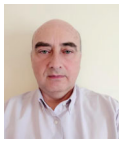
		AGENDA & ABSTRACTS & Bios		*(agenda v27)*	
		FRONT-EDGE Workshop, Barcelona July 7th-9th		josep.prat@upc.edu	
		UPC Campus Nord, Vertex, Plaça d'Eusebi Güell, 6, 08034 Barcelona	*gmaps location:*	https://goo.gl/maps/dJYDqNeo6s92NXq16	
		https://gco.upc.edu/en/research/optical-access-networks/front-edge-workshop			
Wednesday, July 7th					
Time		*TITLE*	*Name*	*Affiliation*	*Country*
13:30		*Registration and Covid19 measures*			
		Sandwich & Coffee			
14:00	*0*	***Workshop wellcome***	***UPC VR Jordi Llorca***		
14:20		***Introduction***	**Josep Prat**		
		The organization and the goals of the WS are introduced: advancements that are revolutionizing the Fixed Optical Networks; investigating changes in architecture required to handle future needs and use cases; identifying technologies that enable the evolution towards the next generations; towards massive Fibre-To-The-Everywhere/Everything (FTTE), expanding to new markets and applications. Also, the UPC university and the GCO group are introduced.	*Prof. Josep Prat (jprat@tsc.upc.edu) is full professor in the Optical Communications Group (www.tsc.upc.edu/gco) of the Signal Theory and Communications Department of the UPC. He has mainly investigated on broadband optical communications with emphasis on FTTH access networks and high bit-rate WDM transmission systems. He led the FP7 European project SARDANA ("Scalable Advanced Ring-based passive Dense Access Network Architecture") on next-generation FTTH networks, winning the 2011 Global Telecommunications Business Innovation Award in the Fixed Network Infrastructure category, and has participated in the European projects COCONUT, ACCORDANCE, Euro-Fos, BONE, ePhoton/One, LION, MEPHISTO, MOON, SONATA and RACE1027, on optical transport and access networks. He was a guest scientist in the University College of London in 1998, and in the Stanford University in 2016; he has been subdirector of the ETSETB Telecom School and member of the Government Counsel of UPC; he has published more than 200 international works and edited the books "Fiber-to-the-Home Technologies" and "Next-Generation FTTH Passive Optical Networks" (Springer Ed.), and has supervised 13 PhD Thesis. He was Associate Editor of the IEEE-PTL and TPC member of OFC, ECOC among others.*		
14:40		***Session 1.-Future optical networks (Chair: Ioannis Tomkos)***			
14:50	1	***Toward intelligence in photonic systems***	**Darko Zibar**	DTU	DN
		Challenges addressed: Fields focuses on the experimental demonstrations ; ML benefits on experimental data should be ideally shown ; Noise in experimental set-ups (non Gaussian, non additive) ; Experimental-set ups are prone drifts and fluctuations ; Automatizing experimental-set ups for training data acquisition (noise, drift,) ; Training of NNs using gradients computation - challenging in experimental environments ; Deep understanding of statistics, linear algebra, optimization and experimental set-up debugging necessary not to end in pitfalls.	*Darko Zibar received the M.Sc. degree in telecommunication and the Ph.D. degree in optical communications from the Technical University of Denmark, in 2004 and 2007, respectively. He is an Associate Professor at the Department of Photonics Engineering, Technical University of Denmark and the group leader of Machine Learning in Photonics Systems (M-LiPS) group. He has been on several occasions (2006, 2008, and 2019) Visiting Researcher with the Optoelectronic Research Group led by Prof. John E. Bowers at the University of California, Santa Barbara, (UCSB). At UCSB, he has been working on topics ranging from analog and digital demodulation techniques for microwave photonics links and machine learning enabled ultra-sensitive laser phase noise measurements techniques. In 2009, he was a Visiting Researcher with Nokia-Siemens Networks, working on clock recovery techniques for 112 Gb/s polarization multiplexed optical communication systems. In 2018, he was Visiting professor with Optical Communication (Prof. Andrea Carena, OptCom) Group, Dipartimento di Elettronica e Telecomunicazioni, Politecnico di Torino working on the topic of machine learning based Raman amplifier design. His resrearch efforts are currently focused on the application of machine learning technqiues to advance classical and quantum optical communication and measurement systems.*		
15:10	2	***Intent-based Networking for Optical Transport-Edge Networks***	**Luis Velasco**	UPC	ES
