

1. DELIVERABLE REPORT

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DELIVERABLE REPORT

Grant Agreement number: **248835**

Project acronym: **SPEDOC**

Project title: **Surface Plasmon Early Detection & Treatment Follow-up of Circulating Heat Shock Proteins & Tumor Cells**

Funding Scheme: **FP7**

Deliverable reported: **D7.2, Dissemination and promotion of the project results**

Due date: **M42**

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Date: 22 / 08 / 2013

Signature of reporter and scientific representative of the Coordinator:

3. Objective

The objective of WP7 is to promote the dissemination of information on the project and its scientific results in one hand and to evaluate the potential of its foreground, in terms of IP and commercial potential in the other hand.

In this document we report the tasks corresponding to dissemination part.

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4. Progress towards objectives

We present a summary of the progress of WP7, concretely **task T7.1** related to the maintenance of the website and its actualization, Dissemination to academy (**task T7.2**), industry (**task T7.3**) and general public (**task T7.4**), as part of the deliverable D7.2.

Dissemination of results of SPEDOC foreground has been very successful due to the position of academic partners on the top of their respective research field, who ensured a high quality and quantity of publications and invited talks, and also thanks to alternative and original dissemination supports such as the permanent museum and the divulgation movie.

5. Deviations

There is no deviation to report on this deliverable, except to mention that its delivery date had been moved from M36 to M42 due to the project extension.

6. Detailed explanations

2.1 Scientific/technical publications relating to the foreground of the project

Oral presentations in conferences and workshops

year 3 (M25 to M42)

T. Brulé,

SPP6, Ottawa, Canada, May 2013.

Towards a integrated plasmonic analytical platform for early cancer diagnosis,

R. Quidant,

Multidisciplinary Workshop on Enabling technologies for Cancer research, Boston, US, March 2013.

Plasmon Nano-Optics: Taming light on the nanoscale,

R. Quidant,

Ernst Abbe Lecture at the SPIE Optics and Optoelectronics, Prague, Czech Republic, May 2013.

Shining a (bright) light on the very small,

R. Quidant,

NanoSpain 2013, Bilbao, April 2013.

Shining a (bright) light on the very small,

R. Quidant,

SPP6, Ottawa, Canada, May 2013.

Shining a (bright) light on the very small,

R. Quidant,

CLEO 2013, San Jose, US, June 2013.

Towards an integrated plasmonic analytical platform,

R. Quidant,

RICI5, San Sebastian, June 2013.

Detection and characterization of biomolecules,

R. Seigneuric,

Basel, Switzerland, 27th of June 2013, (User-meeting),

Plasmon sensing in biology

Eric Finot,

University of Waterloo , Canada, July 2012

Plasmon nanosensors

Eric Finot,

University of Alberta , Canada, July 2012

Nanotechnology approaches to study the role of melatonin in molecular mechanism of amyloid toxicity and neuroprotection related to Alzheimer's disease

Eric Finot,

Nanotechnology Zing Conference 2012, Mexico, 31 oct 2012

SERS and photothermal spectroscopy for molecular detection in microfluidics

Eric Finot,

SPIE Baltimore April 2013

Applications of Surface Plasmon Polariton In Opto-Electronics & Health Diagnosis,

A. Dereux,

California Institute of Technology, Pasadena (CA), USA, May 8th ,2012.

Eric Finot,

THE 14TH INTERNATIONAL SCANNING PROBE MICROSCOPY CONFERENCE, Toronto, Canada, July 2012.

Amplitude fluctuations in dynamic Surface Enhanced Raman spectroscopy

Eric Finot,

International Conference on Nanoscience + Technology, Paris, 23-27 juillet 2012

Dynamic Nanospectroscopy of multidomain proteins in microfluidics

Thibault Brulé,

International Conference on Enhanced Spectroscopy , Oct 2012, Porquerolles France

Maerkl's group

2012 59th AVS International Symposium, Tampa, USA.

Maerkl's group

2012 MipTec 2012, Basel, Switzerland.

Maerkl's group

2012 GDR Microfluidique / Micro Nano Systems, Bordeaux, France.

Maerkl's group

2012 Institute of Chemical and Bioengineering, ETHZ, Switzerland.

Maerkl's group

2012 Institute of Biochemistry, ETHZ, Switzerland.

Maerkl's group

2013, Biomax Workshop on Microfabrication/Microfluidics, Lausanne, Switzerland.

Maerkl's group

2013, Frontiers in Nanomedicine and Imaging, Lausanne, Switzerland.

Biosensor basado en resonancias plasmónicas localizadas para la detección precoz del cáncer

C. Lopez,

X Reunión nacional de óptica, 4-7 Septiembre 2012, Zaragoza, Spain.

Bringing a compact LSPR biosensing device to early cancer detection market,

R. Porcar,

3rd International congress on biophotonics, June 19-21 2012, Jena, Germany.

A compact LSPR biosensing device for early cancer detection,

R. Porcar,

XI Conference on optical chemical sensors and biosensors EUROPTRODE, April 1-4 2012, Barcelona, Spain.

Towards an integrated plasmonic platform for early cancer diagnosis,

R. Quidant,

NFO11, San Sebastian, Spain, September 2012

Optical Antennas for enhanced light-matter interaction

R. Quidant,

Workshop on plasmonics, Erlangen, Germany, August 2012

Plasmon Nano-optics:Taming light on the nanoscale for enhanced light-matter interaction

R. Quidant,

13èmes Journées de la Matière Condensée, Montpellier, France, August 2012

Bright and hot surface plasmons

R. Quidant,

Molecular Nano and Biophotonics Workshop, Hyères, France, June 2012

Molecular plasmonics and its application to nanochemistry, biosensing and single photon sources

R. Quidant,

E-MRS 2012 Spring Meeting, Strasbourg, France, May 2012

Mode-selective Raman spectroscopy and optical trapping using plasmonic antennas,

O.J.F. Martin,

FUNMOLS Workshop, IBM Zurich Research Laboratory, Rüschlikon, Switzerland, January 16-18, 2012.

Monitoring cell metabolism using plasmon resonance energy transfer (PRET),

O.J.F. Martin,

META'12, 3rd Int. Conf. on Metamaterials, Photonic Crystals and plasmonics, Paris, France, April 19-22, 2012, 44 (2012).

On the usage of Fano resonances for sensing,

O.J.F. Martin,

META'12, 3rd Int. Conf. on Metamaterials, Photonic Crystals and plasmonics, Paris, France, April 19-22, 2012, 102 (2012).

Antennas, flowers and bridges: Plasmonic nanostructures to control light at the nanoscale,

O.J.F. Martin,

MicroNanoFabrication Annual Review Meeting, EPFL, Lausanne, Switzerland, May 8, 2012.

Byosynthesis of gold nanoparticles in human cells,

O.J.F. Martin,

Int. Conf. on Nanophotonics 2012, Beijing China, May 27-30, 2012, 34 (2012).

Fano resonances in plasmonic systems,

O.J.F. Martin,

short course at the METAIN school on metamaterials, Tata Institute of Sciences and Technology, Hyderabad, India, June 26 – July 1, 2012.

Plasmonic trapping: Controlling nanoparticles at the nanoscale,

O.J.F. Martin,

Perspectives in nanophotonics, Tata Institute of Sciences and Technology, Hyderabad, India, July 2-3, 2012.

Fano resonant plasmonic systems: Functioning principles and applications,

O.J.F. Martin,

TaCoNa Photonics, Bad Honnef, Germany, October 24-26, 2012.

Fano resonant plasmonic systems: Functioning principles and applications for sensing,

O.J.F. Martin,

Int. Workshop on Nanophotonics, Abdus Salam International Centre for Theoretical Physics (ICTP), Trieste, Italy, December 3-7, 2012.

