AP2 & Debuncher Aperture

- Goal is to increase acceptance to 40π mm-mrad
- Almost all accelerator components are > 40π
- Hence, perfect alignment and steering should result in nearly 40π acceptance (except for some known apertures)
- Current measurements
  - 15π mm-mrad for AP2
  - 25π mm-mrad for Debuncher

Improve Aperture

- Alignment
  - Move components
  - Orbit Correction
- Limiting Apertures
  - Modify/fix or replace
- Studies
  - Reverse proton studies and diagnostics
    - Beam Position Measurement Systems

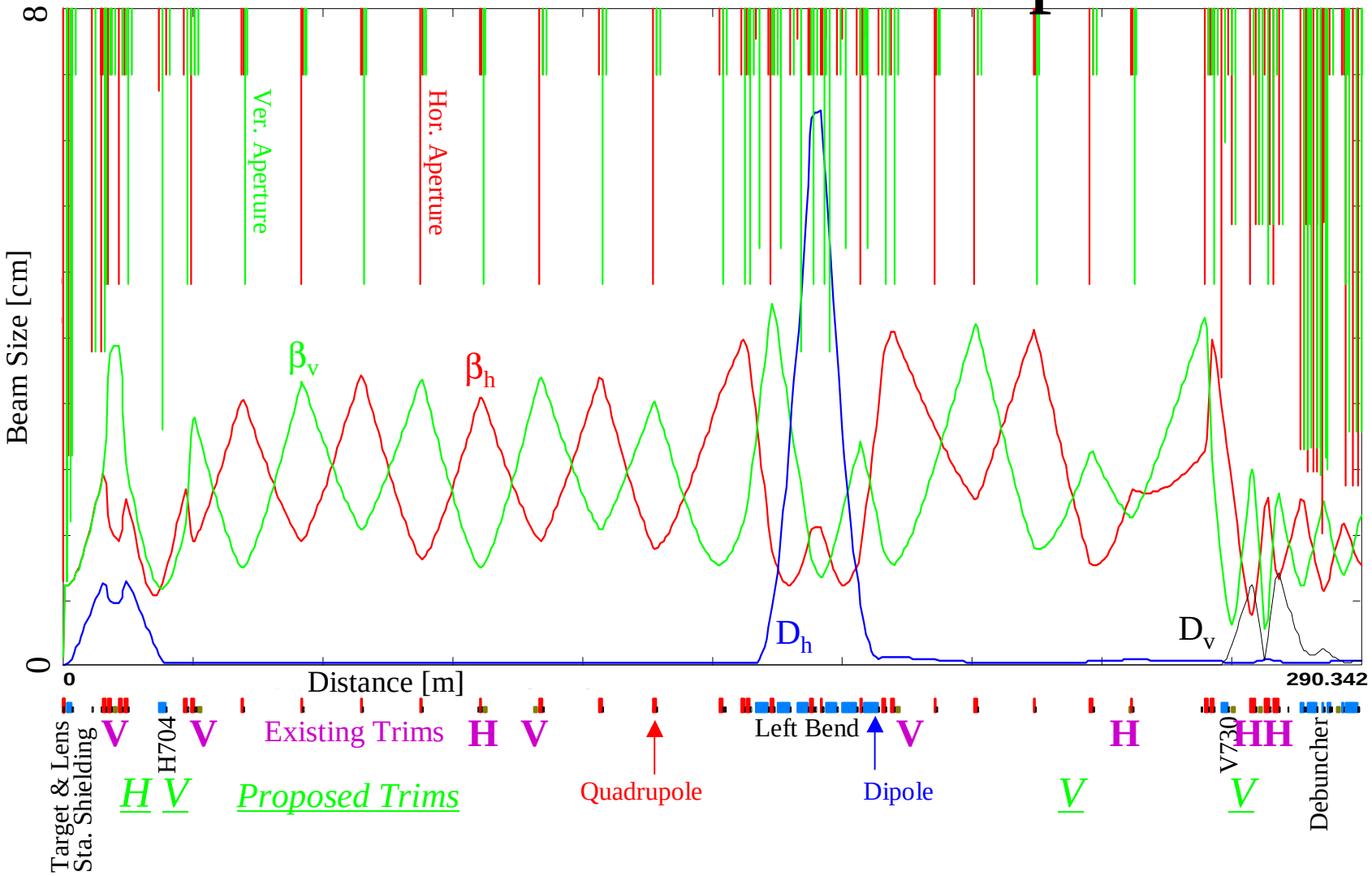
Alignment

- Survey
  - AP1-Target Station-AP2, tunnel settling, etc.
- Motorized stands - beam based
- Quadrupole Portable Alignment Fixture
  - Quick/easy for quad move; hope to do a series of moves with beam studies within a shift
- Orbit correction
  - Dipole trims
  - Motorized quad stands

