Combining one-dimensional stray-field micro-imaging with mechanical field-cycling NMR: A new spectrometer design

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JOURNAL OF MAGNETIC RESONANCE 209 (2011) 47–52

A new spectrometer design combining stray-field micro-imaging with mechanical field-cycling Nuclear Magnetic Resonance (FC-NMR), allowing for one dimensional spatial resolution in the order of 10 μm is described. The field-cycle is implemented by moving the probe in the stray-field of a superconducting gradient magnet. In this way a field range between 10 mT and 6.3 T is covered. The maximum transfer time is less than 5 s. Further, methods to correct for some of the imaging artefacts found in previous studies are implemented. The main objective of this design is a depth- and field-dependent investigation of the defect structure caused by heavy-ion irradiation of ionic crystals.