

Beam Simulations with ASTRA

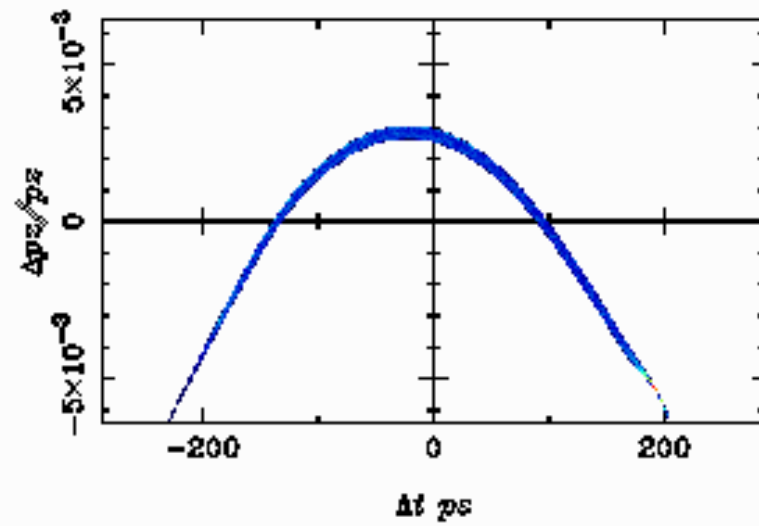
Made in May 2015

Gun Parameter Scan

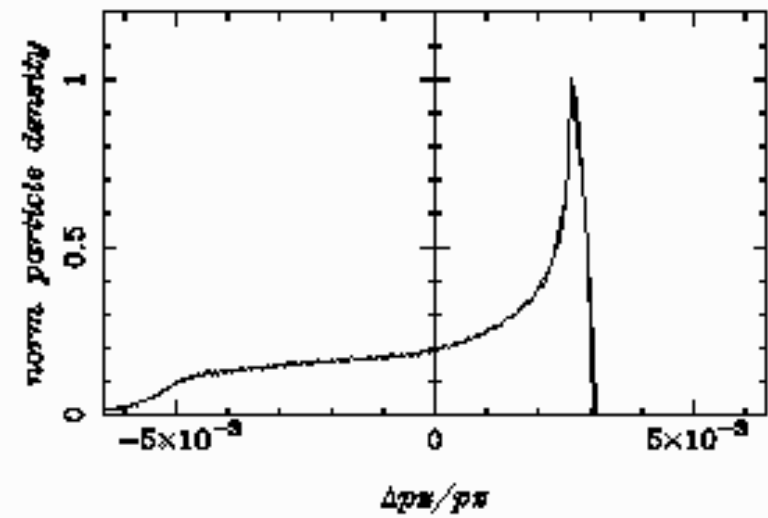
- Initial beam size ($B_{sol} = 0.06$, $Q=2$ nC, beer can beam with 400 ps duration, 0° injection) for minimal emittance at 1.5 m – radius 1.5 mm gives minimal emittance of 2.4 mm mrad
- Cavity phase scan – no losses from -60° to 70°
- There was small cavity phase scan for emittance growth due energy modulation ($B_{sol}=0.063$ T) – minimal emittance at 1.5° , at -8° emittance 4.8 mm mrad

