

Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

New excitations in bcc ^4He - an inelastic neutron scattering study OSHRI PELLEG, Physics Department, Technion - IIT, Haifa 32000, Israel, JACQUES BOSSY, CNRS, BP 166, 38042 Grenoble Cedex 9, France, EMMANUEL FARHI, Institut Laue-Langevin, BP 156, 38042 Grenoble Cedex 9, France, MENI SHAY, SLAVA SORKIN, EMIL POLTURAK, Physics Department, Technion - IIT, Haifa 32000, Israel — We report results of inelastic neutron scattering experiments on bcc solid ^4He (Pelleg et al. *Phys. Rev. B.* **73**, 180301(R)(2006)). In the experiments, we studied the excitation spectrum of the solid, including the phonon branches and the recently discovered “optic-like” branch (T.Markovich et al., *Phys. Rev. Lett.* **88**, 195301(2002)). We were able to determine that the new “optic-like” branch has an intrinsic dispersion, hence it is a propagating mode. This excitation also couples to the usual phonons. In addition, in the new experiments we discovered another “optic-like” branch. The second “optic-like” branch is dispersionless, with an energy around 1 meV ($\sim 11\text{K}$). This excitation does not seem to couple to phonons. Hence, the properties of the two “optic-like” branches seem different. Since one expects only 3 acoustic phonon branches in a monoatomic cubic crystal, these two new branches must represent some different type of excitations. Some potential interpretations, based on Path Integral Monte Carlo simulations, will be presented.

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Date submitted: 14 Nov 2006

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