Polarized Target Beamline for Hall C 12 GeV Experiments

b1/Azz Tensor Collaboration Meeting

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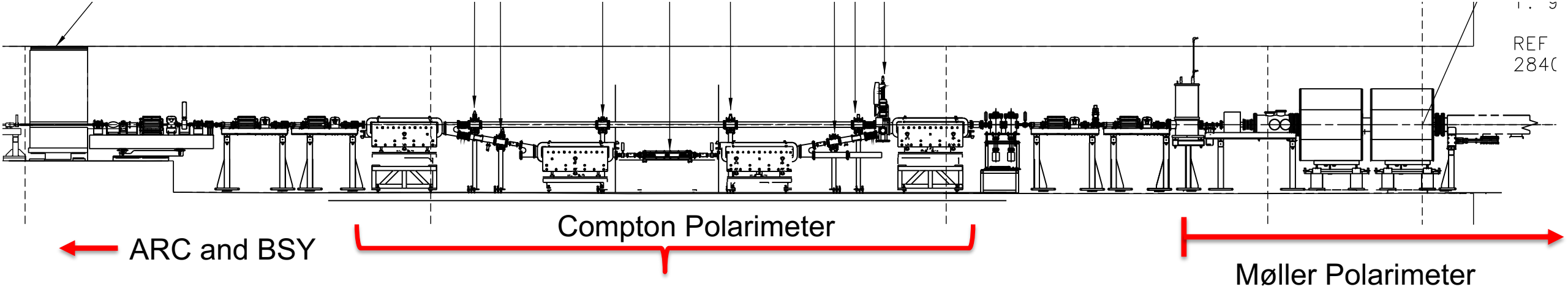
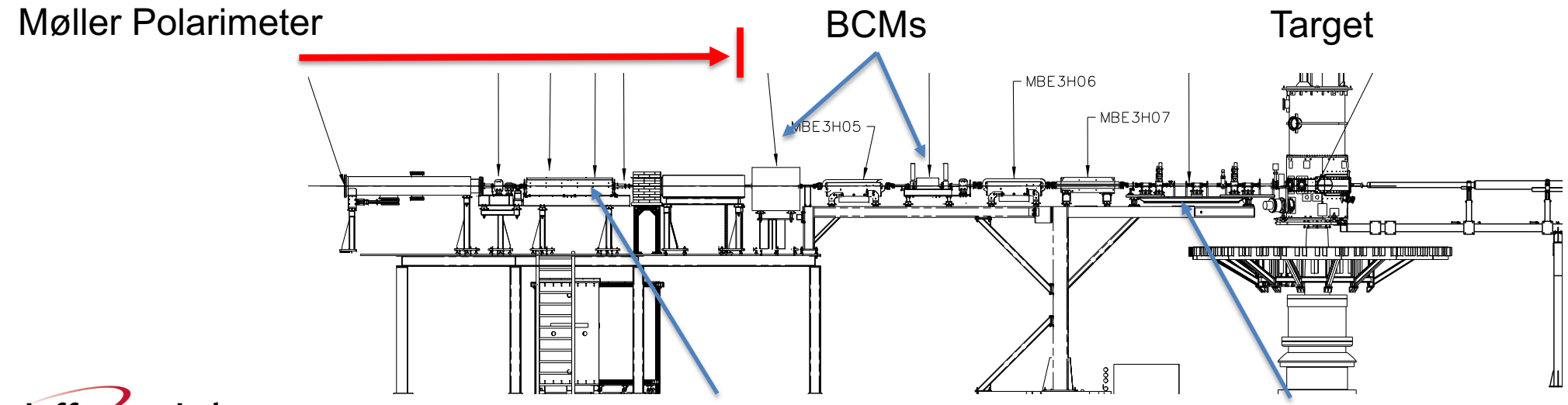
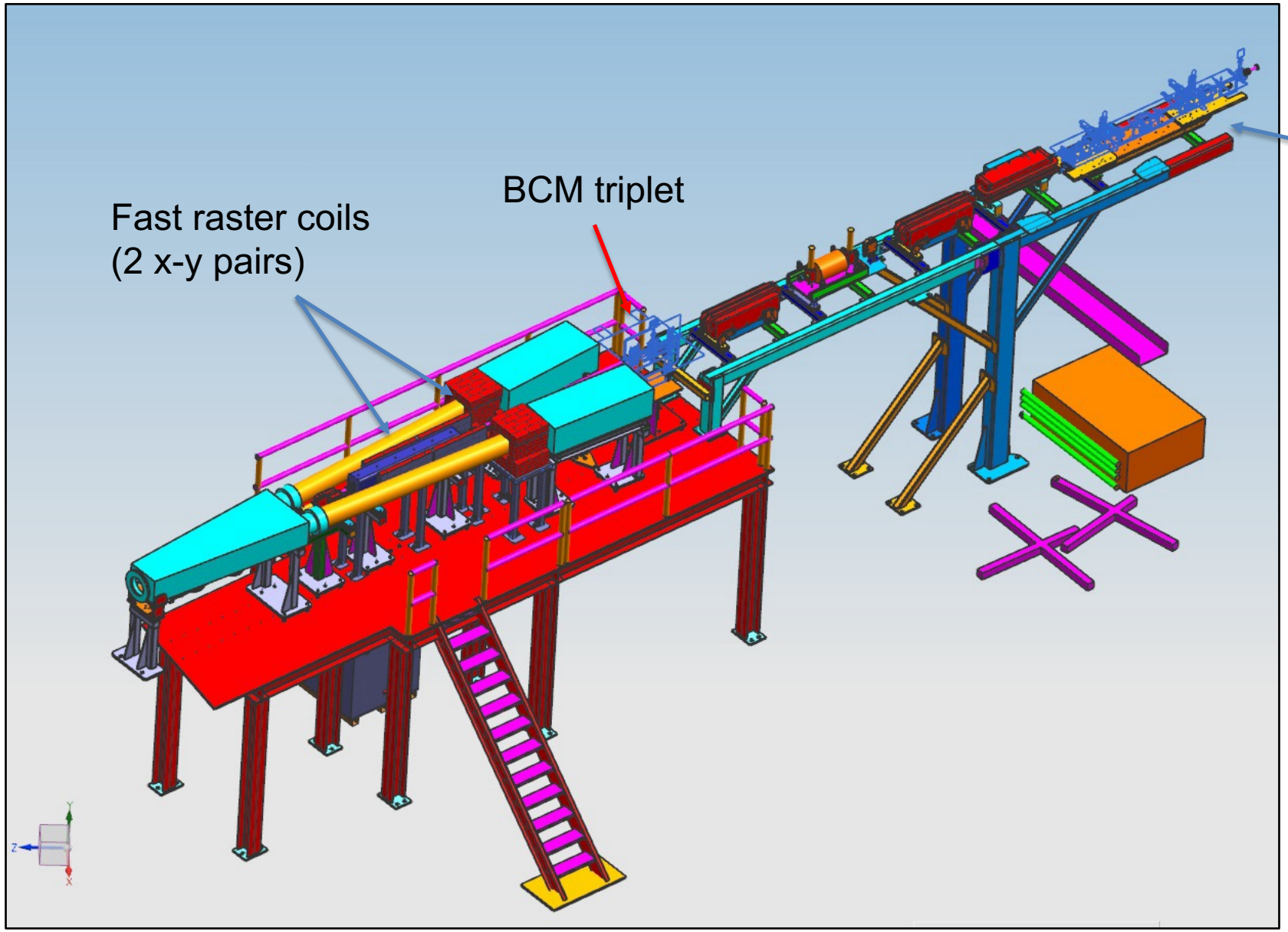
Hall C Beamline – Layout for Unpolarized Targets

