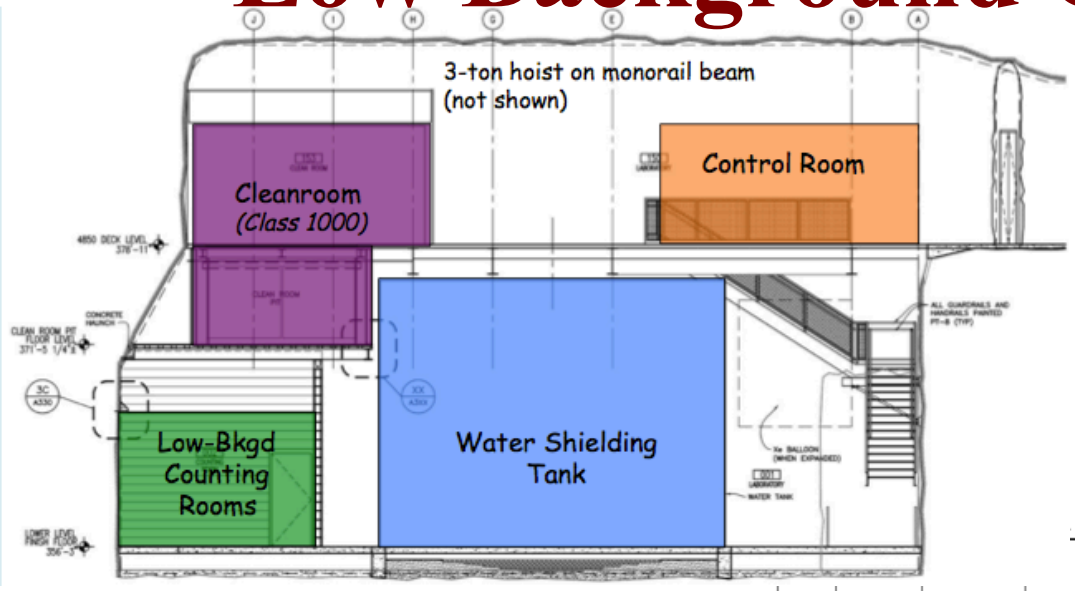
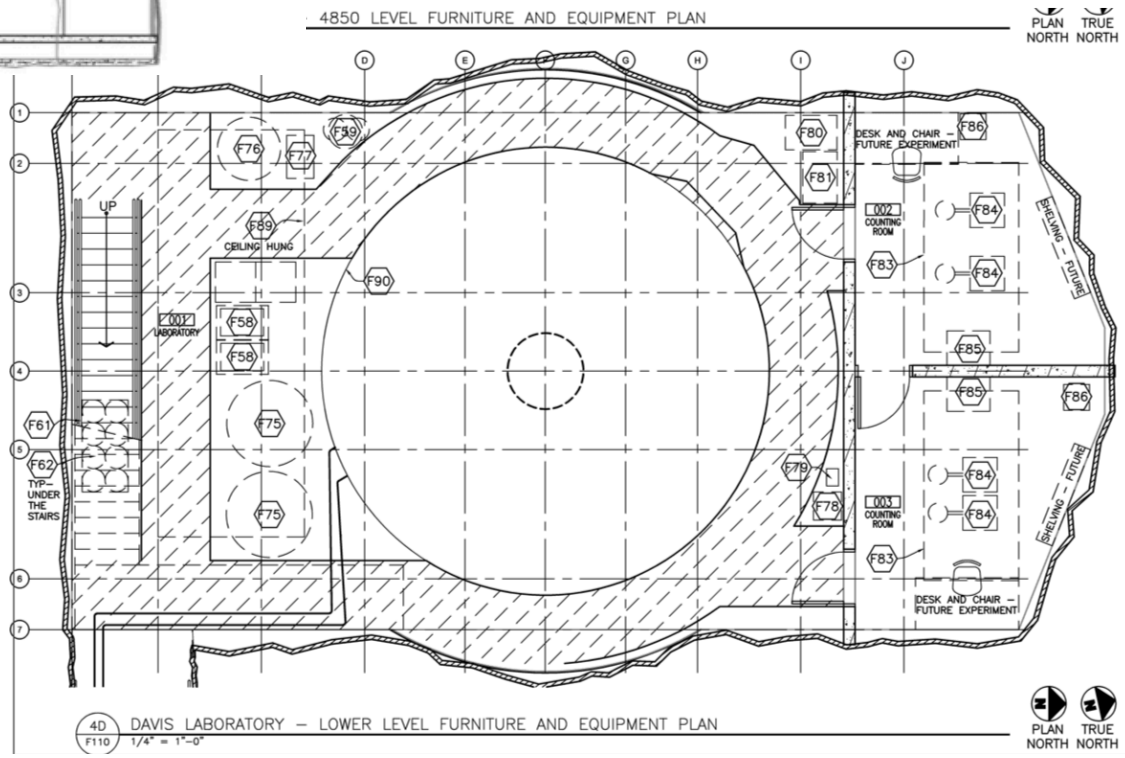
USD Low Background Counting at Davis Cavern

