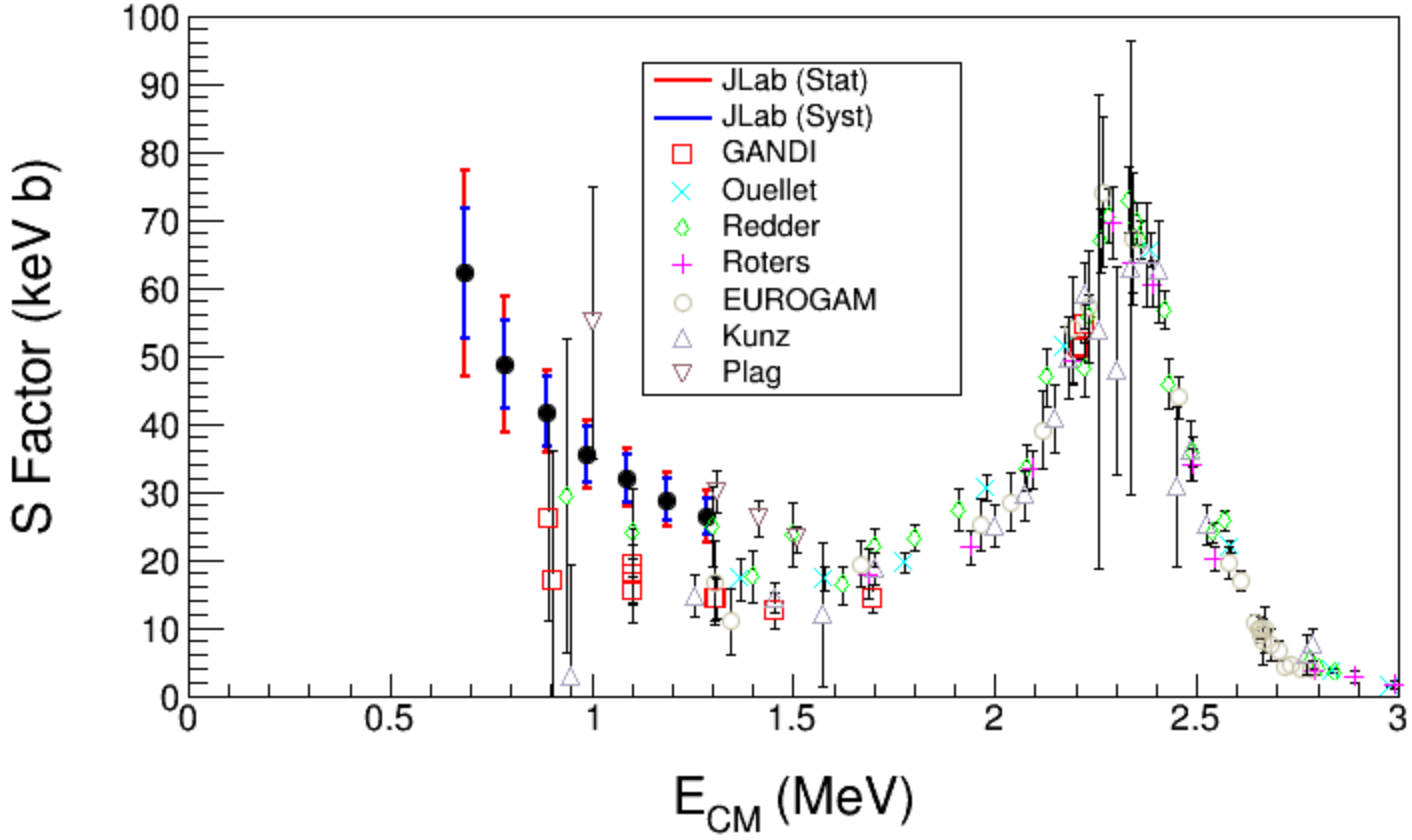
Bubble Chamber Experimental Readiness Review

September 11, 2014

https://wiki.jlab.org/ciswiki/index.php/Bubble_Chamber

Astrophysical S-Factor $^{12}C(\alpha,\gamma)^{16}O$



OUTLINE

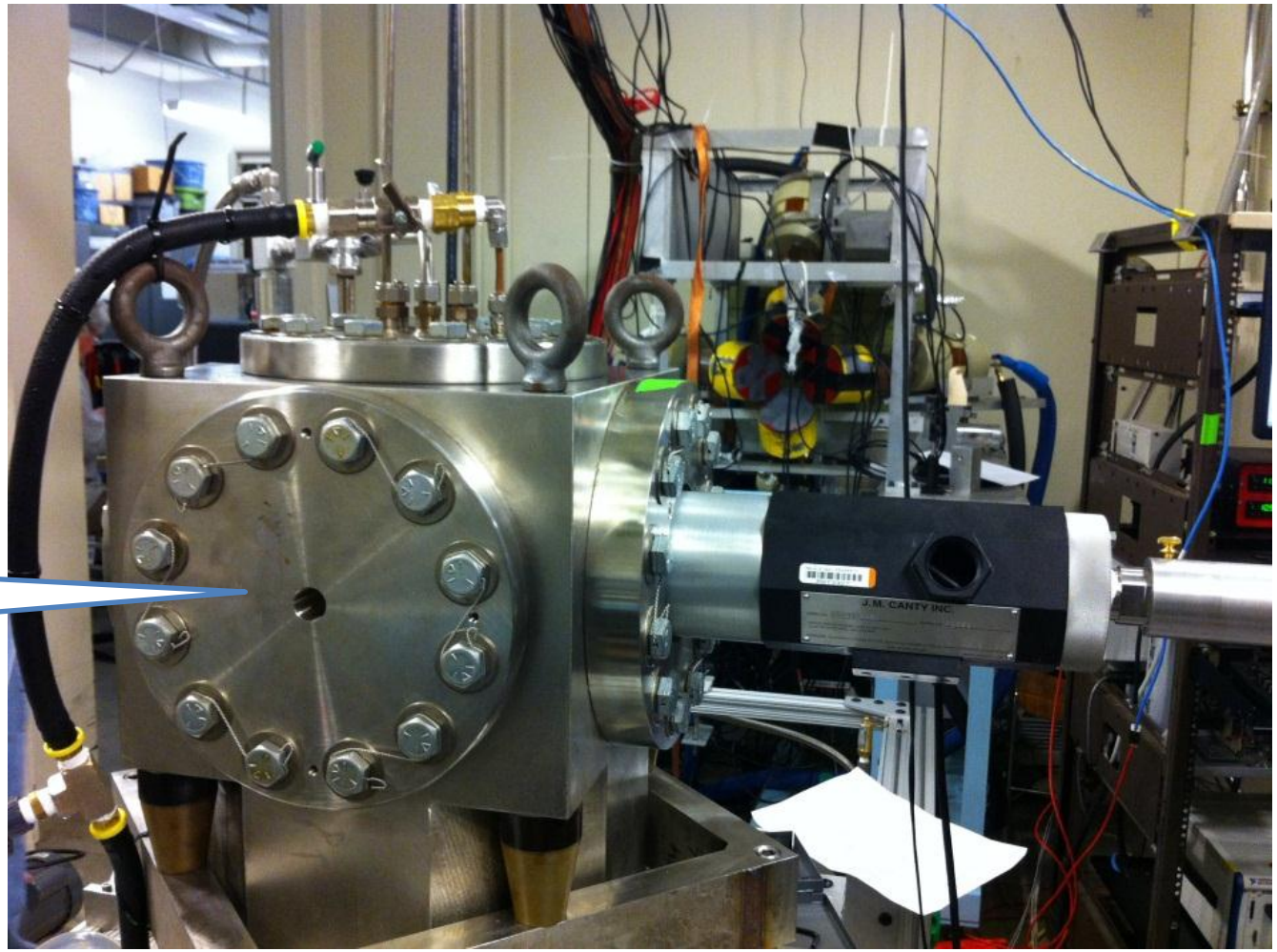
- Beam Requirements
- Bubble Chamber
- Beamlines (Test and Experiment)
- Test Beamline Commissioning
- Schedule
- Safety Reviews
- Readiness Documents

