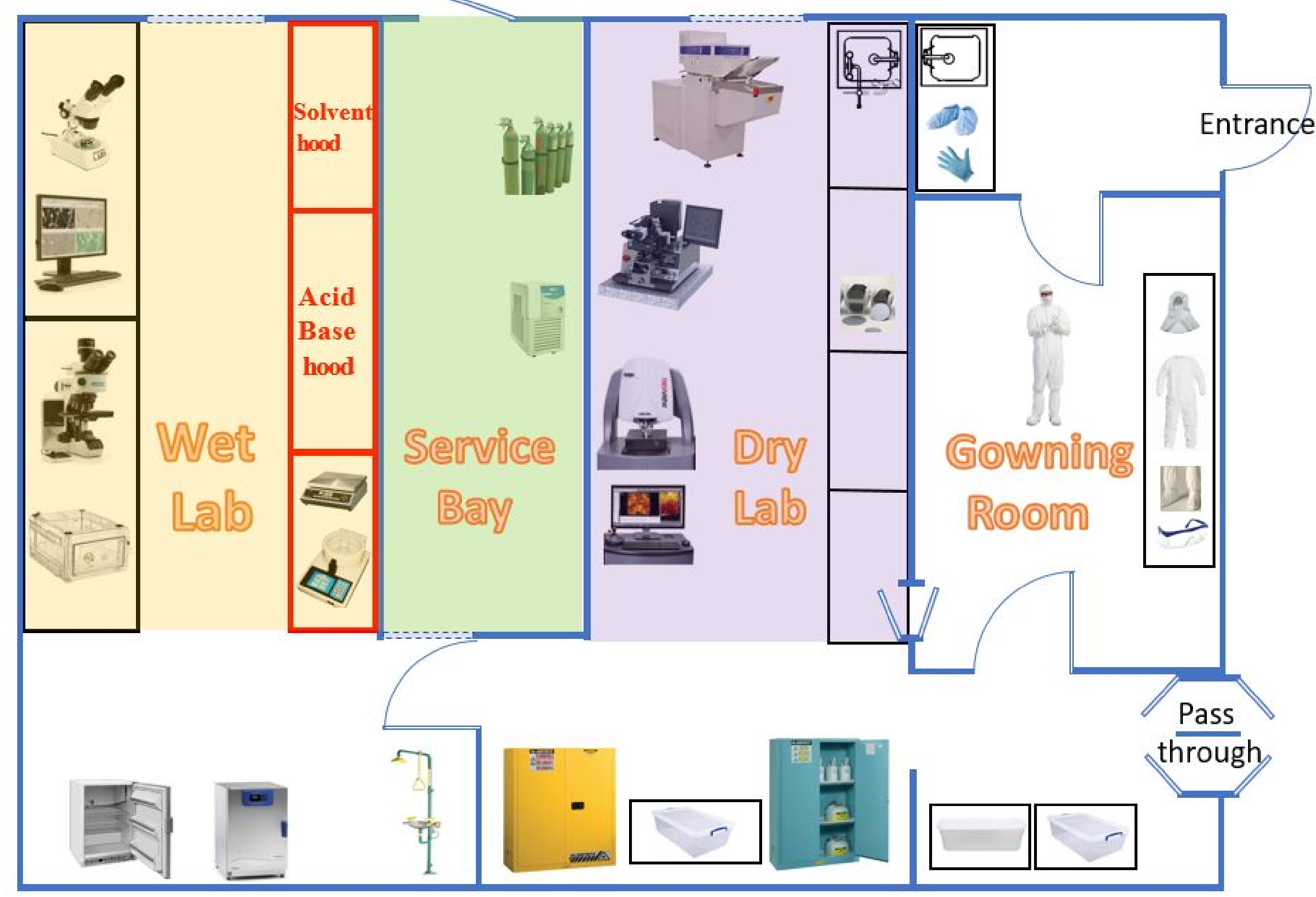


Yale West Campus Cleanroom

Introduction

The Yale West Campus Cleanroom supports the research activities of scientists on West Campus and across Yale. The Class 10,000 Cleanroom, with 1200 ft^2 space, provides a controlled environment with low level of pollutants. We support research groups focused on microfluidics, materials, energy sciences, and electronics, providing photolithography tools including UV mask aligner, spin coaters, hot plates, solvent, acid and base hoods. Surface characterization tools such as optical profiler and optical microscope are also incorporated.



