Dr Aakash Bansal (Early Career Researcher)

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1 SUMMARY

A Royal Academy of Engineering UK Intelligence Community Research Fellow at Loughborough University (LU), I finished my PhD in September 2022. I have extensive experience in RF design, reconfigurable antenna arrays, metamaterials & metasurfaces, RF lenses, microcontrollers, fabrication, and measurement. I have collaborated on > 30 consultancy projects for industries in India and UK. I have 15 journal papers (+9 submitted) and presented 27 conference papers/posters (+1 submitted). I have won multiple research and outreach awards. My research is focused on active mmWave beam-steering antenna, dielectric lenses, metasurfaces, satellite communications on the move, and orbital angular momentum waves.

2 WORK EXPERIENCE

- **Lecturer (Eq. to Assistant Professor) in Applied Electromagnetics, Loughborough University, UK** (Sept 24 onwards)
  Starting as a new Lecturer in parallel to the Royal Academy of Engineering Research Fellowship, responsible for supervising research students, writing new research grants, inviting and maintaining national and international collaborations, co-manage research facilities and teaching subjects such as microwave engineering, electromagnetics and antennas.
- **Royal Academy of Engineering UK IC Research Fellow, Loughborough University, UK** (Jan 24 – Present)
  Funded by the Royal Academy of Engineering under their prestigious scheme for UK Intelligence Community, working with multiple industrial partners on developing new beam-steering antennas for CubeSats. Additional responsibilities include writing new research grants, inviting and maintaining international collaborations, quasi-manage research labs and supervising students.
- **Research Associate, Loughborough University, UK** (Feb 23 – Dec 23)
  Collaborating on several projects focused on antennas, metasurfaces, orbital angular momentum, additive manufacturing for RF applications and satellite communication, consulting on industrial and academic projects, supervising research projects and writing new research grant applications.
- **Future Communications Engineer, Satellite Applications Catapult, UK** (Oct 22 – Jan 23)
  Responsible to work directly with CTO team on industrial consultation projects; developed a new Ku-Band beam-steering antenna for One Web satellite handover at ground stations; advised on new technology for applications in satellite communications.
- **Research Assistant, Loughborough University, UK** (Apr 19 – Sept 22)
  Assisting with projects focused on antenna design and measurement, consulting on industrial and academic projects, writing new grant applications and supporting teaching modules (antennas, digital systems, and electronic circuits).
- **Head of Innovation (Voluntary Position), National Indian Students & Alumni Union UK** (Jun 19 – Jul 21)
  Promoted within a year to Head of Innovation, lead a team of 12 volunteers providing end-to-end query and grievance redressal for students, and volunteer recruitment and lead projects to enable the organisation to leverage technology.
- **Innovation Coach and Consultant, Connecting Dreams Foundation** (Jul 18 – Feb 19)
  Responsible for consulting and training of students and faculty under Atal Tinkering Labs on design innovation, introduction to electronics and programming established among 2400 schools throughout India.
- **Research Associate, CSIR – Central Electronics Engineering Research Institute, Pilani (India)** (Jul 17 – Feb 19)
  Developed a computationally efficient, integrated, and dynamic model for the design of Staggered Double Vane Slow Wave Structure (SDVSWS) and beam-wave interaction analysis of a planar Traveling Wave Tubes (TWT) with a sheet electron beam to determine its RF performance.

3 EDUCATION

- **Doctor of Philosophy (Ph.D.)** (2019 – 2022)
  Loughborough University, UK
  Dissertation: Active Beam-Steering mmWave Antenna System for 5G and Beyond (DOI)
- **Bachelor of Technology (B.Tech.):** *78.3%, Ranked in top 15 out of 200.* (2013 – 2017)
  Guru Gobind Singh Indraprastha University, New Delhi (India)
  Major: Electronics and Communication Engineering
  Dissertation Project: Implementing Vehicular ad-hoc Network with off-the-shelf Components

4 SKILLS

- **Electromagnetic Simulation and Antenna Designing** with EM modelling tools such as CST Microwave Studio, Ansys HFSS, Empire XPU, Microwave AWR Office, and Keysight Advanced Design Suite (ADS).
- **Programming and Scripting** in C/C++, MATLAB, Python and MS Excel/Google Sheets for automation and data analysis; and building embedded systems and automation units using microcontroller/microprocessor boards including Arduino, AVR MCU, Raspberry Pi and NodeMCU.

