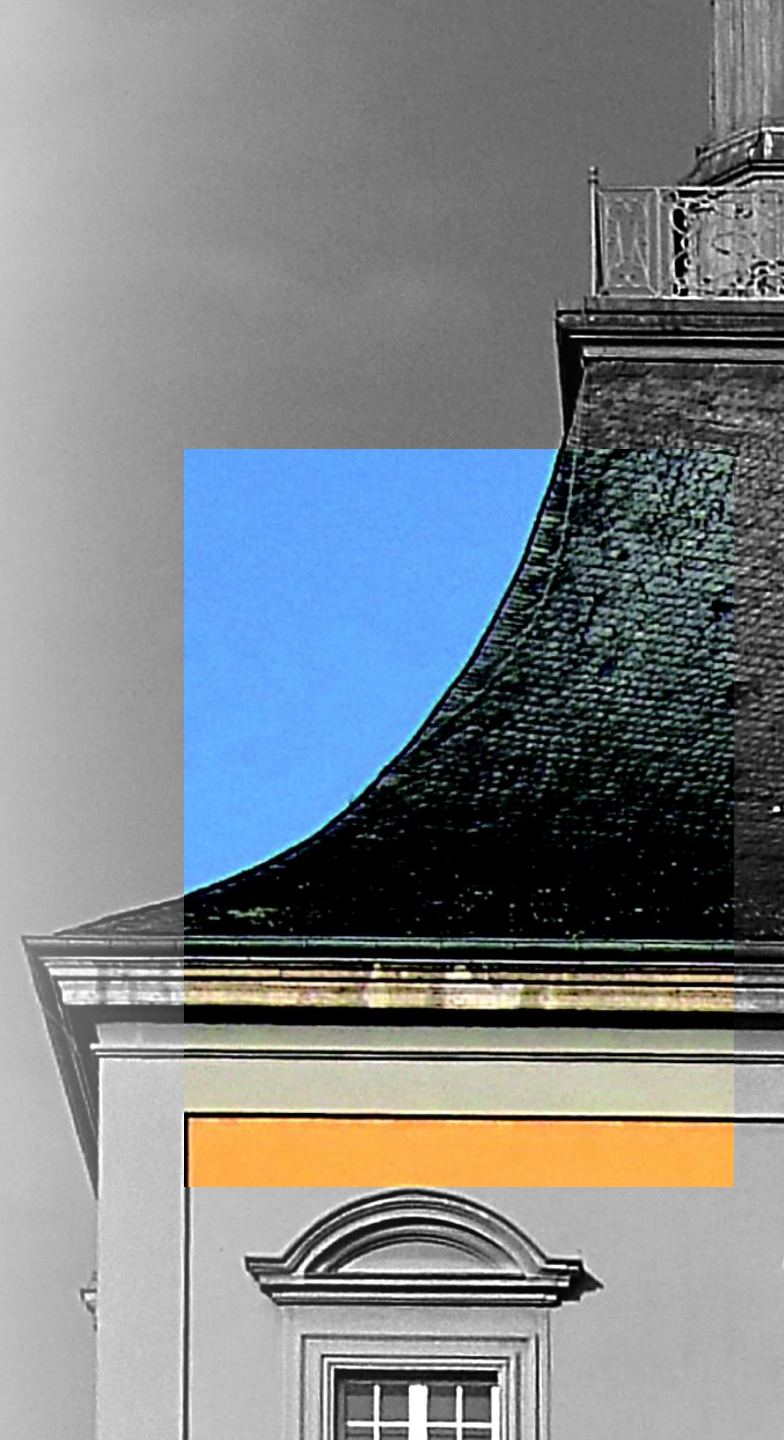
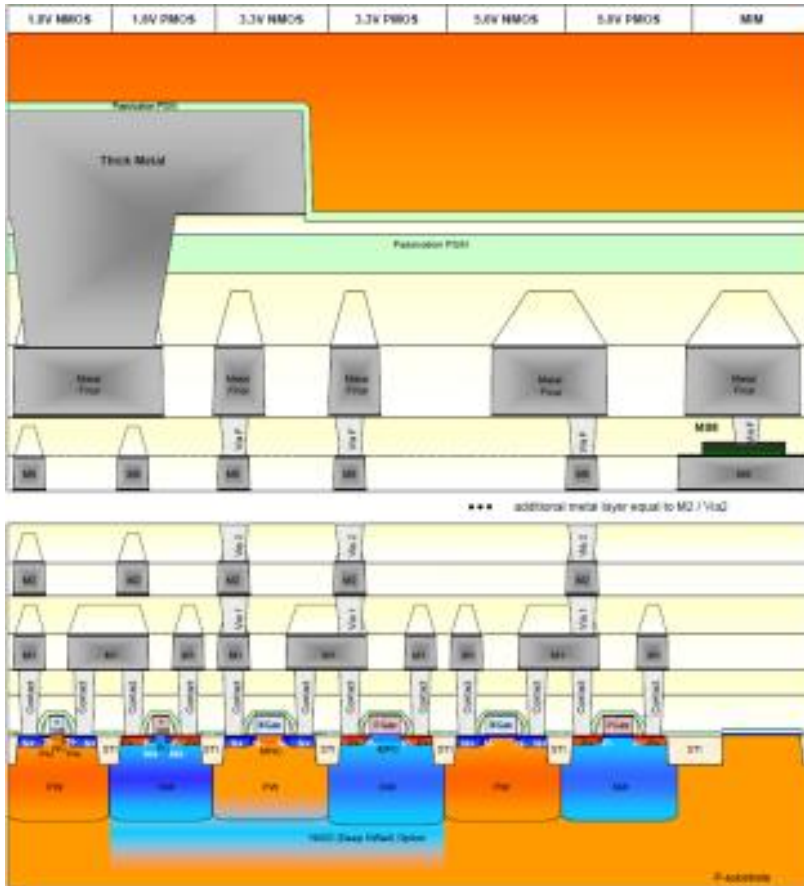


