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A NEW HIGH CURRENT FAST 100NS LTD BASED DRIVER FOR Z-PINCH IFE AT SANDIA[i]

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Sandia is actively pursuing the development of new accelerators based on the novice technology of Linear Transformer Driver (LTD). LTD based drivers are currently considered for many applications including future very high current Z-pinch drivers like ZX and z-pinch IFE (Inertial Fusion Energy). LTD is a new method for constructing high-current, high-voltage pulsed accelerators. The salient feature of the approach is switching and inductively adding the pulses at low voltage straight out of the capacitors through low inductance transfer and soft iron core isolation. High currents can be achieved by feeding each cavity core with many capacitors connected in parallel in a circular array. High voltage is obtained by inductively adding the output voltage of many cavities in series. Utilizing the presently available capacitors and switches we can envision building the next generation of fast z-pinch drivers without the usage of large deionized-water and oil tanks as it is the case with the present technology drivers. The most significant advantage of all is that the LTD drivers can be rep-rated. They can be multipulsed with a repetition rate, in principle, up to the capacitor specifications and up to 10 Hz. The later makes LTD the driver of choice for z-pinch IFE where the required repetition rate is of the order of 0.1 Hz. Presently we have in rep rated operation in Sandia a one 500-kA, 100-kV LTD cavity. Our goal is to establish the maximum possible frequency of repetition rate and test the longevity of the utilized dry air gas switches. The compact fast (<100 ns pulse rise time) LTD technology was suggested and its development is funded and being monitored by Sandia at the High Current Electronic Institute (HCEI) in Tomsk, Russia, where an additional number of larger and stackable 1-MA cavities are under construction to be utilized as building blocks for a 1-MA, 1-MV voltage adder test module. This module will serve as a prototype for longer higher voltage modules, a number of which, connected in parallel, could become the driver of the z-pinch IFE reactor.

In this paper we briefly describe the basic theory underlying the LTD operation, present the device and give performance results of our 500-kA and 1-MA cavities currently in operation and finally describe a first cut design of an IFE driver utilizing the 1-MA, 100-kV cavity as a building block.

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