
RAED MESLEH, PHD**Jordan:****Mobile: +962796952199****Office: +96264294100/Ext:
4115****Fax: +96264300215**raed.mesleh@ju.edu.joraed.mesleh@gmail.com**Electrical Engineering
Department, School of
Electrical Engineering and
Information technology;
German Jordanian University
P.O. Box 35247, Amman
11180, Jordan****Profile Summary**

+15 years research experience in RF wireless communication systems

+15 years research experience in optical wireless communication systems

Stanford/Elsevier Top 2% scientific researcher for years 2020, 2021, and 2022

Advisor: Crown Prince Foundation—CubeSat Initiative, 2017-2019

Consultant: King Abdullah Development and Defense Bureau (KADDB), 2017-2019

+100 published journal papers in top-tier IEEE/OSA journals

+10 filed and published patents

+100 published international conference papers

+15 years teaching experience at graduate and undergraduate levels

+13000 overall citations (Google Scholar)

Research interests

Underwater communication, error statistics, MIMO communication, Monte Carlo methods, acoustic communication, modulation, channel estimation, radio receivers, OFDM modulation, free-space optical communication, receiving antennas, wireless channels, antenna arrays, computational complexity, decoding, fading channels, multi-access systems, precoding, radio transmitters, signal processing, transmitting antennas, 5G and beyond mobile communication, Doppler effect, Rayleigh channels, acoustic wave propagation, acousto—optical modulation, adjacent channel interference.

Professor, School of Electrical Engineering and Information technology,
German Jordan University, November 2018—Present

Dean, School of Electrical Engineering and Information technology, German
Jordan University, September 2019—September 2021

Vice Dean, School of Electrical Engineering and Information technology, German Jordan University, September 2016–2019

Associate Professor, Electrical and Communication Engineering Department, School of Electrical Engineering and Information technology, German Jordan University– February 2016–November 2018

Associate Professor, Electrical Engineering Department, University of Tabuk, Tabuk, Saudi Arabia– February 2015–February 2016

Assistant Professor, Electrical Engineering Department, University of Tabuk, Tabuk, Saudi Arabia – September 2010–December 2014

Teaching:

I have taught the following courses:

Course Name	Course name
Signal and system analysis	Wireless Communications
Electric circuit analysis	Numerical Methods
Analog communication systems	Advanced Wireless Communication (M.Sc. course)
Digital Communication Systems	Discrete Mathematics
Satellite Communication	Error Control Coding
Optical Communication	Telecommunication Electronics
Random variables and stochastic processes	Electronics I
Electronics II	Digital signal processing

Department, College and social Activities at German-Jordanian University:

- Chair, quality check and control on funded journals by the ministry of higher education in Jordan.
- Member, Academic committee, Scientific Research Fund, Ministry of Higher Education
- Member of the Deanship of Scientific Research Council
- Member, academic promotion committee
- Chair, Students affairs committee
- Member, Students admission and transfer committee

- Member of the Dean's council
- Member, Dual studies committee
- Advisor, Prince Crown Foundation, MASAR Initiative
- Consultant, KADDB

Department and College Activities at University of Tabuk:

- Member of the engineering ABET accreditation committee,
- Member of the engineering NCAAA accreditation committee
- Chair of the department academic plan committee
- Member of engineering faculty labs committee
- Chair of the department recruiting committee
- Member of the international collaboration committee

Other University Duties:

- Director, Unit of research excellence & Unit of patents and Intellectual Properties, Deanship of scientific research, University of Tabuk
- Chair, Electrical Engineering Department, University of Tabuk, January 2012-February 2013

**Visiting Scholar, Boston University, Boston, MA, USA —
25 June— 29 July 2014**

**Visiting Professor, The University of Edinburgh, Edinburgh, U.K. —
July—August 2013 & March—May 2009**

Participate in the implementation and testing of a 12x12 NI PXI MIMO system and conduct several research discussions with colleagues and students on Spatial Modulation MIMO technique and VLC.

**Visiting Scholar, Herriot Watt University, Edinburgh, U.K. —
June—September 2011**

Participate in the China-UK bridge research project. Implement Matlab codes for PXI National Instrument 4x2 MIMO test bed. Develop and test SM/SSK algorithms for the MIMO testbed. Supervise several student projects and provide consulting services to several research associates. Demonstrate, for the first time, real-time data transmission for 4x2 SM/SSK/TCSM wireless systems.

Postdoctoral Fellow, Jacobs University, Bremen, Germany — June 2007—
October 2010

Research Duties:

Optical wireless communication using IR and white LEDs:

- Research on new concepts in the field of wireless optical data according to supply and project plan
- Independent production of interim and final reports
- Presentation of project results and coordination of the project involved B.Sc. and M.Sc. students
- Definition of the technical content of the B.Sc. and M.Sc. work and discussions with project participants
- Drafting patent applications and writing scientific papers

MIMO systems and in particular spatial modulation research.

