

How Variable is Variable Shaped Beam?

Ines Stolberg, Matthias Slodowski, Bernd Schnabel, Ulf Weidenmueller
Vistec Electron Beam GmbH, Jena (Germany)

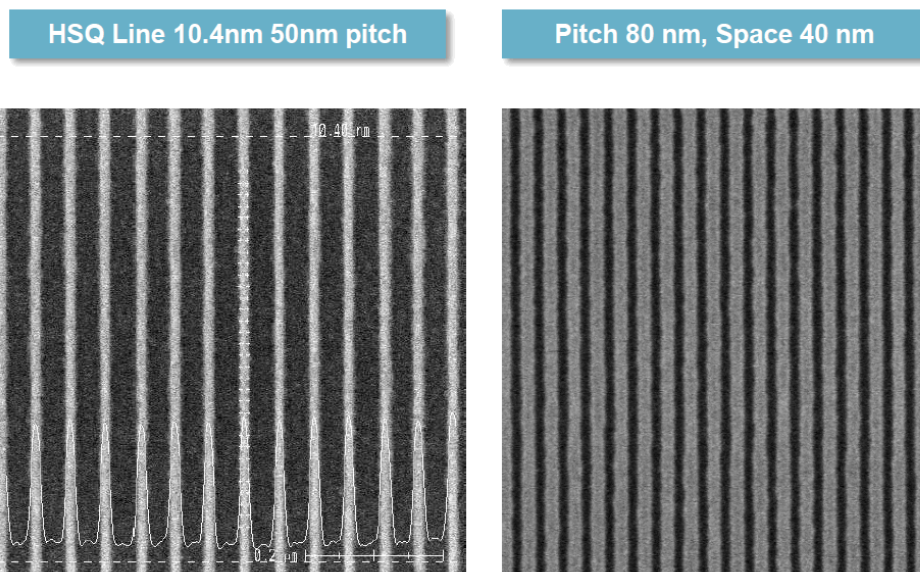
These days Variable Shaped Electron Beam (VSB) lithography is a well established and valuable technology.

Its introduction goes back to the early 70ies, when it was used for direct write on wafers for industrial applications, e.g. at IBM. Later on VSB was more and more used for mask writing too, when optical lithography requested for more advanced mask. Since then the VSB technology has been continuously improved and serves a huge range of applications.

While advanced research mainly focuses on the best resolution and highest flexibility, industrial applications have to meet highest demands with respect to throughput, large area positioning accuracy, reliability, tool utilization rates as well as automatic substrate handling and tool operation.

Constantly increasing performance requirements and an ever growing system complexity are the most challenging aspects of the lithography tool development. On the other side there are application related demands, which require dedicated but also variable hardware and software solutions.

The paper will discuss some application demands and how they can be transformed into hard - and software requirements on the VSB equipment side. Parameters as e.g. maximum shot size, total current and current density are not independent of each other. Keeping the diversity of the application spectrum as large as possible, compromises have to be made. An alternative solution is the tuning of electron-beam lithography systems for a dedicated application or even for a specific technology node (not discussed in this paper). The presentation will also briefly touch resolution of a VSB system and question its physical limits. In addition to sophisticated hardware and software solutions operating the tool itself, a dedicated data preparation package is essential for an adequate performance. On the basis of application examples the potentials as well as the high flexibility of VSB lithography systems will be discussed. Direct write on compound semiconductor materials will exemplarily be presented in more detail. Finally, the impact of the data preparation process on the lithography performance will be shown.



Vistec SB3050 resolution example