Abstract Submitted
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More on the shear modulus of solid helium[1] NORBERT MULDERS[2], University of Delaware — In experiments on solid ^{4}He one finds a striking similarity between the response of torsional oscillators and the shear modulus. It has been suggested that in fact the observed increase in the torsional oscillator frequency at low temperature is just a reflection of the stiffening of the solid helium, and thus that of the oscillator as a whole. In some cases this may indeed be the case, but a recent experiment by Keiya Shirahama and Eunseong Kim's groups in which a measurement of the shear modulus was incorporated in a torsional oscillator cell seemed to indicate that the response of the solid to shear is decoupled from that of the oscillator. However, one may object that a) the shear was not applied at a frequency different from that of the oscillator, and that b) the direction of the applied shear was orthogonal to the stress imposed by the motion of the oscillator. In a series of experiments using two stacks of piezoelectric transducers that can be excited, and are able to detect, in orthogonal shear directions, we show that shearing the solid at one frequency affects the shear modulus at different frequencies, and similarly, that shearing in one direction affects the modulus as measured at the orthogonal direction. We conclude that quite generally shear and torsional oscillator responses are decoupled. And while they may both reflect the same underlying physics, it is unlikely that one causes the other.

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