

# GOUTAM CHATTOPADHYAY

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## Education

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- Ph.D. Electrical Engineering** May 2000.  
California Institute of Technology, Pasadena, CA, USA.  
Thesis title: Dual Polarized and Balanced Receivers at Millimeter and Submillimeter Wavelengths.  
Thesis adviser: Prof. Jonas Zmuidzinis.
- MS Electrical Engineering** January 1995.  
University of Virginia, Charlottesville, VA, USA.  
Thesis title: A Quasi-Optical Ka-Band Subharmonic Mixer with Separately Biased Diodes on a Planar Antenna.  
Thesis Adviser: Prof. Robert M. Weikle II.
- B. E. Electronics and Telecommunication Engineering** June 1987.  
Bengal Engineering College, Calcutta University (currently IEST), Calcutta, INDIA.

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## Positions Held

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- Senior Research Scientist** Mar. 2015 – Present.  
NASA-Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, USA.
- Principal Engineer** Mar. 2012 – Present.  
NASA-Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, USA.
- Visiting Associate** Mar. 2006 – Present.  
Division of Physics, Mathematics, and Astronomy, California Institute of Technology, Pasadena, CA, USA.
- BEL Distinguished Visiting Chair Professor** Aug. 2016 – Present.  
Indian Institute of Science, Bangalore, India.
- Adjunct Professor** Jan. 2019 – Present.  
Indian Institute of Technology, Kharagpur, India.
- Erudite Visiting Chair Professor** Jan. 2018 – Present.  
Cochin University of Science and Technology (CUSAT), Cochin, India.
- Senior Member of the Engineering Staff** Feb. 2005 – Feb. 2012.  
NASA-Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, USA.
- Senior Member of the Research Staff** Dec. 2001 – Feb. 2005.  
George Downs Laboratory of Physics, California Institute of Technology, Pasadena, CA, USA.
- Member of the Research Staff** Oct. 1999 – Nov. 2001.  
George Downs Laboratory of Physics, California Institute of Technology, Pasadena, CA, USA.
- Graduate Research Assistant** Sep. 1994 – Sep. 1999.  
Department of Electrical Engineering, California Institute of Technology, Pasadena, CA, USA.
- Graduate Research Assistant** Jan. 1993 – Aug. 1994.  
Department of Electrical Engineering, University of Virginia, Charlottesville, VA, USA.
- Design Engineer** Nov. 1987 – Dec. 1992.  
Tata Institute of Fundamental Research, Bombay, India.

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## Honors and Awards

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- Thirty-five NASA Invention Awards for work primarily in the submillimeter wavelengths presented by the National Aeronautics and Space Administration, USA – 2005-2020.
- Eighteen United States Patents – 2006-2020.
- IEEE Transactions on Terahertz Science and Technology Best Paper Award – 2020.
- IEEE Region 6 Engineer of the Year Award – 2018.
- NASA-JPL Voyager Award – 2018.
- Indian Institute of Engineering Science and Technology (IEST) Distinguished Alumni Award – 2017.
- European Conference on Antennas and Propagation (EuCAP) Best Paper Award – 2017.
- IETE Prof. S. N. Mitra Memorial Award – 2014.
- IEEE Distinguished Microwave Lecturer Award – 2014.
- IEEE Transactions on Terahertz Science and Technology Best Paper Award – 2014.
- Group Awards for submillimeter-wave frequency multiplier designs, Herschel HIFI instrument design, Herschel SPIRE design, and Terahertz Radar design presented by the NASA-Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, USA – 2005, 2007, 2009, 2011, and 2014.
- NASA-JPL Mariner Award – 2013.
- Award of Excellence presented by the NASA-Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, USA for Exceptional Technical Excellence – 2001, 2003, and 2006.
- IEEE Microwave Theory and Techniques Society (IEEE MTT-S) Graduate Fellowship Award – 1997.
- Jawharlal Nehru Graduate Fellowship Award in Engineering presented by the Government of India – 1992.
- Best Undergraduate Student Award presented by the University of Calcutta, India – 1987.

