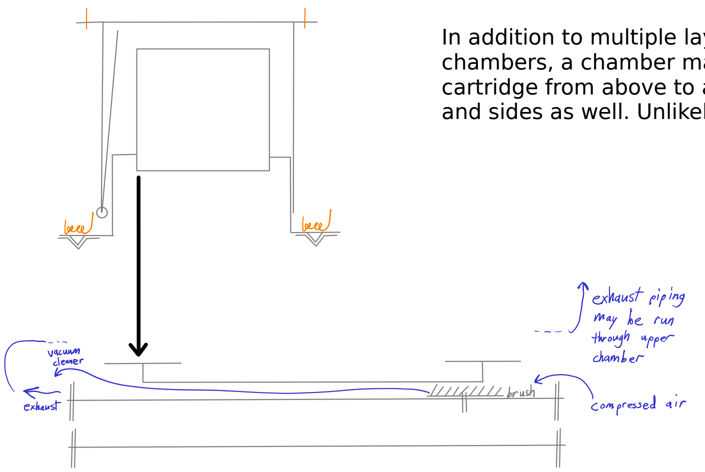
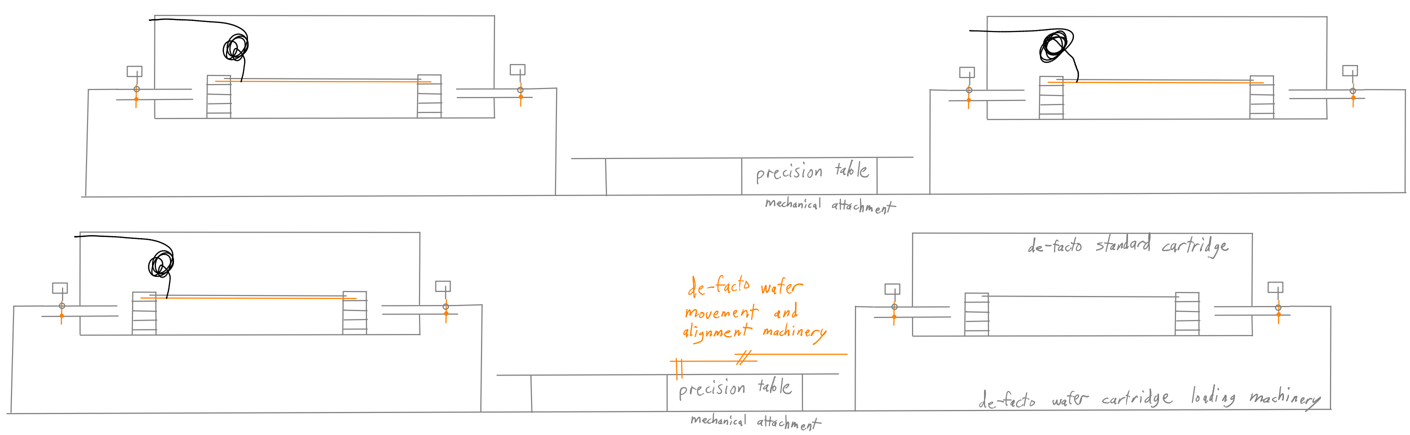


In addition to multiple layers of cartridge floor cleaning chambers, a chamber may be lowered on top of the cartridge from above to allow automatic cleaning of top and sides as well. Unlikely to be appropriate.

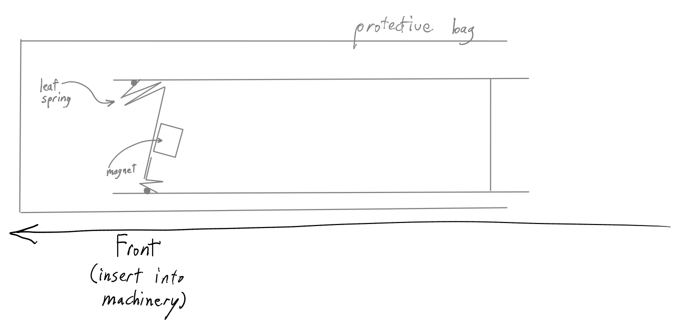
Loading workpieces from table sides - perhaps with entire movable slabs preattached - allows the workpiece to be selected simply by lowering the cartridge until the desired workpiece is at the table depth.

