Micro Writer ML3 Focus Dose Tests

S1805, S1813
small structures
focus-dose calibration

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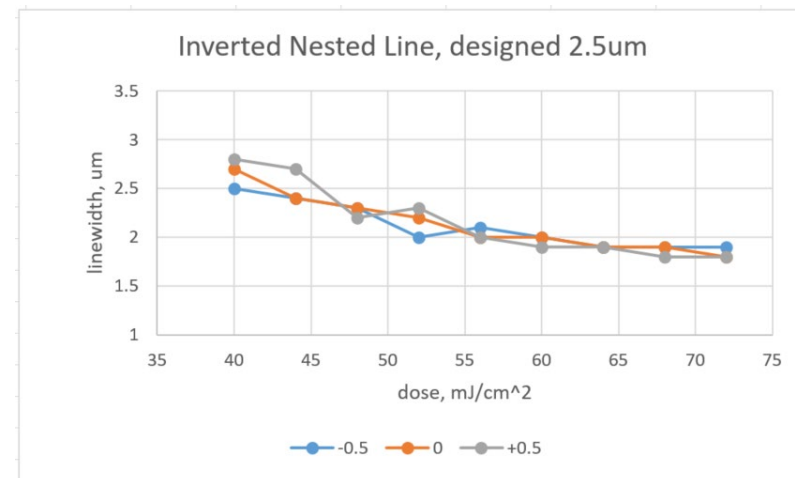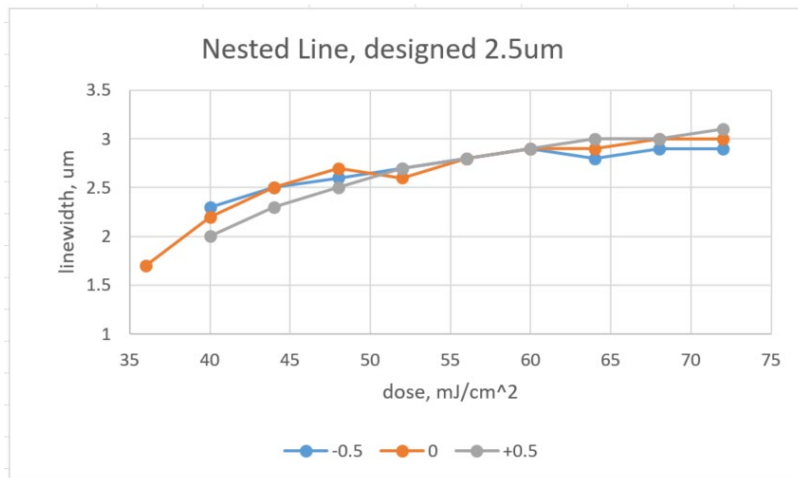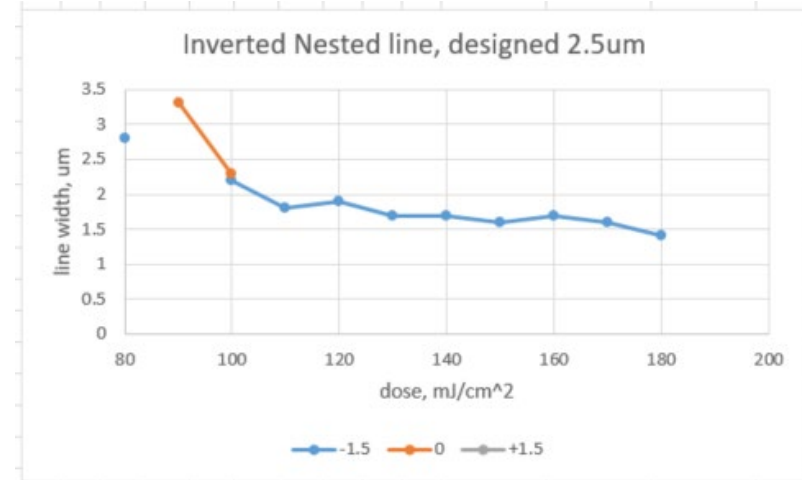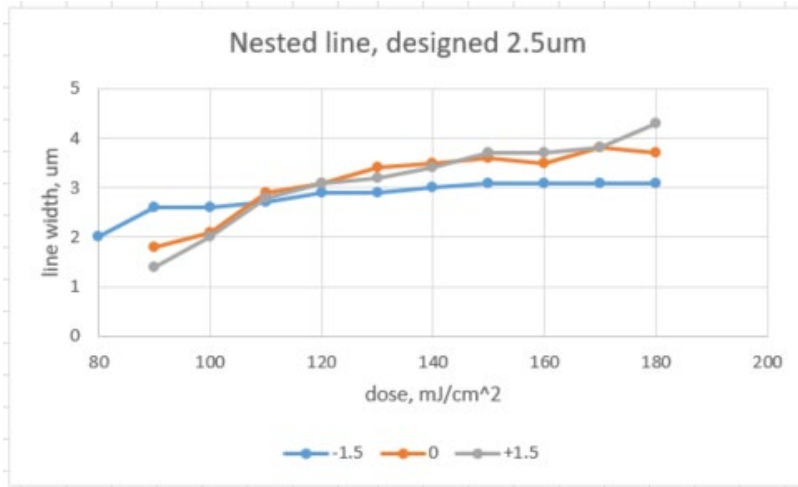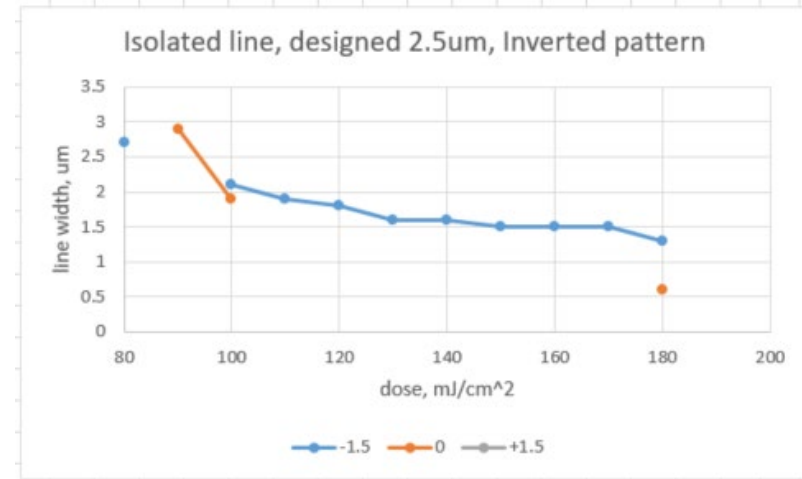