CV - SHANPU SHEN

State Key Laboratory of Internet of Things for Smart City,
N21, University of Macau,
Avenida da Universidade, Taipa, Macau

Phone: +86-15895899479
E-mail: shanpushen@um.edu.mo
sshenaa@connect.ust.hk

EMPLOYMENT

Period	Institution	Position
2025-now	State Key Laboratory of Internet of Things for Smart City, **University of Macau (UM),** Macau	Associate Professor
2023-2025	Department of Electrical Engineering & Electronics, **University of Liverpool (UoL)**, United Kingdom	Lecturer (Assistant Professor)
2020-2023	Department of Electronic and Computer Engineering, **Hong Kong University of Science and Technology (HKUST)**	Research Assistant Professor
2018-2020	Department of Electrical and Electronic Engineering, **Imperial College London (ICL)**, United Kingdom Supervisor: Professor Bruno Clerckx	Postdoctoral Fellow
2017-2018	Department of Electronic and Computer Engineering, HKUST	Postdoctoral Fellow

ACADEMIC QUALIFICATIONS

Period	Institution	Qualification
2013-2017	Department of Electronic and Computer Engineering, **Hong Kong University of Science and Technology**, Supervisor: Professor Ross Murch	Doctor of Philosophy
2016-2017	Department of Electrical Engineering and Computer Science **Massachusetts Institute of Technology (MIT)**, United States Supervisor: Professor Charles G. Sodini	Visiting Doctor of Philosophy
2009-2013	School of Electronic Engineering and Optoelectronic Technology, Nanjing University of Science and Technology (NUST), China GPA: 3.88/4.0, Rank in School: 1/671	Bachelor of Engineering

RESEARCH INTERESTS

Wireless and RF Technologies for Next-Generation Wireless System, including:
RF Energy Harvesting, Simultaneous Wireless Information and Power Transfer, Reconfigurable Intelligent Surface, Electromagnetic Information Theory, Integrated Sensing and Communications, Ambient Backscatter Communications, MIMO Antenna Design, Pixel Antenna and Optimization.

PUBLICATIONS

- **Google Scholar Citations: 3867, h-index: 36, i10-index: 66**
- Publish **72** Top IEEE journal papers (**43 first/corresponding authored**) and **28** conference papers
- **4 ESI Highly Cited Papers**
- **Journal Paper List (*Corresponding Author)**

[1] Z. Ming, **S. Shen***, J. Rao*, Z. Li, J. Zhang, C. Y. Chiu, and R. Murch, "A hybrid transmitting and reflecting beyond diagonal reconfigurable intelligent surface with independent beam control and power splitting," in IEEE

Transactions on Microwave Theory and Techniques (Accepted), 2025.

[2] H. Li, M. Nerini, **S. Shen**, and B. Clerckx, "A tutorial on beyond-diagonal reconfigurable intelligent surfaces: modeling, architectures, system design and optimization, and applications," in IEEE Communications Surveys & Tutorials (Early Access), 2025.

[3] K.-K. Wong, C. Wang, **S. Shen**, C.-B. Chae, and R. Murch, "Reconfigurable pixel antennas meet fluid antenna systems: a paradigm shift to electromagnetic signal and information processing," in IEEE Wireless Communications (Early Access), 2025.

[4] **S. Shen***, K.-K. Wong, and R. Murch, "Antenna coding empowered by pixel antennas," in IEEE Transactions on Communications (Early Access), 2025.

[5] D. Ma, W. Xu, C. Zhang, H. Zhou, **S. Shen**, Q. Zhang, and Y. Fang, "Frequency-diverse integrated sensing and backscatter communication system utilizing high scanning-rate slot array antenna with inverse scattering approach," in IEEE Journal on Selected Areas in Communications (Early Access), 2025.

[6] C. Zhang, **S. Shen***, H. Li, D. Ma, Z. Han, J. Qian, B. Clerckx, and R. Murch, "Compact millimeter wave massive MIMO system utilizing ESPAR," in IEEE Transactions on Communications, vol. 73, no. 11, pp. 10262-10276, Nov. 2025.

[7] W. Xu, D. Ma, P. Jiang, C. Yu, K. Gong, B. Liu, **S. Shen**, and Q. Zhang, "Frequency-diverse integrated sensing and communication system utilizing coupled-resonator LWA with full-space coverage and high scanning rate," in IEEE Journal of Selected Topics in Electromagnetics, Antennas and Propagation, vol. 1, no. 1, pp. 249-264, Sept. 2025.

[8] D. Ma, **S. Shen***, H. Zhou, C. Zhang, Q. Zhang and R. Murch, "Integrated sensing, identification, and backscatter Communication system utilizing inverse scattering approach," in IEEE Transactions on Antennas and Propagation, vol. 73, no. 8, pp. 5877-5889, Aug. 2025.

[9] X. Yang, X. Yu, M. Liu, K. Kurskiy, **S. Shen**, and Y. Huang, "A passive 3D beam-steering gravitational liquid dielectric resonator antenna with polarization diversity," in IEEE Transactions on Antennas and Propagation, vol. 73, no. 7, pp. 4192-4207, July 2025.

