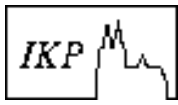


AGATA Week November 2007

Acceptance test of the AGATA Ge detectors

University of Cologne
Andreas Wiens

B. Birkenbach, B. Bruyneel, J. Eberth, H. Hess, D. Lersch, G.
Pascovici, P. Reiter - IKP Cologne
H.-G. Thomas - CTT

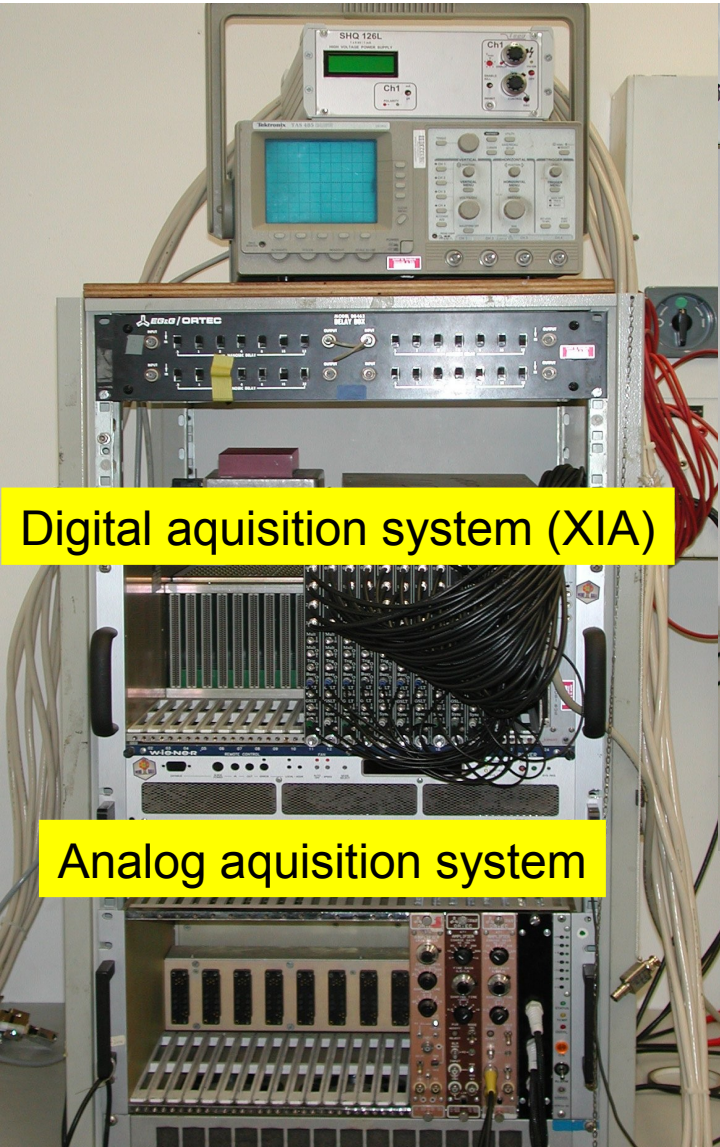


Overview

- Summary of detector deliveries
- Test results
- Microphonics
- Status of the asymmetric detectors
- Summary



detector	delivery	owner	status CAT
A001	11/05	GANIL	rejected – hole trapping
B001	11/05	Padova	rejected – segments with poor resolution
C001	12/05	Padova	accepted
A002	04/06	Munich	rejected – leakage currents
A001	06/06	GANIL	accepted
C002	07/06	GANIL	accepted
B002	08/06	GANIL	accepted
A003	11/06	Liverpool	rejected – leakage currents
C003	03/07	Liverpool	CAT done - open
B003	06/07	Liverpool	CAT done - open
B001	06/07	Padova	CAT done - open
A002	06/07	Munich	CAT done - open
C004	09/07	Ankara	CAT done - open
A004	09/07	Ankara	test ongoing
A003	10/07	Liverpool	delivered to Cologne
B004	Expected 07	Ankara	

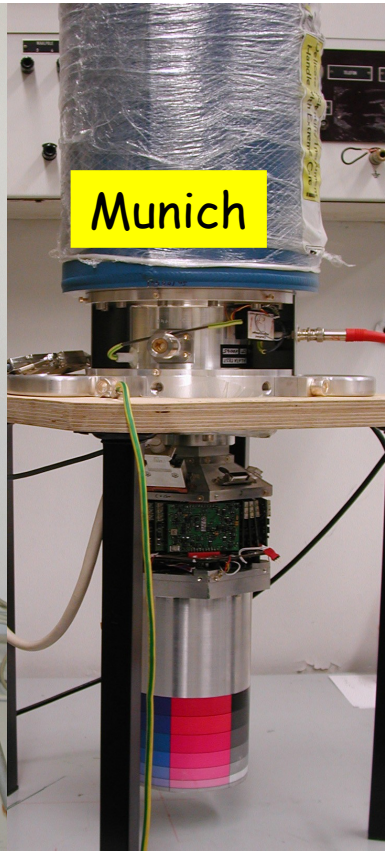


Digital aquisition system (XIA)