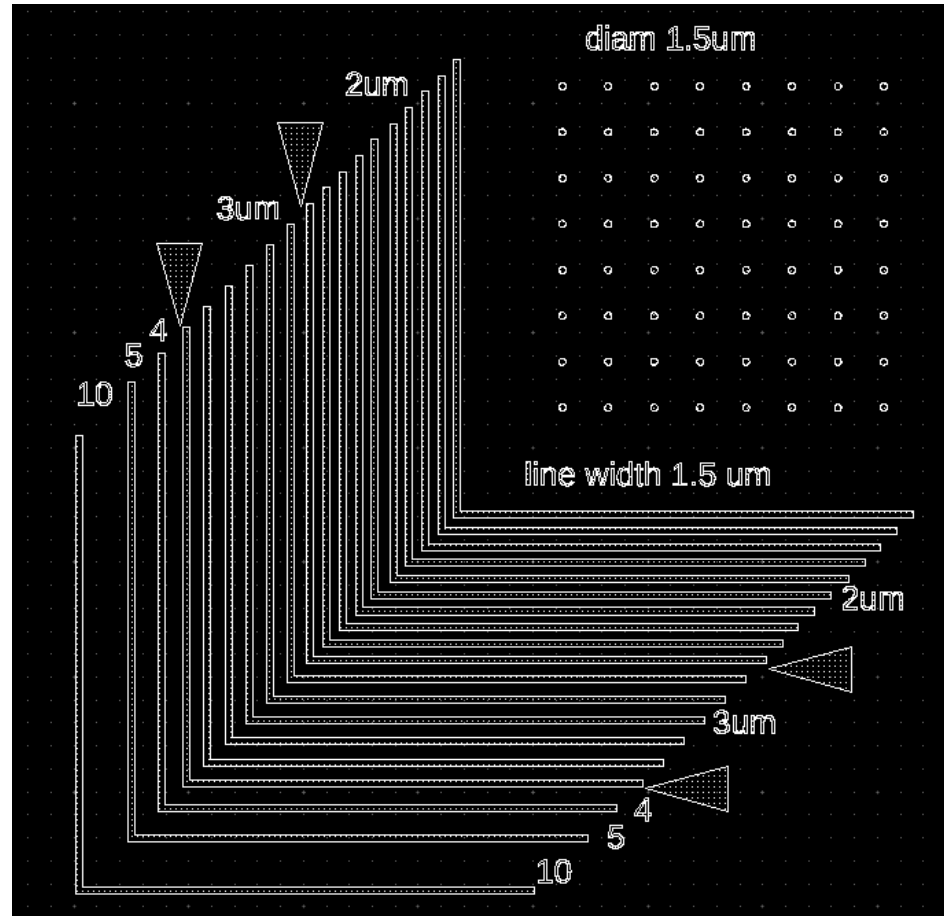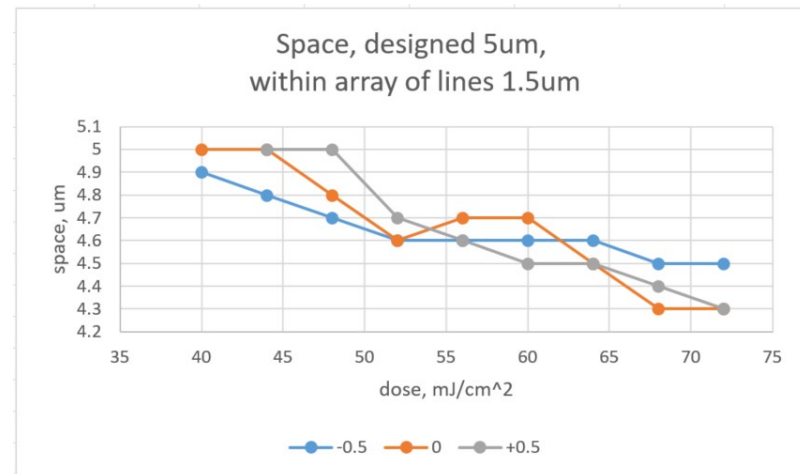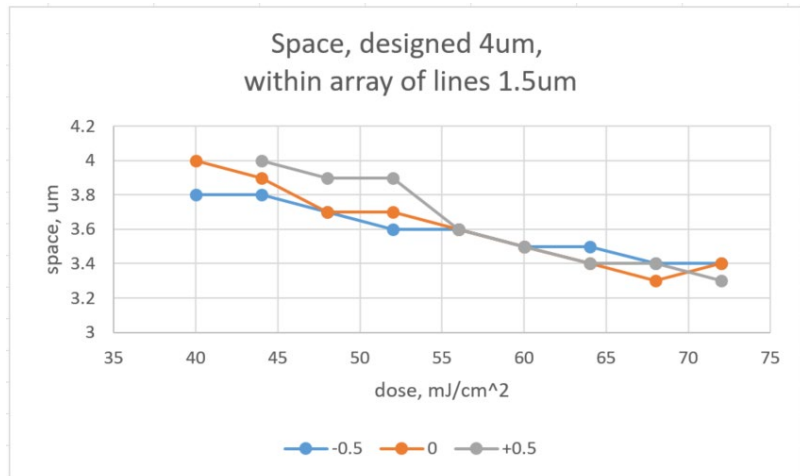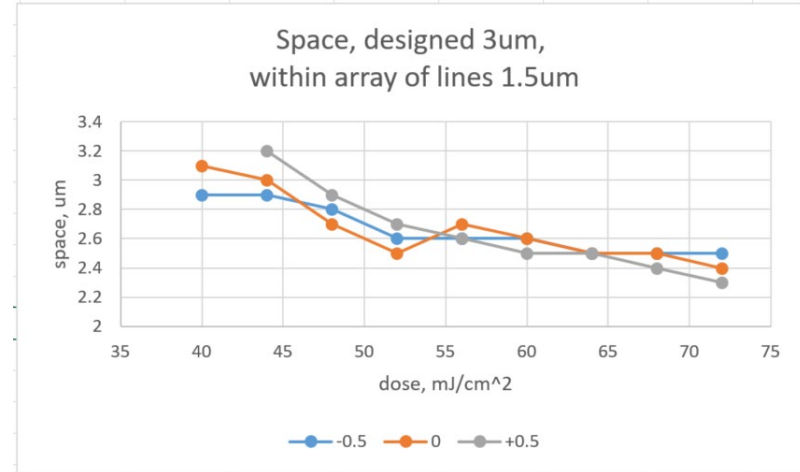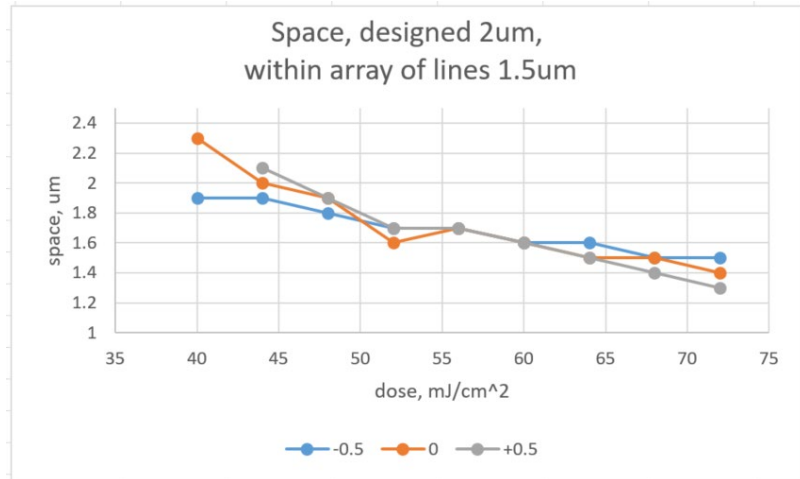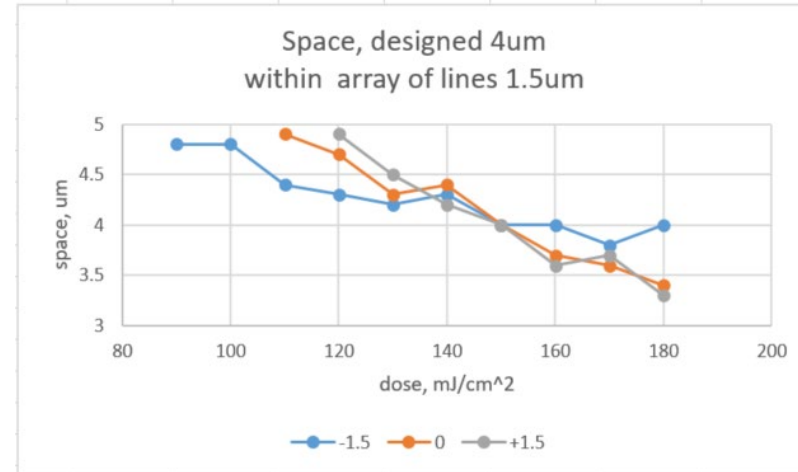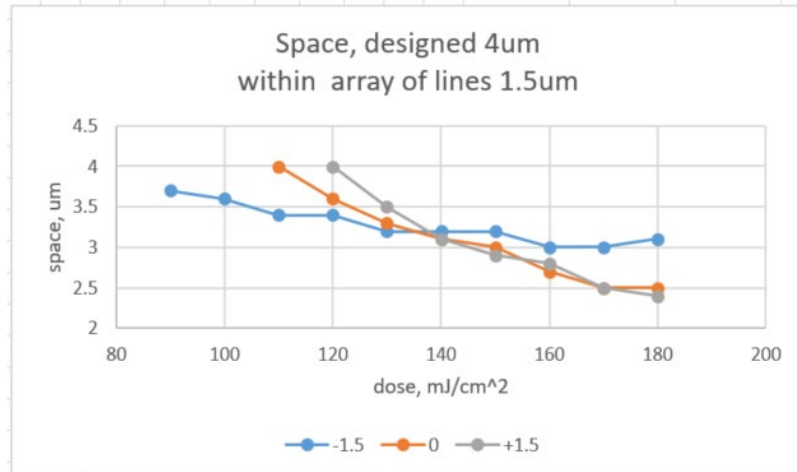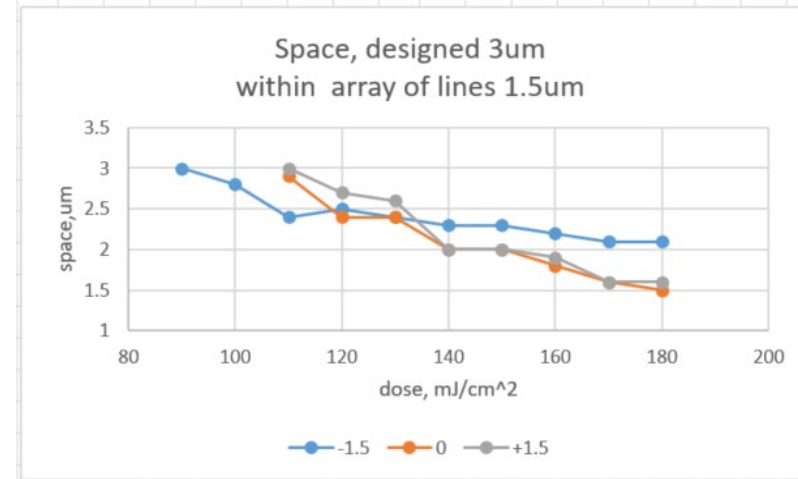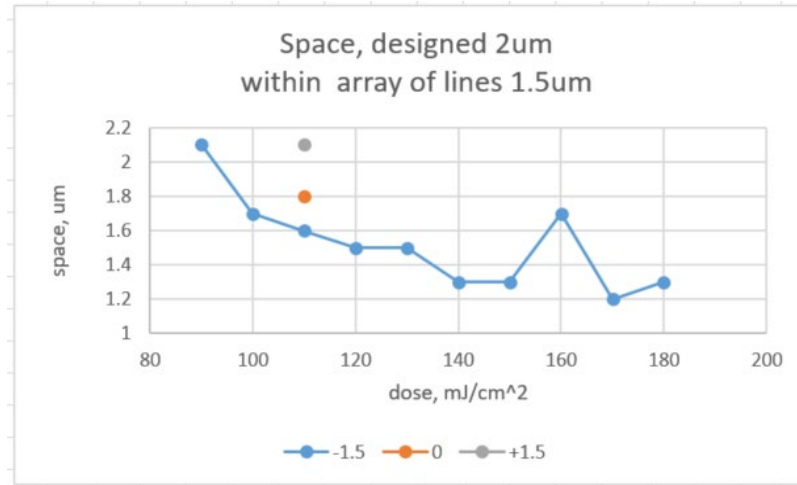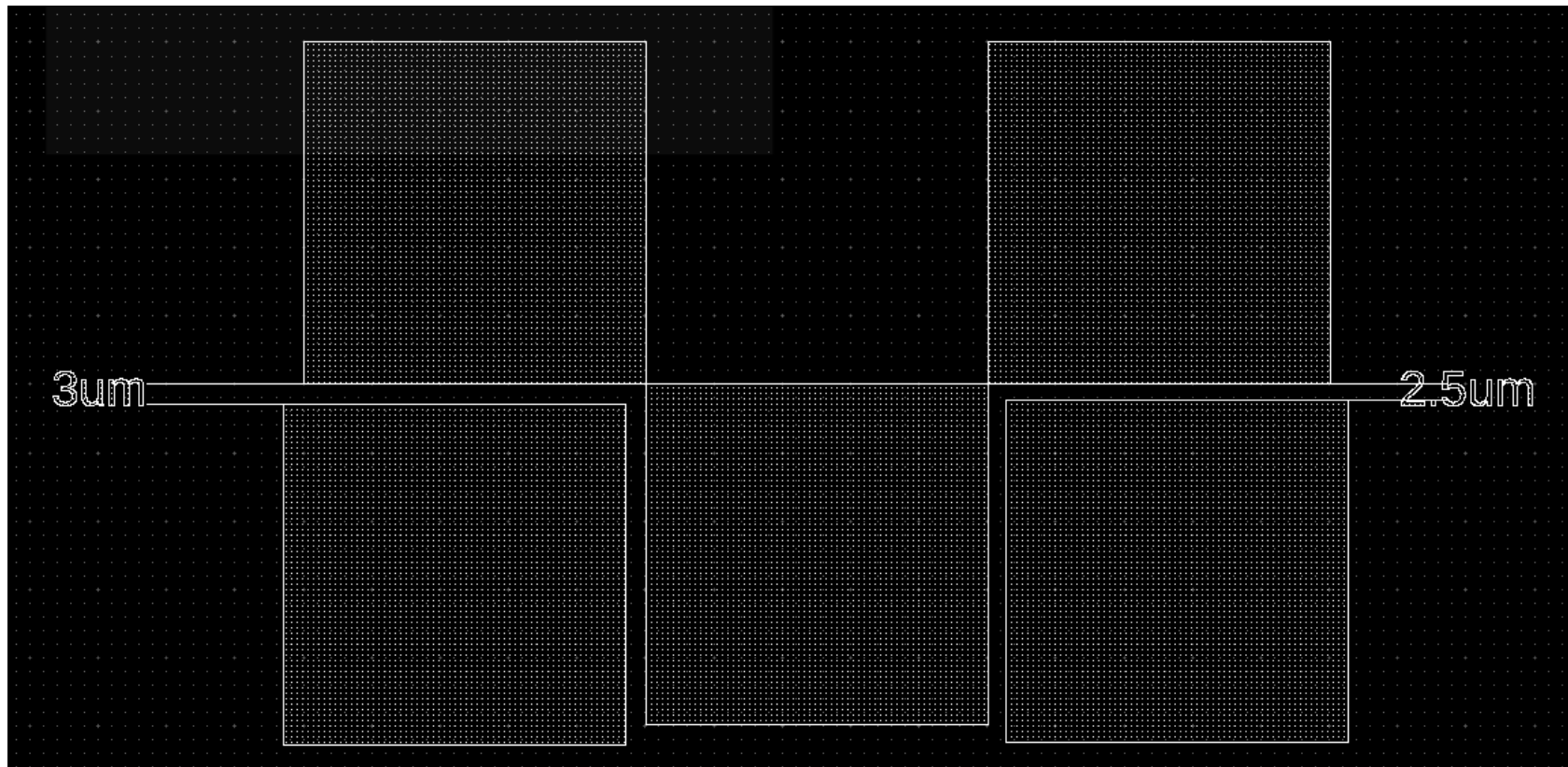