

PHILIPPE VELHA



BORN : 11 – 07 –1981 NATIONALITY : French
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EDUCATION

- 2008, February **PhD**, CNRS (LTM & Institut d'Optique) / CEA-GRENOBLE (SiNaPS)
- « Engineering of slow modes in photonic crystal on SOI »:
- 2004 **Engineer's degree** and **Master of science**, Ecole Centrale Lyon
- Integrated electronics

WORKING EXPERIENCE

- Since May 2013 **Scuola Superiore Sant'Anna**, *Silicon Photonics designer*
- 2008-2013(May) **University of Glasgow**, *Research Associate*
- *European project SPLASH: Slow light on Silicon photonic structures (<http://cordis.europa.eu/>)*
 - *EPSRC (UK) project: Quantum cascade laser for TeraHertz emission at room temperature on SiGe material – Electrically Pumped Light Emitters in Germanium on Si*
- 2004 **CEA-GRENOBLE (LETI)**, France, *Fabrication of III-N photonic crystals*
- 2003 **Thermique Industrie Vide**, France, *Design of vacuum chambers for metal annealing*

LANGUAGES

ENGLISH : fluent	FRENCH : native language	ITALIAN: fluent
SPANISH : basic	PORTUGUESE : second native language	

SOFTWARE SKILLS

Software : Excel, Word, PowerPoint, Publisher, Latex, Blender, The Gimp, L-edit, Ipkiss, Cadence, Lumerical suite solutions, Phoenix(Mentor Graphics), MPB, Beamprop, Nextnano, COMSOL

Operational Systems : Windows, UNIX, Linux

Programming : C/C++, Matlab, Scilab, vhdl, Labview, Python

CLEAN ROOM SKILLS (experience over 9 years) and SPECIALIZED SKILLS

Fabrication: Spin resist, photolithography, e-beam lithography, wet etch, dry etch, deposition (oxide, nitride, metals), Rapid Thermal Annealing

Metrology: ellipsometry, AFM, SEM, Dektak

Design : RCWA calculation, plane wave method, kp-method (nextnano), Lumerical Suite, Phoenix (Mentor Graphics), Matlab

Characterization : waveguided spectroscopy, near field spectroscopy, Photoluminescence, Electroluminescence, THz spectroscopy, DC and RF electrical measurements (probe station), IC lasers

TEACHING (over 250 hours of teaching)

B-Tech 1st Year Electronics: 2011-2013. **42** hours of course / year and **63** hours of labs and tutorials / year.

Hyperfrequency labs: Polytech-Grenoble, **24** hours of tutorials.

Mentoring of 7 PhD students.

HOBBIES

Sport : swimming, rugby, badminton, ski, hiking **Cultural** : Astronomy, water painting, cooking, tango

PUBLISHING STATISTICS (April 2016)

Number of contributions: **75**, Number of citations : **618**, h-index : **14**, g- index: **24 (Harzing)**

SCIENTIFIC ACHIEVEMENTS

Philippe Velha is an established physicist whose expertise lies mainly in Silicon Photonics and nanofabrication. Born in 1981 in Voiron (France), he has spent most of his childhood in this town situated in the middle of the Alps. In 2001 he entered the *École centrale de Lyon*, considered one of the most prestigious schools of engineering and continuously ranking one of the top five in France. In 2004 he graduated from the *École* with a degree in engineering and a Master of Science in Integrated Digital Electronics. The following year he started a PhD in Silicon Photonics working for three different laboratories: *Institut d'Optique*, *Laboratoire des Technologies de la Micro-electronique* and *SiNaPS* from the *CEA – Grenoble*. In this multidisciplinary environment he designed, fabricated and measured the first high quality factor integrated microcavities known today as nanobeams. He became a research assistant at the University of Glasgow in 2008 after obtaining a doctorate degree in Physics, with honours, from the *Université Paris-Sud XI*. His research field spans from purely passive Silicon Photonics to more challenging topics such as light modulators, photodetectors and integrated light-sources on Silicon. In 2012 his expertise in nanotechnology allowed him to fabricate, in collaboration with *M. Mirza*, the smallest nanowire (2.9 nm) ever fabricated by top-down approach. Dr Velha research interests also touched other fundamental optoelectronics topics such as terahertz sources in Silicon-Germanium and excitonic emission of strained Germanium. Along the years he has been involved in the following projects:

