

Making the leap

Photonics and other key enabling technologies have high innovation potential and can contribute significantly to EU industrial leadership, writes Giorgio Anania

Over many decades, the European Union has been placed amongst the top ranks of global economic players due to its world-class, cutting edge products. This fact begs the question of why Europe now keeps losing ground in the great game of the 21st century – the global innovation race. Research shows that the EU faces an “innovation emergency”. R&D is growing, but at a pace too slow for keeping up with both old and new rivals across the world. More importantly, according to the innovation scoreboard, Europe is faced with the seemingly insurmountable weakness of being unable to transform innovative ideas and research results into commercial products and services. Bridging the gap between the labs and the market – the so-called ‘valley of death’ – and closing the competitive divide between Europe and other countries at the global level is an opportunity that we cannot afford to miss, leveraging what we do best. With the Horizon 2020 proposals which the European commission published at the end of 2011, the EU has taken on the challenge of finally repairing the innovation chain and stringing back together its pillars.

This ambitious plan is long-awaited and enthusiastically welcomed by the industry. But for it to work effectively, the plan requires full commitment from all stakeholders involved, stepping up coordination throughout the entire innovation chain and ensuring fruitful cooperation between the European commission, in its role as funding organisation, research performing bodies – such as universities or laboratories – and the private sector deploying the piloting phase. As acknowledged in the commission’s proposal for Horizon 2020, public private partnerships (PPPs) will present a crucial instrument for generating a critical mass of budget that will ensure long-term commitments and the setting of coherent, forward-looking priorities.

Europe stands out for its innovative SMEs, excellence in research and sound manufacturing base. Vibrant and pioneering technology sectors have said aloud that they are determined to do their part in fuelling innovation, economic growth and jobs throughout the European continent. The photonics industry is at the forefront to make its contribution to resolving the crisis. In order to strengthen the bridges between scientific excellence and innovative production, as

well as potentially create an additional 70,000 to 100,000 jobs, the photonics industry makes a clear commitment to leverage the public fund of €1.4bn four-fold. Summing up to a shared account of €7bn, the commission and photonics industry create the basis for making an effective public private partnership a reality.

Its high innovation potential and its significant contribution to European industrial leadership, have gained photonics the title of ‘key enabling technology’ by the European commission.



“The EU can turn into an alluring laboratory for inventors, an attractive marketplace for investors with a solid manufacturing base for Europe’s industry”



The EPSRC Centre for Innovative Manufacturing in Photonics, located at the University of Southampton, focuses on research into the advanced manufacturing of new photonic materials, fibres and components. Funded by the Engineering and Physical Sciences Research Council in the UK at the level of £5M, the EPSRC Centre for Innovative Manufacturing in Photonics is one of 12 EPSRC Centres for Innovative Manufacturing in a new £60M programme to maximise the impact of innovative research, support existing industries, and more importantly, open up new industries and markets in growth areas.

The EPSRC Centre for Innovative Manufacturing undertakes both basic platform research and collaborative joint R&D projects with participating companies. In the UK, as elsewhere in Europe, SMEs make up the majority of companies with photonics as their core business, with estimates of up to 3,400 photonics companies, and annual production volumes in excess of €5Bn. Industrial Partners have access to our recently constructed £120M clean room complex at Southampton, with an extensive suite of state-of-the-art photonics fabrication and characterisation equipment: material deposition (e.g. via MCVD, PECVD, ALD, sputtering), 4 optical fibre draw towers, photo- and E-beam lithography,

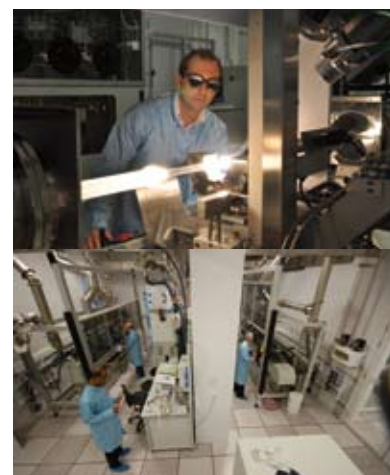
etching - wet, dry (RIE, RIBE), Focused Ion Beam Milling, and SEM, AFM, TEM characterization techniques, as well as a unique He-ion microscope with 0.25nm imaging resolution. Companies are encouraged to send their employees to spend time here and gain exposure to our latest equipment and techniques. In the advanced manufacturing sector, it is often an intimate knowledge of the complexities and the existing limitations of the latest hi-tech enabling equipment that gives rise to innovation and the value-added competitive edge over low cost, low margin off-shore manufacturing plants.

