The Warsaw SiLCA array status and perspectives

Kasia Hadyńska-Klęk

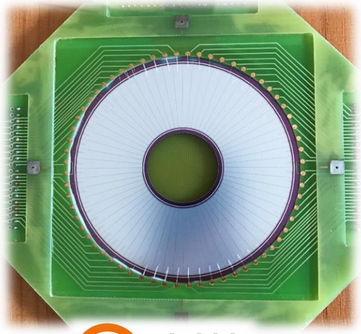
Heavy Ion Laboratory

University of Warsaw

Scientific Workshop on nu-Ball2 2024 - Reports from the last campaign and prospects for future experiments

Milano, 3-5 July 2024

SilCA – Silicon Coulex Array



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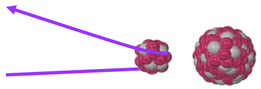
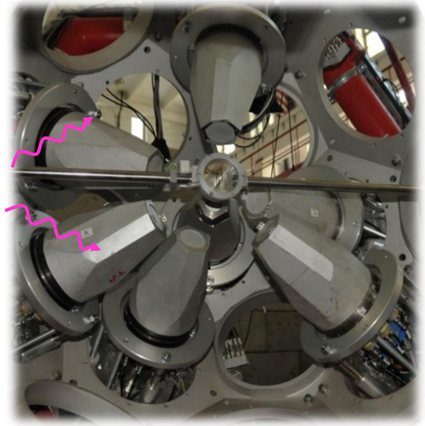
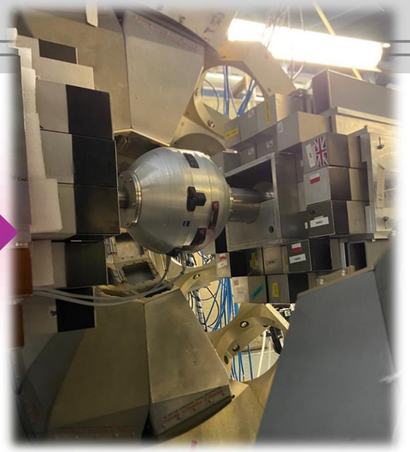




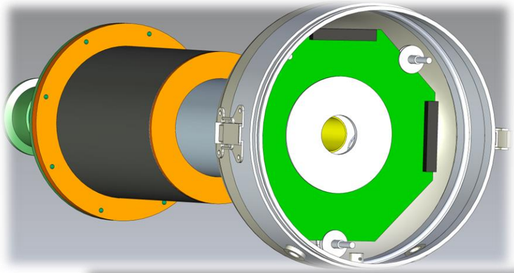
IJCLab
Irène Joliot-Curie

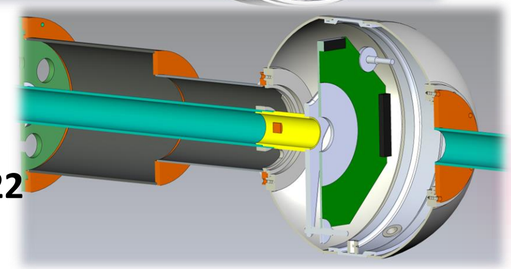


December 2022

Commisioning: ^{16}O (66 MeV) on ^{197}Au target

Campaign
DSSD+NuBALL2
(+PARIS)
I-VI 2023
7 experiments
Fully digital, FASTER

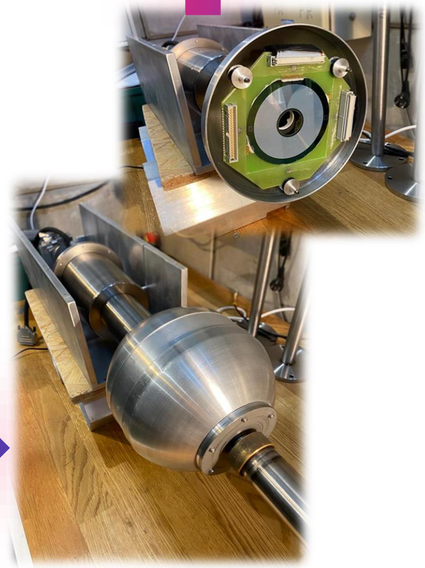




Spring 2022

- r_{in} = 1.6 cm
- r_{out} = 4.2 cm
- 64 sectors
  (32 readout)
- 32 rings
  (16 readout)

October 2022



Project: P. Napiorkowski, J. Iwanicki, A. Iwanicki, J. Mierzejewski, KHK

Experimental campaign with SiLCA @ IJC Lab, Orsay

nuBALL2:

2 rings of 12+12 HPGe CLOVERS + ACS

Eff. ~4%

SiLCA DSSD:

32 sectors + 16 rings

125-152°

PARIS:

