

An Introduction to Holographic Lithography

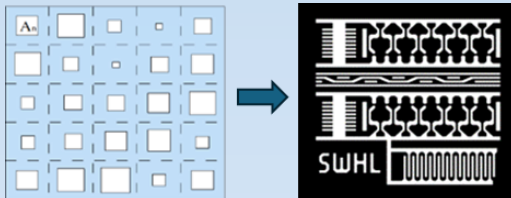
Many things in our daily lives contain computer chips, which are made by a technique called photolithography. The idea is fairly simple: You want to etch a pattern into a flat surface using lasers. But as we know, computer chips are tiny and need to be very precise, otherwise our electrical devices won't function properly!

Currently, this is achieved by using complex stacks of lenses and so called “masks”, which are stencils of the pattern to be made. But this technology, called projection lithography, has some big drawbacks:

Only 2D patterns can be made. By stacking lots of 2D patterns, some slight 3D effect can be achieved, but not all structures can be made. Projection masks are very sensitive and have to be immediately discarded when there is the tiniest sign of damage. They are made of toxic materials, and are cleaned and protected with solutions and films of more toxic substances. This means for every computer chip produced, there is a big amount of waste and toxic materials produced.

This is why the HoLiSTEP consortium has designed a technology that can solve both problems at the same time: **Holographic lithography**.

The theory of holographic lithography can be summarised in a simple explanation: Instead of using a stencil to print a pattern, a “grid” of large and small holes in different shapes will be used as a holographic mask. The pattern that we want to print will then appear through interference of laser light as it shines through the holes.



Using advanced mathematical calculations, virtually any structure can be made in 3D with the technique of holographic lithography. And because the masks are much simpler than for current projection lithography, they are less sensitive to small damages, can be used for much longer and thus produce much less waste during production of computer chips!

During the HoLiSTEP project, our consortium will build the first holographic lithography tool to demonstrate all these benefits in a real-world environment.