BabyLux –a new way to innovation and health
Market trends in Biophotonics

Tanya Nikolova
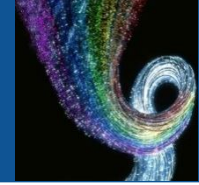
Photonics Unit

DG CONNECT - European Commission

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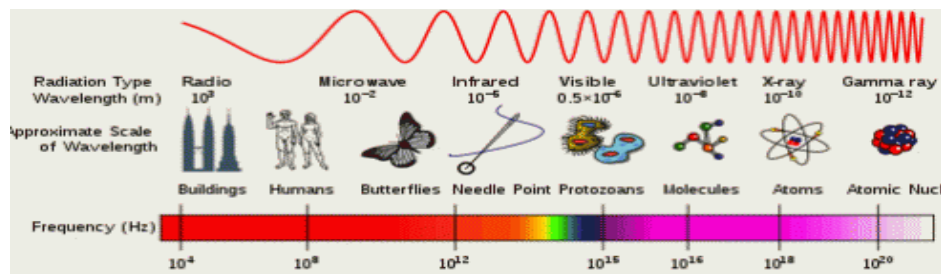# What is Biophotonics?

BioPhotonics
exploits the interaction of light
with biological matter

Biological matter can be found in several application areas:

- Life Science and Health
- Agro-Food
- Environment
- Defense/Security

Light=electromagnetic waves from X-rays to THz

Fast growing area

Recent innovations in (laser) sources and detectors (with high sensitivity and high specificity), paved the way to improved imaging modalities (e.g. OCT), spectroscopic methods (e.g. Raman), (lensless) holography and more.

Together with biochips and optical methods for gene sequencing they now offer new routes to better understanding, diagnosis and treatment of diseases, thereby opening new possibilities of great potential in the health sector.

Growing market with a Strong European position
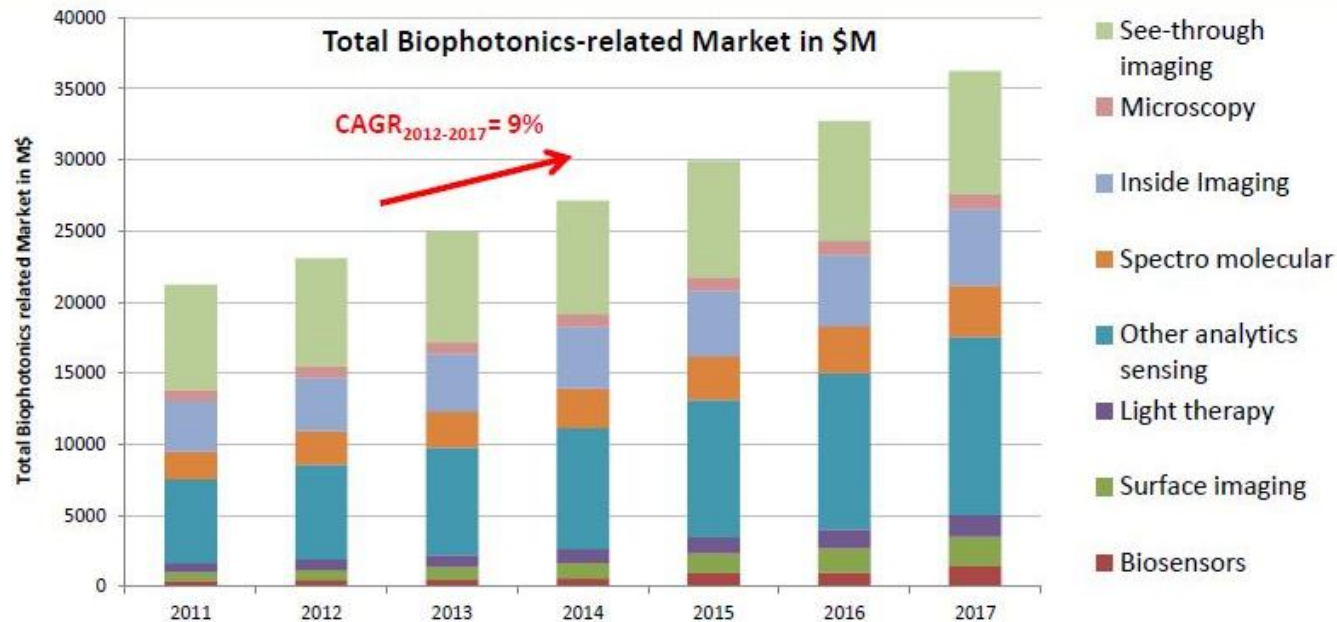
- ◎ **$36B** total Biophotonics-related market by **2017**

  9% CAGR 2012-2017= (with some sectors up to 23%) (*YOLE data*)

- ◎ *Markets&Markets 2015:* "the total market was valued at USD 26.26 Billion in 2014 and is expected to reach USD 50.18 Billion by 2020, at a CAGR of 11.5% between 2015 and 2020".

