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ORAL PRESENTATIONS

Monday Morning

10:30-11:50: Biophotonics, Session 1 (PL)

10:30-10:50	Invited Talk 1	**Hugh James Byme (Dublin Institute of Technology)**	No title
10:50-11:05	1571170927	Daniella L. Peres, Daniela Teixeira da Silva, Joaquim C. Felipe, Luciana Corrêa, Leandro L. de Matos, Thiago Martini Pereira, Denise Maria Zezell	Discriminating Oral Squamous Cell Carcinoma via µFTIR Spectroscopy Imaging and Tree-Based Models
11:05-11:20	1571172356	Daniella L. Peres, Daniela Teixeira da Silva, Joaquim C. Felipe, Luciana Corrêa, Leandro L. de Matos, M´ario Olímpio de Menezes, Thiago Martini Pereira, Denise Maria Zezell	Impact of Sampling Strategies on the Classification of micro-FTIR Hyperspectral Data
11:20-11:35	1571171399	Danielle Laskowski, Sido Feilstrecker Junior, Vinicius P. Anjos, Kevin S Costa, Thiago Neves Machado, Jorge Lenz, Emilson Ribeiro Viana, Rafael Eleodoro de Goes, Wido Herwig Schreiner, Arandi G. Bezerra, Jr.	Laser Ablation in Liquids as a Versatile Approach for the Synthesis of Hybrid Nanoparticles with Plasmonic and Magneto-Plasmonic SERS Applications
11:35-11:50	1571168008	Vinicius P. Anjos, Maria Renata V. B. Freire, Raffaele Stasi, Daniela de Fátima Teixeira da Silva, Denise M. Zezell	Chemometric Evaluation of Ampicillin Stability using FTIR Spectroscopy and Multivariate Techniques

10:30-11:50: Integrated Photonics and Optoelectronics, Session 1 (Room 1)

10:30-10:50	Invited Talk 2	**Cleber Renato Mendonça (IFSC-USP-São Carlos)**.	Ultrafast laser processing for novel photonic system
10:50-11:05	1571171272	**Gustavo H. Magro**, Maria Carolina Volpato, Eduardo Oliveira Bastos, Luis A. M. Barea, Pierre-Louis de Assis, Newton Ces´ario Frateschi	Hybrid integration of two-dimensional dichalcogenides for low power saturable absorption in photonic integrated circuits

11:05-11:20	1571170013	**Frida L. Flores Rivera**, Grethell Georgina Pérez Sánchez, Yolotzin Medina, Rodolfo López-Romero, Leandra I. de Abreu, Ivan A. Aldaya	Erbium and ytterbium co-doped calcium-zinc and sodium-zinc phosphate glasses as high-gain media for integrated photonics
11:20-11:35	1571171107	**Vinicius Pereira Pinto**, Jose Luis Clabel Huaman, Cleber Renato Mendonca, Gabriel de Oliveira Campos	Incorporation of $BaTiO_3$: Er/Yb Nanoparticles into Polymeric Resins for Two-Photon Polymerization
11:35-11:50	1571172758	**Ana Carolina Borges**, Abel Quispe, Alejandro Sierra, Stephany Torres, Andrea Balan, Walter Salcedo	Influence of Silicon Substrate Type and HF Concentration on the Optical and Morphological Properties of Porous Silicon Microcavities

10:30-11:50: Agri-photonics and Sustainability, Session 1 (Room 2)

10:30-10:50	Invited Talk 3	**Giorgio Senesi (National Council Research (CNR) – Italy)**	Laser-induced Breakdown Spectroscopy: A fast in-situ technique applied to identify and discriminate grains and seeds of different nature and detect plant viruses
10:50-11:05	1571172396	**Luís Carlos Leva Borduchi**, Helga Maria Darezzo, Daniele Souza, Debora Marcondes Bastos Pereira Milori.	Integrating LIBS and Machine Learning to Identify Aphelenchoides besseyi Infection in Asymptomatic Soybean Leaves
11:05-11:20	1571161158	**Helga Maria Darezzo**, Luís Carlos Leva Borduchi, , Raphael Antonio Caface, Debora Marcondes Bastos Pereira Milori.	Detection of Escherichia coli in Tomatoes Using Laser-Induced Breakdown Spectroscopy and Machine Learning
11:20-11:35	1571171275	**Luís Carlos Leva Borduchi**, Helga Maria Darezzo, Debora Marcondes Bastos Pereira Milori, Ladislau Martin-Neto.	Total Carbon and Nutrient Quantification in Brazilian Soils Using LIBS Technique with One-Point Calibration
11:35-11:50	1571172368	Daniele Souza, Kleydson Stenio, **Vicente S. Mattos**, Luís Carlos Leva Borduchi, Arthur Lopes Marques Lara, Aida Magalhães, Debora Marcondes Bastos Pereira Milori.	Automated Nutritional Diagnosis in Plants Using DP-LIBS and LIBSsa Software

Monday Afternoon

15:30-16:35: Optics and Instrumentation, Session 1 (PL)

15:30-15:50	Invited Talk 4	**Daniel Varela Magalhães (IFSC-USP-São Carlos)**	Atomic standards of time and frequency and timekeeping applications
15:50-16:05	1571171102	**Lucas G. Woiblet**, Nick J. Schilder, Bernardo Dias da Costa, Pedro Vinicius Pinto Nascimento, Gustavo, Nunes Martins, Gustavo Wiederhecker, Thiago Alegre	Reliable and Affordable Interferometric Wavemeter
16:05-16:20	1571172420	**Julio Gallinaro Maranho**, Patricia Aparecida Ana	A Modular Open-Source Platform for Laboratory Automation in Spectroscopic Applications
16:20-16:35	1571172144	**Renato Moysés Mafra**, Lino Misoguti	Polarization-Resolved Heterodyne Z-Scan for nonlinear refractive index discrimination using ultrafast-high-repetition laser pulses

15:30-16:35: Lasers, Session 1 (Room 1)

15:30-15:50	Invited Talk 5	**Claire Cisowski (University of Glasgow, UK)**	Skyrmions as topological light fields
15:50-16:05	1571167015	**Juan Coronel**, Eisa AlNeyadi, Aaesha Alteneiji, Predrag Sekulic, Guillaume Matras, Felix Vega	IR Spectral Beam Combining: Implementation and Performance Analysis
16:05-16:20	1571170599	**Felipe Maia Prado**, Jessica Dipold, Nicklauss Wetter	ReLU-like Nonlinear Activation from an Nd: YVO Random Laser
16:20-16:35	1571170735	**Paulo Jorge de Morais**, Rubens Cavalcante da Silva, Wagner de Rossi, Claudio C. Mota	Adaptive Optics Systems: Lagrange-Based Woofer-Tweeter Control

15:30-16:35: Optical Communication, Session 1 (Room 2)

15:30-15:50	Invited Talk 6	**Paulo Sergio de Brito (Instituto Superior Técnico de Lisboa, Portugal)**	Quantum Technology: The pathway for intrinsic secure
15:50-16:05	1571171459	**Gabriel Bozelli**, Ana Laura	NSGA-II-based multi-

		Graças, João Pedro Gosmin, Artur Alfe, Leandra I. de Abreu, Ivan Aldaya	objective optimization of neural networks for nonlinear compensation in digital coherent interconnects
16:05-16:20	1571171240	**Ivan A. Aldaya**, Pedro Henrique dos Santos Almeida, Robson Assis Colares, Darli Mello	Mitigation of Nonlinear Distortion in Unrepeatered Interconnects Employing Clustering Algorithms
16:20-16:35	1571170036	**Humberto V. Q. Melo**, Pedro Henrique dos Santos Almeida, Robson A. Colares, Darli A. A. Mello	PAM-4-based Cost Function for CD Estimation in Kramers-Kronig SSB-PAM-4 Systems

Tuesday Morning

10:30-11:55: Biophotonics, Session 2 (PL)

10:30-10:50	Invited Talk 8	**Peter Gardner (Manchester University, UK)**	Separating pussycats and tigers: Risk stratification of prostate cancer using infrared QCL imaging
10:50-11:10	Invited Talk 10	**Hilde Harb Buzza (Faculdad de Física, PUC-Chile)**	Uso de microalgas fotossintéticas para otimização do efeito fotodinâmico
11:10-11:25	1571172762	**Erika Toneth Ponce Ayala**, Layla Pires, Camila Aparecida Antunes, Michelle Barreto Requena, Vanderlei Salvador Bagnato, Sebastião Pratavieira	Evaluation of ALA-Mediated Sonodynamic, Photodynamic, and Sonophotodynamic Therapies in a Murine Model of Early-Stage Cutaneous Melanoma
11:25-11:40	1571172415	**Alfredo Hernández Mendoza**, Josué Daniel Rivera Fernández, Karen Roa Tort, Macaria Hernández Chávez, Diego Adrián Fabila Bustos	Low-cost driver for pulsed blue laser diode systems for telangiectasias treatment
11:40-11:55	1571171236	**Cynthia S. A. Caires**, Amanda F. Pires, Leandro O. Araujo, Anderson Caires, Samuel L. Oliveira	NIR-Triggered Photothermal Antimicrobial Strategy Using PCPDTBT Nanoparticles

10:30-11:55: Photonics and Quantum Technologies, Session 1 (Room 1)

10:30-10:50	Invited Talk 7	**Thiago Pedro Mayer**	.Advances in

		Alegre (UNICAMP-Campinas)	Optomechanical Platforms for Quantum Photonics and Transduction
10:50-11:10	Invited Talk 16	**Celso Villas Boas (UFSCar)**	Fundamental Light Interference to Quantum Communication: New Interpretation and Applications
11:10-11:25	1571171268	**Luís Gustavo Maciel Riveros**, Marvyn Inga, João B. Rosolem, Eduardo Mobilon, Tiago Sutili, and Rafaél C. Figueiredo	Evaluating Quantum Randomness: Random-Walk-Based Characterization of Quantum-Random Number Generators
11:25-11:40	1571173964	**Maria Carolina França Volpato**, Kalebe Estevam, Marcelo I. Davanco, Pierre-Louis de Assis	Broadband photonic structures to achieve high coupling efficiencies and Purcell factors with dark and interlayer excitons in 2D materials
11:40-11:55	1571172784	**Bruno Santos de Souza**, Franciele Renata Henrique, Tiago Bonicelli Gambarotto, Marcio Daldin Teodoro, Paulo H. D. Ferreira, Filippo Giovanni Ghiglieno, Celso J. Villas Boas	Statistical Analysis of the Experimental Reconstruction of Photon Distribution for Attenuated Lasers

10:30-11:50: Sensors, Image and Illumination, Session 1 (Room 2)

10:30-10:50	Invited Talk 9	**Marcelo Nalin (IQ-UNESP-Araraquara)**	Rare Earths Containing Garnets Single Crystals for Magneto-Optical and Luminescent Sensors
10:50-11:05	1571172754	**Eduardo A. V. Souza**, Tales de Vargas Lisbôa, Eric Fujiwara, Axel Spickenheuer, Cristiano M. B. Cordeiro	Non-Invasive Investigation of Humidity in Natural Fibers Using Specklegram Analysis
11:05-11:20	1571155856	**Matheus Bulhões Barbosa**, Rodrigo Moreira Bacurau, Alex Dante	High-Resolution Microcontroller-Based Interrogator for Fiber Bragg Grating Arrays
11:20-11:35	1571172726	Jacilene Martins Medeiros, Antônio A. de Godoy von Zuben, Renato Goulart Jasinevicius, Luís Alberto Mijam Barêa, Arlindo Neto Montagnoli, José Alexandre Diniz,	Direct laser writing of binary Fresnel Zone Plates for low-cost Shack-Hartmann wavefront sensors

		Giuseppe Antonio Cirino	
11:35-11:50	1571166107	Yungui Ma, Yifan Shao	Pixelated Bayer spectral router based on meta-atom arrays

Tuesday Afternoon

14:00-15:20: Lasers, Session 2 (PL)

14:00-14:20	Invited Talk 11	**Henrique Guimarães Rosa (Machenzie-São Paulo)**	Experimental demonstration of graphene
14:20-14:35	1571172807	**Felipe Maia Prado**, Sidney Leal da Silva, Niklaus Wetter	AND, OR, and XNOR Optical Logic Gates via Pixel-Wise Modulation with Spatial Light Modulators and 4f System
14:35-14:50	1571170663	**Elbis S. Cardoso**, Ricardo E. Samad, Claudio C. Motta	Comparative Analysis of Transverse Mode Instability in Single-Clad and Double-Clad Fibers
14:50-15:05	1571171277	**Elbis S. Cardoso**, Ricardo E. Samad, Claudio C. Motta	Theoretical Investigation of Transverse Mode Instability in Yb-DCFs Due to Thermally-Induced Modal Coupling
15:05-15:20	1571172414	**Marlon Medeiros Correia**, Tomas P. V. Andrade, Flávio Cruz	Stimulated Brillouin Scattering Fiber Ring Laser Synthesizing 10.9 GHz Low-Noise Microwave Continuous Wave Signal

14:00-15:20: Optical Communication, Session 2 (Room 1)

14:00-14:20	Invited Talk 12	**Filippo Ghileno (UFSCar-São Carlos)**	From Snell to quantum cryptography: the optical fiber that connects the world
14:20-14:35	1571165647	Gabriel Leonardo da Silva, Amanda de Farias Ribeiro, **Enzo Dantas da Silva**, João Gabriel Marques de Carvalho, Flavio A. M. Marques, Alexandre A. C. Cotta, Jefferson E. Tsuchida, Diego C. Fuzatto, Leomar S. Marques, Walter Margulis, Jonas H. Osório	Optical fiber transverse displacement sensor based on a 3D-printed structure and specklegram analysis
14:35-14:50	1571171198	**Renan V. B. Carvalho**, Diego, Pinheiro, Henrique	A Methodology to Comprehend the Features

		Alves Dinarte da Silva, Raul Almeida Jr, Carmelo Basto-Filho	Importance in Hybrid RSA Using ML
14:50-15:05	1571169364	**Pedro Henrique dos Santos Almeida**, Robson Assis Colares Darli Mello	Power Autocorrelation-based CD Estimation in IMDD Systems with Transmitter Precompensation
15:05-15:20	1571169734	**Lucca Zogbi, Lucca A. Santos**, Felipe Pinto, Arismar Cerqueira Sodré Jr	R-PoF System for B5G Smart Farming Applications

14:00-15:20: Integrated Photonics and Optoelectronics, Session 2 (Room 2)

14:00-14:20	Invited Talk 13	**Evandro Conforti (Unicamp-Campinas)**	Photonic Integrated Circuits: Basic Challenges and Promises
14:20-14:35	1571172407	**Carlos Alvarado**, Marcos A. R. Franco, Paulos de Tarso Neves Jr, Alexandre Pohl	Influence of the Electrode Size in the Design of Polymer-based Phase Electro-Optic Modulators
14:35-14:50	1571172751	**Tomaz Catunda**, Antonio Ricardo Zanatta, Thiago Augusto Lodi, Leonardo Albino, Marcelo Nalin	Structural and Spectroscopic Properties of Nd doped YAG microsize Single Crystals
14:50-15:05	1571170047	**Miguel Nienstedt**, Luca O. Trinchao, Eduardo S. Gonçalves, Luiz Peres, Miguel Diniz, Paulo F. J. de Siqueira, Nathalia B. Tomazio, Thiago Alegre, Gustavo Widerhecker	Dynamics of Dual-Pumped Kerr Frequency Combs
15:05-15:20	1571167724	**Giovana Bonano Carlos**, Herculano Martinho, Carla Carolina Bandeira, André Mourão Batista	Diphenylalanine micro/nanotubes self-assembly control: geometric confinement, electric field and recrystallization effects

Wednesday Morning

10:30-11:50: Agri-photonics and Sustainability, Session 2 (PL)

10:30-10:50	Invited Talk 14	**Anderson Rodrigues Lima Caires (UFMS-Campo Grande)**	Application of Chlorophyll Fluorescence in Agriphotonics
10:50-11:05	1571172409	**Vinícius G. Rufino**, Bianca B. Barreto, Yina J. Onofre, Tiago S. do Espirito Santo, Letícia P. Dantas, Otávio R.	Fluorescence Image Processing and Machine Learning Models for Early Detection of Water Stress

		de Paula, Debora M. B. P. Milori	
11:05-11:20	1571171848	**Tiago S. do Espirito Santo**, Bianca B. Barreto, Yina J. Onofre, Vinícius G. Rufino, Kaique C. Pereira, Otávio R. de Paula, Letícia P. Dantas, Rafael Galbieri, Debora M. B. P. Milori	Laser-Induced Fluorescence Spectroscopy on Cotton Leaves for Early Detection of Nematode Infection
11:20-11:35	1571169856	**Bianca Batista Barreto,** Letícia P. Dantas, Otávio R. de Paula, Vinícius G. Rufino, Rafael Galbieri, Paulino R. Villas-Boas, Debora M. B. P. Milori	Early Diagnosis of Nematode Attack in Cotton Plants Using Photonic Techniques
11:35-11:50	1571172142	**Raphael Antônio Caface**, Helga Maria Darezzo, Arthur L. M. Lara, Daniela Souza, Debora M. B. P. Milori	Pb calibration using DP-LIBS in tomato cultivation

10:30-11:50: Optics and Instrumentation, Session 2 (Room 1)

10:30-10:50	Invited Talk 15	**Miguel Angel Venegas (Molecular Vista Inc)**	Understanding Chemical Characterization at the Nanoscale: Towards the development of a numerical Photo-induced Force Microscope (n-PifM), a virtual PiFM, for Image and spectroscopy calculations
10:50-11:05	1571165320	**Gabriel de Freitas**, Henrique Patriota Alves, Joaquim F. Martins-Filho	Design of Oxide/Metal/Hydride Plasmonic Devices Based on D-shaped Optical Fibers for H_2 Sensing
11:05-11:20	1571158559	**Murilo Neco Saraiva**, Cleber R. Mendonça	Random Forest for chalcogenide glasses: A data-driven method for predicting the nonlinear refractive index
11:20-11:35	1571171335	**Ricardo Rego Bordalo** Correia, André L. D. Valentina, Amanda K. Fritsch, Antônio Z. Khoury	Second Harmonic Generation of Beams with Stochastic Structures
11:35-11:50	1571171345	**Yina Julieth Onofre**, Vinícius G. Rufino, Bianca B. Barreto, Tiago S. do Espirito Santo, Kaique C. Pereira, Gabriel L. de Moura, Rafael Galbieri,	Development of a Fluorescence Imaging Platform for Greenhouse Applications

		Debora M. B. P. Milori	

10:30-12:05: Optical Communication, Session 3 (Room 2)

10:30-10:50	Invited Talk 16	**Brian Pinheiro da Silva (SENAI)**	An Overview of Free-Space Optical Links in Brazilian Quantum Network
10:50-11:05	1571170003	**Ana Júlia N. Francisco**, Plinio S. Dester, Otávio Mendonça, Rafael A. Penchel, Leandra I. de Abreu, Ivan A. Aldaya	Multi-criteria evaluation of Bi-LSTM Recurrent Neural Network for Nonlinearity Compensation in Digital Coherent Optical Systems
11:05-11:20	1571169635	**João Pedro Gosmin**, Raphael Vico, Grethell G. P. Sánchez, Rafael A. Penchel, Ivan A. Aldaya, Leandra I. de Abreu	Anomaly detection in fiber-based distributed acoustic sensing systems employing autoencoders
11:20-11:35	1571171214	Carine Mineto, **Luis G. M. Riveros**, Jhonathan B. de Souza, Weskley Maurício, Tiago Sutili, Júlia A. S. Maciel, Maykon Silva, Rafael C. Figueiredo	Analysis of Optical Propagation Delay as a Limiting Factor in 5G OpenRAN Fronthaul
11:35-11:50	1571169048	**Eduardo Lima**, Lara M. Souza, Arismar C. Sodré Junior	Tunable Optical Frequency Comb Generation Applied to DWDM and 5G Networks
11:50-12:05	1571171222	**Bruno Pereira de Souza** Rocha, Pablo R. N. Marciano, Maxwell E. Monteiro, Maria J. Pontes, Marcelo Segatto	Analysis of n-th Order Fully-Optical FIR Filters for Chromatic Dispersion Compensation

Wednesday Afternoon

14:00-15:35: Sensors, Image and Illumination, Session 2 (PL)

14:00-14:20	Invited Talk 17	**Marcelo Eduardo Vieira Seggato (Instituto Superior Técnico, Lisboa, Portugal)**	Optical Fiber Sensors and Applications
14:20-14:35	1571172150	**Júlia C. X. de Lima**, Lidia O Rosa; Audrey Seda, Cristiano MB Cordeiro, Eric Fujiwara	Electrostatic-driven soft device with embedded optical fiber displacement sensor
14:35-14:50	1571172744	**Laila El Haddad**, Luis Barêa	Dissipative Optical Sensor based on a Photonic Molecule with U-Shaped Feedback Waveguide
14:50-15:05	1571166295	**Sergio Celaschi**; Henrique	Continuously monitoring

		De Canavarro Alencar; Alexandre Augusto De Melo	the Biological Oxygen Demand of effluents by optically determining
15:05-15:20	1571171398	**Luiz Peres**, Luca O. Trinchao, Eduardo S Gonçalves, Miguel Nienstedt, Paulo F. J. de Siqueira, Nathalia B Tomazio, Thiago Alegre, Gustavo Wiederhecker	Characterizing Supermode Overlaps in Coupled Microresonators through Kerr and Thermal
15:20-15:35	1571158333	**Bruno Trefilio Magalhães**, Ana Luiza Costa Silva, Marcio Godoy	Light-stimulated atmosphere-dependent neuromorphic device

14:00-15:35: Biophotonics, Session 3 (Room 1)

14:00-14:20	Invited Talk 18	**Kassio Lima (UFRGN-Natal)**	Use of multivariate classification algorithms with variable selection applied to biospectroscopy
14:20-14:35	1571172488	**Eduardo Ignacio Castellón** Castillo; Diego Adrián Fabila Bustos; Rodrigo Mercado Pimentel; Macaria Hernández Chávez	EasyBrainGen: An Easy-To-Use Automated Workflow for Generating 3D Brain Models from MRI Based on FastSurfer
14:35-14:50	1571171279	**Barbara Regina Melo Ribeiro;** Fernanda Luiza Menezes; Luisa Helena Carmo Araújo; Danielle Cristina Teles Ferreira; Sara Santos Bernardes; Ana Maria de Paula	Nonlinear microscopy imaging and automated analysis allow evaluation of changes in collagen fibers in melanoma
14:50-15:05	1571169061	**Murilo S Sampaio**; Luismar Barbosa da Cruz, Jr; Kaio Bernardo Barros; Luciano Bachmann	Evaluating Skin Tone Classifications through Simulated Optical Properties
15:05-15:20	1571173799	**Maria L F Vicente**; Houssam Hajjoul; Francisco Eduardo Gontijo Guimarães	Singlet oxygen generation by a single soot nanoparticle: a two-photon confocal microscopy quantification
15:20-15:35	1571162948	**Luismar Barbosa da Cruz**, Jr; Marlon Rodrigues Garcia; Lilian Tan Moriyama; Vanderlei Bagnato; Sebastião	Impact of Occupational Activities on Fingerprint

		Pratavieira	

14:00-15:35: Lasers, Session 3 (Room 2)

14:00-14:20	Invited Talk 19	**Nilson Dias Vieira Junior (IPEN-São Paulo))**	Implementation of an ultra-high-intensity laser multiuser facility in Brazil
14:20-14:35	1571161149	**Otávio Augusto Capeloto**; Vitor Santaella Zanuto; Leandro Herculano da Silva; Nelson Guilherme Castelli Astrath; Luis Carlos Malacarne; Gustavo Vinicius Bassi Lukasievicz	Nanosecond Thermoelastic Waves Detection in Optical Material by Pulsed Thermal Mirror and Thermal Lens Methods
14:35-14:50	1571167688	**Giovanni Budroni**, Nt; André F.V. Fonseca; Ana Flávia Nogueira; Jonathas Siqueira	Effect of Quantum Dot Passivation on Hybrid Perovskite Photoconductivity Probed by Optical Pump-Terahertz Probe
14:50-15:05	1571169711	**Sergio Castrillon Salazar**; Henrique Guimarães Rossa; David Steinberg; Matheus G Bonando; Suelene Silva Piva; Cecília de Carvalho C. C e Silva; Juan Zapata; Lúcia Akemi Miyazato Saito	Blade-coated graphene oxide onto D-shaped fiber as a saturable absorber for femtosecond pulse generation
15:05-15:20	1571171231	**Ricardo E. da Silva**; Cristiano MB Cordeiro	Laser-Assisted Deposition of Carbon Nanotubes in Optical Fibers with Multiparameter Control
15:20-15:35	1571172785	**Felipe Maia Prado**; Sidney Leal da Silva; Niklaus Wetter	High-SSIM Reconstruction of Computer-Generated Off-Axis Holograms Using Neural Networks

Oral Presentation Abstract List by Manuscript Number

1571155856

High-Resolution Microcontroller-Based Interrogator for Fiber Bragg Grating Arrays

Matheus Bulhões Barbosa (University of Campinas (UNICAMP), Brazil); Rodrigo Moreira Bacurau, Prof. (University of Campinas, Brazil); Alex Dante (Photonics Innovation Institute (iTech), Brazil & Federal University of Rio de Janeiro (UFRJ), Brazil)

This work presents the design and experimental validation of a high-resolution interrogation system for fiber Bragg grating (FBG) sensor arrays, developed using a microcontroller-based architecture. The system implements a twin-grating scheme with a tunable FBG or a Fabry-Perot filter for interrogating multiple FBGs in a single fiber. It integrates optoelectronics and embedded system for real-time processing. To improve resolution, a peak identification algorithm based on polynomial interpolation was implemented. Hysteresis compensation algorithm and a temperature stabilization module are integrated. Experimental results demonstrate a 1.5 pm resolution with the FBG filter, and a 500 Hz scan frequency with the Fabry-Perot filter.

