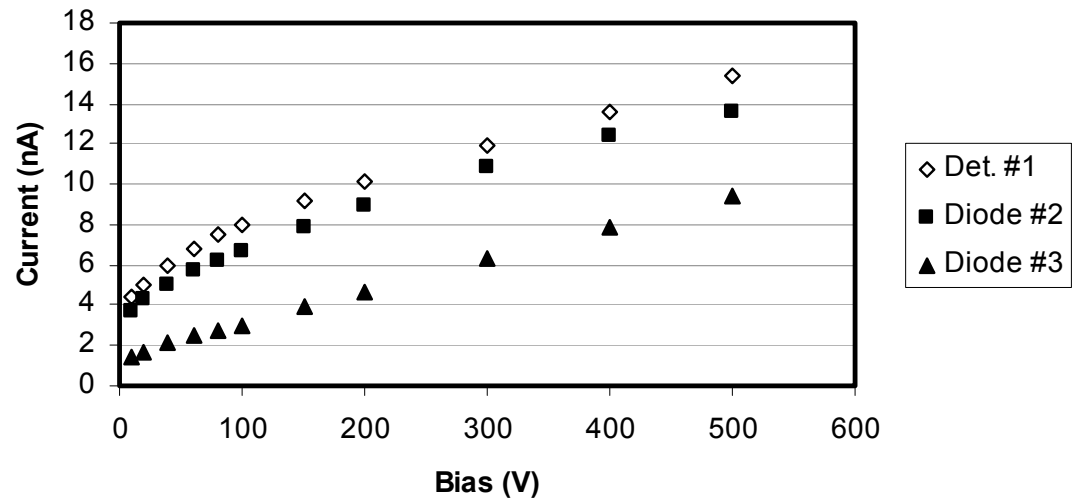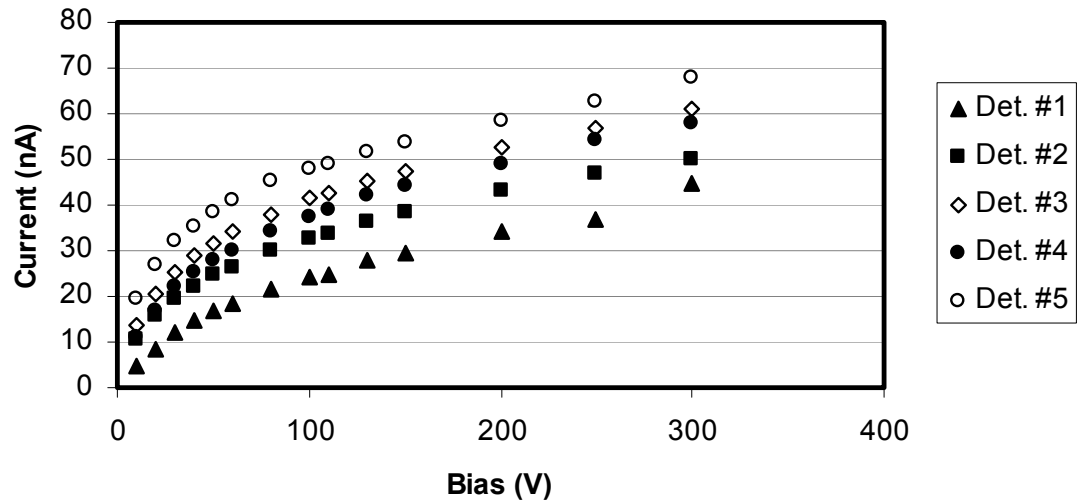# Rd50 full detector system mask design
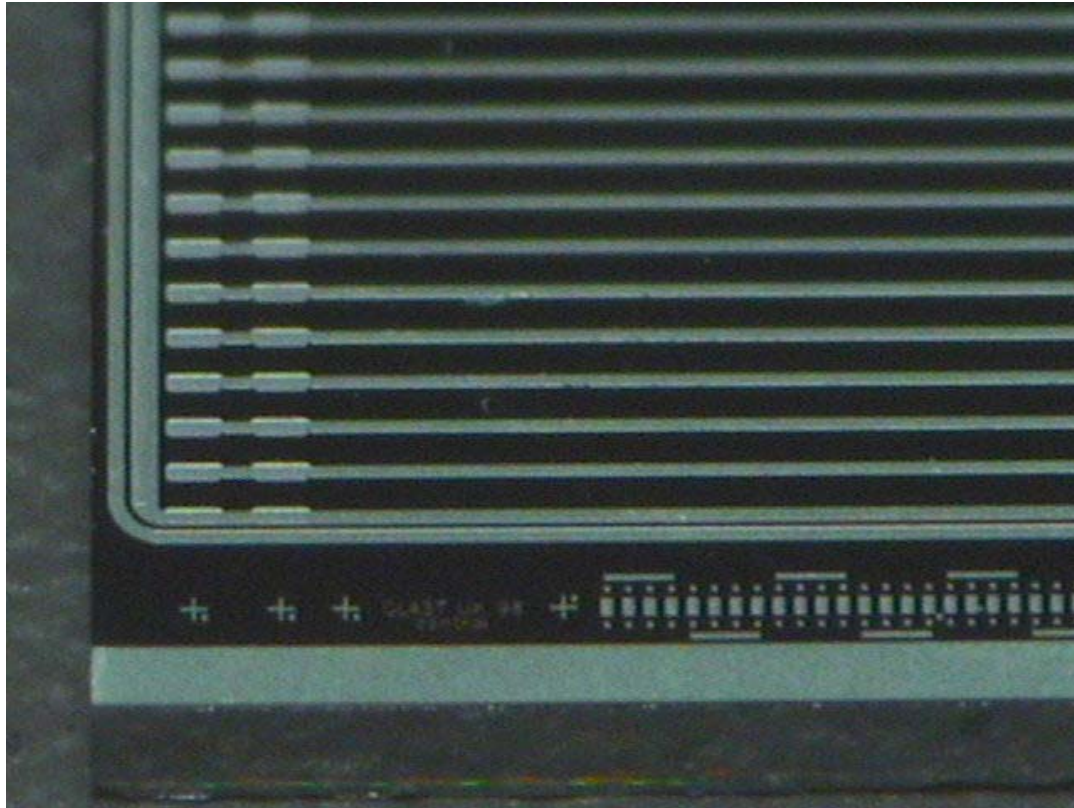
