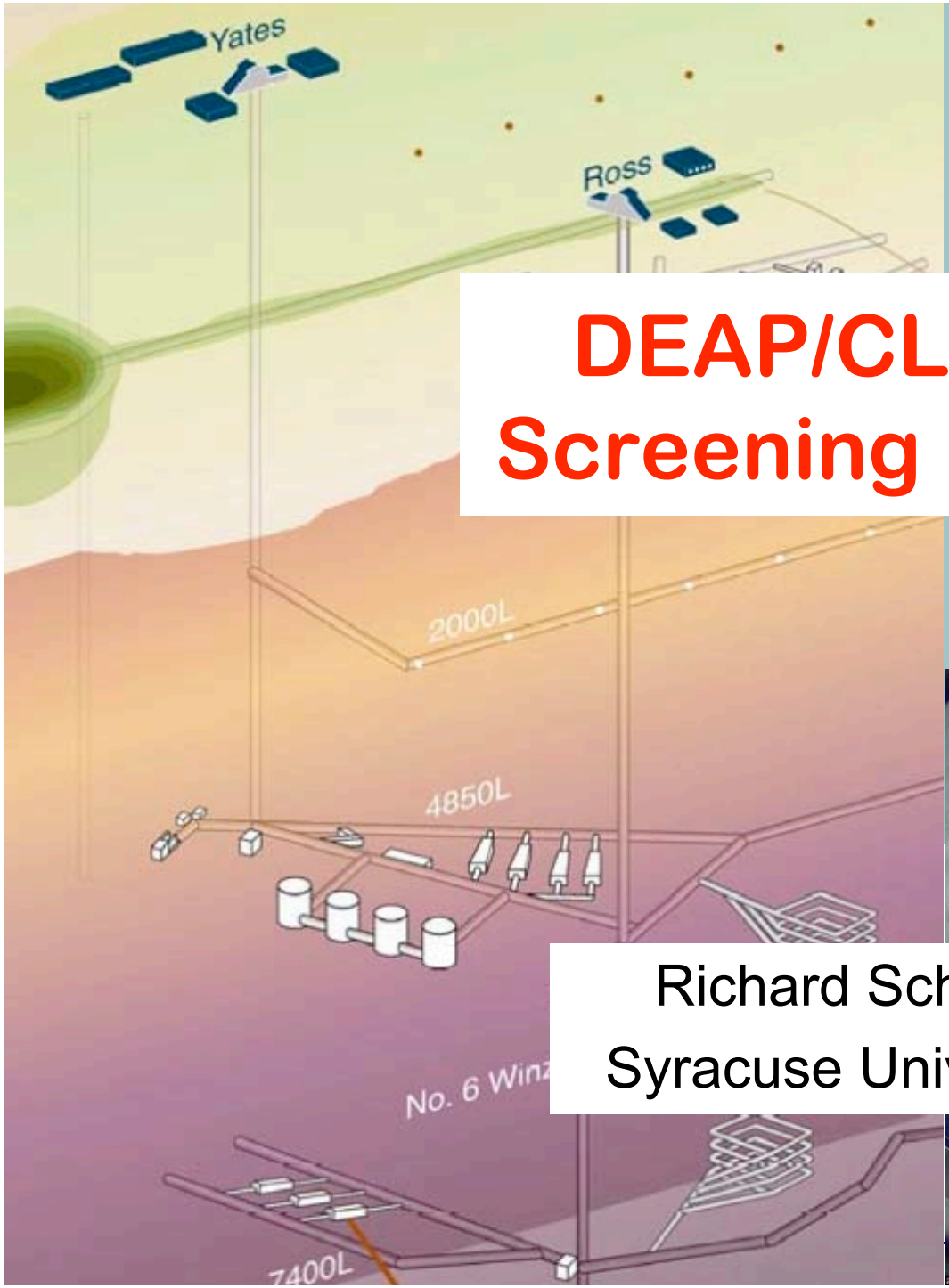

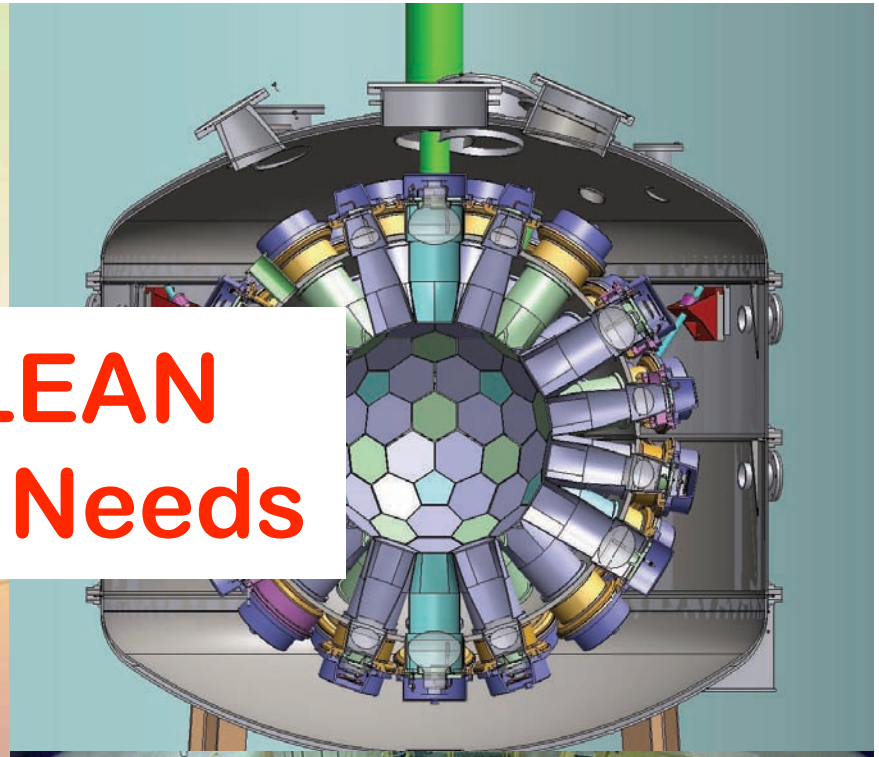

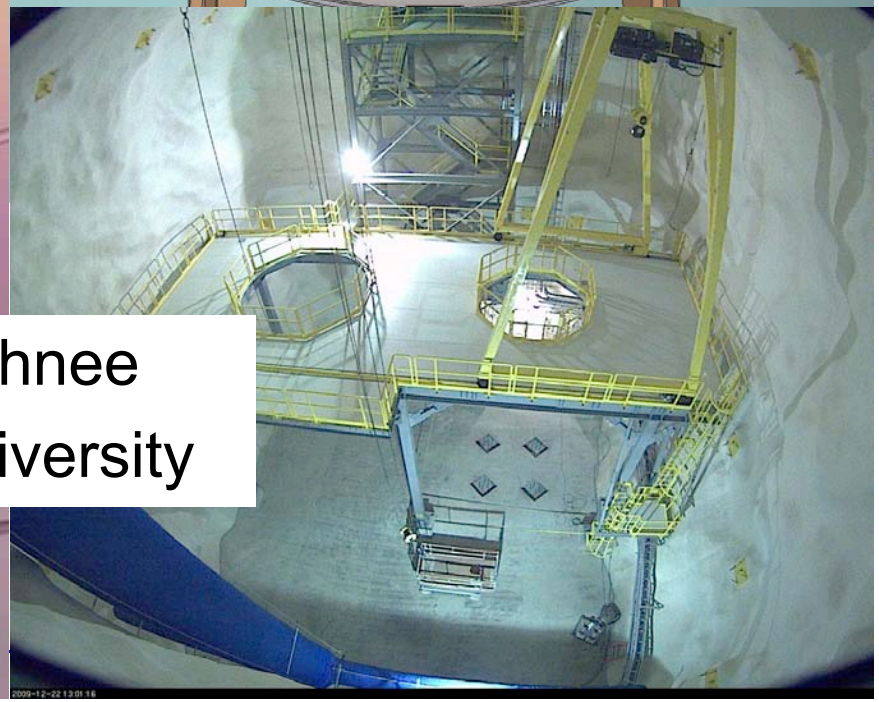

DEAP/CLEAN Screening Needs

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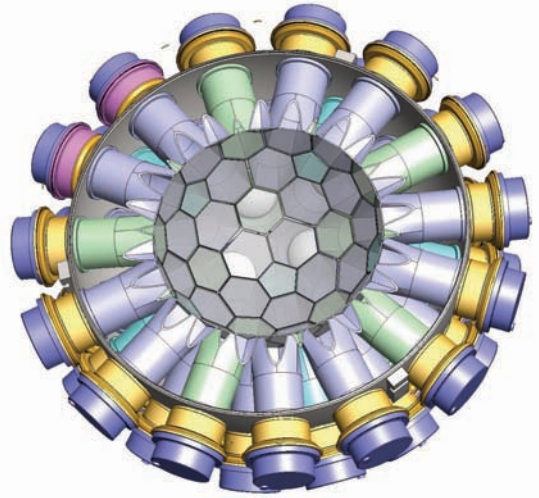
DEAP/CLEAN

