Status of the New Surface Muon Beamline at J-PARC MUSE

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A new surface muon beamline (S-line) dedicated to condensed matter physics experiments is being constructed at the Muon Science Facility (MUSE) located in the Materials and Life Science Facility (MLF) building at J-PARC. This beamline designed to provide high-intensity surface muons with a momentum of 28 MeV/c will comprise four beam legs and four experimental areas that will share the double-pulsed muon beam. The key feature is a new kicker system comprising two electric kickers to deliver the muon beam to the four experimental areas ensuring an optimum and seamless sharing of the double-pulsed muon beam. At present, only one experimental area (S1) has been completed and is now open to the user program since February 2017. An overview of the different aspects of this new surface muon beamline and the present status of the beam commissioning are presented.

KEYWORDS: muon beamline, surface muon, electric kicker, μSR

1. Introduction

The Muon Science Facility (MUSE) [1] at J-PARC is now constructing a new surface muon beamline (S-line) in the Materials and Life Science Facility (MLF) building. The S-line is MUSE third muon beamline after the completion of the D-line in 2008 and the U-line in 2012 in the MLF experimental hall No. 2, and the first beamline being built in the MLF experimental hall No. 1. This beamline is designed to provide high-intensity low-energy muon beams, typically surface muons with a momentum of 28 MeV/c, which will be utilized mainly for materials and life science (μSR) experiments. High-intensity muon beam gives a decisive advantage in the research field of condensed matter physics to measure smaller samples and/or require shorter data acquisition time. In particular, short-time measurement enables us to perform a stroboscopic observation in time-evolving phenomena. The S-line will eventually comprise four beam legs and four experimental areas (namely S1, S2, S3 and S4) that will share the double-pulsed muon beam. However, the secured funding so far was sufficient to construct and operate the beamline toward only one of the four planned experimental areas, i.e., area S1.