

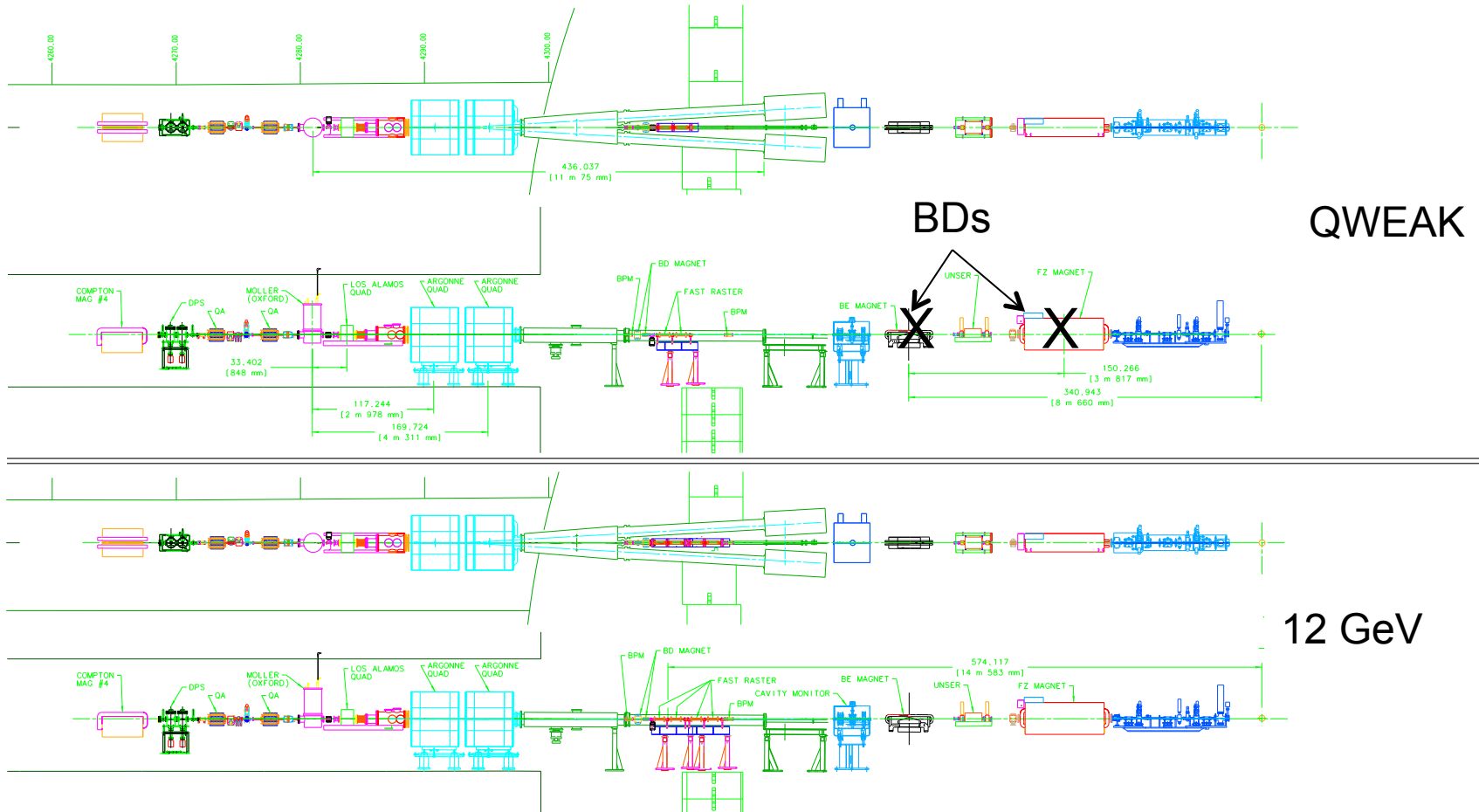
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# Hall C 12 GeV Beamline

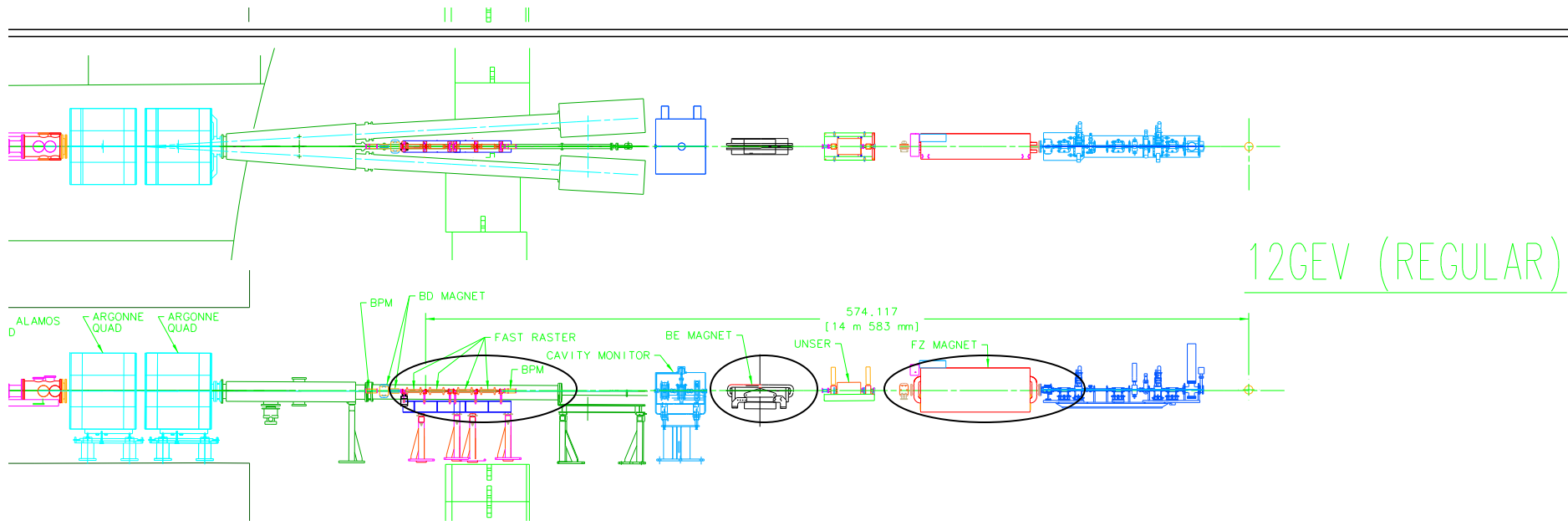
Dave Gaskell  
January 14, 2013

# Hall C 12 GeV Beamline

Hall C beamline redesigned for Qweak – worked hard to make this design compatible with 12 GeV operation (and polarized target..)