[10] M. Kumar, C. Song, Y. Huang, J. Zhou, **S. Shen**, P. Mitcheson, Y. Ding, G. Goussetis, and M. Wagih, "From MHz to mmWaves: a review of application-driven UK-based wireless power research," in IEEE Microwave Magazine, vol. 26, no. 7, pp. 78-92, July 2025.

[11] B. Peng, K. L. Besser, **S. Shen**, F. Poschmann, R. Raghunath, D. Mittleman, V. Jamali, and E. A. Jorswieck, "RISnet: a domain-knowledge driven neural network architecture for RIS optimization with mutual coupling and partial CSI," in IEEE Transactions on Wireless Communications, vol. 24, no. 5, pp. 4469-4482, May 2025.

[12] H. Li, M. Nerini, **S. Shen**, and B. Clerckx, "Beyond diagonal reconfigurable intelligent surfaces in wideband OFDM communications: circuit-based modeling and optimizations," in IEEE Transactions on Wireless Communications, vol. 24, no. 4, pp. 3623-3636, April 2025.

[13] K. Jiang, Y. Huang, **S. Shen**, X. Chen, Y. Xie, "Source stirred method for total radiated power measurements in a TEM cell," in IEEE Transactions on Antennas and Propagation, vol. 73, no. 4, pp. 2192-2203, April 2025.

[14] B. Wang, H. Li, **S. Shen**, Z. Cheng*, and B. Clerckx, "A dual-function radar-communication system empowered by beyond diagonal reconfigurable intelligent surface," in IEEE Transactions on Communications, vol. 73, no. 3, pp. 1501-1516, March 2025.

[15] Z. Li, A. Dubey, **S. Shen***, N. K. Kundu, J. Rao, and R. Murch, "Radio tomographic imaging with reconfigurable intelligent surfaces," in IEEE Transactions on Wireless Communications, vol. 23, no. 11, pp. 15784-15797, Nov. 2024.

[16] M. Nerini, **S. Shen**, H. Li, M.D. Renzo, and B. Clerckx, "A universal framework for multiport network analysis of reconfigurable intelligent surfaces," in IEEE Transactions on Wireless Communications, vol. 23, no. 10, pp.

14575-14590, Oct. 2024.

[17] H. Li, **S. Shen**, Y. Zhang, and B. Clerckx, "Channel estimation and beamforming for beyond diagonal reconfigurable intelligent surfaces," in IEEE Transactions on Signal Processing, vol. 72, pp. 3318-3332, 2024.

[18] J. Qian, **S. Shen***, and R. Murch, "Including antenna effects into capacity formulations of line-of-sight MIMO channels," in IEEE Wireless Communications Letters, vol. 13, no. 9, pp. 2477-2481, Sept. 2024.

[19] M. Nerini, **S. Shen***, H. Li, and B. Clerckx, "Beyond diagonal reconfigurable intelligent surfaces utilizing graph theory: modeling, architecture design, and optimization," in IEEE Transactions on Wireless Communications, vol. 23, no. 8, pp. 9972-9985, Aug. 2024.

[20] H. Li, **S. Shen***, and B. Clerckx, "Synergizing beyond diagonal reconfigurable intelligent surface and rate-splitting multiple access," in IEEE Transactions on Wireless Communications, vol. 23, no. 8, pp. 8717-8729, Aug. 2024.

[21] Y. Zhou, Y. Liu, H. Li, Q. Wu, **S. Shen**, and B. Clerckx, "Optimizing power consumption, energy efficiency and sum-rate using beyond diagonal RIS - a unified approach," in IEEE Transactions on Wireless Communications, vol. 23, no. 7, pp. 7423-7438, July 2024.

[22] M. Nerini, **S. Shen**, and B. Clerckx, "Static grouping strategy design for beyond diagonal reconfigurable intelligent surfaces," in IEEE Communications Letters, vol. 28, no. 7, pp. 1708-1712, July 2024.

[23] W. Liu, **S. Shen***, D. H. K. Tsang, R. K. Mallik, and R. Murch, "An efficient ratio detector for ambient backscatter communication," in IEEE Transactions on Wireless Communications, vol. 23, no. 6, pp. 5908-5921, June 2024.

[24] Z. Liu, Y. Liu, **S. Shen**, Q. Wu, and Q. Shi, "Enhancing ISAC network throughput using beyond diagonal RIS," in IEEE Wireless Communications Letters, vol. 13, no. 6, pp. 1670-1674, June 2024.

[25] H. Li, **S. Shen**, M. Nerini, M.D. Renzo, and B. Clerckx, "Beyond diagonal reconfigurable intelligent surfaces with mutual coupling: modeling and optimization," in IEEE Communications Letters, vol. 28, no. 4, pp. 937-941, April 2024.

[26] H. Li, **S. Shen***, M. Nerini, and B. Clerckx, "Reconfigurable intelligent surfaces 2.0: beyond diagonal phase shift matrices," in IEEE Communications Magazine, vol. 62, no. 3, pp. 102-108, March 2024. **Citation: 122 (ESI Highly Cited Paper)**

[27] M. Nerini, **S. Shen***, and B. Clerckx, "Closed-form global optimization of beyond diagonal reconfigurable intelligent surfaces," in IEEE Transactions on Wireless Communications, vol. 23, no. 2, pp. 1037-1051, Feb. 2024. **Citation: 107 (ESI Highly Cited Paper)**

[28] M. Nerini, **S. Shen***, and B. Clerckx, "Discrete-value group and fully connected architectures for beyond diagonal reconfigurable intelligent surfaces," in IEEE Transactions on Vehicular Technology, vol. 72, no. 12, pp. 16354-16368, Dec. 2023.

