Researchers from IT designed a light trapping device and published in *Nature Communications*

On the way to all-optical memories

Mário Silveirinha and Sylvain Lannebère published in *Nature Communications* an article about the ability to trap light inside an open nanostructure (called meta-atom) in a way that, in an ideal situation, imprisonment time is infinite.

In conventional optical cavities, light always ends up escaping after a certain period of time. So far, researches have confined light for finite periods of time using mirrors and specially engineered materials, so this is a great achievement for many areas of modern science, as it was shown that the amount of light that is retained in the meta-atom has a quantized value, i.e. the energy that is trapped has a very specific value (can be neither more nor less). This meta-atom can be an embryo for future optical memories with ultra-fast switching times.

This research has its origin in an internal project funded by IT-TRAP - developed in Coimbra - Lisboa.

“*Nature Communications* is an open access journal that publishes high-quality research from all areas of the natural sciences and has an Impact Factor of 11.470 according to the 2014 Journal Citation Reports®Science Edition (Thomson Reuters, 2015). Papers published by the journal represent important advances of significance to specialists within each field”, quoting its own webpage. The detailed paper was published in its October edition.

A news release can be found in Phys.org (follow the link below).


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**Editorial**

According to P2020, the program that aims at funding science using structural funds, excellence in science is, or should be, regional. Following the “national strategy for smart specialization” excellence in science is no longer the main requisite for funding. Now what matters is where science is being made, or better still, where science management is located.

In European fora, namely in those related with the Framework Programmes Portuguese authorities have always strongly supported, and very rightly so, excellence as the main criteria to select proposals for funding. I shiver only to think what would happen if 8th European Framework Programme (H2020) was regionalized. Which field, if any, would be opened to Portuguese scientists?

I have always believed, and still do, that science is universal, that excellent scientists may be of any race or country. Excellent science may flourish wherever excellent scientists may be. P2020 is still a very young program. It is still time to modify some of the rules applying to science. Failure to do it will drive a very serious blow to science in Portugal.

Carlos Salema
PROJECT SNAPSHOT

BEACON: Photonics for Telecom Satellites

Telecom satellites are growing like giants employing multiple beams to provide high speed connectivity and broad coverage over entire continents. Under exploding capacity requirements, vendors admit that a technology and payload architecture switch is mandatory. The new technology has to deliver practical, low-power and scalable components with high performance under harsh environment conditions.

Funded by FP7, project BEACON aims to provide this technology and disrupt the transition to multibeam Tb/s satellites. Addressing cost, performance and volume, BEACON invests on the right mix of three basic photonic technologies used in terrestrial optical fiber communication links, which are: ultra-linear GaAs Mach-Zehnder Modulator arrays with a high cut-off frequency suitable for operation in the Ka-band, and half the size of mainstream modulators; first ever scalable multi-core radiation-hard erbium doped optical fiber amplifier; and a photonic beamforming system fully integrated in a highly compact and low power CMOS compatible silicon photonic integrated circuit.

BEACON comprises six partners. Airbus defense and space takes the role of system vendor, and is responsible for driving the main specifications of the project according to its product roadmap and client needs. aXenic is responsible for designing and producing the modulator arrays. Concerning the multicore fiber amplifier, the fiber is provided by InPhoTech, whereas the amplifier’s pumping scheme and final assembly is done by Good & Housego. Instituto de Telecomunicações has three roles in the project. The first is to provide the system architecture and preliminary assessment, therefore providing specifications for all partners, especially IHP GmbH, responsible for the design and implementation of the silicon photonic integrated beamformer. The second role is to test the chips provided by IHP, leading to the final demonstration of the system. The third is to provide a phased array antenna prototype, suitable for operating in the Ka-band, according to Airbus’ specifications. In the last stage of the project a test plan will be elaborated by Airbus envisaging space-ready operation of all devices. Presently, BEACON’s system architecture is defined.

Newsflash

23rd Advanced Laser Technology Conference

The 23rd edition of the annual International Conference on Advanced Laser Technologies (ALT), established in 1992 by the Nobel Prize Laureate Alexander Prokhorov, was held on 7-11 September 2015 in the University of Algarve, Faro. It was organized this time by Instituto de Telecomunicações, I3N, and University of Algarve. This year the conference had nearly 200 participants from the five continents, gathered around scientific topics where IT is a strong player, such as: sensors, optical communication and quantum interaction and manipulation.

URL: http://altconference.org/alt15

Paper co-authored by Marina Perdigão awarded at the IEEE Industry Applications Society Symposium

“A New Technique to Equalize Branch Currents in Multiarray LED Lamps Based on Variable Inductors”, a paper by Rafael Pinto; Marcos Alonso; Marina Perdigão; M. F. da Ailva; R. N. do Prado, was awarded the First Prize by the Industrial Lighting and Display Committee of the IEEE Industry Applications Society, at the IAS Annual Meeting 2015.

Paulo Pedreiras and Diogo da Silva Branco won the Bresimar 2015 Innovation Competition

“The Application of Estimation Techniques to the TekOn sensors” is the work behind the award. Bresimar is an automation company located in Aveiro and the “Concurso de Ideias da Bresimar Automação” aims at rewarding innovative ideas with strong potential to reach the market.

Two more IT researchers have been awarded the IET Fellowship, bringing the total number in IT to three.

Fernando Pereira, from Instituto Superior Técnico and Rafael Caldeirinha, from Instituto Politécnico de Leiria, both researchers at IT, received the Fellowship status from IET (the Institution of Engineering and Technology) in October and November, respectively. IET Fellowship is awarded to individuals who have sustained high levels of achievement, for example through leadership, influence, senior responsibility, innovation, and professional service, at the forefront of engineering, technology or cognate disciplines for a period of five years or more.

