

Recent CAM Developments & Forthcoming Releases

James Forde-Johnston

Environmental Monitoring Product Manager

- ▶ **New iCAM/MF & /MFS Models**
- ▶ **New iCAM Concentration Algorithm**
- ▶ **ECAM/NetCAM & ASPECT Algorithms**
- ▶ **iSolo Update**

- ▶ **iCAM/MF – already released**
 - ◆ For ambient air sampling only
 - ◆ integral sampling head
- ▶ ***iCAM/MF New design to be released Q2 2008***
 - ◆ Replaces old MF design
 - ◆ Also allows connection to sampling pipe or hose
- ▶ ***iCAM/MFS – to be released Q2 2008***
 - ◆ Sampling head separated from controller
 - ◆ For remote sampling of high activity levels
 - ◆ High Integrity, v well sealed, vv low leakage



New Version iCAM/MF mechanism

- ▶ **Replaces previous open MF design**
 - ◆ Better shielded (EMC & gamma!)
 - ◆ Easier to load filter roll
 - ◆ Better tape tensioning (pins)
 - ◆ More reliable filter advance registration (opto not mechanical switch)
 - ◆ Better sealed < 10 cc/min typ.
 - ◆ Window shows roll left at a glance
- ▶ **For local sampling *or* via pipe or hose**
 - ◆ From duct or through wall/cabinets
 - ◆ Ideal for wide area environmental monitoring systems
 - ◆ Identical sampling/deposition to iCAM/D
 - ◆ Uses standard iCAM Air inlet adaptor (/A option)
- ▶ **No hinging of head needed to replace filter roll**



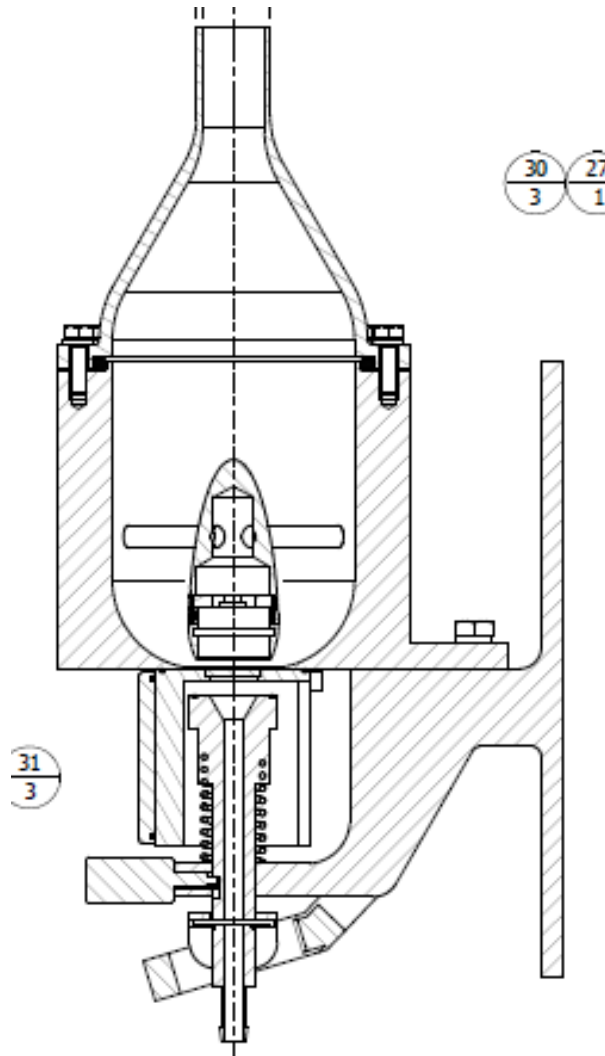


iCAM/MFS

▶ **Completely New Sampling Head**

- ◆ **For high activity sampling**
- ◆ **High Integrity design - Vacuum sealed**
- ◆ **High sampling efficiency: > 96% @ 10 µm**
 - **Low losses & low internal contamination**
- ◆ **Removeable cassette for the filter roll**
 - **Avoids handling highly active filter**
 - **Filter change can be done outside active area**
- ◆ **Ideal for fixed pipework**
 - **No hinging of the head required to change the filter or for calibration**
- ◆ **At least 10 m from head to controller**
- ◆ **Active aerosol testing (²³⁹Pu & ¹³⁷Cs & Rn) completed**
 - **CTHIR certification to IEC61172, 60761-2 & 2 and 61578**

