

Use of Canberra iCAMs at Argonne National Lab

Presented by Charlotte Sholeen at AMUG April 24-27, 2012

i CAM - Main Benefits

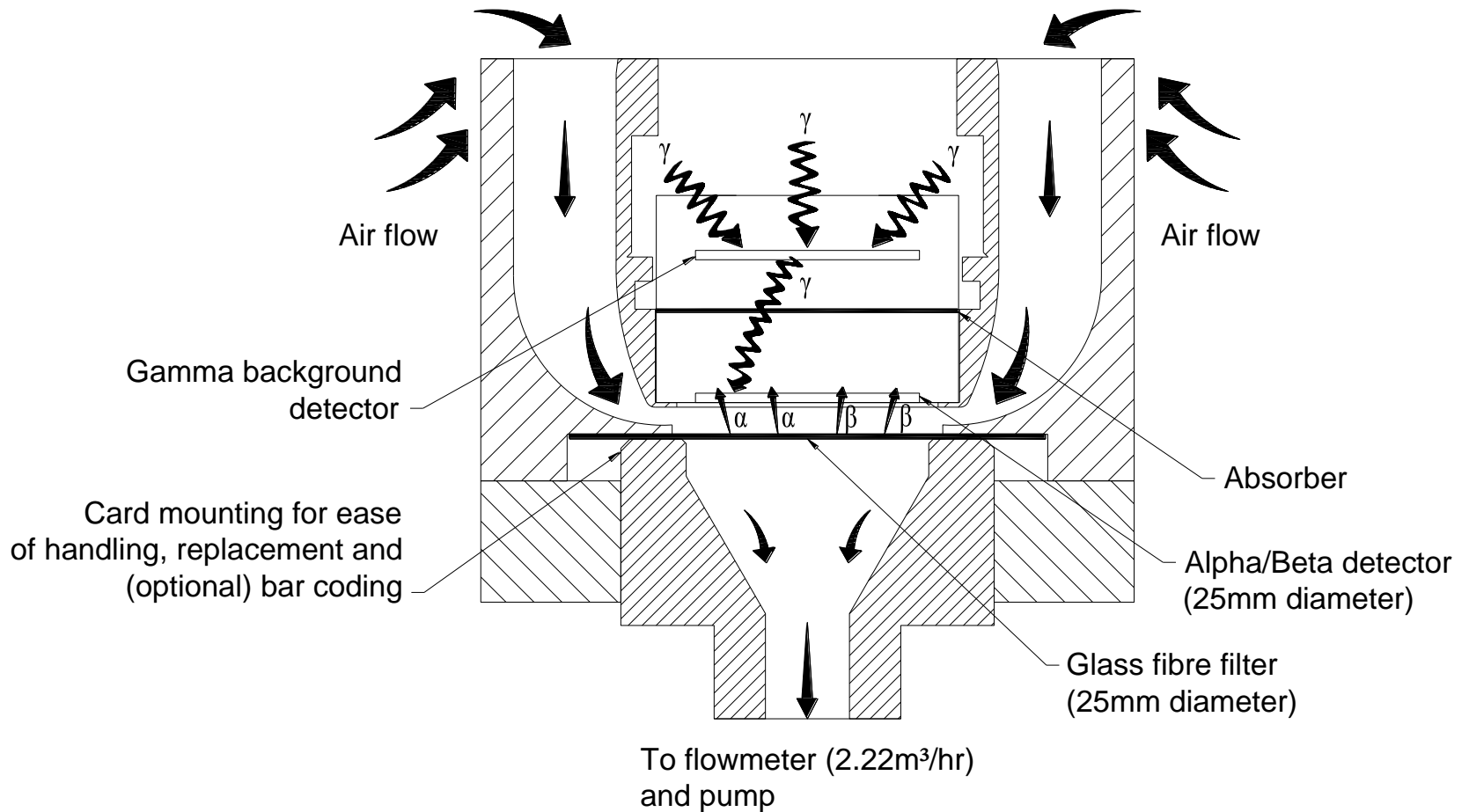
Source: Canberra literature

- **Ease of use**
 - menu driven graphical display
 - automated calibration
- **High Sensitivity for both Alpha & Beta activity**
 - good statistics and low systematic errors for ultimate low level performance
- **Low False Alarm rates**
 - Rn/Th compensation algorithms monitor and adapt to changes in spectrum shape, resulting in
 - low false alarm rates
 - Lower alarm levels
 - less frequent filter changes



iCAM Air Sampling

Source: Canberra literature



PIPS Detector & Filter Support Grill (left) Filter Cards (right)

Fluoropore on left; glass fiber on right



Filter Activity Measurements

(Results expressed in DAC-hrs)

- RT Single 15-sec bin; CT (20) 15-sec bins, 5 min rolling avg.; LT (80) 15-sec bins, 20 min rolling average calculated
- Results updated every 15-sec
- Filter activity: compensated response (net cpm) divided by detector efficiency
- Integrated activity concentration: filter activity divided by the instantaneous flow rate; $\Sigma A/f$
- Bq-h/m³ expressed in DAC-hrs (Am-241 and Sr-90)

