TG-2 Overview

- Recall:
- 37.5 kg of ^{enr}Ge (in form of GeO_2) in hand, stored at IRMM

- 50 kg + 34 kg $^{dep}GeO_2$ acquired and in use for tests

- Purification a solved problem (PPM Pure Metals, GmbH):
  - >90% yield achieved for >6N quality
  - IKZ 4 10^{10} net impurities/cm^3 in float zone with no further purification
  - Canberra <10^{10}/cm^3 after standard monozone refining
  - discussion on contract for purification of ^{end}Ge have started

- Crystal pulling (IKZ)
  - no commercial provider for n-type crystals
  - R&D contract with IKZ started 2007 goals:
    - 75x75 mm dimension
    - n type; net impurity $10^{10}/cm^3$
    - 1000-10000 dislocations/cm^2
    - limitations on gradients
  - Achieved:
    - >= $10^{11}/cm^3$ net impurities (See talk by M. Allardt)
    - Dislocation density OK
    - Still working with small crucible until purity achieved
  - Arsenic contamination of Czochralski puller proven; CZ puller deconstructed, being electropolished + all seals will be replaced. Restart end of the month.
- Contract will be extended by 1 year

IKZ: more details

- since Padua meeting, 4 more CZ crystals & FZ crystal & 1 ‘mini-CZ’ crystal grown

- second crystal growth tried to see if this reduces impurities – no, in fact more As added

- different susceptor (graphite instead of molybdenum) to see if this is source of As. Did not change the results

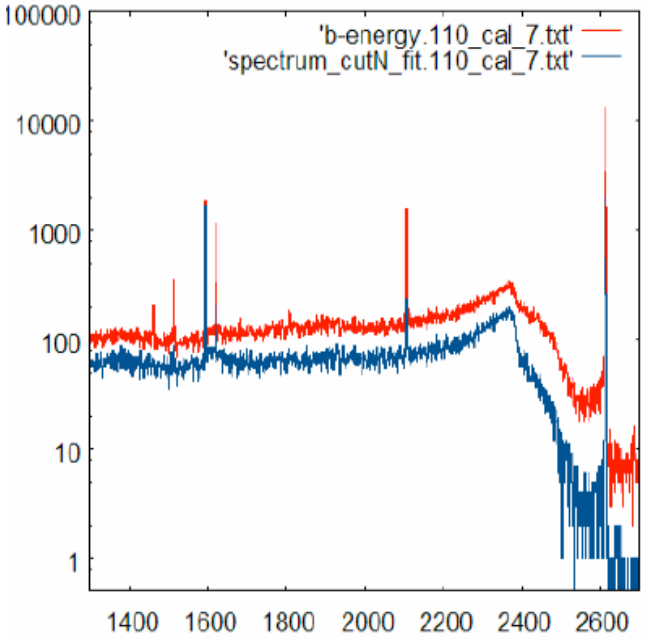
- mini CZ crystal grown in FZ setup. No As seen in the characterization. Further evidence that the As comes from the main CZ puller.

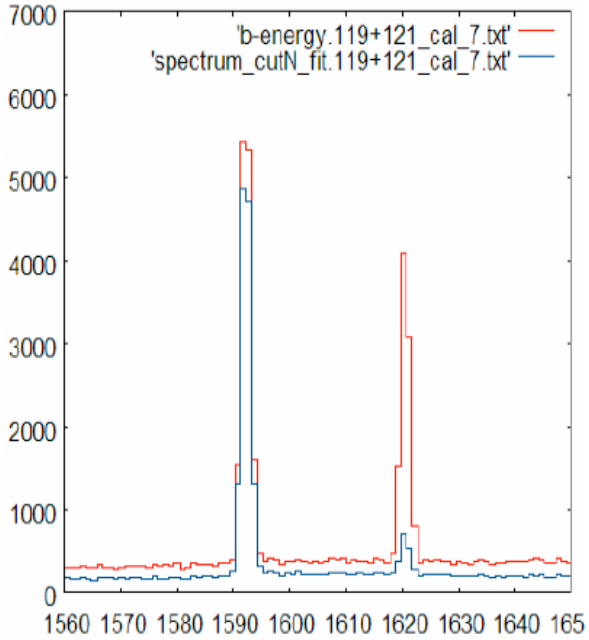
- currently CZ puller has been dismantled and the parts are being electropolished. Also all seals should be replaced. We hope to restart the crystal growing by the end of the month.