- ◎ **30% World Market Share** of **European** companies for MedTech & Life Sciences *(Photonics21 data, 2013)*

Photonics in FP7 (2007-2013) & H2020 (2014-2015)
170 R&I projects for ~620 M€

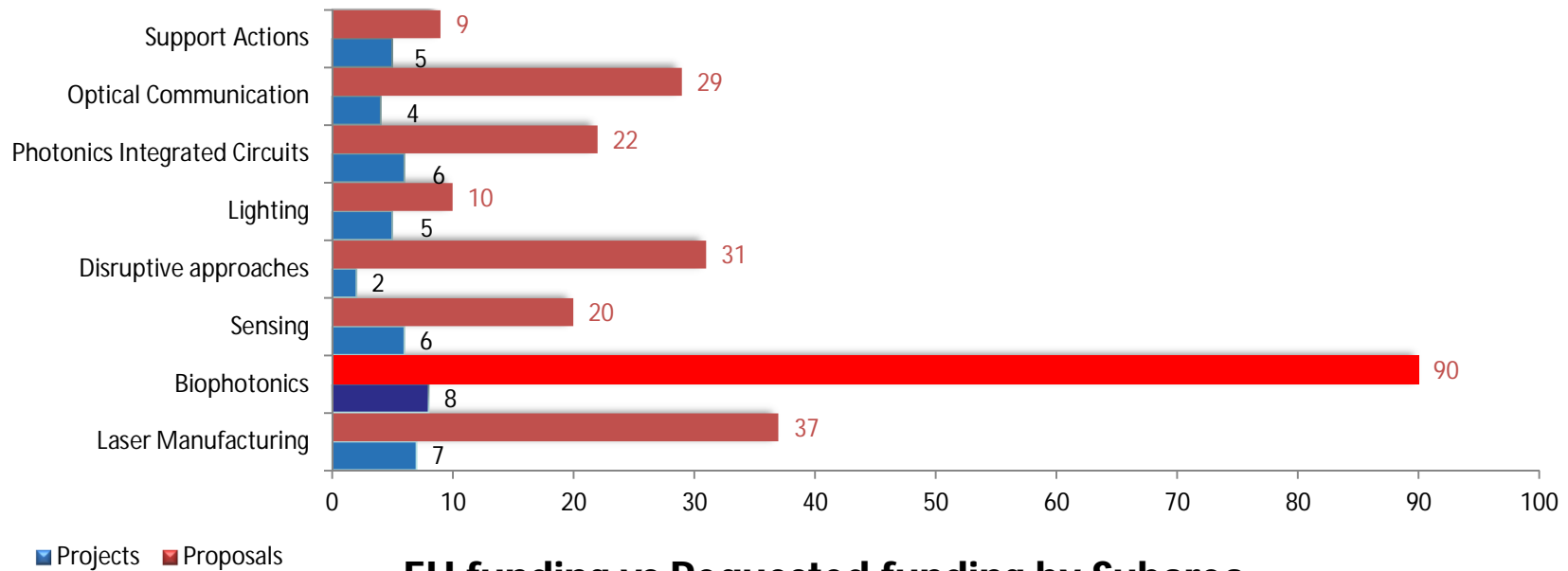| Areas #Projects EU funding	FP7	H2020 2014-15		
Optical data Communications	31 103M€	4 13,5 M€		
Lasers and Manufacturing	10 47 M€	7 24,7M€		
Biophotonics Health&Food	26 98 M€	9 * 37,2 M€		
SSL Lighting, Displays & OPVs	19 92 M€	6 37,8 M€		
Sensors for safety & security	16 44 M€	6 28,7 M€		
Integration Platforms & Nanophotonics	15 58 M€	6 * 26,8 M€		
Cross-cutting Support Actions	12 19 M€	6 10 M€		Education and training, Roadmapping, Coordination between regional/national clusters, Coordination of the Photonics research constituency, Access to advanced technologies, Support to SMEs

