

# Radioactivity Control at SNOLAB

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# Helping Experiments Control Radioactivity is a Large Part of What We Do

4hd

2.9  $\mu$  / m<sup>2</sup> / day



# Keeping Equipment Clean During Shipping to Underground Lab Requires Sophisticated Logistics

Routine materials are brought into the dirty-side car wash from the mine drift.



# Keeping Equipment Clean During Shipping to Underground Lab Requires Sophisticated Logistics

And washed as appropriate by hand, with pressure washers, etc.



# Keeping Equipment Clean During Shipping to Underground Lab Requires Sophisticated Logistics

And then brought through another set of doors to



# Keeping Equipment Clean During Shipping to Underground Lab Requires Sophisticated Logistics

The clean-side car wash where they are cleaned again.



# Keeping Equipment Clean During Shipping to Underground Lab Requires Sophisticated Logistics

The SNOLAB-clean materials are then brought in the lab.

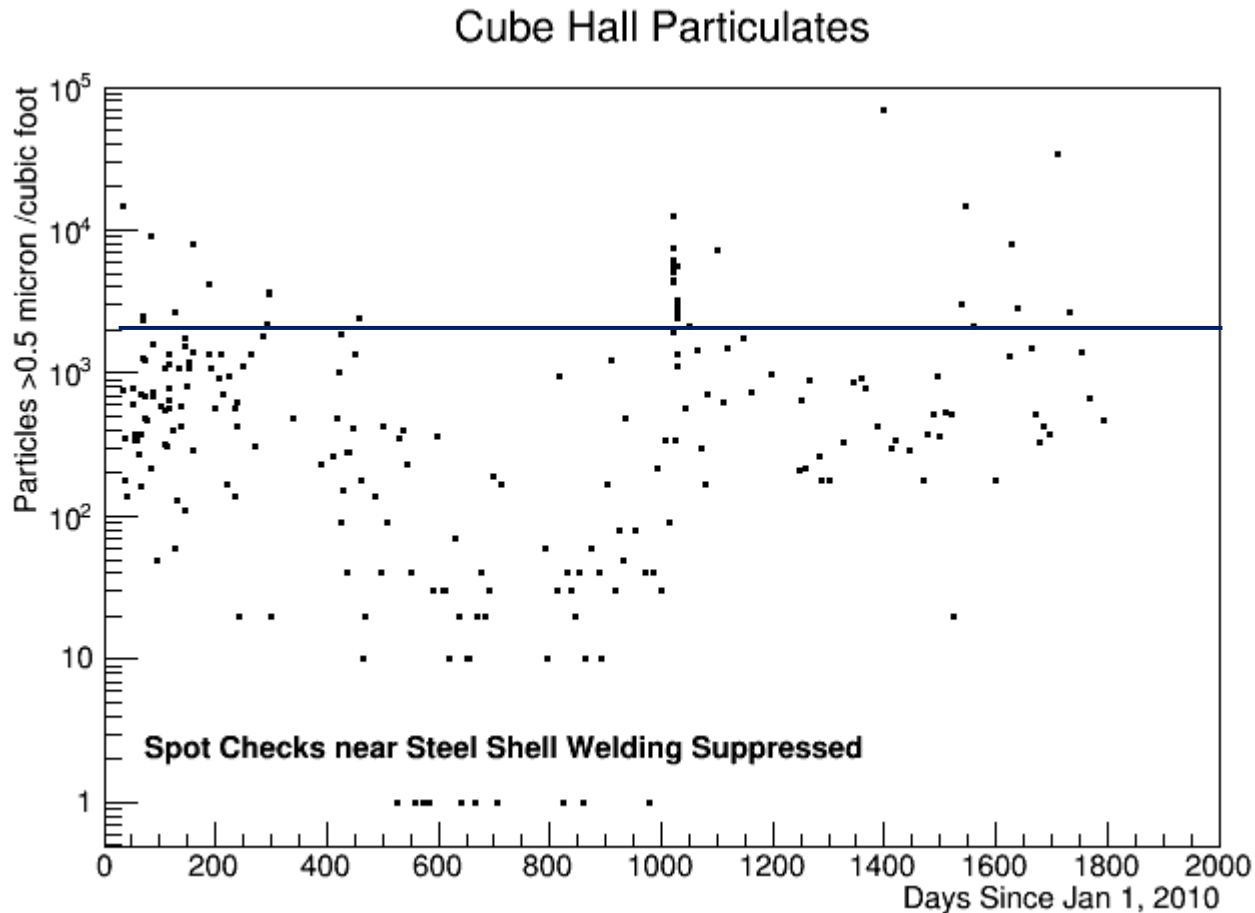


Please don't worry about your delicate Items:  
Clean and pack them on Surface or  
Offsite and Triple Bag for Shipping