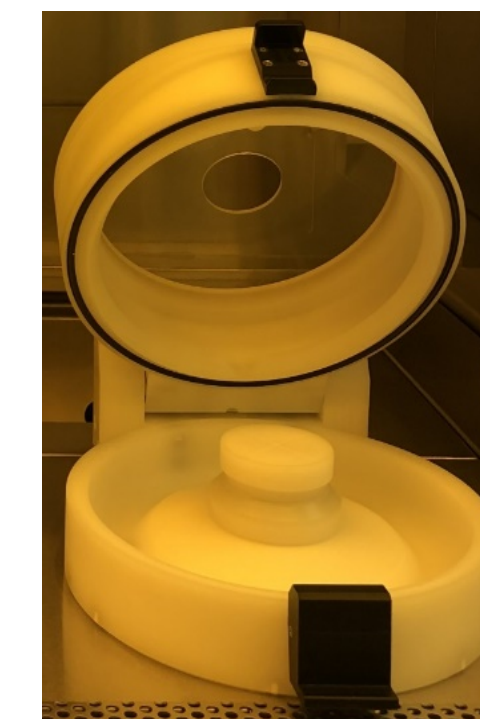
Process Benches

There are Acid, Base, Solvent and Spin coating fume hoods. We provide two spin coaters, multiple hot plates, DI water spray guns, Milli-Q water, nitrogen gun, vacuum ports, and ultrasonic tank with heating. PPE such as safety glasses, nitrile gloves, chemical apron and face shield are available.



Spin Coaters

- Fits wafers 1", 2", 4" and 6" with different chucks.
- Programmable digital motor speed control, +/- 0.5% speed regulation, CW/CCW rotation.
- Easy process recipe creation and editing on or off the system, stores 1000 of recipes on internal compact flash or external thumb drive.

