

Liquid xenon calorimeter for MEG II experiment with VUV-sensitive MPPCs

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The MEG II experiment is the upgrade of the MEG experiment to search for the charged lepton flavor violating decay of muon, $\mu^+ \rightarrow e^+ \gamma$. The MEG II experiment is expected to reach a branching ratio sensitivity of 4×10^{-14} , which is one order of magnitude better than the sensitivity of the current MEG experiment. The performance of the liquid xenon (LXe) gamma-ray detector will be greatly improved with a highly granular scintillation readout realized by replacing 216 photomultiplier tubes (PMT) on the gamma-ray entrance face with 4092 Multi-Pixel Photon Counters (MPPC). For this purpose, we have developed a new type of MPPC which is sensitive to the LXe scintillation light in VUV range, in collaboration with Hamamatsu Photonics K.K. We have measured the detailed properties of MPPC in LXe, and an excellent performance has been confirmed including high photon detection efficiency (>15%) for LXe scintillation light. The production of 4200 MPPCs was completed and a mass test was carried out at room temperature to measure the performance of all the MPPCs. Excellent performance of the LXe detector has been confirmed by Monte Carlo simulations based on the measured properties of the MPPC. For example, energy resolution for 53MeV gamma-ray from the signal event is expected to reach 1%. The details of the performance of the VUV-sensitive MPPC will be reported, as well as the expected performance of the LXe detector by Monte Carlo simulations.

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