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Construction of Vacuum-compatible Straw Tracker for COMET Phase-I

The COMET experiment at J-PARC aims to search for a lepton-flavour violating process of muon to electron conversion in a muonic atom, μ-e conversion, with a branching-ratio sensitivity of $<10^{-16}$, 4 orders of magnitude better than the present limit, in order to explore the parameter region predicted by most of well-motivated theoretical models beyond the Standard Model.

The need for such an excellent sensitivity places several stringent requirements on the detector;
i) good momentum resolution, <2%, for 100 MeV/c electron, which is primarily limited by multiple scattering effect for this momentum region,
and
ii) high rate capability, up to $5 \times 10^9 \mu^-$/s muon beam by J-PARC.

In order to fulfill such requirements, we decided to develop the straw-base planar tracker which is **operational in vacuum** and made of an **extremely light material**. The COMET straw tracker consists of 10 mm diameter straw tube, longer than 1 m length, with 20μm-thick Mylar foil and 70nm-thick aluminum cathode.

In the previous conference VCI2016, the R&D for this vacuum-compatible straw tracker was reported. After that, two big milestones, detector-performance verification by the full-scale prototype with 100 MeV/c e^- beam, and start the assembly of final straw tracker for COMET Phase-I, were achieved.

In VCI2019, we report these two big milestones, **result of beam test** and **status of final assembly**, and **some prospects towards the COMET Phase-II**.

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