# Synchrotron spectra, images, and polarization measurements from runaway electrons in the Alcator C-Mod tokamak

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In the high-field, compact Alcator C-Mod tokamak, relativistic runaway electrons (REs) generated during flattop plasma discharges emit synchrotron radiation in the visible wavelength range. Thus, spectrometers, cameras, and the Motional Stark Effect diagnostic installed on C-Mod measure absolutely-calibrated spectra, distortion-corrected images, and polarization information, respectively, of REs throughout the plasma. Due to the complex interplay of the RE phase-space distribution, plasma magnetic topology, and detector geometry, the synthetic diagnostic SOFT [1] is used to simulate all three measurements and compare theory with experiment. As inputs, the RE momenta and density distributions are calculated using both a test-particle model [2 – 4] and kinetic solver CODE [5]. In particular, this work explores the following: (1) Synchrotron spectra observed from REs generated at three magnetic fields ($B_0$ = 2.7, 5.4, and 7.8 T) indicate a decrease in RE energy as synchrotron power loss is enhanced at higher fields [6]. (2) Transport and MHD activity are incorporated into the analysis of synchrotron images to better explain interesting spatiotemporal features. (3) Profiles of linearly-polarized synchrotron emission intensity and polarization angle are explored as a novel diagnostic of RE dynamics.

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This work is supported by the US DOE (grant DE-FC02-99ER54512), using Alcator C-Mod, a DOE Office of Science User Facility; Vetenskapsrådet (Dnr 2014-5510); and the European Research Council (ERC-2014-CoG grant 647121).