

PROJECT FINAL REPORT

Use and Dissemination of Foreground, Section A

Grant Agreement number: 288869

Project acronym: NAVOLCHI

Project title: Nano Scale Disruptive Silicon-Plasmonic Platform
for Chip-to-Chip Interconnection

Funding Scheme: Collaborative Project

Period covered: from 2012-11-01 to 2015-07-31

Name, title and organisation of the scientific representative of the project's coordinator¹:

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¹ Usually the contact person of the coordinator as specified in Art. 8.1. of the Grant Agreement.

² The home page of the website should contain the generic European flag and the FP7 logo which are available in electronic format at the Europa website (logo of the European flag: http://europa.eu/abc/symbols/emblem/index_en.htm logo of the 7th FP: http://ec.europa.eu/research/fp7/index_en.cfm?pg=logos). The area of activity of the project should also be mentioned.

Section A (public)

A1: PUBLICATIONS								
NO.	Title	Main author	Title of the periodical or the series	Number, date or frequency	Publisher	Year of publication	Relevant pages	Is/Will open access ³ provided to this publication?
1	Plasmonic-organic hybrid (POH) modulators for OOK and BPSK signaling at 40 Gbit/s	<i>A.Melikyan</i>	<i>Opt.Express</i>	<i>23, 2015</i>	<i>OSA</i>	<i>2015</i>	<i>9938-9946</i>	Yes
2	All-plasmonic Mach–Zehnder modulator enabling optical high-speed communication at the microscale	<i>Haffner</i>	<i>Nature Photonics</i>	<i>9, 2015</i>	<i>Nature</i>	<i>2015</i>	<i>525-528</i>	No
3	High-speed plasmonic phase modulators	<i>A.Melikyan</i>	Nature Photonics	8, 2014	Nature	2014	229-233	No
4	Photonic-to-plasmonic mode converter	A.Melikyan	Opt. Express	39, 2014	OSA	2014	3488-2391	No
5	Plasmonic Communications: Light on a Wire	J. Leuthold	Opt. Photon.News	24, 2013	OSA	2013	28-35	No
6	Color tuning and white light by dispersing CdSe, CdTe and CdS in PMMA nanocomposite waveguides	H. Gordillo	IEEE Photon	J.5	IEEE	2013		No
7	Quantum-dot double layer polymer waveguides by evanescent light coupling	H. Gordillo	, IEEE/OSA J. of Lightwave Technol	31, 2013	IEEE/OSA	2013	2515-2525	No
8	Dielectric and plasmonic waveguides	Suárez, H	Opt. Pura Apl	April. 46	OSA	2013	303-308	No

³ Open Access is defined as free of charge access for anyone via Internet. Please answer "yes" if the open access to the publication is already established and also if the embargo period for open access is not yet over but you intend to establish open access afterwards.

	based on quantum dots embedded in polymers							
9	Efficient excitation of photoluminescence in a two-dimensional waveguide consisting of a QD-polymer heterostructure	Suárez, H	Optics Letters	39, 2014	OSA	2014	4692-4695	No
10	UV-patternable nanocomposite containing CdSe and PbS as miniturized luminescent chemo-sensors	P. Rodríguez-Cantó	RSC Advances			2015	19874-19883	No
11	MWP phase shifters integrated in PbS-SU8 waveguides	J. Hervás	Optics Express	23, 2015	OSA	2015	14351-14359	No
12	Low-Loss Silicon Nitride Waveguide Hybridly Integrated With Colloidal Quantum Dots	W. Xie	Optics Express	23, 9, 2015	OSA	2015	12152-12160	Yes
13	Modeling the optical properties of low-cost colloidal quantum dot functionalized strip SOI waveguides	A. Omari	Journal of Selected Topics in Quantum Electronics	99,2013	IEEE	2013		No
14	Giant and Broadband Absorption Enhancement in Colloidal Quantum Dot Monolayers through Dipolar Coupling	P. Geiregat	ACS Nano	7(2)	ACS	2012	987-993	No
15	Light absorption in hybrid silicon-on-insulator/quantum dot waveguides	A. Omari	Optics Express	21(20)	OSA	2013	23272-23285	Yes
16	Broadband and Picosecond Intraband Absorption in Lead-Based Colloidal Quantum Dots	De Geyter, B	Acs Nano	6, 2012	ACS	2012	6067-6074.	no
17	From fabrication to mode mapping in silicon nitride microdisk with embedded colloidal quantum dots	B. De Geyter	Applied Physics Letters	101 (16)	IEEE	2012	161101~4	no
18	Multiple Dot-in-Rod PbS/CdS Heterostructures with High Photoluminescence Quantum Yield in the Near-Infrared	Yolanda Justo	Journal of the American Chemical Society	134, 2012		2012	5484-5487	no