1571158333

Light-stimulated atmosphere-dependent neuromorphic device

Bruno Trefilio Magalhães (Universidade Federal de São Carlos, Brazil & UFSCar, Brazil); Ana Luiza Costa Silva and Marcio Godoy (UFSCar, Brazil)

We report a neuromorphic device based on thin films of sodium-doped zinc oxide and activated by light. The surface present reactive mechanisms that allow the changing in electrical conductivity due to the adsorbed molecules from atmosphere. Neuromorphic behavior is induced by light illumination and memory retention is associated to persistent photoconductivity. The retention is enhanced at non-oxidant environment such as vacuum and carbon dioxide, presenting a long-term memory character higher than one hour. At synthetic and free air, the retention is lower, presenting short-term memory character. The role of oxygen is decisive to the memory retention understanding.

1571158559

Random Forest for chalcogenide glasses: A data-driven method for predicting the nonlinear refractive index

Murilo Neco Saraiva (University of São Paulo, Brazil); Cleber R. Mendonca (IFSC - USP, Brazil)

Chalcogenide glasses exhibit unique properties that make them promising candidates for advanced photonic applications, including nonlinear optics, optical storage, fibers, and optoelectronic devices. However, producing glasses with tailored properties through a "trial and error" approach is time-consuming and costly. In this study, a Random Forest model accurately predicted the nonlinear refractive index of chalcogenide glasses based on their matrix composition, achieving a mean absolute percentage error below 10% on unseen samples. These results highlight the potential of machine learning to accelerate materials development by drastically reducing the dependence on experimental measurements.

1571161149

Nanosecond Thermoelastic Waves Detection in Optical Material by Pulsed Thermal Mirror and Thermal Lens Methods

Otávio Augusto Capeloto (Universidade Federal do Amazonas, Brazil); Vitor Santaella Zanuto (Universidade Estadual de Maringá, Brazil); Leandro Herculano da Silva (Universidade Tecnológica Federal do Paraná, Brazil); Nelson Guilherme Castelli Astrath and Luis Carlos Malacarne (Universidade Estadual de Maringá, Brazil); Gustavo Vinicius Bassi Lukasievicz (Universidade Tecnológica Federal do Paraná, Brazil)

We use the thermal mirror (TM) and thermal lens (TL) techniques on the nanosecond time scale to investigate the thermoelastic waves launched in an optical window. Ultraviolet pulsed laser excitation induces mechanical perturbations in N-BK7 that are detected using the wavefront distortion of the probe beam reflected and transmitted from the excited region. Nanometer-scale deformation of the material is induced on the irradiated surface, releasing transient thermoelastic waves of much smaller amplitudes on the surface. Laser-induced color center formation in the sample during the excitation at 355 nm increased the optical absorption coefficient, amplifying the photothermal signal.

1571161158
Detection of Escherichia coli in Tomatoes Using Laser-Induced Breakdown Spectroscopy and Machine Learning

Helga Maria Darezzo (Embrapa, Brazil & Laboratório Nacional de Agrofotônica, Brazil); Luís Carlos Leva Borduchi (USP, Brazil & Embrapa Instrumentação, Brazil); Raphael Antonio Caface and Debora M. Bastos Pereira Milori (Embrapa, Brazil)

This study evaluated the use of double-pulse laser-induced breakdown spectroscopy (DP-LIBS) combined with machine learning to detect Escherichia coli in grape tomatoes. A total of 216 samples were analyzed, with spectral data from elements like Mg, Zn, and P used as input features for classification. The Multilayer Perceptron (MLP) neural network achieved 92.4% accuracy in the test set, outperforming the Random Forest model. The results demonstrate the potential of DP-LIBS as a rapid, non-destructive, and accurate method for food safety monitoring, paving the way for broader applications in the detection of other pathogens in agricultural products.

1571162948
Impact of Occupational Activities on Fingerprint

Luismar Barbosa da Cruz, Jr (University of São Paulo, Brazil); Marlon Rodrigues Garcia (Sao Paulo State University (Unesp), Brazil); Lilian Tan Moriyama (University of São Paulo & São Carlos Institute of Physics, Brazil); Vanderlei Bagnato (University of São Paulo, Brazil); Sebastião Pratavieira (University of Sao Paulo, Brazil)

Fingerprint biometrics are trusted globally for their precision, but what happens when skin undergoes abrupt changes? This study explores how occupational exposure alters fingerprint structures, affecting biometric reliability. Using Optical Coherence Tomography (OCT), the finger skin of 21 adults from three occupations: educators, mechanics, and cleaning staff, was scanned. Results show visible deformation of fingerprint minutiae, thinning of the stratum corneum, and increased epidermal thickness in those exposed to physical stressors. These changes highlight the impact of occupation on biometric identity. OCT proves a promising, non-invasive tool for detecting skin alterations, advancing dermatological research and secure identification.

1571165320

Design of Oxide/Metal/Hydride Plasmonic Devices Based on D-shaped Optical Fibers for H2 Sensing

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This paper presents results about the design of Oxide/Metal/Hydride structures for D-shaped optical fibers with the aim of proposing hydrogen-sensitive devices. A Finite Element model is developed to investigate the effect of each layer thickness on the sensitivity and an optimization routine is suggested. The obtained structure is computationally investigated under hydrogen load for concentrations between 0%-4%.

1571165647

Optical fiber transverse displacement sensor based on a 3D-printed structure and specklegram analysis

Gabriel Leonardo da Silva, Amanda de Farias Ribeiro, Enzo Dantas da Silva, João Gabriel Marques de Carvalho, Flavio Marques and Alexandre Cotta (Federal University of Lavras, Brazil); Jefferson Tsuchida (Universidade Federal de Lavras, Brazil); Diego C. Fuzatto and Leomar S. Marques (Federal University of Lavras, Brazil); Walter Margulis (Pontifícia Universidade Católica Do Rio de Janeiro, Brazil); Jonas H Osório (Federal University of Lavras, Brazil)

We present a fiber-based transverse displacement sensor relying on a 3D-printed structure and specklegram analysis. The 3D-printed platform embeds a multimode optical fiber to convert transverse displacements into axial deformation on the optical fiber. By analyzing the measured specklegrams, the sensor demonstrated the capability to quantify transverse displacement increments, showing a sensitivity of -2.5 ± 0.1 mm^{-1}, representing the slope of the zero-mean normalized cross-correlation coefficient response to transverse displacements. We believe that this work presents a promising approach for developing fiber sensors for mechanical parameter measurement, broadening their applicability in areas such as structural health monitoring and precision positioning.

1571166107

Pixelated Bayer spectral router based on meta-atom arrays

Yungui Ma and Yifan Shao (Zhejiang University, China)

Efficient light collection has long remained a critical challenge for conventional image sensors employing color filters, which inherently incur energy losses from out-of-band photons. Here, we present a pixelated spectral router constructed from a sparse meta-atom array. This innovation effectively diverts incident light into R (600-700 nm), G (500-600 nm), and B (400-500 nm) bands, directing each to the corresponding pixels of a Bayer sensor. This approach achieves over 56% signal enhancement compared to traditional color filter systems. Comprising straightforward compound Si_3N_4 nanostructures, the design is highly amenable to mass production. Practical imaging tests validate its applicability in real-world scenarios.

1571166295

Continuously monitoring the Biological Oxygen Demand of effluents by optically determining their dissolved O2: A field Proof of Concept

Sergio Celaschi (Centro de Tecnologia da Informação Renato Archer, Brazil & CTI Renato Archer, Brazil); Henrique De Canavarro Alencar (Fundação CPqD Centro de Pesquisa e Desenvolvimento em Telecomunicações, Brazil); Alexandre Augusto De Melo (Companhia de Saneamento Básico do Estado de São Paulo, Brazil)

Delayed results required to determine the five-day biological oxygen demand - BOD5 hinder the ability of wastewater treatment plants - WWTP reacting to different situations and meet treatment goals. Reducing BOD turnaround time from days to a few hours was our quest. Such solution is based on a system of two batch bioreactor end-devices associated to a cloud internet-of-things platform. Such approach aims to monitor and control a WWTP to support decision-making.

1571167015
IR Spectral Beam Combining: Implementation and Performance Analysis
Juan Coronel, Eisa AlNeyadi, Aaesha Alteneiji, Predrag Sekulic, Guillaume Matras and Felix Vega (Technology Innovation Institute, United Arab Emirates)

This work presents the design, implementation and characterization of incoherent beam combination using spectral combining of two laser sources emitting at 1060 and 1065-nm with parallel reflective diffraction gratings configuration. This paper describes the design workflow followed from optical ray tracing simulation, going through the 3D design, the actual implementation and characterization in the laboratory. The combiner efficiency is 92.33% with a total output power of 35.52-mW.

1571167688
Effect of Quantum Dot Passivation on Hybrid Perovskite Photoconductivity Probed by Optical Pump-Terahertz Probe
Giovanni Budroni, Nt and André F.V. Fonseca (Unicamp, Brazil); Ana Flávia Nogueira and Jonathas Siqueira (UNICAMP, Brazil)

We report the first results on terahertz photoconductivity in $Cs_{0.08}(FA_{0.87}MA_{0.13})_{0.92}Pb(I_{0.88}Br_{0.12})_3$ perovskite thin films passivated with $CsPbBr_3$ quantum dots, investigated using time-resolved terahertz spectroscopy. We observed a 17% increase in the charge carrier mobility of the passivated perovskite compared to the pristine one. Fitting the spectrum of the photoconductivity we obtained that both the scattering rate and backscattering parameter decreased for the passivated one in comparison to the pristine one, showing that the passivation reduced the defects in the thin film.

1571167724
Diphenylalanine micro/nanotubes self-assembly control: geometric confinement, electric field and recrystallization effects
Giovana Bonano Carlos, Herculano Martinho and Carla Carolina Bandeira (Universidade Federal do ABC, Brazil); André Mourão Batista (IPEN, Brazil)

This study proposes a method for the unidirectional growth of diphenylalanine nanotubes, essential for biosensors and optical devices, analyzing the effect of microchannels, electric field and recrystallization on the material properties.

1571168008

Chemometric Evaluation of Ampicillin Stability using FTIR Spectroscopy and Multivariate Techniques

Vinicius P Anjos (Nuclear and Energy Research Institute, Brazil & University of São Paulo, Brazil); Maria Renata V B Freire (Nuclear and Energy Research Institute, Brazil); Raffaele Stasi (Instituto de Pesquisas Energéticas e Nucleares, Brazil & Universidade de São Paulo, Brazil); Daniela De Fátima Teixeira Da Silva (IPEN, Brazil); Denise M Zezell (Nuclear and Energy Research Institute, IPEN-CNEN, Brazil & University of Sao Paulo, Brazil)

Antibiotic quality has always been a concern in the pharmaceutical industry and the World Health Organization (WHO), especially in the growing and emerging antimicrobial resistance crisis. FTIR spectroscopy can contribute to the monitoring of antimicrobials, especially when coupled with chemometric techniques. The present work aims to investigate spectral differences of Ampicillin samples through FTIR qualitatively and quantitatively, highlighting the spectral differences associated with different degradation conditions (acidic and thermal).

1571169048
Tunable Optical Frequency Comb Generation Applied to DWDM and 5G Networks

Eduardo Lima and Lara M Souza (Inatel, Brazil); Arismar Cerqueira Sodré Junior (INATEL, Brazil)

A hybrid optical frequency comb generator is demonstrated using two CW lasers modulated by a single-drive Mach-Zehnder Modulator (SD-MZM) and spectrally broadened through four-wave mixing in a highly nonlinear fiber (HNLF). The initial 150 GHz carrier spacing is converted into multiple equidistant tones across the C-band. By adjusting the MZM bias from 4.9 V to 5.25 V, the comb spacing is tuned from 50 GHz to 25 GHz, enabling flexible DWDM grid adaptation. The proposed architecture combines electro-optic and Kerr effects using standard components, making it suitable for 5G/6G photonic systems and reconfigurable optical networks.

1571169061
Evaluating Skin Tone Classifications through Simulated Optical Properties

Murilo S Sampaio (Universidade de São Paulo, Brazil); Luismar Barbosa da Cruz, Jr, Kaio Bernardo Barros and Luciano Bachmann (University of São Paulo, Brazil)

Accessing skin tone has gained significant relevance in recent decades, mainly due to the increased use of images for diagnostics and cosmetology. Color categorization methods like the Individual Typology Angle and the Monk scale have been used to mitigate this bias. In this study, we present a comprehensive evaluation of the correlation between these two scales through Monte Carlo computational simulation. Results indicate the Monk palette provides better segmentation for darker skin tones, but does not represent real human skin tones at the lighter end of the spectrum.

1571169364
Power Autocorrelation-based CD Estimation in IMDD Systems with Transmitter Precompensation

Pedro Henrique dos Santos Almeida (University of Campinas - Unicamp, Brazil & N/a, unknown); Robson Assis Colares (Campinas State University, Brazil); Darli Mello (UNICAMP, Brazil)

We investigate the suitability of the algorithm based on the auto-correlation of the signal power waveform (ACSPW) to estimate accumulated chromatic dispersion (CD) in intensity

modulation with direct detection (IMDD) systems with transmitter CD precompensation. Simulation and experimental results validate the accuracy of the ACSPW method in IMDD systems, while also highlighting its limitations in estimating low accumulated CD values. To circumvent this issue, we propose to intentionally include additional dispersion at the transmitter during system startup, driving the algorithm towards appropriate estimation conditions.

1571169635

Anomaly detection in fiber-based distributed acoustic sensing systems employing autoencoders

Joao Pedro Gosmin and Raphael Vico (Universidade Estadual Paulista, Brazil); Grethell Georgina Pérez Sánchez (Universidad Autónoma Metropolitana, Mexico); Rafael Abrantes Penchel (São Paulo State University (Unesp), Brazil); Ivan A. Aldaya (São Paulo State University, Brazil & Unesp, Brazil); Leandra I de Abreu (São Paulo State University (Unesp), Brazil)

Distributed Acoustic Sensing (DAS) systems have emerged as a high-potential solution for a wide range of applications, including vehicular monitoring. A key challenge in DAS signal processing is the reliable detection of anomalies within high-dimensional data streams, particularly under scarce anomalous training samples. In this work, we propose an autoencoder-based approach for anomaly detection in DAS systems. The method employs a fully connected neural architecture trained on normal traces to model typical system behavior. Reconstruction errors are then used to identify anomalous traces. The approach is validated on an open-access DAS dataset, demonstrating the model's ability to identify anomalous traces.

1571169711

Blade-coated graphene oxide onto D-shaped fiber as a saturable absorber for femtosecond pulse generation

Sergio Castrillon Salazar (Universidade Presbiteriana Mackenzie, Brazil & Universidad de Antioquia, Colombia); Henrique Guimarães Rossa (Presbiterian Mackenzie University, Brazil); David Steinberg and Matheus G Bonando (Mackenzie Presbyterian University, Brazil); Suelene Silva Piva (Presbiterian Mackenzie University, Brazil); Cecília de Carvalho C. C e Silva (Mackenzie Presbyterian University, Brazil); Juan Zapata (Universidad de Antioquia (UdeA), Colombia); Lúcia Akemi Miyazato Saito (Mackenzie Presbyterian University, Brazil)

Carboxyl-functionalized graphene oxide (GO-COOH) is a well-known 2D material with outstanding nonlinear saturable absorption characteristics. When deposited on D-shaped optical fibers, it provides strong evanescent-field coupling, enabling efficient mode-locking in fiber lasers. This work demonstrates, for the first time, the use of blade coating to integrate graphene oxide onto D-shaped fibers, offering a simple, material-efficient, and controlled method for thin film deposition. Using this approach in an erbium-doped fiber laser (EDFL) achieved 240 fs pulses, confirming the potential of blade-coated graphene oxide for ultrafast photonics and advancing practical femtosecond laser technologies.

1571169734

R-PoF System for B5G Smart Farming Applications

Lucca Zogbi (National Telecommunications Institute, Brazil); Lucca A Santos (Instituto Nacional de Telecomunicações - INATEL, Brazil); Felipe Pinto and Arismar Cerqueira Sodré Junior (INATEL, Brazil)

This paper presents an experimental implementation of a Beyond 5G (B5G) communication system for smart farming, integrating Radio-over-Fiber (RoF) and Power-over-Fiber (PoF) technologies. A 2.3 GHz B5G signal is transmitted over a 10-km Single-Mode Fiber (SMF) RoF link, while 5 W of optical power is delivered through a 1-km Multi-Mode Fiber (MMF) PoF link. At the Remote Antenna Unit (RAU), power is converted and regulated to supply the RoF receiver and enable short-range wireless coverage via antenna. RoF and PoF subsystems are validated in terms of EVM and power stability, confirming R-PoF's viability for rural B5G smart farming deployments.

1571169856

Early Diagnosis of Nematode Attack in Cotton Plants Using Photonic Techniques

Bianca Batista Barreto (Brazilian Agricultural Research Corporation, Brazil & Luiz de Queiroz College of Agriculture USP, Brazil); Letícia Piazentin Dantas and Otávio Rodrigues De Paula (Federal University of São Carlos, Brazil); Vinícius G Rufino (Federal University of São Carlos, Brazil & Brazilian Agricultural Research Corporation, Brazil); Rafael Galbieri (Mato Grosso Cotton Institute, Brazil); Paulino Ribeiro Villas-Boas (Embrapa Instrumentation, Brazil); Debora M. Bastos Pereira Milori (Embrapa, Brazil)

The early detection of plant diseases is essential for sustainable cotton production, particularly in response to emerging threats such as Aphelenchoides besseyi recently identified in cotton crops. This study investigates the use of photonic techniques-including infrared thermography, fluorescence imaging, and laser-induced fluorescence spectroscopy (LIFS) to detect physiological changes in cotton plants under nematode stress. These non-invasive methods capture temperature variations and fluorescence signals related to plant metabolism. Combined with classification algorithms, photonic data enabled early identification of infected plants before visual symptoms appeared. Results demonstrate the potential of integrated photonics and AI for early, accurate disease diagnosis.

1571170003

Multi-criteria evaluation of Bi-LSTM Recurrent Neural Network for Nonlinearity Compensation in Digital Coherent Optical Systems

Ana Júlia N Francisco (Universidade Estadual Paulista Júlio de Mesquita Filho, Brazil); Plinio Santini Dester (University of Campinas, Brazil); Otávio Mendonça, Rafael Abrantes Penchel and Leandra I de Abreu (São Paulo State University (Unesp), Brazil); Ivan A. Aldaya (São Paulo State University, Brazil & Unesp, Brazil)

This paper investigates Bidirectional Long Short-Term Memory (Bi-LSTM) recurrent neural networks for nonlinear compensation in digital coherent optical systems. Simulations were conducted for a 112 Gbps DP-16QAM system over a 140 km link, exploring various Bi-LSTM configurations with different memory cell and tap counts. Within the tested parameter range, results show that increasing the number of taps improves bit error ratio (BER) performance by mitigating nonlinear intersymbol interference, but also raises computational complexity. The findings emphasize the need for multi-objective optimization during the hyperparameter selection to achieve a trade-off between computational cost and nonlinear compensation effectiveness in practical optical systems.

1571170013

Erbium and ytterbium co-doped calcium-zinc and sodium-zinc phosphate glasses as high-gain media for integrated photonics

Frida L Flores Rivera, Sra (Universidad AutonomaMetropolitana, Mexico); Grethell Georgina Pérez Sánchez (Universidad Autónoma Metropolitana, Mexico); Yolotzin Medina (Universidad Autónoma de Tlaxcala, Mexico); Rodolfo López-Romero (Universidad Autónoma Metropolitana, Mexico); Leandra I de Abreu (São Paulo State University (Unesp), Brazil); Ivan A. Aldaya (São Paulo State University, Brazil & Unesp, Brazil)

This paper compares the gain and loss coefficients of erbium-ytterbium-co-doped calcium-zinc and sodium-zinc phosphate glasses. The results show that sodium-zinc phosphate glasses exhibit a 1.2 dB/mm transmission loss coefficient and an on-off gain of 2.3 dB/mm for a 5 mm thick sample. As for the calcium-zinc phosphates, they present a slightly higher loss coefficient of 1.3 dB/mm and an on-off gain of 2.1 dB/mm for the same sample thickness. This experimental characterization reveals that both glasses present similar performance, so other factors related to synthesis and hydrophility will be determinant in the matrix selection.

1571170036
PAM-4-based Cost Function for CD Estimation in Kramers-Kronig SSB-PAM-4 Systems
Humberto Vinicius Queiroz Melo (Universidade Estadual de Campinas, Brazil); Pedro Henrique dos Santos Almeida (University of Campinas - Unicamp, Brazil & N/a, unknown); Robson Assis Colares (Campinas State University, Brazil); Darli Mello (UNICAMP, Brazil)

We investigate the application of the best match search technique for chromatic dispersion (CD) estimation in single sideband pulse amplitude modulation 4-level (SSB-PAM-4) systems using a Kramers-Kronig receiver. We propose employing a cost function previously derived for ML-based PAM-4 signal equalization and compare it with the one based on the constant modulus algorithm (CMA), originally derived for M-QAM coherent systems. The results demonstrate that the PAM-4-based cost function (CF) offers higher accuracy and robustness in CD estimation compared to the CMA-based one, including the implementation of smaller NFFT sizes, for which the CMA-based one fails.

1571170047
Dynamics of Dual-Pumped Kerr Frequency Combs
Miguel Nienstedt and Luca O. Trinchao (University of Campinas, Brazil); Eduardo S Gonçalves (Gleb Wataghin Physics Institute, UNICAMP, Brazil); Luiz Peres, Miguel Diniz and Paulo F. J. de Siqueira (University of Campinas, Brazil); Nathalia B Tomazio (University of Sao Paulo, Brazil); Thiago Alegre (University of Campinas & UNICAMP, Brazil); Gustavo Wiederhecker (State University of Campinas, Brazil)

We numerically investigate dual-pumped Kerr frequency combs using a coupled-mode model of seven optical modes. Our results reveal threshold-less comb generation driven by non-degenerate four-wave mixing and a binary phase distribution in the even modes, including the degenerate optical parametric oscillation (DOPO) mode. The observed phase correlations suggest underlying symmetry-breaking dynamics and highlight potential applications in quantum photonics. This study advances understanding of nonlinear dynamics and phase coherence in dual-pumped microresonators.

