CALICE D4 simulation results
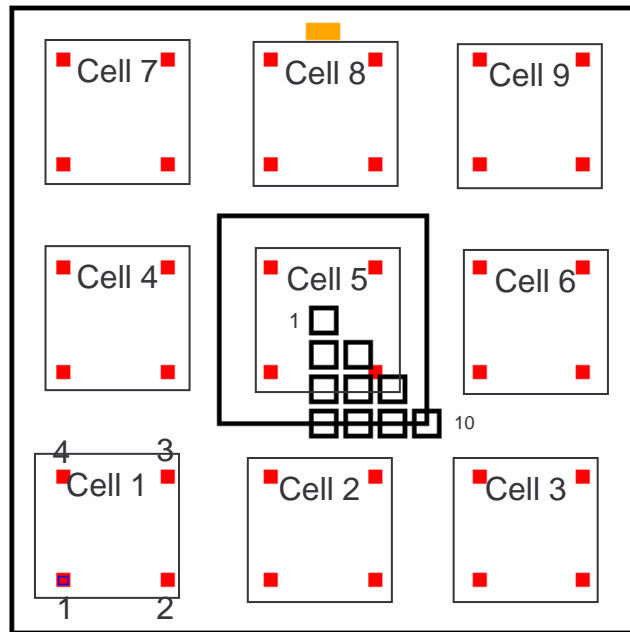
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Cell size: 25 x 25 μm^2

Epitaxial thickness: 20 μm

Diode location: S4

Diode size: 1.5 x 1.5 μm^2

Each cell consists of 4 diodes the signals of which add
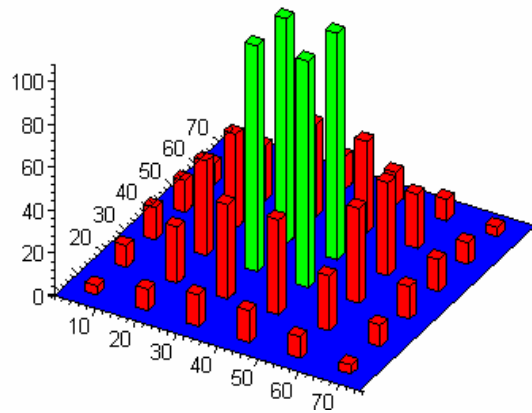
| Diode bias: 2V | PWell bias: 0V | Substrate bias: floating |

10 hits simulated: mirroring over central cell and transformation over 3 x 3 cells allows surface reconstruction of $Q_{coll}(x,y)$
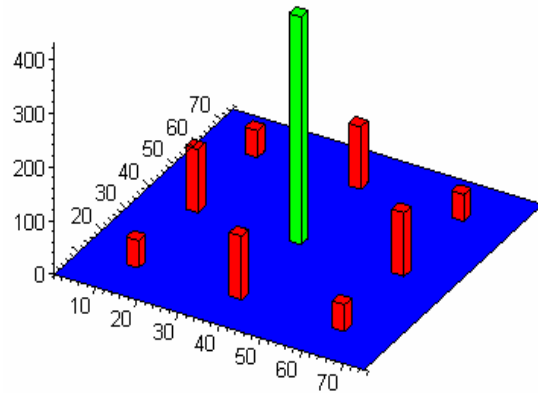
CALICE D4 simulation results

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4	10	15	15	10	4
10	26	43	42	25	10
15	44	105	106	43	15
15	44	105	106	44	15
10	26	44	44	26	10
4	10	15	15	10	4

Individually collected charge e$^-$ hit 1
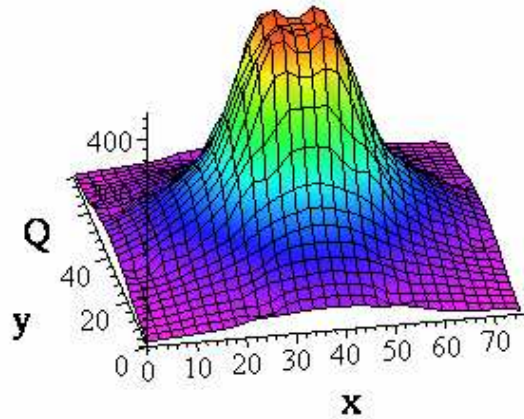