ICT 30 – 2017: Photonics KET Overview

- **ICT30.a Research and Innovation Actions 43 M€**
  - ■ Application driven core photonic technology developments for agile Petabit/s Optical Core and Metro Networks
  - ■ Photonic integrated circuit (PIC) technology
  - ■ Disruptive approaches to optical manufacturing by 2 and 3 D opto-structuring

- **ICT30.b Innovation Actions 43 M€**
  - ■ Innovation Incubator for SMEs
  - ■ Application driven core photonic devices integrated in systems
  - *Focus is on:*
    - – **Biophotonics: imaging systems for in-depth disease diagnosis**
    - – Sensing for process and product monitoring and analysis

- **ICT30.c Coordination and Support actions 43 M€**
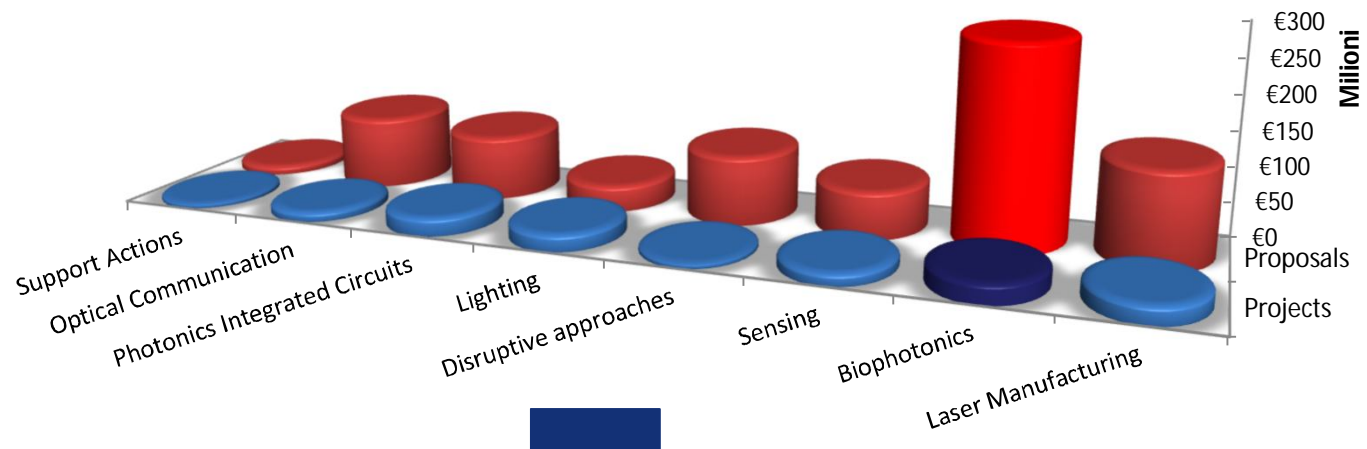 - ■ Supporting the industrial strategy for photonics in Europe

2014-15 H2020 funding in the Photonics Unit

Number of Proposals vs Funded Projects by Subarea

Subarea	Projects	Proposals
Support Actions	5	9
Optical Communication	4	29
Photonics Integrated Circuits	6	22
Lighting	5	10
Disruptive approaches	2	31
Sensing	6	20
Biophotonics	8	90
Laser Manufacturing	7	37

■ Projects ■ Proposals

EU funding vs Requested funding by Subarea

Milioni: €300, €250, €200, €150, €100, €50, €0

Support Actions, Optical Communication, Photonics Integrated Circuits, Lighting, Disruptive approaches, Sensing, Biophotonics, Laser Manufacturing

