



Towards the EDM Polarimetry

Spokespersons: I. Keshelashvili, B. Lorentz

CBAC 2016 | Exp. No.: E002.3

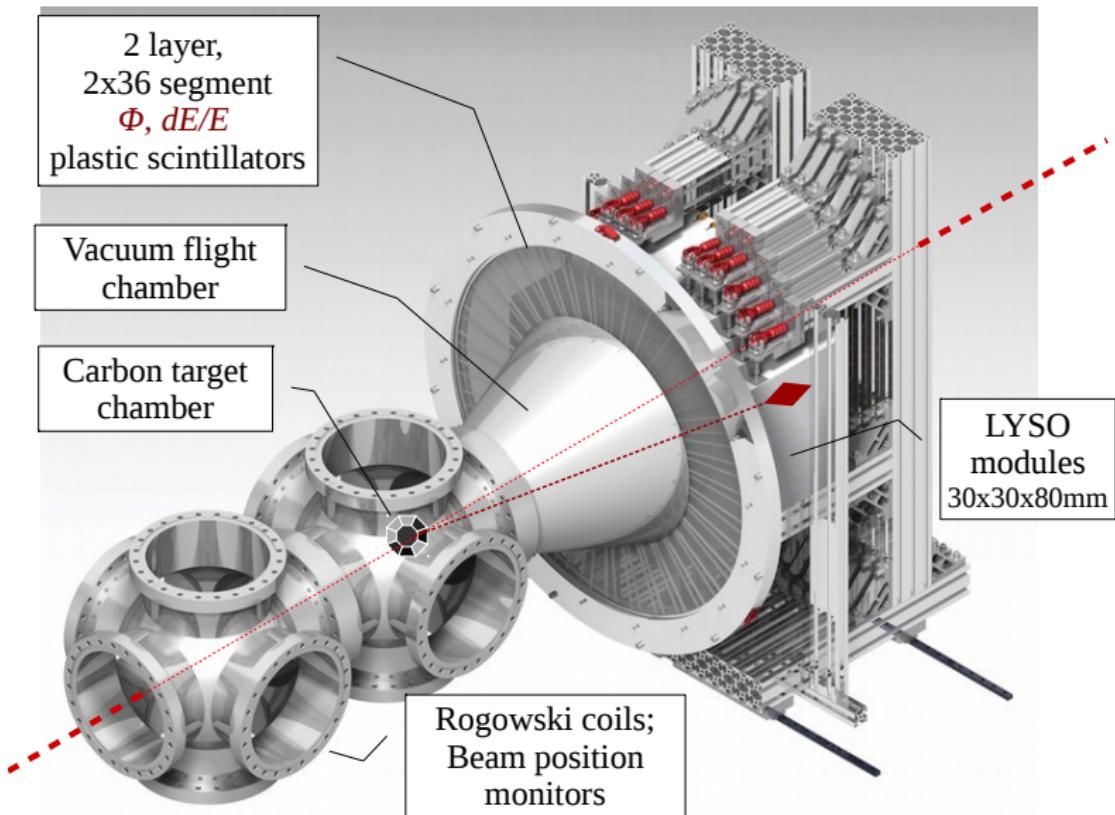
December 19th, 2016 | Irakli Keshelashvili |

- Introduction
- Very Fresh/Hot Results
 - beam time ended today morning at 7:00am :)
- Proposed Experiment

JEDI Polarimeter



Current Design



- Combined test of the read-out electronics with the detector modules to verify the performance of the whole prototype system
FEE, DAQ, HV, FADC, Count-rate, ...
- Measurement / cross-check in $\vec{d}C \rightarrow dC$ of $\frac{d\sigma}{d\Omega}(\Theta)$, $A_y(\Theta)$ where $\Theta = 0^\circ \div 60^\circ$
Comparison to WASA database results.
- Direct measurement of $\frac{\sigma_{el}}{\sigma_{tot}}$ ($dC \rightarrow dC$ over $dC \rightarrow X$)
Background estimation.
- Plastic scintillator placed in front of LYSO modules testing the **dE/E** and count-rate
- Possible test of the **Micromegas & GEM** detector prototype currently being constructed in **Greece & Korea**

Beam Time

LYSO module / DAQ / Software optimization



COSY Beam Time Request

For Lab. use	
Exp. No.:	Session No.
E2.3	5

- Extracted beam
(BIG KARL)

Collaboration:

JEDI

Towards the EDM Polarimetry

- Polarized deuterons
- 5 energies of $T_d =$

100, 150, 200, 235, 270 MeV

- Low count rate
 $\sim 1 \div 50 \text{ kHz}$
- 1 Week end of 2016
(1+1 Weeks next year
→ request for next CBAC)

Spokespersons for the beam time:

Irakli Keshelashvili (Jülich)
Bernd Lorentz (Jülich)

Spokespersons for the collaboration:

Andreas Lehrach (Jülich)
Jörg Pretz (Aachen)
Frank Rathmann (Jülich)

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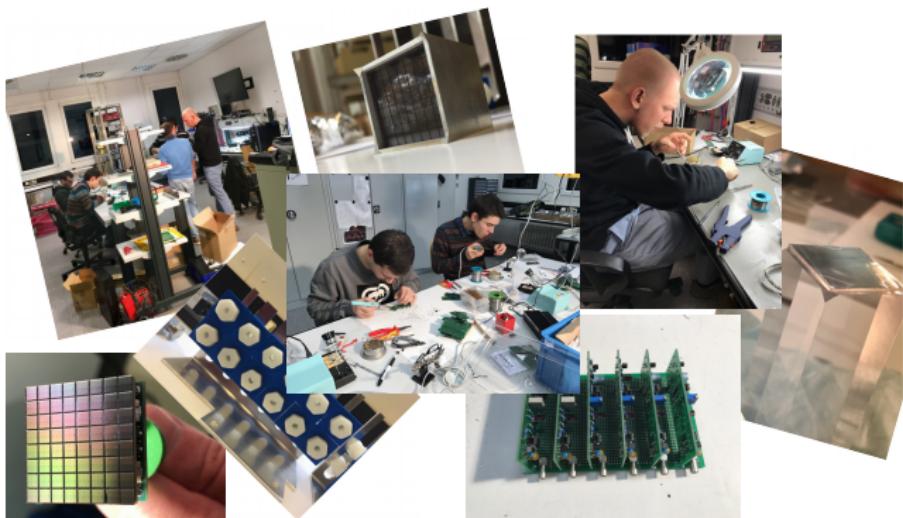
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Total number of particles and type of beam (p,d,polarization)	Kinetic energy (MeV)	Intensity or internal reaction rate (particles per second)	
Extracted beam of polarized deuterons	100, 150, 200, 235, 270 MeV	minimum needed	maximum useful
Experimental area	Safety aspects (if any)	Earliest date of installation	Total beam time (No.of shifts)
Set-up with LYSO crystals at BIG KARL area	none	1 st March 2017	1 week (+ MD)

