Photonics Research Labs

HEAD OF THE GROUP RESEARCH REPORT

The Photonics Research Labs (PRL) brings together research lines or Labs focused on different technologies and fields of application within the area of photonics and optical communications. Currently formed by nearly 50 researchers, PRL mission is to produce high-quality scientific knowledge in the field of optics, quantum optics and photonics, through research projects, R&D contracts and collaboration agreements with the private sector. Our research activity is focused on several applications of photonics, mainly on optical communications of analog and digital signals, radio-over-fiber systems, space-division multiplexing fibers, photonic integrated circuits, programmable photonics and fiber optic sensing and industrial scenarios.

PRL is nowadays involved in different H2020 EU funded projects: "NEuromorphic Reconfigurable Integrated Photonic Circuits as artificial image processor" (NEoteRIC), "European Network for High Performance Integrated Microwave Photonics" (EUIMWP), "Applications and Fundamentals of Microresonator Frequency Combs" (MICROCOMB) and "European Network on Future Generation Optical Wireless Communication Technologies" (NEWFOCUS). Of particular interest regarding excellence are the two projects granted by the European Research Council (ERC): Consolidator Grant "Revolutionizing fibre-wireless communications through space-division multiplexed photonics" InnoSpace and Advanced Grant "Universal microwave photonics programmable processor for seamlessly interfacing wireless and optical ICT systems" (UMWP-Chip).

Continuous work to transfer research results to the market has led to the foundation of 4 successful spin-off companies: VLC-Photonics (recently acquired by Hitachi High-Tech Corporation), Calsens, Ephoox engineering and iPronics programmable photonics (selected as one of the spinoff companies to watch in year 2020).

A complete list of research activities can be found at http://www.iteam.upv.es/group/photonics research-labs-prl and http://www.prl.upv.es

Also, follow us in:

- Twitter: @PRL_UPV
- LinkedIn: https://www.linkedin.com/in/photonicsresearchlabs/

1.- Project activities

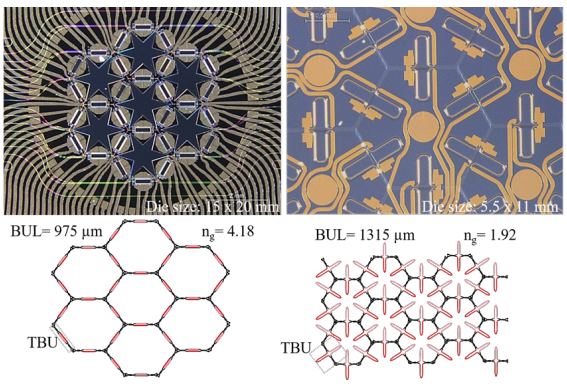
1.1.- Ongoing projects

Name of the project: Universal microwave photonics programmable processor for seamlessly interfacing wireless and optical ICT systems (UMWP-Chip)

***Webpage of the project**: https://cordis.europa.eu/project/id/741415*

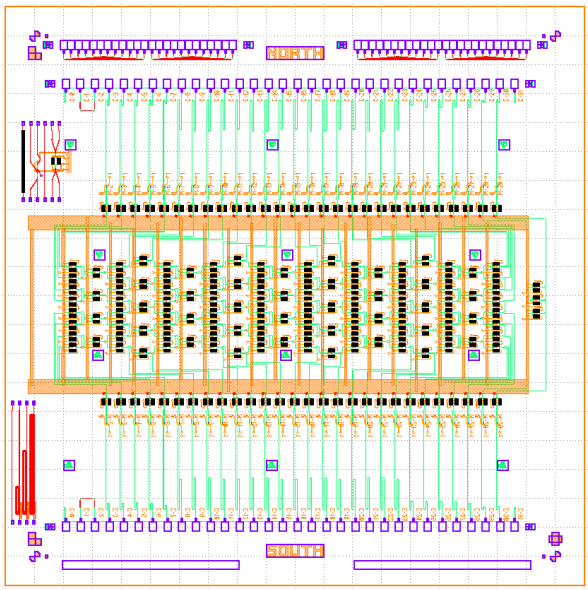
***Funding entity and duration**: European Research Council (ERC), 60 months*

***Summary of the project**: Information and communication technology (ICT) systems are expanding at an awesome pace in terms of capacity demand, number of connected end-users and required infrastructure. To cope with these rapidly increasing growth rates there is a need for a flexible, scalable, and future-proof solution for seamlessly interfacing the wireless and photonic segments of communication networks. RF or Microwave photonics (MWP) is the best positioned technology to provide the required flexible, adaptive, and future-proof physical layer with unrivalled characteristics. Its widespread use is however limited by the high-cost, non-compact and heavy nature of its systems. Integrated Microwave Photonics (IMWP) targets the incorporation of MWP functionalities in photonic chips to obtain cost-effective and reduced space, weight, and power consumption systems. IMWP has demonstrated some functionalities in through application specific photonic circuits (ASPICs), yielding almost as many technologies as applications and preventing cost-effective industrial manufacturing processes. A radically different approach is based on a universal or general-purpose programmable photonic integrated circuit (PIC) capable of performing with the same hardware architecture the main required functionalities. The aim of this project is the design, implementation and validation of such processor based on the novel concept of photonic waveguide mesh optical core and its*



