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Neutrino plasma interactions and supernovae shock revival JOSE MENDONCA, GoLP Instituto Superior Tecnico, ROBERT BINGHAM, STFC/RAL, LUIS SILVA, GoLP Instituto Superior Tecnico, PADMA SHUKLA, Institut fur Theoretische Physik IV — One of the outstanding problems with supernovae is how to reverse the implosion due to gravity to create an explosion. This is sometimes referred to as reviving the stalled shock wave by neutrino heating. During the supernovae collapse an intense flux of neutrinos is emitted. These neutrinos drive a novel class of plasma instabilities: the electroweak versions of the standard electron or photon driven streaming or forward scattering instabilities. Using the relativistic kinetic equations for neutrinos interacting with plasmas via the weak interaction, we explore the different collective plasma instabilities driven by intense neutrino fluxes. We examine the anomalous energy transfer between the neutrinos and the shocked plasma via electron plasma waves and the generation of quasi-static magnetic fields, the electroweak Weibel instability. A quasi linear model of the streaming instability results in plasma heating with about 1% of the neutrino energy being absorbed by the plasma this is sufficient to revive the shock wave and create the explosion.

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