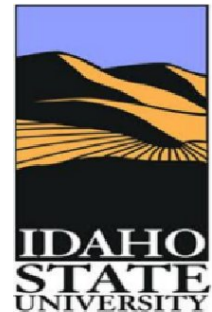
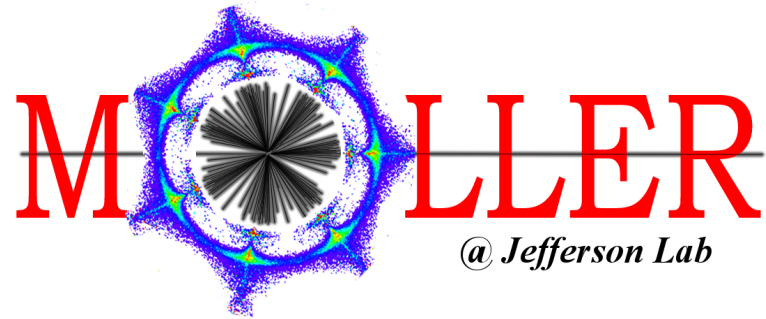


# Detector region layout and SAM design

Dustin McNulty  
Idaho State University  
*mcnulty@jlab.org*

May 15, 2020

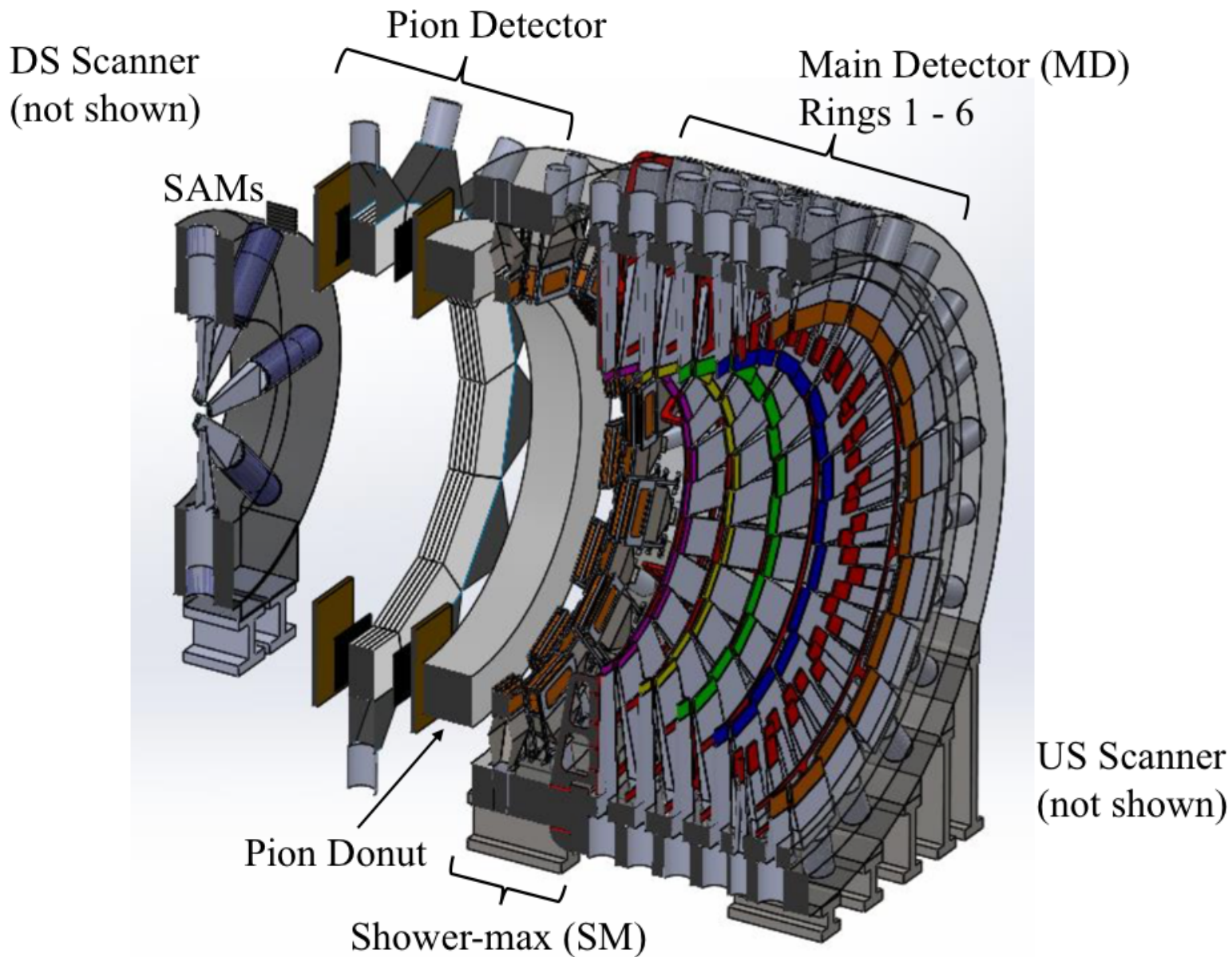


## Detector region layout and SAM design

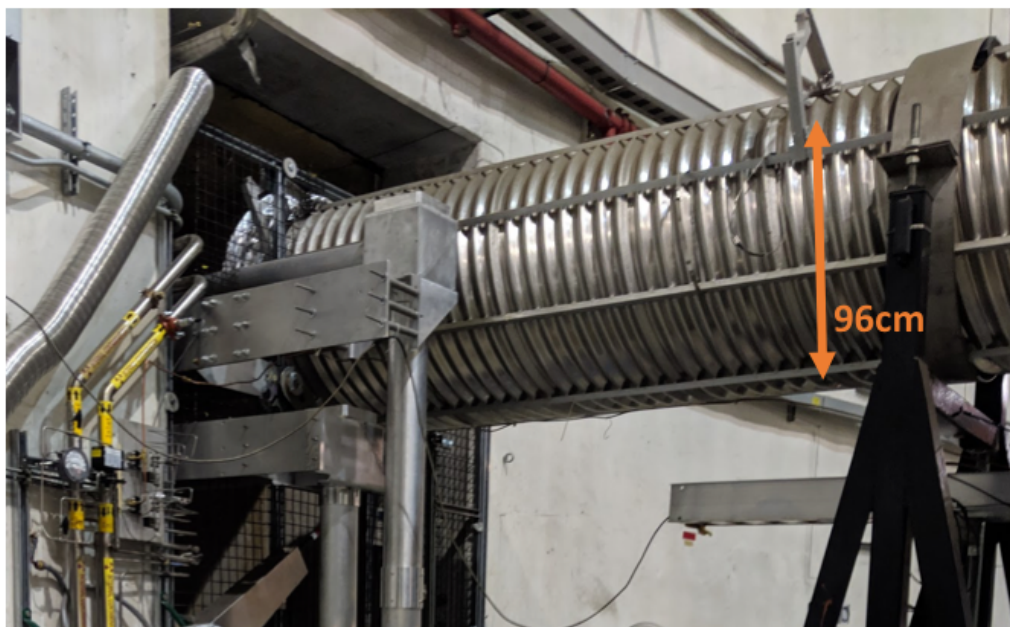
### Outline

- Review recent developments in the beamline layout from the detector region to the Hall wall