1571170599
ReLU-like Nonlinear Activation from an Nd: YVO Random Laser
Felipe Maia Prado (University of São Paulo, Brazil); Jessica Dipold (IPEN, Brazil); Niklaus Wetter (Instituto de Pesquisas Energéticas e Nucleares, Brazil)

This work shows a ReLU-like activation function generated by the emission of a Nd: YVO random laser. The emission response was fitted and implemented as a custom activation function in a neural network trained on the MNIST dataset, achieving an accuracy of 96%. This indicates the potential of random lasers as optical activations for future optical neural network architectures.

1571170663

Comparative Analysis of Transverse Mode Instability in Single-Clad and Double-Clad Fibers

Elbis S Cardoso (University of Sao Paulo, Brazil); Ricardo E. Samad (IPEN/CNEN, Brazil); Claudio C. Motta (University of Sao Paulo, Brazil)

This work presents a comparative study between single-clad (SCF) and double-clad (DCF) fiber designs, focusing on modal propagation and tolerance to the transverse mode instability (TMI). Analytical solutions for LPmn modes and numerical simulations are used to analyze the transverse intensity distributions and the influence of structural parameters on the TMI onset threshold in high-power fiber lasers. Results show that DCFs exhibit greater tolerance to TMI, attributed to the broader transverse mode distribution in lower-index regions, which enhances optical confinement and thermal dissipation.

1571170735

Adaptive Optics Systems: Lagrange-Based Woofer-Tweeter Control

Paulo Jorge de Morais and Rubens Cavalcante da Silva (University of Sao Paulo, Brazil); Wagner de Rossi (Instituto de Pesquisas Energéticas e Nucleares - IPEN, Brazil); Claudio C. Motta (University of Sao Paulo, Brazil)

This paper presents the implementation of a Lagrange-based processor extension for woofer-tweeter adaptive optics control. The approach leverages the complementary response of two deformable mirrors to compensate for a broad range of wavefront aberrations. Applications include high-energy laser propagation through the atmosphere, where adaptive optics mitigate distortions caused by turbulence, enabling improved beam focus and reduced scintillation in scenarios such as free-space optical communication and energy transmission.

1571170927

Discriminating Oral Squamous Cell Carcinoma via µFTIR Spectroscopy Imaging and Tree-Based Models

Daniella L. Peres (Instituto de Pesquisas Energéticas e Nucleares, IPEN/CNEN, Brazil & University of São Paulo, Brazil); Daniela de Fátima Teixeira da Silva (Nuclear and Energy Research Institute, Brazil); Joaquim Cezar Felipe (University of São Paulo, Brazil); Luciana Correa (University of Sao Paulo, Brazil); Leandro Luongo De Matos (Universidade de são Paulo, Brazil); Thiago Martini Pereira, Sr. (UNIFESP & Universidade Federal da São Paulo, Brazil); Denise M Zezell (Nuclear and Energy Research Institute, IPEN-CNEN, Brazil & University of Sao Paulo, Brazil)

This study evaluates the classification of oral squamous cell carcinoma (OSCC) using micro-FTIR hyperspectral imaging and two tree-based models: Random Forest and XGBoost. After preprocessing and PCA, class imbalance was addressed with AllKNN and Tomek Links. Both models achieved high accuracy, and key spectral bands-Amide I, II, and III-were consistently highlighted, supporting their relevance in oral cancer detection.

1571171102
Reliable and Affordable Interferometric Wavemeter

Lucas G Woiblet and Nick J. Schilder (Unicamp, Brazil); Bernardo Dias da Costa (State University of Campinas, Brazil); Pedro Vinicius Pinho Nascimento (UNICAMP, Brazil); Gustavo Nunes Martins (Universidade Estadual de Campinas, Brazil); Gustavo Wiederhecker (State University of Campinas, Brazil); Thiago Alegre (University of Campinas & UNICAMP, Brazil)

We present a low-cost, high-precision wavemeter based on a Mach-Zehnder Interferometer (MZI) combined with a gas absorption reference. A simple fiber-based MZI, built from standard optical splitters, and a hydrogen cyanide (HCN) gas cell enable accurate wavelength measurement of a tunable laser during scanning. The MZI provides fine relative calibration, while HCN lines offer absolute referencing. We characterize the system's phase stability, showing precision is mainly limited by the interferometer's free spectral range (FSR). This approach offers a robust, scalable, and affordable alternative to comercial wavemeters or optical spectrum analyzers for spectroscopy and photonic device characterization.

1571171107
Incorporation of $BaTiO_3$: Er/Yb Nanoparticles into Polymeric Resins for Two-Photon Polymerization

Vinícius Pereira Pinto (University of São Paulo, Brazil); Gabriel O Campos (University of Sao Paulo, Brazil); José Luis Clabel Huaman (Sao Carlos Institute of Physics, Brazil); Cleber R. Mendonca (IFSC - USP, Brazil)

Barium titanate ($BaTiO_3$) perovskites exhibit notable optical properties, which are further enhanced by Er/Yb ions doping, making them promising for advanced photonic applications. Embedding $BaTiO_3$: Er/Yb (BTEY) in polymeric resins can boost optical nonlinearities and enable the creation of functional 3D microstructures. This study presents the fabrication and characterization of BTEY-embedded microstructures via two-photon polymerization (2PP), including analysis of powder and resin properties. The resulting structures exhibit a smooth surface (RMS ~27 nm) and uniform nanoparticle incorporation, with morphological and structural characteristics that are suitable for integrated photonic device applications.

1571171198
A Methodology to Comprehend the Features Importance in Hybrid RSA Using ML

Renan V B Carvalho (University of Pernambuco, Brazil); Diego Pinheiro and Henrique Alves Dinarte Da Silva (Universidade de Pernambuco, Brazil); Raul Almeida Júnior (Federal University of Pernambuco (UFPE), Brazil); Carmelo Bastos-Filho (Universidade de Pernambuco, Brazil)

The hybrid routing and spectrum assignment (HRSA) algorithm for the RSA problem in elastic optical networks (EONs) outperforms the classical RSA algorithms. However, the decision-making process remains largely unexplained. Here, we propose a methodology to study how topological features steer HRSA's adaptive choices between RSA ordering for source-destination node pairs in EONs. Using machine learning models, we aim to identify key topological metrics that govern HRSA's choices. The methodology provides a roadmap for deriving insights into the most relevant metrics to explain HRSA algorithm. Results show that it is possible to identify the minimum set of features that explain HRSA.

1571171214
Analysis of Optical Propagation Delay as a Limiting Factor in 5G OpenRAN Fronthaul

Carine Mineto (University of Campinas & CPQD, Brazil); Luis Gustavo Maciel Riveros (CPQD, Brazil & University of Campinas, Brazil); Jhonatan Brandel De Souza and Weskley Maurício (CPQD, Brazil); Tiago Sutili (CPQD, Brazil & University of Campinas, Brazil); Júlia Aline Sousa Maciel, Maykon Silva and Rafael C. Figueiredo (CPQD, Brazil)

This paper investigates the impact of fiber optic length, and, in consequence, the propagation latency between Distributed Units (O-DU) and Radio Units (O-RU) in Open Radio Access Networks (OpenRAN). The analysis is based on the following key performance metrics: Reference Signal Received Power (RSRP), bitrate between O-RU and User Equipment (UE), and average transmission delay from Core Network (CN) to UE. The goal is to correlate fiber physical distance with signal quality, network throughput, and latency, providing essential insights for planning and optimizing OpenRAN networks, especially in challenging scenarios.

1571171222
Analysis of n-th Order Fully-Optical FIR Filters for Chromatic Dispersion Compensation
Bruno Pereira de Souza Rocha (Federal University of Espírito Santo, Brazil); Pablo Rafael Neves Marciano (Universidade Federal do Espírito Santo, Brazil); Maxwell E. Monteiro (Federal Institute of Espírito Santo - IFES & Federal University of Espirito Santo - UFES, Brazil); Maria Jose Pontes (UFES, Brazil); Marcelo Segatto (Federal University of Espírito Santo, Brazil)

This paper presents the analysis of a fully optical Finite Impulse Response filter, designed via direct realization, which enhances data transmission rates in optical communication systems. As optical fibers present issues like chromatic dispersion (CD), our method reduces reliance on complex Digital Signal Processing (DSP) techniques, thereby lowering system costs. The photonic chip aims to lessen overall system costs by using phase shifters, delay lines, and attenuators to compensate for the CD. The promise of optical filters as an effective way to improve performance in optical networks is highlighted by this study.

1571171231
Laser-Assisted Deposition of Carbon Nanotubes in Optical Fibers with Multiparameter Control
Ricardo E. da Silva (University of Campinas - UNICAMP, Brazil); Cristiano MB Cordeiro (UNICAMP, Brazil)

We demonstrate a new method to deposit carbon nanotubes (CNT) on optical fibers based on a syringe-loaded CNT solution axially aligned to the fiber tip. A laser generates an optical tweezer in a water-based CNT solution, depositing nanotubes over the fiber cross-section. The parameters are adjusted, resulting in two deposited CNT layers with distinct thicknesses. This setup employs smaller solution volumes than those commonly used in beckers, providing high confinement, protection, and interaction of nanotubes, laser, and fiber, offering a promising alternative for real-time monitoring, which are significant to the development of industrial fiber lasers and biomedical optoacoustic devices.

1571171236
NIR-Triggered Photothermal Antimicrobial Strategy Using PCPDTBT Nanoparticles
Cynthia S.A. Caires, Amanda F. Pires and Leandro O. Araujo (UFMS, Brazil); Anderson Caires (Federal University of Mato Grosso do Sul, Brazil); Samuel L. Oliveira (UFMS, Brazil)
Methicillin-resistant Staphylococcus aureus (MRSA) remains a significant global health concern due to its resistance to multiple antibiotics. Here, we report the photothermal inactivation potential of conjugated polymer nanoparticles composed solely of PCPDTBT (Poly[2,6-(4,4-bis-

(2-ethylhexyl)-4H-cyclopenta[2,1-b;3,4-b']dithiophene)-alt-4,7(2,1,3-benzothiadiazole)) against S. aureus strains, including methicillin-susceptible (MSSA) and methicillin-resistant (MRSA) forms. Upon irradiation with a 780 nm laser (529 mW), the solutions containing PCPDTBT-NPs exhibited significant temperature increases (up to 35°C above room temperature), resulting in complete bacterial eradication within 20 min for MSSA and 30 min for MRSA. These findings demonstrate that PCPDTBT-NPs, even without additional compounds, are effective photothermal agents for antimicrobial applications.

1571171240
Mitigation of Nonlinear Distortion in Unrepeatered Interconnects Employing Clustering Algorithms

Ivan A. Aldaya (São Paulo State University, Brazil & Unesp, Brazil); Pedro Henrique dos Santos Almeida (University of Campinas - Unicamp, Brazil & N/a, unknown); Robson Assis Colares (Campinas State University, Brazil); Darli Mello (UNICAMP, Brazil)

This work compares clustering techniques for self-phase modulation (SPM) mitigation, evaluating k-means, Gaussian mixture models (GMM), density-based spatial clustering for applications with noise (DBSCAN), and ordering points to identify the clustering structure (OPTICS) on experimental 32 GBd dual polarization 16-ary quadrature amplitude modulation (DP-16QAM) signals. Results show all clustering methods surpass maximum likelihood detection, with GMM and DBSCAN achieving the best performance. GMM outperforms at higher powers, while DBSCAN excels at lower powers but demands careful tuning.

1571171268
Evaluating Quantum Randomness: Random-Walk-Based Characterization of Quantum-Random Number Generators

Luis Gustavo Maciel Riveros (CPQD, Brazil & University of Campinas, Brazil); Marvyn Inga (CPQD, Brazil); Joao B Rosolem (CPQD - Research and Development Center in Telecommunications, Brazil); Eduardo Mobilon (CPQD Telecom R&D Center, Brazil); Tiago Sutili (CPQD, Brazil & University of Campinas, Brazil); Rafael C. Figueiredo (CPQD, Brazil)

This work presents a comparative study of pseudo-random (PRNG) and quantum-random (QRNG) number generators based on a combination of random-walk-based variance analysis and uniformity assessment. The analysis shows that the quantum source presents the expected variability patterns and exhibits closer agreement with an ideal uniform distribution, while pseudo-random shows wider dispersion and bias. These findings indicate that QRNG presents better performance for applications that require the highest levels of randomness integrity.

1571171272
Hybrid integration of two-dimensional dichalcogenides for low power saturable absorption in photonic integrated circuits

Gustavo Henrique Magro (Unicamp, Brazil & Gleb Wataghin Institute of Physics, Brazil); Maria Carolina França Volpato (Universidade Estadual de Campinas, Brazil & National Institute of Standards and Technology, Gaithersburg, Maryland, USA); Luis Barêa and Eduardo Oliveira Bastos (UFSCar, Brazil); Pierre-Louis de Assis (State University of Campinas (Unicamp) & "Gleb Wataghin" Institute of Physics, Brazil); Newton Cesário Frateschi (University of Campinas, Brazil)

We demonstrate saturable absorption with a 1T'-MoTe2 layer placed onto a silicon-on-insulator based microring resonator. We measured and modeled the transmission behavior of the structure as a function of input power. An absorption saturation power as low as 1.8(1.0) micro Watts was observed.

1571171275

Total Carbon and Nutrient Quantification in Brazilian Soils Using LIBS Technique with One-Point Calibration

Luís Carlos Leva Borduchi (USP, Brazil & Embrapa Instrumentação, Brazil); Helga Maria Darezzo (Embrapa, Brazil & Laboratório Nacional de Agrofotônica, Brazil); Debora M. Bastos Pereira Milori (Embrapa, Brazil); Ladislau Martin-Neto (Embrapa Instrumentation, Brazil)

This study applies OPC-LIBS approach to quantify total C, K, Ca, Mg, Cu, Fe, and Na in Brazilian soils. A Boltzmann-based correction model was used to reduce Al interference in the C I 193.03 nm line. While matrix effects limited the correction model across different samples, OPC-LIBS using Al as an internal standard improved the accuracy (>90%) for all elements, comparable to CHNS and AAS. The results demonstrate LIBS as a fast, accurate, and environmentally sustainable alternative for large-scale multielement soil analysis.

1571171277

Theoretical Investigation of Transverse Mode Instability in Yb-DCFs Due to Thermally-Induced Modal Coupling

Elbis S Cardoso (University of Sao Paulo, Brazil); Ricardo E. Samad (IPEN/CNEN, Brazil); Claudio C. Motta (University of Sao Paulo, Brazil)

This paper presents a theoretical investigation of the transverse mode instability (TMI) threshold in Yb-doped double-clad fibers (Yb-DCFs). The analysis is based on the semi-weak guiding approximation, applied to the LP01 and LP13 modes. The thermally-induced modal coupling is modeled using coupled differential equations, and the TMI threshold is analytically estimated as a function of the fiber core diameter. Results show that, above the critical threshold, power transfer occurs between modes, highlighting the importance of thermal and modal modeling in the design of more stable fibers for high-power applications.

1571171279

Nonlinear microscopy imaging and automated analysis allow evaluation of changes in collagen fibers in melanoma

Barbara Regina Melo Ribeiro, Fernanda Luiza Menezes and Luisa Helena Carmo Araújo (Universidade Federal de Minas Gerais, Brazil); Danielle Cristina Teles Ferreira (Centro Federal de Educação Tecnológica de Minas Gerais, Brazil); Sara Santos Bernardes and Ana Maria de Paula (Universidade Federal de Minas Gerais, Brazil)

Melanoma is the most aggressive form of skin cancer due to its high metastatic potential. Nonlinear microscopy techniques were employed to analyze human melanoma biopsies. The aim was to quantify the organization of collagen fibers and cellular segments in intratumoral (T) and non-tumoral (NT) regions. Images were analyzed using an automated software to obtain quantitative morphological parameters. Statistical models were applied to compare T and NT and achieved 88% accuracy (95% confidence interval (CI): 84%-91%). These results indicate that alterations in collagen architecture are associated with tumor progression and may serve as potential biomarkers in melanoma.

1571171335
Second Harmonic Generation of Beams with Stochastic Structures

Ricardo Rego Bordalo Correia (UFRGS, Brazil); André Luís Della Valentina and Amanda Kronhardt Fritsch (Universidade Federal do Rio Grande do Sul, Brazil); Antonio Zelaquett Khoury (Universidade Federal Fluminense, Brazil)

Second harmonic generation (SHG) was studied using Sudoku-like beams in a Fresnel lens structure. The present study utilizes a spatial phase modulator with stochastic patterns to explore azimuthal phase correlations and their impact on beam intensity distribution. Subsequently, SHG simulated results were compared to experimental distributions obtained with a femtosecond pulsed laser and nonlinear crystals. This comparison enabled the assessment of the beam's central intensity region's sensitivity to nonlinear effects. The incorporation of nonlinearity into the optical system is the objective of this work, correlating the phase patterns of the fundamental beam with the structure of the SHG beam.

1571171345
Development of a Fluorescence Imaging Platform for Greenhouse Applications

Yina Julieth Onofre (Brazilian Agricultural Research Corporation, Brazil); Vinícius G Rufino (Federal University of São Carlos, Brazil & Brazilian Agricultural Research Corporation, Brazil); Bianca Batista Barreto (Brazilian Agricultural Research Corporation, Brazil & Luiz de Queiroz College of Agriculture USP, Brazil); Tiago Santiago do Espirito Santo and Kaique Cesar Pereira (Brazilian Agricultural Research Corporation, Brazil); Gabriel Lupetti de Moura (Federal University of São Carlos (UFSCar), Brazil); Rafael Galbieri (Mato Grosso Cotton Institute, Brazil); Debora M. Bastos Pereira Milori (Embrapa, Brazil)

Fluorescence imaging is a non-destructive photonic technique that offers an alternative to traditional methods for monitoring biotic and abiotic stress in plants. We developed a fluorescence imaging-based platform for greenhouse use and tested it on 300 cotton plants divided into three groups: healthy, under water stress, and inoculated with nematodes. A preliminary classification analysis achieved accuracy above 70%, even at the pre-symptomatic stage of infected plants. These results indicate the platform's potential for acquiring fluorescence images containing stress-related information in plants, highlighting its value as a tool for plant phenotyping and precision agriculture.

1571171398
Characterizing Supermode Overlaps in Coupled Microresonators through Kerr and Thermal Dynamics

Luiz Peres and Luca O. Trinchao (University of Campinas, Brazil); Eduardo S Gonçalves (Gleb Wataghin Physics Institute, UNICAMP, Brazil); Miguel Nienstedt and Paulo F. J. de Siqueira (University of Campinas, Brazil); Nathalia B Tomazio (University of Sao Paulo, Brazil); Thiago Alegre (University of Campinas & UNICAMP, Brazil); Gustavo Wiederhecker (State University of Campinas, Brazil)

We investigate the spatial mode overlap in a photonic molecule composed of three linearly coupled silicon nitride microresonators. Due to their distinct spatial distributions, the supermodes exhibit different nonlinear interactions, which we probe experimentally using a pump-probe setup that distinguishes Kerr and thermal effects. By fitting the probe response across multiple supermode combinations, we extract the relative mode overlaps and compare them with theoretical predictions. The results show good agreement and confirm that spatial mode structure plays a key role in shaping nonlinear dynamics in coupled resonator systems.

1571171399

Laser Ablation in Liquids as a Versatile Approach for the Synthesis of Hybrid Nanoparticles with Plasmonic and Magneto-Plasmonic SERS Applications

Danielle Laskowski (Universidade Tecnológica Federal do Paraná, Brazil); Sido Feilstrecker Junior (Federal University of Technology - Paraná, Brazil); Vinicius P Anjos (Nuclear and Energy Research Institute, Brazil & University of São Paulo, Brazil); Kevin S Costa, Thiago Neves Machado, Jorge Lenz, Emilson Ribeiro Viana, Rafael Eleodoro de Góes, Wido Herwig Schreiner and Arandi G Bezerra, Jr. (Federal University of Technology - Paraná, Brazil)

The synthesis of nanomaterials with tunable optical and magnetic properties is essential for applications in nanomedicine, sensing, and bioimaging. This work explores Laser Ablation in Liquid (LASiS) as a clean and efficient method for producing hybrid nanoparticles for use as SERS (Surface-Enhanced Raman Spectroscopy) substrates. We synthesize and characterize two types of hybrid nanoparticles: metallic Au-Ag alloys and core-shell Au-Fe(oxide) structures. The study demonstrates how LASiS enables the engineering of nanomaterials with enhanced properties for electric field amplification in vibrational spectroscopy, highlighting its potential as a versatile tool for nanobiophotonics applications through a unified experimental approach.

1571171459

NSGA-II-based multi-objective optimization of neural networks for nonlinear compensation in digital coherent interconnects

Gabriel Bozelli, Ana Laura Graças, Joao Pedro Gosmin and Artur Alfe (Universidade Estadual Paulista, Brazil); Leandra I de Abreu (São Paulo State University (Unesp), Brazil); Ivan A. Aldaya (São Paulo State University, Brazil & Unesp, Brazil)

This work proposes a multi-objective optimization framework using NSGA-II to tune Multilayer Percetron (MLP)-based nonlinear equalizers for digital coherent optical systems. A 400 Gbps DP-16QAM link, compliant with the OIF 400ZR standard, was simulated over 120 km. Hyperparameters such as normalization, activation functions, and network size were optimized to balance bit error ratio (BER) and computational complexity measured in FLOPs. Results show that significant complexity reductions are achievable with minimal BER penalty. The study demonstrates the effectiveness of multi-objective approaches for MLP equalizer design, providing insights into optimal configurations suitable for practical high-speed optical interconnects under resource constraints.

1571171848

Laser-Induced Fluorescence Spectroscopy on Cotton Leaves for Early Detection of Nematode Infection

Tiago Santiago do Espirito Santo (National Laboratory of Agri-Photonics (LANAF), Embrapa Instrumentation, São Carlos, Brasil); Bianca Batista Barreto (Brazilian Agricultural Research Corporation, Brazil & Luiz de Queiroz College of Agriculture USP, Brazil); Yina Julieth Onofre (Brazilian Agricultural Research Corporation, Brazil); Vinícius G Rufino (Federal University of São Carlos, Brazil & Brazilian Agricultural Research Corporation, Brazil); Kaique Cesar Pereira (Brazilian Agricultural Research Corporation, Brazil); Otávio Rodrigues De Paula and Letícia

Piazentin Dantas (Federal University of São Carlos, Brazil); Rafael Galbieri (Mato Grosso Cotton Institute, Brazil); Debora M. Bastos Pereira Milori (Embrapa, Brazil)

This work presents the use of laser-induced fluorescence spectroscopy (LIFS) and machine learning models to detect signals of nematode infection in cotton plants. The fluorescence spectrum is measured using a laser diode and a spectrometer. We trained several machine learning models and AdaBoost performed the best with accuracy of higher than 85%. The results show that the LIFS technique combined with a machine learning model can effectively differentiate healthy cotton plants from nematode-infected ones with high accuracy and precision. This indicates the great potential of the LIFS technique as an auxiliary tool for nematode detection in cotton crops.

1571172142
Pb calibration using DP-LIBS in tomato cultivation
Raphael Antonio Caface (Embrapa, Brazil); Helga Maria Darezzo (Embrapa, Brazil & Laboratório Nacional de Agrofotônica, Brazil); Arthur Lopes Marques Lara (Federal University of São Carlos, Brazil); Daniele Souza (Embrapa Instrumentação, Brazil); Debora M. Bastos Pereira Milori (Embrapa, Brazil)

Lead (Pb) contamination in food, worsened by pesticide use, is a growing global concern. Rapid identification methods for this contaminant are crucial. Laser-Induced Breakdown Spectroscopy (LIBS) is a promising tool, enabling swift spectral analysis without complex preparation. This study contaminated tomato seedlings with Pb and analyzed their leaf spectra using LIBS at 15, 30, and 45 days. A calibration curve allowed quantifying Pb in the leaves, demonstrating LIBS's effectiveness in monitoring.

