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Localising QPPs in HXR, microwave and Ly α emissions of an X6.4 flare

We report the simultaneous observations of quasi-periodic pulsations (QPPs) in wavelengths of hard X-ray (HXR), microwave, Ly α , and ultraviolet (UV) emissions during the impulsive phase of an X6.4 flare on 2024 February 22 (SOL2024-02-22T22:08). The X6.4 flare shows three repetitive and successive pulsations in HXR and microwave wavebands, and they have an extremely-large modulation depth. The onset of flare QPPs is almost simultaneous with the start of magnetic cancellation between positive and negative fields. The wavelet power spectra suggest the presence of double periods, which are centered at ~ 200 s and ~ 95 s, respectively. The long-period QPP can also be detected in Ly α and UV wavebands at the flare area, and it could be observed in the adjacent sunspot. Our observations indicate that the flare QPPs are most likely triggered by accelerated electrons that are associated with periodic magnetic reconnections. The long period at ~ 200 s is probably modulated by the slow magnetoacoustic wave originating from the neighboring sunspot, while the short period at ~ 95 s could be regarded as its second harmonic mode.

Primary author: LI, Dong (PMO)

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