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Failure Time for Optical Fibers Used in Telecommunication Networks

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Extended Abstract

For optical fibers used in telecommunication networks, the failure prediction of the fibers is needed to plan maintenance operations and so ensure service reliability. Several methods of calculating the failure probability have already been reported but most of them don't take into account the effect of temperature on fiber lifetime.

On the other hand, the position, shape and the propagation of microcracks are different for every piece of fiber, because they vary with the machine used for manufacturing the fiber, composition of coating materials and the environment around the fiber. This makes difficult to develop a simple mathematical model that can predict fairly accurately the lifetime of fibers subjected to mechanical, thermal and chemical stresses.

To characterize the mechanical reliability of optical fibers [1, 2], three techniques are used to give stress to the fibers have been introduced by the standard IEC-60793-1-33, including, axial tension, two-point bending and uniform bending. Different with axial tension, which mainly describes the fiber condition in cables used for long distances, two-point bending and uniform bending mainly refer to the fiber stress condition that in access networks or in FTTH (Fiber To The Home). Along with the development of FTTH, many works focused on the lifetime or mechanical reliability of bend-insensitive fibers under small radius bending [3-6].

In this work, a lifetime measurement system of uniform twisting technique is introduced. Four mathematical models to estimate the time to failure were studied for different thermomechanical conditions for optical fibers used in telecommunication networks.

Detailed influence factors like temperature, humidity and measurement dispersion are discussed here.

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