TECHNICAL DIGEST

IS-PALD 2015
International Symposium on
Physics and Applications of Laser Dynamics

Wednesday-Friday, November 04-06, 2015
CentraleSupélec
Campus de Metz, France

Organized by
LMOPS
Laboratoire Matériaux Optiques, Photonique et Systèmes
Joint Research Unit between CentraleSupélec and Université de Lorraine

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Preface

IS-PALD is the International Symposium on Physics and Applications of Laser Dynamics and is organized each year since 2011 with an organizing committee that involves in particular researchers from France and Taiwan. The 2015 edition is the second one being organized in France after the successful 2013 edition. IS-PALD 2015 takes place at CentraleSupélec, which is one of the top leading engineering school in France with more than 1000 students being graduated each year with different specializations including electrical and computer engineering. CentraleSupélec is original in the landscape of the so-called ”Grandes Ecoles” in that is is organized in four Campus located at Gif-sur-Yvette, Châtenay-Malabry, Rennes, and Metz. The Metz Campus hosts the photonics research activities and coordinates a Master Program specializing the engineering students in Photonic Systems and Communication.

The 2015 edition of IS-PALD promises to be very successful with 28 oral contributions, 15 poster contributions, 8 invited talks, and 3 keynote speakers. Although the topics are varied, they all target the understanding of the physics of laser dynamics and its application to optical signal processing, sensing and communications. Authors and participants come from all the world covering more than 18 different nationalities.

We thank the invited speakers and participants for their attendance and contributions. We acknowledge the support of three companies: Yenista Optics, Tektronix, and Teledyne Lecroy that will exhibit their new products in laser and optical metrology. We also thank SFO (Société Française d’Optique), Conseil Régional de Lorraine, SEE and the French Committee for 2015 International Year of Light for their support. We thank the scientific committee members for their help in the selection of oral and poster contributions. We thank Dominique Gros, Mayor of Metz, for his agreement to host the welcome cocktail at the Grand Salon of Metz City Hall, and we thank the Abbaye des Prémontrés and Marcotullio for the organization of the gala dinner. We thank our directors at CentraleSupélec and Télécom ParisTech for their support in hosting and organizing the conference.

Finally, we would like to thank the local organizing committee without who this three-day international scientific meeting in Metz would not have been possible. In particular we thank Evelyne Steiner for her involvement and care taken in the organization of the conference. We also thank Sheng-Kwang Hwang (National Cheng Kung University, Taiwan) for his great help in updating the website, Delphine Woltersberger, Damien Rontani, Nicolas Marsal, Noémí Wiersma, Emeric Mercier, Elodie Mirisola, Lionel Weicker, Chi-Hak Uy and Antoine Pivati (CentraleSupélec, France) for their help in preparing with us the documents, badges and bags being distributed to all participants.

We wish you all a fruitful and interesting conference and hope you will have the opportunity to create new collaborations, and therefore to promote even more the interest in studying laser dynamics and applications.

Yours sincerely

Marc Sciamanna (CentraleSupélec, France)
Frédéric Grillot (Télécom ParisTech, France)
Co-chairs of IS-PALD 2015
04-06 November 2015, CentraleSupélec, Metz (France)

Conference Program

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Wednesday 04 November 2015

09h00 Welcome by CentraleSupélec, Metz Campus Director
Konrad Szafnicki, CentraleSupélec

09h10 Welcome by conference chairs
Marc Sciamanna, CentraleSupélec
Frédéric Grillot, Télécom ParisTech

Surface-Emitting Lasers and Microcavities
Chair: Marc Sciamanna, CentraleSupélec (France)

09h20 K. D. Choquette (Keynote)
University of Illinois at Urbana-Champaign (U.S.A.)
Dynamics of coherently coupled microcavity laser arrays

10h10 A. Joly¹, G. Baili¹, M. Alouini², J.-M. George³, D. Dolfi¹
¹Thales Research and Technology (France), ²Institut de Physique de Rennes (France), ³Unité Mixte de Physique CNRS-Thales (France)
Compensation of the residual phase anisotropy in a VECSEL for spin injection

10h30 A. Quirce¹, P. Pérez², Á. Valle², L. Pesquera², Y. Hong³, H. Thienpont¹, K. Panajotov¹
¹Vrije Universiteit Brussel (Belgium), ²Instituto de Fisica de Cantabria (Spain), ³Bangor University (U.K.)
Generation of microwave signals using a long-wavelength VCSEL under dual-beam parallel optical injection

10h50-11h20 Coffee Break

Mode-Locking and Comb Generation
Chair: John Mc Inerney, Tyndall (Ireland)

11h20 D. Bimberg (Invited)
Technische Universität Berlin (Germany)
InP/InAs quantum-dot and quantum-dash lasers: mode-locking, non-linear and dynamic properties

