

# AGATA crosstalk measurement



## Causes of crosstalk:

- Crosstalk due to defects in the electronics
- Crosstalk due to design

## Sources of crosstalk:

- Crosstalk within the AGATA capsule - problem for Canberra
- Crosstalk in the cryostat - our problem

## Types of crosstalk:

- Crosstalk between core and a segment
- Crosstalk between two segments

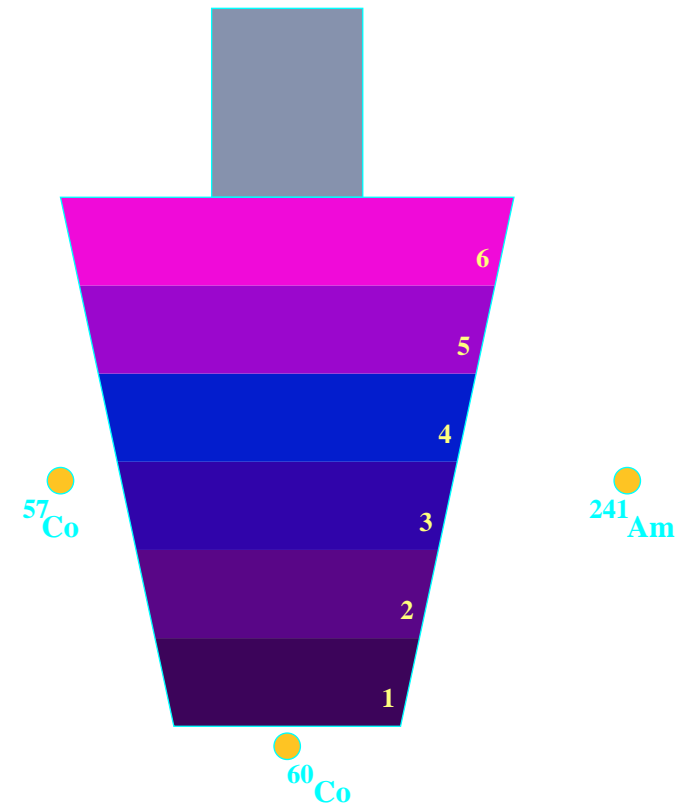
# Setup for crosstalk measurement

## Sources

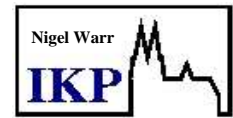
- Count rates of  $\sim 1000$  /s
- $^{60}\text{Co}$  for crosstalk measurement
- $^{57}\text{Co}$ ,  $^{241}\text{Am}$  for calibration