Progress Report

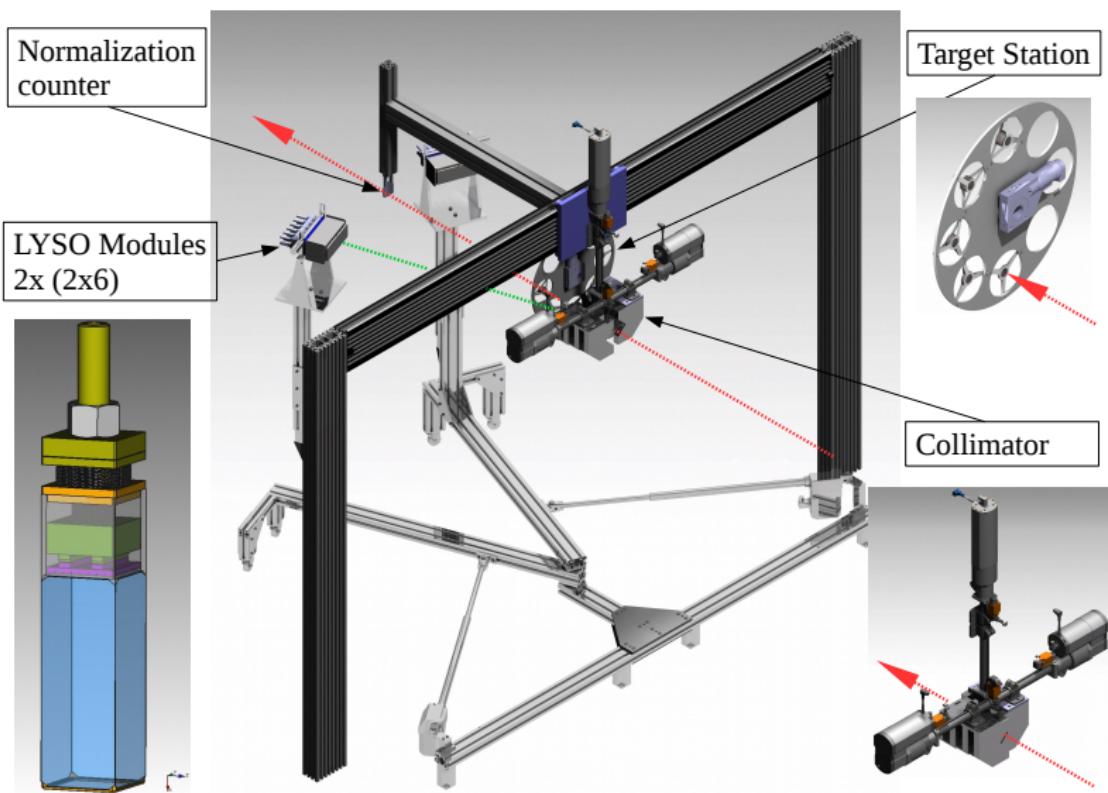
— Hardware —



— Software —

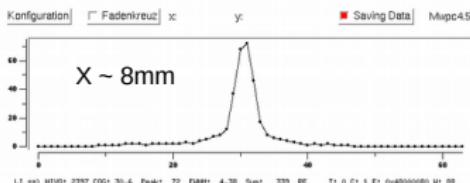
Current Beam Time

Asymmetry Measurements & Target Material Test

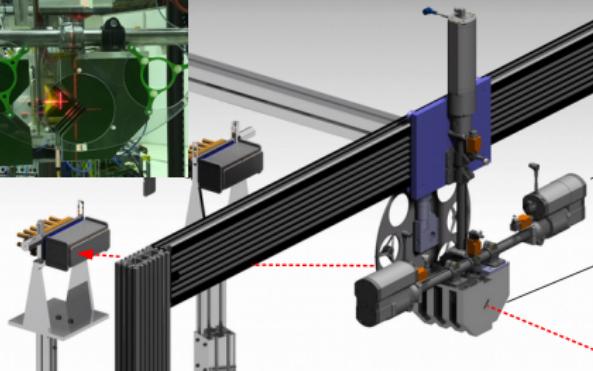
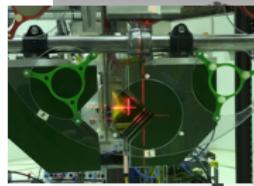
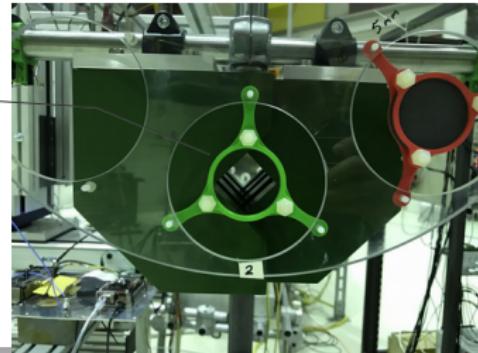
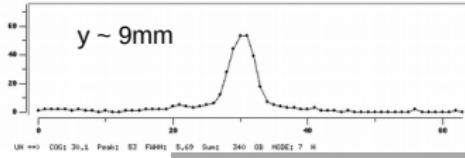


