Passivated implanted Planar Silicon detectors

GSI Darmstadt – 16 April 2004

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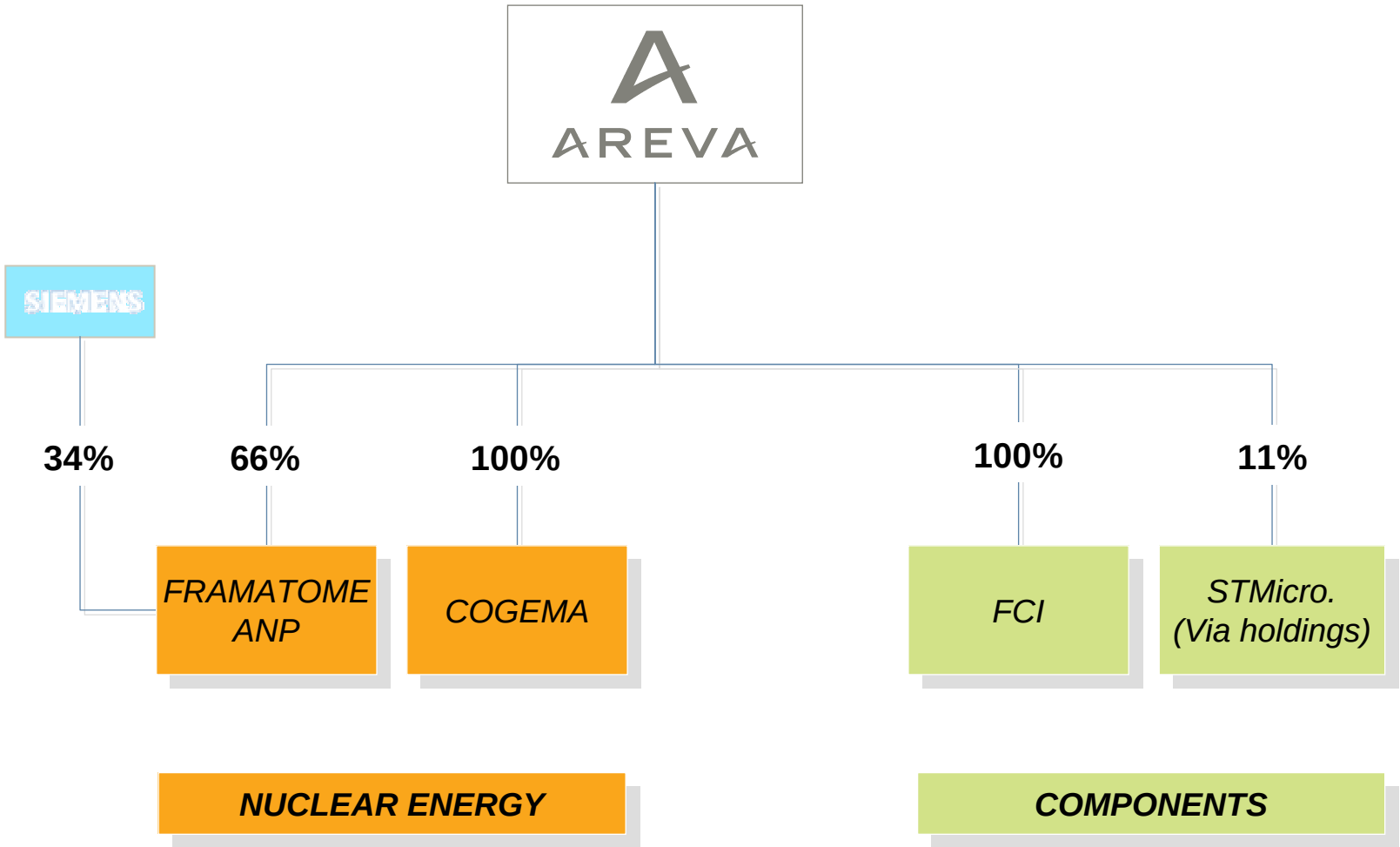
Overview

- The Areva group and Canberra Semiconductor
- Manufacturing of PIPS detectors
  - Cleanroom process
  - From start to end
- Standard detectors
- SMEPS
- Custom design detectors

Creation of AREVA :

