Naresh Emani

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SUMMARY[1]

Prof. Naresh Emani's research interest spans Nanophotonics, Photovoltaics, Optoelectrical devices and Nanofabrication. He is interested in exploring novel phenomena in nano and micro-scale optics for next generation computing, renewable energy and environmental sensing

PROFESSIONAL CAREER

Associate Professor of Electrical Engineering — 09.2022 - present
Indian Institute of Technology, Hyderabad

Assistant Professor of Electrical Engineering — 07.2017 - 09.2022
Indian Institute of Technology, Hyderabad

Scientist, Advanced Concepts and Nanotechnology — 12.2014 - 06.2017
Data Storage Institute, A*STAR, Singapore

Engineer, Advanced Reliability Development Program — 08.2007 - 08.2009
Taiwan Semiconductor Manufacturing Co., Hsinchu, Taiwan

EDUCATION

PhD, Electrical Engineering — 08.2009 - 12.2014
Purdue University, West Lafayette, USA

MTech,Electrical Engineering(Microelectronics) — 07.2005 - 07.2007
Indian Institute of Technology, Bombay, India

MSc Physics and BSc(Hons) — 06.2000 - 03.2005
Sri Sathya Sai Institute of Higher Learning, Prashanthi Nilayam, India

PROFESSIONAL RECOGNITION, AWARDS AND HONOURS

2022 Member, CLEO Sub-committee, Science and Innovation 7 - Micro and Nanophotonic Devices
2021 IEEE Senior Member
2020 Review Editor on the Editorial Board of Plasmonics (speciality section of Frontiers in Photonics)
2017 Ramanujan Fellowship, Science and Engineering Research Board, DST, India
2014 SPIE travel grant, SPIE Optics and Photonics, San Diego, CA, August 16-21, 2014
2009 Most Valuable Person award for outstanding performance in Reliability division of TSMC
2005 All India Rank 1 in Physics Stream of Graduate Aptitude Test in Engineering (GATE) 2005
2005 Junior Research Fellowship in UGC-CSIR JRF/NET Test 2005

RESEARCH PROJECTS

PI, Development of silicon photonics platform for sensing at mid-IR wavelengths — 05.2020- 05.2023
MOE/STARS Scheme

PI, Investigation of the carrier surface recombination in III-V semiconductors for on-chip nanophotonic applications, SERB — 03.2019- 03.2022

[1]Last Updated: October 1, 2022

PI, Ramanujan Fellowship, SERB 09.2017- 09.2022

Research Supervision

PhD and Master's Students

Jinal Tapar	PhD	2017 - 2021, Graduated, presently with A*STAR
Saurabh Kishen	PhD	2017 - present
Vinod Sharma	PhD	2019 - present
Sourabh Chouhan	PhD	2020 - present
Madhurima V	MTech	2017 - 2019, presently at Qualcomm
Gaurav Yadav	MTech	2018 - 2020, presently at TSMC
Sandeep G	MTech	2019 - 2022, presently at Intel
Sahaan P	MTech	2020 - 2022, will be joining TSMC
Naresh U	MTech	2020 - 2022, presently at Qualcomm
Sabanaaz	MTech	2020 - 2022, presently at Qualcomm
Shivani Bhat	MTech	2020 - 2022, presently at Media-Tec

Teaching

MOOC Courses:
I have offered the following online courses on the NPTEL/Swayam platform

Introduction to Semiconductor Devices - Jul-Oct 2021, Jul-Oct 2022 terms
Fundamentals of Nano and Quantum Photonics - Jul- Oct 2022 term

Undergraduate courses: Semiconductor Fundamentals, Electronic Devices and Circuits, Physics of MOS Transistors, Engineering Electromagnetics

Postgraduate courses: Introduction to Nanophotonics, Introduction to VLSI Design, VLSI Technology and Microfabrication and Device Simulation Laboratory