Under sufficiently clean conditions, de-facto standard cartridges may be converted to a more desirable cartridge in this way.

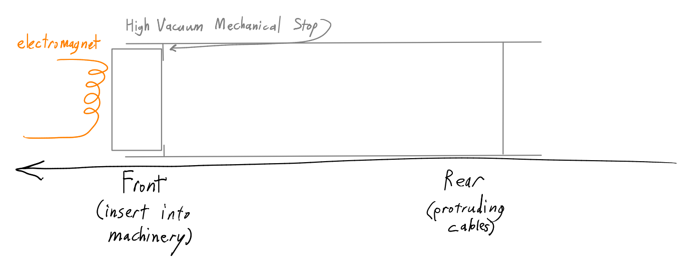
However, except possibly for 'etch' processes tolerance for dust may be very low around 'image' processes.



Front load cartridges are not promising, due to workpiece/slab sliding across a cartridge door area that may not be clean, much more lateral 'floor space' occupied for cleaning chambers, and possibly much more mechanical complexity.

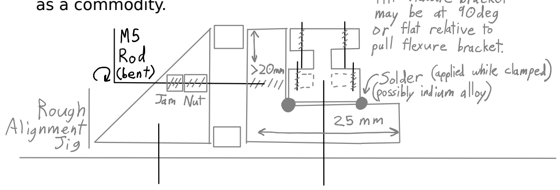


Cartridge must not allow dust to enter. Cartridge may need to have a door which can be opened by electromagnet to access the workpiece.

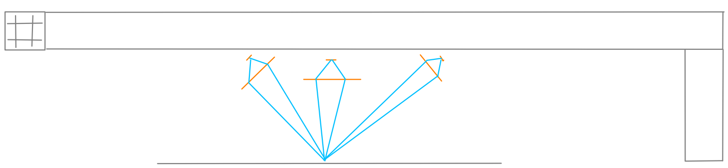


Threaded Rod Bolted Plate and Flexure Tilt Bracket
Flexure and Translation (3-axis)

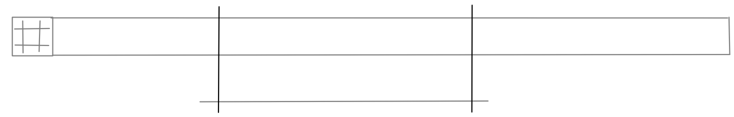
Flexure tilt bracket may be available as a commodity.



Wafer polishing may require specialized metrology, and may rely on nanopositioned slabs with piezo/linear actuators. Such wafers may then be spot polished by other hardware described herein.

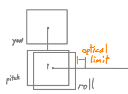


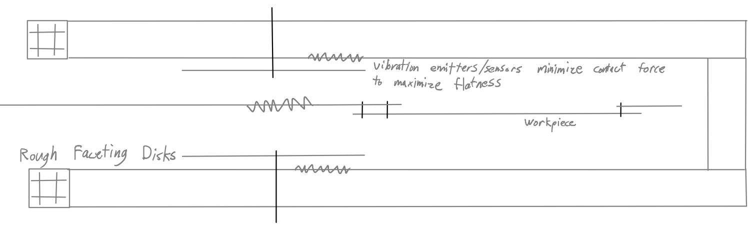
Linear axes (or mere strings) can translate/tilt, dropping a workpiece onto a faceting disk, spot polishing tool, inspection area, etc. Slabs should be far more useful.

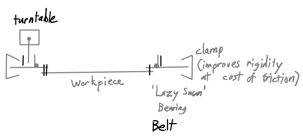


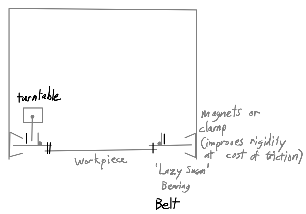
Workpiece is mounted as a tool, to be faceted. May be useful to create spinning mirrors and such from such surfaces as the endpoints of motor spindles.

Such heavy load on long cantilever of multi-axis tool mount may have insufficient rigidity.



