Company Contacts:
Katsutomo Terashima
Gigaphoton, Inc.
Tel: +81-285-28-8410
Fax: +81-285-28-8439
E-mail: katsutomo_terashima@gigaphoton.com

Yutaka Katsuki
Gigaphoton, Inc.
Tel: +81-285-28-8415
Fax: +81-285-28-8439
E-mail: sales@gigaphoton.com

Gigaphoton Confirms Its Debris Mitigation Technology Using Magnetic Fields for EUV Light Sources

Pushing Forward a Mass-production Plan of LPP Light Source for EUV Lithography to be shipped in the beginning of 2012

OYAMA, JAPAN; July 12, 2011 — Gigaphoton Inc., a major lithography light source manufacturer, today announced that the company has confirmed its original technology for mitigating debris with magnetic fieldsfor laser-produced plasma (LPP) light sources, scheduled to be shipped in the beginning of 2012. Gigaphoton has been working on the development of laser-produced plasma (LPP) light sources for EUV lithography with its unique technologies in pursuit of higher output and better CoO since 2002, and proposeda number of unique technologies including mitigation of debris by using magnetic fields. This announcement confirms that Gigaphoton has proven in production-level light sources that its technology of debris mitigation with magnetic fields, which had been verified a number of times, is capable of removing 92% of debris. Therefore, it has made a significant step toward initial shipment of a mass production model in the beginning of 2012.

The debris mitigation technology with magnetic fields verified at this time allows greater reduction in Sn (tin) deposited on the collector mirror as well as in damage to the multi-layer film of the mirror. Gigaphoton considers that this will become indispensable for full-production models of LPP light sources for EUV lithography.

The LPP light source allows radiation by a CO_2 laser of the Sn target (droplets) to cause emission of EUV. Sn debris, such as Sn fragments and Sn atoms, deposits on the collector mirror and Sn ions damage the multi-layer film on the collector mirror. As a result, the reflectance of the collector mirror is lowered within a short period of time, thereby lowering the output. This is a serious problem for full-production light sources.

The Gigaphoton-proposed technology for debris mitigation with magnetic fields uses an optimum combination of the pre-pulse generated by a solid-state laser and the main pulse generated by a CO_2 laser to suppress the generation of Sn fragments and neutral Sn atoms and ionize most of the Sn in each droplet. Ionized Sn is guided to the Sn catcher by magnetic power and then removed to minimize deposition on and damage to the collector mirror.

During the verification experiment, the main pulse of the CO_2 laser radiates each 20 μm diameter droplet following the pre-pulse by a solid-state laser to completely eliminate Sn fragments. As a result, it is has been confirmed that 93% of droplets are ionized, and then optimum magnetic power applied to these droplets guides more than 99% of Sn ions to the Sn catcher. This allows the minimization of damage to the multilayer film on the collector mirror surface. It also becomes a clue for making the mirror reusable.

The remaining 7% of non-ionized Sn atoms after laser radiation may slowly deposit on the collector mirror. However, Gigaphoton uses etching gas to allow regular cleaning and thereby remove all of these remaining Sn atoms.

As double-pattern lithography with a 193 nm immersion lithography tool approaches its resolution limit, an EUV light source with a much shorter wavelength is considered to be the next-generation lithography solution that can support Moore's Law for multiple device generations to come. In order to implement the EUV lithography tool, stabilized operation of the light source has been the major challenge among the technology elements. Overcoming this challenge, therefore, has been considered worthy of attention.

“It has been confirmed by this achievement with the mass-production level LPP light source that our unique LPP light source technologies can be implemented to ensure stable operation at lower running cost. I believe this will further increase momentum for device manufacturers to introduce EUV lithography tools as the next-generation lithography technology. Gigaphoton has already started operating the factory dedicated to initial mass-production of EUV light sources in order to meet our customers’ request for shipment at the beginning of 2012. So, we are on track to prepare for the EUV business,” said Dr Yuji Watanabe, president of Gigaphoton.

About Gigaphoton

Since its founding in 2000, Gigaphoton has developed and delivered user-friendly, high-performance DUV laser light sources used at major semi-conductor chipmakers in the Pan-Asian, US, and European regions. Gigaphoton's patented, innovative LPP EUV technology solutions will lead the way to a cost-effective, highly productive lithography source for high-volume production. With a global business outlook, Gigaphoton strives to be the world’s number one lithography light source provider, focusing on end-user needs in every phase of its business, from research and development to manufacturing to best-in-class reliability and world-class customer support. See http://www.gigaphoton.com.