

Title

Targeted searches for star-planet interaction signatures with MeerKAT

Abstract

We propose to observe three nearby stars with known close-in planets to search for radio signatures of star-planet interaction (SPI). The three target stars, GJ 367, LHS 3844, and GJ 1252, are all $\sim < 20$ pc from the Sun, have one known planet each with an orbital period $\sim < 0.5$ days, and have rotational periods > 1 month. Radio detections of SPI would open a whole new field of research based on the characterisation of exoplanet magnetic fields. Detecting SPI at 1.4 GHz would also allow us to probe the stellar winds and magnetic fields of the host star in detail. We expect to detect radio SPI as periodic radio emission where the period is modulated by the orbital period of the planet and the radio emission is between 280 MHz and 2.8 GHz. As radio SPI is yet to be conclusively detected, the brightness and frequency range of the emission are not well constrained for different stellar, planetary and orbital configurations. As such searching for this emission with a telescope with a wide bandwidth and excellent sensitivity is crucial for detecting radio SPI for the first time. MeerKAT has a wide, 856 MHz bandwidth at L band and can reach RMS noise levels of ~ 0.2 mJy per beam in 8 seconds, making MeerKAT the perfect instrument to search for SPI and produce dynamic spectra to search for periodic signals and constrain properties of the stellar and planetary magnetospheres.