EKANT SHARMA

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Indian Institute of Technology, Roorkee
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RESERCH INTEREST AND PROFILE

- Wireless communications, with special focus on practical massive MIMO, full-duplex, relays, energy efficiency and optimization
- Topics of interest: Massive MIMO, millimeter wave, cell-free systems, intelligent reflecting surfaces, non-orthogonal multiple access, unmanned aerial vehicles (Drones), device-to-device communication, multi-hop and multi-cell wireless networks
- Expertise in modeling and analyzing wireless networks mentioned above
- 6+ year experience in designing and simulating wireless and signal processing algorithms
- Experience in building state-of-the-art 5G base station hardware
- Developed software algorithms for 5G NR
- Author of 37 technical papers published in reputed journals and conferences

EDUCATION

Indian Institute of Technology, Kanpur *Kanpur, India*
Doctor of Philosophy (PhD) in Electrical Engineering (SPCOM) *July 2014 - May 2020*
Title: Analysis and Optimization of Energy-Efficient Massive MIMO Wireless Relaying Systems *CGPA: 9/10*
Advisor: Prof. Rohit Budhiraja and Prof. Kasturi Vasudevan
Awards: Outstanding PhD Thesis Award for the best thesis in Electrical department, IIT Kanpur
Best Doctoral Dissertation Award (Honorable Mention) at IEEE SPCOM conference, 2020

Indian Institute of Technology, Kanpur *Kanpur, India*
Master of Technology (MTech) in Electrical Engineering (SPCOM) *July 2009 - May 2011*
Advisor: Prof. Kasturi Vasudevan *CGPA: 8.5/10*

Chhatrapati Shivaji Institute of Technology *Durg, Chhattisgarh, India*
Bachelor of Engineering (BE) in Electronics and Communications (ECE) *July 2005 - April 2009*
Advisor: Mr. Deepak Sharma *CGPA: 8.66/10*

PROFESSIONAL EXPERIENCE

Teaching Experience *February 2021 - Present*
Indian Institute of Technology, Roorkee *Assistant Professor*

Research lab experience *August 2019 - January 2021*
5G Testbed Lab, Indian Institute of Technology, Kanpur *Project Executive Officer*
Project: Design of hardware and software algorithms for End-to-End 5G New Radio (NR) Testbed
Details: The 5G NR base station hardware consists of remote radio head and baseband unit (BBU), which are connected using high-speed optical cables. In this project, we architected the entire BBU design to suit the physical layer processing requirements. The work involved:

Hardware
- carefully managing the on-board processing power and memory
- designing power supplies, high-speed interfaces and printed circuit board stack-up

- performing the printed circuit board layout, signal-integrity and power-integrity simulations to ensure the desired signal and power integrity
- careful placement of thousands of discrete components. The card has the PCI form factor, and the components will have to be chosen accordingly
- Testing of different interfaces including high speed PCIe, 100G and eCPRI protocol based QSFP interface

Software
- Development of physical uplink control chain (PUCCH), both transmitter and receiver
- Development of physical downlink control chain (PUCCH), both transmitter and receiver
- Development of physical downlink shared chain (PDSCH), both transmitter and receiver
- These chains were developed both in MATLAB and VIVADO HLS software
- All the 5G NR specification were followed

Industry experience *Associate Software Engineer*

IBM India Software Lab, Pune *July 2011 - July 2012*

Projects: 1. Microsoft Windows Copy Offloaded Data Transfer
2. SCSI-3 Persistent Reservation

PUBLICATIONS

Journals papers:

1. Sauradeep Dey, **Ekant Sharma** and Rohit Budhiraja, "Hardware-Impaired Rician-Faded Massive MIMO FD Relay: Analysis And Optimization," to appear in IEEE Transactions on Communications, 2021
2. Dheeraj Naidu Amudala, **Ekant Sharma** and Rohit Budhiraja, "Energy-Efficient Spatially-Correlated Hardware Impaired Massive MIMO FD Relaying," in IEEE Transactions on Communications, vol. 69, no. 3, pp. 2028-2046, March 2021
3. Vikalp Mandawaria, **Ekant Sharma** and Rohit Budhiraja, "Energy-Efficient Massive MIMO Multi-Relay NOMA Systems With CSI errors," in IEEE Transactions on Communications, vol. 68, no. 12, pp. 7410-7428, Dec. 2020
4. Venkatesh Tentu, **Ekant Sharma** and Rohit Budhiraja, "WSEE Optimization Using Asynchronous ADMM For Massive MIMO Two-Way Relaying", in IEEE Communications Letters, vol. 24, no. 10, pp. 2255-2259, Oct. 2020
5. **Ekant Sharma**, Neha Gupta, Sauradeep Dey and Rohit Budhiraja, "Hybrid Massive MIMO Two-Way Relaying With Users And Relay Hardware Impairments", in IEEE Signal Processing Letters, vol. 27, pp. 486-490, Feb. 2020
6. **Ekant Sharma**, Dheeraj Amadula and Rohit Budhiraja, "Energy Efficiency Optimization of Massive MIMO FD Relay With Quadratic Programming," in IEEE Transactions on Wireless Communications, vol. 19, no. 2, pp. 1429-1448, Feb. 2020
7. **Ekant Sharma**, Swadha Siddhi Chauhan and Rohit Budhiraja, "Decentralized WSEE Optimization for Massive MIMO Two-Way Half-Duplex AF Relaying," in IEEE Transactions on Wireless Communications, vol. 19, no. 2, pp. 1397-1414, Feb. 2020
8. Dheeraj Amadula, **Ekant Sharma** and Rohit Budhiraja, "Spectral and Energy Efficiency of Multipair Two-way Full-Duplex Spatially Correlated Massive MIMO MRC/MRT Relaying," in IEEE Transactions on Communications, vol. 67, no. 12, pp. 8346-8364, Dec. 2019

9. **Ekant Sharma**, Arpita Singh Chauhan and Rohit Budhiraja, "Transceiver Design for Massive MIMO Two-Way Half-Duplex AF Hybrid Relay With MIMO Users," in IEEE Transactions on Vehicular Technology, vol. 68, no. 9, pp. 8759-8774, Sept. 2019

10. **Ekant Sharma**, Swadha Siddhi Chauhan, and Rohit Budhiraja, "Weighted Sum Energy Efficiency Optimization for Massive MIMO Two-Way Half-Duplex AF Relaying," IEEE Wireless Communications Letters, Volume: 8 , Issue: 1 , Feb. 2019

11. Vikalp Mandawaria, **Ekant Sharma**, Rohit Budhiraja, "WSEE Optimization of mmWave NOMA Systems," in IEEE Communications Letters, vol. 23, no. 8, pp. 1413-1417, Aug. 2019

12. Sauradeep Dey, **Ekant Sharma**, and Rohit Budhiraja, "Scaling Analysis of Hardware-Impaired Two-Way full-Duplex Massive MIMO Relay," IEEE Communications Letters, Volume: 23 , Issue: 7, July, 2019

13. DN Amudala, A Rajoriya, **Ekant Sharma**, S Dey, Rohit Budhiraja, "Massive MIMO multi-pair two-way half-duplex AF FDD relaying: channel estimation", CSI Transactions on ICT, Springer, 2019

14. **Ekant Sharma**, Rohit Budhiraja, K Vasudevan and Lajos Hanzo, "Full-Duplex Massive MIMO Multi-Pair Two-Way AF Relaying: Energy Efficiency Optimization," in IEEE Transactions on Communications, vol. 66, no. 8, pp. 3322-3340, Aug. 2018

15. **Ekant Sharma**, Ashish Shukla, and Rohit Budhiraja, "Spectral- and Energy-Efficiency of Massive MIMO Two-Way Half-Duplex Hybrid Processing AF Relay," IEEE Wireless Communications Letters, Volume: 7 , Issue: 5 , Oct. 2018

16. Prem Singh, **Ekant Sharma**, K Vasudevan and Rohit Budhiraja, "CFO and Channel Estimation for Frequency Selective MIMO-FBMC/OQAM Systems," IEEE Wireless Communications Letters, Volume: 7 , Issue: 5 , Oct. 2018

17. **Ekant Sharma**, Himanshu B Mishra, K Vasudevan and Rohit Budhiraja, "PAPR Analysis of Superimposed Training Based SISO/MIMO-OFDM Systems With Orthogonal Affine Precoder," Elsevier Physical Communications, Volume 25, Part 1, December 2017, Pages 239-248

