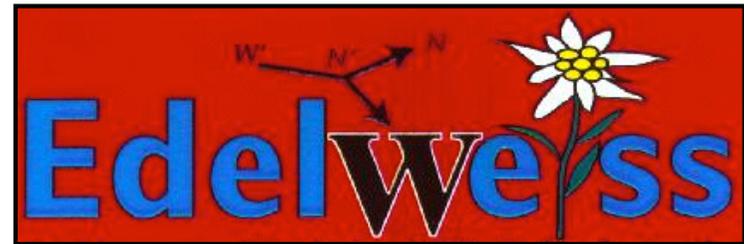
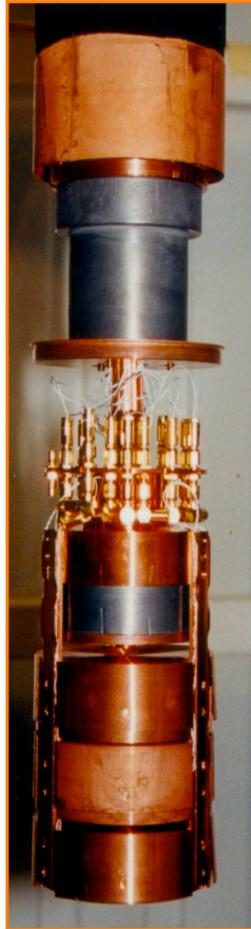

Edelweiss-II status



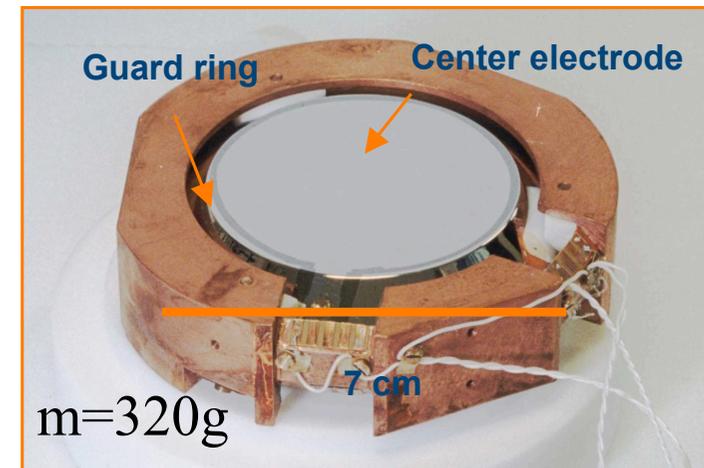
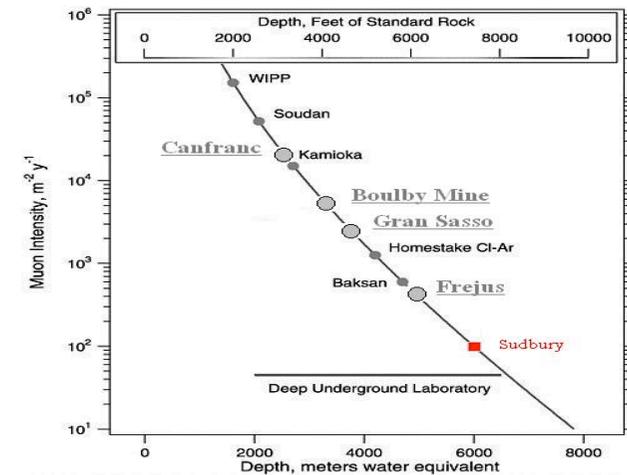
Eric Armengaud (CEA), for the Edelweiss Collaboration
Axion-WIMPs training workshop, Patras, 22/06/2007

Edelweiss-I

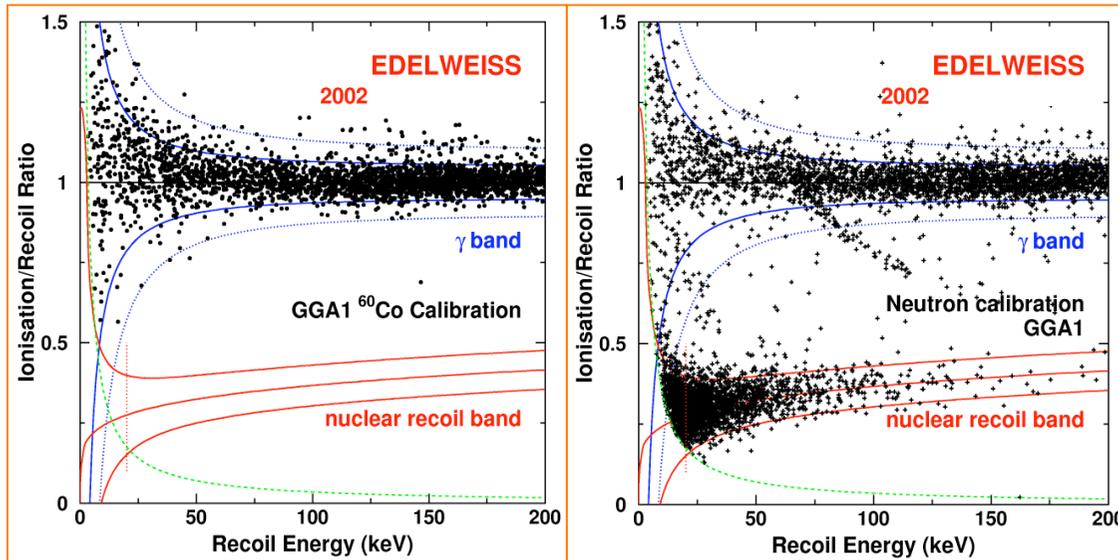


- 3 Ge bolometers with simultaneous measurement:
 - Heat (at ~ 17 mK): NTD thermometers
 - Ionization, Al electrodes with a few V/cm
 - Guard electrode \Rightarrow fiducial volume $\sim 57\%$

- Located at LSM (Frejus tunnel)