1571172144
Polarization-Resolved Heterodyne Z-Scan for nonlinear refractive index discrimination using ultrafast-high-repetition laser pulses
Renato Moysés (University of São Paulo, Brazil); Lino Misoguti (USP - IFSC, Brazil)

This work presents a new technique, Polarization-Resolved Heterodyne Z-Scan (PR-HZS), which is capable of discriminating and quantifying three different nonlinear refractive indices: ultrafast nonresonant electronic, molecular orientation (or nuclear) and thermal. This technique explores laser polarization and phase delay introduced by non-instantaneous nonlinearities to separate these nonlinear effects. Femtosecond pulses at megahertz repetition rate are used to induce simultaneously these nonlinear effects in different materials. We characterized Carbon Disulfide ($CS2$), SF6 and LaSF-N30 optical glasses, and a Neutral Density Filter AND-30C-40, which are known to present more than one nonlinearity.

1571172150
Electrostatic-driven soft device with embedded optical fiber displacement sensor
Júlia C. X. de Lima and Lidia O Rosa (University of Campinas, Brazil); Audrey Sedal (McGill University, Canada); Cristiano MB Cordeiro (UNICAMP, Brazil); Eric Fujiwara (University of Campinas, Brazil)

We propose a biodegradable, flexible device made of agar hydrogel for soft manipulation tasks. The device responds to electrostatic forces and performs a contactless-driven deflection by exploring the polar nature of the agar-glycerol matrix. Furthermore, the structure integrates a concatenated multimode optical fiber probe for deformation sensing through speckle

pattern analysis. Experimental results validate a simplified Euler-Bernoulli beam modeling and reveal a linear relationship between displacement and specklegram correlation coefficient. A pilot test demonstrated the device's ability to grasp objects through symmetric movement, suggesting its suitability for applications in soft robotics and biomedical micromanipulation.

1571172356

Impact of Sampling Strategies on the Classification of micro-FTIR Hyperspectral Data

Daniella L. Peres (Instituto de Pesquisas Energéticas e Nucleares, IPEN/CNEN, Brazil & University of São Paulo, Brazil); Daniela de Fátima Teixeira da Silva (Nuclear and Energy Research Institute, Brazil); Joaquim Cezar Felipe (University of São Paulo, Brazil); Luciana Correa (University of Sao Paulo, Brazil); Leandro Luongo De Matos (Universidade de são Paulo, Brazil); Mário Olímpio de Menezes (comissão Nacional de Energia Nuclear - CNEN, Brazil); Thiago Martini Pereira, Sr. (UNIFESP & Universidade Federal da São Paulo, Brazil); Denise M Zezell (Nuclear and Energy Research Institute, IPEN-CNEN, Brazil & University of Sao Paulo, Brazil)

This study evaluated class balancing strategies for classifying oral squamous cell carcinoma (OSCC) in FTIR hyperspectral images using the XGBoost model. Although the dataset was balanced at the image level, spectral quality filtering introduced pixel-level class imbalance. Resampling methods -SMOTE, Tomek Links, and their combination -were tested, as well as AllKNN for redundancy reduction. All approaches outperformed the unbalanced baseline, but the best overall performance metrics were achieved with the combined use of AllKNN and Tomek Links.

1571172368

Automated Nutritional Diagnosis in Plants Using DP-LIBS and LIBSsa Software

Daniele Souza (Embrapa Instrumentação, Brazil); Kleydson Stenio (Radix Engineering, Brazil); Vicente S Mattos (Embrapa Instrumentation, Brazil); Luís Carlos Leva Borduchi (USP, Brazil & Embrapa Instrumentação, Brazil); Arthur Lopes Marques Lara (Federal University of São Carlos, Brazil); Aida Magalhães (Agrorobótica, Brazil); Debora M. Bastos Pereira Milori (Embrapa, Brazil)

Laser Induced Breakdown Spectroscopy (LIBS) presents advantages such as rapid analysis and low cost per sample when compared to traditional methods like ICP-OES. This study explores the application of double-pulse LIBS combined with the LIBSsa software for automated analysis of macro and micronutrients in plant material. The models developed achieved R^2 values above 0.78 for Ca, Cu, Mn, and Fe, confirming the technique's potential for agricultural diagnostics. The automation provided by LIBSsa enabled fast and accurate data processing, supporting the use of LIBS for assessing plant nutritional composition and enhancing its applicability in agricultural and environmental research.

1571172396

Integrating LIBS and Machine Learning to Identify Aphelenchoides besseyi Infection in Asymptomatic Soybean Leaves

Luís Carlos Leva Borduchi (USP, Brazil & Embrapa Instrumentação, Brazil); Helga Maria Darezzo (Embrapa, Brazil & Laboratório Nacional de Agrofotônica, Brazil); Daniele Souza (Embrapa Instrumentação, Brazil); Debora M. Bastos Pereira Milori (Embrapa, Brazil)

This study evaluated the use of Double Pulse Laser-Induced Breakdown Spectroscopy (DP-LIBS) combined with machine learning to detect asymptomatic soybean leaves infected by

Aphelenchoides besseyi, the causal agent of Green Stem and Foliar Retention Syndrome (GSFR). Spectral lines corresponding to macro- and micronutrients were selected as input features for classification models. The Support Vector Machine achieved 95.7% accuracy, while the Multilayer Perceptron reached 92.9%. The enhanced sensitivity of DP-LIBS allowed detection of additional micronutrient signals, enhancing classification accuracy. Results demonstrate the potential of LIBS as a rapid, non-destructive diagnostic tool for early disease detection in precision agriculture.

1571172407

Influence of the Electrode Size in the Design of Polymer-based Phase Electro-Optic Modulators

Carlos Alvarado (Universidade Tecnológica Federal do Paraná (UTFPR), Brazil); Marcos A. R. Franco (Instituto de Estudos Avançados, CTA, Brazil); Paulo de Tarso Neves, Jr. and Alexandre Pohl (Federal University of Technology - Parana (UTFPR), Brazil)

This work presents an optimization approach for polymer-based electro-optic phase modulators, focusing on the role of the upper electrode width for improving the trade-off between the overlap integral factor and the half-wave modulation voltage. These two parameters are inversely related and are critical for the modulation performance. In contrast to previous studies that adjusted these parameters individually, we optimized the geometry of the upper electrode, waveguide rib, substrate and claddings simultaneously to achieve a high modulation efficiency. The results provide design guidelines for optimizing modulation efficiency in electro-optic polymer modulators.

1571172409

Fluorescence Image Processing and Machine Learning Models for Early Detection of Water Stress

Vinícius G Rufino (Federal University of São Carlos, Brazil & Brazilian Agricultural Research Corporation, Brazil); Bianca Batista Barreto (Brazilian Agricultural Research Corporation, Brazil & Luiz de Queiroz College of Agriculture USP, Brazil); Yina Julieth Onofre and Tiago Santiago do Espirito Santo (Brazilian Agricultural Research Corporation, Brazil); Letícia Piazentin Dantas and Otávio Rodrigues De Paula (Federal University of São Carlos, Brazil); Debora M. Bastos Pereira Milori (Embrapa, Brazil)

This study evaluates the use of fluorescence imaging combined with machine learning models for the early detection of water stress in cotton plants. Fluorescence images of UV-excited leaves were used to extract color and texture features, which were then analyzed using different machine learning algorithms. The Discriminant Analysis model achieved an overall accuracy of 0.86. Remarkably, water stress was detected with high accuracy (up to 0.96) even before visual symptoms appeared. These results highlight the potential of this technique as a robust and non-invasive tool for early stress detection in plants.

1571172414

Stimulated Brillouin Scattering Fiber Ring Laser Synthesizing 10.9 GHz Low-Noise Microwave Continuous Wave Signal

Marlon Medeiros Correia (Unicamp, Brazil); Tomas P V Andrade (UNICAMP, Brazil); Flavio Cruz (Unicamp, Brazil)

We experimentally demonstrate a stimulated Brillouin scattering fiber ring laser (SBS-FRL) in which an amplified acetylene-stabilized continuous-wave laser (1542.384-nm) works as a pump while strong nonlinear optical distributed gain for the back-reflected wave is provided by 24-m polarization-maintaining-fiber in a ring optical cavity. A 1542.470-nm continuous wave laser with 81.9-kHz linewidth was generated by stimulated backward Brillouin scattering. A low-phase-noise X-band microwave signal at 10.9-GHz with a signal-to-noise ratio of 53-dB, is generated by optical heterodyne beating on photodiode. Our results show that such SBS-FRL has great potential in applications such as radar, radio-over-fiber, optical sensing and satellite communications.

1571172415
Low-cost driver for pulsed blue laser diode systems for telangiectasias treatment
Alfredo Hernández Mendoza (Instituto Politécnico Nacional, Mexico & UPIIH, Mexico); Josue Daniel Rivera Fernandez (Instituto Politécnico Nacional, Mexico); Karen Roa Tort, Macaria Hernández Chávez and Diego Adrián Fabila Bustos (Instituto Politecnico Nacional, Mexico)

This work presents the design and implementation of a low-cost driver for controlling a blue laser diode in pulsed mode, intents primarily for treating superficial vascular lesions such as telangiectasias. The system features a microcontroller-based pulse generation unit, power modulation, and active thermoelectric cooling to ensure diode safety and operational stability. Its modular design enables configuration of pulse width, frequency and pulse intensity, allowing it to be scalable to other biomedical laser applications. The proposed driver emphasizes affordability, energy efficiency, and adaptability for clinical and research environments.

1571172420
A Modular Open-Source Platform for Laboratory Automation in Spectroscopic Applications
Julio Gallinaro Maranho (Universidade Federal Do ABC, Brazil); Patricia Aparecida Ana (UFABC, Brazil)

Automation in laboratory spectroscopy is still limited by the high cost and restrictive nature of proprietary systems. This work presents a modular, open-source platform designed to enable affordable, scalable, and reproducible spectroscopy experiments. The system integrates a modified computer numerical controlled (CNC) milling machine with interchangeable 3D-printed sensing heads, supporting standard microplate formats for spectroscopic measurements. The hardware is controlled through a Python library that manages motion control, data acquisition, and automated workflows. Validation experiments on LED emission spectra characterization and fluorescence analysis of fluorescein and rhodamine B demonstrate the platform's versatility.

1571172488
EasyBrainGen: An Easy-To-Use Automated Workflow for Generating 3D Brain Models from MRI Based on FastSurfer
Eduardo Ignacio Castellón Castillo (Instituto Politécnico Nacional, Mexico); Diego Adrián Fabila Bustos (Instituto Politecnico Nacional, Mexico); Rodrigo Mercado Pimentel (Unidad de

Movimientos Anormales y Enfermedades Neurodegenerativas, Mexico); Macaria Hernández Chávez (Instituto Politecnico Nacional, Mexico)

The generation of accurate 3D brain models from medical imaging sources, such as Magnetic Resonance Imaging (MRI) scans, is essential for medical visualization, surgical simulation and educational purposes. However, most existing tools often require significant expertise in medical image processing and command-line environments, therefore, this work presents EasyBrainGen, an automated and easy-to-use web-based workflow that transforms MRI images into anatomically precise 3D Brain Models via FastSurfer Deep Learning Convolutional Neural Network (CNN) without any technical configuration and lowering the barriers for researchers, clinicians and educators.

1571172726

Direct laser writing of binary Fresnel Zone Plates for low-cost Shack-Hartmann wavefront sensors

Jacilene Martins Medeiros (UNICAMP, Brazil); Antonio Zuben (University of Campinas, Brazil); Renato Goulart Jasinevicius (University of Sao Paulo (USP), Brazil); Luis Barêa (UFSCar, Brazil); Arlindo Montagnoli (Federal University of São Carlos, Brazil); José Alexandre Diniz (University of Campinas (UNICAMP), Brazil); Giuseppe Cirino (UFSCAR, Brazil)

This paper presents the design, fabrication, and characterization of a low-cost Fresnel Zone Plate (FZP) array using direct laser writing lithography. The proposed structure act as a microlens array for Shack-Hartmann (SH) wavefront sensors, enabling precise phase modulation through binary microreliefs. The fabrication process eliminates the need for photomasks and complex alignment, significantly reducing fabrication costs. Optical microscopy, profilometry, and optical characterization results show that that the fabricated array exhibit well-defined zones and efficient light focusing. The results validate the viability of this low-cost, scalable approach for wavefront sensing applications.

1571172744

Dissipative Optical Sensor based on a Photonic Molecule with a U-Shaped Feedback Waveguide

Laila P El Haddad (Universidade Federal de São Carlos, Brazil); Luis Barêa (UFSCar, Brazil)

This paper proposes a compact, complementary metal-oxide-semiconductor (CMOS)-compatible architecture for integrated optical sensors based on Photonic Molecules (PMs) operating at a fixed wavelength. The device is implemented on a silicon-on-insulator (SOI) platform and integrates a PM coupled to a U-shaped feedback waveguide. This approach enables dissipative without the need for spectral scanning, relying on detecting variations in the extinction ratio (ER) at a fixed wavelength, as demonstrated by simulations that achieved a sensitivity of up to 195 dB/RIU.

1571172751

Structural and Spectroscopic Properties of Nd doped YAG microsize Single Crystals

Tomaz Catunda (IFSC-USP, Brazil); Antonio Ricardo Zanatta (Sao Carlos Institute of Physics, Brazil); Thiago Augusto Lodi, Sr (Sao Paulo State University (UNESP), Brazil & UNESP, Brazil); Leonardo Albino (UNESP, Brazil); Marcelo Nalin (São Paulo State University, Brazil).

Micro size single crystals of Nd3+ doped YAG were obtained v regulated cooling of supersaturated glass solutions. In this work we investigate the Raman and optical spectroscopic properties of these micro-crystals. Most of the measurements were obtaining

selecting a single micro-crystal using microscope. All results indicated nearly identical properties compared to a reference bulk crystal grown by the Czochralski method.

1571172754
Non-Invasive Investigation of Humidity in Natural Fibers Using Specklegram Analysis

Eduardo A. V. Souza (Unicamp, Brazil); Eric Fujiwara (University of Campinas, Brazil); Cristiano MB Cordeiro (UNICAMP, Brazil); Tales De Vargas Lisbôa and Axel Spickenheuer (Tailored Lightweight Composites IPF, Germany)

This work introduces a non-invasive method to monitor moisture dynamics in natural fiber textiles using specklegram analysis. A flax cloth is illuminated with a 633 nm He-Ne laser, and speckle patterns are captured by a lensless CCD camera. Temporal changes are analyzed using Zero-Mean Normalized Cross-Correlation (ZNCC), and the decay is modeled exponentially to extract a characteristic time constant τ. Results show τ increases with drying time and depends on the initial water content. The technique is low-cost, non-destructive, and sensitive, making it suitable for real-time monitoring of natural fiber behavior in composite material applications.

1571172758
Influence of Silicon Substrate Type and HF Concentration on the Optical and Morphological Properties of Porous Silicon Microcavities

Ana Carolina Bueno Borges (Universidade de Sao Paulo, Brazil); Abel Apaza Quispe (Universidad de Sao Paulo, Brazil); Nelson Alejandro Cortes, Stephany Da Costa Torres and Andrea Balan (University of São Paulo, Brazil); Walter Jaimes Salcedo (Universidade de Sao Paulo, Brazil)

This work presents the structural and optical analysis of porous silicon microcavities fabricated with different silicon types (P++, N++, N+), resistivities, and HF: ethanol concentrations. Layer thicknesses were measured by scanning electron microscopy and used to adjust effective refractive indices through optical simulations, showing good agreement. Lower HF concentrations produced larger pores, affecting porosity and refractive index. Substrate doping influenced corrosion rate, layer thickness, and resonance peak position. P++ substrates generated pores <10 nm, while N++ and N+ yielded pores of 16-24.8 nm. The results highlight the relevance of anodization control for tailoring optical properties in biosensing applications.

1571172762
Evaluation of ALA-Mediated Sonodynamic, Photodynamic, and Sonophotodynamic Therapies in Early-Stage Murine Melanoma

Erika Toneth Ponce Ayala (University of Sao Paulo, Brazil); Layla Pires (Texas A&M University, USA); Sebastião Pratavieira (University of Sao Paulo, Brazil); Camila Aparecida Antunes (University of São Paulo, Brazil); Michelle Barreto Requena (Texa A&M University, USA); Vanderlei Salvador Bagnato (Texas A&M University, USA)

Cutaneous melanoma is an aggressive form of skin cancer. This study evaluates 5-aminolevulinic acid (ALA)-mediated photodynamic (PDT), sonodynamic (SDT), and sonophotodynamic (SPDT) therapies in a murine model of early-stage melanoma, using a conical waveguide for ultrasound delivery. Tumor growth was monitored by high-resolution ultrasound imaging, and tumors were later excised for histological analysis (H&E and Ki67). SDT achieved the greatest tumor growth inhibition (87±11%), while SPDT (79±18%) showed no additional benefit over SDT alone. These results underscore the potential of ALA-mediated SDT

for melanoma treatment and demonstrate the effectiveness of the waveguide in focusing ultrasound energy on small regions.

1571172784
Statistical Analysis of the Experimental Reconstruction of Photon Distribution for Attenuated Lasers

Bruno Santos de Souza (UFSCar, Brazil); Franciele Renata Henrique and Tiago Bonicelli Gambarotto (Federal University of São Carlos, Brazil); Marcio Daldin Teodoro (UFSCar, Brazil); Paulo H. D. Ferreira (Federal University of Sao Carlos, Brazil); Filippo Giovanni Ghiglieno (Universidade Federal de São Carlos, Brazil); Celso J Villas Boas (Federal University of São Carlos, Brazil)

The photon statistics of a strongly attenuated continuous-wave laser (1550 nm), characterized by an Avalanche Photodiode operating in Geiger mode, was reconstructed with the aid of an iterative Maximum Likelihood Estimation model and without photon counting. Statistical analysis of the reconstructed distribution was performed to determine the algorithm convergence criteria. Parameters such as reconstruction error, Fischer Dispersion Index, chi-square, and p-value were evaluated. The photon number distribution for attenuated coherent sources was successfully reconstructed according to the defined convergence criteria.

1571172785
High-SSIM Reconstruction of Computer-Generated Off-Axis Holograms Using Neural Networks

Felipe Maia Prado (University of São Paulo, Brazil); Sidney Leal da Silva (Faculdade de Tecnologia de Itaquera, Brazil); Niklaus Wetter (Instituto de Pesquisas Energéticas e Nucleares, Brazil)

This work presents a computational routine for generating off-axis holograms and training a neural network to reconstruct their corresponding amplitude images. We simulate holograms from the MNIST and Fashion-MNIST datasets using Fresnel propagation and off-axis interference. These synthetic holograms are then used to train a convolutional neural network, enabling accurate amplitude recovery from noisy holographic input. The trained model achieves high reconstruction fidelity, with a mean squared error of 2.80e-4 and structural similarity index of 0.9742 on the validation set.

1571172807
AND, OR, and XNOR Optical Logic Gates via Pixel-Wise Modulation with Spatial Light Modulators and 4f System

Felipe Maia Prado (University of São Paulo, Brazil); Sidney Leal da Silva (Faculdade de Tecnologia de Itaquera, Brazil); Niklaus Wetter (Instituto de Pesquisas Energéticas e Nucleares, Brazil)

We present a simple optical setup based on two cascaded reflective phase-only spatial light modulators in a 4f configuration to perform basic logic operations in parallel. By adjusting polarization states and encoding binary input patterns as phase masks, we implemented three logic gates (AND, OR, and XNOR) with results consistent with the expected truth tables. The modulation relies on polarizing components to allow pixel-wise control across the entire image. Experimental results show good agreement with the target amplitude distributions and expected results.

1571173799

Singlet oxygen generation by a single soot nanoparticle: a two-photon confocal microscopy quantification

Maria L F Vicente (University of São Paulo, Brazil & University of Toulon, France); Houssam Hajjoul (University of Toulon, France); Francisco Eduardo Gontijo Guimarães (University of São Paulo, Brazil)

Carbonaceous aerosol pollutants, particularly black carbon (BC) nanoparticles derived from diesel emissions, can produce reactive oxygen species (ROS), such as singlet oxygen ($1O_2$), through photodynamic activity. This study mapped $1O_2$ emission from individual diesel-derived BC nanoparticles using confocal microscopy and time-resolved fluorescence. High-resolution spectral imaging enabled the quantification of localized photochemical reactions, revealing a singlet oxygen quantum yield of approximately 7\% for single nanoparticles. The findings indicate that individual BC particles exhibit significant oxidative potential, with localized impacts that may not be detected by conventional steady-state analytical methods.

1571173964

Broadband photonic structures to achieve high coupling efficiencies and Purcell factors with dark and interlayer excitons in 2D materials

Maria Carolina França Volpato (Universidade Estadual de Campinas, Brazil & National Institute of Standards and Technology, Gaithersburg, Maryland, USA); Kalebe Estevam (Federal University of Rio Grande Do Norte, Natal, Brazil); Marcelo I. Davanco (National Institute of Standards and Technology, Gaithersburg, Maryland, USA); Pierre-Louis de Assis (State University of Campinas (Unicamp) & "Gleb Wataghin" Institute of Physics, Brazil)

We show that horizontal slot waveguides can obtain coupling efficiencies $\beta > 80\%$ and Purcell factors $F_p > 10$ for dark intralayer excitons monolayers as well as interlayer excitons in TMD heterostructures.

