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Kinetic Simulations of Solar Type II Radio Burst Emission

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Propagation of coronal mass ejection (CME) shock fronts in the heliosphere is often accompanied by the emission of so-called type II radio bursts, which are multi banded emission features.

Their complex emission spectra indicate that interaction processes of multiple plasma waves are responsible for their creation, but the requirement for kinetic treatmet of the problem, together with the large separation of involved lengthscales have made simulations of this phenomenon challenging.

Using the ACRONYM particle-in-cell code, we have investigated the plasma microphysics in the CME foreshock region. We were able to consistently reproduce the electron beam-driven excitation of electrostatic waves and their subsequent nonlinear coupling to form fundamental and harmonic radio emissions.