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Operation in low edge safety factor regime and passive disruption avoidance due to stellarator rotational transform in the Compact Toroidal Hybrid[1] M.D. PANDYA, D.A. ENNIS, G.J. HARTWELL, D.A. MAURER, Auburn University — Low edge safety factor operation at a value less than two ($q(a) = 1/\iota_{tot}(a) < 2$) is routine on the Compact Toroidal Hybrid device. Presently, the operational space of this current carrying stellarator extends down to $q(a) = 1.2$ without significant $n = 1$ kink mode activity after the initial plasma current rise of the discharge. The disruption dynamics of these low $q(a)$ plasmas depend upon the fraction of rotational transform produced by external stellarator coils to that generated by the plasma current. We observe that when about 10% of the total rotational transform is supplied by the stellarator coils, low $q(a)$ disruptions are passively suppressed and avoided even though $q(a) < 2$. When the plasma does disrupt, the instability precursors measured and implicated as the cause are internal tearing modes with poloidal, m, and toroidal, n, mode numbers of $m/n = 3/2$ and $4/3$ observed by external magnetic sensors, and $m/n = 1/1$ activity observed by core soft x-ray emissivity measurements. Even though $q(a)$ passes through and becomes much less than two, external $n = 1$ kink mode activity does not appear to play a significant role in the observed disruption phenomenology.

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