Passive Wireless Sensor-Tag Workshop

July 27-28, 2011

The West Lake Club
570 West Lake Park Blvd.
Houston, TX 77079

Purpose: To bring many Passive Wireless Sensor-Tag(PWST) technology developers, manufacturers and potential industry end-users together to understand the larger market drivers that will drive costs down and applications up. We will also discuss logical next steps.

Objectives:

1. **Understand various PWST technologies, actual & potential uses, and maturity.**
2. **Assess the future applications/advantages/limitations in various industries.**
3. **Assess what is needed for high volume production, standardization & communication.**
4. **Precipitate individual and group "next step" thinking to further develop/apply PWSTs.**
   (via one-on-ones during the meeting and Session VIII splinter groups)

Who Should Attend:

- **Industries and Government programs that could use a lot of cheap sensors**
- **Sensor System, Surface Acoustic Wave(SAW) and Passive RFID Developers**
- **Academic Institutions and Researchers**
- **Investors**

Registration is US$150. Register at http://a3.acteva.com/orderbooking/bookEvent/A310142

Additional Workshop Details/Presentations/Wshop Survey at the ISA Communications Div website:
http://www.isa.org/MSTemplate.cfm?Section=Announcements&Site=Computer_Tech__Division&Template=/ContentManagement/MSContentDisplay.cfm&ContentID=86754

Workshop Steering Committee:

- **Chairman:** NASA/George Studor, Johnson Space Center george.f.studor@nasa.gov
- **Host:** BP/David Lafferty, Westlake Facility, Houston david.lafferty@bp.com
- **Sponsor:** ISA Comm Division/Peter Fuhr, DOE/ORNL fuhrpl@ornl.gov
  ISA Comm Div - current Chair/Ian Verhappen/Industrial Automation Networks
  iverhappen@industrialautomationnetworks.com

Our Workshop blog… http://web-post.community.controlglobal.com/content/passive-wireless-sensor-workshop

Workshop Description

The workshop will explore the current state of technology of passive wireless sensor tags (PWST) and their practical applications. As a quick background, a PWST has no battery, no need for scavenging power and (of course) no need for a wired connection between the sensor and the data acquisition system. In a manner somewhat similar to a classic passive RFID tag, the PWST responds to a wireless interrogation signal from a reader, but unlike RFID it provides a real-time sensor reading along with its unique tag id, stored information and range. PWSTs can be manufactured in high volume – even incorporating direct write fabrication - resulting in an inexpensive device. With its considerable read-range (separation distance between reader and device), compatibility with extreme environments, small size, autonomy of sensor installation, and "no onboard power" capabilities, PWSTs have a wider application arena than traditional wireless sensors. The workshop will explore these and other motivations for using PWSTs in a variety of fields, present and demonstrate current technologies, explore current and future applications of PWSTs in various industries (commercial buildings, industrial settings, transportation, aerospace, etc.). A key component of the two-day PWST Workshop is to facilitate discussions between end users and suppliers on application areas of mutual interest. There will also be a group discussion to explore how to best move the PWST technology forward.

Area Hotels

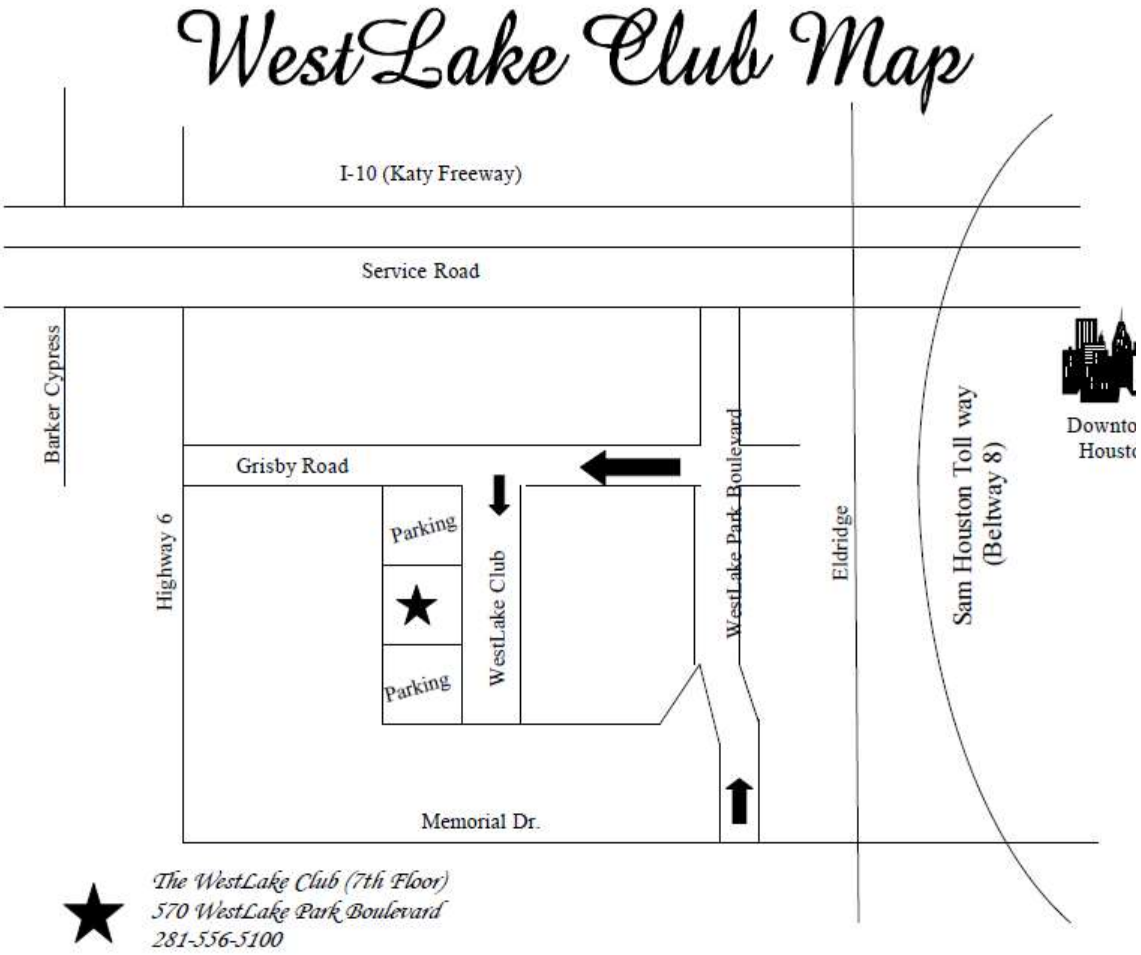
Hotel	Miles	Address	Phone number	Website	Shuttle
Omni Houston Hotel Westside	1.06	13210 Katy Freeway	(281)-558-8338	http://www.omnihotels.com/FindAHotel/HoustonWestside.aspx	Yes
Crowne Plaza I-10 West	1.38	14703 Park Row	(281) 558-5580	http://www.cphoustonwest.com	Yes
Courtyard by Marriott Houston I-10 West/ Energy Corridor	1.63	12401 Katy Freeway	(281) 496-9090	http://www.marriott.com/hotels/travel/houwk-courtyard-houston-i-10-west-energy-corridor	Yes
Residence Inn by Marriott Houston West-Energy Corridor	1.81	1150 Eldridge Parkway	(281) 293-8787	http://www.marriott.com/hotels/travel/houhw-residence-inn-houston-west-energy-corridor/	Yes
Staybridge Suites West	2.00	1225 Eldridge Parkway	(281) 759-7829	http://www.ichotelsgroup.com/h/d/sb/1/en/hotel/houee	Not after 6pm
Houston Marriott Energy Corridor	2.66	16011 Katy Freeway	(281) 829-5525	http://www.marriott.com/hotels/travel/houeg-houston-marriott-energy-corridor/	Yes
The Westin Houston Memorial	5.60	945 Gessner Road	(281) 501-4300	http://www.starwoodhotels.com/westin/property/overview/index.html?propertyID=3108	No

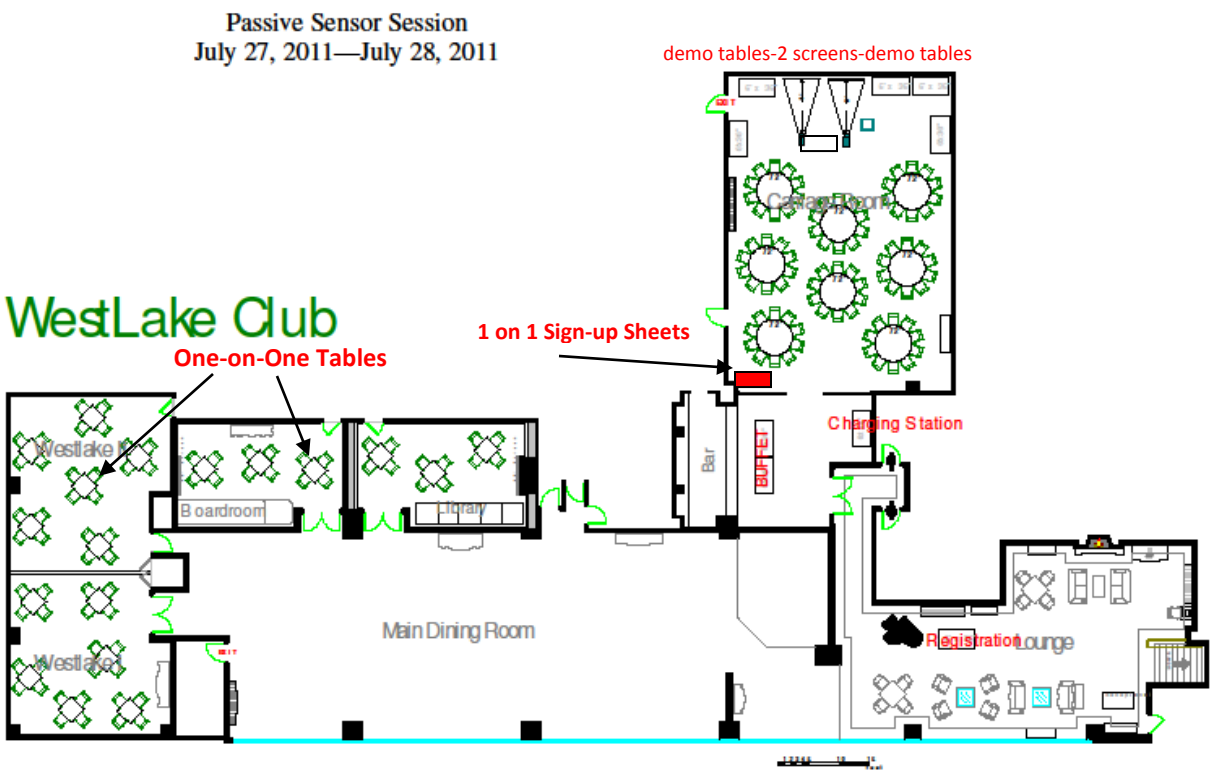
PWST Workshop Location:

The West Lake Club is located between Highway 6 and Eldridge, just off of Memorial Drive and atop the tan parking garage in the West Lake business park.