$z = 1.500 \text{ m}$

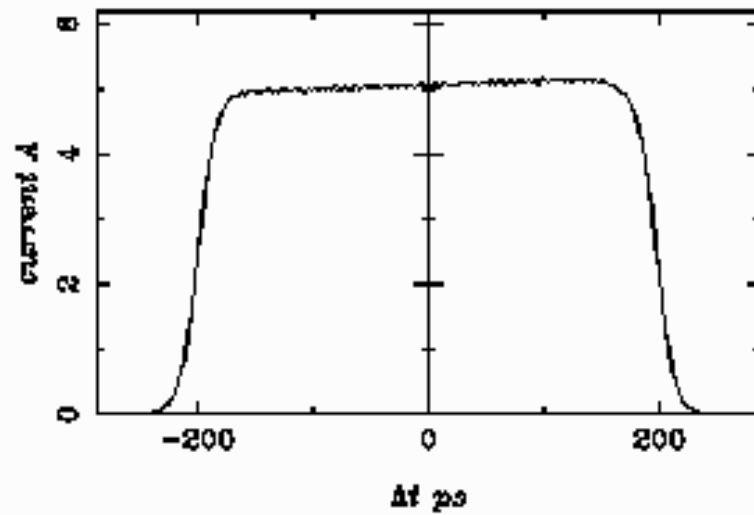
Longitudinal Phase-Space



Momentum Spread



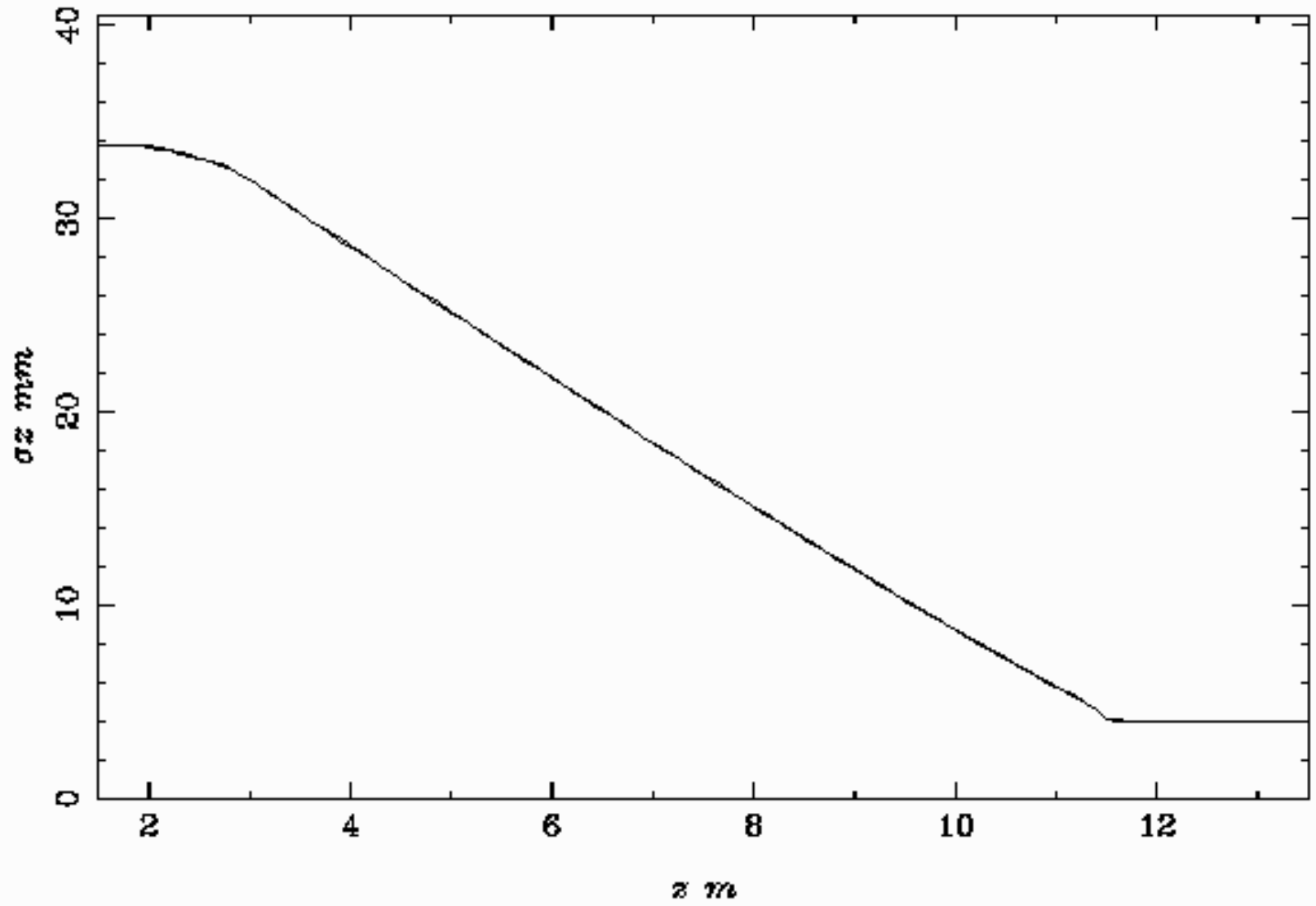
Longitudinal Distribution



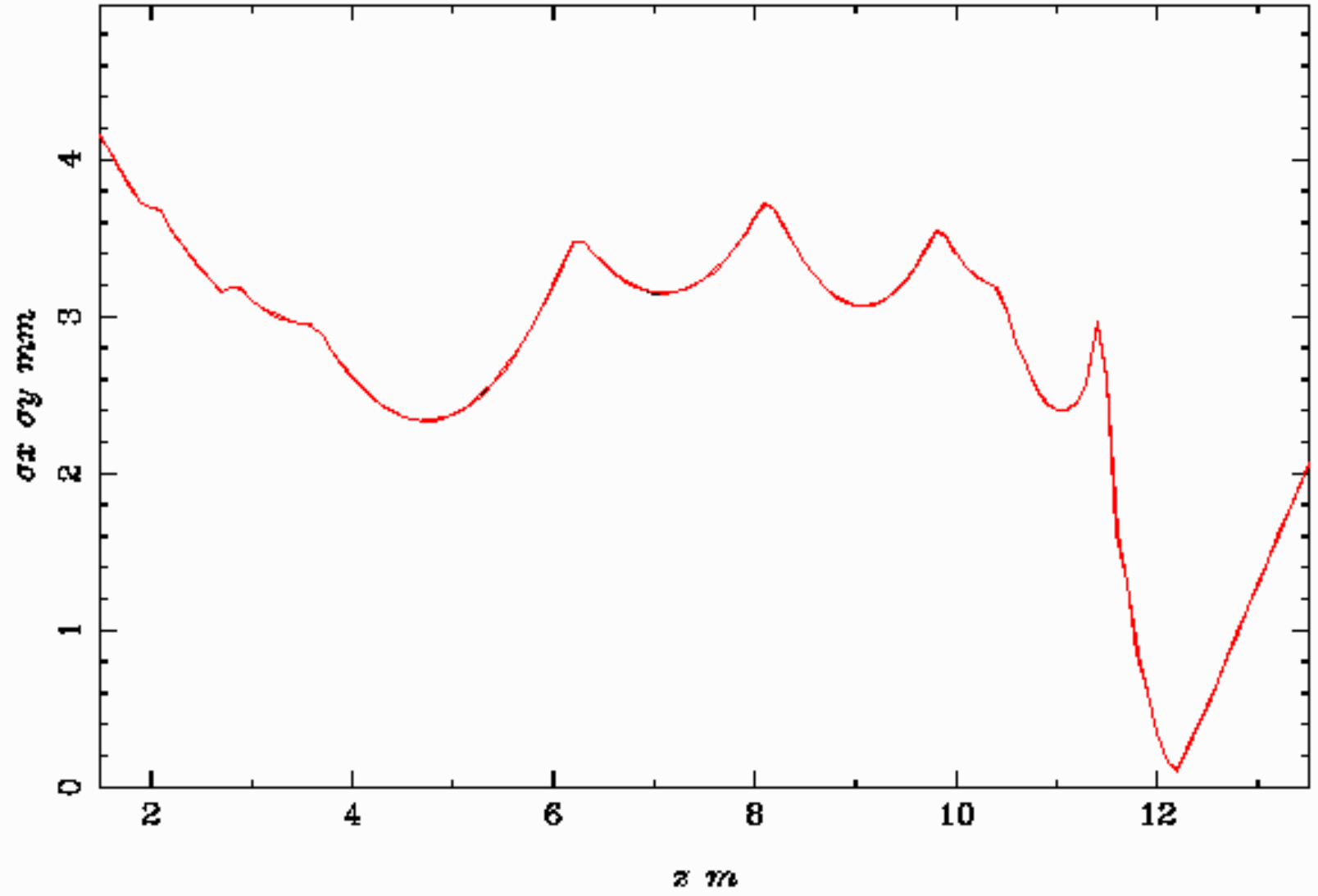
Compression study

- Used beam from 1.5 m position generated during previous studies ($E=22.5$ MV/m, $\beta=0.98$, $B_{sol}=0.06$ T, beam radius 1.5 mm, 2 nC, 400 ps duration)
- Scanned solenoids for minimal emittance after linac at 13.5 m
- Adjusted linac phase and bunching cavity voltages to obtain proper peak current

