International Telecommunication Union

ITU-T
TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

G.959.1
Amendment 1
(04/2011)

SERIES G: TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS

Digital sections and digital line system – Digital line systems

Optical transport network physical layer interfaces
Amendment 1

Recommendation ITU-T G.959.1 (2009) – Amendment 1

ITU-T G-SERIES RECOMMENDATIONS

TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS

For further details, please refer to the list of ITU-T Recommendations.

Recommendation ITU-T G.959.1

Optical transport network physical layer interfaces

Amendment 1

Summary

Amendment 1 to Recommendation ITU-T G.959.1 (2009) contains modifications to add new applications P1I1-3D3 and P1I1-3D5, clarify Table 5-5 with regard to applications moved to Recommendation ITU-T G.693 and to add a note to Table 8-5 to explain the split columns in application 4I1-9D1F.

History

Edition	Recommendation	Approval	Study Group
1.0	ITU-T G.959.1	2001-02-09	15
2.0	ITU-T G.959.1	2003-12-14	15
3.0	ITU-T G.959.1	2006-03-29	15
4.0	ITU-T G.959.1	2008-03-29	15
5.0	ITU-T G.959.1	2009-11-13	15
5.1	ITU-T G.959.1 (2009) Amend. 1	2011-04-13	15

FOREWORD

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The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure, e.g., interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

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As of the date of approval of this Recommendation, ITU had received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at http://www.itu.int/ITU-T/ipr/.

Recommendation ITU-T G.959.1

Optical transport network physical layer interfaces

Amendment 1

1)   Clause 5.5

Modify Table 5-5 as follows:

**Table 5-5 – Classification of single-channel inter-domain interfaces
for intra-office applications**

Application	Intra-office (I)					
Source nominal wavelength (nm)	1310		1550			
Type of fibre	G.652		G.652		G.653	G.655
Optical tributary signal class NRZ 2.5G	–	P1I1-1D1	–	–	–	–
Target distance for class NRZ 2.5G (km) (Note 1)	–	2	–	–	–	–
Parameters given in:	–	Table 8-6	–	–	–	–
Optical tributary signal class NRZ 10G	P1I1-2D1r	P1I1-2D1	P1I1-2D2r	P1I1-2D2	P1I1-2D3	P1I1-2D5
Target distance for class NRZ 10G (km) (Note 1)	0.6	2	2	25	25	25
Parameters given in:	[ITU-T G.693] (Note 2)	[ITU-T G.693] (Note 2)	[ITU-T G.693] (Note 2)	Table 8-9	Table 8-9	Table 8-9
As code:	VSR600-2R1	VSR2000-2R1	VSR2000-2L2			
Optical tributary signal class NRZ 40G	–	P1I1-3D1 1I1-3D1F			P1I1-3D3	P1I1-3D5
Target distance for class NRZ 40G (km) (Note 1)	–	10			10	5 (Note 3)
Parameters given in:	–	Table 8-15			Table 8-15	Table 8-15

NOTE 1 – These target distances are for classification and not for specification.

NOTE 2 – These applications (which were specified in a previous version of this Recommendation) are now contained in [ITU-T G.693].

NOTE 3 – This is for ITU-T G.655.D fibre. If ITU-T G.655.E fibre is used, then the target distance is reduced.

2) Clause 8.1

Modify Table 8-5 as follows:

Table 8-5 – Multichannel IrDI parameters and values for optical tributary signal class NRZ 25G applications

