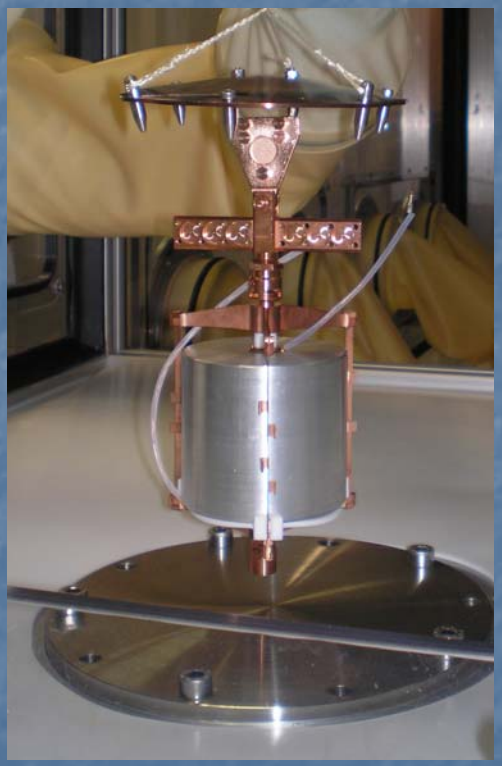
PHASE I detector prototype testing...summary and status



M.Barnabé Heider, C.Cattadori, O.Chkvorets, K.Gusev, S.Schönert, M.Shirchenko

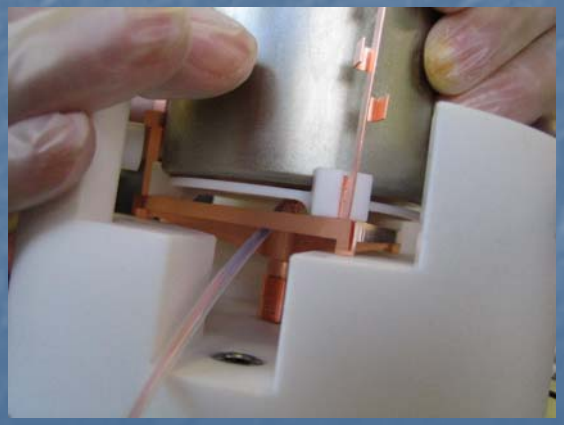
February 2007, GERDA collaboration meeting, Ringberg Castle

Outline

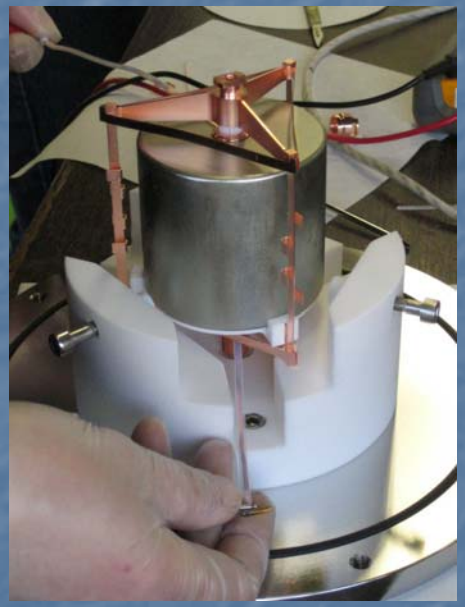
- Summary of 1 year measurement with Phase I detector prototype
  - Mounting
  - Cooling-warming cycles
  - Monitoring (leakage current, spectra)
  - Electronics testing
  - Refurbishment
- Long term stability measurement started

1 year testing...

