A high resolution germanium detector array for hypernuclear studies at P̄ANDA

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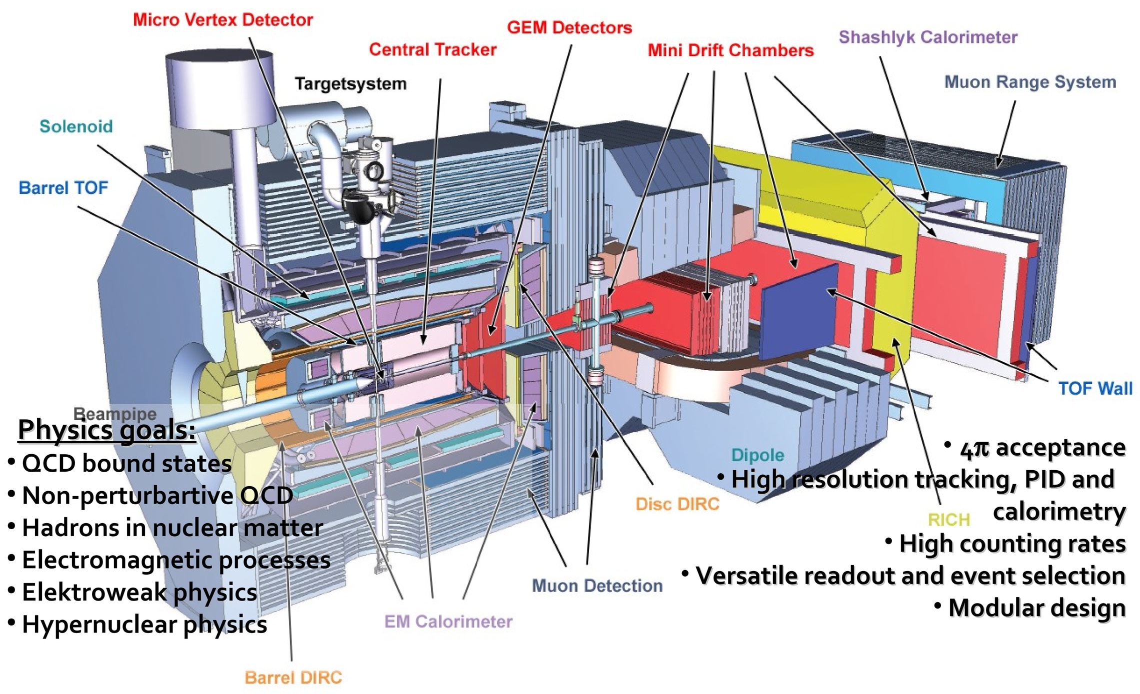
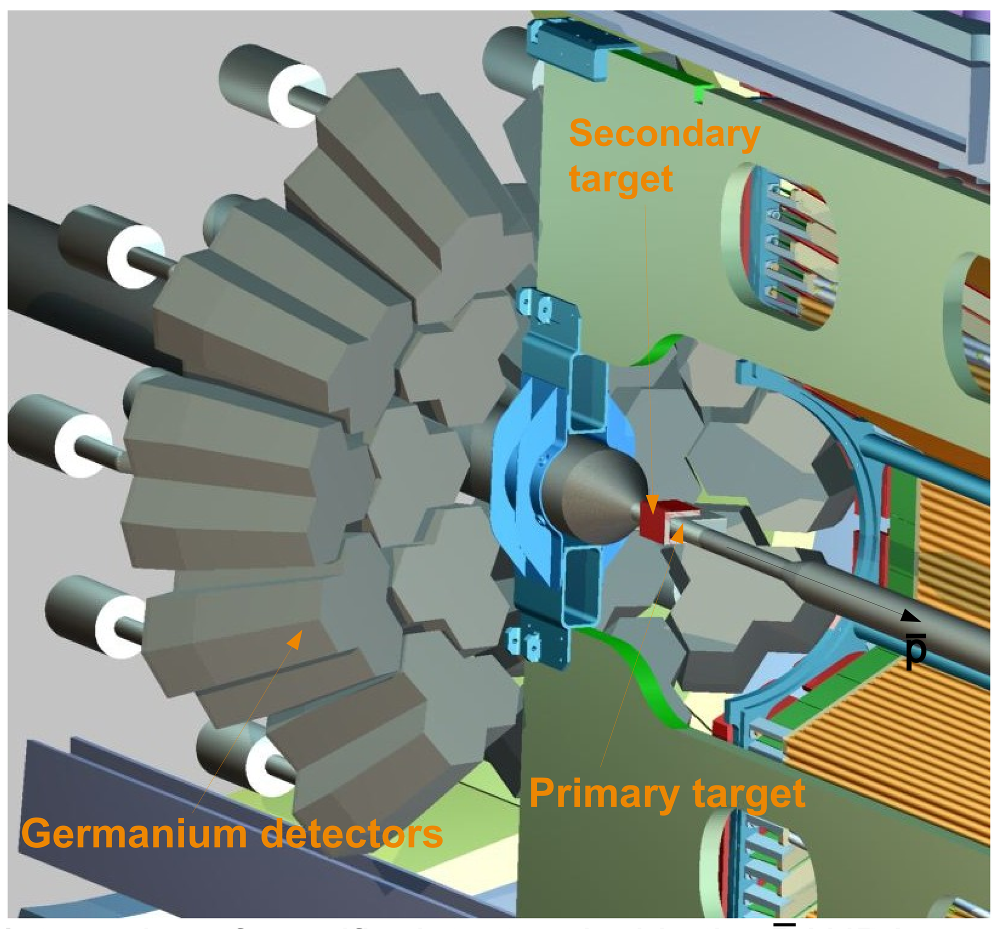
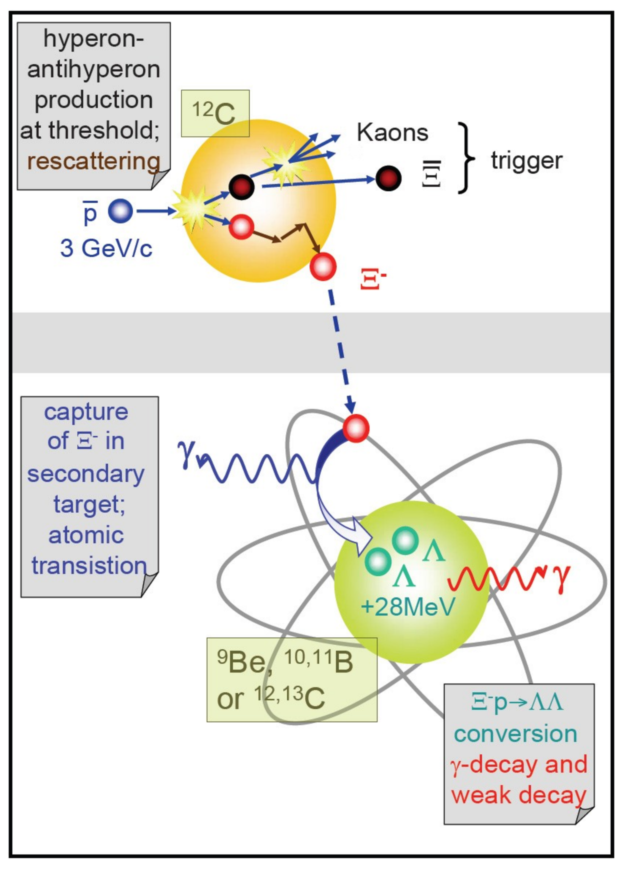


