



Coil homogeneity and the effect of rotor filling on the spectral resolution

A. E. Berns (1) and P. Conte (2)

(1) Forschungszentrum Juelich GmbH, ICG 4, Juelich, Germany (a.berns@fz-juelich.de, +49-2461-612518), (2) Università di Palermo, ITAF, Palermo, Italy

Spectral resolution depends upon the length (N) of the transform interval: $N=F/\Delta f$, where Δf is the smallest frequency difference which can be distinguished at a given sampling frequency F. Δf depends on the signal width, which, in turn, is influenced by the relaxation time of the sampled signal. Relaxation time is affected by the external magnetic field and the applied pulse sent to the sample through the transmitter/receiver coil. The pulse length homogeneity throughout this coil is a major factor affecting NMR resolution and also the sensitivity of the measurement. So far, this fact is only considered when small sample amounts are used, where care should be taken to place the sample in the centre of the coil to maximize the signal. However, no work has been presented as to how much the top and bottom part of the sample might worsen the spectral resolution of the NMR spectrum.

In this work NMR experiments have been performed where constant sample amounts of 2 mm fill height have been measured at different heights in the rotor. At every height the absolute signal intensity and the half height width of the signals were determined as indicators for sensitivity and spectral resolution. Furthermore relaxation times at different heights were determined. Subsequently a rotor was filled with humic acid in the determined optimal region and compared to spectra of a fully filled rotor and a rotor where the top and bottom areas were filled to determine the contribution of the centre and outer regions in the rotor.