		Deployment of business intent across the optical network through policies for automated management is introduced through an illustrative example for edge applications, where a optical conenction based on DSCM is dynamic operated.	*Luis Velasco is a Professor at the Department of Computers Architecture (DAC) and senior researcher at the Advanced Broadband Communications Center (CCABA). He has co-authored more than 200 papers in peer-reviewed International Journals and Conferences, as well as two books related to Elastic Optical Networks. He is serving as an Associate Editor of the IEEE/OSA Journal of Optical Communications and Networking (JOCN) and in the TPC of EOC. He received the ICREA Academia award in engineering sciences in 2015 and 2020. His interests include intent-based networking, including monitoring, data analytics, and artificial intelligence, for autonomous beyond 5G networks and services.*		ES
15:30		*Coffee Break*			
15:50	3	***Fixed 5G standardization directions in ETSI***	**David Hillerkuss**	Huawei	GE
		ETSI ISG F5G serves as a hub for standardization activities in fixed network technologies in close collaboration with numerous SDOs. New requirements and use cases are investigated to enhance existing and develop new standards. This opens new markets and generates possibilities for growth of the optical communications industry.	*David Hillerkuss is senior scientist at Huawei Technologies and secretary of the ETSI ISG F5G. He authored or co-authored >200 publications and numerous patents on novel devices and systems for classical and quantum communications. He served as program and general chair for SPPCOM and on program committees for OFC, ECOC, SPPCOM, and CLEO.*		
16:10	4	***Towards Converged Optical and Wireless Fronthaul Solutions for 5G and Beyond Networks***	**Paulo Monteiro**	IT-Univ. Aveiro	PT
		The fifth-generation mobile communications and emerging sixth-generation are envisaged to support a massive number of deployment scenarios based on the respective use case requirements. The requirements can be efficiently fulfilled with the ultra-dense small-cell cloud radio access network (C-RAN) approaches. However, the C-RAN architectures impose stringent requirements on the transport networks. Our recent advances in converging high capacity, low latency wired and wireless optical networking solutions capable of meeting fronthaul demands will be presented. Namely, new dynamic bandwidth allocation (DBA) algorithms for passive next-generation optical networks (PONS) to jointly support 5G data and fronthaul services, as well as high-capacity open-air free-space optical links, will be addressed.	*Paulo P. Monteiro is Associate Professor at the University of Aveiro and research coordinator of the Optical Communication Systems at the Instituto de Telecomunicações (https://www.it.pt/Groups/Index/59). His main research interests include Optical Communications and Reflectometry Systems. Successfully tutored over 14 PhDs, 24 Masters and participated in more than 26 research projects. He has authored/co-authored more than 18 patent applications, over 115 papers in journals, and 390 conference contributions (https://orcid.org/0000-0003-4664-9238). He is coordinator of the research infrastructure ORCIP (https://orcip.pt/).*		
16:30	5	***i2CAT's 5G Network Slicing approach***	**Miguel Catalan**	i2CAT	ES
		Network slicing is widely considered as one of the main drivers fostering the adoption of 5G technologies. In particular, the unique capabilities offered by network slices are expected to play a relevant role in the path towards new business models based on infrastructure sharing (such as Neutral Hosting) and on-demand provisioning of Network as a Service (NaaS) solutions. While there is a general consensus about the need of network slices and the potential offered by enabling technologies such as SDN and NFV, there still room for novel solutions and improvements in this arena in order to fully unleash their foreseen potential. i2CAT has developed an innovative solution, comprehending an SDN-enabled RAN Controller and a Slice Manager, which is able to manage E2E slices in multi-tenant multi-vendor heterogeneous RAN scenarios. This solution, which has been developed and evaluated within the scope of multiple H2020 projects, is currently being adopted by an i2CAT's spin-off (Neutroon) and the "Àrea 5G" project (Generalitat de Catalunya).	*Miguel Catalan-Cid is a senior research engineer at i2CAT in Barcelona, Spain. He holds since 2008 a Masters degree and since 2016 a Ph.D. from the Polytechnic University of Catalonia (UPC). He has an extensive experience in wireless networks, analysis and definition of communication protocols, utilization of simulation tools, and programming embedded systems and micro-controllers. He is currently being involved in different H2020 and technological transfer projects related to 5G technologies, focusing on network slicing, radio access networks and mobile core networks.*		

