

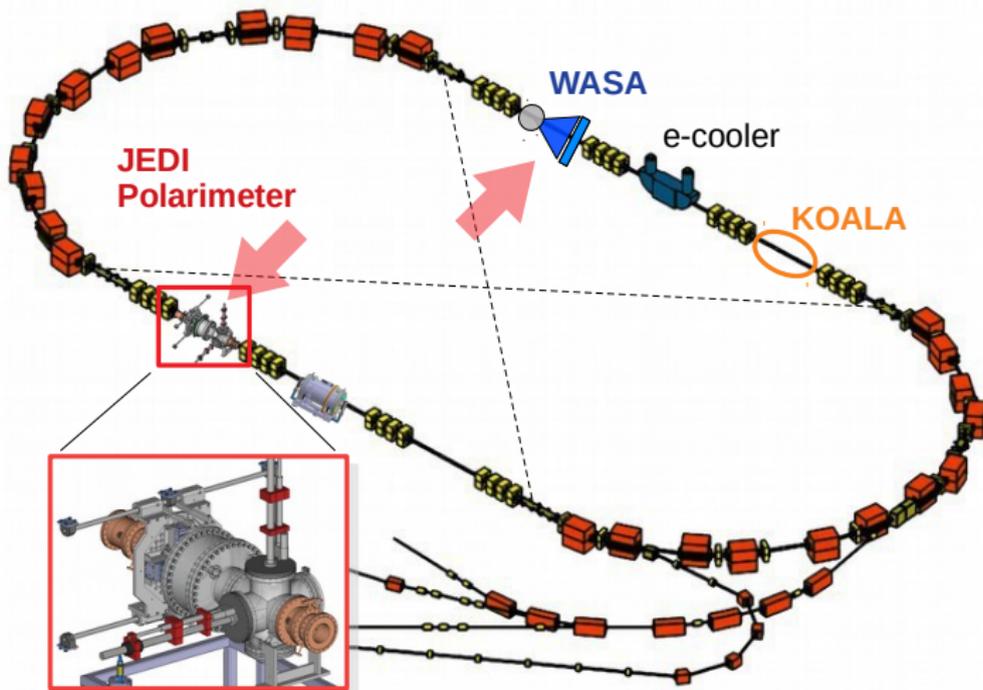
COMMISSIONING OF THE LYSO BASED INTERNAL POLARIMETER

Spokespersons: I. Keshelashvili, D. Mchedlishvili

CBAC 2019 #10 | Exp. No.: E002.7

JEDI POLARIMETER @ COSY

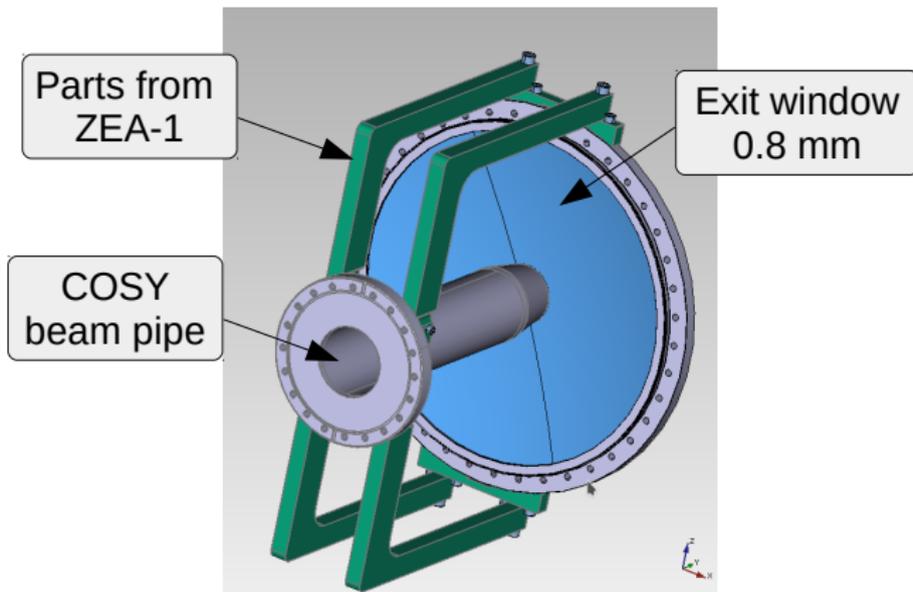
Opposite side polarization monitoring



EXIT WINDOW

