Abstract Submitted
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Progress in theory and simulation of ion cyclotron emission from magnetic confinement fusion plasmas[1] RICHARD DENDY, Culham, BEN CHAPMAN, SANDRA CHAPMAN, JAMES COOK, BERNARD REMAN, Warwick University, KEN MCCLEMENTS, Culham, LEOPOLDO CARBAJAL, Oak Ridge — Suprathermal ion cyclotron emission (ICE) is detected from all large tokamak and stellarator plasmas. Its frequency spectrum has narrow peaks at sequential cyclotron harmonics of the energetic ion population (fusion-born or neutral beam-injected) at the outer edge of the plasma. ICE was the first collective radiative instability driven by confined fusion-born ions observed in deuterium-tritium plasmas in JET and TFTR, and the magnetoacoustic cyclotron instability is the most likely emission mechanism. Contemporary ICE measurements are taken at very high sampling rates from the LHD stellarator and from the conventional aspect ratio KSTAR tokamak. A correspondingly advanced modelling capability for the ICE emission mechanism has been developed using 1D3V PIC and hybrid-PIC codes, supplemented by analytical theory. These kinetic codes simulate the self-consistent full orbit dynamics of energetic and thermal ions, together with the electric and magnetic fields and the electrons. We report recent progress in theory and simulation that addresses: the scaling of ICE intensity with energetic particle density; the transition between super-Alfvénic and sub-Alfvénic regimes for the collectively radiating particles; and the rapid time evolution that is seen for some ICE measurements.

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