UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION

PEGASUS WIRELESS INNOVATION LLC, *Plaintiff*, v. CELLCO PARTNERSHIP d/b/a VERIZON WIRELESS *et al.,* *Defendants*.	§ § § § § § § § § § § § §	Case No. 2:23-cv-00640-JRG (Lead Case)
CELLCO PARTNERSHIP d/b/a VERIZON WIRELESS *et al.*, *Counterclaim-Plaintiff*, v. PEGASUS WIRELESS INNOVATION LLC and KT CORPORATION, *Counterclaim-Defendants*.	§ § § § § § § § § § § § § §	Case No. 2:23-cv-00640-JRG (Lead Case)
PEGASUS WIRELESS INNOVATION LLC, *Plaintiff*, v. AT&T CORP. *et al.,* *Defendants*.	§ § § § § § § § § § § § § §	Case No. 2:23-cv-00638-JRG (Member Case)
NEW CINGULAR WIRELESS PCS, LLC, *Counterclaim-Plaintiff*, v. PEGASUS WIRELESS INNOVATION LLC and KT CORPORATION, *Counterclaim-Defendants*.	§ § § § § § § § § § § § § §	Case No. 2:23-cv-00638-JRG (Member Case)

Petitioners' Exhibit 1014
Google et al. v. KT Corporation et al.
IPR2025-00292

PEGASUS WIRELESS INNOVATION LLC, *Plaintiff*, v. T-MOBILE USA, INC. *et al.,* *Defendants*.	§ § § § § § § § § § § § §	Case No. 2:23-cv-00639-JRG (Member Case)
T-MOBILE USA, INC., *Counterclaim-Plaintiff*, v. PEGASUS WIRELESS INNVOATION LLC and KT CORPORATION *Counterclaim-Defendants*.	§ § § § § § § § § § § § §	Case No. 2:23-cv-00639-JRG (Member Case)

PLAINTIFF AND COUNTERCLAIM-DEFENDANT PEGASUS WIRELESS INNOVATION LLC'S INITIAL PROPOSED CONSTRUCTIONS

Under this Court's Scheduling Order and Local Rule 4-2, Plaintiff Pegasus Wireless Innovation LLC hereby provides its Preliminary Claim Constructions and Extrinsic Evidence for the asserted claims of U.S. Patent Nos. 11,627,631 ("'631 Patent"), 10,181,931 ("'931 Patent"), 10,616,932 ("'932 Patent"), 11,405,942 ("'942 Patent"), 10,594,460 ("'460 Patent"), 10,721,118 ("'118 Patent"), 11,219,000 ("'000 Patent"), 10,638,463 ("'463 Patent"), 11,540,272 ("'272 Patent"), 9,894,644 ("'644 Patent"), and 10,009,161 ("'161 Patent") (collectively, the "Asserted Patents").

Pegasus reserves the right to supplement this disclosure, including the right to add to or remove from or otherwise modify or amend their proposed claim constructions and extrinsic evidence to the extent allowed by applicable law, rule, order, or other practice or agreement. Pegasus may further supplement this disclosure in light of the positions that Defendants or Intervenors take in this litigation.

I. Preliminary Proposed Claim Constructions and Extrinsic Evidence

Subject to the above, Pegasus attaches its preliminary proposed claim constructions and preliminary identification of extrinsic evidence for the Asserted Patents as Exhibit A. Pegasus's preliminary proposed claim constructions apply to each element of the asserted claim(s) where the term appears unless otherwise indicated. Pegasus further reserves the right to rely on extrinsic evidence cited by Defendants or Intervenors, additional extrinsic evidence to rebut as needed, any construction offered by Defendants or Intervenors, and any extrinsic evidence developed as discovery proceeds.[1]

II. Expert Testimony

Pegasus intends to rely on expert testimony in support of its constructions, including expert testimony regarding the technology that underlies the alleged inventions, the level of ordinary skill in the art, how the Asserted Patents, claims, and intrinsic or extrinsic evidence would be understood by one of ordinary skill in the art, the alleged inventions claimed in the Asserted Patents, the meaning of the disputed claim terms, phrases, and clauses to one of ordinary skill in the art, and any other opinions or testimony useful to the Court in conducting the requisite claim constructions. Pegasus may also offer expert testimony for any tutorial the Court may wish to conduct. Pegasus may also offer expert testimony to rebut any extrinsic evidence offered by Defendants or Intervenors, including any expert opinions. Pegasus preliminarily identifies Dr. Martin J. Feuerstein as said expert. The CV for Dr. Feuerstein is attached herein as Exhibit B respectively.

DATED: December 4, 2024

By: */s/ Jordan Rux*

[1] Pegasus reserves the right to adopt or object to the construction of terms and phrases proposed by Defendants or Intervenors. Pegasus further reserves all rights to supplement and amend its list of proposed terms and claim elements for construction, its constructions, and supporting evidence. Pegasus also reserves all rights to offer additional or alternative constructions and supporting evidence in light of any assertion by Defendants or Intervenors that any term or phrase in the Asserted Patents is invalid under 35 U.S.C. § 112.

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ATTORNEYS FOR PLAINTIFF
PEGASUS WIRELESS INNOVATION LLC

CERTIFICATE OF SERVICE

I hereby certify that on December 4, 2024, that I served all counsel of record with a copy of this document via email.

