Wireless Power Transfer Using Resonant Inductive Coupling

Wireless Power Transmission by Tesla CoilWireless Power Transfer via RadiowavesElectromagnetic Transients of Power Electronics SystemsWireless Power Transfer for Implantable Biomedical Devices Using Adjustable Magnetic ResonanceEmerging Capabilities and Applications of Wireless Power TransferWireless Power Transfer for Electric Vehicles and Mobile DevicesResonant Power ConvertersWireless Power Transmission for Sustainable ElectronicsWireless Power TransferLarge Area Wireless Power Transfer with Coupled Relay Resonators2009 IEEE 6th International Power Electronics and Motion Control ConferenceThermoelectrics for Power GenerationNanoelectronics, Circuits and Communication Systems2019 6th International Conference on Signal Processing and Integrated Networks (SPIN)Wireless Power TransferWireless Power Transfer Algorithms, Technologies and Applications in Ad Hoc Communication NetworksWireless Power Transfer for Medical Microsystems10th International Conference on Robotics, Vision, Signal Processing and Power ApplicationsSensing of Non-Volatile Memory DemystifiedWireless Power TransferVLSI Design and TestStudy on Wireless Power Transfer Based on Magnetic Resonance Using Inductive CoilWireless Power Transfer via RadiowavesCompact Size Wireless Power Transfer Using Defected Ground StructuresRecent Wireless Power Transfer

Technologies via Radio WavesInductive Powering2020 IEEE International Instrumentation and Measurement Technology Conference (I2MTC)CMOS Integrated Circuit Design for Wireless Power TransferWireless Power TransferOptical Communication TechnologyDouble Resonant High-frequency Converters for Wireless Power TransferAutomotive, Mechanical and Electrical EngineeringA Wireless Power Transfer System Compatible with MRI ScannersWireless Power Transfer by Using Magnetically Coupled ResonatorsProceedings of International Conference on ICT for Sustainable DevelopmentInductance CalculationsTechnological Innovation for Cyber-Physical SystemsWireless Power Transfer for Electric Vehicles: Foundations and Design ApproachKey Technologies of Magnetically-Coupled Resonant Wireless Power TransferWireless Power Transfer

Wireless Power Transmission by Tesla Coil

In this chapter, a wireless power transmission system based on magnetic resonance coupling circuit was carried out. Mathematical expressions of optimal coupling coefficients were examined with the coupling model. Equivalent circuit parameters were calculated with Maxwell 3D software, and then, the equivalent circuit was solved using MATLAB technical computing software. The transfer efficiency of the system was derived using the electrical parameters of the equivalent circuit. System efficiency was analyzed

depending on the different air gap values for various characteristic impedances using PSIM circuit simulation software. Since magnetic resonance coupling involves creating a resonance and transferring the power without the radiation of electromagnetic waves, resonance frequency is a key parameter in system design. The aim of this research was to define the efficiency according to variations of coefficients in wireless power transfer (WPT) system. In order to do that, the calculation procedure of mutual inductance between two self-resonators is performed by Maxwell software. Equivalent circuit is solved in circuit simulator PSIM platform. The calculations show that using the parameters that are obtained by magnetic analysis can be used for the equivalent circuit which has the capability to provide the efficiency using electrical quantities. The chapter discusses the application of this approach to a coil excited by a sinusoidal voltage source and a receiver coil, which receives energy voltage and current. Both could be obtained to calculate the instantaneous power and efficiency. To do so, the waveforms for voltage and current were obtained and computed with the PSIM circuit simulator. As the air gap between the coils increased, the coupling between the coils was weakened. The impedance of the circuit varied as the air gap changed, affecting the power transfer efficiency. In order to determine the differences between the software programs, efficiency values were calculated using three kinds of software. And it is concluded that equivalent circuit analysis by means of numerical computing is proper to obtain the voltage and current waveforms. Correspondingly, transmission efficiency can be

calculated using the electrical relations.

