

Atlas R&D Activities

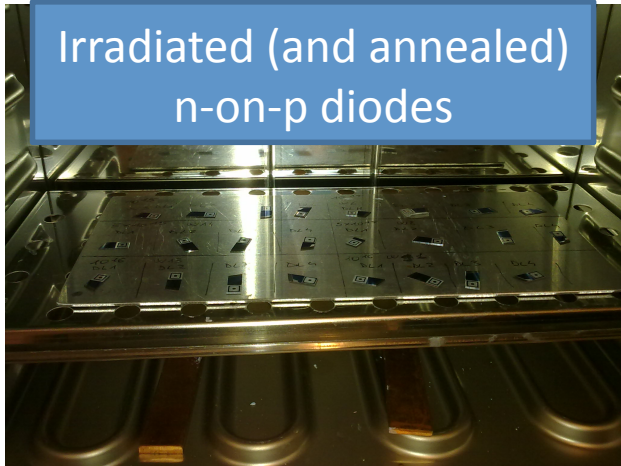


Simulations, Sensors, Electronics & Mechanics

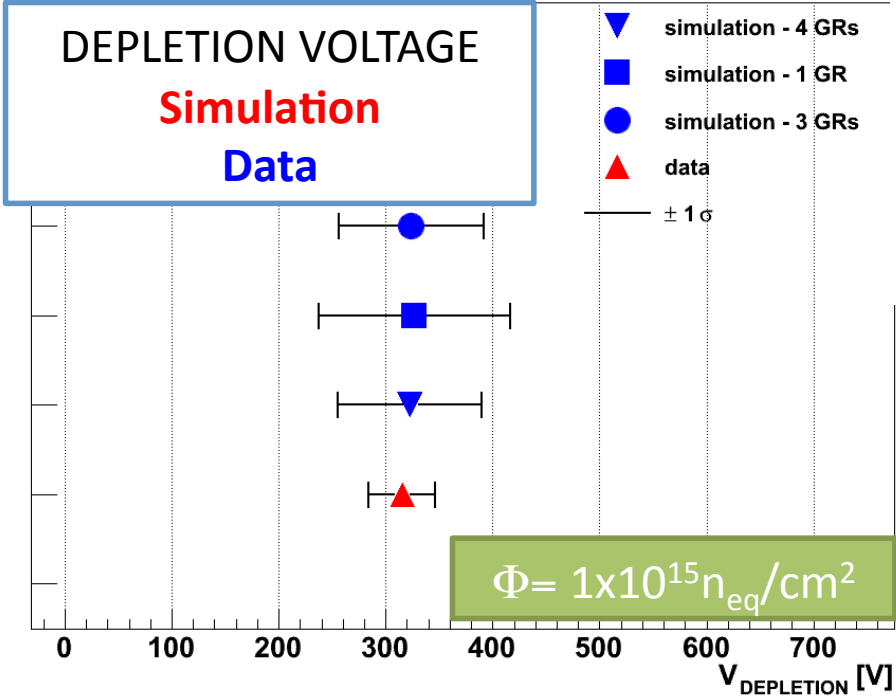
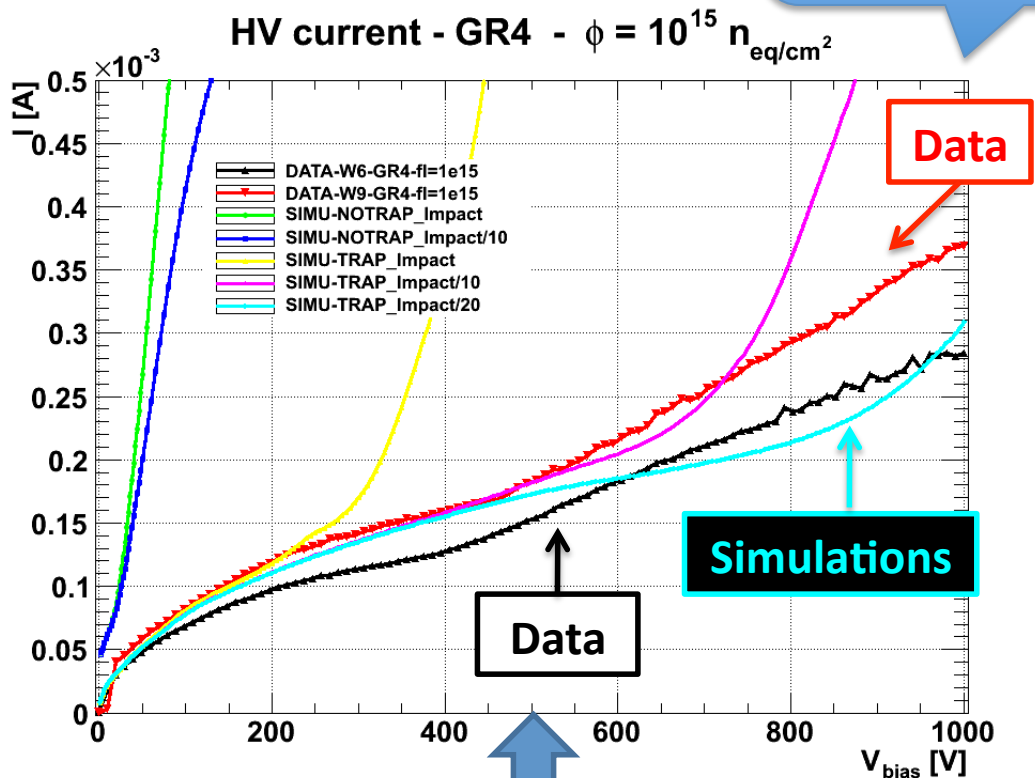
Didier, Filipe, Francesco, Giovanni & Giovanni,
Jacques, Jean-François, Marco & Olivier

