



**ITU Regional Seminar for the Africa Region  
on Conformance and Interoperability Testing  
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**Considerations in building Type Approval and  
Interoperability Test Labs, and areas of operation**

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1



**Fundamentals of an orderly telecom  
equipment marketplace**

- Robust technical requirements for products entering the marketplace
- Interference free services – wireless and wireline
- Products are safe for citizens and service provider personnel
- Market access regime that inspires trust and confidence in users
- Delivers national and international connectivity
- Reflects priorities and values of a society



2



## Implementation alternatives for an orderly telecom equipment marketplace

### Example 1- fully fledged national system

- Robust legal framework for market entry with assessed penalties for non compliance
- Telecom policy and regulations
- Accreditation, certification and testing
- Marking
- Post market surveillance and audit
- Technical specifications covering the following areas of activity:
  - wireless and wireline
  - EMC
  - SAR
  - Broadcast



## Implementation alternatives for an orderly telecom equipment marketplace

### Example 2- Adoption

- Adopt one or more schemes already deployed successfully in other economies
- Examples already used as interim measure by some developing countries:
  - EU marking
  - FCC marking
  - IC marking
  - Other





## Status of needs in Developing Countries


- Many developing countries moving quickly from uncontrolled market access driven by variety of concerns e.g. health, quality, performance of equipment
- Many DCs already using Adoption method to improve orderliness in telecom marketplace
- Many more have moved already to implement test labs, accreditation and certification systems
- Others actively seeking assistance to establish test centres and improve quality and performance
- Growing recognition of business opportunity of becoming country with the test lab(s) of choice for regional needs
- BDT/TSB initiatives on test centres timely and viewed positively



## Interoperability Testing Issues



- Interoperability testing is at another level of complexity beyond regulatory type approval testing
- Deals with complex protocol implementation and interactions between and among complete devices – system testing
- Complementary to conformance testing
- Greater requirement for programming language and computer science expertise
- Expertise required in test suite languages, formal description languages, sophisticated test tools
- Type approval test lab expertise can ease transition to interoperability testing






## Example of Interop Testing Areas: "University of New Hampshire Interop Lab"

- ❖ IP
  - ❖ IPv6 Routing
  - ❖ IPv4 Routing
  - ❖ USGv6 Testing
  - ❖ IPv6 Ready Program
- ❖ Open Fabrics – Open Source
- ❖ Storage
  - ❖ SAS –Stats Analysis
  - ❖ SATA – Computer Bus I/face
  - ❖ Fibre Channel
  - ❖ iSCSI – small computer i/face
- ❖ TR-069 Test Consortium Tools
- ❖ VoIP
- ❖ Wireless LAN
  - ❖ 802.11 a,b,g,n
- ❖ Ethernet
  - ❖ 10BASE-T Ethernet
  - ❖ Gigabit Ethernet
  - ❖ 10 Gigabit Ethernet
  - ❖ Fast Ethernet
  - ❖ Power over Ethernet
- ❖ Backplane
- ❖ Bridging
  - ❖ Data Center Bridging
  - ❖ MACsec
  - ❖ VLAN
  - ❖ Spanning Tree
- ❖ DLNA ICV – Certification Pgm
  - ❖ DHN (Digital Home Networking)
- ❖ DSL
- ❖ MIPI – Music Industry

## Type Approval Test Lab modularity

- Test labs implementations tend to be modular
- Modularity supports growth in step with priorities e.g. Wireless test lab initially focusing on cellphones; second step addition of a Wireless test lab focusing on XDSL
- Test lab modules may include:
  - Certification unit
  - Reception
  - Shipping and receiving
  - Financial operations and fee collection
  - Filing system
  - Market surveillance and audit
  - Inspection





## Type Approval Test Labs - typical sub-units

- Wireless test lab
- Wireline test lab
- EMC test test
- Calibration unit
- SAR test systems
- Environmental chamber
- Anechoic chamber
- Open Area Test Site (OATS)
- Electromagnetically Shielded room



## Test Lab: typical examples of partial scope of technical standards - Broadcasting 1/3

- [BETS-1 - Technical Standards and Requirements for Low Power Announce Transmitters in the Frequency Bands 525-1,705 kHz and 88-107.5 MHz](#)  
Issue 1, November 1, 1996
- [BETS-4 - Technical Standards and Requirements for Television Broadcasting Transmitters](#)  
Issue 1, November 1, 1996
- [BETS-5 - Technical Standards and Requirements for AM Broadcasting Transmitters](#)  
Issue 1, November 1, 1996
- [BETS-6 - Technical Standards and Requirements for FM Broadcasting Transmitters](#)  
Issue 2, August 2005
- [BETS-8 - Technical Standards and Requirements for FM Transmitters Operating in Small Remote Communities](#)  
Issue 1 November 1, 1996
- [BETS-9 - Technical Standards and Requirements for Television Transmitters Operating in Small Remote Communities](#)  
Issue 1, November 1, 1996





