High-NA EUV Lithography exposure tool for EUV roadmap extension

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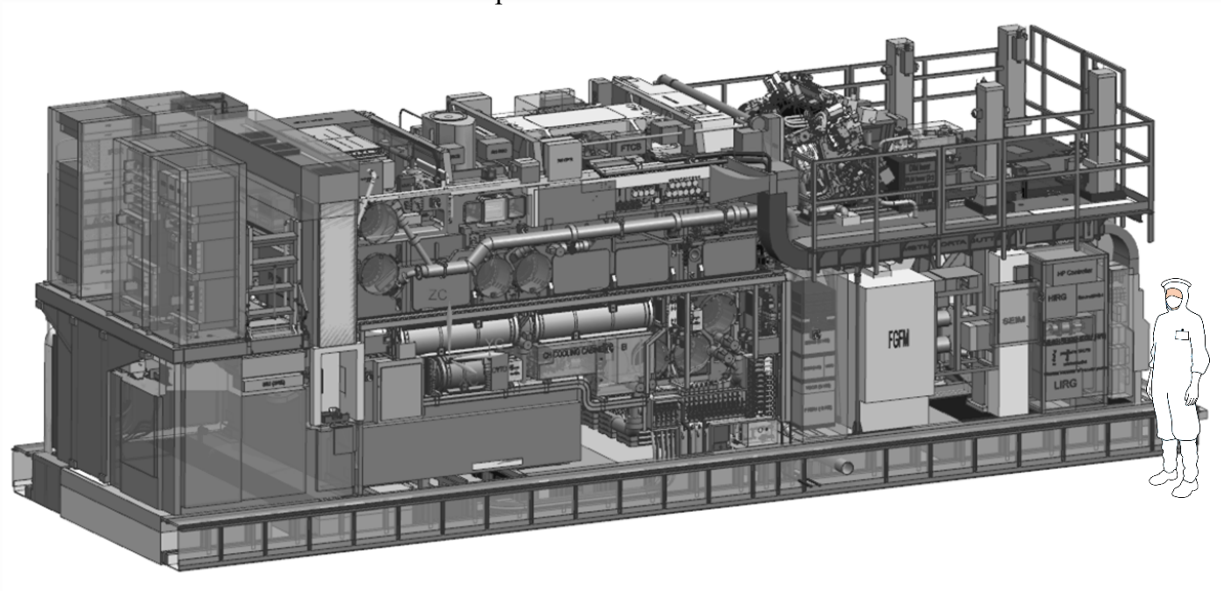
While EUV systems equipped with a 0.33 Numerical Aperture (NA) lens are being applied in high volume manufacturing, ASML and ZEISS are in parallel ramping up their activities on an EUV exposure tool with an NA of 0.55.

The purpose of this so-called high-NA scanner, targeting an ultimate resolution of 8nm, is to extend Moore's law for another decade.

A novel anamorphic lens design, capable of providing the required Numerical Aperture, has been identified; this lens will be paired with new, faster stages and more accurate sensors enabling the tight focus and overlay control needed for future nodes.

In this paper we will outline the advantages of High-NA. Without additional measures, printing smaller features implies that fewer photons will define these features, resulting in larger feature variability (Local CDU of LCDU) due to the stochastic properties of light. To ensure proper printing of these smaller features, the larger NA of the High-NA scanner provides good aerial image contrast. Together with an increased transmission and larger EUV source powers, more photons will be delivered to the wafer, right where they are needed. This will lead to an improved LCDU and extreme low defect printing rates, while maximizing the effective throughput for patterning economics.

Next to this, an update will be given on the status of the developments at ZEISS and ASML. Buildings, cleanrooms and equipment are being constructed, mirror production is ramping up, many tests are carried out to ensure a smooth implementation.



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(175 word bio)

Jan B.P. van Schoot, PhD, is senior principle architect at ASML, dept of System Engineering, based in Veldhoven, The Netherlands.

Van Schoot studied Electrical Engineering at Twente University of Technology. He received his PhD in Physics on the subject of non-linear optical waveguide devices in 1994 and held a post-doc position studying waveguide based electro-optical modulators.

He joined ASML in 1996 and was Project Leader for the Application of the first 5500/500 scanner and its successors up to 5500/750. In 2001 he became Product Development Manager of Imaging Products (DoseMapper, Customized Illumination). In 2007 he joined the dept of System Engineering. He was responsible for the Optical Columns of the 0.25NA and 0.33NA EUV systems. After this he worked on the design of the EUV source. He was the study leader of the High-NA EUV system and is now responsible for the High-NA optical train.

He holds over 35 patents and presents frequently at conferences about photo lithography.