

# nanoMIR

**Groupe “nanoMIR” / “nanoMIR” group**  
**“Composants à nanostructures pour Moyen Infra-Rouge”**  
**“Nanostructure-based devices for Mid-Infra-Red Applications”**

## Publication list (2023)

### C-INV : Communications invitées / Invited communications (national or international)

#### **Integration of Mid-IR lasers and Si photonics circuits**

Eric Tournié, M. Paparella, A. Remis, A. Gilbert, M. Rio-Calvo, L. Monge-Bartolome, G. Boissier, M. Grande, L. Cerutti, A. Blake, L. O’Faolain, J.-B. Rodriguez.  
46<sup>th</sup> European Semiconductor Laser Workshop, 30th September 2023, Glasgow (U.K.): keynote presentation.

#### **Epitaxial integration of mid-infrared III-V devices on group-IV substrates**

E. Tournié, J.-B. Rodriguez, L. Cerutti, A. Gilbert, M. Silvestre, M. Fagot, M. Rio Calvo, A. Remis, M. Paparella, G. Boissier, K. Kinjalk, Z. Loghmani, R. Teissier, A.N. Baranov.  
E-MRS Fall Meeting, Symposium A: “Integration of advanced materials on Silicon: from classical to neuromorphic and quantum applications”, 18 – 21 September 2023, Warsaw (Poland).

#### **GaSb-Based ICLs Grown on GaSb, GaAs and Si Substrates,**

M. Fagot, D. Díaz-Thomaz, A. Gilbert, G. KombilaN'Dmengoye, Y. Rouillard, A. Baranov, J. Rodriguez, E. Tournié, Laurent Cerutti.  
16<sup>th</sup> International Conference on Mid-Infrared Optical Materials and Devices, MIO MD-XVI, August 6 – 10, 2023, Norman, OK, USA.

#### **Mid-IR lasers epitaxially integrated on Si photonics circuits**

Eric Tournié, M. Paparella, A. Remis, A. Gilbert, M. Rio-Calvo, L. Monge-Bartolome, G. Boissier, M. Grande, L. Cerutti, A. Blake, L. O’Faolain, J.-B. Rodriguez.  
International Nano-Optoelectronics Workshop (iNOW 2023), 17 – 27 July 2023, Würzburg (Germany).

#### **Monolithic Integration of GaSb diode lasers on a Si photonic circuit**

A. Remis, M. Paparella, L. Monge-Bartolomé, A. Gilbert, G. Boissier, M. Grande, A. Blake, L. O’Faolain, L. Cerutti, J.-B. Rodriguez and E. Tournié,  
CLEO Europe, 23-30 June 2023, Munich (Germany)

#### **Mid-IR lasers epitaxially integrated onto Si**

E. Tournié, A. Remis, M. Paparella, A. Gilbert, L. Monge-Bartolomé, M. Rio-Calvo, D. A. Diaz Thomas, Z. Loghmani, L. Cerutti, A.N. Baranov, R. Teissier, and J.-B. Rodriguez.  
45<sup>th</sup> Freiburg Infrared Colloquium, May 16 – 17, 2023, Freiburg (Germany).

**Butt-coupled mid-IR diode lasers grown on patterned Si photonic wafers,** A. Remis, M. Paparella, L. Monge-Bartolome, A. Gilbert, M. Rio Calvo, G. Boissier, M. Grande, L. Cerutti, L. O’Faolain, J.-B. Rodriguez, and E. Tournié, SPIE Photonics West, Opto Symposium, 28 January 2 February 2023, San Francisco (USA).

**GaSb-based interband cascade lasers grown onto silicon substrates** L. Cerutti, D. Diaz-Thomas; M. Fagot, A. Gilbert, G. Ndemengoye-Kombila, J.B. Rodriguez, A.N. Baranov, and E. Tournié SPIE Photonics West, Opto-

2023, "Physics and Simulation of optoelectronic devices XXXI", 28 January – 2 February 2023, San Francisco (USA), paper 12415-37. <https://doi.org/10.1117/12.2652483>

A. Vicet, D. Ayache, J. Charenzol, T. Seoudi, E. Kniazeva, E. Rosenkrantz F. Gouzi, M. Bahriz Photoacoustic infrared gas sensors based on mechanical resonators for environmental to diagnosis applications, OPTICA sensing congress 30 July-3 August 2023 Munich

A. Vicet, D. Ayache, J. Charenzol, T. Seoudi, E. Kniazeva, E. Rosenkrantz, F. Gouzi, M. Bahriz- Laser sensing based on photoacoustic techniques : resonators studies and applications, PIERS 2023, 3-6 July 2023 Prague

#### **Performance analysis of Ga-free T2SL infrared barrier detector.**

P. Christol\*, M. Bouschet, M. Tornay, R. Arinero, J.P. Perez, R. Ferreira, F. Carosella, A. Ramiandrasoa, V. Arounassalame, I. Ribet, N. Péré-Laperne.