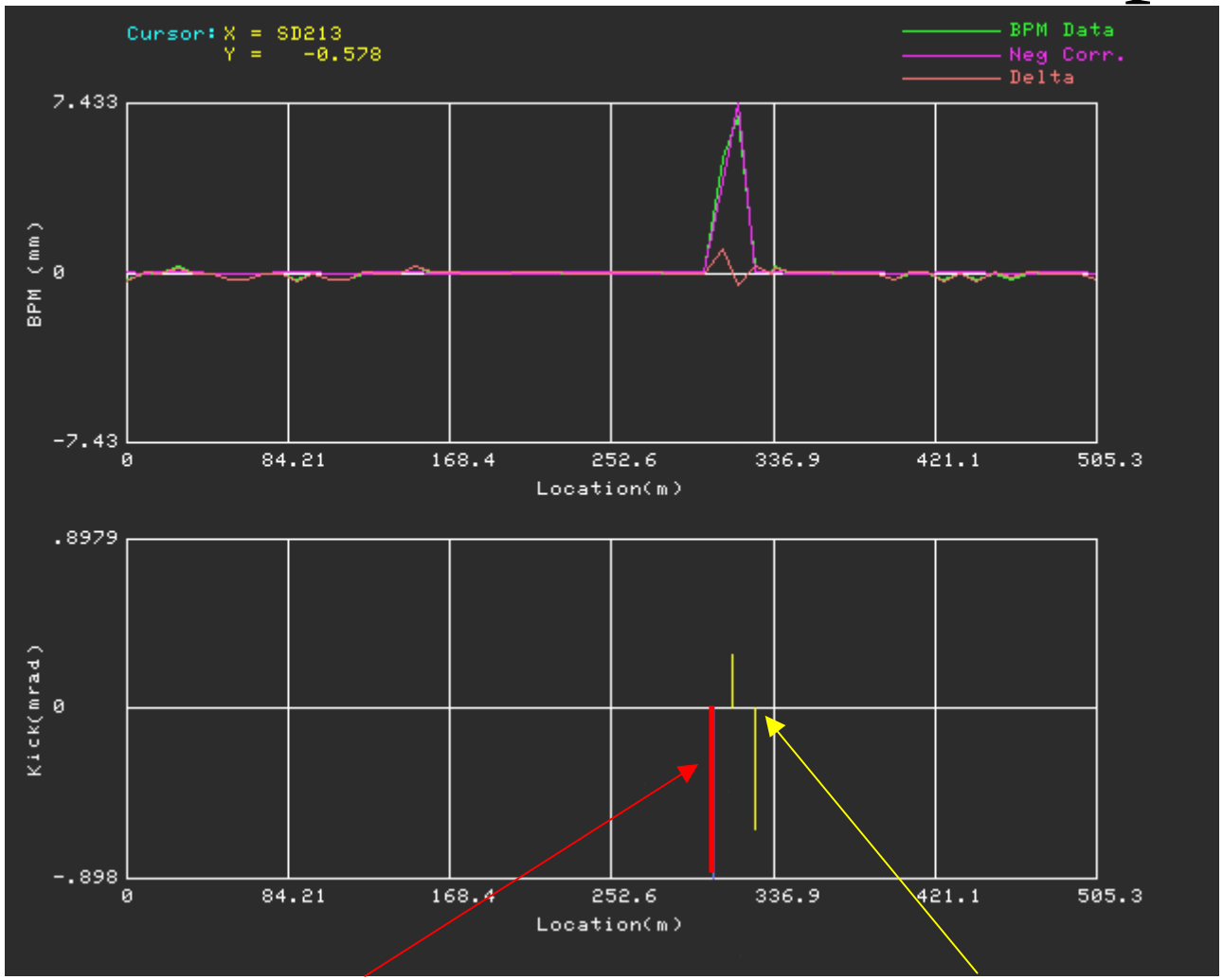
Orbit Correction

- AP2 Trims
  - Few trims; will add more trims
- Debuncher motorized quadrupole stands
  - Real estate limited to add any trims
  - Successful implementation to make bumps
    - 5 motorized stands installed in 2000
  - Will install next set of 10 early in 2002
  - Desire a complete set of local bumps
    - 20 more stands are needed

