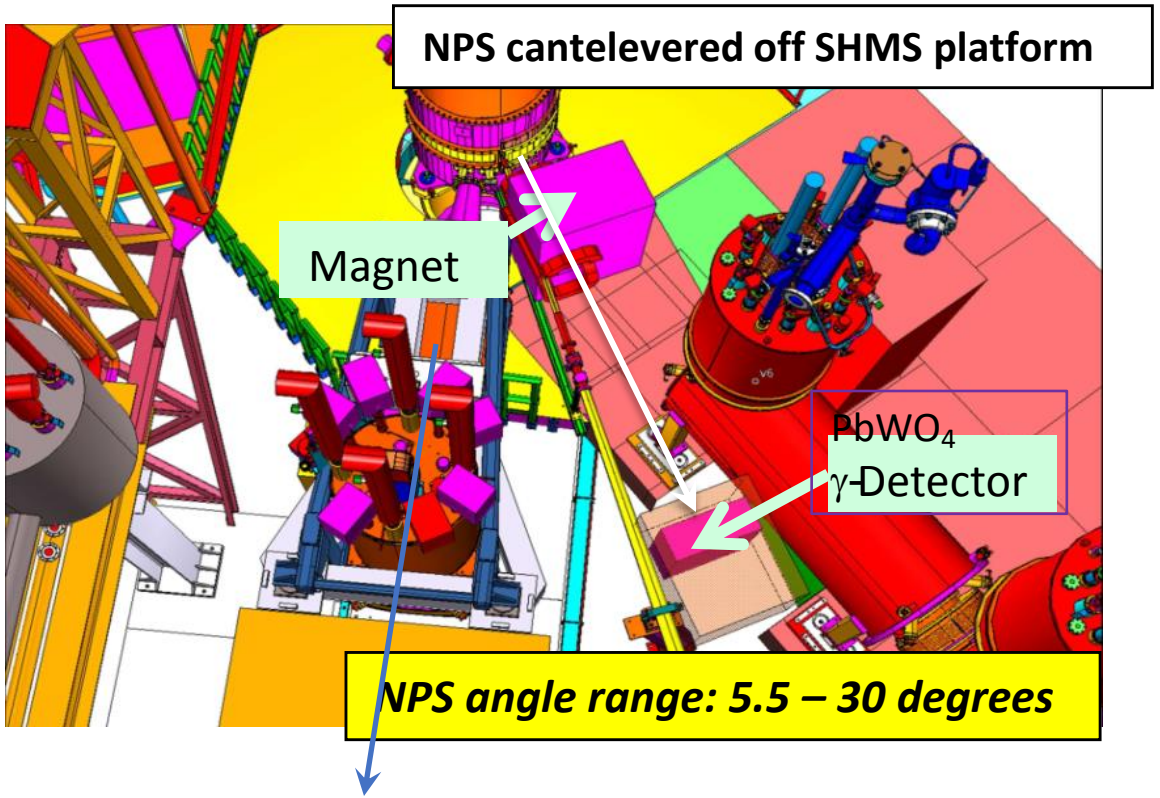
Neutral Particle Spectrometer (NPS) + Compact Photon Source with Longitudinal & Transverse Polarized NH_2

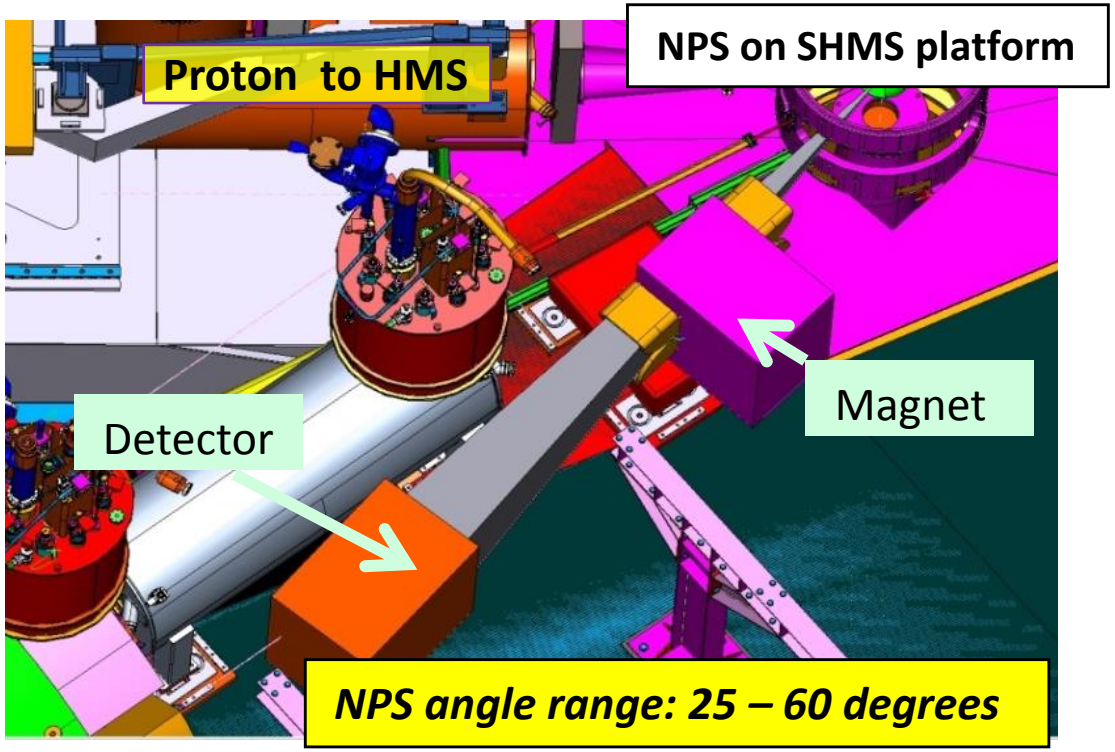
Experiment	Exp #	Beam	Target	PAC Days	Rating
π^0 SIDIS	E12-13-007	$\vec{e}^-$	L H_2	26	A⁻
DVCS and Exclusive π^0	E12-13-010	$\vec{e}^-$	L H_2	53 = (26)+27	A
Wide Angle Compton Scattering (WACS)	E12-14-003	e^-, γ	L H_2	18	A⁻
Wide Angle Exclusive π^0 photoproduction	E12-14-005	e^-, γ	L H_2	(18)	B
Initial State Helicity Correlation in WACS	E12-14-006	CPS: $\vec{\gamma}$	$N\vec{H}_3$	31	B
A_{LL} & A_{LS} Polarization Observables in WACS at large s, t, and u	C12-17-008	CPS: $\vec{\gamma}$	$N\vec{H}_3$	46	A⁻
Timelike Compton Scattering (TCS) off a Transversely Polarized Proton	C12-18-005	CPS: $\vec{\gamma}$	$[N\vec{H}_3]_T$	35	C2