Tunable Fano resonances in modified dipole antennas,

A. Lovera,

Gordon Research Conference on Light-Matter Interaction at the Nanoscale, Waterville, U.S.A., June 10-15, 2012.

year 2 (M13 to 24)

Controlling and utilizing optical forces at the nanoscale with plasmonic antennas

Andrea Lovera and Olivier J. F. Martin

Nanophotonics and Metrology Laboratory, Swiss Federal Institute of Technology Lausanne (EPFL), 1015 Lausanne, Switzerland

SPIE 2011, 21-25 August, San Diego, CA, USA.

Combined Plasmonic Trapping and Surface-Enhanced Raman Spectroscopy Integrated into Microfluidics

A. Lovera, G. Suarez, O.J.F. Martin

Nanophotonics & Metrology Laboratory, EPFL, 1015-CH, Lausanne, Switzerland

SJ. Maerkl

Laboratory of Biological Network Characterization, EPFL, 1015-CH, Lausanne, Switzerland

The 5th international conference on Surface Plasmon Photonics (SPP5) , May 15-20, 2011, BEXCO, Busan, South Korea

Optical trapping at the ultimate nanoscale in the near-field of plasmonic antennas

O.J.F. Martin

CLEO 2011, Conference on Lasers and Electro-Optics, Baltimore, USA, May 1-6, 2011.

Optical trapping in plasmonic nanostructures

O.J.F. Martin

Plamons 2011, Pabellón Argentina, Córdoba, Argentina, May 7, 2011.

Integration of plasmonic trapping in microfluidics for sensing applications

O.J.F. Martin

World of Photonics Congress 2011, Munich, Germany, May 23-25, 2011.

Optical forces in plasmonic nanostructures: new functionalities for nanophotonic circuits

O.J.F. Martin

Integrated Photonics Research Conference, Silicon and Nano Photonics (IPR), Toronto, Canada, June 12-16, 2011

Optical forces in plasmonic metamaterials

O.J.F. Martin

International Conference on Materials for Advanced Technologies, Singapore, June 26 – July 1, 2011.

Controlling light at the nanoscale with optical antennas

O.J.F. Martin

A*STAR Metamaterials Workshop, Singapore, July 1, 2011.

Plasmonics: Introduction and applications

O.J.F. Martin

Tutorial at the 8th Int. Symp. on Modern Optics and Its Applications, Bandung, Indonesia, July 4-7, 2011.

Controlling light and optical forces at the nanoscale using plasmonic antennas

O.J.F. Martin

8th Int. Symp. on Modern Optics and Its Applications, Bandung, Indonesia, July 4-7, 2011.

Biosensing based on plasmon resonance energy transfer

O.J.F. Martin

SPIE 2011 Optics and Photonics, San Diego, USA, August 21-25, 2011.

Engineering the optical response of hybrid plasmonic systems: Fano resonances and applications for sensing

O.J.F. Martin

SPIE 2011 Optics and Photonics, San Diego, USA, August 21-25, 2011.

Controlling and utilizing optical forces at the nanoscale with plasmonic antennas

O.J.F. Martin, A. Lovera

SPIE 2011 Optics and Photonics, San Diego, USA, August 21-25, 2011.

Sensing reactive oxygen species in stressed micro-organisms using plasmon resonant energy transfer

O.J.F. Martin

Int. Conf. on nanoplasmonic sensors in bio- and materials science, plasmon-enhanced spectroscopies and plasmon-enhanced microscopies, Göteborg, Sweden, September 19-22, 2011.

Fano resonances in plasmonic systems

O.J.F. Martin

Advanced DPG Physics School on Nanoantennas and Hybrid Quantum Systems, Bad Honnef, Germany, September 25-30, 2011.

Controlling light at the nanoscale: Advances in plasmonics and optical forces

O.J.F. Martin

University of Yamanashi Int. Symp. on Global Research in Advanced Photonics and Energy (GRAPE, UYIS 2011), Kofu, Japan, December 5, 2011.

Combined plasmonic trapping and Raman spectroscopy for nanoscale sensing

O.J.F. Martin

Int. Photonics Conference 2011, Tainan, Taiwan, December 7-8, 2011.

Optical antennas and their applications to optical trapping and sensing

R. Quidant

GDR Ondes, Nice, France, October 2011

Towards an integrated analytical platform for early cancer diagnosis

R. Quidant

CLP Day ICFO, October 2011

Optical antennas and their application to optical trapping and sensing

R. Quidant

International workshop on optical antenna and hybrid quantum systems, Bad Honnef, Germany, September 2011

Towards an integrated plasmonic analytical platform for early cancer detection

R. Quidant

International workshop on plasmonic sensing and spectroscopy, Chalmers, Sweden, September 2011

Towards a deterministic control of Surface Plasmons

R. Quidant

International workshop on nanoplasmonics for Energy and Environment, Sanxenxo, Spain, June 2011

Deterministic control of SPP fields

R. Quidant

SPP5, Busan, Korea, May 2011

When optofluidics meets plasmonics

R. Quidant

EOS/CLEO 2011, Munich, Germany, May 2011

year 1 (M1 to M12)

Carmen Garrido

Vth International Symposium on heat shock proteins in Biology and Medicine (Boston)

November 2010

Selective protein sensor based on Surface Plasmon Resonance and Surface Enhanced Raman Spectroscopy

Eric Finot

Nanomedecine 2010, Beijing- China

October 2010

Plasmon nano-optics: towards novel nanotools for biomedicine

Romain Quidant

Passion for Knowledge, Donostia, Spain

September 2010

The numerical modelling of optical nanostructures

O.J.F. Martin

11th Int. Conf. Near-field Optics and Related Techniques (Beijing, China)

August 29- September 2, 2010

Optical trapping in the near-field of plasmonic nanostructures

O.J.F. Martin

11th Int. Conf. Near-field Optics and Related Techniques (Beijing, China)

August 29- September 2, 2010

Carmen Garrido

Apoptosis Symposium in Galway

August 2010

Nano-biophotonics

Romain Quidant

Integrated Photonics Research, Silicon and Nano Photonics (IPR), Monterey, California, USA

July 2010

Application de la SPR en microfluidique : vers la détection de protéines de stress en cancérologie

Renaud Seigneuric

GIS Ingenieries et Méthodes Innovantes pour la Santé, Besançon-France

June 2010

Controlling light at the nanoscale with different types of plasmonic antennas

O.J.F. Martin

2nd Int. Workshop on Ultrafast Nanooptics, Bad Dürkheim, Germany

June 27-30, 2010

Integration of reproducible assay in microfluidics for Surface Enhanced Raman Scattering based sensors

Eric Finot

VCIAN 2010, Santorin- Greece

June 2010

Controlling light at the nanoscale with plasmonic antennas: Applications for sensing and trapping

O.J.F. Martin

The International Conference on Nanophotonics 2010, Tsukuba, Japan

May 30-June 3, 2010

Modelling plasmonic antennas and related metallic nanostructures

O.J.F. Martin

18th Int. Workshop on Optical Waveguide Theory and Numerical Modelling, Cambridge, United Kingdom

April 9-10, 2010

Optical sensing and trapping with plasmonic antennas

O.J.F. Martin

Functionalized plasmonic nanostructures for biosensing Ascona, Switzerland

April 18-23, 2010

Plasmonic nano-antennas and their utilization to control light at the nanoscale

O.J.F. Martin

Int. Workshop on Photonic Nanomaterials, PhoNa 2010, Jena, Germany

March 24-25 2010

Applications des micro et nanotechnologies au domaine biomédical : la Microfluidique

Laurent Markey

Grand-Est, Journée Régionale du Réseau des Mécaniciens, DIJON-France

January 2010

Posters presentations in conferences and workshops

year 3 (M25 to M42)

Microfluidic biosensor based on localized surface plasmon resonances for early cancer detection,

C. Lopez, R. Porcar,

5th IBEC symposium on bioengineering and nanomedicine, June 11 2012, Barcelona, Spain.

