NEWSLETTER #1

PHOTONICS ANTENNAS FOR BIOLOGY
Tools for biosensing and cellular imaging

OBJECTIVES

- The first objective of NanoVista is to pioneer the technological development of **novel photonic antenna** geometries (probes & 2D arrays) with improved physical properties that will provide both **ultrasensitive detection** at **high sample concentrations** in fluids and simultaneous spatial **nanometric resolution** and **sub-ms** time resolution in living cells.

- The second objective of the project is to develop **high-throughput large-scale nanofabrication** of photonic antenna arrays fully compatible with biomolecule detection and live cell nanoimaging while ensuring **low cost**, **improved performance**, substrate and design flexibility.

- The third objective of the consortium is to demonstrate the improved performance and functionality of the bionanophotonic technology for a) **ultra-sensitive detection of biomolecules for diagnostic** purposes with transferability into a potential market product and b) nanoimaging and **nanospectroscopy on living cells** being fundamental in strategic applications of cell biology and immunology.

PARTNERS

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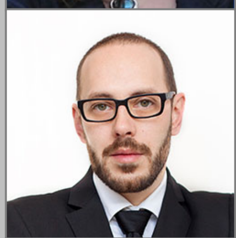

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IN BRIEF

Project reference: **288263**; Funded under: **Information and Communication Technologies**; Area: **ICT-2011.3.5 - Core and disruptive photonic technologies**; Total Cost: **€4.12 Millions**; EU contribution: **€3.02 Millions**; Consortium: **5 partners from 4 different European countries**; Duration: **2011-2016**.

MORE INFORMATION: www.nanovista.eu

SEVENTH FRAMEWORK PROGRAMME

NEWSLETTER #1

nanoVista

KICK OFF

Fig. The European consortium of NanoVista met on the 10th of January 2012 to launch officially the project.

NEWS

- During the first year, the consortium achieved the design and characterization of many antennas geometries such as: dipole antennas, gap-dipole antennas, bowtie nano-apertures (BNA), monopole antennas on BNA, nanostar antennas and asymmetric gap antennas, as well as 2D antennas arrays allowing the generation of illumination hotspots free of background contribution from far field excitation. They are being tested on individual molecules embedded in thin polymer layers and for nano-imaging of cell surface receptors on intact cells.
- In addition, two major processes of fabrication have been explored: direct metal nanocutting and stencil lithography.
- Last, ultra-sensitive detection of biomolecules for diagnostic purposes has been pushed forward based on two approaches: FCS signal enhancement on dimer-antennas embedded in nano-boxes, extending this technique to single pair FRET measurements of proteins bound to DNA at similarly high concentrations using Al-based dimers on boxes, and new technology based on highly geometrically and optically uniform ensembles of high aspect ratio triangular silver nanoplate (TSNP) antennas with excellent ensemble local surface plasmon refractive index sensitivities.

FIRST YEAR PUBLICATIONS

- **A plasmonic 'antenna-in-box' platform for enhanced single-molecule analysis at micromolar concentrations**
D. Punj, M. Mivelle, S. B. Moparthi, T. S. van Zanten, H. Rigneault, N. F. van Hulst, M. F. Garcia-Parajo, J. Wenger
Nature Nanotechnology DOI: 10.1038/NNANO.2013.98
- **Ultra-bright, free-standing bowtie nanoperture antennas probed by single molecule fluorescence**
M. Mivelle, T. S. van Zanten, L. Neumann, N. F. van Hulst, M. F. Garcia-Parajo
Nano Letters 12, 5972-5978, (2012)
- **Recent progress in cell surface nanoscopy: Light and force in the near-field**
Y. F. Dufrêne, M. F. Garcia-Parajo
Nano Today [online DOI:10.1016/j.nantod.2012.08.002] (2012)
- **A Scanning Resonant Dipole Antenna Probe**
Lars Neumann, Jorick van't Oever, Anshuman Singh, Niek van Hulst
Nano Letters
- **Saturated excitation of fluorescence to quantify excitation enhancement in aperture antennas**
H. Aouani, R. Hostein, O. Mahboub, E. Devaux, H. Rigneault, T.W. Ebbesen, and J. Wenger
Opt. Express 20, 18085-18090 (2012)
- **Large area gold/parylene plasmonic nanostructures fabricated by direct nanocutting**
V. Auzelyte, B. Gallinet, V. Flauraud, Ch. Santschi, S. Dutta-Gupta, O. J. F. Martin and J.Brugger
Advanced Optical Materials 1: 50–54, doi: 10.1002/adom.201200017, *coverpage*