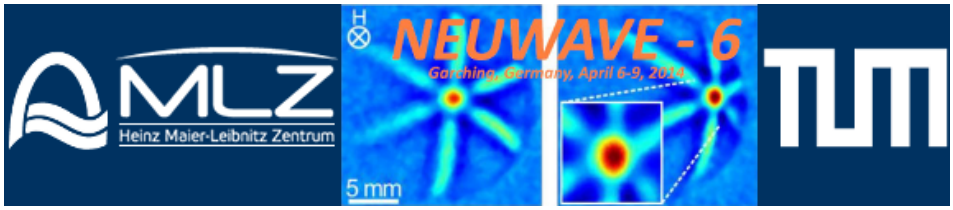

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Progress of Constructing Energy-Resolved Neutron Imaging System at J-PARC MLF

Tuesday, 8 April 2014 09:50 (40 minutes)

Construction of the Energy-Resolved Neutron Imaging System (ERNIS) has started in 2012 at the Material and Life science experimental Facility (MLF) of J-PARC. Beam line shields, a new beam shutter, in-shield devices except a T0 chopper, sample stages and detector stages have been installed in the fiscal year ended March 2013 as shown in the attached photograph. The first beam will be delivered in November 2014. After on-beam commissioning use programs are planned to start in 2015. In this presentation progress of the construction is introduced, and then characteristics of ERNIS are discussed.

The new beam shutter having three different size of holes and two rotary collimators provide various neutron beams: the maximum thermal neutron intensity of 3x10^7 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. Two sample positions of upstream (L=18 m) and downstream (L=23 m) are equipped in the shield having a large spare with high ceiling of 3.8 m from the floor. Samples up to 1-ton in weight can be controlled in X-Y-Z and theta coordinate by a large sample stage at the downstream position. A middle one at the upstream position and a portable small one are also available. Large samples and accompanying equipment are brought about through the 1.2 by 1.5 m hatch above the upstream position or through the 1.5 by 3.0 m one above the downstream position using cranes in MLF.

A well-established neutron imaging apparatus consisting of a cooled-CCD camera viewing a flat neutron scintillator was assembled for conventional neutron radiography. Aiming at the highest spatial resolution 4- and 9-inch "neutron color image intensifier"systems are developed. A new Image Signal Accumulation Sensor (ISAS) [1] is also developed aiming at high spatial and time-of-flight resolution simultaneously. As proven neutron counting detectors two detectors are prepared: the micro-pixel chamber (μ-PIC) -based neutron imaging detector [2] utilizing He-3 gas for spatial resolution of about 0.1 mm, and the B-10 coated Gas Electron Multiplier (GEM) detector [3] for higher counting rate. These counting detectors having 100 mm square of field-of-view will be mainly used for neutron Bragg-edge, resonance and magnetic imaging.

Software for device control, data analysis and computed tomography are developed. In addition to the Filtered Back Projection (FBP) software the Simultaneous Algebraic Reconstruction Technique (SART) one is designed to be calculated by a dedicated GPGPU parallel computer system for ERNIS.

We fully appreciate all proposals, requests, comments, etc. from potential users, the most important requirement to make this ERNIS project a major success.

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