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Synthetic phase contrast imaging diagnostic for the measurement of helicon waves in the DIII-D tokamak[1] S. S. DENK, A. MARINONI, M. PORKOLAB, J.C. ROST, Plasma Science and Fusion Center, C. LAU, Oak Ridge National Laboratory, R. I. PINSKER, General Atomics — A synthetic diagnostic is being developed for the phase contrast imaging (PCI) diagnostic on DIII-D to aid in measuring the amplitude and structure of high-power helicon waves [R. I. Pinsker et al, Nucl. Fusion 58, 106007 (2018)]. These waves have been predicted to be an efficient source for off-axis current drive. To resolve the width, intensity and wave number spectrum of the helicon beam a novel RF beam modulation system is being integrated into the absolutely calibrated DIII-D PCI diagnostic. Integrating this synthetic PCI diagnostic with a full wave code like AORSA [Jaeger et al, Phys. Plasmas 8 (2001) 1573] allows validation studies with DIII-D helicon experiments. AORSA incorporates the full hot dielectric tensor allowing it to accurately model the helicon wave propagation in DIII-D at around the 50th ion cyclotron harmonic. This approach has high computational costs, however, especially when the full toroidal mode number spectrum is modeled for the synthetic PCI diagnostic. To allow sensitivity studies and predict-first modeling for experimental planning, a reduced cold plasma full wave model and the raytracing code GENRAY will be benchmarked against AORSA, including for the first time the full spectrum of toroidal mode numbers, for an experimental case of interest.

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