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

Transmission media characteristics – Submarine cables

Co-location longitudinally compatible interfaces for free space optical systems

ITU-T Recommendation G.640



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ITU-T Recommendation G.640

Co-location longitudinally compatible interfaces for free space optical systems

Summary

This Recommendation provides a procedure for establishing that two co-located Free Space Optical (FSO) transmission systems will not interfere with each other. Calculations of the conditions required to be met to prevent interference in some examples of co-located FSO systems are also included.

Source

ITU-T Recommendation G.640 was approved on 29 March 2006 by ITU-T Study Group 15 (2005-2008) under the ITU-T Recommendation A.8 procedure.

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.

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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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ITU-T Recommendation G.640

Co-location longitudinally compatible interfaces for free space optical systems

1 Scope

This Recommendation defines optical interfaces for "co-location longitudinally compatible" free space optical transmission systems thereby enabling interference-free coexistence of more than one point-to-point free space optical system at a location.

This Recommendation also includes definitions of parameters that are relevant for the characterization of free space optical systems.

Free space optical systems are commonly referred to as "FSO" systems.

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.

- ITU-T Recommendation G.957 (2006), *Optical interfaces for equipments and systems relating to the synchronous digital hierarchy*.
- IEC 60825-1 (2001), *Safety of laser products – Part 1: Equipment classification, requirements and user's guide*.
- IEC 60825-2 (2005), *Safety of laser products – Part 2: Safety of optical fibre communication systems (OFCS)*.
- IEC 60825-12 (2005), *Safety of laser products – Part 12: Safety of free space optical communication systems used for transmission of information*.

2.2 Informative references

- ITU-T G-series Recommendations – Supplement 39 (2006), *Optical system design and engineering considerations*.

3 Terms and definitions

3.1 Definitions

This Recommendation defines the following terms:

3.1.1 acceptance angle: The acceptance angle (of an FSO receiver) is the angle between the lines at which the power detected by the receiver falls to $1/e^2$. This parameter is also called the Field of View (FOV) of an FSO receiver and is commonly defined to be where the power density falls to $1/e^2$, $1/e$ or 50%.

3.1.2 beam divergence: The beam divergence is the angle between the lines at which the power density of an FSO beam falls to $1/e^2$.

NOTE 1 – This parameter is also commonly defined to be where the power density falls to either $1/e$ or 50%.

NOTE 2 – The beam divergence should be measured at a distance at least five times the Rayleigh distance from the lens (see 3.1.8) to ensure that it is measured under far field conditions.

3.1.3 inter-channel crosstalk: The ratio of the disturbing optical power to the wanted optical power detected by the receiver where the wanted and disturbing signals are at different wavelengths.

3.1.4 inter-channel crosstalk penalty: The penalty assigned in the system budget to account for inter-channel crosstalk.

3.1.5 interferometric crosstalk: The ratio of the disturbing optical power to the wanted optical power detected by the receiver where the wanted and disturbing signals can be at the same wavelength.

3.1.6 interferometric crosstalk penalty: The penalty assigned in the system budget to account for interferometric crosstalk.

3.1.7 transmitter (or receiver) setting error: The maximum angle between the axis of the transmitter (or receiver) and a straight line joining the transmitter and receiver together.

3.1.8 Rayleigh distance: This is defined as:

$$\text{Rayleigh distance} = \frac{2D^2}{\lambda}$$

where:

D is the diameter of the transmitter lens

λ is the wavelength

3.2 Terms defined in other Recommendations

This Recommendation uses the following term defined in ITU-T Rec. G.957:

– Extinction ratio.

4 Abbreviations

This Recommendation uses the following abbreviations:

FOV Field Of View

FSO Free Space Optical

R_{fso} Reference plane just before the optical receiver input lens

Rx Receiver

S_{fso} Reference plane just after the optical transmitter output lens

Tx Transmitter