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SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS

E-health multimedia services and applications – Interoperability compliance testing of personal health systems (HRN, PAN, LAN, TAN and WAN)

Conformance of ITU-T H.810 personal health system: Personal Health Devices interface Part 10F: Transcoding for Bluetooth Low Energy: Personal Health Gateway – Pulse oximeter

Recommendation ITU-T H.850.6

International Telecommunication Union

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Recommendation ITU-T H.850.6

Conformance of ITU-T H.810 personal health system: Personal Health Devices interface Part 10F: Transcoding for Bluetooth Low Energy: Personal Health Gateway – Pulse oximeter

Summary

Recommendation ITU-T H.850.6 provides a test suite structure (TSS) and the test purposes (TP) for the transcoding of pulse oximeter data by personal health gateways in the Personal Health Devices (PHD) interface of application-level data between the Bluetooth Low Energy Bluetooth Generic Attribute Profile (GATT) format and the IEEE 11073-20601 data format, of which Recommendation ITU-T H.810 (2016) is the base Recommendation. The objective of this test specification is to provide a high probability of interoperability at this interface.

Recommendation ITU-T H.850.6 is a transposition of clause 3.8 of Continua Test Tool DG2016, Test Suite Structure & Test Purposes, Personal Health Devices Interface; Part 10: PHD Transcoding Whitepaper. Personal Health Gateway (Version 1.7, 2017-07-18), that was developed by the Personal Connected Health Alliance. A number of versions of this specification existed before transposition.

This Recommendation includes an electronic attachment with the protocol implementation conformance statements (PICS) and the protocol implementation extra information for testing (PIXIT) required for the implementation of Annex A.

This Recommendation is part of ITU-T H.850 that was originally approved in 04/2017 as a single part, but which was split at publication time into eight sub-parts for easier use, maintenance and expandability:

– ITU-T H.850 with the general requirements;
– ITU-T H.850.1 with thermometer PHD requirements;
– ITU-T H.850.2 with blood pressure PHD requirements;
– ITU-T H.850.3 with heart rate PHD requirements;
– ITU-T H.850.4 with glucose meter PHD requirements;
– ITU-T H.850.5 with weighing scales PHD requirements;
– ITU-T H.850.6 with pulse oximeter PHD requirements;
– ITU-T H.850.7 with continuous glucose monitoring PHD requirements.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T H.850.6	2017-04-29	16	11.1002/1000/13359

Keywords

Bluetooth Generic Attribute Profile, Bluetooth Low Energy (BLE), Conformance testing, Continua Design Guidelines, data format transcoding, e-health, IEEE 11073-20601, ITU-T H.810, personal area network, personal connected health devices, Personal Health Devices interface, Personal Health Gateway, pulse oximeter, touch area network.

* To access the Recommendation, type the URL http://handle.itu.int/ in the address field of your web browser, followed by the Recommendation's unique ID. For example, http://handle.itu.int/11.1002/1000/11830-en.

FOREWORD

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As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at http://www.itu.int/ITU-T/ipr/.

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Electronic attachment: This Recommendation includes an electronic attachment with the protocol implementation conformance statements (PICS) and the protocol implementation extra information for testing (PIXIT) required for the implementation of Annex A.

Introduction

This Recommendation is a transposition of clause 3.8 of Continua Test Tool DG2016, Test Suite Structure & Test Purposes, Personal Health Devices Interface; Part 10: PHD Transcoding Whitepaper. Personal Health Gateway (Version 1.7, 2017-07-18), that was developed by the Personal Connected Health Alliance. The table below shows the revision history of this test specification; it may contain versions that existed before transposition.

Version	Date	Revision history
1.0	2012-10-05	Initial release for Test Tool DG2011 based on the requirements in [b-CDG 2011].
1.1	2013-05-24	Initial release for Test Tool DG2012. It uses "TSS&TP_DG2011_LP-PAN_PART_10_v1.0.doc" as a baseline and adds new features included in [b-CDG 2012] (BPM and HR profiles).
1.2	2014-01-24	Initial release for Test Tool DG2013. It uses "TSS&TP_DG2012_LP-PAN_PART_10_v1.1.doc" as a baseline and adds new features included in [b-ITU-T H.810 (2013)]/[b-CDG 2013]: • Adds glucose meter BLE • Adds BLE SSP support • Adds NFC new transport • Adds INR device specialization
1.3	2014-04-24	TM Lite & Doc Enhancements (Test Tool v4.0 Maintenance Release 1). It uses "TSS&TP_DG2013_LP-PAN_PART_10_ v1.2.doc" as a baseline and adds new features included in Documentation Enhancements: • "Other PICS" row has been added
1.4	2015-07-01	Initial release for Test Tool DG2015. It uses "TSS&TP_ DG2013_LP-PAN_PART_10_v1.3.doc" as a baseline and adds new features included in [b-ITU-T H.810 (2015)]/ [b-CDG 2015]: • Adds WS/BCA BLE device specialization • Adds SABTE IEEE device specialization
1.5	2016-01-26	First maintenance release for Test Tool DG2015. It uses "TSS&TP_DG2015_LP-PAN_PART_10_v1.4.doc" as a baseline and adds some updates according to the Maintenance 2015 activity.
1.6	2016-09-20	Initial release for Test Tool DG2016. It uses "TSS&TP_ DG2016_LP-PAN_PART_10_v1.5.doc" as a baseline and adds new features included in [ITU-T H.810 (2016)]/[b-CDG 2016]: • Adds PLX BLE device specialization • Adds PLX CGM device specialization
1.7	2017-07-18	Second Maintenance Release for Test Tool DG2016. It uses "TSS&TP_DG2016_LP-PAN_PART_10_v1.6.doc" as a baseline and corrects minor typos.

Recommendation ITU-T H.850.6

Conformance of ITU-T H.810 personal health devices: Personal Health Devices interface Part 10F: Transcoding for Bluetooth Low Energy: Personal Health Gateway – Pulse oximeter

1 Scope

The scope of this Recommendation[1] is to provide a test suite structure (TSS) and the test purposes (TP) for the Personal Health Devices interface based on the requirements defined in the Continua Design Guidelines (CDG) [ITU-T H.810 (2016)]. The objective of this test specification is to provide a high probability of interoperability at this interface.

The TSS and TP for the Personal Health Devices interface have been divided into the parts specified below. This Recommendation covers Part 10F.

– Part 1: Optimized exchange protocol. Personal Health Device
– Part 2: Optimized exchange protocol. Personal Health Gateway
– Part 3: Continua design guidelines. Personal Health Device
– Part 4: Continua design guidelines. Personal Health Gateway
– Part 5: Device specializations. Personal Health Devices interface. This document is divided into the following subparts:
  - Part 5A: Weighing scales
  - Part 5B: Glucose meter
  - Part 5C: Pulse oximeter
  - Part 5D: Blood pressure monitor
  - Part 5E: Thermometer
  - Part 5F: Cardiovascular fitness and activity monitor
  - Part 5G: Strength fitness equipment
  - Part 5H: Independent living activity hub
  - Part 5I: Adherence monitor
  - Part 5J: Insulin pump
  - Part 5K: Peak expiratory flow monitor
  - Part 5L: Body composition analyser
  - Part 5M: Basic electrocardiograph
  - Part 5N: International normalized ratio monitor
  - Part 5O: Sleep apnoea breathing therapy equipment (SABTE)
  - Part 5P: Continuous glucose monitor (CGM)
– Part 6: Device specializations. Personal Health Gateway

[1] This Recommendation includes an electronic attachment with the protocol implementation conformance statements (PICS) and the protocol implementation extra information for testing (PIXIT) required for the implementation of Annex A.

– Part 7: Continua Design Guidelines. BLE Personal Health Device
– Part 8: Continua Design Guidelines. BLE Personal Health Gateway
– Part 9: Personal Health Devices Transcoding Whitepaper. Personal Health Devices
– Part 10: Personal Health Devices Transcoding Whitepaper. Personal Health Gateway. In addition to the main part, the document is subdivided into the following subparts:
  - Part 10A: Whitepaper Thermometer requirements
  - Part 10B: Whitepaper Blood pressure requirements
  - Part 10C: Whitepaper Heart rate requirements
  - Part 10D: Whitepaper Glucose meter requirements
  - Part 10E: Whitepaper Weighing scales requirements
  - **Part 10F: Whitepaper Pulse oximeter requirements**
  - Part 10G: Whitepaper Continuous glucose monitoring requirements

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ITU-T H.810 (2016)] Recommendation ITU-T H.810 (2016), *Interoperability design guidelines for personal health systems*.

[Bluetooth PHDT v1.4] Bluetooth SIG (2013), *Personal Health Devices Transcoding White Paper, v1.4*. https://www.bluetooth.org/DocMan/handlers/DownloadDoc.ashx?doc_id=294539

[Bluetooth PHDT v1.5] Bluetooth SIG (2014), *Personal Health Devices Transcoding White Paper, v1.5*. https://www.bluetooth.org/DocMan/handlers/DownloadDoc.ashx?doc_id=272346

[Bluetooth PHDT v1.6] Bluetooth SIG (2015), *Personal Health Devices Transcoding White Paper, v1.6*. https://www.bluetooth.org/DocMan/handlers/DownloadDoc.ashx?doc_id=310657

[ISO/IEEE 11073-104xx] ISO/IEEE 11073-104xx (in force), *Health informatics – Personal health device communication – Device specialization*. NOTE – Shorthand to refer to the collection of device specialization standards that utilize [ISO/IEEE 11073-20601-2015A], where xx can be any number from 01 to 99, inclusive.

[ISO/IEEE 11073-20601-2015A] ISO/IEEE 11073-20601:2010, *Health informatics – Personal health device communication – Part 20601: Application profile – Optimized exchange protocol,* including ISO/IEEE 11073-20601:2010 Amd 1:2015. https://www.iso.org/standard/54331.html with https://www.iso.org/standard/63972.html

[ISO/IEEE 11073-20601-2016C] ISO/IEEE 11073-20601:2016, *Health informatics – Personal health device communication – Part 20601: Application profile – Optimized exchange protocol*, including ISO/IEEE 11073-20601:2016/Cor.1:2016. https://www.iso.org/standard/66717.html with https://www.iso.org/standard/71886.html

[IHE PCD TF 1] IHE PCD TF 1 (2012), *IHE Patient Care Device Technical Framework – Revision 2.0. Volume 1: Integration Profiles*. http://www.ihe.net/Technical_Framework/upload/IHE_PCD_TF_Rev2-0_Vol1_FT_2012-08-16.pdf

[IHE PCD TF 2] IHE PCD TF 2 (2012), *IHE Patient Care Device Technical Framework – Revision 2.0. Volume 2: Transactions*. http://www.ihe.net/Technical_Framework/upload/IHE_PCD_TF_Rev2-0_Vol2_FT_2012-08-16.pdf

[IHE PCD TF 3] IHE PCD TF 3 (2012), *IHE Patient Care Device Technical Framework – Revision 2.0. Volume 3: Semantic Content*. http://www.ihe.net/Technical_Framework/upload/IHE_PCD_TF_Rev2-0_Vol3_FT_2012-08-16.pdf

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 agent [ISO/IEEE 11073-20601-2016C]: A node that collects and transmits personal health data to an associated manager.

3.1.2 manager [ISO/IEEE 11073-20601-2016C]: A node receiving data from one or more agent systems. Some examples of managers include a cellular phone, health appliance, set top box, or a computer system.

3.2 Terms defined in this Recommendation

None.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

ATS Abstract Test Suite

CDG Continua Design Guidelines

CGM Continuous Glucose Monitor

DUT Device Under Test

GUI Graphical User Interface

INR International Normalized Ratio

IP Insulin Pump

IUT Implementation Under Test

LSB Least Significant Bit

MDS Medical Device System

MSB Most Significant Bit

NFC Near Field Communication

PAN Personal Area Network

PCD Patient Care Device

PCO Point of Control and Observation

PCT Protocol Conformance Testing

PHD Personal Health Device

PHDC Personal Healthcare Device Class

PHG Personal Health Gateway

PICS Protocol Implementation Conformance Statement

PIXIT Protocol Implementation extra Information for Testing

RACP Record Access Control Point

SABTE Sleep Apnoea Breathing Therapy Equipment

SCR Static Conformance Review

SDP Service Discovery Protocol

SOAP Simple Object Access Protocol

TCRL Test Case Reference List

TCWG Test and Certification Working Group

TP Test Purposes

TSS Test Suite Structure

USB Universal Serial Bus

WDM Windows Driver Model

5 Conventions

In this text, the uppercase letter L is used as the symbol for litre.

Several of the test purposes in Annex A refer to "WAN PCD-01 messages"; these messages are specified in the patient care device (PCD) technical framework defined in [IHE PCD TF 1], [IHE PCD TF 2] and [IHE PCD TF 3]. Similarly, the "IEEE 11073 Objects and Attributes" are defined in [ISO/IEEE 11073-104xx].

The key words "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "MAY", "MAY NOT" in this Recommendation are to be interpreted as in [b-ETSI SR 001 262].

– SHALL is equivalent to 'must' or 'it is required to'.

– SHALL NOT is equivalent to 'must not' or 'it is not allowed'.

– SHOULD is equivalent to 'it is recommended to'.

– SHOULD NOT is equivalent to 'it is not recommended to'.

– MAY is equivalent to 'is permitted'.

– MAY NOT is equivalent to 'it is not required that'.

NOTE – The above-mentioned key words are capitalized for illustrative purposes only and they do not appear capitalized within this Recommendation.

In this document, hexadecimal numbers are denoted either with the prefix "0x" or by "(hex)" after the number; "(dec)" after a number indicates it is expressed in decimal format.

Reference is made in the ITU-T H.800-series of Recommendations to different versions of the Continua Design Guidelines (CDG) by a specific designation. The list of terms that may be used in this Recommendation is provided in Table 1.

Table 1 – List of designations associated with the various versions of the CDG

CDG release	Transposed as	Version	Description	Designation
2016 plus errata	[ITU-T H.810 (2016)]	6.1	Release 2016 plus errata noting all ratified bugs [b-CDG 2016].	–
2016	–	6.0	Release 2016 of the CDG including maintenance updates of the CDG 2015 and additional guidelines that cover new functionalities.	Iris
2015 plus errata	[b-ITU-T H.810 (2015)]	5.1	Release 2015 plus errata noting all ratified bugs [b-CDG 2015]. The 2013 edition of ITU-T H.810 is split into eight parts in the ITU-T H.810-series.	–
2015	–	5.0	Release 2015 of the CDG including maintenance updates of the CDG 2013 and additional guidelines that cover new functionalities.	Genome
2013 plus errata	[b-ITU-T H.810 (2013)]	4.1	Release 2013 plus errata noting all ratified bugs [b-CDG 2013].	–
2013	–	4.0	Release 2013 of the CDG including maintenance updates of the CDG 2012 and additional guidelines that cover new functionalities.	Endorphin
2012 plus errata	–	3.1	Release 2012 plus errata noting all ratified bugs [b-CDG 2012].	–
2012	–	3.0	Release 2012 of the CDG including maintenance updates of the CDG 2011 and additional guidelines that cover new functionalities.	Catalyst
2011 plus errata	–	2.1	CDG 2011 integrated with identified errata.	–
2011	–	2.0	Release 2011 of the CDG including maintenance updates of the CDG 2010 and additional guidelines that cover new functionalities [b-CDG 2011].	Adrenaline
2010 plus errata	–	1.6	CDG 2010 integrated with identified errata.	–
2010	–	1.5	Release 2010 of the CDG with maintenance updates of the CDG Version 1 and additional guidelines that cover new functionalities [b-CDG 2010].	1.5
1.0	–	1.0	First released version of the CDG [b-CDG 1.0].	–

6 Test suite structure

The test purposes (TP) for the Personal Health Devices interface have been divided into the groups and subgroups specified below. Annex A describes the TPs for subgroup 2.4.7 (shown in bold).

– Group 1: Personal Health Device (PHD)
  - Group 1.1: Transport (TR)
    - Subgroup 1.1.1: Design guidelines: Common (DGC)
    - Subgroup 1.1.2: USB design guidelines (UDG)
    - Subgroup 1.1.3: Bluetooth design guidelines (BDG)
    - Subgroup 1.1.4: Pulse oximeter design guidelines (PODG)
    - Subgroup 1.1.5: Cardiovascular design guidelines (CVDG)
    - Subgroup 1.1.6: Activity hub design guidelines (HUBDG)
    - Subgroup 1.1.7: ZigBee design guidelines (ZDG)
    - Subgroup 1.1.8: Glucose meter design guidelines (GLDG)
    - Subgroup 1.1.9: Bluetooth low energy design guidelines (BLEDG)
    - Subgroup 1.1.10: Basic electrocardiograph design guidelines (ECGDG)
    - Subgroup 1.1.11: NFC design guidelines (NDG)
  - Group 1.2: IEEE 20601 Optimized exchange protocol (OXP)
    - Subgroup 1.2.1: PHD domain information model (DIM)
    - Subgroup 1.2.2: PHD service model (SER)
    - Subgroup 1.2.3: PHD communication model (COM)
  - Group 1.3: Devices class specializations (CLASS)
    - Subgroup 1.3.1: Weighing scales (WEG)
    - Subgroup 1.3.2: Glucose meter (GL)
    - Subgroup 1.3.3: Pulse oximeter (PO)
    - Subgroup 1.3.4: Blood pressure monitor (BPM)
    - Subgroup 1.3.5: Thermometer (TH)
    - Subgroup 1.3.6: Cardiovascular (CV)
    - Subgroup 1.3.7: Strength (ST)
    - Subgroup 1.3.8: Activity hub (HUB)
    - Subgroup 1.3.9: Adherence monitor (AM)
    - Subgroup 1.3.10: Insulin pump (IP)
    - Subgroup 1.3.11: Peak flow (PF)
    - Subgroup 1.3.12: Body composition analyser (BCA)
    - Subgroup 1.3.13: Basic electrocardiograph (ECG)
    - Subgroup 1.3.14: International normalized ratio (INR)
    - Subgroup 1.3.15: Sleep apnoea breathing therapy equipment (SABTE)
    - Subgroup 1.3.16: Continuous glucose monitor (CGM)
  - Group 1.4: Personal health device transcoding whitepaper (PHDTW)
    - Subgroup 1.4.1: Whitepaper general requirements (GEN)
    - Subgroup 1.4.2: Whitepaper thermometer requirements (TH)
    - Subgroup 1.4.3: Whitepaper blood pressure requirements (BPM)

- Subgroup 1.4.4: Whitepaper heart rate requirements (HR)
- Subgroup 1.4.5: Whitepaper glucose meter requirements (GL)
- Subgroup 1.4.6: Whitepaper weight scale requirements (WS)
- Subgroup 1.4.7: Whitepaper pulse oximeter requirements (PLX)
- Subgroup 1.4.8: Whitepaper continuous glucose monitoring requirements (CGM)

– Group 2: Personal Health Gateway (PHG)

- Group 2.1: Transport (TR)
  - Subgroup 2.1.1: Design guidelines: Common (DGC)
  - Subgroup 2.1.2: USB design guidelines (UDG)
  - Subgroup 2.1.3: Bluetooth design guidelines (BDG)
  - Subgroup 2.1.4: Cardiovascular design guidelines (CVDG)
  - Subgroup 2.1.5: Activity hub design guidelines (HUBDG)
  - Subgroup 2.1.6: ZigBee design guidelines (ZDG)
  - Subgroup 2.1.7: Bluetooth low energy design guidelines (BLEDG)
  - Subgroup 2.1.8: NFC design guidelines (NDG)
- Group 2.2: IEEE 20601 Optimized exchange protocol (OXP)
  - Subgroup 2.2.1: General (GEN)
  - Subgroup 2.2.2: PHD domain information model (DIM)
  - Subgroup 2.2.3: PHD service model (SER)
  - Subgroup 2.2.4: PHD communication model (COM)
- Group 2.3: Devices class specializations (CLASS)
  - Subgroup 2.3.1: Weighing scales (WEG)
  - Subgroup 2.3.2: Glucose meter (GL)
  - Subgroup 2.3.3: Pulse oximeter (PO)
  - Subgroup 2.3.4: Blood pressure monitor (BPM)
  - Subgroup 2.3.5: Thermometer (TH)
  - Subgroup 2.3.6: Cardiovascular (CV)
  - Subgroup 2.3.7: Strength (ST)
  - Subgroup 2.3.8: Activity hub (HUB)
  - Subgroup 2.3.9: Adherence monitor (AM)
  - Subgroup 2.3.10: Insulin pump (IP)
  - Subgroup 2.3.11: Peak flow (PF)
  - Subgroup 2.3.12: Body composition analyser (BCA)
  - Subgroup 2.3.13: Basic electrocardiograph (ECG)
  - Subgroup 2.3.14: International normalized ratio (INR)
  - Subgroup 2.3.15: Sleep apnoea breathing therapy equipment (SABTE)
  - Subgroup 2.3.16: Continuous glucose monitor (CGM)
- Group 2.4: Personal health device transcoding whitepaper (PHDTW)
  - Subgroup 2.4.1: Whitepaper general requirements (GEN)
  - Subgroup 2.4.2: Whitepaper thermometer requirements (TH)
  - Subgroup 2.4.3: Whitepaper blood pressure measurement requirements (BPM)

- Subgroup 2.4.4: Whitepaper heart rate requirements (HR)
- Subgroup 2.4.5: Whitepaper glucose meter requirements (GL)
- Subgroup 2.4.6: Whitepaper weight scale requirements (WS)
- **Subgroup 2.4.7: Whitepaper pulse oximeter requirements (PLX)**
- Subgroup 2.4.8: Whitepaper continuous glucose monitoring requirements (CGM)

7 Electronic attachment

The protocol implementation conformance statements (PICS) and the protocol implementation extra information for testing (PIXIT) required for the implementation of Annex A can be downloaded from http://handle.itu.int/11.1002/2000/12067.

In the electronic attachment, letters "C" and "I" in the column labelled "Mandatory" are used to distinguish between "PICS" and "PIXIT" respectively during testing. If the cell is empty, the corresponding PICS is "independent". If the field contains a "C", the corresponding PICS is dependent on other PICS, and the logical expression is detailed in the "SCR_Expression" field. The static conformance review (SCR) is used in the test tool to assert whether the PICS selection is consistent.

Annex A

Test purposes

(This annex forms an integral part of this Recommendation.)

A.1 TP definition conventions

The test purposes (TPs) are defined according to the following rules:

– **TP Id**: This is a unique identifier (TP/<TT>/<DUT>/<GR>/<SGR>/<XX> – <NNN>). It is specified according to the naming convention defined below:

- Each test purpose identifier is introduced by the prefix "TP".
- <TT>: This is the test tool that will be used in the test case.
  - PAN: Personal area network (Bluetooth or USB)
  - LAN: Local area network (ZigBee)
  - PAN-LAN: Personal area network (Bluetooth or USB) – Local area network (ZigBee)
  - LP-PAN: Low power personal area network (Bluetooth low energy)
  - TAN: Touch area network (NFC)
  - PLT: Personal area network (Bluetooth or USB) – Local area network (ZigBee) – Touch area network (NFC)
- <DUT>: This is the device under test.
  - PHD: Personal Health Device
  - PHG: Personal Health Gateway
- <GR>: This identifies a group of test cases.
- <SGR>: This identifies a subgroup of test cases.
- <XX>: This identifies the type of testing.
  - BV: Valid behaviour test
  - BI: Invalid behaviour test
- <NNN>: This is a sequential number that identifies a test purpose.

– **TP label**: This is the TP's title.

– **Coverage**: This contains the specification reference and clause to be checked by the TP.

- Spec: This indicates the earliest version of the specification from which the testable items to be checked by the TP were included.
- Testable item: This contains the testable items to be checked by the TP.

– **Test purpose**: This is a description of the requirements to be tested.

– **Applicability**: This contains the PICS items that define if the test case is applicable or not for a specific device. When a TP contains an "ALL" in this field it means that it applies to the device under test within that scope of the test (specialization, transport used, etc.).

– **Other PICS**: This contains additional PICS items (apart from the PICS specified in the Applicability row) which are used within the test case implementation and can modify the final verdict. When this row is empty, it means that only the PICS specified in the Applicability row are used within the test case implementation.

– **Initial condition**: This indicates the state to which the DUT needs to be moved at the beginning of TC execution.

– **Test procedure**: This describes the steps to be followed in order to execute the test case.
– **Pass/Fail criteria**: This provides criteria to decide whether the DUT passes or fails the test case.

A.2 Subgroup 2.4.7 – Whitepaper Pulse oximeter requirements (PLX)

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-000		
TP label		Whitepaper. Pulse Oximeter MDS Object - System-Type Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	PLX Specific MDS 1; M		
Test purpose		Check that: PHG does not include MDS object, System-Type attribute in transcoder output.		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS				
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a measurement ready to be sent and it is in the Advertising state (it is discoverable). 2. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 3. When the pairing has been completed (Connection state) the simulated PHD sends the Measurement to the PHG under test. 4. Check in PHG transcoder output the MDS object, System-Type attribute		
Pass/Fail criteria		In Step 4, the MDS object, System-Type attribute is not present.		
Notes (To assist manual testing)		Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes System-Type attribute is not present: ❑ Object: MDS Object ❑ Attribute-id: MDC_ATTR_SYS_TYPE (2438) ❑ Attribute-type: TYPE ❑ Attribute-value: <NOT PRESENT> b) WAN PCD-01 message PCD-01 message does not include segments with System-Type attribute value (67974^MDC_ATTR_SYS_TYPE^MDC)		

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-001		
TP label		Whitepaper. Pulse Oximeter MDS Object - Dev-Configuration-Id Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	Common MDS 17; M		
Test purpose		Check that: PHG includes MDS object, Dev-Configuration-Id attribute in transcoder output. [AND] Dev-Configuration-Id value is set to any value in range of 0x4000 to 0x7FFF (Extended Configuration)		

Applicability	C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040
Other PICS	
Initial condition	The PHG under test and the simulated PHD are in the Standby state.
Test Procedure	1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a measurement ready to be sent and it is in the Advertising state (it is discoverable). 2. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 3. When the pairing has been completed (Connection state) the simulated PHD sends the Measurement to the PHG under test. 4. Check in PHG transcoder output the MDS object, Dev-Configuration-Id attribute
Pass/Fail criteria	In Step 4, the MDS object, Dev-Configuration-Id attribute is present, its value is inside the range 0x4000 - 0x7FFF
Notes (To assist manual testing)	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Dev-Configuration-Id attribute is present: ❑ Object: MDS Object ❑ Attribute-id: MDC_ATTR_DEV_CONFIG_ID (2628) ❑ Attribute-type: INT-U16 ❑ Attribute-value: Any value inside the range 16384 - 32767 (dec) or 0x4000 – 0x7FFF (hex) b) WAN PCD-01 message According to Continua DG, the Dev-Configuration-Id shall not be transmitted in PCD-01 message, therefore it is not possible to check this attribute.

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-002		
TP label		Whitepaper. Pulse Oximeter MDS Object - System-Type-Spec-List Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	Common MDS 15; M	PLX Specific MDS 2; M	
Test purpose		Check that: PHG includes MDS object, System-Type-Spec-List attribute in transcoder output. [AND] System-Type-Spec-List is set to (MDC_DEV_SPEC_PROFILE_PULS_OXIM, Version 1)		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS				
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a measurement ready to be sent and it is in the Advertising state (it is discoverable). 2. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 3. When the pairing has been completed (Connection state) the simulated PHD sends the Measurement to the PHG under test.		

	4. Check in PHG transcoder output the MDS object, System-Type-Spec-List attribute
Pass/Fail criteria	In Step 4, the MDS object, System-Type-Spec-List attribute is present, its value is (MDC_DEV_SPEC_PROFILE_PULS_OXIM, Version 1)
Notes (To assist manual testing)	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes System-Type-Spec-List attribute is present: ❑ Object: MDS Object ❑ Attribute-id: MDC_ATTR_SYS_TYPE_SPEC_LIST (2650) ❑ Attribute-type: SEQUENCE OF [{type (INT-U16), version (INT-U16)}] ❑ Attribute-value: • type: MDC_DEV_SPEC_PROFILE_PULS_OXIM, 4100 (dec) or 10 04 (hex) • version: 1 (dec) or 00 01 (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with System-Type-Spec-List attribute value (check OBX-5): OBX|?|NM|68186^MDC_ATTR_SYS_TYPE_SPEC_LIST^MDC|1.0.0.a| 528388^MDC_DEV_SPEC_PROFILE_PULS_OXIM^MDC|||||R

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-003		
TP label		Whitepaper. Pulse Oximeter MDS Object - Reg-Cert-Data-List Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	Common MDS 14; M	Regulatory Conv 1; M	
Test purpose		Check that: PHG transcodes IEEE 11073-20601 Regulatory Certification Data List characteristic into MDS object, Reg-Cert-Data-List attribute		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS				
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a measurement ready to be sent and it is in the Advertising state (it is discoverable). 2. The simulated PHD implements several BTLE characteristics. The characteristic of interest for this Test Case is: a. IEEE 11073-20601 Regulatory Certification Data List (0x2A2A) • Format: reg-cert-data-list (opaque structure) • Value: 00 02 00 12 02 01 00 08 06 01 00 01 00 02 80 04 02 02 00 02 80 00 (hex) i. Element: • auth-body-and-struc-type: - auth-body: 02 (hex) auth-body-continua(2) - auth-body-struc-type: 01 (hex). continua-version-struct(1) • auth-body-data:		

	- major-IG-version: 06 (hex) - minor-IG-version: 01 (hex) - certified-devices: 80 04 (hex) BTLE Pulse Oximeter ii. Element: • auth-body-and-struc-type: - auth-body: 02 (hex). auth-body-continua(2) - auth-body-struc-type: 02 (hex). continua-reg-struct(2) • auth-body-data: - regulation-bit-field: 80 00 (hex). Unregulated device 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD. 4. When the pairing has been completed (Connection state), force the PHG under test to read IEEE 11073-20601 Regulatory Certification Data List characteristic. 5. Check in PHG transcoder output the MDS object, Reg-Cert-Data-List attribute
Pass/Fail criteria	In Step 5, the MDS object, Reg-Cert-Data-List attribute is present and its value matches with IEEE 11073-20601 Regulatory Certification Data List characteristic value
Notes **(To assist manual testing)**	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Reg-Cert-Data-List attribute is present: ❑ Object: MDS Object ❑ Attribute-id: MDC_ATTR_REG_CERT_DATA_LIST (2635) ❑ Attribute-type: SEQUENCE OF [{auth-body-and-struc-type, auth-body-data}, {…}] ❑ Attribute-value: 00 02 00 12 02 01 00 08 06 01 00 01 00 02 80 04 02 02 00 02 80 00 (hex) [Note that 0x00 0x02 is the number of elements in the sequence and 0x00 0x12 is the length of the sequence] i. Reg-Cert-Data Element: • auth-body-and-struc-type: - auth-body: 02 (hex) auth-body-continua(2) - auth-body-struc-type: 01 (hex). continua-version-struct(1) • auth-body-data: - major-IG-version: 06 (hex) - minor-IG-version: 01 (hex) - certified-devices: 80 04 (hex). BTLE Pulse Oximeter ii. Reg-Cert-Data Element: • auth-body-and-struc-type: - auth-body: 02 (hex). auth-body-continua(2) - auth-body-struc-type: 02 (hex). continua-reg-struct(2) • auth-body-data: - regulation-bit-field: 80 00 (hex). Unregulated device b) WAN PCD-01 message PCD-01 message includes five segments like these with Reg-Cert-Data-List attribute value (check OBX-5 in five segments): OBX|?|CWE|68218^MDC_REG_CERT_DATA_AUTH_BODY^MDC|1.0.0.a|2^auth-body-continua|||||R OBX|?|ST|532352^MDC_REG_CERT_DATA_CONTINUA_VERSION^MDC| 1.0.0.a.x| 6.1|||||R

	OBX|?|NA|532353^MDC_REG_CERT_DATA_CONTINUA_CERT_DEV_LIST^MDC|1.0.0.a.y|32772||||||R OBX|?|CWE|68218^MDC_REG_CERT_DATA_AUTH_BODY^MDC|1.0.0.b|2^auth-body-continua|||||R OBX|?|CWE|532354^MDC_REG_CERT_DATA_CONTINUA_REG_STATUS^MDC|1.0.0.b.z|1^unregulated-device(0)||||||R

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-004		
TP label		Whitepaper. SpO2 Numeric Object (Spot-Check Measurement) - Handle Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	SpO2 Numeric 1; O		
Test purpose		Check that: PHG does not include SpO2 Numeric object, Handle Attribute in transcoder output when using spot-check measurement mode. [OR] If PHG includes SpO2 Numeric object, Handle attribute in transcoder output, then its value shall be different than 0		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS		C_MAN_BLE_042		
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a spot-check measurement ready to be sent and it is in the Advertising state (it is discoverable). The simulated PHD also supports the RACP characteristic and has an identical spot-check measurement temporarily stored. 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 0000 **11**00 (MSB → LSB). Measurement Storage for spot-check measurements is supported (bit 2). Timestamp for Spot-Check measurements is supported. ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included b. PLX Spot-Check Measurement (0x2A5E) i. Field: Flags • Format: 8 bit • Value: 0000 000**1** (MSB → LSB). Timestamp field is present. Measurement Status, Device and Sensor Status, and Pulse Amplitude Index fields are not present. Device Clock is set. ii. Field: SpO2PR-Spot-Check - SpO2 (%) • Format: SFLOAT		

	• Value: Not Relevant iii. Field: SpO2PR-Spot-Check – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: Time Stamp • Format: Date and Time • Value: Not Relevant v. Field: Measurement Status • This field is not included vi. Field: Device and Sensor Status • This field is not included vii. Field: Pulse Amplitude Index (%) • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the measurement to the PHG under test. 6. Check in PHG transcoder output the SpO2 Numeric object, Handle attribute 7. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check in PHG transcoder output the SpO2 Numeric object, Handle attribute
Pass/Fail criteria	In Step 6, the SpO2 Numeric object, Handle attribute is not present or, if it is present then its value is different than 0 If the PHG supports RACP, the same criteria applies to Step 7.b
Notes (To assist manual testing)	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Handle attribute is not present, or if it is present then: ❑ Object: SpO2 Numeric Object ❑ Attribute-id: MDC_ATTR_ID_HANDLE (2337) ❑ Attribute-type: INT-U16 ❑ Attribute-value: Any value different than 0 b) WAN PCD-01 message PCD-01 message does not include segments with Handle attribute value

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-005		
TP label		Whitepaper. SpO2 Numeric Object (Continuous Measurements) - Handle Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	SpO2 Numeric 11; O		