Publication Summary

18 refereed journal articles, 20+ Conference proceedings/talks and 1 patent

Serial Journal Articles

18 Saurabh Kishen, Jinal Tapar, and **Naresh Kumar Emani**. Tunable directional emission from electrically driven nano-strip metal-insulator-metal tunnel junctions. *Nanoscale Advances*, 4(17):3609, 2022. URL https://doi.org/10.1039/d2na00149g. *IF: 5.11*,

17 Jinal Tapar, Saurabh Kishen, and **Naresh Kumar Emani**. Generalized kerker effect in pt-symmetric nanoantenna array. *Journal of Optics*, 24(3):034003, 2022. URL https://doi.org/10.1088/2040-8986/ac486f. *IF: 2.75*,

16 Jinal Tapar, Saurabh Kishen, and **Naresh Kumar Emani**. Dynamically tunable asymmetric transmission in PT-symmetric phase gradient metasurface. *ACS Photonics*, 8(11):3315, 2021. URL https://doi.org/10.1021/acsphotonics.1c01178. *IF: 7.53*,

15 Jinal Tapar, Saurabh Kishen, and **Naresh Kumar Emani**. Spectral singularities and asymmetric light scattering in PT-symmetric 2D nanoantenna arrays. *Optics Letters*, 45(18):5185, 2020a. URL https://doi.org/10.1364/OL.398551. *IF: 3.8*

14 Saurabh Kishen, Jinal Tapar, and **Naresh Kumar Emani**. Enhanced light emission from gap plasmons in nano-strip MIM tunnel junctions. *Journal of Optics*, 22(9):095006, 2020. URL https://doi.org/10.1088/2040-8986/ababe7. *IF: 2.75*

13 Jinal Tapar, Saurabh Kishen, Kumar Prashant, Kaushik Nayak, and **Naresh Kumar Emani**. Enhancement of the optical gain in GaAs nanocylinders for nanophotonic applications. *Journal of Applied Physics*, 127(15):153102, 2020b. URL https://doi.org/10.1063/1.5132613. *IF: 2.5*

12 Song Tung Ha, Y H Fu, **Naresh Kumar Emani**, Pan Zhenying, Reuben M Bakker, Ramon Paniagua-Dominguez, and Arseniy I. Kuznetsov. Lasing action in active dielectric nanoantenna arrays. *Nature Nanotechnology*, 13:1042–1047, 2018. URL https://doi.org/10.1038/s41565-018-0245-5. First three authors contributed equally, *IF: 39.2*

11 **Naresh Emani**, Egor Khaidarov, Ramon Paniagua-Dominguez, Yuan Hsing Fu, Vytautas Valuckas, Shunpeng Lu, Xueliang Zhang, Swee-Tiam Tan, Hilmi Volkan Demir, and Arseniy I. Kuznetsov. High-efficiency and low- loss III-nitride dielectric metasurfaces for visible wavelength Nanophotonics. *Applied Physics Letters*, 111(22):221101, 2017. URL http://doi.org/10.1063/1.5007007. *IF: 3.8*

10 Rohith Chandrasekar, **Naresh Kumar Emani**, Alexei Lagutchev, Vladimir M Shalaev, Cristian Ciracì, David R Smith, and Alexander V Kildishev. Second harmonic generation with plasmonic metasurfaces: direct comparison of electric and magnetic resonances. *Optical Materials Express*, 5(11): 2682–2691, 2015a. URL http://dx.doi.org/10.1364/OME.5.002682. *IF: 3.1*

9 **Naresh Kumar Emani**, Di Wang, Ting-Fung Chung, Ludmila J Prokopeva, Alexander V Kildishev, Vladimir M Shalaev, Yong P Chen, and Alexandra Boltasseva. Plasmon resonance in multilayer graphene nanoribbons. *Laser & Photonics Reviews*, 9, 2015a. URL https://doi.org/10.1002/lpor.201500058. *IF: 8.529*

