



## Research Interests

Metamaterials, Traveling-wave Antennas, Ultra-wide Band (UWB) Systems, Dispersion Engineering, Fourier Optics, Nonlinear Systems, Electromagnetic Systems and Concepts, Filter Synthesis Techniques for Analog Signal Processing.

## Education

*Doctorate in Electrical Engineering (Ph.D)*

École Polytechnique de Montréal, Canada Jan 2007- present

*Master of Science in Telecommunications (MS)*

INRS-EMT, Université du Québec, Canada Jan 2005 - Dec. 2006.

*Bachelors of Technology in Electronic Engineering (B.Tech)*

Indian School of Mines, India June 2000 - June 2004.

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## Internships

1. *Visiting Researcher* - Ando and Hirokawa Lab, Tokyo Institute of Technology, Japan. 6th December 2009 - 6th May 2010.

*Theme: Wave propagation inside oversized slotted waveguide antennas for uniform aperture illumination.*

2. *Research Student* – PolyGrames, École Polytechnique de Montréal, Canada. 1st September 2006 – 30th December 2006.

*Theme: Solitary waves in nonlinear CRLH transmission line metamaterials*

3. *Research Assistant*, INRS – EMT, Université du Québec, Montréal, Canada, 1st September 2004 – 30th December 2004.

*Theme: Joint Time-frequency analysis and algorithm development*

4. *Student Intern*, Laser Science and Technology Centre (LASTEC), Defense Research and Development Organization (DRDO), New Delhi, India, 5th May- 13th June, 2003 (Six weeks).

*Theme: Hardware interfacing and software code development of 8086 Micro-controller.*

5. *Student Intern*, Advanced Level Telecom Training Centre (ALTTC), Ghaziabad, India, 16th June - 11th July, 2003 (four Weeks)

*Theme: Intelligent network principles and Public switched telephone network (PSTN) designs.*

## Patents

1. "Tunable delay system and corresponding method", C. Caloz, V. H. Nguyen, S, Gupta and S. Abielmona, WO/2008/116289, October 2008.

2. "Spectrogram analyzer based on leaky-wave frequency-space mapping with unrestricted time-frequency resolution," **S. Gupta (inventor)**, S. Abielmona, C. Caloz, no. DIV – EPM 283 (Pending).

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## Awards and Honors

1. "Postdoctoral Fellowships for Foreign Researchers(Short-term)" by JSPS (Japanese Society for the Promotion of Science), 2009 with Prof. Makoto Ando, Tokyo Institute of Technology, Japan.

2. *II<sup>nd</sup> Finalist*, International Microwave Symposium IMS (2008), "Most creative and original microwave measurement system", Atlanta, GA, June 2008.

3. *Young Scientist Award (YSA)*, XXIXth General Assembly of Union Radio Science International (URSI), Chicago, IL, Aug. 2008.
4. *Young Scientist Award (YSA)*, International Symposium on Electromagnetic Theory, Ottawa, Canada, July 2007.
5. "*Honorable Mention*", Student Paper Competition (*Finalist*) with a Travel grant in IEEE Antenna and Propagation Symposium (AP-S), Honolulu, Hawaii, US, June 2007.
6. "*Honorable Mention*" in ACM-ICPC Computer Programming contest, IIT-Kanpur, 6th December 2001.

## Publications

### *Refereed Journals*

1. "Group Delay Engineered Non-Commensurate Transmission Line All-Pass Network for Analog Signal Processing", S. Gupta, A. Parsa, E. Perret, R. V. Snyder, R. J. Wenzel and C. Caloz, IEEE Trans. Microwave Theory Tech., submitted.
2. "Efficient time-domain analysis of highly-dispersive linear and non-linear metamaterial waveguide and antenna structures operated in the impulse-regime," J. S. Gómez-Díaz, S. Gupta, A. Alvarez-Melcon, and C. Caloz, IET Microwaves, Antennas and Propagation, To be published.
3. "Microwave Analog Real-Time Spectrum Analyzer (RTSA) based on the Spatial-Spectral Decomposition Property of Leaky-Wave Structures", S. Gupta, S. Abielmona, C. Caloz, IEEE Trans. Microwave Theory Tech., Vol. 57, no. 12, pp. 2989-2999, Dec. 2009.
4. "Analog Signal Processing in Transmission Line Metamaterial Structures", S. Gupta, C. Caloz, Journal of Radioscience and engineering, vol. 18, no. 2, pp. 155-167, June 2009.
5. "Tunable Talbot Imaging Distance using an Array of Beam-Steered Metamaterial Leaky-Wave Antennas", J. S. Gómez-Díaz, S. Gupta, C. Caloz, A. Melcon, J. App. Phys., J. App. Phys., vol. 106, pp. 084908:1-8, Oct. 2009.
6. "Impulse-regime CRLH Resonator for Tunable Pulse Rate Multiplication", J. S. Gómez-Díaz, S. Gupta, C. Caloz, A. Melcon, Radio Science. vol. 44, pp. 1-9, RS4001, doi:10.1029/2008RS003991, July 2009.
7. "Spatio-Temporal Talbot Effect using CRLH metamaterial Antennas", J. S. Gómez-Díaz, S. Gupta, C. Caloz, A. Melcon, J. App. Phys., vol. 104, pp. 104901:1-7, Nov. 2008.
8. "Experimental demonstration and characterization of a tunable CRLH delay line system for impulse/continuous wave", S. Abielmona, S. Gupta, C. Caloz, IEEE Microwave Wireless Compon. Lett., vol. 17, no. 12, pp. 864-866, Dec. 2007.
9. "Complete family of periodic Talbot filters for pulse repetition rate multiplication", J. Azaña, S. Gupta, Optics Express, vol. 14, pp. 4270-4279 (2006).
10. "Study of Schroedinger solitons in left-handed SiO<sub>2</sub>-Ag-SiO<sub>2</sub> and Ag-SiO<sub>2</sub>-Ag plasmonic waveguides using a nonlinear transmission line approach", A. Shahvarpour, S. Gupta, and C. Caloz, J. App. Phys., vol. 104, pp. 124510:1-5, Dec. 2008.
11. "Real-time analog signal processors based on CRLH dispersive delay line", S. Abielmona, S. Gupta and C. Caloz, Trans. Microwave Theory Tech., vol. 57, no. 11, pp. 2617-2618, Nov. 2009.