- PHAT (PHotonic hybrid Architectures based on Two-and three-dimensional silicon photonic crystals) - EU project.
- MIRAMAN (Slow modes applied to Raman Silicon laser) - funded by the French funding agency ANR. (PARTICIPANT)
- SPLASH (Slow Photon Light Activated Switch). – EU project (PARTICIPANT)
- EPSRC project (UK) on TeraHertz Quantum Cascade Laser based on Silicon/Germanium technology. (PARTICIPANT)
- ACTPHAST Access Center for Photonics Innovation Solutions and Technology Support – EU project (PARTICIPANT)
- ESPION Italian funded project (COORDINATOR)
- SENSOR Italian funded project (SCIENTIFIC COORDINATOR)

His work has been published in several high impact international peer-reviewed scientific journals. He is co-author, at the moment (2013), of over sixty publications and a book which are regularly cited as reference. Over the years, he has been involved in the supervision of over 10 PhD students. Teaching of the scientific methodology has been delivered through example and hard work. He has also been teaching a course in Electronics for over 3 years at the *University of Glasgow*. Contributions to the scientific community have always been a priority for Dr Velha, in fact his involvement in reviewing scientific articles for international peer-reviewed journals such as *Applied Optics*, *Optics Express* and *Applied Physics Letters* has been constant over the last years. In June 2013, Dr Velha has joined the newly created Silicon Photonics group at *Scuola Superiore Sant'Anna* (Pisa-Italy) where he is now a Silicon Photonics designer. His multi-cultural background allows him to be fluent in five languages. In his spare time he enjoys nature walks, hiking, skying or simply being in the countryside. He has a passion for rugby and he used to be a player as a university student.

Keywords(expertise): electromagnetic simulations, Germanium integrated devices, integrated optics, passive optical networks, photonic logic gates, Silicon Photonics, spectroscopy, waveguides, WDM optical networks, nanotechnology processing.

CONTRIBUTIONS

Number of contributions: 73, Number of citations : 579, h-index : 14, g- index: 23 (Harzing)