Defense-Commercial-Sensing (DCS 2023) SPIE Conference, Orlando, USA, May 2023

Proceedings of the SPIE "Infrared Technology and Applications XLIX" 12534, 125340K (2023)

**ACL : Articles dans des revues internationales avec comité de lecture référencées par ISI web / Peer reviewed publications referenced by ISIweb**

1. Gilbert, M. Ramonda, L. Cerutti, C. Cornet, G. Patriarche, E. Tournié and J.-B. Rodriguez, "Epitaxial Growth of III-Vs on On-Axis Si: Breaking the Symmetry for Antiphase Domains Control and Burying", *Adv. Optical Mater.* 2023, 11, 2203050. <https://doi.org/10.1002/adom.202203050>.
2. J. Guise, H. Ratovo, M. Thual, P. Fehlen, F. Gonzalez-Posada Flores, J.-B. Rodriguez, L. Cerutti, E. Centeno, S. Blin, T. Taliercio, "Measuring low doping level and short carrier lifetime in indium arsenide with a contactless terahertz technique at room temperature", *J. Appl. Phys.* 134, 165701 (2023). <https://doi.org/10.1063/5.0167272>.
3. Andres Remis, Laura Monge Bartolome, Michele Paparella, Audrey Gilbert, Guilhem Boissier, Marco Grande, Alan Blake, Liam O'Faolain, Laurent Cerutti, Jean-Baptiste Rodriguez, and Eric Tournié, Unlocking the monolithic integration scenario: optical coupling between GaSb diode lasers epitaxially grown on patterned Si substrates and passive SiN waveguides, *Light: Sci. & Appl.* 12, 150 (2023). <https://doi.org/10.1038/s41377-023-01185-4>.
4. Pierre Fehlen, Guillaume Thomas, Fernando Gonzalez-Posada, Julien Guise, Francesco Rusconi, Laurent Cerutti, Thierry Taliercio, Denis Spitzer, Gas sensing of organophosphorous compounds with III-V semiconductor plasmonics, *Sensor & Actuators: B. Chemical* 376, 132987, (2023) <https://doi.org/10.1016/j.snb.2022.132987>.
5. Andres Remis, Laura Monge-Bartolomé, Guilhem Boissier, Mounir Waguaf, Jean-Baptiste Rodriguez, Laurent Cerutti, Eric Tournié, Effect of dislocations on the performance of GaSb-based diode lasers grown on silicon. *J. Appl. Phys.* 133, 093103 (2023). <https://doi.org/10.1063/5.0135606>.
6. Stefano Soresi, Mattia da Lisca, Claire Besancon, Nicolas Vaissiere, Alexandre Larrue, Cosimo Calo, José Alvarez, Christophe Longeaud, Ludovic Largeau, Pablo Garcia Linares, Eric Tournié, Jean-Paul Kleider, and Jean Decobert, Epitaxy and characterization of InP/InGaAs tandem solar cells grown by MOVPE on InP and Si substrates, *EPJ Photovolt.* 14, 1 (2023). <https://doi.org/10.1051/epjpv/2022027>.
7. Ayache, D.; Rousseau, R.; Kniazeva, E.; Charenzol, J.; Seoudi, T.; Bahriz, M.; Gouzi, F.; Spagnolo, V. Vicet, A. Commercial and Custom Quartz Tuning Forks for Quartz Enhanced Photoacoustic Spectroscopy: Stability under Humidity Variation. *Sensors* 2023, 23, 3135. <https://doi.org/10.3390/s23063135>.
8. Seoudi, T.; Charenzol, J.; Trzpil, W.; Pages, F.; Ayache, D.; Rousseau, R.; Vicet, A.; Bahriz, M. Highly Sensitive Capacitive MEMS for Photoacoustic Gas Trace Detection. *Sensors* 2023, 23, 3280. <https://doi.org/10.3390/s23063280>.
9. P. Didier, H. Knötig, O. Spitz, L. Cerutti, A. Lardschneider, E. Awwad, D. Diaz-Thomas, A.N. Baranov, R. Weih, J. Koeth, B. Schwartz, and F. Grillot, "Interband cascade technology for energy-efficient mid-infrared free space-communication" *Photonics Research*, 11 (4), 582 (2023). <https://doi.org/10.1364/PRJ.478776>.
10. Pierre Fehlen, Julien Guise, Guillaume Thomas, Fernando Gonzalez-Posada, Patricia Loren, Laurent Cerutti, Jean-Baptiste Rodriguez, Denis Spitzer, and Thierry Taliercio, "Engineering the Infrared Optical Response of Plasmonic Structures with  $\epsilon$ -Near-Zero III-V Semiconductors". *Adv. Optical Mater.* 2301656 (2023) <https://doi.org/10.1002/adom.202301656>.