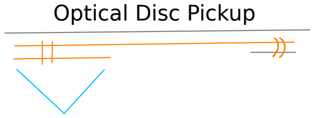






Other mechanisms to bring workpiece in contact with faceting disk and similar tools may be possible.

Optical Disc Pickup

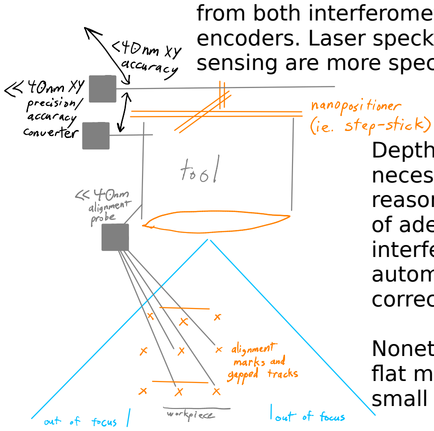


Briefly, relative to nearby locations, some interferometric encoders may allow tool to keep overlay from one position to another.

At least five alignment marks should be within tool field of view for overlay.

Probe may add an additional, crude, overlay mechanism to a tool.

Adequate accuracy is theoretically available from both interferometric and scale linear encoders. Laser speckle and displacement sensing are more speculative.



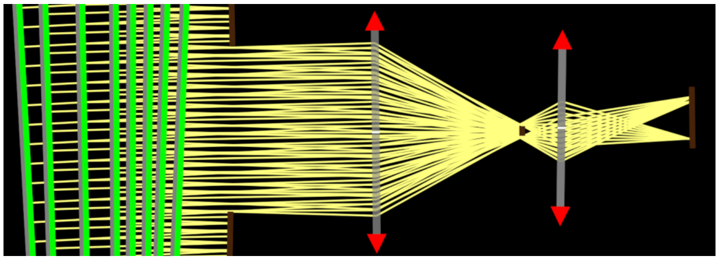
Depth accuracy (Z) not necessary due to reasonable expectation of adequate incoherent interferometry or automatic depth of field correction.

Nonetheless, an optical flat may be used across small (<5cm) distances.

Diffuse Light Source, Spatial Light Modulator, Optical Projection Lithography

Demonstrates that spatial diversity from diffuse light source allows obstructions in focal planes,
but not obstructions out of focus, to modulate projected image.

Similar experiments may be performed with software at - ' https://ricktu288.github.io/ray-optics/simulator ' .



Polar machinery may be mounted atop an already moving slab and well integrated with other nanopositioning machinery. Thus, the benefits may be explored conveniently.

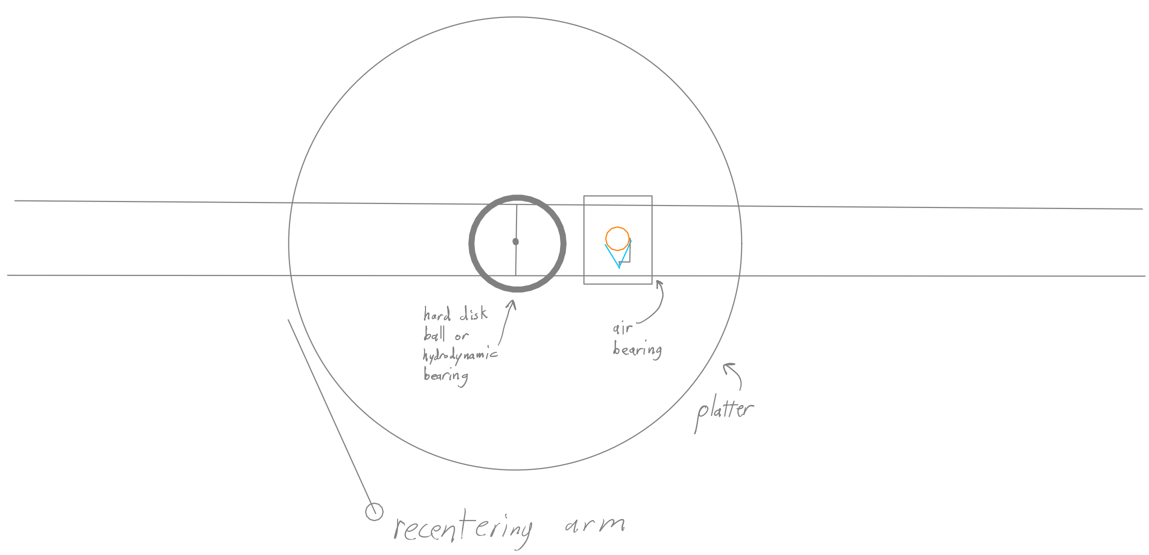
Polar motion allows movements to remain unidirectional and single-axis, allowing some drastically simplified approaches to achieving accuracy (not merely precision). Accuracy as high as 5nm has been reported, unfortunately with a ~1um/1degC thermal expansion error, prohibitive for overlay.

