

2015

Universidade de Aveiro

**Nuno Borges
Carvalho**

[CURRICULUM VITAE]

Nuno Borges Carvalho

Full Professor (Professor Catedrático)

Instituto de Telecomunicações

Departamento de Eletrónica, Telecomunicações e informática

Universidade de Aveiro

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NUNO BORGES CARVALHO

This Curriculum Vitae, describes the technical-scientific activities of Prof. Nuno Borges Carvalho.

Prof. Nuno Borges Carvalho is a Full Professor in the Department of Electronics, Telecommunications and Informatics, DETI, Universidade de Aveiro, UA, and a researcher at the Instituto de Telecomunicações - Aveiro Pole since 1995.

During his teaching career he has been a Professor devoted to courses on Electronics/Telecommunication Systems and scientific activities devoted to Radio Frequency Circuits and Systems.

Its educational component covers other aspects of action, beyond the academic component, such as the coordination of the implementation of the Bologna process in his department, DETI-UA, responsible for coordination and co-authorship in the writing of the documents that were the basis for new courses proposals to the Ministry of Higher Education. It was also the coordinator of the CMU-Portugal program at the Universidade de Aveiro from 2007 to 2009, in this case it was responsible for managing the Professional Master (Master of Science in Information Networking), MSIN and also for managing the joint doctoral programs between CMU and UA.

Prof. Nuno Borges de Carvalho is currently the course director of the Doctoral Program in Electrical Engineering from the Universidade de Aveiro and is also the leading proponent and responsible for the engineering professional advanced training course on "Radio System Design", devoted to continuing engineering education.

Throughout his career he held positions such as administrative level program coordination CMU-Portugal in DETI, as mentioned earlier, was Vice-Chairman of the Board of Directors of DETI in 2003 and Chair of the Scientific Committee of the DETI in the academic year 2009/10.

In the technical-scientific components, he published more than 200 scientific papers in international journals and conferences, not forgetting the activity in editorial and review of scientific works. He is co-author of two books published by prestigious international publishers and also wrote a few chapters of several books published internationally.

He participated as principal investigator or coordinator in projects with scientific and/or industry focus, both at a national and international level.

He also coordinates various activities of international significance, such as: Chair and active member of the Technical Committee MTT-11, which is the technical committee for the promotion and development of the measurements and instrumentation scientific area within IEEE MTT (Microwave Theory and Techniques) society, he is an active member of MTT-20, 24 and 26, which are the technical committees devoted to the promotion and development in the area of wireless communications, RFID and Wireless Power Transmission. He is a member of TPRC (Technical Program Review Committee) of the European Microwave Conference since 2006, member of the IMS TPRC (International

Microwave Symposium) since 2008 and the International Radio and Wireless Symposium since 2011, furthermore, he also coordinates the activity of Metrology of URSI Portugal, being the Chair of Committee A.

Since 2014 he is the chair of the IEEE Portugal Section.

From an administrative point of view he is the co-coordinator of the Wireless Communications Area in the Instituto de Telecomunicações, National Coordinator of the radio systems group in IT-Aveiro. He is also a Member of management committee of IT Aveiro Pole and Vice-Chair of the IEEE MTT / ED / AP Chapter.

In recent years he organized various workshops locally and internationally, particularly in several international microwave symposiums. Moreover he won several scientific awards, national and international, giving particular emphasis to the 2000 IEE Measurement Prize.

PERSONAL INFORMATION

Full Name: Nuno Miguel Gonçalves Borges de Carvalho
Marital Status: Married with Raquel Castro Madureira, 3 children
Nationality: Portuguese
Born Date: 1972, April, 29
Born Place: Luanda (Angola)
e-mail: nbcarvalho@ua.pt
web page: <http://www.av.it.pt/nbcarvalho/>
Employment: Full Professor at the Department of Electronics, Telecommunications and Informatics, DETI, Universidade de Aveiro and a Senior Researcher at the Instituto de Telecomunicações - Aveiro Pole
Member of the Portuguese Engineering Association.
URSI Member.
IEEE Fellow, (Student Member from 1992 to 1999, Member from 1999 to 2005, Senior Member from 2005 to 2015).

ACADEMIC DEGREES

October 2009 → “Agregação”¹ in Electrical Engineering with a lecture devoted to “Metrology for Radio-Frequency Nonlinear Systems Characterization”, Universidade de Aveiro, approved by unanimity.

Jan. 2000 → PhD in Electrical Engineering - Universidade de Aveiro, with the Thesis title - "Nonlinear Distortion Optimization in Multi-carrier Power Amplifiers", approved by unanimity.

June 1995 → “Licenciatura”² in Telecommunication Electronics Engineering, (5 years course), Universidade de Aveiro, with the final mark of 17 (in 20).

¹ Agregação is an academic title awarded by Portuguese Universities that testifies to the quality of the curriculum, professional, scientific and pedagogical, capacity and capability to manage independent research projects and conduct independent scientific work.

² Licenciatura degree corresponds to a five year program, and was the traditional approach before the Bologna Process to the Integrated Master plan.

ACADEMIC PROFESSIONAL EXPERIENCE

2013 – Today → Full Professor at the Department of Electronics and Telecommunications at the Universidade de Aveiro.

2009 – 2013 → Associate Professor with “Agregação” at the Department of Electronics, Telecommunications and Informatics at the Universidade de Aveiro.

2004 – 2009 → Associate Professor at the Department of Electronics and Telecommunications at the Universidade de Aveiro.

2000 – 2004 Assistant Professor at the Department of Electronics and Telecommunications at the Universidade de Aveiro.

1997 – 2000 Assistant Lecturer at Department of Electronics and Telecommunications at the Universidade de Aveiro.

1996-1997 Computing Sciences Teaching as a Young Professor at Universidade de Aveiro.

MANAGEMENT POSITIONS

2007 – 2013 → Director of the PhD program in Electrical Engineering - Universidade de Aveiro.

2010 – Today → Council Member of the Department of Electronics, Telecommunications and Informatics– Universidade de Aveiro.

2007 – 2010 → Coordinator of the international relationship between CMU-USA and Universidade de Aveiro.

2009 – 2010 → Coordinator of the Scientific Committee from the Department of Electronics, Telecommunications and Informatics - Universidade de Aveiro.

2008 – 2009 → Vice-Coordinator of the Scientific Committee from the Department of Electronics, Telecommunications and Informatics - Universidade de Aveiro.

2005 – 2007 → Counselor Professor for the Student Association, AETUA (Associação de Estudantes de Telecomunicações da Universidade de Aveiro).

2003 – 2005 → Member of the directive council of the Department of Electronics, Telecommunications and Informatics – Universidade de Aveiro.

2000 – 2002 → Counselor Professor of the Aveiro IEEE student branch.

2009 – Today → Member of the Management Commission of the Instituto de Telecomunicações – Aveiro Pole.

2010 – Today → Coordinator of the Radio-system group in the Instituto de Telecomunicações.

2007 – Today → Coordinator of the scientific area on Wireless Communications - Instituto de Telecomunicações.

SCIENTIFIC PRODUCTION

In the next sections the scientific production will be presented, including publications in international journals and conferences, as also the citations from two main indexing international services: ISI web of knowledge and Google Scholar.

The Scientific Research activity of Nuno Borges Carvalho is focused in Radio-frequency and microwave circuits and systems, and can further be divided into the next sub-areas:

1. Instrumentation and design of special characterization approaches to nonlinear RF circuits and systems;
2. Analysis, modeling and algorithms for nonlinear circuits and systems CAD/CAE;
3. Special circuit and system design approaches for Software Defined Radio (SDR) and location systems;
4. Wireless Power Transmission circuit and system design.

Prof. Nuno Borges Carvalho has also been invited as keynote speaker in certain international conferences and events, which are described in the following sub-sections.

BOOKS

L.1. J. C. Pedro and **Nuno Borges Carvalho**, “Intermodulation Distortion in Microwave and Wireless Circuits”, Artech House Inc, Norwood, Aug. 2003 ISBN: 1-58053-356-6, 450 pages.

Preface: “This unique new book is your single resource for all issues related to intermodulation and multi-tone distortion in microwave and wireless circuits. Beginning with an overview of the general concepts of distortion in microwave and wireless devices, it delves into the theory and practical aspects of nonlinear distortion, tools for nonlinear analysis, mathematical representations of wireless circuits and devices, and design methods for minimizing distortion.

The book presents the full range of distortion specs to help ensure you select the right telecommunications equipment for your needs. Choose from the full range of design methods for highly linear circuits to optimize linearity in small-signal and high-power amplifiers and mixers. Practical advice on modeling and computer-aided tools guides you toward successful analysis and design. Moreover, the book helps you design other highly-linear circuits and systems related to microwave and wireless communications and it includes the most comprehensive treatment of the application of Volterra methods in the technical literature”.

Google Scholar: 206.

- L.2. Nuno Borges Carvalho** and Dominique Schreurs, “Microwave and Wireless Measurement Techniques”, Cambridge University Press, in press, November 2013, 350 pages, ISBN: 9781107004610.

Preface: “From typical metrology parameters for common wireless and microwave components to the implementation of measurement benches, this introduction to metrology contains all the key information on the subject. Using it, readers will be able to:

- interpret and measure most of the parameters described in a microwave component’s datasheet
- understand the practical limitations and theoretical principles of instrument operation
- combine several instruments into measurement benches for measuring the microwave and wireless quantities

Several practical examples are included, demonstrating how to measure intermodulation distortion, error vector magnitude, S-parameters, and large signal waveforms. Each chapter then ends with a set of exercises, allowing readers to test their understanding of the material covered and making the book equally suited for course use and for self-study.”

CHAPTERS IN BOOKS

- CL.1.** José Carlos Pedro and **Nuno Borges Carvalho**, “Mixed Time and Frequency Domain Behavioral Modeling and Simulation” -Book: Fundamentals of Nonlinear Behavioral Modeling for RF and Microwave Design, Artech House, ISBN 1-58053-775-8, Editor(s): John Wood and David Root , 244 pages.

