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Stepping Up Precision: Automated SiPM Characterization for the nEXO Experiment

Tuesday, August 20, 2024 2:25 PM (10 minutes)

nEXO is a proposed experiment to search for neutrinoless double beta decay in liquid xenon, utilizing ~50 000 silicon photomultipliers (SiPMs) in its photodetector system. These SiPMs are 1 by 1 cm2 squared devices capable of detecting single photons. The nEXO mass testing project is developing automated systems and methods that will be able to test large arrays of more than 100 SiPMs efficiently, where a light source will be positioned and scanned across the SiPMs using a custom x-y stage. To achieve the required scanning precision, we will use precision actuators consisting of stepper motors. We are currently upgrading the actuators to a closed loop system using precision rotary encoders and industrial automation controllers. Controllers direct motors while encoders provide feedback on the motor's position. To communicate to the hardware, we are developing a python program which can send all the unique host commands to the motor through a controller while reading out the encoder feedback. When the encoder is used in the system it will have a linear resolution of 1mm/10 000 or 2mm/10 000 enabling positioning as small as 0.0001mm. The program is divided into three classes - configuration, connection and command logic, and host command handling. Additionally, it will read and save the motor outputs. This program allows simultaneous control and data reading from multiple motors, ensuring precise characterization of each SiPM and contributing to the overall success of the experiment.

What area of study best describes your talk?

Physics

If you answered 'Other', please provide the study area.

Primary author: CHAMPAGNE, Grace (Undergraduate Summer Student)

Presenter: CHAMPAGNE, Grace (Undergraduate Summer Student)

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