## Acquisition using digital electronics (DGF-4C Rev. E)

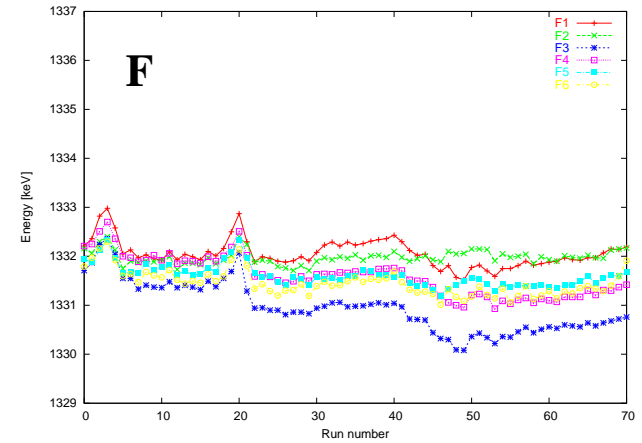
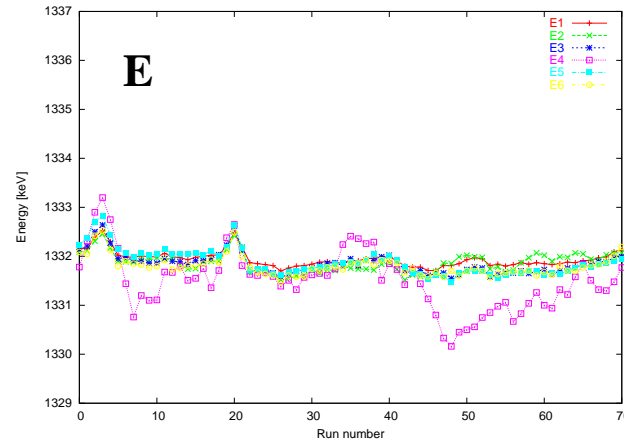
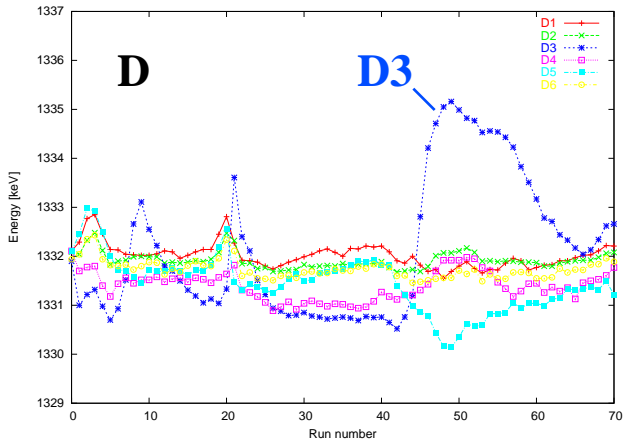
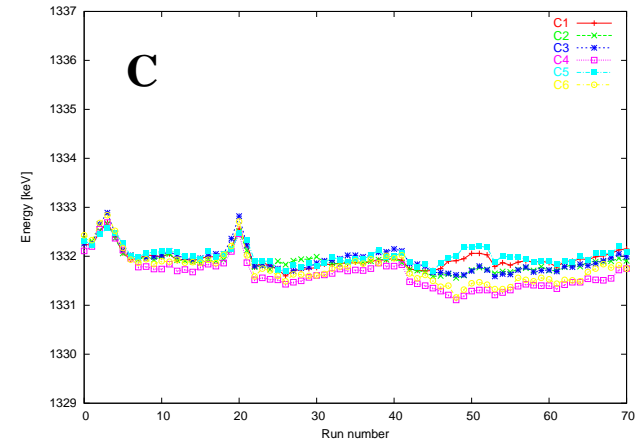
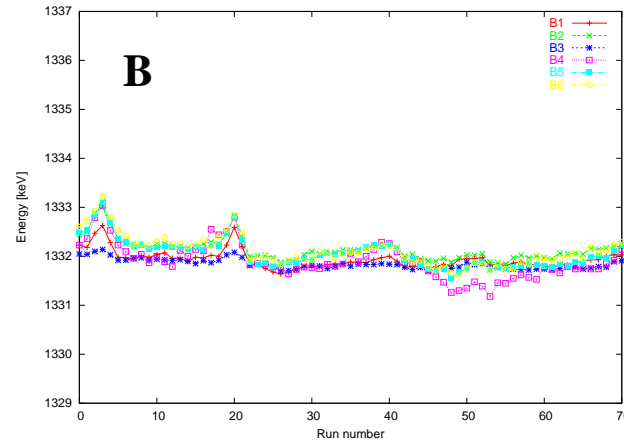
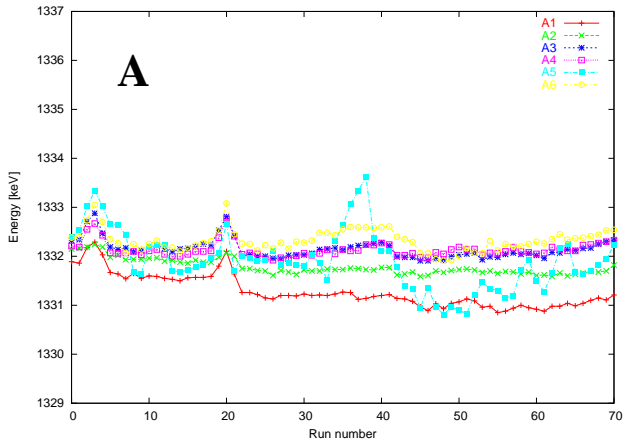
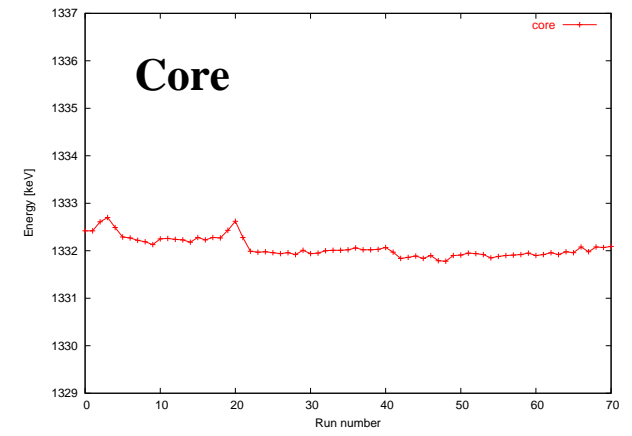
- Trigger on core signal
- Acquire core and all 36 segments for each trigger