Activity concentration: $(IAC_2 - IAC_1)/DT$ DT: difference time, normally 1 hr

- Results logged every 5-min



The Background Problem

Source: Canberra literature

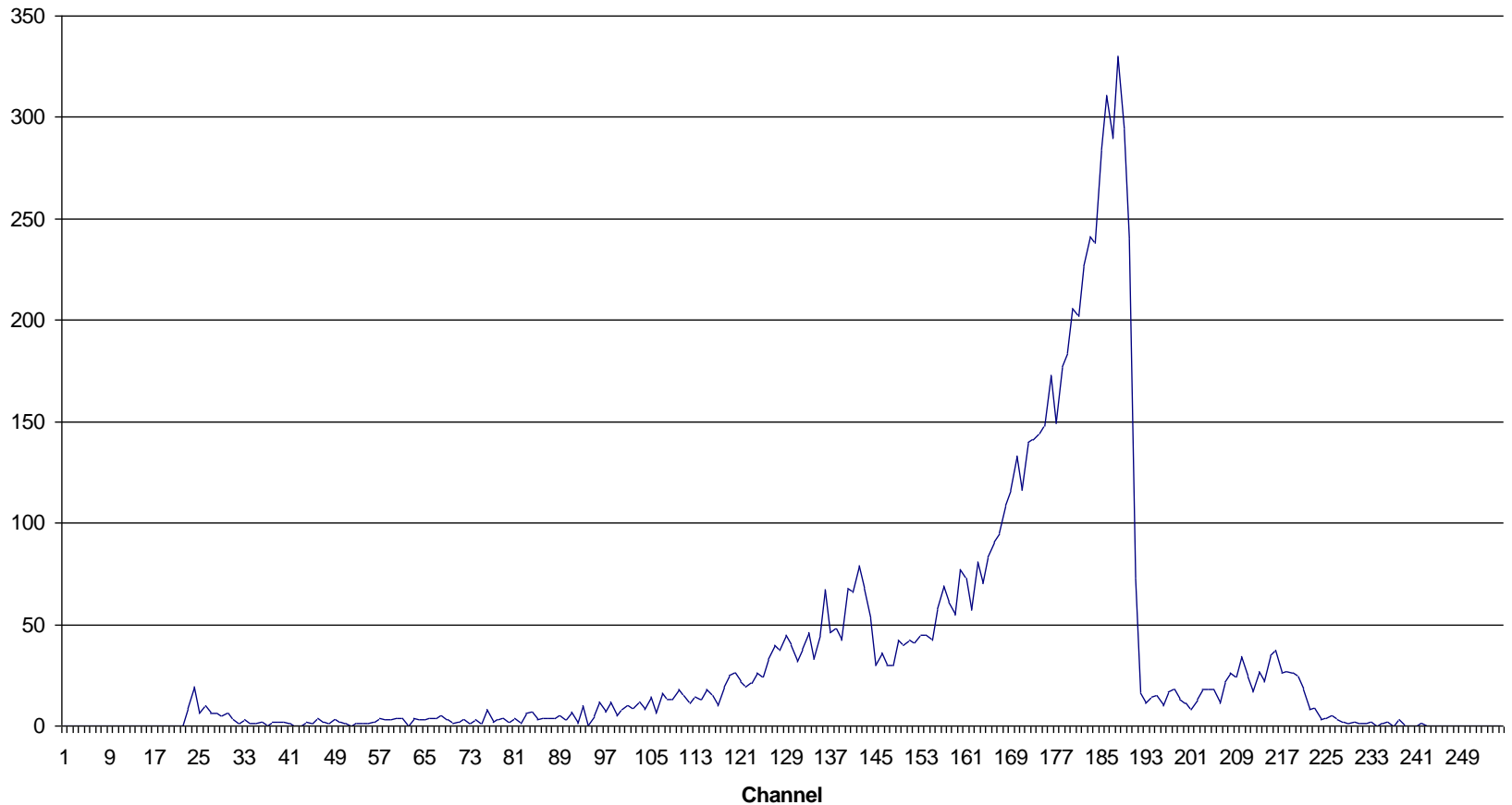
- Typical Radon count rates are 500 cpm, with up to 10,000 cpm in poorly ventilated areas
 - Highest seen > 30,000 cpm!
- How to prevent high radon giving false alarms?
- iCAM uses Alpha Spectrometry and a patented spectrum stripping method to separate Radon from activity of interest in a 256 channel MCA
- iCAM compensates both alpha *and beta measurements* for radon background



i-CAM Alpha Spectrum

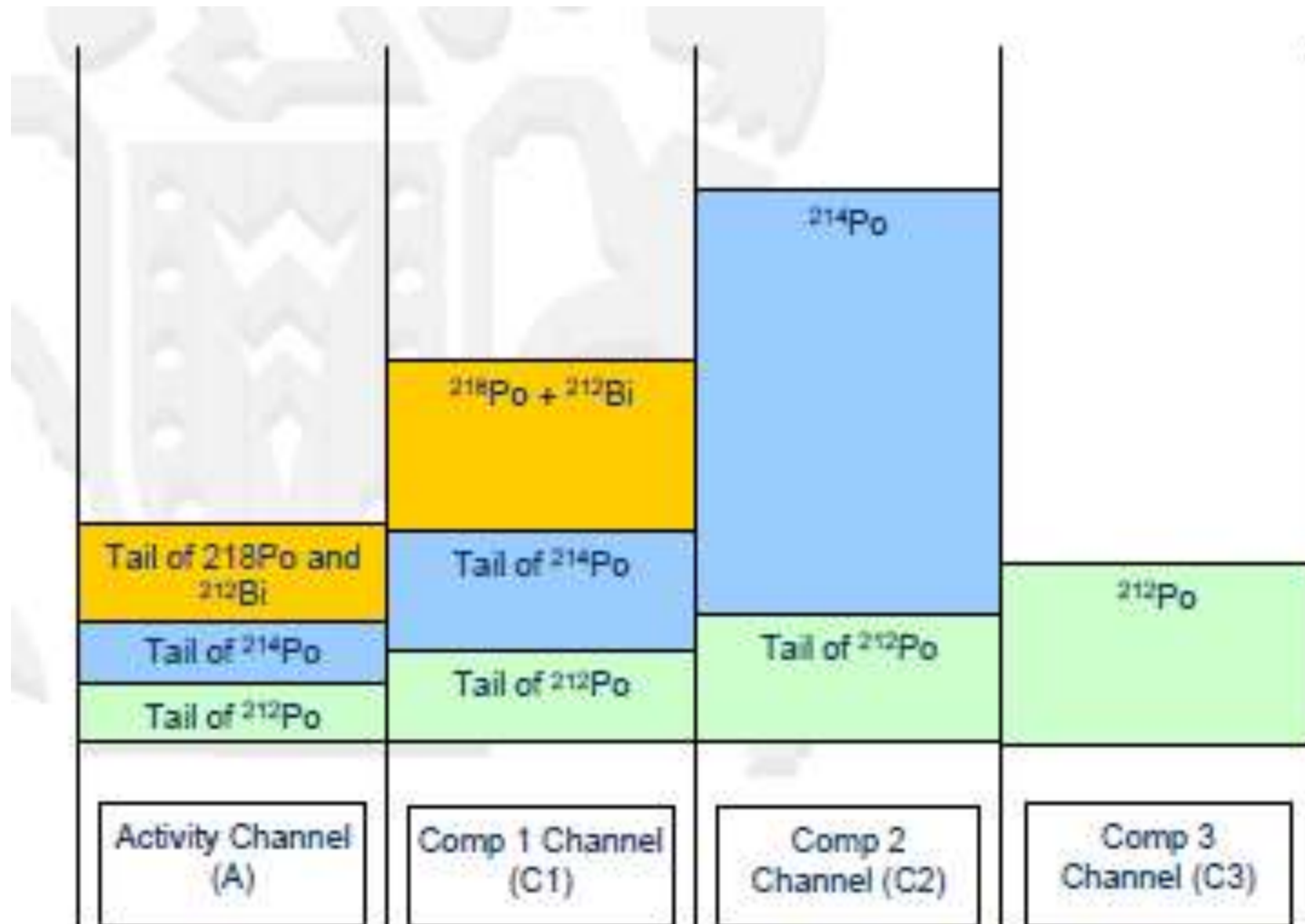
(Po-218 & Bi-212; Po-214; Po-212)

