

Short Bio-data

Name: **Dr Shiv Narayan**

Designation: **Principal Scientist**

Division: **CEM**

Area of Expertise: **Electromagnetics**

Specialization: **Antennas and Radome**

Publications: **Given in Annexure 1**

Subject area willing to guide the student: **Electromagnetics**
Physics/ Electronics



Annexure-I

Dr Shiv Narayan: List of Publications

Books: 3

1. Shiv Narayan, Arun Kesavan, *Handbook of Metamaterial –Derived Frequency Selective Surfaces*, Springer Singapore, ISBN: 978-981-16-6440-3, 2022. (In Press)
2. Shiv Narayan, K. M. Divya, and V. Krushna Kanth, *FDTD Modeling of EM Field inside Microwave Cavities*. SpringerBriefs in Electrical and Computer Engineering, Springer, ISBN: 978-981-10-34145, 71p., 2016.
3. Shiv Narayan, B. Sangeetha, and R. M. Jha, *Frequency Selective Surface based High Performance Antenna*. SpringerBriefs in Electrical and Computer Engineering, ISBN: 978-981-287-774-1, 45p., 2015.

Software Copyright/ Patent: 1

4. CSIR-NAL *Multilayered Metamaterial and Dielectric FSS* Software Package (Copyright ref. no. SW-7583/2013).

Journal Papers: 14

5. Awanish Kumar, Gopi Shrikanth Reddy, Jyotibhusan Padhi, Rushiraj Jawale, and **Shiv Narayan**, “Wideband, polarization independent electromagnetic wave absorber using cross arrow resonator and lumped SMD resistors for C and X-band applications,” *Int J RF Microw Comput Aided Eng.*, e23163, March 2022.
6. Awanish Kumar, G. Shrikanth Reddy, Jyoti B. Padhi, and **Shiv Narayan**, “Asymmetric meander line slotbased X-band leaky wave antenna”, *Microw Opt Technol Lett.*, vol. 63, no. 11, pp. 2846-2851, Nov. 2021.
7. **Shiv Narayan**, J. Sreeja, V.V. Surya, Sangeetha B., and Raveendranath U. Nair, “Radar Absorbing Structures using Frequency Selective Surfaces: Trends and Perspectives,” *Journal of Electronic Materials* (Springer Publication), vol. 49, pp. 1728–1741, 2020,
8. **Shiv Narayan**, Gitansh Gulati, Sangeetha B., and Raveendranath U. Nair, “Novel Metamaterial-element based FSS for Airborne Radome Applications”, *IEEE Trans. on Antennas and Propag.*, vol. 66, no. 9, pp. 4695-4707, DOI: 10.1109/TAP.2018.2851365, Sept. 2018.
9. **Shiv Narayan**, B. Sangeetha, T.V. Sruthi, , V. Sambhulingappa, and R. U. Nair, “Design of low observable antenna using active hybrid-element FSS structure for stealth applications,” *AEU-International Journal of Electronics and Communications*, vol. 80, pp. 137–143, Oct. 2017.
10. **Shiv Narayan** and R. M. Jha, “Electromagnetic techniques and design strategies for FSS structure applications,” *IEEE Antennas and Propagation Magazine*, vol. 57, no. 5, pp. 135-143, Oct. 2015. (Invited paper)
11. **Shiv Narayan**, B.S. Joshi, R.U. Nair, and R. M. Jha, “Electromagnetic performance analysis of novel multi-band metamaterial FSS for millimeter wave radome applications,” *Computers, Materials & Continua* (CMC), vol. 31, no. 1, pp. 1-16, 2012. (Invited paper)