Usually the outer bag is removed in the dirty-side car wash,  
the second bag in the clean side car wash, and  
the item is kept in the inner bag until installation.



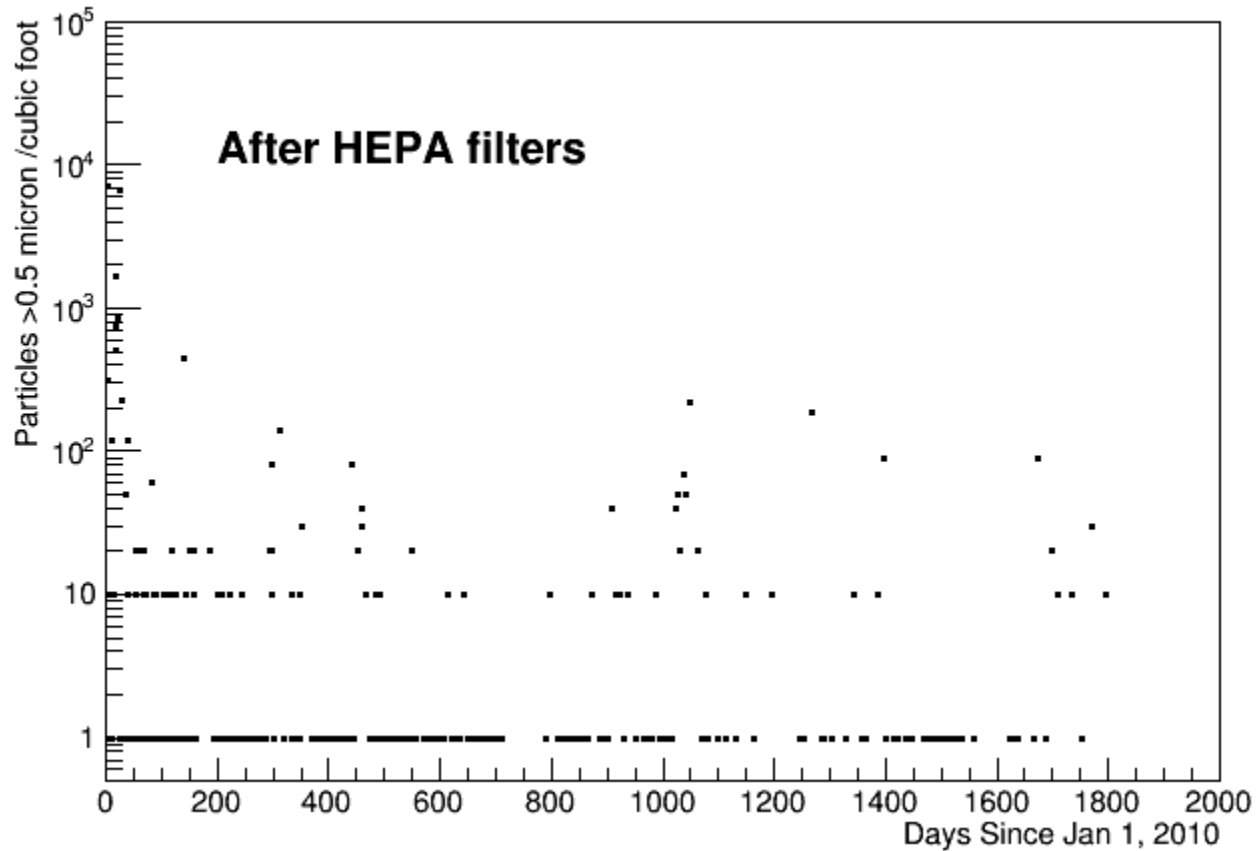
# SNOLAB Maintains Periodic Checks of Air Quality through Particulate Counting.



