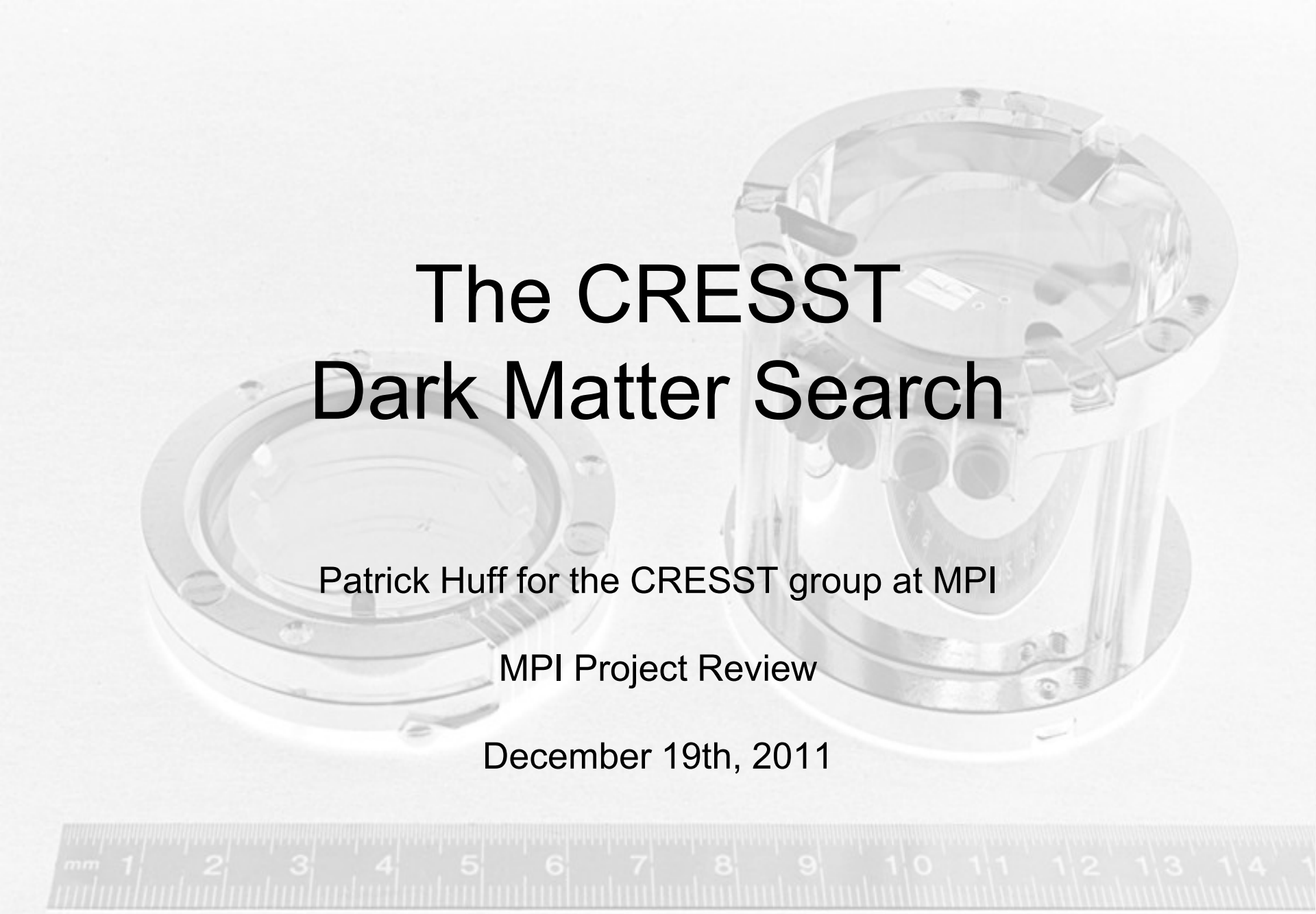


The CRESST Dark Matter Search

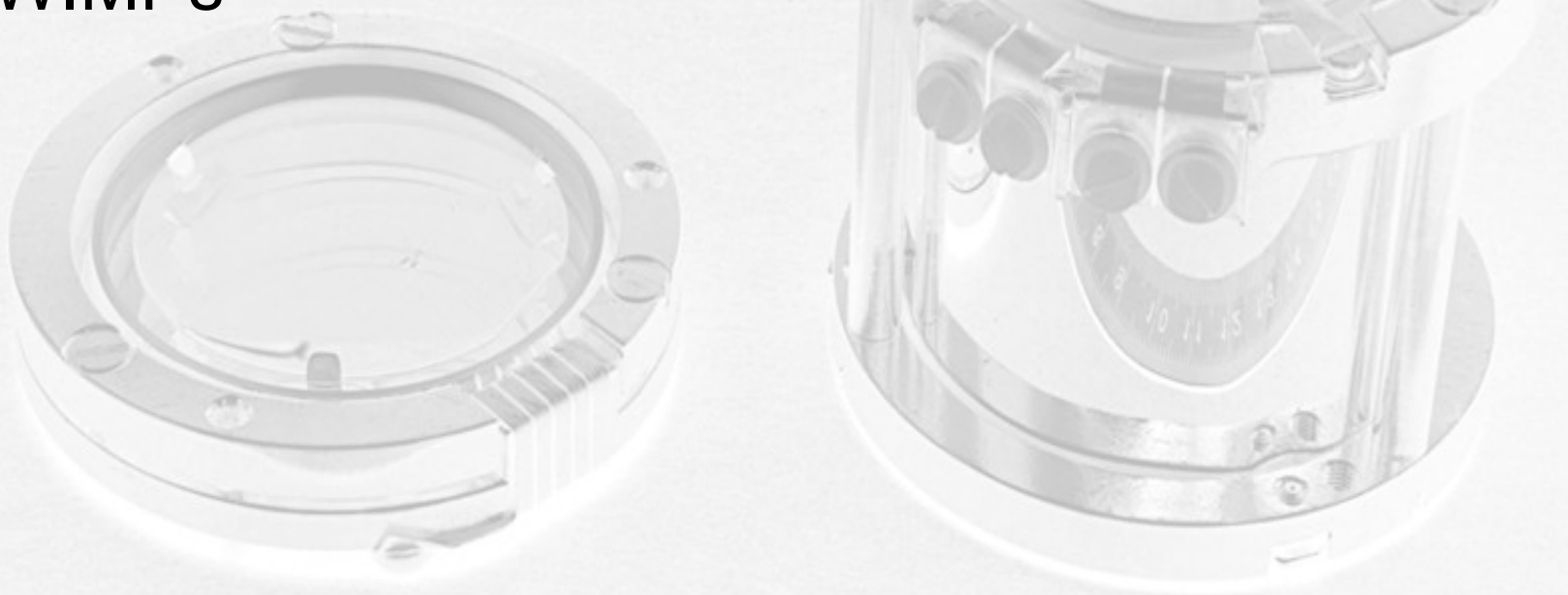
Patrick Huff for the CRESST group at MPI

MPI Project Review

December 19th, 2011

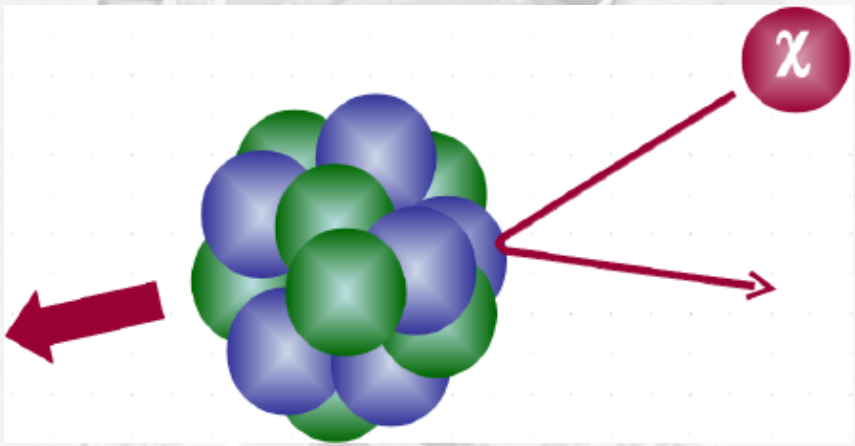
Physical Principle

- Dark Matter in form of WIMPs



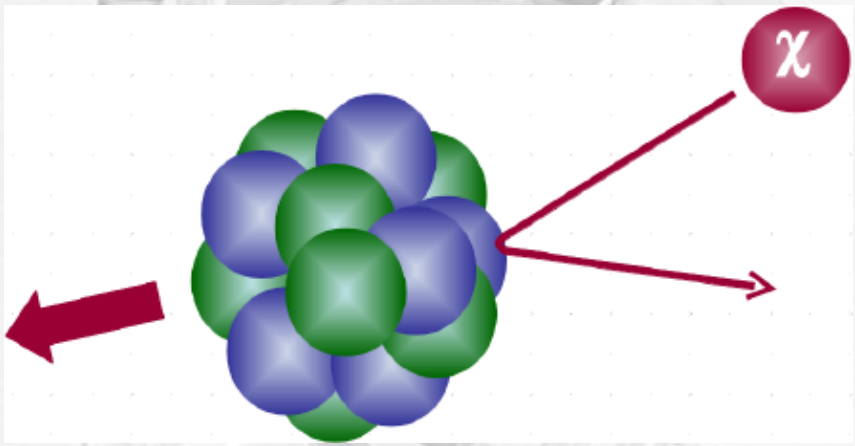
Physical Principle

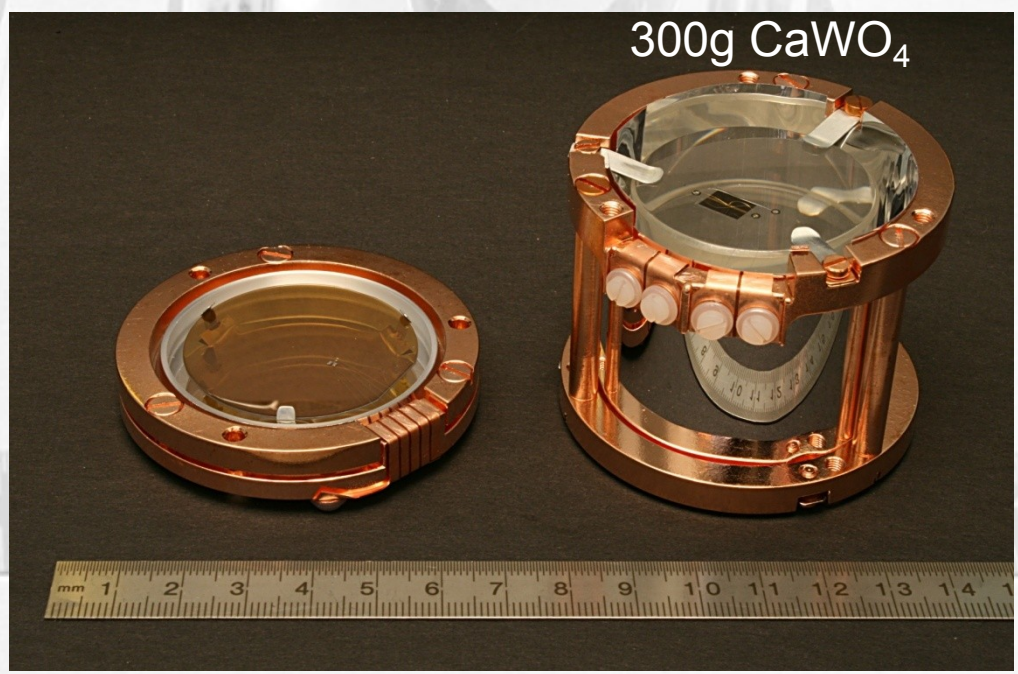
- Dark Matter in form of WIMPs
- Elastic WIMP nucleus scattering
- Energy transfer to nucleus



