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Day 1 of MRI and NMR education: Interactive visualization of MR basics

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Synopsis

It is challenging to teach and learn the very basics of Magnetic Resonance as used in NMR and MRI. A simple approach is demonstrated that provides accurate understanding of basic MR phenomena, also for non-technical students. An interactive free simulation tool is used that invites student exploration of Compass and Nuclear MR via browser or app. This CompassMR simulator offers you a unique opportunity to finally make anybody intuitively understand MR in minutes, even your parents who always wanted to know what you are doing.

Purpose

Students of MR are provided with a basic understanding, and MR educators with tools for teaching it.

Outline of Content

After introducing nuclear magnetization and polarization, compass needle dynamics are taken as a starting point for introducing MR, excitation, detection, FIDs, FFT and relaxation. The difference to nuclear MR follows from spin, that results in precession and modified on- and off-resonance dynamics that are also explored.

Summary

Freely available material for introducing MR is demonstrated. It includes the CompassMR web-based simulator [1] that runs on most smart devices, and provides users with a good MR understanding in minutes, and educators with a valuable tool. It offers a good starting point for use of the more advanced Bloch Simulator [2]. References to typically unnecessary, and oft-misinterpreted quantum mechanics, are avoided [3,4].

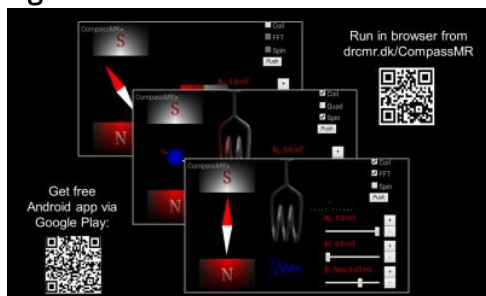
Acknowledgements

No acknowledgement found.

References

- [1] The CompassMR simulator and app, HTML5/JavaScript-based, <http://drcmr.dk/CompassMR>
- [2] The Bloch Simulator for continued MR education, Flash/ActionScript-based, <http://drcmr.dk/bloch>
- [3] Hanson, LG. Is Quantum Mechanics necessary for understanding Magnetic Resonance? Concepts in Magn Reson, 32A(5):329, 2008
- [4] Hanson LG. The Ups and Downs of Classical and Quantum Formulations of MR, in „Anthropic Awareness: The Human Aspects of Scientific Thinking in NMR...“, edited by Csaba Szantay Jr., Elsevier 2015.

Figures



The CompassMR web page and app, <http://drcmr.dk/CompassMR>