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A Space Charge Forces analytical model for emittance compensation

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Space charge forces represent main induced effects in an RF-injector that degrade the beam quality. In this scenario the laser distribution sent on the photocathode acquires an important role in the emittance compensation process, as the slice analysis shows. A novel model of space charge forces is proposed for bunch with arbitrary charge distribution to derive expressions of self-induced forces. As the performance of the fields near the cathode is under present analysis, we can investigate use of this model in low charge regime. Further, the model has been benchmarked with the behavior of the distributions present in the literature and studied for new ones. It has also been applied for the study of the optimization of a C-band hybrid photoinjector now being commissioned, thus explaining the factor two reduction of the emittance observed at the exit of the gun by changing the initial distribution at the cathode.

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Footnotes

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