

Task 7.4

detector validation for tracking devices

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T7.4: (CERN, MPG-MPP, INFN-FI, INFN-MI, UNIMAN)

Characterization of 3D and planar hybrid pixel sensors with laboratory measurements and beam-tests to demonstrate sufficient tracking capabilities in the high radiation and occupancy environment of the ATLAS and CMS pixel systems at HL-LHC

D7.6 : Initial pixel characterization [24] (Manchester, Oxford, Trento)

Characterization of first 3D and planar pixel sensor test-structures on thin substrates, after hybridization, with source measurements and analysis of beam test data. Feedback to the foundries for process optimization in form of a report. (Task 7.4)

Available laboratory test facilities (Manchester)

Electrical tests (before and after irradiation):

- IV, CV, (1)
- probing using temperature controlled IR probe stations (2)

Radioactive Sources stands (before and after irradiation, single diodes, FE-I4, Timepix):

- Operated at different temperatures using climate chambers (3)



(1)

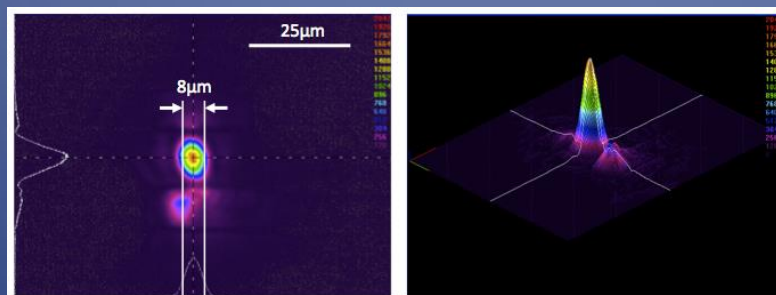
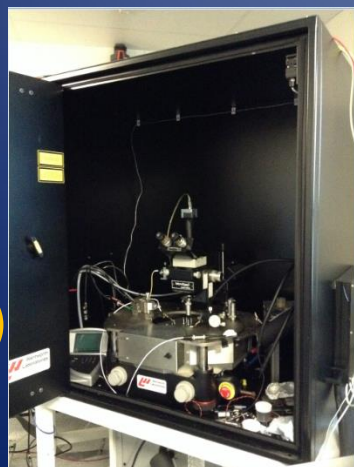


Image of the detector surface with an 8 μ m diameter laser beam shining into the silicon bulk. (I. Haughton)

