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MEG II experiment and liquid xenon detector

The MEG II experiment aims to discover the charged lepton flavor violation decay, μ+⟶e+γ, using high intensity continuous muon beam in the Paul Schrerrer Institute. The MEG II detector consists of the liquid xenon detector for gamma-rays, the spectrometer and timing counter for e+, and the detector for background identification (Fig. 1). In 2021, commissioning run using muon Michel decays and pilot physics run using continuous muon beam were conducted with full number of channel read out for the first time.
The liquid xenon detector measures the energy, timing and position of gamma- rays. Liquid xenon is filled in a cryostat and generates scintillation lights by incident gamma-rays. The scintillation photons are detected by photo sensors attached on the cryostat wall. On the incident face of gamma-ray, 4092 VUV-sensitive MPPCs produced by the Hamamatsu Photonics K.K. are used, and 668 VUV-sensitive PMTs are attached on the other faces. The detector stability during beam time was monitored using alpha-rays, cosmic-rays, and mono-peak (9 MeV and 17.6 MeV) gamma-rays. Detector responses such as position dependence, energy resolution, and timing resolution were also studied using gamma-rays from pion decay (55 MeV, 83 MeV) in special run of charge exchange between charged pion and liquid hydrogen target in addition to 9 MeV and 17.6 MeV mono-peak gamma-rays. In the presentation, these detector study results are reported.
Detection efficiency decrease of SiPMs during beam time in 2021 was observed from alpha-ray data. We tried to recover the decrease by warming up the SiPMs using hot water circulation. This recovery process and result are also presented.
Currently the commissioning is successfully done and the detector is ready for taking physics data. The plan and prospects are shown in the presentation.

Auteur principal: BAN, Sei (ICEPP, The University of Tokyo)

Co-auteurs: M. IKEDA, Fumihito (ICEPP); M. IWAMOTO, Toshiyuki (ICEPP); Mlle MATSUSHITA, Ayaka (ICEPP); Prof. MORI, Toshinori (ICEPP); M. KOBAYASHI, Satoru (ICEPP); Mlle ONDA, Rina (ICEPP); M. OOTANI, Wataru (ICEPP); M. OYA, Atsushi (ICEPP); M. UCHIYAMA, Yusuke (ICEPP); M. YAMAMOTO, Kensuke (ICEPP); M. YONEMOTO, Taku (ICEPP); M. YOSHIDA, Keisuke (ICEPP)

Orateur: BAN, Sei (ICEPP, The University of Tokyo)

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