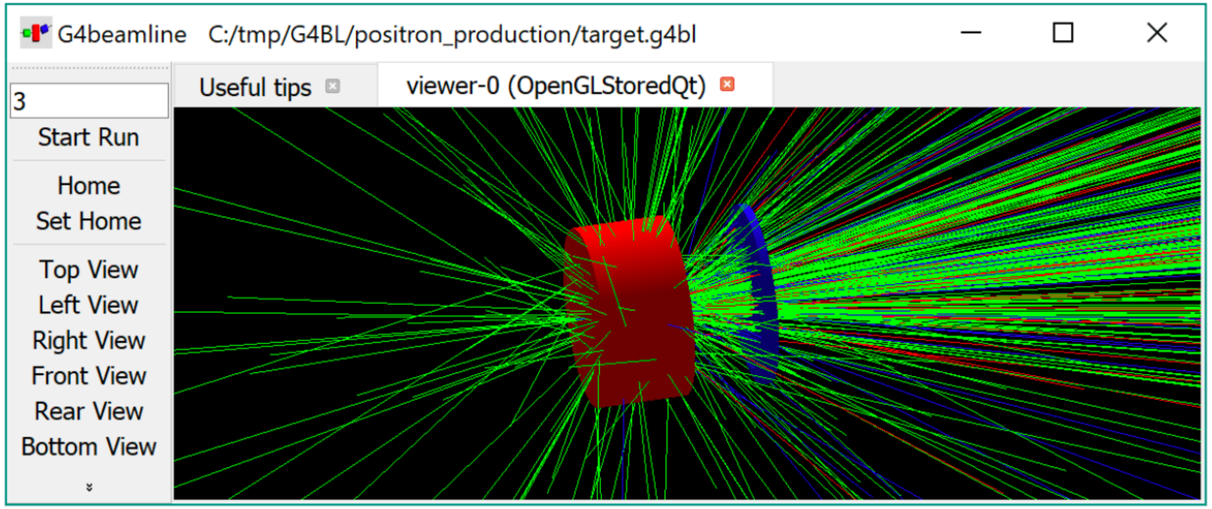
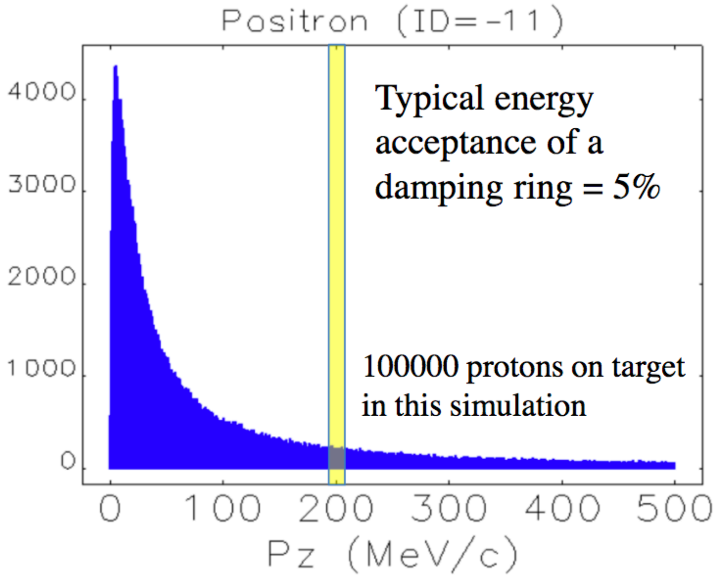
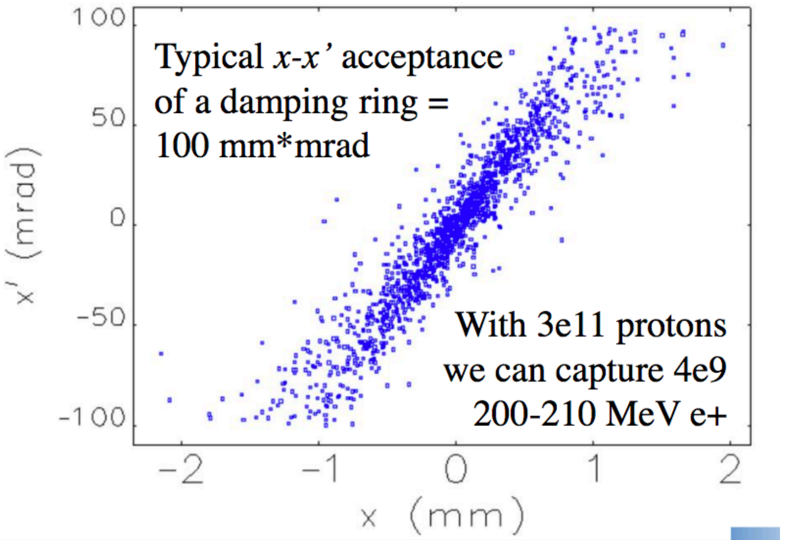
High-Energy Proton Beam on Target

