



Surface trapping and detector degradation in Ge bolometers for the EDELWEISS dark matter search: experiment and simulation

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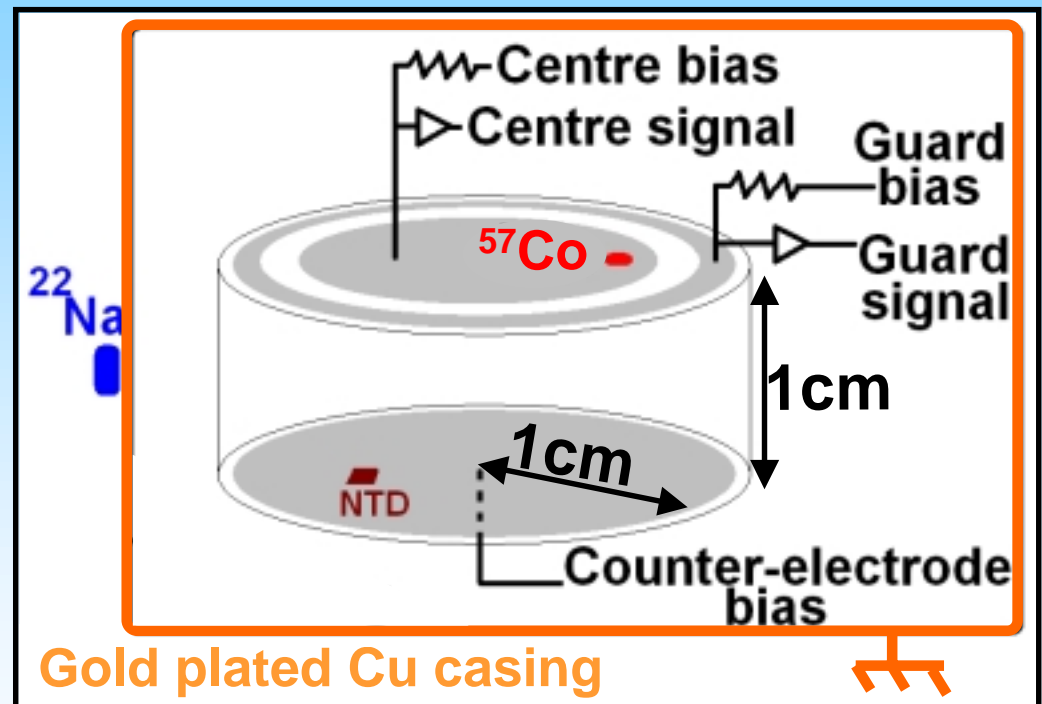
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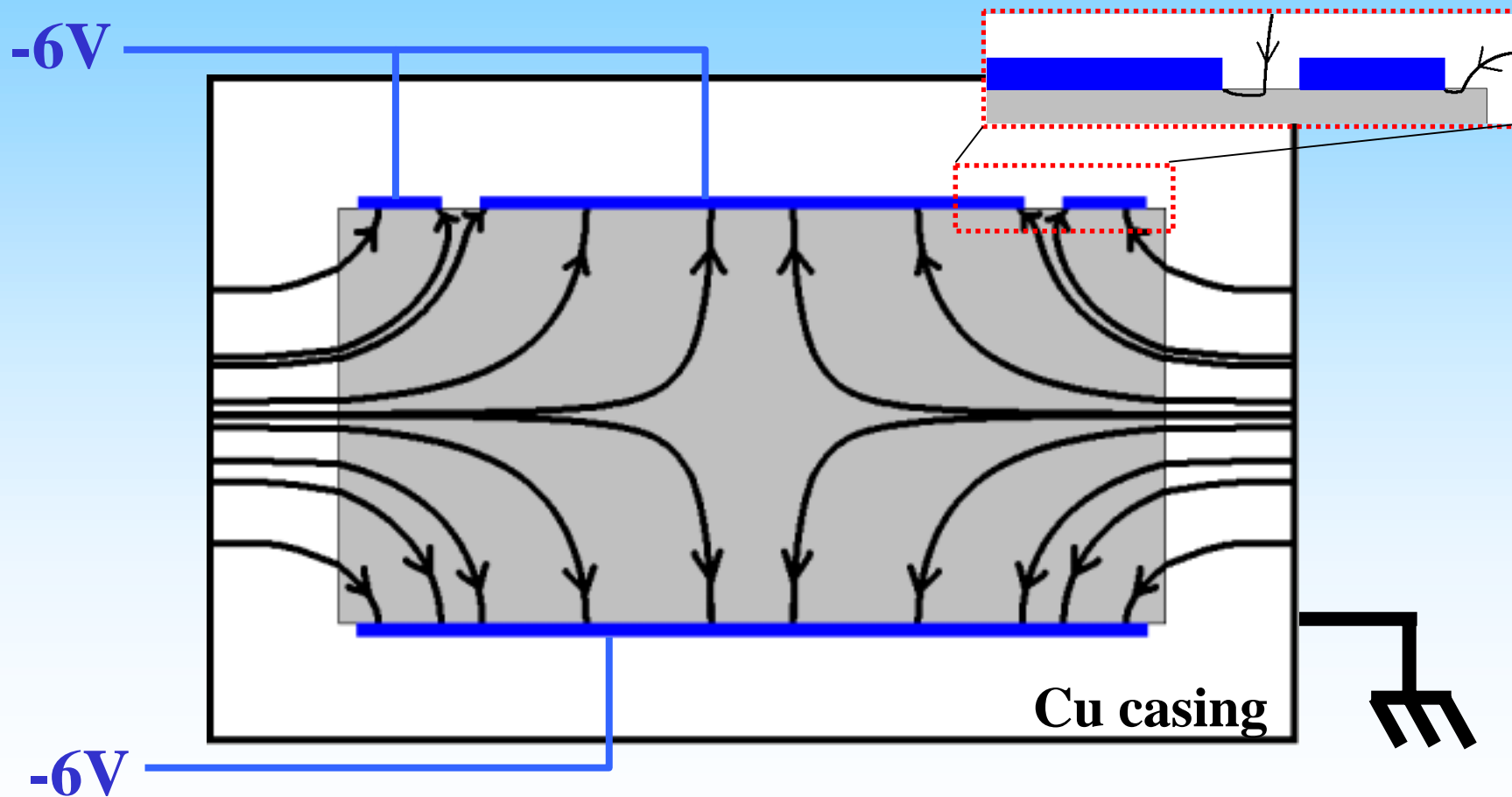
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Setup

