Marco Zennaro

Curriculum Vitae

▬▬ Education

2010	**PhD in Telecommunications**, *KTH – the Royal Institute of Technology*, Stockholm, Sweden.
2001	**Master in Electronical Engineering**, *University of Trieste*, Trieste, Italy.

▬▬ PhD Thesis

Title	*Wireless Sensor Networks for Development: Potentials and Open Issues*
Supervisor	Prof. Bjorn Pehrson
Abstract	Wireless Sensor Networks (WSNs) provide a way to bridge the gap between the physical and the virtual worlds. They promise unprecedented abilities to observe and understand large-scale, real-world phenomena at a fine spatial-temporal resolution. Their application in Developing Countries is even more interesting: they can help solve problems that affect communities.

▬▬ Research Interests

ICT4D	My research interests are in the area of **ICT4D**. More specifically, I focus on IoT, wireless sensor networks and their applications in Developing Countries. The use of wireless sensor networks in developing regions has a great role to play not only to expedite novel solutions that help mitigate development problems, but also to facilitate research activities in crucial scientific areas such as environmental monitoring, physics of complex systems and energy management.

▬▬ Experience

2021–present	**ICTP**, *Trieste, Italy*.
	I work as a Research Scientist and Coordinator of the Science, Technology and Innovation Unit of the ICTP.
2003–2020	**ICTP**, *Trieste, Italy*.
	I worked as a Research Officer in the T/ICT4D Laboratory of the Applied Physics Unit. Over the years I have taken more responsibilities: managing projects with external partners, organizing workshops as main organizer, supervising STEP and TRIL visitors, working with ICTP Associates and managing the group's budget.
2002	**EPFL**, *Lausanne, Switzerland*.
	I worked as a Research Assistant in the Microelectronic System Laboratory in the field of Digital Design

2001	**Infineon**, *Villach, Austria*.
	I worked on my Master Thesis "VHDL Design of a DMA for a DSP"

Outreach

2003–Present	**Workshops in 35 Countries**.
	I have organized workshops and lectured in activities in: Ghana, Kenya, Cameroon, India, Benin, Namibia, South Africa, Indonesia, Thailand, Trinidad, Hong Kong, Taiwan, Tunisia, Senegal, Zambia, Zimbabwe, Lesotho, Japan, Micronesia, Malawi, Mozambique, Rwanda, Bolivia, Argentina, Mauritius, Seychelles, Ecuador, Panama, Nicaragua, Costa Rica, Comoros, Colombia, Nepal, Uganda and Myanmar.
2019	**ITU Centre of Excellence at ICTP**.
	I serve as the Focal Point for the ITU Centre of Excellence in IoT, Big Data and Statistics.
2017	**ITU IoT Master Programme**.
	I served as author of the report for the ITU IoT Master Programme and as coordinator for the production of training material for the ITU IoT Master Programme.

Student supervision

2019–	**Irene Mihigo**, *PhD*, ACoEIoT, Rwanda.
2018–	**Joseph Habiyaremye**, *PhD*, ACoEIoT, Rwanda.
2018–	**Martin Kuradusenge**, *PhD*, ACoEIoT, Rwanda.
2018–	**Salahadin Seid Musa**, *PhD*, Addis Ababa University, Ethiopia.
2019–2020	**Phila Ngarleita Danmadji**, *Master*, IMSP, Benin.
	Implementation de la blockchain pour les applications IoT
2019–2020	**Sidoine Ode**, *Master*, IMSP, Benin.
	Systeme de surveillance d'un reseau sans fil: Cas du Wi-Fi du Campus de Dangbo
2011	**Mayamiko Nkoloma**, *Master*, I2IT, India.
	Remote Monitoring of Renewable Energy Systems Deployed in Malawi
2009	**Athanasios Floros**, *Master*, KTH, Sweden.
	Routing Protocols for SunSPOTs - Analysis, Comparison and Implementation of a new one
2008	**Loris Segolin**, *Master*, University of Trieste, Italy.
	On the optimal placement of Access Points
2008	**Herve' Ntareme**, *Master*, KTH, Sweden.
	Experimental evaluation of Temporal, Spatial and Energy characteristics of an Outdoor Sensor Network
2006	**Marco Liva**, *Master*, University of Trieste, Italy.
	Design of a Point-to-Point HF Data Transmission System

ICTP Service

STEP and TRIL	I supervised two STEP students (Nikola Jovalekic and Salahadin Seid Musa) and trained several TRIL fellows, supervising their scientific work.
Associates	I worked with the following Associates: Bharat Chaudhari (India), Antoine Bagula (South Africa), Diego Mendez Chaves (Colombia), Chomora Mikeka (Malawi), Salomao David Cumbula (Mozambique), Hiba Baha Eldin Sayed Omer (Saudi Arabia) and Rodrigo Neumann (Brazil).
Scientific Staff Board	I am part of the Scientific Staff Board as member of the Applied Physics Unit.

