Abstract

We have derived dispersion relation of transverse waves for anisotropic ultra-relativistic electron plasma. The spectral analysis of the waves shows the effect of temperature anisotropy on plasma frequency. Unmagnetized dielectric tensor is reformulated considering anisotropy in the particle distribution function of the form $f_o(p)=\sqrt{(p^2+\xi(p.n)^2)}$ considering spherical polar coordinates. Such anisotropic particle distributions are suitable for the plasmas that flow elliptically. From the dielectric tensor, we derive dispersion relations of transverse waves for ultrarelativistic electron plasma. Cartesian geometry parametrized in Cylindrical polar coordinate systems seems to be inappropriate for ultrarelativistic plasmas. From the result, we observe that there is no unstable mode in the case of large phase velocities (small propagation limit). The case is also known as superluminal case where the phase velocity of the wave is greater than speed of light. On the other hand, in the subluminal case (large propagation case), we obtain an unstable mode. In this case, the wave become more unstable due to large positive value of temperature anisotropy parameter (large perpendicular temperatures). For isotropic case, we retrieve the standard result reported by VP Silin in 1960.

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