Directions to the West Lake Club:

- *Traveling West on I-10, take Eldridge Exit*
- *Turn Left under the I-10 freeway*
- *Turn Right onto Memorial Drive and continue for ½ mile*
- *Turn Right onto West Lake Park Blvd (1st traffic light)*
- *Turn Left onto Grisby Road*
- *Turn Left onto West Lake Club Drive (between parking garage and Merrill Lynch Bldg)*
- *Follow signs to Visitors Parking(on right)*
- *Take North set of elevators to the 7th floor(dining)*





AREA RESTAURANTS:

Restaurant	Miles	Phone Number	Website
Yard House	5.8	713-461-9273	www.yardhouse.com
Bistro Alex	5.8	713-827-3656	www.bistroalex.com
Brio Tuscan Grill	5.5	713-973-9610	www.brioitalian.com
Eddie V's	5.4	832-200-2380	www.eddiev.com
Flora & Muse	11.3	713-463-6873	www.floraandmuse.com
Flemmings Prime Steakhouse	10.6	713-827-1120	www.flemingssteakhouse.com/locations/tx/town-and-country
McCormick & Schmick's	5.6	713-465-3685	www.mccormickandshmicks.com
Monnalisa Bar (in Hotel Sorella)	5.2	713-467-8646	N/A
Pronto Cucinino	11.3	713-467-5577	www.pronto-2-go.com
Escalante's	4.3	713-467-0400	www.escalantes.net
Nori Shushi Bistro	5.6	713-586-0800	www.norisushibistro.com
Café Express	4.2	713-331-2792	www.cafe-express.com
La Madeleiene Ra Shushi	5.4	713-464-5557	www.rasushi.com
Ruggles Green	4.3	713-365-9922	www.rugglesgreen.com
Straits	5.5		www.straitsrestaurants.com
The Tasting Room	10.6	713-526-2242	www.tastingroomwines.com
Red Mango Yogurts	20.6	713-521-2242	www.redmangousa.com

Passive Wireless Sensor-Tag Workshop
Introduction
Talking Points - George Studor

- **Passive Wireless Sensors are just one of the options in the "Tool Box" for reducing dependency on wired connectivity and adding functionality without wires or cables.**
- **PWS Technologies address common needs of NASA, other agencies and other industries.**
- **There are many types of Passive Wireless Sensors to investigate and compare with others.**
- **PWST Functionality, with no wire to the data acquisition system, or battery at the sensor:**
  - **IDs that are uniquely separable from many, perhaps hundreds of other tags.**
  - **Stored Info that can be retrieved and changed with remote/non-contact means.**
  - **Location/Range information**
  - **Real-time Sensor/State information**
- **Cost motivations:**
  - **Initial Purchases - Unique vs Standards**
  - **Integration, Modularity**
  - **Life-cycle Maintenance and End-of-Life**
  - **Sensor Data saves in other areas: operations, systems, anomalies, safety**
- **Added value when embedded during Manufacturing and Fabrication processes.**
- **Power-scavenging, if practical, can add benefits…avoid cost/restrictions of battery charging**
  - **Data Logging, Remote and Hazardous Operations, Event Monitoring/Reporting**
  - **Secure Communications, Longer Range Communications**
  - **Continuous Operations and Transmissions – if the scavenge source is consistent**
- **What will we be doing at this workshop?**
  - **Internalize the vision and the fundamentals of the technology**
  - **Learn about some of the specific technologies and the providers**
  - **Learn about some of the Industry needs**
  - **Learn about some next-step areas - new devices, manufacturing, communication…**
  - **Meet one-on-one - either on a schedule (see table in back) or ad-hoc.**
  - **Discuss Key Forward Planning topics - in groups, Splinter sessions in Session 8**
  - **Plan to meet again and distribute workshop results on-line**
- **Workshop Premise:**
  - **Our organizations need to be able to take advantage of new technology…how?**
  - **Others are developing and using technology related to or the same as we want.**
  - **There is a lot of important development going on that we should know about.**
  - **We need more efficient ways to keep up with new technology.**
  - **Technology developers need to know what problems need solving.**
  - **"Out of the Box" thinking needs to move from gadget to System Engineering level.**
  - **Combined Business Cases in multiple industries may enable larger scale production.**
  - **Need to cross the walls between Industries, Government organizations and countries**
  - **Communication is the key - let's work at it!**

PASSIVE WIRELESS SENSOR-TAG WORKSHOP AGENDA			
Registration: 7:00 - 8:30am - Light Breakfast - Sign up for 1-on-1 Sessions at Registration Table			
Session 1: 8:30 - 10:00am			
	0830	**0845**	Welcome - Dave Lafferty/BP/ Chief Technologist Office; Tim McIntyre/ORNL/ISA Sponsor
1-1	**0845**	**0915**	*"Fly-by-Wireless and the Passive Wireless Sensor Workshop"* George Studor/NASA-JSC
1-2	**0915**	**1000**	*"Wireless Passive SAW Sensors using Coded Spread Spectrum Techniques"* Don Malocha/Univ of Central Florida; Madjid Belkerdid/Mnemonics
B	**1000**	**1015**	**Break - 15 minutes**
Session 2: 10:15 - 11:45am			
2-1	**1015**	**1100**	*"Multivariable passive RFID sensors: From detailed laboratory evaluations to pilot-scale manufacturing"* Cheryl Surman/GE Global Research; Peter Bloch/George Dyche Avery Dennison
2-2	**1100**	**1145**	*"Compliance Independence–is this the passive revolution? "* Robert Matthews/West Wireless Institute
L	**1145**	**1200**	**Go Get Lunch at Buffet Table**
Lnch	**1200**	**1245**	**Lunch Speaker** *"History, Applications, and Market Overview of Passive Wireless Sensors"* Leo Reindl/Imtek Micro Sys Tech
B	**1245**	**1300**	**Break 15 minutes**
Session 3: 1:00 - 3:05pm			
3-1	**1300**	**1325**	*"Advanced SAW Devices for RFID and Sensing Applications"* Clinton Hartman/RFSAW
3-2	**1325**	**1350**	*"SAW Sensor and Sensor-tag Developments at ASR&D"* Jackie Hines/ASRDC
3-3	**1350**	**1415**	*"VERSA: V-band Enhanced RFID/Sensing Architecture"* Brian Woods/MaXentric
3-4	**1415**	**1440**	*"Seeing Through the Fog: Collecting PWST Data in a Harsh Environment"* Jeff Brown/Radient360
3-5	**1440**	**1505**	*"Location and Temperature Passive Wireless Sensor Tags"* Ali Abedi/Univ of Maine
B	**1505**	**1525**	**Break 20 minutes**
Session 4: 3:25 - 5:00 pm			
4-1	**1525**	**1550**	*"Integrated Diagnostics Using Direct Write Sensors"* Jason Trelewicz/Mesoscribe Technologies
4-2	**1550**	**1615**	*"Wireless Sensors for Gas Turbine Engines"* John Conkle/Wireless Sensor Technologies
4-3	**1615**	**1640**	*"A New Class of Passive Secure ID Display Card"* Mark Krawczewicz/Tocreo Labs
4-4	**1640**	**1705**	*"Wireless Resonant SAW Sensors for Automotive Applications"* Victor Kalinin/Transense
4-5	**1705**	**1730**	*"High-Function, Long-Range PWST"* Harry Ostaffe/Powercast
Session 5: 8:00 - 10:05am			
5-1	**0800**	**0825**	*"Potential Passive Wireless Sensor Tag Applications"* Dave Lafferty/BP Chief Technology Off
5-2	**0825**	**0850**	*"Proceed with Caution with Disaster Recovery Applications in Nuclear Power Plant Control Systems"* Ivan Chow/Doosan-HF Controls
5-3	**0850**	**0915**	*"RFID Sensors in Transportation"* Ron Stieger/Zonar Systems
5-4	**0915**	**0940**	*"Intelligent Multi-Sensor Measurements to Enhance Pavement Monitoring and Safety"* Fred Faridazar/DOT Fed Highway Adm
5-5	**0940**	**1005**	Co-presenter with Fred Faridazar Nazar Lajnef/Michigan State Univ
B	**1005**	**1020**	**Break 15 minutes**
Session 6: 10:20 - Noon			
6-1	**1020**	**1045**	*"Passive Wireless SAW Temperature Sensors"* Ed Gemdjian/Kongsberg Maritime
6-2	**1045**	**1110**	DOE Building Technologies Program: Sensors & Controls R&D-George Hernandez/DOE BuildTechProg
6-3	**1110**	**1135**	*"Use of Passive RFID and Networking Technology in Aerospace Manufacturing"* Al Salour/Boeing Mfg
6-4	**1135**	**1200**	*"Passive Wireless Sensors, Vehicle Health Management Applications"* Robab Safa-Bakhsh/Boeing R&D
L	**1200**	**1215**	**Go Get Lunch at Buffet Table**
Lnch	**1215**	**1245**	**Lunch Speaker:** *"What Works in the World of Wireless Sensors"* Louis Sirico/RFID Network
B	**1245**	**1300**	**Break 15 minutes**
Session 7: 1:00 - 3:05pm Stimulating Areas of Forward Work			
7-1	**1300**	1325	*"Interactive Gen2/Bridging the Gap between Passive RFID, Sensors and Electronics"* Victor Vega/NXP
7-2	**1325**	**1350**	*"Aerosol Jet Direct Write Technology – A Tool for Printed Electronics"* Rich Plourde/Optomec
7-3	**1350**	**1415**	*"NASA Testing of PWST"* Cy Wilson/NASA - LaRC
7-4	**1415**	**1440**	*"AVSI Cooperative Research in Intra-Aircraft Spectrum Usage"* Fred Fisher/Aerospace Vehicle Sys Inst
7-5	**1440**	**1505**	*"Bridging the Mid TRL Gap through Coordinated Technology Development"* Milind Pimprikar/CANEUS
Session 8: 3:05 - 5:00pm Forward Planning Splinter Sessions - Summary - Workshop Comment Forms			

Many Thanks for the Helpful Contributions by:

Ian Verhappen

Industrial Automation Networks
ISA Communications Div Chair
Wainwright, Alberta
Workshop Planning,
Sponsor and Website

Dr. Peter Fuhr

Oak Ridge National Labs
ISA Comm Div Future Chair
Knoxville, TN
Workshop Planning,
Attendees/Accounting

Dave Lafferty

BP - Technology Office
ISA member
Houston, TX
Workshop Planning,
Host Facilities/Personnel

Radina Khalid

West Lake Club Facility

Toni Beasley: BP/CTO Executive Admin
- Host Activity Coordinator

Greg Benning: BP
- Audio-Visual Assistance

Liz Grote: West Lake Club
- Services Coordinator

NASA/JSC Summer Intern (INSPIRE program)
Presenter Info, Wshop Brochure
Nametags, Signs, Sign-in Sheets, W-shop Blog

Rick Zabel - VP Publisher, Automation.com **rick@automation.com 952-563-5448**
Global Internet Advertising/Alerts through Automation.com

Louis Sirico - The RFID Network **Louis@RFID.net 408 768-7343**
RFID Network **http://RFID.net**

Distinguished Presenters Traveling from Europe:

Dr. Victor Kalinin, Transense, UK & Dr. Leo Reindl, IMTEK, Freiberg, GE

Session 1 Presentation 1	**George Studor**
"Passive Wireless Sensors and Fly-by-Wireless Vision"	**NASA/Johnson Space Center**
Demo: No Poster: No (763)208-9283	**Staff Strategic Planning & Partnering**
One-on-One Table: No	**george.f.studor@nasa.gov**

Abstract: Application of Wireless Technology to Aerospace Vehicles can have a number of advantages, but the perception the vulnerability of a single wireless link thwarts system engineering and accurate reliability analyses. Three elements to Fly-by-Wireless are essential: 1) A tool-box of alternatives to standard wiring and sensing, 2) Architectural provisions to all the alternatives to be applied, 3) Management direction and motivations to drive a change in the state-of-the-art. Although smart wireless sensor nodes and networks are coming into maturity, the cost per measurement point is still high and functionality somewhat limited - leaving mainly the applications that have extreme cost, schedule or physical difficulty. Passive Wireless Sensors have the potential to provide extremely useful function, performance benefit to Aerospace Vehicles and their Ground Operations and Test Facilities. By leveraging similar benefits in other industries with much higher volume applications, aerospace can have a mutually beneficial relationship with them - bridging technical gaps and industry bridging cost needs. The topic will address this FBW vision consistent with the PWST workshop goals and content.

Background: Mr. George Studor is a senior project engineer for technology applications in the Strategic Opportunities and Partnership Development Office of the Johnson Space Center. Through innovative use of relationships outside NASA, he is making significant progress towards technology partnerships with external organizations, industries and universities. He is currently leading the Wireless Avionics Community of Practice for the Office of the Chief Engineer. In the past 15 years, he has championed numerous successful wireless flight instrumentation projects for dual-purpose technology - operational use demonstrations on Space Shuttle and International Space Station. Applying the lessons learned, he has promoted changes to future vehicle architectures to enable reduced wires and connectors through a comprehensive approach called "Fly-by-Wireless".

1983-Present: NASA - Mostly at Johnson Space Center
1972-1987 - USAF C-130 Pilot, Detailee at NASA/JSC,
1987-1999 - AF Reserve AFRL - Retired Major
Education: 1976 - BS Astronautical Engineering, USAF Academy
1982 - MS Astronautical Engineering, USAF AFIT

Session 1 Presentation 2	**Dr. Don Malocha**
"Wireless Passive SAW Sensors Using	**Prof, Univ of Central Florida**
Coded Spread Spectrum Techniques"	**Dept of E&CE; Harris Eng Center**
Demo: Yes Poster: No (407)-823-2414	**Donald.Malocha@ucf.edu**
One-on-One Table: No	**http://caat.engr.ucf.edu/**

Abstract: Surface acoustic wave SAW devices provide a robust approach to multi-sensor tagging. Our efforts have demonstrated the first SAW OFC devices and systems ranging in frequency from 250 MHz to 1 GHz with ultra-wide-band (UWB) operation(>25% BW) and moderate bandwidths (< 10%). Device processing gains have varied from 9 to over 50. The systems have demonstrated multi-sensor operation using frequency and time diversity, in open range, and closed environments. This presentation will discuss recent UCF and Mnemonic results on orthogonal frequency coded (OFC) SAW sensor system development, and will demonstrate a fully operational 915 MHz orthogonal frequency coded (OFC) temperature sensor system. Some of the most difficult and critical parameters studied are multi-coding approaches, operational range predictions, SAW device parameters of frequency and bandwidth, sensor post processing, and antenna-SAW device integration. The system is based on a software radio approach which provides great flexibility for future enhancements and diverse sensor applications. The most ubiquitous sensor requirement is for temperature, which is the first application demonstrated for the devices and system. The system has demonstrated a range of approximately 60 meters with a single sensor and over 5 meters with multiple sensors. This presentation's focus will be on the key SAW device technology development to date, addressing the critical device and system parameters, and will present the first operational OFC device system results.