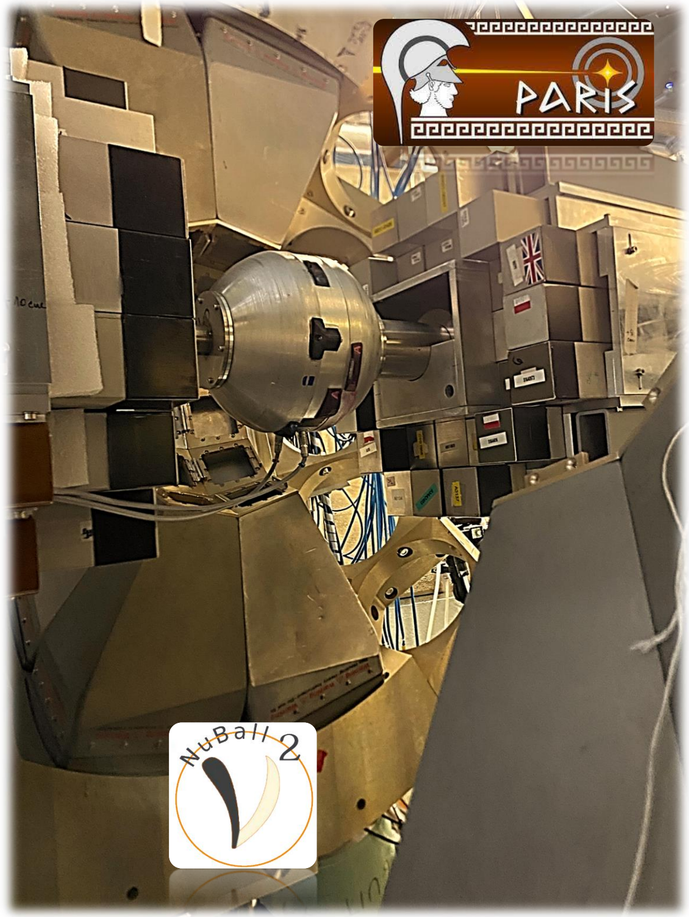
LaBr3 / CeBr3 + NaI array

15 cm from the target

Eff. ~14%

FASTER

fully digital readout of all channels



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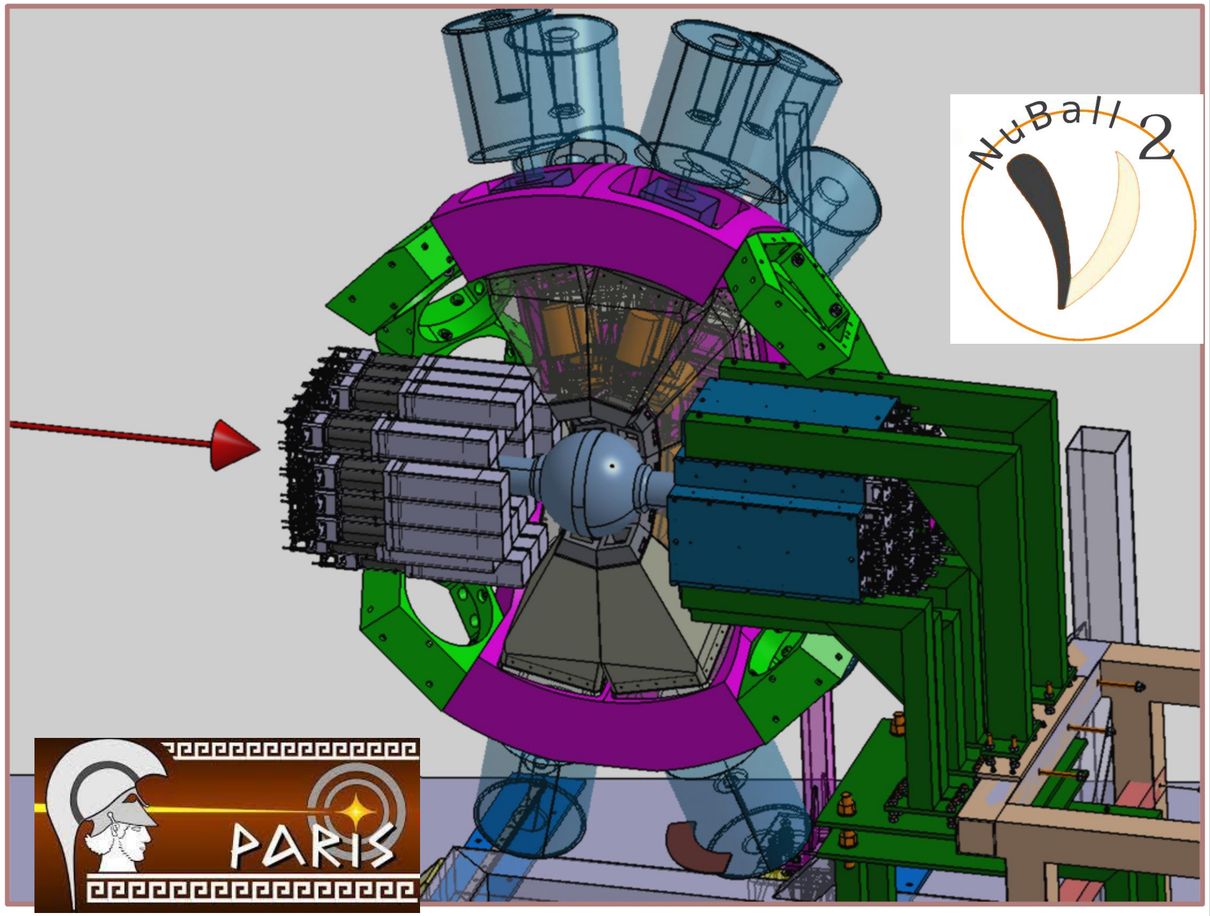
Experimental campaign with SiLCA @ IJC Lab, Orsay