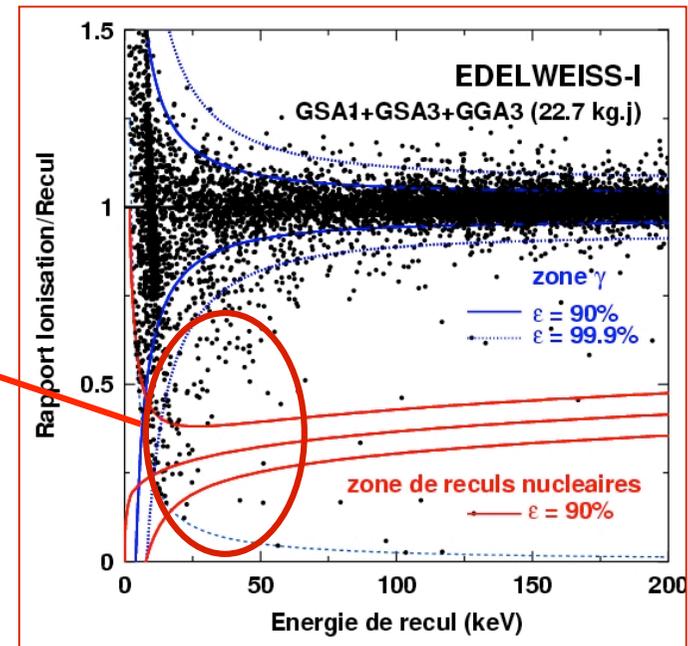


Edelweiss-I : data

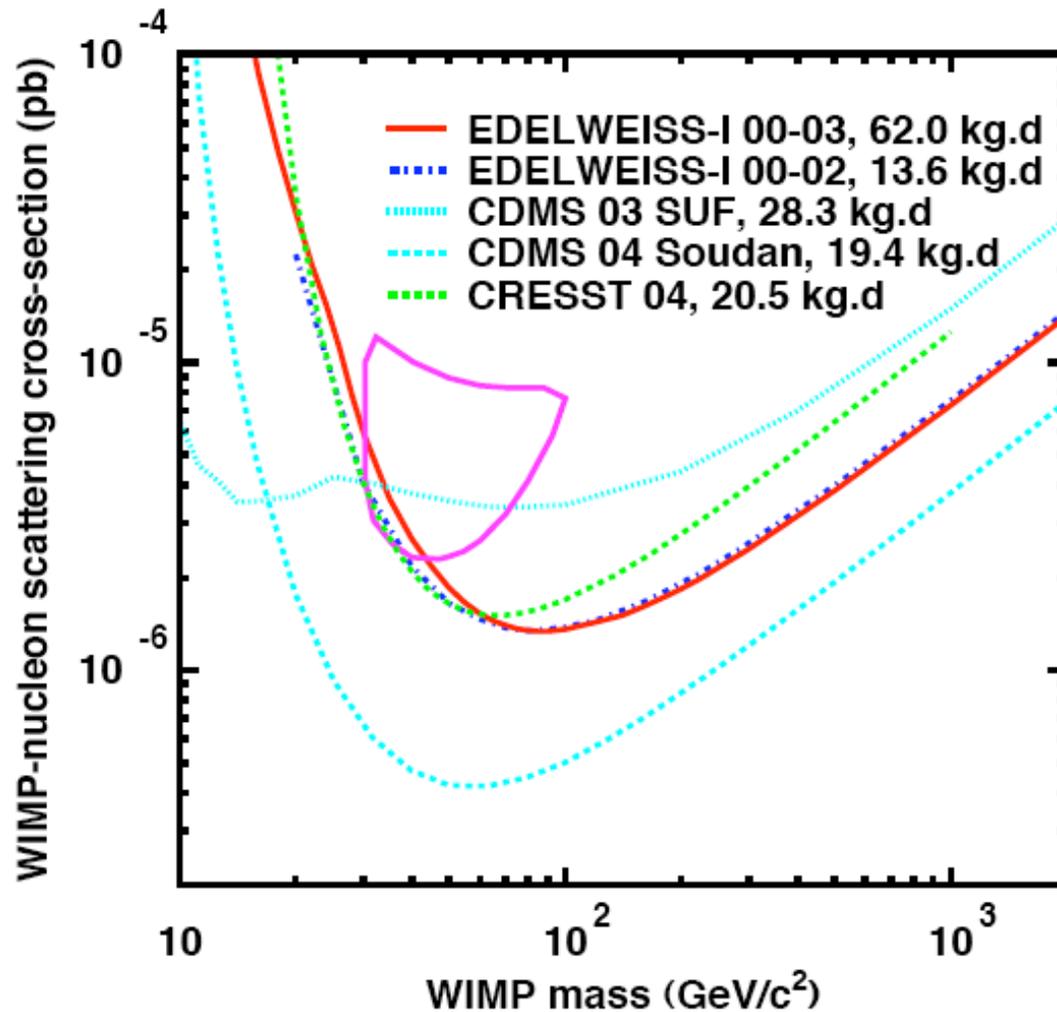


($Q = \text{Ionization} / \text{Recoil}$
 → event by event discrimination)

- Discrimination gamma/n > 99.9% for $E_r > 15$ keV
- Physics run: the sensitivity was eventually limited by a background « leaking » down to the recoil band
 - Neutrons : 2 events expected (1 coincidence observed)
 - Miscollected surface events (electrons)
- Final exposure ~ 62 kg.day



