The Step and Flash Imprint Lithography (S-FIL™) process is a step and repeat nano-replication technique based on UV curable low viscosity liquids. S-FIL uses field-to-field drop dispensing of the UV curable liquids for the step and repeat patterning. This approach allows for patterning of structures with widely varying pattern densities and complicated structures.

Nano-manufacturing requires the features to be printed reproducibly, aligned precisely and printed with low defect density. In this paper, the latest data on the S-FIL process will be described.

In addition, a brief summary of the overall status of the S-FIL process will also be presented. The presentation will specifically include:

- Full wafer (200 mm) residual thickness control to enable practical etching (thickness variation < 10 nm, 3σ)
- Field edge control compatible with 50 um kerf regions
- Field-to-field imprint CD control and line edge roughness
- Overlay alignment results
- Process life and defect data

Molecular Imprints, Inc. (MII) has developed the Imprio™ 100, which is the first commercial step and repeat imprint lithography system with field-to-field alignment (Figure 1). Full wafer step and repeat printing performance is shown in Figure 2. The current status of overlay alignment accuracy is presented in Figure 3. Figure 4 shows the film thickness means and variation data for a full wafer. The data was obtained by at 64 locations per field (field size is 25 mm by 25 mm) over 25 fields on the wafer. Figure 5 shows the edge definition of an imprint field magnified by 1000X. Figure 6 shows process life data for printing pillars and contacts.

**Keywords:** Step and flash imprint technology, imprinting, nano-manufacturing, wafers, imprint process
Figure 2: Full 200 mm step and repeat wafer coverage with lithographically useful residual layer thickness (variation of <20 nm, 3σ) and field edge control compatible with < 500 μm kerf.

<table>
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<tr>
<th>X-mean (nm)</th>
<th>Y-mean (nm)</th>
<th>3σ, X (nm)</th>
<th>3σ, Y (nm)</th>
<th>θ (μrad)</th>
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<tr>
<td>-12</td>
<td>20</td>
<td>252</td>
<td>225</td>
<td>6.32</td>
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Figure 3: Full wafer overlay alignment accuracy based on three alignment error measurements per field on the wafer.

**MEAN OF FULL WAFER = 58.35**
**STDV OF FULL WAFER = 2.97**

Figure 4: Residual film thickness means and variation data for a full wafer

Figure 5: Clearly defined field edge of imprint at 1000 X magnification

Figure 6: (above and below) 60 nm posts and 65 nm vias after 400 imprints (template courtesy of Motorola Labs)