Ion distribution in an ideal step-and-repeat nanowire

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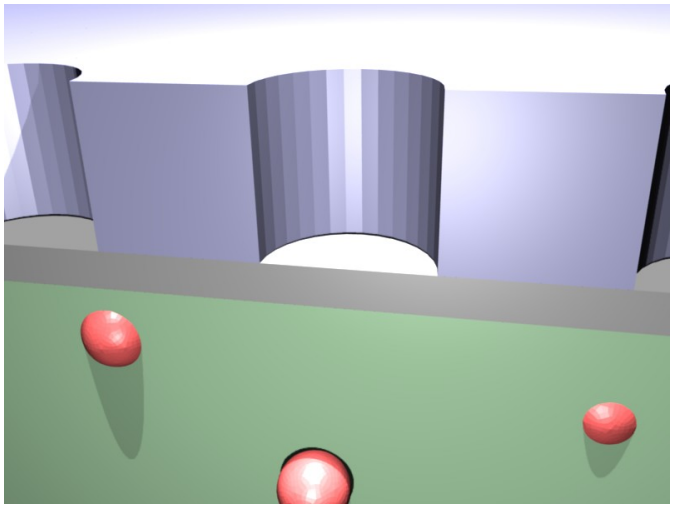
Implanting 14keV P into 10nm PMMA holes spaced at 20nm intervals and looking at the resulting dopant distribution.



1 Methodology

1.1 SRIM

Ran SRIM to record ion implantation positions. 14keV P, 5nm quartz (oxide) into Si, full damage cascades, save 3D data.

1.2 Adjustment

Read in positions from disk. To generate chains, take positions and "simulate" sending one through each 10nm circular PMMA hole (in other words, vector-add the ion position to a random location in the hole). Chain length 3000.

Sort by x-coordinate (holes are aligned in x direction) in case of crossing ("overtaking").

Plot absolute distance to nearest neighbours, second nearest neighbours.

Plot variation in along-axis (x) distance to nearest neighbours, second nearest neighbours.

Plot height variation. (z)

Plot lateral variation. (y)

2 Results

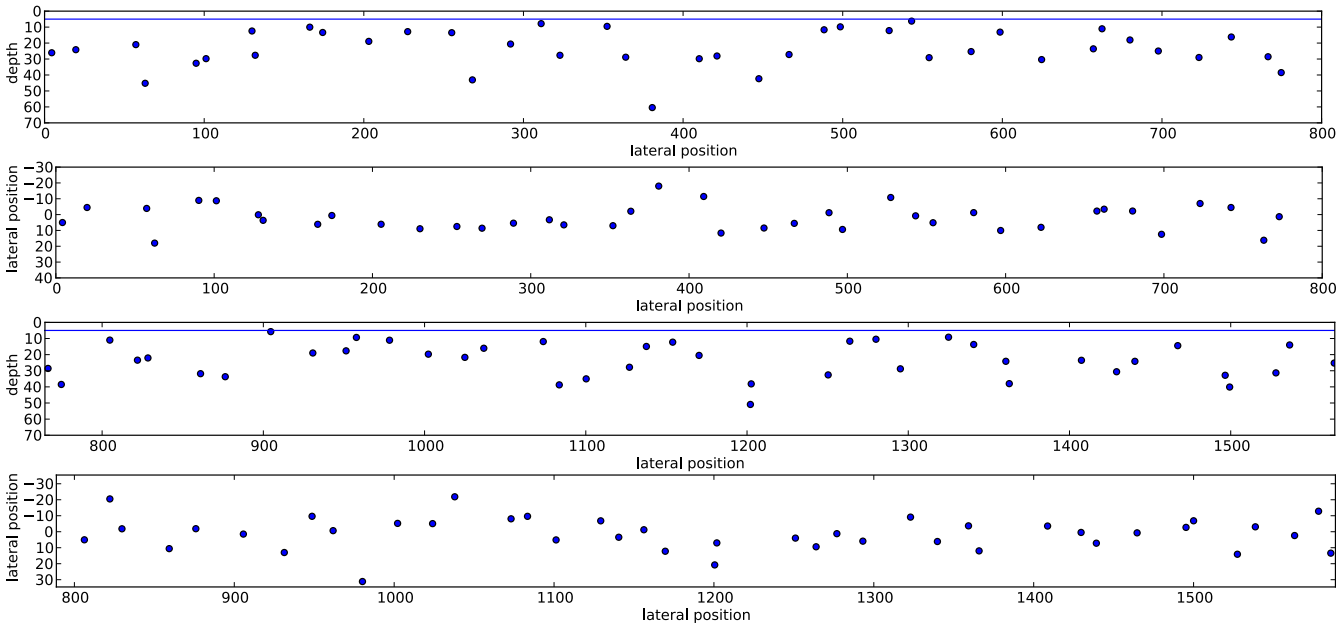


Figure 1: Plots of ion positions. The blue line 5nm below the surface is the oxide boundary. (a) side view of first half (b) top view of first half (c) side view of second half (d) top view of second half.