Physical Principle

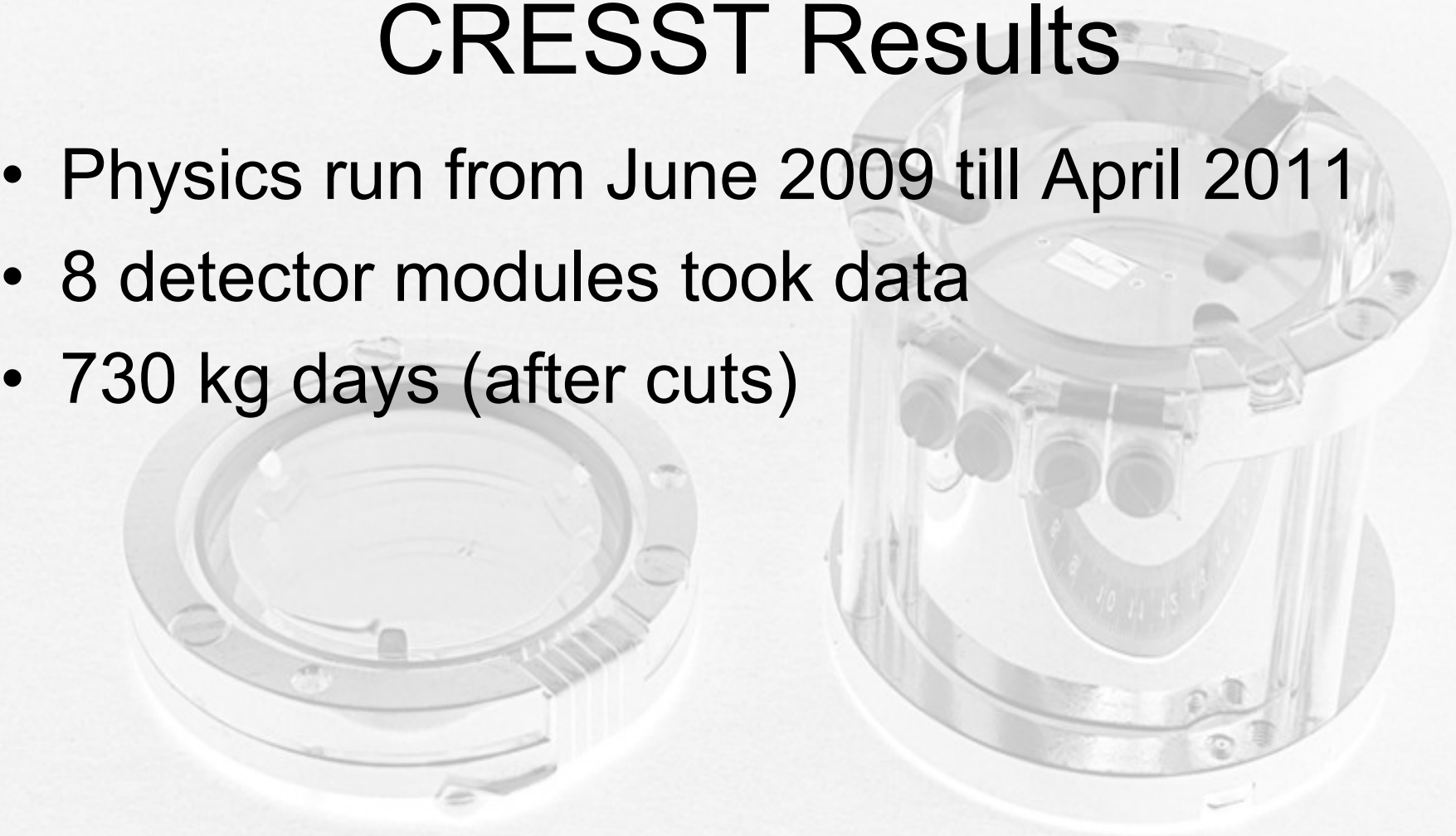
- Dark Matter in form of WIMPs
- Elastic WIMP nucleus scattering
- Energy transfer to nucleus
- Detection of the recoil energy
- CRESST: heat pulse & light signal





CRESST Results

- Physics run from June 2009 till April 2011
- 8 detector modules took data
- 730 kg days (after cuts)



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- Excess above expected background

CRESST Results

- Physics run from June 2009 till April 2011
- 8 detector modules took data
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Colloquium @ MPI on 10th of January 2012

"Results from the latest run
of the CRESST Dark Matter Search"

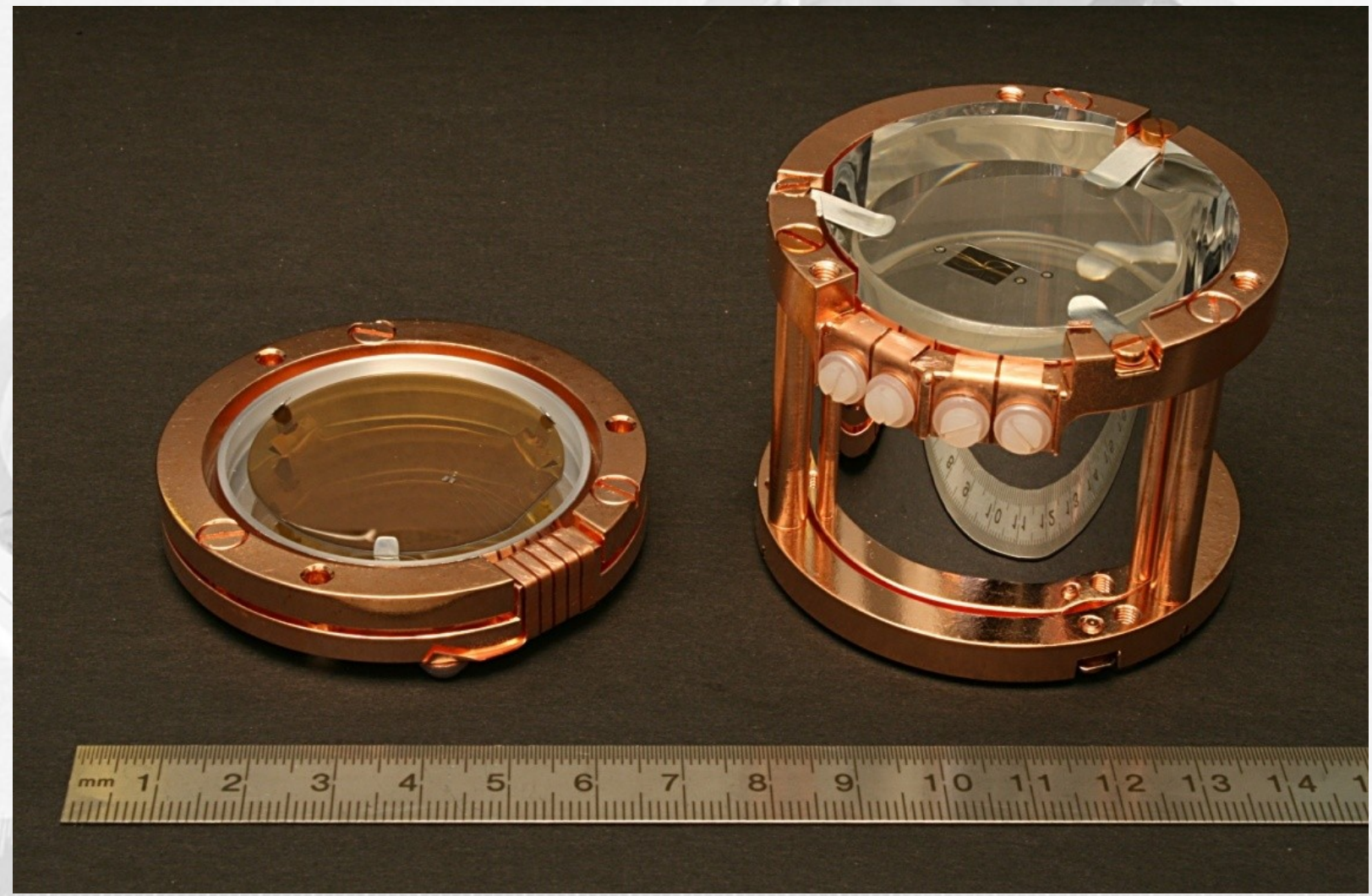
CRESST Results

- Physics run from June 2009 till April 2011
- 8 detector modules took data
- 730 kg days (after cuts)
- 67 accepted events
- Excess above expected background
- Unexplained events …

  …due to unknown background?

  …fit as well to light WIMPs!