TCAD Simulations of irradiated sensors

Presented at 21st RD50 WS



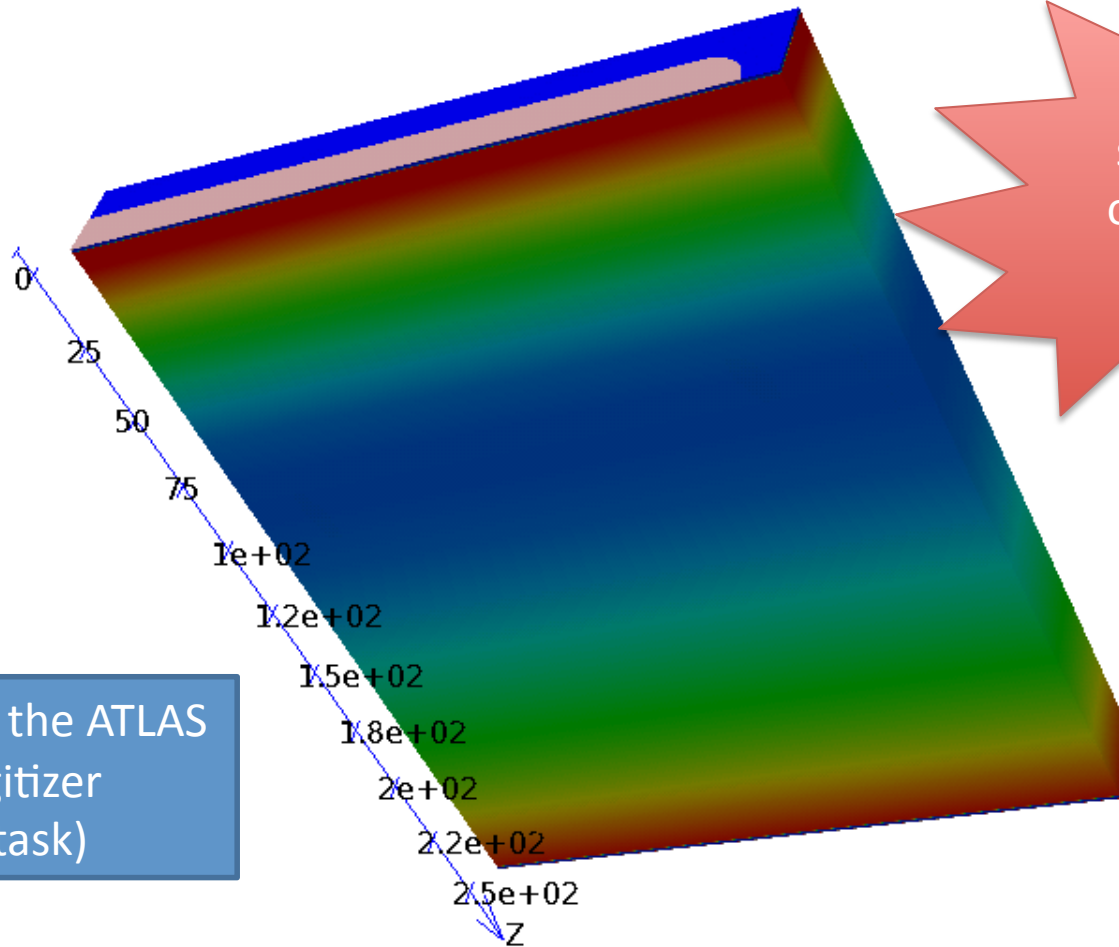
Irradiated (and annealed) n-on-p diodes



A lot of work for impact ionization models and interface traps and charges

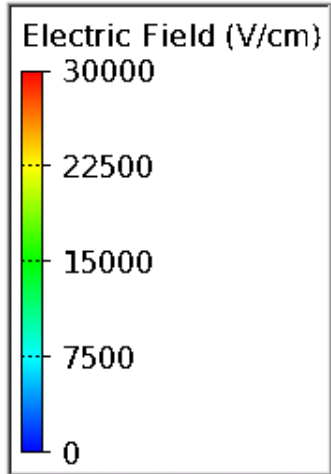
Model for irradiated P-bulk sensors validated on data

