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Development of Variable Charging System for Voltage Adjustment

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Compact pulsed power generators have been used some fields such as biology, agriculture, environment and so on. Therefore, any researchers demand functions such as miniaturization, weight saving, safety and ease to use. Recently, those control systems using a microcomputer or a field programmable gate array (FPGA) has been studied for flexible changing circuits and control of pulsed power. However, each experiment has different conditions, e. g. conductivity, pressure, temperature, humidity and so on. Therefore, different conditions are needed each energy in experiment. Our work aims the changing charge time to primary capacitor using the FPGA, and, change the output of pulsed power energy. A compact pulsed power generator is composed of a charger, a magnetic pulse compression (MPC) circuit, and a controller using the FPGA. The design specification of the controller is the Verilog HDL, Xilinx ISE 14.7, the FPGA (Spartan-3). Charging voltage is maximum 1.5 kV to the primary capacitor of 2.24 μF. Repetition rate is up to 500 pulses per second and charging energy to maximum 1.0 J/pulse. Voltages were measured a high voltage probe (Tektronix Model P6015A) for pulsed power and mid-range voltage probe (Tektronix Model P5100) for charger. The load was 500 Ω resistance. When the frequency signal becomes positive polarity, the charging signal turn off 0.5 to 1.5 ms. Them the primary capacitor is charged. At 50 μs after turning on the charging signal, the trigger signal is sent to the switch for pulsed power. The flexible control of output voltage will be very important for industry applications of pulsed power.

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