

Electron Beam Lithography (EBL)

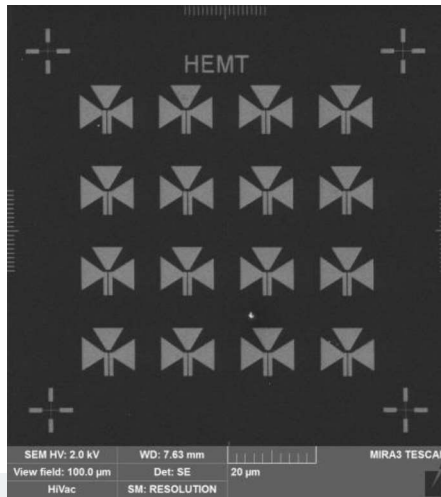
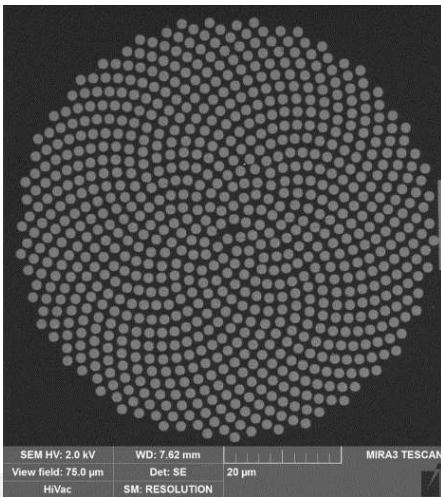
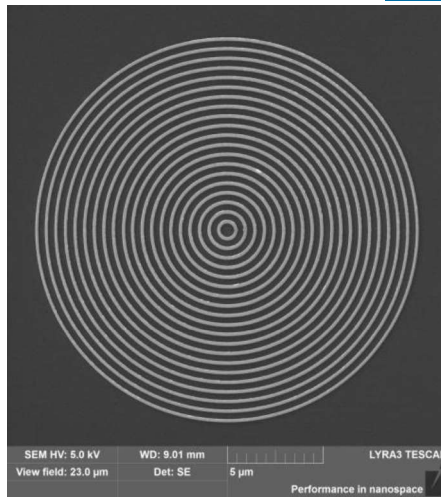
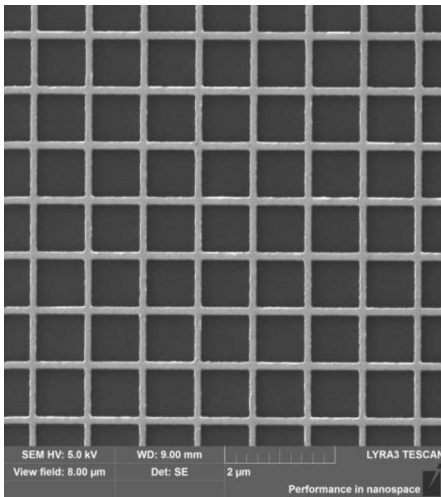
Description – Current Status – Future Prospects

TESCAN Sales Representatives Meeting

Hana Tesařová
Application Specialist

OUTLINE

- Electron Beam Lithography - preface
- Typical lithographic sequence
- Applications
- TESCAN lithography solution
- EBL Package
- What is new in DrawBeam
- FAQ
- Products of the third part
- Schedule for this year



EBL - PREFACE

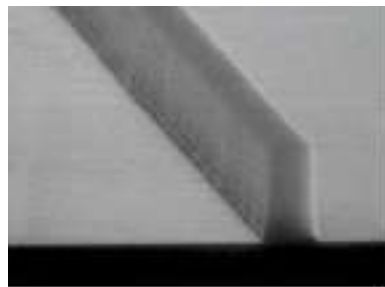
- pattern transfer to the resist via controlled electron beam deflection

TYPE OF THE RESIST

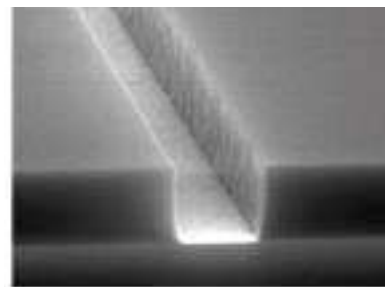
- Negative resist – HSQ, ma-N, NANO™ SU-8 series
- Positive resist – PMMA, ma-P, CSAR – new type, ZEP, GL..



