

Foundation for Research & Technology–Hellas
Institute of Electronic Structure & Laser
Light and Matter

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spiros@iesl.forth.gr

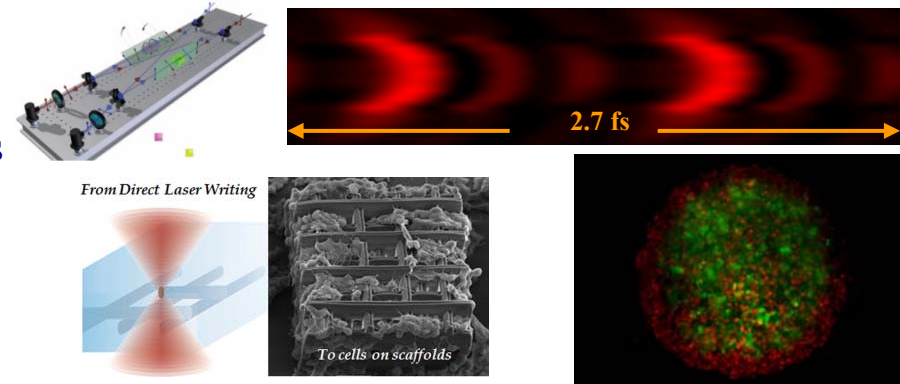


FORTH
INSTITUTE OF ELECTRONIC STRUCTURE AND LASER





Institute of Electronic Structure and Laser

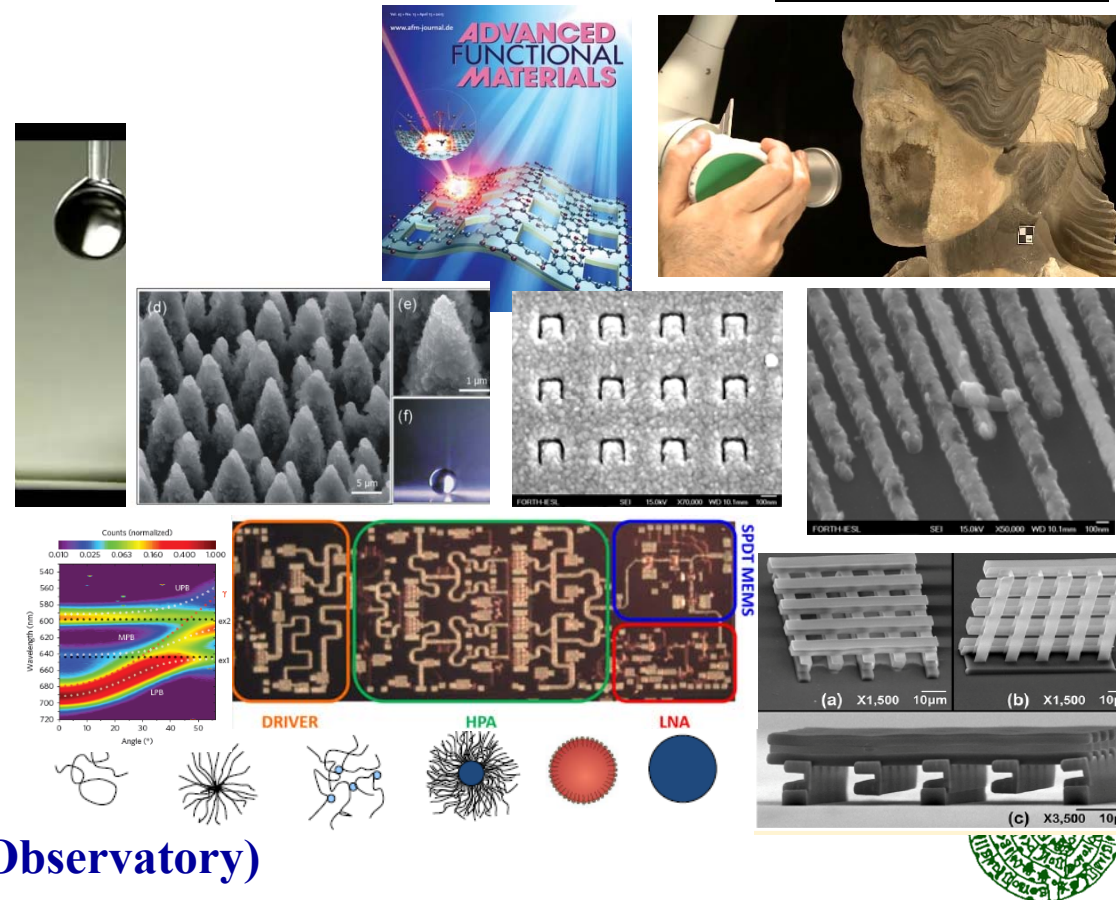
Laser Interactions and Photonics Division

-  Strong Field Physics
-  Dynamic Processes in Atoms, Molecules and Materials
-  Theoretical Atomic, Molecular & Optical Physics
-  Photon Science Applications
 -  Biophotonics
 -  Laser Processing of Materials
 -  Diagnostic Methods and Instrumentation
 -  Lasers in Cultural Heritage