- **Operating Lab Equipment** including anechoic chamber, network analysers, spectrum analysers, 3D-printers, etc; and manufacturing PCB based antenna designs.
- **Research Interests**: Electromagnetics, Antenna Arrays, Microwave and Millimeter Wave Communication, Metamaterial and Metasurfaces, Dielectric Lenses, Space Communication, 5G/6G, Beamforming/Beam Steering Antennas, OAM waves.

5 FUNDING SECURED

- **UK Intelligence Community Research Fellowship** (Jan 24 – Dec 25)
  Royal Academy of Engineering
  Value: GBP 275,000 (£200k from RAEng and £50k from LU, with additional support worth £25k from Industrial Partners)
  Project titled Small Platform Antennas for CubeSats (SPACE) focuses on developing novel low-power beam-steering leaky-wave antennas at X-band using additive manufacturing techniques for applications in small satellites. Link

  Information about new submitted funding applications available on request.
- **Innovation Launchpad Network+ Researcher in Residence Funding** (July 24 – Mar 26)
  Engineering and Physical Science Research Council (EPSRC)
  Value: GBP 275,000 (£200k from RAEng and £50k from LU, with additional support worth £25k from Industrial Partners)
  Project titled Small Platform Antennas for CubeSats (SPACE) focuses on developing novel low-power beam-steering leaky-wave antennas at X-band using additive manufacturing techniques for applications in small satellites. Link

  Information about new submitted funding applications available on request.

6 AWARDS AND ACHIEVEMENTS

- Recipient of Royal Academy UK Intelligence Community Fellowship 2023.
- Recipient of *Loughborough University's Doctoral President's Award 2022* (LU most prestigious doctoral award).
- Recipient of *Sir Robert Martin University Prize 2020* (LU most prestigious student award).
- Runner-up for *Loughborough University's PhD Award for Overall Impact 2020*.
- Recipient of *Action Volunteer Bronze Award 2020* by LU Students' Union for STEM Promotion Activities.
- Recipient of *Electronics Weekly BrightSparks 2020 Award* for research and STEM Promotion in the UK.
- Recipient of *Young Engineer Award 2019* by CSIR-CEERI, Pilani for research and supporting collaborations.
- *Exemplary Performance Award for Student Training and Research 2017* by MSIT, India for developing collaborative research opportunities and training undergraduate students.
- Recipient of *IEEE Computer Society Richard E. Merwin Student Scholarship 2016*.
- Recipient of *MIT GSW Fellowship 2016* for the proposed idea of self-sustained LED Bulbs.
- Received Project Funding for Design of Self Sustained LED Bulbs from NGO: Sristi.
- Won *IEEE MTT-S YouTube/Youku Video Contest* for a demonstration of Offline GPS.
- Recipient of the *IEEE Delhi SAC Outstanding Student Volunteer Award 2016*.
- Winner of four hardware hackathons organised by TATA power, DTU 2015, IIIT 2016, etc.
- Winner of six paper presentation competitions organised by MSIT 2016, JMI 2016, etc.

7 POSITIONS OF RESPONSIBILTY

- Publicity Committee and Technical Program Committee, IEEE Microwave, Antennas and Propagation Conference 2024, India.
- European Liaison, IEEE Space, Aerospace and Defence Conference 2024, India.
- Associate Editor, IEEE Open Journal of Antennas and Propagation (Special Issue: Advances in Additive Manufacturing & 3D Printing: Novel Materials & Metamaterial Structures for Antennas and Other Electromagnetic Devices).
- Review Editor, Frontiers in Antennas and Propagation.
- Reviewer, IEEE Antennas and Wireless Propagation Letters.
- Reviewer, IET Microwave, Antennas and Propagation.
- Reviewer, IET Electronics Letters.
- Reviewer, Progress in Electromagnetics Research.
- Head of Project, STEM Action, Loughborough Students' Union (2019 – 2021)
- Advisor, Atal Innovation Mission, Govt. of India (2017 – 2019)
- Mentor, IEEE India Council Student Support Network (2018 – 2019)
- Mentor, IEEE Delhi Section Student Support Network (2017 – 2019)
- Volunteer Lead, Intel K-12 Education Campaign, India (2016 – 2018)
- Student Section Representative, IEEE Delhi Section Student Support Network (2016 – 2017)
- Head for Industrial-Academic Collaboration, IEEE India Council (2016 – 2017)
- Chairperson, IEEE MSIT Student Branch (2016 – 2017)

8 JOURNAL PUBLICATIONS: 9 PAPERS SUBMITTED (1-9), 15 PAPERS PUBLISHED (10-24)

1) (Under Review) S. N. Narayanan, J. K. Varghese, A. Bansal, Y. W. Li, "Fifth-Generation Mobile Phone Radiation: Evolution, Specifics, and Biological Effects," Journal of Environmental Sciences, 2024.