Background: Donald C. Malocha received a joint BS in electrical engineering (EE) and computer science (CS), an MS in EE, and Ph.D. degree in EE from the University of Illinois, Urbana. He was member of the technical staff (MTS) at Texas Instruments Corporate Research Laboratory, Mgr. of Advanced Product Development, Sawtek, and an MTS at Motorola. He has been a Visiting Scholar at the Swiss Federal Institute of Technology, Zurich (ETH), Switzerland, and the University of Linz, Austria. He is a member emeritus of the Electronics Industries Association (EIA). He is formerly a member of the Board of Directors of Piezo Technology, Inc. He is currently a Professor in the Electrical Engineering and Computer Science Dept., University of Central Florida (UCF), Orlando. His current research interests include surface acoustic wave (SAW) and bulk acoustic wave (BAW) technology, sensors and radio frequency identification systems.

Don is a Fellow of the Institute of Electrical & Electronics Engineers (IEEE). He is an Associate Editor of the IEEE TRANSACTIONS ON ULTRASONICS, FERROELECTRICS AND FREQUENCY CONTROL (UFFC), the UFFC Society Standards Chair, and is past-President of the IEEE UFFC Society. He serves on the Technical Program Committees (TPC) of the IEEE International Ultrasonics Symposium, International Frequency Control Symposium, and has served on the TPC of the IEEE Microwave Theory and Techniques Symposium, and European Frequency and Time Forum. He is the 2004 UCF Distinguished Researcher and has received the IEEE UFFC 2008 Distinguished Service Award, the 2005 J. Staudte Memorial Award, the 2000 IEEE Third Millennium Medal, and the 1998 Electronic Industries Association's David P. Larsen Award. He has over 200 technical publications, 12 patents awarded, and several pending.

Session 1 Presentation 2 - <u>Co-presenter</u> with UCF		**Dr. Madjid Belkerdid**
"Wireless Passive SAW Sensors Using		**Mnemonics**
Coded Spread Spectrum Techniques"	**321-254-7300**	**Principal Systems Engineer**
Demo: Yes(w UCF) Poster: Yes		**mbelkerdid@mnemonics-esd.com**
One-on-One Table: No		**http://mnemonics-esd.com**

Abstract: Surface acoustic wave SAW devices provide a robust approach to multi-sensor tagging. Our efforts have demonstrated the first SAW OFC devices and systems ranging in frequency from 250 MHz to 1 GHz with ultra-wide-band (UWB) operation(>25% BW) and moderate bandwidths (< 10%). Device processing gains have varied from 9 to over 50. The systems have demonstrated multi-sensor operation using frequency and time diversity, in open range, and closed environments. This presentation will discuss recent UCF and Mnemonic results on orthogonal frequency coded (OFC) SAW sensor system development, and will demonstrate a fully operational 915 MHz orthogonal frequency coded (OFC) temperature sensor system. Some of the most difficult and critical parameters studied are multi-coding approaches, operational range predictions, SAW device parameters of frequency and bandwidth, sensor post processing, and antenna-SAW device integration. The system is based on a software radio approach which provides great flexibility for future enhancements and diverse sensor applications. The most ubiquitous sensor requirement is for temperature, which is the first application demonstrated for the devices and system. The system has demonstrated a range of approximately 60 meters with a single sensor and over 5 meters with multiple sensors. This presentation's focus will be on the key SAW device technology development to date, addressing the critical device and system parameters, and will present the first operational OFC device system results.

Background: Dr. Belkerdid is Principal Systems Engineer at Mnemonics, Inc., in Melbourne Florida, where he is involved in UHF SATCOM transceiver design. Prior to joining Mnemonics, he was at Terion Inc. where he was involved in the design, testing, and deployment of a MIL-STD-188-110B HF modem for a commercial application. And prior to joining Terion, he was a professor of Electrical Engineering at the University of Central Florida. Dr Belkerdid received a BSE in Electrical Engineering, an MSE in Electrical Engineering, and a PhD in Electrical Engineering from the University of Central Florida in 1978, 1980, and 1984. He has Published over 90 papers in journals and conference proceedings, and 3 patents.

Session 2 Presentation 1 - <u>Co-presenter</u> with GE Global Research		**Peter Bloch/George Dyche**
Introduction to Avery-Dennison/GE Global Research Partnership		**Avery Dennison**
Demo: No Poster: Yes		**Sr. Manager Strategic Alliances**
One-on-One Table: No	**(608) 232-1852**	**peter.bloch@averydennison.com**
	(770) 967-5831	**george.dyche@averydennison.com**

Webinar - http:// www.rfid.averydennison.com/rfid-sensor-technology-hf-inlay.php

May 9, 2011 Press Release: http://www.rfid.averydennison.com/press_release.php?id=39

Background: Peter Bloch is responsible for the **Management of Strategic Partnerships at Avery Dennison RFID.** His work roles include: business development, partnership & alliance negotiation, business planning, program design, training, and execution. Avery Dennison RFID manufactures UHF, HF and NFC inlays which help enable significant improvements in asset management, product quality and authentication, process improvement and brand experience. Their design experts and applications engineers leverage decades of experience to create real-world RFID solutions in applications such as retail, aviation, supply chain, healthcare and defense. Comprehensive testing of their RFID tags in RFID systems occur in all of their facilities. They partner with an array of industry leaders in tag converting, printer and reader hardware, software and systems integration. Peter previously worked as the Director of RFID at NCR Corporation and has over 20 years experience working in various sales, marketing, and management rolls, including the last 10 years spent in RFID technology. He has also worked as the VP of Marketing for Encore, a healthcare provider delivering assisted living tailored to people with Alzheimer's disease. Bloch holds a Business Degree in Marketing from the University of Wisconsin, Madison, where he currently resides with his family.

(Unable to be present)

George Dyche is currently **Product Manager at Avery Dennison RFID**, supervising the definition, development and marketing of the division's UHF, HF and NFC inlay products. George joined Avery Dennison in 2004 as Senior RFID Engineer and was instrumental in crafting the test capabilities at the company's Atlanta Technical Center. He was influential in creating strategic relationships with high-value end users and partners through superior application and technical support and moved to a Business Development role in 2006. In 2007, George became Global Account Manager and took over responsibility for nurturing a set of key strategic system integrator, label converter and end user accounts. He focused his efforts for three years on item-level apparel adoption strategies and has worked with the major retailers globally including Marks & Spencer, Walmart, and Gerry Weber. George is currently Adjunct Faculty for the Sam M. Walton College of Business at the University of Arkansas, Executive Education Program, Certificate of RFID. He has been invited to speak at multiple industry functions and was the keynote speaker at Baylor University's RFID Technology in Item-level Retail seminar. George has 14 years of experience in the wireless industry with various technologies including RFID at Avery Dennison, fixed point-to-point microwave systems at Alcatel-Lucent, and surface acoustic wave devices (SAW) at RF Monolithics, Inc. He has a B.S.E.E. from Texas A&M, as well as an MBA.

Session 2 Presentation 1	**Dr. Cheryl Surman**
"Multivariable Passive RFID sensors: From Detailed Laboratory Evaluations to Pilot-scale Manufacturing"	**GE Global Research, Chem Sensors Bioanalytical Chemist**
Demo: Yes Poster: No	**(518) 387-5416**
One-on-One Table: No	**Surman@ge.com**
	http://www.ge.com/research

Abstract: We have developed battery-free (passive) proximity-operated physical, chemical, and biological sensors based on radio frequency identification (RFID) tags for numerous applications, such as disposable bioprocess monitoring, food quality, indoor residential monitoring, biodetection, industrial safety and many others. These sensors take advantage of the team's multidisciplinary expertise in transducer design, coating materials, and electronics. Selectivity of developed RFID sensors is provided by measurements of their resonance impedance spectra, followed by the multivariate analysis of spectral features, and correlation of these spectral features to the analytical properties of interest. The multivariate analysis of spectral features also provides the ability for the rejection of ambient interferences. Thus, this developed multivariable RFID sensing concept offers the response selectivity that is impossible to achieve with other individual sensors and even sensor arrays. Our RFID sensing concept features 16-bit resolution provided by the sensor reader, granting a highly desired independence from costly proprietary RFID memory chips with an analog input.

We will discuss laboratory and field test results on the detection of physical, chemical, and biological parameters of industrial, food safety, environmental, and homeland security importance. Laboratory results include ~500 part per trillion detection of ions in pure water, part per billion and part per trillion detection of gases in air, rejection of interfering gases with a single sensor, femtomolar detection of proteins and ~ detection of 35 bacterial spores.

Selected RFID sensors were manufactured on the pilot scale and tested in the standard laboratory conditions for their gas response. Initial field-testing of these sensors has been recently performed. This work has been supported in part from Corporate Research funds and by National Institute of Environmental Health Sciences (Grant 1R01ES016569-01A1).

Background: Cheryl Surman (Bratu) received her B.S. in Chemistry and Biology from Valparaiso University in Valparaiso, Indiana in 1997 and her Ph.D. in Bioanalytical Chemistry from Rensselaer Polytechnic Institute in 2006. She is a lead scientist at GE Global Research with 5 years of experience in the online-process control and 14 years of experience in the development of various analytical techniques. In addition, Surman has an extensive background in chemometric techniques such as PCA, PLS, KNN, and SIMCA, and in combinatorial methods. While working at UOP, LLC in Des Plaines, IL, Surman developed multivariate models for prediction and control of octane in platforming pilot plant operations. In addition, Surman and co-workers developed sample preparation and data analysis methods to efficiently generate and detect novel heterogeneous catalyst materials. At GE, Surman played a major role in the chemical development and fabrication of disposable planar ion sensors for GE Water Technologies. For the past several years her focus has been on the development of radio frequency identification (RFID) sensing technologies for GE Healthcare and The Air Force Research Laboratory. She has 14 technical publications and 14 filed patents.

Session 2 Presentation 3	**Dr. Robert Matthews**
"Compliance Independence – is this the passive revolution?"	**West Wireless Health Institute**
	Chief Technology Officer
Demo: No Poster: No	**(858) 535-7000** **rmatthews@gmwhi.org**
One-on-One Table: TBD	**www.westwirelesshealth.org**

Abstract: Health care in the united states consumes over one third of the GDP, this number in itself is concerning however what is even more concerning is the alarming rate at which it continues to rise. It is imperative we work together to find ways to significantly reduce the cost of managing health care whist maintaining the high quality of care we presently enjoy. One promising new method relies on the ability to collect data from individuals in non traditional environments such as home and work environments. One significant hurdle associated with this method is how do we collect this data, in a reliable manner that does not overburden the individual. In today's world of ever increasing complexity, responsibilities and information overload we all struggle to find time to attend to the basics of our everyday life, adding tasks associated with collecting data for medical analysis will most likely overburden most individuals and consequently lead to poor compliance. The solution will lie in our ability to develop "compliance independent" systems that can collect useful data without inconveniencing the individual being monitored. During this talk we will discuss applications and techniques that can help reduce the complexity and burden of collecting useful data.

Background: Dr. Robert Matthews is the **Chief Technology Officer** (CTO) of the West Wireless Health Institute. In this role, he is responsible for providing strategic and technical leadership to advance the Institute's mission of lowering health care costs. He brings extensive experience in the research and development of state-of-the-art instrumentation, and solving complex problems in the health care, humanitarian and wellness industries.

Recently, Dr. Matthews served as CTO for Archinoetics, where his research and development activities focused on commercial successes in the wellness and fitness markets, including several opportunities currently being transitioned into new spin-offs for the company. In this role, he is responsible for providing strategic and technical leadership to advance the institute's mission of lowering health costs. He brings extensive experience in the research and development of state-of-the-art instrumentation, and solving complex problems in the health care, humanitarian and wellness industries. Previously, he served as President of QUASAR (Quantum Applied Science and Research) in San Diego, CA, where he developed the world's first truly non-invasive EEG/ECG measurement suite. He was responsible for defining the direction of the company, developing new sensor technologies and identifying commercial markets. While at QUASAR, he also helped develop new technologies that were spun out into three successful standalone companies.