# 12 GeV Beamline – Downstream of Møller



## Qweak → 12 GeV

1. Replace raster coils + add 2 more
2. Replace BDs with larger dipoles for vertical chicane
3. Restore Hall C girder to original location

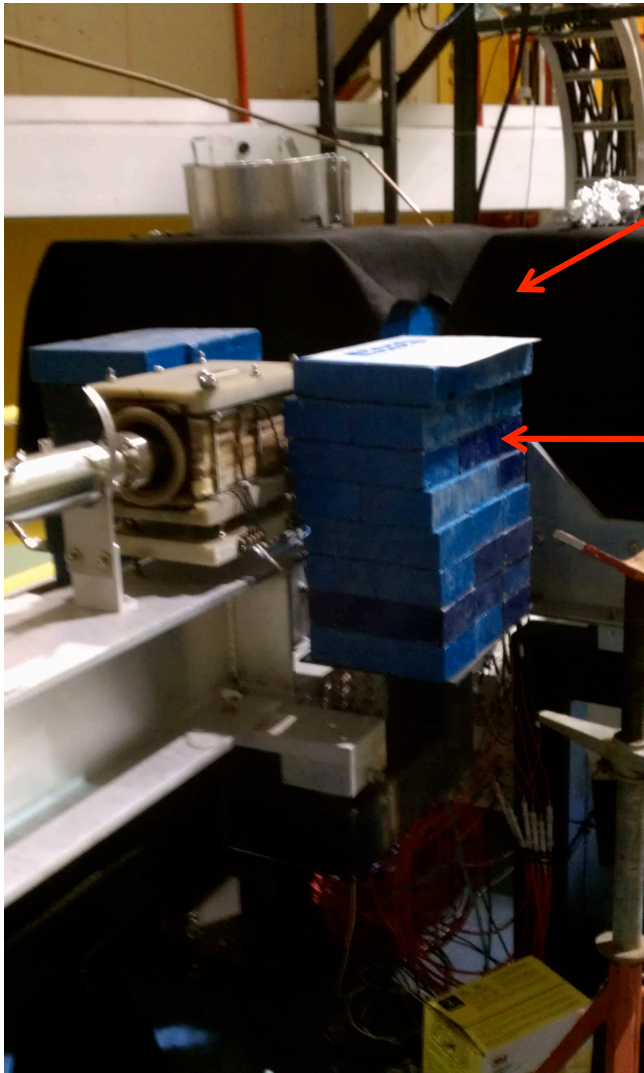
# 12 GeV Beamline Revisited

- Summer 2012, met with J. Benesch and B. Dillon-Townes to re-assess 12 GeV beamline concept
- Still looks good
- Some small changes:
  - Qweak used vertical correctors instead of BE/BZ combo → will not work for 12 GeV, need big dipoles
  - Replace BE/BZ with BE/BE + correctors for vertical jog
  - “Hall C” girder moved slightly for Qweak – will need to be put back in original location
  - Added shielding for Møller detectors near raster – impact will need to be examined

*Detailed design work will begin spring of 2013 – 16 months for design engineering and procurement*



