

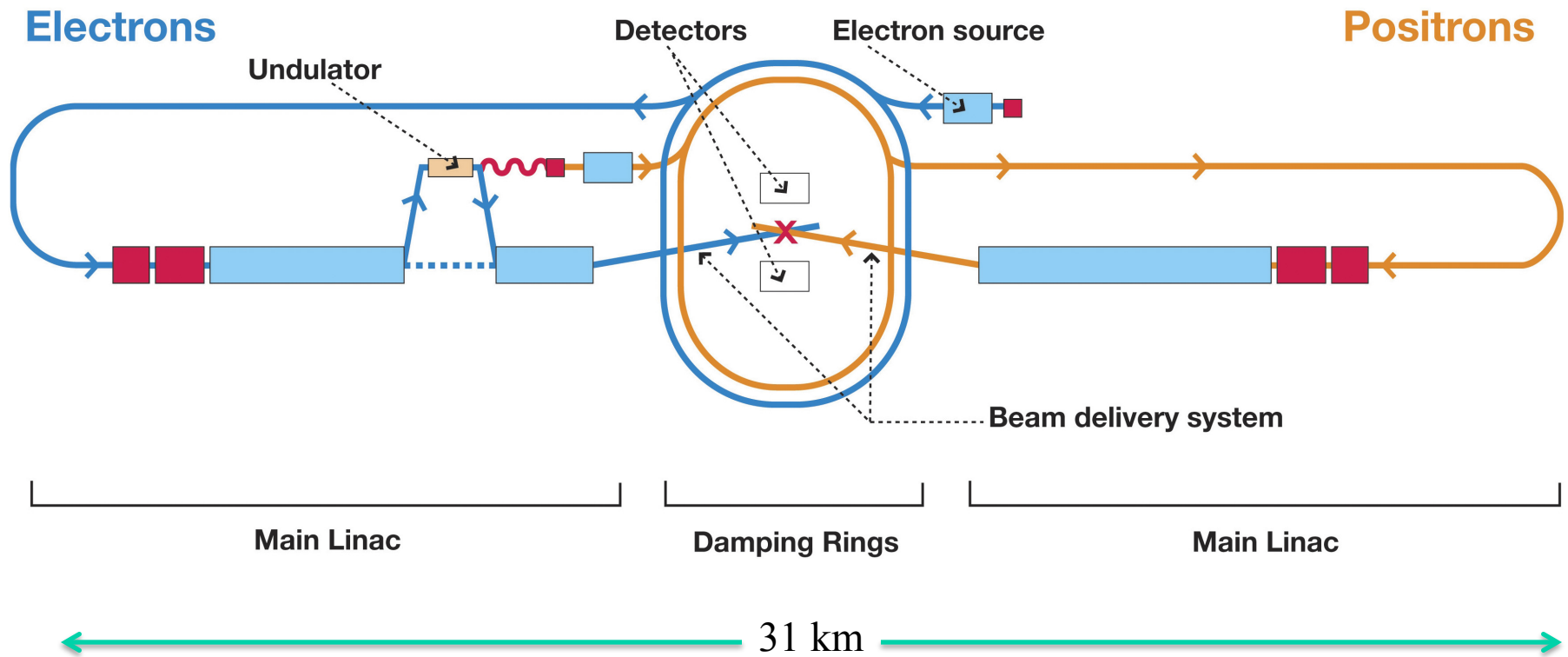


Cesr TA

July 10, 2012

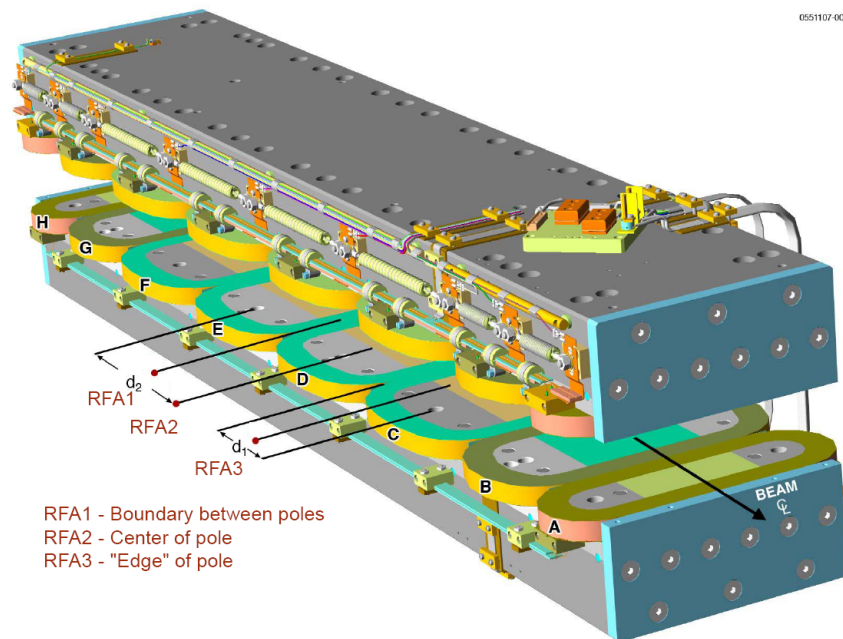


Linear Electron/Positron Collider



To minimize the emittance (temperature) of the beams in CESR

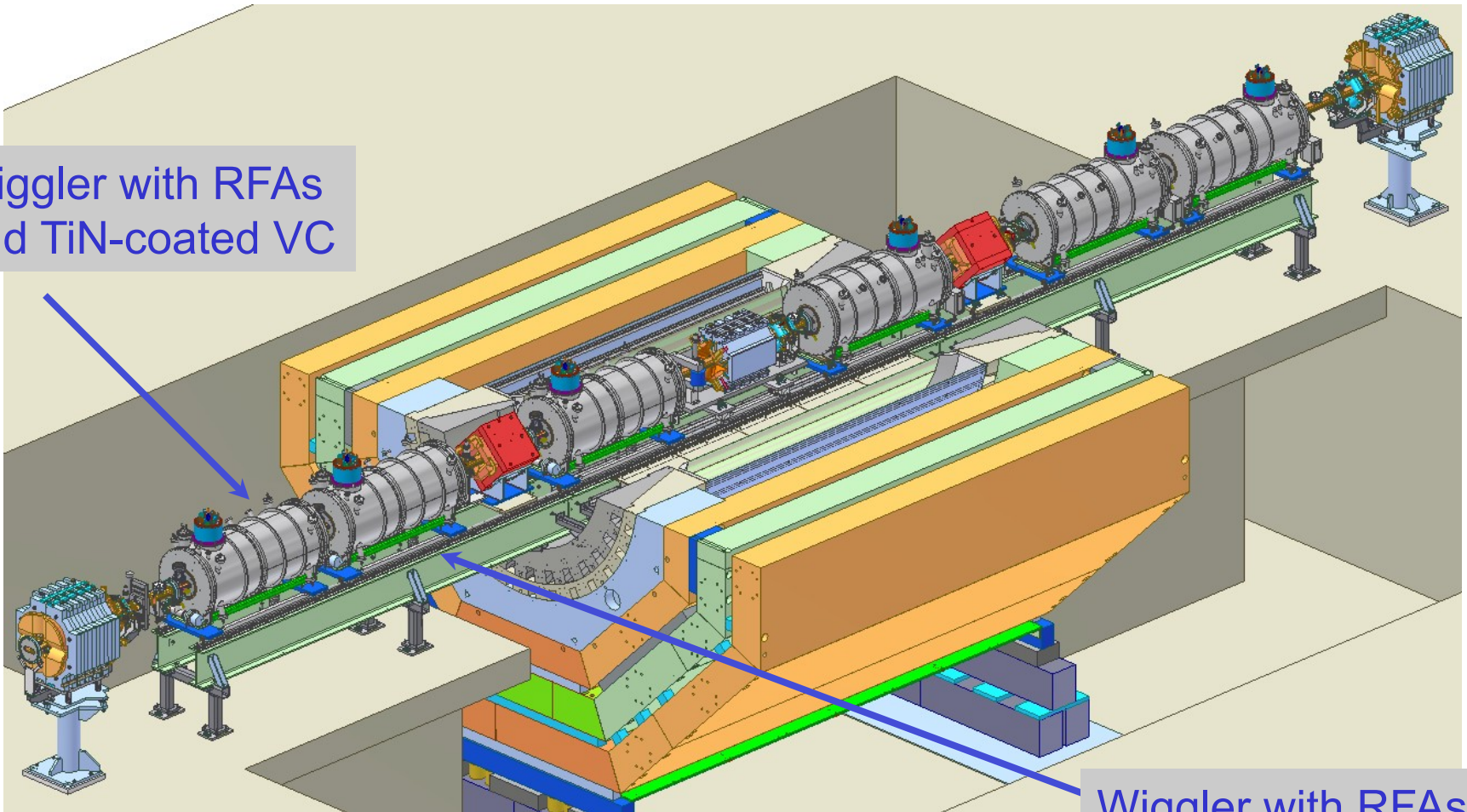
- Operate at 2GeV (vs 5.3)
- Relocate superconducting wigglers to L0 straight to
 - increase radiation damping rate
 - and reduce emittance





