Contribution ID: **218** Type: **not specified**

# COMET —An Experiment to Search for Muon-to-Electron Conversion in Nuclear Field at J-PARC—

COMET is an experiment aiming to search for the muon to electron conversion in a nuclear field (μ-e conversion) with a sensitivity at a level of $10^{-17}$. The μ-e conversion is one of charged-Lepton Flavor Violation (cLFV) processes and not only strictly forbidden in the Standard Model of Particle Physics (SM), but also undetectable in a SM minimally extended via massive Dirac neutrinos. Many New Physics (NP) models beyond the SM predict sizable occurrences of the μ-e conversion. The μ-e conversion is one of the most sensitive searches for NP and, combined with other cLFV observables, has the potential to reveal its nature.
COMET utilizes state-of-the-art muon beam technology with a pion-capture solenoid to produce about $2 \times 10^{11}$/s negative muons, later stopped on a muon-stopping target to create muonic atoms. It takes a staged approach to maintain a steady and robust development of this new experimental technique. In Phase-I, a short muon beam line with a 90◦ bend is constructed and beam quality will be measured. Physics data will also be collected to search for μ-e conversion with an aluminum target at a sensitivity level of $10^{-15}$, which is two orders of magnitude improvement over the current upper limit given by SINDRUM-II. Phase-II will be constructed based on an experience and knowledge we accumulate in Phase-I to reach the sensitivity at a level of $10^{-17}$ or better.
The construction of the Phase-I experiment setup is in progress at J-PARC. All superconducting magnets have been delivered to J-PARC to be installed and tested in 2025–2026. The development and construction of the detectors for physics data-taking and beam measurement are going well. Installation of the detector for the physics data will be carried out in the middle of 2026, followed by COMET Phase-I data acquisition using muon beam in late 2026.

**Author:** AOKI, Masaharu