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Design and Initial Measurements of a 12.5 kV Prototype Inductive Adder for CLIC DR Kickers

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The CLIC study is exploring the scheme for an electron-positron collider with high luminosity and a nominal centre-of-mass energy of 3 TeV. The CLIC pre-damping rings and damping rings will produce, through synchrotron radiation, ultra-low emittance beam with high bunch charge, necessary for the luminosity performance of the collider. To limit the beam emittance blow-up due to oscillations, the pulse generators for the damping ring kickers must provide extremely flat, high-voltage pulses. The specifications for the damping ring extraction kickers call for a 160 ns duration flattop pulses of +/-12.5 kV, 250 A, with a combined ripple and droop of not more than +/-0.02 % (+/-2.5 V). An inductive adder is a very promising approach to meeting the specifications. The first 20-layer prototype inductive adder has been assembled at CERN and initial measurements have commenced. This paper presents the detailed design of the full-scale, 12.5 kV, 250 A, prototype inductive adder. The prototype adder has an active analogue modulation layer to compensate droop and ripple, in order to reach ultra-low the flat-top stability. Nanocrystalline magnetic cores, Finemet type FT-3L, have also been evaluated and this data has been used to predict the output waveform with PSpice simulations. Initial measurements on the 12.5 kV prototype adder have been completed. Results are presented and conclusions are drawn concerning the flat-top stability and repeatability of the output waveforms of the 12.5 kV, 20-layer, prototype.

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