

Recommendation

ITU-T G.9941 (07/2024)

SERIES G: Transmission systems and media, digital systems and networks

Access networks – In premises networks

High speed fibre-based in-premises transceivers – physical layer specification

ITU-T G-SERIES RECOMMENDATIONS
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Recommendation ITU-T G.9941

High speed fibre-based in-premises transceivers – physical layer specification

Summary

Recommendation ITU-T G.9941 belongs to the family of ITU-T G.fin Recommendations. Recommendation ITU-T G.9941 specifies the physical layer for high speed fibre-based in-premises (G.fin) transceivers for in-home and small and medium enterprise (SME) applications.

History *

Edition	Recommendation	Approval	Study Group	Unique ID
1.0	ITU-T G.9941	2024-07-12	15	11.1002/1000/15799

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Recommendation ITU-T G.9941

High speed fibre-based in-premises transceivers – physical layer specification

1 Scope

This Recommendation specifies the physical layer (PHY) for high speed fibre-based in-premises (G.fin) transceivers operating at 2.5 Gbit/s for in-home and small and medium enterprise (SME) applications.

NOTE – 2.5G is the name used throughout this Recommendation for the nominal line rate of 2.48832 Gbit/s (see Table 7-4).

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- [ITU-T G.652] Recommendation ITU-T G.652 (2024), *Characteristics of a single-mode optical fibre cable*.
- [ITU-T G.657] Recommendation ITU-T G.657 (2024), *Characteristics of a bending-loss insensitive single-mode optical fibre and cable*.
- [ITU-T G.9940] Recommendation ITU-T G.9940 (2023), *High speed fibre-based in-premises transceivers – system architecture*.
- [ITU-T G.9942] Recommendation ITU-T G.9942 (2024), *High speed fibre-based in-premises transceivers – Data link layer*.
- [ITU-T I.432.1] Recommendation ITU-T I.432.1 (1999), *B-ISDN user-network interface – Physical layer specification: General characteristics*.
- [ITU-T L.66] Recommendation ITU-T L.313/L.66 (2007), *Optical fibre cable maintenance criteria for in-service fibre testing in access networks*.

3 Definitions

See clause 3.2 of [ITU-T G.9940].

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

BER	Bit Error Ratio
BIP	Bit-Interleaved Parity
CDU	Control Data Unit
CRC	Cyclic Redundancy Check
DLL	Data Link Layer
DTRu	Dynamic Time-assignment Report upstream

F-PLOAM	FIN-Physical Layer Operation and Management
FEC	Forward Error Correction
FEM	Fibre Encapsulation Methodology
FIN	Fibre in-premises Network
IFDN	Indoor Fibre Distribution Network
M-FTR	G.fin transceiver in the MFU
MAC	Medium/media Access Control
MDI	Medium Dependent Interface
MFU	Main Fibre Unit
MPDU	MAC Protocol Data Unit
NRZ	Non-Return to Zero
ORL	Optical Return Loss
PCS	Physical Coding Sublayer
PHY	Physical Layer
PLOu	Upstream Physical Layer Overhead
PMA	Physical Medium Attachment
PMD	Physical Medium Dependent
PMI	Physical Medium-independent Interface
RDI	Remote Defect Indication
RX	Receiver
S-FTR	G.fin transceiver in the SFU
SFU	Sub Fibre Unit
SME	Small and Medium Enterprise
T-CONT	Transmission Container
TAmapping	Time Assignment map
TDM	Time Division Multiplexing
TRx	Transceiver
TX	Transmitter
WDM	Wavelength Division Multiplexing

5 Conventions

5.1 Bit and byte order

Throughout this Recommendation, the transmission order of all fields will be the most significant bit first. For example, the number $F0_{16}$ indicates the sequence beginning with one, and ending with zero.

6 Architecture of the G.fin network

The architecture of a G.fin network is specified in clause 6.2 of [ITU-T G.9940]. A G.fin transceiver (TRx) consists of a data link layer (DLL) as specified in [ITU-T G.9942] and a physical layer (PHY)

as specified in this Recommendation. The corresponding reference protocol stack is specified in clause 6.3 of [ITU-T G.9940].

7 Physical layer specification

7.1 Functional model of the PHY

The functional model of the PHY is shown in Figure 7-1.

In the transmit direction, data enters the PHY from the medium/media access control (MAC) sublayer of the DLL via the physical medium-independent interface (PMI) in the form of MAC protocol data units (MPDUs). The incoming MPDU is mapped into a physical coding sublayer (PCS) frame in the PCS, scrambled and encoded in the physical medium attachment (PMA) sublayer, modulated in the physical medium dependent (PMD) sublayer, and transmitted over the fibre with relevant parameters. In the PMD, electrical to optical conversion is performed.

In the receive direction, frames entering from the medium via the medium dependent interface (MDI) are demodulated and decoded. The recovered MPDUs are forwarded to the DLL via the PMI. The recovered PHY-frame headers are processed in the PHY to extract the relevant framing parameters.

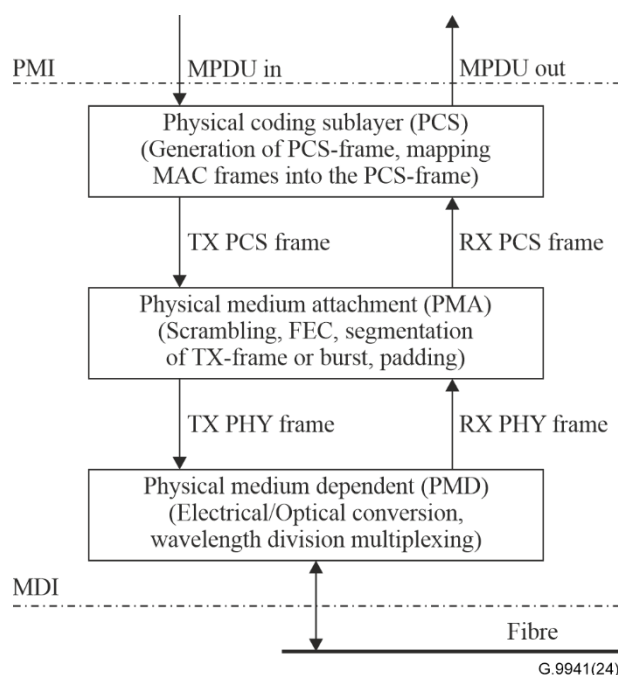


Figure 7-1 – Functional model of the G.fin PHY

7.1.1 Physical coding sublayer (PCS)

The functional model of the PCS is shown in Figure 7-2.