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Photonics in Information & Communication Technologies

A Technology Roadmap for SMEs on
new photonic devices and materials

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Imprint

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1st edition 2012 | Steinbeis-Edition, Stuttgart
ISBN 978-3-941417-78-6

Layout: Steinbeis-Edition

Cover picture: ©Sergii Shchebakov, ©Roland Jelli, © gluke – fotolia.com

Production: Digital Druck Straub GmbH & Co. KG, Schramberg

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142116-2012-02 | www.steinbeis-edition.de

Foreword

The European project „PhotonicRoadSME“ has developed Technology Roadmaps in the fields of photonics for supporting small and medium sized enterprises (SMEs). The demands on forthcoming photonic products should be identified at an early stage. Analysis of relevant international research and development results concerning photonic materials, fabrication technologies, and photonic devices and components shall help the SMEs to react to these emerging requirements. This roadmapping process helps them in their decision making phase for new product strategies, contributes to SMEs investment decisions and to the design of successful business models in medium term. Therefore, the project was divided into three phases.

Phase 1 – Market driven and technology driven approach

The needs and market requirements of SMEs have been analysed by conducting interviews, surveys, and SWOT-analyses (strength/weakness/opportunity/threats analyses). Furthermore, national and international research activities and research publications in the scope of photonics have been investigated and evaluated branch-specifically.

Phase 2 – Industrial sector specific and SME specific technology roadmaps

The results of the analyses in phase 1 contributed to the development of technology roadmaps for the four industrial branches:

- Information and Communication Technologies (ICT),
- Environment & Energy,
- Health & Well-being,
- Safety & Security.

The identified trends within each of these sectors highlight products and their application fields that possess high potentials for solving current technological and socio- economic challenges. The three different SME types “developer”, “producer”, and “user” have been investigated separately.

Phase 3 – Integration of the roadmaps into the industrial context

These Technology Roadmaps developed in phase 2 have been validated by conducting case studies and implementation workshops. Thereby, strategies for products development emerged, enhancing the global competitiveness of these SMEs.

Four branch-specific roadmaps in the sectors of ICT, Health & Well-being, Environment & Energy and Safety & Security have been developed. In addition, these roadmaps have been adapted according to three different profiles of SMEs: developers, producers or users of photonic devices.

The four roadmap reports intend to provide Small and Medium Sized Enterprises (SMEs), as well as Universities, Institutes and other Research Technologies Development organisations (RTD) with practical, useful and easy to follow advices, on how to maximize the impact of Research and Development projects involving SMEs by ensuring that the results are effectively used and disseminated.

The roadmaps have been produced as part of Coordination and Support Activities carried out in the Project “PhotonicRoad” SME, which was funded under the 7th Framework Program of the European Commission.

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Acknowledgements

The authors would like to thank companies, especially SMEs, Research Institutes, Clusters and Experts for their collaboration and valuable input during the preparation of this roadmap reports. This means for example the data collection, analysis and the support concerning the dissemination of the project results.

A special thank goes to all contributors and to the European Commission. It would not have been possible to complete these studies without their support.

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1 Executive summary

In the next ten years, scientific developments in the field of nanophotonics as a key driving force in photonics will influence many different industrial branches. In these industrial sectors, many small and medium sized enterprises (SMEs) are involved as traditional suppliers, start-ups or producers of high tech products. In order to remain competitive on these markets, SMEs have to integrate new results and developments in their commercial vision for future applications and products.

The pilot project PhotonicRoadSME, founded by the 7th Framework Programme of the European Commission, aims at the development of technology Roadmaps to identify future Research & Technology Development (RTD) strategies for Europe within the next 5–15 years in the field of photonics. These Roadmaps identify trends in research and development and associate them to products and applications, thus outlining their technical and economical potential for problem solving. Analysis of relevant international research and development results concerning nanophotonic materials, novel photonic devices and components as well as related key fabrication technologies shall enable SMEs to better react to these emerging requirements. This Roadmapping process contributes to facilitate SMEs investment decision-making and to the design of successful business models in medium term. The development of technology Roadmaps in PhotonicRoadSME not only have a strategic impact on the RTD activities of SMEs in the photonics sectors but also further downstream impacts, meaning that the support to SMEs and their development of novel products and technologies will help to secure the competitiveness of existing industries and will enable the creation of new jobs.

The results of the Roadmap are based on PhotonicRoadSME database which contains information about more than 200 nanophotonic materials, novel photonic devices and components as well as related fabrication technologies, which was developed within the framework of the EC funded project PhotonicRoadSME. The database and the linked Roadmapping tool have been structured by taking into account the results of a European survey carried out on more than 150 European SMEs, the results of several R&D reports on different photonic material categories, more than 40 SMEs' technology audits performed in the photonics sector, 4 SWOT