Progress towards divertor experiments on the Compact Toroidal Hybrid Experiment

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Edge magnetic island divertors can be used as a method of plasma particle and heat exhaust in long pulse stellarator experiments. Detailed power loading on these structures and its relationship to the long connection length scrape off layer physics is a new Compact Toroidal Hybrid (CTH) research thrust. CTH is a five field period, $\ell = 2$ torsatron ($R_0 = 0.75\,\mathrm{m}$, $a_p \sim 0.2\,\mathrm{m}$, and $|B| \leq 0.7\,\mathrm{T}$) with a highly configurable magnetic field structure. For these studies CTH will be operated as a pure stellarator using a 28 GHz, 200 kW gyrotron operating at 2nd harmonic for ECRH. Ray-tracing calculations that will guide the selection of launching position, antenna focal length, and beam-steering characteristics of the ECRH are performed with the TRAVIS code[1]. Non-axisymmetric vacuum and current-carrying CTH equilibria for the ray tracing are modeled with the V3FIT code[2]. It is found that the calculated absorption is highest for vertically propagating rays that traverse the region where a saddle of resonant field strength exists. However, the absorption for top-launched waves is more sensitive to variations in the magnetic equilibria than for a radial side launch where the magnetic field profile is tokamak-like. Next, we give an overview of EMC3-EIRENE[3] modeling of divertor plates near the magnetic island structures. These results show the expected temperature and particle flux distributions on the plates that we plan to compare with future experimental measurements. Finally, we present hardware designs for a divertor plate diagnosed with an array of langmuir type probes, and for the actuating mechanism that will be used to move the array.

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