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## Demonstration of Two Dimensional Muon Profile Measurements by Electron Multiplier Tubes in the T2K Experiment

The key to unraveling the mystery of the matter-dominated universe is believed to lie in CP violation in the lepton sector. The T2K experiment is a long-baseline neutrino oscillation experiment in which neutrinos produced by the J-PARC proton accelerator are detected at Super-Kamiokande, located 295 km away.

MUMON is a detector located about 100 meters downstream of the neutrino production target. It uses Silicon and Ionization Chamber detectors to measure muons, which are byproducts of neutrino production, and thereby monitors the proton and neutrino beam profiles in real time.

In preparation for the Hyper-Kamiokande (HK) experiment, scheduled to begin in 2028, efforts are underway to increase the proton beam power to 1.3 MW. Under these conditions, the silicon detectors are expected to suffer severe radiation damage and will require replacement as frequently as once per month.

This issue will pose a challenge for stable long-term operation.

To address this issue, we are conducting R&D on Electron Multiplier Tubes (EMTs) as radiation-tolerant sensors. Past beam tests have confirmed that EMTs have sufficient radiation tolerance and linearity.

In this presentation, I report the accuracy of muon beam profile measurements using EMTs arranged in plus and star-shaped configuration within MUMON. Also, I will show the observed signal instability and its status.

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