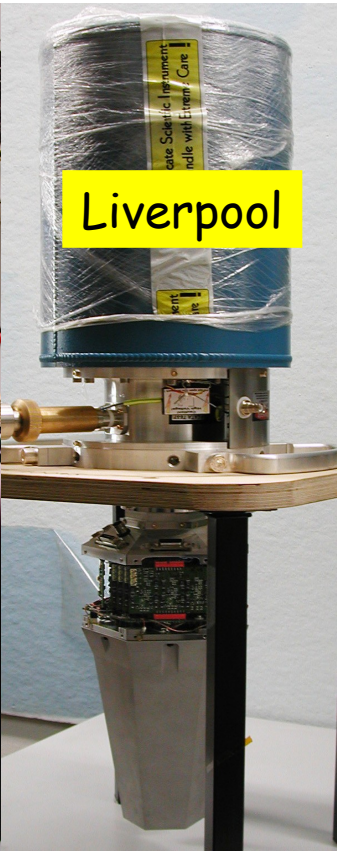
Analog aquisition system



Cologne



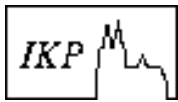
Munich



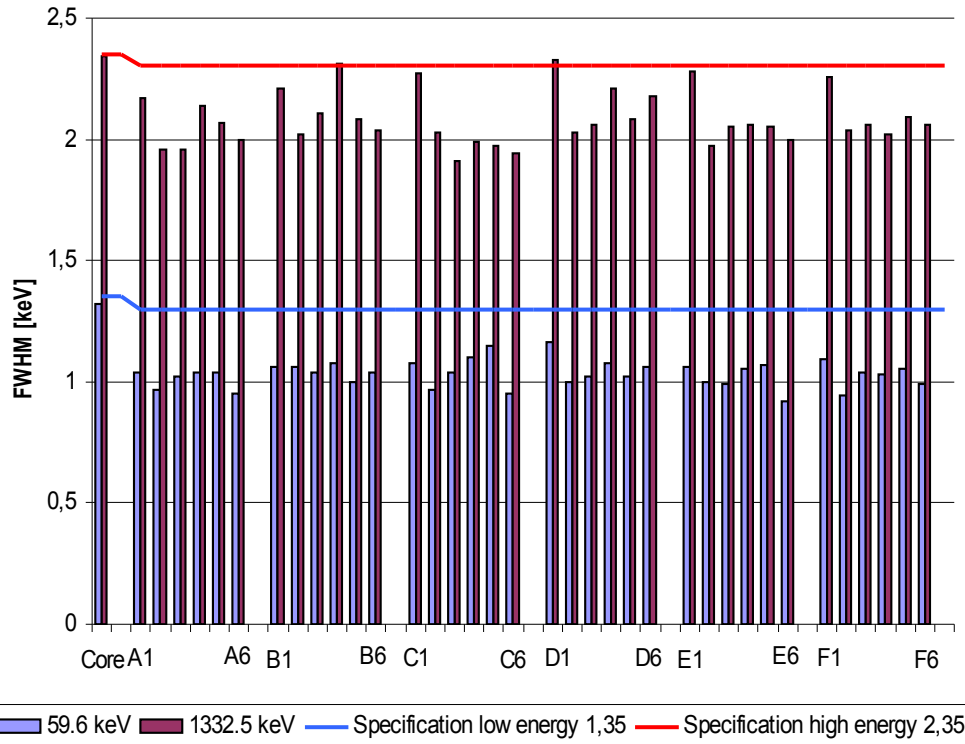
Liverpool

Munich test cryostat: FWHM 2.21 keV @ 1.3 MeV
Can be delivered soon

Liverpool test cryostat: test of cryostat ongoing



Test results C003



Specifications:

Core

Guaranteed at 1.3MeV: $\leq 2.35\text{keV}$
 at 122keV: $\leq 1.35\text{keV}$

Segments

Guaranteed
 at 1.3MeV: $\leq 2.30\text{keV}$, mean $\leq 2.10\text{keV}$
 at 60keV: $\leq 1.30\text{keV}$, mean $\leq 1.20\text{keV}$