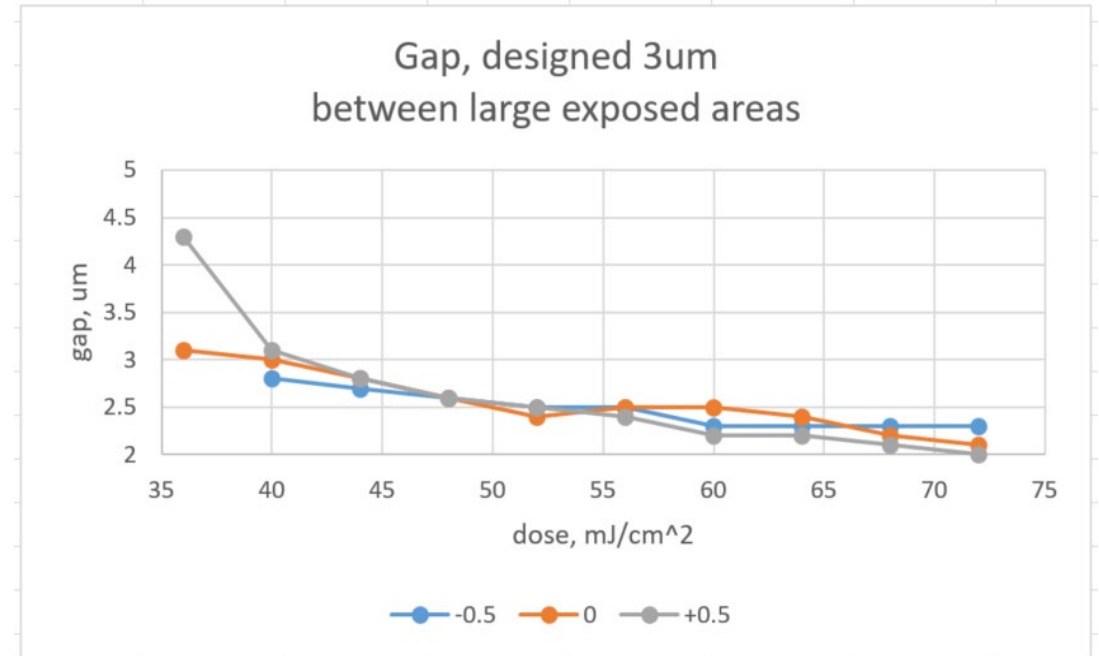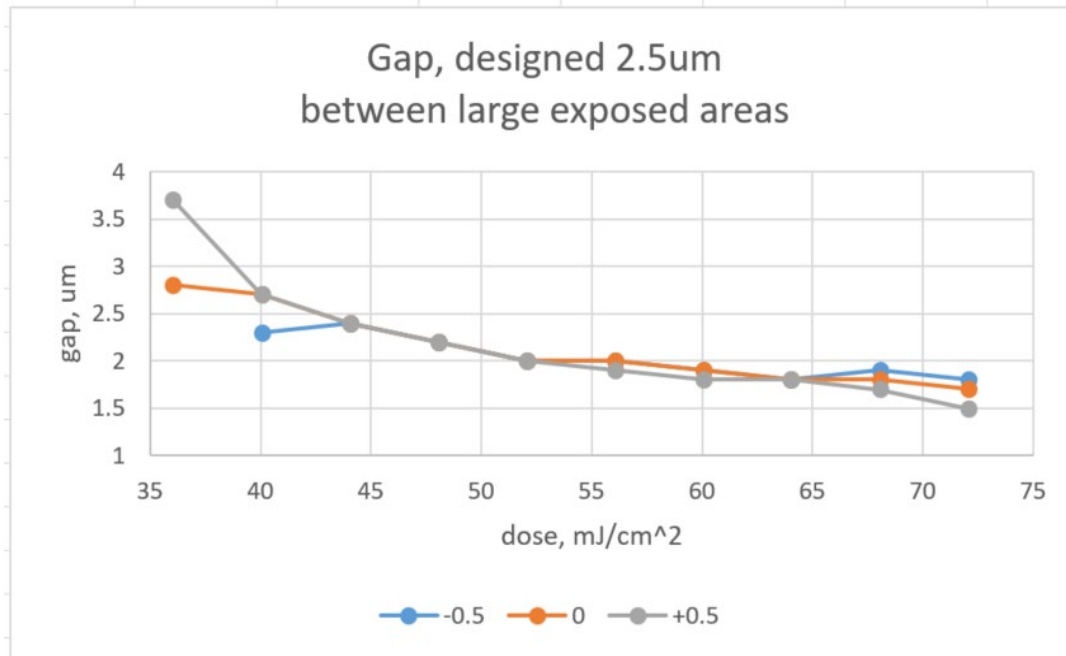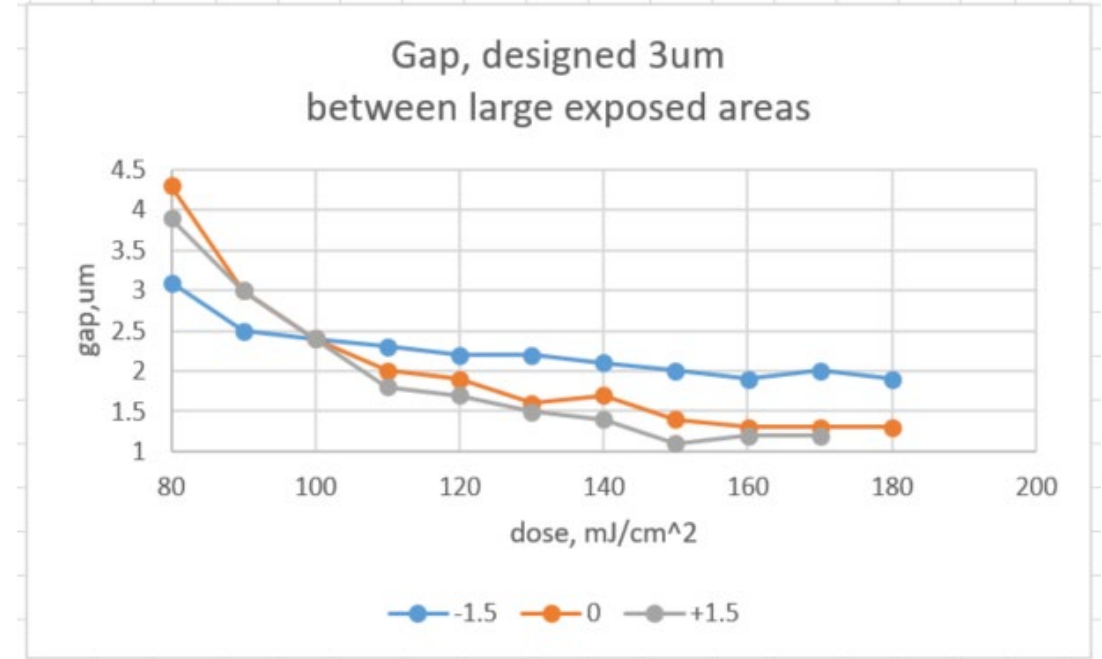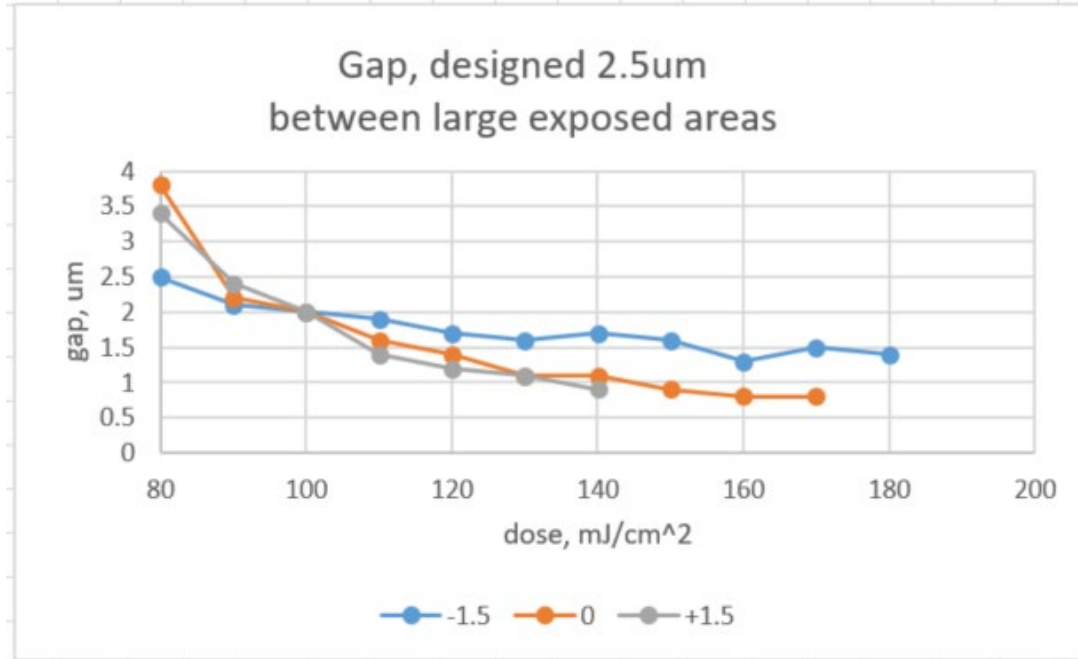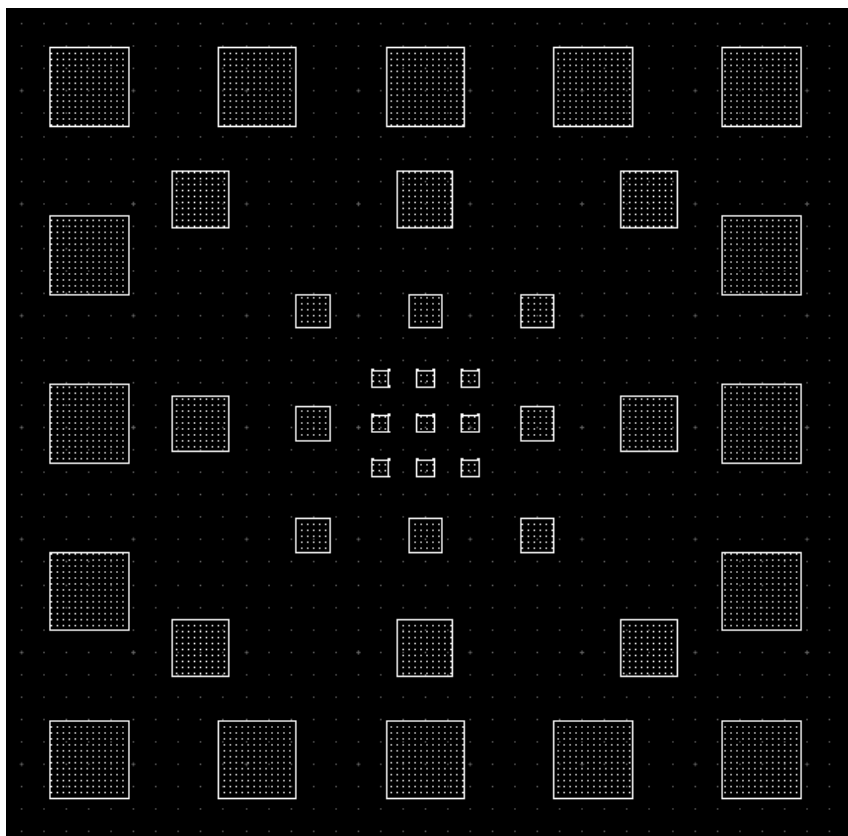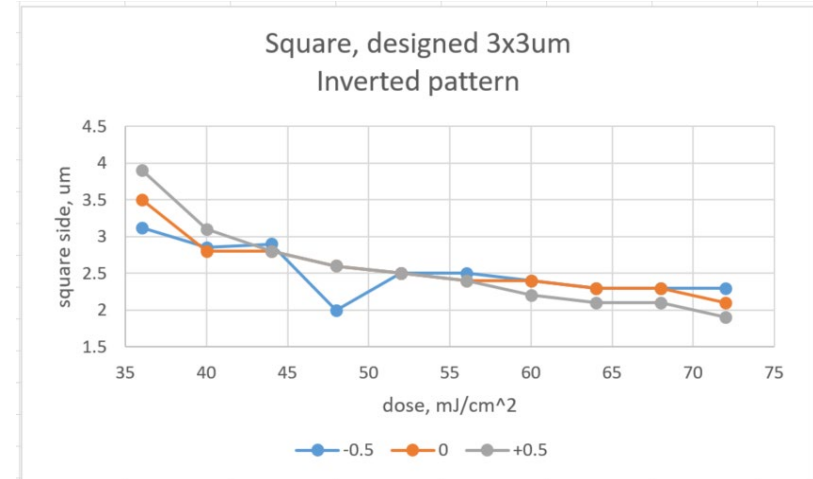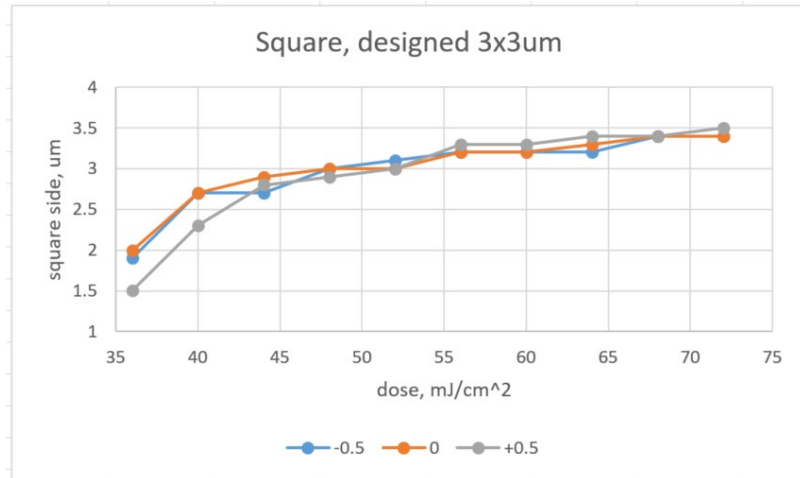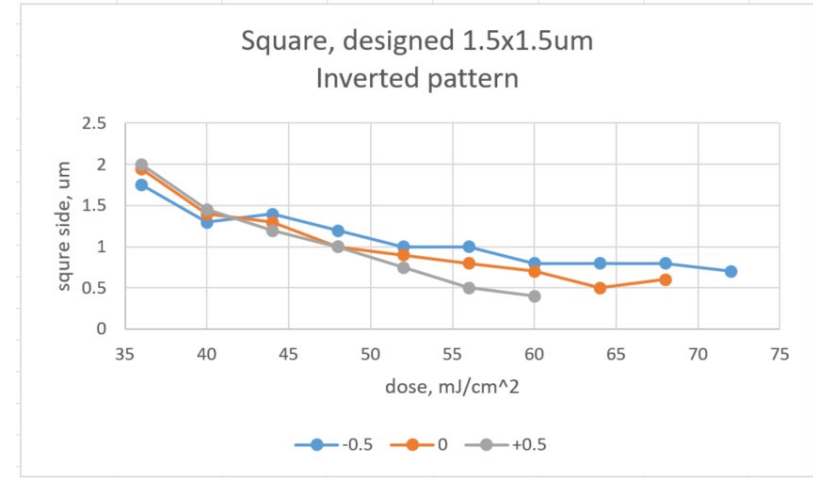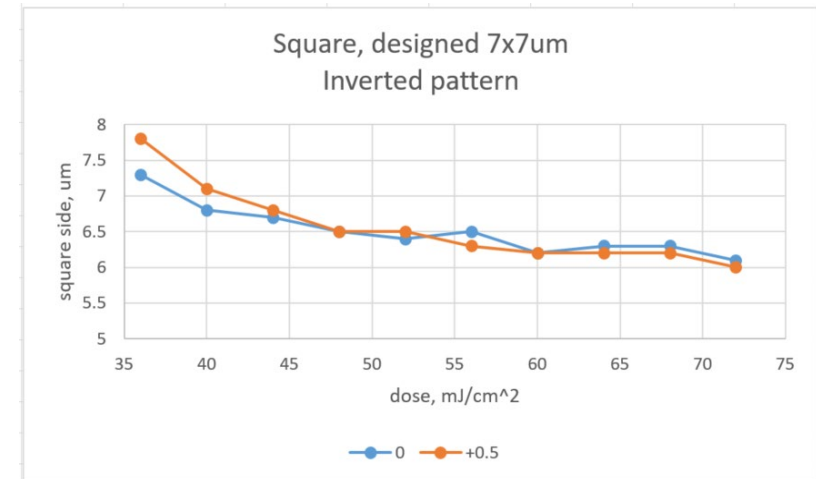