A Single-Scan PM-Fibers Polarization Axes Study

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Abstract— We propose optical scheme for single-pulse reflectometry of anisotropic optical fibers. In application with Brillouin analyzer this scheme was used for birefringence measurements of the Panda-type fiber. With phi-OTDR device, it allowed to increase a number of key parameters.

Keywords—BOTDA, phi-OTDR, polarization, birefringence

I. Introduction

For a distributed study of the of PM-fibers we've developed before a number of methods [1-3]. They are rather slow and other ones require significant upgrade of the OTDR-hardware. Now we propose a setup for single-scan reflectometry of anisotropic optical fibers which doesn't require device modifications.

II. Method

Proposed setup of single-scan probing consists of two polarization beam splitters (PBSs), connected in a special way (Fig. 1).

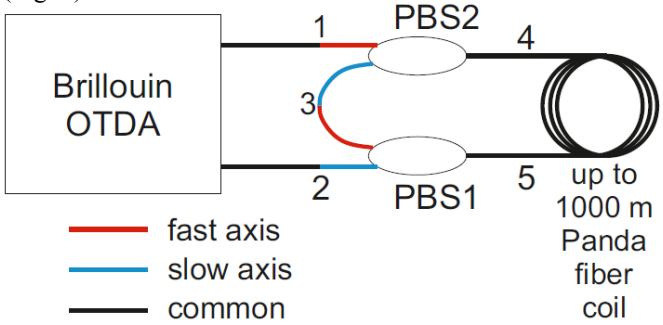

Fig. 1. Scheme of setup for single-scan birefrigence measurement.

When connecting the circuit to a Brillouin analyzer (BOTDA), the pump and the probe radiations are introduced towards each other: the pump goes to the slow axis of the PBS 2, and the probe signal is introduced into the fast axis of the PBS1. Pump pulse, sent to the PBS across the point (2), goes to the common port PBS2 (5), propagate through the FUT to the point (4), which fusion-spliced with common port of PBS1. Since the pump light travels along the slow axis, then, passed PBS #1, it is directed to the corresponding slow axis and gets to the point (3). The fusion-spliced joint (3) is made at 90° angle (may be 0° for another PBS type), so the light from the slow axis of the PBS1 goes to the fast axis of the PBS2 and then travels to the common port (5) and the FUT again, but with a different state of polarization. The probe radiation along passes the circuit in a similar way (Fig.2).

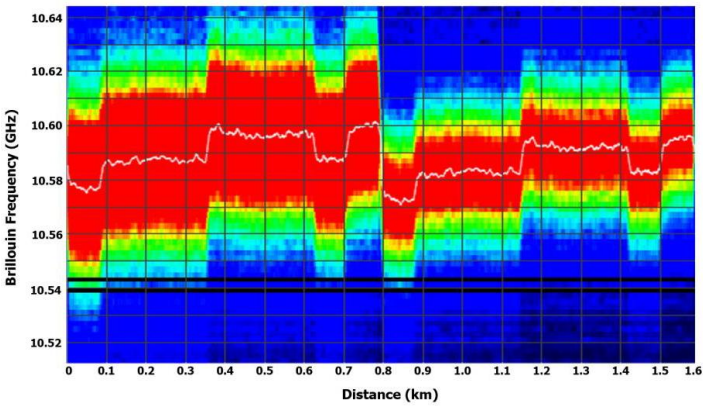

Fig. 2. Brillouin gain spectrum for fast (left half) and slow (right half) axes. The color info describes the signal level.

After processing performed by methods described in [4,5] this scheme not only allows quick measurements of birefrigence for BOTDA but also works with phi-OTDR devices to increase accuracy and sensitivity.

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