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An explosive pulsed power source based on ferroelectric generators and electrical exploding opening switches

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As a primary power supply, the explosive-driven ferroelectric generator (EDFEG) has high energy density, can autonomously produce more than 100 kV high voltage with a few microseconds pulse duration, but hundreds nanoseconds rising time. In our experiments it can output the current of over 10 kA on an inductance load of about 2μH. It is believed that EDFEG should be an ideal primary supply for the pulsed modulator with the inductance energy storage and the electrical exploding opening switch (EEOS). In the tradition of the pulsed modulator with EEOS, there is a high voltage pulsed capacitor or an explosive magnetic generator as the primary power supply. Based on EDFEG and EEOS we have designed an new explosive pulsed power source without external power supply. The EDFEG in our pulsed power source designed can output equivalent constant current of 7.5 kA with pulse duration of 4μs, and generate about 15kA oscillating current through an inductance of 2μH and an EEOS designed specially. A capacitor of 1μF is connected in parallel to the EDFEG in order to reduce the voltage on the EDFEG close to 11kV. In this design the ferroelectric blocks of PZT95/5 endure lower pulse voltage of only 11kV. When metal wires of EEOS explode at the time near peak value of the oscillating current, higher pulse voltage of more than 300kV will be produced on a resistive load of 50Ω with rising time of 10ns and pulse duration of 65ns. The power density of the explosive pulsed power source is expected to exceed 500GW/m3 which is more than twice as much as the traditional pulsed power source with EEOS.

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