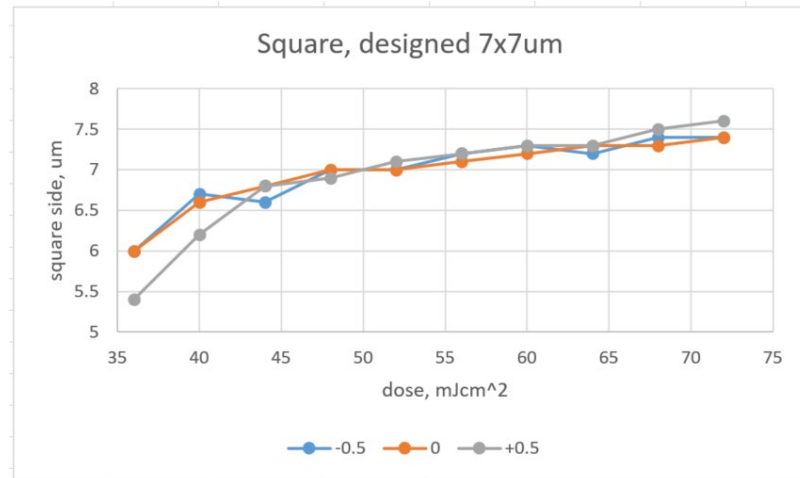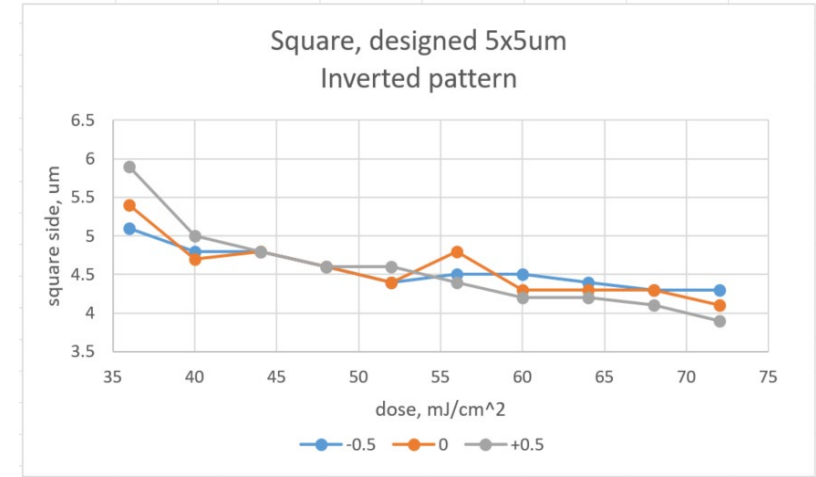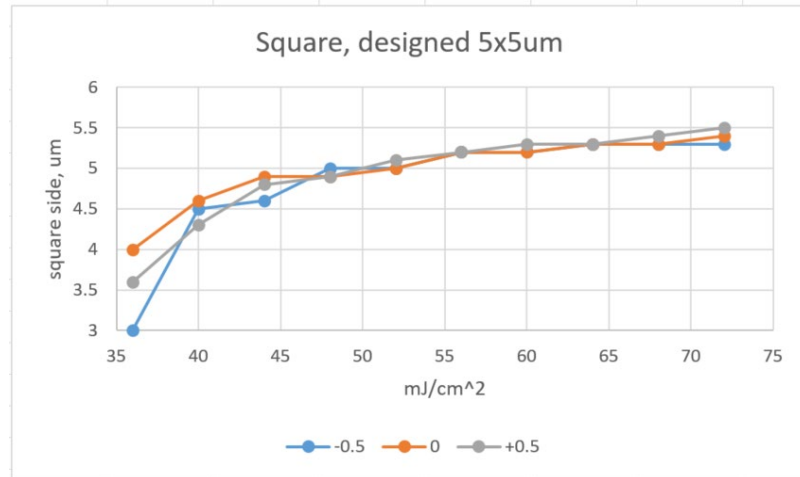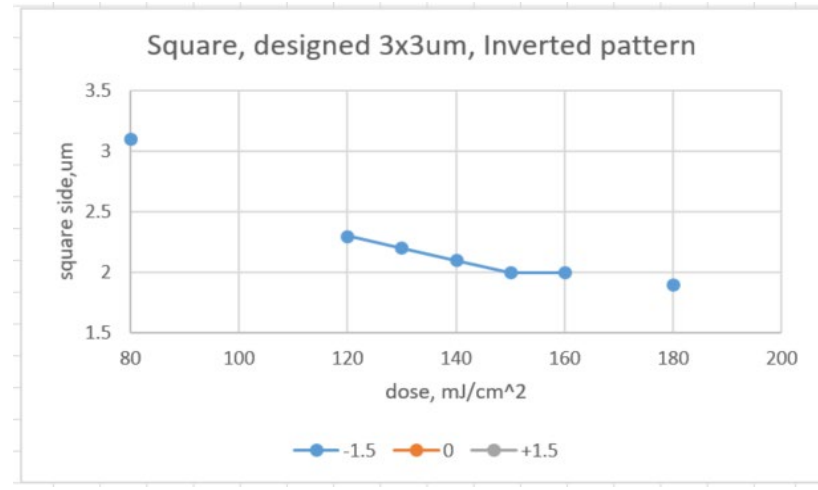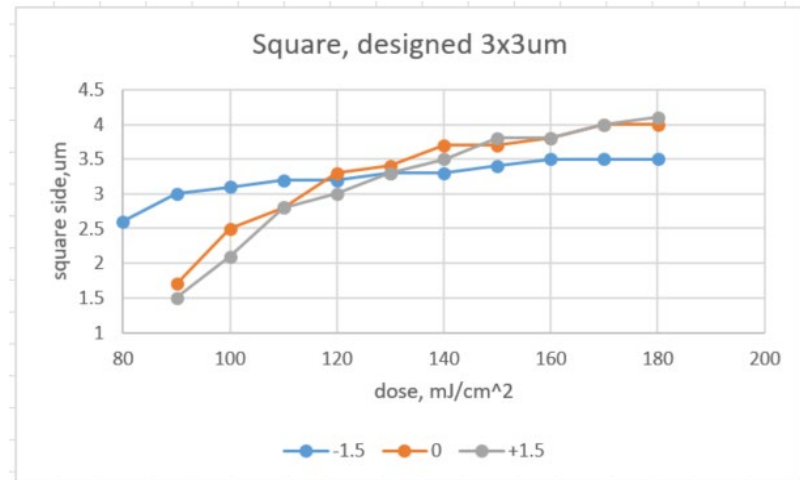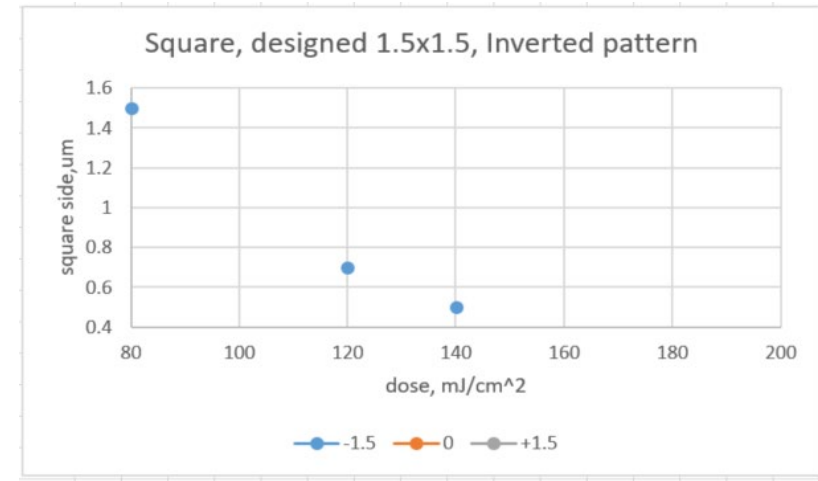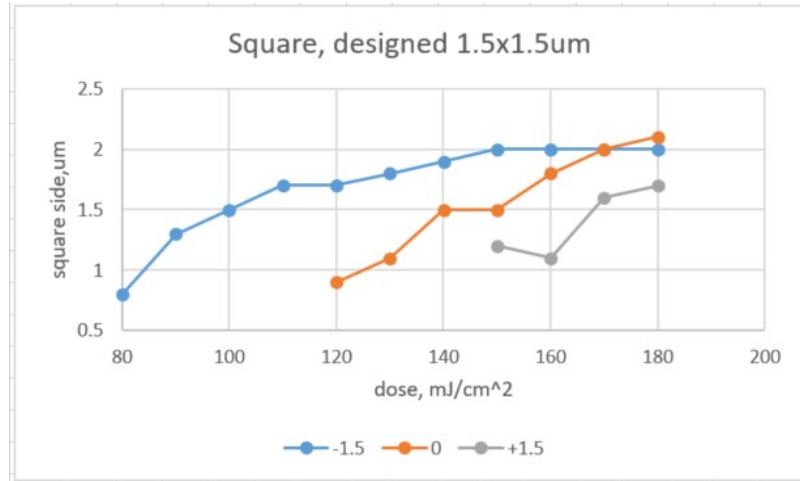
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Dear User,

