Contribution ID: **170** Type: **Contributed Talk**

Commissioning test of a neutron beam monitor for the high-intensity total diffractometer at J-PARC

Thursday, 18 February 2010 10:15 (25 minutes)

MLF at J-PARC is one of the world's highest intensity pulsed neutron sources. When J-PARC becomes fully operational, remarkable achievements in the fields of material structure science and life science are expected. The detectors used in the facility must be able to achieve a high count rate. Since a GEM is a gaseous detector with a high count rate capability, the GEM-based detector is highly suitable for the high-intensity total diffractometer at J-PARC (NOVA). We are developing the GEM-based detector as a neutron beam monitor for the NOVA. In order to analyze the basic characteristics of the GEM-based detector, a neutron irradiation test was carried out at the NOVA beam line in MLF. The wavelength-spectrum distribution obtained from the test is consistent with the calculations, and the beam profiles agree with the simple Monte Carlo (MC) simulation. Therefore we found that as a neutron beam monitor, the GEM-based detector has good two-dimensional imaging ability.

Summary (Additional text describing your work. Can be pasted here or give an URL to a PDF document):

The Materials and Life Science Facility (MLF) at J-PARC [1] is one of the world's highest intensity pulsed neutron sources. When J-PARC becomes fully operational, remarkable achievements in the fields of material structure science and life science are expected. The detectors used in the facility must be able to achieve a high count rate. Since a Gas Electron Multiplier (GEM) is a gaseous detector with a high count rate capability, the GEM-based detector is highly suitable for the high-intensity total diffractometer at J-PARC (NOVA). We are developing the GEM-based detector as a neutron beam monitor for the NOVA. In order to analyze the basic characteristics of the GEM-based detector, a neutron irradiation test was carried out at the NOVA beam line in MLF. According to the simulation [2], the neutron flux below 1 eV is approximately 4 × 108 n/s. The GEM detector was located at L = 13.7 m, 15.0 m, or 18.8 m; where L is the distance from the surface of the moderator to the surface of the 10B layer. In the neutron irradiation test, we measured the GEM-based detector's time of flight (TOF), beam profile.
A wavelength-spectrum distribution is derived from the TOF distribution. A typical wavelength-spectrum distribution is shown in Fig.1. The histogram represents the measurement; the graph with a "+"symbol represents the calculation. Some Bragg cutoffs, which depend on the beam line materials, are observed. Since the difference between the measurement and the calculation is small, we found that the wavelength-spectrum distribution is consistent. Beam profiles were measured by changing the position of the GEM-based detector's position. The beam profiles for various positions of the detector are shown in Fig.2 (a), (b), and (c). The size of the beam and its pattern depend on the position of the detector. Wavelength selection was not carried out. To estimate the beam profile, a simple Monte Carlo (MC) simulation was performed. In the MC simulation, the geometrical conditions of the moderator, the collimator and the detector were considered. The beam profiles of the MC simulation are shown in Fig.2 (d), (e), and (f). At 13.7 m and 15.0 m, the difference between the measured values of the beam profile width and its values obtained from the MC simulation is approximately 5.6 mm. The MC simulation results agree with the measurement results. Therefore the beam size and the beam pattern are explained as geometrical characteristics.

Fig.1 The wavelength-spectrum distribution

Fig.2 The beam profiles

[1] Accelerator Technical Design Report for J-PARC, KEK Report 2002-13; JAERI-Tech 2003-044
[2] M. Harada, "Calculation of high energy neutron spectra for 23 neutron beam lines at JSNS", http://j-parc.jp/MatLife/en/instrumentat

Primary author: Dr OHSHITA, Hidetoshi (High Energy Accelerator Research Organization (KEK))

Co-authors: Dr SEKIMOTO, Michiko (High Energy Accelerator Research Organization (KEK)); Dr UNO, Shoji (High Energy Accelerator Research Organization (KEK)); Mr KOIKE, Takahisa (Tokyo University of Science); Mr

MURAKAMI, Takeshi (High Energy Accelerator Research Organization (KEK)); Dr UCHIDA, Tomohisa (High Energy Accelerator Research Organization (KEK)); Dr OTOMO, Toshiya (High Energy Accelerator Research Organization (KEK))

Presenter: Dr OHSHITA, Hidetoshi (High Energy Accelerator Research Organization (KEK))

Session Classification: Particle ID 1