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First results on interplanetary electron events obtained by joint observations of remote-sensing and in-situ instruments on Solar Orbiter

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Impulsive electron events observed in interplanetary space are believed to be generated by acceleration in solar flares. This notion has been supported by correlations between the characteristics of energetic electrons detected in-situ near 1 au and those in solar flares derived from hard X-ray observations. However, the details of this relation are still unclear, presumably because of the complex combination of acceleration, injection, and transport effects that are involved.

We present the first statistical results on impulsive electron events obtained by joint observations of remote-sensing and in-situ instruments on Solar Orbiter. We use the suite Energetic Particle Detector (EPD) to measure the properties of the electrons (time profile, anisotropy, maximum energy, inferring the injection time at the source, etc.), as well as to determine the particularities of the composition in the suprathermal energy range. Also, X-ray observations from the Spectrometer/Telescope for Imaging X-rays (STIX) constrain the energetic electrons in the solar flare in terms of timing, spectrum, and location. Type III radio bursts detected by the Radio and Plasma Waves (RPW) instrument are used to link the nonthermal X-ray peaks to the interplanetary electron beams. Finally, the Extreme Ultraviolet Imager (EUI) provides context on the flare evolution. We use a large event sample obtained during the first 2.5 years of the Solar Orbiter

mission, which covers a wide range of radial distances ranging from as close as 0.33 au to 1.02 au.

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