Short Curriculum Vitae

Marco Di Renzo, Ph.D., H.D.R.

Laboratoire des Signaux et Systèmes (L2S) – UMR 8506
Université Paris-Saclay
Centre National de la Recherche Scientifique (CNRS)
CentraleSupélec – Université Paris-Sud
Plateau du Moulon 91192 Gif-sur-Yvette CEDEX
Paris, France

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Personal Information
Full name: Marco DI RENZO   *Birth date*: 1 March 1978 (39 years old)
Citizenship: Italian (born in L'Aquila, Italy)   *Residence*: France (Paris)

Current Employer
Centre National de la Recherche Scientifique (CNRS)
Laboratoire des Signaux et Systèmes (UMR-8506)
CentraleSupelec – Plateau du Moulon
91192, Gif-surYvette - France

Academic Qualifications
- October 2013: <u>HDR (French Habilitation) in Wireless Commun. Theory, Univ. Paris-Sud XI, France</u>. Title: "Analysis & Design of Heterogeneous Wireless Networks: A Communication-Theoretic Perspective". Committee: P. Duhamel, M. Alouini, G. Karagiannidis, P. Ciblat, N. Beaulieu, M. Haenggi, P. Loubaton, C. Le Martret.
- January 2007: <u>Ph.D. degree (3 years) in Electrical and Information Engineering, University of L'Aquila, Italy</u>. Title: "Physical Layer Design of Ultra-Wide Band Wireless Communications: Channel Modeling, Detection and Synchronization". Advisors: Fortunato Santucci and Fabio Graziosi.
- April 2003: <u>Laurea degree (5 years) in Electronic Engineering (major in wireless communications), University of L'Aquila, Italy</u> (summa cum laude and special mention for the outstanding academic career).

Employment History
- 2017-present: <u>Chargé de Recherche Titulaire CNRS (CRCN)</u>, Paris-Saclay University (CNRS-CentraleSupelec-Univ. Paris-Sud XI), Paris, France. Position equivalent to Tenured Associate Professor in the US academic system.
- 2014-2016: <u>Chargé de Recherche Titulaire CNRS (CR1)</u>, Paris-Saclay University (CNRS-CentraleSupelec-Univ. Paris-Sud XI), Paris, France. Position equivalent to Tenured Associate Professor in the US academic system.
- 2011-2013: <u>Chargé de Recherche Titulaire CNRS (CR2)</u>, Paris-Saclay University (CNRS-CentraleSupelec-Univ. Paris-Sud XI), Paris, France. Position equivalent to a Tenured Assistant Professor in the US academic system.
- 2010: <u>Chargé de Recherche CNRS (CR2)</u>, Paris-Saclay University (CNRS-CentraleSupelec-Univ. Paris-Sud XI), Paris, France. Position equivalent to Tenure-Track Assistant Professor in the US academic system.
- 2004-present: <u>Co-founder, Chief Scientific Officer - Wireless Communication Research</u>, Wireless Embedded System Technologies, (Spinoff Company of the Univ. of L'Aquila created from his doctoral research activities).
- 2009-2010: <u>Research Fellow</u>, University of Edinburgh (IDCOM), Edinburgh, UK.
- 2008-2009: <u>Tenured Researcher</u>, Catalan Telecommunications Technological Center (CTTC), Barcelona, Spain.
- 2007: <u>Postdoctoral Fellow</u>, University of L'Aquila, Italy.
- Fall 2006: <u>Visiting Scholar</u>, Virginia Tech, Wireless@VT, USA.
- <u>Invited Visiting Researcher</u> at many universities: York University, Canada (5 weeks in 2015), Queen's University Belfast (1 month in 2015), University of Edinburgh, UK (1 month in 2010 & 2011), University of Qatar and Texas A&M University, Qatar (1 month in 2012). Several short visits in Europe, UK, USA, Australia, Asia (China), etc.

Awards and Distinctions (last five years)
For research activities and service to the scientific community, he received the following distinctions:
- 2017: <u>SEE-IEEE Alain Glavieux Award</u>. He received this award with the following citation: "***For outstanding results in developing several mathematical abstractions (for mobile network modeling), innovating ideas, as well as demonstrating their usefulness in future wireless communications systems***".
- 2017: <u>Associate Editor-in-Chief of the IEEE Communications Letters</u>. Appointed by the Editor-in-Chief and the Publications Board of the IEEE Communications Society after 5 years of service as an Editor.
- 2017: <u>Editorial Board of IEEE Transactions on Wireless Communications</u>. This recognizes him as a major expert in the field of Stochastic Geometry modeling of wireless networks.
- 2017: <u>Visiting Professor, University of L'Aquila, L'Aquila</u>. For research contributions on Spatial Modulation and Stochastic Geometry modeling of communication networks.
- 2017: <u>Adjunct Professor, University of Technology Sydney, Australia</u>. For research contributions on Spatial Modulation and Stochastic Geometry modeling of communication networks.
- 2016: <u>IEEE Transactions on Communications Exemplary Reviewer Award</u>. In recognition of the high-quality of his reviews during the previous calendar year. Only the 3% of the reviewers receives such a distinction.
- 2016: <u>Marie Curie Global Fellowship</u> (European Commission, H2020) for conducting research in Canada on Molecular Communication. One of the most selective research fellowships, which he ***declined*** in order to continue his research activity in France and to take the coordination of two EU-funded projects. The L2S provided him with research funding for allowing him to conduct research on the topic and for long visiting periods in Canada.

