# 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 Feb 0.8 simulation results document.

DC Simulation results

The layout and corresponding 3D models of the simulated structures are shown below:
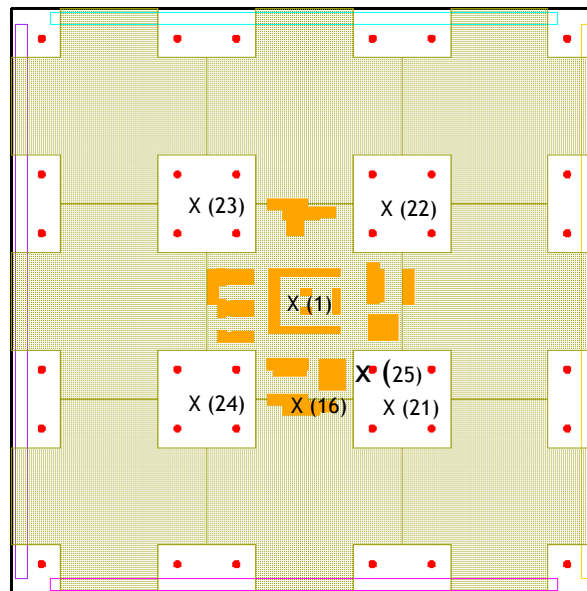
To estimate the percentage of area of the pixel where a S/N > 10 is not guaranteed for different values of noise, the directional derivative of charge over pixel's surface is calculated for all the pixel's corners and low signal points. The minimum of the directional derivative is found and the minimum 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).
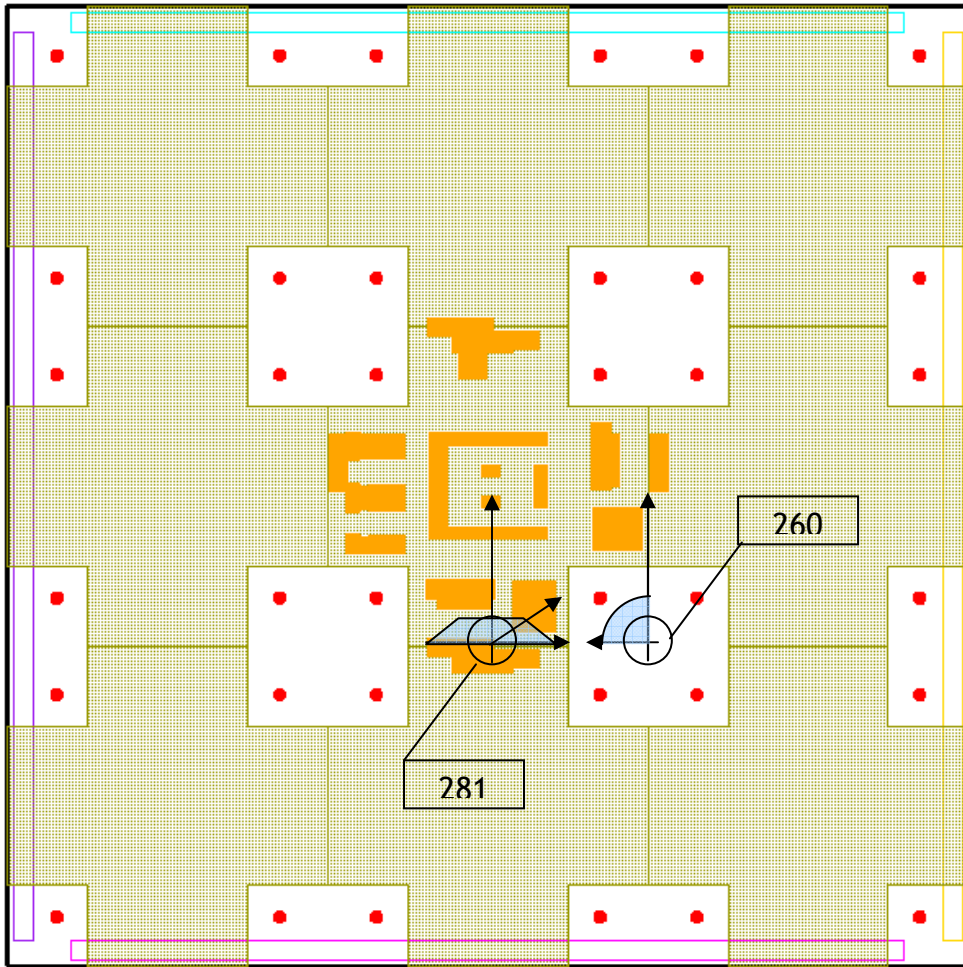
The shaded blue areas show where the signal does not exceed 300e⁻, thus a S/N<=10 is likely, assuming a noise N = 30e⁻.
 The minimum distances from the points for the added charge to increase the total signal above 300e⁻ is shown below:
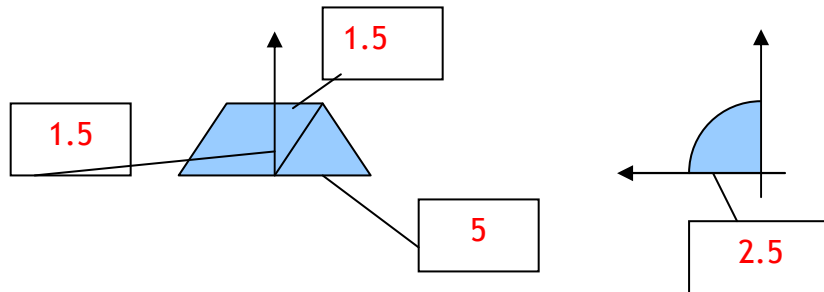
For an N = 28e⁻ only the area around the bottom right corner needs taking into account:

1.25
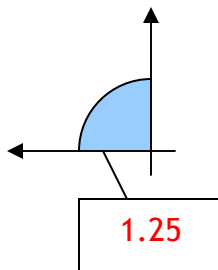
The table below summarizes the results for N = 25, 28, 30 and 35 e⁻$_{rms}$ obtained using the same approach.

Noise (rms e⁻)	Area lost(μm^2)	Area lost (%pixel)	Efficiency (%)
35	544	21.7	78.3
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. This value probably sets the maximum acceptable limit in noise.
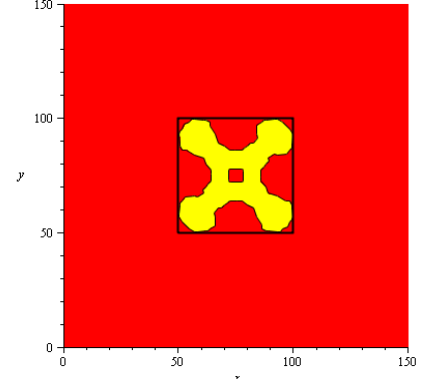
In fact, if the noise exceeds 30e⁻, the fraction of pixel's area lost becomes significant. With an N=40e⁻ also the central area of the pixel shows poor performances in terms of S/N.
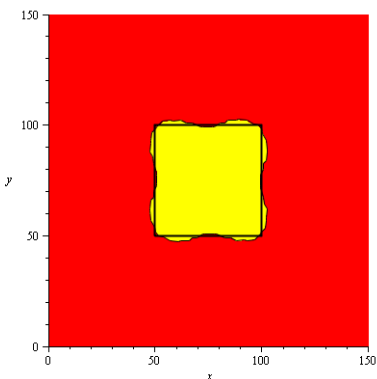
Contour plots for threshold = 300e⁻
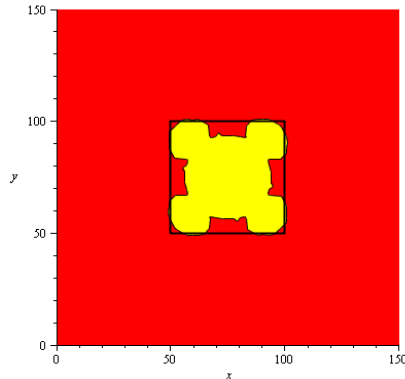
Contour plots for threshold = 350e⁻

Contour plots for threshold = 400e⁻

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