Status Report

- Germanium Activities

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Panda LIV. Coll. Meeting, GSI, 09/08/15
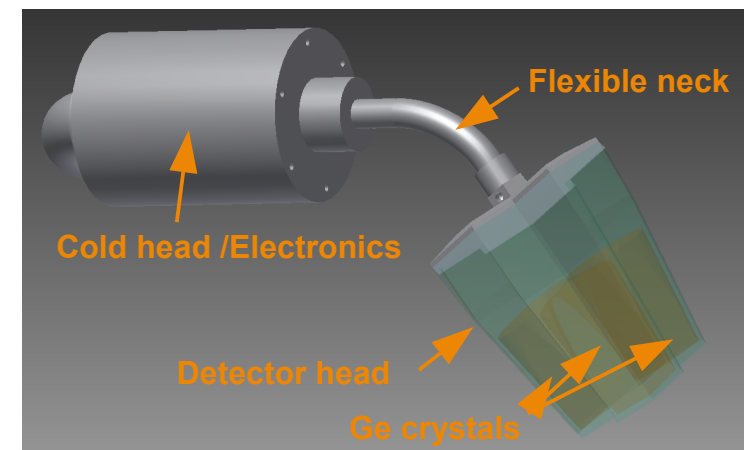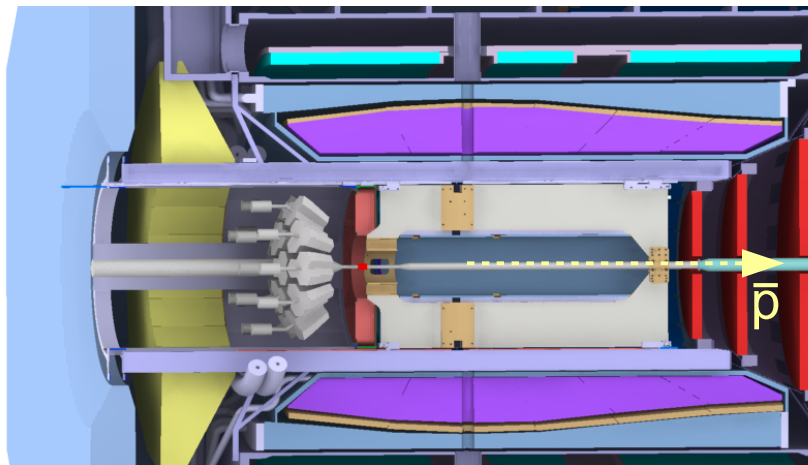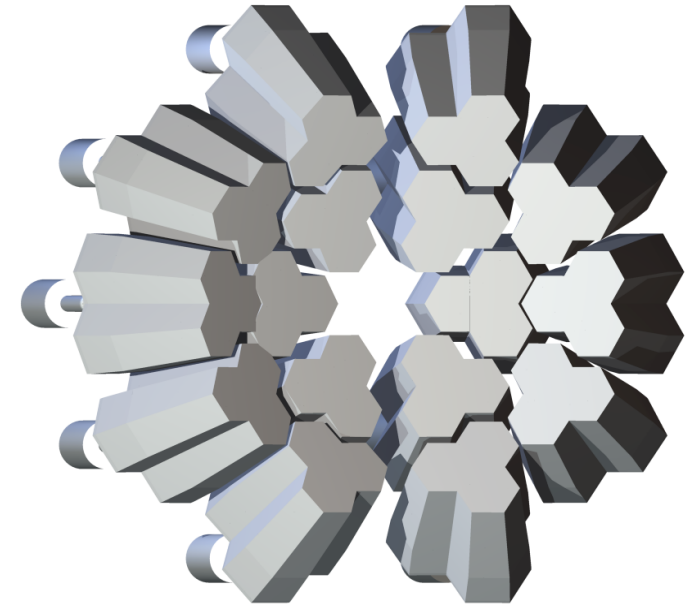
Outline

- Electronics

- Studies for hyper atom experiment

Germanium setup (reminder)

- 48 Euroball crystals
- Triple cryostats
- e.-m. cooled
- Backward angles

Flexible neck

Cold head /Electronics

Detector head
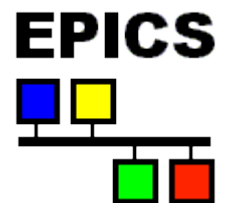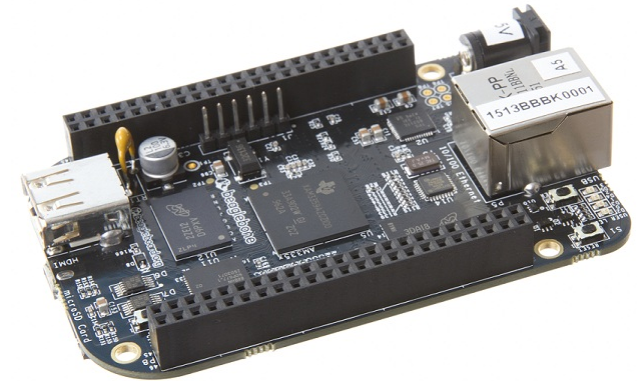
Ge crystals

