



PASSION FOR PHOTONS: A TECHNICAL WORKSHOP WITHIN PASSION FOR KNOWLEDGE CONFERENCE

FINAL REPORT

Summary

The Workshop "Passion for Photons" took place successfully in San Sebastian from September 29th to October 1st of 2010. This workshop was a technical encounter about the science and technology of Photonic Sciences within the more general program of the Conference "Passion for Knowledge" which merged outreach activities for the general public together with a set of 4 technical workshops.

The attendance of "Passion for Photons" was of almost 70 participants from more than 15 different countries.

There was a special session that extended for the whole day on Friday October 1st devoted to Plasmonic bionanosensing, sponsored specifically by ESF.

The meeting joint 16 invited speakers among the best experts in the world on plasmonics and nanophotonics, and other 16 oral contributions were included in the program as short contributions. In addition, all the rest of participants presented a poster in a poster session.

The level of the contributions was extremely high, and all the participants agreed that this conference had been one of the best one in the field of nanophotonics and nanoplasmonics during year 2010.

The contribution of ESF (15.000 €) to the total budget of almost 60.000 € had a major impact in the quality of the event, allowing to invite world-wide experts in the field of Plasmon bionanosensing, and sponsoring a full day meeting, including a lunch on the last day of the conference. The sponsorship and logo of ESF were displayed clearly in all the events of the conference.



Scientific content and discussions

The Scientific content of the workshop consisted in a set of 16 invited talks of 30 minutes duration, together with other 16 oral contributions of 15 minutes each.

The topics covered during the conference were selected among the most interesting topics in nanophotonics currently.

The program of the conference covered the following topics:

- Nanoantennas
- Novel Concepts in Nanooptics
- Interactions between electrons and photons
- Coherence and fast control
- Near-field microscopy and spectroscopy
- Theoretical aspects in nanophotonics
- Plasmonic Bionanosensing

To develop all the different topics, 16 experts in the world were invited to give talks in their respective fields of expertise. These talks concerned real state-of-the art trends in plasmonics and in nanophotonics, and the audience had the opportunity to access the last findings in each of the fields itemized above.

An interesting aspect of the participation in this workshop is that every invited speaker was offered to come along with a student in order to spread this high-quality profile of the program to researchers beginning their careers. More than 2/3 of the invited speakers brought one student with them to the meeting.

The participation of the workshop was at such a high level that the oral contributions were also given by well-known Professors and experts, making the whole program a very competitive selection for the contributions.

To account for the contributions from all the participants, a poster session took place on the first day of the meeting, displaying more than 35 posters on different aspects of plasmonics. This poster session was combined with the poster session of other



technical workshops devoted to electronics, polymer science, and surface physics, therefore, a great interdisciplinary atmosphere was created from the very beginning, allowing the participants to exchange views and strengthen relationships from the beginning of the meeting.

In addition to the formal contributions by invited speakers and contributed speakers, the coffee breaks and the joint lunches during the three days of the meeting developed extraordinary one-to-one interaction that turned to end in joint collaborations and joint publications during the year 2010 and 2011.

All the topics covered in the conference were really interesting, but special attention was devoted to the interaction of electrons and photons in plasmonic structures, as well as in novel spectroscopy approaches of non-linear phenomena and ultrafast processes.

The final program that was developed during the meeting can be found at the end of this document, but all participants agreed that this was one of the best meetings on plasmonics of the year due to the high level of the talks, the dynamical discussions generated during the talks and in meal-breaks, and the professional level of organization of the meeting.

This experience has been really enlightening and highly interacting for many European groups devoting their research efforts to plasmonics, and the general coordinator of the ESF Plasmon Bionanosense network had the opportunity to announce the strategy and options of the ESF network to the audience during his invited talk in the session of the last day fully sponsored by ESF.



