

Very Thin Si-detectors: italian activity

- Motivation
- Timeline
- Manufacturing
- Integration controls
- First Production
- Collaboration decision
- Beam tests

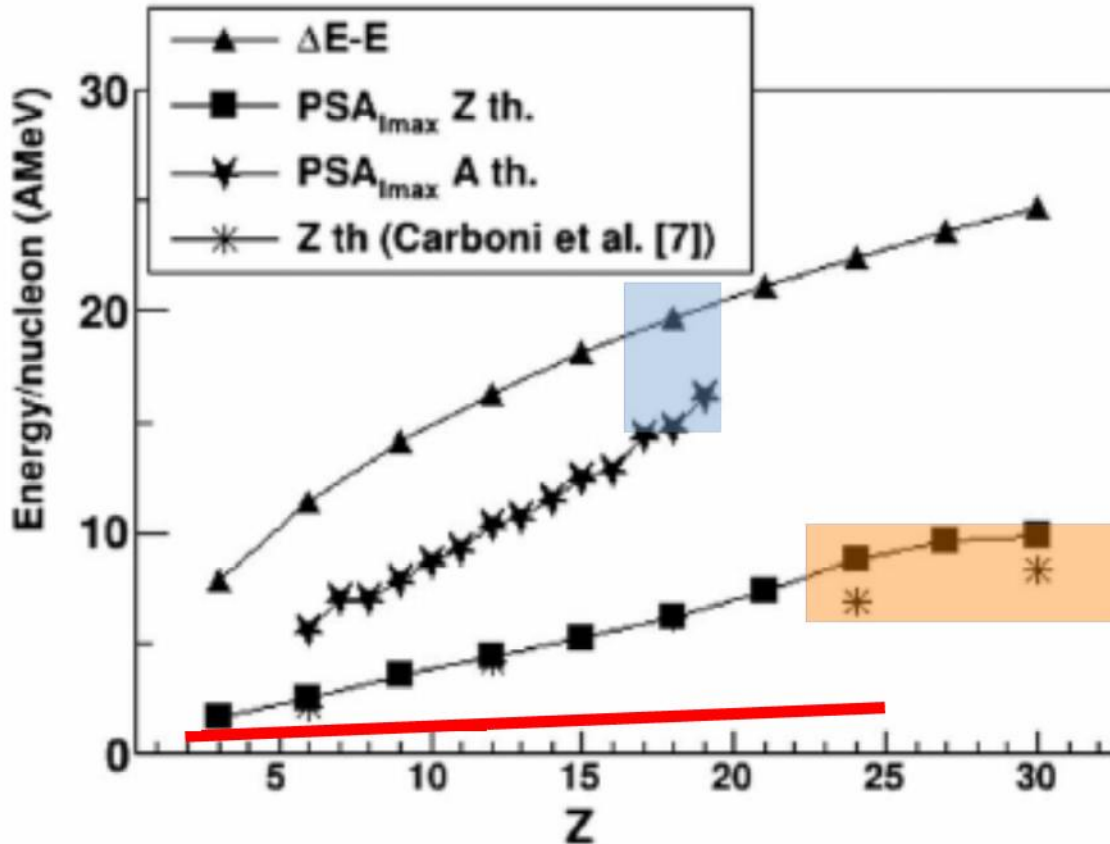


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Thin Si: motivation

A.Kordjasz et al Eur. Phys. J. A (2015) 51: 15
 G.Pastore et al. NIM A 860 (2017) 42–50



Region of E-Z for first **RAON** beams

Lower part of the E-Z range for **SPES** beams

Achieved thresholds with one 20x20mm² 21micron Si-sensor (Andrzej's paper)

OPPORTUNITY

Achieve full Z (no mass) discrimination with 20-30 micron up to iron ions with $E > 2-2.5 \text{ MeV/u}$