19	The plasmonic memristor: a latching optical switch	C. Hoessbacher	Optical	1, 2014	OSA	2014	198-202	yes
20	108 Gbit/s Plasmonic Mach-Zehnder Modulator with > 70 GHz Electrical Bandwidth	W. Heni	J. Lightwave Technol.,		OSA	2015		yes
21	All-plasmonic Mach-Zehnder modulator enabling optical high-speed communication at the microscale	Haffner. C	Nature Photonics	9, 2015	Nature	2015	525-528	no
22	Software-Defined Transceivers in Dynamic Access Networks	D. Hillerkuss	J. Lightwave Technol		OSA	2015		No
23	Polymer/QDs nanocomposites for wave-guiding applications”, Journal of nanomaterials	Henry Gordillo	Journal of nanomaterials			2012		No
24	Temperature sensor based on colloidal Quantum Dots-PMMA nanocomposite waveguides	A. Bueno	IEEE Sensors	12, 2012	IEEE	2012	3069-3074	no
25	Patterning of conducting polymers using UV lithography: the in-situ polymerization approach	R. Abargues	Journal of Physical Chemistry	116, 2012		2012	17547-17553	no
26	Color tuning and white light by dispersing CdSe, CdTe and CdS in PMMA nanocomposite waveguides	I. Suárez	IEEE Photon	J.5	IEEE	2013	2201412-14	no
27	Color tuning and white light by dispersing CdSe, CdTe and CdS in PMMA nanocomposite waveguides	H. Gordillo	IEEE Photonics J.			2012		no
28	UVPatterning of In-Situ Synthesized Conducting Polymers for Polymeric Display Devices	P.J. Rodríguez-Cantó	Synthetic Metals J.			2012		no
29	Novel patternable and conducting metal-polymer nanocomposite: a step toward advanced multifunctional materials	P. J. Rodriguez-Canto	SPIE Journal		SPIE	2012		no

30	Multiple Dot-in-Rod PbS/CdS Heterostructures with High Photoluminescence Quantum Yield in the Near-Infrared	Yolanda Justo	Journal of the American Chemical Society	134, 2012		2012	5484-5487	no
31	Broadband and Picosecond Intraband Relaxation in Lead-Based Colloidal Quantum Dots	B. De Geyter	ACS Nano	6(7)		2012	6067-74	no
32	From fabrication to mode mapping in silicon nitride microdisk with embedded colloidal quantum dots	B. De Geyter	Applied Physics Letters	101(16)		2012	161101~4	no
33	Multiple Dot-in-Rod PbS/CdS Heterostructures with High Photoluminescence Quantum Yield in the Near-Infrared	Yolanda Justo	Journal of the American Chemical Society	134		2012	5484-5487.	no
34	Highly efficient metal grating coupler for membrane-based integrated photonics	V. M. Dolores Calzadilla	Optics Letters,	39(9),		2014	2786-2789	no