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## Professional Memberships and Other Positions

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- Fellow of the Institute of Electrical and Electronic Engineers (IEEE), USA.
- Fellow of the Institute of Electronics and Telecommunications Engineers (IETE), India.
- IEEE Distinguished Microwave Lecturer (IEEE Microwave Theory and Techniques Society).
- Associate Editor, IEEE Transactions on Antennas and Propagation Journal.
- Member of the Administrative Committee (AdCom), IEEE Microwave Theory and Techniques Society.
- Chair of IEEE MTT-S Meetings and Symposia Committee.
- Vice-Chair of IEEE MTT-S Education Committee.
- Chair of the IEEE Microwave Theory and Techniques Society's Technical Coordination Committee on Terahertz Technology and Applications (MTT-4).
- Member of the IEEE Microwave Theory and Techniques Society's Technical Coordination Committee on RF Nanotechnology (MTT-25).
- Member of the editorial board for the IEEE Transactions on Microwave Theory and Techniques Journal.
- Member of the editorial board for the IEEE Transactions on Terahertz Science and Technology Journal.
- Member of the editorial board for the IEEE Transactions on Antennas and Propagation Journal.
- Member of the editorial board for the IEEE Microwave and Wireless Components Letters Journal.
- Member of the editorial board for the IEEE Antennas and Wireless Propagation Letters Journal.
- Member of the editorial board for the IEEE Transactions on Image Processing Journal.
- Member of the editorial board for the Journal of Infrared, Millimeter, and Terahertz Waves.
- Member of the editorial board for the Journal of Applied Physics.
- Member of the editorial board for the Journal of Selected Topics in Quantum Electronics.
- Member of the editorial board for the Review of Scientific Instruments Journal.
- Member of the editorial board for the Nature Photonics.
- Member of the editorial board for the Proc. IEEE.
- Member of the editorial board for the International Journal on Smart Sensing and Intelligent Systems.
- Member of the Technical Program Committee, IEEE International Microwave Symposium.
- Member of the Technical Program Committee, International Conference on Sensor Technology.
- Convener for the Submillimeter-Wave Astronomy, URSI General Assembly. Member Comm. B, F, and J.
- Reviewer for NASA, NSF, DARPA, and others.

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- Member of the review board for Australian Research Council, Swedish National Space Board, and Netherlands Organization for Scientific Research
- Life Member of Eta Kappa Nu – Electrical Engineering Honor Society.

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## Research Activities

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### Principal Investigator and Co-Investigator

February 2005 – Present.

Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, USA.

- Principal Investigator (PI) on NASA ROSES MatISSE planetary science program, developing Water Hunting Advanced Terahertz Spectrometer on an Ultra-small Platform (WHATSUP) – a low-power and low-mass submillimeter-wave instrument on CubeSat/SmallSat platforms to explore cometary water.
- Principal Investigator (PI) on NASA ROSES APRA astrophysics program, developing integrated silicon micromachined SIS heterodyne array instrument at 557 GHz. Enabling a novel packaging architecture that will help building large SIS array instruments at submillimeter-wavelengths.
- Co-Investigator (Co-I) on NASA ROSES IIP Earth science program, developing MLS-Cube – a microwave limb sounder for Continuity of stratospheric observations.
- Co-Investigator (Co-I) on NASA ROSES IIP Earth science program, developing CMOS enhanced metasurface array for active/passive snow sensing. We are developing a snow-sensing radar from a drone platform.
- Co-Investigator (Co-I) on NASA ROSES MatISSE planetary science program, developing a radar spectrometer instrument at terahertz frequencies for planetary exploration.
- Co-Investigator (Co-I) on NASA ROSES ACT Earth science program, developing beam-steering W-band metasurface antenna for radar application.
- Principal Investigator (PI) on NASA ROSES APRA astrophysics program, developing a multi-pixel 1.9 THz receiver array instrument.
- Principal Investigator (PI) on NASA ROSES APRA astrophysics program, developing silicon metasurfaces for integrated dual polarized 1.9 THz heterodyne array instruments.
- Principal Investigator (PI) on NOAA instrument risk reduction program, developing low-profile metasurface antennas. Using 3D metal printing technology, developing ultra-low profile metasurface antennas atmospheric studies as well as for deep space communications.
- Principal Investigator (PI) on JPL Strategic Research and Development program, developing planar multi-pixel heterodyne array architecture suitable for large arrays.
- Principal Investigator (PI) on JPL Topical Research and Development program, developing 2-D steerable submillimeter-wave antenna for planetary wind measurements.
- Co-Investigator (Co-I) on NASA ROSES APRA astrophysics program, developing silicon based local oscillator source array at 1.9 THz.
- Co-Investigator (Co-I) on NASA ROSES PICASSO planetary science program, developing Comets Observation & Mapping Enhanced Terahertz Spectrometer/Radiometer (COMETS) – a multi-pixel spectrometer to map comets.
- Co-Investigator (Co-I) on NASA ROSES IIP Earth science program, Compact Adaptable Microwave Limb Sounder (CAMLs). We developed of high electron mobility transistor (HEMT) based cryogenic receivers at 340 GHz band for the Scanning Microwave Limb Sounder (SMLS) instrument on NASA's future Earth observing mission.
- Co-Investigator (Co-I) on NASA ROSES APRA astrophysics program developing coupling structures for superconducting spectrometer on a chip.
- Working on an ultra-compact spectrometer on a chip using superconducting transmission line resonators that uses Microwave Kinetic Inductance Detectors (MKID) for astrophysics applications.
- Designed and developed the T-Slot dual-polarized array antenna that was used on the BICEP2 instrument for detection of the B-mode polarization of the Cosmic Microwave Background (CMB) radiation.
- Principal Investigator (PI) on NASA ROSES MatISSE planetary science program, Planetary Instrument for Submillimeter-wave Surface and Atmospheric Research and Reconnaissance in Orbit (PISSARRO). We developed silicon micromachined highly-compact and vertically integrated dual-polarized, sideband separating, and balanced submillimeter-wave high-resolution spectrometer instrument.
- JPL Principal Investigator (PI) for the development of terahertz transistors with Northrop Grumman Corporation for DARPA terahertz program.

