Detector and integration status

- Report: available FAZIA detectors worldwide
- On going activities on detectors
- Ideas for next developments
- Very short report from Legnaro

Updated detector budget: BLKS in the WORLD

NOTE: BLK here means detector heads

- 12 BLKs mounted for experiments in GANIL. They are just those used for the exp. E881,884 performed last spring
- 1 BLK fully mounted in Florence (perhaps the one from CNAO)
- 1 BLK fully mounted and used at LNL FAZIATHIN test S+Ti at E=186MeV)
- 1 kBLK in preparation for the test with protons (40-70MeV) in Korea, next december

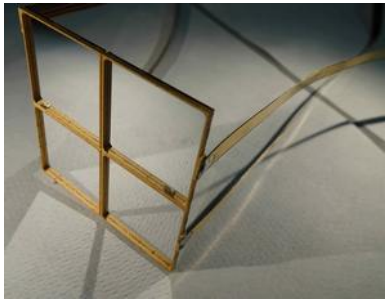
- TO DATE: TOTAL 15 BLKS in the World

- FORESEEN and possibly available (without other investments)
- 1 BLK with Si1 300µm*4; Si2 500µm*1+750µm*3
- 1 BLK with Si1 300µm*4; Si2 300µm*4

- Mid 2026: TOTAL 17 BLKS (+ 3 kBLK if completed in Korea)

Silicon detector budget

Silicons



- 25 micron pads
  only 4 quartettos (one pad broken); under test in LNL
- Some 115 micron quartettos (Korea) for the first kBlk
- 300 micron pads
  We have 11 quartetto (Fi) ready to be mounted (2,75 BLKs)
  There remain 36 pads, i.e. 9 additional quartettos.
  We have some quartetto (Caen) as spare parts for Indra-Fazia
- Some 675 micron quartetto (Korea) for the first kBLk
- 750 micron pads
  There remain 15 pads in clean room, i.e. up to 3 quartettos
- 500 micron pads
  There remain 4 pads, i.e. 1 quartetto

Summary

- We can assemble one full BLK with Si1 (300*4) and Si2 (500*1+750*3)
- We may assemble other two special thin-thin BLKs, using the remaining 16 quartetto 300micron (300*4+300*4)
- In Korea at end 2026 (correct?) there will be 4 kBLks with Si1 115micron + Si2 675 micron

CsI detector budget

As for CsI

- To finish the assembling of remaining 48 CsI for Korea (3 BLKS); 39(*) crystals ready and 9 still to be finalized (*) 16 now mounted in a BLK for the test at LNL
- Also the last purchased 48 CsI (France, 2024) are being used
- Delay on the 2x2 matrix photosensors (Aurel/Excelitas); this is due to the delicate potting of the surface after the mounting of 4 pads on the PCB (Aurel company).
- However of the first 15 matrices arrived, about 8-9 are good, already used for some crystals.
- In order not to accumulate too big delay, various crystals have been coupled with 1x1cm conventional Hamamatsu PDs. They are good photosensors but they are small w.r.t. the back surface (low Light Collection)
- France already ordered other 36 Hamamatsu 1x1 Pds as a back-up for next crystals
- In our lab there remain other about 40 crystals. They can be used to complete the last 2 BLKS mentioned previously, better case if the 2x2 matrix sensors will be ready, early 2026

Very short BLK summary

PRESENT BLK budget

- GANIL 12 BLKs
- KOREA 1 kBLK under test
- FLORENCE 1 SiUltraThin BLK
- FLORENCE 1 spare BLK (ex-CNAO)
- FLORENCE As for silicons there is material to prepare:
  one additional BLK with Si1 (300*4) and Si2 (500*1+750*3)
  two special thin-thin BLKs, using the remaining 16 quartetto 300micron (300*4+300*4)
- FLORENCE As for CsI there is material to prepare:
  3 additional kBLKs already planned
  perhaps 2/3 final BLKS (>32 crystals) by refurbishing in depth the remaining scintillators

POSSIBLE 2026-2028

- GANIL 12 BLKs (ready)
- KOREA 4 kBLKs (2026)
- ITALY 2-3 BLKS almost standard (to be sent FRIB?) (2026)
- Other 2 to 3 BLKS can be prepared (for FRIB) if there is a decision on the physics, on the Si-thicknesses and on the total FEE + trittico availability, provided the full completion of the kBKs will be achieved.
- In this scenario started new contacts with CIS (Germany). The final availability for Silicon (thin-thick) in Korea is not clear to me so far beyond 4 kBLKs

