Observation of CW to pulsed mode transition of cyclotron maser emission from magnetic mirror

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The first experimental evidence of the controlled transition from the generation of periodic bursts of electromagnetic emission into continuous wave (CW) regime of a cyclotron maser formed in magnetically confined non-equilibrium plasmas is reported. The approach to the transition to CW regime, which requires fine tuning of the magnetic field, was found experimentally. From a theoretic point of view [1], the observed transition is related to the Poincare–Andronov–Hopf bifurcation: a stationary point attributed to CW generation becomes unstable through the birth of a stable limit cycle. The kinetic cyclotron instability of the extraordinary wave of weakly inhomogeneous magnetized plasma is driven by the anisotropic electron population resulting from electron cyclotron plasma heating in MHD-stable minimum-B open magnetic trap. Except being of fundamental interest in the context of space cyclotron masers in planet magnetospheres and other astrophysical objects, our results are important for applications, in particular for the development of ECR ion sources.

[1] http://arxiv.org/abs/1712.06700