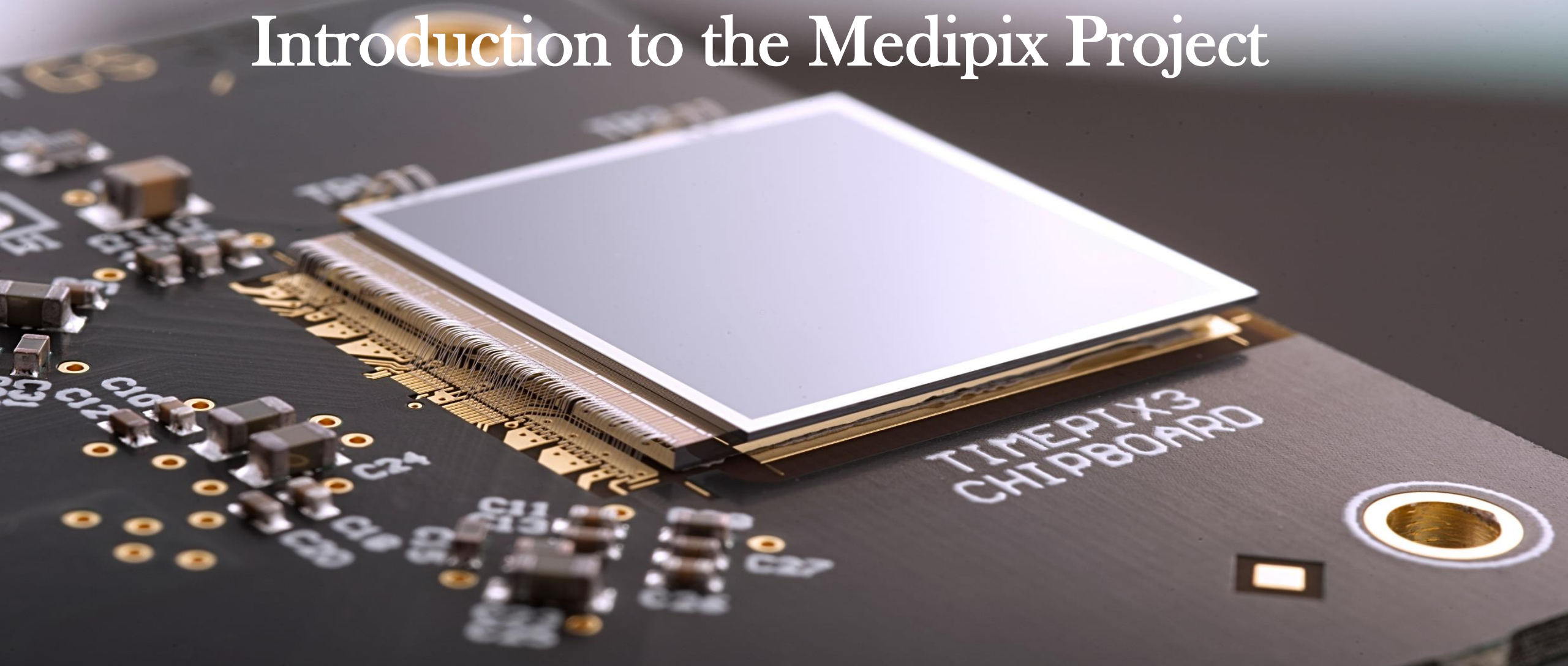


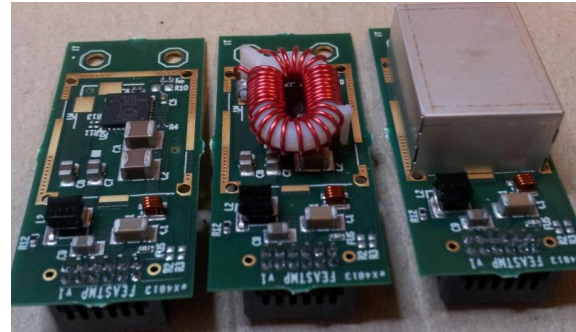
Microelectronics at CERN

Introduction to the Medipix Project

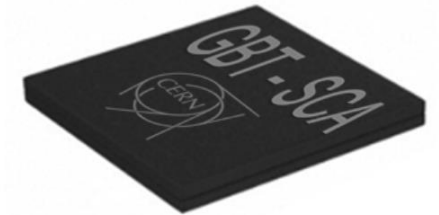


The Microelectronics section at CERN

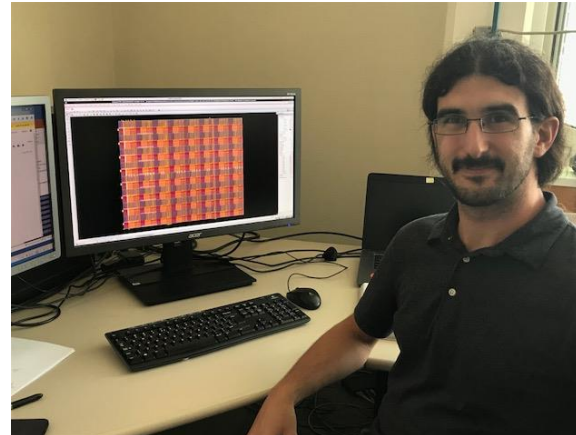
- Provides support to the HEP (High Energy Physics) community:
 - **Radiation and multi-tesla tolerant chip design**
 - **GBT & Versatile Link**
 - **DC-DC Converters**
 - **Medipix**
 - These components are named ASICs (Application Specific Integrated Circuits)



DC DC converter modules



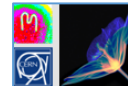
Radiation Hard Optical Link Project (Gigabit/s)



Chip designer Iraklis working on new pixel detectors

The Medipix Pixel detector

- Medipix – a family of successive generations of hybrid pixel detectors
- Collaboration with multiple institutes all around the world
- Medipix1 chip was produced in the 1990s (1 μ m technology)
- Medipix2 (0.25 μ m)
 - Medipix2MXR, **Timepix**
- Medipix3 (0.13 μ m)
 - Timepix3, Medipix3RX
- Medipix4: (65nm) Timepix4 (2019)



Medipix2 Collaboration

- University and INFN Cagliari, Italy
- CEA-LIST Saclay, France
- CERN, Geneva, Switzerland
- Friedrich-Alexander-University Erlangen-Nurnberg, Germany
- ESRF, Grenoble, France
- University of Freiburg, Germany
- University of Glasgow, UK
- IFAE Barcelona, Spain
- Mid-Sweden University, Sundsvall, Sweden
- MRC-LMB. Cambridge, UK
- University and INFN Napoli, Italy
- NIKHEF, Amsterdam, The Netherlands
- University and INFN Pisa, Italy
- FZU Czech Academy of Science, Prague, Czech Republic
- IEAP, Czech Technical University in Prague, Czech Republic
- Space Science Laboratory, UC Berkeley, USA

Technical Introduction of Timepix chip

- ASIC (Application Specific Integrated Circuit)
- Pixel Array: 256x256
- Pixel Pitch: 55 μ m
- Pixel functionality: PC, TOT and TOA

