

Status-Phase II Detectors


- Goal of the TG is to produce Phase II detectors for GERDA
- Achieved:
 - Procurement and transport of 37.5 kg of ^{enr}Ge with isotopic content ca 87%
 - Set up of test facilities at MPI
 - Procurement and successful test of a prototype 18-fold segmented ^{nat}Ge detector
 - New: 2.5 kg of zone refined ^{enr}Ge from IGEX scraps received
- To be achieved:
 - operation of segmented detector in LAr
 - purification
 - crystal pulling
 - detector manufacture

- Detectors

- Know of two commercial manufacturers of Ge detectors (Canberra, Ortec). Ortec did not respond to our several inquiries. Sources indicate that they do not have the capability to make segmented detectors.

- So, we assume Canberra-France will produce our detectors. Need a crystal source acceptable for Canberra. Canberra now gets crystals from either Umicore (n-type) or Canberra-US formerly known as Tennelec (p-type).

- Crystals

- First contact to Umicore two years ago (from MPI-WHI, earlier from MPI-K). After initially encouraging discussions, break in communication. Work through Canberra to reconnect, but little progress. We find out about the huge DHS tender. 

- Canberra is part of DHS Ge detector project, which means Tennelec is also booked (L. Darken mentions no capacity for next 4 years.)

- Ortec is also now busy with DHS activities.

- I know of no **detector grade** crystal manufacturers with willingness to grow our crystals at this time.

- So, we start to look into starting an activity of our own: IKZ (Institut für Krystal Zuchtüing in Berlin).

IKZ:

**Institut für
Kristallzüchtung**


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im Forschungsverbund
Berlin e. V.

Ausschreibung

**Kristalle für
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**Charakterisierung Modellierung
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WEBMASTER


Two visits to IKZ

1. First visit, explained project, general interest expressed
2. Second visit with I. Abt, O. Lampert (head of research branch of Canberra), L. Darken (V.P. of Canberra-Tennelec, head of Germanium crystal pulling).
 - Tour of facilities
 - Specifications for crystals defined (impurities, dimensions, type, crystal axis, charge carrier density, variations, crystal dislocation density)
3. After visit, proposal from IKZ
 - a) Grow crystals starting from 6N natural Germanium
 - b) Once these crystals satisfy the bulk of the specs, then attempt to grow detector grade crystals. This requires much purer starting material.
 - c) Once detector grade ^{nat}Ge crystals produced, can start with ^{enr}Ge. IKZ anticipate 2 year time period.
 - d) Who will purify ? Must be site which also can deal with ^{enr}Ge

Visit to PPM Pure Metals on 2-11-06



PPM
PPM PURE METALS



Welcome to PPM PURE METALS

PPM Pure Metals GmbH
Am Bahnhof 1
38685 Langelsheim

Phone: (+49) 5326 - 5070
Fax : (+49) 5326 - 507151

Fe Co Ni
Ru Rh Pd
Os Ir Pt
Ac

PPM Pure Metals:

- Handle about 20% of yearly world output of Ge (20 tons/yr)
- Main product is GeCl_4 with purity 6-8N for fiber optics industry
- Also produce as standard product 6N polyzone refined Ge metal
- Have produced material for Tennelec and Umicore in the past
- Are interested in working with us on purification of the $^{\text{enr}}\text{Ge}$
- Initial steps which we defined:
 1. Zone refine $^{\text{dep}}\text{GeO}_2$ to check yield and isotopic dilution. They propose to skip GeCl_4 chemistry step. Anticipated yield >90%.
 2. Make many measurements of the zone refined material to check purity (need mass spectrometry help)
 3. If this is successful, set up monozone refining and attempt to reach 8-9N to have good starting material for crystal pulling.
- PPM works with small batches, would use new equipment ...

Current approach:

Try to convince Umicore to work with us. Latest news is that they may have capacity (probably only one pass) next summer. Currently offer 2 crystals, but due to some confusion on the mass of Ge, maybe this can be brought up to 3.

- PPM would presumably do the purification to 6N
- Umicore would likely do their own monozone refinement
- More information expected early next year (too busy now to think about this).

This scenario would allow us to get started with phase II detectors on the Phase I time scale. Background levels could be checked to the $N \times 10^{-3}/(\text{kg yr keV})$ level within about 3 years of data taking.

In parallel, pursue PPM+IKZ option. Look into TU crystal lab possibilities. These options will take time ...