Reconfigurable photonic integrated processor

integration in a Silicon Photonics chip. Its three specific objectives are: (1) The architecture design and optimization of a technology agnostic universal MWP programmable signal processor; (2) The chip mask design, fabrication and testing of the processor; and (3) The experimental demonstration and validation of the processor. Targeting record values in bandwidth and footprint its potential impact will be very large by unlocking bandwidth bottlenecks and providing seamless interfacing of the fiber and wireless segments in future ICT systems.



Design of a Photonic processor with a high node density

Name of the project: NEuromorphic Reconfigurable Integrated Photonic Circuits as artificial image processor (NEoteRIC)

***Webpage of the project**: https://neoterich2020.eu/*

***Funding entity and duration**: European Union's Horizon 2020, 48 months*

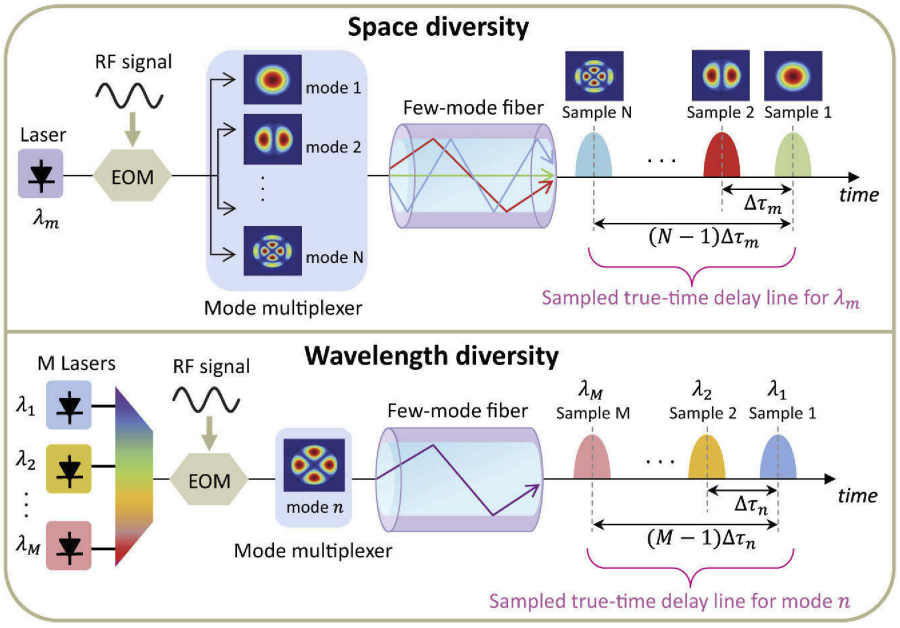
***Summary of the project**: The technological proposition of NEoteRIC aims to merge cutting edge photonic technologies like reconfigurable silicon integrated structures and planar ferroelectric schemes so as to spawn a disruptive generation of general purpose neuromorphic photonic chips, having hundreds of nodes, exhibiting supreme processing speed and consuming negligible power. Low-power & high-speed chip reconfiguration will unleash the true potentials of NEoteRIC's arsenal providing for the first-time photonic implementation of cutting-edge neuromorphic paradigms, multi-task capabilities and on-chip. NEoteRIC's pave a clear technological roadmap to revolutionize high speed imaging applications through careful escalating steps that start from the realization of innovative reconfigurable integrated photonic building blocks, moving to their encapsulation to low-power high-bandwidth machine learning subsystems and finally reaching to application-bound integrated systems able to deliver unparalleled performance in terms of frame rate and marginal power. Through NEoteRIC's photonic-FPGA neuromorphic platform cytometric data analysis will be performed in the analogue-optical domain, alleviating the need for high-speed electronics, offering unparalleled speed, eliminating offline data storage and minimizing power consumption due to photonic passive processing. NEoteRIC's devices can be directly implemented in a vast pallet of applications ranging from laser manufacturing to cyber security applications.*

Name of the project: Revolutionizing fibre-wireless communications through space-division multiplexed photonics (InnoSpace)