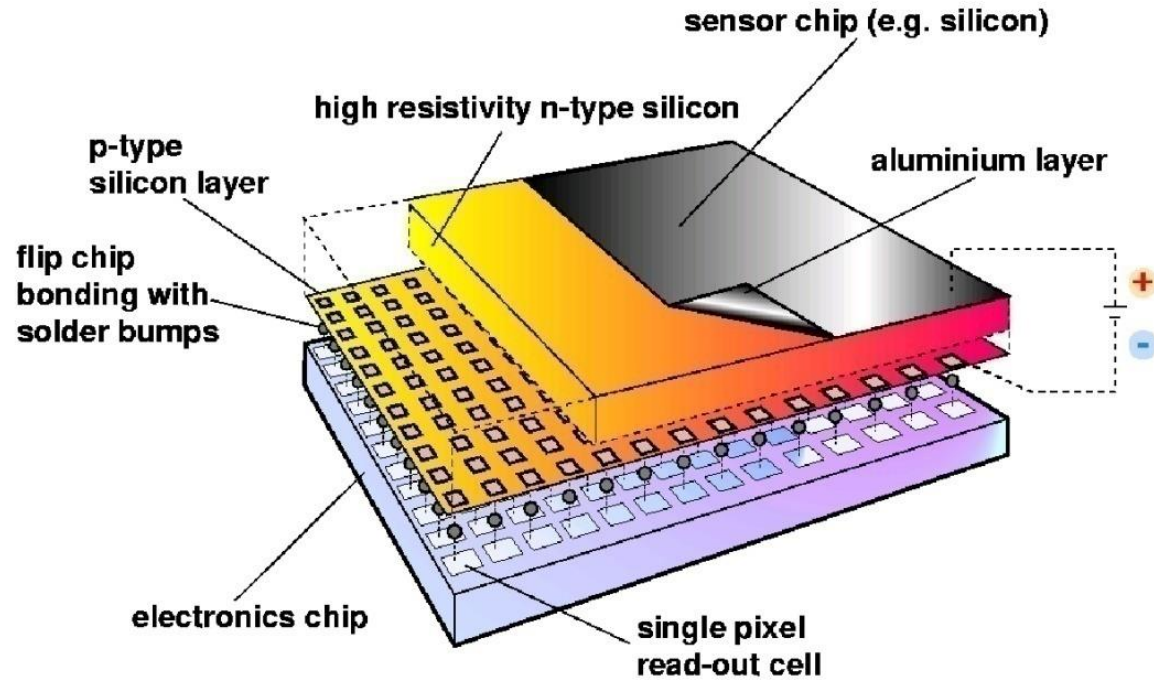
Application Areas and Commercialization

- Medical Imaging
- Education
- Space Dosimetry
- Material Analysis
- Back to High-Energy Physics



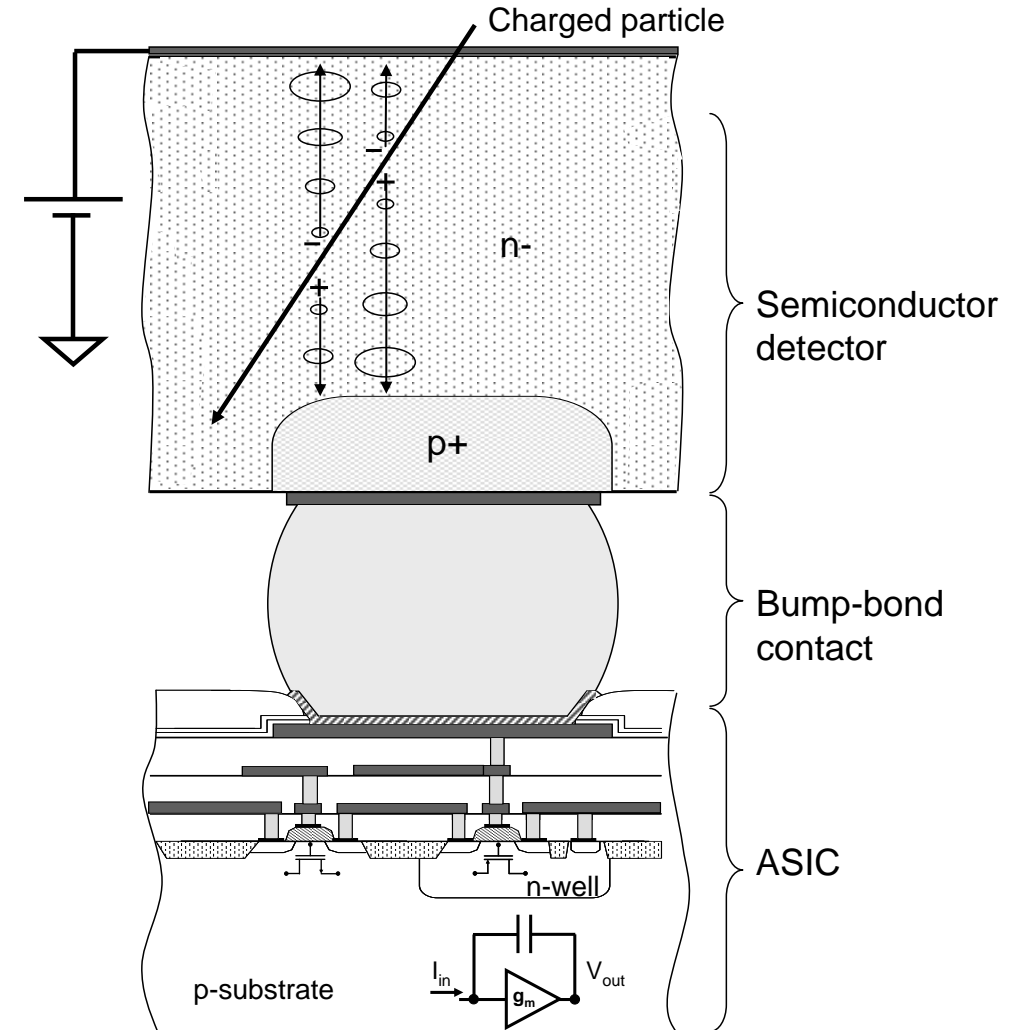
Image of the astronaut Chris Cassidy working near the Timepix USB on the ISS

