ENCONTRO NACIONAL sbfoton 26

August 12-14, 2026
Campinas, Brazil

BOOK OF ABSTRACTS

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PROGRAM AT A GLANCE

Wednesday, August 12

12:00 -	Registration
14:00 – 14:15	Opening session
14:15 – 15:00	**Plenary talk – Anderson Gomes (UFPE)** Entre experimentos e estratégias: uma jornada entre a fotônica e a gestão científica
15:00 – 16:00	Photonics Industry and Entrepreneurship Workshop
16:00 – 16:30	Coffee
16:30 – 18:00	Photonics Industry and Entrepreneurship Workshop
18:30 – 20:00	Welcome reception at Hotel CPV UNICAMP
	Poster presentations 1 – Agriphotonics, Biophotonics, and Lasers

Thursday, August 13

08:30 -	Registration
09:00 – 9:30	**Invited talk 1 – Cristiano Cordeiro (UNICAMP)** Specialty Optical Fibers: Exploring Novel Geometries and Materials for Sensing Applications
09:30 – 10:30	Mini-course 1 – Breno Teixeira (UFABC) Quantum information
10:30 – 11:00	Coffee break
11:00 – 12:00	Mini-course 1 – Quantum information
12:00 – 13:30	Lunch
13:30 – 14:00	**Diamond Sponsor – Keysight Technologies** Testing quantum computing and quantum communication Bruno Duarte – Applications Engineer
14:00 – 16:30	Oral Presentations 1 – Agriphotonics, Biophotonics, Lasers, Sensing, imaging, and illumination
16:30 – 18:00	Coffee Break
	Poster Presentations 2 – Optical fibers and applications, Optical instrumentation and metrology, and Sensing, imaging, and illumination
18:00 – 19:00	SBFoton Assembly
20:00 – 22:00	Conference Dinner (Not included in the registration)

Friday, August 14

08:30 -	Registration
09:00 – 9:30	**Invited talk 2 – Antonio José Roque (CNPEM)**
09:30 – 10:30	Mini-course 2 – Gustavo Pavani (UFABC) Optical networks and cloud computing
10:30 – 11:00	Coffee break
11:00 – 12:00	Mini-course 2 – Optical networks and cloud computing
12:00 – 13:30	Lunch
13:30 – 14:00	**Diamond Sponsor – Anritsu**
14:00 – 16:30	Oral Presentations 2 – Optical fibers and applications, Optical communications, Optical instrumentation and metrology, Integrated optics and optoelectronics, and Optical quantum technologies
16:30 – 18:00	Coffee Break
	Poster Presentations 3 – Optical communications, Integrated optics and optoelectronics, and Optical quantum technologies
18:00 – 18:30	Student prize announcement and closing ceremony

ABSTRACTS

Wednesday, August 12

OPENING SESSION (14:00 - 14:15)

PLENARY TALK (14:15 - 15:00)

Entre experimentos e estratégias: uma jornada entre a fotônica e a gestão científica

Anderson Stevens Leonidas Gomes (Universidade Federal de Pernambuco e Centro de Gestão e Estudos Estratégicos, Brazil)

A fotônica tem revelado novos caminhos para compreender e intervir em sistemas complexos, da coerência da luz ao comportamento de materiais em nanoescala. Nesta apresentação, discutirei resultados recentes (2025/2026) de pesquisa com novas aplicações multidisciplinares de random lasers e random fiber lasers, nanomateriais e no uso de lasers de femtossegundos em aplicações biomédicas, com foco em abordagens inovadoras para o tratamento de câncer. As pesquisas foram realizadas com colaboração nacional e internacional. A partir dessa trajetória científica, ampliarei o olhar para o campo da gestão e inteligência estratégica, compartilhando reflexões sobre como o CGEE – Centro de Gestão e Estudo Estratégico atua na formulação de políticas baseadas em evidências, na prospecção tecnológica e na articulação entre ciência e sociedade. Entre experimentos e estratégias, busco mostrar como o mesmo espírito exploratório que move a física pode iluminar também os caminhos da gestão do conhecimento e da inovação científica no Brasil.

WORKSHOP (15:00 - 18:00)

Photonics Industry and Entrepreneurship Workshop

Newton Cesario Frateschi (Universidade Estadual de Campinas, Brazil)

Se você é aluno ou pesquisador e quer entender como levar a ciência do laboratório para o mercado, o Workshop SBFoton (12 de Agosto, das 15h às 18h) é o seu lugar.

Em apenas 3 horas, você passará por uma verdadeira imersão prática: conhecerá as bases do empreendedorismo na indústria de fotônica, aprenderá a modelar negócios com a metodologia Business Canvas e construirá, em grupo, soluções para problemas reais da área. Tudo isso com mentoria ativa e uma sessão final de apresentações para validar suas ideias — além daquele indispensável coffee break para networking

POSTER PRESENTATIONS I (18:30 - 20:00)

Agriphotonics, Biophotonics, and Lasers

P1.1 - Aphelenchoides Besseyi Early Detection in Cotton: A Fluorescence Imaging Platform Solution

Kaique C. Pereira (Embrapa, Brazil); Yina J. Onofre (Brazilian Agricultural Research Corporation, Brazil); Debora M. B. P. Milori (Embrapa, Brazil); Tiago S. do Espirito Santo (Brazilian Agricultural Research Corporation, Brazil); Vinícius G. Rufino (Federal University of São Carlos, Brazil & Brazilian Agricultural Research Corporation, Brazil); Antonio Gama (Embrapa, Brazil)

This study demonstrates the potential of a greenhouse-based fluorescence imaging platform for the early detection of nematode-induced diseases in cotton. Fluorescence images combined with machine learning algorithms enabled discrimination between healthy and infected plants with 93% accuracy using a Support Vector Classifier (SVC) at the pre-symptomatic stage.

P1.2 - 3D Microfabricated Skin Pore Models for Assessing the Efficacy of Photodynamic Therapy Against C. Acnes

Cleber R. Mendonca, Clara A. Sapio and Andre L. S. Romero (São Carlos Institute of Physics, University of São Paulo); Andrei N. G. Dabul and Carla R. Fontana (São Paulo State University (UNESP), School of Pharmaceutical Sciences, Department of Clinical Analysis); Adriano J. G. Otuka (São Paulo State University (UNESP), Institute of Geosciences and Exact Sciences, Department of Physics)

This study evaluated photodynamic inactivation (PDI) against Cutibacterium acnes (C. acnes) within 3D skin pore-mimicking microenvironments fabricated via multiphoton absorption polymerization. Methylene blue-mediated PDI under 660 nm irradiation

reduced bacterial density by 71%. These customizable biomimetic platforms offer a robust in vitro model for optimizing antimicrobial therapies.

P1.3 - Photodynamic Inactivation of Aedes Aegypti Larvae Using Curcumin-Loaded Cellulose Acetate Nanoparticles

Regiane Godoy de Lima (Universidade Federal de Mato Grosso do Sul, Brazil)

Curcumin-loaded cellulose acetate nanoparticles were developed as sunlight-activated photolarvicides for Aedes aegypti control. The nanosystem preserved curcumin photoactivity, generated reactive oxygen species under irradiation, and produced complete larval mortality at 3 ppm. Absence of dark toxicity and moderate light-dependent ecotoxicity support its potential as an eco-friendly vector-control platform for applications.

P1.4 - Radiomics of SEM Images of NdYAG Laser Irradiated Dental Enamel: Effect of the Number of Irradiations and Subsequent Fluoride Application

Júlia G Cavalero and Daniela F T Silva (Nuclear and Energy Research Institute, Brazil); Carlos P Eduardo (University of São Paulo, Brazil); Denise M Zezell (Nuclear and Energy Research Institute, IPEN-CNEN, Brazil & University of Sao Paulo, Brazil)

Radiomics quantified morphological changes in human enamel treated with multiple NdYAG laser irradiations and fluoride. Principal Component Analysis demonstrated that multiple irradiations significantly increased textural complexity. Fluoride application significantly modified the radiomic profile after a single irradiation. Radiomic analysis effectively clustered the morphological trends of the evaluated surfaces.

P1.6 - Optical Clearing Agents Outperform Mechanical Compression in Reducing Porcine Skin Attenuation

Camila Ramos Silva (Energy and Nuclear Research Institute, Brazil); Tania M Yoshimura (Nuclear and Energy Research Institute, Brazil); Jailda Nonato Dos Santos Oliveira (Universidade Brasil, 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 (Nuclear and Energy Research Institute, Brazil & Lumo Life Science, Brazil)

Light scattering limits deep-tissue optical imaging. We compared topical optical clearing agents (OCAs) with mechanical compression (1.6-47 kPa) on reducing the attenuation coefficient (AC) using 840 nm OCT on porcine skin. PEG-400/oleic acid lowered AC by 23.8% and compression was ineffective, showing OCAs can better optimize light delivery.

P1.7 - Combined Effects of Radiotherapy and Photodynamic Therapy in Melanoma Cells

João Henrique Eleutério (Sao Carlos Institute of Physics, Brazil); Raphael Guimarães Lopes (University of Sao Paulo, Brazil & Sao Carlos Institute of Physics, Brazil); Natalia Mayumi Inada (São Carlos Institute of Physics, Brazil); Vanderlei Salvador Bagnato (Texas A&M University, USA)

This study evaluated the association between radiotherapy (RT) and photodynamic therapy (PDT) mediated by Photodithazine® (PDZ) in B16F10 melanoma cells. Different therapeutic sequences were investigated. Results demonstrated greater cytotoxicity when RT was applied before PDZ incubation, suggesting ionizing radiation may interfere with photosensitizer photochemical properties and reactive oxygen species generation.