Two more IET Fellows at IT this year

(continues on page 3)
PAPETS can make you smell vibrations

PAPETS – Phonon-Assisted Processes for Energy Transfer and Sensing is an EU FET (Future and Emerging Technologies) project involving 7 partners and coordinated by the IT researcher Yasser Omar.

Most people are used to focus on what is wide visible to our eyes, in a macroscopic scale. Quantum Physics goes deeper and focuses on phenomena that occur in an atomic or sub-atomic dimension.

PAPETS is the first European project in Quantum Biology: It aims at contributing, in the long run, in a novel way to such important challenges as the development of more efficient light harvesting technologies or artificial odor sensors.

The first evidence for quantum effects in a biological system was obtained in the process of photosynthesis in plants, which harvest light and use its energy to grow. One of the main objectives of PAPETS is to understand the role of these quantum effects, and to reproduce them in small artificial systems, contributing to develop more efficient light harvesting technologies in the future.

The PAPETS team is also investigating olfaction, one of the hardest senses to reproduce artificially. Today we have devices that outperform biological eyes, ears and sense of touch. But we still resort to the natural olfactory capabilities of dogs to identify hidden substances.

In ICT Lisbon, the biggest European event in Information and Communications Technology, which was held in Lisbon from 20 to 22 October, where PAPETS was represented, it was shown how the vibrational frequency of an odorant molecule could be a key factor on determining its corresponding smell (which so far, it was thought to be determined exclusively by its shape). The European Commissioner for Research, Science and Innovation – Carlos Moedas — visited the PAPETS booth at the event, and was given samples of two molecules with the same shape but different vibrational spectra, and confirmed had different smells, as did the many participants that visited the PAPETS booth and were able to “smell vibration”!

URL: www.space-beacon.eu

PROJECT SNAPSHOT — BEACON

as is the design of the modulator array and of the multicore fiber amplifiers. In the beginning of 2016 the first modulator arrays, multicore fiber amplifiers and photonic integrated circuits will be delivered. Until the end of the year IT will fabricate and test the first phased array antenna prototypes, and will prepare a detailed test plan for the first photonic integrated circuits. The latter task will be done in close cooperation with IHP, which is currently hosting IT’s PhD student Ms. Vanessa Duarte, who has also participates in the design of the photonic integrated circuits.

BEACON’s system architecture is based on IT’s patent pending photonic beamforming system, which has been investigated since 2010. This project is therefore very important in exploiting this technology, but also in giving IT further expertise in the design and testing of photonic integrated circuits, and broadening IT’s vision in the needs of state-of-the-art telecom satellites.

Ana Rita Bastos distinguished in "Programa de Estímulo à Investigação da Fundação Calouste Gulbenkian"

In this year’s edition of the programme “Estímulo à Investigação”, from Fundação Calouste Gulbenkian, one of the awarded projects was “Low Cost Photonic Integrated Circuits for Next Generation Optical Access Networks” by Ana Rita Bastos, supervised by Maria Rute Ferreira André, from U. Aveiro and two researchers from IT: Mário Lima (Aveiro) and Paulo André (Lisbon).

Four students from IT distinguished in the 2015 Fraunhofer Challenge

Once again IT was well represented in the Fraunhofer AICOS annual idea contest. Sérgio Lopes won the major award in the competition: the 1st place in the PhD Category, with “Bringing Low-Cost Centimeter-level Indoor Positioning to Conventional Smartphones”, supervised by Nuno Borges de Carvalho and José Neto Vieira. In the same category, the thesis “A Novel Scalable Video Coding Solution Combining the Predictive and Distributed Paradigms” took Hoang Van Xiem to the 3rd place, a work supervised by Fernando Pereira. In the MSc Category, Diana Batista won the 2nd place, with her work “Pervasive ECG Monitoring and Analysis: a Cloud Computing Approach for User-centered Healthcare”, supervised by Ana Fred, and João Felício won the 3rd place with “Wideband Body-Implantable Antenna for Short-Range High Data Rate Communication”, supervised by Carlos Fernandes and Jorge Costa.


NOTA: Os dados referem-se ao ano 2016 e não ao ano 2017 como mencionado no texto original.
Where are you now?

Sérgio Pires

My contact with IT goes back to 1999. At the time I was in the final year of Engenharia Electrónica e de Telecomunicações degree at Universidade de Aveiro and I opted to do the final year project in IT Aveiro.

It was a RF power amplifier with an LDMOS transistor. That was when my adventure in the RF world started. After completing the degree I left the academy and entered in the Portuguese professional environment. I started in Optimus as a RF Cellular Planning and Optimization engineer, then I went to the semiconductors business in Chipidea, and more recently to Celfinet as Innovation manager. During this time I never lost contact with IT people as I always wanted to do a bit more in academic research. After a combination of conditions, in 2009, I decided to be a PhD candidate in IT-Aveiro. It was a risky bet, mainly because after ten years at the industry, I did not know how I could handle again the academic world. Fortunately, my supervisors (José Carlos Pedro and Pedro Miguel Cabral) were extremely helpful and I successfully completed the degree. The field of study (RF digital architectures and switchmode power amplifiers) also helped, because it was very interesting and demanding, allowing the motivation to be always in high levels.

Looking back, it was the correct decision, as it provided me the conditions to start my international career in late 2014 at NXP Semiconductors Netherlands. Now I am the Advanced PA Concept group manager of the NXP RF Power division. The knowledge that I acquired at IT was fundamental for me to be where I am now.