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# 2P59 - A High-gain nanosecond pulse generator based on inductor energy storage and pulse forming line voltage superposition

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Pulsed gas discharge is an important means of generating low temperature plasma. Short pulses with fast frontier show superior performance in terms of increasing the active particle content, ionization coefficient and electron conversion rate due to its higher voltage rise rate. The common nanosecond pulse generator is based on capacitive energy storage. Compared with the nanosecond pulse generator based on capacitive energy storage, the inductive energy storage has outstanding advantages in energy storage density, miniaturization of the device, and less influence of loop inductance. However, the inductive energy storage also suffers from problems such as limitation of disconnect switch, uncontrollable outputs and waveform distortion.
In this paper, the inductance unit in the transmission line is used as the energy storage inductance, and combined with the characteristics of the rectangular pulse output of the transmission line, and the modular voltage superposition is carried out by using the propagation delay of electromagnetic wave in the transmission line to achieve high-gain rectangular nanosecond pulse output.Then we expand the design of the terminal superposition structure, optimize the magnetic field distribution between the lines to reduce the waveform distortion, and output the nanosecond short pulse.Finally, the paper analyzes the load matching characteristics of the designed pulse generator and provides experimental support for the actual application of the generator.In this paper, the superposition experiment of 10-stage inductive energy storage modules was carried out. The experimental results show that the time-delay isolation method of transmission line can effectively isolate the pulse voltage at the front and rear. The volume of the 10-stage circuit module is 25 cm*6 cm*12 cm, rectangular waveform output, the charging voltage is DC 58 V, the voltage amplitude is 8.2 kV, the voltage gain is about 140 times, the pulse duration is 23 ns and the rise time is 8 ns.

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