Trends in the Second Plenary Meeting of ITU-T SG15 (Networks, Technologies and Infrastructures for Transport, Access and Home)

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Abstract

The second plenary meeting of ITU-T (International Telecommunication Union - Telecommunication Standardization Sector) Study Group 15 for the 2025–2028 study period was held in Geneva, Switzerland, from 13 to 24 October 2025. This article reports on the outcomes of this meeting, with a particular focus on optical access network standards and optical physical-layer standards.

Keywords: ITU-T SG15, optical access network, optical physical layer

1. Overview of ITU-T SG15

The International Telecommunication Union - Telecommunication Standardization Sector (ITU-T) Study Group 15 (SG15) [1] discusses international standards for optical communication networks, including home and access networks. This article introduces the major topics addressed in Working Party 1 (WP1), which covers home and access network standards, and WP2, which handles physical-layer standards for terrestrial and submarine optical communication systems. For trends in WP3, which focuses on the characteristics of optical transport networks, please refer to the article "Optical Network Technology for Future Ultra-high-capacity Communications in the Beyond 5G and Big Data Era" [2].

2. Trends in WP1/SG15

In Question 2, discussions focus on passive optical network (PON) systems connecting central offices and customer premises via optical fiber. Current discussions include future high-speed PON systems as well as technology and requirement considerations for diverse use cases not only for conventional residential services but also industrial networks, mobile fronthaul, and ultra-low-latency networks, and so on.

At the second plenary meeting, Supplement G.Suppl.88 [3] summarizing use cases, requirements, and candidate technologies for next-generation high-speed PON exceeding 100 Gbit/s per wavelength was agreed. As signal waveform degradation is a key challenge for higher speeds, G.Suppl.88 includes various candidate technologies such as coherent schemes, which enable waveform-degradation compensation at the receiver, cost-effective intensity-modulation direct-detection (IMDD) schemes based on single-sideband modulation or transmitter-side dispersion-compensation technologies, and hybrid IMDD–coherent schemes. It was also agreed to begin work on Revision 1 to further discuss items not included in this edition.

Regarding the physical-layer specification

Recommendation G.9804.4 for 50G-TWDM (time and wavelength division multiplexing)-PON, which achieves further speed increases by wavelength-multiplexing 50-Gbit/s-class signals, the applicability of technologies discussed in G.Suppl.88 is also being considered.

For accommodating diverse use cases, discussions continue on the new Supplement G.Suppl. LLSoT(W)DM, which summarizes the requirements and candidate technologies for applying PON systems in mobile fronthaul for wireless communication systems (LLSoT(W)DM: Low Layer Split Mobile Fronthaul over T(W)DM PON).

In association with the Technical Report GSTR.ION-2030—prepared mainly by SG15 Question 12 and summarizing network architectures, component technologies, and use cases beyond 2030—work on the new Supplement G.Suppl.ION-aiBB (Use cases and requirements of AI enhanced ION-2030 for broadband) has been initiated to study artificial intelligence (AI)-enhanced broadband-access use cases and requirements.

In Question 3, discussions focus on transmission technologies mainly for in-building and in-premises networks, as well as communication for smart-grid applications. At the second plenary meeting, five recommendations—Recommendation G.9930 Amendment 2, Recommendation G.9943, Recommendation G.9949, Recommendation G.9949 Amendment 1, and Recommendation G.9975 [4–7]—were approved, and three supplements related to in-home optical fiber communication technologies—Supplement G.Suppl.89, Supplement G.Suppl.90, and Supplement G.Suppl.91 [8–10]—were agreed and published.

3. Topics in WP2/SG15

In Question 5, which is responsible for optical fiber and cable characteristics, discussions are progressing on new recommendations for multi-core optical fibers, which contain multiple optical paths within a single cladding, on the basis of contributions from Japan. It has been agreed to consider multi-core fibers with the same cladding diameter as existing single-mode fibers (SMFs) (i.e., standard-cladding diameter). At the second plenary meeting, work on new recommendations on two types of standard-cladding diameter multi-core fibers, Recommendation G.smmcf and Recommendation G.csmcf, featuring optical compatibility with conventional SMF and low-loss cutoff-shifted fiber was approved. It was also agreed that these new recommendations will target 2-core and 4-core structures.

Proposals on information and technical properties for hollow-core fibers, in which light is guided through air, have been active. Questions 2, 5, and 6 (the latter covering terrestrial optical transmission system interfaces) will jointly discuss future study directions of hollow-core fiber.

Optical fiber sensing technology using optical networks is being discussed in Questions 2, 6, and 8 (which handles submarine optical transmission system standards). In Question 6, ITU-T approved and established Recommendation G.681 [11], the first recommendation specifying optical-interface requirements for distributed fiber-optic sensing (DFOS) in terrestrial optical transmission networks. Future discussions will explore practical application scenarios for DFOS.

Question 8 is considering sensing systems using submarine optical cable. Recommendation G.9730.1 (for sensing-dedicated submarine systems) and Recommendation G.9730.2 (for combined communication-and-sensing systems) have already been approved. Work continues on developing Recommendation G.9730, a new recommendation summarizing general considerations for submarine-cable-based sensing.

In Question 7, which covers maintenance, operation, and connectivity of optical physical infrastructures, interest is growing in applying DFOS to outdoor optical-facilities maintenance and inspection. For example, considering the use of DFOS for remote monitoring after disasters, the revised Recommendation L.391 (Monitoring systems for outside plant facilities) [12] was consented. To incorporate DFOS into Recommendation L.302 (Optical fibre outside plant maintenance support, monitoring and testing system), a new revision effort has begun.

4. Summary

As described above, active discussions are ongoing in ITU-T SG15 WP1 and WP2 regarding technologies for higher-speed and higher-performance optical access networks as well as new optical fiber technologies and optical sensing applications. Further progress is expected. The third plenary meeting of ITU-T SG15 is scheduled to be held in Montreal, Canada, from 29 June to 11 July 2026, together with a joint workshop with IEEE (Institute of Electrical and Electronics Engineers) 802.3 Ethernet.

References

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