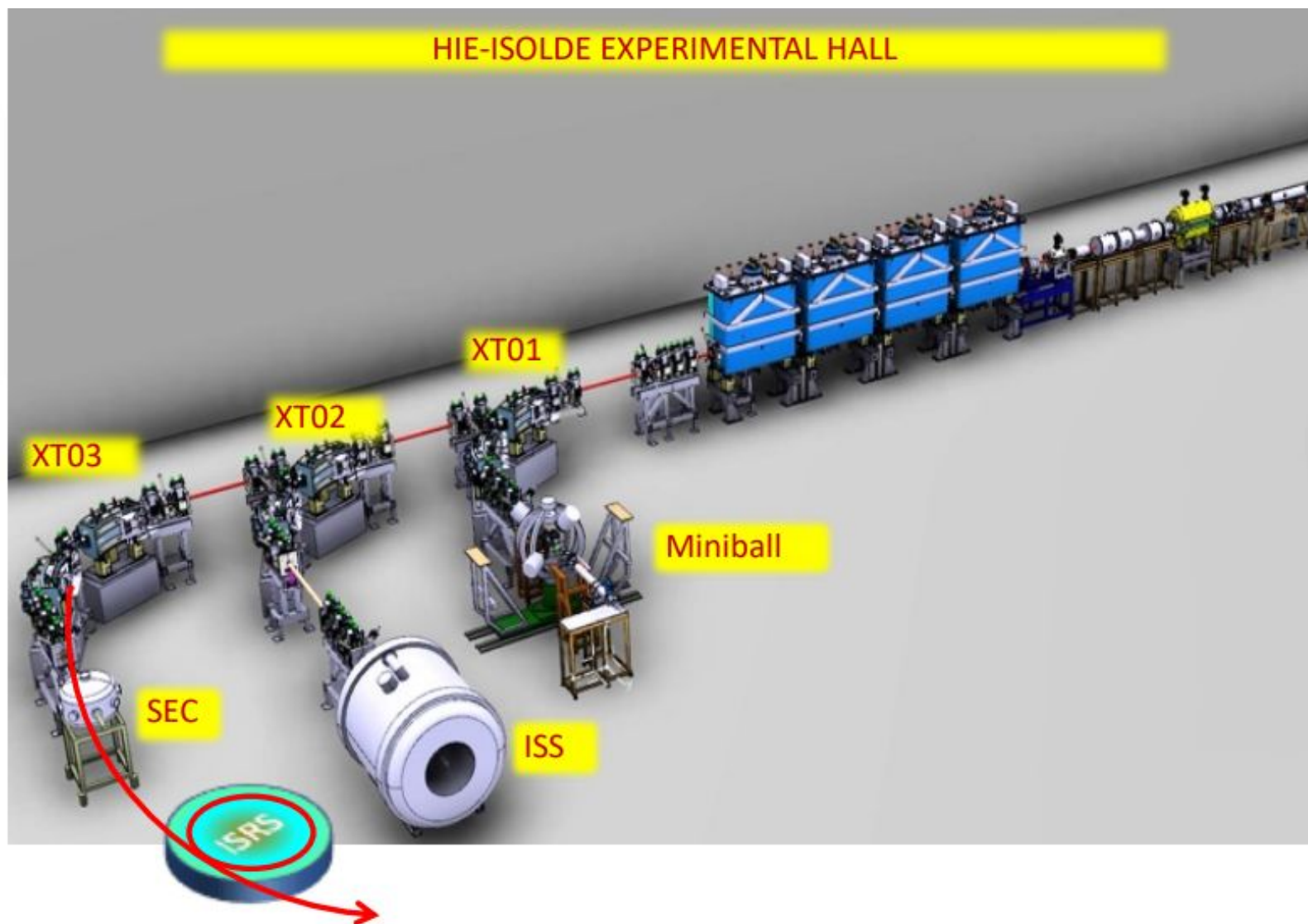


Test bench for the ISOLDE Superconducting Recoil Separator ISRS

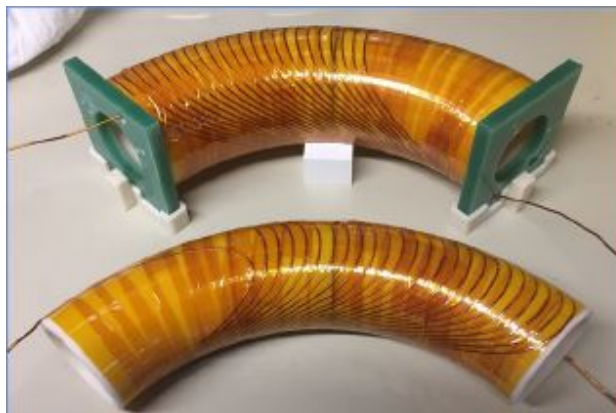
Sergio Sánchez Navas
CSIC-IEM, Madrid (Spain)

ISOLDE Workshop and Users Meeting
November 27th, 2024

Location



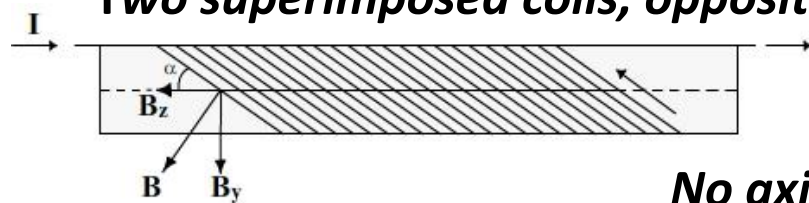
Canted Cosine Theta (CCT)



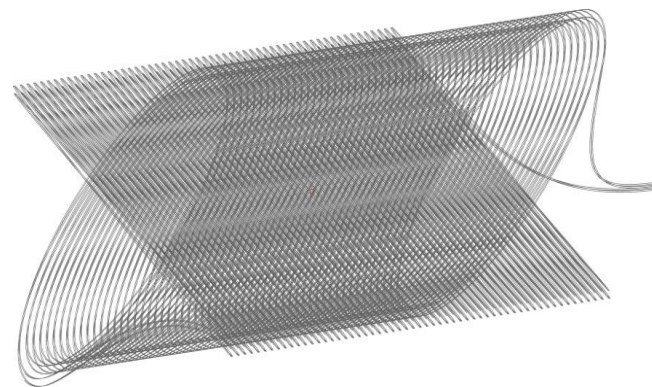
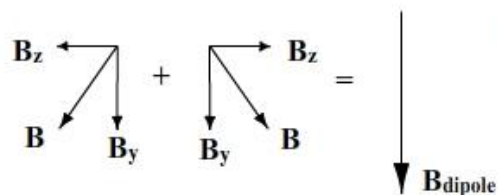
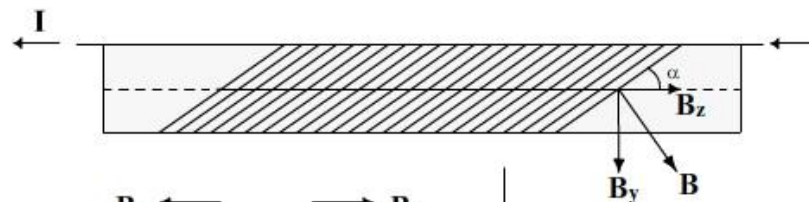
test bench at CERN

