

Curriculum vitae

My name is Marco Vallone, I was born in Torino on 13/11/ 1961 and live in Torino (Italy).

Education:

after secondary school, I graduated in Physics on 4/7/1985 at the Università di Torino with a thesis on magneto-hydrodynamics and fluids stability in general relativity.

Working experience:

Nov. 1985 - Apr. 1987: I worked in Fiat Aviazione (Quality Assurance Laboratory), on the liquid-oxygen pump for the Ariane spacecraft.

Apr 1987 - May 1996: in AET before and CSELT successively (from 1991 till 1996), I worked as software engineer (C, C++, Fortran, various Assemblers - MC68000, Intel8031, Intel8086 -) for the realization of transmission protocols for ISDN videotelephony on switched TLC network, in point-to-point and multipoint configuration. I worked especially on testing and certification of several analogic and digital ISDN telephonic devices, according to specifications.

May 1996 - 2000: still in CSELT, I started working on modeling of **Optoelectronic devices** (electroabsorption modulators, DFB, DBR and FP semiconductor lasers, semiconductor optical amplifiers, APD, etc.)

2000 – Jul 2008: the **Optoelectronics Group** of CSELT was entirely acquired by Agilent Technologies (now named Avago). I exploited my precedent experience to develop several optoelectronic semiconductor devices, designed for Ethernet specifications, working on material and device design, and developing physics-based modeling tools (mainly Matlab based).

Sept 2008 – today:

On September 2008, Avago dismissed its Optoelectronic group. Since that moment, I obtained a temporary position of **Assistant Researcher at Politecnico di Torino, Electronics and Telecommunications Department**, focusing more on the device physics, and obtaining a PhD in Electronic devices in 2016. My working areas and expertises are:

- a) quantum models of electronic transport in optoelectronic devices;
- b) T-CAD 3D modelling of electronic devices (commercial T-CAD softwares and simulators like Sentaurus, RSoft, FullWAVE, etc.)
- c) code development in Matlab, C++, Visual C, Fortran, TCL and other scripting languages (mainly for Synopsys tools).
- d) modeling and design of low-cost “distributed-feedback” semiconductor lasers, especially exploiting photon-photon resonance and innovative, low cost materials and technologies for gratings fabrication;
- e) HgCdTe-based far-infrared focal plane array photodetectors
- f) nitride-based light emitting diodes