/s Jordan Rux
Jordan Rux

Exhibit A

Preliminary Proposed Constructions and Extrinsic Evidence under Local Patent Rule 4-2

I. U.S. Patent No. 11,627,631 ("the '631 Patent")

Claim Term	'631 Patent Claim(s)	Proposed Construction and Extrinsic Evidence
"A controller for transmitting and receiving data, the controller comprising: a processor performs: to decide whether to perform a handover, to transmit a handover request message when it is decided to perform the handover, . . . to receive a handover request confirmation message in response to the handover request message . . . . ."	7	Plain and Ordinary Meaning

II. U.S. Patent No. 10,181,931 ("the '931 Patent")

Claim Term	'931 Patent Claim(s)	Proposed Construction and Extrinsic Evidence
"A method of transmitting response information of downlink data of a Machine Type Communication (MTC) terminal"	1	Plain and Ordinary Meaning 3GPP TS 22.368 V11.3.0 (2011-09)
"A method of configuring a resource of response information of downlink data for a Machine Type Communication (MTC) terminal in a base station"	3	Plain and Ordinary Meaning 3GPP TS 22.368 V11.3.0 (2011-09)
"A Machine Type Communication (MTC) terminal for transmitting response information of downlink data to a base station"	5	Plain and Ordinary Meaning 3GPP TS 22.368 V11.3.0 (2011-09)
"A base station for configuring a resource of response information of downlink data for a Machine Type Communication (MTC) terminal"	7	Plain and Ordinary Meaning 3GPP TS 22.368 V11.3.0 (2011-09)
"terminal different from the MTC terminal"	1, 3, 5, and 7	Plain and Ordinary Meaning 3GPP TS 22.368 V11.3.0 (2011-09)
"Machine Type Communication (MTC) terminal" / "MTC terminal"	1-7	Plain and Ordinary Meaning

		3GPP TS 22.368 V11.3.0 (2011-09)
"separated from"	1, 3, 5, and 7	Plain and Ordinary Meaning Alternatively, "separated from" may be construed as "to be different than."
"configured to" in "a receiving unit configured to receive structural information that contains at least one piece of i) information on a resource allocated to an uplink control channel for transmitting the response information and ii) start offset information on the resource to which the uplink control channel is allocated, configured to receive downlink control information for scheduling the downlink data, and configured to receive the downlink data"	5	Plain and Ordinary Meaning
"configured to" in "a controller configured to determine a resource allocated to the uplink control channel for transmitting the response information of the downlink data based on at least one of i) information on a resource of a downlink control channel for scheduling the downlink data, ii) the information on the resource allocated to the uplink control channel, and iii) the start offset information on the resource allocated to the uplink control channel"	5	Plain and Ordinary Meaning
"configured to" in "a transmitting unit configured to transmit the response information of the downlink data by using the determined resource of the uplink control channel"	5	Plain and Ordinary Meaning

III. U.S. Patent No. 10,616,932 ("the '932 Patent")

Claim Term	'932 Patent Claim(s)	Proposed Construction and Extrinsic Evidence
"access unit"	1, 2, 8, 9, 10, 11, 12, 13, 14	"the node providing an RLC function, a MAC function, and a PHY function for the transmission of user plane data" ('932 at 8:54-57)

"An access unit for configuring a wireless connection of a terminal"	8	Plain and ordinary meaning with "access unit" construed as above.

IV. U.S. Patent No. 11,405,942 ("the '942 Patent")

Claim Term	'942 Patent Claim(s)	Proposed Construction and Extrinsic Evidence
"a newly defined RNTI other than at least a cell-RNTI (C-RNTI)"	1, 5, 9	Plain and Ordinary Meaning Alternatively, the phrase "other than at least a cell-RNTI (C-RNTI)" may be construed as "other than a cell-RNTI or an already defined RNTI." LTE for 4G Mobile Broadband, F. Khan, Cambridge Univ. Press, 2009, p. 15. 3GPP TS 36.212 V8.8.0 (2010-01).
"configured to" in "a receiver configured to receive a specific radio network temporary identifier (RNTI) for DL preemption indication information through a UE-specific radio resource control (RRC) signaling"	9	Plain and Ordinary Meaning An Introduction to LTE, C. Cox, Second Edition, Wiley, 2014, p. 217
"configured to" in "wherein the receiver further configured to receive the DL preemption indication information through a multicast signal"	9	Plain and Ordinary Meaning An Introduction to LTE, C. Cox, Second Edition, Wiley, 2014, p. 217
"configured to" in "a controller configured to monitor a DL control channel for receiving the DL preemption indication information based on the received specific RNTI"	9	Plain and Ordinary Meaning An Introduction to LTE, C. Cox, Second Edition, Wiley, 2014, p. 217
"A method of receiving a downlink (DL) signal by a first user equipment (UE)"	1	Plain and Ordinary Meaning
"A method of transmitting a downlink (DL) signal by a base station (BS)"	5	Plain and Ordinary Meaning
"A user equipment (UE) for receiving a downlink (DL) signal"	9	Plain and Ordinary Meaning

