

# Preface

In recent years, significant efforts have been dedicated to developing implantable electronic medical devices for biomedical applications. An incomplete list of such devices includes endoscopic capsule, artificial retinal prosthesis, implantable ECG recorder, artificial heart, and electrical stimulators. Traditionally, these devices are powered by implantable batteries or percutaneous cables. However, the limited energy budget of implantable batteries severely limits the system performance in terms of operating time, resolution, noise and so on, while the percutaneous cables make patients susceptible to infections.

To address the power deliver problem, an emerging trend is wireless power transfer. Such a solution can be dated back to a high-tension induction coil invented by Nikola Tesla. Since then, the wireless power transfer has been adopted in many electrical appliances including radio frequency identification and water-proofing products like electric shavers. Nowadays, researchers are taking efforts to employ it in biomedical applications. It delivers electrical energy to an implanted electrical device inside human body from a power source without man-made conductors.

The virtually unlimited power made possible by the wireless power transfer promises significant breakthroughs for implantable electronics. For example, surgical procedures will not be needed anymore to change implantable batteries in pacemakers. As a result, recent years witness a dramatic growth of the wireless power transfer technology. However, there are still so many challenges to design a wirelessly powered implant, like power transfer efficiency, power stability, and sizes of power antennas and circuits. This book develops a systematic treatment to this subject. We introduce in-depth current antenna and circuit solutions to meet these challenges. Two wirelessly powered capsule endoscopic systems are given as design cases. We believe wirelessly powered implants will change the landscape of future healthcare devices. We hope this book helps to develop a foundation for this promising technology.

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