- Introduce design for SAMs (Small Angle Monitors)
- Summary and Future Work

# MOLLER Detector Systems (circa 2016)



## Current beamline



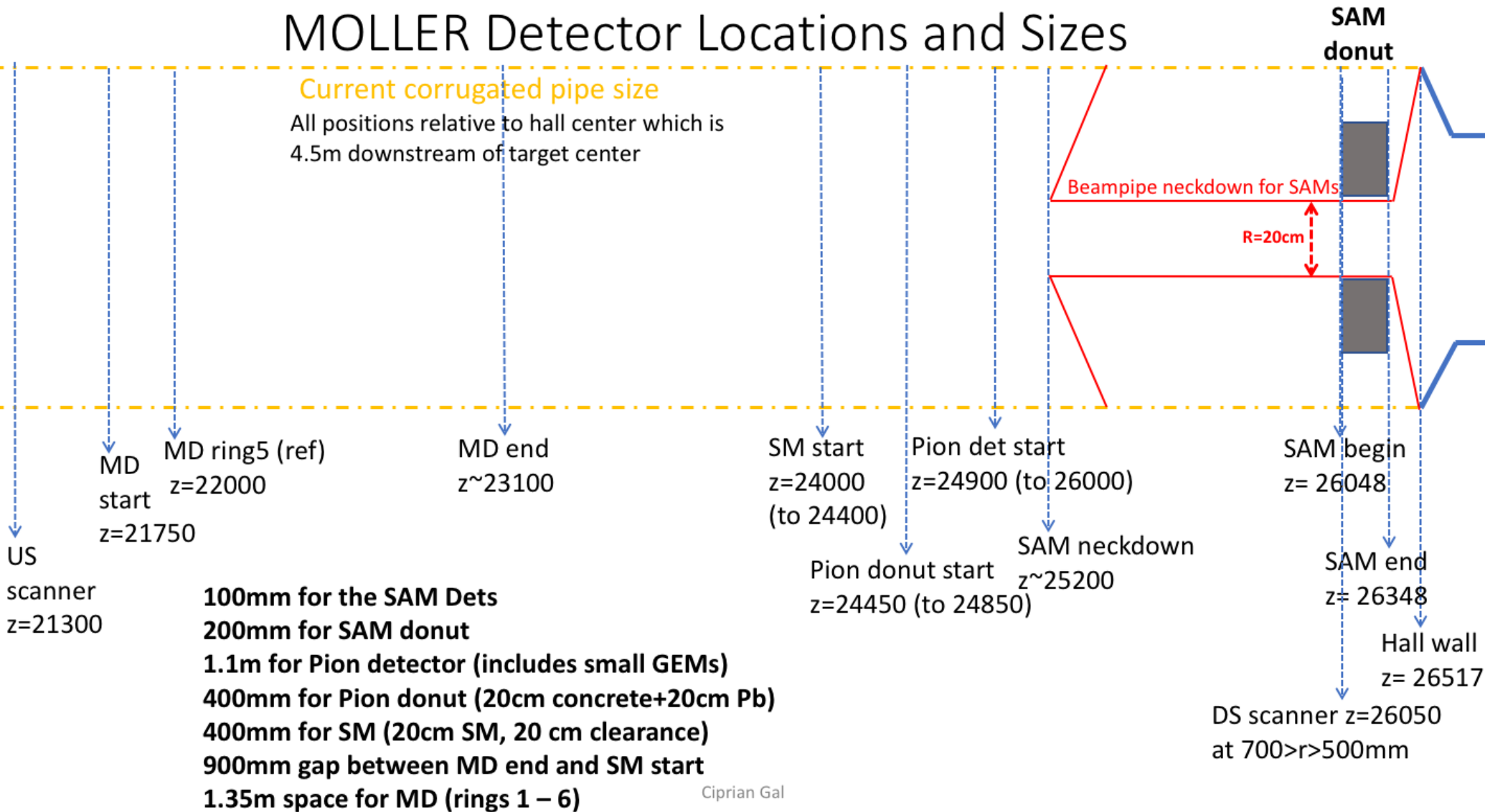
- Current corrugated beam pipe is  $\sim 48\text{cm}$  radius
- The flange is right after the mesh “wall” separating the dump tunnel
- We need to be careful to allow for door to swing open

