

実験報告書様式(一般利用課題・成果公開利用)

(※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。)

	承認日 Date of Approval 2014/10/22 承認者 Approver Ryoichi Kajimoto 提出日 Date of Report 2014/10/22
課題番号 Project No. 2014A0114 実験課題名 Title of experiment Magnetic excitation of low- $T_c$ iron-based superconductors, LaFePO and overdoped LaFeAsO <sub>0.84</sub> F <sub>0.16</sub> 実験責任者名 Name of principal investigator Shin-ichi Shamoto 所属 Affiliation Japan Atomic Energy Agency	装置責任者 Name of responsible person Ryoichi Kajimoto 装置名 Name of Instrument/(BL No.) BL-01 実施日 Date of Experiment 5/21 21:00-- 5/22 11:00 5/28 21:00-- 5/29 11:00 6/19 11:00-- 6/20 11:00

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.
Powder samples of LaFePO <sub>0.9</sub> (~34 g) and LaFeAsO <sub>0.84</sub> F <sub>0.16</sub> (~20 g).

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.
Small hump structures at $Q_{AF} = (\pi, 0)$ ( $\sim 1.2 \text{ \AA}^{-1}$ ) and $E=13 \text{ meV}$ were observed in our previous data of LaFePO <sub>0.9</sub> ( $T_c = 5 \text{ K}$ ) and LaFeAsO <sub>0.84</sub> F <sub>0.16</sub> ( $T_c = 7 \text{ K}$ ) powder samples measured at 4SEASONS at 30 K (above superconducting transition temperatures, $T_c$ ). These origins are checked by the temperature increase to 300 K. The background signals are greatly reduced from the previous commissioning period at BL01 (4SEASONS). Based on the present study, The hump structures disappeared for both low $T_c$ superconducting samples as shown in Figs. 1 and 2. The result for LaFePO <sub>0.9</sub> is consistent with our unpublished result measured at IN5 in ILL. To our surprise, however, dynamical structure factor below $Q < 0.5 \text{ \AA}^{-1}$ increased at 300 K only for LaFePO <sub>0.9</sub> . This low-Q intensity increase can be ascribed to ferromagnetic spin correlation or nanoscale domain formation. The ferromagnetic spin correlation in a similar low- $T_c$ superconducting compound, (La <sub>0.87</sub> Ca <sub>0.13</sub> )FePO, has already been reported by NMR measurements [Nakai et al., PRL <b>101</b> , 077006 (2008)]. The ferromagnetic correlation, however, is discussed only below 30 K. In addition, it is peculiar that the ferromagnetic correlation appears only at room temperature not at low temperature such as 30 K. Regardless of the uncertainty, this finding should be checked in the near future.

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

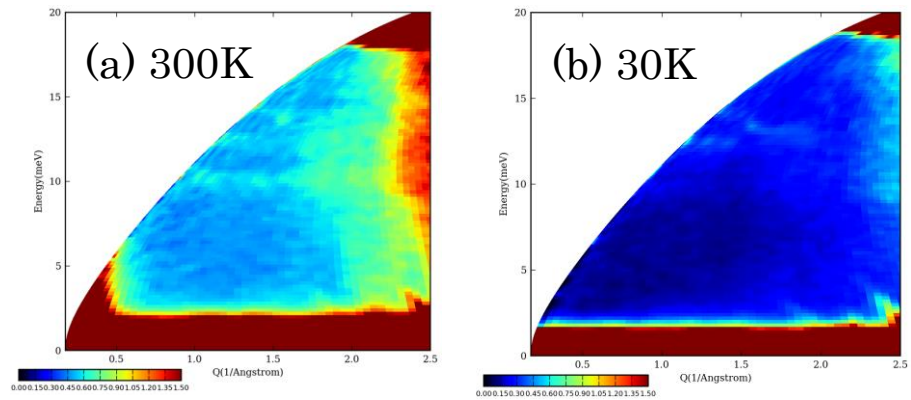


Fig. 1. Dynamical structure factors of  $S(Q, E)$  for  $\text{LaFePO}_{0.9}$  powder sample measured at 300 K (a) and 30 K (b).

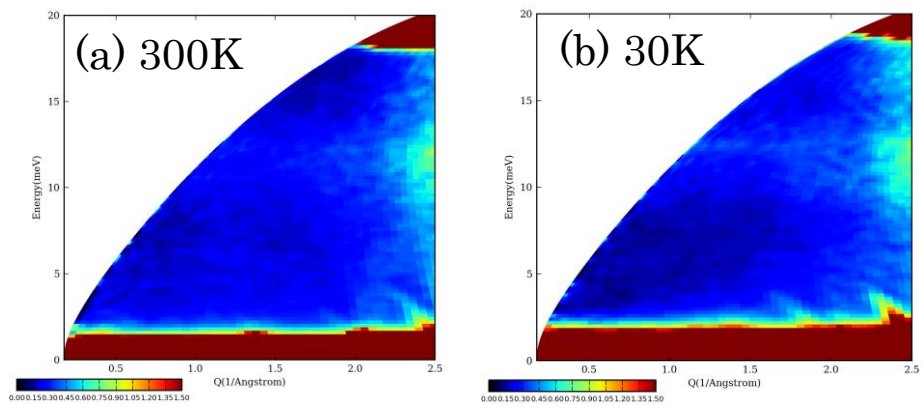


Fig. 2. Dynamical structure factors of  $S(Q, E)$  for  $\text{LaFeAsO}_{0.84}\text{F}_{0.16}$  powder sample measured at 300 K (a) and 30 K (b).