iCAM/MFS: New Sampling Head



Quick Filter Cassette Change

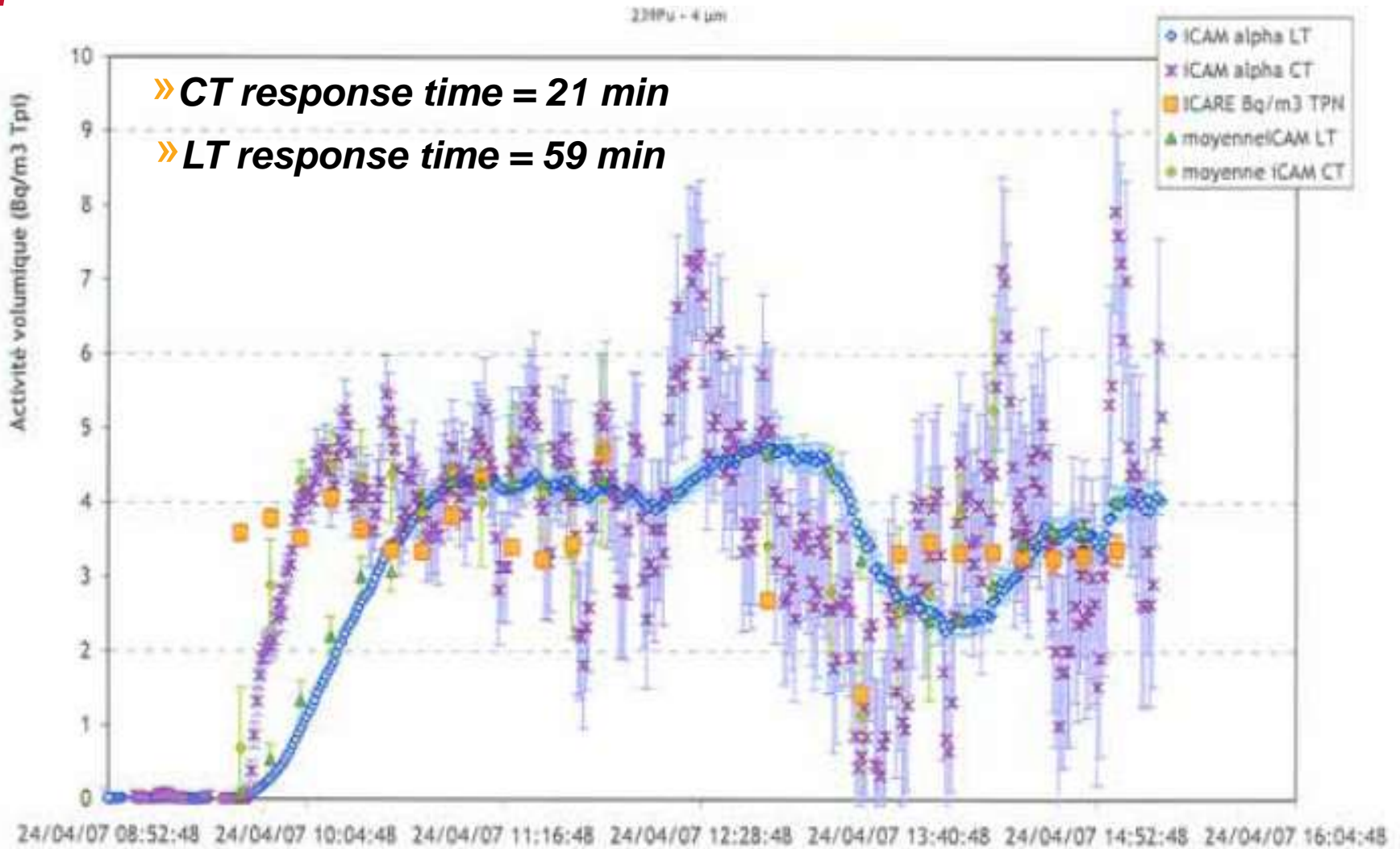


► Improved Concentration algorithm

- ◆ Auto-adaptive time averaging for faster response to step changes in concentration and lower MDA at v low levels
- ◆ Based on Kalman filter, with CUSUM to allow rapid response to changes
- ◆ Will replace separate CT, LT and CT/DT, LT/DLT measurements with a single measurement
- ◆ Greatly improved beta Rn/Th compensation
- ◆ General Release Q2 2008 in V3.02 – with iCAM/MFS