Excursions above 2000 counts mostly isolated and understood events.

# SNOLAB Maintains Periodic Checks of Air Quality through Particulate Counting.

Output of Air Handler 7



# Upgrades to System Are Needed To Automate System

Frequency of checks is getting lower with time as staff are required for other tasks.

Want data more easily available to entire SNOLAB community.

Continuous monitoring in key locations.

Data automatically uploaded to community-readable data server.

Formal inclusion SNOLAB QM program.

# There are a Collection of Witness Plates to Integrate Contamination Over Time

About 12  
throughout  
lab



# X-Ray Fluorescence Allows Precise Measurement of Dust Levels

Want to know about Uranium and Thorium: ppm in rock dust.  
Too little to measure → Use Iron: 7% of mine dust.

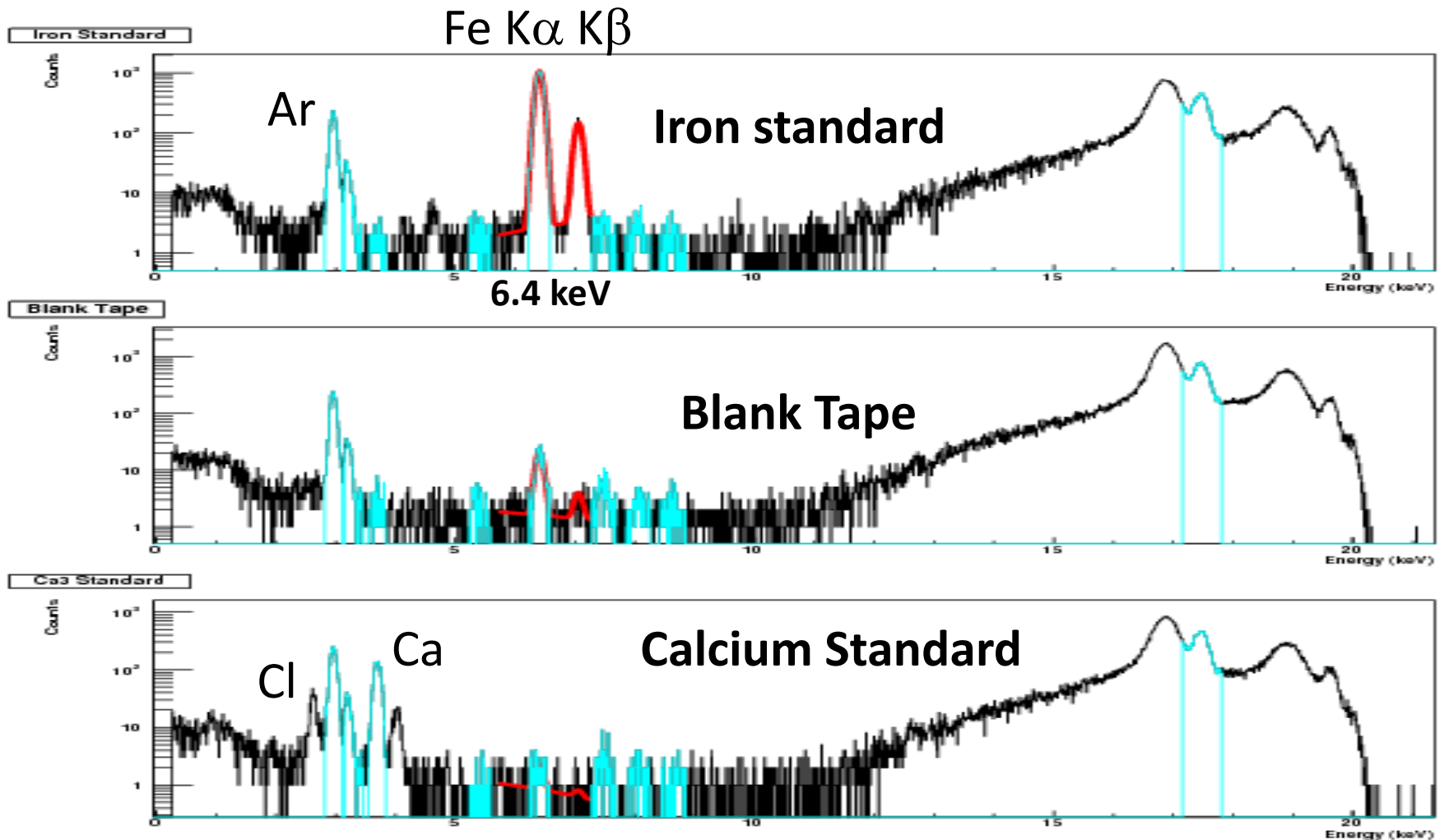
X-ray source and mechanical setup inherited from SNO