Two superimposed coils, oppositely skewed

pure cosine-theta field



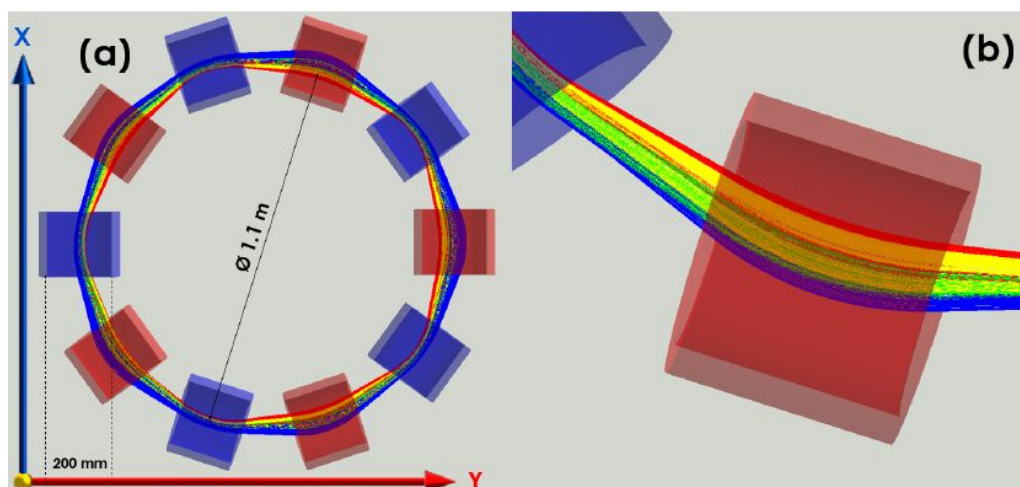
No axial field.



Ion optics

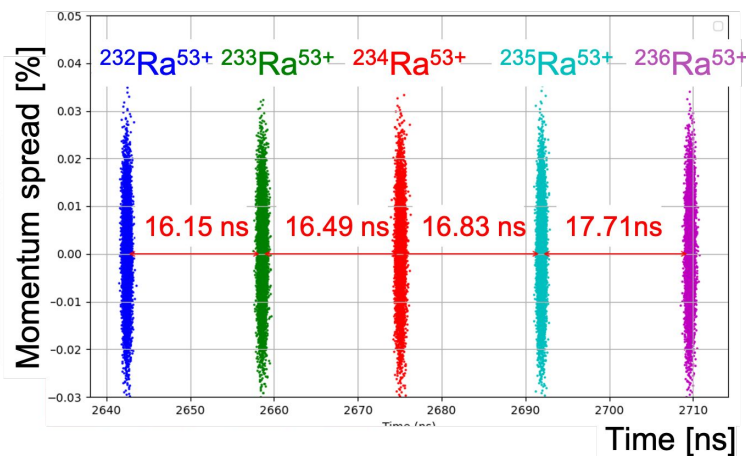
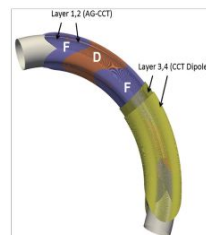
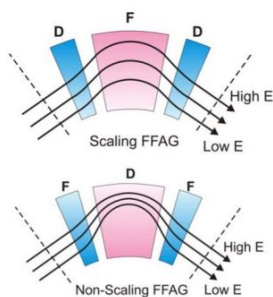
Fixed field alternating gradient (FFAG) focus

Significantly reducing the size with respect to standard recoil separator configurations