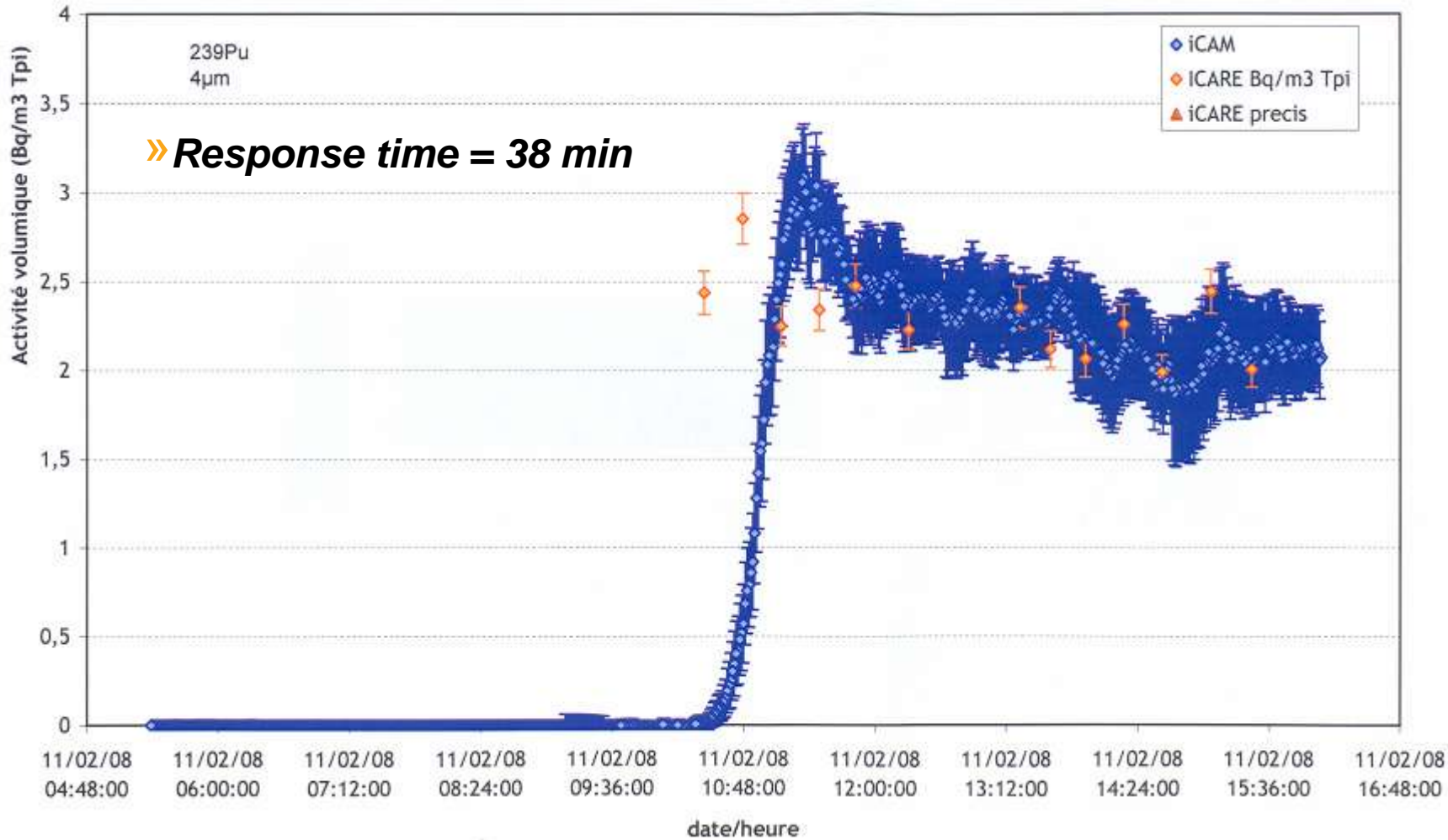
Reminder: Concentration Measurement

- ▶ **Current iCAM Difference Time method:**
- ▶ **$C \text{ (Bq/m}^3\text{)} = (A_{T+DT} - A_T)/(F \times DT)$**
 - ◆ **C is averaged over a fixed timescale DT/DLT**
 - ◆ **DT/DLT is normally 1 hour, but is user settable**
- ▶ **Disadvantages:**
 - ◆ **Fixed response time – whatever the size of the increase**
 - ◆ **Counting statistics get worse as more activity accumulates**

