

# Hall A g2p and 12GeV beam lines

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# g2p beam line requirements

- Low current running at 50-100 nA with online monitoring
- Ability to compensate for 5.1 T field generated by UVA target with beam ranging from 1.1 to 4.4 GeV
- Layout must accommodate septa magnets
- Tungsten calorimeter to measure current precisely

# g2p beam line requirements (cont)

- Slow raster pattern 2.2x2.2 cm
- Fast raster pattern 3mmx3mm
- Support Compton and Moller measurements
- Both straight to dump mode for Compton/Moller/longitudinal polarization runs and through chicane mode for transverse polarization runs

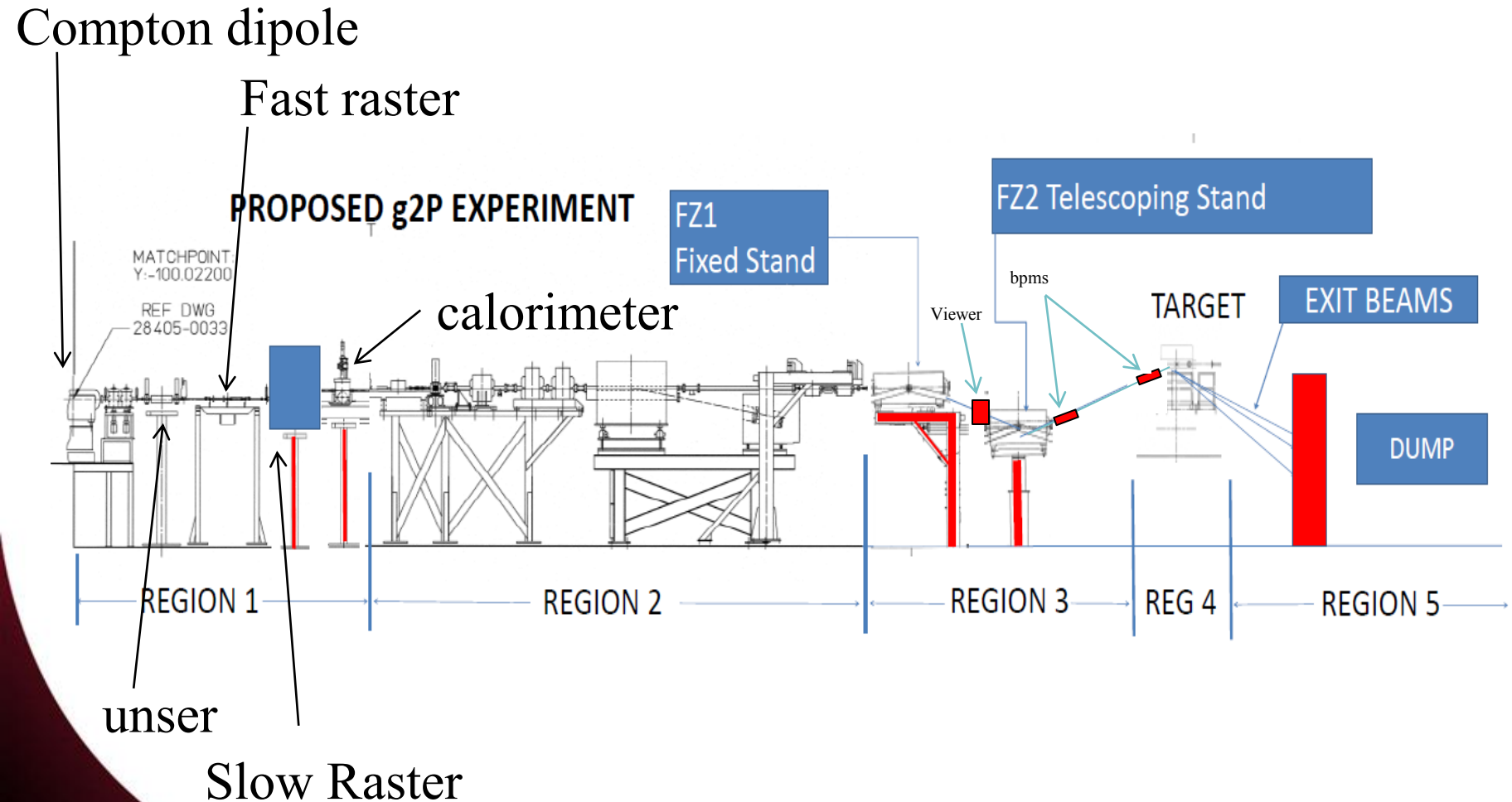