NPS Layout on SHMS Carriage

- DVCS H(e,e' γ)p, Deep H(e,e' π^0)p

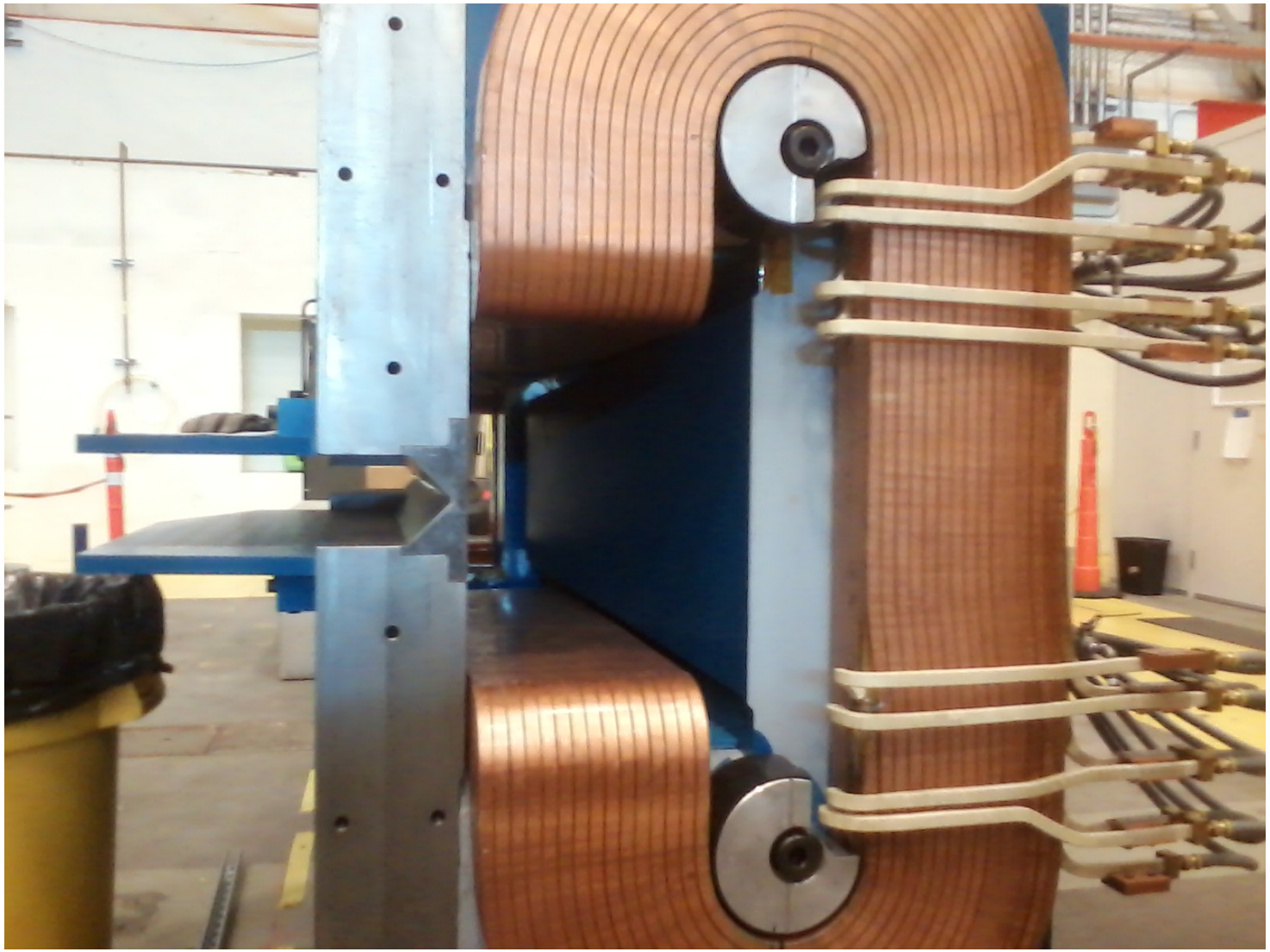


- WACS H(γ, γ p), Wide angle H(γ, π^0p)



Sweep Magnet replaces SHMS Horizontal Bender

- Looking upstream
  - Vertical bend ~0.3 Tm
- 1cm steel septum between 0-field beam pipe and γ–aperture (at smallest angle setting)
- Ready for power, cooling
- Magnetic field mapper constructed at ODU