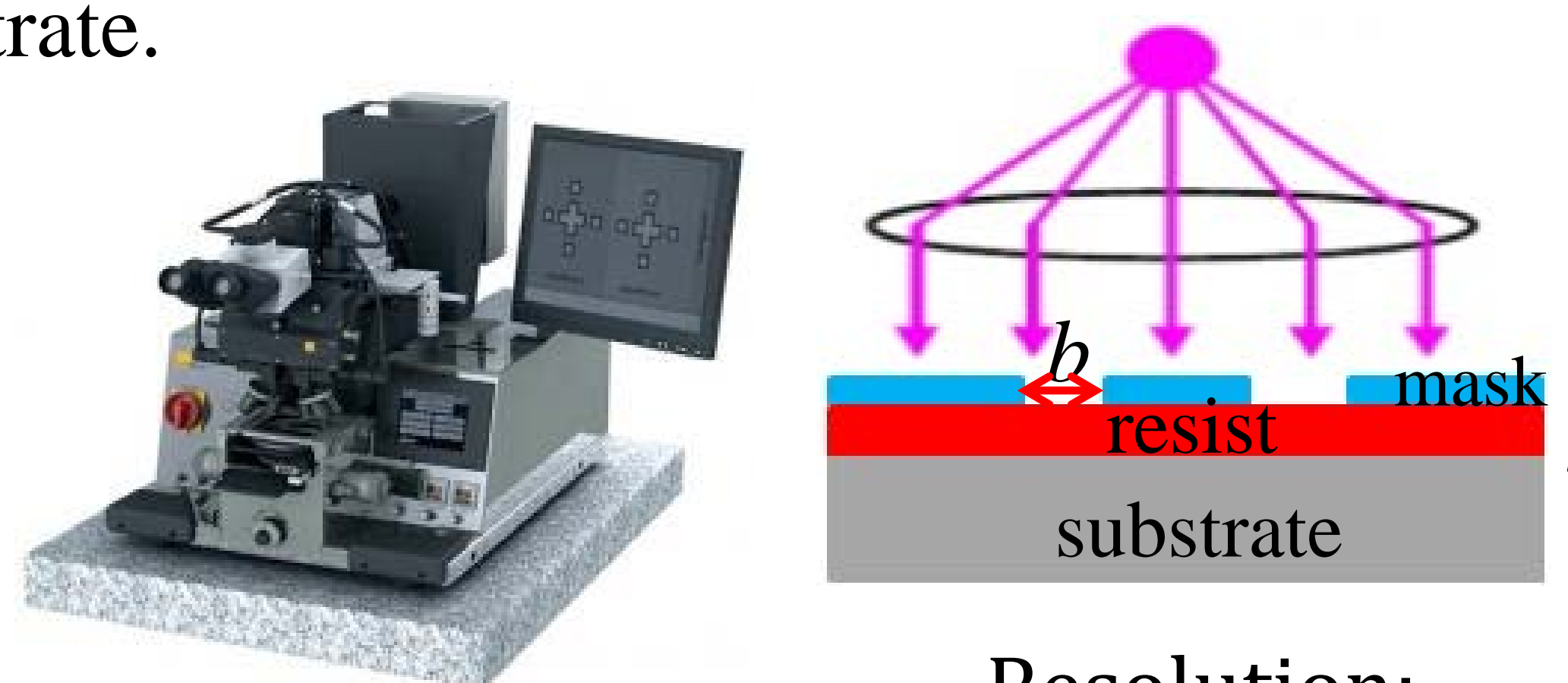


SUSS MJB4 Mask Aligner

MJB4 mask aligner is an economical and efficient photolithography, which uses UV light to transfer a geometric pattern from a photomask to light-sensitive photoresist on the substrate.