G4beamline simulation of 400 GeV p-beam hitting 1 cm long W target:



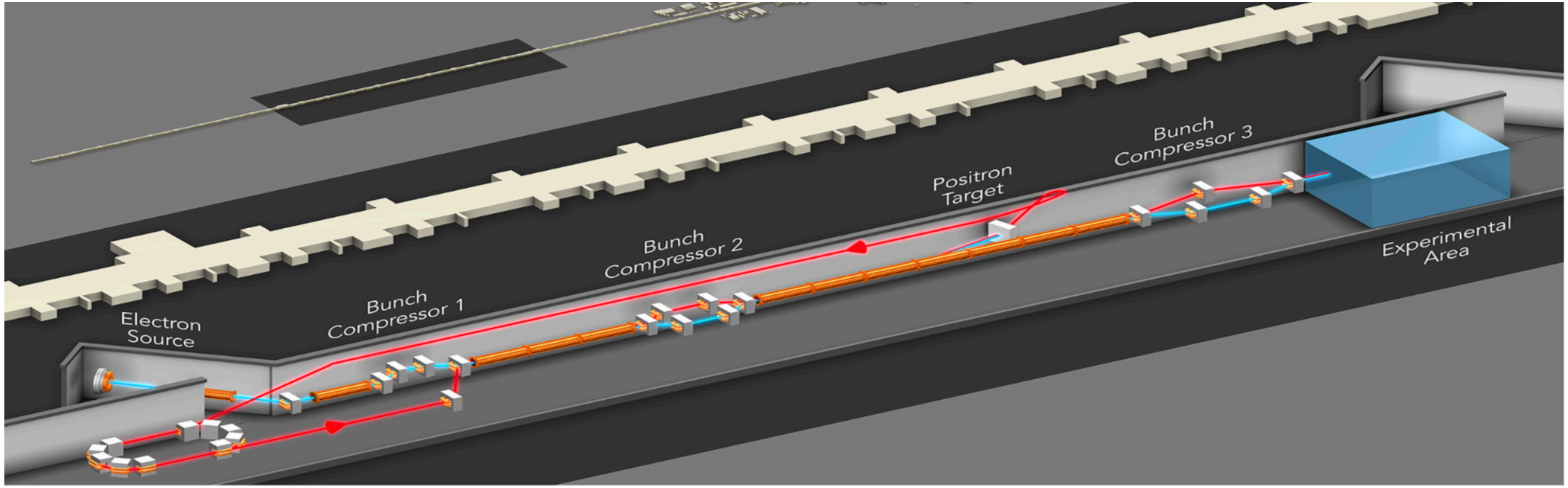
Mainly gamma-photons





A. Petrenko

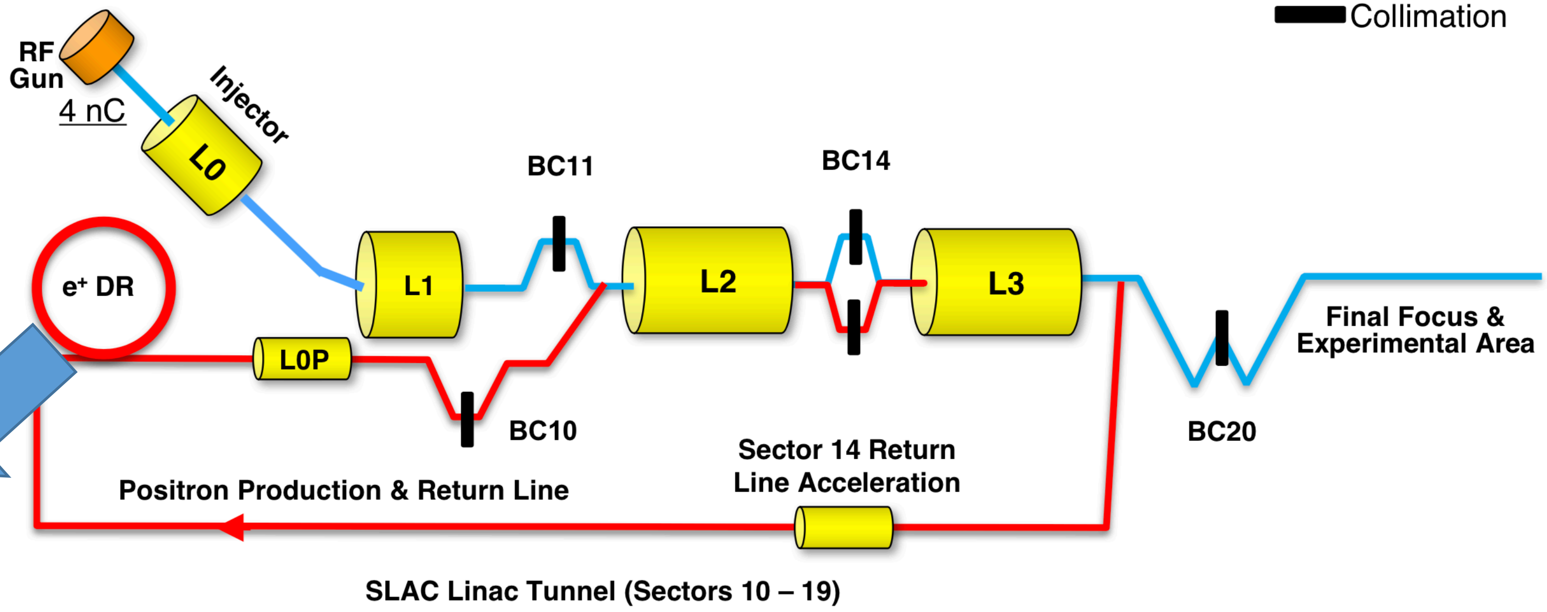
High-Energy Electron Beam on Target

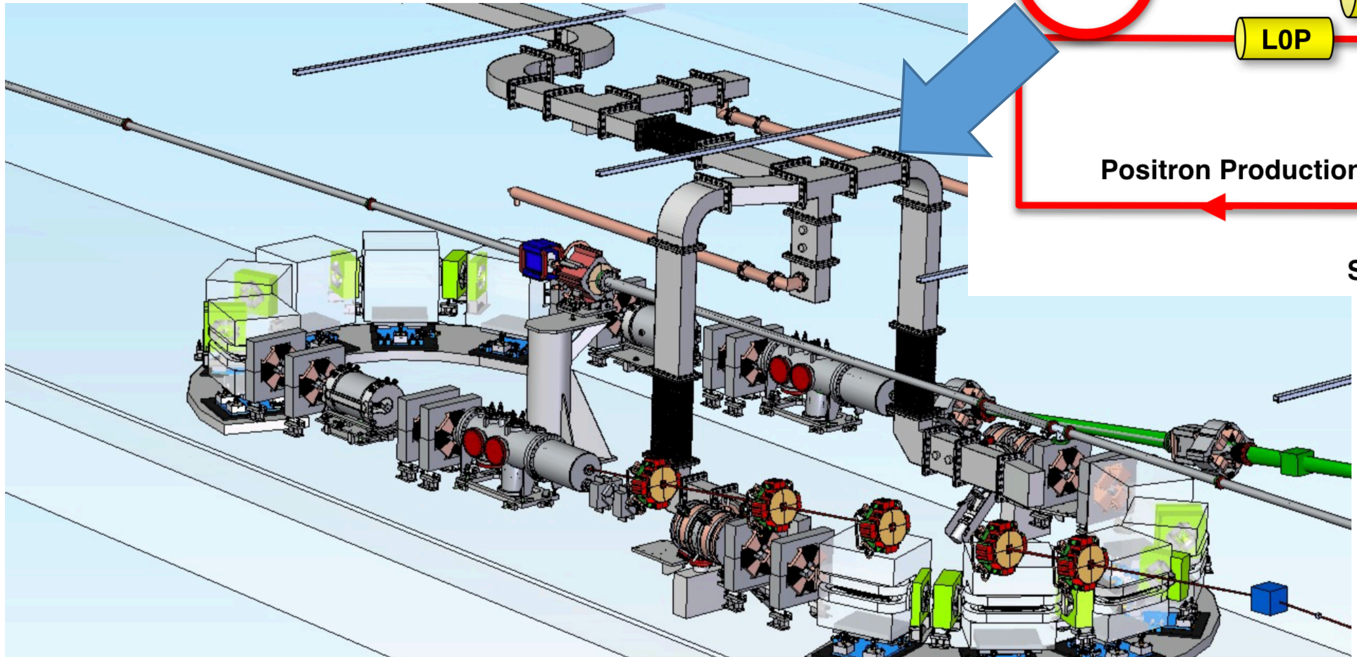


Electron Beam Parameter	Baseline Design	Operational Ranges
Final Energy [GeV]	10	4.0-13.5
Charge per pulse [nC]	2	0.7-5
Repetition Rate [Hz]	30	1-30
