

【Grant-in-Aid for Specially Promoted Research】

Science and Engineering (Mathematics/Physics)



Title of Project: MEG II Experiment – Highest Sensitivity Search for Rare Muon Decay to Explore Grand Unified Theories

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Research Area : Physics, Particle/Nuclear/Cosmic ray/Astrophysics

Keyword : Particle physics (experiment)

【Purpose and Background of the Research】

Based on several years of experience of detector operation in the world-leading MEG experiment and intensive R&D efforts, we came to an idea of an upgrade experiment, MEG II, which should reach an order of magnitude better sensitivity than the MEG experiment by running at the world's highest muon rate, improving the detector resolutions, and expanding the detector acceptance. Our MEG II proposal was immediately approved by the Scientific Advisory Committee of PSI in January 2013, which lead to this research project.

The goal of the project is to construct and carry out the MEG II experiment in order to search for the $\mu \rightarrow e \gamma$ decay with a sensitivity of $O(10^{-14})$ and explore Grand Unified Theories (GUTs), a key to solve the mysteries in the early Universe.

【Research Methods】

In the MEG II experiment (Figure 1) newly developed experimental devices, such as VUV sensitive solid sensors that will replace old-fashioned PMTs in the LXe photon detector (Figure 2), to improve detector resolutions, lower the accidental background and enable running at the highest available muon rate, which enables the world's highest sensitivity to the $\mu \rightarrow e \gamma$ decay.

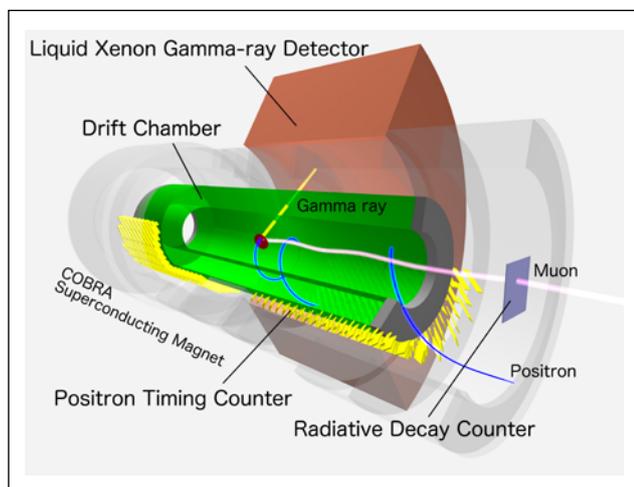


Figure 1 A schematic of MEG II experiment



Figure 2 a newly developed sensor (right) and a PMT

【Expected Research Achievements and Scientific Significance】

As implied by a possible unification of the coupling constants (GUTs), new physics beyond the Standard Model must have played a very important role in the early Universe. While the energy frontier LHC experiments are looking for evidences of such new physics, the MEG II experiment will also explore them with a similar sensitivity but in a different and complementary way. A discovery of the $\mu \rightarrow e \gamma$ decay would have a tremendous impact on the future direction of the particle physics researches. Even non-discovery will be transformative by strongly constraining possible types of new physics.

【Publications Relevant to the Project】

- MEG Collaboration, “New Constraint on the Existence of the mu-e-gamma Decay,” Phys. Rev. Lett. 110 (2013) 201801
- MEG II Collaboration, “MEG Upgrade Proposal,” arXiv:1301.7225

【Term of Project】 FY2014-2018

【Budget Allocation】 425,100 Thousand Yen

【Homepage Address and Other Contact Information】

<http://meg.icepp.s.u-tokyo.ac.jp/>

<http://www.icepp.s.u-tokyo.ac.jp/meg/>