

# 3D detectors optimized for timing applications

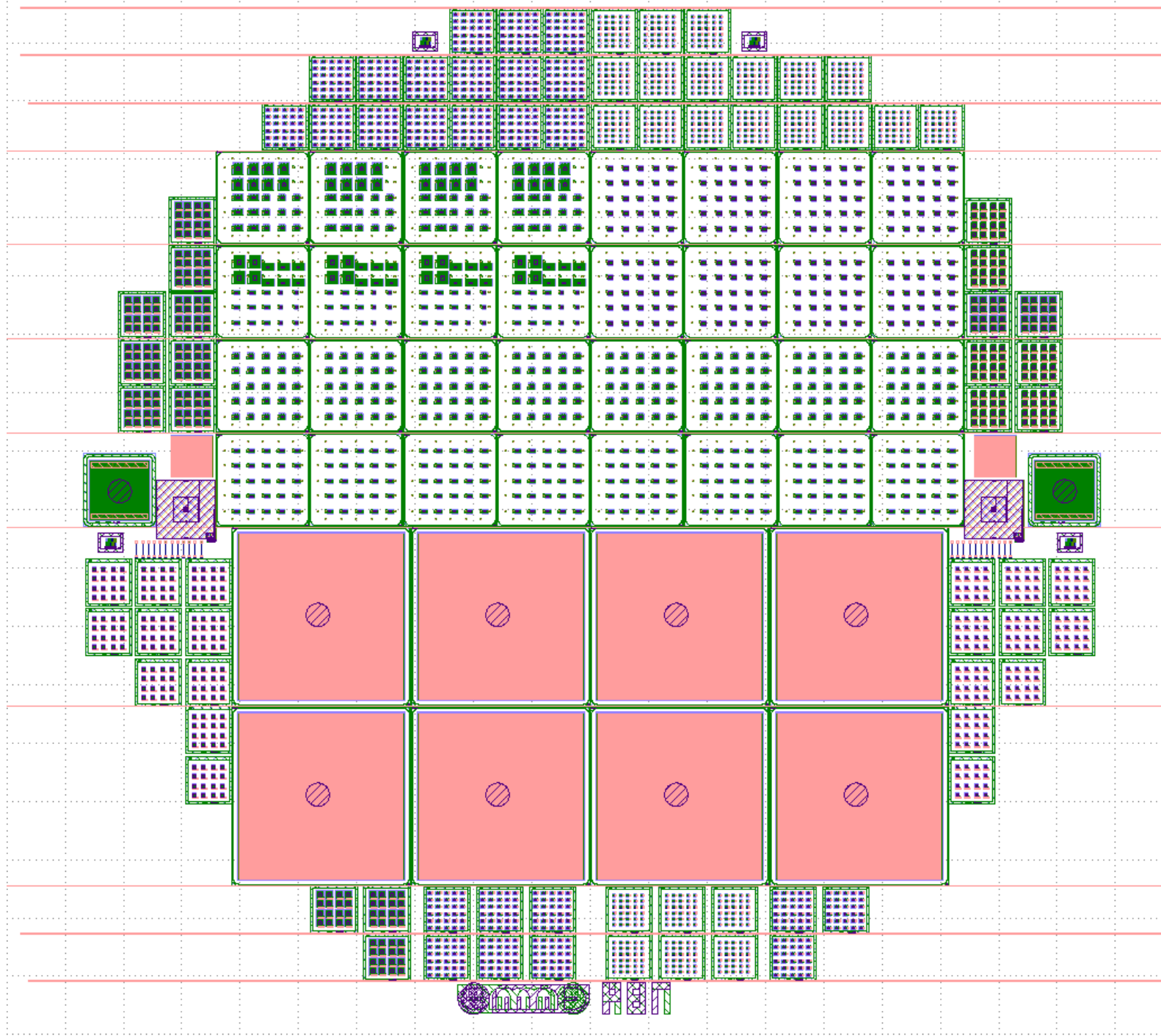


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- RD50 Institutes:
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  - 2. JSI Ljubljana, Gregor Kramberger, <Gregor.Kramberger@ijs.si>
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  - 5. IFAE, Sebastian Grinstein, <sgrinstein@ifae.es>