# Downstream of Compton

- EP removed
- Tungsten calorimeter installed.
- Fast raster, unscr, beam current monitors stay where they are.
- Slow raster added where EP used to be.

# Downstream of Moller

- Moller apparatus stays at location
- Inverted girder stays in place
- Two BZ dipoles. First one is fixed, second one on a moving vertical stand
- Diagnostic girder removed
- Target placed 87.69 cm upstream from pivot (J. Lerosé optimization)

# Proposed Layout



# Beam dump

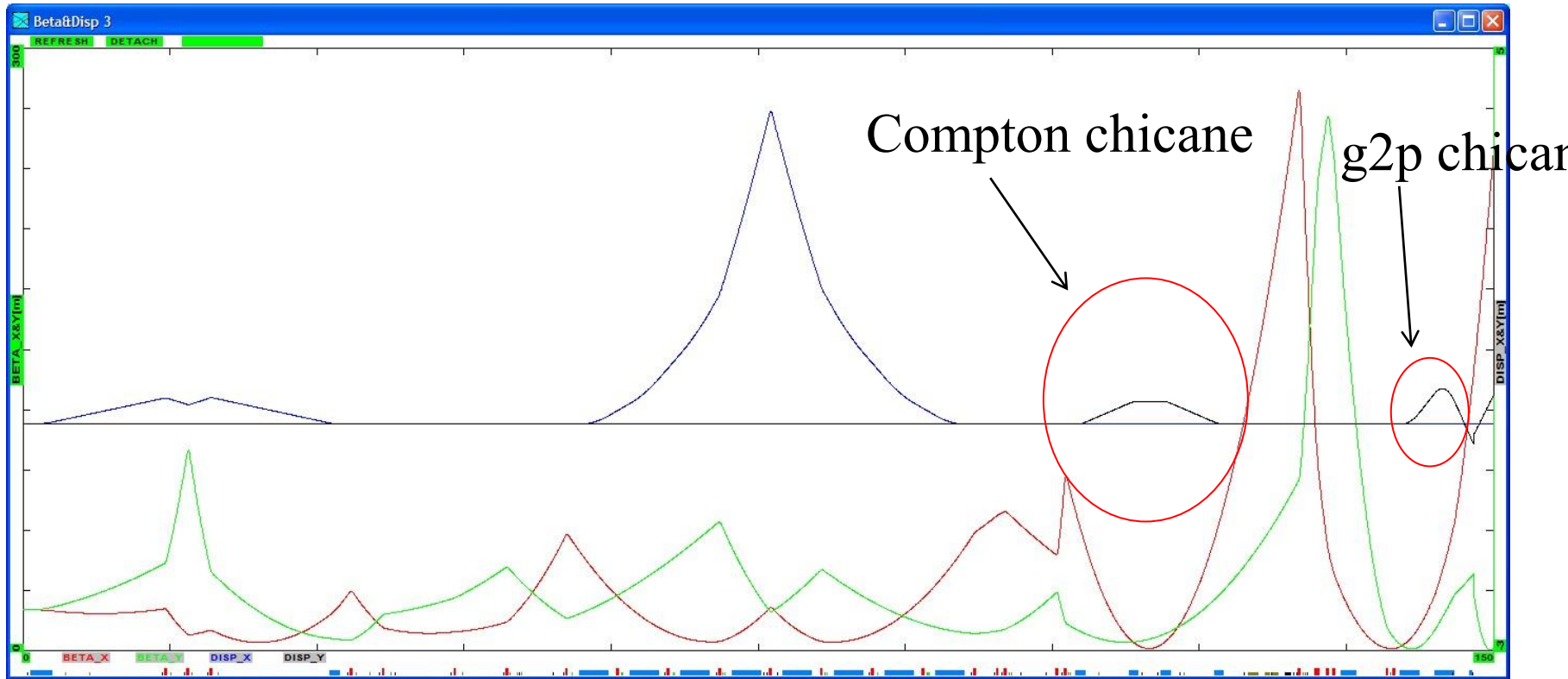
- Local dump has/currently is being designed
- Will be able to take 1.5 % duty factor pulsed beam or 100 nA CW beam up to 4.4GeV.
- Has to be out of the way of main dump line.

