

LITHOGRAPHIC APPARATUS AND DEVICE
MANUFACTURING METHOD UTILIZING DATA FILTERING

ABSTRACT OF THE DISCLOSURE

An apparatus and method are used to form patterns on a substrate. The comprise a projection system, a patterning device, a low-pass filter, and a data manipulation device. The projection system projects a beam of radiation onto the substrate as an array of sub-beams of radiation. The patterning device modulates the sub-beams of radiation to substantially produce a requested dose pattern on the substrate. The low-pass filter operates on pattern data derived from the requested dose pattern in order to form a frequency-clipped target dose pattern that comprises only spatial frequency components below a selected threshold frequency. The data manipulation device produces a control signal comprising spot exposure intensities to be produced by the patterning device, based on a direct algebraic least-squares fit of the spot exposure intensities to the frequency-clipped target dose pattern. In various examples, filters for pattern sharpening, image log slope control, and/or CD biasing can also be used.

Figure 2