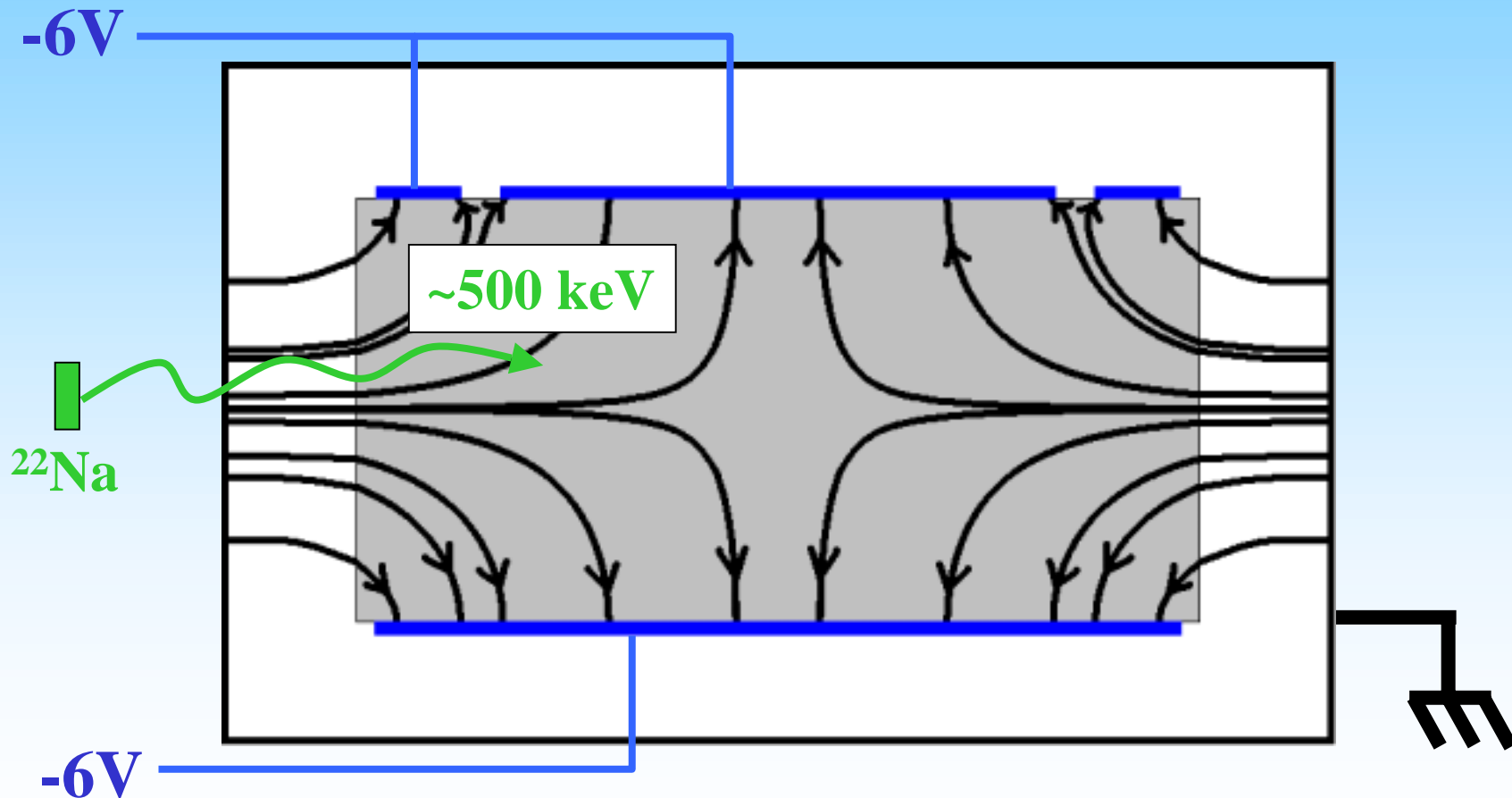
- **High Purity Ge**
- **Evaporated Nb electrodes**
- **Two ionisation channels:**
 - Centre, Guard
 - 2 Low noise amplifiers
- **NTD thermistor for heat measurement**
- **T=19mK (regulated)**