11. Fernando Gonzalez-Posada, Dominique Coquillat, Melissa Najem, Laurent Cerutti, Thierry Taliercio, "THz time-domain spectroscopy modulated with semiconductor plasmonic perfect absorbers" *Optic Express* 31, 32153, (2023) <https://doi.org/10.1364/OE.498479>.
12. Freoa, L-M. Chevin, P. Christol, S. Méléard, M. Rera, A. Véber, J-M. Gibert, "Drosophilids with darker cuticle have higher body temperature under infrared light" *Scientific Reports* 13, 3513 (2023). <https://doi.org/10.1038/s41598-023-30652-6>.
13. User Evaluation of Conversational Agents for Aerospace Domain. Ying-Hsang Liu, Alexandre Arnold, Gérard Dupont, Catherine Kobus, François Lancelot, et al. *International Journal of Human-Computer Interaction*, 2023, pp.1-20. <https://doi.org/10.1080/10447318.2023.2239544>.
14. High Spectral Efficiency Long-Wave Infrared Free-Space Optical Transmission With Multilevel Signals. Mengyao Han, Mahdiah Joharifar, Muguang Wang, Richard Schatz, Rafael Puerta, et al. *Journal of Lightwave Technology*, 2023, 41 (20), pp.6514 - 6520. <https://doi.org/10.1109/jlt.2023.3287934>.

**C-ACTI : Communications avec actes dans un congrès international / Communications with proceedings at international conferences.**

1. A numerical and experimental butt-coupling analysis of GaSb diode laser grown on Silicon photonic integrated circuit. M. Paparella, A. Remis, L. Monge-Bartolomé, J.-B. Rodriguez, L. Cerutti, M. Grande, L. O'Faolain, and E. Tournié : oral. CLEO Europe, 23-30 June 2023, Munich (Germany)
2. Butt-coupling of semiconductor lasers and passive waveguides by direct epitaxy on patterned Si photonic wafers. A. Remis, M. Paparella, A. Gilbert, L. Monge-Bartolome, G. Boissier, M. Grande, L. Cerutti, A. Blake, L. O'Faolain, J.-B. Rodriguez, and E. Tournié. Compound Semiconductor Week, CSW2023, 29 May – 2 June 2023, Jeju island, Korea: oral.
3. T. Seoudi, J. Charensol, W. Trzpił, F. Pages, D. Ayache, R. Rousseau, A. Vicet, and M. Bahriz, Highly Sensitive Silicon Based Micro-electromechanical Resonator for Photoacoustic Gas Sensing, DTIP 2023, 28-31 May 2023 Malta
4. T. Seoudi, J. Charensol, W. Trzpił, F. Pages, D. Ayache, R. Rousseau, A. Vicet, and M. Bahriz, Highly sensitive MEMS for photoacoustic gas sensing, OPTICA sensing congress 30 July-3 August 2023 Munich
5. D. Ayache, J. Charensol, T. Seoudi, N. Molinari, F. Gouzi, M. Bahriz, and A. Vicet exhaled breath analysis by quartz enhanced photoacoustic spectroscopy, PIERS 2023, 3-6 July 2023 Prague
6. J.A.M Fordyce, D.A Diaz-Thomas, T. Piwonski, A.N. Baranov, L. O'Faolain, and L. Cerutti "Continuous-wave single-mode slotted interband cascade lasers emitting at 3.5  $\mu\text{m}$ " SPIE Photonics West, Opto-2022, "Novel In-plane Semiconductor Lasers XX", 28 January – 2 February 2023, San Francisco (USA), paper 12440-19. <https://doi.org/10.1117/12.2648200>
7. K. Kinjalk, A. Gilbert, A. Remis, Z. Loghmari, L. Cerutti, M. Bahriz, R. Teissier, A.N. Baranov, J.B. Rodriguez, and E. Tournié "Monolithic integration of InAs-based quantum cascade lasers on Germanium" SPIE Photonics West, Opto-2022, "Silicon Photonics XVIII", 28 January – 2 February 2023, San Francisco (USA), paper 12426-14. <https://doi.org/10.1117/12.2649886>
8. J. Guise, H. Ratovo, M. Thual, J. Hesler, T. Reck, E. Centeno, Jean-Baptiste Rodriguez, Laurent Cerutti, F. Gonzalez-Posada, Thierry Taliercio, Stéphane Blin "0.75–1.1-THz Waveguide-Integrated Amplitude Modulator based on InAs photo-excitation" 2023 48th International Conference on Infrared, Millimeter, and Terahertz Waves (IRMMW-THz), August 17-22 September 2023, Montreal, Canada. IEEE, DOI: 10.1109/IRMMW-THz57677.2023.10299360
9. Clement Gureghian, Grégory Vincent, Jean-Baptiste Rodriguez, Guilherme Sombrio, Fernando Gonzalez-Posada, Isabelle Ribet-Mohamed, Thierry Taliercio, "Dark current reduction with all-semiconductors nanostructured T2SL LWIR photodetector" Proc. SPIE 12430, Quantum Sensing and Nano Electronics and Photonics XIX, 124300R (15 March 2023); <https://doi.org/10.1117/12.2650777>
10. P. Christol, M. Bouschet, J.P. Perez, N. Péré Laperne, « Barrier Structure for Ga-Free Type-II Superlattice Midwave Infrared Photodetector". PHOTOPTICS International Conference, Lisbon, Portugal, February 2023. Proceedings of the 11th International Conference on Photonics, Optics and Laser Technology (PHOTOPTICS 2023), ISBN 978-989-758-632-3, ISSN 2184-4364, pages 21-27 ; <https://doi.org/10.5220/0011624500003408>