New: 3D simulations

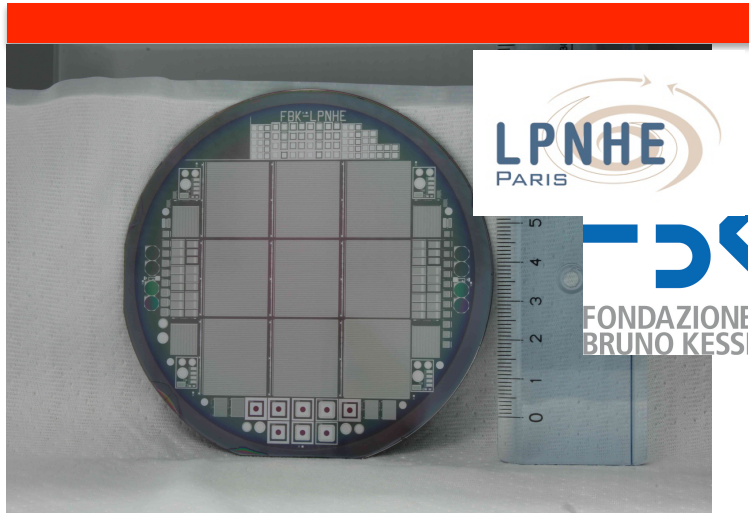


NEW! 3D simulations of irradiated sensors

To be used for the ATLAS pixels digitizer (official task)

