# Design Strategy for Improving EUV Contact Hole Resist Performance

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The target critical dimensions (CD) of contact hole (CH) features for the 10nm lithography node and beyond continue to shrink. The most recent ITRS roadmap lists 2015 DRAM CH and Logic Metal 1 CH CD targets of 23 & 21nm half-pitch, respectively.[1] ASML expects to have NXE3300 EUV exposure tools with sufficient power for use in commercial IC manufacture in 2015.[2] We have developed chemically amplified EUV resists with 20nm CH resolution and good sensitivity. Resist resolution, sensitivity and critical dimension uniformity (CDU) can be improved through manipulation of dissolution contrast, acid diffusion control, absorption, photoacid generator (PAG) density and PAG efficiency. We report on the general impact of these factors and in particular on the impact of longer wavelength out-of band radiation (OOB) on CH performance. OOB radiation is a consequence of the commercial EUV source design, and although the raw source power is greater with OOB, it reduces the optical contrast. We show that resists containing PAGs with high EUV sensitivity but decreased sensitivity to longer exposure wavelengths show improved CDU vs. resists containing PAGs with higher sensitivity to OOB when exposed to EUV radiation containing up to 20% 193nm, 248nm, or broadband flare.

[1] http://www.itrs.net/Links/2012ITRS/2012Tables/Litho_2012Tables.xlsx
[2] http://spectrum.ieee.org/semiconductors/devices/euv-chipmaking-inches-forward