POSTERS

Monday 22

Poster Session 1

Biophotonics

Poster number	Manuscript number	Title	Authors
1	1571172790	Thermal Analysis of Skin-Mimicking Phantoms Under Low Intensity Laser	**Julia Cristina da Silva Oliveira**; Murilo S Sampaio; Kaio Bernardo Barros; Carlos Eduardo Girasol; Luciano Bachmann; Luismar Barbosa da Cruz, Jr
2	1571171409	Ex Vivo Thermal Response of Artificially Pigmented Porcine Skin under Photobiomodulation Protocols	**Isabel Cristina Tinós**; Macsiel Nunes Lima Neves; Julia Cristina da Silva Oliveira; Lilian Tan Moriyama; Luismar Barbosa da Cruz, Jr; Marlon Rodrigues Garcia
3	1571172737	Curcumin and Berberine-Functionalized Selenium Nanoparticles: Synthesis, Characterization, and Biomedical Applications	**Geovanna N Barnabé**; Isabela Lopes; Marcia Franzolin; Bianca Moraes; Susana Barreto; Lilia Coronato Courrol
4	1571170773	Development of a Compact LED Driver and Python-Based Graphical Control Interface for Lens-Free Holographic Microscopy	**Marlon Rodrigues Garcia**; Camila de Paula D'almeida; Cesar Yudi Kuramoto; Felipe Alvarenga Carvalho; Sebastião Pratavieira
5	1571169042	Optics in Pulse Oximetry: Correlation with Oxygen Saturation Accuracy	**Kaio Bernardo Barros**; Jocássia Silva Pinheiro; Murilo S Sampaio; Luismar B. Cruz Junior; Fernando Fagundes Ferreira; Anibal Basile-Filho; Rinaldo Guirro; Luciano Bachmann
6	1571172429	Spatial Dependence of OCT-Based Measurements of Stratum Corneum Thickness and External Ridge Width on Human Digital Core	**Macsiel Nunes Lima Neves**; Luismar Barbosa da Cruz, Jr; Sebastião Pratavieira; Marlon Rodrigues Garcia
7	1571171799	Identifying Inflammatory Signatures in Heart Tissue via FTIR and Linear Discriminant Mapping	**Raffaele Stasi**; Daniela De Fátima Teixeira Da Silva; Vinicius P Anjos; Emiliano Medei; Denise M Zezell
8	1571172759	Artificial Intelligence-	**Deyanira Lopez Salazar**; Josue

		Based System for the Diagnosis of Hepatic Steatosis	Daniel Rivera Fernandez; Macaria Hernández Chávez; Carolina Guzmán Arriaga; Karen Roa Tort; Diego Adrián Fabila Bustos
9	1571172753	UVC decontamination of circulating preservation solution aimed at kidney transplantation improvement	**Loraine Carolina Goenaga Mafud**; Jose D Vollet Filho; Natalia Inada; Cristina Kurachi; Vanderlei Bagnato
10	1571172428	Prototype of a hybrid biosignal acquisition system integrating and optical electrode and fNIRS-based oximeter	**Amish Jocksan J Sierra islas**, Sr; Josue Daniel Rivera Fernandez; Luis Felipe de Jesus Hernandez Quintanar
11	1571171418	FTIR spectroscopy reveals systemic changes in apical periodontitis	**Giovana dos Santos Toledo**; Sara Maria Santos Dias da Silva; Paula Marinho; Maryane Rezende; Rayana Khoury; Luis Felipe Chagas e Silva de Carvalho
12	1571164969	Alveolar bone imaging with optical coherence tomography plus optical clearing agents: a pilot study for osteoporosis diagnosis	**Marcos Humberto Santos**; Marcella D. Zatta; Patricia Aparecida Ana
13	1571155519	Effects of GABA-Synthesized AgCuNPs and SeNPs on Sunflower Seed Development	Isabela Lopes; Charef Kazi Tani; Christophe Couteau; Lilia Coronato Courrol
14	1571172459	Crosslinking of gelatin films with Riboflavin and ultraviolet radiation: a pilot study	**Patrícia da Silva Souza**; Sonia Maria Malmonge; Nasser Ali Daghastanli; Patricia Aparecida Ana
15	1571169724	Radiative Transport Phenomenon in Turbid Media	**Bruno Henrique Garcia Malvestio**; Murilo S Sampaio; Luciano Bachmann
16	1571165699	Salivary ATR-FTIR Signatures for Obstructive Sleep Apnea: A Qualitative Review of Biomarkers and Methodological Validation	**Valeria Mendes**; Vinicius P Anjos; Daniela de Fátima Teixeira da Silva; Denise M Zezell
17	1571171250	Diagnostic potential of FTIR spectroscopy in saliva: challenges in group differentiation	**Sara Maria Santos Dias da Silva**; Giovana dos Santos Toledo; Sara J Michalopoulos; Julia Nani Bittencourt Gouvea; Thiago Martini Pereira, Sr.; Luis Felipe Chagas e Silva de Carvalho
18	1571172800	UV-C Light	**Loraine Carolina Goenaga Mafud**;

		Decontamination System Integrated with Organ Perfusion Machine for Transplantation	Jose D Vollet Filho; Daniel J Chianfrone; Washington L Coimbra; Natalia Inada; Cristina Kurachi; Vanderlei Bagnato
19	1571172748	Evaluation of Optical Clearing Agents and Mechanical Compression on Light Penetration in Skin Using Optical Coherence Tomography	**Jailda Nonato Dos Santos Oliveir**a; Camila Ramos Silva; Marcus Paulo Raele; Marcos Antonio Hortellani; Martha Ribeiro; Denise M Zezell; Marcello Magri Amaral

Agri-Photonics

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20	1571169843	Plant Stress Detection Using Photonic Techniques and Machine Learning	**Bianca Batista Barreto**; Letícia Piazentin Dantas; Otávio Rodrigues De Paula; Vinícius G Rufino; Francisco Aparecido Rodrigues; Debora M. Bastos Pereira Milori
21	1571172782	Label-Free Detection of Nitrate and Reactive Species in Plasma-Activated Water Using SERS on Gold Thin Films	**Isabela Machado Horta**; Nilton Francelosi Azevedo Neto; Felipe De Souza Miranda; Rodrigo Sávio Pessoa
22	1571172667	Change of Ligth Absorption and Scattering Due to Interactions Between Nanoparticles in Black Carbon Clusters	**Ana F Gomes**; Maria L F Vicente; Francisco Eduardo Gontijo Guimarães
23	1571169018	Laser-Induced Breakdown Spectroscopy and Chemometric Tools for Soil Fertility Classification and Carbon Calibration	**Andre T Maoze**, Sr; Gustavo Pontes; Alessandra de Souza Teixeira; Arcangelo Loss; Bruno Marangoni; Gustavo Nicolodelli
24	1571165432	Laser Induced Breakdown Spectroscopy for evaluation of nutrients and adulterants in roasted and ground coffee	**Alessandra de Souza Teixeira**; Gustavo Pontes; Ricardo Schneider; Cleverson Busso; Otniel Freitas Silva; Andressa Moreira De Souza; Gustavo Nicolodelli
25	1571172710	Dronissil: Universal device for attachment to drones, unmanned aerial vehicles, and flying robots for autonomous operations of pest insect detection, identification, and	**Aline Bastos de Paiva**; Leomar S. Marques; Ariel Porto Da Silva; Bruno Carvalho Magalhães; Edgar Marques Paioleti Oliveira; Gabriela De Castro Lourenço; João Vitor Da Silva Santos; Júlia Mazoni

		elimination in crops	Lopes; Nathan Bernardini De Loyolla; Nycolas Borges Da Silva; Lilian Ferreira De Sousa; Bruno Henrique Sardinha De Souza; Jefferson Tsuchida; Joaquim Paulo Da Silva; Joyce Dória; Tatiana Cardoso E Bufalo
26	1571172786	Applications of optical techniques for food quality analysis: milk, cheese and coffee	**Maria Jose Valenzuela Bel**l; Virgílio De Carvalho Dos Anjos
27	1571172397	OPC-LIBS for Quantification of Cd and Pb in Tomatoes: A Sustainable Approach to Food Safety Monitoring	**Luís Carlos Leva Borduchi**; Helga Maria Darezzo; Debora M. Bastos Pereira Milori
28	1571172661	Early Discrimination of Plant Stress Responses Using Laser-Induced Fluorescence Spectroscopy: A Case Study in Cotton	**Bianca Batista Barreto**; Vinícius G Rufino; Letícia Piazentin Dantas; Tiago Santiago do Espirito Santo; Yina Julieth Onofre; Rafael Galbieri; Debora M. Bastos Pereira Milori
29	1571172122	Carbon K-edge XANES Reveals Functional Chemistry Driving Soil Carbon Sequestration in Well-Managed Pasture	**Lucas Raimundo Bento**; Vitor Silveira Freitas; Steffen A. Schweizer; Patrícia P. A. Oliveira; José Pezzopane; Alberto C. De C. Bernardi; Debora M. Bastos Pereira Milori; Ladislau Martin-Neto
30	1571166542	Formation and Growth of Silver Nanoparticles: Effects of Light Intensity and Reaction Time in a Bio-Based Synthesis Using Açaí Seed Extract	**Lilia Coronato Courrol**; Thaina De Sousa
31	1571170601	Predicting Soil Carbon with NIRS in Brazilian soils	**Vitor Silveira Freitas;** Lucas Raimundo Bento; Daniele Souza; Vicente S Mattos; Debora M. Bastos Pereira Milori; Ladislau Martin-Neto
32	1571166739	Comparison of Soil Samples with Different Clay, Sand, and Silt Contents Using Speckle Interferometry	**Felipe Maia Prado**; Gustavo Di Chiacchio Faulin; Luis Eduardo Rissato Zamariolli; Pedro Henrique Miho de Souza; Niklaus Wetter; Sidney Leal da Silva
33	1571170739	Numerical Design of a Photonic Crystal Hydrogel Humidity Sensor for Agricultural Applications	**Licinius Dimitri Sá de Alcantara**

Sensors, Images and Illumination

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34	1571172718	Agar Optical Fibers Prepared by Dip Coating: Optical Characterization and Degradation Analysis	**Lidia O Rosa**; Francisco X. R. Neto; Eric Fujiwara; Cristiano MB Cordeiro
35	1571165709	Development of a Low-Cost Fabrication Process for PIN Photodiode Detectors	**Luis da Silva Zambom**; Ronaldo D Mansano; Henrique Chaves Gulino
36	1571171261	Distributed Acoustic Sensing and Convolution Neural Networks for Leak Detection in Low-Pressure Gas Pipelines	**Rodolfo Pinheiro Cruz**; Felipe Maia; Sérgio Barcelos; Luis E. Ynoquio Herrera; Ana M. Frattini Fileti
37	1571172121	Improving Light Shelf Performance by the Optimization of Tilt Angle	**Beatriz Miranda Viana**; Daniela Pawelski Amaro Marins; Maria José Pontes; José Leandro Félix Salles; Jussara Fardin; Marcelo E. Vieira Segatto; Helder Rocha
38	1571172766	Characterization of fiber bundles applied to visual inspection systems	**Mariana Chagas Alcantara dos Santos**; Bianca Yoshii; Jessica Guerreiro Santos Ramalho; Antônio Ivan Messias Soares Júnior; Valeria L da Silva
39	1571162332	Synthesis and characterization of rare-earth garnets for scintillators applications	**Breno C Siqueira**; Thiago Augusto Lodi, Sr; Leonardo Albino; Marcelo Nalin
40	1571161365	Performance Evaluation of FBG Array Sensors in Underground Power Distribution Lines	**Rivael S Penze**; Fabio R Bassan; Marvyn Inga; Joao B Rosolem

Lasers

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42	1571169925	Simulating Kramers Escape Dynamics under	**Gunther Damaceno Barbosa**; Antonio A. R. Neves

		Forces in the Geometrical Optics Regime	
43	1571165692	Optical characterization of laser beams for the design of a laser deposition head with variable optics	**Bethina V Nicocelli**; Guilherme De Faveri; Joao B Rosolem; Luís Trabasso; Moisés Felipe Teixeira; Natalia Wendt Dreveck
44	1571169853	Fabrication and Characterization of an All-fiber 3 × 1 Pump Combiner	**Thassia Lopes Correia dos Santos**; Davi Pontes Nacaratti; Mauricio Moderno Carvalho; Claudio C. Motta; Thoroh Souza
45	1571170844	Fabrication and Characterization of a 7x1 End-Pumped Fiber Combiner	**Davi Pontes Nacaratti**; Thassia Lopes Correia dos Santos; Mauricio Moderno Carvalho; Thoroh Souza; Claudio C. Motta
46	1571172711	Enhancing Surface Finish of Additive Manufactured 316L Stainless Steel via Laser Surface Remelting	**Rener Washington Mariano dos Santos**; Lucas Da Silva Jubini; Jonas Jakutis; Rafael Humberto Mota De Siqueira; Ana Beatriz Ramos Moreira Abrahão

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Poster Session 2

Integrated Photonics and Optoelectronic

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2	1571172319	Impact of Atomic Layer Deposited Al_2O_3 on the Dielectric Modulation and Optical Behavior of Plasmonic Silver Nanowire Networks	**Isabela Machado Horta**; Nilton Francelosi Azevedo Neto; Claudio Zepeda; Rodrigo Sávio Pessoa
3	1571171390	Ultrafast Terahertz Dynamics of Ti3C2Tx MXene	**Davi H. Soledade**; Giovanni Budroni, Nt; Daniel Corrêa; Jonathas Siqueira
4	1571172747	Epoxy with silver nanoparticles: a simple and cheap method for in situ synthesis	**Isabella D'andrea Lana da Silva**; Paulo H. D. Ferreira; Filippo Giovanni Ghiglieno; Vinicius Tribuzi Rodrigues Pinheiro Gomes
5	1571171463	Investigation of the optical properties of Er3+-doped fluorindate glasses	**Adriano Alemida da Silva**; Tomaz Catunda; Francisco Eroni Paz Eroni; Nefe Jefferson De Brito E Silva
6	1571171211	Effect of Ag-doping on the photoluminescence of nanostructered ZnS material	**Ana Laura Curcio;** Thiago Ardana Chaim; Maria Inês Basso Bernardi; Fábio S. De Vicente; Adriano J. G. Otuka; Alexandre Mesquita
7	1571171249	Red shift in photoluminescence emissions of ZnO nanoparticles with Mg incorporation	**Thiago Ardana Chaim**; Maria Inês Basso Bernardi; Fábio S. De Vicente; Adriano J. G. Otuka; Alexandre Mesquita
8	1571156210	Material Surface Analysis based on SD-OCT	**Vítor José Costa Rodrigues**; Emmanuel Leite De Medeiros; Tiago Henrique Brandao; José Mariano Lima Garcia; Fábio D. Simões; Daniel M Pataca
9	1571168142	Self-Assembly of Monodisperse	Paloma Elias da Silva Pellegrini, Renata C. Nome, Francisco

		Polystyrene Photonic Crystals via Blade Coating	Orlandini, Silvia V. G. Nista, Hugo E. H. Figueroa, Stanislav Moshkalev
10	1571171326	Fluorescence Properties of Graphene Quantum Dots embedded in GPTS/TEOS-derived Organic/Silica Sol	**Thiago Ardana Chaim**; Fábio S. De Vicente; Adriano J. G. Otuka; Alexandre Mesquita
11	1571171088	Characterization of group velocity dispersion in fiber-based Mach-Zehnder interferometers	**Gustavo Nunes Martins**; Lucas G Woiblet; André G Primo; Gustavo Wiederhecker; Thiago Alegre
12	1571172755	The refractive index of ion doped laser materials	**Davi S Oliveira**; Tomaz Catunda
13	1571173949	Photoluminescence of CaTiO3: Pr nanophosphor prepared by the polymeric precursosr method	**Melina Grandis**; Thiago Ardana Chaim; Adriano J. G. Otuka; Fábio S. De Vicente; Alexandre Mesquita
14	1571172749	Multiplex SERS Detection of Cationic Dyes Using Thin Silver Films Deposited by Magnetron Sputtering	**Nilton Francelosi Azevedo Neto**; Isabela Machado Horta; Jade Helena Campos Augstroze; Rodrigo Sávio Pessoa
15	1571172732	Two-Photon Polymerization of Fe2O3/Resin Nanocomposites for Magneto-Responsive Microstructures	**Daniel da Cruz Soares**; José Luis Clabel Huaman; Cleber R. Mendonca
16	1571172419	MoS_2-doped polymeric microstructures fabricated by two-photon polymerization	**Gabriel O Campos**; Vinícius Pereira Pinto; Kelly T. de Paula; Cleber R. Mendonca
17	1571167190	Photoinduced Effects in As_2S_3 and As_2Se_3 Thin Films by Femtosecond Excitation	**Orlando D Marbello Ospina**; Lino Misoguti; Nikita S Dutta; Craig B Arnold; Cleber R. Mendonca
18	1571168663	Dependence of amplitude and shape of the Z-scan curve on the detection aperture	**Lucius Borges de Souza**; Paulo C de Oliveira; Renato A Cruz; Tomaz Catunda

Optical Communication

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19	1571172713	Orthogonal Chirp Division Multiplexing for High-Speed Terahertz Wireless Systems	**Anderson Sanches**; Glecia Oliveira Pereira; Daniel M. C. Neves; Rafael Nobrega; Shyqyri Haxha; Antonio Jurado-Navas; Thiago R Raddo
20	1571171264	Experimental Analysis of a L-Band High-Concentration EDFA Performance Under Forward and Bidirectional Pumping	**Marcionilo José da Silva**; Marcelo Pereira Nogueira; Luis Gustavo Maciel Riveros; Tiago Sutili; Rafael C. Figueiredo
21	1571169912	Inferring Structured Beam Wavefront in Turbulent Free-Space Channel via Deep Learning	**Paulo Monteiro de Carvalho Monson**; Adriane Martins Alves; Antônio Pereira Junior; Yasmin Da Silva Bonfim; Marcos Gil De Oliveira; Cássio de Castro Silva; Christiano Moreira De Sá Do Nascimento; Braian Pinheiro da Silva; Valeria L da Silva
22	1571171209	Margin Analysis for QoT Estimation Using Analytical Network Digital Twins	**Marcos Antonio de Almeida Cora**; Jonathan Aguiar Soares; Darli Mello
23	1571165308	Analysis of the Influence of Different High-Power Laser Sources in a Raman-Amplified Radio and Power-over-Fiber Link	**Paulo Kiohara**; Romildo De Souza; Laura Ghisa; Veronique Quintard; Mikael Guegan; Arismar Cerqueira Sodré Junior; Olympio Coutinho; André Pérennou
24	1571171256	Performance Evaluation of Optical Short-Reach Links Without Blind Phase Search Algorithm Employing Narrow-Linewidth Lasers	**Júlia Aline Sousa Maciel**; Eduardo Rosa; Tiago Sutili; Rafael C. Figueiredo; Edson Porto da Silva
25	1571168938	Self-Homodyne 'Coherent-Lite' Technique for Optical DWDM Communication Systems	**Mateus Souza Coelho**; Pablo Rafael Neves Marciano; Maxwell E. Monteiro; Maria Jose Pontes; Jair Adriano Lima Silva; Marcelo E. Vieira Segatto
26	1571165419	Assessment of a Hybrid RoF-MWP Architecture over Free-Space Optical Links	**Frederico Francisco de Paula Campos**; Arismar Cerqueira Sodré Junior; Celso Henrique

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27	1571169022	Unsupervised Regression for Nonlinear Equalization in Coherent Optical Interconnects	**Ana Laura Graças**; Gabriel Bozelli; Joao Pedro Gosmin; Artur Alfe; Leandra I de Abreu; Ivan A. Aldaya
28	1571169886	T-Shaped Microstrip Patch Antenna Design with Defected Ground Structure for Radio Frequency identification (RFID) and Modern Wireless Communications	**Maryam Liaqat**; Ali Raza; Matheus Henrique Barros da Silva; Ghulam Nabi; Maklayne Barros De Pontes Santiago; Frederico Nunes; Antonino Celso Dantas Antonino

Photonics and Quantum Technologies

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29	1571171695	Implementation of a Fiber-Based Quantum Key Distribution (QKD) Testbed Using Attenuated Laser Pulses	**Bruno Santos de Souza**; Franciele Renata Henrique; Marcio Daldin Teodoro; Celso J Villas Boas; Filippo Giovanni Ghiglieno; Paulo H. D. Ferreira

Optics and Instrumentation

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30	1571171187	Holographic optical tweezers using structured light beams	**Marcos R. R. Gesualdi**; Rafael A. Bonilla Suarez
31	1571152849	Spectroscopic Characterization of Indigenous Pigments from the Museum of Archaeology and Ethnology at UFPR	**Bruna M Gohl**; Carla Damasceno Feliciano; Evaldo Ribeiro; Sady Pereira Do Carmo Júnior; Emerson Cristiano Barbano
32	1571165051	Investigating Nonlinear Solvatochromism in Perylene	**Artur Barbedo**; André Pelosi; João Victor Pereira Valverde; Orlando D Marbello Ospina; Leonardo de Boni; Cleber R. Mendonca
33	1571165052	First-Order Hyperpolarizability of bromochalcone derivatives	**Nathan Bárbola Marucci**; João Victor Pereira Valverde; Eli Ducas; Pablo Gonçalves; Leonardo de Boni; Cleber R. Mendonca
34	1571168607	A Methodological	**Vicente S Mattos**; Jarbas de Castro Neto

		Approach to Dental Tissue Analysis Using Raman Spectroscopy: Development and Clinical Insights	
35	1571171127	Evaluation of Fine-tuning EfficientNet and Vision Transformer model architectures for Oral Lesion Classification	**Akio Kenzo T Frazatto**; Ana Carolina F Motta; Ana Elisa R Alves Ribeiro; Renato Tinós; Luciano Bachmann
36	1571172628	Cost-Effective AI-Driven Integrated Photonics for Spectroscopic Analysis in Biofuels	**Pedro Oliveira Mariz de Carvalho**; Guilherme Luiz Chinini; Alex Dante; Luis E. Ynoquio Herrera; Sérgio Barcelos
37	1571171196	Turbulence effects in optical vortex: experimental generation and analysis via holographic techniques	**Marcos R. R. Gesualdi**; George Reis
38	1571171431	Optical Monitoring of Antioxidant Degradation in Oil-Based Systems	**Iuliia Riabenko**; Jeff Manthorpe; Ronald Miller
39	1571171871	Impact of Manual Agitation on FTIR Spectroscopic Characterization of Trichloroacetic Acid (TCA) Peels	**Sara J Michalopoulos**; Luis Feilipe Carvalho; Sheila C Cortelli; Fernando Gonçalves Togni; Nelson Maurício Júnior; Tatiana Aguilar
40	1571153599	AI-Driven Atmospheric Turbulence Compensation and Channel Modeling in FSO Systems	**Felipe Braga Bittar**; Andrés Pablo López Barbero; Fernando Guiomar; Gil Fernandes; Paulo P Monteiro; Vinicius Nunes Henrique Silva

Poster Abstract List by Manuscript Number

1571152849

Spectroscopic Characterization of Indigenous Pigments from the Museum of Archaeology and Ethnology at UFPR

Bruna M Gohl (Universidade Federal do Paraná, Brazil); Carla Damasceno Feliciano (Universidade Federal do Pananá, Brazil); Evaldo Ribeiro and Sady Pereira Do Carmo Júnior (Universidade Federal do Paraná, Brazil); Emerson Cristiano Barbano (Universidade Federal do Parana - UFPR, Brazil)

This study explores traditional colorants used by the Xetá people, focusing on genipap and a presumed iron oxide. Using UV-Vis spectroscopy, Raman, and EDS, key spectral features and unexpected results emerged. Genipap showed water-related peaks and strong fluorescence in solid and gelatinous forms. The supposed iron oxide also fluoresced strongly and, unexpectedly, contained no iron but high levels of carbon, oxygen, and potassium-indicating a different compound. These findings highlight the need for further investigation and support efforts to preserve the Xetá's cultural heritage through documentation and understanding of their traditional materials.

1571153599

AI-Driven Atmospheric Turbulence Compensation and Channel Modeling in FSO Systems

Felipe Braga Bittar (Universidade Federal Fluminense, Brazil); Andrés Pablo López Barbero (UFF, Brazil); Fernando Guiomar and Gil Fernandes (Instituto de Telecomunicações, Portugal); Paulo P Monteiro (Universidade de Aveiro & Instituto de Telecomunicações, Portugal); Vinicius Nunes Henrique Silva (Universidade Federal Fluminense, Brazil)

Free-space optical (FSO) communication offers high data rates with secure, low-cost, and easily deployable links. However, atmospheric turbulence (AT) distorts the optical wavefront, causing power fading. This experimental work employs a Spatial Light Modulator (SLM) combined with a Convolutional Neural Network (CNN) to predict and compensate the emulated AT channel. Results show improved optical power coupling into a single-mode fiber under turbulence conditions. Analysis of irradiance patterns before and after compensation reveals that the Generalized Extreme Value distribution fits the irradiance model better than traditional models, indicating a novel insight for FSO channel modeling.

1571155519

Effects of GABA-Synthesized AgCuNPs and SeNPs on Sunflower Seed Development

Isabela Lopes (Universidade Federal de São Paulo, Brazil); Charef Kazi Tani and Christophe Couteau (Université de technologie de Troyes, France); Lilia Coronato Courrol (Universidade Federal de São Paulo, Brazil)

This study explores the synthesis, characterization, and application of gamma-aminobutyric acid (GABA) stabilized silver-copper (AgCu) and selenium (Se) nanoparticles for nanopriming in sunflower seeds. GABA plays key roles in plant metabolism, influencing growth, stress response, and chlorophyll biosynthesis. Silver and copper nanoparticles are known for their potent antimicrobial activity and the combination of these metals into bimetallic AgCu nanoparticles synergistically enhances their physicochemical properties. Selenium nanoparticles contribute to human nutrition and plant biofortification but require careful control due to toxicity risks. Nanopriming facilitates efficient micronutrient delivery, leveraging

the synergistic benefits of these nanomaterials to enhance seed germination and stress resilience.