New Amptek detector  
SiPIN diode with FET  
mounted on  
thermoelectric cooler.

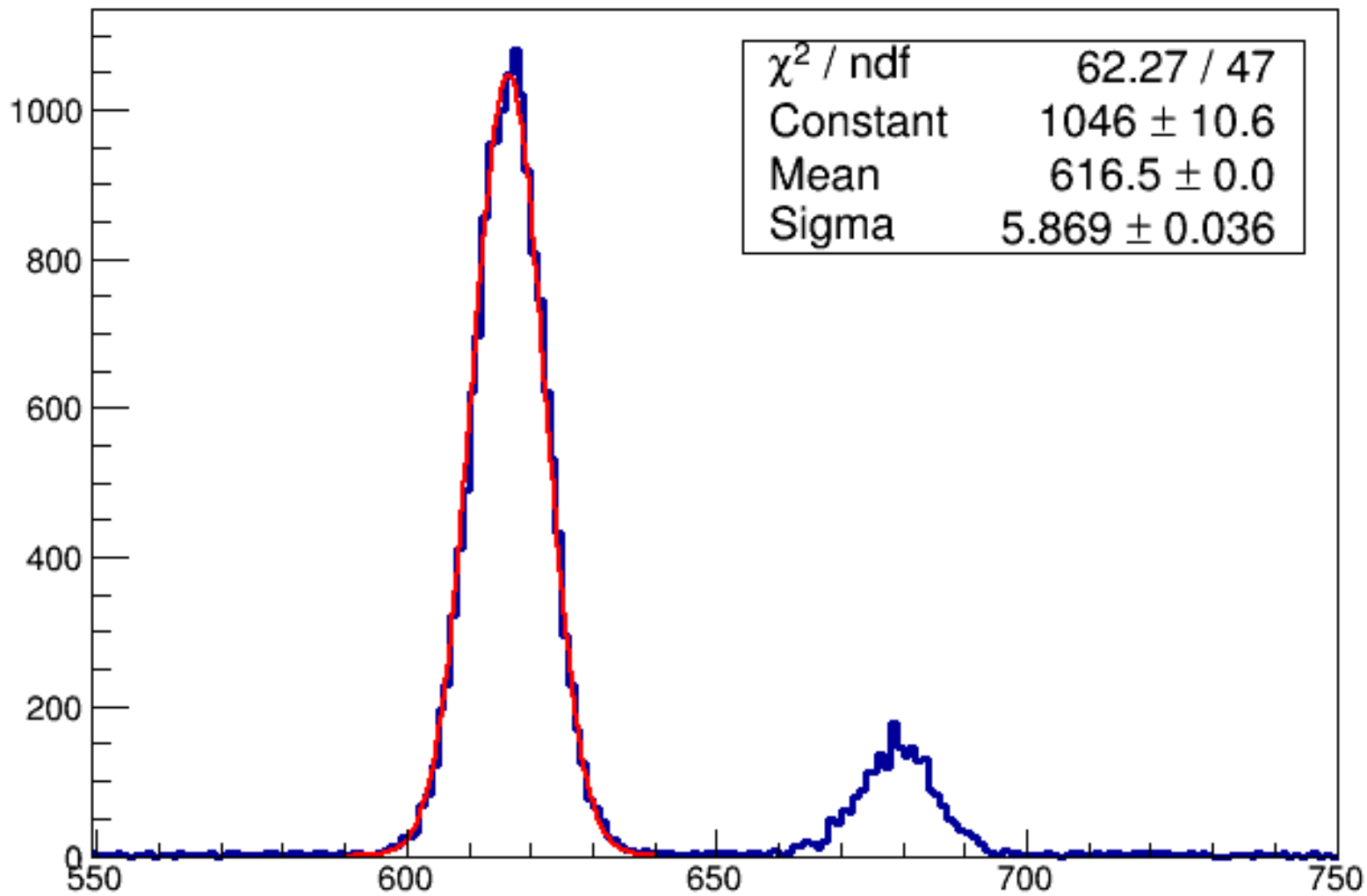
Electronics inside.  
(USB plug-and-play)