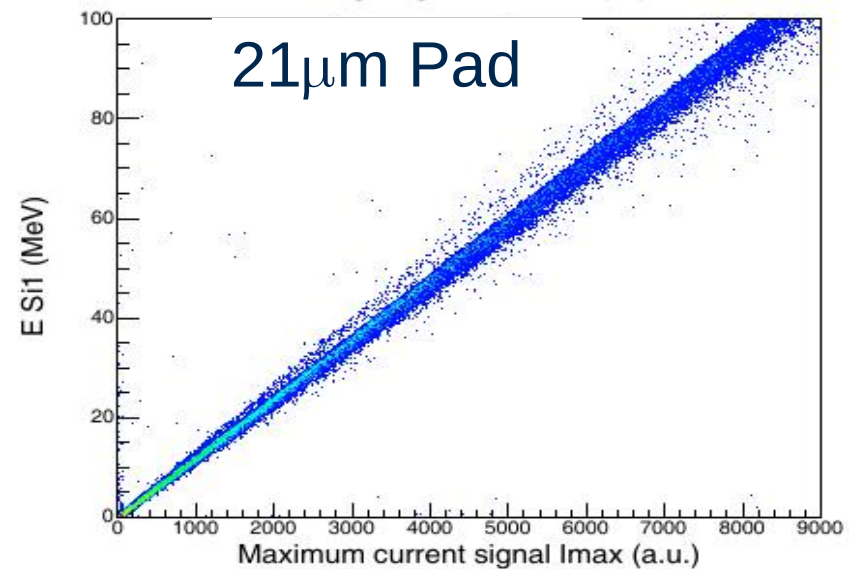
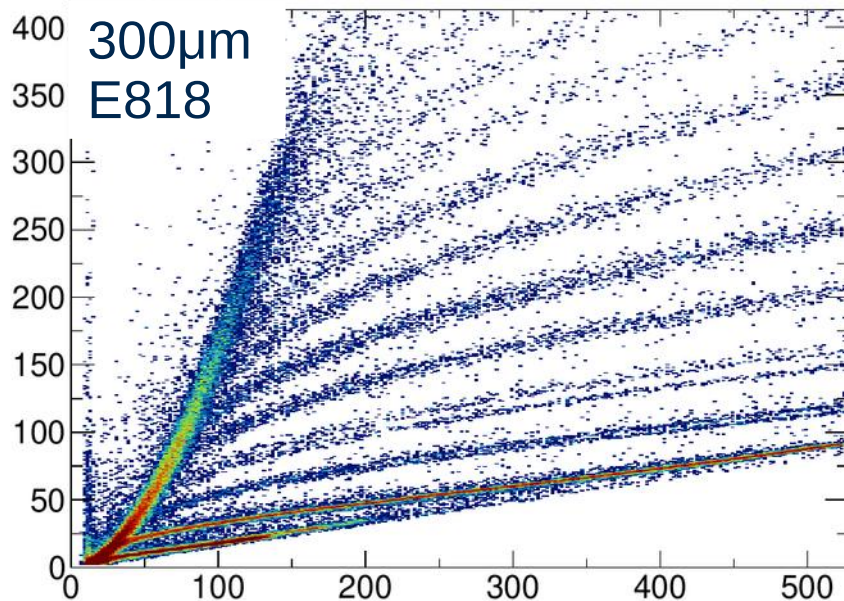
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Thin Si: motivation

Relevant comments/considerations when using thin Si (<40micron)

- No PSA anyway (pictures below) but potentially good Z discrimination with low E-thresholds
- High thickness homogeneity (more important going thinner)
- Successful production (efficiency, to be judged, unknown)
- Capacitance: from 6 to 10 times that of 300micron. Check preamps!
- Resistivity: Should be no problem, very low depl voltages anyhow. (for the moment we know about 300-1000ohm*cm)



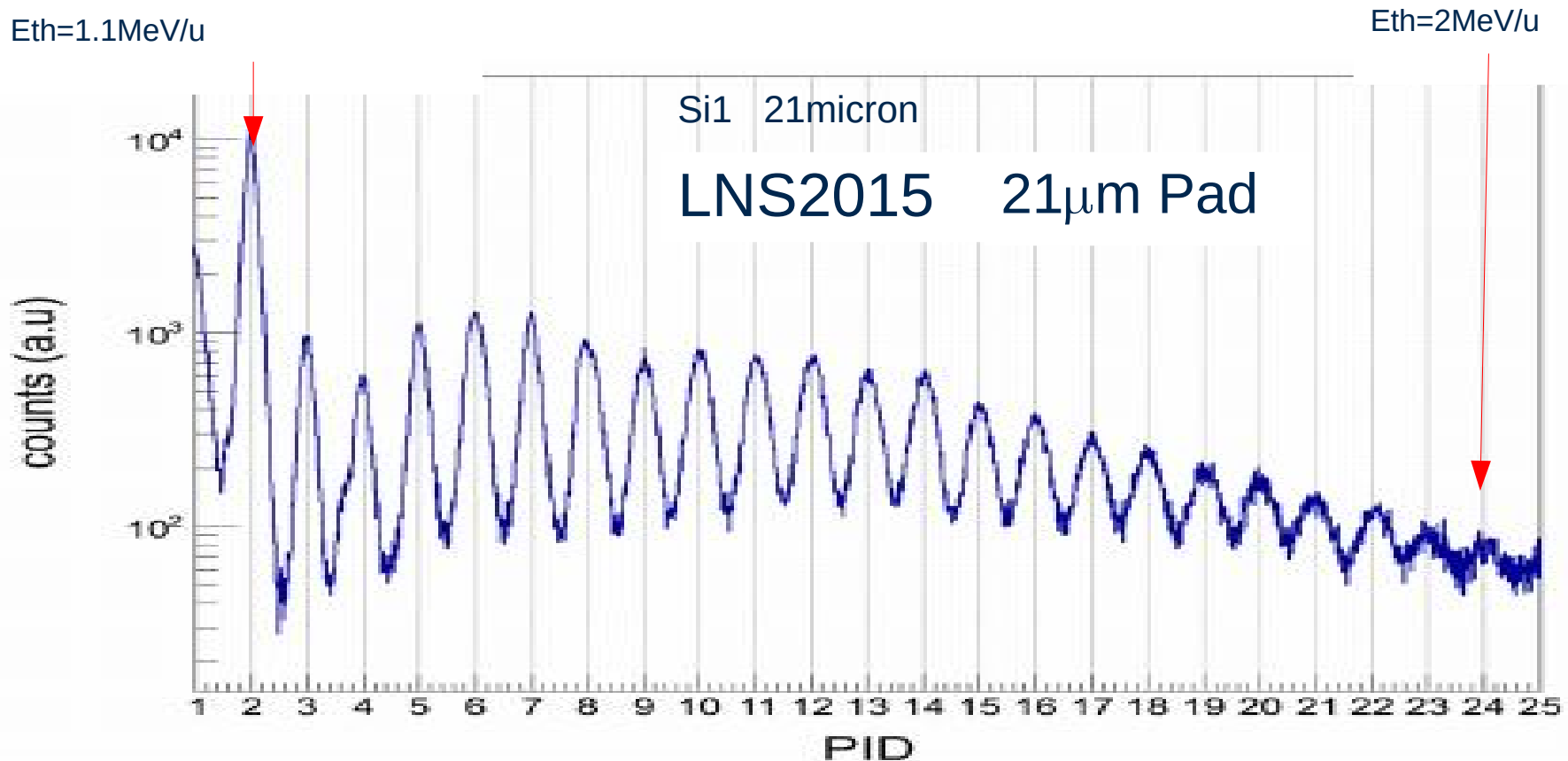
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Thin Si: motivation