1571156210

Material Surface Analysis based on SD-OCT

Vítor José Costa Rodrigues, Emmanuel Leite De Medeiros, Tiago Henrique Brandao, José Mariano Lima Garcia, Fábio D. Simões and Daniel M Pataca (HardwareBR, Brazil)

This paper presents the development of a Spectral-Domain Optical Coherence Tomography (SD-OCT) system designed for high-resolution biomedical and industrial applications, developed using a fiber-coupled Michelson interferometer architecture and GPU-accelerated image reconstruction software. Experimental validation using a human tooth specimen demonstrated the system's ability to resolve sub-millimetric surface features and subsurface structures up to 1.5 mm depth, outperforming photon-counting X-Ray CT imaging in near-surface defect detection. The results achieved acquisition rates of up to 56,000 A-scans/second with 13 µm lateral resolution, highlighting the utility in medical diagnostics and industrial inspections.

1571161155

Population and Thermal Lensing Effect in Nd3+ Doped Optical Materials

Gustavo Vinicius Bassi Lukasievicz (Universidade Tecnológica Federal do Paraná, Brazil); Otávio Augusto Capeloto (Universidade Federal do Amazonas, Brazil); Vitor Santaella Zanuto, Mauro Luciano Baesso, Luis Carlos Malacarne and Nelson Guilherme Castelli Astrath (Universidade Estadual de Maringá, Brazil)

The population lens (PL) effect in the thermal lens (TL) signal is measured in Nd3+ doped optical materials. The time-dependent thermal lens signal is obtained from the divergence/convergence of the probe beam after the pulsed or continuous laser excitation. Thermal lens transients are measured for Nd3+-doped samples in different glass matrices, such as phosphate, fluoride, and low silica calcium aluminosilicate. Experimental results show different electronic and thermal effects depending on the glass matrices. The intensity ratio of PL and TL is relatively large at the probe beam wavelength and can be clearly differentiated when pulsed excitation is used.

1571161365

Performance Evaluation of FBG Array Sensors in Underground Power Distribution Lines

Rivael S Penze (CPqD, Brazil); Fabio R Bassan (AlfaSense, Brazil); Marvyn Inga (CPQD, Brazil); Joao B Rosolem (CPQD - Research and Development Center in Telecommunications, Brazil)

This paper presents an analysis of data obtained from two arrays of Fiber Bragg Grating (FBG) sensors installed in an underground power distribution network of an urban condominium. Sensors were placed along underground ducts (or conduits) and temperature variations were monitored optically in real time. The results show a correlation between the measured temperature and the ambient temperature, without events exceeding the limits established by current standards. However, the thermal stability observed in the measurements reinforces the feasibility of using FBGs for continuous monitoring in underground networks, contributing to predictive maintenance strategies and increased operational reliability.

1571162332

Synthesis and characterization of rare-earth garnets for scintillators applications

Breno C Siqueira (São Paulo State University, Brazil); Thiago Augusto Lodi, Sr (Sao Paulo State University (UNESP), Brazil & UNESP, Brazil); Leonardo Albino (UNESP, Brazil); Marcelo Nalin (São Paulo State University, Brazil)

Research on persistent luminescence on yttrium gallium garnets crystals co-doped with Cerium(III) and Chromium(III) for scintillators

1571164969

Alveolar bone imaging with optical coherence tomography plus optical clearing agents: a pilot study for osteoporosis diagnosis

Marcos Humberto Santos and Marcella D. Zatta (Federal University of ABC, Brazil); Patricia Aparecida Ana (UFABC, Brazil)

Osteoporosis is a disease characterized by bone mineral loss. Optical coherence tomography (OCT) is a promising technique for diagnosis, as it doesn't use ionizing radiation. However, OCT has penetration limitations. This study evaluated the use of optical clearing agents (OCAs) to improve bone images. Four OCAs were tested, and all enhanced visualization of bone microstructure. Silver nanoparticles added to glycerol was the most promising agent for highlighting minimal changes in bone organization.

1571165051

Investigating Nonlinear Solvatochromism in Perylene

Artur Barbedo and André Pelosi (Universidade de São Paulo, Brazil); João Victor Pereira Valverde (University of São Paulo, Brazil & São Carlos Institute of Physics, Brazil); Orlando D Marbello Ospina (Universidade de São Paulo, Brazil); Leonardo de Boni (University of Sao Paulo - Sao Carlos Institute of Physics, Brazil); Cleber R. Mendonca (IFSC - USP, Brazil)

Perylene is an organic compound with potential for different optical applications. One important factor that influences the linear responses of organic molecules is the solvent used in the solution. The nonlinear solvatochromism, however, is not as well explored. Thus, we investigate the nonlinear properties alongside photophysical parameters for perylene in toluene, dichloromethane, and chloroform. The two-photon absorption (2PA) spectra (550-800 nm) were obtained by the femtosecond Z-scan technique. A single 2PA band (~25 GM) was observed for all molecules, around 600 nm. Such results indicate minimal variations in the 2PA with different solvents for pure perylene.

1571165052

First-Order Hyperpolarizability of bromochalcone derivatives

Nathan Bárbola Marucci (São Carlos Institute of Physics, Brazil & University of São Paulo, Brazil); João Victor Pereira Valverde (University of São Paulo, Brazil & São Carlos Institute of Physics, Brazil); Eli Ducas (Federal University of Goiás, Brazil); Pablo Gonçalves (Universidade

Federal de Goias, Brazil); Leonardo de Boni (University of Sao Paulo - Sao Carlos Institute of Physics, Brazil); Cleber R. Mendonca (IFSC - USP, Brazil)

We measured the first-order hyperpolarizability (beta) for a class of bromochalcone derivatives. The beta values remained nearly constant in the near-infrared region, with slightly higher values for samples containing strong electron-donating groups like methoxy and ethoxy. These samples also showed an increase in the beta value at 700 and 800 nm. This enhancement can be attributed either to the proximity of excitation wavelength to the two-photon absorption band - since these samples display a more pronounced bathochromic shift - or to fluorescence induced via two-photon absorption, as our experimental setup does not distinguish between these two phenomena.

1571165308
Analysis of the Influence of Different High-Power Laser Sources in a Raman-Amplified Radio and Power-over-Fiber Link

Paulo Kiohara (Instituto Nacional de Telecomunicações, Brazil & École Nationale d Ingénieurs de Brest Instituto Tecnológico de Aeronáutica, France); Romildo De Souza (Instituto Tecnológico de Aeronáutica & École Nationale d Ingénieurs de Brest, Brazil); Laura Ghisa (ENIB & Lab-STICC UMR CNRS 6285, France); Veronique Quintard and Mikael Guegan (ENIB, France); Arismar Cerqueira Sodré Junior (INATEL, Brazil); Olympio Coutinho (Instituto Tecnológico de Aeronáutica, Brazil); André Pérennou (ENIB & Lab-STICC CNRS, France)

This work compares two hybrid links integrating Radio-over-Fiber, Power-over-Fiber and Raman amplification over 10 km of single-mode fiber. The Raman-based link uses a High-Power Laser Source (HPLS) at 1480 nm and a Tunable Laser Source (TLS) at 1550 nm. The EDFA-based link employs an HPLS at 1550 nm and a TLS at 1610 nm. Key parameters such as Raman gain, delivered optical power, and Analog-RF metrics: RF gain, Noise Figure (NF), and Spurious-Free Dynamic Range (SFDR), are evaluated. Both links achieve comparable Raman and RF gains. However, the EDFA-based link demonstrates superior performance in terms of NF and PoF efficiency.

1571165419
Assessment of a Hybrid RoF-MWP Architecture over Free-Space Optical Links

Frederico Francisco de Paula Campos (Instituto Nacional de Telecomunicações - INATEL, Brazil); Arismar Cerqueira Sodré Junior (INATEL, Brazil); Celso Henrique (Inatel, Brazil)

This paper investigates a converged access architecture that combines Radio over Fiber (RoF), Microwave Photonics (MWP), and Free-Space Optics (FSO) to address last-mile connectivity challenges. A simulation is conducted where an MWP-generated signal is transmitted through RoF and FSO links of varying distances. The study evaluates the effects of atmospheric attenuation-such as fog and rain-on signal quality at the receiver. Results provide insights into performance degradation in optical-wireless integrated networks suitable for 5G and future 6G applications.

1571165432
Laser Induced Breakdown Spectroscopy for evaluation of nutrients and adulterants in roasted and ground coffee

Alessandra de Souza Teixeira and Gustavo Pontes (Federal University of Santa Catarina, Brazil); Ricardo Schneider and Cleverson Busso (Federal University of Technology - Paraná, Brazil); Otniel Freitas Silva and Andressa Moreira De Souza (Embrapa Food Agroindustry, Brazil); Gustavo Nicolodelli (Universidade Federal de Santa Catarina, Brazil)

With the growing demand for food, rapid detection methods like LIBS (Laser Induced Breakdown Spectroscopy) are essential to identify chemical compounds. This study utilizes LIBS to characterize 23 Brazilian coffee samples (Arabica and Robusta field-sourced and commercial) to detect nutrients and adulterants. Machine learning was applied to distinguish Arabica from Robusta coffee, using the PCA (Principal Component Analysis) algorithm. Spectra revealed Fe, Mg, Na, Ca, and K as main nutrients, with Al peaks in one Arabica and one commercial sample. LIBS combined with multivariate analysis showed promising results for coffee authentication.

1571165692
Optical characterization of laser beams for design of a laser deposition head with variable optics

Bethina V Nicocelli (Instituto SENAI de Inovação em Processamento a Laser, Brazil); Guilherme De Faveri (SENAI Innovation Institute in Laser Processing, Brazil); Joao B Rosolem (CPQD - Research and Development Center in Telecommunications, Brazil); Luís Trabasso (ITA, Brazil); Moisés Felipe Teixeira and Natalia Wendt Dreveck (SENAI Innovation Institute in Laser Processing, Brazil)

This study characterizes a high-power laser beam for industrial applications, such as cladding. It examines how focal height affects beam diameter and quality parameters defined by ISO 11146, including divergence, BPP, and M^2. Two complementary approaches were used: beam profiling and measurements with the FocusMonitor FM+ (PRIMES GmbH). Results highlight how divergence and quality factors impact lens positioning, crucial for laser deposition head design. Findings emphasize the role of optical characterization in ensuring stability, precision, and efficiency in laser-based manufacturing, while supporting customized solutions and integration with Industry 4.0 principles.

1571165699
Salivary ATR-FTIR Signatures for Obstructive Sleep Apnea: Review of Biomarkers and Sample Methodological Validation

Valeria Mendes (University of São Paulo, Brazil); Vinicius P Anjos (Nuclear and Energy Research Institute, Brazil & University of São Paulo, Brazil); Daniela de Fátima Teixeira da Silva (Nuclear and Energy Research Institute, Brazil); Denise M Zezell (Nuclear and Energy Research Institute, IPEN-CNEN, Brazil & University of Sao Paulo, Brazil)

This review investigates salivary ATR-FTIR spectral signatures as diagnostic and monitoring tools for Obstructive Sleep Apnea (OSA). The study not only reinforces previous findings but also consistently identifies key vibrational peaks (2962, 1643, 1546/1448, 1076, 1662 cm-1). These results validate the proposed pre-analytical procedures for biofluid sample preparation, ensuring spectral reliability and demonstrating the effectiveness of this methodology in capturing salivary "molecular fingerprints" associated with OSA.

1571165709

Development of a Low-Cost Fabrication Process for PIN Photodiode Detectors

Luis da Silva Zambom (Centro Estadual de Educação Tecnológica Paula Souza, Brazil); Ronaldo D Mansano (Escola Politécnica Da Universidade de São Paulo, Brazil); Henrique Chaves Gulino (Escola Politécnica da Universidade de São Paulo, Brazil)

This work presents the electrical and optical characterization of the 3AWA16 device, evaluated under dark conditions and illumination at wavelengths of 455 nm, 470 nm, 505 nm, and green laser (~520 nm). Current-voltage (I-V) measurements reveal a marked increase in photocurrent in the presence of light, particularly under green laser illumination, where the current reaches values around 100 µA. Pulsed responses observed in the visible range suggest a functional photodetector behavior with sensitivity dependent on both the wavelength and light intensity. The results highlight the device's potential for applications in visible-range optoelectronics, especially for green light detection.

1571166542

Formation and Growth of Silver Nanoparticles: Effects of Light Intensity and Reaction Time in a Bio-Based Synthesis Using Açaí Seed Extract

Lilia Coronato Courrol and Thaina De Sousa (Universidade Federal de São Paulo, Brazil)

This study presents a green synthesis of Ag nanoparticles using waste açaí seeds and xenon lamp photoreduction, controlled by current (10-15 A or 0.4-8 W) and time (0-8 min). Optimal conditions prevented aggregation, as confirmed by both UV-Vis and SPR bands (at 425 nm for Ag). Three kinetic regimes were identified: diffusion-limited (<10 Å), cooperative reduction (10-15 Å), and saturation (>15 Å). The method efficiently upcycles organic waste into well-defined bimetallic nanoparticles, emphasizing precise current and short irradiation times.

1571166739

Comparison of Soil Samples with Different Clay, Sand, and Silt Contents Using Speckle Interferometry

Felipe Maia Prado (University of São Paulo, Brazil); Gustavo Di Chiacchio Faulin and Luis Eduardo Rissato Zamariolli (Fatec Pompeia, Brazil); Pedro Henrique Miho de Souza (Faculdade de Tecnologia de Itaquera, Brazil); Niklaus Wetter (Instituto de Pesquisas Energéticas e Nucleares, Brazil); Sidney Leal da Silva (Faculdade de Tecnologia de Itaquera, Brazil)

This study contrasts the Speckle intensity curves of soil samples with clay and sand. The technique used was Speckle interferometry and the analysis was the computational method based on the Time History Speckle Pattern, THSP, and Error Theory.

1571167190

Photoinduced Effects in As_2S_3 and As_2Se_3 Thin Films by Femtosecond Excitation

Orlando D Marbello Ospina (Universidade de São Paulo, Brazil); Lino Misoguti (USP - IFSC, Brazil); Nikita S Dutta (National Renewable Energy Laboratory, USA); Craig B Arnold (Princeton University, USA); Cleber R. Mendonca (IFSC - USP, Brazil)

This study investigates polarization-dependent photoinduced effects in As_2S_3 and As_2Se_3 thin films excited by fs-laser pulses operating in the telecommunications range. The findings demonstrated the localized formation of structural defects, including crystallization, and revealed anisotropy-induced birefringence that varied with laser parameters.

1571168607

A Methodological Approach to Dental Tissue Analysis Using Raman Spectroscopy: Development and Clinical Insights

Vicente S Mattos (Embrapa Instrumentation, Brazil); Jarbas de Castro Neto (Universidade de São Paulo & Instituto de Física de São Carlos, Brazil)

This study presents a Raman spectroscopy protocol for the analysis of dental tissues, focusing on the ratio between mineral peaks of phosphate (960cm^{-1}) and carbonate (1070cm^{-1}). We investigated samples from distinct conditions: femtosecond laser-treated teeth; teeth with Hypomineralization; and after ionizing radiation. Our results consistently demonstrate the technique's ability to detect significant modifications in the mineral content of dental tissues. Raman spectra revealed changes in peak area, especially in the carbonate/phosphate ratio, allowing the identification of mineral loss or modification. The technique enabled the detection of early alterations related to demineralization, reinforcing its role in dental diagnostics and treatment evaluation.

1571168663

Dependence of amplitude and shape of the Z-scan curve on the detection aperture

Lucius Borges de Souza (University of Sao Paulo (IFSC-USP), Brazil); Paulo C de Oliveira (Universidade Federal da Paraíba, Brazil); Renato A Cruz (IFSP - São Carlos, Brazil); Tomaz Catunda (IFSC-USP, Brazil)

This work presents theoretical and experimental studies of the Z-scan signal considering arbitrary aperture transmittance. The nonlinear ruby crystal was used as the test sample. Experimental data were compared with the Hermann and Wilson model, which applies the Fresnel-Kirchhoff diffraction integral to a Gaussian beam in a thin nonlinear sample. Numerical simulations allowed us to derive empirical functions linking the z-axis positions and the normalized transmittance of peak and valley values, depending on the aperture size S. These results extend the small-aperture approximations originally proposed by Sheik-Bahae, providing more general predictions for Z-scan measurements.

1571168938

Self-Homodyne 'Coherent-Lite' Technique for Optical DWDM Communication Systems

Mateus Souza Coelho (UFES, Brazil); Pablo Rafael Neves Marciano (Universidade Federal do Espírito Santo, Brazil); Maxwell E. Monteiro (Federal Institute of Espírito Santo - IFES & Federal University of Espirito Santo - UFES, Brazil); Maria Jose Pontes (UFES, Brazil); Jair Adriano Lima Silva and Marcelo E. Vieira Segatto (Federal University of Espirito Santo, Brazil)

Coherent optical communication systems are a key technology for enabling high-capacity data transmission and long-haul fiber links. Coherent systems, despite their advantages, are more expensive and complex than traditional systems as a result of the need for narrow-linewidth local oscillators and sophisticated digital signal processing for carrier recovery. This paper presents an infrastructure that aims to leverage the benefits of coherent systems while

eliminating the need for local oscillators and carrier recovery (CR) processes in digital signal processors (DSPs). It is a self-homodyne system that employs frequency shifts to take advantage of the high phase correlation of optical frequency combs.

1571169018
Laser-Induced Breakdown Spectroscopy and Chemometric Tools for Soil Fertility Classification and Carbon Calibration

Andre T Maoze, Sr (Universidade Federal de Mato Grosso do Sul, Brazil & UFMS, Brazil); Gustavo Pontes and Alessandra de Souza Teixeira (Federal University of Santa Catarina, Brazil); Arcangelo Loss (Universidade Federal Santa Catarina, Brazil); Bruno Marangoni (UFMS, Brazil); Gustavo Nicolodelli (Universidade Federal de Santa Catarina, Brazil)

In this study, laser-induced breakdown spectroscopy (LIBS) proved to be a promising alternative for direct and rapid multi-element analysis of 54 samples from three different areas, requiring minimal sample preparation. A calibration model was developed and validated for the carbon (C) line at 247,86 nm. Furthermore, machine learning techniques were applied to distinguish soils fertilized with solid and liquid fertilizers, as well as non-fertilized soils, achieving an accuracy above 98.3%. Principal Component Analysis (PCA) was used to cluster these soils, confirming the separation of the groups.

1571169022
Unsupervised Regression for Nonlinear Equalization in Coherent Optical Interconnects

Ana Laura Graças, Gabriel Bozelli, Joao Pedro Gosmin and Artur Alfe (Universidade Estadual Paulista, Brazil); Leandra I de Abreu (São Paulo State University (Unesp), Brazil); Ivan A. Aldaya (São Paulo State University, Brazil & Unesp, Brazil)

This paper presents a novel equalization technique that combines k-means clustering with a multi-layer perceptron (MLP) to mitigate nonlinear distortions in single-span optical links. The unsupervised k-means algorithm groups data points in the received signal constellation, generating target values for training the MLP. The MLP learns the nonlinear mapping between distorted symbols and corresponding cluster centroids, enabling effective equalization. Simulations for a 112 Gbps dual-polarization 16-QAM single-span optical link show performance improvement and robustness under dynamic channel conditions. The proposed unsupervised regression reduces the bit error ratio from 2.34×10^{-3} to 2.59×10^{-4} when processing 7 adjacent symbols.

1571169042
Optics in Pulse Oximetry: Correlation with Oxygen Saturation Accuracy

Kaio Bernardo Barros (University of São Paulo, Brazil); Jocássia Silva Pinheiro (University of Sao Paulo, Brazil); Murilo S Sampaio (Universidade de São Paulo, Brazil); Luismar B. Cruz Junior, Fernando Fagundes Ferreira, Anibal Basile-Filho, Rinaldo Guirro and Luciano Bachmann (University of São Paulo, Brazil)

Non-invasive oximetry is essential for continuous blood oxygen monitoring in routine and critical care. Evidence suggests pulse oximeters may be biased by melanin absorption, affecting accuracy in individuals with darker skin. In this prospective study of-100 ICU patients, simultaneous SpO_2 and SaO_2 were recorded, and skin tone was objectively measured using ITAº at dorsal hand site. LED emission spectra were also analyzed. Within the 85%-100% SaO_2

range, two of the three devices exceeded the 3% ARMS threshold. The most accurate oximeter had a longer-wavelength, narrower-band infrared LED, underscoring the need for optimized optics and objective pigment evaluation.

1571169724

Radiative Transport Phenomenon in Turbid Media

Bruno Henrique Garcia Malvestio (University of São Paulo, Brazil); Murilo S Sampaio (Universidade de São Paulo, Brazil); Luciano Bachmann (University of São Paulo, Brazil)

This work aims to address and review concepts related to the propagation of optical radiation in turbid media. The radiative transfer equation (RTE) is essential to understand how radiation propagates and interacts with matter. To this end, concepts from electromagnetism and statistical physics will be used to derive the general RTE, which describes multiple scatterings of light by a turbid medium composed of arbitrary particles. Comparisons will also be made with the Boltzmann equation. Additionally, Monte Carlo simulation is commonly used to approximate solutions to both the RTE and the Boltzmann equation.

1571169843

Plant Stress Detection Using Photonic Techniques and Machine Learning

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Water scarcity is a major limiting factor for agricultural productivity, often causing physiological damage before visual symptoms are noticeable. Early detection of water stress is essential for sustainable crop management. This study integrates photonic techniques-infrared thermography and chlorophyll fluorescence imaging-with artificial intelligence (AI) to detect early physiological responses to water deficit in plants. These non-invasive tools capture subtle changes in temperature and photosynthetic activity, generating complex datasets. Machine learning algorithms were applied to classify stressed and non-stressed plants accurately, based on these signals. The combined approach demonstrates strong potential for enhancing early diagnosis of plant stress and sustainable agricultural practices.

1571169853

Fabrication and Characterization of an All-fiber 3 × 1 Pump Combiner

Thassia Lopes Correia dos Santos (Mackenzie Presbyterian University & Brazilian Army, Brazil); Davi Pontes Nacaratti (University of Sao Paulo, Brazil); Mauricio Moderno Carvalho (MackGraphe - Centro de Pesquisas em Grafeno, Nanomateriais e Nanotecnologia, Brazil); Claudio C. Motta (University of Sao Paulo, Brazil); Thoroh Souza (Mackenzie Presbyterian University, Brazil)

Pump combiners are passive optical devices that integrate the power from multiple pump sources into a single output fiber. This combination enables efficient coupling of the pump energy into the inner cladding of double-clad fibers (DCF), making it possible to achieve optical amplification at power levels far beyond those attainable by a single source. This paper reports the fabrication and characterization of a 3 x 1 tapered fiber bundle (TFB) pump power

combiner for fiber laser applications, using a Vytran GPX3400. The average transmission efficiencies obtained were 76.48% (OSA) and 85.02% (power meter). A detailed and reproducible methodology is presented.

1571169886

T-Shaped Microstrip Patch Antenna Design with Defected Ground Structure for Radio Frequency identification (RFID) and Modern Wireless Communications

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This letter presents, a low-profile T-shaped antenna featuring three rectangular patches with defect in ground plane designed is investigated as a radio frequency identification (RFID) antenna. Prototype is fabricated on FR4 (εr= 4.3 and $\tan\delta$=0.030) with 22 X 21 mm^2 dimension and ground plane defects. This prototype working at 1.94 GHz with S11 of -30 dB having bandwidth of 40MHz along minimum VSWR<1.25 and ARBW<3 dB values. The proposed antenna is in the range of ultra-high frequency (UHF) with DGS design and good agreement with S-parameters, VSWR, ARBW and SAR, for modern wireless communication applications.

