Abstract Submitted
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Three-dimensional electromagnetic strong turbulence: I. Scalings, spectra, and field statistics[1] DANIEL GRAHAM, University of Sydney, OLAF SKJAERAASEN, ProsTek, Institute for Energy Technology, PETER ROBINSON, IVER CAIRNS, University of Sydney — The first fully three-dimensional (3D) simulations of large-scale electromagnetic strong turbulence (EMST) are performed by numerically solving the electromagnetic Zakharov equations for electron thermal speeds v_e with $v_e/c \geq 0.025$. The results of these simulations are presented, focusing on scaling behavior, energy density spectra, and field statistics of the Langmuir (longitudinal) and transverse components of the electric fields during steady-state strong turbulence, where multiple wave packets collapse simultaneously and the system is approximately statistically steady in time. It is shown that for $v_e/c < 0.17$ strong turbulence is approximately electrostatic and can be explained using the electrostatic two-component model. For $v_e/c > 0.17$ the power-law behaviors of the scalings, spectra, and field statistics differ from the electrostatic predictions and results because v_e/c is sufficiently high to allow transverse modes to become trapped in density wells. Three-dimensional EMST is shown to have features in common with 2D EMST, such as a two-component structure and trapping of transverse modes.

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