REBL: A Lithography Solution for High Volume Manufacturing at the 16nm Node

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Reflective Electron beam Lithography (REBL) is a novel concept for high speed maskless projection electron beam lithography. REBL is being developed at KLA-Tencor and is jointly funded through a cost sharing contract with DARPA. The target for the current DARPA contract is to achieve 5-7 wafers per hour throughput at the 45 nm HP (half pitch) node but to be commercially viable the system needs to be extendable to HVM (high volume production) at the 16nm HP node.

The maskless pattern generation capability inherent in REBL is produced by the CMOS Digital Pattern Generator (DPG) chip which has over one million independently controlled pixels. The system is capable of maskless printing of arbitrary patterns with pixel redundancy and gray level exposure at the wafer. The DPG chip interfaces with the electron optics of the columns by means of a micro-lenslet MEMS electrode structure integrated with the CMOS control electronics forming a complex integrated chip. The integration of this chip has proven to be a very difficult process but is now starting to show some results. Results of DPG operation and writing in resist using the rotary stage system will be shown.

The column design of the reflective electron optics has changed considerably during the course of the REBL project. Future advancements and size reduction will permit resist exposure with several columns per wafer. This significantly changes the design of the REBL system to a multi-column architecture which when combined with an advanced linear stage architecture will enable the throughput and resolution required for a NGL system. The changes to the system resulting from the multi-column approach and the resulting performance improvements will be shown.

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