

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

G.651.1
Amendment 1
(12/2008)

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

Transmission media and optical systems characteristics –
Optical fibre cables

Characteristics of a 50/125 μm multimode graded
index optical fibre cable for the optical access
network

**Amendment 1: New Appendix I – Historical
perspective on the evolution of the specification
of multimode optical fibre cable**

Recommendation ITU-T G.651.1 (2007) –
Amendment 1

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Recommendation ITU-T G.651.1

Characteristics of a 50/125 μm multimode graded index optical fibre cable for the optical access network

Amendment 1

New Appendix I – Historical perspective on the evolution of the specification of multimode optical fibre cable

Summary

Amendment 1 to Recommendation ITU-T G.651.1 provides background information on the evolution of the specification of multimode optical fibre cable in ITU-T Recommendations.

Source

Amendment 1 to Recommendation ITU-T G.651.1 (2007) was agreed on 12 December 2008 by ITU-T Study Group 15 (2009-2012).

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications, information and communication technologies (ICTs). The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

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.

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Recommendation ITU-T G.651.1

Characteristics of a 50/125 μm multimode graded index optical fibre cable for the optical access network

Amendment 1

New Appendix I – Historical perspective on the evolution of the specification of multimode optical fibre cable

Recommendation ITU-T G.651 "Characteristics of a 50/125 μm multimode graded index optical fibre cable"

Recommendation ITU-T G.651, originally published in 1980, covered the geometrical and transmissive properties of multimode fibres having a 50 μm nominal core diameter and a 125 μm nominal cladding diameter. Test methods and the meanings of the terms used were in the text.

That Recommendation, which had not been significantly changed from the original in the four subsequent editions through 1998, was developed during the infancy of optical fibre solutions for publicly switched networks. At that time (pre-1984), these fibres were considered as the only practical solution for transmission distances in the 10's of kilometres and bit-rates of up to 40 Mbit/s. Single-mode ITU-T G.652 fibres, which became available shortly after the publication of Recommendation ITU-T G.651, have almost completely replaced multimode fibres in the public switched networks.

Today, multimode fibres continue to be widely used in premises cabling applications such as Ethernet in lengths from 300 to 2000 m, depending on bit rate. With a change in the applications, the multimode fibre definitions, requirements, and measurements evolved away from the original Recommendation ITU-T G.651 in some ways and were maintained or improved in others.

The transmission characteristics from this Recommendation have also been moved to the modern equivalent, Recommendation ITU-T G.651.1. A complete documentation for the modern requirements is found in [IEC 60793-2-10].

The contents of Recommendation ITU-T G.651 included the early parameter definitions for glass geometry, numerical aperture, attenuation and baseband response (the combination of modal bandwidth and chromatic dispersion). Some limits on these parameters were also given. Formulas for the attenuation and bandwidth of installed links comprised of concatenations of cables were given. Measurement methods for the parameters were described.

Some differences between Recommendation ITU-T G.651 and the modern requirements include:

- i) the core diameter is defined in terms of the near field profile, rather than the refractive index profile;
- ii) parameters such as core/cladding tolerance field and intrinsic quality factor are no longer used;
- iii) the proof-test stress is now twice what it was;
- iv) bandwidth limits were then 200 MHz · km, where as now limits can be as large as 2000 MHz · km.

With the acceptance of more modern and more tightly specified Recommendation ITU-T G.651.1 in 2007, the old Recommendation ITU-T G.651 was felt to be obsolete, and therefore was withdrawn in February 2008. This appendix indicates some background information about the old Recommendation ITU-T G.651.

Table I.1 – Fibre characteristics of the withdrawn Recommendation ITU-T G.651

Attribute	Detail	Value
Cladding diameter	Nominal	125 μm
	Tolerance	$\pm 3 \mu\text{m}$
Core diameter	Nominal	50 μm
	Tolerance	$\pm 3 \mu\text{m}$
Core-cladding concentricity error	Maximum	6%
Core non-circularity	Maximum	6%
Cladding non-circularity	Maximum	2%
Numerical aperture	Nominal	0.20 or 0.23
	Tolerance	± 0.02
Proof stress	Minimum	0.35 GPa
Modal bandwidth-length product for overfilled launch	Minimum at 850 nm	200 MHz · km
	Minimum at 1300 nm	200 MHz · km
Chromatic dispersion coefficient	Typical at 850 nm	$\leq 120 \text{ ps}/(\text{nm} \cdot \text{km})$
	Typical at 1300 nm	$\leq 6 \text{ ps}/(\text{nm} \cdot \text{km})$
Cable attributes		
Attribute	Detail	Value
Attenuation coefficient	Maximum at 850 nm	4 dB/km
	Maximum at 1300 nm	2 dB/km

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