



PHOTONICS²¹

PHOTONICS PUBLIC PRIVATE PARTNERSHIP



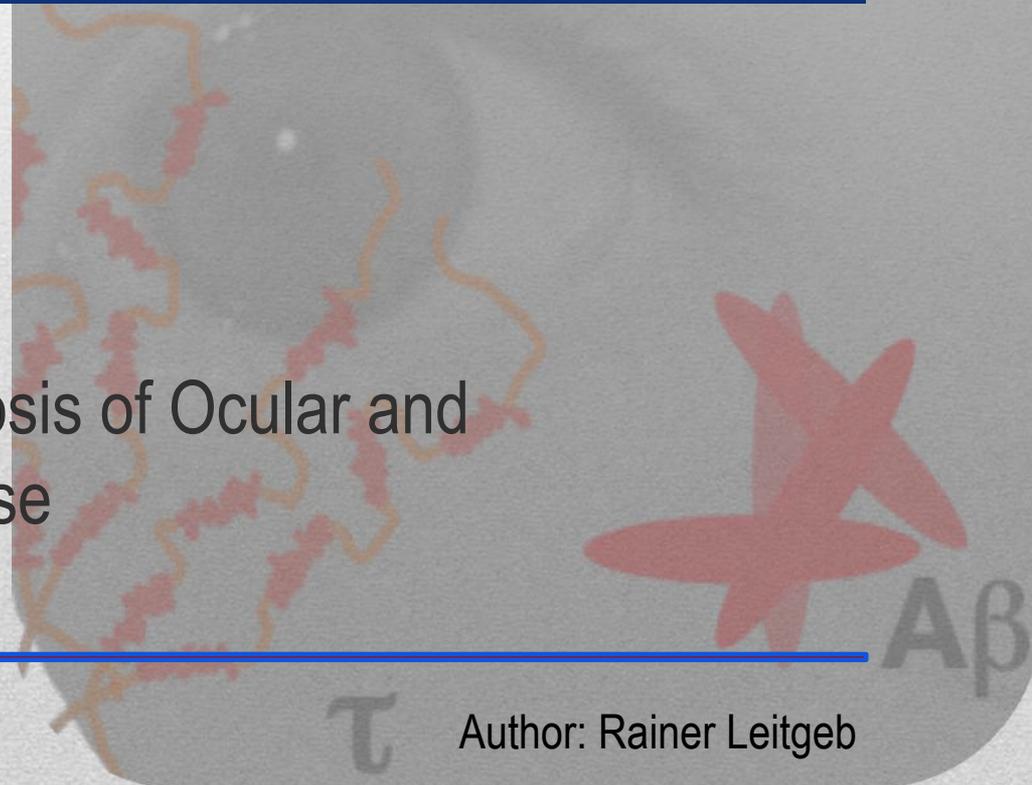
Light for a better quality of life

MOON

Multimodal Optical Diagnosis of Ocular and Neurodegenerative Disease

Project # 732969

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TOWARDS 2020 – PHOTONICS DRIVING ECONOMIC GROWTH IN EUROPE

Multiannual Strategic Roadmap 2014–2020



 PHOTONICS²¹

Some Key Facts:

Demographic Change:

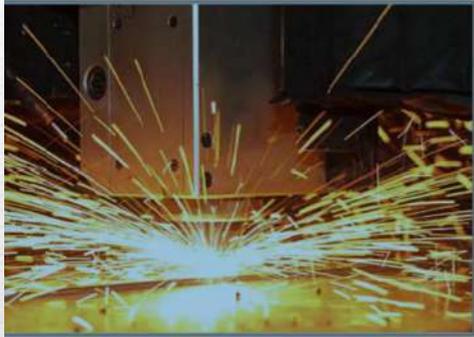
more people aged above 65 will have to be supported by fewer working age people. As global healthcare expenditures are also expected to grow disproportionately, this means that working age people will have to bear significantly higher financial burdens. Photonic technologies can help absorb some of these burdens, offering a potential 20% cost reduction*.

*Photronics21 Strategic Research Agenda *Lighting the way ahead*,

Cited from the Multiannual Strategic Roadmap 2014–2020;
European Technology Platform Photonics21

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Compound Annual Growth Rate – CAGR

Number that describes the rate at which an investment would have grown if it had grown at a steady rate.

Representing the smoothed annualized gain you earned over your investment time horizon.