5 minute Spectrum



Cascade of Progeny Counts

Source: Eliot Williams, UKAEA



Achievable Alarm Set Points

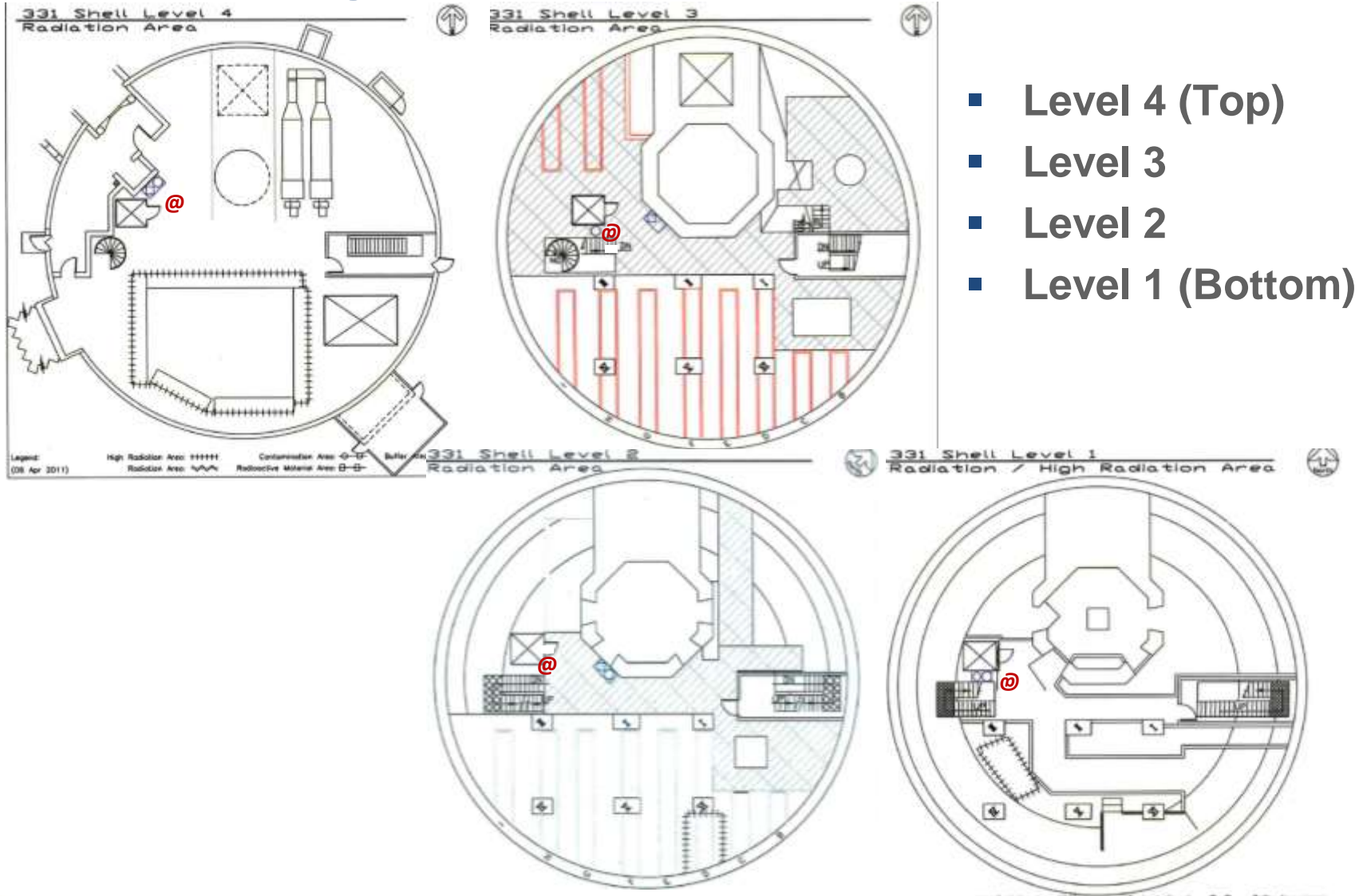
- RT - Quick alarm: 20 DAC-h α ; 5 DAC-h β
- CT - 5-min alarm: 8 DAC-h α ; 1 DAC-h β
- LT - 20-min alarm: 4 DAC-h α ; 0.5 DAC-h β
- Typically correspond to about 4 or 5 standard deviations above the mean background value
- Acceptable “false alarm” probability: ~ 1 or 2 events per year per CAM