1571169912

Inferring Structured Beam Wavefront in Turbulent Free-Space Channel via Deep Learning

Paulo Monteiro de Carvalho Monson (University of Sao Paulo, Brazil); Adriane Martins Alves, Antônio Pereira Junior and Yasmin Da Silva Bonfim (QuIIN - SENAI CIMATEC, Brazil); Marcos Gil De Oliveira (Universidade Federal Fluminense, Brazil); Cássio de Castro Silva, Christiano Moreira De Sá Do Nascimento and Braian Pinheiro da Silva (QuIIN - SENAI CIMATEC, Brazil); Valeria L da Silva (SENAI CIMATEC & Senai Cimatec, Brazil)

Atmospheric turbulence degrades free-space optical links by introducing phase distortions and intensity fluctuations, reducing coupling efficiency in continuous-variable quantum key distribution. We present a deep learning approach using a U-Net architecture to inferring structured beam wavefront in turbulent free-space channel. Simulations with Gaussian and first-order Laguerre-Gaussian beams under varying turbulence strengths generated the training data. The network predicts phase screens directly from distorted intensity images. Our results demonstrate the potential of neural networks for accurate wavefront reconstruction, enabling real-time compensation of turbulence effects and supporting adaptive optics in advanced quantum communication systems.

1571169925

Simulating Kramers Escape Dynamics under Forces in the Geometrical Optics Regime

Gunther Damaceno Barbosa and Antonio A. R. Neves (Universidade Federal do ABC, Brazil)

This research explores the connection between optical force models and the Kramers rate problem, which investigates how a particle escapes a stable potential well due to random fluctuations We use optical traps to study this phenomenon, building on previous research by

shifting from the Rayleigh model, which applies to small particles, to a geometrical optics approach that offers a more comprehensive description beyond the linear regime of trap stiffness This allows us to use a more realistic potential well, rather than a simple parabolic approximation, to improve the study of Kramers' transition.

1571170601

Predicting Soil Carbon with NIRS in Brazilian soils

Vitor Silveira Freitas (Embrapa Instrumentation, Brazil); Lucas Raimundo Bento and Daniele Souza (Embrapa Instrumentação, Brazil); Vicente S Mattos (Embrapa Instrumentation, Brazil); Debora M. Bastos Pereira Milori (Embrapa, Brazil); Ladislau Martin-Neto (Embrapa Instrumentation, Brazil)

We propose a simple near infrared spectroscopy (NIRS) spectral preprocessing approach and modeling to predict soil total carbon in a heterogeneous dataset of soil samples collected from agricultural and native vegetation areas up to 1 meter in depth. Using baseline correction, Savitzky-Golay first derivative, and PLS regression, we achieved R2 of 0.83 and RMSEC of 0.57 in the calibration set, and R2 of 0.73 and RMSEP of 0.57 in the validation set. These results indicate that soil carbon can be accurately estimated using NIR spectroscopy with straightforward spectral processing and modeling.

1571170739

Numerical Modeling and Design of a Photonic Crystal Hydrogel Humidity Sensor for Agricultural Applications

Licinius Dimitri Sá de Alcantara (Universidade Federal Rural da Amazônia, Brazil)

This work presents the design and numerical simulation of a one-dimensional photonic crystal cavity for humidity sensing in agricultural contexts. The structure, composed of alternating layers of SiO2 and Si with a hydrogel-based defect layer, is analyzed via the Finite-Difference Time-Domain (FDTD) method including Perfectly Matched Layers (PML). The defect's refractive index is varied to emulate different moisture levels. Spectral analysis reveals a clear shift in the transmission resonance frequency, indicating the potential of this photonic device as a sensitive optical humidity sensor.

1571170773

Development of a Compact LED Driver and Python-Based Graphical Control Interface for Lens-Free Holographic Microscopy

Marlon Rodrigues Garcia (Sao Paulo State University (Unesp), Brazil); Camila de Paula D'almeida, Cesar Yudi Kuramoto, Felipe Alvarenga Carvalho and Sebastião Pratavieira (University of São Paulo (USP), Brazil)

Lens-free holographic microscopy (LHM) is a compact and cost-effective imaging technique with growing applications in biomedical analysis. This work presents the development and characterization of two key components for a multispectral LHM system: a compact, current-controlled RGB light source and a graphical control interface developed in Python. The light module delivers precise and efficient current regulation, with low ripple and thermal stability, while the software interface enables automated multiframe acquisition and time-lapse imaging requiring reduced user intervention. Together, these modules contribute to making LHM setups more accessible and reproducible.

1571170844

Fabrication and Characterization of a 7$\times$1 End-Pumped Fiber Combiner

Davi Pontes Nacaratti (University of Sao Paulo, Brazil); Thassia Lopes Correia dos Santos (Mackenzie Presbyterian University & Brazilian Army, Brazil); Mauricio Moderno Carvalho (MackGraphe - Centro de Pesquisas em Grafeno, Nanomateriais e Nanotecnologia, Brazil); Thoroh Souza (Mackenzie Presbyterian University, Brazil); Claudio C. Motta (University of Sao Paulo, Brazil)

This paper presents the fabrication details and the characterization results of a 7$\times$1 end-pumped power fiber combiner. The design employs seven input fibers of 200/220 μm core/cladding diameter and a single output 20/400 μm core/cladding diameter double cladding fiber. The mean power transmission efficiency measured by the optical power meter was 83.49%, and using the optical spectrum analyzer the average efficiency was 76.16% at wavelength 1050 nm.

1571171088

Characterization of group velocity dispersion in fiber-based Mach-Zehnder interferometers

Gustavo Nunes Martins (Universidade Estadual de Campinas, Brazil); Lucas G Woiblet (Unicamp, Brazil); André G Primo (State University of Campinas & Gleb Wataghin Physics Institute, Brazil); Gustavo Wiederhecker (State University of Campinas, Brazil); Thiago Alegre (University of Campinas & UNICAMP, Brazil)

Group velocity dispersion (GVD) affects precision in optical frequency measurements, particularly in broadband spectroscopy. This work characterizes GVD in a fiber-based Mach-Zehnder Interferometer (MZI) made from Corning SMF-28 fiber, used for laser frequency calibration in cavity spectroscopy. We show that the interferometer's free spectral range varies with wavelength due to dispersion, which must be accounted for. Using an HCN absorption cell and a dispersion-free reference, we extract the group index variation and dispersion coefficient. Results agree with theory and validate the setup for future studies of microcavities and integrated photonic devices in high-accuracy spectroscopy.

1571171127

Evaluation of Fine-tuning EfficientNet and Vision Transformer model architectures for Oral Lesion Classification

Akio Kenzo T Frazatto, Ana Carolina F Motta and Ana Elisa R Alves Ribeiro (Universidade de São Paulo, Brazil); Renato Tinós (Universidade de São Paulo (USP), Ribeirão Preto, Brazil); Luciano Bachmann (University of São Paulo, Brazil)

Computer-aided diagnosis (CAD) based on deep learning has shown promise in dermatology, but analogous efforts for oral cavity images remain scarce. This paper compares EfficientNet-B7 and Vision Transformers for intra-oral lesion images classification. Each backbone underwent 100 optimization trials under a unified hyperparameter search space, maximizing F1 Score. The best ViT-Base (ImageNet-pretrained) achieved a F1 Score of 0.731 and an average AUC of 0.916, narrowly surpassing the top EfficientNet-B7 pre-trained on a dermatology dataset. Results indicate that Transformer models match-rather than decisively exceed-well-tuned CNNs at this dataset scale, such that choosing between CNNs or ViTs should consider deployment constraints.

1571171187

Holographic optical tweezers using structured light beams

Marcos R. R. Gesualdi (UFABC, Brazil); Rafael A. Bonilla Suarez (Universidad Santiago de Cali, Colombia)

In this work, we optically capture microparticles with structured light beams using holographic optical tweezers. We developed a system of holographic optical tweezers to generate structured light beams, enabling us to create stable traps to trap and guide microparticles in the transverse plane. Experimental results demonstrate that excellent optical trapping stability can be achieved using structured light beams. These results indicate that structured light beams are promising for optical particle trapping and guidance and are potentially useful in a variety of applications, such as biological research, atomic physics, and optical manipulation using structured light with orbital angular momentum.

1571171196

Turbulence effects in optical vortex: experimental generation and analysis via holographic techniques

Marcos R. R. Gesualdi and George Reis (UFABC, Brazil)

This work presents the optical generation and experimental characterization of the effect of atmospheric turbulence on the propagation of optical vortex using computational holography techniques. We have developed a holographic optical system for the generation and characterization of optical vortex under turbulent conditions. Using this experimental setup, we demonstrate how these optical vortex propagate longitudinally, their transverse intensity profiles and their phase maps, with and without turbulence. These results indicate that optical vortex are promising for wireless optical communication systems in turbulent media, optical trapping in turbulent media and characterization of turbulent media for environmental purposes.

1571171209

Margin Analysis for QoT Estimation Using Analytical Network Digital Twins

Marcos Antonio de Almeida Cora (University of Campinas (UNICAMP), Brazil & School of Electrical. & Computer Eng. (FEEC), Brazil); Jonathan Aguiar Soares (University of Campinas, Brazil); Darli Mello (UNICAMP, Brazil)

Zero-touch optical networks rely on network digital twins (NDTs) to predict the quality of transmission (QoT) before service provisioning. Although machine-learning solutions exist, analytical NDTs remain preferred for stability and explainability, yet they require significant safety margins whenever model assumptions deviate from reality. We quantify how such deviations accumulate when amplifiers, assumed flat by the NDT, exhibit random (Gaussian or parabolic) or deterministic (tilt or experimental) perturbations. Simulations over multi-span links show that random profiles average out and demand modest margins, whereas deterministic profiles cause progressively larger errors, ultimately mandating either wider margins or explicit amplifier modelling.

1571171211

Effect of Ag-doping on the photoluminescence of nanostructered ZnS material

Ana Laura Curcio and Thiago Ardana Chaim (UNESP, Brazil); Maria Inês Basso Bernardi (USP, Brazil); Fábio S. De Vicente, Adriano J. G. Otuka and Alexandre Mesquita (UNESP, Brazil)

Zinc sulfide (ZnS) is a wide band gap semiconductor with numerous technological applications in optical devices. In this study, nanostructured Ag-doped ZnS samples were prepared by solvothermal method. Pure-ZnS sample exhibits cubic symmetry of sphalerite structure whereas samples with higher values of Ag content exhibits coexistence of sphalerite structure and wurtzite structure with hexagonal symmetry. Photoluminescence spectra present typical four emissions ascribed to Zn and S vacancies, Zn and S interstitials for ZnS host matrix. As the Ag content increases, the relative intensity increases for red-orange emissions and an additional emission is observed, allowing a tunable photoluminescence emission with Ag-doping.

1571171249

Red shift in photoluminescence emissions of ZnO nanoparticles with Mg incorporation

Thiago Ardana Chaim (UNESP, Brazil); Maria Inês Basso Bernardi (USP, Brazil); Fábio S. De Vicente, Adriano J. G. Otuka and Alexandre Mesquita (UNESP, Brazil)

In this study, nanostructured ZnO-Mg samples were prepared by polymeric precursor method. Pure ZnO sample exhibits hexagonal symmetry of wurtzite structure. Samples with Mg content equal to 30 and 40 at. % exhibit the presence of secondary phase indexed as MgO. Photoluminescence spectra present typical emissions for ZnO. As the Mg content is incorporated exceeding the solubility limit, the relative intensity decreases for green emissions, which has been attributed to the formation of defects like Mgi, inhibiting the formation of Zni and VZn. Thus, red shift tunable photoluminescence emission is observed with Mg incorporation, as depicted by CIE coordinates.

1571171250

Diagnostic potential of FTIR spectroscopy in saliva: challenges in group differentiation

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Saliva is a promising biofluid for diagnosis due to its easy collection and storage. FT-IR spectroscopy has been applied to identify molecular changes in human biofluid. This study analyzed 200 saliva samples from adults, examined in triplicate using the FT-IR ALFA II BRUKER. Samples were scanned with a Python algorithm, generating spectral graphs. There was an overlap between groups in the PC1 vs. PC2 scatter plot, with minor variations in the fingerprint region, limiting group differentiation. Despite this, the technique showed potential and highlighted the need for further studies to improve diagnostic accuracy.

1571171256

Performance Evaluation of Optical Short-Reach Links Without Blind Phase Search Algorithm Employing Narrow-Linewidth Lasers

Júlia Aline Sousa Maciel (CPQD, Brazil); Eduardo Rosa (CPqD - Centro de Pesquisa e Desenvolvimento em Telecomunicações, Brazil); Tiago Sutili (CPQD, Brazil & University of Campinas, Brazil); Rafael C. Figueiredo (CPQD, Brazil); Edson Porto da Silva (Federal University of Campina Grande (UFCG), Brazil)

This work explores the use of narrow-linewidth lasers aiming to simplify the digital signal processing stack by removing the Blind Phase Search (BPS) algorithm. To this end, simulations are performed considering different Optical Signal-to-Noise Ratios (OSNR) aiming to determine the maximum laser linewidth that allows the system to operate without BPS in short-reach links. Additionally, the minimum number of test phases required for BPS to estimate the phase is verified. The results indicate that for OSNR values greater than 21 dB, BPS implementation can be disregarded when using lasers with a linewidth between 500 Hz and 1 kHz.

1571171261

Distributed Acoustic Sensing and Convolution Neural Networks for Leak Detection in Low-Pressure Gas Pipelines

Rodolfo Pinheiro Cruz (Photonics Innovation Institute & Unicamp, Brazil); Felipe Maia (Fiberwork Optical Communications Ltda, Brazil); Sérgio Barcelos (Future Photonics, USA); Luis E. Ynoquio Herrera (Photonics Innovation Institute, Brazil); Ana M. Frattini Fileti (Universidade Estadual de Campinas, Brazil)

This paper experimentally demonstrates the detection of gas leaks in low-pressure pipelines using Distributed Acoustic Sensing and Convolutional Neural Networks. Tiny leak detections with no false alarms in a 50kPa pipeline are demonstrated

1571171264

Experimental Analysis of a L-Band High-Concentration EDFA Performance Under Forward and Bidirectional Pumping

Marcionilo José da Silva (CPqD- Telecom R&D, Brazil & CPQD, Brazil); Marcelo Pereira Nogueira (CPQD, Brazil); Luis Gustavo Maciel Riveros and Tiago Sutili (CPQD, Brazil & University of Campinas, Brazil); Rafael C. Figueiredo (CPQD, Brazil)

This work presents an experimental characterization of a high-concentration L-band EDFA prototype's performance. The analysis focused on gain and noise figure across a wide range of pump and input signal powers. Various pumping configurations were investigated, including forward, backward, and diverse bidirectional power distributions. Results indicate a potential signal gain exceeding 22 dB with a noise figure below 4.5 dB, considering equalized output power. Notably, a significant increase in signal gain, exceeding 10 dB at some operating points, was observed, achievable by simply varying the pumping configuration with the same available pump power.

1571171326

Fluorescence Properties of Graphene Quantum Dots embedded in GPTS/TEOS-derived Organic/Silica Sol

Thiago Ardana Chaim, Fábio S. De Vicente, Adriano J. G. Otuka and Alexandre Mesquita (UNESP, Brazil)

Undoped and N-doped graphene quantum dots (GQDs) were synthesized hydrothermally and studied for their fluorescence. Embedding GQDs in GPTS/TEOS sol showed varying effects: GQD2 exhibited enhanced fluorescence at 300 nm, while GQD3 showed no significant change below 310 nm. Slight increases were seen at 310-320 nm. In contrast, N-doped GQDs showed a clear decrease in fluorescence when embedded in the sol, across both excitation ranges (270-320 nm and 350-420 nm), indicating the matrix suppresses emission for these doped samples.

1571171334
Infrared Dataset Of Beach Sediment Samples and DFT Vibrational Calculations
Julian Rayo Alape (Federal University of ABC, Brazil)

This work used a Fourier transform infrared (FTIR) spectroscopy database with multivariate density functional theory (DFT) analysis to characterize the microplastic polymer composition on three different beaches in Bali: Balanga beach (BB), Kerames beach (KB) and Nyang Nyang beach (NNB). Spectral analysis revealed: (1) polypropylene (PP) and polystyrene (PS) dominated BB samples (low frequency region, 700-1200 cm−1) with minimal polyvinyl alcohol (PVA) contribution; (2) NNB samples showed elevated content of PS and Poly(butyl acrylate) (PBA) high frequency region (2900-3500 cm−1); and (3) mid frequency regions (1550-1700 cm−1) exhibited mixed compositions with reduced overall polymer signals.

1571171390
Ultrafast Terahertz Dynamics of Ti3C2Tx MXene
Davi H. Soledade and Giovanni Budroni, Nt (Unicamp, Brazil); Daniel Corrêa (Embrapa Instrumentação, Brazil); Jonathas Siqueira (UNICAMP, Brazil)

In this paper we use Terahertz-Time Domain Spectroscopy (THz-TDS) and Optical Pump Terahertz Probe (OPTP) to study the conductive properties of Ti3C2Tx MXene, both in equilibrium and non equilibrium of charge carriers.

1571171409
Ex Vivo Thermal Response of Artificially Pigmented Porcine Skin under Photobiomodulation Protocols
Isabel Cristina Tinós and Macsiel Nunes Lima Neves (University of São Paulo (USP), Brazil); Julia Cristina da Silva Oliveira (University of São Paulo, Brazil); Lilian Tan Moriyama (University of São Paulo & São Carlos Institute of Physics, Brazil); Luismar Barbosa da Cruz, Jr (University of São Paulo, Brazil); Marlon Rodrigues Garcia (Sao Paulo State University (Unesp), Brazil)

Light-based therapies, such as photobiomodulation, can induce significant thermal effects due to superficial light absorption, particularly in melanin-rich tissues. This study employed artificially pigmented porcine skin to model pigmented skin and evaluate thermal responses under laser exposure. Three therapeutic laser protocols were tested, with continuous temperature monitoring via infrared thermography. Artificial pigmentation significantly increased heat absorption: carbon black caused rises above 20 °C, while permanent marker remained under 3 °C. Findings emphasize the importance of selecting appropriate pigments in ex vivo thermal safety studies. Future research should incorporate computational modeling and human skin analogs for improved translational relevance.

1571171418

FTIR spectroscopy reveals systemic changes in apical periodontitis

Giovana dos Santos Toledo (Universidade de Taubaté, Brazil); Sara Maria Santos Dias da Silva (Universidade de Taubaté - UNITAU - SP, Brazil & Universidade de Taubaté - SP, Brazil); Paula Marinho, Maryane Rezende and Rayana Khoury (UNESP, Brazil); Luis Felipe Chagas e Silva de Carvalho (Universidade de Taubaté, Brazil)

This study used FTIR spectroscopy to analyze systemic oxidative and inflammatory biomarkers in a rat model of apical periodontitis (AP) with chronic stress. Results showed distinct molecular alterations in lipid and protein spectra, particularly in the combined AP+stress group, revealing synergistic effects. FTIR effectively detected AP-related systemic changes, demonstrating its potential for studying endodontic systemic interactions.

1571171431

Optical Monitoring of Antioxidant Degradation in Oil-Based Systems

Iuliia Riabenko (Carleton University, Canada & V.N. Karazin Kharkiv National University, Canada); Jeff Manthorpe and Ronald Miller (Carleton University, Canada)

Antioxidant degradation in oils was monitored using optical methods under thermal stress. Spectral parameters such as peak shifts and changes in band width were used to track additive stability. The approach enables sensitive, non-destructive assessment of early degradation stages, supporting potential real-time monitoring in lubricant systems.

1571171463

Investigation of the optical properties of Er^{3+}-doped fluoroindate glasses

Adriano Alemida da Silva (Universidade Federal do Piauí, Brazil); Tomaz Catunda (IFSC-USP, Brazil); Francisco Eroni Paz Eroni (Federal University of Piaui, Brazil); Nefe Jefferson De Brito E Silva (Universidade Federal do Piauí, Brazil)

This study explores the optical properties of erbium (Er^{3+})-doped fluoroindate glasses, emphasizing absorption and emission in the near-infrared (NIR) and visible regions. Rare-earth doping enables luminescence and upconversion, relevant for photonics, sensors, and lasers. Fluoroindate glasses stand out for wide transparency, low phonon energy, and high dopant solubility, reducing non-radiative losses and enhancing luminescence. The objective is to investigate energy transfer, upconversion, and luminescence efficiency for advanced optical devices. Results reveal an average $^4I_{13}/_2 \rightarrow {}^4I_{15}/_2$ lifetime of 10.1 ms with nearly ~100% quantum efficiency, confirming strong potential for efficient lasers and optical amplifiers.

1571171695

Implementation of a Fiber-Based Quantum Key Distribution (QKD) Testbed Using Attenuated Laser Pulses

Bruno Santos de Souza (UFSCar, Brazil); Franciele Renata Henrique (Federal University of São Carlos, Brazil); Marcio Daldin Teodoro (UFSCar, Brazil); Celso J Villas Boas (Federal University of São Carlos, Brazil); Filippo Giovanni Ghiglieno (Universidade Federal de São Carlos, Brazil); Paulo H. D. Ferreira (Federal University of Sao Carlos, Brazil)

We report on the early-stage development of a fiber-based quantum key distribution (QKD) testbed using attenuated laser pulses designed to operate under the Coherent-One-Way protocol with decoy-state preparation, reaching photon levels (μ) in the range of 0.1 to 1.0 photons/pulse through intensity modulation. In Coherent-One-Way (COW) protocol, logical bits are encoded in the temporal position of weak coherent pulses, and quantum coherence between successive pulses is monitored to detect eavesdropping. Single-photon detection is achieved with InGaAs SPADs, and calibrated attenuation ensures sub-photon regimes. This setup enables the study of channel loss, error rates, and secure key generation under realistic conditions.

1571171799

Identifying Inflammatory Signatures in Heart Tissue via FTIR and Linear Discriminant Mapping

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Fourier-transform infrared (FTIR) imaging spectroscopy was used to investigate biochemical alterations in cardiac tissue samples treated with Interleukin-1beta (IL-1β). Linear Discriminant Analysis (LDA) was applied to spectra in the 1500-1800 cm −1 region. In this work, the LDA component score for each pixel was plotted as a heatmap, enabling spatial visualization of spectral alterations. Heatmaps were generated for each of the three control and three treated samples. Additionally, the LDA loading curves show the induced alterations across wavenumbers.

1571171871

Impact of Manual Agitation on FTIR Spectroscopic Characterization of Trichloroacetic Acid (TCA) Peels

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Fourier-transform infrared (FTIR) spectroscopy is a valuable technique for evaluating the molecular structure and stability of pharmaceutical and cosmetic formulations. Trichloroacetic acid (TCA), widely used in medium-depth peels, has been typically produced by manipulation pharmacy. Therefore, there is often a lack of a proper descriptive guide for clinical use. In addition, it is not clear whether physicochemical alterations occur when TCA peels are subjected to manual agitation, a frequently overlooked step. This study aimed to investigate the impact of manual agitation on the FTIR spectra of TCA-based formulations. Spectral differences suggest structural reorganization and reinforce the need for standardized handling.

1571172121

Improving Light Shelf Performance by the Optimization of Tilt Angle

Beatriz Miranda Viana (Universidade Federal do Espírito Santo - UFES, Brazil); Daniela Pawelski Amaro Marins (UFES, Brazil); Maria José Pontes (Federal University of Espirito Santo, Brazil); José Leandro Félix Salles (Universidade Federal do Espírito Santo - UFES, Brazil); Jussara Fardin (Federal University of Espírito Santo, Brazil); Marcelo E. Vieira Segatto (Federal University of Espirito Santo, Brazil); Helder Rocha (UFES, Brazil)

This paper models the performance of light shelves in classrooms, to maximize average illuminance. System identification methodology is implemented using multivariate polynomial regression and the least squares method to find the best solutions. The simulation considered a classroom at the Federal University of Espírito Santo. Analysis SOL-AR, Relux and MatLab were used to collect illuminance data of the inclination angles to validate the model. Results indicate that the third-degree static model provided 655 lux at -40° (inner shelf) and 40° (outer shelf). This approach effectively optimizes natural lighting in urban environments, reducing reliance on artificial lighting and enhancing energy efficiency.