Norm. Emittance $\gamma\varepsilon_{x,y}$ at S19 [μm]	4.4, 3.2	3-6
Spot Size at IP $\sigma_{x,y}$ [μm]	18, 12	5-20
Min. Bunch Length σ_z (rms) [μm]	1.8	0.7-20
Max. Peak current I_{pk} [kA]	72	10-200

Positron Beam Parameter	Baseline Design	Operational Ranges
Final Energy [GeV]	10	4.0-13.5
Charge per pulse [nC]	1	0.7-2
Repetition Rate [Hz]	5	1-5
Norm. Emittance $\gamma\varepsilon_{x,y}$ at S19	10, 10	6-20
Spot Size at IP $\sigma_{x,y}$ [μm]	16, 16	5-20
Min. Bunch Length σ_z (rms)	16	8
Max. Peak current I_{pk} [kA]	6	12

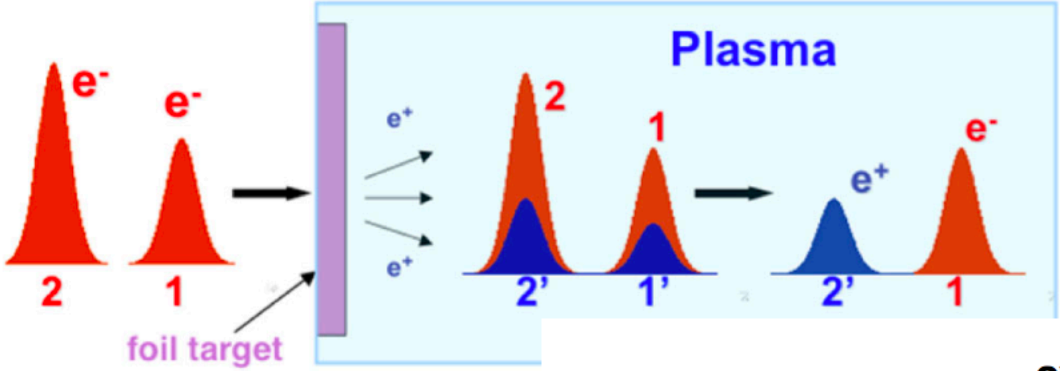
Requires Damping Ring





- 2.9 m diameter ring
- Vertical injection & extraction
- SLC septa, kickers & RF
- New combined-function arc magnet designs

In-Situ Positron Generation



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Positron Injection and Acceleration on the Wake Driven by an Electron Beam in a Foil-and-Gas Plasma