Beam Requirements

I. Beam Properties at Radiator:

Beam Kinetic Energy, (MeV)	7.9–8.7
Beam Current (μA)	0.01–100
Absolute Beam Energy Uncertainty	<0.1%
Relative Beam Energy Uncertainty	<0.02%
Energy Resolution (Spread), σ_T/T	<0.06%
Beam Size, $\sigma_{x,y}$ (mm)	1–2
Polarization	None

Bubble Chamber
at HIGS
April 2013

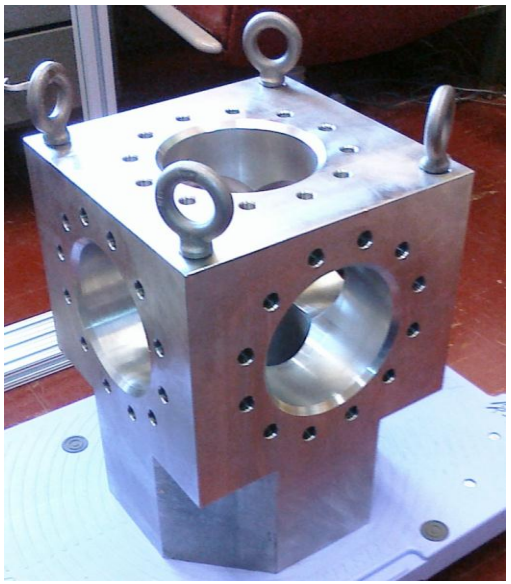


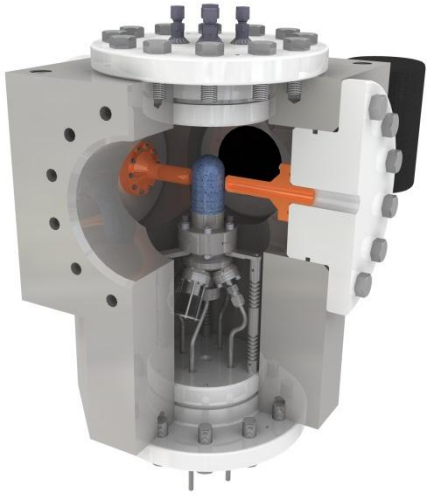
Photon Beam
Entrance

N_2O Bubble Chamber

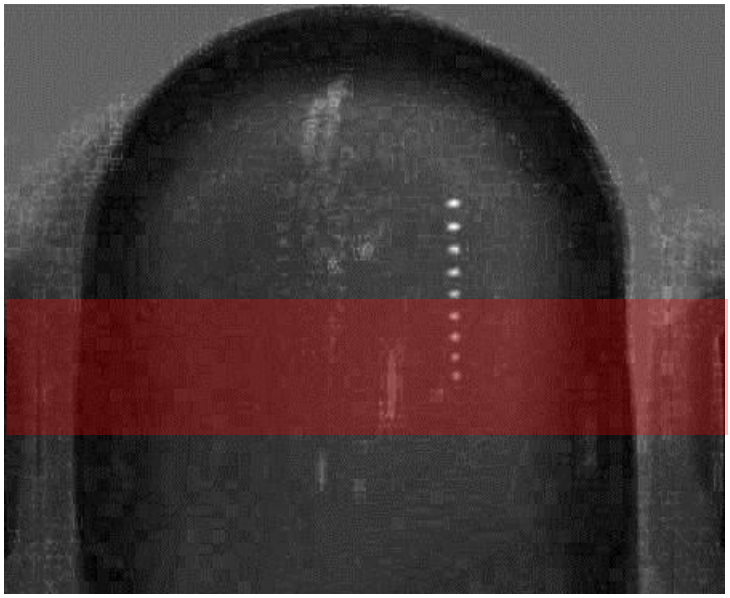
T = -5˚C

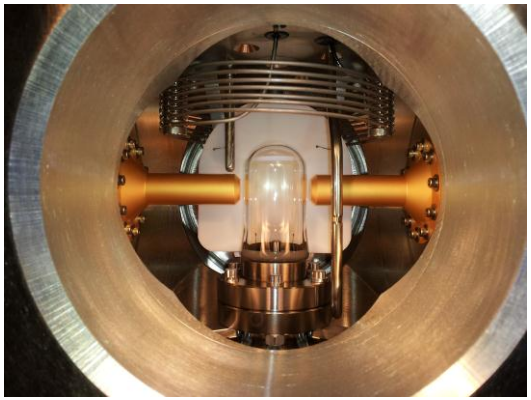
P = 60 atm



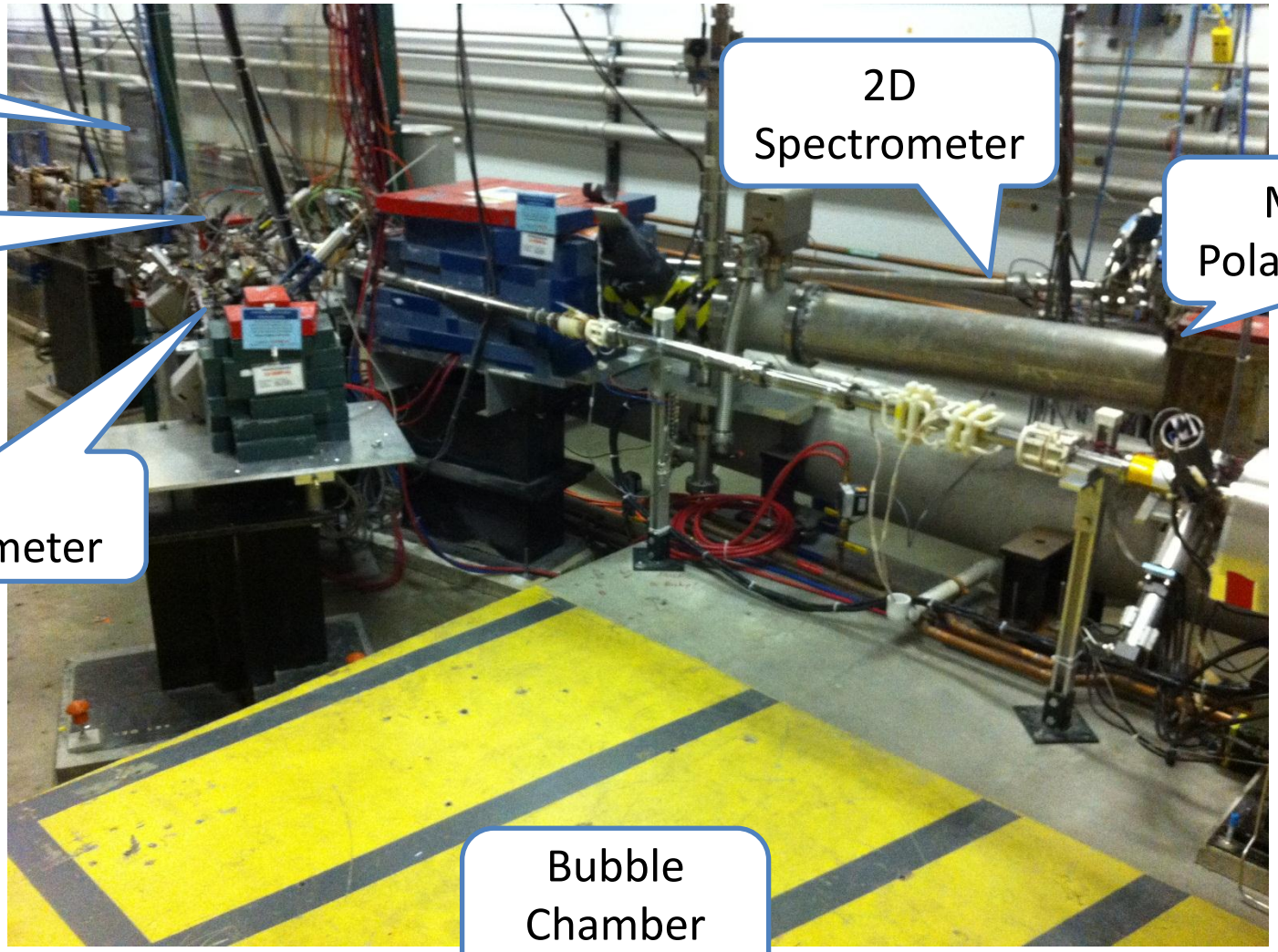


First γ+O→α+C bubble
April 2013