**A2: LIST OF DISSEMINATION ACTIVITIES
CONFERENCES**

	<i>Main author</i>	<i>Title</i>	<i>Conference</i>	<i>Venue</i>
1	<i>Muehlbrandt</i>	<i>Plasmonic Internal Photoemission Detectors with Responsivities above 0.12 A/W</i>	<i>Conf. on Lasers and Electro-Optics (CLEO'15)</i>	<i>San Jose (CA), USA, May 10–15, paper FTh3E. Optical Society of America (OSA) (2015),</i>
2	<i>Melikyan</i>	<i>Plasmonic-organic hybrid (POH) modulators for OOK and BPSK signaling at 40 Gbit/s</i>	<i>Conf. on Lasers and Electro-Optics (CLEO'15)</i>	<i>San Jose (CA), USA, May 10–15, paper SM11.1. Optical Society of America (OSA) (2015),</i>
3	<i>Leuthold</i>	<i>From silicon-organic hybrid to plasmonic modulation</i>	<i>Optical Communication (ECOC)</i>	<i>2014 European Conference on, 1-3, Cannes, France, September 21–25 (2014)</i>
4	<i>Muehlbrandt</i>	<i>Fabrication of Ultra-Compact Plasmonic Waveguide Photo Diodes</i>	<i>Micro and Nano Engineering (MNE'2014)</i>	<i>Lausanne, Switzerland, paper 8274 (2014)</i>
5	<i>Melikyan</i>	<i>High-speed Plasmonic Modulators Integrated Photonics Research</i>	<i>Silicon and Nanophotonics (IPR'14)</i>	<i>San Diego, California United States, July 13-17 , paper IT2A.6 Optical Society of America (OSA) (2014) ,</i>
6	<i>Melikyan</i>	<i>Surface Plasmon Polariton High-Speed Modulator</i>	<i>Conf. on Lasers and Electro-Optics (CLEO'13)</i>	<i>San Jose (CA), USA, June 9–14 , paper CTh5D.2 Optical Society of America (2013) ,</i>
7	<i>Abargues</i>	<i>Metal-polymer nanocomposite resist: a step towards in-situ nanopatterns metallization</i>	<i>Proc. SPIE 8682</i>	<i>Advances in Resist Materials and Processing Technology XXX, 86820X (8 pgs) (2013); SPIE Advanced Lithography Conference, San Jose, USA, 25-28 February 2013.</i>
8	<i>Rodriguez-Canto</i>	<i>Novel patternable and conducting metal-polymer nanocomposites: a step towards advanced multifunctional materials</i>	<i>Proc. SPIE 8682</i>	<i>Advances in Resist Materials and Processing Technology XXX, (9 pgs) (2013); SPIE Advanced Lithography Conference, San Jose, USA, 25-28</i>

				February 2013.
9	Suarez	<i>Light Coupling from Active Polymer Layers to Hybrid Dielectric- Plasmonic Waveguides</i>	<i>15th International Conference on Transparent Optical Networks (ICTON 2013)</i>	<i>23-27 June 2013, Cartagena, Spain, Oral (invited). ,</i>
10	Suarez	<i>Photon plasmon coupling in nanocomposite plasmonic waveguides</i>	<i>16th International Conference on Transparent Optical Networks (ICTON 2014) July 2014</i>	<i>Graz, Austria, oral (invited). PUBLISHED IN Proceedings of the 16th International Conference on Transparent Optical Networks (ICTON 2014), IEEE Conf. Pubs., ISBN 978-1-4799-5600-5</i>
11	Maulu	<i>Colloidal QD-solid photodetectors produced by doctor-blading based on two configurations: nano-gap (MIM) vs Schottky/heterostructure</i>	<i>8th International Conference on Quantum Dots</i>	<i>11-16 May 2014, Pisa (Italy), Oral.</i>
12	Maulu	<i>Fabrication of solution-processed QD-solids by doctor blading technique and their application for photodetection</i>	<i>4th International Colloids Conference</i>	<i>15-18 June 2014, Madrid (Spain), Poster.</i>
13	Maulu	<i>Efficient photodetectors at telecom wavelengths based on thin films of lead sulfide quantum dots</i>	<i>Nanomeeting 2015</i>	<i>26-29 May 2015, Minsk (Belarus), oral contribution. PUBLISHED IN "Physics, Chemistry and Application of Nanostructures ,</i>
14	Suarez	<i>QD-PMMA nanocomposite plasmonic waveguides. Poster. IX Reunion Espanola de Optoelectronica (IX Spanish Meeting of Optoelectronics)</i>	<i>OPTOEL2015</i>	<i>Salamanca (Spain), 13-15 July 2015.</i>
15	Signoretto	<i>Integration of metal nanoparticles in organic waveguides. Poster. IX Reunion Espanola de Optoelectronica (IX Spanish Meeting of Optoelectronics)</i>	<i>OPTOEL2015</i>	<i>Salamanca (Spain), 13-15 July 2015.</i>