Teaching Duties [June 2007-January 2009]:

Wireless communication, advanced wireless communication, Engineering circuit analysis, Circuit theory lab

Education

Doctorate of Philosophy, PhD, Electrical Engineering, June 2007, Jacobs University, Bremen, Germany

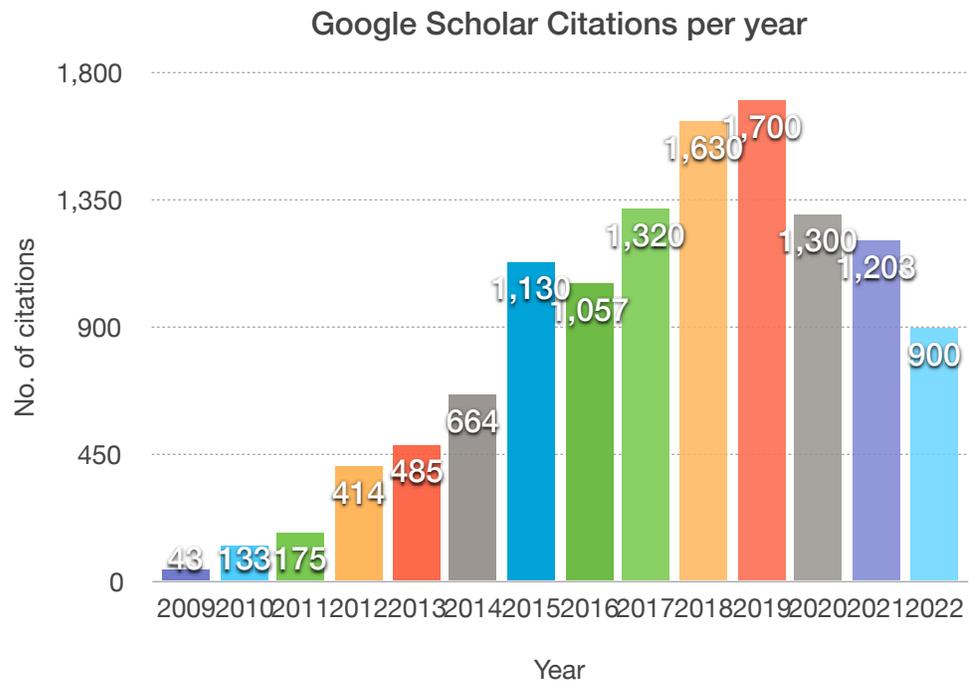
M.Sc., Communication Technology (1st. Rank), August 2004 Ulm University, Ulm, Germany

B.Sc., Communication Engineering (1st. Rank), June 2000, Yarmouk University, Irbid, Jordan

Research Projects & Funds

1. “Hardware Implementation of Spatial Modulation, Quadrature Spatial Modulation and Generalized Space shift Keying systems”, **Principle Investigator**, Funded by Deanship of Scientific Research, German Jordanian University, January 2020—January 2022, **35,000.00 JDs.**
2. “Hardware Implementations Reliability Analysis of Space Modulation Techniques”, **Co-PI**, Abdul Hameed Shoman Foundation, October 2018—September 2019, **15,000.00 JDs.**
3. “Acousto Optical Modulator for free Space Optical Communication”, **Principle Investigator**, Funded by Scientific Research Funding (SRF), Ministry of Higher Education, Amman, Jordan 8 June 2017—8 June 2019, **52,630.00 JDs.**

4. "Implementation of Index Modulation Transmitters for IoT Wireless Applications", **Co-PI**, Funded by Deanship of Scientific Research, German Jordanian University, January 2017—January 2019, **54,400.00 JDs**.
5. "*Single RF Chain MIMO Index Modulation Techniques*", **Principle Investigator**, Funded by Deanship of Scientific Research, German Jordanian University, January 2017—January 2018, **18,660.00 JDs**.
6. "Quadrature Spatial Modulation Performance over Generalized Fading Channels", **Principle Investigator**, Funded by SNCS research center at University of Tabuk. January 2015—August 2015, **59,000.00 SAR**.
7. "Expanding Water Quality Measurement System", **Co-PI**, Funded by SNCS research center at University of Tabuk. January 2015—August 2015, **76,000.00 SAR**.
8. "Performance of energy detection based spectrum sensing over the Extended Generalized-K fading channels", **Principle Investigator**, Funded by Deanship of Scientific Research, University of Tabuk, March—December 2014, **40,000.00 SAR**.
9. "An Efficient Channel Assignment and routing Mechanism for Throughput Enhancement in Single-hop Distributed IEEE 802.11-based Networks", **Co-PI**, Funded by Deanship of Scientific Research, University of Tabuk, March—December 2014, **40,000.00 SAR**.
10. "Quadrature Spatial Modulation" **Principle Investigator**, Funded by SNCS research center at University of Tabuk. September 2013—March 2014, **93,000.00 SAR**.
11. "MIMO Techniques for Optical Wireless Communication Systems". **Principle Investigator**, Funded by Deanship of Scientific Research, University of Tabuk, March 2013—March 2014, **50,000.00 SAR**.
12. "Performance evaluation for SM/SSK in different cooperative networks", **Principle Investigator**, May 2012—May 2103, **277,500.00 SAR**. Funded by SNCS research center at University of Tabuk.
13. "Real-time remote monitoring of selected water quality parameters in marine ecosystem using Wireless Sensor Networks", **Co-PI**, May 2012— May 2103, **285,000.00 SAR**. Funded by SNCS research center at University of Tabuk.
14. "LED Real time Impairments and Their Effect on the performance of Indoor Optical Wireless Communication System", **Principle Investigator**, March 2012— March 2013, **38,000.00 SAR**.



15. "Spatial modulation for cooperative networks", **Principle Investigator**, April 2011— May 2012, **232,000.00 SAR**. Funded by Sensor networks and Cellular Systems (SNCS) research center at University of Tabuk.
16. "Visible light communication (VLC) hardware demonstrator implementation", **Principle Investigator**, October 2010—October 2011, **55,000.00 SAR**. Funded by Deanship of Scientific Research, University of Tabuk.

