

Issue 25 • Quarter 4, 2019

# Standards Quarterly Update:

## What you need to know now for the future of your network

Welcome to the 25th edition of the *Standards Advisor*. This report is issued quarterly and provides updates on the standards relevant to the structured cabling industry, and the impact they have on your network design, planning and operations.

This summary represents standards meetings held during the fourth quarter of 2019 and reports on activities from all aspects of the cabling industry. These activities range from the applications standards (IEEE 802.3 and 802.11 and T11—Fiber Channel) to the cabling standards (ANSI/TIA, ISO/IEC, CENELEC). It also covers new developments in the world of multi-source agreements (MSAs).

TIA TR-42 meeting: No meetings were held during Q4, 2019

67th ISO/IEC JTC1/SC25 WG3 meeting: No meetings were held during Q4, 2019

The next meeting of ISO/IEC JTC1/SC25 WG3 will be held February 2020, in Sydney, Australia.

CENELEC TC215 WG1 meeting: October 29-30, 2019, Paris, France

The meeting was attended by 15 experts from six countries, including France, Germany, Greece, Norway, Sweden and the UK.

- It was agreed that the legacy XML output from field testing should be updated and included in a self-contained document.
- A proposal from France to make a new Technical Specification for Cabling in support of ICT and radio/TV up to 2,150 MHz over balanced cabling was discussed and France will propose a NWIP.

- Work was done on a document covering MPTL, DAC and E2E link, and a new working draft will be circulated.

The next meeting of CENELEC TC215 WG1 will be held March 24-25, 2020, in Frankfurt, Germany.

CENELEC TC215 WG2 meeting: No meetings were held during Q4, 2019

The next meeting of CENELEC TC215 WG2 will be held April 22-23, 2020, location TBD.

### 1. IEEE 802.3cq maintenance on 2-pair power over Ethernet (PoE)

This Task Force is cleaning up discrepancies in the existing 2-pair PoE standard (commonly known as 802.3af and 802.3at, or PoE and PoE+) found during the development of 802.3bt. The modifications do not change the functionality in 2-pair systems. The draft of 802.3cq is doing its final recirculations in the final phase of balloting, Standards Association (SA) ballot, and should be approved by the standards board in early 2020.

### 2. IEEE 802.3cv maintenance on four-pair power over Ethernet (PoE)

This Task Force is cleaning up minor issues found in initial testing of the 802.3bt standard for 4-pair PoE. The modifications do not change the functionality and are not expected to present interoperability or compliance issues. The draft of 802.3cv is currently in the Task Force review stage, prior to entering working group ballot in the first half of 2020.

## Single-twisted-pair copper standards

### 3. IEEE P802.3cg 10 Mbps single-twisted-pair Ethernet

- The 10 Mbps Single Pair Ethernet standard was approved by the IEEE-SA standards board in November 2019.
- The standards cover industrial, automotive, and building automation use cases, encompassing multiple different applications—one up to 15 m, one of approximately 1 km, and a new one in formulation to reflect 25 m multidrop applications. The project has organized around two physical layer PHYs:
  - Up to 1 km single-pair (aka 10BASE-T1L): The project adopted baseline specifications up to 1 Km intended for process control and building automation applications, adopting PAM 3 signaling and various electrical specifications.
  - Short-reach (15+ meters, aka 10BASE-T1S): The project also adopted link segment specifications for 15 m point-to-point links, compatible with 25 m multi-drop networks as well. Short-reach PHYs will optionally support multidrop.
  - An optional improvement collision performance on multidrop networks (known as PLCA in the draft).
  - Optional single-pair powering, based on clause 104 (IEEE Std 802.3bu-2016, known as PoDL) with some specification changes and additional power levels.

### 4. IEEE 802.3 Single Pair Multidrop Enhancements Study Group

- This study group began meeting in September 2019 to examine extensions to the 10BASE-T1S multidrop (10 Mbps shared media) PHY defined in 802.3cg.
- The study group has proposed adding interoperable multidrop power over Ethernet and reach extensions for multidrop to better accommodate building automation. Reaches of 50-75 m have been proposed.
- The study group is expected to work on finalizing objectives in January 2020, and submit paperwork to become a Task Force in March 2020.

### 5. IEEE P802.3ch Multigigabit Automotive Ethernet PHY Task Force

- The 802.3ch draft entered the final stage of balloting, SA ballot, in November 2019 and is expected to be ratified in late 2020.