[29] H. Li, **S. Shen***, and B. Clerckx, "A dynamic grouping strategy for beyond diagonal reconfigurable intelligent surfaces with hybrid transmitting and reflecting mode," in IEEE Transactions on Vehicular Technology, vol. 72, no. 12, pp. 16748-16753, Dec. 2023.

[30] W. Liu, **S. Shen***, D. H. K. Tsang, and R. Murch, "MIMO ambient backscatter communication: capacity maximization and beamforming optimization," in IEEE Transactions on Vehicular Technology, vol. 72, no. 12, pp. 15829-15843, Dec. 2023.

[31] Z. Han, **S. Shen***, Y. Zhang, S. Tang, C. Y. Chiu, and R. Murch, "Using loaded N-port structures to achieve the continuous-space electromagnetic channel capacity bound," in IEEE Transactions on Wireless Communications, vol. 22, no. 11, pp. 7592-7605, Nov. 2023.

[32] D. Ma, A. Dubey, Z. Xu, **S. Shen**, Q. Zhang, and R. Murch, "Reducing the number of measurement nodes in RF imaging using antenna pattern diversity with an extended Rytov approximation," in IEEE Transactions on

Antennas and Propagation, vol. 71, no. 11, pp. 8881-8893, Nov. 2023.

[33] H. Li, **S. Shen***, and B. Clerckx, "'Beyond diagonal reconfigurable intelligent surfaces: a multi-sector mode enabling highly directional full-space wireless coverage'", in IEEE Journal on Selected Areas in Communications, vol. 41, no. 8, pp. 2446-2460, Aug. 2023.

[34] Z. Han, **S. Shen***, Y. Zhang, S. Tang, C. Y. Chiu, and R. Murch, "Spectrally efficient pulse shaping for beamspace space shift keying in single-RF ESPAR systems," in IEEE Transactions on Vehicular Technology, vol. 72, no. 8, pp. 10548-10560, Aug. 2023.

[35] C. Zhang, **S. Shen***, Z. Han, and R. Murch, "Analog beamforming using ESPAR for single-RF precoding systems," in IEEE Transactions on Wireless Communications, vol. 22, no. 7, pp. 4387-4400, July 2023.

[36] Z. Han, **S. Shen***, Y. Zhang, S. Tang, C. Y. Chiu, and R. Murch, "Single-RF MIMO-OFDM using ESPAR," in IEEE Transactions on Vehicular Technology, vol. 72, no. 5, pp. 6080-6089, May 2023.

[37] Z. Li, N. K. Kundu, J. Rao, **S. Shen***, M. R. Mckay, R. Murch, "Performance analysis of RIS-assisted communications with element grouping and spatial correlation," in IEEE Wireless Communications Letters, vol. 12, no. 4, pp. 630-634, April 2023.

[38] D. Ma, Y. Zhang, A. Dubey, S. Deshmukh, **S. Shen***, Q. Zhang*, and R. Murch, "Millimeter-wave 3D imaging using leaky-wave antennas and an extended rytov approximation in a frequency-diverse MIMO system," in IEEE Transactions on Microwave Theory and Techniques, vol. 71, no. 4, pp. 1809-1825, April 2023.

[39] H. Li, **S. Shen***, and B. Clerckx, "Beyond diagonal reconfigurable intelligent surfaces: from transmitting and reflecting modes to single-, group-, and fully-connected architectures", in IEEE Transactions on Wireless Communications, vol. 22, no. 4, pp. 2311-2324, April 2023. **Citation: 217 (ESI Highly Cited Paper)**

[40] T. Qiao, F. Jiang, **S. Shen***, Z. Zhang, M. Li, C. Y. Chiu, Q. S. Cheng*, and R. Murch, "Pixel antenna optimization using the adjoint method and the method of moving asymptotes," in IEEE Transactions on Antennas and Propagation, vol. 71, no. 3, pp. 2873-2878, March 2023.

[41] **S. Shen***, J. Kim, and B. Clerckx, "Closed-loop wireless power transfer with adaptive waveform and beamforming: design, prototype, and experiment", in IEEE Journal of Microwaves, vol. 3, no. 1, pp. 29-42, Jan. 2023.

[42] M. T. Chiu, C. Y. Chiu, C. Ng, L.O. Wong, **S. Shen**, and R. Murch, "An ambient RF powered wireless sensor system," in IEEE Open Journal of Antennas and Propagation, vol. 3, pp. 1382-1393, 2022.

[43] J. Rao, Y. Zhang, S. Tang, Z. Li, **S. Shen**, C. Y. Chiu, and R. Murch, "A novel reconfigurable intelligent surface for wide-angle passive beamforming," in IEEE Transactions on Microwave Theory and Techniques, vol. 70, no. 12, pp. 5427-5439, Dec. 2022.

