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P1.4013 Different dynamic regimes of stimulated electron-cyclotron emission from mirror-confined non-equilibrium plasma

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Electron cyclotron instabilities caused by resonant interaction between energetic electrons and electromagnetic waves are typical for plasma confined in open magnetic configurations. Studies of the cyclotron instabilities of non-equilibrium plasmas have led to the plasma cyclotron maser paradigm, which explains a rich class of phenomena of coherent radio emission from the Earth's magnetosphere, from other astrophysical objects, and from laboratory magnetic traps. In the present communication, we discuss the laboratory experiment on a controlled transition from the generation of periodic bursts of electromagnetic radiation into continuous-wave regime of a cyclotron maser [1]. The kinetic cyclotron instability of weakly inhomogeneous magnetized plasma is driven by the anisotropic electron population resulting from the electron cyclotron plasma heating in MHD-stable minimum-B open magnetic trap. The observed non-trivial dynamics may be caused by the temporal modulation of the electron distribution function due to excitation of unstable kinetic modes [2]. Within this theoretical frame, the transition between the burst and cw regimes of the electron cyclotron instability is related to the Poincae-AndronovHopf bifurcation, i.e., a stationary point attributed to cw generation becomes unstable through the birth of a stable limit cycle. In this paper, basing on new experimental data, we discuss new, more complicated, regimes of instability. Similar systems have been previously studied in the context of space cyclotron masers in planet magnetospheres [3,4]. However, a laboratory experiment is characterized by a very different mechanism providing a source of non-equilibrium electrons, and thus the existing theory needs to be reconsidered.

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