**C-ACTN : Communications avec actes dans un congrès national / Communications with proceedings at national conferences.**

Léa Florentin, Ioana Pasca, Thierry Taliercio, "Le portfolio de compétences : outil d'accompagnement des étudiants du BUT"  
Biennale Internationale de l'Éducation, de la Formation et des Pratiques Professionnelles, Université Catholique de Paris, 20-23 Septembre 2023.

Léa Florentin, Ioana Pasca, Thierry Taliercio, "Exemples d'activités pour accompagner le portfolio de compétences dès le BUT1"  
49ème Colloque GEII à Mulhouse 31 mai – 2 juin 2023. Publié dans la 98ème revue de l'association des départements GEII de France, GESI.

**C-COM : Communications orales sans actes dans un congrès international ou national / Oral communications without proceedings at international or national conferences.**

M. Bouschet, A. Gilbert, J.P. Perez, L. Cerutti, C. Cervera, A. Gravrand, A. Ramiandrasoa, I. Ribet, N. Péré-Laperne, P. Christol, J.B. Rodriguez, and E. Tournié "Ga-free superlattice Bn structure on Si (100): high performance MWIR photodetector" SPIE Photonics West, Opto-2022, "Quantum Sensing and Nano Electronics and Photonics XIX", 28 January – 2 February 2023, San Francisco (USA), paper 12430-39. <https://doi.org/10.1117/12.2649675>

P. Fehlen, G. Thomas; F. Gonzalez-Posada, J. Guise, F. Rusconi, L. Cerutti, T. Taliercio, and D. Spitzer "III-V semiconductor plasmonics for gas sensing of organophosphorous compounds" SPIE Photonics West, Opto-2022, "Quantum Sensing and Nano Electronics and Photonics XIX", 28 January – 2 February 2023, San Francisco (USA), paper 12430-64. <https://doi.org/10.1117/12.2649983>

A. Gilbert, J.B. Rodriguez, M. Rio-Calvo, M. Ramonda, L. Cerutti, C. Cornet, G. Patriarcho, A. Trampert and E. Tournié "Influence of the initial phase distribution on antiphase domains control and burying in MBE growth of III-Vs on "on-axis" Si " Oral: 21<sup>th</sup> European Molecular Beam Epitaxy Workshop, Madrid, Spain, 16-19 April 2023

A. Remis, M. Paparella, A. Gilbert, L. Monge-Bartolomé, G. Boissier, M. Grande, L. Cerutti, A. Blake, L. O'Faolain, J.B. Rodriguez, and E. Tournié, "Butt-coupling of semiconductor lasers and passive waveguides by direct epitaxy on patterned Si photonic wafers" Oral, Compound Semiconductor Week 2023 (CSW 2023), Paper WeA"-3, Jeju (Korea), May 29 – June 2, 2023

M. Paparella, A. Remis, L. Monge-Bartolome, J.B. Rodriguez, L. Cerutti, M. Grande, A. Blake, L. O'Faolain, and E. Tournié, "A numerical and experimental butt-coupling analysis of GaSb diode laser grown on Silicon photonic integrated circuit" Oral, Conference on Lasers and Electro-Optics Europe & European Quantum Electronics Conference (CLEO Europe & EQEC 2023), paper CB-4.2 TUE, 26 – 30 June 2023, Munich (Germany).