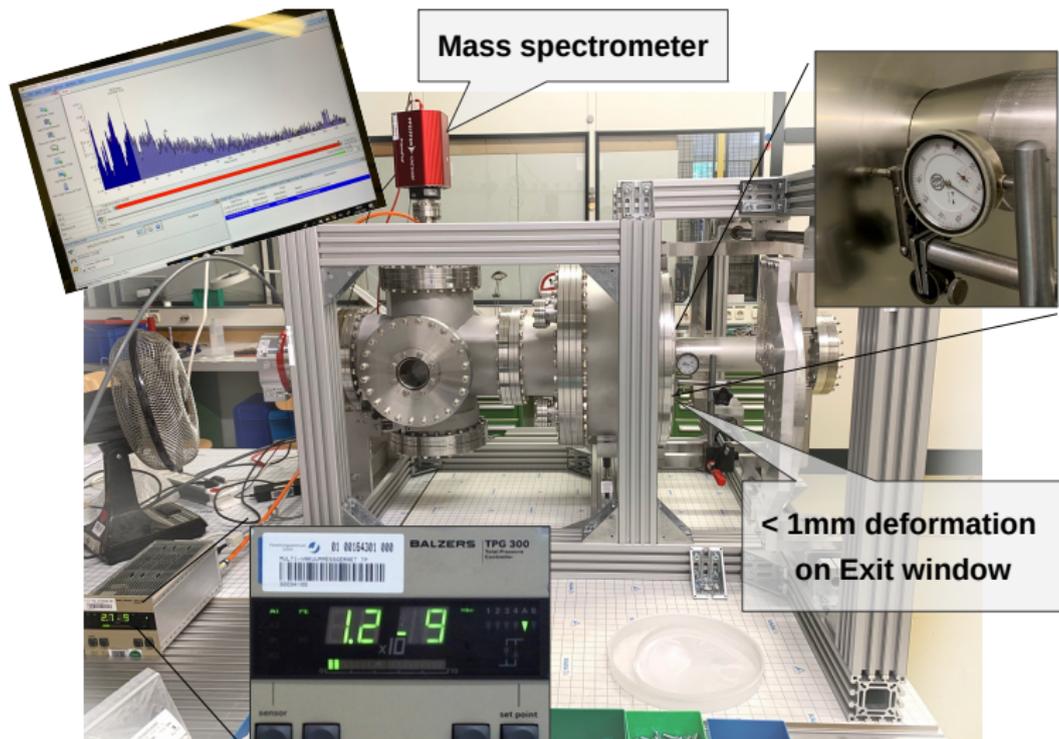
One of the most critical parts of the detector

**The delay in delivering exit window
caused canceling of commissioning beam time in spring 2019!**



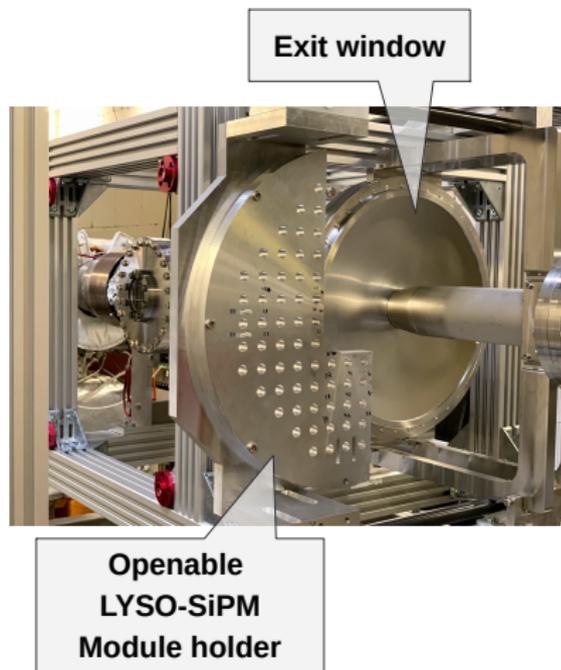
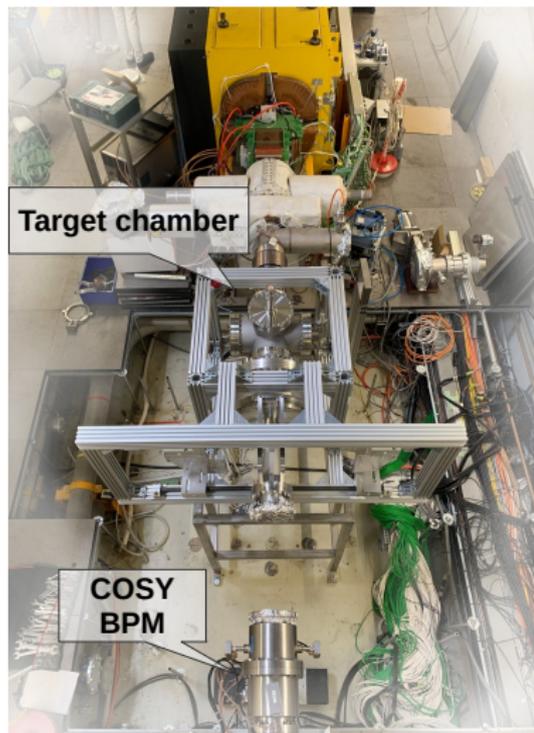
LABORATORY TESTS