Industrial partners can also tap into the broad know-how of over 40 academics at Southampton who have specialist knowledge and interests in a wide range of photonics research activities. Examples of current research activities include specialty optical fibres for high power amplification, distributed sensing and optical communications, materials for the mid-infrared such as chalcogenide glasses and fibres, high power and ultrafast fibre lasers for materials processing and advanced manufacturing.

The EPSRC Centre has a further mission to train PhD students in photonics fabrication techniques - with the aim to produce students with broad hands-on experience and a mindset on the importance of "making things" - and provide the high-skilled manpower needed for growing the advanced manufacturing base. We welcome enquiries from qualified candidates from the UK and the EU who would be interested in undertaking a PhD with us. We are particularly interested in hearing from students keen on undertaking joint PhD projects with participating companies, with short periods of secondment to an industrial partner as part of their training. We currently have an opening for a joint studentship with Selex Galileo (Edinburgh, UK) involving research into mid-infrared technologies and applications.



*Optical Fibre Draw Tower:
EPSRC Centre for Innovative Manufacturing
in Photonics, Southampton, UK*



*MCVD (Modified Chemical Vapour
Deposition) research into making better
optical fibres at the EPSRC Centre*

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Seeing the light

Photonics is an area where Europe enjoys a leading role in global science, but this advantage must be used to meet future societal challenges, writes Malcolm Harbour

Photonics has, quite rightly, been recognised as one of the “key enabling technologies” that Europe must promote to sustain its global competitiveness. Certainly, photonics has huge untapped potential to solve problems across a wide range of industrial sectors and public services. In solar energy and in lighting, it is already providing climate change solutions, with much more development to come. It can enable high speed communications with large carrying capacities and lower energy requirements. It can aid the diagnosis and treatment of many medical conditions. It can monitor the integrity of structures, ranging from bridges to superjumbo jets. These are just a few of the possibilities that are already in everyday use, but evolving all the time.

Photonics is also an area where Europe has a leading role in global science, in generating patents, and in application of technologies. This is particularly evident in solar power deployment. However, Europe is lagging behind in the transfer of photonic innovations into sustainable production. Europe needs more high value added manufacturing, and more integration of photonics technology into the products needed to meet future societal challenges.

To meet these challenges, photonics has a great advantage. The photonics community has been at the forefront of joint activity, to help shape research agendas and promote the results. Photonics21 - the European joint technology platform - is widely regarded as one of the most successful. It has represented photonics research priorities at European level, been instrumental in the achievement of a common research strategy, and balanced the interests of industry, science and policy. One of its major achievements has been to argue, successfully, for photonics to be a “key enabling technology”.

These are exciting, and challenging times ahead. Characteristically, the photonics community is moving ahead of the game by putting forward plans for one of the new public private partnerships envisaged in the commission Horizon 2020 innovation strategy. Private sector participants have already committed €5.6bn of funds to launch public private partnerships. The plans for this investment, to be leveraged by public contributions, are being developed. The key will be the achievement of new forms of knowledge transfer from research, into development and on to full scale exploitation.

New companies will need incubation funds to accelerate their route to market. The public procurement of innovative solutions also has great potential, and the forthcoming reform of EU rules will offer new instruments to encourage ambitious procurement.

Photonics is an area of science and technology that has benefitted from an open, innovative approach to new forms of research collaboration, and knowledge transfer. European policymakers need to ensure that they build on these great foundations to make Europe the photonics champion of the world, in research, innovation and manufacturing. Photonics is, literally, lighting the pathway to the future. ★

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