12. **Shiv Narayan**, K. Prasad, R.U. Nair, and R.M. Jha, "A novel EM analysis of double-layered thick FSS based on MM-GSM technique for radome applications," *Progress In Electromagnetics Research Letters*, vol. 28, pp. 53-62, 2012.
13. Sruthi T.V., Sangeetha B., K. S. Divya, **Shiv Narayan**, "A novel hybrid-element FSS for radome applications," *International Journal of Industrial Electronics and Electrical Engineering*, ISSN: 2347-6982, volume-4, no. 3, pp. 55-53, Mar. 2016.
14. **Shiv Narayan** and Latha S., "Metamaterial based High Performance Antenna: An Overview," *International Journal of Advanced Information Science and Technology (IJAIST)*, vol. 31, no. 31, pp. 142-148, Nov. 2014.
15. **Shiv Narayan**, Latha S., and R. M. Jha, "Polarization Independent Dual-band Metamaterial based Radar Absorbing Structure (RAS) for Millimeter Wave Applications," in *Special Issue on Metamaterials Science and Technology, Computers, Materials & Continua (CMC)*, vol. 39, no. 3, pp. 217-230, 2014.
16. Shiv Narayan, and R. M. Jha, "A Novel Metamaterial FSS-based Structure for Wideband Radome Applications," *Computers, Materials & Continua (CMC)*, vol. 37, no. 2, pp. 97-108, 2013.
17. Shiv Narayan, Latha S., and R. M. Jha, "EM analysis of metamaterial based radar absorbing structure (RAS) for millimeter wave applications," *Computers, Materials & Continua (CMC)*, vol. 34, no. 2, pp. 131-142, 2013.
18. Shiv Narayan, R.U. Nair, and R.M. Jha, "Mode-matching generalized scattering matrix based electromagnetics performance analysis of thick frequency selective surfaces for airborne applications," *Defence Science Journal*, vol. 63, no. 3, pp. 249-253, May 2013.

Papers in Conference Proceedings: 29

19. Awanish Kumar, G. Shrikanth Reddy, and **Shiv Narayan**, "Flexible EM wave absorber with high angular stability and low cross polarization level" 2021 XXXIVth General Assembly and Scientific Symposium of the International Union of Radio Science (URSI GASS), Rome, Italy, 28th Aug.-4th Sept. 2021.
20. Awanish Kumar, Jyotibhusan Padhi, G. Shrikanth Reddy, and **Shiv Narayan**, Dual-band polarization insensitive frequency selective surface absorber," *International Microwave and RF Conference (IMARC-2020)*, IIT Bombay, India, 4p, Dec. 13 -15, 2020.
21. Sreeja J., R. U. Nair, **Shiv Narayan**, "Design and Optimization of Broadband FSS based Radar Absorbing Structure," International Conference on Microwave Integrated Circuits, Photonics and Wireless Networks (IMICPW-2019), NIT Trichy, India, May 21-24, 2019.
22. Sreeja J., Mahima P., **Shiv Narayan**, "EM Design of Miniaturized FSS based Low Observable Antenna for Aerospace Application," International Conference on Microwave Integrated Circuits, Photonics and Wireless Networks (IMICPW-2019), NIT Trichy, India, May 21-24, 2019.
23. Deepal Patil, Suganthi S. and **Shiv Narayan**, "Design of Ultra-wideband Meandered Blade Antenna for Aerospace Applications," *International Conference on Emerging Trends in Science, Engineering, and Technology (ICETSET-2018)*, Pune, India, March 21-23, 2018.
24. Madhura G. Hedge, Sambhulingappa V., Mahima P., Athira R., R. U. Nair, and **Shiv Narayan**, "EM design of active metamaterial based airborne radome for electronic warfare applications," *Proceedings of IEEE International Conference on Antenna Innovations and Modern Technologies (iAIM2017)*, Bangalore, India, 5p., Nov 24-26, 2017.

