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**EBEAM INITIATIVE SURVEY INDICATES NEW EBEAM EXPECTATIONS FOR
PHOTOMASK PRODUCTION**

**Continued semiconductor scaling drives new mask design requirements;
use of complex mask shapes predicted to increase**

SAN JOSE, Calif., September 16, 2014—The eBeam Initiative, a forum dedicated to the education and promotion of new semiconductor manufacturing approaches based on electron beam (eBeam) technologies, today announced the completion of its third annual **eBeam Initiative survey**.

52 industry luminaries representing 29 member companies from across the photomask supply chain participated in the survey.

Respondents provided their opinions on a variety of topics critical to advanced photomask production, including the implementation of **multibeam mask writing**, anticipation of **mask hotspots** as a manufacturing challenge, new expectations for **dose modulation, complex masks** and slower resists, and predictions on the production implementation of extreme ultraviolet (EUV) lithography and complementary eBeam lithography (CEBL). The complete results of the survey will be presented and discussed by an expert panel today during the eBeam Initiative's annual members meeting at the SPIE Photomask Technology Conference in Monterey, Calif., and are available for download at <http://www.ebeam.org/docs/ebeam-initiative-2014-survey.pdf>.

“The eBeam Initiative survey has been a useful instrument in taking the pulse of the photomask ecosystem, and the feedback signals where the eBeam community can make significant contributions to advanced photomask production,” stated **Aki Fujimura, CEO of D2S**, the managing company sponsor of the eBeam Initiative. “For example, the survey results from this year show that dose modulation will be a standard practice, that multibeam-based mask writing is around the corner, and that complex mask shapes are needed. At such an important inflection point in mask making, we’re delighted to be part of a thriving eBeam community.”

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Select Highlights from eBeam Initiative Survey

- A majority (58 percent) of respondents predict that multibeam technology will be used in production by 2016 to address the critical problem of mask write times as the industry moves to smaller geometries.
- Support for **multibeam for mask volume production** is extremely high beyond 2016, with an overwhelming 88 percent of respondents predicting its use for mask production by 2018.
- When asked if the emergence of multibeam technology will propel the industry to adopt **more complex mask shapes**, a majority (60 percent) of respondents agreed for critical-layer 193-nm immersion masks.
- Survey participants unanimously agreed that **dose modulation** would be required for mask writing by 2016.
- Industry luminaries predict that slower resists will be used by 2016 for high-volume mask production.
- **Mask hotspots**, which are wafer-level production issues that are caused when the shapes specified by optical proximity correction (OPC) are not faithfully reproduced on the mask on a per-instance basis, are a significant problem in semiconductor manufacturing at the 28-nm and 20-nm nodes, according to half of all survey respondents—representing an increase over last year.
- Skepticism of **EUV lithography** also increased compared to last year’s survey, with 60 percent of respondents believing EUV lithography would not be used in high-volume manufacturing for system-on-chip (SoC) devices until 2017 or beyond and 35 percent indicating EUV lithography would never be used for SoCs—up from 55 percent and 22 percent, respectively, in last year’s survey.

About The eBeam Initiative

The eBeam Initiative provides a forum for educational and promotional activities regarding new semiconductor manufacturing approaches based on electron beam (eBeam) technologies. The goals of the Initiative are to reduce the barriers to adoption to enable more integrated circuit (IC) design starts and faster time-to-market while increasing the investment in eBeam technologies throughout the semiconductor ecosystem. Members and advisors, which span the semiconductor ecosystem, include: Abeam Technologies, Advantest, Alchip Technologies, AMTC, Applied Materials, Artwork Conversion, Aselta Nanographics, Cadence Design Systems, CEA-Leti, D2S, Dai Nippon Printing, EQUIcon Software GmbH Jena, eSilicon Corporation, Fastrack Design, Fraunhofer CNT, Fujitsu Semiconductor Limited, GenlSys GmbH, GLOBALFOUNDRIES, Grenon Consulting, Hitachi High-Technologies, HOYA Corporation, IMS CHIPS, IMS Nanofabrication AG, JEOL, KLA-Tencor, Maglen, Mentor Graphics Corporation, Multibeam Corporation, NCS, NuFlare Technology, John Chen from NVIDIA, Petersen Advanced Lithography, Colin Harris from PMC-Sierra, Riko Radojic from Qualcomm, Sage Design Automation, Samsung Electronics, STMicroelectronics, Synopsys, tau-Metrix, Tela Innovations, TOOL Corporation, Toppan Printing, Vistec Electron Beam GmbH, and Hugh Durdan from Xilinx. Membership is open to all companies and institutions throughout the electronics industry. To find out more, please visit www.ebeam.org.

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