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| **Title:** | LS/i on potential merger of Q4/9 into Q2/15 [from ITU-T SG15] |
| **LIAISON STATEMENT** |
| **For action to:** | - |
| **For information to:** | TSAG |
| **Approval:** | ITU-T SG15 meeting (Montreal, 12 July 2024) |
| **Deadline:** | - |
| **Contact:** | Frank EffenbergerFuturewei TechnologiesUSA | E-mail: feffenbe@futurewei.com  |

A new liaison statement has been received from SG15.

This liaison statement follows and the original file can be downloaded from the ITU ftp server at <http://handle.itu.int/11.1002/ls/sp17-sg15-oLS-00119.docx>.

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|  | INTERNATIONAL TELECOMMUNICATION UNION**TELECOMMUNICATIONSTANDARDIZATION SECTOR**STUDY PERIOD 2022-2024 | **SG15-LS119** |
| **STUDY GROUP 15** |
| **Original: English** |
| **Question(s):** | 2/15 | Montreal, Canada, 1-12 July 2024 |
| **LS** |
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| **Title:** | LS on potential merger of Q4/9 into Q2/15 |
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| **Abstract:** | This is a liaison to suggest the inclusion of Q4/9 into the work of Q2/15.  |

Currently, there is a move to merge SG9 into SG16, as described in TSAG-RGWPR-DOC1 (240619). The two study groups share a great deal of commonality, and so this merger is a good optimization. However, there is Q4/9 that specializes on the transmission of multi-channel TV signals over fibre access networks. This appears to be a bit far afield from the main work of SG16. Q4/9 would appear to be a better fit with Q2/15 Optical systems for fibre access systems. Indeed, in most deployed systems that use J.186 also support PON systems such as G.983 and G.984 through sharing the access fibre plant. If the two questions could work together, then their outputs could be better harmonized.

Therefore, we would like to suggest that the work of Q4/9 be merged into Q2/15. A modified copy of the Q2/15 text is given in the annex below as a suggestion of how this could be done. If there are other views, we are open to discussing them.

Annex: Proposed modification of Q2/15’s terms of reference.

## A Question 2/15 – Optical systems for fibre access networks

(Continuation of Question 2/15 and part of Question 1/15 and Question 4/9)

### A.1 Motivation

Recommendations for point-to-point and point-to-multi point optical access systems, such as the G-PON (G.984 series), XG-PON (G.987 series), XGS-PON (G.9807 series), and NG-PON2 (G.989 series), have allowed telecommunications manufacturers to develop inter-operable optical access equipment, by which Fibre To The X (FTTx) has become reality. Practical experience with the design and deployment will necessitate revision of these Recommendations to include, for example, enhanced services, better interoperability, higher split ratios, longer reach, and increased capacity.

Fibre networks can be brought closer to users' premises than hybrid fibre-coaxial (HFC) networks, although HFC is still widely used in developed countries and expected to be used in some developing countries as the primary cable access infrastructure. Fibre technology enables transmission of multichannel digital television signals in the form of RF as in the HFC networks. It can also provide high capacity (10Gbps or more) in the forward and return channel in the form of high-speed digital signals such as IP, which is required for the provision of typical cable television services, including interactive ones. Although several Recommendations on optical access networks have been developed to transmit high quality television signals, further study on the interworking and interfaces between digital video systems and fibre networks is needed.

To provide new features in optical access, such as wavelength division multiple access (WDMA) and hybrid xDMA/yDMA systems, will necessitate the development of new Recommendations.

Fibre access systems need to support a range of service capabilities at the edge. Wireless, wireline and fibre (e.g., G.65x and Plastic Optical Fibre (POF)) will be needed. Economies of scale are needed for fibre access deployment to become prevalent as a mass-market solution. Demand will be driven by factors such as: the ability to carry interactive and broadcast services (e.g. residential video, HDTV, AR, VR), managed bandwidth to multiple Internet Service Providers (ISPs), together with higher quality of service and improved resilience. Solutions are required for a wide range of market segments and situations including: business, small-to-medium-enterprise, small-office-home-office, residential, mobile backhaul and fronthaul, as well as green field and network upgrade.

To support current and/or future wireless/mobile services, optical access systems are expected to provide flexible broadband communication channels for plural base stations/remote units in some cases, and to support digital and/or analogue transmission of Radio Frequency signals for remote base stations/remote units in some other cases. Optical access systems are also expected to coordinate with external systems. This is to facilitate end-to-end service provisioning. Necessary information exchange between an optical access system and an external system should be considered to improve network performance. Such coordination and control are key to low-latency services in the IMT-2020/5G era.

The various optical access technologies are expected to serve a wider range of networking applications that are not access networks. In these new application areas, fibre technology brings many advantages compared to current means. By the same token, these new applications can present new requirements for the technology, such as revised loss budgets, fibre reach, topology, and media access control. Coordination with relevant other groups (e.g., Q3/15) and joint projects can help to leverage the existing technology for these new applications. Demand for dedicated GbE, 10GbE, and higher-speed Ethernet services initially to business users is increasing. New techniques are needed to increase performance and reduce costs for both dedicated and shared bearer services. Both access and metro networks should be considered when offering such access services, because currently, access nodes are sometimes bypassed to minimize overall network cost. Both Point-to-point and point-to-multi-point solutions will be considered.

Integration of all services onto a single backhaul fibre network is an important economic consideration for network operators.

To be successful, Q2/15 needs to harmonize with other bodies which have a strong optical access industry role, such as IEEE and IEC. The following major Recommendations in force fall under its responsibility: G.981, G.982, G.983 series, G.984 series, G.985, G.986, G.987 series, G.988, G.989 series, G.9801, G.9802, G.9803, G.9804 series, G.9805, G.9806, G.9807 series, J.185, and J.186.

