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## 5P16 - The Optimization of High Voltage Nanosecond Pulse Generator with Auxiliary Trigger Circuit

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High voltage nanosecond pulse generator has numerous applications on industry, such as triggering the Pockels cell, triggering the spark switch, and generating the discharge plasma. All of these applications require the generators have high amplitude, great stability, fast rise time and low jitter. In this case, solid-state switches have great advantages comparing with gas spark switches. Because of the merits of extremely fast switch speed (over 100 V/ns), tiny size, low jitter, long lifetime, and commercial availability, the avalanche transistors have been widely used to generate the nanosecond and sub-nanosecond pulses. In order to obtain the high voltage output, a Marx-type pulse generator was developed. And there are several avalanche transistors in series at each stage of the Marx circuit. However, the failure rate of transistors was very high in our Previous experiments.

In this paper, we attribute the failure to the short circuit of the emitter and base at each avalanche transistors except for the first one at the first stage. Therefore, a kind of auxiliary trigger circuit is designed and can be used in every stage of the 4×10-stage Marx circuit. This special topology is aimed to provide triggering pulse to each transistor. Therefore, the conduction mode of avalanche transistors will be changed from "over-voltage mode"to "trigger mode". The result shows that the failure rate is significantly reduced. And then, the effect of the auxiliary trigger circuit on the output pulse is studied carefully. The testing result indicates that with the increase of improved stage number, the amplitude of output voltage increases first and then decreases. Finally, improve five stages for 4×10-stage Marx circuit with the output parameters: amplitude of 9.04kV, rise time of 4ns, full width at half maximum of 17ns, and repetition rate of 2 kHz.

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