AP2 Beam Size & Optics



Local Debuncher 3-Bump

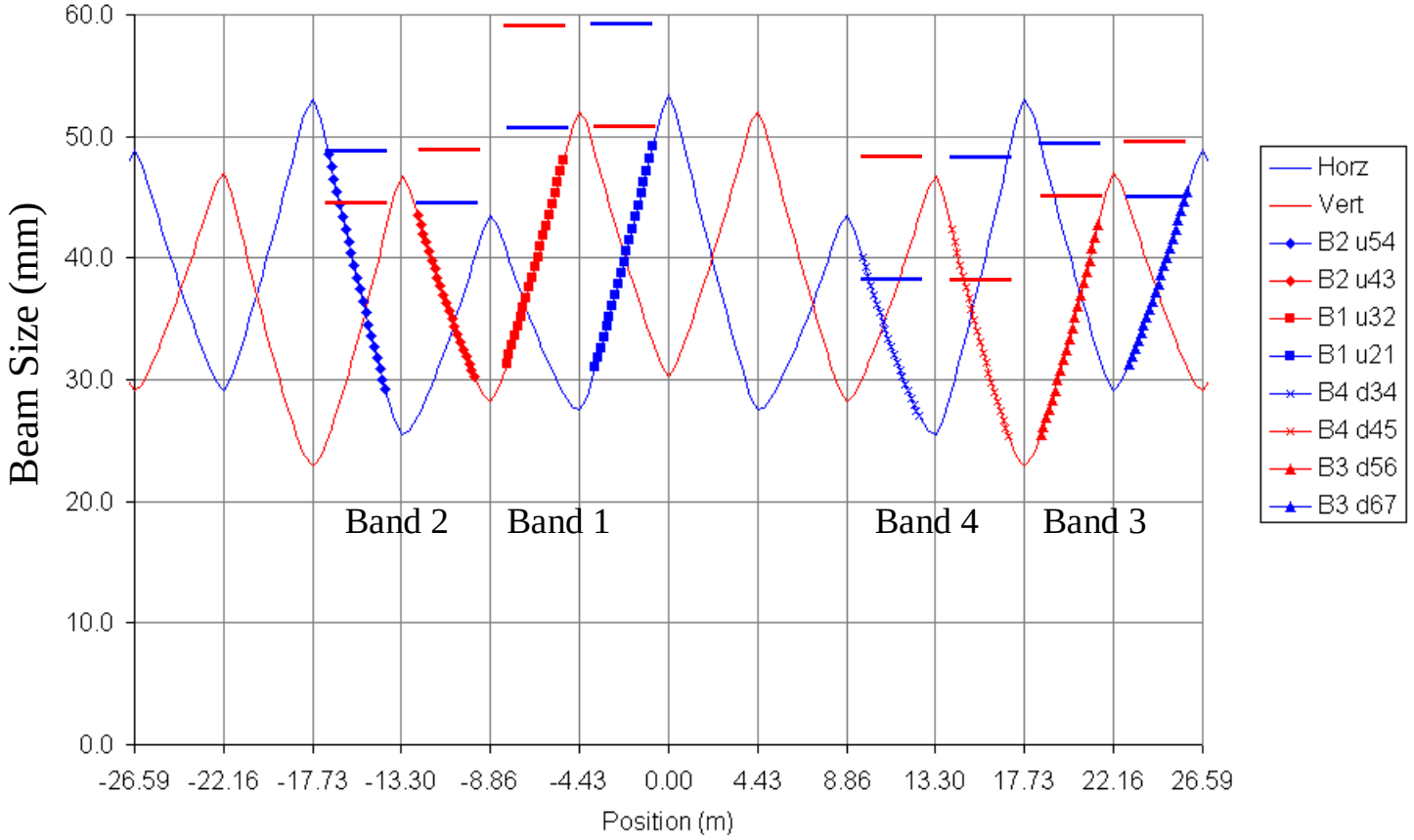


Motorized Quad Stand 2 trims

Apertures

- Determine from lattice/measurements
  - Modify/fix, replace or move
  - Lattice models: being worked upon and verified
- Examples
  - RF cavities - move cavities to different locations.
  - Cooling band 4 - need/rebuild ?
  - Dipole beam pipes - will these be limiting ?
  - Debuncher Injection Region - will better steering or larger quad be the answer?

