
Contribution ID: **1001** Type: **Poster Presentation**

# Development of Electromagnetic Calorimeter Using LYSO Crystals for the COMET Experiment at J-PARC

An electromagnetic calorimeter (ECAL) has been developed for the COMET experiment at J-PARC in Japan, which searches for muon-to-electron conversion of a charged lepton flavor violating process.
The observation of this process forbidden in the standard model (SM) gives a clear evidence of new physics beyond the SM.
The experiment aims at achieving a single event sensitivity of $10^{-17}$ by using a very intense pulsed proton beam and a dedicated beam line.
The detector system consists of an upstream tracker and the ECAL with an active area of about 1 m diameter.
Aluminum is used for the muon stopping target and signal electrons are emitted with a fixed energy of 105 MeV.
Decay-in-orbit (DIO) process, in which the electron energy reaches the signal region, also occurs as an irreducible background.
The ECAL plays an important role in the trigger, so required to have an excellent energy resolution of < 5% at 105 MeV to suppress contamination from the DIO electrons.
In addition, a position resolution of < 1 cm and time response of < 100 nsec are required to distinguish each of pile-up events.
To meet those requirements, the ECAL consists of LYSO ($Lu_{2-x}Y_xSiO_5$) scintillating crystals with a dimension of $20 \times 20 \times 120\ \mathrm{mm}^3$. They have a high light yield and short decay constant compared to conventional inorganic scintillators.
Since the detector system is operated in a vacuum of < 100 Pa and magnetic field of 1 T, Avalanche Photo Diode with a sensitive area of $10 \times 10\ \mathrm{mm}^2$ is adopted as the photodetector and its signals are processed by a fast low-noise preamplifier.
We constructed the final prototype before its construction and its performance was studied with an electron beam.
The result showed an excellent linearity within 0.5%, energy resolution of 4.2%, and position resolution of 7.6 cm at 105 MeV. Details of the experimental result and the ECAL design including its whole system will be reported in this talk.

## Experimental Collaboration

COMET

**Primary author:** OISHI, Kou (Kyushu University)

**Co-authors:** HAMADA, Eitaro; DMITRY, Grigoriev (Budker Institute of Nuclear Physics); NISHIGUCHI, Hajime (KEK); YAMAGUCHI, Hiroshi (High Energy Accelerator Research Organization (KEK)); TOJO, Junji (Kyushu University (JP)); UENO, Kazuki (KEK); KAWAGOE, Kiyotomo (Kyushu University (JP)); NOGUCHI, Kyohei (Kyushu University); Mr EPSHTEYN, Leonid (Budker Institute of Nuclear Physics); TANAKA, Manobu (KEK); IKENO, Masahiro (High Energy Accelerator Research Organization (KEK)); SHOJI, Masayoshi (High Energy Accelerator Research Organization (KEK)); LEE, MyeongJae (Institute for Basic Science (Korea)); EVTOUKHOVITCH, Petr (JINR); MIHARA, Satoshi (KEK); SAITO, Takashi (Kyushu University); YOSHIOKA, Tamaki (Kyushu University); UCHIDA, Tomohisa (High Energy Accelerator Research Organization (KEK)); FUKAO, Yoshi-

nori (High Energy Accelerator Research Organization (KEK)); KUNO, Yoshitaka (Osaka University); Dr IGARASHI, Youichi (KEK); FUJII, Yuki (High Energy Accelerator Research Organization); NAKAI, Yuki (Kyushu Unviersity); YUDIN, Yury (Budker Institute of Nuclear Physics); TSAMALAIDZE, Zviadi (JINR)

**Presenter:** OISHI, Kou (Kyushu University)

**Session Classification:** Poster session

**Track Classification:** Detector R&D and Data Handling