2) (Under Review) A. Bansal, W.G. Whittow, "Figuring Out Impaired Reconfigurable Intelligent Surfaces," IEEE Antennas and Propagation Magazine, 2024 (TechRxiv).
3) (Under Review) A. Bansal, E. Mellios, H. Nagi, P. Febvre, W. G. Whittow, "Two-Dimensional Beam-Steering Lens Antenna with Fast Inter-Beam Handover for Satellite Communications," IEEE Transactions on Vehicular Technology, 2024 (TechRxiv).
4) (Under Review) A. Bansal, T. Whittaker, W. G. Whittow, "Novel Slow-Wave Structure based Leaky Wave Antenna using a 3D-Printed Substrate with Periodic Corrugations," IEEE Transactions on Antennas and Propagation, 2024.
5) (Under Review) A. Patel, A. Bansal, W. G. Whittow, "Wideband End-Fire Antenna Based on a Modulated Grooved Surface Plasmon Polaritons," IEEE Transactions on Antennas and Propagation, 2024.
6) (Under Review) A. Bansal, C. J. Panagamuwa, W. G. Whittow, "State-of-the-art Millimeter-Wave Beam-Steering Antennas for Beyond 5G and 6G Networks - A Comprehensive Survey," To be submitted to IEEE Antennas and Propagation Magazine, 2024 (TechRxiv).
7) (Under Review) P. K. Sharma, A. Bansal, J. Y. Chung, "Conformal Holographic Metasurface-Based Beamforming Antenna using a 3D-Printed Flexible Substrate," Submitted to IET Microwave Antennas and Propagation, 2024 (TechRxiv).
8) (Under Review) N. Faisal, V. Rajendran, S. Kaniapan, V. Ramalingam, A. Prathuru, R. Ahmed, N. Katiyar, A. Bansal, T. Whittaker, P. Isherwood, W. Whittow, M. Egiza, S. Goel, "Air plasma sprayed multi-material composite coatings for enhanced light absorption and thermal emission," Journal of Thermal Spray Technology, 2024.
9) (Under Review) A. Bansal, C. J. Panagamuwa, W. G. Whittow, "Integrated Digitated Capacitor based Corrugated Substrate Integrated Waveguides," Submitted to Wiley Engineering Reports, 2023.