Torino, 21 March 2018

Marco Vallone

Publications and Patents

Peer-reviewed papers

- 2018 A. Palmieri, M. Vallone, M. Calciati, A. Tibaldi, F. Bertazzi, G. Ghione, M. Goano, “*Heterostructure modeling considerations for Ge-on-Si waveguide photodetectors*”, *Opt. Quant. Electron.* (2018) 50:71, doi: 10.1007/s11082-018-1338-y
- 2017 M. Vallone, M. Goano, F. Bertazzi, and G. Ghione, W. Schirmacher, S. Hanna, H. Figgemeier “*Simulation of small-pitch HgCdTe photodetectors*”, **J. Electron. Mater.**, 2017, doi: 0.1007/s11664-017-5378-z.
- 2017 M. Vallone, M. Goano, F. Bertazzi, and G. Ghione, “*Carrier capture in InGaN/GaN quantum wells: role of electron-electron scattering*”, **J. Appl. Physics**, vol. 121, p. 123107, 2017, doi: 10.1063/1.4979010
- 2016 M. Vallone, M. Goano, F. Bertazzi, G. Ghione, W. Schirmacher, S. Hanna, H. Figgemeier, “*Comparing FDTD and Ray-Tracing Models in Numerical Simulation of HgCdTe LWIR Photodetectors*”, **J. Electron. Mater.**, v. 45, n. 9 pp. 4524–4531, 2016, doi: 10.1007/s11664-016-4481-x
- 2015 M. Vallone, M. Mandurrino, M. Goano, F. Bertazzi, G. Ghione, W. Schirmacher, S. Hanna, H. Figgemeier, “*Numerical modeling of SRH and tunneling mechanisms in High Operating Temperature MWIR HgCdTe photodetectors*”, **J. Electron. Mater.**, vol. 44, n. 9, p. 3056-3063, 2015, doi: 10.1007/s11664-015-3767-8, 2015
- 2015 M. Mandurrino, M. Goano, M. Vallone, F. Bertazzi, G. Ghione, G. Verzellesi, M. Meneghini, G. Meneghesso, E. Zanoni, “*Semiclassical simulation of trap-assisted tunneling in GaN-based light-emitting diodes*”, **J. Comp. Electron.**, vol. 14, n. 2, p. 444-455, 2015, doi: 10.1007/s10825-015-0675-3
- 2015 M. Vallone, F. Bertazzi, M. Goano, G. Ghione, “*Model for carrier capture time through phonon emission in InGaN/GaN quantum wells*”, **Physica Status Solidi B**, vol. 252, n. 5, p. 971-976, 2015, doi: 10.1002/pssb.201451580
- 2014 M. Calciati, M. Goano, F. Bertazzi, M. Vallone, X. Zhou, G. Ghione, M. Meneghini, G. Meneghesso, E. Zanoni, E. Bellotti, G. Verzellesi, D. Zhu, C. Humphreys, “*Correlating electroluminescence characterization and physics-based models of InGaN/GaN LEDs: Pitfalls and open issues*”, **AIP ADVANCES**, Vol. 4, n. 6, 067118 (2014), DOI: 10.1063/1.4882176
- 2014 M. Vallone, M. Goano, F. Bertazzi, G. Ghione, R. Wollrab, J. Ziegler, “*Modeling photocurrent spectra of single-color and dual-band HgCdTe photodetectors: Is 3D simulation unavoidable?*”, **J. Electron. Mater.**, Springer, p. 3070-3076, vol. 43, n. 8 (2014), DOI: 10.1007/s11664-014-3252-9
- 2013 M. Vallone, “*Quantum well electron scattering rates through longitudinal optic-phonon dynamical screened interaction: An analytic approach*”, **J. Appl. Phys.** v. 114, n. 5, p. 053704-9 (2013), doi: 10.1063/1.4817242.
- 2011 S. Afzal, F. Schnabel, W. Scholz, J.-P. Reithmaier, D. Gready, G. Eisenstein, P. Melanen, V. Vilokkinen, I. Montrosset, M. Vallone, “*1.3 μm two-section DBR lasers based on surface defined gratings for high speed telecommunication*”, **IEEE Phot. Technol. Lett.**, vol.23, n.7, p.411-413 (2011) DOI: 10.1109/LPT.2011.2107507
- 2011 M. Vallone, P. Bardella, I. Montrosset, “*Enhanced Modulation bandwidth in Complex Cavity Injection Grating Lasers*”, **IEEE J. Quant. Electron.**, Vol. 47, n. 10, p. 1269 - 1276 (2011), DOI: 10.1109/JQE.2011.2163621
- 2011 M. Vallone, “*General self-energy-based formulation of levels coupling in quantum confined structures*”, **Europ. J. Phys.**, pp. 8, Vol. 56 (2011), DOI: 10.1051/epjap/2011110250
- 2010 M. Vallone, “*Many-body formulation of carriers capture time in Quantum Dots applicable to device simulation codes*”, **J. Appl. Phys.**, vol. 107, n. 5, p. 053718-053724 (2010), DOI: 10.1063/1.3309838
- 2006 R. Paoletti, M. Agresti, D. Bertone, L. Bianco, C. Bruschi, A. Buccieri, R. Campi, C. Dorigoni, P. Gotta, M. Liotti, G. Magnetti, P. Montangero, G. Morello, C. Rigo, E. Riva, G. Rossi, D. Soderstrom, A. Stano, P. Valenti, M. Vallone, M. Meliga, “*Highly reliable and high-yield 1300-nm InGaAlAs directly modulated ridge Fabry-Perot lasers, operating at 10-Gb/s, up to 110/spl deg/C, with constant current swing*”, **J. Lightw. Technol.**, vol. 24, n. 1, p. 143-149 (2006), DOI: 10.1109/JLT.2005.861128
- 2002 M. Vallone, “*Practical Formulation of the Electron Capture Rate in Quantum Wells by Phonon emission at Low Carrier Density*”, **J. Appl. Phys.**, vol. 91, 9848 (2002), DOI: 10.1063/1.1477615
- 2000 M. Vallone, D. Campi, C. Cacciatore, , “*Multi Quantum Well Gain Modeling using a Green’s Function-based Fractional Dimensional Approach*”, **J. Appl. Phys.**, vol. 87, n. 6, p. 2947-2955 (2000), DOI: 10.1063/1.372283
- 1998 D. Campi, G. Coli, M. Vallone, “*Formulation of the optical response in semiconductors and quantum-confined structures*”, **Phys. Rev. B**, 1998, vol. 57, n. 8, p. 4681-4686 (1998), DOI: 10.1103/PhysRevB.57.4681

