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Nonlinear kinetic simulations of ion cyclotron emission from fusion products in large tokamak plasmas[1] RICHARD DENDY, Euratom/Culham Centre for Fusion Energy, JAMES COOK, SANDRA CHAPMAN, CFSA, Warwick University — Ion cyclotron emission (ICE) was the only collective radiative instability, driven by fusion-born ions, observed from deuterium-tritium plasmas in both JET and TFTR (R O Dendy et al., Nucl. Fusion **35**, 1733 (1995)). Suprathermal emission, peaked at sequential ion cyclotron harmonics at the outer mid-plane edge, was detected using heating antennas as receivers on JET and using probes in TFTR. The intensity of ICE spectral peaks scaled linearly with fusion reactivity. The underlying emission mechanism appears to be the magnetoacoustic cyclotron instability (MCI), which involves resonance between: the fast Alfvén wave; cyclotron harmonic waves supported by the energetic ions and by the background thermal plasma; and a set of centrally born fusion products, lying on barely trapped orbits, which undergo large drift excursions. Analytical studies show that the linear growth rate of the MCI corresponds well with certain observational features of ICE, including ones where a nonlinear treatment might be thought essential. To help explain this, we have carried out direct numerical simulations using a particle-in-cell (PIC) code. We focus on the results of extending MCI theory from the linear into the nonlinear regime for large tokamak parameters.

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