10) A. Bansal, W. G. Whittow, "3D-Printing for Fast and Secure Satellite Communications," under *Why Space? The Opportunity for Materials Science and Innovation* – Position Paper by Satellite Applications Catapult and Science & Technology Facilities Council, 2024. Link.
11) U. Pandey, P. Singh, N. P. Gupta, R. Singh, A. Bansal, "Wideband Leaky-Wave Antenna with Dumbbell Shaped Slots on SIW with Twisted Corrugations," Electronics Letters, 2023. DOI.
12) A. Bansal, T. Whittaker, W. G. Whittow, "Beam-Scanning Orbital Angular Momentum Beam Circular Leaky Wave Antenna with Half Mode Corrugated Substrate Integrated Waveguide," IEEE Antennas and Wave Propagation Letters, 2023. DOI.
13) A. Bansal, C. J. Panagamuwa, W. G. Whittow, "Fixed frequency beam-steering using bow-tie slot-based dielectric filled waveguide antenna array," Electronics Letters, vol. 59, no. 13, 2023. DOI.
14) A. Bansal, C. J. Panagamuwa, W. G. Whittow, "Full 360° Beam Steering Millimeter-Wave Leaky-Wave Antennas Coupled with Bespoke 3D-Printed Dielectric Lenses for 5G Base Stations," Electronics Letters, vol. 59, no. 8, 2023. DOI.
15) A. Bansal, C. J. Panagamuwa, W. G. Whittow, "Novel Design Methodology of 3D-Printed Lenses for Travelling Wave Antennas," IEEE Open Journal of Antennas and Propagation, vol. 4, pp. 196-206, 2023. DOI.
16) A. Bansal, C. J. Panagamuwa, W. G. Whittow, "Millimeter-Wave Beam Steerable Slot Array Antenna Using an Inter-Digitated Capacitor Based Corrugated SIW", IEEE Transactions on Antenna & Propagation, vol. 70, no. 12, pp. 11761-11770, 2022. DOI.
17) A. Bansal, V. Srivastava, R. Gupta, R. K. Sharma, "Novel Microfabricated Slow Wave Structure for a 0.22-THz Sheet Beam Travelling Wave Tube," IEEE Transactions on Electron Devices (Accepted and in Press).
18) R. Gupta, G. Bakshi, and Aakash Bansal, "Dual-Band Circularly Polarized Stacked Sapphire and TMM13i Rectangular DRA," Progression in Electromagnetics Research, vol. 91, pp. 143-153, 2019. DOI.
19) A. Bansal, et. al. "Integrated Model for Design of SWS and Beam-Wave Interaction Analysis of a Planar THz Sheet-Beam TWT," Progress in Electromagnetics Research, vol. 87, pp. 179-187, 2019. DOI.
20) A. Bansal, "Design and Implementation of a Long-Range Decentralized Vehicular Network," Journal of Mechatronics and Automation, vol. 5, pp. 24-30, 2018. DOI.
21) A. Bansal, et. al. "Any Touch: Design and Implementation of a Touch Interface for Bluetooth Enabled Personal Devices," Intl. Journal of Engineering and Manufacturing, vol. 8, no. 2, pp. 1-11, 2018. DOI.
22) A. Bansal, R. Gupta, "A review on microstrip patch antenna and feeding techniques." International Journal of Information Technology, vol. 12, no. 1, pp. 1-6, 2018. DOI.
23) A. Bansal, et. al. "Analysis and Design of Coaxial Fed Microstrip Antenna on Multilayer substrate at Terahertz Frequency," Journal of Microwave Engineering and Tech., vol. 4, no. 3, pp. 11-14, 2018. DOI.
24) A. Bansal, V. Goyal, "Real-Time Electricity Monitoring using Smart Energy Meter in a Smart LAN based Network," Intl. J. of Electronics, Electrical and Comp. System, vol. 6, no. 5, pp. 2348-3117, 2017. DOI.

9 CONFERENCE PRESENTATIONS AND PUBLICATIONS: 1 UNDER REVIEW, 11 ACCEPTED (2-12), 16 PRESENTED (13-28)

1) (Under Review) A. Bansal, M. Singh, N. Formosa, "New Real-Time Road Traffic Data Monitoring System in a Connected and Autonomous Vehicles Era," Conference in Emerging Technologies in Transportation systems – TRC 30, 2024.

2) (Accepted) A. Bansal, W. G. Whittow, "Generating Mode 2 OAM Beam Using a Circular Leaky-Wave Antenna on a Corrugated Half-Mode SIW with Beam-Scanning," IEEE Space, Aerospace and Defence Conference 2024.