Projects

UN	I managed joint projects with several UN agencies: with UNECA (UN Economic Commission for Africa) on providing connectivity to weather stations in African Islands, with ITU (International Telecommunications Union) on developing a wireless training kit, with UNESCO on developing a wireless training kit and on editing a book on open access and with IAEA on developing low cost sensors for radiation monitoring.
EU	I worked on two EU projects: FP7 "Clommunity: A Community Networking Cloud in a Box" and FP7 "QWeCI: Quantifying Weather and Climate Impacts on Health in Developing Countries". In 2018 and 2019 I acted as external expert for a EU H2020 project on IoT in Africa.
ACoEIoT	I am a Staff Associate of the African Centre of Excellence in Internet of Things project at University of Rwanda since its inception.

Awards

2017	I have been nominated IEEE Senior Member.
2015	I have been nominated Visiting Professor at KIC-Kobe Institute of Computing in Kobe, Japan. I visit KIC every year to lecture on IoT4D.
2013	I have been nominated Sensemaking Senior Research Fellow of the MIT International Development Initiative.
2004	I am a member of the UNESCO Chair in ICT4D which grew out of the ICT4D Collective.

Languages

English	**Excellent**
Italian	**Mothertongue**
French	**Intermediate**

Books

I co-edited with ICTP Associates Sheetal N Ghorpade and Bharat Chaudhari the book "Optimal Localization of Internet of Things Nodes", ISBN 978-3-030-88095-8, Springer, 2021.

I co-edited with ICTP Associate Bharat Chaudhari the book "LPWAN Technologies for IoT and M2M Applications", ISBN 978-0-12-818880-4, Elsevier, 2020.

I co-edited the book "IoT in Five Days", 2015. The book has been translated in French and Spanish with the support of the Internet Society (ISOC).

I co-edited the book "TV White Spaces, a pragmatic approach" (http://wireless.ictp.it/tvws/book/), 2013.

I co-edited the book "m-Science: Sensing, Computing and Dissemination", 2010.

I co-edited the book "Science Dissemination using Open Access" (http://sdu.ictp.it/openaccess/book.html), 2008.

I co-edited the book "How To Accelerate Your Internet: A practical guide to Bandwidth Management and Optimisation using Open Source Software", 2006.

I co-authored the book Wireless Networking in the Developing World (http://www.wndw.net), 2005. The book has been translated in six languages (French, Spanish, Portuguese, Arabic, Indonesian, Burmese) and has been downloaded more than 3 million times.

I co-authored the Radio Laboratory Handbook, International Center for Theoretical Physics, 2004, ISBN 92-95003-24-1

Journal Articles

Sheetal Ghorpade, Marco Zennaro, and Bharat Chaudhari. "Survey of Localization for Internet of Things Nodes: Approaches, Challenges and Open Issues". In: *Future Internet* 13.8 (2021), p. 210.

Sheetal Ghorpade, Marco Zennaro, and Bharat S Chaudhari. "Towards green computing: intelligent bio-inspired agent for IoT-enabled wireless sensor networks". In: *International Journal of Sensor Networks* 35.2 (2021), pp. 121–131.

Sheetal N Ghorpade, Marco Zennaro, and Bharat S Chaudhari. "IoT-based hybrid optimized fuzzy threshold ELM model for localization of elderly persons". In: *Expert Systems with Applications* 184 (2021), p. 115500.

Sheetal N Ghorpade et al. "A novel enhanced quantum PSO for optimal network configuration in heterogeneous industrial IoT". In: *IEEE Access* 9 (2021), pp. 134022–134036.

Sheetal N Ghorpade et al. "Enhanced differential crossover and quantum particle swarm optimization for IoT applications". In: *IEEE Access* 9 (2021), pp. 93831–93846.

