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Conference Program

Thursday, Nov. 5th 2015

7:00 am – Registration / Continental Breakfast

8:15 am – Welcome Address

8:20 am - Keynote Presentation
Clearing-Up Cloud RAN…..1
Keith Radousky, CTO-Americas – Quintel

There are many views regarding how wireless carriers will keep pace with exponential bit growth and tremendous price pressure. There isn't a single answer, but what's clear is that Cloud RAN will play an important role. What is Cloud RAN? Depends on who you ask! This session proposes that Cloud RAN starts with centralized baseband and front haul connected to standard full power remote radios along with sectorized panel antennas (with crisp patterns) that leverage new siting models. This strategy is the most cost-effective and deployable architecture. The session will also weave in how small cells; DAS and LTE-Advanced play in this vision of Cloud RAN.

9:20 am – Featured Presentation
Phase-Change Materials for Antenna Systems: Characteristics, Capabilities and Challenges…..15
Dimitris Anagnostou, Associate Professor of Electrical & Computer Engineering – South Dakota School of Mines & Technology

Phase-change materials such as vanadium dioxide have attracted much interest during the past decade due to their reversible insulator-to-metal transition. The transition makes these materials useful in applications spanning from information storage to artificial muscles and missile guidance. Recently, the application of phase-change materials in antennas was studied. Results showed a potentially game-changing technology where antennas can have analog reconfigurability or tuning, over a wide frequency spectrum, with extreme linearity, and low losses. The capabilities of phase-change materials in the context of antenna systems and the key integration challenges for wider civilian and military adoption will be presented and discussed.

10:00 am – Networking Break/Exhibit Hall Opens

10:40 am
Smart Plasma Antenna as an RFID Reader With Built-in Protection Against EMI…..43
Dr. Theodore R. Anderson, Founder – Haleakala Research and Development, Inc.

The smart plasma antenna based on opening and closing antenna windows to create antenna beam steering. It can steer 360° in the azimuthal direction and 180° in the z direction. The smart plasma antenna RFID reader can scan and read both passive and active RFID tags. Furthermore the smart plasma antenna is very compact compared to a phased array because plasma physics is used to steer and shape the antenna beam. The smart plasma antenna can easily fit in a small room where tags are to be read. It meets most SWaP criteria. The smart plasma antenna can have an omnidirectional metal antenna along the central axis such as a dipole or biconical antenna and is surrounded by a cylindrical ring of plasma tubes to shape and steer the antenna beam. The diameter of the smart plasma antenna is approximately one wavelength. When one of the plasma tubes has the plasma extinguished, it creates an aperture for the antenna beam. This is an open plasma window. The other plasma tubes are on with the plasma not extinguished. These plasma tubes with closed plasma windows protect the inside antenna from EMI.

11:20 am

A Hybrid "Hexa-Band" Cellular Antenna…..53

Mark W. Ingalls – Machine2Wireless LLC
Michael D. Glover, Ph.D – University of Arkansas
Ed Liang, Ph. D. – MCV Microwave, Inc.

Typically, an internal antenna may be custom designed and integrated into a radio's printed wiring board (PWB) or case, implemented as a separate component plus matching elements that are then attached to the PWB or remotely connected to the radio by means of a cable and connectors. These alternatives suffer from both inflexibility and poor economy. A new hexa-band cellular antenna compatible with mass production has been designed and tested that is partly integrated into the PWB. The new design thus offers the benefits of both customization and high-volume production without requiring a separate matching network.

12:00 pm – Networking Lunch

1:00 pm

Multi-Band Low PIM (168 dBc) Test Solution For 4G LTE…..61

Rafi Hershtig, VP of Engineering and Applied R&D - K&L Microwave

The rollout of 4G LTE networks, characterized by faster data rates and utilizing overlapping frequency bands, presents increasingly challenging interference issues due to new intermodulation (IM) sources. The degree of nonlinearity of each component in the RF chain impacts the IMD level of the system. Over the past few years, there has been growing interest in defining and measuring Passive Intermodulation (PIM) 3rd-order products. This measurement is extremely difficult, particularly for antennas operating in multiple bands, and requires steep dynamic range. Filtering solutions in excess of 168 dBc for two +43 dBm tones are presented, along with a low-cost architecture for multi-band low PIM test boxes, and filter-based test system building blocks are described. As bands proliferate, these building blocks can be switched in and out to provide measurements over multiple LTE bands.