3) (Accepted) P. K. Sharma, A. Bansal, J. Y. Chung, "Holographic Metasurface Design for Flexible Beamforming Antennas," IEEE Space, Aerospace and Defence Conference 2024.
4) (Accepted) A. Bansal, W. G. Whittow, "Optically Transparent UHF RFID Antennas," IEEE International Symposium on RFID and Electromagnetics for IoT 2024.
5) (Accepted) A. Bastola, A. Bansal, C. Tuck, W. G. Whittow, "3D Printed Digital Materials for Antenna Applications," IEEE International Symposium on RFID and Electromagnetics for IoT 2024.
6) (Accepted) S. Ghosh, A. Bansal, C. Saha, W. G. Whittow, "Single Feed Dual-Beam Linearly Polarized Holographic Metasurface Antenna," IEEE International Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting 2024.
7) (Accepted) A. Bansal, W. G. Whittow, "Bespoke Lens Design for a High Gain Circularly Polarized Leaky Wave Antenna," IEEE International Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting 2024.
8) (Accepted) A. K. Patel, A. Bansal, C. J. Panagamuwa, W. G. Whittow, "Backward to Forward Radiating Leaky Wave Antenna on a Half Mode Corrugated SIW," IEEE International Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting 2024.
9) (Accepted) A. Bansal, W. G. Whittow, "Millimeter-Wave Dual Beam Corrugated Substrate Integrated Waveguide Based Leaky Wave Antenna," IEEE International Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting 2024.
10) (Accepted) A. Bansal, C. J. Panagamuwa, M. Khalily, W. G. Whittow, "Conformal Millimeter-Wave Corrugated Substrate Integrated Waveguide Slot Array Antenna," IEEE Intl Conf on Microwaves, Communications, Antennas, Biomedical Engineering and Electronic Systems 2023.
11) (Accepted) A. Bansal, C. J. Panagamuwa, M. Khalily, W. G. Whittow, "Bespoke Homogeneous Dielectric Lens for Meander Line-based Leaky Wave Antenna," IEEE Intl Conf on Microwaves, Communications, Antennas, Biomedical Engineering and Electronic Systems 2023.
12) (Accepted) A. Bansal, M. Al-Nuaimi, T Whittaker, H Eskandari, W. G. Whittow, "Optically Transparent Metasurface for Microwave Applications," IEEE Intl Conf on Microwaves, Communications, Antennas, Biomedical Engineering and Electronic Systems 2023.
13) A. K. Patel, A. Bansal, C. J. Panagamuwa, W. G. Whittow, "Half Mode Corrugated Substrate Integrated Waveguide Band-Stop Filter Using Hexagonal Ring Resonators," European Conference on Antennas and Propagation 2024. DOI.
14) A. Bansal, R. Hewson, M. Santer, W. G. Whittow, "Optimal Morphing Metasurface Lens for Next Generation RF Sensing and Communications," European Conference on Antennas and Propagation 2024. DOI.
15) A. Bansal, "Wideband Half-Elliptical Ring Slot Array Leaky-Wave Antenna on a Half-Mode Corrugated Substrate Integrated Waveguide," European Conference on Antennas and Propagation 2024. DOI.
16) S. Ghosh, D. Saha, A. Bansal, W. G. Whittow, "Design of a Concentric Circular Holographic Metasurface Using Hexagonal Anisotropic Unit-Cell for Wireless Communication," European Conference on Antennas and Propagation 2024. DOI.
17) A. Bansal, T. Whittaker, P. Hansen, W. G. Whittow, "Experimental Results for Carbon Nanotube-Sheet Based Microstrip Patch Antenna," European Conference on Antennas and Propagation 2024. DOI.
18) A. Bansal, W. G. Whittow, "Orbital Angular Momentum Beam Antenna Systems for Wireless Communications – A Brief Review," International Conference on Signal Processing and Communications, 2023. DOI.
19) A. Bansal, W. G. Whittow, "LWA on a Half-Mode IDC-CSIW with Tilted Vertical Slots," IEEE Microwaves, Antennas and Propagation Conference 2023. DOI.
20) A. Bansal, C. J. Panagamuwa, W. G. Whittow, "Simplified Design Methodology for RF Dielectric Homogeneous and Graded Index Lenses," IEEE Microwaves, Antennas and Propagation Conference 2023. DOI.
21) A. Bansal, N. Formosa, "Navigating the Road to Connectivity: Use Cases and Design Considerations for V2X Networks Using Millimeter-Wave 5G Beam-Steering Antennas," IEEE Microwaves, Antennas and Propagation Conference 2023. DOI.
22) A. Bansal, H. Nagi, P. Febvre, W. G. Whittow, "Bespoke Luneburg Lens for Two-Dimensional Beam-Steering Antennas for SatComms on the Move," IEEE International Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting 2023. DOI.
23) A. Bansal, C. J. Panagamuwa, W. G. Whittow, "Conformal Millimeter-Wave Corrugated Substrate Integrated Waveguide Slot Array Antenna," IEEE International Symposium on RFID and Electromagnetics for IoT 2023. DOI.
24) (Poster) A. Bansal, T. Whittaker, W. G. Whittow, "3D Printed Graded Index Lenses Using High Relative Permittivity Filaments for Directive Antennas," 17th European Conf. on Antennas and Propagation 2023.
25) (Presentation) A. Bansal, "Active Millimeter-Wave Beam-Steering Antenna for 5G," 32nd Simulia Regional User Meeting 2019.
26) N. Rathee, A. Bansal, A. Gupta, S. Singh, R. Devasia, "Digital Resistance Box: An Approach to Generate Desired Value of resistance by Automatically Varying the Potentiometer," IEEE Intl. Conf. on Power Electronics, Intelligent Control, and Energy Systems 2016. DOI.
27) (Poster) A. Bansal, S. Jain, "Iterations of Offline GPS," Springer's International Conf. on Intelligent Communication Control and Devices 2016.
28) (Poster) A. Bansal, "Centralized Traffic management using Mobile Signal Density," 5th Intl. Symposium on Fusion of Science and Technology, 2016.