Collimator System

December 2016 Beam Time



Empty target holder

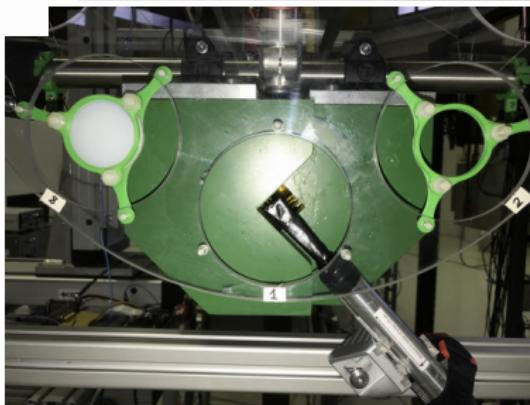
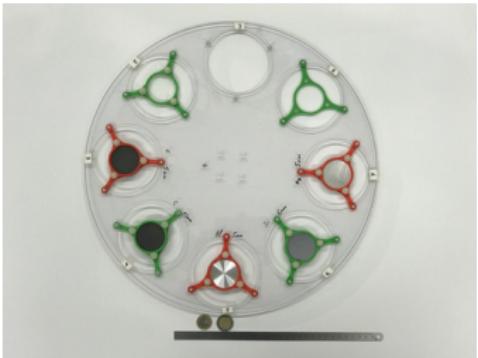
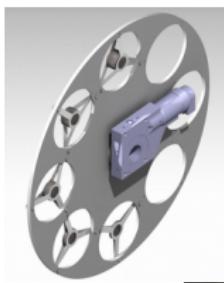
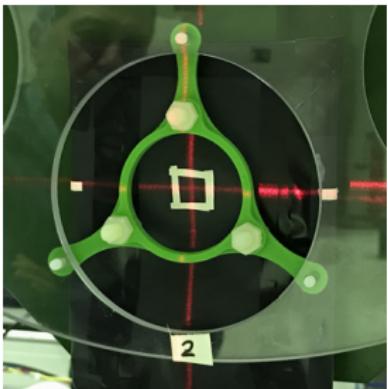


2D movement
Spot diameter

4x2.5cm Iron
collimator blades

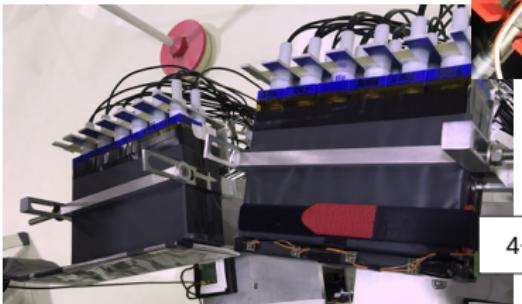
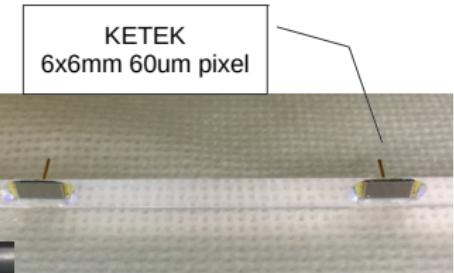
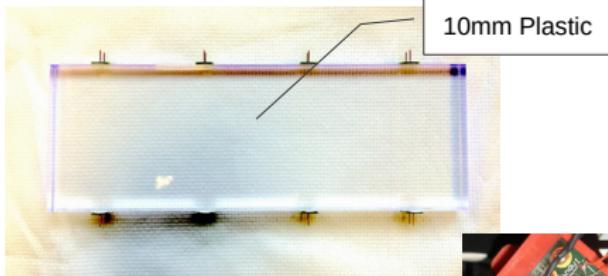
Target System + Start Counter

December 2016 Beam Time

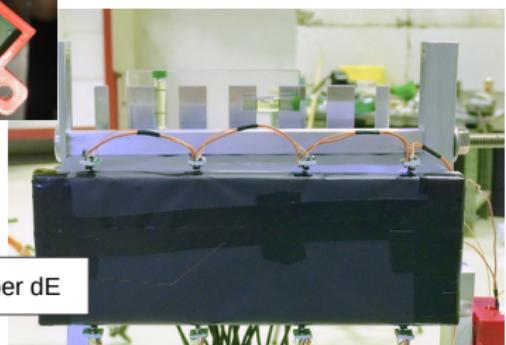


dE 10mm SiPM Scintillators

December 2016 Beam Time

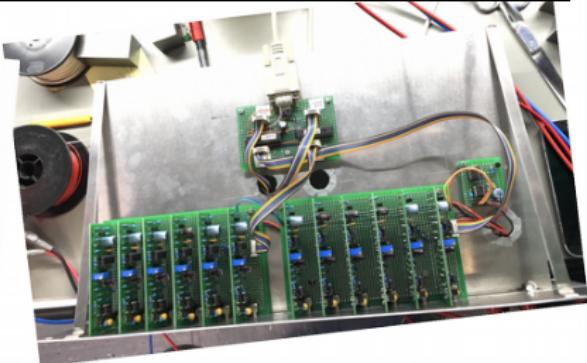
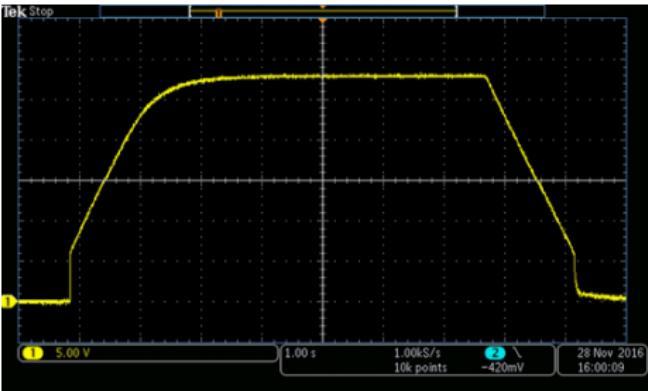
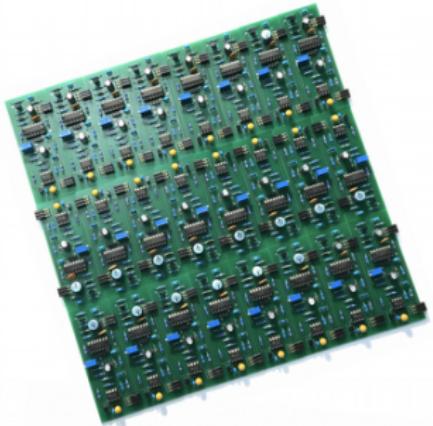


