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Development of an extremely thin-wall straw tracker operational in vacuum - The COMET Straw Tracker System -

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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 better than 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 this sensitivity places several stringent requirements on the detector development. The experiment requires to detect the monochromatic electron of 105 MeV, the momentum resolution is primarily limited by the multiple scattering effect for this momentum region. In addition, high power proton driver is essential to accumulate an enough statistics, ie. high rate capability is necessary. Thus we need the very light material detector which can handle the high intensity beam in order to achieve an excellent momentum resolution, better than 2%, for 100 MeV region and to accumulate an enough statistics, up to $5 \times 10^9 \mu^-$/s. In order to fulfill such requirements, we decided to develop the straw-base planar tracker which is operational in **vacuum** and made by an **extremely light** material. The COMET straw tracker consists of 10 mm diameter straw tube, longer than 1 m length, with 20 μm thickness Mylar foil and 70 nm aluminum deposition. Currently even thinner and smaller, 12 μm-thick and 5 mm diameter, straw is under development by the ultrasonic welding technique.

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