Assesment of the results and impact on future direction of the field

The importance of this meeting can be measured by the impact in boosting new results and concepts in plasmonic nanosensing. This meeting allowed that European researches could meet American and Asian experts, and interesting exchange of ideas came into place regarding quantum plasmonics, and grapheme plasmonics. The teams of San Sebastian and Houston established an strategy to deal with novel concepts in quantum plasmonics, and the teams at ICFO, Institute of Photonic Sciences from Barcelona and the team of Madrid developed a collaboration to address the properties of graphene plasmonics, a novel concept that promises a big effort of research in plasmonics.

The meeting was useful to double check that novel trends in plasmonics are those connected with device-oriented platforms for optoelectronics, as well as those dealing with the limits of the dielectric response to describe the fine details of quantum aspects in plasmonic junctions at the molecular level. A convergence between the field of nanooptics and electronic transport properties within plasmonic junctions points out as a future platform for optoelectronic technologies.

In addition to the field of plasmonics, it was also very fruitful to have contributions from sister fields, such as photonic crystals, photovoltaics, or synthesis groups that provided new options to integrate plasmonics and plasmonic-enhanced fields in different technological areas of interest in the European roadmap of nanophotonics. These topics might have a fundamental importance in sustainable energy generation solutions, hazardous materials detection in chemistry and food industry, or novel communication schemes based on optical signal engineering at the nanoscale.

This meeting boosted and merged all these tendencies, stressing the value of plasmonics as a life research field full of technological and conceptual options to make an impact in future European Science and Technologies.



Meeting programme

WORKSHOP 'PASSION FOR PHOTONS': PROGRAM

WEDNESDAY SEPTEMBER 29

09:00-09:45 KEYNOTE PASSION FOR PHOTONS

Prof. Naomi Halas (Rice University, Houston, USA)

"Plasmonics: nanoscale manipulation of light"

NANOANTENNAS

09:50-10:20 Prof. Lukas Novotny (University of Rochester, USA)

"Nonlinear plasmonics with optical antennas"

10:20-10:50 Dr. Garnett Bryant (NIST, Gaithersburg, USA)

"Photonics with nanohybrids"

10:50-11:10 Francesco De Angelis (Italian Institute for Technology, Genova, Italy)

"Plasmon polariton nanotantenna for single molecule detection"

COFFEE BREAK

11:30-12:15 KEYNOTE PASSION FOR SOFT MATTER

Prof. Dieter Richter (Forschungszentrum Jülich, Germany)

"Soft Matter and Live Science: Research with Neutrons"

CONCEPTS in OPTICS

12:20-12:50 Prof. Sir J. Pendry (Imperial College, London, UK)

"Transformation Optics at Optical Frequencies"

12:50-13:20 Prof. Andrei Borisov (LCAM, Orsay, France)

"Bound states in a continuum: parallels between photonics and Quantum Mechanics"

13:20-13:40 Antonio García-Martín (Inst. de Microelectrónica de Madrid.CSIC Spain)

"Active magnetoplasmonics in hybrid metal/ferromagnet/metal microinterferometers"

LUNCH BREAK

15:30-17:00 POSTER SESSION



THURSDAY SEPTEMBER 30

09:00-09:45 KEYNOTE PASSION FOR INTERFACES

Prof. Fernando Flores (UAM, Madrid, Spain)

"Organic and inorganic semiconductor interfaces across physics, chemistry and time"

ELECTRONS AND PHOTONS

09:50-10:20 Prof. Archie Howie (University of Cambridge, UK)

"Photons and electrons: Tightening their embrace"

10:20-10:50 Prof. F.J. García de Abajo (Institute of Optics CSIC, Madrid, Spain)

"Photons and electrons team up"

10:50-11:10 Dr. Alejandro Reyes Coronado (IESL-FORTH, Heraklion, Greece)

"Plasmonic forces induced by electrons"

COFFEE BREAK

COHERENCE AND FAST CONTROL

11:40-12:10 Prof. Peter Nordlander (Rice University, UK)

"Fano resonances in plasmonic nanostructures"

