Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Dependence of Helicon Antenna Loading on the Antenna/Plasma Gap and $n_{||}$ in DIII-D Experiments[1] R.I. PINSKER, C.P. MOELLER, General Atomics — A comprehensive set of measurements of the plasma loading of a 12-element antenna array, designed to launch helicon waves (i.e., very-high-harmonic fast waves), were performed on DIII-D in 2016. The antenna, operated in the 466 – 486 MHz band, is prototypical of a wider array for a 1-MW-level experiment planned for 2018-9. The dependence of the antenna loading on antenna/plasma gap is of great practical significance, as the gap must be kept greater than a minimum distance to suppress deleterious plasma-material interactions, while the loading must be high enough to retain good efficiency of power transfer to the plasma. While the loading in all examined plasma regimes, including both limited and diverted L-mode discharges and H-mode discharges, decayed exponentially with increasing gap in agreement with simple theory, the characteristic decay length was in all cases larger than expected, motivating the development of a more realistic model. Furthermore, the characteristic decay length did not depend on the launched $n_{||}$, though the absolute level of loading at a given gap increased as $|n_{||}|$was decreased from 4 to 2. After the antenna was removed from DIII-D, measurements of the loading produced by a 100 Ω/sq resistive film were carried out on the bench. Both the antenna/film gap and $n_{||}$ were scanned varied and the results compared with calculations done with the QuickWave FDTD electromagnetics solver. Very good agreement was found in this case.

[1]Work supported by the US DOE under DE-FC02-04ER54698.

Robert Pinsker
General Atomics

Date submitted: 11 Jul 2017 Electronic form version 1.4