Proposals Projects

Biophotonics in the Photonics Unit

28 projects + 1 (pilot line on PICs)
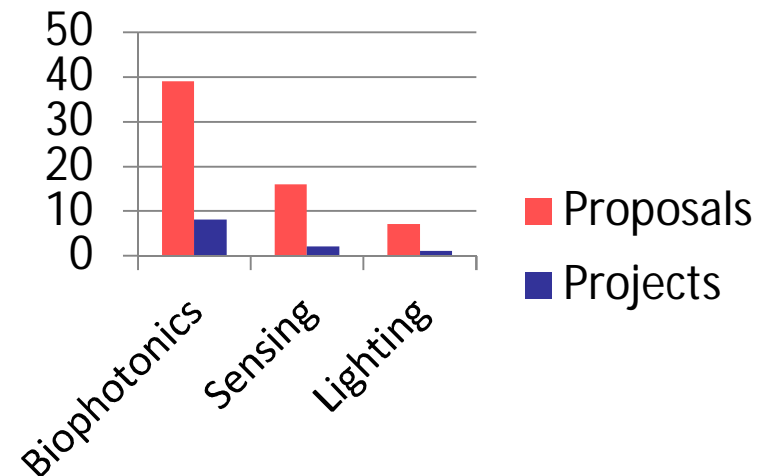
6 completed

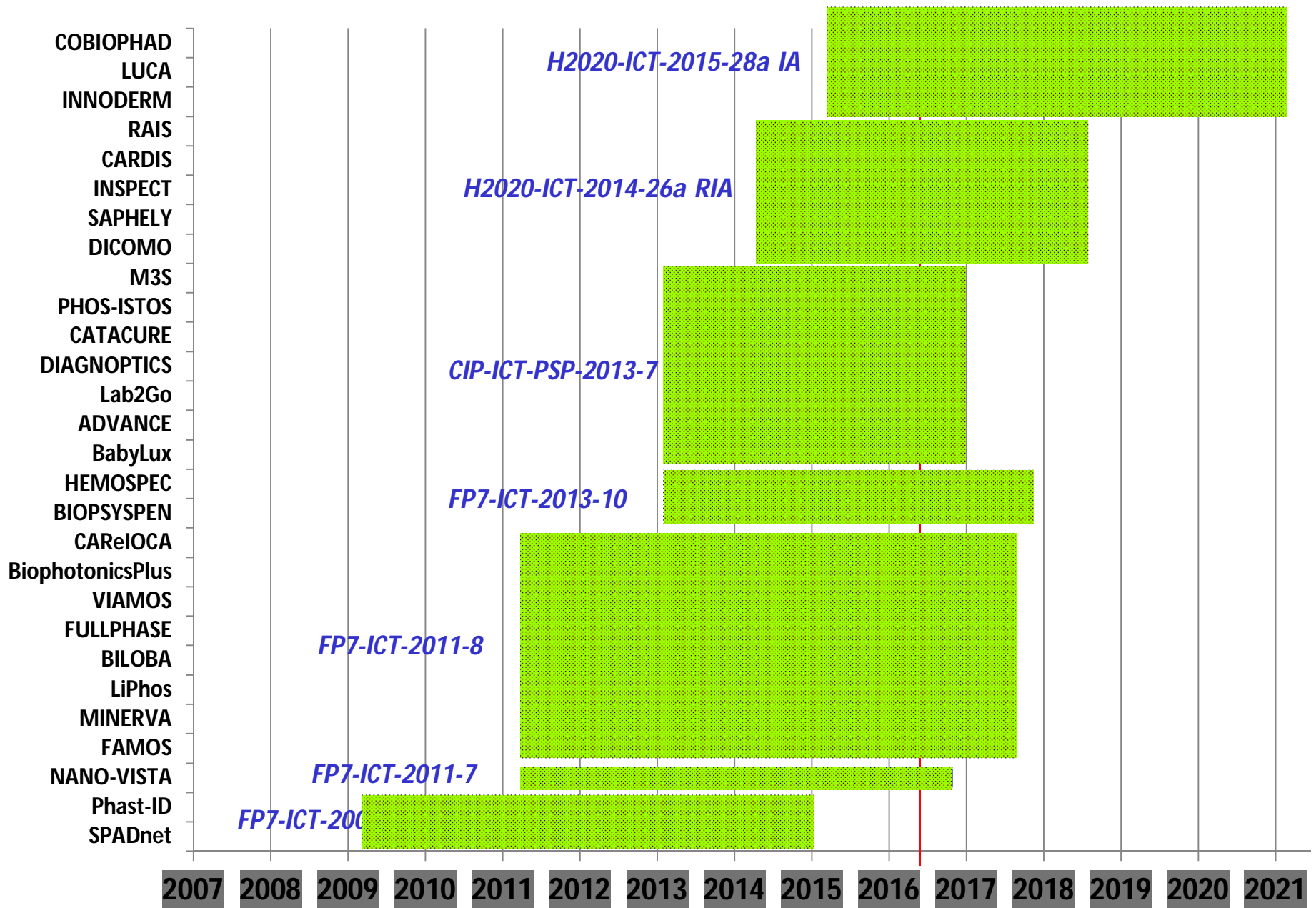*22 ongoing*

8 started (ICT 29-2016 RIA call)