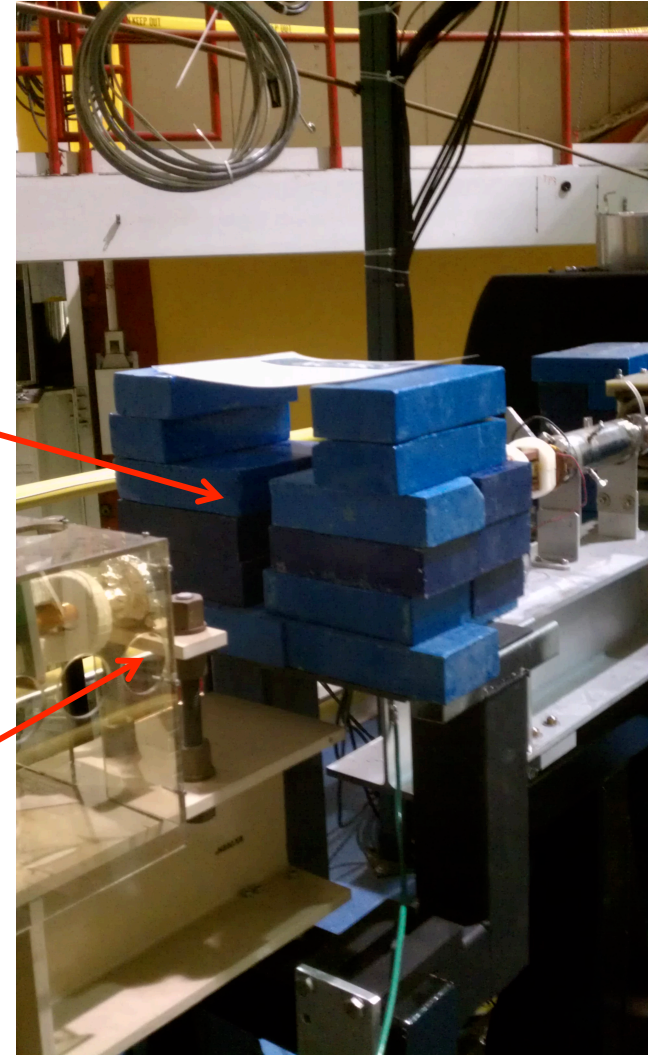
# Extra Shielding along beamline



Moller detectors

Lead shielding supported from beamline stands

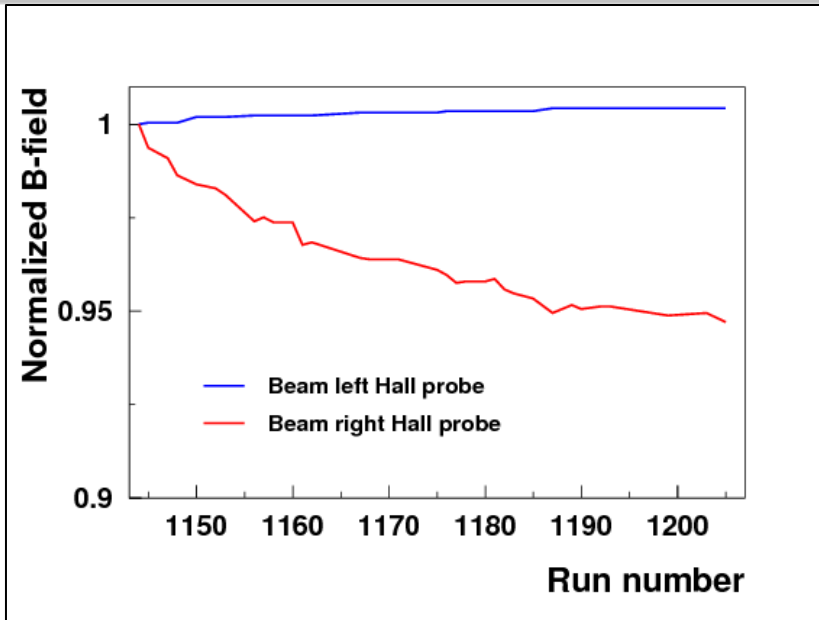
Fast raster



# Møller and Compton Polarimeters

- During Qweak design stage, every effort was made to make the Møller and Compton polarimeters 12 GeV ready
- Nonetheless, there is still some work to be done
- Møller
  - Replace damaged coils
  - New moveable collimators
- Compton
  - Reconfigure chicane to accommodate smaller bend

# Møller Polarimeter

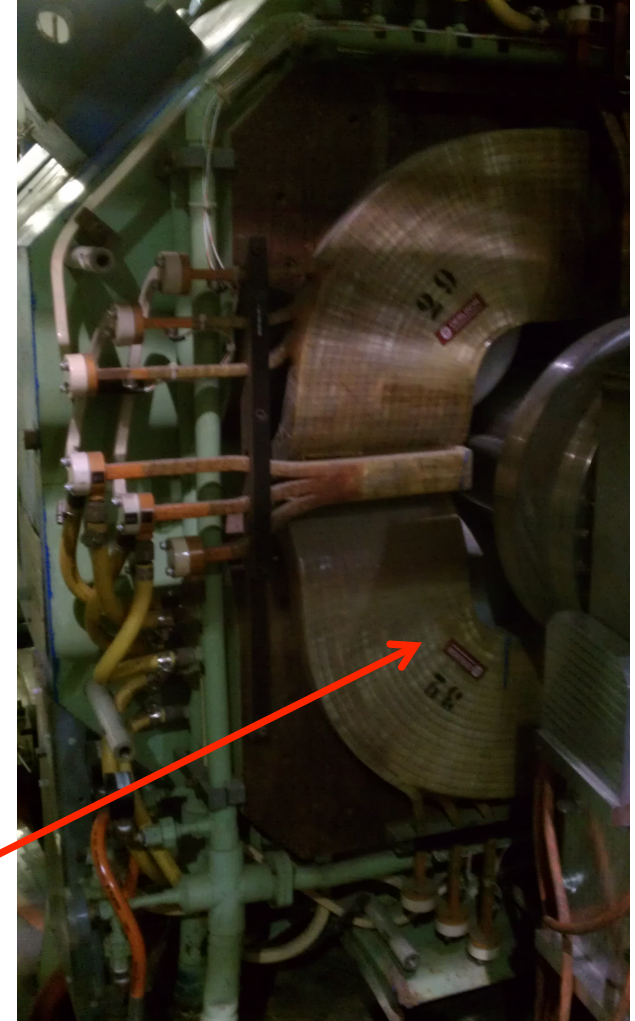


During Qweak, large Møller quad had issues

→ Problem traced to a bad coil, but along the way found that most coils were not “healthy”

→ **Need to replace coils (8 sets of coils + 2 spares)**

Bad coil

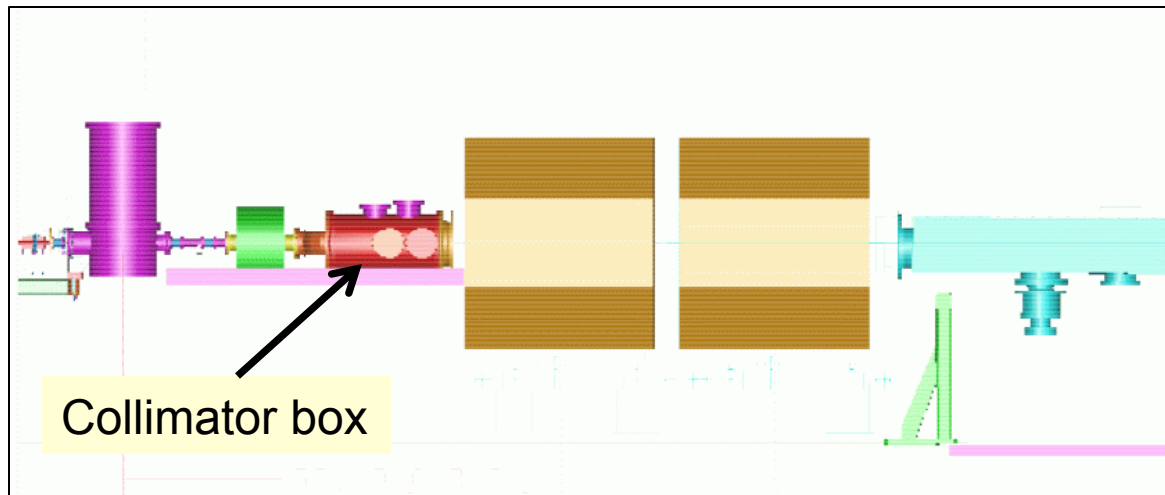


# Møller Polarimeter

## Møller jobs

1. Design and fabricate new coils for large quads
2. Design and fabricate new moveable collimators
3. Fix small quad cooling water clog
4. Install new coils and collimators
5. Fiducialize new collimators in collimator box
6. Field map, B vs. I for large quads with new coils (?)