Wireless Power Transfer via Radiowaves

Rodents are essential models for research on fundamental neurological processing and for testing of therapeutic manipulations including drug efficacy studies. Telemetry acquisition from rodents is important in biomedical research and requires a long-term powering method. A wireless power transfer (WPT) scheme is desirable to power the telemetric devices for rodents. This dissertation investigates a WPT system to deliver power from a stationary source (primary coil) to a moving telemetric device (secondary coil) via magnetic resonant coupling. The continuously changing orientation of the rodent leads to coupling loss/problems between the primary and secondary coils, presenting a major challenge. We designed a novel secondary circuit employing ferrite rods placed at specific locations and orientations within the coil. The simulation and experimental results show a significant increase of power transfer using our ferrite arrangement, with improved coupling at most orientations. The use of a medium-ferrite-angled (4MFA) configuration further improved power transfer. Initially, we designed a piezoelectric-based device to harvest the kinetic energy available from the natural movement of the rodent; however, the harvested power was insufficient to power the telemetric devices for the rodents. After designing our 4MFA device, we designed a novel wireless measurement system (WMS) to collect real-time performance data from the secondary circuit while

testing WPT systems. This prevents the measurement errors associated with voltage/current probes or coaxial cables placed directly into the primary magnetic field. The maximum total efficiency of our novel WPT is 14.1% when the orientation of the 4MFA is parallel to the primary electromagnetic field, and a current of 2.0 A (peak-to-peak) is applied to the primary coil. We design a novel controllable WPT system to facilitate the use of multiple secondary circuits (telemetric devices) to operate within a single primary coil. Each telemetric device can tune or detune its resonant frequency independently of the others using its internal control algorithm.

Electromagnetic Transients of Power Electronics Systems

The 2016 International Conference on Automotive Engineering, Mechanical and Electrical Engineering (AEMEE 2016) was held December 9-11, 2016 in Hong Kong, China. AEMEE 2016 was a platform for presenting excellent results and new challenges facing the fields of automotive, mechanical and electrical engineering. Automotive, Mechanical and Electrical Engineering brings together a wide range of contributions from industry and governmental experts and academics, experienced in engineering, design and research. Papers have been categorized under the following headings: Automotive Engineering and Rail Transit Engineering. Mechanical, Manufacturing, Process Engineering. Network, Communications and Applied Information Technologies. Technologies in Energy and Power, Cell, Engines, Generators, Electric

Vehicles. System Test and Diagnosis, Monitoring and Identification, Video and Image Processing. Applied and Computational Mathematics, Methods, Algorithms and Optimization. Technologies in Electrical and Electronic, Control and Automation. Industrial Production, Manufacturing, Management and Logistics.

Wireless Power Transfer for Implantable Biomedical Devices Using Adjustable Magnetic Resonance

Emerging wireless charging technologies will become essential for medical implants, which currently require cables passing through patients' skin in order to provide power, or force the patient to undergo costly surgery operations to replace dead batteries. Likewise, makers of sensors and devices used on the factory floor are increasingly looking towards wireless power to eliminate the need for battery changes and eliminate downtime. Even the ever-increasing number and diversity of consumer electronics, such as smartphones, laptops, wearables, and VR headsets, will benefit from wireless power solutions that make battery charging more convenient. Commercially available wireless chargers, such as those implementing the Qi standard, partially address the problem. Qi chargers can typically charge only one device at a time and require precise alignment of transmitter and receiver, and so are not effective as the number of electronics that need to be charged increases. Magnetic resonance wireless power transfer systems, which use resonant coils as

transmitters, have greater range and tolerance to misalignment. However, the size of the transmitter cannot be arbitrarily increased to fit any large area because large transmitter-to-receiver size ratios result in extreme inefficiency. As an enhancement on magnetic resonance, phased array transmitters explored in academic research can extend transmission range. However, they have the tradeoff of increased cost and complexity, because each array element requires an independent RF source. Non-magnetic methods of wireless power transfer, such as radiative ultra-high frequency beaming and tracking laser systems, have more extended power transfer range but much less efficiency, and they both have lower output power limits due to safety regulations. So whereas these methods may be useful for devices that only need small amount of energy and require long separation distances, they cannot be used for systems that require high power output while still being safe for use near humans and animals. This dissertation focuses on the design of a wireless power transfer solution that can provide efficient wireless charging over a large area, can tolerate some amount of separation and misalignment, can charge multiple devices at the same time, at a reasonable complexity and cost, and can do all of this while staying well within safety regulations. To achieve this, we introduce an adaptive, passive wireless relay system to extend power transfer range. A prototype of a centrally controlled array of reconfigurable relays (CARR) is implemented that can deliver power to multiple moving receivers. We show that the relay system is much more efficient at delivering power to small receivers over a large area than a single

transmitter system, and has better uniformity of coverage. The CARR prototype can identify and adaptively route power to a new or moving receiver in as little as 120 microseconds. Additionally, a method for enabling large area power transfer without a large transmitter is introduced, which proposes to use receivers themselves as relays when many receivers are in close proximity. We demonstrate a key step towards realizing this receivers-as-relay system by showing that a suitable routing configuration for delivering power to receivers can be identified using a load modulation technique. Finally, in evaluating the safety of magnetic resonance systems, we conclude an interesting feature of coupled resonator systems which reduces safety concerns by reducing the SAR, a measure of the energy absorbed by biological tissue.

