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the excitation spectrum of solid 4He[1] JOHN GOODKIND, University of California, San Diego, ELIZABETH BLACKBURN, SUNIL SINHA, COLLIN BROHOLM, JOHN COPLEY — Speculation about a possible Bose condensation in solid ^{4}He has existed for decades and has recently been further stimulated by the discovery of an acoustic anomaly and a decrease in the moment of inertia at temperatures below 200 mK. The excitation spectrum played an important role in understanding the properties of superfluid liquid helium so that, if there is such a condensation in solid ^{4}He,the spectrum might also confirm it and aid in understanding it. We have measured the excitation spectrum of solid ^{4}He by neutron scattering using the Disc Chopper Spectrometer at NIST. We have identified a sharp line in the spectrum as vacancy wave excitations. The dispersion relation for these excitations has a minimum energy of 1 meV and is quadratic. This vacancy mode intersects the longitudinal phonon mode at 1.1 meV and the two become degenerate at higher energies. The degenerate mode has a linear dispersion law with smaller slope than the longitudinal acoustic mode at lower energies. No change in the spectrum was observed below 200 mK. The spectrum has strong similarities to the spectrum in superfluid liquid helium.

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