実験報告書様式（プロジェクト利用）

MLF Experimental Report	提出日 Date of report
実験課題番号 Project No. 2015P0702 実験課題名 Title of experiment Improvement of Magnetic Field Vector Imaging Techniques using Polarized Neutron with NOBORU. 実験責任者名 Name of principal investigator Kosuke Hiroi 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.） BL10 利用期間 Dates of experiments 2016/3/19 21:00 - 3/24 9:00 2016/5/7 21:00 - 5/12 9:00

1．研究成果概要（試料の名称、組成、物理的・化学的性状を明記するとともに、実験方法、利用の結果得られた主なデータ、考察、結論、図表等を記述してください。

Outline of experimental results (experimental method and results should be reported including sample information such as composition, physical and/or chemical characteristics.

【Purpose】

The purpose of this study is imaging of a driving field around a rotating model motor by means of AC magnetic field analysis using polarized pulsed neutrons.

【Background】

In a previous study, we clarified that polarization distribution image of a model motor reflected a distribution shape of a field angle around the motor. Then, in this experiment, we measured time-dependent periodical change of polarization image of a rotating motor using AC field analysis of the polarized neutron and tried to elucidate the relationship between a driving field around the motor and a driving rotor.

【Experiment】

The polarized pulsed neutron imaging was performed in the BL10 NOBORU at MLF/J-PARC. The experimental setup was the same as our previous study. The μPIC-based Neutron Imaging Detector (μNID) was used as a two-dimensional detector. A distance between neutron source and the detector was 14.8m. Figure 1 is a picture of the model motor located in the magnetic shielding chamber. A distance between neutron source and the motor sample was 14.1m. The rotor was driven by applying three-phase AC current to the motor whose frequency was 21.5 Hz. To perform AC field analysis, time information about the AC current should be recorded. Then, we attached rotation indicator to the motor to detect rotation of the rotor. The indicator produces timing signal when rotor angle is 0 degree and its time was recorded as event data together with neutron events. To protect the rotation indicator from radiation damage, we put a small cadmium (Cd) shield in front of the indicator. The exposure time for the AC field imaging measurement was 10 h.

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

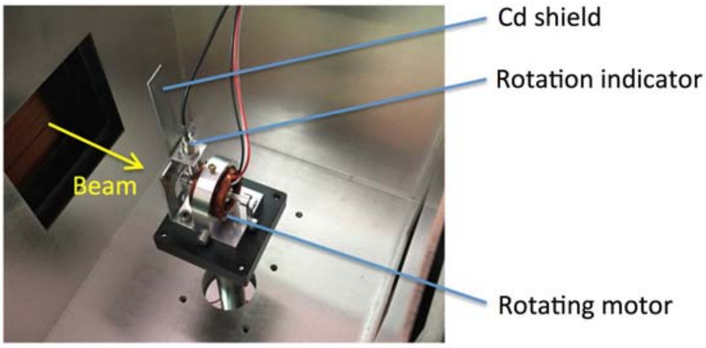

Figure 1. Rotating model motor located in the magnetic shielding chamber.

【Preliminary Result】

Figure 2 displays AC phase dependent radiographic images and corresponding polarization images of the rotating motor. We confirmed that rotating angle of the rotor could be observed from the phase dependent radiographic image. In addition, distribution shape of the polarization image changed depending on AC phase. This result is thought to reflect the phase-dependent change of the field angle distribution around the motor sample. Now we are trying to evaluate field angle distribution quantitatively by comparing experimental result of the polarization image with that obtained from computational simulation.

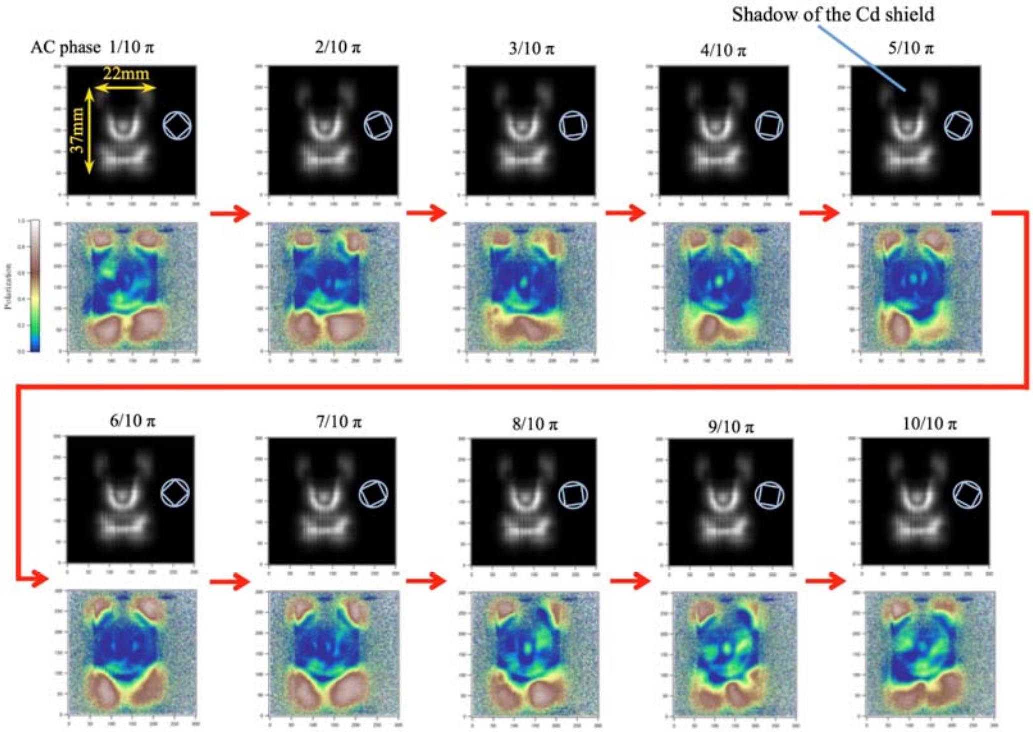

Figure 2. AC phase dependence of the radiographic image and corresponding polarization image. Schematic picture in the radiographic image indicates a rotating angle of the rotor.

This work is supported by Photon and Quantum Basic Research Coordinated Development Program from the Ministry of Education, Culture, Sports, Science and Technology, Japan.

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