# Energy Resolution is Excellent: <1% at Iron Peak

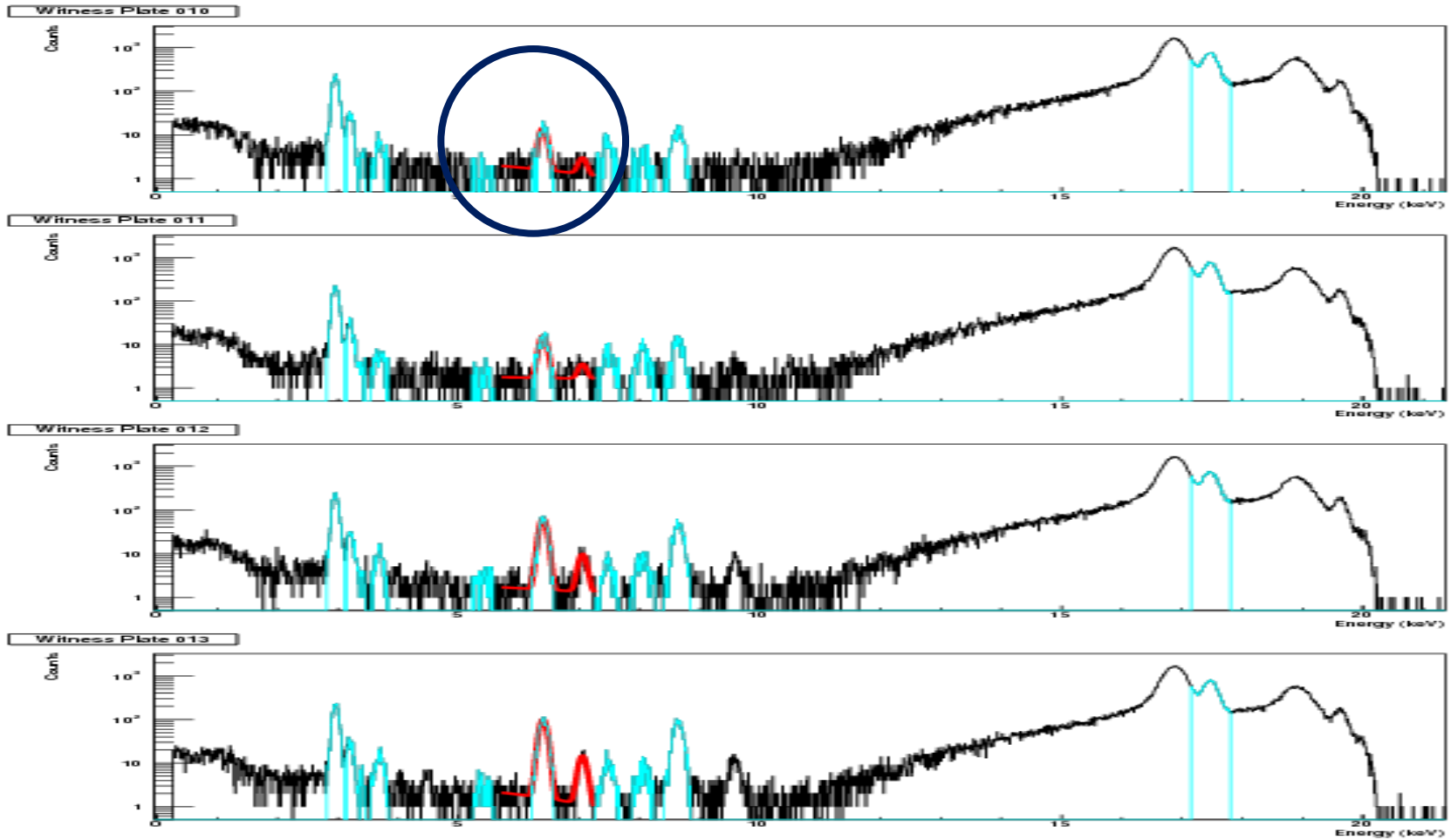


(Fit to Gaussian – zero background assumed)