P. Loren, E. Sakat, J. Hugonin, L. Cerutti, F. Gonzalez-Posada, A. Moreau, and T. Taliercio, "Nonlocal effects in heavily doped semiconductor" Oral, Conference on Mid-infrared Optoelectronics: Materials and Devices (MIOMD), Paper MIOMD-TuA2-19, Norman, USA, 6-10 October 2023.

J. Guise, S. Blin, H. Ratovo, J.-B. Rodriguez, L. Cerruti, E. Centeno, R. Smaali, M. Thual, J. Hesler, T. Reck, and T. Taliercio, "Low Doping Level and Carrier Lifetime Measurements in InAs with a Novel THz Characterization Technique" Mid-IR Optoelectronics: Materials and Devices XVI, August 6-10 2023, Norman Oklahoma, USA.

B. Roux, M. Bouschet, S. Parola, F. Martinez, P. Christol, J. P. Perez, R. Vaillon, "Transforming a type-II InAs/InAsSb superlattice Midwave infrared photodetector into a thermophotovoltaic cell "  
Proc. SPIE Photonics West 2023, "Physics, Simulation, and Photonic Engineering of Photovoltaic Devices XII", San Francisco February 2023,

C. Bataillon, M. Tornay, M. Bouschet, J. P. Perez, O. Gilard, O. Saint-Pé, P. Christol, "Impact of 63 MeV proton irradiation on the dark current of Ga-free T2SL X<sub>Bn</sub> barrier infrared detector Infrared type-II superlattice photodetector under protons radiation"

RADOPT 2023 Workshop on Radiation Effects on Optoelectronics and Photonics Technologies, Toulouse, November 2023

C. Bataillon, J. P. Perez, O. Gilard, M. Bouschet, M. Tornay, O. Saint-Pé, P. Christol "Midwave Infrared type-II superlattice photodetector under protons radiation"

ESA & CNES Workshop on IR detection for space applications, Toulouse, June 2023

A. Ramiandrasoa, V. Arounassalame, M. Tornay, M. Bouschet, J.P. Perez, P. Christol, N. Péré-Laperne, I. Ribet."Electro-optical characterization of midwave infrared Ga-free InAs/InAsSb Type-2 Superlattice (T2SL) barrier photodetector

Infrared Colloquium, Freiburg, June 2023

R. Vaillon, B. Roux, C. Lucchesi, N. Hanouf, D. Cakiroglu, M. Bouschet, P. Christol " Low bandgap (near-field) TPV : materials and structures "

14th World Conference on Thermophotovoltaic Generation of Electricity (TPV-14)

virtual conference, 30-31 May 2023

M. Bouschet, A. Gilbert, M. Tornay, J. P. Perez, L. Cerutti, C. Cervera, O. Gravrand, A. Ramiandrasoa, I. Ribet, N. Péré-Laperne, P. Christol, J. B. Rodriguez, E. Tournié, "Ga-free superlattice nBn structure on Si(100): high performance MWIR photodetector"

SPIE Photonics West 2023, " Quantum Sensing and Nano Electronics and Photonics XIX",

San Francisco February 2023

**C-AFF** : Communications par affiche dans un congrès international ou national / Poster at international or national conferences.

Toward quantum spin Hall effect in InAs/GaInSb three-layer quantum wells.

S. Benlemqwanassa, C. Avogadri, S. Krishtopenko, S. Nanot, C. Consejo, S. Ruffenach, C. Roblin, B. Jouault, F. Teppe, E. Tournié and J.-B. Rodriguez.

25th International Conference on the Electronic Properties of Two-Dimensional Systems (EP2DS-25), 9 – 14 July 2023, Grenoble (France): poster.

M. Fagot, D. Diaz-Thomas, M. Ramonda, G. Kombila, J.B. Rodriguez, E. Tournié, and L. Cerutti, "Type-II interband cascade lasers grown on (100) GaAs substrates " Poster: 21<sup>th</sup> European Molecular Beam Epitaxy Workshop, Madrid, Spain, 16-19 April 2023

P. Fehlen, J. Guise, G. Thomas, F. Gonzalez-Posada, J. Rodriguez, L. Cerutti, D. Spitzer, Thierry Taliercio, "Tuning the Plasmonic Response of Heavily-Doped Semiconductors in Epsilon-Near-Zero Regime"

Mid-IR Optoelectronics: Materials and Devices XVI, August 6-10 2023, Norman Oklahoma, USA.