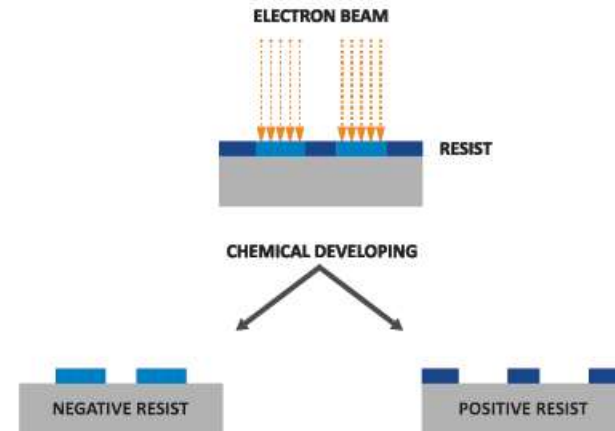
ELECTRON INTERACTION WITH THE RESIST



NEGATIVE

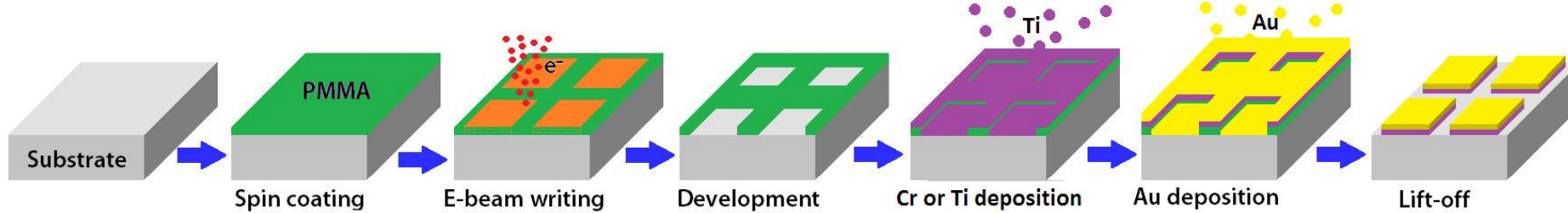
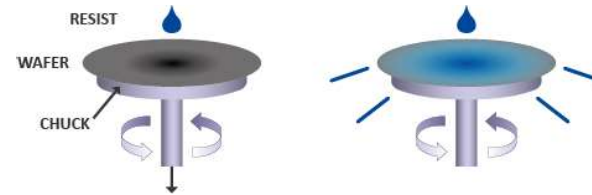
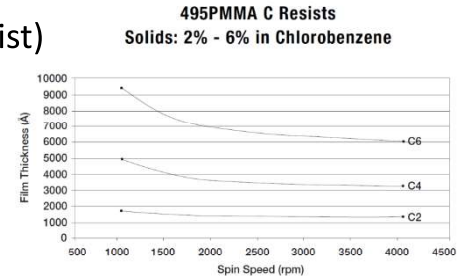


POSITIVE



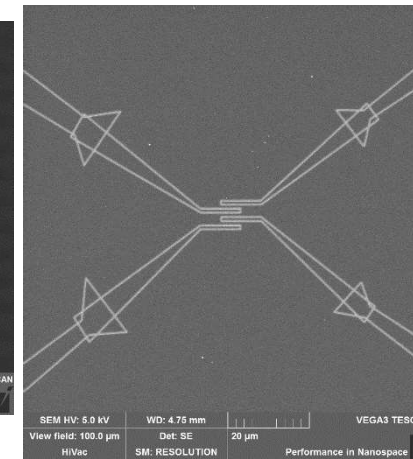
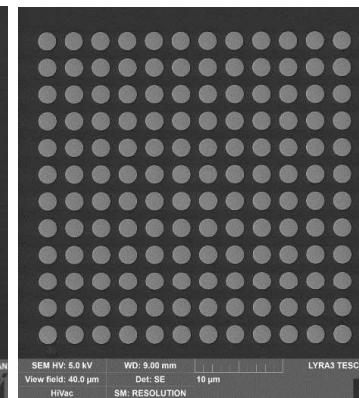
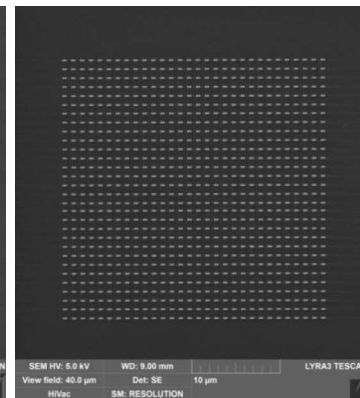
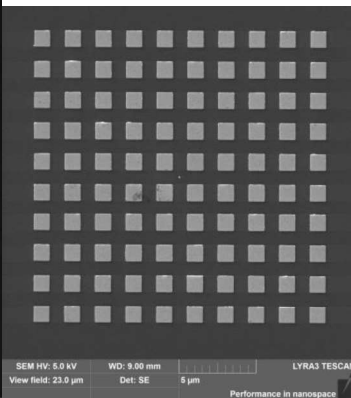
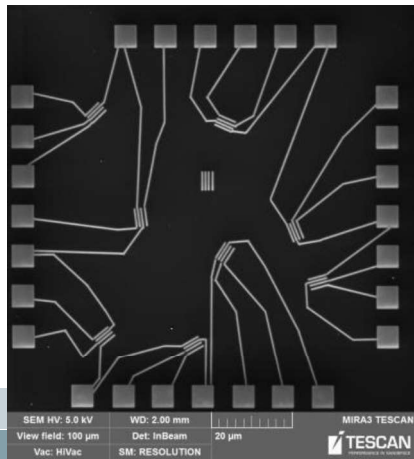
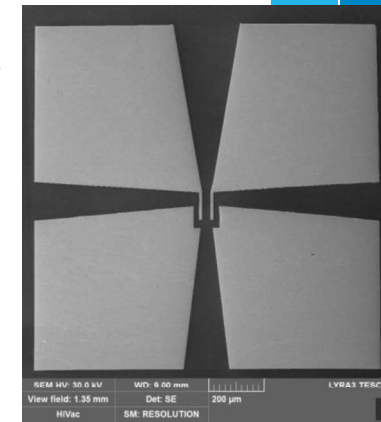
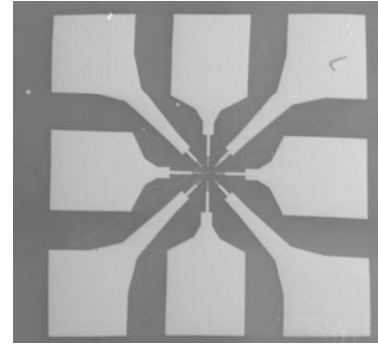
TYPICAL LITHOGRAPHIC PROCESS SEQUENCE

