Thermodynamics of Anisotropic Plasmas

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Temperature anisotropy is commonly found in space plasma environment. The binary collision frequencies in space plasmas are so small that the parallel and perpendicular (to ambient magnetic fields) temperatures can remain different for a considerably long time. The conventional theory of thermodynamics is based on the assumption that a gas has one single temperature, therefore, it is not readily applicable to anisotropic plasmas that have two (parallel and perpendicular) temperatures. The present study is to establish thermodynamics of anisotropic plasmas, with an emphasis on relativistic effects.