Dr. Matthews has in-depth experience in developing non-invasive medical devices and a broad range of practical experience in developing state of the art EM (electromagnetic) sensing systems. An outstanding inventor and an expert in ultra-low noise electronics, he is the author and coauthor on many scientific publications and is the inventor and co-inventor of numerous patents. He is an Executive Board member of the Augmented Condition Society and also belongs to the Human Factor Ergonomic Society. He earned his PhD in Physics from the University of Western Australia.

Lunch Session - July 27th	**Dr. Leonhard Reindl**
"History, Applications, and Market Overview	**Imtek, Institute for Microsystem Technology**
of Passive Wireless Sensors"	**Dept Head, Electrical Instrumentation**
Demo: No Poster: No	**Albert-Ludwig University, Freiburg, Germany**
One-on-One Table: No 49-761-203-7221	**reindl@imtek.uni-freiburg.de**

Abstract: In the recent years unwired SAW sensors and identification tags have come under notice with a growing number of publications and applications. In this presentation the history, the operating principles of wireless passive, mostly SAW based identification marks and sensors, their possible applications and a small market overview are shown.

The whole radio based sensor system consists of a read-out unit, comparable to an RADAR device, and a passive transponder, consisting of a surface acoustic wave (SAW) device wired to an antenna. The surface acoustic wave stores the read-out signal for a predefined period of time to suppress all environmental echo interferences. Physical or chemical effects may influence the propagation characteristics of the surface acoustic wave. Two fundamental devices allow storing and modulating of surface acoustic waves: the resonator, and the uniform or chirped delay line.

In this presentation, the evolution of the technique together with the applied wireless transponders is discussed, as well as the setup of the read out unit using a pulse or FMCW radar. Special emphasis is set on the achievable accuracy and on the sensitivity range. Several applications of such sensor systems and their state-of-the-art performance is presented by way of examples which include identification marks and wireless measurements of temperature, pressure, torque, acceleration, tire-road friction, magnetic field, and water content of soil. A discussion of the possible market chances will close the presentation.

Background: Leonhard Reindl received his Diploma in Physics from Technical University of Munich, Germany, in 1985 and his Dr. sc. techn. from University of Technology Vienna, Austria, in 1997. In April 1985 Dr. Reindl joined the surface acoustic wave group of the Siemens Corporate Technology Division, Munich, Germany. At Siemens Dr. Reindl contributed to the development of SAW convolvers, dispersive, tapped, and reflective delay lines. His primary interest was in the development and application of SAW ID-tag and wireless passive SAW sensor systems. In April 1999 Dr. Reindl joined the Institute of Electrical Information Technology, Clausthal University of Technology, where he became professor of communications and microwave techniques. In May 2003 he accepted a full professor position as the chair for Electrical Instrumentation at the Institute for Microsystem Technology (IMTEK) at the University of Freiburg, Germany. Dr. Reindl is member of the IEEE, of the TPC of the IEEE Frequency Control Symposium, and of the German biannual Symposium Sensoren und Messsysteme. He is and has been elected member of the AdCom of the IEEE UFFC society in 2005 to 2007 and in 2010 to 2012. He holds more than 30 patents on SAW devices and wireless passive sensors and has authored or co-authored more than 150 papers in this field.

Session 3 Presentation 1	**Clinton Hartmann**
"Advanced SAW Devices for RFID and Sensing Applications"	**RFSAW, Founder & President**
Demo: Yes Poster: TBD	**(469) 916-5960** **CHartmann@RFSAW.com**
One-on-One Table: Yes	**www.rfsaw.com**

Abstract: RF SAW Inc. has developed Surface Acoustic Wave sensors that overcome the problems of limited ID numbers, restricted reading range and lack of anti collision. These issues have limited the widespread deployment of SAW based RFID and temperature measurement systems. Use of SAW devices for RFID applications have been know since the 1970's. Despite the high speed reading capabilities and harsh environment range that these devices could withstand, the deployment has been limited by the inability to produce a large number of unique RFID codes and to read more than one tag in the read field at one time. This presentation describes and demonstrates an advanced RFID and temperature sensing system based on the Global SAW Tag (GST) system that overcomes both of these limitations. The company is headquartered in Richardson, Texas, and first delivered the GST to NASA in 2007.

Background: Clinton Hartmann is the **Founder and President of RFSAW, Inc.** Hartmann is internationally recognized pioneer of SAW technology. During his 30-year career, Hartmann has invented many SAW devices that are in common use today, including key enabling devices which are used in cellular telephones, pocket pagers, video tape recorders, automotive keyless entry systems, and many others. In 1985, Hartmann founded Hartmann Research, Inc., an independent SAW research company, at which he invented and developed SAW device types including the EWC/SPUDT, the key filter in color television sets and is used in cell phones. In 1979, Hartmann co-founded RF Monolithics, Inc., a SAW device company that subsequently became a successful public company. Hartmann began his career at Texas Instruments where he achieved the rank of TI Fellow for his pioneering work in the field of Surface Acoustic Wave devices and applications. During this period, he invented numerous SAW devices including the SAW resonator, which has become the most widely used SAW device in the world. In 1976, he was named The Outstanding Young Electrical Engineer in the United States by Eta Kappa Nu, the electrical engineering honor society. Hartmann graduated with honors from the University of Texas at Austin went on to receive advanced degrees from the Massachusetts Institute of Technology (MIT).

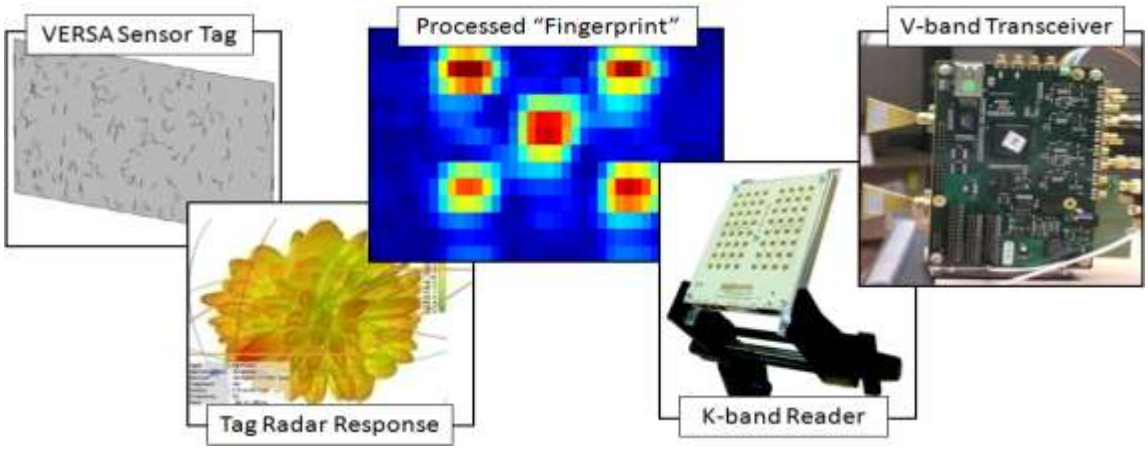
Session 3 Presentation 2	**Dr. Jackie Hines**
"SAW Sensor and Sensor-tag Developments at ASR&D"	**Applied Sensor R&D Corporation**
Demo: Yes Poster: No **410-544-4664**	**President**
One-on-One Table: No	**jhines@asrdcorp.com**
Presentation Link:	**www.asrdcorp.com**

Abstract: ASR&D has developed SAW sensors for hydrogen, humidity, liquid level, and temperature, and passive wireless sensor-tag interface devices, all under NASA SBIR and STTR funded programs. Current work includes the development of a 32-sensor wireless multi-sensor system for humidity measurement, a 32-sensor high-sensitivity temperature sensor system, sensors for hypergol leak detection, and groups of SAW sensor-tags with up to 100 individually identifiable devices. This presentation will summarize ASR&D's activities to date. Several innovations, including the ability to produce temperature sensors with sensitivity controlled by device design, and to selectively read any one coded wireless sensor out of a set of sensors will be described. ASR&D will also demonstrate some of these capabilities during the presentation.

Background: Jackie Hines is **President of ASR&D Corporation.** Jackie received a B.S. in Applied and Engineering Physics from Cornell University College of Engineering, and a M.S. and Ph.D. in Electrical Engineering from the University of Central Florida, Orlando Fl. Jackie served on active duty in the U.S. Navy from 1984 through 1988, and on drilling status in the Naval Reserves until 1996, completing Engineering Duty Officer qualifications and leaving the service as a Lieutenant Commander. In 1988 Jackie joined Sawtek Inc., a company specializing in surface acoustic wave device technology, as a research scientist. While at Sawtek, she was responsible for establishing and managing a SAW-based chemical sensor product development program for DARPA that produced a system capable of detecting, identifying, and quantifying volatile organic chemical vapors alone and in mixtures of up to two vapors plus water. The sensor system was successfully demonstrated at DOE's Savannah River Site in June 1998. Jackie served as Manager of Research and Development for over ten years, and left Sawtek to found her own consulting company in 2000. In August of 2005, having served as PI on two NASA contracts, Jackie founded Applied Sensor Research & Development Corporation to commercialize promising acoustic wave sensor technologies. Located outside Annapolis MD, ASR&D currently conducts contract research into acoustic wave sensor technologies and applications for government and industrial clients. Jackie has been active in a wide range of professional activities, and currently serves as President-Elect of the Administrative Committee (ADCOM) of the IEEE Ultrasonics, Ferroelectrics, and Frequency Control Society (UFFC-S).

Session 3 Presentation 3	**Brian Woods**
"VERSA: V-band Enhanced RFID/Sensing Architecture"	**MaXentric Technologies, LLC**
Demo: Yes Poster: No	**(201) 266-0849** **R&D Engineer**
One-on-One Table: Yes	**bwoods@maxentric.com**
	www.maxentric.com

Abstract: MaXentric is developing a radar-based RFID/sensor technology codenamed VERSA (V-band Enhanced RFID/Sensing Architecture). VERSA uses completely passive wireless sensor tags with small embedded dipoles designed to resonate at 60GHz. When illuminated with RF energy by a VERSA reader, the dipoles of the sensor tag reflect a unique signature that can be processed to provide information about the sensor tag. The VERA-tag Technology can be embedded in wood, paper or plastic at lower cost than conventional RFID tags.



Background: As a **research and design engineer** at MaXentric, Mr. Woods is closely involved in the design, development, and integration of X and K-band radar systems on both the hardware and software sides. His involvement has included design and construction of radar acquisition platforms and test benches, along with the collection and processing of radar signatures for target recognition.

Mr. Woods earned a B.E. degree in Electrical Engineering from Cooper Union for the Advancement of Science and Art, New York in 2004 and is currently pursuing a M.E. degree in Electrical Engineering at the same institution.

