Beam steering capability for target position uncertainty

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Steering in Heavy Ion Drivers

3 kinds of steering in drivers:

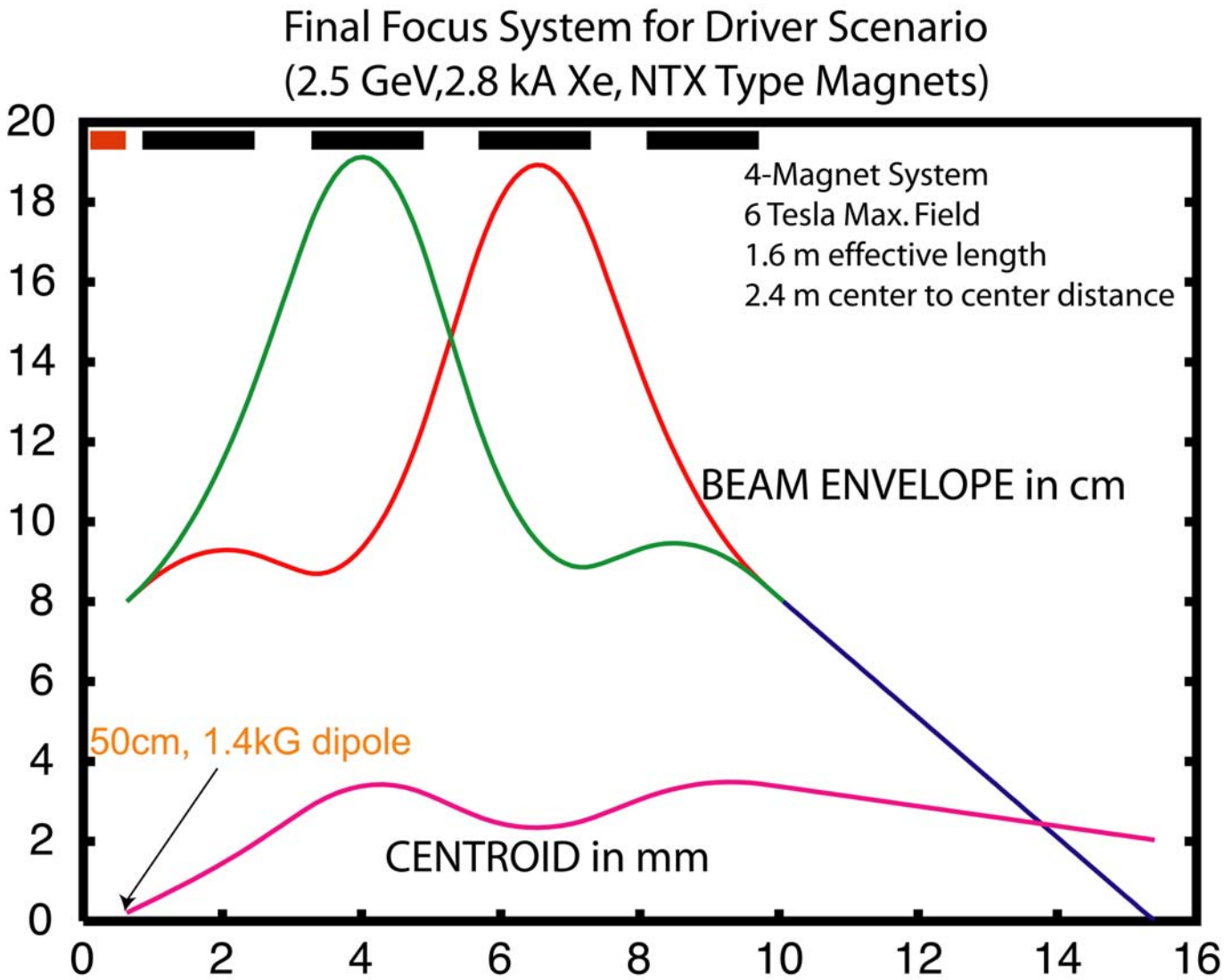
1. Slow (or DC)-dipoles - centroid correction
   (shot-to-shot reproducible errors)
2. Fast Correctors (μs to tens of ns)
   - head to tail variations
   (shot-to-shot reproducible errors)
3. Pulsed correctors (~ms)
   (shot-to-shot variable errors)

Steering Capability for Target Position Uncertainty belongs to the 3rd class.

