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2023 Technical Symposium

**SATURDAY, NOVEMBER 18, 2023
DENVER, COLORADO**



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2023 Technical Symposium AGENDA

7:30 a.m. - Continental Breakfast for all attendees

8:00 – 8:15 a.m. - Welcome and Introductions

*Prof. Jim Breakall, WA3FET, Penn State University; and
David Bart, President, Radio Club of America*

8:15 – 8:55 a.m. - “Antennas & Microwave SGSP (Signal Generations Signal Processing) Electronics, Sensors, and SDR (Software-Defined Radio) for the applications in current and later generation communication systems and Sustainable Developments”

Presented by Dr. Ajay Poddar, AC2KG, Synergy Microwave Corp.

8:55 – 9:35 a.m. - “The Road to LTE HPUE (High Power User Equipment)”

Presented by Robert “Bob” LaRose, Co-founder of Assured Wireless Corporation (Retired)

9:35 – 10:15 a.m. - “When “Old” is “New” Again”

Presented by Charles B Kirmuss, WOCBK, Kirmuss Audio

10:15 a.m. – 10:30 a.m. - Break

10:30 – 11:10 a.m. - “Engineering My College Radio Station, WUVT, Provided a Diverse and Practical Engineering Experience That Is Key to My Professional Success”

Presented by Stephen Floyd, Former WUVT AM/FM Student Chief Engineer

11:10 – 11:50 a.m. - “The Next Generation of Shared Spectrum”

Presented by Richard Lee, N9LIR, Chief Executive Officer, iPosi Inc

11:50 – 2:05 p.m. - Lunch / Poster Presentations

2:05 – 2:45 p.m. - “RCA Youth Activities” and “BARC Jr”

Presented by Carole Perry, Retired – Staten Island School District; and Eric Permut – BARC Jr

2:45 – 3:25 p.m. - “Amateur Radio and Acoustics – The Frequencies That Connect My Life”

Presented by Ruth Willet, Department of Acoustics, Penn State University

3:25 – 3:40 p.m. - Break

3:40 – 4:20 p.m. - “Rapid DNA: Combining Microfluidics, Optics, and Analog to Digital Conversion to Make the World a Better Place”

Presented by Dr. Eugene Tan, Executive Vice President, ANDE Corporation

4:20 – 5:00 p.m. - “Introduction to RF Hacking and Impacts on Satellites”

Presented by Rachel Jones, KO4HLC, Savannah River National Laboratory

5:00 – 5:10 p.m. - Wrap Up

Prof. Jim Breakall, WA3FET

Weekend Schedule



FRIDAY, NOVEMBER 17

- Morning:** Tour of NIST Labs
- Afternoon:** Group lunch followed by tour of Wings Over the Rockies Air and Space Museum
- Evening:** Informal happy hour at the Hyatt Regency, 7-9 p.m.



SATURDAY, NOVEMBER 18

- All Day:** Technical Symposium, Poster Presentations, and Silent Auction
8:00 a.m. - 5:00 p.m.
- Cocktail Hour:** 5:30 p.m. - 7:00 p.m.
- Awards Banquet:** 7:00 p.m. - 10:00 p.m.



SUNDAY, NOVEMBER 19

Free Time / Departures



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Technical Symposium Host



Prof. Jim Breakall received B.S. and M.S. degrees in Electrical Engineering from Penn State University and a Ph.D. in Electrical Engineering and Applied Physics from Case Western Reserve University, Cleveland, OH, and has over 45 years of experience in numerical electromagnetics and antennas. He was a Project Engineer at the Lawrence Livermore National Laboratory (LLNL), Livermore, CA, and an Associate Professor at the Naval Postgraduate School (NPGS), Monterey, CA. Presently he is a Full Professor of Electrical Engineering at Penn State. Dr. Breakall began his career as a graduate student at the Arecibo Observatory in Puerto Rico working on antenna analysis and radar probing of the ionosphere. At LLNL, he and his group worked on the development of the Numerical Electromagnetics Code (NEC), the first sophisticated antenna modeling program. Other significant projects that he has worked on were the designs of the HAARP facility in Alaska, both HF facilities at Arecibo, and the Kinstar low profile AM broadcast antenna. He (electrical) and Tim Duffy (mechanical) designed the

very popular Ham Radio Skyhawk Yagi antenna, and he is the inventor of the Optimized Wideband Antenna (OWA). Dr. Breakall is also a member of the IEEE Antennas and Propagation Society, IEEE Broadcast Technology Society, Eta Kappa Nu, International Union of Radio Science Commission B, IEEE Wave Propagation and Standards Committee, has been an Associate Editor for the Radio Science journal, and served as an Arecibo Observatory Users and Scientific Advising Committee Member. He has been a frequent speaker at the Dayton Hamvention Antenna Forum and has built two major contest superstations, K3CR and KC3R, near Penn State, and WP3R, on his farm in Puerto Rico near the big Arecibo dish. He has graduated numerous graduate students and received many awards over the years. In 2017, Dr. Breakall was awarded the prestigious Sarnoff Citation from the RCA. He was elected as a Director to the Board in 2018 and 2020 and was the Co-Chairman of the 2020 and Chairman of the 2021 and 2022 Technical Symposiums. He also serves on the RCA Scholarship Committee and Education Committee. He was elevated to RCA Fellow at the 2022 Awards Banquet.