Journal papers

- P. **Velha**, JC Rodier, P. Lalanne, JP Hugonin, D. Peyrade, E. Picard, T. Charvolin, E. Hadji, *Ultra-compact silicon-on-insulator ridge-waveguide mirrors with high reflectance*, Applied Physics Letters, Vol. 89, Issue 17, 2006,
- P. **Velha**, J.C. Rodier, P. Lalanne, J. P. Hugonin, D. Peyrade, E. Picard, T. Charvolin, E. Hadji, *Ultra-high-reflectivity photonic-bandgap mirrors in a ridge SOI waveguide*, New Journal of Physics, Vol. 8, p. 204, 2006,
- P. **Velha**, E. Picard, T. Charvolin, E. Hadji, J.C. Rodier, P. Lalanne, D. Peyrade, *Ultra-high Q/V Fabry-Perot microcavity on SOI substrate*, Optics Express, Vol 15., Issue 24, 2007
- L. Lalouat, B. Cluzel, P. Velha, E. Picard, D. Peyrade, J. P. Hugonin, P. Lalanne, E. Hadji, F. de Fornel, *Near-field interactions between a subwavelength tip and a small-volume photonic-crystal nanocavity*, Physical Review B, Vol. 76, 041102, 2007
- P. **Velha**, JP Hugonin, P. Lalanne, *Compact and efficient injection of light into band-edge slow-modes* Optics Express, Vol. 15, Issue 10, 2007
- B. Cluzel, L. Lalouat, P. **Velha**, E. Picard, D. Peyrade, J. C. Rodier, T. Charvolin, P. Lalanne, F. de Fornel, E. Hadji, *A near-field actuated optical nanocavity*, Optics Express, Vol. 16, Issue 1, 2008
- L. Lalouat, B. Cluzel, F. de Fornel, P. **Velha**, P. Lalanne, D. Peyrade, T. Charvolin, E. Hadji, *Subwavelength imaging of light confinement in high-Q/small-V photonic crystal nanocavity*, Applied Physics, Vol. 92, Issue 11, 2008
- B. Cluzel, L. Lalouat, P. **Velha**, E. Picard, D. Peyrade, J. C. Rodier, T. Charvolin, P. Lalanne, E. Hadji, F. de Fornel, *Nano-manipulation of confined electromagnetic fields with a near-field probe*, Comptes Rendus de Physique, Vol. 9, 2008
- P. **Velha**, *Ingénierie de mode en optique intégrée sur silicium sur isolant*, Thesis, 2008
- D.F. Logan, P. **Velha**, M. Sorel, R. De La Rue, A. P. Knights, P. E. Jessop, *Defect-enhanced silicon-on-insulator waveguide resonant photodetector with high sensitivity at 1.55 μm* , IEEE Photonics Technology Letters, Vol. 22, No. 20, 2010
- D.F. Logan, P. **Velha**, M. Sorel, R. De La Rue, G. Wojcik, A. Goebel, A. P. Knights, P. E. Jessop, *Charge state switching of deep-levels for low power optical modulation in silicon waveguides*, Optics Letters, Vol. 36, Issue 19, 2011
- B. Cluzel, L. Lalouat, P. **Velha**, E. Picard, E. Hadji, D. Peyrade, F. de Fornel, *Extraordinary tuning of a nanocavity by a near-field probe*, Photonics and Nanostructures: Fundamentals and Applications, Vol. 9, Issue 3, 2011,
- D.F. Logan, P. **Velha**, M. Sorel, R. De La Rue, G. Wojcik, A. Goebel, P. E. Jessop, A. P. Knights, *Monitoring and Tuning Micro-Ring Properties Using Defect-Enhanced Silicon Photodiodes at 1550 nm*, IEEE Photonics Technology Letters, Vol. 24, No. 4, 2012
- K. Gallacher, P. **Velha**, D. J. Paul, I. MacLaren, M. Myronov, D. R. Leadley, *Ohmic contacts to n-type germanium with low specific contact resistivity*, Applied Physics Letters, Vol. 100, 022113, 2012
- A. Canciamilla, F. Morichetti, Stefano Grillanda, P. **Velha**, Marc Sorel, Vivek Singh, Anu Agarwal, Lionel C. Kimerling, Andrea Melloni, *Photo-induced trimming of chalcogenide-assisted silicon waveguides*, Optics Express, Vol. 14, Issue 20, 2012
- K. Gallacher, P. **Velha**, and D.J. Paul, S. Cecchi, J. Frigerio, D. Chrastina, and G. Isella, *1.55 μm direct bandgap electroluminescence from strained n-Ge quantum wells grown on Si substrates*, Applied Physics Letters, Vol. 101, Issue 21, 2012
- M. Mirza, H. Zhou, X. Li, P. **Velha**, K. Docherty, A. Samarelli, G. Ternent and D.J. Paul, *Nanofabrication of high aspect ratio (50:1) sub-10 nm silicon nanowires using plasma etch technologies*, Journal of Vacuum Science and Technology B, Vol. 30, Issue 6, 2012
- S. Azzini, D. Grassani, M. Galli, D. Gerace, M. Patrini, M. Liscidini, P. **Velha**, D. Bajoni, *Stimulated and spontaneous four-wave mixing in silicon-on-insulator coupled photonic wire nano-cavities*, Applied Physics Letters, Vol. 103, Issue 3, 2013
- P. **Velha**, D.C.S. Dumas, K. Gallacher and D.J. Paul, M. Myronov and D.R. Leadley, *Expanding the absorption wavelength of germanium to 2 μm using process induced strain*, Optics Express, 2013,
- P. **Velha**, S. Faralli, G. Contestabile, "Microring-Based Fully Integrated Silicon DQPSK Receiver", in Photonics Technology Letters, IEEE, vol. 27, no. 15, pp. 1605-1608, Aug. 1, 2015
- G. Contestabile, P. **Velha**, N. Andriolli, *High-Speed InP-Integrated Pre-Amplified Demodulator for WDM-DPSK Signals*, in Photonics Technology Letters, IEEE, vol. 27, no. 24, pp. 2547-2550, Dec. 2015, 3