- This Task Force is focused on short-reach automotive links at rates of 2.5 Gbps, 5 Gbps, and 10 Gbps. The objectives call for up to 15 m and four connectors, and the project has adopted transmission characteristics for shielded cabling with bandwidths up to 6 GHz to provide headroom for PHY developers to study. At the interim, the group adopted PAM 4 PHY proposals for all rates, along with Reed-Solomon forward error correction coding to deal with impulse noise, and link segment (cabling) specifications using shielded cabling specified to 1 GHz, 2 GHz, and 4 GHz for 2.5 Gbps, 5 Gbps, and 10 Gbps rates, respectively.
- The project includes use of the 802.3bu powering but does not expect to extend that powering specification.

### 6. IEEE 802 beyond 10 gigabit automotive Ethernet PHY study group

This study group is focused on electrical automotive Ethernet PHYs at rates greater than 10 Gbps, and is driven primarily by requirements for autonomous vehicle networking. The project adopted objectives for 25 Gbps, 50 Gbps, and 100 Gbps Ethernet links at distances up to 11 m. It is expected to present a project documentation for a new Task Force in March 2020.

## Optical fiber standards

A new Study Group was formed to investigate the development of objectives and project criteria for short-reach (likely 30-50 m) optical PHY that operates at Gbps using a single wavelength. The use cases will likely be to connect 100G servers to middle-of-row (MoR) and end-of-row (EoR) switches, as well as connections between switches. The density reduction of 100G servers necessitates a solution that can reach far enough to interconnect many server racks with a single switch capable of supporting up to 256 100G ports. Thus today's widely deployed top-of-rack (ToR) switch placement architecture is expected to transform to MoR and EoR switch placement architecture as 100G servers emerge.

### 7. IEEE P802.3ca 25G and 50G EPON Task Force

- This Task Force is writing a standard for 25G and 50G EPON.
- The previous objective supporting 100G EPON was removed from the scope.
- The wavelength plan will allow backwards compatibility with networks supporting 10G EPON.
- All upstream and downstream wavelengths will be in O-band (around 1,310 nm).
- The standard will allow the coexistence of:
  - 25G EPON with GPON (reduced wavelength).
  - 25G EPON and 50G EPON with 10G-EPON, XG-PON1, and XGS-PON.
- The 802.3ca draft completed Working Group ballot and advanced to the final stage of balloting, SA ballot, at the November 2019 IEEE 802 plenary meeting. It is expected to complete balloting and publish in the second half of 2020.

### 8. IEEE P802.3cm Next-gen MMF PHYs (i.e., 400 Gbps over fewer pairs of MMF) Task Force

- Project 802.3cm was approved for publication and defines 400GBASE-SR8 and 400GBASE-SR4.2 PHYs.
  - The 400GBASE-SR8 PHY operates over 8 pairs of multimode fiber with reaches of 70 m on OM3 and 100 m on OM4 and OM5. Its lanes can be broken out to interoperate with 50GBASE-SR, 100GBASE-SR2 and 200GBASE-SR4.

- The 400BASE-SR4.2 operates over 4 pairs of multimode fiber using two wavelengths. It supports reaches of 70 m on OM3, 100 m on OM4, and 150 m on OM5.
  - It is the first Ethernet standard to take advantage of OM5's extra capability to support multiple wavelengths, thus joining the 40G-SWDM4, 100G-SWDM4, 40G-BiDi, and 100G-BiDi multi-source agreements (MSAs) in that regard.
- 9. IEEE P802.3cn 50 Gbps, 200 Gbps, and 400 Gbps Operation Over Single-Mode Fiber (formerly called Beyond 10 km Study Group)**
- Project 802.3cn was approved for publication and defines 50GBASE-ER, 200BASE-ER4 and 400GBASE-ER8 PHYs that each reach up to 40 km on singlemode fiber.
- The 50G PHY uses a single wavelength, while the 200G and 400G PHYs use 4 and 8 wavelengths, respectively.
- 10. IEEE P802.3cp 10G, 25G, and 50G Bi-directional Access Optical PHYs Task Force**
- This Task Force is developing standards for bi-directional 10G, 25G, and 50G over 10, 20, and 40 km over a single strand of singlemode fiber.
  - Baseline proposals are currently better refined for working group ballot.
  - All 10G and all 10 km baselines use either 1270/1330 +/- 10 nm wavelengths, while faster or longer baselines use 1290/1310 +/- 8 nm wavelengths.
- 11. IEEE P802.3cs Central Office Consolidation (super PON) Task Force**
- The main objectives of this Task Force are:
    - Support a passive point-to-multipoint ODN with a reach of at least 50 km with at least 1:64 split ratio per wavelength pair.
    - Support at least 16 wavelength pairs for point-to-multipoint PON operation.
    - Support the MAC data rate of 10 Gbps downstream.
    - Support the MAC data rates of 2.5 Gbps and 10 Gbps upstream.
    - Support tunable transmitters.
  - Baseline proposals are being considered.
- 12. IEEE P802.3ct 100 Gbps and 400 Gbps Operation over DWDM Systems Task Force**
- Project 802.3ct is defining 100GBASE-ZR, a PHY capable of supporting 80 km on singlemode fiber using coherent transmission.
  - The complete draft standard advanced to first Working Group ballot.
- 13. IEEE P802.3cu 100 Gbps and 400 Gbps over SMF at 100 Gbps per Wavelength Task Force**
- Project 802.3cu is defining four PHYs that each operate at 100 Gbps per wavelength.
  - 100GBASE-FR1 and 400GBASE-FR4 will each support up to 2 km on singlemode fiber, with FR4 using four wavelengths.
  - 100GBASE-LR1 will support 10 km, while 400GBASE-LR4-6 will support up to 6 km using four wavelengths.
    - Note that the final "-6" suffix is a new naming structure that indicates the reach, adopted to distinguish from the 10-km reach normally associated with "LR" optics.
  - This draft advanced to second Task Force review in preparation for first Working Group ballot.
- 14. IEEE P802.3cw 400 Gb/s Operation over DWDM Systems Task Force**
- Project 802.3cw is being formed as a subdivision of the 802.3ct project to define the 400GBASE-ZR PHY capable of 80 km on singlemode fiber using coherent transmission.
  - The Task Force is working toward a first complete draft.

