Journal of Magnetic Resonance (1969)

Volume 90, Issue 1, 15 October 1990, Pages 52-70

Optimization of eddy-current compensation â˜†

J.J Van Vaals ... A.H Bergman

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https://doi.org/10.1016/0022-2364(90)90365-G

Abstract

A comprehensive method for optimizing the preemphasis applied to pulsed gradients in NMR experiments in order to compensate induced eddy-current fields is presented. First, the eddy-current effects are measured without any compensation active. The eddy-current fields with spatial symmetries different from those of the pulsed gradient are also taken into account. Next, the measured response functions are analyzed with exponentially decaying terms. An exact solution of the required compensation is provided by numerical inversion of the response function using Laplace transformation. The calculated compensation terms are implemented in hardware. This yields a highly improved suppression of the eddy-current effects, including induced fields with spatial symmetries different from those of the switched gradient. The result is independent of the waveform or timing of the pulsed gradient and can compete with shielded gradient systems.

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â˜† Presented in preliminary form at the Eighth Annual Meeting of the Society of Magnetic Resonance in Medicine, Amsterdam, August 1989.

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