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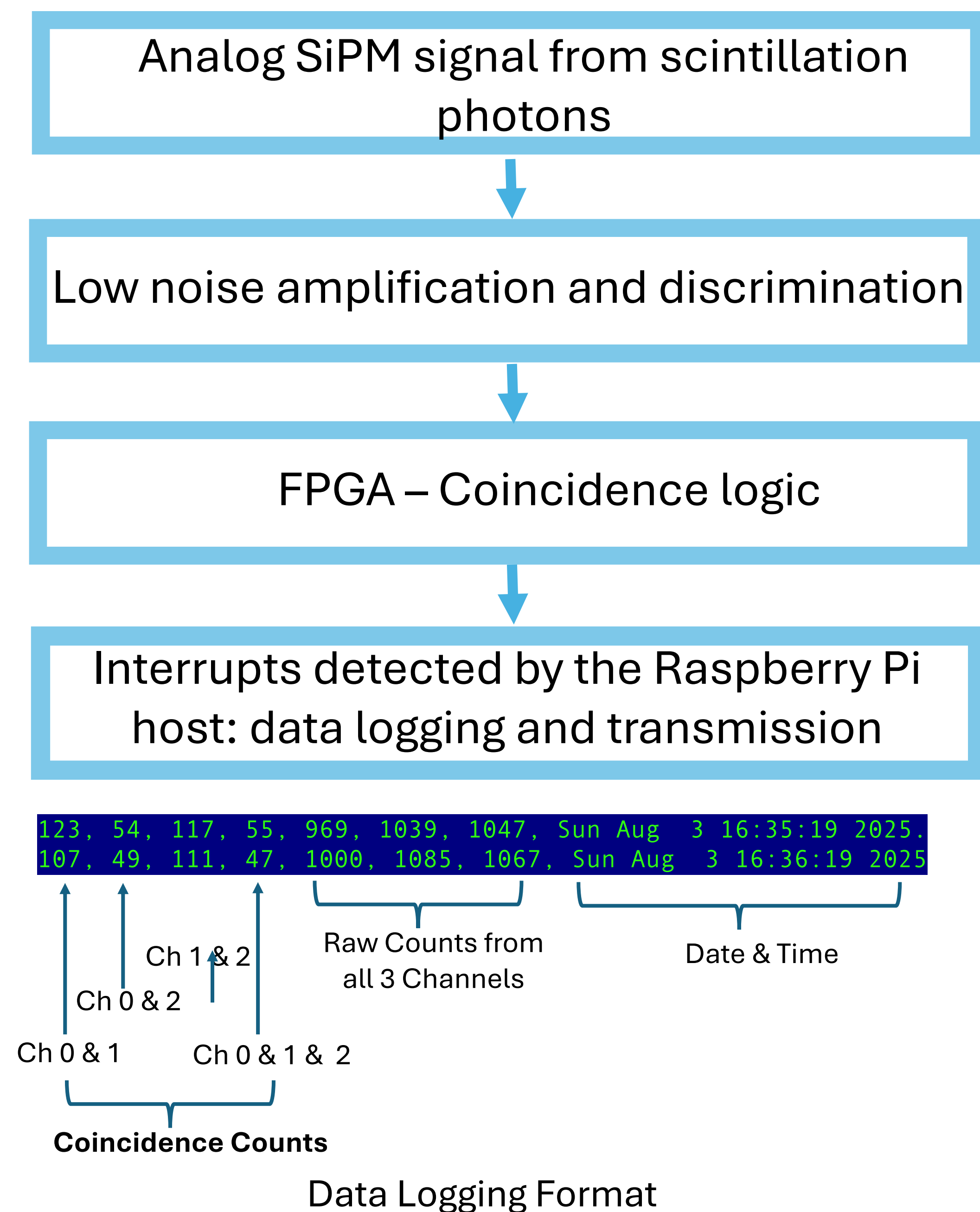
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Network and Goal

