（ ※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。 ）

CROSS TOKAI **Experimental Report** J-PARC	承認日 Date of Approval 2017/12/27 承認者 Approver Ryoichi Kajimoto 提出日 Date of Report 2017/12/27
課題番号 Project No. 2017A0180 実験課題名 Title of experiment Magnetic excitation of high-quality single-crystals of Fe(Se,Te) system 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.） 4SEASONS(BL-01) 実施日 Date of Experiment 2017/11/09, 02:00-11/18, 12:00

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.

Single crystals of FeSe

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.

Single crystals of beta-FeSe have been grown by the KCl/AlCl3 chemical vapour transport as a direct synthesis method. The transition temperature, Tc, is about 8 K. About 800 single crystals with total weight of about 2.9g are aligned on 11 aluminium plates with almost hydrogen-free adhesive glue. However, hydrogen excitations were observed as strong backgrounds in our previous measurements. Therefore, our crystals were annealed in air at 200 C for 1h to remove the possible organic solvents with hydrogen atoms. According to our superconducting diamagnetic susceptibility measurements, the superconducting properties are kept as it is under this mild annealing condition.

Aligned single crystals of FeSe were measured with a proton beam power of 300 kW at 6, 100, and 150 K to confirm our previous results under different conditions (Ei=30, 50, and 400 meV). The c-axis of crystals is set to be parallel to the incident beam direction. The data are partly analyzed by using `Utsusemi' software. Unfortunately, the strong backgrounds remained.

However, the optimization of measuring conditions enables us to observe high-energy magnetic excitations clearly as shown in Fig. 1, where the magnetic excitations can be observed only up to about 190 meV. In addition, chimney-type excitations were not observed. On the other hand, the checkerboard (Neel) type excitations at (π,π) were observed in a limited energy range especially above the structural phase transition, suggesting the competing orders between checkerboard and stripe type magnetic correlations in FeSe.

References

[1] A.E. Boehmer, F. Hardy, F. Eilers, D. Ernst, P. Adelmann, P. Schweiss, T. Wolf, C. Meingast, Phys. Rev. B 87, 180505(R) (2013).

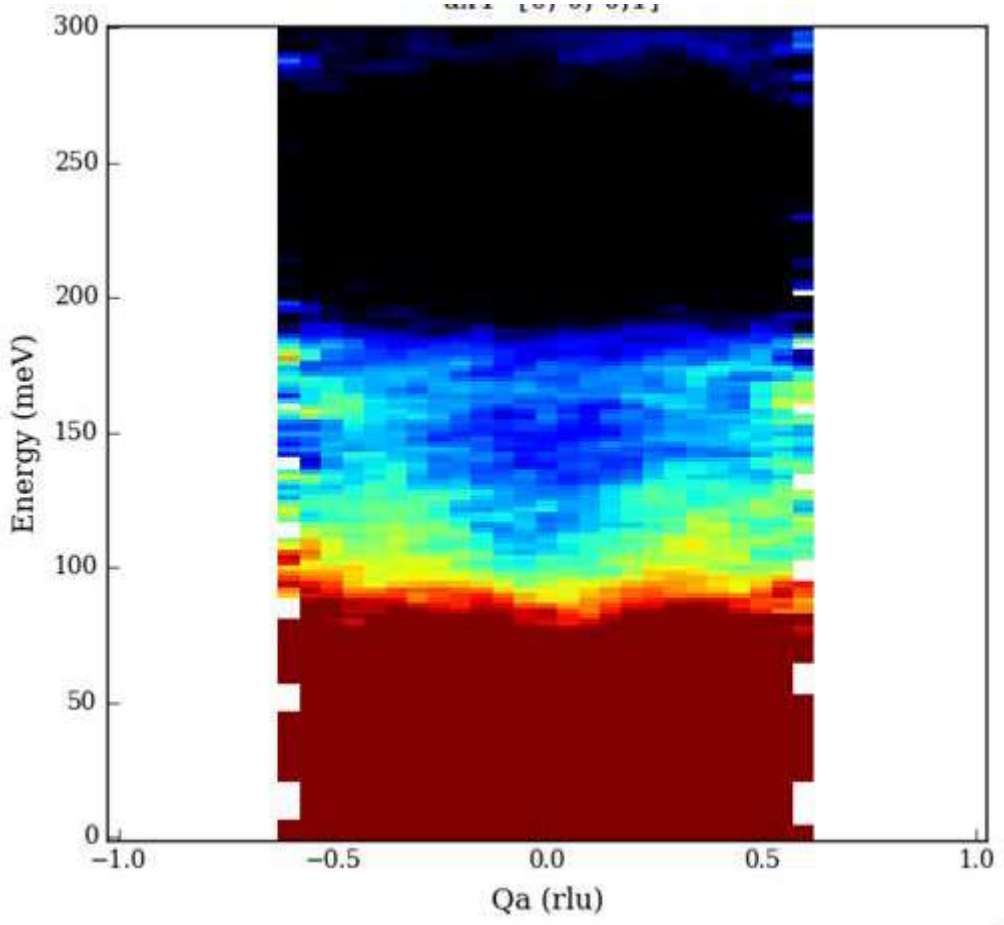

Fig. 1. Observed high-E dispersions as a function of Qa at T= 6 K by using Ei=400 meV.