[44] F. Jiang, Z. Zhang, M. Li, **S. Shen**, C. Y. Chiu, Y. Zhang, Q. S. Cheng, and R. Murch, "Multi-port pixel antenna optimization using characteristic mode analysis and sequential feeding port search," in IEEE Transactions on Antennas and Propagation, vol. 70, no. 10, pp. 9160-9174, Oct. 2022.

[45] Y. Zhang, Z. Han, S. Tang, J. Rao, **S. Shen**, M. Li, C. Y. Chiu, and R. Murch, "A low-profile microstrip vertically polarized endfire antenna with 360° beam-scanning and high beam-shaping capability," in IEEE Transactions on Antennas and Propagation vol. 70, no. 9, pp. 7691-7702, Sept. 2022.

[46] Y. Zhang, Z. Han, S. Tang, **S. Shen**, C. Y. Chiu, and R. Murch, "A highly pattern-reconfigurable planar antenna with 360° single- and multi-beam steering," in IEEE Transactions on Antennas and Propagation, vol. 70, no. 8, pp. 6490-6504, Aug. 2022

[47] Z. Han, **S. Shen***, Y. Zhang, C. Y. Chiu, and R. Murch, "A pattern correlation decomposition method for analysis of ESPAR in single-RF MIMO systems," in IEEE Transactions on Wireless Communications, vol. 21, no. 7, pp. 4654-4668, July 2022

[48] N. K. Kundu, Z. Li, J. Rao, **S. Shen***, M. R. Mckay, and R. Murch, "Optimal grouping strategy for

reconfigurable intelligent surfaces assisted wireless communications", in IEEE Wireless Communications Letters, vol. 11, no. 5, pp. 1082-1086, May 2022.

[49] **S. Shen***, B. Clerckx, and R. Murch, "Modeling and architecture design of reconfigurable intelligent surfaces using scattering parameter network analysis," in IEEE Transactions on Wireless Communications, vol. 21, no. 2, pp. 1229-1243, Feb. 2022. **Citation: 304 (ESI Highly Cited Paper)**

[50] F. Jiang, **S. Shen**, C. Y. Chiu, Z. Zhang, Q. S. Cheng, and R. Murch, "Pixel antenna optimization based on perturbation sensitivity," in IEEE Transactions on Antennas and Propagation, vol. 70, no. 1, pp. 472-486, Jan. 2022.

[51] **S. Shen***, J. Kim, C. Song, and B. Clerckx, "Wireless power transfer with distributed antennas: system design, prototype, and experiments," in IEEE Transactions on Industrial Electronics, vol. 68, no. 11, pp. 10868-10878, Nov. 2021.

[52] W. Liu, **S. Shen***, D. H. K. Tsang, and R. Murch, "Enhancing ambient backscatter communication utilizing coherent and non-coherent space-time codes," in IEEE Transactions on Wireless Communications, vol. 20, no. 10, pp. 6884-6897, Oct. 2021

[53] Y. Zhang, **S. Shen***, Z. Han, C. Y. Chiu, and R. Murch, "Compact MIMO systems utilizing a pixelated surface: capacity maximization," in IEEE Transactions on Vehicular Technology, vol. 70, no. 9, pp. 8453-8467, Sept. 2021.

[54] **S. Shen*** and B. Clerckx, "Joint waveform and beamforming optimization for MIMO wireless power transfer," in IEEE Transactions on Communications, vol. 69, no. 8, pp. 5441-5455, Aug. 2021.

[55] C. Song, P. Lu, and **S. Shen**, "Highly efficient omnidirectional integrated multiband wireless energy harvesters for compact sensor nodes of internet-of-things," in IEEE Transactions on Industrial Electronics, vol. 68, no. 9, pp. 8128-8140, Sept. 2021. **Citation: 98**

[56] D. Ma, J. Zhong, **S. Shen**, A. Dubey, C. Zhang, Q. Zhang, and R. Murch, "Single-shot frequency-diverse near-field imaging using high-scanning-rate leaky-wave antenna," in IEEE Transactions on Microwave Theory and Techniques, vol. 69, no. 7, pp. 3399-3412, July 2021.

[57] F. Jiang, Q. S. Cheng, Z. Zhang, **S. Shen**, C. Y. Chiu, and R. Murch, "An efficient optimization scheme for MIMO antenna decoupling networks using space mapping techniques," in IEEE Journal on Multiscale and Multiphysics Computational Techniques, vol. 6, pp. 56-61, 2021.

[58] Z. Han, Y. Zhang, **S. Shen***, Y. Li, C. Y. Chiu, and R. Murch, "Characteristic mode analysis of ESPAR for single-RF MIMO systems," in IEEE Transactions on Wireless Communications, vol. 20, no. 4, pp. 2353-2367, April 2021.

[59] **S. Shen***, Y. Zhang, C. Y. Chiu and R. Murch, "Directional multiport ambient RF energy-harvesting system for the internet of things," in IEEE Internet of Things Journal, vol. 8, no. 7, pp. 5850-5865, 1 April 2021.

[60] **S. Shen*** and B. Clerckx, "Beamforming optimization for MIMO wireless power transfer with nonlinear energy harvesting: RF combining versus DC combining," in IEEE Transactions on Wireless Communications, vol. 20, no. 1, pp. 199-213, Jan. 2021.

