



LOW BACKGROUND FACILITY

at the Lawrence Berkeley National Laboratory

Serving the Research Community Since 1962



[SNO](#)



[KamLAND](#)



[CUORE](#)



[DoubleCHOOZ](#)



[Daya Bay](#)



[MAJORANA](#)



[KATRIN](#)



[Sandford Lab](#)



[LUX](#)

User Facility - Open to the Research Community



Scope

- Direct γ -ray counting of user provided samples
- γ -ray counting of neutron-activated materials

e.g. (CUORE NAA - UC Davis Reactor, EH&S, LBF)

Resources

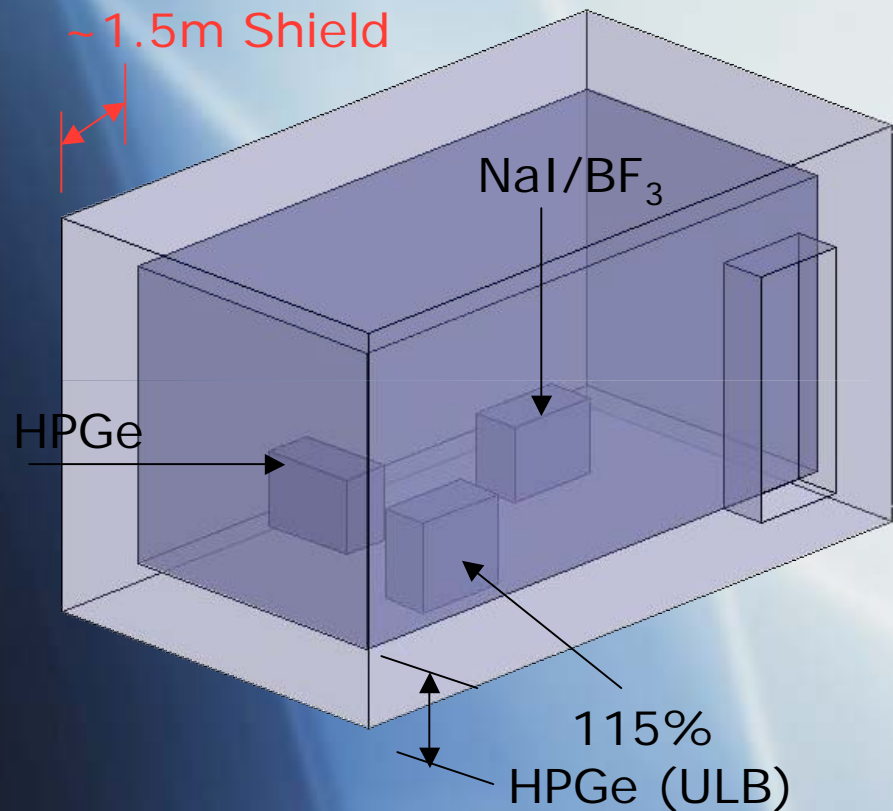
- Two counting facilities run by *devoted* expert staff
- N-type and P-type low-background HPGe, NaI, BF3



Onsite (Bldg.72) Surface Facility

- Environmental Study
- Waste Analysis
- Neutron Action Analysis
- Physics (pre-screening)

■ Features



- Special 4 π -shielded room with concrete walls made from ~500 tons of selected **low-radioactivity serpentine rock (Mg₆Si₁₀(OH)₈) concrete** (wall thickness ~ 4-6 ft)
- 115% N-type Low Background HPGe Detector, w/J-hook mount. Counting chamber has outer Pb and inner Cu (OFHC) shielding layers
- Other HPGe, NaI, and BF₃ couners

Offsite (Oroville Dam) Underground Facility

- Housed in Powerhouse of the Oroville Dam
- ~ 180 mwe, Site of the UCSB-LBL $0\nu\beta\beta$ expt.
- Low activity Pb and Cu shields,
- Radon flushed counting chambers
- 85% P-Type HPGe/ULB detectors

- Physics



$$\begin{aligned}
 1 \text{ Bq } ^{238}\text{U/kg} &\equiv 81 \times 10^{-9} \text{ g/g} \\
 1 \text{ Bq } ^{232}\text{Th/kg} &\equiv 246 \times 10^{-9} \text{ g/g} \\
 1 \text{ Bq } ^{40}\text{K/kg} &\equiv 32 \times 10^{-6} \text{ g/g}
 \end{aligned}$$