Materials and Devices Division

-  Micro/Nano-electronics
 -  III-Nitride Nano- & Opto-electronics
 -  III-Arsenide Nano- & Opto-electronics
 -  Carbon based Nanoelectronics
 -  Thin film Optoelectronics
 -  Transparent Conductive Materials
-  Soft Matter
 -  Polymer & Colloid Science
 -  Hybrid Nanostructures
-  Magnetic Materials
-  Theoretical Condensed Matter Physics
-  Photonic, Phononic and Metamaterials



Astrophysics and Astronomy (Skinakas Observatory)



IESL and the Key Enabling Technologies



Nanotechnology



Advanced Materials

Advanced Manufacturing



Biotechnology



Photonics

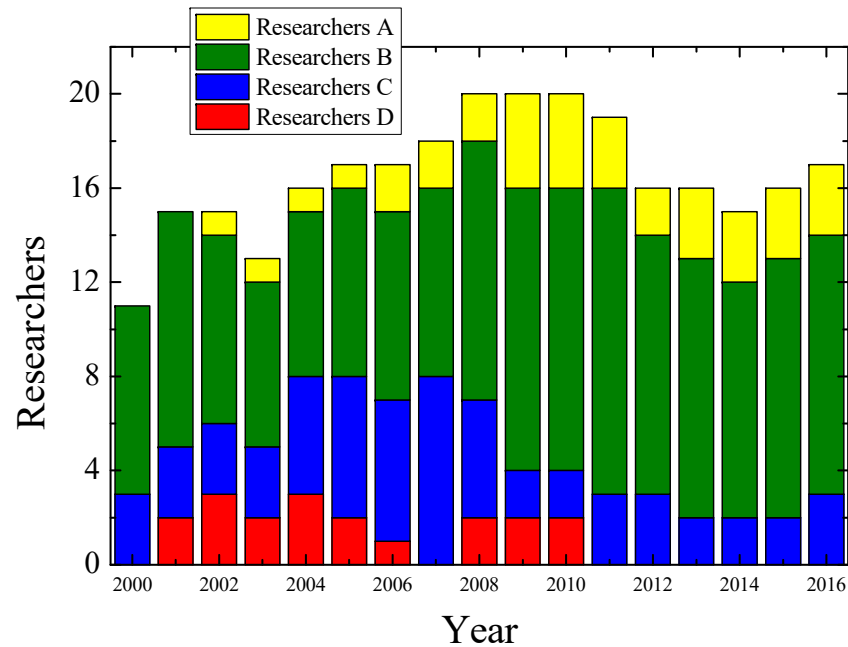


Nano/Micro Electronics

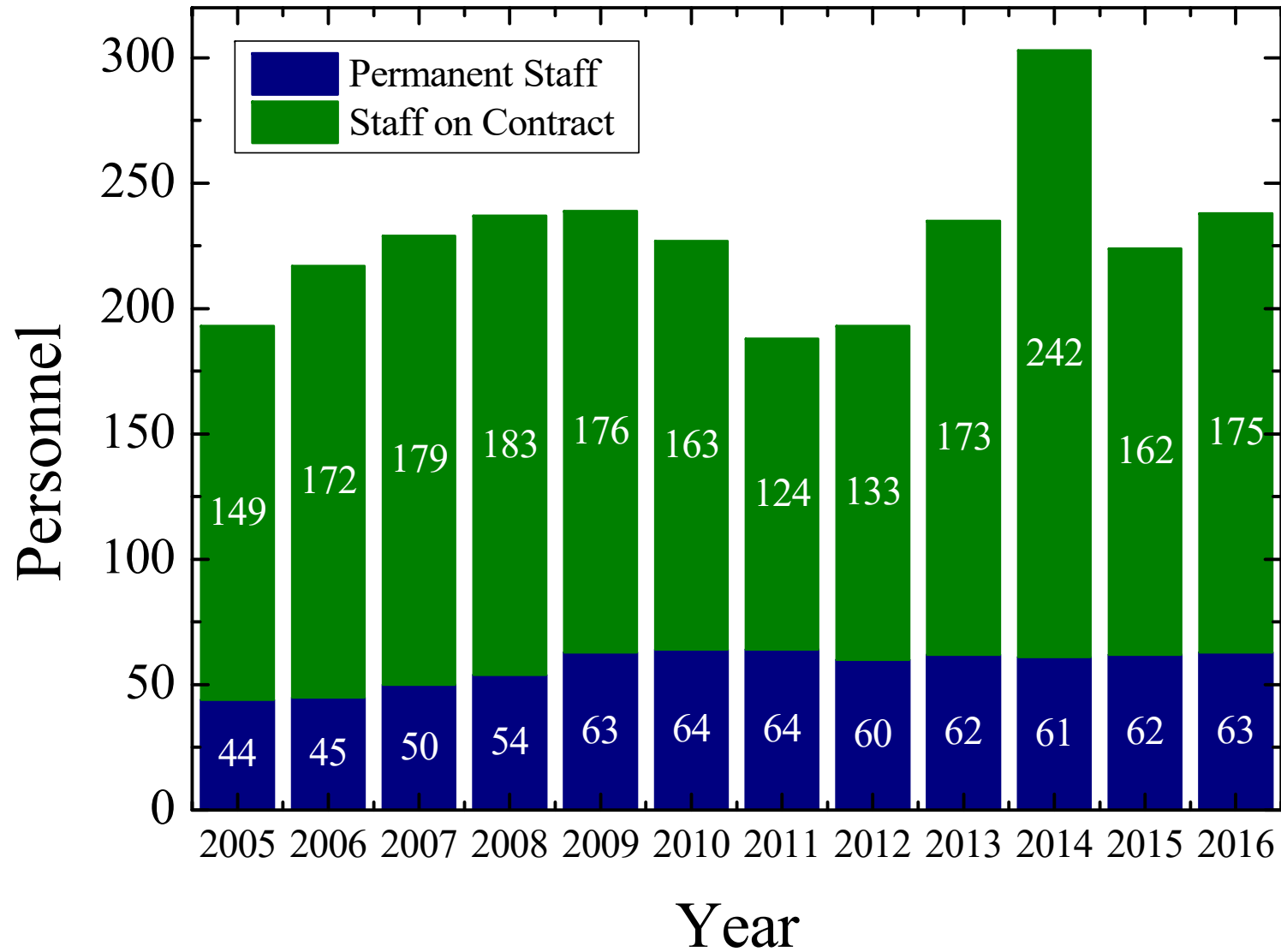


Researchers IESL

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Researchers A	1	2	2	2	4	4	3	2	3	3	3	3
Researchers B	8	8	8	11	12	12	13	11	11	10	11	11
Researchers C	6	6	8	5	2	2	3	3	2	2	2	3
Researchers D	2	1		2	2	2						
Total	17	17	18	20	20	20	19	16	16	15	16	17
Functional Scientists	4	5	7	7	6	6	6	6	6	6	6	6
Collaborating Faculty	33	35	33	30	33	33	29	30	32	32	31	32



Personnel IESL



2014 Evaluation of Research Institutes

👉 Evaluation Committee

- ✎ A. Braco, Università di Milano
- ✎ A. Claverie, CEMES-CNRS
- ✎ A. Dimitrakopoulou-Strauss, Univ. Heidelberg
- ✎ H. Jain, Lehigh Univ.
- ✎ W. Kautek, Univ. of Vienna
- ✎ D. Kotzias, E.U. Joint Research Centre
- ✎ C. Kouveliotou, NASA
- ✎ S. Massaglia, Univ. of Torino
- ✎ M. I. Stockman, Georgia State Univ.
- ✎ L. H. Tsoukalas, Purdue Univ.
- ✎ J. Wood, Imperial College

EVALUATION PERIOD 2005-2012								
EVALUATION COMMITTEE	CENTER	INSTITUTE	CRITERIA					TOTAL