Test purpose	Check that: PHG does not include SpO2 Numeric object, Handle Attribute in transcoder output when using continuous measurements [OR] If PHG includes SpO2 Numeric object, Handle attribute in transcoder output, then its value shall be different than 0
Applicability	C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040
Other PICS	
Initial condition	The PHG under test and the simulated PHD are in the Standby state.
Test procedure	1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a continuous measurement (including fast and slow response measurement values) ready to be sent and it is in the Advertising state (it is discoverable). 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 00**11** 0000 (MSB → LSB). Fast and slow response modes are supported (bits 4 and 5). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included b. PLX Continuous Measurement (0x2A5F) i. Field: Flags • Format: 8 bit • Value: 0000 00**11** (MSB → LSB). SpO2PR–Fast, SpO2PR-Slow fields are present. Measurement Status, Device and Sensor Status and Pulse Amplitude Index fields are not present. ii. Field: SpO2PR-Normal - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Normal – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: SpO2PR-Fast - SpO2 (%) • Format: SFLOAT • Value: Not Relevant v. Field: SpO2PR-Fast - PR (bpm) • Format: SFLOAT • Value: Not Relevant vi. Field: SpO2PR-Slow - SpO2 (%) • Format: SFLOAT • Value: Not Relevant vii. Field: SpO2PR-Slow - PR (bpm)

	• Format: SFLOAT • Value: Not Relevant viii. Field: Measurement Status • This field is not included ix. Field: Device and Sensor Status • This field is not included x. Field: Pulse Amplitude Index (%) • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the Measurement to the PHG under test. 6. Check in PHG transcoder output the SpO2 Numeric object, Handle attribute in all three SpO2 objects (continuous normal, fast and slow).
Pass/Fail criteria	In Step 6, • There are three SpO2 objects (for normal, fast and slow measurement modes). • In all three objects, the SpO2 Numeric object, Handle attribute is not present or, if it is present then its value is different than 0
Notes (To assist manual testing)	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Handle attribute is not present in SpO2 objects, or if it is present then: ❑ Object: SpO2 Numeric Object ❑ Attribute-id: MDC_ATTR_ID_HANDLE (2337) ❑ Attribute-type: INT-U16 ❑ Attribute-value: Any value different than 0 b) WAN PCD-01 message PCD-01 message does not include segments with Handle attribute value

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-006		
TP label		Whitepaper. SpO2 Numeric Object (Spot-Check Measurement) - Type Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	SpO2 Numeric 2; M		
Test purpose		Check that: PHG includes SpO2 Numeric object, Type attribute in transcoder output when using spot-check measurement mode. [AND] Type is set to {MDC_PART_SCADA, MDC_PULS_OXIM_SAT_O2}		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS		C_MAN_BLE_042		
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		

Test procedure	1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a spot-check measurement ready to be sent and it is in the Advertising state (it is discoverable). The simulated PHD also supports the RACP characteristic and has an identical spot-check measurement temporarily stored. 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 0000 1100 (MSB → LSB). Measurement Storage for spot-check measurements is supported (bit 2). Timestamp for Spot-Check measurements is supported. ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included b. PLX Spot-Check Measurement (0x2A5E) i. Field: Flags • Format: 8 bit • Value: 0000 000**1** (MSB → LSB). Timestamp field is present. Measurement Status, Device and Sensor Status, and Pulse Amplitude Index fields are not present. Device Clock is set. ii. Field: SpO2PR-Spot-Check - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Spot-Check – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: Time Stamp • Format: Date and Time • Value: Not Relevant v. Field: Measurement Status • This field is not included vi. Field: Device and Sensor Status • This field is not included vii. Field: Pulse Amplitude Index (%) • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the Measurement to the PHG under test. 6. Check in PHG transcoder output the SpO2 Numeric object, Type attribute 7. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test

	b. Check in PHG transcoder output the SpO2 Numeric object, Type attribute
Pass/Fail criteria	In Step 6, the SpO2 Numeric object, Type attribute is present and its value is {MDC_PART_SCADA, MDC_PULS_OXIM_SAT_O2} If the PHG supports RACP, the same criteria applies to Step 7.b
Notes (To assist manual testing)	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Type attribute is present: ❑ Object: SpO2 Numeric Object ❑ Attribute-id: MDC_ATTR_ID_TYPE (2351) ❑ Attribute-type : SEQUENCE {partition (INT-U16), code (INT-U16)} ❑ Attribute-value: • partition: MDC_PART_SCADA or 2 (dec) or 00 02 (hex) • code: MDC_PULS_OXIM_SAT_O2 or 19384 (dec) or 4B B8 (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Type attribute (check OBX-3): OBX|n|NM|150456^MDC_PULS_OXIM_SAT_O2^MDC|m.0.0.x|[value]| 262688^MDC_DIM_PERCENT^MDC||||R|||[current_date_time]

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-007		
TP label		Whitepaper. SpO2 Numeric Object (Continuous Measurements) – Type Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	SpO2 Numeric 12; M		
Test purpose		Check that: PHG includes SpO2 Numeric object, Type attribute in transcoder output when using continuous measurements. [AND] Type is set to {MDC_PART_SCADA, MDC_PULS_OXIM_SAT_O2}		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS				
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a continuous measurement (including fast and slow response measurement values) ready to be sent and it is in the Advertising state (it is discoverable). 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Feature (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 00**11** 0000 (MSB → LSB). Fast and slow response modes are supported (bits 4 and 5). ii. Field: Measurement Status Support		

	• This field is not included iii. Field: Device and Sensor Status Support • This field is not included b. PLX Continuous Measurement (0x2A5F) i. Field: Flags • Format: 8 bit • Value: 0000 00**11** (MSB → LSB). SpO2PR–Fast, SpO2PR-Slow fields are present. Measurement Status, Device and Sensor Status and Pulse Amplitude Index fields are not present. ii. Field: SpO2PR-Normal - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Normal – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: SpO2PR-Fast - SpO2 (%) • Format: SFLOAT • Value: Not Relevant v. Field: SpO2PR-Fast - PR (bpm) • Format: SFLOAT • Value: Not Relevant vi. Field: SpO2PR-Slow - SpO2 (%) • Format: SFLOAT • Value: Not Relevant vii. Field: SpO2PR-Slow - PR (bpm) • Format: SFLOAT • Value: Not Relevant viii. Field: Measurement Status • This field is not included ix. Field: Device and Sensor Status • This field is not included x. Field: Pulse Amplitude Index (%) • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Feature characteristic. 5. The simulated PHD sends the Measurement to the PHG under test. 6. Check in PHG transcoder output the SpO2 Numeric object, Type attribute in all three SpO2 objects (continuous normal, fast and slow).
Pass/Fail criteria	In Step 6, • There are three SpO2 objects (for normal, fast and slow measurement modes). • In all three objects, the SpO2 Numeric object, Type attribute is present and its value is {MDC_PART_SCADA, MDC_PULS_OXIM_SAT_O2}

Notes (To assist manual testing)	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Type attribute is present in all three SpO2 objects: ❑ Object: SpO2 Numeric Object ❑ Attribute-id: MDC_ATTR_ID_TYPE (2351) ❑ Attribute-type: SEQUENCE {partition (INT-U16), code (INT-U16)} ❑ Attribute-value: • partition: MDC_PART_SCADA or 2 (dec) or 00 02 (hex) • code: MDC_PULS_OXIM_SAT_O2 or 19384 (dec) or 4B B8 (hex) b) WAN PCD-01 message PCD-01 message includes three segments like this with Type attribute (check OBX-3): OBX|n|NM|**150456^MDC_PULS_OXIM_SAT_O2^MDC**|m.0.0.x|[value]| 262688^MDC_DIM_PERCENT^MDC||||R|||[current_date_time]

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-008		
TP label		Whitepaper. SpO2 Numeric Object (Spot-Check Measurement) – Supplemental-Types Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	SpO2 Numeric 3; M		
Test purpose		Check that: PHG includes SpO2 Numeric object, Supplemental-Types attribute in transcoder output when using spot-check measurement mode. [AND] Supplemental-Types attribute is set to {MDC_PART_SCADA, MDC_MODALITY_SPOT}.		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS		C_MAN_BLE_042		
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a spot-check measurement ready to be sent and it is in the Advertising state (it is discoverable). Simulated PHD also supports the RACP characteristic and has an identical spot-check measurement temporarily stored. 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 0000 **11**00 (MSB → LSB). Measurement Storage for spot-check measurements is supported (bit 2). Timestamp for Spot-Check measurements is supported. ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included		

	b. PLX Spot-Check Measurement (0x2A5E) i. Field: Flags • Format: 8 bit • Value: 0000 000**1** (MSB → LSB). Timestamp field is present. Measurement Status, Device and Sensor Status, and Pulse Amplitude Index fields are not present. Device Clock is set. ii. Field: SpO2PR-Spot-Check - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Spot-Check – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: Time Stamp • Format: Date and Time • Value: Not Relevant v. Field: Measurement Status • This field is not included vi. Field: Device and Sensor Status • This field is not included vii. Field: Pulse Amplitude Index (%) • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the Measurement to the PHG under test. 6. Check in PHG transcoder output the SpO2 Numeric object, Supplemental-Types attribute 7. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check in PHG transcoder output the SpO2 Numeric object, Supplemental-Types attribute
Pass/Fail criteria	In Step 6, the SpO2 Numeric object, Supplemental-Types attribute is present and its value is {MDC_PART_SCADA, MDC_MODALITY_SPOT}. If the PHG supports RACP, the same criteria applies to Step 7.b.
Notes **(To assist manual testing)**	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Supplemental-Types attribute is present: ❑ Object: SpO2 Numeric Object (Spot-Check measurement) ❑ Attribute-id: MDC_ATTR_SUPPLEMENTAL_TYPES (2657) ❑ Attribute-type: SEQUENCE of SEQUENCE {partition (INT-U16), code (INT-U16)} ❑ Attribute-value: {MDC_PART_SCADA, MDC_MODALITY_SPOT}. b) WAN PCD-01 message PCD-01 message includes a facet OBX segment of the SpO2 measurement OBX segment

	with Supplemental-Types attribute (check OBX-3 and OBX-5): OBX|n|NM|150456^MDC_PULS_OXIM_SAT_O2^MDC|m.0.0.x|[value]| 262688^MDC_DIM_PERCENT^MDC|||||R|||[current_date_time] OBX|n|CWE|**68193^MDC_ATTR_SUPPLEMENTAL_TYPES^MDC**|m.0.0.x.y| **150580^MDC_MODALITY_SPOT^MDC**||||||R

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-009		
TP label		Whitepaper. SpO2 Numeric Object (Continuous Measurements) – Supplemental-Types Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	SpO2 Numeric 13; M	SpO2 Numeric 14; M	SpO2 Numeric 15; M
Test purpose		Check that: PHG does not include SpO2 Numeric object, Supplemental-Types attribute in transcoder output for the SpO2 continuous measurement object (normal). [AND] PHG includes SpO2 Numeric object, Supplemental-Types attribute in transcoder output for the SpO2 continuous measurement object (fast mode). Supplemental-Types attribute is set to {MDC_PART_SCADA, MDC_MODALITY_FAST}. [AND] PHG includes SpO2 Numeric object, Supplemental-Types attribute in transcoder output for the SpO2 continuous measurement object (slow mode). Supplemental-Types attribute is set to {MDC_PART_SCADA, MDC_MODALITY_SLOW}.		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS				
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a continuous measurement (including fast and slow response measurement values) ready to be sent and it is in the Advertising state (it is discoverable). 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Feature (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 00**11** 0000 (MSB → LSB). Fast and slow response modes are supported (bits 4 and 5). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included b. PLX Continuous Measurement (0x2A5F) i. Field: Flags • Format: 8 bit • Value: 0000 00**11** (MSB → LSB). SpO2PR–Fast, SpO2PR-Slow fields are present. Measurement Status, Device and Sensor Status and Pulse Amplitude Index fields are not present.		

	ii. Field: SpO2PR-Normal - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Normal - PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: SpO2PR-Fast - SpO2 (%) • Format: SFLOAT • Value: Not Relevant v. Field: SpO2PR-Fast - PR (bpm) • Format: SFLOAT • Value: Not Relevant vi. Field: SpO2PR-Slow - SpO2 (%) • Format: SFLOAT • Value: Not Relevant vii. Field: SpO2PR-Slow - PR (bpm) • Format: SFLOAT • Value: Not Relevant viii. Field: Measurement Status • This field is not included ix. Field: Device and Sensor Status • This field is not included x. Field: Pulse Amplitude Index (%) • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Feature characteristic. 5. The simulated PHD sends the Measurement to the PHG under test. 6. Check in PHG transcoder output the SpO2 Numeric object, Supplemental-Types attribute in all three SpO2 objects (continuous normal, fast and slow).
Pass/Fail criteria	In Step 6, • The SpO2 Numeric Object (normal) – Supplemental-Types attribute is not present • The SpO2 Numeric Object (fast response) Supplemental-Types attribute is present and its value is {MDC_PART_SCADA, MDC_MODALITY_FAST}. • The SpO2 Numeric Object (slow response) Supplemental-Types attribute is present and its value is {MDC_PART_SCADA, MDC_MODALITY_SLOW}.
Notes **(To assist manual testing)**	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Supplemental Types attribute is not present for SpO2 Numeric Object (normal). Supplemental-Types attribute is present for SpO2 Numeric Object (fast response): ❑ Object: SpO2 Numeric Object (fast response) ❑ Attribute-id: MDC_ATTR_SUPPLEMENTAL_TYPES (2657) ❑ Attribute-type: SEQUENCE of SEQUENCE {partition (INT-U16), code (INT-U16)}

	❑ Attribute-value: {MDC_PART_SCADA, MDC_MODALITY_FAST}. Supplemental-Types attribute is present for SpO2 Numeric Object (slow response): ❑ Object: SpO2 Numeric Object (slow response) ❑ Attribute-id: MDC_ATTR_SUPPLEMENTAL_TYPES (2657) ❑ Attribute-type: SEQUENCE of SEQUENCE {partition (INT-U16), code (INT-U16)} ❑ Attribute-value: {MDC_PART_SCADA, MDC_MODALITY_SLOW}. b) WAN PCD-01 message For SpO2 Numeric Object (normal) • PCD-01 message does not include segments with Supplemental-Types attribute. For SpO2 Numeric Object (fast) • PCD-01 message includes a facet OBX segment of the SpO2 measurement OBX segment with Supplemental-Types attribute (check OBX-3 and OBX-5): OBX|n|NM|150456^MDC_PULS_OXIM_SAT_O2^MDC|**m.0.0.x**|[value]|262688^MDC_DIM_PERCENT^MDC||||R|||[current_date_time] OBX|n|CWE|**68193^MDC_ATTR_SUPPLEMENTAL_TYPES^MDC|m.0.0.x.y|150580^MDC_MODALITY_FAST^MDC**||||||R • For SpO2 Numeric Object (slow) PCD-01 message includes a facet OBX segment of the SpO2 measurement OBX segment with Supplemental-Types attribute (check OBX-3 and OBX-5): OBX|n|NM|150456^MDC_PULS_OXIM_SAT_O2^MDC|**m.0.0.y**|[value]|262688^MDC_DIM_PERCENT^MDC||||R|||[current_date_time] OBX|n|CWE|**68193^MDC_ATTR_SUPPLEMENTAL_TYPES^MDC|m.0.0.y.z|150580^MDC_MODALITY_SLOW^MDC**||||||R

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-010		
TP label		Whitepaper. SpO2 Numeric Object (Spot-Check Measurement) - Metric-Spec-Small Attribute 1		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	SpO2 Numeric 4; M	SpO2 Numeric 6; M	
Test purpose		Check that: PHG includes SpO2 Numeric object, Metric-Spec-Small attribute in transcoder output when using spot-check measurement mode. [AND] Metric-Spec-Small is set to {0x5040} when the sensor device supports measurement storage.		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS		C_MAN_BLE_042		
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a spot-check measurement ready to be sent and it is in the Advertising state (it is discoverable). Simulated PHD also supports the RACP characteristic and has an identical spot-check measurement temporarily stored. 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Spot-Check Measurement (0x2A5E) b. PLX Feature (0x2A60)		

	i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 0000 **11**00 (MSB → LSB). Measurement Storage for spot-check measurements is supported (bit 2). Timestamp for Spot-Check measurements is supported (bit 3). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Feature characteristic. 5. The simulated PHD sends the Measurement to the PHG under test with the following value: a. PLX Spot-Check Measurement (0x2A5E) i. Field: Flags • Format: 8 bit • Value: 0000 000**1** (MSB → LSB). Timestamp field is supported. Measurement Status, Device and Sensor Status, and Pulse Amplitude Index fields are not present. Device Clock is set. ii. Field: SpO2PR-Spot-Check - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Spot-Check – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: Time Stamp • Format: Date and Time • Value: Not Relevant v. Field: Measurement Status • This field is not included vi. Field: Device and Sensor Status • This field is not included vii. Field: Pulse Amplitude Index (%) • This field is not included 6. Check in PHG transcoder output the SpO2 numeric object, Metric-Spec-Small attribute 7. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check in PHG transcoder output the SpO2 numeric object, Metric-Spec-Small attribute
Pass/Fail criteria	In Step 6, the SpO2 Numeric Object – Metric-Spec-Small attribute is present and its value is {0x5040} (mss-avail-stored-data| mss-msmt-aperiodic| mss-acc-agent-initiated). If the PHG supports RACP, the same criteria applies to Step 7.b

Notes (To assist manual testing)	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Metric-Spec-Small attribute is present: ❑ Object: SpO2 Numeric Object ❑ Attribute-id: MDC_ATTR_METRIC_SPEC_SMALL (2630) ❑ Attribute-type: BITS-16 ❑ Attribute-value: 50 40 (hex) or BITS mss-avail-stored-data (1), mss- msmt - aperiodic(3), mss-acc-agent-initiated(9) set to TRUE and remaining BITS set to FALSE b) WAN PCD-01 message PCD-01 message does not include segments with Metric-Spec-Small attribute value

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-011		
TP label		Whitepaper. SpO2 Numeric Object (Spot-Check Measurement) - Metric-Spec-Small Attribute 2		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	SpO2 Numeric 4; M	SpO2 Numeric 5; M	
Test purpose		Check that: PHG includes SpO2 Numeric Object – Metric-Spec-Small attribute in transcoder output when using spot-check measurement mode. [AND] Metric-Spec-Small is set to {0x1040} when the sensor device does not support measurement storage.		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS				
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The Ssimulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a spot-check measurement ready to be sent and it is in the Advertising state (it is discoverable). 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Spot-Check Measurement (0x2A5E) b. PLX Feature (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 0000 0**0**00 (MSB → LSB). Measurement Storage for Spot-check measurements is not supported (bit 2). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to		

	read the PLX Feature characteristic. 5. The simulated PHD sends the Measurement to the PHG under test with the following value: a. PLX Spot-Check Measurement (0x2A5E) i. Field: Flags • Format: 8 bit • Value: 0000 0000 (MSB → LSB). Timestamp, Measurement Status, Device and Sensor Status, and Pulse Amplitude Index fields are not present. Device Clock is set. ii. Field: SpO2PR-Spot-Check - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Spot-Check – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: Time Stamp • This field is not included v. Field: Measurement Status • This field is not included vi. Field: Device and Sensor Status • This field is not included vii. Field: Pulse Amplitude Index (%) • This field is not included 6. Check in PHG transcoder output the SpO2 Numeric Object – Metric-Spec-Small attribute
Pass/Fail criteria	In Step 6, the SpO2 Numeric Object – Metric-Spec-Small attribute is present and its value is {0x1040} (mss-msmt-aperiodic | mss-acc-agent-initiated).
Notes (To assist manual testing)	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Metric-Spec-Small attribute is present: ❑ Object: SpO2 Numeric Object ❑ Attribute-id: MDC_ATTR_METRIC_SPEC_SMALL (2630) ❑ Attribute-type: BITS-16 ❑ Attribute-value: 10 40 (hex) or BITS mss-msmt-aperiodic(3), mss-acc-agent-initiated(9) set to TRUE and remaining BITS set to FALSE b) WAN PCD-01 message PCD-01 message does not include segments with Metric-Spec-Small attribute value

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-012		
TP label		Whitepaper. SpO2 Numeric Object (Continuous Measurements) - Metric-Spec-Small Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	SpO2 Numeric 16; M		
Test purpose		Check that:		

	PHG includes SpO2 Numeric Object – Metric-Spec-Small attribute in transcoder output when using continuous measurements. [AND] Metric-Spec-Small is set to {0x0040} (mss-acc-agent-initiated)
Applicability	C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040
Other PICS	
Initial condition	The PHG under test and the simulated PHD are in the Standby state.
Test procedure	1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a continuous measurement (including fast and slow response measurement values) ready to be sent and it is in the Advertising state (it is discoverable). 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Feature (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 00**11** 0000 (MSB → LSB). Fast and slow response modes are supported (bits 4 and 5). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included b. PLX Continuous Measurement (0x2A5F) i. Field: Flags • Format: 8 bit • Value: 0000 00**11** (MSB → LSB). SpO2PR–Fast, SpO2PR-Slow fields are present. Measurement Status, Device and Sensor Status and Pulse Amplitude Index fields are not present. ii. Field: SpO2PR-Normal - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Normal – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: SpO2PR-Fast - SpO2 (%) • Format: SFLOAT • Value: Not Relevant v. Field: SpO2PR-Fast - PR (bpm) • Format: SFLOAT • Value: Not Relevant vi. Field: SpO2PR-Slow - SpO2 (%) • Format: SFLOAT • Value: Not Relevant vii. Field: SpO2PR-Slow - PR (bpm) • Format: SFLOAT

	• Value: Not Relevant viii. Field: Measurement Status • This field is not included ix. Field: Device and Sensor Status • This field is not included x. Field: Pulse Amplitude Index (%) • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Feature characteristic. 5. The simulated PHD sends the Measurement to the PHG under test. 6. Check in PHG transcoder output the SpO2 Numeric Object – Metric-Spec-Small attribute in all three SpO2 objects (continuous normal, fast and slow).
Pass/Fail criteria	In Step 6, • There are three SpO2 objects (for normal, fast and slow measurement modes). • In all three objects, the SpO2 Numeric Object – Metric-Spec-Small attribute is present and its value is {0x0040} (mss-acc-agent-initiated).
Notes (To assist manual testing)	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Metric-Spec-Small attribute is present in all three SpO2 objects: ❑ Object: SpO2 Numeric Object ❑ Attribute-id: MDC_ATTR_METRIC_SPEC_SMALL (2630) ❑ Attribute-type: BITS-16 ❑ Attribute-value: 00 40 (hex) or BITS mss-acc-agent-initiated(9) set to TRUE and remaining BITS set to FALSE b) WAN PCD-01 message PCD-01 message does not include segments with Metric-Spec-Small attribute value

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-013		
TP label		Whitepaper. SpO2 Numeric Object (Spot-Check Measurement) – Measurement-Status Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	SpO2 Numeric 7; M		
Test purpose		Check that: PHG includes SpO2 Numeric Object – Measurement-Status attribute in transcoder output when using spot-check measurement mode. [AND] PHG transcodes the Bluetooth Measurement Status field of the PLX Spot-Check characteristic to 11073 Measurement-Status attribute properly		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS		C_MAN_BLE_042		

Initial condition	The PHG under test and the simulated PHD are in the Standby state.
Test procedure	1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a spot-check measurement ready to be sent and it is in the Advertising state (it is discoverable). Simulated PHD also supports the RACP characteristic and has an identical spot-check measurement temporarily stored. 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Spot-Check Measurement (0x2A5E) b. PLX Feature (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 0000 **11**0**1** (MSB → LSB). Measurement Status support is present (bit 0). Measurement Storage for spot-check measurements is supported (bit 2). Timestamp for Spot-Check measurements is supported (bit 3). ii. Field: Measurement Status Support • Format: 16 bit • Value: **1111 1111 111**0 0000 (MSB → LSB). All Measurement Status bits are supported iii. Field: Device and Sensor Status Support • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Feature characteristic. 5. The simulated PHD sends the Measurement to the PHG under test with the following value: a. PLX Spot-Check Measurement (0x2A5E) i. Field: Flags • Format: 8 bit • Value: 0000 00**11** (MSB → LSB). Measurement Status and Timestamp fields are present. Device and Sensor Status, and Pulse Amplitude Index fields are not present. Device Clock is set. ii. Field: SpO2PR-Spot-Check - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Spot-Check – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: Time Stamp • This field is not included v. Field: Measurement Status • Format: 16 bit • Value: **1**000 0000 0000 0000 (MSB → LSB). Invalid measurement detected (bit 15). vi. Field: Device and Sensor Status • This field is not included vii. Field: Pulse Amplitude Index (%)

	• This field is not included 6. Check in PHG transcoder output the SpO2 Numeric Object – Measurement-Status attribute 7. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check in PHG transcoder output the SpO2 Numeric Object – Measurement-Status attribute 8. Simulated PHD sends a Measurement to PHG under test with Measurement Status field set to 0**1**00 0000 0000 0000 (MSB → LSB), questionable measurement detected (bit 14). All remaining fields remain equal to those in step 5. Simulated PHD also deletes all stored records in RACP and stores an identical measurement. 9. Check in PHG transcoder output the SpO2 Numeric Object – Measurement-Status attribute 10. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check in PHG transcoder output the SpO2 Numeric Object – Measurement-Status attribute 11. Simulated PHD sends a Measurement to PHG under test with Measurement Status field set to 00**1**0 0000 0000 0000 (MSB → LSB), measurement not available (bit 13). All remaining fields remain equal to those in step 5. Simulated PHD also deletes all stored records in RACP and stores an identical measurement. 12. Check in PHG transcoder output the SpO2 Numeric Object – Measurement-Status attribute 13. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check in PHG transcoder output the SpO2 Numeric Object – Measurement-Status attribute 14. The simulated PHD sends a Measurement to PHG under test with Measurement Status field set to 000**1** 0000 0000 0000 (MSB → LSB), calibration ongoing (bit 12). All remaining fields remain equal to those in step 5. Simulated PHD also deletes all stored records in RACP and stores an identical measurement. 15. Check in PHG transcoder output the SpO2 Numeric Object – Measurement-Status attribute 16. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check in PHG transcoder output the SpO2 Numeric Object – Measurement-Status attribute 17. The simulated PHD sends a Measurement to PHG under test with Measurement Status field set to 0000 **1**000 0000 0000 (MSB → LSB), data for testing (bit 11). All remaining fields remain equal to those in step 5. Simulated PHD also deletes all stored records in RACP and stores an identical measurement. 18. Check in PHG transcoder output the SpO2 Numeric Object – Measurement-Status attribute 19. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN

	a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check in PHG transcoder output the SpO2 Numeric Object – Measurement-Status attribute 20. The simulated PHD sends a Measurement to PHG under test with Measurement Status field set to 0000 0**1**00 0000 0000 (MSB → LSB), data for demonstration (bit 10). All remaining fields remain equal to those in step 5. Simulated PHD also deletes all stored records in RACP and stores an identical measurement. 21. Check in PHG transcoder output the SpO2 Numeric Object – Measurement-Status attribute 22. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check in PHG transcoder output the SpO2 Numeric Object – Measurement-Status attribute 23. The simulated PHD sends a Measurement to PHG under test with Measurement Status field set to 0000 0000 **1**000 0000 (MSB → LSB), fully qualified data (bit 7). All remaining fields remain equal to those in step 5. Simulated PHD also deletes all stored records in RACP and stores an identical measurement. 24. Check in PHG transcoder output the SpO2 Numeric Object – Measurement-Status attribute 25. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check in PHG transcoder output the SpO2 Numeric Object – Measurement-Status attribute 26. The simulated PHD sends a Measurement to PHG under test with Measurement Status field set to 0000 0000 0**1**00 0000 (MSB → LSB), early estimated data (bit 6). All remaining fields remain equal to those in step 5. Simulated PHD also deletes all stored records in RACP and stores an identical measurement. 27. Check in PHG transcoder output the SpO2 Numeric Object – Measurement-Status attribute 28. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check in PHG transcoder output the SpO2 Numeric Object – Measurement-Status attribute 29. The simulated PHD sends a Measurement to PHG under test with Measurement Status field set to 0000 0000 00**1**0 0000 (MSB → LSB), measurement ongoing (bit 5). All remaining fields remain equal to those in step 5. Simulated PHD also deletes all stored records in RACP and stores an identical measurement. 30. Check in PHG transcoder output the SpO2 Numeric Object – Measurement-Status attribute 31. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check in PHG transcoder output the SpO2 Numeric Object – Measurement-Status

	attribute
Pass/Fail criteria	In Step 6, the SpO2 Numeric Object – Measurement-Status attribute is present and its set to "invalid" (0x8000). If PHG supports RACP, same criteria applies to 7.b. In Step 9, the SpO2 Numeric Object – Measurement-Status attribute is present and its set to "questionable" (0x4000). If PHG supports RACP, same criteria applies to 10.b. In Step 12, the SpO2 Numeric Object – Measurement-Status attribute is present and its set to "not-available" (0x2000). If PHG supports RACP, same criteria applies to 13.b. In Step 15, the SpO2 Numeric Object – Measurement-Status attribute is present and its set to "calibration-ongoing" (0x1000). If PHG supports RACP, same criteria applies to 16.b. In Step 18, the SpO2 Numeric Object – Measurement-Status attribute is present and its set to "test-data" (0x0800). If PHG supports RACP, same criteria applies to 19.b. In Step 21, the SpO2 Numeric Object – Measurement-Status attribute is present and its set to "demo-data" (0x0400). If PHG supports RACP, same criteria applies to 22.b. In Step 24, the SpO2 Numeric Object – Measurement-Status attribute is present and its set to "validated-data" (0x0080). If PHG supports RACP, same criteria applies to 25.b. In Step 27, the SpO2 Numeric Object – Measurement-Status attribute is present and its set to "early-indication" (0x0040). If PHG supports RACP, same criteria applies to 28.b. In Step 30, the SpO2 Numeric Object – Measurement-Status attribute is present and its set to "msmt-ongoing" (0x0020). If PHG supports RACP, same criteria applies to 31.b.
Notes **(To assist manual testing)**	In step 6 (and step 7.b if applicable), possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Measurement-Status attribute is present: ❑ Object: SpO2 Numeric Object ❑ Attribute-id: MDC_ATTR_MSMT_STAT (2375) ❑ Attribute-type: BITS16 ❑ Attribute-value: **80 00** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Measurement-Status attribute value (check OBX-8 and OBX-11): OBX|n|NM|150456^MDC_PULS_OXIM_SAT_O2^MDC|m.0.0.x|[value]| 262688^MDC_DIM_PERCENT^MDC||**INV**|||**X**|||[current_date_time] In step 9 (and step 10.b if applicable), possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Measurement-Status attribute is present: ❑ Object: SpO2 Numeric Object ❑ Attribute-id: MDC_ATTR_MSMT_STAT (2375) ❑ Attribute-type: BITS16 ❑ Attribute-value: **40 00** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Measurement-Status attribute value (check OBX-8 and OBX-11): OBX|n|NM|150456^MDC_PULS_OXIM_SAT_O2^MDC|m.0.0.x|[value]| 262688^MDC_DIM_PERCENT^MDC||**QUES**|||**R**|||[current_date_time] In step 12 (and step 13.b if applicable), possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Measurement-Status attribute is present:

	❑ Object: SpO2 Numeric Object ❑ Attribute-id: MDC_ATTR_MSMT_STAT (2375) ❑ Attribute-type: BITS16 ❑ Attribute-value: **20 00** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Measurement-Status attribute value (check OBX-8 and OBX-11): OBX|n|NM|150456^MDC_PULS_OXIM_SAT_O2^MDC|m.0.0.x|[value]| 262688^MDC_DIM_PERCENT^MDC||**NAV**|||**X**|||[current_date_time] In step 15 (and step 16.b if applicable), possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Measurement-Status attribute is present: ❑ Object: SpO2 Numeric Object ❑ Attribute-id: MDC_ATTR_MSMT_STAT (2375) ❑ Attribute-type: BITS16 ❑ Attribute-value: **10 00** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Measurement-Status attribute value (check OBX-8 and OBX-11): OBX|n|NM|150456^MDC_PULS_OXIM_SAT_O2^MDC|m.0.0.x|[value]| 262688^MDC_DIM_PERCENT^MDC||**CAL**|||**R**|||[current_date_time] In step 18 (and step 19.b if applicable), possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Measurement-Status attribute is present: ❑ Object: SpO2 Numeric Object ❑ Attribute-id: MDC_ATTR_MSMT_STAT (2375) ❑ Attribute-type: BITS16 ❑ Attribute-value: **08 00** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Measurement-Status attribute value (check OBX-8 and OBX-11): OBX|n|NM|150456^MDC_PULS_OXIM_SAT_O2^MDC|m.0.0.x|[value]| 262688^MDC_DIM_PERCENT^MDC||**TEST**|||**R**|||[current_date_time] In step 21 (and step 22.b if applicable), possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Measurement-Status attribute is present: ❑ Object: SpO2 Numeric Object ❑ Attribute-id: MDC_ATTR_MSMT_STAT (2375) ❑ Attribute-type: BITS16 ❑ Attribute-value: **04 00** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Measurement-Status attribute value (check OBX-8 and OBX-11): OBX|n|NM|150456^MDC_PULS_OXIM_SAT_O2^MDC|m.0.0.x|[value]| 262688^MDC_DIM_PERCENT^MDC||**DEMO**|||**R**|||[current_date_time]

	In step 24 (and step 25.b if applicable), possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Measurement-Status attribute is present: ❑ Object: SpO2 Numeric Object ❑ Attribute-id: MDC_ATTR_MSMT_STAT (2375) ❑ Attribute-type: BITS16 ❑ Attribute-value: **00 80** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Measurement-Status attribute value (check OBX-8 and OBX-11): OBX|n|NM|150456^MDC_PULS_OXIM_SAT_O2^MDC|m.0.0.x|[value]| 262688^MDC_DIM_PERCENT^MDC|| |||**F**|||[current_date_time] In step 27 (and step 28.b if applicable), possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Measurement-Status attribute is present: ❑ Object: SpO2 Numeric Object ❑ Attribute-id: MDC_ATTR_MSMT_STAT (2375) ❑ Attribute-type: BITS16 ❑ Attribute-value: **00 40** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Measurement-Status attribute value (check OBX-8 and OBX-11): OBX|n|NM|150456^MDC_PULS_OXIM_SAT_O2^MDC|m.0.0.x|[value]| 262688^MDC_DIM_PERCENT^MDC||**EARLY**|||**R**|||[current_date_time] In step 30 (and step 31.b if applicable), possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Measurement-Status attribute is present: ❑ Object: SpO2 Numeric Object ❑ Attribute-id: MDC_ATTR_MSMT_STAT (2375) ❑ Attribute-type: BITS16 ❑ Attribute-value: **00 20** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Measurement-Status attribute value (check OBX-8 and OBX-11): OBX|n|NM|150456^MDC_PULS_OXIM_SAT_O2^MDC|m.0.0.x|[value]| 262688^MDC_DIM_PERCENT^MDC||**BUSY**|||**X**|||[current_date_time]

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-014		
TP label		Whitepaper. SpO2 Numeric Object (Continuous Measurements) – Measurement-Status Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	SpO2 Numeric 17; M		