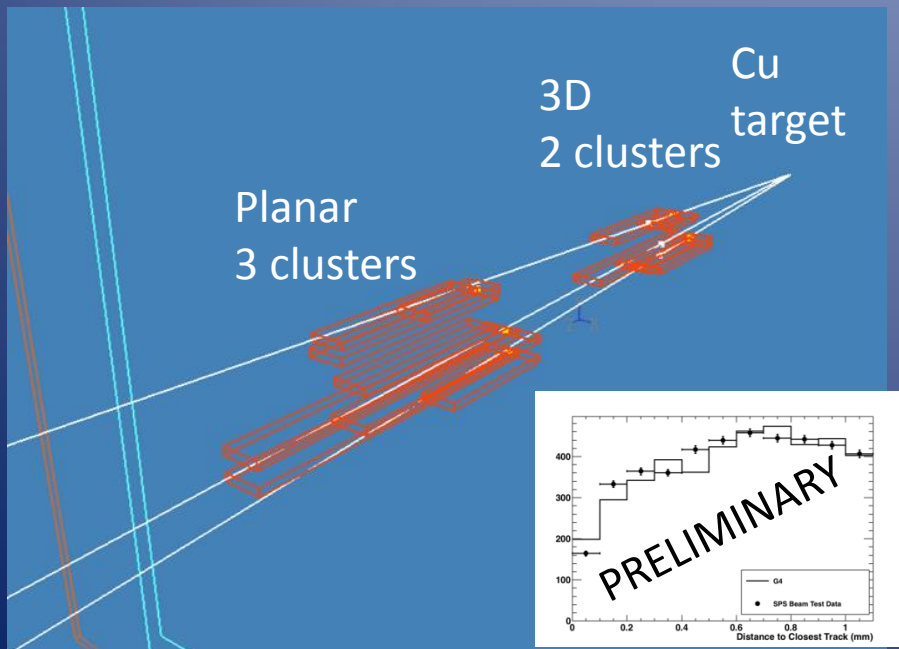
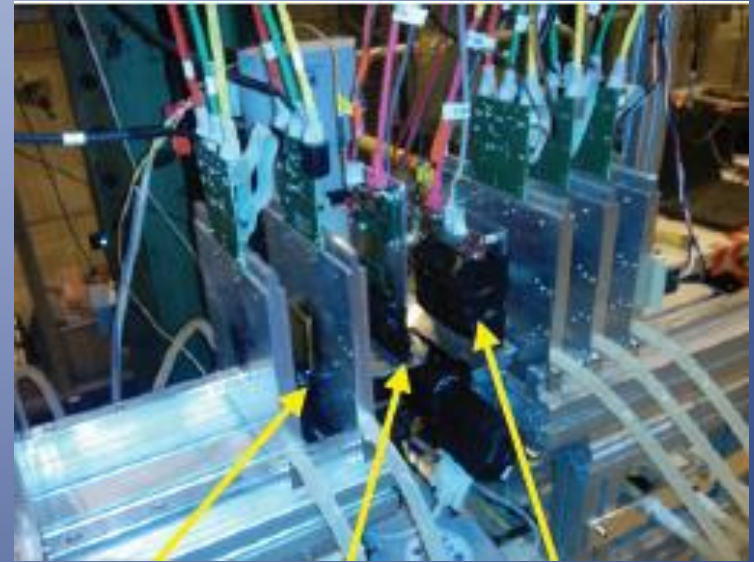


(3)

Extensive test beam experience with hybridised sensors (3D, planar) before and after irradiation

Two tracks separation (ATLAS)
 F. Munoz-Sanchez, M. Battaglia, C. DaVia, N. Dann

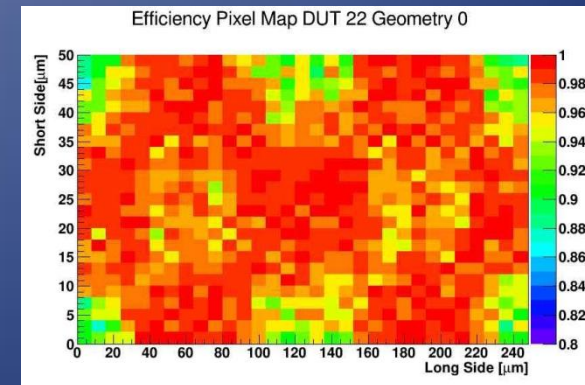
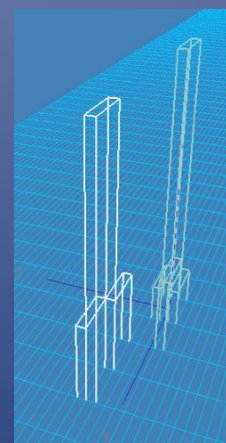
- Beam-line setup experience
- Data acquisition (FE-I4, Timepix)
- Data analysis



target

3D-FE-I4

Planar FE-I4



Conclusions, Plans and open issues

- The group has experience with sensors characterization (3D and planar) in the lab and at test beams for the LHC upgrades, and the IBL in particular.

We are currently acquiring more lab equipment.

- We should be able to perform lab and beam tests as soon as the first 3D and planar pixel sensor test-structures on thin substrates, after hybridization with existing FEC will be ready

Coordination ongoing with Oxford, Trento on this Task



➤ **NOTE for discussion:**

It would be important to know what is the plan on the use of the new FEC FE65 within these tests considering its availability and the AIDA timescale

We should explore alternative irradiation or bump-bonding methods so we can use existing less radhard pixel ASICS