A high resolution germanium detector array for hypernuclear studies at $\bar{P}$ANDA

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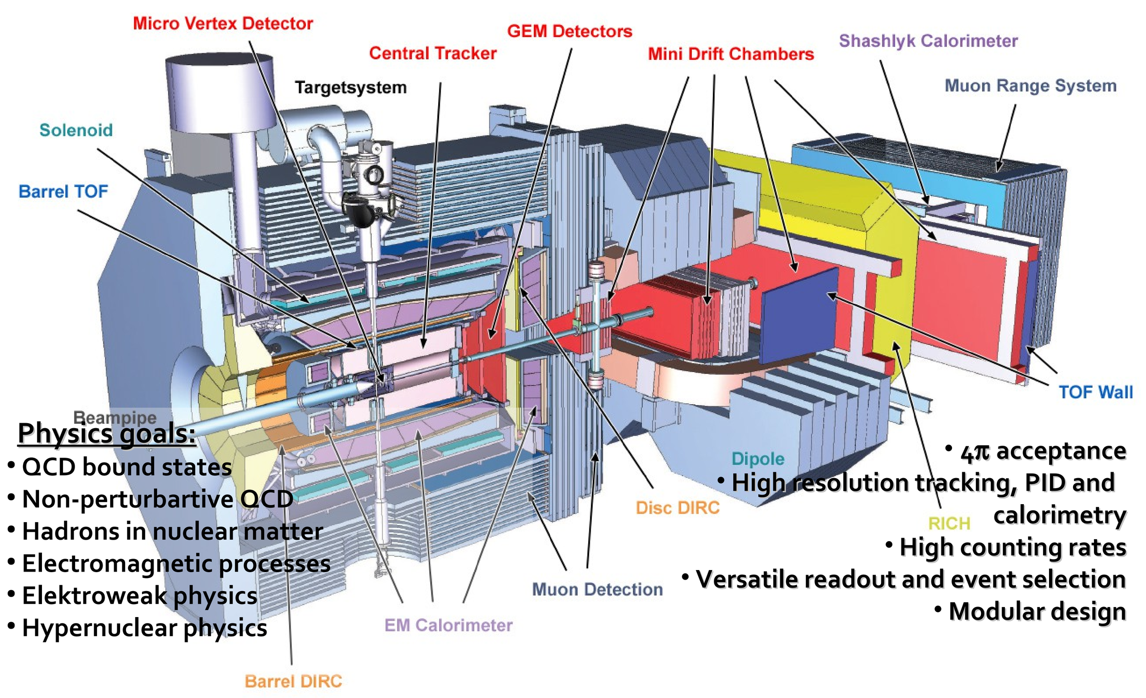
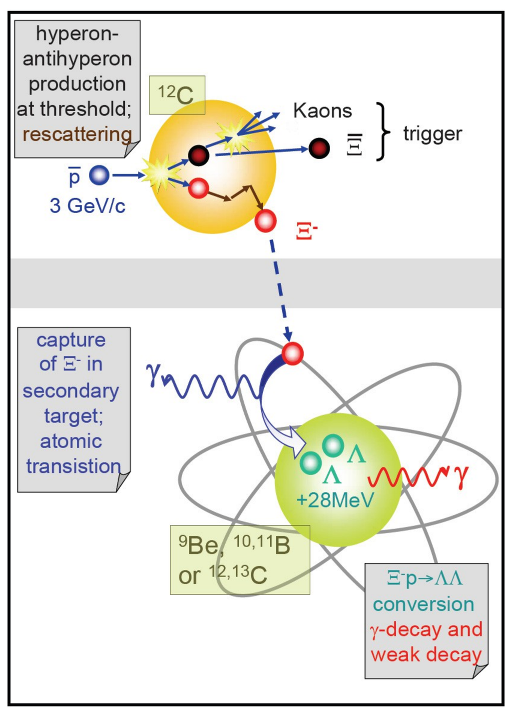
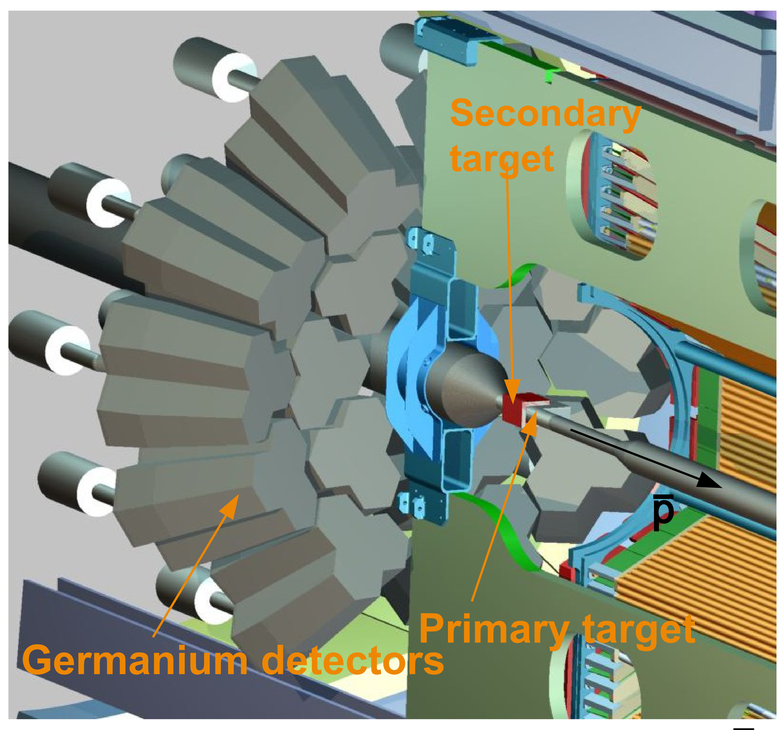