Joseph Habiyaremye et al. "A Data-Driven Predictive Machine Learning Model for Efficiently Storing Temperature-Sensitive Medical Products, Such as Vaccines: Case Study: Pharmacies in Rwanda". In: *Journal of Healthcare Engineering* 2021 (2021).

Martin Kuradusenge et al. "Experimental Study of Site-Specific Soil Water Content and Rainfall Inducing Shallow Landslides: Case of Gakenke District, Rwanda". In: *Geofluids* 2021 (2021).

MARCO MARCELLI et al. "Toward the widespread application of low-cost technologies in coastal ocean observing (Internet of Things for the Ocean)". In: *Mediterranean Marine Science* 22.2 (2021), pp. 255–269.

Kiyoshy Nakamura et al. "A LoRa-based protocol for connecting IoT edge computing nodes to provide small-data-based services". In: *Digital Communications and Networks* (2021).

Kiyoshy Nakamura et al. "LADEA: A Software Infrastructure for Audio Delivery and Analytics". In: *Mobile Networks and Applications* (2021), pp. 1–7.

Mary-Jane Sule, Marco Zennaro, and Godwin Thomas. "Cybersecurity through the lens of Digital Identity and Data Protection: Issues and Trends". In: *Technology in Society* 67 (2021), p. 101734.

Bharat S Chaudhari, Marco Zennaro, and Suresh Borkar. "LPWAN Technologies: Emerging Application Characteristics, Requirements, and Design Considerations". In: *Future Internet* 12.3 (2020), p. 46.

Sheetal N Ghorpade, Marco Zennaro, and Bharat S Chaudhari. "GWO Model for Optimal Localization of IoT-Enabled Sensor Nodes in Smart Parking Systems". In: *IEEE Transactions on Intelligent Transportation Systems* (2020).

Pape Abdoulaye Barro et al. "A Smart Cities LoRaWAN Network Based on Autonomous Base Stations (BS) for Some Countries with Limited Internet Access". In: *Future Internet* 11.4 (2019), p. 93.

Angelica Moreno Cardenas et al. "A Low-Cost and Low-Power Messaging System Based on the LoRa Wireless Technology". In: *Mobile Networks and Applications* (2019), pp. 1–8.

Sheetal N Ghorpade, Marco Zennaro, and Bharat S Chaudhari. "Binary grey wolf optimisation-based topology control for WSNs". In: *IET Wireless Sensor Systems* 9.6 (2019), pp. 333–339.

Pape Barro et al. "Towards Smart and Sustainable Future Cities Based on Internet of Things for Developing Countries: What Approach for Africa?" In: *EAI Endorsed Transactions on Internet of Things* 4.13 (2018).

Riccardo Gerin et al. "On the design of a sustainable ocean drifter for developing countries". In: *EAI Endorsed Transactions on Internet of Things* 4.13 (2018).

Nikola Jovalekic et al. "Experimental study of LoRa transmission over seawater". In: *Sensors* 18.9 (2018), p. 2853.

Nikola Jovalekic et al. "LoRa transceiver with improved characteristics". In: *IEEE Wireless Communications Letters* 7.6 (2018), pp. 1058–1061.

Marco Zennaro and Santhi Kumaran. "Capacity building initiatives in IoT in developing countries: lessons learned and way forward". In: *Capacity Building in a Changing ICT Environment 2018* (2018), pp. 29–36.

Jose Saldana et al. "Alternative networks: Toward global access to the internet for all". In: *IEEE Communications Magazine* 55.9 (2017), pp. 187–193.

Jorge E Luzuriaga et al. "Evaluando un escenario de pruebas para el IoT entre la emulación y el uso de dispositivos reales". In: *Actas Jornadas Sarteco* (2016), pp. 441–445.

Hope Mauwa, Antoine Bagula, and Marco Zennaro. "Improving Spectrum Sensing as a Method for White Space Identification through Design Principles". In: *Journal of ICT Standardization* 3.3 (2016), pp. 177–200.

Junaid Qadir et al. "Wireless technologies for development [Guest Editorial]". In: *IEEE Communications Magazine* 54.7 (2016), pp. 18–19.

Antoine Bagula, Lorenzo Castelli, and Marco Zennaro. "On the design of smart parking networks in the smart cities: An optimal sensor placement model". In: *Sensors* 15.7 (2015), pp. 15443–15467.

