Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Frequency-dependent Study of Ultrapure Solid 4He by Using Rigid Double-pendulum Torsional Oscillator JAEWON CHOI, JAEHO SHIN, EUNSEONG KIM, Korea Advanced Institute of Science and Technology — The physical origin of the period drop found in the torsional oscillator (TO) containing solid 4He was previously interpreted as the appearance of supersolidity.[1] The current consensus is that the increase in the shear modulus leads to the period anomaly. Further studies show that the stiffening effect in TO can be amplified if a TO is not properly designed to be "rigid." In this study, we designed a rigid double-pendulum TO. High purity solid 4He sample (0.6ppb) was grown by the block capillary method. The resonant period of TO starts to decrease from the empty cell data at 80mK. The ratio of the resonant period changes to the total mass loading are 3.8×10^{-5} and 2.6×10^{-4} for 1^{st} and 2^{nd} mode, respectively. Unlike recent experiment[2], we could not found a frequency-independent period drop. The upper bound for the putative supersolid fraction is less than 4×10^{-6}. The dissipation peak accompanied with the period drop was also analyzed with Cole-Cole plot and $\omega\tau$ plot. We conclude that major contribution for the anomalous TO responses comes from the elastic effect.

[1]E. Kim, M. H. W. Chan, **Science** 305, 1941 (2004)
[2]X. Mi, J. D. Reppy, **J. Low. Temp. Phys.** 175, 104 (2014)

Jaewon Choi
Korea Adv Inst of Sci & Tech

Date submitted: 14 Nov 2014 Electronic form version 1.4