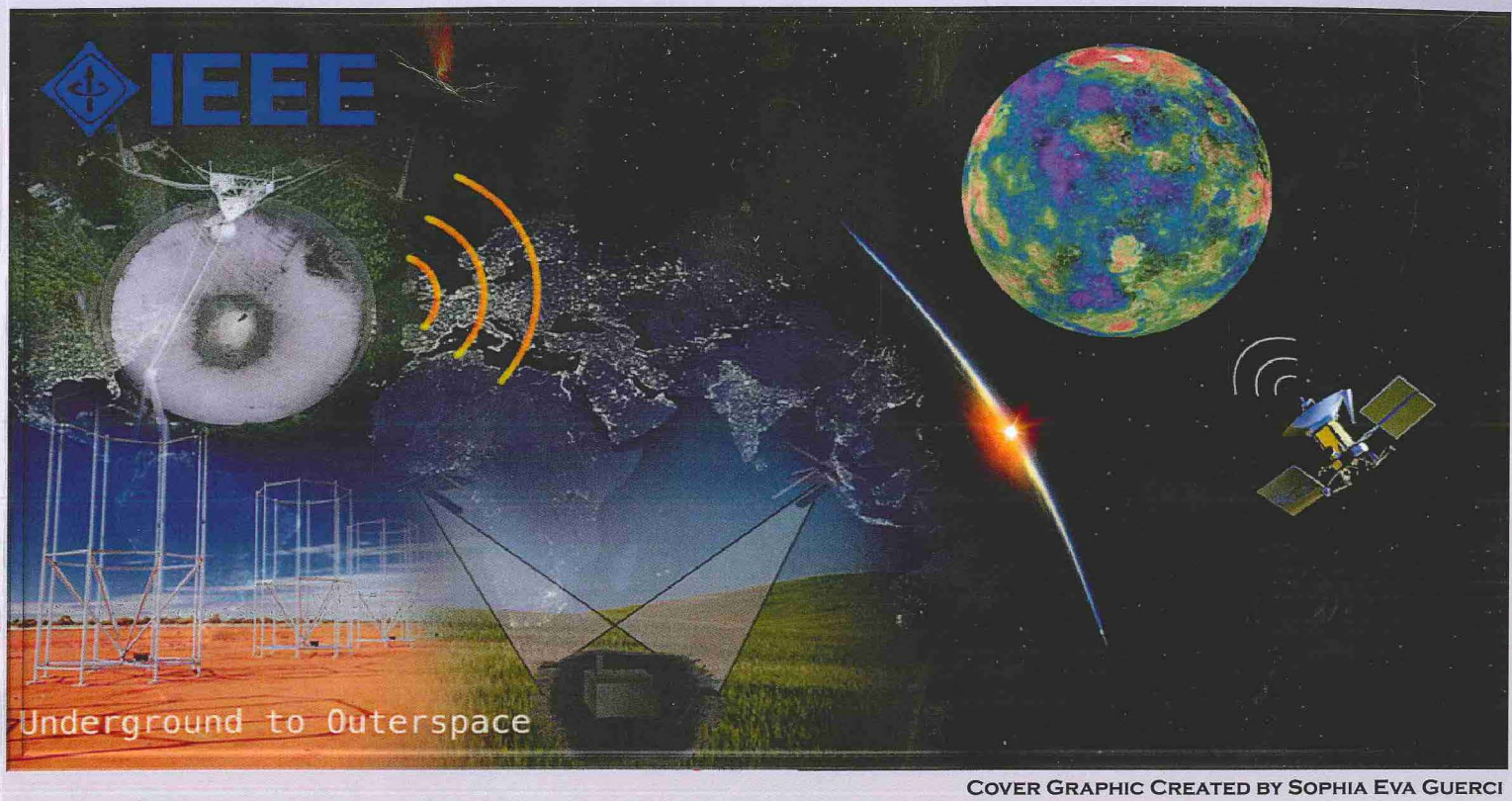

COVER GRAPHIC CREATED BY SOPHIA EVA GUERCI

2015 IEEE INTERNATIONAL RADAR CONFERENCE

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MARRIOTT CRYSTAL GATEWAY

ARLINGTON VA, USA

AESS

IEEE Signal Processing Society

GRSS Geoscience and Remote Sensing Society

IEEE INFORMATION THEORY SOCIETY

T-02 – Radar Transmitter Design for the Crowded Radio Spectrum

Presented by Dr. Charles Baylis, Baylor University; Larry Cohen, Naval Research Lab; and Robert J. Marks, Baylor University, USA

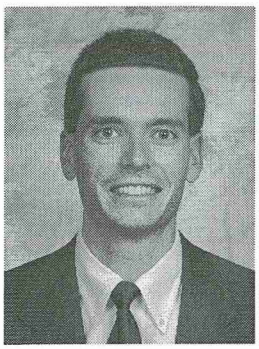
Spectrum requirements on modern radar systems are becoming increasingly stringent. The explosion of wireless broadband devices and the resulting stimulation to the economy has resulted in changes to radar spectrum allocation. Many believe that dynamic spectrum access will result in future allocation of spectrum based on need, requiring radar transmitters and receivers that are flexible in frequency of operation.

This has significant impact on the design of present and future radar systems, and in outfitting of legacy radar transmitters to operate in the crowded spectrum. This tutorial addresses the following topics:

1) Transmitter-Caused Radar/Communications Coexistence Issues (Lawrence Cohen)
2) Design of Radar Transmitters for Spectral Coexistence
3) Panel Session: What spectral challenges will be faced next by radar operators and what is the portfolio of technical expertise that will be needed to solve these challenges?