$\bar{p}$

Electronics: DAQ

- Work on new pre amplifier has started, main features:
    - Active reset
    - Remotely adjustable amplification
    - Diff. and sigle ended output
- Digitalization via NanoMCA or FEBEX
- Unfortunately nothing to show yet

Electronics: Slow control

- Slow control via Beagle Bone Black + piggyback board
  - monitor all supply voltages
  - Set and monitor HV
  - Monitor temperatures
  - Set amplification

- 1 BBB per Cluster

- EPICS (PandaDCS) compatible, Florian is helping us

- HadCon2 as backup

Electronics: Slow control (2)

- BBB already in use to control linear piezo actuators of primary target

- Possible flaw for Germaniums: radiation hardness

    - Backward angles

   - Shielded by crystals and cryostat

    - Needs testing
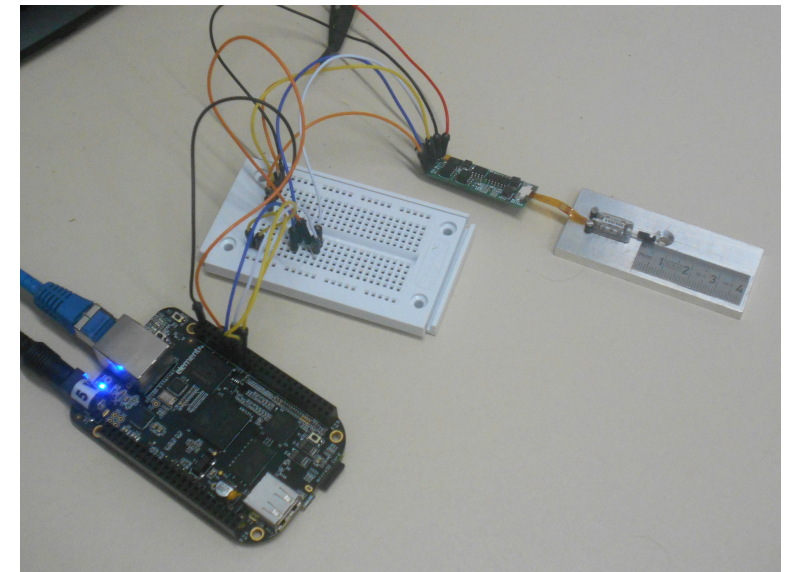
Hyper atoms

- Atom with Ξ^- in atomic shell

- Study interaction of Ξ^- and nucleus

- Cascade of Transitions → Coincidence of γ's

- High Z targets necessary for measurable γ energies

- E_x is the last transition in the cascade before annihilation

- First studies with iron and tantalum

Target	F	Cl	Sn	I	Pb
Transition	$4F \rightarrow 3D$	$5G \rightarrow 4F$	$8J \rightarrow 7I$	$8J \rightarrow 7I$	$10L \rightarrow 9K$
E_x (keV)	131.29	223.55	420.25	474.71	558.47
Y	0.31	0.37	0.76	0.43	0.58
Shift (keV)	1.56	1.84	0.67	2.79	1.73
Width (keV)	0.99	1.14	0.43	2.21	1.26

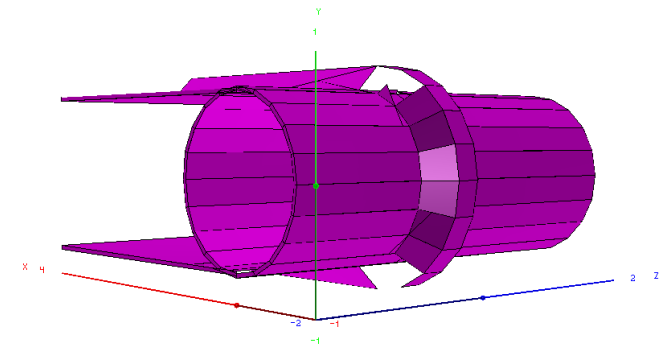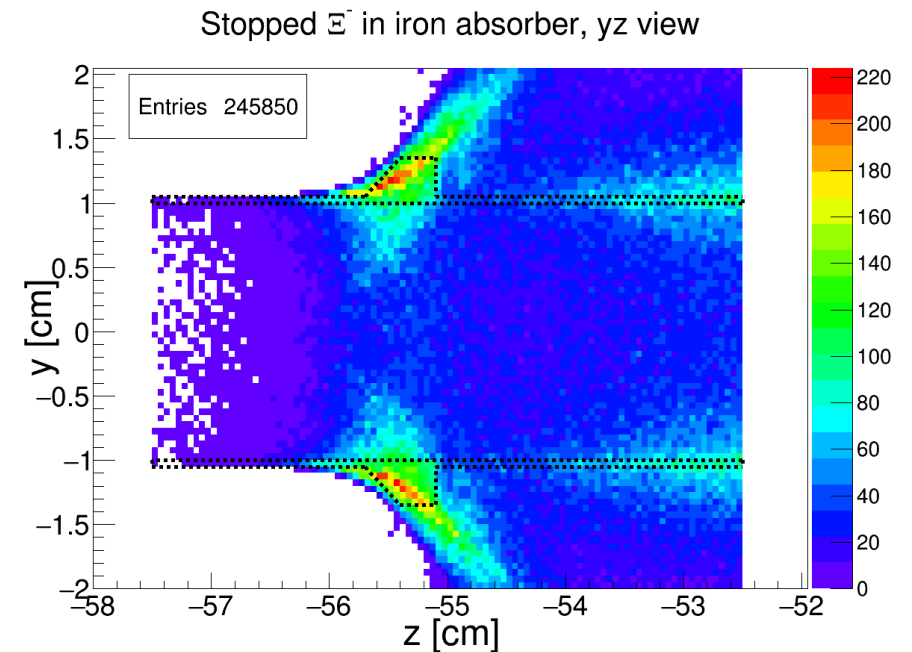*C. J. Batty, E. Friedman, and A. Gal, Phys. Rev. C 59, 295*

