

Update on ISO/IEC 11801-99-1 Guidance on 40GBASE-T Cabling

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Content

1. **status report on ISO/IEC 11801-99-1**
2. **update on Class I & Class II cabling**
3. **comparison with TIA Cat 8 cabling**
4. **plan for completion and next steps**

ISO/IEC 11801-99-1 40GBASE-T Cabling Guidelines

- ISO/IEC TR 11801-99-1 2nd PDTR vote was positive
- comments resolved at SC25 WG3 Oct 2013 meeting
- resolutions implemented in new draft issued in Dec 2013 **as a DTR (final draft)**
- significant technical change, with *reduced differences* between Class I, Class II and TIA Cat 8 specifications

ISO/IEC 11801-99-1 Deliverables

Performance Requirements
for 30m, 2-conductor Channel

Legacy Cat 6 _A Components to 500 MHz	Legacy Cat 7 _A Components to 1000 MHz
Legacy Cat 6 _A Components to 1,600 MHz*	Legacy Cat 7 _A Components to 1,600 MHz*
Enhanced Cat 6 _A Components to 1,600 MHz*	Enhanced Cat 7 _A Components to 1,600 MHz*
Tutorial on Channel Capacity, Assumptions, other PHY-related	

* Upper Frequency of 2 GHz For Further Study

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Legacy Cat 6 _A Components to 500 MHz	Legacy Cat 7 _A Components to 1000 MHz
Legacy Cat 6 _A Components to 1,600 MHz*	Legacy Cat 7 _A Components to 1,600 MHz*
Category 8.1 Components to 1,600 MHz*	Category 8.2 Components to 1,600 MHz*
Tutorial on Channel Capacity, Assumptions, other PHY-related	

Next Generation
Cabling for 40G

* Upper Frequency of 2 GHz For Further Study

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Performance Requirements
for 30m, 2-conductor Channel

Legacy Cat 6 _A Components to 500 MHz	Legacy Cat 7 _A Components to 1000 MHz
Legacy Cat 6 _A Components to 1,600 MHz*	Legacy Cat 7 _A Components to 1,600 MHz*
Class I Channel to 1,600 MHz*	Class II Channel to 1,600 MHz*
Tutorial on Channel Capacity, Assumptions, other PHY-related	

Next Generation
Cabling for 40G

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Comparison of TIA & ISO/IEC Next Gen Cabling

	TIA-568-C.2.1 D0.9b Cat 8 Channel	ISO/IEC 11801-99-1 DTR Class I Channel	ISO/IEC 11801-99-1 DTR Class II Channel
RL	$1 < f < 10$ 19dB $10 < f < 40$ $24 - 5 \cdot \log(f)$ $40 < f < 130$ 16dB $130 < f < 1000$ $35 - 9 \cdot \log(f)$ $1000 < f < 2000$ 8dB	$1 < f < 10$ 19dB $10 < f < 100$ $24 - 5 \cdot \log(f)$ $100 < f < 1000$ $26 - 6 \cdot \log(f)$ $1000 < f < 2000$ 8dB	$1 < f < 10$ 19dB $10 < f < 100$ $24 - 5 \cdot \log(f)$ $100 < f < 1000$ $26 - 6 \cdot \log(f)$ $1000 < f < 2000$ 8dB
IL	$0.312(1.8\sqrt{f} + 0.005f + 0.25/\sqrt{f})$ $+ 2 \cdot B + 0.0324\sqrt{f}$ (ILD) $B = 0.02\sqrt{f} < 500\text{MHz}; > 500\text{MHz}$ $(0.008\sqrt{f} + 0.00029 \cdot f + 0.5 \cdot 10^{-6} \cdot f^2)$	$0.32(1.8\sqrt{f} + 0.005f + 0.25/\sqrt{f})$ $+ 2 \cdot B + 0.0324\sqrt{f}$ (ILD) where B = connector IL	$0.32(1.8\sqrt{f} + 0.005f + 0.25/\sqrt{f})$ $+ 2 \cdot 0.02\sqrt{f}$
TCL	1-2000 $60 - 17 \cdot \log(f)$	1-2000 $60 - 17 \cdot \log(f)$ (for U/UTP or F/UTP cable)	1-2000 $50 - 17 \cdot \log(f)$ (for S/FTP or PIMF cable)
ELTCTL	$1 < f < 170$ $46.8 - 20 \cdot \log(f)$	$1 < f < 170$ $44.6 - 20 \cdot \log(f)$ (for U/UTP or F/UTP cable)	$1 < f < 170$ $34.6 - 20 \cdot \log(f)$ (for S/FTP or PIMF cable)
CA	$100 < f < 2000$ $90 - 20 \cdot \log(f)$	$30 < f < 100$ 50dB $100 < f < 2000$ $90 - 20 \cdot \log(f)$	$30 < f < 100$ 50dB $100 < f < 2000$ $90 - 20 \cdot \log(f)$
PSANEXT	$1 < f < 100$ $105 - 10 \cdot \log(f)$ $100 < f < 2000$ $115 - 15 \cdot \log(f)$	$1 < f < 100$ $105 - 10 \cdot \log(f)$ $100 < f < 2000$ $115 - 15 \cdot \log(f)$	$1 < f < 100$ $105 - 10 \cdot \log(f)$ $100 < f < 2000$ $115 - 15 \cdot \log(f)$
PSAACRF	1-2000 $61 - 20 \cdot \log(f/100)$	$61 - 20 \cdot \log(f/100)$	$61 - 20 \cdot \log(f/100)$