18. **Ekant Sharma**, S. Rane, and K Vasudevan, "BER Efficient Interleaved OFDM System," Wireless Personal Communications, Springer, 98, no. 1 (2018): 1531-1546

Conference papers:

1. Soumyadeep Datta, **Ekant Sharma**, Dheeraj Naidu Amudala, Rohit Budhiraja and Shivendra Panwar, "FD Cell-Free mMIMO: Analysis and Optimization", to appear in IEEE International Conference on Communications (ICC), Jun 2021

2. Venkatesh Tentu, Dheeraj Naidu Amudala, **Ekant Sharma** and Rohit Budhiraja, "UAV-Enabled Hardware-Impaired Cell-free Massive MIMO With Spatially-Correlated Rician Fading", to appear in IEEE International Conference on Communications (ICC), Jun 2021

3. Aditya Gupta, Dheeraj Naidu Amudala, **Ekant Sharma** and Rohit Budhiraja, "Max-Min Fairness for Wireless-Powered Spatially Correlated Massive MIMO Multi-way Relaying", to appear in IEEE International Conference on Communications (ICC), Jun 2021

4. Vikalp Mandawaria, **Ekant Sharma** and Rohit Budhiraja, "Spectral Efficiency for Massive MIMO Multi-Relay NOMA Systems with CSI errors," to appear in IEEE 28th European Signal Processing Conference (EUSIPCO 2020), Amsterdam, Netherlands, Jan, 2021.

5. Sauradeep Dey, **Ekant Sharma** and Rohit Budhiraja, "Dynamic Resolution ADC/DAC massive MIMO FD Relaying System Over Correlated Rician Channel," to appear in IEEE 28th European Signal Processing Conference (EUSIPCO 2020), Amsterdam, Netherlands, Jan, 2021.

6. Dheeraj Naidu Amudala, **Ekant Sharma** and Rohit Budhiraja, "Spatially-Correlated Hardware-Impaired Massive MIMO FD Relaying With MIMO Users," to appear in IEEE ICC 2020 Workshop on Full-Duplex Communications for Future Wireless Networks, Dublin, Ireland, Jun, 2020

7. Sauradeep Dey, **Ekant Sharma** and Rohit Budhiraja, "Impact of User and Relay Hardware Impairments on Spectral Efficiency of HD Massive MIMO Relay," to appear in IEEE SPCOM 2020, Bangalore, India, July, 2020

8. Soumyadeep Dutta, **Ekant Sharma** and Rohit Budhiraja, "Power Scaling for Massive MIMO UAV Communication System," IEEE 12th International Conference on communication systems and networks (COMSNETS), Bengaluru, India, 2020, pp. 507-510

9. Venkatesh Tentu, Dheeraj Amudula, Anupama Rajoriya, **Ekant Sharma** and Rohit Budhiraja, "Energy Efficient Multi-Pair Massive MIMO Two-Way AF Relaying: A Deep Learning Approach," IEEE 12th International Conference on communication systems and networks (COMSNETS), Bengaluru, India, 2020, pp. 440-445

10. Sauradeep Dey, **Ekant Sharma**, and Rohit Budhiraja, "Multi-Pair Two-way Full-Duplex Massive MIMO Relaying with Non-Ideal Hardware," IEEE Global Communications Conference (GLOBECOM), Waikoloa, HI, USA, 2019, pp. 1-6

11. **Ekant Sharma**, Dheeraj Amudula and Rohit Budhiraja, "Energy Efficiency Optimization of Massive MIMO FD Relay Using Quadratic Programming," 2019 IEEE 20th International Workshop on Signal Processing Advances in Wireless Communications (SPAWC)

12. Neha Gupta, **Ekant Sharma**, Sauradeep Dey and Rohit Budhiraja, "Spectral Efficiency of Multi-pair Two-Way Massive MIMO Relay With Correlated Hardware Distortion," 2019 IEEE 20th International Workshop on Signal Processing Advances in Wireless Communications (SPAWC)

