

NAGULA T. SANGARY

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Technical Director/Principal Scientist/Professor working in the wireless industry for more than 23 years in the capacity as designer, manager and visionary, successfully leading design teams in wireless product development and advanced research. Skilled in all phases of project life cycle; R&D, initial feasibility analysis, conceptual designs, implementation, enhancement and cost reduction. Effective in building and managing culturally diverse team-centered operating units, well versed in business processes, strategy development skills and maintain influentially connected professional network worldwide.

Key core qualifications include:

- High level of education in technology with a good understanding of business acumen. Kept updated on technological development with continued education, interaction with technology and business leaders worldwide and with avid research/reading.
- Setting up programs/product development teams and help start operations, demonstrating high level of technical and management skill with awareness for operational details and strategies for high ROI.
- Excellent interpersonal, communication and organizational skills. Team and motivational player with ability to extract individual talent to enhance team performance.
- Having unique experience as professor in teaching and supervising graduate students at three different world class universities with proven ability in fundamental research.
- In-depth conceptual understanding of Electromagnetism, Wireless communication systems, RF design, device physics, microelectronics and mobile computing.

Education:

Executive **MBA**. *University of Oxford, Oxford, United Kingdom*. Completion, September, 2013

Ph.D., Electrical Engineering, *McMaster University, Hamilton, Ontario, Canada*, Graduated, 1995.

M.Eng., Electrical Engineering, *McMaster University, Hamilton, Ontario, Canada*, Graduated, 1991.

B.Sc., Electrical Engineering, *Texas A&M University, Texas, U.S.A.* Graduated, 1998.

Professional Experience:

Research In Motion (RIM), Waterloo, Ontario, Canada

1998–Present

Technical Director / Principal Scientist (2006 - present).

- Developed and manage a program “BlackBerry10 CampUs” to promote the new QNX based OS and application development platform in universities throughout the world. This involves in-depth understanding of SW/HW technologies, preparing course material, managing a team of technical experts and logistic and giving lectures/workshops.
- Provided technical support for RIM executive management team and instituted new initiatives in advanced wireless technologies and product development to address specific customer/market requirements. The past examples include the introduction of new technologies and establishing product development teams in the areas of CDMA, WCDMA, TD-SCDMA and Antenna design.
- Founding member of patent committee, the responsibilities includes reviewing all RIM patents, participate in patent selection process, and work with patent teams on litigation issues.
- Managed and directed senior RF designers working in product development in the areas of Antenna Design, TD-SCDMA, EDGE/GSM, WCDMA and TD-LTE. Mentored team members and ensure optimal application of technologies and engineering resources to meet the product development and/or customer requirements and deadlines.

- Was responsible for technical side of all product designs specific to Asia Pacific market. This includes; strategic planning, setting up product development teams, implementing processes and procedures to maximize productivity, scheduling, estimating and managing operational budget and product cost, maintaining product reliability and the timely product delivery.
- Interacted with APAC carriers on technical level and work on emerging wireless technologies in those markets. Making use of personal connection with many key players in China to the advantage of RIM. Interact with suppliers of RF and Antenna components in China and assisted RIM quality team with audit and procurement of RF components for all BlackBerry products.
- Supervise and review all RIM sponsored universities projects, manage scholarship programs and collaborate on research activities in the areas of Electromagnetism, Wireless Systems and RF Engineering with universities in Canada, USA, China and India. Principal Reviewer of the industrial chairs and projects at Department of Electrical Engineering at University of Waterloo, McMaster University, University of Toronto and Xidian University.
- Deliver lectures and seminars and provide technical workshops in universities, colleges and at RIM in the areas of Wireless technology, Cell phone safety and fundamentals in EM/RF technologies. Chair session in conferences such as ISSSE, URSI, IEEE and Board Member for University of Waterloo Institute of Advanced EM Research and Academic Program Advisory Committee Member for Radio Collage of Canada (RCC), a member of FCC expert panel.

CDMA Hardware System Technical Lead, (2000-2006)

- Lead and managed CDMA and UMTS technical hardware product development team.
- Supervised and reviewed RIM's university grants in the area of Electromagnetism, microelectronics and RF/Microwave Engineering. Reviewer for journals and conferences such as the IEEE Antennas and Prop., (ETRI) and 2003 IEEE Canada conference.
- Provided technical support for RIM executive management teams for new initiatives at RIM in advanced wireless technology. Played the leading role in setting up CDMA development group at RIM, and provided many technical CDMA seminars for RIM employees.
- Worked in governmental standard and safety committees, interfaced with customers, and the product compliance and certification teams.
- Delivered lectures and seminars at universities, colleges and RIM in the area of Wireless Technology, Cell phone safety, fundamentals in EM/RF technology. Electronics Program Advisory Committee Member for DeVry College of Technology.