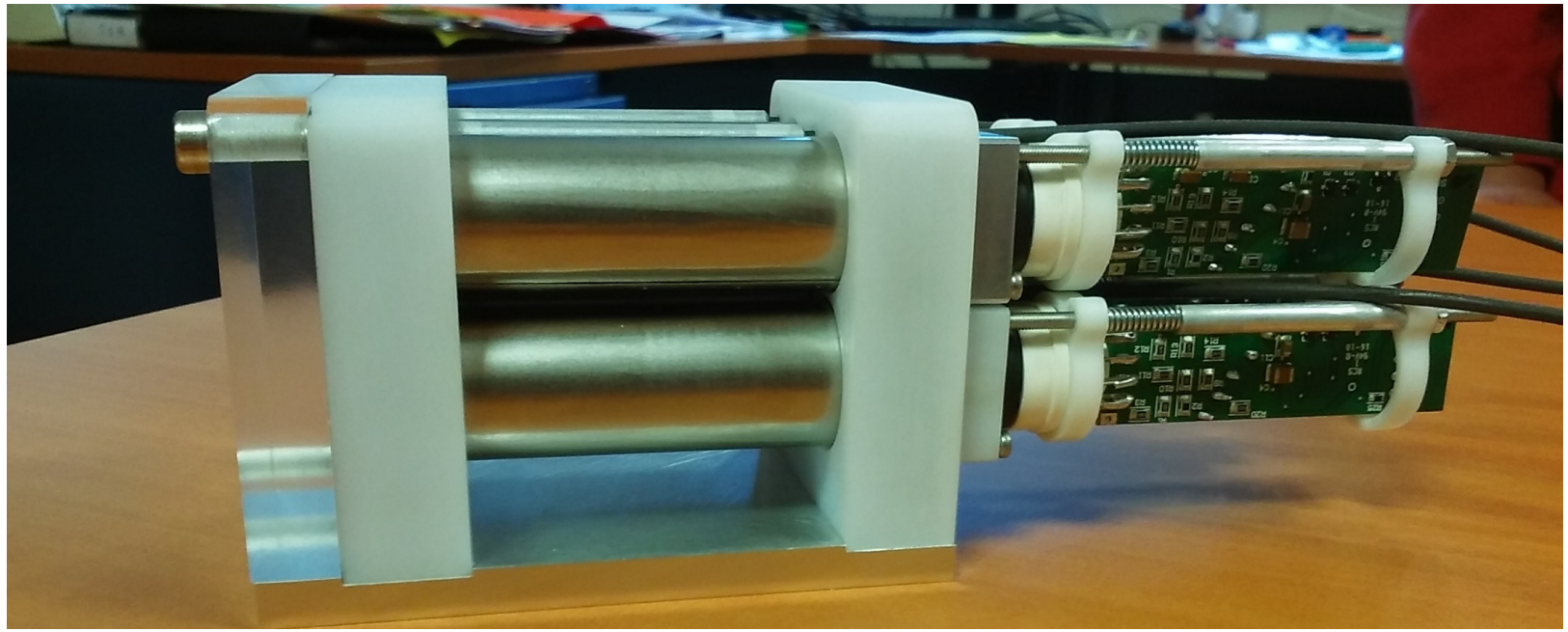


$PbWO_4$ Crystal Procurement *2x2x20 cm^3*

- SICCAS (China): 460 received, 160 failed specs, returned for replacement. Additional 52 below spec to be used at edges.
- SICCAS: Contract to be signed for 400 more
- Crytur (Czech Republic): 100 received, OK
- Crytur: 250 crystals on order delivery ≤ October 2019
  - Supply limited by PANDA order
  - Raw material reserve exhausted