Some Key Facts:

Worldwide healthcare market for optical technologies

- estimated to be €23 billion in 2010, and to be growing at an 8% CAGR by 2015*.
- Europe's share of the market currently amounts to about a third.
- Scope for significant expansion in the areas of medical imaging and laser therapeutic systems (market share currently ~30%), and especially for in-vitro diagnostic systems (currently below 20%)*

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Cited from the Multiannual Strategic Roadmap 2014-2020;
European Technology Platform Photonics21

MOON – Objectives

- Development of a multi-band and multimodal functional imaging platform for **in-depth diagnostics of ocular and neurodegenerative diseases** on a molecular level **combining the specificity of Raman spectroscopy with the structural and functional sensitivity of optical coherence tomography (OCT)**.
 - Development of **disruptive laser technology** to enable a new generation of OCT systems, by supporting wide-field imaging, label-free angiography, and digital aberration correction.
 - **Validation of the system in vivo in a clinical setting** by closely involving clinical collaborators and paving the way for commercialization.
 - Bridging the gap between excellent research results and product development thereby strengthening the participating companies and the European photonics market by **generating a competitive advantage.** 4
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MOON – Consortium



MEDICAL UNIVERSITY
OF VIENNA



TNO innovation
for life

ZEISS

We make it visible.

innolume

HORIBA
Scientific

Academic Partner

Medical University of Vienna, Vienna, Austria (coordinator)