} Hall C  
} ENG



# New Møller Coils

SEE SHEET-2 FOR DETAILS

SEE SHEET-3 & 4 FOR DETAILS

A. COVER CONDUCTOR WITH ITEM-2 AND MOLD THE COILS  
 B. BRAZE FLANGES TO THEIR CORRESPONDING ENDS AND LEAK CHECK EACH COIL  
 C. ASSEMBLE THE COILS AND WRAP WITH ITEM-3  
 D. VACUUM IMPREGINATE

NOTES:  
 1. ITEM SUPPLIED BY JLAB.

|   |    |                |   |               |   |
|---|----|----------------|---|---------------|---|
| 3 | 10 | -              | BAND B JIC FEMALE SHIFTER                             | BRASS         | 1 |
| 3 | 9  | AMPLIFYING CON | ADAPTER MALE CHIRING FITTING                          | BRASS         | 1 |
| 3 | 8  | -8             | WIRE-1.5 X 1/8 DIA                                    |               |   |
| 2 | 7  | -7             | PLATE<br>.05 X .01 .75 FINISHED SIZE                  | COPPER        | - |
| 3 | 6  | -6             | PLATE<br>.05 X .01 .75 FINISHED SIZE                  | COPPER        | - |
| 1 | 5  | -              | ISODHEM RESIN<br>AS REQUIRED                          | ISODHEM RESIN | - |
| 1 | 4  | -              | EPoxy - 9728, PART A & B<br>27 kg (72 lbs)            | 2 PART EPOXY  | - |
| 1 | 3  | -              | 01 FIBERGLASS TAPE 1" WIDE<br>2 ROLLS                 | FIBERGLASS    | - |
| 1 | 2  | -              | 03 WALL SLEEVING FIBERGLASS<br>1641 W (5.284 FT)      | FIBERGLASS    | - |
| 1 | 1  | LINATA<br>R023 | CONDUCTOR 1970 KG (1641 W)<br>14.2mm X 11.4mm X 1.6mm | COPPER        | 1 |

REVISIONS

| NO. | DATE     | DESCRIPTION            | BY      | CHKD |
|-----|----------|------------------------|---------|------|
| 1   | 11/20/00 | ISSUED FOR FABRICATION | W. HALL |      |

APPROVALS

| APPROVED | DATE       | APPROVED | DATE |
|----------|------------|----------|------|
| W. HALL  | 12-20-2001 |          |      |

THIRD ANGLE PROJECTION

67124-00001

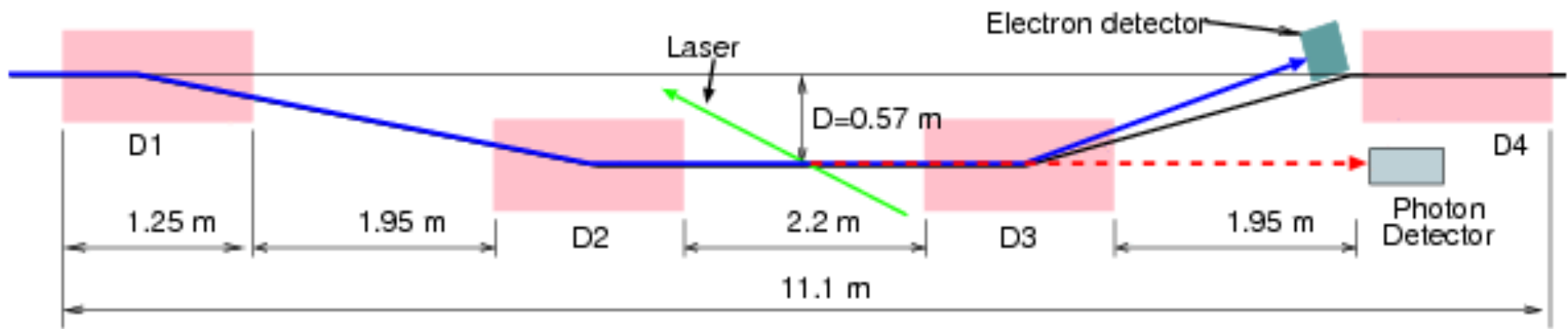
1:2

SHEET 1 OF 4

Had to make drawings for replacement coils “from scratch” – in the process of purchasing copper, getting quotes for fabrication

# Compton Polarimeter

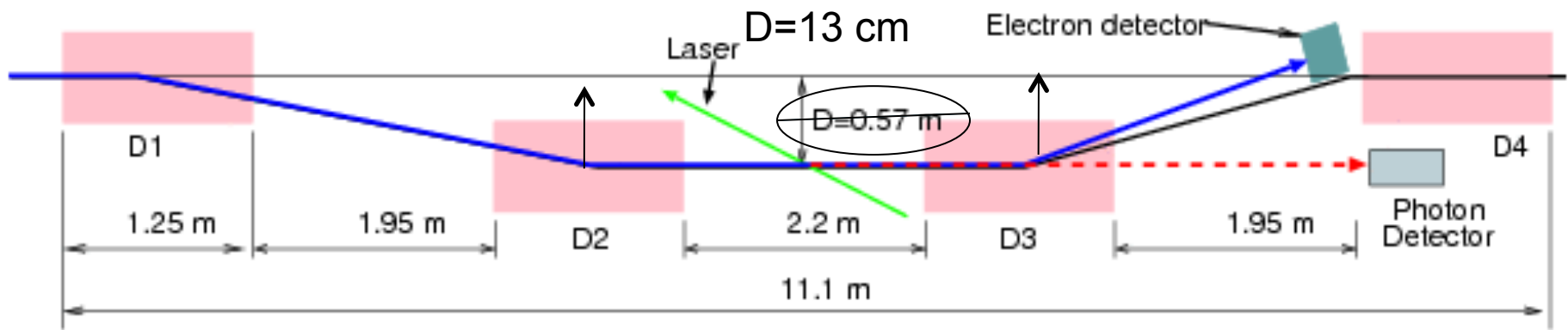
- Compton polarimeter dipole chicane must be re-configured for 12 GeV operations
  - Qweak  $\rightarrow$  beam deflected 57 cm vertically





# Compton Polarimeter

- Compton polarimeter dipole chicane must be re-configured for 12 GeV operations
  - Qweak  $\rightarrow$  beam deflected 57 cm vertically
  - 12 GeV  $\rightarrow$  beam deflected 13 cm
- Dipoles 2 and 3 must be raised
  - Impacts dipole stands, beam pipe, electron detector chamber