The P̄ANDA spectrometer in standard configuration

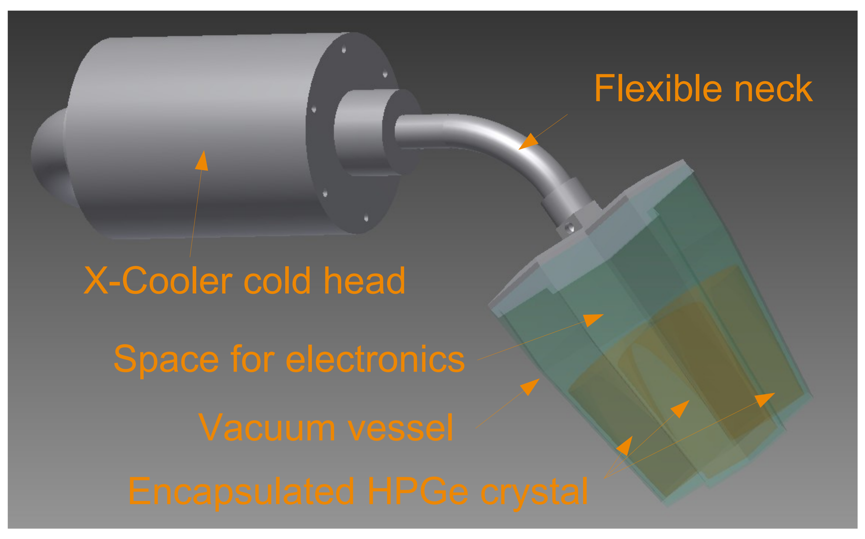


Integration of specific detectors inside the P̄ANDA barrel spectrometer to study Double-Λ-Hypernuclei

