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Plasma Conditions for Edge Harmonic Oscillation and QH mode in DIII-D¹

C.J. LASNIER, Lawrence Livermore National Laboratory, J.S. DEGRASSIE, K.H. BURRELL, C.M. GREENFIELD, General Atomics, E.J. DOYLE, UCLA — We investigate the dependence of the edge harmonic oscillation (EHO) and QH-mode on plasma edge density and edge collisionality in an effort to determine if the QH-mode can scale to reactor-relevant parameters. So far in DIII-D, the QH-mode is observed only at pedestal densities of order $0.2*n_{GW}$, where n_{GW} is the Greenwald density. If high edge collisionality, rather than high density, limits its access window in DIII-D, QH-mode may be possible in future high-power tokamaks, with their reduced edge collisionality even at high density. We have found from particle orbit calculations that the banana bounce frequency of 5 keV D ions in the boundary plasma (6.2 kHz), is similar to the fundamental frequency often observed for the EHO (6 kHz). An energy close to 5 keV is observed for the C⁶⁺ ions in the pedestal region of the plasma edge using charge exchange recombination spectroscopy. The requirement of a large outer gap is another piece of evidence suggesting that the EHO is associated with a resonance in the banana trapped population.

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C.J. Lasnier
lasnier@fusion.gat.com
Lawrence Livermore National Laboratory

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