Google Scholar: 56

- CL.2. Nuno Borges Carvalho**, “Nonlinear distortion measurement techniques“, Book: Characterization and Modelling Approaches for Advanced Linearisation Techniques, SignPost, ISBN 81-308-0027-6 , Editor(s) José Angel García, José María Zamanillo and Máirtín O’Droma.

Google Scholar: 4

- CL.3.** P.M. Cruz, H.C. Gomes and **Nuno Borges Carvalho**, "Receiver Front-End Architectures - Analysis and Evaluation" – Book: Advanced Microwave and Millimeter Wave Technologies Semiconductor Devices Circuits and Systems, Edited by Moumita Mukherjee, In-Tech, Austria, March 2010.

- CL.4.** N. Bonifácio; André, P.S and **Nuno Borges Carvalho**; "Resonant Wireless Power Transmission" - Chapter in Advances in Energy Research – Vol. 8, Edited by: Morena V. Acosta, Nova Publisher, New York, 2011.

- CL.5. Nuno Borges Carvalho** and Wonhoon Jang, “Crest Factor Reduction Techniques”, - Chapter in Digital Front-End in Wireless Communications and Broadcasting: Circuits and Signal Processing, Edição: Fa-Long Luo, Cambridge University Press, London, 2011.

- CL.6.** Pedro Cruz and **Nuno Borges Carvalho**, “Characterization of Software Defined and Cognitive Radio Front-Ends for Multi-mode Operation” - Chapter in Advances in Microwave and Millimeter Wave Circuits and Systems: Emerging

Design, Technologies and Applications, Edited by: Apostolos Georgiadis, Hendrik Rogier, Luca Roselli, Paolo Arcioni, John Wiley & Sons, 2012.

CL.7. Boaventura, A.; Fernandes, R. D.; Matos, J. N. ; Carvalho, N.B.C.; "Unconventional RFID Systems" - Chapter in Green RFID Systems, Luca Roselli, Cambridge University Press, 2013.

THESES

OCC1. Nuno Borges Carvalho, "Optimização da Distorção Não-linear de Intermodulação em Amplificadores de Sinais Multi-Portadora", PhD Thesis, Departamento de Electrónica and de Telecomunicações, Universidade de Aveiro, Jan. 2000.

OCC2. Nuno Borges Carvalho, "A Metrologia nos SisTemes Não-Lineares de Radiofrequência", Agregação lecture, Departamento de Electrónica and de Telecomunicações, Universidade de Aveiro, Oct. 2009.

INTERNATIONAL JOURNALS

RI1. Nuno Borges Carvalho and J. C. Pedro, "Multi-tone Frequency Domain Simulation of Nonlinear Circuits in Large and Small Signal Regimes", IEEE Transactions on Microwave Theory and Techniques, Vol. MTT-46, N° 12, Pages 2016-2024, Dec. 1998.

Google Scholar: 30; ISI: 13

RI2. J. A. Garcia, A. Mediavilla, J. C. Pedro, Nuno Borges Carvalho, A. Tazón and J. L. Garcia, "Characterizing the Gate to Source Nonlinear Capacitor Role on GaAs FET IMD Performance", IEEE Transactions on Microwave Theory and Techniques, Vol. MTT-46, N° 12, Pages 2344-2355, Dec. 1998.

Google Scholar: 28; ISI: 25

RI3. J. C. Pedro, Nuno Borges Carvalho and R. Madureira, "Nonlinear Distortion Model for VCO-PLL FM Transmission Systems", IEEE Transactions on Circuits and Systems II: Analog and Digital Signal Processing, Vol. CAS-46, N° 3, Pages 348-352, Mar. 1999.

Google Scholar: 5; ISI: 4

RI4. Nuno Borges Carvalho and J. C. Pedro, "Large and Small Signal IMD Behavior of Microwave Power Amplifiers", IEEE Transactions on Microwave Theory and Techniques, Vol. MTT-47, N° 12, Pages 2364-2374, Dec. 1999.

Google Scholar: 127; ISI: 37

RI5. J. C. Pedro and N. B. Carvalho, "On the Use of Multi-Tone Techniques for Assessing RF Components' Intermodulation Distortion", IEEE Transactions on Microwave Theory and Techniques, Vol. MTT-47, N° 12, Pages 2393-2402, Dec. 1999.

- RI6.** J. A. Garcia, J. C. Pedro, M. L. de La Fuente, **N. B. Carvalho**, A. Mediavilla and A. Tazón, "Resistive FET Mixer Conversion Loss and IMD Optimization By Selective Drain Bias", IEEE Transactions on Microwave Theory and Techniques, Vol. MTT-47, N° 12, Pages 2382-2392, Dec. 1999.

- RI7.** **N. B. Carvalho** and J. C. Pedro, "Compact Formulas to Relate ACPR and NPR to Two-Tone IMR and IP3", Microwave Journal, Vol. 42, N°12, Pages 70,77-78,80,82,84, Dec. 1999.

- RI8.** J. A. Garcia, M. L. de la Fuente, J. C. Pedro, **N. B. Carvalho**, Y. Newport, A. Mediavilla and A. Tazón, "Time-Varying Volterra-Series Analysis of Spectral Regrowth and Noise Power Ratio in FET Mixers", IEEE Transactions On Microwave Theory and Tech., Vol. MTT-49, N° 3, Pages 545-549, Mar. 2001.

- RI9.** J. C. Pedro and **N. B. Carvalho**, "Evaluating Co-Channel Distortion Ratio in Microwave Power Amplifiers", IEEE Transactions on Microwave Theory and Tech., Vol. MTT-49, N°10, Pages 1777-1784, Oct. 2001.

- RI10.** J. C. Pedro and **N. B. Carvalho**, "A Novel Nonlinear Distortion Characterization Standard for RF and Microwave Communication Systems", Artigo convidado à IEE Engineering Science and Education Journal, Vol. 10, N° 3, Pages 113-119, Jun. 2001.

- RI11.** J. C. Pedro and **N. B. Carvalho**, "Characterizing Nonlinear RF Circuits for Their In-Band Signal Distortion", IEEE Transactions on Instrumentation and Measurement, Vol. IM-51, N°3, Pages 420-426, Jun. 2002.

- RI12.** **N. B. Carvalho** and J. C. Pedro, "Modeling MESFET's for Nonlinear Analog Circuits", International Journal of Analog Integrated Circuits and Signal Processing, Vol. 33, N° 2, Pages 95-106, Nov. 2002.

- RI13.** **N. B. Carvalho** and J. C. Pedro, "A Comprehensive Explanation of Distortion Side Band Asymmetries", IEEE Transactions on Microwave Theory and Tech., Vol. MTT-50, N°9, Pages 2090-2101, Sep. 2002.

- RI14.** C. Fager, J. C. Pedro, **N. B. de Carvalho** and H. Zirath, "Prediction of IMD in LDMOS Transistor Amplifiers Using a New Large-Signal Model", IEEE Transactions on Microwave Theory and Tech., Vol. MTT-50, N°12, Pages 2834-2842, Dec. 2002.

Google Scholar: 71; ISI: 38

- RI15.** C. Fager, J. C. Pedro, **N. B. de Carvalho**, H. Zirath, F. Fortes and M. J. Rosário, "A Comprehensive Analysis of IMD Behavior in RF CMOS Power Amplifiers", IEEE Journal of Solid-State Circuits, Vol: 39, N°: 1, Jan. 2004, Pages:24 - 34.

Google Scholar: 55; ISI: 34

- RI16.** Pedro Miguel Lavrador, **Nuno Borges Carvalho** and Jose Carlos Pedro, "Evaluation Of Signal To Noise And Distortion Ratio Degradation In Nonlinear Systems", IEEE Transactions on Microwave Theory and Techniques, Vol: 52, N°: 3, Mar. 2004, Pages: 813 – 822.

Google Scholar: 15; ISI: 11

- RI17.** José Carlos Pedro and **Nuno Borges Carvalho**, "An Integrated Overview of CAD/CAE Tools and Their Use on Wireless Communication Circuits Design", International Journal of RF and Microwave Computer Aided Engineering, Vol. 14, N°6, Pages 507-534, Nov. 2004.

Google Scholar: 1; ISI: 1

- RI18.** João Moreira Rebelo and **Nuno Borges Carvalho**, "TMAs Alleviate Cellular-Network Strain", Wireless Design Systems, May 2004.

- RI19.** P. M. Cabral, J. C. Pedro and **N. B. Carvalho**, "A Nonlinear Device Model of Microwave Power GaN HEMT's for High-Power Amplifier Design", IEEE Transactions. on Microwave Theory and Tech., Vol. MTT-52, N° 11, Pages .2585-2592, Nov. 2004.

Google Scholar: 46; ISI: 36

- RI20.** J. C. Pedro, **N. B. Carvalho**, C. Fager and J. A. Garcia, "Linearity Versus Efficiency in Mobile Handset Power Amplifiers: A Battle Without a Loser", Microwave Engineering Europe, Pages 19-26, Aug. 2004.

- RI21.** J. C. Pedro and **N. B. Carvalho**, "Designing Multisine Excitations for Nonlinear Model Testing", IEEE Transactions on Microwave Theory and Tech., Vol. MTT-53, N° 1, Pages 45-54, Jan. 2005.

Google Scholar: 32; ISI: 23

- RI22.** P Pedro M. Cabral, José C. Pedro and **Nuno B. Carvalho**, "A Unified Theory for Nonlinear Distortion Characteristics in Different Amplifier Technologies", Microwave Journal, Pages 62-78, Apr. 2005.

Google Scholar: 1; ISI: 5

- RI23.** **N. B. Carvalho**, J. C. Pedro, W. Jang and M. B. Steer, "Nonlinear Simulation of Mixers for Assessing System-Level Performance", Intern. Journal of RF and Microwave Computer-Aided Engineering, Vol. 15, N° 4, Jul. 2005, Pages 350-361.