Edelweiss-I : results



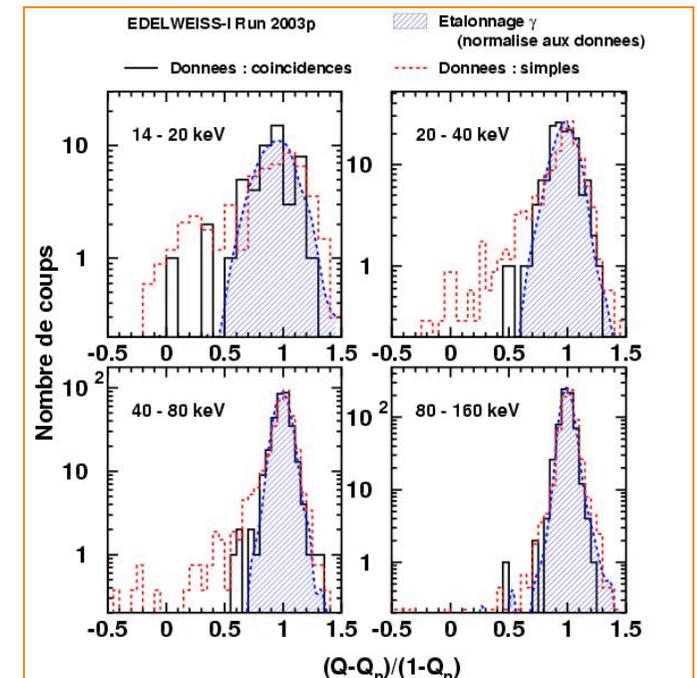
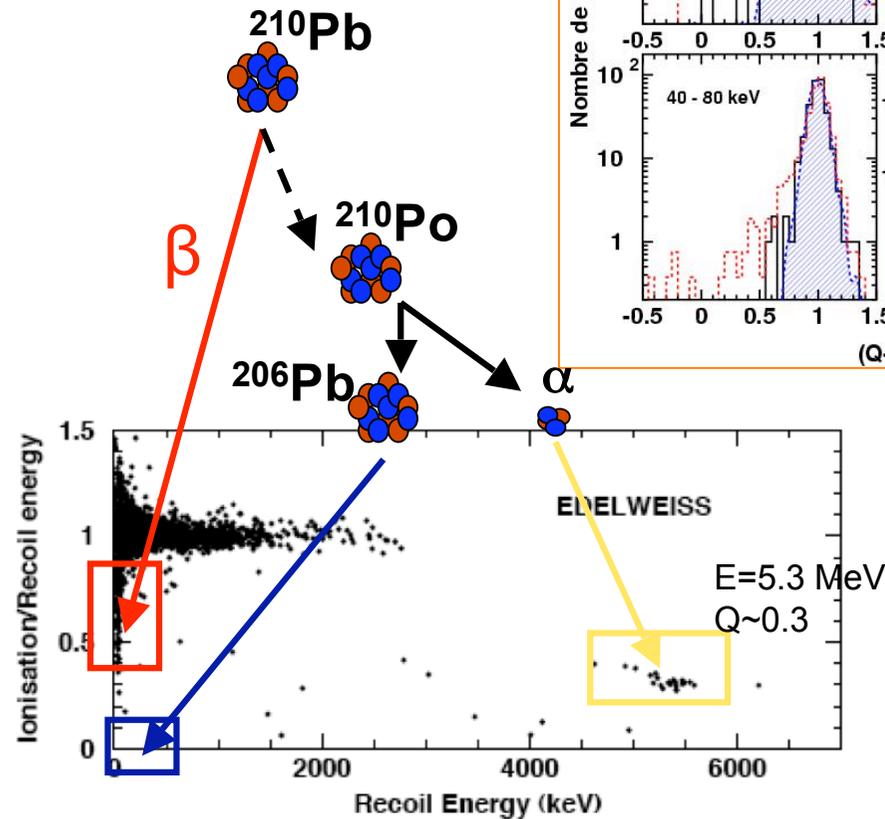
No background subtraction



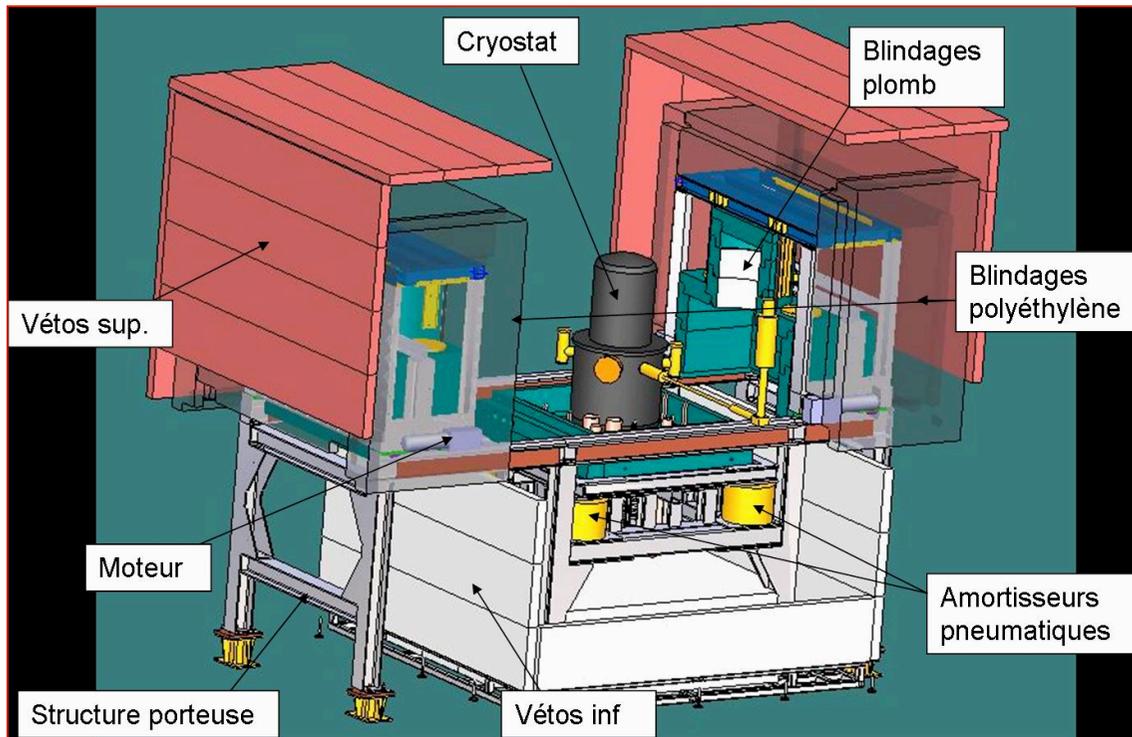
No improvement from
~10 to ~60 kg.d exposures

Edelweiss-I : surface events

- Indications of ^{210}Pb contamination (exposition to Radon):
 - α rate \sim e rate \sim ionizationless events ~ 5 /kg.day
- Surface of bolometers or holders..?
- Also: Possible ^{14}C contamination?



