CROSS TOKAI **Experimental Report** J-PARC

提出日 Date of Report
2013.6.25

実験装置名／BL番号 Name of Instrument/BL
SHARAKU/BL17

実験装置責任者 Name of the person responsible for the instrument:
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1．研究成果概要 （a）装置グループ内の成果、（b）ユーザー課題実装時における特筆すべきサポート、（c）ユーザー課題の執行状況について、まとめてください。A4 サイズ用紙使用のこと。

Outline of your activities. Following results at your instrument should be reported in A4 size papers: (a) results of your instrument group, (b) significant user support works, and (c) statistical summary of user experiments.

(a) results of BL17 instrument group

a-1 Specular Reflectivity down to 10^{-7} (unpolarized neutron)

We achieved to measure the specular reflectivity down to the 10^{-7} order using unpolarized neutrons without any background subtraction (Fig. 1). The sample is Ni/Ti multilayer on a Si substrate. Each thickness of both Ni and Ti layer in the bilayers is 5 nm, and the number of the stack is 20. Fringes are clearly observed in the q-region between q_c of the total reflection and the 1st Bragg peak.

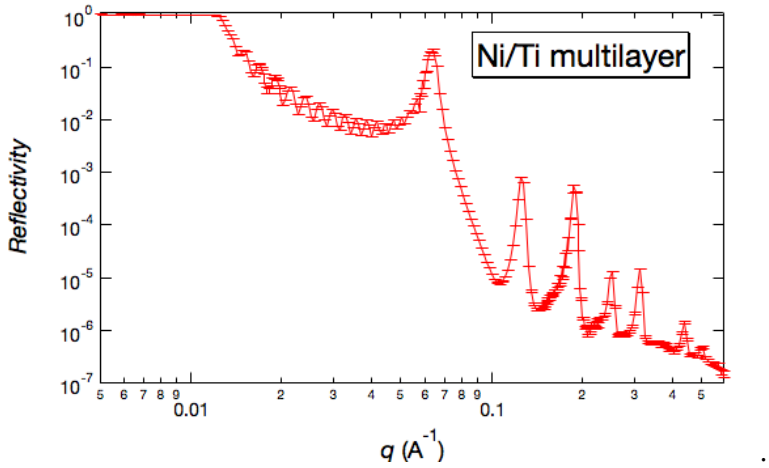

Fig. 1 Specular reflectivity of a Ni/TI multilayer using unpolarized neutron.

a-2 Performance of polarizing devices (polarizer, analyzer, and spin flipper)

The main beam line components are schematically illustrated in Fig.2. The polarizer consists of 4*Q*c Fe/Si polarizing supermirrors which align with double-transmission geometry, and a stack of the same 4 *Q*c Fe/Si polarizing supermirrors are used for the analyzer. Two-coil spin flippers are employed to flip the polarized neutron spin before and after the sample. Figure 3 shows wavelength dependence of flipping ratios (left) and of a product of polarizing efficiency of the polarizer and the analyzer, *pp*, and flipping efficiencies of the flippers, *f*1and *f*2 (right).

1. 研究成果概要（つづき） Outline of experimental results (continued).