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- 2017 M. Vallone, A. Palmieri, M. Calciati, F. Bertazzi, F. Cappelluti, G. Ghione, M. Goano, M. Bahl, E. Heller, R. Scarmozzino, Stefan Hanna, Detlef Eich, Heinrich Figgemeier, “*Non-monochromatic 3D optical simulation of HgCdTe focal plane arrays*”, II-VI US-Workshop, October 5 - 8, 2015, Chicago, IL, U.S.A. (oral presentation)
- 2017 A. Palmieri, M. Calciati, M. Vallone, G. Ghione, A. Tibaldi, F. Bertazzi, M. Goano, “*Energy balance modeling of Ge-on-Si waveguide avalanche photodetectors*”, NUSOD 2017. 17th International Conference on Numerical Simulation of Optoelectronic Devices. 24-28 July 2017. Copenhagen, Denmark, DOI: 10.1109/NUSOD.2017.8010066
- 2017 M. Vallone, A. Palmieri, M. Calciati, F. Bertazzi, F. Cappelluti, G. Ghione, M. Goano, M. Bahl, E. Heller, R. Scarmozzino, Stefan Hanna, Detlef Eich, Heinrich Figgemeier, “*Broadband 3D optical modeling of HgCdTe infrared focal plane arrays*”, NUSOD 2017. 17th International Conference on Numerical Simulation of Optoelectronic Devices. 24-28 July 2017. Copenhagen, Denmark, DOI: 10.1109/NUSOD.2017.8010063
- 2017 M. Vallone, A. Palmieri, M. Calciati, F. Bertazzi, M. Goano, G. Ghione, F. Forghieri, “*3D physics-based modelling of Ge-on-Si waveguide p-i-n photodetectors*”, NUSOD 2017. 17th International Conference on Numerical Simulation of Optoelectronic Devices. 24-28 July 2017. Copenhagen, Denmark, DOI: 10.1109/NUSOD.2017.8010064
- 2016 M. Vallone, M. Goano, F. Bertazzi, G. Ghione, W. Schirmacher, S. Hanna, H. Figgemeier, “*Comparing FDTD and ray tracing models in the*