Increase damping rate and reduce emittance

Wiggler with RFAs
and TiN-coated VC



Wiggler with RFAs
and uncoated Cu VC

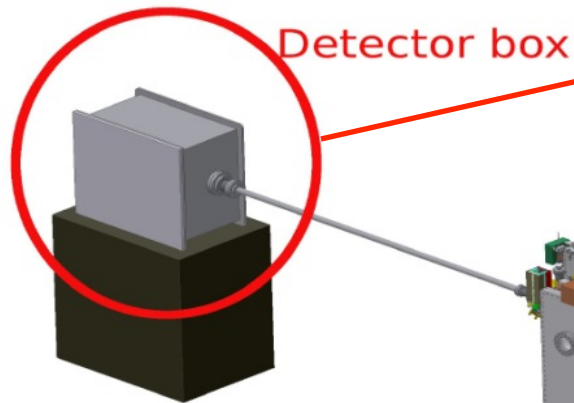


Xray beam size monitor – beam height

Visible light beam size monitor (L3) – beam length and width



Helium or Vacuum



Detector box

DownStream

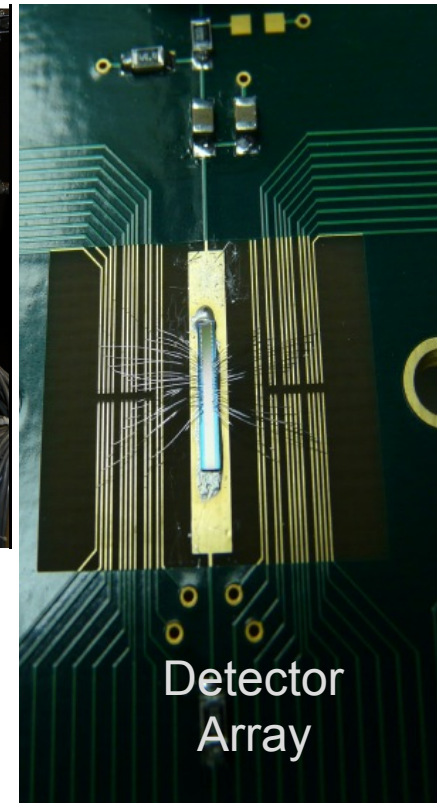
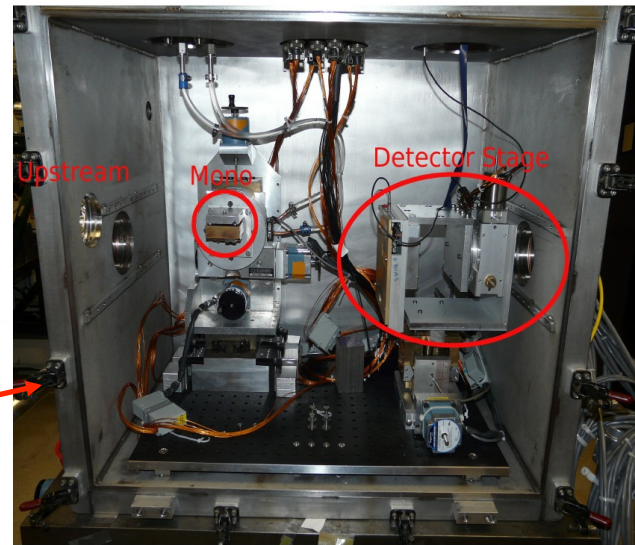
High Vac