16	Suarez	<i>Colloidal QDs/PMMA nanocomposites as a material to provide gain in surface plasmon polaritons</i>	<i>CEN2012</i>	<i>October 2012, Carmona, Spain,</i>
17	Suarez	<i>Surface plasmon-polariton amplifiers</i>	<i>14th International Conference on Transparent Optical Networks (ICTON 2013)</i>	<i>June 2013, Coventry, UK, Oral (invited)</i>
18	Xie	<i>On-chip Hybrid Integration of Silicon Nitride Microdisk With Colloidal Quantum Dots</i>	<i>submitted for publication in 12th International Conference on Group IV Photonics</i>	
19	Geiregat	<i>Picosecond All-Optical Wavelength Conversion using Hot Carrier Intraband Absorption in Colloidal PbS Nanocrystals</i>	<i>MRS Spring Meeting - WW4.04</i>	<i>United States,-2015</i>
20	Xie	<i>Fabrication of high-Q silicon nitride microdisk resonator coupled with on-chip waveguide</i>	<i>Proceedings of the 19th Annual Symposium of the IEEE Photonics Society Benelux Chapter</i>	<i>Netherlands, p.145-148 (2014)</i>
21	Geiregat	<i>Thresholdless Optical Gain using Colloidal HgTe Nanocrystals</i>	<i>CLEO</i>	<i>United States, p.paper FtH4C4 (2014)</i>
22	Xie	<i>High-Q Free-standing Silicon Nitride Microdisk Vertically Coupled with On-chip Waveguide</i>	<i>CLEO 2014</i>	<i>United States,-2014</i>
23	Zhu	<i>Colloidal quantum dot silicon nitride platform</i>	<i>Proceedings of the 2013 Annual Symposium of the IEEE Photonics Society Belenux Chapter</i>	<i>Netherlands, p.175-178 (2013),,,</i>
24	Geiregat	<i>Broadband and Picosecond Intraband Relaxation in Lead Chalcogenide Nanocrystals</i>	<i>International Quantum Dot Conference 2012</i>	<i>(2012)</i>

25	Geiregat	<i>Giant Absorption Enhancement in Colloidal Quantum Dot Supercrystals</i>	<i>International Quantum Dot Conference 2012</i>	<i>United States, (2012)</i>
26	Van Thourhout	<i>Collodial quantum dots for silicon photonics</i>	<i>invited presentation at NaNaX 5</i>	<i>Fuengirola (Spain</i>
27	De Geyter	<i>Ultrafast Photoinduced Intraband Absorption in PbS</i>	<i>PbSe and PbSe/CdSe Core/Shell Nanocrystals for near-Infrared to Mid-Infrared All-Optical Signal Processing</i>	<i>MRS Fall Meeting 2011, United States, (2011)</i>
28	Geiregat	<i>Giant Absorption Enhancement in Close Packed Monolayers of Colloidal Quantum Dots through Dipolar Coupling Effects</i>	<i>MRS Fall Meeting</i>	<i>Boston (US), 2011</i>
29	Hoessbacher	<i>Latching Plasmonic Switch with High Extinction Ratio</i>	<i>in CLEO: 2014(Optical Society of America</i>	<i>San Jose, California, 2014), p. FTu3K.6.,</i>
30	Haffner	<i>High-speed plasmonic Mach-Zehnder modulator in a waveguide</i>	<i>in Optical Communication (ECOC)</i>	<i>2014 European Conference on(2014), pp. 1-3.</i>
31	Heni	<i>Plasmonic Mach-Zehnder Modulator with >70 GHz Electrical Bandwidth Demonstrating 90 Gbit/s 4-ASK</i>	<i>in Optical Fiber Communication Conference(Optical Society of America</i>	<i>Los Angeles, California, 2015), p. Tu2A.2</i>
32	Hillerkuss	<i>Software-Defined Transceivers for Dynamic Access Networks</i>	<i>in Optical Fiber Communication Conference(Optical Society of America</i>	<i>Los Angeles, California, 2015), p. Tu2E.4.</i>
33	Hoessbacher	<i>Dense Plasmonic Mach-Zehnder Modulator Array for High-Speed Optical Interconnects</i>	<i>in Advanced Photonics 2015(Optical Society of America</i>	<i>Boston, Massachusetts, 2015), p. IM2B.1.</i>
34	M. Smit	<i>“Lasers in generic photonic foundry platforms”</i>	<i>24th International Semiconductor Laser Conference plenary, talk, 2014.,</i>	
35	V. M. Dolores-	<i>“Efficient metal grating coupler for membrane-</i>	<i>Integrated Photonics Research, Silicon and Nanophotonics</i>	