V. U.S. Patent No. 10,594,460 ("the '460 Patent")

Claim Term	'460 Patent Claim(s)	Proposed Construction and Extrinsic Evidence
"A method for a user equipment (UE) to transmit an uplink (UL) control channel and a UL data channel to a base station (BS)"	1	Plain and Ordinary Meaning
"A method for a base station (BS) to receive an uplink (UL) control channel and a UL data channel from a user equipment (UE)"	5	Plain and Ordinary Meaning
"A user equipment (UE) for transmitting an uplink (UL) control channel and a UL data channel to a base station (BS)"	9	Plain and Ordinary Meaning
"a frequency hopping offset set composed of one or more frequency hopping offset values"	1, 5, and 9	Plain and Ordinary Meaning An Introduction to LTE, C. Cox, Second Edition, Wiley, 2014, p. 141 LTE: The UMTS Long Term Evolution, S. Sesia, I. Toufik, M. Baker, Second Edition, Wiley, 2011, p. 346 4G LTE/LTE-Advanced for Mobile Broadband, E. Dahlman, S. Parkvall, J. Sköld, Academic Press, 2011, pp. 207-210, Section 11.1.3 PUSCH Frequency Hopping 3GPP TS 36.213 V14.4.0 (2017-09), Section 8.4 UE PUSCH hopping procedure
"configured to" in "a receiver configured to receive, from a BS, bandwidth part (BWP) configuration information of a BWP set composed of one or more BWPs configured for the UE and receive, from the BS, frequency hopping configuration information for a UL control channel and a UL data channel transmitted through one transmission BWP of the BWP set"	9	Plain and Ordinary Meaning LTE for 4G Mobile Broadband, F. Khan, Cambridge Univ. Press, 2009, pp. 350-351 and Table 14.6

"configured to" in "a transmitter configured to transmit a UL control channel and a UL data channel to the BS through the transmission BWP based on the BWP configuration information and the frequency hopping configuration information"	9	Plain and Ordinary Meaning

VI. U.S. Patent No. 10,721,118 ("the '118 Patent")

Claim Term	'118 Patent Claim(s)	Proposed Construction and Extrinsic Evidence
"A method of a user equipment for configuring dual connectivity"	1	Plain and Ordinary Meaning 3GPP TS 36.300 V12.5.0 (2015-03), Annex M Dual Connectivity, Section M.1 Dual Connectivity operation 3GPP TS 36.300 V12.5.0 (2015-03), Section 3 Definitions, symbols and abbreviations, 3.1 Definitions
"A method of a secondary base station for controlling dual connectivity of a user equipment"	7	Plain and Ordinary Meaning 3GPP TS 36.300 V12.5.0 (2015-03), Section 3 Definitions, symbols and abbreviations, 3.1 Definitions 3GPP TS 36.300 V12.5.0 (2015-03), Annex M Dual Connectivity, Section M.1 Dual Connectivity operation
"A user equipment for configuring dual connectivity"	10	Plain and Ordinary Meaning 3GPP TS 36.300 V12.5.0 (2015-03), Section 3 Definitions, symbols and abbreviations, 3.1 Definitions 3GPP TS 36.300 V12.5.0 (2015-03), Annex M Dual Connectivity, Section M.1 Dual Connectivity operation
"configured to" in "a controller configured to add and configure a secondary base station signaling radio bearer (SRB)"	10	Plain and Ordinary Meaning 3GPP TS 36.300 V12.5.0 (2015-03), Annex M Dual Connectivity, Section M.1 Dual Connectivity operation

		3GPP TS 36.331 V13.3.0 (2016-09), Section 4.2.2 Signaling radio bearers 3GPP TS 36.300 V12.5.0 (2015-03), Section 3 Definitions, symbols and abbreviations, 3.1 Definitions
"configured to" in "a receiver configured to receive from a secondary base station, a radio resource control (RRC) message including radio resource configuration information on the secondary base station or a secondary cell group through the secondary base station SRB"	10	Plain and Ordinary Meaning 3GPP TS 36.300 V12.5.0 (2015-03), Annex M Dual Connectivity, Section M.1 Dual Connectivity operation 3GPP TS 36.331 V13.3.0 (2016-09), Section 4.2.2 Signaling radio bearers 3GPP TS 36.300 V12.5.0 (2015-03), Section 3 Definitions, symbols and abbreviations, 3.1 Definitions
"configured to" in "a transmitter configured to transmit a failure information message to a master base station in case the user equipment is unable to comply with the radio resource configuration information included in the RRC message"	10	Plain and Ordinary Meaning 3GPP TS 36.300 V12.5.0 (2015-03), Section 3 Definitions, symbols and abbreviations, 3.1 Definitions 3GPP TS 36.331 V13.3.0 (2016-09) LTE for 4G Mobile Broadband, F. Khan, Cambridge Univ. Press, 2009, p. 9

VII. U.S. Patent No. 11,219,000 ("the '000 Patent")

Claim Term	'000 Patent Claim(s)	Proposed Construction and Extrinsic Evidence
"A method of transmitting uplink (UL) control information by a user equipment (UE)"	1	Plain and Ordinary Meaning
"A method of receiving uplink (UL) control information by a base station"	5	Plain and Ordinary Meaning
"A user equipment (UE) for transmitting uplink (UL) control information"	9	Plain and Ordinary Meaning

"configured to" in "a receiver configured to receive, from a base station, UL control channel resource set configuration information for UL control information transmission"	9	Plain and Ordinary Meaning
"a controller configured to determine one of UL control channel resource sets contained in the received UL control channel resource set configuration information, and determine one of UL control channel resources configuring the determined one UL control channel resource set"	9	Plain and Ordinary Meaning
"configured to" in "a transmitter configured to transmit the UL control information through the determined UL control channel resource"	9	Plain and Ordinary Meaning