Winter 2022-2023

- ***Detailed spectroscopy of fission isomers in uranium isotopes***
  spokesperson J. Wilson
  data analysis C. Hiver

- ***Evidence for enhanced collectivity in ^{58}Fe examined through Coulomb excitation***
  spokespersons: G. Pasqualato, J. Ljungvall, A. Stuchbery
  data analysis G. Pasqualato

- ***Coulomb excitation of super-deformed band in ^{40}Ca***
  spokespersons: P. Napiorkowski, A. Maj, F. Azaiez
  data analysis: K. Hadyńska-Klęk, J. Samorajczyk-Pyśk



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Experimental campaign with SiLCA @ IJC Lab, Orsay

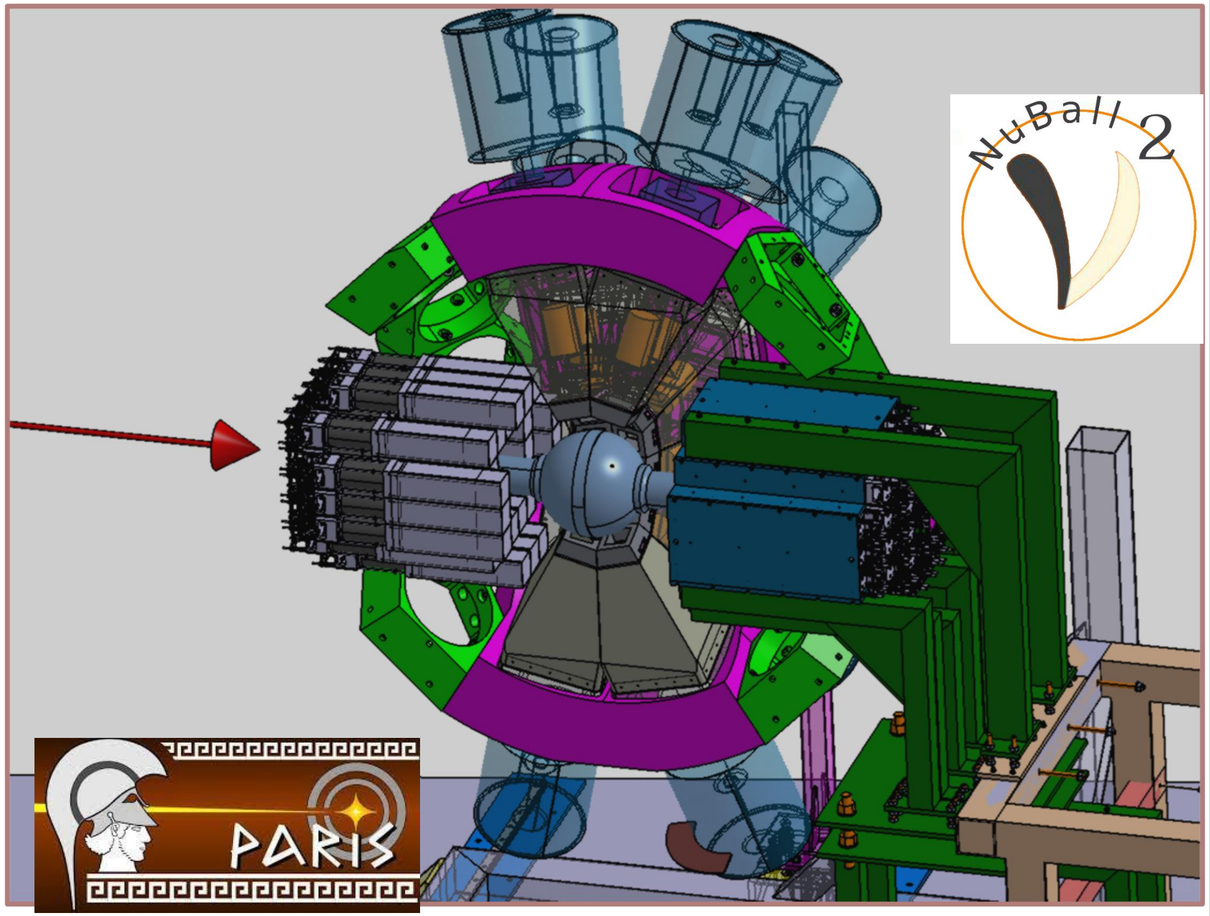
Spring 2023

- ***Search for the fission shape isomer in ^{232}Th***
  spokesperson and data analysis: C. Hiver