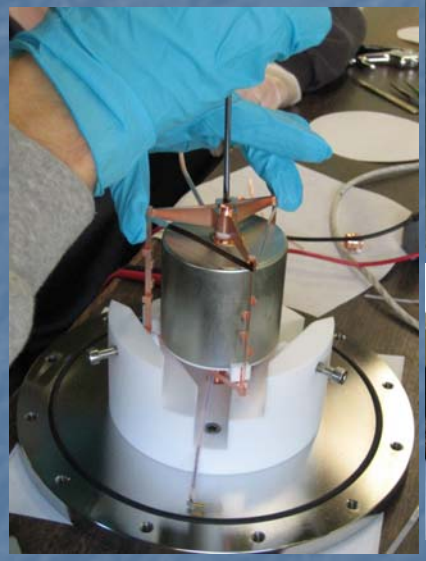
- Low mass copper holder

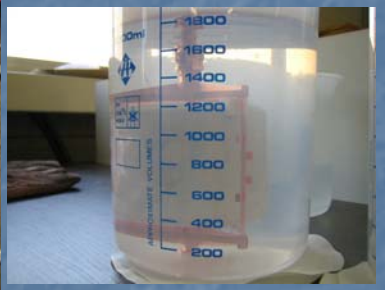


Mounting



HV contact quality

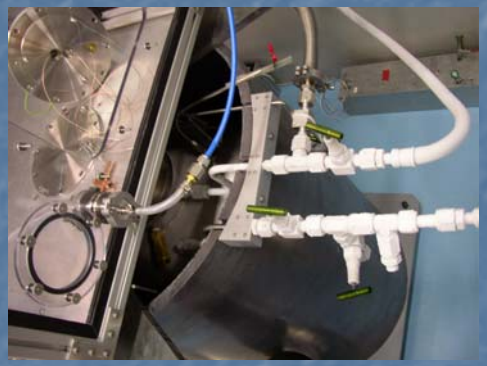




Mechanical stability

1 year testing...