VIII. U.S. Patent No. 10,638,463 ("the '463 Patent")

Claim Term	'463 Patent Claim(s)	Proposed Construction and Extrinsic Evidence
"A method of transmitting uplink (UL) control information by a user equipment"	1	Plain and Ordinary Meaning
"A method of receiving uplink (UL) control information by a base station"	4	Plain and Ordinary Meaning
"A user equipment for transmitting uplink (UL) control information"	7	Plain and Ordinary Meaning
"configured to" in "a receiver configured to receive, from a base station, UL control channel resource set configuration information for UL control information transmission"	7	Plain and Ordinary Meaning
"a controller configured to determine one of UL control channel resource sets contained in the UL control channel resource set configuration information, and determine one of UL control channel resources configuring the determined one UL control channel resource set"	7	Plain and Ordinary Meaning
"configured to" in "a transmitter configured to transmit the UL control information through the determined UL control channel resource"	7	Plain and Ordinary Meaning

IX. U.S. Patent No. 9,894,644 ("the '644 Patent")

Claim Term	'644 Patent Claim(s)	Proposed Construction and Extrinsic Evidence
"A method for receiving, by a terminal, downlink control information through downlink control channels repeatedly allocated in a plurality of subframes"	1	Plain and Ordinary Meaning 4G LTE/LTE-Advanced for Mobile Broadband, E. Dahlman, S. Parkvall, J. Sköld, Academic Press, 2011, pp. 128, 129 Fig. 9.1
"A method for transmitting, by a base station, downlink control information through downlink control channels	2	Plain and Ordinary Meaning

repeatedly allocated in a plurality of subframes"		4G LTE/LTE-Advanced for Mobile Broadband, E. Dahlman, S. Parkvall, J. Sköld, Academic Press, 2011, pp. 128, 129 Fig. 9.1
"A terminal for receiving downlink control information through downlink control channels repeatedly allocated in a plurality of subframes"	3	Plain and Ordinary Meaning 4G LTE/LTE-Advanced for Mobile Broadband, E. Dahlman, S. Parkvall, J. Sköld, Academic Press, 2011, pp. 128, 129 Fig. 9.1
"configured to" in "a receiver configured to receive configuration information comprising information on a start subframe of the plurality of subframes through higher layer signaling, to receive the downlink control channels repeatedly allocated in the plurality of subframes, and to combine the received downlink control channels based on the configuration information"	3	Plain and Ordinary Meaning
"configured to" in "a controller configured to extract downlink control information from the combined downlink control channels"	3	Plain and Ordinary Meaning
"combining the received downlink control channels on the basis of the configuration information" / "to combine the received downlink control channels based on the configuration information"	1, 3	Plain and Ordinary Meaning

X. U.S. Patent No. 10,009,161 ("the '161 Patent")

Claim Term	'161 Patent Claim(s)	Proposed Construction and Extrinsic Evidence
"A method for transmitting channel state information by a User Equipment (UE)"	1	Plain and Ordinary Meaning 4G LTE/LTE-Advanced for Mobile Broadband, E. Dahlman, S. Parkvall, J. Sköld, Academic Press, 2011, pp. 162, 283, 282
"to have same difference within a predetermined error rate"	2, 4	Plain and Ordinary Meaning

"A method for receiving channel state information by a base station"	3	Plain and Ordinary Meaning 4G LTE/LTE-Advanced for Mobile Broadband, E. Dahlman, S. Parkvall, J. Sköld, Academic Press, 2011, pp. 162, 283, 282
"A User Equipment (UE) for transmitting channel state information"	5	Plain and Ordinary Meaning 4G LTE/LTE-Advanced for Mobile Broadband, E. Dahlman, S. Parkvall, J. Sköld, Academic Press, 2011, pp. 162, 283, 282
"configured to" in "a receiver configured to receive a reference signal for measuring channel quality from a base station"	5	Plain and Ordinary Meaning 4G LTE/LTE-Advanced for Mobile Broadband, E. Dahlman, S. Parkvall, J. Sköld, Academic Press, 2011, pp. 217-221, 162, 283, 282
"configured to" in "a controller configured to measure the channel quality based on the reference signal, and select a channel quality indicator (CQI) index value from a predetermined CQI index table including CQI index values for 256 quadrature amplitude modulation (QAM) modulation, based on the measurement result of the channel quality"	5	Plain and Ordinary Meaning 4G LTE/LTE-Advanced for Mobile Broadband, E. Dahlman, S. Parkvall, J. Sköld, Academic Press, 2011, pp. 217-221, 152-161 Section 11.2.2, 162, 283, 282
"configured to" in "a transmitter configured to transmit channel state information including the selected CQI index value to the base station"	5	Plain and Ordinary Meaning 4G LTE/LTE-Advanced for Mobile Broadband, E. Dahlman, S. Parkvall, J. Sköld, Academic Press, 2011, pp. 162, 283, 282
"to have a same difference within a predetermined error rate"	6	Plain and Ordinary Meaning
"wherein and five CQI index values for 64QAM modulation, respectively"	6	"wherein the five CQI index values for 64QAM modulation, respectively"

Exhibit B

Curriculum Vitae

Martin J. Feuerstein, Ph.D.

