



Department of Microelectronics Electron Beam Lithography Facility

Electron Beam Lithography

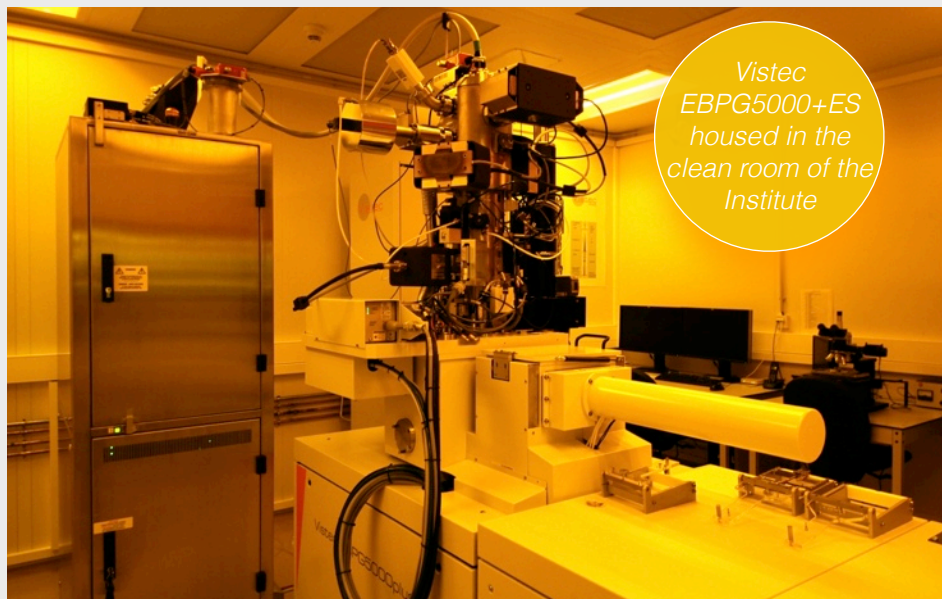
Electron Beam Lithography (EBL) enables the fabrication of extremely fine and complex patterns with great accuracy. Based on the electron microscope, it uses a finely focused electron beam to write patterns on an electron sensitive resist with nanometer precision. For many years, it has been serving as the technology of choice for the fabrication of nanostructures. Apart from the fabrication of masks used in the IC industry, EBL can address a broader range of topics that require highly accurate and reproducible features at the nanoscale. Due to its versatility in design implementation, it is a great research tool in the fields of nanoelectronic devices, integrated optics, photonics and functional nanostructures.

A newly purchased state-of-the-art Electron Beam Lithography system (EBPG5000+ES) from Vistec Lithography is housed in the cleanroom of the Institute of Advanced Materials, Physicochemical Processes, Nanotechnology and Microsystems of NCSR "Demokritos". The tool comes to address the ever increasing nanopatterning needs in a complete and robust way.

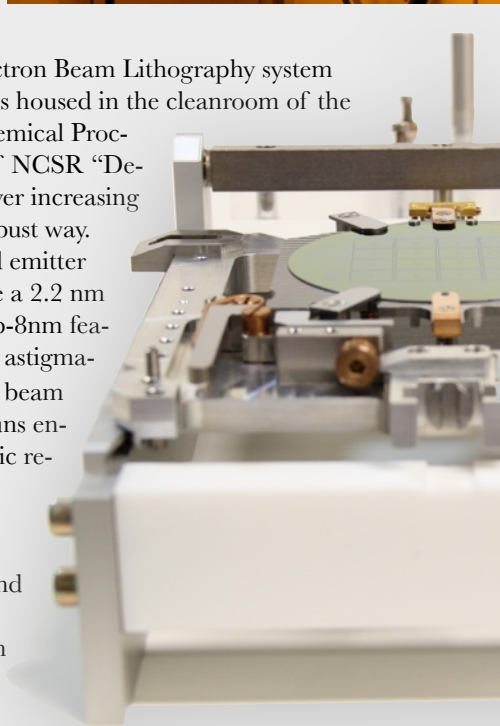
Equipped with a Schottky thermal field emitter operating 100 keV, the machine can achieve a 2.2 nm beam spot size that is capable of writing sub-8nm features. The dynamic correction of focus and astigmatism across the sample, along with the great beam current stability and automated exposure runs enable the realization of consistent lithographic results on the wafer scale.

Applications

- Advanced prototyping for novel devices and concepts
- Critical lithography steps in IC fabrication
- Resist technology development
- Photomask fabrication



