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Kinetic instabilities in a mirror-confined ECR discharge plasma[1]

DMITRY MANSFELD, MIKHAIL VIKTOROV, ALEXANDER VODOPYANOV, SERGEY GOLUBEV, Institute of applied physics Russian Academy of Sciences — Kinetic instabilities of nonequilibrium plasma heated by powerful radiation of gyrotron in electron cyclotron resonance conditions and confined in a mirror magnetic trap are reported. Instabilities are manifested as the generation of short pulses of electromagnetic radiation accompanied by precipitation of hot electrons from magnetic trap. Measuring electromagnetic field with high temporal resolution allowed to observe various dynamic spectra of electromagnetic radiation related to at least five types of kinetic instabilities. The opportunity to recreate different conditions for excitation and amplification of waves in plasma in a single ECR discharge pulse has been demonstrated. This report may be of interest in the context of a laboratory modeling of nonstationary wave-particle interaction processes in nonequilibrium space plasma since the observed phenomena have much in common with similar processes occurring in the magnetosphere of the Earth, planets, and in solar coronal loops.

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