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The injection of ten electron/^{3}He-rich SEP events

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We have derived the particle injections at the Sun for ten good electron/^{3}He-rich solar energetic particle (SEP) events, using a 1.2 AU particle path length (suggested by analysis of the velocity dispersion). The inferred solar injections of high-energy ($\sim$10 to 300 keV) electrons and of $\sim$MeV/nucleon ions (carbon and heavier) start with a delay of 17$\pm$3 minutes and 75$\pm$14 minutes, respectively, after the injection of low-energy ($\sim$0.4 to 9 keV) electrons. The injection duration (averaged over energy) ranges from $\sim$200 to 550 minutes for ions, from $\sim$90 to 160 minutes for low-energy electrons, and from $\sim$10 to 30 minutes for high-energy electrons. Most of the selected events have no reported Hα flares or GOES SXR bursts, but all have type III radio bursts that typically start after the onset of a low-energy electron injection. All nine events with SOHO/LASCO coverage have a relatively fast (>570km/s), mostly narrow ($\lesssim$30°), west-limb coronal mass ejection (CME) that launches near the start of the low-energy electron injection, and reaches an average altitude of $\sim$1.0 and 4.7 R_S, respectively, at the start of the high-energy electron injection and of the ion injection. The electron energy spectra show a continuous power law extending across the transition from low to high energies, suggesting that the low-energy electron injection may provide seed electrons for the delayed high-energy electron acceleration. The delayed ion injections and high ionization states may suggest an ion acceleration along the lower altitude flanks, rather than at the nose of the CMEs.