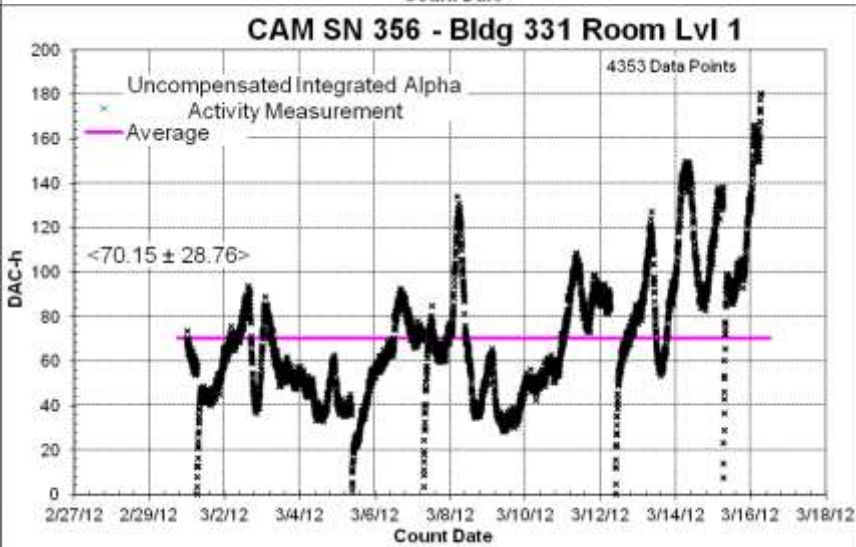
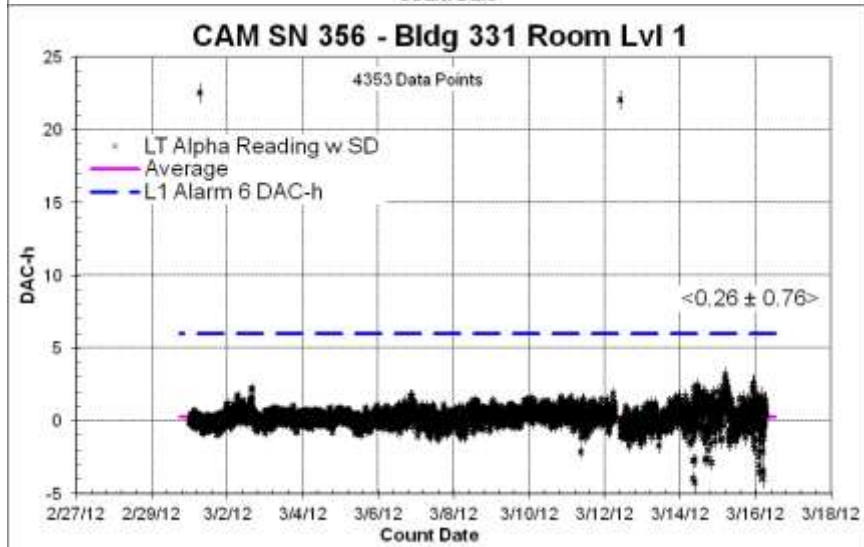
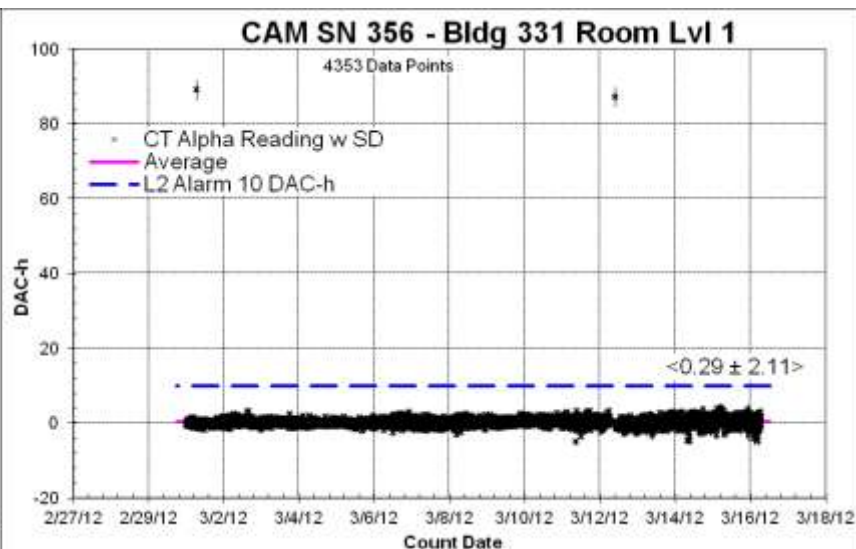
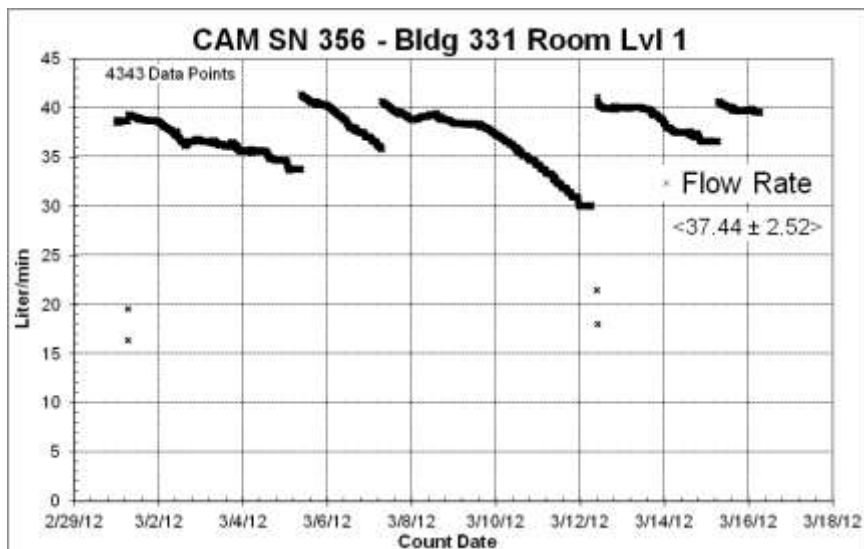
Building 331 RWSF