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Antennas & Microwave SGSP (Signal Generations Signal Processing) Electronics, Sensors, and SDR (Software-Defined Radio) for the applications in current and later generation communication systems and Sustainable Developments

Dr. Ajay Poddar, IEEE Fellow, Chief Scientist, Synergy Microwave Corp., New Jersey, USA, Email: akpoddar@ieee.org.

Antennas, SGSP Electronics, Sensors, and SDR are essential enablers of sustainable development by improving resource efficiency, enhancing monitoring and control, and facilitating data-driven decision-making across various domains. These technologies play a pivotal role in addressing global challenges and promoting a more sustainable future. It is important to note that as technology evolves, there will be a continued focus on making communication systems more energy-efficient, environmentally friendly, and accessible to underserved populations to support sustainable development worldwide. These trends reflect the ongoing evolution of MIMO Antenna, Metamaterial-Inspired sensors, and SGSP to meet the demands of a rapidly changing technological landscape. Additionally, ongoing research in these areas will likely lead to further innovations and applications in the future.

One of the next technology drivers in hardware may be the combination of analog and digital technology onto a single monolithic chip to reduce cost and size, weight, and power (SWaP). Metamaterial-inspired sensors and SGSP electronics offer energy harvesting, which makes it a prospective alternative energy source for sustainable development.

Recent trends in the SDR technology show a noteworthy front-runner in hardware electronics and programming: the ever-growing artificial intelligence (AI) being integrated into the SDR space. Other key trends include the technology of the Internet of Things (IoT) powered and adapted through 5G networks and mixed with cloud computing to create a vast pot of information and data processing capacities. With their flexibility, programmability, and signal processing capabilities, SDRs offer several advantages over traditional radio technology. The integration of AI and ML algorithms, as well as the integration with 5G and IoT technologies, is further expanding the capabilities of SDRs. While there are challenges and limitations to be overcome, it is clear that SDRs will continue to play an important role in the future of communication systems.

The IoT is being envisioned as an effective tool to combat climate change. Through its sensing and monitoring

capabilities, it provides insights into the root cause of climate change by sensing the amount of CO₂ and different greenhouse gases in our atmosphere. The emissions of greenhouse gases from the burning of fossil fuels can be sensed in real-time. Accordingly, the carbon sequestration processes and rates can be monitored to increase the storage of carbon captured in forests which helps to offset emissions. Furthermore, novel atmospheric “things” and technology can be developed to permanently reduce atmospheric CO₂ with integration into the climate IoT. The climate IoT is also useful in climate change anticipation and adaptation preparation. Its sensing and communication technologies coupled with prediction systems and models clear uncertainty and provide useful insights into the exact nature of the climate for addressing UN Envision 2030 SDGs (Sustainable Development Goals).

In summary, the integration of advanced technologies such as SGSP, MIMO, IoT, SDRs, and metamaterial-inspired sensors into our communication systems and sustainability efforts holds great promise for addressing global challenges and achieving sustainable development goals. These innovations are poised to drive progress in resource efficiency, environmental protection, and data-driven decision-making, all of which are essential for a more sustainable future.

SPEAKER BIOGRAPHY

Dr. Ajay Poddar, AC2KG, is a distinguished individual within the field of electrical engineering and electronics. He holds the esteemed title of IEEE Fellow and is a member of IEEE Eta-Kappa-Nu. Dr. Poddar’s educational background is exceptional. He graduated from the prestigious Indian Institute of Technology (IIT) Delhi, India, setting the foundation for his academic journey. Subsequently, he earned his Doctorate (Dr.-Ing.) from the Technical University Berlin in Germany, followed by a Post Doctorate (Dr.-Ing. habil) from Brandenburg Technical University Cottbus, Germany. His academic achievements underscore his commitment to excellence in research and innovation. Currently, Dr. Poddar serves as the Chief Scientist at Synergy Microwave in NJ, USA, where he plays a pivotal role in the design and development of cutting-edge signal generation and signal processing electronics, RF-MEMS (Micro-Electro-Mechanical Systems), and Metamaterial-Antenna/Sensors/ Electronics. His work extends across a broad spectrum of applications, encompassing industrial, medical, and space technologies. Dr. Poddar’s contributions to academia are equally impressive. He holds positions as a visiting professor at the University of Oradea in Romania, the Indian Institute of Technology Jammu in India, and a guest lecturer at the Technical University

