

E-Beam Lithography Mastering

Microscopy Calibration Standards

Institute of Scientific Instruments
of the CAS, v.v.i.
The Czech Academy of Sciences
Královopolská 147, 612 64 Brno,
The Czech Republic
www.isibrno.cz
http://ebl.isibrno.cz/

APPLICATIONS

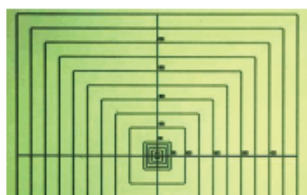
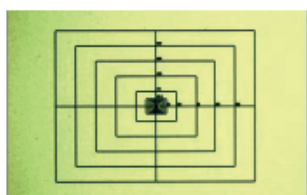
Application areas

- ✓ Calibration standards suitable for large range of optical instruments, microscopes particularly.
- ✓ List of imaging systems — optical imaging (camera, loupe); light microscopy (transmitted, reflected); confocal laser scanning microscopy (CLSM); electron-beam microscopy (scanning, transmission); step height measurements (profilometer; scanning-probe and atomic-force microscopy — SPM, AFM).

Calibration tasks

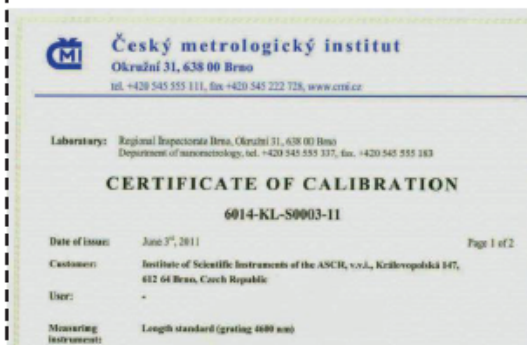
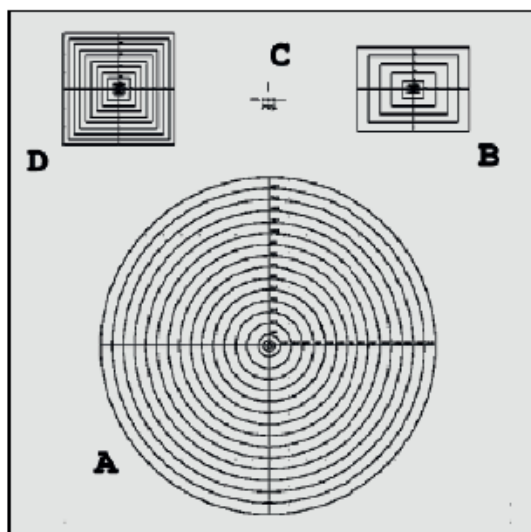
- ✓ Samples, chips and slides — check and calibration of optical device parameters (dimension, orthogonality, linearity..).
- ✓ Interferometry e-beam patterning system assures testing pattern precision.
- ✓ Precise step height for profilometer and SPM/AFM.
- ✓ Combining several metals (SEM - material contrast imaging)

CASE STUDY — PATTERN EXAMPLES



Selected calibration patterns for reflected-light microscopy

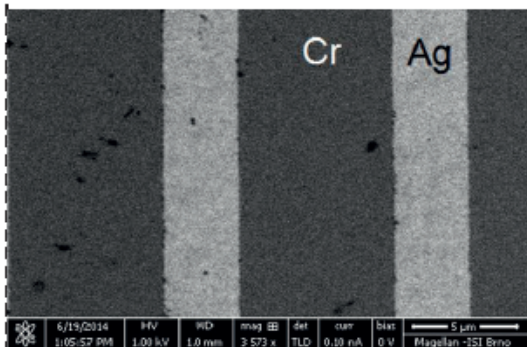
- ✓ Concentric circles
- ✓ Concentric rectangles
- ✓ Micro scale
- ✓ Concentric squares



Certificate of Calibration issued by the Czech Institute of Metrology

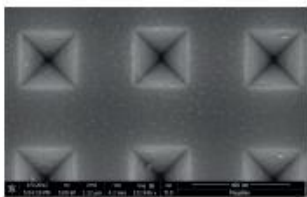
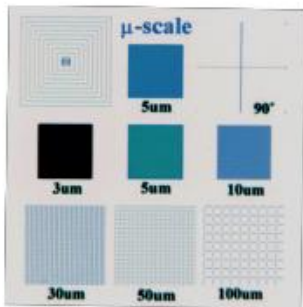
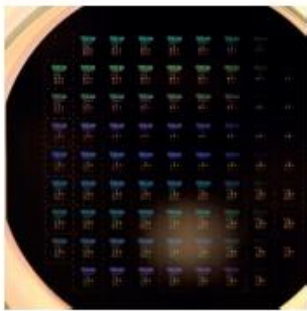


Various-purpose calibration chips



Bi-metallic sample for SEM adjustment

ANISOTROPICALLY ETCHED SILICON FEATURES



Wafer

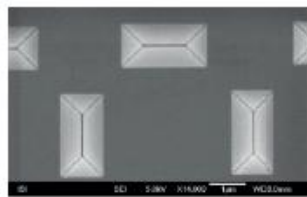
- ✓ Calibration samples may be designed as a set of samples on single Si wafer (e.g. 77 items on the 4" wafer).
- ✓ Individual items may be identical, personalized or different.

Chip layout

- ✓ One chip is composed of several selected patterns.
- ✓ Usual patterns include grating of selected density, concentric squares or orthogonal lines.

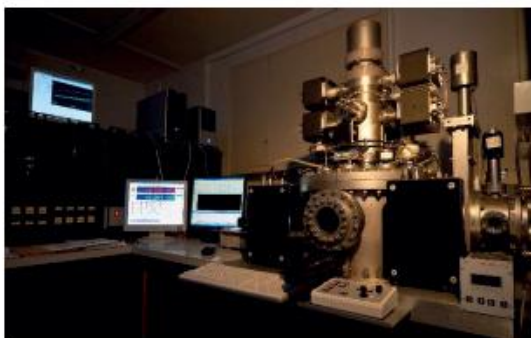
Notches

- ✓ Patterns composed of extremely sharp etched edges are optimal for SEM check and calibration.



WHAT YOU WILL BENEFIT FROM

- ✓ More than 20 years of design experience.
- ✓ Optional *Authority Certificate of Calibration*.
- ✓ From science through R&D, to final product.



Origination system—
e-beam pattern generator

Technical Advantages

- ✓ High flexibility in design (combination of various features).
- ✓ Specific substrate shape and/ or size available.
- ✓ Large selection of protection-layer coating.
- ✓ Customer-related approach.

1951 USAF resolution test chart;
range of group numbers: 0 – 11;
sample size 25 mm x 75 mm