# Gain stability over 4 days



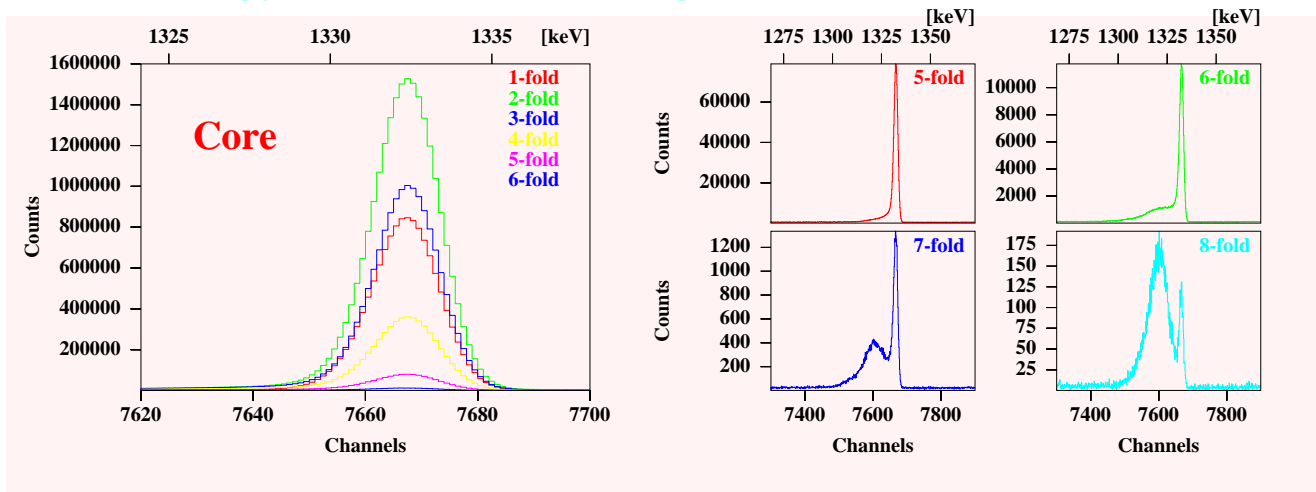
- 736 million events collected
- Sorted into 71 runs
- Each run must be gain matched