## Planned Activities

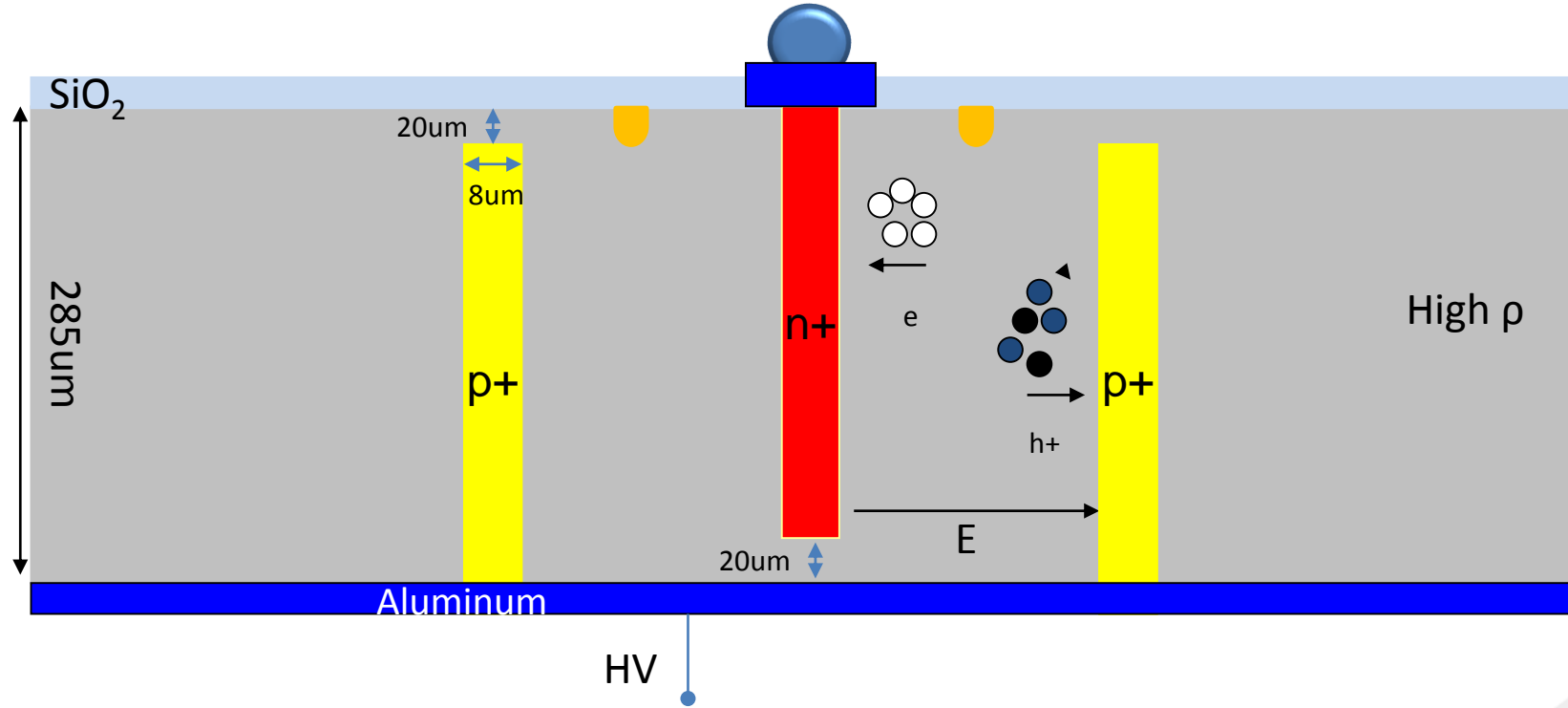
Activity	Institute	Lead
Wafer processing	CNM Barcelona	G. Pellegrini
Process/Detector simulations	CNM Barcelona	G. Pellegrini
Signal/timing performance simulations	JSI, Uni. Freiburg	G. Kramberger
TCT measurements	Uni. Freiburg, JSI, IFAE	U. Parzefall
Electrical characterization	Uni Freiburg, JSI, UZH, IFAE	C. Betancourt
Neutron irradiations	JSI	G. Kramberger
Timing measurements (with discrete electronics, ALTIROC)	JSI, UZH, Uni. Freiburg, IFAE	S. Grinstein