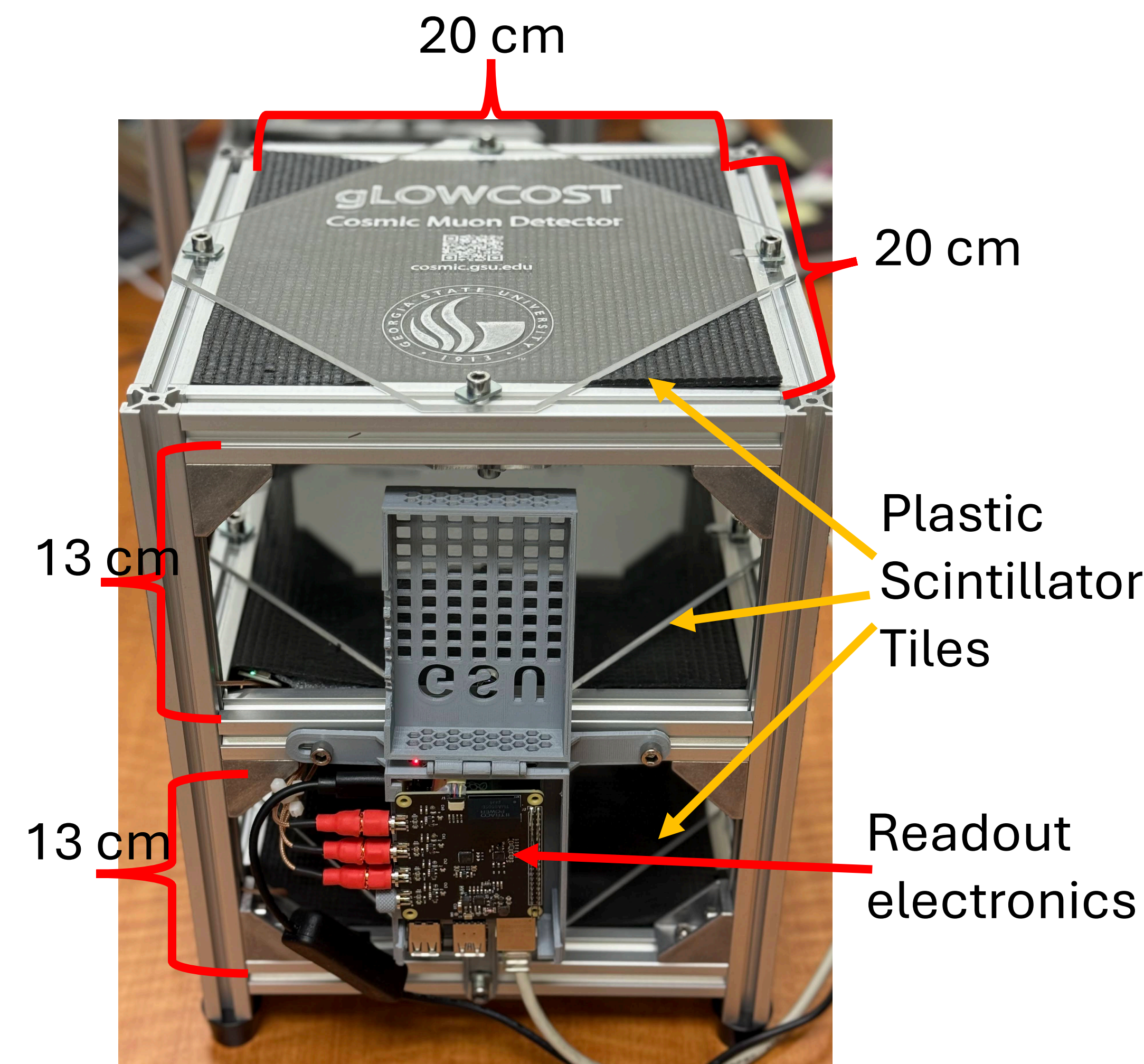
The gLOWCOST (global low-cost cosmic ray muon detector network for monitoring dynamic changes in space and terrestrial weather) project is developing a worldwide, cost-effective network of muon detectors for continuous space weather monitoring and related cosmic ray research.

Each detector uses three plastic scintillators instrumented with SiPMs to detect cosmic ray muons. The custom readout system combines a Raspberry Pi with low-noise amplification, digitally controlled SiPM bias, FPGA-based pulse processing, and real-time counting. The latest design also includes active temperature compensation to improve detector stability during long-term stable operation and fine-tuning sensitivity.