Vacuum and mechanical components



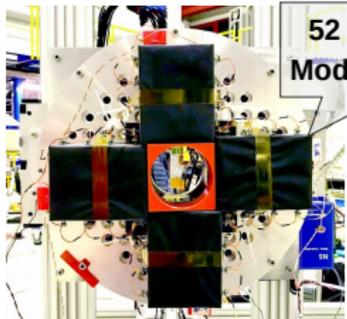
JEPO @ FORMER "EDDA" TARGET SECTION

Pictures from June 28th

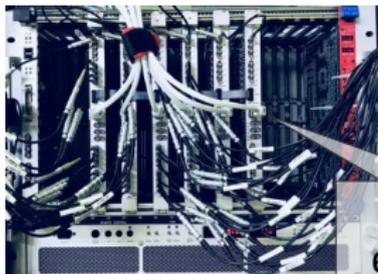


DETECTOR SETUP

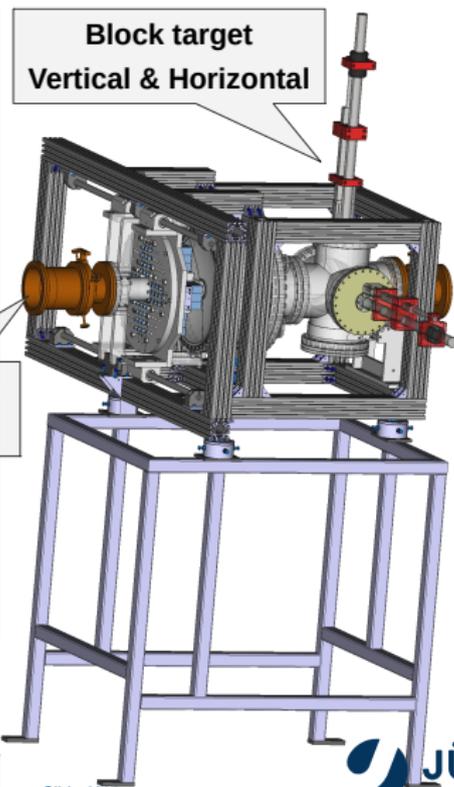
All 52 LYSO-SiPM modules + ΔE and DAQ will be tested



52 SiPM LYSO
Modules with ΔE



Fast FADC
6x16ch system

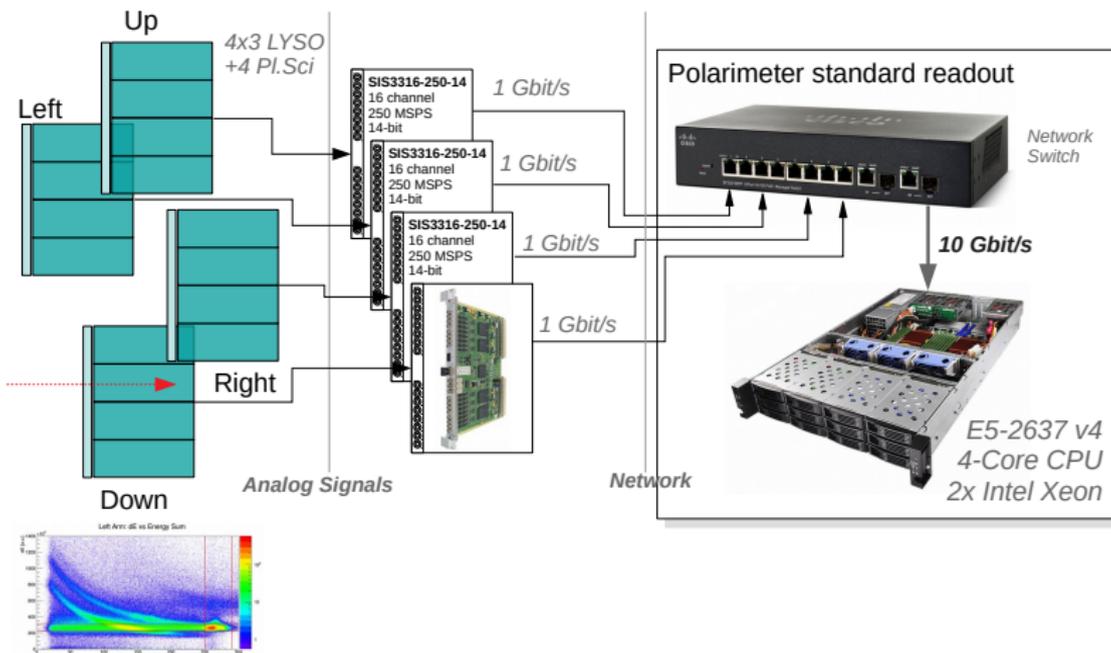


Block target
Vertical & Horizontal

Rogowski coils
both sides

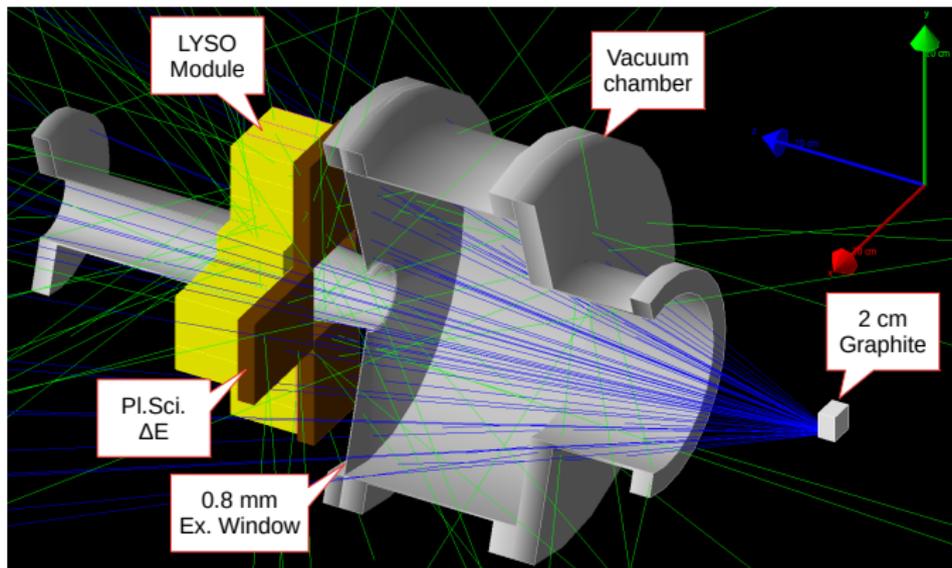
NEW DATA ACQUISITION SCHEMATIC (TWO PARALLEL TS-TDC)