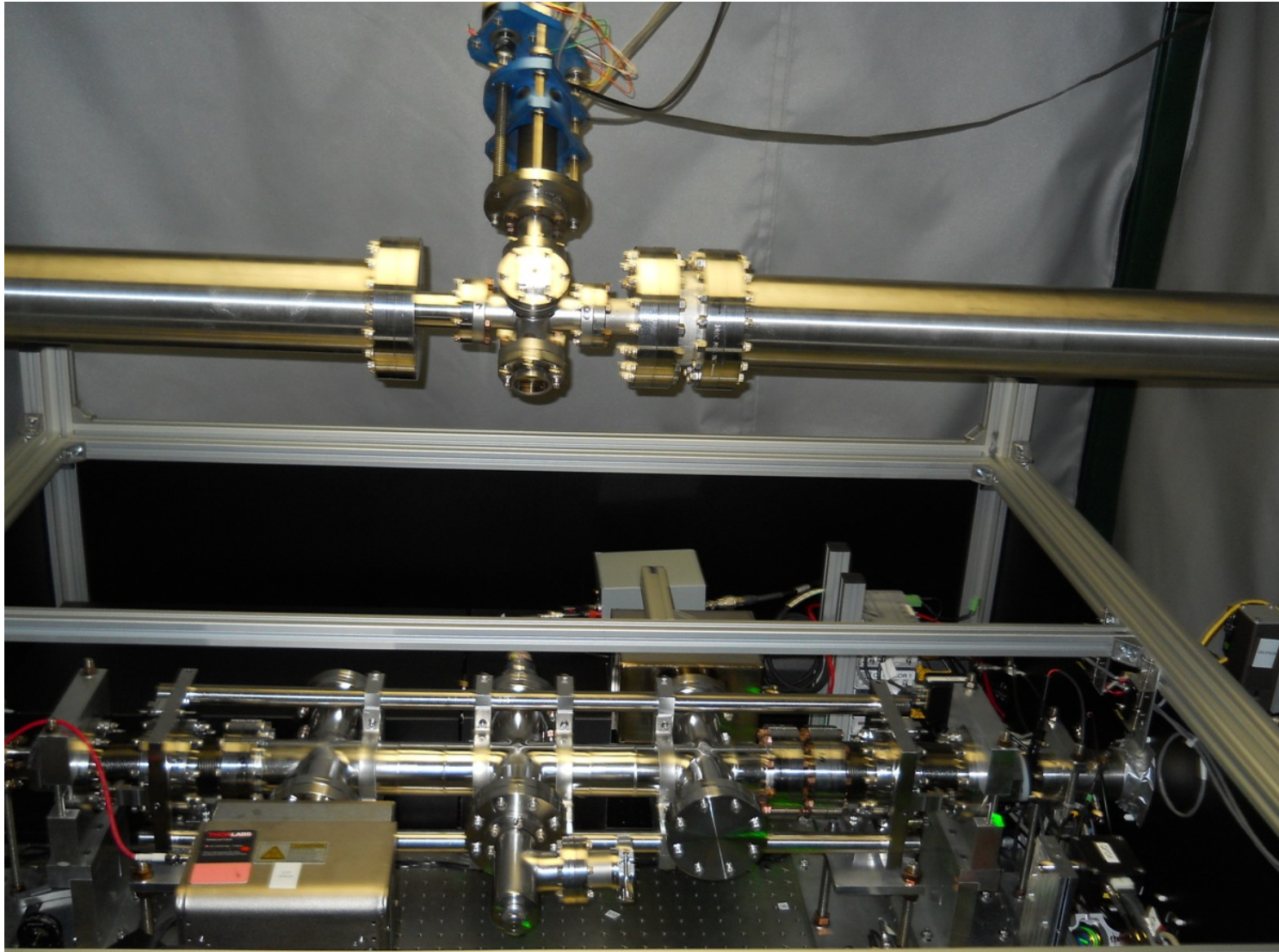


# Compton 12 GeV Design – Key Issues

- Will interaction region “fit”?
  - Interaction region (where laser collides with beam) is “tall”, complicated design.
  - Paulo verified last year that it should be ok – need to rotate valves 90 degrees.
- Dipole 3-4 region
  - Need to accommodate main electron beam + scattered electrons and backscattered photons
  - Instrumentation – MCC wants/needs a BPM and corrector in that region