- Test stand of the LArGe facility



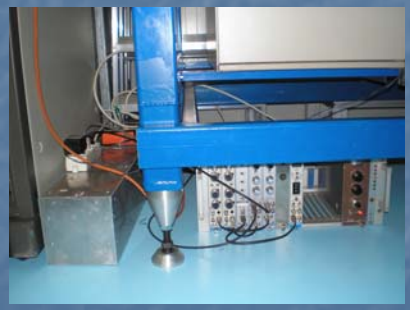
Nitrogen, Argon filling

Spectroscopy performance

Argon level monitoring

Infrared shielding

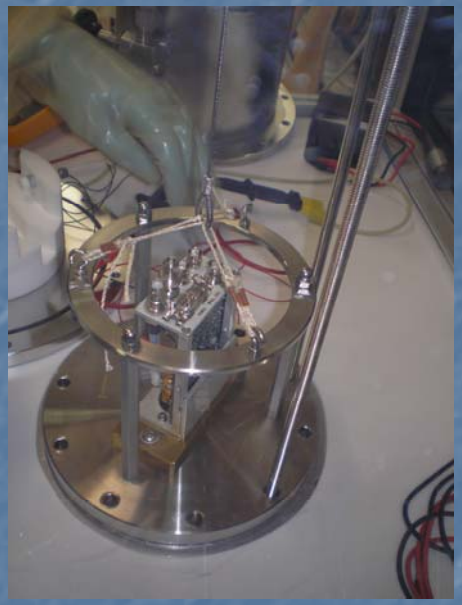
Radon ‘free’ clean bench



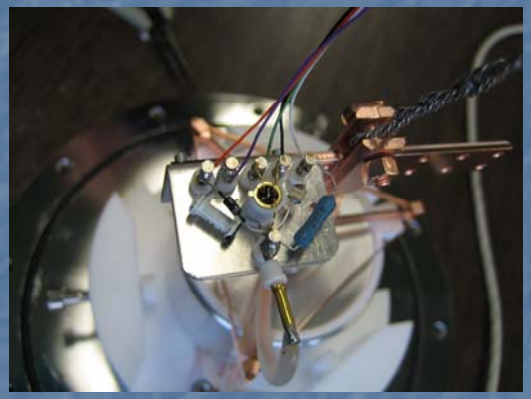
Radon, humidity, temperature monitoring

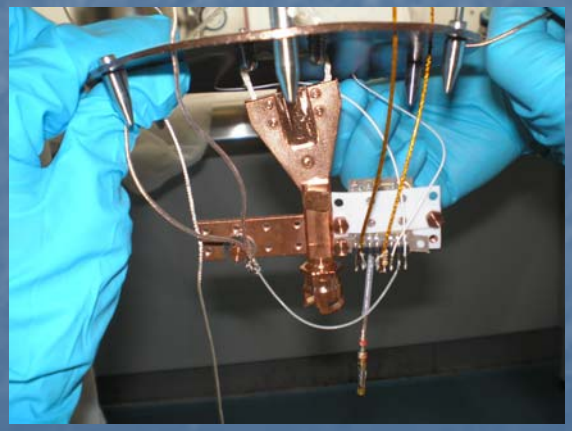
1 year testing...