***Webpage of the project**: https://cordis.europa.eu/project/id/724663*

***Funding entity and duration**: European Research Council (ERC), 66 months*

***Summary of the project**: Space-Division multiplexing (SDM) has been touted as a solution for the capacity bottleneck in digital communications by establishing independent light paths in a single fibre via multicore fibres (MCF) or few-mode fibres (FMF). This project envisions an unprecedented revolution in fibre-wireless communications through the powerful concept of SDM that lead to reconfigurable multifunctional architectures that will allow resource and functionality sharing by suitable software definition. The key challenge that is being faced in the project is to design, implement and demonstrate the feasibility of this new optical technology that offers the required parallelism for the implementation of a compact broadband tunable true time delay line (TTDL) using a single optical fibre, without the need to resort to bulky, heavy, power-consuming and expensive replication architectures, enabling important functionalities such as controlled signal distribution, signal filtering, antenna beam-steering, arbitrary waveform generation and multi-gigabit-per-second analogue-to-digital conversion. These functionalities, in turn, are required in a variety of Information Technology applications, such as broadband wireless and satellite communications, distributed antenna systems, signal processing, sensing, medical imaging and optical coherence tomography. This approach not only goes beyond the state-of-the-art properties of TTDLs, but it also leads to the novel concept of distributed signal processing than can be implemented in the link connecting*



Sampled true-time delay line realized by exploiting the spatial and wavelength diversities of an FMF.

a central office and a remote base station. The project outcomes will hence constitute a groundbreaking achievement in the next generation of fibre-wireless communications with dramatic scientific, technical, and economic impacts.

Sampled true-time delay line realized by exploiting the spatial and wavelength diversities of an FMF.

Name of the project: European Network on Future Generation Optical Wireless Communication Technologies (NEWFOCUS)

Webpage of the project: *https://www.cost.eu/actions/CA19111/#tabs|Name:overview*

Funding entity and duration: *European Union's Horizon 2020, 48 months*

Summary of the project: *The design of future wireless communication networks that cope with the ever-growing mobile data traffic as well as support varied and sophisticated services and applications in vertical sectors with a low environmental impact is recognized as a major technical challenge that European engineers face today. The COST Action NEWFOCUS will propose truly radical solutions with the potential to impact the design of future wireless networks. Particularly, NEWFOCUS aims to establish optical wireless communications (OWC) as an efficient technology that can satisfy the demanding requirements of backhaul and access network levels in beyond 5G networks. This also includes the use of hybrid links that associate OWC with radiofrequency or wired/fiber-based technologies.*

Towards this vision, NEWFOCUS will carry out a comprehensive research programme under two major pillars. The first pillar is on the development of OWC-based solutions capable of delivering ubiquitous, ultra-high-speed, low-power consumption, highly secure, and low-cost wireless access in diverse application scenarios. The developed solutions will in particular support Internet-of-Things (IoT) for smart environments with applications in vertical sectors. The second pillar concerns the development of flexible and efficient backhaul/fronthaul OWC links with low latency and compatible with access traffic growth.

In addition to scientific and technological advances, NEWFOCUS will serve as a global networking platform through capacity building of all relevant stakeholders including universities, research institutions, major industry players, small medium enterprises, governmental bodies, and non-governmental organisations. Within this rich consortium, NEWFOCUS will train experts to accompany related European industries for the standardisation and commercialization of the OWC technology.

Name of the project: Applications and Fundamentals of Microresonator Frequency Combs (MICROCOMB)

Webpage of the project: *https://www.microcomb-eu.org/*

Funding entity and duration: *European Union's Horizon 2020, 48 months*

Summary of the project: *This network establishes and supports cross-sectorial*

training and research programme bringing together leading European academic and industrial centers working in the area of optical frequency combs in microresonators (microcombs). The programme allows to combine and share some of the world leading experience and expertise in the microcombs and train a new generation of scientists in this actively developing area bordering physics and photonic engineering and having pronounced applied and fundamental dimensions. The frequency comb research itself is the Nobel prize winning area (T. Hänsch and J. Hall, 2005), while the microcombs can qualify as an emerging disruptive technology. Europe lacked before the start of this project a structured and comprehensive training programme in this area, while facing a growing competition with its global rivals. This programme will have a lasting impact increasing European innovation capacity through expanding knowledge base, new IP, trained personnel, better equipped laboratories, and future collaborations leading to product development. The project addresses research and technology problems with interdisciplinary importance from the areas of precision frequency metrology, ultrafast data processing, optical to RF signal conversion, astronomical measurements, and soliton physics.

Name of the project: Energy efficient hybrid Optical networks for indoor Communications and Lighting (FOCAL)

Webpage of the project:

Funding entity and duration: *Ministerio de Ciencia e Innovación, 36 months*

Summary of the project: *The Project consists in the definition of the architecture of an indoor hybrid wired and wireless optical network based on VLC communications (Fi2VLC) to provide coverage and 5G services in residences and offices. Full characterization of hybrid POF and VLC links with improved capacity and flexibility, also including different multiplexing techniques will be addressed. Electro-optical transceivers based on low cost commercially available LEDs will be designed to transmit digital modulation formats such as OFDM, QPSK, CAP, 16QAM, etc. and adaptive modulations to adjust the transmission capacity to the actual demand in a multiuser scenario. The Project also includes the experimental characterization of the networks (QoS, BER, SNR) using the developed technologies (multiplexing, adaptive modulations and multiuser access) for service transmission and the implementation of software-defined Fi2VLC networks for energy efficient operation. Finally, the techno-economical evaluation of the implemented solutions will assess their viability in short term 5G networks.*

