CHESSY

Precise SEM test sample for universal applications

The structure

There are more than 1.6 million gold squares of 1 μm size
on silicon forming a 4-fold checkerboard pattern in an area
of 5 nm square. The smallest metric checkerboard has a
size of 10 x 10 μm. Such checkerboards form larger metirc
checkerboards of 100 x 100 μm – these again form checker-
boards of 1 mm square. Finally such 1 mm squares are ar-
ranged in the same manner covering a field of 5 mm square.
The edges of the empty corners in the 100 μm checker-
boards are additionally marked. The surrrounding frame is
10 μm wide and it has an outer side length of 5.04 mm.
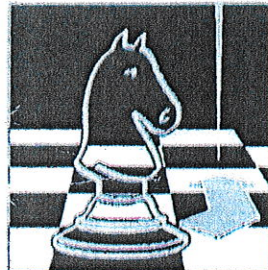
The pattern was directly written in a resist by electron beam
lithography using the ZBA 23H from Leica Microsystems Lithography GmbH, and
pattern transfer in the gold layer was done by ion beam etching.

Applications

Imaging

* Calibration of SEM magnification in all ranges between
  20x and 50,000x
* Check of equal scaling in X and Y
* Check of orthogonality and distortion
* Resolution test at high magnification on the edges of
  the gold squares
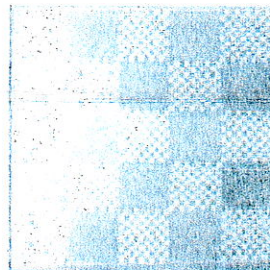
Motorized stages

* Measurement of reproducibility using stored positions
* Calibration of readings in X and Y
* Calibration of stage orthogonality
* Measurement of absolute positioning accuracy

Experimental EBL (use with Raith pattern generator ELPHY Plus or Quantum)

* Generation of metric writing fields between 10 μm and 5 mm square via mark
  recognition and alignment
* Measurement of SEM distortion at any magnification via mark recognition on
  different places
* Check of defocusing in outer areas