MLF Experimental Report	提出日 Date of Report
課題番号 Project No. 2010B0079 実験課題名 Title of experiment Neutron Beam Focusing using supermirrors coated on precisely figured surfaces 実験責任者名 Name of principal investigator Dai Yamazaki 所属 Affiliation J-PARC Center	装置責任者 Name of responsible person Fujio Maekawa 装置名 Name of Instrument/(BL No.) BL10 実施日 Date of Experiment 10/11/30-10/12/02

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.

No sample.

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.

We examined the focusing performance of a 1-dimensional elliptic supermirror fabricated for multichannel focusing-supermirror stack. The mirror is an m=3 NiC/Ti supermirror deposited with an ion-beam sputtering machine of JAEA on a quarts substrate of 1.5mm in thickness which was elliptically shaped with an ultra-precise surface figuring technique (numerically- controlled local wet etching (NC-LWE))

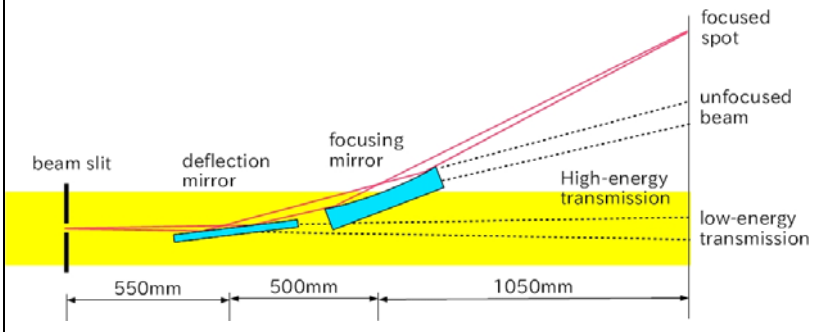

Fig.1 Beam line built at the BL10 instrument room..

Figure1 shows the beamline build on the experimental bench of BL10. A manual slit and an imaging plate (IP) was placed at the two focal points of ellipsoid on which the mirror was designed. The mirror was installed at the middle point of the slit and IP and accept neutrons at incident angle of 0.83 deg, which corresponds to critical

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

angle for 2.79 Å. Additionally, we installed a flat supermirror just after the manual slit in order to deflect the beam out of the high-energy direct beam region and reduce background. In this experiment, both the focusing supermirror and the flat mirror were placed almost horizontally and reflected neutron beam upward.

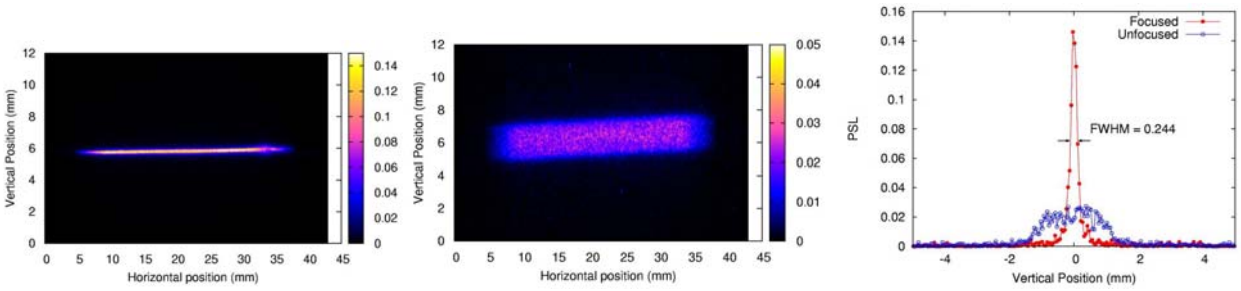

Fig.2 (a)2-dimensional profile of the focused beam. (b) that of the unfocused beam. (c) Vertical slices of profiles (a) and (b) at the horizontal center. Initial slit width was set at 0.10mm

Figure2 shows images of the focused and unfocused beam with the slit width (the initial spot size) 0.10mm. They were taken by a same IP for 1200 seconds. The 2-dimensional data was retrieved from the IP by the IP scanner BAS2500 owned by BL10 with following parameters: dynamic range: L=5, Sensitivity S=10^4, pixel size = 50μm. The focusing mirror successfully focused the beam into 0.244mm, which was also confirmed by a knife-edge scan shown in Fig..3. Deviation from ideal focusing size 0.10 mm might be attributed to some distortion of the mirror and misalignment. Peak intensity gain was about 5.5, which is smaller than the value more than 10 by the previous experiment performed at CHOP, JRR-3.

Figure4 compares wavelength distributions of focused and unfocused beams. The uprising of intensity around 2.7 Å corresponds to critical angle of the focusing supermirror and suggests that the focusing mirror acts well as a m=3 supermirror. The small value 2.7 Å compared with the designed value 2.79 Å shows some misalignment or small distortion of the mirror.

In conclusion, The elliptic mirror successfully focused wideband neutron beam (λ > 2.7 Å) into the size of 0.244mm, but some improvements are needed on mirror alignments and distortions at experiments.

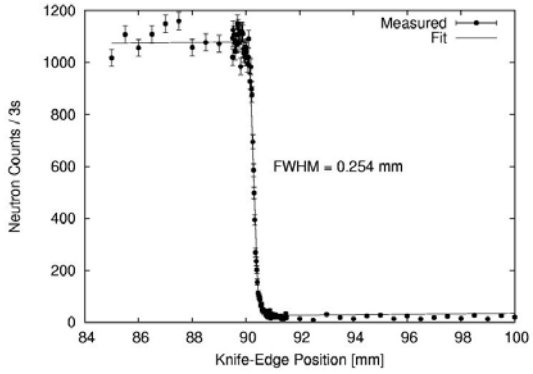

Fig.3 Profile of a knife-edge scan on the focused beam with initial slit width 0.10mm

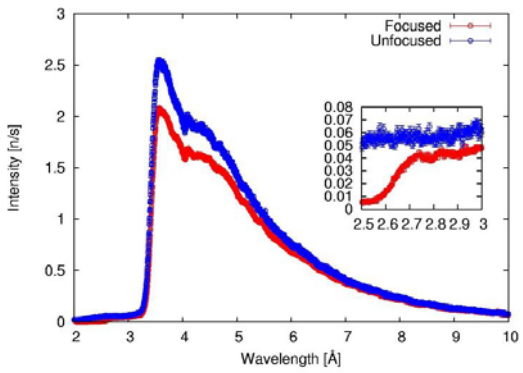

Fig.4 Wavelength distributions of the focused and unfocused beams: inset shows a magnified view around 2.7 Å.