

Implementation of microwave with arbitrary amplitude and phase for the DCLS

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In many experiments, the simultaneous emission of multiple wavelengths of FEL (Free-Electron Laser) is significant. For the pulsed-mode FEL facility, we must accelerate multiple electron beams in one microwave pulse, and they may be in different amplitudes and phases in the acceleration field. Therefore, we implement a microwave excitation, whose amplitude and phase have arbitrary shapes in LLRF (Low-Level Radiofrequency) system. We generate a microwave pulse with step-shaped amplitude and phase for dual beam operation in DCLS (Dalian Coherent Light Source). The microwave system of the primary accelerator has four pulsed LLRF devices, which output excitation to drive four solid-state amplifiers and then excite two 50 MW and two 80 MW klystrons, respectively. Due to the limited bandwidth of the klystron, the burst phase or amplitude of the step-shaped pulse may cause the excitation ring, so we generate a microwave excitation with a smooth step-shaped pulse by a sigmoid function. Preliminary experiments have shown that this step-shaped microwave can be used for the DCLS dual beam operation.

Keyword

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