[61] C. Y. Chiu, **S. Shen***, B. K. Lau, and R. Murch, "The design of a trimodal broadside antenna element for compact massive MIMO arrays: utilizing the theory of characteristic modes," in IEEE Antennas and Propagation Magazine, vol. 62, no. 6, pp. 46-61, Dec. 2020.

[62] Y. Zhang, Z. Han, **S. Shen***, C. Y. Chiu, and R. Murch, "Polarization enhancement of microstrip antennas by asymmetric and symmetric grid defected ground structures," in IEEE Open Journal of Antennas and Propagation, vol. 1, pp. 215-223, 2020.

[63] **S. Shen***, Y. Zhang, C. Y. Chiu, and R. Murch, "A triple-band high-gain multibeam ambient RF energy harvesting system utilizing hybrid combining," in IEEE Transactions on Industrial Electronics, vol. 67, no. 11,

pp. 9215-9226, Nov. 2020. **Citation: 158**

[64] F. Jiang, C. Y. Chiu, **S. Shen**, Q. S. Cheng, and R. Murch, "Pixel antenna optimization using N-port characteristic mode analysis," in IEEE Transactions on Antennas and Propagation, vol. 68, no. 5, pp. 3336-3347, May 2020.

[65] Y. Zhang, **S. Shen***, C. Y. Chiu, and R. Murch, "Hybrid RF-solar energy harvesting systems utilizing transparent multiport micro-meshed antenna," in IEEE Transactions on Microwave Theory and Techniques, vol. 67, no. 11, pp. 4534-4546. Nov. 2019. **Citation: 114**

[66] Z. Zeng, **S. Shen**, X. Zhong, X. Li, C. Y. Tsui, A. Bermak, R. Murch, and E. S. Sinencio, "Design of sub-GHz reconfigurable RF energy harvester from -22 to 4 dBm with 99.8% peak MPPT efficiency," in IEEE Journal of Solid-State Circuits, vol. 54, no. 9, pp. 2601-2613, Sept. 2019. **Citation: 112**

[67] **S. Shen***, Y. Zhang, C. Y. Chiu, and R. Murch, "An ambient RF energy harvesting system where the number of antenna ports is dependent on frequency," in IEEE Transactions on Microwave Theory and Techniques, vol. 67, no. 9, pp. 3821-3832, Sept. 2019. **Citation: 116**

[68] C. Y. Chiu, **S. Shen**, F. Jiang, K. Ishlmiya, Q. S. Cheng, and R. D. Murch, "Reconfigurable metal chassis antenna," in IEICE Transactions on communication, vol. 102, no. 1, pp. 147-155, Jan. 2019.

[69] C. Y. Chiu, F. Xu, **S. Shen**, and R. D. Murch, "Mutual coupling reduction of rotationally symmetric multi-port antennas," in IEEE Transactions on Antennas and Propagation, vol. 66, no. 10, pp. 5013-5021, Oct. 2018.

[70] **S. Shen***, C. Y. Chiu, and R. D. Murch, "Multiport pixel rectenna for ambient RF energy harvesting," in IEEE Transactions on Antennas and Propagation, vol. 66, no. 2, pp. 644-656, Feb. 2018. **Citation: 199**

[71] **S. Shen***, C. Y. Chiu, and R. D. Murch, "A dual-port triple-band L-probe microstrip patch rectenna for ambient RF energy harvesting," in IEEE Antennas Wireless Propagation Letter, vol. 16, pp. 3071–3074, 2017. **Citation: 280**

[72] **S. Shen***, Y. Sun, S. Song, D. P. Palomar, and R. D. Murch, "Successive Boolean optimization of planar pixel antennas," in IEEE Transactions on Antennas and Propagation, vol. 65, no. 2, pp. 920–925, 2017.

[73] **S. Shen*** and R. D. Murch, "Impedance matching for compact multiple antenna systems in random RF fields," in IEEE Transactions on Antennas and Propagation, vol. 64, no. 2, pp. 820–825, 2016.

◆ **Conference Paper List**

[1] Z. Ming, **S. Shen**, J. Rao, C. Y. Chiu, and R. Murch, "A dual-polarized hybrid transmitting and reflecting beyond-diagonal reconfigurable intelligent surface using cell-wise group connection with continuous control," 20th European Conference on Antennas and Propagation (EuCAP 2026), Dublin, Ireland, 2026, pp. 1-4.

[2] Y. Chen, **S. Shen**, T. Qiao, H. Li, J. Qian, and R. Murch "Antenna coding optimization based on pixel antennas for MIMO wireless power transfer with DC combining," submitted to GLOBECOM 2025 - 2025 IEEE Global Communications Conference, Taipei, Taiwan, 2025.

[3] B. Peng, K. L. Besser, **S. Shen**, F. S. Poschmann, R. Raghunath, D. Mittleman, V. Jamali, and E. A. Jorswieck, "RIS-assisted NOMA with partial CSI and mutual coupling: a machine learning approach," submitted to GLOBECOM 2025 - 2025 IEEE Global Communications Conference, Taipei, Taiwan, 2025.

[4] H. Li and **S. Shen**, "Antenna coding design based on pixel antennas for multi-user MISO systems," 2025 IEEE 26th International Workshop on Signal Processing and Artificial Intelligence for Wireless Communications (SPAWC), Surrey, UK, 2025, pp. 1-5.