- Electronics testing



Warm preamp



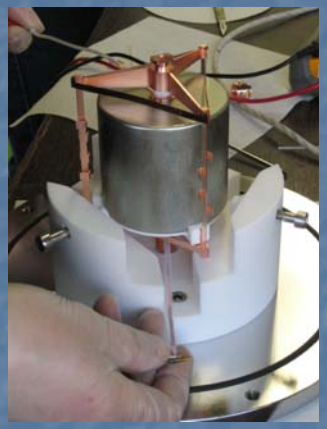


Cold preamp

HV feedthrough

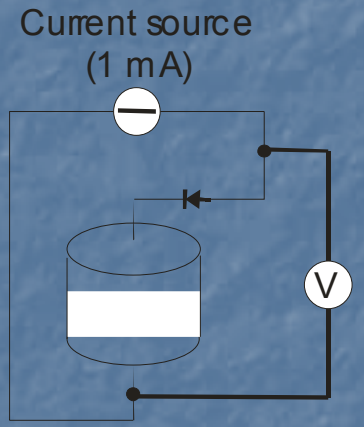
Detector ‘health’ monitoring

- Signal to HV resistivity measurement

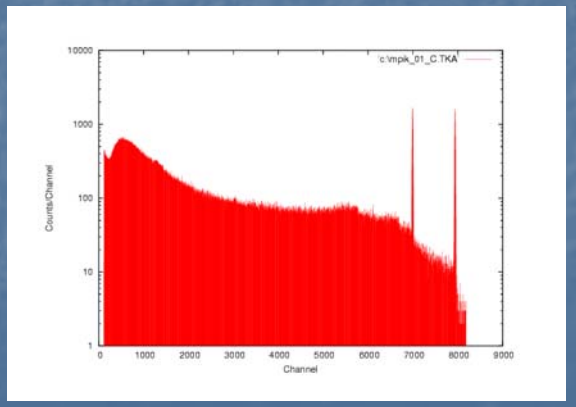


- Test point, picoammeter and noise level recorded

- Forward resistivity measurement while cooling

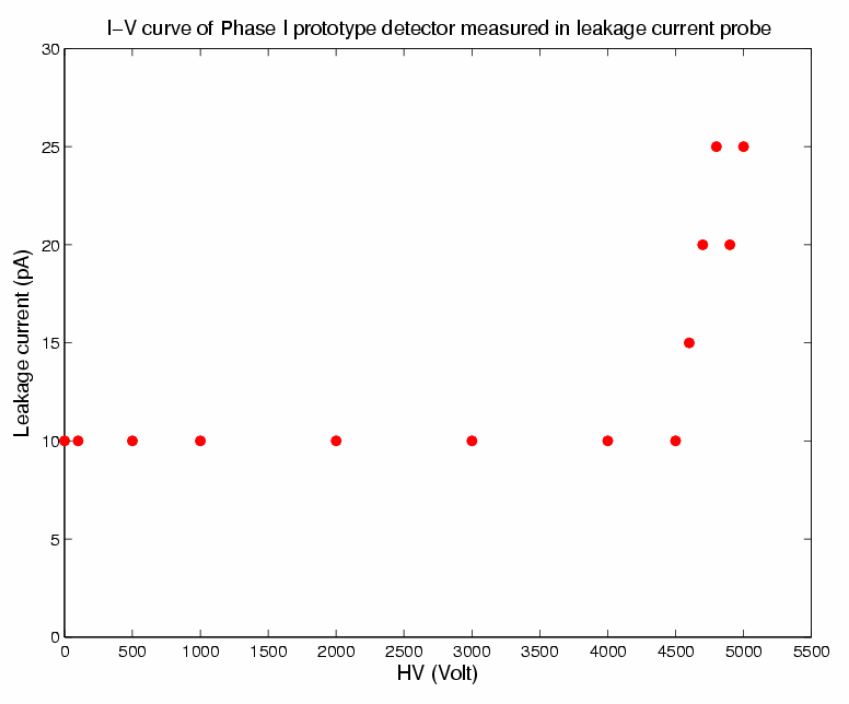


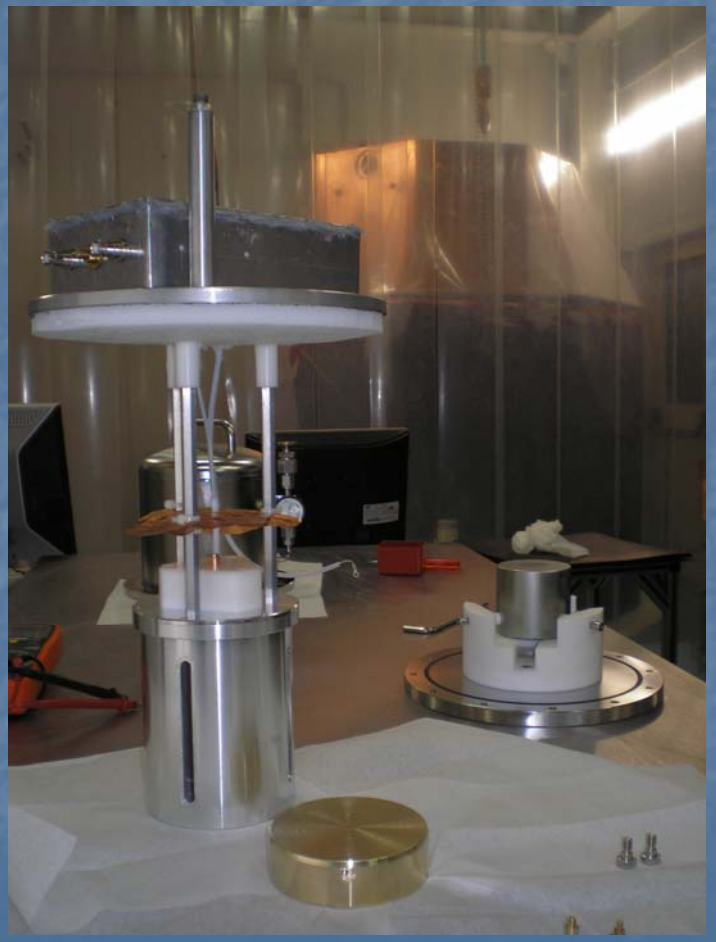
- Spectra collecting

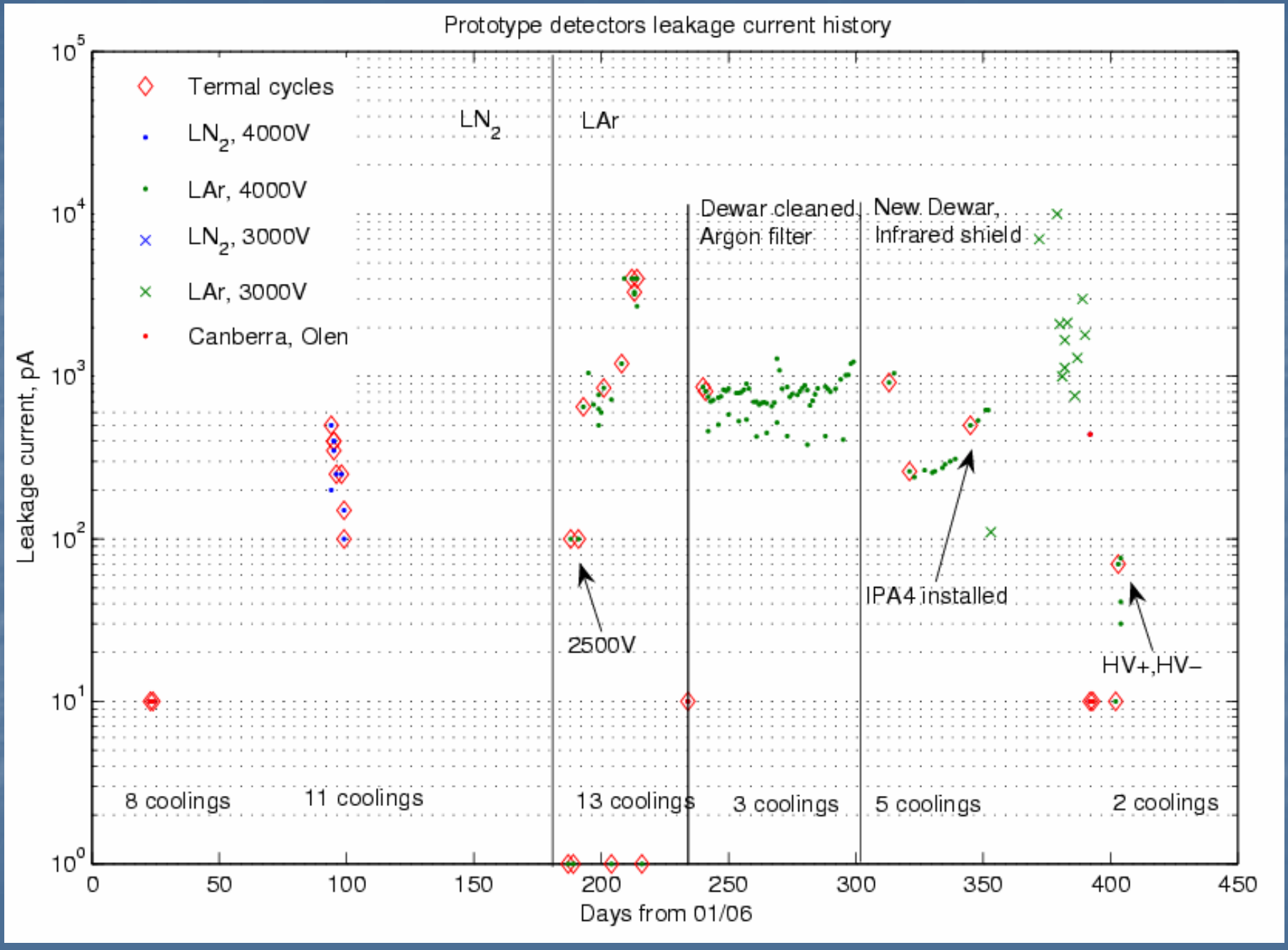


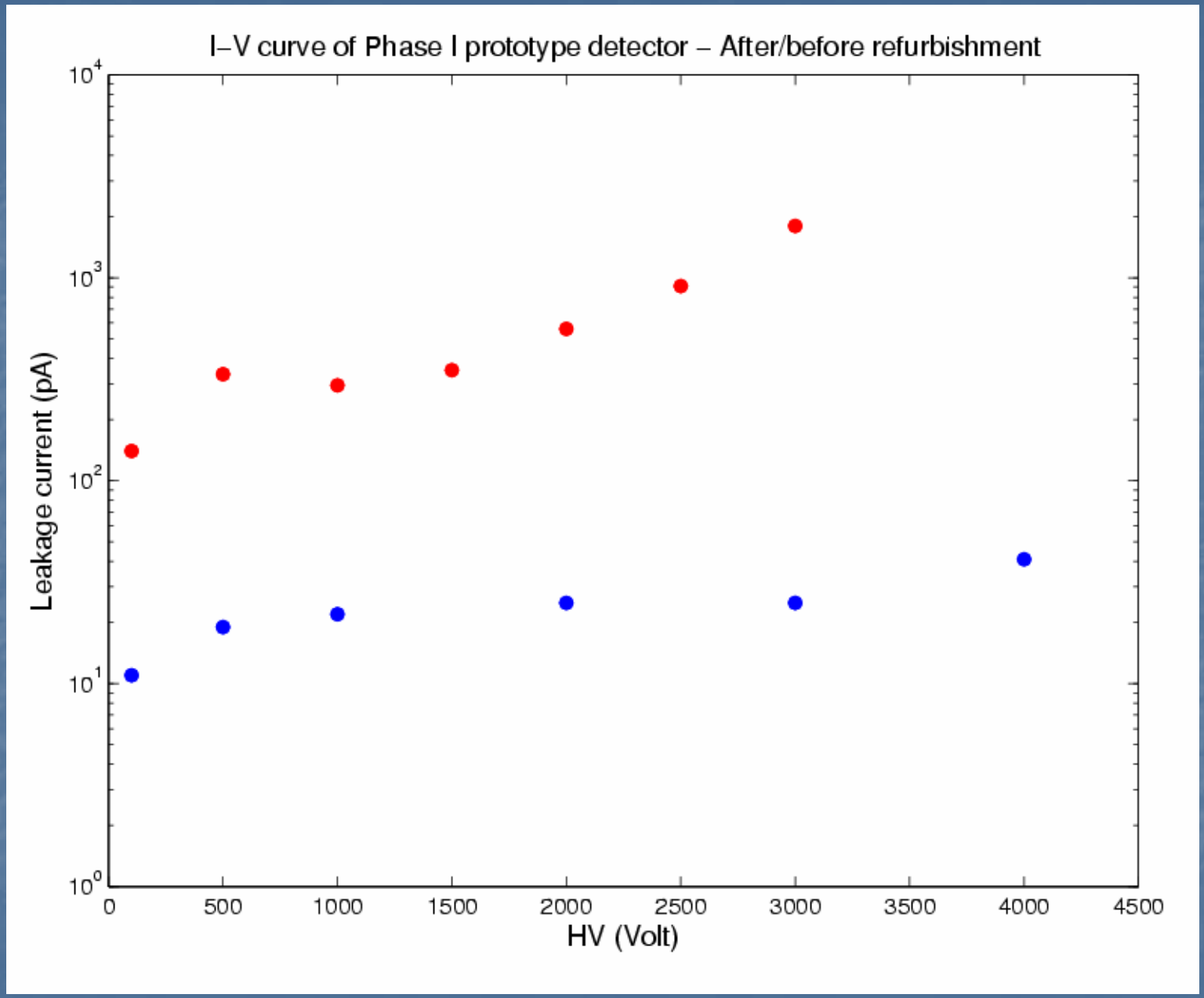