Building 331 RWSF Locations

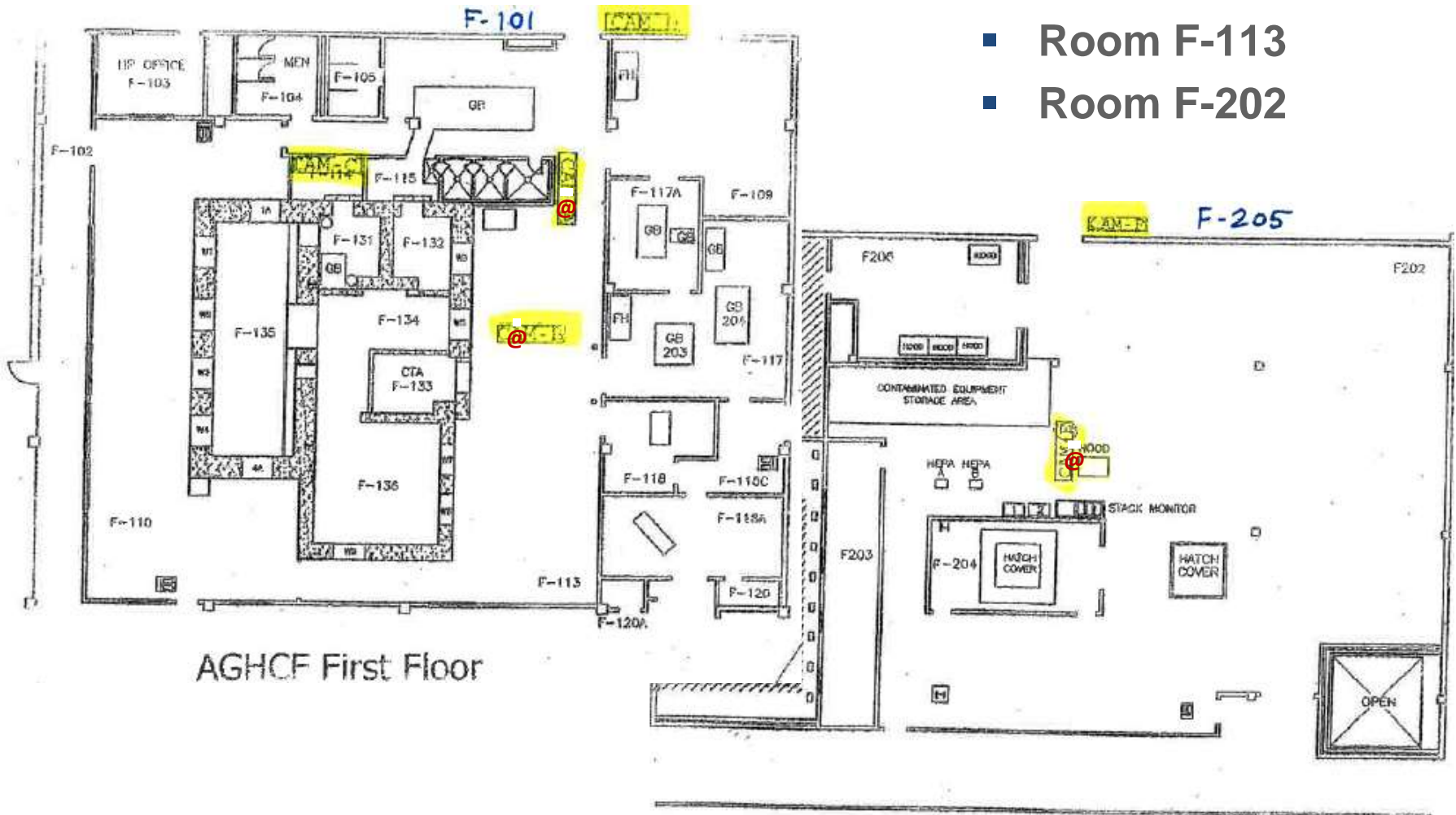


Building 331 RWSF CAM Data



AGHCF Locations

- Room F-113
- Room F-202