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- *Principal Investigator (PI)* for several other NASA Planetary Science Programs (PIDDP, ACT, and others). Working on the development of room-temperature low-power and low-mass submillimeter-wave instruments intended for future Mars, Jupiter-Europa, Saturn-Titan, and other missions.
- *Principal Investigator (PI)* for NASA Earth Science Technology Program. Developing MMIC mixers and multipliers using HEMT transistors working in the 300-850 GHz frequency band.
- Co-Investigator for a DHS program for the development of multi-pixel frequency modulated continuous wave (FMCW) radar operating in the 670 GHz range.
- Involved in the design and development of the polarization detection instrumentation for the next generation cosmic microwave background (CMB) space missions.

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## Invited Lectures

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### More than 200 Invited lectures. Lists only the 2020-2017 lectures:

- G. Chattopadhyay, "Cryogenic Sensors and Other Terahertz Technologies for Science Applications," Space Application Center, Indian Space Research Organization (ISRO), Ahmedabad, India, December 2019.
- G. Chattopadhyay, "Are We Alone? NASA Technologies to Find Life Beyond Earth and Answers to Other Science Questions," IEEE Young Professional (YP) Event, Dubai, United Arab Emirates, November 2019.
- G. Chattopadhyay, "NASA Technologies for Science and Other Applications," NXP Semiconductors, Den Bosch, The Netherlands, October 2019.
- G. Chattopadhyay, "NASA Technologies and Space Applications," Indian Institute of Science, Bangalore, India, July 2019.
- G. Chattopadhyay, "Technologies to Search for Life Beyond Earth," Indian Institute of Technology, Jammu, India, March 2019.
- G. Chattopadhyay, "NASA's Search for Life Beyond Earth," Cadence India, New Delhi, India, March 2019.
- G. Chattopadhyay, "Are We Alone? NASA's Search for Life Beyond Earth," King Abdullah University of Science and Technology, Jeddah, Saudi Arabia, March 2019.
- G. Chattopadhyay, "Terahertz Technology and NASA Applications," National Instruments, Santa Clara, CA, February 2019.
- G. Chattopadhyay, "Are We Alone? NASA's Search to Find Life Beyond Earth," Indian Institute of Technology, Kharagpur, India, February 2019.
- G. Chattopadhyay, "Compact Microwave and Terahertz Instruments on CubeSat Platforms," Kolkata, India, December 2018.
- G. Chattopadhyay, "Instruments and Antenna Systems Design Space Applications," Mälardalen University, Västerås, Sweden, September 2018.
- G. Chattopadhyay, "Terahertz Science and Heterodyne Instrument Technology," European Microwave Week, Madrid, Spain, September 2018.
- G. Chattopadhyay, "1.9 THz Silicon Micromachined Multi-Pixel Receiver Instrument," European Microwave Week, Madrid, Spain, September 2018.
- G. Chattopadhyay, "Space Science and Instruments at NASA," University of Stellenbosch, Stellenbosch, South Africa, August 2018.
- G. Chattopadhyay, "Terahertz Science, Technology, and Their Applications," Indian Space Research Organization (ISRO), Bangalore, India, July 2018.
- G. Chattopadhyay, "Are We Alone? Technologies for Search for Life Beyond Earth," University of Waterloo, Waterloo, Ontario, Canada, February 2018.
- G. Chattopadhyay, "Space Based Instruments and Their Applications," Keynote Address at the Applied Electromagnetic Conference (AEMC), Aurangabad, India, December 2017.