# Energy vs. number of segments hit

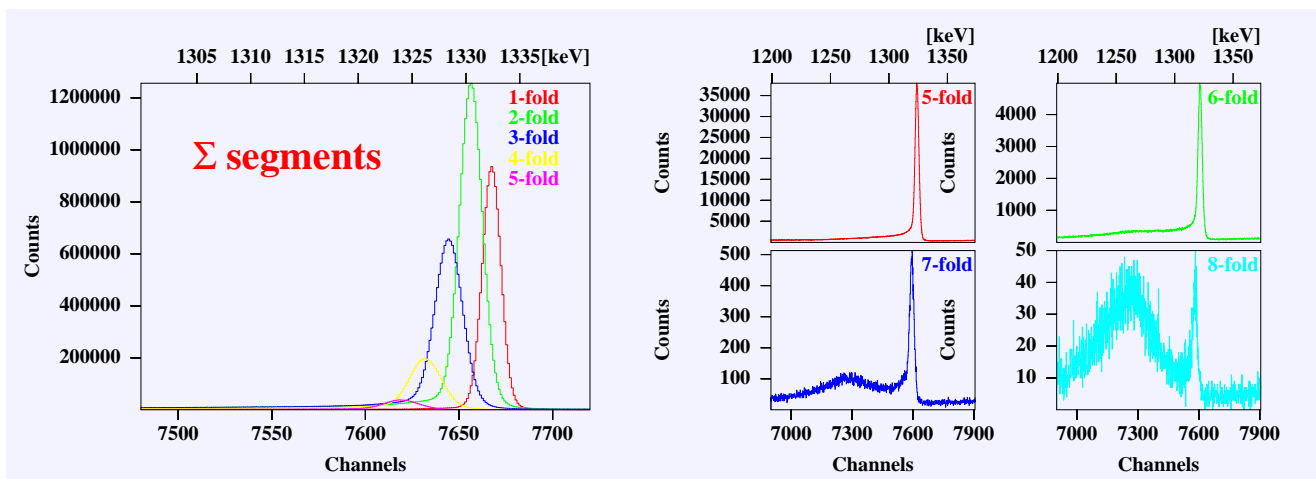
After gain matching to total data, we consider energy as a function of number of segments hit.

## Core energy vs. number of segments hit



- Peak position is independent of fold
- Strange bumps at higher folds

## Sum of segment energies vs. number of segments hit

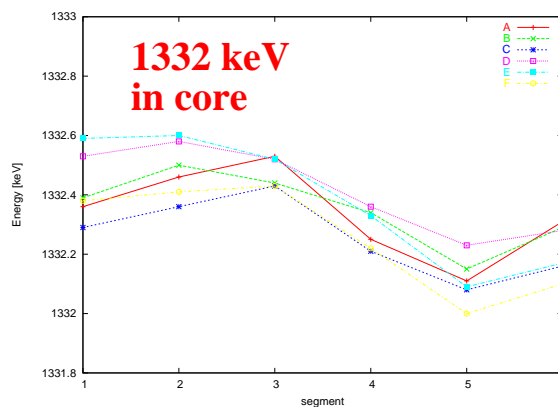
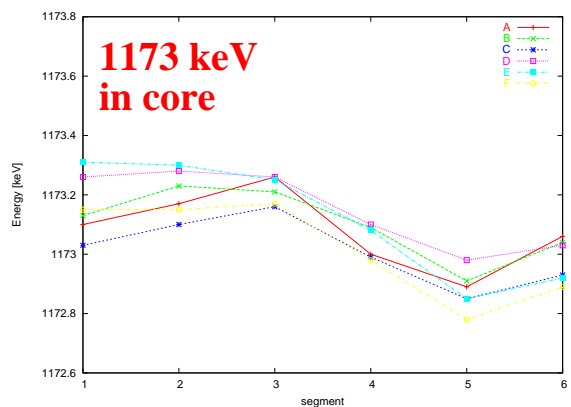


