Structural design and testing of four-knife precision slits on XIL beamline

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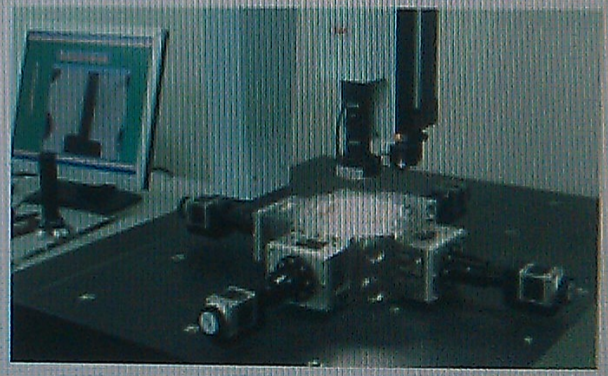
XIL is a new advanced micro processing technology using the interference fringes of two or more coherent X-ray on the exposure of the photoresist. Currently, it can obtain different shapes and periodic (minimum 12.5nm) photolithography graphics, such as nano-wires, nano-point, nano-ring and so on. It is widely used in many fields.

In order to ensure the spatial coherence and beam quality of XIL beamline, the design of four-knife precision slits of hypo-source is very important. The dive device uses precision screw transmission in order to realize the resolution and repeatability of the four-knife precision slits. The Vacuum feed-in device sealed by compressed bellows must have enough mechanical strength. The linear motion guide support and the dive pole are linked with no clearance by elastic structure in order to ensure its accuracy and stability.

The indexes of four-knife precision slits are tested after installation debugging by 3D coordinate measurement machine. It can realize the opening of slits -5~250μm in both horizontal and vertical directions, the straightness is better than 2.5mrad, parallelism is better than 2.5mrad, the movement resolution of the slits knife is better than 0.25μm, the repeatability is better than 2μm, the orientation precision is superior to 2.5μm. The results verify that the four-knife precision slits have very high accuracy and stability, meeting the use requirement XIL beamline. Now, the four-knife precision slit has been completed the online installation, debugging. It starts to work and has made out the etching line structure of 100nm periodicity.

Measuring of knife



Measuring of slit