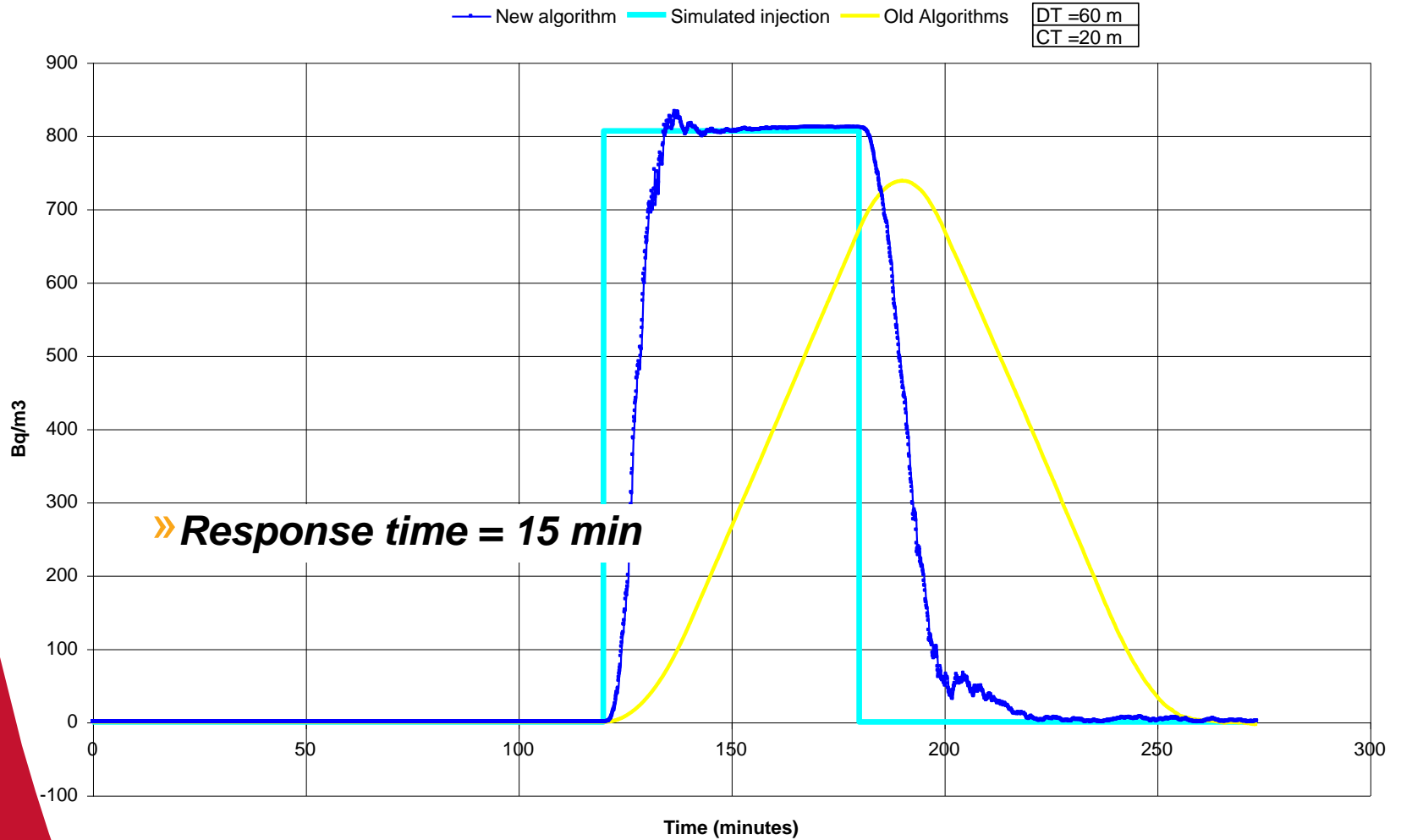


V3 Concentration Algorithm

Real data from CTHIR



V3 Concentration Algorithm Simulated Injection



Alpha Beta ECAM, NetCAM & ASPECT Algorithms

Based on the Alpha Sentry CAM



- ▶ **Full compliance with ANSI N42.17B**
- ▶ **High sensitivity, reduced false alarm rate**
- ▶ **Alpha Airborne activity (Uranium , Plutonium) with accurate Radon background compensation**

The Canberra / Los Alamos Alpha Sentry ECAM



- ▶ LANL-designed cyclone separator inlet
- ▶ multiple compensation algorithms
- ▶ Alpha and Beta air monitoring with 2048-channel MCA
- ▶ Sampler /detector /MCA in all-weather enclosure
- ▶ Vacuum pump
- ▶ Tripod legs and base
- ▶ GPS and met data
- ▶ wireless and hardwired Ethernet communications

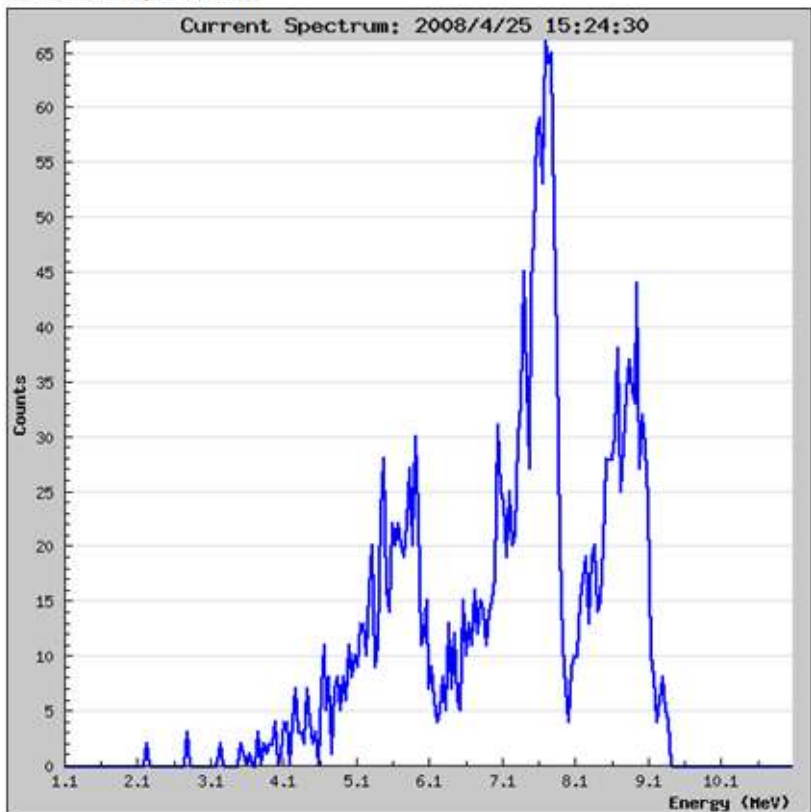


- ▶ **ECAM uses the RadNet data protocol for easy integration**
- ▶ **Can be combined with LLNL's HotSpot software for plume modeling**
- ▶ **integrated temperature sensor**
- ▶ **optional integrated GPS and wind sensor**

