

General Information	
Preliminary title of the European Partnerships	<b>European Partnership on Photonics</b> (Working title: PHOE – Photonics Europe – Light technologies for Europe)
Short description of the partnership	Securing global leadership in core photonic technologies and fostering their integration into products and services for the benefit of citizens.
Services directly involved	CNECT A4
Context and problem definition	<p>It is recognised that the mastery of key technologies or deep technologies like photonics, and their rapid diffusion into downstream or new industries will decide, more than ever, the future wealth and sovereignty of regions and countries.</p> <p>The current partnership which started in 2013 and the preceding photonics work programmes in FP7 have triggered very good progress in bringing the community together and successfully implementing joint R&amp;I priorities. However, the landscape of photonics research and innovation in Europe is fragmented, with several thousand smaller and medium size actors in industry, research institutes and universities and needs further coordination. Moreover, the potential for innovators to transfer photonic technologies to industry at large will be substantial in the next ten years due to the continuous input of new ideas from scientific research. E.g. the development of super-resolved fluorescence microscopy which won the 2014 Nobel Prize will lead to new applications in health and bio technologies.</p> <p><i>“Photonics is one of these essential key enabling building blocks for the digital transformation of Europe, which will be based on deep technologies”</i> – this is the key statement in the recent 2018 European Commission and European Investment Bank report on “Financing the digital transformation”.</p> <p>Photonics is a key enabler for Europe’s ambitions in Industry 4.0, smart farming, 5G, artificial intelligence, health technology and many other applications. Light technologies, components and systems, are critical elements of many key European strategic value chains from the automotive industry to the aeronautics sector. Finally, a resilient photonics capacity is vital for European sovereign security interests.</p> <p>As photonics mainly operates with low energy consumption, it allows reducing the energy needs when replacing other technologies. In addition, photonics solutions can be effectively used for the circular economy, e.g. sensors for automated sorting, laser for disassembly lines, additive manufacturing for spare parts/repairing. Furthermore, solar fuels and organic photovoltaics (OPV) will deliver clean energy and efficiency gains.</p> <p>A strong overarching European photonic landscape is even more important in a very dynamic global supplier market which doubled over the last ten years<sup>1</sup>. The European photonics industry has invested close to 10 billion Euro in 2015 (within a European market of around 69 billion Euro) and operates in fierce competition with Asia and the US.</p> <p>Competitor regions and governments have already integrated the tremendous potential impact of photonics into their economic and industrial competition strategies and innovation policies. By 2020, the South Korean government will have increased its annual investment into photonics to €2.8 billion. Likewise, China’s central government is increasing its spending in photonics by 40% per year to €1 billion in 2020 complemented by regional investments, often a multiple of the central government expenditure. For Europe to compete globally in mastering this key enabling technology, a comprehensive and ambitious strategy is needed.</p> <p>Due to the novelty and specificity of the photonics area, there is a strong competition for skilled researchers, engineers and workers. A recent vision paper, which was drafted after consultation with over 1,700 companies and research institutes, predicts that by 2030 one million new jobs could be created in the</p>

<sup>1</sup> [Europe’s age of light! How photonics will power growth and innovation](#) (2017)

