



## **Research and Development Experience**

Worked in the broad area of microwaves and antennas. More specifically, worked on the followings:

- Broadband Microstrip Antennas (MSA) - Proposed and developed several new broadband MSA configurations, such as, gap coupled and directly coupled rectangular MSA, hybrid coupled circular, semi-circular, and triangular MSA, electromagnetic and aperture coupled multilayer MSA.
- Circularly Polarized MSA - Developed new circularly polarized MSA configurations using modified triangular MSA and off-centered stacked circular MSA.
- Multi-frequency MSA - Worked on several multi-frequency MSA, such as, stub loaded rectangular and circular MSA, hybrid coupled semi-circular and circular MSA.
- Compact Microstrip Antennas - Developed compact MSA configurations using shorted variations of rectangular, circular, and triangular MSA.
- Microstrip Antenna Arrays - Developed phased array MSA for land mobile satellite communication and defence applications.
- HF Broadband antennas - Designed HF broadband antennas using conical monopole, planar disc monopole, and log-periodic antenna arrays.
- Educational Trainer Systems- Designed various antennas, impedance matching networks, and microstrip components for Antenna, Transmission Line, and Microstrip Trainer Systems, respectively.
- Microwave Components - worked on several microwave components, such as, power dividers/combiners, couplers, splitters, filters, amplifiers, oscillators, etc.
- Microwave Systems - worked on several microwave systems, such as, cell phone Jammers, signal enhancers, repeaters, Transceiver, RFID, etc.

## **Professional Memberships**

- Senior Member, Institute of Electrical and Electronics Engineers (IEEE), USA
- Fellow, Institute of Electronics and Telecommunication Engineers (IETE), India
- Life Member, Indian Society for Technical Education (ISTE), India

### **Awards and Scholarships**

- Merit scholarship, Aligarh Muslim University, Aligarh, India, 1973 – 1978
- Nominated for Outstanding faculty award for excellence in undergraduate teaching, University of North Dakota, Grand Forks, USA, 1987.
- Received Elwyn F. Chandler award for superior teaching and special commitment to and relationships with undergraduate and graduate students, University of North Dakota, Grand Forks, USA, 1989.
- My students won first, second, and third prizes in paper competition organised by IEEE Red River Valley Section, USA, in 1989 and 1990 and first and second prizes in 1991.
- My students won first and consolation prizes in the All India M.V. Chauhan student paper contest organised by IEEE, India Section 1994.
- Received best paper award in experimental category at National Communication Conference (NCC-2004), I.I.Sc. Bangalore, India.
- Awarded “Professor Extraordinario” of the Univ. of Navarra, San Sebastian, Spain, 2004.

### **Professional Activities**

- Reviewer for various national and international journals and conference papers.
- International Advisory Committee Member of International symposium on Microwave and Optical Technology (ISMOT), since 2003.
- Chairman, IEEE AP/EDS Mumbai Chapter, 2001-2002.
- Counsellor, IEEE Student Branch at the University of North Dakota, USA, 1987 – 1991.
- Secretary and Treasurer, Vice - Chairman, Chairman, IEEE Red River Valley Section, USA, 1988 – 1990, respectively.
- Campus Representative and Executive Member, ASEE North - Midwest Section, USA, 1989 - 1991.

## **Funded Grants**

- Development of microstrip antennas for land mobile satellite systems, Faculty Research Committee, Univ. of North Dakota, Grand Forks, USA, 1986 - 1987.
- Design and development of wideband gap-coupled rectangular microstrip antennas, Faculty Research Committee, Univ. of North Dakota, Grand Forks, USA, 1987 - 1988.
- Frame synchronisation for GOES series satellites, Centre for Atmospheric Sciences, Univ. of North Dakota, Grand Forks, USA, 1988 - 1989.
- Application of voice recognition and speech synthesis systems, Faculty Research Committee, Univ. of North Dakota, Grand Forks, USA, 1989 - 1990.
- HRPT frame synchroniser, Centre for Atmospheric Sciences, Univ. of North Dakota, Grand Forks, USA, 1989 - 1990.
- Computer controlled radiation pattern measurement system, MHRD Institute Project, I.I.T. Bombay, India, 1993 - 1995.
- Study of MIC tapered slot antenna and its arrays, DRDO, India, 1993 - 1997.
- Broadband microstrip antennas, AICTE, India, 1997 – 2000
- Microstrip antenna array for airborne steerable GPS system, Phase I, ARDB, India, 1999 - 2001.
- EMI / EMC investigations of lasers and pulsed power sources, BRNS, India, 1999 - 2003.
- Microstrip antenna array for airborne steerable GPS system, Phase II, ARDB, India, 2002 - 2003.

