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Experimental measurements of the $m = 1$ unstable diocotron mode\textsuperscript{1} T.B. MITCHELL, B.T. CHANG, W. SHI, Dept. of Physics and Astronomy, U. Delaware, Newark DE — The first experimental observation of an exponentially growing $m = 1$ unstable diocotron mode on a trapped, magnetized, partially hollow electron column was in 1990\textsuperscript{2}, and subsequent measurements examined the effect of end shape curvature\textsuperscript{3}. We present new experimental measurements of the $\mu$ (initial column hollowness parameter) and $\kappa$ (end shape curvature parameter) dependences of growth rates of the $m = 1$ instability. Measurements of the perturbed longitudinal temperatures of the electron column have been incorporated into the present experiments. We have experimentally established a $\mu^{4/3}$ scaling of the growth rates on the column hollowness $\mu$ for $\mu < 2.2$. Our results of growth-rate scaling on $\kappa/\mu$ for relatively large $\mu$ and $\kappa$ are in agreement with theoretical predictions for the instability near onset $(\kappa, \mu) \to 0$ by Finn et al.\textsuperscript{4}.

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\textsuperscript{3}A. A. Kabantsev and C. F. Driscoll, Non-Neutral Plasmas III, 208 (1999).

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