

2006 TAIWAN INTERNATIONAL SCIENCE FAIR

CATEGORY : Physics

PROJECT : Elastomeric Grating for Wavelength

Switching in Optical Communication

Systems

AWARDS : Physics Second Award

SCHOOL : Philippine Science High School-Main Campus

FINALISTS : MARIA KATRINA D. GUEVARA

COUNTRY : Philippines

ABSTRACT OF EXHIBIT TAIWAN INTERNATIONAL SCIENCE FAIR

Category: **PHYSICS**

Title: **ELASTOMERIC GRATING FOR WAVELENGTH SWITCHING
IN OPTICAL COMMUNICATION SYSTEMS**

Name: **Maria Katrina D. Guevara**

Country: **Philippines**

A diffraction grating was fabricated from an elastic polymer. It was patterned after a plane reflection grating with a pitch of 1200 lines/mm. It was characterized using a HeNe laser to verify properties. Angular scanning as a function of applied strain was observed for two individual wavelengths. Intensity of fiber output was optimized as an application of angular scanning in fine alignment. Beam profiles showed consistency of first order diffraction intensities at different levels of strain. This showed that the elastomeric grating's efficiency is independent from strain. The elastomeric grating's variable pitch can be of immense utility in optical communication systems. A stretchable grating can be used to replace typical high-cost architectures of metal or glass gratings of different pitches that correspond to various spectral regions. By changing the pitch, the grating can be used for different wavelength ranges. The elastomeric grating's variable pitch can be used to scan different wavelengths over a wide range of angles. Angular scanning is used for wavelength channel selection, and since an elastomeric grating diffracts different wavelengths differently, it can be used for wavelength switching and wavelength division multiplexing in optical communication systems. Laser beams of different wavelengths carrying different signals can be transmitted simultaneously through an optical fiber and diffracted to route the wavelengths onto separate wavelength-specific channels.

評語

This project studied and manufactured a flexible grating for wavelength switching in optical communication systems. It is a creative ideal with practical application. The elastomeric grating was calibrated by the diffraction experiment. This is a well oriented and organized project.