- Crystal pulling (Canberra)
  - P type crystals, Oak Ridge
  - Good progress (see talks by P. Grabmayr, S. Schoenert)

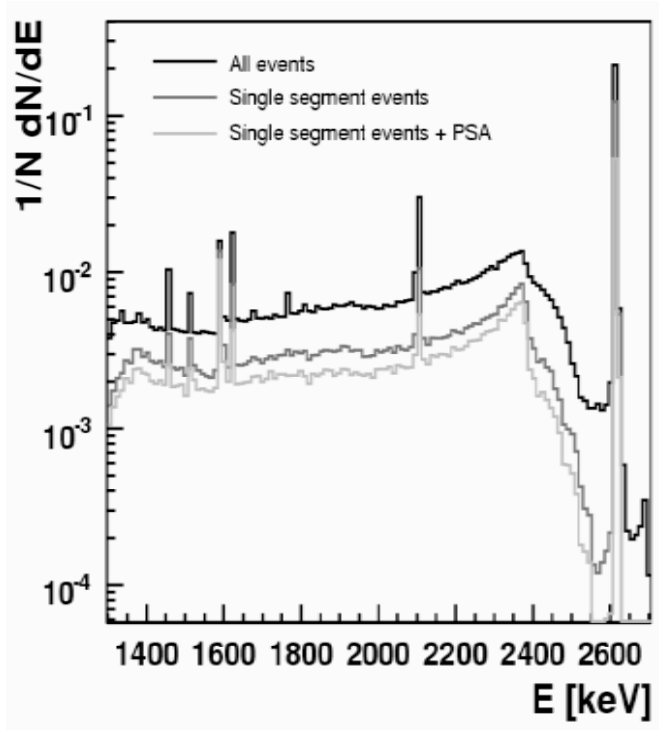
- Detectors
  - Two technologies pursued: n-type segmented; p-type BEGe
  - Extensive studies pursued on n-type segmented (see report on latest studies by J. Janicsko); relies on success at IKZ
  - Several BEGe purchased in last 2 years; impressive performance; Canberra pulls crystals and makes detectors (see talks by D. Budjas, A. Divacri, M. Agostini)

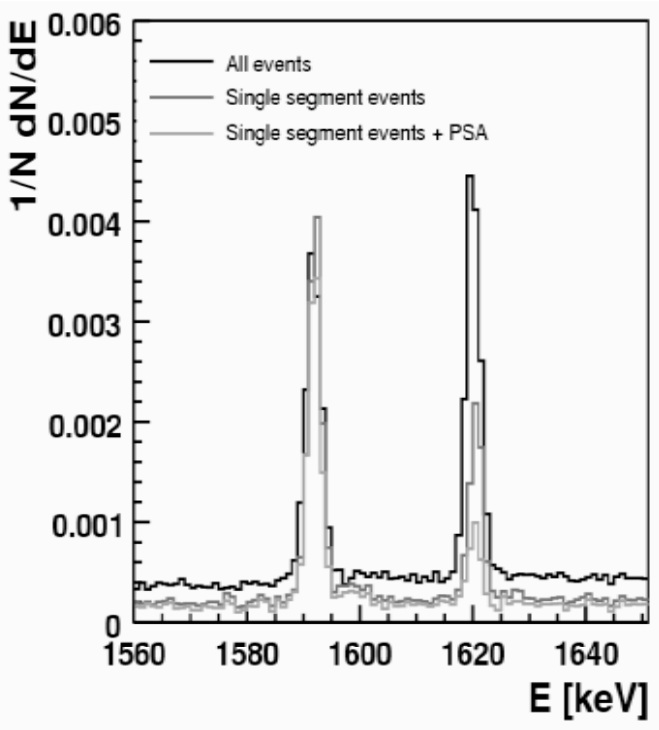
Study on Tl





BEGe point-contact
Fractions remaining after PSA cut:
DEP 91 % ± 0.6 %
1.62 MeV 13 % ± 0.4 %
2.61 MeV 13 % ± 0.1%
ROI Qbb 49 % ± 0.4 %





18-fold segmented coax
Fractions remaining after combined single-segment and PSA cut:
DEP 82% ± 2 %
1.62 MeV 19% ± 0.4%
2.61 MeV 14.6% ± 0.3 %
ROI Qbb 48. % ± 1. %

• **Goal is best physics result**, which means greatest sensitivity to discovery or best limit. This is a combination of background level and exposure time.

• Given that we know how to simulate the backgrounds and the response of the detectors, we need to consider:

  • fixed amount of ^{enr}Ge. The **yield of the process to produce detectors** will determine the mass of ^{enr}Ge in the experiment

  • limited amounts of money – if there is a **big cost difference**, this **will be important**

  • **reliability considerations** – hardware complexity, analysis (understanding of E fields) complexity – produces certain amount of risk in a given technique

• It is too early to know what yields, etc. will be. **More information needed** from IKZ, Canberra

• It is unlikely that we can produce ^{enr}Ge detectors of both types since this would lead to very low yields

• on the other hand, we could certainly consider having reference detectors of different technologies to evaluate performance for a larger scale experiment.

- Beyond the diodes:
  - Electronics
  - Cabling
  - Lock requirements
  - DAQ requirements
  - MC simulations

- We need to be active on developing these items for Phase II as we start up Phase I