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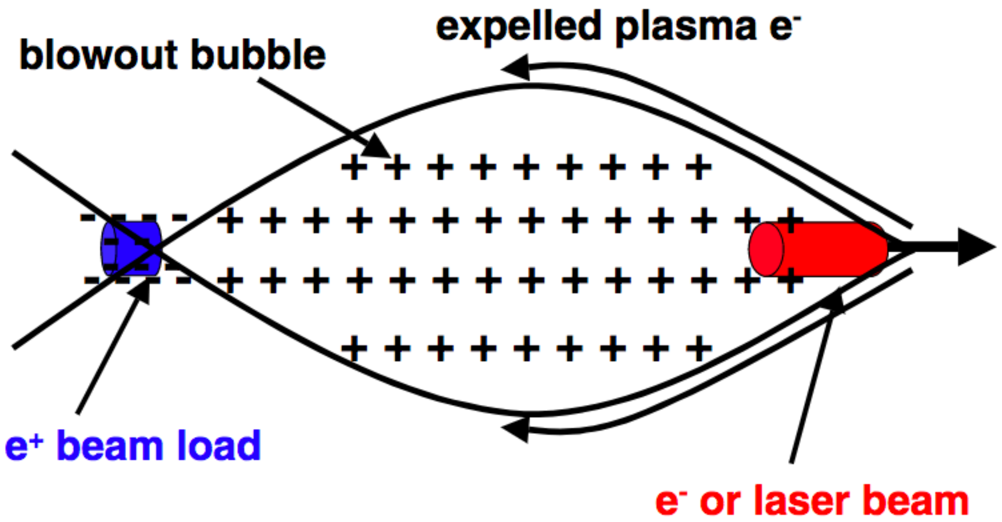
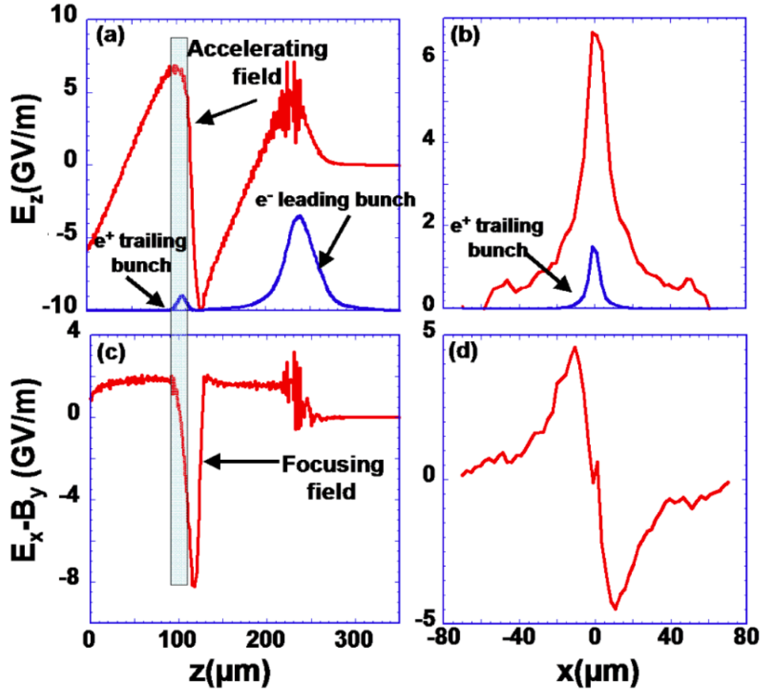
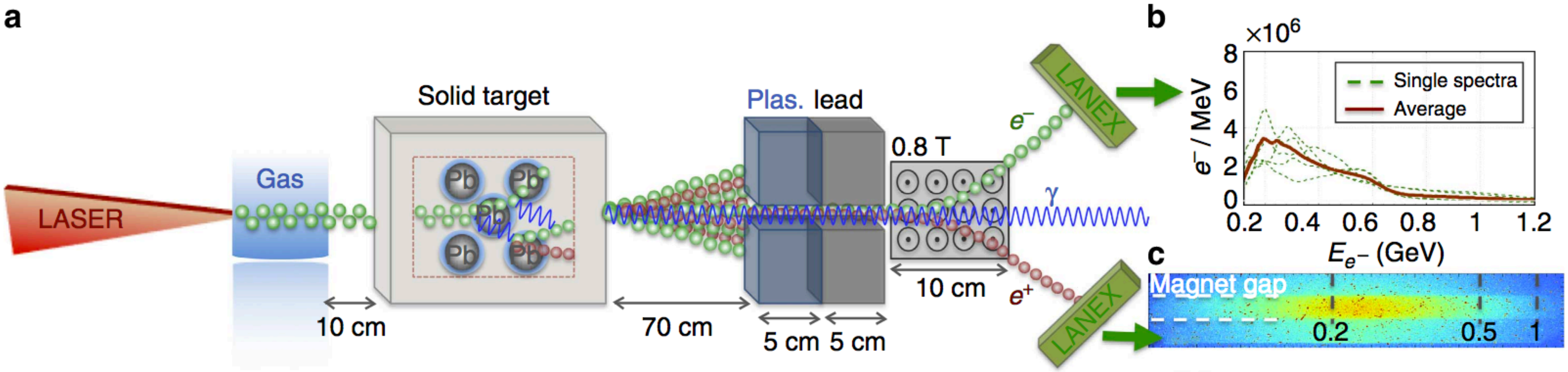