1. MiniCLEAN
   - 150 kg fiducial / 500 kg
   - Assembly in SNOLAB Fall 2011
2. DEAP-3600
   - 1000 kg fiducial / 3600 kg
   - Funded by CFI; assembly in SNOLAB Summer 2012
3. CLEAN
   - 10 ton fiducial / 40 ton
   - ν physics too

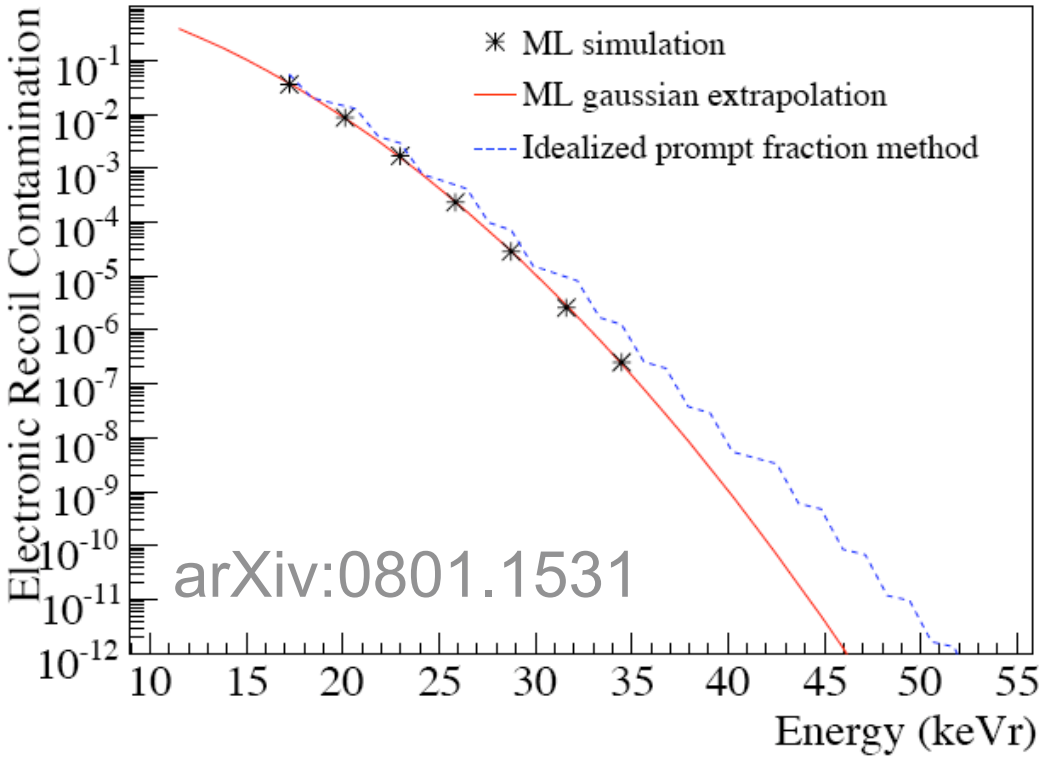
- LAr (LNe) WIMP-search
  - kHz/ton ^{39}Ar background
  - ~10^{9} -10^{11} rejection of electron-recoils based on timing of scintillation light (PSD)



- Use fiducialization to mitigate other dominant backgrounds
  - External neutrons (dominated by (a,n) in PMT glass)
  - Alphas and their recoiling nuclei on detector surface

Depleted Argon

- Key advantage of design is that argon depleted in ^{39}Ar is not needed
  - Fast signal (10 μs) so pileup is issue only at ~100 ton
- However, detector threshold, efficiency set by requirement of good enough pulse-shape discrimination (PSD) of ^{39}Ar
  - Depleted argon would increase sensitivity at each phase
  - Lower data rate would make experiment and calibrations easier
  - Depleted argon could allow even more massive experiment
- MOU with Princeton depleted-argon group



External Neutrons (and Photons)