Hyper atoms (2)

- Production of Ξ^- as in hyper nuclear experiment GiBUU, 3 GeV/c $\bar{p}$

- Secondary Target has to be adapted

- Single big absorber

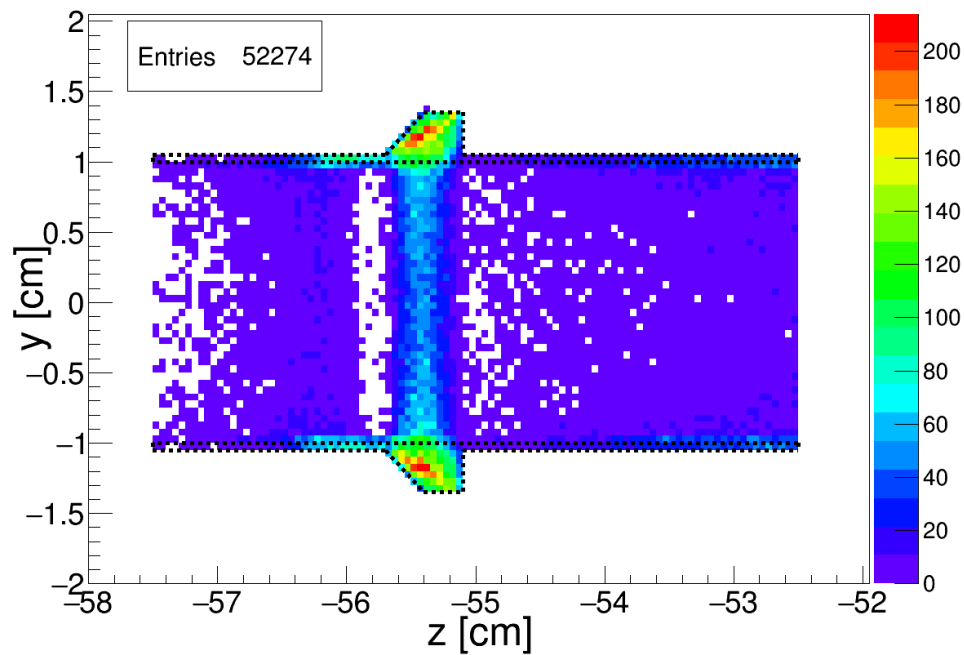- No Si trackers or pion tracking taken into account yet!
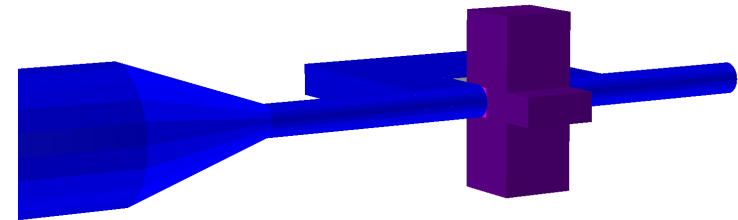
Hyper atoms (3)