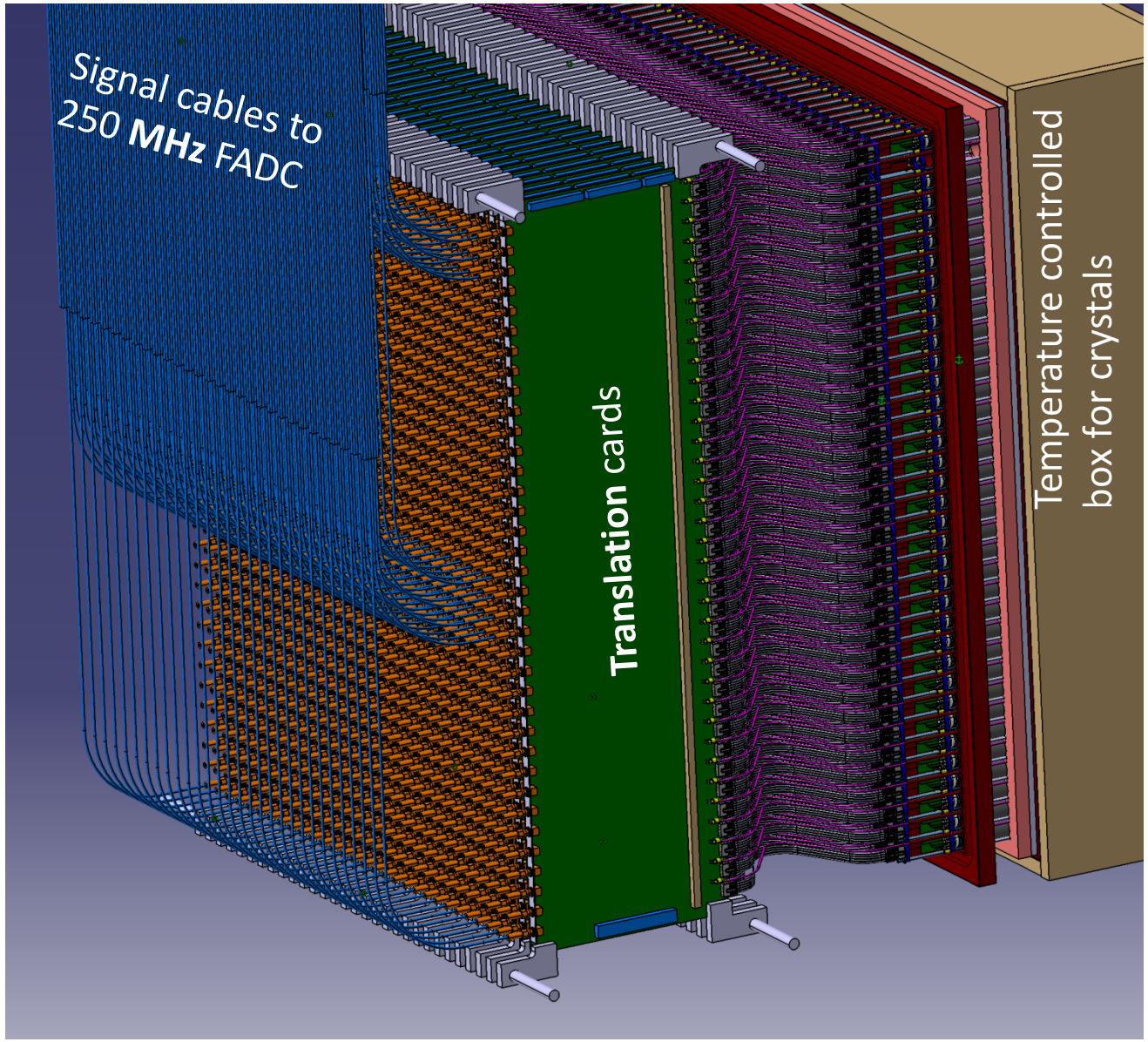
PMTs from HyCal, New Active bases

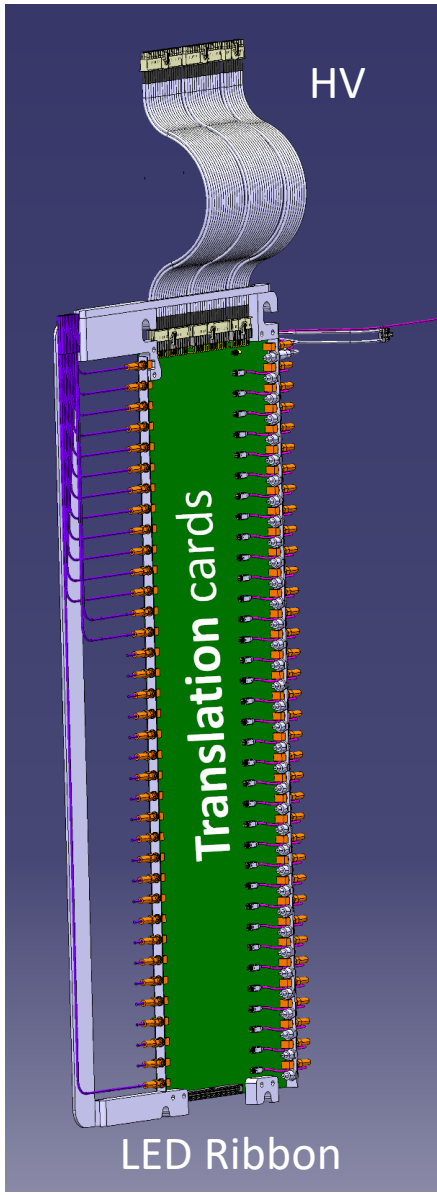
- Gain stabilization at high rates by amplifier fed from last stage of HV divider.
- PMT base assembly:
  Ohio U.
- Prototype assembly:
  IPN-Orsay



Calorimeter Assembly

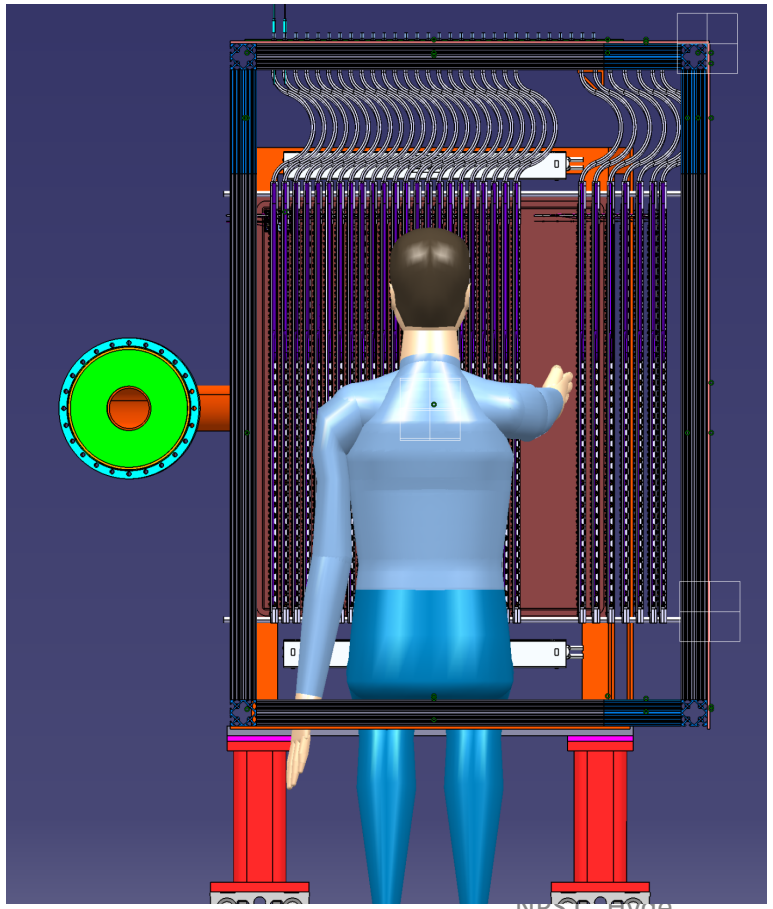
- Carbon fiber alveoli cantilever crystals in place

