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2D full-wave simulation of HHFW in the scrape-off layer of NSTX
EUN-HWA KIM, NICOLA BERTELLI, ERNEST VALEO, JOEL HOSEA, Princeton Plasma Physics Laboratory, Princeton University — The scrape-off layer (SOL) region, the region of the plasma between the last closed flux surface and the tokamak vessel, is important for radio frequency (RF) wave heating of tokamaks because significant wave power loss can occur in this region - for instance, up to 60% of the coupled higher harmonic fast wave (HHFW) power can be lost in the SOL of NSTX. In this presentation, we perform simulations using a 2D full-wave (FW2D) code for HHFW in the SOL of NSTX. A recently developed FW2D code solves the cold plasma wave equations using the finite element method and has been successfully applied to describe low frequency waves in the planetary magnetospheres. Very recently, the FW2D code has been adapted to tokamak geometry to examine radio frequency waves in the SOL of tokamaks. We adopt (1) a rectangular boundary to benchmark with the AORSA results and (2) a limiter boundary to examine boundary effects on HHFW propagation. As results, we found that (1) FW2D and AORSA simulations show an excellent agreement in the rectangular boundary; and (2) FW2D results with a realistic limiter boundary are significantly different to results with the rectangular vessel boundary.

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