Edelweiss-II : setup



Goals :

- $\sim 10^{-8}$ pb (100 bolometers)
- R&D for a larger-scale experiment

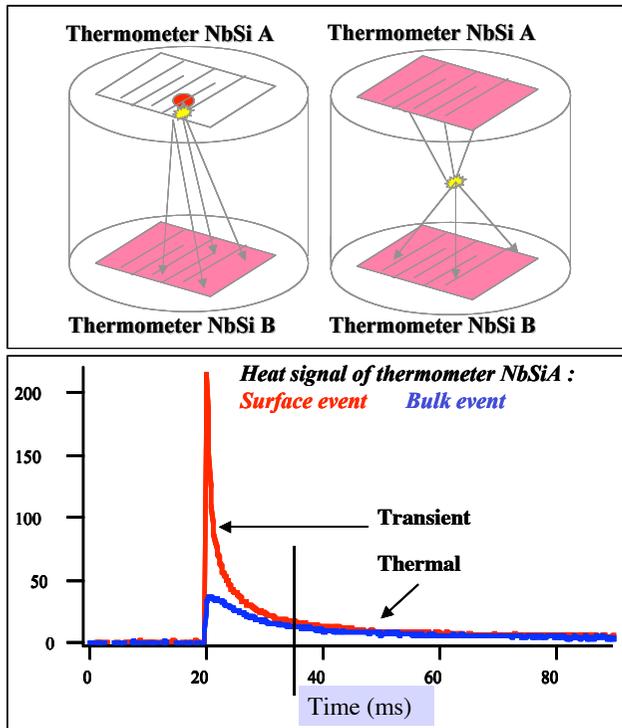
- Goal : $\sigma \sim 10^{-8}$ pb
- Clean room
- HPGe detectors for radioactivity tests
- Deradonized air
- Pb shield, 50cm PE shield, muon veto
- Cryostat with inverted geometry, containing up to 120 detectors, controlled with an automate
- Hexagonal compact arrangement of bolometers
 - Ge/NTD (\sim EDW-I)
 - Ge/NbSi (R&D: active rejection of surface events)
 - A heat-light detector
- New acquisition and electronics

Eliminating surface events

- Passive rejection
 - ❑ Reduce beta emitters contamination (copper screens, reprocessing detectors..)
 - ❑ Improve the charge collection for surface events (amorphous Ge/Si layer...)
- Active rejection
 - ❑ Detector sensitive to athermal phonons = Ge/NbSi detectors (2*200g detectors in lab, goal = 7*400g detectors)
 - ❑ Interdigitized electrodes

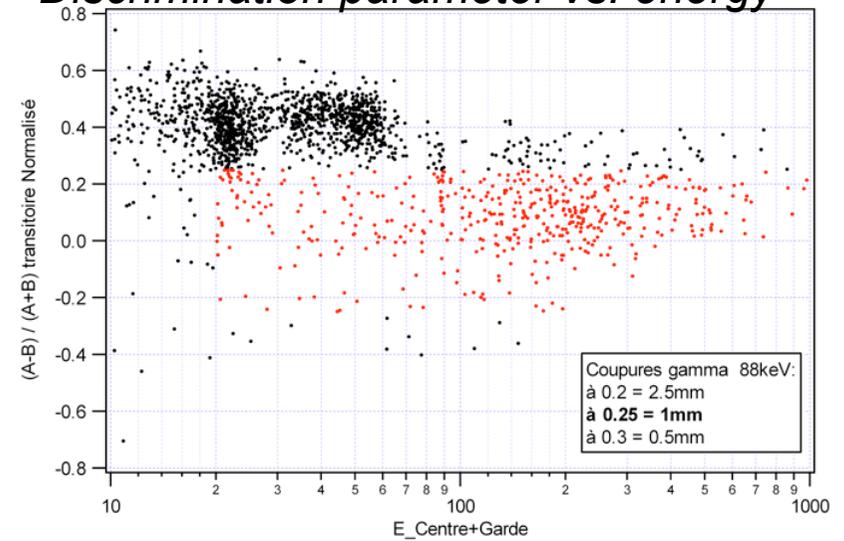


NbSi detectors

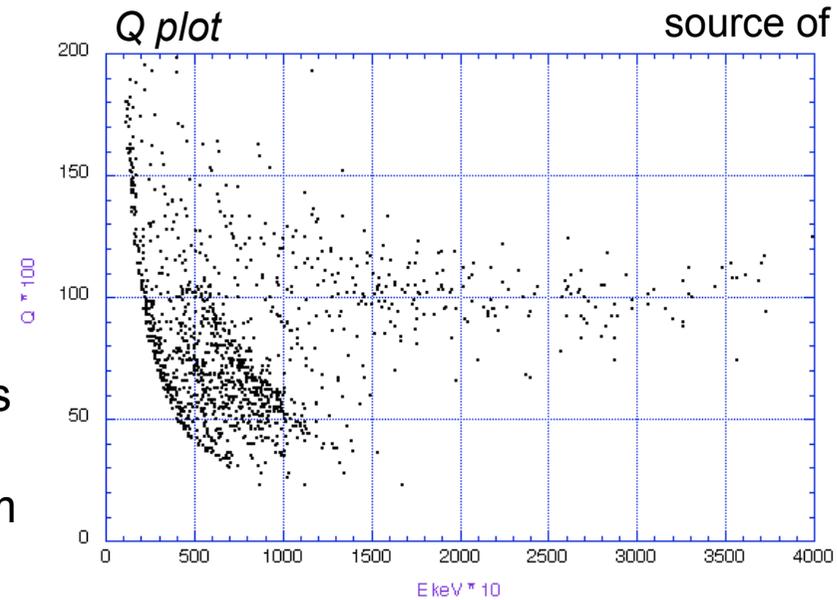


- Excellent rejection of electrons
- Poor resolution for these data
- Nb film now replaced by Al film