11h50 L. Jaurigue¹, B. Lingnau¹, E. Schöll¹ and K. Lüdge²
¹TU Berlin (Germany), ²Freie Universität Berlin (Germany)
Optical control schemes for pulse train stabilization in passively mode-locked lasers

12h10 M. Giudici¹, P. Camelin¹, M. Marconi², J. Javaloyes³, S. Balle³
¹University of Nice Sophia Antipolis (France), ²CNRS - Laboratoire Physique de Nanostructures (France), ³Universitat de las Islas Baleares (Spain)
Control and dynamics of temporal localized structures in mode-locked semiconductor lasers
12h30 S. Barbieri¹, H. Li¹, P. Laffaille¹, D. Gacemi¹, M. Apfel¹, C. Sirtori², J. Leonardon¹, G. Santarelli³, M. Roesch⁴, G. Scalari⁴, M. Beck⁴, J. Faist⁴, W. Haensel⁵, R. Holzwarth⁵
¹University of Paris Diderot and CNRS (France), ²Université Paris Diderot (France), ³LP2N, IOGS CNRS, and Université de Bordeaux (France), ⁴ETH Zurich (Switzerland), ⁵Menlo Systems GmbH (Germany)
*Dynamics of ultra-broadband terahertz quantum cascade lasers for comb operation*

**12h50-14h00 Lunch Break**

**Optical Feedback and Optical Injection**
Chair: Deb Kane, Macqarie University (Australia)

**14h00 F.-Y. Lin (Invited)**
National Tsing Hua University (Taiwan)
*Chaos time delay signature suppression and bandwidth enhancement by electrical heterodyning*

**14h30 E. Mercier, D. Wolfersberger, M. Sciamanna**
CentraleSupélec (France)
*Phase-conjugate feedback in a semiconductor laser enables large chaotic bandwidth*

**14h50 N. Li¹, A. Locquet², C.-Y. Chang², W. Pan¹, D. S. Citrin²**
¹Southwest Jiaotong University (China), ²Georgia Institute of Technology (U.S.A.)
*Time-delay suppression and unpredictability enhancement of an external-cavity laser through optical injection*

**15h10 R. Raghunathan¹, K. Schires³, H. Huang¹, A. Hurtado², L. Lester³, F. Grillot¹**
¹Télécom ParisTech (France), ²University of Strathclyde (U.K.), ³Virginia Tech (U.S.A.)
*Dual mode interaction dynamics in a 1310 nm quantum dot DFB laser under distant side mode injection*

**15h30 C. Quintero, T. Sorrentino, M. C. Torrent, C. Masoller**
¹Universitat Politecnica de Catalunya (Spain), ²Universidade Federal Rural do Semi-Arido (Brasil)
*Analysis of the effects of periodic forcing in the spike rate and spike correlations in semiconductor lasers with optical feedback.*

**15h50-16h20 Coffee Break**

**Fundamental Laser Properties**
Chair: Daan Lenstra, TU Eindhoven (The Netherlands)

**16h20 B. Kelleher (Invited)**
Tyndall National Institute (Ireland)
*Quantum Dot Lasers: Class B but not Class B*
16h50 P. Hamel, F. Raineri, A. Levenson, A. M. Yacomotti (Invited)
LPN-CNRS
Spontaneous symmetry breaking in coupled photonic crystal nanolasers

17h20 T. Wang¹, G.P. Puccioni², G.-L. Lippi³
¹CNRS Institut Non Linéaire de Nice (INLN) (France), ²Istituto dei Sistemi Complessi, CNR (Italy),
Dynamical buildup of lasing in mesoscale devices

17h40 End of Day 1

19h00-21h00 Welcome Cocktail and Poster Session
Metz City Hall, Grand Salon, 1st Floor

P1 C. Wang¹, R. Raghunathan¹, K. Schires¹, S.-C. Chan², L. Lester³, F. Grillot¹
¹Télécom ParisTech (France), ²City University of Hong-Kong (China), ³Virginia Tech (U.S.A.)
P1 dynamics in an InAs/GaAs distributed feedback quantum dot laser using optical injection and feedback

P2 R. M. Nguimdo, G. Verschaffelt, J. Danckaert, G. Van der Sande
Vrije Universiteit Brussel (Belgium)
Simultaneous computation of two independent tasks using reservoir computing based on a single photonic nonlinear node with optical feedback

P3 E. Mercier, C.-H. Uy, D. Wolfersberger, M. Sciamanna
CentraleSupélec (France)
Mapping self-pulsing frequencies in a semiconductor laser with phase-conjugate feedback