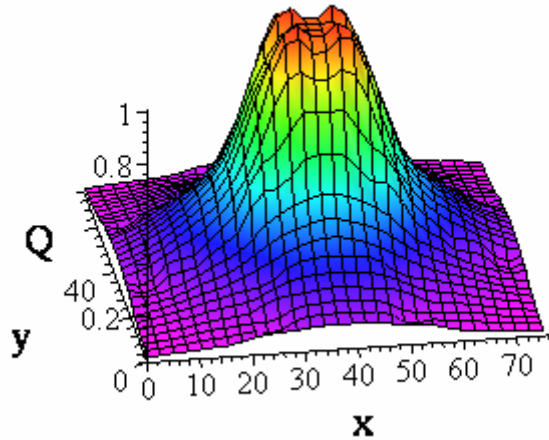| 50	116	49
118	422	118
51	118	50

Cell (Σ diodes) collected charge e$^-$ hit 1

2

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Surface $Q_{coll}(x,y)$
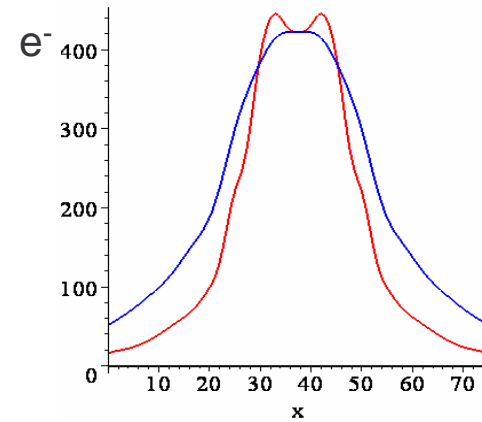
Surface $Q_{coll}(x,y)$ sampled
along (x, x) and (x, 37.5)

Normalized surface $Q_{coll}(x,y)$ vs. max(Qcoll(x,y))

Cell boundaries
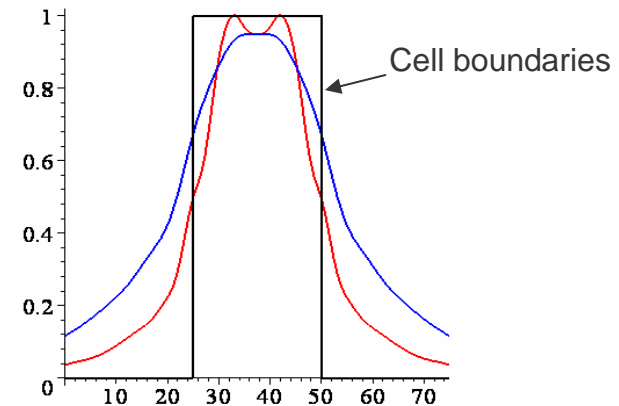
Normalized surface $Q_{coll}(x,y)$ sampled
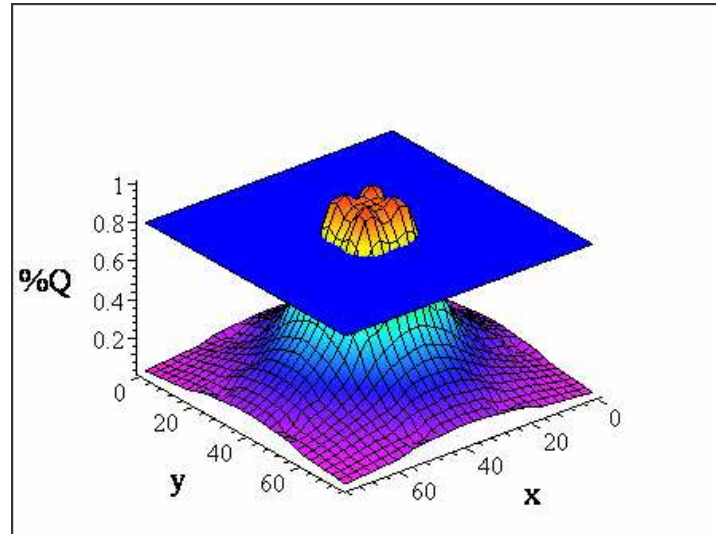along (x, x) and (x, 37.5)

