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Radio emission from exoplanets

A. Lecavelier des Etangs (1), S. Sirothia (2), Gopal-Krishna (2) and P. Zarka (3)
(1) CNRS, Institut d'Astrophysique de Paris, France (lecaveli@iap.fr), (2) National Centre for Radio Astrophysics, TIFR, Pune, India, (3) LESIA, Observatoire de Paris, Meudon, France

Abstract

We will review the current status of search for radio-wavelength emissions from extrasolar planets. Up to now, only negative results have been reported, with some tight upper limits. The reasons for non-detections will be discussed. We will also present the most recent and very interesting results obtained with the GMRT radio-interferometer at 150 MHz.

1. Search for radio emission

Since the radio-frequency emission from planets is expected to be strongly influenced by its interaction with the magnetic field and corona of the host star, the physics of such an interaction can be effectively constrained by obtaining good measurements of the properties of the planetary radio emission. Therefore, in parallel with theoretical estimates for radio emission from extrasolar planets (*e.g.*, Zarka 2007), searches have been undertaken for decameter- and meter-wavelength radio emission from a few carefully selected extrasolar planets. Theoretical estimates show that radio emission from exoplanets are currently feasible. However, all the existing estimates of cyclotron maser decametric emission are based on a host of unknowns, *e.g.*, stellar winds, coronal density, and stellar and planetary magnetic fields.

Practically all searches for radio emission from exoplanets have been carried out at meter wavelengths. So far only non-detections have been reported (review in Lazio et al. 2009).

2. GMRT observations

The Giant Metre-wave Radio Telescope (GMRT), a 30-km baseline array consisting of 30 dishes of 45 metre diameter each seems very appealing for the search of radio-emission from exoplanets. We undertook a search program first targeted toward the best candidates among the known "hot-Jupiter" (Lecavelier des Etangs et al. 2009, 2011). To discriminate any planetary emission from possible stellar or background contributions, we monitored these systems just prior to, during and after the planet's eclipse behind the host star.

Up to now, no emission was detected toward the observed hot-Jupiters. According to theoretical works, the non-detections toward hot-Juipters can be understood because : (1) the Earth is outside the planet's emission beam at the time of observation, or (2) the emission is highly variable with flares, or (3) the planetary emission is too weak, or, more likely, (4) the planetary emission peaks at low frequencies because of the weakness of the planetary magnetic field.

3. Lastest results

Importantly, the survey with the GMRT is going on and is now targeted toward other type of planets. We will present recent and very interesting results obtained with the GMRT at 150 MHz.

References

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