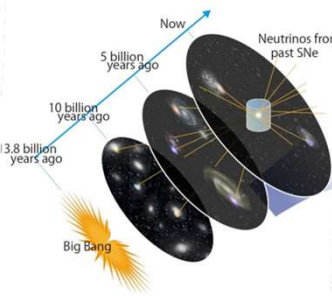


MEASUREMENT OF COSMIC-RAY MUON WITH THE BISCOTTEE SETUP

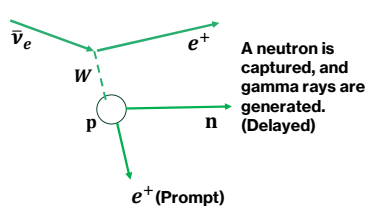
Atsuya Yoshida (Tokyo Univ. of Science, TUS), Hiroshi Ito (Kobe Univ.), Masaki Ishtuka (TUS), Yusuke Koshio (Okayama Univ.), Akihiro Minamino (Yokohama National Univ.), Takatomi Yano (NIT, Niihama Coll.), K.Kadota (Kobe Univ.)

1. Introduction

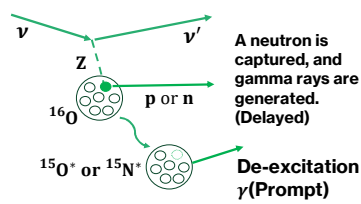
Diffuse Supernova Neutrino Background (DSNB)



- Neutrinos generated by supernova explosions from the birth of the universe to the present.
 - Search for the DSNB in Super-Kamiokande: Delayed coincidence detection of $\bar{\nu}_e$ -p inverse beta decay (IBD)
 - Primary background: ν -O NCQE interactions.
- [The Astrophysical Journal, 1005,101\(2026\)](#)



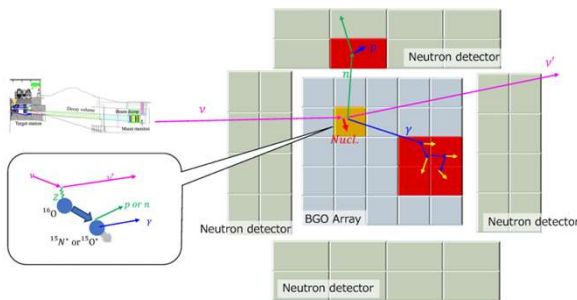
Inverse beta decay



NCQE reaction

BISCOTTEE experiment

Proposed to measure ν -BGO NCQE interactions as one of its primary objectives.



Idea of BISCOTTEE

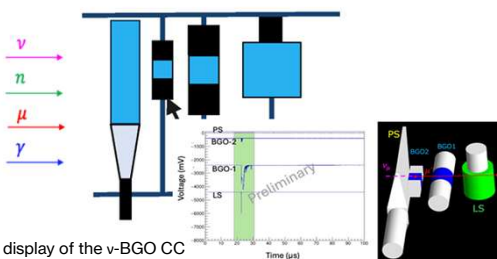
- We are planning a short-baseline NCQE experiment using accelerator neutrinos.
- The primary background comes from accidental neutron inelastic scattering events.
- To evaluate this, it is necessary to measure these background neutrons synchronized with the ν beam.

2. Previous Studies and Upcoming Plans

- Measurement of the Quenching Factor Using a BGO Scintillator
[Y. Ommura et al., JINST 18, T04006 \(2023\)](#)
- Measurement of Background Neutrons in the T101 Experiment
[arXiv:2607.02783](#)

Objectives of the upcoming T116 experiment:

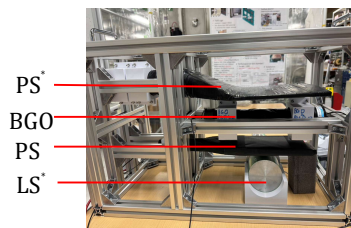
- Measurement of the flux of antineutrino-induced background neutrons
- Observation of ν -BGO CC (charged-current) interactions



The event display of the ν -BGO CC interaction is from the T101 experiment.

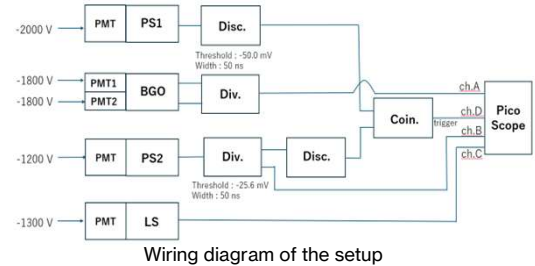
[JPS Conf. Proc.45, 011105 \(2026\)](#)

3. Detector Setup for the Fundamental Study of T116



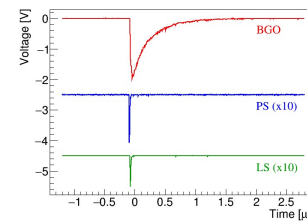
The BGO setup sandwiched between PSs, with LS added. Cosmic-ray muon measurements were conducted to verify the muon response of this setup.

*PS : Plastic Scintillator
LS : Liquid Scintillator

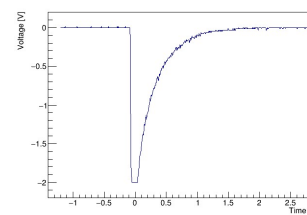


Wiring diagram of the setup

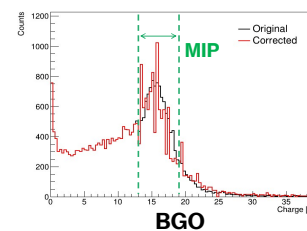
4. Results



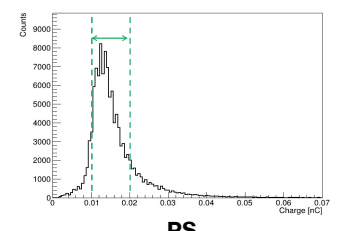
- Typical coincident waveforms from each scintillator.
- Pulse heights for the PS and LS are multiplied by 10 for better



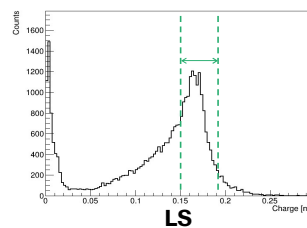
Saturated waveforms were reconstructed using an average template to evaluate the energy deposition accurately.



BGO



PS



LS

- Charge distributions obtained from waveform integration.
- A muon MIP peak was observed in each distribution.

Summary and future

- As a fundamental study for the future BISCOTTEE experiment, we are currently evaluating the performance of the newly designed setup using cosmic-ray muons.
- A neutrino beam test will be conducted at J-PARC in 2027 to verify the neutrino response and measure beam-correlated neutron backgrounds.