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Category Number and Subject:

[ ] Theory [x] Experiment

Exploring the Synergy Among Standing and Traveling Wave Resonant RF Array Systems for Fast Wave Heating and Profile Control in Tokamaks,* D.A. Phelps, R.W. Callis, J.S. deGrassie, C.P. Moeller, R.I. Pinsker, *General Atomics* — A new and evolving technology based on "traveling wave antenna (TWA) arrays and associated traveling wave feeds and resonant loops (or recirculators)" is analyzed. As demonstrated at low power in DIII–D and at high power power in JFT-2M, the simplified engineering characteristics of this technology combine with a remarkable insensitivity to changing plasma conditions to offer an excellent solution for fast magnetosonic wave-particle interaction studies in tokamaks. In this paper, TWA technology is compared with conventional array technology and associated standing wave resonant feeds and loops, such as that deployed in present tokamaks and designed for ITER. In order to explore whether an appropriate combination of these technologies is better than either alone, we model and compare external conversions of the present arrays and rf systems in DIII–D to (1) a 90° phased array featuring four strap-elements connected by a pair of existing standing wave resonant loops that are driven by a recirculator; (2) a phase tunable array featuring four standing wave resonant strap-transmission line "elements" driven by a recirculator. We predict operating regimes wherein the reflected power from the TWA is less than 1% and the launched wave spectrum is maintained (to within 10%), regardless of changes in antenna loading from vacuum to the strongest ELMs. Using a recirculator, we show that the uncoupled power appearing at the output of the TWA can be efficiently recovered, thereby optimizing the coupled power to the plasma.

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[ ] Prefer Poster Session

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