

A Model Based Hybrid Proximity Effect Correction Scheme Combining Dose Modulation and Shape Adjustments

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Electron beam lithography is a well established manufacturing technology, especially for mask making. While dose only proximity effect correction is often sufficient for mask making, direct write applications have to deal with feature sizes much closer to the resolution limits of the e-beam tool and the resist process, and therefore need more freedom for the correction than a pure dose modulation provides.

We present a general approach to combine a model based dose modulation scheme and a model based shape adjustment scheme into a hybrid proximity effect correction scheme. We apply this general approach to two different dose modulation schemes that give rise to fundamentally different hybrid schemes and use an OPC engine for the model based shape adjustment.

The two hybrid methods are used to compute corrections for some test patterns and a more complex design, using a model calibrated for an e-beam tool with 50keV acceleration voltage. We evaluate the quality of the results both for nominal process conditions and in the presence of process variations. The results are also compared against the corresponding results for dose only correction.