

Master 2012

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Design and Development of an Optical Power Detection Unit for Fiber Tension Measurement Setup.

ABSTRACT - Masterthesis

A fiber tension measurement setup is implemented in the lab for analysis of the applied tension to an optical fiber when it is being drawn. The setup contains a laser that illuminates the fiber laterally and a portion of the light scattered by the fiber is collected by a photo detector.

The aim of this master thesis is the development and implementation of a new detection unit for further improvement of the measurement accuracy as well as making the whole setup more compact.

As the initial step, principle of fiber drawing tension measurement and detection scheme was studied i.e. defining required specifications for optimum signal detection. Second step was the design and development of optical power detection unit. For that investigation on light detection concepts as well as evaluation of the concepts were done. Investigation on light distribution is carried out with the help of optical power detection unit. Comparison of experimental and simulated light distribution on single mode and multi mode fibers were also carried out. After the development of detection unit, an analog filter was designed and developed to reduce the effect of ambient light on the detection unit. Both optical power detection unit and analog filter unit are assembled and implemented on the fiber tension measurement setup for carrying out measurement procedures. Experimental investigations on operation parameters such as gain, offset and frequency response were also done with the help of integrated photo detection unit.

As the final step demonstration of functionality of optical power detection unit and analog filter in fiber tension measurement setup were carried out. Comparison of integrated detection unit and discrete detection unit is done for evaluating which unit is giving more stable and accurate measurements.