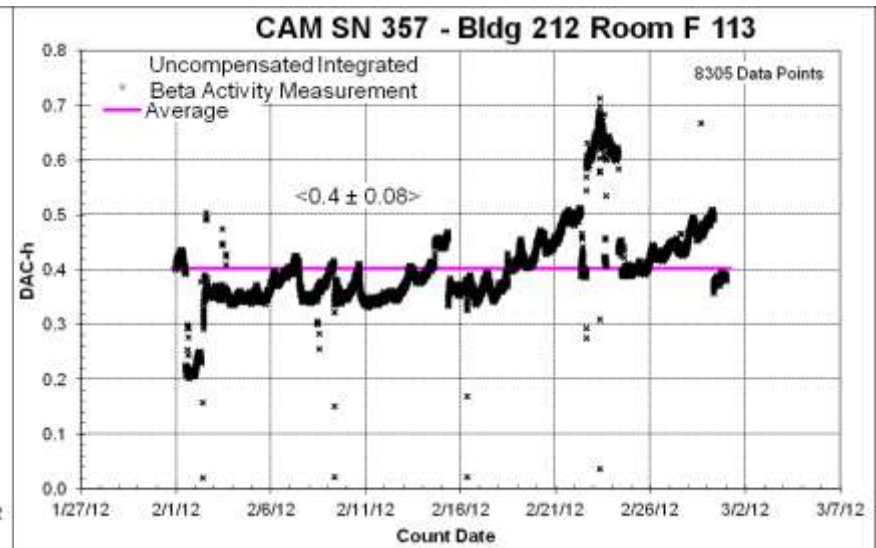
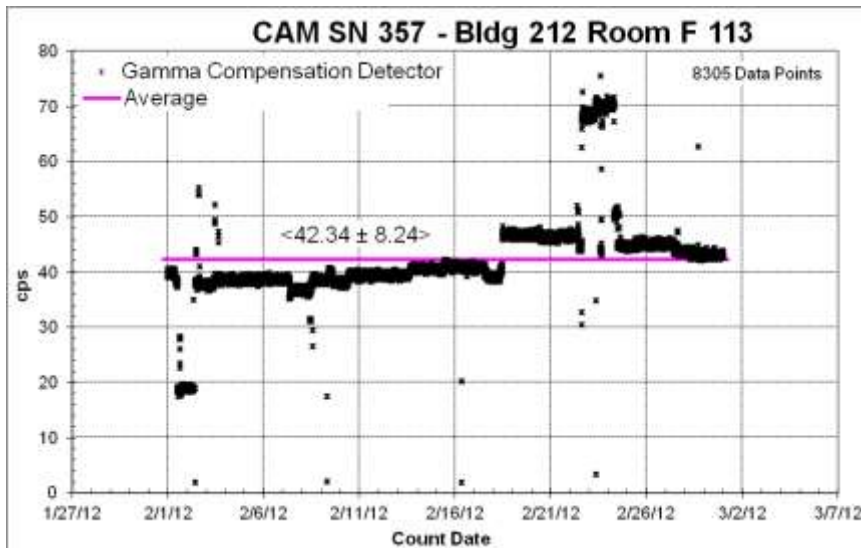
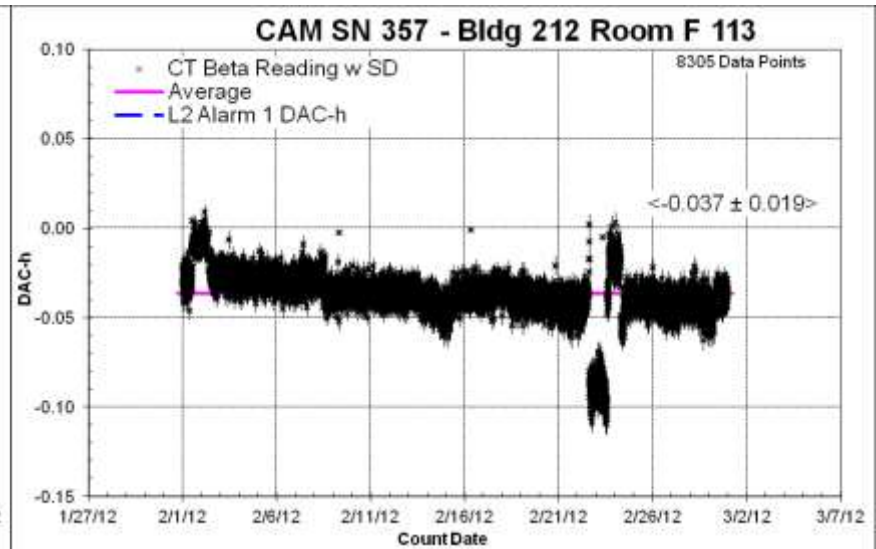
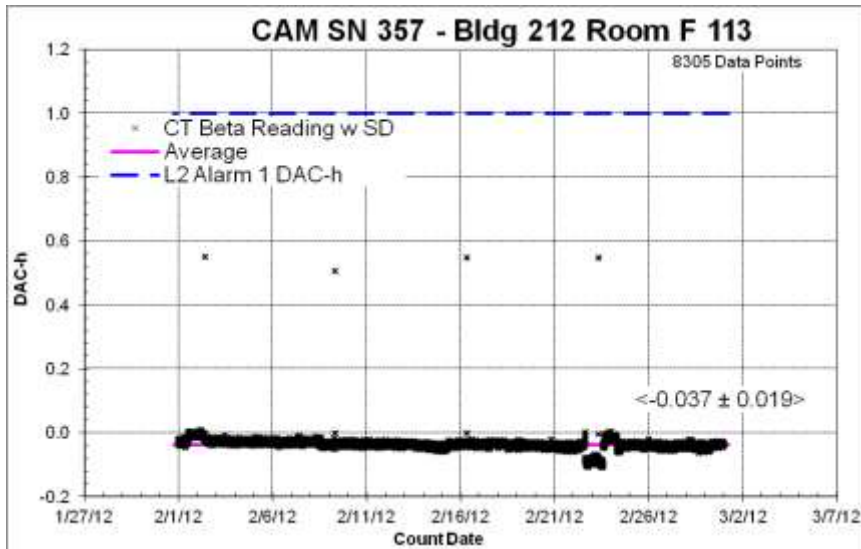