Senior RF/EM Researcher, (1998-2000)

- Member of the team that designed antennas for all RIM handheld units. Contributed to the concept and to the first internal antenna design in wireless handheld devices.
- Developed measurement systems and simulation tools for design and evaluation of antenna performance such as; Antenna gain and SAR.
- Designed and developed user-friendly EM (FDTD) simulator software packages using C++ and MATLAB.

McMaster University and University of Waterloo, Ontario, Canada
Adjunct Professor, Department of Electrical and Computer Engineering.

2004–Present

- Supervise PhD and M.Eng students in the areas of Electromagnetism and numerical computations and wireless system. Graduated 3 PhD and 2 MEng. Supervising 3 PhDs and 3 MEng.
- Research collaborations with professors; teach graduate and undergraduate courses in the areas of Wireless Technology, EM/RF fundamental and design.
- Reviewer for journals and conferences such as the IEEE Antennas and Propagations, IEEE Canada, Journal of Geophysical Research and Electronics and Telecommunication Research Institute (ETRI), International Journal of Microwave Science and Technology.

Center South University, Changsha, Hunan, China
Visiting Professor, Department of Information Technology.

2011–Present

- Research collaborations with professors; teach graduate and undergraduate courses in the areas of Wireless Technology, transparent mobile computing, EM/RF fundamental and design.
- Supervise PhD and M.Eng students in the areas of Electromagnetism and numerical computations.

Nortel networks, Ottawa, Ontario, Canada
System Engineer/Team Lead, CDMA Base-Station System Development Team.

1995–1998

- Lead a team in Frequency Synthesizer design based on Phase Locked Loops and Direct Digital Synthesis. Carried out system performance simulations and measurements to evaluate BTS performance with respect to reference sources. Generated system budget (Phase Noise, Jitter, Spurious level) for MCBTS with respect to all reference clocks and signals.
- Carried out frequency planning/code selection for MCBTS and performed code domain simulations to predict spectral contents in the system. Issued verification plans and provided test cases for evaluation of all reference sources and clocks of MCBTS. Issued performance specifications to vendors on all devices in the synthesizer section of the MCBTS system.
- Implemented High Speed circuitry such as Clock Recovery in the BTS and generated a master reference clock in the Transmit and Receive modules. Initiated design work in Electro-Optical Module used in the BTS system and introduced the team member to equipment in high speed communication.
- Set-up automated testing using HPVVEE for measuring Integrated Phase Noise for all reference sources and spur scanning of all CDMA channels. Evaluated reference signals and clocks in the in MCBTS for performance and compliance with effects of Micro-phonics and temperature variations.
- Reviewed and provided support for new designs (cost reductions) of RF and synthesizer sections of the BTS system.
- Sustained BTS products 800 MHz and 1.9MHz system with respect to Frequency Synthesizer, Receiver, Transmitter, and Amplifier modules.

McMaster University, Hamilton, Ontario, Canada
Research/Teaching Assistant, Communication Research Laboratory / ECE Department.

1989-1995

- Lecturer and laboratory instructor for courses; Microwave Engineering, Transmitting and Radiated System, Electronics II, Electronics, AC Power concept, and Small motors and Drives. Supervised fourth year project; introduced students to Touchstone and fabrication of microwave circuits. Designed new laboratory experiments for fourth year courses. Instructor for the course on use of HP8510 Network Analyzer and Antenna measurement system.
- Worked in a team that built Transmit/Receive modules for eight-element array used in digital beam forming system and repeater modules for PCS (CT2 system) applications. Designed and fabricated microwave circuits such as; amplifier, filters, couplers and new antennas for applications in PCS/Cellular bands. Including a Spatial Power combiner using new configuration of antennas, introduced the concept of Dual mode generation in spatial power combiners.
- Conducted measurements on antennas, field propagation and material characterization for industrial organizations; ComDev, Nortel and RIM. Implemented a new antenna measurement system using HP8510B network analyzer and calibrated the Anechoic Chamber for gain and noise levels.