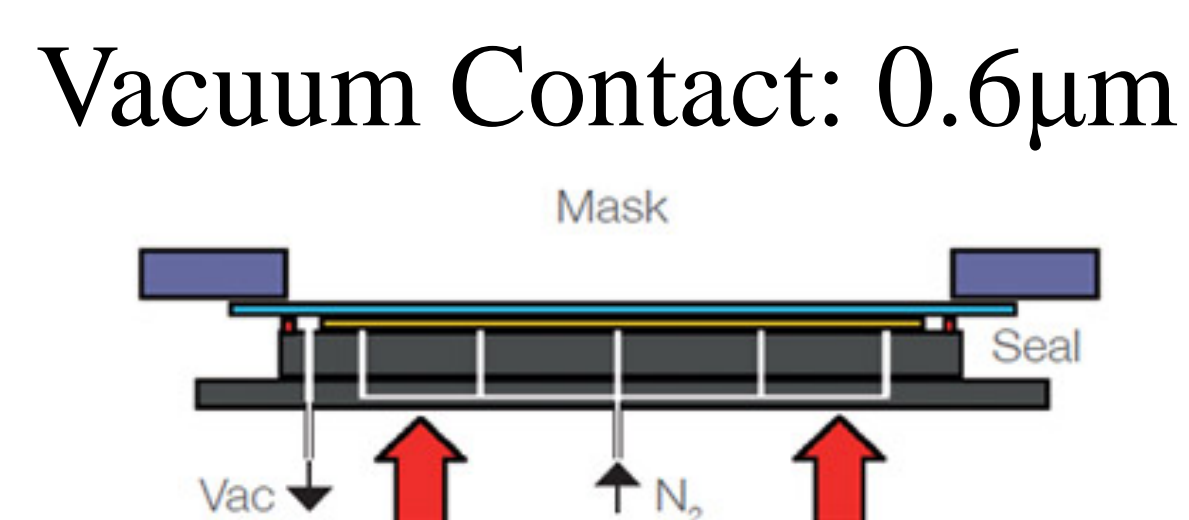
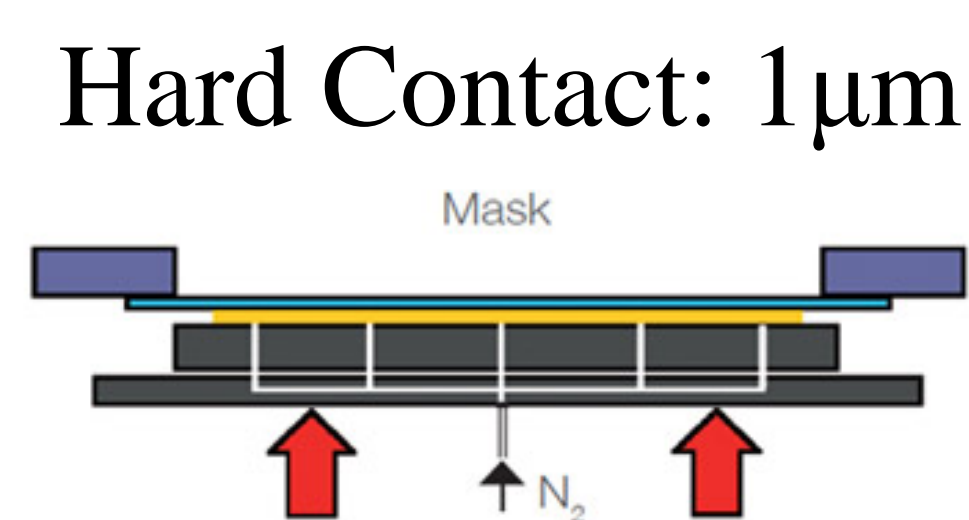
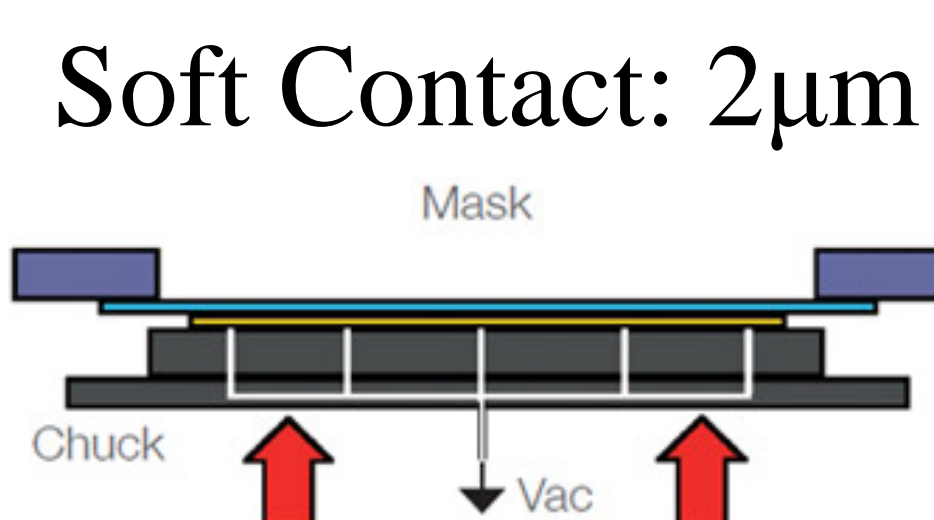
- The wafer size is up to 4 inches.
- High precision X, Y and rotation Θ alignment. The travel range for X and Y is ± 5 mm, for $\Theta \pm 5^\circ$. Mechanical resolution of X and Y is 0.1 μm .
- Two high-resolution splitfield microscopes.