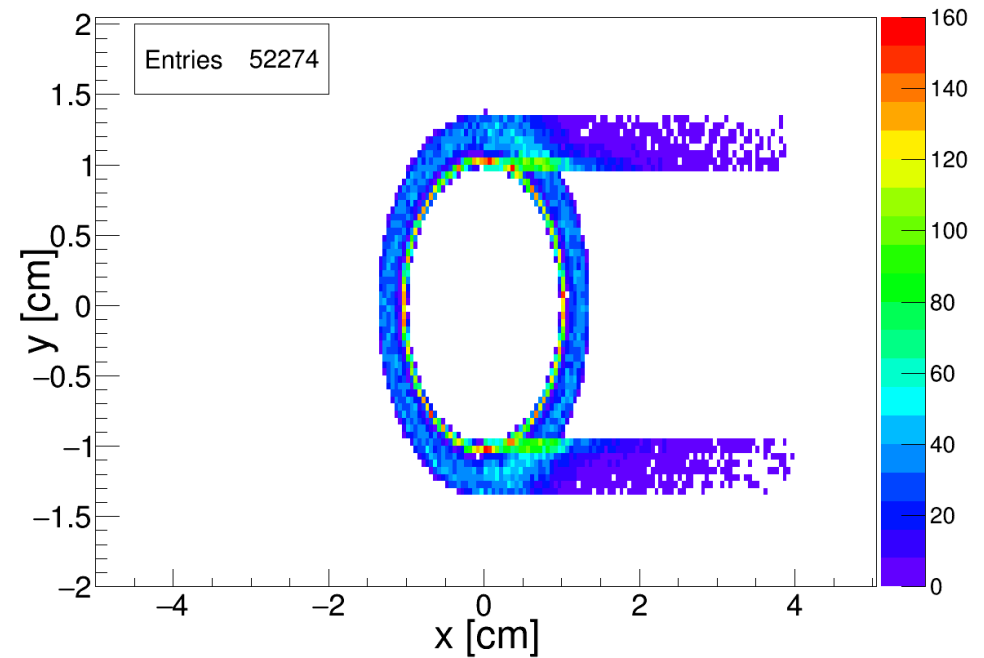- γ absorption in big target to high

- Cut on important areas of Ξ⁻ stopping

Stopped Ξ^- in iron absorber, yz view

Entries   245850

Hyper atoms (4) - iron

Stopped Ξ^- in iron absorber, yz view

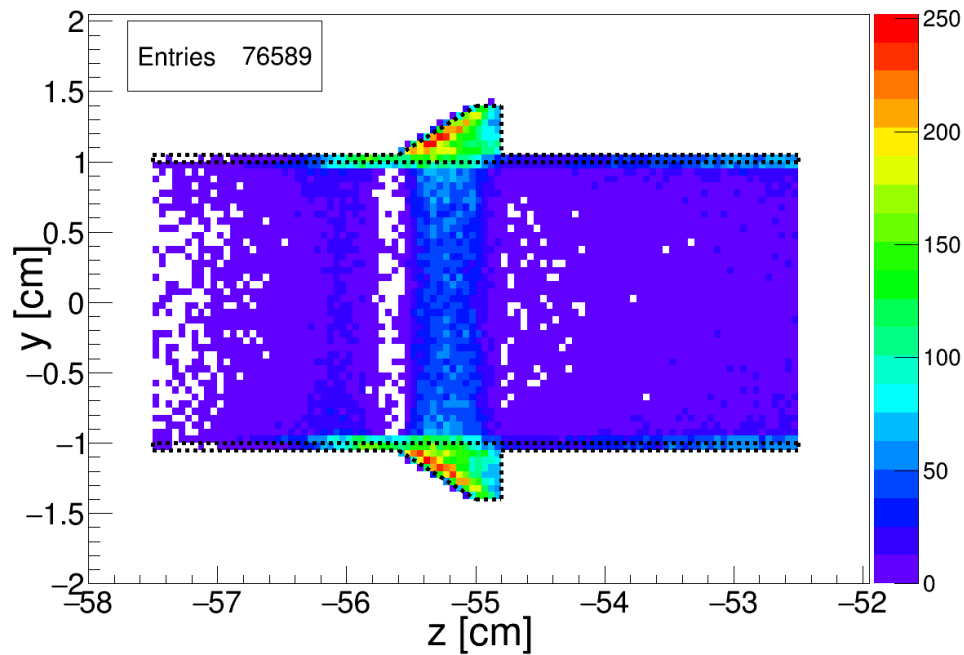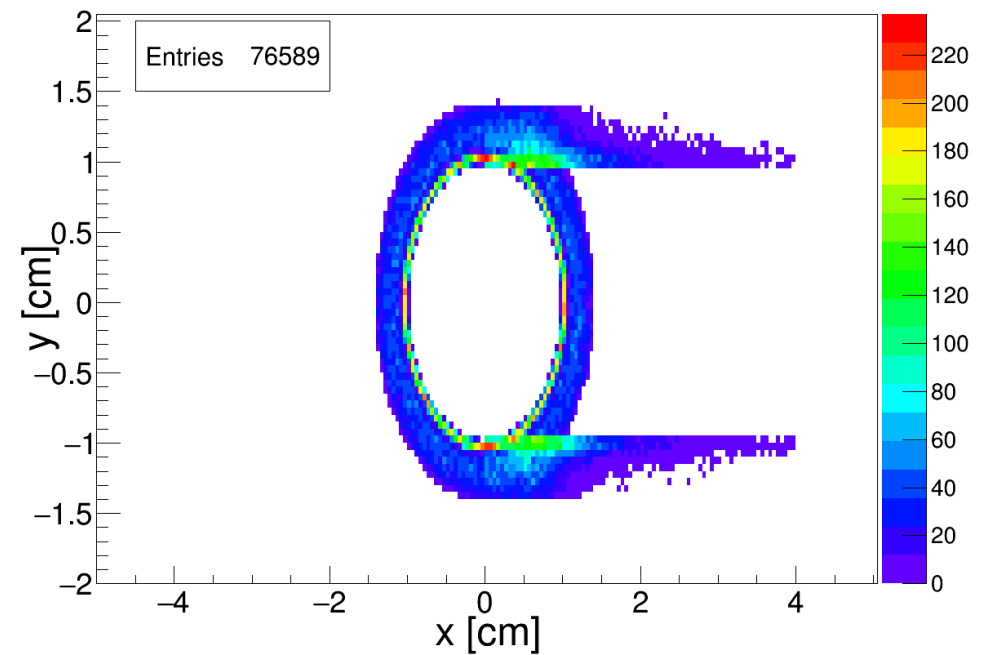
Stopped Ξ^- in iron absorber, xy view