If entire polar motion machinery can tolerate deposit/drill/polish/coat/develop/strip/dissolve (or if the polar machinery is entirely consumable - entire machine may be consumable actually), this technique offers the possibility of non-optical photolithography overlay. Unfortunately, these steps would likely introduce drastic temperature changes.

Overlay may be achieved optically by as little as two or three marks. One line (rotary 0 coordinate), one inner ring (inner centering), one outer ring (outer centering and thermal expansion calibration). Such marks may be inscribed by photolithography or scanning probe. Unfortunately, reading these marks at full rotation speed is likely to prove challenging.

Lens simplicity (possibly merely focusing on a single spot) may allow scanning probe to be placed directly in the optical path with exceptionally rigid mounting geometry directly attached to lens. Unfortunately, this may not be workable at high RPM needed to minimize runout (ie. wobble).

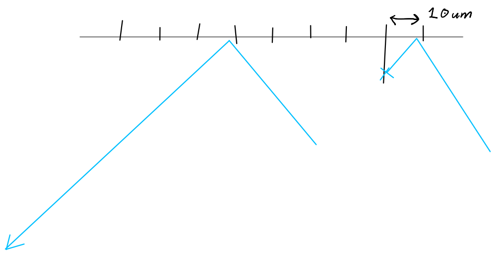
Ultimately, such geometry thoroughly refutes the possibility of alternatives to EUVL (photolithography) optical overlay. Plausible limits are poor for any machinery reliant on mechanical rigidity, unidirectional rigidity, and/or non-optical overlay. Nanoimprint lithography with e-beam overlay and possibly thermal expansion calibration remains the only plausible candidate alternative, with substantial limitations expected, especially in yield.



Workpiece chuck may be magnetic, pressure/vacuum/adhesive,
however, is required to allow 'shove' by recentering arm.

Wall absorbers are proprosed as a new scatering spatial light modulator technique, emphasizing EUV lithography compatibility. Instead of changing the angle or position of mirrors, a single mirror is perforated, and small walls are pushed through to selectively cast a shadow.

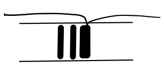
This has the advantage of repurposing existing simple EUVL reflective flats, without substantially changing their optical properties.



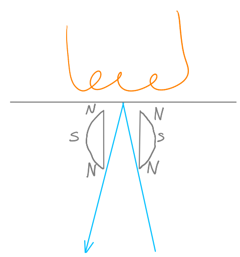
An 8-bit film strip may include all possible 256 states, switchable by simple stepper motor with optical encoder. An 8*8=64 pixel mechanically actuated array may be formed this way, running over top the EUV mirror flat, with no perforation. Of course, the 'film strip' must have physically open/closed shutters, to prevent EUV absorption.

Mechanically actuated microshutter arrays may scale to 30 shutter linear arrays if pulled by mechanical cables connected to solenoids.

Alternatively, mechanically scanned electromagnet array should be able to set these efficiently.



Microstepping is expected to be particularly fast, and may actuate 'light valves'.



Availability of even 405nm photolithography enables the gradual removal of DLP protective covering, or the direct fabrication of a new MEMS micromirror/microshutter device. Slip-step and electrostatic actuators with active matrix or linear binary on/off addressable register arrays may be preferable. Coating existing DLP MEMS micromirrors for EUV reflectivity is expected feasible.