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Sizes of solar radio sources observed by *LOFAR*

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Decametric radio emission provides a unique insight into the physics of solar and heliospheric plasmas. Along with dynamic spectra, the spatial characteristics of the emission sources observed in solar radio bursts yield important information about the behaviour of high-energy non-thermal electrons, and the state of thermal plasma in the upper solar corona. Recently, it has been shown that sizes and locations of radio sources in the 10-100 MHz range can be used as a diagnostic tool for plasma turbulence in the upper corona and inner heliosphere. However, observations in this spectral range can be strongly affected by limited spatial resolution of the instrument, as well as by the effect of the Earth's ionosphere on radio wave propagation.

We describe a new method for correcting radio intensity maps for instrumental and ionospheric effects using observations of a known radio source at an arbitrary location in the sky. Based on this method, we derive sizes and areas of the emission sources in the solar radio bursts observed by the Low-Frequency Array (LOFAR) in 30-45 MHz range. It is shown that the sizes of sources are of the order of ten arcminutes and decrease with increasing frequency. Overall, we find that the sizes and their variation, as well as the shapes of the sources in the considered events are consistent with the theoretical models of turbulent radio-wave scattering in the solar corona developed by Kontar et al. 2019 (Astrophys.J., 884, 122).