Test purpose	Check that: PHG includes SpO2 Numeric Object – Measurement-Status attribute in transcoder output when using continuous measurements. [AND] PHG transcodes the Bluetooth Measurement Status field of the PLX Continuous Measurement characteristic to 11073 Measurement-Status attribute properly
Applicability	C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040
Other PICS	
Initial condition	The PHG under test and the simulated PHD are in the Standby state.
Test procedure	1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a continuous measurement (including fast and slow response measurement values) ready to be sent and it is in the Advertising state (it is discoverable). 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Continuous Measurement (0x2A5F) b. PLX Feature (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 00**11** 000**1** (MSB → LSB). Measurement Status support is present (bit 0). Fast and slow response modes are supported (bits 4 and 5). ii. Field: Measurement Status Support • Format: 16 bit • Value: **1111 1111 111**0 0000 (MSB → LSB). All Measurement Status bits are supported iii. Field: Device and Sensor Status Support • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Feature characteristic. 5. The simulated PHD sends the Measurement to the PHG under test with the following value: a. PLX Continuous Measurement (0x2A5F) i. Field: Flags • Format: 8 bit • Value: 0000 0**111** (MSB → LSB). Measurement Status, SpO2PR–Fast and SpO2PR-Slow fields are present. Device and Sensor Status and Pulse Amplitude Index fields are not present. ii. Field: SpO2PR-Normal - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Normal - PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: SpO2PR-Fast - SpO2 (%) • Format: SFLOAT

	• Value: Not Relevant v. Field: SpO2PR-Fast - PR (bpm) • Format: SFLOAT • Value: Not Relevant vi. Field: SpO2PR-Slow - SpO2 (%) • Format: SFLOAT • Value: Not Relevant vii. Field: SpO2PR-Slow - PR (bpm) • Format: SFLOAT • Value: Not Relevant viii. Field: Measurement Status • Format: 16 bit • Value: **1**000 0000 0000 0000 (MSB → LSB). Invalid measurement detected (bit 15). ix. Field: Device and Sensor Status • This field is not included x. Field: Pulse Amplitude Index (%) • This field is not included 6. Check in PHG transcoder output the SpO2 Numeric Object – Measurement-Status attribute in all three SpO2 objects. 7. Simulated PHD sends a Measurement to PHG under test with Measurement Status field set to 0**1**00 0000 0000 0000 (MSB → LSB), questionable measurement detected (bit 14). All remaining fields remain equal to those in step 5. 8. Check in PHG transcoder output the SpO2 Numeric Object – Measurement-Status attribute in all three SpO2 objects. 9. Simulated PHD sends a Measurement to PHG under test with Measurement Status field set to 00**1**0 0000 0000 0000 (MSB → LSB), measurement not available (bit 13). All remaining fields remain equal to those in step 5. 10. Check in PHG transcoder output the SpO2 Numeric Object – Measurement-Status attribute in all three SpO2 objects. 11. Simulated PHD sends a Measurement to PHG under test with Measurement Status field set to 000**1** 0000 0000 0000 (MSB → LSB), calibration ongoing (bit 12). All remaining fields remain equal to those in step 5. 12. Check in PHG transcoder output the SpO2 Numeric Object – Measurement-Status attribute in all three SpO2 objects. 13. Simulated PHD sends a Measurement to PHG under test with Measurement Status field set to 0000 **1**000 0000 0000 (MSB → LSB), data for testing (bit 11). All remaining fields remain equal to those in step 5. 14. Check in PHG transcoder output the SpO2 Numeric Object – Measurement-Status attribute in all three SpO2 objects. 15. Simulated PHD sends a Measurement to PHG under test with Measurement Status field set to 0000 0**1**00 0000 0000 (MSB → LSB), data for demonstration (bit 10). All remaining fields remain equal to those in step 5. 16. Check in PHG transcoder output the SpO2 Numeric Object – Measurement-Status attribute in all three SpO2 objects. 17. Simulated PHD sends a Measurement to PHG under test with Measurement Status field set to 0000 0000 **1**000 0000 (MSB → LSB), fully qualified data (bit 7). All remaining fields remain equal to those in step 5. 18. Check in PHG transcoder output the SpO2 Numeric Object – Measurement-Status attribute in all three SpO2 objects. 19. Simulated PHD sends a Measurement to PHG under test with Measurement Status field

	set to 0000 0000 0**1**00 0000 (MSB → LSB), early estimated data (bit 6). All remaining fields remain equal to those in step 5. 20. Check in PHG transcoder output the SpO2 Numeric Object – Measurement-Status attribute in all three SpO2 objects. 21. Simulated PHD sends a Measurement to PHG under test with Measurement Status field set to 0000 0000 00**1**0 0000 (MSB → LSB), measurement ongoing (bit 5). All remaining fields remain equal to those in step 5. 22. Check in PHG transcoder output the SpO2 Numeric Object – Measurement-Status attribute in all three SpO2 objects.
Pass/Fail criteria	In Step 6, the SpO2 Numeric Object – Measurement-Status attribute is present in all three SpO2 objects and its set to "invalid" (0x8000) In Step 8, the SpO2 Numeric Object – Measurement-Status attribute is present in all three SpO2 objects and its set to "questionable" (0x4000) In Step 10, the SpO2 Numeric Object – Measurement-Status attribute is present in all three SpO2 objects and its set to "not-available" (0x2000) In Step 12, the SpO2 Numeric Object – Measurement-Status attribute is present in all three SpO2 objects and its set to "calibration-ongoing" (0x1000) In Step 14, the SpO2 Numeric Object – Measurement-Status attribute is present in all three SpO2 objects and its set to "test-data" (0x0800) In Step 16, the SpO2 Numeric Object – Measurement-Status attribute is present in all three SpO2 objects and its set to "demo-data" (0x0400) In Step 18, the SpO2 Numeric Object – Measurement-Status attribute is present in all three SpO2 objects and its set to "validated-data" (0x0080) In Step 20, the SpO2 Numeric Object – Measurement-Status attribute is present in all three SpO2 objects and its set to "early-indication" (0x0040) In Step 22, the SpO2 Numeric Object – Measurement-Status attribute is present in all three SpO2 objects and its set to "msmt-ongoing" (0x0020)
Notes **(To assist manual testing)**	In step 6, possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Measurement-Status attribute is present in all three SpO2 objects: ❑ Object: SpO2 Numeric Object ❑ Attribute-id: MDC_ATTR_MSMT_STAT (2375) ❑ Attribute-type: BITS16 ❑ Attribute-value: **80 00** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like for each SpO2 object this with Measurement-Status attribute value (check OBX-8 and OBX-11): OBX|n|NM|150456^MDC_PULS_OXIM_SAT_O2^MDC|m.0.0.x|[value]| 262688^MDC_DIM_PERCENT^MDC||**INV**|||**X**|||[current_date_time] In step 8, possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Measurement-Status attribute is present in all three SpO2 objects: ❑ Object: SpO2 Numeric Object ❑ Attribute-id: MDC_ATTR_MSMT_STAT (2375) ❑ Attribute-type: BITS16 ❑ Attribute-value: **40 00** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this for each SpO2 object with Measurement-Status attribute value (check OBX-8 and OBX-11): OBX|n|NM|150456^MDC_PULS_OXIM_SAT_O2^MDC|m.0.0.x|[value]|

	262688^MDC_DIM_PERCENT^MDC||**QUES**|||**R**|||[current_date_time] In step 10, possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Measurement-Status attribute is present in all three SpO2 objects: ❑ Object: SpO2 Numeric Object ❑ Attribute-id: MDC_ATTR_MSMT_STAT (2375) ❑ Attribute-type: BITS16 ❑ Attribute-value: **20 00** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this for each SpO2 object with Measurement-Status attribute value (check OBX-8 and OBX-11): OBX|n|NM|150456^MDC_PULS_OXIM_SAT_O2^MDC|m.0.0.x|[value]| 262688^MDC_DIM_PERCENT^MDC||**NAV**|||**X**|||[current_date_time] In step 12, possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Measurement-Status attribute is present in all three SpO2 objects: ❑ Object: SpO2 Numeric Object ❑ Attribute-id: MDC_ATTR_MSMT_STAT (2375) ❑ Attribute-type: BITS16 ❑ Attribute-value: **10 00** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this for each SpO2 object with Measurement-Status attribute value (check OBX-8 and OBX-11): OBX|n|NM|150456^MDC_PULS_OXIM_SAT_O2^MDC|m.0.0.x|[value]| 262688^MDC_DIM_PERCENT^MDC||**CAL**|||**R**|||[current_date_time] In step 14, possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Measurement-Status attribute is present in all three SpO2 objects: ❑ Object: SpO2 Numeric Object ❑ Attribute-id: MDC_ATTR_MSMT_STAT (2375) ❑ Attribute-type: BITS16 ❑ Attribute-value: **08 00** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this for each SpO2 object with Measurement-Status attribute value (check OBX-8 and OBX-11): OBX|n|NM|150456^MDC_PULS_OXIM_SAT_O2^MDC|m.0.0.x|[value]| 262688^MDC_DIM_PERCENT^MDC||**TEST**|||**R**|||[current_date_time] In step 16, possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Measurement-Status attribute is present in all three SpO2 objects: ❑ Object: SpO2 Numeric Object ❑ Attribute-id: MDC_ATTR_MSMT_STAT (2375) ❑ Attribute-type: BITS16 ❑ Attribute-value: **04 00** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this for each SpO2 object with Measurement-Status attribute value (check OBX-8 and OBX-11):

	OBX|n|NM|150456^MDC_PULS_OXIM_SAT_O2^MDC|m.0.0.x|[value]| 262688^MDC_DIM_PERCENT^MDC||**DEMO**|||**R**|||[current_date_time] In step 18, possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Measurement-Status attribute is present in all three SpO2 objects: ❑ Object: SpO2 Numeric Object ❑ Attribute-id: MDC_ATTR_MSMT_STAT (2375) ❑ Attribute-type: BITS16 ❑ Attribute-value: **00 80** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this for each SpO2 object with Measurement-Status attribute value (check OBX-8 and OBX-11): OBX|n|NM|150456^MDC_PULS_OXIM_SAT_O2^MDC|m.0.0.x|[value]| 262688^MDC_DIM_PERCENT^MDC|| |||**F**|||[current_date_time] In step 20, possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Measurement-Status attribute is present in all three SpO2 objects: ❑ Object: SpO2 Numeric Object ❑ Attribute-id: MDC_ATTR_MSMT_STAT (2375) ❑ Attribute-type: BITS16 ❑ Attribute-value: **00 40** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this for each SpO2 object with Measurement-Status attribute value (check OBX-8 and OBX-11): OBX|n|NM|150456^MDC_PULS_OXIM_SAT_O2^MDC|m.0.0.x|[value]| 262688^MDC_DIM_PERCENT^MDC||**EARLY**|||**R**|||[current_date_time] In step 22, possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Measurement-Status attribute is present in all three SpO2 objects: ❑ Object: SpO2 Numeric Object ❑ Attribute-id: MDC_ATTR_MSMT_STAT (2375) ❑ Attribute-type: BITS16 ❑ Attribute-value: **00 20** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this for each SpO2 object with Measurement-Status attribute value (check OBX-8 and OBX-11): OBX|n|NM|150456^MDC_PULS_OXIM_SAT_O2^MDC|m.0.0.x|[value]| 262688^MDC_DIM_PERCENT^MDC||**BUSY**|||**X**|||[current_date_time]

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-015		
TP label		Whitepaper. SpO2 Numeric Object (Spot-Check Measurement) – Unit-Code Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	SpO2 Numeric 8; M		
Test purpose		Check that:		

	PHG includes SpO2 Numeric Object –Unit-Code attribute in transcoder output when using spot-check measurement mode. [AND] Unit-Code is set to MDC_DIM_PERCENT
Applicability	C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040
Other PICS	C_MAN_BLE_042
Initial condition	The PHG under test and the simulated PHD are in the Standby state.
Test procedure	1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a spot-check measurement ready to be sent and it is in the Advertising state (it is discoverable). The simulated PHD also supports the RACP characteristic and has an identical spot-check measurement temporarily stored. 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 0000 **11**00 (MSB → LSB). Measurement Storage for spot-check measurements is supported (bit 2). Timestamp for Spot-Check measurements is supported (bit 3). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included b. PLX Spot-Check Measurement (0x2A5E) i. Field: Flags • Format: 8 bit • Value: 0000 000**1** (MSB → LSB). Timestamp field is present. Measurement Status, Device and Sensor Status, and Pulse Amplitude Index fields are not present. Device Clock is set. ii. Field: SpO2PR-Spot-Check - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Spot-Check – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: Time Stamp • Format: Date and Time • Value: Not Relevant v. Field: Measurement Status • This field is not included vi. Field: Device and Sensor Status • This field is not included vii. Field: Pulse Amplitude Index (%) • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the

	simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the Measurement to the PHG under test. 6. Check in PHG transcoder output the SpO2 Numeric Object – Unit-Code attribute 7. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check in PHG transcoder output the SpO2 Numeric Object – Unit-Code attribute
Pass/Fail criteria	In Step 6, the SpO2 Numeric Object – Unit-Code attribute is present and its set to MDC_DIM_PERCENT. If the PHG supports RACP, the same criteria applies to Step 7.b.
Notes (To assist manual testing)	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Unit-Code attribute is present: ❑ Object: SpO2 Numeric Object ❑ Attribute-id: MDC_ATTR_UNIT_CODE (2454) ❑ Attribute-type: INT-U16 ❑ Attribute-value: MDC_DIM_PERCENT or 544 (dec) or 02 20 (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Unit-Code attribute value (check OBX-6): OBX|n|NM|150456^MDC_PULS_OXIM_SAT_O2^MDC|m.0.0.x|[value]|**262688^MDC_DIM_PERCENT^MDC**||||R|||[current_date_time]

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-016		
TP label		Whitepaper. SpO2 Numeric Object (Continuous Measurements) – Unit-Code Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	SpO2 Numeric 18; M		
Test purpose		Check that: PHG includes SpO2 Numeric Object – Unit-Code attribute in transcoder output when using continuous measurements. [AND] Unit-Code is set to MDC_DIM_PERCENT		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS				
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a continuous measurement (including fast and slow response measurement values) ready to be sent and it is in the Advertising state (it is discoverable). 2. The simulated PHD implements several BTLE characteristics. The characteristics of		

	interest for this Test Case are: a. PLX Feature (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 00**11** 0000 (MSB → LSB). Fast and slow response modes are supported (bits 4 and 5). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included b. PLX Continuous Measurement (0x2A5F) i. Field: Flags • Format: 8 bit • Value: 0000 00**11**(MSB → LSB). SpO2PR–Fast, SpO2PR-Slow fields are present. Measurement Status, Device and Sensor Status and Pulse Amplitude Index fields are not present. ii. Field: SpO2PR-Normal - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Normal – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: SpO2PR-Fast - SpO2 (%) • Format: SFLOAT • Value: Not Relevant v. Field: SpO2PR-Fast - PR (bpm) • Format: SFLOAT • Value: Not Relevant vi. Field: SpO2PR-Slow - SpO2 (%) • Format: SFLOAT • Value: Not Relevant vii. Field: SpO2PR-Slow - PR (bpm) • Format: SFLOAT • Value: Not Relevant viii. Field: Measurement Status • This field is not included ix. Field: Device and Sensor Status • This field is not included x. Field: Pulse Amplitude Index (%) • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Feature characteristic. 5. The simulated PHD sends the Measurement to the PHG under test.

	6. Check in PHG transcoder output the SpO2 Numeric Object – Unit-Code attribute in all three SpO2 objects (continuous normal, fast and slow).
Pass/Fail criteria	In Step 6, • There are three SpO2 objects (for normal, fast and slow measurement modes). • In all three objects, the SpO2 Numeric Object – Unit-Code attribute is present and its set to MDC_DIM_PERCENT.
Notes (To assist manual testing)	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Unit-Code attribute is present in all three SpO2 objects: ❑ Object: SpO2 Numeric Object ❑ Attribute-id: MDC_ATTR_UNIT_CODE (2454) ❑ Attribute-type: INT-U16 ❑ Attribute-value: MDC_DIM_PERCENT or 544 (dec) or 02 20 (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this for each SpO2 object with Unit-Code attribute value (check OBX-6): OBX|n|NM|150456^MDC_PULS_OXIM_SAT_O2^MDC|m.0.0.x|[value]|**262688^MDC_DIM_PERCENT^MDC**||||R|||[current_date_time]

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-017		
TP label		Whitepaper. SpO2 Numeric Object (Spot-Check Measurement) – Absolute-Time-Stamp Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	SpO2 Numeric 9; M	Date-Time Conv 2; M	Date-Time Conv 3; M
		Date-Time Conv 4; M	Date-Time Conv 5; M	
Test purpose		Check that: PHG transcodes Time Stamp field of Spot-Check Measurement characteristic into SpO2 Numeric Object - Absolute-Time-Stamp attribute [AND] PHG transcodes the Bluetooth Time Stamp field format to Absolute Time format [AND] The fraction of seconds in Absolute Time at transcoder output is 0		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS		C_MAN_BLE_042		
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a Spot-Check measurement ready to be sent and it is in Advertising state (it is discoverable). The simulated PHD also supports the RACP characteristic and has an identical spot-check measurement temporarily stored. 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Features (0x2A60) i. Field: Supported Features		

	• Format: 16 bit • Value: 0000 0000 0000 **11**00 (MSB → LSB). Measurement Storage for spot-check measurements is supported (bit 2). Timestamp for Spot-Check measurements is supported (bit 3). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included b. PLX Spot-Check Measurement (0x2A5E) i. Field: Flags • Format: 8 bit • Value: 0000 000**1** (MSB → LSB). Timestamp field is present. Measurement Status, Device and Sensor Status, and Pulse Amplitude Index fields are not present. Device Clock is set. ii. Field: SpO2PR-Spot-Check - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Spot-Check – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: Time Stamp • Format: Date and Time • Value: October 12nd, 2015, 10:39:27 v. Field: Measurement Status • This field is not included vi. Field: Device and Sensor Status • This field is not included vii. Field: Pulse Amplitude Index (%) • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the Measurement to the PHG under test. 6. Check in PHG transcoder output the SpO2 Numeric Object – Absolute-Time-Stamp attribute 7. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check in PHG transcoder output the SpO2 Numeric Object – Absolute-Time-Stamp attribute
Pass/Fail criteria	In Step 6, the SpO2 Numeric Object – Absolute-Time-Stamp attribute is present, its value matches with Time Stamp field of Spot-Check Measurement characteristic and fraction of seconds is set to 0. If the PHG supports RACP, the same criteria applies to Step 7.b.

Notes (To assist manual testing)	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Absolute-Time-Stamp attribute is present: ❑ Object: SpO2 Numeric Object ❑ Attribute-id: MDC_ATTR_TIME_STAMP_ABS (2448) ❑ Attribute-type: SEQUENCE {century (INT-U8), year (INT-U8), month (INT-U8), day (INT-U8), hour (INT-U8), minute (INT-U8), second (INT-U8), sec-fractions (INT-U8)} (BCD encoding) ❑ Attribute-value: • century: 20 (hex) or 32 (dec) • year: 15 (hex) or 21 (dec) • month: 10 (hex) or 16 (dec) • day: 12 (hex) or 18 (dec) • hour: 10 (hex) or 16 (dec) • minute: 39 (hex) or 57 (dec) • second: 27 (hex) or 39 (dec) • sec-fractions: 00 (hex) or 0 (dec) b) WAN PCD-01 message PCD-01 message includes a segment like this with Absolute-Time-Stamp attribute value (check OBX-14): OBX|n|NM|150456^MDC_PULS_OXIM_SAT_O2^MDC|m.0.0.x|[value]| 262688^MDC_DIM_PERCENT^MDC||||R|||**20151012103927+0000**

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-018		
TP label		Whitepaper. SpO2 Numeric Object (Spot-Check Measurement) – Basic-Nu-Observed-Value Attribute 1		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	SpO2 Numeric 10; M	Short Float Type 1; C	
Test purpose		Check that: PHG transcodes SpO2 value of the SpO2PR-Spot-Check field in PLX Spot-Check Measurement chactacteristic into SpO2 Numeric Object - Basic-Nu-Observed-Value attribute		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS		C_MAN_BLE_042		
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a Spot-Check measurement ready to be sent and it is in the Advertising state (it is discoverable). The simulated PHD also supports the RACP characteristic and has an identical spot-check measurement temporarily stored. 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit		

	• Value: 0000 0000 0000 **11**00 (MSB → LSB). Measurement Storage for spot-check measurements is supported (bit 2). Timestamp for Spot-Check measurements is supported (bit 3). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included b. PLX Spot-Check Measurement (0x2A5E) i. Field: Flags • Format: 8 bit • Value: 0000 000**1** (MSB → LSB). Timestamp field is present. Measurement Status, Device and Sensor Status, and Pulse Amplitude Index fields are not present. Device Clock is set. ii. Field: SpO2PR-Spot-Check - SpO2 (%) • Format: 96 (%) • Value: Not Relevant iii. Field: SpO2PR-Spot-Check – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: Time Stamp • Format: Date and Time • Value: Not Relevant v. Field: Measurement Status • This field is not included vi. Field: Device and Sensor Status • This field is not included vii. Field: Pulse Amplitude Index (%) • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the Measurement to the PHG under test. 6. Check in PHG transcoder output the SpO2 Numeric Object – Basic-Nu-Observed-Value attribute 7. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check in PHG transcoder output the SpO2 Numeric Object – Basic-Nu-Observed-Value attribute
Pass/Fail criteria	In Step 6, the SpO2 Numeric Object – Basic-Nu-Observed-Value attribute is present and its value matches with the value of the SpO2 subfield of the SpO2PR-Spot-Check field in the PLX Spot-Check Measurement chactacteristic (96%). If the PHG supports RACP, the same criteria applies to Step 7.b.
Notes **(To assist manual**	Possible values in typical points of observation after transcoder output are:

testing)	a) IEEE 11073 Objects and Attributes Basic-Nu-Observed-Value attribute is present: ❑ Object: SpO2 Numeric Object ❑ Attribute-id: MDC_ATTR_NU_VAL_OBS_BASIC (2636) ❑ Attribute-type: SFLOAT ❑ Attribute-value: 00 60 (hex) or F3C0 (hex) or 96 (dec) b) WAN PCD-01 message PCD-01 message includes a segment like this with Basic-Nu-Observed-Value attribute value (check OBX-5): OBX|n|NM|150456^MDC_PULS_OXIM_SAT_O2^MDC|m.0.0.x|**96**| 262688^MDC_DIM_PERCENT^MDC||||R|||[current_date_time]

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-019		
TP label		Whitepaper. SpO2 Numeric Object (Spot-Check Measurement) – Basic-Nu-Observed-Value Attribute 2		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	SpO2 Numeric 10; M	SpO2 Numeric 20; M	Short Float Type 2; M
Test purpose		Check that: PHG transcodes SpO2 value of the SpO2PR-Spot-Check field in PLX Spot-Check Measurement chactacteristic into SpO2 Numeric Object - Basic-Nu-Observed-Value attribute [AND] PHG assigns special value NaN (0x07FF) when SpO2 value is unavailable.		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS		C_MAN_BLE_042		
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a Spot-Check measurement ready to be sent and it is in the Advertising state (it is discoverable). The simulated PHD also supports the RACP characteristic and has an identical spot-check measurement temporarily stored. 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 0000 **11**00 (MSB → LSB). Measurement Storage for spot-check measurements is supported (bit 2). Timestamp for Spot-Check measurements is supported (bit 3). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included b. PLX Spot-Check Measurement (0x2A5E) i. Field: Flags		

	• Format: 8 bit • Value: 0000 000**1** (MSB → LSB). Timestamp field is present. Measurement Status, Device and Sensor Status, and Pulse Amplitude Index fields are not present. Device Clock is set. ii. Field: SpO2PR-Spot-Check - SpO2 (%) • Format: SFLOAT • Value: 07 FF (hex). Special value: NaN iii. Field: SpO2PR-Spot-Check – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: Time Stamp • Format: Date and Time • Value: Not Relevant v. Field: Measurement Status • This field is not included vi. Field: Device and Sensor Status • This field is not included vii. Field: Pulse Amplitude Index (%) • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read PLX Features characteristic. 5. The simulated PHD sends the Measurement to the PHG under test. 6. Check in PHG transcoder output the SpO2 Numeric Object – Basic-Nu-Observed-Value attribute 7. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check in PHG transcoder output the SpO2 Numeric Object – Basic-Nu-Observed-Value attribute
Pass/Fail criteria	In Step 6, the SpO2 Numeric Object – Basic-Nu-Observed-Value attribute is present and its value is is 0x07FF (NaN). If the PHG supports RACP, the same criteria applies to Step 7.b.
Notes **(To assist manual testing)**	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Basic-Nu-Observed-Value attribute is present: ❑ Object: SpO2 Numeric Object ❑ Attribute-id: MDC_ATTR_NU_VAL_OBS_BASIC (2636) ❑ Attribute-type: SFLOAT ❑ Attribute-value: 07 FF (hex) or NaN (note that a decimal value is not allowed) b) WAN PCD-01 message PCD-01 message does not include special values

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-020		
TP label		Whitepaper. SpO2 Numeric Object (Continuous Measurements) – Basic-Nu-Observed-Value Attribute 1		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	SpO2 Numeric 19; M	Short Float Type 1; C	
Test purpose		Check that: PHG transcodes SpO2 value of the SpO2PR-Normal field in PLX Continuous Measurement chactacteristic into SpO2 Numeric Object (Continuous normal response) - Basic-Nu-Observed-Value attribute [AND] PHG transcodes SpO2 value of the SpO2PR-Fast field in PLX Continuous Measurement chactacteristic into SpO2 Numeric Object (Continuous fast response) - Basic-Nu-Observed-Value attribute [AND] PHG transcodes SpO2 value of the SpO2PR-Slow field in PLX Continuous Measurement chactacteristic into SpO2 Numeric Object (Continuous slow response) - Basic-Nu-Observed-Value attribute		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS				
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a continuous measurement (including fast and slow response measurement values) ready to be sent and it is in the Advertising state (it is discoverable). 2. The Simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Feature (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 00**11** 0000 (MSB → LSB). Fast and slow response modes are supported (bits 4 and 5). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included b. PLX Continuous Measurement (0x2A5F) i. Field: Flags • Format: 8 bit • Value: 0000 00**11** (MSB → LSB). SpO2PR–Fast, SpO2PR-Slow fields are present. Measurement Status, Device and Sensor Status and Pulse Amplitude Index fields are not present. ii. Field: SpO2PR-Normal - SpO2 (%) • Format: SFLOAT • Value: 96 (%) iii. Field: SpO2PR-Normal - PR (bpm) • Format: SFLOAT		

	• Value: Not Relevant iv. Field: SpO2PR-Fast - SpO2 (%) • Format: SFLOAT • Value: 98 (%) v. Field: SpO2PR-Fast - PR (bpm) • Format: SFLOAT • Value: Not Relevant vi. Field: SpO2PR-Slow - SpO2 (%) • Format: SFLOAT • Value: 94 (%) vii. Field: SpO2PR-Slow - PR (bpm) • Format: SFLOAT • Value: Not Relevant viii. Field: Measurement Status • This field is not included ix. Field: Device and Sensor Status • This field is not included x. Field: Pulse Amplitude Index (%) • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Feature characteristic. 5. The simulated PHD sends the Measurement to the PHG under test. 6. Check in PHG transcoder output the SpO2 Numeric Object – Basic-Nu-Observed-Value attribute in all three SpO2 objects.
Pass/Fail criteria	In Step 6, • The SpO2 Numeric Object (Continuous measurement normal) – Basic-Nu-Observed-Value attribute is present and its value matches with the value of the SpO2 subfield of the SpO2PR-Normal field in the PLX Continuous Measurement chactacteristic (96%). • The SpO2 Numeric Object (Continuous measurement fast) – Basic-Nu-Observed-Value attribute is present and its value matches with the value of the SpO2 subfield of the SpO2PR-Fast field in the PLX Continuous Measurement chactacteristic (98%). • The SpO2 Numeric Object (Continuous measurement slow) – Basic-Nu-Observed-Value attribute is present and its value matches with the value of the SpO2 subfield of the SpO2PR-Slow field in the PLX Continuous Measurement chactacteristic (94%).
Notes **(To assist manual testing)**	Possible values in typical points of observation after transcoder output are: a. IEEE 11073 Objects and Attributes SpO2 Numeric object (Continous measurement normal): • Supplemental-types attribute is not present. Basic-Nu-Observed-Value attribute is present: ❑ Object: SpO2 Numeric Object ❑ Attribute-id: MDC_ATTR_NU_VAL_OBS_BASIC (2636) ❑ Attribute-type: SFLOAT ❑ Attribute-value: 00 60 (hex) or F3 C0 (hex) or 96 (dec) SpO2 Numeric object (Continous measurement fast):

	• Supplemental-types attribute is present: ❑ Object: SpO2 Numeric Object (fast response) ❑ Attribute-id: MDC_ATTR_SUPPLEMENTAL_TYPES (2657) ❑ Attribute-type: SEQUENCE of SEQUENCE {partition (INT-U16), code (INT-U16)} ❑ Attribute-value: {MDC_PART_SCADA, MDC_MODALITY_FAST}. • Basic-Nu-Observed-Value attribute is present: ❑ Object: SpO2 Numeric Object ❑ Attribute-id: MDC_ATTR_NU_VAL_OBS_BASIC (2636) ❑ Attribute-type: SFLOAT ❑ Attribute-value: 00 62 (hex) or F3D4 (hex) or 98 (dec) SpO2 Numeric object (Continous measurement slow): • Supplemental-types attribute is present: ❑ Object: SpO2 Numeric Object (slow response) ❑ Attribute-id: MDC_ATTR_SUPPLEMENTAL_TYPES (2657) ❑ Attribute-type: SEQUENCE of SEQUENCE {partition (INT-U16), code (INT-U16)} ❑ Attribute-value: {MDC_PART_SCADA, MDC_MODALITY_SLOW}. • Basic-Nu-Observed-Value attribute is present: ❑ Object: SpO2 Numeric Object ❑ Attribute-id: MDC_ATTR_NU_VAL_OBS_BASIC (2636) ❑ Attribute-type: SFLOAT ❑ Attribute-value: 00 5E (hex) or F3AC (hex) or 94 (dec) b. WAN PCD-01 message SpO2 Numeric object (Continous measurement normal): PCD-01 message includes a segment like this with Basic-Nu-Observed-Value attribute value (check OBX-5): OBX|n|NM|150456^MDC_PULS_OXIM_SAT_O2^MDC|m.0.0.x|**96**| 262688^MDC_DIM_PERCENT^MDC||||R|||[current_date_time] SpO2 Numeric object (Continous measurement fast): PCD-01 message includes two segments like these for SpO2 Numeric object (Fast response), with Basic-Nu-Observed-Value attribute and Supplemental-Types attribute values (check OBX-5 in both segments): OBX|n|NM|150456^MDC_PULS_OXIM_SAT_O2^MDC|m.0.0.x|**98**| 262688^MDC_DIM_PERCENT^MDC||||R|||[current_date_time] OBX|n|CWE|68193^MDC_ATTR_SUPPLEMENTAL_TYPES^MDC|m.0.0.x.y| **150580^MDC_MODALITY_FAST^MDC**||||||[obx-11 of the parent] SpO2 Numeric object (Continous measurement slow): PCD-01 message includes two segments like these for SpO2 Numeric object (Slow response), with Basic-Nu-Observed-Value attribute and Supplemental-Types attribute values (check OBX-5 in both segments): OBX|n|NM|150456^MDC_PULS_OXIM_SAT_O2^MDC|m.0.0.x|**94**| 262688^MDC_DIM_PERCENT^MDC||||R|||[current_date_time] OBX|n|CWE|68193^MDC_ATTR_SUPPLEMENTAL_TYPES^MDC|m.0.0.x.y| **150580^MDC_MODALITY_SLOW^MDC**||||||[obx-11 of the parent]

TP Id	TP/LP-PAN/PHG/PHDTW/PLX/BV-021
TP label	Whitepaper. SpO2 Numeric Object (Continuous Measurements) – Basic-Nu-Observed-Value Attribute 2

<table>
<tr><td rowspan="2">Coverage</td><td>Spec</td><td colspan="3">[Bluetooth PHDT v1.6]</td></tr>
<tr><td>Testable items</td><td>SpO2 Numeric 19; M</td><td>SpO2 Numeric 20; M</td><td>Short Float Type 2; M</td></tr>
<tr><td colspan="2">Test purpose</td><td colspan="3">Check that:
PHG transcodes SpO2 value of the SpO2PR-Normal field in PLX Continuous Measurement chactacteristic into SpO2 Numeric Object (Continuous normal response) - Basic-Nu-Observed-Value attribute
[AND]
PHG transcodes SpO2 value of the SpO2PR-Fast field in PLX Continuous Measurement chactacteristic into SpO2 Numeric Object (Continuous fast response) - Basic-Nu-Observed-Value attribute
[AND]
PHG transcodes SpO2 value of the SpO2PR-Slow field in PLX Continuous Measurement chactacteristic into SpO2 Numeric Object (Continuous slow response) - Basic-Nu-Observed-Value attribute
[AND]
PHG assigns special value NaN (0x07FF) when SpO2 value is unavailable.</td></tr>
<tr><td colspan="2">Applicability</td><td colspan="3">C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040</td></tr>
<tr><td colspan="2">Other PICS</td><td colspan="3"></td></tr>
<tr><td colspan="2">Initial condition</td><td colspan="3">The PHG under test and the simulated PHD are in the Standby state.</td></tr>
<tr><td colspan="2">Test procedure</td><td colspan="3">1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a continuous measurement (including fast and slow response measurement values) ready to be sent and it is in the Advertising state (it is discoverable).
2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are:
a. PLX Feature (0x2A60)
i. Field: Supported Features
• Format: 16 bit
• Value: 0000 0000 0011 0000 (MSB → LSB). Fast and slow response modes are supported (bits 4 and 5).
ii. Field: Measurement Status Support
• This field is not included
iii. Field: Device and Sensor Status Support
• This field is not included
b. PLX Continuous Measurement (0x2A5F)
i. Field: Flags
• Format: 8 bit
• Value: 0000 0011 (MSB → LSB). SpO2PR–Fast, SpO2PR-Slow fields are present. Measurement Status, Device and Sensor Status and Pulse Amplitude Index fields are not present.
ii. Field: SpO2PR-Normal - SpO2 (%)
• Format: SFLOAT
• Value: 07 FF (hex). Special value: NaN
iii. Field: SpO2PR-Normal - PR (bpm)
• Format: SFLOAT
• Value: Not Relevant</td></tr>
</table>

	iv. Field: SpO2PR-Fast - SpO2 (%) • Format: SFLOAT • Value: 07 FF (hex). Special value: NaN v. Field: SpO2PR-Fast - PR (bpm) • Format: SFLOAT • Value: Not Relevant vi. Field: SpO2PR-Slow - SpO2 (%) • Format: SFLOAT • Value: 07 FF (hex). Special value: NaN vii. Field: SpO2PR-Slow - PR (bpm) • Format: SFLOAT • Value: Not Relevant viii. Field: Measurement Status • This field is not included ix. Field: Device and Sensor Status • This field is not included x. Field: Pulse Amplitude Index (%) • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Feature characteristic. 5. The simulated PHD sends the Measurement to the PHG under test. 6. Check in PHG transcoder output the SpO2 Numeric Object – Basic-Nu-Observed-Value attribute for all SpO2 objects.
Pass/Fail criteria	In Step 6, • The SpO2 Numeric Object (Continuous measurement normal) – Basic-Nu-Observed-Value attribute is present and its value is is 0x07FF (NaN). • The SpO2 Numeric Object (Continuous measurement fast) – Basic-Nu-Observed-Value attribute is present and its value is is 0x07FF (NaN). • The SpO2 Numeric Object (Continuous measurement slow) – Basic-Nu-Observed-Value attribute is present and its value is is 0x07FF (NaN).
Notes **(To assist manual testing)**	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes SpO2 Numeric object (Continous measurement normal): • Supplemental-types attribute is not present. Basic-Nu-Observed-Value attribute is present: ❑ Object: SpO2 Numeric Object ❑ Attribute-id: MDC_ATTR_NU_VAL_OBS_BASIC (2636) ❑ Attribute-type: SFLOAT ❑ Attribute-value: Attribute-value: 07 FF (hex) or NaN (note that a decimal value is not allowed) SpO2 Numeric object (Continous measurement fast): • Supplemental-types attribute is present: ❑ Object: SpO2 Numeric Object (fast response)

	❑ Attribute-id: MDC_ATTR_SUPPLEMENTAL_TYPES (2657) ❑ Attribute-type: SEQUENCE of SEQUENCE {partition (INT-U16), code (INT-U16)} ❑ Attribute-value: {MDC_PART_SCADA, MDC_MODALITY_FAST}. • Basic-Nu-Observed-Value attribute is present: ❑ Object: SpO2 Numeric Object ❑ Attribute-id: MDC_ATTR_NU_VAL_OBS_BASIC (2636) ❑ Attribute-type: SFLOAT ❑ Attribute-value: Attribute-value: 07 FF (hex) or NaN (note that a decimal value is not allowed) SpO2 Numeric object (Continous measurement slow): • Supplemental-types attribute is present: ❑ Object: SpO2 Numeric Object (slow response) ❑ Attribute-id: MDC_ATTR_SUPPLEMENTAL_TYPES (2657) ❑ Attribute-type: SEQUENCE of SEQUENCE {partition (INT-U16), code (INT-U16)} ❑ Attribute-value: {MDC_PART_SCADA, MDC_MODALITY_SLOW}. • Basic-Nu-Observed-Value attribute is present: ❑ Object: SpO2 Numeric Object ❑ Attribute-id: MDC_ATTR_NU_VAL_OBS_BASIC (2636) ❑ Attribute-type: SFLOAT ❑ Attribute-value: Attribute-value: 07 FF (hex) or NaN (note that a decimal value is not allowed) b) WAN PCD-01 message PCD-01 message does not include special values

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-022		
TP label		Whitepaper. SpO2 measurement value (Spot-Check Measurement)		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	Short Float Type 1; C	Date-Time Conv 1; M	SpO2 Numeric 9; M
		SpO2 Numeric 10; M		
Test purpose		Check that: PHG processes correctly the SpO2 value (%) of the SpO2PR-Spot-Check field and and the value of the Time Stamp field of the PLX Spot-Check characteristic		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS		C_MAN_BLE_042		
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a Spot-Check measurement ready to be sent and it is in the Advertising state (it is discoverable). The simulated PHD also supports the RACP characteristic and has an identical spot-check measurement temporarily stored. 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Features (0x2A60)		

	i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 0000 **11**00 (MSB → LSB). Measurement Storage for spot-check measurements is supported (bit 2). Timestamp for Spot-Check measurements is supported (bit 3). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included b. PLX Spot-Check Measurement (0x2A5E) i. Field: Flags • Format: 8 bit • Value: 0000 000**1** (MSB → LSB). Timestamp field is present. Measurement Status, Device and Sensor Status, and Pulse Amplitude Index fields are not present. Device Clock is set. ii. Field: SpO2PR-Spot-Check - SpO2 (%) • Format: SFLOAT • Value: 96 (%) iii. Field: SpO2PR-Spot-Check – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: Time Stamp • Format: Date and Time • Value: October 12nd, 2015, 10:39:27 v. Field: Measurement Status • This field is not included vi. Field: Device and Sensor Status • This field is not included vii. Field: Pulse Amplitude Index (%) • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the Measurement to the PHG under test. 6. Check that the PHG accepts the measurement and decodes its value properly (SpO2 measurement value, units and time stamp). 7. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check that PHG accepts the measurement and decodes its value properly (SpO2 measurement value, units and time stamp)
Pass/Fail criteria	In Step 6, the PHG under test shows the following measurement SpO2 = 96(%) with timestamp '2015-10-12 10:39:27'. If the PHG supports RACP, the same criteria applies to Step 7.b.