## **Consultancy Projects**

- Integrated voltage regulator for brushless synchronous generators, Electric Machinery, Minneapolis, USA, Summer 1989 and Summer 1990.
- Data acquisition system for measuring pH and conductivity of soil, Agvise, North Dakota, USA, 1990.
- Compact power supply for interactive display, North star, North Dakota, USA, 1991.
- Measurements of cable parameters, Procon Cables Pvt. Ltd., Bombay, India, 1993.
- Modelling and analysis of Polarimetric SAR antenna, Space Application Centre, Ahmedabad, India, 1994.
- Measurement of cable parameters, Airtech, Bombay, India, 1996.
- Non-ferromagnetic resonance type small isolator, Hitachi Metals, Japan, 1996 – 1997.
- Programmable Logic controller card, Messung Systems, Pune, India, 1997.
- Characterisation of surface mount capacitors, SIMIC Electronics, Bombay, India, 1998.
- HF broadband antennas, Aero-Marine, Bombay, India, 1998 – 1999.
- Microwave heating for pharmaceutical applications, Kleinzaid, Bombay, India, 1998 - 1999
- UHF microstrip antennas, ECIL, Hyderabad, India, 1998 - 1999.
- Microstrip antenna array for replacing paragrid antennas, ECIL, Hyderabad, India, 1998 – 2000.
- Microstrip antennas for WLL and GSM bands, Microqual Techno (P) Ltd., Mumbai, India, 2000.
- Design and development of hybrid coupler and scan converter, ECIL, Hyderabad, India, 2000.
- Software development and CAD data for microstrip antenna arrays at Ka-Band, DEAL, Dehradun, India, 2000-2002.
- Microstrip antenna arrays at X-band, BEL, Bangalore, India, 2001-2002.
- Design of antennas for educational training systems, Signet, Mumbai, India, 2002.
- Design and development of planar microstrip antenna array for the UHF base station, CRL BEL, Bangalore, India, 2002.
- Design of microstrip components for microstrip trainer system, Signet, Mumbai, India, 2003.
- Design of transmission line impedance matching devices for transmission line trainer system, Signet, Mumbai, India, 2003.
- Testing of patch panel antennas, BSNL, Mumbai, India, 2003.
- Development of S and C band printed antennas, DEAL, Dehradun, India, 2003-2005.
- Technical opinion on telecommunication transmission equipment, Etco Telecom Ltd., Mumbai, India, 2005.
- Antenna Design, Innoviti Embedded Solutions Pvt. Ltd., Bangalore, India, 2005.

## **Teaching Experience**

In the last 20 years, I have taught the following under-graduate and post-graduate courses. Also, I have developed following software, laboratories and conducted short-term courses.

### **Under - Graduate Courses**

|                             |                                     |
|-----------------------------|-------------------------------------|
| Analog Electronics          | Communication Electronics           |
| Control Systems I           | Electrical Engineering Fundamentals |
| Electromagnetic Fields      | Electromagnetic Waves               |
| Electronics I and II        | Electronic Circuits                 |
| Linear Electric Circuits II | Network Theory                      |

### **Post - Graduate Courses**

|  |                   |
|--|-------------------|
| Microwave Integrated Circuits                  | Radiating Systems |
| Semiconductor Circuits                         | Radar Systems     |
| Solid State Microwave Devices and applications |                   |

### **Laboratory Development**

|                                |                           |
|--------------------------------|---------------------------|
| Analog and Digital Electronics | Communication Electronics |
| Antennas                       | Microwave Circuits        |
| Electromagnetic Waves          |                           |

### **Course / Software Development**

- Lesson plan for Analog Electronics Course
- Software for Electromagnetic Waves Course
- Software for Radiating Systems Course

### **Short term courses organised / taught**

|                         |                        |
|-------------------------|------------------------|
| Antennas                | Communication Circuits |
| Digital Electronics     | Fibre Optics           |
| Satellite Communication | Microstrip antennas    |