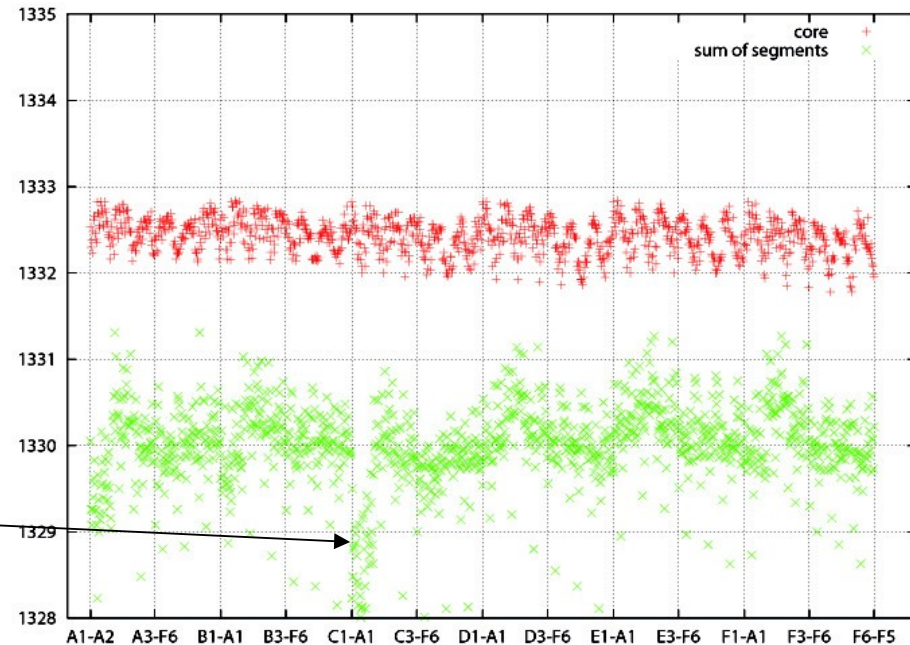
Crosstalk $\leq 1\%$

Microphonics on core signal
 Result within specification

Not reproducible energy resolution on C1

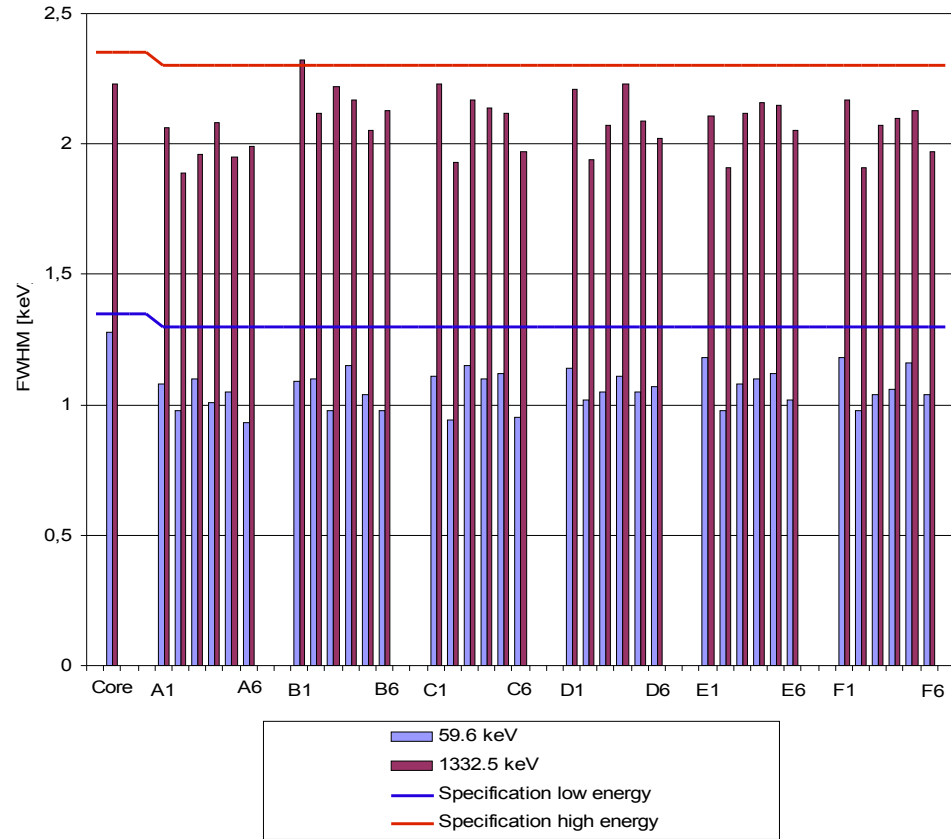
Crosstalk on segment C1

CAT done - result open





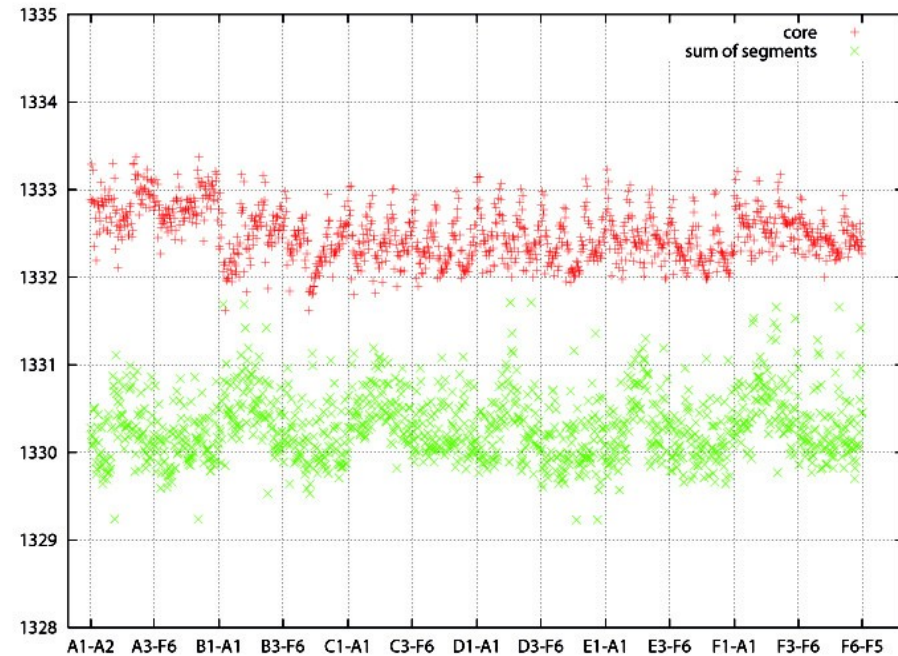
Test results B003

