

Probing star-planet interaction in the Proxima - Proxima b system with MeerKAT

Abstract

The finding of the planet Proxima b in the habitable zone of the closest star to the Sun, Proxima Cen, represented a major breakthrough in exoplanetary science. Proxima - Proxima b is thus the closest exoplanetary system, and hence a key target to study new physical phenomena and novel ways to detect exoplanets. The most direct way to discover an exoplanet in radio is the detection of electron cyclotron radio emission arising from the interaction between the star and the exoplanet, and theoretical works predict that measurable radio emission could result from this interaction. An ATCA radio monitoring of Proxima Cen at L-band showed tentative periodic enhancements close to the quadratures of Proxima, which are suggestive of star-planet interaction, but the orbital coverage does not allow to confirm this is the case.

Here, we propose a sensitive, multi-epoch monitoring campaign of the Proxima Cen system with MeerKAT with main goal of confirming the apparent periodic enhancement of the centimeter radio emission near the quadratures of the planet Proxima b. If confirmed, this would unambiguously prove that star-planet interaction is at work in the Proxima system, and would open the avenue for the detection and/or confirmation of exoplanets in a new, independent way. Our proposed observations will also allow us to determine relevant physical parameters of the Proxima - Proxima b system. In particular, we will obtain an accurate value of the inclination angle of the system, thus constraining the largely unknown value of the mass of the planet Proxima b.