P1.8 - Skin Simulations Modelling Using Color Map Guidance

Murilo S Sampaio and Akio Kenzo T Frazatto (Universidade de São Paulo, Brazil); Jéssica T. S. Gonçalves, Luismar Barbosa da Cruz, Jr and Luciano Bachmann (University of São Paulo, Brazil)

Light-tissue interaction simulations require more realistic models to accurately represent the complexity of human skin. In this study, we propose a framework for generating more realistic models for Monte Carlo simulations. The model was validated using MCX with different non-homogeneous biological structures.

P1.9 - Radiotherapy Fractionation in B16F10 Melanoma: Tumor Control and Perspectives for Immunomodulation

Raphael Guimarães Lopes (University of Sao Paulo, Brazil & Sao Carlos Institute of Physics, Brazil); Natalia Mayumi Inada (São Carlos Institute of Physics, Brazil); Cynthia Aparecida Castro (Federal University of São Carlos, Brazil)

This study evaluates radiotherapy fractionations (1x10 Gy, 2x5 Gy, 4x2.5 Gy) on B16F10 murine melanoma. The 2x5 Gy dose most effectively delayed tumor growth. Ongoing immunological analyses will guide this protocol's future synergistic combination with photodynamic therapy to enhance the antitumor immune response.

P1.10 - FTIR Vibrational Spectroscopy as a Photonic Tool for Monitoring Breast Cancer Therapy Response

Maria Renata Valente Brandão Freire (Nuclear and Energy Research Institute, Brazil); Daniella L. Peres (Instituto de Pesquisas Energéticas e Nucleares, Brazil & University of São Paulo, Brazil); Maria Ângela Carneiro (Nuclear and Energy Research Institute, Brazil); Fábio Fernando Alves da Silva (Universidade Estadual de Campinas, Brazil); Emerson Bernardes (Instituto de Pesquisas Energéticas e Nucleares, IPEN/CNEN, Brazil); Denise M Zezell (Nuclear and Energy Research Institute, IPEN-CNEN, Brazil & University of Sao Paulo, Brazil)

Fourier-transform infrared spectroscopy was employed to investigate molecular alterations in breast cancer xenografts treated with 2-[^{131}I]iodomelatonin or Na[^{131}I]. Spectral analysis revealed alterations in protein secondary structures and nucleic acid-associated bands consistent with radiation-induced damage, highlighting FTIR spectroscopy as a photonic tool for monitoring therapeutic response and detecting treatment-induced biochemical alterations.

P1.11 - Improving Light-Dose Uniformity in 24-Well Microplate PDI Assays

Danielly Christine Adriani Maia Mota (Universidade de São Paulo, Brazil); Luismar Barbosa da Cruz Junior (UFU, Brazil); Daniel J Chianfrone, Vanderlei Bagnato and Kate Cristina Blanco (University of São Paulo, Brazil)

We developed a well-resolved radiometric workflow for a 660-nm LED Biotable used in PDI. Irradiance in 24-well plates was measured at five positions per well and reconstructed by multiquadric RBF interpolation. Independent circuits and optical

diffusion improved uniformity and reduced CFU/mL dispersion in Escherichia coli assays.

P1.13 - Experimental Determination of Ultrashort Laser Pulse Micromachining Parameters for Complex Geometries in BK7 Glass

Antonio Arleques Gomes (Instituto de Pesquisas Energéticas e Nucleares - IPEN/CENEN, Brasil); Arrian P. Nario (Brazil); Jhonatha Ricardo dos Santos and Evandro Drigo da Silva (Instituto de Pesquisas Energéticas e Nucleares, Brazil); Ricardo E. Samad (IPEN/CNEN, Brazil); Emerson Bernardes (Instituto de Pesquisas Energéticas e Nucleares, IPEN/CNEN, Brazil); Wagner de Rossi (Instituto de Pesquisas Energéticas e Nucleares - IPEN, Brazil)

Experimental investigations were conducted to determine the optimal ultrashort laser pulse micromachining parameters for the fabrication of microfluidic mixers with complex geometries in BK7 glass, targeting high sidewall verticality, dimensional accuracy, and process reproducibility.

P1.14 - Laser-Induced Breakdown Spectroscopy and Artificial Neural Networks for Rapid Detection of Biological Stress in Agri-Food Systems

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

Double-pulse laser-induced breakdown spectroscopy combined with artificial neural networks was applied to classify biological stress using elemental signatures. Models detected asymptomatic Aphelenchoides besseyi infection in soybean leaves and Escherichia coli contamination in tomatoes with high accuracy, highlighting a rapid, reagent-free, scalable approach for phytosanitary monitoring and quality control applications.

P1.15 - μFTIR Amide Images for Oral Cancer Classification

Daniella L. Peres (Instituto de Pesquisas Energéticas e Nucleares, Brazil & University of São Paulo, Brazil); Leandro Luongo De Matos (Universidade de são Paulo, Brazil);

Joaquim Cezar Felipe (University of São Paulo, Brazil); Mario O Menezes (Nuclear and Energy Research Institute, Brazil & University of 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)

Hyperspectral μFTIR images from oral squamous cell carcinoma (OSCC) and control tissues were represented by Amide I-III wavenumber intensity images and classified using a convolutional neural network. The proposed approach achieved 82.6% specimen-level accuracy (ROC-AUC=0.920), demonstrating that amide-region information alone supports accurate OSCC discrimination with reduced dimensionality and computational cost.

P1.16 - Engineering Plasmonic Photothermal Damage of Tumors

Mariana Joyce Bezerra da Silva Crispim (Federal University of Pernambuco, Brazil); Gabrielli M. F. Oliveira (Universidade Federal de Pernambuco, Brazil); Túlio L Pedrosa (SENAI CIMATEC, Brazil); Marcilene Souza Silva (Federal University of Pernambuco, Brazil); Renato E Araujo (Universidade Federal de Pernambuco, Brazil)

Analytical modeling, computational simulation, and experimental validation were integrated to optimize gold nanorod-assisted photothermal therapy. Numerical and experimental results demonstrated efficient tumor heating at 46 °C under 800 nm irradiation. Arrhenius-based simulations predicted irreversible thermal damage, highlighting the potential of computational approaches for safer and personalized photothermal treatment planning.

P1.17 - FTIR Spectroscopy of Blood Serum with SVM for Renal Damage Biomarker Detection in 177Lu-DOTATATE-Irradiated Mice

Daniela F T Silva and Tania M Yoshimura (Nuclear and Energy Research Institute, Brazil); Vinicius P Anjos (Nuclear and Energy Research Institute, Brazil & University of São Paulo, Brazil); Emerson Bernardes (Instituto de Pesquisas Energéticas e Nucleares, IPEN/CNEN, Brazil); Denise M Zezell (Nuclear and Energy Research Institute, IPEN-CNEN, Brazil & University of Sao Paulo, Brazil)

FTIR spectroscopy of blood serum from 177Lu-DOTATATE-irradiated female BALB/c mice (0, 10, 50 MBq) was combined with linear SVM to identify renal damage

biomarkers. Analysis of 56 samples revealed dose-dependent biochemical alterations in the Amide I region (AUC = 0.768, 5-fold stratified cross-validation).

P1.19 - Nutrient Prediction in Soybean Plant Tissue via LIBS and Machine Learning

Tiago Santiago do Espirito Santo (Brazilian Agricultural Research Corporation, Brazil); Daniele Souza (Embrapa Instrumentação, Brazil); Raphael Antonio Caface (Embrapa, Brazil); Kleydson Stenio (Radix Engineering, Brazil); Luís Carlos Leva Borduchi (USP, Brazil & Embrapa Instrumentação, Brazil); Debora M. Bastos Pereira Milori (Embrapa, Brazil)

This study developed a rapid methodology for manganese nutritional assessment in 130 soybean samples, integrating LIBS spectroscopy and machine learning. Following spectral preprocessing and the extraction of 33 UV features, the Support Vector Regression (SVR) model outperformed others with high predictive capacity, making it ideal for precision agriculture.

P1.21 - Influence of Ionizing Radiation and Laser Power on Veneer Debonding: Chemical Evaluation of Light-Cured Versus Dual-Cured Resin Cements

Daniela M C Leite (Universidade de São Paulo, Brazil); Daniela F T Silva (Nuclear and Energy Research Institute, Brazil); Vinicius P Anjos (Nuclear and Energy Research Institute, Brazil & University of São Paulo, Brazil); Denise M Zezell (Nuclear and Energy Research Institute, IPEN-CNEN, Brazil & University of Sao Paulo, Brazil)

Er: YAG laser debonding (5W) of lithium disilicate veneers was optimized by the high absorbance and structural stability of dual-cured Panavia V5 compared to Variolink Esthetic LC. PCA (PC1>46.64%) revealed that prior ionizing radiation significantly altered the enamel interface, increasing mechanical resistance and hindering veneer removal for both cements.

P1.22 - Geometric Optimization of Silica@Gold Nanoparticles for Biomedical Diagnostic Technics

Larissa A Silva and Renato E Araujo (Universidade Federal de Pernambuco, Brazil)

This work investigates silica@gold core@shell nanoparticles, analyzing how core diameter and shell thickness influence plasmonic properties. Mie theory reveals optimized geometries for electric-field amplification, enhanced near-infrared scattering and backscattering. Results highlight distinct nanoparticle configurations for biomedical diagnostic techniques.

P1.23 - Application of CRDS for Monitoring Gaseous Fission Products in Research Reactors

Priscila Matos Santos and Leonardo Trindade (Universidade de São Paulo, Brazil); Eduardo Landulfo (IPEN CNEN SP, Brazil); Marcus Paulo Raele (IPEN-CNEN/SP, Brazil)

This work presents the development of a Cavity Ring-Down Spectroscopy (CRDS) system targeting the 631.8nm electronic transition of Xenon. Aimed at early detection of fuel cladding failures in research reactors like the IEA-R1, we describe the optical alignment and the initial baseline measurements.

