

NEW TECHNOLOGY FROM LAB TO FAB: A CASE STUDY ON EUV LITHOGRAPHY

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Extreme Ultra Violet lithography (EUVL) is the most advanced patterning technology for semiconductor device production. The first experiment was performed in 1984 by Dr. Hiroo Kinoshita at NTT (Japan), but EUV lithography was just one of the candidates for advanced lithography technologies until the mid-1990s. EUV wave does not exist on earth, and is very hard to make. Once it is exposed to any material (including the air), it disappears due to strong absorption. In order to generate and manipulate EUV waves for semiconductor patterning process, drastic changes should have been made to every component in lithography system.

Due to the continuous efforts to solve the technical issues, EUV lithography is going to be inserted into high volume manufacturing from this year. It took more than 35 years to get ready for industrial application since the first pioneering studies on EUV lithography. The research on EUV lithography started from mid-1980s in Japan, U.S. and Europe. However, it was 1999 when the basic research on EUVL was started at a university lab. In 2002, a national project on EUVL was launched with the help of government funding, and a couple of research groups in academia and local industries started to build fundamental infrastructures for EUVL. A dedicated beamline in PAL (Pohang Accelerator Laboratory) was installed, and many research tools were built. That was about 15 years behind.

Through continuous research and investment, EUV lithography is now ready for the insertion into mass production of next generation semiconductor chips with a significantly improved performance. And this is already happening in Korea ahead of U.S., Japan and Taiwan. This is one of the best practices of R&D support by government at pre-competitive stage. The R&D funding by the government was an initiator for the long-term and massive investment in new technology by local industries. By the adoption of EUVL technology, Korean semiconductor industry will be reformed to be competitive in the field of foundry business (also fabless business) in addition to the memory business.

During the presentation, the short history of R&D investment on the new technology (EUV lithography) will be introduced and the benefits/limitation of the government support on R&D will also be discussed.