Microfluidic biosensor exploiting localized surface plasmon resonances for early cancer detection,

C. Lopez, R. Porcar,

III International workshop on analytical miniaturization and nanotechnologies, June 11-12 2012, Barcelona, Spain.

Integrated Lab-on-a-Chip Platforms For The Early Detection Of Circulating Heat Shock Proteins & Cancerous Cells,

Srdjan Acimovic, Maria-Alejandra Ortega, Mathieu Juan, Johann Berthelot, Mark P. Kreuzer, Romain Quidant,

Biosensors 2012, May 15-18 2012, Cancun, Mexico.

Fluctuations in dynamic Surface-Enhanced Raman Spectroscopy of proteins, NFO12,

T. Brulé,

San Sebastian, Sept. 2012

Synthesis of Nanoflowers for SERS,

H. Yockell,

Conference Journées Nationales Mat. Cond, Aug. 2012, Montpellier

Synthesis of Nanoflowers for SERS,

H. Yockell,

7th Int. Conference on Surfaces, Sept 2012

year 2 (M13 to 24)

Parallel plasmonic trapping and detection in a microfluidic environment

Lovera and O.J.F. Martin

Nanophotonics & Metrology Laboratory –École Polytechnique Fédérale de Lausanne

Lab-on-a-Chip World Congress , 29th and 30th September 2011 in South San Francisco, CA, USA.

A localized surface plasmon sensor for early cancer detection

Felix Rohde, Srdjan Acimovic, María Alejandra Ortega, Rafael Porcar-Guezenec

ImagineNano, Bilbao, April 2011

A localized surface plasmon sensor for early cancer detection

Felix Rohde, Srdjan Acimovic, María Alejandra Ortega, Rafael Porcar-Guezenec

Molecular Plasmonics, Jena, May 2011

A localized surface plasmon sensor for early cancer detection

Felix Rohde, Srdjan Acimovic, María Alejandra Ortega, Rafael Porcar-Guezenec

EOSOF, Munich, May 2011

A localized surface plasmon sensor for early cancer detection

Felix Rohde, Srdjan Acimovic, María Alejandra Ortega, Rafael Porcar-Guezenec

BioPhotonics, Parma, June 2011

year 1 (M1 to M12)

Trapping and detection of molecules and proteins using plasmonic antennas

Andrea Lovera, Guillaume Suarez, O.J.F. Martin

Photonics Day 2010, November 2010

Détection par SPR couplée à l'ellipsométrie en condition microfluidique de protéines HSP pour la cancérologie

A.Ollagnier





JMC12, Troyes-France, August 2010

Press release:

On April 2010 (M4) the project launched its first press release which was published both on international media. We acknowledged 35 publications during the first month. Some samples are:


- <http://www.nanowerk.com/news/newsid=16031.php>
- <http://www.alphagalileo.org/ViewItem.aspx?ItemId=74222&CultureCode=en>
- <http://www.isegurosdesalud.com/noticias-salud/diagnostico-precoz-del-cancer-id-7.htm>
- http://www.upc.edu/saladeprensa/al-dia/mes-noticies/icfo-is-doing-research-to-develop-a-device-for?set_language=en

- <http://noticias.iberestudios.com/la-politecnica-de-catalunya-colabora-en-la-deteccion-precoz-del-cancer/>
- <http://www.icrea.cat/Web/ScientificStaff/Quidant-Romain-362>

 <p>Surface Plasmon Early Detection of Circulating Heat Shock Proteins & Tumor Cells PROJECT LAUNCH PRESS RELEASE</p> <h3>ICFO investigates a miniaturized device for early cancer detection</h3> <p>The Project, born from the collaboration between oncology and nanotechnology, is developed jointly with research teams from France and Switzerland.</p> <p>SPEDOC will create the precursor of future individualized cancer diagnostic and treatment follow up devices, allowing treatment at an earlier stage and at lower doses, which will help to alleviate notably current secondary effects.</p> <p>Oncologists and Physicists from Spain, France and Switzerland are working together to develop an innovative integrated sensing platform for early cancer detection. The project—named SPEDOC (Surface Plasmon Early Detection of Circulating Heat Shock Proteins & Tumor Cells)—is coordinated by ICREA professor Romain Quidant from ICFO – Institute of Photonic Sciences, affiliated to the Universitat Politècnica de Catalunya (UPC).</p> <p>The SPEDOC project aims to produce the first prototype in three years time, combines the latest advances in nano-optics, optical manipulation and microfluidics (techniques aimed at controlling tiny volumes of fluids) with recent discoveries about the protein HSP70. According to the latter, the capacity of tumour generation as well as the metastatic potential and resistance to chemotherapy are correlated with an increase in the concentration of HSP70 in cancer cells. Likewise, cancer causes an increase in the concentration of protein HSP70 in the peripheral blood flow, at cell membranes and in cancer cells.</p> <p>Lab-on-a-chip</p> <p>Researchers in this project propose the design of a compact device to be integrated in a miniaturized platform (similar to a portable laboratory) to be used in biological labs by doctors or non-specialists in optical techniques. This integrated laboratory could be the precursor of future individualized diagnosis devices.</p> <p>Simultaneously, the early detection of cancer will help the development of new therapies that could be delivered to patients at an earlier stage and at lower doses, with the consequent decrease of secondary effects.</p> <p>The basic elements for this innovative device development are knowledge of the protein HSP70 and the development of optical sensors based on plasmonic effects. This effect is based on certain attributes of metal nanoparticle, for example gold particles, which can act as tiny but extremely efficient light and heat nanosources.</p> <p>This portable lab will gather several types of plasmonic sensors. They will enable the researchers to measure the concentration of HSP70 in the blood circulation as well as in cells membrane. Such monitoring is particularly important because it will allow detection of potential migratory cancer cells, very difficult to detect and responsible for metastasis generated by cells travelling from another parts of the body to a zone not controlled. Besides, the system used to measure the concentration of the protein HSP70 on cells membrane uses the plasmonic effect as tweezers to trap and examine the cells without damaging them.</p>  <p>Surface Plasmon Early Detection of Circulating Heat Shock Proteins & Tumor Cells</p>	 <p>Surface Plasmon Early Detection of Circulating Heat Shock Proteins & Tumor Cells PROJECT LAUNCH PRESS RELEASE</p> <p>This portable lab will gather several types of plasmonic sensors. They will enable the researchers to measure the concentration of HSP70 in the blood circulation as well as in cells membrane. Such monitoring is particularly important because it will allow detection of potential migratory cancer cells, very difficult to detect and responsible for metastasis generated by cells travelling from another parts of the body to a zone not controlled. Besides, the system used to measure the concentration of the protein HSP70 on cells membrane uses the plasmonic effect as tweezers to trap and examine the cells without damaging them.</p> <p>Researchers believe that both techniques could provide a sensitivity about ten times higher than current detection methods of cancer markers. Increasing the sensitivity in marker detection will contribute not only to the early detection of cancer but also to a higher efficiency in the treatment follow up as today considering the disease eradicated depends on the sensitivity of techniques used.</p> <p>Benefits would also be seen in treatment application, in traditional therapies as well newer ones, as the doses could be administrated sooner and at lower levels. New therapies to which we refer, also studied by Romain Quidant's group at ICFO, are based on recognition molecules inserted in gold nanoparticles. These nanoparticles travel guided by the recognition plasmonic effect of gold particles.</p> <p>The Project includes four universities and one company apart from ICFO: the University of Bourgogne, the Institut National de la Santé et de la Recherche Médicale de Dijon, the Ecole Polytechnique Fédérale de Lausanne and COSINGO-Imagine Optic Spain, S.L.</p> <p>For further information:</p> <p>SPEDOC Project www.spedoc.eu spedoc@icfo.es</p> <p>Coordinator: Romain Quidant ICFO - The Institute of Photonic Sciences Mediterranean Technology Park Av. del Canal Olímpic s/nº 08860 Castelldefels (Barcelona), Spain www.icfo.es</p>  <p>Surface Plasmon Early Detection of Circulating Heat Shock Proteins & Tumor Cells</p>
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Press release preview (two pages)

This way of communication has been maintained along the project duration:



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ABOUT ME... ARCHIVES RSS FEED

Posts Tagged 'Spedoc'

CANCER, CANCER DETECTION, EARLY CANCER DETECTION, HSP 70, SPEDOC
early cancer detection coming soon...
in Medicine on Sunday, 11 November 2012 at 11:22

Scientists develop new method for 'extremely' early cancer detection
 November 2, 2012

It may soon be possible to test a person for cancer with just a drop of their blood and a small machine. As part of a European research project, scientists have developed a device for detecting the HSP70 protein, which is over-expressed in patients with many types of cancer.