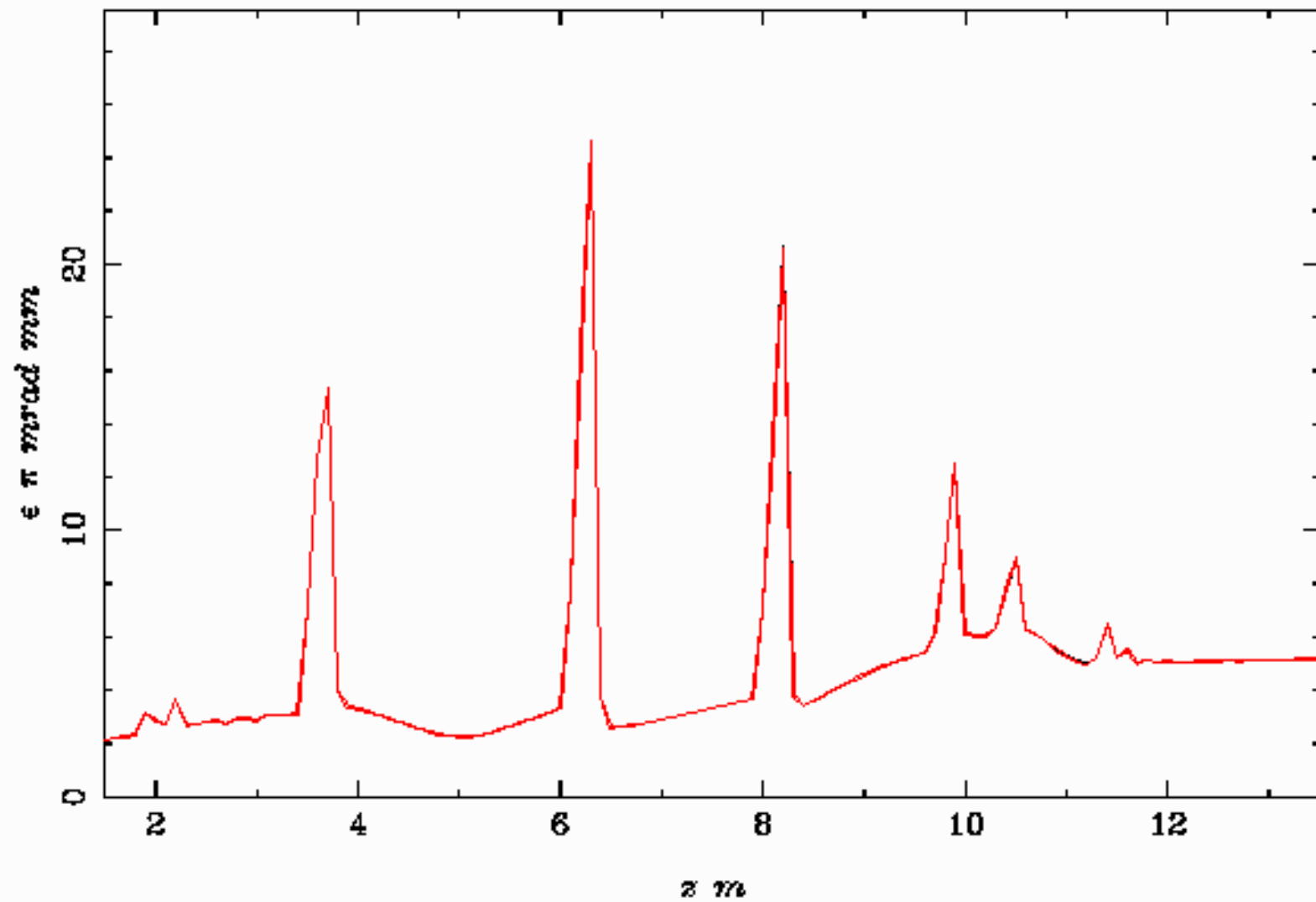
Bunch Length



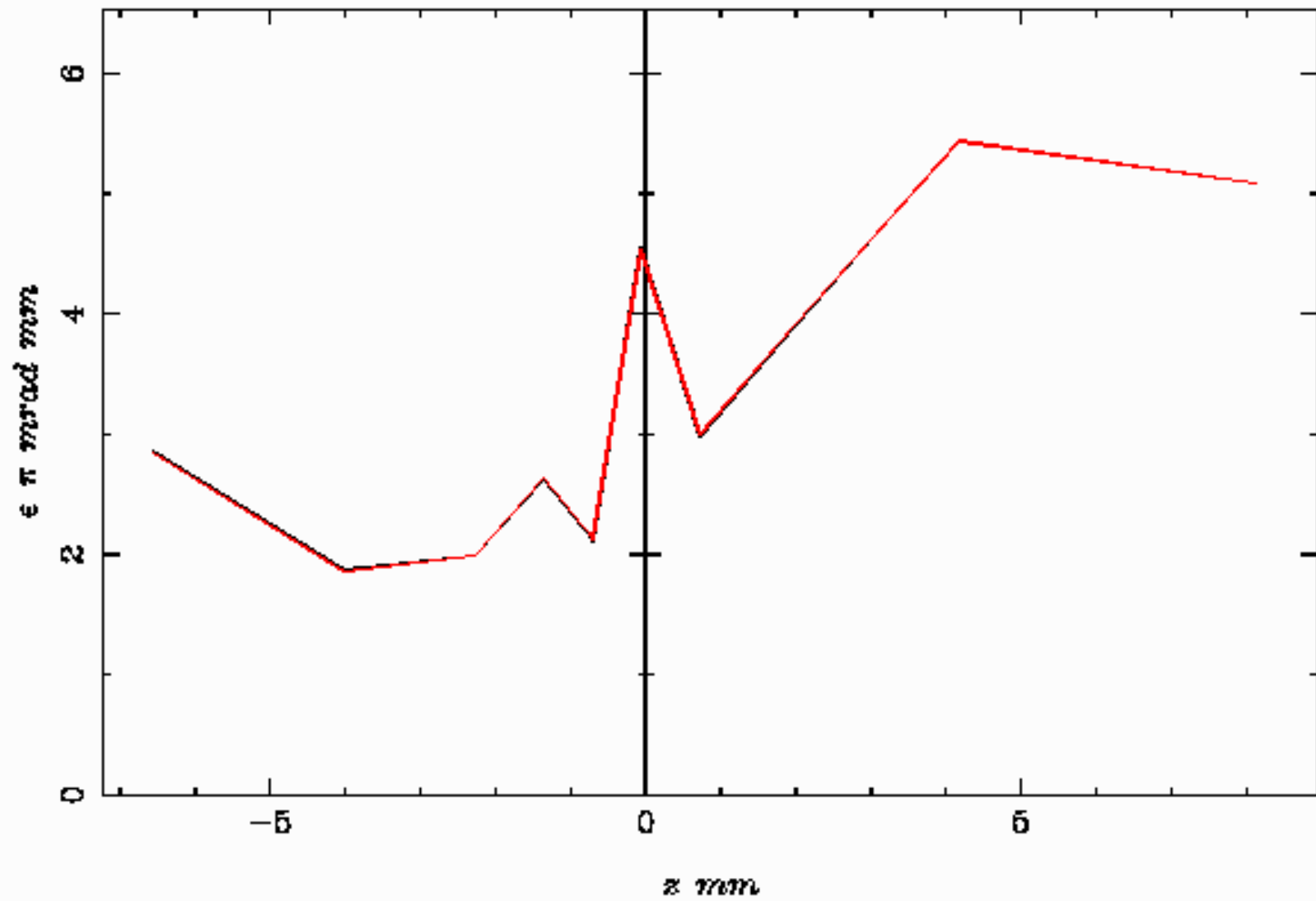
Beam Size



Transverse Emittance