Munich in Germany. These roles highlight his commitment to knowledge dissemination and his willingness to share his expertise with students and researchers around the world. Prior to his current role, Dr. Poddar spent a decade (1991-2001) as a Senior Scientist in the Defense Research and Development Organization (DRDO) under the Ministry of Defense in India. During this period, he also served as a visiting Professor at the University of Pune in India, further emphasizing his dedication to both research and academics. Recognition and accolades have been an integral part of Dr. Poddar's career. He has received numerous awards throughout his professional journey, with highlights including: (1) the 2015 IEEE IFCS Cady Award, which acknowledged his outstanding scientific contributions in the development of frequency-generating and frequency-controlled electronics and timing devices, with applications spanning industrial, medical, and space technologies, (2) the 2018 IEEE MGA (Member and Geographic Activities) Innovation Award, recognizing his dedicated volunteer service to IEEE members, chapters, and humanitarian projects, (3) The 2015 IEEE Region 1 (R1) Award for "Outstanding Scientific Contributions, Leadership, and Service", (4) The 2009 IEEE Region 1 (R1) Award for "Outstanding Leadership and Contributions in the Research, Design, and Development of Microwave Systems". Dr. Poddar's impact extends beyond awards and recognitions. He has contributed significantly to scientific literature, having published over 350 scientific papers in journals, magazines, and conference proceedings. In addition to his publications, he has co-authored six technical books/chapters and holds more than 40 patents for scientific and technological innovations. Mentoring and education are also integral parts of Dr. Poddar's career. Over the past three decades, he has supervised numerous Ph.D. students from around the world, nurturing the next generation of engineers and scientists. He has also served as an Editor for several technical journals and currently holds positions on various scientific committees, professional societies, and voluntary organizations. Dr. Poddar's leadership extends to his role as the Chair of

the Global IEEE Antenna & Propagation Society Chapter Activity Committee. Under his leadership, more than 100 chapters have been established worldwide over the last decade, fostering connectivity and collaboration within the IEEE community and benefiting local members and communities. Dr. Poddar's commitment to humanitarian and global issues is evident through his active involvement with IEEE SIGHT (Special Interest Group on Humanitarian Technology), IEEE Smart Village initiatives, and efforts related to global and climatic changes. His dedication to IEEE MGA activities further demonstrates his commitment to advancing the field and serving the broader engineering community. In summary, Dr. Poddar's illustrious career is characterized by exceptional achievements in research, education, and leadership. His work has had a profound impact on the fields of electronics, signal processing, and microwave systems, and his dedication to mentorship and community involvement has made him a prominent figure in the IEEE and humanitarian community and beyond.



The Road to LTE HPUE (High Power User Equipment)

Robert "Bob" LaRose, W6ACU, Co-founder of Assured Wireless Corporation (Retired), Radio Club of America Fellow, Life/Senior Member IEEE, Community Volunteer.

With the advent of the Public Safety Broadband Network (FirstNet), one of the challenges was to offer ubiquitous broadband coverage, especially in rural and other challenging environments. LTE Base Stations typically offer adequate power to reach out to distant subscriber units. However, by convention, subscriber units have had a much lower uplink power output and associated limited range. The international 3GPP working group addressed this issue and agreed to specifications in Release 11 in 2012 that codified higher subscriber unit output power in North America, specifically on LTE Band 14, that was reserved for Public Safety applications. The speaker will describe the

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road to HPUE products - how a small group of Engineers formed a company and addressed the many challenges in designing, certifying, field testing and delivering the world's first HPUE products.

SPEAKER BIOGRAPHY

Bob LaRose's interest in radio started when he received a Philmore Crystal Set for Christmas when he was 9 years old. He received his first amateur radio license (WV2NYC!) when he was 13. Bob's early interest in radio became a vocation and career. He received his BSEE from the Rochester Institute of Technology and during his career has worked for various radio/communications manufacturers including Harris Corp, Storno A/S (lived and worked in Denmark), Trans World Communications (now Datron World Communications) and retired as Western Regional Sales Manager for Raytheon/JPS Communications. In retirement he was one of the co-founders of Assured Wireless Corporation (now Nextivity Inc.) that developed the world's first High Power LTE User Equipment (HPUE) for the FirstNet Broadband Public Safety communications network. Bob retired (again) in February 2023 and is now involved in several community volunteer programs.



When "Old" is "New" Again

Charles B. Kirmuss, WOCBK, RCA Director and Fellow, Owner of Kirmuss Audio.

Since RCA's inception in 1909, many of its founders and members were leaders in the broader electrical communications industry, from radio and television to broadcast. All these emerging technologies at one point in time relied on the playback and transmission of recordings, whether the spoken word or music.

While we recently celebrated the 120th anniversary of the first transatlantic radio transmission, we also note that Guglielmo Marconi in 1906 brought over from Europe his recording technology. He did not know that Columbia engineer Thomas H. Macdonald had already patented the exact process to be used weeks before Marconi's demonstration of his different system. No matter, Marconi's records, produced and distributed under the Standard and Harmony labels, competed with Columbia. Both of these innovations were competitors to the Edison Wax Cylinder recordings. The Marconi Record was a big departure from the solid shellac discs and wax cylinders then dominating the market. It was made of celluloid laminated over a cardboard core. Celluloid produced less surface noise than shellac and there was no need for a fine grinding agent in the material to shape the needle to the groove in the first few seconds.