The objective: to make a diagnosis extremely early in the disease process, thereby improving outcomes for patients.

HSP70, a protein indicating stress in the human body, is a biomarker for prostate, colon, esophagus, lung, and brain cancer. Being able to track this protein in patients, making early diagnoses of these types of cancer much more likely, would therefore be very useful for doctors. As part of the 'Spedoc' European Research Project, an EPFL team is developing an extremely sensitive, easy-to-use HSP70 detection platform. The device, which will be no bigger than a small suitcase, is expected to be on the market in 2014.

How does it work?


The Spedoc platform requires only a drop of the patient's blood. The blood is inserted in a chip that contains many microchannels. Inside each of the channels are tiny and circular structures made out of gold, with a particular "anti-body" surface chemistry that is designed to "trap" HSP70. As the blood flows through the channels, the HSP70

Press release by EPFL, November 2, 2012

2.2 Industry

Newsletters:

Following the strategy established initially, newsletters have been redacted during the project on a yearly basis. In such communications of two pages in average, were presented the partners of the consortium, main objectives of the research project and the most significant results relative to SPEDOC.



SPEDOC NEWSLETTER 2011
www.spedoc.eu

SURFACE PLASMON EARLY DETECTION OF CIRCULATING HEAT SHOCK PROTEINS & TUMOR CELLS

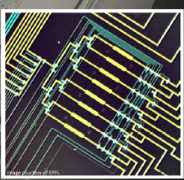
Started on January 2010, **SPEDOC** is a research initiative funded by the European Commission's Seventh Framework Programme for Research. **SPEDOC** aims at combining the latest advances of nano-optics, optical manipulation and microfluidics with recent discoveries in Heat Shock Proteins (HSP) to develop the precursor of future individualized cancer diagnosis and treatment follow-up devices.

The developed platform, integrated in a microfluidic environment, will exploit the surface plasmon resonances supported by micro- and nano-gold nanostructures.

(i) to track HSP70 proteins in the peripheral blood and (ii) to monitor its over expression at the surface of cancer cells.

This innovative platform aims to be the precursor of a high sensitive point of care device to be used in biological labs by medical doctors. It should also permit providing treatment to cancer patients at an earlier stage and at lower doses with the consequent decrease of secondary effects.

In this first Project Newsletter we would like to present the basis of our investigation as well as the main results obtained during this first year of work.



Prof. Dr. Romain Quidant
Scientific Coordinator
ICFO - The Institute of Photonic Sciences
romain.quidant@icfo.es

This project is funded by the European Commission's Seventh Framework Programme for Research (FP7)



CONTEXT AND OBJECTIVES

While conventional ELISA (Enzyme-linked Immunosorbent Assay) tests have been recently used to detect circulating HSP70 proteins, the maximum sensitivity remains limited to a few ng/ml and requires assays that may denature the protein compromising the target affinity for the receptor and extend and complicate the assay. Beyond the sensitivity issues, there is not, to date, any technique, which enables detecting HSP70 directly at the cell membrane surface in serum, which would provide much higher reliability in diagnosis.

Independently, latest advances in nanotechnologies have led to new ultrasensitive sensing schemes able to detect low concentration of specific target molecules. Among the most promising approaches, metallic nanostructures, supporting the so-called surface plasmon resonances, combine (i) a high sensitivity to tiny changes of their surrounding refractive index as induced by the binding of molecules with (ii) intense optical fields suitable for enhanced Raman scattering and enhanced optical trapping.

The **SPEDOC** project aims at developing a novel integrated optical sensing platform based on surface plasmons (SP) for early diagnosis, treatment monitoring and follow-up of cancer at the level of oncology research institutes. By using the latest advances of surface plasmon nano-photonics, we investigate different configurations of compact and ultra sensitive sensors able to detect HSP70 proteins both in the peripheral blood and at the surface of cells of a mice model, using resonance perturbation, scattering imaging and Surface Enhanced Raman Scattering (SERS), respectively. The developed sensors will be implemented in an advanced microfluidics chip to increase reproducibility, reduce the volume of analyte involved and enable parallel detection experiments on a single chip.

Cancer has become the leading cause of death in the world and costs more in productivity and lost life than any other illness, according to the American Cancer Society report presented at the 2010 World Cancer Congress. Although the risk of dying from cancer has been decreasing since the early 1990s, the rate of new cancers remains stable. The treatment of cancer is therefore progressively improving but the disease remains devastating. In this "war" against cancer, one main strategy, complementary with the improvement of treatments, aims at detecting the disease at an earlier stage.

In practice, the higher the sensitivity of the detection is, the earlier the cancer can be identified and treated. This high sensitivity is currently not available, neither in clinical nor point-of-care environments, nor at an institutional oncology research level. Indeed, today diagnosis still relies mainly on microscopic (but not molecular) cues, when the tumor is already composed of several millions of cancer cells. Alternatively, tracking cancer at the molecular level by monitoring the presence of cancer markers in the patient's body would enable to better anticipate the development of the disease. In this context, the **SPEDOC** project is a multidisciplinary European initiative that joins forces of physicists and oncologists to develop a novel ultrasensitive cancer-marker sensing platform for early detection and accurate treatment monitoring.

Prior research studies have demonstrated that in cancer patients, HSP70 (Heat Shock Protein 70) is over-expressed at the surface of cancer cells and in the peripheral blood. Therefore, HSP70 is an interesting target to be tracked in the organism of a patient for at least 2 reasons: Firstly, HSP70 over-expression is associated with many cancers. Secondly, since HSP70 is expressed on the outer membrane of cancer cells but not normal cells, it may also be possible to detect circulating tumor cells in serum.



Towards an integrated Optical Platform for the high sensitivity detection of cancer markers.

This project is funded by the European Commission's Seventh Framework Programme for Research (FP7)



The three main objectives of the project read

- **Objective1:** Increasing the reliability and sensitivity of HSP70 tracking by using ultra-specific detection schemes (coupling highly specific receptors with state of the art plasmonic platforms) able to monitor the concentration of over-expressed biomarkers both circulating in the blood and accumulated at tumour cells membrane. This would facilitate cancer detection in an earlier developmental stage for a more efficient population pre-screening and follow-up.
- **Objective2:** Increasing the detection throughput: The combination of microfluidics and plasmonic nanosensors will facilitate the implementation into a clinical setting due to faster and parallel assays with fewer steps and lesser sample consumption over existing methods.
- **Objective3:** Integration of optical transduction and plasmonic tweezers into a compact platform able to operate in a biology or oncology laboratory setting. Such device should be understood as a precursor of a future portable device enabling point of care (POC) diagnostics in a medical environment.

Description of the work performed and Main research achieved so far

Over the first year of the project, the collaborative efforts of the **SPEDOC** partners have enabled to implement skills and know-how from the different fields of expertise and some first main achievements towards the detection of circulating HSP70 have already been accomplished.

Design and fabrication of plasmonic architectures for the detection of circulating HSP70 Based on extensive numerical simulations, we have identified and optimized geometries of coupled gold nanoparticles that feature high sensitivity to a tiny change of their shallow refractive index, as induced by the binding of HSP70. Based on the optimized designs, samples were fabricated using e-beam lithography.