New contacts with CIS for futher production

FAZIA

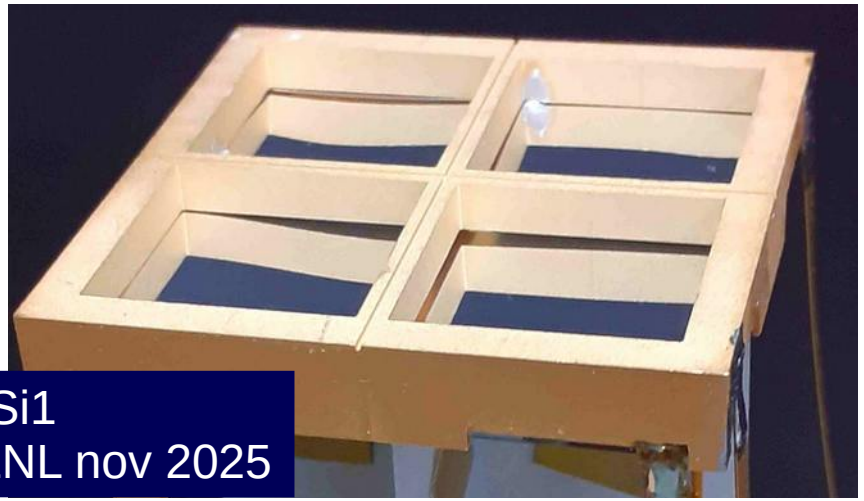
- Can need more silicon detectors for future experiments
- Wishes (dreams) to improve and make easier the pad assembling

CIS

- Last production of 750 micron pads by CIS was in 2020
- CIS is a good reliable partner (they also recovered wafers previously badly processed by CNM)
- They are moving to 6inch technology (2026)
- They are well open to collaborate with FAZIA

As a consequence: I had a videocall (with technical manager) 5 nov 25; this was just to re-start contacts, updating each other after 5 years

Discussed points with CIS



UltrathinSi1
BLK @ LNL nov 2025

CIS

- Available to produce new sensors; from 500 to 1000 micron (1000 micron to be investigated, optimistic)
- Available to develop new masks for single pads (with minor changes needed) following the old project (single-pad)
- Available to evaluate the new mounting scheme, that reported in the two photographs, that was a consequence of the Micron production of the ultrathin Si quartettos.
- Available to give ready-to-use quartettos, i.e. quartettos already assembled and electrically connected with our flexi or alternative possible solutions
- A new videocall fixed around end november (also to have an idea of costs)

Breaking news from LNL

After 7 years from the idea to develop new ultrathin sensors to be integrated in a full BLK

Fazia in the world of thin Silicon

Old history

2013: Andrzej buids a Fazia-like 21micron pad. We successfully tested it In LNS but it remained an isolated attempt

PREQUEL

1) Since 2018 (at least) FAZIA is considering the chance of very thin Si1 layers
2) 2019: Korea group started developments towards 150micron (fully korean activity). Still pending
3) 2019-2021: Within italian group (SPES driven) we were aware that 150micron is not a game changing value; the idea was to push to much thinner sensors but the conditions were not mature for many reasons (budget, physics cases, manpower to think of that etc.)

2018

4) 2022 march: new discussions also triggered by MidTermPlan reports in CSN3 INFN. Ivano proposed to ask Micron UK about developments toward 30-50micron

March 2022

Ivano suggested to contact MICRON Ltd.

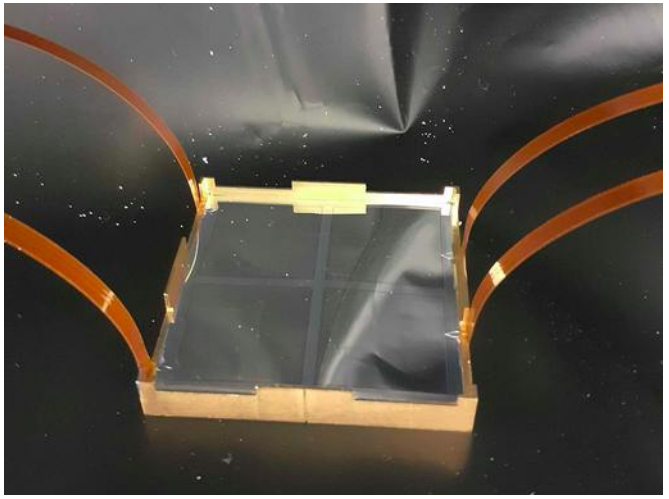
5) 2022 june-september: two ZOOM with Susanne Walsh (design manager) and collaborators and many email
6) 2022 june-july: constraints shown by Micron (main one: complete quartetto, no way to have single pad so thin)
7) 2022 july: my idea was to launch so far only a mockup production of few pieces to train ourselves with the mechanical changes needed to host the new matrices 2x2 pads