The $\bar{P}$ANDA spectrometer in standard configuration

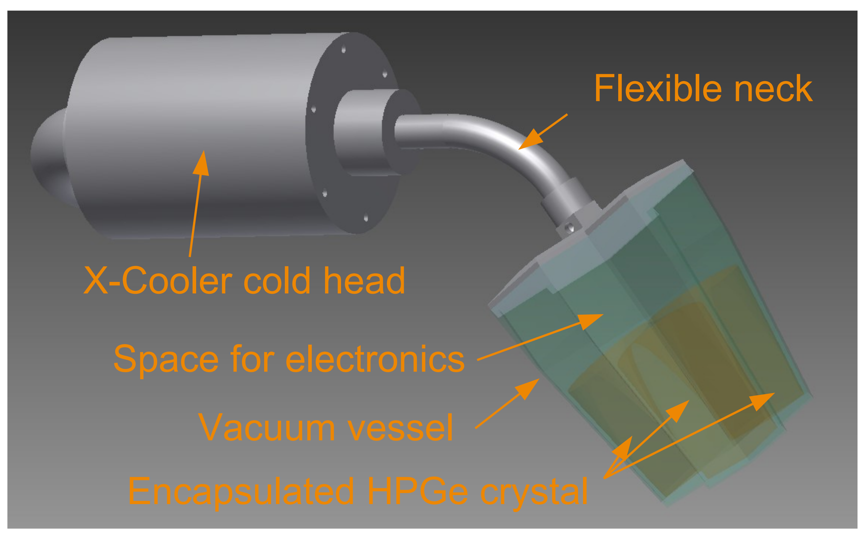


Production process of Double-Λ-Hypernuclei at $\bar{P}$ANDA

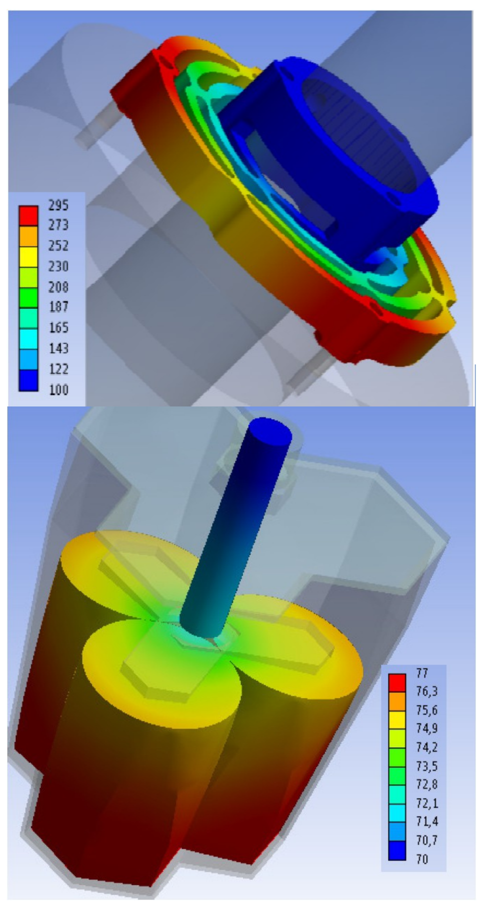


Integration of specific detectors inside the $\bar{P}$ANDA barrel spectrometer to study Double-Λ-Hypernuclei

