Synthetic synchrotron diagnostics for runaway electrons

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The synchrotron radiation emitted by runaway electrons is an important diagnostic for studying their properties, and many tokamak experiments are equipped with cameras for detecting this radiation. In this contribution we present the flexible synthetic-diagnostic tool SOFT (*Synchrotron-detecting Orbit Following Toolkit*), which allows the study of not only synchrotron spot shapes [1], but also intensity variations within the spot. SOFT takes the full angular and spectral distributions of radiation into account, as well as the electron distribution function, the magnetic geometry, and the limited spectral range of the camera. The additional information gained from synthetic imaging using SOFT provides valuable insight into the runaway-electron distribution function. With Fokker-Planck simulations [2], using measured parameter profiles [3], we show that SOFT is able to reproduce the main features of measurements performed at the Alcator C-Mod tokamak. In particular, features in the synchrotron image are linked to variations in the radial, energy and pitch-angle distributions of electrons, as well as detector placement.

References

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