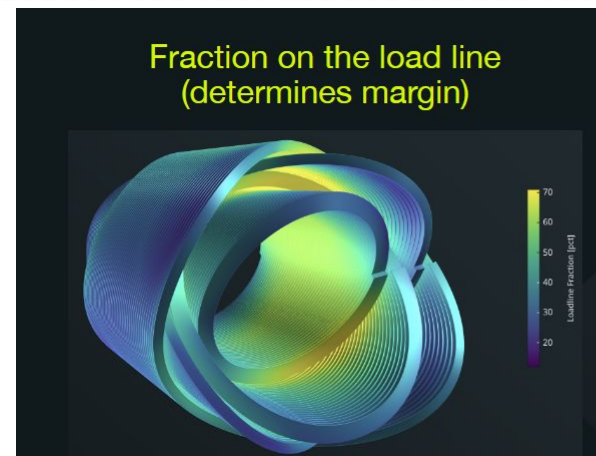
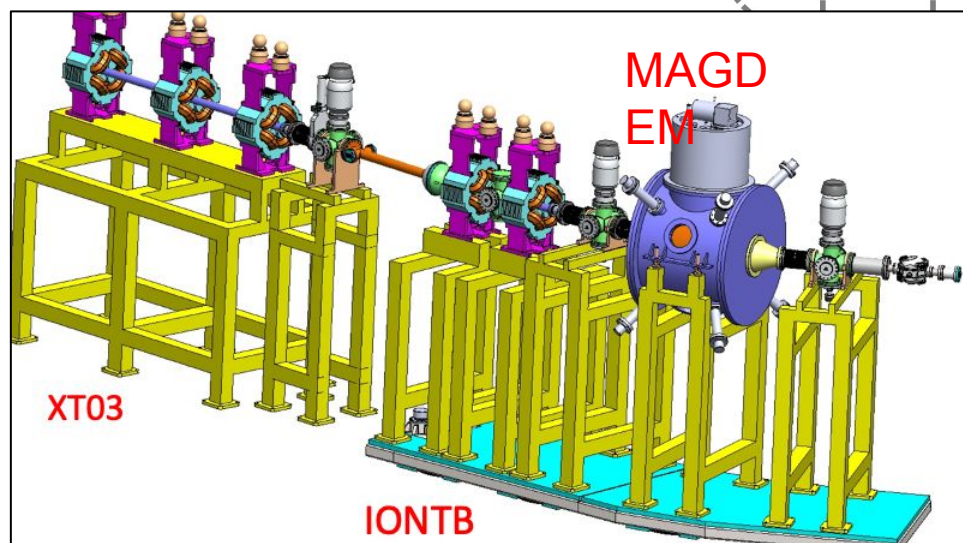
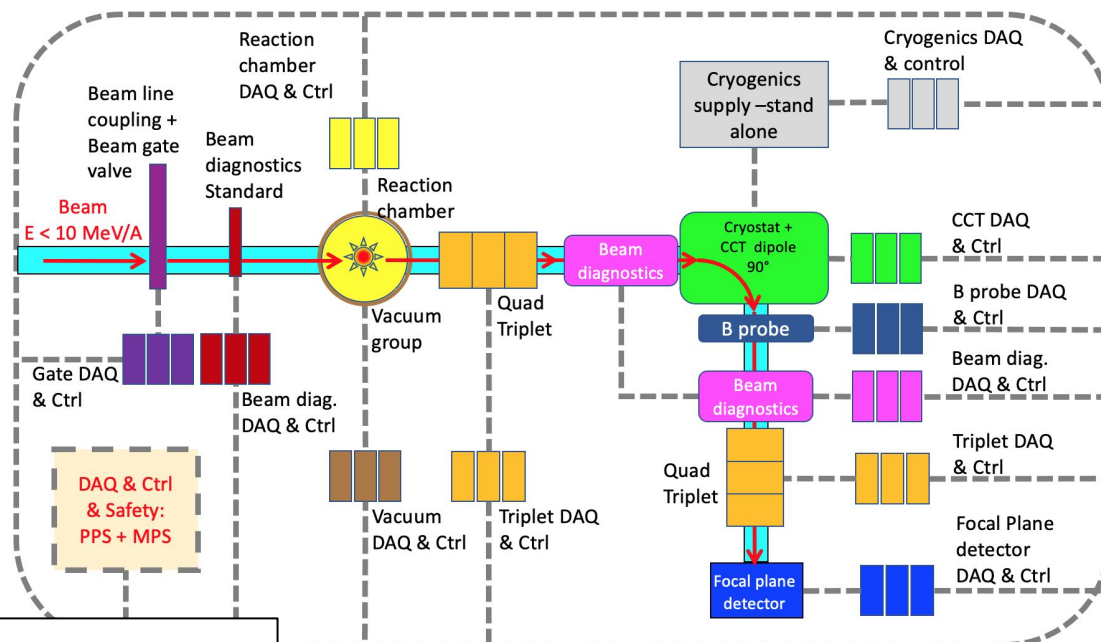
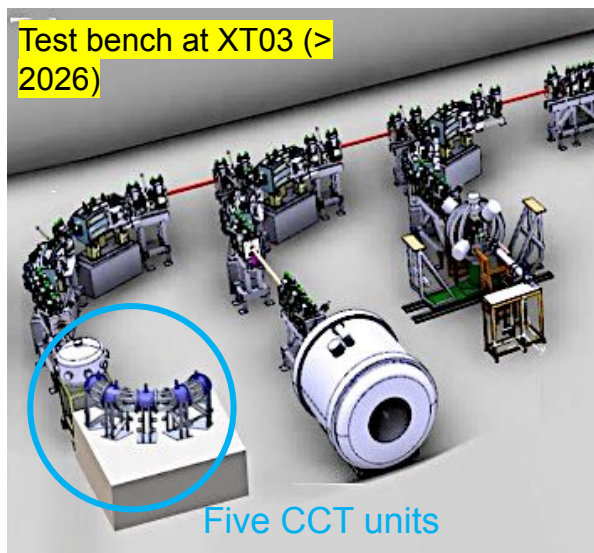
FFAG optics

- DFD or FDF focusing triplet for FFAG lattice
- Combined function magnets as rbends



Longitudinal phase space after 10 turns (2670 ns) for different Ra isotopes in the ISRS ring.

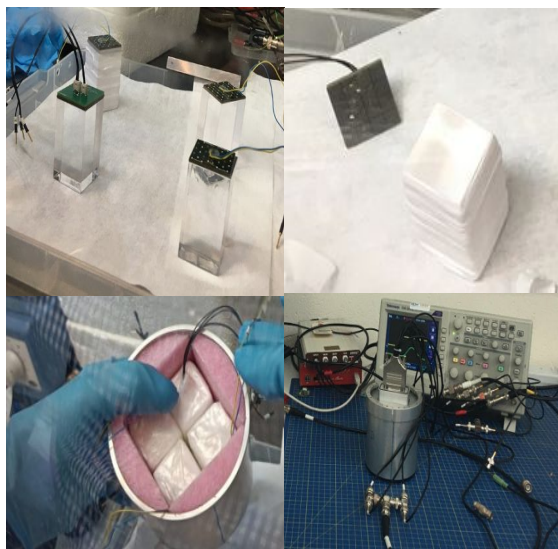
ISRS CCT test bench



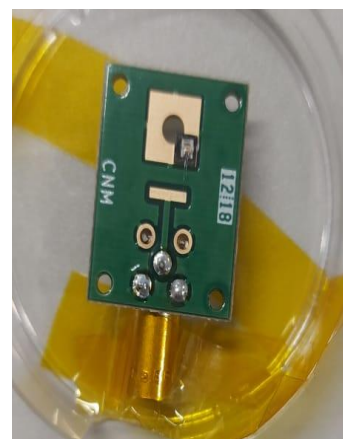
Critical elements of the focal plane

- Particle telescope with different detection layers and a dedicated readout system.
- The frontend electronics must face a twofold challenge, the wide dynamic range and the time resolution for ToF
 - ✓ Silicon Carbide based detectors and fast scintillators.
 - ✓ Collaboration :
 - ✓ Chiara Guazzoni, Politecnico di Milano
 - ✓ Nara Singh Bondili, University of the West of Scotland

