GPPI Homework Set 4

Due on December 10, 2007

Problem 1. Wave energy

For the electrostatic Langmuir wave in cold plasma, prove that the averaged energy of the perturbed electric field is the same as that of the kinetic energy of the fluid perturbation.

Problem 2. Thermal effect of electromagnetic wave

Consider the electromagnetic wave in a homogeneous, unmagnetized plasma with plasma density n and electron temperature T_e. Assume $\mathbf{k} \cdot \mathbf{v} \neq 0$, ions are motionless, and the plasma is isothermal. Drive the dispersion relation.

Problem 3. Electron-cyclotron wave

The lower frequency branch of the R-wave is called the electron-cyclotron wave. What is the maximum phase velocity of the R-wave?