Debuncher Cooling Tanks



Physical Apertures Horz
Vert

Beam Studies

- Majority of studies to be done: 8GeV reverse protons (MI-P1-P2-AP1-AP3-Acc-Deb-AP2)
  - Most reverse proton studies are compatible with an antiproton stack on the accumulator core orbit
  - Forward protons studies have overhead of changing polarity of AP2 and Debuncher
  - Antiprotons from stacking are a small part of *dirty* secondary beam
    - Cannot *see* antiprotons until end of stacking cycle

Beam Studies-Diagnostics

- AP2 beam line
  - BPMs
  - SEM wire grids
  - Scrapers
- Debuncher
  - BPMs
  - Beam loss monitors
  - Scrapers

BPMs

- AP2 & Debuncher systems old and unreliable; will replace parts of both systems
  - AP2
    - Prototype sample-hold unit being prepared
    - Will replace DAQ with commercial system
  - Debuncher
    - Specialized receiver for Closed Orbit measurements
    - Will have switching pre-amp, synchronous detector, simple A/D card and a small processor
      - Prototype should be ready early in 2002
- New BPM assembly for target vault (AP2)

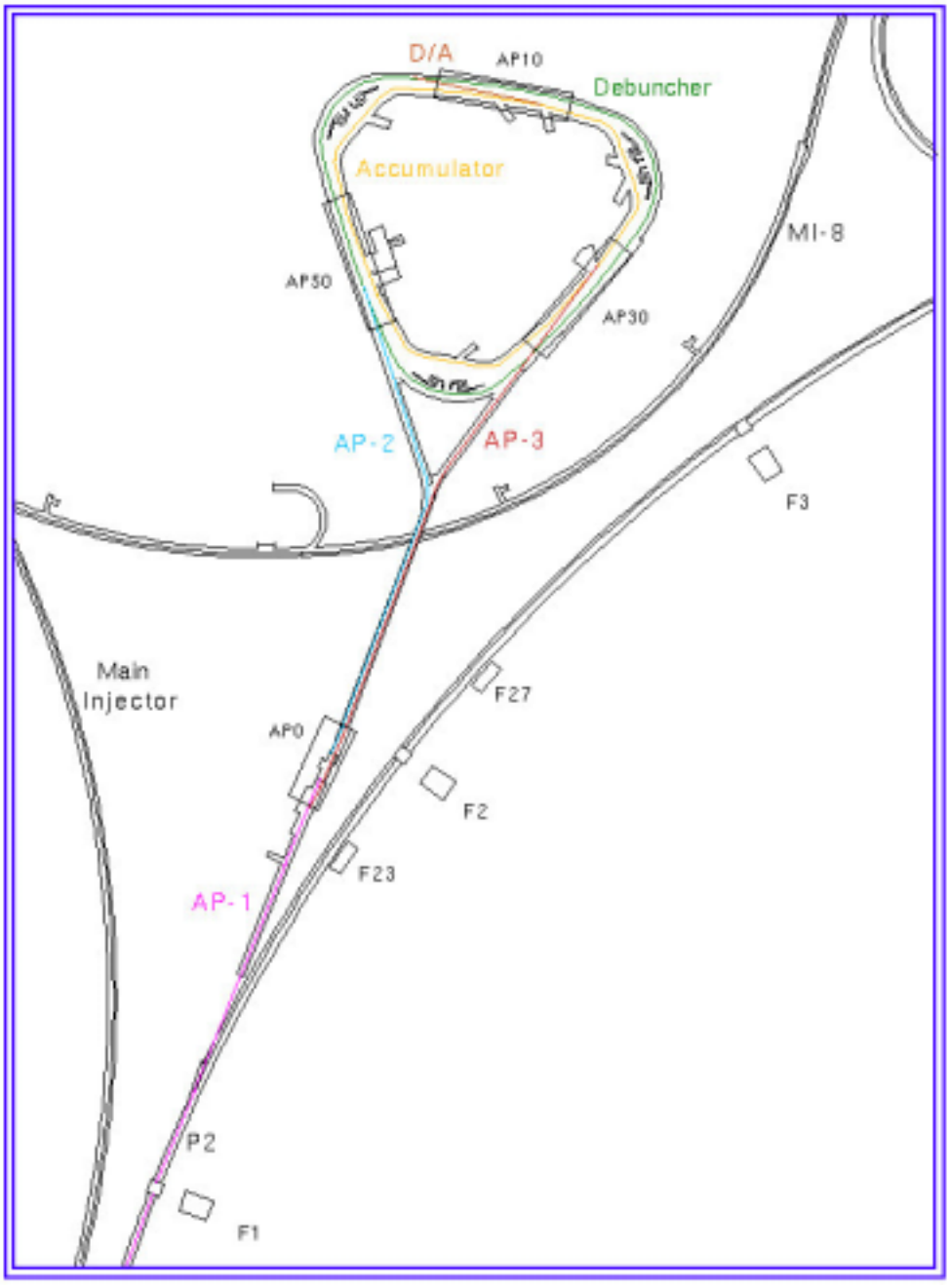
Aperture Plan

- Next two years will be mostly alignment; whenever possible:
  - Survey and alignment
  - Installation of trims and motorized quad stands
  - Beam studies and beam based alignment
- Limiting Apertures
  - Studies/investigation
  - Design replacement/modification or plan move
  - Implement