The following file should help you to find the appropriate parameters to expose your design with MicroWriter.

The entire file contains several charts that describe the effect of major expose parameters: dose (on the x-scale) and focus correction on critical dimensions (CDs) of exposed features on the y-scale. The presented data were collected from the features exposed with the variation of the following parameters:
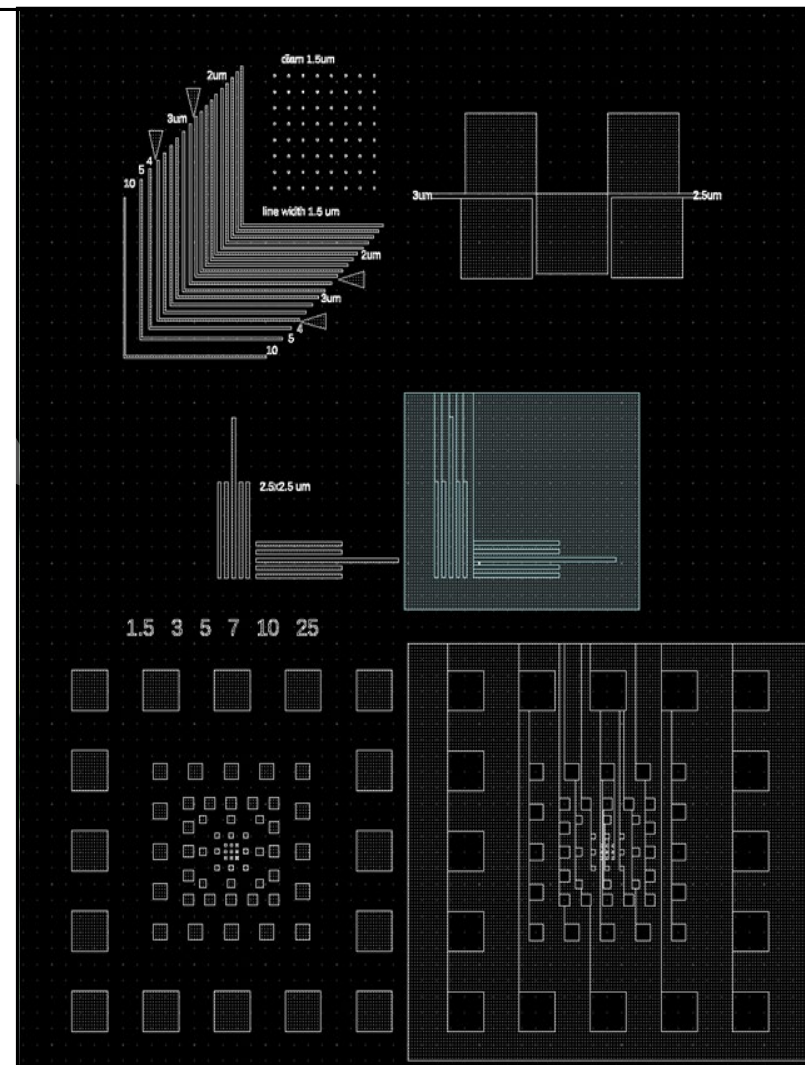
The applied dose varied between 35 to 75 mJ/cm^2