Moving forward to the 1980s and with the advent of digital compression and CDs, vinyl records experienced a decline in demand as CDs replaced them. Master stampers were destroyed by most record pressers. A half decade later digital compression further reduced the imagery and sound

stage of the original "in studio" tape recordings. Tape recording still used today! Vinyl is back!

As proof, the U.S. recorded-music business continues its upward swing, posting a near-record \$15 billion in revenue for 2021, driven by a surge in streaming, solid vinyl and even CD sales, and the inclusion of TikTok music revenue for the first time. In 2022, for the first time since 1987, the number of vinyl LPs sold in the United States (41 million) surpassed the number of CDs sold in the calendar year (33 million). Not counting used vinyl sales, vinyl sales reached \$1.2 billion in 2022, up 17.2%, while CD sales plummeted once again, decreasing 17.6% to \$482 million. According to *Variety*: In 2021, all major formats of music posted growth over the prior year, except digital downloads. The resurgence in vinyl records continued for the 16th consecutive year with a plethora of new hardware entrants manufacturing cardites and turntables have entered onto this growing marketplace. DON'T GED RID OF THOSE PRECIOUS VINYLs!

In the session: Discover some of the history of vinyl records and wax cylinder recordings. Appreciate why "vinyl" sounds better than digital mediums, and why OLD is NEW once more. Discover also the latest in the preservation and sale of encapsulated records pioneered by Heritage Auctions. Witness first hand vinyl record restoration!

SPEAKER BIOGRAPHY

Charles Kirmuss, RCA Member, Director and Fellow has introduced a variety of technologies since 1979. Known for the introduction of both mobile and fixed digital video and audio recording and transmission and analog image transmission over cellular in 1989, to GPS situational awareness for first responders with a patented NMEA data string with text messaging over analog radio and cellular in 2005, now has ventured into in the field of record groove restoration, and not record surface cleaning. His advances in methods to care for both vinyl and Edison Cylinder recordings are receiving global attention. His company Kirmuss Audio is further recognized as the only organization capable of producing a process and machine that is capable restoring records over surface shing and cleaning. An informative and lighthearted session is to be presented.



Engineering My College Radio Station, WUVT, Provided a Diverse and Practical Engineering Experience That Is Key to My Professional Success

Stephen M. Floyd, W4YHD, Former WUVT AM/FM Student Chief Engineer, Principal Systems Engineer, Ultra Electronics.

WUVT FM is the Virginia Tech non-commercial student operated college radio station operating at 90.7 MHz with a 6.5 kW broadcast signal. While an Electrical Engineering undergraduate student Steve was both a DJ and Engineer at the station overseeing a major transmitter infrastructure upgrade project to increase the FM signal transmit power from 770 Watts to 3,00 Watts in addition

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to the maintenance of all station operating equipment. This practical RF Systems Engineering and Technical Management experience gained while operating a real time 24/7 AM and FM radio station has been uniquely valuable to my success as a professional Electrical Engineer in every way. This presentation will tell the story of how the responsibilities of Engineering a full-time college radio station provided an excellent practical education for professional success far beyond what a rigorous Engineering academic curriculum could possibly provide. WUVT has been in one form, or another located on the campus of VA Tech with studios in the Squires Student Center. WUVT AM began broadcasting 75 years ago on April 1, 1948, as an experimental AM “carrier current” radio station on 640 kHz which makes it one of the oldest continuously operating radio stations in the state of Virginia. The station started broadcasting when an Engineering student built an AM transmitter and audio mixing console located in their dorm room on campus, with the RF signal coupled into the building AC power wiring. This student-operated radio station quickly became very popular providing both news and music programming not available elsewhere. The station chose the call letters WUVT AM and then became a

formal student organization at VA Tech and was given studio space on campus. Notably, all aspects of the radio station operations including Engineering, Music programming, News productions, Station management, and all necessary fund-raising activities to meet station expenses, are the responsibility of the student volunteers. Over the years additional AM “carrier current” transmitters were acquired along with commercial studio equipment and in 1969 the station applied for and received a formal FCC broadcast license establishing WUVT FM at 90.7 MHz radiating 10 Watts on the FM band. After many successful fundraising events the station increased transmit power in the mid-70’s to 770 Watts with stereo audio. In the 1977 through 1980 period under the guidance of station Engineer Steve Floyd the WUVT AM/FM student staff successfully installed a “lovingly re-built” RCA BTF5 FM transmitter and a new circularly polarized FM broadcast antenna achieving 3,000 Watts transmit power. In 2009 the student Engineering staff moved the WUVT FM transmitter off campus to a broadcast tower on nearby Price Mountain and increased the transmit power to 6.5 kW where it broadcasts today.