Mask layout



Altiroc 1  
Medipix 3  
Simple pad

# Technology

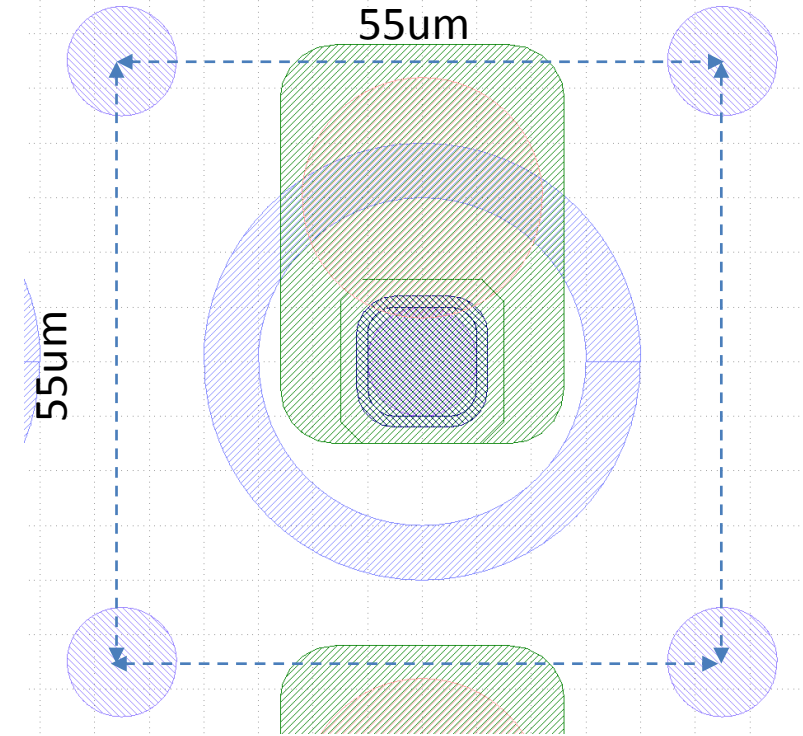
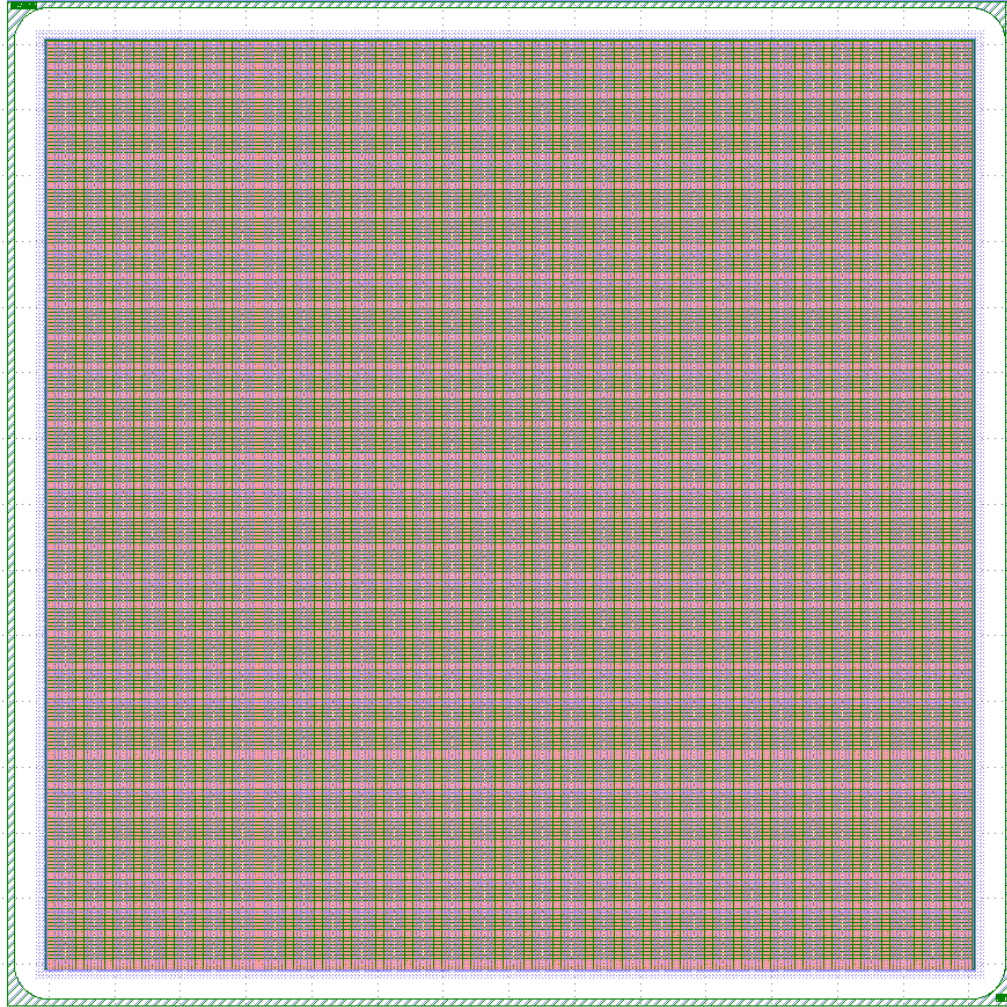