13. **Ekant Sharma** and Rohit Budhiraja, "QoS-Constrained Energy-Efficient AF Two-Way Full-Duplex Relaying with Massive Antennas," Proceedings of IEEE SPCOM 2018 (Invited paper), IISc Bangalore, India, pp. 1-6, Jul. 2018

14. Arpita Chauhan, **Ekant Sharma**, and Rohit Budhiraja, "Hybrid Block Diagonalization for Massive MIMO Two-Way Half-Duplex AF Hybrid Relay," Proceedings of IEEE SPCOM 2018, IISc Bangalore, India, pp. 1-6, Jul. 2018

15. **Ekant Sharma**, Ashish Kant Shukla, and Rohit Budhiraja, "Spectral- and Energy-Efficiency for Massive MIMO Two-Way Full-Duplex Hybrid Processing AF Relay," Proceedings of IEEE SPCOM 2018, IISc Bangalore, India, pp. 1-6, Jul. 2018

16. **Ekant Sharma**, Rohit Budhiraja and K Vasudevan, "Multi-Pair Two Way AF Full-Duplex Massive MIMO Relaying with ZFR/ZFT Processing," Proceedings of IEEE International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC), Montreal, QC, Canada, October 8-13, 2017

17. **Ekant Sharma**, H. B. Mishra, and K Vasudevan, "PAPR Analysis of Superimposed Training Based MIMO-OFDM Systems using an Orthogonal Affine Precoder," IEEE 13th International Conference INDICON, Bengaluru, India, Dec 2016

18. **Ekant Sharma**, H. B. Mishra, and K. Vasudevan, "Training Sequence Optimization for Estimating the Channel in the Presence of Colored Interference for MIMO-OFDM Systems," IEEE Region 10 Conference (TENCON), Singapore, Nov 2016

19. **Ekant Sharma** and K Vasudevan, "PAPR and BER Minimized OFDM Systems with Low Complexity Channel Independent Precoders," 22nd IEEE Symposium on Communications and Vehicular Technology in the Benelux (SCVT), Luxembourg, Nov 2015

RELEVANT COURSES

Representation and Analysis of Random Signals
Probability theory and Random Variables
Transceiver optimization for OFDM wireless system
Simulation-Based Design of 4G/5G Wireless Standards
Mathematical methods in Signal Processing
MIMO Wireless communications
Convex Optimization
Statistical signal processing
Communication theory
Digital Communication Networks

ACADEMIC ACHIEVEMENTS

- Outstanding PhD Thesis Award for the best thesis in Electrical department, IIT Kanpur
- Best Doctoral Dissertation Award (Honorable Mention) at IEEE SPCOM conference, 2020
- Finalist for Qualcomm Innovation Fellowship for 2020-2021
- Awarded with Shastri Indo-Canadian Institute scholarship for 2017-2018
- Qualified GATE 2009 with 99.63%ile (AIR-138) in fourth year of engineering
- Qualified GATE 2008 with 98.48%ile (AIR-422) in third year of engineering

WORKSHOPS/CONFERENCES ATTENDED

- IEEE SPAWC conference, Cannes, France, July 2-5, 2019
- IEEE BIS Seminar at IITK on 5G Communications, Indian Institute of Technology, Kanpur, 2018
- IEEE SPCOM conference, Indian Institute of Science, Bangalore, July 16-19, 2018
- IEEE PIMRC conference, Quebec, Canada, October 8-13, 2017
- IEEE TENCON conference, Singapore, November 22-25, 2016
- Shannon Centenary Day, Indian Institute of Technology, Kanpur, October 19th, 2016
- Joint Telematics Group/IEEE Information Theory Society Summer School on Signal Processing Communications and Networks, IISc Bangalore, July 20-23, 2015
- 22nd IEEE Symposium on Communications and Vehicular Technology, Luxembourg, Nov 2015

PROFESSIONAL ACTIVITIES

- Routinely review articles for IEEE Journal on Selected Areas in Communications, IEEE Transactions on Wireless Communications, IEEE Transactions on Communications, IEEE Transactions on Vehicular Technology, IEEE Internet of Things Journal, IEEE Systems Journal, IEEE Communication Letters, IET Communications

PERSONAL TRAITS

Highly motivated and eager to learn new things

Strong motivational and leadership skills

Ability to work as an individual as well as in group