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PII: S0079-6565(18)30024-4
DOI: https://doi.org/10.1016/j.pnmrs.2018.08.001
Reference: JPNMRS 1462

To appear in: *Progress in Nuclear Magnetic Resonance Spectroscopy*

Received Date: 23 March 2018
Accepted Date: 1 August 2018

Please cite this article as: J-N. Dumez, Spatial encoding and spatial selection methods in high-resolution NMR spectroscopy, *Progress in Nuclear Magnetic Resonance Spectroscopy* (2018), doi: https://doi.org/10.1016/j.pnmrs.2018.08.001

Spatial encoding and spatial selection methods in high-resolution NMR spectroscopy

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Abstract

A family of high-resolution NMR methods share the common concept of acquiring in parallel different sub-experiments in different spatial regions of the NMR tube. These spatial encoding and spatial selection methods were for the most part introduced independently from each other and serve different purposes, but they share common ingredients, often derived from magnetic resonance imaging, and they all benefit from a greatly improved time-efficiency. This review article provides a description of several spatial encoding and spatial selection methods, including single-scan multidimensional experiments (ultrafast 2D NMR, DOSY, Z spectroscopy, inversion recovery and Laplace NMR), pure shift and selective refocusing experiments (including Zangger-Sterk decoupling, G-SERF and PSYCHE), a Z filter, and fast-pulsing slice-selective experiments. Some key elements for spatial parallelisation are introduced and when possible a common framework is used for the analysis of each method. Sensitivity considerations are discussed, and a selection of applications is analysed to illustrate which questions can be answered thanks to spatial encoding and spatial selection methods, and discuss the perspectives for future developments and applications.

Contents

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