LaBr3 clover

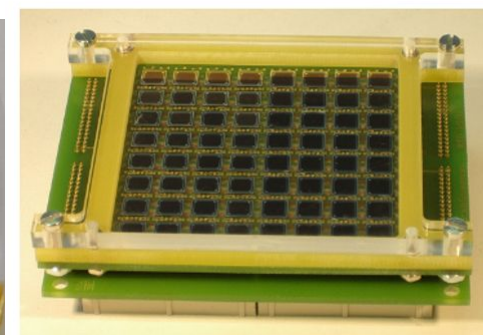


BGO



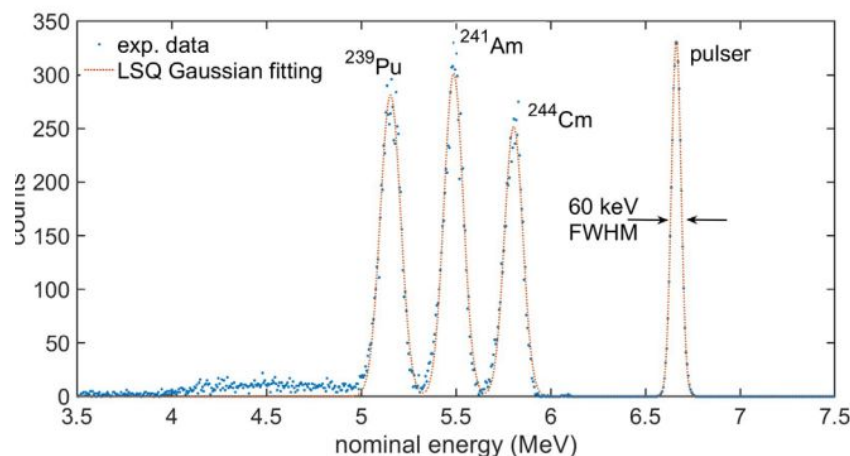
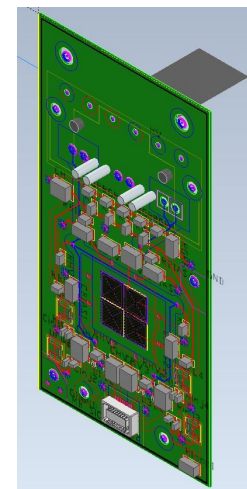
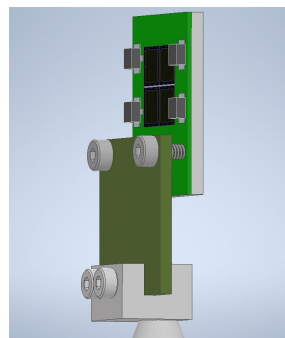
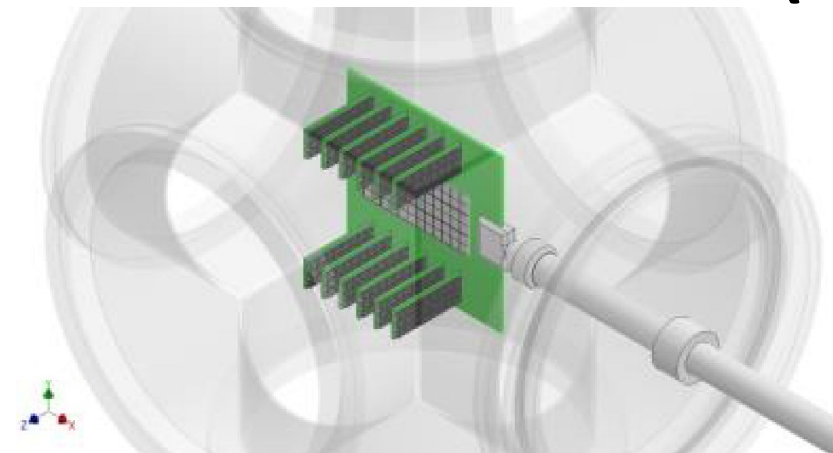
SiC

Monolith



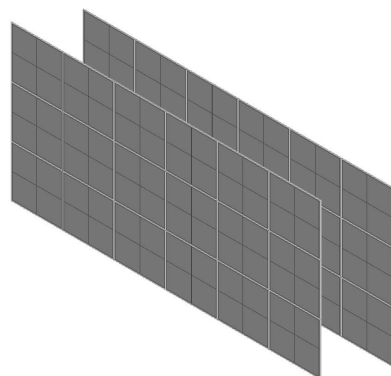
SiC can be used as tagging system due to radiation hardness

SiC first interactions (2022)

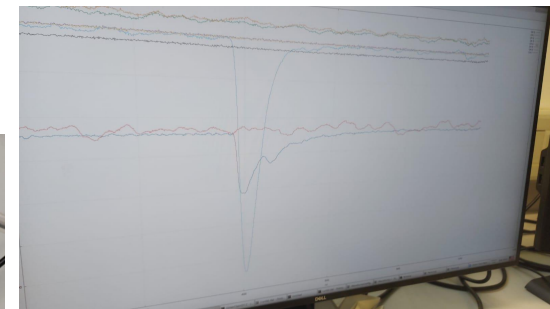
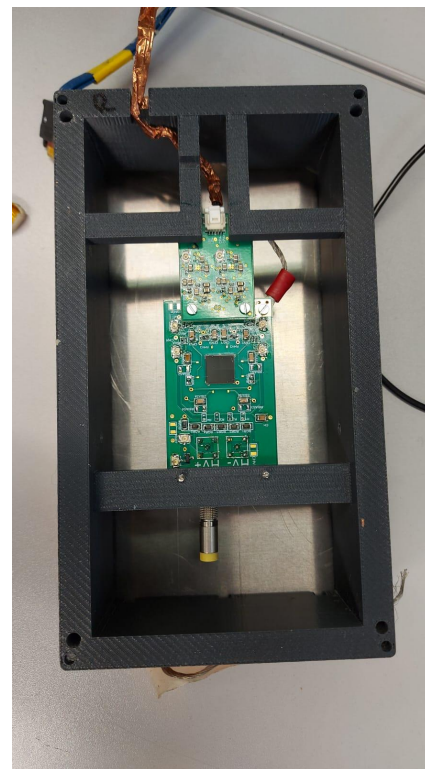
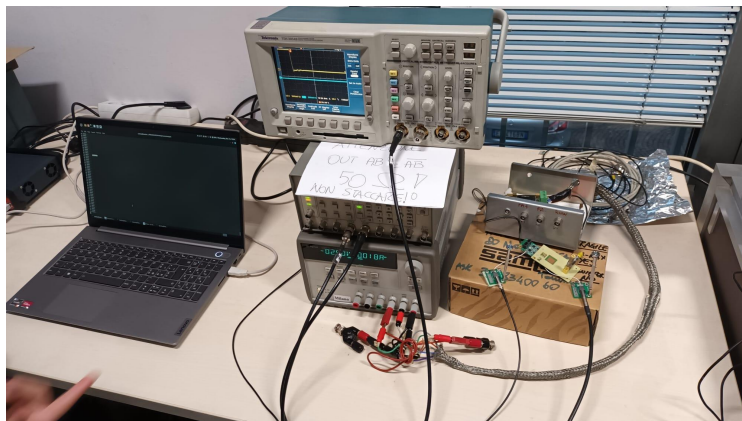


First studies of SiC detector for FRAISE project LNS-INFN and POLIMI, show the ASIC devoted to the system.

Size and Resolution:
100 micron and 60 keV res.