Salomão David, Marco Zennaro, and Américo Muchanga. "The Internet@ rural: why not TV-White spaces in Mozambique?" In: *Privilege, Information, Knowledge and Power: An Endless Dilemma* 7 (2015), p. 28.

Roman Lara et al. "On real-time performance evaluation of volcano-monitoring systems with wireless sensor networks". In: *IEEE Sensors Journal* 15.6 (2015), pp. 3514–3523.

Enrique Canessa et al. "EyApp & AndrEyA–Free Apps for the Automated Recording of Lessons by Students." In: *International Journal of Emerging Technologies in Learning* 9.1 (2014).

C Mikeka et al. "Malawi television white spaces (TVWS) pilot network performance analysis". In: *Journal of Wireless Networking and Communications* 4.1 (2014), pp. 26–32.

Chomora Mikeka et al. "Preliminary performance assessment of TV white spaces technology for broadband communication in Malawi". In: *Procedia Engineering* 78 (2014), pp. 149–154.

Sindiso M Nleya et al. "Optimisation of a TV white space broadband market model for rural entrepreneurs". In: *Journal of ICT Standardization* 2.2 (2014), pp. 109–128.

Clement Onime, Marco Zennaro, and James Uhomoibhi. "A low cost implementation of an existing hands-on laboratory experiment in electronic engineering". In: *International Journal of Engineering Pedagogy (iJEP)* 4.4 (2014), pp. 4–7.

Dhirendra Sharma, Vikram Kumar, and Marco Zennaro. "Ubiquitous Wireless Sensor Networks for Environmental Monitoring in the Western Himalayan Region of India". In: *International Journal* 4.3 (2014).

Enrique Canessa et al. "Apps for synchronized photo-audio recordings to support students". In: *Proc. WAVe* 2013 (2013).

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Roman Lara et al. "Towards a new volcano monitoring system using wireless sensor networks". In: *Intelligent Sensors Sensor Networks and Information Processing (ISSNIP)* (2013).

Million Mafuta et al. "Successful deployment of a wireless sensor network for precision agriculture in Malawi". In: *International Journal of Distributed Sensor Networks* 9.5 (2013), p. 150703.

Antoine Bagula et al. "Ubiquitous sensor networking for development (usn4d): An application to pollution monitoring". In: *Sensors* 12.1 (2012), pp. 391–414.

Enrique Canessa, Carlo Fonda, and Marco Zennaro. "On-line certification for all: the Pinvox algorithm". In: *International Journal of Emerging Technologies in Learning (iJET)* 7.3 (2012), pp. 43–45.

Enrique Canessa and Marco Zennaro. "A mobile science index for development". In: *International Journal of Interactive Mobile Technologies (iJIM)* 6.1 (2012), pp. 4–6.

Sandro Radicella, Ryszard Stru\.zak, and Marco Zennaro. "Educating on Wireless Solutions for Environmental Monitoring". In: *Journal of Telecommunications and Information Technology* (2012), pp. 78–82.

Antoine Bagula et al. "Bridging the digital divide in Africa: A technology perspective". In: *Wireless Communication and Information* (2011), pp. 7–28.

Antoine B Bagula, Isaac Osunmakinde, and Marco Zennaro. "On the relevance of using Bayesian belief networks in wireless sensor networks situation recognition". In: *Sensors* 10.12 (2010), pp. 11001–11020.

Marco Zennaro and Antoine B Bagula. "Design of a flexible and robust gateway to collect sensor data in intermittent power environments". In: *International Journal of Sensor Networks* 8.3-4 (2010), pp. 172–181.

Antoine B Bagula et al. "On the relevance of using openwireless sensor networks in environment monitoring". In: *Sensors* 9.6 (2009), pp. 4845–4868.

Enrique Canessa, Carlo Fonda, and Marco Zennaro. "One year of ICTP diploma courses on-line using the automated EyA recording system". In: *Computers & Education* 53.1 (2009), pp. 183–188.

Enrique Canessa, Marco Zennaro, and Carlo Fonda. "Supporting science in developing countries using open technologies". In: *European journal of physics* 30.3 (2009), p. 651.

Waldir Roque et al. "Tecnologia EyA: uma ferramenta para produção e difusão automatizada de aulas digitais na web". In: *RENOTE-Revista Novas Tecnologias na Educação* 6.1 (2008).

E Canessa, C Fonda, and M Zennaro. "Webcasting of traditional chalkboard lectures: the EyA system". In: *European Journal of Open, Distance and E-learning* 10.2 (2007).