16:50	6	***Models for Edge Network Resource Optimization in C-RAN***	**Nicola di Cicco**	UniBo	ES
		In the evolving scenario of 5G end-to-end networks, optical transport networks provide the connectivity between the mobile edge and the mobile core network. The number of nodes of this network segments is expected to grow to several hundred with high capacity connectivity demand. According to the functional decoupling of the base station into the Remote Radio Unit (RRU) and the Baseband Unit (BBU), the latter can be virtualized into a cloud computing platform to access the mobile core. As a consequence, BBU virtual network functions related to different RRUs can be centralized and assigned to a subset of nodes. With the aim of optimized reliable design, scalable models need to be defined and effective approaches are presented in both static and dynamic scenarios.	*Bio: Nicola Di Cicco is a student of the Master's Degree in Telecommunications Engineering at the University of Bologna, conducting its Master's thesis under the supervision of Prof. Valentina Cacchiani and Prof. Carla Raffaelli. His main research interest is network optimization and planning.*		
17:10		Q&A panel	all		IT
17:30		*Closing 1st day & shuttle bus*	all		
18:30		*Walking tour (Pl.Catalunya, Apple store)*	all		
20:30		*Social dinner by the sea (Tejada Mar)*	speakers		
22:45		*Shuttle bus*			
Thursday, July 8th					
08:45		*Shuttle bus*			
09:20		***Sesion 2.-Advanced Subsystems (Chair: Josep Prat)***			
09:30	1	***Technical options for PON transmission above 50 Gbps per wavelength***	**Roberto Gaudino**	PoliTo	IT
		Until now, all optical access networks standards are based on intensity modulation and direct detection, using elementary signal recovery techniques (clock and data recovery) and very limited physical-layers processing. Now that baud rates are increasing, this simple approach is no longer viable if the system is to maintain the large loss budget (30 dB) that is required by PON Optical Distribution Network. At the same time, the cost of high-speed digital signal processing (DSP) has declined to the point where it can be applied to an optical access system. Our presentation will provide an overview of several DSP techniques that have been recently studied at the research level for the PON environment, including linear pre- and post- compensation, nonlinear processing and adaptive FEC approaches.	*Roberto Gaudino, Ph.D, is currently Full Professor at Politecnico di Torino, Italy. His main research interests are in long haul DWDM systems, fiber non-linearity, modelling of optical communication systems and in the experimental implementation of optical networks, with specific focus on access networks. In the last years, he focused his activity on next-generation passive optical access networks (NG-PON2) and on ultra-high capacity systems for medium reach links. Previously, he worked extensively on fiber modelling, optical modulation formats (such as duo-binary, polarization or phase modulation), coherent optical detection, plastic optical fibers and on the experimental demonstration of packet switched optical networks.* *Prof. Gaudino spent one year in 1997 at the Georgia Institute of Technology, Atlanta, as a visiting researcher. From 1998, he was with the team that coordinated the development of the commercial optical system simulation software OptSim (Artis Software Corp., then acquired by RSoft Design and now by Synopsis). From 2009 to 2016 he was the coordinator of three projects in the area of optical access (EU FP6-IST STREP "POF-ALL" and "POF-PLUS" and EU FP7-ICT STREP project "FABULOUS" http://www.fabulous-project.eu/). He is currently the Coordinator of PhotoNext, the Inter-Departmental Center on Applied Photonics at Politecnico di Torino. He is co-author of more than 250 papers in the field of Optical Fiber Transmission and Optical Networks. For further information, please visit www.optcom.polito.it and www.photonext.polito.it.*		
09:50	2	***The impact of point to multi point XR optics on the architecture of Optical networks***	**Antonio Napoli**	Infinera	GE
		In this presentation, we provide an overview of the recent advances in coherent technology behind the creation of industry's first for point-to-multipoint coherent pluggable optics. We show the technology innovations behind this solution; target applications; and several experimental validations of the proposed concept.	*Antonio Napoli holds a Ph.D. from Politecnico di Torino in 2006. He joined Siemens, NSN, and Coriant in 2006, 2007, 2013 respectively. Since 2018, he is with Infinera. In 2017-2019, he served as OFC TPC member and he co-organized four OFC workshops. He was three times guest editor for the IEEE/OSA JOCN and JLT. He is the technical coordinator of three Marie Curie H2020 projects and represents Infinera within the EU project CiViQ. His research interests include DSP, wideband optical systems, modeling, ML/AI for optics. Dr. Napoli represents Infinera within the OIF and is (co)-author of 7 patents, 161 peer-to-peer reviewed articles, and one book chapter.*		