- numerical simulation of HgCdTe LWIR photodetectors”, II-VI US-Workshop, October 17 - 20, 2016, Baltimore, MD, U.S.A. (oral presentation)
- 2016 M. Vallone et al., “Challenges towards the simulation of GaN-based LEDs beyond the semiclassical framework”, Physics and Simulation of Optoelectronic Devices XXIV, Proc. of SPIE Vol. 9742, 974202, S. Francisco (USA), 2016 DOI: 10.1117/12.2216489 (INVITED PAPER)
- 2015 M. Vallone, M. Goano, F. Bertazzi, G. Ghione, W. Schirmacher, S. Hanna, H. Figgemeier, “Numerical Modeling of SRH and Tunneling Mechanisms in High-Operating-Temperature MWIR HgCdTe Photodetectors”, II-VI US-Workshop, October 5 - 8, 2015, Chicago, IL, U.S.A. (oral presentation)
- 2014 M. Vallone, F. Bertazzi, M. Goano, G. Ghione, “Quantum model for carrier capture time through phonon emission in InGaN/GaN LEDs”, 14th International Conference on Numerical Simulation of Optoelectronic Devices (NUSOD), 1-4 Sept. 2014, Palma de Mallorca (Spain), DOI:10.1109/NUSOD.2014.6935325
- 2014 M. Mandurrino, G. Verzellesi, M. Goano, M. Vallone, F. Bertazzi, G. Ghione, M. Meneghini, G. Meneghesso, E. Zanoni, “Trap-assisted tunneling in InGaN/GaN LEDs: experiments and physicsbased simulation”, 14th International Conference on Numerical Simulation of Optoelectronic Devices (NUSOD), 1-4 Sept. 2014, Palma de Mallorca (Spain), DOI:10.1109/NUSOD.2014.6935325
- 2014 M. Vallone, F. Bertazzi, M. Goano, G. Ghione, “Quantum model for carrier capture time through phonon emission in InGaN/GaN LEDs”, The International Workshop on Nitride semiconductors (IWN), 24-29 Sept. 2014, Wroclaw (Poland)
- 2014 M. Mandurrino, G. Verzellesi, M. Goano, M. Vallone, F. Bertazzi, G. Ghione, M. Meneghini, G. Meneghesso, E. Zanoni, “Trap-assisted tunneling in InGaN/GaN LEDs: experiments and physicsbased simulation”, The International Workshop on Nitride semiconductors (IWN), 24-29 Sept. 2014, Wroclaw (Poland)
- 2014 M. Vallone, M. Mandurrino, M. Goano, F. Bertazzi, G. Ghione, W. Schirmacher, S. Hanna, H. Figgemeier, “Numerical modeling of SRH and tunneling mechanisms in High Operating Temperature MWIR HgCdTe photodetectors”, II-VI US-Workshop, October 21 - 23, 2014, Baltimore, MD, U.S.A.
- 2013 M. Vallone, M. Goano, F. Bertazzi, G. Ghione, R. Wollrab, J. Ziegler, “Modeling photocurrent spectra of one-color and dual-band HgCdTe photodetectors: is 3D simulation unavoidable?”, II-VI US-Workshop, October 1 - 3, 2013, Chicago, IL, U.S.A.
- 2011 M. Dumitrescu, J. Telkkälä, J. Karinen, J. Viheriälä, A. Laakso, S. Afzal, J.-P. Reithmaier, M. Kamp, P. Melanen, P. Uusimaa, P. Bardella, M. Vallone, I. Montrosset, O. Parillaud, D. Gready, G. Eisenstein, G. Sek, “Development of high-speed directly-modulated DFB and DBR lasers with surface gratings”, Proc. of SPIE - Novel In-Plane Semiconductor Lasers, San Francisco (U.S.A.) 24 Jan. 2011, pp. 12, 2011, Vol. 7953, DOI: 10.1117/12.875674
- 2011 S. Afzal, F. Schnabel, W. Scholz, J.-P. Reithmaier, G. Eisenstein, A. Capua, E. Shumakher, O. Parillaud, M. Krakowski, I. Montrosset, M. Vallone, “1.55 μm directly modulated CCIG lasers fabricated by surface-defined lateral feedback gratings”, Proc. of SPIE - Novel In-Plane Semiconductor Lasers X, San Francisco (U.S.A.) 24 January 2011, pp. 6, 2011, Vol. 7953, ISBN: 9780819484901, DOI: 10.1117/12.874043
- 2011 M. Vallone, P. Bardella, I. Montrosset, “Numerical Analysis of short-cavity DFB laser for 40 Gb/s transmission”, 2nd European Optical Society (EOS) Topical Meeting on Lasers., Capri (Italy) 25-28 September 2011, 2011