Google Scholar: 7; ISI: 3

RI24. N. B. Carvalho, J. A. García, E. Azpitarte and J. C. Pedro, "Load-Impedance Selection for Maximized Large-Signal IMD Sweet-Spot Effects", Intern. Journal of RF and Microwave Computer-Aided Engineering, Vol. 15, N° 5, Sep. 2005, Pages 434-440.

Google Scholar: 6

RI25. P. Colantonio, J. A. García, F. Giannini, C. Gómez, N. B. Carvalho, E. Limiti, J. C. Pedro, "High Efficiency And High Linearity Power Amplifier Design", International Journal of RF and Microwave Computer Aided Engineering, Vol. 15, N° 5, Sep. 2005, Pages 453-468.

Google Scholar: 7; ISI: 5

RI26. Antonio Santos, Americo Soares, Fernando Redondo, Nuno Carvalho, "Tracking Trains in Secondary Lines via Radio Frequency Systems", IEEE Transactions on Intelligent Transportation Systems, Vol. 6, N° 2, Jun. 2005 Pages 244 – 258.

Google Scholar: 10; ISI: 7

RI27. João P. Martins and Nuno Borges Carvalho, "Multi-tone Phase and Amplitude Measurement for Nonlinear Device Characterization", IEEE Transactions on Microwave Theory and Techniques, Vol. 53, N° 6, Parte 2, Jun. 2005 Pages 1982 - 1989.

Google Scholar: 11; ISI: 7

RI28. Pedro M. Cabral, José C. Pedro and Nuno B. Carvalho, "Modeling Nonlinear Memory Effects on the AM/AM, AM/PM and Two-Tone IMD in Microwave PA Circuits", International Journal of RF and Microwave Computer-Aided Engineering, Vol. 16, N° 1, Jan. 2006, Pages :13-23.

Google Scholar: 4

RI29. Carvalho, N.B.; Pedro, J.C.; Jang, W.; Steer, M.B.; "Nonlinear RF circuits and systems simulation when driven by several modulated signals", Microwave Theory and Techniques, IEEE Transactions on , Vol. 54, N° 2, Part 1, Feb. 2006 Pages 572 – 579.

Google Scholar: 10; ISI: 7

RI30. Carvalho, N.B.; Pedro, J.C.; Martins, J.P.; "A Corrected Microwave Multisine Waveform Generator", Microwave Theory and Techniques, IEEE Transactions on, Vol. 54, N° 6, Part 2, Jun. 2006 Pages 2659 – 2664.

Google Scholar: 4; ISI: 3

RI31. Martins, J. P.; Cabral, P. M.; Borges Carvalho, N.; Pedro, J. C.; "A Metric for the Quantification of Memory Effects in Power Amplifiers", Microwave Theory and Techniques, IEEE Transactions on, Vol. 54, N° 12, Part 2, Dec. 2006 Pages :4432 – 4439.

- RI32.** Martins, J.P.; Carvalho, **N.B.**; Pedro, **J.C.**; “Intermodulation Distortion of Third-Order Nonlinear Systems With Memory Under Multisine Excitations”, Microwave Theory and Techniques, IEEE Transactions on, Vol. 55, N° 6, Part 2, Jun. 2007, Pages: 1264 – 1271.

- RI33.** Carvalho, **N.B.**; Remley, K.A.; Schreurs, D.; “The MTT-II web Page: A Multitude of Information Resources on Microwave Measurements [Member Benefits]”, Microwave Magazine, IEEE, Vol. 8, N° 4, Aug. 2007 Pages: 106 – 114

- RI34.** Pedro Claro and **Nuno Borges Carvalho**, “Local Positioning System Based on Artificial Neural Networks”, Lecture notes on Computer Science, 2007, Pages 699-708.

- RI35.** Carvalho, **N.B.**; Remley, K.A.; Schreurs, D.; Gard, K.C.; “Multisine Signals for Wireless System Test and Design”, Microwave Magazine, IEEE, Vol. 9, N° 3, Jun. 2008, Pages: 122 – 138.

- RI36.** Gomes, H.G.; Carvalho, **N.B.**; "RFID for Location Proposes Based on the Intermodulation Distortion", Sensors & Transducers Magazine, Vol. 106, N° 7, Pages 85 - 96, Jul. 2009.

- RI37.** Rui E. Santos, **Nuno Borges Carvalho** and Kevin Gard, “Characterization of SNDR Degradation in Nonlinear Wireless Transmitters”, International Journal of RF and Microwave Computer-Aided Engineering, Vol. 19, N° 4, Pages 470 - 480, Jul., 2009.

- RI38.** P.M. Cruz, **N.B. Carvalho** and K.A. Remley, "Designing and Testing Software-Defined Radios", IEEE Microwave Magazine, Vol. 11, N° 4, Pages 83-94, Jun., 2010.

- RI39.** Carvalho, **N.B.**; "MTT-S Workshop Series (IMWS) and MGA Committee News [Around the Globe]", IEEE Microwave Magazine, Vol. 11, N° 6, Pages 124 - 126, Oct., 2010.

- RI40.** **Nuno Borges Carvalho**, “Power Amplifier Linearization Behavior in Presence of Dynamic Effects”, IET Antennas, Propagation and Microwaves, IET Microwaves Antennas & Propagation , Vol. 4, N° 1, Pages 113 - 120, Jan., 2010.

- RI41.** P.M. Cruz and **N.B. Carvalho**, "Wideband Behavioral Model for Nonlinear Operation of Bandpass Sampling Receivers", IEEE Transactions On Microwave Theory and Techniques, Vol. 59, N° 4, Pages 1006-1015, Apr. 2011.

- RI42.** Gomes, H.G.; A. R. T. Testera; **Carvalho, N.B.**; M. B. Barciela; K. R. Remley; "Diode Power Probe Measurements of Wireless Signals", IEEE Transactions on Microwave Theory and Tech., Vol. 59, N° 4, Pages 987 - 997, Apr. 2011.
- RI43.** Z. Liu, M. A. Violas, and **N. B. Carvalho**, "Digital predistortion for RSOAs as external modulators in radio over fiber systems," Opt. Express, Vol. 19, N° 18, Pages 17641-17646, Aug. 2011.
- RI44.** Bras, L.; **Carvalho, N.B.**; Pinho, P., "Pentagonal Patch-Excited Sectorized Antenna for Localization Systems," Antennas and Propagation, IEEE Transactions on , vol.60, no.3, pp.1634,1638, March 2012
- RI45.** Silva, N.V.; Oliveira, A.S.R.; Gustavsson, U.; **Carvalho, N.B.**, "A Novel All-Digital Multichannel Multimode RF Transmitter Using Delta-Sigma Modulation," Microwave and Wireless Components Letters, IEEE , vol.22, no.3, pp.156,158, March 2012
- RI46.** da Silva Cascalheira, M.; Pinho, P.; Teixeira, D.; **De Carvalho, N.B.**, "Indoor guidance system for the blind and the visually impaired," Microwaves, Antennas & Propagation, IET , vol.6, no.10, pp.1149,1157, July 17 2012
- RI47.** Boaventura, A.J.S.; **Carvalho, N.B.**, "Extending Reading Range of Commercial RFID Readers," Microwave Theory and Techniques, IEEE Transactions on , vol.61, no.1, pp.633,640, Jan. 2013
- RI48.** Silva, N.V.; Oliveira, A.S.R.; **Carvalho, N.B.**, "Design and Optimization of Flexible and Coding Efficient All-Digital RF Transmitters," Microwave Theory and Techniques, IEEE Transactions on , vol.61, no.1, pp.625,632, Jan. 2013
- RI49.** Zhansheng Liu; Violas, M.A.; **Carvalho, N.B.**, "Modeling and Simulation of a Reflective Semiconductor Optical Amplifier Modulator Using X-Parameters," Photonics Technology Letters, IEEE , vol.25, no.3, pp.272,274, Feb.1, 2013
- RI50.** Alírio Soares Boaventura and **Nuno Borges Carvalho** "Low Power Wakeup Radios for Application in Indoor Location-Systems", International Journal of Wireless Information Networks, March 2013, Volume 20, Issue 1, pp 67-73
- RI51.** Boaventura, A.; Collado, A.; **Carvalho, N.B.**; Georgiadis, A., "Optimum behavior: Wireless power transmission system design through behavioral models and efficient synthesis techniques," Microwave Magazine, IEEE , vol.14, no.2, pp.26,35, March-April 2013
- RI52.** Magalhaes, J.P.; Vieira, J.M.N.; Gomez-Garcia, R.; **Carvalho, N.B.**, "Bio-Inspired Hybrid Filter Bank for Software-Defined Radio Receivers," Microwave Theory and Techniques, IEEE Transactions on , vol.61, no.4, pp.1455,1466, April 2013
- RI53.** Luis Brás, **Nuno Borges Carvalho**, Pedro Pinho, Lukasz Kulas, and Krzysztof Nyka, "A Review of Antennas for Indoor Positioning Systems", International

Journal of Antennas and Propagation, Volume 2012 (2012), Article ID 953269, 14 pages

- RI54.** Jang, W.; Silva, N.V.S.; Oliveira, A.O.; **Carvalho, N.B.C.**; "Designing Harmonic-Controlled Drivers for Switching Power Amplifiers", IEEE Trans. on Circuits and Systems - II: Express Briefs, Vol. 60, No. 5, pp. 247 - 251, May, 2013.
- RI55.** Brás, L.; **Carvalho, N.B.C.**; Pinho, P.; "Evaluation of a Sectorised Antenna in an Indoor Localization System", , Vol. 7, No. 8, pp. 679 - 685, June, 2013.