…a new industrial group, 2 activities



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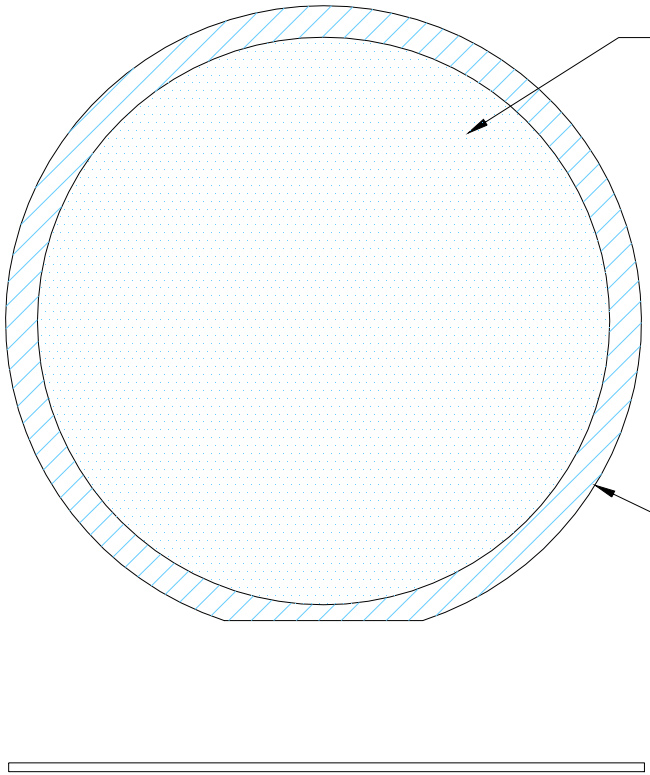
Processing of the PIPS Detectors



Thickness (150), (200), 300, 500, 700, (1000), (1500)

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Processing of the PIPS Detectors

Start with a clean wafer (N-type)
oxidation

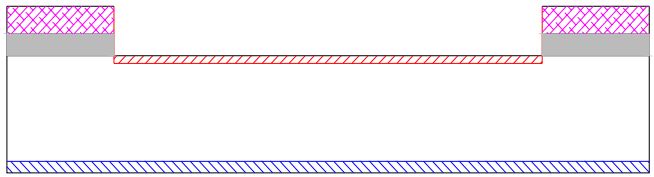
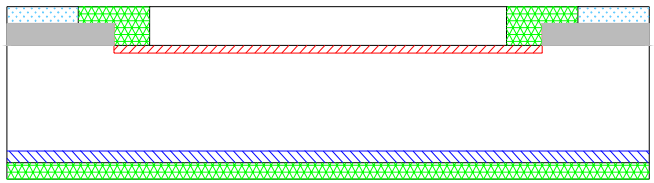


Photo-resist and masking
Etching of the Oxide
Implantation with Boron
and Phosphorus
annealing



Contact with Aluminium
Front and backside
Passivation

PIPS Production

Simulations	Implantation profile Potential distribution Field distribution
Mask Development	Design at Canberra Manufacturing by a specialised company.
Production	4” wafers 150 to 1500um – Active area 60*60mm² 5” wafers 200 to 700um – Active area 80*80mm²
Packaging	Standard or special, space qualified
Testing	Noise, Leakage current, Capacitance, Resisitvity, Material lifetime, Long term stability