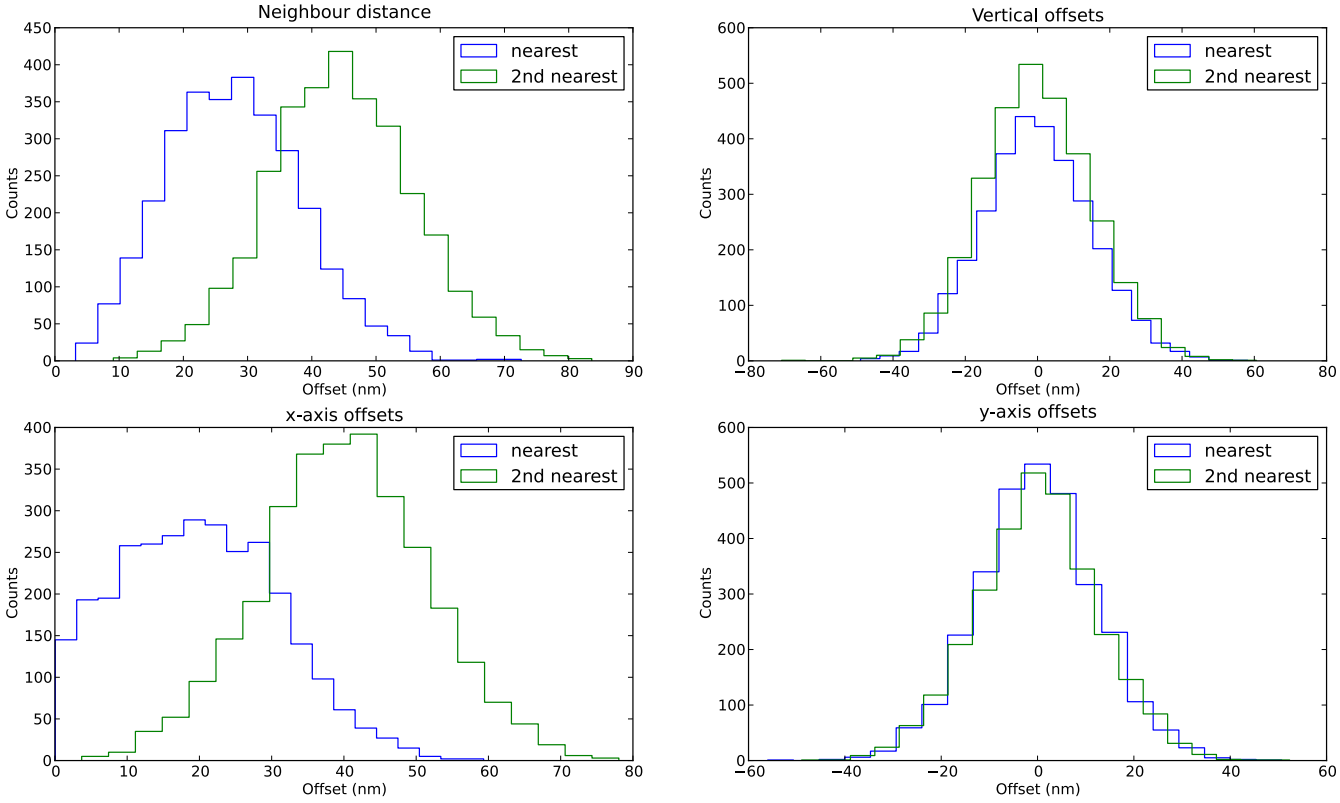


Figure 2: Statistics of ion distributions. (a) Absolute distance between ions. (b) Vertical offset. (c) Along-the-wire spacing (d) lateral (sideways) offset. z ("vertical") is depth; x is distance along the wire, y is horizontal perpendicular to the wire axis. There should be no correlations for y (lateral) and z (vertical) axes, so the nearest-neighbour and second-nearest-neighbour plots should be statistically identical.