



Relaxation-relaxation exchange experiments in porous media with portable Halbach-Magnets.

A. Haber, S. Haber-Pohlmeier, F. Casanova, and B. Blümich

ITMC, RWTH Aachen University, Worringer Weg 1 52056 Aachen, Germany (Tel.: +49 241 80 26421)

Mobile NMR became a powerful tool following the development of portable NMR sensors for well logging. By now there are numerous applications of mobile NMR in materials analysis and chemical engineering where, for example, unique information about the structure, morphology and dynamics of polymers is obtained, and new opportunities are provided for geo-physical investigations [1]. In particular, dynamic information can be retrieved by two-dimensional Laplace exchange NMR, where the initial NMR relaxation environment is correlated with the final relaxation environment of molecules migrating from one environment to the other within a so-called NMR mixing time t_m [2].

Relaxation-relaxation exchange experiments of water in inorganic porous media were performed at low and moderately inhomogeneous magnetic field with a simple, portable Halbach-Magnet. By conducting NMR transverse relaxation exchange experiments for several mixing times and converting the results to 2D T_2 distributions (joint probability densities of transverse relaxation times T_2) with the help of the inverse 2D Laplace Transformation (ILT), we obtained characteristic exchange times for different pore sizes. The results of first experiments on soil samples are reported, which reveal information about the complex pore structure of soil and the moisture content.

References:

1. B. Blümich, J. Mauler, A. Haber, J. Perlo, E. Danieli, F. Casanova, *Mobile NMR for Geo-Physical Analysis and Material Testing, Petroleum Science*, xx (2009) xxx - xxx.
2. K. E. Washburn, P.T. Callaghan, *Tracking pore to pore exchange using relaxation exchange spectroscopy*, *Phys. Rev. Lett.* **97** (2006) 175502.