Name of the project: Broadband HYbrid Silicon Nitride Photonic Integrated CircuitS (BHYSINPICS)

Webpage of the project:

Funding entity and duration: *Ministerio de Ciencia e Innovación, 36 months*

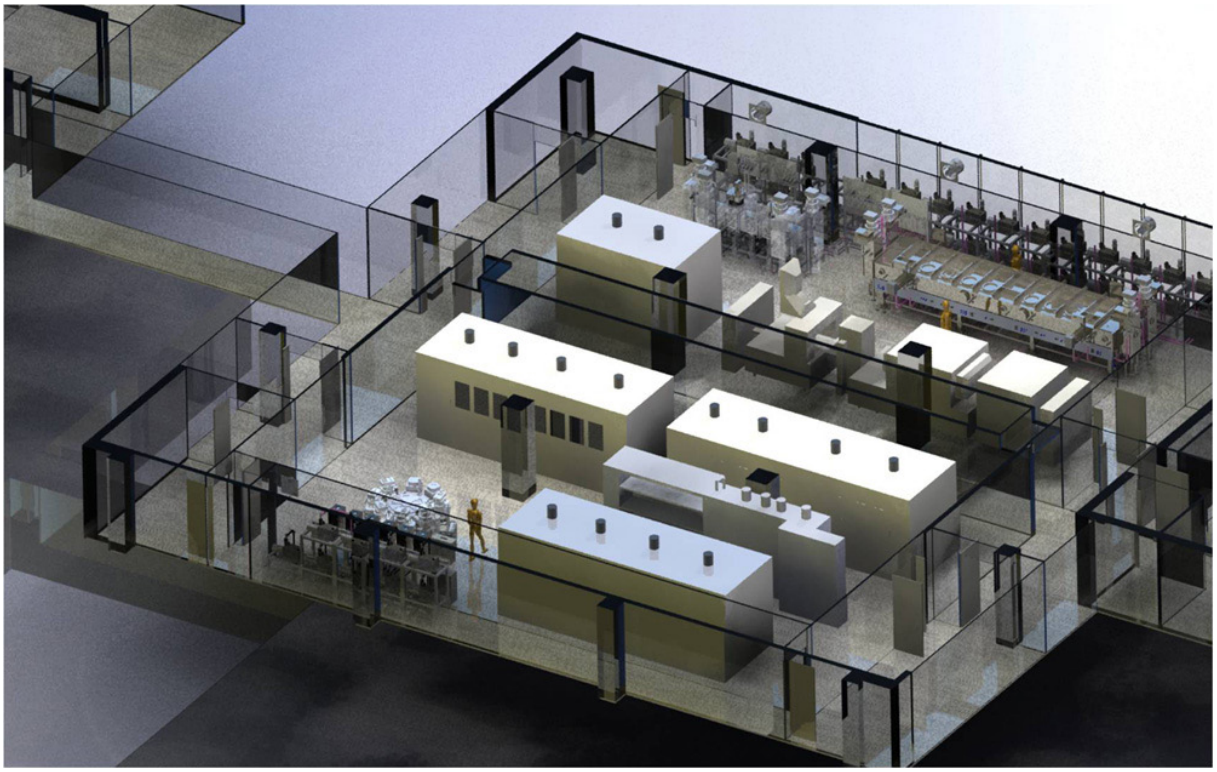
Summary of the project: *Integrated photonics has experienced exponential growth in the last 10 years, thanks to the research, development and commercial exploitation of generic technologies, which allow complex photonic systems into a single micro-chip. These technologies cover different parts of the spectrum, depending on the properties of the materials used in manufacturing, for different applications, in the visible (VIS), near (NIR) and mid infrared (MIR) wavelength ranges. However, there is no broadband technology platform, that allows light guiding over VIS, NIR and MIR. Even if it existed, the problem of hybridization with other active technologies, to enable the incorporation of sources and light detectors, would not be solved either. Together with the two previous aspects, the increasing complexity of photonic integrated circuits (PICs) requires advanced characterization methods, beyond those traditionally used. This project aims at researching and developing technologies, manufacturing and design processes, alongside the associated characterization methods, to address these three challenges: i) a passive photonic integration platform covering VIS, NIR and MIR, ii) advanced characterization methods and iii) micro-fabrication processes for hybridization with active technologies.*

Name of the project: UPVFAB Technopole (IDIFEDER/2020/028)

Webpage of the project: *https://www.fab.upv.es/*

Funding entity and duration: *Generalitat Valenciana and the European Regional Development Fund (ERDF), 24 months*

Summary of the project: *It's an infrastructure acquisition project to upgrade and retrofit. The infrastructure is at the class 100/10000 (ISO 5 / 7) 500 m2 micro-fabrication pilot line / clean room. More specifically, it is intended to complement the installation with the following equipment: 1) (Deposition) Sputter for cylindrical samples, 2) (Attack) Wet banks and attack tanks for samples and wafers up to 6 inches, 3) (Attack) Extraction and neutralization systems for wet banks and attack tanks, 4) (Metrology)*