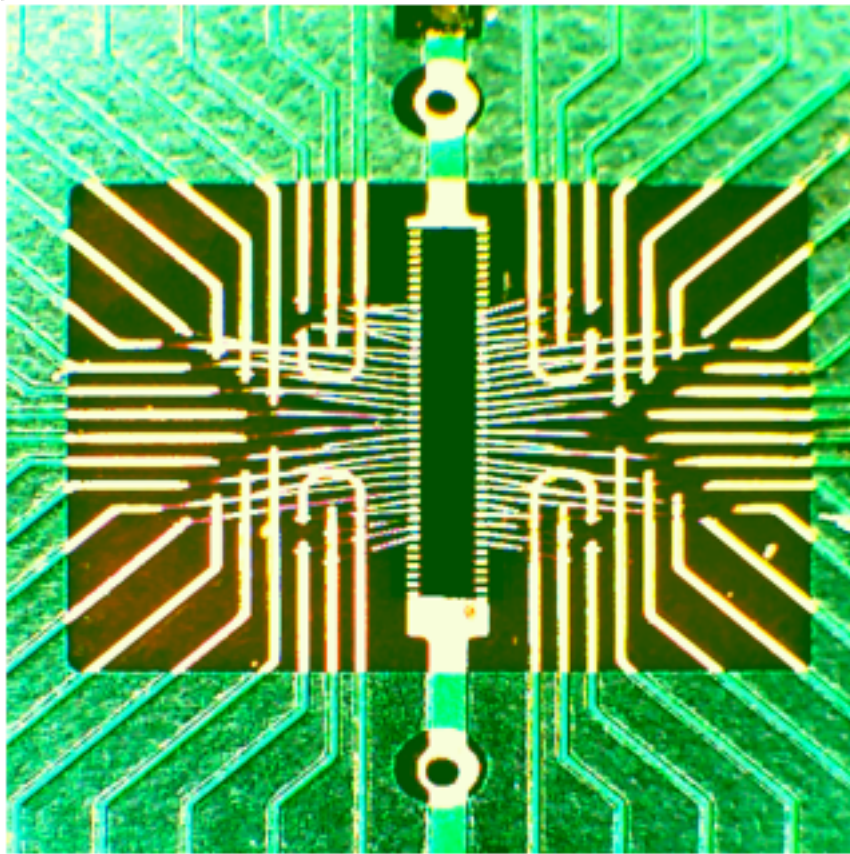
Optics
Box

UHV

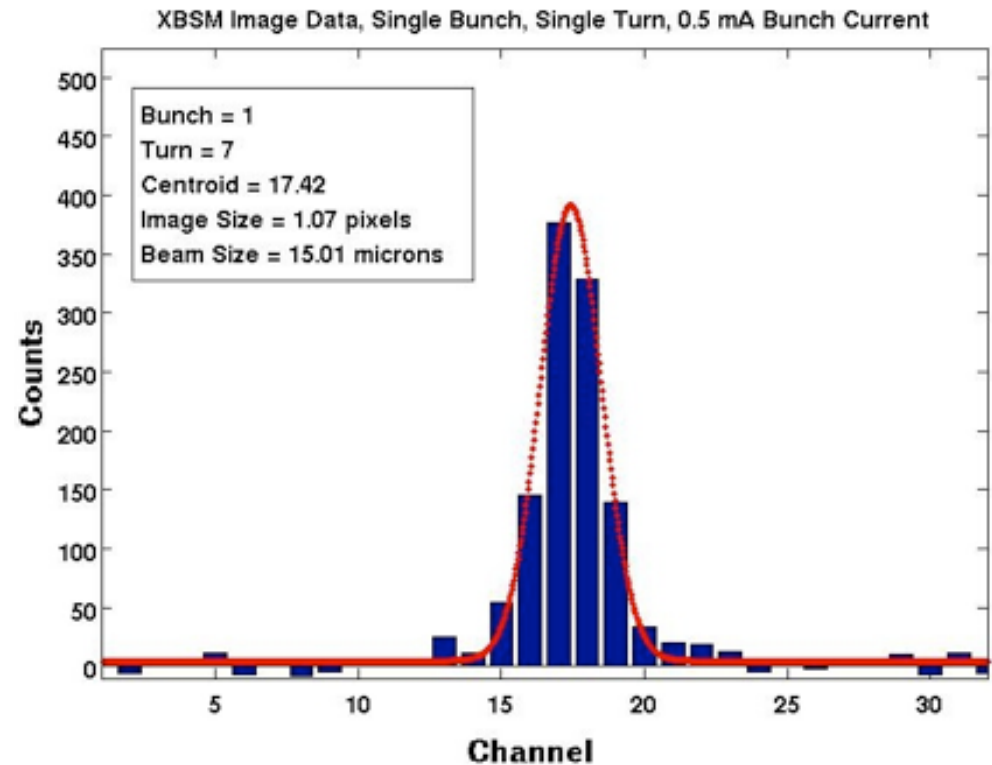
Source

Source to Optics Box = 4.29 m,
Optics box to detector = 10.5m
 $m = 2.45$





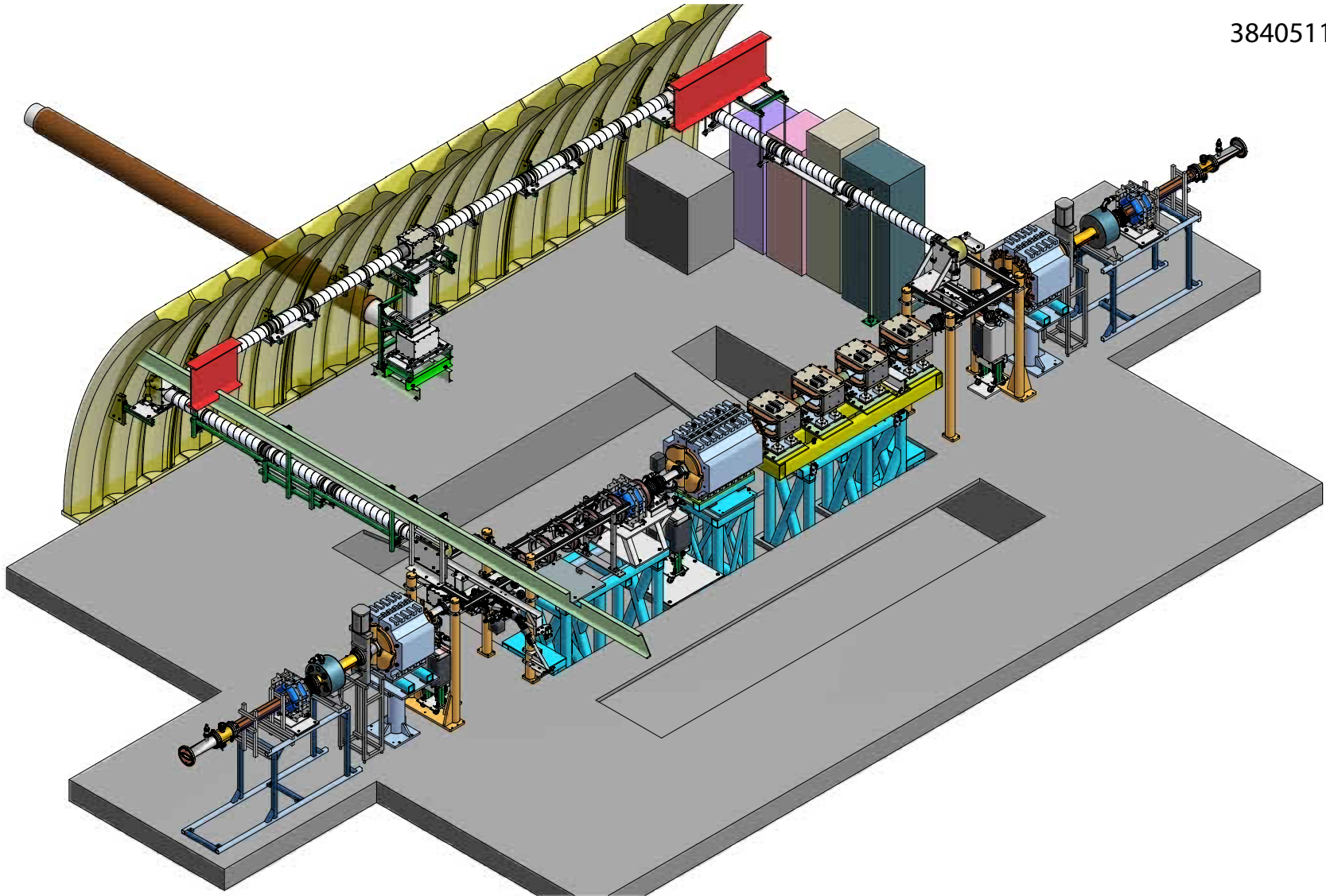
