EUV lithography and actinic mask inspection

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Extreme UV (EUV) lithography operating at 13.5 nm is being tested by major semiconductor companies all over the world as the next generation lithography technique. Various inspection technologies are being developed for EUV mask inspection as well. The EUV mask is patterned on a reflective multilayer blank mask with a sharp reflection peak at 13.5 nm. Unlike the previous deep UV (DUV) lithography that used transmission type masks and could be inspected using the ArF laser at 193 nm, EUV masks require actinic mask inspection using the same 13.5 nm wavelength as EUV lithography itself. The actinic inspection tool (AIT) using zone-plates and aerial image metrology system (AIMS™) can provide direct imaging of the mask, but these zone-plates are very expensive, bulky, and hard to manufacture. Meanwhile, a coherent scattering microscopy (CSM) mask inspection tool is relatively easy to construct and cheap, but does not provide a direct image of the mask. Instead, it requires image reconstruction from the mask diffraction patterns. In this presentation, we describe a coherent EUV light source using high-order harmonic generation (HHG) and its use to measure the critical dimensions (CDs) of the EUV mask with various L/S by the CSM mask inspection tool.

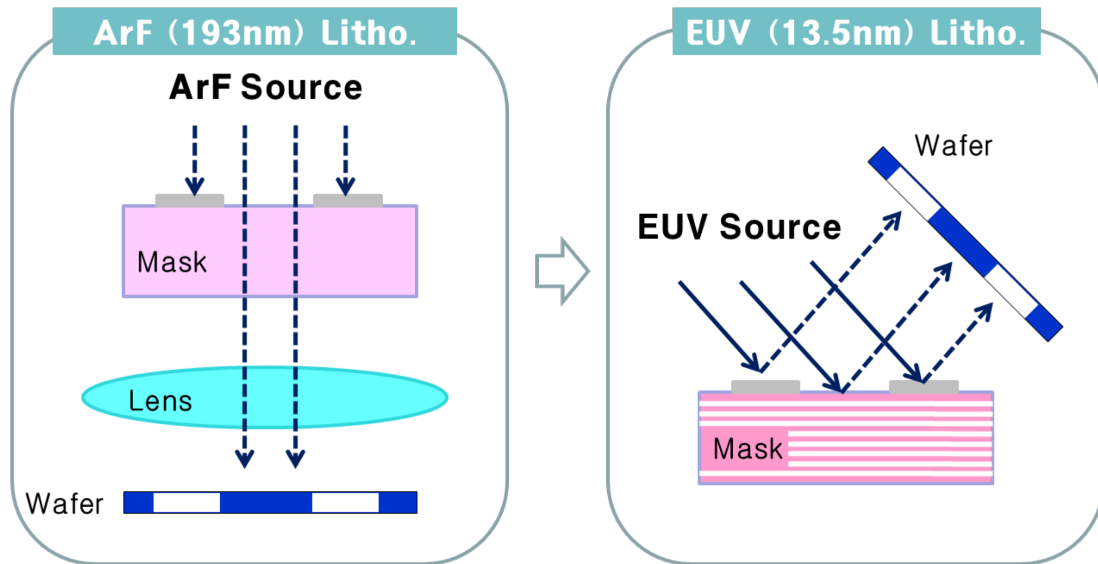

Fig. 1. Comparison of masks and optical systems for ArF (transmission type) and EUV (reflection type) lithography.