July 2022

Technical design discussions and first mockup production apr2023

Fazia in the world of thin Silicon

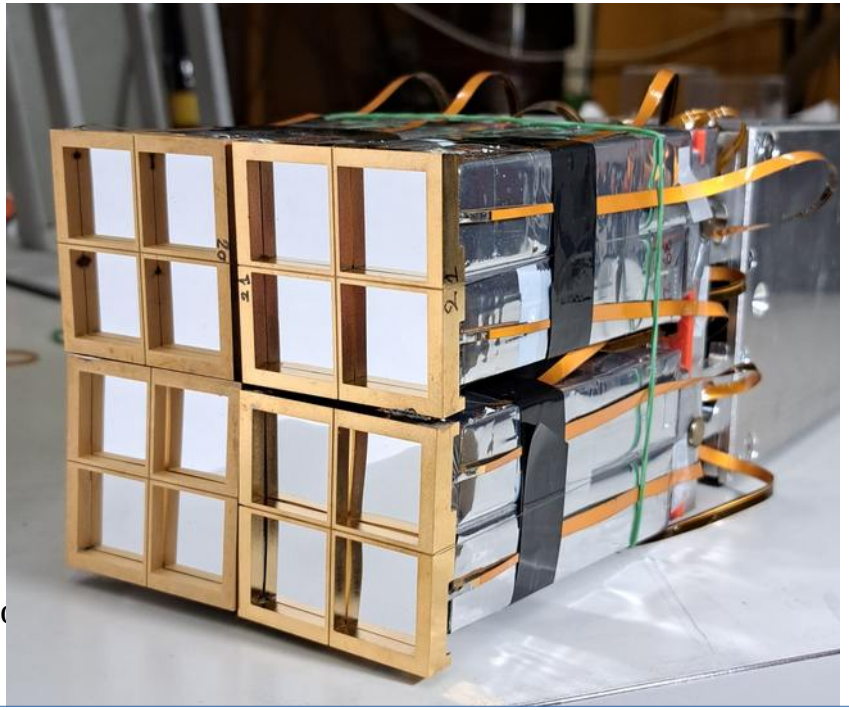
Recent history



2023: support and mounting parts production
2023-2024: MICRON produces sensors
2024 july: Assembling in Florence clean room (G.Tobia)
2024 june: FaziaTHIN proposal submitted to LNL PAC
2024 october: tests with 241Am source on the 4 quartettos

Finally beam time scheduled 9-10 november 2025

Reactions S+Ti at 186MeV (Tandem beam)
Target 48Ti 0.6 mg/cm2
Currents up to 5enA
Lab angle of BLK center: about 25deg
Distance from target: around 110cm
Typical rate on BLK: 400cps
Typical throughput (with waveforms): 3.5GB/s