Emerging Capabilities and Applications of Wireless Power Transfer

Wireless Power Transfer for Electric Vehicles and Mobile Devices

This book addresses the design challenges in near-field wireless power transfer (WPT) systems, such as high efficiency, compact size, and long transmission range. It presents new low-profile designs for the TX/RX structures using different shapes of defected ground structures (DGS) like (H, semi-H, and spiral-strips DGS). Most near-field WPT systems depend on magnetic resonant coupling (MRC) using 3-D wire loops or helical antennas, which are often bulky. This,

in turn, poses technical difficulties in their application in small electronic devices and biomedical implants. To obtain compact structures, printed spiral coils (PSCs) have recently emerged as a candidate for low-profile WPT systems. However, most of the MRC WPT systems that use PSCs have limitations in the maximum achievable efficiency due to the feeding method. Inductive feeding constrains the geometric dimensions of the main transmitting (TX)/receiving (RX) resonators, which do not achieve the maximum achievable unloaded quality factor. This book will be of interest to researchers and professionals working on WPT-related problems.

Resonant Power Converters

This book constitutes the refereed proceedings of the 23st International Symposium on VLSI Design and Test, VDAT 2019, held in Indore, India, in July 2019. The 63 full papers were carefully reviewed and selected from 199 submissions. The papers are organized in topical sections named: analog and mixed signal design; computing architecture and security; hardware design and optimization; low power VLSI and memory design; device modelling; and hardware implementation.

Wireless Power Transmission for Sustainable Electronics

This book describes systematically wireless power transfer technology using magnetic resonant coupling and electric resonant coupling and presents the latest

theoretical and phenomenological approaches to its practical implementation, operation and its applications. It also discusses the difference between electromagnetic induction and magnetic resonant coupling, the characteristics of various types of resonant circuit topologies and the unique features of magnetic resonant coupling methods. Designed to be self-contained, this richly illustrated book is a valuable resource for a broad readership, from researchers to engineers and anyone interested in cutting-edge technologies in wireless power transfer.

Wireless Power Transfer

Recent advances in Wireless Power Transmission (WPT) technologies have enabled various engineering applications with potential product implementation. WPT can be utilized to charge batteries in various pieces of equipment without the need for a wired connection. Energy can be harvested from ambient RF and microwave radiation and 1 million kW microwaves can be transmitted from space to the ground. This book covers all the theory and technologies of WPT, such as microwave generators with semi-conductors and microwave tubes, antennas, phased arrays, beam efficiency, and rectifiers (rectenna). The authors also discuss coupling WPT. Applications, such as energy harvesting, sensor networks, point-to-point WPT, WPT to moving targets (airplane, vehicle, etc.) and Solar Power Satellite are also presented.

Large Area Wireless Power Transfer with

Coupled Relay Resonators

Wireless Power Transfer (WPT) is considered to be an innovative game changing technology. The same radio wave and electromagnetic field theory and technology for wireless communication and remote sensing is applied for WPT. In conventional wireless communication systems, information is "carried" on a radio wave and is then transmitted over a distance. In WPT however, the energy of the radio wave itself is transmitted over a distance. Wireless communication technology has proven to be extremely useful, however in future it should be even more useful to apply both wireless communication and wireless power technologies together. There are various WPT technologies, e.g. inductive near field WPT, resonance coupling WPT, WPT via radio waves, and laser power transfer. Recent Wireless Power Transfer Technologies via Radio Waves focusses on recent technologies and applications of the WPT via radio waves in far field. The book also covers the history, and future, of WPT via radio waves, as well as safety, EMC and coexistence of radio waves for WPT. Technical topics discussed in the book include: Radio Wave GenerationRadio Wave Amplification with Solid States Circuit and Microwave TubesAntenna and Beam Forming TechnologiesRadio Wave Conversion/Rectification to ElectricityBattery-less Sensor Applications toward Internet of Things (IoT)Solar Power Satellite ApplicationSafety, EMC, Coexistence of Radio Waves for the WPT WPT is an old technology based on the basic theory of radio waves, however WPT is also a state-of-the-art

technology for the latest applications in IoT, sensor networks, wireless chargers for mobile phones, and solar power satellite. The theory behind these technologies, as well as applications, are explained in this book.

