

Physics and Applications of High Brightness Beams



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C-band vs S-band: Minimizing Emittance in a High Charge TopGun Photoinjector

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The space charge emittance compensation in the C-band TopGun design has been demonstrated with 100 pC bunch charge. It has shown that a minimum emittance is limited by the intrinsic emittance at the cathode. Scaling this approach to higher bunch charges, however, requires a larger transverse size and a longer pulse duration. The rf emittance dilution due to the iris kick scales quadratically with the transverse size and linearly with the pulse duration. This effect becomes a determinant factor for the minimum emittance in the TopGun designs. The study of S-band TopGun will show the ease of the constraint imposed by the rf emittance. We will show if an intrinsic emittance will become a limiting factor for 250 pC case.

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