Session 3 Presentation 4		**Jeff Brown**
"Seeing Through the Fog: Collecting PWST Data		**Radient360**
in a Harsh Environment"	**709-699-9021(c)**	**Exec. Vice President**
Demo: Yes Poster: No		**jeff.brown@radient360.com**
One-on-One Table: No		**www.radient360.com**

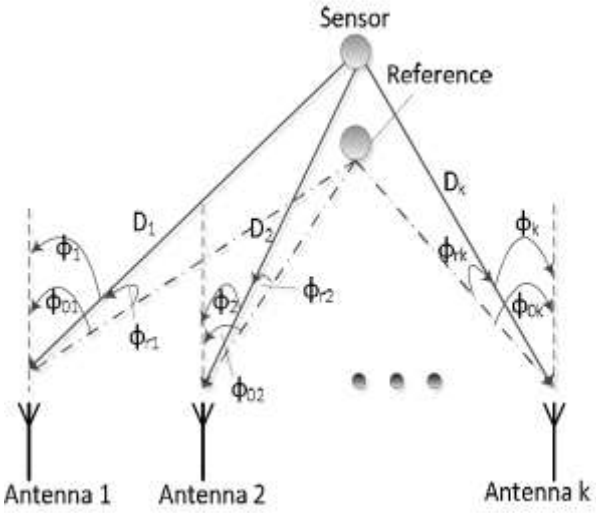
Abstract: A common challenge experienced by organizations when adopting Radio Frequency Identification (RFID) in the Aerospace and Oil & Gas industry is the technologies ability to withstand the harsh environment in which both sectors operate. RFID is a maturing technology that must adhere to global standards, enable interoperability across the value chain, and reach a price point that supports an acceptable ROI all while performing as a stable, asset management solution. Achieving this in a harsh environment while trying to advance the technology readiness levels of the solution is no easy feat. Mr. Brown will explore the past 10 years of passive RFID and his expectations for the 10 years ahead, more specifically, how the lessons learns from deployments in harsh environments will foster the adoption of PWST. Agenda for the Presentation:

1. Passive RFID: The Past 10 Years
2. Case Study #1: Advanced Logistics Systems for Aerospace MRO
3. Case Study #2: Oil & Gas - Field Service Management (FSA) in the Harsh Atlantic Ocean
4. What Have We Learned Through Deployments in Harsh Environments?
5. Passive RFID: The Next 10 Years

Background: Jeff joined the management team at IDBLUE in 2007 to launch and lead IDBLUE Consulting Services (ICS), a solution-services practice at IDBLUE focused on enhanced supply chain solutions for the oil and gas, aerospace, and industrial markets. Jeff played a key role in the growth of ICS to the point it became its own entity in 2011, Radient360. As a member of the senior management team, Jeff is responsible for the development and execution of corporate strategy and operating plans, the development and execution of product and solution roadmaps, and for holding relationships with senior personnel across various accounts. Jeff is a PMI certified Project Manager Professional (PMP) with over 14 years' experience in various technology Management and Business Consulting roles. Prior to joining Radient360, Jeff spent over 10 years at IBM as a senior Project Manager and Practice Lead. Jeff has spent the past seven years managing Radio Frequency Identification (RFID) related projects with a special focus on traceability and asset management, including roles on various standards committees and industry working groups. Jeff spent four years leading the RFID practice at IBM Canada. Jeff brings with him an extensive background in business strategy, technology adoption methodologies, and portfolio project management.

Session 3 Presentation 5	**Dr. Ali Abedi**
"Location and Temperature Passive Wireless Sensor Tags"	**Univ. of Maine, Asso. Prof.**
Demo: No Easel: No 207-581-2231	**Electrical and Computer Eng**
One-on-One Table: No	**ali.abedi@maine.edu**
Publ. Papers: www.eece.maine.edu/~abedi/publications.html	**wisenet.eece.maine.edu**

Abstract: Adding location information to passive wireless sensors opens the door to a large variety of applications with spatio-temporal needs. In this presentation, a hybrid location estimation method based on combined angle of arrival, received signal strength, and time of arrival methods is presented. Fundamental limits of localization using these methods are studied and a roadmap to include location information in passive wireless sensors such as temperature, strain, and pressure sensors is presented. Some application of location sensors includes, structural health monitoring, pressure field estimation, and harsh environment applications.



Background:

Ali Abedi received his PhD in Electrical and Computer Engineering from University of Waterloo, Canada in 2004. He worked as adjunct professor at Queen's University from 2004-2005. Dr. Abedi joined the University of Maine in 2005 where he is currently Associate Professor of Electrical and Computer Engineering and Director of WiSe-Net Lab. His research works include analytical performance evaluation of channel codes and their applications in wireless sensor networks. Dr. Abedi is an affiliate faculty at Maine Institute for Human Genetics and Health as well as President and CTO at Activas Diagnostics, Bangor, ME. Dr. Abedi has received a number of awards and recognitions from NSERC, JSPS, CSA, IEEE, and NASA. He has served as panelist on NSF and NASA proposal review panels.

Related papers available at web-link above: www.eece.maine.edu/~abedi/publications.html

- F. Schwaner, D. Blackmer, A. Abedi, *"Computing Performance Bounds for Analysis of Indoor Wireless Fading Channels for RFID-Based Localization,"* ICWN'11, July 2011, Las Vegas, NV.
- Razi, A. Abedi, "*Interference Reduction in Wireless Passive Sensor Networks Using Directional Antennas,*" IEEE/CANEUS Fly By Wireless Workshop, June 2011, Montreal, QC, pp. 83-86. (Best Paper Award)

Session 4 Presentation 1	**Jason Trelewicz**
"Meso-Plasma Direct Write Fabrication of Conformal, Harsh Environment Sensors"	**Mesoscribe Technologies Program Manager**
Demo: Yes Poster: No	**631-686-5710**
One-on-One Table: No	**www.mesoscribe.com**

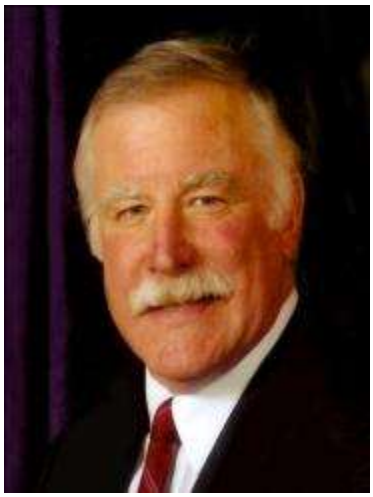
JTrelewicz@mesoscribe.com

Abstract: MesoPlasma™ Direct Write is a highly versatile process technology for fabricating sensors and antennas conformally onto complex geometry components to support integrated health management and advanced communications systems. The innovative MesoPlasma™ process, united with high precision 7-axis automation, enables fine-feature patterns to be fabricated conformally onto contoured surfaces, embedded within structural materials, and deposited over large areas for seamless integration. A broad range of materials can be additively patterned using Direct Write technology, which renders devices immediately functional in the as-deposited state with applicable substrates ranging from high temperature superalloy materials to heat sensitive composite laminates and polymer sheets. Attributes of the Direct Write process central to sensor fabrication for harsh environment diagnostics will be presented, with particular emphasis on aerospace health management applications.

Background: **Dr. Jason Trelewicz** is a **Program Manager** at MesoScribe Technologies and responsible for the **marketing and transition** of the Company's technologies to commercial products. He manages multiple Phase 2 SBIR projects working with AFRL and NAVAIR on harsh environment sensors and composite instrumentation, and oversees subcontractor activity on other DoD and DoE research programs. He received his PhD from MIT in Materials Science and Engineering, specializing in nano-structured materials, protective coatings, and technology transition. While at MIT, he was a technical advisor to high technology start-up companies and also worked as an independent consultant on a variety of failure analysis programs. Previously, he was a metallurgical engineer at Dayton T. Brown Inc. conducting failure analysis and managing project schedules for a number of Department of Defense contracts. He has been involved in Materials Research & Development for 10 years, and has authored multiple technical publications in the areas of nanomaterials and harsh environment sensors. Noteworthy awards include recognition as the "Top Speaker" in the Electronics Technical Sessions at the 2010 Defense Manufacturing Conference, the 2004 SUNY Chancellors Award for Excellence, and the Barry M. Goldwater National Fellowship.

Session 4 Presentation 2	**John Conkle**
"Wireless Sensors for Gas Turbine Engines"	**Wireless Sensor Technologies**
Demo: No Poster: No **408-234-3741**	**Founder and President**
One-on-One Table: No	**jrconkle@att.net**

Abstract: Gas turbine engines present a particularly challenging environment for sensors. Consider temperatures that can exceed 1200C, accelerations up to 50,000 G's, and rotating components that make the use of wired sensors difficult since slip rings are inherently noisy and unreliable and only a limited number of sensors can be accommodated. A class of wireless sensors have been developed that address the operational environment using passive, RFID-like sensors that can be deposited on turbine blades or other surfaces and offer long term, reliable operation. This RF circuitry is" printed" on the surface similar to the processes used to make integrated circuits such that their mass and size are sufficiently small that they do not alter the vibrational modes of the blade on which they are mounted. They are totally passive, requiring no external power to operate. They operate by receiving an interrogating signal, modulating it with the parameter value being monitored, and re-transmitting the modulated return signal to a receiver/signal processor for measured parameter estimation. This paper details the operation of these sensors for temperature measurement. It describes their design and fabrication and details several applications for their use



Background: **John Conkle** is a **Founder and the President** of Wireless Sensor Technologies, Inc. Mr. Conkle is an experienced technology leader possessing a broad range of executive, senior management, and technical skills and experience in information and wireless companies. He has an extensive background in starting and growing technology businesses. During the past twenty-five years Mr. Conkle has focused on wireless systems and products having developed manpack equipment for the military for signal intercept and geolocation, cellular distribution systems to allow wireless reception in tunnels and large buildings, and mobile communications systems for training range applications. Currently, Mr. Conkle is developing passive wireless temperature sensors and pressure sensors for the gas turbine engine environment, and energy harvesting powered wireless networks for condition monitoring applications.

Session 4 Presentation 3	**Mark Krawczewicz**
"A New Class of Passive Secure ID Display Card"	**Tocreo Labs**
Demo: Yes Poster: No **410-562-8746**	**Founder and CEO**
One-on-One Table: No	**mark.kraz@tocreo.com**
	www.tocreo.com

Abstract: Very little has changed over the past 30 years since photo ID credentials were invented to gain access into a facility, remote login into a secure enclave, to verify a person's identity, or to bind a user to a transaction. Most card systems require human interaction to visually match a user's photo printed on the card or stored within the card to the individual standing in front of the verifying party. The current card does not verify status, credentials, and access rights nor can dynamically change access times on the card. The user's credentials are securely stored within the memory of the card and protected by multiple sensors and layers of security preventing unintentional or intentional extraction. After a user authenticates to gain access into a secure facility, Tocreo's secure display card changes resulting from data sent by the reader through the secure processor on card to the on-card display. The flexible on card display is bi-state meaning that it retains the present state without power until the next display change. All power and circuitry on the card is powered entirely through the contactless RFID reader, (ISO14443) - allowing it to last for years. Integrating a display into a card provides *visual* ***authentication*** and ***authentication evidence*** proving that the cardholder is time, date, or role verified. Moreover, the solution is compatible to current standard ID or credit card systems, requiring very little changes to the existing retail authorization process, current infrastructure, or cardholder behavior.

Background: Mark S. Krawczewicz is **Founder and CEO** of Tocreo Labs headquartered in Annapolis MD. The company has developed a new class of thin film technology and has patented and employed solutions for ID cards, tags, and labels. Prior to Tocreo, Mr. Krawczewicz spent 22 years designing and bringing to reality the next generation communication and security systems at DoD. This work including developing secure mobile solutions and chairing "The Secure Mobility Forum" consisting of US companies, Government Labs, and Universities. As a senior cryptographic engineer, Mr. Krawczewicz designed over 24 analog and digital integrated circuits, including the first monolithic random number generator, biometric sensors, gigabit secure communication crypto engines, data-at-rest IC's, protective volatile memory, biometric sensors and more. Mr. Krawczewicz enjoys teaching as an Adjunct Professor of Engineering at Loyola University in Baltimore MD.

Session 4 Presentation 4	**Dr. Victor Kalinin**
"SAW Resonant PWST for Temperature, Torque and Pressure Measurements in Automotive and Industrial Applications"	**Transense**
	Chief Scientist
Demo: Yes Poster: No	**+44 (0) 1869238380**
One-on-One Table: No	**victor.kalinin@transense.co.uk**
	www.transense.co.uk

Abstract: Passive resonant wireless sensors emerged as a new branch of surface acoustic wave (SAW) technology in the early 90s and almost immediately they were proposed for the use in cars. The presentation discusses motivation behind development of the automotive SAW sensors and their advantages and disadvantages in comparison with competing technologies.

Principles of operation of temperature-compensated torque and pressure SAW sensors are explained and methods of their interrogation are outlined. I brief historic overview of R&D in the field of wireless resonant SAW sensors is given from the first demonstrators to production-ready systems. The progress achieved required development of an inexpensive and accurate wireless interrogator and compact SAW sensing elements and packages for them suitable for high volume manufacturing. The presentation discusses evolution of the sensing elements and interrogation methods for the resonant SAW sensors. Packaging methods are also discussed from the point of view of achieving good sensor reproducibility and long-term stability.

A number of SAW sensing systems recently developed for automotive applications is presented: the tire pressure and temperature monitoring systems (TPMS) for sports cars and off-the-road vehicles, the torque and temperature sensors for the electrical power assisted steering system, the flexplate sensor for measuring IC engine output torque, the torque sensor for the F1 kinetic energy recovery system. Potential use of the SAW torque sensors in switching gear applications for high-power transformers and other industrial applications such as wind turbine gearboxes is discussed.

Calibration of the wireless SAW sensors makes a significant contribution into the system cost. Two methods of reducing complexity of the torque sensor calibration are discussed. A rig suitable for high volume calibration of the TPMS sensors is presented.

Further prospects for SAW automotive and industrial physical sensors are briefly discussed in conclusion.

