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Measurements of relativistic emission from runaway electrons in Alcator C-Mod: spectrum, polarization, and spatial structure[1] ROBERT GRANETZ, ROBERT MUMGAARD, MIT Plasma Science and Fusion Center — At low densities, runaway electrons (RE's) can be generated during the flattop of Alcator C-Mod discharges with highly relativistic energies, $\gamma \gg 1$, allowing careful study under steady conditions. These RE's emit light in a narrow forward-peaked cone which is detected with a number of diagnostics, including spectrometers, a video imaging camera, and polarimetry (using the MSE system), in addition to the standard hard x-ray detectors. These measurements of the relativistic emission can provide information about the RE energy distribution, pitch angle distribution, and spatial distribution. Unlike most other tokamaks, C-Mod's high magnetic field shifts the peak of the continuum emission into the visible, due to the smaller gyroradius and higher gyro-frequency, allowing for excellent spectral coverage with standard spectrometers, and thus detailed comparison to theoretical predictions of synchrotron and bremsstrahlung spectra. Additionally, camera images occasionally show highly structured formations. Profiles of the polarization fraction and polarization angle show radial structure, including a jump of 90° outboard of the magnetic axis, in qualitative agreement with recent theoretical calculations for relativistic electrons in a tokamak field.

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