Notes	

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-023		
TP label		Whitepaper. Pulse Rate Numeric Object (Spot-Check Measurement) - Handle Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	PR Numeric 1; O		
Test purpose		Check that: PHG does not include Pulse Rate Numeric Object – Handle Attribute in transcoder output when using spot-check measurement mode. [OR] If PHG includes Pulse Rate Numeric Object – Handle attribute in transcoder output, then its value shall be different than 0		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS		C_MAN_BLE_042		
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a spot-check measurement ready to be sent and it is in the Advertising state (it is discoverable). The simulated PHD also supports the RACP characteristic and has an identical spot-check measurement temporarily stored. 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 0000 **11**00 (MSB → LSB). Measurement Storage for spot-check measurements is supported (bit 2). Timestamp for Spot-Check measurements is supported (bit 3). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included b. PLX Spot-Check Measurement (0x2A5E) i. Field: Flags • Format: 8 bit • Value: 0000 000**1** (MSB → LSB). Timestamp field is present. Measurement Status, Device and Sensor Status, and Pulse Amplitude Index fields are not present. Device Clock is set. ii. Field: SpO2PR-Spot-Check - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Spot-Check – PR (bpm) • Format: SFLOAT • Value: Not Relevant		

	iv. Field: Time Stamp • Format: Date and Time • Value: Not Relevant v. Field: Measurement Status • This field is not included vi. Field: Device and Sensor Status • This field is not included vii. Field: Pulse Amplitude Index (%) • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the measurement to the PHG under test. 6. Check in PHG transcoder output the Pulse Rate Numeric Object – Handle attribute 7. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the simulated PHD sends the temporarily stored spot-check measurement to the PHG under test b) Check in PHG transcoder output the SpO2 Numeric Object – Handle attribute
Pass/Fail criteria	In Step 6, the Pulse Rate Numeric Object – Handle attribute is not present or, if it is present then its value is different than 0. If the PHG supports RACP, the same criteria applies to Step 7.b.
Notes (To assist manual testing)	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Handle attribute is not present, or if it is present then: ❑ Object: Pulse Rate Numeric Object ❑ Attribute-id: MDC_ATTR_ID_HANDLE (2337) ❑ Attribute-type: INT-U16 ❑ Attribute-value: Any value different than 0 b) WAN PCD-01 message PCD-01 message does not include segments with Handle attribute value

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-024		
TP label		Whitepaper. Pulse Rate Numeric Object (Continuous Measurements) - Handle Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	PR Numeric 11; O		
Test purpose		Check that: PHG does not include Pulse Rate Numeric Object – Handle Attribute in transcoder output when using continuous measurements [OR] If PHG includes Pulse Rate Numeric Object – Handle attribute in transcoder output, then its		

	value shall be different than 0
Applicability	C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040
Other PICS	
Initial condition	The PHG under test and the simulated PHD are in the Standby state.
Test procedure	1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a continuous measurement (including fast and slow response measurement values) ready to be sent and it is in the advertising state (it is discoverable). 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 00**11** 0000 (MSB → LSB). Fast and slow response modes are supported (bits 4 and 5). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included b. PLX Continuous Measurement (0x2A5F) i. Field: Flags • Format: 8 bit • Value: 0000 00**11** (MSB → LSB). SpO2PR–Fast, SpO2PR-Slow fields are present. Measurement Status, Device and Sensor Status and Pulse Amplitude Index fields are not present. ii. Field: SpO2PR-Normal - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Normal – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: SpO2PR-Fast - SpO2 (%) • Format: SFLOAT • Value: Not Relevant v. Field: SpO2PR-Fast - PR (bpm) • Format: SFLOAT • Value: Not Relevant vi. Field: SpO2PR-Slow - SpO2 (%) • Format: SFLOAT • Value: Not Relevant vii. Field: SpO2PR-Slow - PR (bpm) • Format: SFLOAT • Value: Not Relevant viii. Field: Measurement Status • This field is not included

	ix. Field: Device and Sensor Status • This field is not included x. Field: Pulse Amplitude Index (%) • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the Measurement to the PHG under test. 6. Check in PHG transcoder output the Pulse Rate Numeric Object – Handle attribute in all three Pulse Rate objects (continuous normal, fast and slow).
Pass/Fail criteria	In Step 6, • There are three Pulse Rate objects (for normal, fast and slow measurement modes). • In all three objects, the Pulse Rate Numeric Object – Handle attribute is not present or, if it is present then its value is different than 0
Notes (To assist manual testing)	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Handle attribute is not present in SpO2 objects, or if it is present then: ❑ Object: Pulse Rate Numeric Object ❑ Attribute-id: MDC_ATTR_ID_HANDLE (2337) ❑ Attribute-type: INT-U16 ❑ Attribute-value: Any value different than 0 b) WAN PCD-01 message PCD-01 message does not include segments with Handle attribute value

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-025		
TP label		Whitepaper. Pulse Rate Numeric Object (Spot-Check Measurement) - Type Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	PR Numeric 2; M		
Test purpose		Check that: PHG includes Pulse Rate Numeric Object – Type attribute in transcoder output when using spot-check measurement mode. [AND] Type is set to {MDC_PART_SCADA, MDC_PULS_OXIM_PULS_RATE}		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS		C_MAN_BLE_042		
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a spot-check measurement ready to be sent and it is in the Advertising state (it is discoverable). The simulated PHD also supports the RACP characteristic and has an identical spot-check measurement temporarily stored. 2. The simulated PHD implements several BTLE characteristics. The characteristics of		

	interest for this Test Case are: a. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 0000 **11**00 (MSB → LSB). Measurement Storage for spot-check measurements is supported (bit 2). Timestamp for Spot-Check measurements is supported (bit 3). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included b. PLX Spot-Check Measurement (0x2A5E) i. Field: Flags • Format: 8 bit • Value: 0000 000**1** (MSB → LSB). Timestamp field is present. Measurement Status, Device and Sensor Status, and Pulse Amplitude Index fields are not present. Device Clock is set. ii. Field: SpO2PR-Spot-Check - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Spot-Check – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: Time Stamp • Format: Date and Time • Value: Not Relevant v. Field: Measurement Status • This field is not included vi. Field: Device and Sensor Status • This field is not included vii. Field: Pulse Amplitude Index (%) • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the Measurement to the PHG under test. 6. Check in PHG transcoder output the Pulse Rate Numeric Object – Type attribute 7. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check in PHG transcoder output the SpO2 Numeric Object – Type attribute
Pass/Fail criteria	In Step 6, the Pulse Rate Numeric Object – Type attribute is present and its value is {MDC_PART_SCADA, MDC_PULS_OXIM_PULS_RATE} If the PHG supports RACP, the same criteria applies to Step 7.b

Notes **(To assist manual testing)**	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Type attribute is present: ❑ Object: Pulse Rate Numeric Object ❑ Attribute-id: MDC_ATTR_ID_TYPE (2351) ❑ Attribute-type: SEQUENCE {partition (INT-U16), code (INT-U16)} ❑ Attribute-value: • partition: MDC_PART_SCADA or 2 (dec) or 00 02 (hex) • code: MDC_PULS_OXIM_PULS_RATE or 18458 (dec) or 48 1A (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Type attribute (check OBX-3): OBX|n|NM|**149530^MDC_PULS_OXIM_PULS_RATE^MDC**|m.0.0.x|[value]| 264864^MDC_DIM_BEAT_PER_MIN^MDC||||R|||[current_date_time]

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-026		
TP label		Whitepaper. Pulse Rate Numeric Object (Continuous Measurements) - Type Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	SpO2 Numeric 12; M		
Test purpose		Check that: PHG includes Pulse Rate Numeric Object – Type attribute in transcoder output when using continuous measurements. [AND] Type is set to {MDC_PART_SCADA, MDC_PULS_OXIM_PULS_RATE}		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS				
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a continuous measurement (including fast and slow response measurement values) ready to be sent and it is in the Advertising state (it is discoverable). 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 00**11** 0000 (MSB → LSB). Fast and slow response modes are supported (bits 4 and 5). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included b. PLX Continuous Measurement (0x2A5F) i. Field: Flags		

	• Format: 8 bit • Value: 0000 00**11** (MSB → LSB). SpO2PR–Fast, SpO2PR-Slow fields are present. Measurement Status, Device and Sensor Status and Pulse Amplitude Index fields are not present. ii. Field: SpO2PR-Normal - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Normal – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: SpO2PR-Fast - SpO2 (%) • Format: SFLOAT • Value: Not Relevant v. Field: SpO2PR-Fast - PR (bpm) • Format: SFLOAT • Value: Not Relevant vi. Field: SpO2PR-Slow - SpO2 (%) • Format: SFLOAT • Value: Not Relevant vii. Field: SpO2PR-Slow - PR (bpm) • Format: SFLOAT • Value: Not Relevant viii. Field: Measurement Status • This field is not included ix. Field: Device and Sensor Status • This field is not included x. Field: Pulse Amplitude Index (%) • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the Measurement to the PHG under test. 6. Check in PHG transcoder output the Pulse Rate Numeric Object – Type attribute in all three Pulse Rate objects (continuous normal, fast and slow).
Pass/Fail criteria	In Step 6, • There are three Pulse Rate objects (for normal, fast and slow measurement modes). • In all three objects, the Pulse Rate Numeric Object – Type attribute is present and its value is {MDC_PART_SCADA, MDC_PULS_OXIM_PULS_RATE}
Notes **(To assist manual testing)**	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Type attribute is present in all three SpO2 objects: ❑ Object: Pulse Rate Numeric Object ❑ Attribute-id: MDC_ATTR_ID_TYPE (2351)

	❑ Attribute-type: SEQUENCE {partition (INT-U16), code (INT-U16)} ❑ Attribute-value: • partition: MDC_PART_SCADA or 2 (dec) or 00 02 (hex) • code: MDC_PULS_OXIM_PULS_RATE or 18458 (dec) or 48 1A (hex) b) WAN PCD-01 message PCD-01 message includes three segments like this with Type attribute (check OBX-3): OBX|n|NM|**149530^MDC_PULS_OXIM_PULS_RATE^MDC**|m.0.0.x|[value]| 264864^MDC_DIM_BEAT_PER_MIN^MDC||||R|||[current_date_time]

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-027		
TP label		Whitepaper. Pulse Rate Numeric Object (Spot-Check Measurement) – Supplemental-Types Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	PR Numeric 3; M		
Test purpose		Check that: PHG includes Pulse Rate Numeric Object – Supplemental-Types attribute in transcoder output when using spot-check measurement mode. [AND] Supplemental-Types attribute is set to {MDC_PART_SCADA, MDC_MODALITY_SPOT}.		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS		C_MAN_BLE_042		
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a spot-check measurement ready to be sent and it is in the Advertising state (it is discoverable). The simulated PHD also supports the RACP characteristic and has an identical spot-check measurement temporarily stored. 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 0000 **11**00 (MSB → LSB). Measurement Storage for spot-check measurements is supported (bit 2). Timestamp for Spot-Check measurements is supported (bit 3). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included b. PLX Spot-Check Measurement (0x2A5E) i. Field: Flags • Format: 8 bit • Value: 0000 000**1** (MSB → LSB). Timestamp field is present. Measurement Status, Device and Sensor Status, and Pulse Amplitude Index fields are not		

	present. Device Clock is set. ii. Field: SpO2PR-Spot-Check - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Spot-Check – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: Time Stamp • Format: Date and Time • Value: Not Relevant v. Field: Measurement Status • This field is not included vi. Field: Device and Sensor Status • This field is not included vii. Field: Pulse Amplitude Index (%) • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the Measurement to the PHG under test. 6. Check in PHG transcoder output the Pulse Rate Numeric Object – Supplemental-Types attribute 7. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check in PHG transcoder output the Pulse Rate Numeric Object – Supplemental-Types attribute
Pass/Fail criteria	In Step 6, the Pulse Rate Numeric Object – Supplemental-Types attribute is present and its value is {MDC_PART_SCADA, MDC_MODALITY_SPOT}. If the PHG supports RACP, the same criteria applies to Step 7.b.
Notes **(To assist manual testing)**	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Supplemental-Types attribute is present: ❑ Object: Pulse Rate Numeric Object (Spot-Check measurement) ❑ Attribute-id: MDC_ATTR_SUPPLEMENTAL_TYPES (2657) ❑ Attribute-type: SEQUENCE of SEQUENCE {partition (INT-U16), code (INT-U16)} ❑ Attribute-value: {MDC_PART_SCADA, MDC_MODALITY_SPOT}. b) WAN PCD-01 message PCD-01 message includes a facet OBX segment of the SpO2 measurement OBX segment with Supplemental-Types attribute (check OBX-3 and OBX-5): OBX|n|NM|149530^MDC_PULS_OXIM_PULS_RATE^MDC|m.0.0.x|[value]| 264864^MDC_DIM_BEAT_PER_MIN^MDC||||R|||[current_date_time] OBX|n|CWE|**68193^MDC_ATTR_SUPPLEMENTAL_TYPES^MDC**|m.0.0.x.y| **150580^MDC_MODALITY_SPOT^MDC**|||||R

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-028		
TP label		Whitepaper. Pulse Rate Numeric Object (Continuous Measurements) – Supplemental-Types Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	PR Numeric 13; M	PR Numeric 14; M	PR Numeric 15; M
Test purpose		Check that: PHG does not include Pulse Rate Numeric Object – Supplemental-Types attribute in transcoder output for the Pulse Rate continuous measurement object (normal). [AND] PHG includes Pulse Rate Numeric Object – Supplemental-Types attribute in transcoder output for the Pulse Rate continuous measurement object (fast mode). Supplemental-Types attribute is set to {MDC_PART_SCADA, MDC_MODALITY_FAST}. [AND] PHG includes Pulse Rate Numeric Object – Supplemental-Types attribute in transcoder output for the Pulse Rate continuous measurement object (slow mode). Supplemental-Types attribute is set to {MDC_PART_SCADA, MDC_MODALITY_SLOW}.		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS				
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a continuous measurement (including fast and slow response measurement values) ready to be sent and it is in the Advertising state (it is discoverable). 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 00**11** 0000 (MSB → LSB). Fast and slow response modes are supported (bits 4 and 5). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included b. PLX Continuous Measurement (0x2A5F) i. Field: Flags • Format: 8 bit • Value: 0000 00**11** (MSB → LSB). SpO2PR–Fast, SpO2PR-Slow fields are present. Measurement Status, Device and Sensor Status and Pulse Amplitude Index fields are not present. ii. Field: SpO2PR-Normal - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Normal - PR (bpm)		

	• Format: SFLOAT • Value: Not Relevant iv. Field: SpO2PR-Fast - SpO2 (%) • Format: SFLOAT • Value: Not Relevant v. Field: SpO2PR-Fast - PR (bpm) • Format: SFLOAT • Value: Not Relevant vi. Field: SpO2PR-Slow - SpO2 (%) • Format: SFLOAT • Value: Not Relevant vii. Field: SpO2PR-Slow - PR (bpm) • Format: SFLOAT • Value: Not Relevant viii. Field: Measurement Status • This field is not included ix. Field: Device and Sensor Status • This field is not included x. Field: Pulse Amplitude Index (%) • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the Measurement to the PHG under test. 6. Check in the PHG transcoder output the Pulse Rate Numeric Object – Supplemental-Types attribute in all three Pulse Rate objects (continuous normal, fast and slow).
Pass/Fail criteria	In Step 6, • The Pulse Rate Numeric Object (normal) – Supplemental-Types attribute is not present • The Pulse Rate Numeric Object (fast response) Supplemental-Types attribute is present and its value is {MDC_PART_SCADA, MDC_MODALITY_FAST}. • The Pulse Rate Numeric Object (slow response) Supplemental-Types attribute is present and its value is {MDC_PART_SCADA, MDC_MODALITY_SLOW}.
Notes **(To assist manual testing)**	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Supplemental Types attribute is not present for Pulse Rate Numeric Object (normal). Supplemental-Types attribute is present for Pulse Rate Numeric Object (fast response): ❑ Object: Pulse Rate Numeric Object (fast response) ❑ Attribute-id: MDC_ATTR_SUPPLEMENTAL_TYPES (2657) ❑ Attribute-type: SEQUENCE of SEQUENCE {partition (INT-U16), code (INT-U16)} ❑ Attribute-value: {MDC_PART_SCADA, MDC_MODALITY_FAST}. Supplemental-Types attribute is present for Pulse Rate Numeric Object (slow response): ❑ Object: Pulse Rate Numeric Object (slow response) ❑ Attribute-id: MDC_ATTR_SUPPLEMENTAL_TYPES (2657)

	❑ Attribute-type: SEQUENCE of SEQUENCE {partition (INT-U16), code (INT-U16)} ❑ Attribute-value: {MDC_PART_SCADA, MDC_MODALITY_SLOW}. b) WAN PCD-01 message For Pulse Rate Numeric Object (normal) • PCD-01 message does not include segments with Supplemental-Types attribute. For Pulse Rate Numeric Object (fast) • PCD-01 message includes a facet OBX segment of the Pulse Rate measurement OBX segment with Supplemental-Types attribute (check OBX-3 and OBX-5): OBX|n|NM|149530^MDC_PULS_OXIM_PULS_RATE^MDC|m.0.0.x|[value]|264864^MDC_DIM_BEAT_PER_MIN^MDC|||||R|||[current_date_time] OBX|n|CWE|**68193^MDC_ATTR_SUPPLEMENTAL_TYPES^MDC|m.0.0.x.y|150580^MDC_MODALITY_FAST^MDC**||||||R For Pulse Rate Numeric Object (slow) • PCD-01 message includes a facet OBX segment of the Pulse Rate measurement OBX segment with Supplemental-Types attribute (check OBX-3 and OBX-5): OBX|n|NM|149530^MDC_PULS_OXIM_PULS_RATE^MDC|m.0.0.x|[value]|264864^MDC_DIM_BEAT_PER_MIN^MDC|||||R|||[current_date_time] OBX|n|CWE|**68193^MDC_ATTR_SUPPLEMENTAL_TYPES^MDC|m.0.0.y.z|150580^MDC_MODALITY_SLOW^MDC**||||||R

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-029		
TP label		Whitepaper. Pulse Rate Numeric Object (Spot-Check Measurement) - Metric-Spec-Small Attribute 1		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	PR Numeric 4; M	PR Numeric 6; M	
Test purpose		Check that: PHG includes Pulse Rate Numeric Object – Metric-Spec-Small attribute in transcoder output when using spot-check measurement mode. [AND] Metric-Spec-Small is set to {0x5040} when the sensor device supports measurement storage.		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS		C_MAN_BLE_042		
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a spot-check measurement ready to be sent and it is in the Advertising state (it is discoverable). The simulated PHD also supports the RACP characteristic and has an identical spot-check measurement temporarily stored. 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Spot-Check Measurement (0x2A5E) b. PLX Feature (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 0000 **11**00 (MSB → LSB). Measurement Storage for spot-		

	check measurements is supported (bit 2). Timestamp for Spot-Check measurements is supported. ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Feature characteristic. 5. The simulated PHD sends the Measurement to the PHG under test with the following value: a. PLX Spot-Check Measurement (0x2A5E) i. Field: Flags • Format: 8 bit • Value: 0000 000**1** (MSB → LSB). Timestamp field is present. Measurement Status, Device and Sensor Status, and Pulse Amplitude Index fields are not present. Device Clock is set. ii. Field: SpO2PR-Spot-Check - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Spot-Check – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: Time Stamp • Format: Date and Time • Value: October 12nd, 2015, 10:39:27 v. Field: Measurement Status • This field is not included vi. Field: Device and Sensor Status • This field is not included vii. Field: Pulse Amplitude Index (%) • This field is not included 6. Check in the PHG transcoder output the Pulse Rate Numeric Object – Metric-Spec-Small attribute 7. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check in PHG transcoder output the Pulse Rate Numeric Object – Metric-Spec-Small attribute
Pass/Fail criteria	In Step 6, the Pulse Rate Numeric Object – Metric-Spec-Small attribute is present and its value is {0x5040} (mss-avail-stored-data| mss-msmt-aperiodic| mss-acc-agent-initiated). If the PHG supports RACP, the same criteria applies to Step 7.b.
Notes **(To assist manual testing)**	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes

	Metric-Spec-Small attribute is present: ❑ Object: Pulse Rate Numeric Object ❑ Attribute-id: MDC_ATTR_METRIC_SPEC_SMALL (2630) ❑ Attribute-type: BITS-16 ❑ Attribute-value: 50 40 (hex) or BITS mss-avail-stored-data (1), mss- msmt - aperiodic(3), mss-acc-agent-initiated(9) set to TRUE and remaining BITS set to FALSE b) WAN PCD-01 message PCD-01 message does not include segments with Metric-Spec-Small attribute value

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-030		
TP label		Whitepaper. Pulse Rate Numeric Object (Spot-Check Measurement) - Metric-Spec-Small Attribute 2		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	PR Numeric 4; M	PR Numeric 5; M	
Test purpose		Check that: PHG includes Pulse Rate Numeric Object – Metric-Spec-Small attribute in transcoder output when using spot-check measurement mode. [AND] Metric-Spec-Small is set to {0x1040} when the sensor device does not support measurement storage.		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS				
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a spot-check measurement ready to be sent and it is in the Advertising state (it is discoverable). 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Spot-Check Measurement (0x2A5E) b. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 0000 0**0**00 (MSB → LSB). Measurement Storage for Spot-check measurements is not supported (bit 2). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the Measurement to the PHG under test with the following		

	value: a. PLX Spot-Check Measurement (0x2A5E) i. Field: Flags • Format: 8 bit • Value: 0000 0000 (MSB → LSB). Timestamp, Measurement Status, Device and Sensor Status, and Pulse Amplitude Index fields are not present. Device Clock is set. ii. Field: SpO2PR-Spot-Check - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Spot-Check – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: Time Stamp • This field is not included v. Field: Measurement Status • This field is not included vi. Field: Device and Sensor Status • This field is not included vii. Field: Pulse Amplitude Index (%) • This field is not included 6. Check in the PHG transcoder output the Pulse Rate Numeric Object – Metric-Spec-Small attribute
Pass/Fail criteria	In Step 6, the Pulse Rate Numeric Object – Metric-Spec-Small attribute is present and its value is {0x1040} (mss-msmt-aperiodic | mss-acc-agent-initiated).
Notes (To assist manual testing)	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Metric-Spec-Small attribute is present: ❑ Object: Pulse Rate Numeric Object ❑ Attribute-id: MDC_ATTR_METRIC_SPEC_SMALL (2630) ❑ Attribute-type: BITS-16 ❑ Attribute-value: 10 40 (hex) or BITS mss-msmt-aperiodic(3), mss-acc-agent-initiated(9) set to TRUE and remaining BITS set to FALSE b) WAN PCD-01 message PCD-01 message does not include segments with Metric-Spec-Small attribute value

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-031		
TP label		Whitepaper. Pulse Rate Numeric Object (Continuous Measurements) - Metric-Spec-Small Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	PR Numeric 16; M		
Test purpose		Check that: PHG includes Pulse Rate Numeric Object – Metric-Spec-Small attribute in transcoder output		

	when using continuous measurements. [AND] Metric-Spec-Small is set to {0x0040} (mss-acc-agent-initiated)
Applicability	C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040
Other PICS	
Initial condition	The PHG under test and the simulated PHD are in the Standby state.
Test procedure	1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a continuous measurement (including fast and slow response measurement values) ready to be sent and it is in the Advertising state (it is discoverable). 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 00**11** 0000 (MSB → LSB). Fast and slow response modes are supported (bits 4 and 5). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included b. PLX Continuous Measurement (0x2A5F) i. Field: Flags • Format: 8 bit • Value: 0000 00**11** (MSB → LSB). SpO2PR–Fast, SpO2PR-Slow fields are present. Measurement Status, Device and Sensor Status and Pulse Amplitude Index fields are not present. ii. Field: SpO2PR-Normal - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Normal – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: SpO2PR-Fast - SpO2 (%) • Format: SFLOAT • Value: Not Relevant v. Field: SpO2PR-Fast - PR (bpm) • Format: SFLOAT • Value: Not Relevant vi. Field: SpO2PR-Slow - SpO2 (%) • Format: SFLOAT • Value: Not Relevant vii. Field: SpO2PR-Slow - PR (bpm) • Format: SFLOAT • Value: Not Relevant

	viii. Field: Measurement Status • This field is not included ix. Field: Device and Sensor Status • This field is not included x. Field: Pulse Amplitude Index (%) • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the Measurement to the PHG under test. 6. Check in PHG transcoder output the Pulse Rate Numeric Object – Metric-Spec-Small attribute in all three Pulse Rate objects (continuous normal, fast and slow).
Pass/Fail criteria	In Step 6, • There are three Pulse Rate objects (for normal, fast and slow measurement modes). • In all three objects, the Pulse Rate Numeric Object – Metric-Spec-Small attribute is present and its value is {0x0040} (mss-acc-agent-initiated).
Notes (To assist manual testing)	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Metric-Spec-Small attribute is present in all three SpO2 objects: ❑ Object: Pulse Rate Numeric Object ❑ Attribute-id: MDC_ATTR_METRIC_SPEC_SMALL (2630) ❑ Attribute-type: BITS-16 ❑ Attribute-value: 00 40 (hex) or BITS mss-acc-agent-initiated(9) set to TRUE and remaining BITS set to FALSE b) WAN PCD-01 message PCD-01 message does not include segments with Metric-Spec-Small attribute value

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-032		
TP label		Whitepaper. Pulse Rate Numeric Object (Spot-Check Measurement) – Measurement-Status Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	PR Numeric 7; M		
Test purpose		Check that: PHG includes Pulse Rate Numeric Object – Measurement-Status attribute in transcoder output when using spot-check measurement mode. [AND] PHG transcodes the Bluetooth Measurement Status field of the PLX Spot-Check characteristic to 11073 Measurement-Status attribute properly		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS		C_MAN_BLE_042		
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		

Test procedure	1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a spot-check measurement ready to be sent and it is in the Advertising state (it is discoverable). The simulated PHD also supports the RACP characteristic and has an identical spot-check measurement temporarily stored. 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Spot-Check Measurement (0x2A5E) b. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 0000 **11**0**1** (MSB → LSB). Measurement Status support is present (bit 0). Measurement Storage for spot-check measurements is supported (bit 2). Timestamp for Spot-Check measurements is supported (bit 3). ii. Field: Measurement Status Support • Format: 16 bit • Value: **1111 1111 111**0 0000 (MSB → LSB). All Measurement Status bits are supported iii. Field: Device and Sensor Status Support • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Feature characteristic. 5. The simulated PHD sends the Measurement to the PHG under test with the following value: a. PLX Spot-Check Measurement (0x2A5E) i. Field: Flags • Format: 8 bit • Value: 0000 00**11** (MSB → LSB). Timestamp and Measurement Status fields are present. Device and Sensor Status, and Pulse Amplitude Index fields are not present. Device Clock is set. ii. Field: SpO2PR-Spot-Check - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Spot-Check – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: Time Stamp • Format: SFLOAT • Value: Not Relevant v. Field: October 12nd, 2015, 10:39:27 • Format: 16 bit • Value: **1**000 0000 0000 0000 (MSB → LSB). Invalid measurement detected (bit 15). vi. Field: Device and Sensor Status • This field is not included vii. Field: Pulse Amplitude Index (%)

	• This field is not included 6. Check in PHG transcoder output the Pulse Rate Numeric Object – Measurement-Status attribute 7. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check in PHG transcoder output the Pulse Rate Numeric Object – Measurement-Status attribute 8. Simulated PHD sends a Measurement to PHG under test with Measurement Status field set to 0**1**00 0000 0000 0000 (MSB → LSB), questionable measurement detected (bit 14). All remaining fields remain equal to those in step 5. Simulated PHD also deletes all stored records in RACP and stores an identical measurement. 9. Check in PHG transcoder output the Pulse Rate Numeric Object – Measurement-Status attribute 10. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check in PHG transcoder output the Pulse Rate Numeric Object – Measurement-Status attribute 11. Simulated PHD sends a Measurement to PHG under test with Measurement Status field set to 00**1**0 0000 0000 0000 (MSB → LSB), measurement not available (bit 13). All remaining fields remain equal to those in step 5. Simulated PHD also deletes all stored records in RACP and stores an identical measurement. 12. Check in PHG transcoder output the Pulse Rate Numeric Object – Measurement-Status attribute 13. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check in PHG transcoder output the Pulse Rate Numeric Object – Measurement-Status attribute 14. Simulated PHD sends a Measurement to PHG under test with Measurement Status field set to 000**1** 0000 0000 0000 (MSB → LSB), calibration ongoing (bit 12). All remaining fields remain equal to those in step 5. Simulated PHD also deletes all stored records in RACP and stores an identical measurement. 15. Check in PHG transcoder output the Pulse Rate Numeric Object – Measurement-Status attribute 16. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check in PHG transcoder output the Pulse Rate Numeric Object – Measurement-Status attribute 17. Simulated PHD sends a Measurement to PHG under test with Measurement Status field set to 0000 **1**000 0000 0000 (MSB → LSB), data for testing (bit 11). All remaining fields remain equal to those in step 5. Simulated PHD also deletes all stored records in RACP and stores an identical measurement. 18. Check in PHG transcoder output the Pulse Rate Numeric Object – Measurement-Status attribute 19. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN

	a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check in PHG transcoder output the Pulse Rate Numeric Object – Measurement-Status attribute 20. Simulated PHD sends a Measurement to PHG under test with Measurement Status field set to 0000 0**1**00 0000 0000 (MSB → LSB), data for demonstration (bit 10). All remaining fields remain equal to those in step 5. Simulated PHD also deletes all stored records in RACP and stores an identical measurement. 21. Check in PHG transcoder output the Pulse Rate Numeric Object – Measurement-Status attribute 22. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check in PHG transcoder output the Pulse Rate Numeric Object – Measurement-Status attribute 23. Simulated PHD sends a Measurement to PHG under test with Measurement Status field set to 0000 0000 **1**000 0000 (MSB → LSB), fully qualified data (bit 7). All remaining fields remain equal to those in step 5. Simulated PHD also deletes all stored records in RACP and stores an identical measurement. 24. Check in PHG transcoder output the Pulse Rate Numeric Object – Measurement-Status attribute 25. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check in PHG transcoder output the Pulse Rate Numeric Object – Measurement-Status attribute 26. Simulated PHD sends a Measurement to PHG under test with Measurement Status field set to 0000 0000 0**1**00 0000 (MSB → LSB), early estimated data (bit 6). All remaining fields remain equal to those in step 5. Simulated PHD also deletes all stored records in RACP and stores an identical measurement. 27. Check in PHG transcoder output the Pulse Rate Numeric Object – Measurement-Status attribute 28. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check in PHG transcoder output the Pulse Rate Numeric Object – Measurement-Status attribute 29. Simulated PHD sends a Measurement to PHG under test with Measurement Status field set to 0000 0000 00**1**0 0000 (MSB → LSB), measurement ongoing (bit 5). All remaining fields remain equal to those in step 5. Simulated PHD also deletes all stored records in RACP and stores an identical measurement. 30. Check in PHG transcoder output the Pulse Rate Numeric Object – Measurement-Status attribute 31. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check in PHG transcoder output the Pulse Rate Numeric Object – Measurement-