32 channel photodiode array
50µm pitch

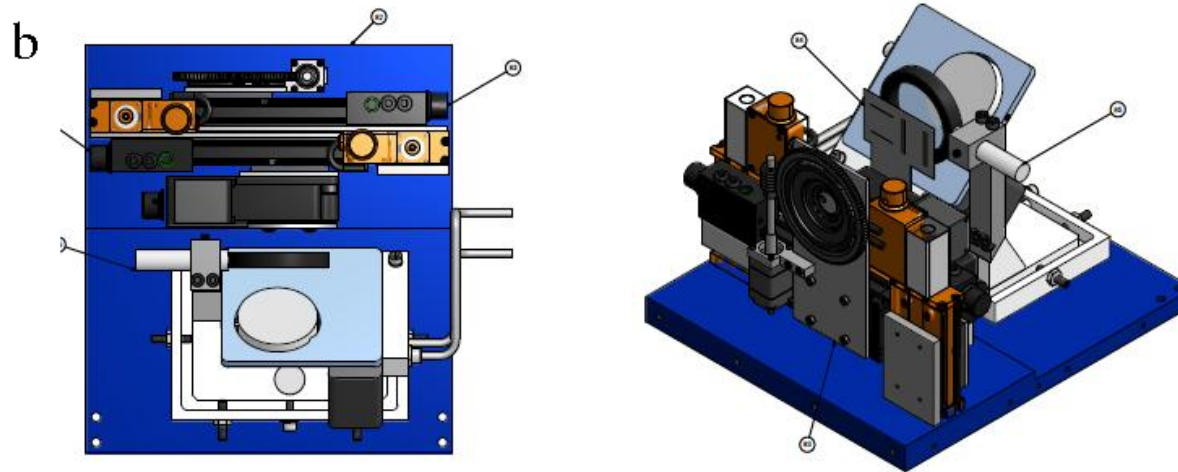
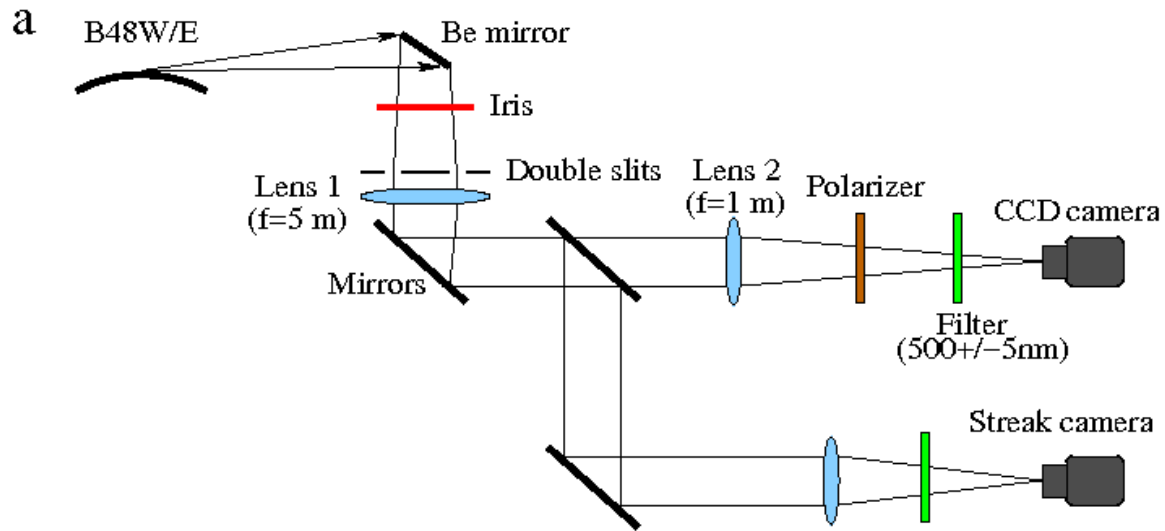


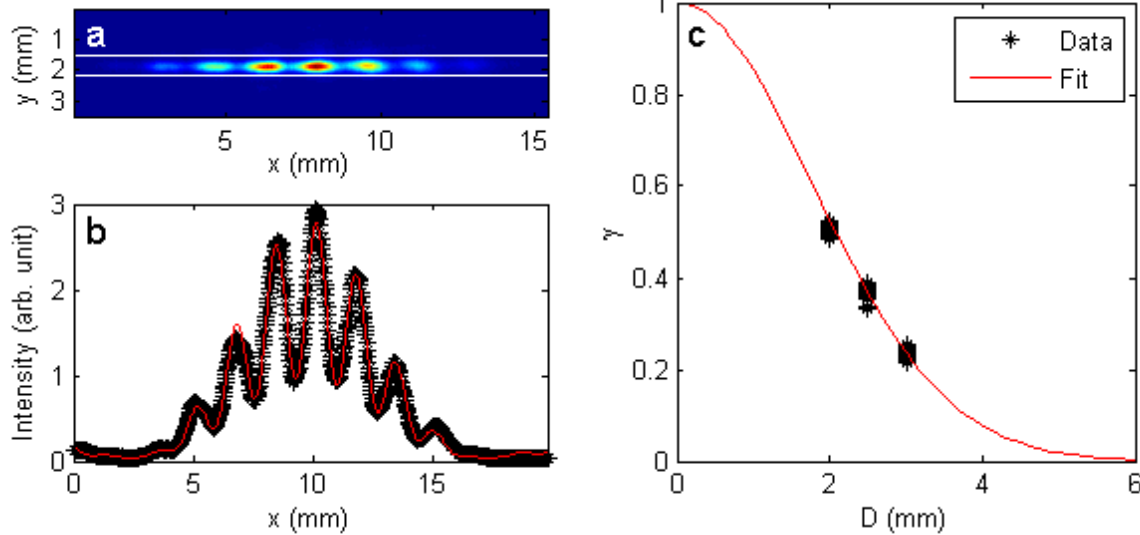
Single pass pin hole image
 $\sigma \sim 20\mu\text{m}$



