Resistivity of p-side

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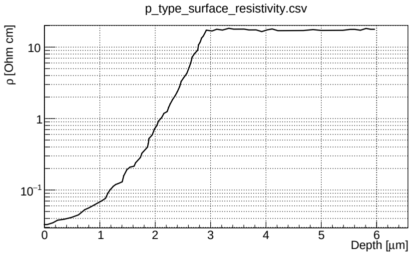
- Inhomogeneus pulseheight across the sensor
- Suspected homogeneous charge collection
- Different resitance between charge deposit and collecting electrode?

Resistance Estimation

Digitized measurement



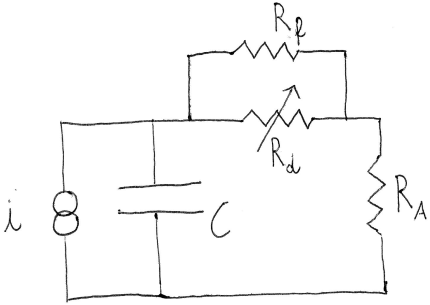
$$R = \rho \frac{d}{A} \qquad G = 1/R \qquad dG = \frac{D\,dz}{\rho(z)\,d} \qquad R = \left(\int_0^{zmax} dG\right)^{-1}$$

$$D = 0.8\,\text{cm} \quad zmax = 40\,\mu\text{m} \quad d \to \text{free}$$

Assume constant resistivity for $z > 6\,\mu$m $\Rightarrow$ $389\,\Omega/\text{cm}$

(n.b. "linear resistivity" $R = k \cdot d$)

Electrical Model



Assuming a delta current pulse of charge Q

$$V_C(t=0) = V_R = \frac{Q}{C}$$

Voltage at the amplifier terminals

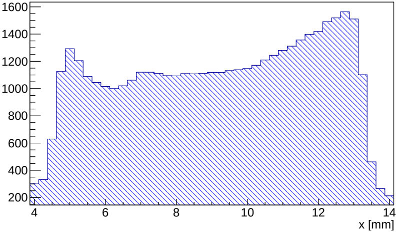
$$V_A = V_R \left(1 + \frac{R_f}{R_A(1 + R_f/R_d)}\right)^{-1}$$

$$R_d = k \cdot d$$

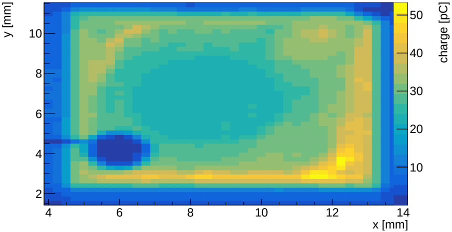
- $C \rightarrow$ det capacitance
- $R_d \rightarrow$ p-side resistance (distance dependent)
- $R_f \rightarrow$ fixed resistance (contribution from trenches??)
- $R_A \rightarrow$ amplifier input

Measurements

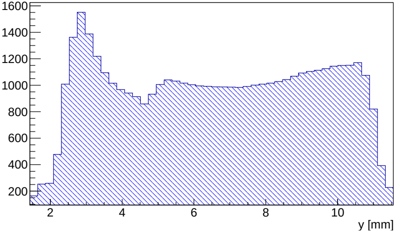
Projection X of charge map



Charge map



Projection Y of charge map

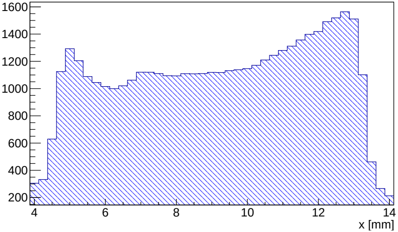


Determine:

- X cuts: $4.6 < x < 13.4\,\mathrm{mm}$
- Y cuts: $2.4 < y < 10.9\,\mathrm{mm}$
- Contact center: $(6.25, 4.6)\,\mathrm{mm}$

Measurements

Projection X of charge map



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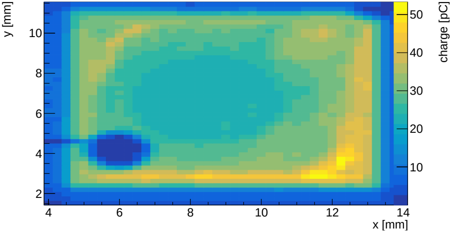

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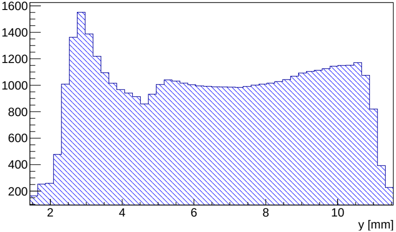
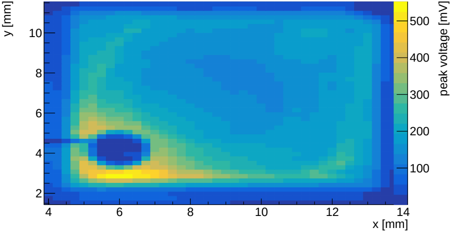
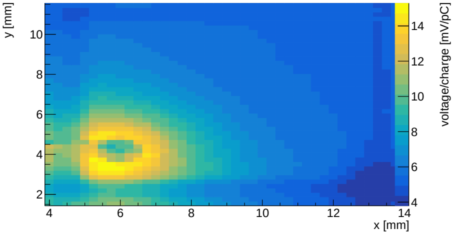


Peak map

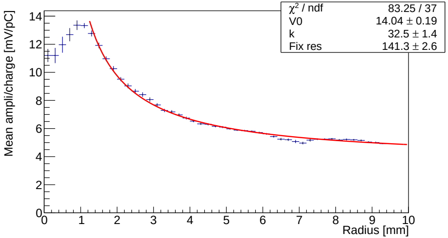


Normalized Peak vs. distance

Peak / charge map



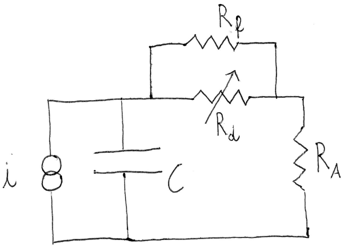
Average peak/charge vs distance from contact



- Description using model shown before
- χ^2/ndf not close to unity, not all features described (e.g. dip at 7 mm)
- Radius of contact (silver paint) set to 1.2 mm
- R_A set to 50 Ω
- $R_f = 141\,\Omega$
- $k = 330\,\Omega/\text{cm}$, smaller than expected (389 Ω/cm is a lower limit)

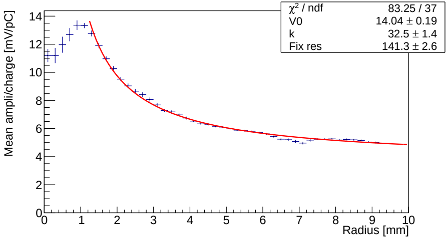
Do we need a better / more physical model?

Normalized Peak vs. distance



$$R_d = k \cdot d$$

Average peak/charge vs distance from contact



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