Standard production

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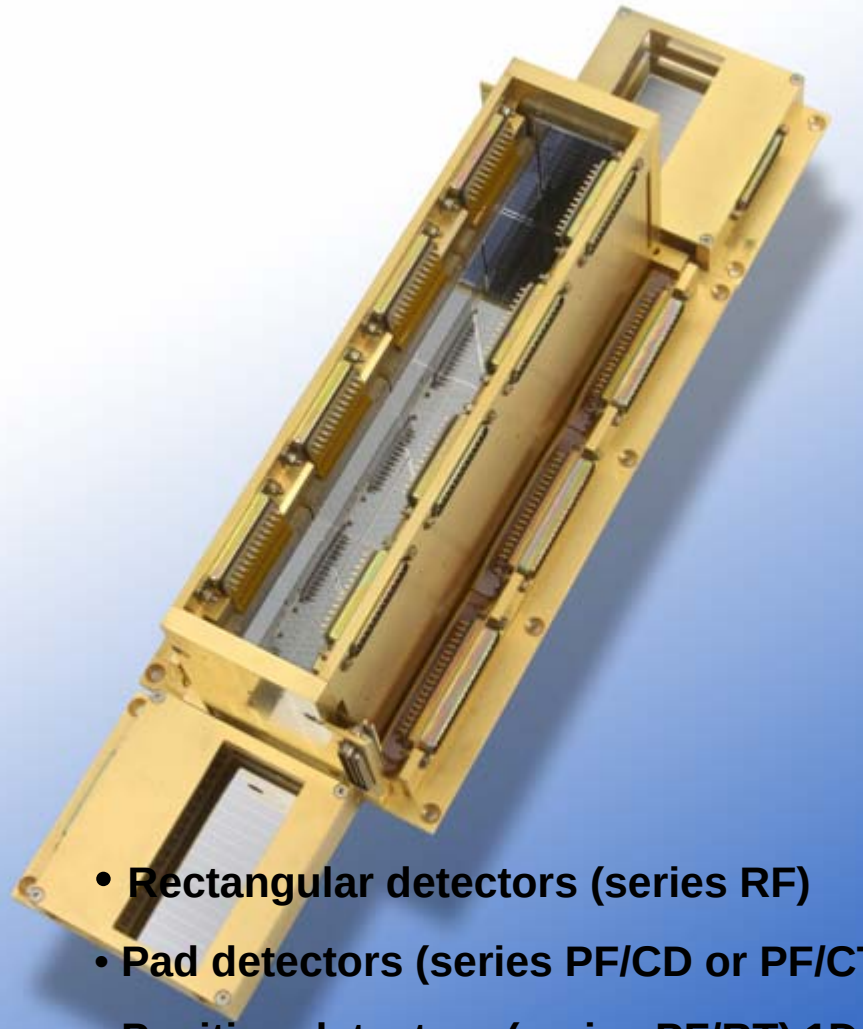
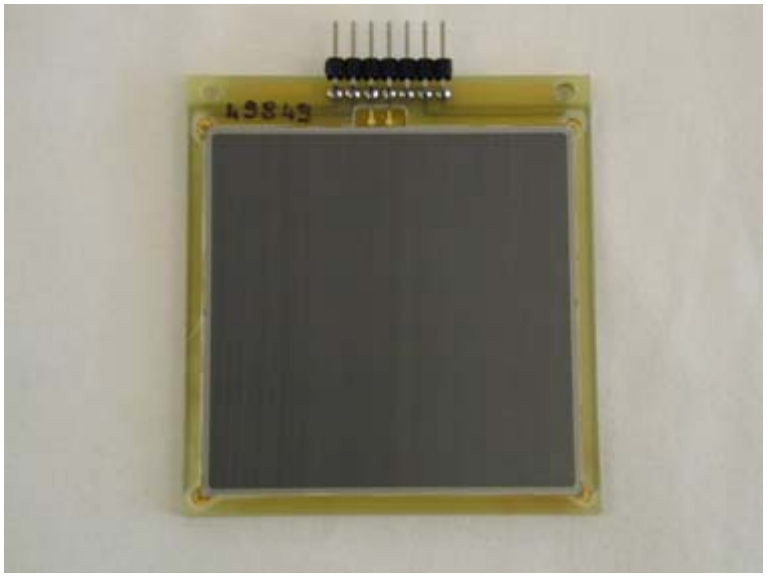
SMEPS (Single and multi-element detectors)