Focus points chosen at autofocus and +/- 0.5 um

The list of features includes isolated and nested lines and squares, spaces, and circles. Both direct and inverted image structures were exposed and measured. Titles of the charts correspond to the type and dimension of the designed structure.

S1805 photoresist 0.5um thick on Si was exposed using an x20 lens. 5nm of Cr was deposited for SEM measurements.

S1813 photoresist 1.5um thick on Si was exposed using an x20 lens. 5nm of Cr was deposited for SEM measurements.

Lines

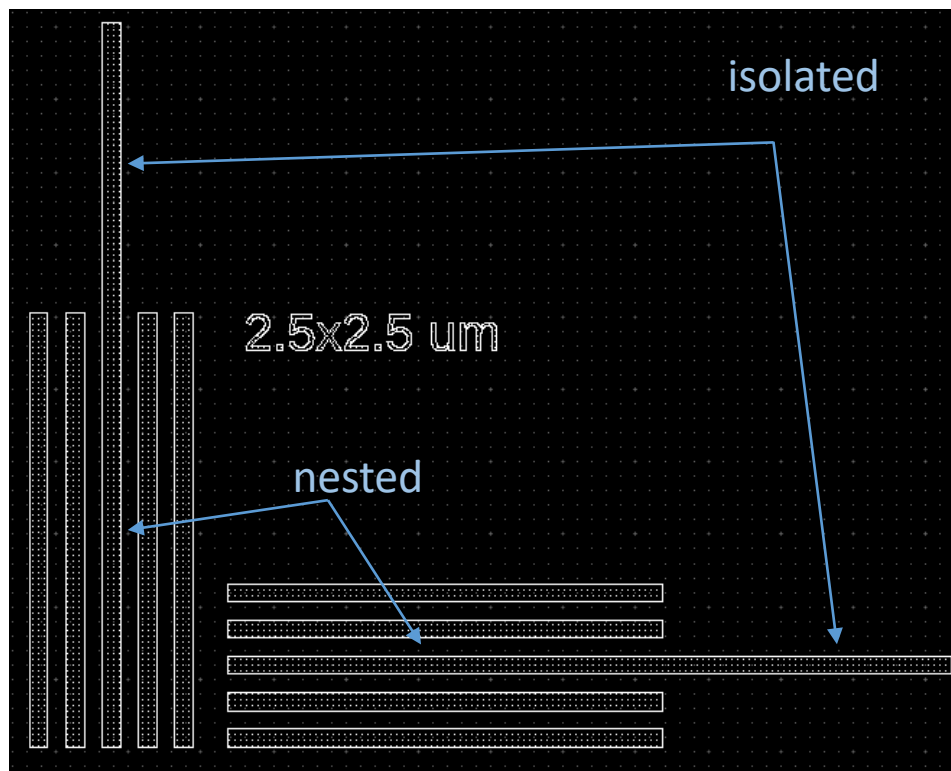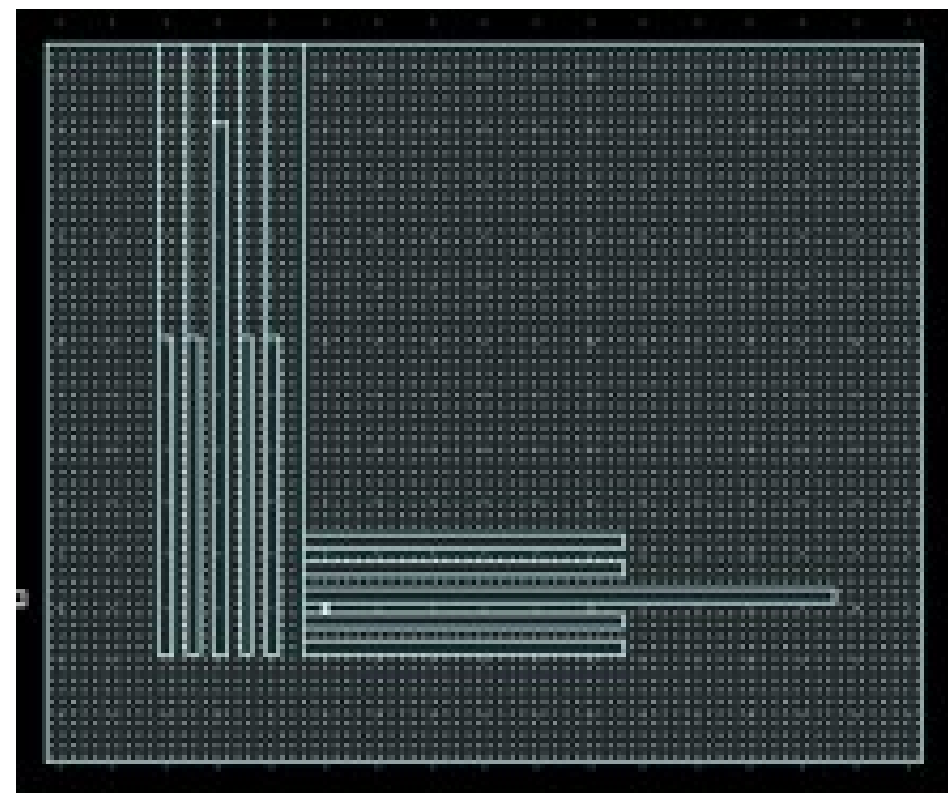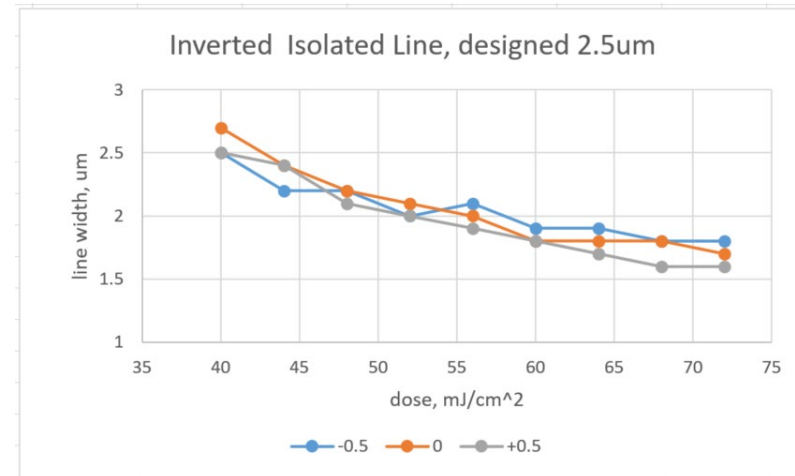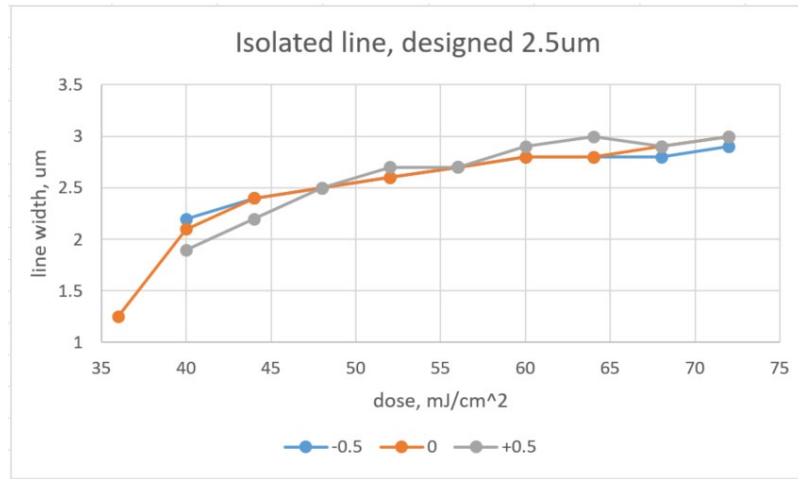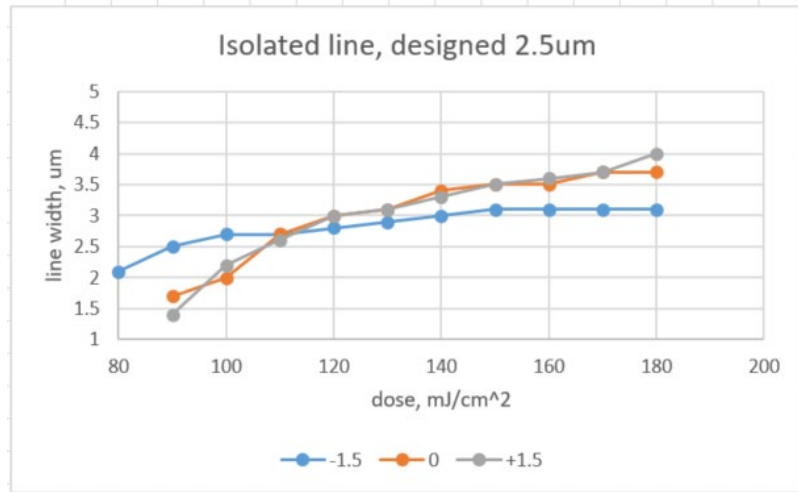2.5um lines, separated by 2.5um spaces