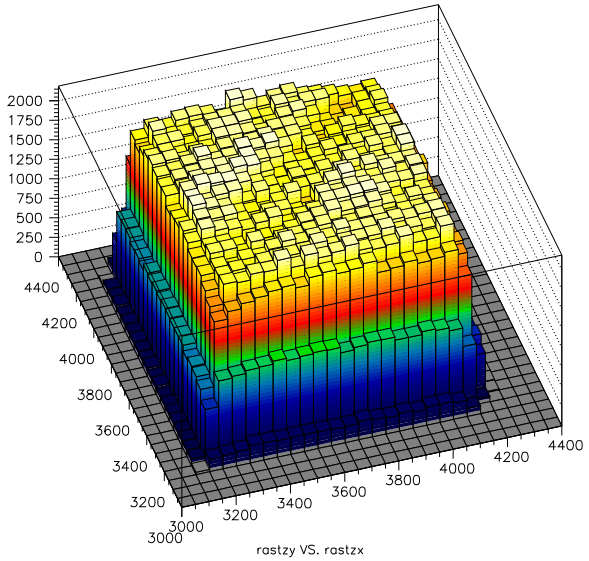




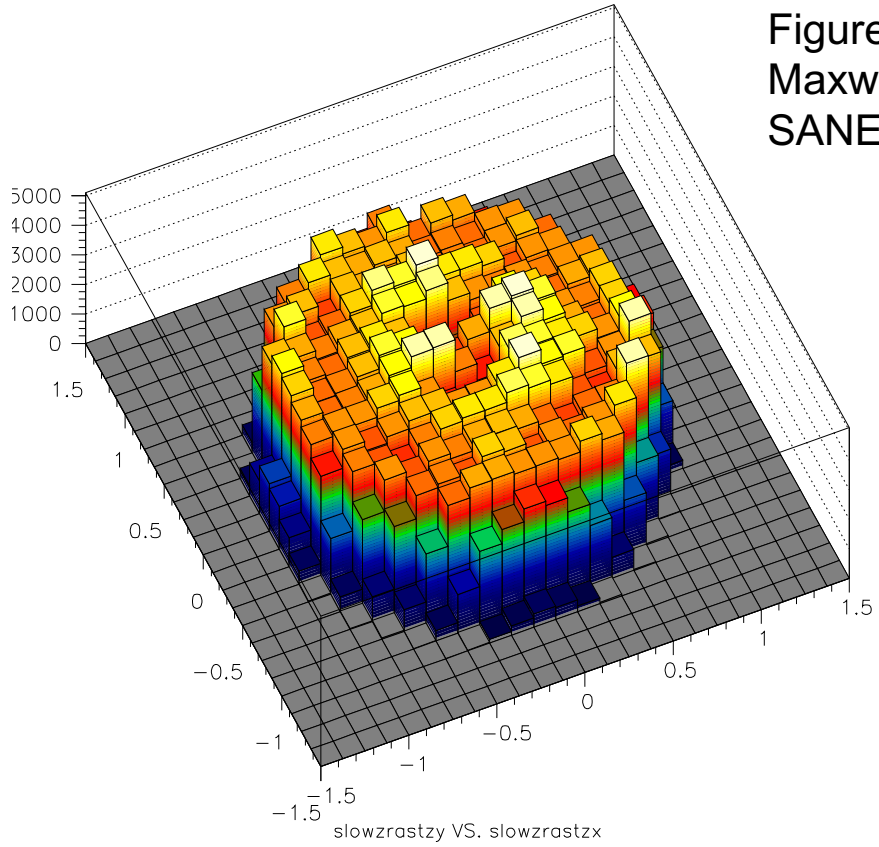
Beamline: Møller to Target



Beamline modifications



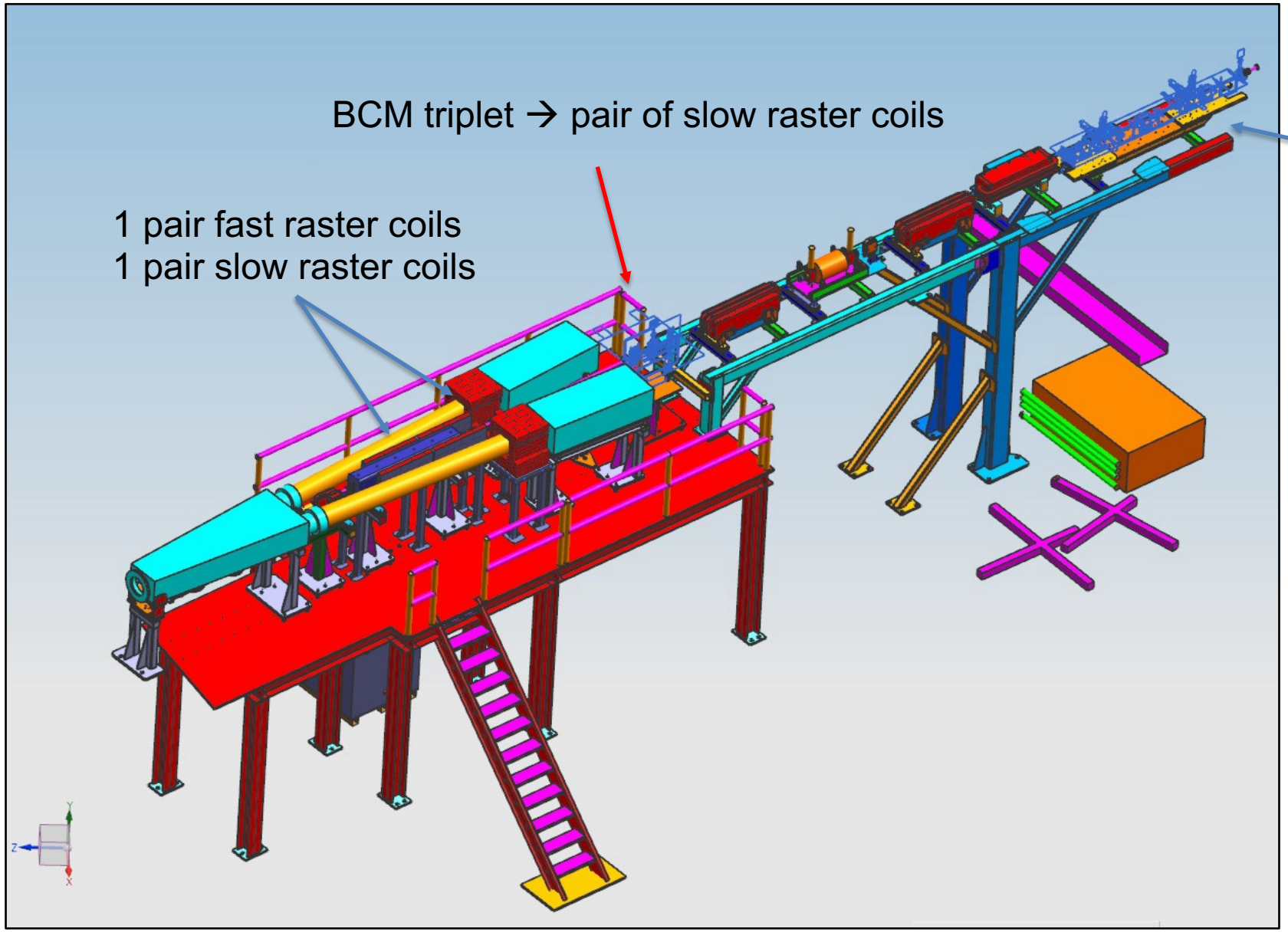
Figures from James Maxwell's thesis SANE experiment



