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Particle acceleration in solar flares from radio and hard X-ray spectra

For a deeper understanding of the physical processes at play in solar
flares, it is necessary to analyse the flare emissions at multiple wavelengths. This multi-frequency approach enables the characterisation of energetic electrons accelerated from tens of keV and up to several hundreds of MeV. This study reports on the observation of nine solar flares, in which the spectral parameters were determined for the cm/mm and X-ray bands, as well as the delay between flux peaks at different wavelengths. The radio spectrum was fitted using gyro-synchrotron emission whereas the hard X-rays fit considered a model of thermal plus non-thermal emission of accelerated electrons. The results show that the spectral indices of the energy distribution of non-thermal electrons emitting in millimeter and hard X-rays do not agree, with the millimeter spectral index being approximately 2 times harder than that of hard X-rays. These findings are consistent with previous research and suggest the existence of a break in the energy spectrum of accelerated electrons.

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