Dongming Mei, Jason Goon, Chao Zhang, Wenzhao Wei, Keenan Thomas (UC Berkeley now)

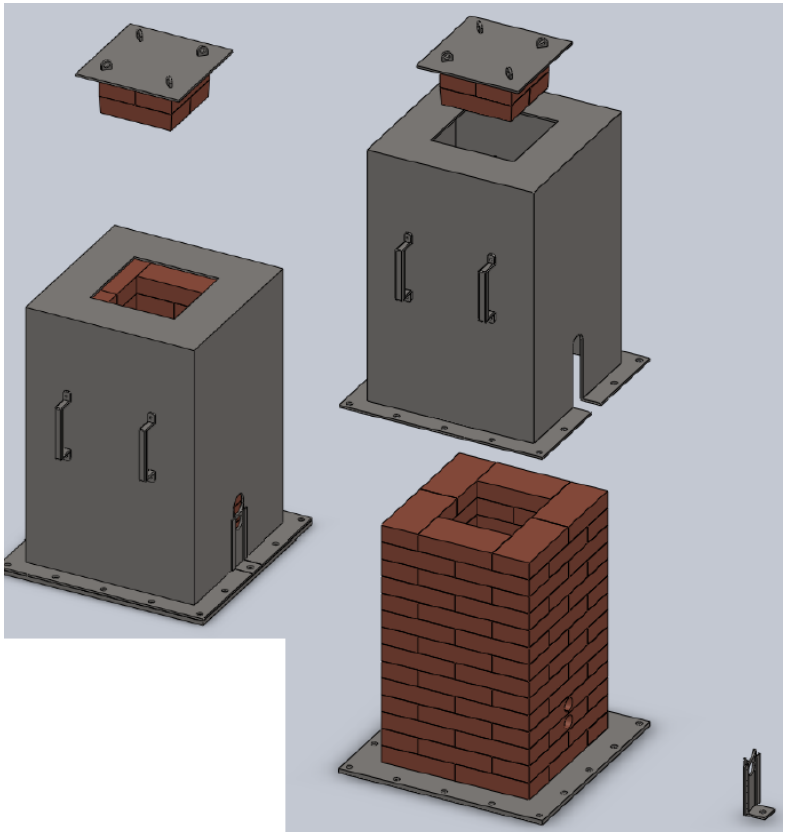
The University of South Dakota

Low Background Counting Rooms

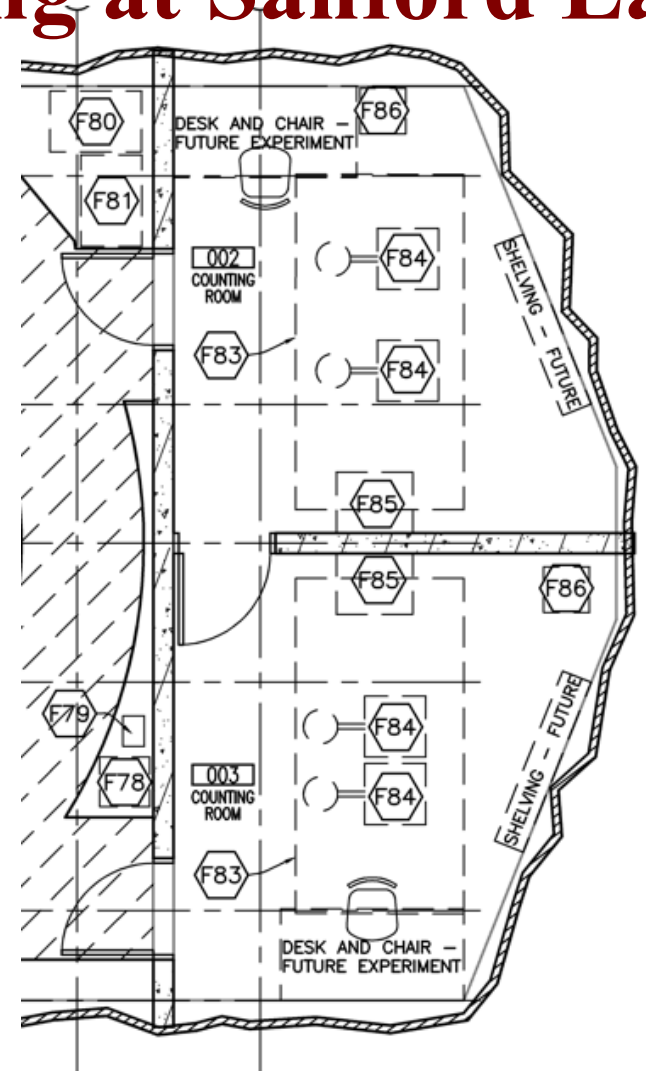




Low Background Counting at Sanford Lab

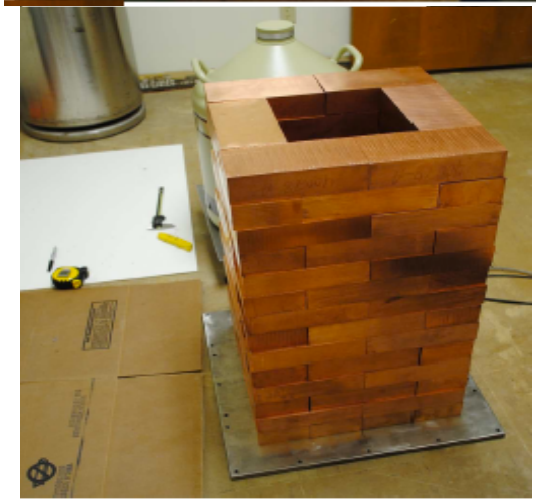


Prototype Rn-exclusion shield is built at USD for use with already purchased HPGE detector. Shield will incorporate an inner layer of OHFC copper, stainless steel radon-exclusion box, and outer layer of lead.



Space reserved for low-background counting with HPGE detectors in the LUX refurbishment of the Davis Cavern on the 4850L. The Davis Cavern is currently under construction.