2009 IEEE 6th International Power Electronics and Motion Control Conference

Wireless power transfer techniques have been gaining researchers' and industry attention due to the increasing number of battery-powered devices, such as mobile computers, mobile phones, smart devices, intelligent sensors, mainly as a way to replace the standard cable charging, but also for powering battery-less equipment. The storage capacity of batteries is an extremely important element of how a device can be used. If we talk about battery-powered electronic equipment, the autonomy is one factor that may be essential in choosing a device or another, making the solution of remote powering very attractive. A distinction has to be made between the two forms of wireless power transmission, as seen in terms of how the transmitted energy is used at the receiving point: - Transmission of information or data, when it is essential for an amount of energy to reach the receiver to restore the transmitted information; - Transmission of electric energy in the form of electromagnetic field, when the energy transfer efficiency is essential, the power being used to energize the receiving equipment. The second form of energy transfer is the subject of this book.

Thermoelectrics for Power Generation

This authoritative reference enables the design of virtually every type of inductor. It features a single simple formula for each type of inductor, together with tables containing essential numerical factors. 1946 edition.

Nanoelectronics, Circuits and Communication Systems

This book is the first systematic exposition on the emerging domain of wireless power transfer in ad hoc communication networks. It selectively spans a coherent, large spectrum of fundamental aspects of wireless power transfer, such as mobility management in the network, combined wireless power and information transfer, energy flow among network devices, joint activities with wireless power transfer (routing, data gathering and solar energy harvesting), and safety provisioning through electromagnetic radiation control, as well as fundamental and novel circuits and technologies enabling the wide application of wireless powering. Comprising a total of 27 chapters, contributed by leading experts, the content is organized into six thematic sections: technologies, communication, mobility, energy flow, joint operations, and electromagnetic radiation awareness. It will be valuable for researchers, engineers, educators, and students, and it may also be used as a supplement to academic courses on algorithmic applications, wireless protocols, distributed computing, and

networking.

2019 6th International Conference on Signal Processing and Integrated Networks (SPIN)

Technologies that enable powering a device without the need for being connected with a cable to the grid are gaining attention in recent years due to the advantages that they provide. They are a commodity to users and provide additional functionalities that promote autonomy among the devices. Emerging Capabilities and Applications of Wireless Power Transfer is an essential reference source that analyzes the different applications of wireless power transfer technologies and how the technologies are adapted to fulfill the electrical, magnetic, and design-based requirements of different applications. Featuring research on topics such as transfer technologies, circuital analysis, and inductive power transfer, this book is a vital resource for academicians, electrical engineers, scientists, researchers, and industry professionals seeking coverage on device power and creating autonomy through alternative power options for devices.

Wireless Power Transfer

The conference will be devoted to all advancements in Signal Processing and Integrated Networks Researchers from all over the country and abroad will gather in order to introduce their recent advances in the field and thereby promote the exchange of new

ideas, results and techniques The conference will be a successive catalyst in promoting research work, sharing views and getting innovative ideas in this field

Wireless Power Transfer Algorithms, Technologies and Applications in Ad Hoc Communication Networks

This book covers the very latest in theory and technology for Wireless Power Transfer (WPT), for both coupling as well as radiative WPT. It describes the theory as well as the technology and applications.

Wireless Power Transfer for Medical Microsystems

This book provides an in-depth introduction to the newest technologies for designing wireless power transfer systems for medical applications. The authors present a systematic classification of the various types of wireless power transfer, with a focus on inductive power coupling. Readers will learn to overcome many challenges faced in the design a wirelessly powered implant, such as power transfer efficiency, power stability, and the size of power antennas and circuits. This book focuses exclusively on medical applications of the technology and a batteryless capsule endoscopy system and other, real wirelessly powered systems are used as examples of the techniques described.

10th International Conference on

Robotics, Vision, Signal Processing and Power Applications

Inductive powering has been a reliable and simple method for many years to wirelessly power devices over relatively short distances, from a few centimetres to a few feet. Examples are found in biomedical applications, such as cochlear implants; in RFID, such as smart cards for building access control; and in consumer devices, such as electrical toothbrushes. Device sizes shrunk considerably the past decades, demanding accurate design tools to obtain reliable link operation in demanding environments. With smaller coil sizes, the link efficiency drops dramatically to a point where the commonly used calculation methods become invalid. Inductive Powering: Basic Theory and Application to Biomedical Systems lists all design equations and topology alternatives to successfully build an inductive power and data link for your specific application. It also contains practical guidelines to expand the external driver with a servomechanism that automatically tunes itself to varying coupling and load conditions.

