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Studies of bodies with interacting magnetospheres in our solar system such as the Jupiter-Io system have shown that currents running along magnetic field lines are driven by the induced potential across the conducting body and emit in radio wavelengths via the electron cyclotron maser mechanism. In this unipolar inductor model, the role of the inductor may be played by either a dwarf star or a conducting terrestrial planet core. It has been proposed recently that similar emissions may be generated by a terrestrial planet in close orbit around a white dwarf (Willes and Wu 2005). The induced potential Φ (which determines both the intensity and frequency of the maser emission) is a function of the masses and sizes of both objects, their orbital parameters, and the magnetic moment of the white dwarf.

Our target was the white dwarf G240-72, selected from a near-IR stellar companion catalogue (Farihi, Becklin, and Zuckerman 2005) for both its relative proximity (6.1 pc) and high declination, which allowed it to be observed throughout the day using the VLA. It was not known prior to this experiment whether this system possessed any planets. We observed G240-72 for 4.5 hours in July 2006 using the VLA in B configuration.

The observations resulted in images with an rms of ~ 1 mJy per channel over 13 channels with $\Delta\nu = 1.56$ MHz, centered at 22.485 GHz. The continuum image had an rms of 0.293 mJy. We made no detections of any maser emission.

Our non-detection of maser emission is somewhat unsurprising since the frequency of such emission (if present) is dependent upon a number of physical parameters, none of which are known for G240-72. In particular, it is not even known today if white dwarfs are capable of harboring terrestrial planets. Furthermore, current models (Willes and Wu 2005) suggest that the optimum frequency range for such detections is from 50-500 GHz, with sensitivity requirements bordering on the very limit of the VLA (1 mJy at 43 GHz). We thus suggest that future searches: a) incorporate a much larger sample of white dwarfs to increase detection probability, b) use instruments with broader bandwidth to accommodate a larger range of orbital parameters, and c) use telescopes with lower sensitivity limits to detect weaker systems. Instruments currently under development such as the EVLA and SKA would be ideally suited to this task.

References:

Farihi, J., E.E. Becklin, and B. Zuckerman (2005), *ApJS*, **161**, 394-428.

Willes, A.J. and K. Wu (2005), *A&A*, **432**, 1091-1100.