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Bright bunch generation in a short pulse high gradient RF gun operating in a the transient regime

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Normal-conducting accelerating structures capable of supporting GV/m-scale electric fields offer a promising pathway to compact accelerators. Similarly, achieving such high fields in photocathode guns is critical for the generation of bright electron bunches. Our group has demonstrated the generation of ~ 0.4 GV/m electric fields on a photocathode surface in an X-band (11.7 GHz) photoemission gun (Xgun) powered by short RF pulses (~ 9 ns). In this work, we investigate the RF characteristics and beam dynamics evolution in the transient field regime. Accurately accounting for the transient nature of the RF field is essential for optimizing the beam dynamics and ensuring the production of high-quality electron bunches.

Footnotes

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