Double sided technology,  
 Wafer thickness : 285um +/-10um  
 HRFZ silicon, p-type >5kohm\*cm  
 P-stop isolation.  
 Holes diameter 8/10um  
 Metal opening on the back

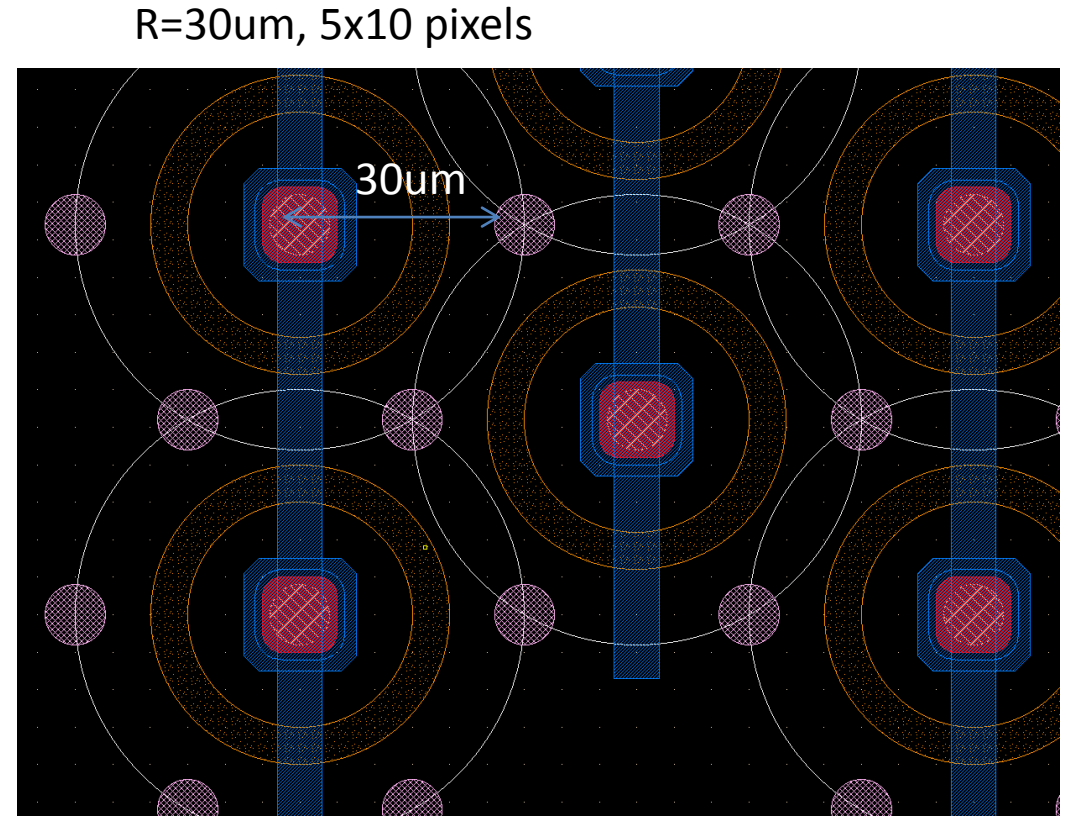