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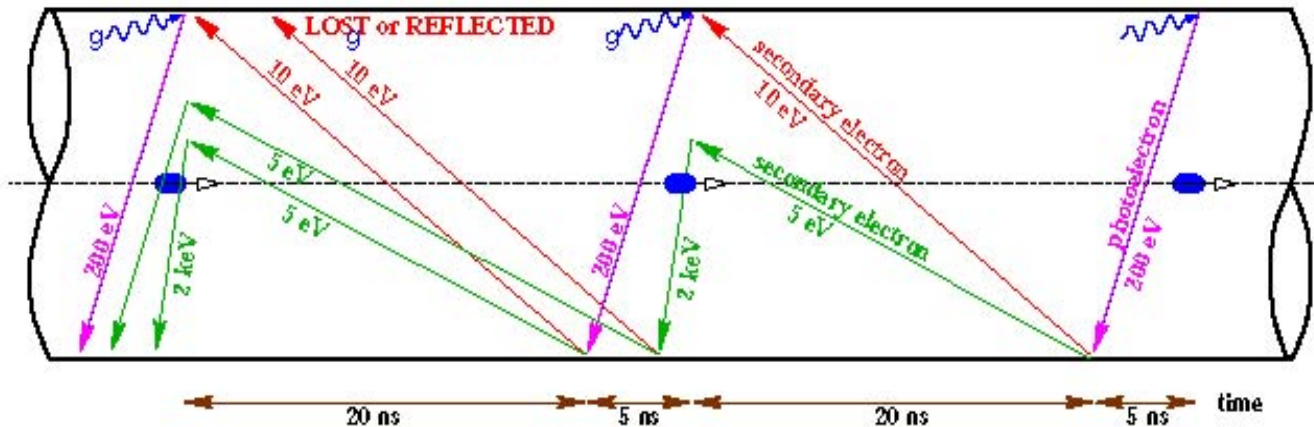




$$\sigma_x = 275 \mu\text{m}$$

What is the electron cloud?

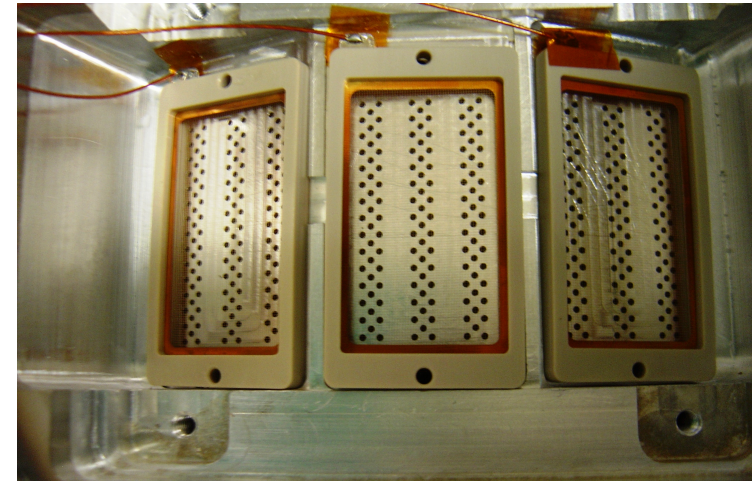
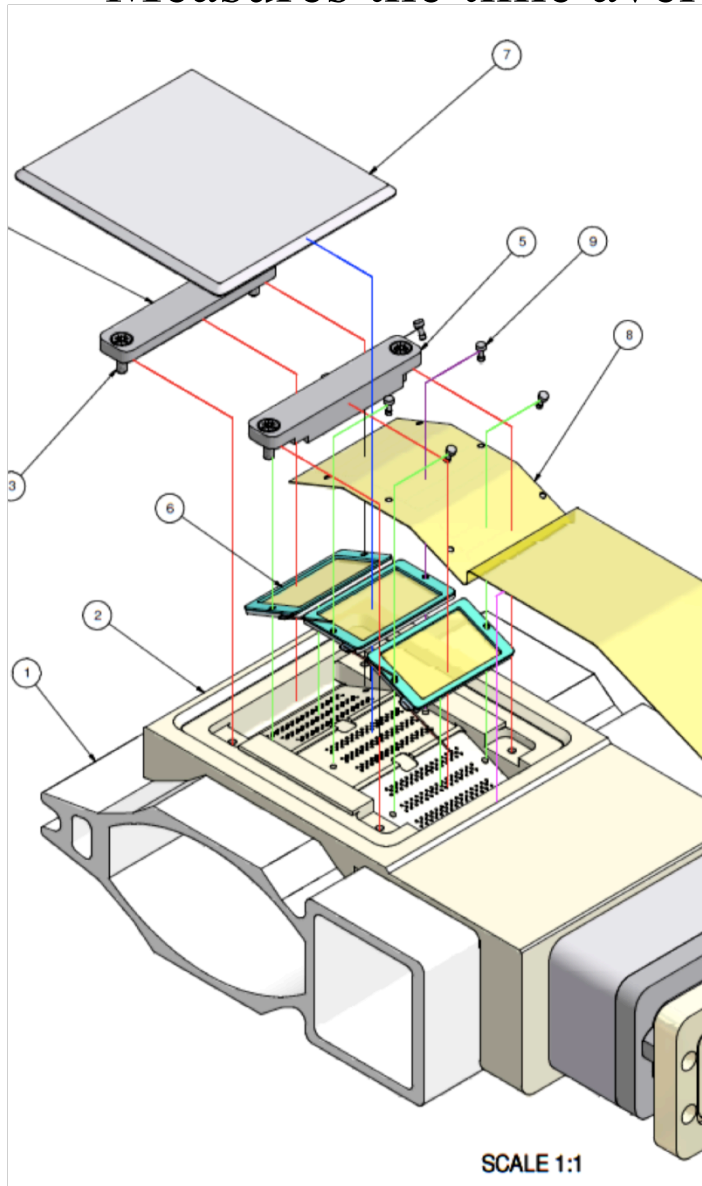
- Synchrotron radiation from the circulating positrons, strikes the walls of the vacuum chamber and photoelectrons are emitted
- Photo electrons traverse the chamber, strike the opposite wall and emit secondary electrons
- Secondary electrons are accelerated by subsequent bunches, hit the wall and emit . . .
- Evolution of the cloud depends on chamber geometry and local magnetic field



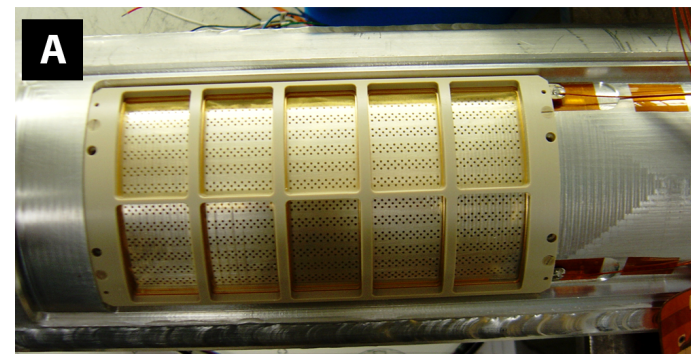
schematic of e- cloud build up in the arc beam pipe,
due to **photoemission and secondary emission**

[Courtesy F. Ruggiero]