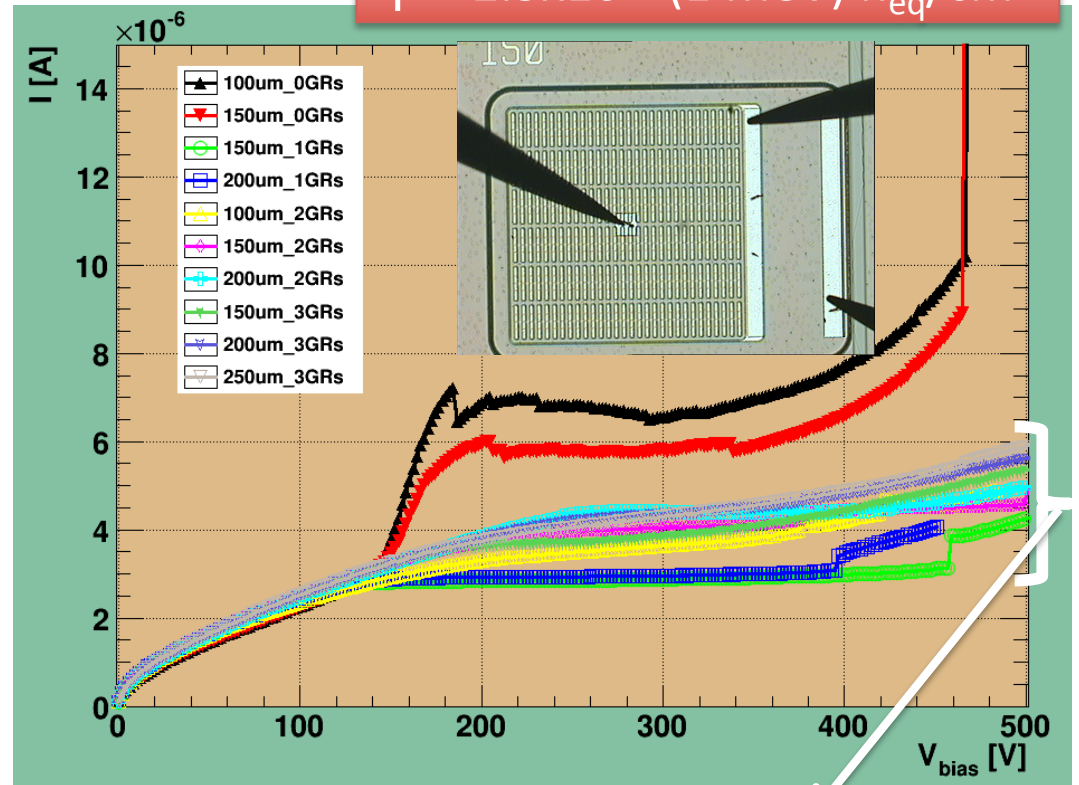


Edgeless sensors for the Phase-II Atlas Pixels

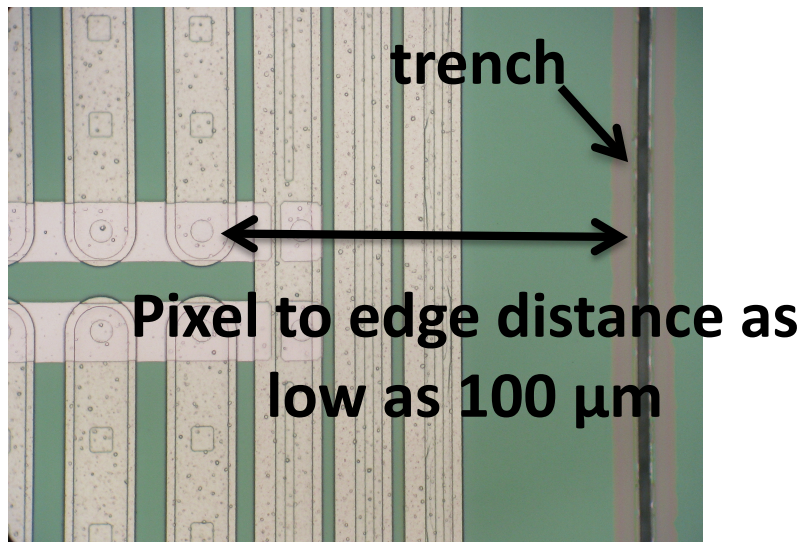


Performance after irradiation presented at IEEE 2013

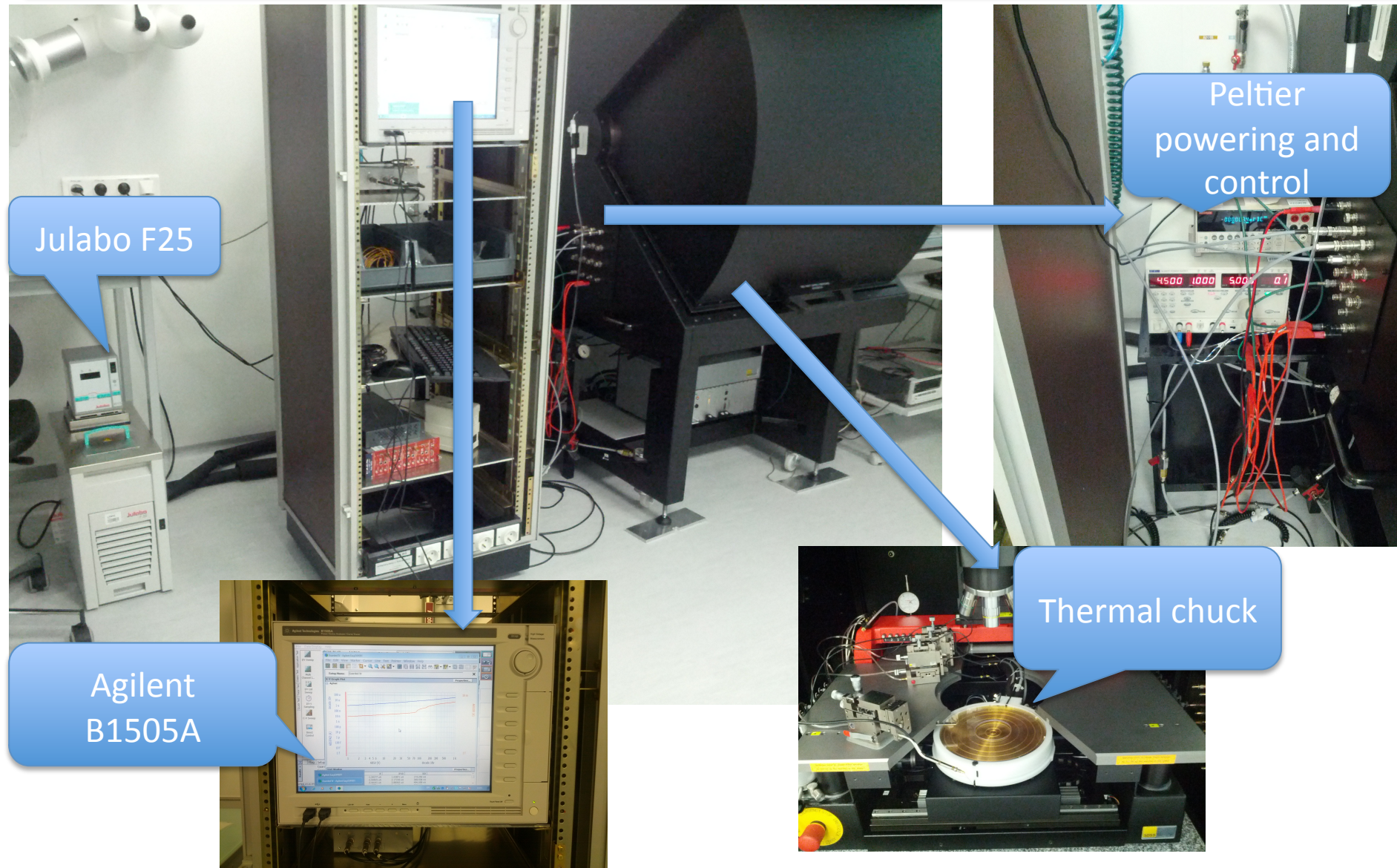
$$\phi = 2.5 \times 10^{15} \text{ (1 MeV) } n_{eq}/\text{cm}^2$$



