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Laboratory study of pulsed regimes of electron cyclotron instabilities in a mirror-confined plasma for astrophysical applications

Mikhail Viktorov, Sergey Golubev, Dmitry Mansfeld, Ivan Izotov, Egor Gospodchikov, Alexander Shalashov, and Andrei Demekhov

Institute of Applied Physics RAS, Plasma physics department, Nizhny Novgorod, Russian Federation (mikhail.viktorov@appl.sci-nnov.ru)

We discuss the use of a mirror-confined plasma of the electron cyclotron resonance discharge for modeling of burst processes in the inner magnetosphere of the Earth associated with the implementation of the plasma cyclotron maser. Heating under the electron cyclotron resonance conditions allows to create two component plasma which is typical for the inner magnetosphere of the Earth. One of the most interesting electron cyclotron resonance manifestations is the generation of bursts of electromagnetic radiation that are related to the explosive growth of cyclotron instabilities of the magnetoactive plasma confined in magnetic traps of various kinds and that are accompanied by particle precipitations from the trap. We investigate several regimes of cyclotron maser which are realized in dense and rarefied plasma, in the presence and absence of a permanent powerful gyrotron microwave radiation as a source of nonequilibrium particles in the plasma. Using the new technique for detection of microwave radiation we studied the dynamical spectrum and the intensity of stimulated electromagnetic radiation from the plasma in a wide frequency band covering all types of cyclotron instabilities. Also possible applications for astrophysical plasma are discussed.