

# Subtlety in the Use of Maxwell's Equation and a New Electromagnetic Wave in Electron Plasmas

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The ambiguity involved in the use of Maxwell's equation particularly in electron plasmas is discussed. It is pointed out that in the slow time scale perturbations the displacement current is ignored but it does not imply that the electron density fluctuations vanish. The contradictions in the assumptions and approximations used in the literature on this subject are discussed. A new low frequency electromagnetic wave is described which is a normal mode of non-uniform magnetized electron plasmas. This wave can couple with plasma hybrid oscillations if ion dynamics is taken into account. It is stressed that the electron magnetohydrodynamics (EMHD) model seems to be simple but in fact its use is subtle and its scope is very limited.

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