2016: Distinguished Lecturer, IEEE Communications Society for research on Spatial Modulation and Stochastic Geometry. A major distinction from the Communication Society that is bestowed based on research achievements.
2016: Distinguished Lecturer, IEEE Vehicular Technology Society for research on Spatial Modulation and Stochastic Geometry. A major distinction from the IEEE Society that is bestowed based on research achievements.
2016: Best Paper Award, 2017 IEEE SigTelCom. The paper is the first providing a stochastic geometry framework to assess the energy harvesting potential of millimeter-wave frequencies compared to conventional bands.
- 2015: CNRS Award for Excellence in Research and in Advising Doctoral Students. It is given to a very limited number of French-based researchers and professors and it is based on the international research impact (awards, citations) created and on the effectiveness and number of doctoral students supervised in the previous 5 years.
- 2015: IEEE Jack Neubauer Memorial Award. Best distinction from the IEEE Vehicular Technology Society for his paper "Bit Error Probability of SM-MIMO over Generalized Fading Channels", as the Best System paper published in IEEE Trans. Veh. Tech. based on citations (>200) and impact created on Spatial Modulation research.
- 2015: Best Paper Award, 2015 IEEE ComManTel. The paper is the first providing a stochastic geometry modeling of uplink cellular networks with interference-aware power control and unveiling fundamental trade-offs.
- 2014: IEEE Top 100 Most Downloaded Paper & Highly Cited Paper from ISI Web of Science. The paper "Spatial Modulation for Generalized MIMO" (Proc. of the IEEE, Jan. 2014) appears in the list of the most downloaded papers for more than 20 months and received enough citations to place it in the top 1% of its academic field.
- 2014: Inducted into Faculty Row, America's Top Professors. A major distinction bestowed to the best researchers and professors. It is possible to join only based on an invitation from peers and after passing a vetting process with the Faculty Row Admissions Director who determines the eligibility of the candidate for admission.
- 2014: IEEE Wireless Communications Letters Exemplary Reviewer Award. In recognition of the high-quality of his reviews during the previous calendar year. Only the 3% of the reviewers receives such a distinction.
- 2014: Best Paper Award, 2014 IEEE CAMAD. The paper is the first providing a stochastic geometry modeling of relay-aided cellular networks in the presence of other-cell interference and proving fundamental trade-offs.
- 2014: Best Demo Award, 2014 IEEE CAMAD. We built a complete and fully-functional testbed for telemedicine applications, which include advanced communication protocols based on cooperation and network coding.
- 2014: Best Paper Award, 2014 IEEE ATC. The paper is the first providing a complete and general mathematical characterization of the achievable diversity order of cooperative wireless networks with network coding.
- 2014-2015: Royal Academy of Engineering Distinguished Visiting Fellowship, UK. The most prestigious award for a visiting researcher. Usually awarded to senior researchers. It is rare that a 36 years old researcher gets it.
- 2014: IEEE ComSoc Best Young Researcher Award for Europe, Middle East & Africa Region (EMEA). This is the most prestigious award for a researcher under the age of 35 years and working in the field of Communication Theory (IEEE Communications Society) in an academic/research organization based in the EMEA region.
- From January 2014: Most downloaded paper. For more than 20 months, the paper "Spatial Modulation for Generalized MIMO" published in the Proceedings of the IEEE has been appearing in the TOP-100 list of the most downloaded papers of all IEEE papers (more than 4 million papers are available in IEEE Xplore) and it has been either the second or the third most downloaded paper of the TOP-25 list of papers published in the Proceedings of the IEEE in the same period. In this short period of time, it has collected 550+ Google Scholar citations.
- 2014: Elevated to the grade of Senior Member of the IEEE, a recognition that acknowledges his international research excellence. It is bestowed only to researchers who have made significant contributions to the profession.
- 2014: Single Best Paper Award Nomination, 2014 IEEE ICNC (Wireless Communications Symposium). The paper is the first on the mathematical analysis of Spatial Modulation in ad hoc networks using stochastic geometry.
- 2014: Editorial Board of the IEEE Transactions on Communications - Editor of the IEEE Communications Society for Heterogeneous Networks Modeling and Analysis. This recognizes him as a major worldwide expert in the field of Stochastic Geometry modeling of wireless networks. At present, he is the only Editor of the journal for this research topic. Only 20 Editors are appointed in the "Wireless Communications" research area.
- 2013: Best Paper Award, Network of Excellence in Wireless Communications (NoE-NEWCOM#). The paper is on an innovative mathematical methodology to the analysis of heterogeneous networks using Stochastic Geometry. Award committee: M. Medard, MIT, USA; P. Djuric, Stony Brook Univ., USA; B. Ottersten, KTH, Sweden.
- 2013: IEEE Transactions on Vehicular Technology Top Reviewer Award. In recognition of the high-quality of his reviews during the previous calendar year. Only three awardees (he ranked first) out of thousands of reviewers.
- 2013: Best Paper Award, 2013 IEEE VTC-Fall. The paper is the world's first substantiating the performance of Spatial Modulation with the aid of channel measurements taken in a dense urban European city (Bristol in the UK).
- 2012: IEEE Wireless Communications Letters Exemplary Reviewer Award. In recognition of the high-quality of his reviews during the previous calendar year. Only the 3% of the reviewers receives such a distinction.
- 2012: Best Paper Award, 2012 IEEE CAMAD. The paper is on energy efficient design of cognitive networks.
- 2012-2017: Editorial Board of the IEEE Communications Letters. Appointed based on his expertise on communication theory and Spatial Modulation. He was the designated Editor for papers related to Spatial Modulation and Stochastic Geometry modeling of communication networks.

- 2011-now: The paper "Spatial Modulation for Multiple-Antenna Wireless Systems: A Survey" published in the IEEE Communications Magazine (December 2011 issue) appeared in the <u>TOP-10 list of the most popular articles of all IEEE-ComSoc periodicals</u> in December 2011 and in the <u>TOP-25 list of the most downloaded papers published in the IEEE Communications Magazine</u> (December 2011 – February 2012). Until December 2013, it was the only survey paper on Spatial Modulation, having currently collected 400+ Google Scholar citations.
- 2011-now: Several papers on Spatial Modulation and Stochastic Geometry appeared in the <u>TOP-25 lists of the most downloaded papers of the IEEE journals where they were published</u> (based on IEEE Xplore).
- Before 2011: He received many awards as a student/researcher, including the Special Mention for the outstanding 5-year (1997-2003) academic career & the THALES Commun. Ph.D. fellowship (2003-2006), Univ. of L'Aquila, Italy; the 2004 Best Spin-Off Company Award, Abruzzo Province, Italy; the 2008 Torres Quevedo Award, Ministry of Science, Spain; the "Dérogation pour l'Encadrement de Thèse" (2010), Univ. Paris-Sud XI, France.
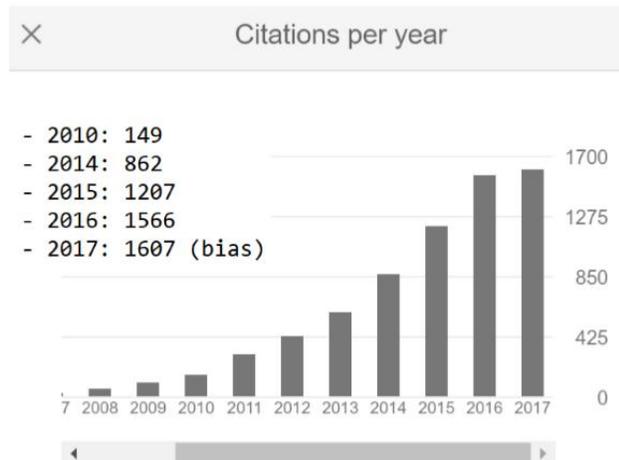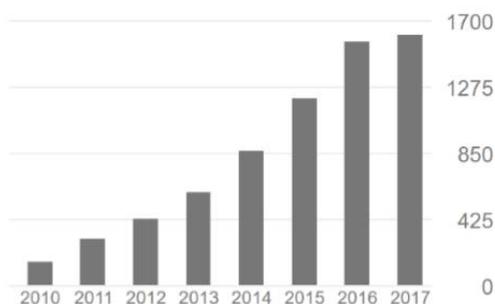
Research Record (Publications)

The table below summarizes the number of papers that he has authored. All papers have been peer-reviewed by Editorial Boards and Technical Program Committees. Almost all papers are published in journals and conferences technically sponsored by the IEEE. The figure shows the number of citations (Google Scholar, Dec. 2017). His Google Scholar profile is available here: http://scholar.google.fr/citations?user=5dRt0OoAAAAJ&hl=en&oi=ao.

Journals	Conferences	Patents	Book Chapters	Tutorials
115 (+10 submitted)	170 (+5 submitted)	3	14 (+0 submitted)	44 (+5 submitted)
2014-2017	2014-2017	2014-2017	2014-2017	2014-2017
72 published/to appear	61 published/to appear	0	7 published	38 given/accepted

Cited by

	All	Since 2012
Citations	6992	6295
h-index	43	41
i10-index	136	126

Citations per year
- 2010: 149
- 2014: 862
- 2015: 1207
- 2016: 1566
- 2017: 1607 (bias)

Note: For brevity and to be focused, the complete list of publications of the candidate is not reported in this short CV. Only a few relevant (journal) papers (5 at most) that describe the candidate's research activity in the period 2011-2017 years are listed below. The complete list of publications is available in the dedicated file.