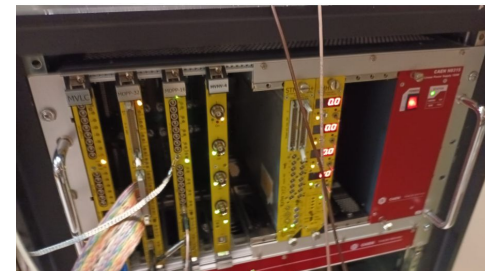
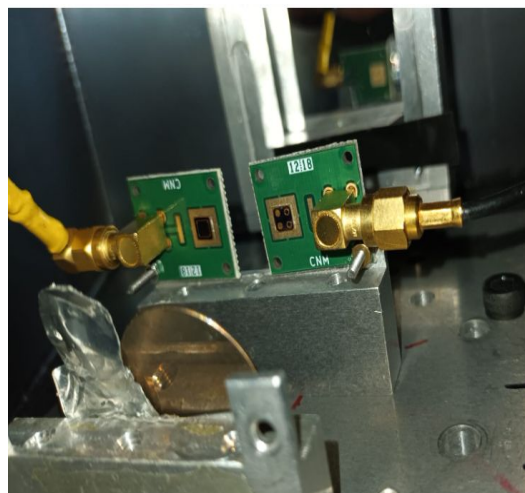
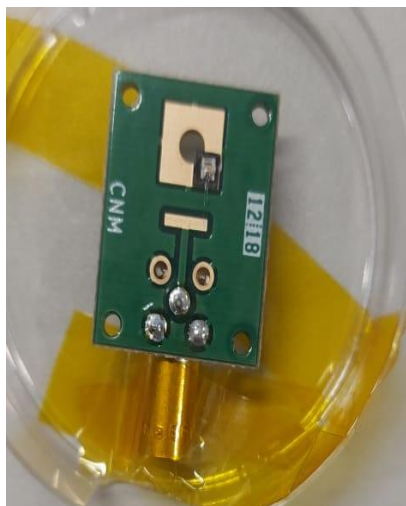
SiC first interactions: Trying with commercial Digitizers (POLIMI-GSI)- Dec. 2023



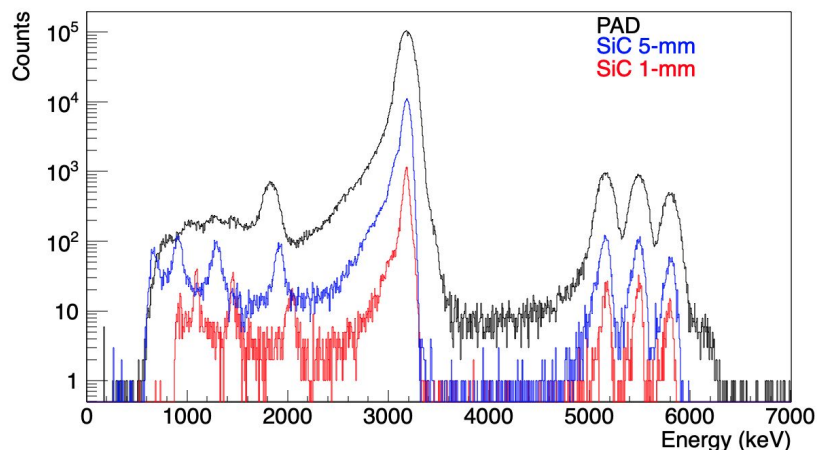
- Prototype tested at POLIMI (LNS-MI-CSIC) using the ASIC + 8 channels digitizer CAEN module.
- First test with beam carried out at GSI as parasitic setup of the S122 “test for the experiment”.
- Very few coincidences between plastic and SiC were observed.

SiC developed at IMB-CSIC for ISRS project (IEM-CSIC)

April 2024



MVLC vme controller, MSI-8,
MDPP16-L QDC digitizer module

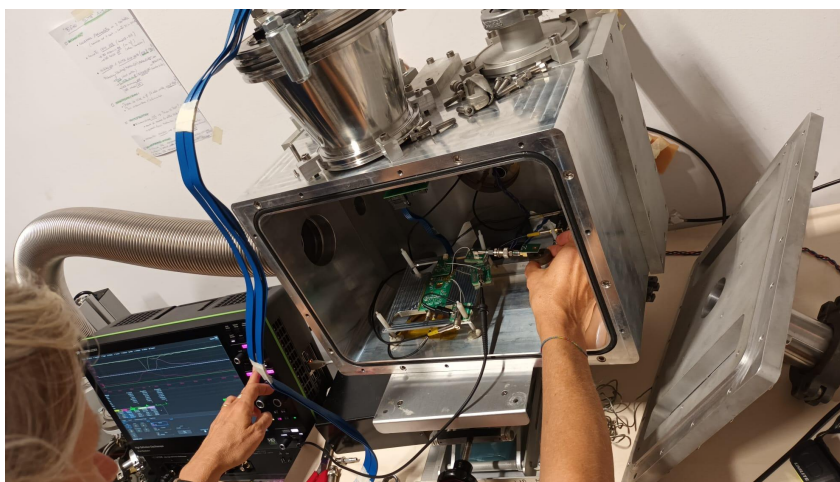
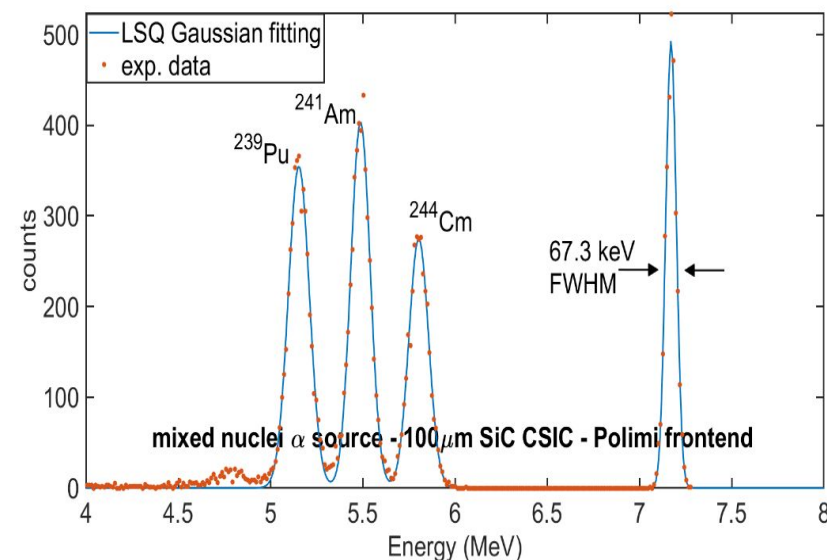
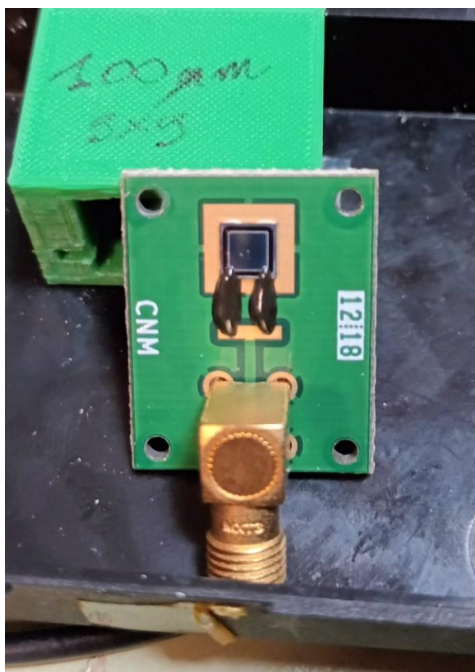


We obtain a resolution of about 60 keV for the
1mm SiC, 80 keV for the 5mm SiC and 150 keV
for the Si PAD. Thickness of 50 microns.