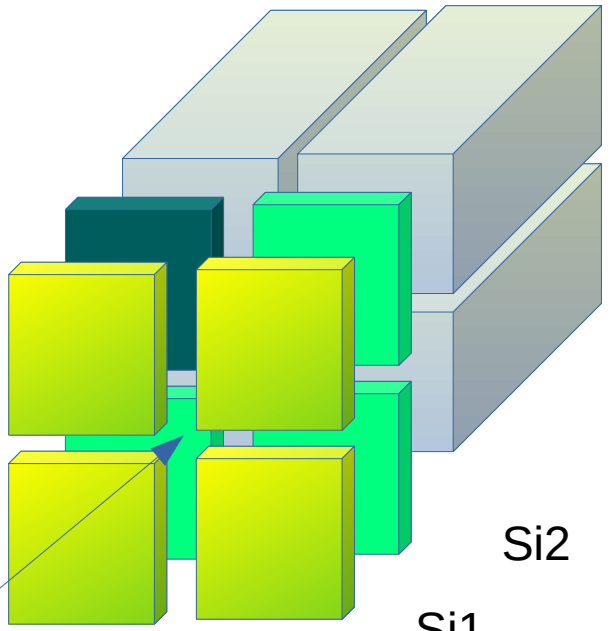
Fazia in the world of thin Silicon

Configuration @LNL

23µm Micron 2x2

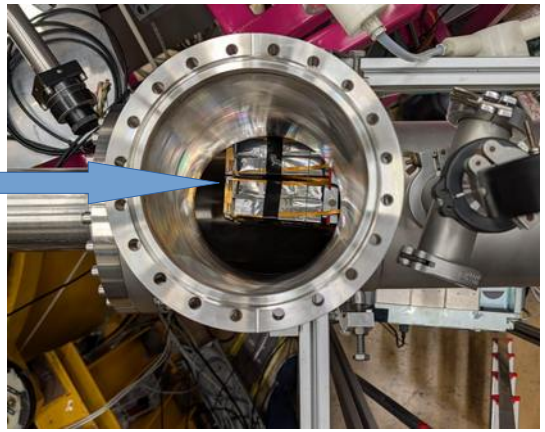
300µm CIS

675µm ETRI



