

Abstract Submitted  
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**Is Supersolid still out there?**<sup>1</sup> XIAO MI, ANNA EYAL, JOHN D. REPPY, Cornell University — After almost a decade of experiments attempting to display a superfluid-like behavior in solid  $^4\text{He}$ , it now seems that this “super-solid” state may not exist. Although, the results of some of the experiments reporting a supersolid behavior can be interpreted by other means, there exist others for which a plausible alternative explanation is lacking. Currently we are performing experiments employing a double torsional oscillator (TO), which can discriminate between two scenarios - that of signals arising from the acceleration of the sample involving elastic effects, which depend on the square of the frequency, and that of a supersolid condensate indicated by a frequency-independent term. We see a small frequency-independent term for our bulk samples contained in both cylindrical and annular geometries. This term represents a fraction of about  $10^{-4}$  of the total moment of inertia of the solid sample. The observation of such small signals requires high stability for the TO and in our most recent measurements, we have been able to improve the stability and signal to noise ratio by an order of magnitude over our previous works. The small remaining frequency-independent signals, we observe, are inexplicable by elastic effects alone and may be indicative of a true supersolid.

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