Stitching Optimization with CI-over

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The DWL Series uses a raster scan exposure mode enabling the system to expose adjacent stripes with a width of 600 pixels with very high throughput. The connection between adjacent stripes is called stitching. The stitching is not visible on thin photoresist.

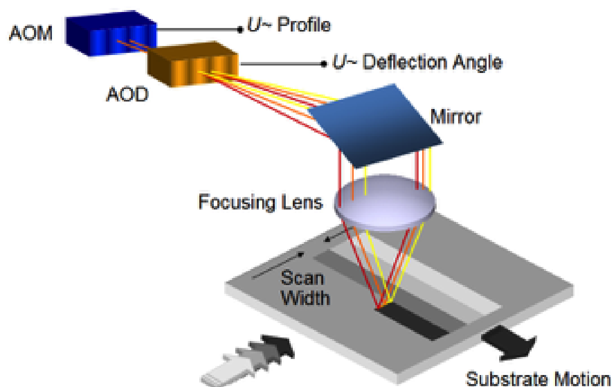

Fig. 1: Raster scan exposure strategy

Only when applying the raster scan mode to thick positive photoresists for the exposure of 3D structures stitching is clearly visible and hard to optimize.

To improve this defect the exposure mode was specially modified for this type of application (n over x). The n-over method avoids an explicit stitching by overlapping multiple stripes:

The n-over X method allows each stripe to overlay the last X-1/ Xth of the previous one. Each pixel is exposed X times and the exposure time is multiplied by the factor X. For example, with n-over 4 each stripe overlaps the last three quarters of the previous one. Each pixel is then exposed four times causing the exposure time to quadruple.

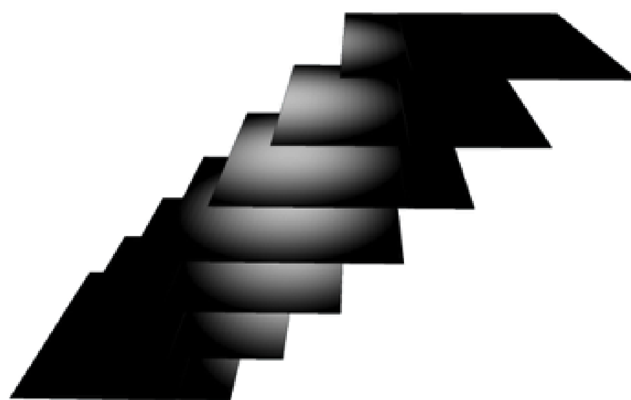

Fig. 2: N-over 4 exposure strategy

Although the quality of the structures improves with X, the exposure time increases drastically. This can pose a problem when time plays a major role.

To overcome this handicap Heidelberg Instruments invented and developed a new writing strategy called CI-over.

Similar to the previous n-over X, this Controlled Intensity Method also uses overlapping stripes but softens the stitching area.

Application Note

The result is a better exposure quality of thick resist applications with a much shorter exposure time.

The following series of pictures illustrates the difference in the exposure results of the raster scan mode when using the n-over and CI-over method:

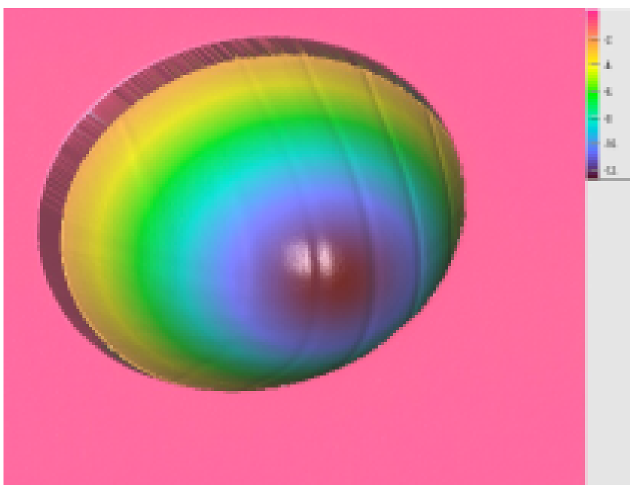

Fig. 3: Lens with n-over method, time = t

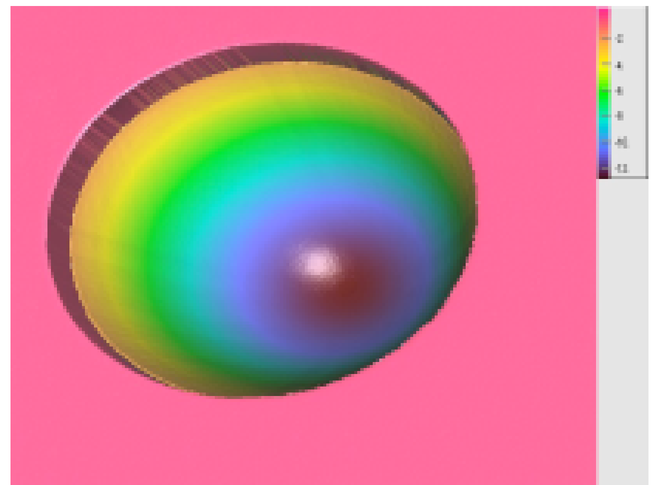

Fig. 5: Lens with CI-over method, time = t

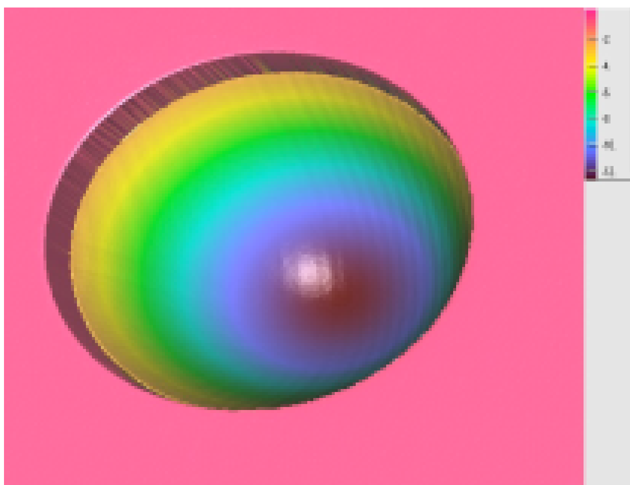

Fig. 4: Lens with higher n-over method, time = 4 x t