Standard JePo DAQ System



GEANT4 SIMULATION

Full model of current setup (Master thesis of Mariam Abuladze)

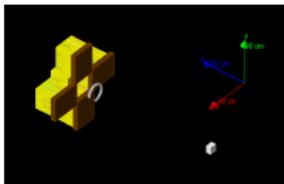


Asymmetry due to multiple scattering inside the target material

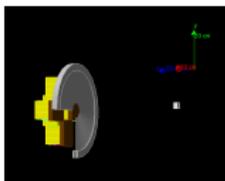
GEANT4 SIMULATION

Investigating a influence of different detector parts on Ay

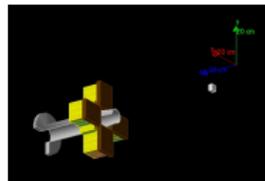
No vacuum parts



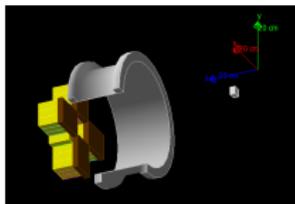
Exit window



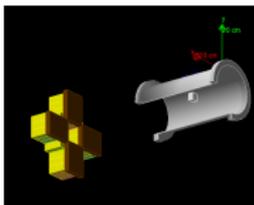
Beam pipe



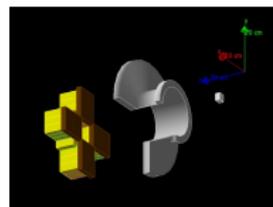
Large barrel



Target chamber



Barrel endcap



ACKNOWLEDGMENT

People contributing to the project

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(SRNSFG grant number DI-18-298),

”High-precision polarimetry for charged-particle Electric Dipole Moment (EDM) searches
in storage rings”

- **Mechanics:** B. Klimczok, G. D’Orsaneo & D. Spölgén
- **COSY Vacuum:** J. Böker & G. Langenberg
- **Electronics:** Tanja Hahnrahts-von der Gracht & T. Seifick
- **DAQ & FEE:** D. Mchedlishvili, & P. Wüstner
- **Geant4:** M. Abuladze (Master) , G. Macharashvili
- **Ms.:** G. Kvantrishvili, M. Gagoshidze
- **PhD:** F. Müller, D. Shergelashvili, O. Javakhishvili & N. Canale

BEAM TIME REQUEST FOR COMMISSIONING

Executive summary for "COSY Test Beam Time"

For Lab. use	
Exp. No.: E2.7	Session No.: 10

- Internal \vec{d} beam
(former EDDA target station)
- Variable intensity and extraction rate
- RF-WF exp. beam momentum
 $P_d = 970 \text{ MeV}/c$
- Commissioning of dual DAQ system
- **MD+1 Week Autumn 2019**
(commissioning)
- **1 Week with WF/Precursor in 2020**
(measurement)

Collaboration _____ **JEDI** _____

Spokesperson for test beam time: I. Keshelashvili (FZJ)
D. Mchedlishvili (HEPI TSU / SMARTJEDM_Lab)

Address: _____ Is support* from the LSF program of the EU requested?

Yes **No**

Phone: _49 2461 615603_ Fax: _____ E-mail: i.keshelashvili@fz-juelich.de

Total number of particles and type of beam (p,d,polarization)	Momentum range (MeV/c)	Intensity or internal reaction rate (particles per second)	
		minimum needed	maximum useful
Polarized deuterons	970 MeV/c	10^8	10^{10}
Experimental area	Safety aspects (if any)	Earliest date of installation	Total beam time (No. of shifts)
COSY internal beam	none	1.10.2019	(MD) +1 Week + 1 Week Total 2 Weeks

What equipment, floor space etc. is expected from Forschungszentrum Jülich/IKP?

*EU-Support:

The European Commission is planning to support access of new users from member and associated states to COSY. As soon as the grant negotiations are complete, travel and subsistence costs can be financed in the frame of the program Access to Large Scale Facilities (LSF).