1) Stochastic Geometry Research

In the context of **Stochastic Geometry** modeling and analysis of networks, he has published 20+ journal papers in less than 2 years and others are under review in IEEE journals. Recently, he has been lecturing all around the world on this topic and has started several national and international collaborations. He has developed new methodologies for the analysis of heterogeneous cellular networks that account for the statistical distribution of the interference obtained through Stochastic Geometry modeling. Relevant journal papers are as follows.
- M. Di Renzo et al., "Average Rate of Downlink Heterogeneous Cellular Networks over Generalized Fading Channels – A Stochastic Geometry Approach", IEEE Trans. Commun., Vol. 61, No. 7, pp. 3050–3071, July 2013.
- M. Di Renzo et al., "Stochastic Geometry Modeling and Performance Evaluation of MIMO Cellular Networks by Using the EiD-Based Approach", IEEE Trans. Commun., Vol. 63, No. 3, pp. 977-996, Mar. 2015.
- M. Di Renzo, "Stochastic Geometry Modeling and Analysis of Multi–Tier Millimeter Wave Cellular Networks", IEEE Trans. Wireless Commun., Vol. 14, No. 9, pp. 5038–5057, Sep. 2015.
- M. Di Renzo et al., "The Intensity Matching Approach: A Tractable Stochastic Geometry Approximation to System–Level Analysis of Cellular Networks", IEEE Trans. Wireless Commun., Vol. 15, No. 9, pp. 5963–5983, Sep. 2016.

- M. Di Renzo et al., "System-Level Analysis/Optimization of Cellular Networks with Simultaneous Wireless Information and Power Transfer: Stochastic Geometry Modeling", IEEE Trans. Vehicular Technology, Vol. 66, No. 3, pp. 2251-2275, Mar. 2017.

Industrial Valorization

In the context of Stochastic Geometry modeling of 5G ultra-dense heterogeneous cellular networks, he is actively collaborating with industry in order to make his theoretical findings practically relevant. Two notable examples are the recent collaborations with Huawei R&D (France) and NEC Laboratories Europe (Germany). These activities started in January 2017. In 2017, the first jointly published papers have been submitted.

Huawei R&D (France) – The collaboration with Huawei R&D is part of a European-funded project titled BESMART, which is focused on the design of energy-efficient large-scale communication networks by using tools from Stochastic Geometry and a branch of Optimization Theory called fractional programming. BESMART is an individual Marie Curie fellowship. The holder of the fellowship is Alessio Zappone and the supervisors are Merouane Debbah (Huawei) and Marco Di Renzo (the candidate). As part of this collaboration, the first tractable approach for optimizing the energy-efficiency of cellular networks is proposed. Currently available approaches, in fact, cannot be used because they rely on oversimplified assumptions that lead to a utility function (the energy efficiency) that monotonically decreases with the transmit power and the deployment density of cellular base stations. As a result, the energy-efficiency would be maximized by switching all the base stations off. This is in contrast with reality. A new approach has been developed that consists of taking into account the receiver sensitivity during the detection of pilot signals. It has been shown that this is a crucial issue to be taken into account in order to formulate a practically-relevant utility function. Based on this mathematical modeling, the existence and uniqueness of optimal values for the transmit power and deployment density of cellular base stations have been proved and computed. This is the first concrete marriage between Stochastic Geometry modeling and system-level optimization in a tractable and engineering–relevant manner. The related publication is the following:
- M. Di Renzo, A. Zappone, M. Debbah, "System-Level Modeling and Optimization of the Energy Efficiency in Cellular Networks - A Stochastic Geometry Framework", IEEE Trans. Wireless Commun., July 2017 (submitted).

NEC Laboratories Europe (Germany) – The collaboration with NEC-Europe is part of a European-funded projects titled 5Gaura, which is focused on the design and optimization of programmable multi-tenant communication networks by using tools from Stochastic Geometry, optimization theory and leveraging the concept of Network Slicing. 5Gaura is a Marie Curie Innovative Training Network gathering 4 academic partners, 4 industrial partners, and 14 Ph.D. students. Marco Di Renzo (the candidate) is the coordinator of the project and Xavier Costas-Perez (NEC) and Vincenzo Sciancalepore (NEC) are the Leaders of the research activities on Network Slicing. To date, the main outcome of this industrial collaboration is "STORNS": A new stochastic admission control scheme to perform system-level Network Slicing. STORNS is developed based on an innovative mathematical formulation of the Network Slicing concept with the aid of Stochastic Geometry. This is the first time that such a problem is addressed in the literature. Network Slicing is a logical concept and mapping it into the allocation of physical resources is a pioneering research problem in academia, with important industrial applications. NEC Europe contacted the candidate for evaluating the possibility of realizing the "Slicing" concept, i.e., the creation of "on-demand" logical networks ("called slices") over a common shared physical infrastructure based on a formal mathematical theory that is aimed to quantify its potential and limitations in a tractable manner. The objective and challenge of this research activity is to answer the following question: How to optimally slice the network spectral efficiency by taking into account the network topology and appropriately allocating power and bandwidth in an exclusively reserved fashion to each logical network? STORNS provides the solution to the question. The main result of the paper is to prove mathematically and via computer simulations that a sliced network based on STORNS provides better performance than a monolithic network that is not sliced. This is the first time that this result is shown and proved mathematically. The next step is the implementation of STORNS in the NEC's network emulator to validate its performance based on actual physical and network parameters. NEC plans to exploit this result within its development branch and the European 5G Public-Private Partnership. In particular, NEC and CNRS are currently discussing the terms of filing a joint patent application. The related publication is the following:
- M. Di Renzo, V. Sciancalepore, X. Costas-Perez, "STORNS: Stochastic Radio Access Network Slicing", 2017 (submitted).

2) Spatial Modulation Research

In the context of **Energy Efficient & Low-Complexity Wireless Networks Design**, the candidate is leading worldwide research on **Spatial Modulation (SM)** for multiple-antenna transmission. In the last 3 years, he has been a tutorial speaker at many IEEE conferences and an invited lecturer at several universities in the world. In the last 2 years, he has published 20+ IEEE journal papers and others are under review. He is the author of the only survey papers on Spatial Modulation that are published in major IEEE journals. Main examples are as follows:

- M. Di Renzo et al., "Spatial Modulation for Multiple-Antenna Wireless Systems - A Survey", IEEE Commun. Mag., Vol. 49, No. 12, pp. 182-191, Dec. 2011.
- M. Di Renzo et al., "Spatial Modulation for Generalized MIMO: Challenges, Opportunities and Implementation", Proceedings of the IEEE, Vol. 102, No. 1, pp. 56-103, Jan. 2014.
- M. Di Renzo et al., "Design Guidelines for Spatial Modulation", IEEE Commun. Surveys & Tutorials, Vol. 17, No. 1, pp. 6-26, Jan. 2015.
- P. Yang, M. Di Renzo, et al., "Single–Carrier Spatial Modulation: A Promising Design for Large–Scale Broadband Antenna Systems", IEEE Commun. Surveys & Tutorials, Vol. 18, No. 3, pp. 1687–1716, 2016.
- E. Basar, M. Di Renzo, et al., "Index Modulation Techniques for Next-Generation Wireless Networks", IEEE Access, August 2017 (55 pages, double-column).