## Test Lab: typical examples of partial scope of technical standards - Wireless 2/3

- [RSS-192 - Fixed Wireless Access Equipment Operating in the Band 3450 - 3650 MHz](#)  
Issue 3, January 2008
- [RSS-194 - Fixed Wireless Access Equipment Operating in the Band 953-960 MHz](#)  
Issue 1, October 2007
- [RSS-193 - Multipoint and Point-to-Point Communication Systems \(MCS\) in the Fixed Service Operating in the 2150-2160 MHz, 2500-2596 MHz and 2686-2690 MHz Bands](#)  
Issue 1, July 2003
- [RSS-195 - Wireless Communications Service Equipment Operating in the Bands 2305-2320 MHz and 2345-2360 MHz](#)  
Issue 1, January 2004
- [RSS-197 — Wireless Broadband Access Equipment Operating in the Band 3650-3700 MHz](#)  
Issue 1, February 2010
- [RSS-199 — Broadband Radio Service \(BRS\) Equipment Operating in the Band 2500-2690 MHz](#)  
Issue 1, January 2010
- [RSS-210 - Low-power Licence-exempt Radiocommunication Devices \(All Frequency Bands\): Category I Equipment](#) New  
Issue 8, December 2010
- [RSS-Gen - General Requirements and Information for the Certification of Radiocommunication Equipment](#) New  
Issue 3, December 2010



## Test Lab: typical examples of partial scope of technical standards - EMC 3/3

- [ICES-001 - Industrial, Scientific and Medical Radio Frequency Generators](#)  
Issue 3, March 7, 1998
- [ICES-002 - Spark Ignition Systems of Vehicles and Other Devices Equipped with Internal Combustion Engines](#)  
Issue 5, August 2009
- [ICES-003 - Digital Apparatus](#)  
Issue 4, February 7, 2004
- [ICES-004 - Alternating Current High Voltage Power Systems](#)  
Issue 3, December 2001
- [ICES-005 - Radio Frequency Lighting Devices](#)  
Issue 3, May 2009
- [ICES-006 - AC Wire Carrier Current Devices \(Unintentional Radiators\)](#)  
Issue 2, June 2009
- [RSS-102 - Radio Frequency Exposure Compliance of Radiocommunication Apparatus \(All Frequency Bands\)](#)  
Issue 3, June 2009
- [RSS-310 - Low-power Licence-exempt Radiocommunication Devices \(All Frequency Bands\): Category II Equipment](#) New  
Issue 3, December 2010
- [RSS-Gen - General Requirements and Information for the Certification of Radiocommunication Equipment](#) New  
Issue 3, December 2010





## Type Approval Test Lab activities – Portfolio of Test Methods

- Electromagnetic emission test methods
- Immunity test methods
- Product safety test methods
- Radio test methods
- Telecom equipment test methods
- RF exposure test methods



## Examples - Electromagnetic emission test methods

- IEC/CISPR 13 (2001-04), EN 55013 (2001), AS/NZS CISPR 13 (2003), and CNS 13439 (2001): Sound and television broadcast receivers and associated equipment - Radio disturbance characteristics - Limits and methods of measurement
- [12/CIS13aa] CISPR 13, Edition 4.2 (2006-03)  
Sound and broadcast receivers and associated equipment - Radio disturbance characteristics - Limits and methods of measurement
- [12/CIS14a3] EN 55014-1 (2000) with Amendments A1(2001) & A2 (2001)  
Electromagnetic Compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 1: Emission
- [12/CIS14x1] IEC/CISPR 14-1, Ed. 5.0 (2005)  
Electromagnetic Compatibility - Requirements for Household Appliances, Electric Tools and Similar Apparatus - Part 1: Emission
- [12/CIS22] IEC/CISPR 22 (1997) & EN 55022 (1998) + A1(2000)  
Limits and methods of measurement of radio disturbance characteristics of information technology equipment
- [12/CIS22b] CNS 13438 (1997)  
Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment
- [12/CIS22ij] IEC/CISPR 22, Edition 5.2 (2006-03)  
Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment





## Examples - Immunity test methods

- [12/I11b] EN 50083-2 (2001)  
Cabled distribution systems for television and sound signals Part 2:  
Electromagnetic compatibility for equipment
- [12/KN11] KN 61000-4-11 with RRL Notice No. 2005-83 (Sept. 29, 2005)  
Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests
- [12/KN11f] KN 61000-4-11 (2008-5); RRL Notice No. 2008-4 (May 20, 2008)  
Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests
- [12/KN2] KN 61000-4-2 with RRL Notice No. 2005-83 (Sept. 29, 2005)  
Electrostatic Discharge Immunity Test
- [12/KN24] KN24 (December 2005) with RRL Notice No. 2005-83  
Information Technology Equipment - immunity characteristics - limits and  
methods of measurements
- [12/KN24d] KN 24 (2008-5) with RRL Notice No. 2008-4 (May 20, 2008)  
Information Technology Equipment - immunity characteristics - limits and  
methods of measurements
- [12/KN24d1] KN 24 (Annex 11) RRA Announce 2008-12 (Dec. 16, 2008)  
Conformity Assessment Procedure for EMS (Information technology equipment ?  
Immunity characteristics ? Limits and methods of measurement)
- [12/KN24d2] KN 24 (Annex 11) RRA Announce 2009-10 (Dec. 21, 2009)  
Conformity Assessment Procedure for EMS (Information technology equipment ?  
Immunity characteristics ? Limits and methods of measurement)



## Examples - Product safety test methods

- [12/50392] BS EN 50392 (2004)  
Generic standard to demonstrate the compliance of electronic and electrical  
apparatus with the basic restrictions related to human exposure to  
electromagnetic fields (0 Hz - 300 GHz)
- [12/60065] IEC 60065 (2001-12), 7th edition  
Audio, video and similar electronic apparatus - Safety requirements
- [12/60601aa] IEC 60601-1-2, Ed 2.1 (2004-11) & EN 60601-1-2 (2002)  
Medical electrical equipment - Part 1-2: General requirements for safety -  
Collateral standard: Electromagnetic compatibility - Requirements and tests
- [12/60601ab] IEC 60601-1-2, Ed. 3.0 (2007)  
Medical electrical equipment - Part 1-2: General requirements for safety -  
Collateral standard: Electromagnetic compatibility - Requirements and tests
- [12/61010a] IEC 61010-1 (2001-02), 2nd edition  
Safety requirements for electrical equipment for measurement, control, and  
laboratory use - Part 1: General requirements
- [12/T41a] AS/NZS 60950 (2000)  
Safety of Information Technology Equipment (including Amdt1)
- [12/T41i] EN 60950-1 (2006), IEC 60950-1 (2005) & UL 60950-1  
Information technology equipment - Safety - Part 1: General requirements







## Examples – Wireless/radio test methods

- [12/300220d] ETSI EN 300 220-1 V2.1.1 (2006-04)  
Electromagnetic Compatibility Radio Spectrum Matters; Short Range Devices; Radio Equipment to be used in the 25 MHz to 1,000 MHz Frequency Range with Power Levels Ranging up to 500mW; Part 1: Technical Characteristics and Test Methods
- [12/300220e] ETSI EN 300 220-2 V2.1.1 (2006-04)  
ERM; Short Range Devices; Radio Equipment to be used in the 25MHz to 1,000 MHz Frequency Range with Power Levels Ranging up to 550 mW; Part 2: Supplementary Parameters Not Intended for Conformity Purposes
- [12/300220f] ETSI EN 300 220-2 V2.1.2 (2007-06)  
ERM; Short Range Devices; Radio Equipment to be used in the 25MHz to 1,000 MHz Frequency Range with Power Levels Ranging up to 550 mW; Part 2: Supplementary Parameters Not Intended for Conformity Purposes
- [12/300224b] ETSI EN 300 224-2 v1.1.1 (2001-01)  
Electromagnetic compatibility and Radio spectrum Matters (ERM); On-site paging service; Part 2: Harmonized EN under article 3.2 of the R&TTE Directive
- [12/300328b] ETSI EN 300 328-2 v1.2.1 (2001-12)  
Wideband Transmission systems; Data transmission equipment operating in the 2.4 GHz ISM band and using spread spectrum modulation techniques; Part 2: Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive



## Examples-Telecom terminal equipment test methods

- [12/CS03a] Industry Canada CS-03, Issue 9, Amendment 1 (2005)  
Compliance Specification for Terminal Equipment, Terminal Systems, Network Protection Devices, Connection Arrangements and Hearing Aids Compatibility (Sections I, II, V only)
- [12/T01]  
Terminal Equipment Network Protection Standards, FCC/ACTA Method - 47 CFR Part 68 - Analog and Digital
- [12/T01b]  
68.316 and 68.317 Hearing Aid Compatibility: technical standards
- [12/TIA31B] TIA/EIA TSB-31-B (1998)  
Part 68 Rational and Measurement Guidelines
- [12/TIA968] ANSI/TIA-968-A (2003)  
Telephone Terminal Equipment, Technical Requirements for Connection of Terminal Equipment to the Telephone Network
- [12/TIA968a] ANSI/TIA-968-A-1 (2003)  
Telephone Terminal Equipment, Technical Requirements for Connection of Terminal Equipment to the Telephone Network - Addendum 1
- [12/TIA968b] ANSI/TIA-968-A-2 (2004)  
Telephone Terminal Equipment, Technical Requirements for Connection of Terminal Equipment to the Telephone Network - Addendum 2





## Examples - RF exposure test methods

- [12/50360] EN 50360 (2001)  
Product standard to demonstrate the compliance of mobile phones with the basic restrictions related to human exposure to electromagnetic fields (300 MHz - 3 GHz)
- [12/50361] EN 50361 (2001)  
Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz)
- [12/50371] EN 50371 (2002)  
Generic standard to demonstrate the compliance of low power electronic and electric apparatus with the basic restrictions related to human exposure to electromagnetic fields (300 MHz - 3 GHz)
- [12/50383] EN 50383:2002  
Basic Standard for the calculation and measurement of electromagnetic field strength and SAR related to human exposure from radio base stations and fixed terminal stations for wireless telecommunication system (110 MHz - 40 GHz)
- [12/60215] EN 60215 (1989) and IEC 215 (1987)+ A1 (1992) + A2 (1994)  
Safety requirements for radio transmitting equipment
- [12/H46] H46-2/99-273E  
Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range From 3 kHz to 300 GHz - Safety Code 6 (Canada)



## References to Worldwide Test Labs and their scopes 1/3

- **USA - National Institute of Standards and Technology (NIST)**  
<http://ts.nist.gov/standards/scopes/programs.htm>  
<http://ts.nist.gov/standards/scopes/ect.htm>
- **AFRICA, CHINA ETC**  
[http://www.itu.int/dms\\_pub/itu/oth/06/24/T06240000010009MSWE.doc](http://www.itu.int/dms_pub/itu/oth/06/24/T06240000010009MSWE.doc)  
[http://www.itu.int/dms\\_pub/itu-oth/06/24/T06240000010009MSWE.doc](http://www.itu.int/dms_pub/itu-oth/06/24/T06240000010009MSWE.doc)
- **AUSTRALIA**  
[http://www.austest.com.au/about\\_us.php](http://www.austest.com.au/about_us.php)
- **EUROPEAN**  
<http://start.europadev.com/Home/consultancy-1>





## References to Worldwide Test Labs and their scopes 2/3

- **A4Labs**

<http://www.at4wireless.com/testing-certification-services/accreditations.html>

- **TUNISIA**

<http://www.cn-c114.net/575/a488636.html>

- **FCC Q&A SITE**

[http://www.bureauveritas.com/wps/wcm/connect/bv\\_com/group/home/news/did-you-know-that/fcc\\_faqs?presentationtemplate=by\\_master/news\\_full\\_story\\_presentation](http://www.bureauveritas.com/wps/wcm/connect/bv_com/group/home/news/did-you-know-that/fcc_faqs?presentationtemplate=by_master/news_full_story_presentation)



21



## References to Worldwide Test Labs and their scopes 3/3

- **MIDDLE EAST**

[http://www.uaelab.ae/UAELAB/about\\_UAELAB.htm](http://www.uaelab.ae/UAELAB/about_UAELAB.htm)

<http://www.wipro.com/services/testing-services/services/lab-on-hire.htm>

<http://www.contractlaboratory.com/labclass/telecommunications.cfm>

<http://www.intertek.com/it/>

<http://teletimesinternational.com/middleeast/3662/wimax-forum-certification-lab-opens-in-malaysia>



22



## Conclusions

- Excellent websites exist in various countries fully furnished with type approval test info as in previous 3 slides
- Websites are replete with detailed technical standards, test methods, procedures, fee schedules and market surveillance and audit information
- In principle the same parameters tested are common for all regulatory type approval systems
- No need to re-invent the wheel
- Many countries willing to provide on-site training, in some cases for free
- Some Lab visits and demonstrations available at no charge – travel and accommodation costs to be borne by visitors



# THANK YOU

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