Antenna Systems Conference 2016

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Conference Program

November 3rd, 2016 - Day 1 Program

7:30 am – Registration Opens/Continental Breakfast

8:15 am – Welcome and Introduction

8:30 am – Featured Presentation

Antenna Synthesis – Evolutionary Optimization Supports Design by Specification 1

Growing demand for wireless connectivity requires satisfying multiple performance metrics such as gain, size, efficiency and bandwidth. Traditionally, this involves numerous iterative design cycles and significant knowledge. With the expected demand greatly exceeding the current supply of antenna engineers, an alternative approach is warranted.

Using evolutionary algorithms (EA) to automatically generate antenna designs has matured into a viable technology, and is proving to be effective at creating antennas with excellent performance. This talk will present examples of novel antenna design via antenna synthesis using AntSyn, a new commercial software product from National Instruments that combines EA with EM simulation.

Derek Linden, Director of Technology – National Instruments, AWR Group

9:15 am -

A New Paradigm in MIMO Antenna System Design 15

The advent of Multiple Input Multiple Output (MIMO) based wireless products and the multi antenna systems they employ have dramatically increased information throughput and have opened the door for even more opportunities. However, traditional antenna metrics such as return loss and gain are inadequate in assessing antenna performance under MIMO operation. They are intermediate performance indicators as opposed to ultimate performance metrics. Extension of these metrics to Envelope Correlation Coefficient (ECC) and Mean Effective Gain (MEG) are good steps, but still lack the robustness of higher level specifications such as capacity and throughput. Sometimes, a multiple antenna system with higher MEG performs worse than a system with lower MEG. In this talk we will discuss a new way of predicting, during the design phase, MIMO antenna performance at the capacity level. This approach presents a paradigm shift as the electromagnetic design has to be augmented with Information Theory and Communications Theory concepts. However, the talk will demonstrate both, the necessity as well as the benefits of the approach.

Nicholas Buris, President – NEBENS

10:00 am – Networking Break – Exhibit Hall Opens

11:00 am – Sessions Resume

Closed Loop Aperture Tuning Using MEMS Based Variable Capacitor 30

This presentation will describe a novel technique for closed loop tuning of a Smart Phone main antenna to compensate for the loading effects of the users hand and head during phone operation. The technique involves monitoring only the magnitude of the reflected power from the antenna terminals and using this information in a dynamic feedback loop to compensate the antenna resonant frequency. Using a single, multi-state, MEMS based, variable capacitor for antenna aperture tuning, the antenna resonant frequency can be restored thereby recovering power lost due to impedance mismatch and radiation efficiency loss.

Paul Tornatta, VP RF Systems & Antenna Engineering – Cavendish Kinetics

11:45 am

Plasma Antennas in Magnetic Resonance Imaging (MRI) and Positron Emission Tomography (PET) 41

Metal transmitter and receiver coils or antennas are currently used in magnetic resonance imaging (MRI) and positron emission tomography (PET) in conjunction with MRI. This presentation shows various experiments that were done to show advantages of using plasma coils or antennas instead of metal coils or antennas in magnetic resonance imaging (MRI) and positron emission tomography (PET) in conjunction with magnetic resonance imaging. The metal antenna coils were removed from an MRI machine and replaced by plasma antennas in the form of simple fluorescent tubes. The first in vivo imaging was done with plasma antennas in an MRI machine. Of course plasma antennas as fluorescent tubes are not the optimal plasma antenna design for MRI and MRI/PET applications. The problem with metal transmit and receive antennas in an MRI machine is that they interfere with each other. This problem is greatly reduced or eliminated using plasma antennas. In MRI machines combined with PET, the metal antenna coils greatly attenuate the gamma ray paths which are used to locate tumors. Plasma antenna coils greatly reduce or eliminate this problem.

Dr. Theodore Anderson, CEO – Haleakala R&D, Inc.