Building the counting station at USD

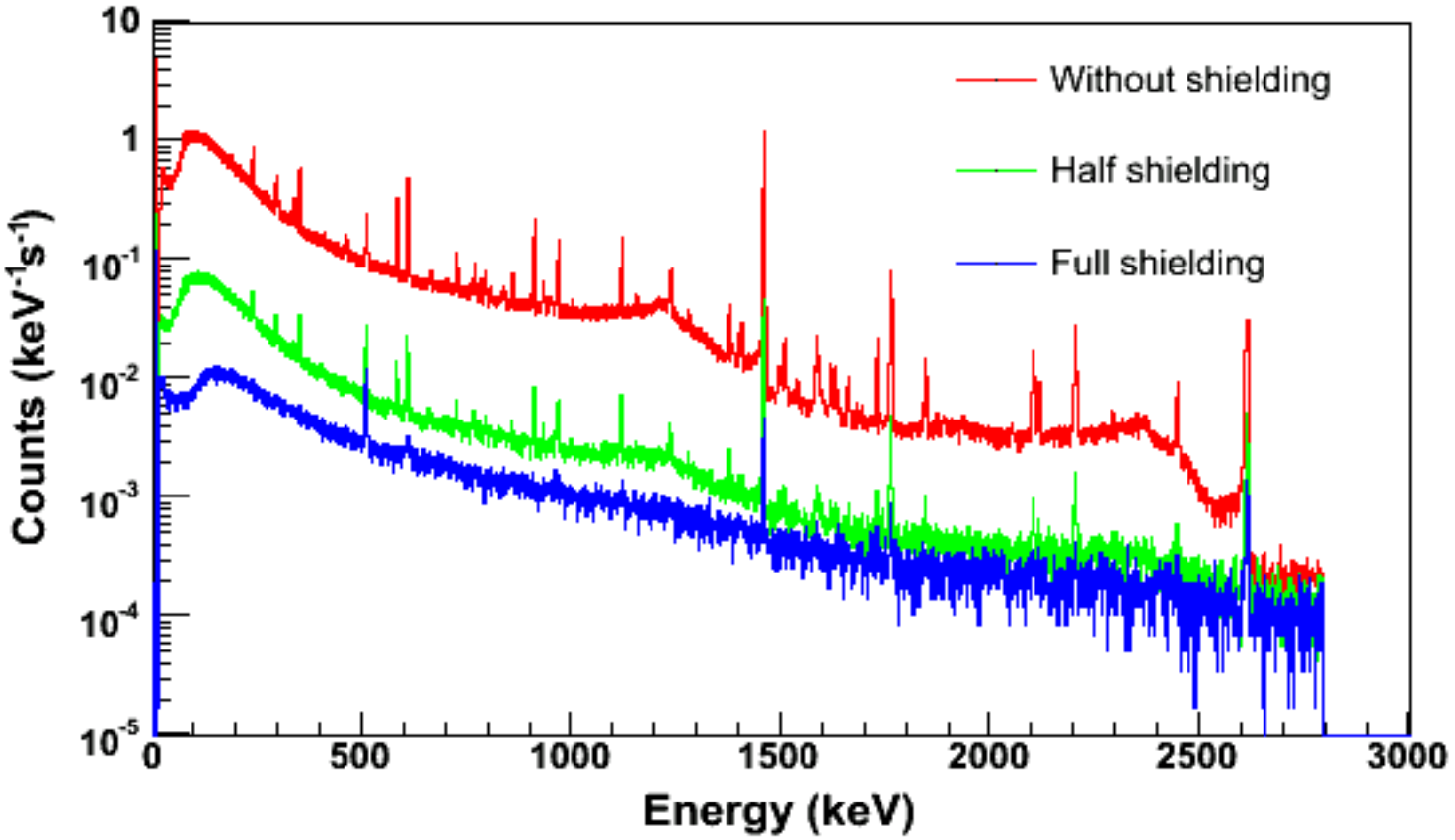


Plans for Calibrating the Detector

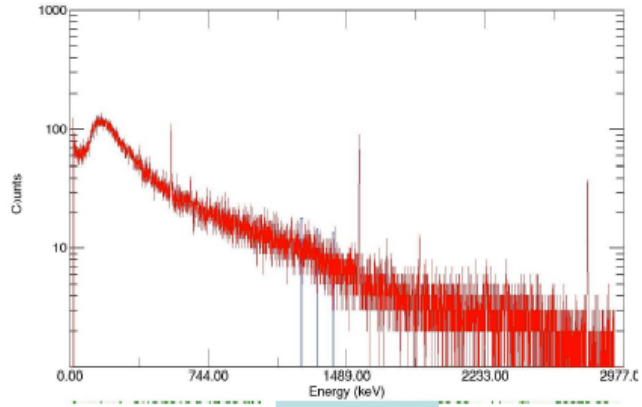
1. Background reduction with shielding
2. Radon background reduction with LN purging
3. Geometry scan
4. Detector efficiency with well-known sources