1:40 pm

Frequency Tunable Antenna for LTE (4G) Handsets Operating in the 2.3-2.7 GHz Global Roaming Band…..84

Tayfun Ozdemir, Ph.D., Chief Technology Officer - Monarch Antenna, Inc.

A frequency tunable antenna measuring 10m by 10m by 3mm in size operating in the 2.2-2.9 GHz band is presented. Both the design and manufacturing methods are described and measured data are provided. Antenna is a half-patch with a reconfigurable aperture and the design is based on the patented self-structuring antenna technology. Antenna's tunable feature makes it immune to detuning when used in a closed loop control system. Though the design is compatible with a multitude of manufacturing and embedding methods, the particular prototype was built by wire-bonding bare-die SPST switches onto the antenna board.

2:20 pm

Simultaneous Dual-Band Antenna Aperture Tuning in a Smart Phone…..97

Larry Morrell, Executive Vice President, Marketing and Business Development – Cavendish Kinetics

The expanding frequency range that mobile devices need to cover for full LTE support coupled with the challenging form factors in which the antenna must operate require new design approaches. This paper describes the first commercial consumer wireless device that tunes in two different frequency ranges independently. The nubia Z9 supports frequencies from 824 MHz to 2,700 MHz using an aperture-tuned antenna-frame structure with MEMS variable capacitors to tune the low band (824 MHz to 960 MHz) and mid band (1,710 MHz to 2,300 MHz). Using only two tunable components, the device has superior transmit and receive performance in all bands without the requirement for complex tuning circuits and control in the match circuit. This technique presents an attractive solution for carrier aggregation since two different bands can be optimized completely independently.

3:00 pm – Networking Break in Exhibit Hall

3:40 pm

Direct Printing of Cellular Antenna and 3D Molded Interconnect Devices…..108

David Sessoms, Applications Engineer – Optomec, Inc.

There is fast growing demand for antennas directly integrated into products including smartphones, wearables, and IoT devices. Direct write approaches for creating 3D antenna enable rapid design and prototyping, reduce manufacturing steps, and broaden the choice of substrate materials. Aerosol Jet technology is used to print a wide variety of materials, including conductive inks suitable for electrical circuitry and antenna. Material considerations will be discussed, and case studies involving broadband, Bluetooth, NFC and other antenna with comparisons between Aerosol Jet and traditional fabrication methods will be presented. Examples of via filling, wrap-around printing, and five axis motion will be shown.

4:20 pm
Modeling and Simulation of Antenna Designs For Internet of Things (IoT)…..N/A
Dr. C. J. Reddy, Vice President of Business Development Electromagnetics, Americas – Altair Engineering, Inc.

With proliferation of miniature wireless sensors every device (however low-tech it may be) is expected to have internet connectivity and there is a widespread Machine to Machine (M2M) and Machine to Human (M2H) and Human to Machine (H2M) interaction wirelessly. This phenomenon is referred to popularly as Internet of Things (IoT), which will span roughly 200 billion devices worldwide in the near future. It is expected to be a challenge, to have reliability, and performance of wireless connectivity, which is mainly dependent on not only efficient antenna designs, but also flawless function of these antennas in very complicated environments. One of the key aspects of IoT is requirement of key components to enable communications between devices and objects. Objects need to be augmented with an Auto-ID technology, typically an RFID tag, so that the object is uniquely identifiable. In this presentation, various modeling techniques, such as MoM, MLFMM, FEM, FDTD etc, will be presented. Also asymptotic, ray-based method such as the uniform theory of diffraction or Ray Launching geometrical optics (shooting and bouncing rays) will be presented for electrically extremely large RFID problems such as long distance indoor propagation.

5:00 pm – Cocktail Reception in Exhibit Hall

Friday, Nov. 6th 2015

7:30 am – Registration / Continental Breakfast

9:20 am
Multi-Band Base Station Antennas…..118

Dr. Igor Timofeev, Senior Principal Engineer – CommScope

Modern Base Station Antennas (BSAs) need to support frequencies from 698 MHz to 960 MHz (the so called low band, or LB) and from 1,695 MHz to 2,700 MHz (HB). In the near future, more new wireless bands are coming at 1,452 to 1,492 MHz, 550 to 690 MHz and 3,400 to 3,800 MHz. These will need to be combined in one aperture and have very small cubic volume while being ultra-wideband (50%+) and have dual-polarized low and high band arrays. Additionally, to support MIMO, there is a need to place into BSAs several linear arrays of different bands. Due to zoning and wind-loading issues, wireless operators are not comfortable increasing BSA sizes, and the physical width of BSA has actually stayed the same (around 12 inches) for the last decade, although antenna bandwidth and the number of radiating elements inside BSA increased dramatically. This presentation will describe the design challenges and practical solutions

for minimizing distortion of key antenna parameters (gain, beam width/position, polarization purity, port-to-port isolation, PIM) in heavily overlapped ultra-wideband LB and HB arrays.

