



**Agency Contact:**

David Moreno

**MCA**

Tel: +1-650-968-8900, ext. 125

E-mail: [dmoreno@mcapr.com](mailto:dmoreno@mcapr.com)

**EBEAM INITIATIVE SURVEY REPORTS CONFIDENCE IN EUV LITHOGRAPHY AND  
MULTI-BEAM TECHNOLOGY FOR HIGH-VOLUME SEMICONDUCTOR AND PHOTOMASK PRODUCTION**

**Survey results to be presented at BACUS 2016**

**SAN JOSE, Calif., September 12, 2016**—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 fifth annual eBeam Initiative members' perceptions survey. A record 73 industry luminaries representing more than 30 different companies from across the semiconductor ecosystem—including photomasks, electronic design automation (EDA), chip design, equipment, materials and manufacturing—participated in this year's survey. The eBeam Initiative also completed its second annual mask makers' survey with feedback from 10 captive and merchant photomask manufacturers.

Among the results of the members' perception survey, respondents remained optimistic in the implementation of EUV lithography for semiconductor high-volume manufacturing (HVM), with confidence in EUV increasing over other next-generation lithography (NGL) techniques compared with last year's survey. In addition, expectations on the use of multi-beam technology for advanced photomask HVM by the end of 2018 continue to remain strong. Results from the eBeam Initiative's second annual mask makers' survey indicate several surprising trends on mask making related to write times, turn-around time (TAT) for mask manufacturing, resists, mask yields and other critical issues.

The complete results of both surveys will be presented and discussed by an expert panel later today during the eBeam Initiative's annual members meeting at the SPIE Photomask Technology Conference in San Jose, Calif., and will be available for download following the meeting at [www.ebeam.org](http://www.ebeam.org).

**Select Highlights from eBeam Initiative Member Survey**

- 68 percent of respondents predict that multi-beam technology will be used for photomask HVM by the end of 2018 to address the critical problem of mask write times as the industry moves to smaller geometries and more complex mask features.
- Expectations on the availability of EUV lithography continue to be positive, while pessimism has decreased significantly, with only six percent of respondents indicating EUV will never be used in HVM versus 35 percent two years ago.
- Among five NGL technologies being considered for advanced semiconductor fabrication, respondents predict EUV as the most likely method to be used in at least one manufacturing step by 2020, with an average confidence rating of 60 percent—mirroring similar results in last year’s survey.
- When comparing NGL techniques under the same criteria across different application segments (logic, memory and microprocessor), confidence in NIL was on par with that of EUV in memory manufacturing—at 40 percent versus 44 percent, respectively.
- Nearly all respondents acknowledged that slower resists will be needed for HVM mask production by the end of 2018, with 43 percent indicating resists will be at least 2X slower compared to today.

**Select Highlights from Mask Makers Survey (data from Q3 2015 through Q2 2016)**

- According to the mask makers’ survey, the largest data volume reported for any mask level was 16 Terabytes—about 20X higher compared to what was reported in last year’s survey.
- At the same time, average mask write times actually decreased from last year’s survey where the lowest reported was 4.0 hours, while the 2016 weighted average was 4.0 hours; the longest reported mask write time also decreased over last year (from 72 hours to 48 hours).
- The average design-to-mask TAT continues to increase with each new node as a general trend, and is approaching 10 days for the 7-nm to 10-nm node range.
- The average mask yield reported overall across all mask types included in the survey (EUV, Alternating Phase Shift, Attenuated Phase Shift and Binary) was 96 percent, while the average yield reported for EUV masks was 82.4 percent based on a small sample size.

“I want to thank all of our members for coming out in force and participating in record numbers in our fifth annual members’ perception survey,” stated Aki Fujimura, CEO of D2S, the managing company sponsor of the eBeam Initiative. “From the very beginning, this survey has served as a valuable tool in getting the pulse of the semiconductor and photomask ecosystem on the issues surrounding eBeam technology that are of greatest concern to our members in order to guide our education and promotion efforts, and the results of this year’s survey are no different. It’s particularly interesting to observe the dramatic turn-around in the confidence of EUV lithography as compared to only a few years ago, as well as the rising confidence in multi-beam technology for high-volume production mask making. These and other results reflect the fact that while the industry continues to face many challenges as we push further along Moore’s Law, the ecosystem continues to show remarkable resiliency in rising to the occasion and tackling those challenges.”

Added Fujimura, “I also want to thank Brian Grenon for his role in championing our second annual mask makers’ survey and helping to solicit participation from many key players who have provided their valuable input on critical trends in mask manufacturing. Brian, who is himself a pioneer in the mask industry, will be presenting the results of this survey during the eBeam Initiative meeting and then lead the discussion with our luminary panel and audience members on what these results mean to the semiconductor and photomask supply chain as a whole.”

***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, which span the semiconductor ecosystem, include: aBeam Technologies; Advantest; Alchip Technologies; AMTC; Applied Materials; Artwork Conversion; Aselta Nanographics; Cadence Design Systems; Canon; CEA-Leti; D2S; Dai Nippon Printing; EQUIcon Software GmbH Jena; eSilicon Corporation; Fraunhofer CNT; Fujitsu Semiconductor Limited; GenISys GmbH; GLOBALFOUNDRIES; Grenon Consulting; Hitachi High-Technologies; HOLON CO., LTD; HOYA Corporation; IMS CHIPS; IMS Nanofabrication AG; JEOL; KLA-Tencor; Maglen; Mentor Graphics Corporation; Multibeam Corporation; NCS; NuFlare Technology; Petersen Advanced Lithography; Photonics; Sage Design Automation; Samsung Electronics; STMicroelectronics; Synopsys; tau-Metrix; Tela Innovations; TOOL Corporation; Toppan Printing; Toshiba; UBC Microelectronics; Vistec Electron Beam GmbH; Xilinx and ZEISS. Membership is open to all companies and institutions throughout the electronics industry. To find out more, please visit [www.ebeam.org](http://www.ebeam.org).

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