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Current adding strategies in compact linear transformer drivers

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Linear transformer drivers have now become the technology of choice for the next generation of pulsed-power devices. The main advantage of LTDs over Marx generators, is the lack of pulsed compression hardware. Dropping this requirement has enabled the design of more efficient, highly modular systems. But capacitor technology is still a limiting factor, with two hard limits: peak current and charge voltage. Research needs dictate current and voltage at the load and capacitors must be arranged in series to meet voltage constraints, and in parallel to meet current constraints. As more and more capacitors are added in parallel to increase current, the diameter of the LTD cavity becomes so large that it becomes impractical to stack cavities in series, de facto limiting the voltage of the driver. In this talk, we will show how current requirements can be met using compact LTD cavities. While this design can be applied to multi-mega-ampere designs, we will focus on University-scale machines, limiting our discussion to one mega-ampere. Based on a post hole-convolute approach, nested transmission lines located inside the cavity bore are used to add currents together. Using high resolution electromagnetic simulations with full electrical circuit coupling, different topologies will be discussed, and a final design will be presented.

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