Design of the triple cluster detectors

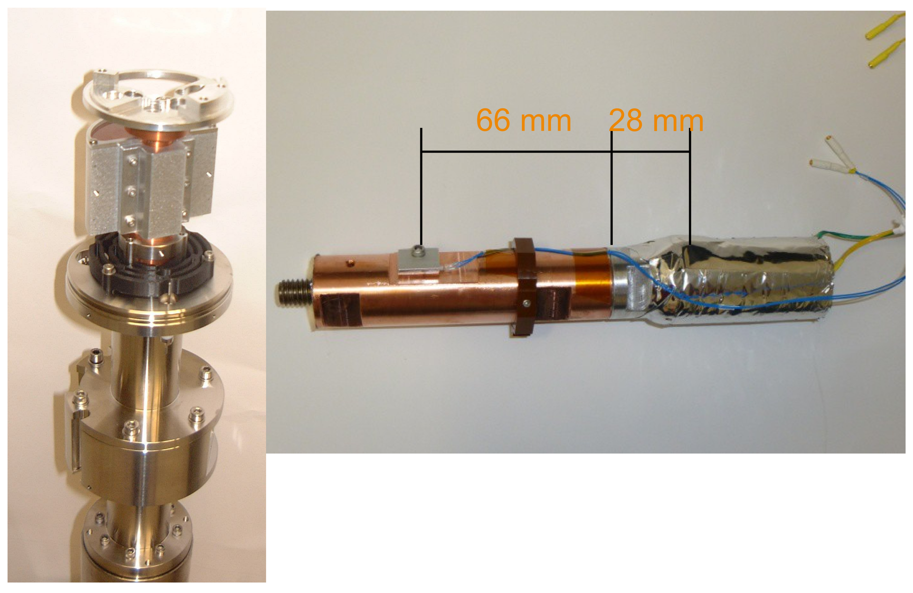


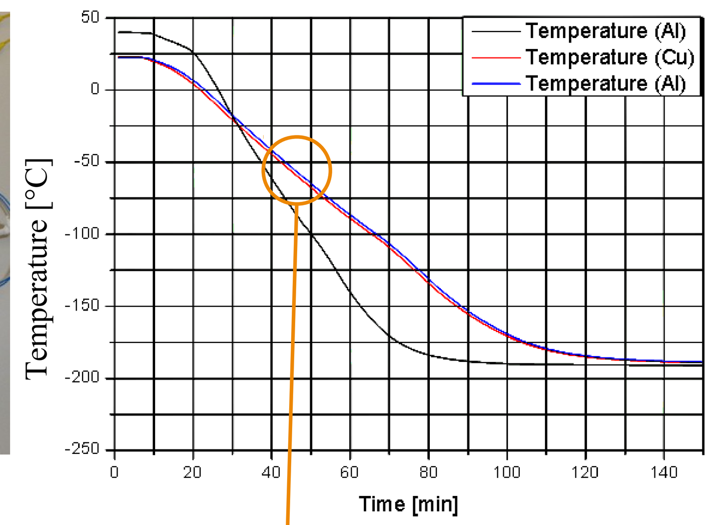
Design of a detector with three crystals