The resolution depends on the wavelength of UV light and the gap distance between the mask and substrate. There are three types of contact to reduce gap distance and increase the resolution.



Resolution:

$$2b_{min} \cong 3\sqrt{\lambda t/2}$$



Zygo 3D Nexview Optical Profiler

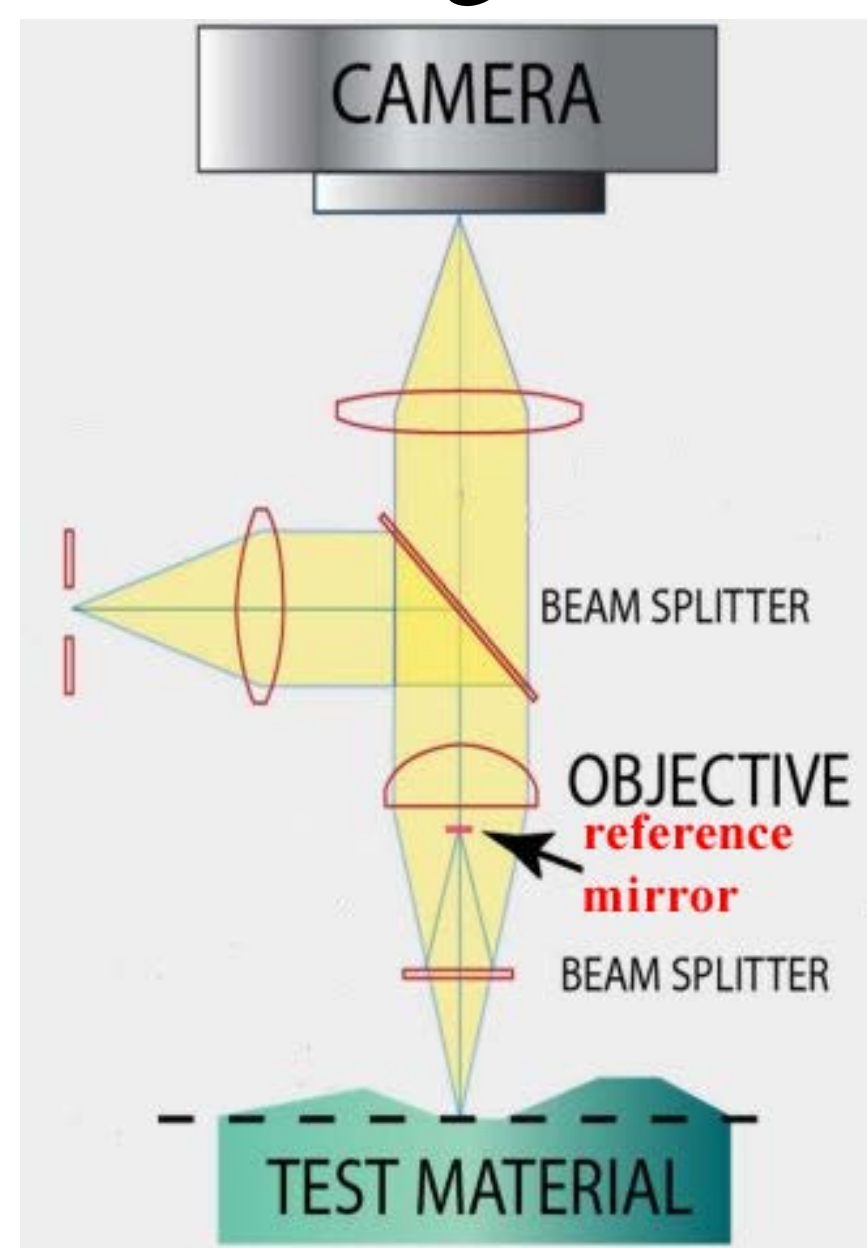
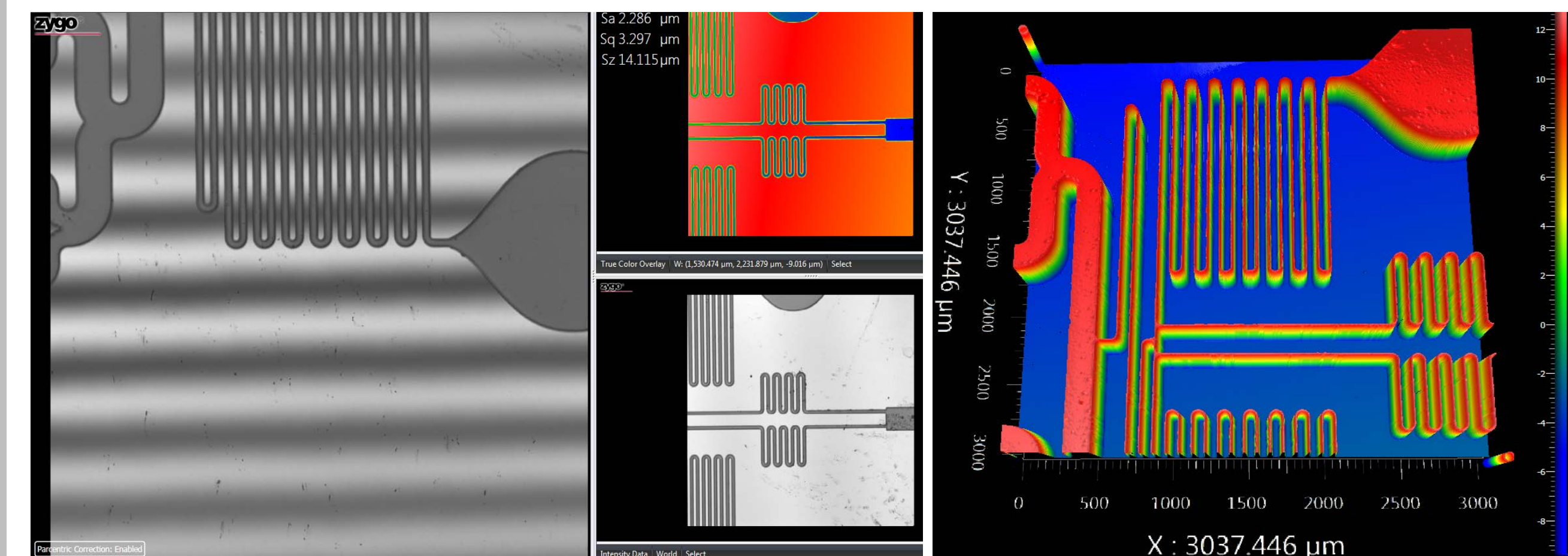
Zygo optical profiler is an interference microscope to measure the height variations of surface using the wavelength of light as a ruler.