Modern radio station Engineers require technical competencies in; RF systems Engineering, Audio Processing, Studio to Transmitter links, Digital remote-control systems, Internet based networks for audio streaming and program automation, Studio production facilities, and the measurement of all FM broadcast technical parameters to ensure technical licensing requirements are met. The WUVT student Engineers must assume this full-time responsibility. When the technical management responsibility of an all-volunteer staff is added, this radio station experience provides a modern Engineering education “by doing” like no other. This presentation will provide a look back at how my professional Engineering career success is clearly the result of the diverse technical learning and management experiences I acquired Engineering WUVT AM/FM as an undergraduate Electrical Engineering student. Radio Broadcasting is a unique passion that centers on quality programming, technical excellence, community service, and this exciting pursuit will be described in a humorous and profound way. Modern FM radio station Engineering requirements will be reviewed with a summary of technical standards rarely understood in the context of running a high reliability 24/7 full-time FM broadcast radio station.

WUVT FM has been recognized as a highly successful student operated non-commercial college radio station providing unique music programming and local news to the VA Tech student community and the wider Southwest Virginia radio market. The volunteer student staff are responsible for all aspects of operating WUVT FM, receiving very little financial support from VA Tech. Many well known and accomplished professional Broadcast Engineers, Radio Personalities, and Industry Management leaders owe their careers to the serious and fun “learning by doing” student experiences gained by operating this high-quality full time AM and FM Broadcast college radio station.

RCA Mentorship Program

A way to share your knowledge and experience, or learn from the best!



The new RCA Mentorship Program is designed to pair RCA members together, providing opportunities for young professionals to learn and emulate the experience of more seasoned RCA members. Several mentoring pairs have already been formed and more are being formed. Learn more on the RCA website.

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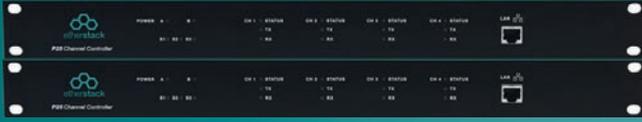
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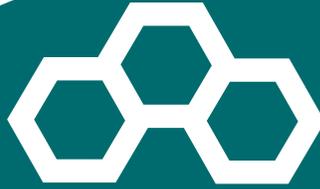
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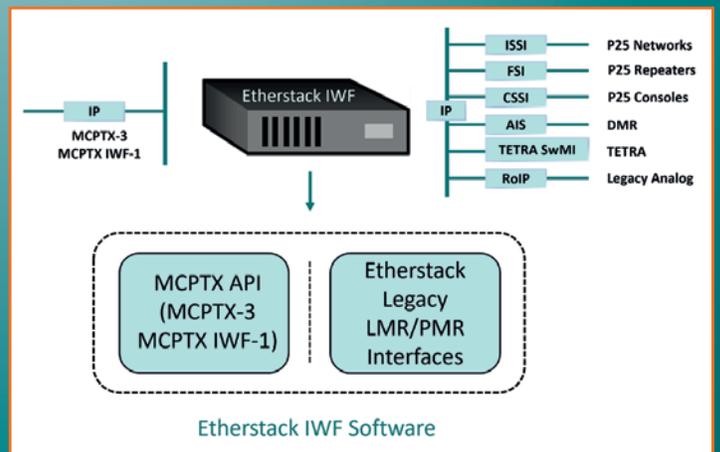


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SPEAKER BIOGRAPHY

Stephen Floyd is a BSEE graduate of Virginia Tech, a former student DJ and Chief Engineer at WUVT-FM in Blacksburg, VA, and obtained his MSEE (with emphasis on RF and Microwave Engineering and Radar Systems Engineering) from The Johns Hopkins University in 1991. He became a licensed Amateur Radio operator at 12 years old and is active as W4YHD and acquired his commercial First Class FCC Radiotelephone License at the age of 17 years old. Steve began his professional career designing high power RF communications and Radar systems at E-Systems Inc., then became Chief RF Systems Design Engineer for the High Frequency Active Auroral Research Program “HAARP” working at APTI/BAE Systems. As Chief Engineer for the HAARP facility he was responsible for all hardware systems designs, equipment installations, and site operations until 2014 when he became a part time consultant to the program. The HAARP site in Alaska has been widely recognized as a reliable state-of-the-art radio science research facility providing significant advancements into all aspects of Radio Science research. Steve’s current responsibilities are primarily involved in the design of high power SDR based Radar systems, including EW and Communications systems, at Ultra Electronics. Steve is also active in the broadcast industry where he is a member of the Society of Broadcast Engineers DC Chapter 37, a member of the Association of Federal Communications Consulting Engineers, and has a lifelong love of radio broadcasting and amateur radio.



The Next Generation of Shared Spectrum

Richard Lee, Chief Executive Officer, iPosi Inc, Denver CO.

Traditional wireless communication systems vitally depended on having substantial reserves of (as used here, idle or substantially unoccupied) radio spectrum. While 5G “High Band” millimeter wave and 6G Terahertz band reserves are generally ample, propagation limitations within these bands will not fulfill many communication use cases, aside from the fact these bands can be cost ineffective for many human-to-human cellphone or machine-to-machine IoT use cases. Those cases mandatorily require maintaining operations at carrier frequencies further down in the low/mid microwave range – where no idle, unoccupied spectrum exists. We review current concepts of spectrum sharing informing these choices. We cover the top level aims of actively managed sharing and their success in avoiding interference while raising useful same-frequency access.

