Construction of the energy-resolved neutron imaging system "RADEN" at J-PARC

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Construction of the Energy-Resolved Neutron Imaging System (RADEN) has started in 2012 at the beam line of BL22 in the Materials and Life science experimental Facility (MLF) of J-PARC. This is the first instrument, which is dedicated to the energy-resolved neutron imaging experiments using the pulsed neutron beam, in the world. Several components, such as beam line shields, a new beam shutter, in-shield devices, sample stages and detector stages, have been installed in 2013, and the first beam will be delivered in November 2014. After on-beam commissioning user programs are planned to start.

In this instrument, a broad wavelength range neutron beam up to 8 Å can be used with a good wavelength resolution $\Delta\lambda/\lambda$ of smaller than 0.26%, and high energy neutrons with the energy of a few keV are also available at the same time. Several types of two-dimensional neutron detectors with high time-resolution and spatial-resolution are prepared to utilize the Time-of-Flight method. The complementary measurement systems for gamma ray analysis and neutron diffraction experiments are equipped to enhance the accuracy of data analysis of neutron resonance absorption and Bragg-edge imaging. To visualize the magnetic field, polarization analysis apparatus is installed.

Moreover, this instrument is also designed to be a state-of-the-art neutron radiography instrument. The maximum thermal neutron intensity of 3×10^7 n/s/cm^2/MW with 100 mm square in beam size, the maximum beam size of 300 mm square, and the highest L/D value of 7500 are provided. A wide experimental room and a thick shield allow to observe large objects. Samples up to 1-ton in weight can be controlled in X-Y-Z and theta coordinate by a large stage, and a portable small one are also available for the tomography experiments.

In the presentation, progress of the construction is explained, and then characteristics of RADEN are discussed.