Background: Victor Kalinin **is Chief Scientist at Transense**. He was born in Moscow Region, Russia in 1956 and received the MSc and PhD degrees in radio physics and electronics from Moscow Power Engineering Institute in 1978 and 1983.

From 1978 to 1996 he worked at Moscow Power Engineering Institute first as a research assistant and then as an assistant and associate professor. From 1996 to 2002 he held a position of a Senior Lecturer at Oxford Brookes University, Oxford, U.K and in 2001 he was appointed a Chief Scientist at Transense Technologies plc., U.K. He was also a visiting scientist at Oxford University and Catholic University of Leuven, Belgium. His research interests cover non-linear optical interactions in photorefractive materials, wave phenomena in metamaterials, plasmonics, SAW devices for RF signal processing and sensing. Since 2001, he has been leading a development of a number of SAW wireless resonant sensors for measuring torque and pressure in various automotive and industrial applications.

Session 4 Presentation 5		**Harry Ostaffe**
"High-Function, Long-Range PWST"		**Powercast**
Demo: Yes Poster: No	**412-323-4774**	**VP Marketing & Business Dev**
One-on-One Table: Yes		**hostaffe@powercastco.com**
		www.powercastco.com

Abstract:

This presentation will describe PWST for high-function and longer range operation which uses lower cost RF sources and readers. Performance with different antenna sizes over various distances will provided. The core RF power harvesting technology available for OEM products or custom devices will also be described.

Recent Presentations:

Powercast Wireless Sensor System:

http://www.powercastco.com/PDF/wireless-sensor-system.pdf

RF Energy Harvesting: Theory to Deployment
http://www.powercastco.com/PDF/RF-Energy-Harvesting-Theory-to-Deployment.pdf

RF Energy Harvesting for Building and Industrial Automation
http://www.powercastco.com/PDF/RF-Energy-Harvesting-for-Building-and-Industrial-Automation.pdf

Background: Harry Ostaffe is **Vice President of Marketing and Business Development** at Powercast Corporation, and has over 23 years experience in the fields of broadband and wireless networking, industrial controls, and computing at Ericsson, Marconi, Lucent Technologies, AT&T Network Systems, Bayer and IBM. Harry received an MBA from Carnegie Mellon University and a B.S. in Electrical Engineering from Penn State University.

Session 5 Presentation 1	**Dave Lafferty**
"Potential Passive Wireless Sensor Tag Applications"	**BP - Chief Technology Office**
Demo: No Poster: No 630-853-7625	**Technology Consultant**
One-on-One Table: Yes	**david.lafferty@bp.com**

Abstract: The oil and gas business is full of sensing challenges. Some are unique to the oil and gas business – but some are common with other manufacturing businesses. This presentation explains how the BP Chief Technology Office finds and introduces technology. Then the various potential applications of passive wireless sensor tags are explored. Finally

Background: Since joining BP's Information Technology and Services (IT&S) Chief Technology Office in 2004, Dave Lafferty has spearheaded a wide range of innovative projects including:

- Established and maintains a "Business Partnership" between CTO and the Alaska business unit resulting in the introduction of many innovations
- Developing the "Digital Umbrella" concept as a template for industrial wireless backhaul within BP
- Enhancing safety and operations using 3D virtual environments – including the award winning Virtual Hazard Monitor.
- Transforming the Location Intelligence concept into the various business solutions including the Alaska Pipeline Renewal Compliance tool.
- Award-winning Wireless Measurements systems using "motes" resulting in reducing industrial instrumentation cost an order of magnitude.
- Numerous integrity management systems including leak detection and corrosion measurements including the North Slope wireless corrosion project and the cross segment real-time corrosion measurement program.
- Predictive Analytics for both equipment health and supply chain optimization
- Geo-fencing projects including perimeter defense for the North American refineries and a Pipeline Intruder Detection System
- Handheld projects including Operator Rounds Mobility with embedded work rules
- Representing BP in the creation of the new ISA100 industrial wireless standard

For ten years before joining BP, Dave owned a consulting firm in Anchorage, Alaska providing IT consulting and project management services. Projects included business continuity planning for North Slope drilling operations; re-design of spill response procedures for Valdez, merging of the Alaska IT assets during the ARCO acquisition. Prior to establishing his company, Dave served as Director of Exploration Applications for ARCO Alaska for 6 years and as Researcher in the Reservoir Research Group at the ARCO Plano Research Lab for 9 years. Dave has a BS in Computer Science from the University of Wisconsin – La Crosse.

Session 5 Presentation 2	**Ivan Chow**
"Proceed with Caution with Disaster Recovery Applications	**Doosan/HF Controls**
in Nuclear Power Plant Control Systems"	**Manager, V & V**
Demo: No Poster: No	**469-855-8899**
One-on-One Table: Yes	**ivan.chow@doosan.com**
	www.doosan.com; www.hfcontrols.com

Abstract:

The aftermath of Fukushima Daiichi Nuclear Power Plant crisis sent shockwave to the world and shook the nuclear industry once again after perhaps forgotten Chernobyl and Three-mile Island incidents. While there are countries putting their nuclear energy programs on hold, some are keeping theirs on – with extra cautions and additional measures/systems. For an example, in Korea, early warning applications such as enhancement seismic detections are started to be implemented at a fast pace. While these applications are important, applications for disaster recovery are equally critical. For these disaster recovery applications, wireless applications using harsh environment RFID tags can provide solutions which are not possibly accomplished by other approaches. This presentation discusses the potentials of these applications.

Background: Ivan Chow, **Manager for V & V for HF Controls Doosan**, started working at the Superconducting Super Collider Laboratory from 1991 to 1993. After the laboratory was shutdown, he entered the telecom industry working for Sprint for more than 6 years. In 1996, recognizing the potential of the Internet, Ivan started a VoIP company with a few friends and sold the company to then a Nokia subsidiary in 1998. Since then, Ivan has kept himself involved in companies with latest technology which can make great impact. Before joining Doosan HF Controls, he was one of the key technologists at AirGATE Technologies focusing on applying the latest wireless technology such as RFID, Ground Penetrating Radar, UltraWideBand (UWB) Applications. After joining Doosan in 2008, Ivan was in charge of getting Doosan Digital Safety Platform to be approved by US NRC to be used in US nuclear power plants. In April 2011, the approval was granted. Doosan becomes only the fourth company approved by the US NRC for providing nuclear digital

Session 5 Presentation 3		**Ron Stieger**
"RFID Sensors in Transportation"		**Zonar Systems**
Demo: No Poster: No	**206-878-2459 x240**	**Director of Engineering**
One-on-One Table: Yes		**ron.stieger@zonarsystems.com**
		www.zonarsystems.com

Abstract:

RFID tags are currently being used in transportation both for asset identification and for vehicle inspection with devices such as Zonar's EVIR inspection system. At the same time, vehicle owners rely on sensors to monitor data, including tire pressure, oil pressure, temperature, and other parameters that affect vehicle health. The possibility of mating sensor data collection with RFID technology opens up many new possibilities for expanding vehicle inspection and monitoring capabilities.

Background: **Ron Stieger** is the **Director of Engineering** at Zonar Systems, a manufacturer of electronic fleet inspection, tracking, and operations solutions for public and private vehicle fleets. Ron has BS and MS degrees in electrical engineering from the California Institute of Technology and over fifteen years of electronic design and management experience at companies including BSQUARE, Fluke Networks, and Terabeam.

Session 5 Presentation 4	**Fred Faridazar**
"Intelligent Multi-Sensor Measurements to Enhance Pavement Monitoring and Safety."	**DOT-FHWA- Turner-Fairbank Admin Pavement and Bridge Research Eng.**
Demo: No Poster: No	**202-493-3076**
One-on-One Table: Yes	**fred.fardazar@dot.gov**
http://www.fhwa.dot.gov/research/; http://www.tfhrc.gov	

Abstract: The presentation provides an overview of the Federal Exploratory Advance .Research (EAR) Program and its various ongoing research projects related to sensors that are aim to improve pavement maintenance, and highway safety including: Carbon Nanotube Based Self-sensing Concrete for Pavement Structural Health - using carbon nanotube in concrete and monitoring its structural health by continuously detecting internal stress level changes of the pavement; "Self-powered Pavement Monitoring Sensor" - using piezoelectric technology to harvest energy to record strain history; and "Roadway Renewable Energy" - designing an innovative system for harvesting kinetic energy of moving vehicles using the phenomenon of piezoelectricity, "Stay in Lane" - Integrate data from a variety of onboard sensing equipments to enhance vehicle navigation and safety systems.

Background: Fred Faridazar has served as a **Highway Research Engineer** at the Federal Highway Administration (FHWA), Turner-Fairbank Highway Research Center, since January 2000. Through his work in the Office of Infrastructure Research Development he has acquired **pavement** and material related technical experience to complement the **bridge** and structure design and construction obtained through his prior positions with FHWA.

He has very broad experience in highway engineering and management applications. In his current position, he provides effective oversight of research contracts, and also chairs panels that provide technical guidance on pavement research, development, and technology transfer. He is a graduate of University of Maryland. His profession affiliations include members of American Society of Civil Engineers, and American Society for Testing and Materials and serves on several Technical Working Group related to concrete.

Session 5 Presentation 4 - Co-Presenter
"Intelligent Multi-Sensor Measurements to Enhance Pavement Monitoring and Safety."
Demo: No Poster: No
One-on-One Table: No

Dr. Nizar Lajnef
Michigan State University
Director, Comp Sensors Lab
517-353-8883
Assist Prof, Civil and Env Eng
lajnefni@egr.msu.edu
http://www.egr.msu.edu/cee/people/lajnef.html

Abstract:
In situ continuous monitoring of structural components is a powerful tool which allows to trace dangerous overloads and to anticipate unforeseen failure. It also produces useful information on the actual mechanical characteristics of the monitored system. One of the most important enabling technologies, for embedded monitoring, has been the introduction of miniaturized sensors that integrate on chip sensing, processing, computational power, and wireless communication. These systems can be deployed into large networks allowing dense and detailed sensing, within a novel adaptive scheme in which the network is the sensor.

A novel miniaturized self-sustained data logger/processor capable of continuously and autonomously storing input strain/stress history while consuming less than 1 microwatt of power has been recently developed and tested at Michigan State University. The very small form factor of the developed sensor (manufactured on a 1.5mm2 silicon substrate) makes it ideal for high density networks deployment. Combined with active piezoelectric transducers, the sensing network is capable of operating using only the piezo-generated power. Each network node stores the local power input as clusters of events at specific magnitude levels proportional to levels of the sensed physical variable. The data is then rendered as a probability distribution of the monitored events occurrence. Tested applications for the sensing module include a smart pavement monitoring system. The project is sponsored by the Federal Highways Administration. Successful development of the proposed sensing system could transform the economics of highway construction inspection and ultimately improve the safety and quality of road systems.

Background: Nizar Lajnef, Ph.D. is the **Director of the Computational Sensors Laboratory**, at Michigan State University. Dr. Lajnef received his B.S degree in Mechanical Engineering from Tunisia Polytechnic School (TPS), Tunis, Tunisia, in 2004. He received two M.S degrees, in Computational Mechanics from TPS in 2005 and in Civil Engineering from Michigan State University (MSU) in 2008, and a Ph.D degree in Civil Engineering from MSU in 2008. He is currently an Assistant Professor in Civil and Environmental Engineering at Michigan State University. He has submitted two patents on the area of sensor design and testing. Dr. Lajnef was a recipient of the Nothstine fellowship and the most outstanding Ph.D student award in 2007.

Session 6 Presentation 1		**Ed Gemdjian**
"Passive Wireless SAW Temperature Sensors"		**Kongsberg Maritime**
Demo: Yes - at One-on-One Table	**201-669-6857**	**Mechanical Engineer**
Poster: No		**kongsbergnj@verizon.net**
One-on-One Table: Yes		**www.km.kongsberg.com**

Abstract:

Real-time temperature measurement of machine elements in motion has been a task with no successful solution – especially in heavy, expensive machinery and the hostile environment inside such large machines. The suitability of existing technologies has been limited by the need for a highly flexible system that can be easily installed and adjusted to different mechanical tolerances and operate under adverse, varying conditions. In the meantime an (e.g.) undetected crank bearing shell failure would develop into damage to the crankshaft of a diesel engine, compressor or press – a $200,000 to $500,000+ job, plus month(s) out of service …vs. a $5,000 shell replacement.

Background:

Edward Gemdjian: Mechanical Engineer at Kongsberg Maritime NJ;
Manager – Sensors/Americas

Education: MSc. in Mechanical Engineering - 1973;
BS in Marine Engineering - 1971
Technical University/Institute of Mech. & El. Engineering.

