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Misconceptions About Heat~~**Electromagnetic Waves - with Sir Lawrence Bragg**~~ ***Heat Transfer: Introduction to Thermal Radiation (12 of 26)*** ***Electromagnetic And Thermal Modeling Of***

Performing a thermal simulation can be used to determine the heat distribution and dissipation due to conduction, convection, or radiation for industrial and scientific applications. Ultraflex can provide thermal 2D and 3D simulations and heat transfer analysis

for induction heating applications in steady state or transient conditions. Using electromagnetic modeling, the generation of heat due to electromagnetically induced eddy currents in the load can be precisely simulated.

Electromagnetic Modeling and Thermal Analysis | Ultraflex ...
Introduction. Co-authored by an international research group with a long-standing cooperation, this book focuses on engineering-oriented electromagnetic and thermal field modeling and application. It presents important contributions, including advanced and efficient finite element analysis used in the solution of electromagnetic and thermal field problems for large and multi-scale engineering applications involving application script development; magnetic measurement of both magnetic ...

Modeling and Application of Electromagnetic and Thermal ...

Electromagnetic and thermal modeling of electrical machines for marine applications . By Ming Huei Chong. Abstract. With increasing usage of induction motor due to the its reliability and economical reason, not only it is common to be found at home but it is also widely use in marine environment for pumps, compressors etc. However, overheating ...

Electromagnetic and thermal modeling of electrical ...

MODEL NUMERICAL RESULTS CONCLUSIONS Electromagnetic and Thermal Modeling of Vacuum Distillation Furnace Thermal field – Fourier equation Solid computational domains of the model, All the initial temperatures are set to 30oc.

All the inside free surfaces in the model are allowed to participate in surface to surface radiation.

Electromagnetic and Thermal Modeling of Vacuum ...

Co-authored by an international research group with a long-standing cooperation, this book focuses on engineering-oriented electromagnetic and thermal field modeling and application. It presents important contributions, including advanced and efficient finite element analysis used in the solution of electromagnetic and thermal field problems for large and multi-scale engineering applications involving application script development; magnetic measurement of both magnetic materials and ...

Modeling and Application of Electromagnetic and Thermal ...

A segmented-core (SC) structure has been widely used for high-power-density (HP) motors. However, the SC motor is associated with a number of problems due to the complexity of both the structure and the manufacturing process. To address these issues, a novel structure of a HP motor is proposed, referred to as the ring-coupled segmented-stator (RSS) model here.

IET Digital Library: Electromagnetic and thermal analysis ...

The model consists of the two electromagnetic and heat transfer modeling. Electromagnetic modeling provides the transformer losses as heat source. The heat transfer equations through TEC are applied to obtain the temperature distribution of different parts.

Electromagnetic and thermal behavior of a single-phase ...

The thermal and electromagnetic problems are solved independently and a supervisor manages these solvings and the data transfers (temperatures and losses). A first 2D example gives qualitative satisfying results and shows the importance of the thermal electromagnetic coupling. There is a need for benchmarks to validate and compare codes.

Thermal-electromagnetic modeling of superconductors ...
Coupled electromagnetic-thermal modeling of electrical machines Abstract: This paper describes some modeling techniques used in computing the heat losses and temperature distribution in some electrical machines. The thermal sources can be eddy currents in conductors and winding I/sup 2/R losses.

Coupled electromagnetic-thermal modeling of electrical ...
6.3 A simplified thermal model for PM machines ..... 146 6.3.1 Simulation results .... 149 6.3.2 Sensitivity analysis 151

Electromagnetic and Thermal Modeling of Highly Utilized PM ...
Electromagnetic mechanism of Joule heating and thermal conduction on conductive material characterization broadens their scope for implementation in real thermography based Nondestructive testing and evaluation (NDT&E) systems by imparting sensitivity, conformability and allowing fast and imaging detection, which is necessary for efficiency.

Electromagnetic Thermography Nondestructive Evaluation ...
Electromagnetic and thermal modeling of SAR and temperature fields in tissue due to an RF decoupling coil. Hand JW(1), Lau RW, Lagendijk JJ, Ling J, Burl M, Young IR. Author information: (1)Department of Imaging, Imperial College School of Medicine, Hammersmith Hospital, London, United Kingdom. jhand@rpms.ac.uk

Electromagnetic and thermal modeling of SAR and ...
Modeling and Application of Electromagnetic and Thermal Field in Electrical Engineering eBook: Cheng, Zhiguang, Takahashi, Norio, Forghani, Behzad: Amazon.co.uk ...

Modeling and Application of Electromagnetic and Thermal ...

