

RFID Ladies: spotlight on recent scientific and industrial advances of Women Engineers

Cecilia Occhiuzzi

University of Roma Tor Vergata
Italy

Johanna Virkki

Tampere University
Finland

Academic and Industrial research on Radio Frequency Identification Technology (RFID) has, from its early beginning, a well pronounced “pink” side. Hence, when in February 2019 we were invited to organize the first Special Session on “Women in RFID” to the IEEE RFID-TA 2019 conference, we were more than excited and proud to finally have the occasion to show it.

IEEE RFID-TA is the annual Conference on the advancement of RFID technology and practice, rotating between Europe and Asia. It is already at its 10th edition. This year, for the first time, it has been held in Italy, in Pisa and chaired by Prof. Paolo Nepa from the University of Pisa.

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In the last twenty years, several Women have contributed with innovative ideas and applications to the acceptance and deployment of the RFID technology, with a worldwide recognition in terms of Scientific, Educational and Industrial leadership. This Special Session has been hence a fruitful occasion to meditate on the RFID ladies.

By searching on SCOPUS the key word “RFID” and by limiting the analysis to the top ranking journals on electromagnetics, antennas and propagations, microwaves, sensors, and IoT, 986 documents result. Among them, only 80 papers have been co-authored by women, corresponding to about 8-10 % of the entire scientific production. A recent report by Elsevier [1] stated that on average, the proportion of women among researchers in engineering is worldwide about 20 %-30 %. In the RFID sector, with our 8 %-10 %, we are hence sensibly under the threshold.

Such a percentage does not represent, however, the real status of the facts. Although the feminine presence is definitively low (too low, no excuse), the “quality” of such a contribution and especially its impact is not negligible at all. By analyzing the SCOPUS results, it is worth noticing that one of the three most prolific authors is a woman (h-index=30) with the first journal publication in 2005 (only 17 papers have been published that year). Three women are present in the top 20 ranking for number of papers per author (average h-index=22) and finally five in the top 50 ranking of the most cited papers (the mid- position is for a paper authored by 4 women out 5 authors). Thus, definitively a meaningful presence, without even considering the industrial sector, whose impact is not accounted into the scientific statistics. Such results are well in line with the Elsevier report that, among the conclusions, states that although women tend to publish fewer research articles than men, their articles are cited or downloaded at similar rates. In particular, in US, EU28, UK, Japan, and Canada, women’s output in engineering has a slightly higher citation impact than men’s.

With this in mind, when we started our brainstorming on the session, the aim was clear: share experiences and achievements to inspire other researchers and applications. We hence decided to include contributions describing scientific activity as well as contributions describing the adoption and implementation of RFID technology in real test cases and companies. We promoted the multidisciplinary of the topics as well as the balance between young and experienced speakers. At the end, we organized a session with 9 papers from both Academia and Industry (shared into two sub-sessions). Directly or through collaborators, we have enthusiastically put together almost all the Ladies in RFID research!

The following presentations took place in this Special Session:

- **Francesca Vipiana** (Politecnico di Torino, Italy): “Polarization Reconfigurable Patch Antenna for Compact and Low Cost UHF RFID Reader”;
- **Alice Buffi** (University of Pisa, Italy): “A Phase-based Method for UHF-RFID Gate Access Control”;
- **Sofia Benouakta** (Université Claude Bernard Lyon 1, France): “New Approaches for Augmented UHF RFID Textile Yarn”;
- **Maria Cristina Caccami** (Bridgestone Europe NV/SA - Italian Branch, Italy): “Method and System for Reading RFID Tags Embedded into Tires on Conveyors”;
- **Sari Merilampi** (Satakunta University of Applied Sciences, Finland): “User-driven Development with Scientific & Applied Research - RFID-controlled Physiogame Case Study”;
- **Nikta Pournoori** (Tampere University, Finland): “A Batteryless Semi-Passive RFID Sensor Platform”;
- **Laura Corchia** (University of Salento, Italy): “A Chipless Humidity Sensor for Wearable Applications”;
- **Alessandra Costanzo** (DEI, University of Bologna, Italy): “Exploitation of the RFID Technology for Autonomous Living”;
- **Cecilia Occhiuzzi** (RADIO6ENSE srl & University of Roma “Tor Vergata”, Italy): “RFID Technology for Industry 4.0: Architectures and Challenges”.