Hybrid Silicon Pixel Detectors

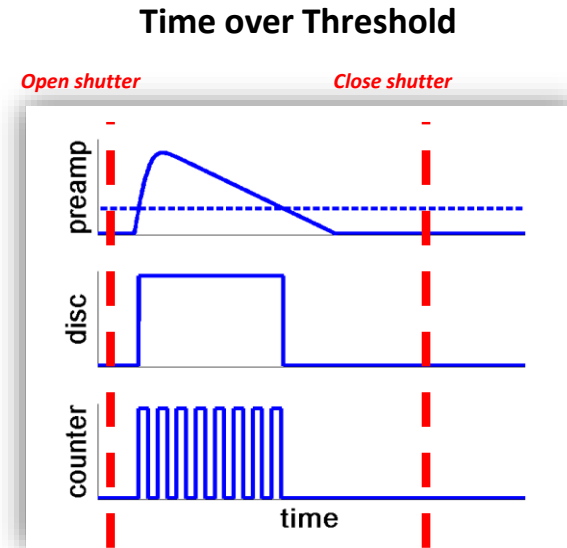
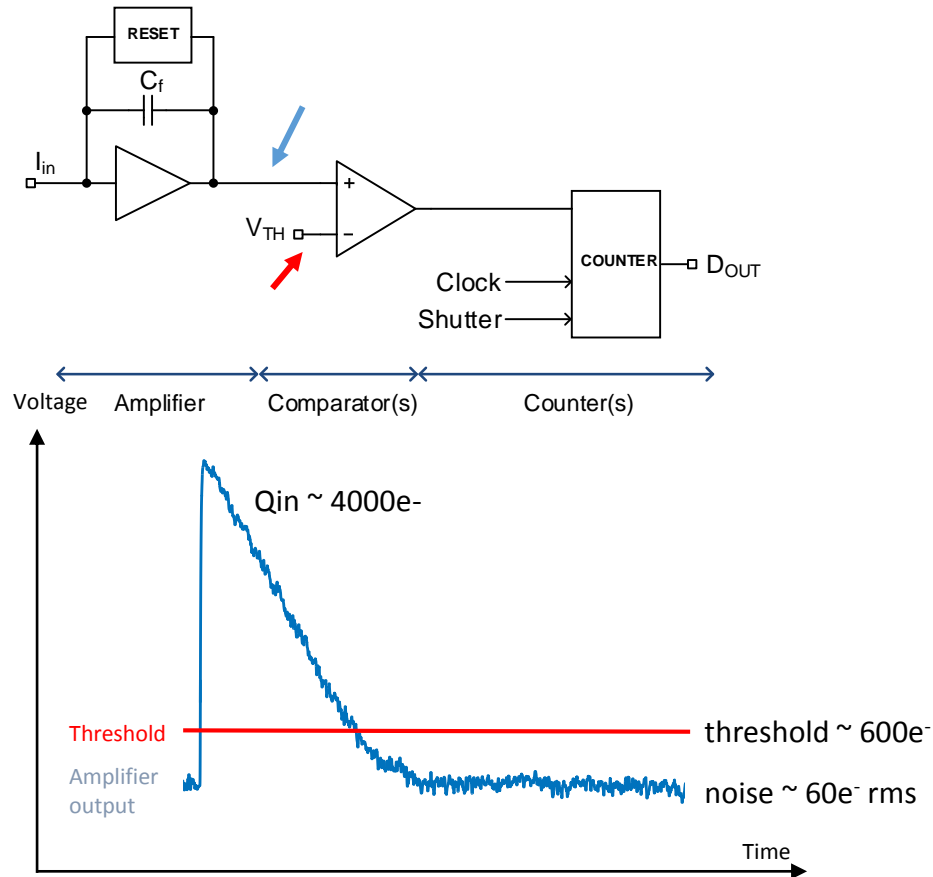


Standard CMOS can be used allowing on-pixel signal processing

Sensor material can be changed (Si, GaAs, CdTe..)

