2014 DVCS Run Preparations

DVCS and GMP Symbiosis

Charles Hyde

Three models:

- Independence
  - GMp installs and runs first ~1 PAC month
    - Full operation of both HRS for GMp, no Luminosity limits from DVCS
  - One month shutdown for DVCS installation
  - DVCS runs ~3 PAC months
  - No modification to scattering chamber needed

No 11 GeV beam before Autumn 2014

- Cooperation
  - GMp and DVCS install together (except DVCS Calo.)
  - GMp runs independently
    - Restrictions on HRS angles from vacuum chamber and DVCS stand
    - Restrictions on HRS movement from DVCS cables and stand,
    - HRS movement needs manual assistance
  - One week shutdown to install DVCS Calo.
  - DVCS runs ~3 PAC months
    - GMp acquires parasitic data in HRS-R at large angles.

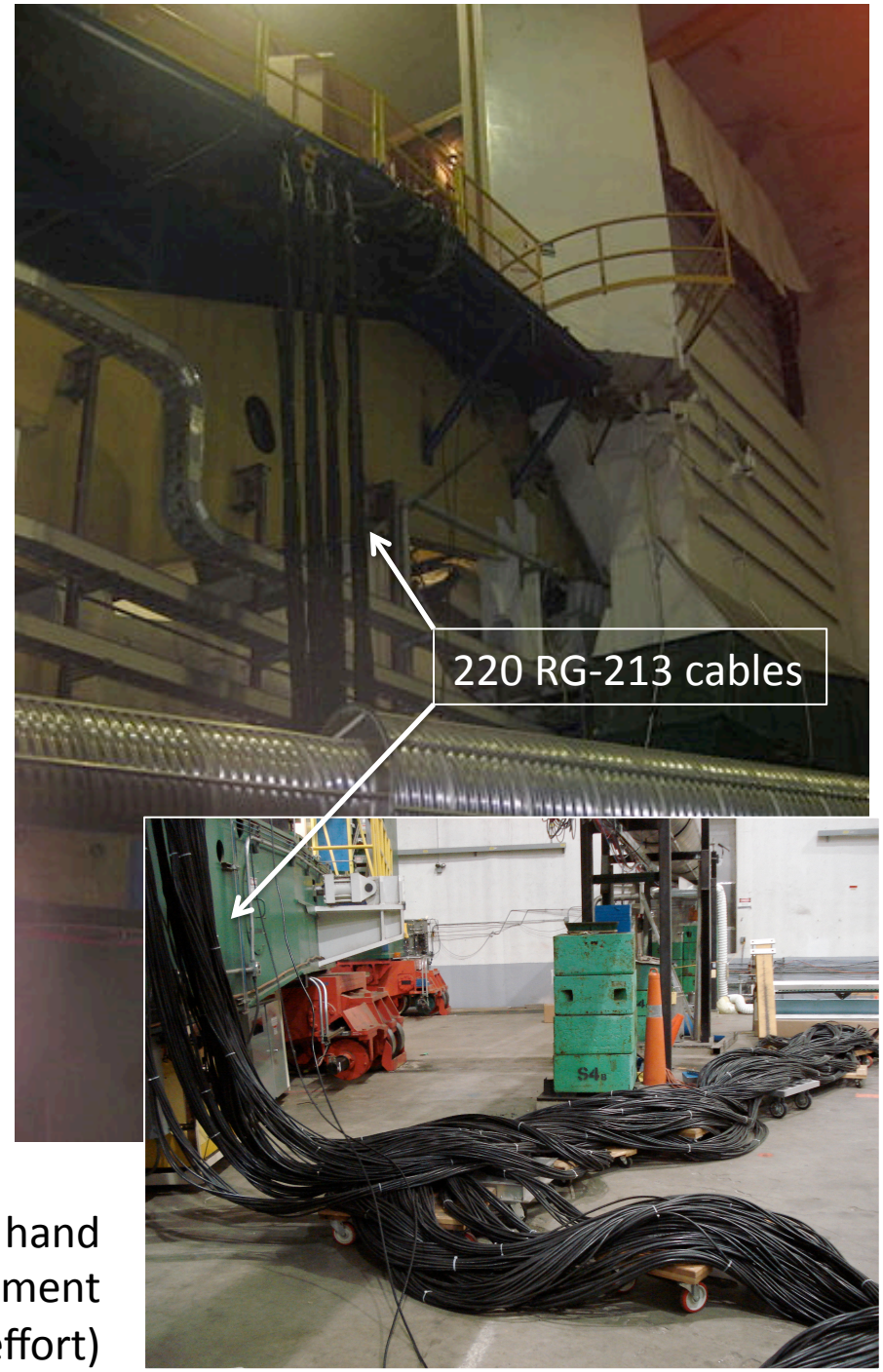
Must have DVCS DAQ operational Jan 2014

- Symbiosis
  - GMp and DVCS fully install together
  - GMp and DVCS running is interlaced (circa weekly)
    - Maximum luminosity is 25μA × 15 cm LH_2 (radiation limit for DVCS Calo.)
    - Beam in Compton Chicane
    - Restrictions on HRS angles and movement
    - GMp acquires "unlimited" parasitic data in wide angle HRS-R
      - Luminosity is correlated with beam energy: 10^{37} @ 6.6 GeV, of $10 \bullet 10^{37}$ @ 11 GeV
    - GMp angles < 49° only accessible with HRS-L
      - DVCS Calo parked in "safe mode" at 5.5 m from target at 14°

Too many restrictions on G_M^p

DVCS Cabling

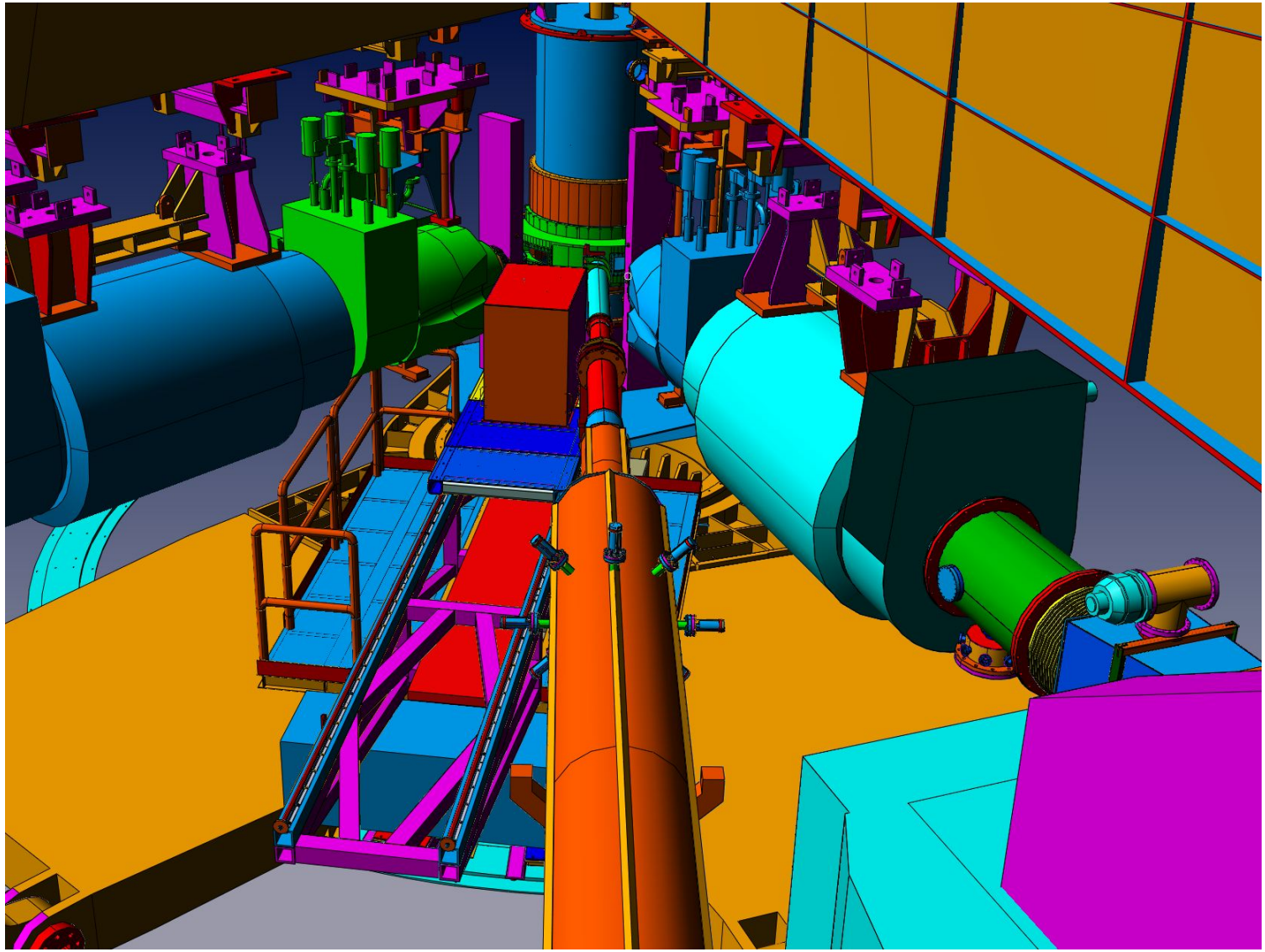
Spectrometers movement must be monitored in the Hall



