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Design of tangential multi-energy SXR cameras for tokamak plasmas H. YAMAZAKI, University of Tokyo, L. F. DELGADO-APARICIO, N. PABLANT, K. HILL, M. BITTER, PPPL, Y. TAKASE, University of Tokyo, M. ONO, B. STRATTON, PPPL — A new synthetic diagnostic capability has been built to study the response of tangential multi-energy soft x-ray pin-hole cameras for arbitrary plasma densities ($n_{e,D}$), temperature (T_e) and ion concentrations (n_Z). For tokamaks and future facilities to operate safely in a high-pressure long-pulse discharge, it is imperative to address key issues associated with impurity sources, core transport and high-Z impurity accumulation. Multi-energy soft xray imaging provides a unique opportunity for measuring, simultaneously, a variety of important plasma properties (e.g. T_e, n_Z and ΔZ_{eff}). These systems are designed to sample the continuum- and line-emission from low- to high-Z impurities (e.g. C, O, Al, Si, Ar, Ca, Fe, Ni and Mo) in multiple energy-ranges. These x-ray cameras will be installed in the MST-RFP, as well as NSTX-U and DIII-D tokamaks, measuring the radial structure of the photon emissivity with a radial resolution below 1 cm at a 500 Hz frame rate and a photon-energy resolution of 500 eV. The layout and response expected for the new systems will be shown for different plasma conditions and impurity concentrations. The effect of toroidal rotation driving poloidal asymmetries in the core radiation is also addressed for the case of NSTX-U.

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