AGHCF First Floor

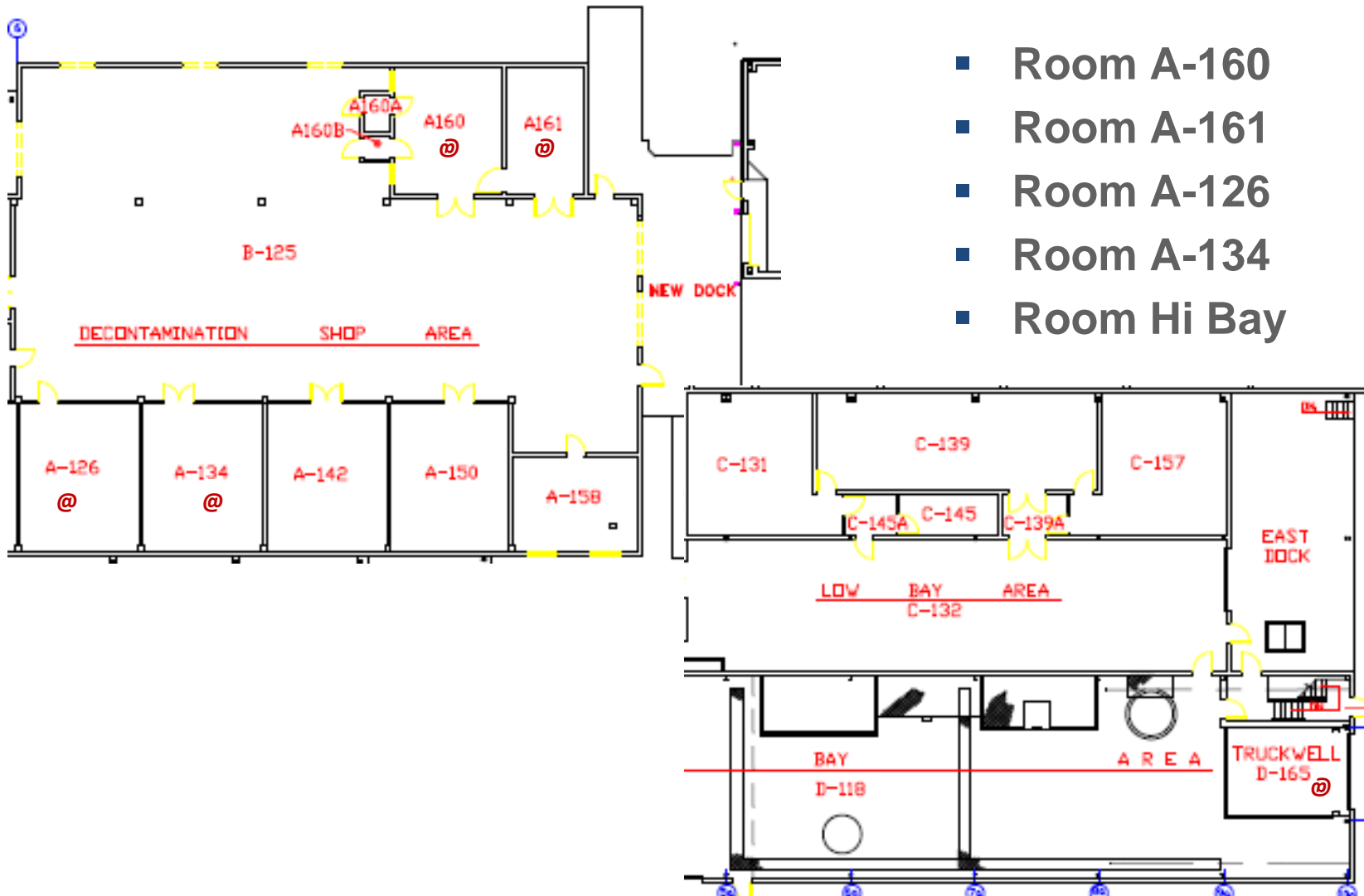
AGHCF Second Floor



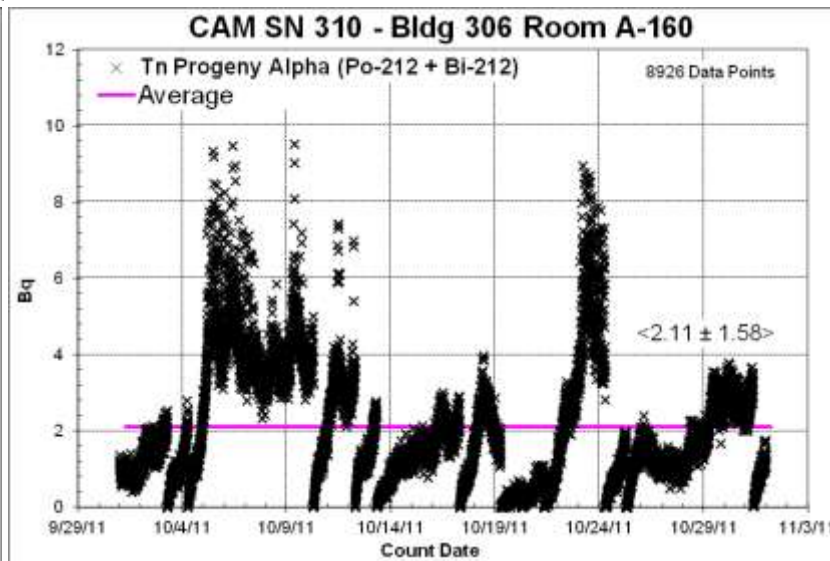
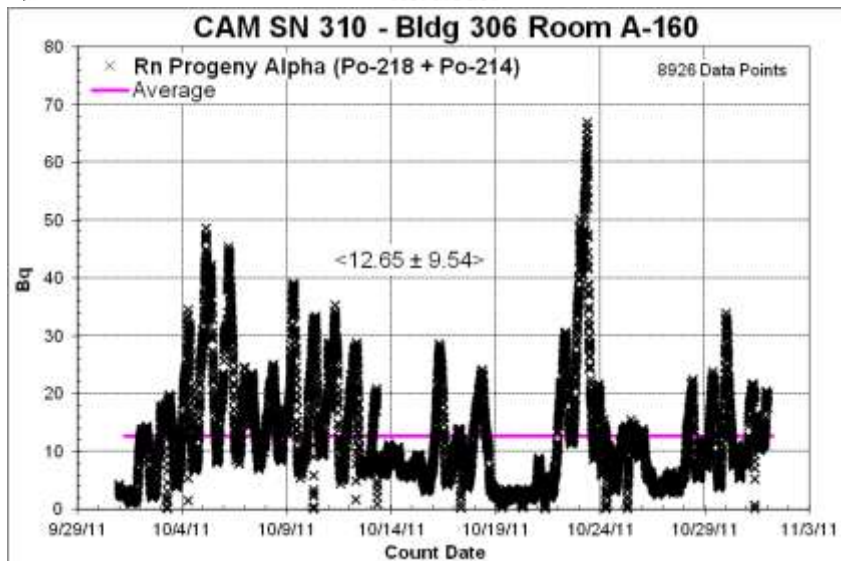
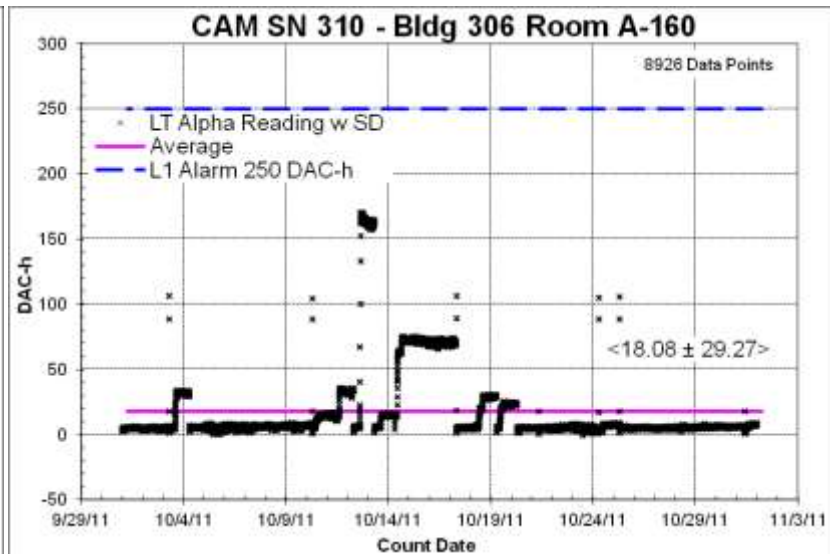
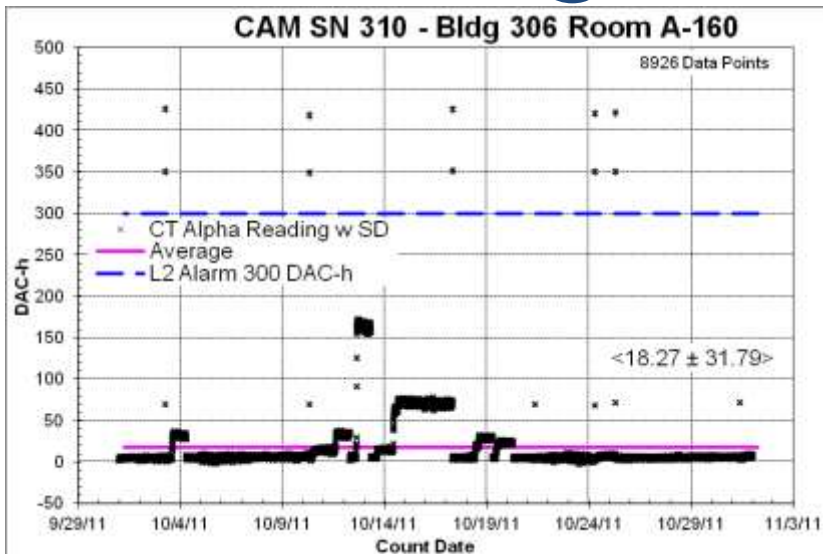
AGHCF CAM Data