	<p>European photonics sector. Currently there are not enough researchers and professionals for these. A coordinated European approach will be instrumental to provide a strong impetus for educational efforts necessary to fully exploit the potential of photonics for the benefit of European industries and citizens.</p>
Objectives and expected impacts	<p>The objective of the new partnership is to focus on mastering photonic core technologies. In addition, it has the ambition to disseminate photonic core technologies into the end user industry including low-tech sectors to boost mutually beneficial exchanges, cooperation and eventually the impact of the partnership. It will target in a flexible way application areas that show high growth potential or build on established European strengths. Hence it will boost the competitiveness of industry and drive the digital transformation of the European society by:</p> <ul style="list-style-type: none"> <li>• Gaining and maintaining leadership in core photonic technologies to provide the critical components and systems for next generation high-speed information networks, autonomous driving, Industry 4.0, smart farming and personalized healthcare applications</li> <li>• Achieving autonomy/sovereignty in this critical key enabling technology</li> <li>• Establishing a cross-regional and Member State prototyping and pilot production service infrastructure (Digital Innovation Hub) to upgrade products of “non-photonic” end user companies to make these “more digital” and competitive at global scale.</li> <li>• Mobilizing and connecting the stakeholders in a fragmented innovation landscape, directing them to opportunities</li> <li>• Ensuring broad uptake of new and adapted photonic technologies into various sectors of European end-user industry</li> </ul> <p>To prepare envisaged changes, the current Horizon 2020 partnership has already initiated more than 30 joint strategic actions with end user industry. It help to launch several cross-regional networks of innovation hubs across Europe which the EU supports by complementing funds coming from ERDF budget. The partnership plans to continue these actions and to better connect R&amp;I with the rollout of deployment capacities in European regions.</p> <p><b>Expected Impacts:</b></p> <ul style="list-style-type: none"> <li>• Secure leadership in photonics core technologies (#1 in the world)</li> <li>• Help reaching critical mass of effort for future photonics-based innovations</li> <li>• Accelerate uptake and deployment of photonic technology in end user industries (10 billion Euro investment in photonics per year )</li> <li>• Promote and provide skills in photonics</li> <li>• Help combining photonics with other key technologies and their integration into systems</li> <li>• Contribute to the creation of new jobs in supplier and end user industries.</li> <li>• Foster start-ups and growth of SMEs</li> </ul> <p>To illustrate impacts coming by developing and fostering the use of core photonics technologies, some examples follow. Food production will become more transparent and safe. Road transport will become nearly accident-free saving thousands of lives. Medical treatment can start earlier through instant diagnosis of diseases allowing citizen to live longer and healthier lives. Thousands of manufacturing jobs will be created by introducing versatile laser-based technologies. Green and circular economy will benefit from the low energy consumption and the possibly clean energy sources and efficiency gains photonic technologies offer.</p> <p><b>Expected timeframe of the partnership</b></p> <p>The initiative will run concurrently with Horizon Europe. An interim assessment shall check whether the rationale and the objectives of the partnership are still valid and modify the action accordingly.</p>

<p>Necessity test: rationale for a European Partnership</p>	<p>The envisaged partnership will secure leadership in photonic technologies. This ambitious objective requires a dedicated process for a European roadmap (Strategic R&amp;I agenda) involving all relevant actors. Research activities in photonics are very demanding in terms of infrastructure and expertise and take decades to build up and reach world class performance. If implemented in normal Horizon Europe actions there would be a significant risk that continuity is not preserved.</p> <p>Moreover, without a joint European roadmap and implementation in collaborative projects, the photonics community in Europe might lose synergies and coordination. For instance projects to develop cutting edge photonic technologies such as single-photon image sensors operating at room temperature are risky, benefit from cross-fertilization and require very diverse expertise. The innovators would have difficulties to perform these in a fragmented approach and were more likely to fall behind their global competitors.</p> <p>The directionality is particularly important for the photonics sector, due to the lack of large companies acting as a pacemaker. The 5000 European SMEs in Photonics have neither the capacity nor capability to do so. Thus, for Europe to tap the full potential of Photonics it is essential that core technology development is carefully aligned and well-coordinated. Interaction within the photonics community will allow ideas to be transferred to new areas. The entire value chain from basic research to component development and system integration must be framed within a joined overall strategy that engages the smartest minds in Europe.</p> <p>The positive effects of a partnership approach have been shown in the running Photonics PPP which has helped increase the R&amp;I investment quota of the photonics industry in Europe to 10%. Nearly €10 billion Euros are invested by European Photonics industry in R&amp;I in Europe. The partnership is vital for directing these investments along a well-coordinated strategy.</p>
<p>Relevant for the following parts of Horizon Europe</p>	<p>Pillar II 'Global Challenges and European Industrial Competitiveness'</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Cluster Health</li> <li><input type="checkbox"/> Cluster Culture, creativity and inclusive society</li> <li><input checked="" type="checkbox"/> Cluster Civil Security for Society</li> <li><input checked="" type="checkbox"/> Cluster Digital, Industry and Space</li> <li><input checked="" type="checkbox"/> Cluster Climate, Energy and Mobility</li> <li><input checked="" type="checkbox"/> Cluster Food, Bio-economy Natural Resources, Agriculture and Environment</li> <li><input checked="" type="checkbox"/> Cross-cluster</li> <li><input checked="" type="checkbox"/> Pillar III 'Innovative Europe'</li> </ul> <p>Photonics is an enabling technology from which actions in all clusters will benefit.</p>
<p>Currently identified links with other partnership candidates / Union programmes</p>	<p>As a partnership on a Key Enabling Technology, it will contribute to a large number of partnerships, and support the achievements of objectives of major priorities under the Global Challenges and Industrial Competitiveness pillar of Horizon Europe. Close links have already been established to proposed partnerships within the cluster 'Digital, Industry and Space' related to High Performance Computing, Key Digital Technologies, Robotics and Artificial Intelligence, Smart Networks and Manufacturing. Other links to work programmes dealing with Health, Agrofood and Environment will be further expanded.</p> <p>In the context of the ongoing preparations of other partnerships, it will be assessed if photonic activities with close connections to other programmes are better pursued elsewhere. For example synergies exist with the Key Digital Technologies partnership for the work on Photonics Integrated Circuits (PICs) as these are manufactured on semiconductor wafers in a way similar to electronic integrated circuits. Similarly, laser-based technologies are linked with the proposed partnership on manufacturing.</p>
<p>Does the proposed partnership build on currently active ones?</p>	<p>This partnership will build on the community of the running Photonics<sup>21</sup> PPP which will end in 2020, and that received top ratings among all cPPPs by an independent expert group of the European Commission as part of the Horizon 2020 Mid-Term evaluation.</p>