4+4 SiPM per dE



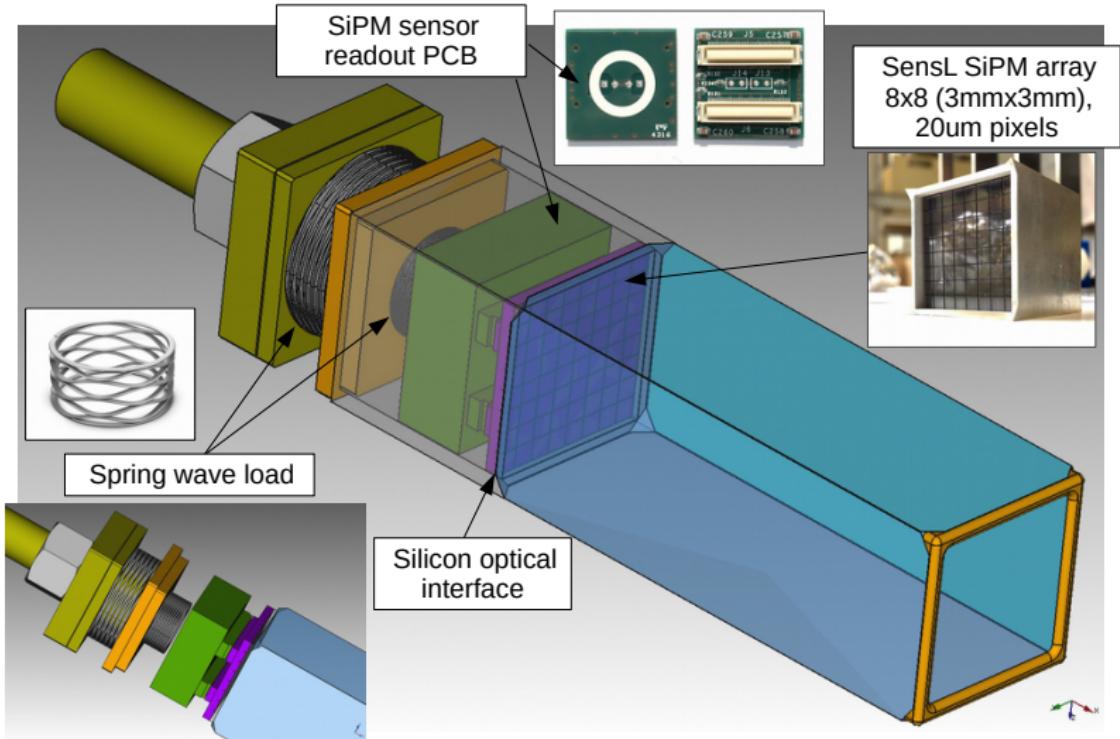
SiPM Voltage Supply

December 2016 Beam Time



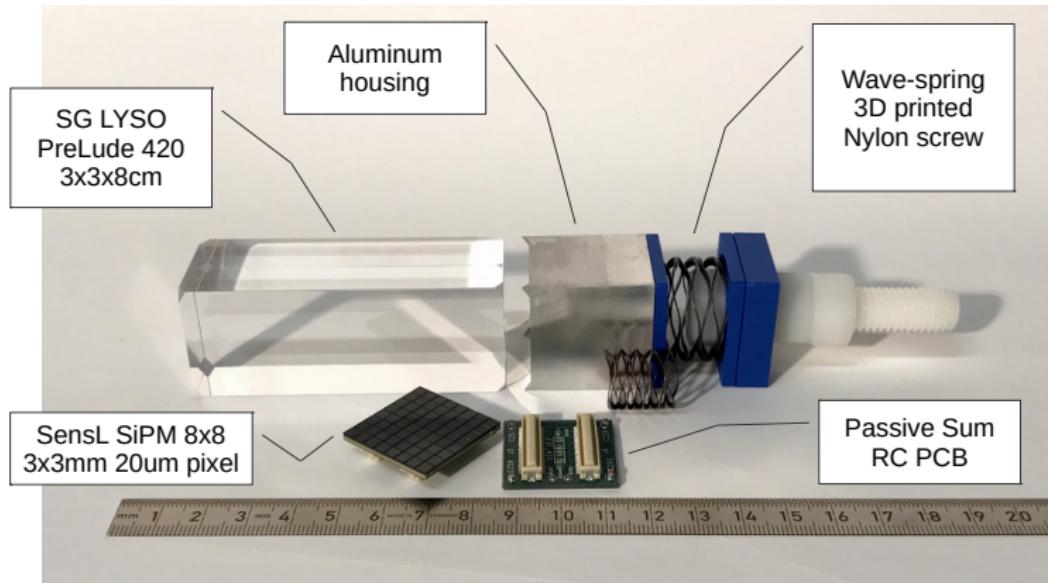
LYSO Modules

SiPM based LYSO module



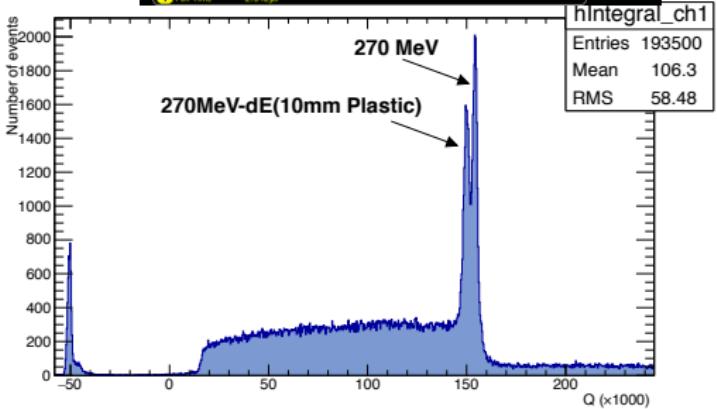
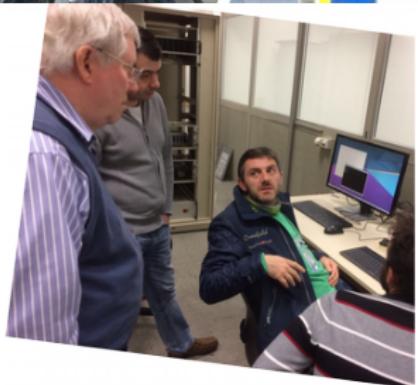
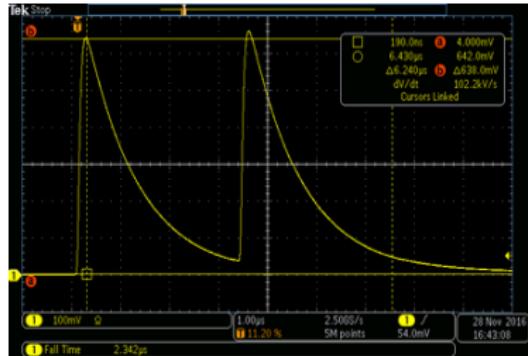
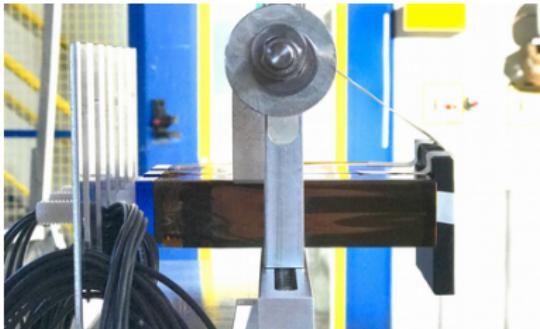
LYSO Module

December 2016 Beam Time



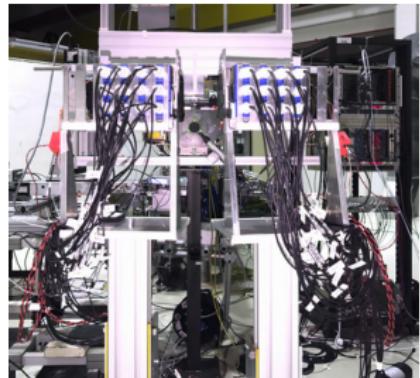
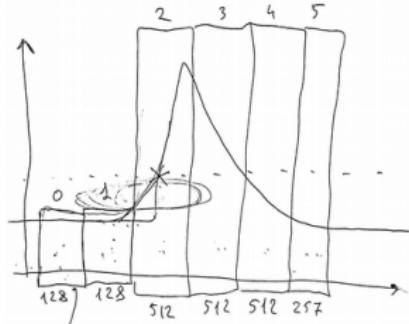
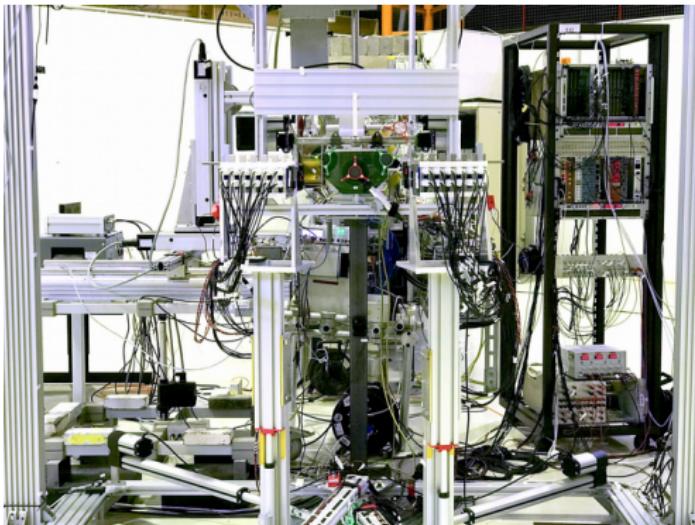
First Saturation Test

December 2016 Beam Time



Different Configurations

December 2016 Beam Time



