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A 400A programmable linear current pulse generator

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As part of the LHC Injector Upgrade (LIU) project, the production of a high-intensity proton beam in the Proton Synchrotron Booster (PSB) at CERN will be achieved by injecting a beam of H- ions from the new LINAC4. During the injection process the two electrons of the H- ions are removed with a stripping foil across which the machine orbit is shifted to fill the machine aperture with beam. The process of filling the machine aperture is called 'phase space painting'and is accomplished with four individually-pulsed ferrite-cored kicker magnets. The magnets, two of 39µH inductance and two of 390µH inductance, will be excited by piecewise linearly decreasing currents with a maximum current of 400A for the 39µH magnets. The waveforms will comprise four different programmable slopes, changeable from pulse to pulse in the range of 8µs to 150µs. The four kicker waveforms must be well synchronized and deviate less than 0.5% from a reference waveform. Each pulse generator contains several stages of pre-charged capacitors that one after another are switched to the magnet to generate the current with the required slopes; additional stages are present to allow fine control of the slope linearity. The performance of the first operational prototype is presented and compared to theoretical calculations.

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