- 25% fiducial-volume cut is more effective at rejecting external backgrounds for larger detectors
  - Most screening requirements within factor of 4 for all phases
- Expected neutron/photon backgrounds dominated by PMTs
  - Lower-radioactivity light detectors may allow fiducial volume to be enlarged, increase experiment sensitivity
  - Do not need ultra-sensitive Ge screening in most cases
- Need moderate Ge screening of many parts
  - Ensure phototubes dominate background

MiniCLEAN Gamma Screening

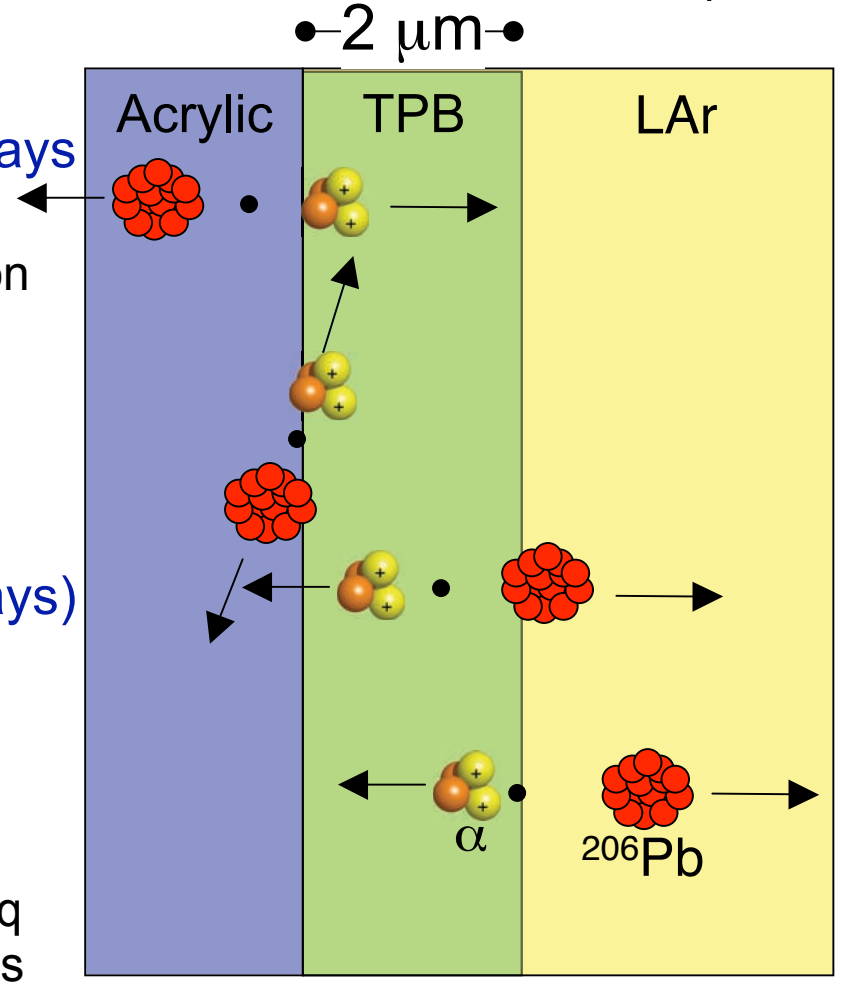
	^{238}U (mBq/kg)	^{232}Th (mBq/kg)	^{40}K (mBq/kg)	^{137}Cs (mBq/kg)	^{60}Co (mBq/kg)	^{54}Mn (mBq/kg)
Whole PMT R5912	905+/-25	471+/-15	2986+/-175	2+/-3		
PMT Glass R5912	1274+/-34	692+/-21	3623+/-214	2.4+/-4	1.3+/-2.3	
PMT metal R5912	15+/-7	46+/-11	2412+/-270	7.5+/-6.9	17 +/-5	11+/-5
PMT ceramic R5912	1221+/-103	383+/-72	20736+/-1969			
OV dome	0.9+/-0.2	0.6+/-0.1	<1.28	<0.09	3.1+/-0.2	1.3+/-0.2
OV Main Flanges	3.1+/-1.2	2.8+/-1.2	6.2+/-5.8	<0.87	23+/-2	5.6+/-1.3
OV Cylinder sections	0.92+/-0.74	3.5+/-0.9	<3.65	1.2+/-0.7	20+/-2	4.9+/-0.9
OV-B to J, & T flange	0.10+/-0.13	0.69+/-0.18	<1.01	<0.11	5.3+/-0.4	1.1+/-0.2
OV TIG weld rod	1.0+/-0.7	2.8+/-0.8	<1.45	<0.9	3.8+/-0.7	

A small subset…not the full list! (~50 so far, ~100 total)

- Still need to screen inner vessel parts, calibration system (mostly SNOLAB, some Kimbalton, …?)