G. Casse, P. Turner
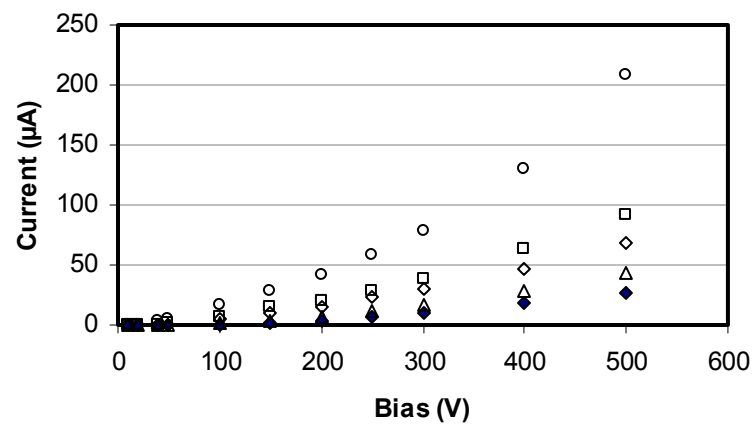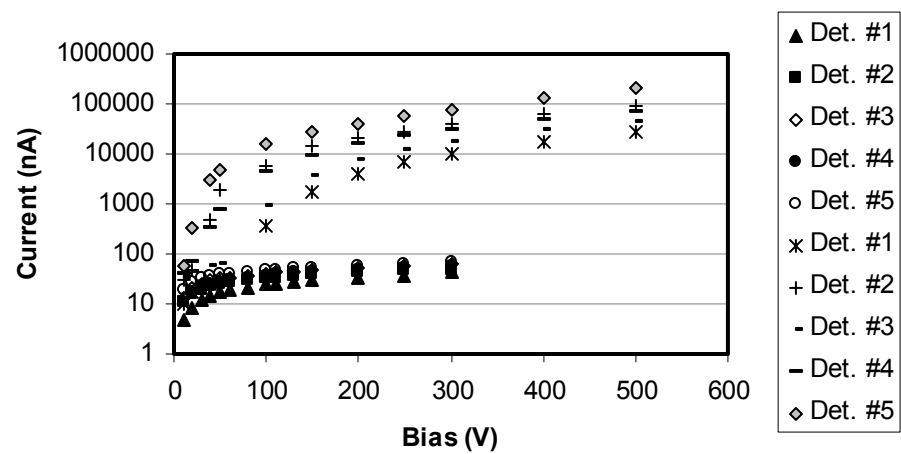
Controlling the edge current