Alpha Spectrum Analysis (ASPECT)

Am Critical Level	1.709841 cpm
U(Th) Critical Level	2.692939 cpm

Current Spectrum

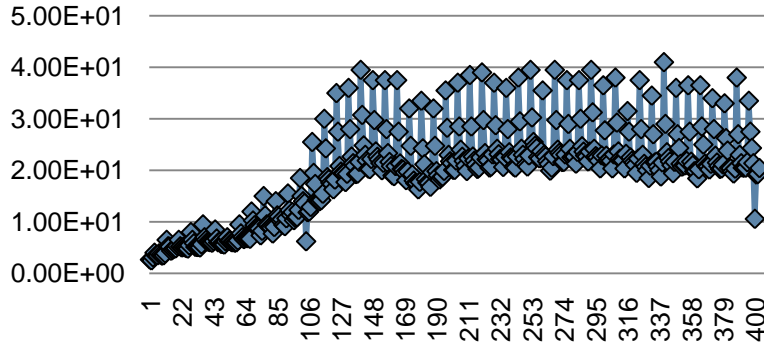


Accurate tracking of peak overlaps for calculating Critical Levels of lower energy peaks

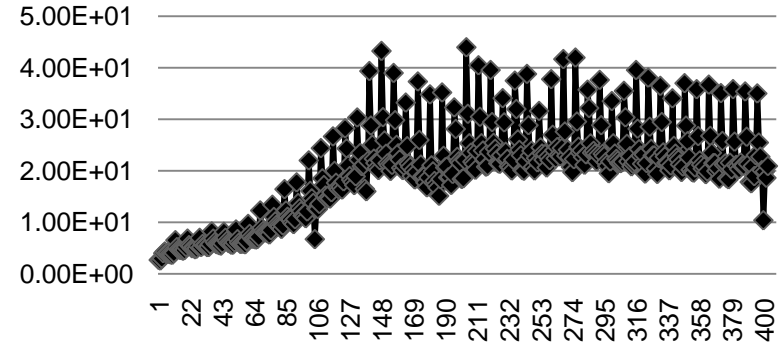
Refinements in peak identification and false peak rejection - an especially difficult task when sampling dusty ambient air for long periods of observation