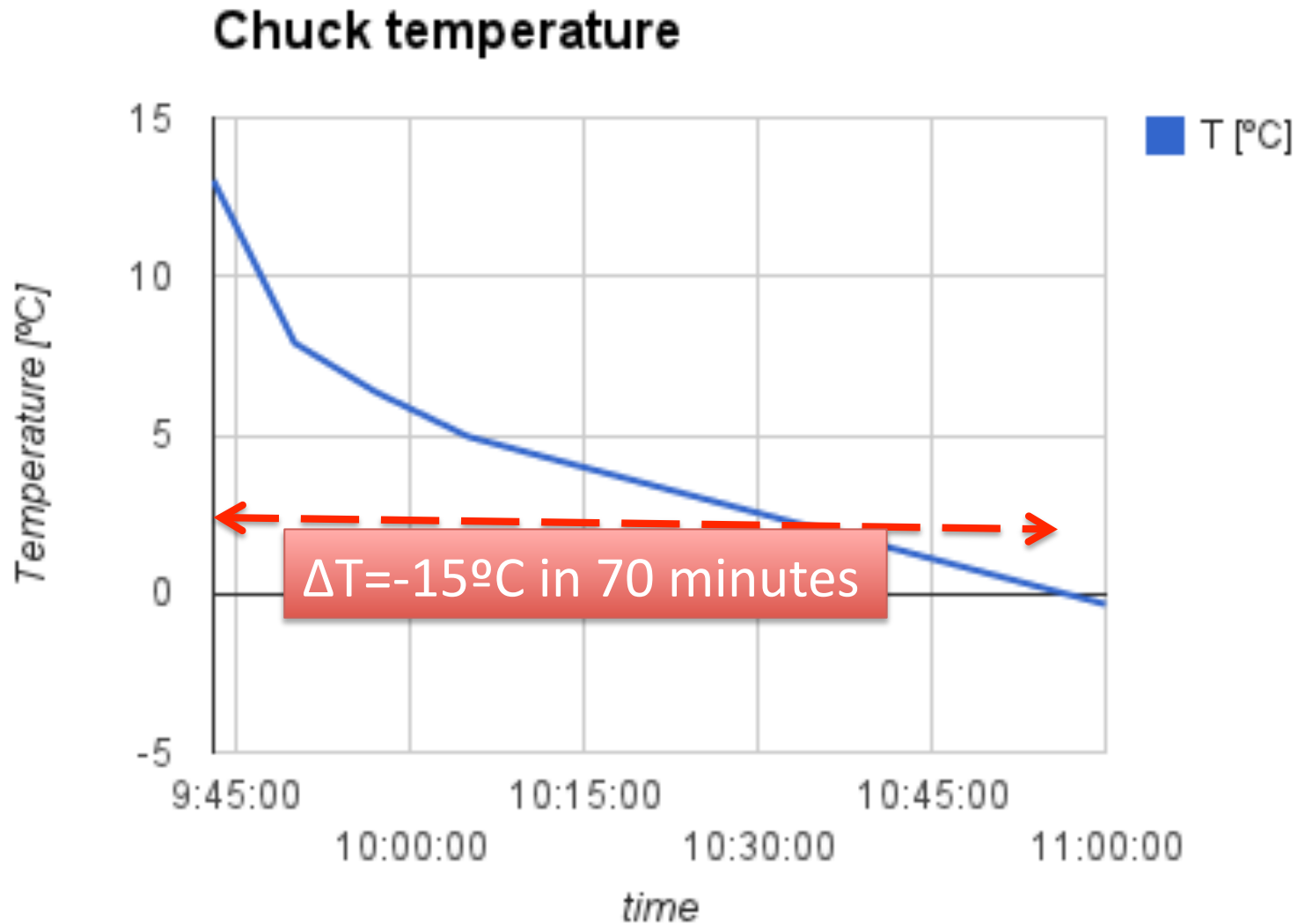
≥ 1 GR: very stable!