Scholastic Achievement:

- Member of engineering Honors Societies **Eta Kappa Nu** and **Tau Beta Pi**.
- Won best thesis project awarded in south Texas by IEEE.
- Obtained excellent rating for the PhD thesis and presentation.
- In B.Sc. ranked 1st in the College of Engineering and in the top 7% of all graduates.

Some of the recent workshops:

“Multiband Handheld Antenna Design and Test Techniques: Recent Advances and Challenges”
Nagula Sangary, Yihong Qi, and George Shaker, *IEEE AP-S* 2010.

“Recent Advances and Challenges in Multiband Handheld Antenna Design and Test Techniques”,
Yihong Qi, George Shaker, and **Nagula Sangary**, *IEEE AP-S* 2011.

“FCC Workshop on Distractive Driving”, November 2008, invited to give a presentation on our proposed solution. **Nagula Sangary**, expert panel member in the FCC seminar.

“Handheld Antenna Design Challenges in Context of Multi-band Operation and their EM Effects on Wireless Device Performance”, **N. Sangary**, Y. Qi and P. Jarmuszewski, Invited paper *IEEE Radio and Wireless Symposium*, February 2008.

“Industrial Trend and Design Challenges in Wireless Handheld Development”. **Nagula Sangary**, keynote speaker, The Applied Computational Electromagnetics Society Symposium, July 2005.

Patents issued and pending (short list):

1. Estimation of the speed of a mobile device (**US 7895013**)
2. Automatic activation of speed measurement in mobile device based on available motion indicia
3. (**US 8355751**)
4. Method and system for characterizing a radio channel of a wireless network using variability of synchronization (**US 8160503**, **EP 2224606**, [WO 2010096910](#))
5. Method, device and system for detecting the mobility of a mobile device (**US 8442447**, **EP 2326130**)
6. Method and apparatus for improving power amplifier efficiency in wireless communication systems (**US7787566**, **US7551689**, **US7333563**, **US8000409**)
7. Safety for mobile device users while driving (**US 7898428**)
8. Method and apparatus for precise open loop tuning of reference frequency within a wireless device (**US 7787566**, **US 7508888**, **EP 1561278**, **US 8295403**, **EP 1820274**, [US20130016800](#)).
9. Method and apparatus for regulating the transmitted power in multi-rate wireless communication systems (**US 7558540**, **US 7869776**).
10. Communications device with separate I and Q phase power amplification having selective phase and magnitude adjustment and related methods (**EP 2378669**, [US 20110255575](#), [EP 2509228](#))
11. A method to characterize the radio channel of wireless networks using the measure of the chaotic variation of time synchronizing signal (**EP10745761**).
12. Power Distribution Network based on Multiple Charge Storage Components (**EP2360809**).
13. Method and apparatus for improving power amplifier efficiency in wireless communication systems having high peak to average power ratios (**US7551689**, **US7333563**, **US7787566**, **US8000409**, [US20120329411](#)).
14. Mobile Wireless Communications Device Using Separate In-Phase and Quadrature-Phase Power Amplification pre-distortion and IQ balance compensation (**US 8223885**, **EP 2485448**, **EP 2222044**, [US 20120263213](#)).
15. A Method of Automatic GPS Activation/Deactivation Using Wireless Network Information to Minimize Battery Consumption.
16. Mobile Wireless Communications Device Using Separate In-Phase and Quadrature-Phase Power Amplification (PA) for Transmission Diversity.

17. Power Efficient and Multi-Sense Mobility Detection Mechanism for Mobile Devices in Wireless Communication Systems.
18. A method to estimate antenna impedance of a wireless device based on existing on board sensors.
19. Radio Receiving System Employing the Accessories of Portable Devices.
20. A method to estimate antenna impedance of a wireless device based on existing on-board sensors and RF power amplifier electric current consumption.

Publications (short list):