5. Detector efficiency with calibrated sand from LBL
6. Monte Carlo simulation for absolute efficiency

Count rates on the surface

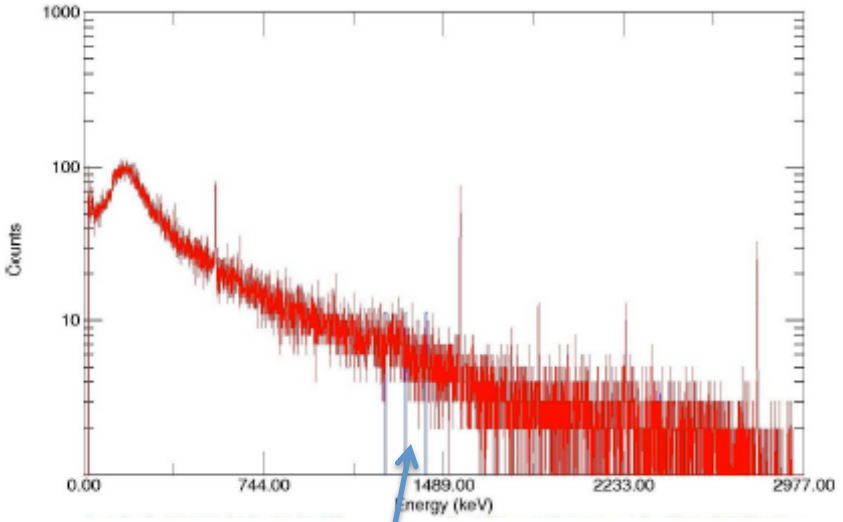
1. Without shielding: 286.44 CPS, without lid shielding: 19.92 CPS, Full shielding: 4.88 CPS



