INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

G.694.2

(12/2003)

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

Transmission media characteristics – Characteristics of optical components and subsystems

Spectral grids for WDM applications: CWDM wavelength grid

ITU-T Recommendation G.694.2

CYTEK V. BECKMAN
IPR2025-01319
BECKMAN 2032

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ITU-T Recommendation G.694.2

Spectral grids for WDM applications: CWDM wavelength grid

Summary

This Recommendation provides the wavelength grid for coarse wavelength division multiplexing (CWDM) applications. This wavelength grid supports a channel spacing of 20 nm.

The wavelength grid in this version of this Recommendation has been moved by 1 nm to align it with current industry practice while maintaining symmetrical nominal central wavelength deviations.

Source

ITU-T Recommendation G.694.2 was approved on 14 December 2003 by ITU-T Study Group 15 (2001-2004) under the ITU-T Recommendation A.8 procedure.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications. 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.

NOTE

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

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ITU-T Recommendation G.694.2

Spectral grids for WDM applications: CWDM wavelength grid

1 Scope

The purpose of this Recommendation is to provide the definition of a wavelength grid to support coarse wavelength division multiplexing (CWDM) applications. This grid is designed to allow simultaneous transmission of several wavelengths with sufficient separation to permit the use of uncooled sources.

2 References

2.1 Normative 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.

[1] ITU-T Recommendation G.671 (2002), *Transmission characteristics of optical components and subsystems*.

2.2 Informative references

The following ITU-T Recommendations contain other relevant information.

[2] ITU-T Recommendation G.983.3 (2001), *A broadband optical access system with increased service capability by wavelength allocation*.

[3] ITU-T Recommendation J.185 (2002), *Transmission equipment for transferring multi-channel television signals over optical access networks by FM conversion*.

[4] ITU-T Recommendation J.186 (2002), *Transmission equipment for multi-channel television signals over optical access networks by sub-carrier multiplexing (SCM)*.

3 Definitions

3.1 Terms defined in this Recommendation

This Recommendation defines the following term:

3.1.1 wavelength grid: A wavelength grid is a reference set of vacuum optical wavelengths used to denote allowed nominal central wavelengths that may be used in defining applications.

3.2 Terms defined in other Recommendations

This Recommendation uses terms defined in ITU-T Rec. G.671:

– Coarse Wavelength Division Multiplexing (CWDM).

– Dense Wavelength Division Multiplexing (DWDM).

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations:

CWDM Coarse Wavelength Division Multiplexing

DWDM Dense Wavelength Division Multiplexing

WDM Wavelength Division Multiplexing

5 Coarse WDM and its applications

Coarse Wavelength Division Multiplexing (CWDM), a WDM technology, is characterized by wider channel spacing than Dense WDM (DWDM) as defined in ITU-T Rec. G.671. CWDM systems can realize cost-effective applications, through a combination of uncooled lasers, relaxed laser wavelength selection tolerances and wide passband filters.

CWDM systems can be used in transport networks in metropolitan areas for a variety of clients, services and protocols.

Appendix I provides an explanation of the rationale for choosing the central wavelength spacing and the determining factors of the wavelength variation.

6 Nominal central wavelengths for coarse WDM systems

The nominal central wavelengths for coarse WDM systems are used as a reference to define, for each channel used, an upper wavelength bound and a lower wavelength bound. These bounds define limits for the wavelength of the transmitter under all conditions and at the same time the wavelength limits over which the specifications of the optical multiplexers and demultiplexers must be met.

The upper wavelength bound is the central wavelength of the channel plus the central wavelength deviation found in the Recommendation defining the application.

The lower wavelength bound is the central wavelength of the channel minus the central wavelength deviation found in the Recommendation defining the application.

The CWDM grid wavelengths within the range 1271 nm to 1611 nm are shown in Table 1. The value of "c" (speed of light in vacuum) that should be used for converting between wavelength and frequency is 2.99792458×10^8 m/s.

Table 1/G.694.2 – Nominal central wavelengths

Nominal central wavelengths (nm) for spacing of 20 nm
1271
1291
1311
1331
1351
1371
1391
1411
1431
1451
1471
1491
1511
1531
1551
1571
1591
1611
NOTE – The endpoints of this table are illustrative only.

Appendix I

Central wavelength spacing and wavelength variation

Effective CWDM realizations with uncooled lasers and wide passband filters require a nominal central wavelength spacing of not less than 20 nm. Total source wavelength variation of the order of ±6-7 nm is expected to be compatible with current filter technologies. As for the guardband, one third of the minimum channel spacing is sufficient. Therefore, in order to maximize the number of channels, 20 nm has been chosen.

Specific values and allocations of this variation will be defined in individual applications.

The wavelength variation is determined by mainly two factors. First, the laser manufacturer is allowed a wavelength variation around the nominal wavelength in order to achieve a higher yield and/or relax fabrication tolerances. Second, the use of uncooled lasers will cause the wavelength to change with temperature within the specified temperature range of the laser.

Appendix II

Wavelength allocation

ITU-T Rec. G.983.3 (March 2001) defines the wavelength allocation for video distribution signals multiplexed with B-PON. ITU-T Recs J.185 and J.186 (February 2002) define the wavelength allocation for transferring multi-channel television signals.

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Geneva, 2004