1. George Shaker, Yihong Qi, **Nagula Sangary** "Multiband Handheld Antenna Design and Test Techniques: Recent Advances and Challenges", 2010 *IEEE International Symposium on Antenna and Propagation*.
2. Shaker, G., Safavi-Naeini, S., **Sangary, N.**, Tentzeris, M. M., "Inkjet Printing of Ultrawideband (UWB) Antennas on Paper-Based Substrates", *Antennas and Wireless Propagation Letters*, IEEE, January 2011.
3. Bakr, M.H., Ghassemi, M., **Sangary, N.**, "Bandwidth enhancement of narrow band antennas exploiting adjoint-based geometry evolution", *Antennas and Propagation Symposium*, July 2011.
4. G. S. A. Shaker, S. Safavi-Naeini, **N. Sangary**, and M. Tentzeris, "Inkjet Printing of Ultra-Wideband (UWB) Antennas on Paper-Based substrates," *IEEE Antennas and Wireless Propagation Letters*, 2010.
5. G. S. A. Shaker, M. Bakr, **N. Sangary**, and S. Safavi-Naeini, "Accelerated Multi-Objective Antenna Design Exploiting Parameterized Cauchy Models," *Progress in Electromagnetic Research B*, 2009. p 41.
6. Li Liu, Natalia and **Nagula Sangary**, "Evaluation of the Specific Absorption Rate and the Temperature Rise in the Human Eyes with Account for Resonance," *IEEE Transactions on Microwave Theory and Techniques*, vol. 57, no. 12, pp. 3450–3460, 2009.
7. G. S. A. Shaker, S. Safavi-Naeini, and **N. Sangary**, "Q-Bandwidth Relations for the Design of Coupled Multi-Element Antennas," *IEEE Antennas and Propagation Society Symposium AP-S 2009*. Best Student Paper Award.
8. Li Liu, Natalia and **Nagula Sangary**, "Feasible Methods for the Evaluation of the Specific Absorption Rate and the Temperature Rise in the Human Eyes," *IEEE MTT Microwave Symposium Digest*, 2009. MTT pp. 1321–1324, 2009.
9. Bakr, M.H., Ghassemi, M., Sangary, N., "Reduceing the Size of MIMO Arrays Using Adjoint-based Geometry Evolution", *Antennas and Propagation Society International Symposium*, 2012.
10. G. S. A. Shaker, S. Safavi-Naeini, and **N. Sangary**, "A Generalized Modal Analysis Method for Antenna Design," *IEEE Antennas and Propagation Society Symposium AP-S 2009*.
11. G. S. A. Shaker, S. Safavi-Naeini, and **N. Sangary**, "Filter Integrated Antennas: Concept and Proposed Design Methodology," *IEEE Radio Wireless Symposium RWS 2009*.
12. G. S. A. Shaker, S. Safavi-Naeini, G. R. Rafi, and **N. Sangary**, "On the Fundamental Q-Bandwidth Relations for Antennas," *IEEE Antennas and Propagation Society Symposium AP-S 2008*.
13. G. S. A. Shaker, G. R. Rafi, S. Safavi-Naeini, and **N. Sangary**, "A Synthesis Technique for Reducing Mutual Coupling between Closely Separated Patch Antennas," *IEEE Antennas and Propagation Society Symposium AP-S 2008*. Best Student Paper Award.
14. G. S. A. Shaker, G. R. Rafi, S. Safavi-Naeini, and **N. Sangary**, "Design Method for Pattern/Polarization Diversity Antenna," *Applied Computational Electromagnetic Society*. April 2008.
15. G. Shaker, M. H. Bakr, N. Sangary, and S. Safavi-Naeini, "Space Mapping-based Optimization Exploiting Tolerant Cauchy Approximations", *2009 International Microwave Symposium, IEEE MTT*. June 2009.