Ciprian Gal

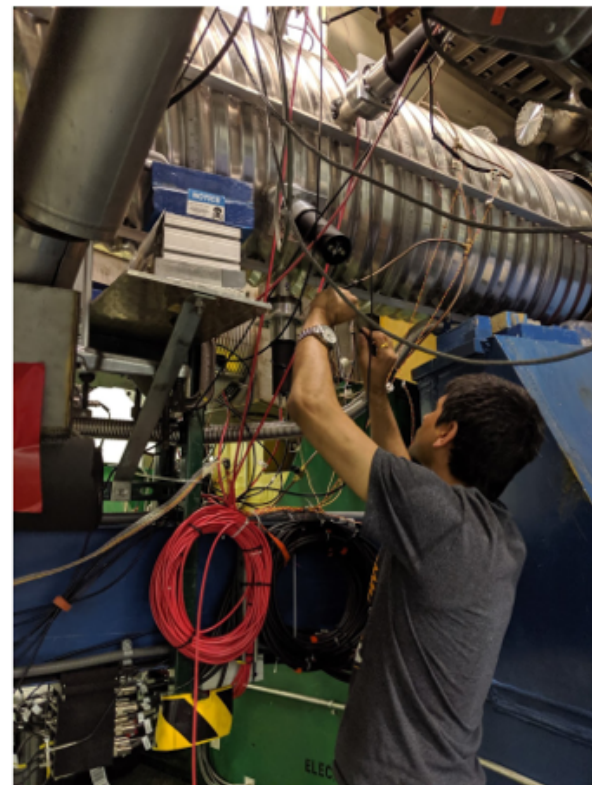
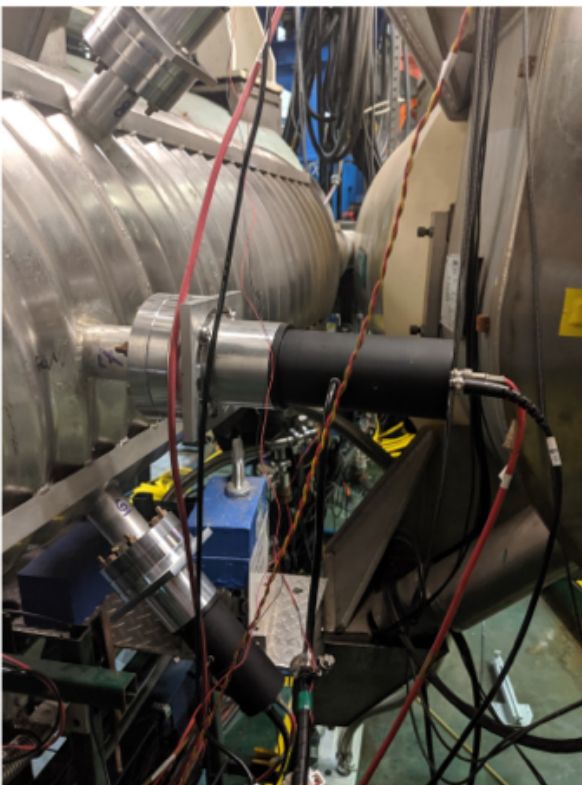
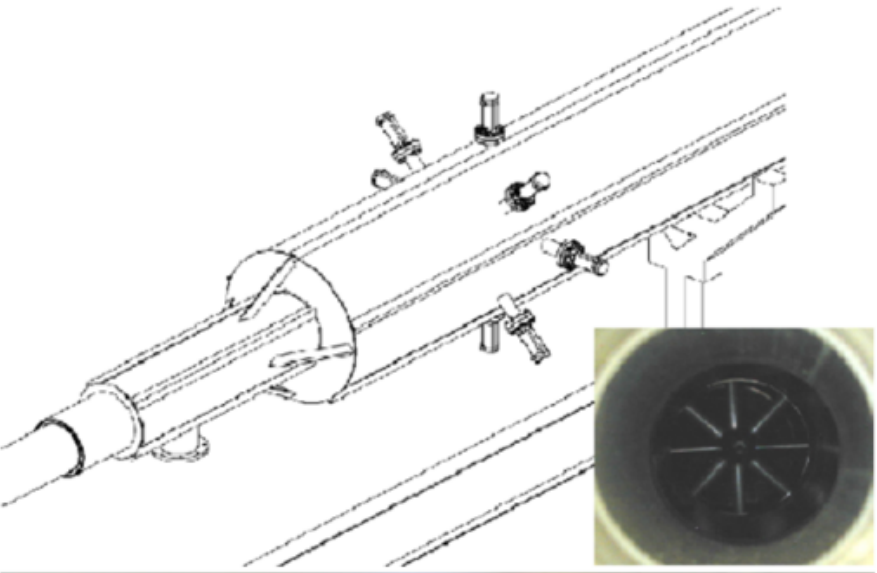




