Towards 7-nm node and below technologies by MEBW

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E-beam direct writing (EBDW) is capable of single digital resolution; hence the industry often resorts to e-beam to make single-digital node device in R&D. However its relatively low throughput restricted EBDW development and application to mostly mask making, small volume wafer production, and prototyping. Massive parallelism is the only way to increase throughput. It can be realized economically by the current mature technologies of system-on-chip CMOS circuits, 2.5-D packaging, and micro electro mechanical systems.

Hence recently production-worthy massive electron beam direct writing (MEBDW) approaches, >10,000 e-beams writing in parallel, have been proposed by KLA-Tencor, MAPPER, and IMS. In this presentation, the development status of MEBDW systems towards the 7-nm node and below, will be introduced. In addition, I will present the benefits of MEBW for critical and non-critical layers, as well as the cost reduction opportunities, especially for 450 mm.

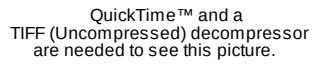

Figure 1: The Debutantes' Ball: At the debutantes' ball, young nano-women gather in their finery at the edge of the stage to weep because none of the nano-boys will not dance with them. The micrograph shows an array of 50 nm wide posts with a periodicity of 100 nm. The posts consist of PMMA on top of an antireflection coating. The substrate consists of a 250 nm thick layer of silicon nitride on silicon. Winner of the 1995 “Most Bizarre Micrograph” prize. Submitted by Tim Savas, Massachusetts Institute of Technology.