Background correction for beta-counting based on accurate alpha-peak analysis

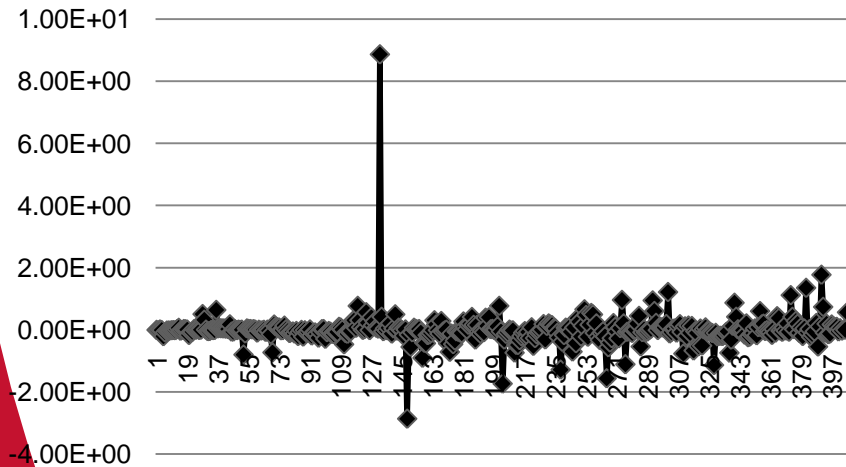
Beta CPM



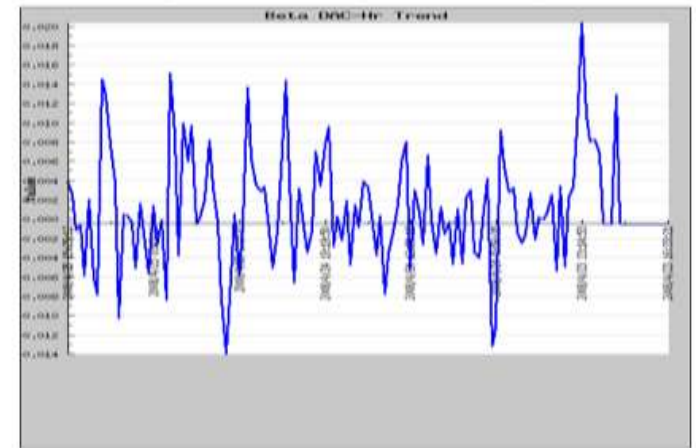
Predicted Beta CPM



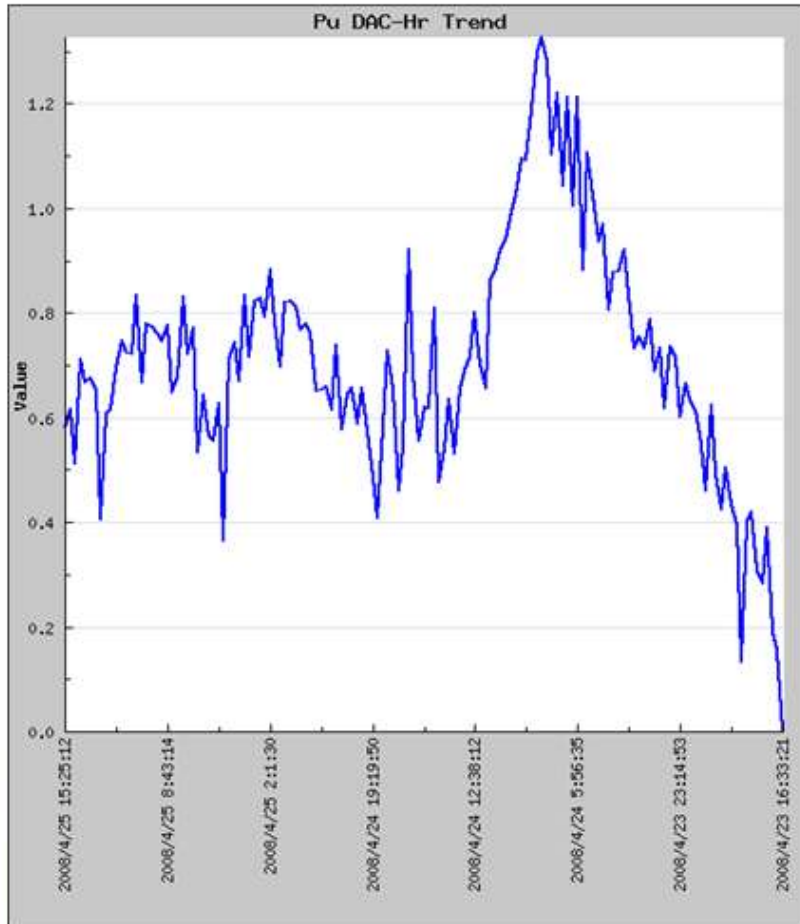
Net B CPM



Net Beta DAC-hr from ECAM



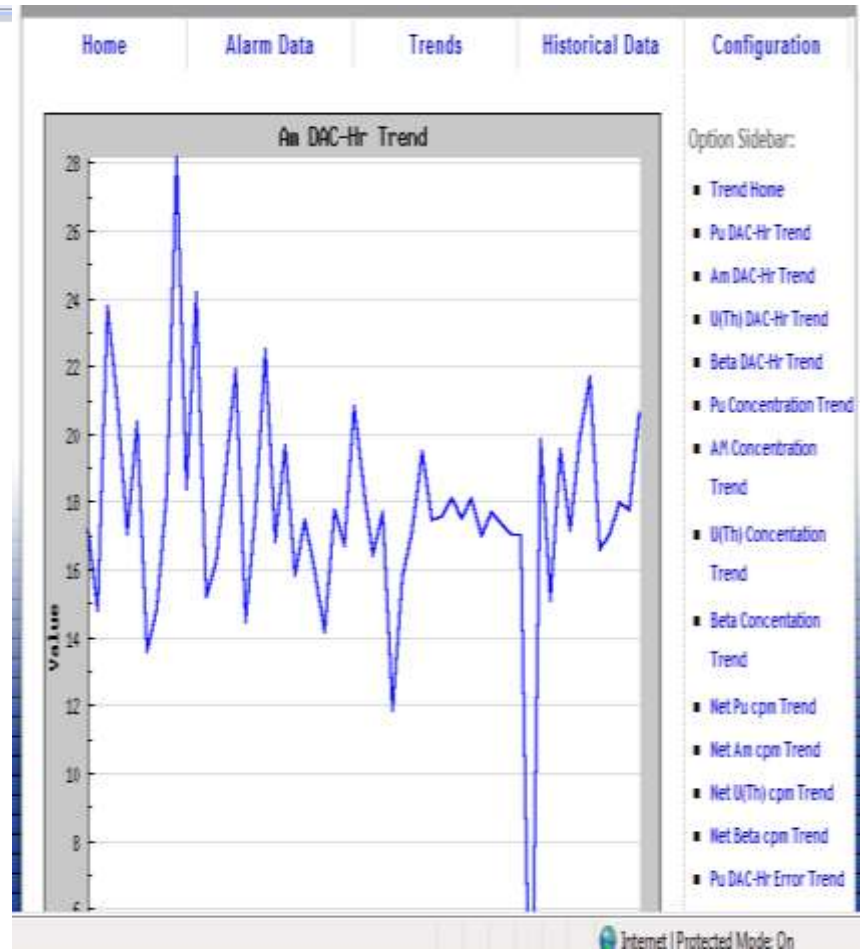
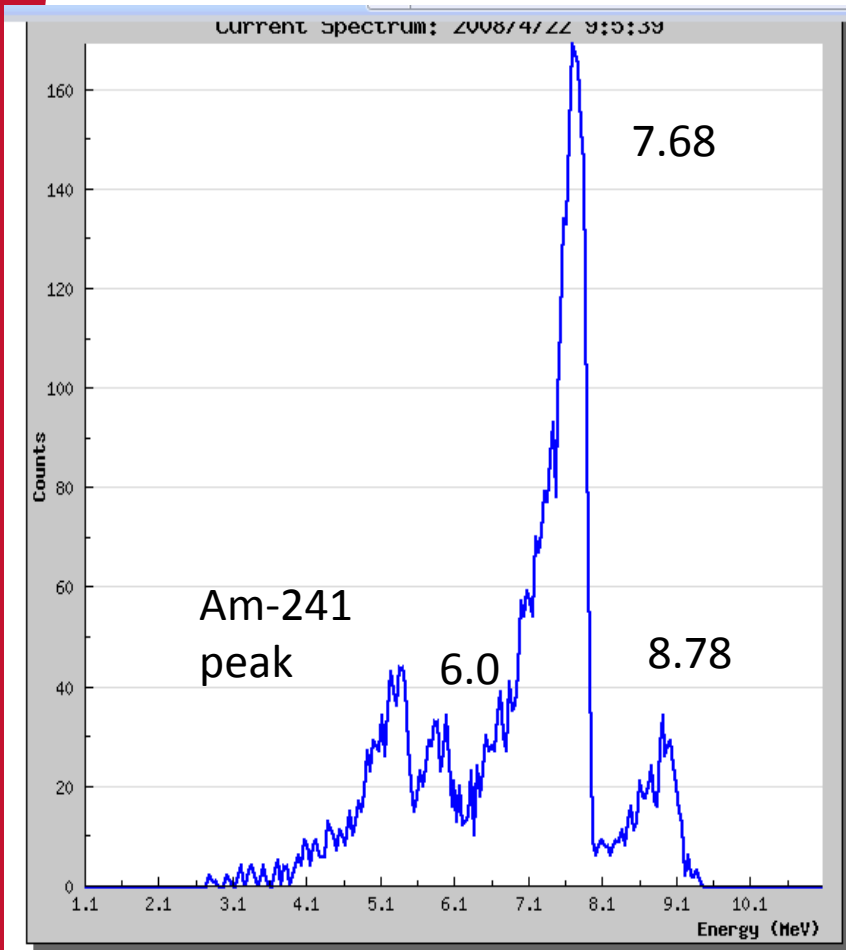
Tracking blank data while monitoring



If no Pu peak is found or if a peak is found but it's characteristics fail to pass critical tests, then a value corresponding to $\frac{1}{2}$ DL is reported