DVCS cables must be moved by hand with HRS-L movement (multi-person effort)

New (skinny) support for DVCS Stand

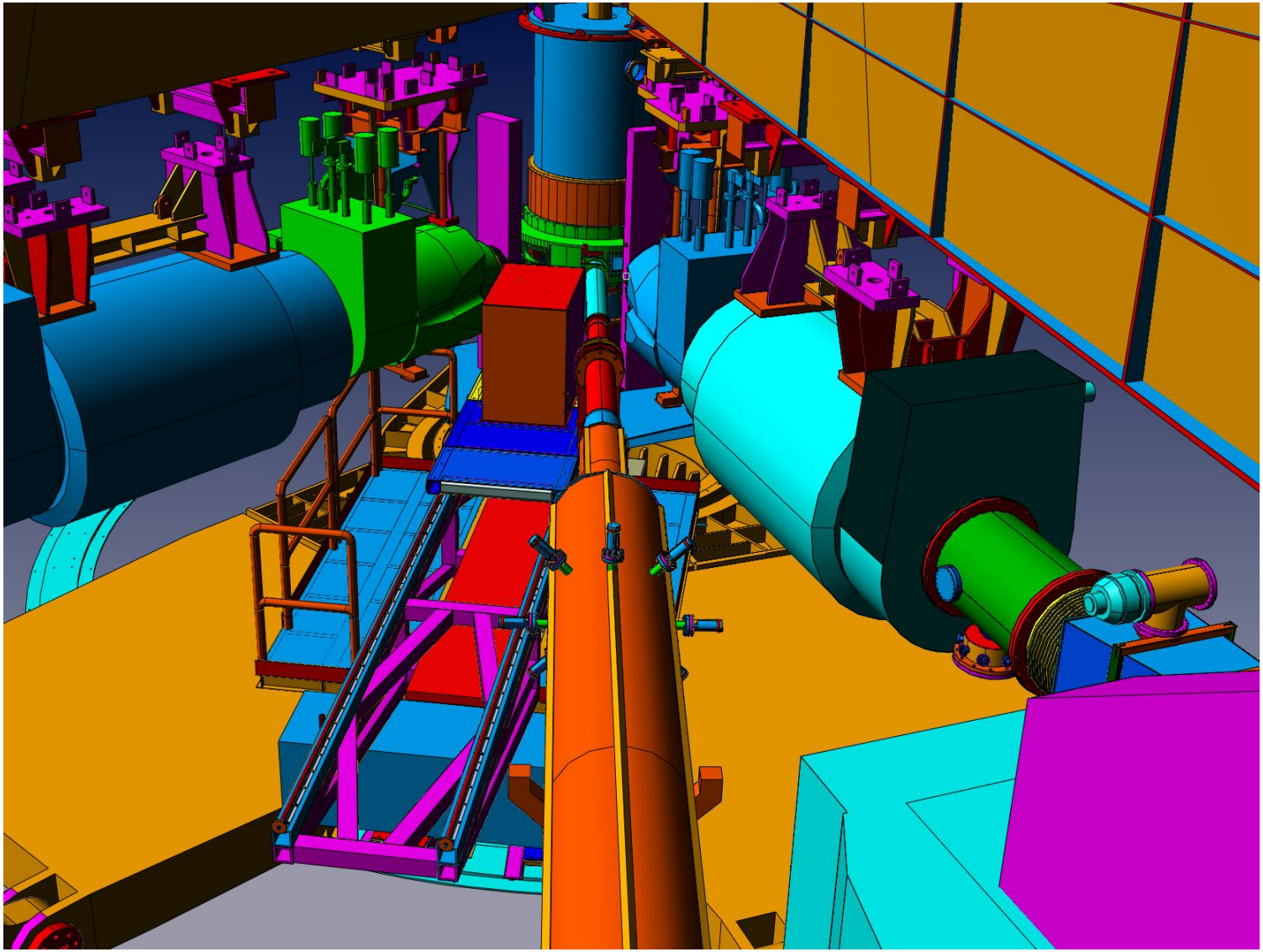
HRS-L: 20.2°; HRS-R: –43°; DVCS:–8.5°



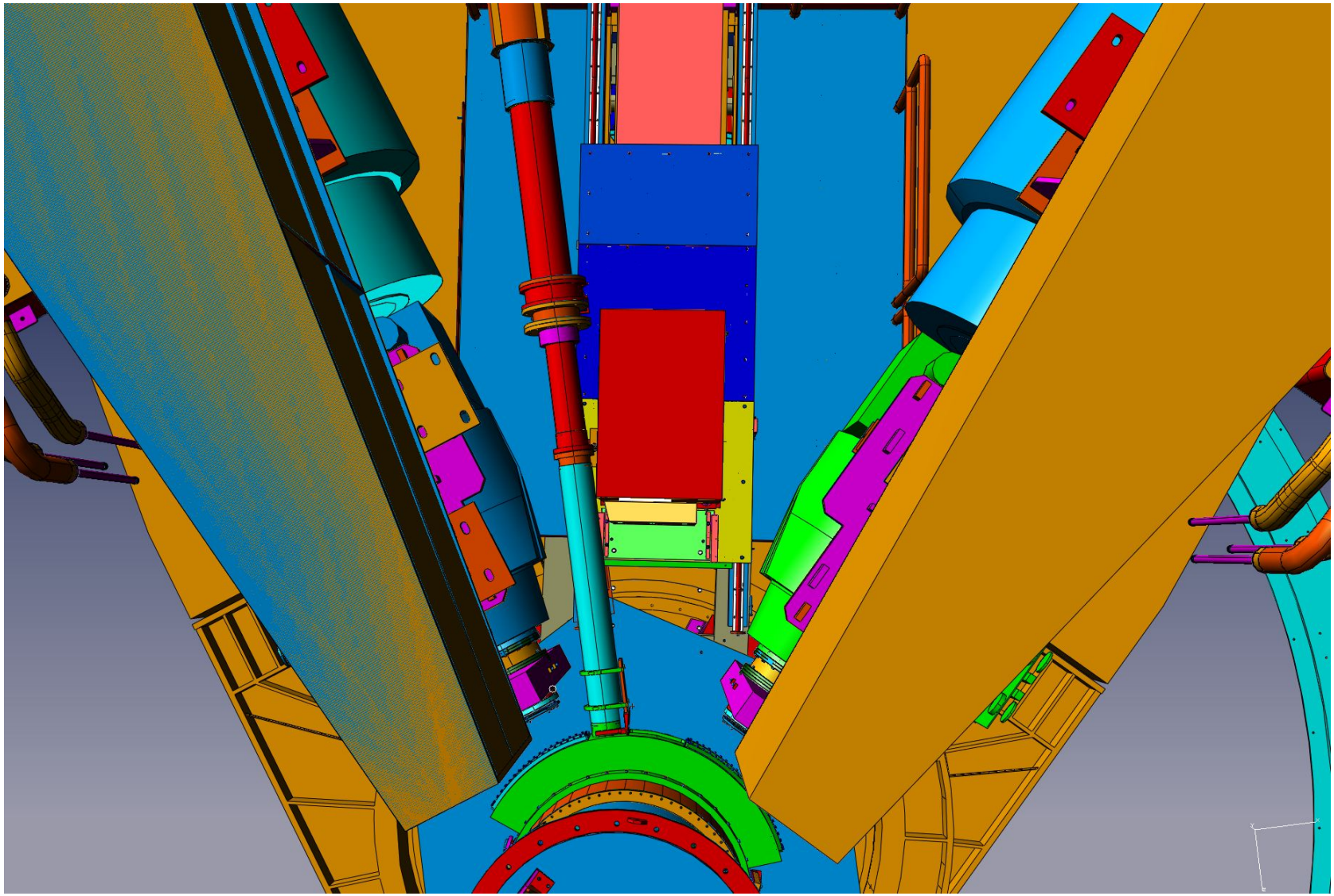
New (skinny) support for DVCS Stand

HRS-L: 20.2°; HRS-R: –43°; DVCS:–8.5°

- Removable support struts for walkways
- Must be removed for angle changes



DVCS: –8.5° and 2.0 m from target center (minimum distance 1.5 m)