- ***^{194,196}Hg fission studies***
  spokesperson and data analysis: K. Miernik

- ***Investigation of high spin structures in ^{44}Ti and ^{42}Ca via discrete and continuum gamma spectroscopy using nuBall2, PARIS and OPSA setup***
  spokespersons: M. Matejska-Minda, K. Hadyńska-Klęk
  data analysis: M. Matejska-Minda

- ***Emergence of collectivity near magic nuclei: Coulomb-excitation of ^{62}Ni****
  spokespersons: : K. Hadyńska-Klęk, M. Rocchini, N. Marchini
  data analysis: K. Hadyńska-Klęk



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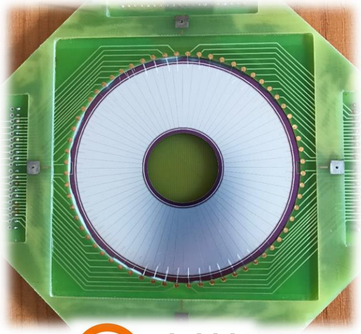
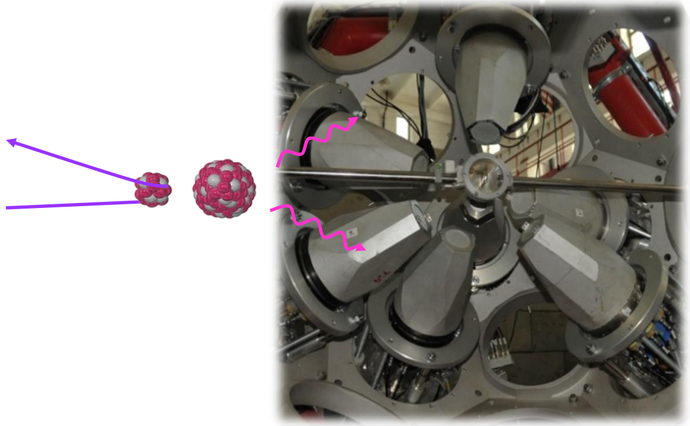
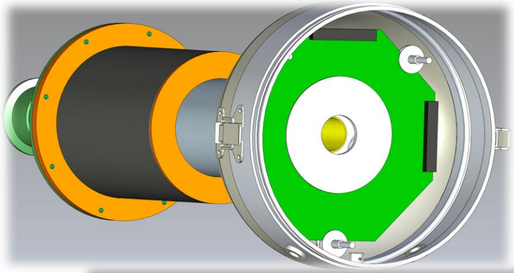
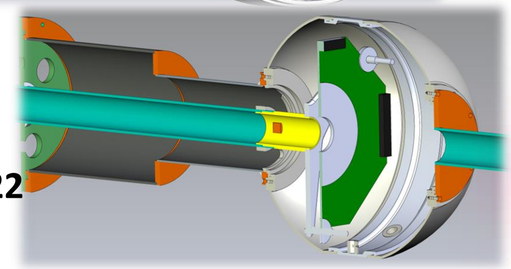
SiCA – Silicon Coulex Array









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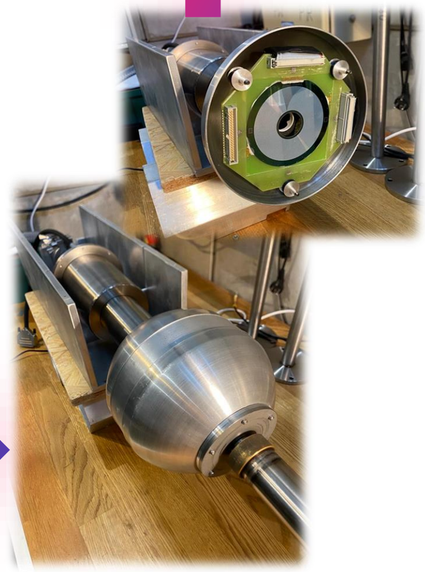
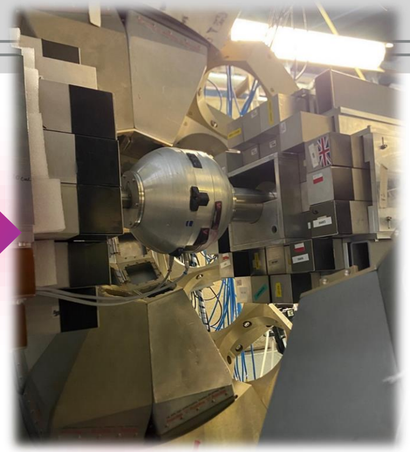


