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Effects of pulsed power modulation on intense relativistic electron beam dynamics

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The Scorpius linear induction accelerator (LIA) will utilize solid-state pulsed power (SSPP) to generate accelerating fields for a multi-pulse intense relativistic electron beam. By optimizing the trigger on and off times of the linear transformer drivers that make up the SSPP system, the accelerating field amplitude can be flattened to reduce unwanted effects. Circuit modeling suggests that the RMS deviation in the pulse flat-top can be optimized to less than 1% in both the injector A-K gap and the accelerating cell gaps, contributing to improved beam dynamics throughout the machine. This capability gives unprecedented inter- and intra-pulse beam energy control, and effects on dynamic beam spot size on the Bremsstrahlung converter target are discussed. Ongoing efforts in circuit modeling seek to predict SSPP behavior for different pulse shapes within a pulse train to fully utilize the capabilities of the SSPP system.

Footnotes

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