

Tutorial I

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Ultrawideband; Technology and Issues

Abstract

This tutorial delves into the major issues surrounding the emerging UWB environment. We discuss some of the fundamental technology issues of this PHY in both the analog and digital domains. This topic is elaborated using real world designs to consider the key system level issues that manifest in UWB based designs. We follow the technology discussions with target market descriptions and explore the opportunities that UWB technologies enable. Our discussions are hosted by the drivers behind UWB, system architects and chip implementers. They describe and discuss the tradeoffs that they faced during their development of the UWB specs and the initial implementations.

Biography

Dr. Aiello is founder and CEO of Staccato Communications, Inc. He is a recognized leader in the ultrawideband (UWB) community and is actively involved in standards-setting committees. Dr. Aiello is a founding member of both the IEEE 802.15.3a and the 802.15.4a Groups and of the Multiband OFDM Alliance. He was previously founder, President and CEO at Fantasma Networks, a UWB product company. Prior to Fantasma, Dr. Aiello had joined Interval Research, Paul Allen's research laboratory, in 1996 to work on advanced wireless technologies where he built the first documented UWB network. He previously held senior positions at the Stanford Linear Accelerator Center (SLAC) and the National Superconducting Super Collider Laboratory in Texas. He has served and serves on several advisory boards, such as iPASS and Microwave Photonics.

Dr. Aiello holds a Ph.D. degree in physics from the University of Trieste. He has authored more than 20 patents on UWB technology

Anuj Batra received the B.S. degree, with distinction, in electrical engineering from Cornell University, Ithaca, NY, in 1992; the M.S. degree in electrical engineering from Stanford University, Stanford, CA, in 1993; and the Ph.D. degree in electrical engineering from Georgia Institute of Technology, Atlanta, in 2000. In 1992, he was with Raytheon E-Systems, Falls Church, VA, where he designed algorithms for a software-

defined radio based on the AMPS standard. In 2000, he joined the Digital Signal Processing Solutions (DSPS) Research and Development Center, Texas Instruments, Inc. (TI), Dallas, TX.

Since 2002, Dr. Batra helped start an internal UWB development effort within TI and co-developed the Time-Frequency Interleaved OFDM (TFI-OFDM) proposal, which served as the foundation for the MultiBand OFDM proposal. This proposal defines a wireless ultra wideband (UWB) based physical layer for high speed communications (up to 480 Mbps). In addition, Dr. Batra serves as the Physical Layer Technical Chair for the MultiBand OFDM Alliance (MBOA), a partnership of more than 140 of the companies in the Consumer Electronics, Personal Computing, Home Entertainment, Semiconductor and Digital Imaging spaces.

He is currently a Member, Group Technical Staff at TI and his research interests are in the areas of wireless communications, in particular, the design of high-speed wireless networks, multi-user detection theory, and coexistence between unlicensed wireless devices. Since joining TI, he has also been involved in standardization activities for MBOA SIG, IEEE 802.15.3a, IEEE 802.11g, IEEE 802.15.2 and Bluetooth SIG.

Dr. Batra is a member of Eta Kappa Nu and Tau Beta Pi.

Nathan Belk is the Lead RF architect within the DSPS R&D center at Texas instruments. He is a developer of the systems specification and the lead designer for TI's MBOA UWB RFIC. Prior to this he was a Distinguished Member of Technical Staff in the Wireless Research Laboratory at Bell Labs Basic Research where he developed radio architectures, RF circuit solutions, integrated RF components and modeling algorithms. Nathan received his BS from the University of Minnesota and his PhD from MIT.

Mr. Sandeep Kumar is co-Founder, President and CEO of Adimos Inc a fabless semiconductor startup developing and marketing innovative wireless multimedia home networking solutions. He has helped build a company that has achieved significant business successes in its very 1st year and raise 16M\$ of capital. Prior to starting Adimos, he was an executive advisor at JVP and a Venture Partner at Crimson Ventures. He has over 15 years experience in P&L management, marketing and R&D at TI as GM, Cable Broadband Communications Group; New business development manager of the DSP Group, and WW Design & Development manager for the MCU Group.

Early in his professional career he developed embedded memory silicon processes, VLSI test methods and IC design methodology. His academic research covered design and fabrication of sub-micron optical components. He has authored several research papers in broadband communications, applied quantum electronics, rapid thermal processing, Raman spectroscopy, embedded NOVO process and DFT.

Mr. Kumar holds an MSEE from University of Cincinnati & BSEE from IIT Delhi, India.