10:10	3	***Advanced digital signal processing for broadband access***	**Robert Killey**	UCL	UK
		This talk will cover digital signal processing methods for short-reach coherent optical fibre communications, including access and inter-data centre links. The methods we have studied include pilot symbol-based carrier phase estimation and equalisation and constellation shaping for residual phase noise in partially-coherent systems. We have also carried out numerical and experimental assessments of signal bandwidth extension across S-, C- and L-bands.	*Prof Robert Killey received the B.Eng. degree in electronic and communications engineering from the University of Bristol in 1992, the M.Sc. degree from University College London (UCL) in 1994, and the D.Phil. degree from the University of Oxford, in 1998. He is currently Professor of Optical Communications with the Optical Networks Group at UCL. His research interests include optical fibre transmission systems, fibre nonlinearity, and digital signal processing for optical communications. He has participated in many European projects and national projects, and is currently a Principal Investigator in the EPSRC-funded TRANSNET programme. He was with the technical program committees of many international conferences including ECOC and OFC, and has served as an Associate Editor of the Journal of Optical Communications and Networking, Journal of Lightwave Technology and the IEEE Photonics Journal. He was a recipient of the Royal Academy of Engineering 2015 Colin Campbell Mitchell Award.*		
10:30		*Coffee break*			
10:50	4	***Enhancing the Performance of low cost optical Transceiver Technologies***	**Werner Rosenkranz**	Univ. KIEL	GE
		SSB and multilevel ASK-DMPSK are cost efficient solutions for shorter reach transmission, with No local làsers, No carrier recovery, No ADC or DAC required, No DSP required. High Speed is manageable as has been demonstrated.	*Werner Rosenkranz studied Electrical Engineering at the University of Erlangen-Nurnberg, Erlangen, Germany. There he received the Ph.D. and the Habilitation at the Lehrstuhl für Nachrichtentechnik. He worked on Phase-locked Loops, digital FM-systems, and Digital Signal Processing. In 1989 he joined Philips Kommunikations Industrie and Lucent Technologies in Nuremberg, Germany, where he was responsible for a transmission group in the basic development team. In 1997 he became Professor and head of the Chair for Communications in the Department of Engineering of the University of Kiel, Germany. In 2016 he became Professor Emeritus. His main research activities are transmission-aspects in very high-speed digital communication systems with focus on optical transmission, synchronization systems, signal processing, and simulation. He is author or coauthor of more than 200 publications on selected topics as e.g. compensation and equalization of optical transmission channels, advanced modulation formats in optical communications, high-speed transmission, modeling of channel impairments etc. Prof. Rosenkranz is a Senior Member of IEEE, a Fellow of the OSA, and member of VDE and ITG.*		
11:10	5	***Statistical udWDM multiplexing***	**Josep Segarra**	UPC	ES

		A Passive Optical Network (PON) for access, making use of ultra-dense Wavelength Division Multiplexing (udWDM) by densely spacing channels at few GHz, and introducing the "wavelength-to-the-user" concept, is proposed. The key challenge is to develop low-cost coherent transceivers, providing an excellent selectivity while avoiding filters, and furnishing high sensitivity, which allows high splitting ratios, large number of users and long distance reach. An Optical Network Unit (ONU) design realized with coherent transceivers using two lasers is presented, and the corresponding Optical Line Terminal (OLT) architecture is introduced. The ONUs at customer premises own lasers with limited thermal tunability and their wavelengths are randomly distributed in a band. By using heuristic Dynamic Wavelength Assignment (DWA) schemes and extending the original working band, the required optical band is obtained. In activation processes, ONU acceptances up to 99.9% are achieved for different user bandwidths with flexible channel assignment. Afterwards, an access-metro network for Cloud-Radio Access Network is introduced. Next, a practical PON design and a trial setup is presented, including an activation-initialization procedure and the corresponding experimental results. Finally, the conclusions are shown.	