# LARGE AREA SILICON SENSORS IN ADVANCED CMOS PROCESS

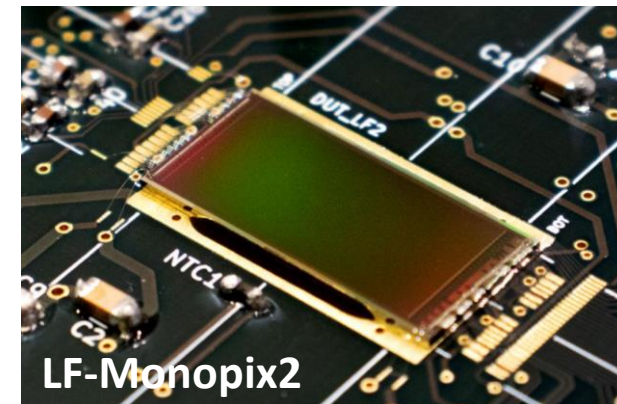
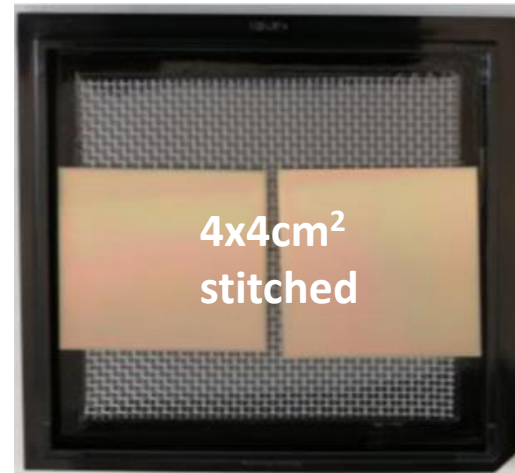
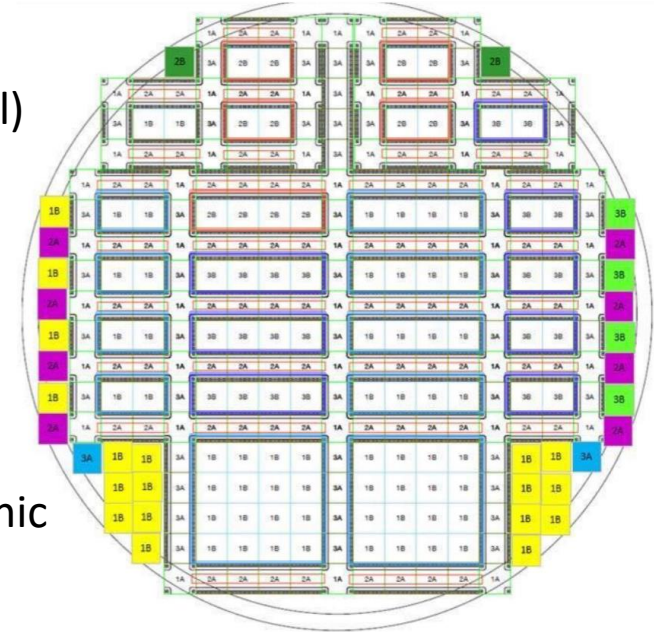
T. Hemperek





