Unveiling Distant Worlds: A Polarization Study of the Boötes Field using LOFAR

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Radio detection of exoplanets can provide details about their magnetospheres and associated space weather conditions, information that is challenging to get at other frequencies. The emission mechanism responsible for coherent radio signals from exoplanets, known as electron cyclotron maser (ECM) emission, produces highly circularly polarised signals. In this study, we utilized the LOw Frequency ARray (LOFAR) radio telescope to observe the Bootes field at 150 MHz. We analyzed 80 hours of observational data and produced circularly polarised images with 6" resolution over a 20 deg sq field. We have identified an interesting candidate, J1433, which exhibits strong circular polarization ($\sim70\%$) and periodic variability, matching a known TESS light curve of 3.4 hours. A multi-wavelength analysis suggests, J1433 may potentially be a long-period radio transient associated with a M dwarf-white dwarf binary. Its rising radio spectrum indicates a peak frequency much higher than expected for exoplanetary auroral emission. In this talk, I will discuss the analysis techniques applied to our data and explore the possible implications of J1433's variability. If confirmed as a long-period radio transient, J1433 could be the first such transient detected by LOFAR at a relatively close distance of 48 pc.