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Interferometric Chromatic Dispersion Measurement of Short Length of MPOF

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Fibre chromatic dispersion characteristics are important for high-speed transmission system and dispersion compensation and management, and an accurate knowledge of fibre dispersion is essential for new special linear and nonlinear optical devices. Microstructured optical fibres have recieved considerable attention in recent times, in part because control of the hole-structure allows the waveguide dispersion to be greatly modified. In microstructured polymer optical fibres (MPOF), the fabrication techniques allow almost arbitary hole structures, which may be valuable for applications such as dispersion compensation. However the relatively higher losses of such fibres mean that the lengths available for testing are much shorter than similar glass fibres.

Measurements of dispersion in optical fibres are based on three basic principles: 1) time of flight type measurement in long fibre spans; 2) interferometric measurements in short samples of fibre and 3) mode-field diameter measurements. Time of flight type techniques require fast pulse detection, and can be used to characterize fibre lengths longer than about 0.5km. Interferometric techniques can provide the equivalent time resolution and are sufficient to characterize fibre lengths of less than 1m. Mode-field-diameter spectra can be used to characterize waveguide dispersion effects and the material dispersion must be measured independently in order to determine the total chromatic dispersion in fibre.

In this paper, we present a pre-unbalanced two arm interferometer scheme, which makes the interferometer's two arms power unequal before inserting the test fibre. This technique can maximize the fringe visibility. Chromatic dispersion near 840nm in a short (less than 1 meter) section of MPOF was measured by using a broad spectral width LED light source. The wavelength dependent group delay of the fibre is obtained directly from the spectra of the output light from a Mach-Zehnder fibre interferometer. Experiment result showed that this pre-unbalanced technique can measure the fibre dispersion with loss as high as 10dB/m.