SiC-CSIC test at POLIMI (with MI-ASIC)

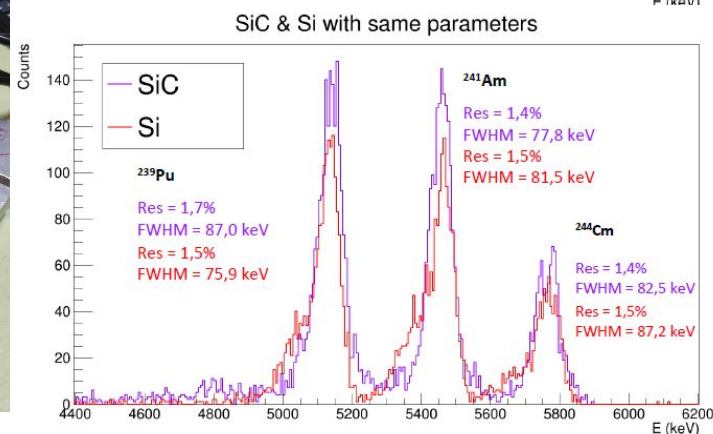
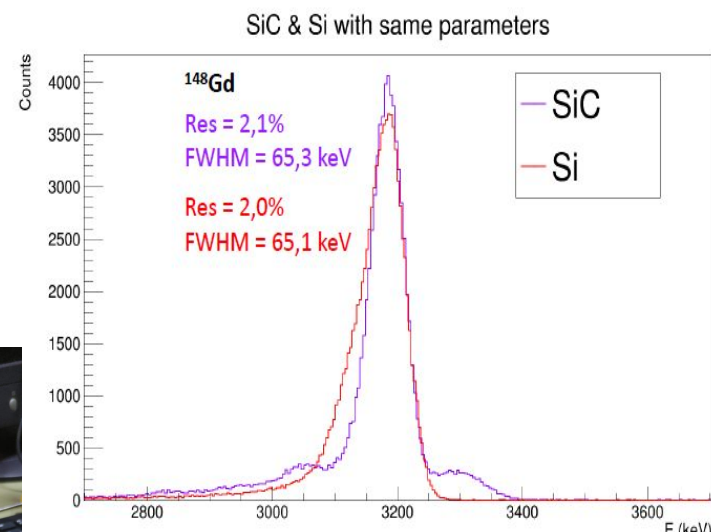
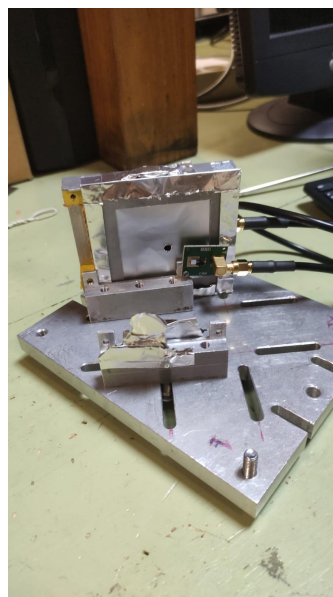
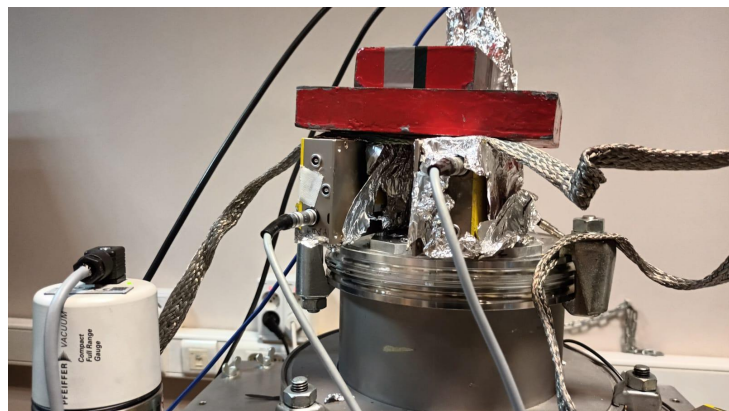
POLIMI lab setup with a 100 micron

They kept the 5 mm 50 micron detector
for further adaptation

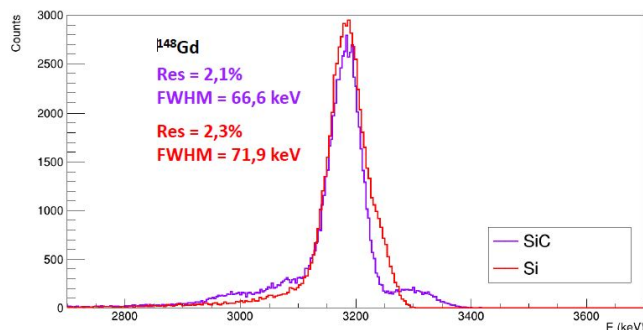


SiC vs Si test at IEM-CSIC: 3rd round, using **Mesytec MPR-1**, Cividec (for diamond module) along to **DAQ-Mesytec** and Maestro Multichannel

Fine tuning of MDPP-32 Mesytec module and obtain very similar resolution to Si.