EDUCATION

Ph.D., E.E., Dissertation: Spread Spectrum Wireless Location and Communications, Virginia Tech, 1990
M.S., E.E., Thesis: Antennas and Electromagnetics, Northwestern University, 1987
B.E., E.E. and Mathematics, Magna Cum Laude, Vanderbilt University, 1984
Management and leadership short courses**:** MIT Sloan School of Management

PROFESSIONAL EXPERIENCE

JADE MARTIN CONSULTING LLC, PRINCIPAL **2003-present**

- Expert witness in multiple patent lawsuits for domestic and international clients on wireless technology and location services: 5G/4G/3G/2G, SU-MIMO and MU-MIMO, AA, beamforming, spatial processing, HSPA, MUD, CDMA, OFDMA, QoS, DSP, FEC coding, eSIM/SIM, AuC, interference cancellation, network performance, message flows, capacity enhancement, antenna systems, network eNodeB and mobile device software/firmware
- Advisor to established and startup companies on technology, strategy, business development, marketing, product development, intellectual property acquisition and valuation, venture capital and private equity fund raising
- Focus on wireless technology, protocols and standards, location systems, smart antennas, Internet of Things, data analytics, safety and security systems
- Past engagement clients include (none on the following list are currently active): CommScope, T-Mobile, Verizon, Andrew, IBM, Nortel, Motorola, Philips, NextWave, TenXc Wireless, Intellectual Ventures, Lucent

OSSIA, CHIEF OPERATING OFFICER **2018-present**

- Lead technology development and product strategy in wireless power and IoT portfolio across industry segments: retail, consumer, enterprise, automotive, government using 5G/4G, WiFi, Bluetooth, Zigbee, UWB, cellular
    - Managed product development engineering teams, including systems architecture, software, embedded firmware, cloud, hardware, technical program management, procurement, manufacturing and IT
    - Direct customer accounts through business plans, design wins, product development, mass production and market launch activities for Cota wireless power enabled products, such as IoT sensors
    - Personally courted and engaged Foxconn as an investor in Ossia and ecosystem partner for design and mass production of IoT devices, smartphones, wearables and power nodes
    - Guided technical teams at key customers, such as Walmart and Saint-Gobain, through program implementations (PoCs, reviews, implementation roadmaps, value propositions, business plans)
    - Set and execute product roadmaps, including IP, ASICs, RDKs, hardware, systems, software, cloud and mobile apps, data analytics, regulatory (FCC/CE, UL) and manage partner engagements
    - Decisive thought leader in industry through blogs, webinars and presentations; wirelessly powered phone case won CES 2019 Innovation Award, power table product won CES 2022 Innovation Award

RECON DYNAMICS, CHIEF EXECUTIVE OFFICER & CTO **2011–2016**

- Headed company for lead investor Eagle River Investments (cellular telephone pioneer, Craig O. McCaw)
- Guided all aspects of the company's operations in wireless asset management capitalizing on M2M, IoT, cloud, analytics big data, mobile apps, asset location and tracking using 4G/3G cellular, WiFi, Bluetooth
- Raised over $12M in private equity venture capital and funded R&D to create new IoT product line from scratch
- Established Cooperative Research and Development Agreement (CRADA) with Battelle's Pacific Northwest National Laboratory (PNNL) to develop sensor fusion technologies for government security and force protection
- Under my leadership the company designed, integrated, manufactured and commercialized an award-winning asset management and safety product line which was successfully marketed into the energy industry
- Company was acquired by joint venture partner in July 2016

POLARIS WIRELESS, CHIEF TECHNOLOGY OFFICER **2003–2011**

- Led research and development of 4G/3G/2G AI Machine Learning position location products (SMLC, eSMLC, PDE) for E–911, security/surveillance, location–based services, presence and network optimization, including responsibility for hiring and managing high caliber R&D team through rapid growth phase
- Research and publications in advanced wireless location technologies using cellular, WiFi, GPS, A-GPS, Bluetooth and hybrid methods
- Improved accuracy, time to fix, transaction rates, urban and indoor performance and other aspects of fundamental location performance through major algorithm & product architecture advances
- Commercialized products for GSM, TDMA and UMTS to meet strict FCC accuracy limits. Created LTE system, as well as new products for network optimization and mass location for security/surveillance market. Prototyped & demonstrated for operators and government customers.
- Enabled successful commercial product sales driving company to reach profitability since 2004, grow revenue, expand customer base internationally and expand into new product lines (security, surveillance, optimization)
- Interacted personally with wireless carriers' technical organizations at AT&T, Verizon, Sprint, Docomo, Vodafone, Rogers, Telus and Bell Mobility including technical evaluations and RFP/RFI responses

- Established and guided joint R&D collaboration with leading Japanese wireless service provider in UMTS and LTE hybrid location methods to achieve best-in-class accuracy and time-to-fix resulting in joint IPR
- Drove technology partnerships, architectures and product interfaces with Alcatel Lucent, Motorola, Thales Alenia Space, Commprove, TCS, Actix, Andrew/CommScope, Verint and other joint bid partners
- Directed standardization initiatives in 3GPP RAN/SA/CT/GERAN, OMA LOC, ESIF, CSRIC and other industry organizations, including standardizing Polaris's RF Pattern Matching (RFPM) technology in 3GPP
- Managed intellectual property portfolio with ~50 pending patents. Key inventor and hands-on contributor.
- Authored FCC public comment filings for regulatory proceedings, managed relationships with regulatory agencies associated with E-911 and U.S. government agencies for surveillance/security applications
- Fostered and grew funded research collaboration projects with Stanford University, UC Berkeley, MIT, Georgia Tech and other leading university research labs to extend R&D capabilities