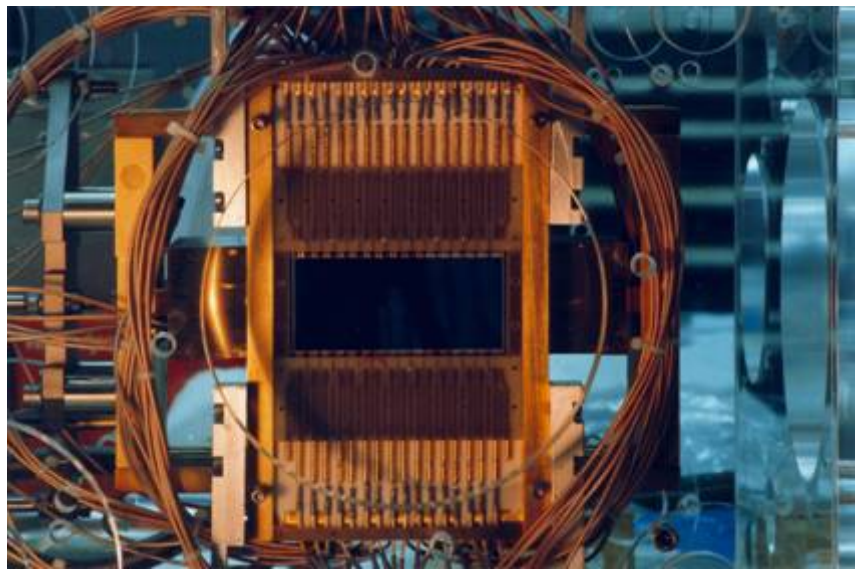
- Rectangular detectors (series RF)
- Pad detectors (series PF/CD or PF/CT),
- Position detectors (series PF/RT) 1D or 2D
- Double sided detectors (series PF/CD/CD)

