MAIN OBJECTIVES

5G-PHOS aims to develop novel 5G broadband fronthaul architectures and evaluate them for Ultra-Dense and Hot-Spot areas exploiting the recent advances in optical technologies towards producing a powerful photonic integrated circuit technology toolkit. It aims to capitalize on novelties in InP transceiver, Triplex optical beamformers and multi-bitrate optical communications into next generation fronthaul in order to migrate from CPRI-based to integrated Fiber-Wireless packetized C-RAN fronthaul supporting mm-Wave massive MIMO communications.

APPLICATIONS

5G-PHOS expects to release a seamless, interoperable, RAT-agnostic and SDN-programmable FiWi 5G network that supports 64x64 MIMO antennas in the V-band and offers a) up to 400 Gb/s wireless peak data rate in ultra-dense networks, adopting optical Spatial-Division-Multiplexed solutions on top of the emerging 25 Gb/s PON infrastructures, delivering a packetized integrated FiWi fronthaul network and b) 100 Gb/s wireless peak data rate in Hot-Spot areas, showcasing the benefits of WDM technology and packetized fronthauling in private C-RAN solutions. These blocks will be integrated towards architecting 5G networks for Ultra-Dense and Hot-Spot use cases, evaluating their performance in lab and field experiments at the deployed network of Greek telecom operator COSMOTE (Fig.1 (a)), at the Orange Labs in Lannion, France (Fig.1(b)) and at the stadium of P.A.O.K. F.C. in Thessaloniki, Greece (Fig.1(c)).

TECHNICAL AND RESEARCH CHALLENGES

5G-PHOS addresses the challenging ultra-dense 5G framework encompassing a range of environments with different

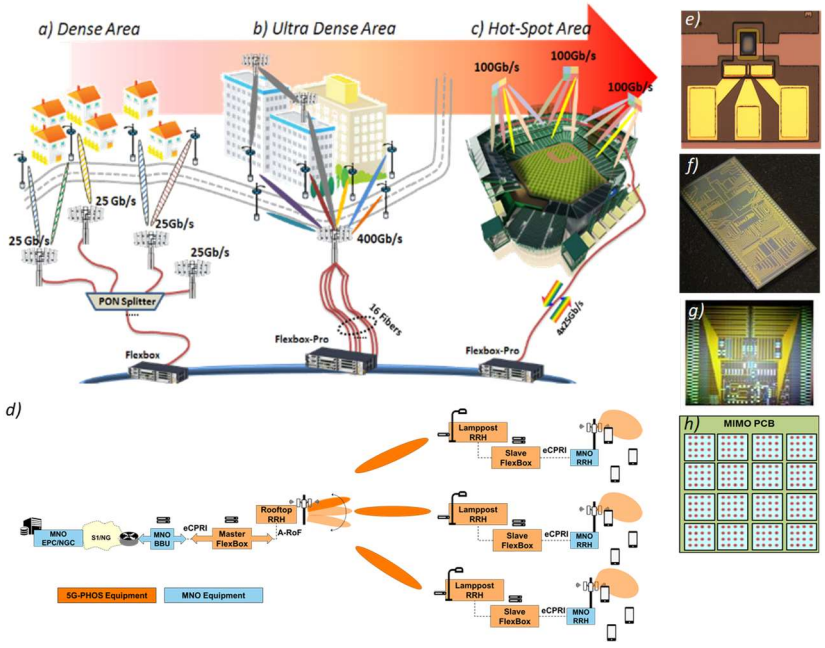

Fig. 1. a) 5G-PHOS network for PON-overlaid dense area coverage, b) Ultra-Dense areas, c) Hot-Spot case at a stadium, d) centralized analog fronthaul architecture, e) 10G InP Photodiode, f) Optical beamformer chip, g) Triplex mini-ROADM chip, h) massive MIMO antenna PCB.

traffic density and coverage needs. To this end, 5G-PHOS aims to meet the following technical and research challenges: 1) Release a cost-effective ultra-dense eCPRI fronthaul architecture based on an analog Radio-over-Fiber Physical Layer functional split (Fig.1 (d)) that achieves the highest degree of RAN centralization with immediately commercially exploitable perspectives, 2) Meet the respective User Experience and System Performance Key Performance Indicator (KPI) metrics by jointly deploying a series of photonic technology innovations such as 10GHz Photodiodes (Fig. 1(e)), Optical Beamformers (Fig. 1(f)), and Triplex ROADMs (Fig. 1(g)), 3) Synergize mm-wave wireless radio and massive MIMO antennas (Fig. 1(h)) to provide increased capacity and link reliability and 4) Demarcate from CPRI-based schemes towards Ethernet-friendly solutions.

ACHIEVEMENTS

The 5G-PHOS project has made remarkable progress since its launch date as it has produced the first of its kind analog Fiber-Wireless (FiWi) Point-to-Multipoint (PtMP) fronthaul architecture, capable of supporting the target 5G New Radio fronthaul bandwidth, while at the same time alleviating the need to install fiber terminations at every Mobile Network Operator (MNO) Access Point site. In this way, 5G-PHOS transforms the current all-digital Point-to-Point fronthaul that necessitates direct and dedicated links from the centralized location to all remote locations, to a PtMP digital + analog converged FiWi fronthaul that addresses the problem of 5G NR densification since it allows for flexible wireless last-mile placement of the remote equipment in the area of service while maintaining compatibility with the eCPRI standard. By offering the aforementioned advantages, the 5G-PHOS solution becomes a very appealing proposal for both vendors and MNOs, since to the best of our knowledge it is the only solution that specifically targets to reduce the costs of 5G NR densification. Experimentally-wise, the project has recently succeeded in transmitting the world's highest cumulative 5G optical-wireless transmission speed, by concurrently transmitting 6 millimeter-wave channels, each carrying up to 4 Gb/s of data by use of highly directional 60 GHz antennas.

5G-PHOS fact sheet

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