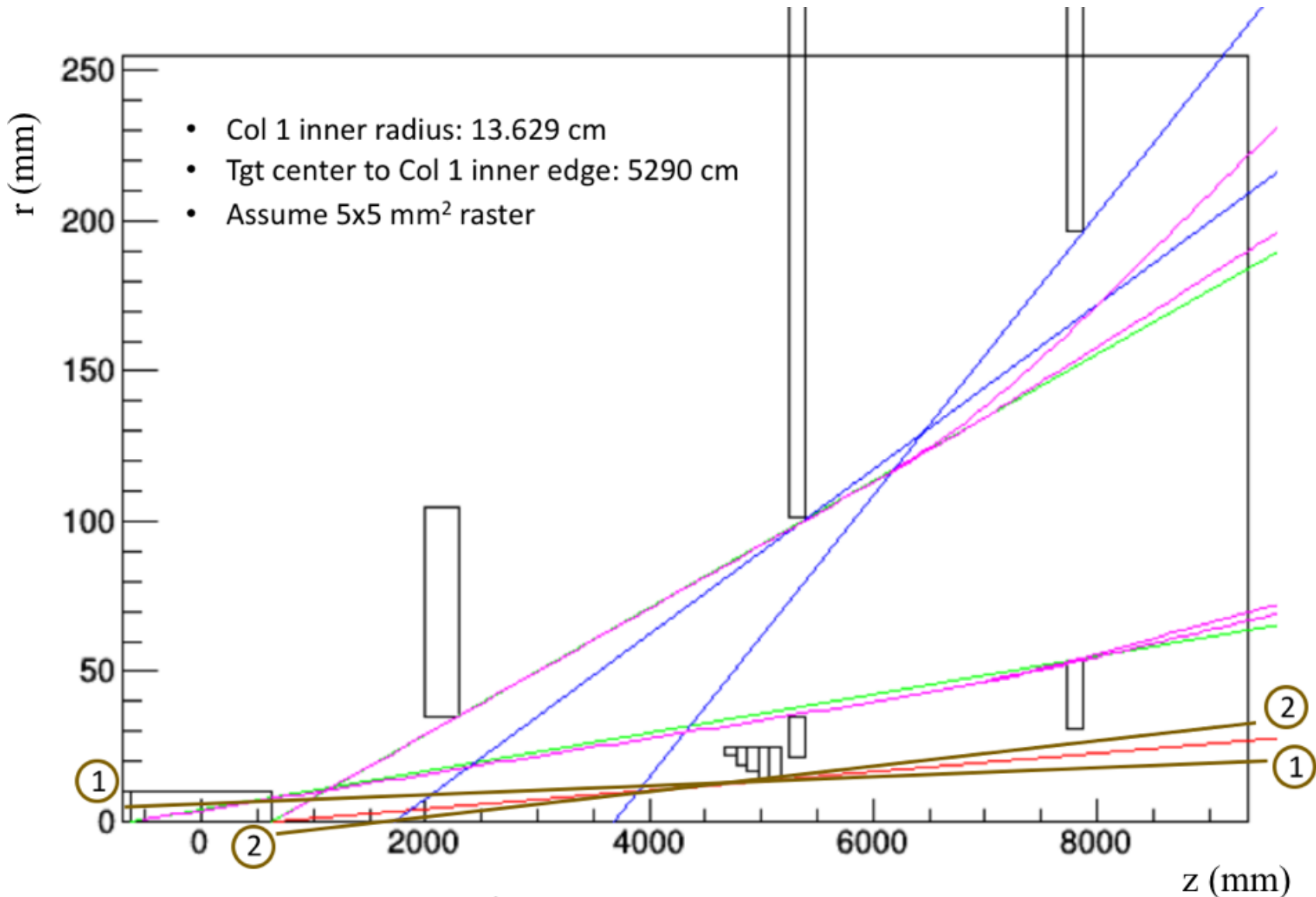
## MOLLER Detector Locations and Sizes



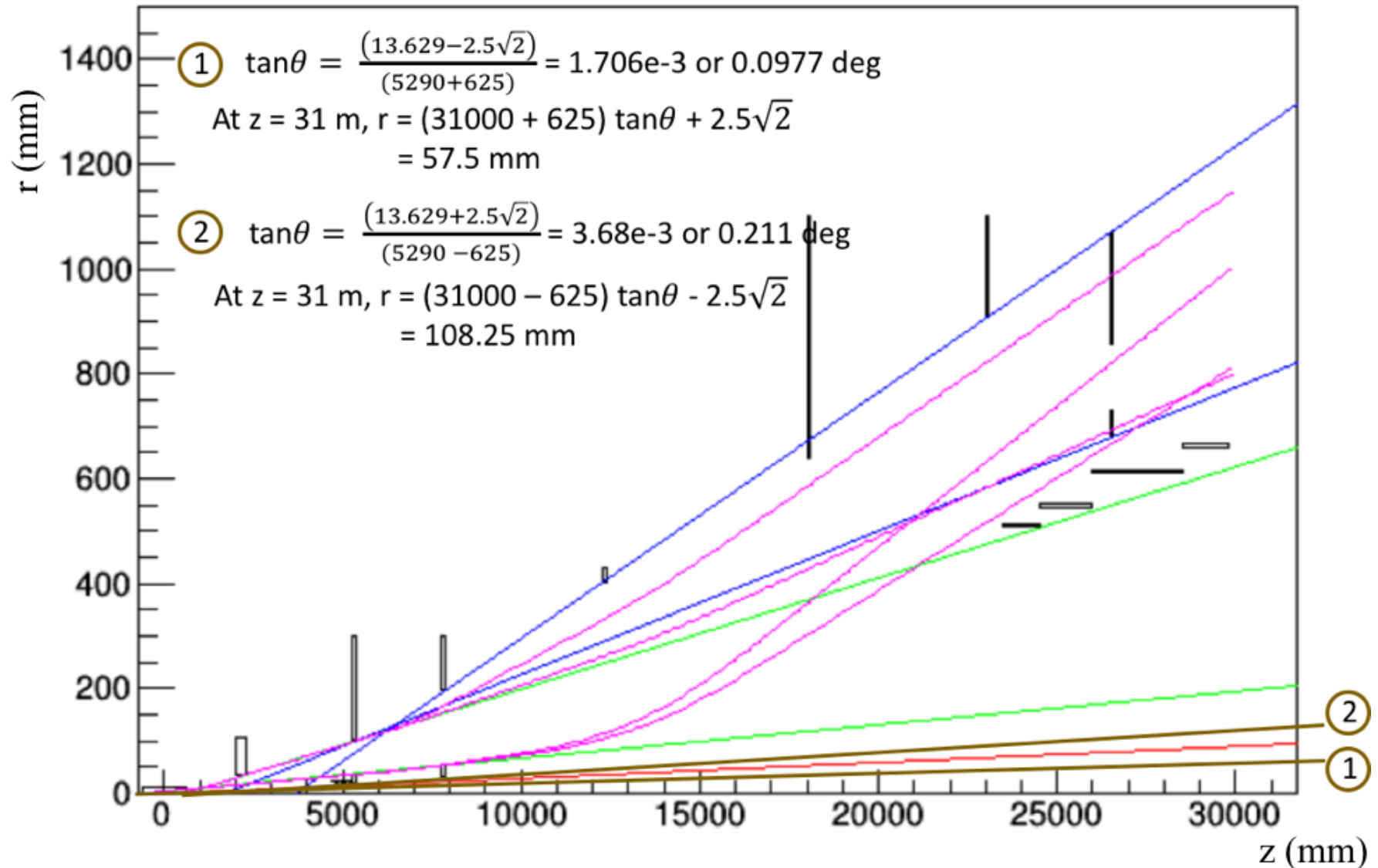
# PREX-II/CREX Small Angle Monitors



# MOLLER SAM Acceptance



# MOLLER SAM Acceptance

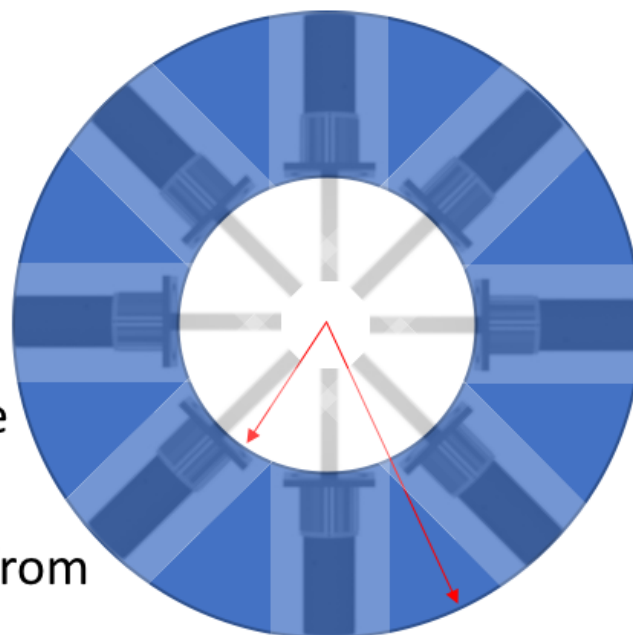


- 31m from target center corresponds to 26.5m from Hall center