P1.24 - Raman Scattering Analysis of Imazapic Pesticide Effects on Nile Tilapia Hepatic Tissue

Bruna Gobbi Medina (Universidade Estadual Paulista, Brazil); Giovana Rampazzo Teixeira, Victor Rogerio Garcia Batista, Rafael Ribeiro Correia and Rafael Jesus Gonçalves Rubira (Universidade Estadual Paulista (UNESP), Brazil)

This study investigated molecular and histological alterations in Nile tilapia liver tissue following Imazapic (IMZ) exposure. Raman spectroscopy combined with multivariate analysis revealed biochemical changes associated with oxidative stress and hepatotoxicity, demonstrating its potential as a sensitive tool for environmental monitoring.

P1.25 - Microfluidic Devices for Bioengineering Applications Fabricated by Direct Laser Writing

Isabelle V. Lazaro, Miria N. Yamauti, Paulo H. C. Marques, Fábio S. De Vicente, Alexandre Mesquita and Adriano J. G. Otuka (São Paulo State University (UNESP) - Institute of Geosciences and Exact Sciences, Brazil)

Microfluidic devices are widely used in bioengineering and require versatile fabrication methods. In this work, acrylic polymer matrices were processed by 450nm CW laser ablation to fabricate three-dimensional microfluidic structures using a layer-by-layer approach. The resulting devices exhibited well-defined channels approximately 100µm wide, demonstrating their potential for bioengineering applications.

P1.26 - Integrated Soil-Plant Carbon and Nutrient Monitoring Using Laser-Induced Breakdown Spectroscopy

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

Laser-induced breakdown spectroscopy was validated as a rapid, reagent-free platform for quantifying carbon and nutrients in soils and soybean leaves. By combining calibration-free modeling with one-point calibration, the method achieved high accuracy across distinct matrices, supporting sustainable soil-plant monitoring, precision agriculture, and agro-environmental management.

P1.29 - Liquid Chromatography Coupled to Mass Spectrometry for Identification of Products Generated by Photodynamic and Sonodynamic Therapy

Juliana Cristina Barreiro (University of São Paulo, Brazil); Erika Toneth Ponce Ayala (University of Sao Paulo, Brazil); Vanderlei Bagnato (University of São Paulo, Brazil); Sebastião Pratavieira (University of Sao Paulo, Brazil)

Photodynamic therapy (PDT) and sonodynamic therapy (SDT) are well-known alternative anti-cancer strategies. However, studies on the identification of the degradation products generated during these therapies remain limited. In this work, the products generated from Protoporphyrin IX (PpIX) following PDT and SDT were identified using Liquid chromatography-tandem mass spectrometry (LC-QqTOF-MS).

Thursday, August 13

INVITED TALK (09:00 - 09:30)

Specialty Optical Fibers: Exploring Novel Geometries and Materials for Sensing Applications

Cristiano Monteiro de Barros Cordeiro (Universidade Estadual de Campinas, Brazil)

Standard optical fibers have revolutionized global communications and have become vital to modern communication infrastructure, with more than 6 billion kilometers of fiber manufactured worldwide. Advanced optical fibers exploit internal microstructures and novel materials to expand waveguide functionality and enable new applications. Our work focuses on developing optical-fiber sensing platforms, including microstructured and hollow-core fibers made from silica and polymers, as well as specialty fibers based on biodegradable materials. These platforms are investigated for refractive-index, curvature, temperature, and strain sensing, alongside biodegradable photonic devices with potential future applications in sustainable biomedical and environmental monitoring. By combining advanced fiber architectures, functional materials, and innovative fabrication approaches, this research seeks to establish versatile sensing platforms with improved performance, adaptability, and reduced environmental impact.

MINI COURSE 1 (09:30 - 12:00)

Quantum Information

Breno Marques Gonçalves Teixeira (Universidade Federal do ABC, Brazil)

A informação quântica investiga o aprimoramento de processos informacionais por meio da exploração de propriedades quânticas de sistemas físicos. Diferentes propostas de algoritmos quânticos fundamentam-se em características não clássicas distintas. Este minicurso apresenta uma revisão das propriedades quânticas de sistemas físicos sob a perspectiva da teoria da informação, demonstrando sua aplicação em protocolos centrados nestes fenômenos. Além disso, abordaremos a utilização de estados da luz como plataforma física para a implementação experimental de protocolos de informação quântica. Inicialmente, serão discutidos os princípios fundamentais da mecânica quântica relevantes para o processamento e transmissão de informação, incluindo superposição, interferência e emaranhamento quântico. Tais

propriedades permitem o desenvolvimento de estratégias computacionais e comunicacionais que não possuem equivalentes clássicos diretos, abrindo caminho para ganhos de eficiência em determinadas tarefas de processamento de dados, criptografia e simulação de sistemas físicos complexos. Em seguida, serão apresentados exemplos de protocolos de informação quântica que exploram esses recursos, como distribuição quântica de chaves, teleportação quântica e algoritmos voltados à aceleração computacional. A análise desses protocolos será conduzida de forma conceitual e operacional, enfatizando a relação entre as propriedades físicas dos sistemas quânticos e as vantagens informacionais obtidas a partir delas. Por fim, o minicurso discutirá aspectos experimentais associados à implementação de sistemas quânticos ópticos, destacando o papel da fotônica quântica como uma das principais plataformas para aplicações em informação quântica. Serão introduzidos conceitos relacionados à geração, manipulação e detecção de estados quânticos da luz, bem como os desafios tecnológicos envolvidos na construção de dispositivos e arquiteturas voltados ao processamento quântico de informação.

DIAMOND SPONSOR (13:30 - 14:00)

Keysight Technologies

Testing Quantum Computing and Quantum Communications

Bruno Duarte – Applications Engineer (Keysight Technologies)

Quantum applications require extremely low-noise environments and highly precise control, generation, and measurement technologies. This presentation covers Quantum Computing, Quantum Sensing, and Quantum Communications. Topics include qubit characterization, Quantum Control Systems (QCS), Quantum Key Distribution (QKD) and Photonics Instrumentation.

ORAL PRESENTATIONS I (14:00 - 16:30)

Agriphotonics, Biophotonics, Lasers, Sensing, Imaging, and Illumination

14:00 - 14:13
O2.1 - Water Deficit Detection in Cotton Plants Using Fluorescence Images and Machine Learning: A Greenhouse Solution

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

This study combines fluorescence imaging with machine learning for early water-stress detection in cotton. Color and texture features from UV-excited leaves were classified by several algorithms. Accuracy ranged between 0.82 and 0.87 in pre-symptomatic stage and the most consistent model was Linear Discriminant Analysis.

14:13 - 14:26

O2.2 - Fabrication of Nanostructured Sensors via Layer-by-Layer Thin Films Using Gold Nanoparticles to Detect the Herbicide Simazine

Lucca Sanches Schimidt and João Victor Mendes (Universidade Estadual Paulista, Brazil); Azeneth A B Brochero (UNESP, Brazil); Cibely S. Martin (Universidade Estadual Paulista (UNESP), Brazil); Lucas F. Santos (UNESP, Brazil); Rafael Jesus Gonçalves Rubira (Universidade Estadual Paulista (UNESP), Brazil)

The project aims to investigate the fabrication of thin films via Layer-by-Layer assembly utilizing gold nanoparticles for Simazine pesticide detection. The adsorption behavior of Simazine and its interactions with gold nanoparticle colloids and Layer-by-Layer films were systematically investigated using complementary optical and electrochemical spectroscopic techniques: UV-Vis absorption, Raman and impedance.

14:26 - 14:39

O2.3 - Piperine Boosts Curcumin-SeNPs aPDT Against A. Baumannii

Geovanna N Barnabé and Isabela Lopes (Universidade Federal de São Paulo, Brazil); Bianca Moraes (Pós graduação, Brazil); Marcia Franzolin and Susana Barreto (Instituto Butantan, Brazil); Lilia Coronato Courrol (Universidade Federal de São Paulo, Brazil)

Curcumin-functionalized selenium nanoparticles were synthesized via photoreduction using sodium selenite and piperine. Characterization through UV-Vis, FTIR, and Zeta

potential confirmed stable nanostructures. Against multidrug-resistant Acinetobacter baumannii, piperine enhanced stability and significantly potentiated antimicrobial activity, highlighting this system's nanotechnological promise as a viable strategy to counteract multidrug-resistant pathogens.

14:52 - 15:05
O2.5 - Automated 1D-CNN Preprocessing of FTIR Spectra for Antibiotic Monitoring

Vinicius P Anjos (Nuclear and Energy Research Institute, Brazil & University of São Paulo, Brazil); Daniela F T Silva (Nuclear and Energy Research Institute, Brazil); Mario O Menezes (Nuclear and Energy Research Institute, Brazil & University of São Paulo, Brazil); Denise M Zezell (Nuclear and Energy Research Institute, IPEN-CNEN, Brazil & University of Sao Paulo, Brazil)

A 1D-CNN was developed to automate the preprocessing of FTIR spectra from an antibiotic degradation model. The CNN accurately reproduced a conventional gold-standard preprocessing workflow, demonstrating strong spectral similarity and excellent clustering performance (ARI = 0.9933; NMI = 0.9878), enabling rapid, standardized, and automated FTIR preprocessing.

