

T_cSAM Bi-Weekly Brown Bag Seminar

Texas Center for Superconductivity and Advanced Materials

Jarek Wosik

Texas Center for Superconductivity and
Electrical and Computer Engineering
Department, University of Houston

“Superconducting MRI Coils for Clinical and Research Applications”

Friday, October 10, 2003

Room 102, Houston Science Center

12:00 p.m. – 1:00 p.m.

Abstract

Magnetic Resonance Imaging (MRI) is related to the phenomenon of nuclear magnetic resonance (NMR), which is based on the excitation and relaxation of nuclei (most frequently protons) within living tissues in a dc magnetic field. In a MRI set-up, a receiver probe detects such a signal. For selected applications, high-T_c superconductor MRI receiver coils and coil arrays have superior properties to those of comparable copper coils. In this talk, a brief review of MRI physics will also include design issues such as the signal-to-noise ratio dependence on frequency, body size and coil size. Fundamentals of design processes of MRI coils, including issues pertaining to cryo-packaging will be discussed together with examples of practical coils made of normal metal and superconductors. New theoretical and practical concepts for significant shortening of the MRI acquisition time by using parallel processing with phased array probes will be presented. Utilization of superconducting coils in cardiovascular medicine will be discussed for examination of aortic walls and identification of atherosclerotic plaques responsible for acute coronary syndromes (vulnerable plaque). Carotids images will show that superconducting coils can overcome limitations of routine MRI, which does not provide enough resolution for plaque investigation. Application of the HTS resonators in research on small animals will be addressed.

Brief Bio

Dr. Jaroslaw (Jarek) Wosik obtained M.S. in Solid State Physics from University of Warsaw and Ph. D. from The Institute of Physics, Polish Academy of Sciences in Poland (1985). He specialized in magnetic resonance and microwave spectroscopy of magnetic materials and semiconductor materials. He developed complementary material characterization techniques for his studies of physical, electrical and electronic properties of neutron transmuted (doped) silicon single crystals and semi-insulating GaAs single crystals. Dr. Wosik is a Research Professor of Electrical and Computer Engineering at University of Houston and a task leader in the Texas Center for Superconductivity and Advanced Materials. He has extensive and well-recognized experience in microwave characterization of superconducting materials as well as in designing and simulation of microwave and mm-wave resonators including MRI surface coils. Currently, he is responsible for development of superconducting MRI coils in a Atherosclerotic Plaque Characterization and Spine Injuries in Small Animals Programs conducted by groups at University of Texas Houston School of Medicine and Texas Heart Institute in Houston and at M.D. Anderson Cancer Center.

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