*Josep Segarra Mullerat was born in Arbeca (Lleida, Catalonia, Spain) in 1959. He received the M.S. degree in telecommunications engineering in 1985 and the Ph. D. degree in 2007, both from the Universitat Politècnica de Catalunya (UPC), Barcelona, Spain, where he is currently working in optical networks, focusing his current research on architectures of optical access and in past in optical access based on optical burst switching with QoS. From 1981 to 1985, he was with Telefónica, Barcelona, Spain, where he worked on O&M telephone switching systems. From 1986 to 1987 he joined the Telefónica R&D Department, in Madrid, Spain, where he developed subscriber terminals. Since 1988 to 2011, he served the Network Administration Section (now Assignment and Activation Section) in Telefonica, Barcelona, provisioning circuits; e.g. PSTN links, interconnection links between operators and private circuits, which were accomplished by managing the SDH and using all sorts of bit rates and services. From 2011 to 2012 he served the Outside Plant Section of Telefonica, in Barcelona, designing deployments of optical fiber networks, in core, feeder and drop sections. In 1987, he became professor at the Department of Signal Theory and Communications, UPC, teaching digital communications. He has also participated in the European project ePhoton/One about optical networks. Afterwards, he has been involved in projects focused on access networks: the SARDANA and COCONUT European projects.*		
11:30	6	***Low cost coherent access RXs***	**Jeison Tabares**	UPC	ES
		Coherent systems are a mature technology in high-capacity core networks supporting large volumes of data traffic. However, the high cost and complexity of commercial coherent transceivers for core networks are hardly affordable in optical networks with high terminal density like optical access. In this talk, we discuss novel strategies to simplify the coherent receiver architecture by either low-complexity DSP or analog hardware design. A polarizationdiversity homodyne -PSK receiver with ADCs and DSP operating at the symbol-rate is demonstrated real-time at 1.25 Gb/s with FPGA. Moreover, novel front-end architectures[19] for polarization-independent heterodyne detection using 3x3 optical coupler are explored.	*Jeison Tabares received the B.S. degree in Electronic Engineering from the National University of Colombia, Manizales, Colombia, in 2009, and the M.Sc. degree in Communication and Information Technologies from the Polytechnic University of Catalonia, Barcelona, Spain, in 2012, where he is currently working towards the Ph.D. degree. His research focuses on the mitigation of transmission impairments in coherent optical access networks, DSP for short-reach coherent, and optical transceivers simplification.*		
11:50		*Q&A pannel discussion*	*all*		
12:10		*Visit to GCO lab and demos on udWDM-PONs*	*outsiders*		
13:00		*Lunch*			
14:00		*Maremostrum supercomputer*	*outsiders*		
14:50		***Session 3.-Advanced Enabling Technologies (Chair: Roberto Gaudino)***			
15:00	1	***Ultra-dense spatial&spectral swithing***	**Dan Marom**	Hebr. Un. Jerusalem	IS
		First demonstration of RCF for Mode Division Multiplexing; Modal properties confirmed and match well with simulations; RCF should be an excellent can candidate for MDM transmission, possibly enabling MIMO-free transmission; Applicable for QKD encoding of qudits as well.	*Dan M. Marom is a Full Professor in the Applied Physics Department at Hebrew University, Israel, heading the Photonic Devices Group and currently serving as the Department Chair. From 2000 until 2005, he was a Member of the Technical Staff at the Advanced Photonics Research Department of Bell Laboratories, Lucent Technologies, where he invented and headed the research and development effort of MEMS based wavelength-selective switching solutions for optical networks. Since 2005, he has been with the Applied Physics Department, Hebrew University of Jerusalem, Israel, where he leads a research group pursuing his research interests in creating photonic devices and sub-systems for switching and manipulating optical signals, in guided-wave and free-space optics solutions using light modulating devices, nonlinear optics, and compound materials.*		
15:20	2	***Evolution of PON transceiver technologies***	**Francisco Rodriguez (on behalf of A.Teixeira)**	Instituto de Telecomunicações	PT
		25G-PON will compete with the 10Gb/s market; 25G-PON will benefit from already available 25G Ethernet Technology; Final market forecast for 50G will surpass the forecast of 25G-PON; Future PON systems will be driven by new Applications.			