Laser-Target Positron Generation



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Generation of neutral and high-density electron–positron pair plasmas in the laboratory

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Positron Beams from Traps

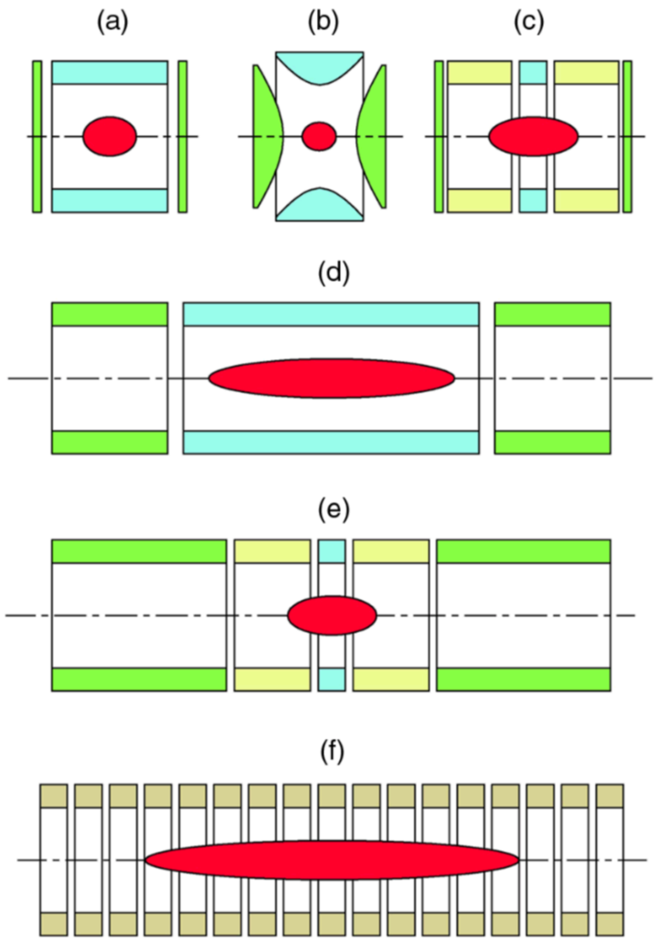


FIG. 7 (color online). Geometries for Penning traps: (a) cylindrical trap with closed end caps, (b) trap with hyperboloidal electrodes ("harmonic trap"), (c) orthogonalized cylindrical trap, (d) open end cap cylindrical trap (i.e., the Penning-Malmberg trap), (e) orthogonalized open end cap design, and (f) multiring trap. For online readers, the color code is as follows: (blue) ring electrode, (green) end caps, (yellow) compensation electrode, (red) confined charge cloud, and (brown) multiring electrodes.