## **BOOKS PUBLISHED**

G. Kumar and K.P. Ray, "Broadband Microstrip Antennas", Artech House, USA, 2003

## **LIST OF PUBLICATIONS**

### **Papers in refereed journals**

- [1] G. Kumar and K.C. Gupta, "Geometrical tolerance effects in branch - line and rat - race hybrids", *JIETE*, vol. 28, pp. 336 - 345, July 1982.
- [2] G. Kumar and L. Shafai, "Radiation characteristics and generation of higher order modes of circular microstrip antennas", *Electronic Letters*, vol. 20, pp. 681 - 683, Aug. 16, 1984.
- [3] G. Kumar and K.C. Gupta, "Broadband microstrip antennas using additional resonators gap - coupled to the radiating edges", *IEEE Trans. Antennas Propagat.*, vol. AP - 32, pp. 1375 - 1379, Dec. 1984.
- [4] G. Kumar and K.C. Gupta, "Non - radiating edges and four edges gap - coupled multiple resonator broadband microstrip antennas", *IEEE Trans. Antennas Propagat.*, vol. AP - 33, pp. 173 - 178, Feb. 1985.
- [5] G. Kumar and K.C. Gupta, "Directly - coupled multiple resonator wideband microstrip antennas", *IEEE Trans Antennas Propagat.*, vol. AP - 33, pp. 588 - 593, June 1985.
- [6] G. Kumar and L. Shafai, "Generation of conical patterns from circular patch antennas and their performances", *Canadian Electrical Engineering Journal*, vol. 10, pp. 108 - 112, July 1985.
- [7] K. Parasnis, L. Shafai and G. Kumar, "Performance of star microstrip as a linearly and circularly polarised  $TM_{21}$  mode radiator", *Electronic Letters*, vol. 22, pp. 463 - 464, April 24, 1986.
- [8] V. Rathi, G. Kumar and K.P. Ray, "Improved coupling for aperture coupled microstrip antennas", *IEEE Trans Antennas Propagat.*, vol. AP - 44, pp. 1196 - 1198, Aug. 1996.
- [9] K.P. Ray and G. Kumar, "Multi-frequency and broadband hybrid-coupled circular microstrip antennas", *Electronic Letters*, vol. 33, no. 6, pp. 437 - 438, March 13, 1997.
- [10] S.K. Satpathy, K.P. Ray, and G. Kumar, "Compact shorted variations of circular microstrip antennas", *Electronic Letters*, vol. 34, no. 2, pp. 137 - 138, Jan. 22, 1998.
- [11] N.P. Agrawal, G. Kumar, and K.P. Ray, "Wideband planar monopole antennas", *IEEE Trans Antennas Propagat.*, vol. AP - 46, pp. 249 - 251, Feb. 1998.
- [12] S.K. Satpathy, K.P. Ray, and G. Kumar, "Compact shorted variations of triangular microstrip antennas", *Electronics Letters*, vol. 34, no. 8, pp. 709-711, April 1998.
- [13] K.P. Ray and G. Kumar, "Hybrid coupled planar microstrip antennas", *IETE Technical Review*, vol. 16, no.1, pp. 81-84, Jan.-Feb. 1999.
- [14] G. Kumar and R.K. Kotapati, "Aperture coupled microstrip antennas", *IETE Technical Review*, vol. 16, no.1, pp. 85-88, Jan.-Feb. 1999.

