

## 論文の内容の要旨

論文題目 Search for the Lepton Flavor Violating Muon Decay  $\mu^+ \rightarrow e^+ \gamma$  with a Sensitivity below  $10^{-12}$  in the MEG Experiment  
(MEG 実験による  $10^{-12}$  以下の感度でのレプトンフレーバーを破るミューオン崩壊  $\mu^+ \rightarrow e^+ \gamma$  の探索)

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The Standard Model (SM) of the particle physics has been established by many experimental tests. However, there are still several issues which cannot be explained by the SM and it is thought that the SM is an approximated theory of more fundamental new physics. In order to discover the new physics, the MEG experiment searches for the Lepton Flavor Violating decay:  $\mu^+ \rightarrow e^+ \gamma$ . Since this decay is strictly forbidden in the SM, the discovery of the  $\mu^+ \rightarrow e^+ \gamma$  decay should be unambiguous evidence of the new physics. We performed a  $\mu^+ \rightarrow e^+ \gamma$  search using new data sample and improved analysis methods. Compared with the previous MEG result, the total statistics are doubled by adding the data taken in 2011. In this search, several methods of calibrations and analysis are improved to gain the experimental sensitivity and data of 2009–2010 are also analyzed with new methods again. By analyzing the dataset of 2009–2011, we achieved the 90% confidence level (C.L.) upper limit sensitivity of

$$S = 7.7 \times 10^{-13}$$

This is the first search for the  $\mu^+ \rightarrow e^+\gamma$  decay with a sensitivity below  $10^{-12}$ . The result shows consistent with background-only hypothesis. Therefore we set only the upper limit. The observed 90% C.L. upper limit is calculated to be

$$B(\mu \rightarrow e\gamma) < 5.7 \times 10^{-13}.$$

This is a 4 times more stringent upper limit on the existence of the  $\mu^+ \rightarrow e^+\gamma$  decay than the previous result.