Cold setup in our cleanroom

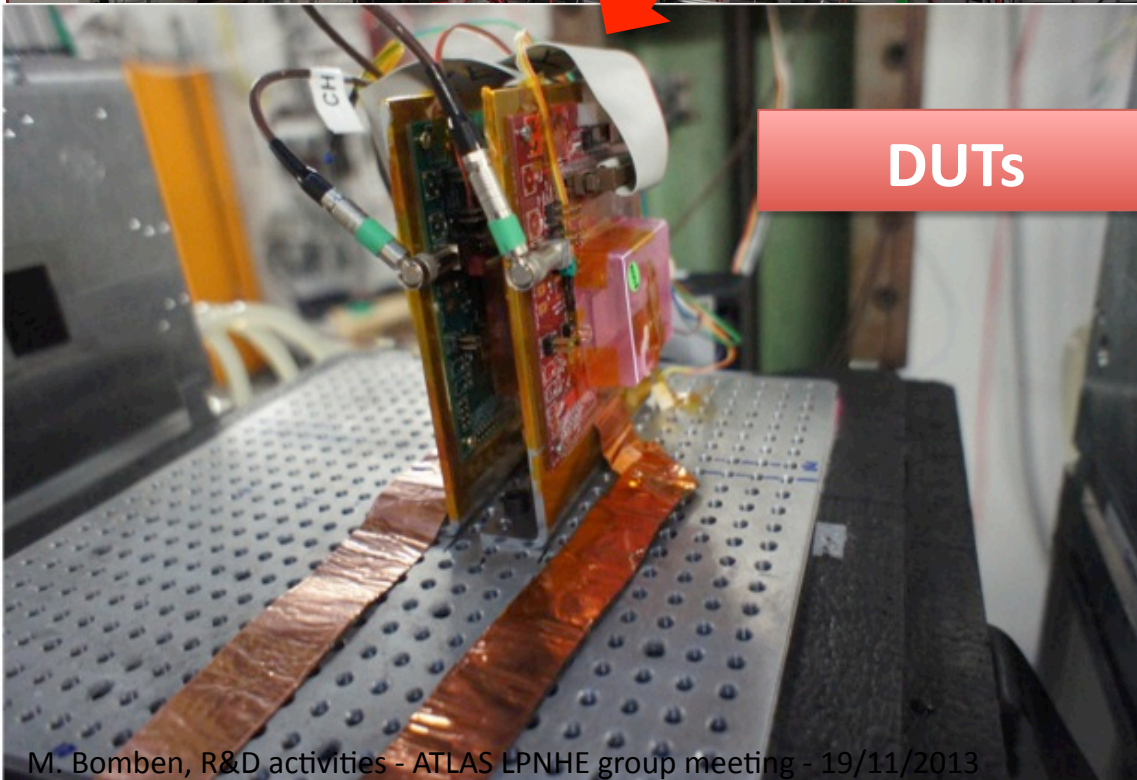
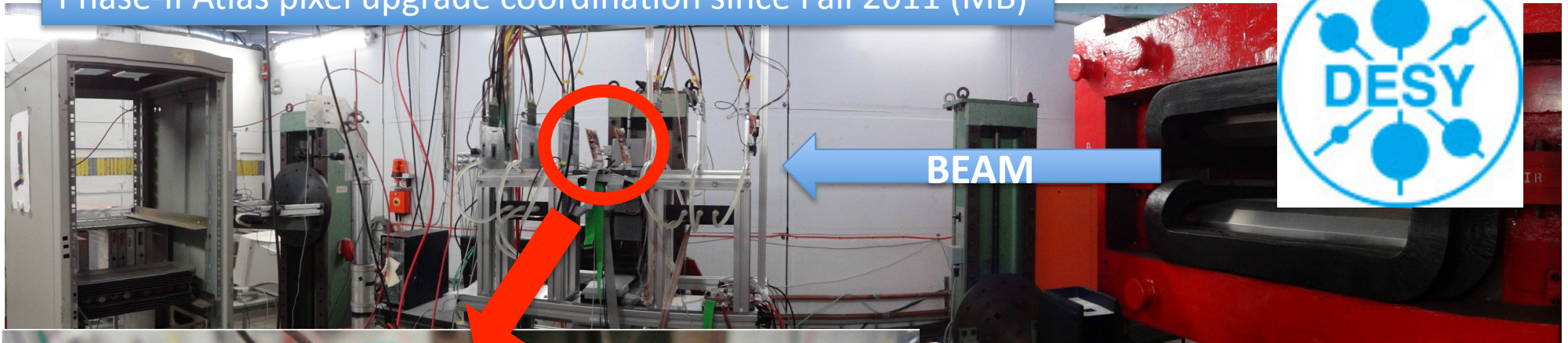


Cold chuck performance



Beam test setup (DESY)

Phase-II Atlas pixel upgrade coordination since Fall 2011 (MB)