Carriers driven to free surfaces



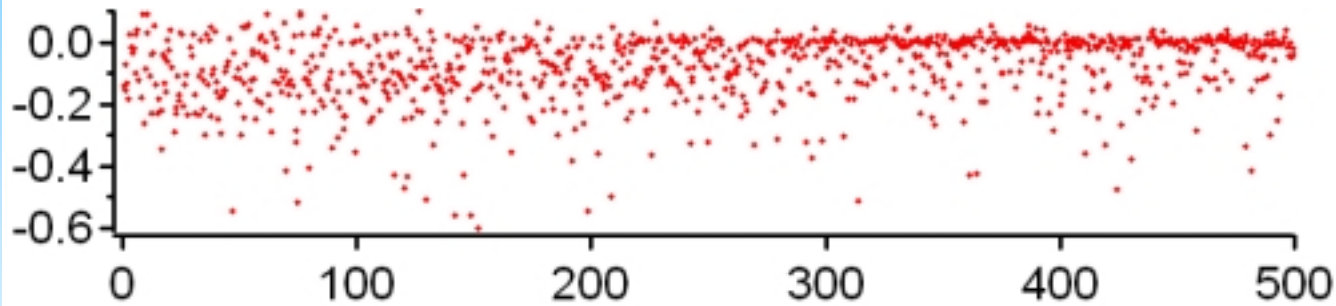
Degradation monitoring





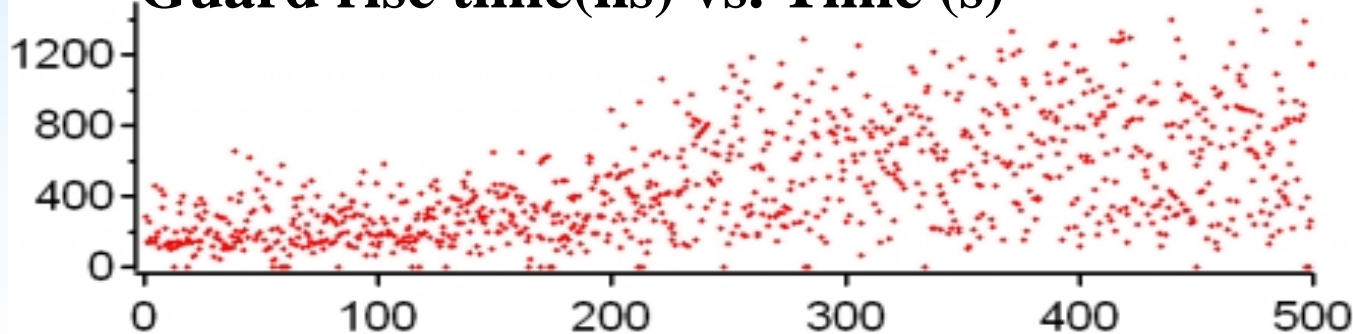
Degradation monitoring

Centre amplitude(V) vs. Time (s)