15:40	3	*Secure quantum communications test-bed at Eindhoven (cancelled)*	Idelfonso Tafur	TUE	NL
16:00		*Coffee break*			
16:20	4	***Plasmonics - an Enabling Technology for Highest Speed***	**Juerg Leuthold**	ETH Zurich	SW
		Plasmonics – an Enabling Technology for fj/bit Operation: Plasmonic Modulators, Plasmonic Detectors ; Electronic-plasmonic integration – a need for energy-efficient speed. ; THz Technology.	*Juerg Leuthold is the head of the Institute of Electromagnetic Fields (IEF) at ETH Zurich, Switzerland since 2013. His interest are in the field of Photonics, Plasmonics and Microwave with an emphasis on applications in communications and sensing. In the time from 2004 until 2013 he was affiliated with the Karlsruhe Institute of Technology (KIT) in Germany, where he was the Head of the Institute of Photonics and Quantum Electronics (IPQ) and the Helmholtz Institute of Microtechnology (IMT). From 1999 to 2004, he was affiliated with Bell Labs, Lucent Technologies, Holmdel, NJ, USA, where he performed device and system research with III/V semiconductor and silicon optical bench materials for applications in high-speed telecommunications. Juerg Leuthold received the Ph.D. degree in physics from ETH Zurich in Switzerland for work in the field of integrated optics and all-optical communications in 1998.*		
16:40	5	***50 Gbps Passive Optical Network (50G-PON): Challenges and Current Developments***	**Ricardo Rosales**	Huawei	GE
		Passive optical networks (PON) have been deployed worldwide on a massive scale. Gigabit class PONs are in the process of being upgraded to 10 Gigabit PON. This has stimulated the development of new PON standards to address the next evolution step. In the ITU-T, 50G-PON has been recently consented and it has been recently considered for the 5G x-haul optical transport in order to benefit from the deployed optical distribution network. In this talk, I will review the current challenges and developments for meeting the 50G-PON high loss budgets requirements.	*Ricardo Rosales received the Ph.D. degree from the UPMC (Paris, France) in 2012, for his work on quantum-dash mode-locked lasers for optical communications at the Laboratory for Photonics and Nanostructures (CNRS France). From 2013 to 2015, he was a Marie Curie Postdoctoral Fellow with the Institute of Solid State Physics at the TUB (Berlin, Germany) to develop quantum-dot-based semiconductor amplifiers for life science applications. From 2015 to 2018, he continued at the TUB working on novel concepts for high-power semiconductor lasers as well as high-bandwidth vertical-cavity surface-emitting lasers. He is currently a Research Scientist at Huawei Technologies (Munich, Germany) where he develops photonic components and systems for telecom and datacom use cases.*		
17:00	6	***Present and future Passive Optical Networks enabled by Photonic Integrated Circuits***	**Francisco Rodrigues**	PICAdvanced	PT

		Abstract: With 10Gbps technology deployments for Passive Optical Network (PON) occurring, the operators and technology users desire now to take full advantage of bandwidth and flexibility provided, however bandwidth requirements will not stop and expected to quadruplicate at every decade. This poses burdens on the physical layer and its electro optical hardware evolution. While standardization bodies are intensely working on new types of PON such as Wavelength Division Multiplexing, coherent based or 25/50Gbps, the operators and component vendors are exploiting improvements on the hardware for deployment of future and current technologies such as NG-PON2, the only PON standardized offering Time and Wavelength Division Multiplexing. Photonic integrated circuits (PICs) are a solution to increase complexity on the networks and be able to keep up on the physical layer. In this presentation an overview of PON evolution, the research done so far to bring PIC based transceivers to PON will be discussed. The agnostic approach for photonic integration development and the most recent results achieved in PICadvanced will also be presented.	*Biio: Francisco Rodrigues received his Master's Degree in Electronics and Telecommunication from Universidade de Aveiro in 2014 and currently is engaged in the PhD under the program of Doctorate in Business and Innovation from the same university. With a research focus on Photonic Integrated Circuits and NG-PON2, Francisco worked as a researcher at Instituto Telecomunicações and as an intern in PT Inovação e Sistemas. In 2015 he joined PICadvanced as optoelectronic engineer contributing to the development of ONU transceivers for NG-PON2 and photonic integrated circuit platform. Francisco also led PICadvanced in multiple R&D projects on the field at national and European level. Current topics of interest are photonic integrated circuits for PON and Terahertz optoelectronics. Since 2017 Francisco is the CEO of PICadvanced S.A.*		
17:20	7	***Continuous Variable Quantum Communications***	**Samael Sarmiento**	ICFO	ES
		Quantum cryptography, Quantum Random Number Generator (QRNG), Quantum Key Distribution (QKD), CiviQ Project, Luxquanta.			