Measures the time average cloud density and energy spectrum



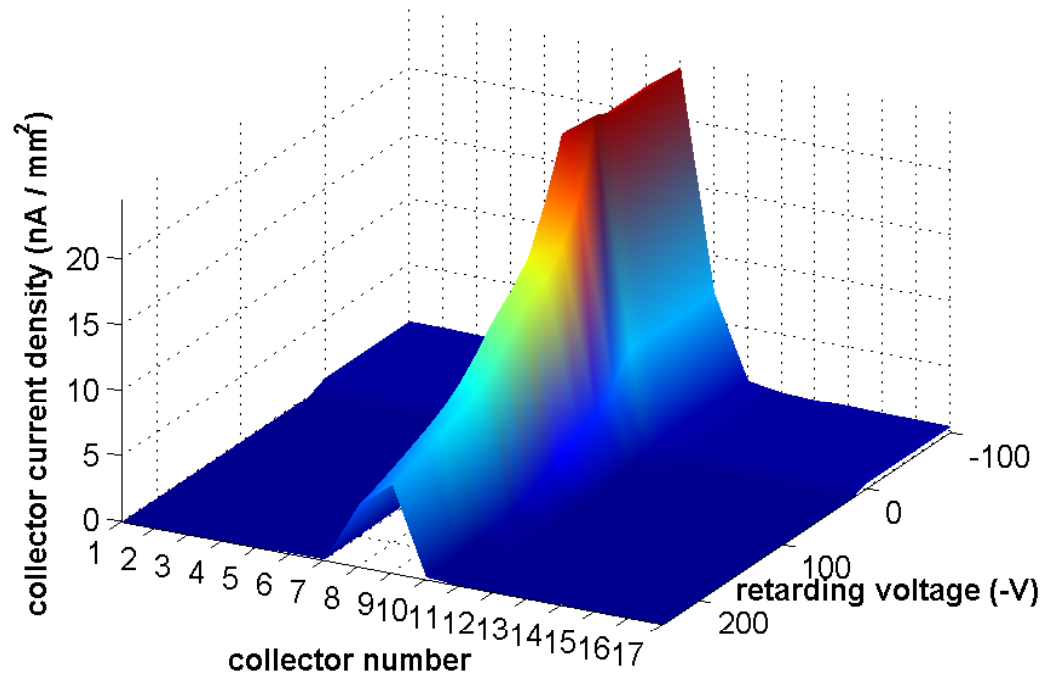
View of from outside vacuum chamber of dipole style RFA with 9 independent collectors. The fine mesh wire grid is in place (but transparent)



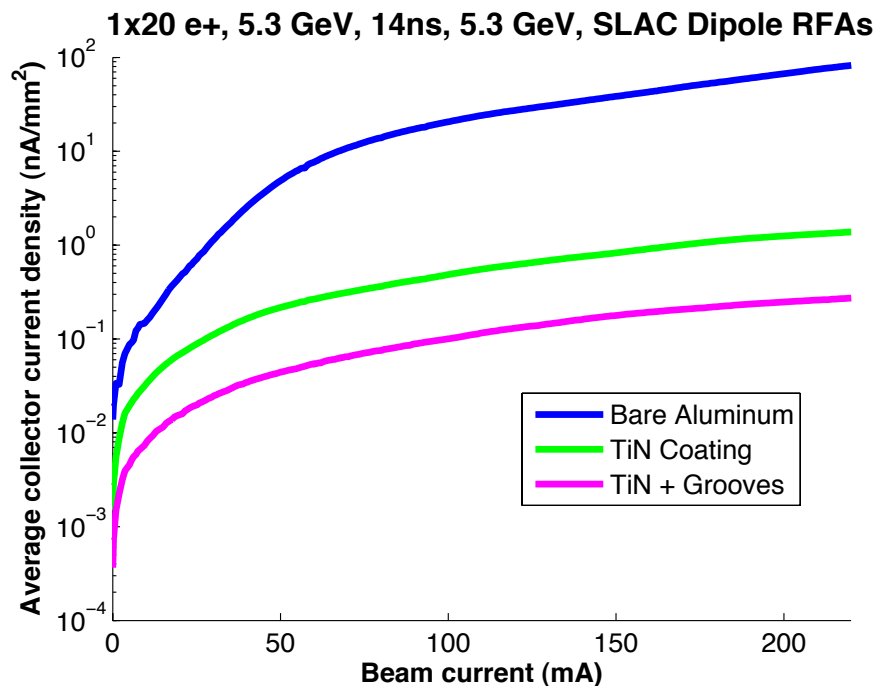
Quadrupole RFA

Dipole RFA data with characteristic central peak

Run #2983 (1x45x1.25mA e+, 5.3 GeV, 14ns): SLAC4 (Al) Col Curs

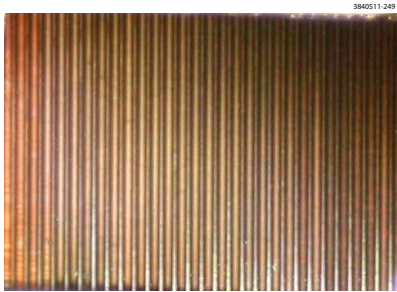
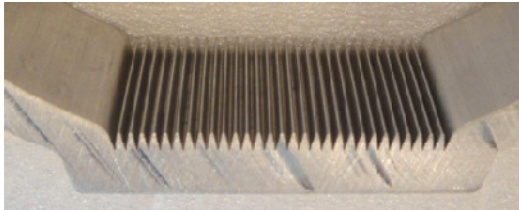
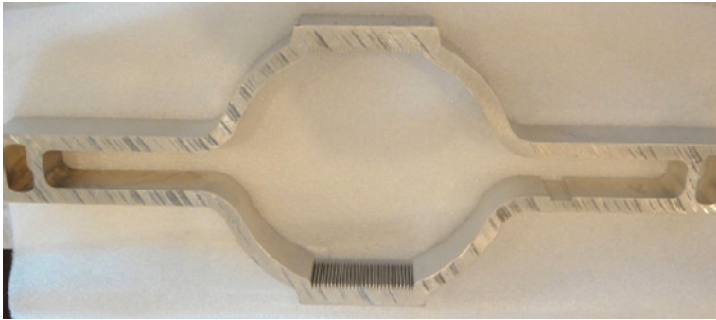