- G. Chattopadhyay, "Are We Alone? NASA's Search for Exoplanets and Life Beyond Earth," American Center, US Consulate in Kolkata, India, December 2017.
- G. Chattopadhyay, "Terahertz Instruments for CubeSats," Invited Lecture at the IEEE International Microwave and RF Conference (IMaRC), Ahmedabad, India, December 2017.
- G. Chattopadhyay, "Terahertz Technology and NASA Applications," Institute Lecture, Indian Institute of Technology (IIT), Kharagpur, India, December 2017.
- G. Chattopadhyay, "Terahertz Antennas for Space-Borne Applications," Invited Keynote at the Loughborough Antennas and Propagation Conference (LAPC), Loughborough, UK, November 2017.
- G. Chattopadhyay, "CubeSats for Communication and Spaceborne Instruments," Plenary Lecture, IEEE IEMCON, Vancouver, Canada, October 2017.
- G. Chattopadhyay, "Terahertz Science, Technology, and Applications," IEEE Distinguished Lecture, University of Illinois, Chicago, USA, October 2017.

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- G. Chattopadhyay, "670 GHz FMCW Radar for Imaging and Science Applications," Invited Keynote Lecture at the International Conference on Electromagnetics in Advanced Applications (ICEAA), Verona, Italy, September 2017.
- G. Chattopadhyay, "Receivers, Antennas, and Systems at Terahertz Frequencies," Invited Lecture at the XXXII<sup>nd</sup> International Union of Radio Science General Assembly and Scientific Symposium, Montreal, Canada, August, 2017.
- G. Chattopadhyay, "Terahertz Science, Technology, and Applications," Plenary Address at the European Conference on Antennas and Propagation (EuCAP), Paris, France, March 2017.
- G. Chattopadhyay, "Terahertz Conformal Antennas and Packaging," Invited Keynote Lecture at the International Workshop on Antenna Technologies, Athens, Greece, March 2017.
- G. Chattopadhyay, "Space Science and Instruments at NASA," American Center, US Consulate in Kolkata, India, Feb. 2017.
- G. Chattopadhyay, "Terahertz Heterodyne Instrument Designs for Space Applications," University of California, Los Angeles, February 2017.
- G. Chattopadhyay, "Space Technology and its Applications," University of Engineering and Management, Kolkata, India, February 2017.

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## List of Publications

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### Book Chapter

- [1] Book Title: CubeSat Antennas for Earth Science and Deep Space Missions, Ed. N. Chahat et al.  
Chapter: Metasurface Antennas: Flat Antennas for Small Satellites  
Authors: David González-Ovejero, Okan Yurduseven, Goutam Chattopadhyay, and Nacer Chahat  
Publisher: John Wiley & Sons, 2020.
- [2] Book Title: Aperture Antennas for Millimeter and Submillimeter-Wave Applications, Ed. A. Boriskin and R. Sauleau  
Chapter: Terahertz Antennas and Feeds  
Authors: **Goutam Chattopadhyay**, Maria Alonso-delPino, Nacer Chahat, David González-Ovejero, Choonsup Lee, and Theodore Reck.  
Publisher: Springer, 2017.
- [3] Book Title: Handbook of Modern Reflector Antennas and Feed Systems for Space and Ground Applications, Vol. 3: Reflector Antenna Applications, Ed. S. Rao, L. Shafai, and S. Sharma  
Chapter: Reflector Antennas for Terahertz Imaging  
Authors: **G. Chattopadhyay**, N. Lombart, A. Neto, and A. Freni  
Publisher: Artech House, 2013.
- [4] Book Title: Smart Sensors and Sensing Technology.  
Chapter: Submillimeter-Wave Coherent and Incoherent Sensors for Space Applications.  
Author: **G. Chattopadhyay**.  
Publisher: Springer, 2008.