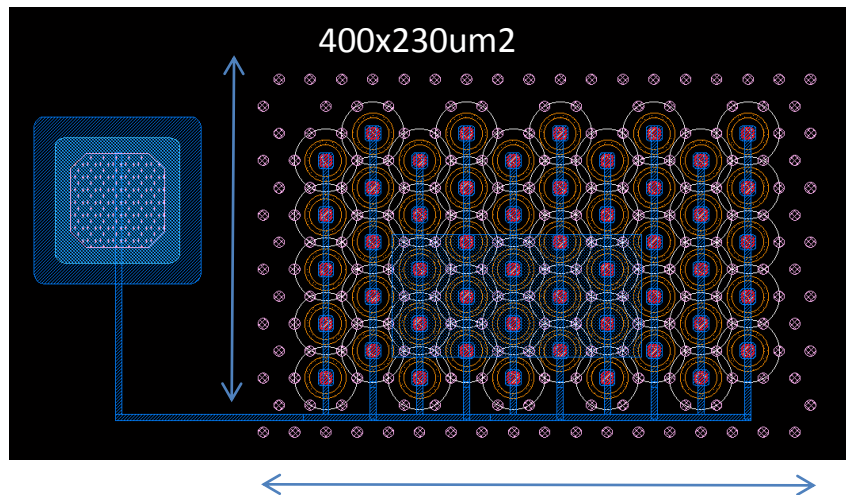
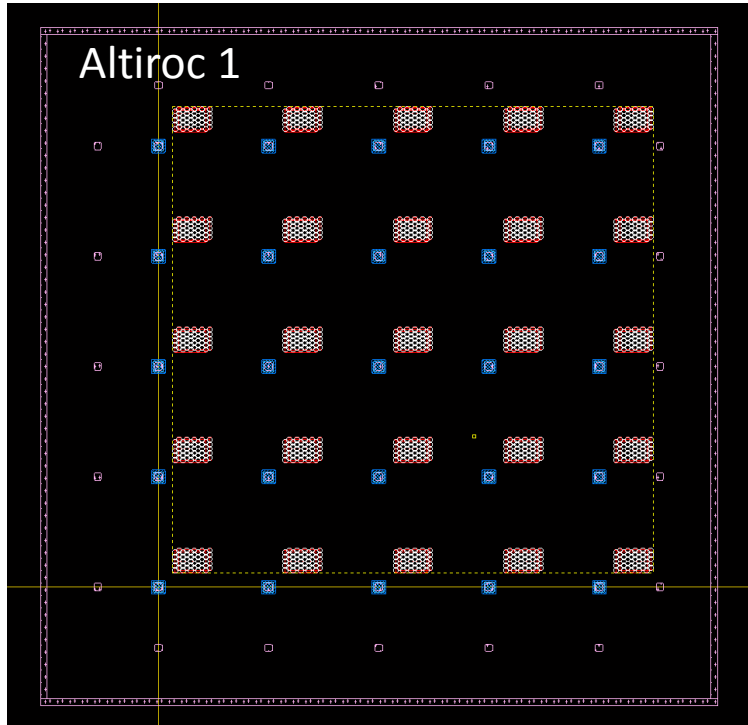
Using 500um wafers will require larger holes diameters. (may be 15um)  
 The new Deep RIE available (under calibration) may solve the problem.



