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Design and Operation of a 28GHz Gyrotron System for the Compact Toroidal Hybrid Experiment[1] G.J. HARTWELL, S.F. KNOLTON, D.A. ENNIS, D.A. MAURER, Auburn University — The Compact Toroidal Hybrid (CTH) is an $\ell = 2, m = 5$ torsatron/tokamak hybrid ($R_0 = 0.75\,\mathrm{m}$, $a_p \sim 0.2\,\mathrm{m}$, and $|B| \leq 0.7\,\mathrm{T}$). It can generate its highly configurable confining magnetic fields solely with external coils, but typically operates with up to 80 kA of of plasma current for ohmic heating. A gyrotron system has been installed that features a Varian VGA-8050M tube operating at 28 GHz and capable of up to 200 kW of power. The system is used for 2nd harmonic ECRH to supplement the existing 10 kW klystron system operating at the fundamental frequency; the latter generating target plasmas. Ray-tracing calculations that guided the selection of launching position, antenna focal length, and beam-steering characteristics of the ECRH were performed with the TRAVIS code[1]. The calculated absorption is up to 95.7% for vertically propagating rays; however, the absorption is more sensitive to magnetic field variations than for a side launch where the field gradient is tokamak-like. The design of the waveguide path and components for the top-launch scenario will be presented, as well as ECRH results showing the efficacy of the gyrotron system.
[1]N.B. Marushchenko, Y. Turkin, H. Maassberg, Comp. Phys. Comm. 185 165 (2014)

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