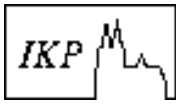


Microphonics on core signal
Result within specification

Crosstalk within specification

CAT done - open due to microphonics





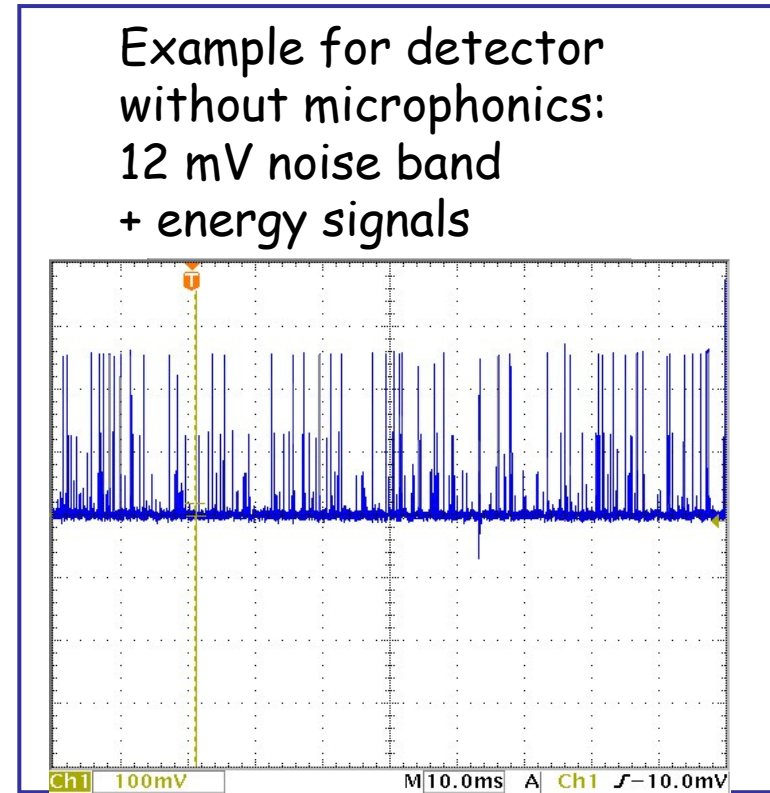
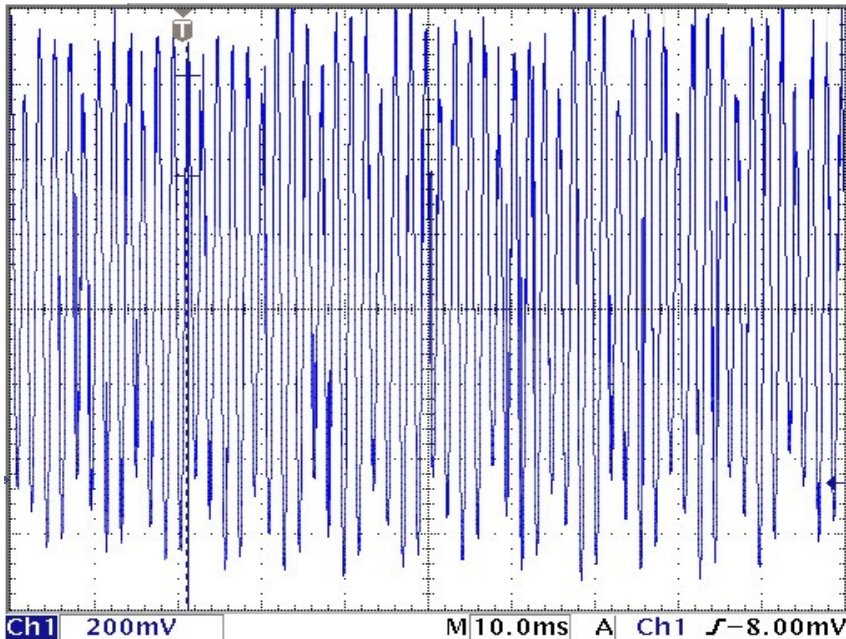
B001, A002 & C004 suffer from severe microphonics problem - these detectors do not pass CAT



