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Relativistic Solar Electrons

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Relativistic solar electrons, which can reach energies of 20 MeV or more, exhibit many interesting features -- most of which are unexplained. Their time profile is similar to that of GeV protons, yet they show a spectral continuity with much lower energy electrons. The spectral shape is quite variable, but a characteristic hardening of the spectrum at a few MeV is well correlated with short duration x-ray emission from a flare. This suggests an origin deep within the solar atmosphere, yet the spectra are identical when the particle event is observed from spacecraft widely separated in heliolongitude. There is strong evidence that some electrons are released coincident with gamma ray emission in the impulsive phase of the flare, yet overall injection times of an hour or more are observed in the same events. I present a summary of these puzzling observations and offer some suggestions as to interpretation.