

Status Report: Teststand Gun

November 26 2003

Input Parameters (Run 191):

Cathode Potential: -100 kV

Active Emitter Radius: $r_{act} = 100 \mu\text{m}$

Pulse: Gaussian, $\pm 3\sigma_z$, $\sigma_z = 20 \text{ ps}$, $Q \approx -5 \cdot 10^{-12} \text{ C}$ ($\hat{I} = 100 \text{ mA}$)

Gun Geometry: $r_{gun} = 30 \text{ mm}$, $z_{gun} = 40 \text{ mm}$

Iris: $r_{iris} = 500 \mu\text{m}$

Results After Gun Section ($z = 40 \text{ mm}$):

Beam Radius: $\sigma_r = 0.72 \text{ mm}$

Transverse RMS Angle: $r\prime = 16 \text{ mrad}$

Normalized Transverse RMS Emittance: $\epsilon_r^{(n)} = 1.8 \cdot 10^{-7} \text{ m}\cdot\text{rad}$

Bunch Length: $\sigma_z = 3.4 \text{ mm}$

RMS Momentum Spread: $\sigma_p/p = 0.1 \%$

Results After Drift Section ($z = 340 \text{ mm}$):

Beam Radius: $\sigma_r = 6.0 \text{ mm}$

Transverse RMS Angle: $r\prime = 18 \text{ mrad}$

Normalized Transverse RMS Emittance: $\epsilon_r^{(n)} = 3.1 \cdot 10^{-7} \text{ m}\cdot\text{rad}$

Bunch Length: $\sigma_z = 3.7 \text{ mm}$

RMS Momentum Spread: $\sigma_p/p = 0.2 \%$

Input Parameters (Run 193):

Cathode Potential: -30 kV

Active Emitter Radius: $r_{act} = 100 \mu\text{m}$

Pulse: Gaussian, $\pm 3\sigma_z$, $\sigma_z = 20 \text{ ps}$, $Q \approx -5 \cdot 10^{-12} \text{ C}$ ($\hat{I} = 100 \text{ mA}$)

Gun Geometry: $r_{gun} = 30 \text{ mm}$, $z_{gun} = 40 \text{ mm}$

Iris: $r_{iris} = 500 \mu\text{m}$

Results After Gun Section ($z = 40 \text{ mm}$):

Particle loss: For $z \in [8\text{mm}:19\text{mm}]$ 83% of particles are lost!

Beam Radius: $\sigma_r = 0.85 \text{ mm}$

Transverse RMS Angle: $r\prime = 19 \text{ mrad}$

Normalized Transverse RMS Emittance: $\epsilon_r^{(n)} = 2.0 \cdot 10^{-7} \text{ m}\cdot\text{rad}$

Bunch Length: $\sigma_z = 4.1 \text{ mm}$

RMS Momentum Spread: $\sigma_p/p = 0.4 \%$

Results After Drift Section ($z = 340 \text{ mm}$):

Beam Radius: $\sigma_r = 6.8 \text{ mm}$

Transverse RMS Angle: $r\prime = 20 \text{ mrad}$

Normalized Transverse RMS Emittance: $\epsilon_r^{(n)} = 2.7 \cdot 10^{-7} \text{ m}\cdot\text{rad}$

Bunch Length: $\sigma_z = 5.1 \text{ mm}$

RMS Momentum Spread: $\sigma_p/p = 0.4 \%$

Input Parameters (Run 194):

Cathode Potential: -70 kV

Active Emitter Radius: $r_{act} = 100 \mu\text{m}$

Pulse: Gaussian, $\pm 3\sigma_z$, $\sigma_z = 20 \text{ ps}$, $Q \approx -5 \cdot 10^{-12} \text{ C}$ ($\hat{I} = 100 \text{ mA}$)

Gun Geometry: $r_{gun} = 30 \text{ mm}$, $z_{gun} = 40 \text{ mm}$

Iris: $r_{iris} = 500 \mu\text{m}$

Results After Gun Section ($z = 40 \text{ mm}$):

Particle loss: For $z \in [9\text{mm}:18\text{mm}]$ 31% of particles are lost!

Beam Radius: $\sigma_r = 0.81 \text{ mm}$

Transverse RMS Angle: $r\prime = 18 \text{ mrad}$

Normalized Transverse RMS Emittance: $\epsilon_r^{(n)} = 2.3 \cdot 10^{-7} \text{ m}\cdot\text{rad}$

Bunch Length: $\sigma_z = 3.5 \text{ mm}$

RMS Momentum Spread: $\sigma_p/p = 0.2 \%$

Results After Drift Section ($z = 340 \text{ mm}$):

Beam Radius: $\sigma_r = 6.5 \text{ mm}$

Transverse RMS Angle: $r\prime = 19 \text{ mrad}$

Normalized Transverse RMS Emittance: $\epsilon_r^{(n)} = 3.3 \cdot 10^{-7} \text{ m}\cdot\text{rad}$

Bunch Length: $\sigma_z = 4.0 \text{ mm}$

RMS Momentum Spread: $\sigma_p/p = 0.2 \%$