Mechanical vibrations cause low frequency oscillations around 1 kHz of core signal

Spontaneous oscillation:
Amplitude: up to 50 mV Frequency: 1 kHz

Triggered oscillation:
Amplitude: up to 4 V Frequency: 1 kHz



Example:
B001 main amp core signal

Triggered oscillation
1 kHz frequency
1.5 V amplitude
Decay time > secs

Microphonics

Microphonics may be caused by mechanical properties of detector and cryostat assembly.

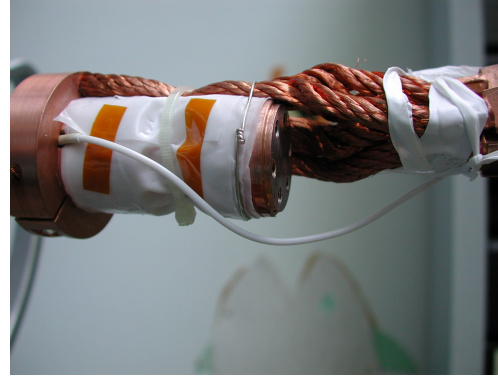
- only core signal is affected !

Microphonics may be caused by

- Cryostat
- Ge detector

Search within cryostat:

- reassembly of test cryostat
- modification of cold core pre-amp boards
 - mechanical layout of pcb
 - coupling capacitor, FET, resistors
 - wiring from pcb to capsule
- electric shielding
- high voltage cabling
- mounting of end cap



Cu cooling device
HV cable



Cold FET board
HV contact

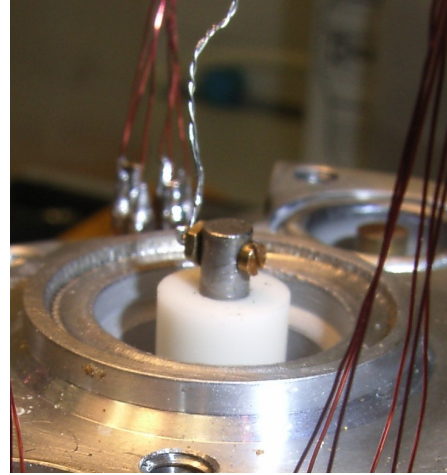


electrical
shielding
of preamp board

Microphonics

Search within cryostat:

- reassembly of test cryostat
- modification of cold core pre-amp boards
 - mechanical layout of pcb
 - coupling capacitor, FET, resistors
 - wiring from pcb to capsule
- electric shielding
- high voltage cabling
- mechanical HV contact
- mounting of end cap



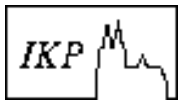
high voltage cabling



New mechanical HV contact

- Each test at LN temperature requires more than one week due to pumping, cooling, warming.