3

CALICE D4 simulation results
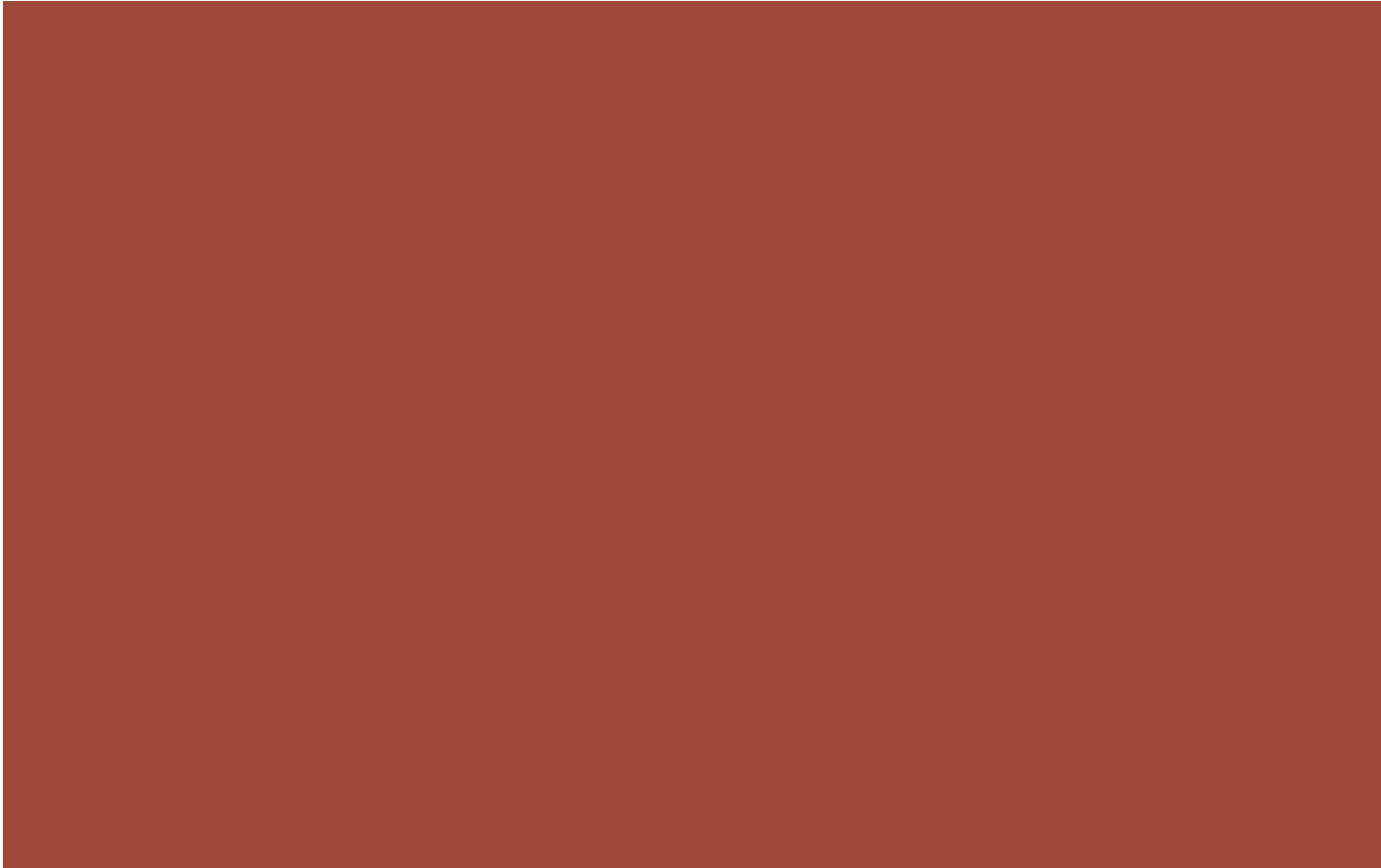
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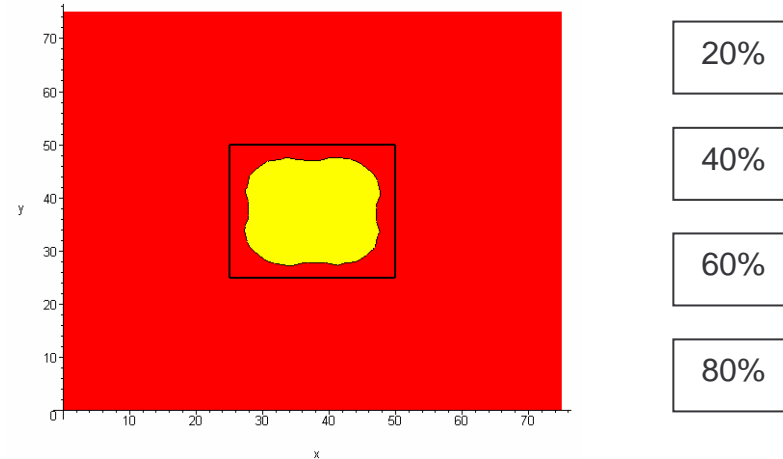**Normalized surface $Q_{coll}(x,y)$**