15:05 - 15:20
Short break

15:20 - 15:33
O2.6 - Intracellular Localization of Bacteriochlorin Photosensitizers in Melanoma Cells

Julia Bernardes Coelho and Dianeth Sara Lima Bejar (Universidade de São Paulo, Brazil); Erika Toneth Ponce Ayala (University of Sao Paulo, Brazil); Marciana Pierina Uliana Machado (Universidade Federal da Integração Latino-Americana, Brazil); Bruna Bueno Postacchini (Universidade Federal de Ouro Preto, Brazil); Sebastião Pratavieira (University of Sao Paulo, Brazil)

Evaluating methoxy-bacteriochlorin (M-Bchl) internalization in melanoma (SH-4) and fibroblast (HDFN) cells, confocal microscopy revealed primarily lysosomal, non-nuclear

localization. This favorable internalization profile supports M-Bchl's potential for melanoma PDT.

15:33 - 15:46
O2.7 - Density Profiling of Gas Jets for Laser Electron Acceleration Using a Nomarski Interferometer

Beatriz da Silva Oliveira (Universidade de São Paulo, Brazil); Jhonatha dos Santos and Ricardo E. Samad (IPEN/CNEN, Brazil)

Interferometry is a non-invasive diagnostic technique used to characterize gas jet expansion under vacuum conditions, which is essential for laser-driven electron acceleration experiments. The Nomarski interferometer employs a single beam, thereby simplifying the experimental setup and the optical alignment while providing highly stable interference fringes.

15:46 - 15:59
O2.8 - Photothermal Behavior of Polydopamine Nanospheres: Experimental and Theoretical Analysis

Flávia Eduarda Souza Ferreira and Renato E Araujo (Universidade Federal de Pernambuco, Brazil); Kevin Braeckmans and Ilia Goemaere (Ghent University, Belgium)

The photothermal behavior of polydopamine nanospheres was studied by thermal lens spectroscopy at 400 nm and 800 nm excitation. Heat generation exhibited a dependence on particle size and excitation wavelength, consistent with theoretical findings. Maximum efficiency occurred at approximately 130 nm for 400 nm and 413 nm for 800 nm.

15:59 - 16:12
O2.9 - SLM-Based Angular Scanning for Surface Plasmon Resonance Sensing

Andressa Cristine Marinho Costa and Andriel Vinicius Martins Da Silva (Centro Nacional de Pesquisa em Energia e Materiais (CNPEM), Brazil); Ursula Salazar Roggero (UNICAMP, Brazil); Hugo Enrique Hernandez-Figueroa (University of Campinas (Unicamp), Brazil)

We integrated a Spatial Light Modulator (SLM) into a SPR sensor for programmable angular scanning, reducing the dependence on mechanical angular scanning with phase-mask modulation. By beam conditioning, we mitigated SLM-induced optical artifacts. This approach enhanced resolution from 2° to 0.02°, demonstrating the potential of SLM-based interrogation for SPR sensing.

POSTER PRESENTATIONS II (16:30 - 18:00)

Optical fibers and applications, Optical instrumentation and metrology, Sensing, imaging, and illumination

P2.1 - Electro-Active qBIC Silicon Metasurfaces for Fast Electrophysiological Sensing

Henrique Stumm Rocha (Universidade Estadual de Campinas, Brazil); Hugo Enrique Hernandez-Figueroa (University of Campinas (Unicamp), Brazil)

We propose an electro-active optical sensor based on PEDOT-coated silicon qBIC metasurfaces for neuronal electrophysiology. Electrochromic modulation of high-Q dielectric resonances, combined with e-beam patterned PEDOT volume reduction via reactive ion etching, targets sub-millisecond response times, enabling compact, label-free optical spike detection.

P2.2 - Arrayed Waveguide Grating Design for OCT Applications

Fellipe Peternella (Instituto Hardware BR, Brazil); Eduardo Lima (Instituto Hardware BR, Brazil); Emmanuel Leite De Medeiros and Vítor José Costa Rodrigues (HardwareBR, Brazil); João Paulo Magalhães Fernandes (Instituto Hardware Brasil, Brazil); Allan Alves (Instituto Hardware Brasil, UNESP, Brazil); Tiago Henrique Brandao (HardwareBR, Brazil)

We present the design of the first module of a two-stage AWG spectrometer for OCT. The 61-channel AWG, to be fabricated on a silicon nitride platform, achieves 1.0 nm resolution. Maximum imbalance loss at edge channels is 3.5 dB. The module targets a compact and scalable spectrometer for OCT imaging.

P2.3 - Moisture Analysis of PMMA Preforms Prior to Polymer Optical Fibers Manufacturing

Francisco Xavier Ribeiro Neto (Universidade Estadual de Campinas, Brazil); Eduardo A. V. Souza (Unicamp, Brazil); Cristiano MB Cordeiro (UNICAMP, Brazil)

This work presents a characterization of moisture content in poly(methyl methacrylate) (PMMA) rods before and after thermal treatment. The mass-loss rate associated with water removal was quantified to optimizations in optical fiber fabrication process. The subsequent rehydration behavior was also investigated, since the samples may reabsorb moisture after annealing.

P2.4 - Study of FBG Time Response Using the Eigenfunctions Expansion and FEM Methods

Paulo de Tarso Neves, Jr. (Federal University of Technology - Parana (UTFPR), Brazil); Ricardo E. da Silva (Universidade Tecnológica Federal do Paraná, Brazil); David Webb (Aston University, United Kingdom (Great Britain)); Alexandre de Almeida Prado Pohl (Federal University of Technology - Parana (UTFPR), Brazil)

This paper present two techniques to simulate the time response of the wavelength shift of fiber Bragg grating (FBG) using the Eigenfunctions Expansion Technique (EET) and the Finite Element Method (FEM).

P2.5 - Photonic Scissors: Cutting Polymer anti-Resonant Optical Fibers Using an Nd: YAG Laser

João Preizal (Instituto de Telecomunicações & University of Aveiro, Portugal); Eduardo A. V. Souza and Ivan Prearo (Unicamp, Brazil); Ricardo Oliveira (IT - Aveiro, Portugal); Cristiano MB Cordeiro (UNICAMP, Brazil)

An Nd: YAG laser (266 nm) and continuous fiber rotation were employed for cleaving anti-resonant polymer optical fiber. Compared with the blade cleaving method, for optimized conditions (57 mW laser power and 38 rpm fiber rotation), the method produces cleaner end face, preventing structural collapse preserving the fiber geometry.

P2.6 - Software Solution for Cavity Locking of a Resonant Electro-Optic Modulator

Leandro Moralli Fernandes (Universidade Estadual de Campinas, Brazil); Marlon Medeiros Correia and Flavio Cruz (Unicamp, Brazil)

In this work, we propose a software-defined method to stabilize cavity drifts in resonant electro-optic modulators, utilizing a sub-Hz tracking algorithm based on the nonlinear spectral broadening generated by femtosecond optical pulses.

P2.7 - 5 GHz Optoelectronic Oscillator Based on Resonant Electro-Optic Frequency Comb Generator

Nathany Ferreira Jammal and Marlon Medeiros Correia (Unicamp, Brazil); Flavio Caldas da Cruz (UNICAMP, Brazil)

This study describes the construction and performance of a 5 GHz optoelectronic oscillator employing a resonant electro-optic modulator coupled with a fiber-optic delay line. Evaluation of the single-sideband spectra reveals stable oscillation with phase-noise levels reaching −92.82 dBc/Hz at offsets above 10kHz, confirming its viability for low-noise microwave signal generation.

P2.8 - Stable Electro-Optical Frequency Combs for Astronomy and Telecommunications

Tomas P V Andrade (UNICAMP, Brazil); Marlon Medeiros Correia (Unicamp, Brazil); Leandro Moralli Fernandes (Universidade Estadual de Campinas, Brazil); Flavio Caldas da Cruz (UNICAMP, Brazil)

We report two 20 GHz electro-optical comb developments at UNICAMP, based on a resonant electro-optic modulator and on cascaded four-wave mixing driven by two intensity modulators, aimed at robust near-infrared and visible comb generation.

P2.9 - Matrix Model for FSBS Sensors: Decoupling Artifacts to Enable Blind Source Separation

Aleksander Paterno (Santa Catarina State University, Brazil); Rafael Kingeski (Santa Catarina State University Brazil, Brazil); Carlos Andrés Álvarez Ocampo (ICMUV, Spain); Antonio Diez (Universidad de Valencia, Spain); Jose Luis Cruz (Universitat de València, Spain); Miguel V Andres (Universidad de Valencia, Spain)

Forward Stimulated Brillouin Scattering (FSBS) in SMF28 enables multi-parametric sensing suffering from phase cross-talk. We present a Breit-Wigner-Fano (BWF) preprocessing framework that recovers the true resonance frequency, removes a nonlinear tracking artifact, and yields observations that are linear combinations of physical sources-a mathematical condition for blind source separation validation.

P2.10 - Antiresonant Capillary Fibers for Refractometry

Sinei Felix Gonçalves Junior (Federal University of Lavras, Brazil); Lidia O Rosa (University of Campinas, Brazil); Flavio Marques and Alexandre Cotta (Federal University of Lavras, Brazil); Jefferson Tsuchida (Universidade Federal de Lavras, Brazil); Leomar S. Marques (Federal University of Lavras, Brazil); Eric Fujiwara (University of Campinas, Brazil); Cristiano MB Cordeiro (UNICAMP, Brazil); Jonas H Osório (Federal University of Lavras, Brazil)

We demonstrate refractometric measurements using filled silica capillary fibers. Based on the antiresonant reflecting optical waveguide guidance mechanism, the material dispersion is retrieved directly from the fiber transmission spectrum. This straightforward method yields dispersion data across the visible and near infrared range, providing a versatile platform for optical materials characterization.