250partners

146 M€ total budget

101 M€ EU funding

97 project years
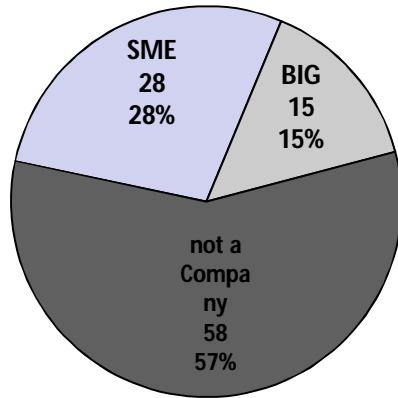
Projects, Programs, Calls, Timelines

Industry Commitment and Funding

~45 M€ input from industry

Funding 101 M€

SME 28 28%
BIG 15 15%
not a Company 58 57%

250 entities, 232 unique

SME 75 30%
BIG 41 16%
not a Company 134 54%

Companies

Labtech 15 6%
Optec 36 15%
Medtech 31 12%
Electronics/IT 21 8%
Hospitals 25 10%
PM/IP 7 3%
Academic Research 102 41%
Gov 13 5%
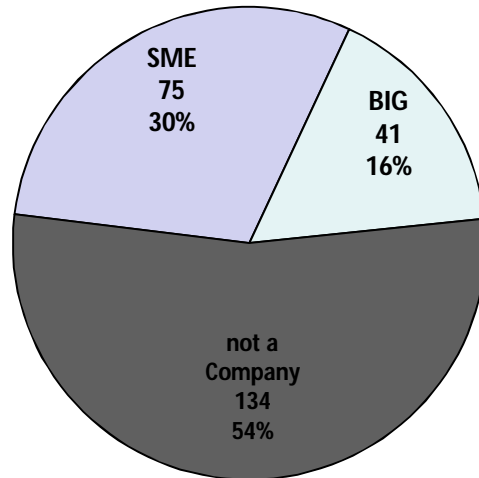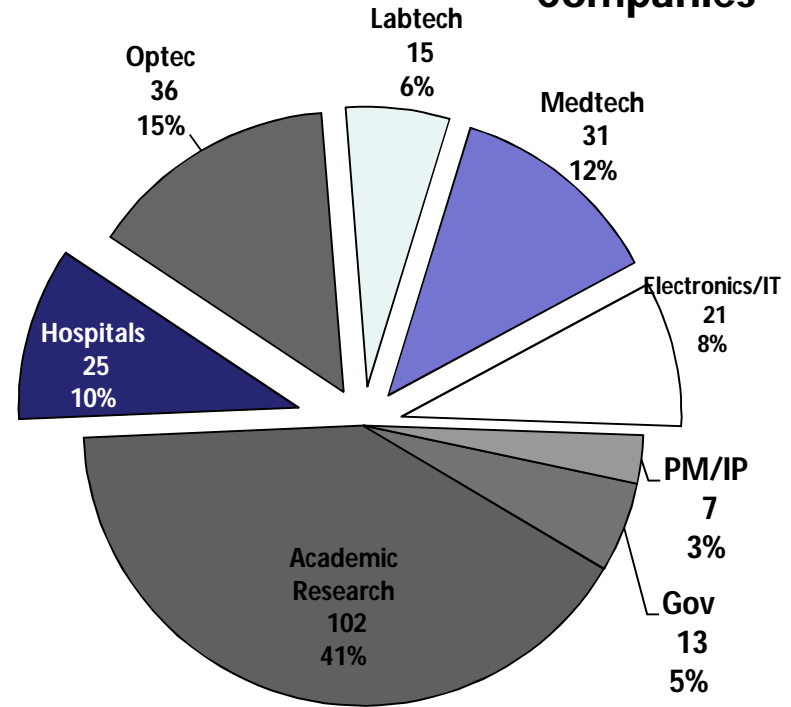
Portfolio Analysis: Medical Need and Coverage