PORTUGUESE JOURNALS

- RN1.** R. Madureira, **Nuno Borges Carvalho** and J. C. Pedro, "Projecto de Redes de Adaptação para Amplificadores de Banda Larga", Revista do Departamento de Electrónica e Telecomunicações da Universidade de Aveiro, Vol. 1, N° 4, Pages 343-348, Sep. 1995.
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- CI106.** Luis Brás, Marco Oliveira, **Nuno Borges Carvalho** and Pedro Pinho, “Improved Sectorised Antenna for Indoor Localization Systems”, European Microwave Integrated Circuits Conference, Manchester, UK, Oct. 2011.
- CI107.** Ludimar Guenda and **Nuno Carvalho** , “Indoor and Outdoor Audio Guide System Using Smart-Phones and Electronic Tablets”, IPIN, Guimarães, Portugal, Oct., 2011
- CI108.** Carlos Pereira, **Nuno Borges Carvalho** and Ludimar Guenda, “A Smart-Phone Indoor/Outdoor Localization System”, IPIN, Guimarães, Oct., 2011
- CI109.** Traian E. Abrudan, Luís M. Paula, João Barros, João Paulo Silva Cunha and **Nuno Borges de Carvalho**, “Indoor Location Estimation and Tracking in Wireless Sensor Networks using a Dual Frequency Approach”, IPIN, Guimarães, Portugal, Oct., 2011.
- CI110.** Luis Brás, Marco Oliveira, Ludimar Guenda, **Nuno Borges Carvalho** and Pedro Pinho, “Location System applied in Management of Emergency Scenarios”, IPIN, Guimarães, Portugal, Oct., 2011.
- CI111.** Z. Liu, M. A. Violas, and **N. B. Carvalho**, “Transmission of Four Channels SCM over Fiber and Nonlinear Compensation for RSOA External Modulators,” in IEEE Globecom, First Workshop on Distributed Antenna Systems for Broadband Mobile Communications, Houston USA, 2011.
- CI112.** Guenda, L.; Collado, A.; **Carvalho, N.B.**; Georgiadis, A.; Niotaki, K., "Electromagnetic geo-referenced footprints for energy harvesting systems," Radio and Wireless Symposium (RWS), 2012 IEEE , vol., no., pp.339,342, 15-18 Jan. 2012

CI113. Silva, N.V.; Oliveira, A.S.R.; Gustavsson, U.; **Carvalho, N.B.**, "A dynamically reconfigurable architecture enabling all-digital transmission for cognitive radios," Radio and Wireless Symposium (RWS), 2012 IEEE , vol., no., pp.1,4, 15-18 Jan. 2012

IEEE RWW Student Paper Contest Finalist – 3° Place.

CI114. Boaventura, A.S.; **Carvalho, N.B.**, "A proposal for dynamic power control in RFID and Passive Sensor Systems based on RSSI," Antennas and Propagation (EUCAP), 2012 6th European Conference on , vol., no., pp.3473,3475, 26-30 March 2012

CI115. Gomez-Garcia, R.; Vieira, J.; **Carvalho, N.B.**; Magalhaes, J.P., "Mixed-domain receiver architecture for white space software-defined radio scenarios," Circuits and Systems (ISCAS), 2012 IEEE International Symposium on , vol., no., pp.822,825, 20-23 May 2012

CI116. Boaventura, A.S.; **Carvalho, N.B.**, "A measurement strategy for test and characterization of UHF RFID systems," Microwave Measurement Conference (ARFTG), 2012 79th ARFTG , vol., no., pp.1,3, 22-22 June 2012

CI117. Silva, N.V.; Oliveira, A.S.R.; **Carvalho, N.B.**, "Evaluation of pulse modulators for all-digital agile transmitters," Microwave Symposium Digest (MTT), 2012 IEEE MTT-S International , vol., no., pp.1,3, 17-22 June 2012

CI118. Boaventura, A.S.; **Carvalho, N.B.**, "Enhanced front-end to extend reading range of commercial RFID readers using efficient multisine signals," Microwave Symposium Digest (MTT), 2012 IEEE MTT-S International , vol., no., pp.1,3, 17-22 June 2012

CI119. Silva, N.V.; Ventura, M.; Oliveira, A.S.R.; **Carvalho, N.B.**, "Evaluation of an FPGA-based Reconfigurable SoC for All-Digital Flexible RF Transmitters," Digital System Design (DSD), 2012 15th Euromicro Conference on , vol., no., pp.890,895, 5-8 Sept. 2012

CI120. Magalhaes, J.P.; Vieira, J.N.; Gomez-Garcia, R.; **Carvalho, N.B.**, "RF and IF channelizers for wide-band sensing in cognitive/Software-Defined-Radio receivers," Microwave Conference (EuMC), 2012 42nd European , vol., no., pp.1158,1161, Oct. 29 2012-Nov. 1 2012

CI121. Ribeiro, D.C.; Cruz, P.M.; **Carvalho, N.B.**, "Corrected mixed-domain measurements for software defined radios," Microwave Conference (EuMC), 2012 42nd European , vol., no., pp.554,557, Oct. 29 2012-Nov. 1 2012

CI122. Cruz, P.M.; **Carvalho, N.B.**; Valkama, M.E., "Evaluation of second-order bandpass sampling receivers for software defined radio," Microwave Integrated Circuits Conference (EuMIC), 2012 7th European , vol., no., pp.667,670, 29-30 Oct. 2012

CI123. - Tavares, J.; Barroca, N.; Henrique M. Saraiva M. Saraiva; Borges, Luis M.; Velez, F. J.; C. Loss; R. Salvado; Pinho, P.; Gonçalves, R.; **Carvalho, N.B.C.**;

"Spectrum Opportunities for Electromagnetic Energy Harvesting from 350 MHz to 3 GHz", Proc International Symp. on Medical Information and Communication Technology - ISMICT, Tokyo, Japan, Vol. -, pp. 126 - 130, March, 2013.

CI124. - Gonçalves, R.; Pinho, P.; Reis, J.R.; E. S. Santana; **Carvalho, N.B.C.**; "Smart Floor: Indoor navigation based on RFID", Proc IEEE Wireless Power Transfer Conf. - WPTC, Perugia, Italy, Vol. -, pp. - - -, May, 2013.

CI125. Gonçalves, R.; **Carvalho, N.B.C.**; Pinho, P.; "Increasing the RFID Readability Range Using Wireless Power Transmission Enhancements", Proc IEEE Wireless Power Transfer Conf. - WPTC, Perugia, Italy, Vol. -, pp. - - -, May, 2013.

CI126. Gonçalves, R.; **Carvalho, N.B.C.**; Pinho, P.; C. Loss; R. Salvado; "Textile Antenna for Electromagnetic Energy Harvesting for GSM900 and DCS1800 bands", Proc IEEE AP-S/URSI International Symp., Orlando, United States, Vol. -, pp. - - -, July, 2013.

CI127. Brás, L.; **Carvalho, N.B.C.**; Pinho, P.; "Planar Omnidirectional Microstrip Antenna Array for 5 GHz ISM and UNII band", Proc IEEE AP-S/URSI International Symp., Orlando, United States, Vol. 1, pp. 1 - 2, July, 2013.

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CI129. Gonçalves, R.; **Carvalho, N.B.C.**; Pinho, P.; "Metamaterial inspired compact printed antenna for WLAN applications", Proc IEEE AP-S/URSI International Symp., Orlando, United States, Vol. -, pp. - - -, July, 2013.

CI130. Barroca, N.; Pinho, P.; Henrique M. Saraiva M. Saraiva; Paulo T. Gouveia T. Gouveia; Tavares, J.; Borges, Luis M.; Velez, F. J.; C. Loss; R. Salvado; Gonçalves, R.; **Carvalho, N.B.C.**; ; "Antennas and Circuits for Ambient RF Energy Harvesting in Wireless Body Area Networks", Proc IEEE International Symp. on Personal, Indoor and Mobile Radio Commun - PIMRC , London, United Kingdom, Vol. -, pp. - - -, September, 2013.

PORTUGUESE CONFERENCES

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CN2. **N. B. Carvalho** and J. C. Pedro, "Simulação da Resposta Estacionária de Circuitos Não-Lineares de Rádio-Frequência - Estado da Arte 1996 -", Actas da I Conferência Nacional de Telecomunicações, Pages 127-130, Aveiro, Portugal, Apr. 1997.

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- CN4.** **N. B. Carvalho** and J. C. Pedro, “Gain Compression or Expansion, Distortion and Other Large Signal Power Amplifier Related Phenomena”, Actas da II Conferência de Telecomunicações, Pages 515-518, Sesimbra, Portugal, Apr. 1999.
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- CN6.** J. C. Pedro and **N. B. Carvalho**, “A Very Fast and Efficient Computation Method for Nonlinear Distortion on Uniformly Discretized Spectra”, Actas da II Conferência de Telecomunicações, Pages 519-522, Sesimbra, Portugal, Apr. 1999.
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- CN14.** P. M. Lavrador, **N. B. Carvalho** and J. C. Pedro, “Underlying Linear System Identification of Memoryless and Dynamic Nonlinear Systems”, IV Conferência de Telecomunicações, Aveiro, Portugal, Pages 343-346, Apr. 2003.