Iron Peaks from Standard

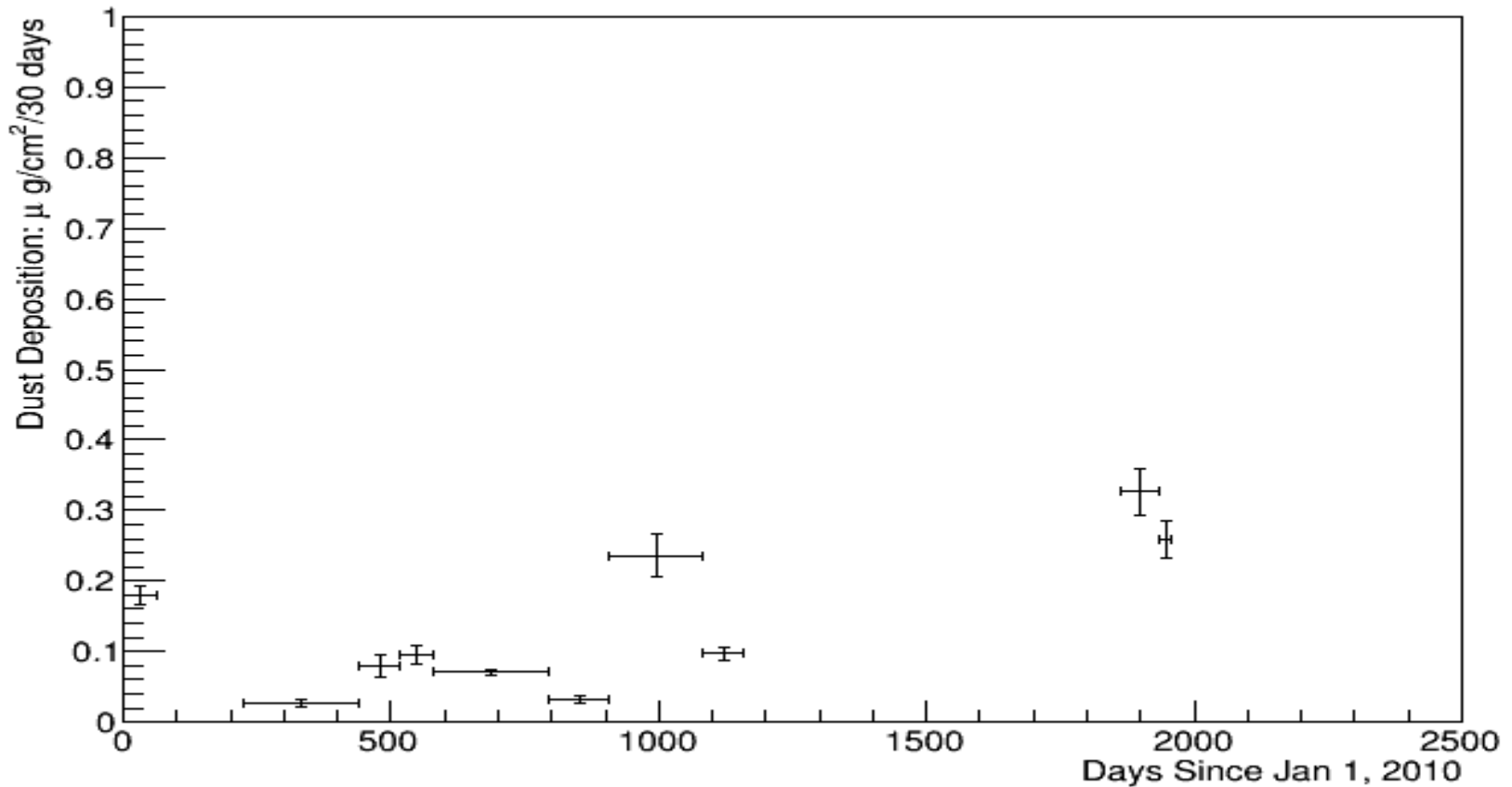


# Witness Plate 10 recent measurement





## Witness Plate Near Lab Entrance



Similar to the particulate counting this is being brought under SNOLABs Quality Management program.

