Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

Enhanced Accessibility and Absorption of Helicon and Lower Hybrid Waves in Tokamak Plasmas Via $n_{||}$ Upshift From Poloidal Inhomogeneity[1] R.I. PINSKER, M.W. BROOKMAN, B. VAN COMPERNOLLE, A.M. GAROFALO, General Atomics - San Diego, P.T. BONOLI, M. PORKOLAB, A. SELTZMAN, S.J. WUKITCH, MIT, J.J. LARSON, UCLA — Two high-power systems for non-inductive current drive in the mid-radius region with waves in the lower hybrid range of frequencies are being implemented on the DIII-D tokamak. One system will launch fast waves at 0.48 GHz ('helicons') from a 30-element antenna on the outboard side of the torus; the other will launch slow waves at 4.6 GHz from a grill on the high-field side of the torus. In each case the aim is to couple 1 MW of power to DIII-D plasmas at a launched value of the parallel index of refraction $n_{||} \approx 3$. The high value of $n_{||}$, with its challenge for efficient coupling, is needed for core accessibility at high density at the toroidal field of DIII-D (B_T<2.2 T) for the 4.6 GHz slow wave, while for the 0.48 GHz helicon, a value of $n_{||}$ at least this high is needed for strong Landau damping at attainable electron pressures in DIII-D. (Lower values of $n_{||}$ would be appropriate for reactor plasmas for both waves.) Analysis verifies that the evolution of $n_{||}$ along the ray is decisively affected by poloidal inhomogeneity for both waves. The similarity in behavior can be traced to the essentially geometric origin of the effect. Consequences for wave accessibility to the core and the location of strong damping are analyzed for the conditions of the upcoming DIII-D experiments.

[1]Acknowledgement: Work supported by US DOE under DE-FC02-04ER54698 and DE-SC0014264

R.I. Pinsker
General Atomics - San Diego

Date submitted: 26 Jun 2020 Electronic form version 1.4