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Evidence of electron acceleration around the reconnection X-point in a solar flare

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Particle acceleration is one of the most significant features that are ubiquitous among space and cosmic plasmas. It is most prominent during flares in the case of the Sun, with which huge amount of electromagnetic radiation and high-energy particles are expelled into the interplanetary space through acceleration of plasma particles in the corona. Though it has been well understood that energies of flares are supplied by the mechanism called magnetic reconnection, where and how in the flaring magnetic field plasmas are accelerated has remained unknown.

We here report the first observational identification on the site of electron acceleration in the reconnecting magnetic field structure during a flare, around the point of the ongoing magnetic reconnection (X-point); with the location of the X-point identified by soft X-ray imagery (Yohkoh/SXT) and the localized presence of non-thermal electrons identified from imaging-spectroscopic data at two microwave frequencies (the Nobeyama Radioheliograph). We also infer from the observations that the energetic electrons around the X-point would be accelerated by the shock waves generated by the fragmented magnetic islands in the current sheet.