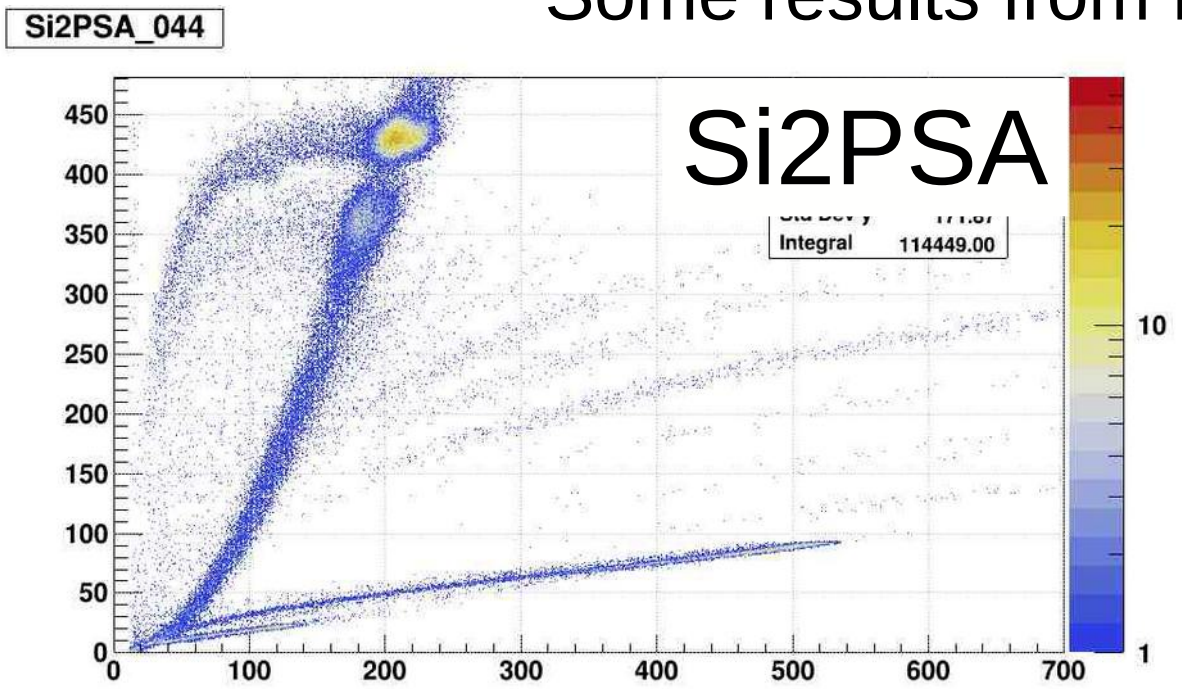
25 deg

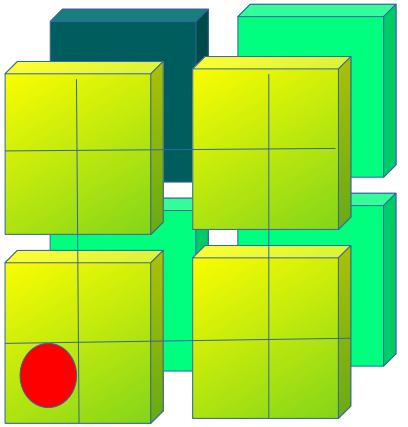
25deg



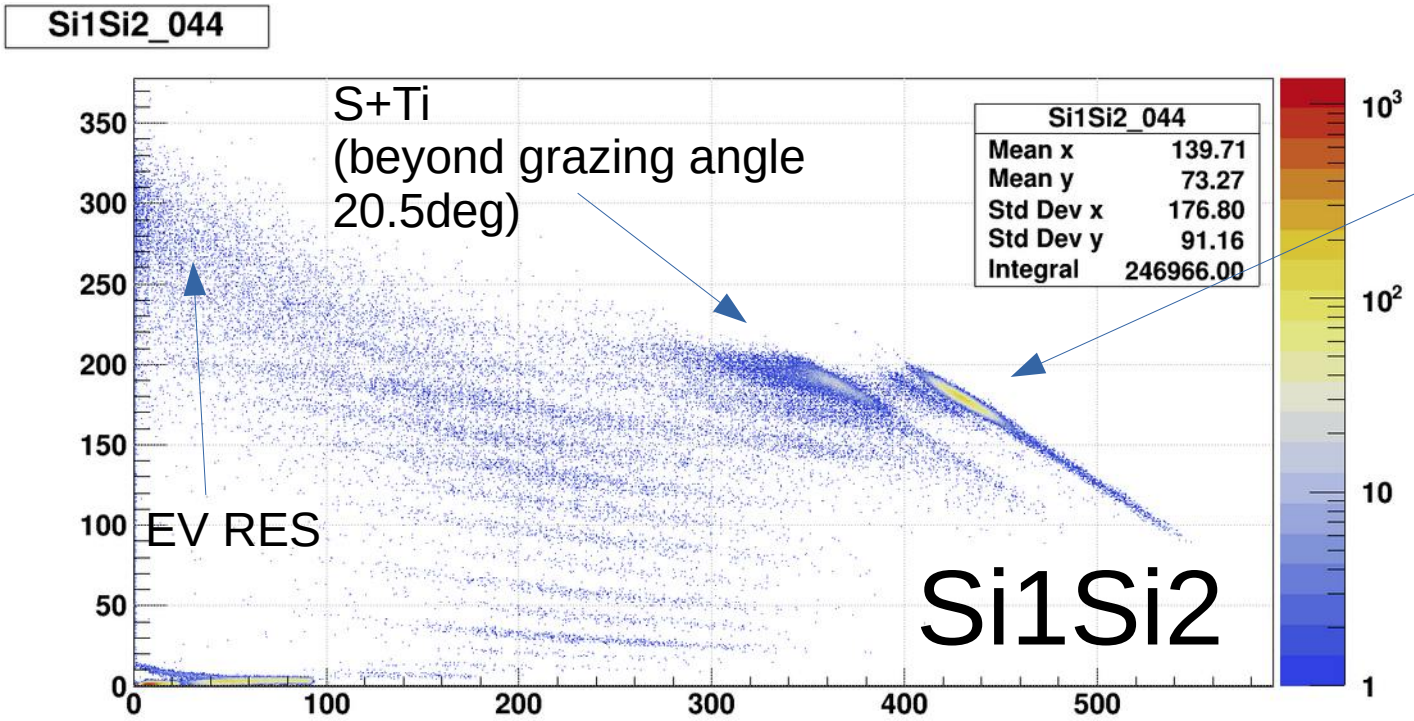
Hosted at the PISOLO deflector line

Some results from LNL

