Corning® SMF-28® ULL Optical Fiber Fusion Splicing Report

Application Note

AN2023
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ISO 9001 Registered

Objective

In this report Corning tested homogeneous and heterogeneous fusion splice performance of Corning's SMF-28 ULL fiber, as well as splicing performance to other Corning optical fibers including SMF-28 ULL fiber with advanced bend. Compliant with ITU-T Recommendation G.652.D and G.654.C, Corning's SMF-28® ULL optical fiber portfolio has the lowest-loss 80 μm² terrestrial-grade fibers available in the market – with millions of kilometers sold and deployed worldwide in the harshest environments and most demanding long-haul applications. There, ultra-low attenuation can be leveraged to extend network span lengths, skip amplification sites, upgrade to faster bit rates, add network components for improved flexibility, and/or lengthen the distance between regenerators. Splice loss performance across the SMF-28® family of products is represented in this report.

Test Plan and Procedure

This splicing study involved homogeneous (same fiber type) and heterogeneous (different fiber type) splices. All fiber splices were completed using a commercially available active core alignment fusion splicer, Fujikura 90S, using a standard pre-set factory program (SM-AUTO). Multiple fibers were used spanning a range of mode field diameter (MFD) values.

For more information on splicing best practices and how to interpret optical time domain reflectometer (OTDR) measurements, please review the following documentation:

- AN3060 - Guidance for OTDR Assessment of Fusion Spliced Single-mode Fibers
- AN103 - Single Fiber Fusion Splicing

Fusion splicers may show a faint grey line after splicing homogeneous and heterogeneous optical fibers together. Figures 1 and 2 are images of typical homogeneous and heterogeneous optical fiber splices. The faint fusion line associated with the homogeneous splice and the black-white lines associated with the heterogeneous splice are both a result of small refractive index differences created by the fusing process that are detectable by a splicer's imaging system. These lines do not affect the quality of the splice.

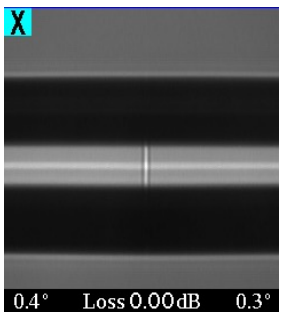

Figure 1. Homogeneous splice

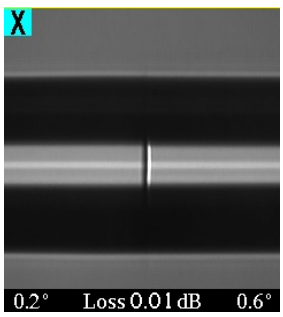

Figure 2. Heterogeneous splice

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The splice loss should be measured by OTDR from both directions and the average of bothmeasurements calculated, known as bidirectional splice loss. However, in the field, most splice technicians only have access to measure from one direction. To provide guidance, Figures 3 and 4 represent typical unidirectional and bidirectional splice loss at 1550 nm that can be expected when splicing SMF-28 ULL optical fiber to itself and SMF-28 ULL fiber to Corning® SMF-28 Ultra fiber. MFD difference is the primary driver behind the unidirectional losses reported by an OTDR for a homogeneous optical fiber splice. In the case of SMF-28 ULL fiber to SMF-28 Ultra fiber splices, differences in scattering (lower attenuation) will also contribution to the unidirectional loss values.