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- CN16.** **N. B. Carvalho**, “Optimum Load Selection for Maximized Large Signal IMD Sweet Spots”, IV Conferência de Telecomunicações, Aveiro, Portugal, Pages 527-530, Apr. 2003.
- CN17.** P. M. Lavrador, J. C. Pedro, **N. B. Carvalho** , “A New Nonlinear Quasi-Orthogonal Model Extracted in the Frequency Domain”, V Conferência de Telecomunicações, Apr., 2005, Tomar, Portugal.
- CN18.** P. Pedro M. Cabral, José C. Pedro and **Nuno B. Carvalho**, “Novel Explanation for Low Frequency High Linearity Characteristics on BJTs”, V Conferência de Telecomunicações, Apr., 2005, Tomar, Portugal.
- CN19.** J. M. Rebelo and **N. B. Carvalho**, “Tower Mounted Amplifiers Drawbacks”, V Conferência de Telecomunicações, Apr., 2005, Tomar.
- CN20.** Cabral, P. M.; J. C. Pedro; **NBC Carvalho**; " GaN Model Robustness from an IMD point of view ", Proc Conf. on Telecommunications - ConfTele , Peniche , Portugal , Pages 177 - 180 , May , 2007 .
- CN21.** Hugo Cravo Gomes and **Nuno Borges Carvalho**, “RFID for Location Purposes”, Proc Conf. on Telecommunications - ConfTele , Peniche , Portugal , May , 2007.
- CN22.** Paul Saad and **Nuno Borges Carvalho**, “Design of a Highly Linear Power Amplifier Based on HBT Technology”, Proc Conf. on Telecommunications - ConfTele , Peniche , Portugal , May , 2007.
- CN23.** Charles Nader and **Nuno Borges Carvalho**, “WiMAX Power Amplifier Design Based On Si-LDMOS”, Proc Conf. on Telecommunications - ConfTele , Peniche , Portugal , May , 2007.
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- CN25.** **Nuno Borges Carvalho**, “The Importance of Radio Metrology for Health Impact Evaluation”, URSI Portugal Seminar , Lisboa , Portugal, 2007.
- CN26.** José Pedro Borrego and **Nuno Borges Carvalho**, “Harmful Interferences to Aeronautical Radio Communications Arising from Passive Intermodulation”, URSI Portugal Seminar , Lisboa , Portugal, 2007.
- CN27.** Carlos Baptista and **Nuno Borges Carvalho**, “Classificação automática da modulação de sinais digitais”, URSI Portugal Seminar , Lisboa , Portugal, 2008.

- CN28.** Gonçalo Martins, **Nuno Borges Carvalho** and Sérgio Pires, “Problema da co-localização de diferentes tecnologias wireless no mesmo site usando TMAs”, URSI Portugal Seminar, Lisboa , Portugal, 2008.
- CN29.** Pedro Cruz and **Nuno Borges Carvalho**, “Multi-Mode Receiver for Software Defined Radio”, URSI Portugal Seminar, Lisboa , Portugal, 2008.
- CN30.** P.M. Cruz and **N.B. Carvalho**, “Characterization of a SDR Front-End Receiver with Multisine Excitations”, 7th Conference on Telecommunications – ConfTele 2009, Santa Maria da Feira, Portugal, May 2009.
- CN31.** Nelson Silva, Arnaldo S. R. Oliveira, **Nuno Borges de Carvalho**. Reconfigurable Architectures for Next Generation Software-Defined Radio. In REC'2010: VI Jornadas sobre SisThemes Reconfiguráveis, Pages 41-44, Feb. 2010.
- CN32.** Nelson V. Silva, Arnaldo S. R. Oliveira and **Nuno Borges de Carvalho**. “Validation of a Flexible FPGA-based LDPC Decoder Through Hardware-Software Co-simulation”. na REC'2011: VII Jornadas sobre SisThemes Reconfiguráveis, pages 39-42, Feb. 2011.
- CN33.** J.P. Borrego, **N. Carvalho** and J. Vieira, “New Trends in Spectrum Management in Europe: How to deal with Transient Waveforms”, Conference on Electronics, Telecommunications and Electronics, Nov., Lisboa, Portugal.
- CN34.** Pedro Miguel Cruz, **Nuno Borges Carvalho and** Mikko Valkama, “On the Implementation of a Mixed Frequency-Time Simulator for Band-Pass Sampling Receivers”, Conference on Electronics, Telecommunications and Electronics, Nov., Lisboa, Portugal.
- CN35.** Nelson Silva, Arnaldo Oliveira and **Nuno Carvalho**, “Prototyping a Fast Delta-Sigma Modulator Architecture Enabling FPGA-embedded Software-Defined Radio Transmitters”, Aceite na REC'2012: VIII Jornadas sobre SisThemes Reconfiguráveis, 2012.
- CN36.** Tavares, J.; Barroca, N.; Henrique M. Saraiva M. Saraiva; Borges, Luis M.; Velez, F. J.; C. Loss; R. Salvado; P. Pinho; Gonçalves, R.; **Carvalho, N.B.C.**; "Spectrum Opportunities for Electromagnetic Energy Harvesting from 350 MHz to 3 GHz", Proc URSI Seminar of the Portuguese Committee, Lisbon, Portugal, Vol. -, pp. - - -, November, 2013.
- CN37.** Gonçalves, R.; **Carvalho, N.B.C.**; Pinho, P.; "Investigation into cork substrate printed antennas for RFID applications", Proc URSI Seminar of the Portuguese Committee, Lisboa, Portugal, Vol. -, pp. - - -, November, 2013.
- CN38.** Gonçalves, R.; **Carvalho, N.B.C.**; Pinho, P.; "RFID tags on paper substrate for bottle labelling", Proc Conf. on Electronics, Telecommunications and Computers - CETC, Lisboa, Portugal, Vol. -, pp. - - -, December, 2013.

SOFTWARE PACKAGES

S1. Nuno Borges de Carvalho, José Carlos Pedro and Paulo Jorge Silva, “Multi-tone Figures of Merit”, Version 1.0, Instituto de Telecomunicações, Universidade de Aveiro, 2000.

This software package can be downloaded from <http://www.rfglobalnet.com>, <http://www.wirelessdesignonline.com>. This software package calculates multi-tone Intermodulation (IMD) Figures of Merit, like ACPR, M-IMR, NPR and CCPR from conventional two tone IMD figures of merit, IP3. The formulas implemented on this software were published on: J. C. Pedro e N. B. Carvalho, "On the Use of Multi-Tone Techniques for Assessing RF Components' Intermodulation Distortion", IEEE Trans. on Microwave Theory and Techniques, vol. MTT-47, n° 12, pp.2393-2402, Dec. 1999.

S2. Ludimar Guenda and Nuno Borges de Carvalho, several smart phone applications related to location systems, wireless sensor networks and energy harvesting can be downloaded from the Google Store (Google Play): <http://bit.ly/zmM7li>

CITATION TO PUBLISHED PAPERS

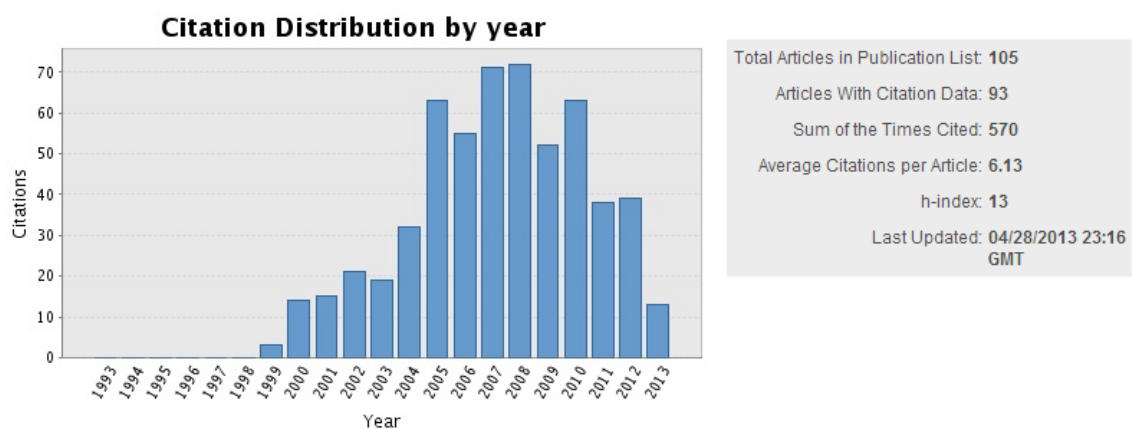
In the previous sections we identified the citations for each paper in quotes for international journals and books, the indicators used were the Thomson Reuters ISI Web of Knowledge and Google Scholar.

This section describes, in accordance with these international indicators, the number of citations to published work.

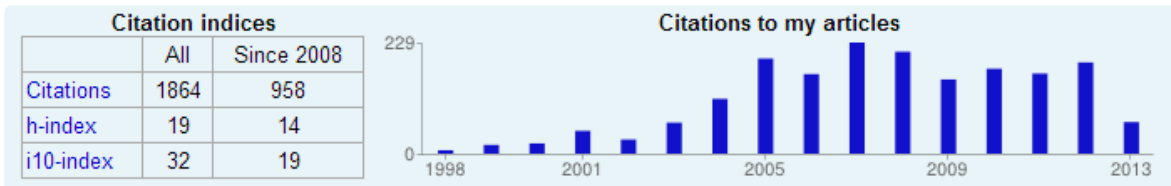
The ISI Web of Knowledge indicates 570 articles mentioning the work published by Prof. Nuno Borges Carvalho, note that these quotes are just quotes existing in this database, there may be other unaccounted. The next picture is a capture graph representing the number of citations per year. These data can be found at

<http://www.researcherid.com/rid/A-8645-2008>.

This graph shows the number of times the articles on the publication list have been cited in each of the last 20 years.
Note: Only articles from Web of Science with citation data are included in the calculations. [More information about these data.](#)



Google Scholar refers 1864 citations; note that these quotes are just quotes existing in this database. The following graph represents these values and their temporal evolution.



These values can be seen in:

<http://scholar.google.com/citations?hl=en&user=FKzPn8wAAAAJ>

COORDINATION OF RESEARCH PROJECTS

Participation in projects by Dr. Nuno Borges de Carvalho can be divided in three variants: the projects funded by Portuguese agencies, international agencies and funded or promoted by private entities.

From a basic research point of view, Prof. Nuno Borges Carvalho has been involved in projects funded by the Portuguese Science and Technology Foundation (FCT) and the European Space Agency (ESA). These projects of theoretical-scientific nature are naturally geared to the production of theory and scientific publications. One of the measures of success of such projects is the number of produced publications.

The main activities developed within these projects was focused on the study and understanding of nonlinear distortion phenomena in RF circuits and systems, typically power amplifiers, transceivers for Software Defined Radio and RF-DC converters, commonly used in RFID systems.

In this sense the work includes the analysis, instrumentation, modeling and design of RF circuits optimized both in linearity, and efficiency. In this context partnerships with international universities and laboratories were also pursued, those include: Centre of Tecnologic Telecomunicacions de Catalunya (Spain), University of Vigo (Spain), University of Cantabria (Spain), University of Alcalá (Spain), North Carolina State University, (USA), University of Leuven (Belgium), Chalmers University (Sweden), University of Gävle (Sweden) and National Institute of Standards and Technology (NIST-CO-USA).