$10^7 \; \Xi^-$ simulated

Stopped Ξ^- in tantalum absorber, yz view

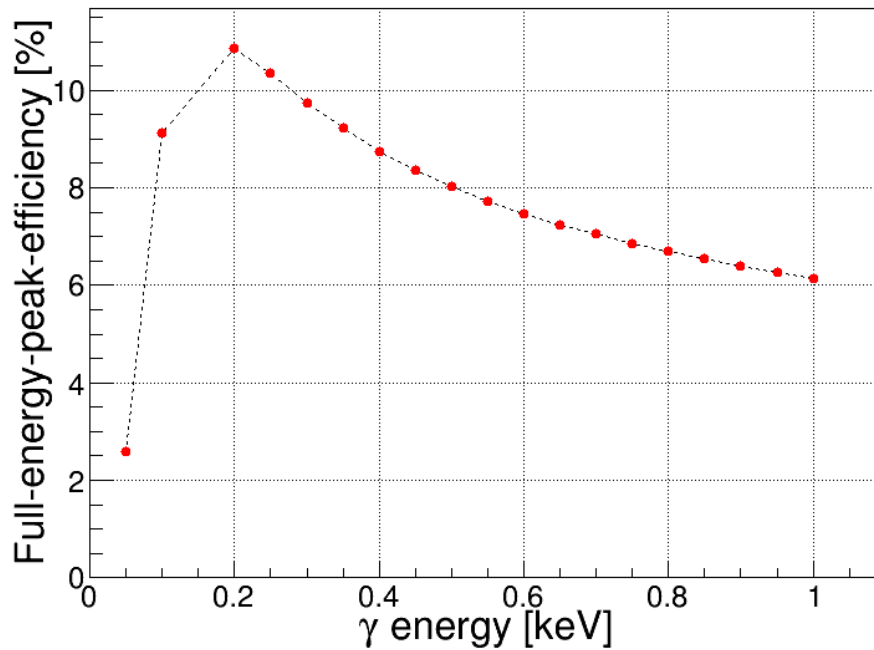Stopped Ξ^- in tantalum absorber, xy view

10^7 Ξ^- simulated
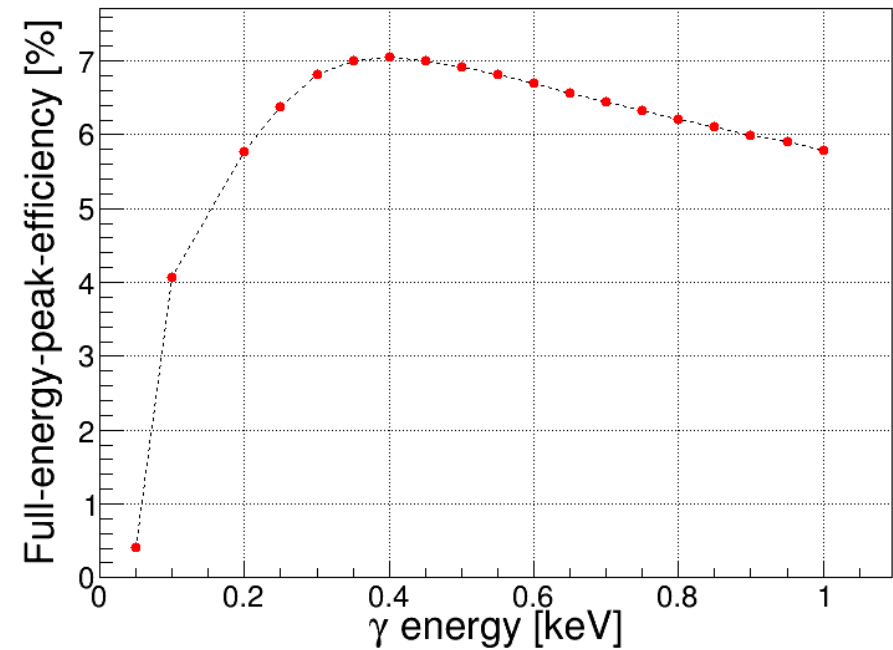
Simulation of full-energy-peak-efficiency, iron target