CRESST Results



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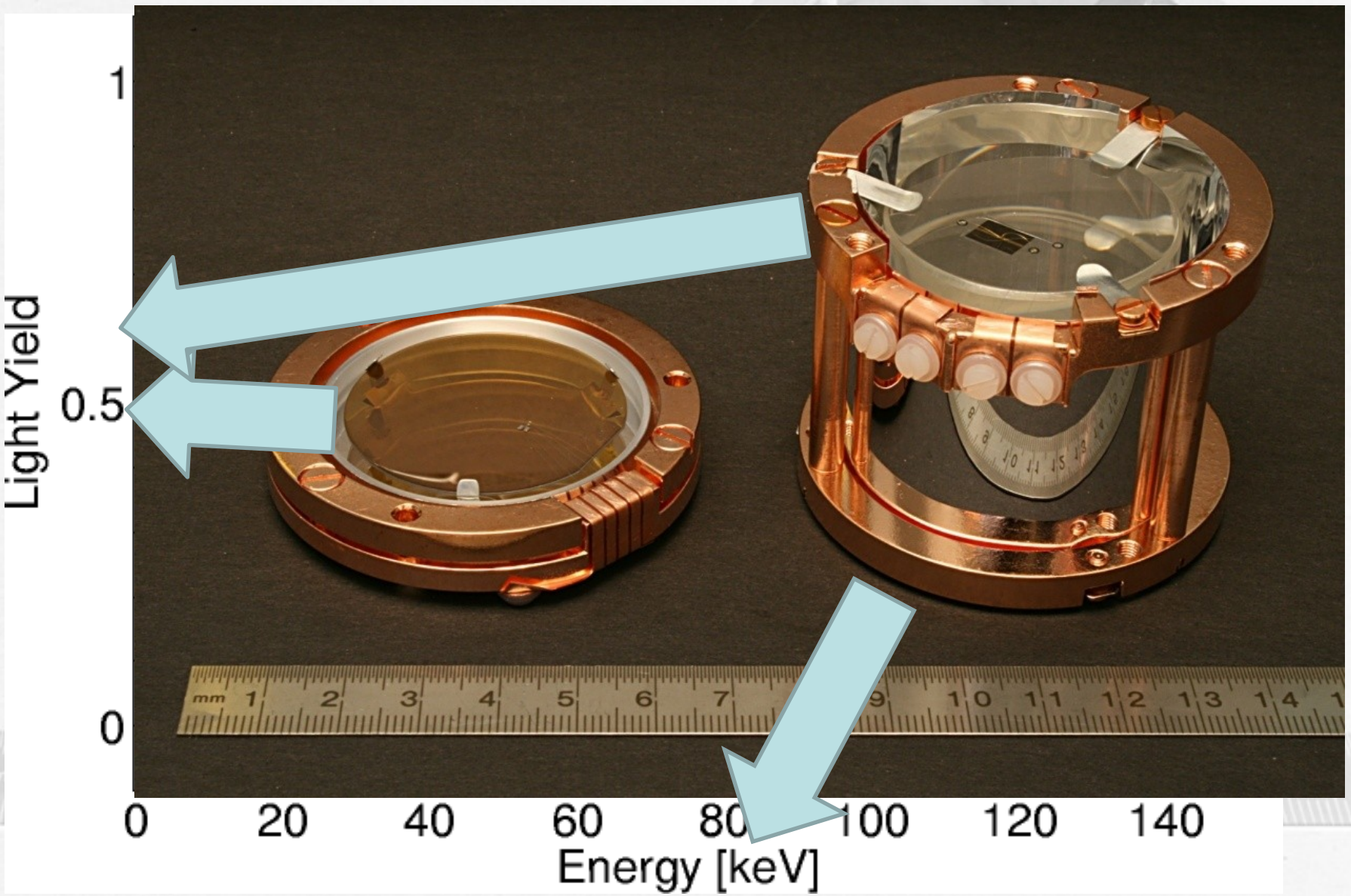
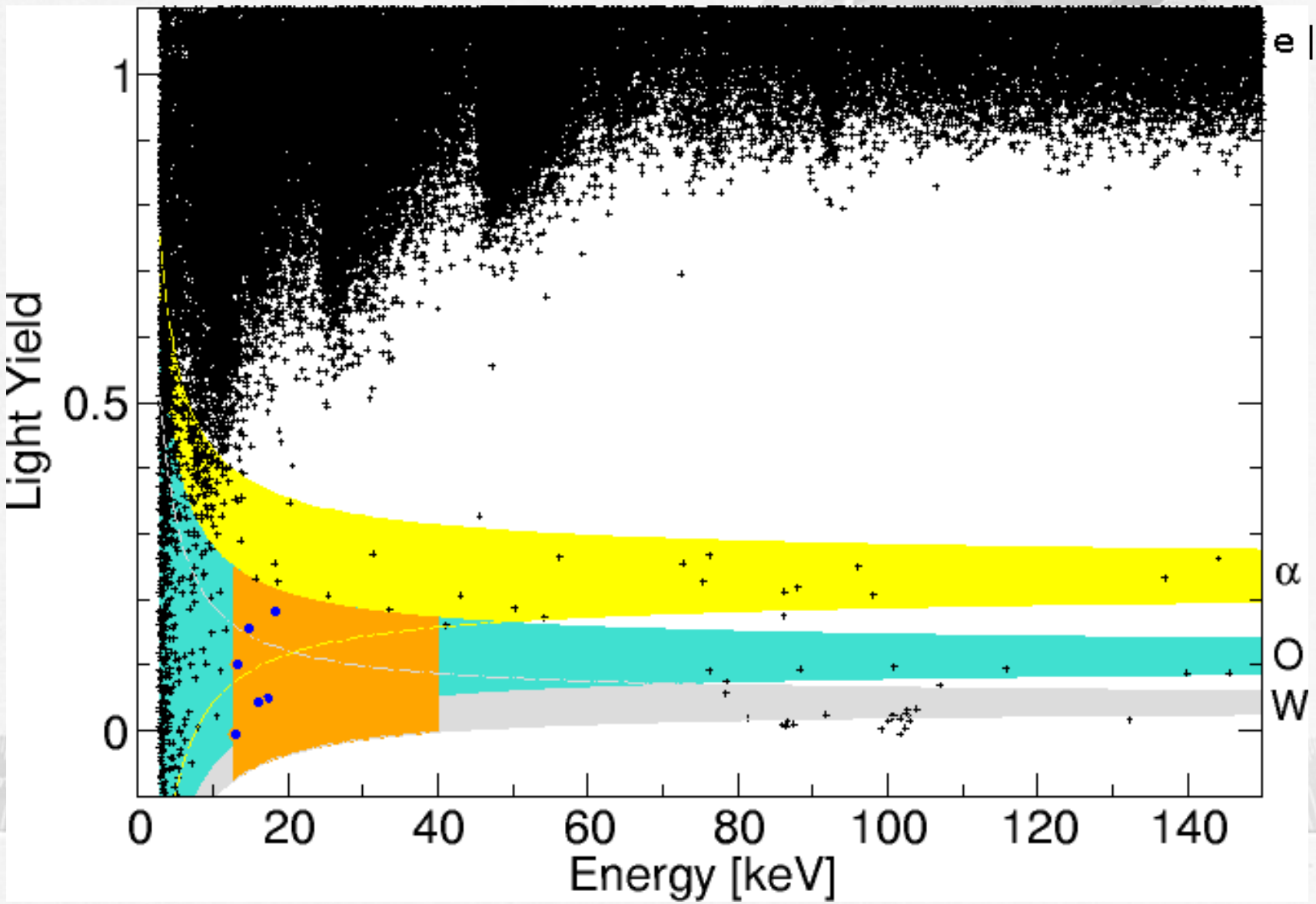
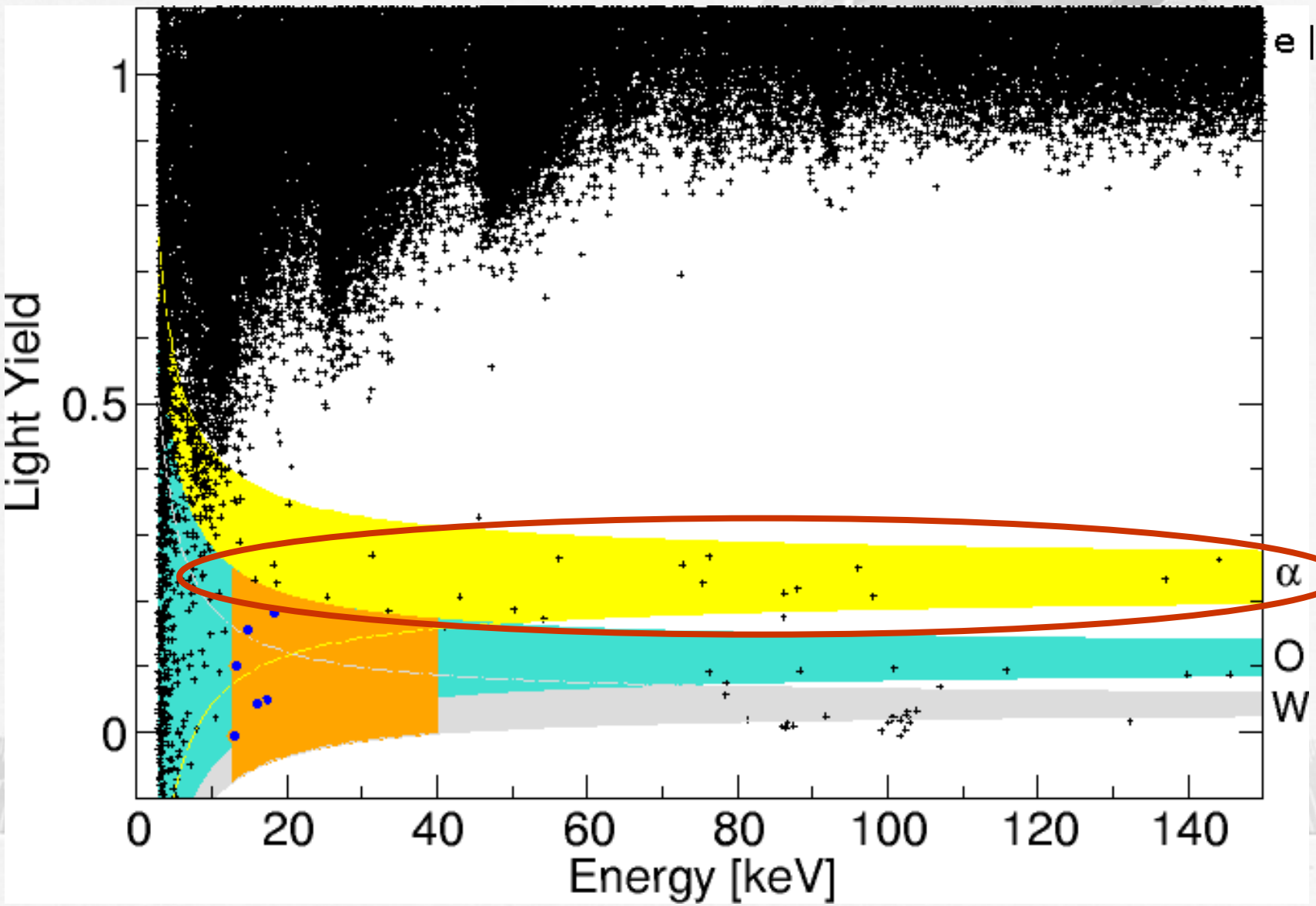


CRESST Results



Low energetic Alphas



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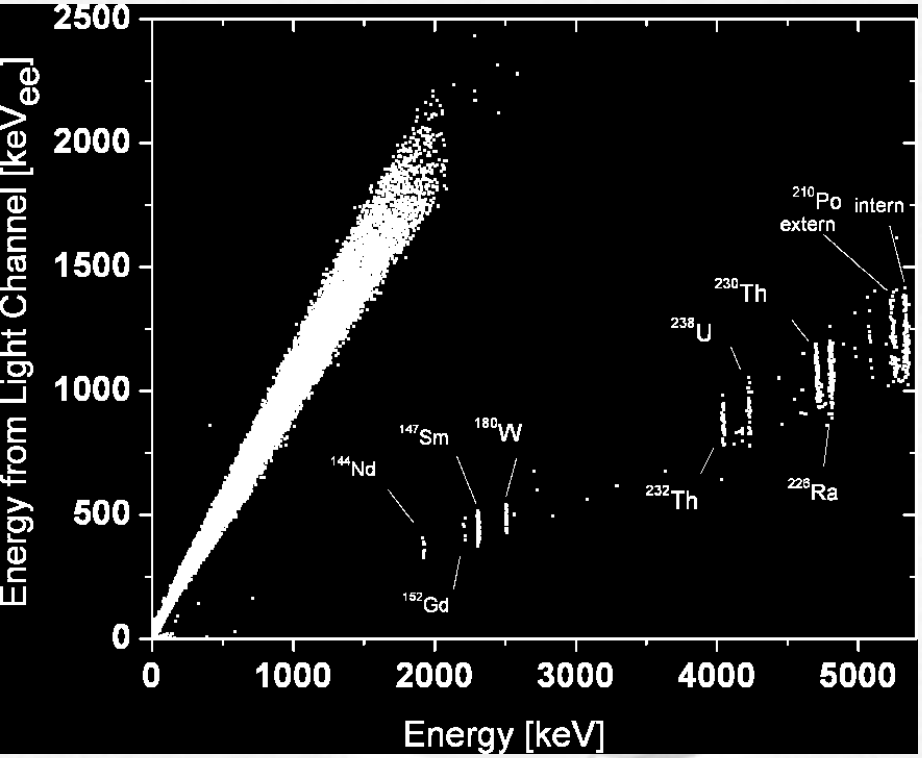
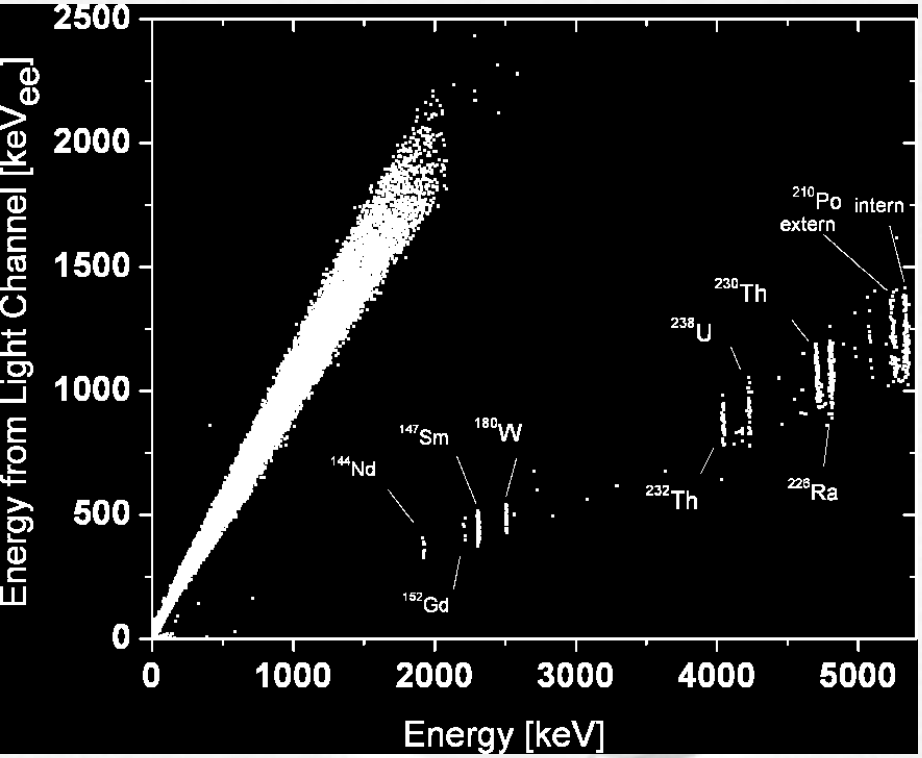
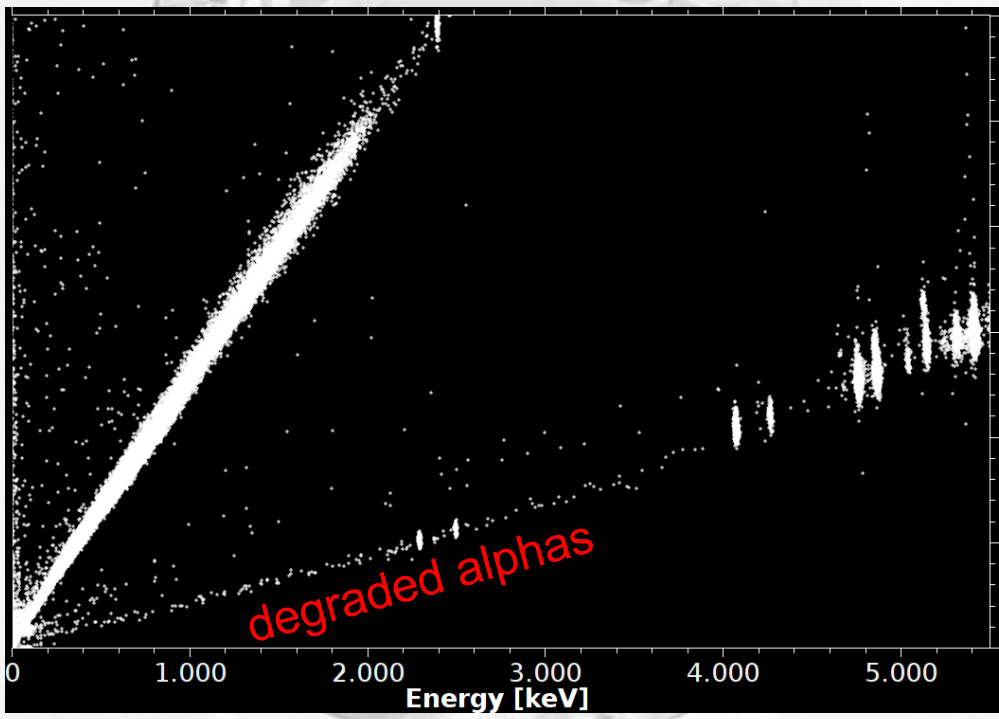


