Mechanisms of fundamental electromagnetic wave radiation in the solar wind

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Large-scale and long-term two-dimensional Particle-In-Cell simulations performed for parameters typical of type III solar radio bursts have provided new results on the generation mechanisms of fundamental electromagnetic waves. The dynamics of ion acoustic waves is studied and signatures confirming the three-waves' interactions are provided. The decisive role played in the Electromagnetic Wave Decay (EMD) process by the backscattered Langmuir waves coming from the electrostatic wave decay (ESD) is demonstrated. Moreover, it is shown that EMD is stimulated by ion acoustic waves coming from the two cascades of the faster and more intense ESD. When the plasma is randomly inhomogeneous, EMD is not suppressed but develops only within confined plasma regions of reduced or quasi-uniform density. It coexists with linear conversion of Langmuir waves into electromagnetic radiation, which is the fastest and prominent process, as well as with ESD. Moreover, the impact of the ion-to-electron temperature ratio on electromagnetic energy growth and saturation is shown to be rather weak.