### Papers in Refereed Journals

#### Year 2020

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- [1] M. Alonso-delPino, C. Jung-Kubiak, T. Reck, C. Lee, and **G. Chattopadhyay**, "Micromachining for Advanced Terahertz: Interconnects and Packaging Techniques at Terahertz Frequencies," *IEEE Microwave Magazine*, vol. 21, no. 1, pp. 18-34, January 2020.

#### Year 2019

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- [1] N. Chahat, E. Decrossas, D. Gonzalez-Ovejero, O. Yurduseven, M. J. Radway, R. E. Hodges, P. Estabrook, J. D. Baker, D. J. Bell, T. A. Cwik, and **G. Chattopadhyay**, "Advanced CubeSat Antennas for Deep Space and Earth Science Missions: A review," *IEEE Antennas and Propagation Magazine*, vol. 61, no. 5, pp. 37-46, October 2019.
- [2] Y. Kim, Y. Zhang, T. Reck, D. J. Nemchick, **G. Chattopadhyay**, B. Drouin, M-C. F. Chang, and A. Tang, "A 183-GHz InP/CMOS-Hybrid Heterodyne-Spectrometer for Spaceborne Atmospheric Remote Sensing," *IEEE Transactions on Terahertz Science and Technology*, vol. 9, no. 3, pp. 313-334, May 2019.

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- [3] M. Alonso-delPino, C. Jung-Kubiak, T. Reck, N. Llombart, and **G. Chattopadhyay**, "Beam Scanning of Silicon Lens Antennas Using Integrated Piezomotors at Submillimeter Wavelengths," *IEEE Transactions on Terahertz Science and Technology*, vol. 9, no. 1, pp. 47-54, January 2019.
- [4] O. Yurduseven, K. Cooper, and **G. Chattopadhyay**, "Point-Spread-Function (PSF) Characterization of a 340-GHz Imaging Radar Using Acoustic Levitation," *IEEE Transactions on Terahertz Science and Technology*, vol. 9, no. 1, pp. 20-26, January 2019.