12:30 pm – Networking Lunch

1:30 pm – Sessions Resume

Low-Cost and Light-Weight Metamaterial Lens for Wireless Applications ***Not Available***

Millimeter wave (MMW) lens antennas have the advantages of low cost and low mass relative to their counter parts in microwave frequencies. In addition, the wave propagation of MMW signals has higher attenuation, namely, low probability of intercept (LPI) and low electromagnetic interference (EMI). Hence it is often considered for high data rate mobile communication and radar systems, such as, the evolving 5G cellular communication and the automotive radar systems. In this paper, a low-cost, low-volume, and light-weight metamaterial (MTM) lens antenna consisting of perforated dielectrics is described to provide at least 25 dB directive gain for the wireless communication system.

Tekao Wu – Antenna & FSS Consultant

2:15 pm

Selective Metallization for the Production of Antennas 55

Learn about a new selective metallization technology development that can be used to produce antennas. With this process, first a mask is deposited via ink jet printing, followed by the metallization step resulting in a selective metallization.

Two aqueous solutions, an oxidant (containing metal salt) and a reducer are sprayed simultaneous onto the substrate with standard painting equipment. A chemical reaction takes place immediately and a metal layer is formed. Metals like Ag and Ni can be easily deposited on all types of substrates (metals & alloys, plastics, composites) independently of the size and shape (2D / 3D). During this session, attendees will learn about this new process for designing and prototyping industrial grade antennas.

Koen Staelens, Business Development Manager – Jet Metal Technologies

3:00 pm – Networking Break

3:30 pm – Sessions Resume

Physical Optics: A Solution to Some Difficult SATCOM Antenna Problems 68

To protect adjacent satellites from excess interference the FCC, Intelsat, International Telecommunications Union (ITU) and other International organizations have developed an agreed to maximum level of allowable far out antenna sidelobes for SATCOM antennas. Specifically as summarized in Intelsat IESS-2018 there are two sidelobe masks (equations describing the maximum allowable sidelobe level versus angle from peak antenna level): one sidelobe mask for large antennas and a different sidelobe mask for small antennas. Small antenna are defined as less than 50 wavelengths in diameter, and large antennas are defined as greater than 50 wavelengths in diameter.

Techniques for analyzing the radiation patterns of SATCOM antennas include the method of moments (MoM), the finite-element method (FEM), and the finite-difference time-domain (FDTD) method. These methods are robust and accurate but are complex and a large amount of computing resources are required for large antennas. A number of commercial computer software packages are available in the industry utilizing these techniques and discussed.

The method discussed in this presentation uses Physical Optics (PO) and builds on the well known Huygen's principle to model the propagation of a received wavefront via propagation channels (ray tracing) that include the amplitude as well as the phase of the wave. The technique is reasonably accurate, easy to program on a PC computer and uses minimal computational resources.

This PO method is useful for estimating the effect on far out sidelobes of a SATCOM antenna as modified by large nearby objects (outside of the main beam). In other applications, if applied to an antenna within a radome one could determine the far out

sidelobe degradation of a small COTM/SOTM ballistic radome, for instance, as a damaged. It could even be used to assess an aircraft SATCOM radome as damaged by lightning strikes allowing water ingestion. Some of these results will be presented.

Dennis J. Kozakoff – Kozakoff LLC
Vic Tripp - Georgia Tech Research Institute

4:15 pm -
Next Generation Interconnect Cabling for Antenna Applications 80
Advancements in device engineering in the aerospace, military and commercial sectors have contributed to components and end systems that are more sophisticated and smaller than their predecessors. In this age of miniaturization, legitimate concern exists relative to the weight and extensive space needed for the mounting, spacing, and manual mating of conventional connectors and cables. As electronic systems expand in capability and shrink in size, there is a distinct need for multifunctional microwave interconnect solutions that support higher RF frequencies, greater bandwidth, improved survivability, easier servicing and a more compact footprint. This presentation identifies reliable alternatives to packaging challenges of traditional interconnect cabling.

Donald Bradfield, General Manager – Southwest Microwave, Inc.

5:00 pm – Cocktail Reception in Exhibit Hall

November 4th, 2016 – Day 2 Sessions

Antenna Systems attendees will have access to IoT West, Low Power and Sessions. See Event Show Guide for Details.