Description of request (motivation, milestone(s), goals; maximum 5 pages)

Appendix

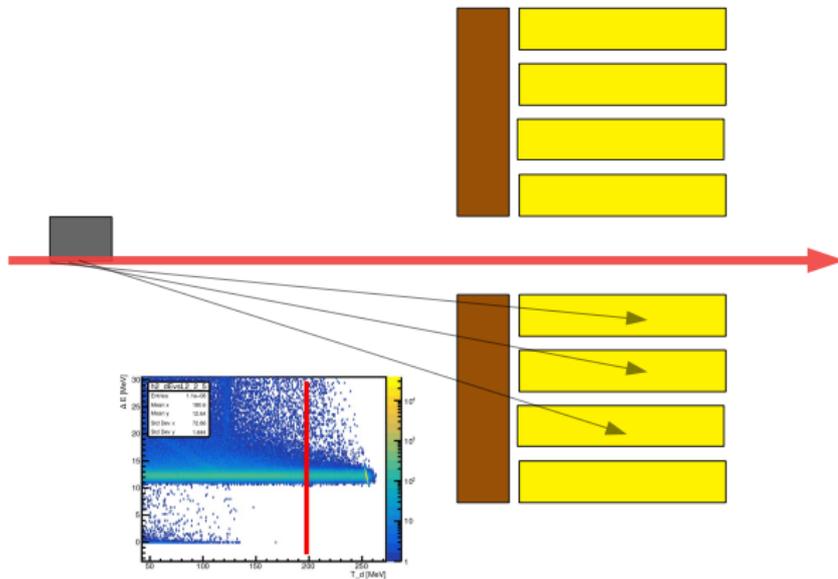
CONTACT

Contacting me via e-mail

Click here: i.keshelashvili@fz-juelich.de

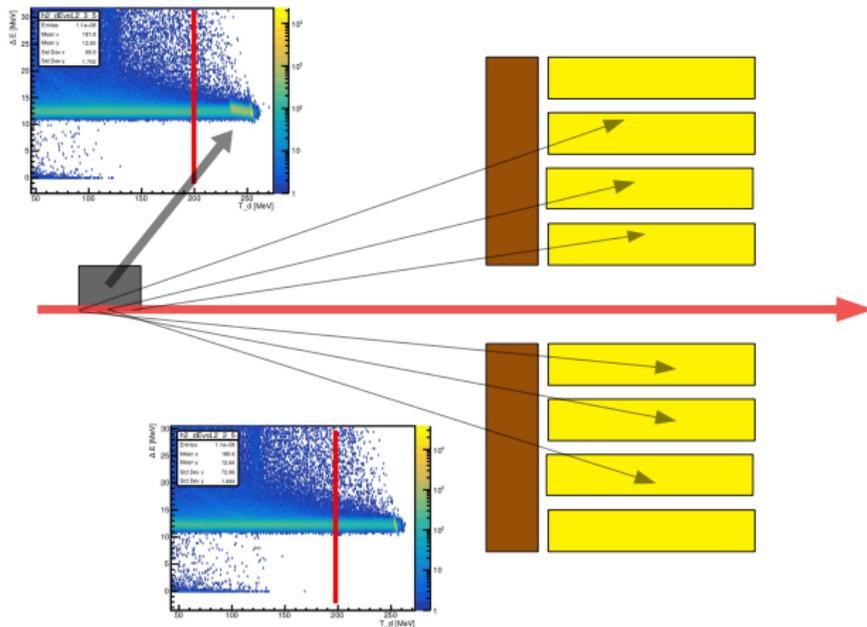
GEANT4 SIMULATION

Expected track distribution



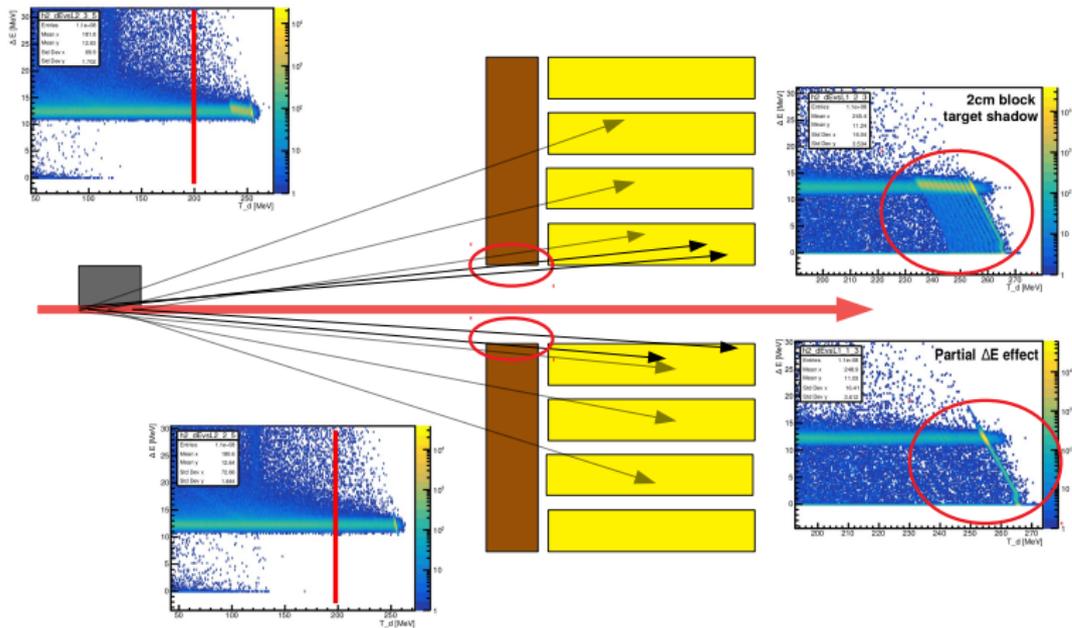
GEANT4 SIMULATION

Expected track distribution