UPVFAB Technopole facilities

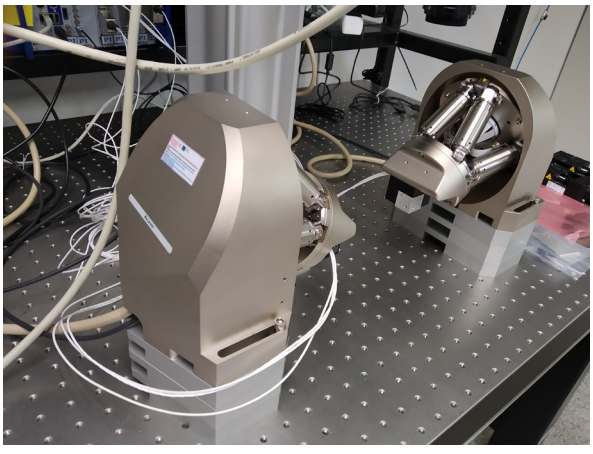
FTIR equipment with microscope for sample analysis. 5) (Post-process) Microscopic transfer equipment by priming chips from 2-4 inches wafers to 6 inches wafers. The general objective is to develop new technological processes in the work areas of the proposing groups (ITEAM, ITQ, CI2B), specifically: I) integrated photonics, II) integrated catalytic membranes and III) electro-chemical devices. A new 2-year ERDF action, "multi-level microfabrication technologies" (T-MFAB-MN, IDIFEDER/2021/046), will still strengthen and complement this key infrastructure.

Name of the project: Advanced Instrumentation for world class microwave and programmable photonics Research (IDIFEDER/2020/032)

Webpage of the project: *https://www.prl.upv.es/advanced-instrumentation-for-world-class-microwave-and-programmable-photonics-research/*

Funding entity and duration: *Generalitat Valenciana and the European Regional Development Fund (ERDF), 27 months*

Summary of the project: *The Photonics Research Labs (PRL) has thoroughly enlarged and improved through this project the equipment and instrumentation available in its facilities due to the procurement of a last generation infrastructure to i) carry out measurements in the time domain of pulses and radio frequency signals up to 70GHz that will be used both in the temporal characterization of programmable photonic chips and the special MCF and FMF fiber-based components that process high-speed radio frequency and wireless input signals, ii) expand the measurement capabilities of the our programmable integrated photonics laboratory through the acquisition of programmable motorized nano-positioner equipment that allows six degrees of freedom (3 of position and 3 angular) for measuring individual chips. The objective is to complete the equipping of the silicon technology programmable chip measurement workstation, iii) provide fiber fusion and glass shaping functionalities that will allow to expand the capabilities of the PRL optical fiber laboratory, enabling the realization*



Six degrees of freedom nano-positioner

of splices between various types of optical fibers, considering both standard fibers and special fibers (multicore and few modes); the production of modal and geometric adaptation elements (Tapers) between different fiber cores; the writing of spherical lenses at the ends of the fibers and, in general, the realization of combiners (and splitters) of signals at the input (and output) of arbitrary optical fibers. As a result, the PRL has consolidated its world reference position in the field of Microwave Photonics, which will be still strengthened and complemented by the specific objectives pursued by the ERDF infrastructure project "Advanced Instrumentation for world class microwave and programmable photonics Research Phase 2" (IDIFEDER/2021/050) during the next two years.

Name of the project: Microwave Photonics IC Systemization and Development

Webpage of the project:

Funding entity and duration: *HUAWEI TECHNOLOGIES CO., LTD., 36 months*

Summary of the project: *The goal of this project is to research and develop some of the key microwave-photonic technologies required for microwave-photonic radio base station architecture – more specifically these key technologies are modulator, true-time delay, and tunable filter with supporting required technologies such as semiconductor optical amplifier, photodetector, etc. The scope of the project includes systemization of the end-to-end microwave-photonic architecture to assess system performance, proposal of novel concepts/techniques, assessment of key technologies feasibility, maturity, performance, and limitation, and research/development of the key technologies*

2.- Research results

2.1.- Featured publications

Title, Authors, Name of the publication, pages, year: "Broadband random optoelectronic oscillator", Z. Ge, T. Hao, J. Capmany, W. Li, N. Zhu & M. Li, Nature Communications 11, art. 5724, 2020