- Peak position depends on fold
- Strange bumps at higher folds

# One-fold events

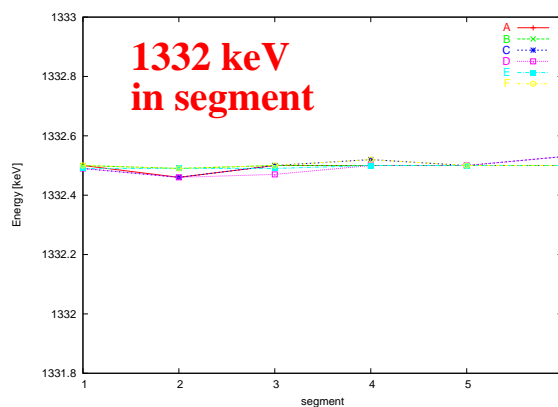
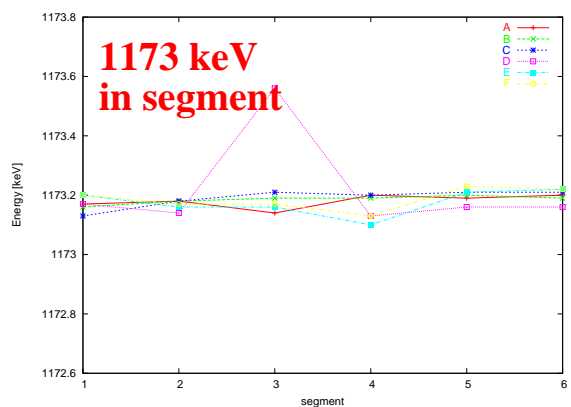
If we select events where only one segment was hit:

## ● Core energy vs. segment number



- Systematic variations in energy as a function of ring
- Real physics!  
(See B. Bruyneel's talk)

## ● Segment energy vs. segment number

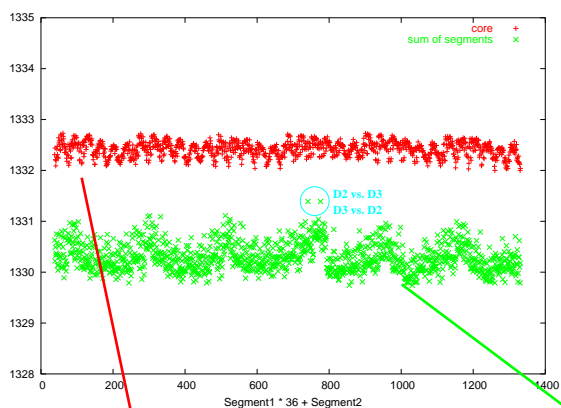


- Variations in energy removed by the calibration
- Except for D3

# Two-fold events

If we select events where two segments were hit:

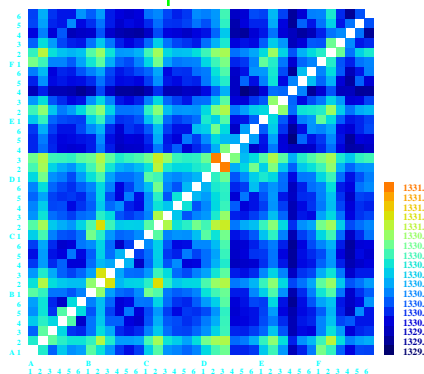
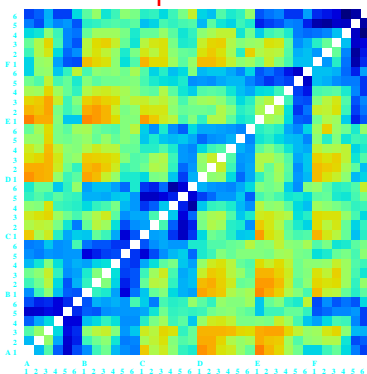
- Core energy vs. pair number : 2 = A1 vs. A2, 3 = A1 vs. A3 etc.
- Sum of segment energies vs. pair number



Core

- Clear structure on core, but mean energy is correct
- Also structure on sum of segments and mean energy is about 2 keV too low.
- The pair D2 vs. D3 and D3 vs. D2 are inconsistent with the trend

$\Sigma$ segments



- Core shows nearest-neighbour effects clearly
- For sum of segments, systematic effects dominate

# Conclusions



**The crosstalk test was successful**

- **The cryostat and the AGATA capsule comply with the required specifications.**
- **There is some crosstalk between D2 and D3, but this is well within the tolerance.**