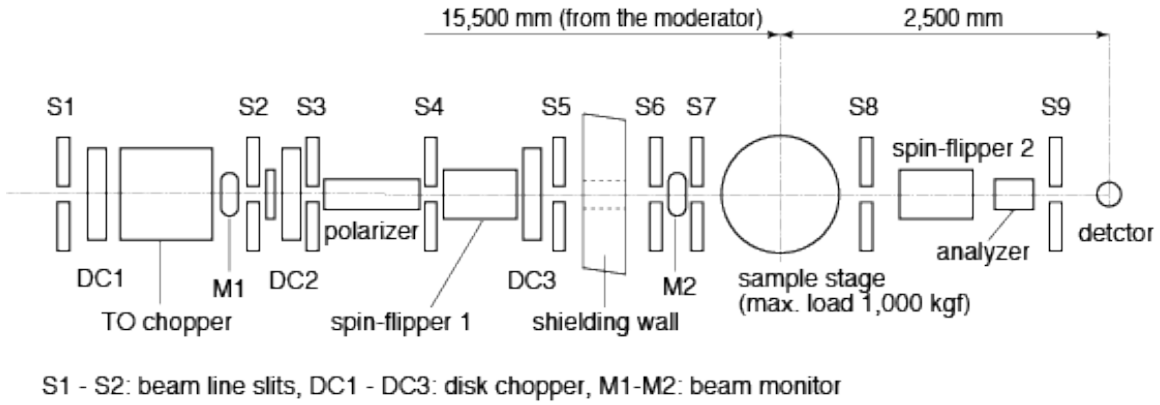

Fig. 2 Schematic drawing of the beam line components of SHARAKU.

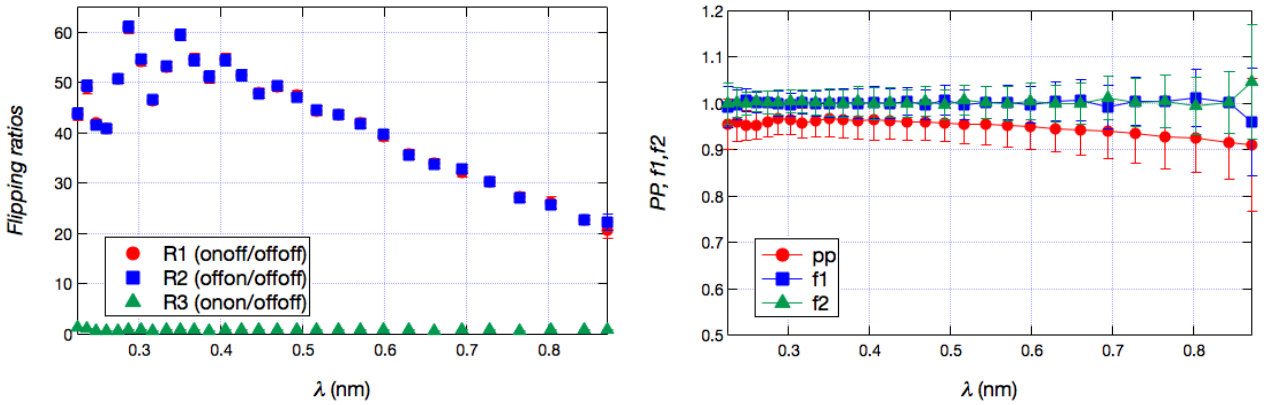

Fig. 3 The flipping ratios and the polarization efficiencies (left), and the flipping efficiencies (right).

This figure indicates that all of the polarizer, the analyzer, and the two spin flippers work very well. The maximum flipping ratio is approximately 50 for the 0.3 nm neutron, and linearly decreases with increasing the wavelength. There is no additional fine structure in the flipping ratios and the efficienies. It enables us to do a simple data correction.

(b) significant user support works

A 7 T superconducting magnet (SM) has been introduced to MLF. As the first user of this magnet, we conducted the initial performance test in collaboration with sample environment (SE) team of MLF. We are most grateful to SE team for their invaluable technical assistance. The magnet successfully generated magnetic fields up to 70 kOe. Then, polarized neutron reflectivity measurements in a general use program were performed using this SM at low temperatures.

Fig. 4 The 7 T superconducting magnet on the sample table of SHARAKU.

必要に応じて、A4 サイズの用紙に続きを記入して下さい。
Please use A4-size papers for further reporting, if necessary.

1. 研究成果概要(つづき) Outline of experimental results (continued).

(c) statistical summary of user experiments.

