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# A Pulsed Muon Source Based on a High-Repetition-Rate Electron Accelerator

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Muons have been playing an important and unique role in both fundamental physics and applied sciences. Recent results of the muon magnetic anomaly hint at physics beyond the Standard Model; Muon spin rotation techniques have been widely applied to the study of superconductivity and magnetic materials. A typical muon experiment measurement time of 10 muon lifetimes means that an ideal muon source should operate at around 50 kHz in the pulsed mode. However, current muon sources are either driven by several 10 Hz pulsed proton accelerators (e.g. J-PARC) or DC proton accelerators (e.g. PSI), resulting in low-duty cycles for many types of muon experiments. Here we explore the use of a high-repetition-rate pulsed electron beam at the Shanghai SHINE facility as a muon source driver. SHINE is based on an 8-GeV CW superconducting RF linac, with a bunch rate of 1 MHz and a bunch charge of 100 pC. Downstream of undulators, the electron beam is deflected and absorbed in a beam dump. Based on a GEANT4 Monte Carlo simulation, we estimated the maximum intensity of the muon beam to be around 10^9. The main production channels are photo-nuclear and Bethe-Heitler processes, and each of these processes generates muon beams with different kinematics and time profiles. Such muon beams can improve the performance of current muon physics experiments, such as the muonium to anti-muonium conversion and the muon spin rotation technique.

**Primary authors:** LV, Meng; WANG, Jiangtao (UPC); KHAW, Kim Siang (TDLI/SJTU)

**Co-authors:** LIU, Fangchao; 陈, 思元 (15961622211); LIANG, wang

**Presenter:** LV, Meng

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