The Muon-to-Electron Conversion Search Experiment (COMET) at the J-PARC

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On behalf of the COMET Collaboration

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A muon-to-electron conversion is expected to occur with branching ration of 10^{-54} in the standard model, which is far from the current measurement sensitivity. Observation of the muon-to-electron conversion is a clear signal for the new physics beyond the standard model. The COMET collaboration has been proposed to search for the muon-to-electron conversion at J-PARC with sensitivity by improving 10^4 by current upper limit obtained by SINDRUM-II at PSI in 1998. The COMET will take staging approach, where single event sensitivity is expected to be 3.1×10^{15} for phase-I and 2.6×10^{17} for phase-II.

In phase-I, 8 GeV (3.2 kW) proton beams from J-PARC's Main Ring is transported into hadron hall to bomber a pion production target, which is located inside a super-conductive pion capture solenoid of 5 tesla. Backward low energy pions are captured and transported through 3 tesla super-conductive solenoids to 90 degrees. Muons are mostly stopped at stopping targets inside a detector solenoid of 1 tesla at the end of the transport solenoid. A Cylindrical Drift Chamber (CDC) detects a conversion electron emitted from the muon-stopping target to measure electron's momentum. Cylindrical Cherenkov counters located at upstream and downstream end of the detector solenoid makes trigger signal. To improve momentum resolution to have better separation from background of decay in orbit electrons helium based light gas mixture is selected for the CDC. Single event sensitivity of 3.1×10^{15} is reached in three month running in phase-I.

In this talk strategy of COMET experiment to improve sensitivity, each of components as proton/muon beamline, and detectors especially for the phase-I are presented. Simulation and development of detector for the phase-I is briefly summarized.