12:10-12:40 Prof. Mark Stockman (Georgia State University, Atlanta, USA)

"Trends in Nanoplasmonics: Ultrasmall, Ultrafast, Ultrastrong"

12:40-13:00 Dr. Otto Muskens (University of Southampton, UK)

"Active plasmonic nanoantennas for optical switching"

13:00-13:20 Dr. Ricardo Sapienza (ICFO, Barcelona, Spain)

"LDOS fluctuations probed by single-molecule spectroscopy in random and periodic media"

LUNCH BREAK

TAKING ADVANTAGE OF THE NEAR_FIELD

15:30-16:00 Dr. Rainer Hillenbrand (nanoGUNE, San Sebastian, Spain)

"scattering-type Scanning Near-Field Optical Microscopy"

16:00-16:20 Dr. Riedel Damien (Nanophysics Lab. CNRS, Orsay, France)

"A scanning tunneling microscope as a tunable nanoantenna for atomic scale control of optical-field enhancement"

16:20-16:40 Dr. M.L. Juan (ICFO, Barcelona, Spain)

"Self-induced back-action optical trapping"

16:40-17:00 Dr. Amador Menéndez (Instituto tecnológico de Materiales de Asturias, Spain)

"Improving the efficiency of luminescent solar concentrators"



FRIDAY OCTOBER 1: MORNING SESSION

THEORY

9:00-9:30 Prof. Nader Engheta (University of Pennsylvania, USA)

"From Electronics to Metatronics to Graphene Metamaterials"

9:30-10:00 Prof. F. J. García Vidal (Universidad autónoma de Madrid, Spain)

"Controlling the flow of surface plasmons"

10:00-10:30 Prof. Juan José Sáenz (Universidad autónoma de Madrid, Spain)

"Resonant optical forces on metallic and dielectric nanoparticles"

10:30-10:50 Prof. Fernando Moreno (Universidad de Cantabria, Santander, Spain)

"Electromagnetic interactions between plasmon nanostructures and substrates"

COFFEE BREAK

PLASMON-BIONANOSENSE (ESF SPONSORED SESSION)

11:15-11:45 Dr. Romain Quidant (ICFO, Barcelona, Spain)

"Plasmon nano-optics: designing novel nanotools for Biosciences and Medicine"

11:45-12:15 Prof. Mikael Kall (Chalmers University of Technology, Sweden)

"Nanoplasmonic sensing: refractive index, SERS and optical forces"

12:15-12:35 Prof. J.R. Krenn (University of Graz, Austria)

"Plasmonic control of elementary emitters"

12:35-12:55 Dr. Jaime Gómez Rivas (AMOLF, The Netherlands)

"Collective plasmonic resonances in arrays of nanoantennas"

12:55-13:15 Prof. Luis Martín-Moreno (Inst. de Ciencia de Mat. de Aragón, Spain)

"Extraordinary optical transmission due to strongly localized modes"

13:15-13:35 Alberto Curto (ICFO- Barcelona, Spain)

"A nano-optical Yagi-Uda antenna driven by a quantum dot"

LUNCH BREAK (SPONSORED BY ESF)

FRIDAY OCTOBER 1: AFTERNOON SESSION PLASMON BIO-NANOSENSE (ESF SPONSORED SESSION)

15:30-16:00 Prof. Stefan Maier (Imperial College, London, UK)

"Correlative electron and optical spectroscopies of metallic nanostructures and applications in nanometrology"

16:00-16:20 Dr. Andrea Csáki (IPHT, Jena, Germany)

"Plasmonic-tuned microstructured optical fibers for localized surface plasmon resonance (LSPR) sensing"

16:20-16:40 Bjoern Niesen (IMEC vzw, Leuven, Belgium)

"Interactions of excitons with localized surface plasmons in organic semiconductor-metal nanoparticle thin-films"

16:40-17:00 Antonio Fernández (Imperial College, London, UK)

"Kissing spheres: broadband response and superfocusing properties"