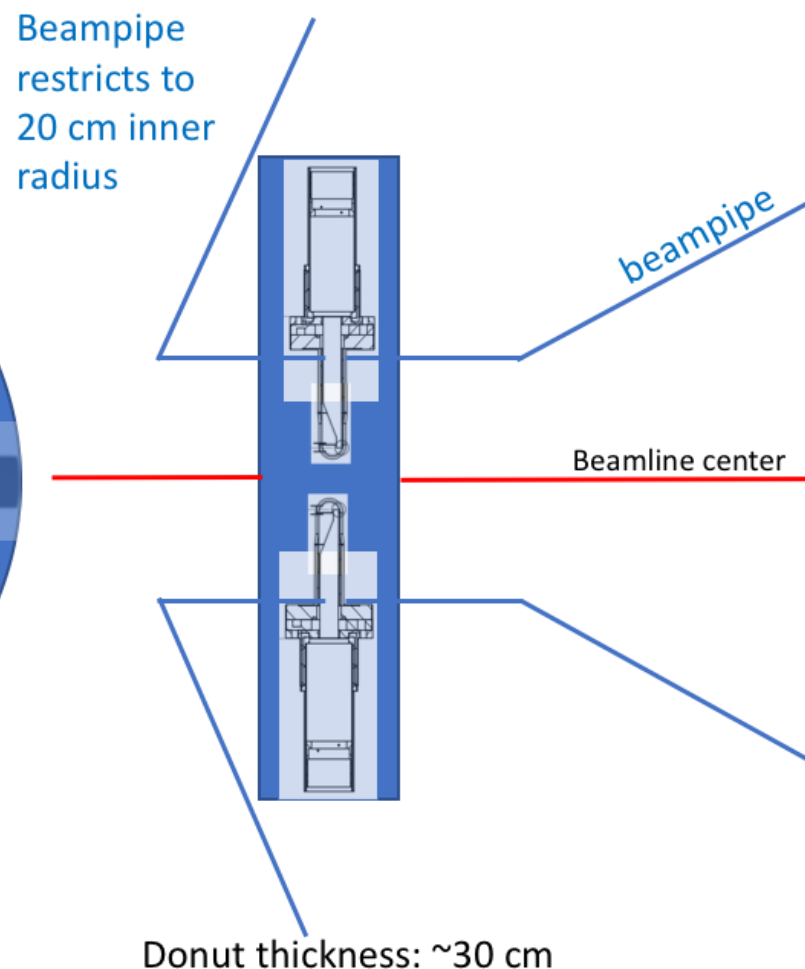


# MOLLER SAM Concept

- Design based on PREX-II/CREX SAMs (similar rate and detector geom.)
- 8-fold symmetry
- PMTs encased in lead donut
- Beampipe inner radius at SAM neckdown should be no smaller than 20 cm
- SAM quartz should span from 4.5 – 5.5 cm radially from beamline center

