

Preface

The subject of nuclear magnetic resonance (NMR) has grown rapidly over the last 50 years, with wide applications in physics, chemistry, and more recently in biophysics and medicine. Since this development has no reason to stop, the increasing interest in designing the NMR head probes which constitute the very heart of NMR equipment is obvious.

The NMR probe simply represents a fine interface along the border separating two different worlds, the macroscopic one and the world of tiny precessing nuclear spins. It should be able to accommodate different samples, from very small quantities to the entire human body, while being able to capture the spin's signals. It should produce a specific RF magnetic field, as intense as possible, while being homogeneous over the largest possible sample volume. It should simultaneously capture the signal from several types of spins, without any interference and above all, it should be sensitive. These are, only in part, the general demands a user expects from an NMR head probe.

Having all these in mind, the authors have tried to lead the reader through the most basic stages in accomplishing a correct probe design, starting from the very basic oscillating circuit up to more complicated designs. General principles of matching and tuning the probe are presented while some typical examples are explained in detail. The general requirements preventing an NMR probe becoming a radiating antenna are presented in Chapter 4. Multiple tuning principles are introduced together with an extensive discussion regarding the properties of coupled resonators in Chapter 6. Further, specific properties of homogeneous resonators are presented in Chapter 8 and in Chapter 9 the properties of heterogeneous resonators are discussed. Whenever we have

considered it useful, calculated field maps are shown, accompanying the designs.

We did not want to finish the book without presenting a few considerations regarding debugging and evaluating the probe, on both the RF bench work and connected to the spectrometer, in the last chapter.

Since the accompanying CD contains some software utilities used by the authors to exemplify the results of different probe designs, in the appendices there are some detailed explanations regarding the software manipulation.

The reference list is rather extensive (but not exhaustive), in order to give the readers the opportunity to access most of the information on which the book is based.

Generally, the book is intended to be useful to almost anyone involved in NMR or MRI, from students to medical or biological scientists, needing to perform an experiment under certain physical and/or geometrical conditions, not met by conventional or available probes.

The authors

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