

Scientific report

EMRS spring meeting 2012 – Symposium N

Control of light at the nanoscale: materials, techniques and applications

1. Summary

The symposium N of the spring meeting of the EMRS 2012 aimed to gather researchers interested in improving the control over light at a truly nanoscale level. It took place in Strasbourg, Palais de la Musique et des Congrès, from the 14th May to the 18th. Discussions were focused on presenting the recent breakthroughs in the ability to control, concentrate, and produce light at the nanoscale – evolving towards quantum optics on the nanoscale. Emphasis was put on the methods to fabricate and characterize the materials enabling these abilities: advanced fabrication methods including e-beam, FIB, self-assembly and synthesis of nanometric sources of light, and deeply sub-wavelength and/or time resolved microscopic methods applied to nanophotonics (SNOM, EELS, PEEM...). Moreover, the effort towards nanophotonic devices has been developed *via* the discussion of active components and strategies to guide and concentrate light on a subwavelength scale. The symposium also addressed the question of how the community tackles the problem of attenuation in plasmonic structures. Eventually, progress on all these fronts is fostered by the development of computational or theoretical models – this has been touched upon by this symposium as well. Every session was opened by invited contributions from speakers leading in their field.

In parallel, Symposium O focused on Plasmonics specifically. As the scopes of the two symposia were overlapping on the theme of Plasmonics Nanoantennas, a one-day joint session has been organised.

The total budget of the symposium exceeded 11,000€, which allowed to take in charge a large part of the expenses of the invited speakers and the organisers', to award two best poster prizes and support one contributor from India.

2. Description of the scientific content

The scientific content, described session by session, was as follows:

- Sessions Nanoscale Characterisation I and II:

Opened by the invited contributions of Prof. Martin Aeschlimann (Univ. Kaiserslautern) and Prof. Albert Polman (AMOLF Amsterdam). Several contributions discussing ways to observe light-matter interactions at resolutions beyond the diffraction limit. These included fully optical methods (SNOM) and methods using electrons (PEEM, cathodoluminescence...)

- Session Metamaterials:

Opened by invited contribution by Wei Ting Chen (instead of Prof. Din Ping Tsai, National Taiwan University). Contributions about the way metamaterials can have chiral properties, and properties of antennas in hyperbolic media (for instance media with negative refractive index).

- Session Non Linear Processes:

Contributions showing the benefits of using nanoparticles to enhance non-linear interactions and processes.

- Sessions Plasmonic Nanoantennas I to IV:

This joint session with symposium O, covering a full day of presentations, included the invited presentations by Prof. Bert Hecht (Univ. Würzburg), Federico Capasso (Harvard), Niek van Hulst (ICFO Barcelona), Teri Odom (Northwestern Univ.), Mark Brongersma (Stanford). Contributions about the properties of light focussing, steering of optical nanoantennas. Active control of nanoantennas.

- Session Nanoscale Quantum Optics:

Opened by the invited contribution of Nathalie De Leon (instead of Mikhail Lukin, Harvard). Contributions about the possibility to use plasmons in the quantum regime for quantum information, and about quantum emitters.

- Session Nanosources of Light:

Opened by Dr. Serge Huant (Institut Néel, Grenoble, invited). Contributions about synthesis and properties of various nanosources of light (nanocrystals and quantum dots).

- Session Metal-Emitter Coupling:

Opened by the invited contribution of Prof. C.D. Geddes (Univ. of Maryland). Contributions about the influence of metal close to emitters (Förster radius, quenching...)

- Sessions Active Nanophotonics I and II:

Invited contributions by Prof. Anatoly Zayats (King's College, London) and Frank Koppens (ICFO, Barcelona). Contributions about active devices using thermo-optical effects, graphene. Loss compensation, propagation control of plasmons.

- Session Plasmonics in Other Fields:

Opened by Prof. Nikolay Zheludev (University of Southampton, invited). Contributions about metal-assisted optical trapping, sensing and SERS.

- Session Computational and Theory:

Opened by Prof. Mario Agio (ETH Zurich, invited). Contributions about various theoretical and computational methods to tackle problems involving light on nanometric scales.

- Session Advanced Nanofabrication:

Opened by Erik Dujardin (CEMES Toulouse, invited). Contributed talks mostly about self-assembled nanosystems with interesting optical properties.

- Session Plasmonics and Energy:

Opened by Prof. Harry Atwater (Caltech, invited). Contributions about approaches to improve thin-film solar cells.

- Poster sessions:

The symposium hosted two poster sessions, with topics identical to the ones of the regular sessions. More than 60 posters have been presented.

3. Discussion of the event

The symposium received in excess of 140 submissions, of which 60 have been selected for an oral presentation. The invited contributions were of outstanding quality, show-casing the latest research results from world-leading groups. Many contributions presented works of excellent quality.

Graduate Student Awards have been awarded by the symposium's organisers, after nomination of candidates with strong support from their supervisors. The two students selected for the award after interview were:

- Ms. Martina Abb, University of Southampton (UK)
- Ms. Saba Saeed, Univesity of Amsterdam (Netherlands)

The proceedings of the symposium will be joint proceedings with symposium O. Two options have been offered to the attendees: either regular proceedings in Plasmonics (Springer), or a proceeding in a new open-access journal of the Nature group: Scientific Reports. The former option will be published shortly after the summer, the latter in December.

The total budget of the symposium included 6,400€ from the EMRS, 7000€ by the ESF, and a total of 1090€ from industrial sponsors (PicoQuant and Witec). The logos of the sponsors (ESF, PicoQuant and Witec) were present on the web page of the symposium throughout, were visible on the symposium's program and displayed whenever announcements have been made during the symposium. We thank the ESF for its support as it allowed for:

- Covering some of the 13 invited speakers' and organisers' travel and accommodation expenses
- The support of a contributor (travel & accommodation expenses)
- Awarding two best poster prizes (300€ each), to Mr. Maxime Bayle (CEMES Toulouse) and Mr. Zackaria Mafoud (Université Paris Sud, Laboratoire de physique des solides).
- Cover some living expenses of the invited speakers and organisers.

4. Assessment of results and impact

The feedback from attendees about the symposium is very positive, usually emphasising the high quality of the contributions. It has been a success and allowed attendees to hear about, and discuss the new results presented. Surely this will trigger new research directions and foster new collaborations worldwide.

5. Full list of speakers and participants: to be found in attachment

Note that this list comprises only the participant who asked for the printed proceedings.