Slow Control System



 JÜLICH
FORSCHUNGSZENTRUM

December 2016 Beam Time

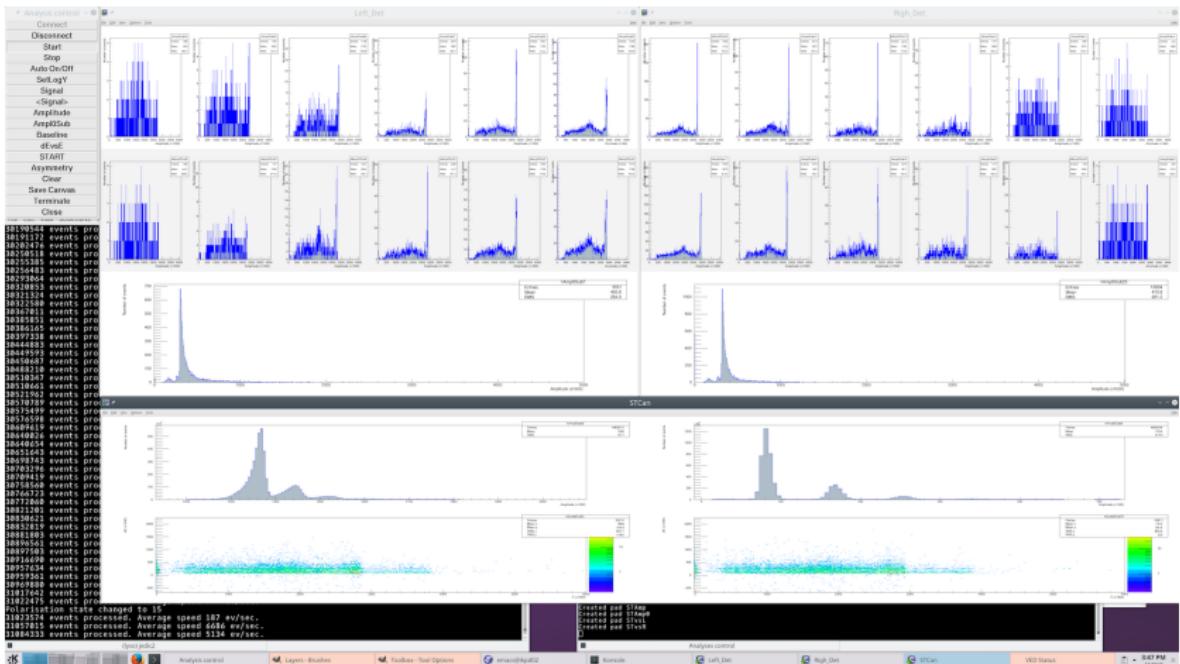
The image displays four screenshots of the LYSO Beamtime II Slowcontrol software interface. The top-left screenshot shows a close-up of a mechanical assembly with a green laser beam. The top-right screenshot shows a zoomed-in view of the laser beam hitting a target, with a grid overlay. The bottom-left screenshot shows a wider view of the experimental setup in a large hall. The bottom-right screenshot is a detailed control panel with various temperature, position, and power settings.

