Le Gun Revised
The Hollow Cathodes

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Outline

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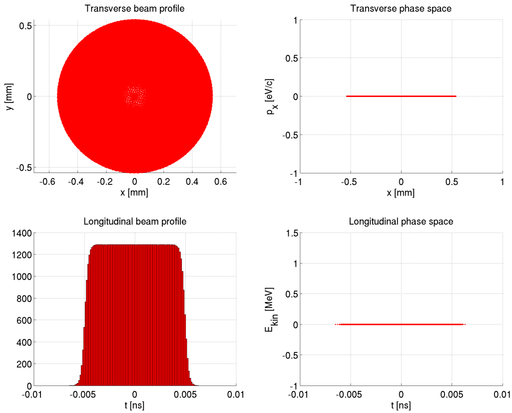
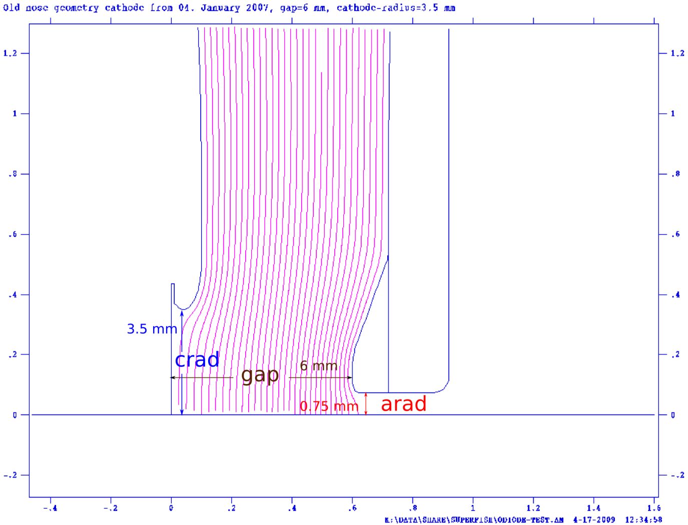
TiSa initial phase space

Beam qualities

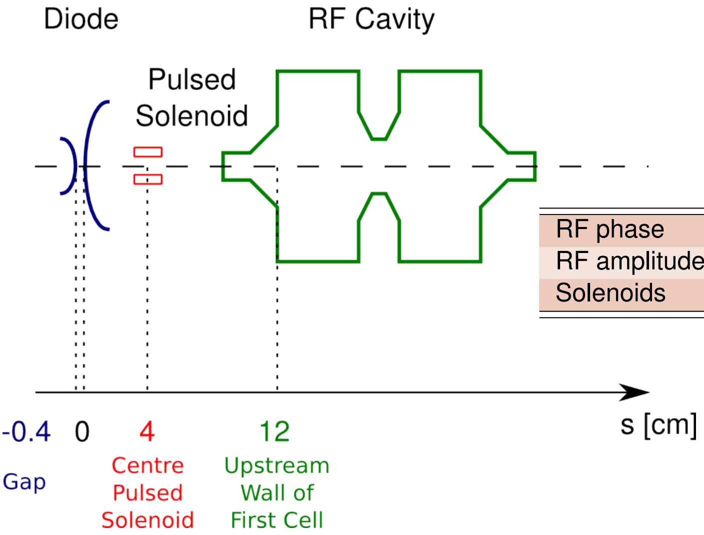
- Q = 200 pC
- I = 22 A
- r = 540 µm (radially uniform)
- t = 9.9 ps (FWHM) 0.7 ps r/f (plateau)
- ε_{thm} = 0 µm



