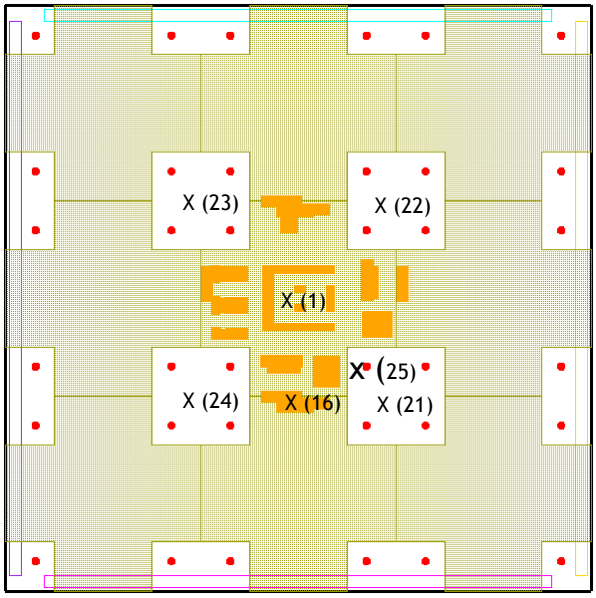
Simulation results for Deep P Well Calice pixel - April 07 submission -

Introduction

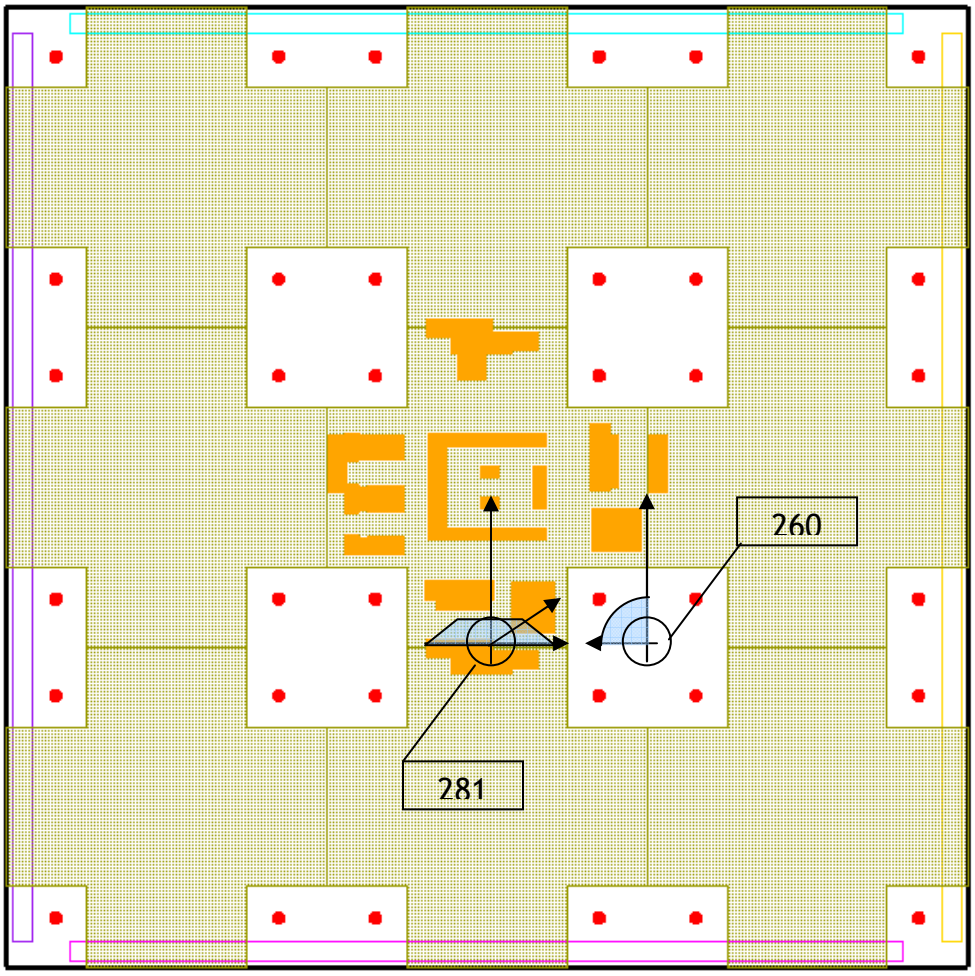
An estimate of the total effective area of the pixel fabricated in INMAPS process that guarantees S/N>10 is presented. The analysis is based on the simulation results presented in the earlier document.

DC Simulation results

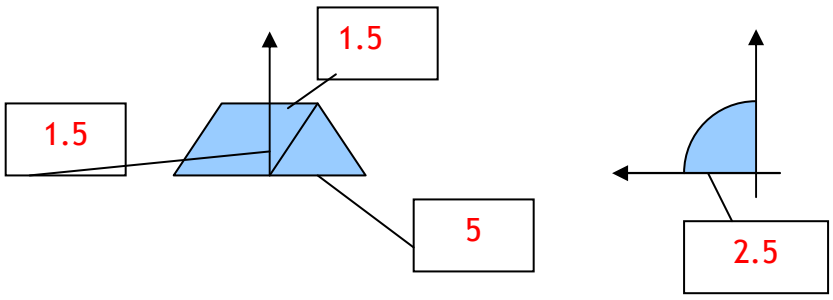
The layout and corresponding 3D models of the simulated structures are shown below:



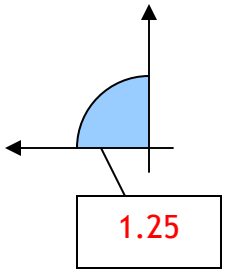
To estimate the percentage of area of the pixel where a S/N > 10 is not guaranteed for different values of noise, the directional derivative of charge over pixel's surface is calculated for all the pixel's corners and low signal points. The minimum of the directional derivative is found and the minimum distance from the related corner or point is calculated to guarantee that the added signal to the corner's exceeds the required one to guarantee a S/N>10. This approach assumes a minimum of the directional derivative common for all the points. Thus, this overestimates the area of low S/N (i.e. the percentage of pixel 'lost' because of low S/N is in reality lower than indicated).



The shaded blue areas show where the signal does not exceed 300e$^-$, thus a S/N<=10 is likely, depending on the noise level.
The minimum distances from the points for the added charge to increase the total signal above 300e$^-$ is shown below:



For a N = 28e^- only the area around the bottom right corner needs taking into account:



The table below summarizes the results for N = 25, 28, 30 e^-_{rms}

Noise (rms e^-)	Area lost(μm^2)	Area lost (%pixel)	Efficiency (%)
30	58.6	2.3	97.7
28	4.9	0.2	99.8
25	0.0	0.0	100

According to simulations, even in case of N = 30e^-_{rms} the pixel shows a good efficiency.

□