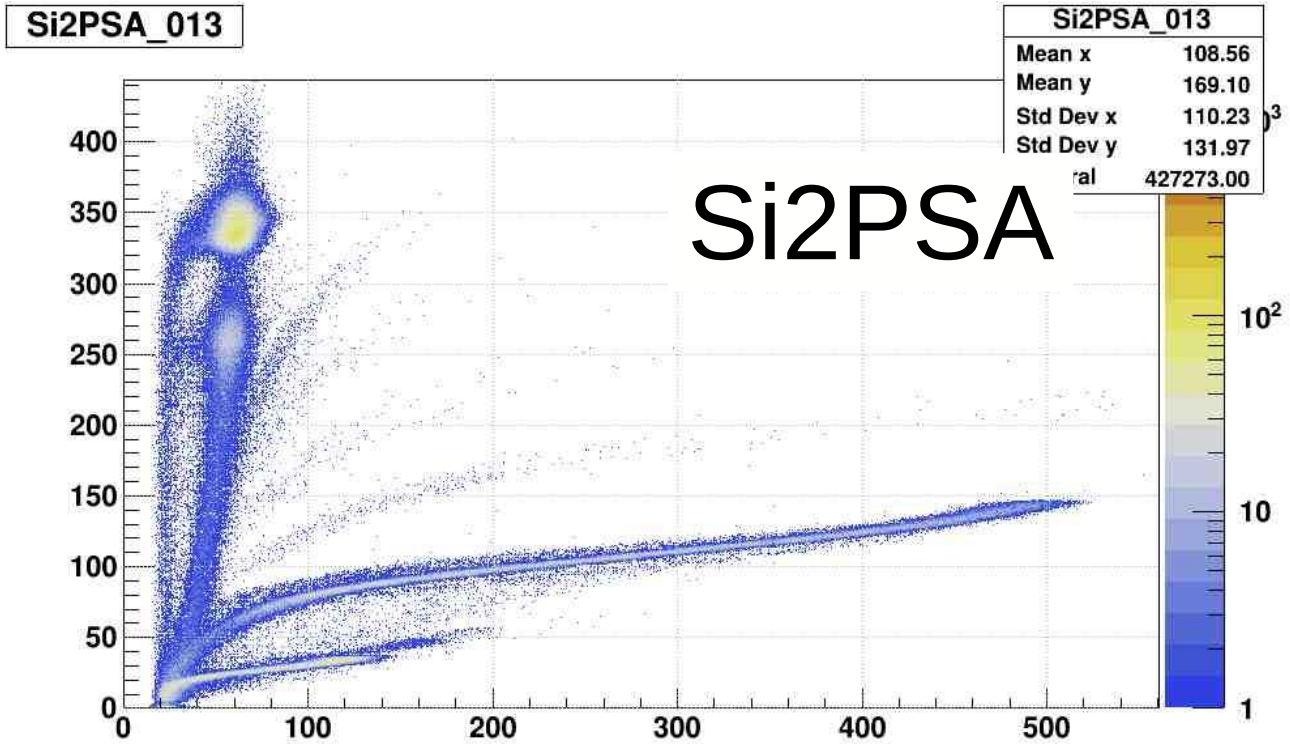


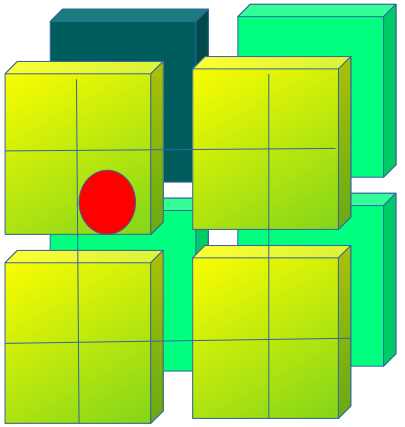


25+300 micron

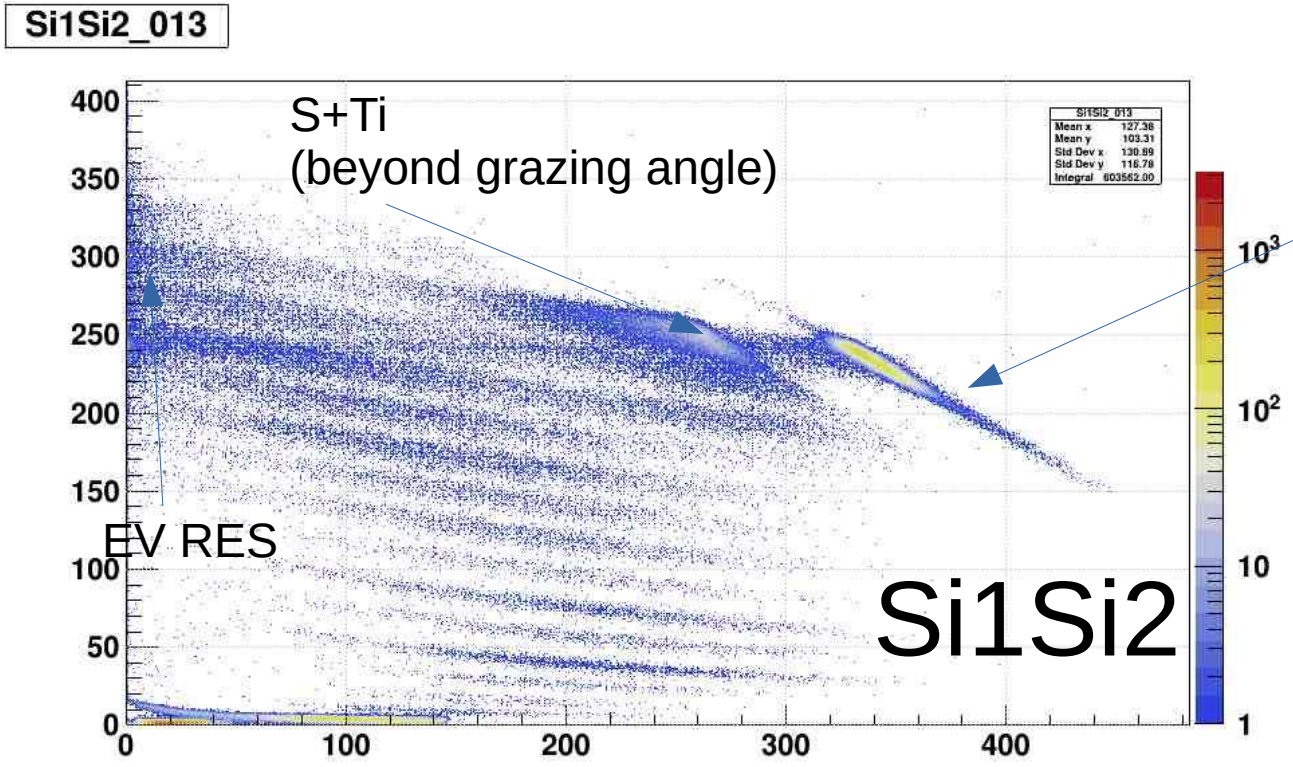


S+Au (backing)
(well below
grazing angle 102deg)