Professional Experience:
Naval and Merchant Shipping – 7 years
Marine and Process Automation – 29 years

Current main field of activity:
Sensors for Marine, Power & Energy applications,
Engineering and International sales

Session 6 Presentation 2	**George Hernandez**
"DOE Building Technologies Program - Sensors and Controls R&D "	**DOE/PNNL/Building Sensors**
Demo: No Poster: No	**202-287-1394**
One-on-One Table: TBD	**george.hernandez@ee.doe.gov**

Background: Mr. George Hernandez manages the **Sensors and Controls residential and commercial applied research work** for the US DOE in Washington DC in the Building Technologies Program. The mission of the Building Technologies Program (BTP) is to develop technologies, techniques, and tools for making buildings more energy efficient, productive, and affordable. BTP focuses on improving commercial and residential building components, energy modeling tools, building energy codes, and appliance standards. The Building Technologies Program's Research and Development group works to improve the energy efficiency of our nation's buildings through innovative new technologies and better building practices. The program conducts research and development on energy-efficient building components, materials, and equipment, and determines how those technologies can be integrated with innovative building methods to optimize building performance and savings.

DOE's Building Technologies Program: http://www1.eere.energy.gov/buildings/

- Technology resources: http://availabletechnologies.pnl.gov/technology.asp?id=60
- Commercial Building Alliance: http://www1.eere.energy.gov/buildings/alliances/
- Retailer Energy Alliance: http://www1.eere.energy.gov/buildings/alliances/retailer_energy_alliance.html
- Commercial Real Estate Energy Alliance: http://www1.eere.energy.gov/buildings/alliances/commercial_real_estate.html
- Hospital Energy Alliance: http://www1.eere.energy.gov/buildings/alliances/hospital_energy_alliance.html
- O&M Working Group www1.eere.energy.gov/femp/program/om_group.html
  May 2011 Mtg: http://www1.eere.energy.gov/femp/pdfs/omwg_notes_032011.pdf
- Partnering for Better Buildings Presentation - Feb 2011 http://apps1.eere.energy.gov/buildings/publications/pdfs/alliances/2011-02-03_hvac_holuj.pdf

Biography - http://eppa.pnnl.gov/staff/staff_info.asp?staff_num=2141

George Hernandez joined the Energy Planning & Policy Analysis group at PNNL in 2009. Mr. Hernandez is a senior demand side management professional with innovative and detail-oriented knowledge to develop and produce successful programs that deliver products and services to the commercial and industrial energy marketplace. Mr. Hernandez is distinguished by exceptional execution skills that enable efficient concept to product delivery. Accomplishments demonstrate coordination abilities, creative thinking, developmental organization, strong leadership, management skills, and strategic planning. Mr. Hernandez has extensive knowledge, skills, and capabilities derived from a substantial career in demand side utility management across a wide variety of commercial and industrial sectors and utilities as both a corporate employee and an independent consultant. Mr. Hernandez is a Licensed Professional Engineer (PE) by the State of California. He has an M.S. degree in Mechanical Engineering from the University of California at Berkeley and a B.S. in Mechanical Engineering from California State University.

Session 6 Presentation 3	**Dr. Al Salour**
"Use of Passive RFID and Networking Technology	**Boeing - St. Louis**
in Aerospace Manufacturing"	**Enterprise Lead for NEM R&T**
Demo: No Poster: No	**314-619-8526**
One-on-One Table: No	**al.salour@boeing.com**

Abstract:

This presentation recommends leverages from emerging sensor and networking technologies to develop data driven manufacturing systems and move toward seamless operations between the factory, the supply chain, and the service centers. It proposes an agile development of intelligent factory for situational awareness, interface system to product and process for improving performance, and digital thread from in-house to fleet in-service end user for feedback/trending, early problem detection, and proactive OEM execution. The audience will learn how passive RFID systems are emerging toward aerospace manufacturing and supply chain with typical examples of the technology applications. The vision will be to provide the means for taking quicker actions with fewer risks through reliable knowledge and data sources aligned to design models, process documentation, and backend production systems.

Background:

Dr. Al Salour is the **Enterprise Leader for the Boeing Research & Technology's Network Enabled Manufacturing (NEM) initiatives**. He is leading a multi site effort in sensor based factory, supply chain, and support & services process optimization. He is also the principal investigator for a NAVY sponsored program in advanced sensors development to monitor product subcomponent life cycle. Al has two patents in RFID work-in- process, and scan targets for vision systems. He also has 4 pending patents in the NEM technologies. Al has been with Boeing for 26 years with the most recent assignments in leading network centric and assembly automation projects. His previous roles include leading the integrated product team as the wing captain during the F/A-18 Super Hornet Engineering/manufacturing development. Al is a Boeing Technical Fellow with a B.S. in Industrial Engineering from University of Missouri – Columbia, M.A. in Business Administration from Webster University, and a Doctoral degree in Management from Webster University.

Session 6 Presentation 4	**Robab Safa-Bakhsh**
"Passive Wireless Sensors	**Boeing Research and Technology**
For Vehicle Health Management Applications"	**Asso. Tech Fellow for VHM & SHM**
Demo: No Poster: No	**610-591-6154** **robab.safa-baksh@boeing.com**
One-on-One Table: No	

Abstract: This presentation provides an overview of vehicle health management application, the technology needs and how the passive wireless sensor tags enable transition of VHMS to aerospace platforms. One of the barriers to implementation and fielding of vehicle management systems has been the weight penalty of additional wiring as the result of new sensor installations. Wiring not only adds weight, it also adds to operation and support cost. Applications of passive wireless sensors are strain, temperature, pressure and position monitoring for structure, drive, rotor, electrical and flight control systems.

Background: Robab Safa-Bakhsh is an **Associate Technical Fellow at Boeing Research and Technology,** leading various advanced technology projects in the areas of **vehicle health management and structural health monitoring**. Robab has been an officer of American Helicopter Society (AHS) Health and Usage Monitoring System (HUMS), where she has organized and chaired many technical sessions and committee meetings. Robab has been an active member of Society of Automotive Engineering (SAE) E-32 committee where she has published several SAE standards and Aerospace Recommended Practices related to HUMS. Robab has two patent applications on Vehicle Health Management Technologies.

Lunch Speaker July 28	**Louis Sirico**
"What Works in the World of Wireless Sensors"	**The RFID Network**
Demo: No Poster: Yes 408 768-7343	**Host - Manager**
One-on-One Table: No	**Louis@RFID.net**
Presentation Link: http://RFID.net/wireless-sensors	**http://RFID.net**

Abstract: Even if you're a rocket scientist, it's easy to get confused by all the different types of wireless sensors. It gets even more complicated when you start connecting them together into a Wireless Sensor Network (WSN). Of course, you need to apply business rules that generate value and that part really pushes some people over the edge. In this multi-media presentation, we'll explore what works, and what hasn't worked so well, in the world of wireless sensors. We'll also show you some flashy videos with dramatic music scores just to be fun and interesting.

Background: Louis Sirico is the host of The RFID Network, a TV video series dedicated to RFID and wireless sensor technologies with a syndicated distribution reaching an audience of millions of professionals around the globe. During the past 10 years, Louis has evaluated and implemented a wide variety of wireless RF technologies. He's documented his findings in a video series, and by publishing hundreds of articles as well as a book titled, "Thin Air, How Wireless Technology Fulfills the Lean Manufacturing Mission". Louis has provided industry analysis and RFID subject matter expertise to: CNN, CNBC / MSN, CBS News, Fox News, The New York Times, the MIT Enterprise Forum (mitef.org), Neikki Business Publications, SAP Information Magazine, Inbound Logistics Magazine, Piranet, American Freedom Radio, and the Arkansas Democratic Gazette. You can find Louis at http://RFID.net.

Session 7 Presentation 1	**Victor Vega**
"Interactive Gen2 | Bridging the Gap between Passive RFID, Sensors and Electronics"	**NXP Semiconductors**
	Marketing Director, RFID Solutions
Demo: Yes Poster: Yes 408-474-5117	**victor.vega@nxp.com**
One-on-One Table: No	**www.nxp.com**

Abstract: Recent innovations augment EPC Gen2 functionality to help bridge the gap between passive UHF RFID, sensors and electronics. NXP Semiconductors has introduced a new UHF IC platform called the UCODE I^2C to expand the functionality of passive RFID tags into wireless communication portals, allowing unprecedented bidirectional interactivity for a myriad of applications. In this discussion we will outline some of the key features enabled by the new interactive Gen2 IC and discuss how energy harvesting techniques may be used to source more than just the RFID IC, including passive sensors for power harvesting applications.

Recent News Release:

http://www.designnews.com/document.asp?doc_id=230383

Background:

Victor has been involved in RFID for over 16 years. His responsibilities have ranged from engineering to his current position as **Marketing Director for RFID Solutions.**

Prior employment appointments include Alien Technology, Motorola, IBM, NASA and Temescal. He holds a BSEE and is author to 19 RFID-related patents.

Session 7 Presentation 2	**Rich Plourde**
"Aerosol Jet Direct Write Technology	**Optomec – Headquarters**
– A Tool for Printed Electronics"	**Dir of Business Development**
Demo: No Poster: No **904-742-5600**	**rplourde@optomec.com**
One-on-One Table: No	**www.optomec.com**

Presentation Link:
www.optomec.com/Additive-Manufacturing-Applications/Printed-Electronics-for-Displays
www.optomec.com/Additive-Manufacturing-Applications/Printed-Electronics-for-3D-Printing
www.optomec.com/Additive-Manufacturing-Technology/Printed-Electronics

Abstract: Aerosol Jet direct write technology is an additive manufacturing process, accommodating a wide range of materials (and substrates), including conductive nanoparticle inks, polymers, insulators, adhesives, dopants, etchants, and even biological matter which can be accurately deposited onto planar and non-planar substrates. The material (1-1,00cP) is aerodynamically focused to produce fine feature circuitry and embedded components without the use of masks or patterns. The resulting functional electronics can have line widths and pattern features as small as 10 microns, and as wide as 1 cm or more, successfully bridging the gap between screen-printing and thin-film lithography capabilities. Optomec's Aerosol Jet development systems are used for material, process, and application development, and low volume manufacturing. Optomec recently announced the Aerosol Jet Marathon Series for integration into high volume production manufacturing systems. The Marathon Series represents the next generation of Aerosol Jet print module technology and sets a new performance standard for fine feature printed electronics and wide area coating applications.

Background: Rich Plourde joined Optomec in 1998 as **Director of Business Development** for Laser Engineered Net Shaping (LENS), Optomec's first additive manufacturing technology which was invented at Sandia National Labs. As Aerosol Jet (AJ) direct write technology matured from a $9M DARPA project, Rich transitioned his efforts from LENS to AJ in 2009. Before joining Optomec, Rich has been involved with high tech manufacturing and Government technology companies since 1974, holding Business Development and Sales Management positions with Engineering Animation, Rosetta Technologies, Cisco Systems, Apple Computer, Falcon Systems, and ITT.

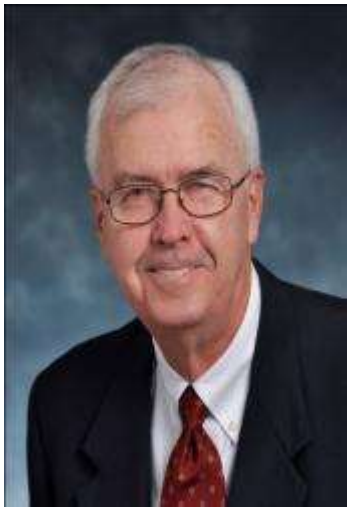
Session 7 Presentation 3		**William C. Wilson**
"NASA Testing of PWST"		**NASA- LaRC/NDE Branch**
Demo: No Poster: No	**757-864-7105**	**Research Engineer in SAW**
One-on-One Table: Yes		**William.c.wilson@nasa.gov**

Abstract: NASA has the capability to perform most forms of testing. From large to small structures, sensors, devices, instruments and systems, NASA has testing facilities. NASA has a history of testing RFID devices. Devices have been tested for aircraft applications, the Space station, and for use on Mars. To match the operational environment, testing has been performed in desert in Arizona and down in Antarctica. Devices have even been tested to track the TEDS (Transducer Electronic Data Sheets) for smart sensors on the Max Launch Abort System (MLAS). This presentation will give a brief overview of a small subset of the testing capability that is found at NASA as an agency, and some of the testing that has already been performed at NASA. Topics that will briefly be discussed will include: transducer characterization, functional testing, environmental testing, compliance testing, industry Standards, Mil Spec qualification, space qualification, and RFID testing.

