Signatures of acceleration/injection in beam-like near-relativistic solar electron events: Solar Cycle 23

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We sort the near-relativistic electron events based on their onset profiles into, spikes, pulses, and ramps and evaluate the associated electromagnetic emissions.

Ramp events have properties consistent with acceleration by shocks driven by large CMEs: Significant delays with respect to electromagnetic emissions; Higher intensity and harder spectra; delays with respect to CME launch times.

Spike and Pulse events have properties consistent with a more localized and sporadic acceleration mechanism: Shorter delays with respect to solar electromagnetic emissions; Poor correlation with CME-driven shocks and type-II events; Smaller intensity and softer spectra; Fairly good agreement with coronal models of open fields near the associated active region.