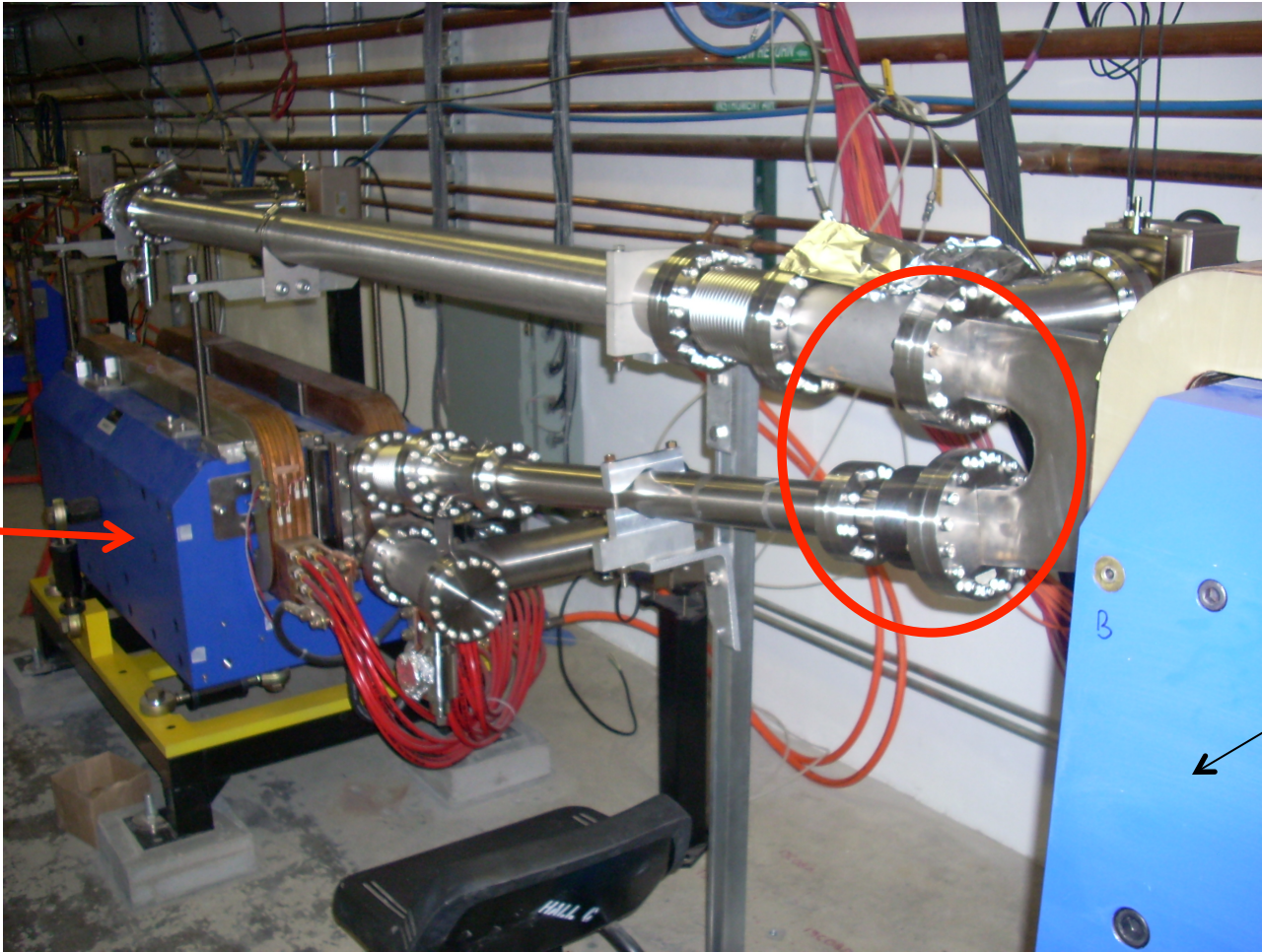


# Compton Interaction region



# Compton Polarimeter

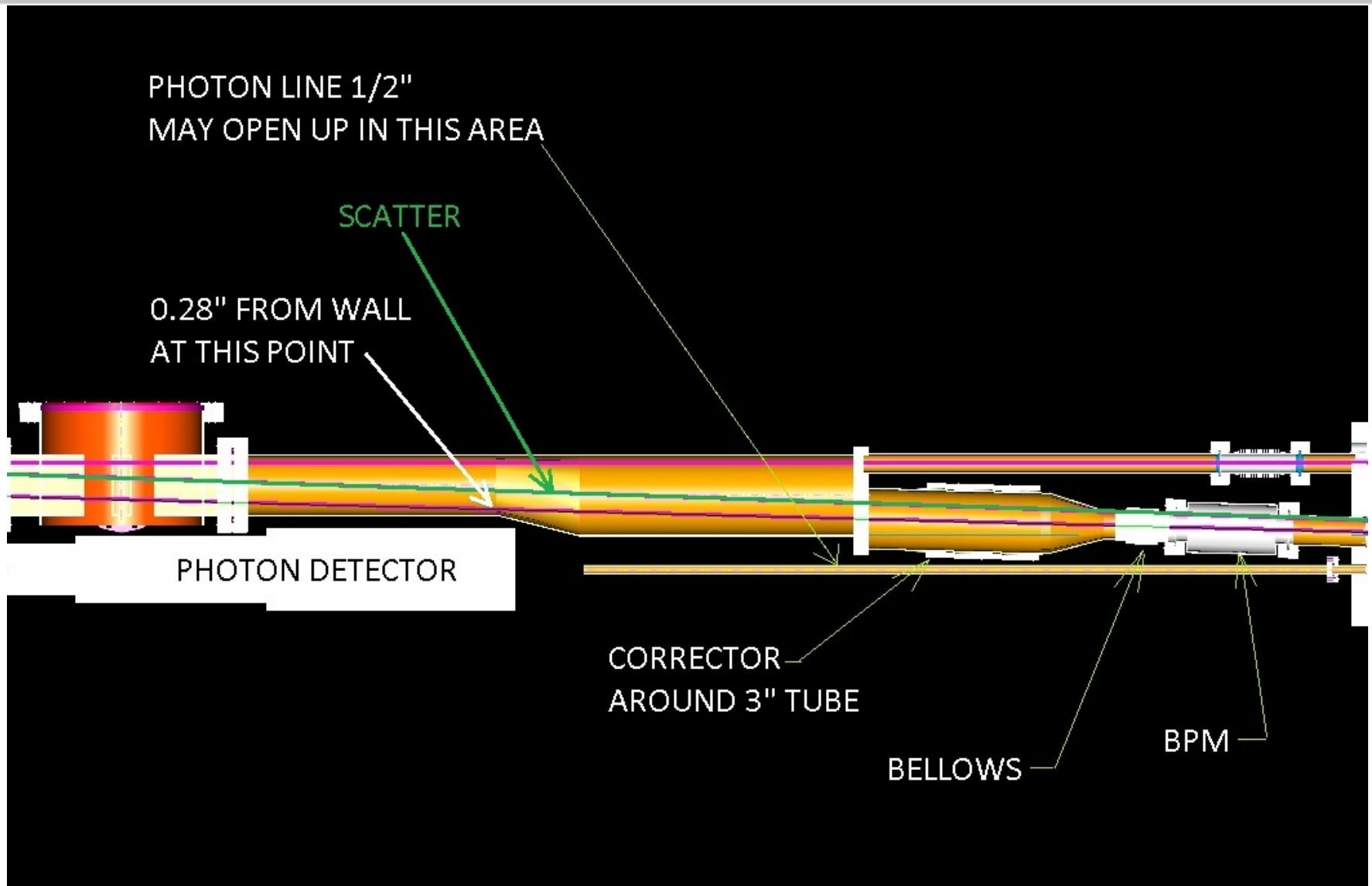
Dipole 3



Dipole 4

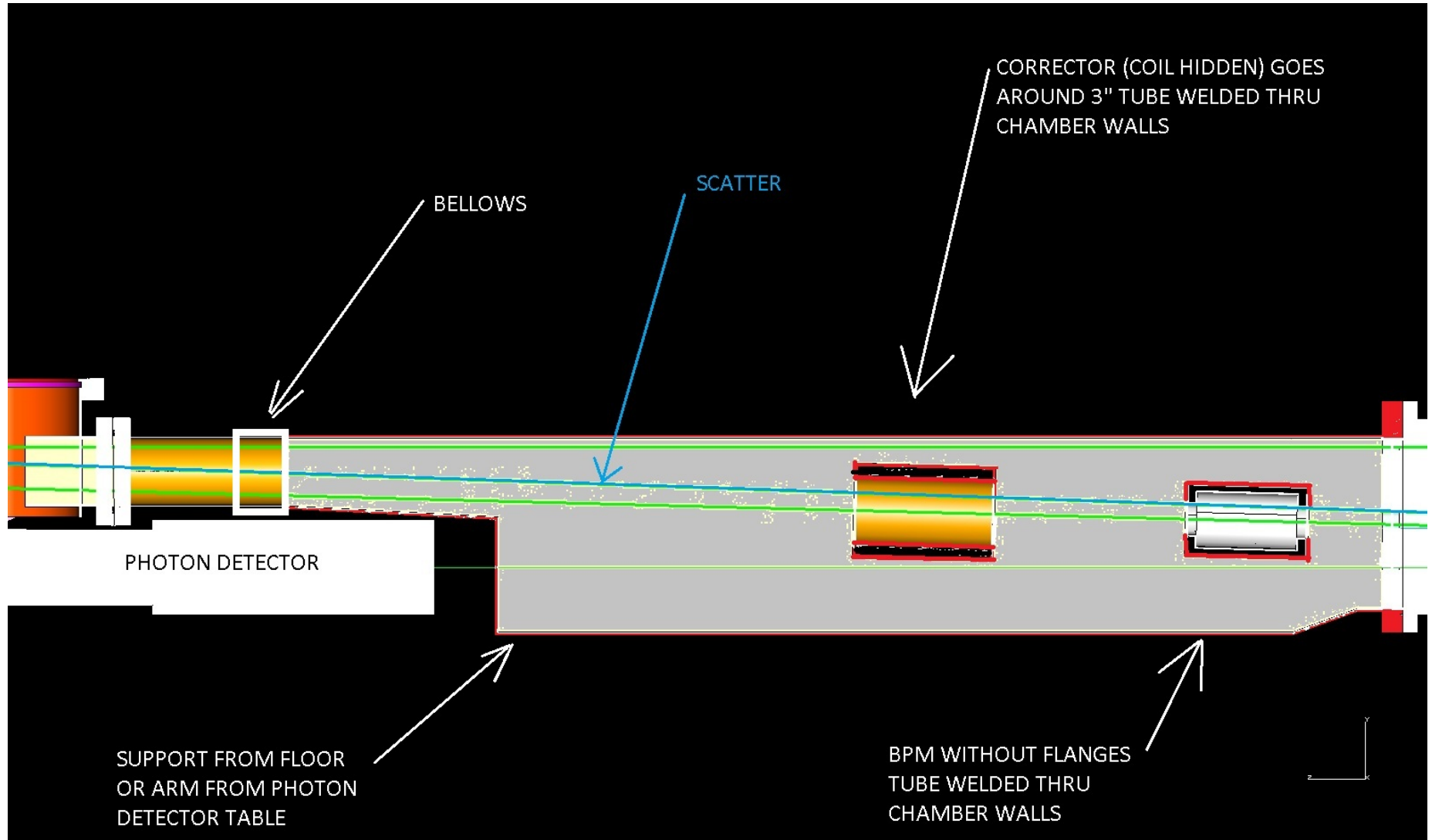


# Compton 12 GeV Design





# Compton 12 GeV Design

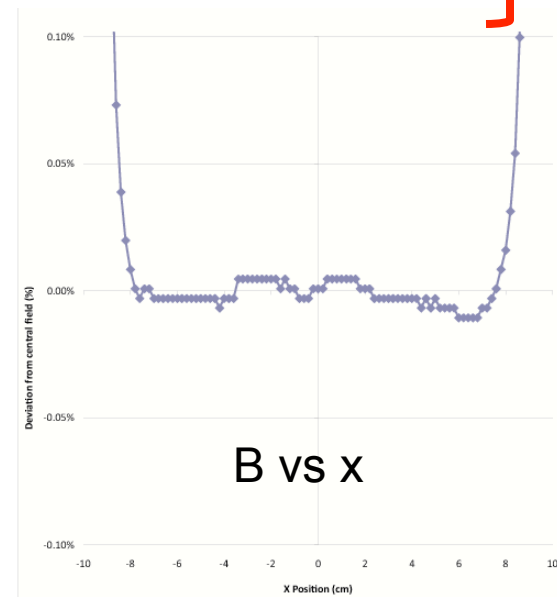
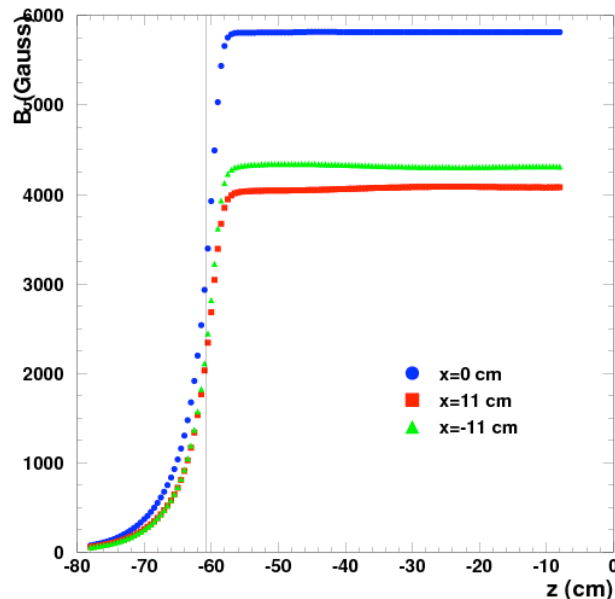


# Compton Polarimeter

## Compton jobs

1. Modified chicane design, vacuum pipe, stand fabrication
  2. Installation of dipole 12 GeV poles (exist)
  3. Raise dipoles
  4. Install new vacuum pipes where needed
  5. Map dipole (in situ?) with new poles
  6. Re-fiducialize detectors, chicane survey and alignment
- Hall C
- ENG