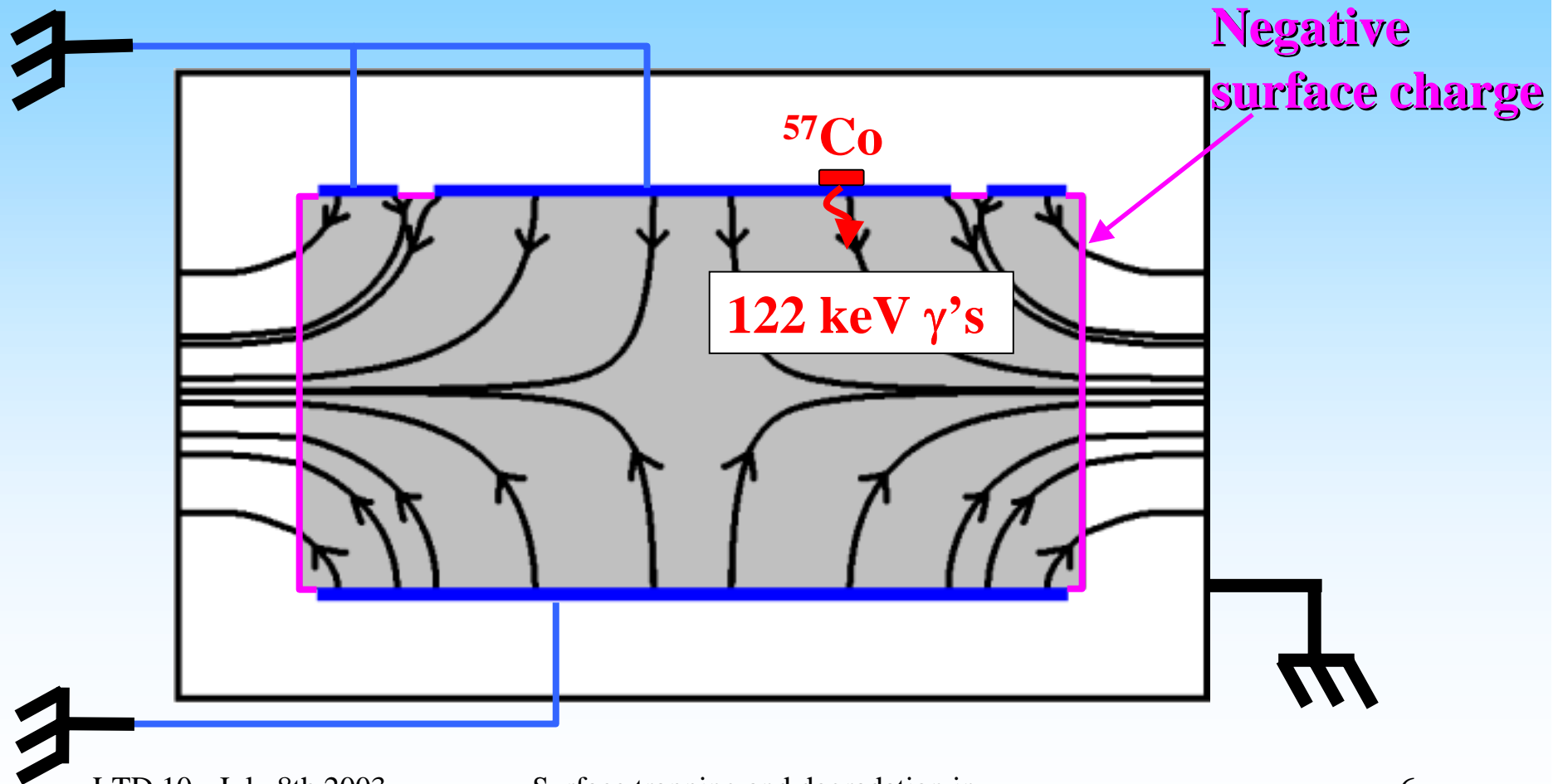
Charge collection efficiency drops

Guard rise time(ns) vs. Time (s)