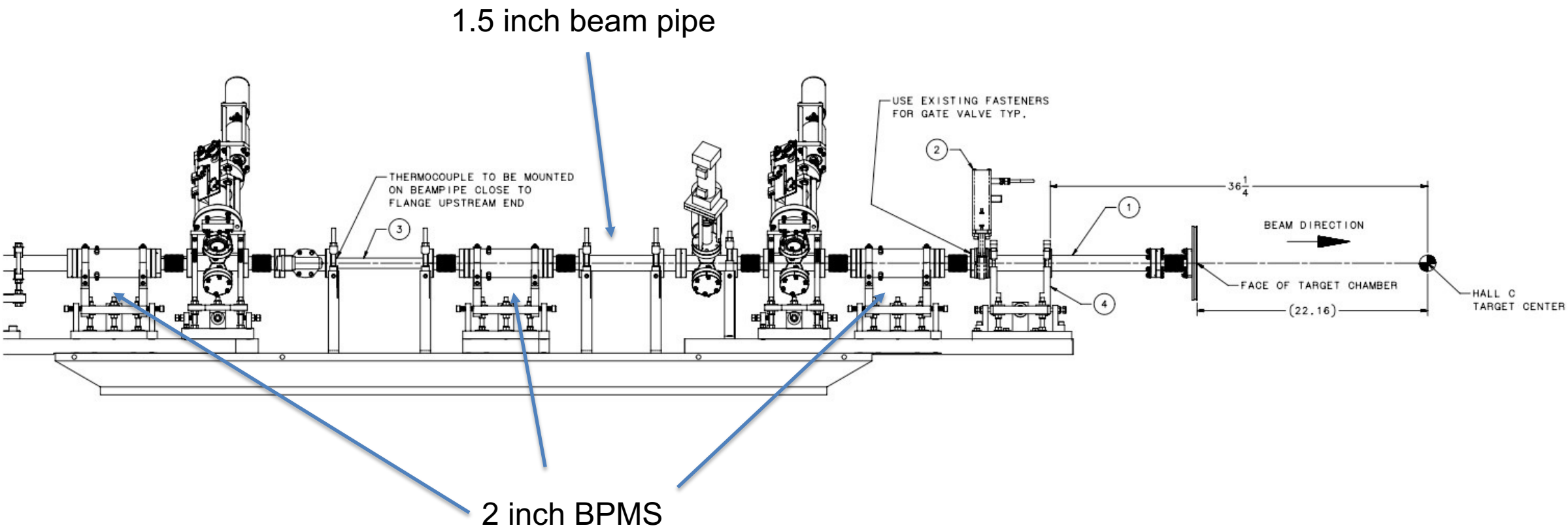
Standard beamline aperture needs to be able to transport rastered beam → size typically on the order of 2-3 mm

Polarized target needs raster pattern on the order of ~1-2 cm → beamline modifications needed t accommodate this