Sensitivity for ~kg Samples

~1 Day

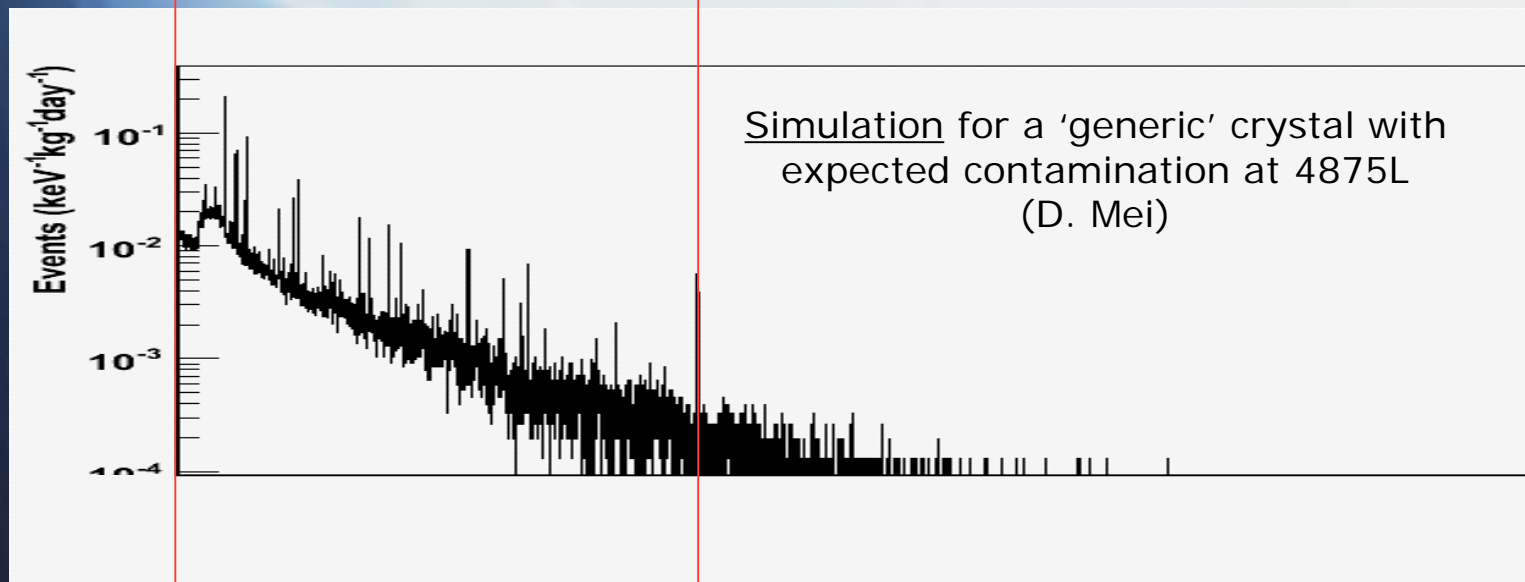
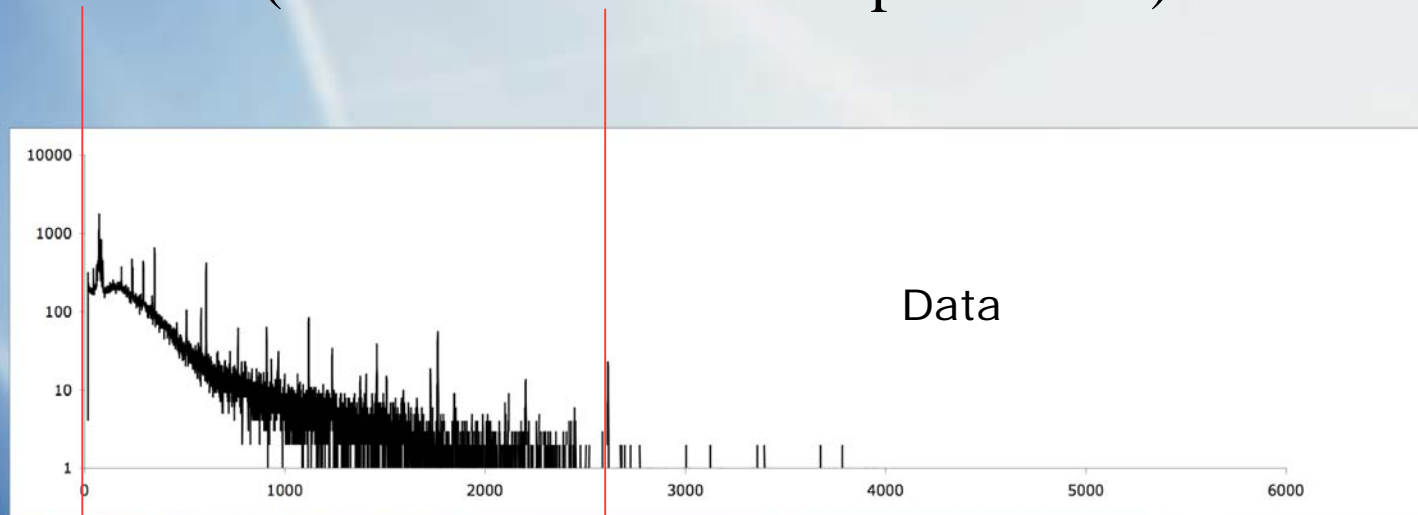
~1 Week