The tutorial will provide attendees with an understanding of challenges in radar transmitter design based on scarcity of available spectrum. Design approaches are presented for the transmitter that mitigate spectral spreading and allow frequency adjustment to meet changing spectral requirements. The tutorial concludes with a panel session. The interactive component of this tutorial will allow attendees to leave with ability to apply solid spectrum engineering principles to transmitter design and emerging technologies to solve the spectrum challenges they face. Many will attend this tutorial because they are facing specific spectrum issues in their radar design, and the interactive discussion at the conclusion will allow them to apply what they learn in this tutorial to solving the problems they are facing.

Biographies

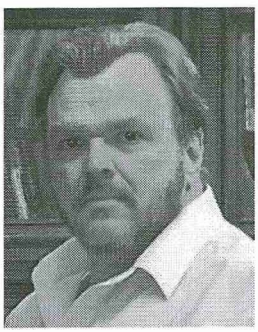


Charles Baylis is an Associate Professor of Electrical and Computer Engineering at Baylor University, where he directs the Wireless and Microwave Circuits and Systems (WMCS) Program. Dr. Baylis received the B.S., M.S., and Ph.D. degrees. in Electrical Engineering from the University of South Florida in 2002, 2004, and 2007, respectively. His research focuses on spectrum issues in radar and communication systems, and has been sponsored by the National Science Foundation and the Naval Research Laboratory. He has focused his work on the application of microwave circuit technology and measurements, combined with intelligent optimization algorithms, to creating reconfigurable transmitters. He serves as the general chair of the annual Texas Symposium on Wireless and Microwave Circuits and Systems.

Lawrence Cohen has been involved in electromagnetic compatibility (EMC) engineering and management, shipboard antenna integration and radar system design for 33 years. In this capacity he has worked in the areas of shipboard electromagnetic interference (EMI) problem identification, quantification and resolution, mode-stirred chamber research and radar absorption material design, test and integration. In March of 2007 Mr. Cohen acted as the Navy's Principal Investigator in the assessment of radar emissions on a WiMAX network. Additionally, he has acted as the Principal Investigator for various radar programs, including the radar

transmitter upgrades. Currently, he is involved with identifying and solving spectrum conflicts between radar and wireless systems as well as research into spectrally cleaner power amplifier designs, tube and solid state

Mr. Cohen received a BS in Electrical Engineering from The George Washington University in 1975 and a Master of Science in Electrical Engineering from Virginia Tech in 1994. He is certified as an EMC engineer by the National Association of Radio and Telecommunications Engineers (NARTE). Larry served as the Technical Program Chairman for the IEEE 2000 International Symposium on EMC and was elected for a three year term to the IEEE EMC Society Board of Directors in 1999 and 2009. he is also a member of the IEEE EMC Society Technical Committee 6 (TC-6) for Spectrum Management. For the past 26 years he has been employed by the Naval Research Laboratory in Washington, DC. In his spare time he enjoys golf, hiking, cycling and target shooting.



Robert J. Marks II, Ph.D. is Distinguished Professor of Engineering in the Dept ofEngineering at Baylor University. He is the author of hundreds of journal and conference papers. Some of them are good. His latest book, co-edited with Michael Behe, William Dembski, Bruce Gordon and J.C. Sanford, is Biological Information - New Perspectives (World Scientific, Singapore, 2013). He is also the (co)author/(co)editor of Neural Smithing: Supervised Learning in Feedforward Artificial Neural Networks (MIT Press), Handbook of Fourier Analysis and Its Applications (Oxford University Press), Introduction to Shannon Sampling and Interpolation Theory (Springer-Verlag), Advanced Topics in Shannon Sampling and Interpolation Theory, (Springer-Verlag), Fuzzy Logic Technology and Applications, (IEEE Press), Computational Intelligence: Imitating Life (IEEE Press) and Computational Intelligence: A Dynamic System Perspective (IEEE Press)

Marks is the recipient of a NASA Tech Brief Award and a best paper award from the American Brachytherapy Society for prostate cancer research. He is Fellow of both IEEE and The Optical Society of America. His consulting activities include Microsoft Corporation, Pacific Gas & Electric, and Boeing Computer Services. His research has been funded by organizations such as the National Science Foundation, General Electric, Southern California Edison, EPRI, the Air Force Office of Scientific Research, the Office of Naval Research, the Whitaker Foundation, Boeing Defense, the National Institutes of Health, The Jet Propulsion Lab, Army Research Office, and NASA.

Marks was awarded the IEEE Outstanding Branch Councilor Award, The IEEE Centennial Medal, the IEEE Computational Intelligence Society Meritorious Service Award, the IEEE Circuits and Systems Society Golden Jubilee Award and a IEEE CIS Chapter of the IEEE Dallas Section Volunteer of the Year award. He was was named a Distinguished Young Alumnus of Rose-Hulman Institute of Technology, is an inductee into the Texas Tech Electrical Engineering Academy, and in 2007 was awarded the Banned Item of the Year from the Discovery Institute. He was also co-recipient of a NASA Tech Brief Award for the paper "Minimum Power Broadcast Trees for Wireless Networks", and the Judith Stitt Award at the American Brachytherapy Society 23rd Annual Meeting.Dr. Marks served as a Distinguished Lecturer for the IEEE Computational Intelligence Society. He was given IEEE Dallas Chapter Volunteer of the Year Award from the Dallas IEEE CIS Chapter. Dr. Marks served for 17 years as the faculty advisor to the University of Washington's chapter of Campus Crusade for Christ. In 2010, he was listed by CollegeCrunch.com as one of "The 20 Most Brilliant Christian Professors," and, in 2013, one of "the 50 smartest people of faith" at TheBestSchools.org. He has an embarrassingly low Erdős-Bacon number of five.