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ERL based EUV-FEL light source for lithography

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In extreme ultraviolet (EUV) lithography, high volume manufacturing recently started using a laser-produced plasma (LPP) source of 250-W power at 13.5 nm. However, development of a high-power EUV light source is still very important to overcome stochastic effects with a high throughput. The required EUV power to realize the 3-nm node and beyond with a high speed of future scanners is estimated to be more than 1 kW [1]. We have designed and studied an ERL-based EUV-FEL for future lithography [2-6] and showed that it can provide EUV power of more than 1 kW for ten scanners simultaneously. It is also upgradable to a "Beyond EUV" FEL light source that performs much finer pattering with shorter wavelength light (~6.7 nm). In addition, it can variably control the polarization of the EUV light, which might be utilized for high-NA lithography. Switching to the EUV-FEL light source from the LPP source can greatly reduce electric power consumption per scanner or 1-kW EUV power and it is suitable for sustainable semiconductor technologies and systems [7]. In this talk, I will present the ERL-based EUV-FEL light source for future lithography and the related activities.

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