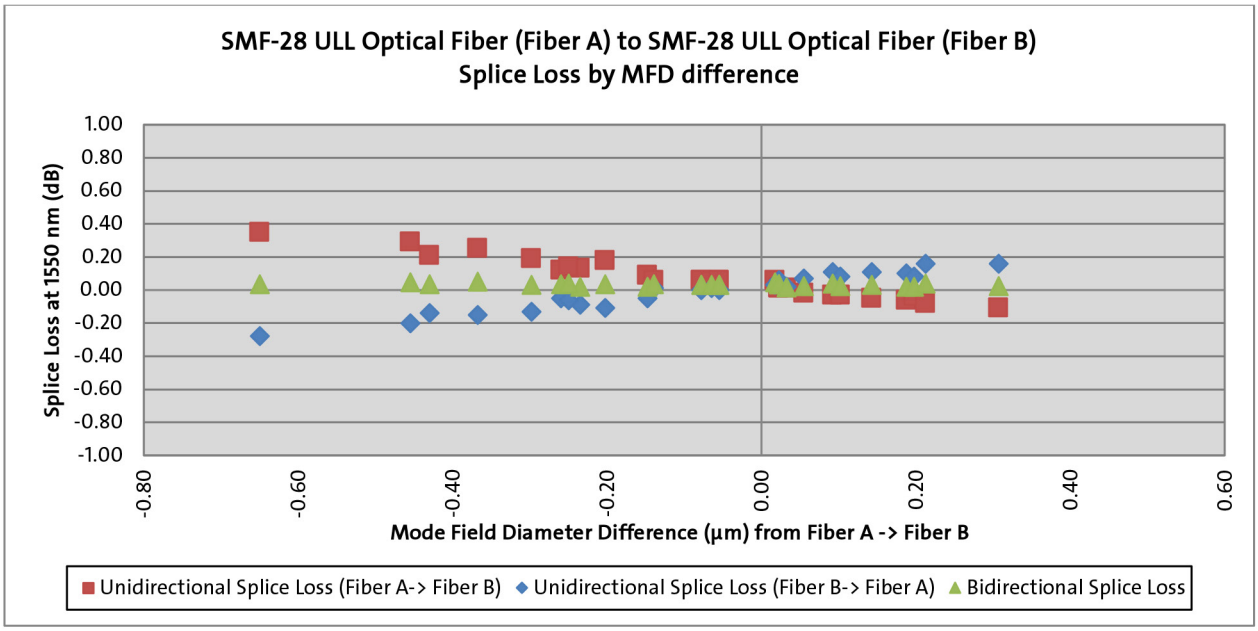

Figure 3. Unidirectional and Bidirectional Splice Loss.
SMF-28 ULL optical fiber to SMF-28 ULL optical fiber.

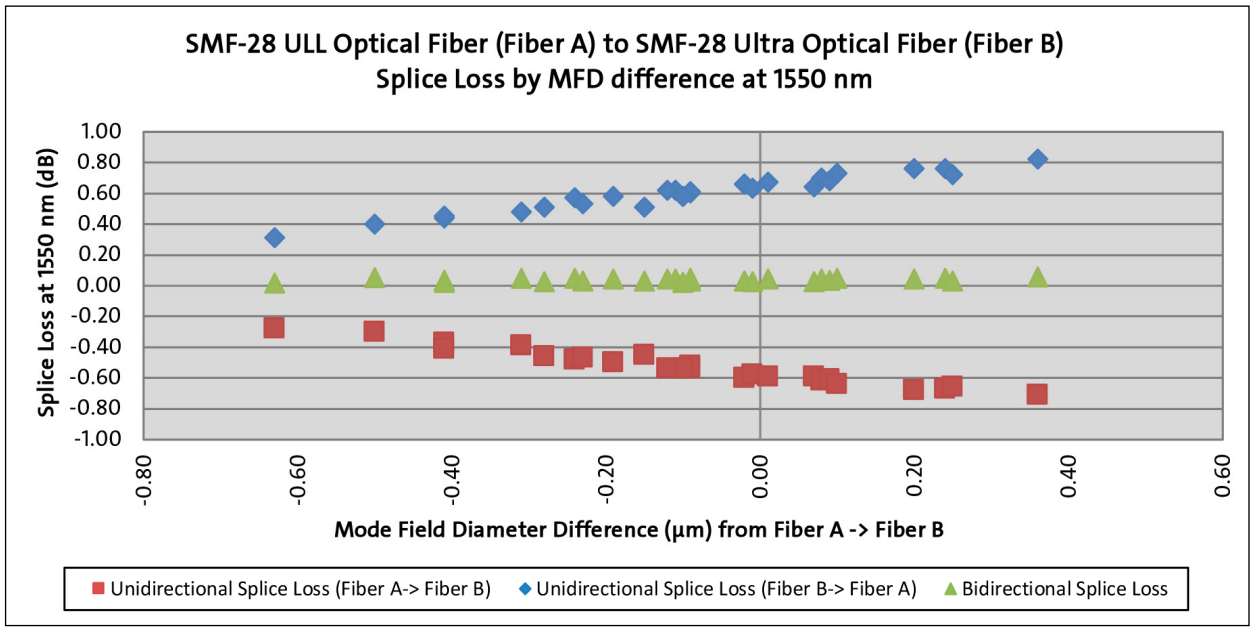

Figure 4: Unidirectional and Bidirectional Splice Loss.
SMF-28 ULL optical fiber to SMF-28 Ultra optical fiber.

Corning® SMF-28® ULL Optical Fiber Typical Splice Loss to SMF-28® Optical Fiber Products

To assist our customers when different Corning optical fiber types are being spliced together, we have included splice losses for common fiber combinations.

Fusion Splicer: Fujikura 90S (Core alignment)
Splicer Recipe: SM AUTO

		1310 nm		1550 nm		1625 nm	
Fiber A	Fiber B	Mean (dB)	Max (dB)	Mean (dB)	Max (dB)	Mean (dB)	Max (dB)
SMF-28 ULL optical fiber	SMF-28 ULL optical fiber	0.03	0.05	0.03	0.05	0.03	0.06
SMF-28 ULL optical fiber	SMF-28 ULL optical fiber with advanced bend	0.03	0.08	0.03	0.07	0.03	0.07
SMF-28 ULL optical fiber	SMF-28 Ultra optical fiber	0.03	0.06	0.03	0.06	0.04	0.06
SMF-28 ULL optical fiber	SMF-28 Contour optical fiber	0.03	0.06	0.03	0.06	0.03	0.06

Conclusion

This report demonstrates the capability of optical fiber splicing for the SMF-28® ULL optical fiber portfolios in both homogeneous and heterogeneous conditions.

For any questions or concerns regarding optical fiber or fusion splicing, you can contact Corning Optical Fiber by phone at 1-607-248-2000 or by email at cofic@corning.com.

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