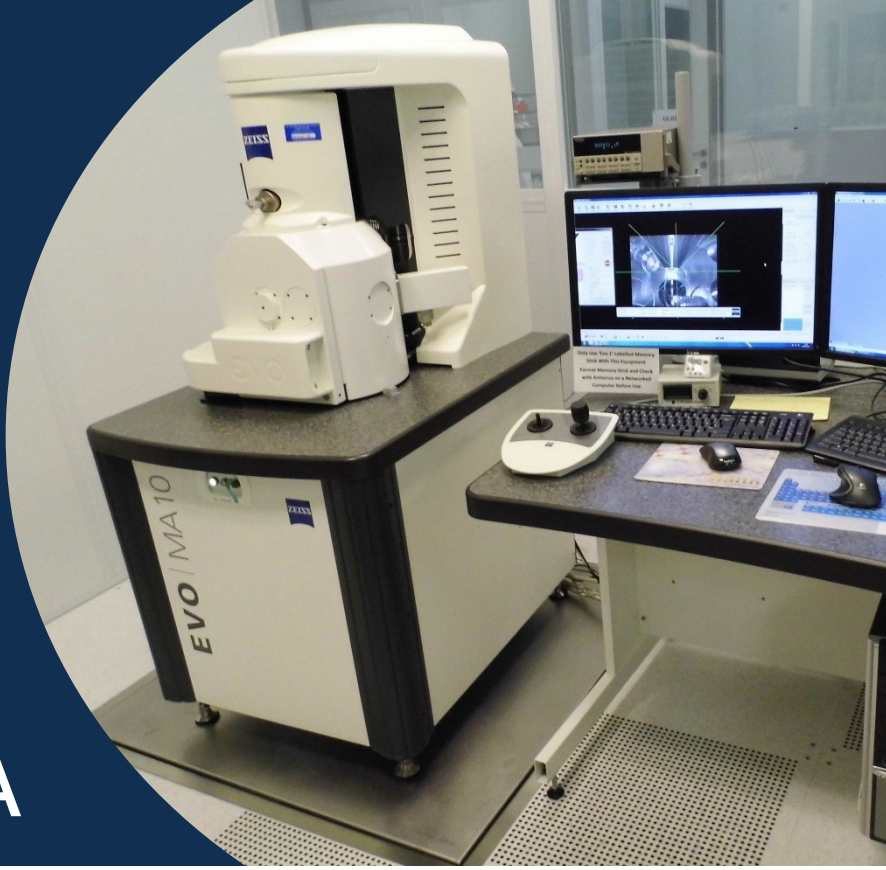
MANCHESTER 1824
The University of Manchester



STANDARD EBL EVO AND SIGMA

Zeiss EVO MA10 Small Scale Electron Beam Lithography Tools

Overview

Through the use of specialised spin-coated polymeric coatings, masks for evaporation and etching can be written onto user's samples using an e-beam.

Firstly a design is made in one of many commercially available pieces of design software and converted to the correct file-type for the machine; once loaded, the machine will fracture the design into small areas that it will sequentially scan and, therefore, expose with the e-beam. The pattern is then developed in a wet chemical developer solution.

'Positive' e-beam resist coatings become more soluble in a developer solution when exposed to an e-beam, ideal for patterning electrodes and other structures onto devices which can later be metallised using one of a multitude of metal deposition techniques available; 'negative' e-beam resist coatings become less soluble in a developer solution when exposed to an e-beam, generally more useful when a small area needs to be protected during wet/dry etch processes, or when the majority of a sample requires metallization.

Once metallisation/etching is complete, the remaining resist can be removed with a remover solution, this will also remove any metal remaining on top of the resist, a process known as lift-off.

MANCHESTER 1824
The University of Manchester

STANDARD EBL EVO AND SIGMA

Capability profile
The EVOs have the capability to provide acceleration voltages up to 30kV, but are generally used at 10kV by most of the current users as, although it reduces the ultimate resolution of the system through more backscattered electrons in the resist and a larger forward scattering angle, it does improve the contrast of alignment markers needed to properly align designs to the substrate.

These machines are designed to pattern smaller device areas (up to a maximum of 2mmx2mm at a time), larger areas (up to 8" wafers) should be patterned on the Raith EBPB5200. Both of the EVO machines are very heavily used in the fabrication of the majority of the 2D devices the NGI users produce, they are ideal for the fabrication of devices not requiring the large area, speed or ultimate resolution offered by the larger Raith machine.

Electron Source	Thermionic Source (LaB6)
Acceleration Voltage	10–30kV
Beam Current	0.1pA– 0nA
Maximum Clock Rate	6MHz
Main Field Beam Deflection	16-bit DAC
Maximum Field Size	2mm x 2mm
Minimum Theoretical Spot Size	~3nm
Stage Travel Range	80mm x 100mm
User Interface	Zeiss SmartSEM + Raith ELPHY Quantum NANOSUITE (V6.0)
Thermal Stability	~500nm/h
Minimum Feature Size	12nm (monolayer resist), 20nm (bilayer resist)
Overlay Accuracy	~50nm
Stitching Accuracy	~1µm
Maximum Substrate Size	50mm x 50mm