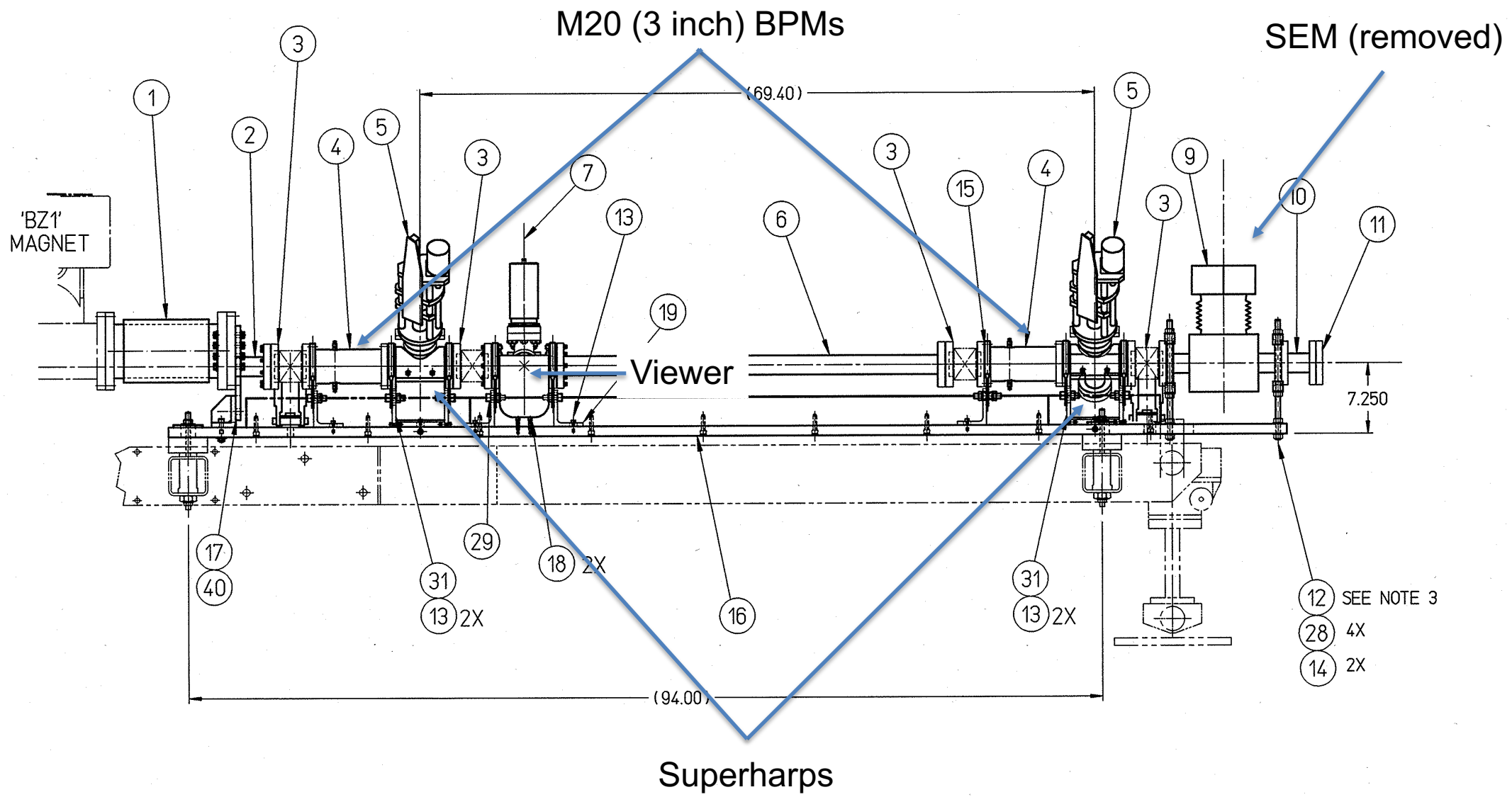
Changes for Polarized Target Running



(Standard) Superharp Girder

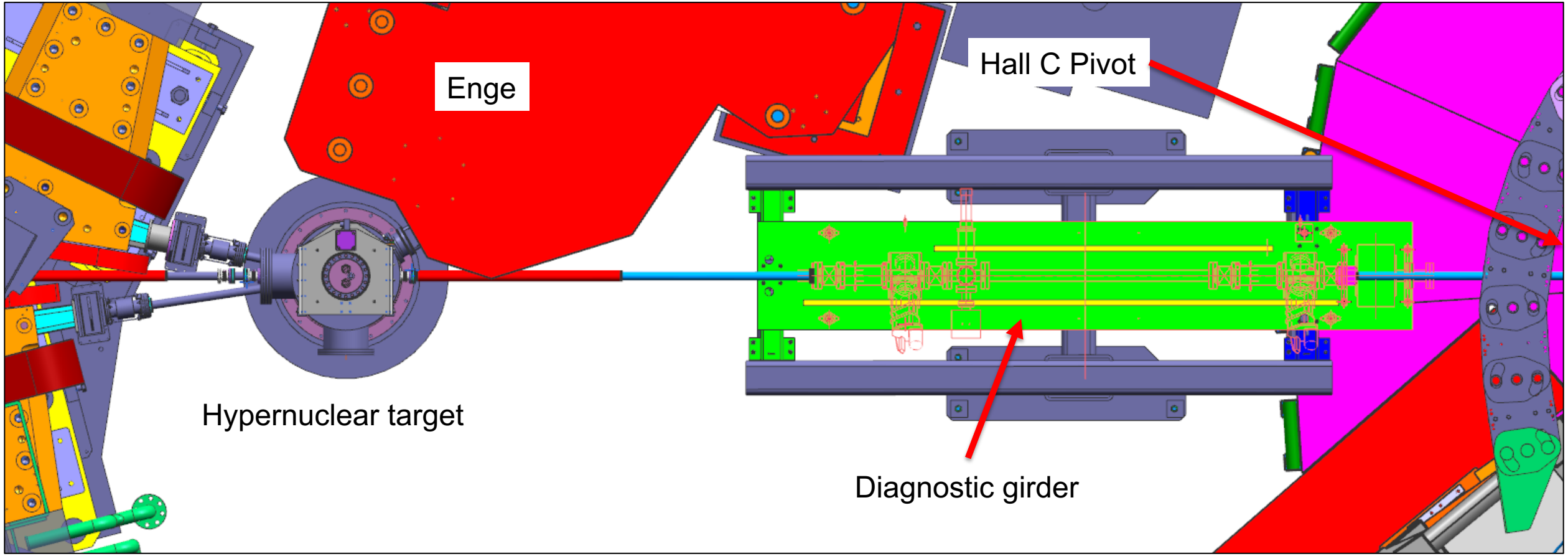


Polarized Target Girder



Superharp Grider and Hypernuclear Experiments

Polarized target girder hasn't been used since SANE experiment in 6 GeV era
→ Will be used to provide additional diagnostics for Hypernuclear experiments



Polarized Target Girder - Refurbishment

Girder was kept in Physics Storage in Hall C area
→ Over the years, parts have been scavenged for “emergency” repairs in other parts of accelerator
→ Section of 3-inch beampipe gone (easy to replace)
→ One 3-inch BPM and one superharp missing → harder to replace
→ Could move one of the standard harps to this girder if needed
→ Used 3-inch BPMs for Hall C Compton – may still be stored somewhere

Slow raster coils

Before his retirement, Chen Yan made sure there were 2 sets of (x-y) slow raster coils available

→ One pair in Physics Storage
→ Need to locate 2nd pair – were perhaps lent to Hall B for target tests in UITF

One set of coils does not have enough bending power to achieve needed size at 5 pass – both sets required

