A Wavelength-Division-Multiplexing Demonstrator

Background and Motivation
Wavelength division multiplexing (or WDM) is one of the technologies that underlies modern communication networks that power the internet. In WDM we multiplex (i.e. combine) several optical wavelengths or colors carrying distinct information into the same waveguide. At the receiver we then separate the different wavelength channels and detect the data transmitted on each independently. WDM therefore greatly enhances the information carrying capacity of optical fibers, from a few hundred Gbit/s to over 100 Tbit/s.

Project Description
In this project you will build a WDM experiment that can be used to demonstrate the principles behind optical communications and WDM in a classroom, at outreach events and for school visits. For this purpose you will modulate data such as music from the headphone jack of your phone onto three different color laser pointers. The light from the laser pointers is then multiplex into a plexiglass or acrylic waveguide using diffraction gratings and transmitted through the waveguide. At the receiver another grating will separate the wavelength channels enabling to detect the data modulated from each laser separately.

You will apply skills in electronic- (data-modulation, ...), optical- (coupling of the lasers, multiplexing ...) and mechanical- (building a robust, portable experiment) engineering. It is therefore a great learning experience giving you understanding what it takes to pull together a multi-disciplinary project. Throughout the project you will learn about data modulation techniques, lasers and the principles of gratings and diffraction, light propagation and how to interface with the driving electronic circuits and the mechanics of building a robust demonstrator.

Supervision in English, report can be written in Swedish or English.

Group size: 3-4 students
Target group: F, E

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