

# J-PARC muon facility, MUSE

Yasuhiro MIYAKE<sup>1,2</sup>, Koichiro SHIMOMURA<sup>1,2</sup>, Naritoshi KAWAMURA<sup>1,2</sup>, Akihiro KODA<sup>1,2</sup>, Patrick STRASSER<sup>1,2</sup>, Kenji M. KOJIMA<sup>1,2</sup>, Hiroshi FUJIMORI<sup>1,2</sup>, Shunsuke MAKIMURA<sup>1,2</sup>, Yutaka IKEDO<sup>1,2</sup>, Yasushi KOBAYASHI<sup>1,2</sup>, Jumpei NAKAMURA<sup>1,2</sup>, Yu OISHI<sup>1,2</sup>, Soshi TAKESHITA<sup>1,2</sup>, Taihei ADACHI<sup>1,2</sup>, Amba Datt PANT<sup>1,2</sup>, Hirotaka OKABE<sup>1,2</sup>, Shiro MATOBA<sup>1,2</sup>, Motobobu TAMPO<sup>1,2</sup>, Masatoshi HIRAISHI<sup>1,2</sup>, Koji HAMADA<sup>1,2</sup>, Shougo DOIUCHI<sup>1,2</sup>, Wataru HIGEMOTO<sup>2,3</sup>, Takashi U. ITO<sup>2,3</sup>, Ryosuke KADONO<sup>1,2</sup>

<sup>1</sup>*Muon Science Laboratory, Institute of Materials Structure Science, High Energy Accelerator Research Organization (KEK), Tokai, Ibaraki 319-1106, Japan*

<sup>2</sup>*Muon Section, Materials and Life Science Division, J-PARC center, 2-4 Shirane Shirakata, Tokai-mura, Naka-gun, Ibaraki 319-1195, Japan*

<sup>3</sup>*Japan Atomic Energy Agency, Sector of Nuclear Science Research, Advanced Science Research Center, Ooaza Shirakata 2-4, Tokai, Naka, Ibaraki 319-1195, Japan*

*E-mail: yasuhiro.miyake@kek.jp*

(Received July 21, 2017)

At J-PARC MUSE (Muon Science Establishment), one graphite target was installed in the proton beam line on the way to the neutron source, from which four sets of the secondary lines were designed to be extracted and extended into two experimental halls (toward the west wing, one decay-surface muon channel (D-Line) and the axial focusing muon channel (U-Line), and towards the east wing one surface muon channel (S-Line) and one fundamental muon channel (H-Line)).

MUSE has been suffering from many troubles such as the giant earthquake, fire, twice water leakage from the neutron target. Although the proton beam intensity was restricted lower than 200 kW, we have been having a rather stable operation at the MUSE since February, 2016.

In this paper, the latest situation on the MUSE is reported.

**KEYWORDS:** muon, J-PARC, MLF, MUSE, neutron, surface muon, decay muon

## 1. Operation and troubles at J-PARC MUSE

J-PARC MUSE has been suffering from many troubles such as the giant earthquake, fire, water leakage from the neutron target. In 2011, MUSE suffered severe damages from the earthquake on March 11, so called "Higashi-Nippon Dai-Shinsai". Fortunately the damaged apparatus ducts, and shields were fixed within the following year. We managed to restart user's run on February 2012. In 2013, whole the J-PARC operation had to be shut down because of the radioactive materials leakage accident at the Hadron Hall Experimental Facility. After this accident, we had to demonstrate how sound MUSE facility was designed and had been maintained in the sense of the target safety against the radioactive materials leakage. Finally we managed to restart user's run on February 2014. In 2015 we were forced to stop all the operation of not only MLF (Materials and Life Science Facility) but also neutrino, or hadron including a whole accelerator at J-PARC, because of the fire from the power supply for the septum magnet at the muon D-line on January 16. Thanks to the tremendous efforts by the members of the J-PARC task force, they managed to restart neutrino and neutron operation in the end of February, 2015. Although we were about to restart muon experiments in the end of April, we faced the second troubles in a water leakage from the neutron target. We had a short period of the MLF beam time in October, 2015, but unfortunately we had a third trouble in the neutron target