Each presentation started with a quick introduction on the speaker activity and career. It was extremely interesting to appreciate the diversities among the Ladies but the same enthusiasm and passion toward research and professional life. The same strength in facing studies, jobs and aspirations. Some of the speakers shared with us also some details of their personal life: husbands, children, family responsibilities, work-life balance...to be contemporarily a wife, a mum and an engineer is part of the play, it makes it even more challenging and appealing!

The technical content of the session was high. We had a good balance between applications and design contributions. Industrial and biomedical use cases have been described, as well as new layouts and architectures for tag and reader antennas. Particularly important was the contribution by Dr. Buffi on gate access control, which also won the conference best paper award. The resulting feeling was the confirmation that RFID technology is nowadays more than mature to be successfully applied in many realistic scenarios, being a versatile platform suitable to be deployed in both industrial and civil life. Important synergies are hence expected between academia and industry to effectively guide such a technology transfer, that pledges to bring important benefits for the final users, provided that scientists and technologists are able to dominate the many performance parameters.



Figure 1 Panelists and organizers of the Special Session on RFID Ladies. From left to right: Sari Merilampi, Alessandra Costanzo, Laura Corchia, Sofia Benouakta, Nikta Pournoori, Johanna Virkki, Prof. Paolo Nepa General Chair, Alice Buffi, Cecilia Occhiuzzi, Maria Cristina Caccami, Francesca Vipiana.

The session was recognized and inspiring: The amount of male and female attendees and interesting technical questions was numerous. At the end of the day, some male colleagues jokingly admitted their worry in ascertaining that the RFID Ladies are nowadays ready to undermine the masculine role of the RFID research: "We should be alert, the Ladies are here" someone nicely advised. Thanks for the compliment, we really appreciate! However, that is not the point: the point is that we were already there, even if maybe sometimes we are not completely aware!

We conclude the first edition of the Special Session on Women in RFID and the WIE column with the hope to have, in the next few years, more and more participants to such a Session, more and more enthusiastic ladies that want to share with us the results of their research, their career and their life... So many ladies, that in a few years, the necessity to organize such kind of session will be pointless.

References

- [1] Elsevier, Gender in the Global Research Landscape Report, Elsevier, 2017.

Authors Information



Cecilia Occhiuzzi received the M.Sc. degree in medical engineering and Ph.D. degree in electromagnetics from the University of Rome “Tor Vergata,” Rome, Italy, in 2008 and 2011, respectively.

Currently, she is Assistant Professor with the University of Rome “Tor Vergata”, where she teaches Electromagnetic Fields. In 2008, she was with the School of Engineering, University of Warwick, Coventry, U.K. as a post-graduate student, in 2010, she was a Visiting Researcher with the Georgia Institute of Technology, Atlanta, GA, USA and in 2014 she was a Research Assistant with the University of Palermo, Italy. She is the Co-Founder and CEO of RADIO6ENSE. Her research interests include wireless health monitoring by means of wearable and implantable radio-frequency/mm-

wave identification techniques and pervasive sensing paradigms for Industry 4.0.

Dr. Occhiuzzi was the recipient of the IEEE APS Doctoral Award, in 2011. In 2012, she was the recipient of the Best Thesis Award at the 2012 RFID Journal Live, Orlando, FL, USA. She is author of more than sixty papers on International Journals and Conferences.



Johanna Virkki received her M.Sc. degree (2008) in production engineering of electronics and completed her D.Sc. degree (2010) in the field of reliability engineering in Tampere University of Technology, Finland. Her current research portfolio in Tampere University concentrates on textile-integrated wireless electronics. She is interested in a multidisciplinary approach for the creation of body-centric wireless systems by utilizing new materials in novel fabrication methods to enable innovative structures and reliability improvement. In 2016, she received a very competitive Academy Research Fellowship for 5 years, from the

Academy of Finland. At the beginning of 2017, she was given the title of Adjunct Professor in the field of “Additive fabrication methods and materials for wireless sensing systems”. In June 2018, she received the highly valued “Young Researcher Award of the Year 2018” from The Finnish Foundation for Technology Promotion.