

Benjamin Vial

PhD Engineer | Microwave Engineering and Photonics

Contact

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Information

date of birth 09/11/1984
French citizenship

Languages

French mother tongue
English fluent
Spanish basic

Programming

operating systems
Linux, Windows
languages and scripts
C, C++, Matlab, Python,
Mathematica, \LaTeX
applications
Comsol Multiphysics,
Gmsh, GetDP, Gsolver,
Gimp, LibreOffice

Interests

professional
microwave engineering
Photonics
Transformation Optics
invisibility cloaking
resonant processes
light-matter interaction
plasmonics
photovoltaics
computational EM
numerical modelling
optimization techniques
finite element method
Fourier modal method
FDTD
modal analysis
wave physics
fabrication
characterization
personal
playing the guitar
listening to music
football
snowboard
hiking
traveling
cooking

Education

- Apr. 2013 **PhD** in Physics Institut Fresnel, CNRS, Centrale Marseille, Aix Marseille Université, Marseille, France
Optics, Photonics and image processing
- Oct. 2009 **Master's degree** in Physics Centrale Marseille / Laboratoire de Mécanique et d'Acoustique, CNRS,
Marseille, France
Mechanics, Physics and Engineering, specialization in Acoustics
- Oct. 2009 **Master's degree** in Engineering Centrale Marseille, Marseille, France
High level scientific and technical training

Research activities

- Jul. 2014 **Postdoc** Queen Mary, University of London, Antennas & Electromagnetics research group, London, UK
Now Project Quest for Ultimate Electromagnetics Using Spatial Transformations (QUEST).
Transformation Optics applied to the design, fabrication and characterization of
novel electromagnetic devices using metamaterials. Development of simulation
tools and optimization techniques.
- Nov. 2013 **Postdoc** Institut Fresnel, Marseille, France
Jan. 2014 Resonant antennas. Numerical study of the coupling of light to subwavelength par-
ticles. Modal analysis of electric and magnetic resonances to shape the emission
pattern and control the local density of states.
- May 2013 **Postdoc** Institut Fresnel, Marseille, France
Oct. 2013 Development of simulation tools for ray tracing in complex media, inverse problem of
finding index distribution to make light follow a prescribed path, deshomogenization
technique with graded index photonic crystals.
- Oct. 2009 **PhD in Physics** Institut Fresnel – Silios Technologies, Marseille, France
Apr. 2013 *Study of open electromagnetic resonators by modal approach. Application to infrared
multispectral filtering.*(CIFRE PhD scholarship: this French grant allowed me to work
simultaneously in academia and industry).
Numerical modelling based on the Finite Element Method to find eigenmodes of bi-
periodic diffractive structures. Spectral representation of the diffracted field, giving a
pertinent reduced order model and highlighting the conditions of resonant excitation
of leaky modes. Application to the design of infrared filters for multispectral imaging
devices. Fabrication and characterization of metamaterial based reflexion bandcut
and transmission bandpass filters.
- Apr. 2009 **MS Research Internship** Laboratoire de Mécanique et d'Acoustique, CNRS, Marseille, France
Sept. 2009 *Model order reduction of reed instruments for sound synthesis: a proper orthogonal
modes approach.*
Numerical study and validation of proper orthogonal decomposition of the pressure
field, optimal in the meaning of energy distribution.

Teaching/supervising experience

- 2012 **Internship supervisor** Institut Fresnel, CNRS, Centrale Marseille, Marseille, France
Optimization of diffractive spectral infrared filters (1 engineer student, 3 months).
- 2011 **Internship supervisor** Institut Fresnel, CNRS, Centrale Marseille, Marseille, France
Optimization of absorption in solar cells (4 engineer students, 1 month).

Awards and honours

- Best PhD thesis in 2013 award from the Doctoral School 352, Physics and Condensed Matter Science
Best PhD thesis in 2013 award from CNano PACA, finalized research category