Extra slides

Nice slides to have around

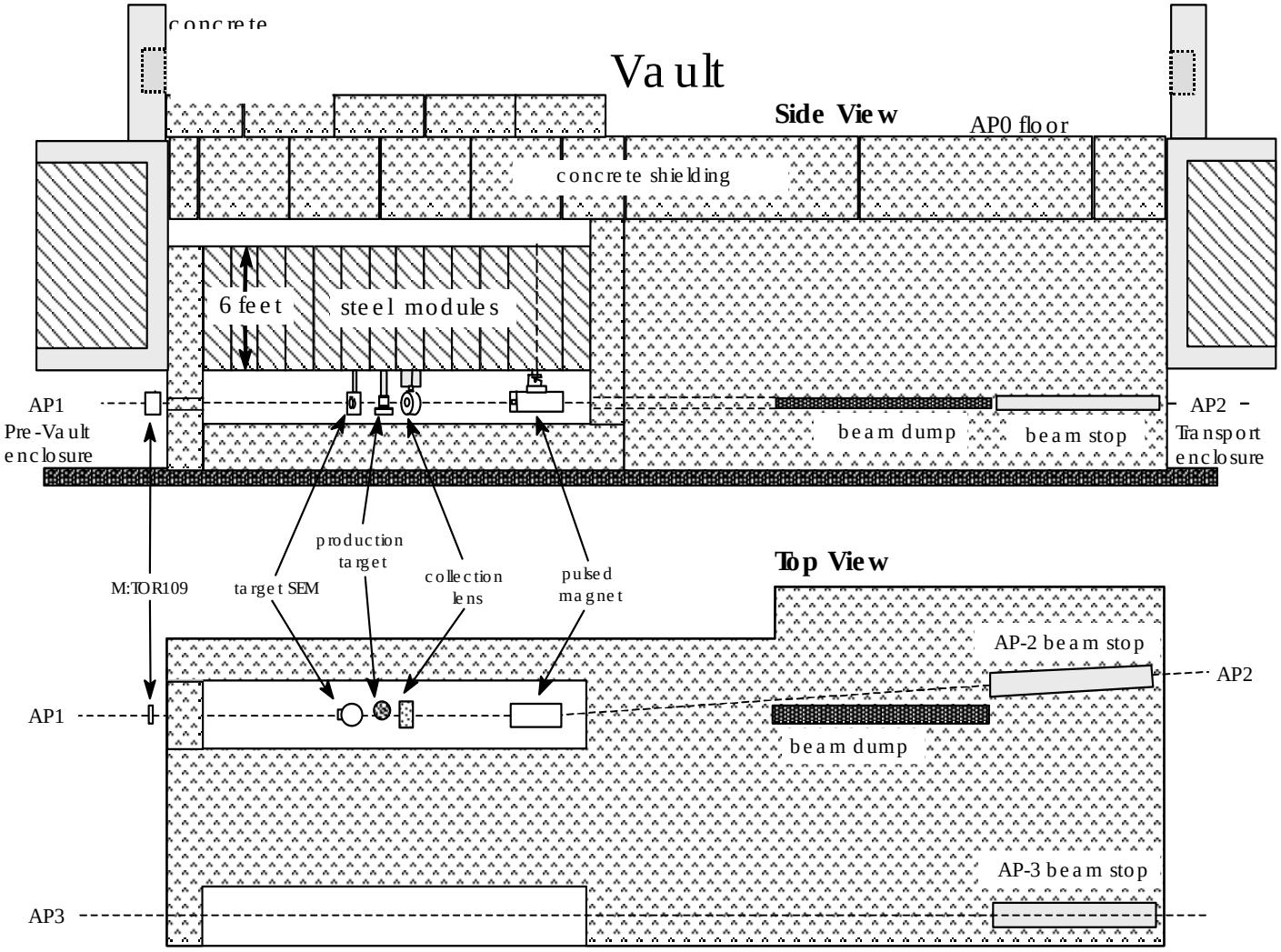
Antiproton Source



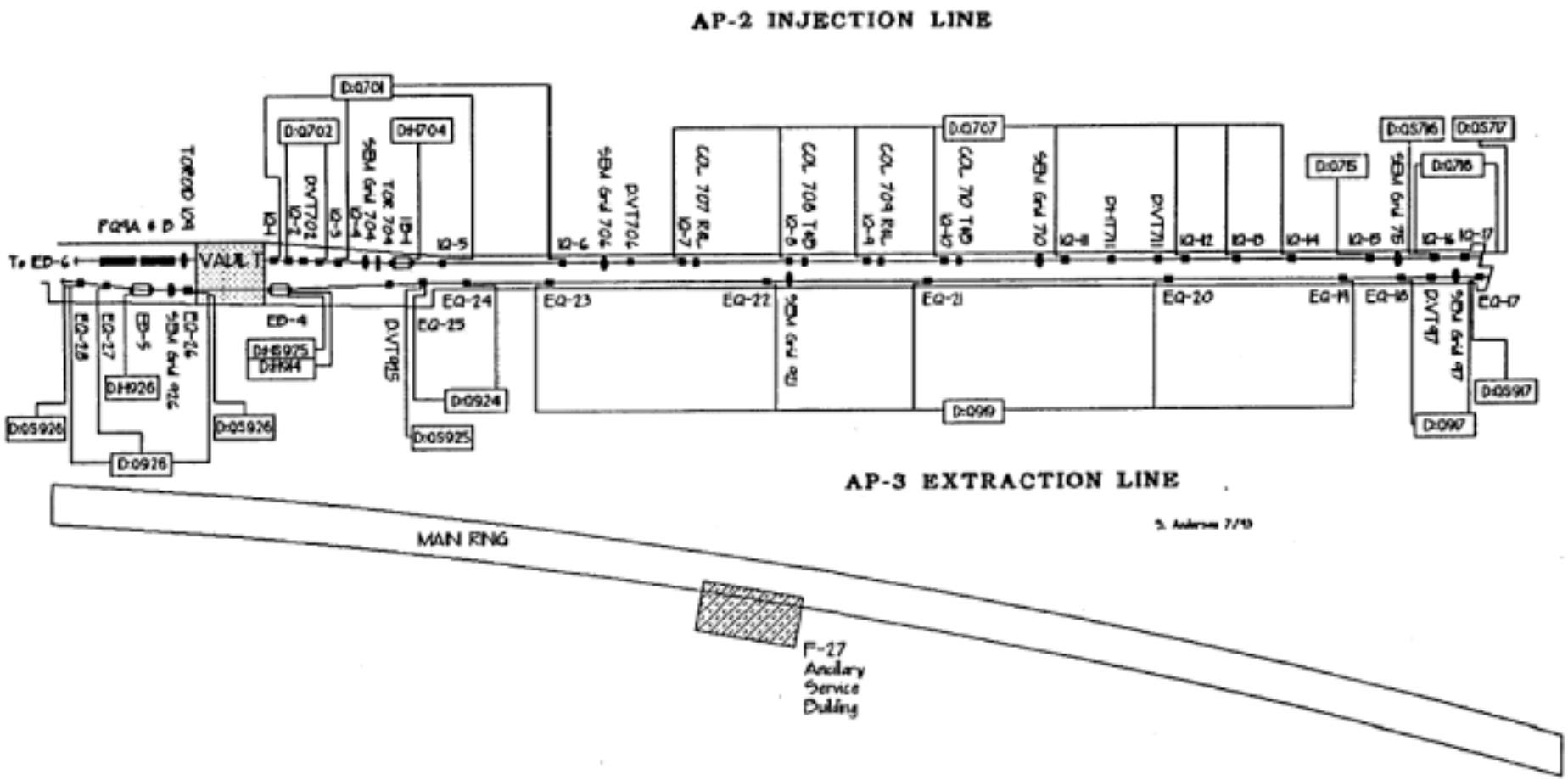