- Resist preparation (ultrasonic bath, hot plate, spin coater, substrate, resist)
- Electron beam exposure
- Resist development (MIBK:IPA, IPA:H₂O)
- Cr, Ti and Au deposition
- Lift-off (using the acetone or oxygen plasma)



APPLICATIONS

- Integrated circuits – low volume production in semiconductor industry
- Mask fabrication for optical lithography
- Optics, photonic, spintronics
- Tool for nanotechnology – laboratory prototyping
- Etc.

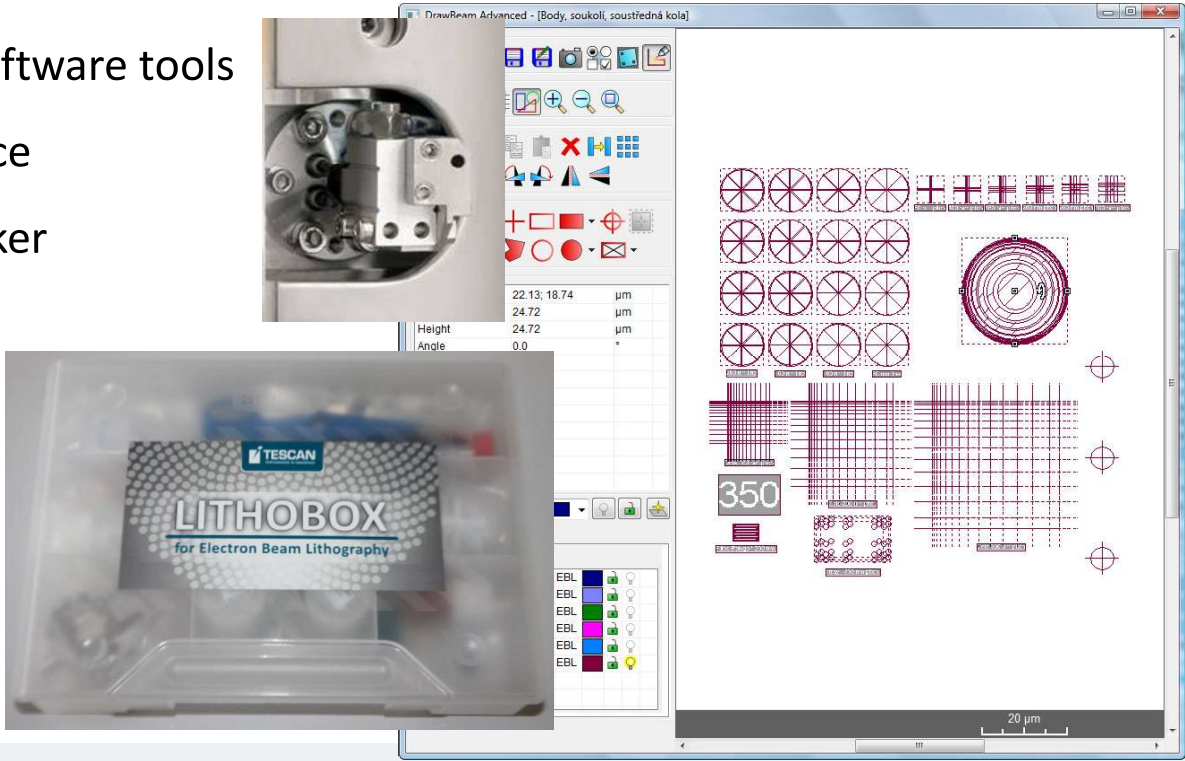
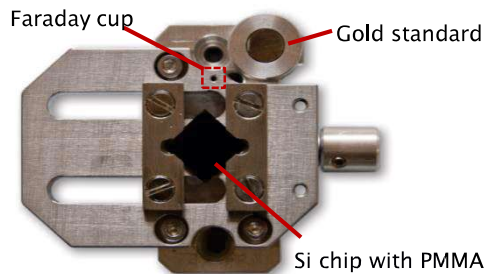