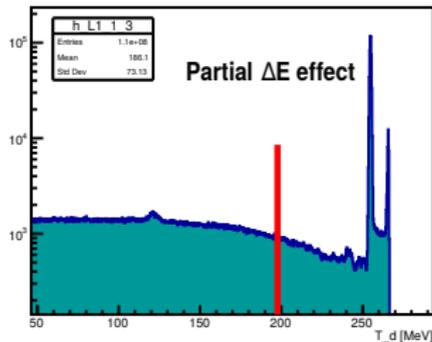
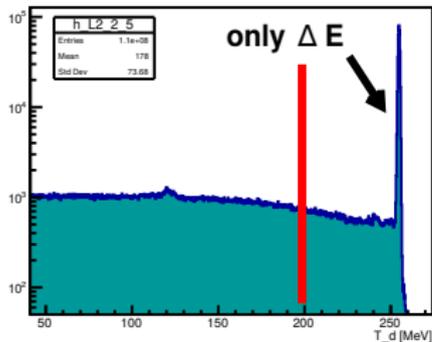
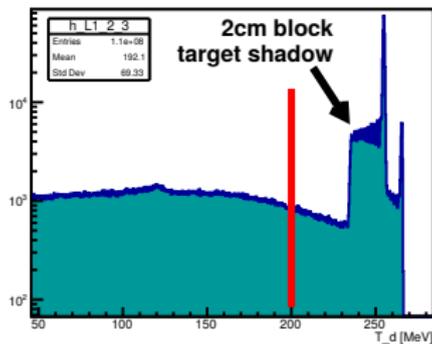
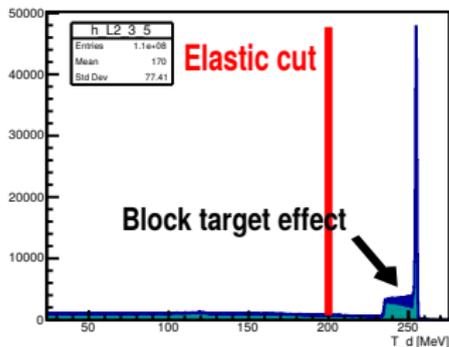
GEANT4 SIMULATION

Expected track distribution



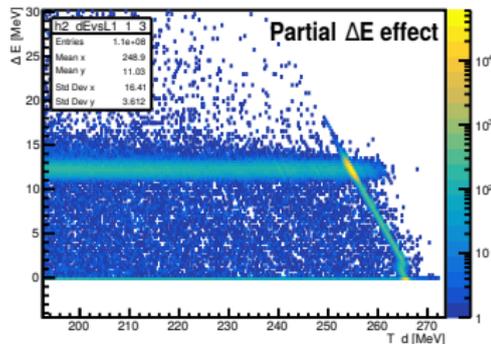
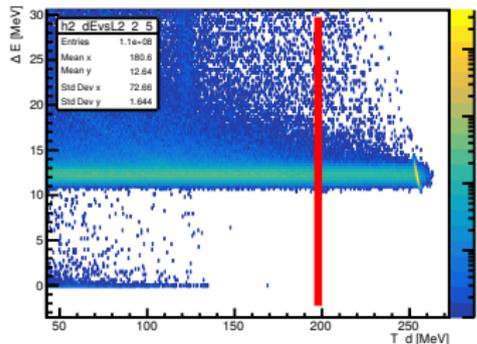
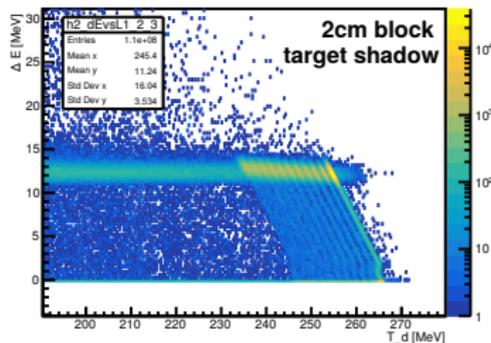
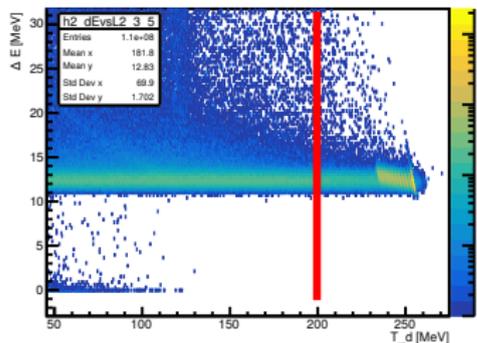
GEANT4 RESULTS