Surface chemistry and preparation of gold particles We have successfully elaborated a surface chemistry protocol that enables to bind to the gold sensors receptors with high binding specificity to HSP70. This accomplishment is essential since it determines the specificity and therefore the reliability of the different HSP70 sensing schemes that will be investigated.

Detection of HSP70 proteins in serum by plasmonic nano-sensors.

Design and production of microfluidic design compatible with LSP sensing. We have designed and fabricated a first microfluidic platform that is compatible with LSP sensing and could enable parallel sensing assays under a wide set of experimental conditions.

Successful demonstration of sensing of protein binding in microfluidic environment After integrating the fabricated sensors into the microfluidic platform, we have lately successfully achieved the detection of protein binding and study of the binding kinetics.

The expected final results and their potential impact and use

The expected final outcome of **SPEDOC** is the integration of the most successful plasmon-based sensing schemes into a compact microfluidic platform. We foresee the platform first to achieve label-free detection of free HSP70 proteins circulating in serum with sensitivity in the 10-100 pg/ml range i.e. at least one order of magnitude beyond state of the art sensitivity of prior label-based sensing schemes. Beyond, we aim at quantifying for the first time the actual over expression of HSP70 proteins at the membrane of tumour cells circulating in serum. By the end of the project, we expect the platform to be operated by a laboratory turnkey device that could be easily operated in a biology or oncology laboratory environment for carrying out parallel assays.

The current project focuses on the detection of a danger signal (HSP70 protein in serum) combined to the direct identification of circulating cancer cells (while many studies monitor cancer indirectly through byproducts). It is therefore highly suited for detecting cancer progression and relapse.

This project is funded by the European Commission's Seventh Framework Programme for Research (FP7)



The project is based on blood samples, which are minimally invasive to collect and routinely used in clinical practice with well-established protocols. The integrated optical device within a microfluidic platform would allow a rapid and reproducible detection from small blood samples volumes without labour intensive and potentially error-prone laboratory manipulations. According to the "EMMA" 2007: Emerging Markets for Microfluidic Applications (from Market Research, <http://www.marketresearch.com/>), microfluidics components for diagnostic are expected to reach a market of a billion euros in 2011 (with a Total Accessible Market of about 5 billion euros), with major contributions due to point-of-care and clinical diagnostics.

Beyond the applications to diagnosis and treatment monitoring, the knowledge generated in **SPEDOC** is expected to contribute to the development of new treatments (e.g. by the discovery of new molecular entities), in recent years new technologies (e.g. monoclonal antibodies) and novel targeted approaches (e.g. targeting EGF receptor) have provided significant new weapons in cancer therapy. HSP70 levels are high in tumour cells and are enhanced in response to certain anti-cancer drugs. For example, STA783, a drug in Phase 3 clinical trials and which is the subject of a recent 5.1 billion deal between GlaxoSmithKline and the biotechnology firm Synta Pharmaceuticals, leads to stimulation of oxidative stress in tumour cells and a concomitant increase in HSP70 levels. HSP70 provides a major escape mechanism for tumours in response to therapies and it has been shown recently that specific targeting of HSP70 can increase tumour cell death. **SPEDOC** thus also provides a means to evaluate treatment efficacy or resistance. HSP70 antagonists have a very interesting potential for combination with drugs like STA783. HSP70 inhibitors and others that induce HSP70 expression in tumours. INERM is developing a conditional cancer treatment targeting HSP70 that fits in this innovative trend. **SPEDOC** is therefore at the cutting edge of efforts to explore new scientific information for the discovery and validation of novel therapeutic approaches such as the one targeted by the end user INERM.

A multidisciplinary Consortium

ICFO (coordinator) brings its expertise in the fields of advanced optical microscopy and spectroscopy on nanostructures, nanofabrication and optical trapping. INERM is the expert in Heat Shock Proteins and will bring all the know how to enable biochemistry, providing serum of model mice and the necessary background to guide cells manipulation with optical tweezers towards pertinent results. Located in the same city as INERM, UB will ensure the optimal interface between partners featuring expertise in nanotechnologies and the biologists of INERM. Moreover, UB brings its full support to the consortium in the design and nanofabrication plasmonic devices, near-field optical measurements, surface functionalization and biostatistics. IFR provides to the consortium strong expertise in both numerical simulations (Martin's group) and advanced microfluidics (Maer's group). Finally, COSINGO is specialized in the integration of optical devices. COSINGO's skills and experience in optical engineering will enable the development of a compact Detection Platform. As the industrial partner of the consortium, COSINGO plans to exploit the outcome of the project to offer a new generation of sensing devices for biology research laboratories.



This project is funded by the European Commission's Seventh Framework Programme for Research (FP7)

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This project is funded by the European Commission's Seventh Framework Programme for Research (FP7)

First SPEDOC newsletter

SPEDOC NEWSLETTER 2012 OCTOBER 2012
www.spedoc.eu

SURFACE PLASMON EARLY DETECTION OF CIRCULATING HEAT SHOCK PROTEINS & TUMOR CELLS

Context and Objectives

Cancer has become the leading cause of death in the world and costs more in productivity and life lost than any other illness, according to the American Cancer Society report presented at the 2010 World Cancer Congress. Although the risk of dying from cancer has been decreasing since the early 1990s, the rate of new cancers remains stable. The treatment of cancer is therefore progressively improving but the disease remains devastating. In this "war" against cancer, one main strategy, complementary with the improvement of treatments, aims at detecting the disease at an earlier stage. In practice, the higher the sensitivity of the detection is, the earlier the cancer can be identified and treated. Such higher sensitivity is though not available today neither in clinical nor point of care environment, but also at the level of oncology research institutes. Indeed, today diagnosis still relies mainly on microscopic (but not molecular) cues, when the tumor is already composed of several millions of cancer cells. Alternatively, tracking cancer at the molecular level by monitoring the presence of cancer markers in the patient's body would enable to better anticipate the development of the disease. In this context, the SPEDOC project is a multidisciplinary European initiative that joins forces of photonics experts and oncologists to develop a novel ultrasensitive cancer-marker sensing platform for early detection and accurate treatment monitoring.

Prior research studies have demonstrated that for patients affected by cancer, HSP70 (Heat Shock Protein 70) is over-expressed at the surface of cancer cells and in the peripheral blood. Therefore, HSP70 is an interesting target to be tracked in the organism of a patient for at least 2 reasons: Firstly, HSP70 over-expression is associated with many cancers. Secondly, since HSP70 is expressed on the outer membrane of cancer cells but not normal cells, it may also be possible to detect circulating tumor cells in serum. While conventional ELISA (Enzyme-Linked Immunosorbent Assay) tests have been recently used to detect circulating HSP70 proteins, the maximum sensitivity remains limited to a few ng/ml and requires labels that may denature the protein compromising the target affinity for the receptor and extend and complicate the assay. Beyond the sensitivity issues, there is not, to date, any technique, which enables detecting HSP70 directly at the cell membrane surface in serum, which would provide much higher reliability in diagnosis.

Independently, latest advances in nanotechnologies have led to new ultrasensitive sensing schemes able to detect low concentration of specific target molecules. Among the most promising approaches, metallic nanostructures, supporting the so-called surface plasmons resonances, combine (i) a high sensitivity to tiny changes of their surrounding refractive index as induced by the binding of molecules with (ii) intense optical fields suitable for enhanced Raman scattering and enhanced optical trapping.

The SPEDOC project aims at developing a novel integrated optical sensing platform based on surface plasmons (SP) for early diagnosis, treatment monitoring and follow-up of cancer at the level of oncology research institutes. By using the latest advances of surface plasmon nano-photonics, we investigate different configurations of compact and ultra-sensitive sensors able to detect HSP70 proteins both in the peripheral blood and at the surface of cells of a mice model, using resonance perturbation, scattering imaging and Surface Enhanced Raman Scattering (SERS), respectively. The developed sensors will be implemented in an advanced microfluidic chip to increase reproducibility, reduce the volume of analyte involved and enable parallel detection experiments on a single chip.