December 2022



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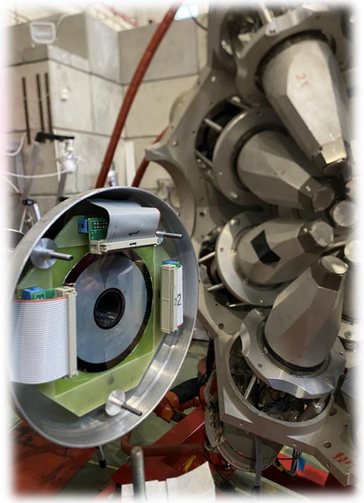


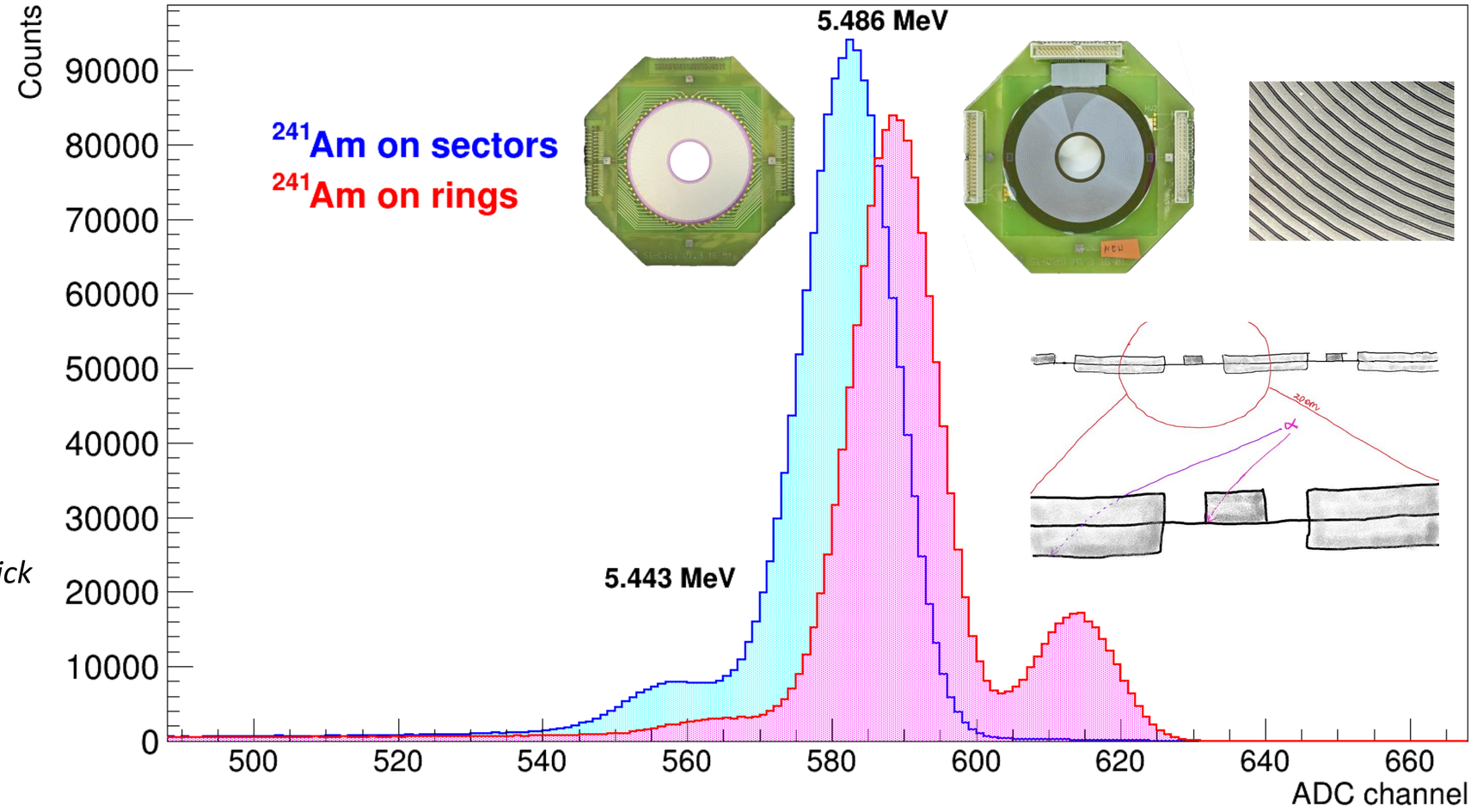
First tests (^{241}Am**): February 2024**
DSSD+EAGLE (fully digital, CAEN 1725)