New 5G and 6G systems are forecast to bring about billion-plus, ubiquitous device applications persistently operating with no less ubiquity but likely higher communication intensity, thus challenging radio interference profiles further. These use cases also “pressure test” concepts of

spectrum management which has to evolve, and introduce new challenges to shared frequency occupancy. This trend requires new oversight and regulation. These present new policy and related challenges to adapt sharing consistent with modern, multi-trillion dollar national economies that are dependent on 5-6G.

The most cited remedy for offsetting this pressure is to “dynamically” share spectrum, allocations once reserved to be exclusively and proactively ready to use by “incumbents” spectrum operations. “Dynamic” sharing involves significant cooperation, perhaps even concessions by once exclusive-use incumbents. Incumbents are asked to accept substantial risk with sharing that can arise from disruptive interference by incoming new and relatively uncontrolled shared-frequency “peers” with still evolving operational profiles.

We present the status of recent frequency sharing in technological terms including discussion of the latest occupancy-based sharing approaches, which use continuous “in-situ” site-specific measurements versus incumbent sensing to manage interference and reliance on general purpose RF propagation models.

SPEAKER BIOGRAPHY

Richard Lee holds a Bachelor of Electrical Engineering from the University of Detroit, and an MBA from the University of Chicago, Booth School of Business. His 50-year career in the wireless industry spans technology, devices & network equipment, and semiconductors. He was involved in the first mobile assisted-GPS technology launch in Japan. He started his career at Motorola as RF engineer and later in management, both in its Communication and Cellular Sectors. He moved to early cellular and PCS operations with US West/Air Touch, and PrimeCo (both now Verizon Wireless), before assignment internationally to Bouygues Mobile, Versailles, France for its 1994 cellular launch. He held executive positions in wireless and GPS companies including Global Locate (later acquired by Broadcom), and as executive and co-founder of RX Networks, Vancouver, BC (acquired by BD Star, Beijing), before launching iPosi, Inc.



RCA Youth Activities

Carole Perry, WB2MGP, Youth Activities

The review of events for our RCA Youth Activities included both ZOOM presentations and in person events. Several candidates were interviewed for the “Young Ham Lends a Hand” contest;

and two young hams were chosen as winners for their volunteerism efforts. In February, two RCA Young Achievers were showcased for their presentations at my Youth Forum in Orlando, Florida at Hamcation. At Hamcation, the winner of the 2023 Carole Perry Educator of the Year contest was Jim Storms for his excellent work with youth in technology. At the Dayton Hamvention in May, I moderated the 34rd

annual Youth Forum and Instructors' Forum. I featured 6 RCA Young Achievers who gave outstanding presentations. We continued to donate, support, and send supplies to start up radio youth groups and to classroom teachers teaching technology via the fun of amateur radio.

SPEAKER BIOGRAPHY

Carole Perry, WB2MGP, worked as an executive secretary in an electronics manufacturing company, Rapid Circuit Inc., for 16 years. In 1980, when the company relocated, she returned to Intermediate School 72 in Staten Island, NY where she worked until her retirement in 2004, teaching "Introduction to Amateur Radio" to 6th, 7th, and 8th graders for almost 30 years. Carole wrote the curriculum for "Introduction to Amateur Radio" a very successful program which had 950 students a year coming through it.

Carole Perry is the recipient of the prestigious 1987 Dayton Ham of The Year Award, the 1987 ARRL Instructor of The Year Award, the 1991 Marconi Wireless Memorial Award, the 1993 QCWA President's Award, the 1996 Radio Club of America (RCA) Barry Goldwater Amateur Radio Award, the 2009 RCA President's Award, the 2012 RCA President's Award, and the 2015 Vivian Carr Award for Women in Radio. She is the winner of the 2016 SOAR (Sisterhood of Amateur Radio) Legacy award for Pioneering Women in Amateur Radio, and the 2016 recipient of the YASME Foundation Award for Excellence. In 2017 she was the winner of the Brooklyn College Milton Fisher Second Harvest Award for her volunteer work with young people and technology, around the world. In May 2018 Carole was inducted into the "CQ Amateur Radio Hall of Fame." In July 2018 "QST" magazine, Carole was the featured member in "Member Spotlight."

In February 2019, at Hamcon, Carole became the first recipient of the newly created "Carole Perry Educator of the Year Award." In 2020 Carole was awarded the position of Fellow in the AWA (Antique Wireless Association).

In 2022, she was the Inaugural recipient of the RCA Carole Perry Young Professional Award. This award will be presented to Carole's former RCA Young Achievers who have gone on to contribute to the wireless industry in some way.

Carole is an RCA Fellow, and in 2007 she was elected to the RCA Board of Directors; a position she still holds, and she created the Youth Activities Committee which she now chairs. She serves on the RCA Scholarship committee and the Mentorship committee as well. She also created the RCA Young Achiever's Award, given to students in grade 12 and below who have demonstrated excellence and creativity in wireless communications. One hundred and sixty-one youngsters have received this award along with a stipend, so far.