# Medipix



Medipix  
Orthogonal geometry  
Pitch=55μm

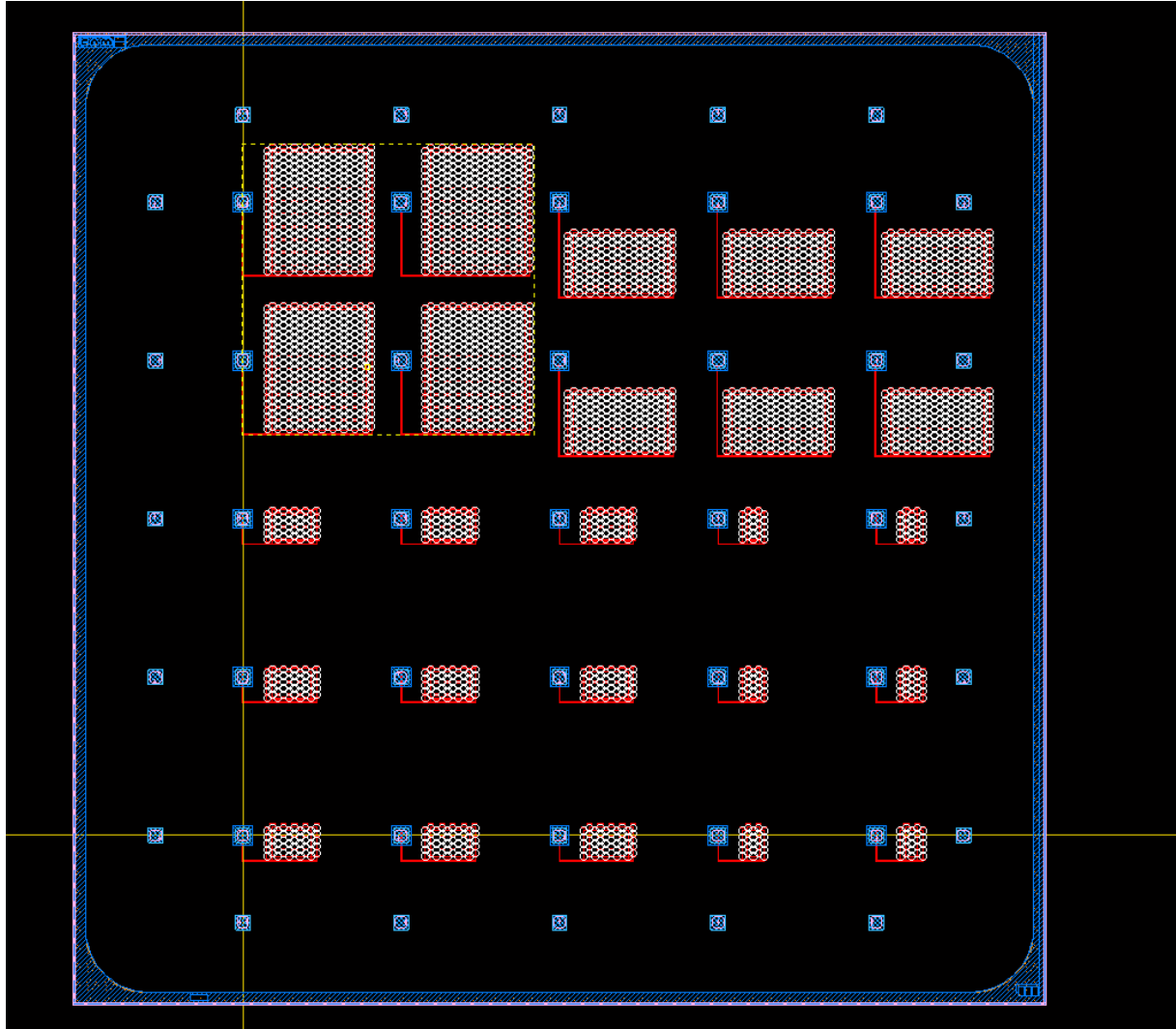


Proposal for the Altiroc 1  
Hexagonal and orthogonal geometries (repeated)