CEBAF 5 MeV Region

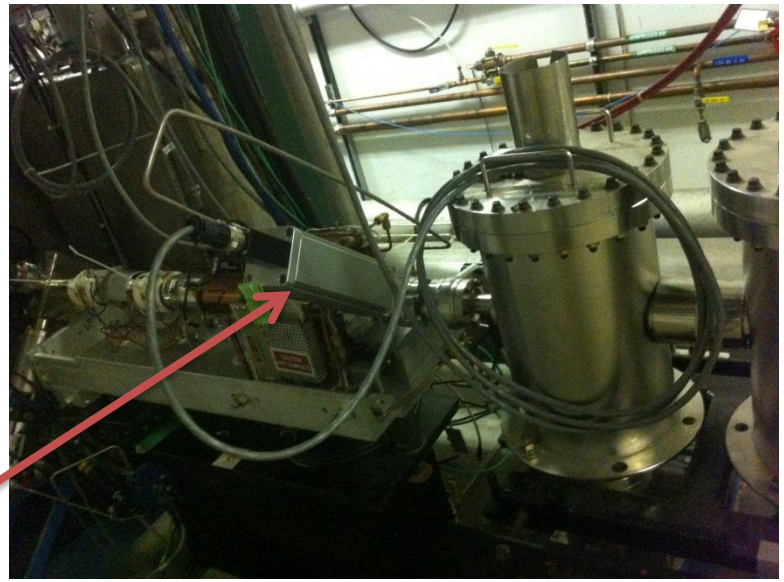


New Beamline Elements

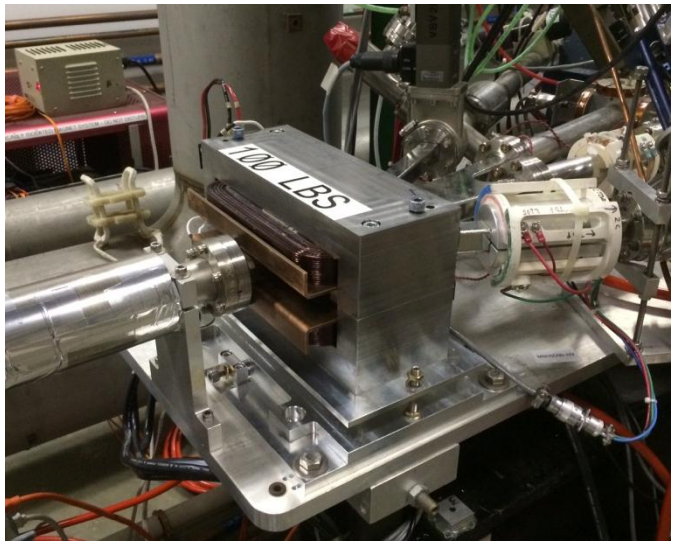
New Beamline elements installed in support of Bubble Chamber experiment:

I. Fast Valve after ¼ Cryounit

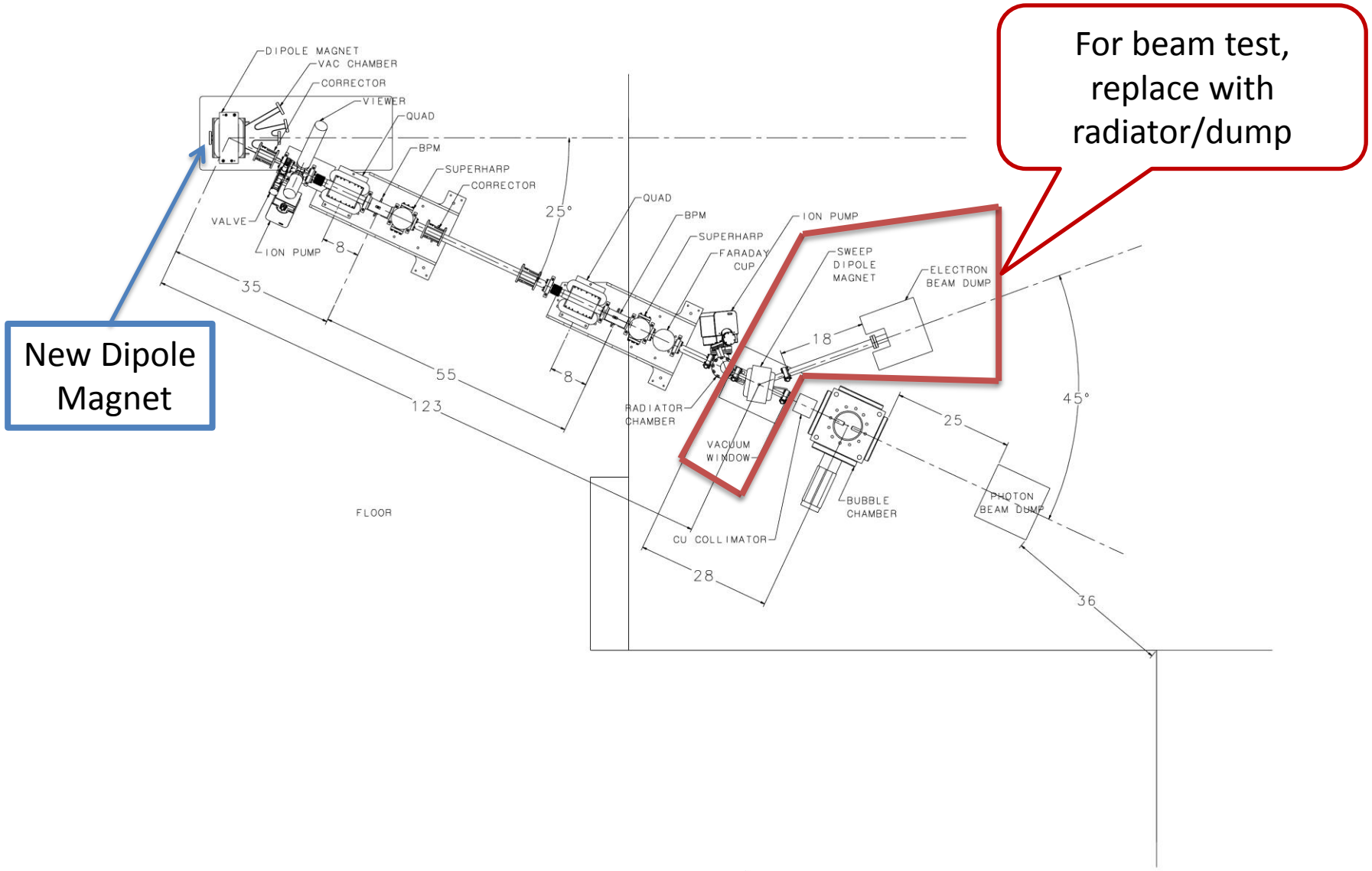
protect from vacuum failure in front of ¼ Cryo-unit