Intrinsic alpha decays
in the volume
of the target crystal
→ discrete lines

Run 2008

Low energetic Alphas

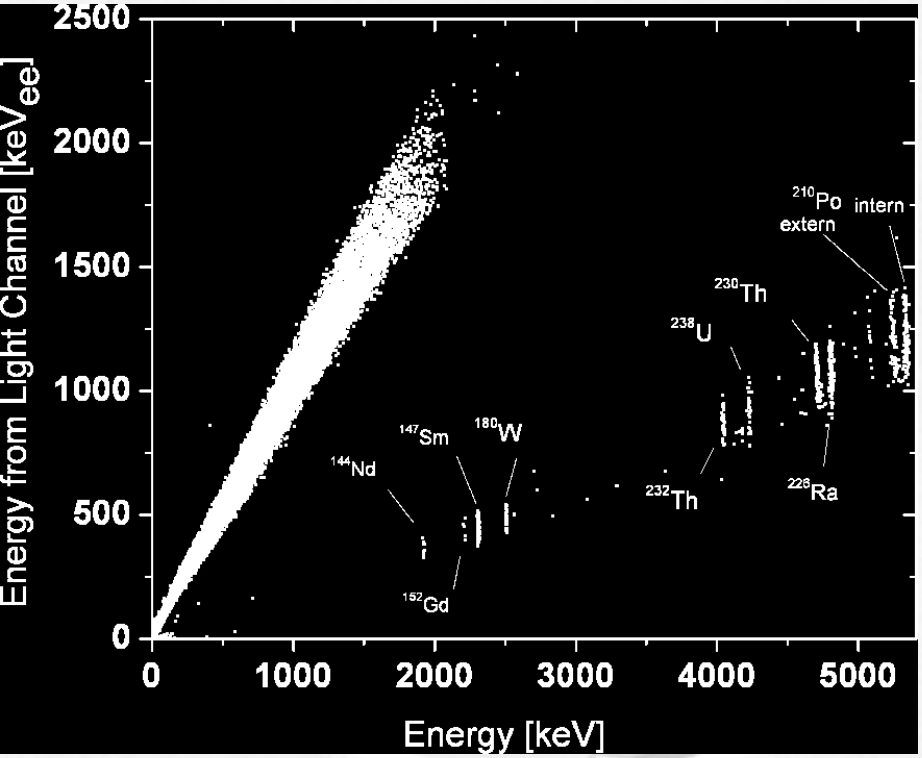


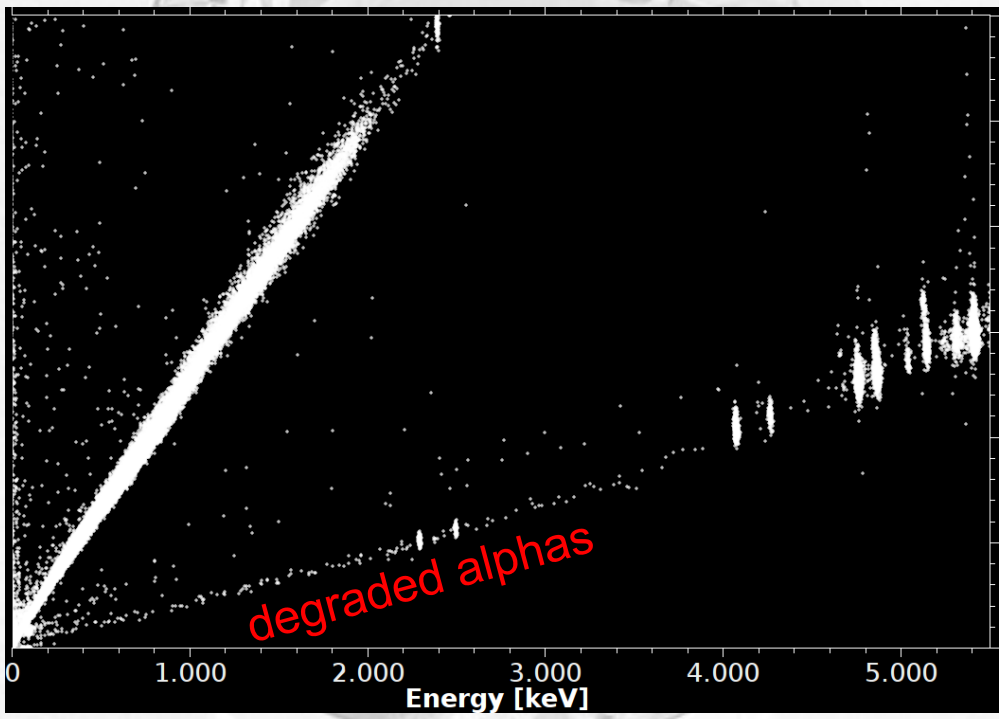


Run 2008

Run 2009-2011

Low energetic Alphas





Run 2008

holding clamps

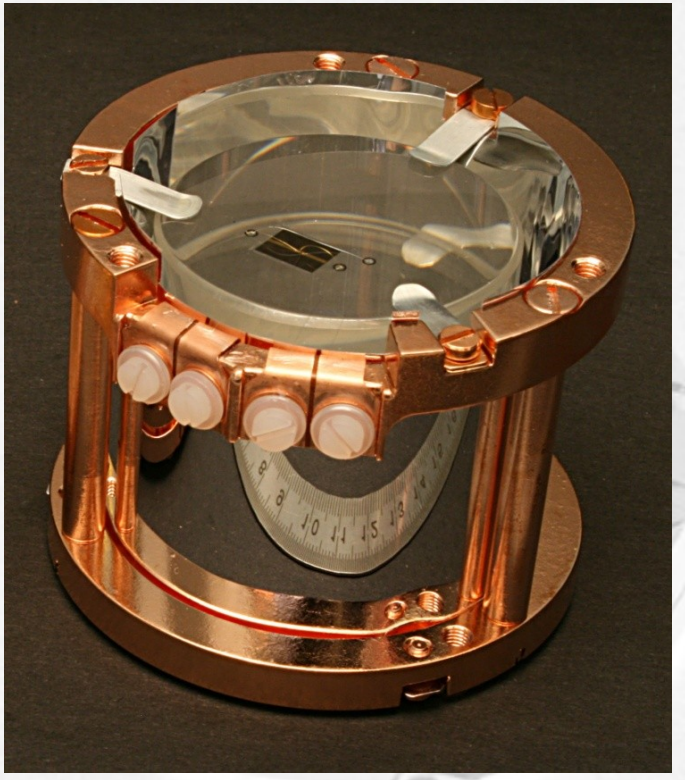
with scintillating veto

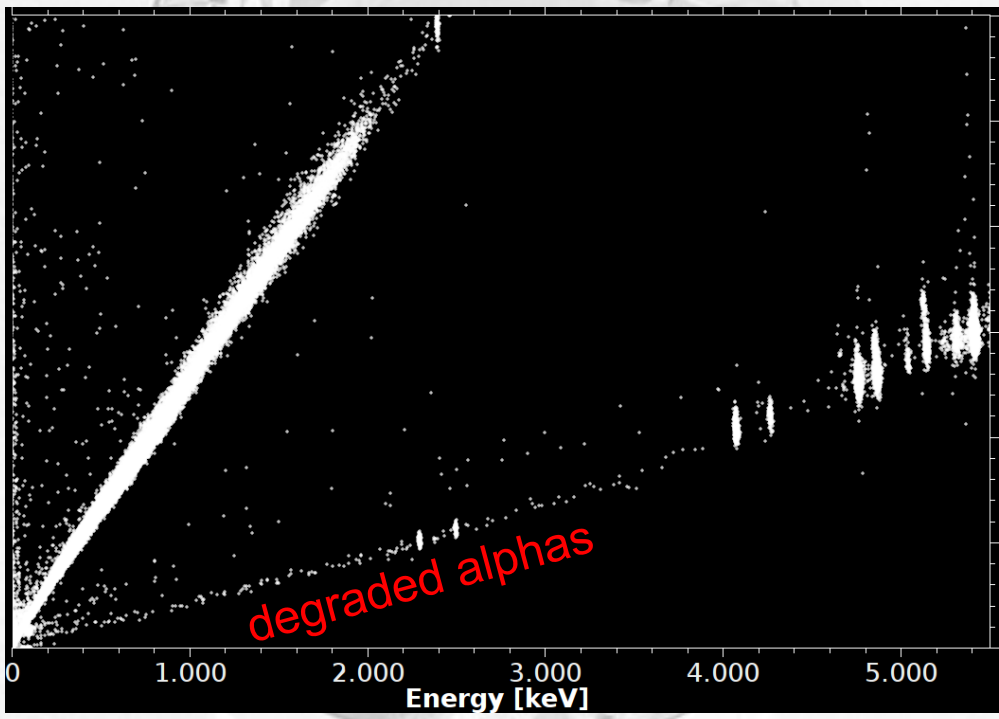
Run 2009-2011

holding clamps

