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Commissioning of Liquid Xenon Gamma-Ray Detector for MEG II Experiment

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The MEG II experiment searches for $\mu \rightarrow e\gamma$ decay which is one of the charged lepton flavor violation decays, and the discovery of the decay will be a clear evidence of new physics beyond the Standard Model. The liquid xenon (LXe) gamma-ray detector to precisely measure the energy, position, and timing of the gamma-ray from $\mu \rightarrow e\gamma$ is a key to the unprecedented sensitivity of the MEG II experiment. The LXe scintillation light is read out by VUV-sensitive photosensors (4092 SiPMs and 668 PMTs) specially developed for the MEG/MEG II LXe detector. In 2021, a full commissioning of the LXe detector with all the channels read out was carried out for the first time, and a pilot physics run was also performed in the beamtime 2021. The detector response was monitored using a muon beam and several calibration sources, and the timing and energy resolutions were measured using the gamma-rays whose energies are around the signal energy from the π^0 decays after charge exchange reactions of charged pions in a liquid hydrogen target. The performance of the entire LXe detector depending on the gamma-ray interaction points was evaluated. Further investigations were performed about the degradation of the photosensor sensitivity by radiation damage found in the previous years. The MEG II LXe detector has been successfully commissioned and is now ready for the long physics run of the MEG II starting in 2022. In this presentation, the performance of the LXe detector measured in the commissioning will be reported.

Collaboration

MEG II Collaboration

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