Using miniature detectors for flexibility to use

Reverse current in miniature detector or diodes implemented as test structures on Glast or Atlas detector masks. Traditional G.R.

The detectors are cut to
reduce the distance from the
edge to the active area.

Current (nA)

1000000
100000
10000
1000
100
10
1

0   100   200   300   400   500   600

Bias (V)

▲ Det. #1
■ Det. #2
◇ Det. #3
● Det. #4
○ Det. #5
✳ Det. #1
+ Det. #2
- Det. #3
— Det. #4
◇ Det. #5

Current (µA)

250
200
150
100
50
0

0   100   200   300   400   500   600

Bias (V)

◆ Det. #1
□ Det. #2
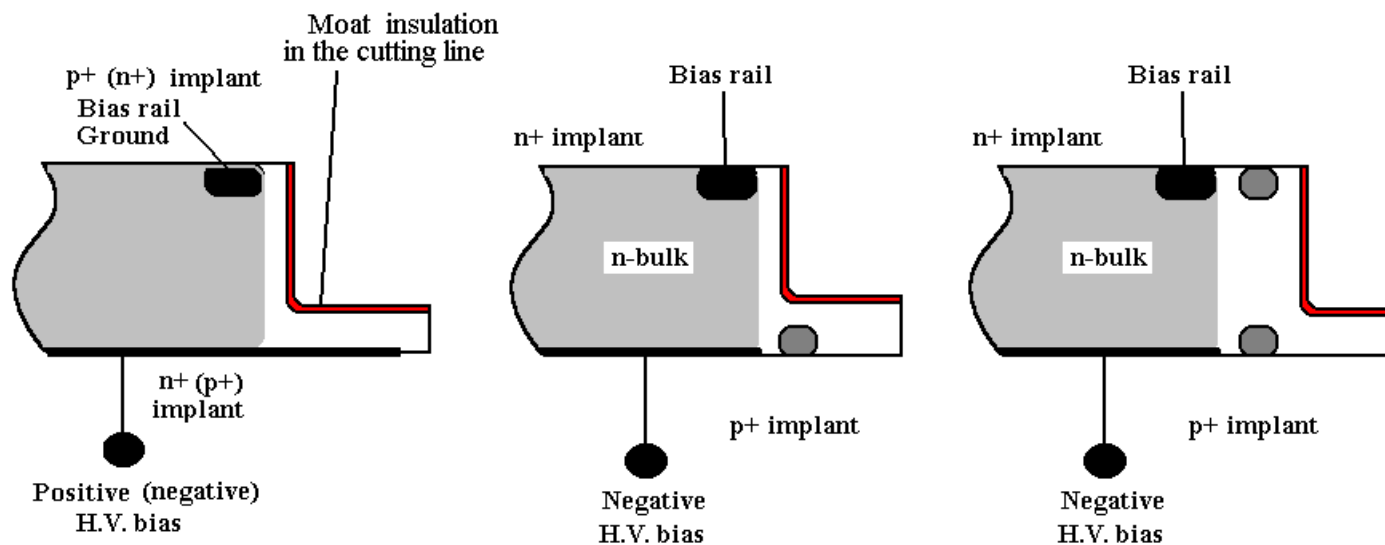△ Det. #3
◇ Det. #4
○ Det. #5