- [15] S. Babu and G. Kumar, "Parametric study and temperature sensitivity of microstrip antennas using improved linear transmission line model", *IEEE Trans. Antennas Propagat.*, vol. 47, pp. 221-226, Feb. 1999.
- [16] R. Kapur and G. Kumar, "Hybrid-coupled shorted rectangular microstrip antennas", *Electronics Letters*, vol. 35, no. 18, pp. 1501-1502, Sep. 1999.
- [17] K.P. Ray and G. Kumar, "Determination of the resonant frequency of microstrip antennas", *Microwave and Optical Tech. Letters*, vol. 23, no. 2, pp. 114-117, Oct. 1999.
- [18] V. Srinivasan, S. Malhotra and G. Kumar, "Multiport network model for chip resistors loaded rectangular microstrip antennas", *Microwave and Optical Tech. Letters*, vol. 24, no. 1, pp. 11-13, Jan. 2000.
- [19] V. Srinivasan, K.T.V. Reddy and G. Kumar, "Multiport network model analysis of second and third order modes of rectangular microstrip antennas", *Microwave and Optical Tech. Letters*, vol. 26, no. 1, pp. 8-10, July 2000.
- [20] K.P. Ray and G. Kumar, "Tuneable and dual band circular microstrip antenna with stubs", *IEEE Trans Antennas Propagat.*, vol. AP - 48, pp. 1036-1039, July 2000.
- [21] K.P. Ray and G. Kumar, "Compact gap-coupled shorted  $90^{\circ}$  sectoral microstrip antennas for broadband and dual-band operations", *Microwave and Optical Tech. Letters*, vol. 26, no. 3, pp. 143-145, Aug. 2000.
- [22] K.T.V. Reddy and G. Kumar, "Dual feed gap-coupled square microstrip antennas for broadband circular polarization", *Microwave and Optical Tech. Letters*, Sep. 2000.
- [23] S. Pandav and G. Kumar, "Modeling of Yagi-Uda antenna using method of moments", *IETE Technical Review*, vol. 17, no. 5, pp. 283-291, Sep.-Oct. 2000.
- [24] K.P. Ray, P.V. Anob, R. Kapur and G. Kumar, "Broadband planar rectangular monopole antennas", *Microwave and Optical Tech. Letters*, vol. 28, no. 1, pp. 55-59, Jan. 2001.
- [25] S. Babu and G. Kumar, "Reliability studies of microstrip antennas using Monte Carlo Simulation", *IETE Technical Review*, vol. 18, no. 1, pp. 51-56, Jan.-Feb. 2001
- [26] K.P. Ray and G. Kumar, "Multiport network model for fundamental and higher order modes of semi-circular microstrip antennas", *Microwave and Optical Tech. Letters*, vol. 28, no. 4, pp. 237-241, Feb. 2001.
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- [29] S. Pandav and G. Kumar, "Analysis of log periodic dipole array antennas using method of moments", *IETE Journal of Research*, vol. 47, no. 5, pp. 247-251, Sep.-Oct. 2001.
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- [32] G. Kumar, "Antennas for commercial applications", *Electrical & Electronics*, India, pp. 52-56, June 2004.

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- [34] A. Deshmukh and G. Kumar, "Compact Broadband U-Slot Loaded Rectangular Microstrip Antenna", *Microwave and Optical Tech. Letters*, pp. 556-559, Sep. 2005.
- [35] A. Deshmukh and G. Kumar, "Compact Broadband E-shaped Microstrip Antennas", *Electronics Letters*, Vol. 41, No. 18, pp. 989 – 990, 1<sup>st</sup> Sept. 2005.
- [36] A. Deshmukh and G. Kumar, "Broadband Pairs of Slots Loaded Rectangular Microstrip Antennas", *Microwave and Optical Tech. Letters*, pp. 223-226, Nov. 2005.
- [37] A. Deshmukh and G. Kumar, "Compact Broadband gap-coupled Shorted L-shaped Microstrip Antennas", *Microwave and Optical Technology Letters*, Vol. 47, No. 6, pp. 599 – 605, Dec. 2005.
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- [43] A. Deshmukh and G. Kumar, "Compact Broadband Gap-Coupled Shorted Square Microstrip Antennas", *Microwave and Optical Technology letters*, Vol. 48, No. 7, pp. 1261 – 1265, July 2006.