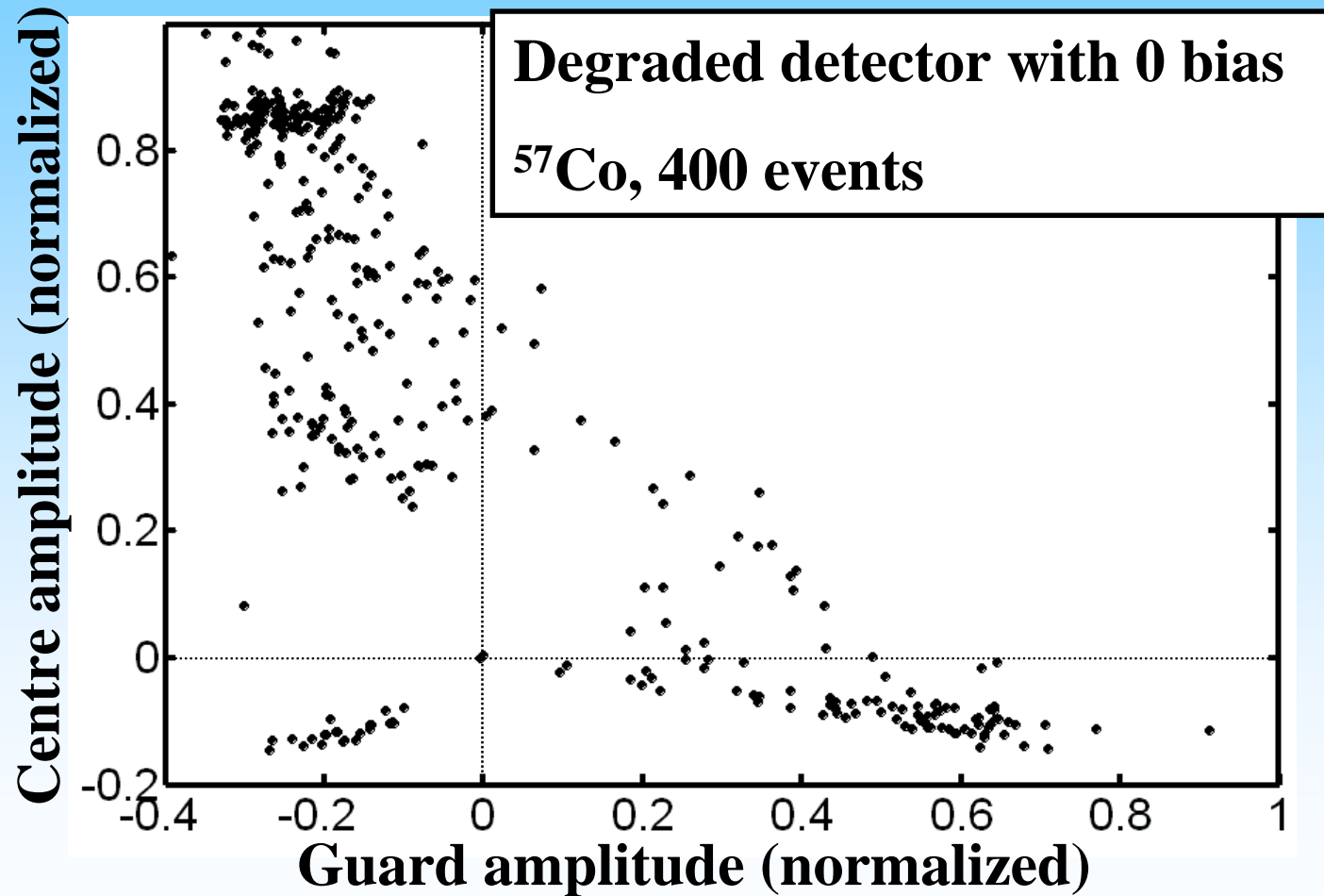


Collection gets slower

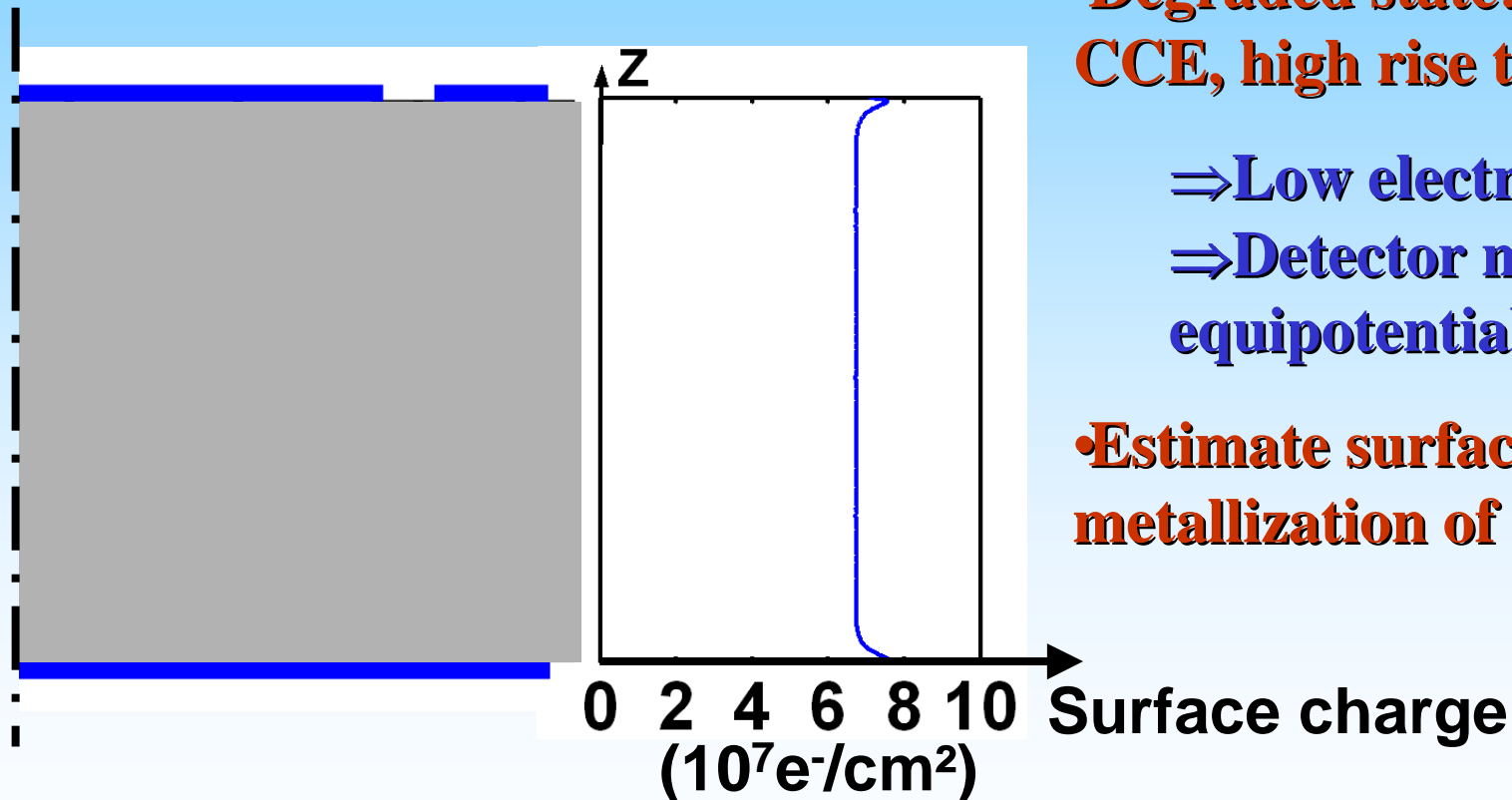
Probing the trapped charge



Experimental scatter plot



Modelisation

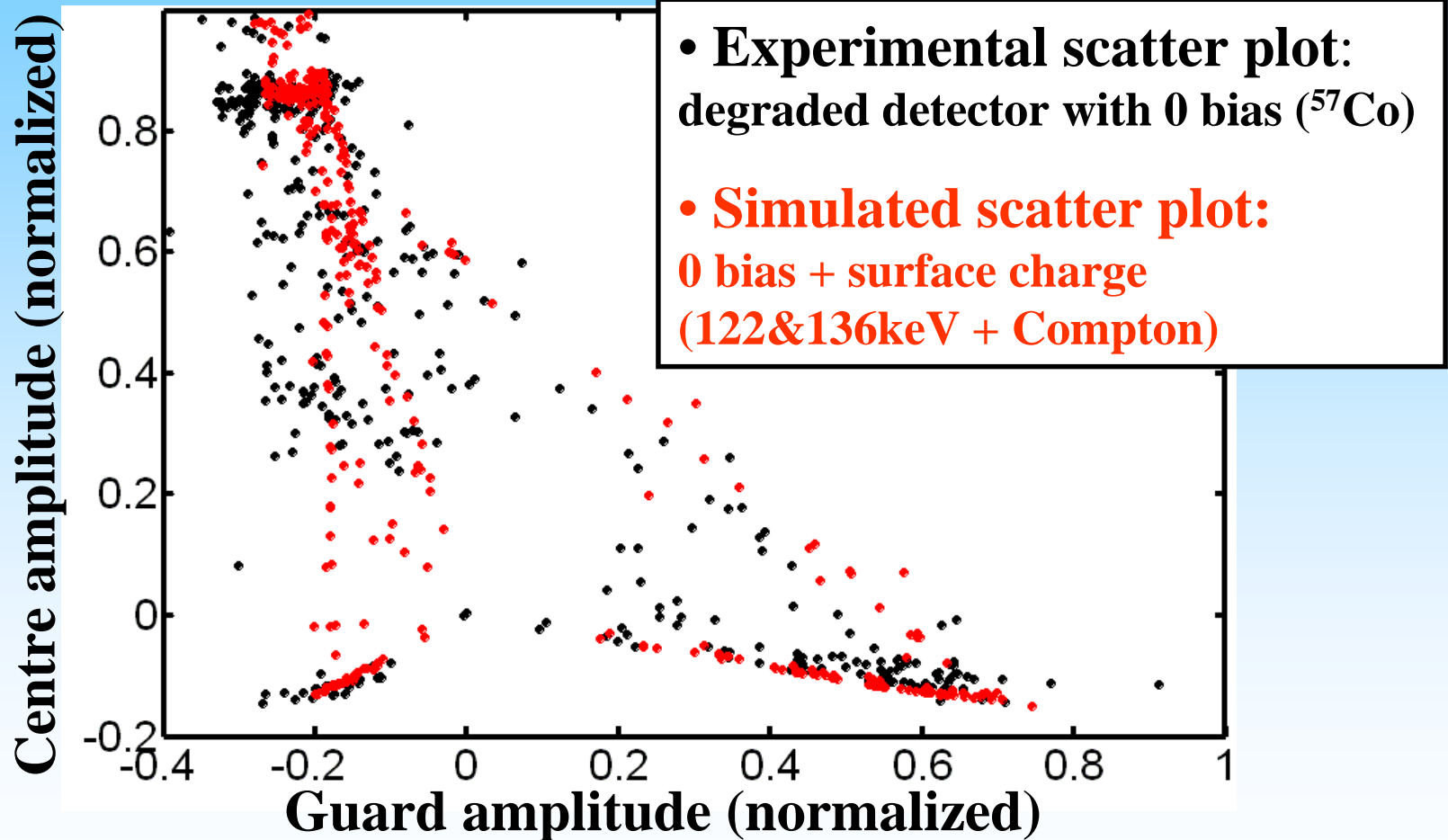