In this context the project with the higher impact from a social point of view is the GaNSpace. In this project the outcome was to design a system for measuring GaN devices, which will be placed in space, aboard INMARSAT, in July 2013, the test board circuit is based on Gallium Nitride (GaN) and was fully developed at Universidade de Aveiro.

The industrial project sponsors are usually companies or entities in which the promoter is a company. In this type of projects the success metric is typically a prototype or a demonstrator, a patent and the publication of results in national or international conferences, in which one can promote the idea/concept and therefore use the discussion sessions to improve the development of the commercial prototype.

In this context, the projects were typically focused on the topic of radio frequency systems dedicated to specific niche markets, with a focus on location and positioning using RF signals. Some of the companies that sponsor the research work are: PTInovação, YDreams, MICRO I/O, PHILLIPS Portugal, Miguel Rios Design, MaisIs, BREEZE, Acronym, Celfinet, EFACEC, Portuguese Navy, RN2S and Cicloria Consortium.

Recently an European Project was also awarded to a consortium where the objective will be to design highly linear high power amplifiers for space applications based on GaN with power space combination.

A summary of the projects Prof. Carvalho coordinate are:

2013 - Today → IC1301 – WIPE COST Action General Chair.

Funding Entity: European Union (COST Office).

2013 - Today → GANSAT: GaN Power Amplifiers for Satellite Applications (European Union FP7-Space).

Funding Entity: European Union.

2013 - Today → CREATION: cognitive radio transceiver design for energy efficient data transmission (XCL/EEI-TEL/0067/2012).

Funding Entity: Portuguese National Science Foundation.

2013 - Today → PANORAMA II – High bit-rate Microwave Links.

Funding Entity: QREN via PTInovação.

2013 - Today → RFOVERLAY – Digital RF over Ethernet.

Funding Entity: PTInovação.

2012 - Today → WAVESYS.

Funding Entity: QREN via Wavecom.

2012 - Today → PROENERGY-WSN: Prototypes for Wireless Sensor Networks Energy Efficient and Self-sustained (PTDC/ EEATEL/122681/2010).

Funding Entity: Portuguese National Science Foundation.

2011 - Today → CICLORIA – geo-referenced multimedia tourist guide system.

Funding Entity: CICLORIA Consortium (Several City Halls: Estarreja, Ovar e Murto).

2010 - 2012 → GREENTEL

Funding Entity: PTInovação.

2010 - 2012 → TACCS - Cognitive Radios Adaptable Wireless Transceivers (PTDC/EEA-TEL/099646/2008)

Funding Entity: Portuguese National Science Foundation.

2010 - 2012 → NAPIS

Funding Entity: Portuguese Navy.

2009 - 2012 → National Delegate for COST IC0803

Funding Entity: European Union

2009 - 2012 → Virtual Responder.

Funding Entity: Portuguese National Science Foundation.

2009 - 2011 → PANORAMA.

Funding Entity: QREN.

2008 - 2011 → GaN-Space.

Funding Entity: European Space Agency.

2008 - 2010 → MBSR - Multitechnology Base Station Router.

Funding Entity: PT Inovação

2008 - 2010 → VirtualB – Indoor Person Location.

Funding Entity: PTInovação

2007 - 2008 → LOPES – Indoor Person Location.

Funding Entity: Agência de Inovação

2007 - 2010 → Large Signal Measurements for Nonlinear Behavioral Model Extraction.

Funding Entity: CRUP

2005 - 2008 → ColteMepai – Compensation of Long Term Memory Effects in Power Amplifier Intermodulation Distortion, POSC/EEA-ESE/55739/2004.

Funding Entity: Portuguese National Science Foundation.

2005 - 2006 → ViAve – DSRC system development destined to the automatic toll gate payment.

Funding Entity: BRISA.

2005 - 2006 → MusiLage – Multi-sine wave generator, IT/LA.

Funding Entity: Portuguese National Science Foundation.

2005 - 2006 → Local-WiFi

Funding Entity: PTInovação

2004 - 2005 → I-Garment

Funding Entity: European Space Agency.

2004 - 2007 → TARGET – Top Amplifier Research Groups in an European Teamwork.

Funding Entity: European Commission, 6th Framework Programme for Research, Technological Development and Demonstration.

2002 - 2006 → MEGaN – Model Extraction of GaN Transistors.

Funding Entity: Portuguese National Science Foundation.

2002 - 2005 → OALMT – Multi-carrier amplifier characterization - E-72/03.

Funding Entity: CRUP

2002 - 2005 → FindIT

Funding Entity: Agência de Inovação

2002 - 2006 → TRIVIAL - Interactive Video over Radio Links

Funding Entity: Phillips

2002 - 2004 → OPAMS –Optimum Power Amplifiers for Modulated Signals, POCTI/ESE/37531/2001.

Funding Entity: Portuguese National Science Foundation.

2000-2002 → LDMOSCA –RF MOS Low distortion circuits, ESE/34074/99-00.

Funding Entity: Portuguese National Science Foundation.

1999-2001 → LINMIX – Linearity Assessment in Active Mixers - PRAXIS/C/EEI/14160/1998

Funding Entity: Portuguese National Science Foundation.

MANAGEMENT OF RESEARCH TEAMS

Prof. Nuno Borges Carvalho is currently the coordinator of Radio Systems group at the Instituto de Telecomunicações Aveiro pole (<http://radiosystems.av.it.pt>). Radio Systems group is dedicated to the study and development of technology solutions for emerging Radio Frequency systems, focusing on systems from Software Defined Radio to Wireless Power Transmission, which have their main application in RFID systems.

The group is currently composed of six University Professors, two Postdocs and eight PhD students, plus several Masters students and Scientific Research Fellows.

To date Prof. Nuno Borges Carvalho has led and leads 13 PhD students and several MSc students (more than 30). Emphasis is placed on collaboration with foreign universities, the case of Gävle in Sweden and dissertations that were held in a business environment, in this case some collaborations can be highlighted, as: CP, NEC, ANACOM, CELFINET, ACRONYM, MICRO-I/O, PTInovação.

POS-DOC SUPERVISOR

2013 – Today

Name: Dr. Pedro Cruz

Theme: Software Defined Radio System Design

Funding Entity: National Science Foundation Award.

2010 – Today

Name: Dr. Wonhoon Jang

Theme: Software Defined Radio Transmitters

Funding Entity: National Science Foundation Award.

PHD SUPERVISOR

2011 – Today

Name: Ricardo Fenandes

Theme: Electromagnetic Energy Harvesting in Wireless Sensor Networks

Funding Entity: National Science Foundation Award
(SFRH/BD/69392/2010).

2011 – Today

Name: Sérgio Lopes

Theme: Hybrid Location in Mobile Wireless Sensor Networks based on Radio-Frequency and Inaudible Acoustic Signals

Funding Entity: IEETA.

2011 – Today

Name: Ludovico Bolas

Theme: Militar Cognitive Radio Applications

Funding Entity: Portuguese Navy.

2011 – Today

Name: Alírio Boaventura

Theme: Efficient Microwave Power Transmission for RFID and Energy Harvesting Systems

Funding Entity: National Science Foundation Award (SFRH/BD/80615/2011).

2010 – Today

Name: Zhansheng Liu

Theme: Research on Nonlinearities in Radio over Fiber Systems

Funding Entity: National Science Foundation Award (SFRH/BD/68376/2010).

Defesa Prevista em: 2013

2010 – Today

Name: José Pedro Borrego

Theme: Análise de SisTemes Não Lineares Sujeitos a Sinais Transientes

Funding Entity: ANACOM.

2009 – Today

Name: Luis Brás

Theme: Indoor Location Systems

Funding Entity: National Science Foundation Award (SFRH/BD/61834/2009).

2008 – Today

Name: Nelson Silva

Theme: Reconfigurable Architectures for Software-Defined Radios

Funding Entity: National Science Foundation Award (SFRH/BD/76807/2011).

2008 – 2013

Name: Pedro Cruz

Theme: Software Defined Radio System Design

Funding Entity: National Science Foundation Award.

2007 – 2011

Name: Hugo Cravo Gomes

Theme: Study of the Impact of Nonlinear Distortion in Radio Reception Architectures

Funding Entity: National Science Foundation Award (SFRH/BD/39440/2007).

2002 – 2006

Name: Pedro Miguel Cabral

Theme: Nonlinear Modelling of Power Transistors for RF and Microwaves

Funding Entity: National Science Foundation Award.

2002 – 2006

Name: Pedro Miguel Lavrador

Theme: Contribution to the Study of the Impact of Nonlinear Distortion in Telecommunications Systems

Funding Entity: National Science Foundation Award.