Beamline Performance at Low Currents

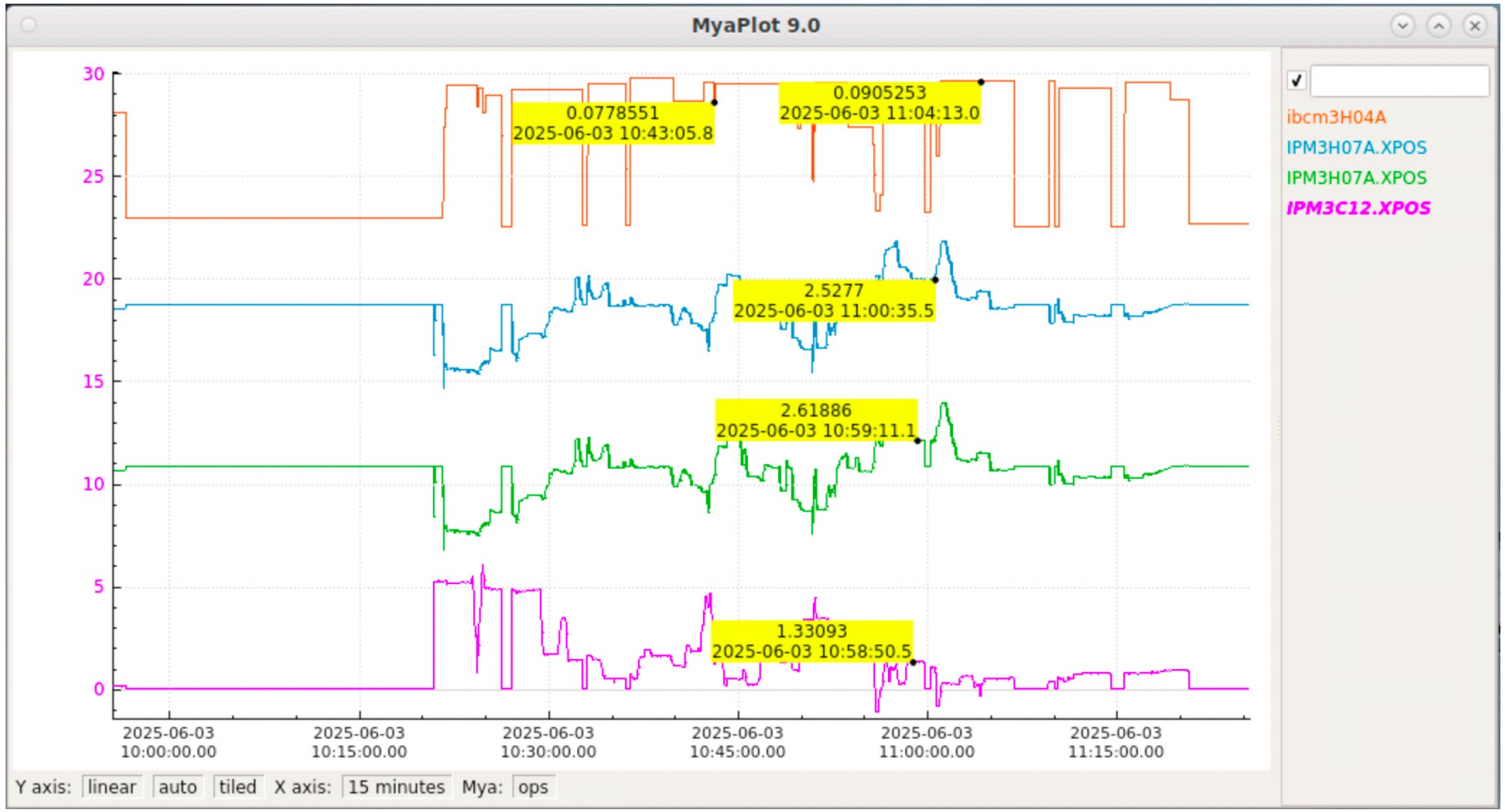
LAD experiment ran at lower currents during last run period

→ Typical production running was at 300 nA

→ Some tests were done at even lower currents (<100 nA)

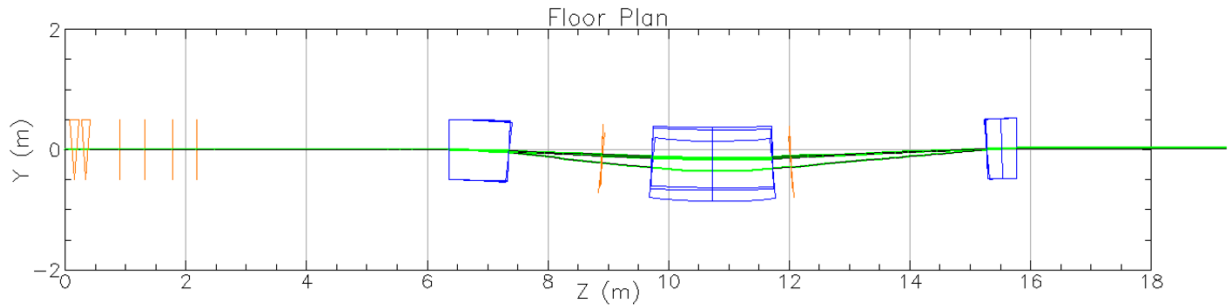
→ Like 6 GeV era, beamline instrumentation (BPMs, BCMs) functioned ok

→ There was some issue getting the slow position locks working, but this could have been resolved if more time had been taken



g2p Beamline

b1/Azz target field direction will not be transverse, so pre-target chicane not needed
→ g2p will need target chicane to transport the beam to dump (will also reduce incoming vertical angle of beam)
→ Initial design from Jay Benesch, further calculations from Ryan Bodenstein