Expected distributions for the internal experiment



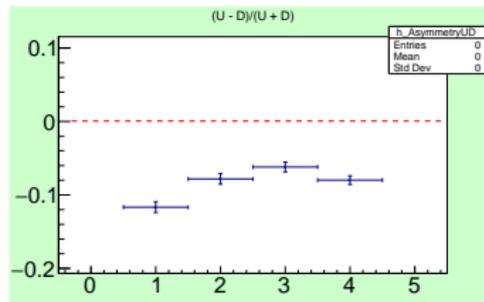
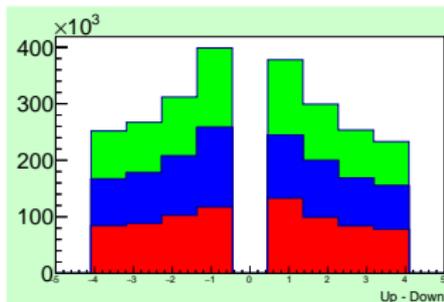
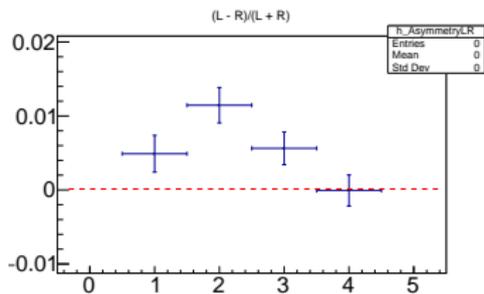
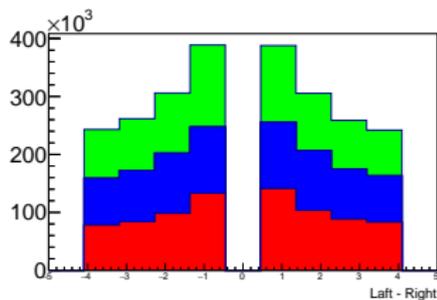
GEANT4 RESULTS

