実験報告書様式(一般利用課題·成果公開利用)

MLF Experimental Report	提出日 Date of Report
	2011/7/1
課題番号 Project No.	装置責任者 Name of responsible person
2010B0045	Ryoichi Kajimoto
実験課題名 Title of experiment	装置名 Name of Instrument/(BL No.)
Identifying electromagnons in multiferroic TbMnO3 実験責	4SEASONS(BL01)
任者名 Name of principal investigator	実施日Date of Experiment
Hajime Sagayama	2010/11/16-2010/11/20
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Tohoku University	

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.

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.

Recent spectroscopic studies for a variety of multiferroics endowed with both ferroelectric and magnetic orders have revealed the possible emergence of a new collective excitation referred to as electromagnon. It is magnetic in origin, but it becomes active in response to the electric field component of light. Especially, spectroscopy of electromagnons in $RMnO_3$ (R denotes rare-earth ions) were energetically investigated. Aim of this study is to obtain whole picture of the electromagnons in representative maltiferroic material, TbMnO₃.

Six single crystals of TbMnO₃ grown by a floating-zone method were aligned and attached to an aluminum cell which is usually used at JRR-3 for neutron scattering experiment. The c axis was set perpendicular to the horizontal plane and parallel to the sample rotation axis named phi. Sample was cooled down to 10K with a closed-cycle He refrigerating machine. Energies of incident neutron beam were tuned into 6, 10, 16, 30, and 76 meV (multi-Ei mode). Energy resolution of each case was 5% of Ei. Generating power was 120kW.

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

Inelastic neutron scattering spectra was observed with the time-of-fright technique. Measurement was performed at every 2.5 degree in phi range between - 20 and 120 degree, where phi is angle between the b-axis and incident beam. When the phi is zero, b axis is along the incident beam. Exposure time was 1 hour. Data analysis is going on with UTSUSEMI which is a program for 4-dimetional data analysis developed by Dr. Inamura. Below figures show a part of the analysis. Magnetic excitation can be clearly seen. To investigate a relation between the magnetic excitation and optical absorption, further analysis should be circumstantially performed.