The next meeting of IEEE 802.3 will be a interim meeting held the week of January 20, 2020, in Geneva, Switzerland.

#### FC-PI-7 64GFC

(INCITS 543-2019) has been approved by INCITS and is to be published by the February 2020 meeting.

#### FC-PI-7P 256GFC

- T11.2 committee reviewed proposed modifications to the draft document. Teleconference is scheduled to review the incorporated changes before the February 2020 meeting.
- 256GFC will contain a four-lane MMF variant only and will reuse the parameters from FC-PI-7. All SMF variants have been removed from the base document.

#### FC-PI-8 128GFC

- June 2021 target completion date
- C2M Training on 128GFC Links
  - Committee reviewed proposal of optical segment training between the modules to improve BER and reach performance; similar to the existing Host-to-ASIC training for electrical performance optimization.

- The proposed change would impact total link bring up time significantly.
- Link Bring Up Time
  - Total link bring up time consists of Lane Speed Negotiation (LSN), Optical Module Bring Up and Link Training.
  - Link bring up time is estimated to be 2 seconds for 32GFC and 5.5 seconds for 64GFC. Estimated bring up time of 128GFC is 19.5 seconds, which is consumed mostly by the link training segment (~15 seconds). Committee discussed approaches to best implement to reduce link bring up time.
- COM analysis at 112.2 Gbps
  - Channel Operating Margin (COM) analysis shows that 106.25 Gbps (IEEE data rate) and 112.2 Gbps (proposed FC data rate) are separated by approximately 1 dB in COM margin.
  - Neither margin currently meets requirements and both shall be improved.

The next meeting of INCITS/T11 will be held February 2-6, 2020, in Fort Worth, TX, USA.

#### IEC TC46 meeting: October 14-18, 2019, Shanghai, China

Routine meeting was held where comment resolution was discussed on a few documents.

The next meeting of IEC TC46 will be held the week of May 4th, 2020, in Tel Avia, Israel.

#### IEC SC48B meeting: No meetings were held during Q4, 2019

#### IEC SC48D meeting: No meetings were held during Q4, 2019

## Fibers and cables

### IEC TR 62959—Optical fiber cables—Shrinkage effects on cable and cable element end termination—Guidance

More than 100 comments were received on previously circulated CD. Most of the comments were editorial, but approximately 50 were technical points that have been addressed during several sessions in IEC SC86A WG3 and IEC SC86B JWG8. A proposal from OFS to include FOTP 46 as an alternative test method was agreed in WG3. However, due to lack of time to address all comments, a new CD is currently in circulation for further comments and annotations. A general feeling is that no consensus is going to be reached soon.

### Amendment to IEC 60794-1-21—New mechanical tests to be included

The document contains new and revised mechanical test methods. It is intended that this Amendment is to be included in a revision of IEC 60794-1-21, when it has reached an appropriate level of maturity. Mechanical tests included are: Method E27— Indoor simulated installation test; Method E32—Creep behavior by alternate tension test (for ADSS); Method E33—Multiple cable coiling and uncoiling performance; Method E30—Coefficient of friction between cables; Method E34—Coefficient of dynamic friction between cables. Of interest for Commscope at this moment is the new Method E29—Straight midspan access to optical elements. The method offers two procedures for evaluating individual retractability of optical elements in a “retractable” cable. Both procedures include a 6 m distance between cable openings (window-cuts), and different bends lay-out. Retraction in straight line is not considered descriptive of the cable properties, in this approach.

