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Hydrodynamic theory of rotating ultracold supersolids[1] SANKALPA GHOSH, Physics Department, Indian Institute of Technology, Delhi, RASHI SACHDEVA[2], Physics Department, Indian Institute of Technology, Kanpur — Ultra cold atomic condensate with long range interaction is considered as a possible candidate to realize the supersolid phase. Such a supersolid phase can be subjected to artificial gauge field created either through rotation or by introducing space dependent coupling among hyperfine states of the atoms using Raman lasers. Starting from a Gross-Pitaevskii energy functional that describes such systems at zero temprature we construct hydrodynamic theory to describe the low energy long wavelength excitations of such rotating supersolid of weakly interacting ultra cold atoms for generic type of long range interaction. We treat the supersolid within the framework of well known two fluid approximation. We consider such system in the fast rotation limit where a vortex lattice in superfluid coexists with the supersolid lattice and analytically obtain the dispersion relations of collective excitations around this equilibrium state. The dispersion relation suggests a mode splitting due to the existence of two lattices which can be experimentally measured within the current technology. We point out that this can clearly identify such a ultra cold atomic supersolid phase. Ref. Rashi Sachdeva and Sankalpa Ghosh arXiv: 1308.1592 (Cond-Mat)

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