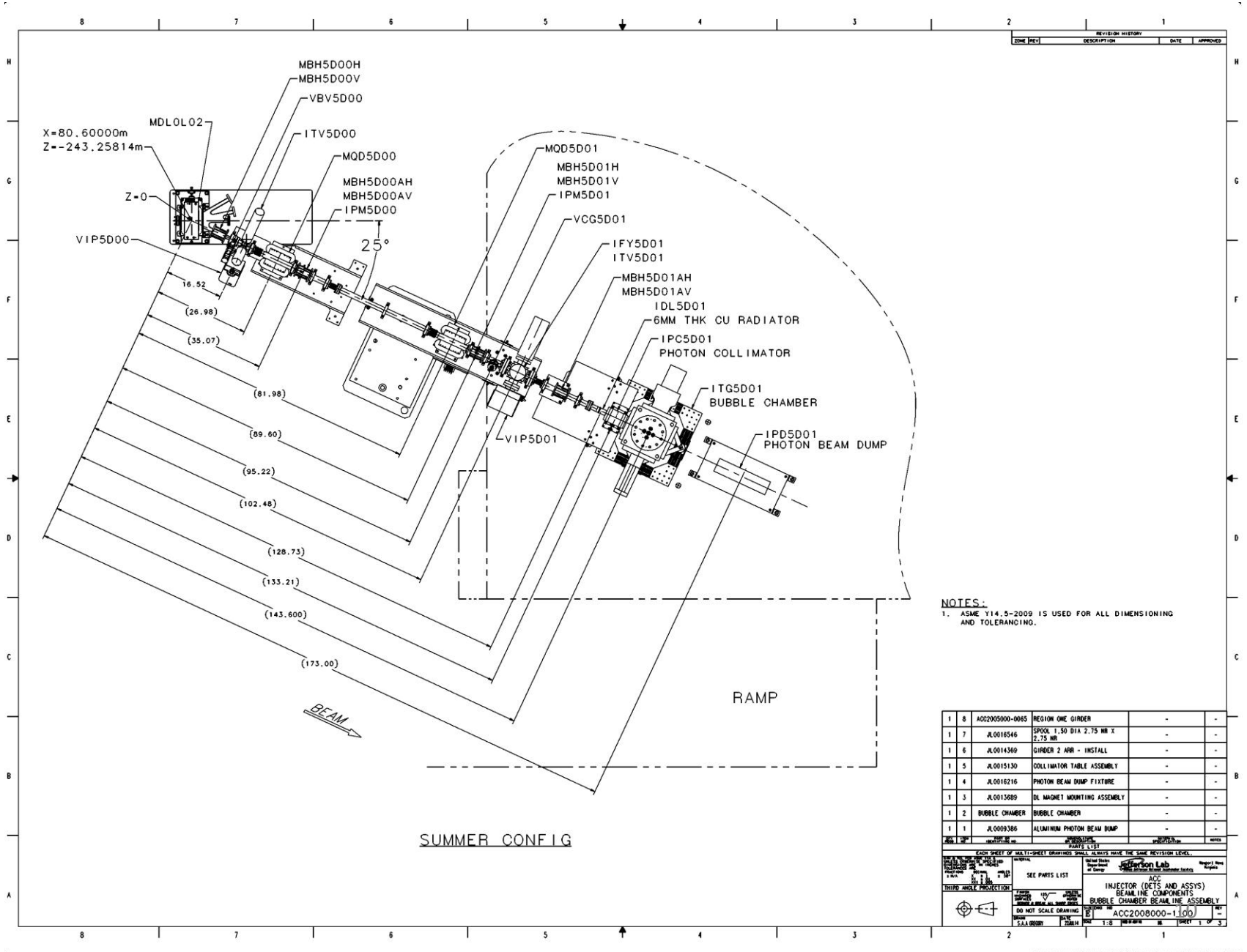
II. New MDL0L02 Dipole Magnet

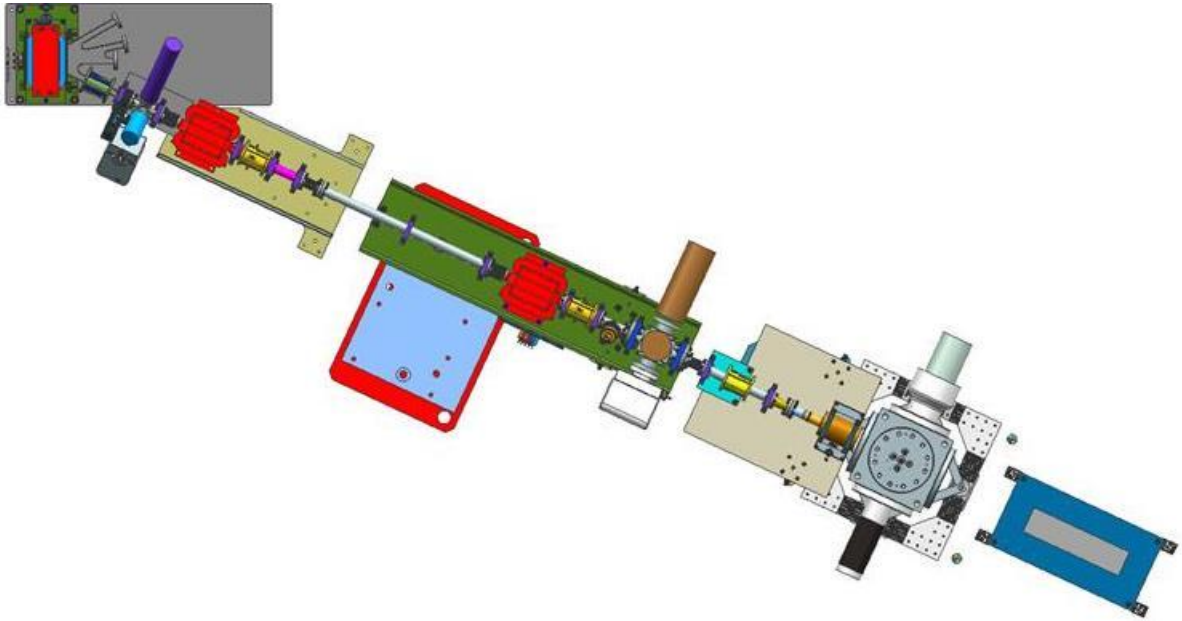


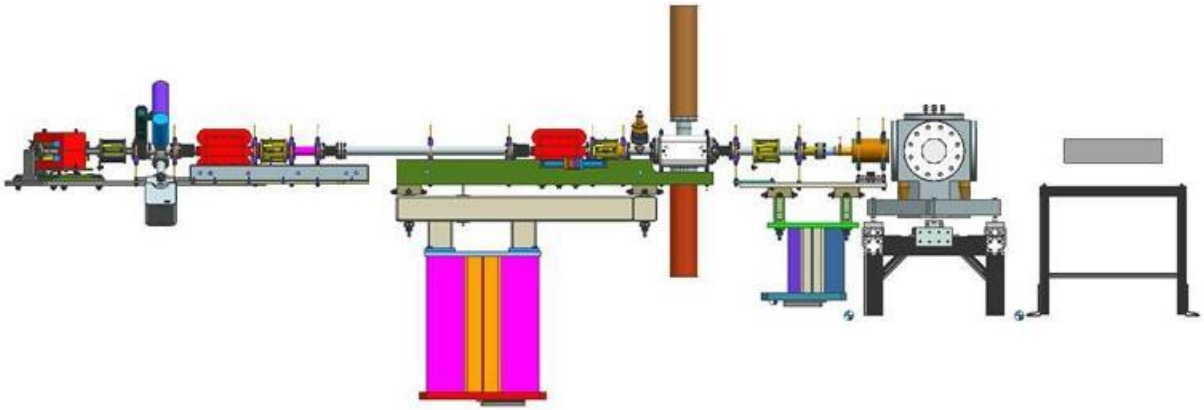
EXPERIMENT BEAMLINE

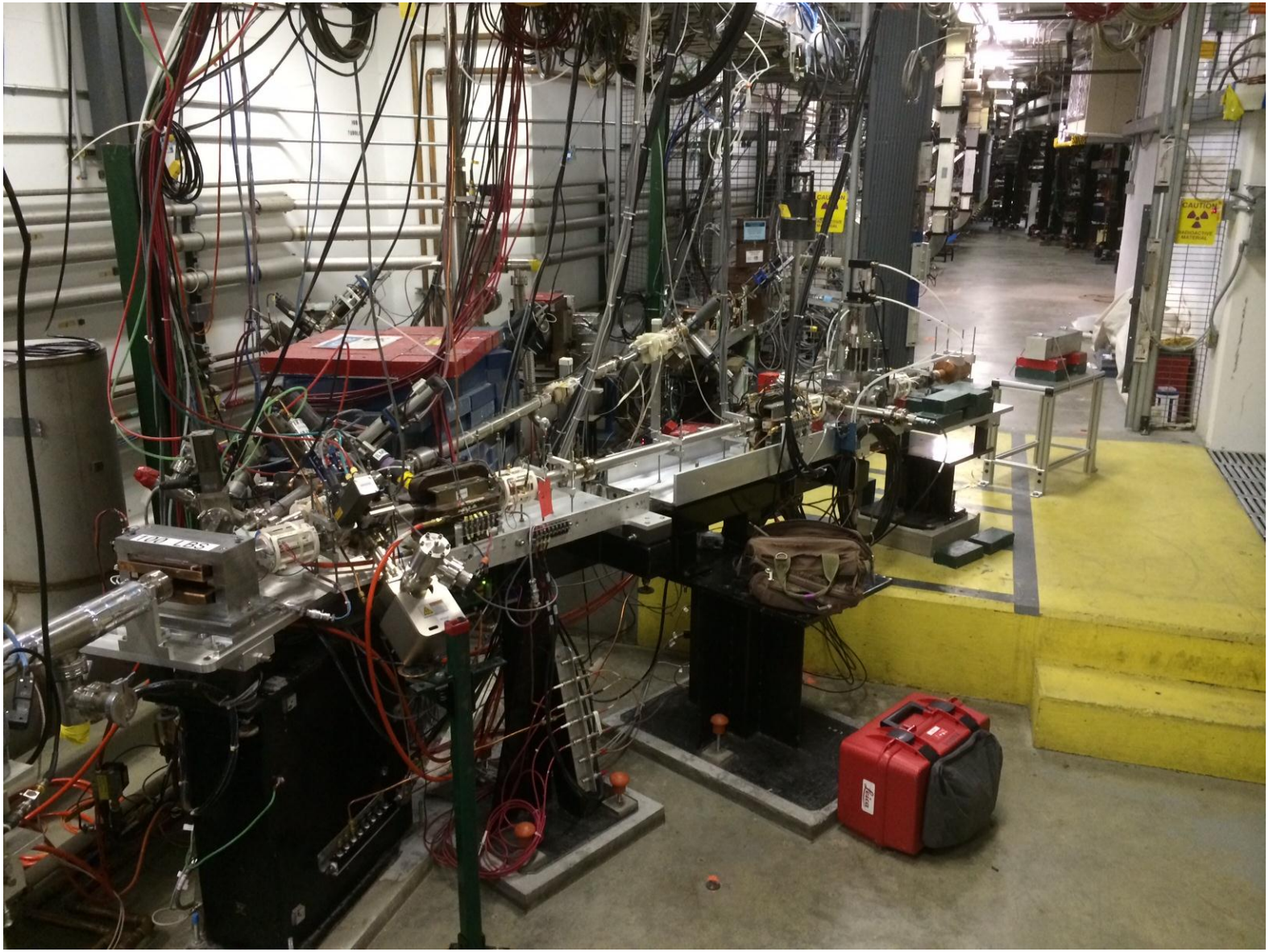


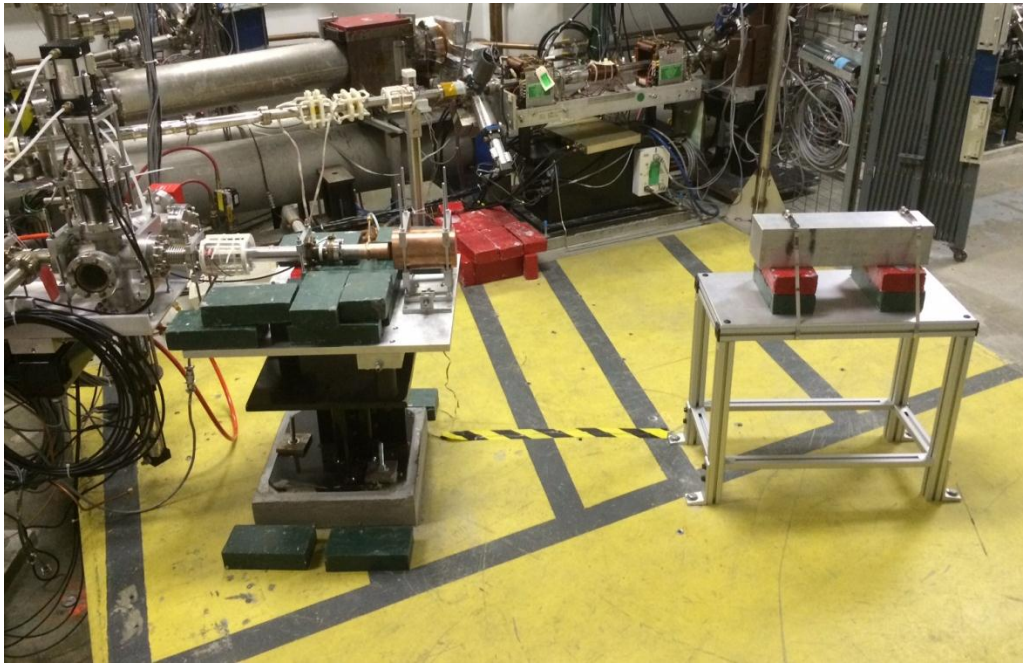
TEST BEAMLINE

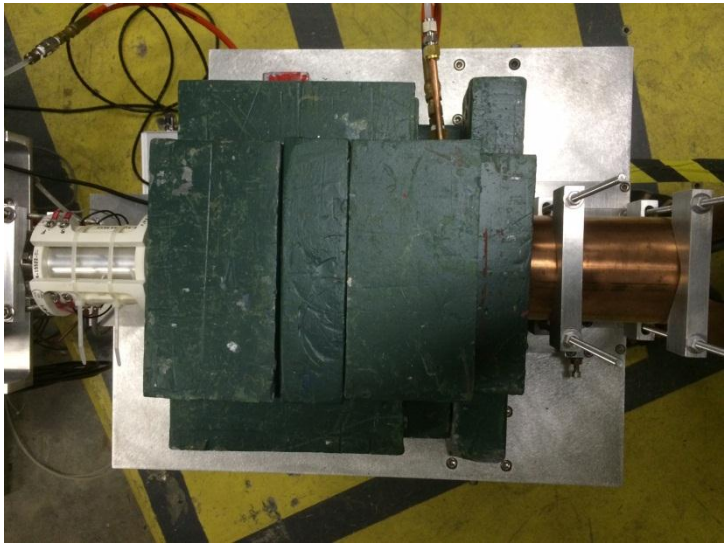




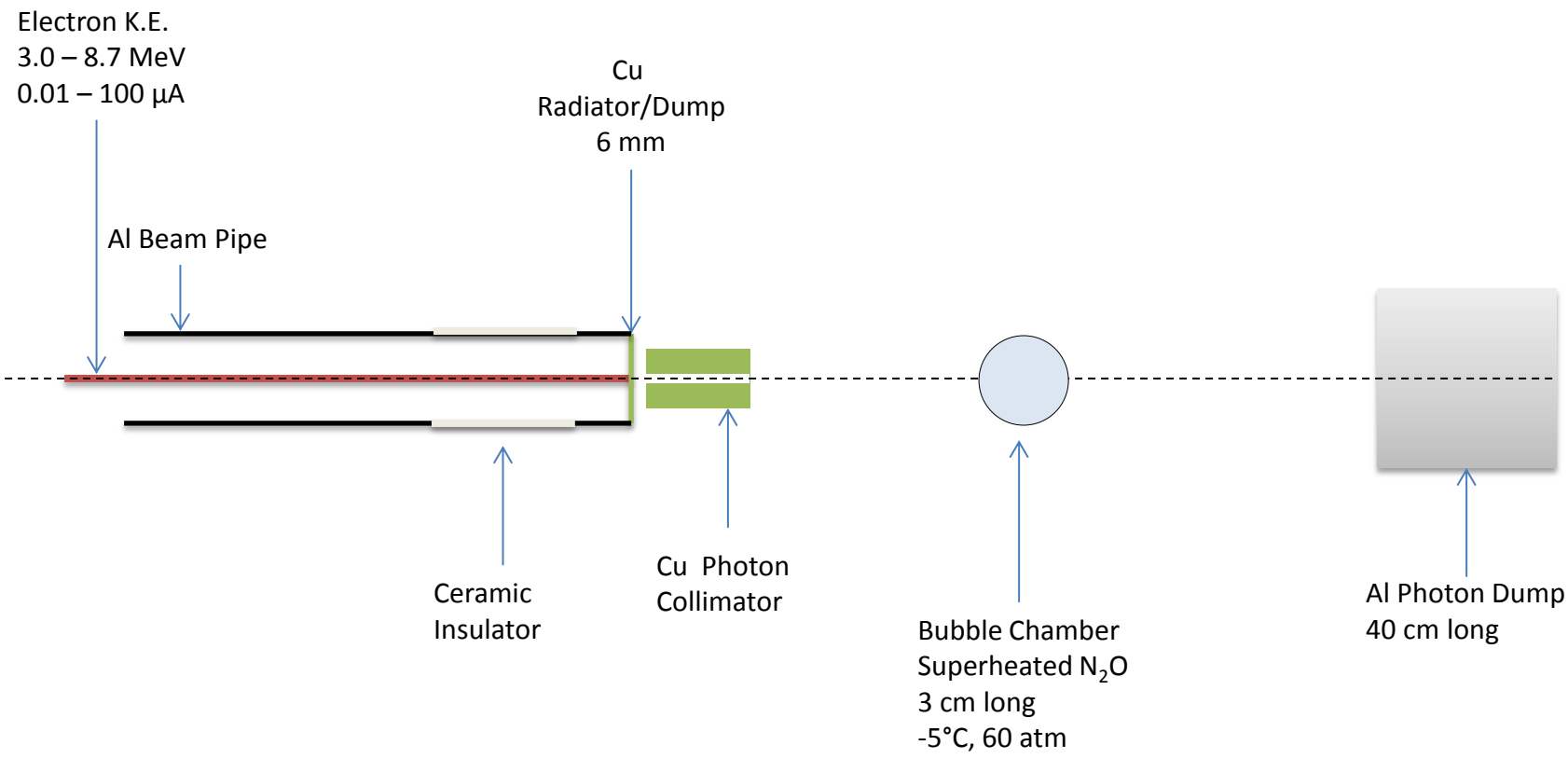



CAUTION





- Use pure Copper and Aluminum
- Radiator/dump isolated and current in EPICS readback



Test Beamline Commissioning

- New Test Beamline is ready for Fall 2014 run

- Commissioning plan will be submitted:
  I. Checklist of machine protection interlocks and controls (no review is required)
  II. Checkout of beamline with electron beam

- Beam Studies:
  I. Momentum measurement
  II. Measure Bremsstrahlung spectra
  III. Operation at high current
  IV. Measure beam charge at different currents

SCHEDULE

May 3 – September 18, 2014	Summer Shutdown, CHL@4K
September 19 – December 22, 2014	2.2GeV/pass
Fall 2104	Bubble Chamber commissioning at HIGS
December 23, 2014 – February 5, 2015	Winter Shutdown, CHL@2K
February 6, 2015 – June 12, 2015	Hall A Physics, Hall D Eng. Run
June 13, 2015 – September 10, 2015	Summer Shutdown, CHL@2K (?)