17:40		Pannel discussion	all		
18:00		*Closing 2nd day*			
19:30		*Social dinner (Gallery hotel)*	*speakers*		
21:20		*Cultural visit (La Pedrera)*	*speakers*		
Friday, July 9th					
09:20		***Session 4.-Converged Networks and new Applications (Chair: Francisco Rodriguez)***			
09:30	1	***Converged 5G networks; 5Gcomplete & Marsal EU projects***	**Christos Verikoukis**	CTTC	ES
		The aim of this talk is to briefly introduce MARSAL project. MARSAL project targets the development and evaluation of a complete framework for the management and orchestration of network resources in 5G and beyond, by utilizing a converged optical-wireless network infrastructure in the access and fronthaul/midhaul segments.	*Christos Verikoukis got his PhD from the Signal Theory and Communications Department of the Technical University of Catalonia (UPC), Barcelona, in 2000. He joined CTTC on February 2004 and he is currently a Research Director and head of the SMARTECH department. Since 2007 he has been an adjunct associate professor at Barcelona University (UB). Dr Verikoukis has participated or is currently participating in several European and National funded projects. He is currently coordinate the MonB5G, MARSAL, 5GMediaHub and Semantic project. Dr. Verikoukis is the IEEE ComSoc EMEA Director.*		
09:50	2	***Towards reconfigurable p2mp fiber wireless fronthaul networks based on Silicon Photonic ROADMs and 60GHz Phased Array Antenna for multi-user mmWave C-RANs***	**Chris Vagionas**	Aristotele Univ.	GR
		The proposed architecture exploits four 1 Gb/s Fiber Wireless channels, transported using analog radio over fiber (IFoF) schemes and flexibly allocated at up to eight mmWave antenna sites by two in-series 1x4 integrated photonic ROADMs. The ROADMs rely on an ultra-low loss Si3N4 TriPleX platform with a lattice filter design of 100 GHz channel spacing and less than 5 dB fiber-to-fiber losses, while at the antenna site a V-band Phased Array Antenna with 32 radiating elements is presented, supporting analog RF beamsteering capabilities at up to 90°-sector. Each Fiber Wireless mmWave fronthaul link can transport at least 1 Gb/s user rate using a 250 Mbd 16QAM modulation format, meeting the 5G KPI data rate and 3GPP EVM metrics. The use of two ROADM nodes allows flexible lightpath reconfiguration to two different network segments and up to eight portable mmWave antenna terminals. The presented Fiber Wireless technologies can shape a promising roadmap towards serving multi-user network environments of high-density and high-capacity in future mmWave C-RANs.	*Chris Vagionas received his Diploma of Electrical and Computer Engineering at the Aristotle University of Thessaloniki in 2008, as well as his M.Sc. and Ph.D. from the Department of Informatics of the same University in 2011 and 2017. Currently, he is a senior researcher at WinPhos research group working in Integrated Photonics and Optical Communication Systems for Fiber Wireless 5G networks. His latest research efforts are directed towards developing reconfigurable point-to-multipoint, multi-beam mmWave architectures using integrated photonics, as part of the Int5Gent and 5G-PHOS 5G-PPP projects. Dr. Vagionas also holds a national postdoctoral research grant on ultra-fast optical look-up memory operation funded by the Hellenic Foundation for Research & Innovation. He is a recipient of an IEEE Photonics Society Graduate Student Fellowship awarded at IPC in 2016, a Newport Grant awarded by the OSA at CLEO 2012 and a Best Paper award at the Panhellenic Conference Eureka 2011 in Kastoria, Greece, and is co-author of more than 70 journal and conference publications.*		
10:10		*Coffee break*	all		
10:30	3	***The EU vision for 6G networks***	**Ioannis Tomkos**	Univ. Patras	GR
		We are at the start of intense discussions and research activities on 6G networks that during the running decade will drive technological developments in communications, computing and sensing, bringing a new era in the way that billions of connected things, humans, vehicles, robots and drones will generate zettabytes of digital information and will support a wide variety of new and enhanced services for consumers and industry sectors. Various orchestrated efforts around the world at national, regional and continental scale have been initiated to define research priorities related to 6G with the goal to offer competitive advantage to those who will invest on time and in the right directions/ways in the associated technologies. Among those efforts, we will focus on the recently published white article prepared by 5G-IA that outlines a European Vision for the 6G Network Ecosystem and we will highlight a few areas where photonics and optical communications/sensing/computing can play a key role in this new era.	