

# 15th International Conference on Muon Spin Rotation, Relaxation and Resonance



Contribution ID: 174 Contribution code: P-THU-6

Type: Poster

## Development of Transient $\mu$ SR at J-PARC

Thursday, 1 September 2022 18:40 (20 minutes)

To obtain one time-differential  $\mu$ SR spectrum using a conventional technique, we must wait around  $10^2$  minutes. In the majority of  $\mu$ SR experiments, the  $\mu$ SR spectrum is recorded as a function of temperature. Thus, such a long recording time ( $t_{record}$ ) has not been a serious problem, because the lead time ( $t_{lead}$ ) for stabilizing temperature requires typically 10-20 min, which is shorter than the recording time ( $t_{lead} < t_{record}$ ). However, due to the developments of the high-intensity pulsed muon beam with a repetition of 25 Hz in J-PARC MUSE and the multi-detector counting system, the recent data recording time is very short compared with the time to stabilize the measurement condition ( $t_{record} < t_{lead}$ ), which makes  $t_{lead}$  a significant bottleneck for the advanced  $\mu$ SR measurements. In order to solve this problem, we are developing a novel data record and analysis technique to use a high-intensity muon beam more efficiently. In the novel technique named transient  $\mu$ SR, the sample environment, such as temperature and magnetic field, is continuously changing during the  $\mu$ SR measurements. Positron events in each muon pulse are recorded as multidimensional data, i.e., along with the number of pulses and the changing parameter. The whole data is then resorted as a function of the parameter. This transient  $\mu$ SR technique also enables us to study a transient phenomenon that is now unavailable with the standard  $\mu$ SR technique. It should be emphasized that the feasibility of this technique crucially depends on the intensity of the pulsed muon beam. We have also developed a new software based on ROOT to analyze the huge number of the  $\mu$ SR spectrum within a reasonable amount of time. We will introduce the analysis software how to analyze the transient  $\mu$ SR data and report the results obtained under dynamic sample environments.

**Primary author:** NISHIMURA, Shoichiro (KEK IMSS)

**Co-authors:** OKABE, Hirotaka (Tohoku Univ.); Prof. KADONO, Ryosuke (KEK IMSS); SUGIYAMA, Jun (CROSS Neutron Science and Technology Center); Dr HIRAIISHI, Masatoshi (Ibaraki University); Prof. KODA, Akihiro (IMSS, KEK)

**Presenter:** NISHIMURA, Shoichiro (KEK IMSS)

**Session Classification:** Posters

**Track Classification:** New techniques