Contribution ID: **37** Type: **Oral Talks**

Muon source project at SHINE

Saturday 20 April 2024 09:30 (25 minutes)

Muons have been playing an important role in particle and nuclear physics and materials science. Furthermore, they are increasingly in demand for applications in archaeology and disaster prevention. Typical muon experiments are performed with approximately a few muon lifetimes, meaning that the ideal muon source for these experiments is a pulsed-mode operation with a repetition rate of tens of kHz. Nowadays, a copious number of muons can be produced artificially by irradiating targets with high-intensity proton beams from accelerator facilities. However, the muon beam repetition rates currently available at these facilities are essentially limited to two modes: pulsed mode (25-50 Hz, e.g., J-PARC) and continuous mode (e.g., PSI). There are several plans to generate high-repetition proton beams for ideal repetition-rate muon sources, but these have not yet been realized or are not versatile enough. On the other hand, muon sources using electron beams have also been proposed; high-repetition-rate (kHz to MHz) electron beams with linear accelerators have already been established, and their beam dump combined with a thin target could be an ideal muon source. We are currently planning to utilize a high-repetition-rate electron beam from an XFEL facility called SHINE for a muon source. The SHINE facility is under construction in Zhangjiang, Shanghai, with an electron accelerator (8 GeV energy, 1 MHz repetition rate, 100 pC charge, 6.25×10^8 electrons/bunch) scheduled for commissioning in 2025. Preliminary simulations indicate that a muon yield of $\sim10^3$ muons per bunch is expected with a bunch rate tunable from kHz to MHz with the electron beam. Currently, target studies using simulations, design and optimization of muon extraction beamlines, and preparations for a proof-of-principle test using the existing 1.6 GeV SXFEL electron beamline are underway. In this talk, an overview of the muon source project at SHINE and the current status will be presented.

Primary author: TAKEUCHI, Yusuke (Shanghai Jiao Tong University)

Presenter: TAKEUCHI, Yusuke (Shanghai Jiao Tong University)

Session Classification: Plenary-1