# Of Course Iron and Mine Dust aren't equivalent

Iron + zinc = galvanized steel (probably)  
(less than ppm U and Th)

Iron + chromium + Nickel = stainless (probably)  
(1-10 ppb U and Th)

And this misses potassium

# Radon is a Potential Problem

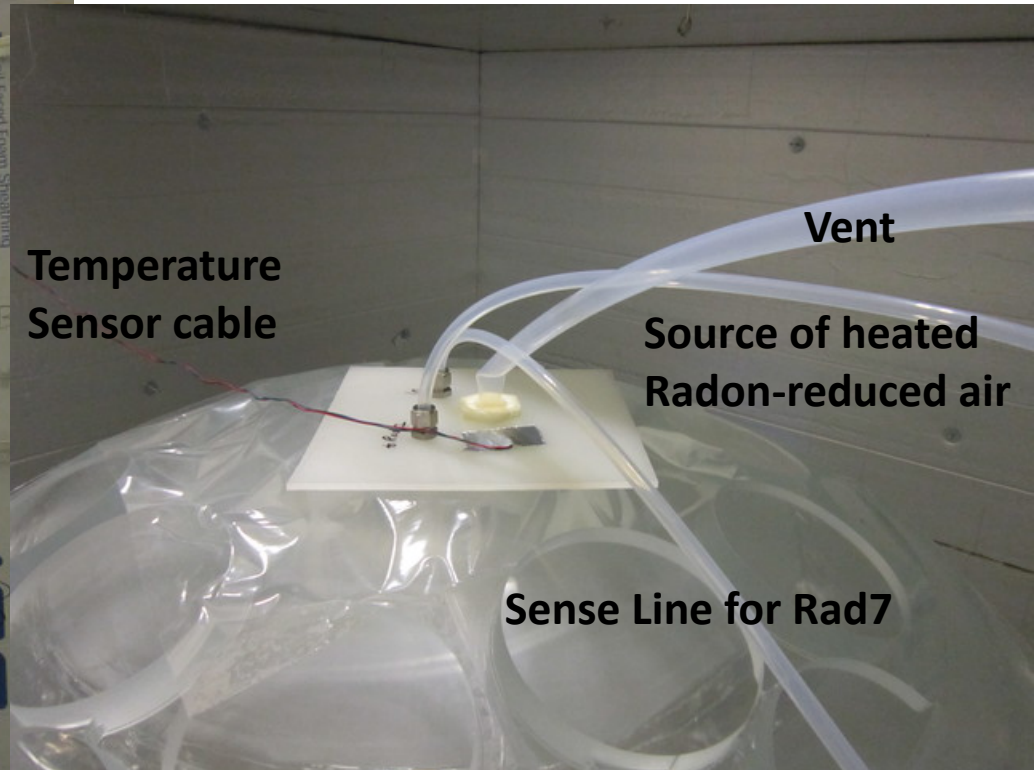
Radon levels in the air are about 120 Bq / m<sup>3</sup>

Working on improving this for our low-background counting

We can supply about 100 cfm of radon reduced air for particular uses: DEAP and SNO+ have taken advantage.