- **Source of microphonics not located!**



Cross check with symmetric AGATA detector S002



Reason for microphonics of detectors B001, A002 could not be located in Cologne test cryostat and Munich test cryostat.

Cross check with tested and accepted symmetric AGATA detector S002

- electrical contact - only one soldering point for HV was opened
- identical mechanical contact

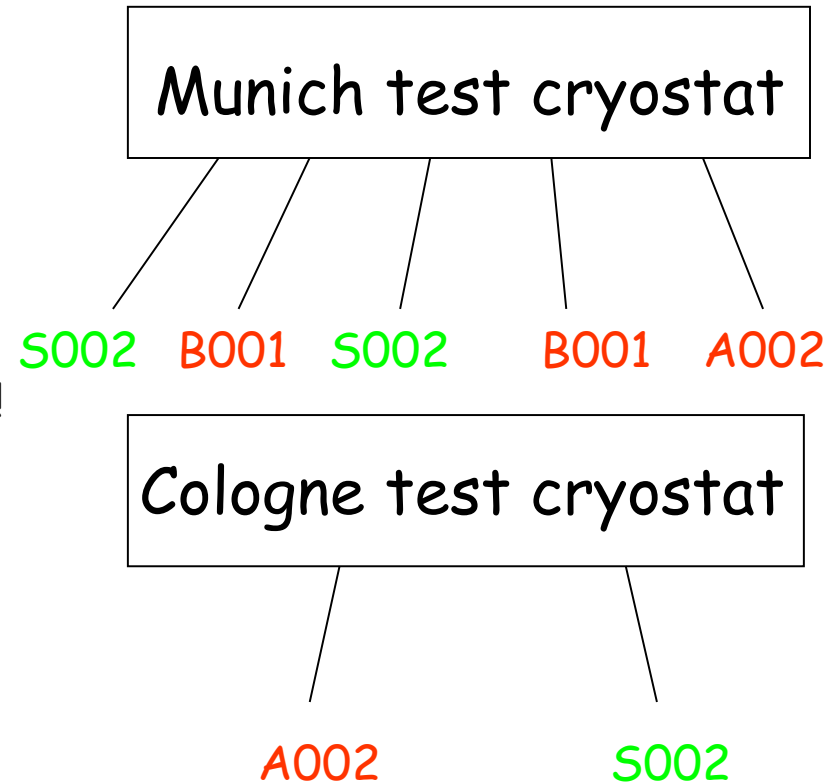
Results with S002 in Munich test cryostat:

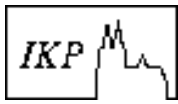
- earlier test results were readily reproduced!!
- no microphonics observed
- core energy resolution of 2.21 keV at 1.3 MeV

Results with S002 in Cologne test cryostat:

- again earlier test results were readily reproduced!!
- no microphonics observed
- core energy resolution of 2.23 keV at 1.3 MeV

Microphonics is caused by detector capsule
not by test cryostat





Comparison of S002 with asymmetric detectors



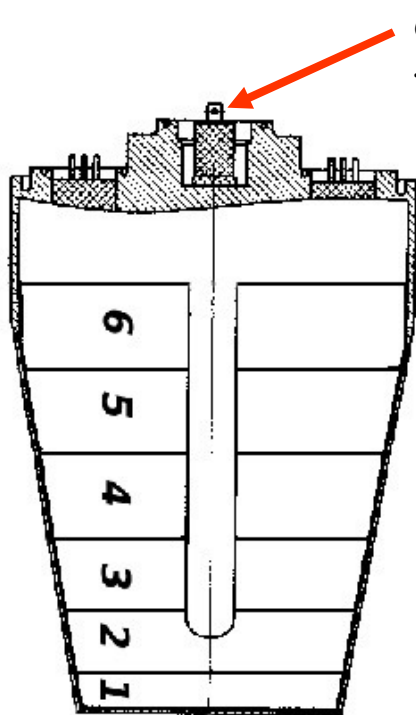
	Cologne test cryostat	Munich Liverpool test cryostats
A002	Microphonics CAT failed	Microphonics CAT failed
B001		Microphonics CAT failed
S002	No microphonics $\Delta E = 2.23 \text{ keV}$	No microphonics $\Delta E = 2.21 \text{ keV}$