Conference papers

- P. Noe, B. Cluzel, P. **Velha** , *Generation and manipulation of coherent and incoherent light in silicon structures* , Group IV Photonics, 2005,
- P. **Velha** , JC Rodier, P. Lalanne, D. Peyrade, E. Picard, T. Charvolin, E. Hadji, *Recycling losses and tapered lineic microcavities on SOI*, Proceedings of SPIE, 6195, 2006,
- P. **Velha** , P. Lalanne, D. Peyrade, J. P. Hugonin, J.C. Rodier, E. Hadji, *Fighting Mode-Profile Scattering Losses at Bragg Mirror Interfaces* ,2006, Integrated Photonics Research and Applications, 2006
- P. Lalanne, P. **Velha** , G Lecamp , C. Sauvan, J.P. Hugonin, *Light confinement in photonic-crystal microcavities: a Fabry-Perot point of view* ,2007, Lasers and Electro-Optics ,2007,
- B. Cluzel, L. Lalouat, F. de Fornel, P. **Velha** , J.C. Rodier, P. Lalanne, D. Peyrade, E. Picard, T. Charvolin, E. Hadji, *Micro-Nano Lithography and Fabrication: Near-field control and switching of an optical signal*, SPIE, 0881, 2007
- P. **Velha** , C. Jocteur, E. Picard, T. Charvolin, E. Hadji, JC Rodier, P. Lalanne, D. Peyrade, *Temperature tuning of ultra-high Q/V SOI microcavities* ,2008, Proceedings of SPIE,6989, 2008,
- P. **Velha** , B. Cluzel, L. Lalouat, E. Picard, D. Peyrade, JC Rodier, P. Lalanne, D. Peyrade, E. Picard, T. Charvolin, F. de Fornel, E. Hadji, *Photonics at nanometer scale: tracking light in high Q low V nanocavities*, tntconf,2008,
- D.F. Logan, P. **Velha** , M. Sorel, R. De La Rue, A. P. Knights, P. E. Jessop, *High Sensitivity Defect-Enhanced Silicon Ring-Resonator Photodetectors at Telecom Wavelengths* ,Integrated Photonics Research, Silicon and Nanophotonics (IPRSN), 2010,
- D.F. Logan, P. **Velha** , M. Sorel, R. De La Rue, A. P. Knights, P. E. Jessop, *Deep-level Mediated Silicon Micro-ring Power Monitors*,IPRSN, 2011,
- D.F. Logan, JJ Ackert, PE Jessop, P. **Velha** , M. Sorel, R. De La Rue, *Defect mediated detection of wavelengths around 1550 nm in a ring resonant structure*,Proc. SPIE, 7943, 2011,
- A. Melloni, S. Grillanda, F. Morichetti, P. **Velha**, M. Sorel, L. Kimerling, *Exploiting photosensitivity in chalcogenide-assisted integrated optics*,IPRSN, 2011
- M.M. Mirza, P. **Velha**; Ternent, G.; Zhou, H.P.; Docherty, K.E.; Paul, D.J., *Silicon nanowire devices with widths below 5 nm,*” in Nanotechnology (IEEE-NANO), 2012 12th IEEE Conference on , vol., no., pp.1-4, 20-23 Aug. 2012
- N. P., Johnson, B. Lahiri, G. Sharp, G.A. Rahman, P. **Velha**, A. Khokhar,R.M. De La Rue,S. McMeekin, *Transparent Optical Networks* (ICTON), 14th International Conference on Transparent Optical Networks, july 2012
- R. M. De La Rue, M. Sorel, A. Samarelli, P. **Velha**, M. J. Strain, N. P.Johnson, G. Sharp, Ali Z. Khokar, B. Lahiri, *Planar nanophotonic devices and integration technologies*, Proceedings of SPIE,8414, 2012
- P. **Velha** , K. F. Gallacher, D. Dumas, D. J. Paul, M. Myronov, and D. Leadley, *Direct Band-gap Electroluminescence from Strained n-Ge Light Emitting Diodes*, ECS transaction, sept. 2012
- P. **Velha** , D. J. Paul, M. Myronov, and D. Leadley,*Long Wavelength 1.9 um Germanium for Optoelectronics Using Process Induced Strain*, ECS transaction, sept. 2012
- K. F. Gallacher, P. **Velha** , D. J. Paul, I. Maclaren, M. Myronov, and D. Leadley, *Low Specific Ohmic Contacts to n-type Germanium Using a Low Temperature NiGe Process*, ECS transaction, sept. 2012
- R. W. Kelsall, V. Dinh, P. Ivanov, A. Valavanis, L. Lever, Z. Ikonc, P. **Velha** , D. Dumas, K. F. Gallacher, D. J. Paul, J. Halpin, M. Myrnov, D. Leadley, *Germanium/Silicon Heterostructures for Terahertz Emission*, ECS transaction, sept. 2012
- S. Azzini; D. Grassani, M. Liscidini, M. Galli, D. Gerace, M. Sorel, M. J. Strain; P. **Velha** and D. Bajoni, *Spontaneous parametric fluorescence in SOI integrated microresonators*, PROC. OF SPIE,Vol. 8915, oct. 2013
- V Sorianello, F Testa, P **Velha** , S Doneda, M Romagnoli, *Experimental evaluation of Residual Added Signal Crosstalk in a silicon photonics integrated ROADM*,2014,
- V Sorianello, P **Velha** , F Testa, M Romagnoli, *Integrated silicon photonics ROADM for mobile network applications: System evaluation*, Group IV Photonics, 2014
- V Sorianello, P **Velha** , F Testa, M Romagnoli, *Experimental evaluation of system requirements for integrated silicon photonics ROADM*, Fotonica AEIT 2014
- P. **Velha** , S. Faralli, and G. Contestabile, *A fully integrated DQPSK receiver based on Compact Silicon-on-Insulator Micro-Rings*, OFC, 2015
- M. Ghazali, A. Rahman, P. **Velha** , R.M. De La Rue, N.P. Johnson, *Progress in high-Q optical nanobeam cavities for label-free sensing*(Invited), ICTON 2015
- P. **Velha** , I. Cerutti, O. Liboiron-Ladouceur, N. Andriolli, *A Silicon Photonics Network-on-Chip Architecture based on Mode and Wavelength Switching*, Group IV Photonics, 2015