CALICE D4 simulation results

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Normalized surface $Q_{coll}(x,y)$ vs. max(Qcoll(x,y))

20%

40%

60%

80%

Contour plot of cell charge at different % of total collected charge

Increasing number of threshold levels reduces spatial error

Minimum error around ≈ 57 % (need further analysis)

CALICE D4 simulation results
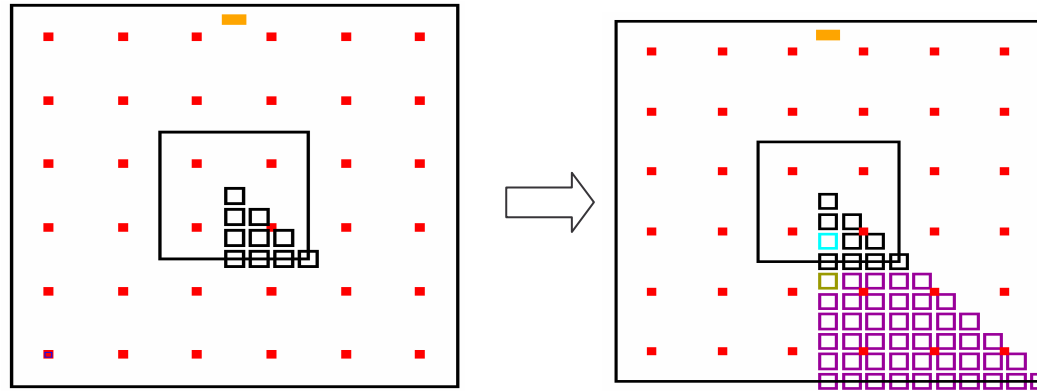
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Conclusions

- Maximum signal around 420 e$^-$ when Σ
- Effect of spread of charge can be limited by increasing number of levels threshold or reducing thickness of epitaxial layer

ADDENDA
CALICE D4 simulation results

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Starting from the simulation data corresponding to the hits of figure 1, a triangular matrix of hits is built:

For example, the effect of hit (6,1), highlighted in yellowish, on central cell is assumed to be the same of hit (8,1), highlighted in cyan, on cell 2 (cells are numbered as in figure 1).
This transformation is accomplished by applying a symmetry matricial transformation to each hit until a triangular matrix is obtained. A mirroring over the full 3 x 3 cells finally gives the hits array (19 x 19 sampling points, $\approx$ 4.16 μm virtual cell size)
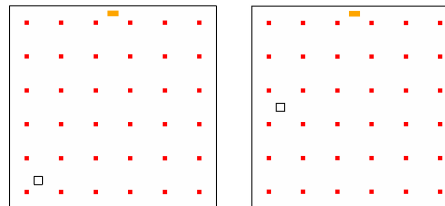
ü As a consistency check, two simulation were run at locations (10.5,10.5) and (10.5,37.5)
to verify goodness of the method. Predicted results of normalized collected charge differed from simulations
of 2% and 0.5% respectively.