Sensing of Non-Volatile Memory Demystified

From mobile, cable-free re-charging of electric vehicles, smart phones and laptops to collecting solar electricity from orbiting solar farms, wireless power transfer (WPT) technologies offer consumers and society enormous benefits. Written by innovators in

the field, this comprehensive resource explains the fundamental principles and latest advances in WPT and illustrates key applications of this emergent technology. Key features and coverage include: The fundamental principles of WPT to practical applications on dynamic charging and static charging of EVs and smartphones. Theories for inductive power transfer (IPT) such as the coupled inductor model, gyrator circuit model, and magnetic mirror model. IPTs for road powered EVs, including controller, compensation circuit, electro-magnetic field cancel, large tolerance, power rail segmentation, and foreign object detection. IPTs for static charging for EVs and large tolerance and capacitive charging issues, as well as IPT mobile applications such as free space omnidirectional IPT by dipole coils and 2D IPT for robots. Principle and applications of capacitive power transfer. Synthesized magnetic field focusing, wireless nuclear instrumentation, and future WPT. A technical asset for engineers in the power electronics, internet of things and automotive sectors, Wireless Power Transfer for Electric Vehicles and Mobile Devices is an essential design and analysis guide and an important reference for graduate and higher undergraduate students preparing for careers in these industries.

Wireless Power Transfer

The Conference focuses on all aspects of instrumentation and measurement science and technology research development and applications The list of program topics includes but is not limited to Measurement Science & Education, Measurement

Systems, Measurement Data Acquisition, Measurements of Physical Quantities, and Measurement Applications

VLSI Design and Test

Focusing on inductive wireless power transfer (WPT), which relies on coil resonators and power converters, this book begins by providing the background and basic theories of WPT, which are essential for newcomers to the field. Then two major challenges of WPT – power transfer distance and efficiency – are subsequently addressed, and multi-resonator WPT systems, which not only offer a way to extend power transfer distance but also provide more flexibility, are investigated. Recent findings on techniques to maximize the power transfer efficiency of WPT systems, e.g. maximum efficiency point tracking, are also introduced. Without the constraint of cables, wireless power transfer (WPT) is an elegant technique for charging or powering a range of electrical devices, e.g. electric vehicles, mobile phones, artificial hearts, etc. Given its depth of coverage, the book can serve as a technical guideline or reference guide for engineers and researchers working on WPT.

Study on Wireless Power Transfer Based on Magnetic Resonance Using Inductive Coil

This thesis focuses on the key technologies involved in magnetically coupled Wireless Power Transfer (WPT). Starting from the basic structures and theories

of WPT, it addresses four fundamental aspects of these systems. Firstly, it analyzes the factors affecting transfer efficiency and compares various methods for reducing the working frequency. Secondly, it discusses frequency splitting and offers a physical explanation. Thirdly, it proposes and assesses three multiple-load transfer structures. Lastly, it investigates WPT systems with active voltage-source and current-source load. As such, the thesis offers readers a deeper understanding of WPT technology, while also proposing insightful new advances.

Wireless Power Transfer via Radiowaves

This book is devoted to resonant energy conversion in powerelectronics. It is a practical, systematic guide to the analysisand design of various dc-dc resonant inverters, high-frequencyrectifiers, and dc-dc resonant converters that are building blocksof many of today's high-frequency energy processors. Designed tofunction as both a superior senior-to-graduate level textbook forelectrical engineering courses and a valuable professionalreference for practicing engineers, it provides students andengineers with a solid grasp of existing high-frequency technology,while acquainting them with a number of easy-to-use tools for theanalysis and design of resonant power circuits. Resonant powerconversion technology is now a very hot area and in the center ofthe renewable energy and energy harvesting technologies.