Patents

- N. Andriolli, I. Cerutti, P. **Velha** , *Mode Multiplexing Optical Interconnection Methods and System*, US patent provisional, US 62/056,650
- P. **Velha** , V. Sorianello, M. Romagnoli, A. Bianchi, M. Romagnoli, *1x2 Photonics Integrated Switch*, patent pending, P44583

List of conferences

- GDR Besanon, 21-23 novembre 2005, Cavités linéiques à recyclage de pertes et à adaptation de profil de mode sur SOI, POSTER
- OSA , Nanophotonics Topical Meeting (NANO) ,April 26-28, 2006, Fighting mode-profile scattering losses at Bragg mirror interfaces, ORAL
- EMRS,Nice (France),29 mai-2 juin, 2006, High Q lineic microcavities on SOI with losses recycling and Bloch mode engineering, POSTER
- EOS, Topical Meeting on Nanophotonics, Metamaterials and Optical Microcavities, 16-19 octobre 2006, Tuning of high Q small V microcavities on SOI waveguide, 1 ORAL
- SPIE, Photonics Europe, Strasbourg,3-7 April 2008, Recycling losses and tapered lineic microcavities on SOI POSTER
- Concertation meeting on Nano-Photonics Florence, 12-13 February 2009, Italy, 1 ORAL
- International Conference on Advanced Optoelectronics & Lasers, 10-14 September, 2010, Ukraine, ORAL
- SPIE Silicon Photonics VI , january 2011, 1 ORAL
- 8th International Conference on Group IV Photonics, 14-16 Sep 2011, London (UK), 2 ORALS
- CLEO 2012: Technical Conference, May 2012, 2 ORALS
- 9th International Conference on Group IV Photonics, 29-31 August 2012, San Diego (USA) 1 ORAL, 1 POSTER
- PRiME 2012(Honolulu, Hawaii), October 7-12, 2012, 4 ORALS (2 in collaboration)
- 10th International Conference on Group IV Photonics, 28-30 Aug. 2013 , Seoul (Korea), 1 ORAL
- OFC, Technical Conference 9-13 March 2014, Moscone Center, San Francisco, California, USA, 1 POSTER
- FOTONICA, Italian Photonics Annual Meeting, 12-14 May 2014, Napoli, 1 ORAL, 1 POSTER
- 11th International Conference on Group IV Photonics, 28-30 August 2014, Paris,1 ORAL
- OFC, 2015, San Diego, 1 POSTER
- FOTONICA, Italian Photonics Annual Meeting, 6-8 May 2015, Torino, 1 ORAL
- ICTON 2015, 1 invited ORAL
- 12th International Conference on Group IV Photonics, 26-28 Aug.2015, Vancouver (Canada), 1POSTER
- Integrated Photonics Conference, Oct. 2015, Hernston (VA) USA, 1 invited ORAL
- Asia Communications and Photonics Conference (ACP) 2015, Nov. 2015, Hong-Kong, 1 invited ORAL