- Spring, Summer and Fall beam test campaigns at DESY with 4 GeV/c electrons
- Total: > 10 weeks
 - Reminder: No beam at CERN till late 2014
- Phase-II pixel candidates tested

Beam test highlights

Phase-II Atlas pixel upgrade coordination since Fall 2011 (MB)

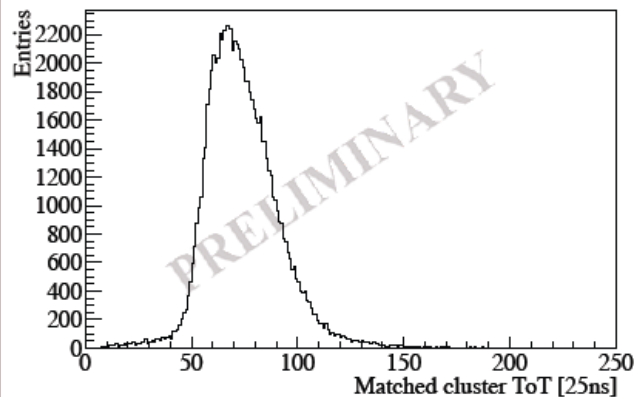
Characterization of thin n-in-p planar pixel sensors with active edges before and after irradiation

n-in-p FE-I4 pixel modules 150 μm thick

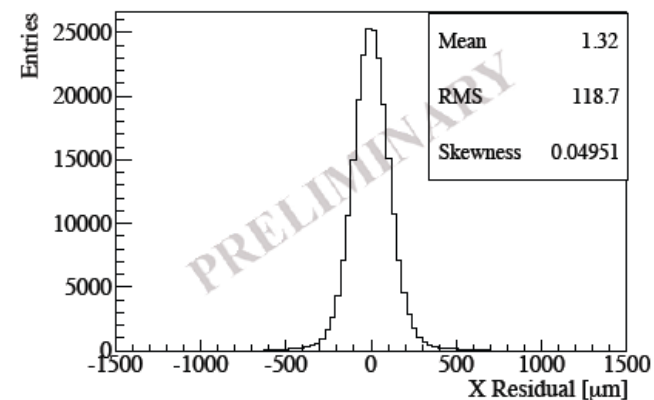
Pixel cell efficiency: high-eta

- ▶ FE-I4 150 μm thick, irradiated to $4 \times 10^{15} \text{ n}_{\text{eq}}/\text{cm}^2$ in Los Alamos
- ▶ $\vartheta=85^\circ$ track incidence ($\eta \sim 3.1$)

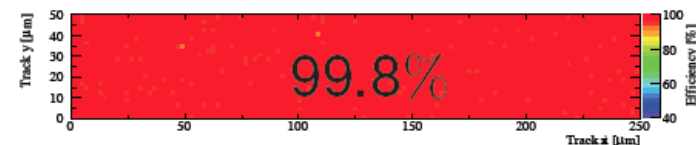
Full cluster ToT distribution
as expected (10 ToT@10 ke)



Residual along the titled
direction (pitch: 250 μm)



