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## Study of Cockcroft-Walton Multipliers Driven by AC Sources with Limited Current

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Cockcroft-Walton (CW) multipliers are common and simple DC high voltage sources; however, almost all literature on CW design assumes an ideal AC current source drives the multiplier. Our work on piezoelectric transformer driven CW multipliers for use in compact x-ray sources prompted a study of CW operation with limited supply current. Limiting the AC source current supplying a CW has been shown to significantly reduce its output voltage. Using SPICE, differing degrees of current limiting, varying stage capacitance, and variable loads all had a significant impact on total output voltage from a CW. CW multipliers are known to have an optimal number of stages to produce the highest output voltage, which is no different for multipliers with current limited sources. However, the optimum number of stages is dependent upon the current limiting and tends toward lower numbers of stages for reduced drive current. Varying stage capacitance also has a significant impact on output voltage, which is dependent on supply current. Both uniform stage capacitance and variable stage capacitance have been investigated, with marginal improvements found for the variable capacitance case. From simulation, the output voltage is shown to increase as the load increases, with the amount of increase dependent on the supplied current.

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**Authors:** WILLIAMS, Jacob (University of Missouri Electrical Engineering and Computer Science); Dr KO-VALESKI, S. D.; YANG, Enbo

**Presenter:** WILLIAMS, Jacob (University of Missouri Electrical Engineering and Computer Science)

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