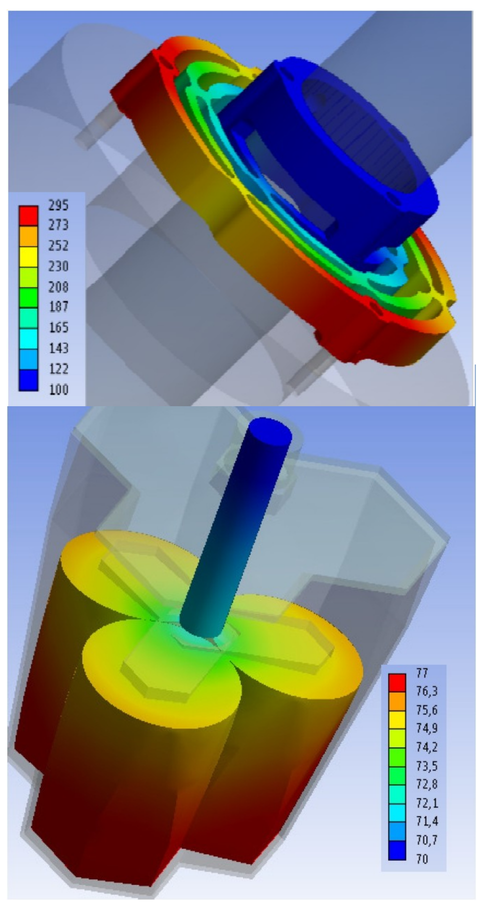


Production process of Double-Λ-Hypernuclei at P̄ANDA

Design of the triple cluster detectors

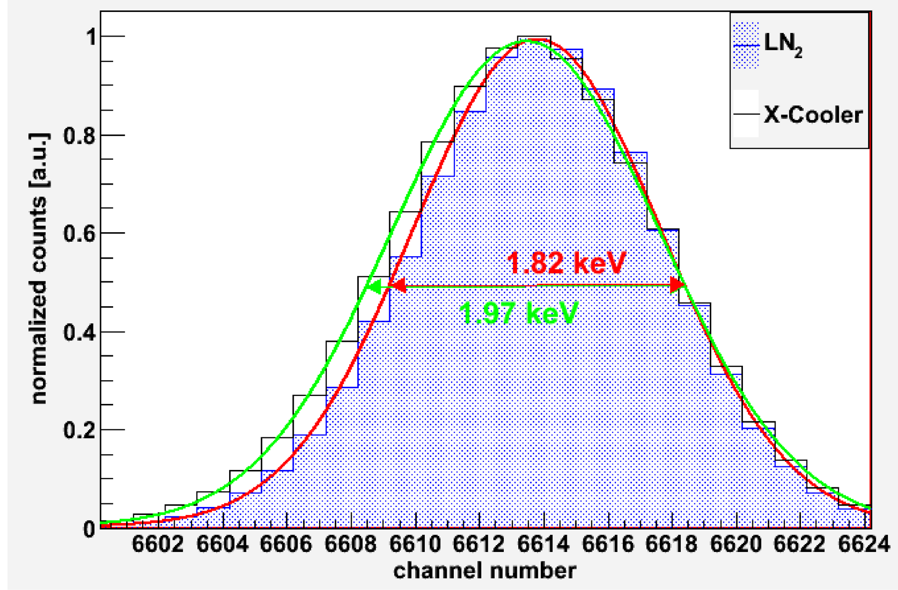


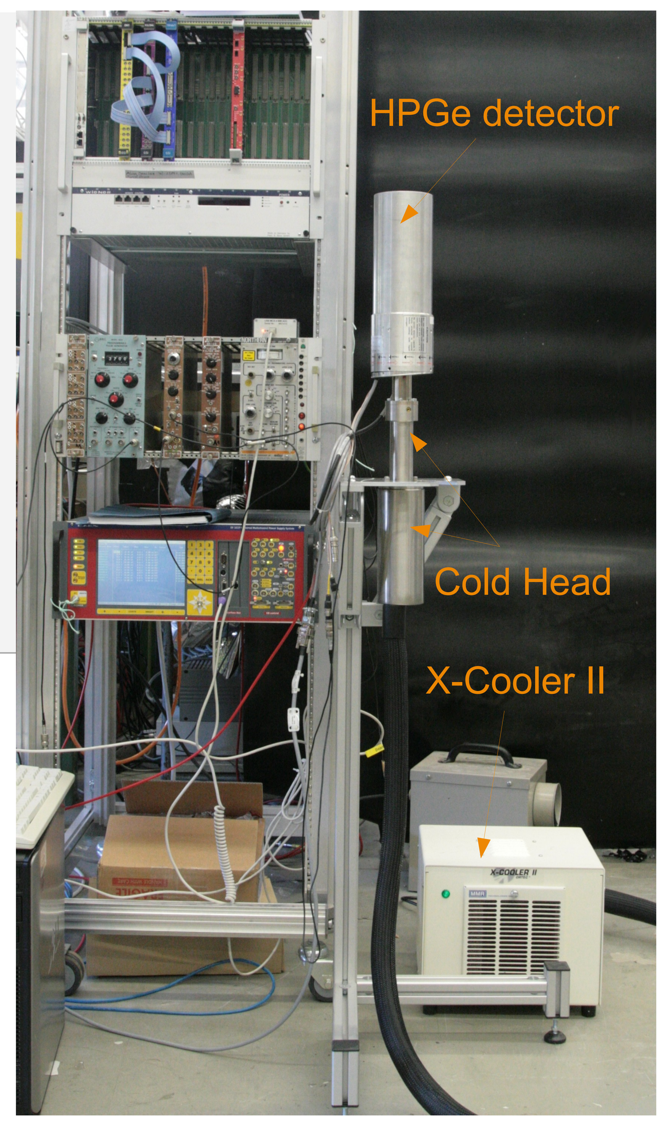
Design of a detector with three crystals



Simulation of the thermal capabilities of the planned design

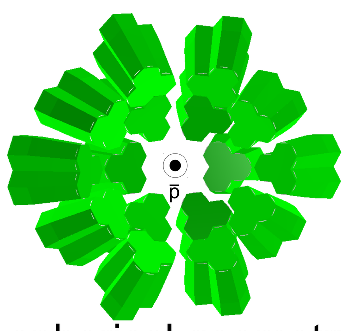
Test of the electro-mechanical cooling system