The objective of this chapter is to discuss the electromagnetic and thermal simulation requirements when designing large power transformers; in particular, the focus will be on the study of overheat problems in the transformer tank due to the leakage flux and the induced eddy currents. There are a number of requirements for the model specification, the field solution, and the evaluation of the results, related to the electromagnetic performance, as there are a number of requirements for the ...

Solution of Coupled Electromagnetic and Thermal Fields ...
2D electromagnetic transient and thermal modeling of a three phase power transformer ... The aim of this paper is to introduce hot-spot and top-oil temperature thermal models for more accurate ...

(PDF) 2D electromagnetic transient and thermal modeling of ...
In order to optimize the design of an enclosed induction machine of railway traction, a multi-physical model is developed taking into account electromagnetic, mechanical and thermal-flow phenomena. The electromagnetic model is based on analytical formulations and allows calculating the losses. The thermal-flow modeling is based on an equivalent thermal circuit which has the feature to consider the flow structure inside the machine.

Coupled electromagnetic acoustic and thermal-flow modeling ...
Basic electromagnetic blocks and modeling techniques Magnetic libraries contain blocks for the magnetic domain, organized into elements, sources, and sensors. Connect these blocks together just as you would assemble a physical system.

Electromagnetic Models - MATLAB & Simulink
EM modeling is an essential tool for accelerating the opti-mization of all aspects of MRI development and deployment. The remainder of this study demonstrates how EM modeling is applied to optimize the design and deployment of the main magnet, gradients, and RF coils of an MR scanner. Since EM modeling in MRI is a broad topic, a comprehensive review

Electromagnetic computation and modeling in MRI
Co-authored by an international research group with a long-standing cooperation, this book focuses on engineering-oriented electromagnetic and thermal field modeling and application.

This thesis describes a systematic process to develop and characterize a geometric computer model of the mouse foot flexor digitorum brevis (FDB) skeletal muscle, which was then used to compute detailed electric fields (E-fields) within the muscle when exposed to 94 GHz millimeter wave (MMW) fields. The purpose of this research was to investigate the possibility that MMW fields can affect the contractile performance of skeletal muscle through non-thermal mechanisms. Experiments performed in our laboratory documented some possible non-thermal effects on the FDB muscle. When electrically stimulated to contract in the presence of 94 GHz MMW fields, the muscle, which was maintained at a constant temperature, exhibited a decrease in contractile force that was not reversible when the fields were removed. It was not known if high E-fields or temperature changes were occurring within the muscle that could potentially cause such performance deviations. Since it was not possible to measure E-field and temperature distributions within the muscle due to its very small size, computer simulations of these experiments were needed to predict these distributions. To accomplish this, a highly detailed geometric computer model of the FDB muscle was developed and assigned appropriate dielectric properties, which are necessary for EM simulation. Then detailed numerical calculations of the E-fields and temperature changes within the muscle were performed using commercially available Finite-Difference Time-Domain (FDTD) software. Analysis of the results showed little evidence of E-field or temperature "hot spots" within the muscle, which would indicate that the effects observed in the laboratory were non-thermal in nature.

Keywords: Retinal stimulator microchip, Visual Prosthesis, Retinal prosthesis.

Co-authored by an international research group with a long-standing cooperation, this book focuses on engineering-oriented electromagnetic and thermal field modeling and application. It presents important contributions, including advanced and efficient finite element analysis used in the solution of electromagnetic and thermal field problems for large and multi-scale engineering applications involving application script development; magnetic measurement of both magnetic materials and components under various, even extreme conditions, based on well-established (standard and non-standard) experimental systems; and multi-level validation based on both industrial test systems and extended TEAM P21 benchmarking platform. Although these are challenging topics, they are useful for readers from both academia and industry.

This dissertation describes the design and study of a retinal prosthesis for individuals who have suffered loss of vision from degeneration of the outer retina. Retinitis pigmentosa and age-related macular degeneration lead to blindness through progressive loss of retinal photoreceptors. Experiments reveal that direct electrical stimulation of remaining ganglion cells in degenerate retina elicits visual percepts in blind RP/AMD patients. This motivates research toward the development of a retinal prosthesis system involving an implantable stimulator microchip to compensate the defective photoreceptors. Many prostheses do not reside fully inside the body, but consist of an implantable stimulation unit and an external unit. This underscores a need in the retinal prosthesis to deliver power and support high-speed bi-directional communication with the implant wirelessly. The current progress in the types of non-invasive connections to bio-implants is reviewed as it relates to the power and communication needs of prostheses. The extraocular unit is a hardware-reconfigurable system based on FPGA technology which produces real-time instructions for the implantable micro-stimulator IC. The current retinal stimulator IC is designed to provide electrical stimulation to the remaining ganglion cells of post-degenerative retina. Also described is a design technique to significantly reduce the on-chip area of the stimulus circuits. This yields more output channels per chip area, thereby raising the stimulation resolution. Temperature elevation in the eye and head tissues associated with the retinal prosthesis is studied. A high resolution 2D human head and eye model is developed at 0.25mm spatial resolution with associated dielectric and thermal properties suitable for numerical simulations. The Finite Difference Time domain method (FDTD) with material independent absorbing boundary conditions is used to predict the specific absorption rate (SAR) induced from electromagnetic expo.