<http://www.meduniwien.ac.at>

Leibniz Institute of Photonic Technology, Jena, Germany

www.ipht-jena.de

Netherlands Organisation for Applied Scientific Research,
Den Haag, Netherlands

<http://www.tno.nl>

Industry Partner

Carl Zeiss AG, Oberkochen, Germany

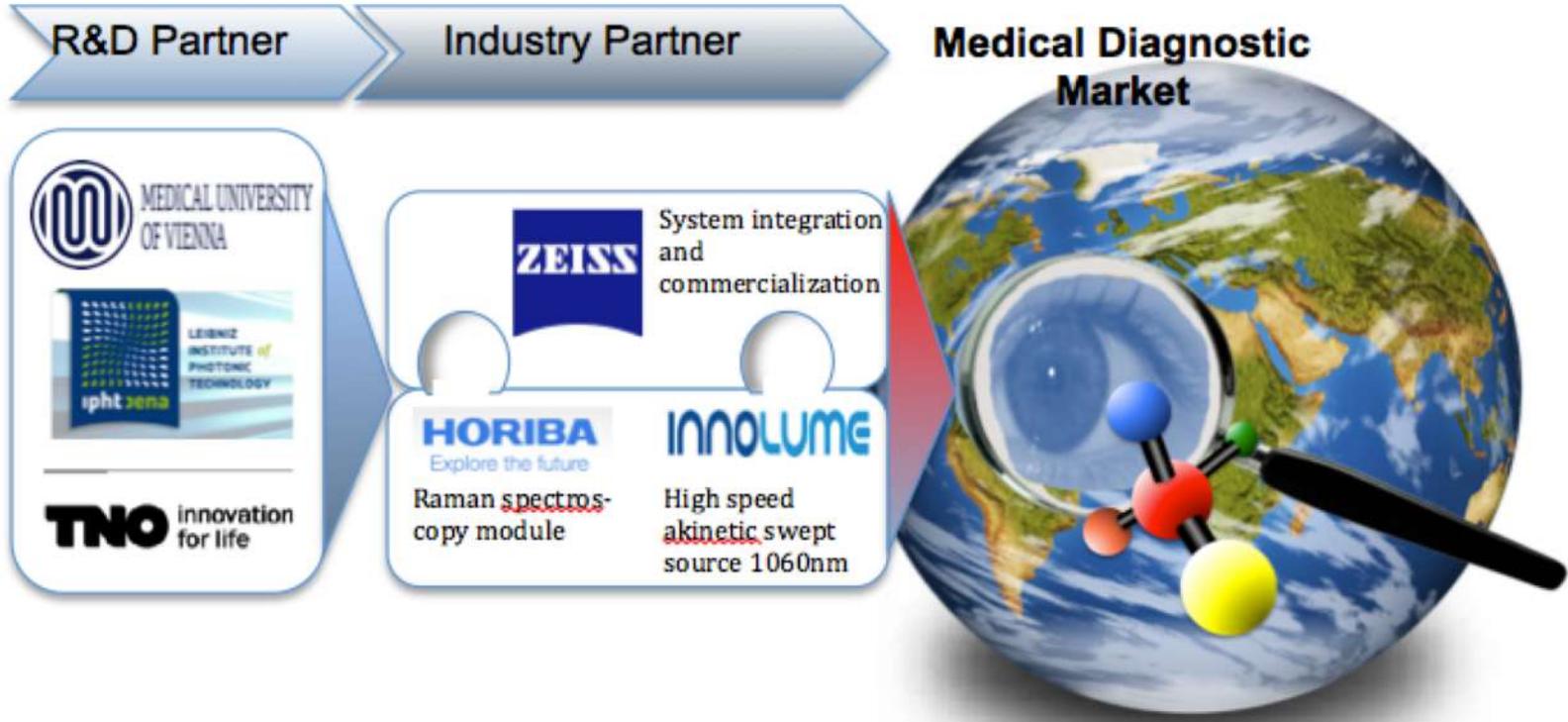
<http://www.zeiss.de>

Innolume GmbH, Dortmund, Germany

<http://www.innolume.com/>

Horiba Jobin-Yvon, S.A.S., Longjumeau, France

<http://www.horiba.com/scientific>



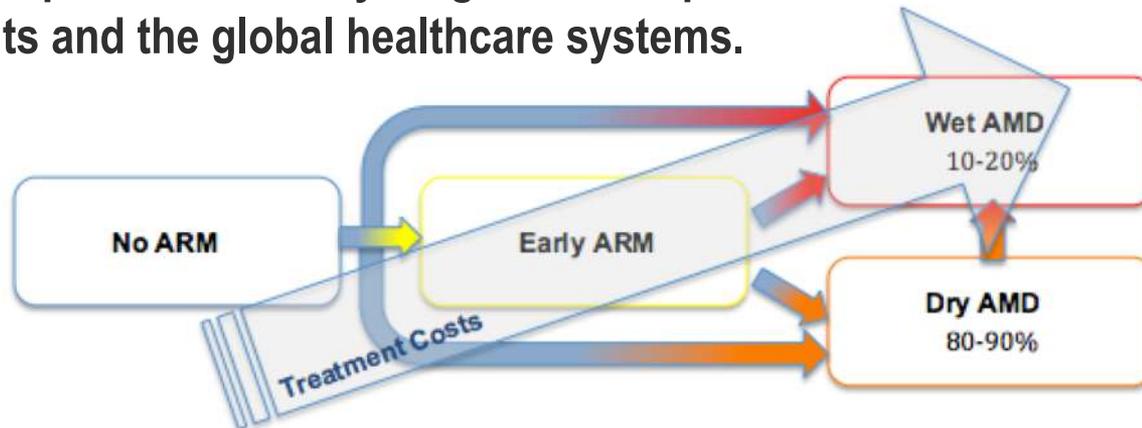
MOON – Value Chain

Background – Alzheimer's

- **46.8 million people worldwide are living with dementia** and this number will almost double every 20 years, reaching 131.5 million in 2050. Of the 46.8 million people **60-80% of cases are related to Alzheimer's disease (AD)**.
- AD starts 10-20 yrs prior to clinical manifestation
- therapies fail at late stages (only then diagnosis possible with 70-90% certainty)
- MR test – brain volume measurement yet to be established for AD diagnosis
- Cerebro-spinal fluid (CSF): detection of $A\beta$ -, τ - proteins seems to allow diagnosis of mild cognitive impairment (MCI) however invasive and used micro-arrays show bad reproducibility;
- indication that Curcumin helps to reduce plaque in neural tissue; attaches to $A\beta$ and can be observed by fluorescence imaging; this is however not specific enough for diagnosis, as plaques present also with age
- **The world is in need of a non-invasive, easily accessible and accurate diagnostic tools for NDD.**

Background - Age-related Macula Degeneration (AMD)

- It is predicted that cases of early age-related macular degeneration (AMD) will increase approximately by 96% from 9.1 million in 2010 to 17.8 million affected people in 2050
- Estimates of the global cost of visual impairment due to AMD are \$343 billion, including \$255 billion in direct health care costs.
- No prediction currently available, if/when transition of early form of AMD (ARM – age related maculopathy) to aggressive form of wet AMD occurs.
- No cure for AMD exists, but expensive treatment for wet AMD and specific diets and additives -> **importance of early diagnosis and prediction of transitions for the benefit of the patients and the global healthcare systems.**



Laser and DAQ Technology



Patient Module - OCT



Raman spectroscopy



Fundus Fluorescence module



Improved retinal disease diagnostics

- combining
- wide field imaging
 - digitally enhanced resolution
 - employing non-invasive OCT angiography
 - enhanced penetration at 1060nm

In-depth molecular specific retinal disease diagnostics

combining OCT and Raman spectroscopy

In-depth molecular specific diagnostics of neuro-degenerative disease

combining OCT, fluorescence, and Raman spectroscopy

MOON - Technology

- MOON will be the first step towards a fully non-invasive and molecularly sensitive diagnosis through the eye.
- Such outstanding sensitivity could pave the way for early diagnosis as well as personalized treatment of age related diseases and support the development of urgently needed drugs to treat neurodegenerative diseases.
- Applications if successful could extend to other neurodegenerative diseases (Parkinson's, Multiple Sclerosis,...) and ophthalmic diseases (glaucoma, diabetic retinopathy,...) as well as cancer.

Learn more on

<http://moon2020.meduniwien.ac.at/>

Outlook



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 732969 (MOON). The program is an initiative of the Photonics Public Private Partnership.



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www.photonics21.org

Acknowledgement