Method E30—Coefficient of friction between cables and Method E34—Coefficient of dynamic friction between cables do not refer to the CoF between a cable and the inner wall of the conduit being pushed (pulled) in. Currently in IEC, specific coefficient of friction (CoF) determination methods are described in IEC TR 62470/2011—Guidance on techniques for the measurement of the coefficient of friction (CoF) between cables and ducts.

## Restructuring of the IEC 60794-2 series

Two drafts are in circulation, proposing new specifications for mechanical test results:

- IEC 60794-2-23 Indoor optical fibre cables—Detailed specification for multi-fibre cables (without subunits) to be terminated with multi-fiber connectors.
- IEC 60794-2-24 Indoor optical fibre cables—Detailed specification for multiple multi-fibre unit breakout cables to be terminated with multi-fibre connectors.

IEC 60794-2-23 refers specifically to: a) trunking cables, and b) cables intended for patch-cords intended for termination with multi-fiber connectors. Different values are specified as required for mechanical tests, following IEC 60794-1-21 test methods. Environmental conditions (temperature cycle limits) are not specifically required, being left per user request. It is not the intention of this document to specify the finished terminated cable assembly complete with terminations.

IEC 60794-2-24 refers to cables containing multiple multi-fiber units. Each multi-fiber unit can be used as a breakout branch with or without further protections and terminated with multi-fiber connectors. As with IEC 60794-2-23, different values are specified as required for mechanical tests, following IEC 60794-1-21 test methods. Environmental conditions (temperature cycle limits) are not specifically defined. Samples preparation for bend (mandrel) and environmental tests follows the same requirement of cable components being fixed together. An outer sheath shrinkage test is required for constructions that include the outer sheathing in the termination assembly, based on Method F11, with a maximum acceptable shrink of 5.0 mm (1 m sample length).

The next meeting of IEC SC86 WG1 and WG3 will be held May 12-15, 2020, Kyoto, Japan.

## Fibre optic interconnecting devices and passive components

### IEC 61300-3-35 Visual inspection of fibre optic connectors and fibre-stub transceivers

On the first committee draft that circulated, more than 400 comments were received. Comments related to inspection requirements are the responsibility of WG6, whereas WG4 is responsible for the technical content of the inspection method, such as requirements for the microscope, etc. It was previously agreed to introduce a cleanliness inspection for the entire MT ferrule surface, including recommended cleaning methods in an informative annex. The draft for the second CD was first circulated to the WG experts and comments were handled at the meeting. A revised document will be prepared and recirculated to the national committees for comments. The IEC measurement methods specify only the minimum requirements of an instrument.

### vSFF (very small form factor) connector development

vSFF (very small form factor) Connector Development

Presentations were made for the SN and MDC connectors. The working group WG6 consensus was to advance both SN and MDC interfaces as new mechanical interface projects. Working Drafts are expected at the next WG meeting.

### IEC 61755-3 Optical interface standards

Comments were resolved for the committee drafts IEC 61755-3-1 and -2 for the oriented (tuned) and IEC 61755-3-11 and -12 for the non-oriented (untuned) connector interfaces. These documents not only place a limit on the maximum fiber core eccentricity, but also define a limit for the mean value to control the shape of the eccentricity distribution.

A proposal to combine the oriented and non-oriented into single documents was accepted after significant debate. This will allow future flexibility in choosing manufacturing methods for the requested performance grades B and C by a customer.

It is expected that the new drafts will circulate for CDV (Committee Draft for Vote), with voting closing before April 2020. Other improvements to the standard include informative guidance on the expected attenuation against a reference and description of the simulation methods used to estimate attenuation.

### Singlemode MPO reference connector

An SM MPO reference connector was proposed. Using the connector samples provided by three ferrule manufacturers, the intermating results demonstrated the attenuation of less than 0.2 dB (for 99.1%). In the proposal of the reference MPO connector, the fiber core true position is tightened to 0.5  $\mu\text{m}$  with the guide pin hole pitch tolerance of  $\pm 0.5 \mu\text{m}$ . However, the guide pin hole diameter specification is the same as the product ferrule, 699.0–699.6  $\mu\text{m}$ , which seems insufficient. Further investigation will be done.