[5] T. Zhan, **S. Shen**, and D. H. K. Tsang, "Machine learning based accurate modeling of rectenna nonlinear behavior," 2025 IEEE Wireless Power Technology Conference and Expo (WPTCE), Rome, Italy, 2025.

[6] T. Qiao, **S. Shen**, Z. Han, C. Y. Chiu, Q. S. Cheng, and R. Murch, "A wideband compact 20-port antenna design developed using electromagnetic information theory for MIMO-OFDM systems," 2025 IEEE International Symposium on Antennas and Propagation and ITNC-USNC-URSI Radio Science Meeting, Ottawa, Canada,

2025.

[7] X. Yang, **S. Shen**, and Y. Huang, "A passive 3D beam-steering gravitational liquid dielectric resonator antenna," 2024 IEEE 12th Asia-Pacific Conference on Antennas and Propagation (APCAP), Nanjing, China, 2024, pp. 1-2

[8] H. Li, M. Nerini, **S. Shen**, and B. Clerckx, "Wideband modeling and beamforming for beyond diagonal reconfigurable intelligent surfaces," 2024 IEEE 25th International Workshop on Signal Processing Advances in Wireless Communications (SPAWC), Lucca, Italy, 2024, pp. 1-5.

[9] Z. Ming, **S. Shen**, and R. Murch, "A 2-bit phase reconfigurable aperture coupled pixel antenna," 2024 IEEE International Symposium on Antennas and Propagation and ITNC-USNC-URSI Radio Science Meeting, Florence, Italy, 2024.

[10] T. Qiao, Z. Han, **S. Shen**, C. Y. Chiu, Q. S. Cheng, and R. Murch, "Performance bounds on the partial gain to Q-factor quotient for loaded N-port antenna systems," 2024 IEEE International Symposium on Antennas and Propagation and ITNC-USNC-URSI Radio Science Meeting, Florence, Italy, 2024.

[11] Z. Han, Y. Zhang, **S. Shen**, J. Rao, T. Qiao, J. Jin, Q. Wang, and Ross Murch, "Characteristic modes for orthogonal beamsteering using ESPAR," 2024 IEEE International Symposium on Antennas and Propagation and ITNC-USNC-URSI Radio Science Meeting, Florence, Italy, 2024.

[12] Z. Han, S. Wang, J. Jin, Q. Wang, **S. Shen** and R. Murch, "Loaded N-port structure for reconfigurable compact MIMO antenna design," 2023 IEEE MTT-S International Microwave Workshop Series on Advanced Materials and Processes for RF and THz Applications (IMWS-AMP), Chengdu, China, 2023, pp. 1-3.

[13] W. Liu, **S. Shen**, C. Zhang, D. H. K. Tsang, and R. Murch, "Optimal antenna selection and time sharing in RF-powered cognitive networks with ambient backscatter communication," 2023 IEEE Vehicular Technology Conference (VTC), Florence, 2023.

[14] T. Fang, Y. Mao, **S. Shen**, Z. Zhu, and B. Clerckx, "Fully connected reconfigurable intelligent surface aided rate-splitting multiple access for multi-user multi-antenna transmission," 2022 IEEE International Conference on Communications Workshops (ICC Workshops), Seoul, 2022.

[15] Z. Zeng, **S. Shen**, B. Wang, J. E. Lopez, R. Murch, and E. S. Sinencio, "An ultra-low-power power management circuit with output bootstrapping and reverse leakage reduction function for RF energy harvesting," 2020 IEEE/MTT-S International Microwave Symposium (IMS), Los Angeles, 2020.

[16] Y. Zhang, **S. Shen**, C. Y. Chiu, and R. Murch, "A broadband transparent antenna integrated with an indoor solar cell for WLAN applications," 2020 IEEE International Symposium on Antennas and Propagation and North American Radio Science Meeting, Montreal, 2020.

[17] R. Murch, C. Y. Chiu, and **S. Shen**, "Harnessing ambient RF waves for novel applications," 2020 IEEE Asia-Pacific Microwave Conference (APMC), Hong Kong, 2020.

[18] **S. Shen**, Y. Zhang, C. Y. Chiu, and R. Murch, "Multiport rectennas for ambient RF energy harvesting," 2019 IEEE MTT-S International Wireless Symposium (IWS), Guangzhou, 2019.

[19] L. Yang, Y. Zhang, C. Y. Chiu, **S. Shen**, and R. Murch, "Investigation of a flexible reconfigurable antenna using liquid crystal," 2019 8th IEEE Asia-Pacific Conference on Antennas and Propagation (APCAP), Incheon, 2019.

[20] **S. Shen**, Y. Zhang, C. Y. Chiu, and R. D. Murch, "A compact quad-port dual-polarized dipole rectenna for ambient RF energy harvesting," 12th European Conference on Antennas and Propagation (EuCAP 2018), London, 2018.

[21] Y. Zhang, **S. Shen**, C. Y. Chiu, and R. D. Murch, "A dual-band transparent coplanar patch antenna for WLAN systems," 2018 IEEE International Symposium on Antennas and Propagation & USNC/URSI National Radio Science Meeting, Boston, 2018.