The RCA Young Achiever Scholarship is another new initiative whereby former Young Achievers could qualify for a special RCA Scholarship. In 2012 Carole created the Young Ham Lends a Hand Contest to honor and reward young hams who demonstrate the spirit of volunteerism

Under Carole's leadership, the RCA Youth Activities Committee goes into schools across the country to set up radio/technology programs. Equipment, cash grants, books, and supplies are donated to the chosen schools or youth groups.

Carole has moderated the Dayton Hamvention Youth Forum and Instructors' Forum for 34 years. She is a member/director of RCA and was a director of QCWA (Quarter Century Wireless Association) for 7 years. She is also a member of ARRL, DARA, (Dayton Amateur Radio Association) AWA (Antique Wireless Association), Portage County Amateur Radio Society, YL Harmonics, and Brandeis Women.



BARC Jr. at the Dayton Hamvention Youth Forum

Eric Permut, KGOYS.

Under the devoted attention of Ellie and "Rip" Van Winkle, BARC Jr. became a force in the Youth in Amateur Radio movement and helped 250+ youths achieve radio licenses. BARC Jr. also became a key contributor to Carole Perry's Dayton Hamvention Youth Forum, educating and coaching 81 young hams to be exceptional Youth Forum presenters over a period of 27 years.

SPEAKER BIOGRAPHY

Eric Permut achieved his Novice license at age 12 and became comfortable with a straight key and low-power radio on the 15m and 40m bands. His upgrade to Technician Class brought a fascination with 1200-baud, 2m packet radio and its active, nighttime messaging scene. Eric convinced his middle school science teacher to earn her radio license, and together, they assembled a small, school radio club and station. Eric was also chosen as the first BARC Jr presenter in the Dayton Hamvention Youth Forum. Eric just renewed his Advanced Class callsign, KGOYS, for the third time. He enjoys fox-hunting, Parks on the Air, perpetually relearning CW, and continued involvement with BARC Jr.



Amateur Radio and Acoustics – The Frequencies That Connect My Life

Ruth Willet, KM4LAO, Second-Year Graduate Student in Acoustics, Penn State University.

Amateur Radio is an incredible service and hobby that enables two-way communication around the world. Since first becoming licensed at age 15, I have explored many different aspects of this wireless hobby including HF communications using my voice and Morse Code, portable operations, satellite communications, kit-building, ARISS contacts, school club development, and workshops and leadership through

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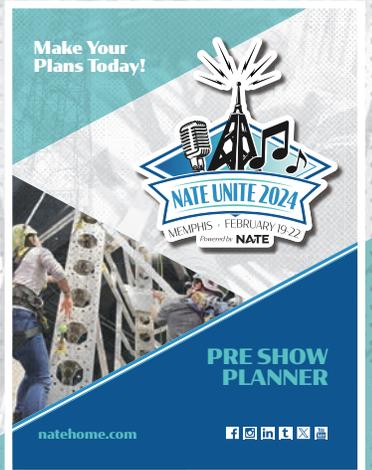
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- Radio System Coverage Analysis
- Land Mobile Radio System Design
- Backhaul Network Design
- Radio Communications Site Design
- RFP Development and Procurement
- Grant Writing
- Implementation Oversight



Youth on the Air. My amateur radio activity first paralleled my academic journey through physics and mechanical engineering before finally coming together in acoustics. This presentation will detail my journey through STEM and wireless communications into acoustics studies and research in prognostic health management. The field of Acoustics is rich in connections with the wireless industry – from the math of sound propagation, design of microphones for communications and wireless systems to connect them, and the application of prognostic health management to reduce system failures. Specifically, my work in prognostic health management seeks to quantify how piezoelectric accelerometers, condenser microphones, and micro-electro-mechanical systems (MEMS) accelerometers and microphones can be best used for vehicle prognostic health management.

SPEAKER BIOGRAPHY

Ruth Willet is a second-year graduate student in Acoustics at Pennsylvania State University where she is working as a research assistant in Acoustic Prognostic Health Management. In May 2023, she presented on her research at the 184th meeting of the Acoustical Society of America. Ruth graduated Summa Cum Laude from Kettering University in 2021 with a double major in Engineering Physics and Mechanical Engineering and a minor in Acoustics. Throughout undergrad and prior to starting graduate school, she worked at Textron Specialized Vehicles in Augusta, GA.

Ruth, KM4LAO, is also an accomplished Amateur radio operator. After becoming licensed in 2015 due to an interest in Morse code, she earned her Amateur Extra class license within a year. In 2018 she was awarded both the RCA Young Achiever award, which was presented at the International Wireless Communications Expo, and the ARRL Hiram Percy Maxim Memorial award. She restarted the Kettering University Amateur Radio club and served as its president for several years and is now in her second year as event planner for the Penn State Amateur Radio club. She is also the assistant camp director for Youth on the Air. Ruth is well-known for her enthusiastic approach to life and ham radio, and has been featured on the ICQ Podcast, multiple international magazine articles, an Amateur Radio on the International Space Station (ARISS) pre-contact video, several Youth on the Air workshops, multiple satellite communications workshops, and many video and podcast interviews.