Taken from [A.Kordjasz et al Eur. Phys. J. A \(2015\) 51: 15](#)

- Good Z identification verified up to Z=22



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Timeline: so far



2019		Q4 2021	Q1 2022	Q2	Q3	Q4	Q1 2023	Q2	Q3	Q4	Q1 2024	Q2	Q3	Q4
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Korea started efforts towards 150micron detectors

INFN: discussions on future labs; decision to go thinner...
Contacts with MICRON, Uk

INFN funding received for MR (only integration not sensor)
Order sent in nov 2022

Jan 2023: after many discussion finalized design. Mask production

Apr 2023: 2 matrices 2x2 pads delivered

May 2023 New mechanics production

May-june Gold plating of new frames/collimators

Now waiting for new flexi strips for final mounting



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Timeline: next future



2019		Q4 2021	Q1 2022	Q2	Q3	Q4	Q1 2023	Q2	Q3	Q4	Q1 2024	Q2	Q3	Q4
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Now waiting for new flexi strips for final mounting

Mounting of the 2 matrices
Electrical tests

Unlock INFN funds (20ke) for first real sensor production; budget sufficient for 3 matrices; support from other countries to achieve the BLK completion (5ke/matrix) ??

production

Mounting.
A ThinBlk constructed
Ready to go: where?

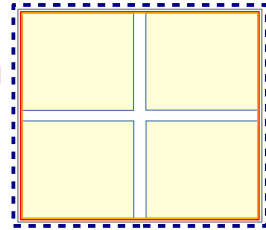


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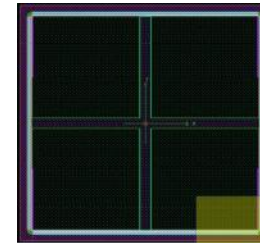


From drawings to reality

first libreoffice-Draw sketch



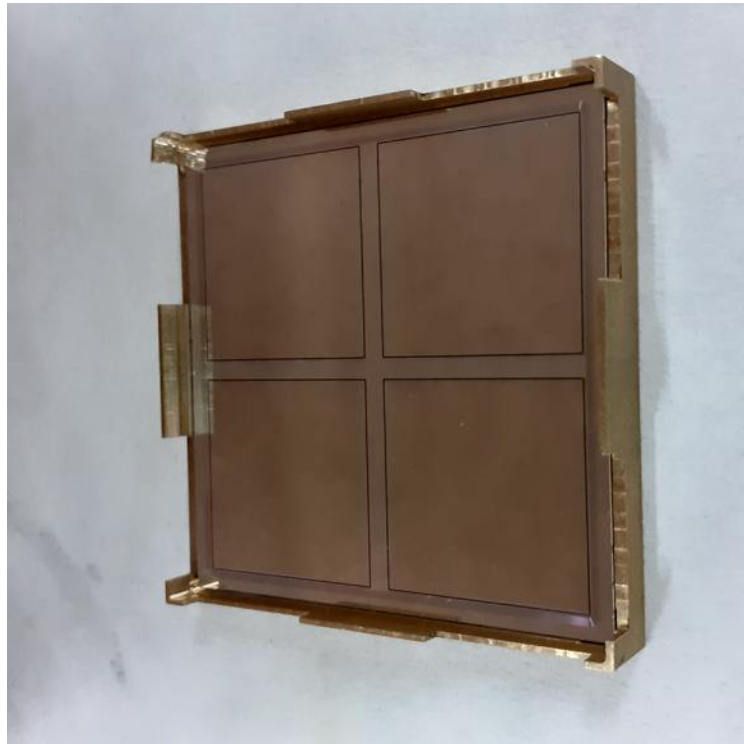
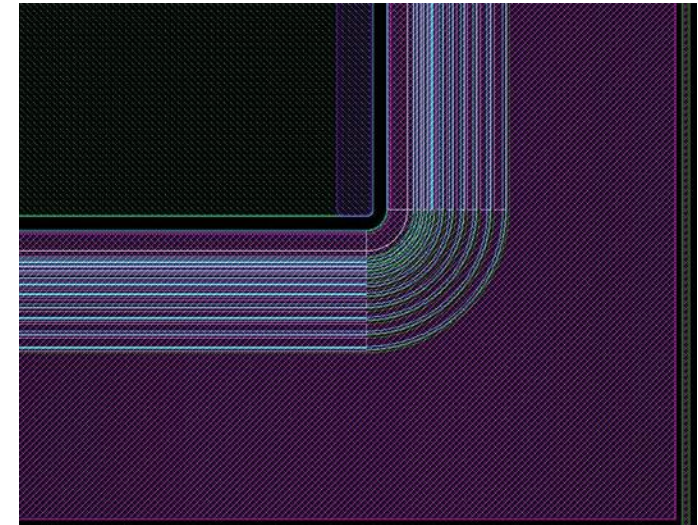
4 months