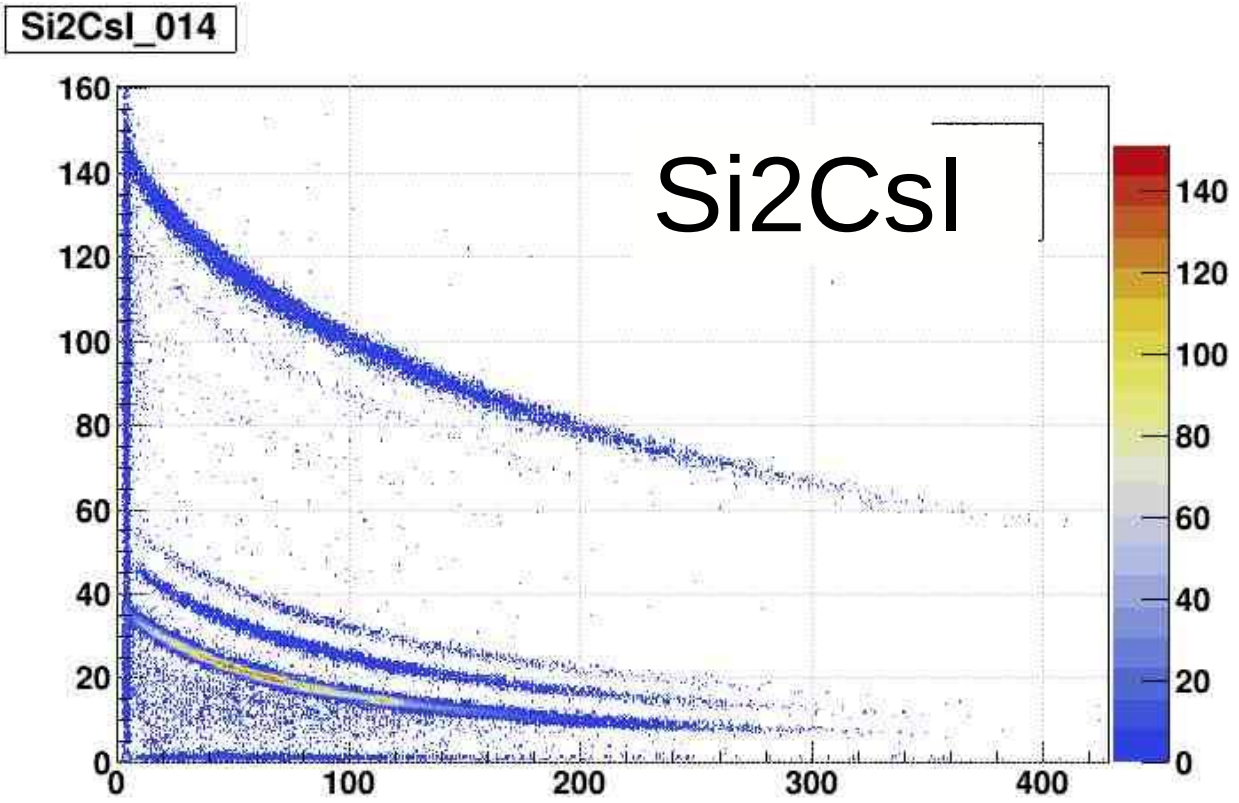


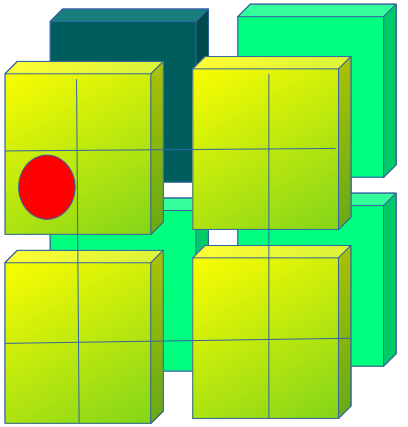


25+675micron



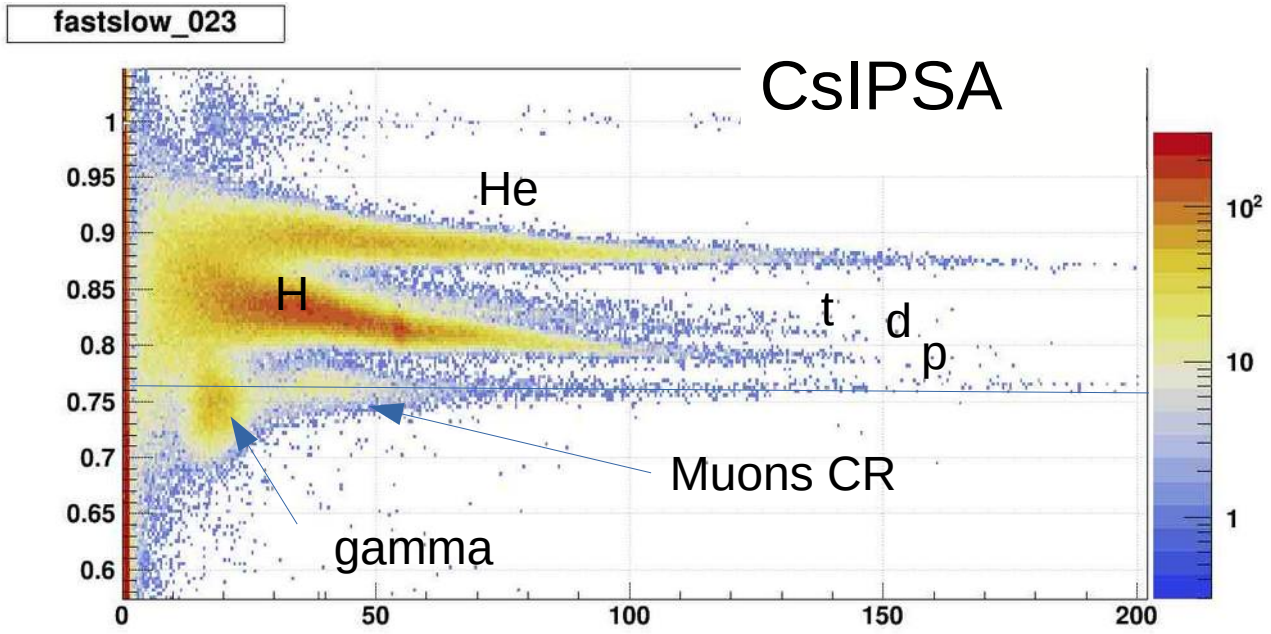
S+Au (backing)
(well below
grazing angle)