# AV in Oven with Lid for Radon-Reduced Air

Slide from DEAP presentation to LRT 2013



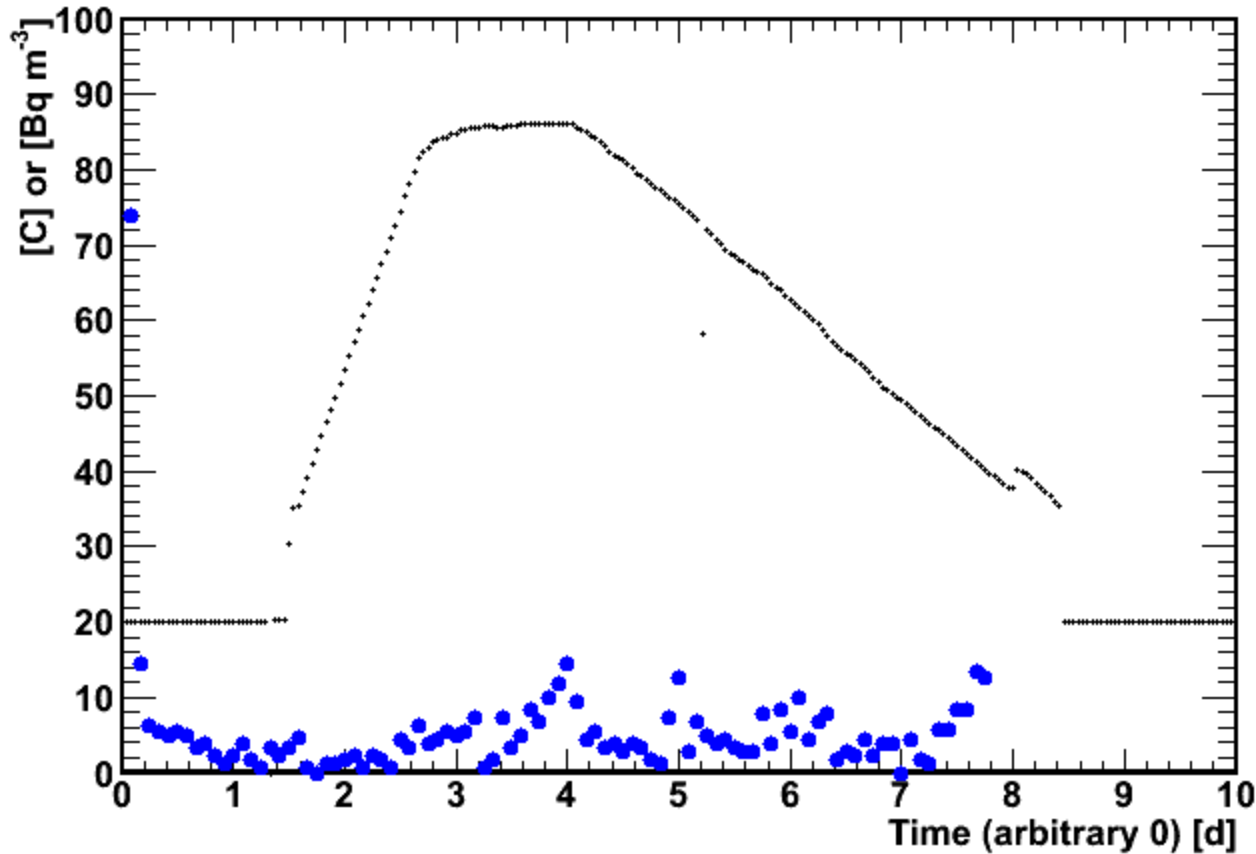
Chris Jillings: Radon Daughters in DEAP-3600 Acrylic Vessel

# RRA verified with DurrIDGE Rad7\*

Monitor you may be able to borrow

Slide from DEAP presentation to LRT 2013

Temperature and Radon Activity During Anneal



\* Thanks to Ian Lawson for assistance with the Rad-7.

Chris Jillings: Radon Daughters in DEAP-  
3600 Acrylic Vessel

# Exceptions To the Rules Exist

Sometimes work gets dirty: firewalls and insulation around the SNO+ scintillator plant. Work with SNOLAB to plan mitigations for exceptional conditions.

Also, always feel free to install cleaner rooms within SNOLAB.

# One of SNOLAB's Main Purposes is to Help Experiments Work Clean

- This means smart logistics
- Keeping the lab clean
  - And monitoring that
  - And sharing that data with the SNOLAB community
  - Mine dust  $\cong$  ppm U and Th
  - Concrete  $\cong$  few ppm U and Th
- And doing our best to help plan for the high-radon environment.