# Beam envelope and rastering

- Slow raster to produce 2.2x2.2cm pattern
- Fast raster to produce 3mmx3mm on top of it
- Unrastered beam about 30 microns round at target
- Beam about 50 microns round at Compton



# Twiss functions



# Raster range checks okay

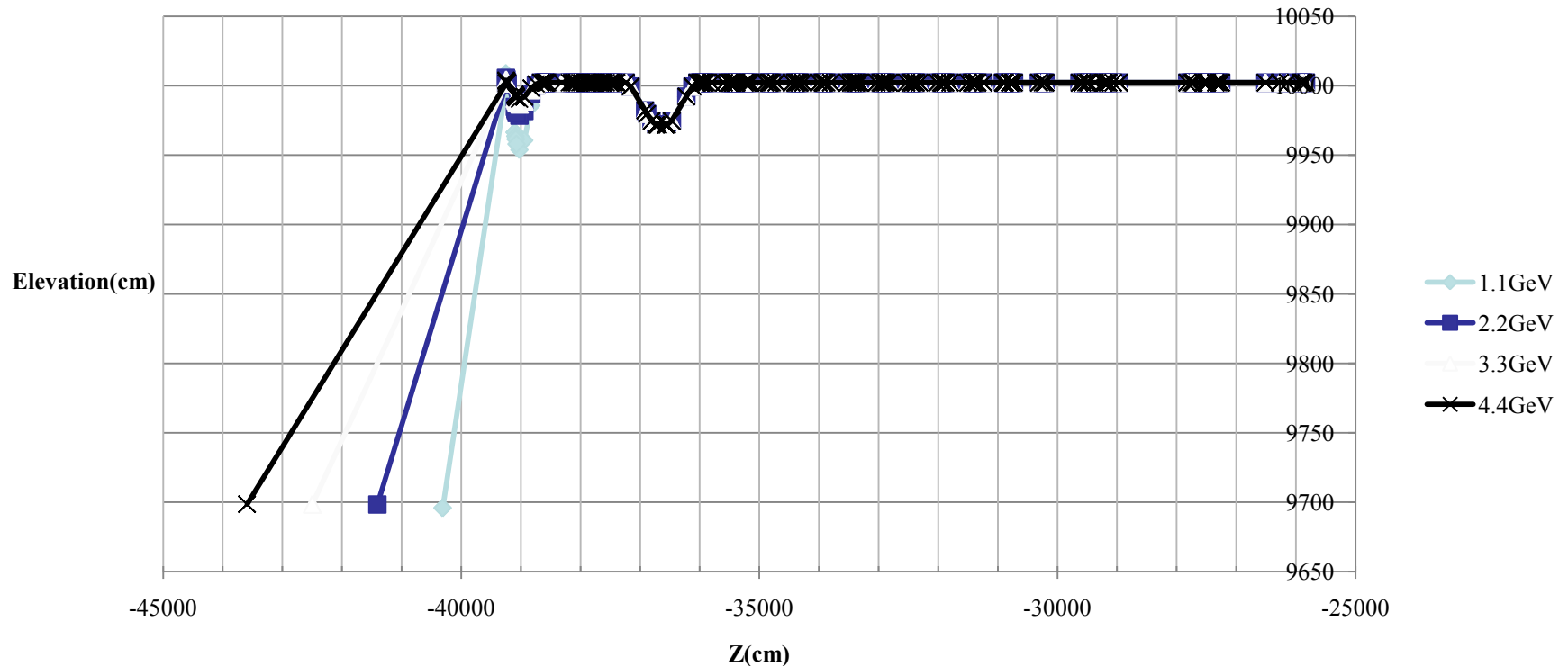
Energy	X slow	Y slow	X fast	Y fast
1.1 GeV	+/- 2.1 kG cm	+/- 1.3 kG cm	+/- 0.15 kG cm	+/- 0.1 kG cm
2.2 GeV	+/- 4.2 kG cm	+/- 2.6 kG cm	+/- 0.30 kG cm	+/- 0.2 kG cm
3.3 GeV	+/- 6.3 kG cm	+/- 3.9 kG cm	+/- 0.45 kG cm	+/- 0.3 kG cm
4.4 GeV	+/- 8.4 kG cm	+/- 5.2 kG cm	+/- 0.6 kG cm	+/- 0.4 kG cm

