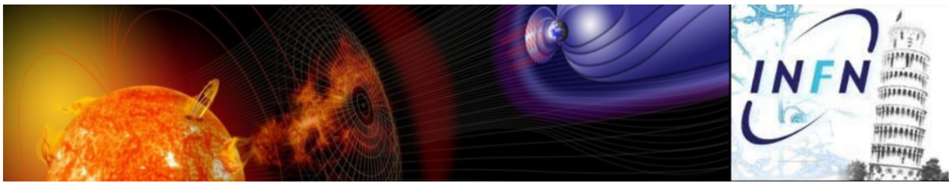
RHESSI-20 Workshop: Preparing for the Next Decade in High-Energy Solar Physics Research



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Quasi-Periodic Particle Acceleration in a Solar Flare

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A common feature of electromagnetic emission from solar flares is the presence of intensity pulsations that vary as a function of time. Known as quasi-periodic pulsations (QPPs), these variations in flux appear to include periodic components and characteristic time-scales. Here, we analyse a GOES M3.7 class flare exhibiting pronounced QPPs across a broad band of wavelengths using imaging and timeseries analysis. We identify QPPs in the timeseries of X-ray, low frequency radio and EUV wavelengths using wavelet analysis, and localise the region of the flare site from which the QPPs originate via X-ray and EUV imaging. It was found that the pulsations within the 171 A, 1600 A, soft X-ray (SXR), and hard X-ray (HXR) light curves yielded similar periods of ~122 s, ~131 s, ~123 s, and ~137 s, respectively, indicating a common progenitor. The low frequency radio emission at 2.5 MHz contained a longer period of ~231 s. Imaging analysis indicates that the location of the X-ray and EUV pulsations originates from a HXR footpoint linked to a system of nearby open magnetic field lines. Our results suggest that intermittent particle acceleration, likely due to 'bursty'magnetic reconnection, is responsible for the QPPs. The precipitating electrons accelerated towards the chromosphere produce the X-ray and EUV pulsations, while the escaping electrons result in low frequency radio pulses in the form of type III radio bursts. The modulation of the reconnection process, resulting in episodic particle acceleration, explains the presence of these QPPs across the entire spatial range of flaring emission.

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