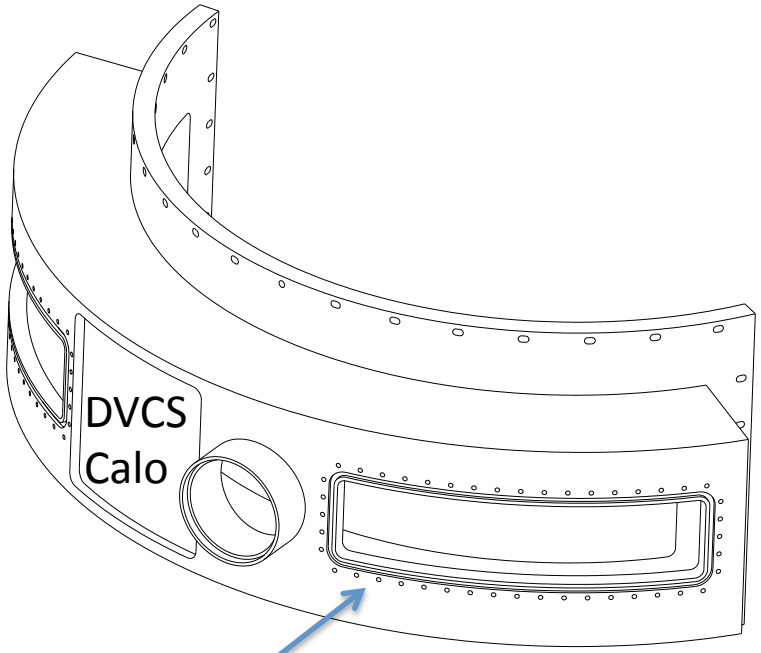
Angle Restrictions

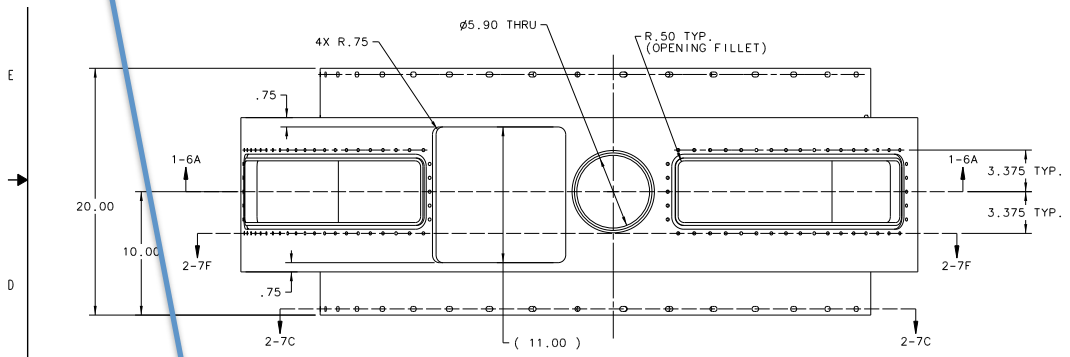
(Approximate, to be revised)

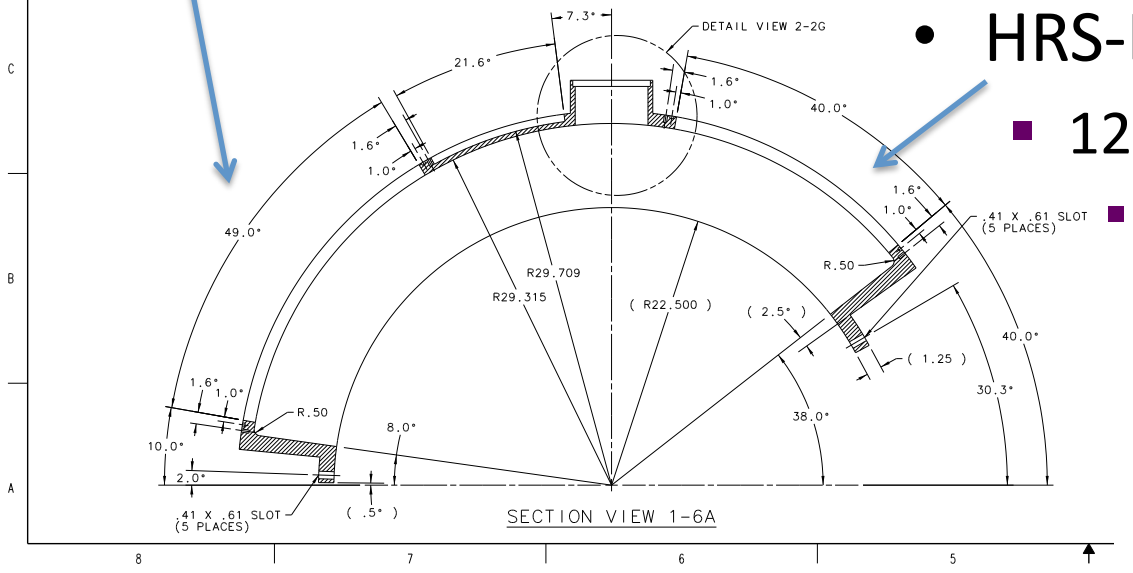
- Minimum (central) HRS—DVCS-Calo opening angle: 25° (limited by DVCS-Calo stand)
  - θ(HRS-L)–θ(DVCS-Calo) ≥ 28.7°
    - HRS-L ≥ 19° with DVCS-Calo @ –9.7°
  - θ(DVCS-Calo)–θ(HRS-R) ≥ 34.5°
    - |HRS-R| ≥ 49° with DVCS-Calo @ –14.5°
- Restrictions of the common Scattering Chamber design
  - HRS-L ≤ 46°
  - HRS-R: 33°—80°

