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On the fine structure of Type III bursts: numerical simulation

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In this paper we simulate propagation of electromagnetic waves generated by a beam of fast electrons moving through the plasma of the solar corona. Previously, we considered an analytical model describing the frequency drift of Type III bursts for a point source, as well as numerical simulations of Type III bursts for a beam of electrons having a finite size. In both cases, the frequency drift were obtained for different speeds of the electron beam, and the angles between the direction of propagation of the beam and the direction of the observer. In this work we focus on the shape of individual peaks and their fine structure. Unlike the conventional method of group delay, in this paper we take into account the variable density of solar plasma from the very point of generation, therefore, the group velocity of electromagnetic waves is a continuous function of the plasma density i.e. the coordinate. This allows us to explicitly take into account the fine structure of the inhomogeneities of the plasma and the beam near the point of generation, as well as the dependence of these inhomogeneities on the coordinate. We have obtained profiles of Type III bursts, and formulated the conditions for which the fine structure of these bursts appears. Our numerical results are in accordance with fine-structured Type III bursts observed by the UTR-2 radiotelescope, and this similarity allows us to make predictions about the shape and the propagation direction of the beam of fast electrons.