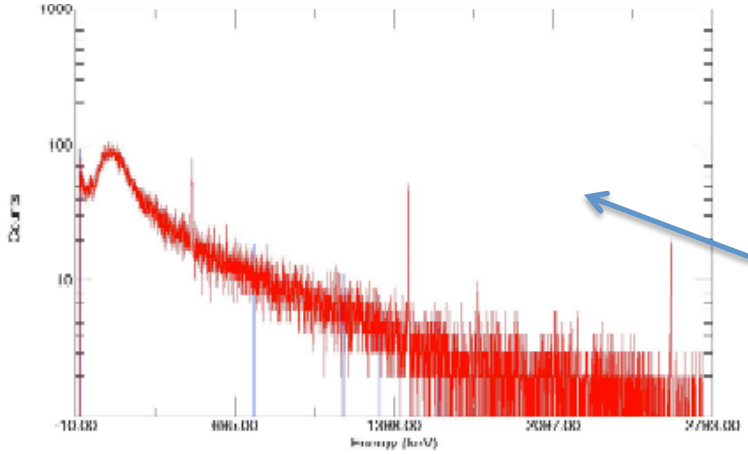
LN Purging Effect



Original



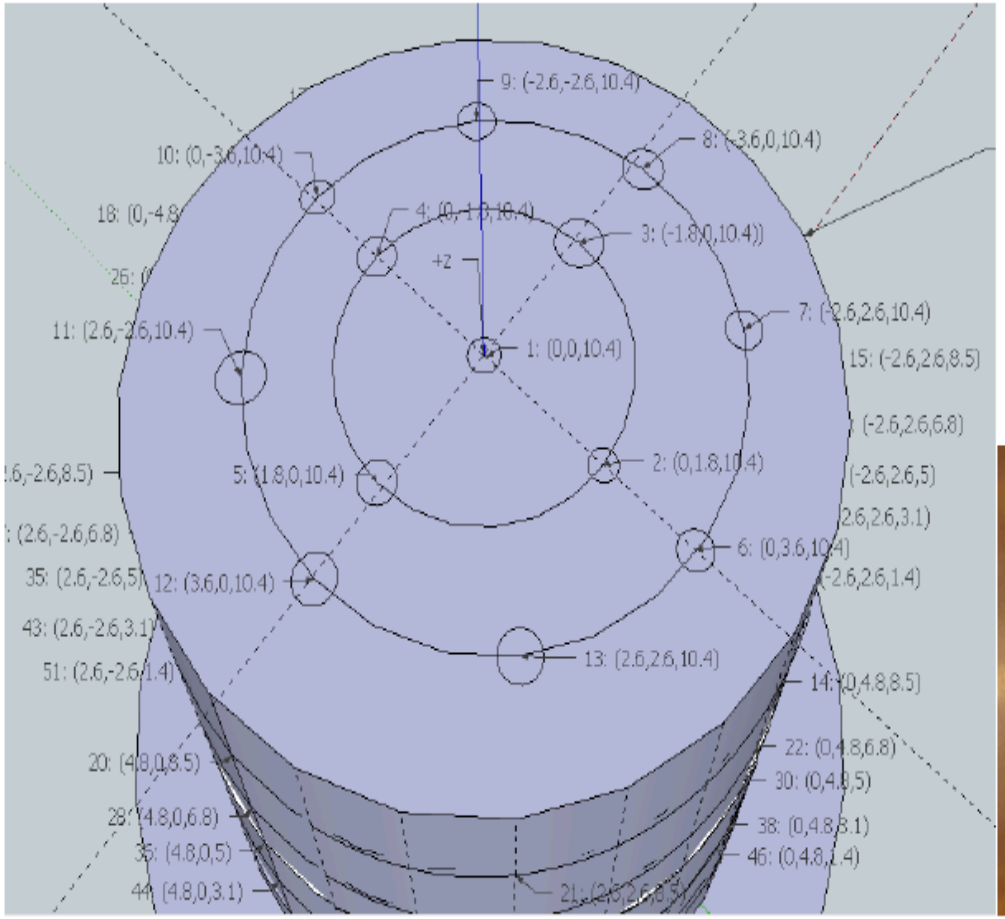
First purging with a reduction of a factor of 4



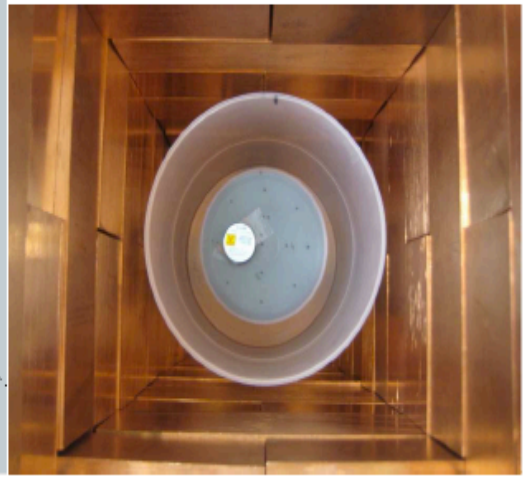
Second purging with a further reduction of a factor of 3