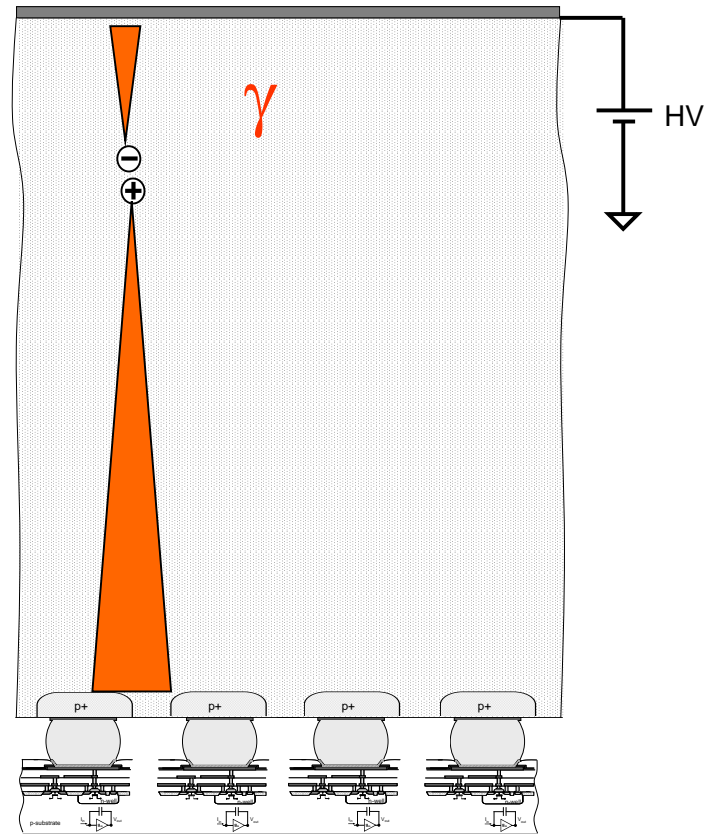


Hybrid Pixels Detector – Measuring Energy

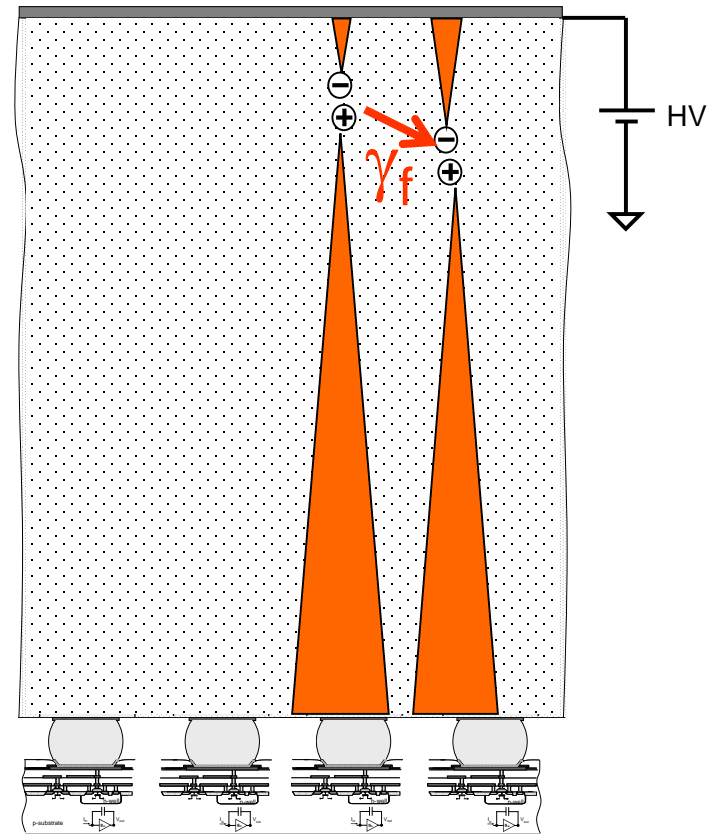


→ Noise hit free imaging

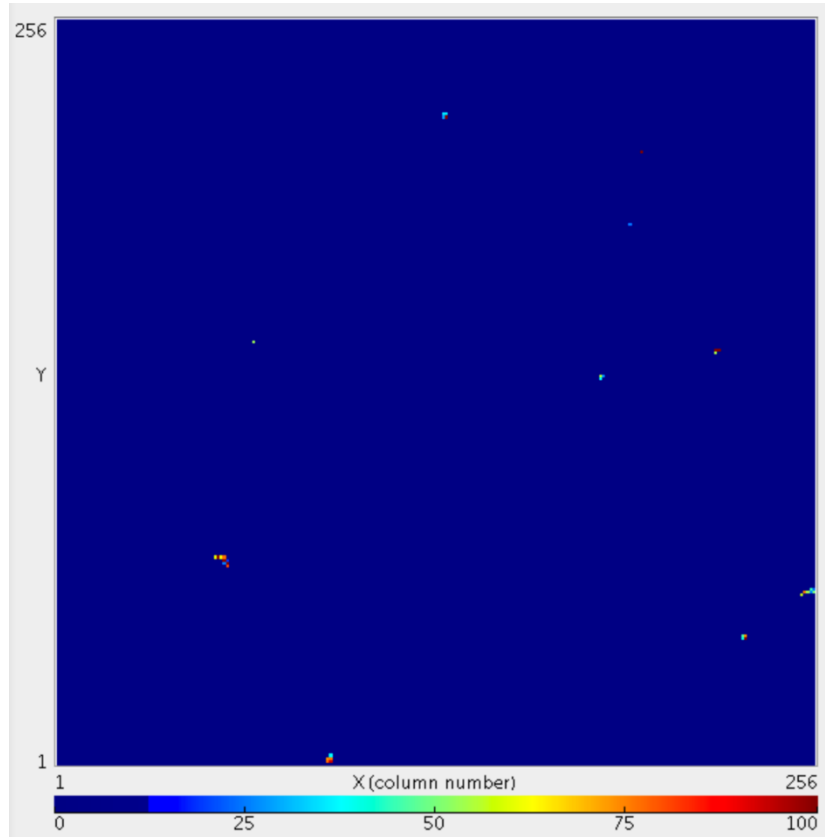
X-ray photon energy deposition



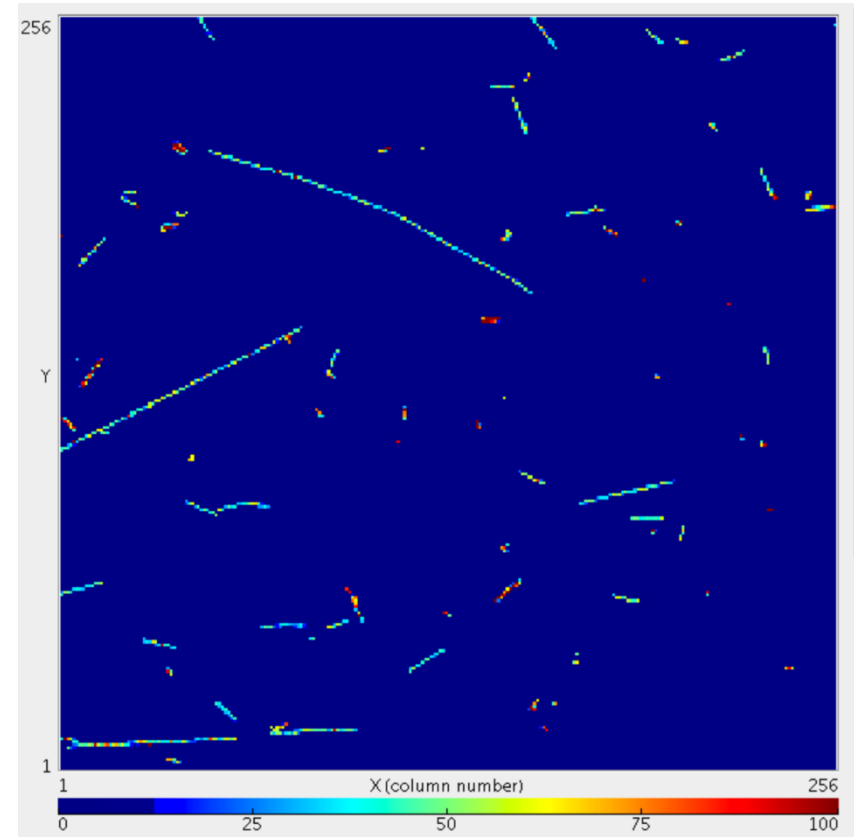
Fluorescence in High-Z Materials



(Timepix chip) – 60s exposure



Near sea level



34 000 feet

My Internship

- Does my proposed solution work?
- Could the solution improve?
- Will my solution be of use?
- Is my supervisor satisfied?
- Am I happy? What have I learned?

Probably!

YES!

Surprisingly YES!

Hopefully!

Thank you for your attention!

Special thanks to Jerome Alexandre Alozy