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Modelling ion cyclotron emission from KSTAR tokamak and LHD helical device plasmas[1] RICHARD DENDY, Culham Centre for Fusion Energy, BEN CHAPMAN, BERNARD REMAN, SANDRA CHAPMAN, Warwick University, TSUYOSHI AKIYAMA, NIFS, GUNSU YUN, POSTECH — New high quality measurements of ion cyclotron emission (ICE) from KSTAR and LHD greatly extend the scope and diversity of plasma conditions under which ICE is observed. Variables include the origin (fusion reactions or neutral beam injection) and energy (sub- or super-Alfvénic) of the minority energetic ions that drive ICE; the composition of the bulk plasma (hydrogen or deuterium) which supports the modes excited; plasma density in the emitting region, and the timescale on which it changes; and toroidal magnetic field geometry (tokamak or helical device). Future exploitation of ICE as a diagnostic for energetic ion populations in JET D-T plasmas and in ITER rests on quantitative understanding of the physics of the emission. This is tested and extended by current KSTAR and LHD measurements of ICE. We report progress on direct numerical simulation using full orbit ion kinetic codes that solve the Maxwell-Lorentz equations for hundreds of millions of particles. In the saturated regime, these simulations yield excited field spectra that correspond directly to the measured ICE spectra under diverse KSTAR and LHD regimes. At early times, comparison of simulation outputs with linear analytical theory confirms the magnetoacoustic cyclotron instability as the basic driver of ICE.

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Richard Dendy
Culham Centre for Fusion Energy

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