Awards

1. Top 2% scientific researcher for years 2020 and 2021.
2. **Arab creativity award: Scientific creativity**, Arab Thought Foundation, 14 December 2016, Abu Dhabi, UAE.
3. **Research Excellence award for the academic year of 2015/2016**, German Jordanian University, July 2016.
4. **Certificate of appreciation**, Optical Engineering, SPIE, 2013 and 2014.
5. Article **Salama Ikki and R. Mesleh**, "A General Framework for Performance Analysis of Space Shift Keying (SSK) Modulation in the Presence of Gaussian Imperfect Estimations," *IEEE Communications Letters*, vol. 16, no. 2, 2012, selected by *IEEE ComSoc Technology News* as a top 0.5% of the most interesting, timely, and newsworthy articles to ComSoc members and to the entire global community.

6. "National Instruments Graphical System Design Achievement Awards 2013" in the category of "RF and Communications", London, UK, November 2013
7. **Marquis Who's Who**, Berkeley Heights, NJ, USA, 2014 & 2013
8. **Research Excellence award (55,000.00 SAR)**, University of Tabuk, Tabuk, Saudi Arabia, February 2013
9. **IEEE Communication Letters "Exemplary Reviewer"**, IEEE Communication letters Editorial board, March 2013
10. The work in the optical wireless communication project in Bremen, Germany was selected for publication in 100 Produkte der Zukunft (100 Products of the Future) authored by Nobel Laureate T. W. Hänsch, December 2008
11. **PhD Scholarship, (3 years)(15,000.00 Euro/Year)**, Jacobs University, Bremen, Germany, November 2004-September 2007
12. Best student award (LEG award), Ulm University, Ulm, Germany, May 2003
13. **Best graduate communication engineer student of the year 2000 award (1000 \$)**, Yarmouk University, Hijawi College for Technology Engineering, Irbid, Jordan, June 2000

Industrial Projects

1. **Lufo 2nd Call project (SINTEG)**, German Federal Ministry of Economics and Technology (BMWi), Jan. 2009- Sept. 2011
2. Optical Cabin Communication Network (OPTIKOM), *Airbus Germany*, Jan.2008- Dec. 2009
3. Spatial Modulation MIMO Transmission Technique, *Samsung Electronics Co., Ltd.*, January 2005- June 2007
4. **EPSRC project on Spatial Modulation (partly involved)**, The university of Edinburgh, Scotland, UK, January 2009- December 2011

Publications

Citation Index	Citations	H-index	i10-index
Google Scholar	13100	45	111
SCOPUS	9200	37	NA

Invited Keynote talks & Panel Discussions

1. **R. Mesleh**, "Internet of Things (IoT): Driving The Next Industrial Revolution", 6 December 2022, 4th IEEE Middle East & North Africa Communications Conference Advancing the Communication Vision, Amman, Jordan.
2. **R. Mesleh**, "Communication Environments For Beyond 5G Wireless Systems", 2021 IEEE Jordan International Joint Conference on Electrical Engineering and Information Technology (JEEIT), 16 November 2021, Dead Sea, Jordan.
3. **R. Mesleh**, "5G Wireless Systems and Beyond", IEEE Comsoc workshop, 24 November 2018, Amman, Jordan.
4. **R. Mesleh** and H. Yanikomeroğlu, " Research and Innovation in the Information Age", Panel Discussion, IEEE Comsoc Jordan Chapter, 20 November 2018, Amman, Jordan.
5. **R. Mesleh**, "Space Modulation Techniques: Promising Technologies for Future Wireless Systems", The 9th International Conference on Broadband Communications, Networks, and Systems (BROADNET'18), 19–20 September 2018, Faro, Portugal.
6. **R. Mesleh**, "Space Modulation Techniques: Promising Technologies for Future Wireless Systems", The 9th International Conference on Information and Communication Systems (ICICS'18), 3–5 April 2018, Irbid, Jordan.
7. **R. Mesleh**, "Space Modulation Techniques: Promising Technologies for Future Wireless Systems", The First Yarmouk University Scientific Research Symposium (YUSR), 25–28 March 2017, Irbid, Jordan.
8. **R. Mesleh**, "Space Modulation Techniques", IEEE international Conference on Wireless Communications, Signal Processing and Networking (WiSPNET), 22–24 March 2017, Chennai, India.
9. **R. Mesleh**, "Spatial Modulation Implementation using PXI System", NIWeek'16, Beirut, 02 May 2016.
10. **R. Mesleh**, "Engineering Professional Ethical Obligations ", IMAM University, Riyadh, Saudi Arabia, 05 April 2014.
11. **R. Mesleh** and A. Bdour, "Real-time remote monitoring of selected water quality parameters in marine ecosystem using Wireless Sensor Networks" 4th. International Conference on International Exhibition & higher Education, Riyadh, Saudi Arabia, 17–20 April 2013.

12. **R. Mesleh**, "Spatial Modulation and its applications in cooperative networks," 3rd International Conference on International Exhibition & higher Education, Riyadh, Saudi Arabia, 17–20 April 2012.
13. **R. Mesleh**, "Optical Wireless Communication: Challenges and Opportunities," Second International Conference on Aerospace Science and Engineering (ICASE-2011), Islamabad, Pakistan, 28–30 December 2011.

