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Emittance compensation in a high charge TOPGUN photoinjector

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A simple acceleration of a high charge, needle-shaped electron bunch from a cathode is affected by strong correlated emittance growth due to current-dependent transverse space-charge forces. It was shown that such emittance growth could be reversed by focusing the bunch soon after it emerges from the cathode, and that one can expect to retrieve the emittance the beam was born with –the intrinsic emittance. We present a space charge emittance compensation study for a 250 pC radiofrequency photoinjector based on a 100 pC design developed by the UCLA team. We expect that a bright electron beam with an order of magnitude improvement over currently operating photoinjectors can be achieved with 250 pC electron bunches that maintain their emittance below 100 nm-rad.

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Footnotes

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Yes

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