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MEG II experiment: Upgraded Liquid Xe Detector with SiPM readout

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The MEG II experiment is an upgraded experiment of MEG at PSI. MEG II aims to search the cLFV decay $\mu \rightarrow e + \gamma$ with one order of magnitude better sensitivity than MEG. Because the sensitivity is strongly affected by the accidental backgrounds, the resolutions of the detectors must be improved in MEG II.

The energy resolution of the γ detector is especially important for the $\mu \rightarrow e + \gamma$ search. The γ detector in MEG was a 900 l liquid Xe surrounded by 2-inch round 846 PMTs. This detector has been upgraded for MEG II by replacing 216 PMTs at γ entrance face with 4092 SiPMs (12 mm square shaped). Thanks to the better uniformity and the higher granularity of the scintillation photon readout, the energy and position resolutions are expected to improve by a factor of 2.

The SiPM for this upgrade was newly developed in collaboration with Hamamatsu Photonics K.K. It is sensitive to the ultra-violet scintillation light from Xe (photon detection efficiency > 15%), and the sensitive area is much larger than the standard ones. After a mass test of all SiPM chips, they were installed to the cryostat.

The detail of the upgraded detector, such as the alignment and readout of 4092 SiPMs and an operation of new cryogenic system, will be described in this presentation.

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