without scintillating veto

Low energetic Alphas





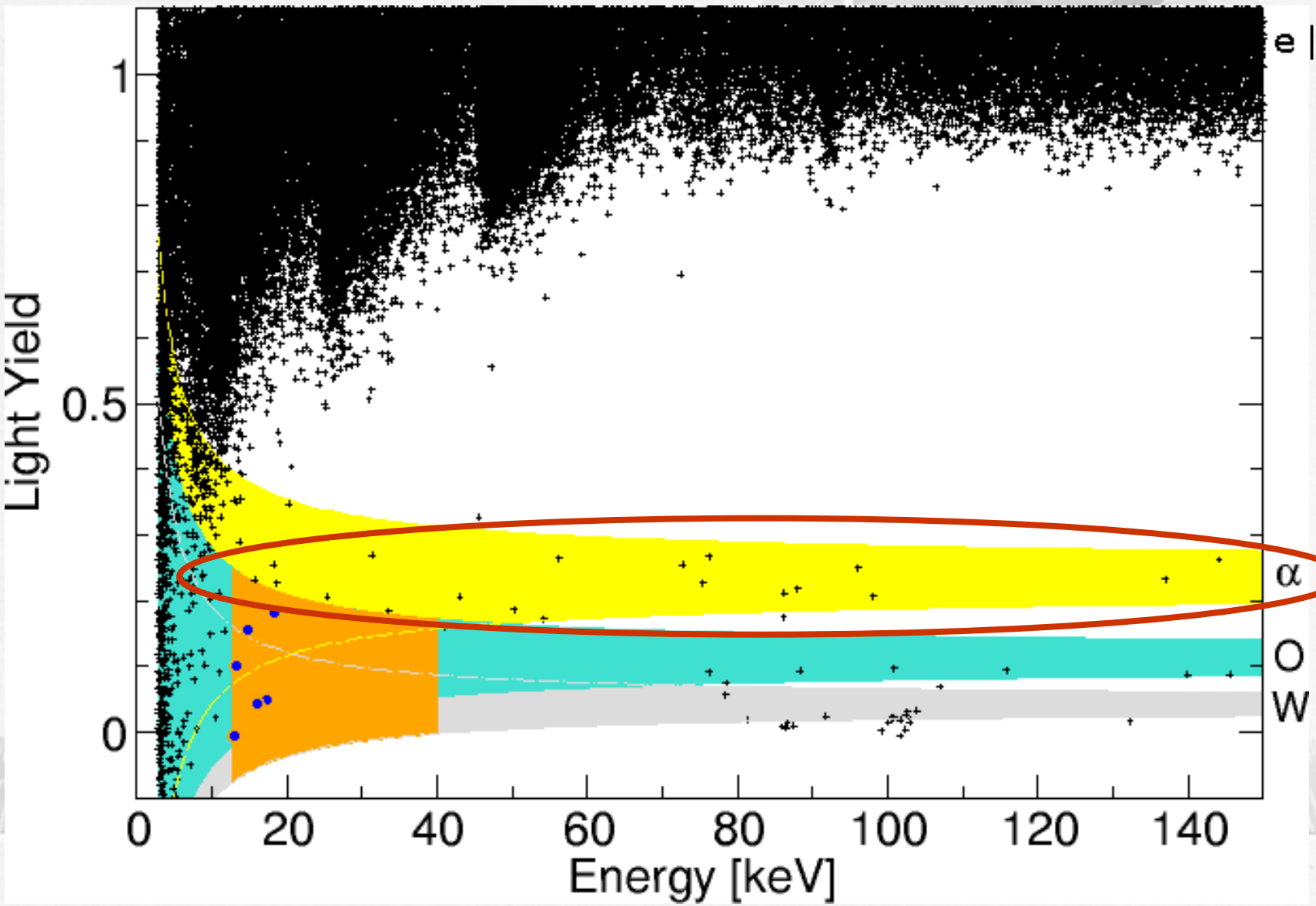
New holding clamps
without scintillating veto

Run 2009-2011

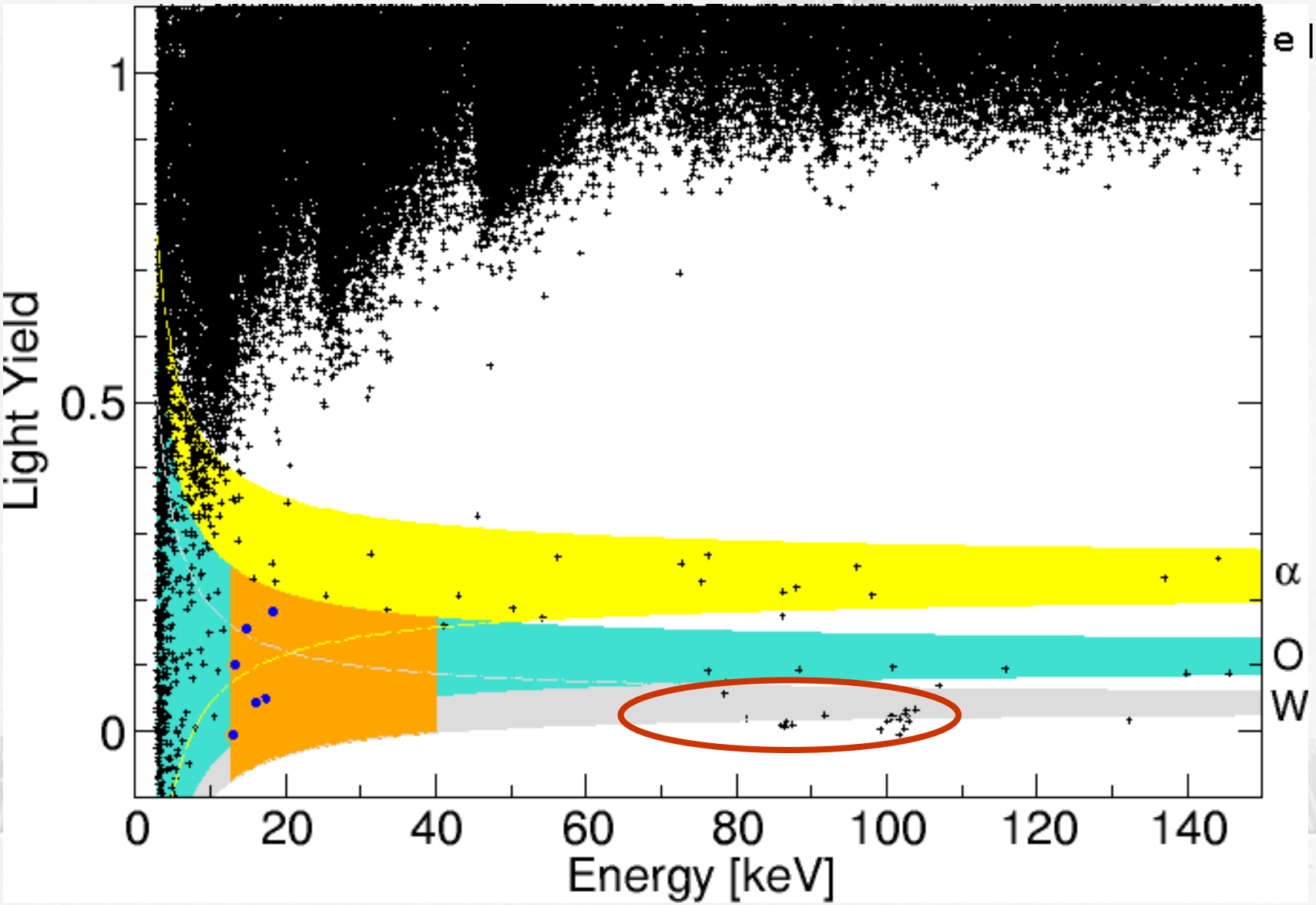
⇔ degraded alphas

Low energetic Alphas

Low energetic Alphas



Low energetic Lead Recoils



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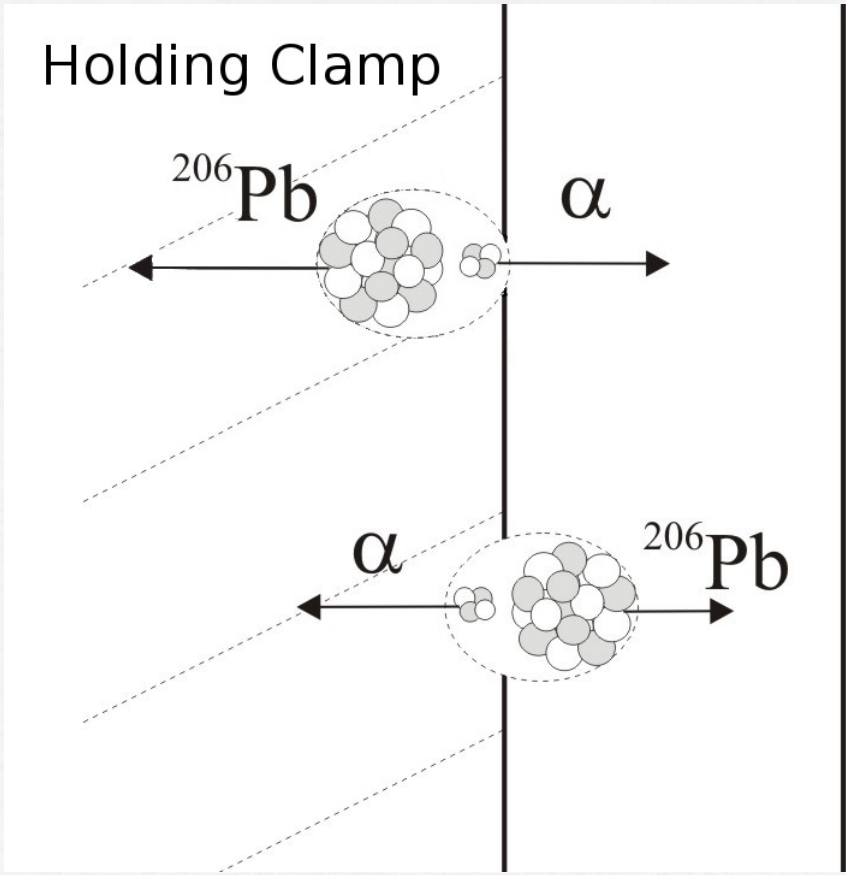
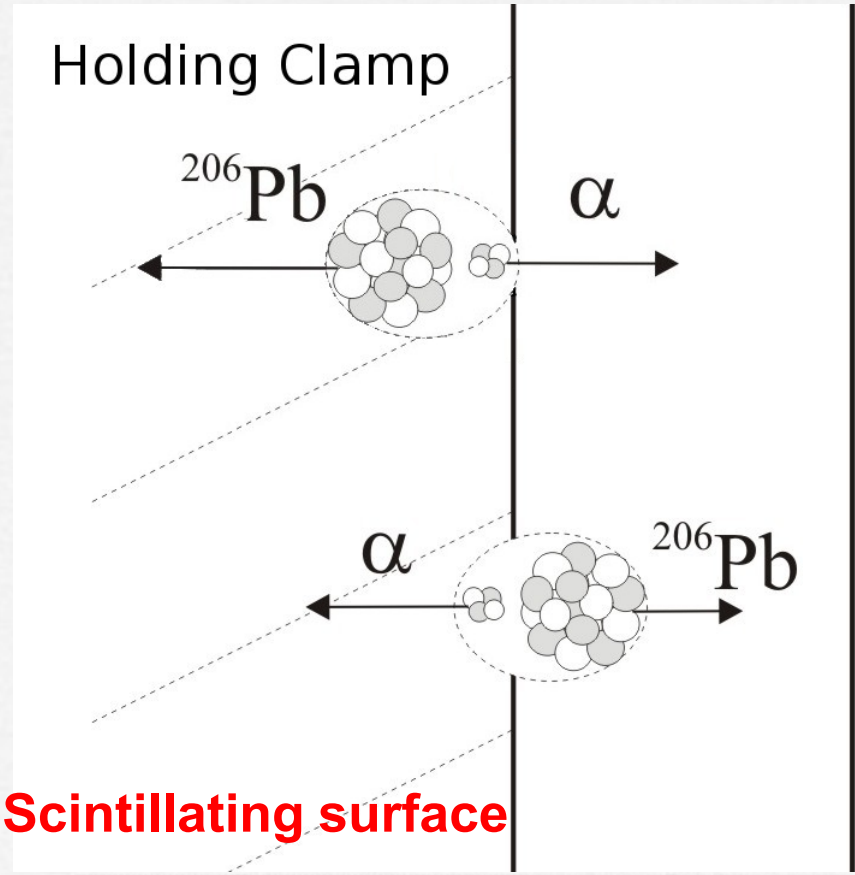