Published and Filed Patents

1. Qaraqe, Khalid; **Mesleh, Raed**; Althunibat, Saud; "Spectral efficient uplink multiple access techniques using index modulation", US Patent App. 16/901,567, 2020.
2. **R. Mesleh** and O. Hiari, "Single RF—Chain transmitter implementing space modulation", U.S. Patent, June 2017.
3. **R. Mesleh**, S. S. Ikki and H. M. Aggoune, "Quadrature Spatial Modulation System", U.S. Patent application, No.: US9813278B1, Granted 2017.
4. C. W. Ahn, S. Yun, H.Haas, **R. Mesleh**, and S.McLaughlin, "Methods for Transmitting Data in a MIMO Communication System," US Patent 8,045,639, 2011, Patent No.: 8045639, Published 25 November 2011.
5. **R. Mesleh** and H. Elgala, "Nonlinearity compensation in optical communication systems via alternative signal clipping and a multiple LED transmitter", EP Patent 2,274,841, Patent No. WO/2011/082713, Published 14 July 2011.
6. **R. Mesleh**, H.Haas, and H. Elgala, "Transmitter For Optical Data Transfer Having A Non-Linear Light Source And Associated Receiver," WO Patent WO/2011/003,393, 2011, Patent No.: WO/2011/003393 , Published 13 January 2011.
7. **R. Mesleh**, H.Haas, I.Stefan, and P.Grant, "A Method and System of Enhanced Performance in Communication Systems," US Patent US/20r2t0r3433 Patent, Published 26 May 2012.
8. H.Haas, E. Bassow, H. Elgala, and **R. Mesleh**, "Optical Free Space Data Transmission," EP Patent 2,274,841, Patent No. WO/2009/132877, Published 05 November 2009.
9. C. W. Ahn, S. Yun, E. Kim, H. Haas, **R. Mesleh**, T. Hyon and S.McLaughlin, "Spatial Modulation Method And Transmitting And Receiving Apparatuses Using The Same In A Multiple Input Output System," Us Patent 11822872, Patent No. 8045639, Published February 14, 2008.

Books & book chapters

1. Ehab Ali, Abdelhamid Younis, **Raed Mesleh**, "Energy Harvesting in Wireless Sensor Networks and Internet of Things", Chapter 8: A Review of Resonant Beam Co munit ion Techniques, 199, IET, 2022.
2. **Raed Mesleh** and Abdelhamid Alhassi, "Space Modulation Techniques", *Wiley*, June 2018, 1st. edition, ISBN: 978-1-119-37565-4.
3. Mohamed Abaza, **Raed Mesleh**, Ali Masnour and el-Hadi M. Aggoune, " *Cooperative MIMO and Multi-hop relaying techniques for free-space optical communications: a survey*", book chapter published in " *Advanced Secure Optical Image Processing for Communications*", March 2018,

Selected Journal papers

2022:

1. Yazid M. Khattabi, Salim A. Alkhaldeh, Mustafa M. Matalgah, Osamah S. Badarneh, **Raed Mesleh**, "Vehicle-to-roadside-unit-to-vehicle communication system under different amplify-and-forward relaying schemes", *Vehicular Communications*, 2022, 100539, ISSN 2214-2096, <https://doi.org/10.1016/j.vehcom.2022.100539>.
2. Ali, E, Jibreel, N, Rajab, Z, Younis, A, **Mesleh, R**. Simultaneous wireless information and power transfer in resonant beam charging. *Int J Commun Syst.* 2022; 35(18):e5339. doi:[10.1002/dac.5339](https://doi.org/10.1002/dac.5339)
3. M. Alshawaqfeh, A. Gharaibeh and **R. Mesleh**, "Tree-Search-Based Optimal and Suboptimal Low Complexity Detectors for Differential Space Shift Keying MIMO System," in *IEEE Transactions on Wireless Communications*, 2022.
4. **Raed Mesleh**, Mohammad Abudayah, Omar Hiari, "Novel space shift keying MIMO technique based on a Steiner triple system", *Journal of the Franklin Institute*, 2022.
5. M. Alshawaqfeh, A. Gharaibeh and **R. Mesleh**, "Optimal Low Complexity Detector for Signed-Quadrature Spatial Modulation MIMO System," in *IEEE Journal on Selected Areas in Communications*, 2022, doi: 10.1109/JSAC.2022.3196107
6. Osamah S. Badarneh, **Raed Mesleh**, Yazid M. Khattabi, "Reconfigurable Intelligent Surfaces-Assisted Terahertz Communications", *Journal of the Franklin Institute*, July 2022
7. **R. Mesleh**, O. Badarneh, "Performance analysis of variant MIMO systems over Hoyt fading channel", *Wireless Networks*, Early access, March 2022, <https://doi.org/10.1007/s11276-022-02930-0>.

8. O. Hiari and **R. Mesleh**, "Hybrid Transmitter Hardware Models for Reliable Implementations of Space Modulation Techniques," in *IEEE Transactions on Communications*, March 2022, Early access, doi: 10.1109/TCOMM.2022.3157317.
9. Ziyad Altarawneh, Saud Althunibat, **Raed Mesleh**, "Optical wireless sensor networks using tunable optical filters", *Physical Communication*, Volume 52, 2022.
10. O. Hiari and **R. Mesleh**, "Receiver Designs for Variant Precoded Signed Space Modulation Techniques," in *IEEE Systems Journal*, doi: 10.1109/JSYST.2021.3138945.

2021:

1. **R. Mesleh**, O. S. Badarneh and O. Hiari, "Space Shift Keying MIMO System for Underwater Acoustic Communication," in *IEEE Wireless Communications Letters*.
2. Eltira, K., Younis, A. & **Mesleh, R.** Capacity analysis of cooperative amplify and forward–quadrature spatial modulation MIMO system. *Wireless Netw* (2021).
3. Eltira, K, Jibreel, N, Younis, A, **Mesleh, R.** Capacity analysis of cooperative amplify and forward multiple-input multiple-output systems. *Trans Emerging Tel Tech*. 2021;e4290.
4. O. Hiari and **R. Mesleh**, "Novel Transmitter Designs for Variant Signed Quadrature Space Modulation Techniques," in *IEEE Systems Journal*, doi: 10.1109/JSYST.2021.3070369.
5. O. Hiari, **R. Mesleh** and N. Aljanini, "A Reliability Analysis Framework for Space Modulation Techniques," in *IEEE Transactions on Communications*, vol. 69, no. 7, pp. 4795-4806, July 2021, doi: 10.1109/TCOMM.2021.3069260.