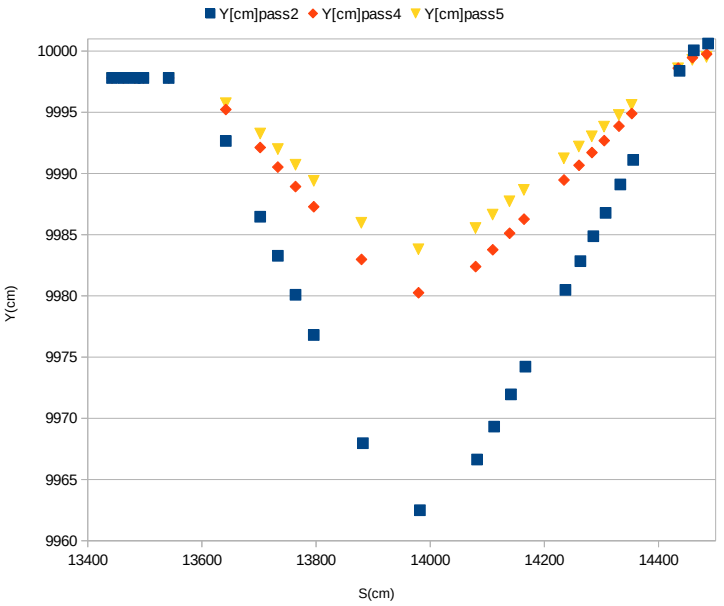
Ryan Bodenstein's note

→ Chicane will require 2 dipoles, different elevation at each energy
→ Existing BE, FZ magnets do not have sufficient Bdl - new magnets will need to be fabricated:
  1 m dipole capable of 1.55 T
  2 m dipole capable of 1.45 T

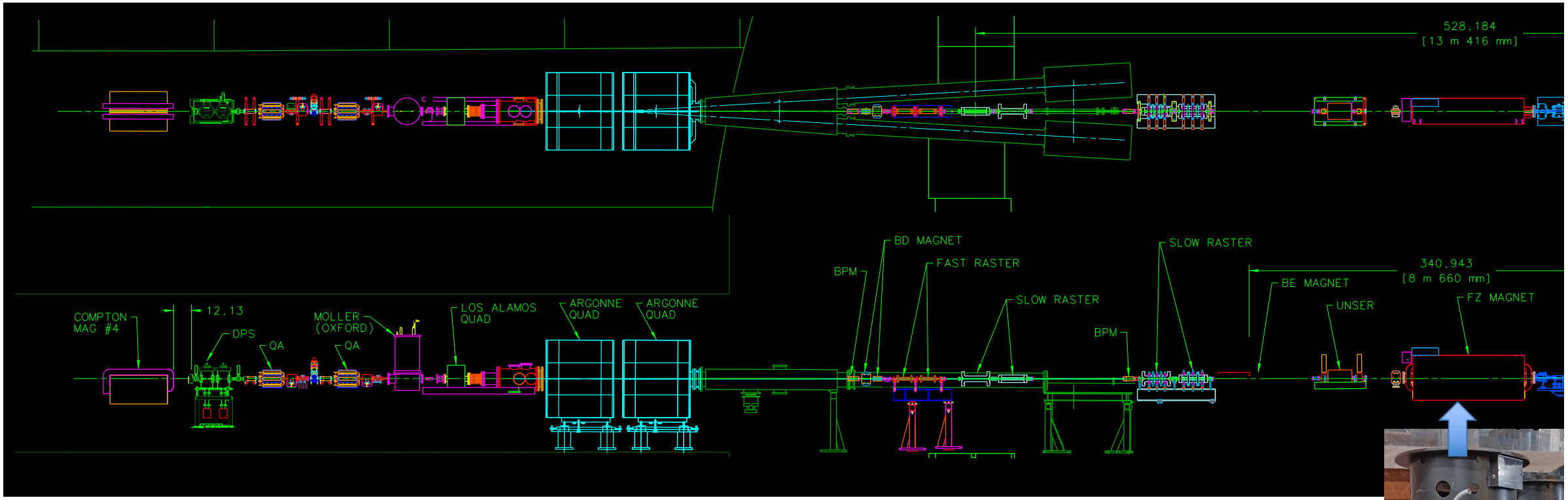
Table 2: ∫BdL for chicane dipoles

	1 m G-cm	2 m G-cm	solenoid
Pass 2	-1540000	2880000	-1342000
Pass 4	-1520000	2868000	-1342000
Pass 5	-1513000	2866000	-1342000

Jay Benesch's note



Qweak-era Beamline Upgrade



When modifying the beamline to accommodate new Compton polarimeter before Q-Weak, intention had been to re-use original FZ magnet, supported by “telescoping” stand for 12 GeV running

→ This would have impeded movement of lifts and material from one side of hall to the other

→ During 12 GeV Upgrade, the “bridge” style design was implemented instead

Scope of Work for Upstream Beamline

- b1/Azz
  - Detailed design for slow raster, polarized target girder placement
  - Refurbish polarized target girder
  - Installation (accelerator installation, vacuum groups, instrumentation, survey and alignment)
- g2p
  - Detailed design and fabrication of new chicane magnets ($$)
  - Detailed design of beamline → remove “bridge”, re-install telescoping stand + slow raster, target girder as noted above
  - Installation – this will be significantly more complex and time consuming.