Requirements:

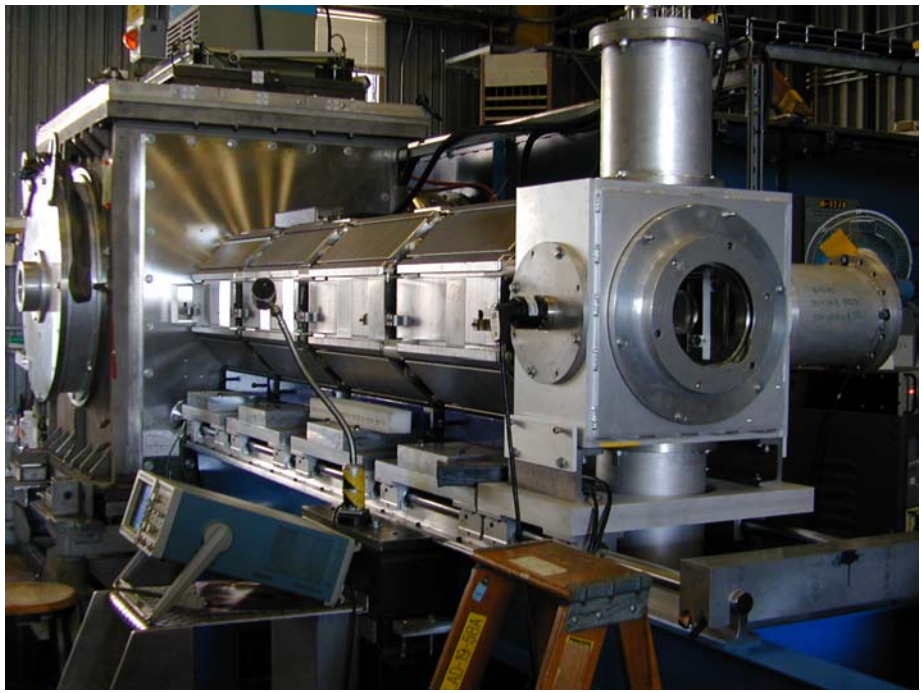
- Respond in 25ms (target injection at 200m/s)
- Correction of a few mm (< ± 2mm)

Sample dipole corrector layout for final focus

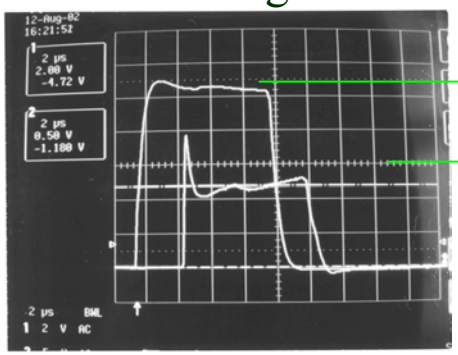


First Beam through NTX Magnetic Transport (August 2002)

NTX with source tank,
4 pulsed quadrupoles,
and diagnostic tank
In Bldg. 58, LBNL