Scattering Chamber

- HRS-R (central angles)
  - 49°—80° w/ DVCS Calo @ 14.5°







- HRS-L
  - 12.5°—46° (central angles)
  - 14.5° min w/ Calo @ 14.5°

E12-04-114 DVCS Kinematics: nucl-ex/0609015

Beam (GeV)	k' (GeV)	θ (HRS-L)	Q^2 (GeV^2)	x_{Bj}	Beam (μA)	θ(Calo)	d(Calo) (m)	Time (days)	
6.6	2.15	26.5°	3.0	0.36	5.0	–11.7°	1.5	3	
6.6	3.20	22.5	3.1	0.50	5.0	–18.5	1.5	5	
Subtotal days @ 6.6 GeV									8
8.8	2.88	22.9	4.0	0.36	8.5	–10.3	2.0	2	
8.8	3.68	22.2	4.8	0.50	8.5	–14.5	2.0	4	
8.8	4.27	21.2	5.1	0.60	5.0	–17.8	1.5	13	
8.8	3.47	25.6	6.0	0.60	5.0	–14.1	1.5	16	
Subtotal days @ 8.8 GeV									35
11.0	4.26	17.9	4.5	0.36	13.	–10.8	2.5	1	
11.0	4.29	21.1	6.3	0.50	13.	–12.4	2.5	4	
11.0	3.32	25.6	7.2	0.50	13.	–10.2	2.5	7	
11.0	4.16	23.6	7.7	0.60	13.	–13.1	2.5	13	
11.0	3.00	30.2	9.0	0.60	20.	–10.2	3.0	20	
Subtotal days @ 11 GeV									45

G_M^p Proposal

Kinematics

- Last two kinematic points rejected by PAC
- Possible parasitic points in blue

- 3 Beam Energies
  I = 80μA
- Both HRSs in symmetric configuration*
- 3 Redundant Q^2
  - Different ε
- 21.5 days for LH_2
- 31 days requested

Update for the PAC35 presentation

E_e (GeV)	Q^2 $(GeV)^2$	θ_e (deg)	E' (GeV)	ϵ	Rate (Hz)	Time (hours)	Events
4.8**	7.0	71.0	1.08	0.25	0.60	9.3	40k
6.6	7.0	35.4	2.87	0.62	7.45	0.7	40k
6.6	8.0	42.0	2.35	0.51	2.29	2.4	40k
5.8**	9.0	77.0	1.00	0.18	0.15	36.3	40k
6.6	9.0	52.0	1.78	0.37	0.48	11.6	40k
8.8	9.0	29.3	4.00*	0.67	3.38	3.3	40k
6.6	10.0	67.0	1.25	0.23	0.15	38.3	40k
8.8	10.0	33.3	3.47*	0.59	1.31	8.5	40k
8.8	11.0	38.0	2.95	0.51	0.53	10.5	40k
8.8	12.0	44.0	2.42	0.41	0.21	26.7	40k
8.8	13.0	53.0	1.86	0.30	0.06	67.4	28k
11.0	13.0	31.3	4.07*	0.58	0.36	21.2	28k
11.0	14.0	35.0	3.54*	0.50	0.17	39.0	24k
~~11.0~~	~~15.5~~	~~42.0~~	~~2.74~~	~~0.39~~	~~0.053~~	~~52.8~~	~~20k~~
~~11.0~~	~~17.0~~	~~53.0~~	~~1.94~~	~~0.26~~	~~0.013~~	~~175.2~~	~~16k~~
						503.3	