Online Analysis Software



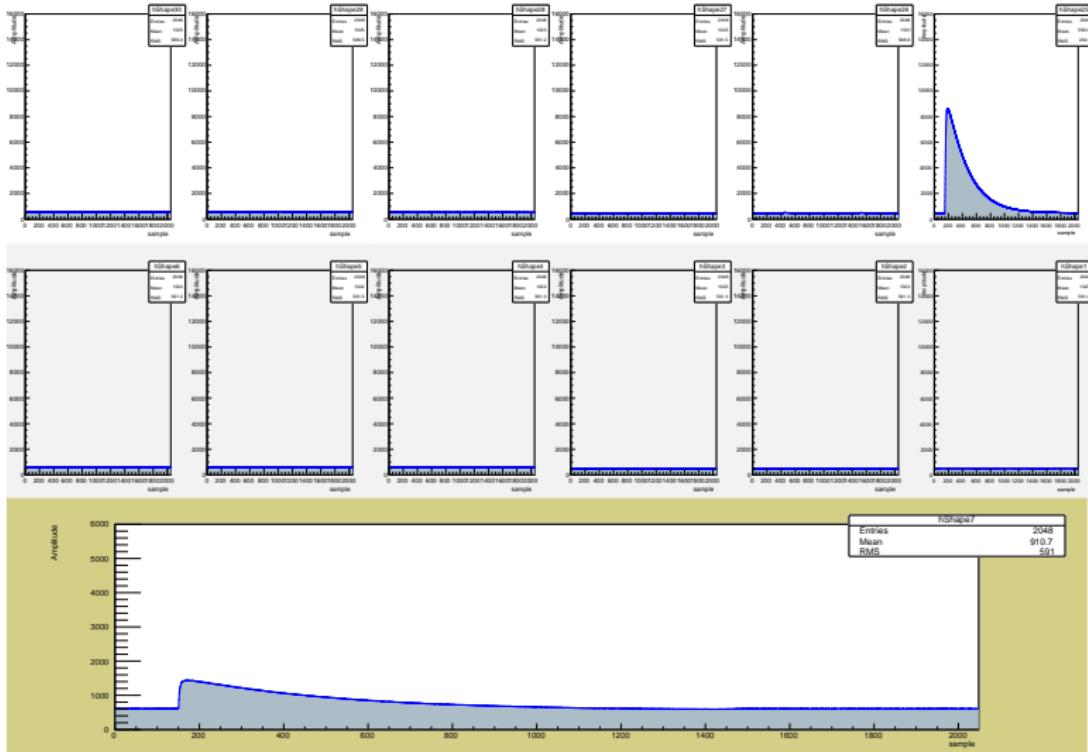
 JÜLICH
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December 2016 Beam Time