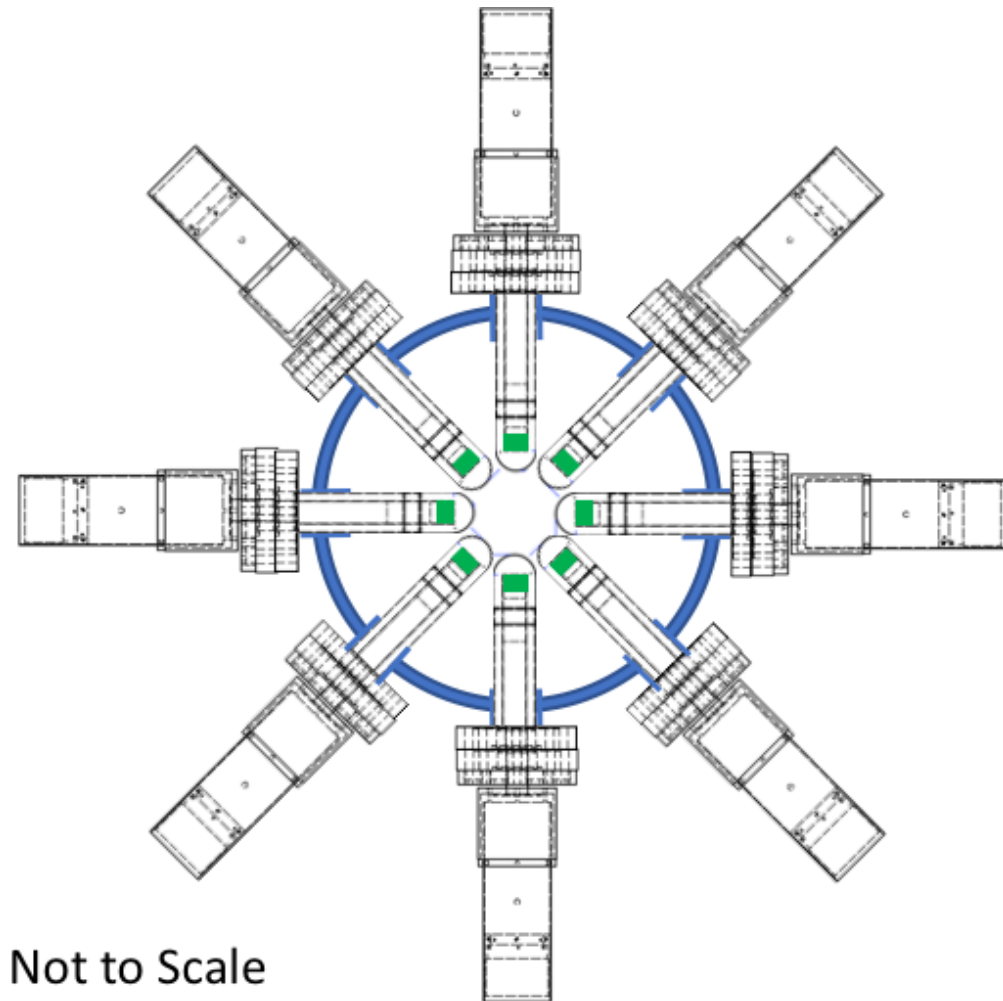


Pb Donut  
Inner radius ~20 cm  
Outer radius ~40 cm



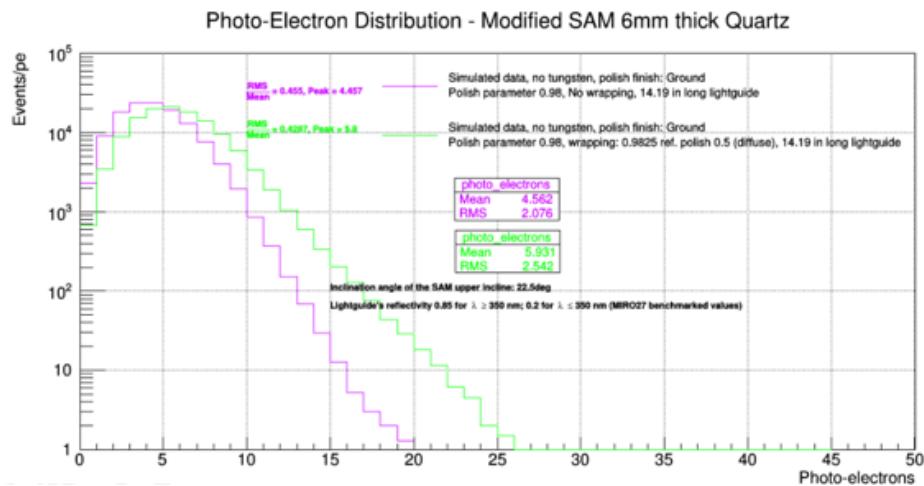