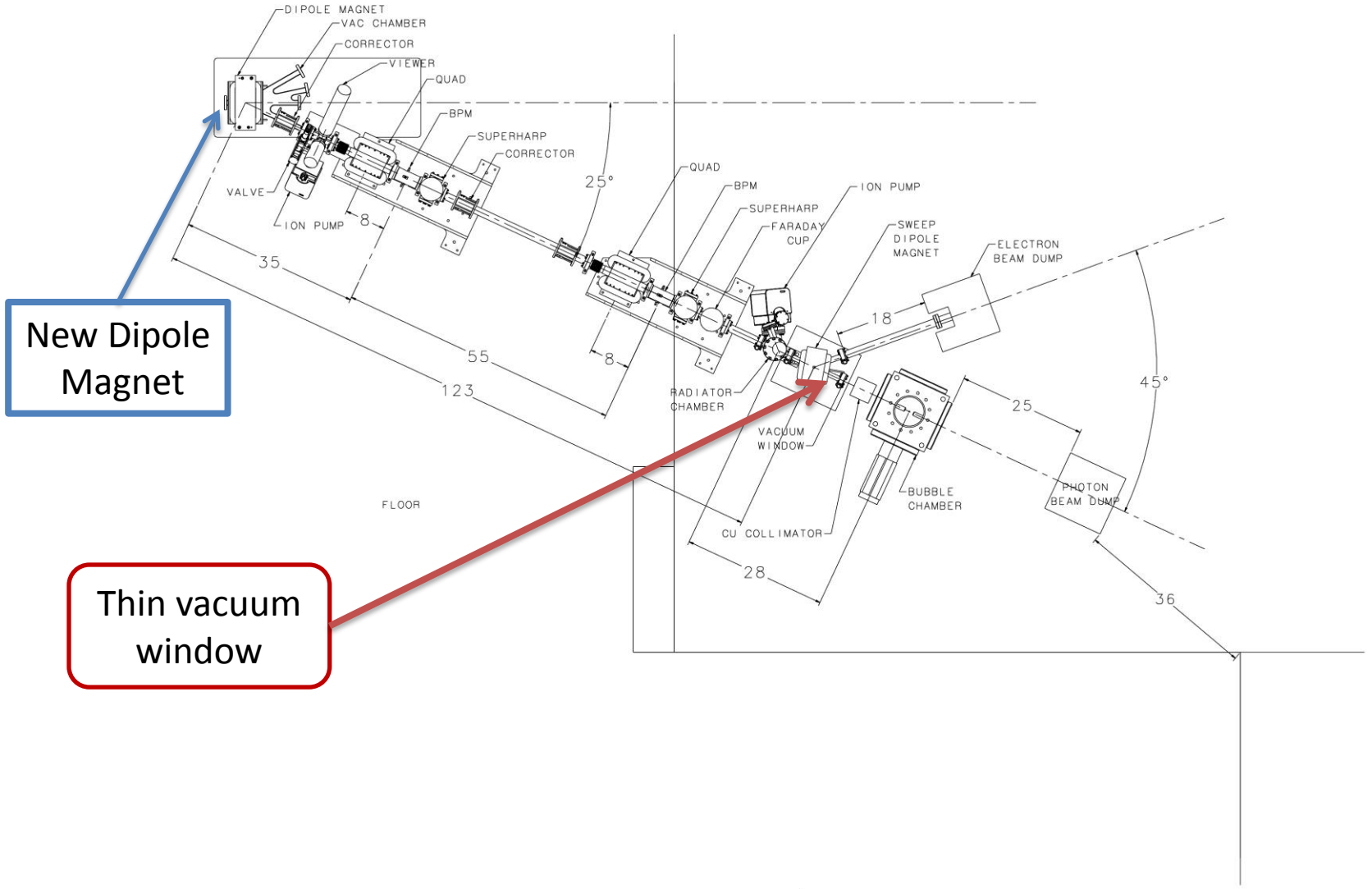
Commission Test Beamline

1st Opportunity in January

2nd Opportunity in Summer

For helium processing of Cryo-modules

EXPERIMENT BEAMLINE REVIEW

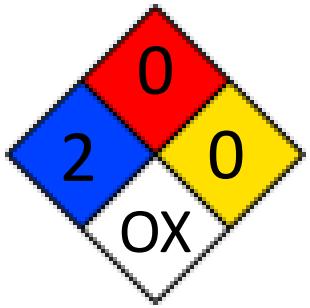


New Dipole Magnet

Thin vacuum window

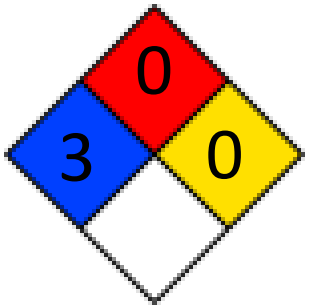
Bubble Chamber Safety Reviews

- Superheated liquid: N_2O, Nitrous oxide (laughing gas)
  I. At room temperature, it is colorless, non-flammable gas, with slightly sweet odor and taste



- High pressure system:
  I. Design Authority: Dave Meekins
  II. T = -5˚C
  III. P = 60 atm

- Buffer liquid: Mercury
  I. Closed system
  II. Volume: 135 mL



All done at Argonne. How to transfer to JLab?

Readiness Documentation

1. Conduct of Operations (**COO**)
2. Experiment Safety Assessment Document (**ESAD**)
3. Radiation Safety Assessment Document (**RSAD**)
4. Operational Safety Procedures (**OSP**)

Similar to PEPPo