Measurements of hard x-ray emission from runaway electrons in DIII-D

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Abstract. The spatial distribution of runaway electron (RE) strikes to the wall during argon pellet-initiated rapid shutdown of diverted and limited plasma shapes in DIII-D is studied using a new array of hard x-ray (HXR) scintillators. Two plasma configurations were investigated: an elongated diverted H-mode, and a low-elongation limited L-mode. HXR emission from MeV level REs generated during the argon pellet injection is observed during the thermal quench (TQ) in diverted discharges from REs lost into the divertor. In limiter discharges, this prompt TQ loss is reduced, suggesting improved TQ confinement of REs in this configuration. During the plateau phase when the plasma current is carried by REs, toroidally symmetric HXR emission from remaining confined REs is seen. Transient HXR bursts during this RE current plateau suggest the presence of a small level of wall losses due to the presence of an unidentified instability. Eventually, an abrupt final loss of the remaining RE current occurs. This final loss HXR emission shows a strong toroidal peaking and a consistent spatiotemporal evolution that suggests the development of a kink instability.

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