P4 G.P. Puccioni¹, N. Dokhane², G.-L. Lippi³
¹Istituto dei Sistemi Complessi, CNR (Italy), ²Université M'Hamed Bougara de Boumerdès (Algeria), ³CNRS Institut Non Linéaire de Nice (INLN) (France),
Master-mode-driven evolution of the linewidth of an edge-emitting semiconductor laser at switch-on

P5 M. Wishon¹, V. Cartillier², D. Choi¹, C.-Y. Chang¹, A. Locquet¹, D. Citrin¹
¹Georgia Institute of Technology (U.S.A.), ²CentraleSupélec (France)
Confirming the reservoir computing property separability using a free space optoelectronic implementation

P6 C.-Y. Chang¹, D. Choi¹, M. Wishon¹, A. Locquet¹, K. Merghem², A. Martinez², F. Lelarge³, A. Ramdane², D. Citrin¹
¹Georgia Institute of Technology (U.S.A.), ²LPN-CNRS (France), ³III-V Lab & Alcatel Lucent Bell Labs (France)
Simultaneous bifurcation diagrams of optical intensity and carrier number of external cavity semiconductor laser
P7  F. Baladi¹, M. W. Lee¹, J.-R. Burie², M. A. Bettiati², A. P. A. Fischer¹, A. Boudrioua¹
ⁱUniversité Paris 13 (France), ²3SP Technologies (France)
Low frequency fluctuation mapping of a high power laser diode emitting at 980 nm subject to filtered optical feedback

P8  M. Almulla
University of California Los Angeles (France)
Fluctuation-frequency dependence of the low-sensitivity periodic oscillations in optically injected semiconductor lasers

P9  D. Rontani¹, D. Choi², C.-Y. Chang², A. Locquet², D. Citrin²
¹CentraleSupélec (France), ²Georgia Institute of Technology (U.S.A.),
Sparse signal reconstruction using optical chaos generated by a laser diode with optical feedback

P10  L. Wang, M. Romanelli, M. Vallet
Institut de Physique de Rennes (France),
Synchronization of DFB lasers in bounded regime with optical feedback loop

P11  W.-J. Lee, Y.-S. Chiu and Y.-S. Juan
Yuan Ze University (Taiwan),
Analysis of amplitude variation of regular pulses under dual feedback loops

P12  C.-W. Fu and Y.-S. Juan
Yuan Ze University (Taiwan),
Chaos generation utilizing switching optical injection system

P13  M. Mattheakis¹, Th. Oikonomou², M. I. Molina³, G. P. Tsironis⁴
¹Harvard University (U.S.A.), ²Nazarbayev University (Kazakhstan), ³Universidad de Chile (Chile), ⁴University of Crete (Greece)
Parity-time plasmonic instabilities

P14  E. Mirisola, E. Mercier, D. Wolfersberger, M. Sciamanna
CentraleSupélec (France)
Observation and simulation of extreme events in a laser diode with time-delayed feedback

P15  N. Wiersma, N. Marsal, M. Sciamanna, D. Wolfersberger
CentraleSupélec (France)
Nonlinear interactions of accelerating beams
Thursday 05 November 2015

Quantum-Cascade Lasers
Chair: Wolfgang Elsaesser, TU Darmstadt (Germany)

09h00 J. Faist (Keynote)
ETH Zurich (Switzerland)
Quantum cascade frequency combs: noise, stability and spectroscopy applications

09h50 L. Jumpertz¹, K. Schires¹, M. Carras², M. Sciamanna³, F. Grillot¹
¹Telecom ParisTech (France), ²MirSense (France), ³CentraleSupélec (France)
Chaotic pulsing in quantum cascade lasers subject to optical feedback

10h10 M.I. Amanti¹, M. Renaudat Saint-Jean¹, A. Bismuto¹, M. Beck², J. Faist², C. Sirtori¹
¹Université Paris Diderot/Paris 7 (France), ²ETH Zurich (Switzerland)
Mode stabilization in quantum cascade lasers via an intra-cavity cascading nonlinearity

10h30 G. Friart¹, Th. Erneux¹, G. Van der Sande¹, G. Verschaffelt¹, J. Danckaert¹
¹Université Libre de Bruxelles (Belgium), ²Vrije Universiteit Brussel (Belgium)
Stability of quantum cascade lasers subject to optical feedback

10h50-11h20 Coffee Break

Quantum-Dot and Quantum-Dash Lasers
Chair: Frédéric Grillot, Télécom ParisTech (France)

11h20 S. Breuer (Invited)
TU Darmstadt (Germany)
Stabilization of passively mode-locked quantum dot lasers

11h50 M. Gioannini, P. Bardella, I. Montrosset
Politecnico di Torino (Italy)
Role of the homogeneous and inhomogeneous broadening on the mode dynamics of Quantum dot Fabry-Perot lasers

12h10 H. Huang¹, K. Schires¹, D. Arsenijević¹, D. Bimberg², F. Grillot¹
¹Telecom ParisTech (France), ²Technische Universität Berlin (Germany)
Excited state and ground state optical feedback sensitivity of an InAs/GaAs quantum dot lasers

12h30 D. Marah, P. Kumar, H. Asghar, S. Keshri, R. Kumar, J. McInerney
University College Cork (Ireland)
Pulse characteristics of passively mode-locked dual-section quantum-dash laser subjected to optical feedback
12h50-14h00 Lunch Break

Extreme Events
Chair: K. Alan Shore, Bangor University (U.K.)

