

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

G.984.2
Amendment 1
(02/2006)

SERIES G: TRANSMISSION SYSTEMS AND MEDIA,
DIGITAL SYSTEMS AND NETWORKS

Digital sections and digital line system – Optical line
systems for local and access networks

Gigabit-capable Passive Optical Networks
(G-PON): Physical Media Dependent (PMD) layer
specification

**Amendment 1: New Appendix III – Industry best
practice for 2.488 Gbit/s downstream,
1.244 Gbit/s upstream G-PON**

ITU-T Recommendation G.984.2 (2003) – Amendment 1

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For further details, please refer to the list of ITU-T Recommendations.

ITU-T Recommendation G.984.2

Gigabit-capable Passive Optical Networks (G-PON): Physical Media Dependent (PMD) layer specification

Amendment 1

New Appendix III – Industry best practice for 2.488 Gbit/s downstream, 1.244 Gbit/s upstream G-PON

Summary

This amendment adds a new appendix to ITU-T Rec. G.984.2 that establishes the industry best practice optical budgets for the G-PON system operating at 2.488 Gbit/s downstream, 1.244 Gbit/s upstream.

Source

Amendment 1 to ITU-T Recommendation G.984.2 (2003) was agreed on 17 February 2006 by ITU-T Study Group 15 (2005-2008).

Keywords

G-PON, optical.

FOREWORD

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Introduction

This amendment describes the recommended practical power budgets for systems described in the G.984 series that operate at the downstream rate of 2.488 Gbit/s and upstream rate of 1.244 Gbit/s. These budgets are optional extensions of the Recommendation, and reflect the observed practical optimum values for this particular system.

ITU-T Recommendation G.984.2

Gigabit-capable Passive Optical Networks (G-PON): Physical Media Dependent (PMD) layer specification

Amendment 1

New Appendix III – Industry best practice for 2.488 Gbit/s downstream, 1.244 Gbit/s upstream G-PON

III.1 Introduction

The widespread interest in the 2.4 Gbit/s downstream, 1.2 Gbit/s upstream G-PON system has provided increased visibility into the feasibility of loss budgets for this system. This appendix captures the industry best practices for this rate combination.

The notable variations from the loss budgets found elsewhere in this Recommendation include:

- overall loss budgets midway between class B and class C;
- different value of optical path penalties;
- the OLT must support FEC in the downstream.

These variations can provide increased capabilities for operation of G-PON systems. Therefore, the budgets contained in this appendix are recommended over and above all others in this Recommendation for the 2.4/1.2 Gbit/s rate PON.

III.2 System applications

There are currently two major applications for the G-PON system. The first is a full-service system with a video overlay. The second is a digital-only system without a video overlay. These two applications are diagrammed in Figure III.1.

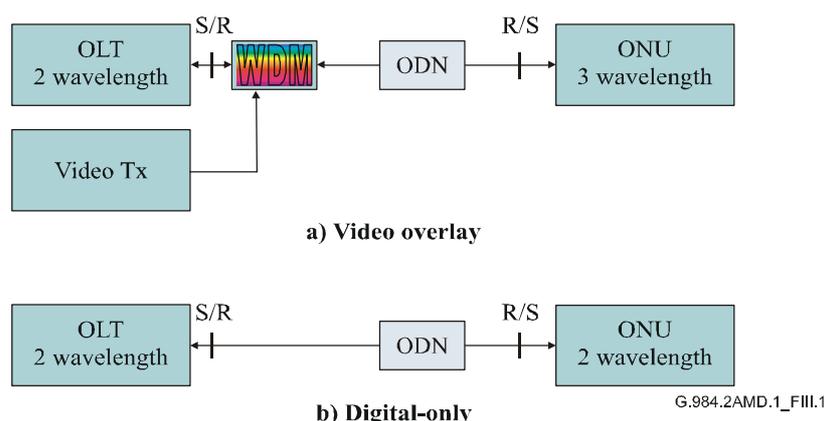


Figure III.1/G.984.2 – G-PON applications

III.3 Optical specifications

The optical specifications for the OLT and ONU optics are given in Table III.1. This table refers to power levels measured at the interface points shown in Figure III.1, i.e., both types a (Video overlay) and b (Digital-only) systems. Specifically, any WDM filters external to the OLT or ONU equipment are considered part of the ODN. These specifications are meant to augment similar

specifications found in Table 2 in the main body of the Recommendation. All other specifications found elsewhere in the table still apply.

