

Gluon Collective Modes in Anisotropic Quark-Gluon Plasma

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Gluon collective modes of quark-gluon plasma are systematically studied. The momentum distribution of plasma constituents is obtained from the isotropic one by stretching it or squeezing in one direction, which leads to a prolate or oblate distribution, respectively. There are considered all possible degrees of one dimensional deformation from the extremely prolate case, when the momentum distribution is infinitely elongated in one direction, to the extremely oblate distribution, which is infinitely squeezed in the same direction. For each case, the complete mode spectrum is given analytically if possible, and numerically when not. The number of modes is found by means of a Nyquist analysis. Unstable modes are shown to exist in all cases except that of isotropic plasma. The conditions for the existence of these instabilities are derived. The stable modes, which are not limited to small domains of wave vectors and therefore have an important influence on the system's dynamics, are also discussed.

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