Proposed geometries to control the edge field. Trench etched outside the guard-rings.
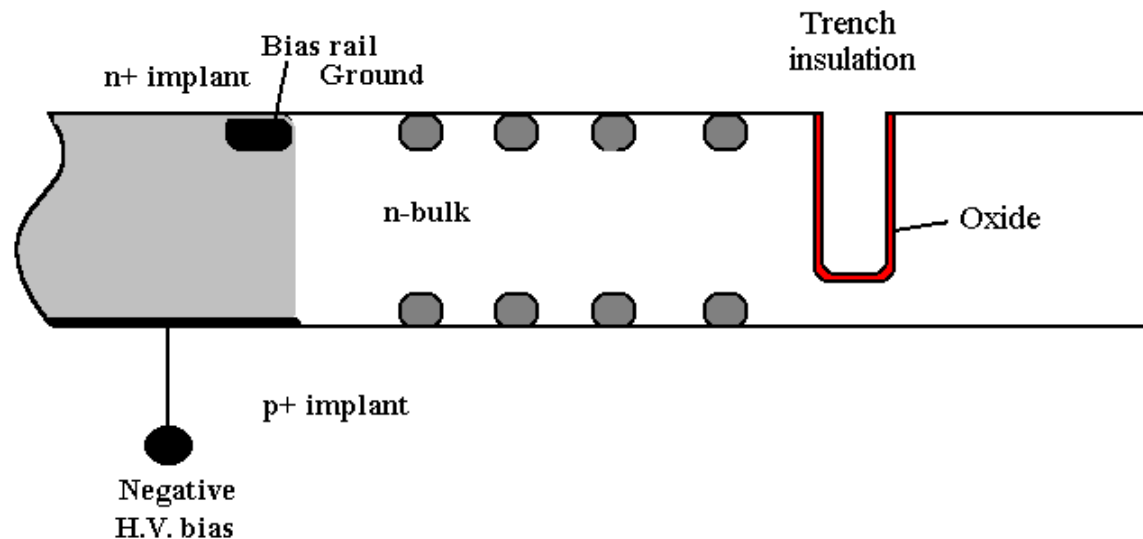
More extreme solutions with or without backside guard-rings.

Miniature detectors with about 100-120 strips, suitable for bonding to available 40MHz analogue electronics (e.g. SCT128A – 128 channels). The number of strips can be variable between detector types in order to keep straight cutting lines on the wafer (for economy reasons). The choice of miniature detectors allows to put more devices on a single wafer and to reduce the parallel noise contribution (short strips).

The standard microstrip structure (SMS) here proposed is 80 μm strip pitch and 20μm width, with 125 strips/cm.

We propose the following detector types:

- Type 1: SMS with 100 μm distance of the sensitive area to the cutting edge (d), 1 guard ring (GR).

- Type 2: SMS with d = 200 μm and 4 GRs.

