

Development of high voltage pulsed modulator for the CEPC C band 80MW Klystron

High-voltage pulse modulator is a key device in linear accelerators, serving as the intermediate link that converts power from the power supply into microwave power. According to the CEPC technical design, the linear accelerator requires 236 sets of C-band 80 MW power source systems to supply 5712 MHz/3 μ s/100 Hz pulsed power to the accelerating structures. To achieve the target klystron output power of 80 MW, the high-voltage pulse modulator must deliver pulsed voltages of 425 kV, pulsed currents of 425 A, and a minimum output power of 180 MW. The pulse rise and fall times directly determine the modulator's efficiency, while repetition stability critically influences beam quality. The 100 Hz repetition rate imposes stringent requirements on power handling capacity and thermal management. To meet these challenges, a high-voltage pulse modulator based on a solid-state topology has been developed specifically for C-band 80 MW applications. This paper presents the current development progress from several aspects, including the comprehensive circuit calculation of the high-voltage pulse modulator, theoretical analysis and structural design of the pulse transformer, and simulation analysis.

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