CELLULAR AND WIRELESS COMMUNICATIONS RESEARCH LABORATORY

Contact details

Name	**Cellular and Wireless Communications Research Laboratory**	
Acronym	**CWL**	
Logo		
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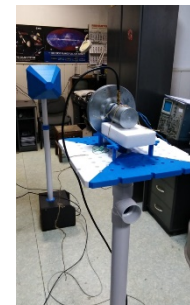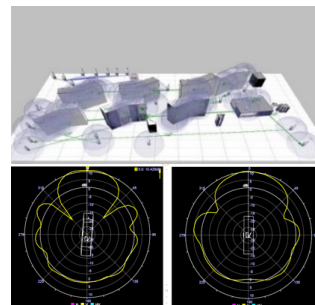
Areas of expertise

Radio network planning and performance evaluation for fixed, mobile and satellite systems: radio network planning (satellite, cellular, local, and sensors) and behavior analysis (QoS and QoE) using professional tools (QualNet, EXata, ICS Telecom EV/HTZ communications);
Electromagnetic waves propagation and radio channel characterization: radio channel modelling (Matlab), smart antenna arrays / MIMO systems (direction finding and beamforming), RF and microwave propagation, EM field modelling and simulation (AWR Microwave Office); ionospheric propagation monitoring;
Microwave antenna design and measurement: design using professional tools (AWR Microwave Office, HFSS) and measurement using professional equipment (R&S analyzers, MegiQ Radiation Measurement System)
Environmental monitoring: evaluation of electromagnetic pollution; sensor networks for pollution monitoring;
Industrial IoT: sensor networks for IIoT (redundancy, dual-standard, energy efficiency), modelling and analysis of IIoT sensor networks

Team

Prof. Tudor Palade, Prof. Emanuel Puschita, Lect. Andra Pastrav, Lect. Paul Dolea, Assist. Cristian Codau, Assist. Rares Buta

Representative projects

RoNaQCI, Romanian National Quantum Communication Infrastructure, EU, 2023-2025.
IntraSAT-Tech, Centre of competence for wireless Intra-SATellite Technologies, STAR 115/2016, ROSA, 2016-2019.
RDAntenna, Compact retro-directive wireless antenna network for wireless systems in IEEE 802.11 and IEEE 802.11 communication protocols, 6 SOL/2017, PNCDI III, 2017-2020.
SIRIUS, Ionospheric propagation predictions and wide-band communications with SDR sensors in the HF range for emergency informational support in Romania, PCCA, 2014 - 2016.
SIM-SCP, Implementation of an integrated system for acquisition and transmission of monitoring data from hazardous substances in Cluj, RO04-0006, SEE Grant, 2015 – 2016.
WiSAT, Wireless Communication Bus for Satellite Applications**,** ESA (European Space Agency), 2014-2015.
SMANT, New Algorithms for adaptive/smart antennas in 3G and post-3G communication systems, PN2, 2007-2010.
RAMA, Experimental weak radio signals monitor for ionospheric disturbances analysis, STAR, 2012-2014.
PABMAR, Integrated wireless platform of local access for broadband and mobility based on self-organizing resources, PN2, 2007-2010.
COSMOS, S band mobile satellite communications platform, PN2, 2007-2010.
CERVIT, Virtual network IT&C for education and research units geographical spread, PN2, 2007-2010.
4WARD, Architecture and design for the future internet, FP7-ICT, 2007-2009.
BROADWAN, Broadband services for everyone over fixed wireless access networks, FPVI, 2003-2006.
EMBRACE, Efficient millimeter broadband radio access for convergence and evolution, PCV, 1999-2002.
MARCH, Multilink architecture for multiply services, Eureka Cluster Project, 2008-2011.