12. "Time-domain Green's function analysis and phenomenology of impulse-regime metamaterial transmission lines", J. S. Gómez-Díaz, S. Gupta, A. Alvarez-Melcon, and C. Caloz, *IEEE Trans. Antennas Propagat.*, vol. 57, no. 12, pp. 4010-4014, Dec. 2009.

### *Invited Papers*

13. Numerical Analysis of Impulse Regime Phenomena in Linear and Non-Linear Metamaterial Transmission Lines", J. S. Gomez Diaz, S. Gupta, A. Melcon, C. Caloz, *International Conference on Electromagnetics in Advanced Applications*, Torino, Italy, March 2009, submitted.

14. "Green's function analysis of spatio-temporal Talbot Phenomenon", J. S. Gómez-Díaz, S. Gupta, C. Caloz, and A. Alvarez-Melcon, *Proc. European Conf. Antennas Propagat. (EuCAP)*, Berlin, pp. 870-874.

15. Dispersion Engineered Impulse Regime Metamaterial Devices", S. Abielmona, S. Gupta, H. V. Nguyen, C. Caloz, in *Proc. XXIXth Assembly of Union Radio Science International (URSI)*, Chicago, IL, Aug. 2008.

16. Study of Schrödinger solitons in a left-handed plasmonic waveguide using a nonlinear transmission line approach", A. Shahvarpour, S. Gupta, and C. Caloz, in *Proc. XXIXth Assembly of Union Radio Science International (URSI)*, Chicago, IL, CD-ROM, Aug. 2008.

17. Phase-engineered metamaterial structures and devices", C. Caloz, S. Gupta, in *Proc. Progress in Electromagnetics Research Symposium (PIERS)*, Special session Metamaterials: From Microwave to Optical Frequency, Hangzhou, China, March 2008.

18. Dispersion and Nonlinearity Engineered Metamaterial Devices", C. Caloz, S. Gupta, *Advanced First International Congress on Advanced Electromagnetic Materials in Microwaves Electromagnetic Materials in Microwaves and Optics*, Rome, Italy, 627-630, (2007).

19. Temporal Talbot effect in Left-handed Metamaterials Transmission lines", S. Gupta, C. Caloz, *Proc. in International Symposium on Electromagnetic Theory*, Ottawa, ON, CD-ROM, July (2007).

### *Conference Proceedings*

20. "Analog Inverse Fourier Transformer using Group Delay Engineered C-Section All-Pass Network", 40th European Microwave Conference 2010, Paris, submitted.

21. "Analog Real-Time Fourier Transformer Using a Group Delay Engineered C-Section All-Pass Network", Shulabh Gupta, Christophe Caloz, 2010 IEEE International Symposium on Antennas and Propagation and CNC/USNC/URSI National Radio Science Meeting, Toronto, Submitted.

22. Frequency Resolved Electrical Gating (FREG) System based on a CRLH Leaky-Wave Antenna for UWB Signal Characterization", S. Gupta, J. S. Gomez Diaz, C. Caloz, in *Proc. 39th European Microwave Conf. (EuMC)*, Rome, September 2009.

23. Spatial Demultiplexer based on the Spectral Decomposition Property of the Metamaterial Leaky-Wave Antenna", S. Gupta, C. Caloz, in *Proc. XXIXth Assembly of Union Radio Science International*

(URSI), Chicago, IL, CD-ROM, Aug. 2008.

24. Leaky-wave based spectrum analyzer with unrestricted time-frequency resolution", S. Gupta, C. Caloz and S. Abielmona, Proc. IEEE MTT-S Int. Microwave Symp. Dig., Atlanta, GA, pp. 807-810, June 2008.

