

LOFAR 150-MHz observations of SS 433 and W50

Trushkin S., Stewart A., Anderson G., Staley T., Blundell K., Pietka M., Markoff S., Rowlinson A., Swinbank J., van der Horst A., Bell M., Breton R., Carbone D., Corbel S., Eislöffel J., Falcke H., Gießmeier J., Hessels J., Kondratiev V., Law C., Molenaar G., Serylak M., Stappers B., van Leeuwen J., Wijers R., Wijnands R., Wise M., Zarka P.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

© 2017 The Author(s). We present Low-Frequency Array (LOFAR) high-band data over the frequency range 115-189 MHz for the X-ray binary SS 433, obtained in an observing campaign from 2013 February to 2014 May. Our results include a deep, wide-field map, allowing a detailed view of the surrounding supernova remnant W50 at low radio frequencies, as well as a light curve for SS 433 determined from shorter monitoring runs. The complex morphology of W50 is in excellent agreement with previously published higher frequency maps; we find additional evidence for a spectral turnover in the eastern wing, potentially due to foreground free-free absorption. Furthermore, SS 433 is tentatively variable at 150 MHz, with both a debiased modulation index of 11 per cent and a X2 probability of a flat light curve of 8.2×10^{-3} . By comparing the LOFAR flux densities with contemporaneous observations carried out at 4800 MHz with the RATAN-600 telescope, we suggest that an observed ~ 0.5 -1 Jy rise in the 150-MHz flux density may correspond to sustained flaring activity over a period of approximately 6 months at 4800 MHz. However, the increase is too large to be explained with a standard synchrotron bubble model. We also detect a wealth of structure along the nearby Galactic plane, including the most complete detection to date of the radio shell of the candidate supernova remnant G38.7-1.4. This further demonstrates the potential of supernova remnant studies with the current generation of low-frequency radio telescopes.

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Keywords

ISM: individual objects: W50, ISM: jets and outflows, ISM: supernova remnants, Radio continuum: ISM, Radio continuum: starss, Stars: individual: SS 433

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