METAWAVE COMMUNICATIONS, CTO, SVP & GM 1997 - 2003

- Invented and championed the company's flagship smart antenna adaptive array beamforming 2G/3G SpotLight CDMA product, convinced Board of Directors to back the proposal, developed and deployed the product under tight budget and schedule constraints, worked closely with customers driving sales to Verizon, Alltel, Iusacell. Built interfaces to multiple Lucent, Nortel, Motorola base stations. Evangelized within the wireless industry driving adoption of this new adaptive sectorization technology for traffic load balancing.
  - Product ramped to over 92% of revenue in 2 quarters after launch, enabling highly successful IPO.
  - Generated total sales revenues of over $100M over lifespan of product.
  - Implemented cost reductions and new features to improve gross margins from 26% to 34%.
- Grew the company from small startup stage into publicly traded industry leader. Heavily involved in venture capital funding rounds, roadshows, IPO process, SEC filings, relations with industry, press and financial community.
- Recommended acquisition of Adaptive Telecom Inc. (ATI) to accelerate next generation adaptive array technology and grow market share. Acquired ATI, proposed and implemented new business structure, and became General Manager for multi-site business unit with P&L responsibility. Worked closely with CEO and Board of Directors to set strategic direction. Led joint development with Samsung to embed adaptive array into base stations, concluded with $1M+ licensing and royalty agreement.
- Directed engineering (systems, hardware, software, systems, mechanical, test and certification), product management and research departments with 85 people and $12+M/yr budget. Built value propositions, business cases, roadmaps, rollout strategies and owned margins. Planned large, multifaceted development and deployment programs. Determined program content, milestones, schedules and inspired team to completion. Developed commercial products for cdmaOne/CDMA2000 and GSM/GPRS/EDGE.
- Conceived and patented designs for antenna sharing with independent sector pattern control. Conceptual idea later evolved into a new product line targeted at a diverse customer segment, tower owners.

LUCENT/AT&T BELL LABS, TECHNICAL MANAGER, CDMA OPTIMIZATION & APPLICATIONS 1995-1997

- Led successful development rollout of Lucent's flagship 2G/2.5G CDMA product. Identified and fixed fatal flaws in call processing algorithms in the network equipment to make the product commercially viable. Convinced customers of product capabilities and value, enabling deployments resulting in $250M+ sales to Sprint, Primeco, GTE, AirTouch, Ameritech, Bell Atlantic, Centennial. As a result, Lucent captured and maintained a dominant 65% share of the cdmaOne/cdma2000 market.
- Resolved critical performance issues with key customers to launch networks and build revenues, several examples are:
  - Due to acceptance test failure at SprintPCS, performed comprehensive analyses and proposed power control algorithm improvements for reverse link capacity shortfall. Resolution led directly to completion of major contract milestone.
  - Commercial launch of Primeco network was halted due to radio performance failures. Proposed and conclusively proved solutions improving performance. Convinced Primeco's senior management to proceed with network rollout.
  - Major GTE markets experienced acute problems with call reliability. Spent months in these markets optimizing performance and building customer confidence. This achievement resulted in an important revenue payment.
- Implemented dramatic, market-proven improvements to handoff and power control algorithms. Headed task force created to resolve critical system requirements and performance problems.
- Guided radio performance optimization and network applications. Resolved technical bottlenecks, created deployment guidelines and tools, enabled CDMA to be rapidly deployed in widespread rollouts as a highly competitive technology.

VERIZON/USWEST/AIRTOUCH, SENIOR MEMBER TECHNICAL STAFF 1992-1995

- Simulated performance of the world's first 2G CDMA cellular trials and deployments. Contributed to IS-95 standards through TIA/TR45.5 committee and CDMA Development Group. Wrote C/C++ software for performance prediction (power control, handover, interference management, overload control).
- Guided company's strategies on digital wireless technologies for rollout at cellular and PCS bands, such as smart antenna systems. Led joint industry test bed for comparative evaluation of air interfaces. Evaluated new network architectures, air interfaces, access methods.
- Key inventor of patented wireless position location system for position location, zone-based billing and E-911. Created robust statistical estimation algorithm to predict position in severe multipath. Simulated digital control loop for synchronization of base stations.

VIRGINIA TECH, ASS'T PROFESSOR, MOBILE/PORTABLE RADIO RESEARCH GROUP 1991-1992

- Principal Investigator on funded research projects in wireless location and communications. Supervised 3 M.S. student theses.

- Created and published widely-referenced RF propagation models for microcellular design. Proposed frequency hopping band-sharing techniques to mitigate interference problems with European LEO satellite.
- Designed and built experimental spread spectrum systems for wideband channel sounding and high-resolution position estimation. Constructed hardware for both direct sequence and frequency hopping techniques.
- Taught wireless communications networks courses, developed curriculum, received teaching excellence rating.

