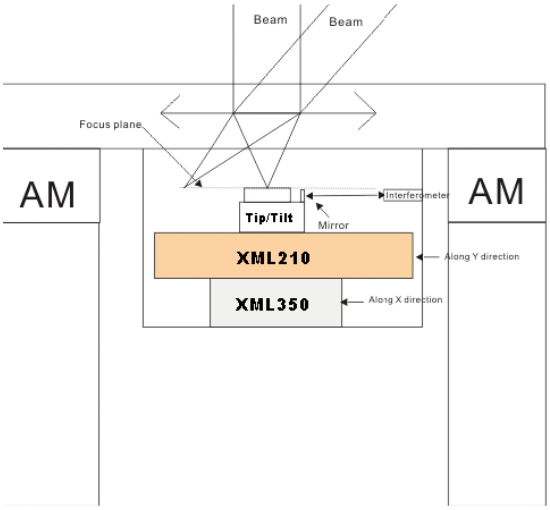
# Optical Inspection With XY Stages In Lithography Machine System

Market: Semiconductor, Industrial

Application: Metrology Testing




Lithography plays an important role in the fabrication of devices at the core of technologies in the wide range of applications such as Integrated Circuits and DNA arrays. Advanced research is made possible in the area of electronic packaging, display technology and biomedical research as the lithography system continues the advancement of technology in the sub-micron scale. The positioning requirements for lithography tools become increasingly demanding for the fabrication of microstructures in substrate.

During the fabrication process with optical lithography tools, a photo-resist with the appropriate spectral absorption is placed in the optics path and is exposed to beam moving in a specific pattern for proper spatial placement of microstructures. Due to the high resolution of structure in geometry and placement, the high level of accuracy and minimum incremental motion are critical in both X and Y axis.

A Newport customer uses XML stages for the lithography machine which consists of light source, optics, sensor and position feedback control with interferometer encoder. The sensor is placed on a Z-Tip-Tilt stage on top of an XY stage stack and the entire motorized assembly is mounted on a Newport optical table. An interferometer provides feedback control of XY position and the focal plane of optics are maintained within the range of 200 x 300mm.

### Newport 2-Axis System:

XML350 (X axis), XML210 (Y axis)

XPS-C2 Controller with XPS-DRV02 modules

· Travel: 350mm (X), 210mm (Y)

· Speed: 300mm/s (X, Y)

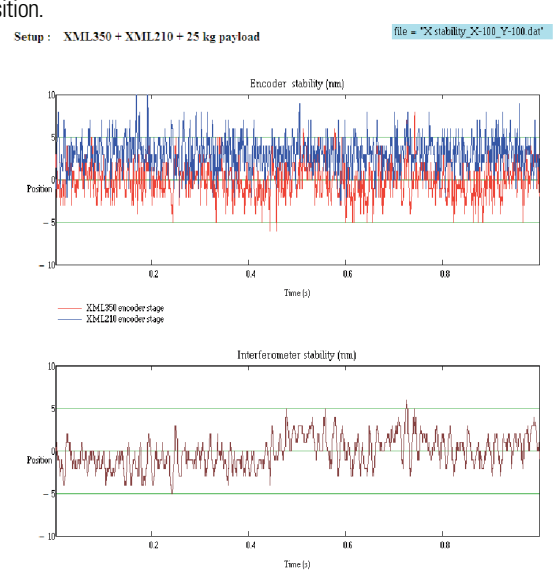
· Minimal Incremental Motion (MIM): 10nm (X, Y)

· On-Axis Accuracy: 3µm (X, Y)

· Bi-directional Repeatability: 80nm


One of challenges from the customer was the motion requirement to stop and maintain the position noise of less than 10 nm within the period of one second after the sensor reaches the desired position. As the dynamic behavior of the stage is dependant on various settings such as payload mass, center of gravity, motion speed and etc., the payload weight (25 kg) and the center of gravity (80mm above carriage) posed additional challenge for the rapid settling of motion to several nanometers.

Newport XML stages helped meet all the requirements with the extreme high dynamic performance and reliability of ironless linear motors. The special metrology testing is performed for measurement under the specific customer test condition and the optimization of control loop settings is done to achieve further improvement on short settling motion. The test result with 25 kg load in XY setting demonstrated the final position stability of less than 7nm within one second after reaching the final position.




Newport motion solutions can be provided with the special metrology testing and measurement reports of dynamic performance for the most demanding applications. For additional information or any questions, please contact Newport applications engineers.

Newport
Experience | Solutions