Exp. No.		Start			End		day	total (days)	remarks
2012A0053		2012/6/15	10:00	–	2012/6/19	22:00	4.5	4.5	
2012A0068		2012/5/5	10:00	–	2012/5/7	10:00	2		
		2012/6/22	10:00	–	2012/6/24	10:00	2	8	
		2012/11/8	10:00	–	2012/11/12	10:00	4		
2012A0085		2012/6/27	10:00	–	2012/6/30	10:00	3	6	
		2012/11/2	18:00	–	2012/11/5	18:00	3		
2012A0091		2012/6/30	10:00	–	2012/7/1	10:00	1	3	
		2012/11/6	10:00	–	2012/11/8	10:00	2	2	
2012A0098		2012/10/25	9:00	–	2012/11/2	18:00	8	8	10/31a half day
						2013A general use total		31.5	days
2012B0055		2013/1/24	9:00	–	2013/1/29	9:00	5	5	
2012B0144		2012/11/21	21:00	–	2012/11/28	9:00	6	6	
2012B0163		2012/12/17	9:00	–	2012/12/19	9:00	2		
		2012/12/20	21:00	–	2012/12/23	9:00	2	6	12/21a half day
		2013/2/7	21:00	–	2013/2/9	21:00	2		
2012B0177		2012/12/2	9:00	–	2012/12/7	9:00	5	7	
		2013/1/13	9:00	–	2013/1/15	9:00	2		
2012B0155		2012/11/28	21:00	–	2012/12/2	9:00	3.5	3.5	
2012B0069		2012/12/26	9:00	–	2012/12/27	9:00	1	1	trial use
2012B0076		2012/12/25	9:00	–	2012/12/26	9:00	1	1	trial use
2012B0095		2012/12/23	9:00	–	2012/12/25	9:00	2	2	trial use
2012B0162		2012/12/7	9:00	–	2012/12/10	9:00	3	3	reserved
2012B0140		2012/12/10	9:00	–	2012/12/12	9:00	2	8	reserved
		2013/3/20	9:00	–	2013/3/26	9:00	6		
2012B0139		2013/3/16	21:00	–	2013/3/19	9:00	2.5	3	reserved
		2013/3/19	21:00	–	2013/3/20	9:00	0.5		
2012B0128		2012/3/9	9:00	–	2012/3/11	9:00	2		reserved
2012B0131		2013/3/11	9:00	–	2013/3/13	9:00	2	5	reserved
		2013/3/13	21:00	–	2013/3/16	21:00	3		
						2013B general use total		50.5	days
2012I0104	A	2012/6/20	21:00	–	2012/6/22	9:00	1.5	3.5	
	B	2013/2/5	21:00		2013/2/7	21:00	2		
2012I0017	A	2012/4/1	0:00	–	2013/4/1	0:00			
	B								
2012P0302	A	2012/6/7	9:00	–	2012/6/15	9:00	7.5	7.5	6/13 a half day
	B	2013/1/15	9:00	–	2013/1/17	9:00	2	9.5	
		2013/1/17	21:00	–	2013/1/18	21:00	1		
		2013/1/29	9:00	–	2013/1/30	9:00	1		
		2013/1/30	21:00	–	2013/2/5	9:00	5.5		
2012P0803	A	–			–			0	
	B	2013/1/18	21:00	–	2013/1/23	9:00	4.5	5	
		2013/1/23	21:00	–	2013/1/24	9:00	0.5		
2013P0903	A	–			–			0	
	B	2013/2/27	21:00		2013/2/28	9:00	0.5	5	
		2013/2/28	21:00		2013/3/1	9:00	0.5		
		2013/3/1	21:00		2013/3/2	9:00	0.5		
		2013/3/2	21:00		2013/3/3	9:00	0.5		
		2013/3/3	21:00		2013/3/4	9:00	0.5		
		2013/3/4	21:00		2013/3/5	9:00	0.5		
		2013/3/5	21:00		2013/3/6	9:00	0.5		
		2013/3/6	21:00		2013/3/7	9:00	0.5		
		2013/3/7	21:00		2013/3/8	9:00	0.5		
		2013/3/8	21:00		2013/3/9	9:00	0.5		
						project use total		27	days

必要に応じて、A4 サイズの用紙に続きを記入して下さい。

Please use A4-size papers for further reporting, if necessary.