Examples of SMEP Detectors



»*Model PF-50X50*

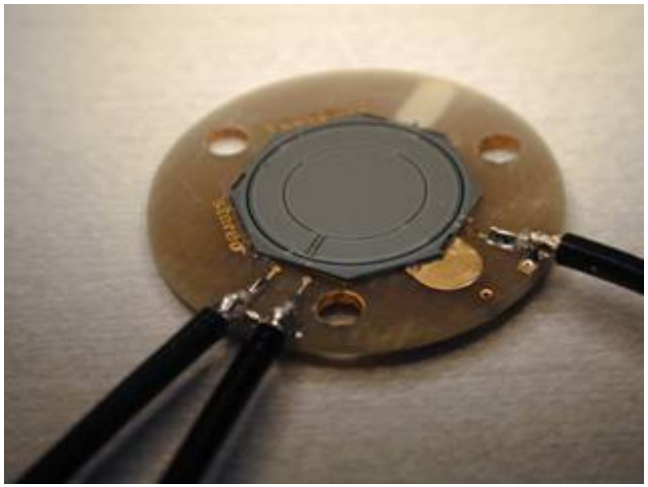
»*Model PF-16RT-35*80*

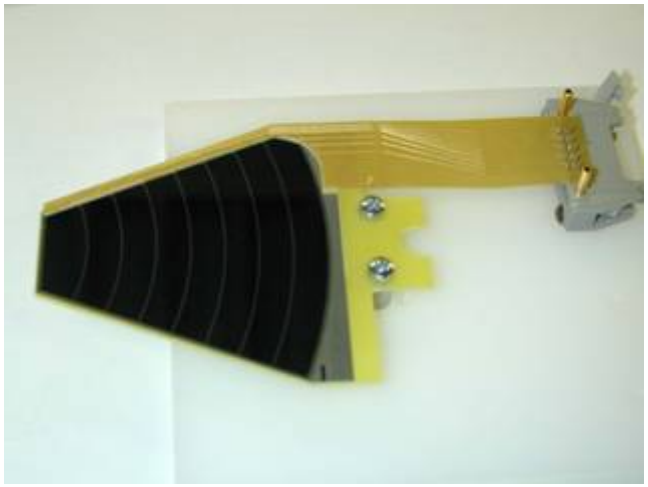


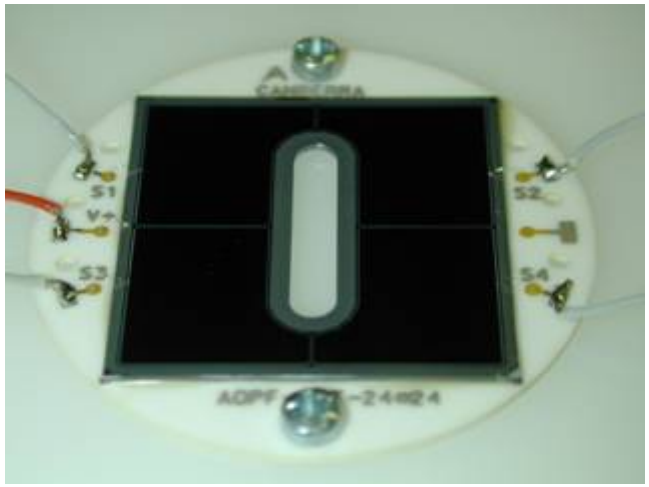
Custom Design Detectors

- **Single junction, Pad and Segment detectors**
  - Large area 80*80mm² or ¢ 115
  - Thickness from 200 to 1500µm
- **Pixel detectors**