MSC SUPERVISOR (PRÉ-BOLOGNA PROCESS)

2005 – 2006 - Hugo Gomes - RFID for Location Purposes

2006 – 2007 - Rui Estanqueiro Santos - Nonlinear Distortion in Wireless Systems

2006 – 2006 - Charles Nader - PA for WiMax Applications

2006 – 2006 - Paul Saad - PA for Wi-Fi Applications

2005 – 2006 - Pedro Miguel Claro - Local positioning System based on Wi-Fi Networks

2002 – 2004 - João Paulo Martins - Study techniques for linearization of RF Devices

2001 – 2003 - António José Duarte Figueiredo Guilherme dos Santos – Location of Trains via Radio Signals

MSC SUPERVISOR (POS-BOLOGNA PROCESS)

2011 – 2012 - João Condeço - Commercial Radios Online

2011 – 2012 - Fábio Rico - Location and Communication System for the Universidade de Aveiro

2011 – 2012 - Luís Dias - Electromagnetic Energy Harvesting Systems

2011 – 2012 - Emanuel Santana – Geo referenced systems using Android phones

2010 – 2011 - Carlos Pereira - Geo referenced systems using Android phones

2010 – 2011 - Mariana Cascalheira – Indoor navigation systems for blind people

2010 – 2011 - Diana Teixeira - Indoor navigation systems for blind people

2010 – 2011 - Diogo Ribeiro – Instrumentation of the characterization of Software Defined Radio

2010 – 2011 - José Pedro Magalhães – Using the human cochlea concept for Software Defined Radio design

2009 – 2010 - Vanessa Silva – M2M using GSM approaches

2009 – 2010 - Diogo Condeço – Museum tracking system

2009 – 2010 - Teófilo Monteiro – radio receiver based in the human cochlea

2008 – 2009 - Paulo Saraiva - Vitaljacket : location

2008 – 2009 - João Lima – Remote processing units

2008 – 2009 - Abílio Neves – Remote interaction using FPGA's

2008 – 2009 - Nuno Bonifácio – Wireless Power Transmission

2008 – 2009 - Luís Brás – Location systems based on wireless sensor networks

2008 – 2009 - Alírio Boaventura – RFID reader for 13MHz

2008 – 2009 - Ludimar Guenda – Location system based on M2M modules

2007 – 2008 - Gonçalo Martins - Co-location of Wireless Systems in a Mobile Infrastructure

2007 – 2008 - Ruben Ferreira - Epistemic Radios

2007 – 2008 - Sónia Luís - Military Wireless Interference

2007 – 2008 - Pedro Cruz - Nonlinear Distortion in ADC Systems

2007 – 2008 - Pedro Sá - Project of a Satellite Payload RF front end

2006 – 2007 - Manuel Baptista - Identification of Modulated Signals from Spectrum and Time Waveforms

2006 – 2007 - José Pedro Borrego - Passive Intermodulation in Wireless Communication Scenarios

2006 – 2007 - Pedro Prata - RFID for Warehouses Applications

2006 – 2007 - Sérgio Pires - Impact of non-ideal channels in UWB Systems

RESEARCH FELLOWSHIP SUPERVISING

2011 – 2012 → Fellowship Research Supervising of Diana Teixeira related to the research project TICE-Rádio.

2011 – 2012 → Fellowship Research Supervising of Mariana Cascalheira related to the research project Greentel.

2011 – 2012 → Fellowship Research Supervising of Diogo Ribeiro related to the research project TACCS.

2008 – 2012 → Fellowship Research Supervising of Ludimar Guenda related to the research project Napis.

2011 – 2011 → Fellowship Research Supervising of Daniel Morais related to the research project Napis.

2009 – 2010 → Fellowship Research Supervising of Miguel Bergano related to the research project Panorama.

2009 – 2010 → Fellowship Research Supervising of Luís Silva related to the research project Panorama.

2008 – 2011 → Fellowship Research Supervising of Marco Oliveira related to the research project Napis.

2008 - 2008→ Fellowship Research Supervising of Marco Araújo related to the research project Virtual- Boundaries.

2008 - 2008→ Fellowship Research Supervising of Hugo Mostardinha related to the research project GaN-Space.

2008 - 2008→ Fellowship Research Supervising of Pedro Miguel Sá related to the research project GaN-Space.

2007 - 2008→ Fellowship Research Supervising of Arnaldo Oliveira Martins related to the research project LOPES.

2005 - 2007→ Fellowship Research Supervising of Rui Estanqueiro Santos related to the research project ColteMepai.

2005 - 2007→ Fellowship Research Supervising of Rui Estanqueiro Santos related to the research project Musilage.

2005 - 2006→ Fellowship Research Supervising of João Paulo Martins related to the research project ColTemepai.

2002 - 2005→ Fellowship Research Supervising of João Paulo Martins related to the research project OPAMS.

2000 – 2001→ Fellowship Research Supervising of João Paulo Martins related to the research project LDMOSCA.

IMPACT IN TECHNICAL AND INDUSTRY COMMUNITIES

Prof. Nuno Borges Carvalho had an impact on technical and industry communities around the world, these activities are mainly devoted to management and coordination of knowledge in their areas of specialty, mainly RF and Microwave circuits and systems.

In this sense it has been called to perform many different activities for review and editing journals nationally and internationally. Internationally the most important societies such as the IEEE (Institute of Electrical and Electronics Engineers), IOP (Institute of Physics), URSI (Union Radio Scientifique Internationale) or IET (The Institution of Engineering and Technology) have requested periodically reviewing of several scientific articles in various areas of knowledge within the scientific area of radio communications.

At the editorial level he belonged to several committees, including Technical Program Committees of the major conferences on his area, such as the European Microwave Conference or the International Microwave Symposium. He was also the guest editor for special issues of IEEE Transactions on Microwave Theory and Techniques, the IEEE Microwave Magazine and IEEE Journal of Emerging Technologies on Circuits and Systems he is currently Associate Editor for the IEEE Microwave Magazine.

Moreover he was responsible for proposing and coordinating several successful workshops in IEEE International Microwave Symposiums, with a high number of participants and was Chair or Vice-Chair of international conferences with the support of the IEEE.

In the context of international commissions he is Chair of the IEEE-MTT-11 Committee (Microwave Measurements). He belongs to the IEEE - MTT-20 (Wireless Communications MTT-20), IEEE - MTT-24 (RFID), and IEEE - MTT-26 (Wireless Power Transmission).

He is the current coordinator of the A-commission from URSI Portugal, the Vice-chair of the IEEE MTT/AP/ED Portuguese chapter and the Chair of the IEEE Portuguese Section.

ORGANIZATION OF INTERNATIONAL EVENTS

January 2012

Event: Winter School on the Technology Challenges for the Internet of Things

Position: Chair

Location: Centro de Congressos, Aveiro

January 2012

Event: Workshop on the Future of Radio

Position: Chair

Location: IT-Aveiro, Aveiro

December 2011

Event: Workshop on White Space Technologies (with Rhode and Schwarz)

Position: Chair

Location: IT-Aveiro, Aveiro

November 2011

Event: Workshop on Space Technologies & Synergies with Technological Poles

Position: Co-Chair

Location: IT-Aveiro, Aveiro

June 2011

Event: Workshop on “Practical Compression, IMD, Load Pull and Behavioral Modeling Measurements”

Position: Chair

Location: International Microwave Symposium, 2011, Baltimore, USA

June 2011

Event: Workshop on “Wireless Sensor Network Technologies for Emerging Applications”

Position: Chair

Location: International Microwave Symposium, 2011, Baltimore, USA

March 2011

Event: Software Defined Radio Short Course

Position: Chair

Location: Universidade de Aveiro

Fevereiro 2010

Event: IEEE International Microwave Workshop Series on “RF Front-ends for Software Defined and Cognitive Radio Solutions”

Position: Chair

Location: Reitoria da Universidade de Aveiro, Aveiro

Fevereiro 2010

Event: COST IC-0803 Workshop

Position: Chair

Location: Reitoria da Universidade de Aveiro, Aveiro

June 2008

Event: Workshop on “Measurements for Wireless System-Level Evaluation”

Position: Chair

Location: International Microwave Symposium, 2008, Atlanta, USA

June 2006

Event: Workshop on “Memory Effects in Power Amplifiers”

Position: Principal Chair

Location: International Microwave Symposium, 2006, San Francisco, USA

January 2006

Event: International Workshop on Integrated Nonlinear Microwave and Millimetre-Wave Circuits

Position: Co-Chair

Location: Reitoria da Universidade de Aveiro, Aveiro

EDITORIAL ACTIVITIES

2013 - Today

Position: Associate Editor

Journal: IEEE Transactions on Microwave Theory and Techniques

Site: <http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=22>

2013

Position: Guest Editor

Journal: IEEE Journal on Emerging and Selected Topics on Circuits & Systems (JETCAS)

Theme: Special Issue on: “Advanced Circuits and Systems for CR/SDR Applications”, with Dr. Roberto Gomez-Garcia, Prof. Fadhel M. Ghannouchi, Prof. Howard C. Luong.

Site : http://jetcas.polito.it/JETCAS_CFP-Advanced_Circuits_and_Systems_for_CR-SDR_Applications.pdf

2012 - Today

Position: Steering Committee

Conference: Radio and Wireless Week Conference 2013

Site: <http://www.radiowirelessweek.org/>

2011 - Today

Position: Associate Editor

Journal: IEEE Microwave Magazine

Site: <http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=6668>

2010 - Today

Position: Technical Program Committee

Conference: Radio and Wireless Week Conference

Site: <http://www.radiowirelessweek.org/>

2010 - Today

Position: Technical Program Committee

Conference: ARFTG

Site: <http://www.arftg.org/>

2009 - Today

Position: Editorial Advisory Board

Journal: Journal of Sensors & Transducers

Site: http://www.sensorsportal.com/HTML/DIGEST/Editorial_board.htm

2010 - Today

Position: Editorial Board

Journal: International Journal of Microwave Science and Technology

Site: <http://www.hindawi.com/journals/ijmst/editors/>

2011

Position: Publicity Chair

Conference: IEEE International Conference on RFID-Technology and Applications (RFID-TA2011) – Barcelona - Spain

Site: http://ewtw.cttc.es/images/Cfp/cfp_rfidta.pdf

2010

Position: International Advisory Committee

Conference: IEEE MTT-S International Microwave Workshop Series On IEEE Intelligent Radio for Future Personal Terminals – Daejeon - Korea

Site : http://imws2011.kaist.ac.kr/images/Final_Program.pdf

2008-Today

Position: Technical Program Review Committee

Conference: IEEE International Microwave Symposium

Site : <http://www.mtt.org>

2009-Today

Position: Technical Program Review Committee

Conference: European Microwave conference

Site: <http://www.eumweek.com/>

2006

Position: Guest Editor

Journal: IEEE Transactions on Microwave Theory and Techniques

Theme: Special Issue devoted to Microwave Measurements, “Measurements for Large-Signal Characterization and Modeling of Nonlinear Analog Devices, Circuits, and Systems”, with Dr. Kate Remley - NIST and Dr. David Root - Agilent

