MLF Experimental Report	提出日 Date of Report
課題番号 Project No. 2012A0084 実験課題名 Title of experiment Neutron beam focusing with high performance supermirrors on precisely figured surfaces 実験責任者名 Name of principal investigator Dai Yamazaki 所属 Affiliation J-PARC Center, JAEA	装置責任者 Name of responsible person Kenichi Oikawa 装置名 Name of Instrument/(BL No.) NOBORU/BL10 実施日 Date of Experiment 2012/04/16-2012/04/20 2012/05/18-2012/05/22 2012/06/13-2012/06/17

試料、実験方法、利用の結果得られた主なデータ、考察、結論等を、記述して下さい。(適宜、図表添付のこと)
Please report your samples, experimental method and results, discussion and conclusions. Please add figures and tables for better explanation.

1. 試料 Name of sample(s) and chemical formula, or compositions including physical form.

chemical formula: Cd
size: 10^{W} x 10^{H} x 1^{T} mm^3

The sample was not brought into MLF in the experiment but was equipped in MLF for beam-line shielding.

2. 実験方法及び結果 (実験がうまくいかなかった場合、その理由を記述してください。)
Experimental method and results. If you failed to conduct experiment as planned, please describe reasons.

The Experimental setup is illustrated and photographed in Fig.1.

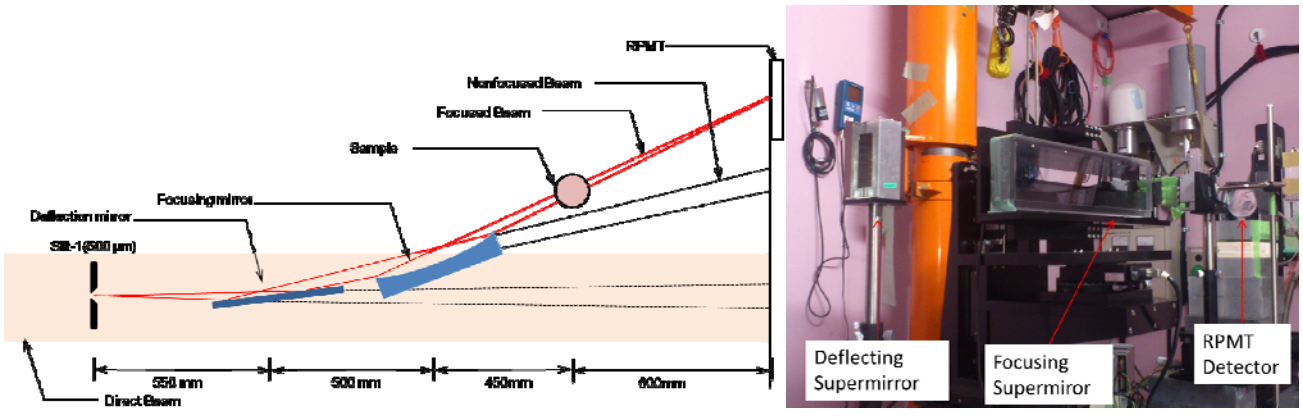

Figure1: Experimental Setup.

2. 実験方法及び結果（つづき） Experimental method and results (continued)

The focusing geometry is based on an ellipsoid whose focal length is 1050+1050 mm. Neutron beam was transversally narrowed by a slit at the first focal spot, reflected by a focusing mirror at 1050mm from both of the focal points, and then transversally focused into the detector surface at the second focal point. The beam was collimated vertically with a couple of slits: one is the slit at the first focal point and the other is placed just in front of the second focal spot. The beam-line was deflected by a flat supermirror (m=3) in order to get away from direct beam which includes high-energy neutrons and gamma-rays.

A 2-dimensional profile of the transversally-focused and vertically-collimated beam is shown in Fig.2. The profile was observed with a scintillation detector (RPMT). The focused beam size looks broadened due to the spatial resolution of the area detector although design value is 1 x 1 mm^2.

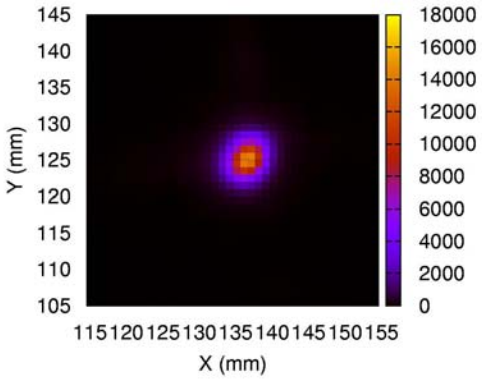

Figure 2. Profile of the transversally-focused and vertically-collimated beam observed with a scintillation area detector.

A prompt-gamma activation analysis (PGAA) was performed using the intense and small beam. A cadmium plate of 10^W x 10^H x 1^T mm3 was placed at the second focal point and prompt-gamma-rays from the cadmium plate were measured with a germanium detector. It should be noted that the germanium detector was not shielded at all in the measurement.

Figure 3 compares the spectrum of the prompt-gamma-rays and backgrounds. The measurement time was 2000 seconds for prompt-gamma-rays and 600 seconds for background. Prompt-gamma rays from cadmium (558 keV) were clearly observed, which suggests neutron beam focusing should be very useful to PGAA on small samples as large as 1 x 1 mm^2 or smaller.

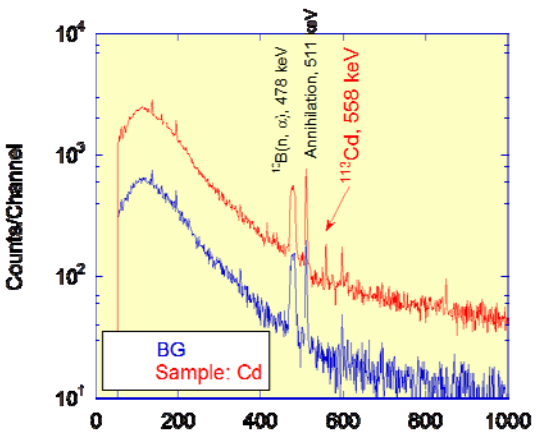

Figure 3. Prompt-Gamma-Ray measurement. Spectrum of prompt-gamma-ray from a cadmium plate of 10^W x 10^H x 1^T mm^3 which was irradiated by the small beam transversally focused vertically collimated into 1x1mm^2.