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10.7 Measurement of bremsstrahlung radiation from runaway electrons with the Gamma Ray Imager on DIII-D

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The Gamma Ray Imager (GRI) is a novel diagnostic providing 2D tangential imaging of bremsstrahlung radiation from runaway electrons (RE) in the DIII-D tokamak. GRI is a lead pin-hole camera utilizing a 2D array of Bismuth Germanate (BGO) detectors. It is located at the DIII-D midplane and possesses up to 123 tangential sight-lines spanning the entire plasma poloidal cross-section. BGO detectors are sensitive to gamma-rays with energies 1–30 MeV, have sensitivity of 14 mV/MeV, energy resolution of 10%, and are able to distinguish pulses for pulse height analysis with 100 μ s time resolution. This allows investigation of RE spatial and energy distribution evolution, which is critical to evaluating the importance of various RE dissipation mechanisms. A recent upgrade saw the number of instrumented GRI channels doubled (56) to image the entire plasma region, and additional lead shielding installed to reduce the flux of uncollimated gammas. Other detectors (BGO crystal coupled with Multi-Pixel Photon Counter (MPPC) and LYSO coupled with MPPC) were also investigated to improve the time resolution to 5 μ s and 50 ns respectively. Measurements of bremsstrahlung radiation and comparison to synthetic diagnostics will be discussed. This work was supported by the US DOE under DE-FC02-04ER54698

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