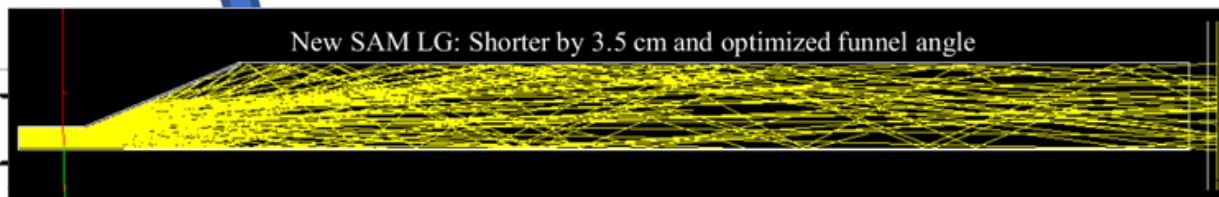
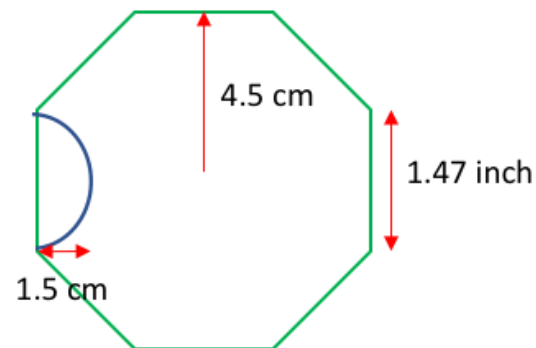
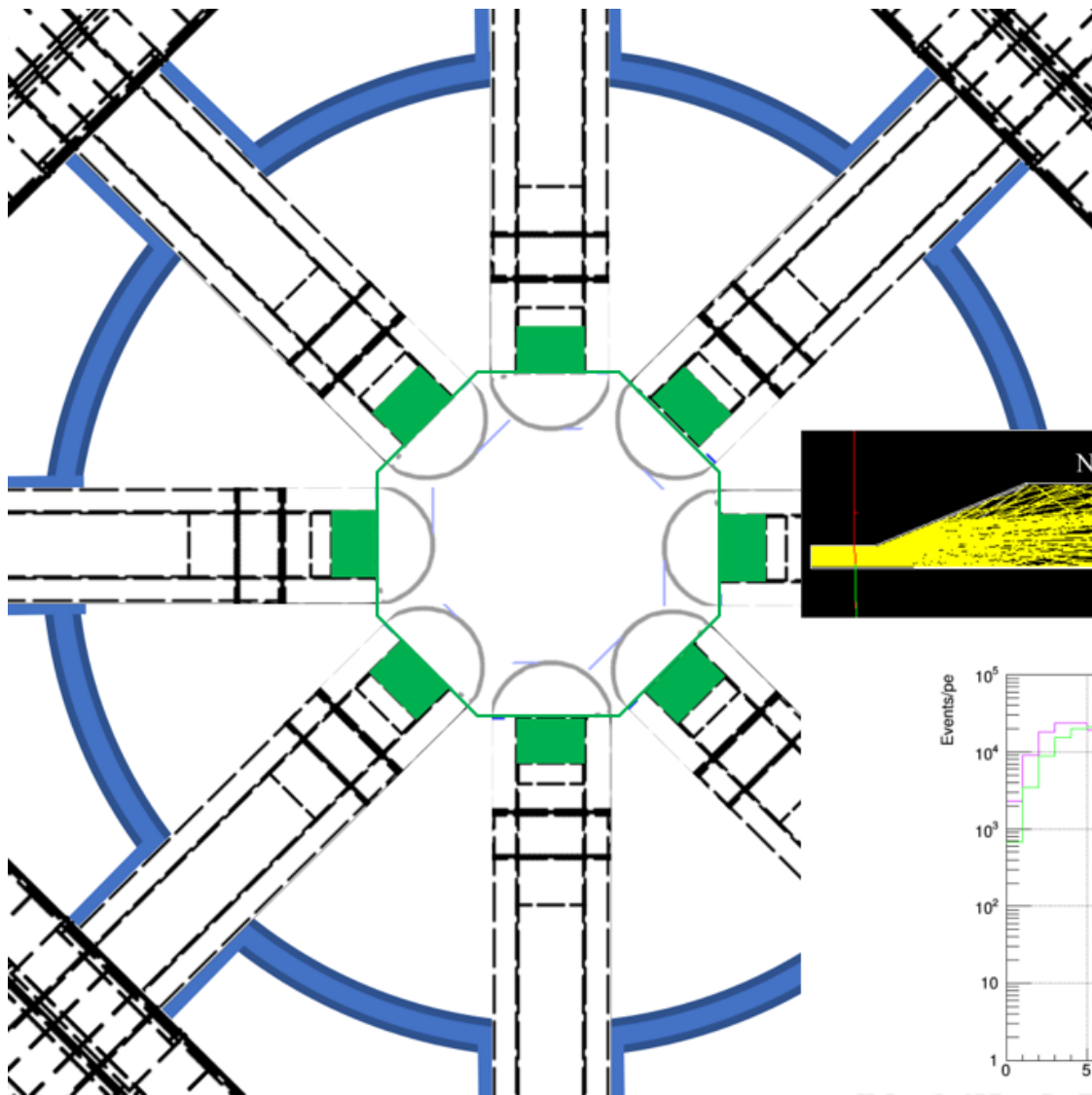
## SAM Concept

