EGU21-11912
https://doi.org/10.5194/egusphere-egu21-11912
EGU General Assembly 2021


# Electron beaming instabilities as sources of CME radio emissions

**Marian Lazar**[1,2], Rodrigo Lopez[3], Shaaban Mohammed Shaaaban[4], Stefaan Poedts[2], and Horst Fichtner[1]

[1]Institute for theoretical physics IV, Ruhr-University Bochum, D-44780 Bochum, Germany
[2]KU Leuven, Centre for mathematical Plasma-Astrophysics, Department of Mathematics, Leuven, Belgium
(marianlazar@yahoo.com)
[3]Departamento de Fisica, Universidad de Santiago de Chile, Casilla 307, Santiago, Chile
[4]Institute of Experimental and Applied Physics, University of Kiel, Leibnizstrasse 11, D-24118 Kiel, Germany

Radio emissions accompanying coronal mass ejections (CMEs) from their flaring sources (type III bursts) to interplanetary shocks (type II bursts) are believed to originate in the electrostatic (ES) wave instabilities, which are excited by the electrons beaming along the intense magnetic fields. Theoretically, radio emissions of fundamental (plasma) frequency $\omega_{p}$ or the second harmonic $2 \omega_{p}$ may result from non-linear three waves interaction of electrostatic Langmuir and ion sound fluctuations. However, it is not clear yet what kind of electron beams and specific CME plasma conditions can determine destabilization of Langmuir waves (ion sound waves may result from non-linear decay). Recent attempts to identify and characterize these unstable regimes suggest very critical and limited conditions for Langmuir instabilities to develop, which may undermine our current understanding of their implication in nonlinear generation of radio waves. Thus, even for a dominance of ES instabilities, conditioned by high beaming velocities, Langmuir waves appear to be in close competition with other ES growing modes (such as electron acoustic instabilities), while for less energetic beams the theory predicts a strong interplay with instabilities of different nature (electromagnetic or hybrid, and propagating obliquely to the magnetic field).