	<i>Calzadilla</i>	<i>based integrated photonics”</i>	<i>(IPR) 2014, IT2A.1, 2014.</i>
36	<i>V. M. Dolores-Calzadilla</i>	<i>Diffraction-suppressed adiabatic tapers for photonic circuits</i>	<i>Proceeding of the Proceedings of the 19th Annual Symposium of the IEEE Photonics Society Benelux Chapter, 2014.,,</i>
37	<i>A. Melikyan</i>	<i>"Integrated Wire Grid Polarizer and Plasmonic Polarization Beam Splitter"</i>	<i>in Optical Fiber Communication Conference, OSA Technical Digest (Optical Society of America, 2012), paper OWIE.3</i>
38	<i>Melikyan A</i>	<i>"Chip-to-Chip Plasmonic Interconnects and the Activities of EU Project NAVOLCHI"</i>	<i>ICTON 2012, Warwick (GB); 2012:14-16.,,</i>
39	<i>J. Leuthold</i>	<i>"Ultracompact CMOS-compatible Modulators</i>	<i>in Frontiers in Optics 2012/Laser Science XXVIII, OSA Technical Digest (online) (Optical Society of America, 2012), paper FTu4A.1.,,</i>
40	<i>I. Suarez</i>	<i>"Surface plasmon-polariton amplifiers”</i>	<i>ICTON 2012 (UK). ,,,</i>
41	<i>V. Dolores-Calzadilla</i>	<i>"Towards plasmonic lasers for optical interconnects”</i>	<i>IEEE Proceedings of the 14th International Conference on Optical Transparent Networks, 2012.,,</i>
42	<i>V. Dolores-Calzadilla</i>	<i>"Metallo-dielectric nanolaser coupled to an InP-membrane waveguide”</i>	<i>Proceeding of the Proceedings of the 17th Annual Symposium of the IEEE Photonics Society Benelux Chapter, 2012.,,</i>
43	<i>D. Heiss</i>	<i>"Design of a waveguide-coupled nanolaser for photonic integration”</i>	<i>Integrated Photonics Research, Silicon and Nano- Photonics, 2013.,,</i>
44	<i>V. Dolores-Calzadilla</i>	<i>"Waveguide-coupled nanolasers in III-V membranes on silicon”</i>	<i>IEEE Proceedings of the 15th International Conference on Optical Transparent Networks, 2013. ,,</i>
45	<i>V. Dolores-Calzadilla</i>	<i>"Nanometallic lasers for optical interconnects”</i>	<i>The 18th OptoElectronics and Communications Conference/Photonics in Switching,2013, Poster contribution at the ITC (Lisboa, Portugal) 01/2012.</i>
46	<i>P. Rodriguez-Canto</i>	<i>"In-situ synthesis of conducting polymers into patternable polymer matrices”</i>	<i>Poster contribution at the European Conference of Integrated Optics ECIO (Barcelona,Spain) 04/2012. ,,</i>
47	<i>I. Suarez</i>	<i>"Multicolor wave-guiding in polymer/quantum dot nanocomposite waveguides”</i>	<i>Poster contribution at Conference on Laser Ablation and Nanoparticle Generation in Liquids Taormina ANGEL2012 (Sicilia Italy) 05/2012.,,</i>
48	<i>R. Garcia-Calzada</i>	<i>"Gold nanoparticles obtained by pulsed laser ablation in liquids: formation of monolayers on chemically functionalized patterns/substrates”</i>	<i>Talk at the International Conference of Transparent Optical Networks ICTON (Warwick, England) 06/2012.,,</i>
49	<i>I. Suarez</i>	<i>"Surface plasmon-polariton amplifiers”</i>	<i>Poster contribution at the Spanish Conference of Nanophotonics CEN2012 (Carmona, Spain) 09/2012.,,</i>