Old Diode Geometry - November 2007

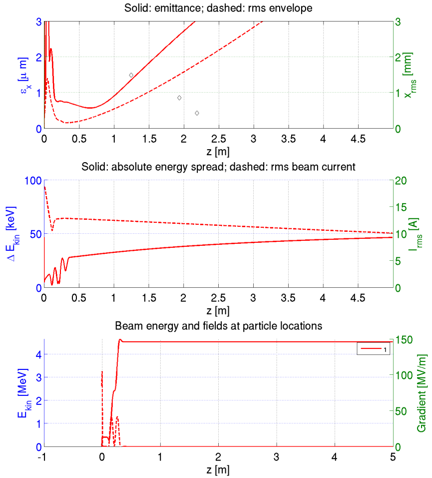


OBLA Beamline Layout



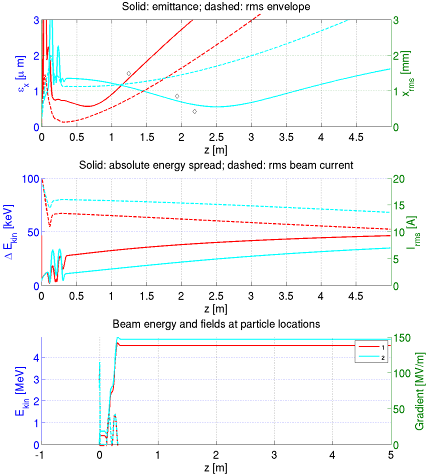
RF phase	-5 degree
RF amplitude	42 MV/m
Solenoids	off

ASTRA - Simulation - OBLA Beamline



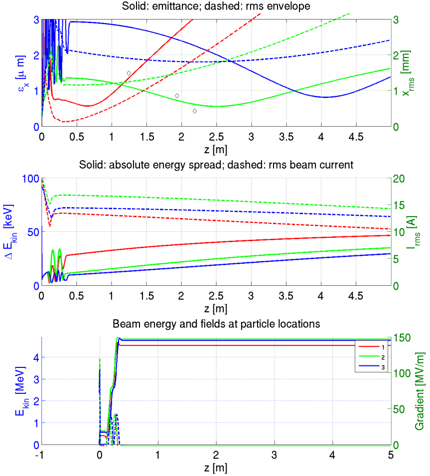
1	4 mm–400 kV|4 cm - 12 cm

ASTRA - Simulation - OBLA Beamline



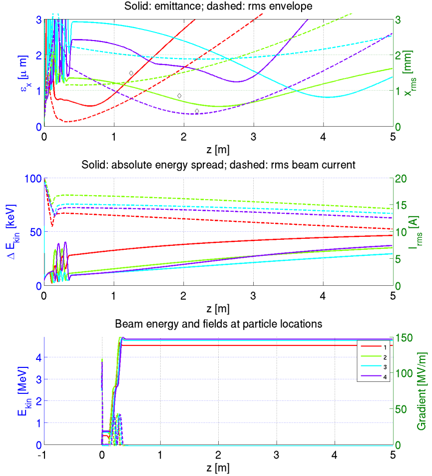
1	4 mm–400 kV	4 cm - 12 cm
2	6 mm–600 kV	4 cm - 12 cm

ASTRA - Simulation - OBLA Beamline



1	4 mm–400 kV|4 cm - 12 cm
2	6 mm–600 kV|4 cm - 12 cm
3	6 mm–600 kV|4 cm - 15 cm

ASTRA - Simulation - OBLA Beamline

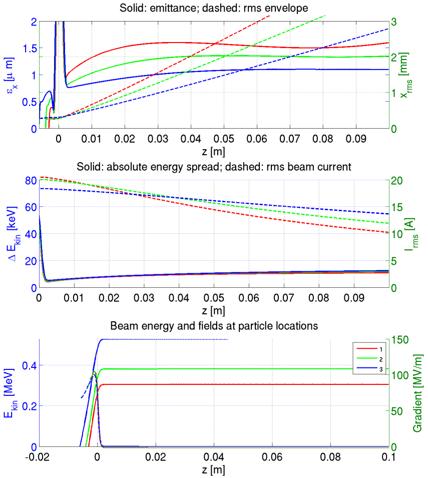


1	4 mm–400 kV|4 cm - 12 cm
2	6 mm–600 kV|4 cm - 12 cm
3	6 mm–600 kV|4 cm - 15 cm
4	6 mm–600 kV|4 cm - 16.61 cm

Gradient equal at 100 MV/m
Best Result:
#2: $\varepsilon_x \approx 0.5521$ µm
#1: $\varepsilon_x \approx 0.5887$ µm

