Simulations of type III solar radio bursts in the inhomogeneous corona and interplanetary space

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It is generally accepted that plasma emission is responsible for type III solar radio bursts, which sometimes show harmonic pairs with radiation near the electron plasma frequency and its second harmonic. This emission mechanism consists of a sequence of steps: (i) a semi-relativistic electron beam generates primary Langmuir waves via a beam instability; (ii) the primary Langmuir waves undergo electrostatic decays and generate product Langmuir waves and ion-sound waves; (iv) the ion-sound waves stimulate the primary Langmuir waves to produce electromagnetic emission at the fundamental frequency; and (iv) the nearly oppositely-directed Langmuir waves coalesce and generate electromagnetic emission at the second harmonic of the plasma frequency. We present here the first simulations of type III bursts that incorporate both small-scale and large-scale density inhomogeneities, and include the dynamics of the beam, Langmuir and ion-sound waves and electromagnetic radiation. The evolution of the radiation in coordinate and phase space are explored for illustrative parameters of type III bursts in the corona and interplanetary space. The establishment of a stochastic growth state for the beam-Langmuir wave system is demonstrated.