- Type 3: SMS with d = 300 μm and 6 GRs

- Type 4: SMS with d = 400 μm and 8 GRs

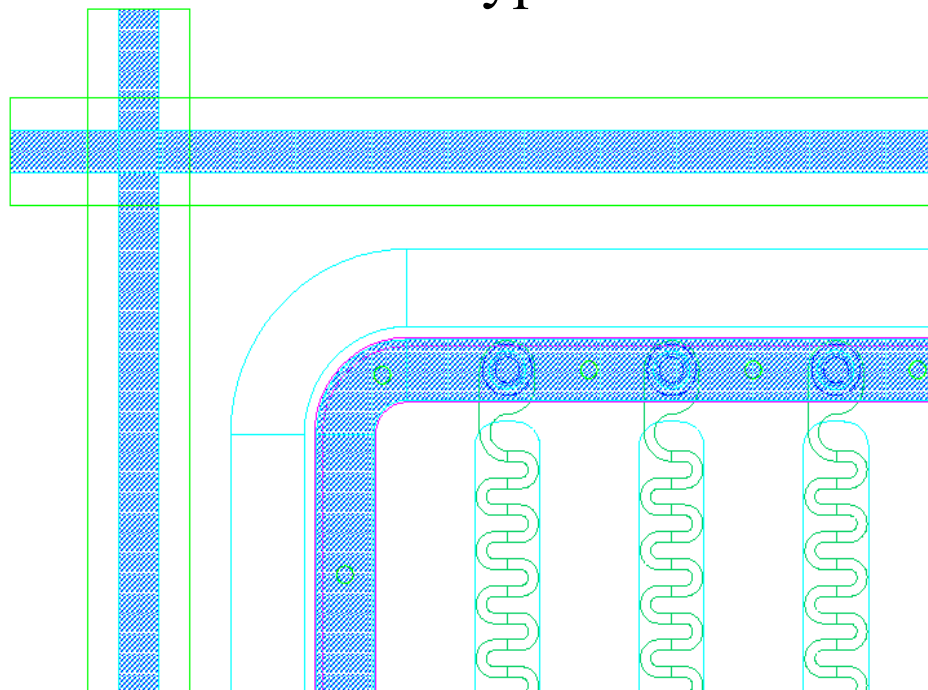**And the following trenched structures**