B vs z



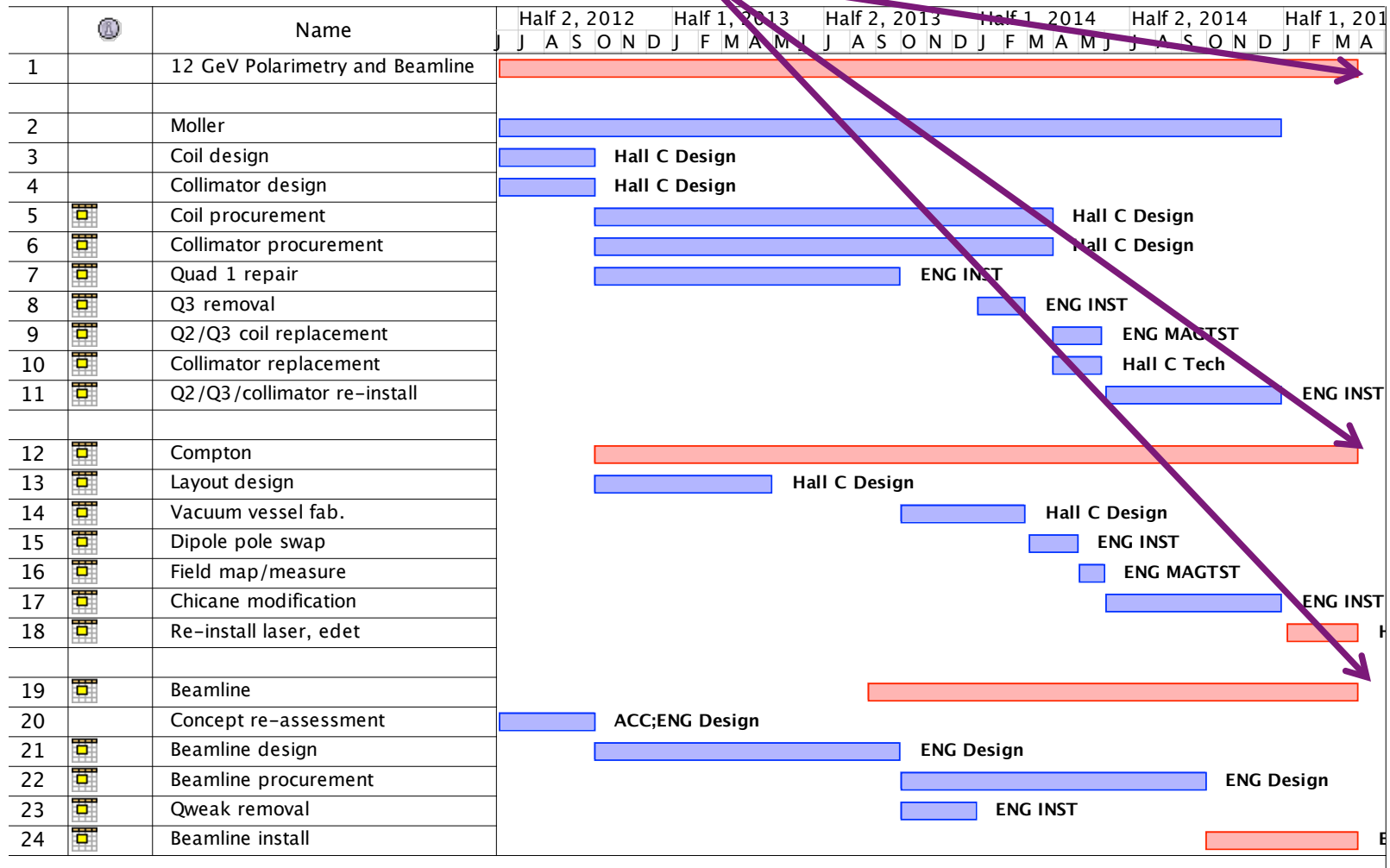
B vs x

# Timeline

- First beam to Hall C expected in Spring 2015
  - In planning, I assume that means April 1
- Polarimetry (Compton, Møller) not required for initial Hall C experiments
  - May be needed in 2016 if polarized  $^3\text{He}$  program begins at that point
  - Møller quads part of normal beamline optics, but existing large quad adequate for beam delivery
- I would like to have everything, including the polarimeters, ready “Day 1” – this will allow time to re-commission the system and fix problems before polarimetry is required

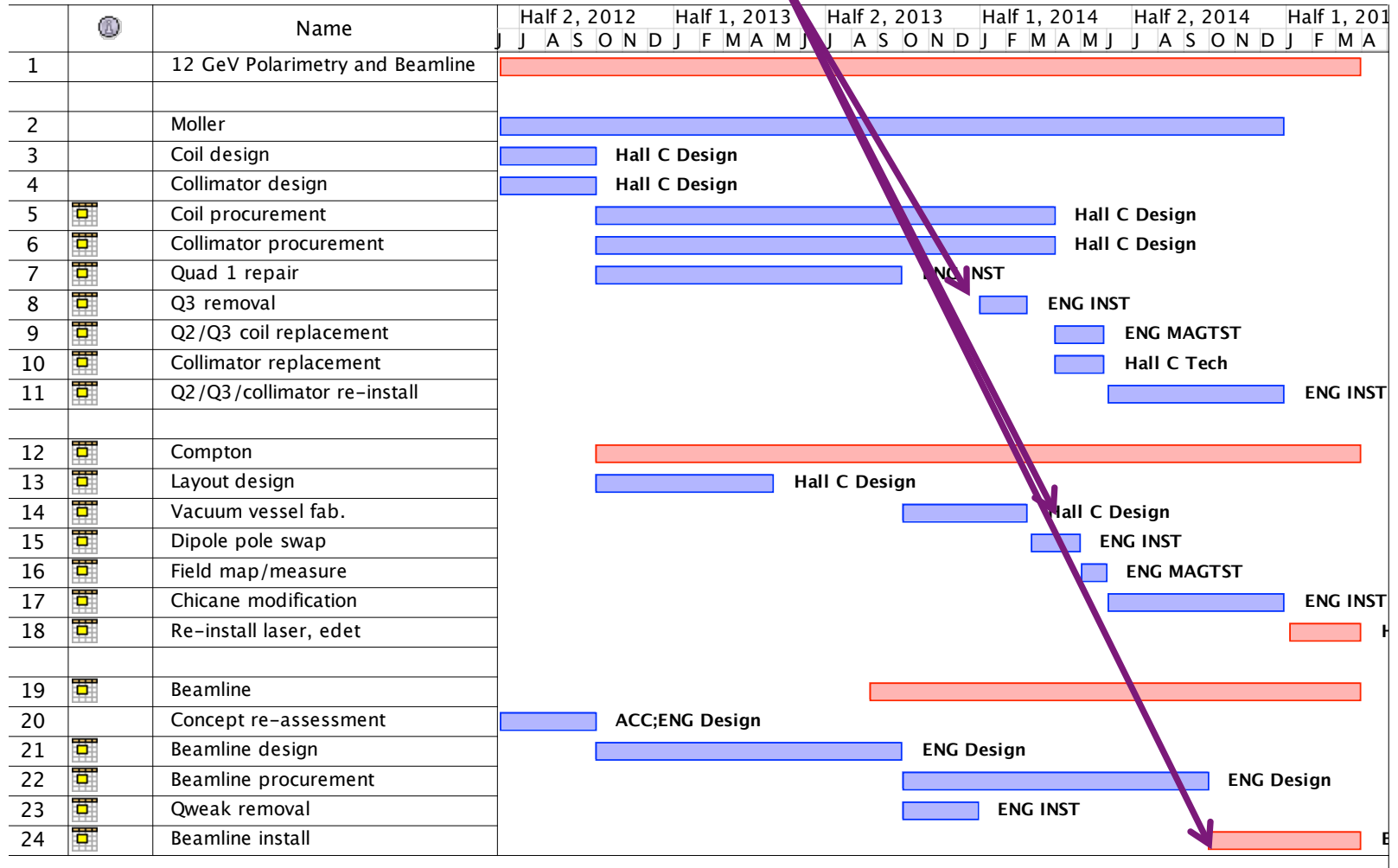
# Proposed Timeline

Møller, Compton, Beamline ready April 1, 2015



# Proposed Timeline

Beamline installation work in hall begins January, 2014





# Proposed Timeline

Design work and procurement complete by January-August, 2014

