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New theoretical aspects of potential radio wave emission from Jupiter like exoplanets

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The UTR-2 (Ukrainian T-shaped Radio Telescope 2nd generation), LOFAR (Low Frequency Array) or the upgrade of LOFAR in Nancay (the NENUFAR project) are promising facilities with sensitivities sufficiently low to be able to detect radio emission from exoplanets, especially from so-called Hot Jupiters. These are Jovian like planets very close to their host star (about 0.045 AU) and their radio emission is expected to be up to 10E5 times higher than the emission from Jupiter in our solar system. Also recent investigations of the possibility of moons around a Jovian exoplanet (an analog of the Io-Jupiter system) are promising candidates amongst the exoplanets for a future detection of exoplanetary radio emission. As is well known Io triggers radio emission up to 40 MHz in the Jovian case, a frequency which lies well above the ionospheric cutoff of 10 MHz and thus can be measured with ground-based facilities on Earth.

We present simulation results for wave growth rates at Jupiter-like exoplanets orbiting at distances smaller than 0.1 AU from their parent star. Under sophisticated assumptions for the plasma environment at these exoplanets we find that the cyclotron maser instability (CMI), the process which is very likely responsible for the generation of radio waves in our solar system, produces radio waves which can propagate away from the planet. Furthermore we check the influence of a magnetodisc at Hot Jupiters on the possible power of the emitted radio waves.