Industrial Valorization

In the context of Spatial Modulation research, he has made several important research contributions and received several awards. In terms of industrial impact, he was awarded (January 2016) a research project funded by the French National Agency for Research (ANR). The project is titled "*SpatialModulation: modulation spatiale et antenne reconfigurable pour connecter en haut débit des capteurs mobiles et autonomes en énergie*" (http://www.agence-nationale-recherche.fr/?Project=ANR-15-CE25-0016). It is led by **Orange Labs** and the coordination is ensured by Ms. Dinh-Thuy PHAN-HUY. The objective of the project is to conceive, design and implement a new approach for realizing the benefits of Spatial Modulation based on the use of reconfigurable antennas. This idea was proposed by the candidate (Marco Di Renzo) in a paper published in January 2014 in the Proceedings of the IEEE. In 2013, during one of his tutorials on Spatial Modulation, he was contacted by some researchers of Orange Labs, who were aware of his research on this technology and were interested in a possible collaboration in a nationally-funded project and, especially, in the industrial exploitation of Spatial Modulation. People at Orange Labs, in particular, were particularly interested in the application of Spatial Modulation to the Internet of Things and in the idea of using reconfigurable antennas in order to avoid one of the main issues for the practical implementation of this technology: the RF switch. The use of reconfigurable antennas allows one to avoid such an RF switch and to encode information data directly into the physical characteristics of the antennas. In addition, Orange Labs had developed new antenna designs in the context of another ANR project (TRIMARAN) that could be exploited for Spatial Modulation. During the first year of the project, the first prototype was implemented and was showcased for the first time to the public in May 2017 at the IEEE International Conference on Communications. The demonstration was a very successful event and the candidate was invited to present the theoretical foundation and the experimental results of this technology at the IEEE 5G Summit in July 2017. He was invited to write a position paper on what is today known as "RecAnt-SM" (Spatial Modulation Based on Reconfigurable Antennas) that was presented at the 2017 IEEE Military Communications Conference that was held in Baltimore, USA, in October 2017. The reason is the high relevance of the technology for realizing a secure transmission scheme for the Internet of Things. Spatial Modulation encodes the information into specific physical features of the antennas that may be difficult to detect without any a priori information. These concepts are illustrated in the two papers as follows:

- D.-T. Phan-Huy, M. Di Renzo, et al., "First Demonstration and Visualization of Receive Spatial Modulation Using the Radio Wave Display", IEEE Int. ITG Workshop on Smart Antennas, Berlin, Germany, Mar. 16-17, 2017.
- M. Di Renzo, "Spatial Modulation Based on Reconfigurable Antennas – A New Air Interface for the IoT", IEEE Military Communications Conference, Baltimore, USA, Oct. 2017. [The candidate is the single author]

3) Network-Coded Cooperative Communications

In 2010, he pioneered research in the context of **Network-Coded Cooperative Communications**, which is an emerging area of research aimed to combine network coding and cooperative communications to strike a good trade-off in terms of transmission reliability and throughput. He was the first researcher proving the potential of achieving unequal diversity orders for different transmitters by using network coding and proposing demodulation schemes to leverage this potential. For these research activities, he was awarded the 2014 IEEE ATC Best Paper Award. He published 7 IEEE journal papers in less than 3 years. Some of them are:

- M. Di Renzo, "On the Achievable Diversity of Repetition–Based and Relay Selection Network–Coded Cooperation", IEEE Transactions on Communications, Vol. 62, No. 7, pp. 2296-2313, July 2014.

- M. Di Renzo et al., "Analog Network Coding in the Multiple Access Relay Channel: Error Rate Analysis and Optimal Power Allocation", IEEE Trans. Wireless Commun., Vol. 14, No. 6, pp. 3015–3032, June 2015.
- M. Di Renzo et al., "RLNC–Aided Cooperative Compressed Sensing for Energy Efficient Vital Signal Telemonitoring", IEEE Trans. Wireless Commun., Vol. 14, No. 7, pp. 3685–3699, July 2015.
- T. X. Vu, P. Duhamel, M. Di Renzo, "On the Diversity of Network-Coded Cooperation With Decode-and-Forward Relay Selection", IEEE Trans. Wireless Commun., Vol. 14, No. 8, pp. 4369–4378, Aug. 2015.
- T. X. Vu, P. Duhamel, M. Di Renzo, "Performance Analysis of Network Coded Cooperation with Channel Coding and Adaptive DF–Based Relaying in Rayleigh Fading Channels", IEEE Signal Processing Letters, Vol. 22, No. 9, pp. 1354–1358, Sep. 2015.

Research Impact

The quantitative assessment of his research impact is summarized in the Google Scholar citation count and indices provided in the figure/table above. In addition, his research impact can be briefly summarized as follows:

- ***Spatial Modulation***. In the last 4 years, he has been lecturing all around the world and presenting tutorials at major IEEE conferences and Ph.D. schools (20+). In the period 2011-2014, he was the originator and a Principal Investigator of the only EU-funded project on Spatial Modulation research (GREENET). From January 2016, he has been a Principal Investigator of the ANR-funded project "SpatialModulation", which is coordinated by Orange Labs for realizing the first fully-functional prototype that exploits the Spatial Modulation principle based on Reconfigurable Antennas for application to the Internet of Things. He has played a key role for executing the first experiments on Spatial Modulation in the UK. Several papers of him are among the most cited in the field and many have received international distinctions and recognitions. In the last two years, he has been collaborating with researchers and professors in Austria in order to prove, theoretically and practically (via experimental measurements), the feasibility of Spatial Modulation for application to the millimeter-wave frequency band (60 GHz). The experimental activities were submitted for publication in mid-2017 and have proved that Spatial Modulation is a suitable approach for millimeter-wave communication. He is an inventor of 1 internationally awarded patent. He received the 2015 IEEE Jack Neubauer Memorial Award for pioneering research on the mathematical analysis and evaluation of Spatial Modulation and the 2013 IEEE VTC-Fall Best Student Paper Award for pioneering research contributions on the experimental assessment of Spatial Modulation in outdoor environments. In 2017, his paper titled "Spatial Modulation for Generalized MIMO: Challenges, Opportunities and Implementation" was proposed by the IEEE Technical Committee on Signal Processing for Communications for receiving the IEEE Signal Processing Society Donald G. Fink Overview Paper Award. The outcome will be disclosed to the public in 2018.

From the technical point of view, he developed the fundamental mathematical frameworks for understanding and optimizing the performance of Spatial Modulation. He proved that conventional modulation schemes are sub-optimal for application to Spatial Modulation and identified the conditions for minimizing the error probability. These findings were awarded with the Jack Neubauer Memorial Award. He developed the first Spatial Modulation scheme based on power optimization that opened the way to a large number of publications on link adaptation. He amalgamated space-time block coding and Spatial Modulation and identified the mathematical conditions under which single-stream decoding and transmit-diversity can be achieved simultaneously. These two findings were rewarded with an international patent. He participated to the first channel measurements campaign and to the first testbed implementation of Spatial Modulation that convinced people of the practical feasibility of this technology. For these activities, he was awarded the Best Student Paper Award at VTC-Fall in 2013. In 2014, he published a Proceeding of the IEEE paper – his most cited paper to date – where he introduces the concept of generalized Spatial Modulation where he envisions a system where information bits can be encoded into any physical characteristics of the antennas and, in particular, into the radiation patterns of the antennas. This idea received the attention of Orange Labs and is currently being developed within an ANR-funded (French Science Foundation) project. The first prototype was showcased for the first time at the IEEE International Communications Conference in May 2017. These results got the attention of the attendees of the conference and he was invited to present these activities at the 2017 IEEE 5G Summit and at the 2017 IEEE Military Communications Conference. He has made several other contributions in this field of research. They are discussed in the companion document.