Background: William C. Wilson earned t a B.S degree in Applied Physics and, and an M.S. degree in Applied Physics and Computer Science from Christopher Newport University, in Newport News VA, in 1992 and 1998 respectively, and is pursuing a Ph.D. in electrical engineering from Virginia Commonwealth University in Richmond, VA. He has been employed at NASA Langley Research Center in Hampton VA for 24 years, where he has designed electronic circuits, digital electronics, FPGAs, and ASICs for wind tunnel applications, ground test instrumentation, and satellite instruments. He is currently a **researcher in the Non-Destructive Evaluation Sciences Branch**. His current research interests include the application of MEMS and MOEMS technology to autonomous agents for structural analysis. He is also working on Surface Acoustic Wave (SAW) devices, and wireless sensor network technology for non-destructive evaluation of aerospace vehicles.

Session 7 Presentation 4	**Fred Fisher**
"AVSI Cooperative Research in Intra-Aircraft Spectrum Usage"	**AVSI; TEES**
Demo: No Poster: No	**979-847-8585** **Assistant Director**
One-on-One Table: No	**ffisher@avsi.aero**
	www.avsi.aero

Abstract: The **Aerospace Vehicle Systems Institute(AVSI)** is a research cooperative comprised of major aerospace companies, government and academia. The cooperative is a part of the Texas Engineering Experiment Station(TEES), a state agency under the umbrella of the Texas A&M University System. AVSI is engaged in research of intra-aircraft spectrum usage, including optimum wavelength, best protocols, potential interference, security and ITU spectrum allocation. The AVSI process and network is working well for the IASU project and may be just the thing to successfully facilitate projects that may come out of this workshop.



Background: Fred Fisher has over 40 years of experience in aerospace and academia including work in the areas of software engineering, networking, control systems, image processing, and simulation.

Education

Ph.D., Computer Science TEXAS A&M UNIVERSITY
M.S., Computer Science STEPHEN F. AUSTIN STATE UNIVERSITY
M.S., Physics TEXAS CHRISTIAN UNIVERSITY
B.S., Physics THE UNIVERSITY OF TEXAS

Experience

Texas Engineering Experiment Station
2008-**Present, Assistant Director, AVSI**
2006-2008, Interim Director, AVSI
2000-Present, various AVSI Project Management Committees
1995-Present, Director, Network and Computing Services
1980-1983, Research Engineer
Texas A&M University: 1983-1995, Group Manager
Stephen F. Austin University: 1976-1980, Manager
The Baker & Taylor Company: 1970-1976, Operations Manager
Collins Radio: 1969, Systems Engineer
Link-Singer, a NASA contractor during the Apollo program
1967-1969, Systems Engineer

Session 7 Presentation 5	**Dr. Milind Pimprikar**
"Bridging the Mid TRL Gap through Coordinated Technology Development"	**CANEUS International Founder and Chairman**
Demo: No Poster: Yes 514-267-2434(c)	**milind.pimprikar@caneus.org**
One-on-One Table: Yes	**www.CANEUS.org/FBW**

Abstract: We have seen that the PWST technology based system development process involves several important aspects. All of the factors have to come together in a coordinated fashion for the PWST technology to successfully make the transition from the laboratory proof-of-principle stage to infusion into product / systems / missions. Often, this can be quite a formidable task for a single inventor, or even a single institution to undertake. In order to overcome these odds, the international CANEUS organization brings together the various elements representing technology developers, stakeholders, end-users and investors across international boundaries, which are required for successfully transitioning exciting technology concepts into aerospace systems.

This presentation is divided in four parts: The first part covers the need for international partnership and the CANEUS approach using a three-step process for concepts to systems/products. Additionally, Industry Canada as well the National Research Council and other Canadian organizations have several programs to support international collaboration initiatives covering a variety of sensors for SHM and other diverse industrial applications. This presentation will provide synopsis of these programs and related activities as potential vehicles in advancing such international partnerships.

The second part will provide a case study illustrating the CANEUS collaboration model for a group such as the "Passive Wireless Sensors Tag" to move forward using potential international cooperation with industry/universities/government agencies. Next, it will demonstrate how the CANEUS approach distinguishes itself from the many other Consortia in place worldwide. Finally, this presentation is aimed to set the stage for potential teams between end users and PWST suppliers on application areas of mutual interest using CANEUS collaboration mechanism. It is our expectation that at the end of this presentation, participants can see the "big picture" and are convinced that CANEUS's and Canada's contributions will have a significant impact on future collaborative development with PWST.

Background: Dr. Milind Pimprikar is **Founder and Chairman of CANEUS International**, a Global network of 59+ countries, with offices and affiliates in Canada, Ohio-USA, France-Europe, Sao Paolo-Brazil, Tokyo-Japan and Saudi Arabia, for Collaborative Aerospace Development using advancing emerging micro-nano-technology concepts. He is also chairman of the Centre for Large Space Structures and Systems Inc. he founded in 1992 at Montreal, Canada. Milind chaired Canada's first "Task Group on LSS (Large Space Structures & Systems)" and the 1st International Symposium on "Design of Space Station, on September 13-18, 1987, which defined and formulated the long-term LSS strategy. This work was based on his Ph.D. studies covering optimization issues in space station structures with colleagues from NASA Langley and MIT. In Canada, Milind initiated and undertook several pioneering activities and programs related to Micro-Nano-Technology development specifically for aerospace applications.

Session 8 - Forward Planning Splinter Sessions

Dr. Peter Fuhr and Tim McIntyre

Oak Ridge National Laboratory

Background: Dr. Peter Fuhr has been involved in industrial wireless, sensors, and secure systems for 30+ years as a NASA space optical physicist, university professor, serial entrepreneur and ORNL employee. Peter serves as the Co-chair of The Secure Infrastructure Controls Society, is the co-chair of the Association for Advanced Agricultural Technology, is the co-founder and past Chairman of the Wireless Industrial Networking Alliance, and is the Director-Elect of ISA's Communication Division. He is involved in wireless, sensors, and control systems standards organizations chairing numerous work groups and committees. Peter has embedded sensors into various structures worldwide ranging from buildings, dams, airplanes, hot air balloon, spacecraft, nuclear power plant containment vessels, even humans. He has deployed wireless systems in too many industrial, agricultural, underwater, underground, and even outer space settings to list. Peter has published/presented over 750 technical articles pertaining to wireless, sensors, security and systems. His pioneering work in networked sensor systems for structures earned him the Presidential Award for Excellence in Research. Segments of his research activities are featured in the SPIE Milestone Series on Fiber Optics. Dr. Fuhr is currently involved in R&D activities pertaining to cybersecurity of energy delivery systems.

Peter Fuhr

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fuhrpl@ornl.gov

Recent 2011 Publications/Presentations:

Wireless Sensor Networks (WSNs) for Real-Time Situational Awareness of Hydrofracking Operations, AWRA IMPACT Journal of Water Resources, Vol. 13, No. 4, July 2011.

Wireless Sensors and Systems for Secure for Energy and Water Delivery Systems, ISA Water & Wastewater Annual Meeting, St. Louis, June 2011

Smart Grid Technology – Cybersecurity and Wireless, Smart Grid Technology Conference 2011, San Jose, CA June 2011.

SCADA Asia – Cyber Security and Wireless Systems, Keynote Presentation, Hong Kong, February 2011

Sensors and Systems for Environmentally Friendly Gas Shale Drilling, RPSEA Meeting, San Antonio, March 2011

Wireless Sensor Networks – Oil and Gas Shale, Society of Petroleum Engineers Annual Meeting, Pittsburgh, April 2011

Sensors and Systems for Environmental Monitoring in the Canadian Shield, Oil Canada meeting – ISA Meeting, Edmonton, Alberta, April 2011

Tim McIntyre

ORNL/Sensors & Controls
(865) 576-5402
mcintyretj@ornl.gov

Tim McIntyre has over twenty years experience in sensors and controls research covering areas such as fiber optics, optical spectrometers, ultra-precision actuators and measurement systems, wireless sensor networks and sensor design. He currently manages a research and development group at 24 scientific and technical staff engaged in measurement science and systems engineering approaches for energy efficiency in buildings and industry, study of carbon cycles and climatology, non-destructive testing and analysis, nuclear reactor instrumentation and controls, electricity grid resilient controls and global security missions. Tim has given more than a dozen invited talks, published 40+ journal articles and conference proceedings, has 5 patents and 2 R&D 100 Awards.

Session 8 Forward Planning Splinter Sessions

Introduction	**1525**	**1535**	**Peter Fuhr**	**Motivation and Explanation of Splinter Sessions**
Meetings	**1535**	**1625**	**Splinter Session leader**	**Splinter Sessions Meet in Separate Locations**
Summary	**1625**	**1700**	**Splinter Spokesperson**	**5 minute Report from Each of 7 Splinter Groups**
Close Wshop	**1700**	**1705**	**George Studor**	**Collect Workshop Surveys**

Draft Candidate Splinter Sessions

(Need Participant Input)

Candidate Splinter Area	Proposed Session Leader
Projects and Consortiums	
Studies, Papers and Reports	
Organize for Future Workshops	
Communication Methods and Forums	
Security and Trustworthiness	
Miniaturizing Interrogators & Antennas	
Standards and Interoperability	
Software Defined Radios	
Production Enhancements	
Test and Evaluation	
Funding Opportunities	

Notes

Additional Attendees

First	Last	Position	Organization
Kourosh	Pahlavan	CEO & CTO	TagArray
Terry	Willoner	Engineer	Savannah River Nuclear Solutions
Thanh	Tran	NMO Process Engineer	Savannah River Nuclear Solutions
Aaron	Trott	Program Director	Invocon
Alex	Drobshoff	Engineer	Lawrence Livermore National Laboratory
Elizabeth	Adams	Technology Project Leader - Wireless	BP
Wolfgang	Baumann	Sales Engineer	R. STAHL INC
Don	Kimball	Chief Technology Officer	MaXentric
Scott	Hyde	Manager	Aerojet
William	Smith	Project Engineer	Mesoscribe
Takashi	Ogai	Manager, Gr. Space Development Department, Aero Engine & Space Operations	IHI Corporation
Ed	Struble	Vice President, Avionics, Weapons, and Sensor Systems	Mnemonics
Timothy	McIntyre	Leader, Sensors and Controls Research Group	DOE/ORNL - Sensors & Controls
Rick	Barton	Wireless Communication Engineer	NASA- JSC/EV4
Mark	Patterson	Propulsion Directorate Turbine Engine Research Center	AFRL /RZTE - Turbine Research Center
Penny	Chen	Principal Systems Architect	Yokagawa
Mark	Haines	Director of Engineering	Mnemonics
Larry	Oberle	Instr. For Heavy Lift Launch Vehicles	NASA - GRC
Debra	Goodenow	Instr. for Heavy Lift Launch Vehicles	NASA - GRC
Bob	Hedtke	Director of Technology	Rosemount Inc
Alan	Daniel	Sr. Research Engineer	Southwire Company
Tom	Hartmann	Director Brand Security & Electronics	Topflight
Walt Jr.	Bonneau	President & General Manager	Cubic Security Systems, Inc
Adedeji	Oluwatosin	Shell Global Solutions International B.V.	Shell
Joseph	Citrano	Global Product Marketing Manager	Honeywell
Andrea	Adkins	Assistant Dir. Commercilization: Office of Technology Transfer UCF	UCF
Robert	Krisel	Engineering Manager	Panduit Corp
Wilson	Cuartas	Engineer	AW ELECTRONICA
Dana	Ferguson	Business Development	Ventyx
Leland	Solie	Senior Scientist	ASRDC
Tom	Oeste	Technician	ASRDC
Andy	Hines	Technician	ASRDC
Bruce	Montgomery	President	Syntonics LLC
Hiroki	Saito	Staff Member	IHI Corporation
Steve	Griggs	Engineer	Weatherford
Justin	Ward	Sr Business Systems Associate	EOG Resources
Stephen	Ho	Research Scientist	MIT Auto-ID Labs
John	Zipay	Structural Engineer	NASA/JSC - ES
Andrea	Cote	Chief Technology Officer and VP of PM	Omni-ID
Paul	Hartmann	Vice President, Engineering	RFSAW
Russel	Bachtel	Engineer	NASA-JSC - EC
Ronald	Cramer	Senior Advisor	Shell
Richard	Smith	Shell SEIP	Shell
Doyle	Scoggins	Metrology Supervisor	STP Nuclear Operating Company
Jeff	Scott	Technologist - RFID	Pacific Northwest National Laboratory
Nezih	Mrad	Defence Scientist,Air Vehicles Research Section (AVRS)	Department of National Defence (DND)