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A systematic study of HXR flares and Metric type III radio bursts between 2002 and 2015

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Solar flares are very efficient particle accelerators on a short timescale. The X-ray and type III radio emission emitted during a flare are direct signatures of the accelerated electrons. Hard X-rays are emitted from the accelerated electrons through bremsstrahlung radiation primarily in the dense atmosphere, while type III emissions are caused by the accelerated electrons propagating through the upper corona where they produce Langmuir waves which then convert to radio emission near the local plasma frequency or its harmonics. The aim of the present study is to understand the link between these two different electron populations. The analysis is based on a list of HXR/ type III radio bursts observed by RHESSI or FERMI/GBM, the Nançay Radioheliograph and the PHOENIX/ORFEES/NDA spectrographs in the 1000 GHz-10 MHz range in the 2002-2015 time period. For the list of almost 200 events, we analysed the relationship between the energetic electrons producing the HXR emissions and the type III radio fluxes at different frequencies. We shall present and discuss here some of the results: the correlation between the number of HXR emitting electrons and the peak flux of the type III emissions decreases with increasing frequency and the correlation is better for electrons above 20 keV than for electrons above 10 keV. We also find that the peak radio flux is anti-correlated with the electron power-law index deduced from at low electron energies from the HXR spectral analysis. These results will be briefly discussed in the context of the numerical simulations or models describing the production of type III bursts in the corona.

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