Contribution ID: **621** Type: **Oral**

The developments of Linear Transformer Drivers in Xi'an Jiaotong University

Thursday 27 June 2019 10:00 (30 minutes)

Xi'an Jiaotong University in collaboration with the Northwest Institute of Nuclear Technology, is developing fast linear transformer driver (FLTD) technology for high energy density physics applications. Recently, the advances in gas switches, bricks, cavities and triggering system have been made.
First, a new type of three-electrode field distortion gas switch was developed, and FLTD bricks composed of two 100nF capacitors and one switch was built. Each brick can deliver a 49.2kA pulse current to a compactly connected 78nH/2.2Ω load under a charging voltage of ±100 kV. The discharge current waveform indicates that the inductance of the brick is ˜ 160 nH. Second, a multi-gap gas switch, with resistors and capacitors mounting in parallel with the switch gaps, was developed. At a charging voltage of ±80 kV and operating at 60% of the self-breakdown voltage, the trigger voltage was reduced from 110 kV to 75 kV while the 3.2 ns jitter of the switch was preserved. Third, a FLTD cavity composed by 23 bricks and one built-in trigger brick was built. One single trigger pulse was used to trigger the triggering brick, and the other 23 bricks were triggered by the discharge of the trigger brick, which used the modified multi-gap gas switch. The cavity can deliver a 0.9-MA 120 ns pulse to a 5nH/0.06Ω load when charged to ±80 kV. Finally, a four-cavity 1 MA FLTD voltage adder is under construction. The FLTD module will use gas insulation and a transmission line insulated with deionized water. Some new ideas including: multistage cascade trigger and sharing common cavity will be tested.

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Session Classification: 7.4 Linear Tranformer Driver

Track Classification: 7.4 Linear Transformer Drivers