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Signal Detection and Processing in Fiber Tension Measurement Setup

ABSTRACT - Masterthesis

Optical fiber manufacturing is a critical process as undesirable changes can occur during this process. This alters the mechanical and optical properties of the fiber. The performance of optical fiber degrades due to change in its optical and mechanical properties.

Fiber drawing tension is one of the key factors that affect fiber properties during the fiber drawing process. To avoid alterations in fiber properties due to drawing tension, the tension must be known and needs to be controlled. The tension measurement schemes which determine the fiber tension by making direct contact with the fiber eventually degrades the fiber strength.

In this thesis work, a 'Non contact birefringence based fiber tension measurement method' is proposed. To evade the direct contact with the fiber, it is illuminated by a laser beam. The tension is determined based on the retardation induced by the fiber in a laser beam. For continuous monitoring of the tension and increasing the measurement speed, a data acquisition device is used. The data acquisition device is also used for modulating the laser diode. The data acquisition and laser modulation is controlled from the graphical user interface (GUI) which is developed by using LabVIEW software.

Using the equation proposed in this thesis work, accurate tension applied to the fiber can be calculated with the tolerance level of ±1 g. The signal processing and averaging scheme employed at the software improves the accuracy of the results by reducing the noise.