Current at magnet exit

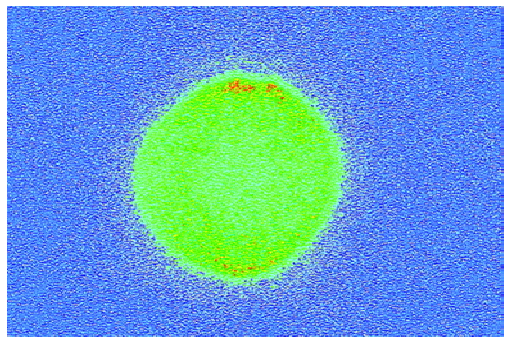


voltage

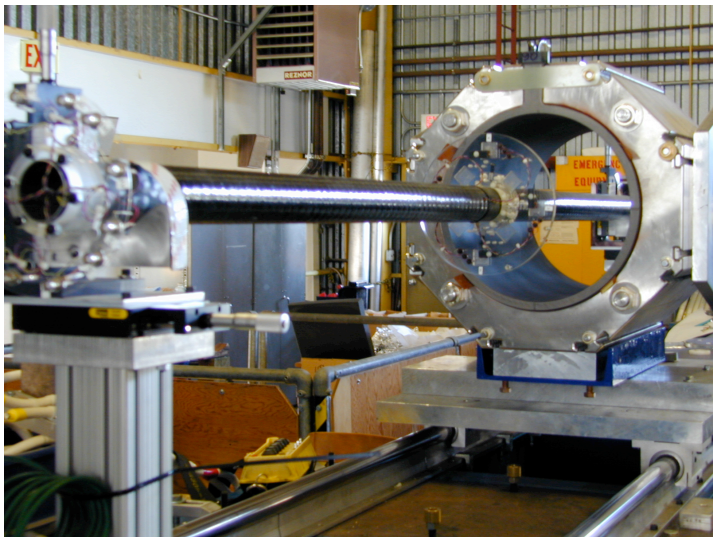
current

Profile at magnet exit

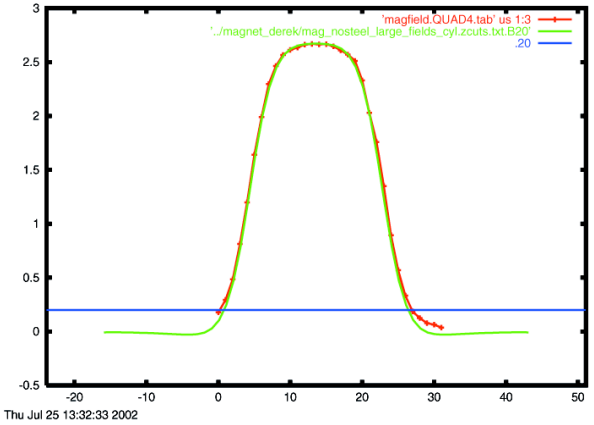
5cm



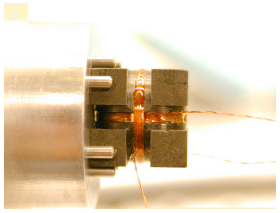
Test Stand for Measurement of Transient Magnetic Field

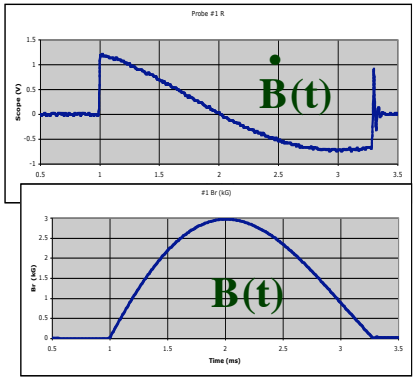


Axial profile (measurement vs. ANSYS)

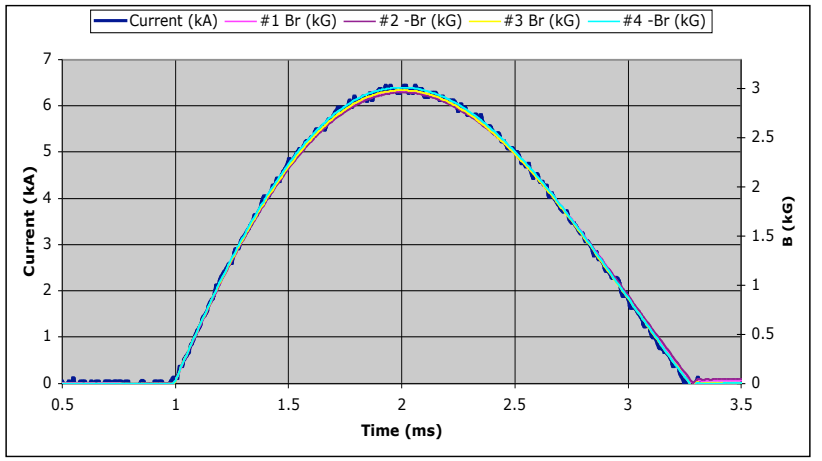


Three-way $\dot{B}$ probes (B_x, B_y and B_z)