- ***Stochastic Geometry***. His research findings in this field have received various international distinctions and recognitions. In 2015, he was awarded the prestigious Distinguished Visiting Fellowship of the Royal Academy of Engineering from the UK, in order to collaborate with local universities. In February 2015, he spent 3 weeks lecturing on this topic at several British universities. In 2015-2016, he presented 20+ invited lectures/tutorials

related to Stochastic Geometry modeling at several IEEE conferences and Ph.D. schools worldwide. His research on Stochastic Geometry modeling of future wireless networks has received substantial funding from Europe and he has been a Principal Investigator of three European-funded projects in this field: CROSSFIRE, 5Gwireless and 5Gaura. As for the last two projects, he is the Project Coordinator responsible for all research and training activities of 18 European partners and 29 doctoral students. Starting from mid-2017, he has been a Principal Investigator of the European-funded project 5GstepFWD, on the integration of wireless and optical communication networks, where he will lead all the activities on wireless research. He received the 2013 European Network of Excellence on Wireless Communications Best Paper Award for his pioneering contributions to the mathematical analysis of the achievable throughput of heterogeneous cellular networks, as well as three IEEE international conference Best Paper Awards on stochastic geometry modeling of wireless communication networks (2014 IEEE Camad, 2015 IEEE ComManTel, and 2017 IEEE SigTelCom).

From the technical point of view, he developed new mathematical methodologies for the analysis of ultra-dense cellular networks. He proposed a new mathematical approach for computing the average rate that can be applied to any channel models and that can be formulated in a simple single-integral form as opposed to the state-of-the-art frameworks that were not mathematically tractable. For this research activity, he was awarded the 2013 European Network of Excellence on Wireless Communications Best Paper Award. He developed a new methodology for evaluating the error probability of cellular networks that does not need any approximations. The methodology is known as the EiD-approach (Equivalent-in-Distribution) and consists of rewriting the interference as the summation of conditionally-independent Gaussian random variables whose distribution can be computed in closed-form at an affordable complexity. With this methodology, he was able to prove the impact of multiple-antenna technology on the system-level performance of cellular networks. This methodology was used by a group of researchers from Saudi Arabia (KAUST) and the United States (MIT) to unify the analysis of cellular networks. He developed the most comprehensive framework (as a single author) for analyzing and optimizing millimeter-wave cellular networks. His mathematical framework accounts for realistic path-loss and blockage models by using a simple modeling approach that is named "two-ball approximation". He was able to prove mathematically and generalize some findings that were obtained through experimental activities by researchers from New York University, USA: he proved that, in a Manhattan-like environment, millimeter-wave cellular networks will not work if the inter-site distance of the base stations is larger than 200 meters and that they will outperform micro-wave cellular networks if the inter-side distance is of the order of 50 meters. He was invited to present (by Professor Robert Heath Jr. – a pioneer on millimeter-wave research) these findings at several IEEE conferences, including the 2016 IEEE Asilomar Conference in Pacific Grove (USA). In September 2016, he published in the IEEE Transactions on Wireless Communications the so-called "Intensity Matching Approach". This is a very comprehensive approach for modeling and optimizing ultra-dense cellular networks. This papers provides an answer to the most important question in this field: "What is the impact of network densification"? He mathematically proved that an optimal deployment density of the base stations exists as well as that the network load highly impacts the area spectral efficiency of cellular networks. These results, in addition, were validated with the aid of empirical data. This finding received the attention of the research community, since early research works proved that the density of base stations had no impact. This early finding, however, was an artifact of the system model that was too simplified. The paper of the candidate, on the other hand, attracted the attention of Huawei R&D France and NEC Europe Labs in Germany. The candidate started a collaboration with these two companies on two different topics. With Huawei, on the system-level optimization of the energy-efficiency of ultra-dense cellular networks and with NEC on the system-level optimization of programmable networks with network slicing. The first results on these two topics were submitted for publication in July 2017. The papers mathematically prove that an optimal transmit-power and base station density that maximize the energy-efficiency exist and are unique and that slicing a cellular network is better than not slicing it. The scientific impact of these findings will be quantified in the next few months since the papers are still under review.

- As a recognition for his research contributions on Spatial Modulation, Stochastic Geometry and Communication Theory during the last years, in February 2014 he _**was awarded the 2013 IEEE/COMSOC Best Young Researcher Award for Europe, Middle East and Africa (EMEA) Region for his promising research activities for the benefit of the society**_. This is the best honor bestowed to a researcher under the age of 35, based in the EMEA region and conducting research on Communication Theory.

- As a recognition for his research contributions during the last years and his international reputation in the fields of Spatial Modulation and Stochastic Geometry modeling of wireless networks, he was named, in June 2016, _**Distinguished Lecturer of the IEEE Vehicular Technology Society**_, and, in January 2017, _**Distinguished Lecturer of the IEEE Communications Society**_. This is a major honor bestowed to a researcher under the age of 40. He is one of the very few research scientists who are named distinguished lecturer of both societies (at the same time).

- As a recognition for his research achievements, contributions and expertise on Spatial Modulation and Stochastic Geometry modeling of wireless networks, he was invited to join the Editorial Board of three major IEEE journals on "Communications". The ***IEEE Communications Letters*** in 2012, the ***IEEE Transactions on Communications Letters*** in 2014 and the ***IEEE Transactions on Wireless Communications*** in 2017. In the last six years, he has been responsible for the publication of the vast majority of papers on Spatial Modulation and Stochastic Geometry. After 5 years of service as an Editor of IEEE Communications Letters, he had to step down from the Editorial Board as per the rules of the IEEE Communications Society. The Editor-in-Chief of the journal and the Publication Board of the IEEE Communications Society invited him to take the position of ***Associate Editor-in-Chief of the IEEE Communications Letters*** until December 2019 when the new Editor-in-Chief will be nominated. He started his duties in July 2017 and he is now responsible for all the activities of the journal jointly with the Editor-in-Chief and the only responsible when the Editor-in-Chief is unavailable.

- In June 2016, he was awarded the prestigious ***Marie Curie Global Fellowship***, for his research proposal "TWEET-A-MOLECULE" on the emerging and interdisciplinary research topic "**Molecular Communication**", which is at the interface of communication networks, biology and chemistry. In order to continue his research in France, lead the research activities of the Network Communication Theory Group that he established in the Laboratory of Signals and Systems at CentraleSupelec, and coordinate the ITN projects 5Gwireless and 5Gaura, he decided to decline the fellowship. The L2S decided to support his research activity on this topic with one Ph.D. scholarship and research funding for long-stay research visits in Canada and the United States, where he will be collaborating with research scientists who are currently working on molecular communication systems and networks. The Ph.D. student joined the group on September 1st, 2017 and he will be co-supervised with Professor Andrew Eckford – a pioneer in this field of research – and colleagues from INRIA-Lyon (Malcom Egan).

- As a recognition for his research achievements, contributions and expertise on Spatial Modulation and Stochastic Geometry modeling of wireless networks, he received the prestigious **SEE-IEEE Alain Glavieux Award** with the following citation: "***For outstanding results in developing several mathematical abstractions (for mobile network modeling), innovating ideas, as well as demonstrating their usefulness in future wireless communications systems***".