Project: P. Napiorkowski, J. Iwanicki, A. Iwanicki, J. Mierzejewski, KHK

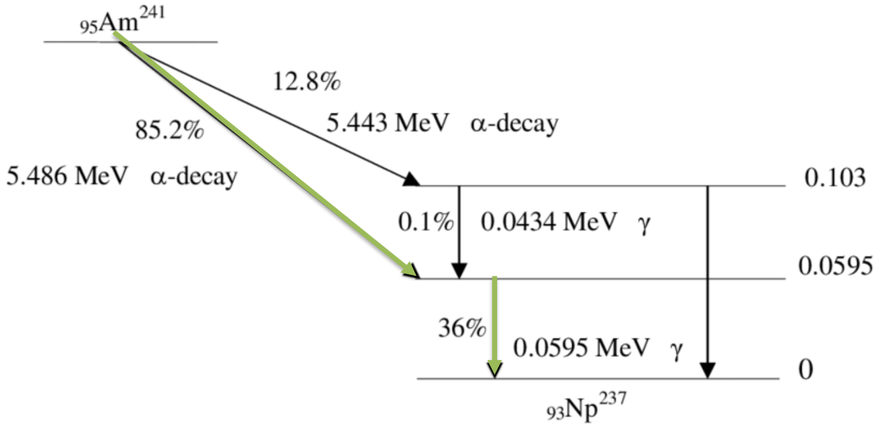
Tests with ^{241}Am - back to the basics

Setup:

- *DSSD detector (new) – 315 mm thick*
- *64 sectors (32 readout)*
- *32 rings (16 readout)*
- *3 differential-to-single-ended converters (made at HIL & FUW)*
- *3 CAEN 1725 digitizers 16-channel, 14 bit, 250 MS/s*