	Status attribute
Pass/Fail criteria	In Step 6, the Pulse Rate Numeric Object – Measurement-Status attribute is present and its set to “invalid” (0x8000). If PHG supports RACP, same criteria applies to 7.b. In Step 9, the Pulse Rate Numeric Object – Measurement-Status attribute is present and its set to “questionable” (0x4000). If PHG supports RACP, same criteria applies to 10.b. In Step 12, the Pulse Rate Numeric Object – Measurement-Status attribute is present and its set to “not-available” (0x2000). If PHG supports RACP, same criteria applies to 13.b. In Step 15, the Pulse Rate Numeric Object – Measurement-Status attribute is present and its set to “calibration-ongoing” (0x1000). If PHG supports RACP, same criteria applies to 16.b. In Step 18, the Pulse Rate Numeric Object – Measurement-Status attribute is present and its set to “test-data” (0x0800). If PHG supports RACP, same criteria applies to 19.b. In Step 21, the Pulse Rate Numeric Object – Measurement-Status attribute is present and its set to “demo-data” (0x0400). If PHG supports RACP, same criteria applies to 22.b. In Step 24, the Pulse Rate Numeric Object – Measurement-Status attribute is present and its set to “validated-data” (0x0080). If PHG supports RACP, same criteria applies to 25.b. In Step 27, the Pulse Rate Numeric Object – Measurement-Status attribute is present and its set to “early-indication” (0x0040). If PHG supports RACP, same criteria applies to 28.b. In Step 30, the Pulse Rate Numeric Object – Measurement-Status attribute is present and its set to “msmt-ongoing” (0x0020). If PHG supports RACP, same criteria applies to 31.b.
Notes **(To assist manual testing)**	In step 6 (and step 7.b if applicable), possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Measurement-Status attribute is present: ❑ Object: Pulse Rate Numeric Object ❑ Attribute-id: MDC_ATTR_MSMT_STAT (2375) ❑ Attribute-type: BITS16 ❑ Attribute-value: **80 00** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Measurement-Status attribute value (check OBX-8 and OBX-11): OBX|n|NM|149530^MDC_PULS_OXIM_PULS_RATE^MDC|m.0.0.x|[value]| 264864^MDC_DIM_BEAT_PER_MIN^MDC||**INV**|||**X**|||[current_date_time] In step 9 (and step 10.b if applicable), possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Measurement-Status attribute is present: ❑ Object: Pulse Rate Numeric Object ❑ Attribute-id: MDC_ATTR_MSMT_STAT (2375) ❑ Attribute-type: BITS16 ❑ Attribute-value: **40 00** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Measurement-Status attribute value (check OBX-8 and OBX-11): OBX|n|NM|149530^MDC_PULS_OXIM_PULS_RATE^MDC|m.0.0.x|[value]| 264864^MDC_DIM_BEAT_PER_MIN^MDC||**QUES**|||**R**|||[current_date_time] In step 12 (and step 13.b if applicable), possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Measurement-Status attribute is present:

	❑ Object: Pulse Rate Numeric Object ❑ Attribute-id: MDC_ATTR_MSMT_STAT (2375) ❑ Attribute-type: BITS16 ❑ Attribute-value: **20 00** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Measurement-Status attribute value (check OBX-8 and OBX-11): OBX|n|NM|149530^MDC_PULS_OXIM_PULS_RATE^MDC|m.0.0.x|[value]| 264864^MDC_DIM_BEAT_PER_MIN^MDC||**NAV**|||**X**|||[current_date_time] In step 15 (and step 16.b if applicable), possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Measurement-Status attribute is present: ❑ Object: Pulse Rate Numeric Object ❑ Attribute-id: MDC_ATTR_MSMT_STAT (2375) ❑ Attribute-type: BITS16 ❑ Attribute-value: **10 00** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Measurement-Status attribute value (check OBX-8 and OBX-11): OBX|n|NM|149530^MDC_PULS_OXIM_PULS_RATE^MDC|m.0.0.x|[value]| 264864^MDC_DIM_BEAT_PER_MIN^MDC||**CAL**|||**R**|||[current_date_time] In step 18 (and step 19.b if applicable), possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Measurement-Status attribute is present: ❑ Object: Pulse Rate Numeric Object ❑ Attribute-id: MDC_ATTR_MSMT_STAT (2375) ❑ Attribute-type: BITS16 ❑ Attribute-value: **08 00** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Measurement-Status attribute value (check OBX-8 and OBX-11): OBX|n|NM|149530^MDC_PULS_OXIM_PULS_RATE^MDC|m.0.0.x|[value]| 264864^MDC_DIM_BEAT_PER_MIN^MDC||**TEST**|||**R**|||[current_date_time] In step 21 (and step 22.b if applicable), possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Measurement-Status attribute is present: ❑ Object: Pulse Rate Numeric Object ❑ Attribute-id: MDC_ATTR_MSMT_STAT (2375) ❑ Attribute-type: BITS16 ❑ Attribute-value: **04 00** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Measurement-Status attribute value (check OBX-8 and OBX-11): OBX|n|NM|149530^MDC_PULS_OXIM_PULS_RATE^MDC|m.0.0.x|[value]| 264864^MDC_DIM_BEAT_PER_MIN^MDC||**DEMO**|||**R**|||[current_date_time]

	In step 24 (and step 25.b if applicable), possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Measurement-Status attribute is present: ❑ Object: Pulse Rate Numeric Object ❑ Attribute-id: MDC_ATTR_MSMT_STAT (2375) ❑ Attribute-type: BITS16 ❑ Attribute-value: **00 80** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Measurement-Status attribute value (check OBX-8 and OBX-11): OBX|n|NM|149530^MDC_PULS_OXIM_PULS_RATE^MDC|m.0.0.x|[value]| 264864^MDC_DIM_BEAT_PER_MIN^MDC||||**F**|||[current_date_time] In step 27 (and step 28.b if applicable), possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Measurement-Status attribute is present: ❑ Object: Pulse Rate Numeric Object ❑ Attribute-id: MDC_ATTR_MSMT_STAT (2375) ❑ Attribute-type: BITS16 ❑ Attribute-value: **00 40** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Measurement-Status attribute value (check OBX-8 and OBX-11): OBX|n|NM|149530^MDC_PULS_OXIM_PULS_RATE^MDC|m.0.0.x|[value]| 264864^MDC_DIM_BEAT_PER_MIN^MDC||**EARLY**||**R**|||[current_date_time] In step 30 (and step 31.b if applicable), possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Measurement-Status attribute is present: ❑ Object: Pulse Rate Numeric Object ❑ Attribute-id: MDC_ATTR_MSMT_STAT (2375) ❑ Attribute-type: BITS16 ❑ Attribute-value: **00 20** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Measurement-Status attribute value (check OBX-8 and OBX-11): OBX|n|NM|149530^MDC_PULS_OXIM_PULS_RATE^MDC|m.0.0.x|[value]| 264864^MDC_DIM_BEAT_PER_MIN^MDC||**BUSY**||**X**|||[current_date_time]

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-033		
TP label		Whitepaper. Pulse Rate Numeric Object (Continuous Measurements) – Measurement-Status Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	PR Numeric 17; M		

Test purpose	Check that: PHG includes Pulse Rate Numeric Object – Measurement-Status attribute in transcoder output when using continuous measurements. [AND] PHG transcodes the Bluetooth Measurement Status field of the PLX Continuous Measurement characteristic to 11073 Measurement-Status attribute properly
Applicability	C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040
Other PICS	
Initial condition	The PHG under test and the simulated PHD are in the Standby state.
Test procedure	1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a continuous measurement (including fast and slow response measurement values) ready to be sent and it is in the Advertising state (it is discoverable). 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Continuous Measurement (0x2A5F) b. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 00**11** 000**1** (MSB → LSB). Measurement Status support is present (bit 0). Fast and slow response modes are supported (bits 4 and 5). ii. Field: Measurement Status Support • Format: 16 bit • Value: **1111 1111 111**0 0000 (MSB → LSB). All Measurement Status bits are supported iii. Field: Device and Sensor Status Support • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Feature characteristic. 5. The simulated PHD sends the Measurement to the PHG under test with the following value: a. PLX Continuous Measurement (0x2A5F) i. Field: Flags • Format: 8 bit • Value: 0000 0**111** (MSB → LSB). Measurement Status, SpO2PR–Fast and SpO2PR-Slow fields are present. Device and Sensor Status and Pulse Amplitude Index fields are not present. ii. Field: SpO2PR-Normal - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Normal - PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: SpO2PR-Fast - SpO2 (%) • Format: SFLOAT

	• Value: Not Relevant v. Field: SpO2PR-Fast - PR (bpm) • Format: SFLOAT • Value: Not Relevant vi. Field: SpO2PR-Slow - SpO2 (%) • Format: SFLOAT • Value: Not Relevant vii. Field: SpO2PR-Slow - PR (bpm) • Format: SFLOAT • Value: Not Relevant viii. Field: Measurement Status • Format: 16 bit • Value: **1**000 0000 0000 0000 (MSB → LSB). Invalid measurement detected (bit 15). ix. Field: Device and Sensor Status • This field is not included x. Field: Pulse Amplitude Index (%) • This field is not included 6. Check in the PHG transcoder output the Pulse Rate Numeric Object – Measurement-Status attribute in all three Pulse Rate objects. 7. The simulated PHD sends a Measurement to the PHG under test with the Measurement Status field set to 0**1**00 0000 0000 0000 (MSB → LSB), questionable measurement detected (bit 14). All remaining fields remain equal to those in step 5. 8. Check in the PHG transcoder output the Pulse Rate Numeric Object – Measurement-Status attribute in all three Pulse Rate objects. 9. The simulated PHD sends a Measurement to PHG under test with Measurement Status field set to 00**1**0 0000 0000 0000 (MSB → LSB), measurement not available (bit 13). All remaining fields remain equal to those in step 5. 10. Check in the PHG transcoder output the Pulse Rate Numeric Object – Measurement-Status attribute in all three Pulse Rate objects. 11. The simulated PHD sends a Measurement to PHG under test with Measurement Status field set to 000**1** 0000 0000 0000 (MSB → LSB), calibration ongoing (bit 12). All remaining fields remain equal to those in step 5. 12. Check in the PHG transcoder output the Pulse Rate Numeric Object – Measurement-Status attribute in all three Pulse Rate objects. 13. The simulated PHD sends a Measurement to PHG under test with Measurement Status field set to 0000 **1**000 0000 0000 (MSB → LSB), data for testing (bit 11). All remaining fields remain equal to those in step 5. 14. Check in the PHG transcoder output the Pulse Rate Numeric Object – Measurement-Status attribute in all three Pulse Rate objects. 15. The simulated PHD sends a Measurement to PHG under test with Measurement Status field set to 0000 0**1**00 0000 0000 (MSB → LSB), data for demonstration (bit 10). All remaining fields remain equal to those in step 5. 16. Check in the PHG transcoder output the Pulse Rate Numeric Object – Measurement-Status attribute in all three Pulse Rate objects. 17. The simulated PHD sends a Measurement to PHG under test with Measurement Status field set to 0000 0000 **1**000 0000 (MSB → LSB), fully qualified data (bit 7). All remaining fields remain equal to those in step 5. 18. Check in the PHG transcoder output the Pulse Rate Numeric Object – Measurement-Status attribute in all three Pulse Rate objects. 19. The simulated PHD sends a Measurement to PHG under test with Measurement Status

	field set to 0000 0000 0**1**00 0000 (MSB → LSB), early estimated data (bit 6). All remaining fields remain equal to those in step 5. 20. Check in the PHG transcoder output the Pulse Rate Numeric Object – Measurement-Status attribute in all three Pulse Rate objects. 21. The simulated PHD sends a Measurement to PHG under test with Measurement Status field set to 0000 0000 00**1**0 0000 (MSB → LSB), measurement ongoing (bit 5). All remaining fields remain equal to those in step 5. 22. Check in the PHG transcoder output the Pulse Rate Numeric Object – Measurement-Status attribute in all three Pulse Rate objects.
Pass/Fail criteria	In Step 6, the Pulse Rate Numeric Object – Measurement-Status attribute is present in all three Pulse Rate objects and its set to "invalid" (0x8000) In Step 8, the Pulse Rate Numeric Object – Measurement-Status attribute is present in all three Pulse Rate objects and its set to "questionable" (0x4000) In Step 10, the Pulse Rate Numeric Object – Measurement-Status attribute is present in all three Pulse Rate objects and its set to "not-available" (0x2000) In Step 12, the Pulse Rate Numeric Object – Measurement-Status attribute is present in all three Pulse Rate objects and its set to "calibration-ongoing" (0x1000) In Step 14, the Pulse Rate Numeric Object – Measurement-Status attribute is present in all three Pulse Rate objects and its set to "test-data" (0x0800) In Step 16, the Pulse Rate Numeric Object – Measurement-Status attribute is present in all three Pulse Rate objects and its set to "demo-data" (0x0400) In Step 18, the Pulse Rate Numeric Object – Measurement-Status attribute is present in all three Pulse Rate objects and its set to "validated-data" (0x0080) In Step 20, the Pulse Rate Numeric Object – Measurement-Status attribute is present in all three Pulse Rate objects and its set to "early-indication" (0x0040) In Step 22, the Pulse Rate Numeric Object – Measurement-Status attribute is present in all three Pulse Rate objects and its set to "msmt-ongoing" (0x0020)
Notes **(To assist manual testing)**	In step 6, possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Measurement-Status attribute is present in all three Pulse Rate objects: ❑ Object: Pulse Rate Numeric Object ❑ Attribute-id: MDC_ATTR_MSMT_STAT (2375) ❑ Attribute-type: BITS16 ❑ Attribute-value: **80 00** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like for each SpO2 object this with Measurement-Status attribute value (check OBX-8 and OBX-11): OBX|n|NM|149530^MDC_PULS_OXIM_PULS_RATE^MDC|m.0.0.x|[value]| 264864^MDC_DIM_BEAT_PER_MIN^MDC||**INV**|||**X**|||[current_date_time] In step 8, possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Measurement-Status attribute is present in all three Pulse Rate objects: ❑ Object: Pulse Rate Numeric Object ❑ Attribute-id: MDC_ATTR_MSMT_STAT (2375) ❑ Attribute-type: BITS16 ❑ Attribute-value: **40 00** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this for each SpO2 object with Measurement-Status attribute value (check OBX-8 and OBX-11): OBX|n|NM|149530^MDC_PULS_OXIM_PULS_RATE^MDC|m.0.0.x|[value]|

	264864^MDC_DIM_BEAT_PER_MIN^MDC||**QUES**|||**R**|||[current_date_time] In step 10, possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Measurement-Status attribute is present in all three Pulse Rate objects: ❑ Object: Pulse Rate Numeric Object ❑ Attribute-id: MDC_ATTR_MSMT_STAT (2375) ❑ Attribute-type: BITS16 ❑ Attribute-value: **20 00** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this for each SpO2 object with Measurement-Status attribute value (check OBX-8 and OBX-11): OBX|n|NM|149530^MDC_PULS_OXIM_PULS_RATE^MDC|m.0.0.x|[value]| 264864^MDC_DIM_BEAT_PER_MIN^MDC||**NAV**|||**X**|||[current_date_time] In step 12, possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Measurement-Status attribute is present in all three Pulse Rate objects: ❑ Object: Pulse Rate Numeric Object ❑ Attribute-id: MDC_ATTR_MSMT_STAT (2375) ❑ Attribute-type: BITS16 ❑ Attribute-value: **10 00** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this for each SpO2 object with Measurement-Status attribute value (check OBX-8 and OBX-11): OBX|n|NM|149530^MDC_PULS_OXIM_PULS_RATE^MDC|m.0.0.x|[value]| 264864^MDC_DIM_BEAT_PER_MIN^MDC||**CAL**|||**R**|||[current_date_time] In step 14, possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Measurement-Status attribute is present in all three Pulse Rate objects: ❑ Object: Pulse Rate Numeric Object ❑ Attribute-id: MDC_ATTR_MSMT_STAT (2375) ❑ Attribute-type: BITS16 ❑ Attribute-value: **08 00** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this for each SpO2 object with Measurement-Status attribute value (check OBX-8 and OBX-11): OBX|n|NM|149530^MDC_PULS_OXIM_PULS_RATE^MDC|m.0.0.x|[value]| 264864^MDC_DIM_BEAT_PER_MIN^MDC||**TEST**|||**R**|||[current_date_time] In step 16, possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Measurement-Status attribute is present in all three Pulse Rate objects: ❑ Object: Pulse Rate Numeric Object ❑ Attribute-id: MDC_ATTR_MSMT_STAT (2375) ❑ Attribute-type: BITS16 ❑ Attribute-value: **04 00** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this for each SpO2 object with Measurement-Status attribute value (check OBX-8 and OBX-11):

	OBX|n|NM|149530^MDC_PULS_OXIM_PULS_RATE^MDC|m.0.0.x|[value]| 264864^MDC_DIM_BEAT_PER_MIN^MDC||**DEMO**|||**R**|||[current_date_time] In step 18, possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Measurement-Status attribute is present in all three Pulse Rate objects: ❑ Object: Pulse Rate Numeric Object ❑ Attribute-id: MDC_ATTR_MSMT_STAT (2375) ❑ Attribute-type: BITS16 ❑ Attribute-value: **00 80** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this for each SpO2 object with Measurement-Status attribute value (check OBX-8 and OBX-11): OBX|n|NM|149530^MDC_PULS_OXIM_PULS_RATE^MDC|m.0.0.x|[value]| 264864^MDC_DIM_BEAT_PER_MIN^MDC||||**F**|||[current_date_time] In step 20, possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Measurement-Status attribute is present in all three Pulse Rate objects: ❑ Object: Pulse Rate Numeric Object ❑ Attribute-id: MDC_ATTR_MSMT_STAT (2375) ❑ Attribute-type: BITS16 ❑ Attribute-value: **00 40** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this for each SpO2 object with Measurement-Status attribute value (check OBX-8 and OBX-11): OBX|n|NM|149530^MDC_PULS_OXIM_PULS_RATE^MDC|m.0.0.x|[value]| 264864^MDC_DIM_BEAT_PER_MIN^MDC||**EARLY**||**R**|||[current_date_time] In step 22, possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Measurement-Status attribute is present in all three Pulse Rate objects: ❑ Object: Pulse Rate Numeric Object ❑ Attribute-id: MDC_ATTR_MSMT_STAT (2375) ❑ Attribute-type: BITS16 ❑ Attribute-value: **00 20** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this for each SpO2 object with Measurement-Status attribute value (check OBX-8 and OBX-11): OBX|n|NM|149530^MDC_PULS_OXIM_PULS_RATE^MDC|m.0.0.x|[value]| 264864^MDC_DIM_BEAT_PER_MIN^MDC||**BUSY**||**X**|||[current_date_time]

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-034		
TP label		Whitepaper. Pulse Rate Numeric Object (Spot-Check Measurement) – Unit-Code Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	PR Numeric 8; M		
Test purpose		Check that:		

	PHG includes Pulse Rate Numeric Object –Unit-Code attribute in transcoder output when using spot-check measurement mode. [AND] Unit-Code is set to MDC_DIM_BEAT_PER_MIN
Applicability	C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040
Other PICS	C_MAN_BLE_042
Initial condition	The PHG under test and the simulated PHD are in the Standby state
Test procedure	1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a spot-check measurement ready to be sent and it is in the Advertising state (it is discoverable). The simulated PHD also supports the RACP characteristic and has an identical spot-check measurement temporarily stored. 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 0000 **11**00 (MSB → LSB). Measurement Storage for spot-check measurements is supported (bit 2). Timestamp for Spot-Check measurements is supported (bit 3). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included b. PLX Spot-Check Measurement (0x2A5E) i. Field: Flags • Format: 8 bit • Value: 0000 000**1** (MSB → LSB). Timestamp field is present. Measurement Status, Device and Sensor Status, and Pulse Amplitude Index fields are not present. Device Clock is set. ii. Field: SpO2PR-Spot-Check - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Spot-Check – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: Time Stamp • Format: Date and Time • Value: Not Relevant v. Field: Measurement Status • This field is not included vi. Field: Device and Sensor Status • This field is not included vii. Field: Pulse Amplitude Index (%) • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the

	simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the Measurement to the PHG under test. 6. Check in PHG transcoder output the Pulse Rate Numeric Object – Unit-Code attribute 7. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check in PHG transcoder output the Pulse Rate Numeric Object – Unit-Code attribute
Pass/Fail criteria	In Step 6, the Pulse Rate Numeric Object – Unit-Code attribute is present and its set to MDC_DIM_BEAT_PER_MIN. If the PHG supports RACP, the same criteria applies to Step 7.b.
Notes (To assist manual testing)	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Unit-Code attribute is present: ❑ Object: Pulse Rate Numeric Object ❑ Attribute-id: MDC_ATTR_UNIT_CODE (2454) ❑ Attribute-type: INT-U16 ❑ Attribute-value: MDC_DIM_BEAT_PER_MIN or 2720 (dec) or 0A A0 (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Unit-Code attribute value (check OBX-6): OBX|n|NM|149530^MDC_PULS_OXIM_PULS_RATE^MDC|m.0.0.x|[value]|**264864^MDC_DIM_BEAT_PER_MIN^MDC**||||R|||[current_date_time]

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-035		
TP label		Whitepaper. Pulse Rate Numeric Object (Continuous Measurements) – Unit-Code Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	PR Numeric 18; M		
Test purpose		Check that: PHG includes Pulse Rate Numeric Object – Unit-Code attribute in transcoder output when using continuous measurements. [AND] Unit-Code is set to MDC_DIM_BEAT_PER_MIN		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS				
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a continuous measurement (including fast and slow response measurement values) ready to be sent and it is in the Advertising state (it is discoverable). 2. The simulated PHD implements several BTLE characteristics. The characteristics of		

	interest for this Test Case are: a. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 00**11** 0000 (MSB → LSB). Fast and slow response modes are supported (bits 4 and 5). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included b. PLX Continuous Measurement (0x2A5F) i. Field: Flags • Format: 8 bit • Value: 0000 00**11**(MSB → LSB). SpO2PR–Fast, SpO2PR-Slow fields are present. Measurement Status, Device and Sensor Status and Pulse Amplitude Index fields are not present. ii. Field: SpO2PR-Normal - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Normal – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: SpO2PR-Fast - SpO2 (%) • Format: SFLOAT • Value: Not Relevant v. Field: SpO2PR-Fast - PR (bpm) • Format: SFLOAT • Value: Not Relevant vi. Field: SpO2PR-Slow - SpO2 (%) • Format: SFLOAT • Value: Not Relevant vii. Field: SpO2PR-Slow - PR (bpm) • Format: SFLOAT • Value: Not Relevant viii. Field: Measurement Status • This field is not included ix. Field: Device and Sensor Status • This field is not included x. Field: Pulse Amplitude Index (%) • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the Measurement to the PHG under test.

	6. Check in PHG transcoder output the Pulse Rate Numeric Object – Unit-Code attribute in all three Pulse Rate objects (continuous normal, fast and slow).
Pass/Fail criteria	In Step 6, • There are three Pulse Rate objects (for normal, fast and slow measurement modes). • In all three objects, the Pulse Rate Numeric Object – Unit-Code attribute is present and its set to MDC_DIM_BEAT_PER_MIN.
Notes (To assist manual testing)	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Unit-Code attribute is present in all three Pulse Rate objects: ❑ Object: Pulse Rate Numeric Object ❑ Attribute-id: MDC_ATTR_UNIT_CODE (2454) ❑ Attribute-type: INT-U16 ❑ Attribute-value: MDC_DIM_BEAT_PER_MIN or 2720 (dec) or 0A A0 (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this for each Pulse Rate object with Unit-Code attribute value (check OBX-6): OBX|n|NM|149530^MDC_PULS_OXIM_PULS_RATE^MDC|m.0.0.x|[value]|**264864^MDC_DIM_BEAT_PER_MIN^MDC**||||R|||[current_date_time]

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-036		
TP label		Whitepaper. Pulse Rate Numeric Object (Spot-Check Measurement) – Absolute-Time-Stamp Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	PR Numeric 9; M	Date-Time Conv 2; M	Date-Time Conv 3; M
		Date-Time Conv 4; M	Date-Time Conv 5; M	
Test purpose		Check that: PHG transcodes Time Stamp field of Spot-Check Measurement characteristic into Pulse Rate Numeric Object - Absolute-Time-Stamp attribute [AND] PHG transcodes the Bluetooth Time Stamp field format to Absolute Time format [AND] The fraction of seconds in Absolute Time at transcoder output is 0		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS		C_MAN_BLE_042		
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a Spot-Check measurement ready to be sent and it is in the Advertising state (it is discoverable). The simulated PHD also supports the RACP characteristic and has an identical spot-check measurement temporarily stored. 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Features (0x2A60) i. Field: Supported Features		

	• Format: 16 bit • Value: 0000 0000 0000 **11**00 (MSB → LSB). Measurement Storage for spot-check measurements is supported (bit 2). Timestamp for Spot-Check measurements is supported (bit 3). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included b. PLX Spot-Check Measurement (0x2A5E) i. Field: Flags • Format: 8 bit • Value: 0000 000**1** (MSB → LSB). Timestamp field is present. Measurement Status, Device and Sensor Status, and Pulse Amplitude Index fields are not present. Device Clock is set. ii. Field: SpO2PR-Spot-Check - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Spot-Check – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: Time Stamp • Format: Date and Time • Value: October 12nd, 2015, 10:39:27 v. Field: Measurement Status • This field is not included vi. Field: Device and Sensor Status • This field is not included vii. Field: Pulse Amplitude Index (%) • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG to read the PLX Features characteristic. 5. The simulated PHD sends the Measurement to the PHG under test. 6. Check in PHG transcoder output the Pulse Rate Numeric Object – Absolute-Time-Stamp attribute 7. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check in PHG transcoder output the Pulse Rate Numeric Object – Absolute-Time-Stamp attribute
Pass/Fail criteria	In Step 6, the Pulse Rate Numeric Object – Absolute-Time-Stamp attribute is present, its value matches with Time Stamp field of Spot-Check Measurement characteristic and fraction of seconds is set to 0. If the PHG supports RACP, the same criteria applies to Step 7.b.

Notes (To assist manual testing)	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Absolute-Time-Stamp attribute is present: ❑ Object: Pulse Rate Numeric Object ❑ Attribute-id: MDC_ATTR_TIME_STAMP_ABS (2448) ❑ Attribute-type: SEQUENCE {century (INT-U8), year (INT-U8), month (INT-U8), day (INT-U8), hour (INT-U8), minute (INT-U8), second (INT-U8), sec-fractions (INT-U8)} (BCD encoding) ❑ Attribute-value: • century: 20 (hex) or 32 (dec) • year: 15 (hex) or 21 (dec) • month: 10 (hex) or 16 (dec) • day: 12 (hex) or 18 (dec) • hour: 10 (hex) or 16 (dec) • minute: 39 (hex) or 57 (dec) • second: 27 (hex) or 39 (dec) • sec-fractions: 00 (hex) or 0 (dec) b) WAN PCD-01 message PCD-01 message includes a segment like this with Absolute-Time-Stamp attribute value (check OBX-14): OBX|n|NM|149530^MDC_PULS_OXIM_PULS_RATE^MDC|m.0.0.x|[value]| 264864^MDC_DIM_BEAT_PER_MIN^MDC||||R|||**20151012103927+0000**

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-037		
TP label		Whitepaper. Pulse Rate Numeric Object (Spot-Check Measurement) – Basic-Nu-Observed-Value Attribute 1		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	PR Numeric 10; M	Short Float Type 1; C	
Test purpose		Check that: PHG transcodes PR value of the SpO2PR-Spot-Check field in PLX Spot-Check Measurement chactacteristic into Pulse Rate Numeric Object - Basic-Nu-Observed-Value attribute		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS		C_MAN_BLE_042		
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a Spot-Check measurement ready to be sent and it is in the Advertising state (it is discoverable). The simulated PHD also supports the RACP characteristic and has an identical spot-check measurement temporarily stored. 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit		

	• Value: 0000 0000 0000 **11**00 (MSB → LSB). Measurement Storage for spot-check measurements is supported (bit 2). Timestamp for Spot-Check measurements is supported (bit 3). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included b. PLX Spot-Check Measurement (0x2A5E) i. Field: Flags • Format: 8 bit • Value: 0000 000**1** (MSB → LSB). Timestamp field is present. Measurement Status, Device and Sensor Status, and Pulse Amplitude Index fields are not present. Device Clock is set. ii. Field: SpO2PR-Spot-Check - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Spot-Check – PR (bpm) • Format: SFLOAT • Value: 90 (bpm) iv. Field: Time Stamp • Format: Date and Time • Value: Not relevant v. Field: Measurement Status • This field is not included vi. Field: Device and Sensor Status • This field is not included vii. Field: Pulse Amplitude Index (%) • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the Measurement to PHG under test. 6. Check in PHG transcoder output the Pulse Rate Numeric Object – Basic-Nu-Observed-Value attribute 7. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check in PHG transcoder output the Pulse Rate Numeric Object – Basic-Nu-Observed-Value attribute
Pass/Fail criteria	In Step 6, the Pulse Rate Numeric Object – Basic-Nu-Observed-Value attribute is present and its value matches with the value of the PR subfield of the SpO2PR-Spot-Check field in the PLX Spot-Check Measurement chactacteristic (90bpm). If the PHG supports RACP, the same criteria applies to Step 7.b.
Notes **(To assist manual**	Possible values in typical points of observation after transcoder output are:

testing)	a) IEEE 11073 Objects and Attributes Basic-Nu-Observed-Value attribute is present: ❑ Object: Pulse Rate Numeric Object ❑ Attribute-id: MDC_ATTR_NU_VAL_OBS_BASIC (2636) ❑ Attribute-type: SFLOAT ❑ Attribute-value: F3 84 (hex) or 10 09 (hex) or 00 5A (hex) or 90 (dec) b) WAN PCD-01 message PCD-01 message includes a segment like this with Basic-Nu-Observed-Value attribute value (check OBX-5): OBX|n|NM|149530^MDC_PULS_OXIM_PULS_RATE^MDC|m.0.0.x|**90**| 264864^MDC_DIM_BEAT_PER_MIN^MDC||||R|||[current_date_time]

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-038		
TP label		Whitepaper. Pulse Rate Numeric Object (Spot-Check Measurement) – Basic-Nu-Observed-Value Attribute 2		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	PR Numeric 10; M	PR Numeric 20; M	Short Float Type 2; M
Test purpose		Check that: PHG transcodes Pulse Rate value of the PR subfield of the SpO2PR-Spot-Check field in PLX Spot-Check Measurement chactacteristic into Pulse Rate Numeric Object - Basic-Nu-Observed-Value attribute [AND] PHG assigns special value NaN (0x07FF) when Pulse Rate value is unavailable.		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS		C_MAN_BLE_042		
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a Spot-Check measurement ready to be sent and it is in the Advertising state (it is discoverable). The simulated PHD also supports the RACP characteristic and has an identical spot-check measurement temporarily stored. 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 0000 **11**00 (MSB → LSB). Measurement Storage for spot-check measurements is supported (bit 2). Timestamp for Spot-Check measurements is supported (bit 3). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included b. PLX Spot-Check Measurement (0x2A5E) i. Field: Flags		

	• Format: 8 bit • Value: 0000 000**1** (MSB → LSB). Timestamp field is present. Measurement Status, Device and Sensor Status, and Pulse Amplitude Index fields are not present. Device Clock is set. ii. Field: SpO2PR-Spot-Check - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Spot-Check – PR (bpm) • Format: SFLOAT • Value: 07 FF (hex). Special value: NaN iv. Field: Time Stamp • Format: Date and Time • Value: Not Relevant v. Field: Measurement Status • This field is not included vi. Field: Device and Sensor Status • This field is not included vii. Field: Pulse Amplitude Index (%) • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the Measurement to the PHG under test. 6. Check in PHG transcoder output the Pulse Rate Numeric Object – Basic-Nu-Observed-Value attribute 7. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check in PHG transcoder output the Pulse Rate Numeric Object – Basic-Nu-Observed-Value attribute
Pass/Fail criteria	In Step 6, the Pulse Rate Numeric Object – Basic-Nu-Observed-Value attribute is present and its value is is 0x07FF (NaN). If the PHG supports RACP, the same criteria applies to Step 7.b.
Notes **(To assist manual testing)**	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Basic-Nu-Observed-Value attribute is present: ❑ Object: Pulse Rate Numeric Object ❑ Attribute-id: MDC_ATTR_NU_VAL_OBS_BASIC (2636) ❑ Attribute-type: SFLOAT ❑ Attribute-value: 07 FF (hex) or NaN (note that a decimal value is not allowed) b) WAN PCD-01 message PCD-01 message does not include special values

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-039		
TP label		Pulse Rate Numeric Object (Continuous Measurements) – Basic-Nu-Observed-Value Attribute 1		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	PR Numeric 19; M	Short Float Type 1; C	
Test purpose		Check that: PHG transcodes Pulse Rate value of the PR subfield of the SpO2PR-Normal field in PLX Continuous Measurement chactacteristic into Pulse Rate Numeric Object (Continuous normal response) - Basic-Nu-Observed-Value attribute [AND] PHG transcodes Pulse Rate value of the PR subfield of the SpO2PR-Fast field in PLX Continuous Measurement chactacteristic into Pulse Rate Numeric Object (Continuous fast response) - Basic-Nu-Observed-Value attribute [AND] PHG transcodes Pulse Rate value of the PR subfield of the SpO2PR-Slow field in PLX Continuous Measurement chactacteristic into Pulse Rate Numeric Object (Continuous slow response) - Basic-Nu-Observed-Value attribute		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS				
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a continuous measurement (including fast and slow response measurement values) ready to be sent and it is in the Advertising state (it is discoverable). 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 00**11** 0000 (MSB → LSB). Fast and slow response modes are supported (bits 4 and 5). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included b. PLX Continuous Measurement (0x2A5F) i. Field: Flags • Format: 8 bit • Value: 0000 00**11** (MSB → LSB). SpO2PR–Fast, SpO2PR-Slow fields are present. Measurement Status, Device and Sensor Status and Pulse Amplitude Index fields are not present. ii. Field: SpO2PR-Normal - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Normal - PR (bpm) • Format: SFLOAT		

