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Generation of interplanetary type IIIb radio bursts

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Solar type III radio bursts are the radio signatures of fast electron beams propagating through open and quasi-open magnetic field lines. While they have been well explored in the past 60 years, several open questions remain to the present day which concerns their generation and propagation. The generally accepted theory for their generation in the corona is via the plasma emission mechanism and a substantial amount of work has been done to support this idea.

Some of the previous studies of type III radio bursts have employed that bursts ~~used it~~ as means to probe the background plasma characteristics through which the electron beams propagate. Fine structures in type III radio bursts can therefore provide vital input in understanding the properties of the ambient plasma. The presently available advanced ground-based radio imaging spectroscopic techniques (using e.g., LOFAR, MWA, etc.,) and space-based observations (Wind, STEREO A & B, Parker solar probe, Solar Orbiter) provide a unique opportunity to identify, and study fine structures observed in the low corona and interplanetary space.

In this study, we focus on the radio fine structures observed in range of the hecto-kilometric wavelengths that were much less studied than the one in the metric-decametric range. We present for the first time three different types of fine structures observed in interplanetary type III radio bursts. The presented fine structures show spectral characteristics similar to the striae-like fine structures observed within the type IIIb radio bursts at decametric wavelengths. We employ the probabilistic model for beam-plasma interaction to investigate the role of density inhomogeneities on the generation of the striae elements. The results suggest that there is a good correlation between the width of the striae elements and the scale of density inhomogeneities found in interplanetary space.