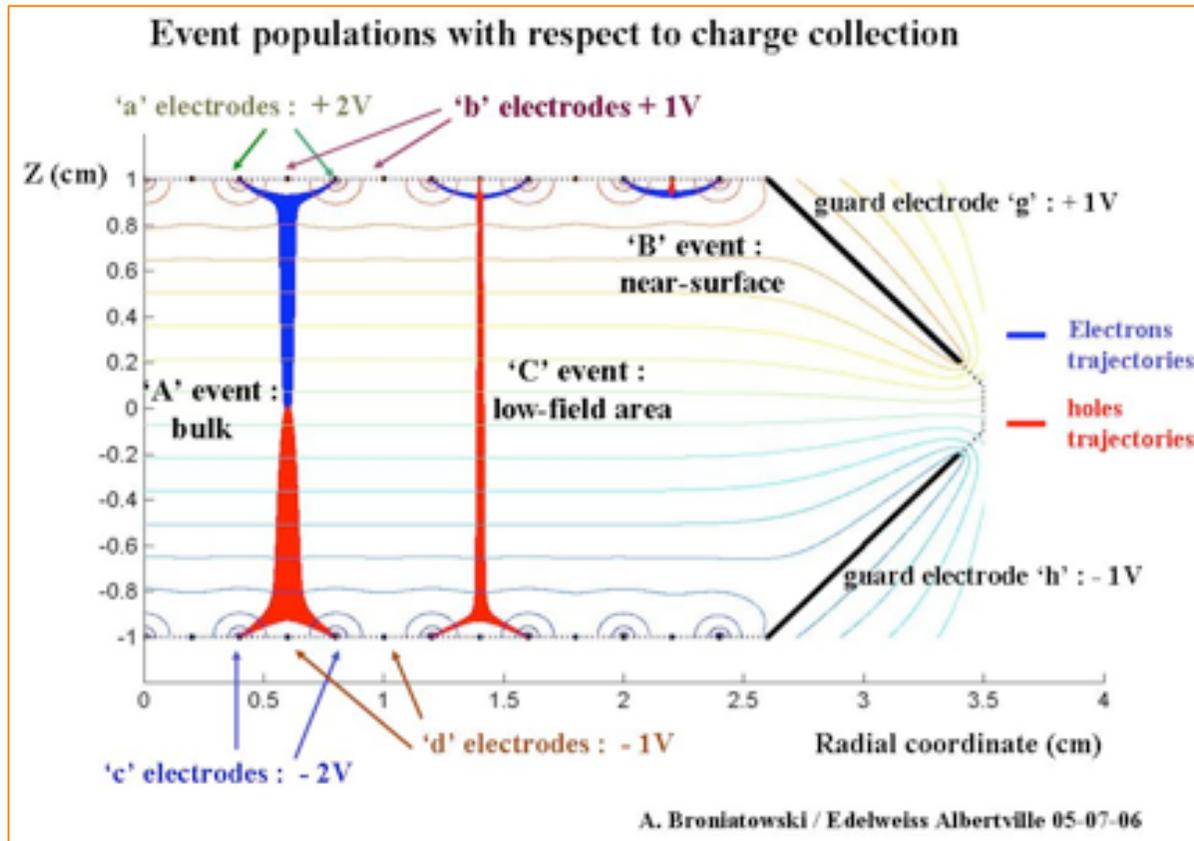
Discrimination parameter vs. energy



Exposition to a source of ^{109}Cd



Interdigitated combs



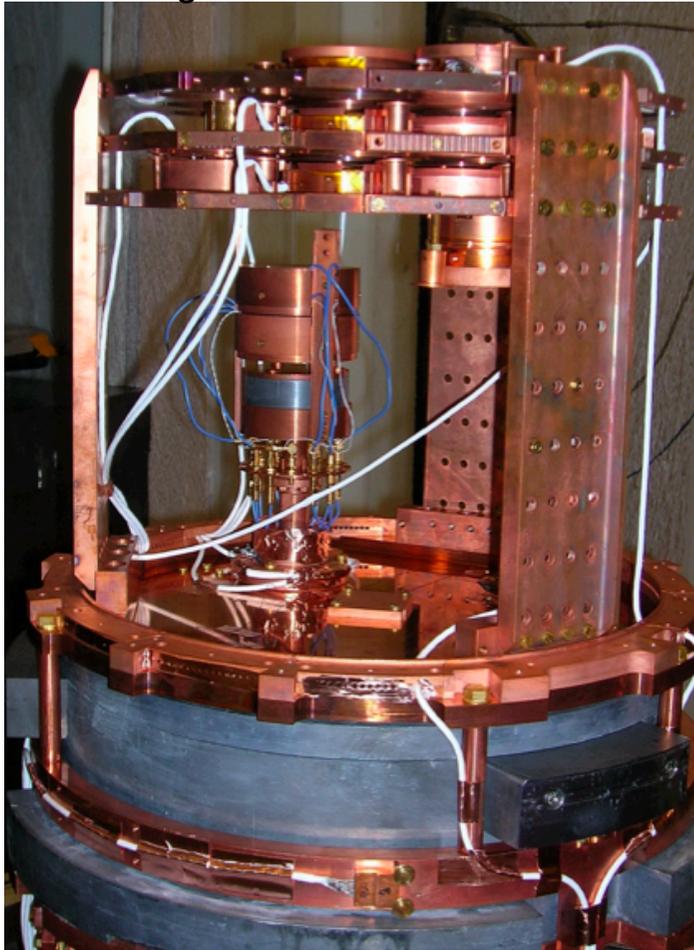
- R&D going on (joint ANR CSNSM/CEA)
- First results for LTD12?