- Excellent at measuring all surfaces from super-smooth to very rough, with sub-nanometer precision, independent of field of view.
- Measurement types include flatness, roughness, large steps and segments, thin films, and steep slopes, with feature heights ranging from nm up to mm.
- Non-contact profiling, no damage to samples.
- Exceptional precision and repeatability for the most demanding production applications.



Interference fringes

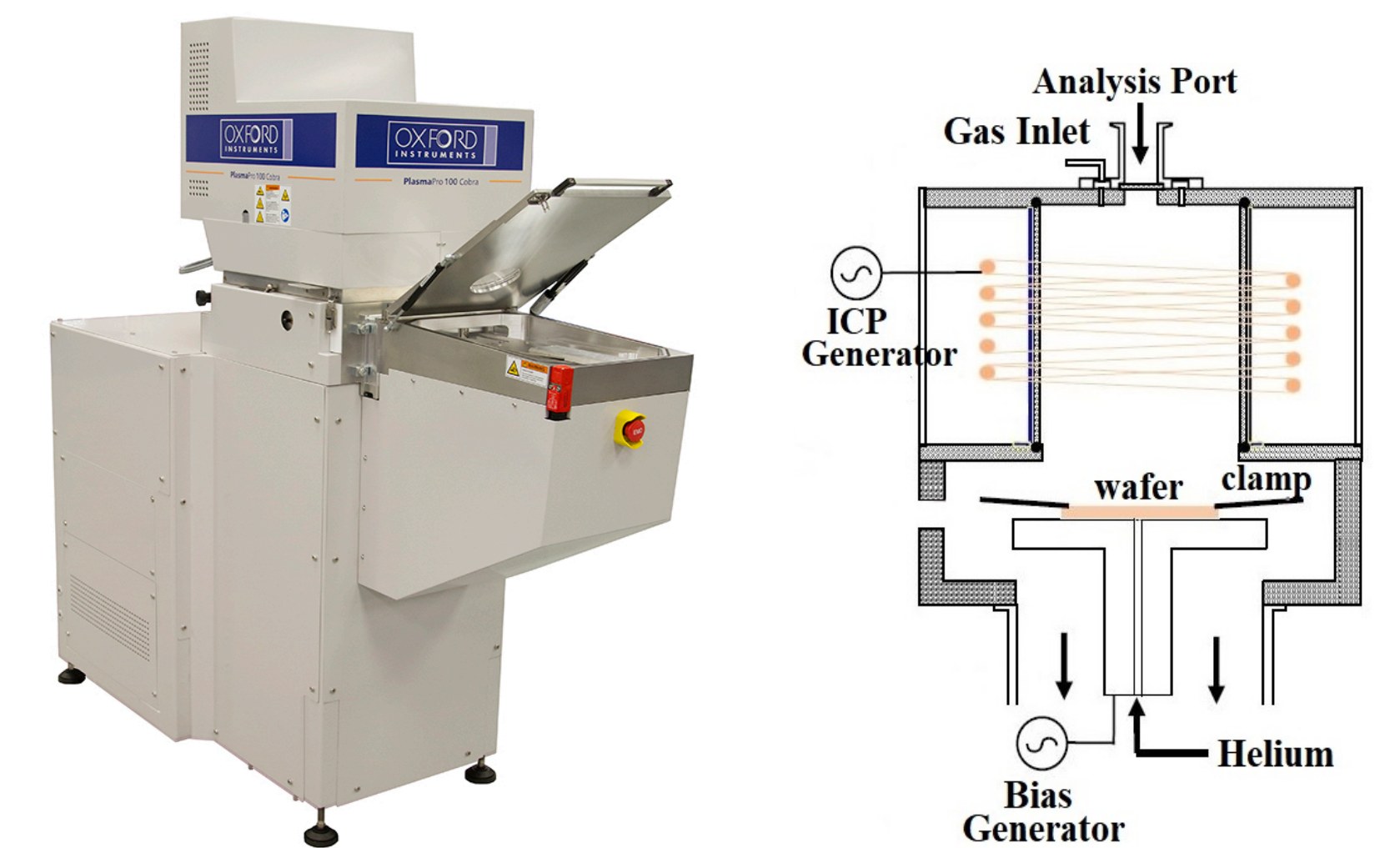
3D plot



Oxford Reactive Ion Etcher (Pending)

Oxford PlasmaPro 100 RIE is a powerful dry etching tool using chemically reactive plasma to remove materials.

- The high-density plasma is generated by Inductively Coupled Plasma (ICP) power at low pressure.
- The ion energy is controlled by a Radio Frequency (RF) generator at 13.56 MHz.
- Able to etch different materials such as graphene, GaN, AlN, Si, and SiO₂.
- The process gases include non-toxic CHF₃, CF₄, SF₆, Ar, O₂, and toxic Cl₂ and BCl₃.



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