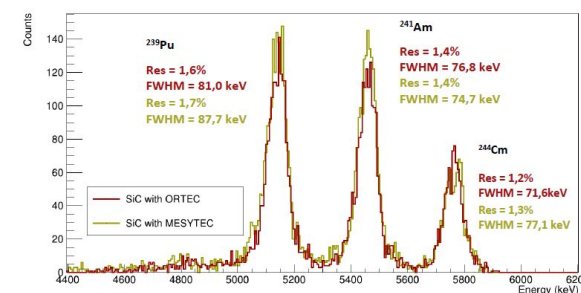
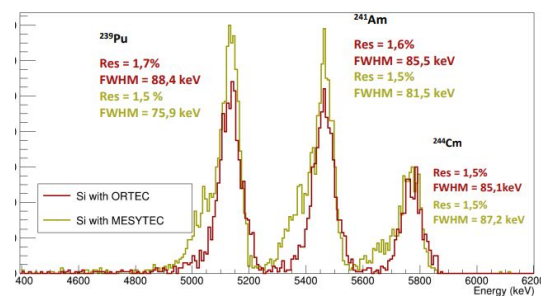
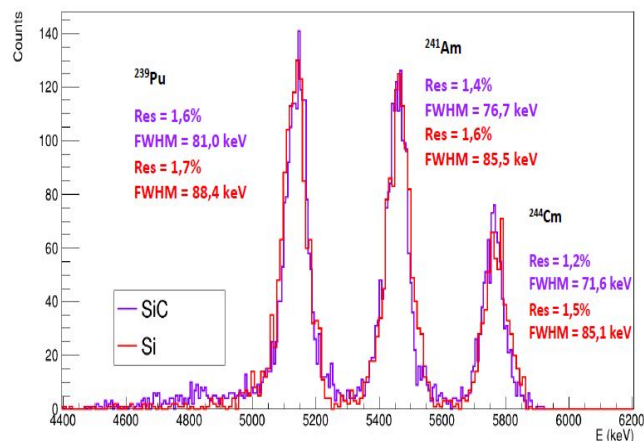
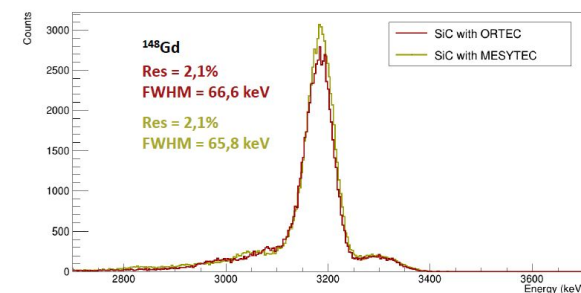
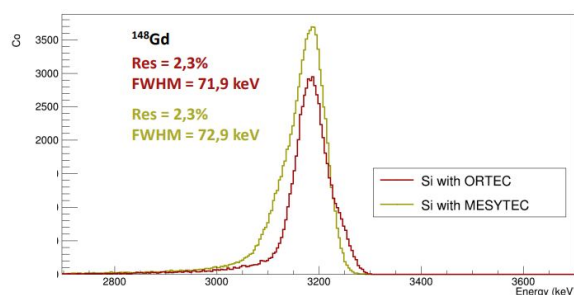


SiC vs Si test at IEM-CSIC: 3rd round, using **Mesytec MPR-1**, Cividec (for diamond module) along to **DAQ-Mesytec** and **Maestro Multichannel**

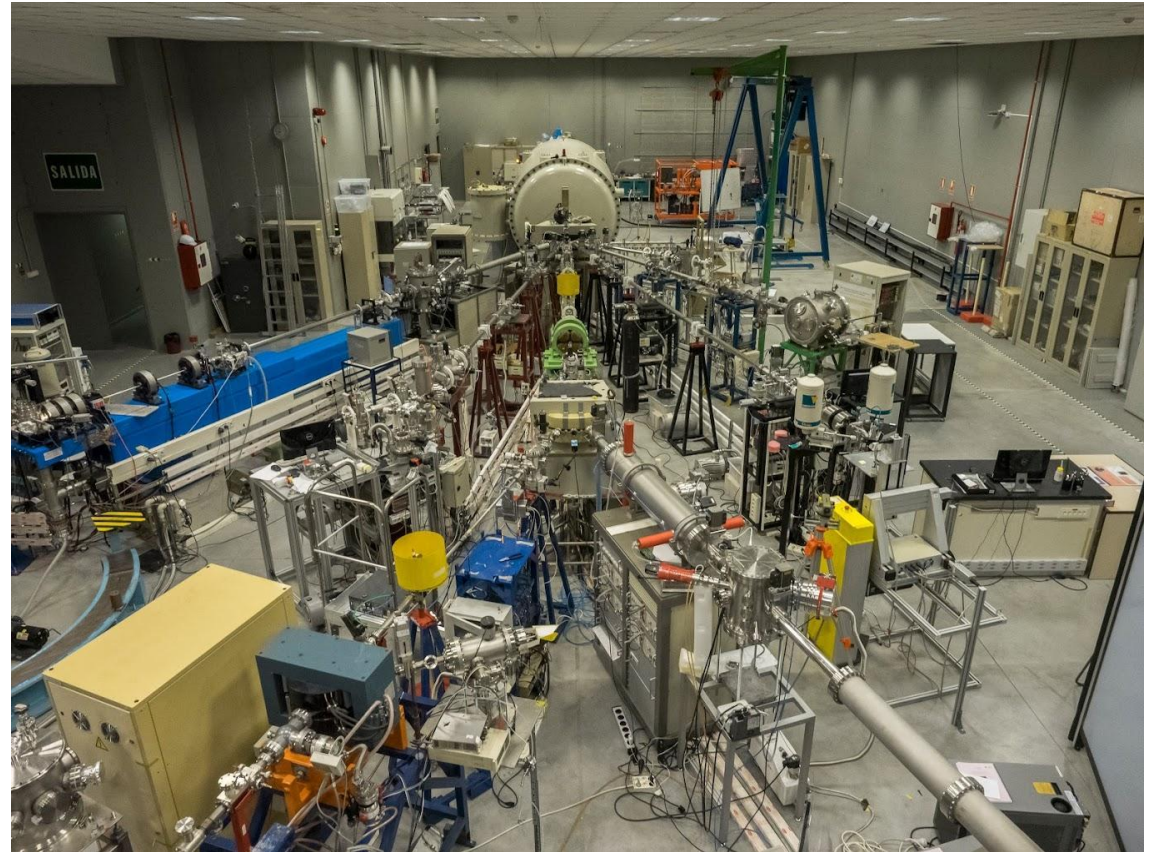


Comparison between ORTEC chain + Maestro data taking Mesytec digitizer for SiC and Si detector. Both cases use the MPR-1 readout