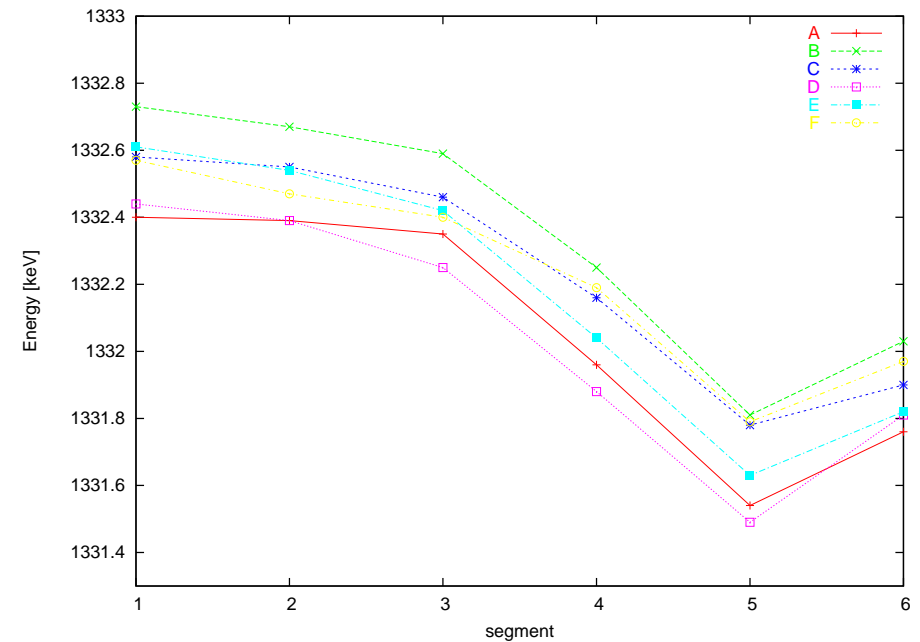
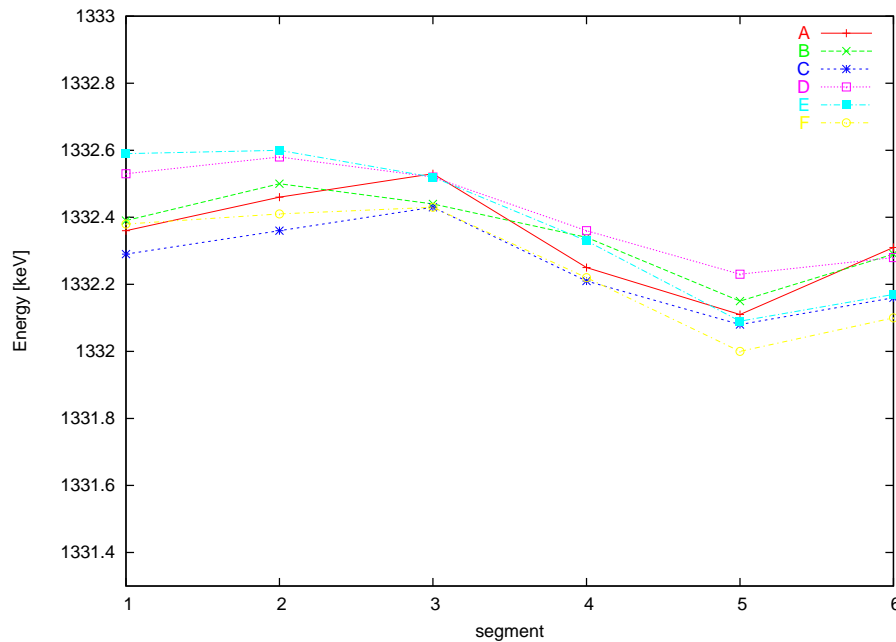
**These measurements had much greater statistics than previous ones, so new effects can be seen.**

- **The average core energy is independent of the number of segments hit.**
- **The average sum of segment energies is depends on the number of segments hit.**
- **Spectra for higher folds exhibit strange bumps, which cannot be accounted for by crosstalk (the energy is too low). They are on both core and sum of segments.**
- **Energy on core depends on which segment was hit. So there is some crosstalk.**
- **Effect on core dominated by nearest-neighbour effects.**
- **Effect on sum of segments depends on ring. Ring 2 gives highest energies, ring 5 gives lowest. There are still some nearest-neighbour effects as well.**

# Another AGATA detector



- We have started measuring a second detector.
- So far we do not have enough statistics to look at two-fold events.
- The one-fold events show similar effects.

