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New hybrid optical integration project to develop next generation modules for optical networks

Photonic 'monolithic on hybrid' chip to provide high-performance, high-speed data communication and reduce carbon footprint

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The Centre for Integrated Photonics (CIP) has today announced its participation in the new EU FP7 APACHE project. This major three-year research project will be part-funded by the EU, who are contributing 3 million Euros, and will plug a major gap in the optical module roadmap – the lack of cost-effective, high-performance, multi-channel components for high-speed optical communications systems, such as the emerging 100Gigabit Ethernet.

Called APACHE (Agile Photonic Integrated Systems-on-Chip Enabling WDM Terabit Networks), this new project will develop novel compact and scalable photonic integrated components capable of generating, regenerating and receiving amplitude (OOK) and phase (DPSK, QPSK) encoded optical signals for high capacity (>100Gbit/s) WDM networks.

APACHE aims to build on the advances in hybrid photonic integration techniques by assembling arrays of high-performance monolithic InP devices onto a common planar silica hybrid integration platform using passive alignment.

The project's Technical Manager, CIP's Dr. Graeme Maxwell, said: "Hybrid integration of photonic arrays is key to realising practical, scalable, high-performance optical modules, since only this approach allows optimisation of the optical, electrical and thermal performance. Adopting a 'monolithic on hybrid' approach also reduces costs, especially with increasing scale, since the piece-parts for assembly can be yielded at a much earlier stage of the manufacturing process compared to the fully monolithic approach."

The optical sub-systems that are being developed under APACHE will take state-of-the-art hybrid integrated photonic technology and extend it to meet the emerging performance requirements of next generation optical networks. Dr. Maxwell continues: "Reducing the power and footprint of optical subsystems is becoming increasingly important as optical networks grow to meet expanding data capacity requirements. APACHE aims to target power reduction by developing un-cooled active optoelectronic arrays that do not greatly sacrifice optical performance".

In addition, different optical network topologies such as point to point, ring and mesh with ROADM functionality, different traffic load and growth predictions will be considered. This analysis will be used to identify possible schemes for incorporation of the developed APACHE modules into new DWDM system architectures.

The APACHE project brings together a consortium that spans the optical networks supply chain, ensuring that the technologies under development can be realised commercially, and will satisfy a

real application need. Consortium partners are: optical component and sub-system fabricators CIP (UK) and HHI (Germany), systems vendor Ericsson (UK & Sweden), component software designer PhoeniX Software (Netherlands), and research institutions ICCS/NTUA (Greece - project co-ordinator) and AIT (Greece).

For further information visit www.ciphotonics.com

Notes to Editors:
The project partners in the APACHE project are:

CIP (Project Technical Manager): CIP is a leading manufacturer of advanced photonic hybrid integrated circuits and InP based optoelectronic chips, devices, arrays and modules for communications, biomedical, defence and industrial markets. With over 600 years of combined expertise in photonics and nearly 250 published articles and patents, CIP refines research into viable, manufacturable products based on leading edge technologies, thus helping customers develop the photonic products of tomorrow. CIP is a major provider of technical services and consultancy in the photonics field. CIP's wide range of competencies is based on world-renowned research and is uniquely broad, incorporating III-V photonic materials, silicon micromachining, planar silica waveguides and systems measurements expertise. Together with state-of-the-art, ISO9001:2000 registered, co-located fabrication, coating, test, validation and pilot production facilities, as well as strategic partnerships with volume packaging providers, CIP is able to develop and deliver exciting product ideas based on these technologies.

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ICCS/NTUA (Project co-ordinator): The Institute of Communication and Computer Systems (ICCS) is associated with the School of Electrical and Computer Engineering (SECE) of the National Technical University of Athens (NTUA). It was founded in 1989 in order to carry research and development activities in the field of telecommunications systems and computer systems. ICCS employs more than 500 researchers including SECE faculty staff, senior research scientists and PhD students. ICCS participates in APACHE with the Photonics Communications Research Laboratory (PCRL). PCRL was founded in 1995 and is being lead by Prof. Hercules Avramopoulos. PCRL research activities focus on the design and implementation of photonic devices and subsystems for optical communication systems ranging from high□capacity optical transmission, dynamic optical label and burst switched networks to multi□wavelength systems for wavelength division multiplexing networks. PCRL also investigates the design and development of new photonic□based devices for terahertz/photonic communications and sensing applications. PCRL is a fully equipped laboratory with a range of high□speed test and measurement systems and a large number of passive and active photonic devices. PCRL has worldwide links and collaborations with other top research institutes and industrial research organizations and its activities are supported by industrial grants, national and EU funded research programs. PCRL has significant presence and a proven track record with successful participation and leadership in a number of European projects (DICONET, BONE, MULTIWAVE, MUFINS, LASAGNE, e□Photon/One, DO_ALL).
(www.telecom.ece.ntua.gr/photonics/index.php)