	• Value: 90 (bpm) iv. Field: SpO2PR-Fast - SpO2 (%) • Format: SFLOAT • Value: Not Relevant v. Field: SpO2PR-Fast - PR (bpm) • Format: SFLOAT • Value: 91 (bpm) vi. Field: SpO2PR-Slow - SpO2 (%) • Format: SFLOAT • Value: Not Relevant vii. Field: SpO2PR-Slow - PR (bpm) • Format: SFLOAT • Value: 92 (bpm) viii. Field: Measurement Status • This field is not included ix. Field: Device and Sensor Status • This field is not included x. Field: Pulse Amplitude Index (%) • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the Measurement to PHG under test. 6. Check in PHG transcoder output the Pulse Rate Numeric Object – Basic-Nu-Observed-Value attribute in all three Pulse Rate objects.
Pass/Fail criteria	In Step 6, • The Pulse Rate Numeric Object (Continuous measurement normal) – Basic-Nu-Observed-Value attribute is present and its value matches with the value of the PR field of the SpO2PR-Normal field in the PLX Continuous Measurement chactacteristic (90bpm). • The Pulse Rate Numeric Object (Continuous measurement fast) – Basic-Nu-Observed-Value attribute is present and its value matches with the value of the PR subfield of the SpO2PR-Fast field in the PLX Continuous Measurement chactacteristic (91bpm). • The Pulse Rate Numeric Object (Continuous measurement slow) – Basic-Nu-Observed-Value attribute is present and its value matches with the value of the PR subfield of the SpO2PR-Slow field in the PLX Continuous Measurement chactacteristic (92bpm).
Notes **(To assist manual testing)**	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Pulse Rate Numeric object (Continous measurement normal): Supplemental-types attribute is not present. • Basic-Nu-Observed-Value attribute is present: ❑ Object: Pulse Rate Numeric Object ❑ Attribute-id: MDC_ATTR_NU_VAL_OBS_BASIC (2636) ❑ Attribute-type: SFLOAT ❑ Attribute-value: F3 84 (hex) or 10 09 (hex) or 00 5A (hex) or 90 (dec) Pulse Rate Numeric object (Continous measurement fast):

	• Supplemental-types attribute is present: ❑ Object: Pulse Rate Numeric Object (fast response) ❑ Attribute-id: MDC_ATTR_SUPPLEMENTAL_TYPES (2657) ❑ Attribute-type: SEQUENCE of SEQUENCE {partition (INT-U16), code (INT-U16)} ❑ Attribute-value: {MDC_PART_SCADA, MDC_MODALITY_FAST}. • Basic-Nu-Observed-Value attribute is present: ❑ Object: Pulse Rate Numeric Object ❑ Attribute-id: MDC_ATTR_NU_VAL_OBS_BASIC (2636) ❑ Attribute-type: SFLOAT ❑ Attribute-value: F3 8E (hex) or 00 5B (hex) or 91 (dec) Pulse Rate Numeric object (Continous measurement slow): • Supplemental-types attribute is present: ❑ Object: Pulse Rate Numeric Object (slow response) ❑ Attribute-id: MDC_ATTR_SUPPLEMENTAL_TYPES (2657) ❑ Attribute-type: SEQUENCE of SEQUENCE {partition (INT-U16), code (INT-U16)} ❑ Attribute-value: {MDC_PART_SCADA, MDC_MODALITY_SLOW}. • Basic-Nu-Observed-Value attribute is present: ❑ Object: Pulse Rate Numeric Object ❑ Attribute-id: MDC_ATTR_NU_VAL_OBS_BASIC (2636) ❑ Attribute-type: SFLOAT ❑ Attribute-value: F3 98 (hex) or 00 5C (hex) or 92 (dec) b) WAN PCD-01 message Pulse Rate Numeric object (Continous measurement normal): • PCD-01 message includes a segment like this with Basic-Nu-Observed-Value attribute value (check OBX-5): OBX|n|NM|149530^MDC_PULS_OXIM_PULS_RATE^MDC|m.0.0.x|90| 264864^MDC_DIM_BEAT_PER_MIN^MDC||||R|||[current_date_time] Pulse Rate Numeric object (Continous measurement fast): • PCD-01 message includes two segments like these for Pulse Rate Numeric object (Fast response), with Basic-Nu-Observed-Value attribute and Supplemental-Types attribute values (check OBX-5 in both segments): OBX|n|NM|149530^MDC_PULS_OXIM_PULS_RATE^MDC|m.0.0.x|**91**| 264864^MDC_DIM_BEAT_PER_MIN^MDC||||R|||[current_date_time] OBX|n|CWE|68193^MDC_ATTR_SUPPLEMENTAL_TYPES^MDC|m.0.0.x.y| **150580^MDC_MODALITY_FAST^MDC**||||||[obx-11 of the parent] Pulse Rate Numeric object (Continous measurement slow): • PCD-01 message includes two segments like these for Pulse Rate Numeric object (Slow response), with Basic-Nu-Observed-Value attribute and Supplemental-Types attribute values (check OBX-5 in both segments): OBX|n|NM|149530^MDC_PULS_OXIM_PULS_RATE^MDC|m.0.0.x|**92**| 264864^MDC_DIM_BEAT_PER_MIN^MDC||||R|||[current_date_time] OBX|n|CWE|68193^MDC_ATTR_SUPPLEMENTAL_TYPES^MDC|m.0.0.x.y| **150580^MDC_MODALITY_SLOW^MDC**||||||[obx-11 of the parent]

TP Id	TP/LP-PAN/PHG/PHDTW/PLX/BV-040
TP label	Whitepaper. Pulse Rate Numeric Object (Continuous Measurements) – Basic-Nu-Observed-

		Value Attribute 2		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	PR Numeric 19; M	PR Numeric 20; M	Short Float Type 2; M
Test purpose		Check that: PHG transcodes Pulse Rate value of the PR subfield of the SpO2PR-Normal field in PLX Continuous Measurement chactacteristic into Pulse Rate Numeric Object (Continuous normal response) - Basic-Nu-Observed-Value attribute [AND] PHG transcodes Pulse Rate value of the PR subfield of the SpO2PR-Fast field in PLX Continuous Measurement chactacteristic into Pulse Rate Numeric Object (Continuous fast response) - Basic-Nu-Observed-Value attribute [AND] PHG transcodes Pulse Rate value of the PR subfield of the SpO2PR-Slow field in PLX Continuous Measurement chactacteristic into Pulse Rate Numeric Object (Continuous slow response) - Basic-Nu-Observed-Value attribute [AND] PHG assigns special value NaN (0x07FF) when Pulse Rate value is unavailable.		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS				
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a continuous measurement (including fast and slow response measurement values) ready to be sent and it is in the Advertising state (it is discoverable). 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 00**11** 0000 (MSB → LSB). Fast and slow response modes are supported (bits 4 and 5). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included b. PLX Continuous Measurement (0x2A5F) i. Field: Flags • Format: 8 bit • Value: 0000 00**11** (MSB → LSB). SpO2PR–Fast, SpO2PR-Slow fields are present. Measurement Status, Device and Sensor Status and Pulse Amplitude Index fields are not present. ii. Field: SpO2PR-Normal - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Normal - PR (bpm) • Format: SFLOAT		

	• Value: 07 FF (hex). Special value: NaN iv. Field: SpO2PR-Fast - SpO2 (%) • Format: SFLOAT • Value: Not Relevant v. Field: SpO2PR-Fast - PR (bpm) • Format: SFLOAT • Value: 07 FF (hex). Special value: NaN vi. Field: SpO2PR-Slow - SpO2 (%) • Format: SFLOAT • Value: Not Relevant vii. Field: SpO2PR-Slow - PR (bpm) • Format: SFLOAT • Value: 07 FF (hex). Special value: NaN viii. Field: Measurement Status • This field is not included ix. Field: Device and Sensor Status • This field is not included x. Field: Pulse Amplitude Index (%) • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the Measurement to PHG under test. 6. Check in PHG transcoder output the Pulse Rate Numeric Object – Basic-Nu-Observed-Value attribute for all Pulse Rate objects.
Pass/Fail criteria	In Step 6, • The Pulse Rate Numeric Object (Continuous measurement normal) – Basic-Nu-Observed-Value attribute is present and its value is is 0x07FF (NaN). • The Pulse Rate Numeric Object (Continuous measurement fast) – Basic-Nu-Observed-Value attribute is present and its value is is 0x07FF (NaN). • The Pulse Rate Numeric Object (Continuous measurement slow) – Basic-Nu-Observed-Value attribute is present and its value is is 0x07FF (NaN).
Notes **(To assist manual testing)**	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Pulse Rate Numeric object (Continous measurement normal): • Supplemental-types attribute is not present. Basic-Nu-Observed-Value attribute is present: ❑ Object: Pulse Rate Numeric Object ❑ Attribute-id: MDC_ATTR_NU_VAL_OBS_BASIC (2636) ❑ Attribute-type: SFLOAT ❑ Attribute-value: Attribute-value: 07 FF (hex) or NaN (note that a decimal value is not allowed) Pulse Rate Numeric object (Continous measurement fast): • Supplemental-types attribute is present:

	❑ Object: Pulse Rate Numeric Object (fast response) ❑ Attribute-id: MDC_ATTR_SUPPLEMENTAL_TYPES (2657) ❑ Attribute-type: SEQUENCE of SEQUENCE {partition (INT-U16), code (INT-U16)} ❑ Attribute-value: {MDC_PART_SCADA, MDC_MODALITY_FAST}. • Basic-Nu-Observed-Value attribute is present: ❑ Object: Pulse Rate Numeric Object ❑ Attribute-id: MDC_ATTR_NU_VAL_OBS_BASIC (2636) ❑ Attribute-type: SFLOAT ❑ Attribute-value: Attribute-value: 07 FF (hex) or NaN (note that a decimal value is not allowed) Pulse Rate Numeric object (Continous measurement slow): • Supplemental-types attribute is present: ❑ Object: Pulse Rate Numeric Object (slow response) ❑ Attribute-id: MDC_ATTR_SUPPLEMENTAL_TYPES (2657) ❑ Attribute-type: SEQUENCE of SEQUENCE {partition (INT-U16), code (INT-U16)} ❑ Attribute-value: {MDC_PART_SCADA, MDC_MODALITY_SLOW}. • Basic-Nu-Observed-Value attribute is present: ❑ Object: Pulse Rate Numeric Object ❑ Attribute-id: MDC_ATTR_NU_VAL_OBS_BASIC (2636) ❑ Attribute-type: SFLOAT ❑ Attribute-value: Attribute-value: 07 FF (hex) or NaN (note that a decimal value is not allowed) b) WAN PCD-01 message PCD-01 message does not include special values

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-041		
TP label		Whitepaper. Pulse Rate measurement value (Spot-Check Measurement)		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	Short Float Type 1; C	Date-Time Conv 1; M	PR Numeric 9; M
		PR Numeric 10; M		
Test purpose		Check that: PHG processes correctly the Pulse Rate value (bpm) of the PR subfield of the SpO2PR-Spot-Check field and and the value of the Time Stamp field of the PLX Spot-Check characteristic		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS		C_MAN_BLE_042		
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a Spot-Check measurement ready to be sent and it is in the Advertising state (it is discoverable). The simulated PHD also supports the RACP characteristic and has an identical spot-check measurement temporarily stored. 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are:		

	a. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 0000 **11**00 (MSB → LSB). Measurement Storage for spot-check measurements is supported (bit 2). Timestamp for Spot-Check measurements is supported (bit 3). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included b. PLX Spot-Check Measurement (0x2A5E) i. Field: Flags • Format: 8 bit • Value: 0000 000**1** (MSB → LSB). Timestamp field is present. Measurement Status, Device and Sensor Status, and Pulse Amplitude Index fields are not present. Device Clock is set. ii. Field: SpO2PR-Spot-Check - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Spot-Check – PR (bpm) • Format: SFLOAT • Value: 90 (bpm) iv. Field: Time Stamp • Format: Date and Time • Value: October 12nd, 2015, 10:39:27 v. Field: Measurement Status • This field is not included vi. Field: Device and Sensor Status • This field is not included vii. Field: Pulse Amplitude Index (%) • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the Measurement to the PHG under test. 6. Check that PHG accepts the measurement and decodes its value properly (Pulse Rate measurement value, units and time stamp). 7. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the simulated PHD sends the temporarily stored spot-check measurement to the PHG under test b) Check that the PHG accepts the measurement and decodes its value properly (Pulse Rate measurement value, units and time stamp)
Pass/Fail criteria	In Step 6, the PHG under test shows the following measurement Pulse Rate = 90(bpm) with timestamp '2015-10-12 10:39:27'.

	If the PHG supports RACP, the same criteria applies to Step 7.b.
Notes	

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-042		
TP label		Whitepaper. Pulsatile Quality Numeric Object (Spot-Check Measurement) - Handle Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	PQ Numeric 1; O		
Test purpose		Check that: PHG does not include Pulsatile Quality Numeric Object – Handle Attribute in transcoder output when using spot-check measurement mode. [OR] If PHG includes Pulsatile Quality Numeric Object – Handle attribute in transcoder output, then its value shall be different than 0		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS		C_MAN_BLE_042		
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a spot-check measurement ready to be sent and it is in the Advertising state (it is discoverable). The simulated PHD also supports the RACP characteristic and has an identical spot-check measurement temporarily stored. 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 0**1**00 **11**00 (MSB → LSB). Pulse Amplitude Index field is supported (bit 6). Measurement Storage for spot-check measurements is supported (bit 2). Timestamp for Spot-Check measurements is supported (bit 3). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included b. PLX Spot-Check Measurement (0x2A5E) i. Field: Flags • Format: 8 bit • Value: 0000 **1**00**1** (MSB → LSB). Timestamp and Pulse Amplitude Index fields are present. Measurement Status and Device and Sensor Status fields are not present. Device Clock is set. ii. Field: SpO2PR-Spot-Check - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Spot-Check – PR (bpm)		

	• Format: SFLOAT • Value: Not Relevant iv. Field: Time Stamp • Format: Date and Time • Value: Not Relevant v. Field: Measurement Status • This field is not included vi. Field: Device and Sensor Status • This field is not included vii. Field: Pulse Amplitude Index (%) • Format: SFLOAT • Value: Not Relevant 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the measurement to the PHG under test. 6. Check in PHG transcoder output the Pulsatile Quality Numeric Object – Handle attribute 7. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check in PHG transcoder output the Pulsatile Quality Numeric Object – Handle attribute
Pass/Fail criteria	In Step 6, the Pulsatile Quality Numeric Object – Handle attribute is not present or, if it is present then its value is different than 0 If the PHG supports RACP, the same criteria applies to Step 7.b.
Notes (To assist manual testing)	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Handle attribute is not present, or if it is present then: ❑ Object: Pulsatile Quality Numeric Object ❑ Attribute-id: MDC_ATTR_ID_HANDLE (2337) ❑ Attribute-type: INT-U16 ❑ Attribute-value: Any value different than 0 b) WAN PCD-01 message PCD-01 message does not include segments with Handle attribute value

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-043		
TP label		Whitepaper. Pulsatile Quality Numeric Object (Continuous Measurements) - Handle Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	PQ Numeric 9; O		
Test purpose		Check that:		

	PHG does not include Pulsatile Quality Numeric Object – Handle Attribute in transcoder output when using continuous measurements [OR] If PHG includes Pulsatile Quality Numeric Object – Handle attribute in transcoder output, then its value shall be different than 0
Applicability	C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040
Other PICS	
Initial condition	The PHG under test and the simulated PHD are in the Standby state.
Test procedure	1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a continuous measurement (including fast and slow response measurement values) ready to be sent and it is in the Advertising state (it is discoverable). 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 0**111** 0000 (MSB → LSB). Fast and slow response modes are supported (bits 4 and 5). Pulse Amplitude Index field is supported. ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included b. PLX Continuous Measurement (0x2A5F) i. Field: Flags • Format: 8 bit • Value: 000**1** 00**11** (MSB → LSB). SpO2PR–Fast, SpO2PR-Slow and Pulse Amplitude Index fields are present. Measurement Status, and Device and Sensor Status and fields are not present. ii. Field: SpO2PR-Normal - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Normal – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: SpO2PR-Fast - SpO2 (%) • Format: SFLOAT • Value: Not Relevant v. Field: SpO2PR-Fast - PR (bpm) • Format: SFLOAT • Value: Not Relevant vi. Field: SpO2PR-Slow - SpO2 (%) • Format: SFLOAT • Value: Not Relevant vii. Field: SpO2PR-Slow - PR (bpm) • Format: SFLOAT

	• Value: Not Relevant viii. Field: Measurement Status • This field is not included ix. Field: Device and Sensor Status • This field is not included x. Field: Pulse Amplitude Index (%) • Format: SFLOAT • Value: Not Relevant 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Feature characteristic 5. The simulated PHD sends the Measurement to the PHG under test. 6. Check in PHG transcoder output the Pulsatile Quality Numeric Object – Handle attribute.
Pass/Fail criteria	In Step 6, the Pulsatile Quality Numeric Object – Handle attribute is not present or, if it is present then its value is different than 0.
Notes (To assist manual testing)	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Handle attribute is not present, or if it is present then: ❑ Object: Pulsatile Quality Numeric Object ❑ Attribute-id: MDC_ATTR_ID_HANDLE (2337) ❑ Attribute-type: INT-U16 ❑ Attribute-value: Any value different than 0 b) WAN PCD-01 message PCD-01 message does not include segments with Handle attribute value

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-044		
TP label		Whitepaper. Pulsatile Quality Numeric Object (Spot-Check Measurement) - Type Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	PQ Numeric 2; M		
Test purpose		Check that: PHG includes Pulsatile Quality Numeric Object – Type attribute in transcoder output when using spot-check measurement mode. [AND] Type is set to {MDC_PART_SCADA, MDC_SAT_O2_QUAL}		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS		C_MAN_BLE_042		
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a spot-check measurement ready to be sent and it is in the Advertising state (it is discoverable). The simulated PHD also supports the RACP characteristic and has an		

	identical spot-check measurement temporarily stored. 2. The simulated PHD implements several BTLE characteristics. The characteristic of interest for this Test Case is: a. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 0**1**00 **11**00 (MSB → LSB). Pulse Amplitude Index field is supported (bit 6). Measurement Storage for spot-check measurements is supported (bit 2). Timestamp for Spot-Check measurements is supported (bit 3). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included b. PLX Spot-Check Measurement (0x2A5E) i. Field: Flags • Format: 8 bit • Value: 0000 **1**00**1** (MSB → LSB). Timestamp and Pulse Amplitude Index fields are present. Measurement Status and Device and Sensor Status fields are not present. Device Clock is set. ii. Field: SpO2PR-Spot-Check - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Spot-Check – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: Time Stamp • Format: Date and Time • Value: Not Relevant v. Field: Measurement Status • This field is not included vi. Field: Device and Sensor Status • This field is not included vii. Field: Pulse Amplitude Index (%) • Format: SFLOAT • Value: Not Relevant 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the Measurement to the PHG under test. 6. Check in PHG transcoder output the Pulsatile Quality Numeric Object – Type attribute 7. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test

	b) Check in PHG transcoder output the Pulsatile Quality Numeric Object – Type attribute
Pass/Fail criteria	In Step 6, the Pulsatile Quality Numeric Object – Type attribute is present and its value is {MDC_PART_SCADA, MDC_SAT_O2_QUAL} If the PHG supports RACP, the same criteria applies to Step 7.b.
Notes (To assist manual testing)	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Type attribute is present: ❑ Object: Pulsatile Quality Numeric Object ❑ Attribute-id: MDC_ATTR_ID_TYPE (2351) ❑ Attribute-type: SEQUENCE {partition (INT-U16), code (INT-U16)} ❑ Attribute-value: • partition: MDC_PART_SCADA or 2 (dec) or 00 02 (hex) • code: MDC_SAT_O2_QUAL or 19248(dec) or 4B 30 (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Type attribute (check OBX-3): OBX|n|NM|**150320^MDC_SAT_O2_QUAL^MDC**|m.0.0.x|[value]| 262688^MDC_DIM_PERCENT^MDC||||R|||[current_date_time]

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-045		
TP label		Whitepaper. Pulsatile Quality Numeric Object (Continuous Measurements) - Type Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	PQ Numeric 10; M		
Test purpose		Check that: PHG includes Pulsatile Quality Numeric Object – Type attribute in transcoder output when using continuous measurements. [AND] Type is set to {MDC_PART_SCADA, MDC_SAT_O2_QUAL}		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS				
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a continuous measurement (including fast and slow response measurement values) ready to be sent and it is in the Advertising state (it is discoverable). 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 0**111** 0000 (MSB → LSB). Fast and slow response modes are supported (bits 4 and 5). Pulse Amplitude Index is supported (bit 6). ii. Field: Measurement Status Support		

	• This field is not included iii. Field: Device and Sensor Status Support • This field is not included b. PLX Continuous Measurement (0x2A5F) i. Field: Flags • Format: 8 bit • Value: 000**1** 00**11** (MSB → LSB). SpO2PR–Fast, SpO2PR-Slow and Pulse Amplitude Index fields are present. Measurement Status, and Device and Sensor Status fields are not present. ii. Field: SpO2PR-Normal - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Normal – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: SpO2PR-Fast - SpO2 (%) • Format: SFLOAT • Value: Not Relevant v. Field: SpO2PR-Fast - PR (bpm) • Format: SFLOAT • Value: Not Relevant vi. Field: SpO2PR-Slow - SpO2 (%) • Format: SFLOAT • Value: Not Relevant vii. Field: SpO2PR-Slow - PR (bpm) • Format: SFLOAT • Value: Not Relevant viii. Field: Measurement Status • This field is not included ix. Field: Device and Sensor Status • This field is not included x. Field: Pulse Amplitude Index (%) • Format: SFLOAT • Value: Not Relevant 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Feature characteristic. 5. The simulated PHD sends the Measurement to the PHG under test. 6. Check in PHG transcoder output the Pulsatile Quality Numeric Object – Type attribute.
Pass/Fail criteria	In Step 6, the Pulsatile Quality Numeric Object – Type attribute is present and its value is {MDC_PART_SCADA, MDC_SAT_O2_QUAL}
Notes **(To assist manual testing)**	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes

	Type attribute is present: ❑ Object: Pulsatile Quality Numeric Object ❑ Attribute-id: MDC_ATTR_ID_TYPE (2351) ❑ Attribute-type: SEQUENCE {partition (INT-U16), code (INT-U16)} ❑ Attribute-value: • partition: MDC_PART_SCADA or 2 (dec) or 00 02 (hex) • code: MDC_SAT_O2_QUAL or 19248(dec) or 4B 30 (hex) b) WAN PCD-01 message PCD-01 message includes three segments like this with Type attribute (check OBX-3): OBX|n|NM|**150320^MDC_SAT_O2_QUAL^MDC**|m.0.0.x|[value]| 262688^MDC_DIM_PERCENT^MDC||||R|||[current_date_time]

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-046		
TP label		Whitepaper. Pulsatile Quality Numeric Object (Spot-Check Measurement) - Metric-Spec-Small Attribute 1		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	PQ Numeric 3; M	PQ Numeric 5; M	
Test purpose		Check that: PHG includes Pulsatile Quality Numeric Object – Metric-Spec-Small attribute in transcoder output when using spot-check measurement mode. [AND] Metric-Spec-Small is set to {0x5040} when the sensor device supports measurement storage.		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS		C_MAN_BLE_042		
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a spot-check measurement ready to be sent and it is in the Advertising state (it is discoverable). The simulated PHD also supports the RACP characteristic and has an identical spot-check measurement temporarily stored. 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Spot-Check Measurement (0x2A5E) b. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 0**1**00 **11**00 (MSB → LSB). Pulse Amplitude Index field is supported (bit 6). Measurement Storage for spot-check measurements is supported (bit 2). Timestamp for Spot-Check measurements is supported (bit 3). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included		

	3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the Measurement to the PHG under test with the following value: a. PLX Spot-Check Measurement (0x2A5E) i. Field: Flags • Format: 8 bit • Value: 0000 **1**00**1** (MSB → LSB). Timestamp and Pulse Amplitude Index fields are present. Measurement Status, and Device and Sensor Status are not present. Device Clock is set. ii. Field: SpO2PR-Spot-Check - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Spot-Check – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: Time Stamp • Format: Date and Time • Value: Not Relevant v. Field: Measurement Status • This field is not included vi. Field: Device and Sensor Status • This field is not included vii. Field: Pulse Amplitude Index (%) • Format: SFLOAT • Value: Not Relevant 6. Check in PHG transcoder output the Pulsatile Quality Numeric Object – Metric-Spec-Small attribute 7. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the simulated PHD sends the temporarily stored spot-check measurement to the PHG under test b) Check in PHG transcoder output the Pulsatile Quality Numeric Object – Metric-Spec-Small attribute
Pass/Fail criteria	In Step 6, the Pulsatile Quality Numeric Object – Metric-Spec-Small attribute is present and its value is {0x5040} (mss-avail-stored-data| mss-msmt-aperiodic| mss-acc-agent-initiated). If the PHG supports RACP, the same criteria applies to Step 7.b.
Notes **(To assist manual testing)**	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Metric-Spec-Small attribute is present: ❑ Object: Pulsatile Quality Numeric Object ❑ Attribute-id: MDC_ATTR_METRIC_SPEC_SMALL (2630) ❑ Attribute-type: BITS-16 ❑ Attribute-value: 50 40 (hex) or BITS mss-avail-stored-data (1), mss- msmt -

	aperiodic(3), mss-acc-agent-initiated(9) set to TRUE and remaining BITS set to FALSE b) WAN PCD-01 message PCD-01 message does not include segments with Metric-Spec-Small attribute value

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-047		
TP label		Whitepaper. Pulsatile Quality Numeric Object (Spot-Check Measurement) - Metric-Spec-Small Attribute 2		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	PQ Numeric 3; M	PQ Numeric 4; M	
Test purpose		Check that: PHG includes Pulsatile Quality Numeric Object – Metric-Spec-Small attribute in transcoder output when using spot-check measurement mode. [AND] Metric-Spec-Small is set to {0x1040} when the sensor device does not support measurement storage.		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS				
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a spot-check measurement ready to be sent and it is in the Advertising state (it is discoverable). 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Spot-Check Measurement (0x2A5E) b. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 0**1**00 **11**00 (MSB → LSB). Pulse Amplitude Index field is supported (bit 6). Measurement Storage for spot-check measurements is supported (bit 2). Timestamp for Spot-Check measurements is supported (bit 3). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the Measurement to the PHG under test with the following value: a. PLX Spot-Check Measurement (0x2A5E) i. Field: Flags • Format: 8 bit		

	• Value: 0000 **1**00**1** (MSB → LSB). Timestamp and Pulse Amplitude Index fields are present. Measurement Status and Device and Sensor Status fields are not present. Device Clock is set. ii. Field: SpO2PR-Spot-Check - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Spot-Check – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: Time Stamp • Format: Date and Time • Value: Not Relevant v. Field: Measurement Status • This field is not included vi. Field: Device and Sensor Status • This field is not included vii. Field: Pulse Amplitude Index (%) • Format: SFLOAT • Value: Not Relevant 6. Check in PHG transcoder output the Pulsatile Quality Numeric Object – Metric-Spec-Small attribute
Pass/Fail criteria	In Step 6, the SpO2 Numeric Object – Metric-Spec-Small attribute is present and its value is {0x1040} (mss-msmt-aperiodic | mss-acc-agent-initiated).
Notes **(To assist manual testing)**	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Metric-Spec-Small attribute is present: ❑ Object: Pulsatile Quality Numeric Object ❑ Attribute-id: MDC_ATTR_METRIC_SPEC_SMALL (2630) ❑ Attribute-type: BITS-16 ❑ Attribute-value: 10 40 (hex) or BITS mss-msmt-aperiodic(3), mss-acc-agent-initiated(9) set to TRUE and remaining BITS set to FALSE b) WAN PCD-01 message PCD-01 message does not include segments with Metric-Spec-Small attribute value

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-048		
TP label		Whitepaper. Pulsatile Quality Numeric Object (Continuous Measurements) - Metric-Spec-Small Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	PQ Numeric 11; M		
Test purpose		Check that: PHG includes Pulsatile Quality Numeric Object – Metric-Spec-Small attribute in transcoder output when using continuous measurements.		

	[AND] Metric-Spec-Small is set to {0x0040} (mss-acc-agent-initiated)
Applicability	C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040
Other PICS	
Initial condition	The PHG under test and the simulated PHD are in the Standby state.
Test procedure	1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a continuous measurement (including fast and slow response measurement values) ready to be sent and it is in the Advertising state (it is discoverable). 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 0**111** 0000 (MSB → LSB). Fast and slow response modes are supported (bits 4 and 5). Pulse Amplitude Index field is supported (bit 6) ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included b. PLX Continuous Measurement (0x2A5F) i. Field: Flags • Format: 8 bit • Value: 000**1** 00**11** (MSB → LSB). SpO2PR–Fast, SpO2PR-Slow and Pulse Amplitude Index fields are present. Measurement Status and Device and Sensor Status fields are not present. ii. Field: SpO2PR-Normal - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Normal – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: SpO2PR-Fast - SpO2 (%) • Format: SFLOAT • Value: Not Relevant v. Field: SpO2PR-Fast - PR (bpm) • Format: SFLOAT • Value: Not Relevant vi. Field: SpO2PR-Slow - SpO2 (%) • Format: SFLOAT • Value: Not Relevant vii. Field: SpO2PR-Slow - PR (bpm) • Format: SFLOAT • Value: Not Relevant viii. Field: Measurement Status

	• This field is not included ix. Field: Device and Sensor Status • This field is not included x. Field: Pulse Amplitude Index (%) • Format: SFLOAT • Value: Not Relevant 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the Measurement to the PHG under test. 6. Check in PHG transcoder output the Pulsatile Quality Numeric Object – Metric-Spec-Small attribute
Pass/Fail criteria	In Step 6, the Pulsatile Quality Numeric Object – Metric-Spec-Small attribute is present and its value is {0x0040} (mss-acc-agent-initiated).
Notes (To assist manual testing)	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Metric-Spec-Small attribute is present: ❑ Object: Pulsatile Quality Numeric Object ❑ Attribute-id: MDC_ATTR_METRIC_SPEC_SMALL (2630) ❑ Attribute-type: BITS-16 ❑ Attribute-value: 00 40 (hex) or BITS mss-acc-agent-initiated(9) set to TRUE and remaining BITS set to FALSE b) WAN PCD-01 message PCD-01 message does not include segments with Metric-Spec-Small attribute value

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-049		
TP label		Whitepaper. Pulsatile Quality Numeric Object (Spot-Check Measurement) – Unit-Code Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	PQ Numeric 6; M		
Test purpose		Check that: PHG includes Pulsatile Quality Numeric Object – Unit-Code attribute in transcoder output when using spot-check measurement mode. [AND] Unit-Code is set to MDC_DIM_PERCENT		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS		C_MAN_BLE_042		
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a spot-check measurement ready to be sent and it is in the Advertising state (it is discoverable). The simulated PHD also supports the RACP characteristic and has an identical spot-check measurement temporarily stored.		

