

3D Gradient Shimming: A new Tool to Adjust Resolution

Product used : Nuclear Magnetic Resonance (NMR)

Magnetic field generated by superconducting magnets (SCM) changes with time. In addition, magnetic field homogeneity is also disturbed by each NMR sample. For these reasons, it is usually desirable to adjust resolution on each sample in order to achieve high resolution in solution NMR.

Resolution adjustment, also called shimming, was traditionally done by manually adjusting electric currents in shim coils. Later, gradient shimming was introduced which made shimming much faster (from tens of seconds to a few minutes) and automatic. However, Z-axis gradient shimming is capable of adjusting the axial shims, *i.e.* shims along Z-axis (Z¹-Z⁶). The radial shims (X, Y, XZ, YZ, etc.) still need manual adjustment which requires operator's experience and might be very time consuming. If the radial shims are not adjusted correctly, so-called spinning sidebands (SSB) are readily observed in NMR spectra of spinning samples. These SSBs may complicate analysis of impurities or decrease accuracy of quantitative measurements. If sample spinning is stopped under such conditions, resolution is poor. For this reason, it is highly desirable to adjust all shims, both axial and radial, efficiently and automatically.

Anybody can adjust radial shims using 3D gradient shimming

3D gradient shimming has become available since Delta NMR software Version 5.2. It is automatic and easy to use. The figure below compares spectra of chloroform before and after 3D gradient shimming (non spinning sample). The 3D gradient shimming took less than 30 minutes.



¹H spectra of chloroform before (left) and after 3D shimming (right).

Available solvents

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Chloroform-*d*, acetone- d_6 , D_2O and some other deuterated solvents can be used. For this reason, any standard sample is suitable to keep your NMR system in a great condition by regularly using 3D gradient shimming.

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