Germanium Detector and Beaker

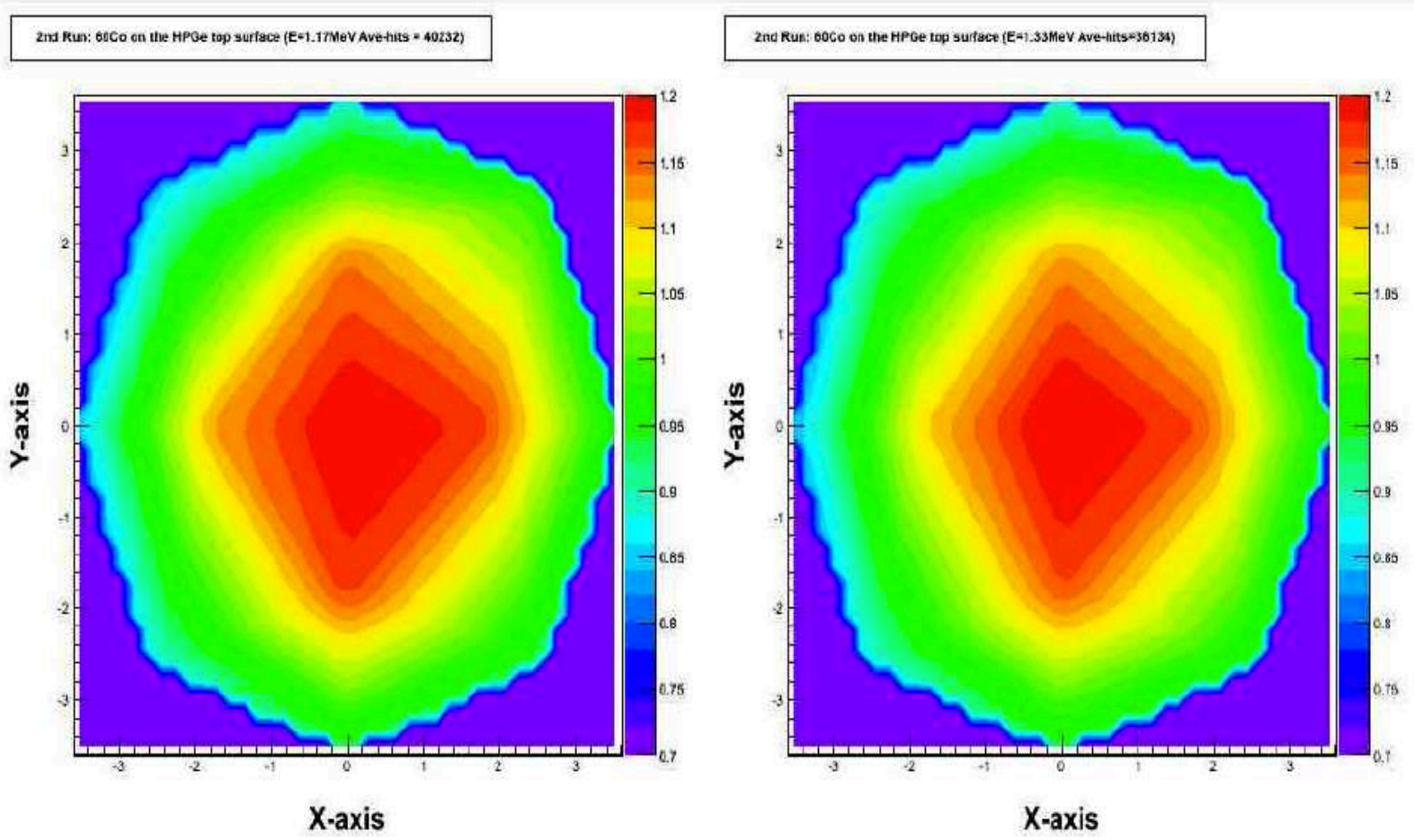
Mapping Detector for Anomalous



Diameter diff between the plastic container & HPGe endcap < 5 mm



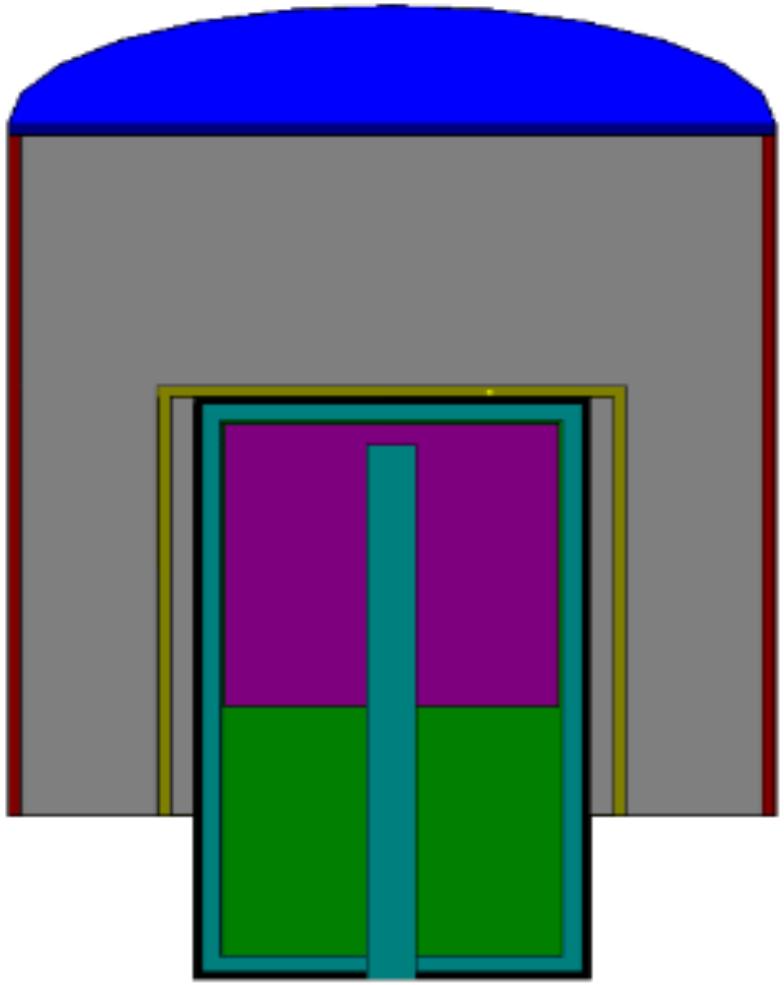
Top Radial Scan



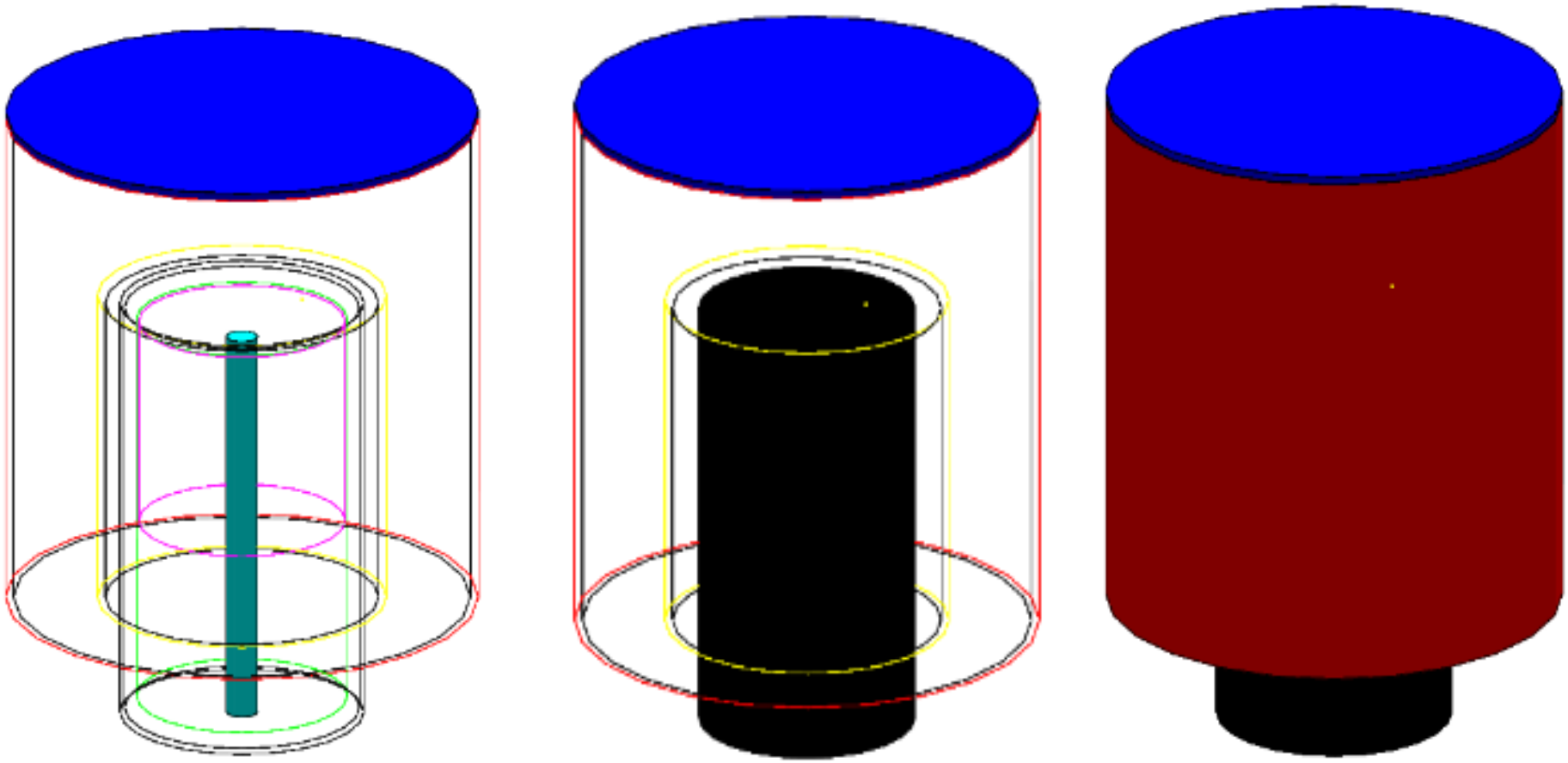
Dimension& Material

	Lid	Out Bk	OutAir Layer	Inne rBk	Inner Air Layer	End Cap Wall	Vacuum Layer	Mount Cup	Crystal	Hole
Material	PE	PP	Air	PP	Air	Carbon Fiber	Vacuum	Cu	Ge	Vacuum
Radius (mm)	78.5	78.5	75.87	48	45.37	40.51	39.01	35.01	34.25	5.15
Length (mm)	2.63	165	165	104	101.4	141	138	130	68.7	129.5