Raster limits:

COIL	SLOW	FAST
X	16.8 kG cm	3.3 kG cm
Y	16.8 kG cm	3.3 kG cm

# Beamline elevation for various setups

## Elevation of Hall A beamline along floor position



# 12 GeV modifications

Current Proposal By J. Benesch for 11 GeV Parity experiments:

Proof of concept:

<http://www.jlab.org/technotes/2009/09-063.pdf>

Still need to do mechanical layout and deal with other issues such as raster strength

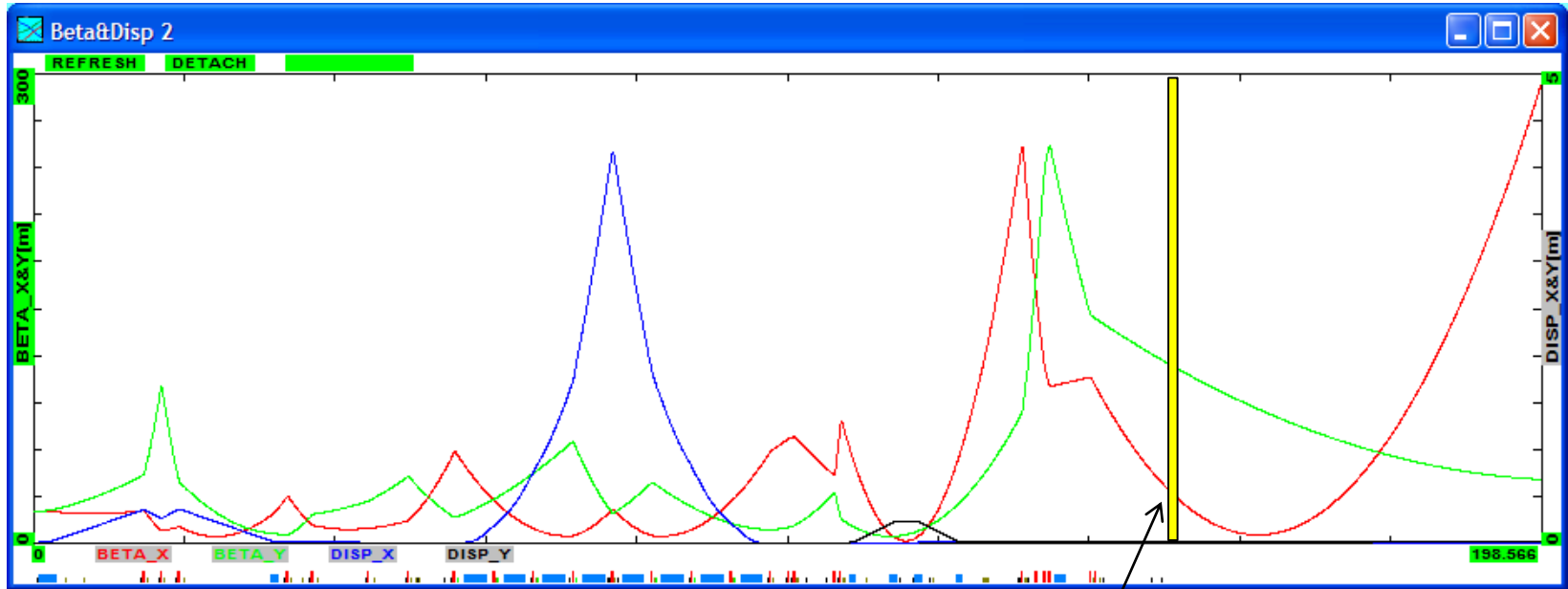
# 12 GeV modifications (cont)