Expected type and composition of partners	<p>The Photonics21 platform assembles more than 3000 members of the current PPP and includes companies (mainly from the supply side), research institutes and universities which are the essential stakeholders. It forms the basis for the new partnership and will be fully open to new members. Moreover, it shall actively reach out and include more industrial end users and associate experts on business development and on access to finance. In ethically sensitive areas like healthcare, monitoring representatives of the civil society will be involved to co-develop activities.</p> <p>It will be particularly important that the partnership will reinforce the involvement of end-user industry in co-programming activities.</p>
Contributions and commitments expected from partners	<p>The partners are expected to:</p> <ul style="list-style-type: none"> <li>• jointly create and update a strategic R&amp;I agenda</li> <li>• implement this agenda in collaborative R&amp;I projects</li> <li>• contribute in kind and possibly financially to the implementation</li> <li>• invest in R&amp;I areas identified in the strategic R&amp;I agenda</li> <li>• reach out to other European R&amp;I communities who could benefit from cooperation</li> <li>• participate in national and regional R&amp;I programmes to reinforce EU measures</li> <li>• take societal and ethical issues into account and give input to policy development where possible</li> <li>• inform the public at large about prospects and value of their work</li> <li>• develop joined technology and market intelligence and strategies for international collaboration</li> <li>• engage in defining standards/regulation frameworks to foster adoption of European technology</li> </ul> <p>The European photonics industry is expected to significantly invest in research, innovation and manufacturing in Europe by matching 1 Euro spent by the European Commission with 5 Euro, or the equivalent in kind. Moreover, the partners will be invited to contribute by providing hardware infrastructure, equipment and knowledge.</p> <p>Regulatory issues and policy uptake will be closely linked to the R&amp;I activities undertaken under the partnership (e.g. for connected mobility, precision farming, health monitoring) to maximize the benefit for society and hence reduce time to innovation.</p>
Currently envisaged implementation mode(s).	<p><input checked="" type="checkbox"/> Co-programmed European Partnership</p> <p><input type="checkbox"/> Co-funded European Partnership</p> <p><input type="checkbox"/> Institutionalised European Partnership</p> <p><input type="checkbox"/> Article 185</p> <p><input type="checkbox"/> Article 187</p> <p><input type="checkbox"/> EIT-KIC</p>
Justification of the implementation mode	<p>The research and innovation challenges of the photonics Partnership require a lean implementation mode, to lower the barriers and ease access to the partnership for typically small and medium sized stakeholders from industry and the research community.</p> <p>In the current partnership, stakeholders are represented in the Photonics21 association with more than 3000 members. The election of the stakeholder board and its decision making processes follow democratic principles. This way of cooperation has proven to be agile and effective and is the preferred option for the new partnership.</p>
Proposed starting year	2021