Marco Zennaro et al. "Book Sprint: A New Model for Rapid Book Authoring and Content Development". In: *International Journal of the Book* 4.1 (2007).

Enrique Canessa et al. "A web community to foster science in developing countries: www. ictp. it". In: *International Journal of Web Based Communities* 2.2 (2006), pp. 172–182.

Enrique Canessa et al. "Access to scholarly literature via a free knowledge management enabler: an opportunity for scientists in developing countries". In: *Knowledge Management for Development Journal* 2.3 (2006), pp. 75–85.

Katepalli Sreenivasan et al. "Access to scholarly literature via a free knowledge management enabler: An opportunity for scientists in developing countries". In: (2006).

M Zennaro et al. "Scientific measure of Africa's connectivity". In: *Information Technologies & International Development* 3.1 (2006), pp–55.

Book Chapters

Sheetal N Ghorpade, Marco Zennaro, and Bharat S Chaudhari. "Introduction to Internet of Things". In: *Optimal Localization of Internet of Things Nodes*. Springer, Cham, 2022, pp. 1–15.

Sheetal N Ghorpade, Marco Zennaro, and Bharat S Chaudhari. "IoT-Based Localization of Elderly Persons". In: *Optimal Localization of Internet of Things Nodes*. Springer, Cham, 2022, pp. 95–113.

Sheetal N Ghorpade, Marco Zennaro, and Bharat S Chaudhari. "Localization Approaches for Internet of Things". In: *Optimal Localization of Internet of Things Nodes*. Springer, Cham, 2022, pp. 17–50.

Sheetal N Ghorpade, Marco Zennaro, and Bharat S Chaudhari. "Node Localization for Smart Parking Systems". In: *Optimal Localization of Internet of Things Nodes*. Springer, Cham, 2022, pp. 51–66.

Sheetal N Ghorpade, Marco Zennaro, and Bharat S Chaudhari. "Optimal Network Configuration in Heterogeneous Industrial IoT". In: *Optimal Localization of Internet of Things Nodes*. Springer, Cham, 2022, pp. 67–94.

Anjali Askhedkar, Bharat Chaudhari, and Marco Zennaro. "Hardware and software platforms for low-power wide-area networks". In: *LPWAN Technologies for IoT and M2M Applications*. Academic Press, 2020, pp. 397–407.

Anjali Askhedkar et al. "TV white spaces for low-power wide-area networks". In: *LPWAN Technologies for IoT and M2M Applications*. Academic Press, 2020, pp. 167–179.

Bharat Chaudhari and Marco Zennaro. "LoRa Transmission Over Rayleigh Fading Channels in Presence of Interference". In: *Innovations in Electronics and Communication Engineering*. Springer, Singapore, 2020, pp. 185–192.

Bharat S Chaudhari and Marco Zennaro. "Introduction to low-power wide-area networks". In: *LPWAN Technologies for IoT and M2M Applications*. Academic Press, 2020, pp. 1–13.

Antoine B Bagula, Mieso K Denko, and M Zennaro. "Middleware for Mobile and Pervasive Services". In: *Handbook of Mobile Systems Applications and Services*. Vol. 7. CRC Press, 2012, pp. 246–265.

Conference Papers

Moez Altayeb et al. "TurboLoRa: enhancing LoRaWAN data rate via device synchronization". In: *2021 IEEE 18th Annual Consumer Communications & Networking Conference (CCNC)*. IEEE. 2021, pp. 1–4.

Jorge Luis Zapico, Fredrik Ahlgren, and Marco Zennaro. "Insect biodiversity in agriculture using IoT: opportunities and needs for further research". In: *IEEE Global Communications Conference, 7-11 December 2021, Madrid, Spain; Connecting Cultures around the Globe*. 2021.

Marco Zennaro, Marco Rainone, and Ermanno Pietrosemoli. "TAT. py: Tropospheric Analysis Tools in Python". In: *2021 17th International Conference on Wireless and Mobile Computing, Networking and Communications (WiMob)*. IEEE. 2021, pp. 25–29.

Steve Chan et al. "The Blindspot of Electromagnetic Interference Affecting Sensitive Medical Devices at Hospitals and Healthcare Facilities". In: *2020 10th Annual Computing and Communication Workshop and Conference (CCWC)*. IEEE. 2020, pp. 0449–0457.