Invited Presentations and Tutorials (last three years)
- 2018: Several planned invited presentations and distinguished lectureships in France, Europe and worldwide.
- November 2017: Invited Speaker at the GdR-ISIS "Méthodes et outils mathématiques pour la modélisation des réseaux IoT", Paris, France.
- July-October 2017: IEEE COMSOC Distinguished Lecturer Tour at many (8) universities in Japan and USA.
- July-October 2017: IEEE VTS Distinguished Lecturer Tour at many universities (8) in Canada and Sweden.
- May 2017: Keynote Workshop Speaker at the Workshop on Resource Allocation, Cooperation & Competition in Wireless Nets on "Stochastic Geometry Modeling", Paris, France.
- April 2017: Présentation en Séance Plénière at the Axe COMEX du Labex DIGICOSME on "Stochastic Geometry Modeling", Paris, France.
- March 2017: Keynote Workshop Speaker at the 5G Workshop for Universal Access: Challenges for Urban & Rural Coverage on "Stochastic Geometry Modeling", Paris, France.
- January 2017: Invited Talk/Lecture at the IEEE Austrian Joint COM/MTT Chapter Talk, Johannes Kepler University on "Energy-Neutral Nets", Linz, Austria.
- November 2016: Invited Talk/Lecture at the 2016 Frontiers of Engineering for Development organized by the Royal Academy of Engineering, UK, on "Connected Development – Connected Health: Communication Using Chemical Signals", November 2016, Wellcome Genome Campus, Cambridge, UK.
- November 2016: Invited Talk/Lecture at the 2016 IEEE Asilomar Conference on Signals, Systems, and Computers on "Stochastic Geometry Modeling of Millimeter-Wave Cellular Networks with Interference Alignment", November 2016, Pacific Grove, USA.
- October 2016: IEEE Vehicular Technology Society Distinguished Lecture Tour on "Stochastic Geometry Modeling" at several universities, including Univ. of New South Wales (Sydney), Univ. of Technology Sydney (Sydney), Univ. of Melbourne (Melbourne), and Australian National Univ. (Canberra), October 2016, Australia.
- September 2016: Invited Lectures on "Stochastic Geometry Modeling" and "Spatial Modulation" at the 5G Lab Germany summer school, September 2016, Dresden, Germany.
- September 2016: Invited Talk at the 2016 Tyrrhenian International Workshop on Digital Communications on "Stochastic Geometry Modeling and Analysis of Wireless Powered Communications", September 2016, Italy.

- September 2016: <u>Invited Talk/Lecture</u> at the Oxford Symposium on Spatial Networks on "Stochastic Geometry Modeling of Cellular Networks", September 2016, Oxford University, United Kingdom.
- September 2016: <u>Invited Talk/Lecture</u> at the University of Oulu on "Stochastic Geometry Modeling of Cellular Networks", September 2016, Oulu, Finland.
- February 2016: <u>Invited Talk/Lecture</u> at the 2016 IEEE International Conference on Computing, Networking and Communications on "Stochastic Geometry Modeling", February 2016, Hawaii, USA.
- October 2015: <u>Invited Speaker</u> at NEC Laboratories Europe (Germany) on "Stochastic Geometry Modeling of SDN-Enabled Cellular Networks", October 2015, Heidenberg, Germany.
- October 2015: <u>Invited Speaker</u> at the H2020 ICT 2015 Innovate, Connect, Transform on "Stochastic Geometry Modeling of Energy Harvesting for the IoT", October 2015, Lisbon, Portugal.
- July 2015: <u>Invited Speaker</u> at the National Institute of Scientific Research of Canada and École de Technologie Supérieure on "Stochastic Geometry Modeling" and "Spatial Modulation", July 2015, Montreal, Canada.
- June 2015: <u>Invited Plenary Speaker</u> at the 2015 Italian Annual Meeting of Communication Theorists on "Stochastic Geometry Modeling", June 2015, L'Aquila, Italy.
- June 2015: <u>Invited Distinguished Lecturer</u> at the 1st IEEE Italy Section Summer Ph.D. School on "Stochastic Geometry Modeling" and "Spatial Modulation", June 2015, Perugia, Italy.
- June 2015: <u>Invited Distinguished Lecturer</u> on "Stochastic Geometry Modeling" and "Spatial Modulation" at the Graduate School of the University of Malaga, June 2015, Malaga, Spain.
- June 2015: <u>Invited Speaker</u> at the bi-annual meeting of the IEEE Technical Committee on Green Communications and Computing, IEEE Int. Conf. Commun., June 2015, London, UK.
- February 2015: <u>Invited Distinguished Speaker</u> at the 2015 NICT Japan - US Network Opportunity (JUNO) Workshop on "Future Energy- and Spectral-Efficient Ultra-Dense Networks", February 2015, Sendai, Japan.
- February 2015: <u>Royal Academy of Engineering Distinguished Visiting Lecture Tour</u> (invited) on "Stochastic Geometry Modeling" at several universities and research centers, including Queen's Univ. Belfast, Edinburgh Univ., Heriot-Watt Univ., Imperial College London, Oxford Univ., Univ. College London, King's College London, Queen Mary Univ. of London, Univ. of Bristol, and Toshiba Research Laboratories in Bristol.
- January 2015: <u>Invited Distinguished Lecturer</u> at the National Key Laboratory of Science and Technology on Communications, University of Electronic Science and Technology of China (UESTC) on "Stochastic Geometry Modeling" and "Spatial Modulation", January 2015, Chengdu, China.
- 2015-present: **Tutorial speaker** at 25+ IEEE conferences on "Stochastic Geometry Modeling", including IEEE VTC 2015, EW 2015, ICC 2015, ICCC 2015, ICUWB 2015, ComManTel 2015, CCNC 2016, VTC 2016, EUSIPCO 2016, ICC 2016, GLOBECOM 2016, EW 2016, Wireless@VT 2016, CCNC 2017, ICC 2017, etc.
- 2013-present: **Tutorial speaker** at 25+ IEEE conferences on "Spatial Modulation", including IEEE WCNC 2013 & 2014, EW 2013 & 2014, VTC 2013 & 2014 Spring&Fall, ICC 2013, CAMAD 2013, EUSIPCO 2014, PIMRC 2014, ATC 2014, MASCOTS 2014, CCNC 2015, GLOBECOM 2015, CCNC 2016, etc.
- November 2014: <u>Invited Speaker</u> at the IEEE Austria Section, Johanned Kepler University, Institute for Communications Engineering, on "Stochastic Geometry" & "Spatial Modulation", November 2014, Linz, Austria.
- October 2014: <u>Invited Speaker</u> at the 2014 "NEWCOM# Emerging Topics Workshop on D2D and mmWave - New Paradigms for 5G" on "Stochastic Geometry for mmWave", October 2014, Vienna, Austria.
- August 2014: <u>Invited Distinguished Lecturer</u> at the 2014 IEEE Summer School on "5G Emerging Technologies for Circuits and Systems: Beyond 4G Mobile Systems", August 2014, Taiwan.
- April 2013: <u>Invited panelist</u> at 2013 IEEE WCNC on "Spatial Modulation for Green Networks", Shanghai, China.