### A.2 Questions

– What new architectures, technologies and protocols are needed to:

 Enable next generation PON architecture and technology to offer broader bandwidth as well as improved services and economics in optical access networks?

 Integrate access and metro/backhaul networks into one seamless optical access and aggregation networks?

 Allow individual customers on a live legacy PON to be upgraded to higher capacity next generation systems without impacting on other users' traffic?

 Allow systems to evolve to higher split ratios physically and logically in optical access networks?

 Improve resiliency in optical access networks?

 Serve a mixture of optical, copper and radio (broadband) final customer connections to the same optical access system, with simplified remote electronics?

 Support digital and/or analogue transmission of radio frequency signals for current and future wireless/mobile services?

 Coordinate optical access systems and external systems in an end-to-end fashion for low-latency services?

 Support non-access applications of optical access technology through coordination with or joint projects with other groups?

– What enhancements to existing Recommendations are needed to improve interoperability between optical network unit (ONU) and optical line terminal (OLT)?

– What new or enhancements to existing Recommendations are needed to:

 Provide energy savings directly or indirectly in Information and Communication Technologies (ICTs) or in other industries?

 Realize mobile fronthaul/backhaul with optical access technologies?

 optical access network systems and services in the concept of software define network (SDN) / network function virtualization (NFV)?

 Secure information transmission over optical access systems?

* Distribute quantum information over optical access systems?
* Support distributed fibre optic sensing over access systems?

– Study items to be considered include, but are not limited to:

 Next generation PON architecture and technology.

 New long-reach access system(s) for access/metro-integrated applications based on WDM access and/or enhanced TDM access technologies.

 How to specify ONUs for the consumer market?

 Impact of new component technology on optical access networks.

 How to ensure the optical systems contribute to the end-end QoS for packet services?

 How to ensure the maximum service capability for Ethernet and wireless local area network (WLAN) edge networks?

 How to provide for multimedia and low-latency services?

 Interoperability and physical interconnect conformance.

 The definition of access demarcation point, in the light of consumer-owned optical network terminations.

 Modulation schemes over fibre access.

 What is the service capacity and requirements outlook for access?

 How to ensure efficient inter-connection between fibre access systems and other technologies?

 How to manage wavelength channels in optical access?

 How to provide coexistence and migration of generations of optical access systems

 How to improve energy savings?

 How to mitigate rogue ONUs?

 How to coordinate with external systems and provide end-to-end services?

* Which mechanisms can be used to transport multichannel digital television signals over fibre networks and hybrid fibre–coaxial (HFC), in view of the high loss of optical splitters used for PON (passive optical networks)?
* Which mechanisms can be used to ensure the low composite distortion and high carrier-to-noise ratio (CNR) that are required for frequency division multiplex (FDM) transport of digital television signals over fibre networks?
* Which mechanism can be used to transport multichannel digital television signals over fibre networks in the form of a high-speed digital communication link or IP packets?
* Which mechanism can be used to compensate the jitter arising from transporting over asynchronous communication links over fibre networks?
* Which mechanism can be used to compensate the packet loss arising from transporting over best effort communication links over fibre networks?
* Which mechanism or interface can be used between content providers, core networks and optical access networks/HFC?
* Which mechanism can be used to control access to the traffic in term of traffic management and security?
* How ITU-T SG9 can support developing countries to deploy digital television services on optical fibres and HFC, taking into account their limited resources as well as other specific needs?

### A.3 Tasks

Tasks include, but are not limited to:

– Maintenance and enhancements of G.981, G.982, G.983 series, G.984 series, G.985, G.986, G.987 series, G.988, G.989 series, G.9801, G.9802, G.9803, G.9804 series, G.9805, G.9806, G.9807 series, J.185, and J.186 Recommendations and associated Supplements with regard to capacity, interoperability, management and control interfaces, survivability, spectral management, split ratios or other requirements

– Draft one or more new Recommendation series to describe the next generations of optical access systems

– Liaison and co-work with other groups to explore new applications of optical access systems

– Maintain the Access Network Transport (ANT) standards overview, including liaison to all relevant groups.

– Publish useful information (e.g. Reports, Surveys, Supplements, Guidelines or Handbooks) to support the deployment of broadband services on optical fibres and HFC in developing countries.

An up-to-date status of work under this Question is contained in the SG15 work programme (<https://www.itu.int/ITU-T/workprog/wp_search.aspx?sp=17&q=2/15>).

### A.4 Relationships

Recommendations:

– None.

Questions:

– All Questions in SG15.

Study Groups:

– ITU-T SG2 on management aspects

– ITU-T SG5 on energy consumption and efficiency

– ITU-T SG9 on television and sound transmission

– ITU-T SG12 on QoS and QoE

– ITU -T SG13 on Multi-Protocol Label Switching (MPLS) layer characteristics

– ITU-T SG16 on multimedia

– ITU-T SG17 on security

– ITU-D SG1 on enabling connectivity– ITU-D SG2 on digital transformation

– ITU-R SG1 on spectrum management

– ITU-R SG5 on terrestrial services

– ITU-R SG6 on broadcasting services

Other bodies:

– IEC TC86 and its sub-committees on devices and other topics

– Broadband Forum on network architectures, fibre access, and management

– IETF on MIB

– IEEE 802 on optical access systems, Ethernet and WLAN

– IEEE 1904.1 on service interoperability in ethernet passive optical networks

– ATIS Committee STEP

– O-RAN Alliance WG4

– ETSI TC ATTM

– ETSI ISG F5G

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