Parameter	Units	4I1-9D1F	4L1-9C1F
General information			
Maximum number of channels	–	4	4
Bit rate/line coding of optical tributary signals	–	OTL4.4	OTL4.4
Maximum bit error ratio	–	10^{-12} (Note 1)	10^{-12} (Note 1)
Fibre type	–	G.652	G.652
Interface at point MPI-S$_M$			
Maximum mean channel output power	dBm	4.5	2.9
Minimum channel extinction ratio (Note 2)	dB	4 $\mid$ 8	8
Minimum mean channel output power (Note 2)	dBm	−0.6 $\mid$ −2.9	−2.7
Maximum mean total output power	dBm	10.5	8.9
Maximum channel power difference	dB	5	3.6
Central frequency	THz	229.0 + 0.8 m, m = 0 to 3	229.0 + 0.8 m, m = 0 to 3
Channel spacing	GHz	800	800
Maximum spectral excursion	GHz	±184	±184
Eye mask	–	NRZ 25G Ratio	NRZ 25G Ratio
Optical path (single span) from point MPI-S$_M$ to MPI-R$_M$			
Maximum attenuation	dB	6.3	18
Minimum attenuation	dB	0	0
Maximum chromatic dispersion at upper wavelength limit	ps/nm	−28.5 to +9.5	−114 to +38
Maximum chromatic dispersion at lower wavelength limit	ps/nm	−28.5 to +9.5	−114 to +38
Minimum optical return loss at MPI-S$_M$	dB	20	20
Maximum discrete reflectance between MPI-S$_M$ and MPI-R$_M$	dB	−26	−26
Maximum differential group delay	ps	8	10.3
Interface at point MPI-R$_M$			
Maximum mean channel input power	dBm	4.5	4.5
Minimum mean channel input power (Note 2)	dBm	−6.9 $\mid$ −9.2	−20.7
Maximum mean total input power	dBm	10.5	10.5
Maximum channel power difference	dB	5.5	4.5
Maximum optical path penalty	dB	1.5	2.5
Minimum equivalent sensitivity (Note 2)	dBm	−8.4 $\mid$ −10.7	−23.2
Maximum reflectance of optical network element	dB	−26	−26

**Table 8-5 – Multichannel IrDI parameters and values for
optical tributary signal class NRZ 25G applications**

NOTE 1 – The BER for these application codes is required to be met only after the error correction (if used) has been applied. The BER at the input of the FEC decoder can therefore be significantly higher than 10^{-12}.

NOTE 2 – The parameters for 4I1-9D1F allow two options for the transmitter (shown via a split in the column) with different values for "Minimum channel extinction ratio" and "Minimum mean channel output power". The two sets of transmitter parameter values provide different values for "Minimum mean channel input power" and "Minimum equivalent sensitivity" for the same physical receiver as indicated by the split values for these parameters.

3)   **Clause 8.2**

Modify Table 8-15 as follows:

**Table 8-15 – Single-channel IrDI parameters and values for
optical tributary signal class NRZ 40G intra-office applications**

Parameter	Units	P1I1-3D1	1I1-3D1F	P1I1-3D3	P1I1-3D5
General information					
Maximum number of channels	–	1	1	1	1
Bit rate/line coding of optical tributary signals	–	NRZ 40G	NRZ OTU3 FEC enabled	NRZ 40G	NRZ 40G
Maximum bit error ratio	–	10^{-12}	10^{-12} (Note 1)	10^{-12}	10^{-12}
Fibre type	–	G.652	G.652	G.653	G.655.D (Note 2)
Interface at point MPI-S					
Operating wavelength range	nm	1307-1317	1307-1317	1530-1565	1530-1565
Source type	–	SLM	SLM	SLM	SLM
Maximum spectral power density	mW/ 10 MHz	FFS	FFS	FFS	FFS
Minimum side mode suppression ratio	dB	35	35	35	35
Maximum mean output power	dBm	+4	+4	+3	+3
Minimum mean output power	dBm	0	0	0	0
Minimum extinction ratio	dB	8.2	8.2	8.2	8.2
Eye mask	–	NRZ 40G	NRZ 40G	NRZ 40G	NRZ 40G
Optical path from point MPI-S to MPI-R					
Maximum attenuation	dB	6	6	5	4
Minimum attenuation	dB	0	0	0	0
Maximum chromatic dispersion at upper wavelength limit	ps/nm	±16	±16	±33	33
Maximum chromatic dispersion at lower wavelength limit	ps/nm	±16	±16	±33	33
Minimum optical return loss at MPI-S	dB	24	24	24	24
Maximum discrete reflectance between MPI-S and MPI-R	dB	−27	−27	−27	−27
Maximum differential group delay	ps	7.5	7.5	7.5	7.5

**Table 8-15 – Single-channel IrDI parameters and values for
optical tributary signal class NRZ 40G intra-office applications**

Parameter	Units	P1I1-3D1	1I1-3D1F	P1I1-3D3	P1I1-3D5
Interface at point MPI-R					
Maximum mean input power	dBm	+4	+4	+3	+3
Minimum sensitivity	dBm	−7	−7	−7	−6
Maximum optical path penalty	dB	1	1	2	2
Maximum reflectance of optical network element	dB	−27	−27	−27	−27
NOTE 1 – The BER for these application codes is required to be met only after the error correction (if used) has been applied. The BER at the input of the FEC decoder can therefore be significantly higher than 10^{-12}. NOTE 2 – If ITU-T G.655.E fibre is used, then the target distance is reduced.					

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