99.8% hit efficiency
for matched clusters

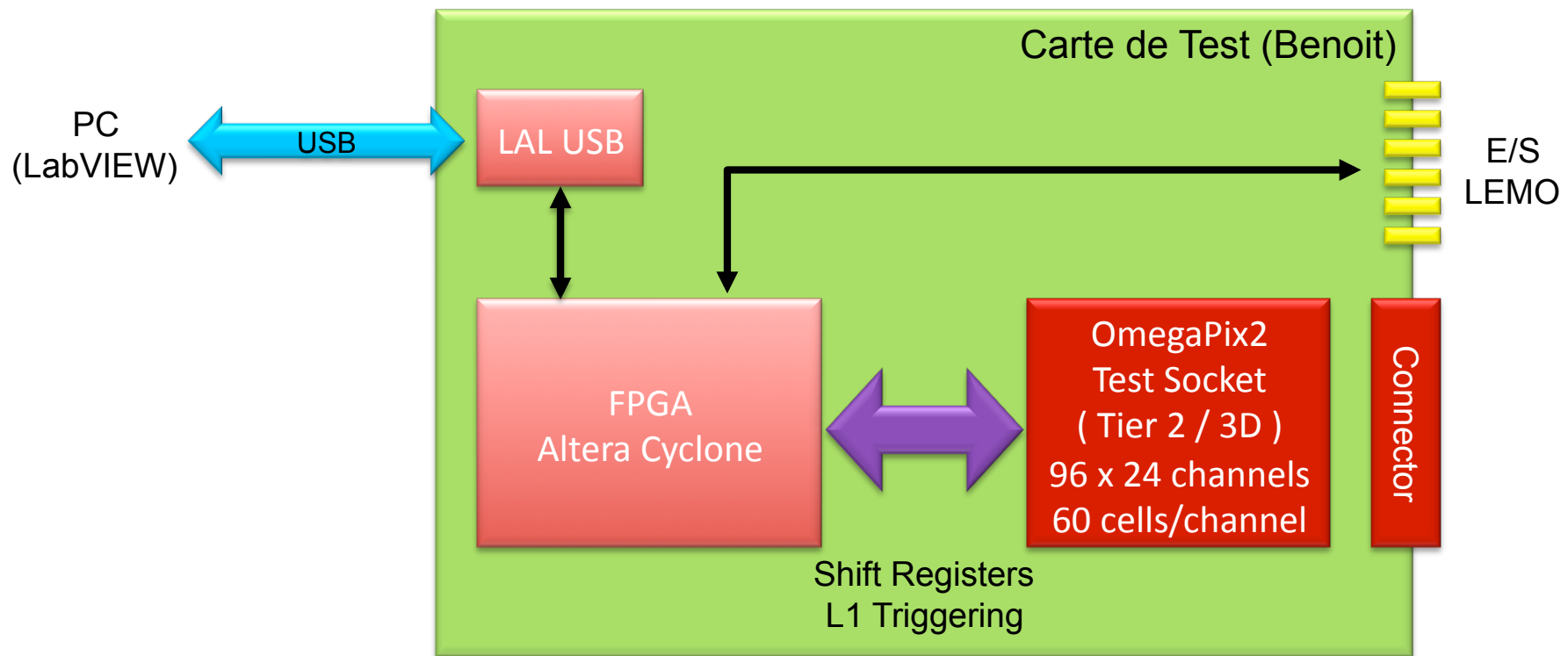


Omegapix2 status

- The Omega group has received a set of packaged Omegapix2 **digital** tier chips in the end of september.
- Tests in Paris began on tuesday 8th oct (visit of Damien and Jeanne from Omega, M. Cohen-Solal and C. Sylvia from LAL): power up, setting up of the various test boards (one board per lab is now operational)
- Olivier made some fpga firmware and labview software adjustments last week:
=> **good programming** of the various shift registers of the digital chip
- **The setup is now ready to test the pipelining and L1 triggering logic.** Olivier will continue the tests.
- On the other hand, **the 3D version** (analog + digital tier) is now ***really* expected soon**

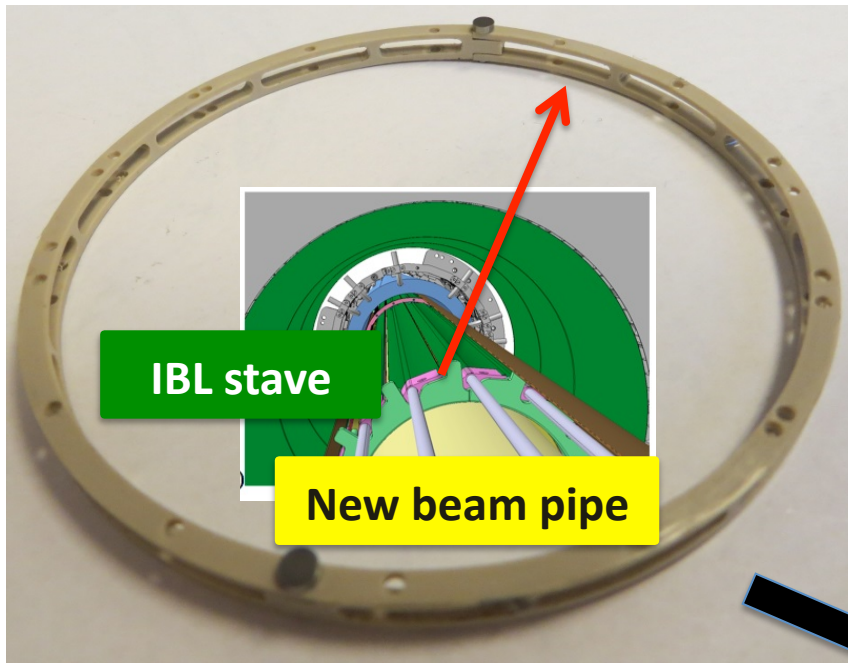
Banc de test Omegapix2 3D

- Carte de test Omegapix2 3D
 - Circuit: Omegapix2 Tier Numérique et version 3D



IBL central ring (100% Made in LPNHE)

- 2 pièces → 7 Pièces



- Matière : PEEK
- → PAI (Polyamide-imide)

Conclusions

- TCAD simulations results: an effort recognized by the ATLAS (and not only) community
- FBK-LPNHE Edgeless sensors: good electrical performance, even after irradiation
- Beam test: a lot of measurements done; nice results from important HL-LHC scenarios
- Electronics: LAL/LPNHE synergy for 3D/65nm chip
- Mechanics: good impact of LPNHE work on IBL