Abstract: Radiofrequency ablation is an important surgical method for eliminating cancer; however, the lack of adequate technology to image the internal organ temperature profile forces surgeons to often guess at the ablation margin. If a sufficient temperature is not reached and all of the cancerous tissue is not destroyed, a recurrence is likely. Therefore, we propose to develop a numerical electromagnetic and thermal model of radiofrequency ablation that will be used in future surgical planning. The model is based on the finite element method and couples the electromagnetic and thermal models by considering the electric fields as the heat source. Furthermore, the two physical phenomena are coupled through temperature-dependent material properties. To verify our models,

we compare them to experiments conducted on excised bovine liver. Internal temperatures are measured with thermocouples and lesion shape and size are compared after ablation. At the same time, we attempt to predict surface temperature during ablation in order to investigate the possibility of correlating surface temperature to internal temperatures. During the experiments, surface temperature was measured with an infrared camera. Over the course of three experiments, we found that internal temperatures are predicted with good accuracy (within 2 0C) when the ablation ground plane is placed more than 8 cm away from the electrode. If the ground plane is closer, then some error is introduced into our approximate model. Also, we found that the lesion shape and size predicted by the simulation are similar to the lesion observed after ablation. Finally, the simulation predictions for surface temperature were mixed. In one case, the temperature values were predicted closely but the distribution was somewhat different. In the other case, the isothermal contours were very similar but the simulated temperatures were as much as 25 0C above what was measured.

The continuous miniaturization of electronic systems using the three-dimensional (3D) integration technique has brought in new challenges for the computer-aided design and modeling of 3D integrated circuits (ICs) and systems. The major challenges for the modeling and analysis of 3D integrated systems mainly stem from four aspects: (a) the interaction between the electrical and thermal domains in an integrated system, (b) the increasing modeling complexity arising from 3D systems requires the development of multiscale techniques for the modeling and analysis of DC voltage drop, thermal gradients, and electromagnetic behaviors, (c) efficient modeling of microfluidic cooling, and (d) the demand of performing fast thermal simulation with varying design parameters. Addressing these challenges for the electrical/thermal modeling and analysis of 3D systems necessitates the development of novel numerical modeling methods. This dissertation mainly focuses on developing efficient electrical and thermal numerical modeling and co-simulation methods for 3D integrated systems. The developed numerical methods can be classified into three categories. The first category aims to investigate the interaction between electrical and thermal characteristics for power delivery networks (PDNs) in steady state and the thermal effect on characteristics of through-silicon via (TSV) arrays at high frequencies. The steady-state electrical-thermal interaction for PDNs is addressed by developing a voltage drop-thermal co-simulation method while the thermal effect on TSV characteristics is studied by proposing a thermal-electrical analysis approach for TSV arrays. The second category of numerical methods focuses on developing multiscale modeling approaches for the voltage drop and thermal analysis. A multiscale modeling method based on the finite-element non-conformal domain decomposition technique has been developed for the voltage drop and thermal analysis of 3D systems. The proposed method allows the modeling of a 3D multiscale system using independent mesh grids in sub-domains. As a result, the system unknowns can be greatly reduced. In addition, to improve the simulation efficiency, the cascadic multigrid solving approach has been adopted for the voltage drop-thermal co-simulation with a large number of unknowns. The focus of the last category is to develop fast thermal simulation methods using compact models and model order reduction (MOR). To overcome the computational cost using the computational fluid dynamics simulation, a finite-volume compact thermal model has been developed for the microchannel-based fluidic cooling. This compact thermal model enables the fast thermal simulation of 3D ICs with a large number of microchannels for early-stage design. In addition, a system-level thermal modeling method using domain decomposition and model order reduction is developed for both the steady-state and transient thermal analysis. The proposed approach can efficiently support thermal modeling with varying design parameters without using parameterized MOR techniques.