（ ※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 2016/4/5 承認者 Approver Hattori Takanori 提出日 Date of report 2016/4/3
課題番号 Project No. 2015A0033 実験課題名 Title of experiment Update the MITO system to 30 K and its application for the discovery of ordered phase of ice Ic 実験責任者名 Name of principal investigator Kazuki Komatsu 所属 Affiliation The University of Tokyo	装置責任者 Name of responsible person Takanori Hattori 装置名 Name of Instrument/（BL No.） PLANET (BL11) 実施日 Date of Experiment 2016/2/20-2016/2/27

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.

$MgH_2 + D_2O$

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.

We have developed so-called ‘MITO system’ from several years ago, which allows us to access in a p-T range of 77 – 473 K and 0- 10 GPa, and in this experiment we conducted a feasibility test for the updated version of MITO system enabling the accessibility to further low temperature. The new MITO system (2nd version) includes a 4 K GM cryostat as shown in Fig. 1 in addition to the previous MITO system (1st version) consisting of 100t press and liquid nitrogen flow system (Komatsu et al., High Press Res, **33**, 208, 2013). The new system was tested in prior to the experiment and confirmed that it works below 40 K at minimum, and more at higher pressure because the fitted surface area will be increased with increasing pressure. Fig 2 shows the lattice parameter of ice Ic with decreasing pressure under low temperature, from the Rietveld refinement for the data taken by using the new system. Temperature was not controlled in this process but it decreased with decreasing pressure owing to the reason described. Further development would be necessary in order to access lower temperature particularly at higher pressure, so that we will try to put more thermal insulator in between anvils and surroundings, which is going to be tested in the future experiments.

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

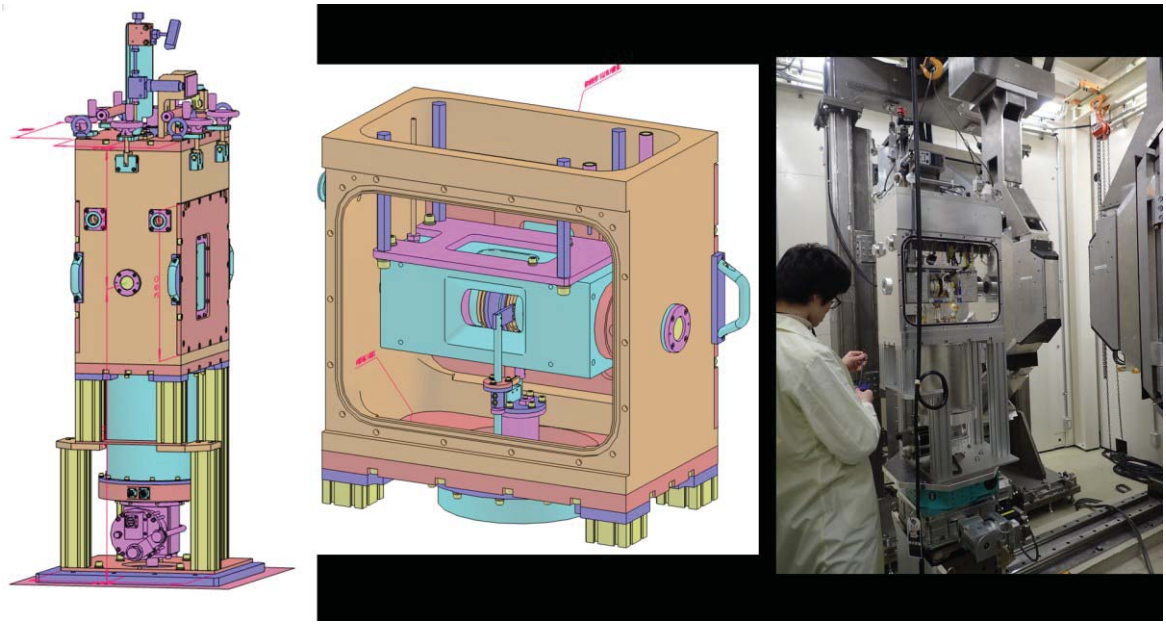

Fig. 1. Drawings of the new MITO system (left and middle) and a picture (right) showing that the system is installing at the PLANET, BL11, in MLF.

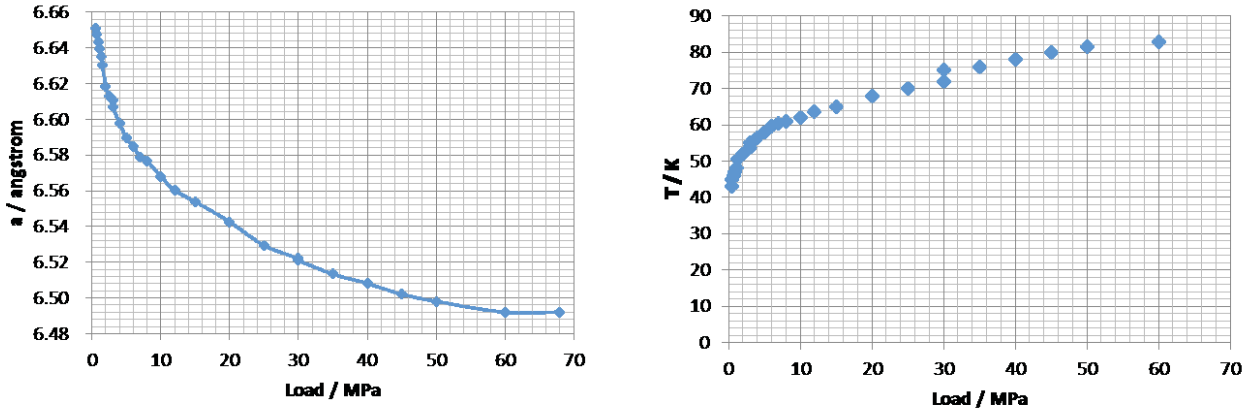

Fig. 2. Refined lattice parameters of ice Ic (left) at temperatures (right) with decreasing pressure (load).