- Type 5: SMS with d = 100 μm and no GRs

- Type 6: SMS with d = 200 μm and 3 GRs

- Type 7: SMS with d = 300 μm and 6 GRs

- Type 8: SMS with d = 400 μm and 8 GRs

Type 1
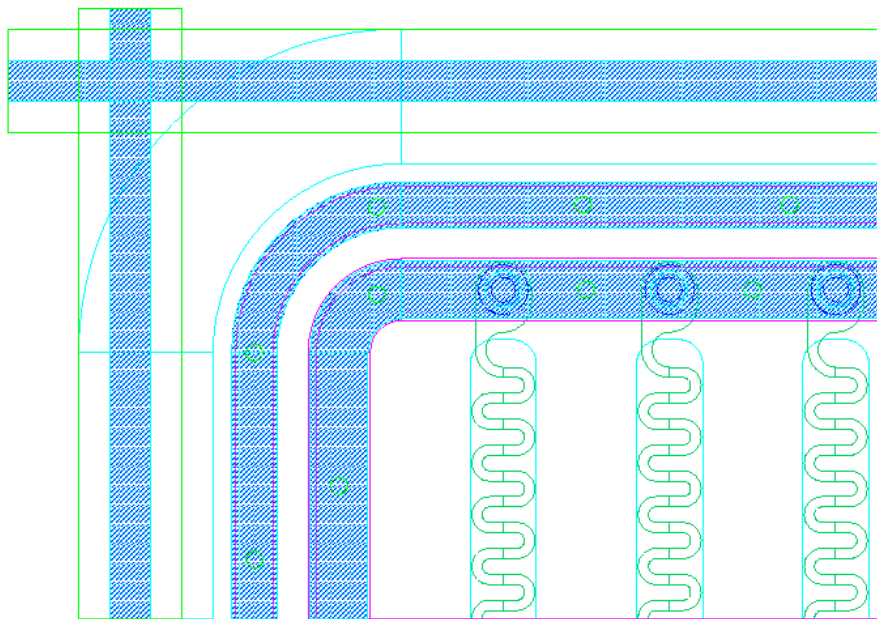
Type 5

Type 2

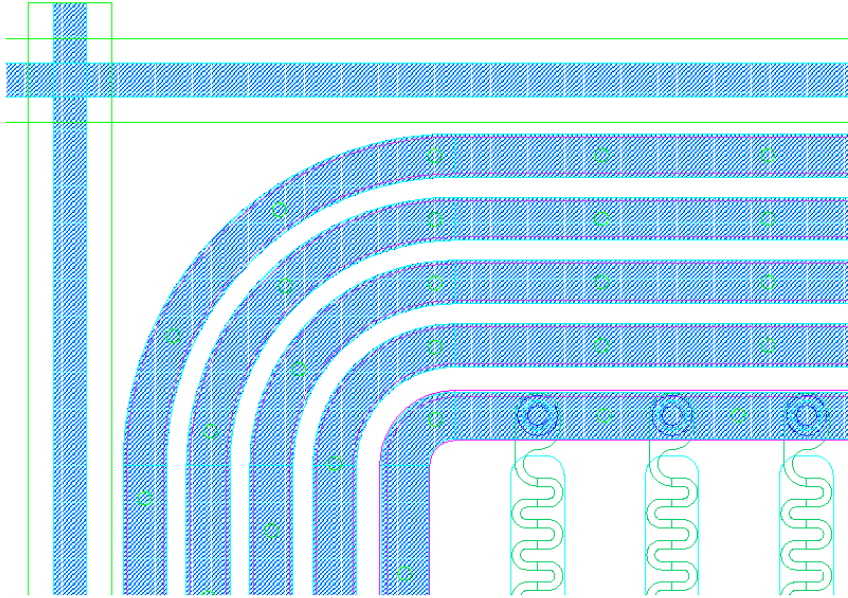