16. L. Liu, N. K. Nikolova and **N. T. Sangary**, "Feasible Methods for the Evaluation of the Specific Absorption Rate and the Temperature Rise in the Human Eyes", *2009 International Microwave Symposium, IEEE Microwave Theory and Techniques Society*. June 2009.
17. **N. Sangary**, Y. Qi and P. Jarmuszewski, "Handheld Antenna Design Challenges in Context of Multi-band Operation and their EM Effects on Wireless Device Performance", Invited paper *IEEE Radio and Wireless Symposium*, February 2008.
18. G. Shaker, S. Safavi-Naeini, and **N. Sangary**, "Filter Integrated Antennas: Concept and Proposed Design Methodology", *IEEE Radio and Wireless Symposium*, February 2008.
19. George Shaker, Safieddin Safavi-Naeini, Gholamreza Rafi and **Nagula Sangary**, "On the fundamental Q-bandwidth relations for antennas", *Antennas and Propagation Society International Symposium*, July 2008.
20. G. S. A. Shaker, G. R. Rafi, S. Safavi-Naeini, and **N. Sangary**. Design Method for Pattern/Polarization Diversity Antenna. Applied Computational Electromagnetic Society Conference. Published. March 2008.
21. G. S. A. Shaker, G. R. Rafi, S. Safavi-Naeini, and **N. Sangary**, "Design Method for Pattern/Polarization Diversity Antenna", Applied Computational Electromagnetic Society Conference. Published. March 2008.
22. S.M. Ali, N.K. Nikolova, and **N.T. Sangary**, "Near-field microwave non-destructive testing for defect shape and material identification," *Nondestructive Testing & Evaluation*, vol. 21, #2, June 2006, pp: 79–93.
23. S.M. Ali, N.K. Nikolova, and **N.T. Sangary**, "Microwave nondestructive defect identification using sensitivity analysis," *IEEE/URSI Int. Symposium on Antennas and Propagation*, July 2006 (Albuquerque, NM), pp. 1391-1394.
24. **N.T. Sangary** and N. Georgieva, "Line-of-sight approximation to the equivalence principle," *IEEE Trans. Antennas and Propagation*, July 2004. **N. Sangary**, *Enhancement of Finite Difference Time Domain Technique and its Application to Microwave Devices*, Ph.D. Dissertation, 2003. **N. Sangary** and N.K Georgieva, "Line-of-sight approximation to the equivalence principle for far-field computations," *URSI International XXVII General Assembly Symposium Digest*, Aug. 2002.
27. **N.T. Sangary**, C. Wu, J. Litva, "Application of non-uniform FDTD method to PCS antennas," *IEEE International Antennas Propagation/URSI Symposium Digest*, vol. 33, pp. 1148 - 1151, June 1995. E.A. Navarro, **N.T. Sangary**, C. Wu, and J. Litva, "Analysis of a coupled patch antenna with application in personal communications," *IEE Proc. H, Microwave Antennas Prop.*, vol. 142, no. 6, pp. 495-497, 1995.
29. **N.T. Sangary**, J. Litva and E.A. Navarro. "Non-uniform FDTD method and its application to waveguide analysis when combined with the perfectly matched layer technique," *IEEE Transactions on Microwave Theory and Techniques*, vol. 44, July 1996, Part I pp: 1115-1124. Y. Shen, C. Laperle, **N. Sangary** and J. Litva. "A new active array module for spatial power combiners and active antennas (short papers)," *IEEE Transactions on Microwave Theory and Techniques*, vol. 43, pp. 683-685, March 1995. Y. Shen, C. Laperle, **N. Sangary** and J. Litva; "A symmetrical 4-element active array module for spatial power combiner," *IEEE International Antennas Propagation/URSI Symposium Digest*, vol. 31, pp. 1390 - 1393, June 1993. **N. Sangary**, T. Lo, C. Wu and J. Litva, "Application of spiral antennas for digital beam-forming," *IEEE International Antennas Propagation Symposium/URSI Digest Symposium*, 1994.
33. **N. Sangary**, Theoretical and Experimental Investigation on Equiangular Spiral Antennas, M.Eng. Thesis, 1993.
34. G. S. A. Shaker, M. H. Bakr, **N. Sangary**, and S. Safavi-Naeini, "Accelerated antenna design methodology exploiting parameterized cauchy models," *Progress In Electromagnetics B*, Vol. 18, 279-309, 2009.

Professional Training and Graduate Courses:

MBA Courses: Developing Effective Managers, China & Emerging Markets strategy & analysis, Decision & Data analysis, Marketing, Strategy, Understanding General Management, Managerial Economics, Finance, Strategy & Innovation, Macroeconomics, Global Strategy, Finance II, Entrepreneurial Finance, Financial Reporting, Private Equity, The Strategic Leader, and Social Entrepreneurship.

Graduate Courses: Quantum Mechanics, Optical Communication II, Engineering Optics, Advanced Concept in Optoelectronics, Advanced Semiconductor Device Physics, Microwave circuit, Microwave Device and Circuit Applications, Microwave Integrated circuits, Antenna Array Theory and Design, and Phase Lock Loop Design.

Programming and Simulation: Matlab, C++, FORTRAN, Basic, EESOF, Touchstone/Libra, Momentum, H-Spice, P-Spice, FEKO, XFDTD, AutoCad, Viewlogic, HPVVEE.

Profession courses: Completed 6 days LTE Workshop (2010), Completed University of Oxford summer (2005) program in UMTS Advanced Professional Education. GPS Theory and Application, Optical Fiber Design, Introduction to CDMA, Advanced CDMA, Introduction to Wireless System, RF Engineering, Wireless Communications, Introduction to Telecommunication Networks, Wireless Industry Overview, Mobile and Wireless Network, Designing with Viewlogic Powerview, Design Delivery Management Environment.