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HXR Observations with Lower Hybrid Current Drive on MST

M.C. KAUFMAN, J.A. GOETZ, D.R. BURKE, C.B. FOREST, S.C. PRAGER, University of Wisconsin-Madison — Lower Hybrid current drive has been offered as a means to reduce tearing fluctuations and improve confinement in the reversed field pinch. Experiments at 160 kW input power show robust coupling to a variety of plasmas. Hard x-ray (HXR) bremsstrahlung emission from rf-generated fast electrons with energies up to and beyond 60 keV has been observed using CdZnTe detectors. Monte Carlo simulations and simple modeling of the antenna demonstrate that near-fields (within a cm of the antenna) exceeding 3 kV/cm can drive thermal electrons to energies above 30 keV, consistent with experimental observations. HXR emission far from the antenna is spatially localized around the antenna with a toroidal spread of about 60 degrees. Power launched in the co-current drive direction generates an order of magnitude more flux than in the counter-current drive direction. Moreover, the HXR spectra of the co-current drive plasma emission are qualitatively different from both the counter-current plasma emission as well as the near-field emission. The HXR spectra from the co-current drive exhibits the signature of a bi-Maxwellian distribution while the other cases do not, corroborating a different production mechanism. However, this two-temperature spectrum is distinct from a typical fast electron tail seen with rf drive in tokamaks.
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