## Year 2018

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- [1] J. Siles, K. B. Cooper, C. Lee, R. H. Lin, **G. Chattopadhyay**, and I. Mehdi, "A New Generation of Room-Temperature Frequency-Multiplied Sources With up to 10x Higher Output Power in the 160-GHz–1.6-THz Range," *IEEE Transactions on Terahertz Science and Technology*, vol. 8, no. 6, pp. 596-604, November 2018.
- [2] D. González-Ovejero, N. Chahat, R. Sauleau, **G. Chattopadhyay**, S. Maci, and M. Ettore, "Additive Manufactured Metal-Only Modulated Metasurface Antennas," *IEEE Transactions on Antennas and Propagation*, vol. 66, no. 11, pp. 6106-6114, November 2018.
- [3] W. G. Read, L. K. Tamppari, N. J. Livesey, R. T. Clancy, F. Forget, P. Hartogh, S. C. R. Rafkin, and **G. Chattopadhyay**, "Retrieval of Wind, Temperature, Water Vapor, and Other Trace Constituents in the Martian Atmosphere," *Planetary and Space Science*, vol. 161, pp. 26-40, October 2018.
- [4] A. Tang, Y. Kim, T. J. Reck, **G. Chattopadhyay**, I. Mehdi, B. J. Drouin, K. B. Cooper, N. J. Livesey, and M-C. F. Chang, "DDFS and Sigma Delta Approaches for Fractional Frequency Synthesis in Terahertz Instruments," *IEEE Transactions on Terahertz Science and Technology*, vol. 8, no. 4, pp. 410-417, July 2018.
- [5] J. Kooi, R. A. Reeves, A. W. Lichtenberger, T. J. Reck, A. K. Fung, S. Weinreb, J. W. Lamb, K. A. Cleary, and **G. Chattopadhyay**, "A Programmable Cryogenic Waveguide Calibration Load with Exceptional Temporal Response and Linearity," *IEEE Transactions on Terahertz Science and Technology*, vol. 8, no. 4, pp. 434-445, July 2018.
- [6] F. Defrance, C. Jung-Kubiak, J. Sayers, J. Connors, C. DeYoung, M. I. Hollister, H. Yoshida, **G. Chattopadhyay**, S. R. Golwala, and S. J. E. Radford, "1.6:1 Bandwidth Two-Layer Antireflection Structure for Silicon Matched to the 190-310 GHz Atmospheric Window," *Applied Optics*, vol. 57, no. 18, pp. 5196-5209, June 2018.
- [7] Y. Kim, T. J. Reck, M. Alonso-delPino, T. H. Painter, H-P. Marshal, E. H. Bair, J. Dozier, **G. Chattopadhyay**, K-N. Liou, M-C F. Chang, and A. Tang, "A Ku-Band CMOS FMCW Radar Transceiver for Snowpack Remote Sensing," *IEEE Transactions on Microwave Theory and Techniques*, vol. 66, no. 5, pp. 2480-2494, May 2018.
- [8] A. Tang, Y. Kim, T. Reck, Y. Tang, Y. Xu, **G. Chattopadhyay**, B. Drouin, I. Mehdi, and M-C F. Chang, "A 177-205 GHz 249 mW CMOS-Based Integer-N Frequency Synthesizer Module for Planetary Exploration," *IEEE Transactions on Terahertz Science and Technology*, vol. 8, no. 2, pp. 251-254, March 2018.

## Year 2017

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- [1] M. Alonso-delPino, P. Goldsmith, C. Elmaleh, T. Reck, and **G. Chattopadhyay**, "Efficiency Optimization of Spherical Reflectors by Feed Position Adjustment," *IEEE Antennas and Wireless Propagation Letters*, vol. 16, pp. 2865-2868, Nov. 2017.
- [2] **G. Chattopadhyay**, T. Reck, C. Lee, and C. Jung-Kubiak, "Micromachined Packaging for Terahertz Systems," *Proc. IEEE*, vol. 105, no. 6, pp. 1139-1150, June 2017.
- [3] D. González-Ovejero, G. Minatti, **G. Chattopadhyay**, S. Maci, "Multibeam by Metasurface Antennas," *IEEE Transactions on Antennas and Propagation*, vol. 65, no. 6, pp. 2923-2930, June 2017.
- [4] J. Kooi, T. Reck, R. A. Reeves, J. Kotz, A. K. Fung, L. A. Samoska, W. R. Deal, X. Mei, R. Lai, R. F. Jarnot, N. J. Livesey, and **G. Chattopadhyay**, "Submillimeter InP MMIC Low Noise Amplifier Gain Stability Characterization," *IEEE Transactions on Terahertz Science and Technology*, vol. 7, no. 3, pp. 335-346, May 2017.
- [5] U. Shah, T. Reck, H. Frid, C. Jung-Kubiak, **G. Chattopadhyay**, I. Mehdi, and J. Oberhammer, "A 500-750 GHz RF MEMS Waveguide Switch," *IEEE Transactions on Terahertz Science and Technology*, vol. 7, no. 3, pp. 326-334, May 2017.
- [6] M. Alonso-delPino, T. Reck, C. Jung-Kubiak, C. Lee, and **G. Chattopadhyay**, "Development of Silicon Micromachined Microlens Antennas at 1.9 THz," *IEEE Transactions on Terahertz Science and Technology*, vol. 7, no. 2, pp. 191-198, March 2017.

