

【Grant-in-Aid for Specially Promoted Research】
Science and Engineering (Mathematics/Physics)



Title of Project : MEG Experiment – From Lepton Flavor Violation toward Grand Unified Theory

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

Keyword : Particle physics (experiment)

【Purpose and Background of the Research】

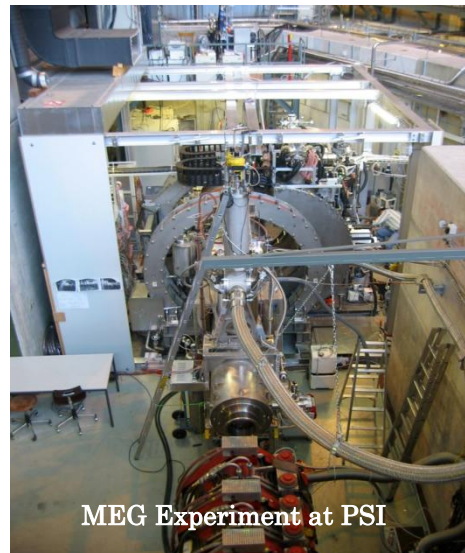
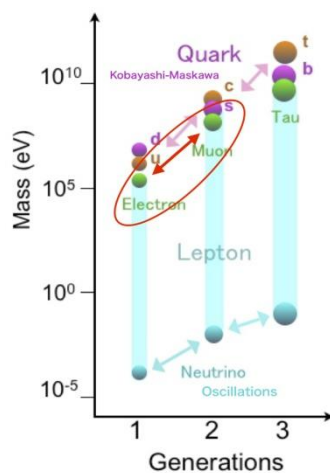
There are three generations of elementary particles which include heavier particles than those that compose ordinary matter (Figure). Transitions between quarks in different generations are well understood by the Kobayashi-Maskawa theory in the framework of the Standard Model (SM). Unexpected oscillations among neutrinos, discovered by Super-Kamiokande, have made it more important to understand flavor-violating transitions in the lepton sector. In fact, it was pointed out that transitions among charged leptons (electrons and muons), strictly forbidden by the SM, should occur at a measurable rate in Supersymmetric Grand Unified Theories (SUSY GUT), highly respected theories beyond the SM. The aim of this research project is to experimentally verify SUSY GUT by searching for $\mu \rightarrow e\gamma$ decays, muon's transition into an electron, which violates lepton flavor.

【Research Methods】

The MEG experiment with innovative and ingenious detectors to reach an unprecedentedly small branching ratio of 10^{-13} has been started at Paul Scherrer Institute (PSI), where good quality high intensity muon beam is available. In this research project, in collaboration with Switzerland, Italy, Russia and U.S., we operate the experiment and significantly improve the physics sensitivity to experimentally verify SUSY GUT. In parallel R&D to realize an ultimate experiment with much higher sensitivity will be carried out.

【Expected Research Achievements and Scientific Significance】

The discovery of $\mu \rightarrow e\gamma$ will immediately prove existence of new physics beyond the SM such as SUSY GUT, which could revolutionize particle physics. Results obtained here will be complementary to studies being carried out at LHC and are essential in reaching correct understanding of new physics beyond the SM.



【Publications Relevant to the Project】

- "A Limit for the $\mu \rightarrow e\gamma$ Decay from the MEG Experiment," MEG Collaboration (T. Mori, S. Mihara, W. Ootani, A. Baldini, et al.), Nucl. Phys. B 834 (2010) 1-12.
- "Charged Lepton Flavor Violation Experiment," W.J. Marciano, T. Mori, and J.M. Roney, Annu. Rev. Nucl. Part. Sci. 58 (2008) 315-341.

【Term of Project】 FY2010-2014

【Budget Allocation】 415, 200 Thousand Yen

【Homepage Address and Other Contact Information】

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