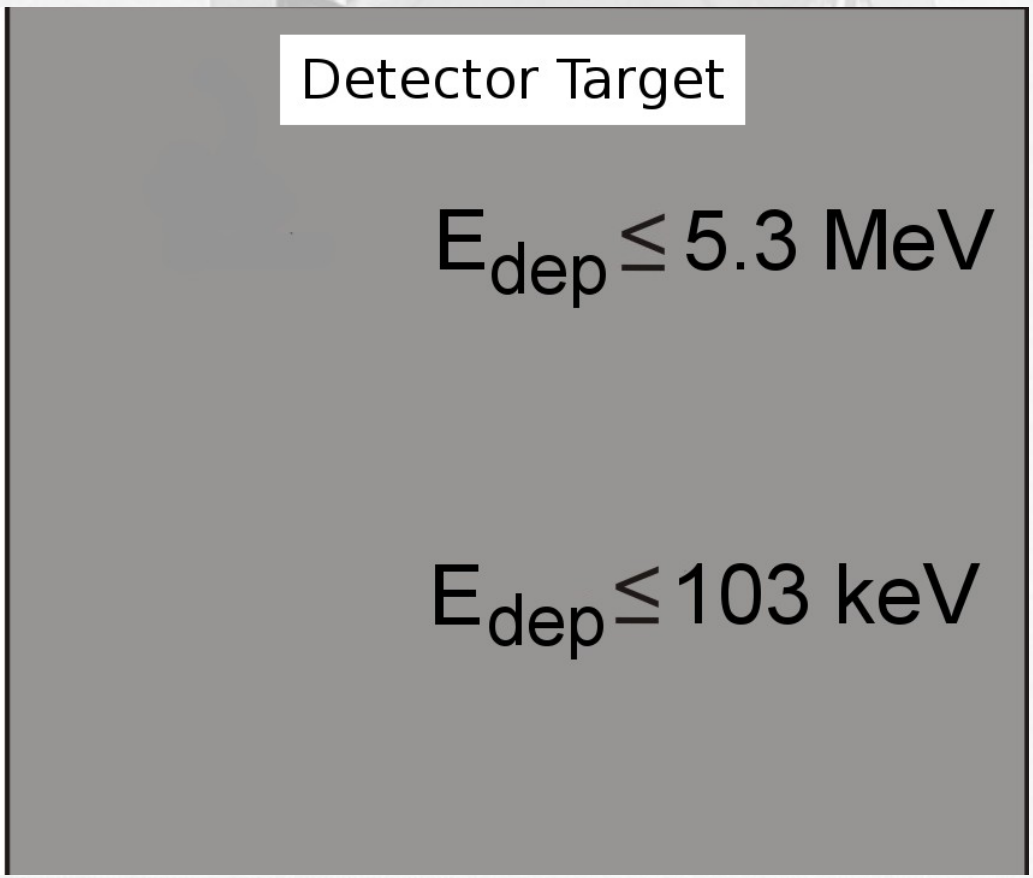
Detector Target

$E_{dep} \leq 5.3$ MeV

$E_{dep} \leq 103$ keV

Low energetic Lead Recoils





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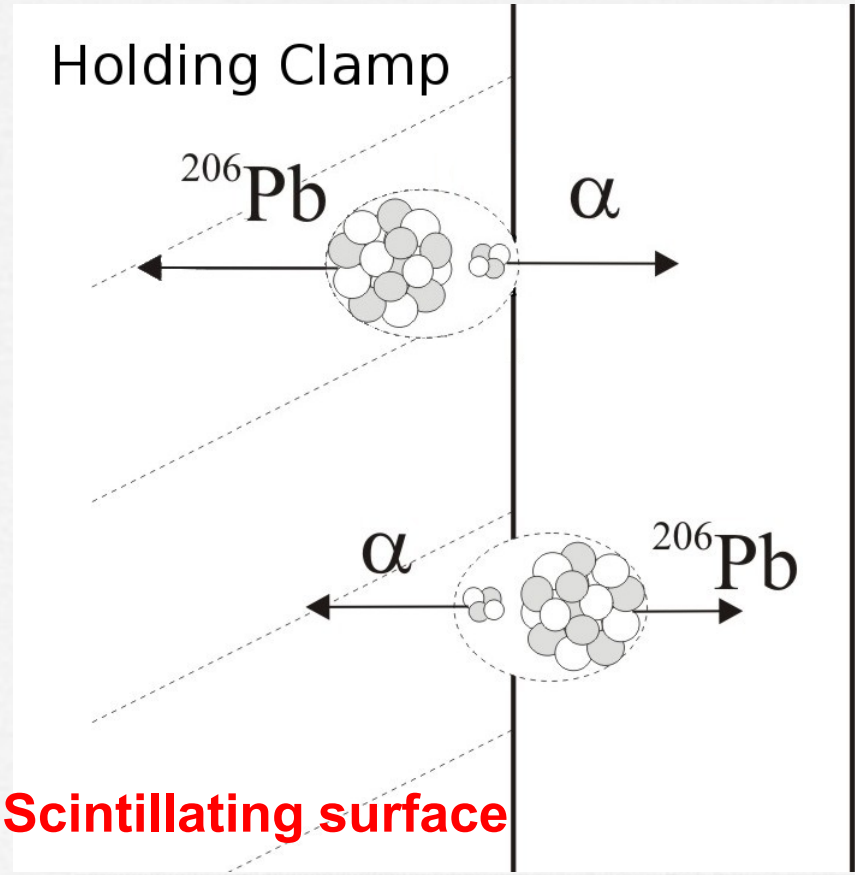

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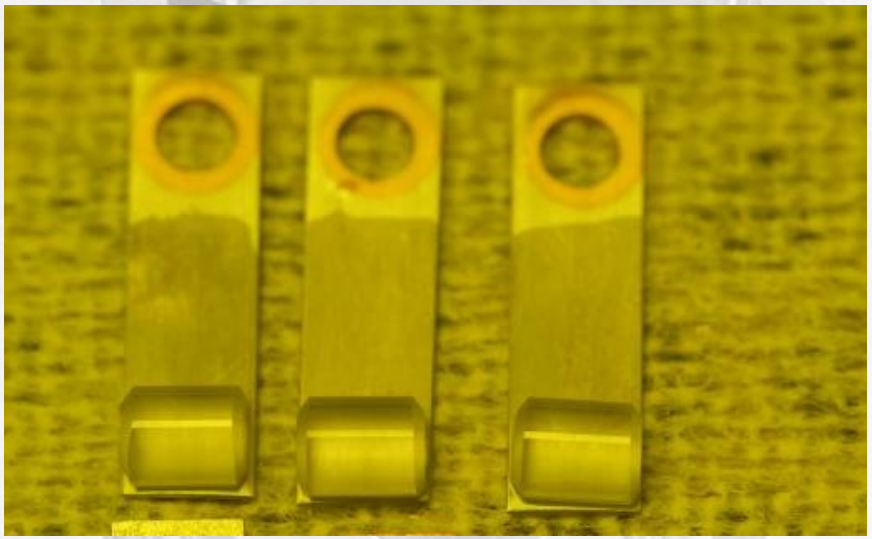
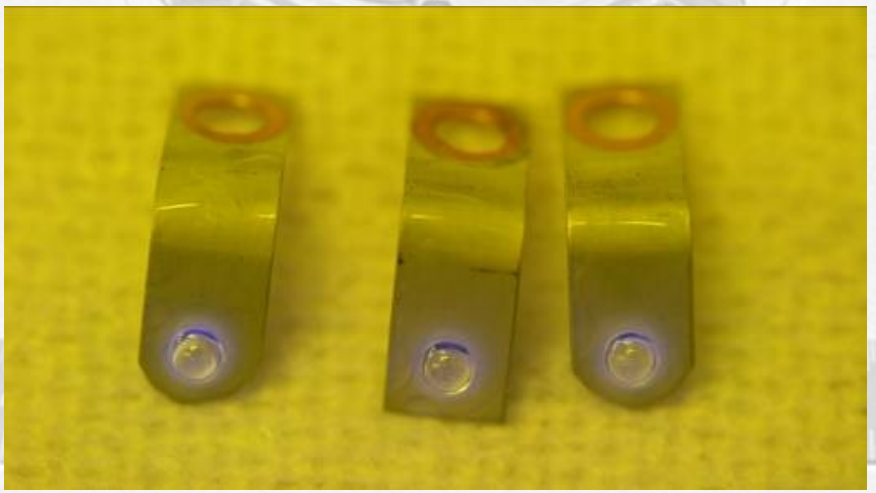
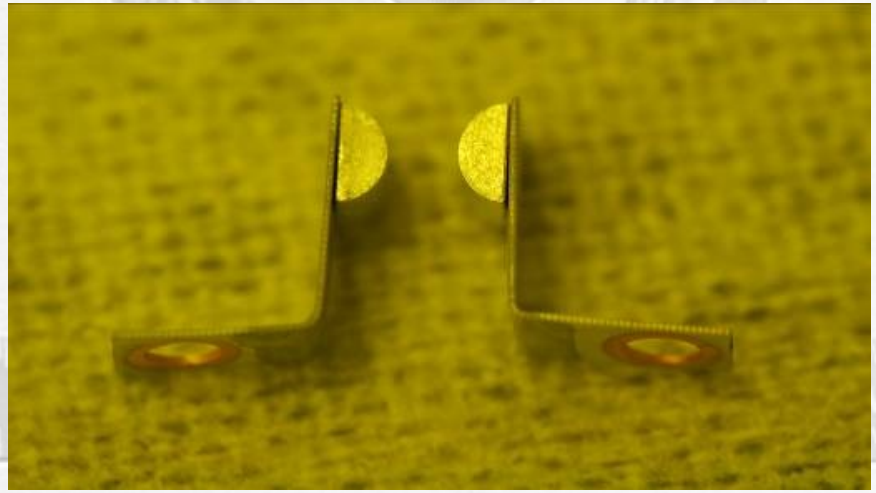
→ **Take advantage from both holding clamp types!**

New holding Clamps







New holding Clamps

Request for clamps:

- High radio purity
- Scintillating surface
- No stress relaxation
- No microphonics
- No crystal damage
- High reflectivity

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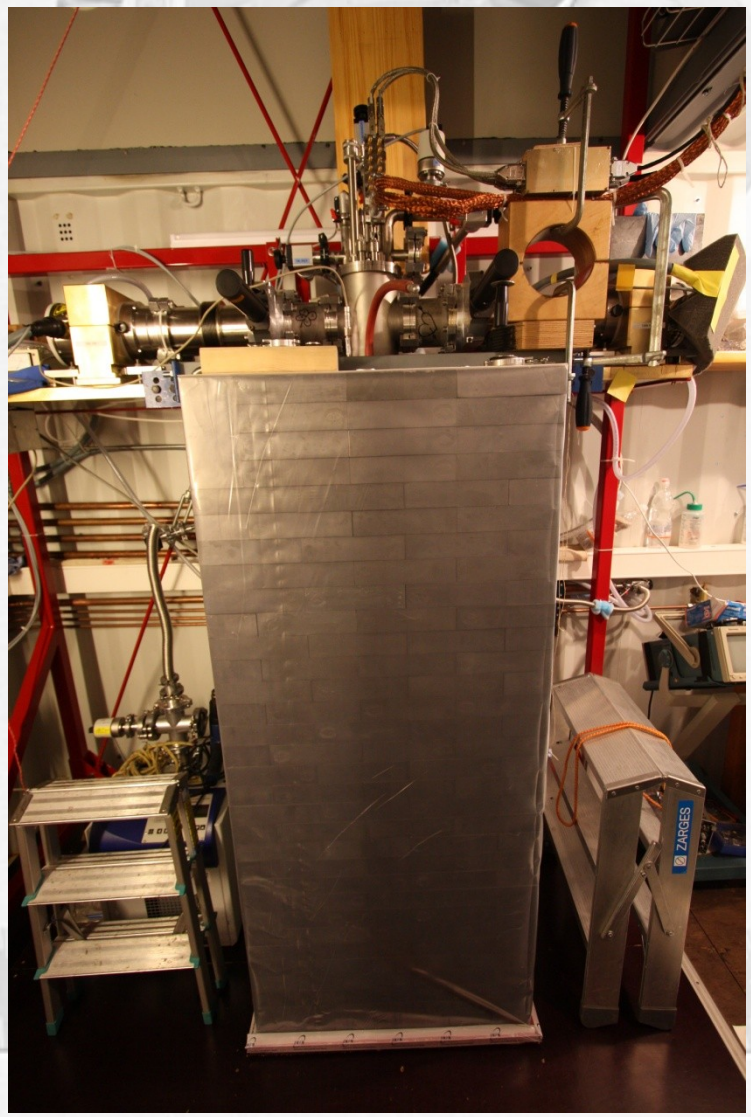