1571172122

Carbon K-edge XANES Reveals Functional Chemistry Driving Soil Carbon Sequestration in Well-Managed Pasture

Lucas Raimundo Bento (Embrapa Instrumentação, Brazil); Vitor Silveira Freitas (Embrapa Instrumentation, Brazil); Steffen A. Schweizer (Technical University of Munich, Germany); Patrícia P. A. Oliveira, José Pezzopane and Alberto C. De C. Bernardi (Brazilian Agricultural Research Corporation, Brazil); Debora M. Bastos Pereira Milori (Embrapa, Brazil); Ladislau Martin-Neto (Embrapa Instrumentation, Brazil)

Soils are major carbon sinks, with mineral-associated organic matter (MAOM) playing a key role in long-term carbon storage. This study evaluated the impact of pasture management on MAOM stocks and chemistry in a long-term experiment in Brazil. MAOM from degraded (DP), managed pasture (RMS), and native vegetation (NV) were isolated and analyzed with C K-edge XANES spectroscopy. MAOM stocks were highest in RMS, which showed greater accumulation of aliphatic, carboxylic, phenolic, and O-alkyl carbon. Results indicate that improved pasture management enhances soil organic carbon stocks by increasing forage inputs and promoting biochemical transformations that stabilize carbon in the MAOM fraction.

1571172319

Impact of Atomic Layer Deposited Al_2O_3 on the Dielectric Modulation and Optical Behavior of Plasmonic Silver Nanowire Networks

Isabela Machado Horta, Nilton Francelosi Azevedo Neto, Claudio Zepeda and Rodrigo Sávio Pessoa (Instituto Tecnológico de Aeronáutica, Brazil)

This study examines the dielectric modulation of silver nanowire (AgNW) networks via atomic layer deposition (ALD) of ~2 nm Al_2O_3 and its effects on plasmonic and optical properties. The coating preserved morphology and reduced roughness, as confirmed by AFM. UV-Vis spectroscopy revealed a redshift and broadening of the LSPR peak. Raman and fluorescence analyses showed wavelength-dependent effects: enhanced SERS at 532 nm, attenuation at 633 nm, and suppressed metal-enhanced fluorescence (MEF) after coating. Time-resolved photoluminescence indicated shorter decay times due to dielectric screening. These findings support ALD-grown Al_2O_3 as a tunable modulator for nanoplasmonic sensing applications.

1571172397

OPC-LIBS for Quantification of Cd and Pb in Tomatoes: A Sustainable Approach to Food Safety Monitoring

Luís Carlos Leva Borduchi (USP, Brazil & Embrapa Instrumentação, Brazil); Helga Maria Darezzo (Embrapa, Brazil & Laboratório Nacional de Agrofotônica, Brazil); Debora M. Bastos Pereira Milori (Embrapa, Brazil)

This study shows that laser-induced breakdown spectroscopy (LIBS), combined with one-point calibration (OPC) and a dual-laser system, provides a rapid, cost-effective alternative to conventional methods like atomic absorption spectroscopy (AAS) and inductively coupled plasma mass spectrometry (ICP-MS) for detecting heavy metals in tomatoes. OPC-LIBS quantified cadmium and lead with 93% and 89% accuracy, achieving low limits of quantification (0.03 mg/kg for Cd, 0.08 mg/kg for Pb), complying with ANVISA and EU standards. These results validate OPC-LIBS as a scalable, environmentally friendly approach for real-time contaminant monitoring, offering strong potential for integration into agri-food quality control systems.

1571172419

MoS$_2$-doped polymeric microstructures fabricated by two-photon polymerization

Gabriel O Campos (University of Sao Paulo, Brazil); Vinícius Pereira Pinto (University of São Paulo, Brazil); Kelly T. de Paula (IFSC-USP, Brazil); Cleber R. Mendonca (IFSC - USP, Brazil)

Growing interest in integrated photonics is driving demand for efficient, versatile, and scalable materials. Two-photon polymerization (2PP) is a promising method for fabricating high-resolution, low-cost microstructures by embedding functional components in a polymer matrix. In this study, MoS$_2$ nanoparticles were incorporated into a commercial resin and used for 2PP via direct laser writing. A range of characterization techniques - including SEM, DLS, EDX, AFM, and Raman spectroscopy - examined particle size, morphology, and MoS$_2$ integration. The characteristic E_2g^1 and A_1g Raman modes confirmed successful integration, highlighting the potential of these hybrid composites for integrated photonic applications.

1571172428

Prototype of a hybrid biosignal acquisition system integrating and optical electrode and fNIRS-based oximeter

Amish Jocksan J Sierra islas, Sr (Instituto Politécnico nacional, Mexico); Josue Daniel Rivera Fernandez and Luis Felipe de Jesus Hernandez Quintanar (Instituto Politécnico Nacional, Mexico)

New technologies in the medical field are crucial to improving public health. In this context, we present a prototype that incorporates the functionality of traditional electrodes, replacing them with an optical electrode capable of capturing biosignals. This system integrates an oximetry module to evaluate the hemodynamic changes. The prototype requires careful characterization of a laser diode and light-emitting diodes (LEDs), including parameters such as optical power, temperature, wavelength. To validate both modules, a dynamic model replicating a cardiac biosignal is used for the optical electrode, while Monte Carlo simulations or phantom tissues are proposed for validating the oximetry module.

1571172429

Spatial Dependence of OCT-Based Measurements of Stratum Corneum Thickness and External Ridge Width on Human Digital Core

Macsiel Nunes Lima Neves (University of São Paulo (USP), Brazil); Luismar Barbosa da Cruz, Jr (University of São Paulo, Brazil); Sebastião Pratavieira (University of Sao Paulo, Brazil); Marlon Rodrigues Garcia (Sao Paulo State University (Unesp), Brazil)

This pilot study investigates whether the position of Optical Coherence Tomography (OCT) measurements affects the thickness of the stratum corneum (SC) and the width of external ridges (ER) at the center of the digital. OCT images were acquired from six healthy male volunteers at four fingertip positions. Statistical analysis revealed no significant differences in SC or ER measurements across positions. These findings suggest that OCT provides stable and position-independent assessments within the digital core region, supporting its use in dermatological and biometric applications, and guiding future clinical studies involving skin microstructure analysis.

1571172459
Crosslinking of gelatin films with Riboflavin and ultraviolet radiation: a pilot study

Patrícia da Silva Souza (Universidade Federal do ABC, Brazil); Sonia Maria Malmonge, Nasser Ali Daghastanli and Patricia Aparecida Ana (UFABC, Brazil)

This study evaluated the effect of UVC radiation, associated or not with riboflavin, on the crosslink of type-B gelatin, aimed at biomedical applications. UVC radiation alone was a more promising alternative to the traditional chemical method to promote this effect.

1571172628
Cost-Effective AI-Driven Integrated Photonics for Spectroscopic Analysis in Biofuels

Pedro Oliveira Mariz de Carvalho and Guilherme Luiz Chinini (Photonics Innovation Institute, Brazil); Alex Dante (Photonics Innovation Institute (iTech), Brazil & Federal University of Rio de Janeiro (UFRJ), Brazil); Luis E. Ynoquio Herrera (Photonics Innovation Institute, Brazil); Sérgio Barcelos (Future Photonics, USA)

Spectroscopy is a powerful non-invasive technique increasingly enhanced by integrated photonics, artificial intelligence (AI), and the Internet of Things (IoT), enabling the development of compact, smart analytical devices. This work presents a cost-effective spectroscopic platform combining near-infrared (NIR) sensors, AI algorithms, and IoT communication for real-time analysis. The system was validated for ethanol fuel quality control by accurately quantifying water content. Additionally, it shows strong potential for non-invasive healthcare diagnostics and agricultural quality assessment. Its versatility makes it a promising tool for decentralized, rapid, and autonomous analysis across various industrial and agricultural applications.

1571172661
Early Discrimination of Plant Stress Responses Using Laser-Induced Fluorescence Spectroscopy: A Case Study in Cotton

Bianca Batista Barreto (Brazilian Agricultural Research Corporation, Brazil & Luiz de Queiroz College of Agriculture USP, Brazil); Vinícius G Rufino (Federal University of São Carlos, Brazil & Brazilian Agricultural Research Corporation, Brazil); Letícia Piazentin Dantas (Federal University of São Carlos, Brazil); Tiago Santiago do Espirito Santo and Yina Julieth Onofre (Brazilian

Agricultural Research Corporation, Brazil); Rafael Galbieri (Mato Grosso Cotton Institute, Brazil); Debora M. Bastos Pereira Milori (Embrapa, Brazil)

This study evaluates the use of Laser-Induced Fluorescence Spectroscopy to differentiate biotic and abiotic stress in cotton plants. Machine learning algorithms were applied to develop prediction models and characterize the different stresses. The results showed accuracy up to 89% while in asymptomatic phase from both stresses.

1571172667

Change of Light Absorption and Scattering Due to Interactions Between Nanoparticles in Black Carbon Clusters

Ana F Gomes (Universidade de São Paulo, Brazil); Maria L F Vicente (University of São Paulo, Brazil & University of Toulon, France); Francisco Eduardo Gontijo Guimarães (University of São Paulo, Brazil)

Black carbon (BC) nanoparticles, formed by incomplete fossil fuel combustion, pose environmental and health risks. This study examines how dispersion and clustering in different aqueous media: Milli-Q water, alkaline solution (pH 13), and 5% coconut oil-affect their molecular electronic states. Using UV-Vis-IR spectroscopy and confocal microscopy, we found that coconut oil promotes superior dispersion (n=0.98), while the alkaline medium also improves dispersion (n=1.0). In contrast, neutral water favors agglomeration (n=0.8). Results highlight the strong influence of particle-particle interactions on BC's optical and electronic properties, with implications for environmental reactivity and pollution control strategies.

1571172710

Dronissil: Universal device for attachment to drones, unmanned aerial vehicles, and flying robots for autonomous operations of pest insect detection, identification, and elimination in crops

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The Dronissil project develops a device for drones to reduce agrochemical use and promote sustainable farming. Using infrared cameras and AI, it identifies pests like caterpillars while protecting beneficial organisms. Once detected, a laser precisely eliminates the pests. Retractable, rotating cylinders improve targeting accuracy. As the drone scans the crops, the AI processes images to distinguish harmful from harmless species before activating the laser. Dronissil reduces chemical residues, benefiting the environment, health, and longevity. This innovation marks a major advance in precision agriculture, merging technology and sustainability for a healthier, more efficient, and environmentally responsible agricultural future.

1571172711

Enhancing Surface Finish of Additive Manufactured 316L Stainless Steel via Laser Surface Remelting

Rener Washington Mariano dos Santos and Lucas Da Silva Jubini (Instituto Tecnológico de Aeronáutica, Brazil); Jonas Jakutis (IEAv, Brazil); Rafael Humberto Mota De Siqueira (iEAV, Brazil); Ana Beatriz Ramos Moreira Abrahão (Laboratório de Eletroquímica e Corrosão (LEC), Brazil)

This study optimizes laser polishing of additively manufactured 316L stainless steel to reduce surface roughness. Using Response Surface Methodology (RSM), optimal parameters were identified and applied to test samples. Initial average roughness of 11.83 µm was reduced to 1.08 µm. The selected condition underwent micrographic analysis to examine microstructural changes. Microhardness testing revealed increased surface hardness. Results confirm that optimized laser polishing significantly enhances surface quality and mechanical performance, highlighting its potential as a finishing technique for 316L parts produced via additive manufacturing.

1571172713

Orthogonal Chirp Division Multiplexing for High-Speed Terahertz Wireless Systems

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6G systems are expected to operate in the THz band to support ultra-high data rates. However, severe propagation impairments in THz channels pose significant challenges. This paper presents a new channel model and numerical analysis of a THz system using orthogonal chirp division multiplexing (OCDM). The system includes chirped waveforms at 300 GHz, minimum mean square error (MMSE) equalization, amplitude modulation, and three ray-tracing-derived indoor environments: spacious hall, long corridor, and empty room. Results show OCDM enhances resilience to multipath effects, especially for lower-order modulations. The findings highlight OCDM with environment-aware techniques as a robust solution for future THz communications.

1571172718

Agar Optical Fibers Prepared by Dip Coating: Optical Characterization and Degradation Analysis

Lidia O Rosa, Francisco X. R. Neto and Eric Fujiwara (University of Campinas, Brazil); Cristiano MB Cordeiro (UNICAMP, Brazil)

This work reports the development of an automated dip-coating system for fabricating biodegradable fibers with core and cladding made of agar, a biocompatible, transparent, and renewable optical material. Adding an agar-glycerol hydrogel cladding reduces the optical loss and enhances the robustness against environmental effects. Moreover, we investigate the degradation of agar devices under room conditions and evaluate the potential of the automated dip-coating method to improve the uniformity of the samples. Thus, the agar fibers obtained using this technique were characterized for clad thickness and mass loss at room temperature.

1571172732

Two-Photon Polymerization of Fe2O3/Resin Nanocomposites for Magneto-Responsive Microstructures

Daniel da Cruz Soares (Universidade de São Paulo, Brazil); José Luis Clabel Huaman (Sao Carlos Institute of Physics, Brazil); Cleber R. Mendonca (IFSC - USP, Brazil)

This work presents the 3D microfabrication of magnetic nanocomposites via multiphoton polymerization. A photosensitive resin blend containing 9.33×109 Fe2O3 particles/mL enabled the fabrication of microstructures with high dimensional accuracy. Microscopy analyses revealed well-defined edges, RMS roughness of 43 nm, and magnetic contrast related to nanoparticle distribution. Under a magnetized needle, the structures exhibited deflection due to Fe2O3 magnetization, demonstrating external control. The results confirm the technique's potential for developing magnetically tunable microdevices and multifunctional sensors.

1571172737

Curcumin and Berberine-Functionalized Selenium Nanoparticles: Synthesis, Characterization, and Biomedical Applications

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Curcumin and berberine are natural compounds with demonstrated anticancer, anti-inflammatory, and antimicrobial properties. Selenium nanoparticles (SeNPs) exhibit significant biomedical potential due to their antioxidant, anticancer, and antimicrobial effects, primarily through the generation of reactive oxygen species (ROS), which induce cellular and DNA damage. This study presents the synthesis of SeNPs stabilized with curcumin and berberine via xenon lamp photoreduction, followed by characterization. The functionalized nanoparticles were tested against bacteria and fungi to evaluate their antimicrobial efficacy.

1571172747

Epoxy with silver nanoparticles: a simple and cheap method for in situ synthesis

Isabella D'andrea Lana da Silva (Universidade Federal de São Carlos, Brazil); Paulo H. D. Ferreira (Federal University of Sao Carlos, Brazil); Filippo Giovanni Ghiglieno and Vinicius Tribuzi Rodrigues Pinheiro Gomes (Universidade Federal de São Carlos, Brazil)

Silver nanoparticles (AgNPs) are widely used in multifunctional polymer nanocomposites due to their antimicrobial, conductive, and optical properties. While conventional synthesis methods involve multiple steps and stabilization agents, limiting scalability and reproducibility, we propose a simpler alternative: the in-situ formation of AgNPs directly in epoxy resin by incorporating an aqueous AgNO₃ solution before curing, followed by thermal treatment. This one-step, surfactant-free process enables controlled nanoparticle formation, reduces waste, and offers a cost-effective, scalable route for producing advanced nanocomposites.

1571172748

Evaluation of Optical Clearing Agents and Mechanical Compression on Light Penetration in Skin Using Optical Coherence Tomography

Jailda Nonato Dos Santos Oliveira (Universidade Brasil, Brazil); Camila Ramos Silva (Energy and Nuclear Research Institute, Brazil); Marcus Paulo Raele (IPEN-CNEN/SP, Brazil); Marcos Antonio Hortellani (Energy and Nuclear Research Institute, Brazil); Martha Ribeiro (IPEN, Brazil); Denise M Zezell (Nuclear and Energy Research Institute, IPEN-CNEN, Brazil & University of Sao Paulo, Brazil); Marcello Magri Amaral (Universidade Brasil, Brazil)

Light scattering in biological tissue reduces light penetration, limiting the effectiveness of optical techniques, mainly due to refraction index mismatching between subcellular structures and interstitial fluid. Here we investigate the effects of optical clearing agents (OCAs) and mechanical compression (MC) on enhancing light penetration in the skin tissue. We used Mineral Oil, PEG400, and Tartrazine as OCAs, and Oleic Acid (OA) as permeation enhancers. PEG-400 significantly reduced the optical attenuation coefficient (OAC) after 6 min, performing better alone than combined with OA. Tartrazine provided immediate but milder effects without dehydration. MC alone did not significantly alter OAC.

1571172749

Multiplex SERS Detection of Cationic Dyes Using Thin Silver Films Deposited by Magnetron Sputtering

Nilton Francelosi Azevedo Neto, Isabela Machado Horta, Jade Helena Campos Augstroze and Rodrigo Sávio Pessoa (Instituto Tecnológico de Aeronáutica, Brazil)

This work reports multiplex Surface-Enhanced Raman Spectroscopy (SERS) detection of Rhodamine 6G (R6G), Methylene Blue (MB), and Crystal Violet (CV) using silver films deposited via low-power (10W) magnetron sputtering. SERS measurements at 1×10^{-7} M revealed wavelength-dependent enhancements: R6G excelled at 532 nm, MB and CV at 633 nm. Unambiguous discrimination was achieved via distinct marker bands. Spatially resolved SERS mapping confirmed simultaneous detection of all three dyes. Sputtered silver films are established as a reproducible, scalable, and cost-effective platform for trace-level multiplex sensing.

1571172753

UVC decontamination of circulating preservation solution aimed at kidney transplantation improvement

Loraine Carolina Goenaga Mafud (University of São Paulo, Brazil); Jose D Vollet Filho (University of Sao Paulo & Sao Carlos Institute of Physics, Brazil); Natalia Inada, Cristina Kurachi and Vanderlei Bagnato (University of São Paulo, Brazil)

The shortage of kidneys for transplantation is worsened by the discard of organs due to contamination. This study demonstrates a novel technique to decontaminate kidneys before transplant. Using a prototype ultraviolet-C radiation system, combined with ultrasound and a detergent (polysorbate 80), during machine perfusion, we achieved a rapid reduction of the microbial load in the preservation fluid. The addition of the detergent effectively contributed to removing S. aureus and E. coli from within the kidney tissue. These promising results support the clinical viability of this approach, potentially increasing the supply of safe organs for transplantation.

1571172755

The refractive index of ion doped laser materials

Davi S Oliveira (University of São Paulo (IFSC - USP), Brazil); Tomaz Catunda (IFSC-USP, Brazil)

This work presents theorical studies of refractive index of laser materials. The Lorentz-Lorenz equation and Gladstone-Dale relation were subjected to testing, verifying the validity in the calculation of the refractive index of mixtures and in predicting the behavior of the refractive index with doping.

1571172759
Artificial Intelligence-Based System for the Diagnosis of Hepatic Steatosis
Deyanira Lopez Salazar and Josue Daniel Rivera Fernandez (Instituto Politécnico Nacional, Mexico); Macaria Hernández Chávez (Instituto Politecnico Nacional, Mexico); Carolina Guzmán Arriaga (Laboratorio de Hígado, Páncreas y Motilidad, Unidad de Medicina Experimental, Mexico); Karen Roa Tort and Diego Adrián Fabila Bustos (Instituto Politecnico Nacional, Mexico)

Non-alcoholic hepatic steatosis is characterized by excess fat accumulation in the liver, where early detection is essential to prevent severe complications. This work presents a methodology for processing fluorescence images provided by a portable system based on a digital camera and LED irradiation at 365, 405, 455 nm, and white light. Although rich in information, these images contain noise that complicates analysis. To overcome this, advanced image processing and classification algorithms were implemented. These algorithms isolated the hepatic region and extracted relevant features using artificial intelligence. The study contributes to an accessible method for diagnosing non-alcoholic fatty liver disease.

1571172766
Characterization of fiber bundles applied to visual inspection systems
Mariana Chagas Alcantara dos Santos, Bianca Yoshii, Jessica Guerreiro Santos Ramalho and Antônio Ivan Messias Soares Júnior (SENAI CIMATEC, Brazil); Valeria L da Silva (SENAI CIMATEC & Senai Cimatec, Brazil)

Visual inspection in hard-to-reach or potentially explosive environments may require special imaging systems. An alternative solution is to use a fiber bundle to guide the image. The aim of this work is to characterize and compare the same image sensor equipped with a glass bundle and a plastic bundle, identifying their characteristics as well as limitations for visual inspection purposes. Experimental and quantitative tests were carried out. In the end, it was possible to identify the main characteristics of each bundle and evaluate their possible applications in the inspection context.

1571172782
Label-Free Detection of Nitrate and Reactive Species in Plasma-Activated Water Using SERS on Gold Thin Films
Isabela Machado Horta and Nilton Francelosi Azevedo Neto (Instituto Tecnológico de Aeronáutica, Brazil); Felipe De Souza Miranda (UNESP, Brazil); Rodrigo Sávio Pessoa (Instituto Tecnológico de Aeronáutica, Brazil)

Plasma-activated water (PAW), generated via air-fed dielectric barrier discharge (DBD), contains nitrate and other long-lived reactive species with relevance for agriculture. Here,

PAW was produced by exposing 50 mL of deionized water to coaxial DBD plasma for 80 minutes and analyzed via surface-enhanced Raman spectroscopy (SERS) after drying 10 μL on a Ti/Au substrate. Strong SERS signals from nitrate at ~1045 cm^{-1} and related species were detected under 633 and 785 nm excitation. Laser-induced aggregation was observed at irradiated spots, revealing localized enrichment. These findings establish gold-based SERS as an effective, label-free tool for PAW characterization and nitrate detection.

1571172786
Applications of optical techniques for food quality analysis: milk, cheese and coffee

Maria Jose Valenzuela Bell (Universidade Federal de Juiz de Fora, Brazil); Virgílio De Carvalho Dos Anjos (Universidade Federal de Juíz de Fora, Brazil)

In this work we present optical methodologies used to perform food quality analysis, especially milk, cheese and coffee. We also evaluate non-conformities and adulterations. We show the feasibility of optical techniques for the determination of macroconstituents such as fats, proteins, lactose and moisture in milk and cheeses. The discrimination of robusta and arabica coffee was also possible due to the detection of selected coffee fluorophores, by using optical spectroscopy techniques. The advantage of these techniques lies in the fact that they are remote, fast and of low cost, with sufficient sensitivity to comply with current brazilian legislation.

1571172790
Thermal Analysis of Skin-Mimicking Phantoms Under Low Intensity Laser

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The increasing adoption of lasers in medical procedures has highlighted some limitations of the technique, such as the influence of melanin on thermal effects. This study focuses on analyzing the local temperature during and after the irradiation for different skin tones using optical phantoms, with a low intensity 660 nm laser. It was shown that as the sample was more pigmented, the temperature increased faster, and it was observed that the temperature rise is equivalent to a logarithmic pattern, while the decreasing temperature after irradiation was well described by Newton's law of cooling.

1571172800
UV-C Light Decontamination System Integrated with Organ Perfusion Machine for Transplantation

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The shortage of viable organs for transplantation is a global challenge worsened by the possibility of infections in donor organs. This study presents the development of an innovative decontamination device using UV-C radiation, coupled to organ perfusion systems, with the aim of reducing the microbial load in the preservation liquid and increasing the viability of grafts. The system, composed of a peristaltic pump, quartz tubes and UV-C lamps (254 nm), promotes continuous circulation and decontamination of the fluid in a closed circuit, ensuring

safe conditions. The proposal contributes to expanding the use of discarded organs, reducing infections and post-transplant rejections.

1571173949

Photoluminescence of CaTiO3: Pr nanophosphor prepared by the polymeric precursor method

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In this study, CaTiO3-Pr sample was prepared by polymeric precursor method. PL curve shows sharp red emission ascribed to transition from 1D2 state to the ground 3H4 state. Broad emission is also observed in blue-yellow region with lower intensity. Fluorescence decay time of the emission at 611 nm was determined, with average lifetime equals to 457 µs. CIE coordinates obtained by PL spectrum is related to red color shade.