Simulation of charge migration and collection

Commissioning runs : detector configurations

Construction begun 2004
2006 : first cryogenic tests

Oct 06 - jan 07 : ~ 8 bolometers
• including the old EDW-I tower

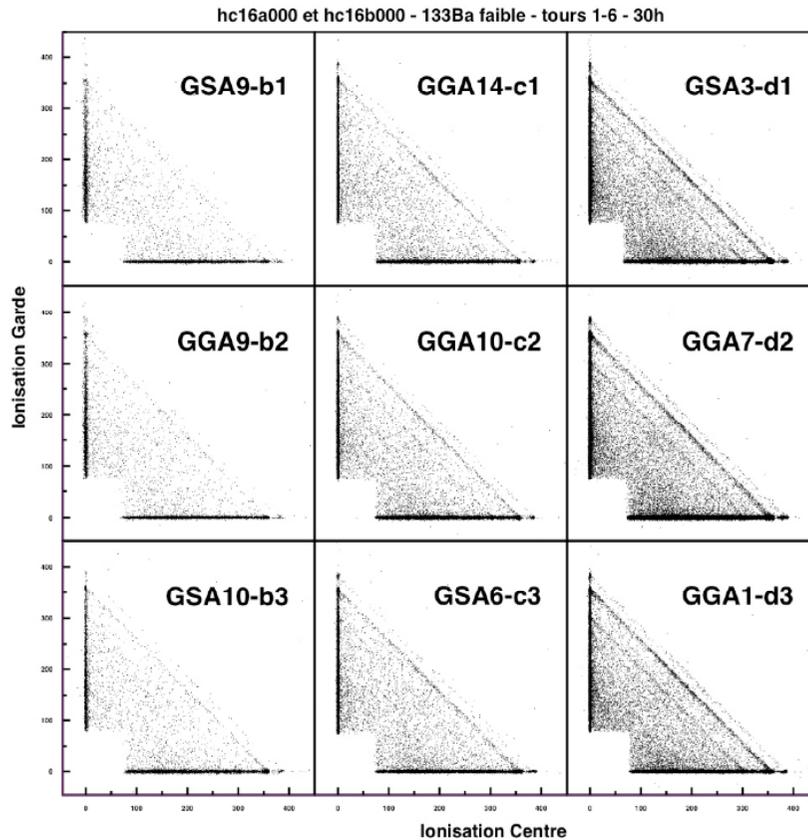


March - june 07 : ~ 28 detectors

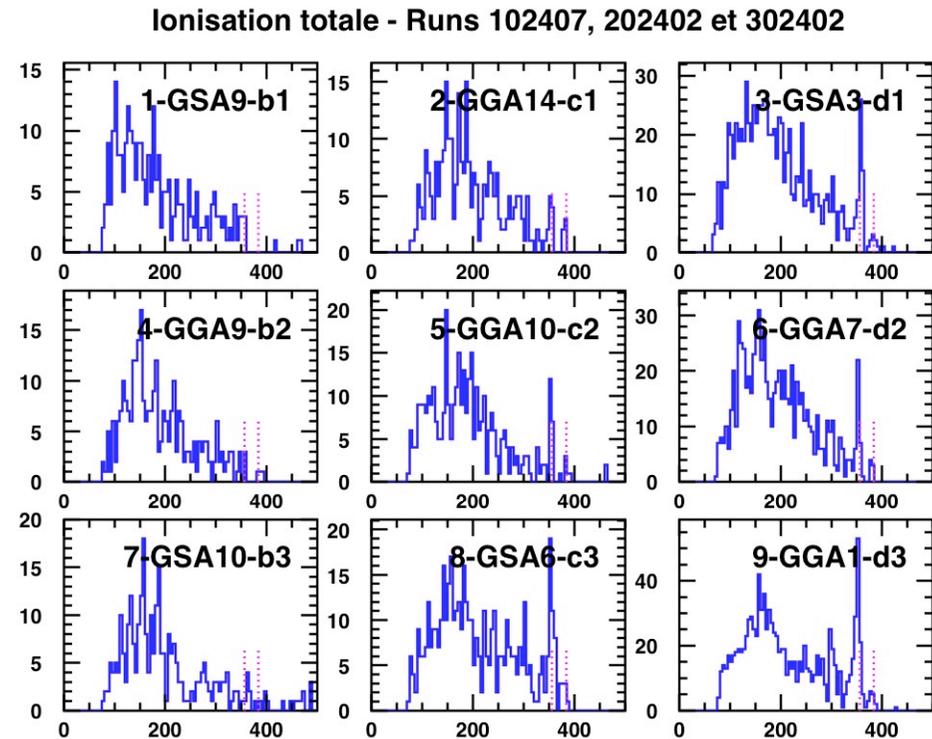


→ goal: first
« milestone »
at 10kg

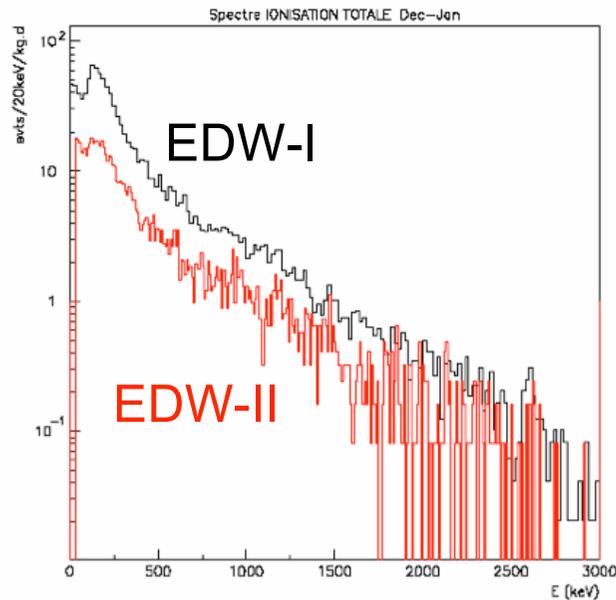
Commissioning runs : some examples



(spring 2007)



Commissioning runs : background runs

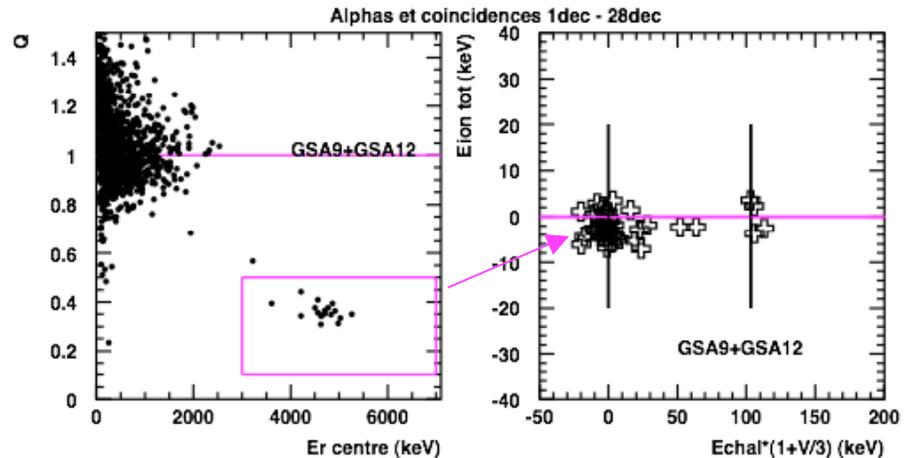


Gamma background divided by ~ 2 wrt EDW-I

- The intensity of the background might vary depending on the detector position

Alpha observations:

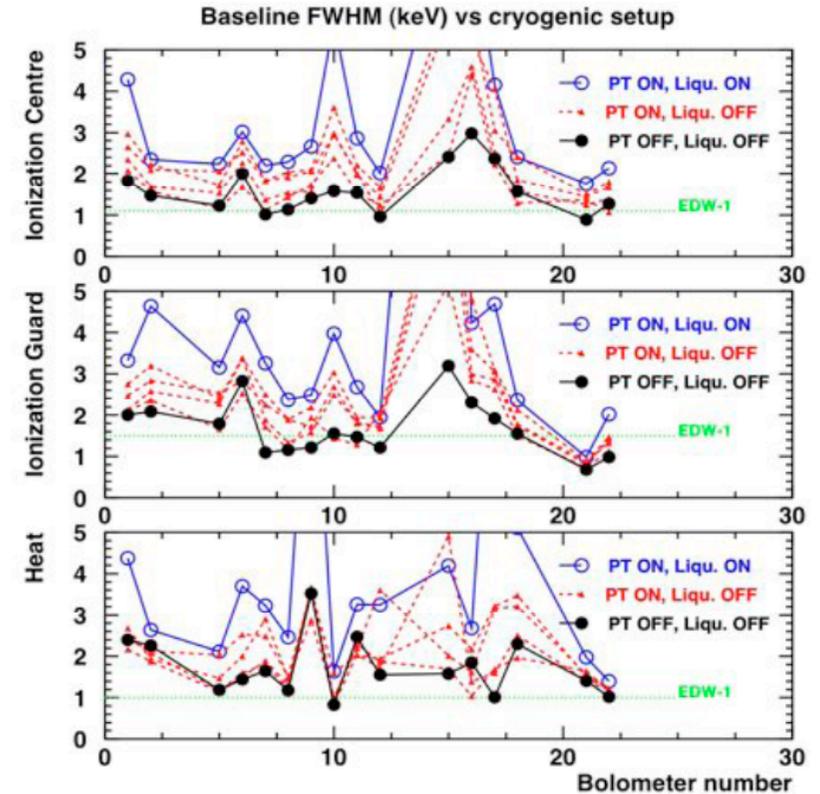
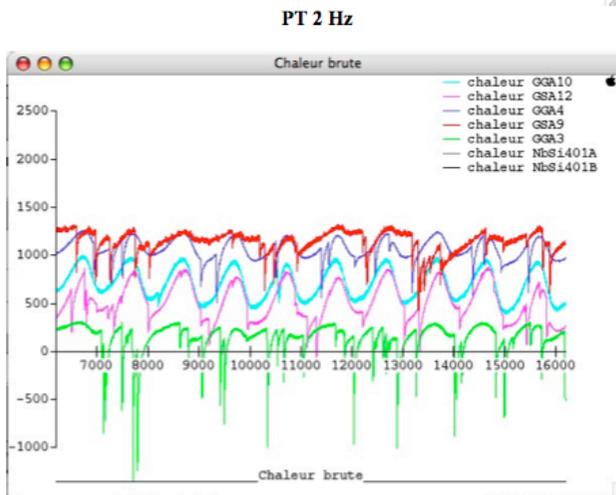
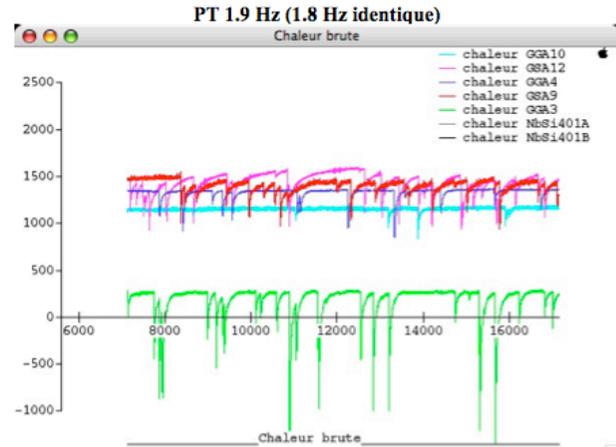
- Global rates similar to EDW-I but smaller rates on the guard
- Coincidences observed / ²⁰⁶Po recoil
- Some detectors were reprocessed
→ no obvious improvements
- Bolo-to-bolo variations
(influence of copper covers under study)



Commissioning runs : noise improvements

Strong influence of the cryogenic setup

- Improvements already made, more coming
- Best resolutions achieved are similar to EDW-I



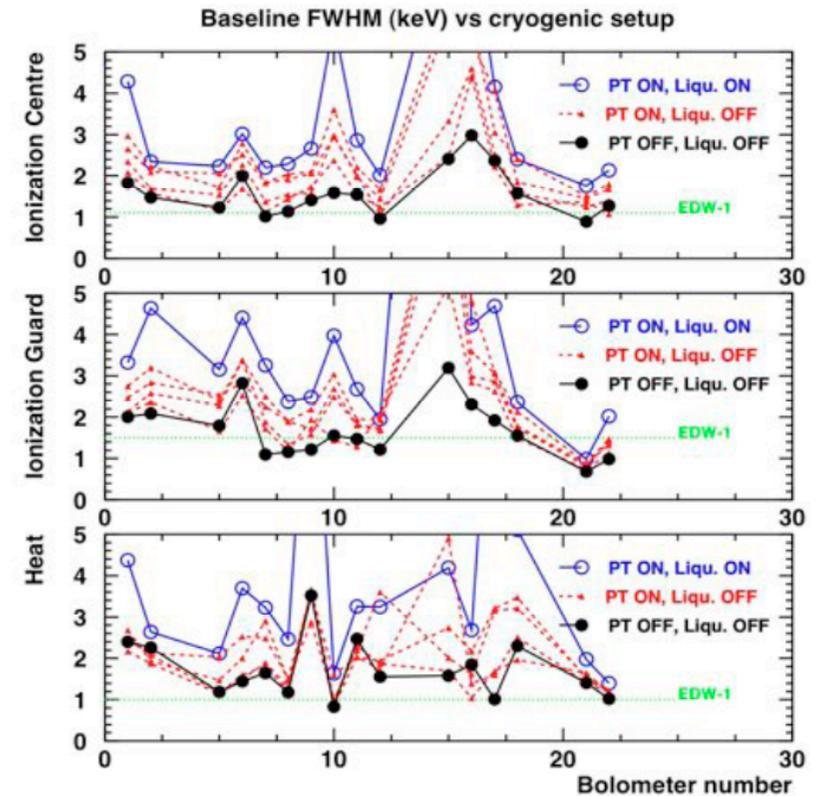
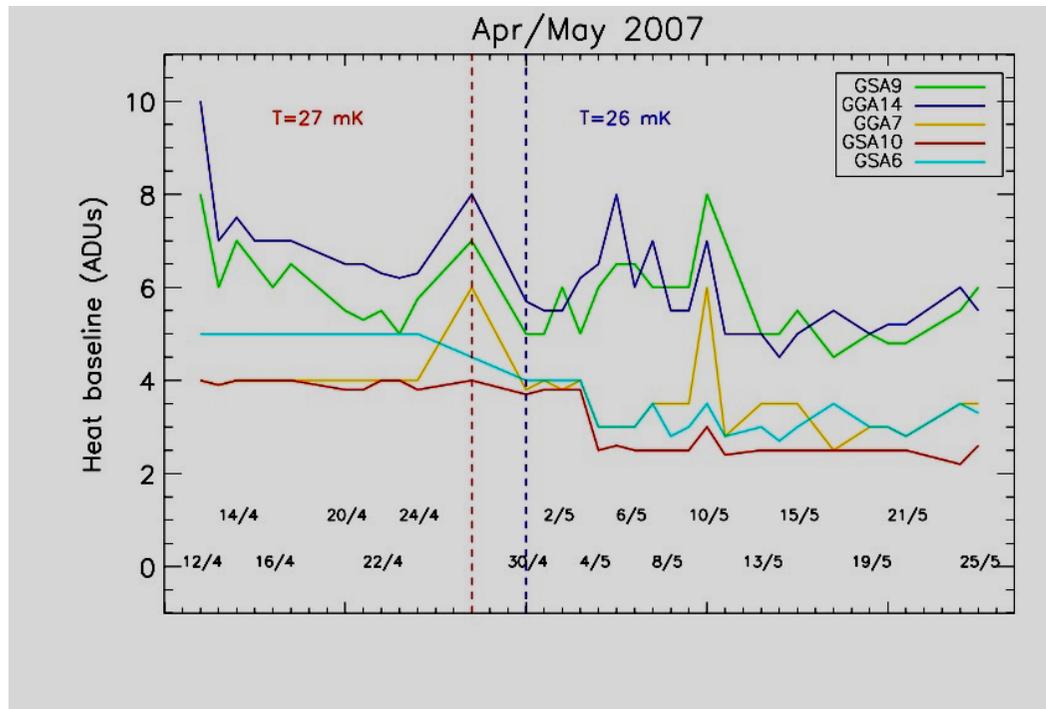
(spring 2007)