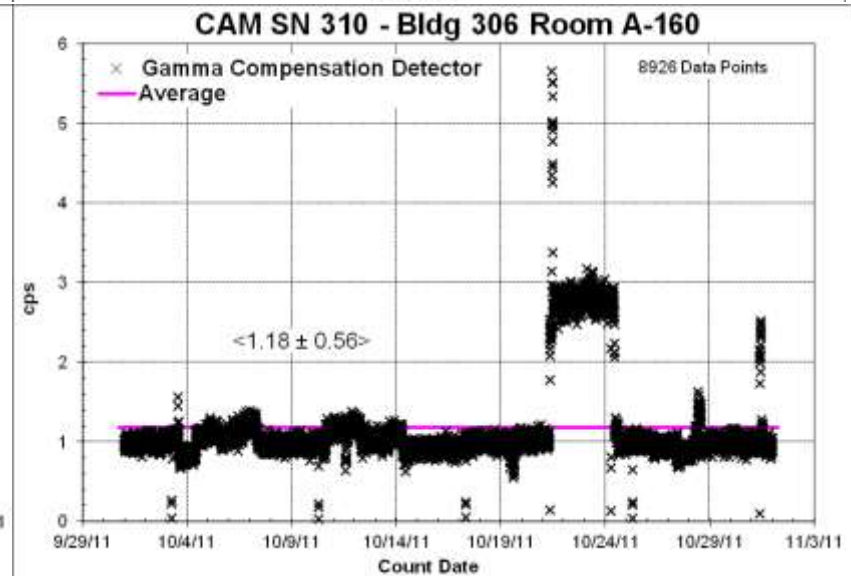
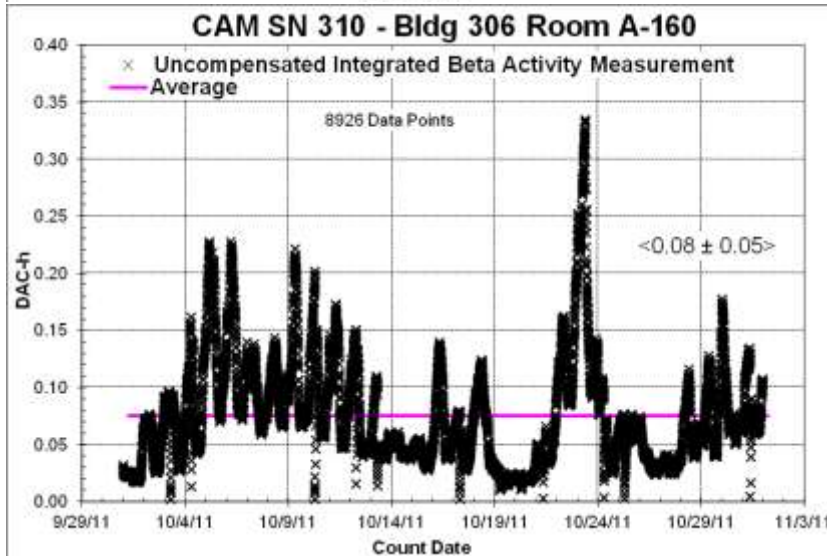
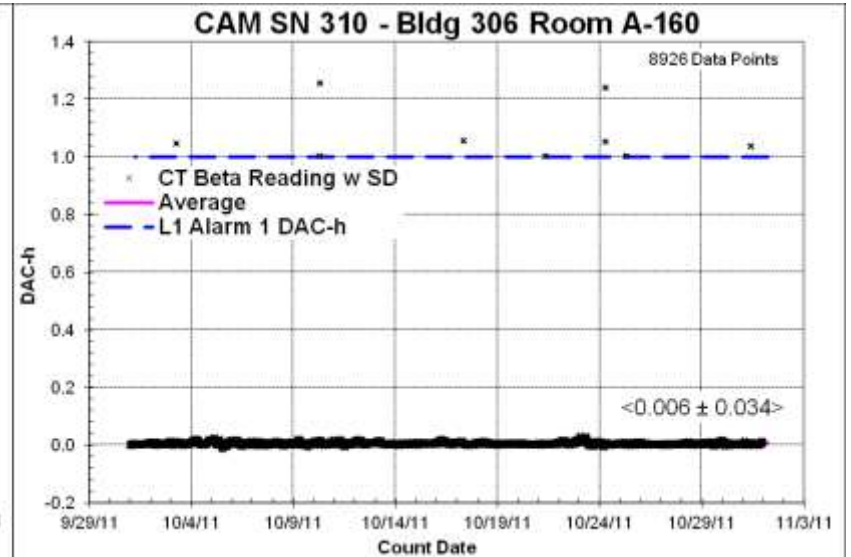
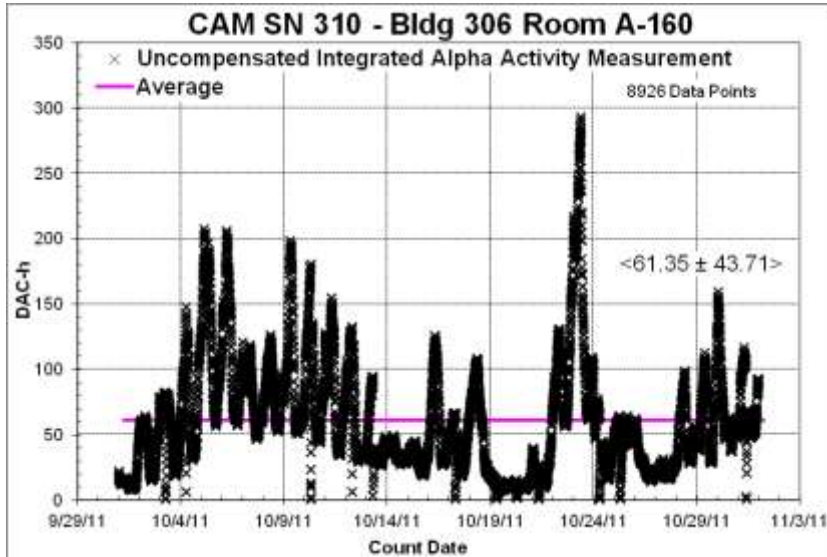
Building 306 Locations



Building 306 Room A-160



Building 306 Room A-160



Final Remarks

- i-CAM dependability very good so far: > 90%
- Adequate DAC-h sensitivity (alpha and beta)
- Demonstrated rapid response to events
- Compact detector head fairly unobtrusive
- Tendency to let filters collect too much debris
- Workplace positioning not always optimum
- High external backgrounds are problematical