[22] C. Y. Chiu, Y. Zhang, **S. Shen**, and R. D. Murch, "Co-design of antenna and illumination systems," 2018 IEEE

International Symposium on Antennas and Propagation & USNC/URSI National Radio Science Meeting, Boston, 2018.

[23] **S. Shen**, C. Y. Chiu, and R. D. Murch, "A broadband L-probe microstrip patch rectenna for ambient RF energy harvesting," 2017 IEEE International Symposium on Antennas and Propagation & USNC/URSI National Radio Science Meeting, San Diego, 2017.

[24] **S. Shen**, C. Y. Chiu, and R. D. Murch, "Optimization of 2.45-GHz pixel rectenna for wireless power transmission using mixed integer linear programming," 2017 IEEE International Symposium on Antennas and Propagation & USNC/URSI National Radio Science Meeting, San Diego, 2017.

[25] C. Y. Chiu, **S. Shen**, and R. D. Murch, "Transparent dual-band antenna for smart watch applications," 2017 IEEE International Symposium on Antennas and Propagation & USNC/URSI National Radio Science Meeting, San Diego, 2017.

[26] **S. Shen**, C. Y. Chiu, and R. D. Murch, "Multi-port ladder impedance matching for compact MIMO communication systems," 2016 IEEE International Symposium on Antennas and Propagation (APSURSI), Fajardo, 2016.

[27] C. Y. Chiu, **S. Shen**, and R. D. Murch, "Dual-band antenna pair for MIMO WiFi compact mobile terminals," 2016 IEEE International Symposium on Antennas and Propagation (APSURSI), Fajardo, 2016.

[28] **S. Shen** and R. D. Murch, "Designing dual-port pixel antenna for ambient RF energy harvesting using genetic algorithm," 2015 IEEE International Symposium on Antennas and Propagation & USNC/URSI National Radio Science Meeting, Vancouver, 2015.

PATENTS

[1] R. Murch, C. Y. Chiu, W. Xie, Y. Zhang, and **S. Shen**, "Multi-port endfire beam-steerable planar antenna", U.S. Patent Application, No. 17/327,186. 2021.

[2] R. Murch, C. Y. Chiu, Y. Zhang, **S. Shen**, and W. Xie, "多端口端射波束可控平面天线和天线系统", China Patent Application, CN202110619032.X, 2021.

[3] Z. Han, **S. Shen**, Y. Zhang, S. Tang, C. Y. Chiu, and R. Murch, "一种用于空间移位键控的脉冲整形方法和系统", China Patent Application, 2024101365675, 2023.

[4] C. Zhang, **S. Shen**, Q. Li, B. Wang, and X. Tao, "混合波束成形方法、装置、设备及存储介质", China Patent Application, 2025105570207, 2025.

RESEARCH GRANTS

- Principal Investigator, "Energy-efficient massive MIMO wireless communications based on novel antenna technique (基于新型天线技术的高能效大规模多输入多输出无线通信)," UMDF-TISF-I/2026/025/IOTSC, funded by University of Macau Development Foundation, 200,000 MOP, Jan-2026 to Dec-2028, ongoing.
- Principal Investigator, "Beyond diagonal reconfigurable intelligent surface aided wireless power transfer system (超对角可重构智能表面辅助无线能量传输系统)," SRG2025-00060-IOTSC, funded by University of Macau, 200,000 MOP, Oct-2025 to Oct-2027, ongoing.

TEACHING EXPERIENCES

- **Course Instructor**

  UM ECEN7108: Advanced Topics in Internet of Things, 2025-2026 Spring
  UM ECEN1001: Introduction to Electrical and Computer Engineering, 2025-2026 Fall
  UoL ELEC299: UG Placement in Year 3, 2023-2025
  UoL ELEC340/440/460: BENG/MENG/MSc Project, 2023-2025

UoL ELEC461: Communications Networks, 2023-2025
UoL ELEC498: MSc Placement Experience, 2023-2025
UoL ELEC499: MSc Industrial Project, 2023-2025
HKUST ELEC3120: Computer Communication Network, 2021 Fall, 2022 Fall
HKUST ELEC2910/3910: Academic and Professional Development, 2022 Fall, 2023 Spring

- **Teaching Assistant**
  HKUST ELEC1200: A System View of Communications: from Signals to Packet, 2015 Fall, 2017 Spring
  HKUST ELEC2600: Probability and Random Processes in Engineering, 2014 Fall
  HKUST ELEC3600: Electromagnetics from Wireless to Photonic Applications, 2014 Spring
  HKUST ELEC4120: Computer Communication Networks, 2016 Spring
  HKUST SISP1303: Intelligent Sensing Technologies, 2015 Summer

