

Bimodal Two-Frequency Half-Cell RF Gun

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The concept of a Multi-Frequency Photoinjector (MUFFIN) is aimed at the possibility of raising the breakdown threshold due to a reduction of surface exposure time to high fields, and due to the so-called anode-cathode effect. These properties help one to reach the desired beam energies (5-10 MeV) even in a two-frequency half-cell normal conducting cavity. Simulations that invoke standard transverse emittance compensating techniques were made for 1.3 GHz + 2.6 GHz MUFFIN to provide electron bunches with parameters: 0.5-1 nC, 3-20 ps, $f_{\text{rpt}}=1.3$ GHz. Results show that one can produce bunches 1) 20 ps, 5 MeV (64 MV/m peak cathode-like surface electric field) with transverse emittance $2.5 \mu\text{mrad}\cdot\text{mm}$ consuming only 6.5 MW RF power, or optionally 2) 3 ps, 7.6 MeV (96 MV/m cathode-like field), $3 \mu\text{mrad}\cdot\text{mm}$, 14.7 MW.

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