Readout Workflow



Ground-Based Detector



Each detector undergoes a validation test at GSU with baseline detectors before deployment



A collaborative international network of 20+ muon detectors across 10 countries and 5 continents, delivering continuous measurements of cosmic ray variations.

Readout Evolution

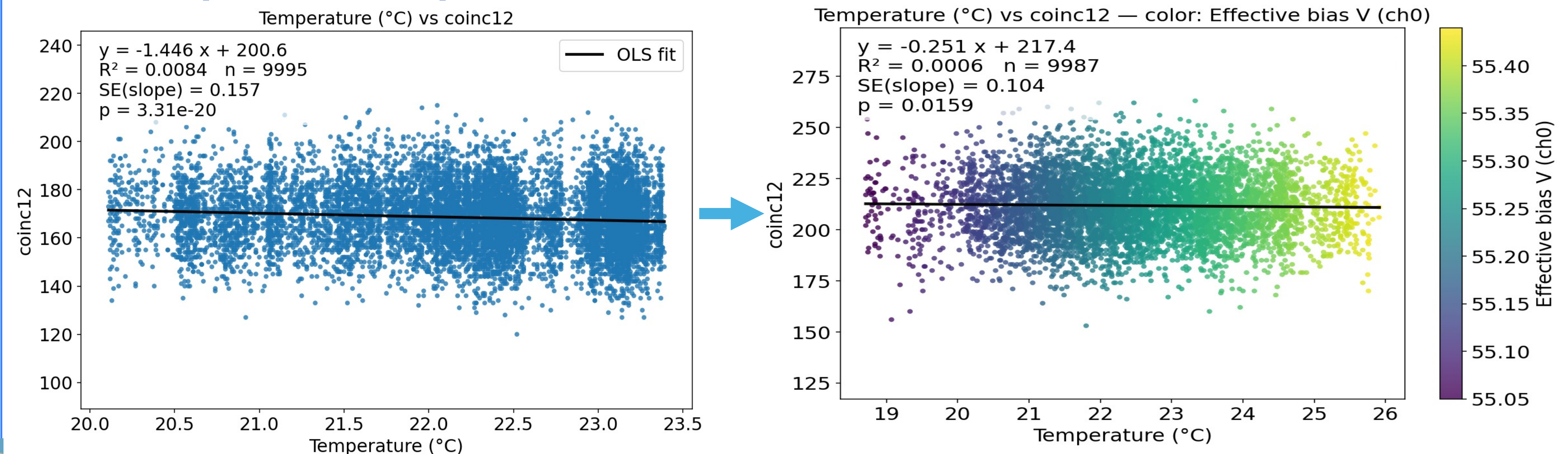
V0 -4 Chnl. 2020
1V0 -8 Chnl. 2021
1V1 -8 Chnl. 2023.
1V2 -4 Chnl. 2024 - Aug.
1V3 -4 Chnl. 2024 - Oct.
2V0 -4 Chnl. 2025 - Aug.
2V1 -4 Chnl. 2026

- The readout electronics evolved from V0, a simple yet reliable muon counter;
- Latest versions (2v0 & 2v1) has;
 - Live bias correction for temperature-driven gain drift.
 - Ability to tune each channel to its SiPM-scintillator pair (2v1) enabling efficient and reliable cosmic muon detection.
- Readout cost ~\$140
- Total detector cost ~\$650

Latest in Development

cosmic.gsu.edu
for more information

Room Temperature Compensation for Consistent Sensitivity



Before and After Coincident counts from channel 1 & 2 behavior with live bias voltage correction for room temperature variations. Improved sensitivity stability under varying environmental conditions supports broader network expansion.

Future of the Detector Network

The gLOWCOST project is working toward a truly global muon detector network for space weather and terrestrial weather studies. Expanding detector coverage worldwide will improve observations of cosmic ray variations and atmospheric effects on ground-level muons. The network also contributes to STEM outreach by creating opportunities for student engagement, international collaboration, and research training. Ongoing detector development continues to improve reliability, stability, affordability, and accessibility for long-term global deployment.

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