2020:

6. **R. Mesleh** and O. Hiari, "Hardware Architecture Design and Implementation of Different Space Modulation Techniques," in *IEEE Communications Magazine*, vol. 58, no. 12, pp. 57-63, December 2020, doi: 10.1109/MCOM.001.2000340.
7. Marwa Qaraqe, Saud Althunibat, Osamah S. Badarneh, **Raed Mesleh**, "Performance analysis of chirp spread spectrum system under mobility

- scenario, *Physical Communication*, Volume 43, 2020, 101233, ISSN 1874-4907.
8. O. S. Badarneh and **R. Mesleh**, "Diversity analysis of simultaneous mmWave and free-space-optical transmission over \mathcal{F} -distribution channel models," in *IEEE/OSA Journal of Optical Communications and Networking*, vol. 12, no. 11, pp. 324-334, November 2020.
 9. A. Jaiswal, M. Abaza, M. R. Bhatnagar and **R. Mesleh**, "Multipoint-to-Multipoint Cooperative Multiuser SIM Free-Space Optical Communication: A Signal-Space Diversity Approach," in *IEEE Access*, vol. 8, pp. 159244-159259, 2020.
 10. O. Hiari, **R. Mesleh** and A. Alkhatib, "A Physical Transmitter Implementation of a Quadrature Space Shift Keying MIMO System," in *IEEE Transactions on Circuits and Systems II: Express Briefs*, 68 (1), 251-255.
 11. O. Hiari, **R. Mesleh**, S. Alshaer and F. Shahin, "First Hardware Implementation of an SSK MIMO System with no RF-Chain at the Transmitter," in *IEEE Transactions on Industrial Electronics*, 2020.
 12. A. Alashqar, A. Tahat and **R. Mesleh**, "Performance Analysis of Variant MIMO Systems Over 3-D Vehicular to Vehicular Channel," in *IEEE Access*, vol. 8, pp. 73250-73258, 2020.
 13. M. Alshawaqfeh and **R. Mesleh**, "A Novel Low Complexity-Sparse Recovery Detector for Differential Space Shift Keying MIMO System," in *IEEE Communications Letters*, vol. 24, no. 7, pp. 1514-1518, July 2020.
 14. M. Alshawaqfeh and **R. Mesleh**, "Reduced Complexity Sparse Recovery Detectors for Differential Space Shift Keying MIMO System," in *IEEE Transactions on Vehicular Technology*, vol. 69, no. 4, pp. 4558-4562, April 2020.
 15. S. Althunibat, **R. Mesleh** and K. A. Qaraqe, "Secure Index-Modulation Based Hybrid Free Space Optical and Millimeter Wave Links," in *IEEE Transactions on Vehicular Technology*, vol. 69, no. 6, pp. 6325-6332, June 2020.
 16. O. Hiari, **R. Mesleh**, S. Alshaer and F. Shahin, "First Hardware Implementation of an SSK MIMO System with no RF-Chain at the Transmitter," in *IEEE Transactions on Industrial Electronics*, Early access, April 2020.
 17. Nareeman Jibreel, Salma Elkawafi, Abdelhamid Younis, **Raed Mesleh**, "Performance analysis of sparse code multiple access with variant MIMO techniques", *Physical Communication*, Volume 39, 2020.

2019:

18. Saud Althunibat, Osamah S. Badarneh, **Raed Mesleh**, Khalid Qaraqe, "A hybrid free space optical-millimeter wave cooperative system", *Optics Communications*, Volume 453, 2019, 124400, ISSN 0030-4018,
19. S. Althunibat, **R. Mesleh** and K. Qaraqe, "Quadrature Index Modulation Based Multiple Access Scheme for 5G and Beyond," in *IEEE Communications Letters*, vol. 23, no. 12, pp. 2257-2261, Dec. 2019.
20. Alouneh, S., Abed, S., Al Shayejji, M.H., **Mesleh, R.**, "A comprehensive study and analysis on SAT-solvers: advances, usages and achievements", *Artificial Intelligence Review*, December 2019, Vol. 52, No. 4, pp.: 2575–2601.
21. S. Althunibat, **R. Mesleh** and K. A. Qaraqe, "IM-OFDMA: A Novel Spectral Efficient Uplink Multiple Access Based on Index Modulation," in *IEEE Transactions on Vehicular Technology*, vol. 68, no. 10, pp. 10315-10319, Oct. 2019.
22. Althunibat, S, Altarawneh, Z, **Mesleh, R.** Performance analysis of free space optical-based wireless sensor networks using corner cube retroreflectors. *Trans Emerging Tel Tech.* 2019;e3707.
23. S. Althunibat, **R. Mesleh** and T. F. Rahman, "A Novel Uplink Multiple Access Technique Based on Index-Modulation Concept," in *IEEE Transactions on Communications*, vol. 67, no. 7, pp. 4848-4855, July 2019.
24. O. Hiari and **R. Mesleh**, "Hardware Design and Analysis for Generalized Receive Space Modulation Techniques," in *IEEE Communications Letters*.
25. Althunibat, S., Badarneh, O. S. and **Mesleh, R.**, Random Waypoint Mobility Model in Space Modulation Systems, *IEEE Communications Letters*, IEEE, **2019**.
26. Hiari, O., **Mesleh, R.** and Al-Khatib, A., A System Simulation Framework for Modeling Space Modulation Techniques, *IEEE Systems Journal*, IEEE, **2019**.
27. Althunibat, S. and **Mesleh, R.**, Cooperative Decode-and-Forward Quadrature Spatial Modulation over Correlated and Imperfect η - μ Fading Channels, *Wireless Networks*, Springer, February **2019**, Vol. 52, No. 2, pp.: 689–698.

