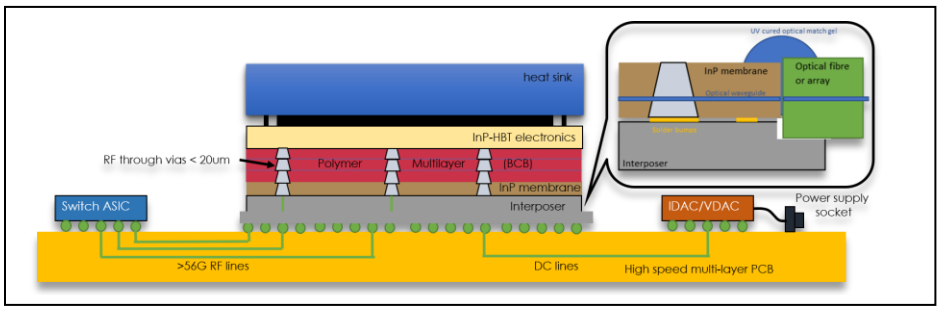
Press Release

EU Project TWILIGHT to develop high performance components that will enable 112 Gbaud per lane speeds and ultrafast switches by exploiting InP membranes and InP-HBT electronics.

Friday March 13th, 2020: TWILIGHT "Towards the neW era of 1.6 Tb/s System-In-Package transceivers for datacenter appLIcations exploiting wafer-scale co-inteGration of InP membranes and InP-HBT elecTronics", a new EU-funded project under the H2020 ICT 2019 – LEIT Photonics Call and the initiative of the Photonics Public Private Partnership, was launched at December 1st 2019, aiming to bring InP membranes and InP-HBT electronics at unprecedently close distances (<20 um) to unleash the speed capabilities of its high performance components and to enable 112Gbaud per lane. Moreover, optical space switches with nanosecond latency and small footprint will be developed addressing the datacenter and DCI market. The project has duration of 4 years and a budget of 5.080.621,25 €. The project coordinator is the Institute of Communications and Computer Systems – National Technical University of Athens (GR) and it comprises a consortium of 6 partners; 3 top-leading universities: Technische Universiteit Eindhoven (NL), KTH Royal Institute of Technology (SE), Institute of Communications and Computer Systems – National Technical University of Athens (GR), 1 world-class industry-oriented research institute III-V Lab (FR), 1 high-tech SME Argotech (CZ) and 1 major industrial partner Mellanox (IL), from 6 European countries.

Rapidly growing cloud applications, big data, Internet-of-Things (IoT), artificial intelligence (AI) and machine learning are the main drivers for the explosion of datacentre traffic which is foreseen to reach 19.5 ZB per year by 2021 ramping up from 6 ZB in 2016. The majority of this traffic stays within the datacentre and accounts for 71.5% of the total with respect to 13.6% which account for the traffic exchanged from one datacentre to another. The deployment of hyperscale datacentres to meet the vast amount of traffic growth within the datacentre environment is currently driving the market of 400GbE pluggable modules which is expected to grow fast by 2023, while the next standards ratification for 800GbE and 1.6T are expected in the 2023-2024 timeframe. The increasing traffic demands impose a huge problem for datacentre operators because on one hand they have to keep pace with the increasing speeds dictated by modern datacentre applications and on the other, they have to cope with the increasing power consumption that is required for airflow management and cooling. This is where TWILIGHT steps in, aiming to develop the next generation of 800Gb/s and 1.6Tb/s system-in-package (SiP) transceivers operating at 112Gbaud per lane exploiting a series of technological breakthroughs ranging from the development of high-speed photonic components based on InP membranes and high performance InP-HBT electronics ICs to the development of advanced co-integration and packaging concepts.



In more detail, TWILIGHT's photonic technology platform comprises Electro-Absorption Modulated Lasers (EMLs) with ultrahigh bandwidth (100 GHz) and 100 GHz UTC photodiodes and their combination with other active and passive components co-integrated on the same chip to enable all necessary transceiver functionalities.

Selective Area Growth (SAG) in combination with butt-joint process will be employed for developing components operating both in the O-band (for intra-DC 2km and 10km links) and in the C-band (for short DCI 40km links) with optimized bandgap along the WDM arrays and for the co-integration of actives and passives. On the electronics side, the analog bandwidth interleaving concept will be exploited to interface TWILIGHT transceivers with the latest 112G PAM4 SERDES products and to generate 112Gbaud PAM4 per lane (i.e. 224Gb/s signalling rate). Additional linear driver and TIA circuits will be co-integrated for necessary electronic amplification. The target performances of TWILIGHT will rely on wafer-scale bonding of the InP membranes and the InP-HBT electronics layers that will bring the two worlds at close distances (<20μm), benefiting from the matching thermal coefficients of the two platforms which essentially share the same material system. TWILIGHT will also develop a fully integrated medium-scale 16x16 optical space switch exploiting polarization insensitive Semiconductor Optical Amplifiers (PI-SOAs) using the EML SAG medium with adapted layerstack on the InP membrane platform.

ICCS/NTUA apart from the role of the project coordinator, is responsible for the development of the necessary PAM4 DSP and FEC algorithms for the inter-DC transceivers and will contribute to component modeling and system simulation studies. Furthermore, it will be responsible for the laboratory system performance evaluation of the inter-DC transmitter and receiver modules and for the system testing of the inter-DC demonstrator. Finally, ICCS/NTUA will lead communication and clustering activities of the project.

Driven by the latest industrial trends and technology standards, TWILIGHT aims to bridge research in optical transceivers and optical switches with near-market exploitation, addressing the whole value chain and achieving transformational impact in performance, cost and energy consumption. TWILIGHT will ensure European industrial leadership by turning its technological innovations into tangible products that will put Europe in the driver seat of optical transceiver and switches markets for datacentre and short DCI applications.

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