First results for C004: suffers from microphonics in Cologne test cryostat

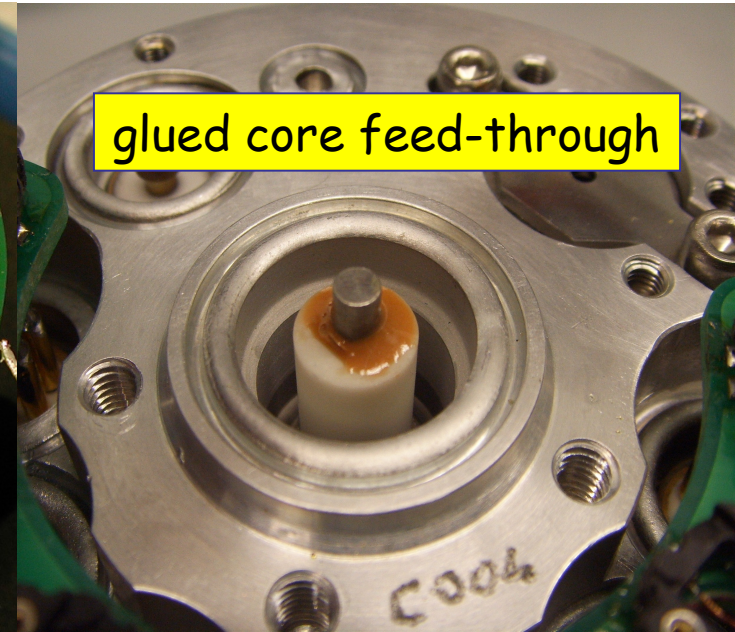
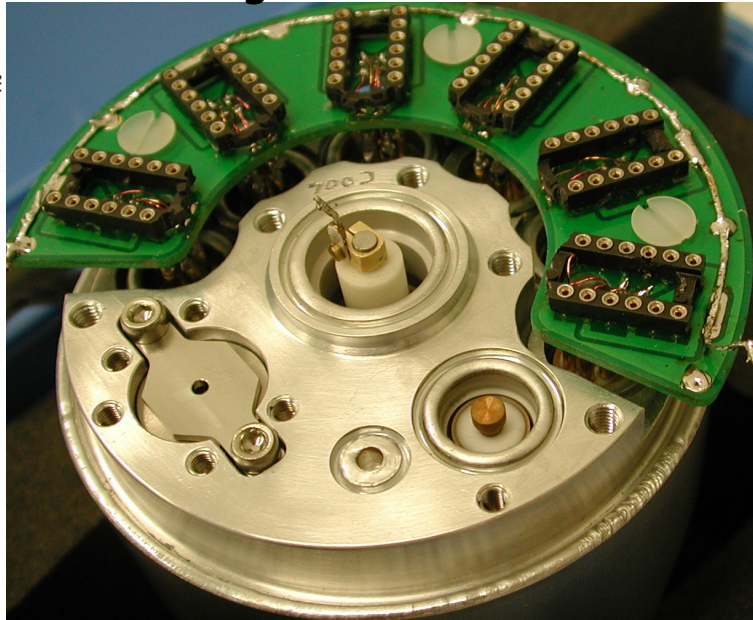
Exchange with Canberra (September 07):

- core feed-through in the capsule was modified by supplier
- provisional repair of outside part of feed-through