Contaminant	LBL Surface Facility	Oroville Facility
^{238}U and Daughters	0.5 ppb (6 mBq/kg)	50 ppt (0.6 mBq/kg)
^{232}Th and Daughters	2.0 ppb (8 mBq/kg)	200 ppt (0.8 mBq/kg)
^{40}K	1.0 ppm	100 ppb
^{60}Co	0.04 pCi/kg	0.004 pCi/kg

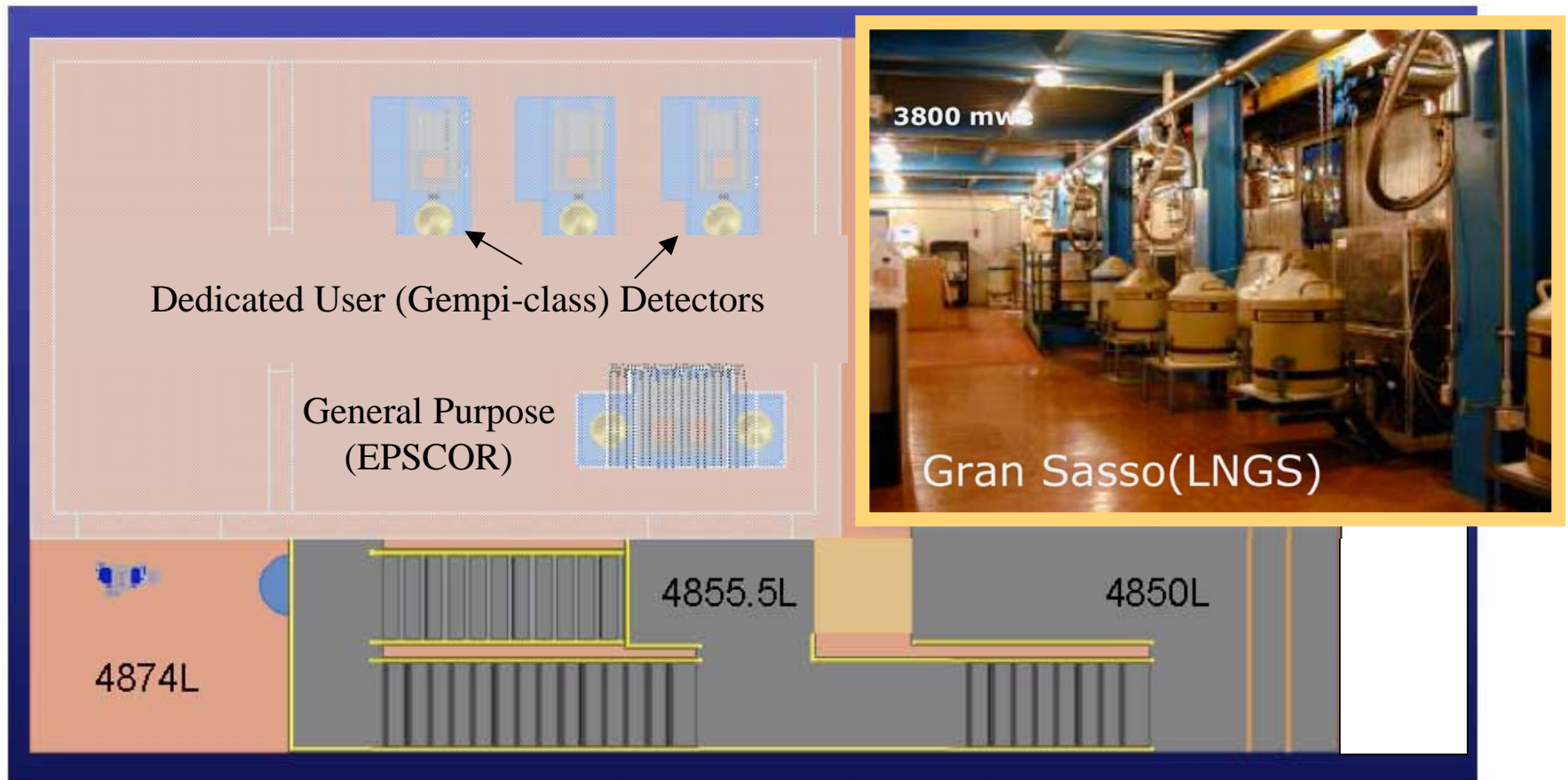
(Sensitivities are currently limited by detector contamination.)