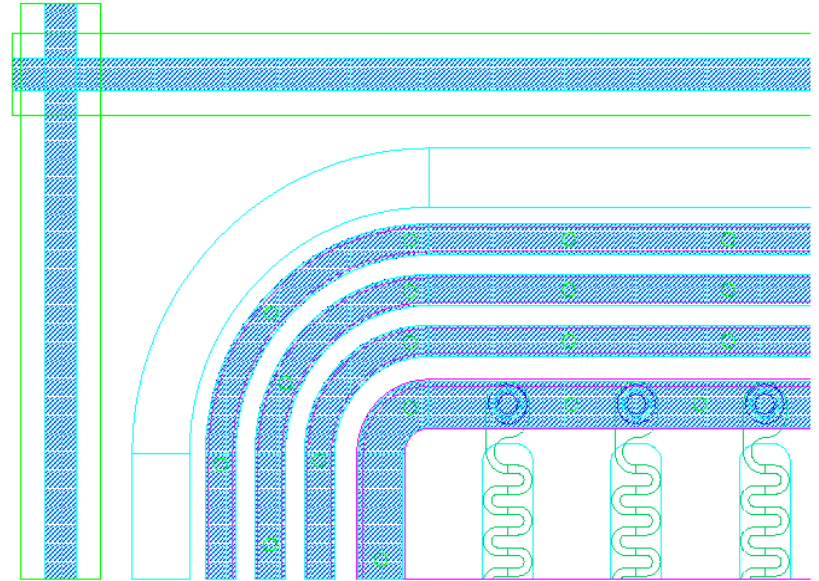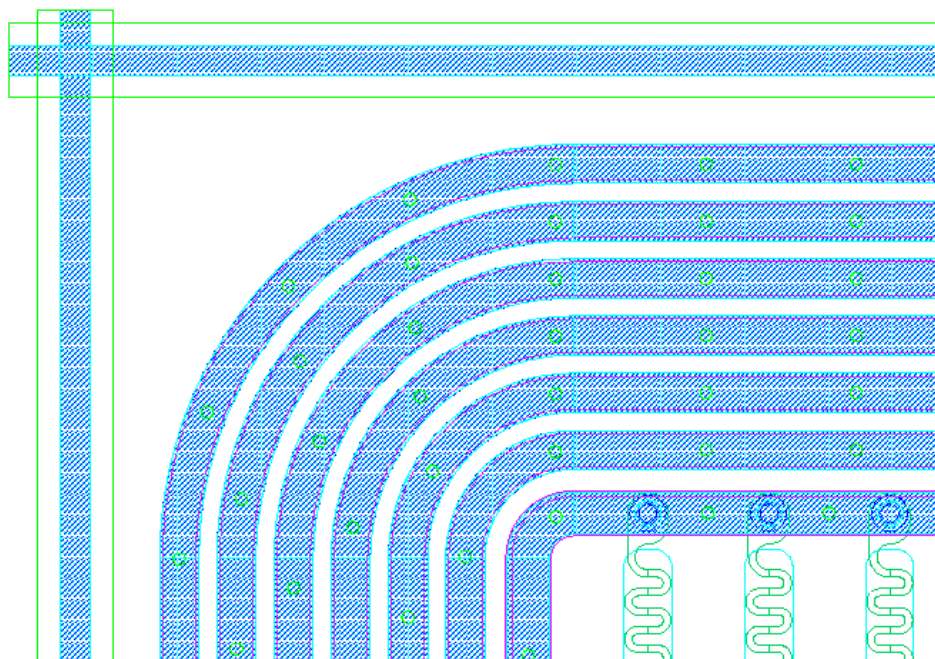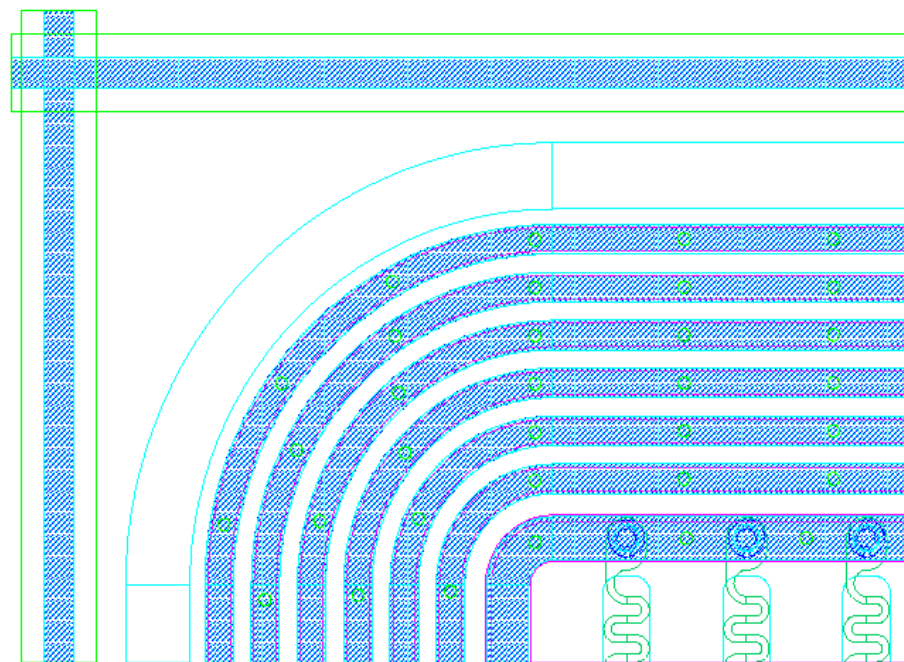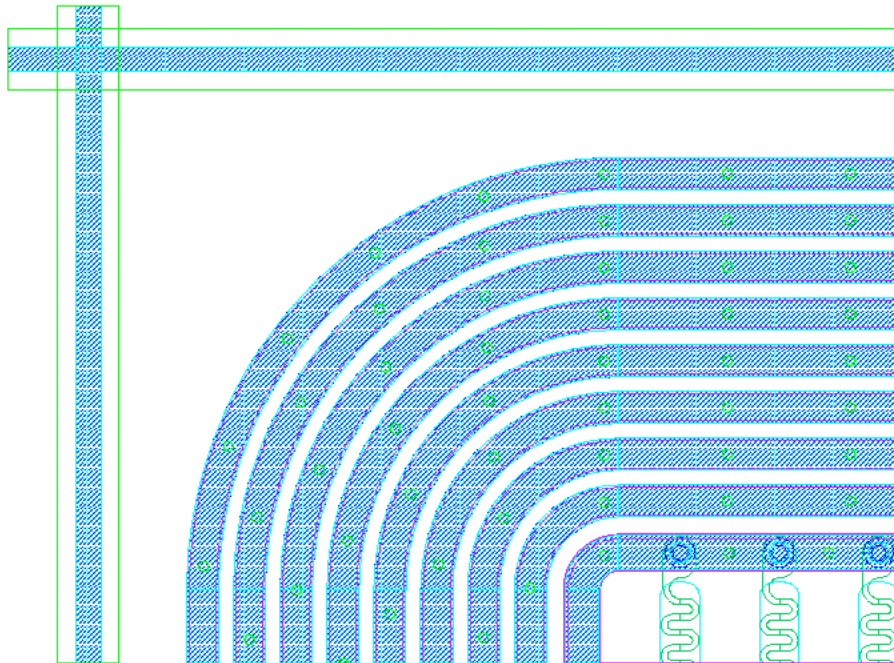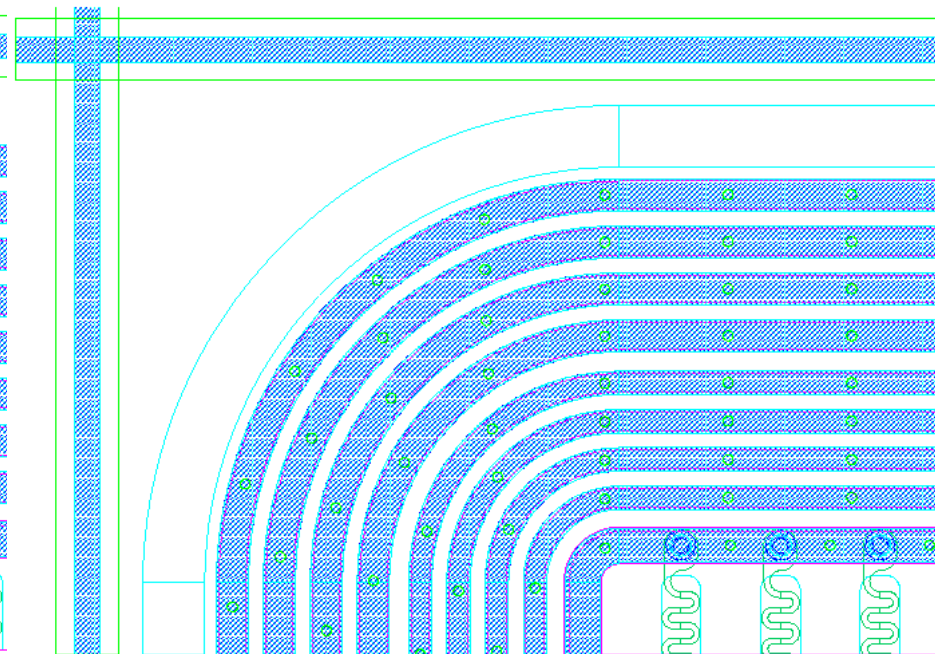# Type 6

Type 3

Type 7

Type 4

Type 8

32 ~ 1X1 cm-2 miniature detectors can be allocated on a 4'' wafer, allowing 4 detectors per each type. For cost reduction, it would be appropriate to produce a single mask set and several copies to distribute to the interested manufacturers. To realise this, a common set of alignment marks should be agreed with the manufacturers.