P2.11 - Cellulose Acetate-Polyaniline Composite Coatings for Fabry-Perot Optical Fiber Sensing Applications

Maxwell Ogochukwu Ojukwu (Universidade Federal de Lavras, Brazil); Jonas H Osório, Julio Ugucioni and Fabiana da Silva Felix (Federal University of Lavras, Brazil)

We developed a Fabry-Perot interferometer by depositing a cellulose acetate-polyaniline composite onto the tip of an optical fiber. Spectral characterization revealed that the device's optical response is tunable by adjusting the number of coating cycles. These preliminary results demonstrate this configuration as a promising platform for biochemical sensing applications.

P2.12 - Concatenated Multimode Interference and Fabry-Perot Structures for Refractive Index Sensing

João Gabriel Carvalho, Luiz David C. Silva, Flavio Marques and Alexandre Cotta (Federal University of Lavras, Brazil); Jefferson Tsuchida (Universidade Federal de Lavras, Brazil); Julio Ugucioni, Silésia Curcino Da Silva, Leomar S. Marques and Diego C. Fuzatto (Federal University of Lavras, Brazil); Alexandre dos Santos (Federal University of Juiz de Fora, Brazil); Cristiano MB Cordeiro (UNICAMP, Brazil); Limin Xiao (Fudan University, China); Jonas H Osório (Federal University of Lavras, Brazil)

We report an in-series singlemode-multimode-singlemode (SMS) and Fabry-Perot interferometer (FPI)-based refractive index sensor. By modulating the broad SMS spectral peaks with narrow FPI fringes, this configuration overcomes the wavelength shift resolving limitations of conventional self-imaging devices. The sensor exhibits an enhanced sensitivity-to-FWHM ratio, expanding the capabilities of resolving spectral shifts.

P2.13 - Agar-Based Soft Device with Optical Fiber Displacement Sensing

Júlia C. X. de Lima and Eric Fujiwara (University of Campinas, Brazil)

This work presents a biodegradable soft device made of agar hydrogel with an embedded optical fiber for mini-manipulation. Deformation is monitored through speckle analysis, enabling reversible bending without mechanical loading. Experimental results demonstrate a linear response, highlighting the potential of this simple and effective sensing approach for soft robotic actuators.

P2.15 - Birefringent Transparency Film Interferometer for Fourier-Transform Spectrometer

Lino Misoguti (USP - IFSC, Brazil); Leonardo Garcia Ferreira (USP, Brazil)

FT spectrometers are known to offer several advantages over other conventional dispersive ones. Here, we propose a new FT spectrometer made with a single-path birefringent transparency film interferometer. Beside the simplicity and low-cost, this spectrometer is insensitive to vibration and has good potential for visible and UV range applications.

P2.16 - Development of a Low-Cost Automated Optical Fiber Unwinding System

Felipe Cardoso Thomé (Universidade Estadual de Campinas, Brazil); Carlos da Silva (Universidade Estadual de Campinas (UNICAMP), Brazil); Cristiano MB Cordeiro (UNICAMP, Brazil)

This paper details a low-cost, automated unwinder for safely transferring delicate non-conventional optical fibers between a drum and a spool. Dual DC motors sustain 400 rpm to transfer 1 km of fiber in five minutes.

P2.17 - Speckle Analysis Applied to Surface Characterization

Juan F. Serighelli and Eric Fujiwara (University of Campinas, Brazil)

This study validates a fast, low-cost, non-destructive optical method using laser speckle scattering to evaluate surface roughness. By combining first-order statistics for micrometric scales and GLCM descriptors for nanometric scales, this methodology provides a framework for the multiscale topographical analysis.

P2.19 - Adaptation of PCA and Whitening for Quadrature Error Correction in 1D Homodyne Interferometry

Luis Felipe Pereira Ramos (Universidade Estadual Paulista, Brazil); Claudio Kitano (UNESP, Brazil)

This work adapts the Principal Component Analysis (PCA) and whitening method from 2D interferograms to 1D homodyne quadrature signals. Simulations show that the method effectively corrects errors, offsets, and gains for linear phases, but requires at least one full fringe to avoid inducing arbitrary axes.

P2.20 - High-Stability Common-Path Speckle Interferometer for Effective Thermo-Optic Metrology

Erasmo C Bessa, Jr. and Gustavo Almeida (Universidade Federal de Uberlândia, Brazil)

We present a highly stable common-path speckle interferometer for measuring the effective thermo-optic coefficient of solid media. By employing a single-beam Mach-Zehnder analog architecture, the system achieves robust phase extraction. A proof of concept using a borosilicate glass slide validates the instrument's high metrological reliability for thermal characterization.

P2.21 - SrAl12O19: Mn Phosphor Prepared via Co-Precipitation Method: Structure and Optical Characterization

Thiago Ardana Chaim and Fábio S. De Vicente (UNESP, Brazil); Adriano J. G. Otuka (São Paulo State University (UNESP) - Institute of Geosciences and Exact Sciences, Brazil); Florian S Günther (Universidade Estadual Paulista "Júlio de Mesquita Filho", Brazil); Alexandre Mesquita (UNESP, Brazil)

In this study, Mn4+ doped SrAl12O19 was synthesized via coprecipitation with high heating rate at 1000-1300 °C. XRD revealed secondary phases at lower temperatures, while 1300 °C yielded the best crystallinity. Emission spectra showed Mn4+ peaks (~644, 657, 677 nm), with intensity decreasing as synthesis temperature decreased, confirming phase interference.

P2.22 - Detection of DRAM IC Incorrect Positioning in Burn-in Sockets Using YOLO and PatchCore

Vinicius Motta Garcia (Hardware BR Institute, Brazil); Fabio R Bassan (HBR, Brazil)

This work presents a machine vision system for detecting DRAM chip misalignment in Burn-in Boards. Using a 25 MP camera, YOLO-based socket detection, and PatchCore anomaly detection, the system identifies placement errors such as chip inclination and improper clip positioning, reducing risks of component and socket damage.

P2.23 - Effects of Zn Co-Doping on the Photoluminescence of SrAl2O4: Pr Phosphor

Helena Braunger (Unesp - IGCE, Brazil); Thiago Ardana Chaim (UNESP, Brazil); Raquel Riciati Do Couto Vilela (USP, IFSC, Brazil); Maria Inês Basso Bernardi (USP, Brazil); Adriano J. G. Otuka (São Paulo State University (UNESP) - Institute of

Geosciences and Exact Sciences, Brazil); Fábio S. De Vicente and Alexandre Mesquita (UNESP, Brazil)

In this study, Pr-doped and Zn-co-doped SrAl2O4 phosphors were synthesized via the polymeric precursor method. Zn co-doping decreased lattice defects and charge imbalances caused by Pr. This enhanced crystallinity suppressed non-radiative relaxation, increasing photoluminescence emission intensity and prolonging decay lifetimes, optimizing these materials for solid-state lighting applications.

P2.24 - Single-Particle Photothermal Reshaping in Gold Nanoshells Investigated by Cross-Grating Microscopy

Mariana Joyce Bezerra da Silva Crispim (Federal University of Pernambuco, Brazil); Guillaume Baffou (Institut Fresnel, Aix Marseille University, France); Renato E Araujo (Universidade Federal de Pernambuco, Brazil)

Gold nanoshells are widely used photothermal agents due to their strong plasmonic heating and tunable optical response. Individual nanoshells were investigated under femtosecond excitation using Cross-Grating Microscopy. Results revealed shell deformation and reduced optical response above irradiation thresholds (9.5 W/μm²), defining operational limits for their use in photothermal applications.

P2.25 - 3D-LiDAR Data-Sensing Analysis for Processing Intelligent 6G Applications

Vinicius Godoy (National Institute of Telecommunications, Brazil); José Matheus G. Rodrigues (Instituto Nacional de Telecomunicações, Brazil); Renan Matheus (National Institute of Telecommunications, Brazil); Paulo Kiohara (Instituto Nacional de Telecomunicações, Brazil); Arismar Cerqueira Sodré Junior (INATEL, Brazil)

This article presents a 3D LiDAR-based environmental perception approach for distinguishing colors and fabric types in people and distant-object identification. Point-cloud density, mesh surface area, and roughness were evaluated for cotton, polyamide, and polyester, with white shirts exhibiting increases of 24.9%, 32.2%, and 28.6%, respectively, compared to black shirts.

P2.26 - Probing Pancharatnam-Berry Phase with a Ferrocell

Alberto Tufaile (Universidade de São Paulo, Brazil); Adriana P. B. Tufaile (University of São Paulo, Brazil)

Our work experimentally maps the geometric phase in complex magnetic geometries using a Ferrocell. By analyzing polarization transitions through the magnetized fluid, we demonstrate that the optical anisotropy reflects the topology of the field. Mueller matrix mapping confirms intensity-invariant phase shifts, validating the Ferrocell as a simulator for topological photonics.

P2.27 - Structural and Photoluminescence Analysis of the SrAl12O19: Mn Phosphor

Melina Grandis (Unesp, Brazil); Thiago Ardana Chaim and Alexandre Mesquita (UNESP, Brazil)

In this study, SrAl12O19: Mn was synthesized by the polymeric precursor method. PL Curve shows a characteristic emission caused by the transition 2E→4A2 around 658nm, emitting in the red as expected by the literature. Data from strontium aluminate were studied using an x-ray diffraction measurement to analyze its crystalline phases.

P2.28 - Near-Field Modeling of Subwavelength Apertures Using a Hybrid Bethe-Bouwkamp and Rayleigh-Sommerfeld Framework

Luana de Moraes (Unicamp, Brazil); Freddy Orlando Jara Poma (Universidade Estadual de Campinas, Brazil); Paloma Elias da Silva Pellegrini (Center for Semiconductor Components and Nanotechnologies, Brazil); Hugo Enrique Hernandez-Figueroa (University of Campinas (Unicamp), Brazil)

We present a hybrid near-field diffraction model combining the Bethe-Bouwkamp aperture solution with the Rayleigh-Sommerfeld diffraction integral. The approach replaces uniform aperture approximations with a physically derived boundary condition, enabling efficient analysis of evanescent-field propagation. Implemented in MATLAB, the model reproduces maintaining low computational cost compared to FDTD methods.

