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TIA STANDARD

Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant; IEC 61280-4-1 edition 2, Fibre-Optic Communications Subsystem Test Procedure-Part 4-1: Installed cable plant- Multimode attenuation measurement

TIA-526-14-B October 2010

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ANSI/TIA Foreword

International Standard IEC 61280-4-1 Ed. 2.0 has been prepared by subcommittee 86C: Fibre optic systems and active devices, of IEC technical committee 86: Fibre optics. This document, OFSTP-14-B is an adoption of IEC 61280-4-1 and supersedes ANSI/TIA/EIA-526-14-A, Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant. This foreword includes clarification on major changes between earlier versions of the TIA document and this version including the nomenclature for the three reference methods and text to describe additional encircled flux launch conditions uncertainty not previously considered in the IEC document.

Reference methods nomenclature

The different ways in which reference measurements can be made of the power input to the cabling under test are explicitly referred to in the IEC document by the number of test cords that are used in the reference configuration. In the TIA document these were often referenced as configuration A, B or C. A cross reference of these test methods is shown in the table below.

IEC 61280-4-1 Ed. 2.0		OFSTP-14-A
Name	Location	Name
One-cord reference method	Annex A	Method B
Three-cord reference method	Annex B	Method C
Two-cord reference method	Annex C	Method A

OTDR testing

OTDR testing was not in the original OFSTP-14-A. The use of the OTDR for measuring attenuation is described in Annex D for total attenuation with additional guidance in Annex G including measuring individual component losses.

Inspecting and cleaning connectors

The IEC document highlights the importance of, and gives guidance on, good measurement practices including inspection and cleaning of connector end faces.

Test cord insertion loss verification

Annex H describes procedures for checking the insertion loss of test cords that should be performed before undertaking cable plant measurements, as poorly performing test cords invalidate measurements made with them. The procedures are delineated by the reference measurement method and by the type of connector system.

Reference grade connectors

This document recommends the use of ‘reference grade connections’ on test cords to reduce measurement uncertainty. This means that there is now a difference between the test result acceptance criteria and the expected link or channel insertion loss in its final configuration. The insertion loss acceptance criteria should be tightened up accordingly.

Encircled Flux

The requirement for the modal launch conditions for the sources used to measure multimode fibers is changed from one based on coupled power ratio (CPR) and mandrel requirements to one based on measurements of the near field at the output of the launching test cord. The launch condition must now meet the requirements of the specified ‘encircled flux template’. Compliance provides significant improvement in measurement repeatability. Note that the Encircled Flux template example of Figure E.1 unintentionally shows incomplete Target and OFL lines. The red Target line should run continuously thru the center of the shaded Template region, and the blue OFL line should be continuous thru the region from 11 to 15 µm radius.

Encircled flux uncertainty

For field test equipment using a single optical port that launches two wavelengths, a test cord that is conditioned by a mandrel may not allow an alignment on the target for both wavelengths simultaneously. Should this be the case, the use of the same mandrel for both wavelengths will reduce the margin for compliance within the templates and add uncertainty.

Due to the effect of variations in source wavelength, fiber core size and numerical aperture, mandrel tolerances, temperature changes, other physical variations, and the measurement equipment itself, launch conditions at the time of factory calibration will not be identical in the field should any variable change. The use of attenuation artifacts described in IEC 61280-4-1 can help ensure that the equipment produces a launch condition that performs acceptably.

Although this document is not intended to grant compliance to equipment that predates its publication, it may be possible to bring such equipment into compliance with the use of an external mode conditioner designed for this purpose. Unless the equipment, its launch cords, and the external mode conditioner are verified to produce the intended launch conditions, this approach will be an additional source of uncertainty, but that uncertainty may be less than without the use of the external mode conditioner.

Alignment of encircled flux targets to eliminate wavelength bias

Efforts were taken to harmonize the expected component losses at 850 nm and 1 300 nm wavelengths for a given fiber core diameter. This was accomplished by adjustment of the 850 nm and 1 300 EF targets to produce comparable extrinsic component losses. An example of matching the attenuation characteristics at the two wavelengths is illustrated in Figure Foreword1. This elimination of bias provides an opportunity to ensure dual wavelength compliance of a passive component or a short cable plant link using a single source.

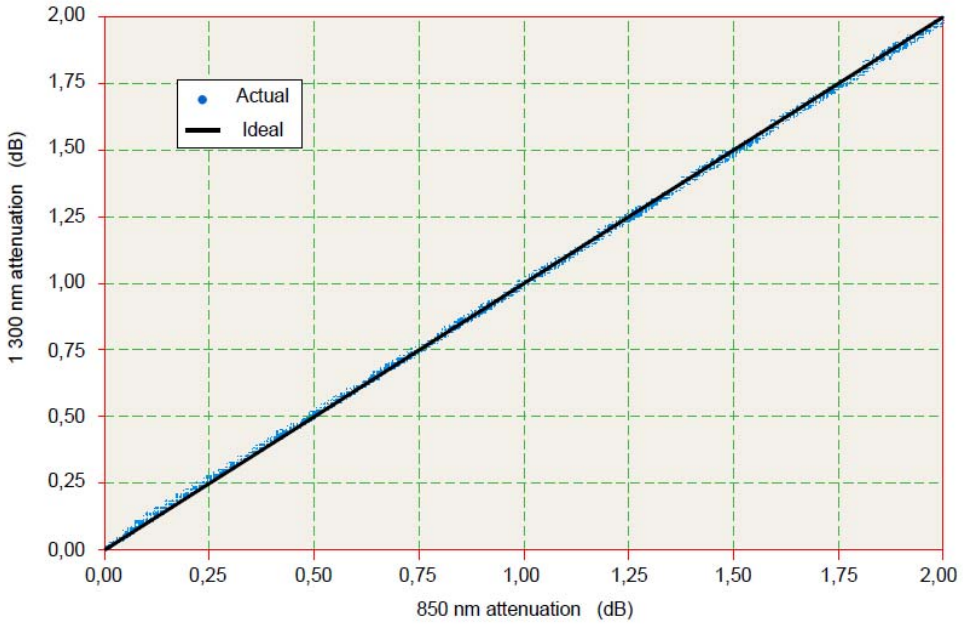

Figure Foreword1 – Calculated Wavelength Comparison

Other references

The following references document the foundational work underlying the development of the Encircled Flux launch condition specifications and can be obtained at the following internet location:

http://ftp.tiaonline.org/TR-42/TR-42.11/Public/TSB-178ReferenceRepository

1) T. Hanson, “Considerations on multimode link loss,” December 13, 2005
2) T. Hanson, “Considerations regarding the target RPD, coupled power, and steady state,” July 13, 2006
3) R. Conte, “Mode Scattering and Steady State Distributions,” August 18, 2006
4) Robert Conte, “A Template Based Approach to Source Qualification” , August 18, 2006
5) Thomas Hanson and James Luther, “Multimode source boundary experiment,” October, 2006
6) Robert Conte, “CPR, MPD, and EF,” December 5, 2006