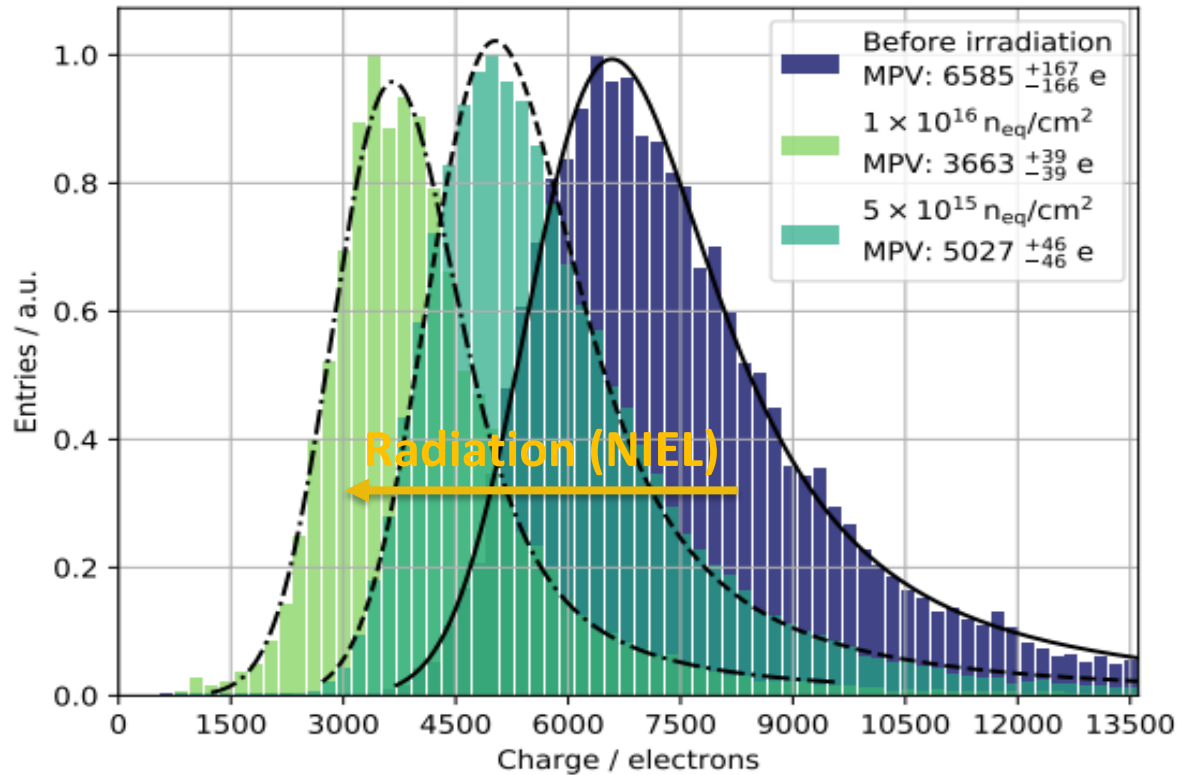
## LFA150 :

- L-Foundry **150 nm** process (deep N-well/P-well)
- **Up to 7 metal layers**
- Substrate: P-type  $>2000 \Omega \cdot \text{cm}$  (Fz/Cz)
- Small implant customization
- Backside processing (post production)
- **200mm** wafers
- Reticle stitching
- Many designed produced: pixel, strip, monolithic
- Backside processing