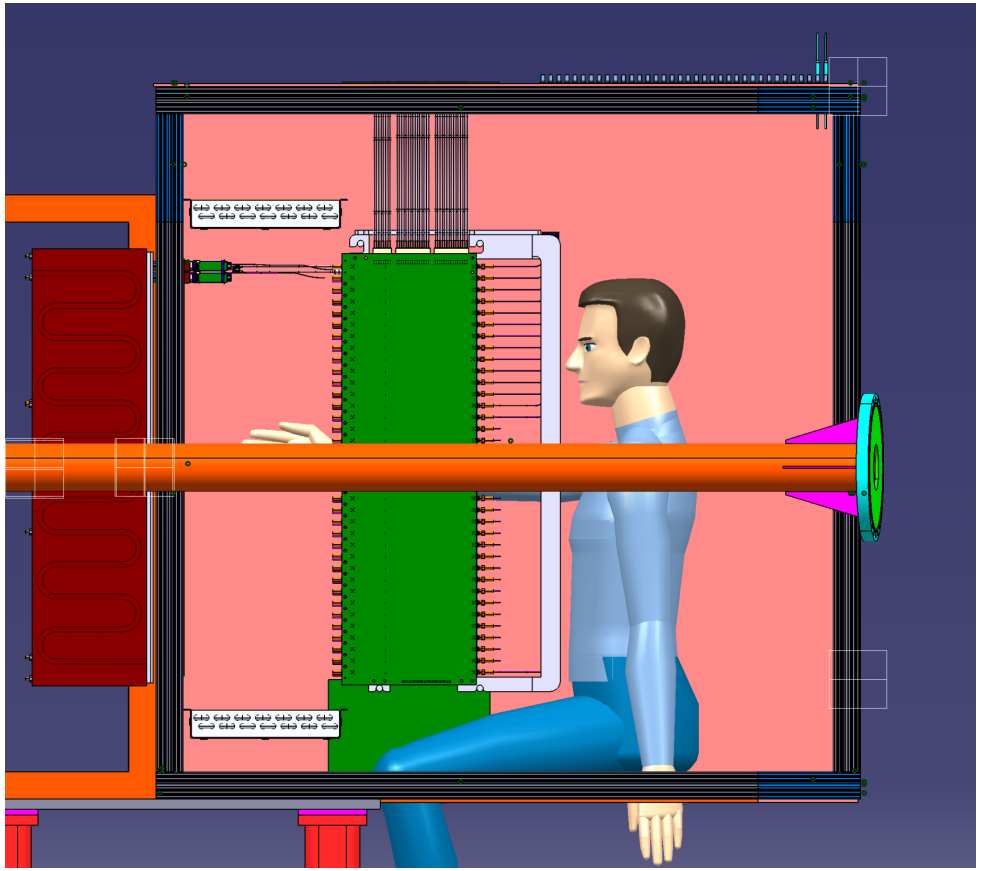


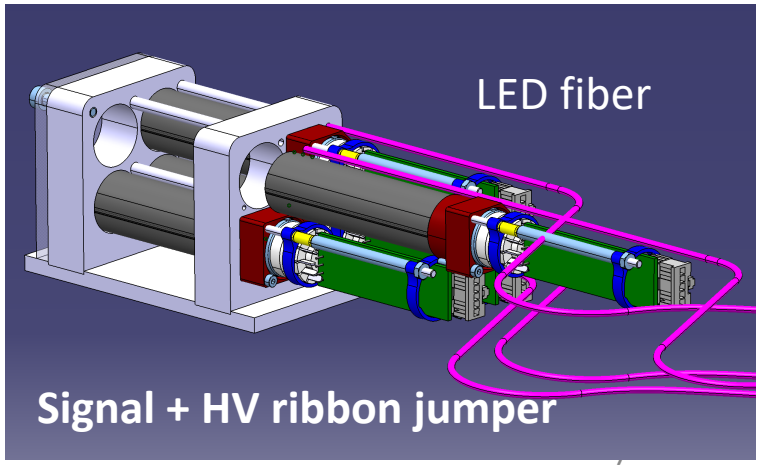


Calorimeter Servicing

- Access to remove any individual PMT+Base module without disassembly
- Module disassembles from calo with a single screw