Proceedings and Conference Papers (Last Five Years Only)

1. **R. Mesleh**, M. Abudayah, O. Hiari and A. Younis, "A Secure MIMO Wireless Communication Systems Based on Hamiltonian Graphs and Artificial Noise," *2022 IEEE 2nd International Maghreb Meeting of the Conference on Sciences and*

Techniques of Automatic Control and Computer Engineering (MI-STA), 2022, pp. 385-389.

2. **R. Mesleh**, O. Badarneh and A. Younis, "Nakagami- m MIMO Channel Model," 2022 9th International Conference on Electrical and Electronics Engineering (ICEEE), 2022, pp. 280-284, doi: 10.1109/ICEEE55327.2022.9772568.
3. Ayat Hamad AL-Olaimat, **Raed Mesleh**, Omar Hiari, and ABDELHAMID YOUNIS. 2021. Impact of Channel Correlation on the Performance of Acousto Optical Modulator-Free Space Optical System. The 7th International Conference on Engineering & MIS 2021. Association for Computing Machinery, New York, NY, USA, Article 93, 1–6.
4. Aya Abdelgader, Abdelhamid Younis, and **Raed Mesleh**. 2021. Mutual Information and Capacity Analysis of Index Modulated OFDM. The 7th International Conference on Engineering & MIS 2021. Association for Computing Machinery, New York, NY, USA, Article 82, 1–6.
5. Khadiga Farage Eltira, Nareeman Alawamy, Salma Elkawafi, Abdelhamid Younis, and **Raed Mesleh**. 2021. Cooperative Amplify and Forward Space Modulation MIMO Techniques: Capacity Analysis With Channel Imperfections. The 7th International Conference on Engineering & MIS 2021. Association for Computing Machinery, New York, NY, USA, Article 85, 1–7.
6. Alzahra Badi, Abdulrhman Mohammed Osama Elzwaie, Mohamed Alshareef Baayu, Faraj Mohamed Darrat, Salma Mohamed Elkawafi, and **Raed Mesleh**. 2021. Detection of Self-installed Mobile Repeaters. The 7th International Conference on Engineering & MIS 2021. Association for Computing Machinery, New York, NY, USA, Article 51, 1–6
7. Khadiga Farage Eltira, Nareeman Alawamy, Abdelhamid Younis, **Raed Mesleh**, and Osamah Badarneh. 2021. Cooperative Communications Based Quadrature Space Shift Keying: An Information-Theoretic Approach. The 7th International Conference on Engineering & MIS 2021. Association for Computing Machinery, New York, NY, USA, Article 38, 1–6.
8. K. Eltira, N. Alawami, A. Younis and **R. Mesleh**, "On the Theoretical Capacity of Cooperative Amplify and Forwards MIMO Sparse Code Multiple Access Systems," 2021 IEEE 1st International Maghreb Meeting of the Conference on Sciences and Techniques of Automatic Control and Computer Engineering MI-STA, 2021, pp. 639-646, doi: 10.1109/MI-STA52233.2021.9464472.

9. N. Jibreel, K. Eltira, A. Younis and **R. Mesleh**, "Cooperative Amplify and Forward SSK Sparse Code Multiple Access System: Performance Analysis," 2021 IEEE 1st International Maghreb Meeting of the Conference on Sciences and Techniques of Automatic Control and Computer Engineering MI-STA, 2021, pp. 717-721, doi: 10.1109/MI-STA52233.2021.9464485.
10. M. Shawaqfeh, B. Maqableh and **R. Mesleh**, "Efficient IoT Compatible Sparse Recovery-Based Detectors for Differential Space Shift Keying MIMO System," 2021 8th International Conference on Electrical and Electronics Engineering (ICEEE), 2021, pp. 299-304, doi: 10.1109/ICEEE52452.2021.9415960.
11. O. Hiari and **R. Mesleh**, "Generalized Receive Quadrature Space Modulation Techniques: Hardware Models and Analysis," 2019 IEEE 30th Annual International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC), Istanbul, Turkey, 2019, pp. 1-6.
12. **R. Mesleh** and A. Younis, "Impact of Channel Estimation Errors on the Capacity of Space Modulation Techniques," 2019 IEEE 30th Annual International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC), Istanbul, Turkey, 2019, pp. 1-6.
13. S. Elkawafi, A. Younis and **R. Mesleh**, "Performance Analysis of Sparse Code Multiple Access MIMO Systems," 2019 IEEE 30th Annual International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC), Istanbul, Turkey, 2019, pp. 1-6.
14. A. Al Ashqar and R. Mesleh, "Quadrature Spatial Modulation OFDM System Performance in the Presence of High Power Amplifier Nonlinearities," 2019 International Symposium on Networks, Computers and Communications (ISNCC), Istanbul, Turkey, 2019, pp. 1-6.
15. R. Mesleh and A. Al-Olaimat, "Performance Analysis of Acousto Optical Modulator-Free Space Optical System Over Gamma-Gamma Turbulent Channel," 2019 International Symposium on Networks, Computers and Communications (ISNCC), Istanbul, Turkey, 2019, pp. 1-6.
16. O. Hiari and R. Mesleh, "Impact of I/Q Imbalance on Receive Space Modulation Techniques," 2019 International Symposium on Networks, Computers and Communications (ISNCC), Istanbul, Turkey, 2019, pp. 1-6.