### 16-fiber SM MPO connector

A 16F SM MPO connector with different spring forces (10 N, 16 N, and 20 N) was investigated by five ferrule manufacturers. The performance didn't meet the grade C spec (97% < 0.5 dB) and also there was no clear answer on the best choice of spring force (higher spring force doesn't associate a better RL). Therefore, a decision was made to move forward on the 16F MPO standard with MM configuration only (with a 20 N spring) and remove the SM 16F while further studies are conducted.

### IEC 61753-111-8 Ed2 update for sealed closures category G (ground level)

An update of IEC 61753-111-8 (category G closure) was needed since an additional environmental requirement for applications up to 1 m under ground level was added in the recent published IEC 61753-1 Ed2 document. Major changes in the updated closure document are:

- Immersion in water (1 m for seven days)
- Cable retention test adapted to new generation of cables (microduct tubes, microduct cables and small drop cables). Proposal was made to use a reduced load for cables with a diameter smaller than or equal to 5 mm:
  - 20  $\text{N}$  cable (mm) for cables with diameter > 5 mm
  - 10  $\text{N}$  cable (mm) for cables with diameter  $\leq$  5 mm
  - 10 N for microduct tubes and cables without strength member attachment

The diameter value of 5 mm was just a proposal made in the IEC meeting and can be discussed. Decision was made to proceed with a new draft 2CD.

### IEC 61756-1 General and guidance for fiber management systems

IEC 61756-1 Ed2, "General and guidance for fiber management systems," is approved and published. This document gives the minimum recommended bending radius of installed and stored fibers in fiber management systems for the various types of singlemode fibers. It also includes the mechanical interfacing requirements for various fusion splice protectors and mechanical splice.

### Intrusion Protection (IP) acceptance criteria for passive optical housings (IEC 60529)

New IP (intrusion protection) pass/fail criteria in IEC 60529 for IP54, IP55 and IP56 were proposed for passive optical housings and hardened connectors. For dust (IPX5) the pass/fail criterion is maximum of three cleaning steps to bring the re-mated connections within the specification. For water ingress (IPX4, IPX5 and IPX6) the maximum allowed ingress depends on the volume of the protective housings and is defined as 1%V for housing volume V less than 1 liter and 10 ml+0.1%V for volumes larger than 1 liter. These criteria will make the sealing performance tests of the wall boxes more clear but also more relaxed than the current requirement "no water ingress allowed." IEC SC86B approved the new IP acceptance criteria for optical fiber protective housings.

The next meeting of IEC SC86B WG2 will be held  
April 20-24, 2020, in Beijing, China.

## Fibre optic interconnect, passive and connectorized components

The following new documents are published:

- EN 50411-3-4 "Wall box for categories C and A"
- EN 50411-4-1 "Outdoor street cabinet for category A"
- EN 50411-3-3: "Singlemode optical fibre fusion splice protectors category OP"

The comments of the document prEN 50377-14-1, "Connector sets

and interconnect components to be used in optical fibre communication systems—Product specifications Part 14-1: Simplex and duplex cords made from simplex plugs with cylindrical ferrules, using EN 60793-2-50 single-mode B1 or B6 fibre for Category C according to EN 61753-1," were reviewed. The document will be updated and circulated for final voting.

The following documents are in maintenance and the updated drafts are submitted to the national committees for comments:

- EN 50411-2-4: "Sealed dome fibre splice closures for categories S and A"
- EN 50411-3-1: "Wall mounted fibre optic closure with splices for categories G and C"
- EN 50411-3-2: "Singlemode mechanical fibre splice for use in an outdoor protected environment (Cat OP)"
- EN 50411-3-6: "Multimode mechanical fibre splice for use in an outdoor protected environment (Cat OP)"
- EN 50411-6-1: "Unprotected microduct for categories A and S"

Due to the unexpected deletion by IEC SC876A of category OP performance for patch-cord cables in the new edition of IEC 60794-2-50, making a reference to this document in the EN 50377 and EN 50411 series is not relevant anymore for the category U/OP products! This issue was discussed in the joint working group meeting of TC86A and TC86BXA. IEC SC86A is planning to restructure the IEC 60794-2 series. The document IEC 60794-2-50 will be replaced in the future by a new IEC 60794-2-12. IEC SC86A seems not to understand the difference between weather-protected and non-weather-protected applications.

The next meeting of CENELEC TC86BXA WG1 will be held May 19-20, 2020, in Kessel-lo, Belgium (To be confirmed).

## ITU-T SG15 meeting: No meetings were held during Q4, 2019

The next meeting of ITU-T SG15 will be held January 27 through February 7, 2020, in Geneva, Switzerland.



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