REBL: A maskless ebeam direct write lithography approach using the Reflective Electron Beam Lithography concept

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REBL (Reflective Electron Beam Lithography) is a program for the development of a novel approach for high throughput maskless lithography. The program at KLA-Tencor is funded under the DARPA Maskless Nanowriter Program. This program is specifically targeting for 5 to 7 wafers per hour at the 45 nm node. The system is also being designed for extension to the 32 nm node and beyond.

REBL utilizes several novel technologies to generate and expose lithographic patterns at throughputs that could make ebeam maskless lithography feasible for manufacturing. The REBL program was first described at this conference two years ago[1]. Since that time the program has made steady progress and has now implemented a 2nd generation column and the ~ 1 million beam CMOS Dynamic Pattern Generator (DPG). This paper will review the current system architecture and the progress of REBL in the last two years. This will include the main technologies making REBL unique which are the reflective electron optics, the rotary stage, non-actinic optical registration and the DPG. The projected system throughput performance based on the performance data of the prototype system will also be discussed.

The DPG is a CMOS ASIC chip with an array of small, independently controllable electron mirrors in an array of over 1 million beamlets. This array of electron mirrors act exactly analogous to the DLP technology used in projection television. The massively parallel and individually controlled beamlets reflected from the DPG is the principal enabling technology that provides the high speed maskless pattern generation capability. Fabricating an effective electron mirror proved to be more difficult than first envisioned. This required an extensive development effort to integrate the CMOS logic with a MEMS structure that produces the required mirror performance. In this paper, results of the first 1 million beamlet CMOS/MEMS DPG will be shown along with exposure results written in resist.

1. P. Petric, C. Bevis, A Carroll, H. Percy, M. Zywno, K. Standiford, A. Brodie, N. Bareket, and L. Grella, J. Vac. Sci. Technol. B **27**(1), 161, Jan/Feb 2009.