Target Configuration

LH_2 : 20 cm Racetrack

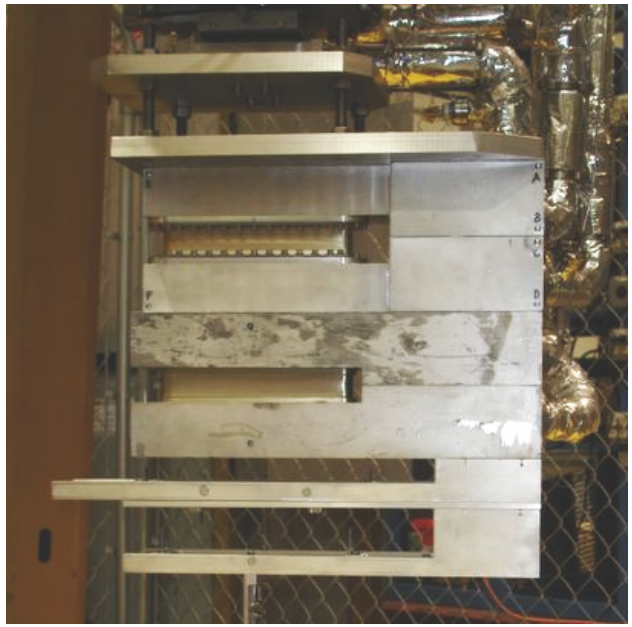
- Vertical Flow Design
- Dedicated Studies of density stability
- Luminosity Monitor in datastream

Solid Aluminum Foils (Dummy)

- Endcap subtraction

Carbon Optics Targets

- 1-2 cm spacing along z_{lab} for extended target optics/acceptance



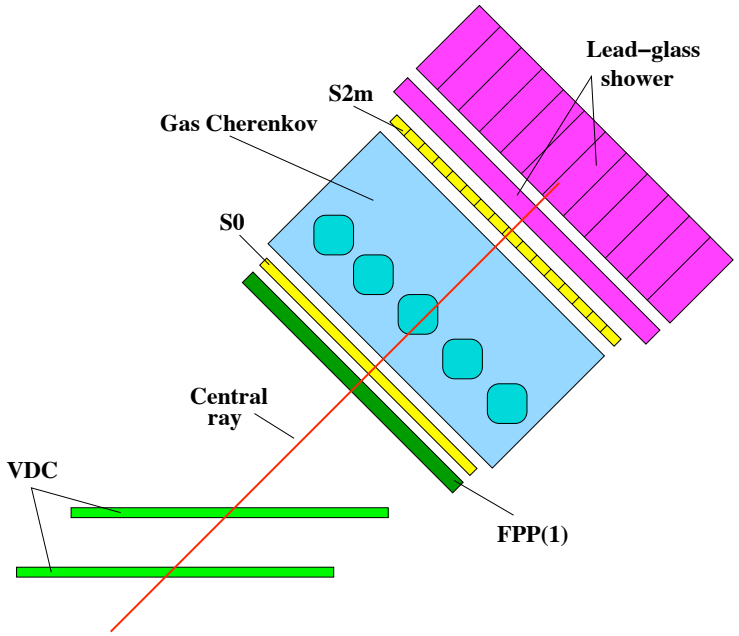
Picture from 2005 HAPPEX-II

Maximum vertical acceptance of DVCS Calo: ±(24cm/150 cm) Target vertical aperture = ±15cm*160 mr = ±2.4 cm

Solid Target / Racetrack Endcaps measured with X-ray attenuation

Detector Configuration

- Cerenkov mirrors need re-coating.
- Short Cerenkov for FPP chamber?
- Trigger options:
  - S0
  - Cerenkov
  - Pb-Glass



2013

- Reconstruct the Calorimeter
  - Return PMT to JLab
  - re-wrap blocks
- Remount calorimeter
  - Space in TEDF building?
  - Small stand for Calo
  - Space to organize cables?
  - Need 200 x ~5m cables to connect to ARS
- Re-commission ARS/Trigger/CODA
- Ready for Jan 2014?