Positive

Negative

S1805 Lines

Isolated line, designed 2.5um

Inverted Isolated Line, designed 2.5um

Nested Line, designed 2.5um

Inverted Nested Line, designed 2.5um

S1813 Lines

Isolated line, designed 2.5um

Nested line, designed 2.5um

Isolated line, designed 2.5um, Inverted pattern

Inverted Nested line, designed 2.5um

Spaces

2,3,4,5 um between the lines of 1.5um width

S1805 Spaces

Space, designed 2um, within array of lines 1.5um

Space, designed 3um, within array of lines 1.5um

Space, designed 4um, within array of lines 1.5um

Space, designed 5um, within array of lines 1.5um

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S1813 Spaces

Gaps

2.5 um and 3um between large exposed areas

S1805 Gaps

Gap, designed 2.5um between large exposed areas

Gap, designed 3um between large exposed areas

S1813 Gaps

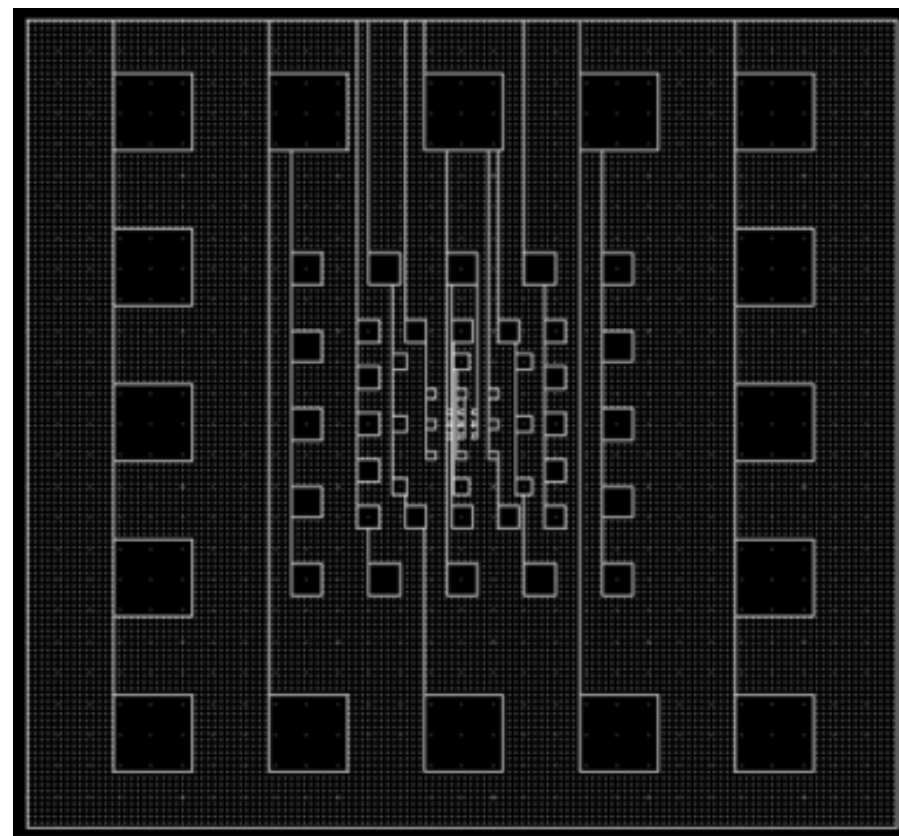Gap, designed 2.5um between large exposed areas

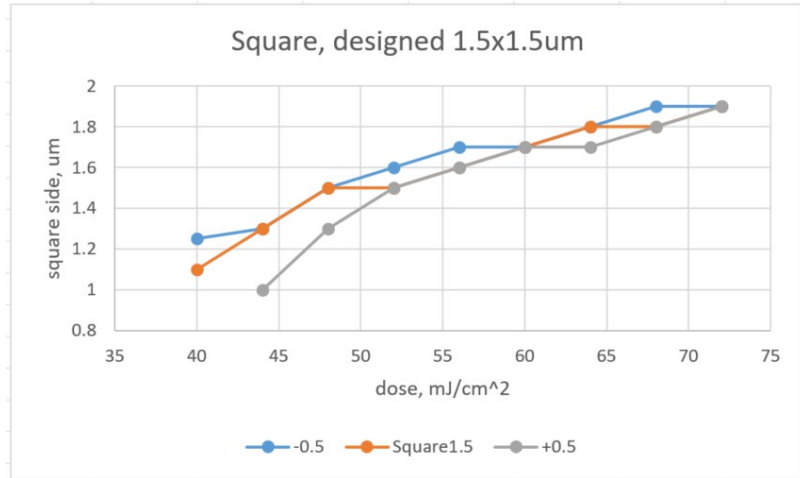Gap, designed 3um between large exposed areas

Squares

1.5, 3, 5, 7 um

Positive

Negative

S1805 Squares

Square, designed 1.5x1.5um

Square, designed 1.5x1.5um
Inverted pattern

Square, designed 3x3um

Square, designed 3x3um
Inverted pattern

S1805 Squares cont...

Square, designed 5x5um

Square, designed 5x5um
Inverted pattern

Square, designed 7x7um

Square, designed 7x7um
Inverted pattern

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S1813 Squares

S1813 Squares cont...