Here the DL climbs as background peaks grow in on a fresh filter and transient equilibrium produces a characteristic diurnal pattern

Canberra QA Check Source – Plated ring source with open port for collecting radon progeny



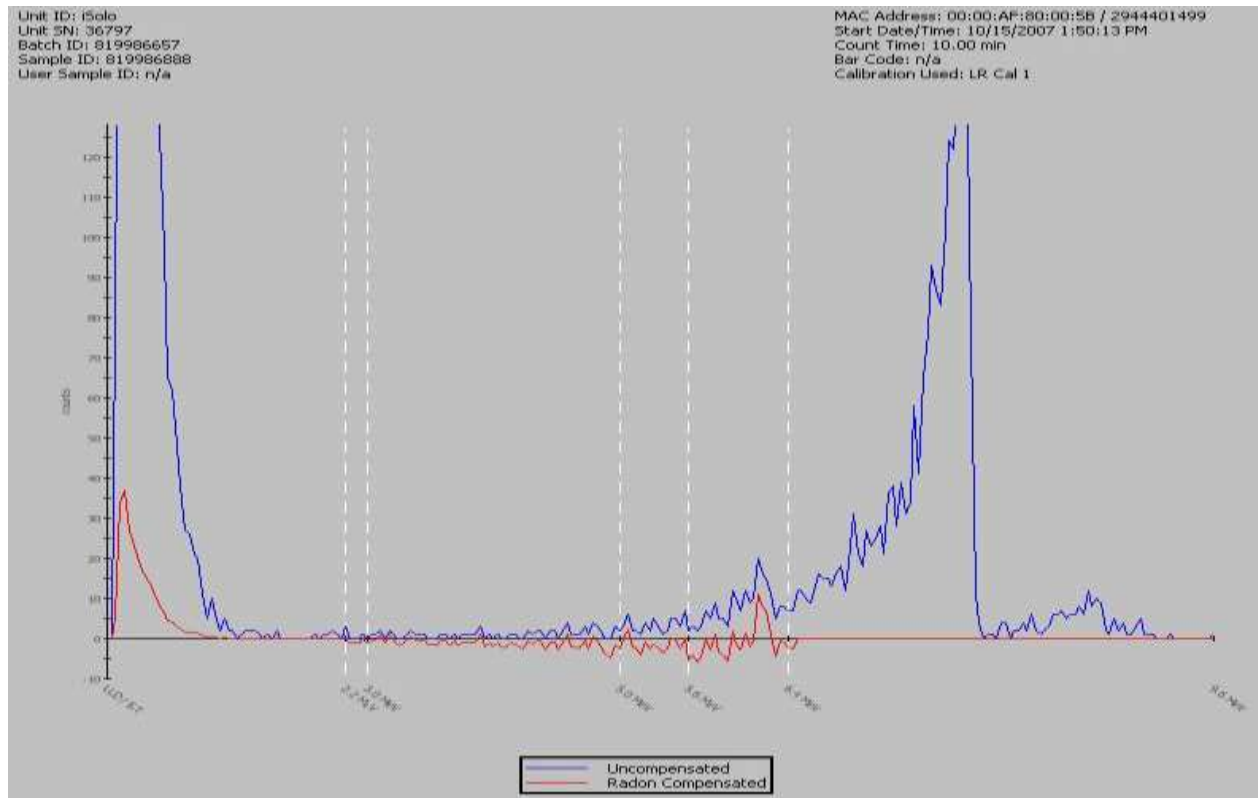
- ▶ **Los Alamos National Laboratory (LANL)**
- ▶ **Lawrence Livermore National Laboratory (LLNL)**
- ▶ **Fluor Hanford**
- ▶ **Brooks Air Force Base**
- ▶ **NASA**