Compact Size Wireless Power Transfer

Using Defected Ground Structures

Wireless Power Transfer is the second edition of a well received first book, which published in 2012. It represents the state-of-the-art at the time of writing, and addresses a unique subject of great international interest in terms of research. Most of the chapters are contributed by the main author, though as in the first edition several chapters are contributed by other authors. The authors of the various chapters are experts in their own right on the specific topics within wireless energy transfer. Compared to the first edition, this new edition is more comprehensive in terms of the concepts discussed, and the range of current industrial applications which are presented, such as those of magnetic induction. From the eleven chapters of the first edtion, this second edition has expanded to twenty chapters. More chapters on the theoretical foundations and applications have been included. This new edition also contains chapters which deal with techniques for reducing power losses in wireless power transfer systems. In this regard, specific chapters discuss impedance matching methods, frequency splitting and how to deploy systems based on frequency splitting. A new chapter on multi-dimensional wireless power transfer has also been added. The design of wireless power transfer systems based on bandpass filtering approach has been included, in addition to the two techniques using couple mode theory and electronic circuits. The book has retained chapters on how to increase efficiency of power conversion and induction, and also how to control the power systems. Furthermore, detailed

techniques for power relay, including applications, which were also discussed in the first edition, have been updated and kept. The book is written in a progressive manner, with a knowledge of the first chapters making it easier to understand the later chapters. Most of the underlying theories covered in the book are clearly relevant to inductive near field communications, robotic control, robotic propulsion techniques, induction heating and cooking and a range of mechatronic systems.

Recent Wireless Power Transfer Technologies via Radio Waves

The optical world is continuously and rapidly evolving, and new challenges arise every day. As a result of these rapid changes, the need for up-to-date texts that address this growing field from an interdisciplinary perspective persists. This book presents an overview of new optical communication technologies and a bird's-eye view of some of the more promising technologies among them. The book covers the theoretical but also the practical aspects of technology implementation in a way that is suitable for undergraduate- and graduate-level students, as well as researchers and professional engineers.

Inductive Powering

Recent advances in Wireless Power Transmission (WPT) technologies have enabled various engineering applications with potential product implementation. WPT can be utilized to charge batteries in various

pieces of equipment without the need for a wired connection. Energy can be harvested from ambient RF and microwave radiation and 1 million kW microwaves can be transmitted from space to the ground. This book covers all the theory and technologies of WPT, such as microwave generators with semi-conductors and microwave tubes, antennas, phased arrays, beam efficiency, and rectifiers (rectenna). The authors also discuss coupling WPT. Applications, such as energy harvesting, sensor networks, point-to-point WPT, WPT to moving targets (airplane, vehicle, etc.) and Solar Power Satellite are also presented.

2020 IEEE International Instrumentation and Measurement Technology Conference (I2MTC)

CMOS Integrated Circuit Design for Wireless Power Transfer

Thermoelectrics for Power Generation - A Look at Trends in the Technology is the first part of the InTech collection of international community works in the field of thermoelectric power generation. The authors from many counties have presented in this book their achievements and vision for the future development in different aspects of thermoelectric power generation. Remarkably, this hot topic unites together efforts of researchers and engineers from all continents of our planet. The reader will find in the book a lot of new interesting information concerning

prospective materials for thermoelectric generators, both inorganic and organic; results of theoretical studies of materials characteristics; novel methods and apparatus for measuring performance of thermoelectric materials and devices; and thermoelectric power generator simulation, modeling, design, and practice.

Wireless Power Transfer

Provides a collection of works produced by COST Action IC1301 with the goal of achieving significant advances in the field of wireless power transmission This book constitutes together information from COST Action IC1301, a group of academic and industry experts seeking to align research efforts in the field of wireless power transmission (WPT). It begins with a discussion of backscatter as a solution for Internet of Things (IoT) devices and goes on to describe ambient backscattering sensors that use FM broadcasting for low cost and low power wireless applications. The book also explores localization of passive RFID tags and augmented tags using nonlinearities of RFID chips. It concludes with a review of methods of electromagnetic characterization of textile materials for the development of wearable antennas. Wireless Power Transmission for Sustainable Electronics: COST WiPE - IC1301 covers textile-supported wireless energy transfer, and reviews methods for the electromagnetic characterization of textile materials for the development of wearable antennas. It also looks at: backscatter RFID sensor systems for remote health monitoring; simultaneous localization (of

robots and objects) and mapping (SLAM); autonomous system of wireless power distribution for static and moving nodes of wireless sensor networks; and more. Presents techniques for smart beam-forming for "on demand" wireless power transmission (WPT) Discusses RF and microwave energy harvesting for space applications Describes miniaturized RFID transponders for object identification and sensing Wireless Power Transmission for Sustainable Electronics: COST WiPE - IC1301 is an excellent book for both graduate students and industry engineers involved in wireless communications and power transfer, and sustainable materials for those fields.