NORTEL, SYSTEMS ENGINEER, ADVANCED COMMUNICATIONS TERMINALS 1984-1985

- Wrote node control LAN software for robotic automated test and repair facility
- Trialed knowledge-based AI expert system for computer aided repair of printed circuit boards, developed in academic collaboration with Vanderbilt University

PATENTS ISSUED

1. **9,959,458 Surveillance system**
2. **9,538,328 Estimating whether or not a wireless terminal is in a geographic zone using pattern classification**
3. **9,432,631 Surveillance system**
4. **9,398,402 Tracking large numbers of wireless terminals**
5. **9,247,516 Estimating whether or not a wireless terminal is in a geographic zone using pattern classification**
6. **8,583,141 Estimating the location of a wireless terminal based on signal path impairment**
7. **8,571,577 Estimating the location of a wireless terminal based on signal path impairment**
8. **8,565,786 Estimating the location of a wireless terminal based on signal path impairment**
9. **8,320,933 Estimating whether or not a wireless terminal is in a zone using radio navigation**
10. **8,155,394 Wireless location and facial/speaker recognition system**
11. **8,068,802 Estimating the location of a wireless terminal based on calibrated signal-strength measurements**
12. **7,899,467 Estimating the location of a wireless terminal based on the traits of the multipath components of a signal**
13. **7,796,966 Estimating the location of a wireless terminal based on calibrated signal-strength measurements**
14. **7,753,278 Estimating the location of a wireless terminal based on non-uniform locations**
15. **7,734,298 Estimating the location of a wireless terminal based on signal path impairment**
16. **6,950,416 Embedded digital beam forming**
17. **6,937,863 System and method for dynamically adjusting cell sectorization**
18. **6,829,491 Dynamic and self-optimizing smart network**
19. **6,522,897 RF radiation pattern synthesis using existing linear amplifiers**
20. **6,351,237 Polarization and angular diversity among antenna beams**
21. **6,246,674 Antenna deployment sector cell shaping system and method**
22. **6,181,276 Sector shaping transition system and method**
23. **6,178,333 System and method providing delays for CDMA nulling**
24. **6,141,565 Dynamic mobile parameter optimization**
25. **6,118,767 Interference control for CDMA networks using a plurality of narrow antenna beams and an estimation of the number of users/remote signals present**
26. **6,070,090 Input specific independent sector mapping**
27. **6,055,230 Embedded digital beam switching**
28. **6,005,516 Diversity among narrow antenna beams**
29. **5,758,288 Signal time of arrival position determining method for calculating cellular telephone billing charges**
30. **5,600,706 Method and system for determining the position of a mobile receiver**

PATENTS PENDING

1. **20130072230 Tracking Large Numbers of Wireless Terminals**
2. **20120289249 Estimating the Location of a Wireless Terminal Based on Signal Path Impairment**
3. **20120282947 Estimating the Location of a Wireless Terminal Based on Signal Path Impairment**
4. **20120249787 Surveillance System**
5. **20120014567 Wireless Location and Facial/Speaker Recognition System**
6. **20110298930 Integrated Wireless Location and Surveillance System**

7. **20100329144 Estimating the Location of a Wireless Terminal Based on Calibrated Signal-Strength Measurements**
8. **20100245115 Estimating the Location of a Wireless Terminal Based on Signal Path Impairment**
9. **20090280829 Using A Priori Geographical Location Density Information To Improve Location Accuracy**
10. **20080207222 Estimating Whether Or Not A Wireless Terminal Is In A Geographic Zone Using Pattern Classification**
11. **20080207219 Estimating Whether Or Not A Wireless Terminal Is In A Zone Using Radio Navigation**
12. **20060240846 Estimating the Location of a Wireless Terminal Based on Signal Path Impairment**
13. **20060240845 Estimating the Location of a Wireless Terminal Based on the Traits of the Multipath Components of a Signal**
14. **20060240843 Estimating the Location of a Wireless Terminal Based on Non-Uniform Locations**
15. **20060211376 Estimating the location of a wireless terminal based on calibrated signal-strength measurements**
16. **20170107090 Comprehensive Worksite and Transportation Safety System**

PUBLICATIONS

BOOKS AND BOOK CHAPTERS

- **High Speed Packet Access (HSPA) Performance and Evolution: A Practical Perspective**, John Wiley & Sons Ltd.
- **Wireless Personal Communications**, with Prof. T. Rappaport, Kluwer Academic Publishers
- **Wireless Network Deployments**, Chapter 3, Springer International
- **Wireless Communications: Emerging Technologies for Enhanced Communications,** Chapter 5, Springer International
- **Wireless Personal Communications: Channel Modeling and Systems Engineering,** *Chapter: Methods for Measuring and Optimizing Capacity in CDMA Networks Using Smart Antennas, Springer*
- **Wireless Personal Communications: Bluetooth and Other Technologies,** *Chapter: Smart Antennas for CDMA Cellular and PCS Networks, Springer*

TECHNICAL JOURNAL ARTICLES

- **Performance Evaluation of a Cellular Base Station Multibeam Antenna,** *IEEE Transactions on Vehicular Technology*
- **Path Loss, Delay Spread and Outage Models for Microcellular System Design**, *IEEE Transactions on Vehicular Technology*
- **Reflection Coefficients for Exterior Wall Surfaces in a Mobile Radio Environment**, *IEEE Transactions on Antennas & Propagation*
- **Distribution of Phase Errors in Wireless Position Location Systems,** *IEE Electronics Letters*
- **Performance of Decision Feedback Equalizers in Simulated Urban and Indoor Radio Channels***, IEICE Transactions on Communications*