Simulation of full-energy-peak-efficiency, tantalum target

Hyper atoms (5) – numbers

- Figure of Merit:
  $$\text{FoM} = \text{stopEff}_\Xi * \text{PeakEff}_\gamma^2$$

Material	StopEff$_\Xi$ [%]	PeakEff$_\gamma$ @ 300 keV [%]	FoM [10^{-6}]
Iron	0.52	9.7	49
Tantalum	0.77	6.8	35

- 10^7 Ξ^- ~ 1,1 day → maximum
  ~0.5*FoM events /day
  (110 Ξ^- /s, GiBUU S.Bleser, Uppsala
  Talk; 5 % capture prob.)

- ALL OTHER FACTORS
  NEGLECTED!!!

- Geometries not optimized!

Summary / Outlook

- Work on electronics has started
- BBB and EPICS will be used

- First studies for hyper atomic experiment
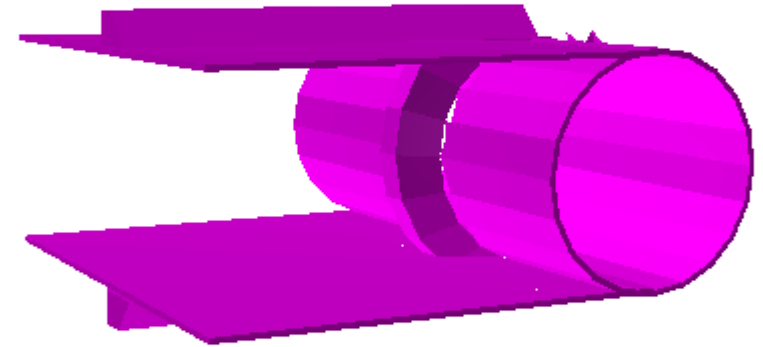- Numbers seem promising