8 **Naresh Kumar Emani**, Alexander V Kildishev, Vladimir M Shalaev, and Alexandra Boltasseva. Graphene: A dynamic platform for electrical control of plasmonic resonance. *Nanophotonics*, 4 (1), 2015b. URL http://dx.doi.org/10.1515/nanoph-2015-0014. *IF: 8.5*

7 Carl Pfeiffer, **Naresh Kumar Emani**, Amr M Shaltout, Alexandra Boltasseva, Vladimir M Shalaev, and Anthony Grbic. Efficient light bending with isotropic metamaterial huygens surfaces. *Nano Letters*, 14(5):2491–2497, 2014. URL http://pubs.acs.org/doi/abs/10.1021/nl5001746. *IF: 11.2*

6 **Naresh Kumar Emani**, Ting-Fung Chung, Alexander V Kildishev, Vladimir M Shalaev, Yong P Chen, and Alexandra Boltasseva. Electrical modulation of fano resonance in plasmonic nanostructures using graphene. *Nano Letters*, 14(1):78–82, 2013. URL http://pubs.acs.org/doi/abs/10.1021/nl403253c. *IF: 11.2*

5 Jongbum Kim, Gururaj V Naik, **Naresh Kumar Emani**, Urcan Guler, and Alexandra Boltasseva. Plasmonic resonances in nanostructured transparent conducting oxide films. *Selected Topics in Quantum Electronics, IEEE Journal of*, 19(3):4601907–4601907, 2013. URL http://dx.doi.org/10.1109/JSTQE.2013.2238611. *IF: 3.5*

4 **Naresh Kumar Emani**, Ting-Fung Chung, Xingjie Ni, Alexander V Kildishev, Yong P Chen, and Alexandra Boltasseva. Electrically tunable damping of plasmonic resonances with graphene. *Nano letters*, 12(10):5202–5206, 2012. URL http://pubs.acs.org/doi/abs/10.1021/nl302322t. *IF: 11.2*

3 Xingjie Ni, **Naresh Kumar Emani**, Alexander V Kildishev, Alexandra Boltasseva, and Vladimir M Shalaev. Broadband light bending with plasmonic nanoantennas. *Science*, 335(6067):427–427, 2012a. URL http://www.sciencemag.org/content/335/6067/427.short. *IF: 41.8*

2 P.R. West, S. Ishii, G.V. Naik, **N. K. Emani**, V.M. Shalaev, and A. Boltasseva. Searching for better plasmonic materials. *Laser & Photonics Reviews*, 4(6):795–808, 2010a. URL http://onlinelibrary.wiley.com/doi/10.1002/lpor.200900055/abstract. *IF: 10.6*

1 Vrajesh D Maheta, **Emani Naresh Kumar**, Shweta Purawat, Christopher Olsen, Khaled Ahmed, and Souvik Mahapatra. Development of an ultrafast on-the-fly I_{DLIN} technique to study NBTI in plasma and thermal oxynitride pMOSFETs. *Electron Devices, IEEE Transactions on*, 55(10):2614–2622, 2008. URL http://dx.doi.org/10.1109/TED.2008.2003224. *IF: 2.9*

Conference Proceedings/Talks

21 Jinal Tapar, Saurabh Kishen, and **Naresh Kumar Emani**. Tunable spectral singularities with asymmetric directional response in pt-symmetric 2D nanoantenna array. Frontiers in Optics, pp. FM2E-3. Optical Society of America, 2020c. URL https://doi.org/10.1364/FIO.2020.FM2E.3

20 Jinal Tapar and **Naresh Kumar Emani**. Exceptional scattering in PT-symmetric GaInP nanoantenna metasurfaces. Photonics and Plasmonics symposia, IEEE ICEE, IIT Delhi (virtual), 26-28 November, 2020. URL http://icee2020.iitd.ac.in/awards.html. Best Poster Award

