On the mechanism of radio emission in type III Solar Radiobursts

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Abstract

Type III solar radio bursts are generated by streams of energetic electrons accelerated at the Sun during periods of the solar activity. The generation occurs in two steps. Initially, electron beams generate electrostatic Langmuir waves and then these waves are transformed into electromagnetic emissions. It is widely accepted that the mechanism of generation of emission on fundamental (plasma) frequency is due to induced scattering of Langmuir waves. However this process imposes quite restrictive limit of the ratios of effective brightness temperatures of electromagnetic and Langmuir waves in the source region. Recent studies showed that the level of density fluctuations in the solar wind and in the solar corona is so high that it may significantly affect beam-plasma interaction. Here we show that the presence of intense density fluctuations not only crucially influences the process of beam plasma interaction but also changes the mechanism of energy transfer from electrostatic waves into electromagnetic. Reflection of the Langmuir waves from the density inhomogeneities may result in partial transformation of the energy of electrostatic wave into electromagnetic. We show that the linear wave energy transformation for the level of fluctuations of the order of 1% or higher is efficient enough to produce radio bursts with brightness temperature of $10^{14} - 10^{15}$K.