


(※本報告書は英語で記述してください。ただし、産業利用課題として採択されている方は日本語で記述していただいても結構です。)

 MLF Experimental Report	提出日 Date of Report
課題番号 Project No. 2012B0213 実験課題名 Title of experiment Neutron beam focusing with high performance supermirrors on precisely figured surface 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 21-25 Dec. 2012

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 was measured.

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.

In the experiment, 2-dimensional neutron beam focusing was demonstrated using two 1-dimensional elliptical supermirrors which were fabricated with ion-beam sputtering of NiC/Ti supermirrors on ultra-precisely figured elliptical surfaces of quart substrates. Elliptical surface figures were fabricated with the numerically-controlled local wet etching method. Figure1 shows the beam-line configuration built in the NOBORU instrument (BL10).

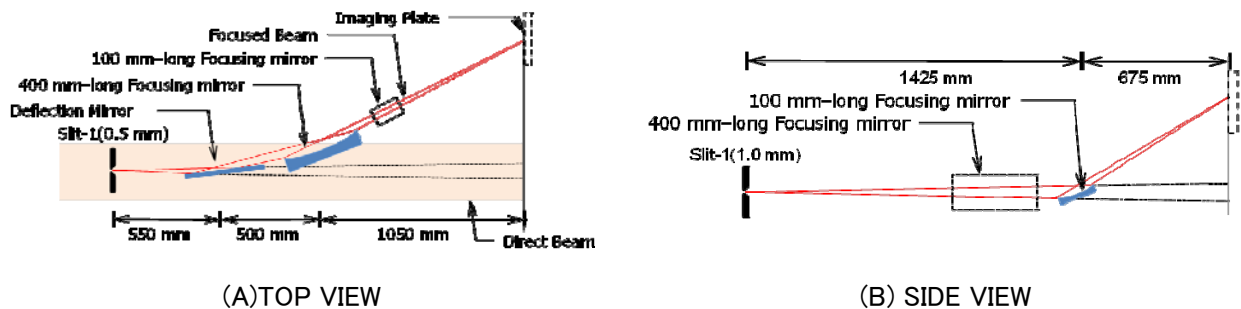


Fig.1 Beam-line setup for 2-dimensional beam focusing (the Kirkpatrick-Baez configuration) at BL10.

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

Pulsed neutron beam is, first, narrowed by the “Slit-1”, which defines a virtual beam source of 0.5 mm in width and 1.0 mm in height, then reflected sequentially by a deflection mirror, the horizontally-focusing mirror (400mm in length) and a vertically focusing mirror (100mm in length). The beam is finally focused to the focal position, 2010 mm downstream from the “Slit-1”, where the beam profile was measured with an imaging plate. The focusing mirrors were designed so that beam size at the focal position is $0.5 \times 0.5 \text{ mm}^2$. The deflection mirror was used in order to kick the beam away from the “direct beam area” shown in yellow or bisque-color, where intense gamma-ray and fast-neutron flushes directly illuminate the imaging plate and deteriorate experimental data.

Figure 2 shows the 2-dimensional intensity map measured at the focal position with an imaging plate. Cross sections of the intensity peak along horizontal and vertical directions are shown in Fig.3. Size of the intensity peak is $0.5 \times 0.5 \text{ mm}^2$ in full-width at half maximum agreeing with our mirror design.

In conclusion, we succeeded in focus pulsed neutron beam into a spot of $0.5 \times 0.5 \text{ mm}^2$ using elliptical supermirrors in the Kirkpatrick-Baez configuration fabricated with numerically-controlled local wet etching technique and ion-beam sputtering.

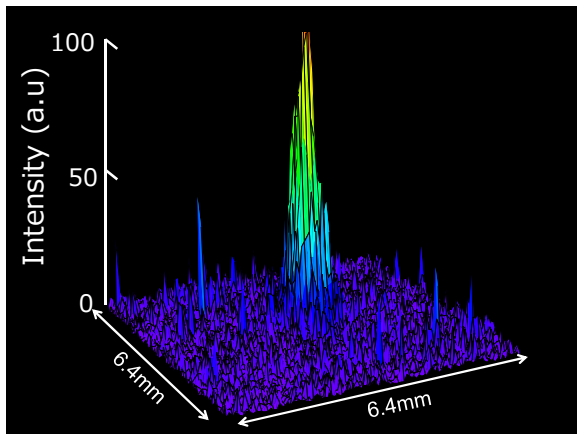
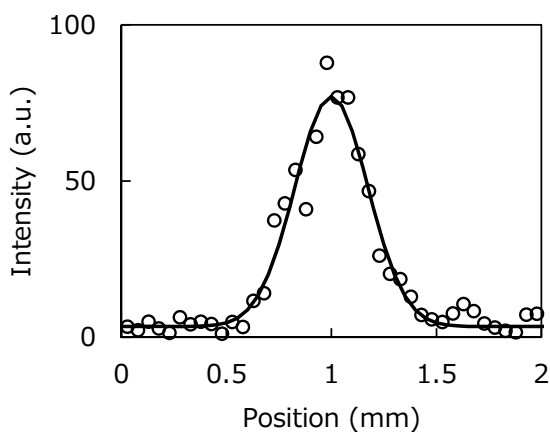
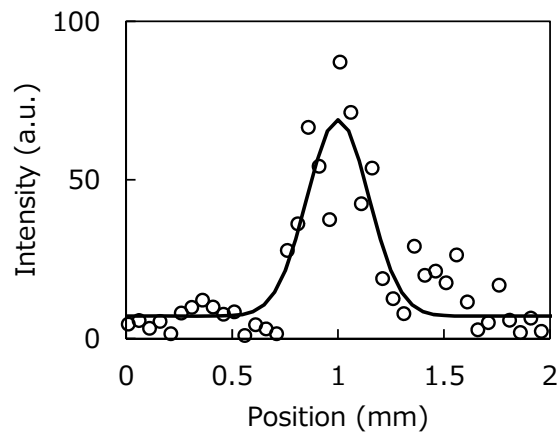


Figure2. 2-dimensional intensity map at the focal position measured with an imaging plate.



(a) Horizontal direction



(b) Vertical direction

Figure 3. Cross sections of the intensity peak in Fig.2 along the horizontal and vertical directions.