The three main objectives of the project read:

- Objective1: Increasing the reliability and sensitivity of HSP70 tracking by using ultra-specific detection schemes (coupling highly specific receptors with state of the art plasmonic platforms) able to monitor the concentration of over-expressed biomarkers both circulating in serum and accumulated at tumour cells membrane. This would facilitate cancer detection in an earlier developmental stage for a more efficient population pre-screening and follow-up.
- Objective2: Increasing the detection throughput. The combination of microfluidics and plasmonic nanosensors will facilitate the implementation into a clinical setting due to faster and parallel assays with fewer steps and lesser sample.
- Objective3: Integration of optical transduction and plasmonic tweezers into a compact platform able to operate in a biology or oncology laboratory setting. Such device should be understood as a precursor of a future portable device enabling point of care (POC) diagnostics in a medical environment.

This project is funded by the European Commission's Seventh Framework Programme for Research (FP7)

Second SPEDOC newsletter

Description of the work performed and Main research achieved so far

Joint efforts and multidisciplinary interactions between SPEDOC partners have already led to several important achievements that bring us closer to the ultimate goals of the project.

The main research achievements so far can be organized into the two main directions pursued in SPEDOC, namely the detection of circulating HSP70 in serum and the screening of tumor cells based on HSP70 overexpression.

Development of LSP-based sensing platforms to monitor low concentration of circulating HSP70

- Design and implementation of a first stand-alone, computer-controlled LSPR sensing prototype to detect low concentrations of HSP70 and monitor binding kinetics with different ligands molecules.

- Exploration and first implementation of new alternative transduction strategies to detect even lower concentrations of HSP70

Towards screening of tumor cells based on HSP70 overexpression

- Quantification of the HSP70 overexpression in several cancer cell lines.

- Development of new plasmon-based strategies towards the fast discrimination of tumor cells overexpressing HSP70.

Transverse to both main research directions, extensive biochemistry analysis have permitted to identify the best chemistry to recognize and capture both circulating HSP70 and HSP70 overexpressed at the membrane of cancer cells.

The expected final results and their potential impact and use

The expected final outcome of SPEDOC is the integration of each of the most successful plasmon-based sensing schemes into a compact microfluidic platform operated by a stand-alone device. We foresee the developed platform(s) first to achieve label-free detection of free HSP70 proteins circulating in serum with sensitivity in the 10-100 pg/ml range (i.e. at least one order of magnitude beyond state of the art sensitivity of prior label-based sensing schemes. Beyond, we aim at quantifying for the first time the actual over expression of HSP70 proteins at the membrane of tumor cells circulating in serum and exploit it for circulating tumor cell (CTC) screening. By the end of the project, we expect the platform(s) to be operated by a tabletop turnkey device that could be easily operated in a biology or oncology laboratory environment for carrying out parallel assays. Beyond the applications to diagnosis and treatment monitoring, the knowhow generated in SPEDOC is

expected to contribute to the development of new treatments (e.g.: by the discovery of new molecular entities).

A multidisciplinary Consortium

ICFO (coordinator) brings its expertise in the fields of advanced optical microscopy and spectroscopy on nanostructures, nanofabrication and optical trapping. INSERM is the expert in Heat Shock Proteins and will bring all the know how to enable biochemistry, providing serum of model mice and the necessary background to guide cells manipulation with optical tweezers towards pertinent results. Located in the same city as INSERM, UB will ensure the optimal interface between partners featuring expertise in nanotechnologies and the biologists of INSERM. Moreover, UB brings its full support to the consortium in the design and nanofabrication plasmonic devices, near-field optical measurements, surface functionalization and biostatistics. EPFL provides to the consortium strong expertise in both numerical simulations (Martin's group) and advanced microfluidics (Maerkl's group). Finally, CODINGO is specialized in the integration of optical devices. CODINGO's skills and experience in optical engineering will enable the development of a compact Detection Platform. As the industrial partner of the consortium, CODINGO plans to exploit the outcome of the project to offer a new generation of sensing devices for biology research laboratories.

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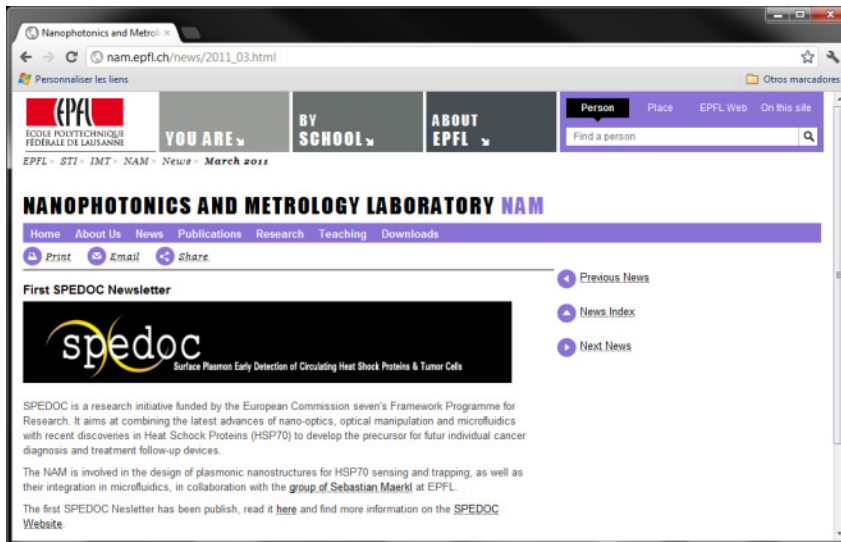
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This project is funded by the European Commission's Seventh Framework Programme for Research (FP7)

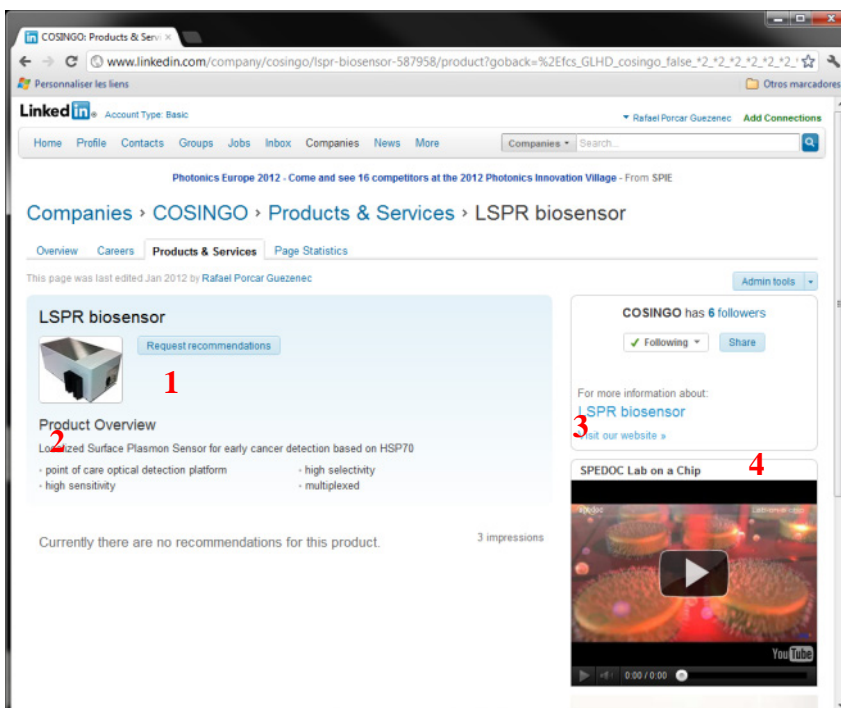
These newsletters have been relayed in the websites of the partners as well as by press release, and professional networks such as LinkedIn (Link to product webpage: [click here](#))



EPFL website



COSINGO website



Linkedin company webpage

1. Picture of the product
2. Product general specifications
3. Link to spedoc.eu website
4. Link to Youtube spedoc movie

2.3 General public

Flyers and brochures:

A flyer have been redacted to disseminate the Project. This flyer was printed during M6 and distributed through all partners to be used in events, talks and any other relevant events in which the audience gathered shall be interested in the Project. About 50 copies were sent to Mr. John Magan at the European Commission.