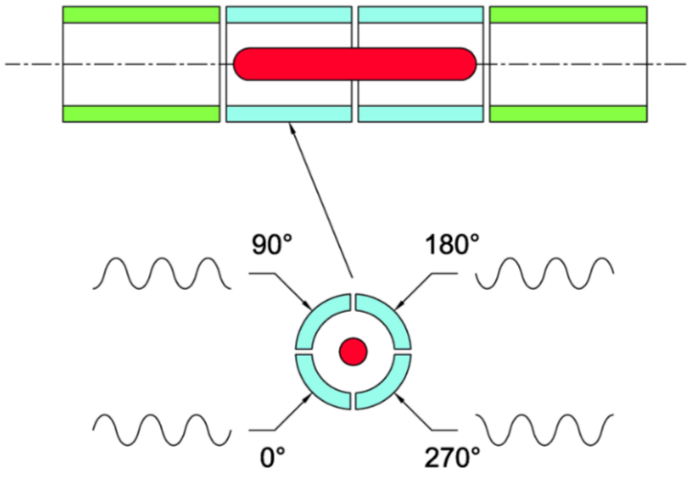
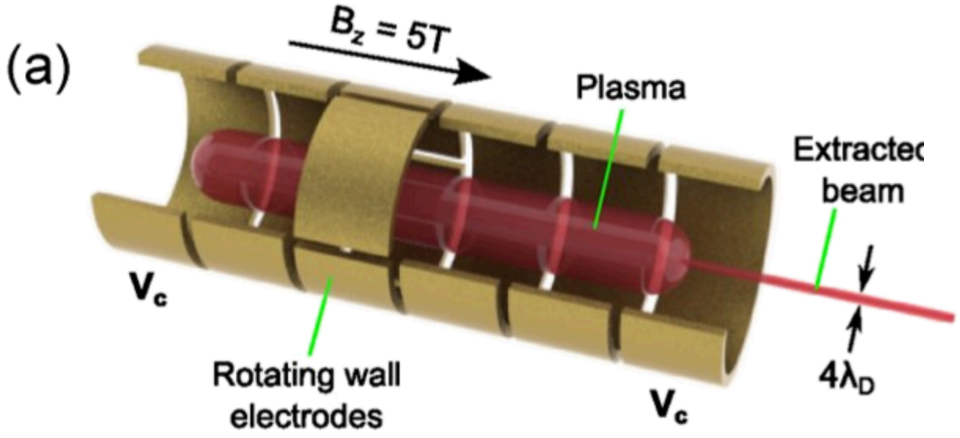


FIG. 8 (color online). Typical layout for a PM trap for RW compression. Phased sine waves applied to azimuthal segments create the rotating electric field. The RW field is applied along only part of the length of the plasma. For the online readers, the color code is the same as in Fig. 7.



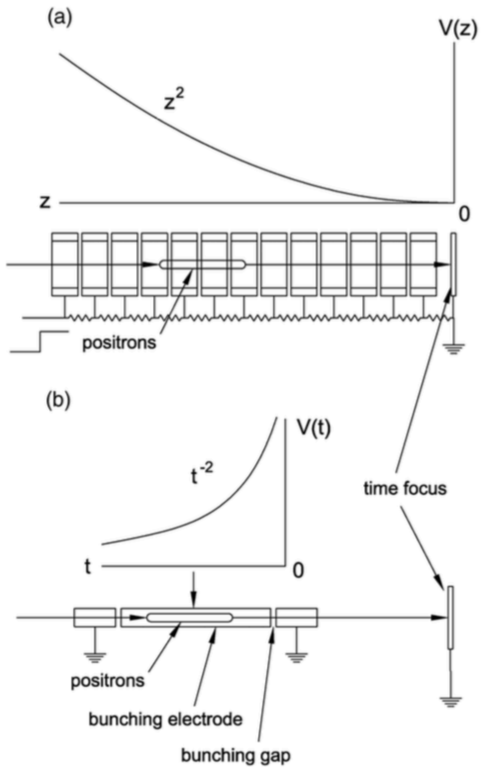


FIG. 32. Arrangement for (a) harmonic potential bunching. The resistor divider chain is configured to produce a harmonic potential within the buncher electrode structure when a high voltage pulse is applied to the left end of the chain. (b) Timed potential bunching: the potential on the buncher is raised according to a $1/t^2$ ($t < 0$), as the positron passes through the buncher gap. In both cases the spatial extent of the positron pulse must be shorter than the respective electrode structure.

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