25. P Pramodh Kumar, K Sreelakshmi, Sangeetha B, Shiv Narayan, "Metasurface based low profile reconfigurable antenna," *IEEE International Conference on Communication and Signal Processing, ICCSP-17*, Athiparashakthi Engineering College, Kanchipuram, Tamilnadu, 5p., 6-8 April, 2017.
26. Limna T. J., Shiv Narayan, and R. U. Nair, "Scattering analysis of conformal frequency selective surface structure," *Proceedings of ISAMPE National Conference on Composites (INCCOM-15)*, Bangalore, 4p., 2-3 March 2017.
27. Ganeshnath R., Shambulingappa K.V., R. U. Nair, and Shiv Narayan, "FDTD-based modeling for RCS estimation of multilayered dielectric cube," *2017 3rd URSI Regional Conference on Radio Science (URSI-RCRS)*, Tirupathi, AP, India, 1-4 March 2017.
28. Sangeetha B., Athira R., K.S. Venu, Padamavathi T., Jyotsna K. M., Vanaja A., R. U. Nair and Shiv Narayan, "FSS based high performance radar absorbing structures," *Proceedings of ISAMPE National Conference on Composites (INCCOM-15)*, Bangalore, 4p., 2-3 March 2017.
29. Gitansh Gulati, Sangeetha B., Shambulingappa K.V., R U. Nair, Shiv Narayan, "Novel Swastika-shaped tightly coupled resonator based metamaterial-FSS for radome applications," *Asia Pacific Microwave Conference (APMC)*, New Delhi, 4p., 5-9 Dec., 2016.
30. Sangeetha B., Gitansh Gulati, R.U. Nair, Shiv Narayan, "Design of airborne radome using Swastika-shaped metamaterial-element based FSS," *13th International IEEE India Conference (INDICON 2016)*, Bangalore, 5p., Dec. 16-18, 2016.
31. Mahima P., Sangeetha B., Shiv Narayan, R.U. Nair, "EM design of hybrid-element FSS structure for radome application," *13th International IEEE India Conference (INDICON 2016)*, Bangalore, 4p., Dec. 16-18, 2016.
32. V. Krushna Kanth, K. M. Divya, A. S. Ammu, R.U. Nair, and Shiv Narayan, "EM analysis of hybrid cylindrical microwave autoclave for aerospace application," in *Proceedings of International Symposium on Antennas and Propagation (APSYM 2016)*, Cochin, 4p., 15-17 Dec., 2016.
33. Sruthi T.V, Sangeetha B., K. Sai Divya, and Shiv Narayan, "A novel Hybrid-element FSS for Radome Applications," *2016 International Conference on Science, Technology, Engineering and Management (ICSTEM)*, Chennai, India, Jan. 17th, 2016.
34. Shiv Narayan, Sangeetha B, and Sai Samhitha S, "EM analysis of active hybrid-element FSS for low observable antenna applications" *Proceedings of International Radar Symposium India (IRSI-2015)*, Bangalore, 5p., Dec. 15-19, 2015.
35. Shiv Narayan, Divya K.M., and V. Krushnakanth, "Analysis of microstrip antenna loaded with high impedance ground plane frequency selective surface" *Proceedings of International Radar Symposium India (IRSI-2015)*, Bangalore, 4p., Dec. 15-19, 2015..
36. Shiv Narayan, Sangeetha B., and Divya K.M., "Analysis of metamaterial based FSS structure for millimeter wave radome applications" *Proceedings of International Radar Symposium India (IRSI-2015)*, Bangalore, 4p., Dec. 15-19, 2015.
37. Shiv Narayan, Sangeetha B., and R.M. Jha, "Directivity enhancement of microstrip antenna loaded with FSS based superstrate," *2014 IEEE International Microwave and RF Conference (IMaRC)*, Bangalore, India, Dec. 15-17, 2014.
38. Shiv Narayan and Latha S, "Metamaterial based high performance antenna: An overview," *3rd National Conference on Networking, Embedded and Wireless Systems*, Bangalore, India, 7-8 Nov., 2014.
39. Shiv Narayan, Latha S., and R.M. Jha, "EM analysis of metamaterial based radar absorbing structure (RAS) with dual-resonant characteristics," *International Conference on Computational & Experimental Engineering and Sciences ICCES'13*, Seattle, WA, USA, May 24th -27th, 2013. ([Invited paper](#))