- Accommodates a target 5m upstream of pivot
  - Diagnostic girder moved accordingly and reused
- Accommodates rastering at 11 GeV:
  - Raster after last quad (maximum strength, not impeded by quad focusing)
  - Raster is doubled in length to provide needed strength

# 12 GeV modifications (cont)

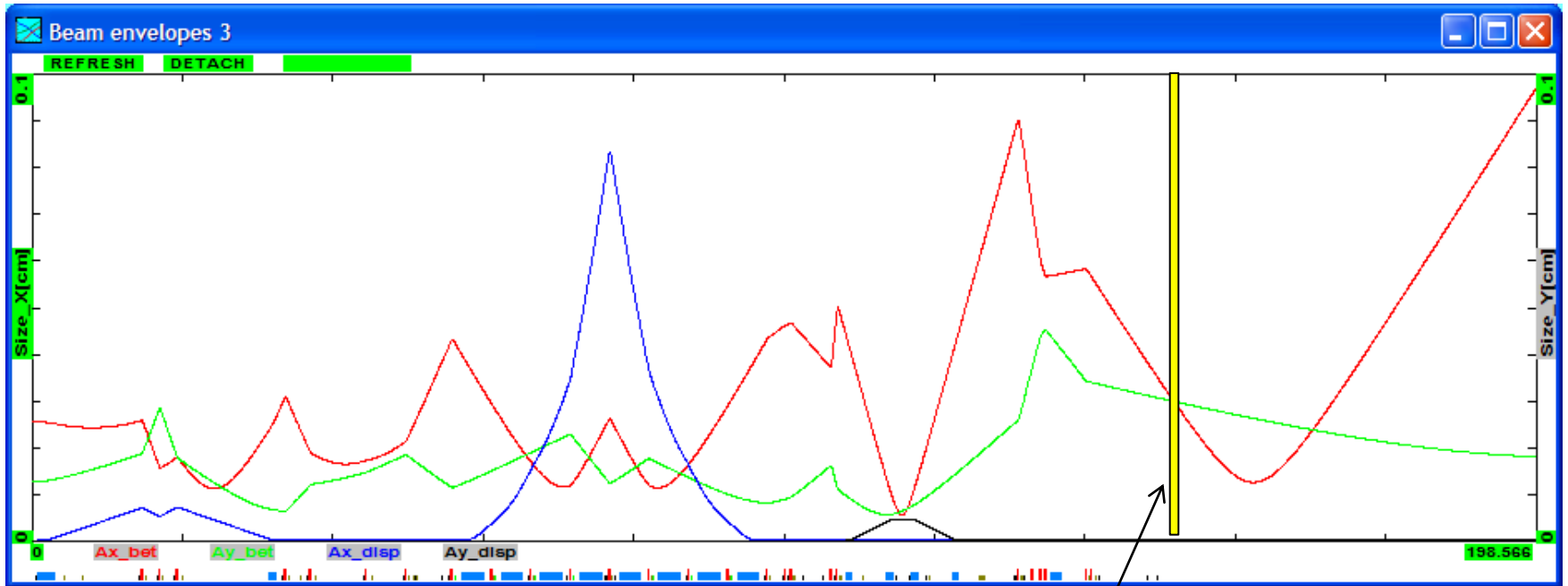
- Satisfy constraints of beam size and phase advance at target:
  - A quad doublet between Compton and Moller in order to satisfy constraints of beam size and phase advance at target
  - A Quad between the two harps on the “french bench” part of a doublet with C19 or C20 to set size at compton

# 12 GeV deck twiss functions



target

# 12GeV deck beam sizes



target