P2.29 - Chlorophyll-Doped Agar Samples for Solar Light-Dose Sensing

Lidia O Rosa (University of Campinas, Brazil); Sinei Felix Gonçalves Junior and Jonas H Osório (Federal University of Lavras, Brazil); Eric Fujiwara (University of Campinas, Brazil); Cristiano MB Cordeiro (UNICAMP, Brazil)

This work reports the fabrication and characterization of agar gel films doped with chlorella extract for light exposure sensing. By subjecting samples to light exposure for different periods of time, we can observe the reduction of the absorption peak intensity due to the photodegradation of chlorophyll pigments within the extract.

P2.30 - Growth of TbPO4 Single Crystals in Glasses via Controlled Cooling

Maria Eduarda Aguiar Mariano (São Paulo State University, Brazil); Douglas Faza Franco and Eduardo Oliveira Ghezzi (Institute of Chemistry São Paulo State University - UNESP, Brazil); Thiago Augusto Lodi, Sr (Sao Paulo State University (UNESP), Brazil & UNESP, Brazil); Marcelo Nalin (São Paulo State University, Brazil)

The growing interest in rare-earth ions has spurred research in the field photonics, due to the wide range of applications associated with these materials. In this context, the production of $TRPO_4$ single crystals offers an alternative for these photonic applications, particularly to produce materials, presenting, magnetic, magneto-optics and luminescent properties.

O2.10 - Plasmon-Enhanced Optical Gain in Nd3+ Doped TeO2-ZnO Pedestal Waveguides: Concentration, Geometry, and Au Nanoparticle Effects

Daniel Kendji Kumada (Fatec-SP, Brazil); Igor Abe (University of São Paulo, Brazil); Thiago Vecchi Fernandes and Marcos Vinicius Morais Nishimura (Universidade de São Paulo, Brazil); Marco I Alayo (University of Sao Paulo, Brazil & Polytechnic School, Brazil); Luciana Reyes Pires Kassab (Centro Estadual de Educação tecnológica Paula Souza, Brazil)

This review summarizes plasmon-enhanced relative gain in Nd3+ doped TeO2-ZnO pedestal waveguides with Au nanoparticles. Gain enhancements reached ~80% in straight and ~100% in S-bend geometries. Results show that low Nd3+ concentration leads to improved performance, whereas direct nanoparticle-core interaction is required.

Friday, August 14

INVITED TALK (09:00 - 09:30)

TBA

Antônio José Roque (CNPEM)

MINI COURSE 2 (09:30 - 12:00)

Optical networks and cloud computing

Gustavo Sousa Pavani (Universidade Federal do ABC, Brazil)

As redes ópticas desempenham um papel essencial na infraestrutura moderna de comunicação, permitindo a transmissão de grandes volumes de dados com alta velocidade, baixa latência e maior confiabilidade. Utilizando fibras ópticas como meio de transmissão, essas redes são fundamentais para suportar aplicações que exigem desempenho elevado, como streaming, inteligência artificial, internet das coisas e serviços em tempo real. O avanço das tecnologias ópticas tem impulsionado a expansão da conectividade global e a evolução das redes de próxima geração. A computação em nuvem, por sua vez, revolucionou a forma como empresas e usuários acessam recursos computacionais, oferecendo serviços sob demanda de armazenamento, processamento e aplicações pela internet. Modelos como IaaS, PaaS e SaaS permitem maior flexibilidade, escalabilidade e redução de custos operacionais. A integração entre redes ópticas e ambientes em nuvem é indispensável para garantir eficiência no transporte de dados entre data centers, usuários e aplicações distribuídas. Este minicurso tem como objetivo apresentar os fundamentos das redes ópticas e da computação em nuvem, explorando conceitos, arquiteturas, tecnologias e aplicações práticas. Serão abordados temas como transmissão óptica, multiplexação, virtualização, serviços em nuvem e desafios relacionados à segurança e desempenho. Ao final, os participantes terão uma visão integrada dessas tecnologias e sua importância para a transformação digital e a infraestrutura das comunicações modernas.

DIAMOND SPONSOR (13:30 - 14:00)

Anritsu

TBA

ORAL PRESENTATIONS I (14:00 - 16:30)

Optical fibers and applications, Optical communications, Optical instrumentation and metrology, Integrated optics and optoelectronics, and Optical quantum technologies

14:00 - 14:13

O3.1 - Optimized DSP Architecture for High-Capacity and Low-Complexity CPON Systems

Eduardo Rosa (CPqD - Centro de Pesquisa e Desenvolvimento em Telecomunicações, Brazil); Júlia Aline Sousa Maciel (CPQD, Brazil); Tiago Sutili (CPQD, Brazil & University of Campinas, Brazil); Rafael C. Figueiredo (CPQD, Brazil)

This study proposes an alternative DSP architecture for passive optical networks, eliminating dynamic channel equalization to adapt coherent technologies aiming to meet cost and power consumption targets for future PONs.

14:13 - 14:26

O3.2 - Selective Degenerate Optical Parametric Oscillation in Asymmetric Three-Ring Photonic Molecule

Luiz Peres (University of Campinas, Brazil); Eduardo S Gonçalves (Center for Information Technology Renato Archer, Brazil); Luca O. Trinchao and Miguel Nienstedt (University of Campinas, Brazil); Thiago Alegre (University of Campinas & UNICAMP, Brazil); Paulo Jarschel (University of Campinas (Unicamp), Brazil); Gustavo Wiederhecker (State University of Campinas, Brazil)

We demonstrate selective degenerate optical parametric oscillation in an asymmetric three-ring photonic molecule. By simultaneously engineering dispersion and nonlinear modal overlap, the device concentrates parametric gain around the central mode,

suppresses competing four-wave mixing channels, and enlarges the operational window for isolated DOPO generation.

14:26 - 14:39
O3.3 - Dual-Band Mode-Locking Enabled by Blade-Coated Graphene Oxide on D-Shaped Fiber

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

Graphene oxide (GO) saturable absorbers on D-shaped fibers enable strong evanescent-field interaction for ultrafast lasers. Here, we report a blade-coated GO device integrated into an erbium-doped fiber laser, producing switchable mode-locking at two separated C-band wavelengths and simultaneous dual-band operation. These results combine scalable liquid-phase deposition with multiband laser dynamics.

14:39 - 14:52
O3.4 - Polarization Angle Sensing via Hollow-Core Fibers with Modified Symmetry

Enzo Dantas da Silva, Giovanna Castro, Murilo Batista, Flavio Marques and Alexandre Cotta (Federal University of Lavras, Brazil); Jefferson Tsuchida (Universidade Federal de Lavras, Brazil); Julio Ugucioni and Leomar S. Marques (Federal University of Lavras, Brazil); Matthieu Chafer (GLOPhotonics, France); Benoit Debord, Frédéric Gérôme and Fetah Benabid (University of Limoges, France); Jonas H Osório (Federal University of Lavras, Brazil)

We demonstrate a polarization angle sensor based on a hollow-core fiber with a two-fold symmetric cladding. The sensing mechanism relies on the polarization-dependent interference between LP01 and LP11-like modes. By evaluating the output intensity profile as the input polarization rotates, an all-fiber sensor with a resolution of 0.4° is demonstrated.

14:52 - 15:05
O3.5 - Lensless on-Chip Microscopy Based on Quadriwave Lateral Shearing Interferometry

Allan C. Rodrigues Barboza (Federal University of Pernambuco, Brazil); Meimei Peng (McMaster University, Canada); Guillaume Baffou (Institut Fresnel, Aix Marseille University, France); Qiyin Fang (McMaster University, USA); Renato E Araujo (Universidade Federal de Pernambuco, Brazil)

This work presents a compact lensless on-chip quantitative phase microscopy platform based on Quadri-wave Lateral Shearing Interferometry. Using Fourier demodulation of a single interferogram, the system enables wavefront reconstruction and optical characterization of biological samples. Experimental and numerical results demonstrate accurate operation in contact and geometrically magnified imaging regimes.

15:05 - 15:20
Short break

15:20 - 15:33
O3.6 - Mamdani Fuzzy Controller for Quadrature Correction Applied to Optical Voltage Sensor

Rodrigo Barbosa Pazote (UNESP, Brazil); Luis Miguel Quispe-Valencia (São Paulo State University (UNESP), Brazil); Claudio Kitano (UNESP, Brazil)

This paper proposes a Mamdani fuzzy controller to achieve in-quadrature interferometric signals in optical voltage sensor. The error signal is extracted from the Lissajous figure generated by the two interferometric signals and fed, along with its derivative, into a Mamdani fuzzy inference engine.

15:33 - 15:46
O3.7 - Agar Made Optical Fibers for Sensing

Lidia O Rosa (University of Campinas, Brazil); Cristiano MB Cordeiro (UNICAMP, Brazil); Eric Fujiwara (University of Campinas, Brazil)

This work provides an overview of biodegradable and biocompatible agar optical fibers with tunable properties suitable for sensing. No-core, structured, and core-cladding fibers were fabricated and characterized regarding optical loss, sensing capabilities, and degradation. The results highlight the potential of these devices for applications in biomedicine and environmental sensing.