EBL PACKAGE


Complete solution for EBL - provides the best price performance ratio when compared to competitors' solutions

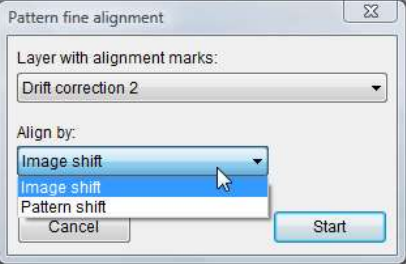
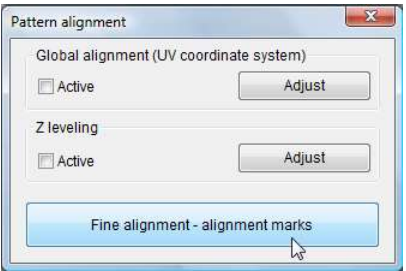
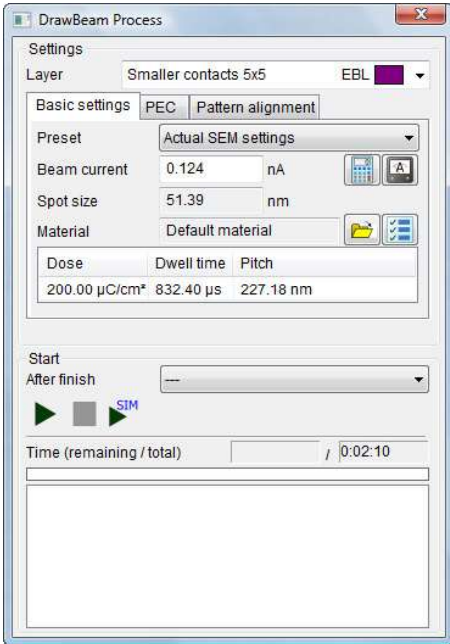
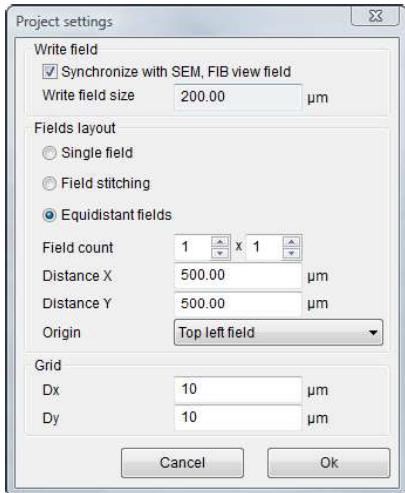
- DrawBeam Advanced software tools
- DrawBeam Offline licence
- Electrostatic Beam Blanker
- LithoBox
- User manual

2014 – 14 pcs



WHAT IS NEW IN DRAWBEAM

- Equidistant write field
- Mirroring of the objects 
- DrawBeam Process Panel
- Manual Pattern alignment - single field



FAQ

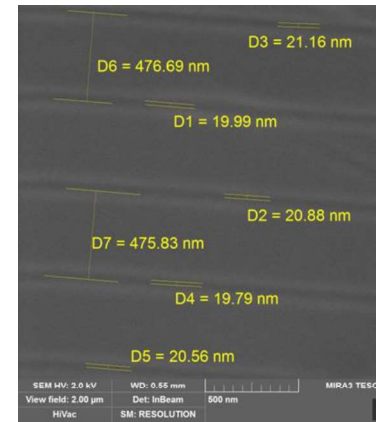
Resolution of our EBL system

- the same as resolution as our competitors
- depends on the type of the resist and its thickness
- condition which will be used
- with PMMA resist - structure approximately 20 nm and structure 40 nm after lift-off

Accuracy of the stage – standard $\pm 2 \mu\text{m}$ (being improved)

Minimum, maximum write field size

- the same as SEM view field



FAQ

■ Drift specifications of beams – there is combined stage + beam drift – it is hard to asses exact numbers, depends on ambient temperature, time for SEM stabilization

■ Accuracy of Stitching – it depends on the distortion of the write field (1 % from write field) and accuracy of the stage