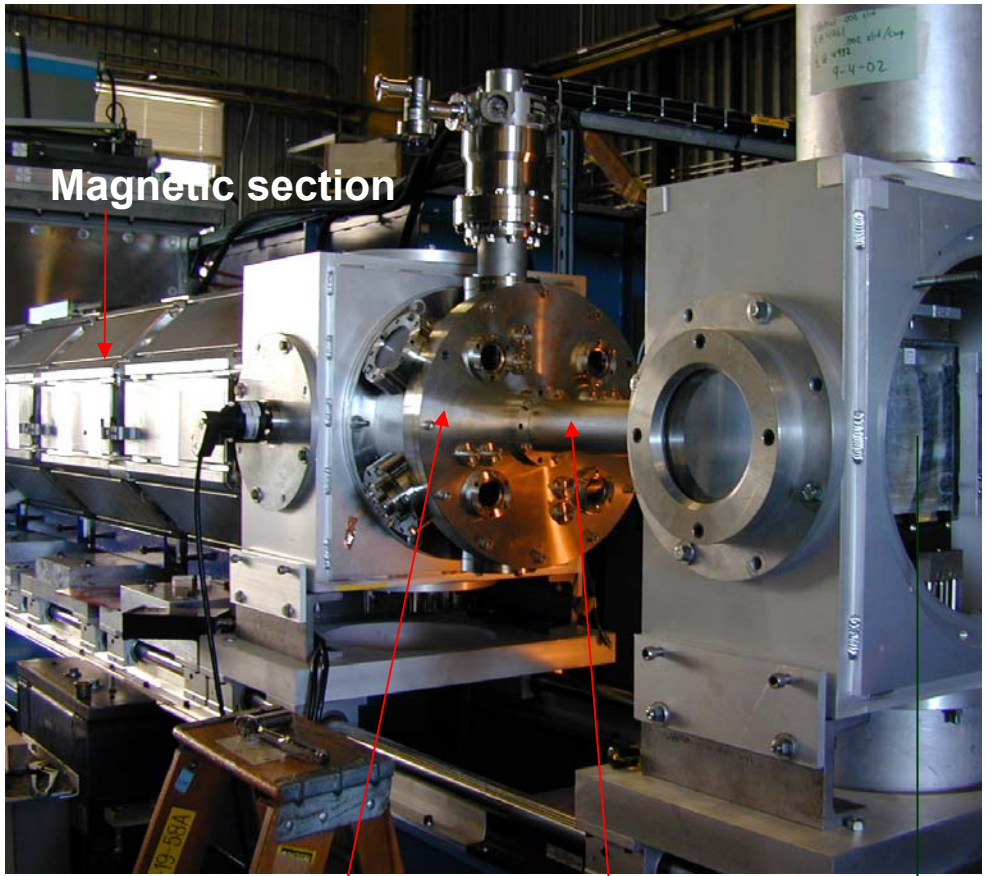




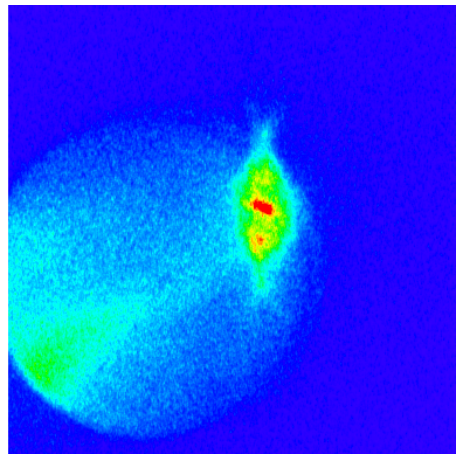
Overlay of B(t) in 4 quadrants and I(t)



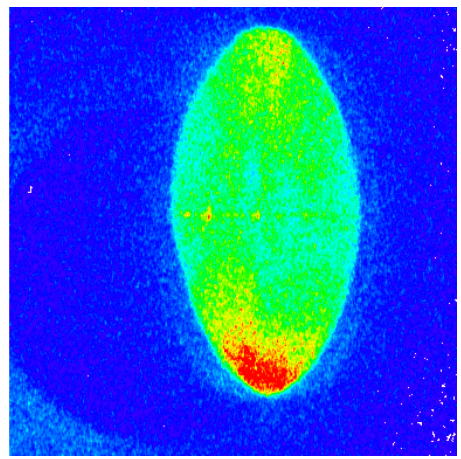
First Beam through Neutralized Drift Section with Plasma Plug



Spot size with plasma



Spot size without plasma



Dipole corrector Requirements are very easy to meet

Required:

Pulsed dipoles ~ 1kG in < 25msec

Achieved:

NTX quadrupoles ~ 7kG in 1 msec