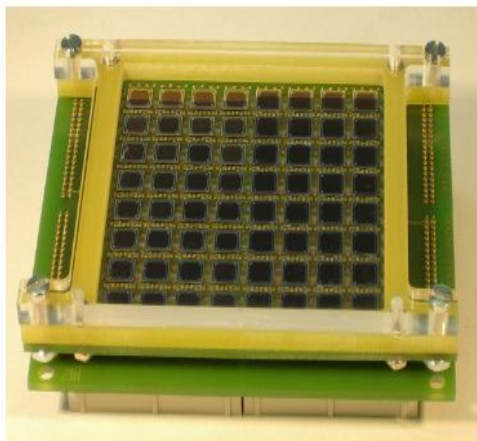
MPR-1 + ORTEC 671 Amp on
Maestro



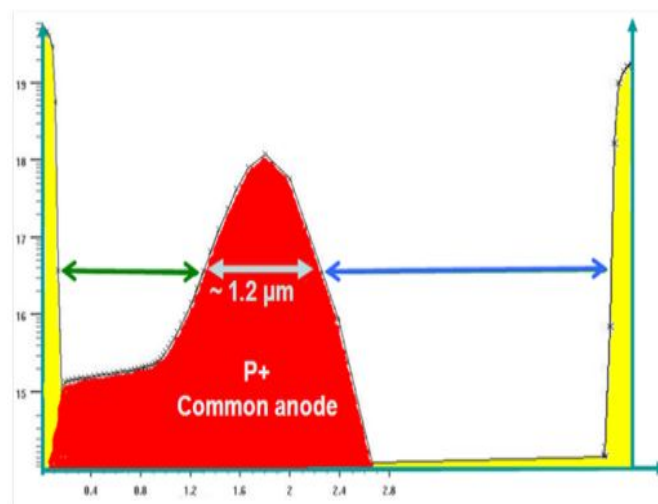
**Further studies to
be carried out at
CMAM Madrid
Using the best
solution with
beams, including
the photon arrays
(still in the waiting
list)**



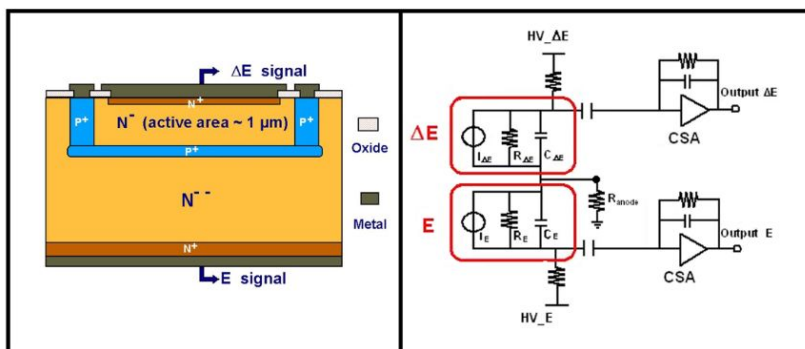
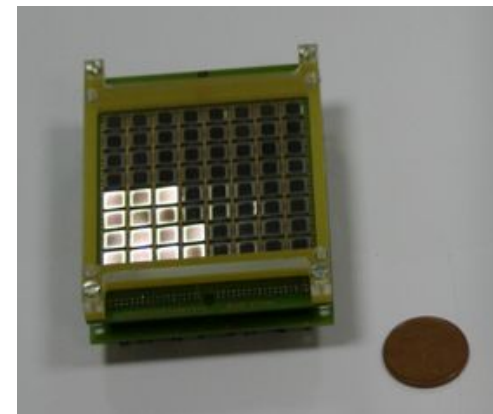
Monolithic Si Detector (will be included in CMAM test)



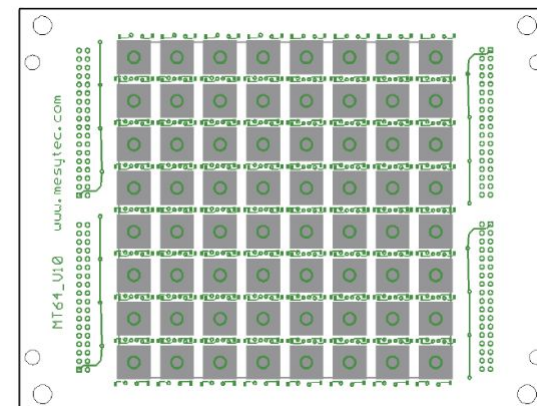
a) Photo of the monolithic detector.



b) Doping structure of the Si wafer.



c) Electronic equivalent circuit of the monolithic detector.



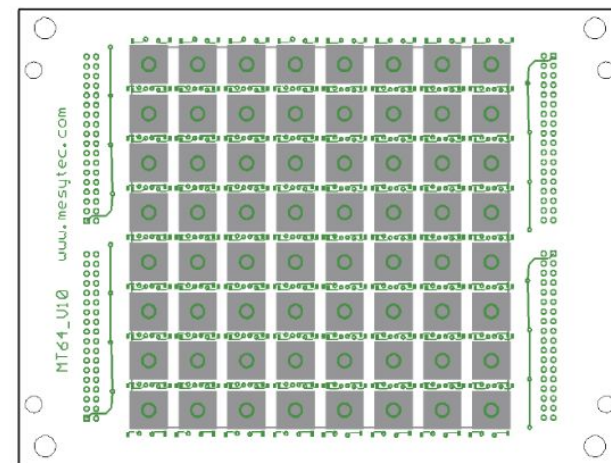
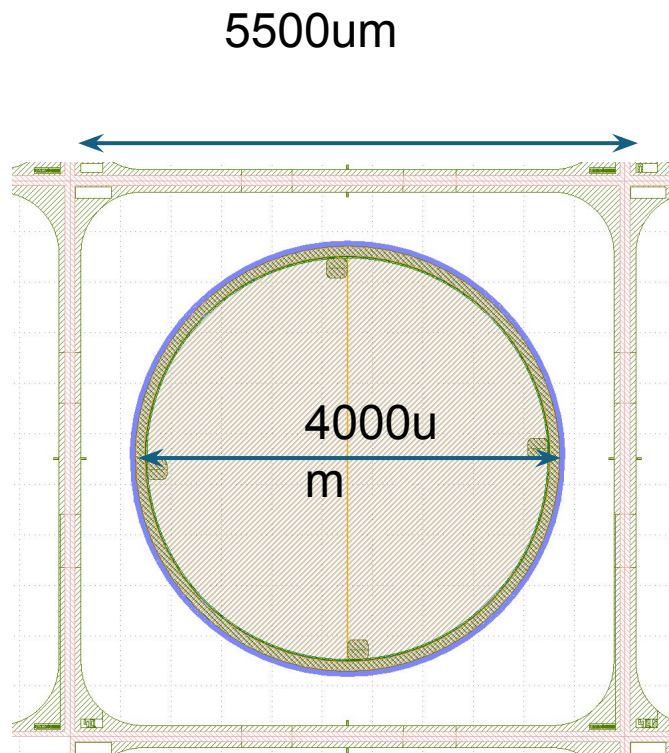
Build new SiC detectors coming in the future months

The dice is 5500 μm x 5500 μm

Active diameter is 4000 μm

The quadrant has a radius of 2000 μm

Giulio Pellegrini
performance at IMB



32 diodes of
50 μm

32 diodes of
100 μm

Thank you for your attention!