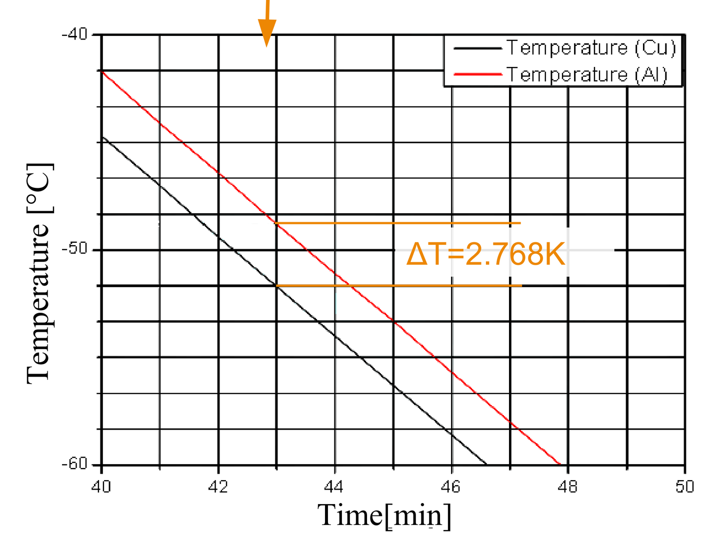


Simulation of the thermal capabilities of the planned design

Test of the electro-mechanical cooling system

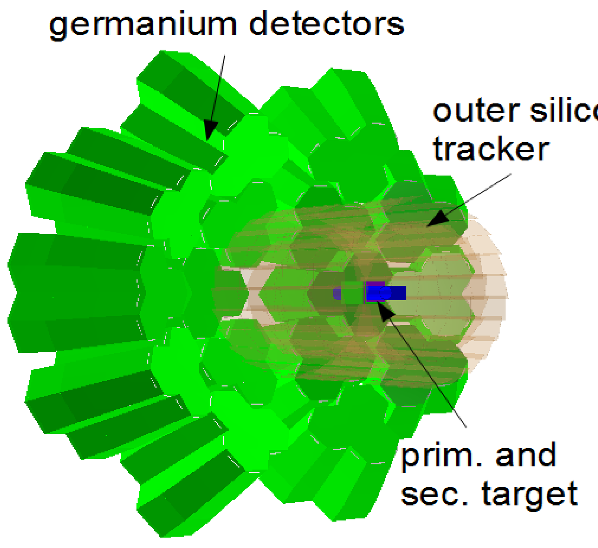




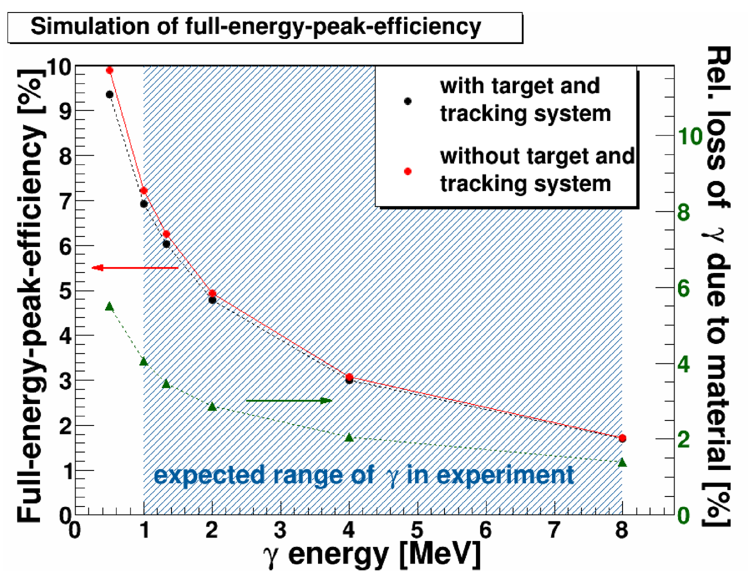


The limitation of space inside the PANDA barrel spectrometer makes a standard LN_2 cooling unfeasible. An electro-mechanical cooler (Ortec X-Cooler II) can be placed outside of the spectrometer. A measurement of its cooling power yields 13 W. This cooling power is reduced by the thermal contact resistance of the individual cold finger parts leading to the crystal. This resistance must be reduced in the future.

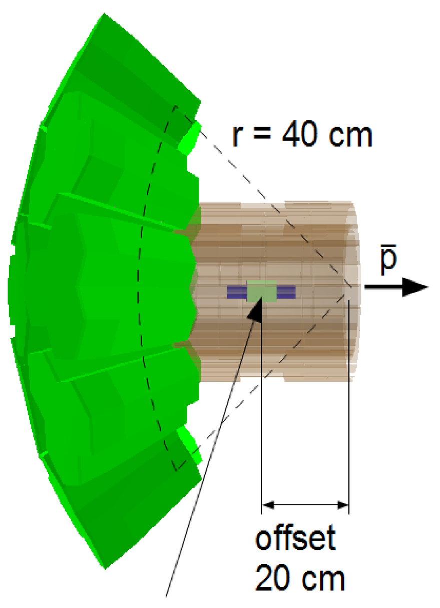
Simulation of the detector (PandaRoot)