Vistec
EBPG5000+ES
housed in the
clean room of the
Institute



Key Features

Gun
Schottky thermal field emitter at
100kV

Resolution
Sub-8nm features

Scan speed
25MHz

Mainfield
256 μ m @100kV

Stitching and overlay
Better than 20 nm at 100 keV

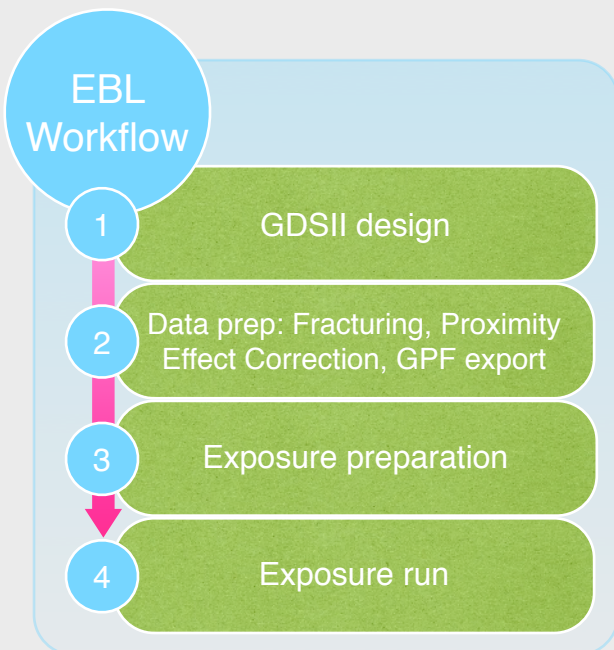
Sample sizes
Currently: Up to 5" mask plates,
up to 4" wafers and smaller
pieces. Possibility of up to 6" mask
plates & wafers

Substrates
Si, SiO₂, Si₃N₄, SOI, Fused Silica,
GaAs, Maskplates



Our workflow

We have established a powerful and thorough workflow that begins with your design and continues with data preparation which includes: Pattern fracturing, proximity effect correction, and export to a readable format for the e-beam machine. The file is sent to the machine and the exposure is set and run.



EBL workflow: From your design, to your exposure

Available tools and complementary capabilities

Software

- Linux workstation to control the EBL machine
- Computer with pattern preparation and proximity effect correction software (Beamer from GenISys)

Processing

- PMMA, HSQ, UV-5, AZ resists are available
- Spin-coaters, hot-plates and wet-benches for sample preparation and development
- As the EBL facility is part of the main Si processing line of the Institute, subsequent sample processing like pattern transfer or lift-off can be discussed with the staff

Characterization

- FE-SEM for inspection of the fabricated structures
- Profilometer and ellipsometer for resist thickness measurement

Contact

For additional information on the use of the EBL facility:

Dr. N. Glezos

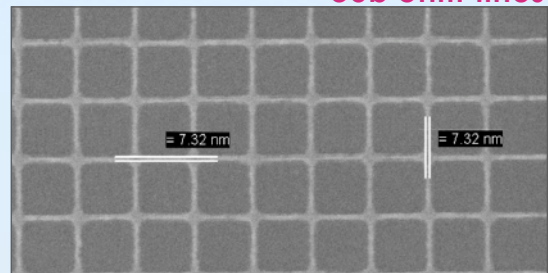
NCSR "Demokritos"

Patriarchou Grigoriou & Neapoleos, Agia Paraskevi, Athens, Greece, 15310

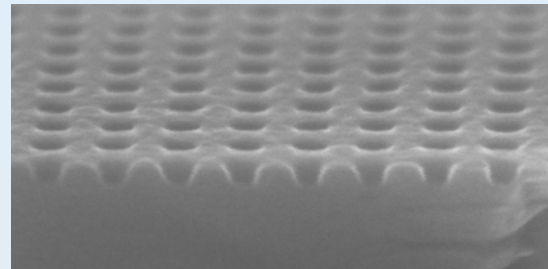
☎ +30-210-650-3236

✉ glezos@imel.demokritos.gr

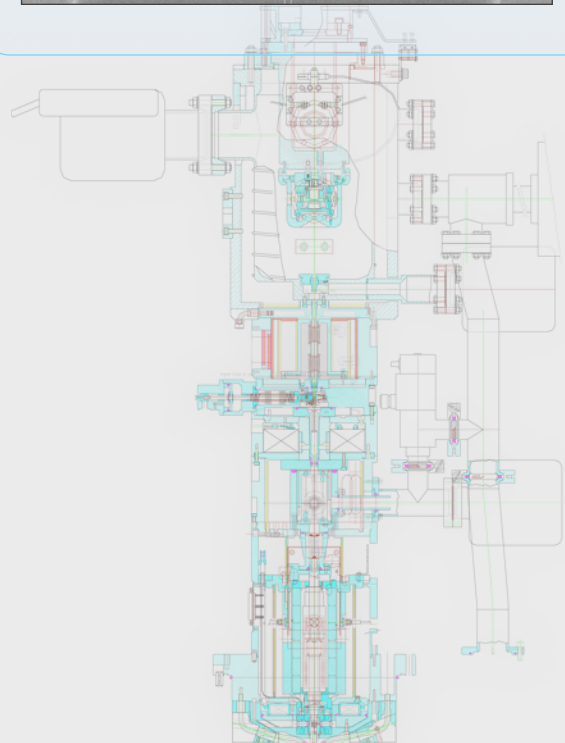
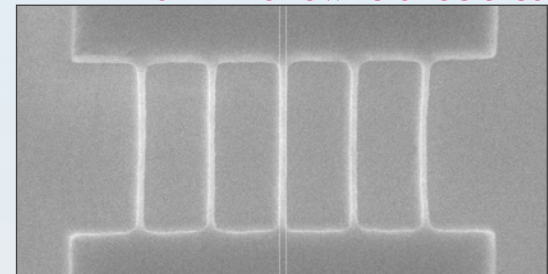
Sub-8nm lines



30 nm holes etched on Si



20 nm nanowire structures



Web

www.imel.demokritos.gr

www.imel.demokritos.gr/projects/minasys/Home.html