25. Super-Compact Power Splitter Based on Coupled Surface Plasmons", A. Rennings, J. Mosig, S. Gupta, C. Caloz, R. Kashyap, D. Erni and P. Waldow, *ISSSE, Montreal (QC), Canada*, 2007, July-Aug. 2007, 471-474, (2007).

26. Carrier frequency tunable impulse/continuous wave CRLH delay line system", S. Gupta, S. Abielmona, C. Caloz, Proc. *IEEE AP-S*, Honolulu, HI, June 2007, 5523-5526 (2007).

27. Dark and bright solitons in left-handed nonlinear transmission line Metamaterials", S. Gupta, C. Caloz, Proc. *IEEE-MTT International Symposium*, Honolulu, HI, June 2007, June 2007, 979-982, (2007).

28. Joint Time-Frequency analysis of ultrashort soliton propagation in nonlinear optical fibers", S. Gupta, J. Azaña, *Photonics North Symposium*, Proc. SPIE Int. Soc. Opt. Eng. 6343, 63430V, Quebec City (2006).

29. Time-Frequency Analysis of Temporal Talbot Effect", S. Gupta, J. Azaña, Proc in *IEEE LEOS Summer Topicals*, San Diego, California, US, 163-164 (2005).

30. A new insight into the problem of temporal Talbot phenomena in optical fibers", S. Gupta, J. Azaña, P. F. Ndione, and R. Morandotti, *Photonics North Symposium 2005*, Proceedings of the SPIE, Volume 5971, pp. 168-179 (2005).

### *National Conferences*

31. "Efecto Talbot Espacio-Temporal basado en CRLH LWAs: Fundamentos y Validación Experimental", J. S. Gómez-Díaz, S. Gupta, J. L. Gómez-Tornero, M. García-Vigueras, C. Caloz and A. Álvarez Melcón, in Proc. XXIV Simposium Nacional de la Unión Científica Internacional de Radio URSI, Santander (Cantabria), Spain, Sept. 2009.

32. "Resonador CRLH de Banda Ancha: Aplicación para la Multiplicación Sintonizable de la Periodicidad de un Tren de Pulsos", J. S. Gómez-Díaz, S. Gupta, J. Pascual-García, D. Cañete-Rebenaque, F. D. Quesada-Pereira, C. Caloz and A. Álvarez-Melcón, in Proc. XXIV Simposium Nacional de la Unión Científica Internacional de Radio URSI, Santander (Cantabria), Spain, Sept. 2009.

33. Estudio de la Radiación de Antenas CRLH Leaky-Wave Excitadas por Pulsos Temporales", J.S. Gomez-Diaz, S. Gupta, M. Martinez-Mendoza, A. Alvarez-Melcon, C. Caloz, Proc. in *XXIII Simposium Nacional de la Unión Científica Internacional de Radio (URSI 2008)*, Madrid, Spain, Sept 2008.

34. Modeling and Simulation of Pulse Compression in Non-linear Yttrium Iron Garnet Waveguides", V. Priye, S. Gupta, Session on Mathematical Modeling of Nonlinear Systems at the *Seminar on Advances in Theoretical and Applied Seismology*, Indian School of Mines, India, 2003.

## *Peer-reviewed Reports*

35. Joint Time-frequency analysis of linear and nonlinear propagation of light in optical fibers", S. Gupta, Masters *thesis*, Advisor: Prof. Jose Azaña, l'Institut national de la recherche scientifique (INRS), ISBN M-1031, (2006).

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## **Computer Skills**

C/C++, Visual C++, X-CODE (Macintosh), Flash Professional CS4 (Actionscript AS3), Dreamweaver (Website designs), Adobe Photoshop CS4, PHP, XML, ADS Momentum, Zeland IE3D, Computer Microwave Studio (CST), Ansoft Designer.

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## **Recreational and Philosophical Interests**

iPhone application development, Homeopathy and medicines, web designing, running, hiking, tennis, dragon-boating, traveling, languages, english tutoring, human behavior, human origin, extra-terrestrial life forms, religion, traditions.

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## **References**

1. Prof. Christophe Caloz, Fellow, École Polytechnique de Montréal, Québec, Canada. (present PhD research supervisor)  
christophe.caloz@polymtl.ca
2. Dr. Richard V. Snyder, IEEE Life fellow, RS Microwaves, 22 park Place, Butler, NJ 07405, USA.  
r.snyder@ieee.org
3. Dr. Robert J. Wenzel, IEEE Life Fellow, Independent consultant, 5431 Lockhurst Drive, Woodland Hills California, USA.  
carolbobw@aol.com
4. Prof. Jose Azaña, INRS Énergie, Matériaux et Télécommunications, Université de Québec, Montréal. (Former MS research supervisor)  
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5. Prof. Alejandro Alvarez Melcon, Technical University of Cartagena, Campus Muralla del Mar s/n, Cartagena, Spain  
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