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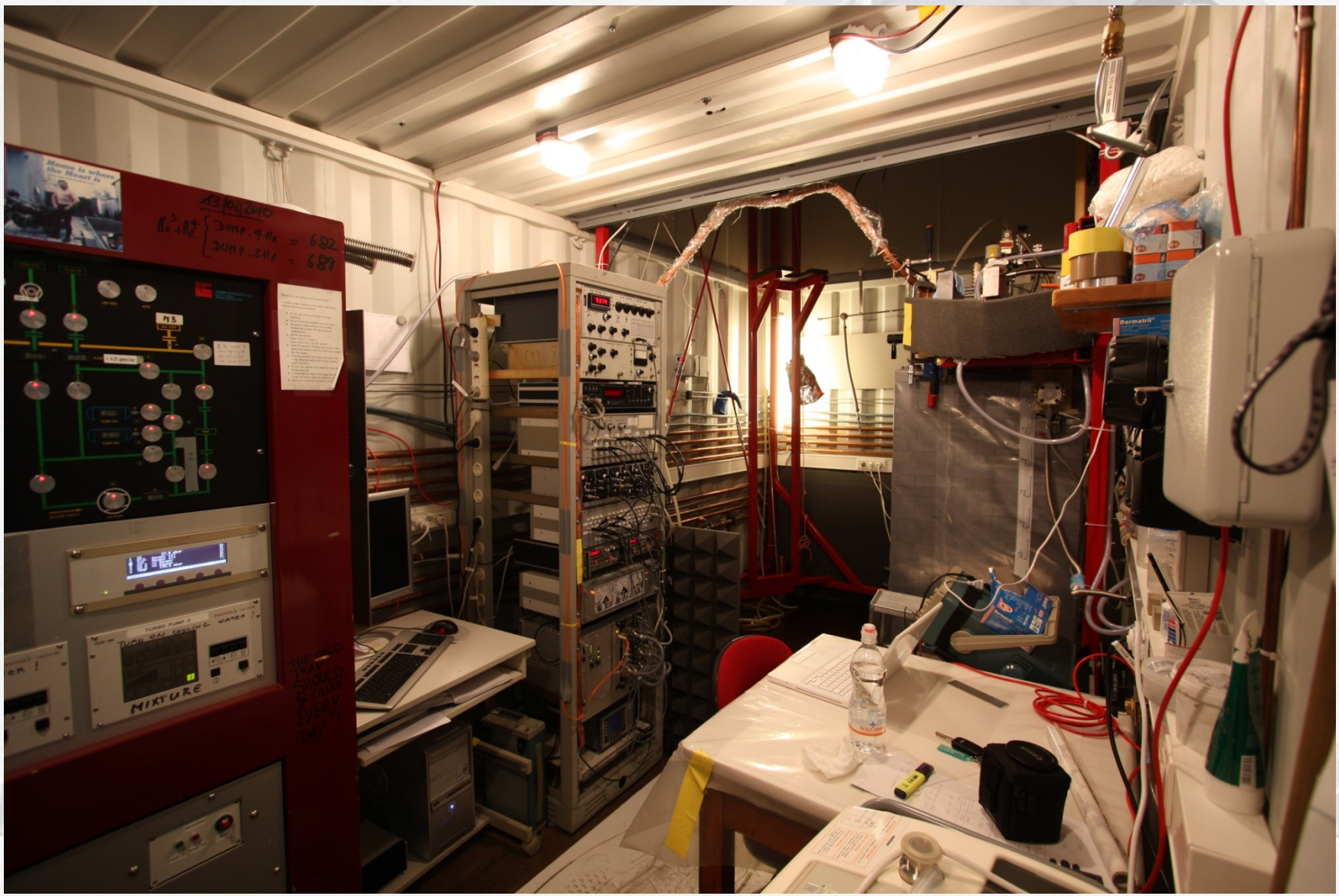
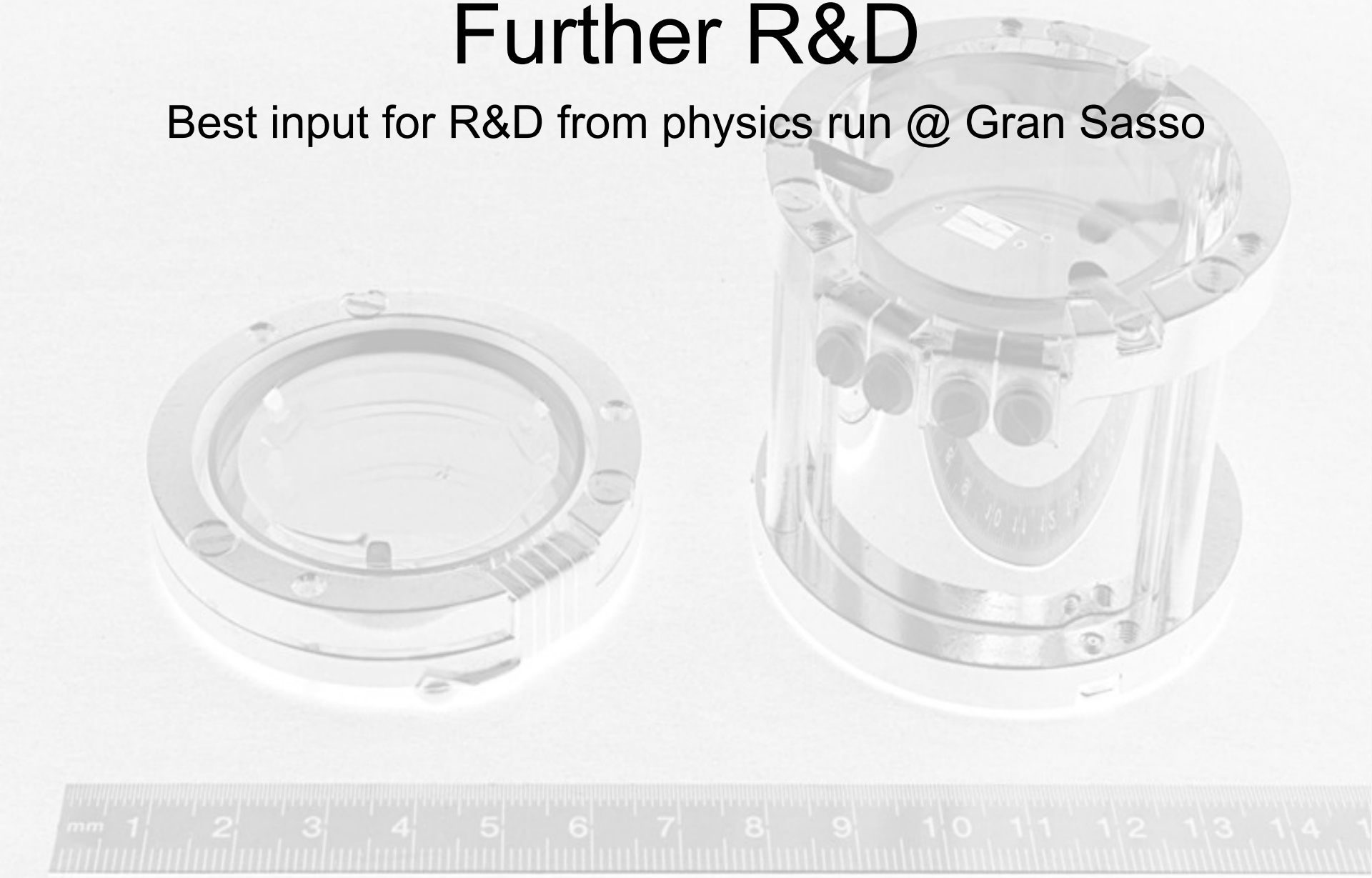


Further R&D

Best input for R&D from physics run @ Gran Sasso



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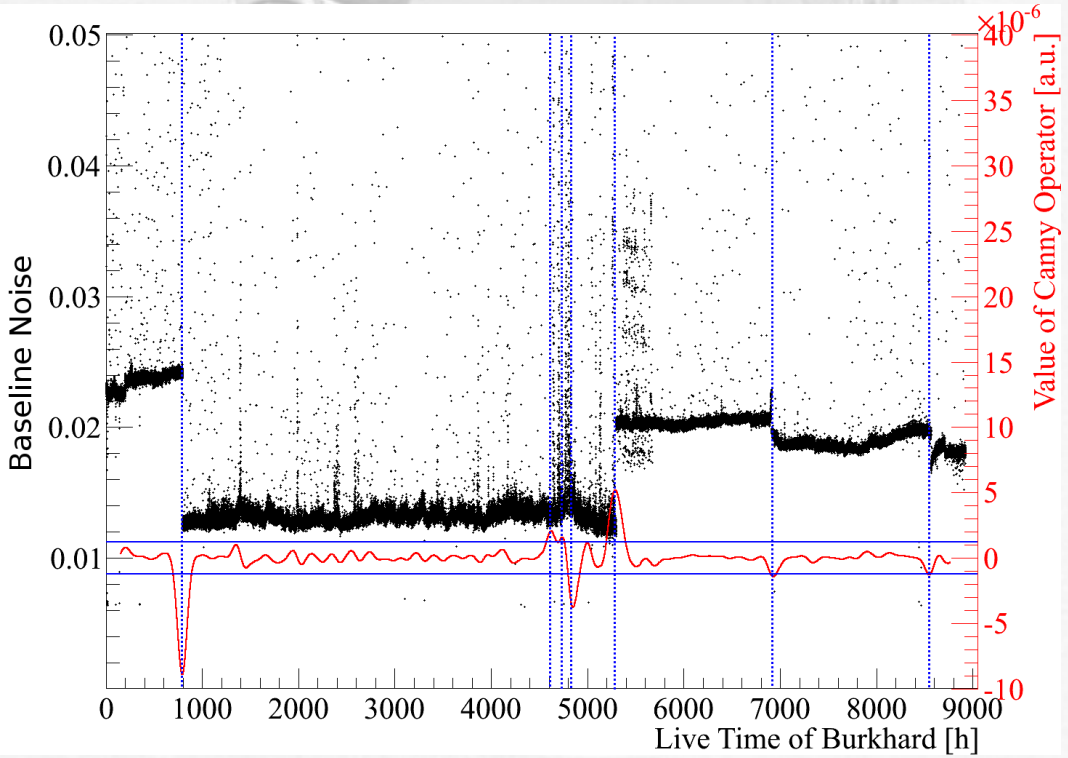

