

**PRESS RELEASE**

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**For Immediate Release**

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## **Multibeam Adds Two E-Beam Patents for Advanced IC Processing**

Innovative solutions enable precise, local deposition and etch directly from the design layout database in the fabrication of advanced devices

**SANTA CLARA, CA - October 13, 2016** - Multibeam Corporation today announced the expansion of its e-beam patent portfolio with two innovations that enhance fabrication processes of advanced ICs. The new patents underscore the company's leadership in developing a high-throughput e-beam platform that currently enables three major applications: Complementary E-Beam Lithography (CEBL) to reduce litho cost, Direct Electron Writing (DEW) to enhance device security, and E-Beam Inspection (EBI) to speed defect detection and yield ramp.

Significantly, the inventions broaden the common platform beyond current applications by leveraging two key attributes: precision placement of electrons on the wafer to activate chemical processes such as deposition and etch, and multi-column parallel processing to increase throughput.

### **Patent #9,453,281**

Direct deposition facilitates patterning of IC layers through accurate deposition of material in accordance with the design layout database. Highly localized process control enables precision fabrication of advanced 3D device structures. In some applications, such as restoring interconnect continuity, the activation electrons are directed to repair defects that are detected during wafer inspection.

### **Patent #9,466,464**

Direct Etch allows activation electrons to be directed according to the design layout database. Process steps to form etch masks prior to etching are no longer needed. Costs are reduced and edge placement accuracy is improved by eliminating or reducing errors associated with photomasks, litho steps, and hard masks. With highly localized process control, etch depths can vary to accommodate advanced 3D device structures.

According to David K. Lam, Multibeam Chairman, "Both patents announced today can dramatically reduce the cost and errors associated with masks by generating patterns directly from the design layout database." He confirmed that his company's intellectual property momentum remains strong with more patent filings in progress.

### **About Multibeam**

Multibeam Corporation is a leading electron-beam technology innovator. With 36 patents filed, 25 issued, the Silicon Valley pacesetter focuses on developing multicolumn e-beam systems and platforms for three major applications: Complementary E-Beam Lithography (CEBL), Direct Electron Writing (DEW), and E-Beam Inspection (EBI).

Multibeam Pilot™ CEBL Systems work in a hybrid mode with 193nm ArF immersion (193i) lithography to pattern cuts (of lines in "lines-and-cuts" layout) and holes (i.e., contacts and vias) with no masks. Pilot™ CEBL

complements 193i and eliminates the soaring costs associated with optical multi-patterning in the manufacture of advanced ICs. Further, Pilot™ CEBL systems can seamlessly incorporate multicolumn EBI. With feedback and feedforward as well as die-to-database comparison, CEBL-integrated multicolumn EBI greatly accelerates yield ramp.

Multibeam ChipLock™ DEW Systems embed security information in each IC including chip ID, MAC address, and private key encryption. The chip ID guards against counterfeiting and enables supply chain traceability while encryption keys are crucial in authenticating software. IC-embedded security complements software security and extends from IoT to other ICs that populate automobiles, power grids, manufacturing plants, communication networks, transportation networks, and other critical infrastructure.

Based in Santa Clara, California, Multibeam is led by Dr. David K. Lam, the founder and first CEO of Lam Research who successfully guided the development and market penetration of his eponymous company's first fully automated plasma etch system. Widely recognized as a key contributor to the growth of the semiconductor industry, Dr. Lam was inducted into the Silicon Valley Engineering Hall of Fame in 2013.

For more information, visit [www.multibeamcorp.com](http://www.multibeamcorp.com).