17. AbuTayeh, S., Alsalahat, M., Kaddumi, I., Alqannas, Y., Althunibat, S. and Mesleh, R., A half-full transmit-diversity spatial modulation scheme, International Conference on Broadband Communications, Networks and Systems, **2018**, pp. 257-266
18. **Raed Mesleh** and Osamah Badarneh, "Performance of Quadrature Spatial Modulation over Correlated and Imperfect η - μ Fading Channels", The international Conference on Wireless Communications, Signal Processing and Networking (WiSPNET), 22-24 March, 2017, Chennai, India.
19. Elkawafi, S., Younis, A., Mesleh, R., Abouda, A., Elbarsha, A. and Elmusrati, M., Spatial Modulation or Spatial Multiplexing for mmWave Communications?, International Conference on Broadband Communications, Networks and Systems, **2018**, pp. 237-246
20. Hiari, O. and Mesleh, R., Hardware implementation of space modulation techniques using Simulink RF Blockset, 2018 International Conference on Advanced Communication Technologies and Networking (CommNet), **2018**, pp. 1-7
21. Hiari, O., Shahin, F., Alshaer, S. and Mesleh, R., Hardware implementation of space shift keying on a Xilinx Zynq platform, International Conference on Broadband Communications, Networks and Systems, **2018**, pp. 267-275
22. Mesleh, R., Olaimat, A. and Khalifeh, A., On the Performance of Acousto Optical Modulators--Free Space Optical Wireless Communication Systems over Negative Exponential Turbulent Channel, International Conference on Broadband Communications, Networks and Systems, **2018**, pp. 307-316
23. Elkawafi, S., Younis, A., Mesleh, R., Abouda, A., Elbarsha, A. and Elmusrati, M., Spatial modulation and spatial multiplexing capacity analysis over 3D mmWave communications, European Wireless 2017; 23th European Wireless Conference, **2017**, pp. 1-6
24. Elkawafi, S., Younis, A., Mesleh, R., Abouda, A., Elmusrati, M. and Elbarsha, A., Spatial modulation and spatial multiplexing performance comparison over 3D mmWave communications, 2017 International Conference on Wireless Communications, Signal Processing and Networking (WiSPNET), **2017**, pp. 1734-1738
25. Salma Elkawafi, Abdelhamid Younis, **Raed Mesleh**, Abdulla Abouda, Mohammed Elmusrati and Ahmed Elbarsha, "Spatial Modulation and Spatial Multiplexing Performance Comparison over 3D mmWave Communications", The international

Conference on Wireless Communications, Signal Processing and Networking (WiSPNET), 22-24 March, 2017, Chennai, India.

PhD Thesis

R.Mesleh, "Spatial Modulation: A spatial multiplexing technique for efficient wireless data transmission," *Information Resource Center*, Jacobs University, June 2007.

Master's Thesis

R.Mesleh, "Development and testing of algorithms for a flexible MIMO demonstrator," *Information Technology Department*, Ulm University, August 2004.

<https://scholar.google.com/citations?user=SRYwY4UAAAAJ&hl=en>

Community service & professional activities

- Training on Python language, business development center, Amman, Jordan, 2 – 4 October 2022.
- **Guest Editor:** *IEEE Journal on Selected Topics in Signal Processing, special issue on "INDEX MODULATION FOR FUTURE WIRELESS NETWORKS: A SIGNAL PROCESSING PERSPECTIVE"*, 2019.
- Associate Editor, *IEEE Access*, September 2017—2018.
- **Guest Editor:** *IEEE Access, special issue on "Index Modulation Techniques for Next-Generation Wireless Networks"*.
- **TPC Member: PIMRC, VTC, WCNC, ICT.**
- Reviewer for most top-tier journals and conferences in communication and telecommunication engineering including:
 - IEEE transactions on Communication, IEEE transaction on Wireless communication, IEEE communication Letters, IEEE Wireless Communication letters, IEEE transaction on Vehicular technology, IEEE photonics letters, IEEE signal processing letters, IEEE/OSA Journal on Optical Communication and Networking, EURASIP Journal on Advances in Signal Processing, Elsevier Computers & Electrical Engineering Journal, IEEE Photonics journal, IEEE/OSA journal on Quantum photonics, IEEE ICC, IEEE GLOBECOM, IEEE VTC, IEEE PIMRC.
- IEEE Student member since 2000, member from 2008 and senior member from 2013 (S'00, M'08, SM'13)
- **OSA** member of highly cited papers in 2012