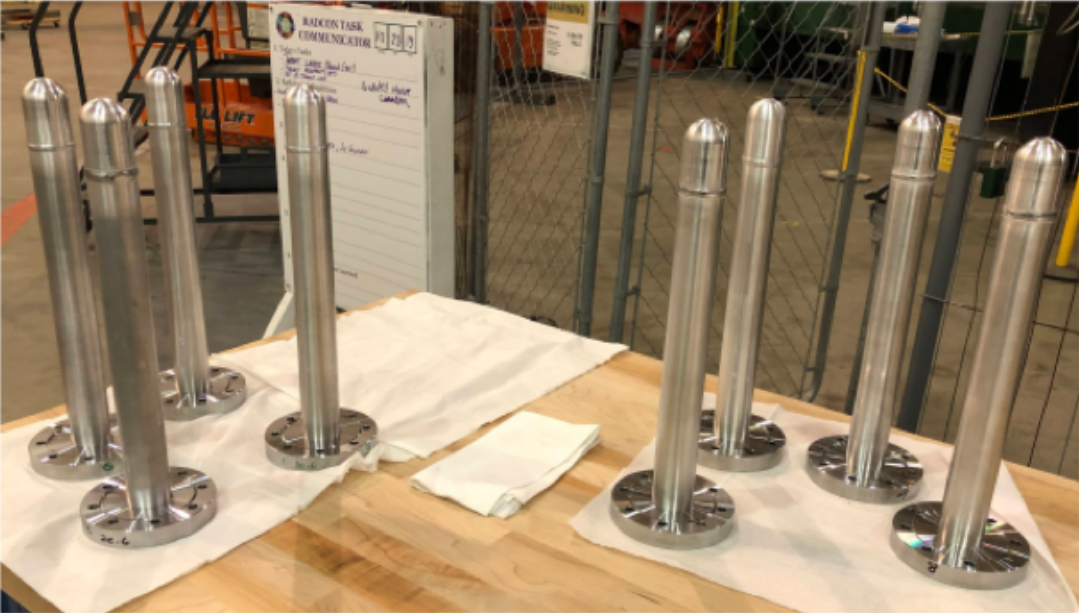
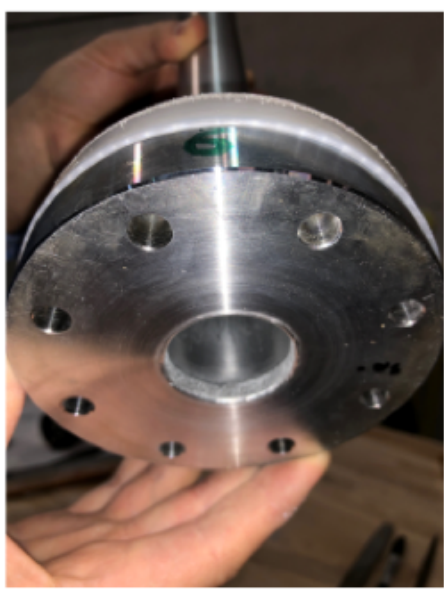
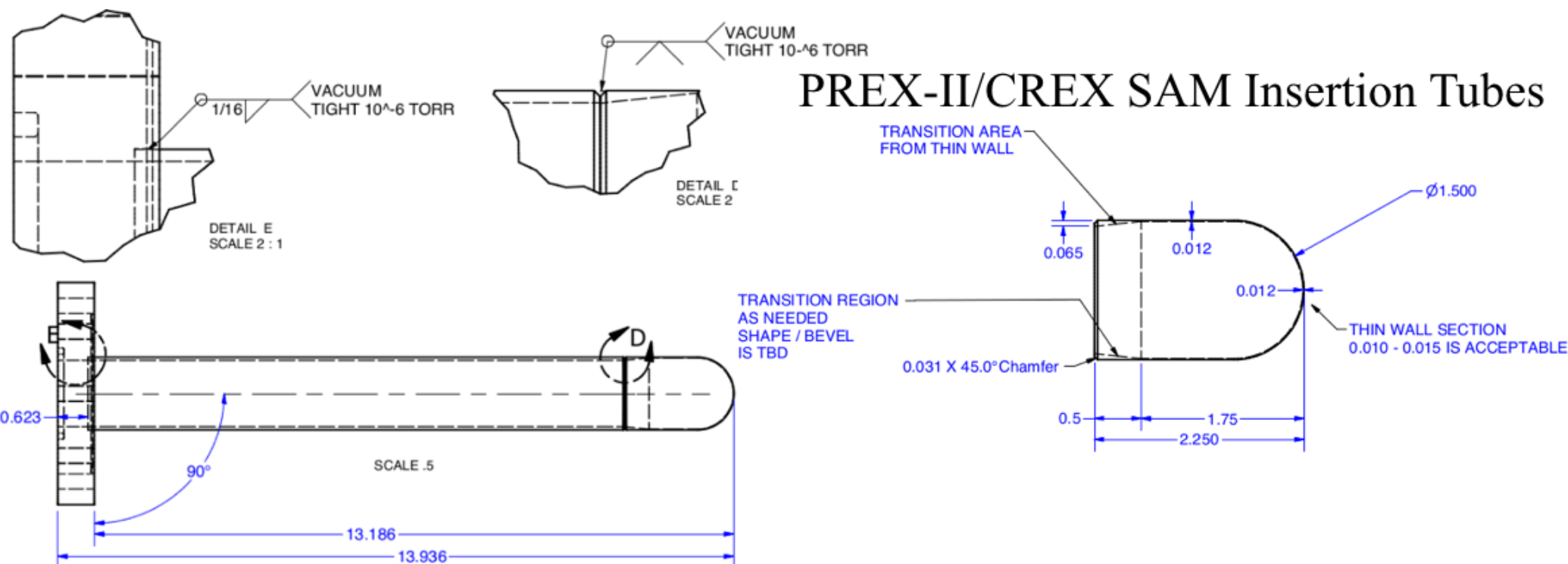
- SAM beampipe with vacuum penetrations
- SAM insertion-cans have domed end-cap (12 mil thick)
- Quartz radiator shown as green (2cm x 1.3cm x 0.6cm)



Not to Scale

## SAM Concept







## Summary and future Work

- Much progress made developing a realistic downstream beamline configuration and detector layout plan
- In the process of documenting and passing info on to engineers for starting development of support ‘superstructures’ -- one for MD array and another for the rest
- Main Detector array placeholder is 1.35 m in z with 0.9 m buffer to the start of Shower-max
- New DS radial scanner concept developed to validate alignment between collimators/spectrometer and beamline
- MOLLER SAM design based on PREX/CREX; needs to be incorporated into next round of radiation simulations