Rapid DNA: Combining Microfluidics, Optics, and Analog to Digital Conversion to Make the World a Better Place

Dr. Eugene Tan, Executive Vice President of Product Development at ANDE Corporation.

Although the development of DNA analytic tools is one of the technical hallmarks of the last century, essentially all sophisticated applications have required well-equipped laboratories and highly skilled scientists. As a result, DNA analysis is slow and subject to human error. For example, forensic DNA evidence typically requires 6-24 months to process—not the 60 minutes one would guess from an episode of CSI Miami. My work in the development of Rapid DNA has changed all that. For example, when the 2023 Maui Wildfire struck, Rapid DNA became the primary identification modality—displacing fingerprints, odontology, and radiology; Rapid DNA generated identifications the day that a set of remains was recovered—in other disasters, this work typically requires years (and is frequently never completed).

This presentation will describe the automation of a highly-complex laboratory-based process using microfluidics, the ruggedization of the optical system for field-based use, and the development and integration of an Expert System to allow automated analogic to digital data conversion and interpretation of the resulting data; the fundamental principles of system development and the application of optical, mechanical, chemical, and software engineering to solve previously intractable problems; and the impact of the technology, ranging from a Federal Law that enables Rapid DNA to be used by police officers to dramatically accelerate the identification of murders and rapists to the use of Rapid DNA to support the identification of the victims of the Ukraine War.

SPEAKER BIOGRAPHY

Dr. Eugene Tan is the Executive Vice President of Product Development at ANDE Corporation, Waltham MA. He received his Bachelor's degree in Engineering Physics summa cum laude, Masters in Engineering Physics, and PhD in Engineering from McMaster University. Dr. Tan also has extensive experience in bringing research programs to commercialization in industrial settings. He developed an optical interference back-electrode structure to achieve full sunlight legibility in thin-film electroluminescent flat panel display systems for avionics, prototyped and manufactured micro-electromechanical-based tunable vertical cavity surface emitting laser and tunable filter modules for optical communication, and optimized the microfabrication processes for optoelectronic transceivers for networking. Dr. Tan is the Chief Architect of the ANDE Rapid DNA System and has spent the last two decades at ANDE. His work is focused on developing and optimizing Rapid DNA consumables, instrumentation and software, and developing novel applications for the system. He has been

the Principal Investigator on many government grants and contracts, is an inventor of 29 US patents, and is an author of 13 peer-reviewed publications.



Introduction to RF Hacking and Impacts on Satellites

Rachel Jones, Savannah River National Laboratory (SRNL) and Ph.D. Student at the University of North Dakota.

This session will answer questions related to hacking radio frequency (RF). We will review past RF hacking events (both those that have happened and those of urban legend). We will discuss common RF hacking tools such as the Flipper Zero, HackRF, and more. Then we will touch on setting up a space for RF experimentation and the types of programs one might want to support RF work, such as GNU Radio.

Finally, these concepts will be applied to the satellite security environment.

SPEAKER BIOGRAPHY

Rachel Jones has an interdisciplinary background, specializing in space and cyber technology. She has been an analyst at Savannah River National Laboratory (SRNL) since 2020. Previously, Rachel supported the United States Air Force as a civil servant working on space and cyber projects. Rachel is also a PhD Student at the University of North Dakota studying Aerospace Science. She has a Master of Science in Space Management from the International Space University and a Master of Arts in Intelligence with a cyber focus from the American Military University. In addition, she has a Bachelor of Arts in Political Science from LaGrange College and a Bachelor of Science in Computer Networking and Cybersecurity from the University of Maryland Global Campus.

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SPECTRUM SENSING USING DISPERSIVE DELAY LINE STRUCTURE IN REAL-TIME

Sri Tarun Reddy Chilukury(1)(2), Aakash Sahai(1), Mark Golkowski(1), Dan Kuester(2)
(1) Department of Electrical Engineering, University of Colorado Denver
(2) NIST Communications Technology Laboratory

SIGNAL CLASSIFICATION WITH MACHINE LEARNING USING A LOW-COST SDR

Akimun J. Alvina(1), Yao Ma(2), Vijay Harid(1), and Mark Golkowski(1)
(1) University of Colorado Denver, USA (akimunjannat.alvina@ucdenver.edu)
(2) National Institute for Standards and Technology (NIST), Boulder, CO, USA

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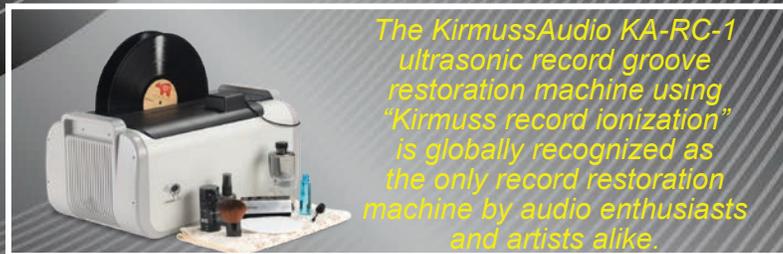
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