Detector ‘health’ monitoring

- Latest gadget : leakage current probe (à la Canberra)
  - I-V curve of crystals






Prototype detectors leakage current history
Termal cycles
LN2, 4000V
LAr, 4000V
LN2, 3000V
LAr, 3000V
Canberra, Olen
LN2
LAr
Dewar cleaned,
Argon filter
New Dewar,
Infrared shield
IPA4 installed
2500V
HV+,HV–
8 coolings
11 coolings
13 coolings
3 coolings
5 coolings
2 coolings
Leakage current, pA
Days from 01/06


I–V curve of Phase I prototype detector – After/before refurbishment
Leakage current (pA)
HV (Volt)
10^4
10^3
10^2
10^1
10^0
0
500
1000
1500
2000
2500
3000
3500
4000
4500

1 year testing...

- 43 cooling-warming cycles:

32→refurbishments, 8→refurbishments

- We know
  - Origin of leakage current: passivation layer
  - High humidity harms passivation layer
  - High cleanliness required: gloves, methanol, air, particulate, …
- Questions
  - Handling?
  - Passivation layer?
  - Argon purity?

Conclusion

- Detector parameters measured in Canberra are reproduced in GERDA detector lab (10 pA)
- Long term stability in Argon measurement started (^{60}Co: 3.4 keV ; Pulser: 3.0 keV)
- Dedicated set up for electronics testing