

SEMINAR IN PHYSICS

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~ Refreshments ~

SPACE GPS USING PULSARS

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The need for a more autonomous method of navigating space can hopefully be obtained by using fast spinning and strongly magnetized neutron stars (pulsars). Their periodic signals have a very precise timing that can be used to detect where a spacecraft is in relation to a system of pulsars.

This technique is beneficial to very deep space missions because communication with Earth takes a long time, and the error of traditional ground-based radio navigation can be negated. Pulsar detecting spacecraft would have an accuracy of around five kilometers at a distance of Pluto or even farther. The main issue, however, with pulsar navigation is that very accurate X-ray detectors connected to massive antennas are required.

A LOW-COST RAMAN SPECTROMETER

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A Raman spectrometer is a device that can tell you exactly what is in your drink, i.e., it can identify the types of molecules in the liquid. This is accomplished via the inelastic scattering of light from molecules; the scattered photon energies provide “molecular fingerprints” for the molecules being observed.

I created a low-cost Raman spectrometer using 3-D printing and optical cables and filters. I used four different software programs to convert thirty-second exposure time photographs into a Raman spectrum that displays light intensity versus wavenumber. This process produces a graph with well-defined peaks, and based on their wavenumbers I will be able to identify the molecules that compose the liquid.