Outline

ASTRA - Simulation - Gap

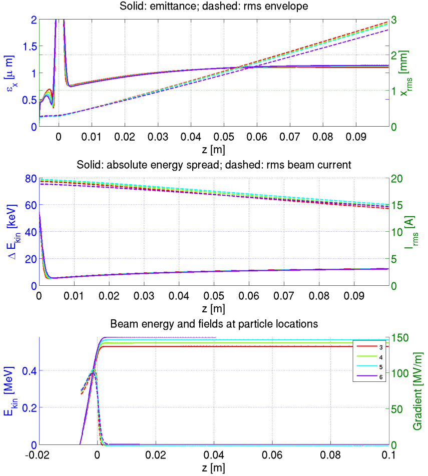


1	3 mm
2	4 mm
3	6 mm

Gradient equal at 100 MV/m

Best Result: Highest Voltage

ASTRA - Simulation - Anode Radius

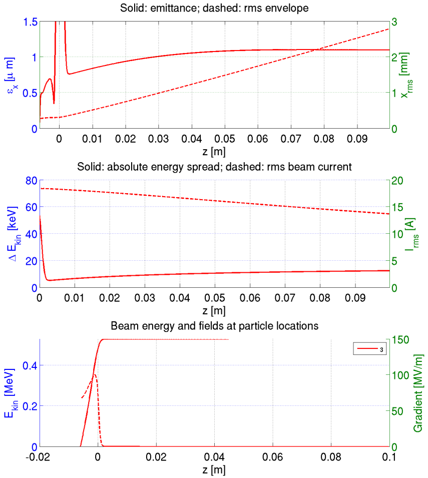


3	0.75 mm
4	1.00 mm
5	1.25 mm
6	1.50 mm

Gradient equal at 100 MV/m

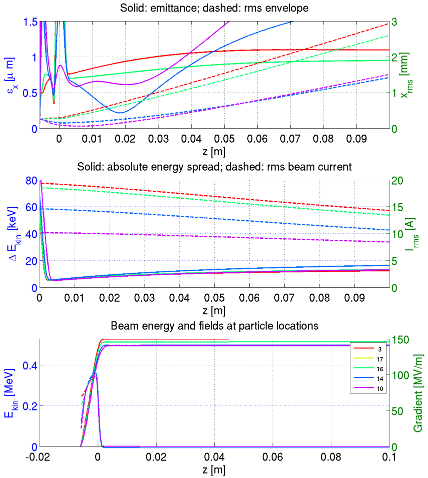
Best Result: -

ASTRA - Simulation - Cathode Radius



1	3.5 mm

ASTRA - Simulation - Cathode Radius



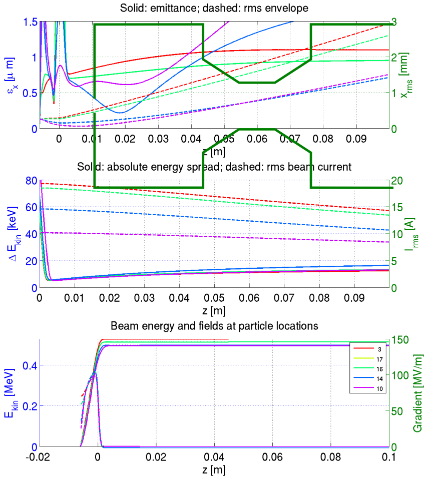
1	3.5 mm
17	2.5 mm
16	1.5 mm
14	1.3 mm
10	1.0 mm

Gradient equal at 100 MV/m

Best Result:

#14: $\varepsilon_x \approx 0.2142$ µm

ASTRA - Simulation - Cathode Radius



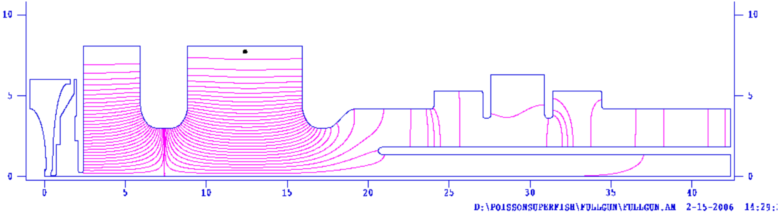
1	3.5 mm
17	2.5 mm
16	1.5 mm
14	1.3 mm
10	1.0 mm

Gradient equal at 100 MV/m

Best Result:

#14: $\varepsilon_x \approx 0.2142$ µm

Jean-Yves Cavity



Upgrades

- Emittance Compensation as a Combination of
  - Carlsten scheme
  - Serafini-Rosenzweig scheme
  - Slice emittance compensation
- Synchronisation achievable (1.7 cell for 500 kV)
- Velocity bunching up to a factor 4 achievable
- Matching by laser spot size: $p_r' \sim \sum J_m \left(x_{mn} \frac{r}{R}\right)$

Thanks to

Bolko Beutner, Yujong Kim, Anne Oppelt, Thomas Schietinger

and...

Thank You!