The design is simple but eye-catching, and contains general information on the Project aim as well as the contact details of the Project Coordinator and the website. Acknowledgement of the funding by the European Commission is done both on the front and back page.



Flyer (cover and back page)

Museum:

ICFO created a showroom in the floor plant of its building, named ICFOseum. This space is dedicated to promote the developments performed at ICFO with its collaborative partners in the framework of research projects.

SPEDOC has been awarded with a corner showing the microfluidic chip, together with the projection of the promotional movie.



Picture of ICFOseum

Websites:

The reason of having a project website is to build a platform both for project partners as well as for people interested in the project. For this reason the project website features a public and a private part (member's area). The extension of the website is .eu in accordance to EC recommendation. The website also includes the funding notice sentence for the EC as well as the EC and FP7 logos linked to the EC websites.

Project overview

Latest News

Please find in the following link the second Newsletter for SPEDOC project.

How article on Impact International SPEDOC lab was published in article on July's issue of Impact Journals "Cancer Targeting cancer with surface plasmon resonance" (see full article).

Supervisor: Jessica Goblet, Pierre Coste, Carmen Garcia. Click to read full article.

Surface Plasmon Early Detection of Circulating Heat Shock Proteins (SPEDOC)

SPEDOC is a recently started (January 2010) research initiative financially supported by the European Commission's 7th Research Framework programme. SPEDOC aims at combining the latest advances of nano-optical, optical manipulation and microfluidics with recent discoveries about heat shock proteins (HSP) to develop the prospect of future microfluidic cancer diagnosis and treatment follow-up devices.

The developed platform, integrated in a microfluidic environment will assist the surface plasmon resonances supported by micro- and nano- gold nanostructures.

(i) to block HSP70 proteins in the peripheral blood and
 (ii) monitor its over expression at the surface of cancer cells.

This innovative platform should also permit monitoring treatments cancer patients at an earlier stage and at lower doses with the consequent decrease of secondary effects.

SPEDOC counts with the collaborative participation of five research institutions and companies from France, Switzerland and Spain: Institut de Photonique Suisse, Université de Bourgogne, Institut National de la Santé et de la Recherche Médicale, Ecole Polytechnique Fédérale de Lausanne and Innogy Optics (Spain).

ICFO COSINGO EPFL Insmem UB

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Project description

Cancer causes an increased expression of Heat Shock Protein (HSP70) in the peripheral blood at the surface of and in cancer cells as a result of different sources of stress, including anti-tumor treatment. It was recently demonstrated that, using genetic, microfluidic patterns and resistance to photobleaching combined with an microfluidic environment (HSP70) in cancer cells.

The core goal of this project is to combine the latest advances of nano-optical, optical manipulation and microfluidics with the ultra-sensitive binding of HSP70 to develop a novel integrated and ultra sensitive sensing platform for early cancer detection. An early detector could benefit to diagnose but also new cancer therapies based on specific aptamers, which could be delivered sooner and at lower doses. The integrated sensing device, based on surface plasmon resonances supported by micro and nano structures, will operate in a microfluidic cell to minimize the volume of analyses and increase reproducibility.

Characterized and optimized plasmonic fields will be engineered at the nanoscale to implement two main sensing schemes:

- (i) Ultra sensitive binding of HSP70 proteins circulating in the peripheral blood based on resonance photobleaching (resonance photobleaching).
- (ii) Individual cell optical trapping (apoptosis) (selective generation of plasmonic hot-spots) combined with surface plasmon resonance and surface enhanced Raman Scattering to minimize the concentration of HSP70 proteins at the microfluidic surface and achieve sensitive cancer cell screening.

These transduction mechanisms and plasmonic features will be integrated into a compact platform to operate in a biological laboratory environment. Such a portable device should be seen as a precursor of a future device enabling point of care diagnosis in a medical environment and opening to individualized therapy.

Descriptions of the work performed and main research achieved so far

Over the first year of the project the photophysical effects of the SPEDOC sensor have extensively implemented optics and introduced from the different fields of expertise and some first main achievements towards the detection of circulating HSP70 have already been accomplished.

Original and low-cost of production architectures for the detection of circulating HSP70 based on different numerical simulations, we have designed and optimized geometries of coupling onto microfluidic that feature a high sensitivity to a tiny change of refractive index (due to the binding of HSP70). Based on the optimized design, a sensor was fabricated using e-beam lithography.

Surface chemistry and preparation of gold particles have successfully demonstrated a surface chemistry protocol that enables to load the gold sensors (resistor) with high density of specific HSP70. This accomplishment is essential since it determines the specificity and therefore the reliability of the obtained HSP70 sensing scheme that will be investigated.

Design and production of microfluidic design compatible with LSP sensing. We have designed and fabricated a first microfluidic platform that is compatible with LSP sensing and could enable parallel sensing across a wide array of experimental conditions.

Successful demonstration of coupling of probe binding to microfluidic environment after incorporating the fabricated sensors into the microfluidic platform, we have likely successfully achieved the detection of protein binding and study of the binding kinetics.

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SPEDOC website (www.spedoc.eu)

Additionally, ICFO website has been updated to increase dissemination and visibility of Research performed by the institution in collaboration with academy and industry (<http://outreach.icfo.eu/>). An important part is dedicated to SPEDOC project:

Members area

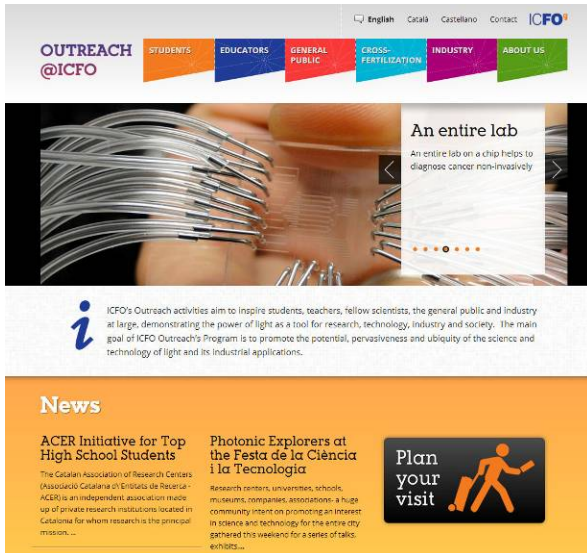
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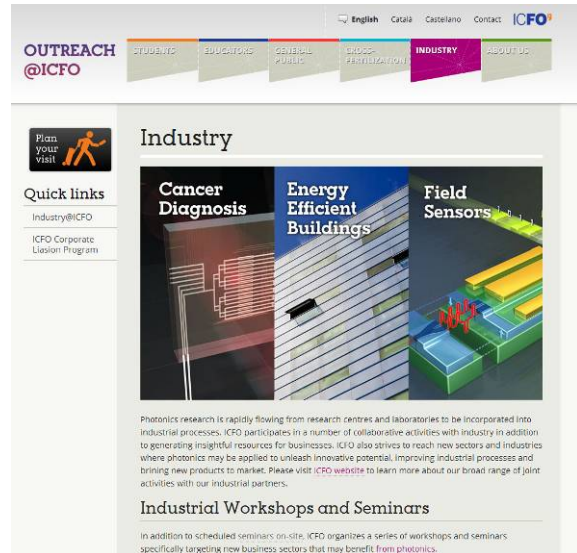
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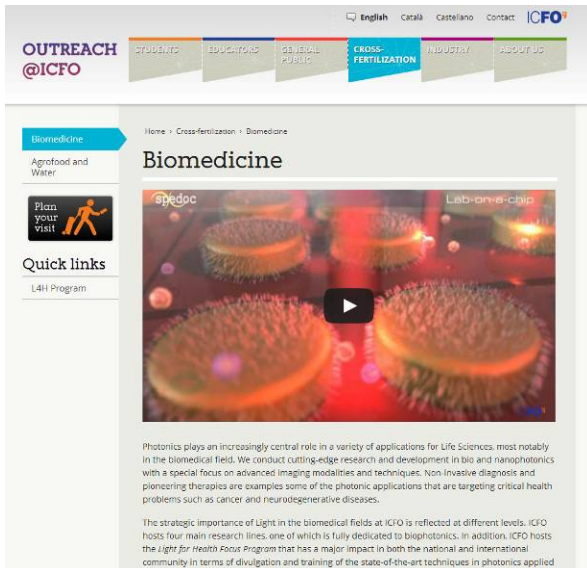
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Picture of SPEDOC lab-on-a-chip on Home page of ICFO Outreach website



