## Navigating with Nanoscale Accuracy: Process Control and Metrology Solutions

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Process control in nanofabrication is crucial to assure that Research and Development products and prototypes can be optimized and transferred to production environments.

In this poster, we present a customer story using a Raith SEM-based metrology solution. The Customer generated a design of experiments to test the performance of optoelectronic components, varying different factors such as critical point dimensions, scaling factors, and pattern fracturing strategy. We selected and measured approximately 6,000 inspection points across the 6" wafer. All SEM alignments were performed automatically, avoiding variability due to the operator. SEM images were acquired automatically for all sites in a few hours and parametric data was generated for critical dimension metrology and line edge roughness. These data were compared to various factors in the experimental design to enable the process window analysis and measure lithography performance. Excellent gauge repeatability < 1 nm and placement accuracy < 10 nm (without pre-scanning the measurement site) was achieved on this Customer sample through the laser-interferometer driven stage. CAD navigation and visualization tools are used to enable easy inspection of the lithography compared to the design file.

Raith has decades of experience in providing nanofabrication and characterization systems and solutions. Prototyping requires flexible methods for metrology, handling various sample sizes, and compatibility with fab protocols to ensure efficient lab-to-fab transitions. Here, we show how Raith can take advantage of its core competencies to provide highly automated and flexible Process Control solutions in the form of SEM-based metrology, bridging the gap created between analytical SEMs and dedicated CD-SEMs. Specifically, repeatable scan field calibrations and excellent placement accuracy are enabled by the laser-interferometer driven stage.

Our process control solutions take advantage of an extremely precise and stable column, focus control by automated height measurement, CAD file handling, unmatched positional accuracy due to the laser interferometer stage, and various algorithms that allow for automation procedures with lowest overhead.



Figure 1. Mosaic image displaying DOE of ring resonators with different gap sizes.



Figure 2. Left side shows a SEM image with GDS design overlay. The right side shows GDS with image site overlay.