Aluminum chamber
45 bunches, 1.25mA/bunch
14ns spacing, 5.3GeV



Mitigation in a dipole field

Dipole chamber with
antechamber and grooves



Cu



TiN



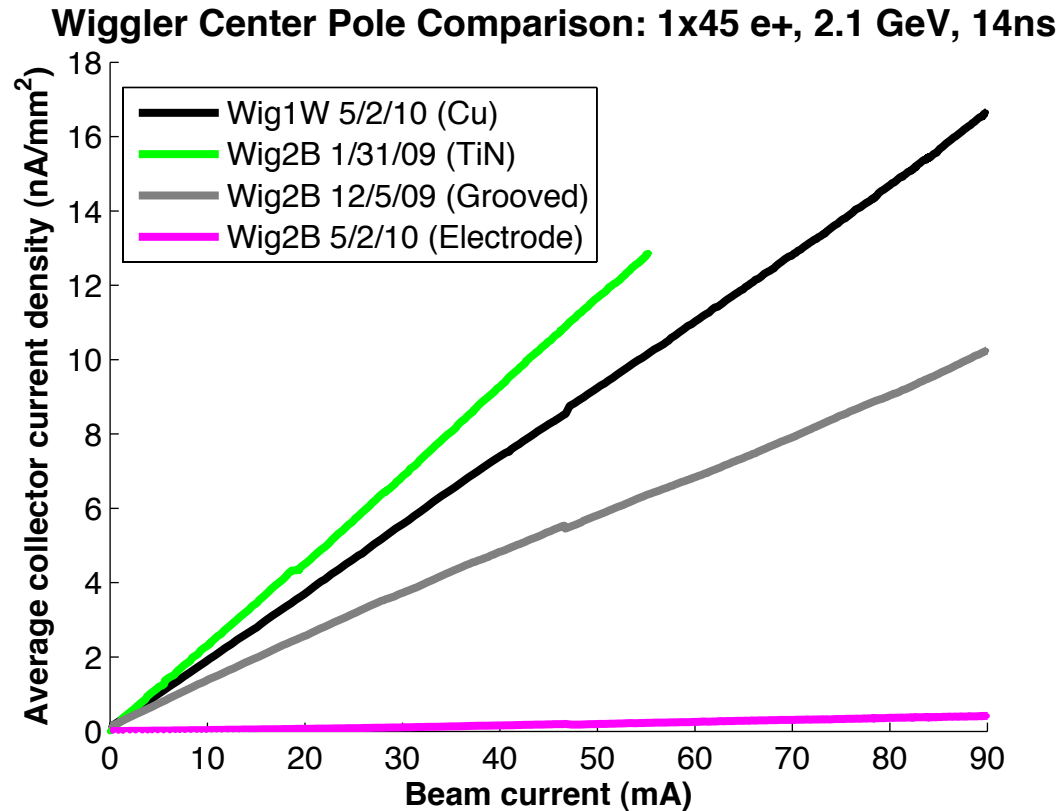
Wiggler chamber with clearing electrode

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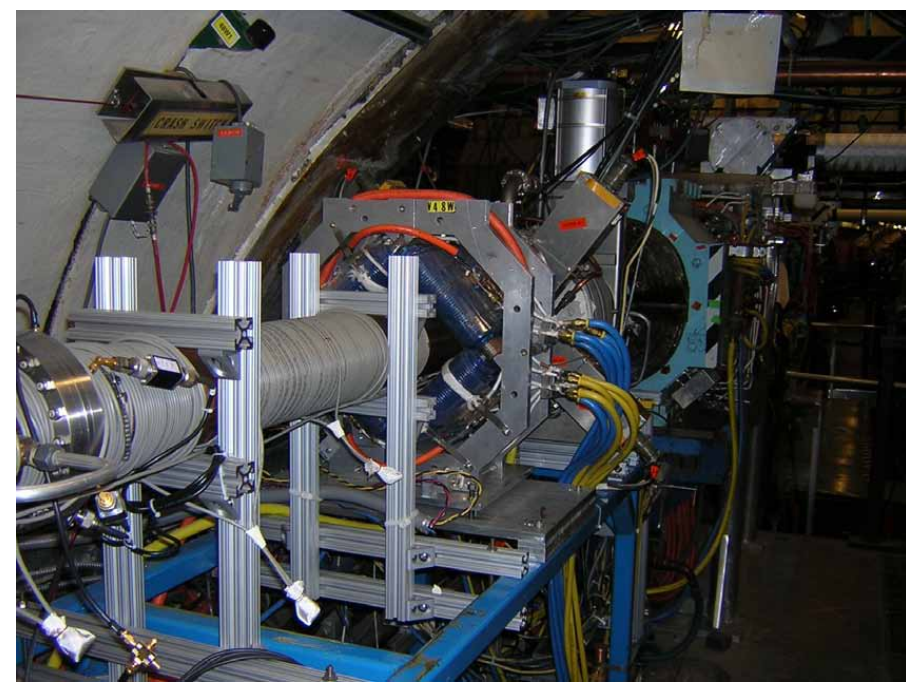
RFAs located at B-field max, min, and mid