Expected distributions for the internal experiment



GEANT4 RESULTS

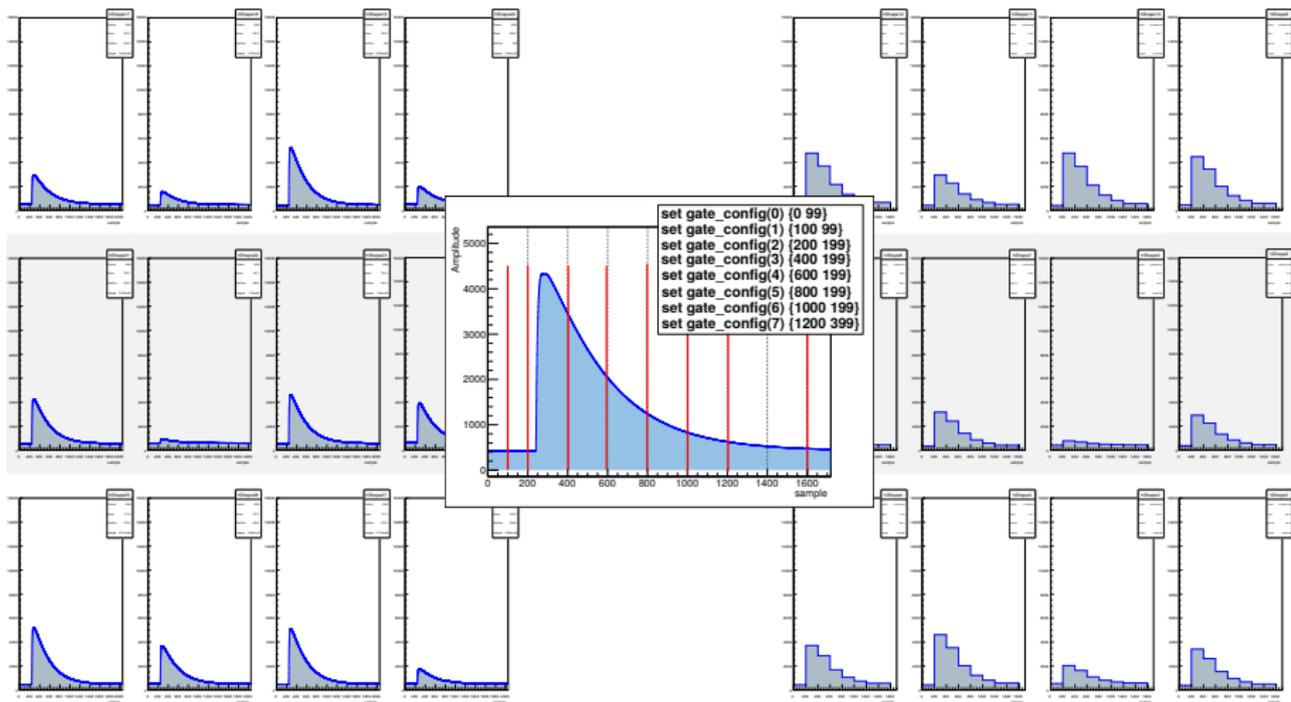
2 cm graphite target on to of beam



Asymmetry due to multiple scattering inside the target material

SIGNAL SHAPES

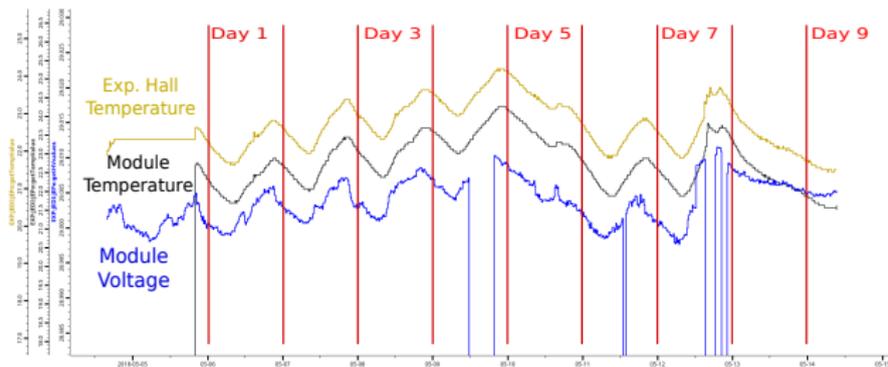
Full signal shape vs 8 accumulator/integral region



DETECTOR MONITORING AND ARCHIVING SYSTEM

The EPICS based system

- COSY compatible EPICS CSS slow control system
- Monitoring of voltage, temperature, ...)



LYSO module internal temperature

Big Karl exp. hall (brown) temperature variation

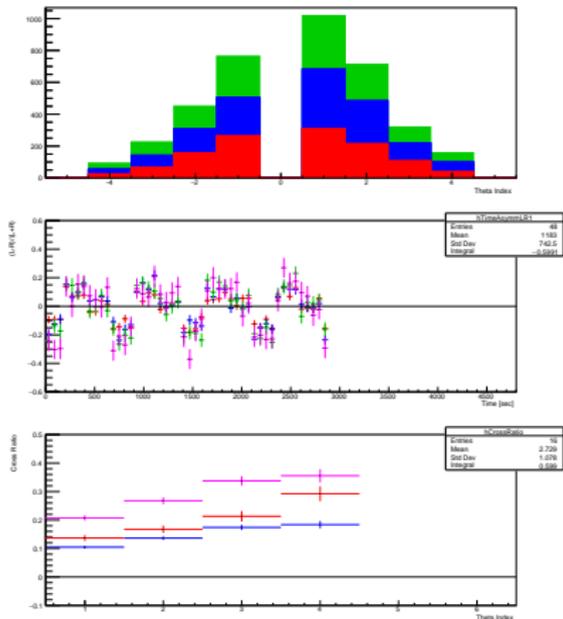
Blue graph, the supply voltage for the same module

The apparent correlation between all the values is evident.

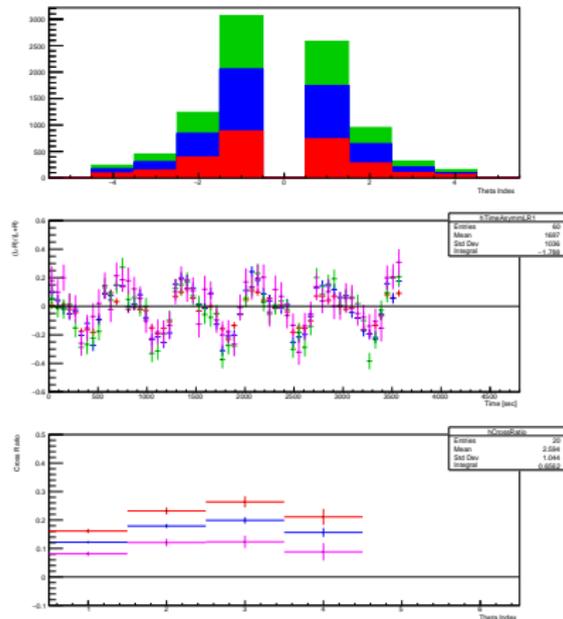
ONLINE ASYMMETRY MONITORING

Elastic $\vec{d}C \rightarrow dC$ scattering

$\Theta = 4^\circ \rightarrow 9^\circ$



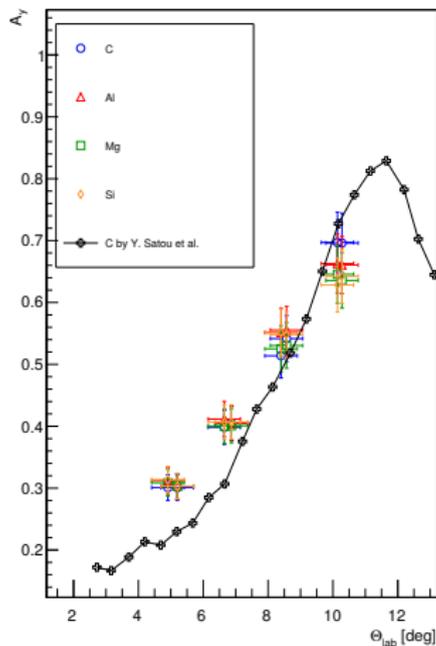
$\Theta = 4^\circ \rightarrow 15^\circ$



VECTOR ANALYZING POWER

Elastic $\vec{d}C \rightarrow dC$ scattering

$T_d = 270 \text{ MeV}$



$T_d = 300 \text{ MeV}$

