



## Synthesis of Low-Cost, High-Density DNA Microarrays

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**WARF: P08067US**

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**The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a device and method for synthesizing DNA microarrays using image reduction and precision stage motion.**

### Overview

A DNA microarray is a collection of microscopic DNA spots arranged on a solid surface via covalent attachment to a chemically suitable substrate. DNA microarrays allow hundreds of thousands of DNA sequences to be organized in a very small area. They can be used to measure gene expression in a process known as expression analysis or expression profiling, or to assess genome content in cells or organisms.

Microarrays are fabricated using a variety of techniques including printing, photolithography or electrochemistry. In a photolithography technique known as maskless array synthesis (MAS), a high-precision instrument uses light to direct the parallel synthesis of the DNA sequences one nucleotide at a time. In contrast to other lithography techniques that require expensive, labor-intensive chromium masks, MAS uses graphics files that describe the pattern of light to create a series of virtual masks. Maskless synthesis uses dynamic mirror devices to direct the light onto the substrate following the graphics file patterns with a high level of precision, eliminating the need for masks.

The widespread use of DNA microarray chips is limited by the relatively high cost of this process. For large-scale studies, the cost-per-feature rather than cost-per-chip is of high importance. Therefore, a system and method to increase the number of features per chip to reduce the cost-per-feature is needed.

### The Invention

UW-Madison researchers have developed a system and method for synthesizing DNA microarrays using a device that includes a reduction optics assembly and a target assembly. These new components incorporate image reduction and precision stage motion into the synthesis process, increasing the density of the DNA chip to 25 times the density of a traditional microarray while maintaining the cost per feature. As a result, the system offers a significant reduction in the cost of DNA microarrays by increasing the amount of information contained within the microarray while keeping the consumables necessary for the process constant when compared to similar technologies.

### Applications

- Rapid design and production of high-density DNA microarrays for use in personal medicine, genomic research and bioterror threat detection

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- Lower cost-per-feature than traditional microarray synthesis



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- High level of repeatability in the alignment and overlay of synthesis steps
- Compatible with systems that facilitate feedback on optical system parameters and microarray substrate position

#### Tech Fields

- [Research Tools : Arrays](#)
- [Semiconductors & Integrated Circuits : Lithography](#)

For current licensing status, please contact Jennifer Gottwald at [jennifer@warf.org](mailto:jennifer@warf.org) or 608-960-9854

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