- 2011 S. Afzal, F. Schnabel, W. Scholz, J. P. Reithmaier, M. Vallone, P. Bardella, I. Montrosset, “Trench width dependant deeply etched surface-defined InP gratings for low-cost high speed DFB/DBR”, 37th International Conference on Micro and Nano Engineering (MNE 2011), Berlin 19 - 23 September 2011, 2011
- 2011 M. Vallone, P. Bardella, I. Montrosset, “Design of high modulation bandwidth DBR lasers exploiting detuned loading and photon-photon resonance effects”, 2nd EOS Topical Meeting on Lasers (ETML'11), Capri (IT) 26-28 September 2011, pp. 2, 2011, Vol. 1, ISBN: 9783000337109
- 2010 M. Vallone, P. Bardella, I. Montrosset, “Enhanced Modulation Bandwidth in CCIG lasers”, HSSL High Speed Semiconductor Laser Workshop, Wroclaw, Poland 7-8 October 2010, pp. 2, 2010
- 2010 M. Vallone, P. Bardella, I. Montrosset, “Photon-photon resonance enhanced modulation bandwidth in CCIG lasers”, 15th European Conference on Integrated Optics, ECIO 2010, Cambridge 7-9 aprile 2010, 2010
- 2010 A. Enard, P. Resneau, M. Calligaro, O. Parillaud, M. Krakowski, M. Vallone, P. Bardella, I. Montrosset, “Mode locking and bandwidth enhancement in single section ridge laser with two spatial modes”, IEEE International Semiconductor Laser Conference 2010, ISLC, Kyoto (Japan) 26-30 Sept. 2010, pp. 2, 2010, ISBN: 9781424456833, DOI: 10.1109/ISLC.2010.5642725
- 2009 M. Vallone, P. Bardella, I. Montrosset, “Investigation of broadband modulation in CCIG lasers”, , 1st European Optical Society (EOS) Topical Meeting on Lasers, Capri, Italy 27-30 September 2009, pp. 2, 2009, ISBN: 9783000241918
- 2006 C. Coriasso, L. Bianco, C. Cacciatore, S. Codato, R. De Franceschi, R. Fang, G. Fornuto, L. Fratta, G. Ghiglieno, M. Liotti, G. Morello, G. Roggero, M. Rosso, D. Soldani, J. Kraus, S. Stano, P. Valenti, M. Vallone, M. Meliga, “Low-cost 10 Gb/s 1310nm uncooled electroabsorption modulated lasers”, European Conference on Optical Communications, ECOC, Cannes (F), 2006
- 2005 R. Paoletti, M. Agresti, D. Bertone, L. Bianco, C. Bruschi, A. Buccieri, R. Campi, C. Dorigoni, P. Gotta, M. Liotti, G. Magnetti, P. Montangero, G. Morello, C. Rigo, E. Riva, G. Rossi, D. Soderstrom, A. Stano, P. Valenti, M. Vallone, M. Meliga, “Highly reliable and high-yield 1300-nm InGaAlAs directly modulated ridge fabry-Perot lasers, operating at 10-gb/s, up to 110/spl deg/C, with constant current swing”, OFC (Optical Fiber Communication Conference and Exposition), Anaheim (USA), 2005
- 2004 E. Foti, L. Fratta, F. Ghiglieno, C. Coriasso, C. Cacciatore, C. Rigo, M. Agresti, M. Vallone, S. Codato, G. Fornuto, R. Fang, M. Rosso, A. Buccieri, P. Valenti, “Optimisation of 10 Gbit/s InGaAsP electroabsorption modulator operating at high temperature”, IEE Proceedings Optoelectronics, Apr. 2004.
- 1998 D. Campi, M. Vallone, “Compact integrated interferometer with semiconductor optical amplifiers”, Proceedings of the 1998 11th Annual Meeting IEEE Lasers and Electro-Optics Society, LEOS. Part 2, 1998 11th Annual Meeting IEEE Lasers and Electro-Optics Society, Orlando (USA) December 1-4, 1998, pp. 2, 1998, Vol. 2

Patents

- 2008 M. Meliga, A. Stano, P. M. Charles, C. Coriasso, R. Paoletti, M. Vallone, “Wide Tuneable Laser Sources”, 2008
- 2007 M. Agresti, C. Rigo, M. Vallone, “Method of providing electrical separation in integrated devices and related device”, 2007
- 2007 M. Agresti, R. Paoletti, M. Vallone, “Wide Tuneable Laser Sources”, 2007

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