15:46 - 15:59
O3.8 - Color Symmetry Breaking in a Microring Resonator

Luca O. Trinchao (University of Campinas, Brazil); Alekhya Ghosh, Arghadeep Pal and Haochen Yan (Max Planck Institute for the Science of Light, Germany); Toby Bi (Max Planck Institute for the Science of Light, Erlangen, Germany); Shuangyou Zhang (Technical University of Denmark, Denmark); Nathalia B Tomazio (University of Sao Paulo, Brazil); Flore Kunst and Lewis Hill (Max Planck Institute for the Science of Light, Germany); Pascal Del Haye (Friedrich Alexander University Erlangen-Nuremberg, Germany); Gustavo Wiederhecker (State University of Campinas, Brazil)

We demonstrate color symmetry breaking between spectrally nondegenerate modes of a bichromatically-pumped silicon nitride microresonator. Above a critical power threshold, the system spontaneously transitions to a state with unequal intracavity intensities at the two wavelengths.

15:59 - 16:12
O3.9 - Impact of Detector Bandwidth on CV-QKD Excess Noise: An Experimental Analysis

Maria Heloísa Fraga da Silva (SENAI CIMATEC, Brazil & Computational Modeling Program, CIMATEC University, Salvador Bahia Brazil, Brazil); Igor P Vieira (UNICAMP, Brazil); Anderson R. C. Buarque (SENAI CIMATEC, Brazil); Valeria L da Silva (SENAI CIMATEC & Senai Cimatec, Brazil)

Continuous-variable quantum key distribution (CV-QKD) offers secure communication. However, its performance is limited by excess noise, while the impact of detector bandwidth remains insufficiently explored. We experimentally investigate balanced photodetectors with bandwidths up to 1.6-GHz, revealing a bandwidth-noise trade-off affecting excess noise, secret key rate, and transmission distance in systems.

16:12 - 16:25
O3.10 - Towards the Generation of Entangled States of Light

José Rodrigo Blanco Pelleteiro and Rafael Cárbat Miranda (Universidade Estadual de Campinas, Brazil); Valeria Pachas Yeren (Unicamp, Brazil); Gustavo Correa (Universidade Estadual de Campinas, Brazil); Felipe Boechat Mazzi and Felippe Alexandre Silva Barbosa (State University of Campinas, Brazil)

Entangled states of light are necessary for quantum communication protocols. These states can be generated through nonlinear optical processes in dielectric materials such as lithium niobate. In this work we show the feasibility of generating continuous variable entangled states of light based on spontaneous parametric down conversion.

POSTER PRESENTATIONS III (16:30 - 18:00)

Optical communications, Integrated optics and optoelectronics, and Optical quantum technologies

P3.1 - Sidewall Roughness Optimization for Low-Loss Thin-Film Lithium Niobate Waveguides

Gustavo Correa (Universidade Estadual de Campinas, Brazil); Amanda V Halsman (Unicamp, Brazil); José Rodrigo Blanco Pelleteiro and Rafael Cárbat Miranda (Universidade Estadual de Campinas, Brazil); Felippe Alexandre Silva Barbosa (State University of Campinas, Brazil)

When designing integrated photonic devices, we should seek to increase gain while reducing propagation losses. In this work, we investigate strategies to reduce sidewall roughness, a major contribution to propagation losses, through optimization of lithography and dry etching processes. Device characterization will be studied through Atomic Force Microscopy (AFM).

P3.2 - Source-Based Topology Optimization for Modal Problems in Photonics

Ian Parra (Universidade Estadual de Campinas, Brazil); Flávio Moraes (UNICAMP, Brazil); Jorge Morvan Marotte Luz Filho and André Novotny (Laboratório Nacional de

Computação Científica, Brazil); Gustavo Wiederhecker (Unicamp, Brazil); Thiago Alegre (University of Campinas & UNICAMP, Brazil)

Photonic crystal cavities confine light via Bragg mirrors reflecting band-gap frequencies. We optimized a silicon nanobeam cavity by reshaping its reflectors' permittivity with an adjoint-based gradient method. Driven by a 193 THz TE-polarized Gaussian pump and treated as a scattering problem, the cavity reached 40% energy concentration, a 75% improvement.

P3.3 - Symmetry Breaking of Two-Color Solitons

Miguel Nienstedt and Luca O. Trinchao (University of Campinas, Brazil); Alekhya Ghosh and Arghadeep Pal (Max Planck Institute for the Science of Light, Germany); Thiago Alegre (University of Campinas & UNICAMP, Brazil); Pascal Del Haye (Friedrich Alexander University Erlangen-Nuremberg, Germany); Gustavo Wiederhecker (State University of Campinas, Brazil)

We numerically demonstrate spontaneous symmetry breaking of two-color Kerr solitons in microresonators. Sweeping detuning transitions a symmetric two-soliton state into a single dominant soliton comb, dictated purely by microscopic noise. These bifurcation dynamics enable novel optical switching and random number generation.

P3.4 - Dispersion Engineering of Silicon Nitride Waveguides for Supercontinuum Generation

Eduardo S Gonçalves (Center for Information Technology Renato Archer, Brazil); Gustavo Wiederhecker (State University of Campinas, Brazil)

We numerically investigate SiN waveguides for supercontinuum generation. Full-vector modal simulations provide dispersion and nonlinearities, used in split-step GNLSE propagation. A 1.4 micron wide waveguide broadens a 100 fs pulse to more than 2300 nm after 4 mm

P3.5 - Patterning Ultra-Compact Waveguide Bends Through Thermal Scanning Probe Lithography

Paloma Elias da Silva Pellegrini (Center for Semiconductor Components and Nanotechnologies, Brazil); Luana de Moraes (Unicamp, Brazil); Freddy Orlando Jara Poma (Universidade Estadual de Campinas, Brazil); Frederico H. Cioldin (UNICAMP, Brazil); Silvia Vaz Guerra Nista (Center for Semiconductor Components and Nanotechnologies, Brazil); Hugo Enrique Hernandez-Figueroa (University of Campinas (Unicamp), Brazil); Stanislav Moshkalev (Center for Semiconductor Components and Nanotechnologies, Brazil)

Waveguide bends remain challenging due to optical losses and fabrication sensitivity. We demonstrate high-fidelity patterning of L and U-bend waveguides using thermal scanning probe lithography (t-SPL), achieving sub-10% deviation for radii down to 0.7 μm across silicon photonic and dielectric optical platforms. The results highlight t-SPL for ultra-compact photonics.

P3.6 - Comparative Evaluation of Techniques for Characterizing Domain Inversion in Periodically Poled Thin-Film Lithium Niobate

Rafael Cárbat Miranda (Universidade Estadual de Campinas, Brazil); Felippe Alexandre Silva Barbosa (State University of Campinas, Brazil)

Domain inversion in nonlinear optical crystals plays a critical role in a wide range of phase-sensitive nonlinear optical applications. In this work, we present and compare some widely used techniques for verifying and assessing the quality of periodically poled structures in thin-film lithium niobate (TFLN).

P3.7 - Fe3GaTe2 Few-Layer Harmonic Generation and Raman Spectroscopy Characterization

Juan Diego Vergara Castro (Universidad de Antioquía, Colombia); David Steinberg and Henrique Guimarães Rosa (Mackenzie Presbyterian University, Brazil); Juan Zapata (Universidad de Antioquia (UdeA), Colombia); Lúcia Akemi Miyazato Saito (Mackenzie Presbyterian University, Brazil)

We report the characterization of Fe3GaTe2 flakes by means of Raman spectroscopy, third and second harmonic generation, which was observed from 11.25 mW. Using Raman spectroscopy, we observed distinct modes not yet reported in the literature and demonstrated that these modes can indicate the material's oxidation state.

P3.8 - Integrated Photonics Strain Sensor Using Phase-Shifted Bragg Gratings over a SOI Platform

Erick Candido Sousa (Federal University Of Campina Grande, Brazil); Murilo A Romero (University of Sao Paulo, Brazil); Adolfo Fernandes Herbster (Federal University of Campina Grande, Brazil)

A phase-shifted silicon-photonics Bragg-grating is designed and fabricated for strain sensing. The resulting passband response allowed a dual-wavelength amplitude scheme to measure strain, while cancelling spurious amplitude fluctuations. The full sensor circuit was numerically evaluated, indicating excellent linearity, power sensitivity of 0.00514 dB/με in a maximum deformation of 4970με.

P3.9 - Towards Design and Characterization of a Silicon Nitride Optomechanical Microgear Cavity

Pedro Leonardo Vincoletto and Ian Parra (Universidade Estadual de Campinas, Brazil); Nick Schilder (University of Campinas, Brazil); Roberto O. Zurita and Gustavo Wiederhecker (State University of Campinas, Brazil); Thiago Alegre (University of Campinas & UNICAMP, Brazil)

This project focuses on the design and simulation of silicon nitride microgear optomechanical cavities, which combine high quality factor whispering gallery optical modes with mechanically confined breathing modes. Our final goal is to fabricate structures with simultaneously optimized optomechanical coupling and evaluate the silicon nitride photoelastic tensor.

P3.10 - Nd^{3+}-Doped Phosphate Glasses as Optical Materials for Photonic Applications

Saulo de Tácito Silveira Santos, Donizete Lopes Pereira, Emelly Souza Queiroz, Alexandre Cotta, Jonas H Osório and Flavio Marques (Federal University of Lavras, Brazil); Jefferson Tsuchida (Universidade Federal de Lavras, Brazil)

Nd^{3+}-doped phosphate glasses were investigated for near-infrared photonic applications. Raman spectroscopy indicated preservation of the phosphate network after dopant incorporation. Absorption spectra revealed well-defined 4f-4f transitions,

while photoluminescence showed emission around 1053 nm. Lifetime measurements revealed concentration-dependent decay behavior, suggesting enhanced non-radiative processes and supporting optical performance optimization studies.

