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Radio wave propagation in the solar corona: high-time-resolution observations with LOFAR

Eduard Kontar (1), Sijie Yu (2), Alexey Kuznetsov (3), Gordon Emslie (4), Ben Alcock (1), Natasha Jeffrey (1), Valentin Melnik (5), Nic Bian (1), and Prasad Subramanian (6)

(1) University of Glasgow, Physics and Astronomy, GLASGOW, United Kingdom, (2) New Jersey Institute of Technology, Newark, NJ, 07102, USA, (3) Institute of Solar-Terrestrial Physics, Irkutsk, 664033, Russia, (4) Department of Physics & Astronomy, Western Kentucky University, Bowling Green, Kentucky, 42101, USA, (5) Institute of Radio Astronomy, National Academy of Sciences of Ukraine, Kharkiv, 61002, Ukraine, (6) Indian Institute of Science Education and Research, Pune, 411008, India

Using the Low Frequency Array (LOFAR), we analyse the source sizes and locations of the fine frequency structures in a solar radio burst. The high time resolution allows us to determine the location and the size of the radio emission source, and its evolution with time, following the radio emission propagation through the solar corona. It is found that intrinsically very small radio sources have an apparent size that is a thousand times larger than the actual region where the radio waves originate [1]. The observations suggest that it is radio wave propagation effects, rather than the intrinsic properties of the emission source, that determine the observed spatial characteristics of the plasma emission radio bursts. In addition, the observations provide a new opportunity for diagnostics of small-scale plasma fluctuations by imaging the radio source halos as the radio waves move in the solar corona.

[1] Kontar et al.: Imaging Spectroscopy of Solar Radio Burst Fine Structures, *Nature Communications* **8**, Article number: 1515 (2017) DOI: 10.1038/s41467-017-01307-8