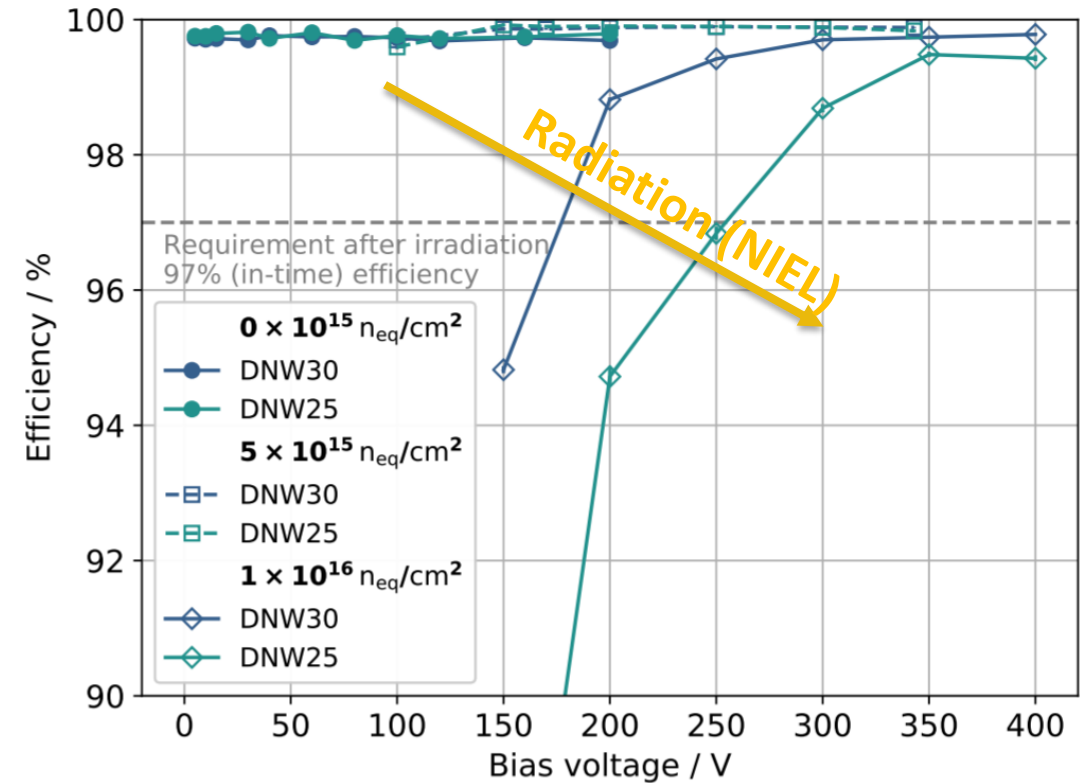


Many successful designs ...