10:00 am – Networking Break in Exhibit Hall

10:40 am
Open Standards 'Open' Antenna Integration for VSAT Technology…..129
Karl Fuchs, VP of Technology – iDirect Government

Antenna integration for satellite communications can be challenging as various VSAT manufacturers products operate on different standards. The development of an industry-wide open-source standard for antenna-router integration, known as OpenAIMP, changes the difficulties with antenna integration. The protocol eliminates the need for proprietary coding to make new antennas and routers introduced into the market work together. And it allows organizations to choose from a wider selection of hardware to best suit their needs. This session will review how open standards are being used for antenna integration for VSAT.

11:20 am
Rapid Efficiency Measurements of Complex, High Port Count Antenna Systems…..134
Derek Skousen, Technical Marketing Manager – Bluetest

Antenna efficiency is a fundamental metric of antenna performance. The basic definition is simply the ratio of the total power radiated to the total power applied. In practice however, efficiency measurements can often be time consuming and fraught with practical test uncertainties. These issues are compounded by the latest demands for advanced wireless antenna systems, which require the flexibility of increased TX/RX ports, wide IF bandwidth performance and very broad frequency coverage, all in more restrictive packaging. This presentation will describe these test challenges along with a practical solution using a Reverberation Chamber that significantly reduces the measurement time and complexity of this essential test.

12:00 pm – Networking Lunch

1:00 pm
Concealed Enclosure Designs that Address The Myriad Issues Surrounding SATCOM and Telecom Antennas…..145
Dr. D. J. Kozakoff, J. Fitzhugh and W. Pounds - Concealfab Corp.

The global proliferation of both SATCOM and telecom antennas creates a multitude of infrastructure problems and business opportunities for vendors willing to accept the challenge. The drivers of these challenges include commercial oDAS and Small Cell deployments, the launch of mid earth orbit satellites and varied military and IC missions. A host of previously unforeseen issues are unfolding related to concealing these antennas

from public view for OPSEC reasons, weather resistance, maintenance, and/or vandalism deterrence, or local HOA stipulations. In addition, the limited amount of space available has led to dense clusters of antennas which have been known to interfere with each other. A consideration in the design of RF transparent concealments is its effect on antenna transmission loss, increase in sidelobes, depolarization of the energy, increase in antenna noise temperature, and in the case of SATCOM antennas, back lobe interference and the introduction of a boresight error (BSE). The approaches used to investigate and mitigate all these factors are the subject of this paper.

1:40 pm

Graphical Analysis of a RF Analog IM-DD Photonic Link with an Integrated Optical AGC Receiver…..N/A

Richard Stewart, Engineering Director, RF Transmission Systems – Microwave Photonic Systems

MPS presents a graphical analysis of the Noise and Linearity performance tradeoffs of a high performance RF analog antenna remoting subsystem using an Intensity Modulated – Direct Detection (IM-DD) photonic link with an integrated optical AGC. The paper includes a Case Study highlighting the use of such a link in an S Band antenna system that required stringent control of the optical link budget.

2:20 pm

Low-Cost and Frequency-Selective Metamaterial and its Antenna Applications…..175

T.K. Wu – Antenna and FSS Consulting

Low-cost metamaterial (MTM) or Frequency Selective Surfaces (FSS) have a myriad of applications in the advanced sensor, radar, and communication systems. In this presentation, a low-cost, single-layer, and frequency-selective MTM with the fractal elements was first applied to the dichroic sub-reflector in a dual-band high gain reflector antenna. This MTM sub-reflector diplexes the transmit (11.7 to 12.2 GHz) and receive (14 to 14.5 GHz) bands of a domestic satellite antenna, so both bands share the same high gain reflector. Thus significant savings of this Ku-band communication antenna’s mass, volume, and cost are achieved.

3:00 pm – Conference Conclusion