Influence of magnetic gradient fields on the Hall effect

B. Berkes
MCS Magnet Consulting Services
Wettingen, Switzerland

Summary

The behavior of the Hall effect in a Hall device exposed to a magnetic gradient field was already theoretically investigated several decades ago. However, due to the lack of very precise instrumentation at that time, particularly high resolution linear encoders and DVM's - both necessary to detect the small Hall voltage variations due to the magnetic gradient fields, prevented until now the experimental proof of the calculations.

For the first time measurements with Hall sensors with their supply current direction once perpendicular and then parallel to the magnetic gradient field direction were published recently. Although these measurements were performed for different reason and on very low field and gradient level, their results gave some idea about the influence of magnetic gradient fields on the Hall voltage

The basic equations from investigations - extended by additional calculations - were then used to determine the errors of the Hall voltage due to the influence of an undulator magnetic gradient field for point as well as for integral field measurements. In another example it was possible to show that due to the gradient fringe field of a dipole magnet, causing error terms with the first and second field derivatives, the measured effective field length will be always smaller than the true one.