R=30um  
R=50um

Matrix  
5x10 pixels and 5x5 pixels

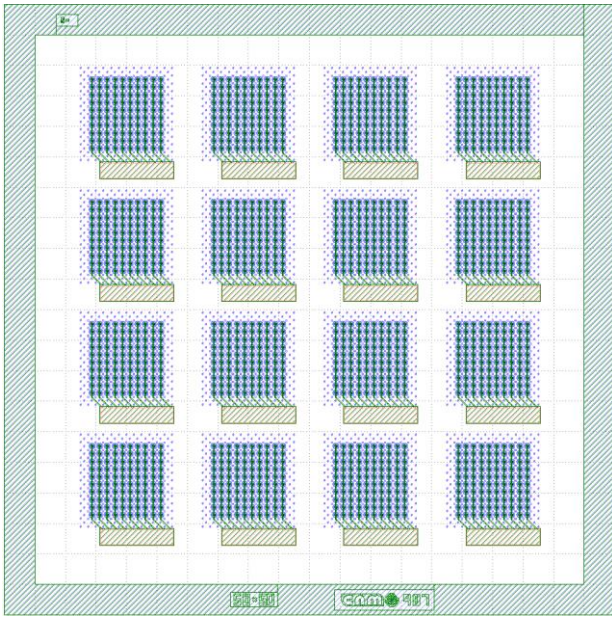




Proposal for the Altiroc 1  
Hexagonal geometry  
Guard ring is not connected

Matrix R=30um  
5x5 pixels  
5x10 pixels  
20x10 pixels  
20x20 pixels

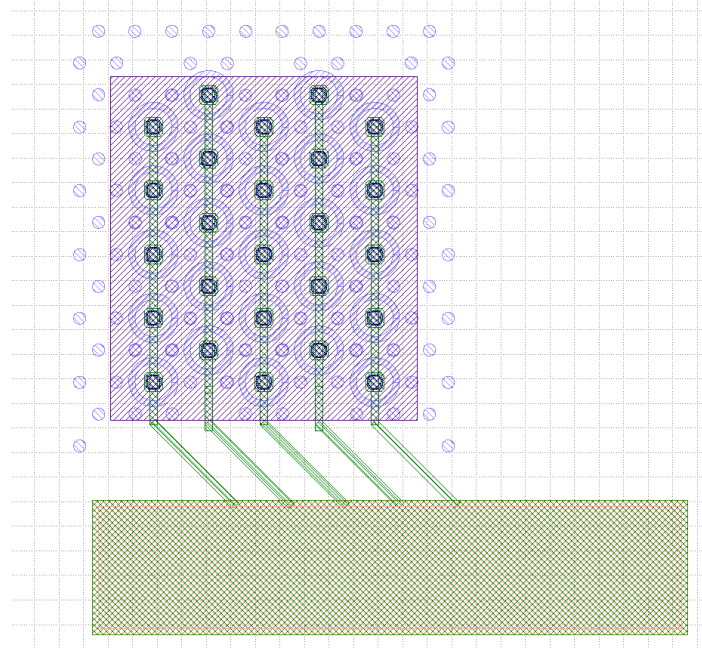
Matrix R=50um  
5x5 pixels  
5x10 pixels  
10x10 pixels



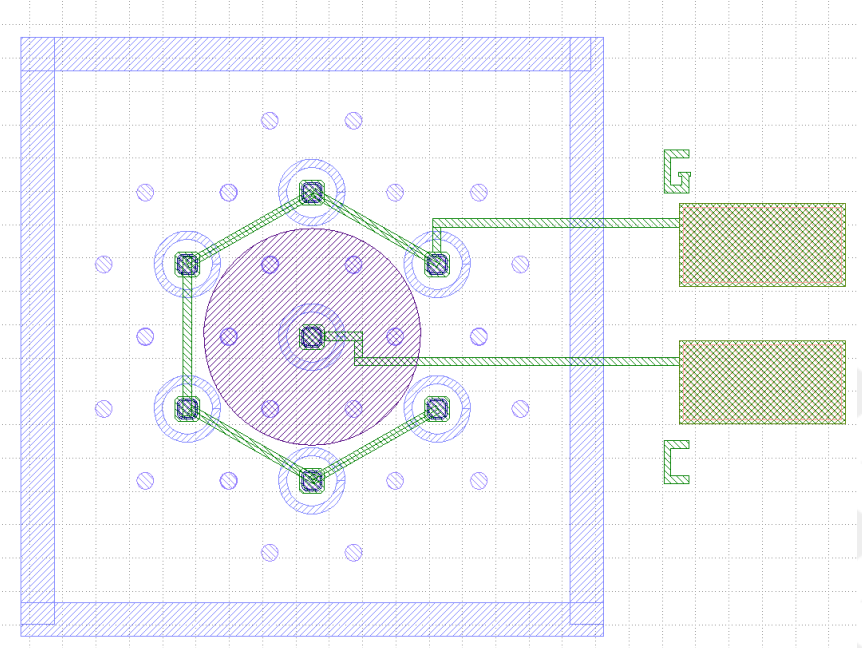
10x10 pixels

### Diodes

- 50x50um (100x100 pixels) **3-** orthogonal
- 50x50um (10x10 pixels), **6-** orthogonal , **7-** hexagon
- 50x50um (5x5 pixels) **4-** hexagonal + **5-** orthogonal
- 50x50um (1 pixel) **1-** orthogonal + **2-** hexagonal



5x5 pixels



1 pixel



- Mask design is ready
- Working on simulation of the new geometry, Oscar Ferrer new PhD student.
- Fabrication may start in September 2020, if no further delay the device will be ready in June 2021. We are busy with Atlas and CMS pre-productions
- Signal formation before and after irradiation -> input for time performance simulation (optimization of geometry for specific applications ?).
- First IV measurements
- TCT study, may be next year also timing measurements .

