

Abstract Submitted
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Optimization of the RF-performance of the DIII-D high power helicon antenna¹ BART VAN COMPERNOLLE, M. W. BROOKMAN, C. MOELLER, R. I. PINSKER, R. O'NEILL, A. GAROFALO, C. C. PETTY, General Atomics - San Diego, DIII-D TEAM — Helicon current drive, also called fast wave current drive in the lower hybrid range of frequencies, has long been regarded as a promising current drive tool for reactor grade plasmas. A newly installed MW-level system at DIII-D will be the first test of this technology in reactor-relevant plasmas, where full single-pass absorption is expected. A 30-module traveling wave antenna has been installed and optimized in-vessel. The linear electromagnetic characteristics of the unloaded module array have been extensively tested both on the bench and in the vessel at instrumentation power levels. As power is transferred down the antenna through mutual coupling from one module to the next, it was found that adjusting the spacing between modules is crucial for mitigating undesirable effects arising from the lack of toroidal antenna symmetry. Bench testing and modeling of the antenna in different configurations clearly showed the adverse effect of spatial modulation in the mutual coupling between modules. Complete results of the bench testing and optimization procedure will be presented. In the final in-vessel installation, excellent performance has been achieved, less than 2% reflected power and 1.4% dissipated power per module in air, in a 10 MHz band around the operating frequency of 476 MHz.

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