The ONU sensitivity can be achieved either using an APD without FEC, or a PIN with FEC. The choice is a matter of ONU implementation. The APD solution is seen as an immediately available option, while the PIN with FEC solution is a longer-term option that depends on the introduction of higher performance receiver circuitry. The OLT must support FEC in the downstream by having the capability of calculating and transmitting the FEC parity bytes in the downstream signal. The OLT equipment must also have the ability to activate or deactivate the downstream FEC feature by operations system command. The ONU can optionally support FEC decoding in the downstream, and in any specific instance the ONU can use the FEC parity at its own discretion.

The optical penalty does not include any Raman impairment in the downstream wavelength. Any penalty due to this effect must be accounted for out of the link budget. However, in any system with appreciable Raman effect will also have a significant length of fibre. Because of the loss differential between 1490 nm and 1310 nm, it is anticipated that the Raman impairment will be compensated by the lower fibre loss at 1490 nm.

Table III.1/G.984.2 – Optical power levels for the 2.4 Gbit/s downstream, 1.2 Gbit/s upstream system

Items	Unit	Single fibre
OLT:		OLT
Mean launched power MIN	dBm	+1.5
Mean launched power MAX	dBm	+5
Minimum sensitivity	dBm	-28
Minimum overload	dBm	-8
Downstream optical penalty	dB	0.5
ONU:		ONU
Mean launched power MIN	dBm	+0.5
Mean launched power MAX	dBm	+5
Minimum sensitivity	dBm	-27
Minimum overload	dBm	-8
Upstream optical penalty	dB	0.5

III.4 Link budget

The link budget is given in Table III.2. This budget covers all optical components between the OLT and ONU, including non-integrated WDM filters for the multiplex of video overlays and other enhancement band services, and must include any Raman impairment from the overlay signal.

Table III.2/G.984.2 – Loss budgets for the G-PON system

Items	Unit	Single fibre
Minimum optical loss at 1490 nm	dB	13
Minimum optical loss at 1310 nm	dB	13
Maximum optical loss at 1490 nm	dB	28
Maximum optical loss at 1310 nm	dB	28

In comparison, the B-PON class B+ budgets recommended in ITU-T Rec. G.983.3/Amd.2 are shown in Table III.3. The G-PON budget is similar to the Video Overlay system in that it supports a 13-dB minimum loss, and it is similar to the digital-only budget in that it is symmetric and it supports a 28-dB maximum loss. It is theoretically possible that a PON that complies with the B-PON B+ budgets might not comply with the G-PON budget; however, such cases should be very rare in the actual deployed base of PONs. Therefore, the G-PON budget should be compatible with practically all deployed PONs.

Table III.3/G.984.2 – Loss budgets for the B-PON G.983.3/Amd.2 systems

Items	Unit	Single fibre
Video Overlay system (OLT1-ONT)		
Minimum optical loss at 1490 nm	dB	9
Minimum optical loss at 1310 nm	dB	13
Maximum optical loss at 1490 nm	dB	27
Maximum optical loss at 1310 nm	dB	29
Digital-only system (OLT2-ONT)		
Minimum optical loss at 1490 nm	dB	10
Minimum optical loss at 1310 nm	dB	10
Maximum optical loss at 1490 nm	dB	28
Maximum optical loss at 1310 nm	dB	28

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