	2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 0**1**00 **11**00 (MSB → LSB). Pulse Amplitude Index field is supported (bit 6). Measurement Storage for spot-check measurements is supported (bit 2). Timestamp for Spot-Check measurements is supported (bit 3). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included b. PLX Spot-Check Measurement (0x2A5E) i. Field: Flags • Format: 8 bit • Value: 0000 **1**00**1** (MSB → LSB). Timestampo and Pulse Amplitude Index fields are present. Measurement Status and Device and Sensor Status fields are not present. Device Clock is set. ii. Field: SpO2PR-Spot-Check - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Spot-Check – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: Time Stamp • Format: Date and Time • Value: Not Relevant v. Field: Measurement Status • This field is not included vi. Field: Device and Sensor Status • This field is not included vii. Field: Pulse Amplitude Index (%) • Format: SFLOAT • Value: Not Relevant 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the Measurement to the PHG under test. 6. Check in the PHG transcoder output the Pulsatile Quality Numeric Object – Unit-Code attribute 7. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test

	b) Check in PHG transcoder output the Pulsatile Quality Numeric Object – Unit-Code attribute
Pass/Fail criteria	In Step 6, the Pulsatile Quality Numeric Object – Unit-Code attribute is present and its set to MDC_DIM_PERCENT. If the PHG supports RACP, the same criteria applies to Step 7.b.
Notes (To assist manual testing)	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Unit-Code attribute is present: ❑ Object: Pulsatile Quality Numeric Object ❑ Attribute-id: MDC_ATTR_UNIT_CODE (2454) ❑ Attribute-type: INT-U16 ❑ Attribute-value: MDC_DIM_PERCENT or 544 (dec) or 02 20 (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Unit-Code attribute value (check OBX-6): OBX|n|NM|150320^MDC_SAT_O2_QUAL^MDC|m.0.0.x|[value]|**262688^MDC_DIM_PERCENT^MDC**||||R|||[current_date_time]

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-050		
TP label		Whitepaper. Pulsatile Quality Numeric Object (Continuous Measurements) – Unit-Code Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	PQ Numeric 12; M		
Test purpose		Check that: PHG includes Pulsatile Quality Numeric Object – Unit-Code attribute in transcoder output when using continuous measurements. [AND] Unit-Code is set to MDC_DIM_PERCENT		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS				
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a continuous measurement (including fast and slow response measurement values) ready to be sent and it is in the Advertising state (it is discoverable). 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 0**111** 0000 (MSB → LSB). Fast and slow response modes are supported (bits 4 and 5). Pulse Amplitude Index field is supported (bit 6). ii. Field: Measurement Status Support		

	• This field is not included iii. Field: Device and Sensor Status Support • This field is not included b. PLX Continuous Measurement (0x2A5F) i. Field: Flags • Format: 8 bit • Value: 000**1** 00**11**(MSB → LSB). SpO2PR–Fast, SpO2PR-Slow and Pulse Amplitude Index fields are present. Measurement Status, and Device and Sensor Status fields are not present. ii. Field: SpO2PR-Normal - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Normal – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: SpO2PR-Fast - SpO2 (%) • Format: SFLOAT • Value: Not Relevant v. Field: SpO2PR-Fast - PR (bpm) • Format: SFLOAT • Value: Not Relevant vi. Field: SpO2PR-Slow - SpO2 (%) • Format: SFLOAT • Value: Not Relevant vii. Field: SpO2PR-Slow - PR (bpm) • Format: SFLOAT • Value: Not Relevant viii. Field: Measurement Status • This field is not included ix. Field: Device and Sensor Status • This field is not included x. Field: Pulse Amplitude Index (%) • Format: SFLOAT • Value: Not Relevant 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the Measurement to the PHG under test. 6. Check in PHG transcoder output the Pulsatile Quality Numeric Object – Unit-Code attribute.
Pass/Fail criteria	In Step 6, the Pulsatile Quality Numeric Object – Unit-Code attribute is present and it is set to MDC_DIM_PERCENT.
Notes **(To assist manual**	Possible values in typical points of observation after transcoder output are:

testing)	a) IEEE 11073 Objects and Attributes Unit-Code attribute is present: ❑ Object: Pulsatile Quality Numeric Object ❑ Attribute-id: MDC_ATTR_UNIT_CODE (2454) ❑ Attribute-type: INT-U16 ❑ Attribute-value: MDC_DIM_PERCENT or 544 (dec) or 02 20 (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this for each SpO2 object with Unit-Code attribute value (check OBX-6): OBX|n|NM|150320^MDC_SAT_O2_QUAL^MDC|m.0.0.x|[value]| **262688^MDC_DIM_PERCENT^MDC**||||R|||[current_date_time]

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-051		
TP label		Whitepaper. Pulsatile Quality Numeric Object (Spot-Check Measurement) – Absolute-Time-Stamp Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	PQ Numeric 7; M	Date-Time Conv 2; M	Date-Time Conv 3; M
		Date-Time Conv 4; M	Date-Time Conv 5; M	
Test purpose		Check that: PHG transcodes Time Stamp field of Spot-Check Measurement characteristic into Pulsatile Quality Numeric Object - Absolute-Time-Stamp attribute [AND] PHG transcodes the Bluetooth Time Stamp field format to Absolute Time format [AND] The fraction of seconds in Absolute Time at transcoder output is 0		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS		C_MAN_BLE_042		
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a Spot-Check measurement ready to be sent and it is in the Advertising state (it is discoverable). The simulated PHD also supports the RACP characteristic and has an identical spot-check measurement temporarily stored. 2. The simulated PHD implements several BTLE characteristics. The characteristic of interest for this Test Case is: a. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 0**1**00 **11**00 (MSB → LSB). Pulse Amplitude Index field is supported (bit 6). Measurement Storage for spot-check measurements is supported (bit 2). Timestamp for Spot-Check measurements is supported (bit 3). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support		

	• This field is not included b. PLX Spot-Check Measurement (0x2A5E) i. Field: Flags • Format: 8 bit • Value: 0000 **1**00**1** (MSB → LSB). Pulse Amplitude Index and Timestamp fields are present. Measurement Status and Device and Sensor Status fields are not present. Device Clock is set. ii. Field: SpO2PR-Spot-Check - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Spot-Check – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: Time Stamp • Format: Date and Time • Value: October 12nd, 2015, 10:39:27 v. Field: Measurement Status • This field is not included vi. Field: Device and Sensor Status • This field is not included vii. Field: Pulse Amplitude Index (%) • Format: SFLOAT • Value: Not Relevant 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the Measurement to the PHG under test. 6. Check in PHG transcoder output the Pulsatile Quality Numeric Object – Absolute-Time-Stamp attribute 7. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check in PHG transcoder output the Pulsatile Quality Numeric Object – Absolute-Time-Stamp attribute
Pass/Fail criteria	In Step 6, the Pulsatile Quality Numeric Object – Absolute-Time-Stamp attribute is present, its value matches with Time Stamp field of Spot-Check Measurement characteristic and fraction of seconds is set to 0. If the PHG supports RACP, the same criteria applies to Step 7.b.
Notes **(To assist manual testing)**	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Absolute-Time-Stamp attribute is present: ❑ Object: Pulsatile Quality Numeric Object ❑ Attribute-id: MDC_ATTR_TIME_STAMP_ABS (2448)

	❑ Attribute-type: SEQUENCE {century (INT-U8), year (INT-U8), month (INT-U8), day (INT-U8), hour (INT-U8), minute (INT-U8), second (INT-U8), sec-fractions (INT-U8)} (BCD encoding) ❑ Attribute-value: • century: 20 (hex) or 32 (dec) • year: 15 (hex) or 21 (dec) • month: 10 (hex) or 16 (dec) • day: 12 (hex) or 18 (dec) • hour: 10 (hex) or 16 (dec) • minute: 39 (hex) or 57 (dec) • second: 27 (hex) or 39 (dec) • sec-fractions: 00 (hex) or 0 (dec) b) WAN PCD-01 message PCD-01 message includes a segment like this with Absolute-Time-Stamp attribute value (check OBX-14): OBX|n|NM|150320^MDC_SAT_O2_QUAL^MDC|m.0.0.x|[value]| 262688^MDC_DIM_PERCENT^MDC||||R|||**20151012103927+0000**

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-052		
TP label		Pulsatile Quality Numeric Object (Spot-Check Measurement) – Basic-Nu-Observed-Value Attribute 1		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	PQ Numeric 8; M	Short Float Type 1; C	
Test purpose		Check that: PHG transcodes Pulse Amplitude Index value of the PLX Spot-Check Measurement chactacteristic into Pulsatile Quality Numeric Object - Basic-Nu-Observed-Value attribute		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS		C_MAN_BLE_042		
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a Spot-Check measurement ready to be sent and it is in the Advertising state (it is discoverable). The simulated PHD also supports the RACP characteristic and has an identical spot-check measurement temporarily stored. 2. The simulated PHD implements several BTLE characteristics. The characteristic of interest for this Test Case is: a. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 0**1**00 **11**00 (MSB → LSB). Pulse Amplitude Index field is supported (bit 6). Measurement Storage for spot-check measurements is supported (bit 2). Timestamp for Spot-Check measurements is supported (bit 3). ii. Field: Measurement Status Support • This field is not included		

	iii. Field: Device and Sensor Status Support • This field is not included b. PLX Spot-Check Measurement (0x2A5E) i. Field: Flags • Format: 8 bit • Value: 0000 **1**00**1** (MSB → LSB). Timestamp and Pulse Amplitude Index fields are present. Measurement Status and Device and Sensor Status fields are not present. Device Clock is set. ii. Field: SpO2PR-Spot-Check - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Spot-Check – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: Time Stamp • Format: Date and Time • Value: Not Relevant v. Field: Measurement Status • This field is not included vi. Field: Device and Sensor Status • This field is not included vii. Field: Pulse Amplitude Index (%) • Format: SFLOAT • Value: 70 (%) 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the Measurement to PHG under test. 6. Check in PHG transcoder output the Pulsatile Quality Numeric Object – Basic-Nu-Observed-Value attribute 7. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the simulated PHD sends the temporarily stored spot-check measurement to the PHG under test b) Check in PHG transcoder output the Pulsatile Quality Numeric Object – Basic-Nu-Observed-Value attribute
Pass/Fail criteria	In Step 6, the Pulsatile Quality Numeric Object – Basic-Nu-Observed-Value attribute is present and its value matches with the value of the Pulse Amplitude Index of the PLX Spot-Check Measurement chactacteristic (70%). If the PHG supports RACP, the same criteria applies to Step 7.b.
Notes **(To assist manual testing)**	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Basic-Nu-Observed-Value attribute is present: ❑ Object: Pulsatile Quality Numeric Object

	❑ Attribute-id: MDC_ATTR_NU_VAL_OBS_BASIC (2636) ❑ Attribute-type: SFLOAT ❑ Attribute-value: 00 46 (hex) or 1007 (hex) or F2BC (hex) or 70 (dec) b) WAN PCD-01 message PCD-01 message includes a segment like this with Basic-Nu-Observed-Value attribute value (check OBX-5): OBX|n|NM|150320^MDC_SAT_O2_QUAL^MDC|m.0.0.x|**70**| 262688^MDC_DIM_PERCENT^MDC||||R|||[current_date_time]

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-053		
TP label		Whitepaper. Pulsatile Quality Numeric Object (Spot-Check Measurement) – Basic-Nu-Observed-Value Attribute 2		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	PQ Numeric 8; M	PQ Numeric 14; M	Short Float Type 2; M
Test purpose		Check that: PHG transcodes Pulse Amplitude Index value of the PLX Spot-Check Measurement chactacteristic into Pulsatile Quality Numeric Object - Basic-Nu-Observed-Value attribute [AND] PHG assigns special value NaN (0x07FF) when SpO2 value is unavailable.		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS		C_MAN_BLE_042		
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a Spot-Check measurement ready to be sent and it is in the Advertising state (it is discoverable). The simulated PHD also supports the RACP characteristic and has an identical spot-check measurement temporarily stored. 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 0**1**00 **11**00 (MSB → LSB). Pulse Amplitude Index field is supported (bit 6). Measurement Storage for spot-check measurements is supported (bit 2). Timestamp for Spot-Check measurements is supported (bit 3). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included b. PLX Spot-Check Measurement (0x2A5E) i. Field: Flags • Format: 8 bit • Value: 0000 **1**001 (MSB → LSB). Timestamp and Pulse Amplitude Index fields are present. Measurement Status and Device and Sensor Status fields		

	are not present. Device Clock is set. ii. Field: SpO2PR-Spot-Check - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Spot-Check – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: Time Stamp • Format: Date and Time • Value: Not Relevant v. Field: Measurement Status • This field is not included vi. Field: Device and Sensor Status • This field is not included vii. Field: Pulse Amplitude Index (%) • Format: SFLOAT • Value: 07 FF (hex). Special value: NaN 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the Measurement to the PHG under test. 6. Check in PHG transcoder output the Pulsatile Quality Numeric Object – Basic-Nu-Observed-Value attribute 7. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check in PHG transcoder output the Pulsatile Quality Numeric Object – Basic-Nu-Observed-Value attribute
Pass/Fail criteria	In Step 6, the Pulsatile Quality Numeric Object – Basic-Nu-Observed-Value attribute is present and its value is 0x07FF (NaN). If the PHG supports RACP, the same criteria applies to Step 7.b.
Notes **(To assist manual testing)**	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Basic-Nu-Observed-Value attribute is present: ❑ Object: Pulsatile Quality Numeric Object ❑ Attribute-id: MDC_ATTR_NU_VAL_OBS_BASIC (2636) ❑ Attribute-type: SFLOAT ❑ Attribute-value: 07 FF (hex) or NaN (note that a decimal value is not allowed) b) WAN PCD-01 message PCD-01 message does not include special values

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-054		
TP label		Whitepaper. Pulsatile Quality Numeric Object (Continuous Measurements) – Basic-Nu-Observed-Value Attribute 1		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	PQ Numeric 13; M	Short Float Type 1; C	
Test purpose		Check that: PHG transcodes Pulse Amplitude Index value of the PLX Continuous Measurement chactacteristic into Pulsatile Quality Numeric Object - Basic-Nu-Observed-Value attribute		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS				
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a continuous measurement (including fast and slow response measurement values) ready to be sent and it is in the Advertising state (it is discoverable). 2. The simulated PHD implements several BTLE characteristics. The characteristic of interest for this Test Case is: a. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 0**111** 0000 (MSB → LSB). Fast and slow response modes and Pulse Amplitude Index fields are supported (bits 4, 5 and 6). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included b. PLX Continuous Measurement (0x2A5F) i. Field: Flags • Format: 8 bit • Value: 000**1** 00**11** (MSB → LSB). SpO2PR–Fast, SpO2PR-Slow and Pulse Amplitude Index fields are present. Measurement Status and Device and Sensor Status fields are not present. ii. Field: SpO2PR-Normal - SpO2 (%) • Format: SFLOAT • Value: 96 (%) iii. Field: SpO2PR-Normal - PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: SpO2PR-Fast - SpO2 (%) • Format: SFLOAT • Value: 98 (%) v. Field: SpO2PR-Fast - PR (bpm) • Format: SFLOAT • Value: Not Relevant		

	vi. Field: SpO2PR-Slow - SpO2 (%) • Format: SFLOAT • Value: 94 (%) vii. Field: SpO2PR-Slow - PR (bpm) • Format: SFLOAT • Value: Not Relevant viii. Field: Measurement Status • This field is not included ix. Field: Device and Sensor Status • This field is not included x. Field: Pulse Amplitude Index (%) • Format: SFLOAT • Value: 70 (%) 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the Measurement to the PHG under test. 6. Check in PHG transcoder output the Pulsatile Quality Numeric Object – Basic-Nu-Observed-Value attribute.
Pass/Fail criteria	In Step 6, the Pulsatile Quality Numeric object – Basic-Nu-Observed-Value attribute is present and its value matches with the value of the Pulse Amplitude Index field of the PLX Continuous Measurement chactacteristic (70%).
Notes **(To assist manual testing)**	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Basic-Nu-Observed-Value attribute is present: ❑ Object: Pulsatile Quality Numeric Object ❑ Attribute-id: MDC_ATTR_NU_VAL_OBS_BASIC (2636) ❑ Attribute-type: SFLOAT ❑ Attribute-value: 00 46 (hex) or 1007 (hex) or F2BC (hex) or 70 (dec) b) WAN PCD-01 message PCD-01 message includes a segment like this with Basic-Nu-Observed-Value attribute value (check OBX-5): OBX|n|NM|150320^MDC_SAT_O2_QUAL^MDC|m.0.0.x|**70**| 262688^MDC_DIM_PERCENT^MDC||||R|||[current_date_time]

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-055		
TP label		Whitepaper. Pulsatile Quality Numeric Object (Continuous Measurements) – Basic-Nu-Observed-Value Attribute 2		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	PQ Numeric 13; M	PQ Numeric 14; M	Short Float Type 2; M
Test purpose		Check that: PHG transcodes Pulse Amplitude Index value of the PLX Continuous Measurement		

	chactacteristic into Pulsatile Quality Numeric Object - Basic-Nu-Observed-Value attribute [AND] PHG assings special value NaN (0x07FF) when Pulsatile Quality value is unavailable.
Applicability	C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040
Other PICS	
Initial condition	The PHG under test and the simulated PHD are in the Standby state.
Test procedure	1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a continuous measurement (including fast and slow response measurement values) ready to be sent and it is in the Advertising state (it is discoverable). 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 0**111** 0000 (MSB → LSB). Fast and slow response modes are supported (bits 4 and 5). Pulse Amplitude Index field is supported (bit 6). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included b. PLX Continuous Measurement (0x2A5F) i. Field: Flags • Format: 8 bit • Value: 000**1** 00**11** (MSB → LSB). SpO2PR–Fast, SpO2PR-Slow and Pulse Amplitude Index fields are present. Measurement Status and Device and Sensor Status fields are not present. ii. Field: SpO2PR-Normal - SpO2 (%) • Format: SFLOAT • Value: 07 FF (hex). Special value: NaN iii. Field: SpO2PR-Normal - PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: SpO2PR-Fast - SpO2 (%) • Format: SFLOAT • Value: 07 FF (hex). Special value: NaN v. Field: SpO2PR-Fast - PR (bpm) • Format: SFLOAT • Value: Not Relevant vi. Field: SpO2PR-Slow - SpO2 (%) • Format: SFLOAT • Value: 07 FF (hex). Special value: NaN vii. Field: SpO2PR-Slow - PR (bpm) • Format: SFLOAT • Value: Not Relevant

	viii. Field: Measurement Status • This field is not included ix. Field: Device and Sensor Status • This field is not included x. Field: Pulse Amplitude Index (%) • Format: SFLOAT • Value: 07 FF (hex). Special value: NaN 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the Measurement to the PHG under test. 6. Check in PHG transcoder output the Pulsatile Quality Numeric Object – Basic-Nu-Observed-Value attribute.
Pass/Fail criteria	In Step 6, the Pulsatile Quality Numeric Object – Basic-Nu-Observed-Value attribute is present and its value is is 0x07FF (NaN).
Notes (To assist manual testing)	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Basic-Nu-Observed-Value attribute is present: ❑ Object: Pulsatile Quality Numeric Object ❑ Attribute-id: MDC_ATTR_NU_VAL_OBS_BASIC (2636) ❑ Attribute-type: SFLOAT ❑ Attribute-value: 07 FF (hex) or NaN (note that a decimal value is not allowed) b) WAN PCD-01 message PCD-01 message does not include special values

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-056		
TP label		Whitepaper. Pulsatile Quality measurement value (Spot-Check Measurement)		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	Short Float Type 1; C	Date-Time Conv 1; M	PQ Numeric 7; M
		PQ Numeric 8; M		
Test purpose		Check that: PHG processes correctly the Pulse Amplitude Index value (%) and and the value of the Time Stamp field of the PLX Spot-Check characteristic		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040		
Other PICS		C_MAN_BLE_042		
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a Spot-Check measurement ready to be sent and it is in the Advertising state (it is discoverable). The simulated PHD also supports the RACP characteristic and has an identical spot-check measurement temporarily stored. 2. The simulated PHD implements several BTLE characteristics. The characteristic of interest		

	for this Test Case is: a. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 0**1**00 **11**00 (MSB → LSB). Pulse Amplitude Index field is supported (bit 6). Measurement Storage for spot-check measurements is supported (bit 2). Timestamp for Spot-Check measurements is supported (bit 3). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • This field is not included b. PLX Spot-Check Measurement (0x2A5E) i. Field: Flags • Format: 8 bit • Value: 0000 **1**00**1** (MSB → LSB). Pulse Amplitude Index and Timestamp fields are present. Measurement Status and Device and Sensor Status fields are not present. Device Clock is set. ii. Field: SpO2PR-Spot-Check - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Spot-Check – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: Time Stamp • Format: Date and Time • Value: October 12nd, 2015, 10:39:27 v. Field: Measurement Status • This field is not included vi. Field: Device and Sensor Status • This field is not included vii. Field: Pulse Amplitude Index (%) • Format: SFLOAT • Value: 70 (%) 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read PLX Features characteristic. 5. The simulated PHD sends the Measurement to the PHG under test. 6. Check that the PHG accepts the measurement and decodes its value properly (Pulse Amplitude Index value, units and time stamp). 7. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check that PHG accepts the measurement and decodes its value properly (Pulse Amplitude Index value, units and time stamp)

Pass/Fail criteria	In Step 6, the PHG under test shows the following measurement Pulsatile Quality = 70(%) with timestamp '2015-10-12 10:39:27'. If the PHG supports RACP, the same criteria applies to Step 7.b
Notes	

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-057		
TP label		Whitepaper. Device and Sensor Status Enumeration Object (Spot-Check Measurement) - Handle Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	DSS Enumeration 1; O		
Test purpose		Check that: PHG does not include Device and Sensor Status Enumeration Object – Handle Attribute in transcoder output when using spot-check measurement mode. [OR] If PHG includes Device and Sensor Status Enumeration Object – Handle attribute in transcoder output, then its value shall be different than 0		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040 AND C_MAN_BLE_041		
Other PICS		C_MAN_BLE_042		
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a spot-check measurement ready to be sent and it is in the Advertising state (it is discoverable). The simulated PHD also supports the RACP characteristic and has an identical spot-check measurement temporarily stored. 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 0000 **111**0 (MSB → LSB). Device and Sensor Status field is supported (bit 1). Measurement Storage for spot-check measurements is supported (bit 2). Timestamp for Spot-Check measurements is supported (bit 3). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • Format: 24 bit • Value: Not Relevant b. PLX Spot-Check Measurement (0x2A5E) i. Field: Flags • Format: 8 bit • Value: 0000 0**1**0**1** (MSB → LSB). Timestamp and Device and Sensor Status fields are present. Pulse Amplitude Index and Measurement Status fields are not present. Device Clock is set. ii. Field: SpO2PR-Spot-Check - SpO2 (%)		

	• Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Spot-Check – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: Time Stamp • Format: Date and Time • Value: Not Relevant v. Field: Measurement Status • This field is not included vi. Field: Device and Sensor Status • Format: 24 bit • Value: Not Relevant vii. Field: Pulse Amplitude Index (%) • This field is not included. 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the measurement to the PHG under test. 6. Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Handle attribute 7. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check in PHG transcoder output the Device and Sensor Status Enumeration Object – Handle attribute
Pass/Fail criteria	In Step 6, the Device and Sensor Status Enumeration Object – Handle attribute is not present or, if it is present then its value is different than 0 If the PHG supports RACP, the same criteria applies to Step 7.b.
Notes (To assist manual testing)	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Handle attribute is not present, or if it is present then: ❑ Object: Device and Sensor Status Enumeration Object ❑ Attribute-id: MDC_ATTR_ID_HANDLE (2337) ❑ Attribute-type: INT-U16 ❑ Attribute-value: Any value different than 0 b) WAN PCD-01 message PCD-01 message does not include segments with Handle attribute value

TP Id	TP/LP-PAN/PHG/PHDTW/PLX/BV-058
TP label	Whitepaper. Device and Sensor Status Enumeration Object (Continuous Measurements) - Handle Attribute

Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	DSS Enumeration 5; O		
Test purpose		Check that: PHG does not include Device and Sensor Status Enumeration Object – Handle Attribute in transcoder output when using continuous measurements [OR] If PHG includes Device and Sensor Status Enumeration Object – Handle attribute in transcoder output, then its value shall be different than 0		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040 AND C_MAN_BLE_041		
Other PICS				
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a continuous measurement (including fast and slow response measurement values) ready to be sent and it is in the Advertising state (it is discoverable). 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 0000 00**1**0 (MSB → LSB). Device and Sensor Status field is supported (bit 1). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • Format: 24 bit • Value: Not Relevant b. PLX Continuous Measurement (0x2A5F) i. Field: Flags • Format: 8 bit • Value: 000**0** **1**0**11** (MSB → LSB). SpO2PR–Fast, SpO2PR-Slow and Device and Sensor Status fields are present. Measurement Status and Pulse Amplitude Index fields are not present. ii. Field: SpO2PR-Normal - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Normal – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: SpO2PR-Fast - SpO2 (%) • Format: SFLOAT • Value: Not Relevant v. Field: SpO2PR-Fast - PR (bpm) • Format: SFLOAT		

	• Value: Not Relevant vi. Field: SpO2PR-Slow - SpO2 (%) • Format: SFLOAT • Value: Not Relevant vii. Field: SpO2PR-Slow - PR (bpm) • Format: SFLOAT • Value: Not Relevant viii. Field: Measurement Status • This field is not included ix. Field: Device and Sensor Status • Format: 24 bit • Value: Not Relevant. x. Field: Pulse Amplitude Index (%) • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the Measurement to the PHG under test. 6. Check in PHG transcoder output the Device and Sensor Status Enumeration Object – Handle attribute.
Pass/Fail criteria	In Step 6, the Device and Sensor Status Enumeration Object – Handle attribute is not present or, if it is present then its value is different than 0
Notes (To assist manual testing)	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Handle attribute is not present, or if it is present then: ❑ Object: Device and Sensor Status Enumeration Object ❑ Attribute-id: MDC_ATTR_ID_HANDLE (2337) ❑ Attribute-type: INT-U16 ❑ Attribute-value: Any value different than 0 b) WAN PCD-01 message PCD-01 message does not include segments with Handle attribute value

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-059		
TP label		Whitepaper. Device and Sensor Status Enumeration Object (Spot-Check Measurement) - Type Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	DSS Enumeration 2; M		
Test purpose		Check that: PHG includes Device and Sensor Status Enumeration Object – Type attribute in transcoder output when using spot-check measurement mode. [AND]		

	Type is set to {MDC_PART_SCADA, MDC_PULS_OXIM_DEV_STATUS}
Applicability	C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040 AND C_MAN_BLE_041
Other PICS	C_MAN_BLE_042
Initial condition	The PHG under test and the simulated PHD are in the Standby state.
Test procedure	1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a spot-check measurement ready to be sent and it is in the Advertising state (it is discoverable). The simulated PHD also supports the RACP characteristic and has an identical spot-check measurement temporarily stored. 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 0000 **111**0 (MSB → LSB). Device and Sensor Status field is supported (bit 1). Measurement Storage for spot-check measurements is supported (bit 2). Timestamp for Spot-Check measurements is supported (bit 3). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • Format: 24 bit • Value: Not Relevant b. PLX Spot-Check Measurement (0x2A5E) i. Field: Flags • Format: 8 bit • Value: 0000 0**10****1** (MSB → LSB). Timestamp and Device and Sensor Status fields are present. Pulse Amplitude Index and Measurement Status fields are not present. Device Clock is set. ii. Field: SpO2PR-Spot-Check - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Spot-Check – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: Time Stamp • Format: Date and Time • Value: Not Relevant v. Field: Measurement Status • This field is not included vi. Field: Device and Sensor Status • Format: 24 bit • Value: Not Relevant vii. Field: Pulse Amplitude Index (%) • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the

	simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristics. 5. The simulated PHD sends the Measurement to the PHG under test. 6. Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Type attribute 7. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the simulated PHD sends the temporarily stored spot-check measurement to the PHG under test b) Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Type attribute
Pass/Fail criteria	In Step 6, the the Device and Sensor Status Enumeration Object – Type attribute is present and its value is {MDC_PART_SCADA, MDC_PULS_OXIM_DEV_STATUS} If the PHG supports RACP, the same criteria applies to Step 7.b.
Notes **(To assist manual testing)**	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Type attribute is present: ❑ Object: Device and Sensor Status Enumeration Object ❑ Attribute-id: MDC_ATTR_ID_TYPE (2351) ❑ Attribute-type: SEQUENCE {partition (INT-U16), code (INT-U16)} ❑ Attribute-value: • partition: MDC_PART_SCADA or 2 (dec) or 00 02 (hex) • code: MDC_PULS_OXIM_DEV_STATUS or 19532 (dec) or 4C 4C (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Type attribute (check OBX-3): OBX|n|CWE|**150604^MDC_PULS_OXIM_DEV_STATUS^MDC**|m.0.0.x|[value]|||||R

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-060		
TP label		Whitepaper. Device and Sensor Status Enumeration Object (Continuous Measurements) - Type Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	DSS Enumeration 6; M		
Test purpose		Check that: PHG includes Device and Sensor Status Enumeration Object – Type attribute in transcoder output when using continuous measurements. [AND] Type is set to {MDC_PART_SCADA, MDC_PULS_OXIM_DEV_STATUS}		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040 AND C_MAN_BLE_041		
Other PICS				
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		

Test procedure	1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a continuous measurement (including fast and slow response measurement values) ready to be sent and it is in the Advertising state (it is discoverable). 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 00**11** 00**1**0 (MSB → LSB). Device and Sensor Status is supported (bit 1). Fast and slow response modes are supported (bits 4 and 5). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • Format: 24 bit • Value: Not Relevant b. PLX Continuous Measurement (0x2A5F) i. Field: Flags • Format: 8 bit • Value: 000**0 1**0**11** (MSB → LSB). SpO2PR–Fast, SpO2PR-Slow and Device and Sensor Status fields are present. Measurement Status and Pulse Amplitude Index fields are not present. ii. Field: SpO2PR-Normal - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Normal – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: SpO2PR-Fast - SpO2 (%) • Format: SFLOAT • Value: Not Relevant v. Field: SpO2PR-Fast - PR (bpm) • Format: SFLOAT • Value: Not Relevant vi. Field: SpO2PR-Slow - SpO2 (%) • Format: SFLOAT • Value: Not Relevant vii. Field: SpO2PR-Slow - PR (bpm) • Format: SFLOAT • Value: Not Relevant viii. Field: Measurement Status • This field is not included ix. Field: Device and Sensor Status • Or Format: 24 bit • Value: Not Relevant.

	x. Field: Pulse Amplitude Index (%) • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the Measurement to the PHG under test. 6. Check in PHG transcoder output the Device and Sensor Status Enumeration Object – Type attribute.
Pass/Fail criteria	In Step 6, the Pulsatile Quality Numeric Object – Type attribute is present and its value is {MDC_PART_SCADA, MDC_PULS_OXIM_DEV_STATUS}
Notes (To assist manual testing)	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Type attribute is present: ❑ Object: Device and Sensor Status Enumeration Object ❑ Attribute-id: MDC_ATTR_ID_TYPE (2351) ❑ Attribute-type: SEQUENCE {partition (INT-U16), code (INT-U16)} ❑ Attribute-value: • partition: MDC_PART_SCADA or 2 (dec) or 00 02 (hex) • code: MDC_PULS_OXIM_DEV_STATUS or 19532 (dec) or 4C 4C (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Type attribute (check OBX-3): OBX|n|CWE|**150604^MDC_PULS_OXIM_DEV_STATUS^MDC**|m.0.0.x|[value]|||||R

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-061		
TP label		Whitepaper. Device and Sensor Status Enumeration Object (Spot-Check Measurement) - Metric-Spec-Small Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	DSS Enumeration 3; M		
Test purpose		Check that: PHG includes Device and Sensor Status Enumeration Object – Metric-Spec-Small attribute in transcoder output when using spot-check measurement mode. [AND] Metric-Spec-Small is set to {0x0040} (mss-acc-agent-initiated)		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040 AND C_MAN_BLE_041		
Other PICS		C_MAN_BLE_042		
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a spot-check measurement ready to be sent and it is in the Advertising state (it is discoverable). The Simulated PHD also supports the RACP characteristic and has an identical spot-check measurement temporarily stored. 2. The simulated PHD implements several BTLE characteristics. The characteristics of		

	interest for this Test Case are: a. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 0000 **111**0 (MSB → LSB). Device and Sensor Status field is supported (bit 1). Measurement Storage for spot-check measurements is supported (bit 2). Timestamp for Spot-Check measurements is supported (bit 3). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • Format: 24 bit • Value: Not Relevant b. PLX Spot-Check Measurement (0x2A5E) i. Field: Flags • Format: 8 bit • Value: 0000 0**1**01 (MSB → LSB). Timestamp and Device and Sensor Status fields are present. Pulse Amplitude Index and Measurement Status fields are not present. Device Clock is set. ii. Field: SpO2PR-Spot-Check - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Spot-Check – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: Time Stamp • Format: Date and Time • Value: Not Relevant v. Field: Measurement Status • This field is not included vi. Field: Device and Sensor Status • Format: 24 bit • Value: Not Relevant vii. Field: Pulse Amplitude Index (%) • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristics. 5. The simulated PHD sends the Measurement to the PHG under test. 6. Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Metric-Spec-Small attribute 7. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test

	b) Check in PHG transcoder output the Device and Sensor Status Enumeration Object – Metric-Spec-Small attribute
Pass/Fail criteria	In Step 6, the Device and Sensor Status Enumeration Object – Metric-Spec-Small attribute is present and its value is {0x0040} (mss-acc-agent-initiated). If the PHG supports RACP, the same criteria applies to Step 7.b.
Notes (To assist manual testing)	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Metric-Spec-Small attribute is present: ❑ Object: Device and Sensor Status Enumeration Object ❑ Attribute-id: MDC_ATTR_METRIC_SPEC_SMALL (2630) ❑ Attribute-type: BITS-16 ❑ Attribute-value: 00 40 (hex) or BITS mss-acc-agent-initiated(9) set to TRUE and remaining BITS set to FALSE b) WAN PCD-01 message PCD-01 message does not include segments with Metric-Spec-Small attribute value

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-062		
TP label		Whitepaper. Device and Sensor Status Enumeration Object (Continuous Measurements) - Metric-Spec-Small Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	DSS Enumeration 7; M		
Test purpose		Check that: PHG includes Device and Sensor Status Enumeration Object – Metric-Spec-Small attribute in transcoder output when using continuous measurements. [AND] Metric-Spec-Small is set to {0x0040} (mss-acc-agent-initiated)		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040 AND C_MAN_BLE_041		
Other PICS				
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a continuous measurement (including fast and slow response measurement values) ready to be sent and it is in the Advertising state (it is discoverable). 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 00**11** 001**0** (MSB → LSB). Device and Sensor Status is supported. Fast and slow response modes are supported (bits 4 and 5). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support		

	• Format: 24 bit • Value: Not Relevant b. PLX Continuous Measurement (0x2A5F) i. Field: Flags • Format: 8 bit • Value: 000**0** 1**0**1**1** (MSB → LSB). SpO2PR–Fast, SpO2PR-Slow and Device and Sensor Status fields are present. Measurement Status and Pulse Amplitude Index fields are not present. ii. Field: SpO2PR-Normal - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Normal – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: SpO2PR-Fast - SpO2 (%) • Format: SFLOAT • Value: Not Relevant v. Field: SpO2PR-Fast - PR (bpm) • Format: SFLOAT • Value: Not Relevant vi. Field: SpO2PR-Slow - SpO2 (%) • Format: SFLOAT • Value: Not Relevant vii. Field: SpO2PR-Slow - PR (bpm) • Format: SFLOAT • Value: Not Relevant viii. Field: Measurement Status • This field is not included ix. Field: Device and Sensor Status • Or Format: 24 bit • Value: Not Relevant. x. Field: Pulse Amplitude Index (%) • This field is not included 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the Measurement to the PHG under test. 6. Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Metric-Spec-Small attribute
Pass/Fail criteria	In Step 6, the the Device and Sensor Status Enumeration Object – Metric-Spec-Small attribute is present and its value is {0x0040} (mss-acc-agent-initiated).
Notes (To assist manual testing)	Possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes

	Metric-Spec-Small attribute is present: ❑ Object: Device and Sensor Status Enumeration Object ❑ Attribute-id: MDC_ATTR_METRIC_SPEC_SMALL (2630) ❑ Attribute-type: BITS-16 ❑ Attribute-value: 00 40 (hex) or BITS mss-acc-agent-initiated(9) set to TRUE and remaining BITS set to FALSE b) WAN PCD-01 message PCD-01 message does not include segments with Metric-Spec-Small attribute value

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-063		
TP label		Whitepaper. Device and Sensor Status Enumeration Object (Spot-Check Measurement) – Enum-Observed-Value-Bit-Str Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	DSS Enumeration 4; M		
Test purpose		Check that: PHG transcodes Device and Sensor Status field of the PLX Spot-Check Measurement chactacteristic into Device and Sensor Status Enumeration Object - Enum-Observed-Value-Basic-Bit-Str attribute [AND] PHG transcodes the Bluetooth Device and Sensor Status field of the PLX Spot-Check characteristic to 11073 Enum-Observed-Value-Basic-Bit-Str attribute properly		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040 AND C_MAN_BLE_041		
Other PICS		C_MAN_BLE_042		
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a spot-check measurement ready to be sent and it is in the Advertising state (it is discoverable). The simulated PHD also supports the RACP characteristic and has an identical spot-check measurement temporarily stored. 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Spot-Check Measurement (0x2A5E) b. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit • Value: 0000 0000 0000 **111**0 (MSB → LSB). Device and Sensor Status support is present (bit 1). Measurement Storage for spot-check measurements is supported (bit 2). Tiimestamp for Spot-Check measurements is supported (bit 3). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • Format: 24 bit • Value: 0000 0000 **1111 1111 1111 1111** (MSB → LSB). All Device and Sensor Status bits are supported		

	3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the Measurement to the PHG under test with the following value: a. PLX Spot-Check Measurement (0x2A5E) i. Field: Flags • Format: 8 bit • Value: 0000 0**1**0**1** (MSB → LSB). Device and Sensor Status and Timestamp field are present. Measurement Status,and Pulse Amplitude Index fields are not present. Device Clock is set. ii. Field: SpO2PR-Spot-Check - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Spot-Check – PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: Time Stamp • This field is not included v. Field: Measurement Status • This field is not included vi. Field: Device and Sensor Status • Format: 24 bit • Value: 0000 0000 0000 0000 0000 000**1** (MSB → LSB). Extended Display Update Ongoing (bit 0). vii. Field: Pulse Amplitude Index (%) • This field is not included 6. Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute 7. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute 8. The simulated PHD sends a Measurement to the PHG under test with Measurement Status field set to 0000 0000 0000 0000 0000 00**1**0 (MSB → LSB). Equipment Malfunction (bit 1). All remaining fields remain equal to those in step 5. Simulated PHD also deletes all stored records in RACP and stores an identical measurement. 9. Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute 10. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to the PHG under test b) Check in PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute

	11. The simulated PHD sends a Measurement to the PHG under test with Measurement Status field set to 0000 0000 0000 0000 0000 0**1**00 (MSB → LSB). Signal Processing Irregularity Detected (bit 2). All remaining fields remain equal to those in step 5. Simulated PHD also deletes all stored records in RACP and stores an identical measurement. 12. Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute 13. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to the PHG under test b) Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute 14. The simulated PHD sends a Measurement to the PHG under test with Measurement Status field set to 0000 0000 0000 0000 0000 **1**000 (MSB → LSB). Inadequate Signal Detected (bit 3). All remaining fields remain equal to those in step 5. Simulated PHD also deletes all stored records in RACP and stores an identical measurement. 15. Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute 16. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute 17. The simulated PHD sends a Measurement to the PHG under test with Measurement Status field set to 0000 0000 0000 0000 000**1** 0000 (MSB → LSB). Poor Signal Detected (bit 4). All remaining fields remain equal to those in step 5. The simulated PHD also deletes all stored records in RACP and stores an identical measurement. 18. Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute 19. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute 20. The simulated PHD sends a Measurement to the PHG under test with Measurement Status field set to 0000 0000 0000 0000 00**1**0 0000 (MSB → LSB). Low Perfusion Detected (bit 5). All remaining fields remain equal to those in step 5. Simulated PHD also deletes all stored records in RACP and stores an identical measurement. 21. Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute 22. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the simulated PHD sends the temporarily stored spot-check measurement to the PHG under test b) Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute 23. The simulated PHD sends a Measurement to the PHG under test with Measurement Status field set to 0000 0000 0000 0000 0**1**00 0000 (MSB → LSB). Erratic Signal Detected (bit 6). All remaining fields remain equal to those in step 5. Simulated PHD also deletes all stored records in RACP and stores an identical measurement. 24. Check in the PHG transcoder output the Device and Sensor Status Enumeration Object –

	Enum-Observed-Value-Basic-Bit-Str attribute 25. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the simulated PHD sends the temporarily stored spot-check measurement to the PHG under test b) Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute 26. The simulated PHD sends a Measurement to the PHG under test with Measurement Status field set to 0000 0000 0000 0000 **1**000 0000 (MSB → LSB). Non-Pulsatile Signal Detected (bit 7). All remaining fields remain equal to those in step 5. The simulated PHD also deletes all stored records in RACP and stores an identical measurement. 27. Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute 28. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the simulated PHD sends the temporarily stored spot-check measurement to the PHG under test b) Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute 29. The simulated PHD sends a Measurement to the PHG under test with Measurement Status field set to 0000 0000 0000 000**1** 0000 0000 (MSB → LSB). Questionable Signal Detected (bit 8). All remaining fields remain equal to those in step 5. The simulated PHD also deletes all stored records in RACP and stores an identical measurement. 30. Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute 31. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the Simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the Simulated PHD sends the temporarily stored spot-check measurement to PHG under test b) Check in PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute 32. The simulated PHD sends a Measurement to the PHG under test with Measurement Status field set to 0000 0000 0000 00**1**0 0000 0000 (MSB → LSB). Signal Analysis Ongoing (bit 9). All remaining fields remain equal to those in step 5. The simulated PHD also deletes all stored records in RACP and stores an identical measurement. 33. Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute 34. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the simulated PHD sends the temporarily stored spot-check measurement to the PHG under test b) Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute 35. The simulated PHD sends a Measurement to the PHG under test with Measurement Status field set to 0000 0000 0000 0**1**00 0000 0000 (MSB → LSB). Sensor Interference Detected (bit 10). All remaining fields remain equal to those in step 5. The simulated PHD also deletes all stored records in RACP and stores an identical measurement. 36. Check in PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute 37. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the simulated PHD sends the temporarily stored spot-check measurement to the PHG

	under test b) Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute 38. The simulated PHD sends a Measurement to PHG under test with Measurement Status field set to 0000 0000 0000 **1**000 0000 0000 (MSB → LSB). Sensor Unconnected to User (bit 11). All remaining fields remain equal to those in step 5. The simulated PHD also deletes all stored records in RACP and stores an identical measurement. 39. Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute 40. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the simulated PHD sends the temporarily stored spot-check measurement to the PHG under test b) Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute 41. The simulated PHD sends a Measurement to the PHG under test with Measurement Status field set to 0000 0000 000**1** 0000 0000 0000 (MSB → LSB). Unknown Sensor Connected (bit 12). All remaining fields remain equal to those in step 5. The simulated PHD also deletes all stored records in RACP and stores an identical measurement. 42. Check in PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute 43. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the simulated PHD sends the temporarily stored spot-check measurement to the PHG under test b) Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute 44. The simulated PHD sends a Measurement to the PHG under test with Measurement Status field set to 0000 0000 00**1**0 0000 0000 0000 (MSB → LSB). Sensor Displaced (bit 13). All remaining fields remain equal to those in step 5. The simulated PHD also deletes all stored records in RACP and stores an identical measurement. 45. Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute 46. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the simulated PHD sends the temporarily stored spot-check measurement to the PHG under test b) Check in PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute 47. The simulated PHD sends a Measurement to the PHG under test with Measurement Status field set to 0000 0000 0**1**00 0000 0000 0000 (MSB → LSB). Sensor Malfunctioning (bit 14). All remaining fields remain equal to those in step 5. The simulated PHD also deletes all stored records in RACP and stores an identical measurement. 48. Check in PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute 49. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the simulated PHD sends the temporarily stored spot-check measurement to the PHG under test b) Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute 50. The simulated PHD sends a Measurement to the PHG under test with Measurement Status field set to 0000 0000 **1**000 0000 0000 0000 (MSB → LSB). Sensor Disconnected

	(bit 15). All remaining fields remain equal to those in step 5. The simulated PHD also deletes all stored records in RACP and stores an identical measurement. 51. Check in PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute 52. IF C_MAN_BLE_042 = TRUE (PHG supports RACP) THEN a) The PHG under test requests the simulated PHD to report stored records by performing a writing operation in the Record Access Control Point (RACP) and the simulated PHD sends the temporarily stored spot-check measurement to the PHG under test b) Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute
Pass/Fail criteria	In Step 6, the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute is present and it is set to "device-extended-update" (0x8000). If PHG supports RACP, same criteria applies to 7.b. In Step 9, the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute is present and it is set to "device-equipment-malfunction" (0x4000). If PHG supports RACP, same criteria applies to 10.b. In Step 12, the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute is present and it is set to "signal-processing-irregularity" (0x2000). If PHG supports RACP, same criteria applies to 13.b. In Step 15, the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute is present and it is set to "signal-inadequate" (0x1000). If PHG supports RACP, same criteria applies to 16.b. In Step 18, the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute is present and it is set to "signal-poor" (0x0800). If PHG supports RACP, same criteria applies to 19.b. In Step 21, the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute is present and it is set to "signal-low-perfusion" (0x0400). If PHG supports RACP, same criteria applies to 22.b. In Step 24, the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute is present and it is set to "signal-erratic" (0x0200). If PHG supports RACP, same criteria applies to 25.b. In Step 27, the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute is present and it is set to "signal-non-pulsatile" (0x0100). If PHG supports RACP, same criteria applies to 28.b. In Step 30, Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute is present and it is set to "signal-pulse-questionable" (0x0080). If PHG supports RACP, same criteria applies to 31.b. In Step 33, Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute is present and it is set to "signal-searching" (0x0040). If PHG supports RACP, same criteria applies to 34.b. In Step 36, Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute is present and it is set to "signal-interference" (0x0020). If PHG supports RACP, same criteria applies to 37.b. In Step 39, Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute is present and it is set to "sensor-off" (0x0010). If PHG supports RACP, same criteria applies to 40.b. In Step 42, Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute is present and it is set to "sensor-unsupported" (0x0008). If PHG supports RACP, same criteria applies to 43.b. In Step 45, Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute is present and it is set to "sensor-displaced" (0x0004). If PHG supports RACP, same criteria applies to 46.b. In Step 48, Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute is present and it is set to "sensor-malfunction" (0x0002). If PHG supports RACP, same criteria applies to 49.b. In Step 51, Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-

	Str attribute is present and it is set to “sensor-disconnected” (0x0001). If PHG supports RACP, same criteria applies to 52.b.
Notes (To assist manual testing)	In step 6 (and step 7.b if applicable), possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Enum-Observed-Value-Basic-Bit-Str attribute is present: ❑ Object: Device and Sensor Status Enumeration Object ❑ Attribute-id: MDC_ATTR_ENUM_OBS_VAL_BASIC_BIT_STR (2662) ❑ Attribute-type: BITS16 ❑ Attribute-value: **80 00** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Enum-Observed-Value-Basic-Bit-Str attribute value (check OBX-5): OBX|n|CWE|150604^MDC_PULS_OXIM_DEV_STATUS^MDC|m.0.0.x|**1^device-extended-update(15)**||||||R In step 9 (and step 10.b if applicable), possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Enum-Observed-Value-Basic-Bit-Str attribute is present: ❑ Object: Device and Sensor Status Enumeration Object ❑ Attribute-id: MDC_ATTR_ENUM_OBS_VAL_BASIC_BIT_STR (2662) ❑ Attribute-type: BITS16 ❑ Attribute-value: **40 00** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Enum-Observed-Value-Basic-Bit-Str attribute value (check OBX-5): OBX|n|CWE|150604^MDC_PULS_OXIM_DEV_STATUS^MDC|m.0.0.x|**1^device-equipment-malfunction(14)**||||||R In step 12 (and step 13.b if applicable), possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Enum-Observed-Value-Basic-Bit-Str attribute is present: ❑ Object: Device and Sensor Status Enumeration Object ❑ Attribute-id: MDC_ATTR_ENUM_OBS_VAL_BASIC_BIT_STR (2662) ❑ Attribute-type: BITS16 ❑ Attribute-value: **20 00** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Enum-Observed-Value-Basic-Bit-Str attribute value (check OBX-5): OBX|n|CWE|150604^MDC_PULS_OXIM_DEV_STATUS^MDC|m.0.0.x|**1^signal-processing-irregularity(13)**||||||R In step 15 (and step 16.b if applicable), possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Enum-Observed-Value-Basic-Bit-Str attribute is present: ❑ Object: Device and Sensor Status Enumeration Object ❑ Attribute-id: MDC_ATTR_ENUM_OBS_VAL_BASIC_BIT_STR (2662) ❑ Attribute-type: BITS16

	❑ Attribute-value: **10 00** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Enum-Observed-Value-Basic-Bit-Str attribute value (check OBX-5): OBX|n|CWE|150604^MDC_PULS_OXIM_DEV_STATUS^MDC|m.0.0.x|**1^signal-inadequate(12)**||||||R In step 18 (and step 19.b if applicable), possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Enum-Observed-Value-Basic-Bit-Str attribute is present: ❑ Object: Device and Sensor Status Enumeration Object ❑ Attribute-id: MDC_ATTR_ENUM_OBS_VAL_BASIC_BIT_STR (2662) ❑ Attribute-type: BITS16 ❑ Attribute-value: **08 00** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Enum-Observed-Value-Basic-Bit-Str attribute value (check OBX-5): OBX|n|CWE|150604^MDC_PULS_OXIM_DEV_STATUS^MDC|m.0.0.x|**1^signal-poor(11)**||||||R In step 21 (and step 22.b if applicable), possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Enum-Observed-Value-Basic-Bit-Str attribute is present: ❑ Object: Device and Sensor Status Enumeration Object ❑ Attribute-id: MDC_ATTR_ENUM_OBS_VAL_BASIC_BIT_STR (2662) ❑ Attribute-type: BITS16 ❑ Attribute-value: **04 00** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Enum-Observed-Value-Basic-Bit-Str attribute value (check OBX-5): OBX|n|CWE|150604^MDC_PULS_OXIM_DEV_STATUS^MDC|m.0.0.x|**1^signal-low-perfusion(10)**||||||R In step 24 (and step 25.b if applicable), possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Enum-Observed-Value-Basic-Bit-Str attribute is present: ❑ Object: Device and Sensor Status Enumeration Object ❑ Attribute-id: MDC_ATTR_ENUM_OBS_VAL_BASIC_BIT_STR (2662) ❑ Attribute-type: BITS16 ❑ Attribute-value: **02 00** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Enum-Observed-Value-Basic-Bit-Str attribute value (check OBX-5): OBX|n|CWE|150604^MDC_PULS_OXIM_DEV_STATUS^MDC|m.0.0.x|**1^signal-erratic(9)**||||||R In step 27 (and step 28.b if applicable), possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes

	Enum-Observed-Value-Basic-Bit-Str attribute is present: ❑ Object: Device and Sensor Status Enumeration Object ❑ Attribute-id: MDC_ATTR_ENUM_OBS_VAL_BASIC_BIT_STR (2662) ❑ Attribute-type: BITS16 ❑ Attribute-value: **01 00** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Enum-Observed-Value-Basic-Bit-Str attribute value (check OBX-5): OBX|n|CWE|150604^MDC_PULS_OXIM_DEV_STATUS^MDC|m.0.0.x|**1^signal-non-pulsatile(8)**||||||R In step 30 (and step 31.b if applicable), possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Enum-Observed-Value-Basic-Bit-Str attribute is present: ❑ Object: Device and Sensor Status Enumeration Object ❑ Attribute-id: MDC_ATTR_ENUM_OBS_VAL_BASIC_BIT_STR (2662) ❑ Attribute-type: BITS16 ❑ Attribute-value: **00 80** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Measurement-Status attribute value (check OBX-5): OBX|n|CWE|150604^MDC_PULS_OXIM_DEV_STATUS^MDC|m.0.0.x|**1^signal-pulse-questionable(7)**||||||R In step 33 (and step 34.b if applicable), possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Enum-Observed-Value-Basic-Bit-Str attribute is present: ❑ Object: Device and Sensor Status Enumeration Object ❑ Attribute-id: MDC_ATTR_ENUM_OBS_VAL_BASIC_BIT_STR (2662) ❑ Attribute-type: BITS16 ❑ Attribute-value: **00 40** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Measurement-Status attribute value (check OBX-5): OBX|n|CWE|150604^MDC_PULS_OXIM_DEV_STATUS^MDC|m.0.0.x|**1^signal-searching(6)**||||||R In step 36 (and step 37.b if applicable), possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Enum-Observed-Value-Basic-Bit-Str attribute is present: ❑ Object: Device and Sensor Status Enumeration Object ❑ Attribute-id: MDC_ATTR_ENUM_OBS_VAL_BASIC_BIT_STR (2662) ❑ Attribute-type: BITS16 ❑ Attribute-value: **00 20** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Measurement-Status attribute value (check OBX-5):

	OBX|n|CWE|150604^MDC_PULS_OXIM_DEV_STATUS^MDC|m.0.0.x|**1^sensor-interference(5)**||||||R In step 39 (and step 40.b if applicable), possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Enum-Observed-Value-Basic-Bit-Str attribute is present: ❑ Object: Device and Sensor Status Enumeration Object ❑ Attribute-id: MDC_ATTR_ENUM_OBS_VAL_BASIC_BIT_STR (2662) ❑ Attribute-type: BITS16 ❑ Attribute-value: **00 10** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Measurement-Status attribute value (check OBX-5): OBX|n|CWE|150604^MDC_PULS_OXIM_DEV_STATUS^MDC|m.0.0.x|**1^sensor-off(4)**||||||R In step 42 (and step 43.b if applicable), possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Enum-Observed-Value-Basic-Bit-Str attribute is present: ❑ Object: Device and Sensor Status Enumeration Object ❑ Attribute-id: MDC_ATTR_ENUM_OBS_VAL_BASIC_BIT_STR (2662) ❑ Attribute-type: BITS16 ❑ Attribute-value: **00 08** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Measurement-Status attribute value (check OBX-5): OBX|n|CWE|150604^MDC_PULS_OXIM_DEV_STATUS^MDC|m.0.0.x|**1^sensor-unsupported(3)**||||||R In step 45 (and step 46.b if applicable), possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Enum-Observed-Value-Basic-Bit-Str attribute is present: ❑ Object: Device and Sensor Status Enumeration Object ❑ Attribute-id: MDC_ATTR_ENUM_OBS_VAL_BASIC_BIT_STR (2662) ❑ Attribute-type: BITS16 ❑ Attribute-value: **00 04** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Measurement-Status attribute value (check OBX-5): OBX|n|CWE|150604^MDC_PULS_OXIM_DEV_STATUS^MDC|m.0.0.x|**1^sensor-displaced(2)**||||||R In step 48 (and step 49.b if applicable), possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Enum-Observed-Value-Basic-Bit-Str attribute is present: ❑ Object: Device and Sensor Status Enumeration Object ❑ Attribute-id: MDC_ATTR_ENUM_OBS_VAL_BASIC_BIT_STR (2662) ❑ Attribute-type: BITS16

	❑ Attribute-value: **00 02** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Measurement-Status attribute value (check OBX-5): OBX|n|CWE|150604^MDC_PULS_OXIM_DEV_STATUS^MDC|m.0.0.x|**1^sensor-malfunction(1)**||||||R In step 51 (and step 52.b if applicable), possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Enum-Observed-Value-Basic-Bit-Str attribute is present: ❑ Object: Device and Sensor Status Enumeration Object ❑ Attribute-id: MDC_ATTR_ENUM_OBS_VAL_BASIC_BIT_STR (2662) ❑ Attribute-type: BITS16 ❑ Attribute-value: **00 01** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Measurement-Status attribute value (check OBX-5): OBX|n|CWE|150604^MDC_PULS_OXIM_DEV_STATUS^MDC|m.0.0.x|**1^sensor-disconnected(0)**||||||R

TP Id		TP/LP-PAN/PHG/PHDTW/PLX/BV-064		
TP label		Whitepaper. Device and Sensor Status Enumeration Object (Continuous Measurements) – Enum-Observed-Value-Bit-Str Attribute		
Coverage	**Spec**	[Bluetooth PHDT v1.6]		
	Testable items	DSS Enumeration 8; M		
Test purpose		Check that: PHG transcodes Device and Sensor Status field of the PLX Continuous Measurement chactacteristic into Device and Sensor Status Enumeration Object - Enum-Observed-Value-Basic-Bit-Str attribute [AND] PHG transcodes the Bluetooth Device and Sensor Status field of the PLX Continuous characteristic to 11073 Enum-Observed-Value-Basic-Bit-Str attribute properly		
Applicability		C_MAN_BLE_000 AND C_MAN_BLE_002 AND C_MAN_BLE_040 AND C_MAN_BLE_041		
Other PICS				
Initial condition		The PHG under test and the simulated PHD are in the Standby state.		
Test procedure		1. The simulated PHD is configured with a Pulse Oximeter Profile (device specialization), it has a continuous measurement (including fast and slow response measurement values) ready to be sent and it is in the Advertising state (it is discoverable). 2. The simulated PHD implements several BTLE characteristics. The characteristics of interest for this Test Case are: a. PLX Continuous Measurement (0x2A5F) b. PLX Features (0x2A60) i. Field: Supported Features • Format: 16 bit		

	• Value: 0000 0000 00**11** 00**1**0 (MSB → LSB). Device and Sensor Status support is present (bit 1). Fast and slow response modes are supported (bits 4 and 5). ii. Field: Measurement Status Support • This field is not included iii. Field: Device and Sensor Status Support • Format: 24 bit • Value: 0000 0000 **1111 1111 1111 1111** (MSB → LSB). All Device and Sensor Status bits are supported 3. The PHG under test initiates a discovery process (Scanning state), it discovers the simulated PHD and it starts a pairing process with the simulated PHD (Initiating state). 4. When the pairing has been completed (Connection state), force the PHG under test to read the PLX Features characteristic. 5. The simulated PHD sends the Measurement to the PHG under test with the following value: a. PLX Continuous Measurement (0x2A5F) i. Field: Flags • Format: 8 bit • Value: 0000 **1**0**11** (MSB → LSB). Device and Sensor Status, SpO2PR–Fast and SpO2PR-Slow fields are present. Measurement Status and Pulse Amplitude Index fields are not present. ii. Field: SpO2PR-Normal - SpO2 (%) • Format: SFLOAT • Value: Not Relevant iii. Field: SpO2PR-Normal - PR (bpm) • Format: SFLOAT • Value: Not Relevant iv. Field: SpO2PR-Fast - SpO2 (%) • Format: SFLOAT • Value: Not Relevant v. Field: SpO2PR-Fast - PR (bpm) • Format: SFLOAT • Value: Not Relevant vi. Field: SpO2PR-Slow - SpO2 (%) • Format: SFLOAT • Value: Not Relevant vii. Field: SpO2PR-Slow - PR (bpm) • Format: SFLOAT • Value: Not Relevant viii. Field: Measurement Status • This fiels is not included ix. Field: Device and Sensor Status • Format: 24 bit • Value: 0000 0000 0000 0000 0000 000**1** (MSB → LSB). Extended Display Update Ongoing (bit 0). x. Field: Pulse Amplitude Index (%)

	• This field is not included 6. Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute. 7. The simulated PHD sends a Measurement to the PHG under test with Measurement Status field set to 0000 0000 0000 0000 0000 00**1**0 (MSB → LSB). Equipment Malfunction (bit 1). All remaining fields remain equal to those in step 5. 8. Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute. 9. The simulated PHD sends a Measurement to the PHG under test with Measurement Status field set to 0000 0000 0000 0000 0000 0**1**00 (MSB → LSB). Signal Processing Irregularity Detected (bit 2). All remaining fields remain equal to those in step 5. 10. Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute. 11. The simulated PHD sends a Measurement to the PHG under test with Measurement Status field set to 0000 0000 0000 0000 0000 **1**000 (MSB → LSB). Inadequate Signal Detected (bit 3). All remaining fields remain equal to those in step 5. 12. Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute. 13. The simulated PHD sends a Measurement to the PHG under test with Measurement Status field set to 0000 0000 0000 0000 000**1** 0000 (MSB → LSB). Poor Signal Detected (bit 4). All remaining fields remain equal to those in step 5. 14. Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute. 15. The simulated PHD sends a Measurement to the PHG under test with Measurement Status field set to 0000 0000 0000 0000 00**1**0 0000 (MSB → LSB). Low Perfusion Detected (bit 5). All remaining fields remain equal to those in step 5. 16. Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute. 17. The simulated PHD sends a Measurement to the PHG under test with Measurement Status field set to 0000 0000 0000 0000 0**1**00 0000 (MSB → LSB). Erratic Signal Detected (bit 6). All remaining fields remain equal to those in step 5. 18. Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute. 19. The simulated PHD sends a Measurement to the PHG under test with Measurement Status field set to 0000 0000 0000 0000 **1**000 0000 (MSB → LSB). Non-Pulsatile Signal Detected (bit 7). All remaining fields remain equal to those in step 5. 20. Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute. 21. The simulated PHD sends a Measurement to the PHG under test with Measurement Status field set to 0000 0000 0000 000**1** 0000 0000 (MSB → LSB). Questionable Signal Detected (bit 8). All remaining fields remain equal to those in step 5. 22. Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute. 23. The simulated PHD sends a Measurement to the PHG under test with Measurement Status field set to 0000 0000 0000 00**1**0 0000 0000 (MSB → LSB). Signal Analysis Ongoing (bit 9). All remaining fields remain equal to those in step 5. 24. Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute. 25. The simulated PHD sends a Measurement to the PHG under test with Measurement Status field set to 0000 0000 0000 0**1**00 0000 0000 (MSB → LSB). Sensor Interference Detected (bit 10). All remaining fields remain equal to those in step 5. 26. Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute. 27. The simulated PHD sends a Measurement to the PHG under test with Measurement Status field set to 0000 0000 0000 **1**000 0000 0000 (MSB → LSB). Sensor Unconnected to User (bit 11). All remaining fields remain equal to those in step 5.

	28. Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute. 29. The simulated PHD sends a Measurement to the PHG under test with Measurement Status field set to 0000 0000 000**1** 0000 0000 0000 (MSB → LSB). Unknown Sensor Connected (bit 12). All remaining fields remain equal to those in step 5. 30. Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute. 31. The simulated PHD sends a Measurement to the PHG under test with Measurement Status field set to 0000 0000 00**1**0 0000 0000 0000 (MSB → LSB). Sensor Displaced (bit 13). All remaining fields remain equal to those in step 5. 32. Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute. 33. The simulated PHD sends a Measurement to the PHG under test with Measurement Status field set to 0000 0000 0**1**00 0000 0000 0000 (MSB → LSB). Sensor Malfunctioning (bit 14). All remaining fields remain equal to those in step 5. 34. Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute. 35. The simulated PHD sends a Measurement to the PHG under test with Measurement Status field set to 0000 0000 **1**000 0000 0000 0000 (MSB → LSB). Sensor Disconnected (bit 15). All remaining fields remain equal to those in step 5. 36. Check in the PHG transcoder output the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute.
Pass/Fail criteria	In Step 6, the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute is present and it is set to “device-extended-update” (0x8000). In Step 8, the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute is present and it is set to “device-equipment-malfunction” (0x4000). In Step 10, the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute is present and it is set to “signal-processing-irregularity” (0x2000). In Step 12, the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute is present and it is set to “signal-inadequate” (0x1000). In Step 14, the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute is present and it is set to “signal-poor” (0x0800). In Step 16, the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute is present and it is set to “signal-low-perfusion” (0x0400). In Step 18, the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute is present and it is set to “signal-erratic” (0x0200). In Step 20, the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute is present and it is set to “signal-non-pulsatile” (0x0100). In Step 22, the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute is present and it is set to “signal-pulse-questionable” (0x0080). In Step 24, the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute is present and it is set to “signal-searching” (0x0040). In Step 26, the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute is present and it is set to “signal-interference” (0x0020). In Step 28, the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute is present and it is set to “sensor-off” (0x0010). In Step 30, the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute is present and it is set to “sensor-unsupported” (0x0008). In Step 32, the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute is present and it is set to “sensor-displaced” (0x0004). In Step 34, the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute is present and it is set to “sensor-malfunction” (0x0002). In Step 36, the Device and Sensor Status Enumeration Object – Enum-Observed-Value-Basic-Bit-Str attribute is present and it is set to “sensor-disconnected” (0x0001).

Notes (To assist manual testing)	In step 6, possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Enum-Observed-Value-Basic-Bit-Str attribute is present: ❑ Object: Device and Sensor Status Enumeration Object ❑ Attribute-id: MDC_ATTR_ENUM_OBS_VAL_BASIC_BIT_STR (2662) ❑ Attribute-type: BITS16 ❑ Attribute-value: **80 00** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Enum-Observed-Value-Basic-Bit-Str attribute value (check OBX-5): OBX|n|CWE|150604^MDC_PULS_OXIM_DEV_STATUS^MDC|m.0.0.x|**1^device-extended-update(15)**||||||R In step 8, possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Enum-Observed-Value-Basic-Bit-Str attribute is present: ❑ Object: Device and Sensor Status Enumeration Object ❑ Attribute-id: MDC_ATTR_ENUM_OBS_VAL_BASIC_BIT_STR (2662) ❑ Attribute-type: BITS16 ❑ Attribute-value: **40 00** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Enum-Observed-Value-Basic-Bit-Str attribute value (check OBX-5): OBX|n|CWE|150604^MDC_PULS_OXIM_DEV_STATUS^MDC|m.0.0.x|**1^device-equipment-malfunction(14)**||||||R In step 10, possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Enum-Observed-Value-Basic-Bit-Str attribute is present: ❑ Object: Device and Sensor Status Enumeration Object ❑ Attribute-id: MDC_ATTR_ENUM_OBS_VAL_BASIC_BIT_STR (2662) ❑ Attribute-type: BITS16 ❑ Attribute-value: **20 00** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Enum-Observed-Value-Basic-Bit-Str attribute value (check OBX-5): OBX|n|CWE|150604^MDC_PULS_OXIM_DEV_STATUS^MDC|m.0.0.x|**1^signal-processing-irregularity(13)**||||||R In step 12, possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Enum-Observed-Value-Basic-Bit-Str attribute is present: ❑ Object: Device and Sensor Status Enumeration Object ❑ Attribute-id: MDC_ATTR_ENUM_OBS_VAL_BASIC_BIT_STR (2662) ❑ Attribute-type: BITS16 ❑ Attribute-value: **10 00** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Enum-Observed-Value-Basic-Bit-Str attribute value (check OBX-5):

	OBX|n|CWE|150604^MDC_PULS_OXIM_DEV_STATUS^MDC|m.0.0.x|**1^signal-inadequate(12)**||||||R In step 14, possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Enum-Observed-Value-Basic-Bit-Str attribute is present: ❑ Object: Device and Sensor Status Enumeration Object ❑ Attribute-id: MDC_ATTR_ENUM_OBS_VAL_BASIC_BIT_STR (2662) ❑ Attribute-type: BITS16 ❑ Attribute-value: **08 00** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Enum-Observed-Value-Basic-Bit-Str attribute value (check OBX-5): OBX|n|CWE|150604^MDC_PULS_OXIM_DEV_STATUS^MDC|m.0.0.x|**1^signal-poor(11)**||||||R In step 16, possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Enum-Observed-Value-Basic-Bit-Str attribute is present: ❑ Object: Device and Sensor Status Enumeration Object ❑ Attribute-id: MDC_ATTR_ENUM_OBS_VAL_BASIC_BIT_STR (2662) ❑ Attribute-type: BITS16 ❑ Attribute-value: **04 00** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Enum-Observed-Value-Basic-Bit-Str attribute value (check OBX-5): OBX|n|CWE|150604^MDC_PULS_OXIM_DEV_STATUS^MDC|m.0.0.x|**1^signal-low-perfusion(10)**||||||R In step 18, possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Enum-Observed-Value-Basic-Bit-Str attribute is present: ❑ Object: Device and Sensor Status Enumeration Object ❑ Attribute-id: MDC_ATTR_ENUM_OBS_VAL_BASIC_BIT_STR (2662) ❑ Attribute-type: BITS16 ❑ Attribute-value: **02 00** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Enum-Observed-Value-Basic-Bit-Str attribute value (check OBX-5): OBX|n|CWE|150604^MDC_PULS_OXIM_DEV_STATUS^MDC|m.0.0.x|**1^signal-erratic(9)**||||||R In step 20, possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Enum-Observed-Value-Basic-Bit-Str attribute is present: ❑ Object: Device and Sensor Status Enumeration Object ❑ Attribute-id: MDC_ATTR_ENUM_OBS_VAL_BASIC_BIT_STR (2662) ❑ Attribute-type: BITS16 ❑ Attribute-value: **01 00** (hex) b) WAN PCD-01 message

PCD-01 message includes a segment like this with Enum-Observed-Value-Basic-Bit-Str attribute value (check OBX-5):

OBX|n|CWE|150604^MDC_PULS_OXIM_DEV_STATUS^MDC|m.0.0.x|**1^signal-non-pulsatile(8)**||||||R

In step 22, possible values in typical points of observation after transcoder output are:

a) IEEE 11073 Objects and Attributes

Enum-Observed-Value-Basic-Bit-Str attribute is present:

- ❑ Object: Device and Sensor Status Enumeration Object
- ❑ Attribute-id: MDC_ATTR_ENUM_OBS_VAL_BASIC_BIT_STR (2662)
- ❑ Attribute-type: BITS16
- ❑ Attribute-value: **00 80** (hex)

b) WAN PCD-01 message

PCD-01 message includes a segment like this with Measurement-Status attribute value (check OBX-5):

OBX|n|CWE|150604^MDC_PULS_OXIM_DEV_STATUS^MDC|m.0.0.x|**1^signal-pulse-questionable(7)**||||||R

In step 24, possible values in typical points of observation after transcoder output are:

a) IEEE 11073 Objects and Attributes

Enum-Observed-Value-Basic-Bit-Str attribute is present:

- ❑ Object: Device and Sensor Status Enumeration Object
- ❑ Attribute-id: MDC_ATTR_ENUM_OBS_VAL_BASIC_BIT_STR (2662)
- ❑ Attribute-type: BITS16
- ❑ Attribute-value: **00 40** (hex)

b) WAN PCD-01 message

PCD-01 message includes a segment like this with Measurement-Status attribute value (check OBX-5):

OBX|n|CWE|150604^MDC_PULS_OXIM_DEV_STATUS^MDC|m.0.0.x|**1^signal-searching(6)**||||||R

In step 26, possible values in typical points of observation after transcoder output are:

a) IEEE 11073 Objects and Attributes

Enum-Observed-Value-Basic-Bit-Str attribute is present:

- ❑ Object: Device and Sensor Status Enumeration Object
- ❑ Attribute-id: MDC_ATTR_ENUM_OBS_VAL_BASIC_BIT_STR (2662)
- ❑ Attribute-type: BITS16
- ❑ Attribute-value: **00 20** (hex)

b) WAN PCD-01 message

PCD-01 message includes a segment like this with Measurement-Status attribute value (check OBX-5):

OBX|n|CWE|150604^MDC_PULS_OXIM_DEV_STATUS^MDC|m.0.0.x|**1^sensor-interference(5)**||||||R

In step 28, possible values in typical points of observation after transcoder output are:

a) IEEE 11073 Objects and Attributes

Enum-Observed-Value-Basic-Bit-Str attribute is present:

- ❑ Object: Device and Sensor Status Enumeration Object
- ❑ Attribute-id: MDC_ATTR_ENUM_OBS_VAL_BASIC_BIT_STR (2662)
- ❑ Attribute-type: BITS16
- ❑ Attribute-value: **00 10** (hex)

	b) WAN PCD-01 message PCD-01 message includes a segment like this with Measurement-Status attribute value (check OBX-5): OBX|n|CWE|150604^MDC_PULS_OXIM_DEV_STATUS^MDC|m.0.0.x|**1^sensor-off(4)**||||||R In step 30, possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Enum-Observed-Value-Basic-Bit-Str attribute is present: ❑ Object: Device and Sensor Status Enumeration Object ❑ Attribute-id: MDC_ATTR_ENUM_OBS_VAL_BASIC_BIT_STR (2662) ❑ Attribute-type: BITS16 ❑ Attribute-value: **00 08** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Measurement-Status attribute value (check OBX-5): OBX|n|CWE|150604^MDC_PULS_OXIM_DEV_STATUS^MDC|m.0.0.x|**1^sensor-unsupported(3)**||||||R In step 32, possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Enum-Observed-Value-Basic-Bit-Str attribute is present: ❑ Object: Device and Sensor Status Enumeration Object ❑ Attribute-id: MDC_ATTR_ENUM_OBS_VAL_BASIC_BIT_STR (2662) ❑ Attribute-type: BITS16 ❑ Attribute-value: **00 04** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Measurement-Status attribute value (check OBX-5): OBX|n|CWE|150604^MDC_PULS_OXIM_DEV_STATUS^MDC|m.0.0.x|**1^sensor-displaced(2)**||||||R In step 34, possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Enum-Observed-Value-Basic-Bit-Str attribute is present: ❑ Object: Device and Sensor Status Enumeration Object ❑ Attribute-id: MDC_ATTR_ENUM_OBS_VAL_BASIC_BIT_STR (2662) ❑ Attribute-type: BITS16 ❑ Attribute-value: **00 02** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Measurement-Status attribute value (check OBX-5): OBX|n|CWE|150604^MDC_PULS_OXIM_DEV_STATUS^MDC|m.0.0.x|**1^sensor-malfunction(1)**||||||R In step 36, possible values in typical points of observation after transcoder output are: a) IEEE 11073 Objects and Attributes Enum-Observed-Value-Basic-Bit-Str attribute is present: ❑ Object: Device and Sensor Status Enumeration Object ❑ Attribute-id: MDC_ATTR_ENUM_OBS_VAL_BASIC_BIT_STR (2662) ❑ Attribute-type: BITS16

	❑ Attribute-value: **00 01** (hex) b) WAN PCD-01 message PCD-01 message includes a segment like this with Measurement-Status attribute value (check OBX-5): OBX|n|CWE|150604^MDC_PULS_OXIM_DEV_STATUS^MDC|m.0.0.x|**1^sensor-disconnected(0)**||||||R

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