Conference attendance

- 8th International Conference on Engineering and Emerging Technologies (ICEET 2022), 27–28 October 2022, Kuala Lumpur, Malaysia.
- 2022 ICEEE, 9TH INTERNATIONAL CONFERENCE ON ELECTRICAL AND ELECTRONICS ENGINEERING, Alanya, Turkey.
- 2019 ISNCC, Istanbul, Turkey.
- 2018 BROADNET conference, FARO, Portugal
- 2018 IEEE WCNC, 15–19 April, Barcelona, Spain
- 2017 The international Conference on Wireless Communications, Signal Processing and Networking (WiSPNET), 22-24 March, 2017, Chinnai, India
- 2014 IEEE WCNC, 6–9 April 2014, Istanbul, Turkey
- 2013 NI Academic Day, 13–18 May 2013, Beirut, Lebanon
- 2013 IEEE International Telecommunication Conference (ICT'13), 06–08 May 2013, Casablanca, Morocco
- 2012 IEEE 75th Vehicular Technology Conference: VTC2012-Spring, 6–9 May 2012, Yokohama, Japan
- 2012 IEEE International Telecommunication Conference (ICT'12), 22–25 April 2012, Jounieh, Lebanon
- 2012 IEEE Wireless Communication and Networking Conference (WCNC), 1–4 April 2012, Paris, France
- 7th IEEE, IET International Symposium on Communication Systems, Networks and Digital Signal Processing (CSNDSP'10), 21–23 July, 2010, Newcastle, UK
- IEEE International Conference on Communication (ICC'10), 23–27 May, 2010, Cape Town, South Africa
- IEEE International Symposium on Spread Spectrum Techniques and Applications (ISSSTA'08), 25–28 August 2008, Bologna, Italy
- IEEE 16th International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC'05), 11–14 September, 2005, Berlin, Germany

Professional training

- Solid State Lighting, IEEE e-learning, November 2015 (Online)
- AXE 10 Survey, Ericsson Institute (Amman, Jordan)

- GSM System Survey, Ericsson Institute (Amman, Jordan)
- Minilink E-Commissioning and Operation, Ericsson Institute (Amman, Jordan)
- RBS 2000 O&M, Ericsson Institute (Amman, Jordan)
- Material Energy 3000, Conversion Rack 1.4, SGTE system of services (Le mans, France)
- On Job Training, FTML (Beirut, Lebanon)
- Advanced GSM System, Telemate Training Center (Amman, Jordan)
- Installation, commissioning and integration of Ultra Site Nokia BTS (Jeddah, Saudi Arabia)

Hardware Implementations

- Digital wireless communication implementation using USRP SDR and Matlab with channel coding and hardware impairments, 2022—in progress
- GNURadio implementation of variant MIMO systems (SSK, QSSK, and SM), 2022 — in progress.
- SSK Hardware Implementation using Xilinx Zynq Zedboard with the Analog Devices International (ADI) FMCOMMS3 Frontends, 2021
- Spatial Modulation (SM) and SSK MIMO systems development and testing on NI 2x4 MIMO PXI systems, Herriot Watt university, Edinburgh, UK 2011.
- Optical wireless communication chain implemented using Tektronix Oscilloscope and Function Generator through Matlab interface, University of Tabuk, Tabuk, Saudi Arabia 2011.
- Optical wireless OFDM communication system implemented on Altera and Xilinx FPGA platforms through Matlab/Simulink, Jacobs University Bremen, Bremen, Germany 2007-2010.
- VLC demonstrator implemented on TI DSP development board, Jacobs University Bremen, Bremen, Germany 2005.
- Alamouti MIMO scheme development and tested on 4x4 MIMO setup, Ulm University, ULM, Germany 2004

Software Skills

Environments: Matlab and Simulink, NI MultiSIM (NI certificate), Altera Quartus II, DSP Builder, Model SIM, COSSAP simulation, OPNET Wireless Modular Languages: Python, Jupiter, Django, C, Visual C++

Applications: LATEX, XFIG, Visio, Adobe-In-Design, 3DS Max, Office 2007,
Open office Operating systems: MacOS, UNIX/Linux, Windows

Students Supervision

1. Abdallah Alkatib, Hardware Implementation of Quadrature Space Shift Keying Transceiver with no Transmit RF Chain, M.Sc. Thesis, GJU, 2020.
2. MIMO cooperative communication techniques for free space optical communication, Mohammad R. Abaza, Phd student, 2012
3. SINR and Path Loss Modeling in a Cellular Infrared Optical Wireless Communication System for an Aircraft, Svilen Dimitrov, M.Sc. thesis, 2009
4. FPGA Design and implementation of an optical wireless communication system based on OFDM, Irina Stefan, M.Sc. thesis, 2009
5. Development and testing of algorithms for a flexible Ethernet communication between Altera Stratix II FPGA and user PC, Dipesh Mistry, B.Sc. thesis, 2009
6. Trellis coded spatial modulation, Amita Shrestha, Guided research, 2008
7. Performance comparison of trellis coded spatial modulation, V-BLAST, and Alamouti in correlated channel conditions, Irina Stefan, Guided research, 2008
8. Performance of spatial modulation in correlated fading channels, Sudharsan Ganesan, M.Sc. thesis, 2007

Languages

English, Fluent

Arabic, Native

German, Very Good

References

1. Prof. Thomas D.C. Little, Information Systems and Sciences (ISS) Laboratory, the Multimedia Communications Laboratory, and the Center for Information and Systems Engineering, 8 Saint Mary's Street, Boston, MA 02215, USA, Tel: (617)353-9877, Fax: (617) 353-6440, E-mail: tdcl@bu.edu
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4. Prof. el-Hadi M. Aggoune, Professor and Director of SNCS, Electrical Engineering Department, Sensor Networks and Cellular System (SNCS) University of Tabuk, P.O. Box: 741 Tabuk 71491, KSA, Phone: +966 4 4248379, E-mail: haggoune@ut.edu.sa
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6. Prof. Ali Mansour, Professor, Lab STICC, , ENSTSA-Bretagne, Brest, France, rue Francoise Verny, 29806 Brest, CEDEX 9 France, Phone: +33 298 348866, Fax: +33 298 34 893, Email: mansour@ieee.org
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