



# Magnetic Resonance Imaging: Physical Principles and Applications (Electromagnetism)

*Vadim Kuperman*

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**Magnetic Resonance Imaging: Physical Principles and Applications (Electromagnetism)** Vadim Kuperman

This book is intended as a text/reference for students, researchers, and professors interested in physical and biomedical applications of Magnetic Resonance Imaging (MRI). Both the theoretical and practical aspects of MRI are emphasized. The book begins with a comprehensive discussion of the Nuclear Magnetic Resonance (NMR) phenomenon based on quantum mechanics and the classical theory of electromagnetism. The first three chapters of this book provide the foundation needed to understand the basic characteristics of MR images, e.g., image contrast, spatial resolution, signal-to-noise ratio, common image artifacts. Then MRI applications are considered in the following five chapters. Both the theoretical and practical aspects of MRI are emphasized. The book ends with a discussion of instrumentation and the principles of signal detection in MRI.

## Key Features

- \* Clear progression from fundamental physical principles of NMR to MRI and its applications
- \* Extensive discussion of image acquisition and reconstruction of MRI
- \* Discussion of different mechanisms of MR image contrast
- \* Mathematical derivation of the signal-to-noise dependence on basic MR imaging parameters as well as field strength
- \* In-depth consideration of artifacts in MR images
- \* Comprehensive discussion of several techniques used for rapid MR imaging including rapid gradient-echo imaging, echo-planar imaging, fast spin-echo imaging and spiral imaging
- \* Qualitative discussion combined with mathematical description of MR techniques for imaging flow

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