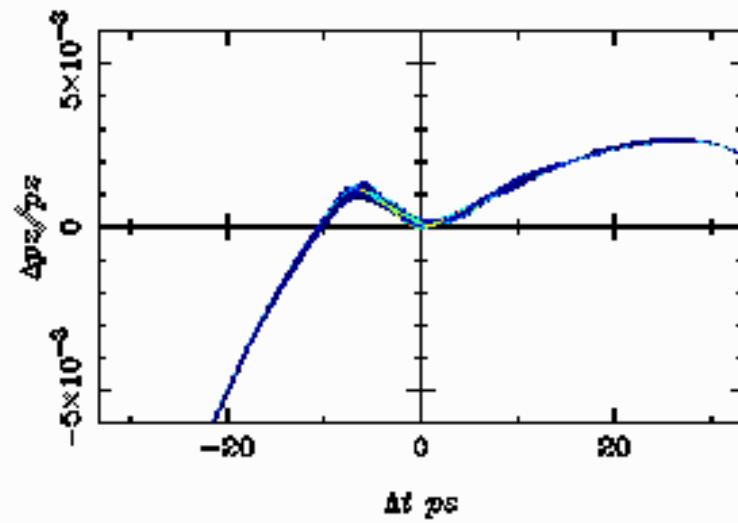


Slice Emittance

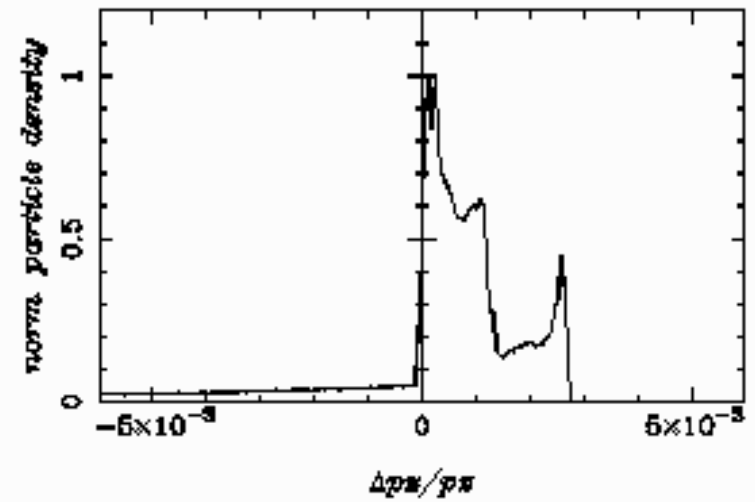


$z = 13.50 \text{ m}$

