

PRESS RELEASE

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For Immediate Release

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Multibeam Secures \$35M Defense Contract to Build E-Beam System

**Advanced multicolumn e-beam platform enables new solutions for IC makers,
including low-volume production litho and embedded chip security**

SANTA CLARA, CA - May 25, 2017 - Multibeam Corporation today disclosed it has been awarded a \$35 million contract from the U.S. Department of Defense to manufacture an advanced E-Beam system for IC production by 2020 or sooner. The production-system award, sponsored by the Air Force Research Laboratory (AFRL), culminates the company's prior Defense-funded development efforts, spanning proof-of-concept to proof-of-feasibility to production readiness. Part one of the two-part contract is underway.

The Silicon Valley firm's multi-e-beam technology currently addresses two applications: Low-volume production lithography and IoT device embedded security.

Need for Cost-Efficient, Low-Volume Production Lithography

"DoD foundries make a wide variety of custom chips in small quantities - the exact opposite of commercial practice. This creates a big challenge due to soaring mask cost," noted Dr. David K. Lam, Multibeam chairman. "Since lithography equipment today is designed for high-volume manufacturing, it is unsuited and very costly for low-volume production. Multibeam's multi-e-beam lithography solves both mask and equipment cost problems with its miniature column technology and modular system architecture.

"In addition, Multibeam's maskless lithography system patterns certain "critical layers", complementing optical lithography that prints all other layers - an approach known as complementary e-beam lithography or CEBL. Multibeam's CEBL solution enhances both production and security of DoD microchips.

"DoD chip designs often challenge technology limits in pursuit of advanced features and functions; Multibeam's solution reduces cost and time in developing such ICs by eliminating the need for a new set of masks in each re-spin.

"Further, all mini-columns in an array write independently and in parallel. This provides unique flexibility in production lithography and speeds cycles of learning with multi-project wafers.

"While not part of this contract, high-volume manufacturing needs are also met with Multibeam's approach," asserted Dr. Lam. "Our modular system architecture enables higher throughput with additional e-beam writing modules integrated in a cluster system."

Critical Need to Fortify IoT Device Security

"The Internet of Things (IoT), hailed as a major market growth driver, presents cybersecurity challenges never before faced by the semiconductor industry. Inadequate security in IoT devices now threatens our personal safety and privacy as well as national economy and security," said Dr. Lam.

Most IoT devices, performing simple functions and machine-to-machine communication, possess scant resources and memory with no built-in security. Once breached, an IoT device becomes a staging point for attacks on other devices and systems. While network and software security products continue to advance and improve, they have been unable to thwart hacking. Multibeam's device-level security solution complements other solutions to bolster cyber defense.

According to Dr. Lam, this solution is built on the same multi-e-beam direct write technology that underlies the low-volume production lithography system disclosed today. The multi-e-beam system writes chip-specific data in each IC during fab production - just like doing lithography.

Device security embedded deep into each chip may include serialized ID, MAC address, and device-unique key (DUK). Chip ID guards against counterfeiting while deep embedding prevents tampering; MAC address is for internet communication. The DUK fulfills the most critical cybersecurity need, which is device-level hardware "Root-of-Trust" to authenticate software and prevent unauthorized access.

"Since the first ICs were manufactured about a half century ago, better, faster, cheaper has been the semiconductor industry's motto," remarked Dr. Lam. "With escalating and more alarming breaches of cybersecurity, we must now add more secure to this mantra."

About Multibeam

Multibeam is a leading electron-beam technology innovator. Over the past two years, the company has doubled its IP portfolio. Of the 40 patents filed, 29 have been awarded by the USPTO. **Patented applications** include Direct Electron Writing (DEW) to embed security in IC devices; Complementary E-Beam Lithography (CEBL) to reduce mask cost, process complexity, cycle time, and yield impact due to optical multi-patterning; Direct Deposition/Etch (DDE); and E-Beam Inspection (EBI), in addition to multi-column charged-particle technology. 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.