ADMINISTRATION EXPERIENCES

- Coordinator for Year in Industry (YINI) Placement Program in UoL, 2023-2025

PROFESSIONAL ACTIVITIES

- **IEEE Senior Member**
- **Associate Editor**, IEEE Transactions on Antennas and Propagation, 2025-Now
- **Guest Editor**, IEEE Journal of Selected Topics in Electromagnetics, Antennas and Propagation, 2026
- **Youth Editor**, Journal of Information and Intelligence, 2024-Present
- **IEEE Antenna and Propagation Society Young Professional Ambassador**, 2024
- **Technical Program Committee (TPC) Chair**
  IEEE International Workshop on Antenna Technology (iWAT), 2026
- **TPC Member**
  IEEE International Conference on Communications (ICC), Workshop 2024-25, SAC 2025, Symposium 2026
  IEEE Global Communications Conference (GC), Workshop 2023-24, SAC 2024-25
  IEEE Wireless Communications and Networking Conference (WCNC), Workshop 2024
  IEEE/CIC International Conference on Communications in China (ICCC), 2019-25
  European Conference on Antennas and Propagation (EUCAP), 2021-22
  The 28th International Workshop on Smart Antennas (WSA), 2025
- **Publicity Co-Chair**, IEEE Global Communications Conference, 2026
- **Outstanding Youth Editor**, Journal of Information and Intelligence, 2025
- **Top Reviewer**, IEEE Transactions on Antennas and Propagation, 2023-2025 (**Selected to College of Reviewers**)
- **Outstanding Reviewer**, IEEE Antennas Wireless Propagation Letter, 2024-2025
- **Exemplary Reviewer**, IEEE Transactions on Communications, 2022
- **Journal Reviews**

IEEE Journal on Selected Areas in Communications	Proceedings of the IEEE
IEEE Journal of Selected Topics in Signal Processing	IEEE Transactions on Industrial Electronics
IEEE Internet of Things Journal	IEEE Transactions on Microwave Theory and Techniques
IEEE Transactions on Wireless Communications	IEEE Transactions on Antennas and Propagation
IEEE Transactions on Communications	IEEE Transactions on Power Electronics
IEEE Transactions on Signal Processing	IEEE Transactions on Circuits and Systems I
IEEE Transactions on Vehicular Technology	IEEE Transactions on Circuits and Systems II
IEEE Transactions on Inf. Forensics Security	IEEE Journal of Solid State Circuits

IEEE Transactions on Cogn. Commun. Netw.
IEEE Transactions on Green Commun. Netw.
IEEE Transactions on Mobile Computing
IEEE Transactions on Industrial Informatics
IEEE Transactions on Intelligent Vehicles
IEEE Transactions on Network Sci. and Engineering
IEEE Open Journal of Signal Processing
IEEE Open Journal of the Communications Society
IEEE Open Journal of Vehicular Technology
IEEE Wireless Communications Letters
IEEE Communications Letters
IEEE Signal Processing Letters
IEEE Wireless Communications
IEEE Communications Magazine
IEEE Network Magazine
IEEE Vehicular Technology Magazine
IEEE Communications Surveys and Tutorials
IEEE Transactions on Reliability
IEEE Trans. on Very Large Scale Integration Systems
IEEE Transactions on Comp. Packag. Manufact. Technol.
IEEE Transactions on Consumer Electronics
IEEE Transactions on Magnetics - Conferences
IEEE Journal of Multiscale Multiphys. Comput. Techn.
IEEE Journal of Radio Frequency Identification
IEEE Open Journal on Antennas and Propagation
IEEE Sensors Journal
IEEE Photonics Journal
IEEE Antennas Wireless Propagation Letter
IEEE Microwave and Wireless Technology Letters
IEEE Electron Device Letters
IEEE Journal of Electromagn. RF Microw. Med. Biol.
IEEE Access
IEEE Communications Standards Magazine
IEEE Internet of Things Magazine
IEEE Journal of Selected Areas in Sensors
IEEE Journal on Wireless Power Technologies
IEEE Journal of Selected Topics in Electromagnetics, Antennas and Propagation
IET Electronics Letters
NATURE Scientific Report
Nature Communications
MDPI: Electronics Sensors, Telecom, Energies, Sustainability, Applied Sciences, Mathematics, Micromachines
ELSEVIER AEU-International Journal of Electronics and Communications
WILEY International Journal of RF and Microwave Computer-Aided Engineering

- **Conference Reviews**

European Conference on Antennas and Propagation (EUCAP), 2019-2025
IEEE Vehicular Technology Conference (VTC), 2023
IEEE International Workshop on Signal Processing Advances in Wireless Communications (SPAWC), 2024
IEEE International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC), 2025
International Conference on Wireless Communications and Signal Processing (WCSP), 2024
United Conference on Millimetre Waves and Terahertz Technologies (UCMMT), 2024

HONORS AND AWARDS

- Top 2% Scientists by ELSEVIER and Stanford University, 2023, 2024, 2025
- Best Student Paper Award, IEEE Asia-Pacific Conference on Antennas and Propagation, 2024 (coauthored with supervised student)
- Honorable Mention, Student Paper Competition in IEEE International Symposium on Antennas & Propagation and North American Radio Science Meeting, 2025 (coauthored with supervised student)
- Selected to Participate in Global Young Scientists Summit (GYSS), Singapore, 2016
- HKUST Overseas Research Awards, 2016
- HKUST Research Travel Grant, 2015, 2017, 2018
- HKUST Postgraduate Studentship, 2013-2017
- National Scholarship, China, 2010, 2012 (Only for Top 0.2 % students)
- NUST Top-Class Scholarship, 2009, 2010, 2011, 2012 (Only for Top 1% students)