Low frequency noise on the heat from pulse tubes (end 2006)

Commissioning runs : noise improvements

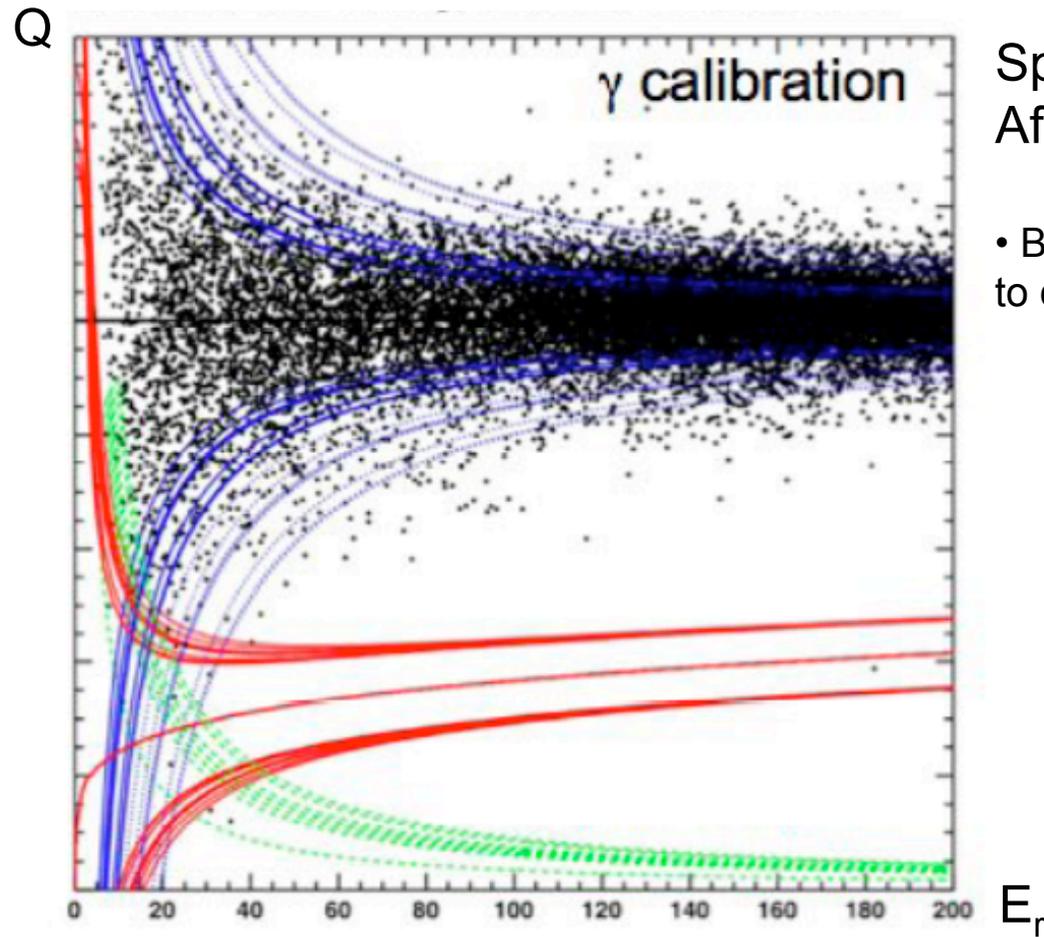
Strong influence of the cryogenic setup

- Improvements already made, more coming
- Best resolutions achieved are similar to EDW-1



Time variations of the baseline
(from raw online monitoring)

Commissioning runs



Spring 2007 data
After quality cuts

- Background results to come

Conclusions

- EDW-II: Commissioning runs of phase 28 (9 kg) :
 - Many improvements going on : data quality, backgrounds
 - R&D on NbSi (close to validation) and Interdigit (promissing)
- DM physics runs to start soon..
- Phase 100 (30 kg): towards $< 10^{-8}$ pb.
 - Funding to be asked this year
- 10^{-10} pb : towards a 1T cryogenic experiment = EURECA
 - Project of integration in a future extension of the Frejus lab (safety gallery dig by 2012)