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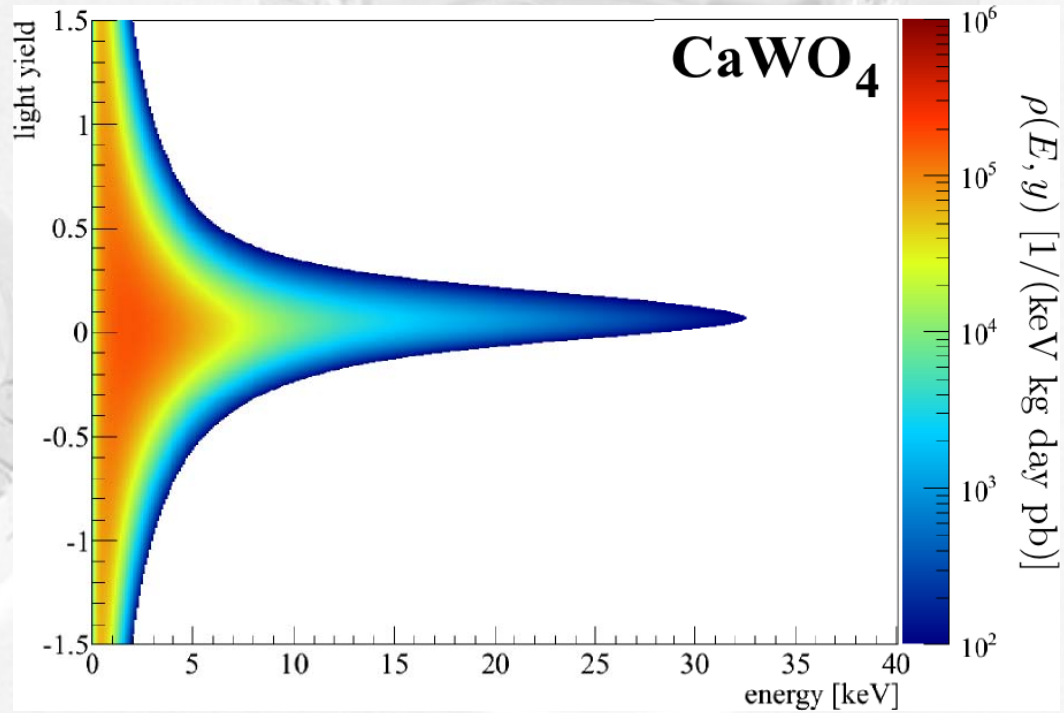
- …



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Software:

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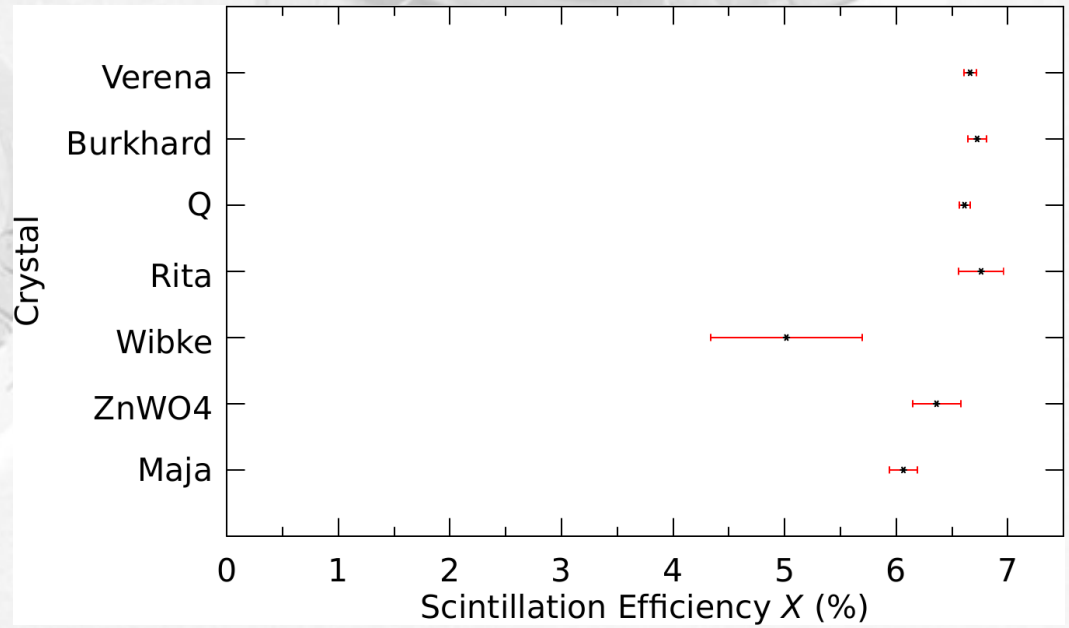
Hardware:

- Crystal



Further R&D

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Software:

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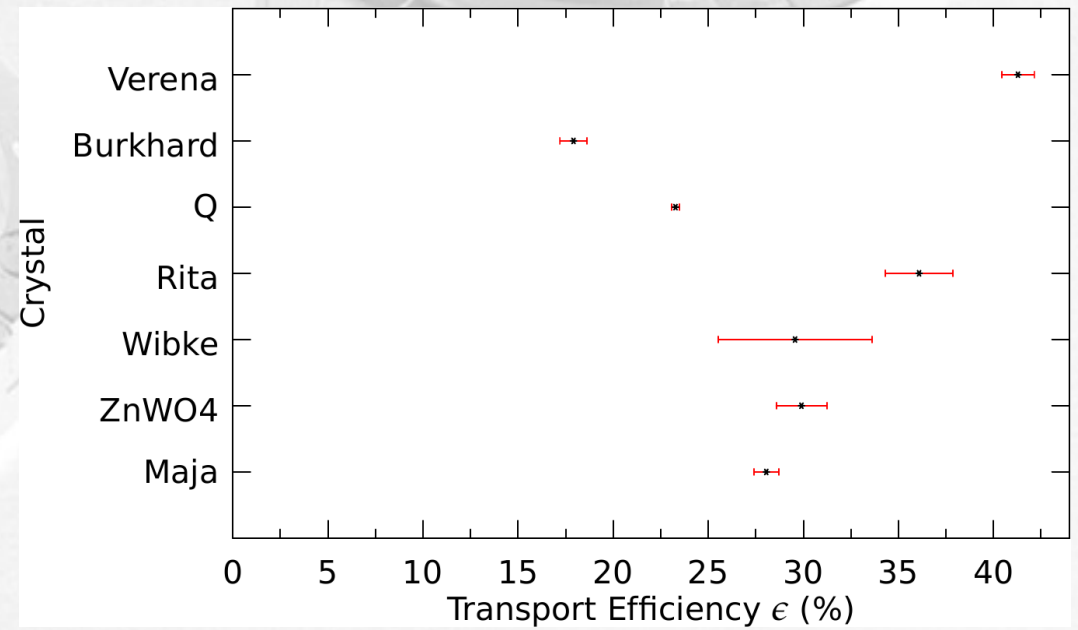
Hardware:

- Crystal
- Reflective housing



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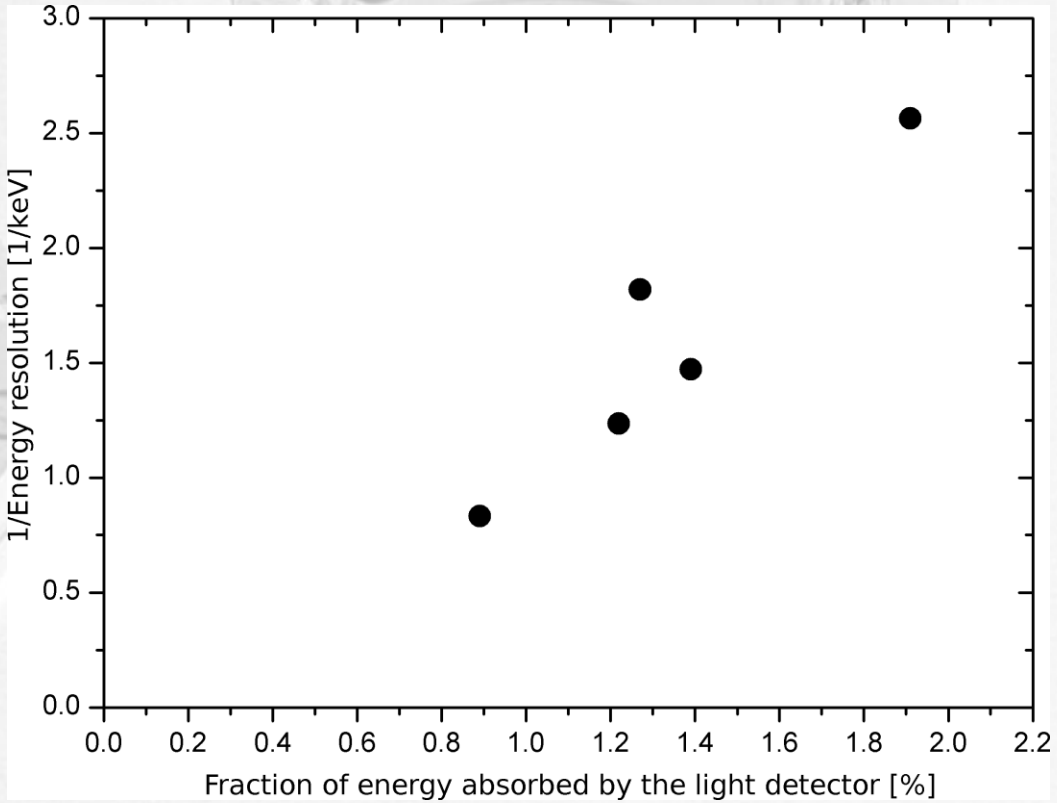

Further R&D

Best input for R&D from physics run @ Gran Sasso

Software:

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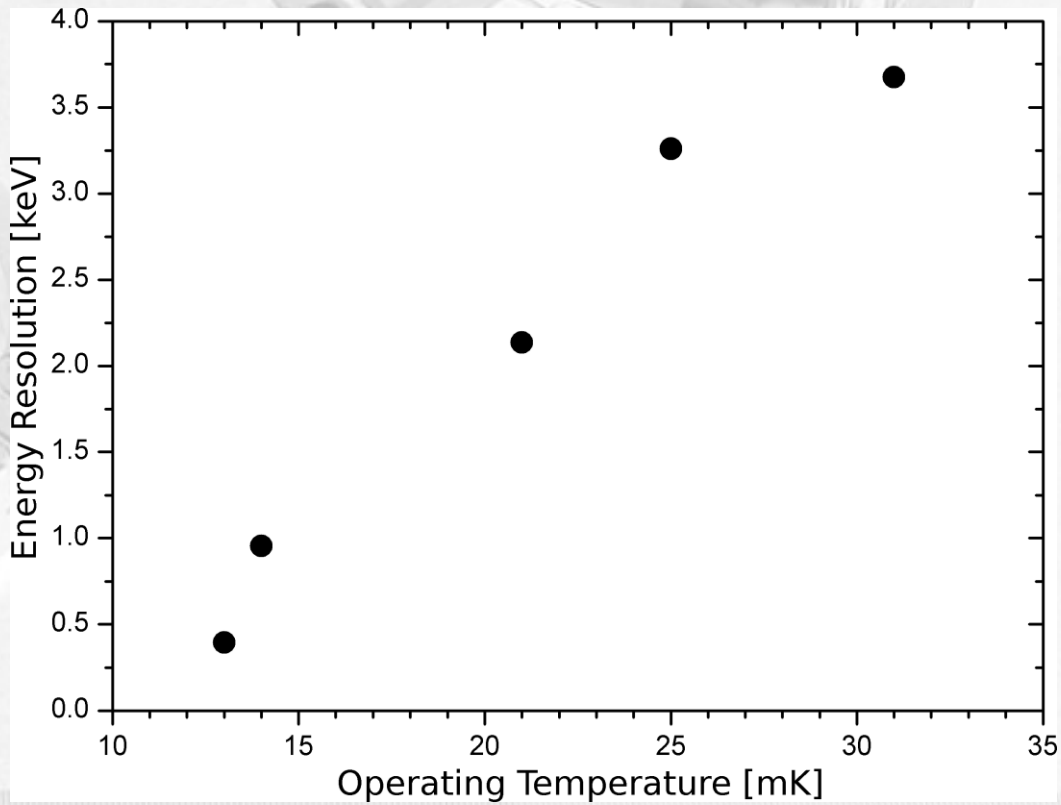
- …

Hardware:

- Crystal
- Reflective housing
- Light detector
- …



Conclusions & Outlook

- Successful physics run of CRESST
- Events above expected background
- Deep understanding of the detector performance

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- Successful physics run of CRESST
- Events above expected background
- Deep understanding of the detector performance

- Background reduction due to…
  - new holding clamps
  - additional inner neutron moderator
- Increase target mass by a factor of two
- Schedule: Next run starts spring 2012