Run 2B - AP2 & Debuncher Aperture

Keith Gollwitzer - Dec 12, 2001

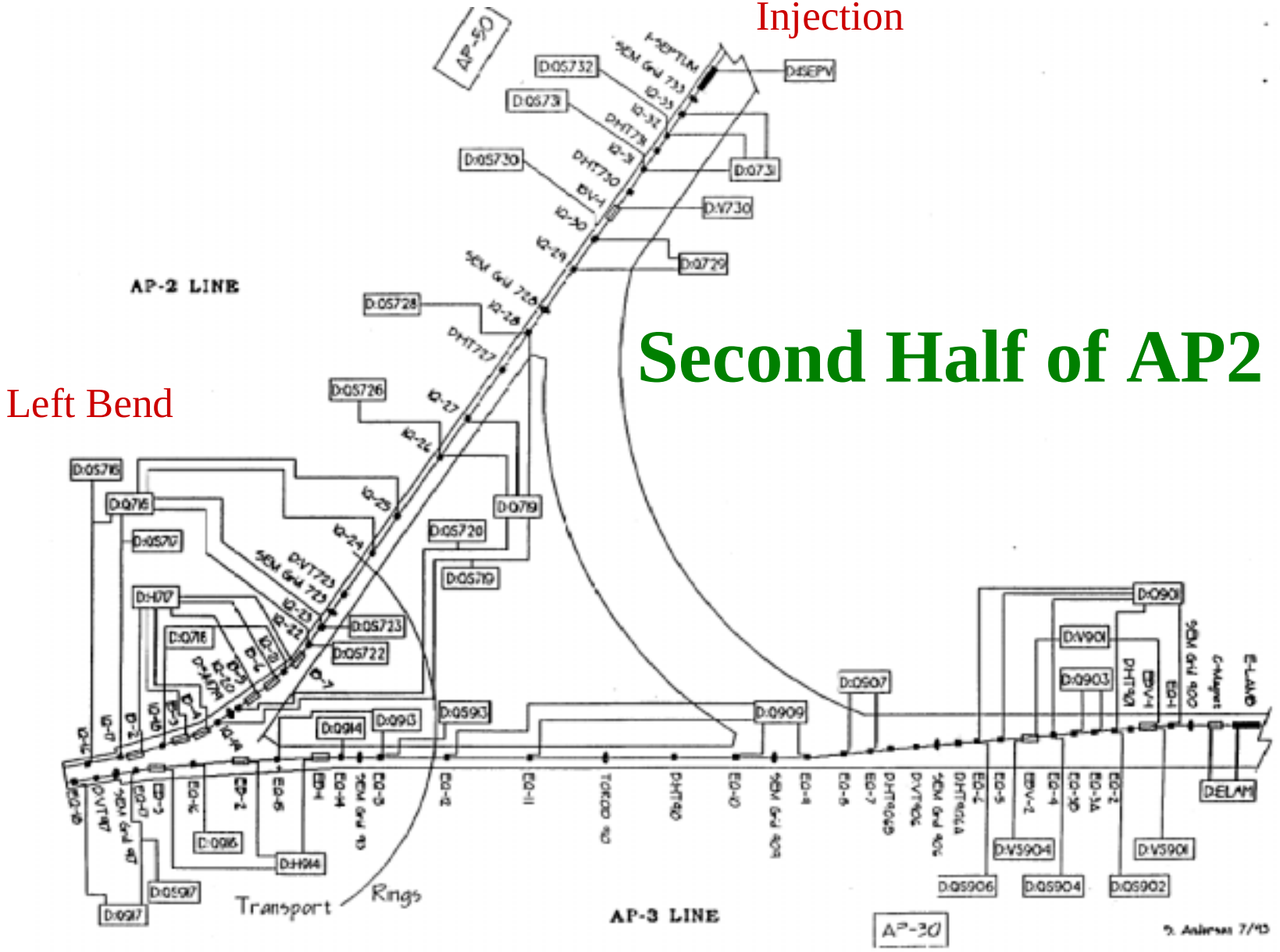