Online Monitoring

December 2016 Beam Time

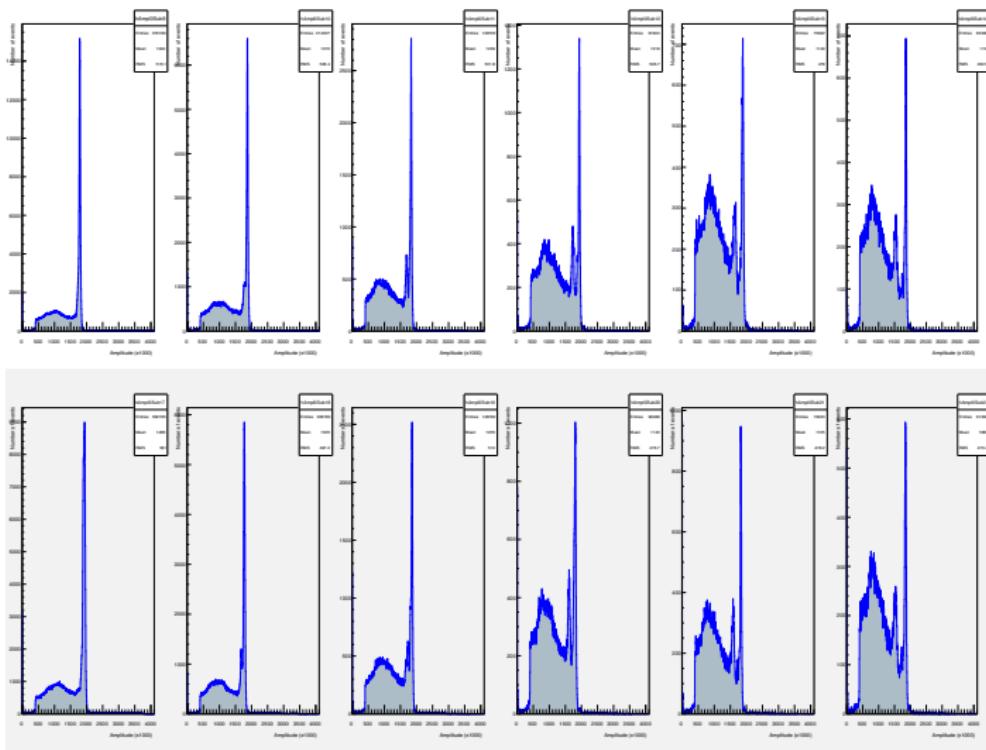


Preliminary results

December 2016 Beam Time

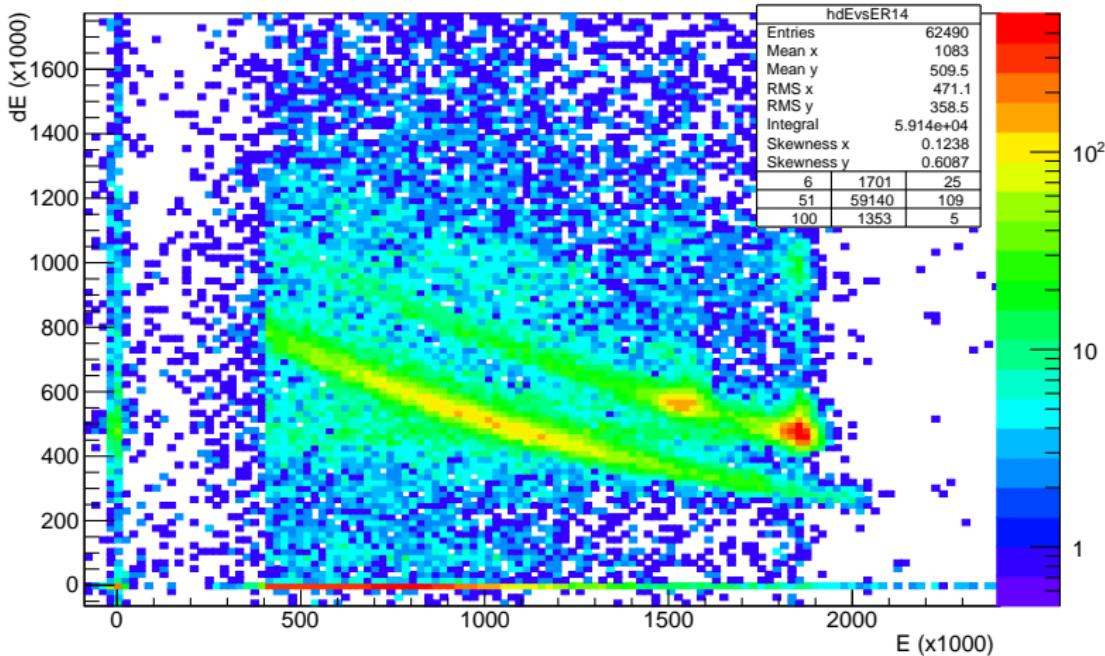


Measurement on CH_2 Polyethylene target

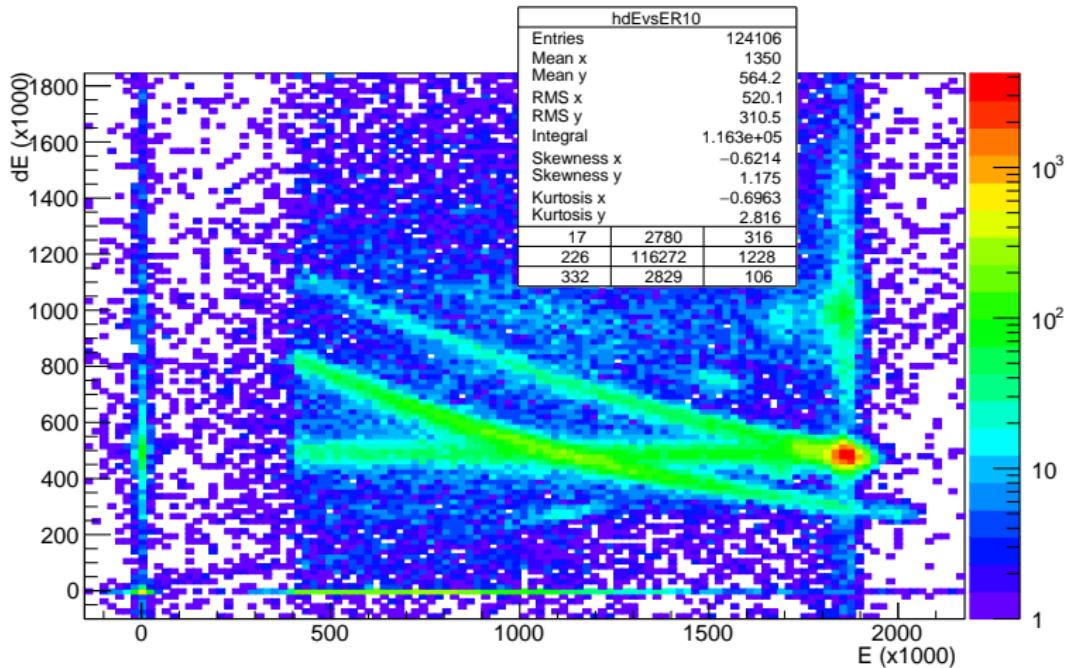


December 2016 Beam Time

Measurement on CH_2 Polyethylene target



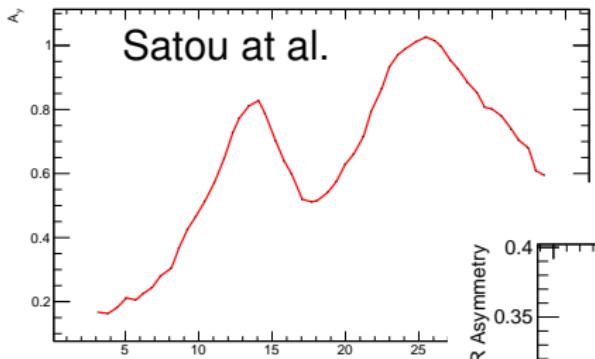
Measurement on Carbon target



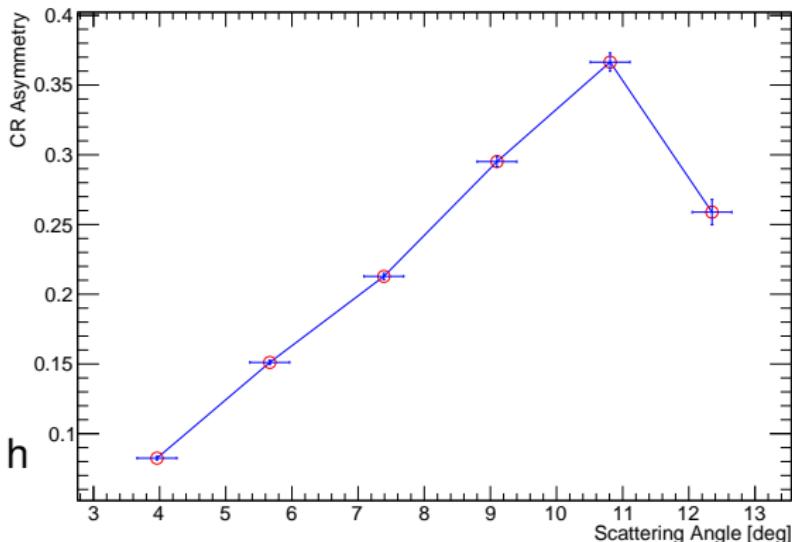
Preliminary results on A_y



Asymmetry: Cross-Ratio



$\vec{d}C \rightarrow dC$ at $T_d = 270$ MeV

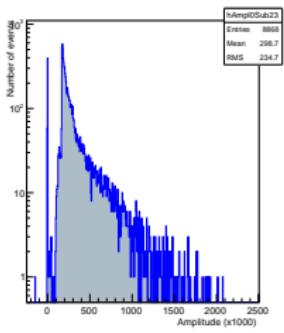
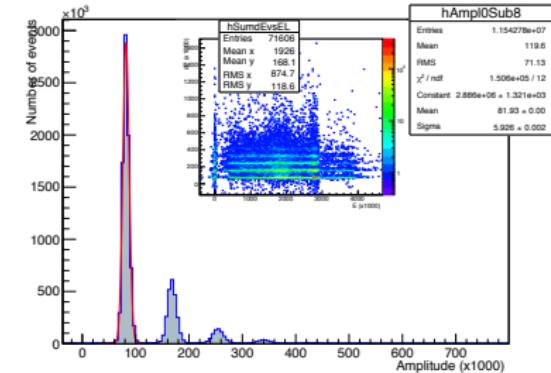
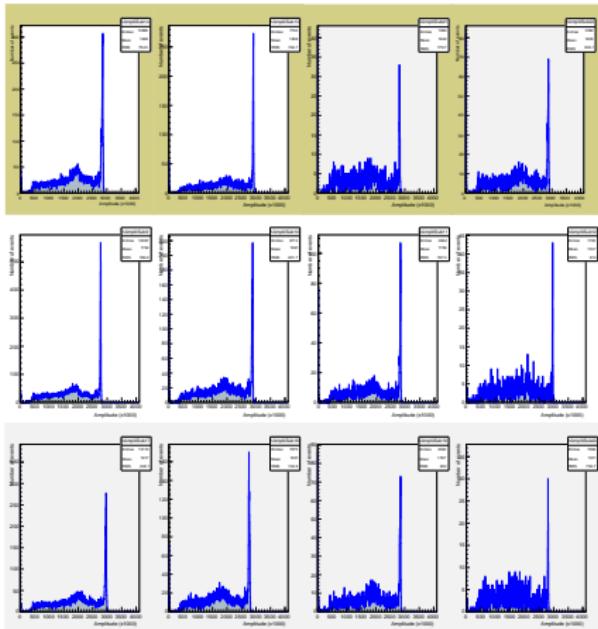


Preliminary results on $\frac{d\sigma}{d\Omega}$

Not yet done!



$$\vec{d}C \rightarrow dC \text{ at } T_d = 270 \text{ MeV}$$



Acknowledgment

People contributing to the experiment



- Mechanics: N. Giese, M. Maubach, G. D'Orsaneo & D. Spölgen
- Electronics: Tanja Hahnrats-von der Gracht & T. Sefzick
