

A pioneering UHF survey of the coldest brown dwarfs— a bridge to exoplanet magnetism

Abstract

Some brown dwarfs emit circularly polarised cyclotron maser emission in the radio band. The radio emission is pivotal to measuring their magnetic field strengths and magnetospheric acceleration mechanisms. The coldest brown dwarfs are particularly interesting as they are most like gas-giant exoplanets and therefore, provide a window into magnetism on exoplanets. Because the coldest brown dwarfs are also expected to have weaker magnetic fields, their cyclotron emission may have been missed by legacy surveys that were conducted by the JVLA and Arecibo at <5 GHz. Here we propose a pioneering MeerKAT UHF band survey of a volume-limited sample of the 14 coldest brown dwarfs. We anticipate this 63 hr survey (including overheads) to lead to at least one radio detection of the coldest object to date and provide a small but crucial radio-loud sample for multi-wavelength follow-up studies to understand dynamo action and magnetospheric acceleration mechanisms in the exoplanet-mass regime.