Electron cloud mitigations in damping wiggler

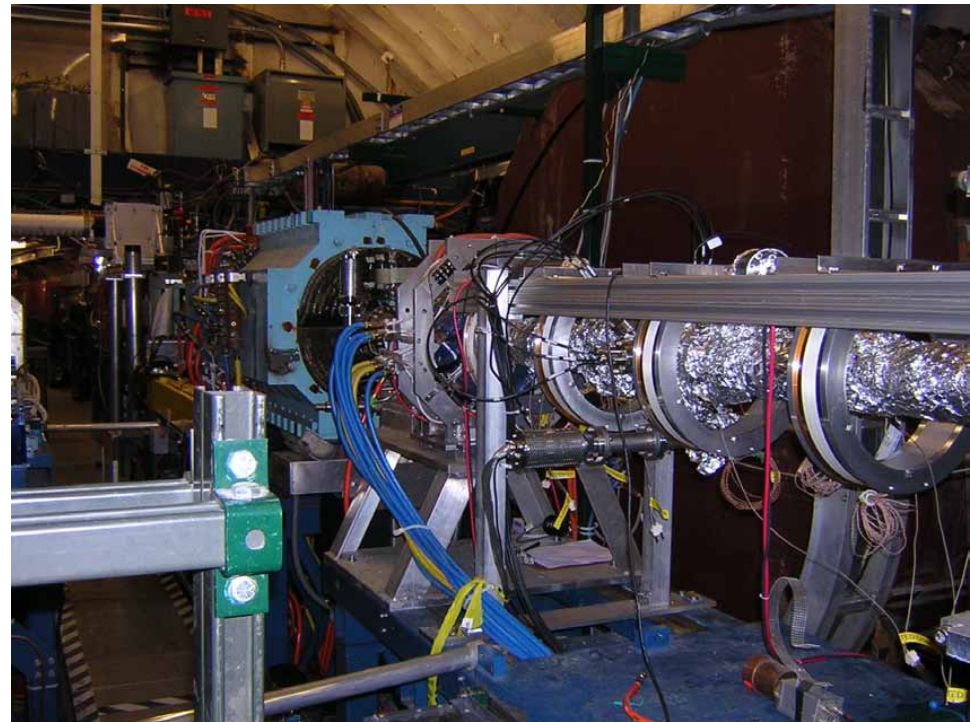




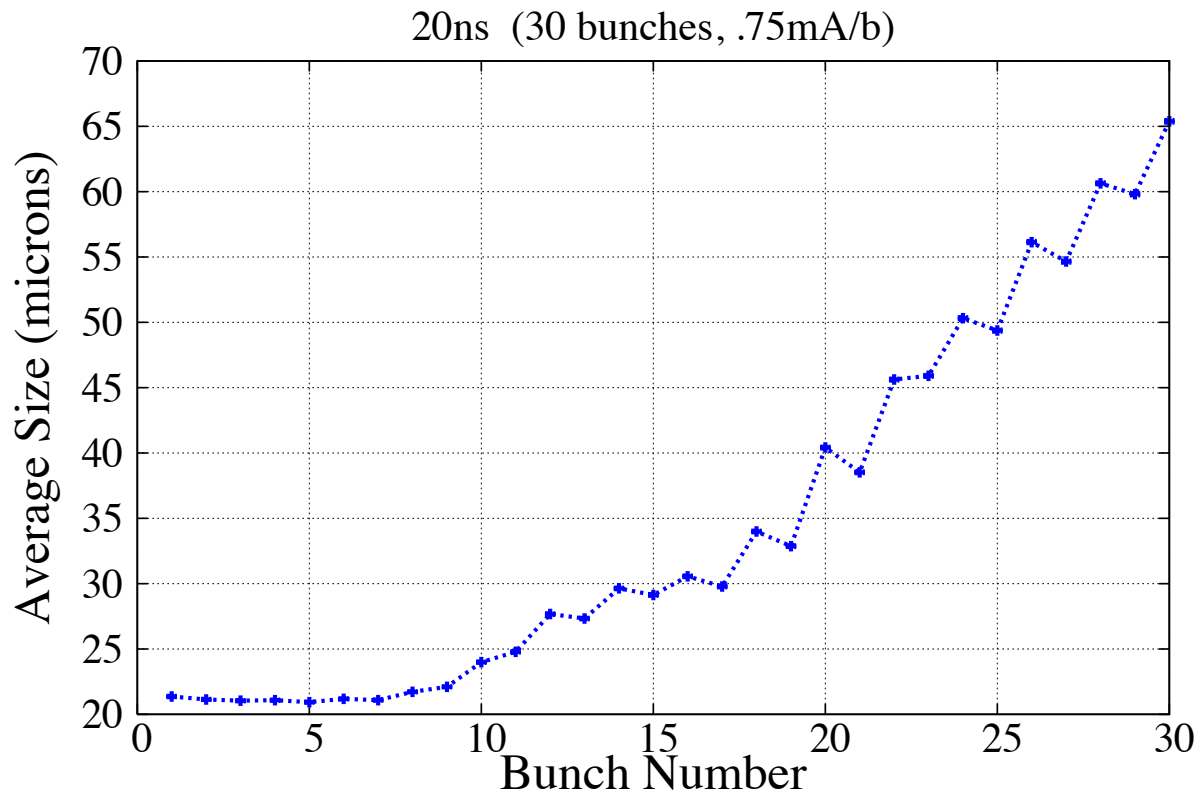
Solenoids suppress ecloud



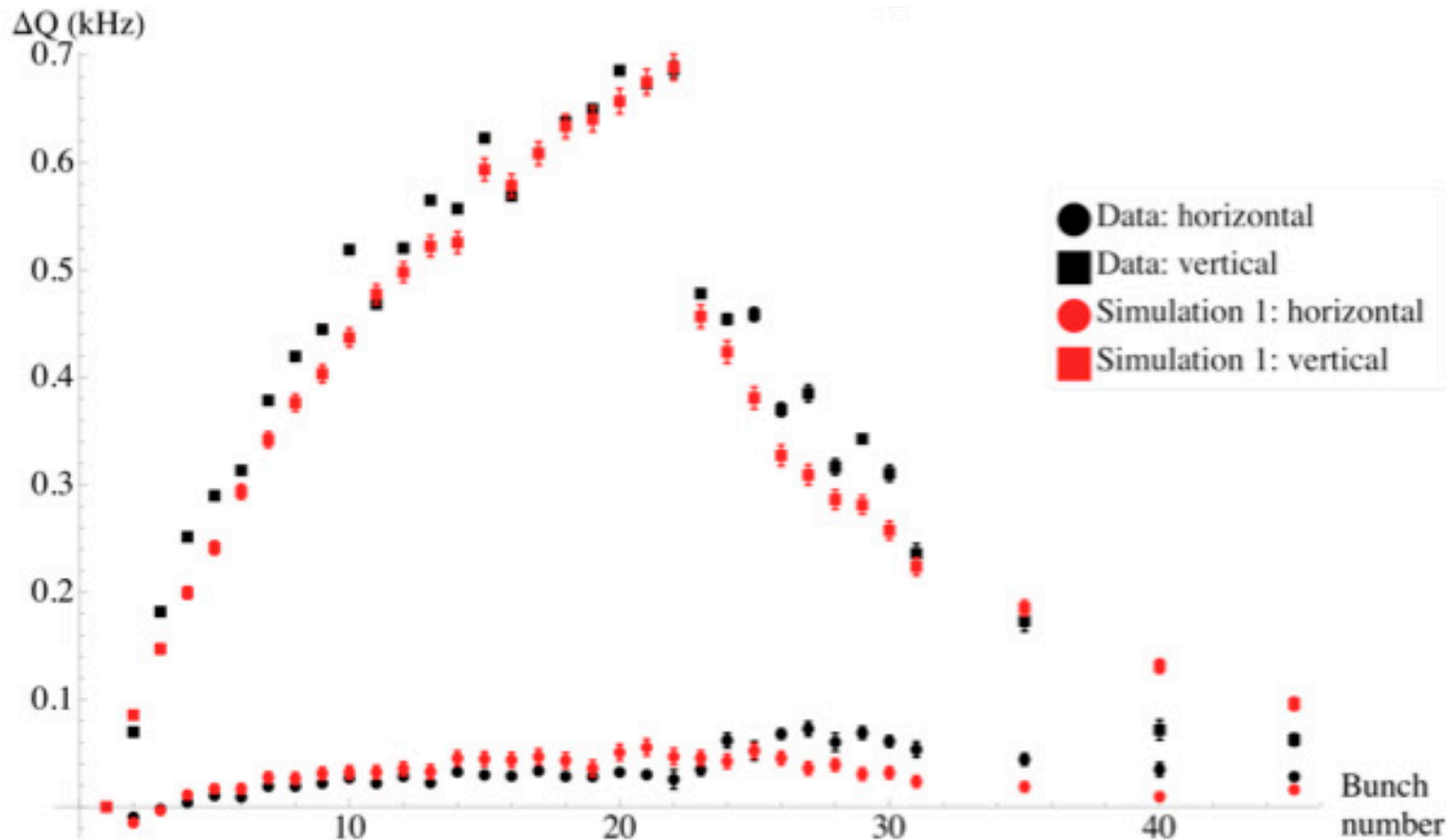
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Bunch by bunch and turn by turn vertical emittance is measured with xray beam size monitor



Emittance dilution begins in bunch 10



Vertical and horizontal tune shift vs bunch number
 22 bunches/train - 14ns spacing
 $\Delta Q \sim$ cloud density



- Install time resolving RFAs in L3 chicane grooved chamber
- Replace Q15W a-Carbon coated chamber with TiN chamber
- Replace Q15E diamond-like carbon coated chamber with bare aluminum
- All vacuum D-line for xray beam size monitor
- Upgrade visible light monitor with fast readout



END