Gluing done for A004 by Canberra and C004 by IKP



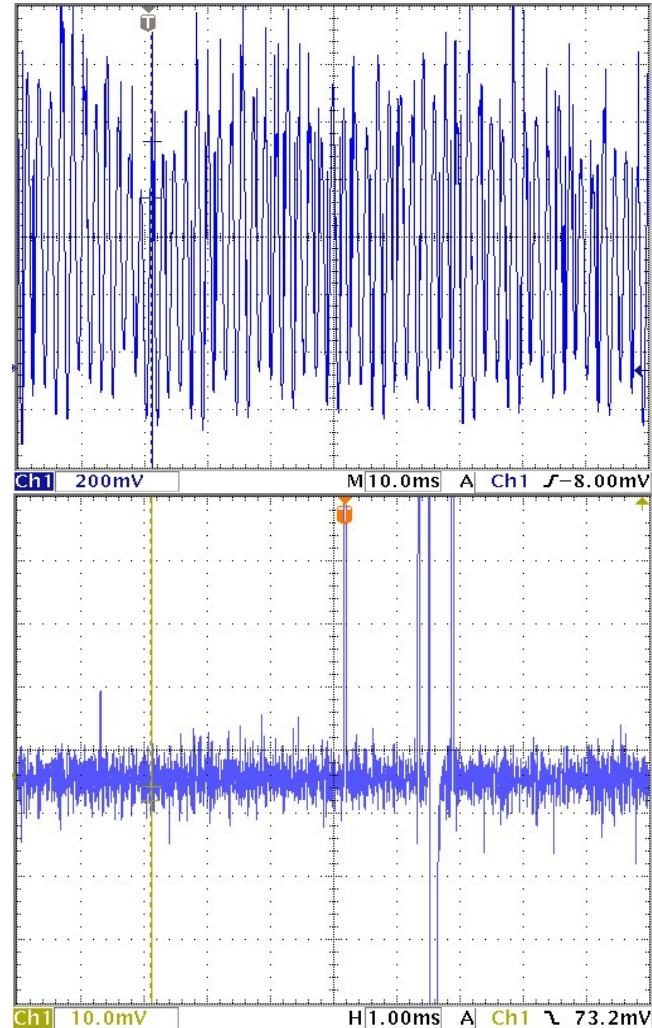
core
feed-through



Strong microphonics **without**
glued core contact (Amplitude > 1 V).
HV could not be fully applied
→ **CAT failed**

After gluing core feed-through
no microphonics **with** glued core contact :

FWHM on core signal with glued
core contact on capsule: 2.21 keV @ 1.3 MeV



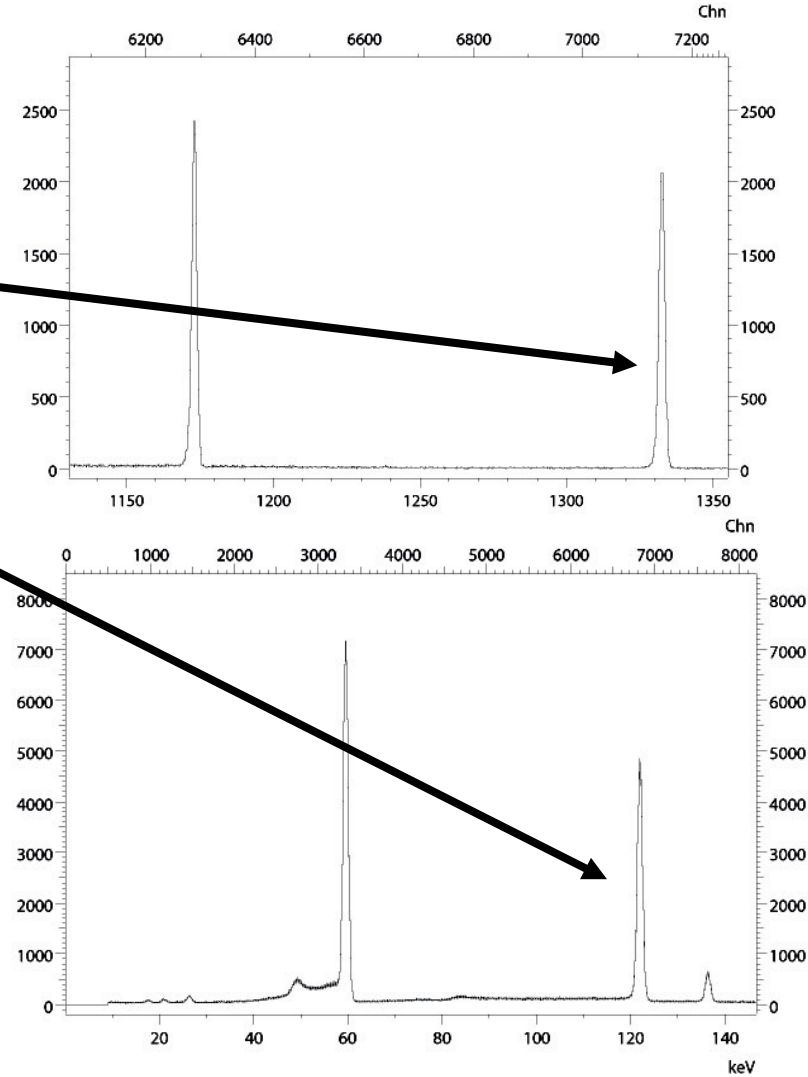
A004 with glued core contact

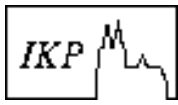
Energy resolution:

FWHM on core signal: 2.24 keV @ 1.3 MeV

1.24 keV @ 122 keV

Source of microphonics located
in detector capsule





Summary

Sequence of acceptance test was stopped after C003 & B003.

Microphonics problem: C003 & B003 - microphonics within specs, B001, A002 & C004 - severe microphonics - detectors do not pass CAT.

Microphonics is located within capsule - not in the cryostat.

Tedious investigation of cryostat without result.

First results of detectors with glued core feed-throughs are promising.

Outlook: B001 & A002 need repair (glued contact).

Do all asymmetric detectors need glued core contact?

Acceptance tests are delayed, glued detectors have to be tested again.