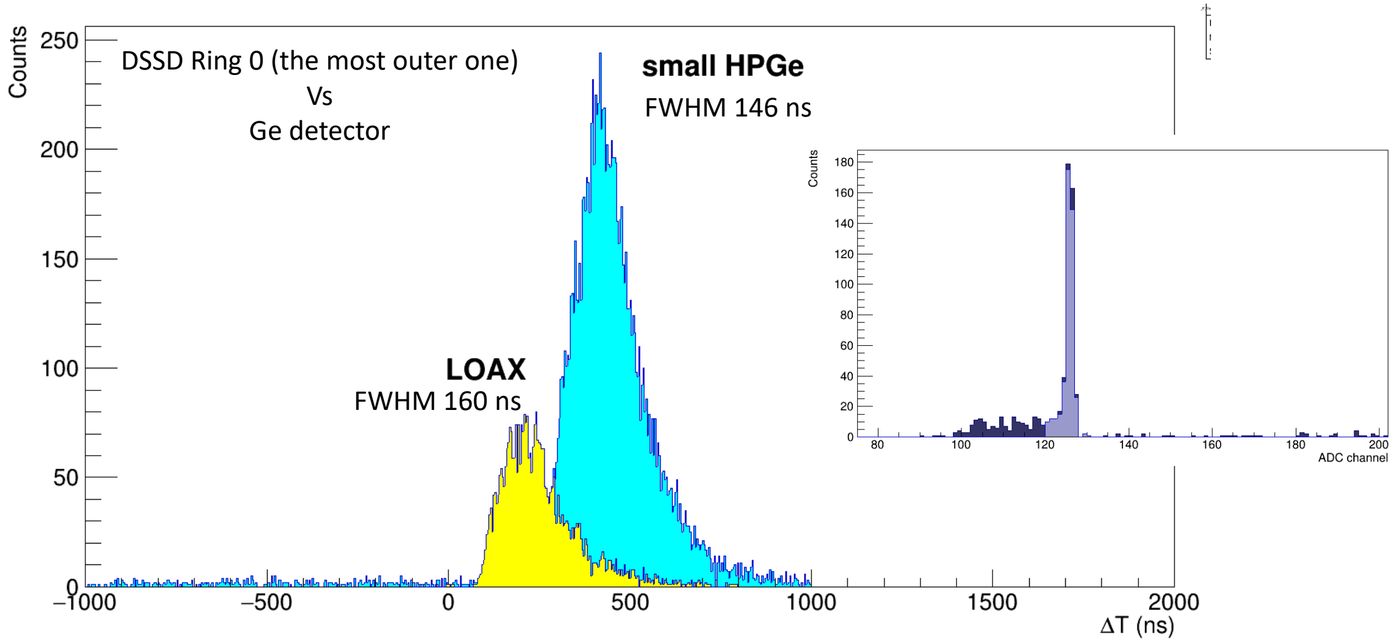


Tests with ^{241}Am - coincidence time

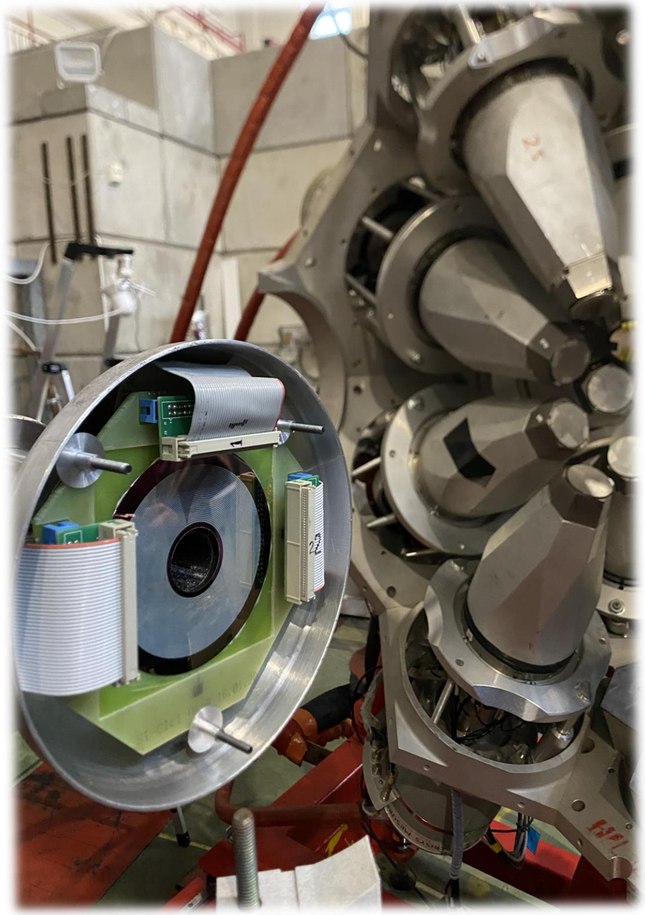


Setup:

- *DSSD detector - 315 mm thick*
- *64 sectors (32 readout)*
- *32 rings (16 readout)*
- *LO-AX gamma detector*
- *HPGe detector (30% efficiency)*
- *3 differential-to-single-ended converters (made at HIL & FUW)*
- *3 CAEN 1725 digitizers*
  16-channel, 14 bit, 250 MS/s



Tests with ^{241}Am - SiLCA @ EAGLE



Setup:

- *DSSD detector (used at IJC Lab and)*
- *64 sectors (32 readout)*
- *32 rings (16 readout)*

- *3 differential-to-single-ended converters (made at HIL & FUW)*
- *3 CAEN 1725 digitizers 16-channel, 14 bit, 250 MS/s*

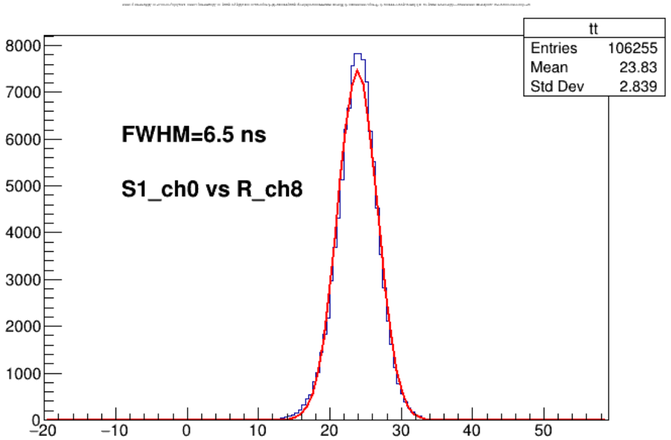
- *^{241}Am source*
- *5.486 MeV energy*

Data taken with:

- *COMPASS (CAEN software)*
- *xdaq*

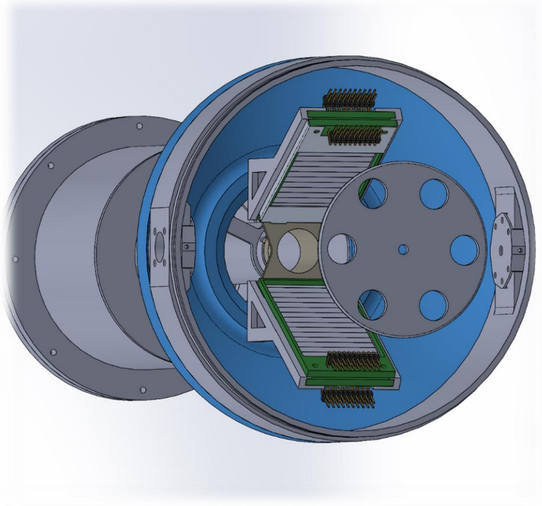
Results:

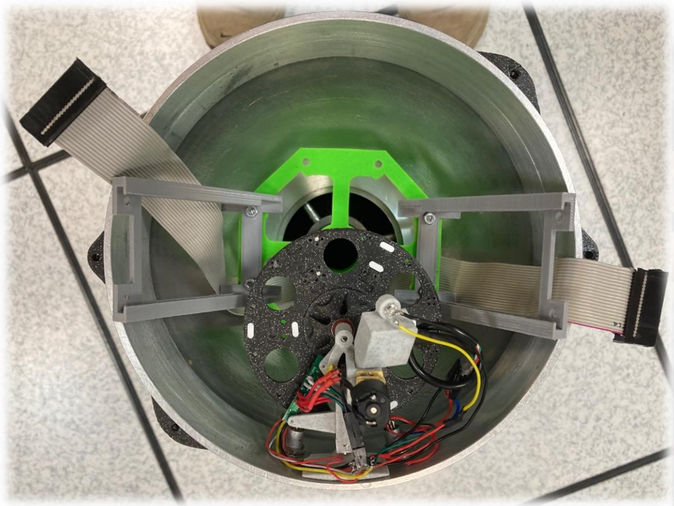
- *Obtained energy resolution: ~3% at 5.5 MeV*
- *Obtained sector-ring timing resolution: 6.5-8.5 (1) ns*

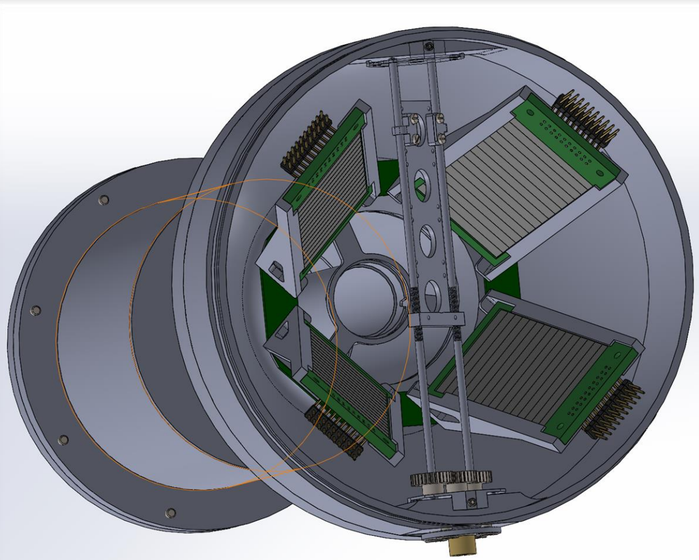


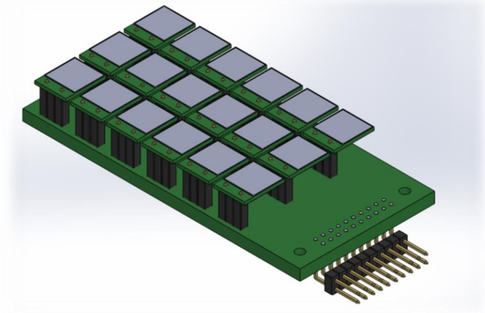
*In-beam commissioning of **SEAGLE** (SiLCA+EAGLE) tentatively scheduled: October 2024*

SiCA – Silicon Coulex Array and beyond!

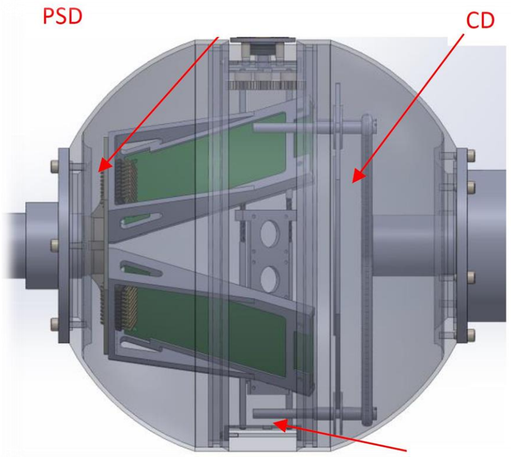








- Position-sensitive DSSD detectors (Micron X3, 43.3 × 78 mm)
E or E-dE
- A set of pin-diodes
- Target lader – rotation optional



Project: J. Iwanicki, M. Moukkaddam, M. Matejska-Minda, KHK, M. Matuszewski

OUTLOOK

- A new versaile scattering chamber (20 cm diameter)
- DSSD / S3 detectors in the backward angles
- PiN-diode ladders – at 90 degrees
- Si telescopes / compact scintilators in the forward angles
- Fully digital readout (CAEN modules)
- Tested already in France, ready to be taken to any other lab in the world for the campaign with the gamma arrays

Thank you