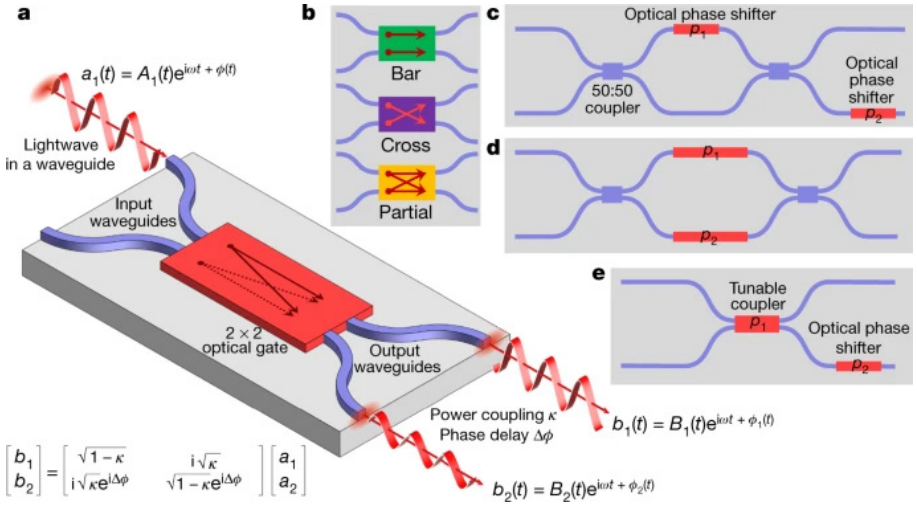
Brief summary of the paper*: Random scattering of light in transmission media has attracted a great deal of attention in the field of photonics over the past few decades. An optoelectronic oscillator (OEO) is a microwave photonic system offering unbeatable features for the generation of microwave oscillations with ultra-low phase noise. Here, we combine the unique features of random scattering and OEO technologies by proposing an OEO structure based on random distributed feedback. Thanks to the random distribution of Rayleigh scattering caused by inhomogeneities within the glass structure of the fiber, we demonstrate the generation of ultra-wideband (up to 40 GHz from DC) random microwave signals in an open cavity OEO. The generated signals enjoy random characteristics, and their frequencies are not limited by a fixed cavity length figure. The proposed device has potential in many fields such as random bit generation, radar systems, electronic interference and countermeasures, and telecommunications.*

Title, Authors, Name of the publication, pages, year: "Programmable photonic circuits", W. Bogaerts, D. Pérez, J. Capmany, DAB. Miller, J. Poon, D. Englund, F. Morichetti & A. Melloni, Nature, 586, pp 207-216, 2020

Brief summary of the paper*: The growing maturity of integrated photonic technology makes it possible to build increasingly large and complex photonic circuits on the surface of a chip. Today, most of these circuits are designed for a specific application, but the increase in complexity has introduced a generation of photonic circuits that can be programmed using software for a wide variety of functions through a mesh of on-chip waveguides, tunable beam couplers and optical phase shifters. Here we discuss the state of this emerging technology, including recent developments in photonic building blocks and circuit architectures, as well as electronic control and programming strategies. We cover possible applications in linear matrix operations, quantum information processing and microwave photonics, and examine how these generic chips can accelerate the development of future photonic circuits by providing a higher-level platform for prototyping novel optical functionalities without the need for custom chip fabrication.*

Title, Authors, Name of the publication, pages, year: "Dispersion-tailored few-mode fiber design for tunable microwave photonic signal processing ", E. Nazemosadat & I. Gasulla, Optics Express, 28, pp 37015-37025, 2020

Brief summary of the paper*: This paper presents a novel double-clad step-index few-mode fiber that operates as a five-sampled tunable true-time delay line. The unique feature of this design lies in its particular modal chromatic dispersion behavior, which varies in constant incremental steps among adjacent groups of modes. This property, which to the best of our knowledge has not been reported in any other few-mode fiber to date, is the key to tunable operation of radiofrequency signal processing functionalities implemented in few-mode fibers. The performance of the*



a, A 2 × 2 optical gate mixes the modulated optical waves a1 and a2 from two input waveguides, controlling both the power coupling κ and the phase delay Δϕ of the output waves b1 and b2. b, the gate can be tuned between 'bar' and 'cross' states. c–e, the gate can be implemented as a circuit with two degrees of freedom, p1 and p2, such as an MZI with two optical phase shifters, or a tunable coupler with an additional phase shifter.

designed true-time delay line is theoretically evaluated for two different microwave photonics applications, namely tunable signal filtering and optical beamforming networks for phased array antennas. In the 35-nm optical wavelength tuning range of the C-band, the free spectral range of the microwave filter and the beam-pointing angle in the phased array antenna can be continuously tuned from 12.4 up to 57 GHz and 12.6° up to 90°, respectively.