Opthalmology FAMOS: OCT, PA
GALAHAD: OCT

Cataract CATACURE: Trp-F/Laserbleach

Onc. Thyroid LUCA: DCS-TRS

Melanoma, AK Minerva: NIR
DIAGNOPTICS: multimodal
INNODERM, RSOM

Esophageal Cancer
ESOTRAC: OCT

Staying at the surface:
Skin Malignancies ADVANCE: OCT
VIAMOS: OCT

Non-Melanoma BiopsyPen: OCT

Keratosis, Psoriasis PHOSISTOS PDT

Breast cancer
HYPOSENS: NIR
PAMMOUTH: PA, US
SOLUS: DO, US

Rheumatoid Arthritis
FULLPHASE: PA Imaging

(Auto)immunology

Allergies
COBIOPHAD:IgE-IVD CompactDisc

Cameras for Organs SPADnet: PET
DICOMOS: X-ray

Colon
PICCOLO: OCT

NEURODEGENERATIVE
MOON: OCT, RAMAN

BABYLUX: DCS-TRS
Cerebral Bloodflow/Oxyg. **Neonatology**

Arterial stiffness **Acute Myocard Infarct**
CVENT: PA, US
CARDIS: laser vibrometer
FULLPHASE: PA Imaging

LIPHOS: cell spectrosc.signature
Lab2Go cTn I, IVD **CVDs**

Infectious **Sepsis** ~~Malaria~~
Diseases RAIS: If-IVD
Hemospec: Raman, Fl

Optical Biopsy **Histo/Pathol/Tissue/Cell**
CareIOCA: FFOCT M3S: Raman imaging
Inspect: Spectrometers **CLL**

Head Neck, Larynx
Mouth Cancers

Onc. Biomarker **Pancreas**
Phast-ID: 2D ph.crystal, If-IVD
SAPHELY: miRNA-IVD
BILOPA: If-IVD, angiogenesis

Subcellular imaging **Research Tools**
NANO-VISTA: nano-antenna
FAMOS: OCT-FA

11

H2020-ICT-2015-28a

further development

TRL 7

TRL 4

H2020-ICT-2014-1

∨

CIP-ICT-PSP-2013-7

proven technical feasibility

∨

proven their functionality with respect to the biological interaction mechanism in human patients

∨

FP7-ICT-2013-10

∨

FP7-ICT-2011-8

∨

FP7-ICT-2011-7

TRL 4,5,6

∨

proof-of-principle

TRL 3

FP7-ICT-2009-5

Photonics -
strong European industry with huge economic impact

- Global photonics market ~373 bn EUR (2013)
- European photonics market ~69 bn EUR (2013) □ Market share ~18% (2013)
- Estimated global photonics market in 2020 ~615 bn EUR
- SME based - more than 5.000 SMEs in Europe
- ~370.000 employees in the European photonics sector
- Market shares of European companies

      Production technology 55%

      Optical components & systems 40%

      Measurement & automated vision 35%

      Medical technology & life sciences 30%

"Photonics impacts around 10% of the European economy"

[Study: The Leverage Effect of Photonic Technologies, European Commission, 2011]

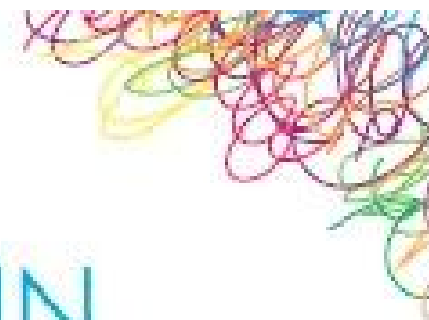# BABYLUX- a good success story of EU biophotonics project with hugh health benefit

"Light-to-Cure": Steps from Photonics to Improved Care of Neonates Born Preterm

BabyLux - An Optical Neuro-Monitor of Cerebral Oxygen Metabolism and Blood Flow for Neonatology *- is a project that aims to provide an innovative and reliable tool to monitor and assess brain blood flow and oxygenation in extremely preterm neonates. The device can be brought to the bedside, measurements can be done in a few minutes and repeatedly, if the condition is critical. The project takes up complete R&D works and* ***extends already tested prototypes to the level of demonstrator****, bridging the gap between research products and commercialization.*

THANK YOU FOR YOUR ATTENTION