

## Project Effective Medium Theory for MRI Signal

Effective medium theory is a general theoretical framework originally developed within condensed matter physics to describe transport in heterogeneous media. Applying this method to the Bloch-Torrey equation, the basic equation of the spin evolution, our collaboration with the NYU School of Medicine has recently resulted in establishing the effective medium framework for the MRI signal. This framework encompasses all the measurable quantities which survive the voxel averaging, and naturally unifies various MRI modalities and acquisition techniques for diffusion and relaxation measurements. What cellular properties are accessible with specific MRI modalities? What are the relations between different signal metrics? What are the realistic parameter domains? Such questions form our current workspace. Theory motivates specific applied projects and helps us to address challenges of clinical research as illustrated by the specific projects described below.

### Related publications

- DS Novikov, VG Kiselev.  
[Effective medium theory of a diffusion-weighted signal \(2010\)](#)  
NMR in Biomedicine 23(2010)682-697
- DS Novikov, VG Kiselev.  
[Transverse NMR relaxation in magnetically heterogeneous media \(2008\)](#)  
Journal of Magnetic Resonance 195 (2008) 33-39

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