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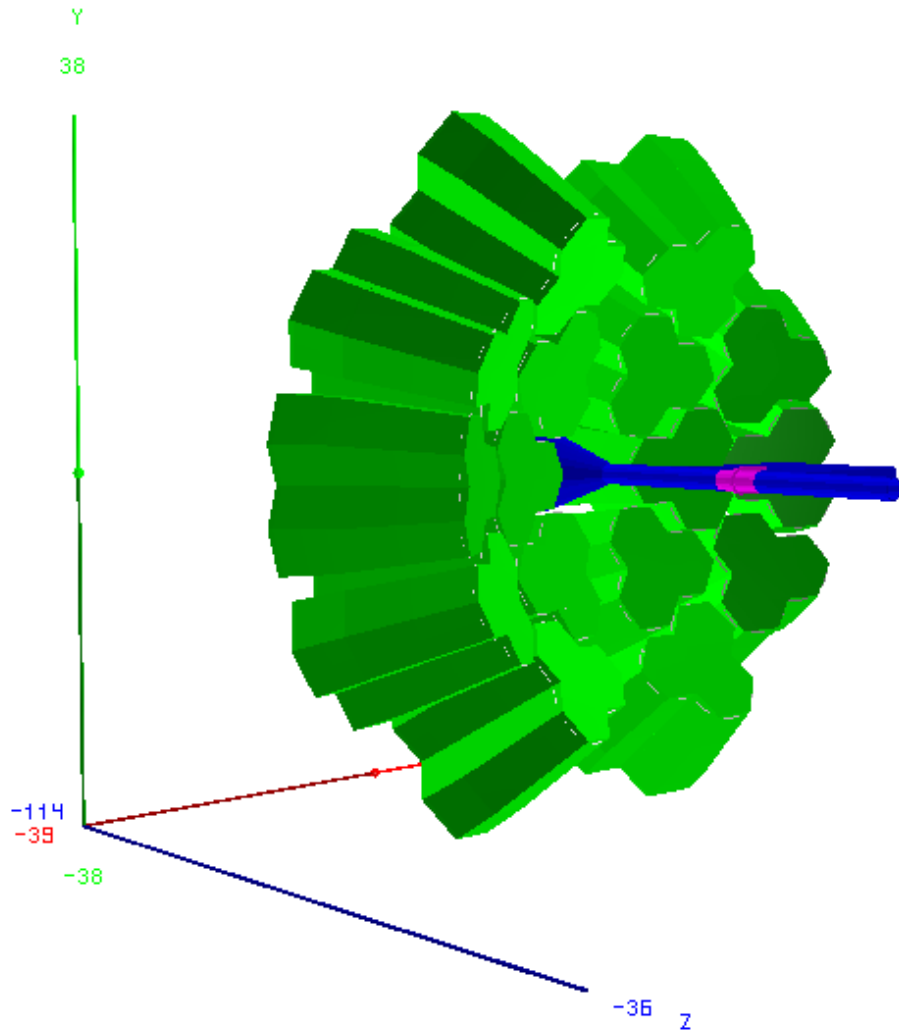- First studies for hyper atomic experiment
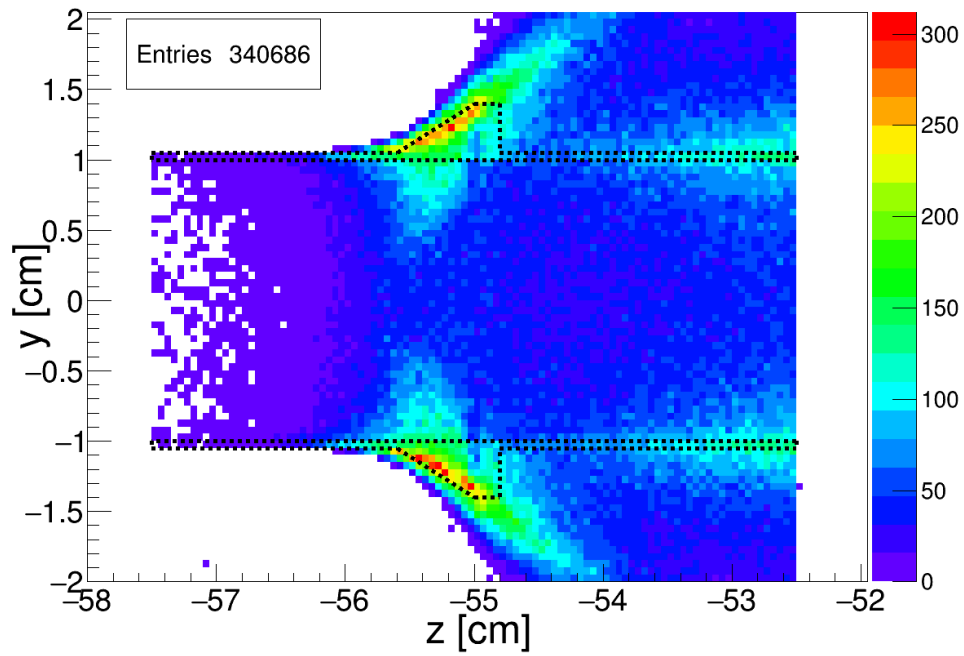- Numbers seem promising