Title, Authors, Name of the publication, pages, year: " Mode-division multiplexing for microwave signal processing", E. Nazemosadat & I. Gasulla, IEEE Photonics Society Summer Topicals Meeting Series, 2021

***Brief summary of the paper**: This paper presents an overview of different mode-division multiplexing fiber technologies engineered to provide tunable microwave signal processing, including signal filtering and optical beamforming for phased-array antennas. The exploitation of both the space and wavelength dimensions brings advantages in terms of increased compactness, flexibility, and versatility.*

Title, Authors, Name of the publication, pages, year: "Fiber Optic Shape Sensors: A comprehensive review", I. Floris, J. M. Adam, P.A. Calderón & S. Sales, Optics and Lasers in Engineering, 139, pp 106508, 2021

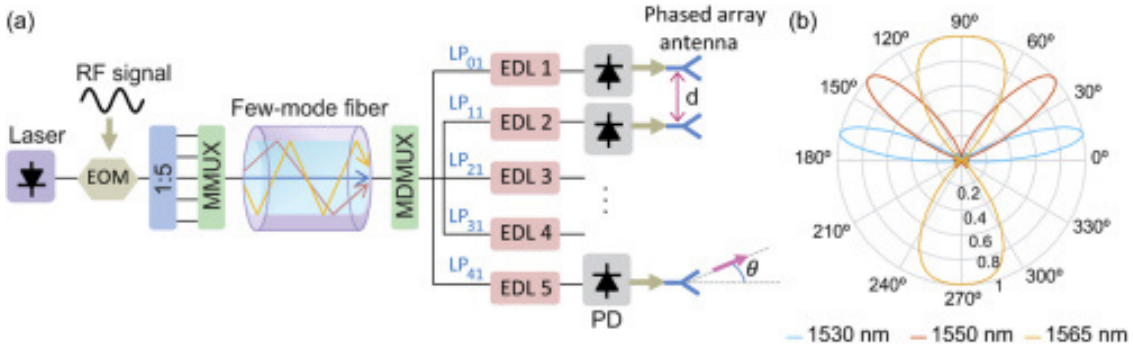
***Brief summary of the paper**: This paper presents an ambitious review of the current state of the art of Fiber Optic Shape Sensors (FOSS) based on Optical Multicore Fibers (MCF) or multiple optical single-core fibers with embedded strain sensors and provides a comprehensive analysis of a wide range of aspects, comprising: existing alternative technologies; an overview of optical fiber sensors; characteristics and advantages of fiber optic shape sensors; historical achievements; applications; performance and error analysis; and present and future perspectives.*

Title, Authors, Name of the publication, pages, year: " Fiber Bragg Gratings for Medical Applications and Future Challenges: A Review", D. Lo Presti, C. Massaroni, C. S. Jorge Leitao, M. F. Domingues, M. Sypabekova, D. Barrera, I. Floris, L. Massari, C. M. Oddo, S. Sales, I. I. Iordachita, D. Tosi & E. Schena, IEEE Access, 8, pp 156863 - 156888, 2020.

***Brief summary of the paper**: This paper reviews the FBG-based measuring systems, their principle of work, and their applications in medicine and healthcare. Particular attention is given to sensing solutions for biomechanics, minimally invasive surgery, physiological monitoring, and medical biosensing. Strengths, weaknesses, open challenges, and future trends are also discussed to highlight how FBGs can meet the demands of next-generation medical devices and healthcare system.*

Title, Authors, Name of the publication, pages, year: "Optical-phased array beam-steering using multi-input slab coupler in silicon nitride waveguides", P Muñoz, D Pastor, J Benítez, G Micó, LA Bru, DJ Goodwill & E Bernier, Optical Fiber Communication Conference, W1D. 4, 2021

***Brief summary of the paper**: A 2D beam-steering optical phased array is demonstrated in SiN. The multiple-input slab- coupler reduces OPA footprint 8x versus previous single-input*



Implementation of an optical beamforming network using the designed FMF in space diversity operation.

designs. Measured field of view is 15° x 2.8°. Gaussian beam full width is 0.36° x 0.175°.

Title, Authors, Name of the publication, pages, year: "On the 40 GHz Remote versus Local Photonic Generation for DML-based C-RAN Optical Fronthaul", L. Vallejo, J. Mora, D.-N. Nguyen, J. Bohata, V. Almenar, S. Zvanovec and B. Ortega, Journal of Lightwave Technology, 2021

***Brief summary of the paper**: The paper presents a full comprehensive formulation of the frequency response of a system based on a directly modulated laser transmitting data over 40 GHz signal generated by external carrier suppressed modulation and optical frequency multiplication. Theoretical and experimental characterization of the system response at baseband and mmW band for local and remote generation setups show very good agreement.*

Title, Authors, Name of the publication, pages, year: "Efficiency Analysis of a Truncated Flip-FBMC in Burst Optical Transmission", M. S. Bahaaelden, B. Ortega, R. Pérez-Jiménez & M. Renfors, IEEE Access, 9, pp. 100558-100569, 2021

***Brief summary of the paper**: A novel Flip-filter bank multicarrier (Flip-FBMC)-based transmultiplexer (TMUX) with offset quadrature amplitude modulation is proposed to enhance the transmission performance compared to a conventional Flip-OFDM system. Moreover, the possibility to reduce the TMUX response (latency) and increase spectral efficiency is investigated for the first time through a tail shortening method.*