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- [1] G. Kumar and K.C. Gupta, "Trapezoidal shaped microstrip antennas for wider bandwidth and beamwidth", *Int. conf. on communication and circuit systems*, Calcutta, India, p. 7, Dec. 1981.
- [2] G. Kumar and K.C. Gupta, "Gap - coupled microstrip antennas", *Int. Symp. on microwave and communication*, Kharagpur, India, pp. 12 - 15, Dec 1981.
- [3] G. Kumar and K.C. Gupta, "Broadband microstrip antennas using coupled resonators", *IEEE AP - S Int. Symp. Digest*, pp. 67 - 70, May 1983.
- [4] G. Kumar, L. Shafai, A. Ittipiboon and E. Bridges, "Characteristics of higher order modes of circular microstrip antennas", *IEEE AP - S Int. Symp. Digest*, pp. 573 - 576, June 1984.
- [5] G. Kumar, L. Shafai and G.B. Neilson, "Antenna technology for land mobile satellite communication", *Miconex Symp. Digest*, Winnipeg, Canada, May 1985.
- [6] K. Parasnis, G. Kumar and L. Shafai, "A new microstrip antennas for generation of higher order modes", *IEEE AP - S Int. Symp. Digest*, pp. 79 - 82, June 1985.
- [7] G. Kumar and L. Shafai, "Microstrip phased array antennas for mobile satellite communication", *IEEE AP - S Int. Symp. Digest*, pp. 719 - 722, June 1985.
- [8] G. Kumar and L. Shafai, "Multifed technique to generate any higher order mode of circular microstrip antennas", *Proc. of North Dakota Academy of Science*, vol. 40, p. 10, April 1986.
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- [10] B. Rawat and G. Kumar, "Scattering matrix analysis of inverted strip dielectric waveguides", *IEEE Infrared and Millimetre wave Int. Conf. Digest*, pp. 168 - 169, Dec. 1987.
- [11] G. Kumar, T. Hapy and J. Maalouf, "Voice - controlled video - display system", *Proc. of North Dakota Academy of Science*, vol. 42, p. 52, April 1988.
- [12] G. Kumar, "Emphasis of creativity in the under graduate engineering education", *Supplement of Proc. of ASEE North - Midwest section Annual Meeting*, Oct. 1988.
- [13] T. Gerber, K. Guillaume and G. Kumar, "Appliance timer using digital clock module", *Proc. of North Dakota Academy of Science*, vol. 43, p. 91, April 1989.
- [14] P. Zabinsky and G. Kumar, "Data Acquisition for GOES series satellites", *Proc. of North Dakota Academy of Science*, vol. 43, p. 110, April 1989.
- [15] D. Quack, J. Salls, and G. Kumar, "Infrared deer detector and time recorder", *Proc. of North Dakota Academy of Science*, vol. 44, p. 113, April 1990.
- [16] J. Sloan, M. Hennes and G. Kumar, "12 Channel fibre optic data link", *Proc. of North Dakota Academy of Science*, vol. 44, p. 115, April 1990.
- [17] C. Kohl and G. Kumar, "Microprocessor based remote well depth recording system", *Proc. of North Dakota Academy of Science*, vol. 44, p. 100, April 1990.
- [18] D. Rogers and G. Kumar, "Design links engineering education with industry and community", *Proc. of North Dakota Academy of Science*, vol. 44, p. 28, April 1990.
- [19] G. Kumar, "Innovative electronic design techniques leading towards research and economic development", *Proc. of North Dakota Academy of Science*, vol. 44, p. 35, April 1990.

- [20] G. Kumar, D. Mathsen and A. Fletcher, "Planning for engineering education in 2000", *Proc. of Frontiers in education*, Vienna, Austria, July 1990.
- [21] G. Kumar, "Teaching electronics design can be rewarding", *Proc. of ASEE North - Midwest section Annual Meeting*, pp. 6.12 - 6.16 Oct. 1990.
- [22] M.H. Kostepen and G. Kumar, "Speech recognition using back propagation neural networks", *Proc. of IEEE TENCON'91*, New Delhi, vol. II, pp. 144 - 148, Aug. 1991.
- [23] G. Joshi, B.R. Bahiri, and G. Kumar, "Development of resonator controller for the super - conducting linear accelerator", *Symp. on Advanced Instrumentation for Nuclear Research*, BARC, Bombay, pp. G2.1 - G2.9, Jan. 1993.
- [24] M.B. Nile and G. Kumar, "Analysis of circular sectors using Green's function and segmentation method", *IEEE AP - S Symp. Digest*, pp. 170 - 173, June 1994.
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- [26] M.B. Nile, A.A. Rasheed and G. Kumar, "Broadband gap - coupled semi - circular and triangular microstrip antennas", *IEEE AP - S Symp. Digest*, pp. 1202 - 1205, June 1994.
- [27] R. K. Singh and G. Kumar, "Edge - coupled and multilayered circular microstrip antennas", *26<sup>th</sup> midterm symp. on microwaves and millimetre waves - Recent trends*, DEAL, Dehradun, India, April 1995.
- [28] A.E. Daniel and G. Kumar, "Rectangular microstrip antenna with stub along the non radiating edge for dual band operation", *IEEE AP - S Symp. Digest*, pp. 2136 - 2139, June 1995.
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- [31] A.E. Daniel and G. Kumar, "Multiport network model for tuneable rectangular microstrip antennas", *Proc. NSAML*, New Delhi, pp. 572-577, Dec. 1995.
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- [34] A. Goel and G. Kumar, "Reduced height antennas for mobile communication", *Proc. NCC*, Bombay, pp. 32-35, Feb. 1996.
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- [55] K.P. Ray, G. Kumar and S.H.Damle, "Improved method for calculating the resonant frequency of microstrip antennas", *Proc. ISRAMT 99*, Malaga, Spain, pp. 515-518, Dec. 1999.
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