Thanks for your attention
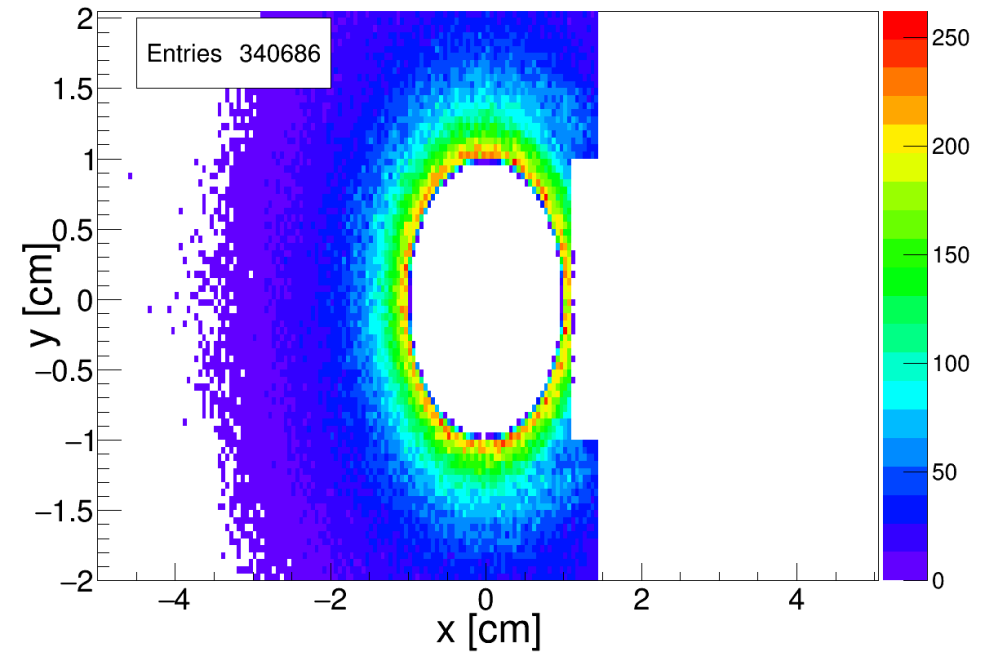
Backup slides

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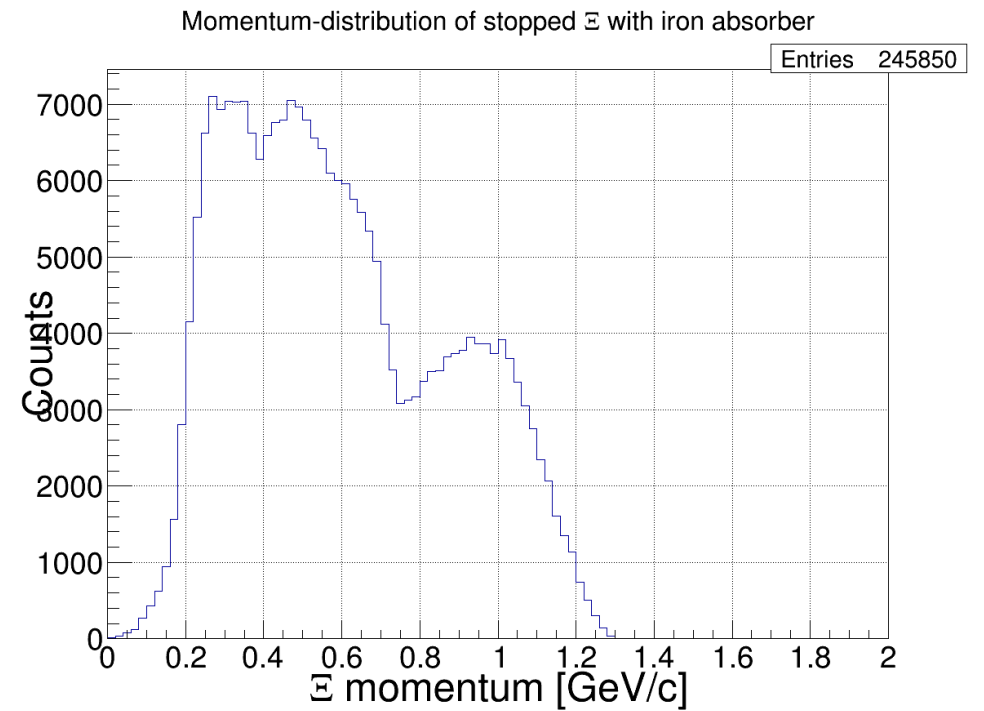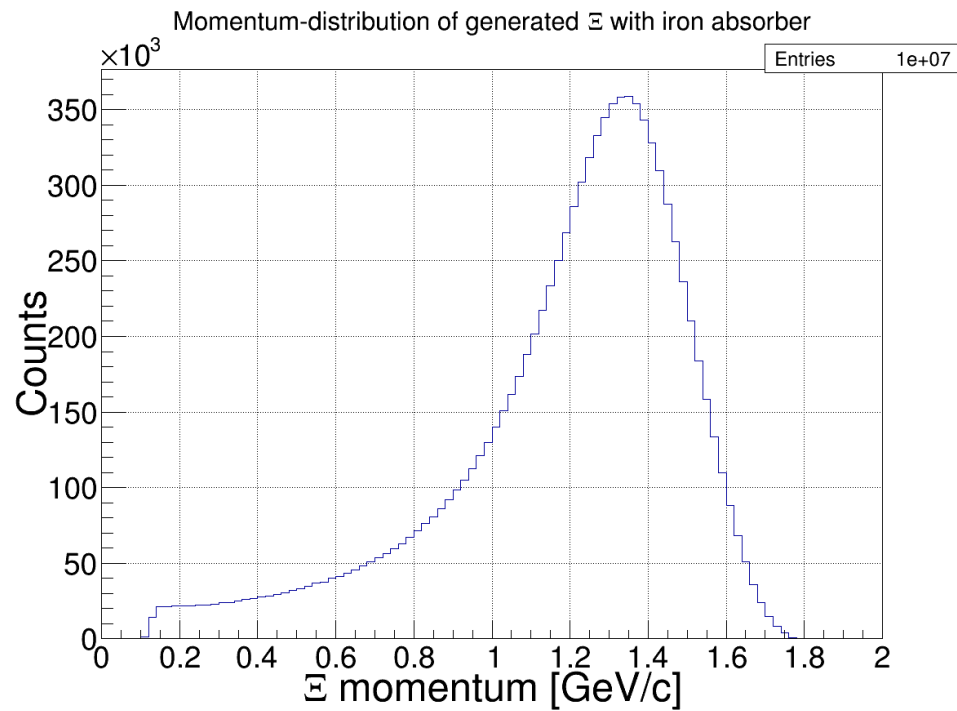

Stopped Ξ^- in tantalum absorber, yz view

Stopped Ξ^- in tantalum absorber, xy view

Backup slides

Momentum-distribution of generated Ξ with iron absorber

Momentum-distribution of stopped Ξ with iron absorber

Backup slides

Stopping probability-momentum-distribution with iron absorber