Abstract Submitted
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Impact of dislocations on the structure of solid helium[1] HANS LAUTER, Oak Ridge National Lab, JOHN GOODKIND, USCD San Diego, KENNETH HERWIG, Oak Ridge National Lab, ECKHARD KROTSCHECK, University at Buffalo, EFIM KATS, Institut Laue Langevin, ANDREY PODLESNYAK, ANDREII SAVICI, DIALLO SOULEYMANE, JUSTIN CAREMICHAEL, Oak Ridge National Lab — Uncommon phonon spectra were obtained from solid helium below 1.3K and at pressures near 30 bar. Rapid cooling using the blocked capillary method created stressed solid helium in non-equilibrium state. Using inelastic neutron scattering, we disclosed the absence of Bragg-scattering combined with the presence of a phonon-gap, a phenomenon revealing the absence of long-range crystalline order. The energy of the gap is close to the value of a thermal activation energy measured by ultrasonic attenuation in unstrained solid 4He [1] crystals. The dispersion of the phonons shows point-like intensities interpreted as signature of finite-length edge dislocations. The range and shape of the strain field perpendicular to the dislocation line was identified discerning excitations related to the fluttering mechanism [2]. These finding give new input to the discussion of a dislocation network in view of the shear modulus in distorted solid 4He [3,4].
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