- DAQ & FEE: D. Mchedlishvili, L. Barion & P. Wüstner
- G4: G. Macharashvili, P. Maanen & N. Lomidze
- Ms & Bs: O. Javakhishvili, M. Gagoshidze
- PhD: F. Müller, S. Basile, & D. Shergelashvili

Current Proposal

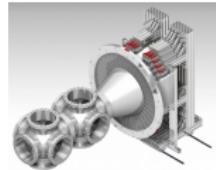
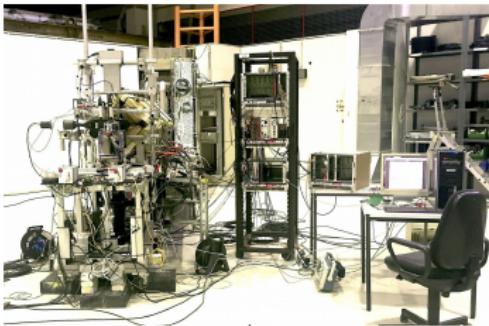
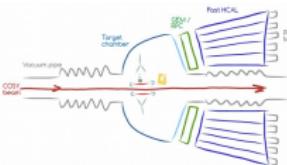
P r o d u c t i o n r u n !

*Polarized \vec{d} -beam on
 Mg, C, CH_2, Si, Al -targets
at five different energies*

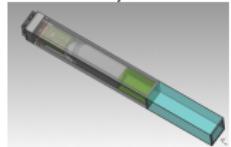
1 Week (+ MD) → March 2017 (2x PhD and 1 Ms Student)

Timeline

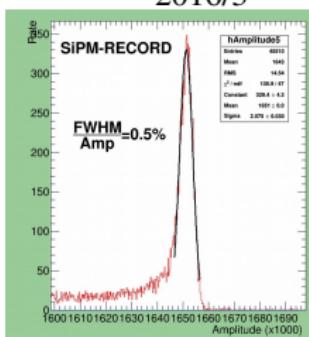
Towards Precursor Experiment



2014/9 → 2015



Lab tests



1 Week BT



Coming beam tests

- Very successful beam-time ended today morning :)
- All 24 LYSO crystals, SiPM and Si-optical interfaces are performed well!
- **dE vs. E** Plastic scintillator modules are under development...
- **Micromegas & GEM** detector prototypes are currently under development in **Greece & Korea**