AN-125

Bend-Insensitive Multimode Fiber (BIMMF)

Overview

It is no secret that when standard optical fiber is bent, twisted, or otherwise contorted, it will exhibit increased loss. Until recently it was an accepted fact that in certain situations, such as in patch panels, cabinets, enclosures, and other places where space is limited or sharp corners or bends exist, there was a trade-off between how small these spaces could be and how long the cables would have to be without significant bend loss due to bending, twisting, or stretching. In 2009, however, a more durable, stress-resistant type of multimode cable was developed and it is revolutionizing fiber optics by allowing enclosures, patch-cabinets, and other types of cable hubs to be designed much more compact than was previously possible without introducing loss.

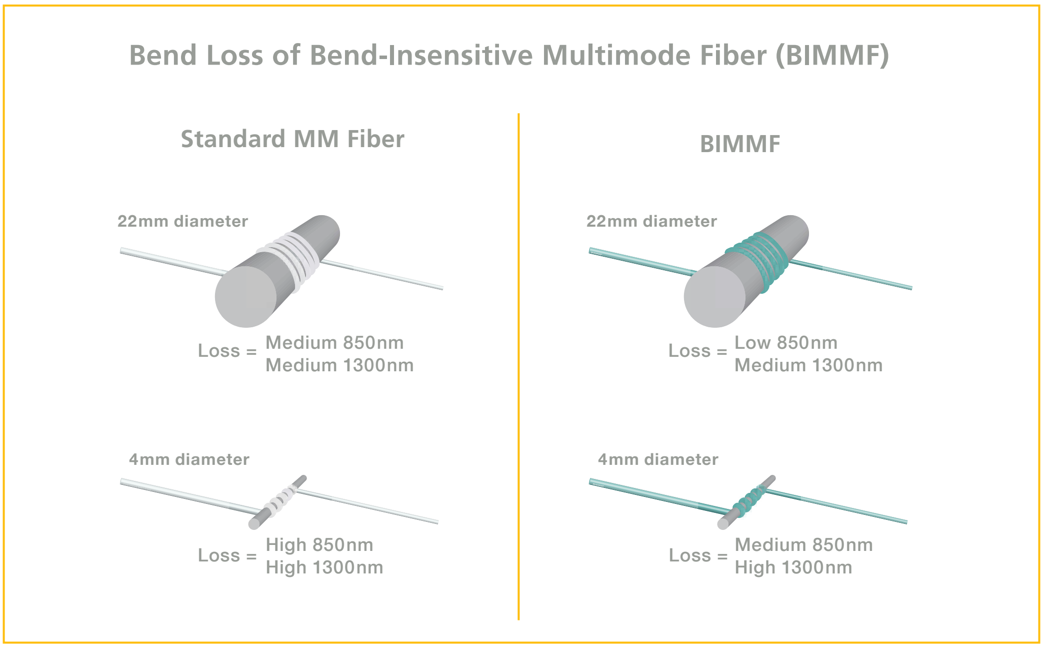

Figure 1: Bend Loss of Bend-Insnesitve MultiMode Fiber (BIMMF)

Bend-Insensitive Multimode Fiber, or BIMMF, as its name suggests, is more impervious to bend loss than standard 50µm multimode cable. In fact, BIMMF is so resistant to bend loss that measurements taken with a 22mm mandrel produce essentially the same results as without a mandrel. Furthermore, a 4mm mandrel will produce the results that would typically be exhibited by a 22mm mandrel on standard 50µm fiber.

Unfortunately, BIMMF cables are only optimized for 850nm and not for 1300nm. While the bend loss at 850nm is as described above, the results at 1300nm are not much different than with standard 50µm fiber.