Marco Zennaro et al. "Evaluating the performance of NRENs in deploying IoT in Africa: the case for TTN". In: *2020 IEEE 17th Annual Consumer Communications & Networking Conference (CCNC)*. IEEE. 2020, pp. 1–4.

Pape Abdoulaye Barro, Marco Zennaro, and Jules Degila. "A LoRaWAN Coverage Testbed and a Multi-optional Communication Architecture for Smart City Feasibility in Developing Countries". In: *International Conference on e-Infrastructure and e-Services for Developing Countries*. Springer, Cham. 2019, pp. 73–83.

Pape Abdoulaye Barro, Marco Zennaro, and Ermanno Pietrosemoli. "TLTN–The local things network: on the design of a LoRaWAN gateway with autonomous servers for disconnected communities". In: *2019 Wireless Days (WD)*. IEEE. 2019, pp. 1–4.

Salomão David, Ermanno Pietrosimoli, and Marco Zennaro. "Evaluation of IoT gateways for developing communities: smart Maputo". In: *Proceedings of the Tenth International Conference on Information and Communication Technologies and Development*. 2019, pp. 1–5.

M Marcelli et al. "OpenMODs project: advancing toward the widespread application of low-cost technologies in coastal ocean observing." In: *OCEAN OBS '19, An Ocean of Opportunity, Hawaii Convention Center, Honolulu, HI, USA, 16 September 2019 - 20 September 2019*. 2019.

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Salomão David, Américo Muchanga, and Marco Zennaro. "The Co-Regulation of TV-White Spaces: The Southern Africa Development Community Approach". In: *International Conference on Cross-Cultural Design*. Springer, Cham. 2018, pp. 286–297.

Jorge Herrera-Tapia et al. "Evaluating the use of sub-gigahertz wireless technologies to improve message delivery in opportunistic networks". In: *2017 IEEE 14th International Conference on Networking, Sensing and Control (ICNSC)*. IEEE. 2017, pp. 305–310.

Nikola Jovalekic et al. "Smart and very distant objects". In: *Proceedings of the 3rd Workshop on Experiences with the Design and Implementation of Smart Objects*. 2017, pp. 29–34.

Jorge E Luzuriaga et al. "A disruption tolerant architecture based on MQTT for IoT applications". In: *2017 14th IEEE Annual Consumer Communications & Networking Conference (CCNC)*. IEEE. 2017, pp. 71–76.

Antoine Bagula et al. "Cloud based patient prioritization as service in public health care". In: *2016 ITU Kaleidoscope: ICTs for a Sustainable World (ITU WT)*. IEEE. 2016, pp. 1–8.

Salomão David et al. "TV-White Spaces for Education: The Internet for Education in Boane". In: *Conference on M4D Mobile Communication Technology for Development*. 2016, p. 265.

Hope Mauwa et al. "Systematic analysis of geo-location and spectrum sensing as access methods to TV white space". In: *2016 ITU Kaleidoscope: ICTs for a Sustainable World (ITU WT)*. IEEE. 2016, pp. 1–8.

Md Nazmus Sakib Miazi et al. "Enabling the Internet of Things in developing countries: Opportunities and challenges". In: *2016 5th International Conference on Informatics, Electronics and Vision (ICIEV)*. IEEE. 2016, pp. 564–569.

Andres Arcia Moret et al. "Open and regionalised spectrum repositories for emerging countries". In: *Proceedings of the 2016 workshop on Global Access to the Internet for All*. 2016, pp. 13–18.

Ermanno Pietrosemoli et al. "BLOP: Broadband Link to an Offshore Platform in the Venice Lagoon". In: *ExtremeCom 2016*. 2016.

Marco Rainone, Marco Zennaro, and Ermanno Pietrosemoli. "RFTrack: a tool for efficient spectrum usage advocacy in Developing Countries". In: *Proceedings of the Eighth International Conference on Information and Communication Technologies and Development*. 2016, pp. 1–4.

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Roger Baig et al. "The Cloudy distribution in community network clouds in Guifi. net". In: *2015 IFIP/IEEE International Symposium on Integrated Network Management (IM)*. IEEE. 2015, pp. 1161–1162.

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Sindiso M Nleya et al. "A non-cooperative TV white space broadband market model for rural entrepreneurs". In: *Proceedings of the 2014 ITU kaleidoscope academic conference: Living in a converged world-Impossible without standards?* IEEE. 2014, pp. 79–85.

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