Sample Detector Spectrum

(Detector rather than depth limited)



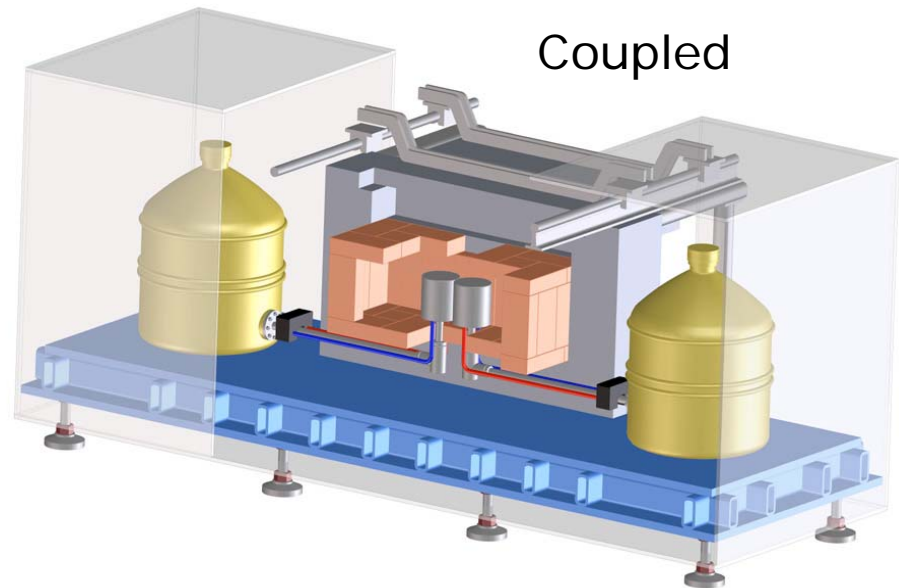
- EPSCOR Proposal (USD/LBNL) *D. Mei et al.*
Site Characterization
Experimental Support



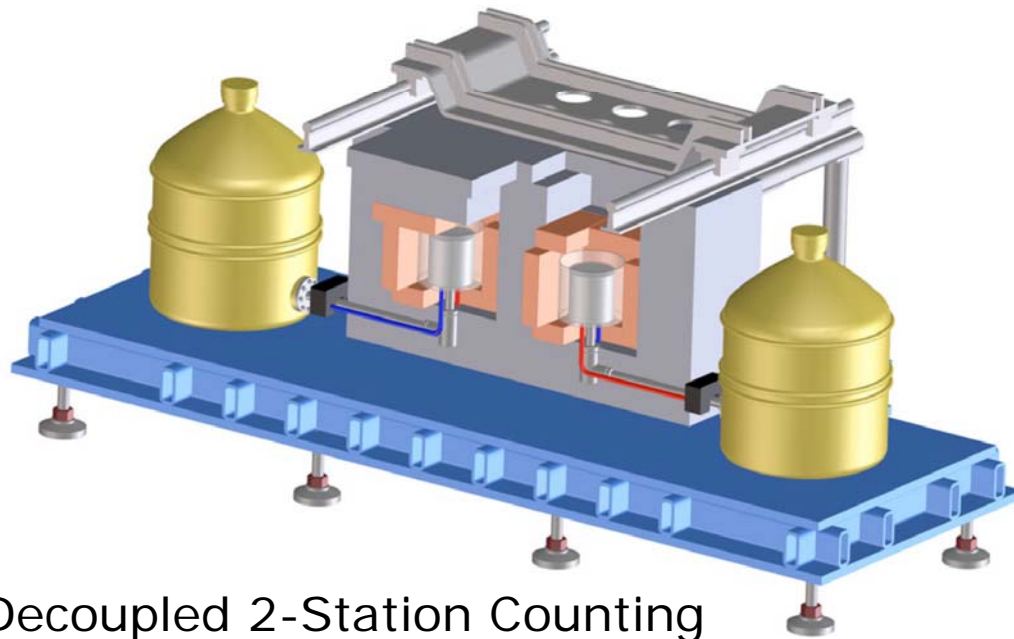
4874L Davis Cavity Conversion

EPSCOR Proposal (USD/LBNL)

General Purpose &
Flexible Configuration



(Large Samples or Coinc.)



Top-loading geometry.
Two lids can be opened
or closed independently
with a railed sliding
carriage system.
(A.R. Smith)

150% p-Type Coaxial HPGe [90mmx(90+/-10)mm]
Ultra-Low-Background Cryostat w/30-liter Dewar

Summary

- Serving the research community, had made significant contributions to several important expts
- General purpose, flexible and fast turn around time
- Very knowledgeable, devoted, and expert staff
(A.R. Smith)
- Couple to DUSEL LBF

Contacts:

Web <http://neutrino.lbl.gov>

Y.D. Chan ydchan@lbl.gov

A.R. Smith arsmith@lbl.gov

K.T. Lesko ktlesko@lbl.gov

Conceptual Design