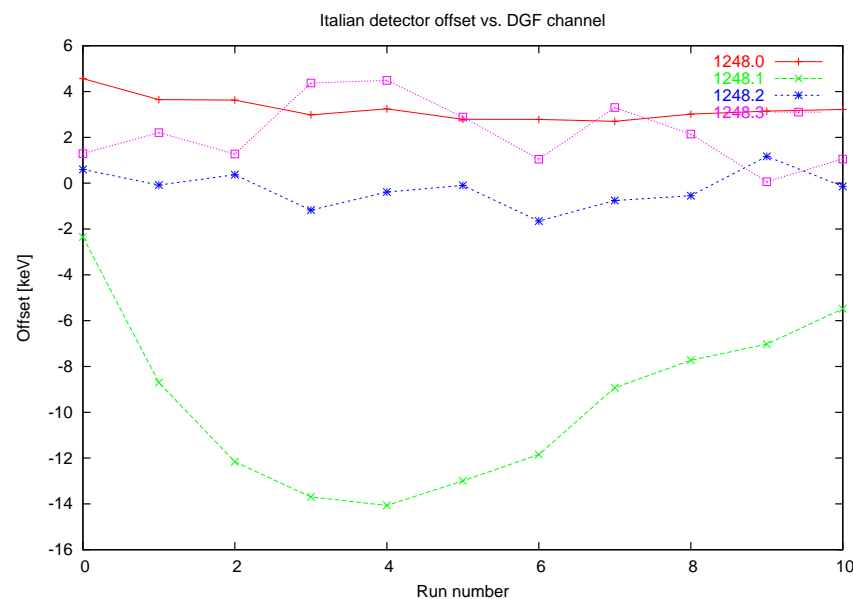
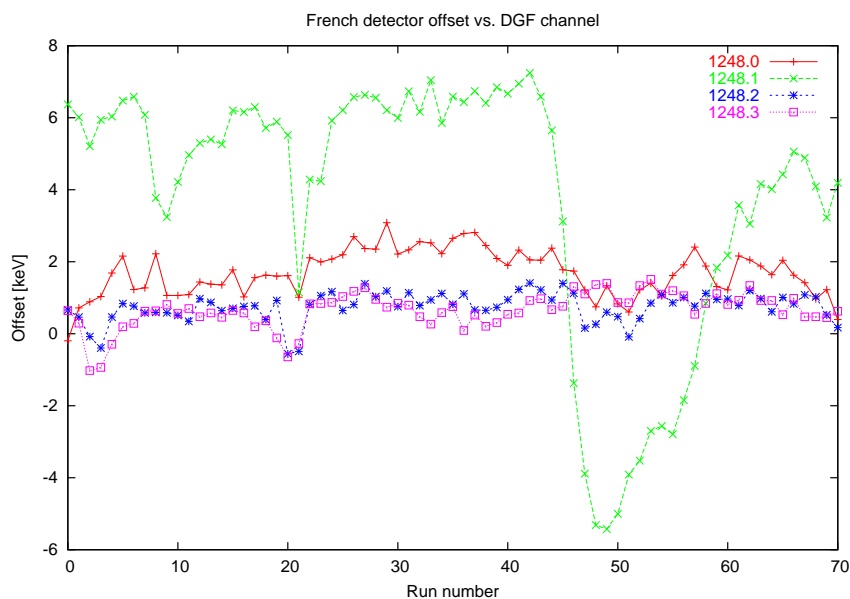


- Note, however, that the amplitude of the changes is much greater.
- French detector has 0.45 % variation, while Italian has 0.93 %.



# DGF with serial number 1248

- If we look at the offset as a function of run number for this module for two different detectors:



- Channel 1 (green) shows large fluctuations.
- This clearly comes from the measurement electronics.
- This was channel **D3** in the data presented here.