Micron CAD output jpeg



ZOOM: GR and bonding pad



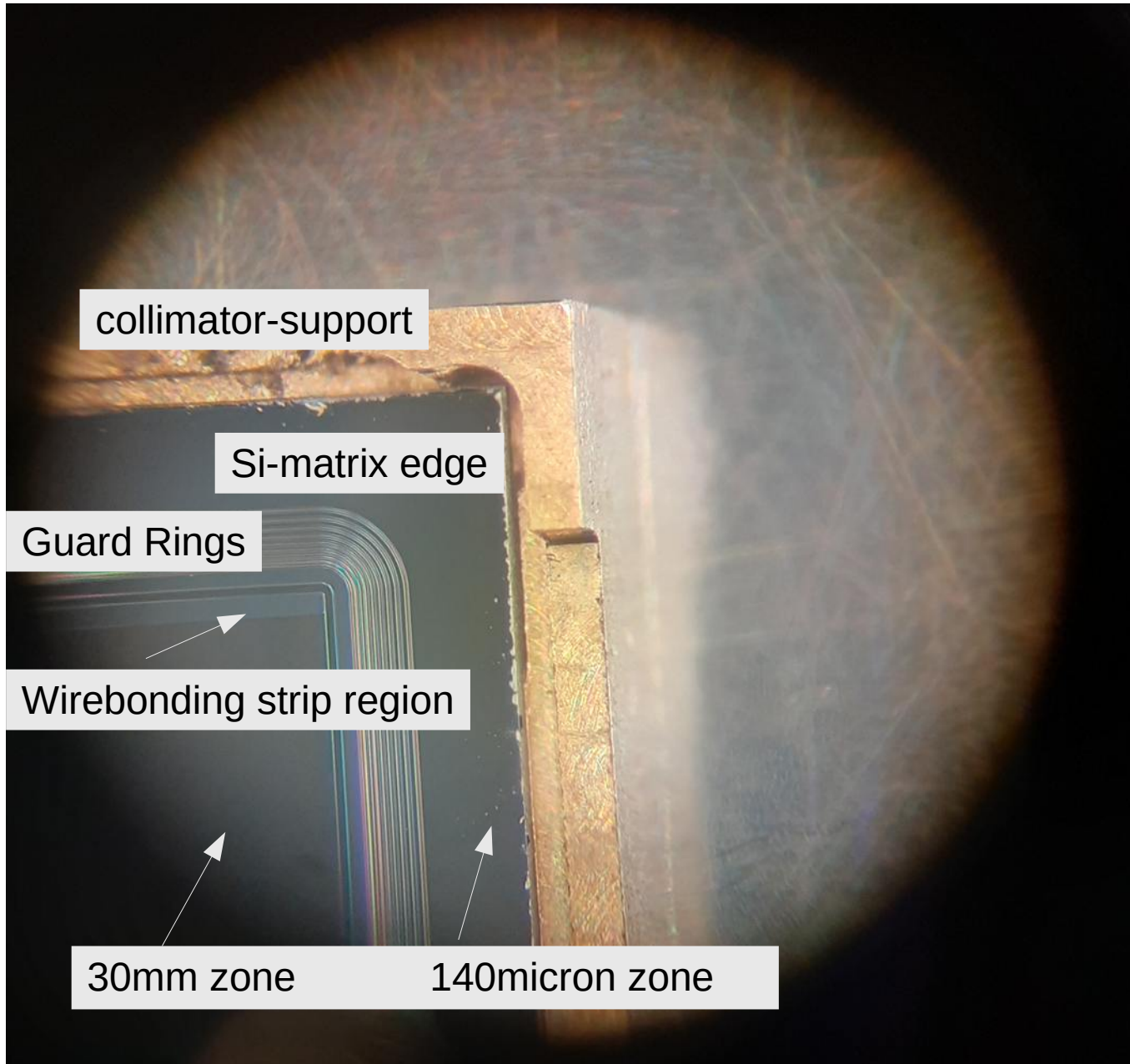
May 31st, 2023
One matrix inserted
in the new mechanic
frame