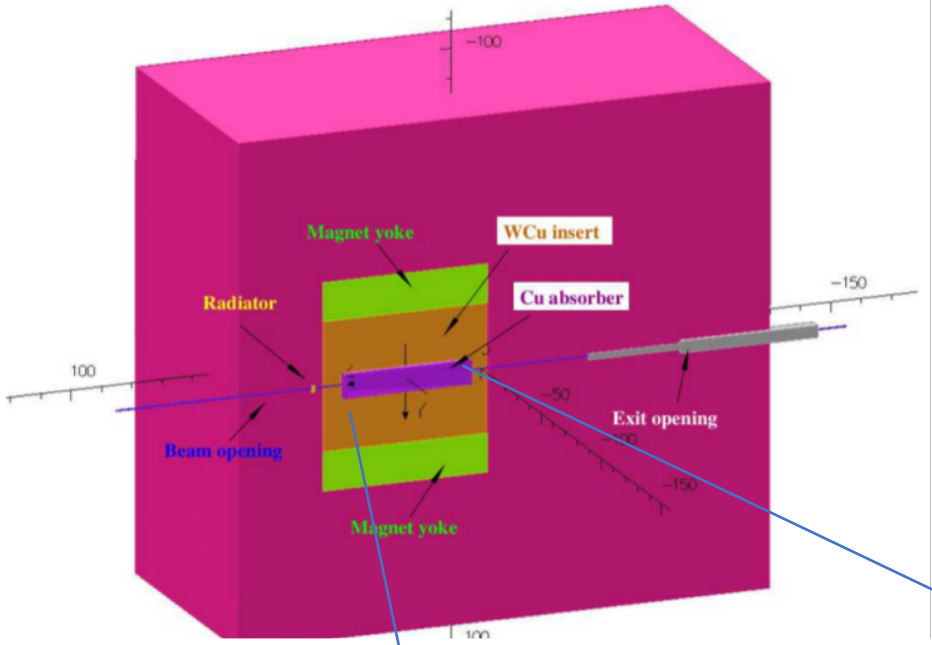


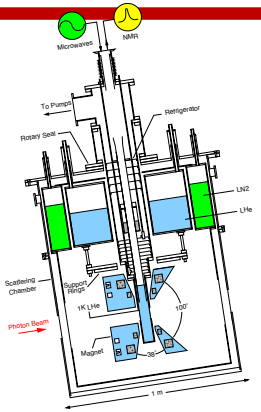


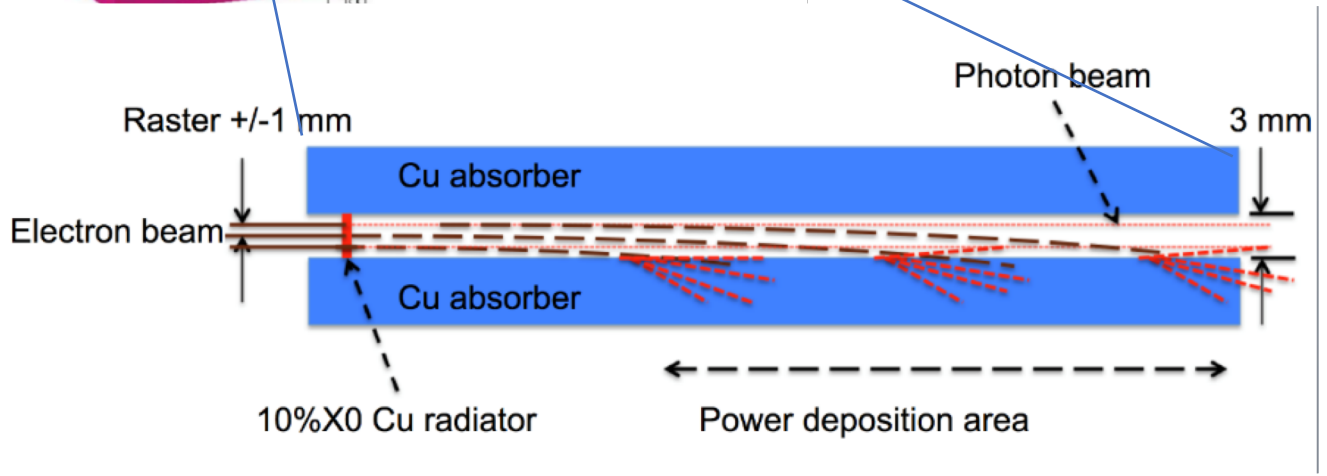


Compact Photon Source for Polarized Targets

- Self-contained radiator, forward collimator, & electron dump
- Pure photon beam on NH_3
  - Longer polarization lifetime
  - Higher γp luminosity
  - Transverse polarization
- Dipole magnet, central Cu absorber/dump, W powder and borated plastic radiation absorber.
- CPS concept Jlab Internal Review Committee 2018. Feasible and ready for detailed design