Optical Communication Technology

This book constitutes the refereed proceedings of the 7th IFIP WG 5.5/SOCOLNET Advanced Doctoral Conference on Computing, Electrical and Industrial Systems, DoCEIS 2016, held in Costa de Caparica, Portugal, in April 2016. The 53 revised full papers were carefully reviewed and selected from 112 submissions. The papers present selected results produced in engineering doctoral programs and focus on research, development, and application of cyber-physical systems. Research results and ongoing work are presented, illustrated and discussed in the following areas: enterprise collaborative networks; ontologies; Petri nets; manufacturing systems; biomedical applications; intelligent environments; control and fault tolerance; optimization and decision support; wireless technologies; energy: smart grids, renewables, management, and optimization; bio-

energy; and electronics.

Double Resonant High-frequency Converters for Wireless Power Transfer

In this research, the inductance expression based on Current Sheet Approximation and Modified Wheeler Formula are proposed. Simulations show that the change of the number of turns and air gap distance are found to be affecting the power transfer efficiency. Simulation results showed that the model of WPT system achieved the highest efficiency 99.5% at a distance of 30 cm and resonant frequency of 12.05 MHz.

Automotive, Mechanical and Electrical Engineering

This proceedings book presents a collection of research papers from the 10th International Conference on Robotics, Vision, Signal Processing & Power Applications (ROVISP 2018), which serves as a platform for researchers, scientists, engineers, academics and industrial professionals from around the globe to share their research findings and development activities. The book covers various topics of interest, including, but not limited to: •Robotics, Control, Mechatronics and Automation•Vision, Image, and Signal Processing•Artificial Intelligence and Computer Applications•Electronic Design and Applications•Biomedical, Bioengineering and Applications•RF, Antenna Applications and

Telecommunication Systems•Power Systems, High Voltage and Renewable Energy•Electrical Machines, Drives and Power Electronics•Devices, Circuits and Embedded Systems•Sensors and Sensing Techniques

A Wireless Power Transfer System Compatible with MRI Scanners

Wireless technology has impacted just about every aspect of modern life. As the number of portable electronic devices expands for phones, robotics, internet of things (IoT), and wearable devices, battery-free operation and the elimination of charging adapter cables have become major technology drivers. This is equally true for health care monitoring devices and the needs for mobility in the hospital environment. Wireless power transfer (WPT) has made major inroads for wireless charging of battery-operated devices, and efforts are underway by companies like WiTricity for powering devices in the home. In magnetic resonance imaging (MRI), there are many motives for using wireless technology to create completely cable-free receive arrays. There is a continuous drive toward a greater number of receiver channels in an effort to improve the signal-to-noise ratio (SNR) or imaging speed. Increasing channel counts require a commensurate increase in the number of RF cables and connectors for the array. The added bulk of these cables can cause increased patient discomfort, as well as requiring longer setup times which reduce patient throughput. Bulky cable traps are necessary to prevent the induction of RF current on the cables during B1 transmit, and

avoidance of RF burn hazards. To remove all of these cables, there needs to be a method to wirelessly provide power to the receive array. Non-magnetic batteries are one option, but it would be difficult to ensure that they maintain a full charge. This would lead to limits on scan time and additional time lost swapping batteries out between scans. Batteries also restrict the voltage and power available, and physically large batteries can also suffer from vibrations due to eddy currents from the large gradient fields. As a result, it would be ideal to use wireless power transfer to continuously provide power to the wireless coil array. This dissertation demonstrates a wireless power transfer system based upon resonant inductive coupling and explores the adaptations of WPT in terms of electromagnetic coupling, physical deployment and noise emissions for compatibility with MRI. To minimize added noise and decouple the wireless power system from MRI coils, restrictions are placed on the coil geometry of the wireless power system, which are shown to limit its efficiency. The final WPT system includes a class-E power amplifier, RF MEMs automated impedance matching, a primary coil array employing RF MEMs power steering, and a flexible secondary coil with class-E rectification. A major challenge was the identification and suppression of noise and harmonic interference, by gating, filtering, and rectifier topologies. Efficiency can be traded off to reduce noise through additional filtering and rectifier choice, and by replacing the switching supply to the power amplifier with batteries. An ultimate SNR performance within 6 dB of the ideal can be achieved while continuously transferring power. For the present

system, the feasibility of wireless power transfer within an MRI scanner has been fully demonstrated, and the realization of completely wireless MRI receive arrays appears within reach.