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Chip details



collimator-support

Si-matrix edge

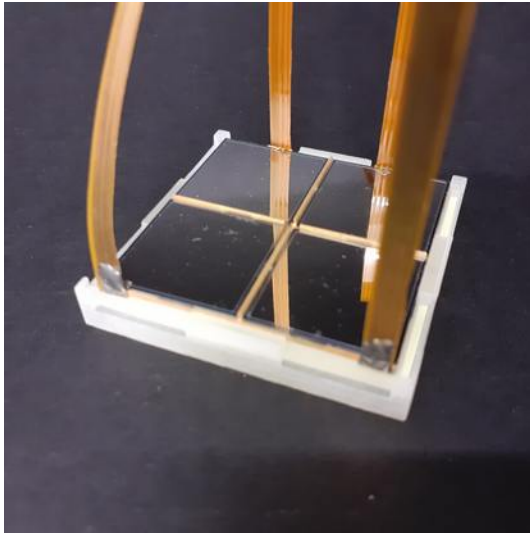
Guard Rings

Wirebonding strip region

30mm zone

140micron zone

Integration test phases



Feb 2023
Plastic mockup
Old standard
quartetto



June 6th
Gold plated
frames



End may 2023: Test before gold plating

New 30micron MATRIX

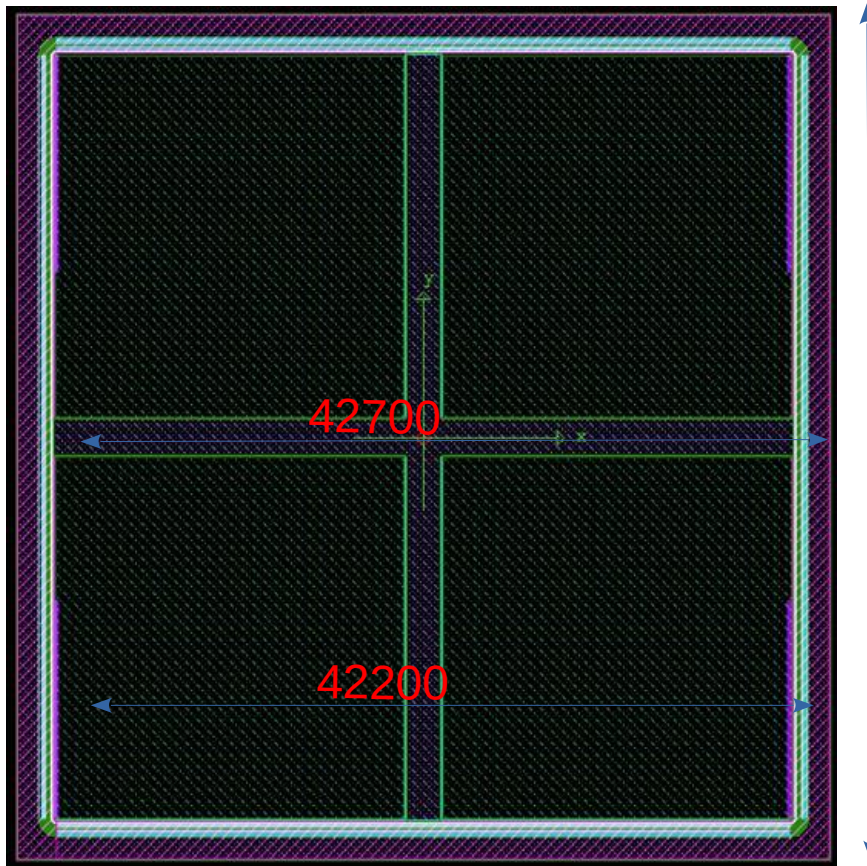
By mid july



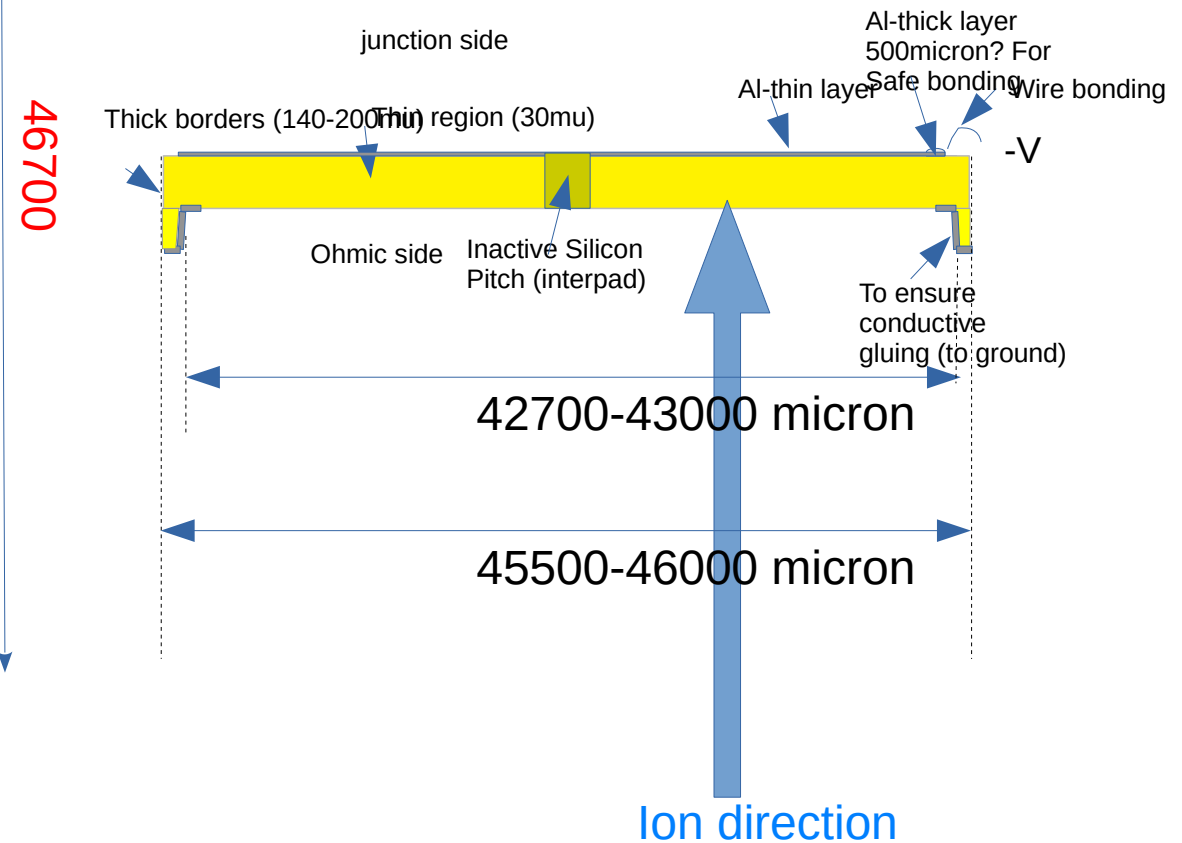
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Matrix geometry: imposes new mechanics