P3.12 - Symbol-Resolved Analysis of Kerr Nonlinear Interactions in Digital Coherent Interconnects

João Pedro Gosmin, Ana Laura Graças, Gabriel Bozelli, Artur Alfe, Ivan A. Aldaya (São Paulo State University, Brazil & Unesp, Brazil)

This work presents a symbol-resolved analysis of intra-channel Kerr distortion in digital coherent interconnects. By estimating perturbation coefficients through complex linear regression, we show that root-raised-cosine pulse shaping produces richer perturbation coefficient structures than Gaussian-pulse models predict. These results highlight the need for more general perturbative descriptions of nonlinear distortion.

P3.13 - Cluster-Assisted Unsupervised Training of MLP Equalizers for 400 Gb/s WDM Digital Coherent Optical Interconnects

Ana Laura Graças, João Pedro Gosmin, Gabriel Bozelli, Artur Alfe, Ivan A. Aldaya (São Paulo State University, Brazil & Unesp, Brazil)

This paper presents an unsupervised regression framework for 400 Gb/s wavelength-division-multiplexed digital coherent optical systems. Clustering is first applied to received constellations to generate tentative symbol labels, which are then used to train a multilayer perceptron equalizer. The approach enables nonlinear compensation without transmitted-label supervision, supporting practical receiver-side adaptation scenarios.

P3.14 - Programmable Interface via NETCONF for Dynamic QoS Orchestration in SD-PON

Carine Mineto (University of Campinas & CPQD, Brazil); Nycolas Borges da Silva and Júlia Aline Sousa Maciel (CPQD, Brazil); Luis Gustavo Maciel Riveros and Tiago Sutili (CPQD, Brazil & University of Campinas, Brazil); Rafael C. Figueiredo (CPQD, Brazil)

This work proposes NETCONF/YANG APIs for dynamic SLA configuration in SD-PONs. Stress tests validated SLA assignment with low jitter peaks and stable optical power, enabling real-time QoS management for low-latency 5G network slicing requirements.

P3.15 - Event Detection in OTDR Traces Using Adaptive Filtering Techniques

Marcelo Pereira Nogueira (CPQD, Brazil); Rivael S Penze (CPqD, Brazil); Marcionilo José da Silva (CPqD- Telecom R&D, Brazil & CPQD, Brazil); Tiago Sutili (CPQD, Brazil & University of Campinas, Brazil)

This work studies the Welch-Butterworth and EMD-Wavelet DSP architectures to mitigate noise effects in event detection within OTDR traces. Both techniques detected mostly experimental events with an error of less than 1%. Furthermore, the identification of the fiber end in low SNR scenarios is investigated.

P3.16 - Optical Link Modeling and Optimization for C+L-Band Transmission via RNN and MOWCA

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

Addressing C+L-band transmission challenges, this work proposes data-driven EDFA modeling using Recurrent Neural Networks (RNN) combined with the Multi-Objective Water Cycle Algorithm (MOWCA) for link optimization. Our joint approach successfully eliminates the need for Gain Flattening Filters (GFFs) while achieving a uniform OSNR in long-haul optical links.

P3.17 - NSGA-II-Based Joint Optimization of MLP Equalizers and Optical Launch Power in Digital Coherent Interconnects

Gabriel Bozelli, Ana Laura Graças, João Pedro Gosmin, Artur Alfe, Ivan A. Aldaya (São Paulo State University, Brazil & Unesp, Brazil)

This paper proposes a joint multiobjective optimization framework for multilayer perceptron-based nonlinear equalizers and optical launch power in digital coherent transmission systems. Using the nondominated sorting genetic algorithm II, the method explores trade-offs among bit-error-rate performance, computational complexity, and launch-power levels, enabling balanced equalizer configurations and launch-power selection for interconnects.

P3.18 - Wideband and High-Gain Terahertz Dielectric Resonator Antenna Using Photonic Crystal Substrate

Mario Luis Chiaparini, Neto (Universidade Estadual de Campinas, Brazil); Christian Esteve Rothenberg (University of Campinas - UNICAMP, Brazil); Hugo Enrique Hernandez-Figueroa (University of Campinas (Unicamp), Brazil); Gianni Masaki Tanaka Portela (Unicamp, Brazil)

Annular resonators act as antennas for terahertz communications. Their silicon-based disk geometry, with micrometric dimensions, resonates within the tuned terahertz range. Modes are excited in the resonant structure, while surface-wave suppression arises from photonic crystal effects in the substrate

P3.19 - Femtosecond Laser Written Waveguides for Orbital Angular Momentum Propagation in Photonic Chips

Jonathas Matias de Oliveira (Federal Institute of Alagoas & Grupo de Óptica e Nanoscopia (Gon/IF/UFAL), Brazil); Eduardo J. S. Fonseca and Alcenisio J. Jesus-Silva (Universidade Federal de Alagoas, Brazil); José Vinicius Moura (Federal University of Alagoas, Brazil)

We report recent advances in femtosecond-laser-written annular waveguides for guiding orbital angular momentum beams in photonic chips. Experimental and numerical results demonstrate selective excitation, stable propagation, and mode-dependent phase evolution of OAM states enabled by tailored refractive-index profiles. These results highlight the potential of annular waveguides for integrated structured-light photonics.

P3.20 - Characterization of Power Coupling Coefficients in Deployed Multi-Mode Fibers

Lucas Alves Zischler (University of Aquila, Italy); Giammarco Di Sciullo (University of LAquila, Italy); Antonio Mecozzi (Universita' dell'Aquila, Italy); Cristian Antonelli (University of L'Aquila, Italy)

We characterize the modal power coupling coefficients and loss profiles in a field-deployed 15-mode fiber. The methodology isolates penalties introduced by the mode multiplexer and demultiplexer, enabling characterization of the intrinsic fiber parameters. The coefficients scale inversely with the propagation constant mismatch, as predicted by theory.

P3.21 - Distributed Acoustic Sensing of MMFs Using an SMF-Based Interrogator

Robson Assis Colares (Campinas State University, Brazil); Valter Vagner Cardoso and Stefan Tenembaum (Unicamp, Brazil); Evandro Conforti (University of Campinas - UNICAMP, Brazil); Darli Mello (UNICAMP, Brazil)

We evaluate the performance of direct-detection φ-OTDR, originally designed for SMFs, when deployed in MMFs for traffic-monitoring applications. The results confirm the viability of MMF sensing while highlighting substantial performance constraints.

P3.22 - Efficient Chip Edge-Coupling with Flame-Brushed Nanospikes

Miguel Diniz and Paulo F. J. de Siqueira (University of Campinas, Brazil); Thiago Alegre (University of Campinas & UNICAMP, Brazil); Gustavo Wiederhecker (State University of Campinas, Brazil)

Replacing costly lensed fibers, we propose customizable flame-brushed optical nanospikes for fiber-to-chip edge-coupling. FEM simulations at 1.55 μm demonstrate > 0.99 modal overlap at an optimal 1 μm diameter. By resolving effective index mismatch, this work establishes a viable method for integrated photonics.

P3.23 - Integrated Cost-Effective Photonic Sensing Enabled by Machine Learning

Paulo V. Pizzol (UNICAMP, Brazil); Luis Barêa (UFSCar, Brazil); Samuel L. Nogueira (UFSCAR, Brazil); Newton Cesário Frateschi (University of Campinas, Brazil)

We propose a low-cost microring resonator array sensor with broadband optical excitation, integrated photodetectors, and machine learning. Simulations of a 16-channel architecture successfully achieved 0.061% error for ethylene glycol-water mixtures, i.e., refractive index variations of 1.10×10^{-5} RIU. Data augmentation improved robustness, and costs dropped ~90% versus conventional approaches.

P3.24 - Two-Photon Absorption Spectroscopy of ^{87}Rb at 778 Nm: Towards an Optical Frequency Standard

Julio Smanioto Garcia (Universidade Estadual de Campinas, Brazil); Flavio Caldas da Cruz (UNICAMP, Brazil); Nathany Ferreira Jammal (Unicamp, Brazil)

We report two-photon absorption spectroscopy of the ^{87}Rb $5S_{1/2} \rightarrow 5D_{5/2}$ transition at 778 nm using a heated vapor cell. Signal dependence on laser power, cell temperature, and polarization were characterized along with lineshapes. The system is being extended to a two-color scheme (780+776nm) towards a cold-atom optical frequency standard.

P3.25 - Optical Circuit Assembly for Quantum Frequency Conversion

Amanda V Halsman (Unicamp, Brazil); Gustavo Correa (Universidade Estadual de Campinas, Brazil); Felippe Alexandre Silva Barbosa (State University of Campinas, Brazil)

We propose an optical circuit capable of performing Quantum Frequency Conversion by injecting a high intensity pump laser through a device along with the original single photon, it is possible to generate a new photon that inherits all the properties of the original single photon except for its frequency.

P3.26 - Experimental Evaluation of a Dual-Hop Decoy-State BB84 QKD System

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

This work experimentally evaluates a commercial dual-hop Decoy-State BB84 Quantum Key Distribution (QKD) system. Results show secure bit rates of up to 2.7 kbit/s over 100 km optical links, low QBER values, and stable operation, demonstrating the feasibility of QKD deployment in practical optical communication networks.

P3.26 - Assessment of TD-DFTB for Excited-State Absorption in Alpha-Sexithiophene: C60 Charge-Transfer Systems

Isabelle Freitas (Universidade Estadual Paulista, Brazil); Florian S Günther (Universidade Estadual Paulista "Júlio de Mesquita Filho", Brazil)

Time-dependent density functional tight binding (TD-DFTB) is evaluated for modeling excited-state absorption in alpha-sexithiophene/C60 charge-transfer systems. Calculated spectra of charged alpha-sexithiophene are benchmarked against previous TD-DFT results to assess the method's reliability in describing electrostatic and symmetry-breaking effects.

CLOSING CEREMONY AND STUDENT PRIZE ANNOUNCEMENT (18:00 - 18:30)