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Low Frequency Dynamics of Solid Helium[1] JOHN BEAMISH, JAMES DAY, OLEKSANDR SYSHCHENKO, University of Alberta — Torsional oscillator measurements involving solid ^{4}He show a frequency increase at temperatures below 200 mK which suggests that mass is decoupling from the oscillator, the "non-classical rotational inertia" (NCRI) which characterizes a supersolid. A dissipation peak accompanies the onset of decoupling but its origin is unclear. The elastic shear modulus stiffens in the same temperature range and is also accompanied by a dissipation peak. It is clear from the similarities between the shear modulus and the torsional oscillator NCRI that the two phenomena are closely related. We have measured the shear modulus and the dissipation (phase angle) in solid ^{4}He at frequencies from 0.5 to 8000 Hz. The onset of stiffening and the dissipation peak shift to higher temperatures with increasing frequency. The stiffening and dissipation can be described as the real and imaginary parts of a thermally activated Debye relaxation process. However, a broad range of activation energies is needed to describe the elastic response.

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