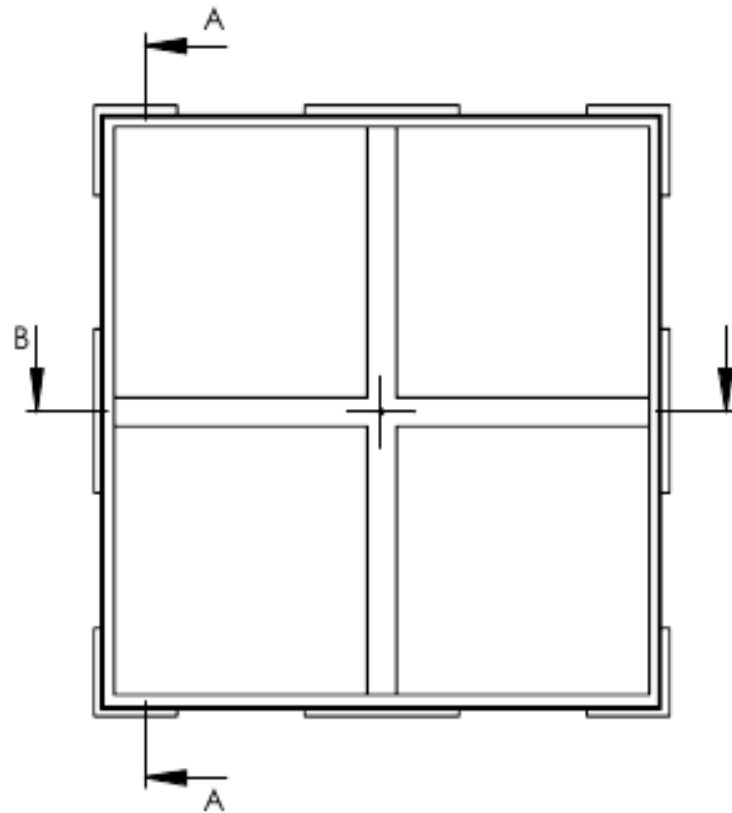
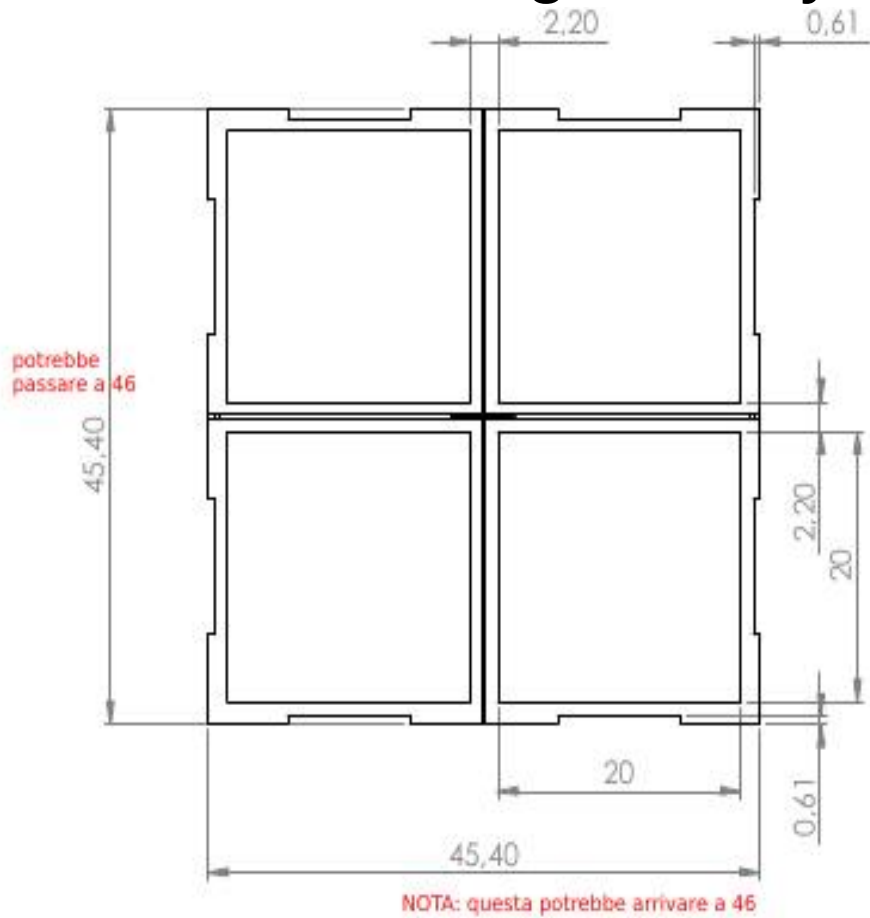
Crucial support by **Carlo Cialdai** (technologist And mechanical Engineer) INFN Firenze



