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A comparative study of spliced optical fibers

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Abstract

A fusion-spliced optical fiber is examined with a laser sheet of light. A CCD camera is used to record the transverse interference pattern from the fiber. The buckling on the fiber material in one direction of the spliced point is distinct inside the transverse interference pattern. The refractive index profile inside the fiber core, obtained at different illumination directions, is calculated using a new method showing the change in the refractive index due to fusion splicing of the fiber. A simple theoretical model is introduced to simulate the anomalous behavior in the transverse interference fringes due to a slight change of the optical parameters.

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1. Introduction

The optical fiber [1–4] used in communication systems needs to be spliced mechanically or by fusion splicing techniques. Splicing in the region of connections (of two fibers or more) causes buckling of the fiber material. This buckling causes an appreciable change (fluctuation) in the refractive index of the fiber material, which in turn leads to some loss in the transmitted information. The most significant parameters contributing to this loss are the differences between: the core diameters (geometric imperfection); the numerical apertures; the profile parameters; and the refractive indices of the conjoined fibers.

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