HHI: HHI was founded in 1928 as the Heinrich Hertz Institute for Research on Oscillations. Since then, HHI has been on the forefront of wireline and wireless communications research. Recent work focuses on optical communications, both component and system topics, on H.264 video compression, and on wireless broadband systems. HHI has achieved several world records in optical communications and holds numerous patents. Since 2002, HHI is a member of the Fraunhofer Society, which focuses on applied research of direct utility to private and public enterprises and of wide benefit to society. It currently employs more then 200 people and has founded 10 spin□offs. HHI has successfully developed a wide range of different devices, is in close cooperation with many SMEs, both from Germany and internationally, and HHI is one of the leading laboratories worldwide with emphasis on InP□based OptoElectronic Integrated Circuits (OEICs). Devices

developed successfully in the past comprise various types of laser diodes, ultra□fast photodetectors, high□bit rate modulators, and components for all□optical signal processing. In addition, examples of successful monolithic integrations comprise a fully integrated heterodyne receiver, optical mm□transmitters for optical microwave systems, 1.5/1.3 µm bidirectional optical transceiver chips, and HEMT integrated photoreceivers. HHI has long standing experience with European Projects carried out in the ESPRIT, RACE□I/II, ACTS, and IST programmes as well as national research programmes (PHOTONIK□I/II, KomNet, MultiTeraNet and Eibone).
(www.hhi.fraunhofer.de)

PhoeniX Software: PhoeniX B.V. is a privately held company based in Enschede, the Netherlands and is a supplier of professional software tools for the micro- and nano technology industry. As the market has matured rapidly, there is an increased demand for professional working methods and tools. PhoeniX, with a highly skilled and experienced team in the various fields of micro- and nano technology, supports customers worldwide with its professional software. Typical products include software for mask lay-out and process flow simulation (MaskEngineer, CleWin and FlowDesigner), software for integrated optics simulations (OptoDesigner, FieldDesigner, Aspic and Aurora) and the leading manufacturing execution system dedicated to the industry: the Living Database.
(www.phoenixbv.com)

Ericsson: Ericsson is the world's leading provider of technology and services to telecom operators. The market leader in 2G and 3G mobile technologies, Ericsson supplies communications services and manages networks that serve more than 185 million subscribers. The company's portfolio comprises mobile and fixed network infrastructure, and broadband and multimedia solutions for operators, enterprises and developers. The Sony Ericsson joint venture provides consumers with feature-rich personal mobile devices. Ericsson is advancing its vision of 'communication for all' through innovation, technology, and sustainable business solutions. Working in 175 countries, more than 70,000 employees generated revenue of USD 27.9 billion (SEK 188 billion) in 2007. Founded in 1876 and headquartered in Stockholm, Sweden, Ericsson is listed on the Stockholm and NASDAQ stock exchanges.
(www.ericsson.com)

AIT: AIT is a centre of excellence in ICT research and graduate education. The main role of AIT as a research and educational institute is to provide high quality research in the field of telecoms and IT, as well as training through three post□graduate educational programs and special professional courses focused on the industrial needs. AIT participates in APACHE project with its ‘Networks and Optical Communications’ (NOC) research group. The group maintains a broad range of research activities and technical expertise supported by a state□of□the□art laboratory to that provides innovative research activities on optical communications. The work carried out within the AIT’s NOC group is focused on optical network infrastructures for existing and future broadband networks and services in access, metro and wide area networks. Specific areas of interest include novel architectures for circuit□, burst□ and packet switching, optical system and subsystem design, signalling and routing protocols, network resilience, service aware network design and traffic engineering, advanced transmissions and switching techniques, and techno□economic studies. AIT’s NOC group has strong experience in collaborative joint activities through its participation in the NoE ePHOTON/One+ project and the COST 291 action. Additionally AIT has a leading role in both projects, serving as a WP joint project leader in ePHOTON/ONe and chairing the COST 291 management committee. Moreover, AIT holds close relationships with a large number of academic and industrial institutions, in various research fields related with optical networking.
(www.ait.edu.gr)