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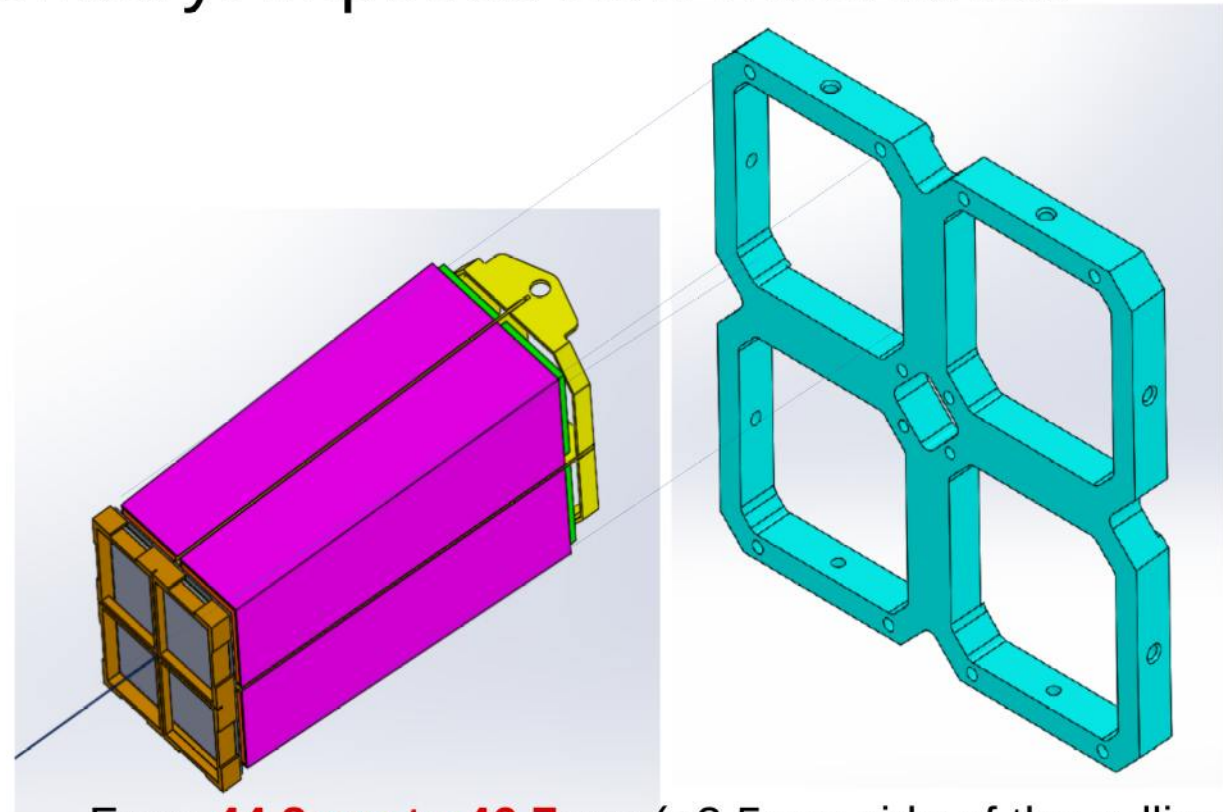
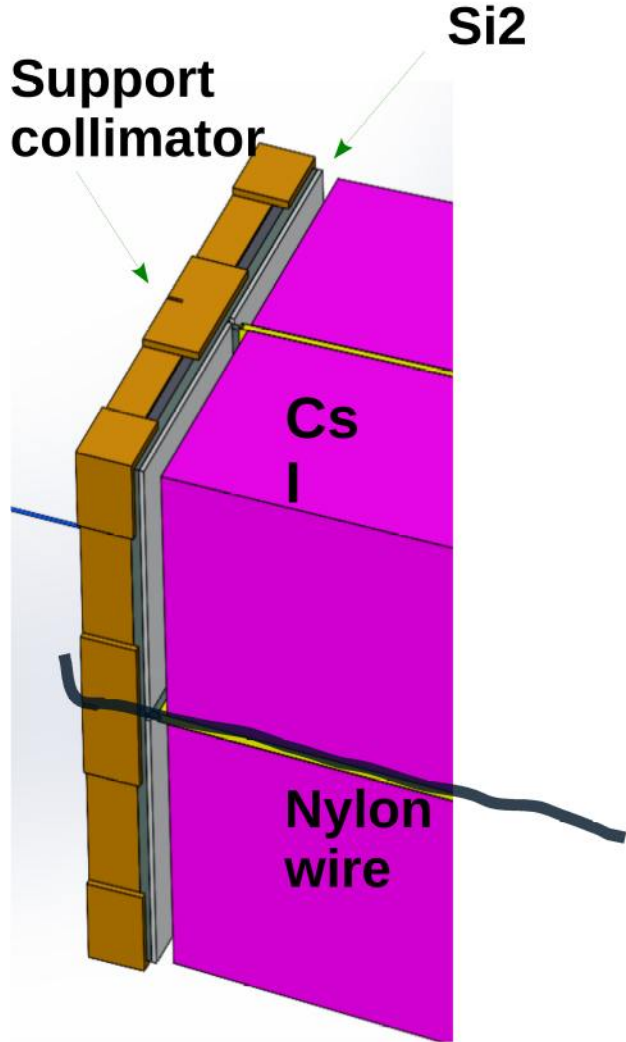
Matrix geometry: imposes new mechanics