TECHNICAL CONFERENCE PRESENTATIONS AND ARTICLES

- **Gain Improvement of a Cellular Base Station Multibeam Antenna,** *IEEE Vehicular Technology Conference*
- **The Future of Smart Antennas: Evolution to 3G and IP Networks,** *IEEE Personal Indoor Mobile Radio Communications*
- **Applications of Smart Antennas in Cellular Networks**, *IEEE Antennas & Propagation Symposium*
- **Design and Test of CDMA Cellular Systems,** *IEEE Vehicular Technology Conference*
- **Performance of Decision Feedback Equalizers in Urban and Indoor,** *IEEE Vehicular Technology Conference*
- **Field Tests of Hybrid Wireless Location Technologies***, International Symposium on Advanced Radio Technologies*
- **Design & Performance of Minimum Variance Hybrid Location Algorithms,** *Institute of Navigation*
- **Precision Automatic Vehicle Location System Construction Automation,** *Vehicle Navigation and Information Systems Conference*
- **Wireless Signatures Technology for Position Location***, International Symposium on Advanced Radio Technologies*
- **In Situ Microwave Reflection Coefficient Measurements for Smooth and Rough Exterior Wall Surfaces***, IEEE Vehicular Technology Conference*
- **Impact of Surrounding Buildings on Propagation for Wireless In-building Wireless System Design***, IEEE Vehicular Technology Conference*
- **Path Loss and Delay Spread Models as Functions of Antenna Height for Microcellular System Design***, IEEE Vehicular Technology Conference*
- **Applications of Smart Antennas to CDMA Cellular Mobile Radio Networks***, International Symposium on Advanced Radio Technologies*
- **Applications of Smart Antennas in Cellular Networks***, IEEE Antennas and Propagation Society International Symposium*
- **Future of Smart Antennas: Evolution to 3G and IP Networks***, IEEE International Symposium on Personal Indoor and Mobile Radio Communications*

- **Performance of Decision Feedback Equalizers in Urban and Indoor Mobile Channels**, *IEEE Vehicular Technology Conference*
- **Wireless Signatures Technology for Position Location**, *International Symposium on Advanced Radio Technologies*
- **Multi-beam Smart Antenna System Performance in CDMA Networks**, *CDMA Technology Conference*
- **Melding Air Interfaces, Frequency Bands, User/Control Planes and Technologies**, *Invitational Workshop on Opportunistic RF Localization for Next Generation Wireless Devices*
- **Urban and Indoor Location using Pattern Matching of Wireless Network Measurements**, *Invitational Workshop on Opportunistic RF Localization for Next Generation Wireless Devices, Future Directions, Technologies, Standards and Applications*

Numerous other technical conference presentations and articles including:

- **International Symposium on Advanced Radio Technologies**
- **CDMA Americas Congress**
- **CDMA Technology Conference**
- **CDMA World Congress**
- **IEEE International Conference on Communications**
- **ITS Advanced Radio Symposium**
- **PCS CDMA Technology Conference**
- **Stanford University Smart Antenna Workshop**
- **Virginia Tech Wireless Symposium**
- **Personal Indoor Mobile Radio Conference**
- **CDMA Development Group (CDG) Digivent Webcast on Smart Antennas**
- **CDG Technology Forum**
- **Advanced CDMA Workshop**
- **IEEE International Conference on Third Generation Wireless and Beyond**
- **3G Forum**
- **Stanford University Position Navigation and Time Symposium**
- **Worchester Polytechnic Institute Invitational Workshops on Wireless Location**
- **University of Texas Wireless Networking and Computing Group Symposium**
- **CES Fourth Generation Mobile Forum**
- **International Wireless Communications Expo**

MAGAZINE ARTICLES AND OTHER PUBLICATIONS

- **Smart Antennas Increase Capacity in CDMA Networks,** *Wireless Design Online*
- **Smart Antennas: The Freedom to Choose,** *Wireless Design Magazine*
- **Unraveling the Complex World of E911 Wireless Location,** *Mobile Radio Technology*
- **E911 Location and Call Processing,** *National Emergency Number Association Magazine*
- **Locating Wireless Calls with Enhanced 9-1-1: How Does It All Work?,** *APCO Magazine*
- **Controlling RF Coverage–Smart Antennas Know How to Optimize CDMA Networks**, *America's Network*
- **Capacity Technology Previously Used for Military Applications: Smart Antennas Now Can Increase Capacity in CDMA Networks**, *Wireless Review*
- **Characterization of Electromagnetic Properties of Building Materials for Use in Site-specific Propagation Prediction**, *Virginia Tech Mobile and Portable Radio Research Group publications*
- **Multiple other magazine articles in trade press**

QUOTED AS WIRELESS TECHNOLOGY SUBJECT MATTER EXPERT

- **GPS World (multiple articles)**
- **RCR Wireless (multiple articles)**
- **Wireless Week (multiple articles)**
- **GPS World (multiple articles)**
- **Electrical Engineering Times**
- **Reuters**
- **Government Technology**
- **Internet Telephony**
- **The Where Business (multiple articles)**
- **Converge Network Digest (multiple articles)**
- **Computer World**
- **GIS User**
- **Beta News**