Significant results

The most representative publications of the past 5 years:
Research Articles
1. Minteuan, G., Palade, T., Puschita, E., Dolea, P., Pastrav, A., "Monopulse Secondary Surveillance Radar Coverage—Determinant Factors", Sensors 2021, 21, 4198. https://doi.org/10.3390/s21124198.
2. Padrah, Z.; Pastrav, A.; Palade, T.; Ratiu, O.; Puschita, E., "Development and Validation of an ISA100.11a Simulation Model for Accurate Industrial WSN Planning and Deployment", Sensors 2021, 21, 3600. https://doi.org/10.3390/s21113600
3. Domuta, I. and Palade, T., "On-line Estimation of Base Station Location", in IEEE Wireless Communications Letters. 2019. https://doi.org/10.1109/LWC.2019.2953848.
4. Domuta, I., Palade, T.P., Puschita, E., Pastrav, A., "Timestamp Estimation in P802.15.4z Amendment", Sensors 2020, vol. 20(18), Article Number: 54225422. https://doi.org/10.3390/s20185422
5. Popescu, D., Jacquet, P., Mans, B., Dumitru, R., Pastrav, A., Puschita, E., "Information Dissemination Speed in Delay Tolerant Urban Vehicular Networks in a Hyperfractal Setting", IEEE/ACM Transactions on Networking, vol. 27, no. 5, Oct. 2019, p. 1901-1914, doi: 10.1109/TNET.2019.2936636. https://doi.org/10.1109/TNET.2019.2936636
6. Murariu, T., Pastrav, A., Tripon, C., Morari, C., Puschita, E., and Zarbo, L., "A roadmap for building quantum key distribution devices," 2022 21st RoEduNet Conference: Networking in Education and Research (RoEduNet), Sovata, Romania, 2022, pp. 1-6, https://doi.org/10.1109/RoEduNet57163.2022.9921102.
7. Minteuan, G., Pastrav, A., Palade, T., "Monopulse Secondary Surveillance Radar – Environment Impact on Target Detection," 2022 International Workshop on Antenna Technology (iWAT), Dublin, Ireland, 2022, pp. 86-89. https://doi.org/10.1109/iWAT54881.2022.9811020
8. Dolea, P., Pastrav, A., Puschita, E., Palade, T., "Geomagnetic Storms Forecasting by VLF Radio Waves Monitoring", 2021 IEEE Conference on Antenna Measurements & Applications (CAMA), Antibes Juan-les-Pins, France, 2021, pp. 161-164. https://doi.org/10.1109/CAMA49227.2021.9703524
9. Buta, R., Codau, C., Pastrav, A., Palade, T., Dolea, P., Puschita, E., "Performance evaluation of sub-band MVDR beamforming for IEEE 802.11ac wideband signals", 2020 International Symposium on Electronics and Telecommunications (ISETC), Timisoara, Romania, 2020. https://doi.org/10.1109/ISETC50328.2020.9301125
10. Padrah, Z., Pop, C., Jecan, E., Pastrav, A., Palade, T., Ratiu, O., Puschita, E., "An ISA100.11a Model Implementation for Accurate Industrial WSN Simulation in ns-3", 2020 International Workshop on Antenna Technology (iWAT), Bucharest, Romania, 2020. https://doi.org/10.1109/iWAT48004.2020.1570616114
11. Borz, I., Palade, T., Puschita, E., Dolea, P., Pastrav, A., "Wireless Sensor Networks for Healthcare Monitoring" In: Vlad, S., Roman, N.M. (eds) 7th International Conference on Advancements of Medicine and Health Care through Technology (MEDITECH 2020), IFMBE Proceedings, vol 88. Springer, Cham. https://doi.org/10.1007/978-3-030-93564-1_26

Significant solutions:
1. Optimized models for radio channel using MIMO mechanisms and cognitive radio approaches.
2. Profile and fuzzy-logic based QoS support for wireless access networks.
3. Network planning and performance evaluation of the QoS support (active and passive site survey for WLAN).
4. Wireless sensors network implementation in pollution monitoring systems and industrial IoT.
5. Smart antenna systems controlled with SDRs for target detection, localization and tracking.

Products and technologies:
1. Network planning for various radio technologies: satellite links, broadcasting systems, fixed broadband radio links, mobile cellular networks, wireless systems for metropolitan, local and personal use.
2. Professional simulation tools for wireless networks (sensor, local, cellular and satellite) and electromagnetic field analysis in different propagation environments.
3. Tools and equipment for microwave antenna design and measurement.
4. Evaluation of electromagnetic pollution in urban areas.
5. Wireless sensors networks design, deployment, calibration, and maintenance following standards and custom requirements.

The offer addressed to the economic environment

Research & development	Terrestrial and satellite radio channel analysis and modelling. Terrestrial and satellite network architecture optimization. Heterogeneous network planning. Smart antenna arrays using SDR (direction finding, beamforming).
Consulting	Consulting on radio networks planning and optimization for efficient resource allocation, smart antenna design and positioning using adaptive beamforming and direction finding.
Training	**SICAS** Master (Integrated Communication Systems for Special Applications) including: Wireless systems, Interferences and electromagnetic compatibility, Satellite communications systems, Measurement of radio systems, Radio networks planning. http://master-sicas.utcluj.ro

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