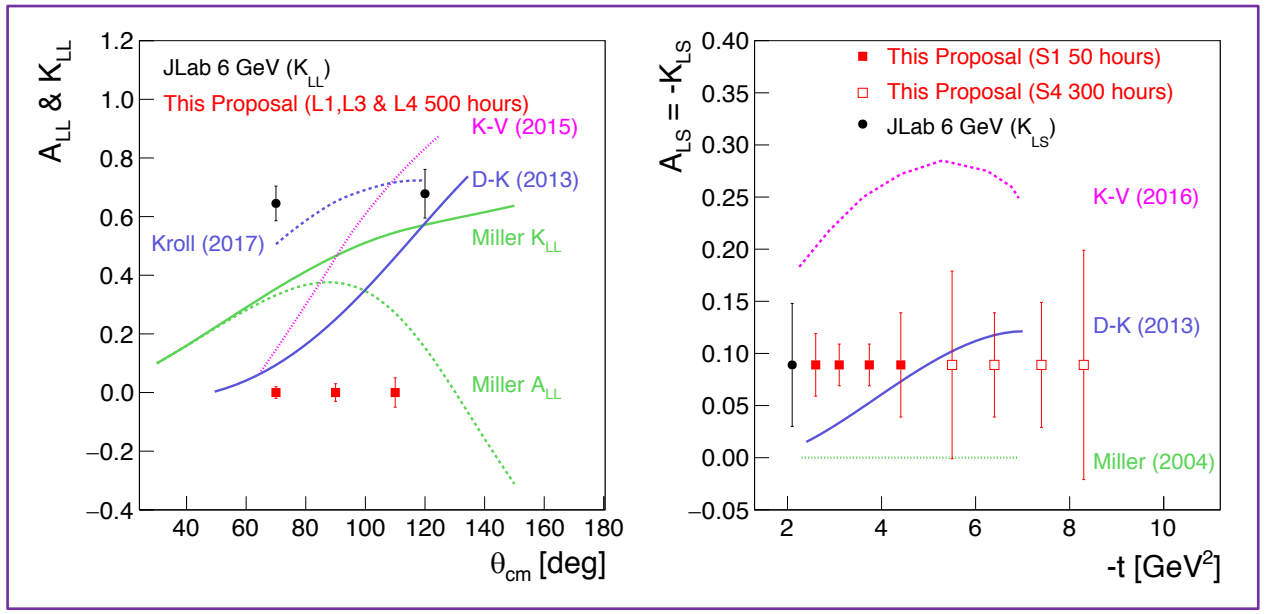


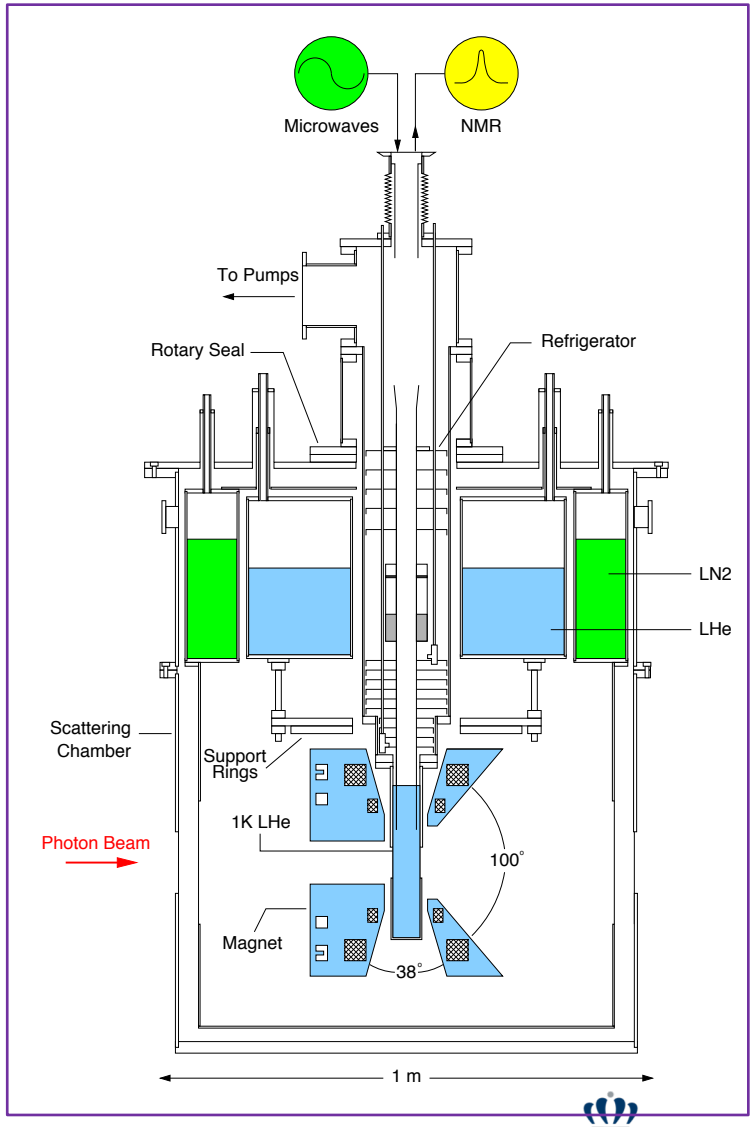


WACS Polarization Observables

- UVA n NH_3 target
  - 100° longitudinal aperture
  - 38° transverse aperture
- $A_{LL} = K_{LL}$
  - Except when it doesn't.
  - Free elementary quark (diluted by polarization)

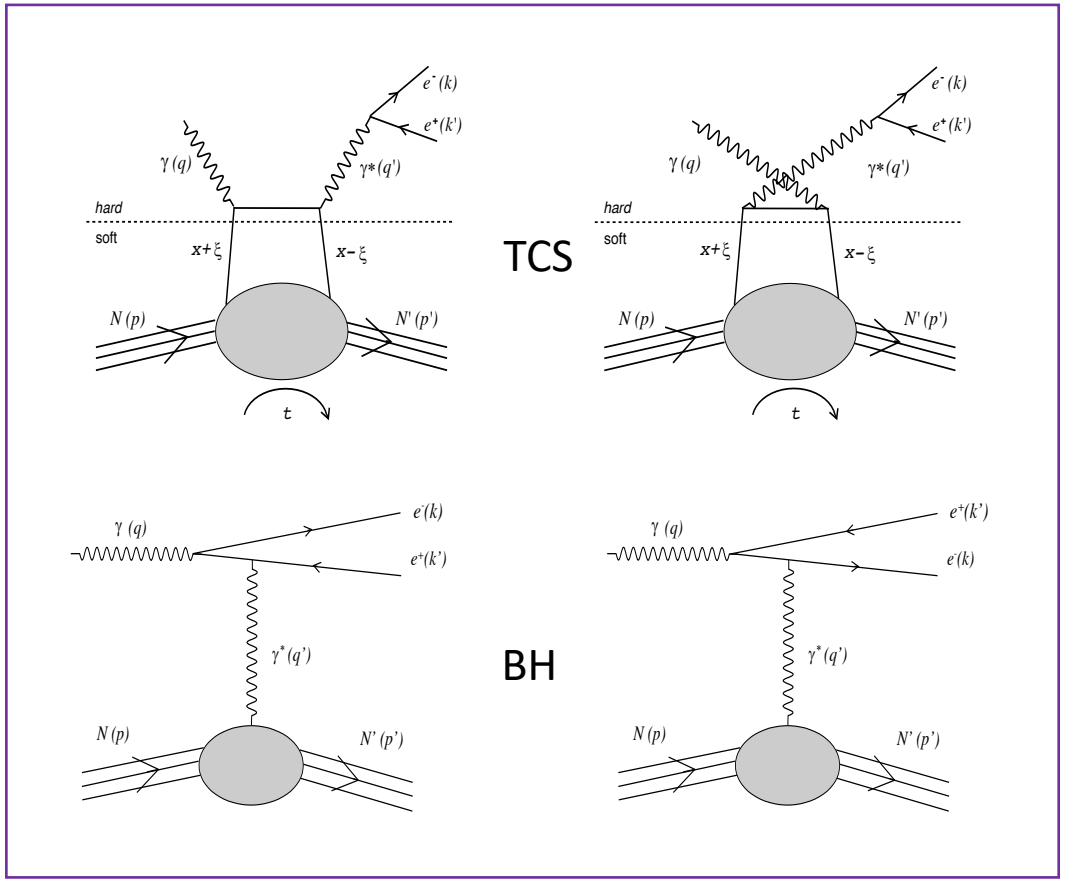
- Kroll, Miller = handbag models (different off-shell)
- K-V = SCET