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## Year 2016

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- [1] A. Tang, T. Reck, and **G. Chattopadhyay**, "CMOS System-on-Chip Techniques in Millimeter-Wave/THz Instruments and Communications for Planetary Explorations," *IEEE Communications Magazine*, vol. 54, no. 10, pp. 176-182, October 2016.
- [2] C. Jung-Kubiak, T. Reck, J. V. Siles, R. Lin, C. Lee, J. Gill, K. Cooper, I. Mehdi, and **G. Chattopadhyay**, "A Multi-Step DRIE Process for Complex Terahertz Waveguide Components," *IEEE Transactions on Terahertz Science and Technology*, vol. 6, no. 5, pp. 690-695, September 2016.
- [3] U. Shah, E. Decrossas, C. Jung-Kubiak, T. Reck, **G. Chattopadhyay**, I. Mehdi, and J. Oberhammer, "Submillimeter-Wave 3.3-bit RF MEMS Phase Shifter Integrated in Micromachined Waveguide," *IEEE Transactions on Terahertz Science and Technology*, vol. 6, no. 5, pp. 706-715, September 2016.
- [4] T. Reck, C. Jung-Kubiak, and **G. Chattopadhyay**, "A 700 GHz MEMS Waveguide Switch," *IEEE Transactions on Terahertz Science and Technology*, vol. 6, no. 4, pp. 641-643, July 2016.
- [5] T. Kiuru, **G. Chattopadhyay**, T. Reck, A. J. Minnich, R. Line, E. Schlecht, J. Siles, C. Lee, and I. Mehdi, "Thermal Characterization of Substrate Options for High-Power THz Multipliers over a Broad Temperature Range," *IEEE Transactions on Terahertz Science and Technology*, vol. 6, no. 2, pp. 328-335, March 2016.
- [6] T. Reck, A. Zemora, E. Schlecht, R. Dengler, W. Deal, and **G. Chattopadhyay**, "A 230 GHz MMIC-Based Sideband Separating Receiver," *IEEE Transactions on Terahertz Science and Technology*, vol. 6, no. 1, pp. 141-147, January 2016.

## Year 2015

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- [1] N. Chahat, T. Reck, C. Jung-Kubiak, T. Nguyen, R. Sauleau, and **G. Chattopadhyay**, "1.9 THz Multi-Flare Angle Horn Optimization for Space Instruments," *IEEE Transactions on Terahertz Science and Technology*, vol. 5, no. 6, pp. 914-921, November 2015.
- [2] P. A. R. Ade, **G. Chattopadhyay**, et al., "Antenna-Coupled TES Bolometers used in BICEP2, Keck Array, and SPIDER," *Astrophysical Journal*, vol. 812, issue 2, October 2015.
- [3] N. Chahat, A. Tang, C. Lee, R. Sauleau, and **G. Chattopadhyay**, "Efficient CMOS Systems with Beam-Lead Interconnects for Space Instruments," *IEEE Transactions on Terahertz Science and Technology*, vol. 5, no. 4, pp. 637-644, July 2015.
- [4] T. Reck, C. Jung-Kubiak, J. V. Siles, C. Lee, R. Lin, **G. Chattopadhyay**, I. Mehdi, and K. Cooper, "A Silicon Micromachined Eight-Pixel Transceiver Array for Submillimeter-Wave Radar," *IEEE Transactions on Terahertz Science and Technology*, vol. 5, no. 2, pp. 197-206, March 2015.
- [5] J. V. Siles, C. Lee, R. Lin, **G. Chattopadhyay**, T. Reck, C. Jung-Kubiak, I. Mehdi, and K. Cooper, "A High-Power 105-120 GHz Broadband On-Chip Power-Combined Frequency Tripler," *IEEE Microwave and Wireless Components Letters*, vol. 25, no. 3, pp. 157-159, March 2015.
- [6] M. Varonen, L. Samoska, A. Fung, S. Padmanabhan, P. Kangaslathi, R. Lai, S. Sarkozy, M. Soria, H. Owen, T. Reck, **G. Chattopadhyay**, P. V. Larkoski, and T. Gaier, "A WR4 Amplifier Module Chain with an 87 K Noise Temperature at 228 GHz," *IEEE Microwave and Wireless Components Letters*, vol. 25, no. 1, pp. 58-60, January 2015.

## Year 2014

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- [1] K. B. Cooper and **G. Chattopadhyay**, "Submillimeter-Wave Radar," *IEEE Microwave Magazine*, pp. 51-67, November-December 2014.
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