Publications

Articles in peer-reviewed journal

- B. Vial, Y. Hao. *Topology optimized all-dielectric cloak: design, performances and modal picture of the invisibility effect*. Opt. Express 23.18 (2015) pp. 23551–23560
- M. Commandré, B. Vial, S. Tisserand, L. Roux, H. Dallaporta, F. Bedu, G. Demésy, A. Nicolet, F. Zolla. *Design, fabrication and characterization of resonant metamaterial filters for infrared multispectral imaging*. Thin Solid Films (2015)
- M. Abbarchi, M. Naffouti, B. Vial, A. Benkouider, L. Lermusiaux, L. Favre, A. Ronda, S. b. Bidault, I. Berbezier, N. Bonod. *Wafer scale formation of monocrystalline silicon-based mie resonators via silicon-on-insulator dewetting*. ACS nano 8.11 (2014) pp. 11181–11190
- B. Vial, M. Commandré, G. Demésy, A. Nicolet, F. Zolla, F. Bedu, H. Dallaporta, S. Tisserand, L. Roux. *Transmission enhancement through square coaxial aperture arrays in metallic film: when leaky modes filter infrared light for multispectral imaging*. Optics letters 39.16 (2014) pp. 4723–4726
- B. Vial, F. Zolla, A. Nicolet, M. Commandré. *Quasimodal expansion of electromagnetic fields in open two-dimensional structures*. Phys. Rev. A 89 (Feb. 2014) p. 023829
- B. Vial, G. Demésy, F. Zolla, A. Nicolet, M. Commandré, C. Hecquet, T. Begou, S. Tisserand, S. Gautier, V. Sauget. *Resonant metamaterial absorbers for infrared spectral filtering: quasimodal analysis, design, fabrication, and characterization*. J. Opt. Soc. Am. B 31.6 (June 2014) pp. 1339–1346
- V. Debierre, G. Demésy, T. Durt, A. Nicolet, B. Vial, F. Zolla. *Absorption in quantum electrodynamic cavities in terms of a quantum jump operator*. Phys. Rev. A 90.3 (2014) p. 033806
- B. Vial, F. Zolla, A. Nicolet, M. Commandré, S. Tisserand. *Adaptive perfectly matched layer for Wood's anomalies in diffraction gratings*. Opt. Express 20.27 (Dec. 2012) pp. 28094–28105

Contribution to book chapter

- T. Antonakakis, F. I. Baida, A. Belkhir, K. Cherednichenko, S. Cooper, R. Craster, G. Demésy, J. Desanto, G. Granet, B. Gralak, S. Guenneau, D. Maystre, A. Nicolet, B. Stout, F. Zolla, B. Vial, E. Popov. *Gratings: Theory and Numeric Applications*. AMU (PUP), 2012

Proceedings of international peer-reviewed conferences

- B. Vial, G. Demésy, F. Zolla, A. Nicolet. *3D FEM Quasimodal Analysis of the Haroche QED Cavity*. Nineteenth COMPUMAG Conference on the Computation of Electromagnetic Fields, 2013, Budapest, Hungary
- A. Nicolet, F. Zolla, B. Vial, G. Demésy, M. Commandré. *Perfectly matched layers via transformation electromagnetism for the computation of quasi-modes*. International Conference on Electromagnetics in Advanced Applications (ICEAA), 2012, Cape Town, South Africa
- B. Vial, A. Nicolet, F. Zolla, G. Demésy, M. Commandré, S. Tisserand. *Transformation optics PML and quasi-mode analysis: Application to diffraction gratings*. TaCoNa-Photonics, 2012, Bad Honnef, Germany
- B. Vial, M. Commandré, F. Zolla, A. Nicolet, S. Tisserand. *Resonances determination in microstructured films embedded in multilayered stacks*. Proc. SPIE 8168 : Advances in Optical Thin Films IV, 2011, Marseille, France
- B. Vial, M. Commandré, F. Zolla, A. Nicolet, S. Tisserand. *Analysis of diffraction gratings via their resonances*. TaCoNa-Photonics, 2011, Bad Honnef, Germany

International peer-reviewed conferences

- B. Vial, A. Nicolet, F. Zolla, G. Demésy. *Exact PML and the numerical computation of quasi-modes in electromagnetic open structures*. 2nd Radio and Antenna Days of the Indian Ocean (RADIO), 2014, Mauritius
- B. Vial, M. Commandré, F. Zolla, A. Nicolet, G. Demésy, S. Tisserand. *Analysis of diffraction gratings via their quasi-modes*. XXII Symposium on Electromagnetic Phenomena in Nonlinear Circuits (EPNC), 2012, Pula, Croatia
- B. Vial, F. Zolla, A. Nicolet, M. Commandré, S. Tisserand. *Engineering eigenmodes in open microstructured resonators for far infrared filtering applications*. Workshop on Metallic Nano Objects, 2012, Saint-Étienne, France