2.2.- Patents

P. Muñoz, D. Pastor, G. Micó, L.A. Bru & J. Benítez. "OPTICAL-PHASED ARRAY BEAM-STEERER", 87246075US0. 2021.

J. Villatoro, S. Sales & J. Madrigal, "COUPLED-CORE OPTICAL FIBER WITH FIBER BRAGG GRATING AND SENSING DEVICE", EP21382402, 2021

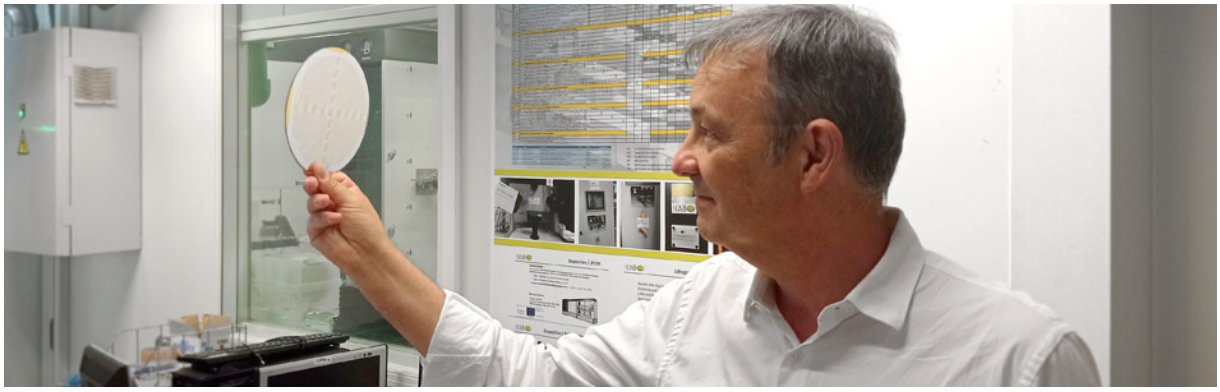
2.2.- Awards.

King Philip VI of Spain hands the National Research Award in the Engineering area to José Capmany.

The jury of the 2020 National Research Awards decided to grant **José Capmany Francoy**, lead researcher of the Photonics Research Labs (PRL), this award for his pioneering contribution to the field of photonic engineering and optical telecommunications, through a cutting-edge scientific activity with a significant international impact. In addition, he highlighted the exemplary nature of Capmany's professional career, his leadership capacity and his perseverance in developing the practical application of his research. "This award recognizes the top-level research and technology transfer work that has been carried out by my research group for the last 25 years. For me is an honor to work with the members of my team and learn from them in a daily basis, to jointly contribute to the development of the science and the competitiveness in Spain, what is especially important in difficult times like these", pointed out professor Capmany.

R&D and innovation, essential

José Capmany receiving the prize



José Capmany holding a wafer

The National Research Awards aim to recognize the merit of Spanish researchers who are carrying out an outstanding work in scientific fields of international relevance and their extraordinary contribution to the scientific progress, the transfer of technology and the progress of Humanity. These prizes grant 30.000€ per category.

National Research Awards ceremony has been chaired by the kings of Spain, **Philip VI and Letizia**, along with the minister of Science and Innovation, **Pedro Duque**, who highlighted the special relevance of the awards granted this year because "effective vaccines to stop coronavirus pandemic have been delivered in a surprisingly short time period thanks to science and innovation research". The minister said during his speech that R&D and innovation is "essential to improve competitiveness of Spain, what makes possible high quality and highly paid employment". Prof. Capmany and the rest of the excellent scientific researchers awarded this year "play a key role to achieve that objective".

José Capmany receives the Engineering Achievement Award from IEEE Photonics Society

José Capmany, Head of the Photonics Research Labs-iTEAM and Full Professor at the Escuela Técnica Superior de Ingeniería de Telecomunicación (ETSIT) of the Universitat Politècnica de València (UPV), has obtained a new international recognition for his scientific career.

This time, Professor Capmany has been honored by the IEEE Photonics Society, the most prestigious organization in the field of Photonics. This organization bestowed him the Engineering Achievement Award for his "pioneering and sustained contributions to integrated microwave and programmable photonics including the invention of Field Programmable Photonic Gate Arrays".

"I am really proud to receive this prize from the IEEE Photonics Society, that not only recognizes my work, but also the great effort made by my teammates, specially by the other co-founders of iPRONICS. What makes this award remarkable is that it recognizes excellent scientific research altogether with the engineering development and technological transfer of the scientific results", highlighted Prof. Capmany.

A technological revolution in telecommunications

Photonics is revolutionizing the field of telecommunications. It is a real breakthrough that will have a direct impact not only in the industrial sector but also in our daily life. Among the numerous applications of this technology, it is worth highlighting 5G communications and autonomous driving, as well as quantum and neuromorphic computing, which develops chips that imitate the neural network structure of the human brain.

According to José Capmany, "These applications need to process a huge amount of data at a high speed with extreme versatility, and this is just what both microwave and programmable photonics can provide. In fact, we are currently developing a programmable photonic circuit at the Photonics Research Labs to meet the highly demanding requirements of these new applications."