## Charge spectrum (MIP)

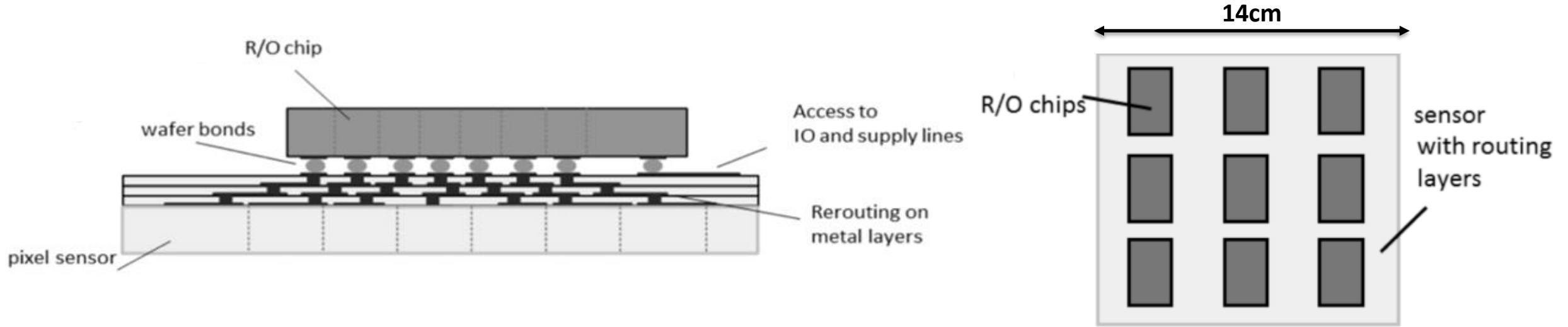


## Hit detection Efficiency (MIP)

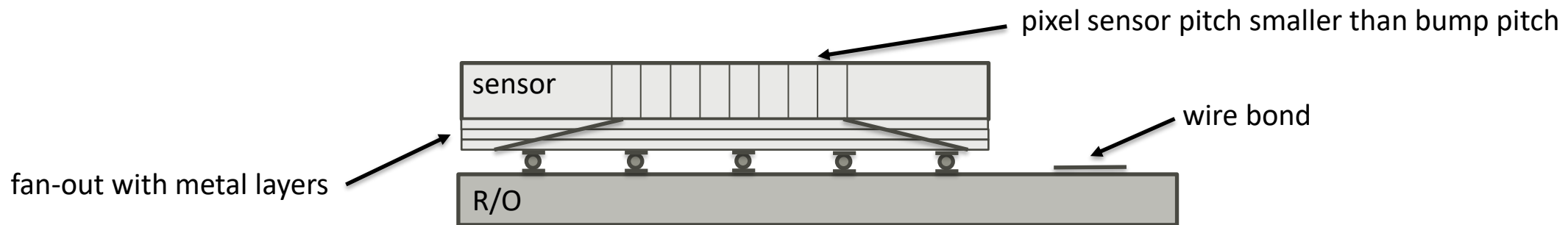


**100um (~90um sensor) + RD53A**

Large area (up to  $\sim 14 \times 14 \text{cm}^2$ ) and homogenous (all pixels same size) modules

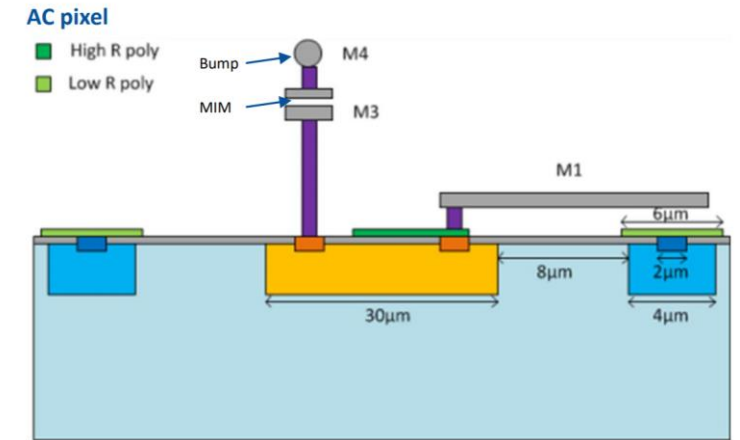


Higher resolution sensors and/or "faster" readout (rate/cm<sup>2</sup>)

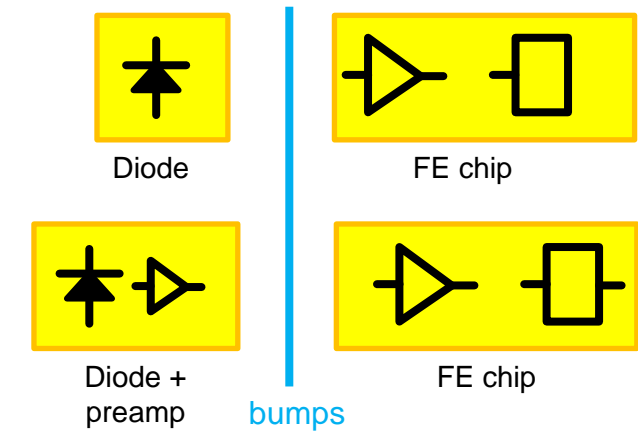




- Multiple metal layers
- Custom thickness: 50-300 $\mu\text{m}$
- Custom **backside process** after wafer processing  
-> thin entrance window possible<sup>1</sup> (~20nm)
- **AC coupling** on pixel level (remove leakage current)
- **Integrate transistors** (amplifiers) in the sensor -> low-noise (multiplex multiple sensor pixels to one readout, ...)



### Hybridization



<sup>1</sup><https://doi.org/10.1016/j.apsusc.2008.11.010>

References: <https://www.researchgate.net/project/Depleted-Monolithic-Active-Pixel-Sensors-DMAPS-in-CMOS-technologies>