Analysis of mode field diameter and macro bending loss of rectangular Trench-Assisted Fiber profile for Fiber-To-The-Home Technology

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Abstract- In this paper, we have analyzed Rectangular Trench-Assisted Fiber [RTAF] for Mode Field Diameter [MFD] and low macro-bending loss. The modified profile of trench-assisted fibbers consists of central core and outer claddings. In between the cladding introducing deep trench filled by low RI materials. We analyze the effect of core, cladding and trench parameters on bending loss and MFD. We have theoretically studied the effect of different trench parameters on effective mode field diameter, and macro-bending loss of optical fiber by finite element method with a trench-assisted optical fiber model. The results show that all the properties are affected obviously by the trench. The analysis shows that the relative refractive index difference in trench affects the properties of mode field diameter and bending loss in optical fibbers for FTTH applications. Bend insensitive single-mode fibers are attractive for fiber-to-the-home (FTTH) applications because they can lower the installation costs and improve system performance [1]. They can increasing refractive index difference between core and cladding glass while reducing the mode field diameter (MFD), adding a low index trench (Fluorine doped glass ring) [2], There have been many reports on bend-insensitive optical fibers that employ such techniques as reducing the mode field diameter (MFD) [3]. When talking about trench-assisted optical fiber (TA-F), bend-insensitive optical fiber can be used in FTTH applications. The trench can reduce both macro-bending loss [4, 5] and micro-bending loss [6]. It performs perfectly in following the ITU-T G.652 standard to achieve very low bending loss.

Theoretically, an ideal optical fiber used in optical communication system should have these following characteristics: small MFD and low bending loss. Although there have been many discussions about the TA-F, we will study how different parameters of the trench affect properties of optical fiber respectively. The figures shows the bending and MFD properties of the fiber with wavelength.

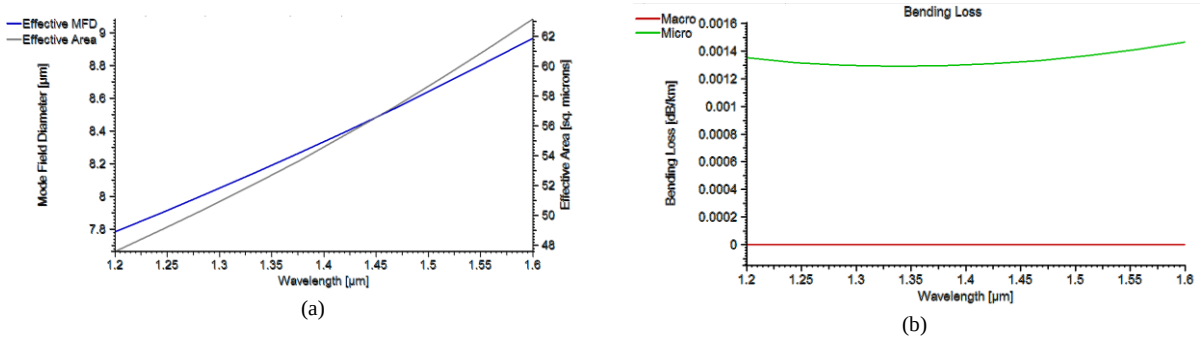

Fig. 1 (a) shows the effective Mode Field Diameter and effective area versus wavelength. (b) Bending loss at bending radii (5 and 7.5 mm).of proposed fiber.

To concluded our work, we have proposed bend-insensitive rectangular core fiber design namely, rectangular Trench-Assisted fiber. The rectangular Trench-Assisted fiber has deep trench profile illustrates the advantages of the bend insensitive fiber for FTTH applications. Based on the numerical analysis, it can be observed that two important properties such as bending loss and mode field diameter are sensitive to separation from the core but insensitive to trench width. On the other hand, if the trench is placed near to the core then both MFD and bending loss decreases due to lower index contrast of trench or when trench move away from core region, the MFD increases. The designed TA-F has MFD of about 8.8 µm at 1550 nm wavelength, as well as low bending losses. The excellent bending performances of new rectangular Trench-Assisted fiber, plus their ease of manufacturing and standards compliance, make this fiber particularly well suited to the potential application of FTTH networks.

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