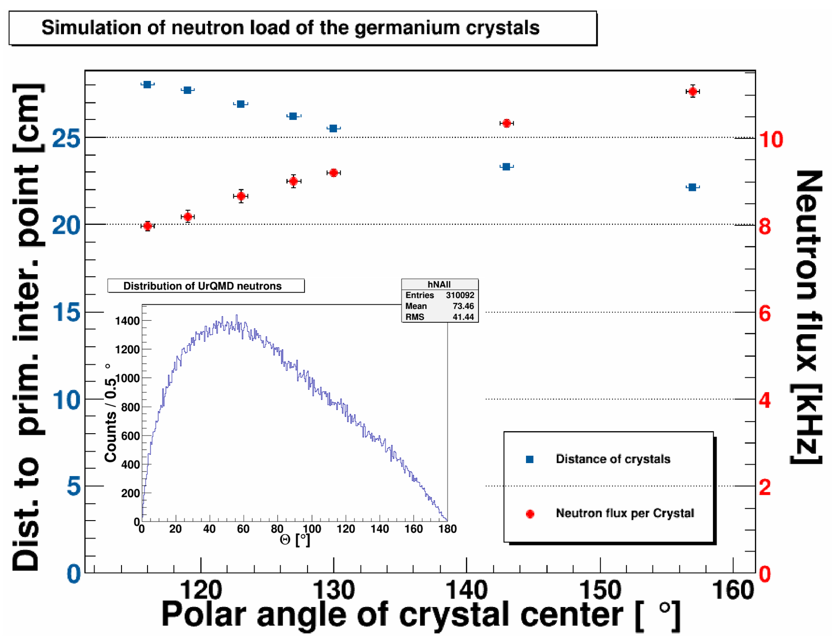
ROOT geometry used for the simulation



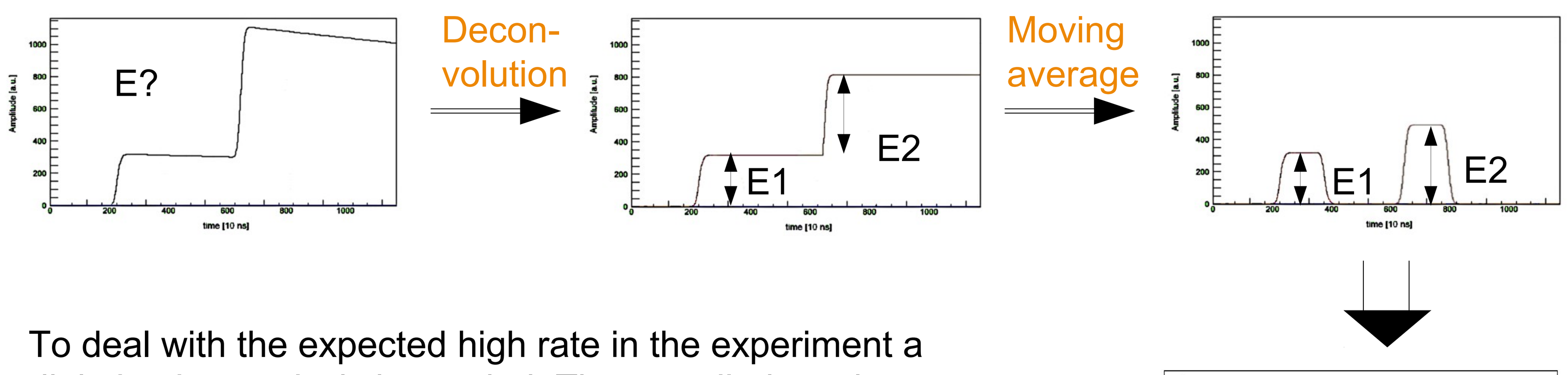
A high hadronic background is expected inside the $\bar{P}$ANDA spectrometer. Accordingly the geometry of the detector array has to be a reasonable compromise on the detection efficiency and the neutron load.



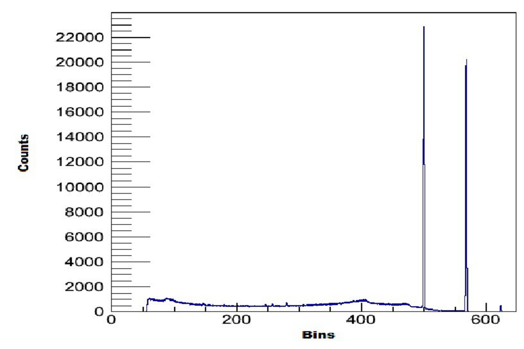
primary interaction point



Digital pulse analysis



To deal with the expected high rate in the experiment a digital pulse analysis is needed. The so called moving window deconvolution (MWD) algorithm is used for this purpose. MWD enables to shorten the long signals of germanium detectors (time constant τ ≈ 50 μs) and to disentangle pile up events. Consequently an improvement of the detection efficiency under high background conditions can be achieved.



Outlook

- High rate beam test @COSY(Jülich) (this month!)
- Radiation hardness test @COSY(beginning of 2014)
- Evaluation of neutron damage effects within a full simulation framework
- Commissioning of triple cluster prototype (2014)

For target system see poster by S. Bleser.
For full experiment see the talk by A. Sanchez Lorente

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