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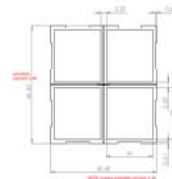


Matrix geometry: imposes new mechanics

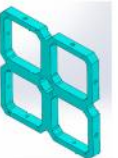


From **44.2mm to 46.7mm** (+2.5mm side of the collimator)

4 new gold-plated
collimator-supports
Produced: ready



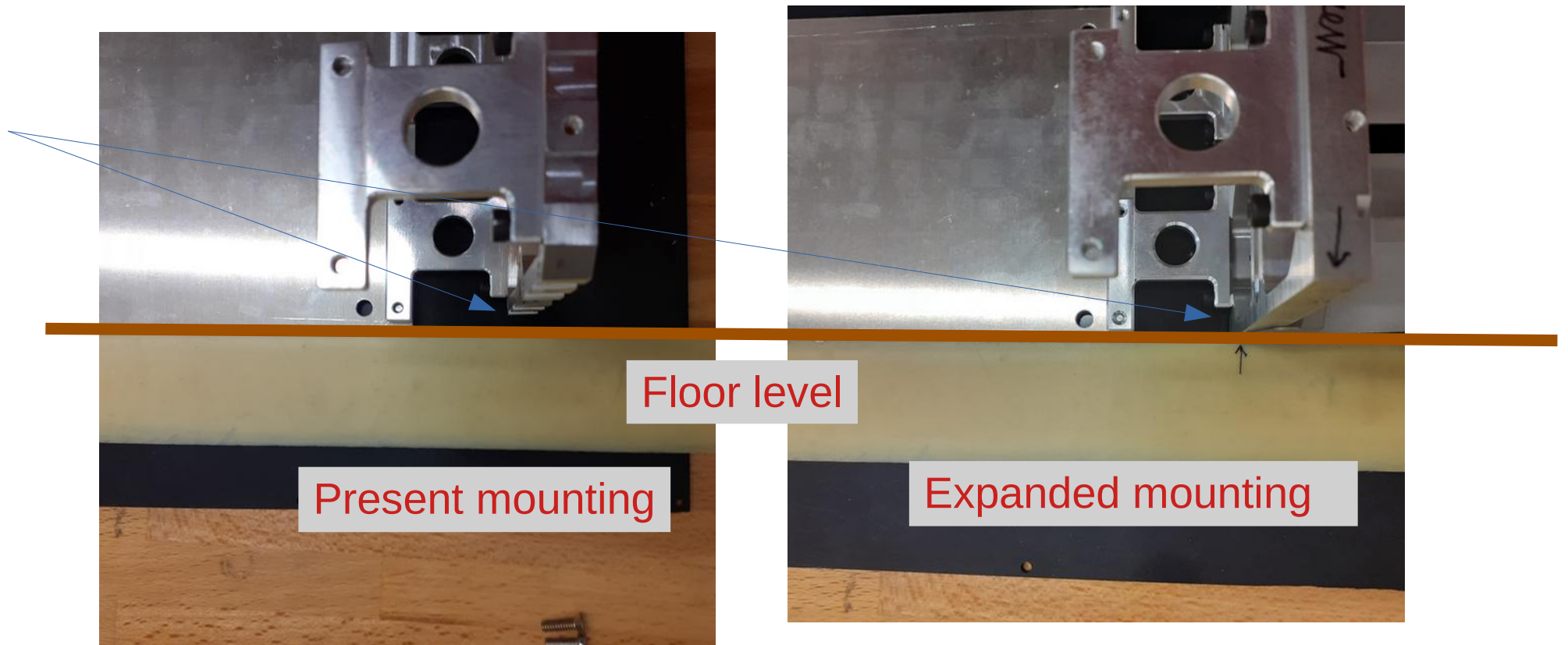
8 new det-supports
Produced: ready



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Saving backcompatibility



Also the new mechanics should preserve the use of previous BLK mounting mechanics (copper plates, lateral plates, etc)

CAVEAT: reduced geo-efficiency

new quartetto from 82 to 73%

new BLK: from 80 to 71%

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