  - direct connection to electronics with bumping
- **strip detectors**
  - Pitch down to 25 µm
- **Drift chamber**
  - Up to 80*70mm²
  - very good linearity
  - voltage divider on chip

Examples of CD Detectors







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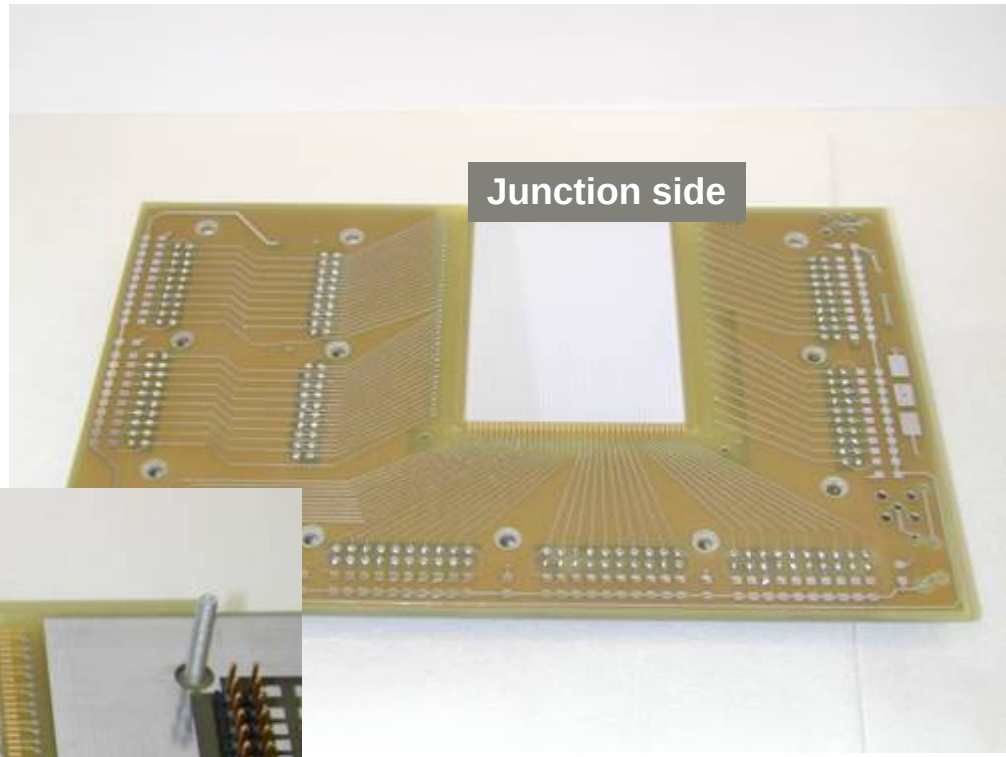
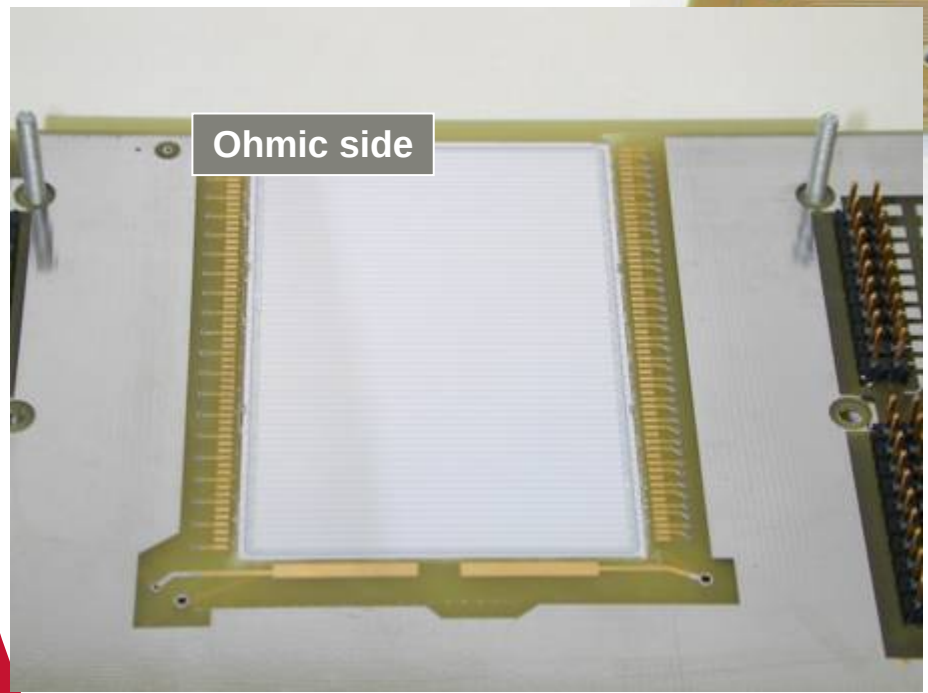
Double Sided Strip Detectors





