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Brand-New Extremely Light Straw-Tube Detector with a Nonwoven Graphite-Textile

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The COMET experiment at J-PARC aims to search for a lepton-flavour violating process of muon to electron conversion, with a branching-ratio sensitivity of 10^{-17} . The expected signal of this process is monochromatic 105 MeV single electron. To distinguish such a low energy signal, a material budget of detector is essential since the detection accuracy is primarily limited by multiple scattering.

To realize the required low material detector, a vacuum-compatible ultra-thin-wall straw tracker, **20 μ m-thick Mylar straw with 70nm Al cathode**, has been developed employing ultrasonic-welding technique. This was reported in VCI2016, and the detector performances such as detection efficiency and intrinsic spacial resolutions were reported in VCI2019. In parallel to 20 μ m straw production, further thinner straw, **12 μ m-thick**, was developed for the COMET upgrade, ie. COMET Phase-II. Details of R&D on 12 μ m straw were reported in VCI2022.

In the process of developing the 12 μ m straw, it became clear that it would be fundamentally difficult to make it any thinner using the current straw manufacturing method based on ultrasonic welding. Our R&D showed that the limit is around 10-12 μ m. Then, the brand-new extremely light straw was developed with **a nonwoven graphite-textile**. This was enabled by a collaboration with the nano-tech textile science.

In VCI2025, detailed R&D of the brand-new nonwoven graphite straw will be presented, in addition to the R&D status of the 12 μ m-thick straw.

Primary experiment

COMET

Author: NISHIGUCHI, Hajime

Co-authors: PAULAU, Aliaksei (Joint Institute for Nuclear Research (RU)); HAMADA, Eitaro (University of Tsukuba-Unknown-Unknown); DANIELSSON, Hans (CERN); SUZUKI, J (KEK); Dr WATANABE, K (Shinshu University); UENO, Kazuki (Osaka University); OISHI, Kou (High Energy Accelerator Research Organization); HIGASHIDE, M (SOKENDAI); SHOJI, Masayoshi (KEK); TSVERAVA, Nikolozi (Georgian Technical University (GE)); Dr OHSAWA, O (Shinshu University); NAKABAYASHI, Takuho (SOKENDAI); HASHIMOTO, Y (KEK); TSAMALAI DZE, Zviadi (Georgian Technical University (GE))

Presenter: NISHIGUCHI, Hajime**Session Classification:** Gas detectors**Track Classification:** Gaseous Detectors