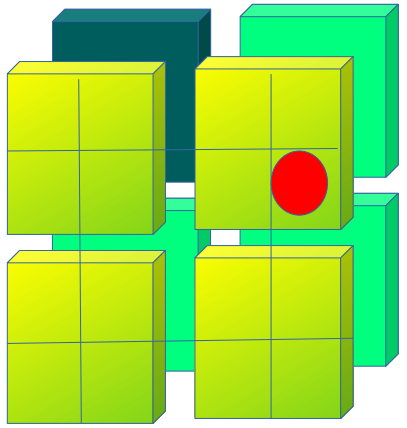




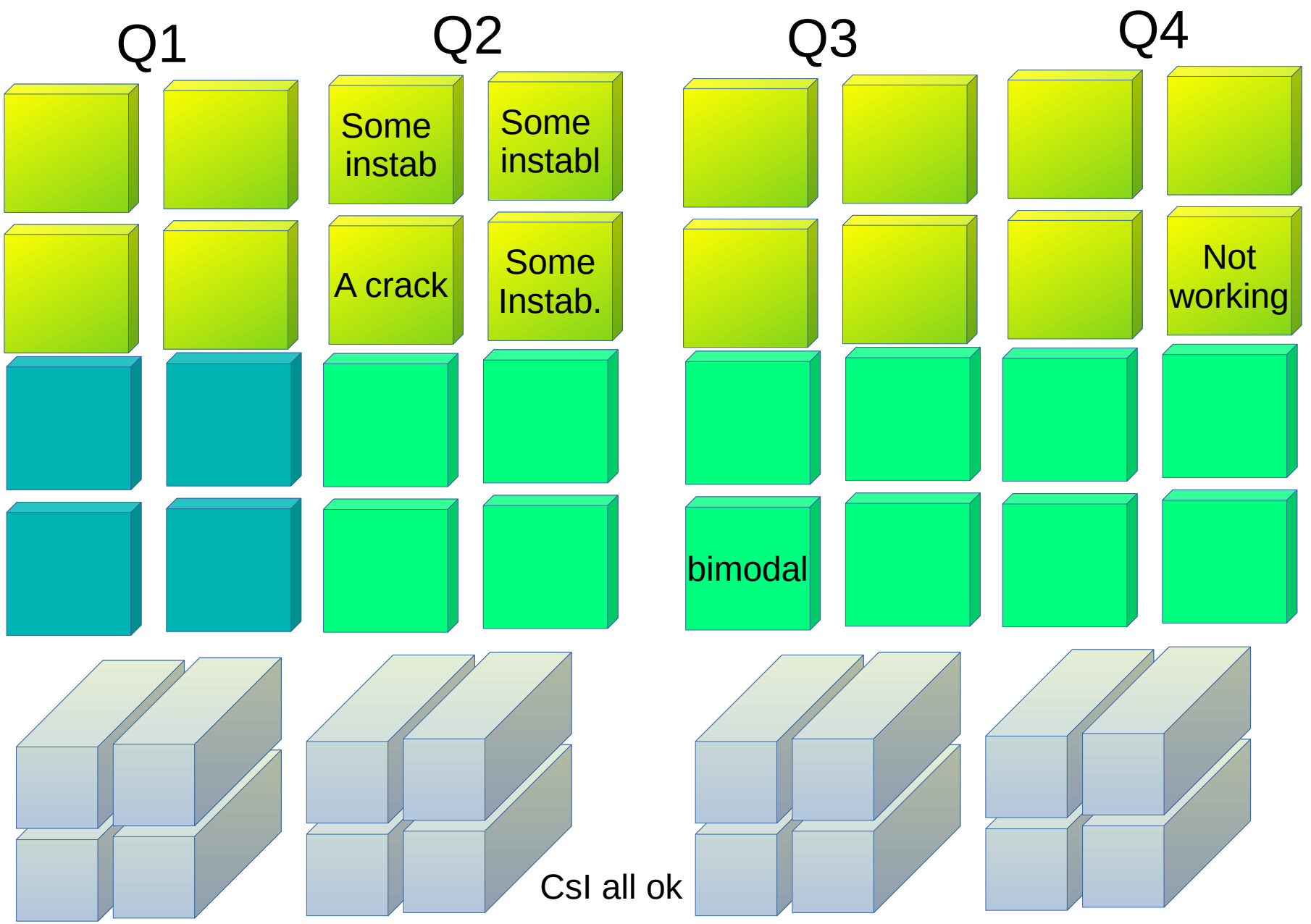
675 mic+CsI

Scarce production of LCP and also having low E.





CsI


Q1
Q2
Q3
Q4
Some instab
Some instabl
A crack
Some Instab.
Not working
bimodal
CsI all ok