End of AP1→Target → Lens → AP2 Start



First Half of AP2

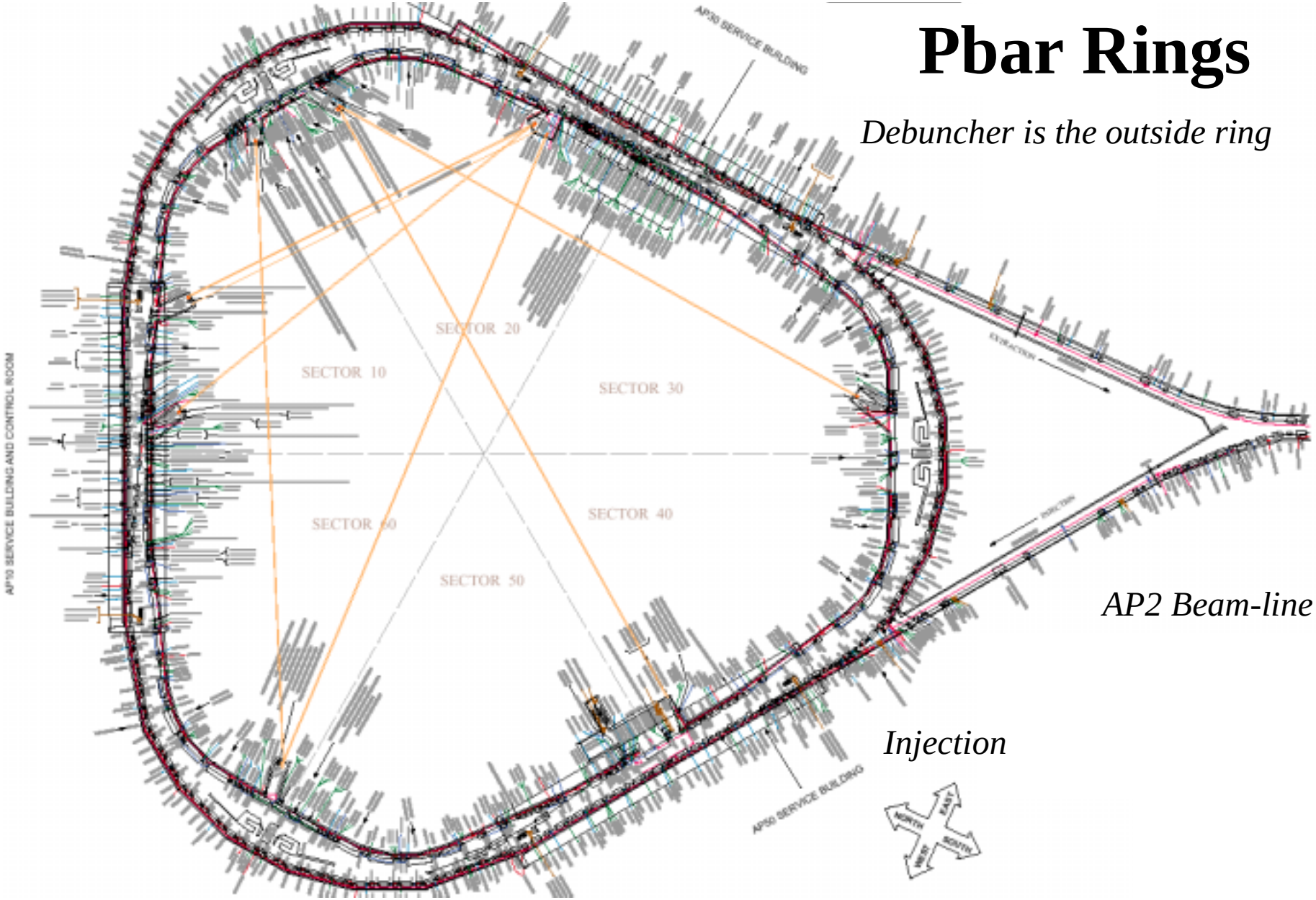


Injection


AP-50
AP-2 LINE
Second Half of AP2
Left Bend
Transport Rings
AP-3 LINE
AP-30

Pbar Rings

Debuncher is the outside ring



AP2 Beam-line

Injection