• **Degraded state:** **Low CCE, high rise times**

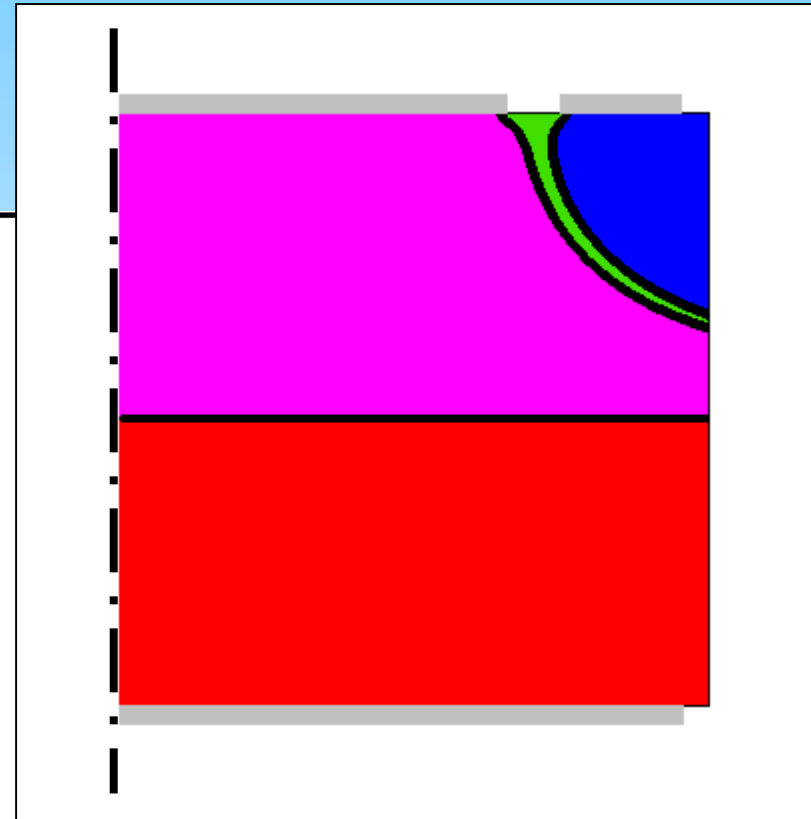
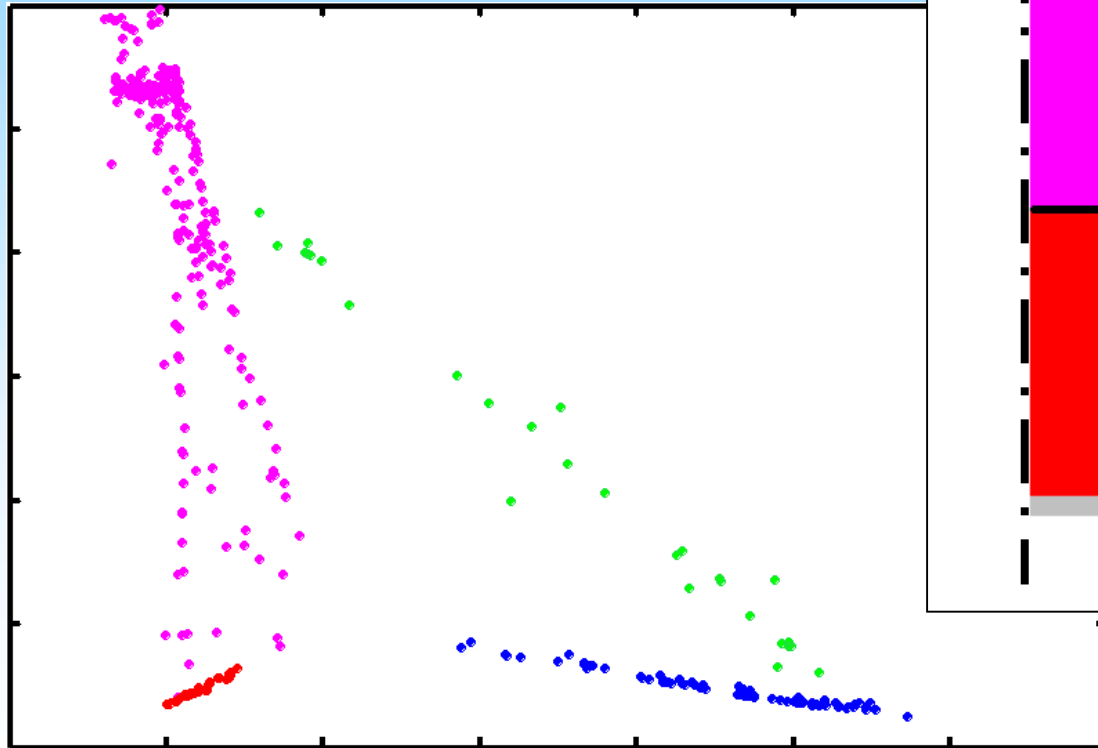
⇒ **Low electric field**
⇒ **Detector nearly equipotential**

• **Estimate surface charge by metallization of free surfaces**

Simulated scatter plot



Events populations localization



LTD 10 - July 8th 2003

Surface trapping and degradation in
Ge bolometers



Conclusion

- **Method for degradation studies**
- **Influence of surface charge**
- **Evidence for surface trapping with holes and electrons**
- **What about bulk trapping ?**
- **Further investigations:**
 - **Heat signals analysis**
 - **Time resolved analysis of charge signals**