Comparison of TIA & ISO/IEC Next Gen Cabling

key
performance
differences

	TIA-568-C.2.1 D0.9b Cat 8 Channel @ 1GHz	ISO/IEC 11801-99-1 DTR Class I Channel @ 1GHz	ISO/IEC 11801-99-1 DTR Class II Channel @ 1GHz
RL	8.0dB	8.0dB	8.0dB
IL	22.0dB	22.5dB	21.1dB
NEXT	19.3dB	19.6dB	47.9dB
ACR-F	12.0dB	12.0dB	33.1dB
CA	30.0dB	30.0dB	30.0dB
PSANEXT	70.0dB	70.0dB	70.0dB
PSAACRF	41.0dB	41.0dB	41.0dB

Characterisation Frequency

- **ISO/IEC 11801-99-1 specifies all parameters to 2GHz**
 - *ffs* at frequencies above 1.6GHz
- **1.6GHz eases cabling design, manufacture & testing**
- **manufacturers surveyed are able to design to 2GHz**
- **Technical Report = vehicle to optimise requirements**
- **formal requirements to follow in new ISO/IEC standard**

Cable Standardisation in IEC SC46

- **NWIPs approved for cables for 40G Class I & II channels**
- **CDs for IEC 61156-9/10 for Cat 8.1/Cat 8.2 cables to 2GHz**
 - *ffs* at frequencies above 1.6GHz
- **data being gathered to support field testing up to 2GHz :**
 1. channel and PL configurations
 2. supported connector types
 3. pass/fail limits
 4. test accuracy requirements

Connector Standardisation in IEC SC48B

- **NWIP approved to define Cat 8.1 RJ45 connector with upper freq. of 2GHz (IEC 60607-3-81 CD circulated)**
- **NWIP circulated to define Cat 8.2 GG45 connector with upper freq. of 2GHz (to be IEC 60607-3-82)**
- **IEC 61076-3-104 Ed.3 (*Tera*) connector being revised with upper freq. increased to 2GHz**
- **NWIP being prepared to revise IEC 61076-3-110 (ARJ45) connector to increased upper freq. to *at least* 2GHz**
- **IEC 60512-28-100 Measurement & Test Procedures upper freq. being increased from 1GHz to 2GHz**

The Plan to Completion

- **ISO/IEC 11801-99-1 DTR national review ends 17 Mar 2014**
- **IEEE 802.3bq also invited to participate in the DTR review**
- **NWIP has been circulated for ISO/IEC 11801 3rd Edition**
- **Next Gen cable & connectors being standardised by IEC**
- **Next Gen cabling to be included in ISO/IEC 11801 Ed.3**
- **SC25 WG3 will continue to liaise closely with 802.3bq**