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All-solid-state bipolar high voltage nanosecond pulse adder with output parameters adjustable

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Nanosecond high voltage pulse generators are widely used in dielectric barrier discharges, plasma jets, corona discharges in water, et al. In this paper, a novel bipolar pulse adder with output parameters adjustable is proposed. Several full bridge MOSFET units are connected in series. And the storage capacitors in each units is charged isolated by a high-frequency resonant power supply. In order to solve voltage unbalance between storage capacitors, a third winding is added to each magnetic core transformer. The mechanism of eliminating voltage difference by third windings is analyzed in theory, and validated by simulation and experiments. Optic fibers, together with gate drivers, are used to drive MOSFETs. Thus, each switch can be turned on or off independently and the rising/falling time of each pulse is adjustable. A 6-stage prototype is implemented in laboratory. The pulse adder can generate 5 kV bipolar pulses with voltage polarity, amplitude, repetition rate, pulse width, and rising/falling time adjustable independently. The experimental results are shown in this paper and discussed at last

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