Beam Monitors for the Commissioning of Energy Upgraded Linac

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In J-PARC Linac, an energy upgrade project has started since 2009 using Annular-ring Coupled Structure (ACS) cavities to achieve design beam power of 1 MW at the exit of the downstream rapid cycling synchrotron (RCS). Beam parameters of the upgraded Linac is drastically improved especially for the beam energy from 181 to 400 MeV in the project. To meet with the significant upgrades of the Linac, beam monitors to be used for the upgraded beam line are newly designed and fabricated as well as the beam monitor layout is newly designed with the consideration to the beam commissioning strategies.

During the summer shutdown of 2013, we completed the installation of ACS cavities and the beam lines including all beam monitors. At the middle of December 2013, we started the beam commissioning to establish the reproducibility of 181-MeV operation. After establishing the 181-MeV operation, the functioning of the newly installed beam monitors was checked and the proper functioning of the magnets was examined with the response from the beam monitors. We measure the beam energy with various pairs of fast current transformer (FCT) for the TOF (Time-Of-Flight) method. Conducting the consistency check among new FCT pairs in the beam energy measurement at 181 MeV, we moved to the phase and amplitude scan tuning for new ACS cavities module by module, and achieved 400-MeV operation on January 17th, 2014.

This paper introduces the beam monitors, their related commissioning methods and the layout of the beam monitors in the new ACS beam line. Finally, the beam commissioning results relating of the beam monitor functioning is also introduced.