Contribution ID: **711** Type: **Parallel**

Japanese-Style Compact Cosmic-Ray Muon Detector for Outreach and Education

Friday 11 July 2025 09:30 (20 minutes)

For many students and members of the public interested in particle physics and astrophysics, direct access to real research is limited due to the need for expensive and large-scale equipment such as accelerators and telescopes. However, recent advances in technology have made it feasible to develop low-cost detectors, and several groups have started creating simple yet functional instruments for outreach and educational purposes.
We have developed a compact and low-cost cosmic-ray muon detector named **OSECHI** (Outreach & Science Education Cosmic-ray Hunting Instrument). The detector is housed in a Japanese-style tiered lunch box, *Jubako*, and consists of three layers of 3D-printed plastic scintillators. These are capable of detecting coincident muon events with a single unit. Light from the scintillators is collected by silicon photomultipliers (SiPMs), and the signals from the SiPMs are processed by a custom-designed electronics board, which records both charge and timing information. The board includes LEDs that light up in real time when muons pass through the corresponding scintillators, offering an intuitive way for users to visualize cosmic-ray events. It operates via a USB power source and includes a DC-HV converter for SiPM bias. Additional sensor interfaces, such as GPS and temperature monitors, are also supported. Signal processing is fully handled by an onboard microcontroller.
We have produced and evaluated prototype versions of the OSECHI detector, conducted several hands-on workshops with students and educators, and incorporated the feedback to improve the design.
In this presentation, we will describe the design and performance of the OSECHI detector, and share examples of its successful use in outreach and educational activities.

Secondary track

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Session Classification: T14 (Outreach, Education and EDI)

Track Classification: T14 - Outreach, Education and EDI