50	Martinez-Pastor	<i>“Colloidal QDs/PMMA nanocomposites as a material to provide gain in surface plasmon polaritons”</i>	<i>· Poster contribution at the Spanish Conference on Nanophotonics CEN2012 (Carmona, Spain) 09/2012.,,</i>
51	M. L. Martinez-Marco	<i>“In - situ synthesis of conducting polymers and gold nanoparticles into PMMA”</i>	<i>Talk at the SPIE advanced lithography (California, EEUU) 02/2013.,,</i>
52	R.Abargues	<i>“Metal-polymer nanocomposite resists: a step toward in situ nanopatterns metallization”</i>	<i>Talk at the SPIE advanced lithography (California, EEUU) 02/2013.,,</i>
53	P. Geiregat	<i>“Broadband and Picosecond Intraband Relaxation in Lead Chalcogenide Nanocrystals”</i>	<i>International Quantum Dot Conference 2012, (2012).,,</i>
54	B. De Geyter	<i>“Ultrafast Photoinduced Intraband Absorption in PbS</i>	<i>PbSe and PbSe/CdSe Core/Shell Nanocrystals for near-Infrared to Mid-Infrared All-Optical Signal Processing”, MRS Fall Meeting 2011, United States, (2011).</i>
55	P. Geiregat	<i>“Giant Absorption Enhancement in Close Packed Monolayers of Colloidal Quantum Dots through Dipolar Coupling Effects”</i>	<i>MRS Fall Meeting, Boston (US), 2011.,</i>
56	Q. Lu	<i>“Design of Nanocrystal Light Source for Silicon Photonics”</i>	<i>IEEE Photonics Annual Meeting 2011, WP4, United States, p.527-528 (2011).</i>
57	P. Geiregat	<i>“Giant Absorption Enhancement in Colloidal Quantum Dot Supercrystals”</i>	<i>International Quantum Dot Conference 2012, United States, (2012).,,</i>
58	P. Geiregat	<i>“Integrated light source for silicon photonics using colloidal nanocrystal light emitters under AC field excitation”</i>	<i>ELOPTO 2012.,,,</i>
59	B. De Geyter	<i>“Broadband and Ultrafast Intraband Absorption in Lead based Colloidal Quantum Dots”</i>	<i>NaNax 5, Fuengirola (Spain), 2012.,</i>
60	B. De Geyter	<i>“Ultrafast Photoinduced Intraband Absorption in PbS</i>	<i>PbSe and PbSe/CdSe Core/shell Nanocrystals for Near-infrared to Mid-infrared All-optical Signal Processing”, ICTON, Warwick (UK), 2012.</i>
61	D. Van Thourhout	<i>“Silicon Photonics: short course (3 hours)”</i>	<i>CLEO Europe 2013, May 2013, Munich. ,</i>
62	B. De Geyter	<i>“Embedding Colloidal Nanocrystals in Silicon Nitride Micro-Disk Resonators: From mode-mapping to single dot spectroscopy”</i>	<i>E-MRS Spring Meeting (2013).,,,</i>
63	P. Geiregat	<i>“Giant And Broadband Absorption Enhancement</i>	<i>E-MRS Spring Meeting (2013).,,,</i>

		<i>in colloidal nanocrystal monolayers through dipolar coupling”</i>	
64	<i>C. Kachris</i>	<i>Optical Interconnects in Data Center Networks</i>	<i>HiPEAC Computing System Week, Ghent, 2012, presentation</i>
65	<i>P. Geiregat</i>	<i>“Absorption Enhancement in 2D Nanocrystal Superlattices through Near-Field Dipolar Coupling: A Novel Optical Phenomenon at the Nanoscale”</i>	<i>CLEO (USA), -2013,,</i>