*Dr. Ioannis Tomkos is Professor of Optical Communications at the Department of Electrical and Computer Engineering of the University of Patras, Greece. His Research Group was/is involved in over 30 EU-funded research projects with a consortium-wide leading role (serving as Technical Manager of 10 major EU projects). In 2018, Dr. Tomkos was elected a Fellow of IEEE "for contributions in Dynamic Optical Networks". He is also a Fellow of the IET (2010) and a Fellow of the "Optical Society - OSA" (2012). Together with his colleagues and students he has co-authored over 650 peer-reviewed archival articles, including over 150 Journal/Magazine/Book publications. His published work has received about 11.500 citations (h-factor=50; m-factor=2.55).*		
10:50	4	***Comparing transport options for Small Cell X-Hauling in the Sub-6GHz region***	**Albert Rafel**	BT	UK
		MNOs are facing the roll out of 5G NR Small Cells in the next few years. High cell density will require "intensive" support of optical transport, but likely with a limited deployment budget. Small Cell mass deployments need eCPRI to reduce transport costs (compared to CPRI) enabling the use of TDMA-PON.	*ALBERT RAFEL [M'18] (albert.2.rafel@bt.com) received a degree in telecommunications engineering in 1992 and a Ph.D. degree in optical communications in 1999, both from the Technical University of Catalonia in Barcelona, where between 1996 and 2001 he was a lecturer and researcher. He joined BT in April 2001 where his current role is optical networks research manager. His current work includes optical transport solutions for 5G NR. He participates in optical access Standards bodies ITU-T and FSAN. He has participated in numerous European collaborative projects, has published several technical papers in international conferences and journals, and is co-inventor of several patents*		

11:10	5	***5G fronthaul over partially-disaggregated WDM/SDM network***	**Josep M. Fabrega**	CTTC	ES
		In this talk we discuss the experimental demonstration of a 5G digital fronthaul network that relies on multi-adaptive bandwidth/bitrate variable transceivers (BVTs) and an autonomic software-defined networking (SDN) control system for partially-disaggregated wavelength division multiplexing (WDM) / space division multiplexing (SDM). Transmission of 256-QAM 760.32 MHz orthogonal frequency-division multiplexing (OFDM) radio signal is performed, with a total radio transmission capacity of 5.667 Gb/s. Digitized signal samples are carried as a 22.25 Gb/s digitized radio-over-fiber (DRoF) data stream and transmitted over a WDM/SDM infrastructure including 40-wavelength 100-GHz arrayed waveguide gratings (AWGs) and 19-core fiber. The autonomic SDN controller deploys a control loop for the multi-adaptive OFDM-based BVTs that monitor the per-subcarrier signal to noise ratio (SNR) and assigns the optimal constellation based on the actual signal degradation. An error vector magnitude (EVM) below the targeted 2.1% is achieved while setting up connections in less than 5 s.	*Dr. Josep M. Fabrega (IEEE S'05 M'10 SM'17) received his PhD degree in signal theory and communications from UPC-BarcelonaTech, Barcelona, Spain, in 2010. Currently he is a Senior Researcher in the Optical Networks and Systems Department of CTTC, Castelldefels, Spain. He has participated or promoted over 30 R&D projects either funded by industry or the EU and Spanish national Research programmes. He is the author of 53 publications and coauthor of another 124 publications, including international journals, conferences and patent families; covering theoretical and practical aspects of transmission devices and systems for fiber optic communication networks. Dr. Fabrega received the EuroFOS Best Student Research Award for his PhD thesis (2010) and he has been awarded by a PTA R&D Engineering Fellowship (2007) and the Torres Quevedo Fellowship (2011) by Spanish Ministry of Science and Technology. He serves as an elected member of board of stakeholders of Photonics21 European Technology Platform since 2018.*		
11:30		*Panel on Networks and Applications*	all		
11:50		*Panel on Subsystems and Technologies*	all		
12:10		***Research programmes, funding opportunities, strategic future research***	**Ioannis Tomkos and all**		
13:00		*Lunch / visit*	all		
14:30		***Pre-recorded presentations***	**Antonio Teixeira, Alex Stavdas,**		
14:50		***Workshop Closure***	**Josep Prat**		
15:00		*Meetings*	all		
19:00		*Beach-boley match*	all		
20:00		*Social dinner (Xiringuito Escriba)*	all		