XIA ALPHA COUNTER

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MORE DETAILS - L. HSU POSTER
Surface Contamination: Radon

Monitor contamination by measuring alpha emission.

- **Rn - 222**
  - 3.82 d
  - 5.5 MeV

- **Po - 218**
  - 3.05 m
  - 6.0 MeV

- **Bi - 214**
  - 19.7 m
  - 0.4-3.3 MeV

- **Pb - 214**
  - 26.8 m
  - 0.7,1.0 MeV

- **Po - 214**
  - 0.16 ms
  - 7.7 MeV

- **Po - 210**
  - 138 d
  - 5.3 MeV

- **Bi - 210**
  - 5.0 d
  - 1.2 MeV

- **Pb - 210**
  - 22 y
  - <0.1 MeV

- **Pb - 206**
  - stable
XIA ALPHA COUNTER

- Easiest way to monitor $^{210}\text{Pb}$ contamination is to measure alpha-particle emission.
- XIA UltraLo 1800 prototype evaluation and testing was done at Stanford.
- Spring 2010 moved to Fermilab to screen materials for SuperCDMS SNOLAB.

see L. Hsu poster for details
Detector Details

- Drift chamber:
  - 21 x 21 inches
  - 15 in tall
- Counting area:
  - 19 x 19 inches (inner electrode);
  - 1 inch outer guard
- Argon gas purge
  - 20 L/m prior to data taking
  - 4 L/m during normal operation
PARTICLE IDENTIFICATION

- **Alphas**: energy > 2 MeV, little guard ring activity, risetime between 60-80 μs
- **Ceiling**: low energy, low risetime
- **Sidewall**: significant guard ring activity
- **Noise**: events not fitting into other classifications

Pulses from $^{230}$Th Source
SENSITIVITY OF PROTOTYPE

• Stanford prototype
  • 0.0003 α/hr-CM² (paper in progress).

• IBM prototype
  • 0.0006 α/hr-cm² (published in NSREC proceedings 2009).

• Sensitivity is limited by mid-air events which can not be subtracted off.

• XIA is studying the effects of comogenics by running the counter in various locations
  • SUF - 10 mwe (under analysis)
  • Soudan - 2040 mwe (currently operating)
  • ASTEP - France Alps, elev. 2552 meters (moving soon)

• Approximately x10 more sensitive than other commercial proportional counters.
PRODUCTION MODEL
ELECTRODE DESIGN CHANGES

Adjustable inner electrode size:
1800 cm$^2$ or 707 cm$^2$
ELECTRODE DESIGN CHANGES

Adjustable inner electrode: 1800 cm$^2$ or 707 cm$^2$
NEW SAMPLE HANDLING SYSTEM
LOWE R H A L F  A S E M B L Y
SOFTWARE IMPROVEMENTS

• communication scheme
  • changed to USB, more robust and faster.

• new analysis:
  • more plots and displays

• safety:
  • tilt sensors shut off HV when machine is bumped

• moisture sensors:
  • added for monitoring purposes.
TIMELINE

• Assembly of first production unit is near completion. Expected delivery to XIA LLC Friday, August 27.

• Qualification and testing at XIA LLC.

• If it passes, expect to start initial production of a small number of units