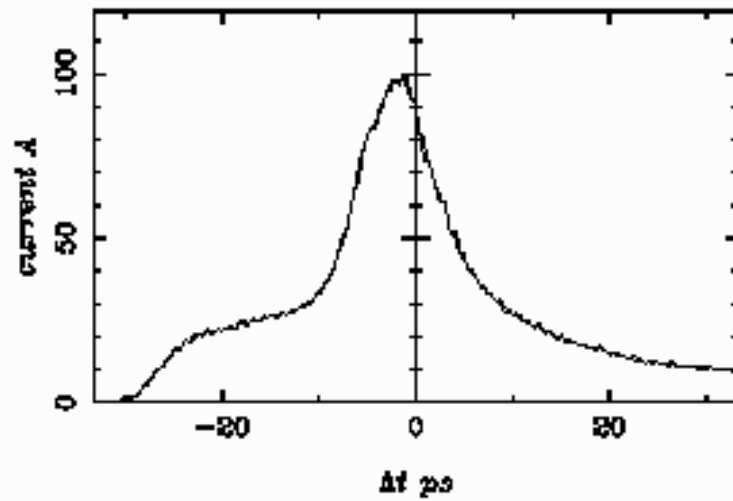
Longitudinal Phase-Space



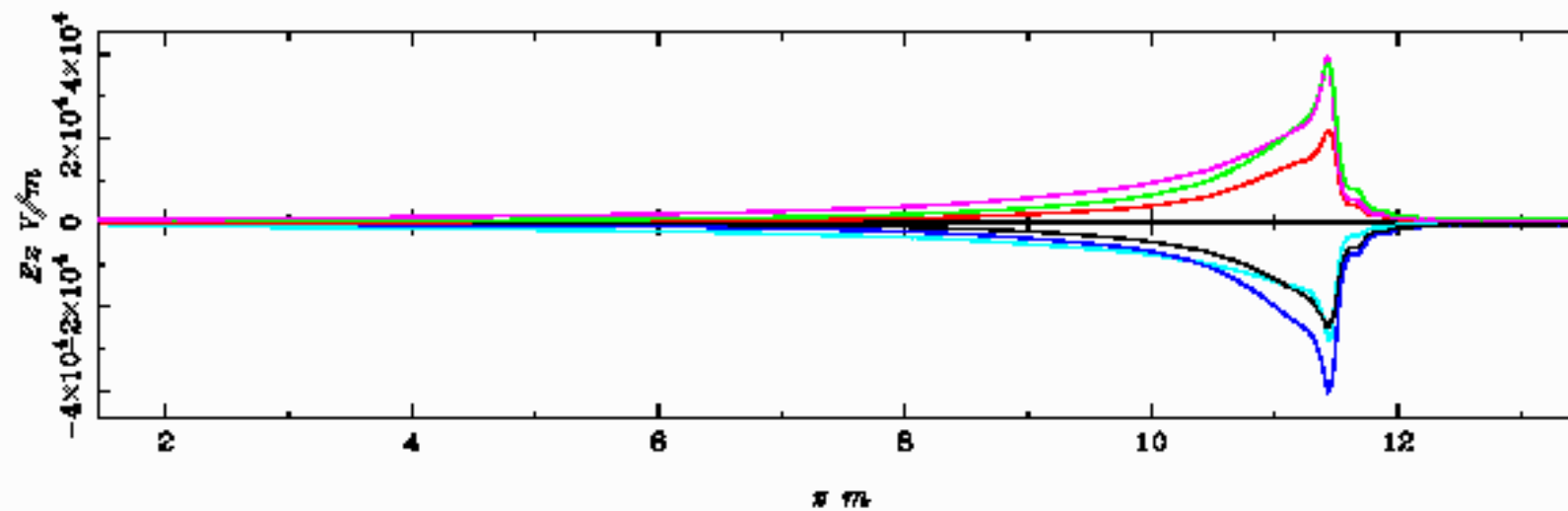
Momentum Spread



Longitudinal Distribution



longitudinal space charge field acting on Probe Particles



radial space charge field acting on Probe Particles

