

Salient Technologies @ ICFO with potential for the Aerospace, Defense & Security sector

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Photonics is the science and technology of harnessing light. It has been selected by the European Commission as one of the six Key Enabling Technologies (KETs) in recognition of its versatility. At ICFO, the focus is mainly on applications at the forefront of photonics, especially of laser light, and the research is oriented towards three main umbrella research programs: Light for Health, Light for Energy and Light for Information, but also towards the development of new tools for Security and Defence.



With more than 300 ICFOians and 22 research groups, the expertise subsumes numerous areas of research from ultrafast optoelectronics and space communications to ultrasensitive devices for quantum optics, including nano and bio photonics among others. This wide range of topics leads us to develop an even wider range of devices.

We present here an introduction to a variety of technologies developed at ICFO with potential for application in the Aerospace, Defence and Security sector.

Sensing devices are presented, from night vision and temperature sensors to bio-chemicals and explosives detection, as well as imaging devices [1-2]. Other Light for Information program technologies will be reviewed, from devices for

quantum cryptography to display-related coatings, electrodes and projectors [3-4]. Proprietary technologies in spectroscopy, tunable laser sources and photovoltaics will also be discussed [5].



Moreover, ICFO plays a special leadership role in the Graphene Flagship, branded EU's biggest research initiative ever with a budget of EUR one billion, through Prof. Frank Koppens appointment as co-leader of the Optoelectronics work package, in collaboration with Prof. Andrea Ferrari (Cambridge, UK), and its participation in the Intellectual Property Rights and Entrepreneurship Management group. As a result of this, a number of graphene-related technologies and devices have been developed, which will also be detailed [6-7].

Finally, one of ICFO's main goals is to maximize business opportunities arising from research being carried out at the Institute and from collaborations with industries, investors and health-care allies, through a strong Knowledge and Technology Transfer (KTT) Team that plays a key role at the interface with the industrial and corporate worlds maximizing the flow of information, knowledge, technology and talent. KTT Team is responsible for establishing strategic alliances and collaborations with industry, the private sector in general and all types of collaborators.

References

- [1] Biosensing: Plasmons offer a helping hand, R. Quidant, M. Kreuzer, *Nature Nanotechnol.* 5, 762-763 (2010)
- [2] Diffuse correlation spectroscopy for non-invasive, micro-vascular cerebral blood flow measurement, T. Durduran, A. G. Yodh, *NeuroImage* 85, 51-63 (2014)
- [3] Ultra-fast quantum randomness generation by accelerated phase diffusion in a pulsed laser diode, C. Abellán, W. Amaya, M. Jofre, M. Curty, A. Acín, J. Capmany, V. Pruneri, M. W. Mitchell, *Opt. Express* 22, 1645-1654 (2014)
- [4] Superomniphobic, transparent and antireflection surfaces based on hierarchical nanostructures, P. Mazumder, Y. Jiang, D. Baker, A. Carrilero, D. Tulli, D. Infante Gómez, A. Hunt, V. Pruneri, *Nano Lett.* 14, 4677-4681 (2014)
- [5] Transparent polymer solar cells employing a layered light-trapping architecture, R. Betancur, P. Romero-Gomez, A. Martinez-Otero, X. Elias, M. Maymó, J. Martorell, *Nature Photon.* 7, 995-1000 (2013)
- [6] Hybrid graphene-quantum dot phototransistors with ultrahigh gain, G. Konstantatos, M. Badioli, L. Gaudreau, J. Osmond, M. Bernechea, F. P. Garcia de Arquer, F. Gatti, F. H. L. Koppens, *Nature Nanotechnology*, 7, 363-368 (2012)
- [7] Graphene shows its colours, *The Economist*, May 12th 2012