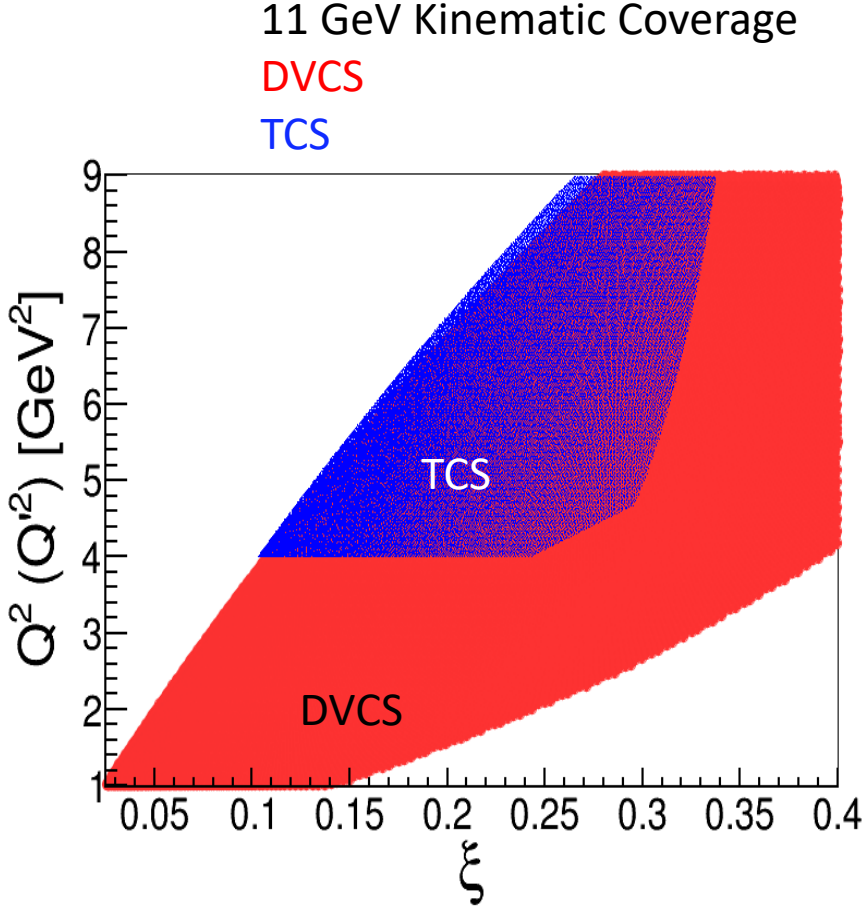




Timelike Compton Scattering

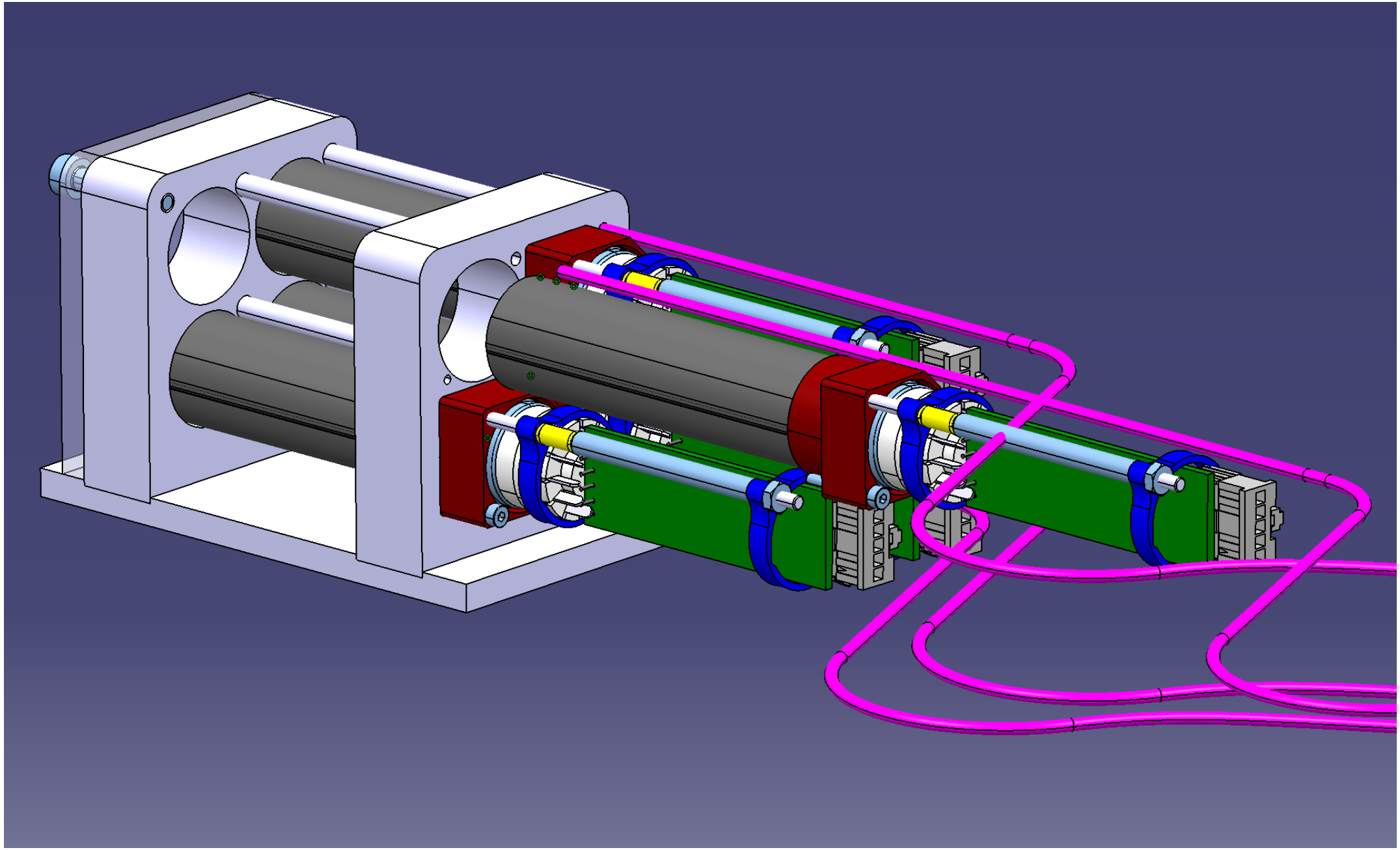
- Access to $\mathcal{E}(\xi,t)$ Compton Formfactor with transversely polarized target.
- Quark Orbital Angular Momentum





NPS

- Equipment will be ready for beam before 2022
- Rich physics program
- Join us!
- https://wiki.jlab.org/cuawiki/index.php/Main_Page
- Tanja Horn, coordinator



Magnet Mapper

- ODU graduate student Mitch Kerver at the controls
- Hall Probe recording now added