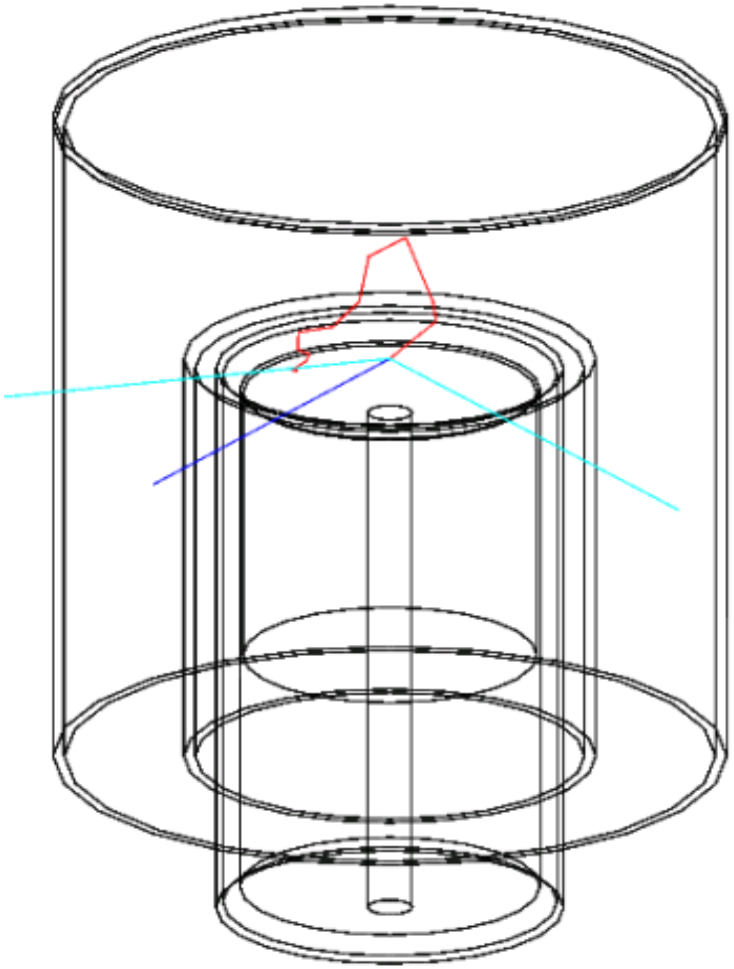
Geometry(180^0)

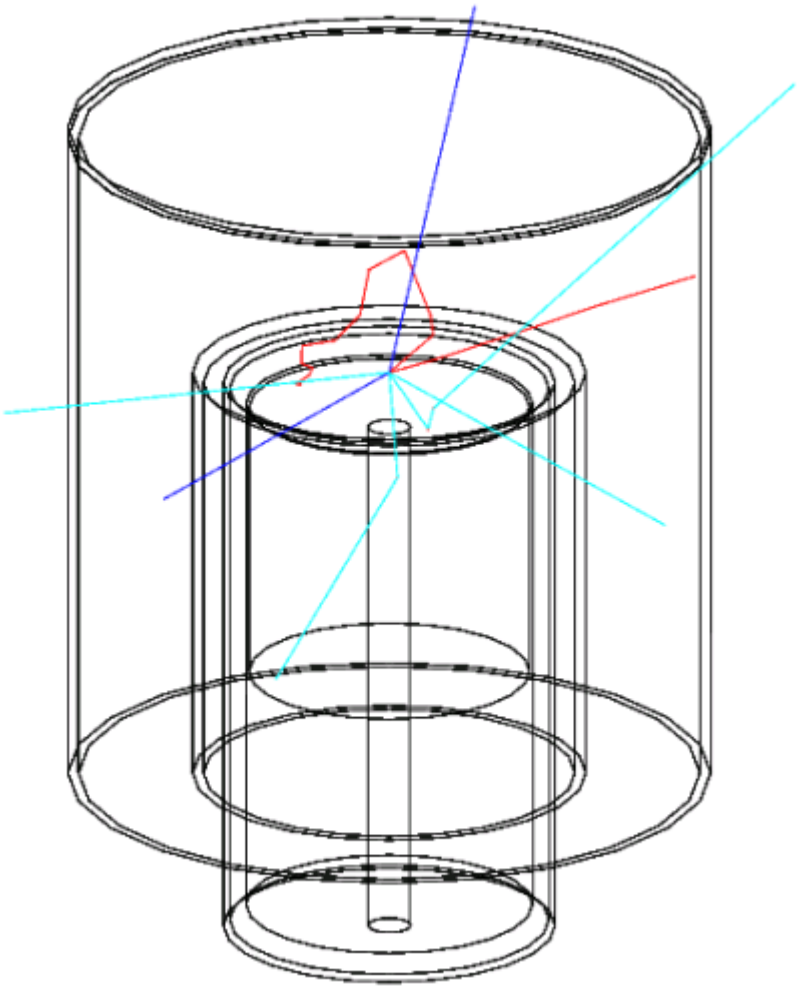


Geometry(360^0)



Simulation --- ^{60}Co





- **Source position:**
  Top of the Inner Beaker

Electron
Neutrino
Gamma(1.17Mev & 1.33MeV)

Efficiency of the Germanium Detector