Professional Service (including organization of international conferences) – last three years
In the last years, he has been an active volunteer of the IEEE, especially of the IEEE Communications and Vehicular Technology Societies. He delivers tutorials on Spatial Modulation and Stochastic Geometry at many IEEE conferences. He is the Associate Editor-in-Chief of a major IEEE journal and serves in the Editorial Board of two IEEE journals. He is a reviewer of IEEE journals & conferences. He serves in the Technical Program Committees (TPC) of many IEEE conferences, e.g., ICC, GLOBECOM, VTC Spring & Fall, often helping with their organization. He is a member of IEEE Technical Committees (TCs), e.g., Communications Theory, Wireless Communications, Signal Processing for Communications, Communication Systems Integration & Modeling, Green Communications and Computing. He is a member of the recently formed EURACON (European Association for Communications and Networking) aimed to support and coordinate EU research and education activities on Communications and Networking. In 2016, he was invited to **coordinate the technical program of the Communication Theory symposium of IEEE GLOBECOM 2017**, which is the most important conference on communication theory that was held in Singapore in December 2017. Still in 2016, he was invited to **organize the 2017 workshop on Spatial Stochastic Models for Wireless Networks (SpaSWiN)**, which is the major event for people working on stochastic geometry modeling of wireless networks that was held in Paris in May 2017. In 2017, thanks to the success of SpaSWiN 2017, he was invited to organize the **2018 workshop on Spatial**

Stochastic Models for Wireless Networks (SpaSWiN) that will be held in China in 2018. He is the **Technical Program Lead-Chair of IEEE European Wireless 2018**, the main event on wireless communications in Europe.

Other major activities are the following:
- He is the ***Associate Editor-in-Chief of the IEEE Communications Letters***, where he assists the Editor-in-Chief in all the operations of the journal (since 2017).
- He is in the ***Editorial Board of the IEEE Transactions on Wireless Communications***, where he serves as an Editor in the area of Heterogeneous Networks Modeling and Analysis (since 2017).
- He is in the ***Editorial Board of the IEEE Transactions on Communications***, where he serves as the Editor of the IEEE Communications Society for Heterogeneous Networks Modeling and Analysis (since 2014).
- He is in the ***Editorial Board of the IEEE Communications Letters***, where he serves as an Editor in the general field of mathematical modeling and analysis of wireless communication systems (2012-2017).
- He is a ***Founding Member of the IEEE Green Cellular Networks Special Interest Group***. In recognition of his contributions to power-efficient wireless network design conducted in the framework of the EU project GREENET.
- He is the ***Founding Chair of the Special Interest Group on "Ultra-Dense Heterogeneous Networks"*** of the Communication Systems Integration & Modeling Technical Committee (since 2015).
- He is the ***Membership Development Responsible for Europe*** and ***Student Competition Program Officer*** of the Communication Systems Integration & Modeling Technical Committee (since 2015).
- He serves as the Technical Program Lead-Chair of European Wireless 2018.
- He serves as the Technical Workshop Co-Chair of SpaSWiN 2018.
- He serves as a Lead Track Chair of IEEE VTC 2018.
- He serves as the Technical Program Co-Chair of IEEE WSA 2018.
- He serves as the Technical Symposium Co-Chair (Communication Theory) of IEEE GLOBECOM 2017.
- He serves as the Technical Workshop Co-Chair of SpaSWiN 2017.
- He serves as the Technical Symposium Co-Chair (Communication Theory) of IEEE SigTelCom 2017.
- He serves as the Technical Program Committee Co-Chair of IEEE CAMAD 2016.
- He served as a Special Session Co-Organizer of IEICE ICTF 2016.
- He served as a Special Track Organizer of ADHOC-NOW 2015.
- He served as a Track Co-Chair of IEEE VTC-Fall 2014, 2015 & 2016 and IEEE VTC-Spring 2015 & 2016.
- He served as a TPC Co-Chair of 2015 IEEE ComManTel.
- He served as a Special Session Co-Organizer of 2015 IEEE ISWCS.
- He served as the Lead TPC Co-Chair of the 2014 WSN4Health Workshop co-located with 2014 IEEE MoWNet.
- He served as the Lead Special Session Co-Chair of 2014 IEEE CAMAD.
- He served as a Co-Chair for the Information and Coding Theory Symposium of 2014 IEEE ICCVT.
- He served in the TPC of several IEEE (and non-IEEE) conferences, including ICC, GLOBECOM, WCNC, VTC, PIMRC, CAMAD, ISWCS, ICUWB, ComManTel, MobiHealth, HealthCom, EuCNC, etc.
- He served as a Reviewer of several IEEE (and non-IEEE) journals, including, TCOM, TWireless, TVT, TSP, JSAC, COMMAG, WirelessCommun, COMML, WCL, EURASIP, HINDAWI, etc.

Ability to Attract Research Funding and Participation in Research Projects
In the last years, he played leading roles in EU & national projects that have funded his research on Spatial Modulation and Stochastic Geometry. All in all, these projects allowed him to raise, as a Principal Investigator and Project Coordinator, more than 5.0 million Euro in personal research funding. *In particular, in 2016 he became the* ***Project Coordinator*** *of two large European Training Networks: 5Gwireless and 5Gaura, where he coordinates all research and training activities of 18 European partners (9 from academia and 9 from industry) and 29 doctoral students. The total budget of these two projects is 7.5 million Euro (among which 1.6 million Euro is for CNRS).*
The most relevant projects worth mentioning are the following:
- **H2020 Marie Curie Individual European Fellowship (IF) BESMART**, which is about energy-efficient system-level optimization (2017-2019). The Fellow is Alessio Zappone, jointly supervised with Prof. M. Debbah.
- **H2020 Marie Curie Individual Global Fellowship (IF) TWEET-A-MOLECULE**, which is about Molecular Communication networks. ***Declined*** in order to continue his research activity based in France at CNRS/L2S.
- **FP7 Marie Curie Initial Training Network (ITN) GREENET**, which is about green wireless networks and Spatial Modulation (2011-2014). Supervised two Doctoral Researchers. Individual budget: 500k Euro.
- **FP7 Marie Curie Initial Training Network (ITN) CROSSFIRE**, which is about Stochastic Geometry modeling of heterogeneous networks (2012-2015). Supervised two Doctoral Researchers. Individual budget: 500k Euro
- **H2020 Marie Curie European Training Network (ETN) 5Gwireless**, which is about 5G wireless technologies (2015-2018). Supervising two Doctoral Researchers. Individual budget: 800k Euro. ***Project Coordinator***.
- **H2020 Marie Curie European Training Network (ETN) 5Gaura**, which is about 5G softwarization and mmWave (2015-2018). Supervising two Doctoral Researchers. Individual budget: 800k Euro. ***Project Coordinator***.

- **H2020 Marie Curie European Training Network (ETN) 5GstepFWD**, which is about the integration of 5G wireless and optical networks (2017-2020). Two Doctoral Researchers to supervise. Individual budget: 500k Euro.
- **French National Agency for Research (ANR) SpatialModulation**, which is about the world's first implementation of Spatial Modulation based on reconfigurable antennas (2015-2019). Supervising one Postdoctoral Researcher. The project is led by Orange Labs (France Telecom).
- **FP7 Marie Curie IAPP WSN4QoL**, which was about body sensor networks and healthcare provisioning (2011-2015). Supervised one Postdoctoral Researcher.
- **FP7 Marie Curie IAPP SmartNRG**, which is about the smart grid (2013-2016). Supervised one Postdoctoral Researcher.
- **H2020 Marie Curie RISE CASPER**, which is about network virtualization and software defined networking (2016-2019). Supervised one Postdoctoral Researcher.
- **H2020 COST Action IRACON**, which is about 5Gnetworks and systems (2016-2020). Research scientist in collaboration with other EU partners and representative for CNRS and Paris-Saclay University.
- **FP7 Network of Excellence on Wireless Communications (NoE) NEWCOM#**, which was about heterogeneous cellular networks & network coding (2011-2014). Research collaboration with other EU partners.
- **GdR ISIS 2010 "Young Researchers Project"**, which is about cooperative networks and network coding (2010-2011). Awarded by CNRS as a promising young researcher.
- **Starting Grant for "Young Researchers"**, which is about Spatial Modulation for multi-antenna systems (2010-2012). Awarded by the Laboratory of Signals and Systems of CNRS as a promising young researcher.
- Involved in several EU-funded projects when working at CTTC (Spain) and at the University of L'Aquila (Italy), during the period 2007-2009. He was a young research scientist/assistant.