40. Shiv Narayan, B. S. Joshi, and R.M. Jha, "A novel metamaterial based radar absorbing structure (RAS) for millimeter wave applications," *International Symposium on Microwaves-2012 (ISM-2012)*, Bangalore, India, December 12th – 14th, 2012.
41. Shiv Narayan, Arun K., R. M. Jha, and Jason P. Bommer, "RF leakage radiation from microwave oven for aircraft interior applications," *2012 IEEE International Symposium on Antennas and Propagation and URSI Meeting*, Chicago, IL, USA, July 8-13, 2012.
42. Shiv Narayan, Shamala Joshi B., R. U. Nair, and R. M. Jha, "EM performance analysis of novel double-layer MNG-ENG metamaterial FSS for radome applications," *2012 IEEE International Symposium on Antennas and Propagation and URSI Meeting*, Chicago, IL, USA, July 8-13, 2012.
43. Shiv Narayan, Arun K., and R. M. Jha, "EM analysis of tri-layer metamaterial FSS for radome applications," *International Conference on Computational & Experimental Engineering and Sciences ICCES'12*, Platania, Crete, Greece, April 30-May 4, 2012. (Invited paper)
44. Shiv Narayan, Shamala Joshi B., R. U. Nair, and R. M. Jha, "A dual-band metamaterial FSS for millimeter wave applications," *International Conference on Computational & Experimental Engineering and Sciences ICCES'12*, Platania, Crete, Greece, April 30-May 4, 2012. (Invited paper)
45. Shiv Narayan, K. Prasad, R.U. Nair, and R.M. Jha, "A novel EM analysis of cascaded thick FSS using Mode-matching generalized scattering matrix technique," *IEEE Applied Electromagnetics Conference AEMC 2011*, Kolkata, India, December 18-22, 2011.
46. Shiv Narayan, Gopinath R., R.U. Nair, and R.M. Jha, "EM performance analysis of multilayered metamaterial frequency selective surfaces," *IEEE Applied Electromagnetics Conference AEMC 2011*, Kolkata, India, December 18-22, 2011.
47. Shiv Narayan, R.U. Nair, Jason P. Bommer, and R.M. Jha, "Performance analysis of cable-based leaky feeder antenna for aircraft in-cabin applications," *2011 IEEE AP-S Symposium & and USNC/URSI Meeting*, Spokane, WA, USA, July 3-8, 2011.

Graduate/ Post Graduate Dissertations Guided: 6

48. Deepal Patil, "Design and Optimization of Blade Antenna Enclosed with Radome for Aerospace Applications," Electronics and Communication Engineering Faculty of Engineering, Christ (Deemed to be University), M.Tech. Thesis, 2018.
49. Sreeja J., "Design and Optimization of Wideband Frequency Selective Surface based Radar Absorbing Structures," DOT, Cochin University of Science and Technology (CUSAT), M.Tech. Thesis, 2018.
50. Limna T. J., "*Design and Development of Conformal Frequency Selective Surfaces for Aerospace Applications*," DOT, Cochin University of Science and Technology (CUSAT), M.Tech. Thesis, 2017.
51. Ganeshnathan, "*FDTD based Modeling for RCS Estimation of Aerospace-like Structures*," DOT, Cochin University of Science and Technology (CUSAT), M.Tech. Thesis, 2017.
52. Shruthi T. V., "*Design and Analysis of Low Observable Antenna by FSS Technology*," DOT, Cochin University of Science and Technology (CUSAT), M.Tech. Thesis, 2016.
53. Latha S., "*Gain Enhancement of Microstrip Patch Antenna Loaded with Metamaterial Superstrate for Wireless Communications*", BMS College of Engineering, VTU, Karnataka, M.Tech. Thesis, 2014.