

Development of 81.25 MHz and 162.5 MHz LDMOS-based solid-state power amplifiers for the heavy ion accelerator

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Construction of a heavy ion accelerator facility to support various scientific studies is underway. The heavy ion accelerator facility is largely comprised of SCL3 for low-energy acceleration and SCL2 for high-energy acceleration. SCL3 consists of 22 quarter wave resonators (QWR) with a superconducting acceleration cavity frequency of 81.25 MHz and 102 half wave resonators (HWR) with a frequency of 162.5 MHz, and SCL2 consists of 213 single spoke resonators (SSR) with a frequency of 325 MHz. A low-energy superconducting linear accelerator consisting of an injector, QWR, and HWR was successfully commissioned. SCL3 superconducting accelerator tube can supply up to 4kW of RF power to the acceleration cavity using a solid-state power amplifier (SSPA) based on LDMOS (Lateral Double-Diffused Metal Oxide Semiconductor). The basic principle of the solid-state power amplifier applied to the acceleration cavity of 81.25 MHz and 162.5 MHz is the same, with differences in the location and quantity of components such as circulator and RF combiner. The main components of SSPA are the main transistor, a bidirectional coupler for RF input power monitoring, an attenuator, a limiter to prevent over-input, an ultra-short MMIC, a driving amplifier, a 4-way input power divider, a 4-way output power combiner, a circulator, and a dummy load.

Footnotes

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