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Physics of simultaneous excitation of electrostatic slow mode and fast helicon waves[1] EUN-HWA KIM, SYUN'ICHI SHIRAIWA, NICOLA BERTELLI, Princeton Plasma Physics Laboratory, BART VAN COMPERNOLLE , General Atomics, MASAYUKI ONO, Princeton Plasma Physics Laboratory —
The significance of parasitic coupling to the undesired slow waves for helicon wave excitation was quantified using the high-resolution full wave simulation code, Petra-M. RF current drive is expected to be a crucial current drive actuator in a fusion power plant and particularly useful for current profile control needed for an advanced tokamak reactor. In particular, helicon waves are thought to be promising since it can penetrate into reactor-grade high density core and drive off-axis current at higher efficiency. In experiments on helicon current drive in DIII-D and KSTAR near 500 MHz, both electrostatic slow and fast helicon waves can coexist, and since slow waves can only penetrate to n_e ˜1 x 10^{19} m^{-3} they are not useful for core current drive. For this reason, it is important to understand the slow wave excitation. To properly treat the physics of simultaneous excitation of slow and fast waves, the state-of-the-art rf modeling codes with 3D realistic antenna and plasma geometry were utilized to handle the waves with different wavelength and polarization. In particular, sufficiently fine mesh sizes must be chosen to allow for short wavelength slow wave excitation.

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