19 Saurabh Kishen, Jinal Tapar, and **Naresh Kumar Emani**. Study of gap plasmons in 2d finite metal-insulator-metal tunnel junctions. WRAP 2019, Guwahati, India, 2019. URL https://10.1109/WRAP47485.2019.9013735

18 Akshita Ramya K, Jinal Tapar, Saurabh Kishen, and **Naresh Kumar Emani**. Experimental verification of enhanced photoluminescence in p-doped GaAs using fluorescence lifetime measurements. WRAP 2019, Guwahati, India, 2019. URL https://10.1109/WRAP47485.2019.9013731

17 **Naresh Kumar Emani**. Directional lasing in resonant semiconductor nanoantennas arrays. WRAP 2019, Guwahati, India. Invited Talk

16 Jinal Tapar, Saurabh Kishen, and **Naresh Kumar Emani**. Optimizing the gain in semiconductor nanostructures for all-dielectric active metamaterial applications. ICMAT, Marina Bay Sands, Singapore, 23-28 June, 2019. Poster

15 **Naresh Kumar Emani**, Hanfang Hao, Egor Khaidarov, Ramon Paniagua-Dominguez, Yuan Hsing Fu, Reuben M Bakker, Vytautas Valuckas, and Arseniy I Kuznetsov. III-V material platforms for active dielectric metasurfaces. In *Plasmonics: Design, Materials, Fabrication, Characterization, and Applications XV*, page 103460S. International Society for Optics and Photonics, 2017. URL https://doi.org/10.1117/12.2273861

14 Ludmila J Prokopeva, You-Chia Chang, **N. K. Emani**, Ted Norris, and Alexander V Kildishev. In-the-cloud optimization tool for retrieving experimentally fitted conductivity of graphene (presentation recording). In *SPIE Nanoscience+ Engineering*, pages 95461W–95461W. International Society for Optics and Photonics, 2015. URL http://dx.doi.org/10.1117/12.2190139

13 Rohith Chandrasekar, **N. K. Emani**, Alexei Lagutchev, Vladimir M Shalaev, Cristian Ciraci, David R Smith, and Alexander V Kildishev. Studying the interplay of electric and magnetic resonance-enhanced second harmonic generation: Theory and experiments. In *CLEO: QELS_Fundamental Science*, pages FW3D–2. Optical Society of America, 2015b. URL http://dx.doi.org/10.1364/CLEO_QELS.2015.FW3D.2

12 Di Wang, **N. K. Emani**, Ting-Fung Chung, Ludmila Prokopeva, Alexander V Kildishev, Vladimir M Shalaev, Yong P Chen, and Alexandra Boltasseva. Plasmon resonance in single-and double-layer cvd graphene nanoribbons. In *CLEO: QELS_Fundamental Science*, pages FTu1E–3. Optical Society of America, 2015. URL http://dx.doi.org/10.1364/CLEO_QELS.2015.FTu1E.3

11 Rohith Chandrasekar, **Naresh Emani**, Alexei Lagutchev, Vladimir M Shalaev, Alexander Kildishev, Cristian Ciraci, and David R Smith. Second harmonic generation by metamagnetics: Interplay of electric and magnetic resonances. In *Frontiers in Optics*, page FM4B5. Optical Society of America, 2014. URL http://dx.doi.org/10.1364/FIO.2014.FM4B.5

10 **N. K. Emani**, Ting-Fung Chung, Alexander Kildishev, Yong P Chen, Vladimir M. Shalaev, and Alexandra Boltasseva. Graphene as a platform for dynamically controlled plasmonics. In *SPIE Optics and Photonics*, pages 9163–11. International Society for Optics and Photonics, 2014. Invited Talk

9 Ludmila J Prokopeva, **N. K. Emani**, Alexandra Boltasseva, and Alexander Kildishev. Tunable pulse-shaping with gated graphene nanoribbons. In *CLEO: QELS_Fundamental Science*, pages FM4C–2. Optical Society of America, 2014. URL http://dx.doi.org/10.1364/CLEO_QELS.2014.FM4C.2

