

**Magnetic Fields and the Technology Challenges They Pose to Beam-Based
Equipment as Process Technology Progresses into the Future
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As semiconductor devices shrink in size to accommodate the expectations of Moore's Law the need for higher resolution beam-based metrology equipment such as Scanning Electron Microscopes (SEMs) and Transverse Electron Microscopes (TEMs), as well as beam-based writing equipment will increase. The electron and ion beams used within these types of equipment are sensitive to very small changes in magnetic force applied to beam that can impact equipment and process performance. This phenomenon is a result of changes in Alternating Current (AC) and Direct Current (DC) magnetic flux density at the beam column which causes deflections of the beam. Currently the most sensitive beam based microscope manufacturers require an ambient magnetic field environment that does not exceed .2milli-Gauss. Studies have shown that such low levels of magnetic flux density can be extremely difficult to achieve. Items such as elevators, scissor lifts, vehicles, metal chairs, and doors moving in time and space create distortions in the Earth's magnetic field that can exceed .2mG at the beam column. In addition it is known that changes in the Earth's magnetic field caused by solar flares, earth quakes, and changes in the Earth's core all cause changes in the magnetic field that can exceed the .2mG.

This paper will provide the reader with the basic understanding of the emerging problem, will discuss the environmental and facility level challenges associated meeting such stringent magnetic field environments, will discuss some of the mitigation techniques used to address the problem, and will close by discussing needs for further research in this area to assure we are pre-positioned for even more stringent magnetic field environmental requirements as process technology strives to keep up with Moore's Law.