14h00 Ph. Grelu (Invited)
ICB, Université de Bourgogne (France)
Extreme wave dynamics in ultrashort fiber lasers

14h30 M. Romanelli1, M. Brunel1, Th. Erneux2, M. Vallet1
1 Université Rennes-1 and IPR (France), 2 Université Libre de Bruxelles (Belgium),
Extreme events and excitability in an opto-RF oscillator

14h50 M. W. Lee1, F. Baladi1, J.-R. Burie2, M. A. Bettiat2, A. Boudrioua1,
A. P. A. Fischer1
1 Université Paris 13 (France), 2 3SP Technologies (France)
Observation of rogue waves in a high-power laser diode subject to optical feedback
via a fibre Bragg grating

15h10 D. Choi, A. Locquet, J. Barnoud, C.-Y. Chang, M. Wishon, D. Citrin
Georgia Institute of Technology (France)
Extreme events in external-cavity lasers: from low frequency fluctuations to coherence collapse

15h30-16h00 Coffee Break

High-Performance Optoelectronic Oscillators
Chair: Fan-Yi Lin, National Tsing Hua University (Taiwan)

16h00 S.C. Chan (Invited)
City University of Hong-Kong (China)
Microwave phase noise characteristics of P1 dynamics in semiconductor lasers

16h30 V. Kovannis
Nazarbayev University, Astana (Kazakhstan)
Fast, tunable & low linewidth photonic oscillators

16h50 R. M. Nguimdo1, K. Saleh2, A. Coillet2, G. Lin2, R. Martinenghi2, Y. K. Chembo2
1 Vrije Universiteit Brussel (Belgium), 2 CNRS FEMTO-ST, University Franche-Comté (France)
Phase noise performance of optoelectronic oscillators based on whispering-gallery mode resonators

17h10 End of Day 2

18h45 Bus Transfer to Gala Dinner from CentraleSupélec
19h00 Bus Transfer to Gala Dinner from Place d’Armes, Metz
to: Abbaye des Prémontrés, Pont-à-Mousson
Nonlinear Laser Dynamics and Chaos
Chair: Vassilios Kovanis, Nazarbayev University (Kazakhstan)

09h00 D. Lenstra (Keynote)
TU Eindhoven (The Netherlands)
Laser dynamics in integrated photonics

09h50 D. Kane¹, J. Toomey¹, C. McMahon¹, A. Argyris², D. Syvridis²
¹Macquarie University (Australia), ²University of Athens (Greece)
Open database from experimental nonlinear laser systems - bigger data for science today and as a research resource for the future

10h10 L. Weicker¹, Th. Erneux², D. Wolfersberger¹, M. Sciamanna¹
¹CentraleSupélec (France), ²Université Libre de Bruxelles (Belgium)
Dynamical properties of a semiconductor laser with filtered phase-conjugate optical feedback

10h30 A. Vladimirov¹, A. Pimenov¹, M. Tlidi², D. Turaev³, D. Puzyrev¹, S. Yanchuk¹, S. Gurevich⁴
¹WIAS (Germany), ²Université Libre de Bruxelles (Belgium), ³Imperial College (U.K.), ⁴University of Muenster (Germany)
Feedback induced instabilities of cavity solitons

10h50-11h20 Coffee Break

Dynamics of new laser structures
Chair: Thomas Erneux, Université Libre de Bruxelles (Belgique)

11h20 R. Colombelli (Invited)
Institut d’Electronique Fondamentale (France)
Perspectives for intersubband polariton lasers

11h50 Z.A. Sattar, K.A. Shore
Bangor University (U.K.)
Effect of optical Injection in semiconductor nanolasers

12h10 S. Barbay¹, F. Selmi¹, R. Braive¹, F. Lelièvre¹, A. Golestani¹, R. Kuszelewicz²
¹LPN-CNRS (France), ²Université Paris Descartes (France)
Nonlinear dynamics in a neuromimetic micropillar laser

12h30 K. Schires¹, N. Girard², G. Baili², G.-H. Duan³, F. Grillot¹
¹Télécom ParisTech (France), ²Thales Research and Technology (France), ³III-V lab (France)
Feedback sensitivity of hybrid III-V silicon lasers

12h50 End of IS-PALD 2015