Site : <http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=01668329>

2004

Position: Technical Program Committee

Conference: 4ª Conferência Nacional de Telecomunicações

1999-Today

Position: Reviewer Board

Conference: IEEE Transactions on Microwave Theory and Techniques

REVISION ACTIVITIES

JOURNALS

- Institution of Physics Measurement Science and Technology Magazine.
- IEEE Transactions on Communications.
- IEEE Transactions on Microwave Theory and Techniques.
- IEEE Transactions on Circuit and Systems.
- IEEE Transactions on Intelligent Transport Systems.
- IEEE Microwave and Wireless Components Letters.
- IEEE Transactions on Electronic Design.
- IEEE Transactions on Neural Networks.
- Transactions on Signal Processing, Elsevier.
- International Journal of RF and Microwave Computer-Aided Engineering.
- Journal on Emerging and Selected Topics on Circuits & Systems (JETCAS)

CONFERENCES

- IST-Mobile Summit 2003
- Conftele 2003, 2005, 2007, 2009
- PIMRC 2005 e 2006
- “Journées Nationales Microondes 2001”, Poitiers, França.
- TPRC (Technical Program Review Committee) da European Microwave Conference
- TPRC (Technical Program Review Committee) da International Microwave Symposium, IMS
- International Workshop on Integrated Nonlinear Microwave and Millimetre-Wave Circuits

- Automatic RF Techniques Group Conference

INVITED LECTURES

- CC.1** **N. B. Carvalho**, “The Effects of Nonlinear Distortion in Radio Systems”, As Telecomunicações para a Today Década, Universidade de Aveiro, Apr., 2001.
- CC.2** **N.B.Carvalho**, “Como Funcionam os Telemóveis”, Universidade de Aveiro, 2001, 2002.
- CC.3** **N.B.Carvalho**, “O Mundo sem Fios”, Universidade de Aveiro, 2003.
- CC.4** **N.B.Carvalho**, “Memory Effects in Power Amplifiers”, 2006 RF and Microwave Electronics Meeting, Lisboa.
- CC.5** **N.B.Carvalho**, “The Importance of Radio Metrology for Health Impact Evaluation”, 1.º Portuguese URSI Committee, Lisboa, 2007.
- CC.6** **N.B.Carvalho**, “Peak to Average Power Ratio”, 2007 RF and Microwave Electronics Meeting, Aveiro.
- CC.7** **N.B.Carvalho**, “Hardware/Physical Problems in Security”, WinSys – International Conference on Wireless Information Networks and Systems, Porto, 2008
- CC.8** **N.B.Carvalho**, “The importance of Metrology in Wireless Communication Systems (From AM/FM to SDR Systems)”, Keynote Speaker - International Conference on Wireless Information Networks and Systems, Porto, 2008
- CC.9** **N.B.Carvalho**, ”O Rádio do Futuro”, Rádio em Congresso, Lisboa, Mar., 2011
- CC.10** **N.B.Carvalho**, ”RFID Technologies: Status and Challenges”, Panel session on RFID-TA, Barcelona, Sep., 2011
- CC.11** **N.B.Carvalho**, ”As Comunicações Rádio no Futuro”, Wireless Inovation, Aveiro, Oct., 2011
- CC.12** **N.B.Carvalho**, ” Electromagnetic Energy Harvesting Systems”, Keynote Speaker Conference on Electronics, Telecommunications and Computers, Lisboa, Nov., 2011
- CC.13** **N.B.Carvalho**, ”Sistemas de Transmissão de Energia”, Ordem dos Engenheiros Sul, Lisboa, Nov., 2011

PHD JURY PARTICIPATION

Dec., 2011 → Pedro Mota PhD defense, with the theme “In-circuit Test and Linearization of RF Power Amplifiers”, Faculdade de Engenharia da Universidade de Porto, Supervisor: José Machado da Silva.

2009 → Jorge dos Santos Freitas de Oliveira, PhD defense, with the theme “Análise de Comportamentos Multi-Ritmo em Sistemas Electrónicos”, Universidade de Aveiro, Supervisor: José Carlos Pedro.

Aug., 2008 → Mestre Maciej Myslinski, PhD defense, with the theme “Using Modulated Signals for the Validation and Construction of Nonlinear Behavioral Models for Microwave Components”, KU Leuven, Leuven, Belgium, Supervisor: Dominique Schreurs.

Dec., 2007 → Manuel de Jesus Ferreira Dinis, PhD defense, with the theme “Desempenho de um sistema Celular na Banda Larga na Faixa dos 40GHz”, Universidade de Aveiro, Supervisor: José Carlos Neves

Nov., 2005 → Emigdio Malaver, PhD defense, with the theme at Universidade de Cantabria, Santander, Spain, Supervisor: José Angel Garcia.

R&D COMMITTEE MANAGEMENT

2012 – Today → Chair of IEEE-MTT-11 (Microwave Measurements <http://www.mtt-archives.org/~mtt11/>)

2013 – Today → Vice-chair of IEEE MTT/AP/ED Portuguese chapter.

2012 – Today → IEEE-MTT-24 committee member (RFID)

2012 – Today → IEEE-MTT-26 committee member (WPT)

2010 – 2012 → Vice-Chair of IEEE-MTT-11 (Microwave Measurements)

2010 – 2013 → Chair of IEEE MTT/AP/ED Portuguese chapter.

2010 – Today → IEEE-MTT-20 committee member (Wireless Communications <http://www.mtt-archives.org/~mtt20/>)

2007 – Today → Chair A-committee A, URSI Portugal.

2007 – 2010 → Management of the IEEE-MTT-11 webpage.

2007 – 2010 → Vice-chair do IEEE MTT/AP/ED Portuguese chapter.

PRIZES

Prof. Nuno Borges Carvalho has won awards both at nationally and internationally level.

Dec. 2011 → First place with the work “Sistemas de Sensores Passivos”, at Fraunhofer Portugal Challenge, awarded to the PhD student Ricardo Fernandes.

Dec. 2010 → First place with the work “Rádio do Futuro”, at the PLUG 2010 sponsored by APRITEL – The association of Portuguese Telecom Operators, to the TACCS project, where Nuno Borges de Carvalho is the principal investigator.

Dec. 2007 → Second place to the work MBSR - Multitechnology Base Station Router, sponsored by PTInovação.

May 2004 → Second place to the work Local-WiFi., sponsored by PTInovação

06 de Dec. de 2000 → IEE 2000 Measurement Prize, sponsored by IEE – The Institute of Electrical Engineers.

20 de Jun. de 1998 → Third place at the student paper competition in the International Microwave Symposium, IMS, 1998.

1995 – 1997 → PhD Grant from JNICT (Portuguese National Science Foundation) PRAXIS XXI/BD/5630/95.

07 de Oct. de 1996 → Eng^o Ferreira Pinto Basto Prize, sponsored by ALCATEL PORTUGAL to the best student in the “Licenciatura em Engenharia Electrónica e Telecomunicações”.

15 de Jun. de 1996 → Prize to the best engineering student in the Universidade de Aveiro, sponsored by the Portuguese Engineering Association..

KNOWLEDGE TRANSFER

PORTUGUESE PATENT

PN1. Patent pending registered Dec. de 2011 – 106073 – “ Sistema de Guia Multimédia Baseados em Navegação Multi-Tecnologia”

Inventors: Nuno Borges de Carvalho, Ludimar Guenda e Diogo Miguel do Céu Condeço.

PN2. Patent pending registered Jul. de 2011 – “SisTheme de Seguimento (Tracking) Utilizando Fotografias Georreferenciadas”

Inventors: Nuno Borges de Carvalho, Ludimar Guenda e Fábio Ferreiro.

PN3. PATENTE DE INVENÇÃO NACIONAL Nº 102521– “Sistema de Medida de Distorção Não Linear Co-Canal”, Boletim da Propriedade Industrial, Apêndice do Diário da República de Terça Feira, 30 de Apr. de 2002, Pages1438,

Inventors: Nuno Borges de Carvalho e José Carlos Pedro.

PN4. PATENTE DE INVENÇÃO NACIONAL Nº 103590 - "Método Para Localizar Pessoas ou Objetos Usando uma Rede Sem Fios", Boletim da Propriedade Industrial, Apêndice do Diário da República de 22 de Dec. de 2008, Pages 17,

Inventors: Nuno Borges Carvalho, Pedro Miguel Claro e Mário Rui Santos

INTERNATIONAL PATENTS

PIN1 International Patent Nº 103616 – “Integrated System for Multichannel Monitoring and Communication in the Management of Rescue Teams”

Países: AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LI, LU, LT, LV, MC, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR

Inventors: Nuno Borges Carvalho, Tiago Fonseca e Miguel Rios

COLLABORATION WITH SPIN OFF COMPANIES

As part of its activities in projects related to companies Prof. Nuno Borges Carvalho has collaborated and encouraged the creation of several spin off companies from the Universidade de Aveiro, the collaboration was usually as a consultant or as an expert.

Some of these companies have been or are chaired by former students, some of whom used the knowledge gained in the group to develop activities of a professional nature, two of those most important cases were: RN2S, who used a software package originally produced at the Instituto de Telecomunicações and ThinkIT where one of its products was based on the patent " Tracking system Using Georeferenced Photos".

The list of companies with closer collaborations is:

ThinkIT – Information Technologies

website: thinkit.pt.vu/

RN2S, LDA

website: www.escutar.eu/

IUZ, TECHNOLOGIES, LDA

website: www.iuz.pt

BE.UBI

website: <http://www.beubi.com>

Formiga Urbana - PRODUTOS DIGITAIS, UNIPESOAAL LDA

website: www.formigaurbana.com/

ECOINSIDE- Soluções em ecoeficiência e sustentabilidade, LDA

website: www.ecoinside.pt/



PROFESSOR NUNO BORGES CARVALHO

Full Professor

Instituto de Telecomunicações – Pólo de Aveiro
Departamento de Electrónica, Telecomunicações e Informática
Universidade de Aveiro
Portugal