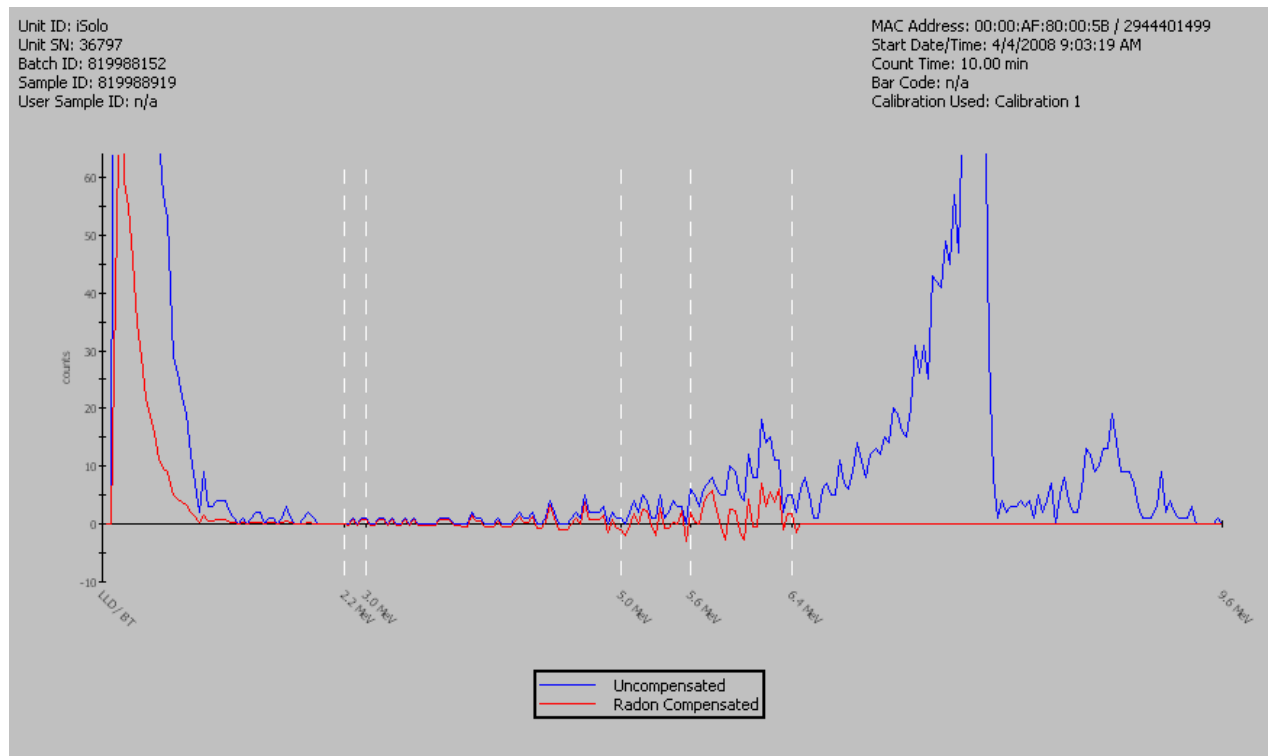
iSOLO Update

Lee Reagan

- ▶ Under- reporting Issue Reported by Dr. Robert Hayes
- ▶ Canberra confirmed the problem



- ▶ Customer identified cases where the iSOLO would UNDER-REPORT results in the first 180 minutes after collection
- ▶ Canberra has modified Algorithm since
- ▶ Expect Release imminently



Comparison of Alpha Results with New and Old Algorithm