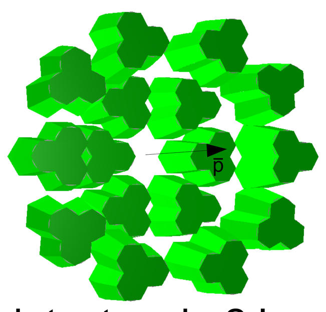


The limitation of space inside the PANDA barrel spectrometer makes an standard LN_2 cooling unfeasible. An electro-mechanical Cooler (Ortec X-Cooler II) can be placed outside of the spectrometer and connected by tubes. The resolution (60Co@1.332 MeV) of a detector with such a device was measured. A worsening of 8 % due to an higher crystal temperature (110 K; LN_2 77 K) was observed.

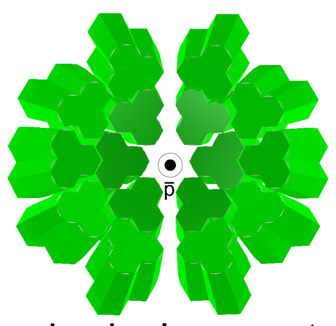
Simulation of the detector array



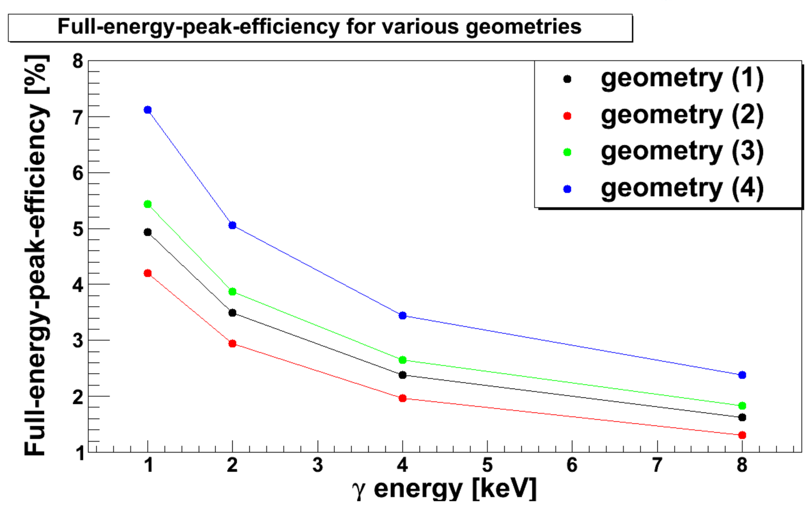
spherical geometry (1)
r = 30 cm



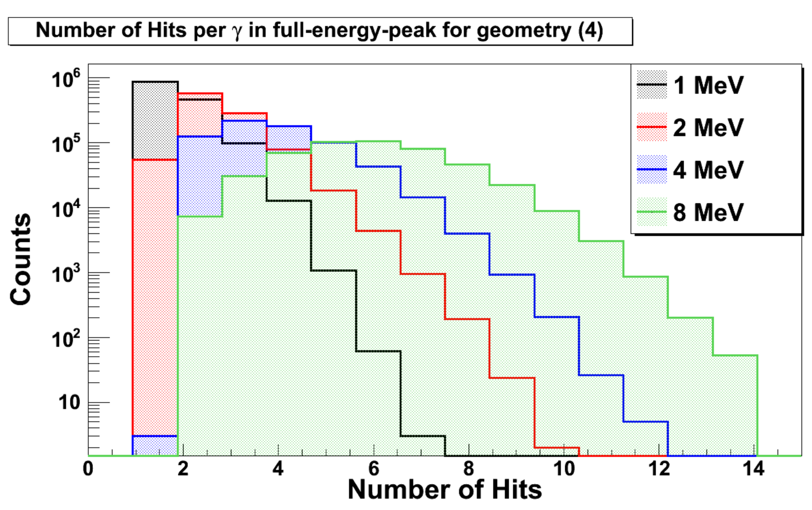
detectors in 2 layers (2)



spherical geometry r = 40 cm,
+10 cm offset in beam direction (3)
+20 cm offset in beam direction (4)