Introduction of SPEDOC project and cancer diagnosis as one of the axis of ICFO collaboration with Industry



Detailed presentation of SPEDOC project on ICFO outreach specific website

In the framework of the dissemination to general public, SPEDOC project and the Optical Detection Platform prototype have been presented to the Spanish Secretary of State for Research, Ms Carmen Vela, On 5 November 2012, at ICFO ([link to the news](#))

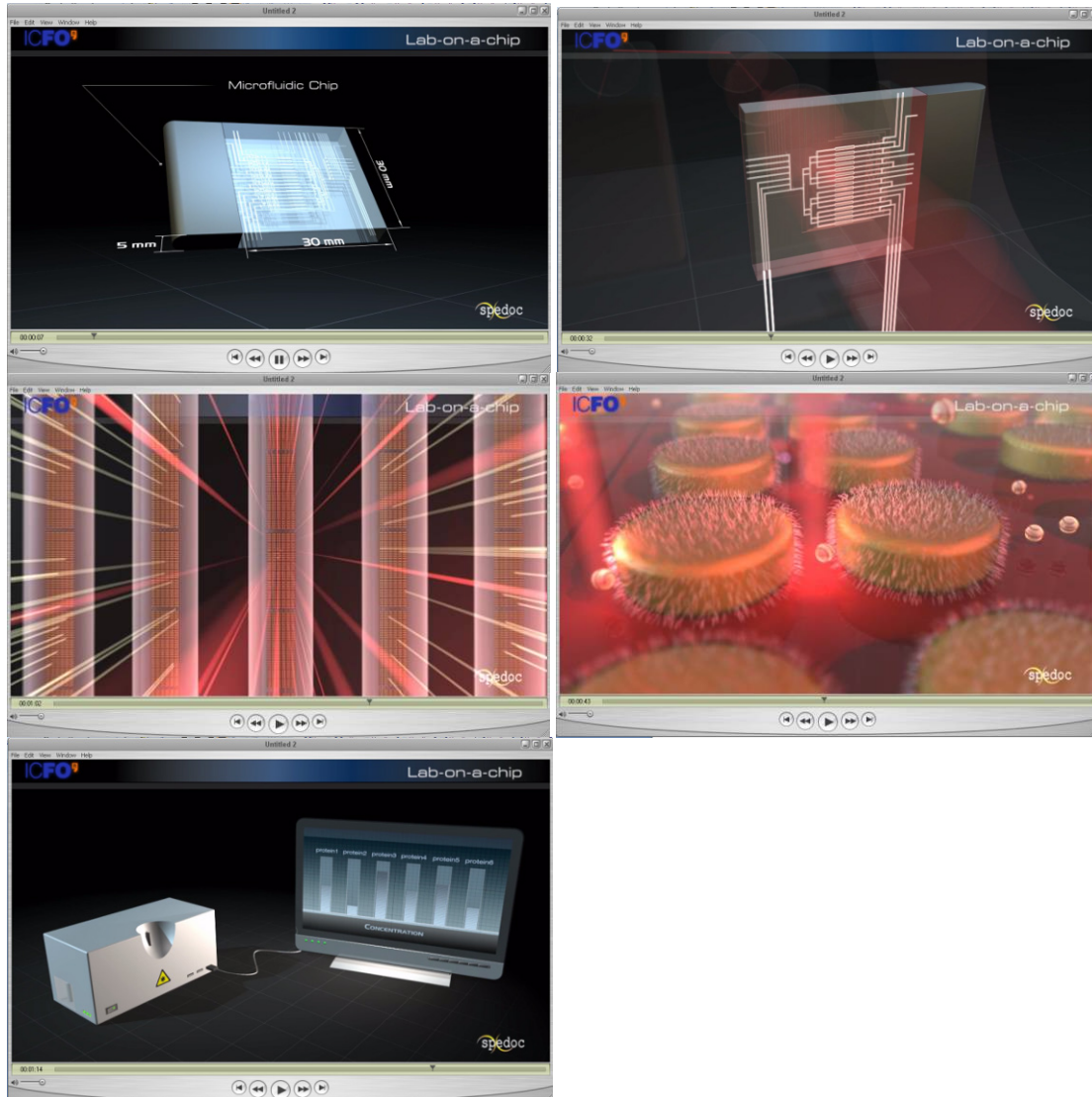


Up: Romain Quidant, SPEDOC coordinator, Carmen Vela, Spanish Secretary of State for Research and Lluís Torner, Director of ICFO around the Optical Detection Platform, Down left: discovering the lab-on-a-chip, heart of the Detection Platform

An interview has been given to the divulgation website <http://www.diariomedico.com/> by Carol Lopez in the framework of the Reunion Nacional de Optica, following her oral presentation of the Optical Detection Platform for early cancer detection (publication pending). The divulgation publication is addressed to healthcare professionals and medical doctors, being distributed everyday in more than 3000 hospitals and clinics in Spain and mailed monthly to more than 12000 centers.

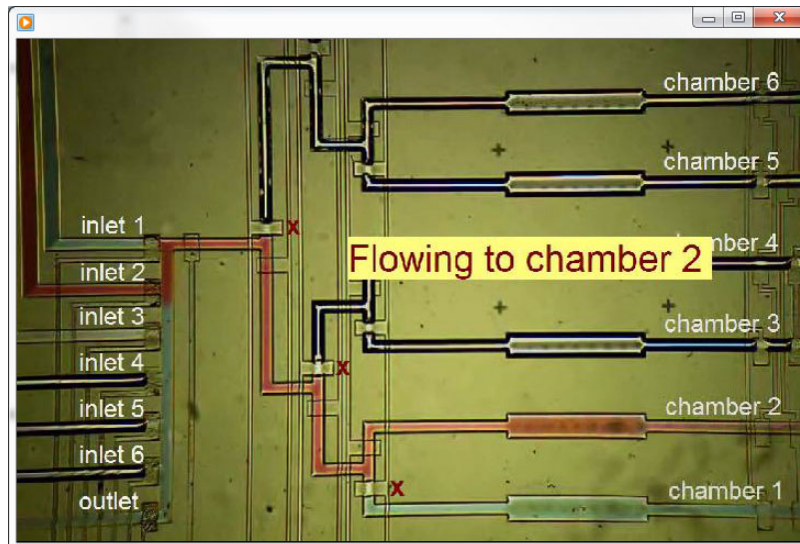
Several movies have been created during the project.

First, a video aiming at describing the project to a broad audience. The video is available to be included on the website and used in conferences or any other dissemination activities. Below are attached some screenshots of the video.



screenshots of SPEDOC divulgation movie

A dissemination movie presenting the protocol of the microfluidic chip and user-defined protocols for sensing experiments has been edited and already used in the framework of dissemination activities:



Screenshot from COSINGO movie of SPEDOC microfluidic chip used in multiplexed mode.