Among the (many) **in-submission & submitted projects**, some are worth mentioning in light of his <u>future research</u> activities:
- 1 H2020-ETN project with 11 partners on "beyond-RF communication networks" (terahertz, light and chemical enhanced communication networks). Submitted in Jan. 2018.
- 2 H2020-ETN project with 10+ partners on "drone-aided cellular networks". Submitted in Jan. 2018.
- 1 H2020-ETN project with 10+ partners on "artificial intelligence for wireless networks". Submitted in Jan. 2018.
- 1 H2020-ETN project with 10+ partners on "network slicing for wireless networks". Submitted in Jan. 2018.
- 1 H2020-IF project on "system-level optimization: tools and applications". Submitted in Sept. 2017.
- 1 H2020-IF project on "system-level optimization for wireless fog networks". Submitted in Sept. 2017.

Relevant Administrative Duties
- Served as President and/or Member of the Committee for Ph.D. qualifying and final exams at the University of Trento, Italy, at the Polytechnic University of Catalonia, Spain, at Aalborg University, Denmark, at the University of Orleans, France, at Johannes Kepler University, Austria, and at the University of Edinburgh, UK (2010-present).
- **Project coordinator** of two EU projects: 5Gwireless & 5G-Aura (2015-2019).
- Co-supervisor, BESMART (2017-2019).
- Budget and management responsible of EU and national projects: e.g., GREENET & CROSSFIRE (2010-2015) and 5Gwireless & 5G-Aura (2015-2019).
- Chairman of the Supervisory Board, 5Gwireless & 5G-Aura (2015-2019).
- Member of the Supervisory Board, GREENET & CROSSFIRE (2011-2015) and 5GstepFWD (2017-2020).
- Chairman of the Recruitment Committee, 5Gwireless & 5G-Aura (2015-2019).
- Member of the Recruitment Committee, GREENET & CROSSFIRE (2011-2015) and 5GstepFWD (2017-2020).
- Work Package & Task Leader, Research Supervisor of GREENET & CROSSFIRE (2011-2015) and 5Gwireless & 5G-Aura (2015-2019).
- Project Evaluator, Vietnam National Foundation for Science and Technology – NAFOSTED (2012-present).
- Project Evaluator, French National Agency (ANR) – CEFIPRA (2013)
- Project Evaluator, French National Association for Technological Research (ANRT) – CIFRE (2015).
- Member of the Research Council of UMR-8506 (2015-present). Named by the Director of UMR-8506.

Participation in Industrial Innovation
- **_Spin-off_**. In December 2004, he co-founded a spin-off company on wireless embedded systems to commercialize the outcomes of his Ph.D. research at the Univ. of L'Aquila. Under his guidance and leadership, the company raised a significant amount of funding in the R&D areas of e-Health, Smart Grid and multi-hop networking. In addition, several prototypes were implemented in order to validate the impact of technologies like relaying, cooperative communications and network coding in collaborative research projects (WSN4QoL and SmartNRG).

Academic Teaching and Training

In the period 2011-2017, he was involved in 2 EU-funded Initial Training Networks (ITNs), GREENET and CROSSFIRE, aimed to provide graduate training to Ph.D. students: 17 in GREENET and 12 in CROSSFIRE. For each project (4-year duration), focused (usually 6 of 20-hour duration each) and complementary (usually 5 of 20-hour duration each) courses are organized. He was the lead responsible for the organization of several courses and a lecturer on several topics for many of them. In June 2013, he was the lead organizer of the "Joint GREENET/CROSSFIRE Ph.D. Summer School" at SUPELEC, a 5-day intensive training week organized for all 29 Ph.D. students. In the period 2015-2019, he will be the Project Coordinator of two EU-funded European Training Networks (ETNs), 5Gwireless and 5Gaura, aimed to provide graduate training to 29 Ph.D. students: 15 in 5Gwireless and 14 in 5Gaura. In September 2016, he was the organizer with colleagues from the Technical University of Dresden (Germany) of the 1st 5Gwireless training event, where he led the organization of 60+ hours of classes on 5G technologies, protocols and tools encompassing theory and practice. In 2017, he was the main organizer and local host of the 2nd 5Gwireless training event and of the 2nd 5Gaura training event in Paris, France. In 2018-2020, he will be the lead organizer of all the training and dissemination events of these research projects (hundreds of hours of courses). In 2018, he will be teaching at the University of L'Aquila, Italy, where he will be a Visiting Professor and will be teaching wireless communications, stochastic geometry, and point processes.

Supervision of Research Graduate Students

He has been an advisor of several Master students when Research Assistant at the University of L'Aquila and, recently, of 15 Ph.D. students and 3 Postdoctoral students. The graduated Ph.D. students are: L. Imbriglio, M. Iezzi, M. Chaudhry, S. Narayanan & D. De Leonardis joint with the University of L'Aquila (Italy), A. Guidotti joint with the University of Bologna (Italy), S. Althunibat joint with the University of Trento (Italy), N. Serafimovski, A. Younis, A. Stavridis & X. Wu joint with the University of Edinburgh (UK), K. Ntontin joint with the University of Catalonia (Spain), T. X. Vu, P. Guan & W. Lu joint with colleagues of CNRS, CentraleSupelec, Univ. Paris-Sud XI. Since 2016, he has been leading a research group of 6 Ph.D. students (based in France) and 3 Postdoctoral students (2 based in France and 1 based in Italy) working on Network Communication Theory, among whom one working full-time on Molecular Communication Networks. In addition, he has been collaborating with colleagues on the supervision of 1 Postdoctoral student in Italy, 1 Postdoctoral student in Australia, 1 Ph.D. student in Australia, 1 Ph.D. student in Austria, and 1 Ph.D. student in the UK (working on Molecular Communication Networks). Other two Ph.D. students will be joining the group in 2018 and will be based in France working on the ETN-5GstepFWD project.

Communication, Public Engagement and Outreach

In the last 6 years, he has actively contributed to the open days organized by French local universities. In particular, he has presented the activities of ITN-GREENET and ITN-CROSFFIRE at the 4th, 5th and 6th "Journée Portes Ouverte" of the "Collège de Sciences de l'Ingénierie et des Systèmes (CSIS)". Starting from 2016, he has been coordinating all outreach and public engagement activities of the projects ITN-5Gwireless and ITN-5Gaura. Also, he has made two YouTube videos to disseminate his research findings on Spatial Modulation and Stochastic Geometry to the public-at-large. The videos are available at the following URLs: https://youtu.be/cNgCJK4oimM and https://youtu.be/MB8IvOYYvB0. He actively contributes and participates to the French "Fete de la Science" of Paris-Saclay University and the European Researcher Night organized by the European Commission.

Last update:
December 2017
Paris, France

Marco Di Renzo