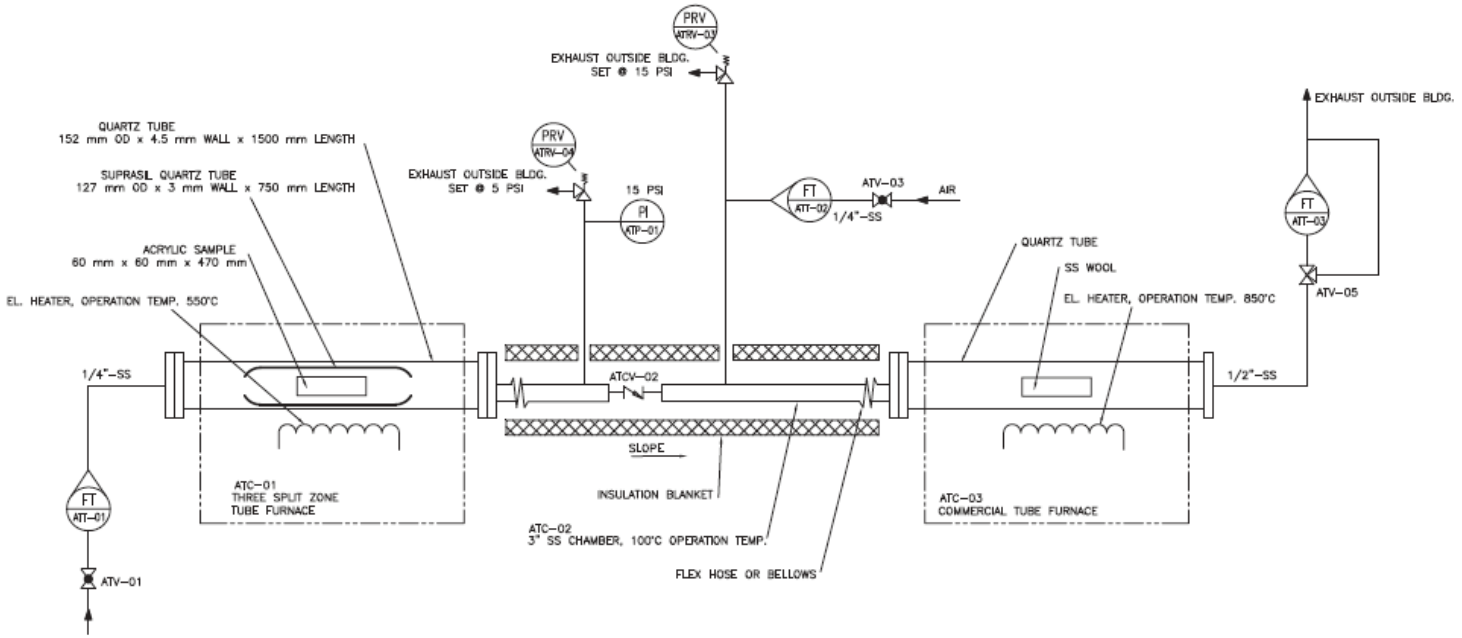
Alphas on Surfaces from Radon Daughters

- If alpha loses most of its energy in acrylic, can appear in energy region of interest (& pass PSD cut, assumed here)
- 4 Problematic classes
  - Contaminant in acrylic (~1% of decays in first 40 μm)
    - Bulk contamination or radon diffusion
    - Requires <ppt U/Th screening
  - Radon-daughter plateout in acrylic surface (~0.01% of decays)
    - Requires surface α/β screening
  - Contaminant in TPB (~15% of decays)
    - Requires <ppt g/g U/Th screening
  - Radon-daughter plateout or 210Pb desorption/adsorption onto TPB surface (0.5%-20% of decays)
    - Requires α/β surface screening, μBq radon emanation of process systems



Plans for Acrylic Screening

- For bulk contamination, previous SNO limits ~3x too high
  - To achieve desired sensitivity, two-furnace system and new Ge well detector are being set up, plan measurements in 2011



- For surface contamination, test of MiniCLEAN cutting of final mm has been tested successfully with spike, but not to desired absolute sensitivity
  - Plan to retest in coming year with XIA α-detector and/or BetaCage prototype