Wireless Power Transfer by Using Magnetically Coupled Resonators

This book presents state-of-the-art analog and power management IC design techniques for various wireless power transfer (WPT) systems. To create elaborate power management solutions, circuit designers require an in-depth understanding of the characteristics of each converter and regulator in the power chain. This book addresses WPT design issues at both system- and circuit-level, and serves as a handbook offering design insights for research students and engineers in the integrated power electronics area.

Proceedings of International Conference on ICT for Sustainable Development

This book introduces readers to the latest advances in sensing technology for a broad range of non-volatile memories (NVMs). Challenges across the memory technologies are highlighted and their solutions in mature technology are discussed, enabling innovation of sensing technologies for future NVMs. Coverage includes sensing techniques ranging from well-established NVMs such as hard disk, flash, Magnetic RAM (MRAM) to emerging NVMs such as ReRAM, STTRAM, FeRAM and Domain Wall Memory will be

covered.

Inductance Calculations

This book describes the fundamentals and applications of wireless power transfer (WPT) in electric vehicles (EVs). Wireless power transfer (WPT) is a technology that allows devices to be powered without having to be connected to the electrical grid by a cable. Electric vehicles can greatly benefit from WPT, as it does away with the need for users to manually recharge the vehicles' batteries, leading to safer charging operations. Some wireless chargers are available already, and research is underway to develop even more efficient and practical chargers for EVs. This book brings readers up to date on the state-of-the-art worldwide. In particular, it provides: • The fundamental principles of WPT for the wireless charging of electric vehicles (car, bicycles and drones), including compensation topologies, bi-directionality and coil topologies. • Information on international standards for EV wireless charging. • Design procedures for EV wireless chargers, including software files to help readers test their own designs. • Guidelines on the components and materials for EV wireless chargers. • Review and analysis of the main control algorithms applied to EV wireless chargers. • Review and analysis of commercial EV wireless charger products coming to the market and the main research projects on this topic being carried out worldwide. The book provides essential practical guidance on how to design wireless chargers for electric vehicles, and supplies MATLAB files that

demonstrate the complexities of WPT technology, and which can help readers design their own chargers.

Technological Innovation for Cyber-Physical Systems

Wireless Power Transfer for Electric Vehicles: Foundations and Design Approach

The technology for wireless power transfer (WPT) is in the forefront of electronic development. Applications involving microwaves, solar cells, lasers, and resonance of electromagnetic waves have had the most recent success with WPT. The main function of wireless power transfer is to allow electrical devices to be continuously charged and lose the constraint of a power cord. Although the idea is only a theory and not widely implemented yet, extensive research dating back to the 1850

Key Technologies of Magnetically-Coupled Resonant Wireless Power Transfer

The two volumes of this book collect high-quality peer-reviewed research papers presented in the International Conference on ICT for Sustainable Development (ICT4SD 2015) held at Ahmedabad, India during 3 – 4 July 2015. The book discusses all areas of Information and Communication

Technologies and its applications in field for engineering and management. The main focus of the volumes are on applications of ICT for Infrastructure, e-Governance, and contemporary technologies advancements on Data Mining, Security, Computer Graphics, etc. The objective of this International Conference is to provide an opportunity for the researchers, academicians, industry persons and students to interact and exchange ideas, experience and expertise in the current trend and strategies for Information and Communication Technologies.

Wireless Power Transfer

This book discusses topics related to power electronics, especially electromagnetic transient analysis and control of high-power electronics conversion. It focuses on the re-evaluation of power electronics, transient analysis and modeling, device-based system-safe operating area, and energy balance-based control methods, and presenting, for the first time, numerous experimental results for the transient process of various real-world converters. The book systematically presents both theoretical analysis and practical applications. The first chapter discusses the structure and attributes of power electronics systems, highlighting the analysis and synthesis, while the second chapter explores the transient process and modeling for power electronics systems. The transient features of power devices at switching-on/off, transient conversion circuit with stray parameters and device-based system-safe operating area are described in the subsequent three

chapters. The book also examines the measurement of transient processes, electromagnetic pulses and their series, as well as high-performance, closed-loop control, and expounds the basic principles and method of the energy-balanced control strategy. Lastly, it introduces the applications of transient analysis of typical power electronics systems. The book is valuable as a textbook for college students, and as a reference resource for electrical engineers as well as anyone working in the field of high-power electronics system.

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