Doc: AN-125 Rev. A 7/15/13

Germany & Other Countries
Laser Components Germany GmbH
Tel: +49 8142 2864 – 0
Fax: +49 8142 2864 – 11
info@lasercomponents.com
www.lasercomponents.com

How It Works

BIMMF is structurally the same as standard multimode cable but there is an added layer of glass between the core and the cladding. This layer of glass, often referred to as the trench or moat, has a much lower refractive index than the cladding. While the innermost modes are strongly guided to the end of the fiber, the modes that propagate towards the edge of the core are less strongly guided. Normally when the fiber undergoes more and more stress, these modes are lost into the cladding and only the innermost modes reach the end of the cable. However with the addition of this extra layer of glass, the modes that are less strongly-guided get reflected back into the core and are more likely to propagate through the length of the cable. With such high signal fidelity, it is certainly unsurprising that BIMMF is quickly replacing standard 50µm multimode cable in applications around the world.

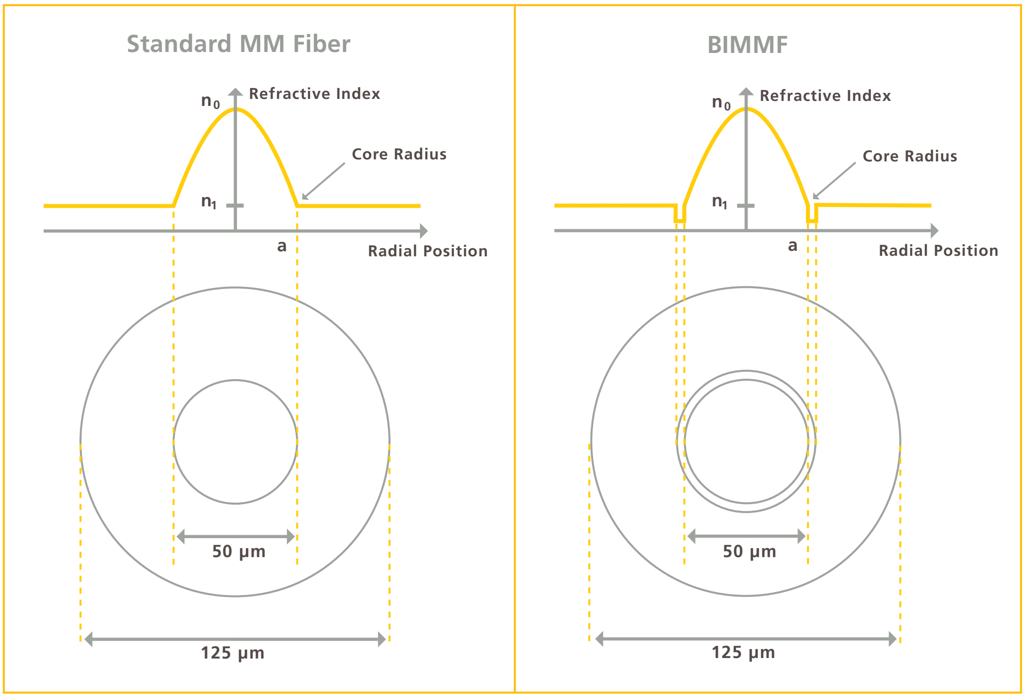

Figure 2: Basic differences between Standard MMF and BIMMF refractive index profiles.

Testing BIMMF

Numerous experiments have concluded that BIMMF can be tested and implemented in applications just as any other 50µm cable could be used. One application where the use of BIMMF is strongly advised against is as a reference cable. Testing insertion loss and return loss on BIMMF cables should be handled as though the cables were not bend-insensitive. In general, reference cables should always be non-BIMMF cables, the core diameter of the reference cables should always match that of the cables under test, and the fibers should never be over-filled, but rather be conditioned to meet EF standards or be slightly under-filled.

Doc: AN-125 Rev. A 7/15/13

01/19 / V02 / IF / lc/application-reports/optotest/an125_bimmf

Germany & Other Countries
Laser Components Germany GmbH
Tel: +49 8142 2864 – 0
Fax: +49 8142 2864 – 11
info@lasercomponents.com
www.lasercomponents.com