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Ultrafast high voltage kicker system hardware for ion clearing gaps

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Ionization scattering of electron beams with residual gas molecules causes ion trapping in electron rings, both in a collider and electron cooling system. These trapped ions may cause emittance growth, tune shift, halo formation, and coherent coupled bunch instabilities. In order to clear the ions and prevent them from accumulating turn after turn, the gaps in a temporal structure of the beam are typically used. Typically, the gap in the bunch train has a length of a few percent of the ring circumference. In those regions, the extraction electrodes with high pulsed voltages are introduced. In this paper, we present the design consideration and initial test results of the high-voltage pulsed kicker hardware that includes vacuum device and pulsed voltage driver, capable of achieving over 3 kV of deflecting voltage amplitude, rise and fall times of less than 10 ns, 100 ns flat-top duration at 1.4 MHz repetition rate.

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