Square, designed 5x5um

Square, designed 5x5um, Inverted pattern

Square, designed 7x7um

Square, designed 7x7um, Inverted pattern

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Circles

diameter 1.5 um

diam 1.5um

S1805 Circles

Circle, designed 1.5um

S1813 Circles

Circle, designed diameter 1.5um

Positive vs. Inverted structure

The "golden point" exposure dose could be found to obtain matching final critical dimensions for positive and inverted structures both. Unfortunately, this final critical dimensions value usually will be lower than the designed value. Therefore, to get the desired final critical dimensions, the corresponding value in the design file should be corrected (increased) accordingly.
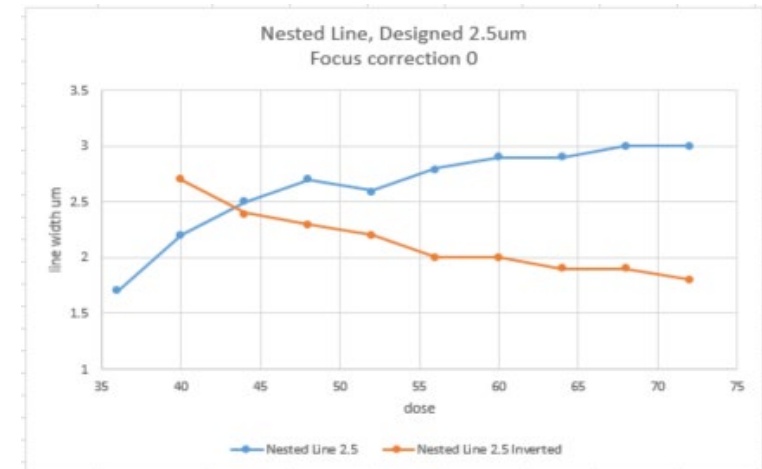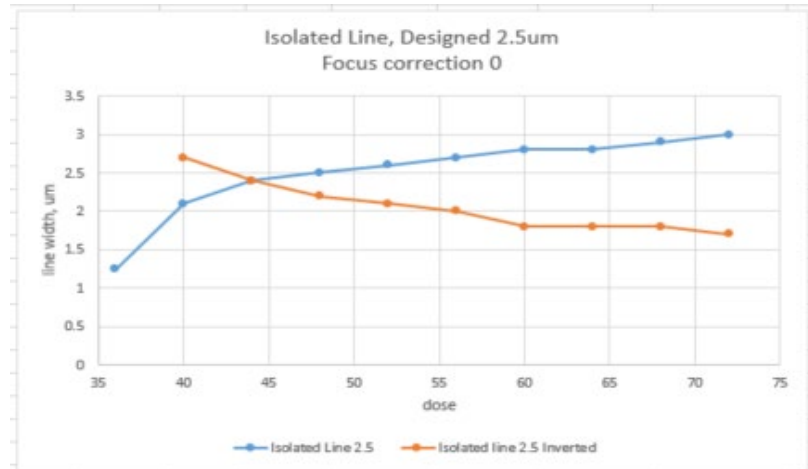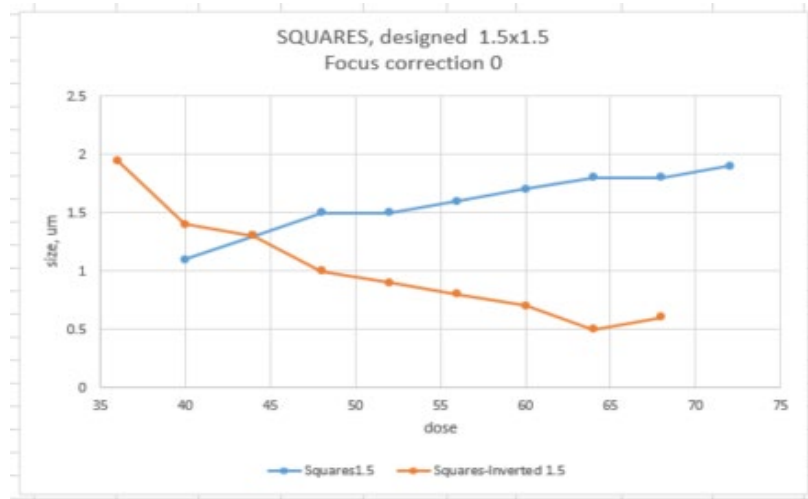
S1805 Positive vs. Inverted "golden point"

S1813 Positive vs. Inverted "golden point"

Isolated line, Designed 2.5um, focus correction -1.5um

Nested line, Designed 2.5um, focus correction -1.5um

Squares, designed 5um, Focus correction -1.5um

Squares, designed 7um, Focus correction -1.5um

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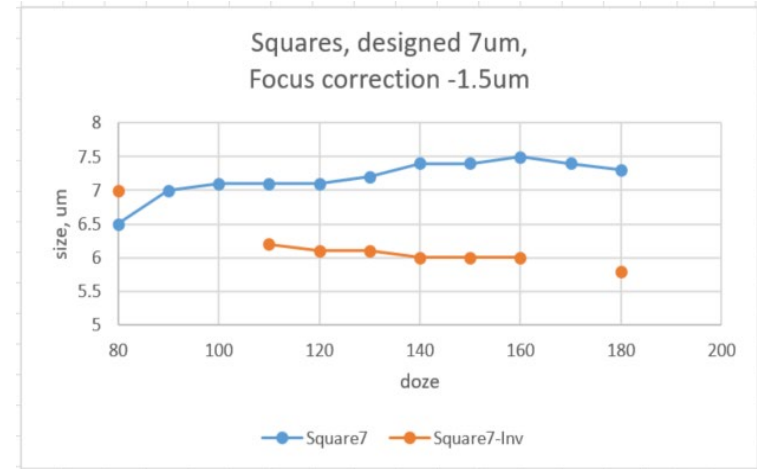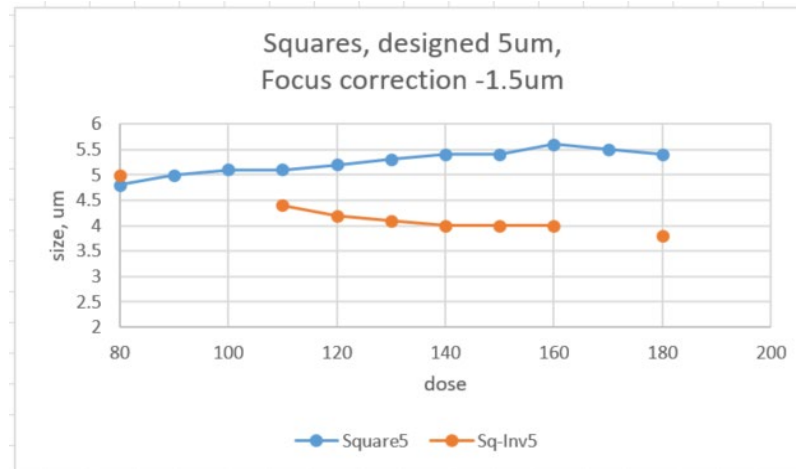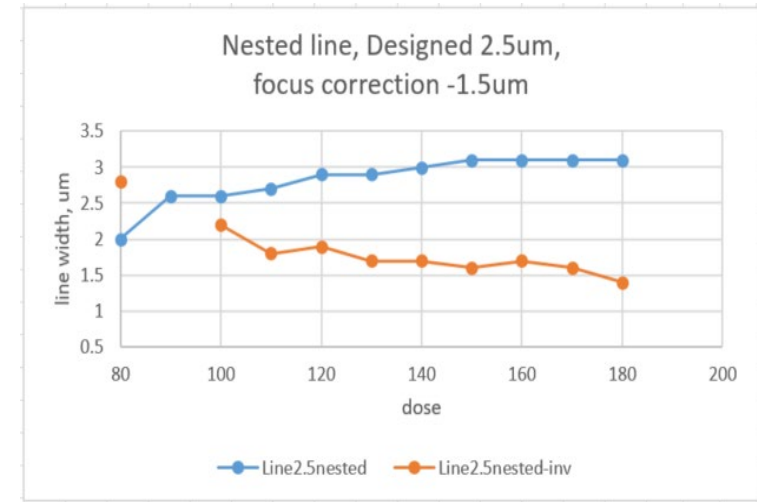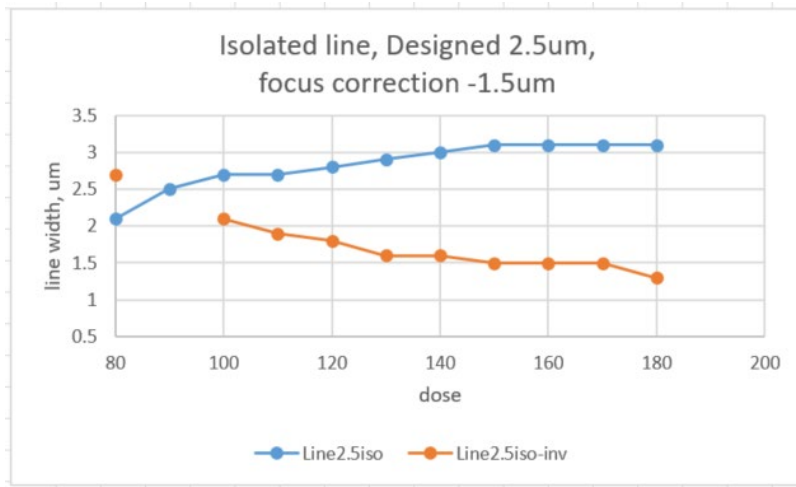
* There were difficulties obtaining stable repetitive results on inverted structures (underexposed). Some of the points in the charts are missing.

Micro Writer Focus Dose Tests

Thank you