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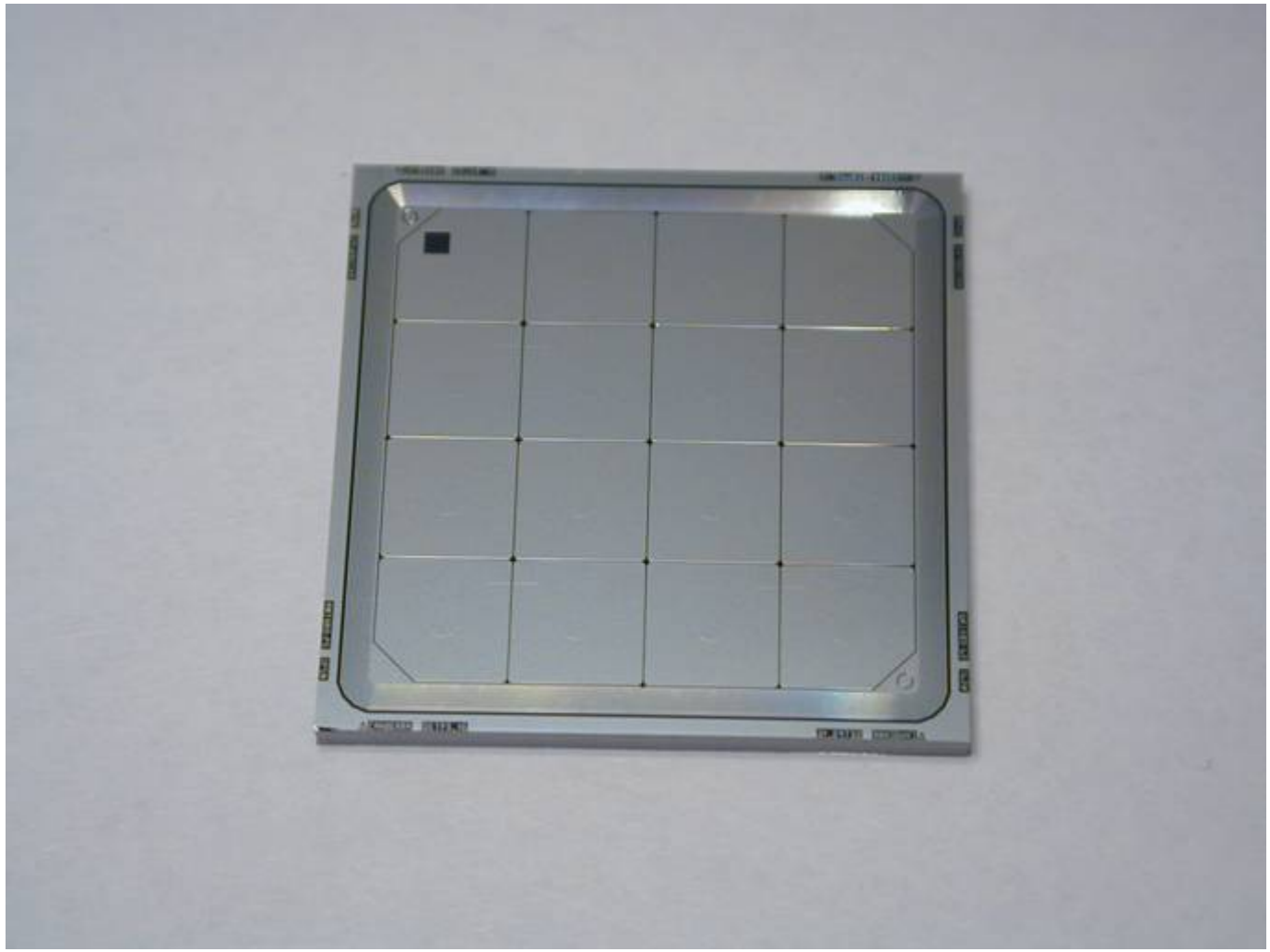
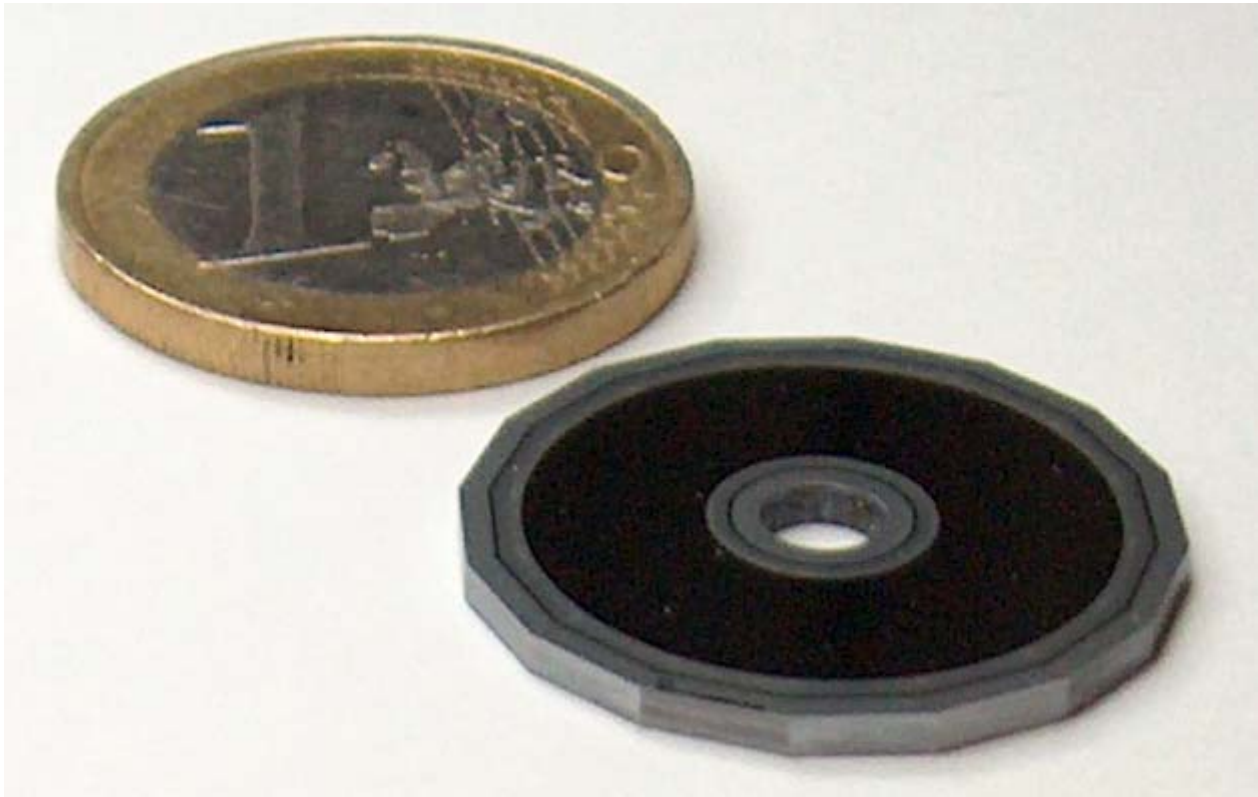
Pixel Detector for X-Ray Experiment