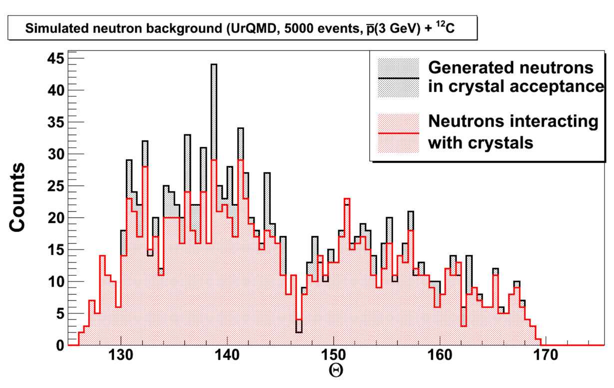


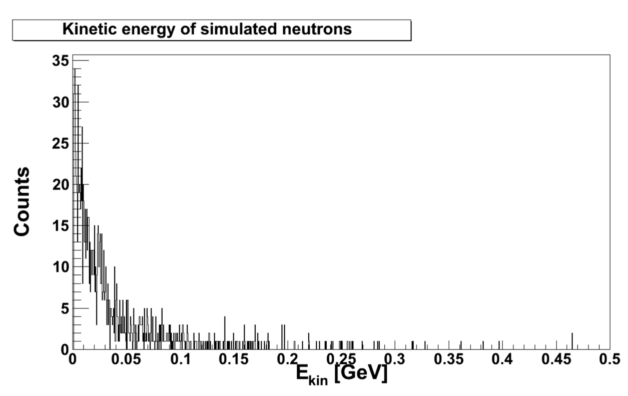
The efficiency of various geometries is compared by simulation of γ in the expected energy range of 1 to 8 MeV. The number of crystals hit raises significantly with the energy of the simulated γ.



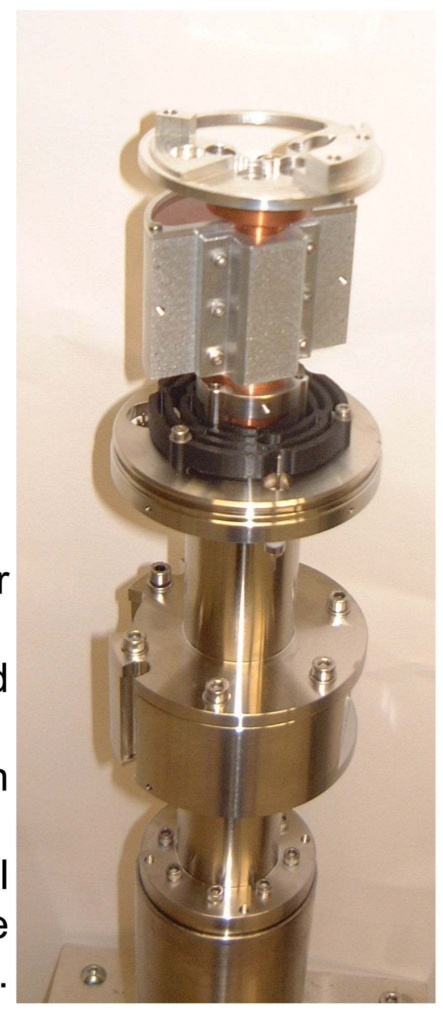
Ongoing activities

Background studies will be performed to further optimize the arrangement of germanium detectors with respect to e.g. the γ-efficiency and the background rejection.





Assembly of a detector with improved cryostat. This detector will be used to verify the thermal capabilities. Radiation tests will be performed with this detector. Digital readout using pulse shape analysis will be used.



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