8 **N. K. Emani**, Ting-Fung Chung, Ludmila Prokopeva, Alexander Kildishev, Yong Chen, and Alexandra Boltasseva. Tuning fano resonances with graphene. In *CLEO: Science and Innovations*, pages CW3O–4. Optical Society of America, 2013. URL http://dx.doi.org/10.1364/CLEO_SI.2013.CW3O.4

7 Ludmila J Prokopeva, **N. K. Emani**, Alexandra Boltasseva, and Alexander Kildishev. Time domain modeling of tunable response of graphene. In *CLEO: QELS_Fundamental Science*, pages QTh1A–8. Optical Society of America, 2013. URL http://dx.doi.org/10.1364/CLEO_QELS.2013.QTh1A.8

6 **N. K. Emani**, Ting-Fung Chung, Xingjie Ni, Alexander Kildishev, Yong P Chen, Vladimir Shalaev, and Alexandra Boltasseva. Electrically tunable plasmonic resonances with graphene. In *Quantum Electronics and Laser Science Conference*, pages JTu1M–2. Optical Society of America, 2012. URL http://dx.doi.org/10.1364/CLEO_AT.2012.JTu1M.2

5 Xingjie Ni, **N. K. Emani**, Alexander Kildishev, Alexandra Boltasseva, and Vladimir Shalaev. Symmetry-breaking plasmonic metasurfaces for broadband light bending. In *Quantum Electronics and Laser Science Conference*, pages QM3F–1. Optical Society of America, 2012b. URL http://dx.doi.org/10.1364/QELS.2012.QM3F.1

4 Paul West, Satoshi Ishii, Gururaj Naik, **Naresh Emani**, and Alexandra Boltasseva. Identifying low-loss plasmonic materials. In *SPIE Newsroom*. SPIE, 2010b. URL http://dx.doi.org/10.1117/2.1201009.003167

3 Souvik Mahapatra, Vrajesh Maheta, Shweta Deora, **Emani Naresh Kumar**, Shweta Purawat, Chris Olsen, Khaled Ahmed, Ahmed Islam, and MA Alam. Material dependence of negative bias temperature instability (NBTI) stress and recovery in sion p-mosfets. *ECS Transactions*, 19(2):243–263, 2009. URL http://ecst.ecsdl.org/content/19/2/243.short

2 AE Islam, **Emani Naresh Kumar**, H Das, S Purawat, V Maheta, H Aono, E Murakami, S Mahapatra, and MA Alam. Theory and practice of on-the-fly and ultra-fast vt measurements for NBTI degradation: Challenges and opportunities. In *IEDM Tech. Dig*, pages 805–808. IEEE, 2007. URL http://dx.doi.org/10.1109/IEDM.2007.4419070

1 **Emani Naresh Kumar**, VD Maheta, S Purawat, AE Islam, C Olsen, K Ahmed, MA Alam, and S Mahapatra. Material dependence of NBTI physical mechanism in silicon oxynitride sion pmosfets: A comprehensive study by ultra fast on the fly (UF OTF) idlin technique. In *IEDM Tech. Dig*. IEEE, 2007. URL http://dx.doi.org/10.1109/IEDM.2007.4419071

PATENTS

1 Jiaw-Ren Shih, Neeraj Kumar Jha, Rakesh Ranjan, and **Naresh Kumar Emani**. Methodology for bias temperature instability test, July 20 2010. US Patent 7,759,962

PROFESSIONAL ACTIVITIES AND OUTREACH

Technical reviewer for Optics Letters, Nano Letters, Applied Physics B, Optics. Express and Journal of Optics

Served as Purdue Research Park Ambassador to represent Birck Nanotechnology Center in engagement efforts with visiting professors, government officials, industry representatives and high school students

Nano Days Volunteer: Demonstrated fundamental and intriguing aspects of Nanotechnology for K-12 students to excite them towards a career in STEM disciplines