each pixel 25 mm2 – thickness 1.5 mm



Thick Detectors for X-Ray Experiment
Annular 300mm2 – thickness 1.5 mm



Drift Detector for Alice in CERN

Largest drift detector in the world
- **Active area: 52 cm2**
- **Anode pitch: 294µm**
- **512 anodes on two rows**
- **Position resolution: <50µm**
- **MOS injectors for calibration**

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Principle of the drift detector

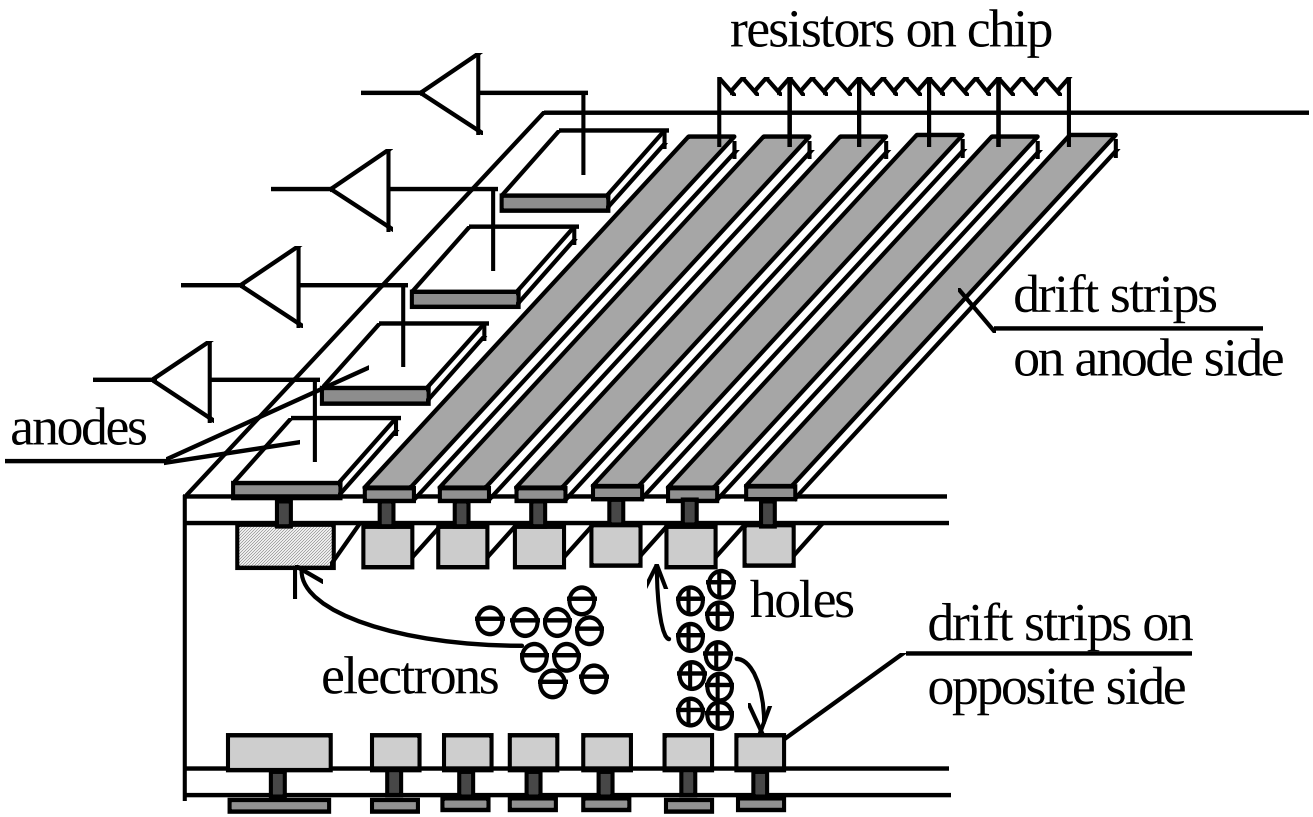

Fig. 6 - Cross section of a silicon drift detector

End

»What you need to remember

If you have a need for Silicon Detectors

Contact Canberra

Thanks for your time, no thanks for mine!!!