			OVERALL ASSESSMENT (TABLE 1)	OVERALL ASSEMENT OF QUALITY (TABLE 2)	OVERALL ASSEMENT OF PRODUCTIVITY (TABLE 3)	OVERALL ASSEMENT OF RESEARCH RELEVANCE (TABLE 4)	OVERALL ASSEMENT OF VITALITY (TABLE 5)	
PHYSICS	FOUNDATION FOR RESEARCH AND TECHNOLOGY-HELLAS	Electronic Structure and Laser	5.00	5.00	5.00	5.00	5.00	5.00



Participation in the European Research Infrastructures Programme

👉 Laserlab-Europe: European **Laser** Infrastructure

📌 An ambitious project since 1990!



👉 CHARISMA: **Cultural Heritage** Advanced Research Infrastructure



👉 IPERION CH: Integrated Platform for the European Research Infrastructure **ON Cultural Heritage**



👉 PARTHENOS: Pooling Activities, Resources and Tools for **Heritage E-research** Networking, Optimization and Synergies



👉 ESMI: European **Soft Matter** Infrastructure



👉 EUSMI: European Infrastructure for Spectroscopy, Scattering and Imaging of **Soft Matter**

👉 NFFA-EUROPE: **Nanoscience** Foundries and Fine Analysis for Europe



👉 European Strategy Forum on Research Infrastructures (ESFRI)

📌 ELI (**Extreme Light** Infrastructure)

📌 E-RIHS (European Research Infrastructure for **Heritage Science**)



Laserlab-Europe:

A European Laser Research Infrastructure

An ambitious project since 1990!

Goals

- ➡ To co-ordinate most of the largest European national laboratories in laser-based inter-disciplinary research
- ➡ To strengthen the European leading role in laser research
- ➡ To provide Transnational Access opportunities in a co-ordinated fashion (4000 days of access) to European researchers.

- ➡ 33 laser infrastructures
- ➡ 5 subcontractors
- ➡ 9 associates
- ➡ 22 European countries

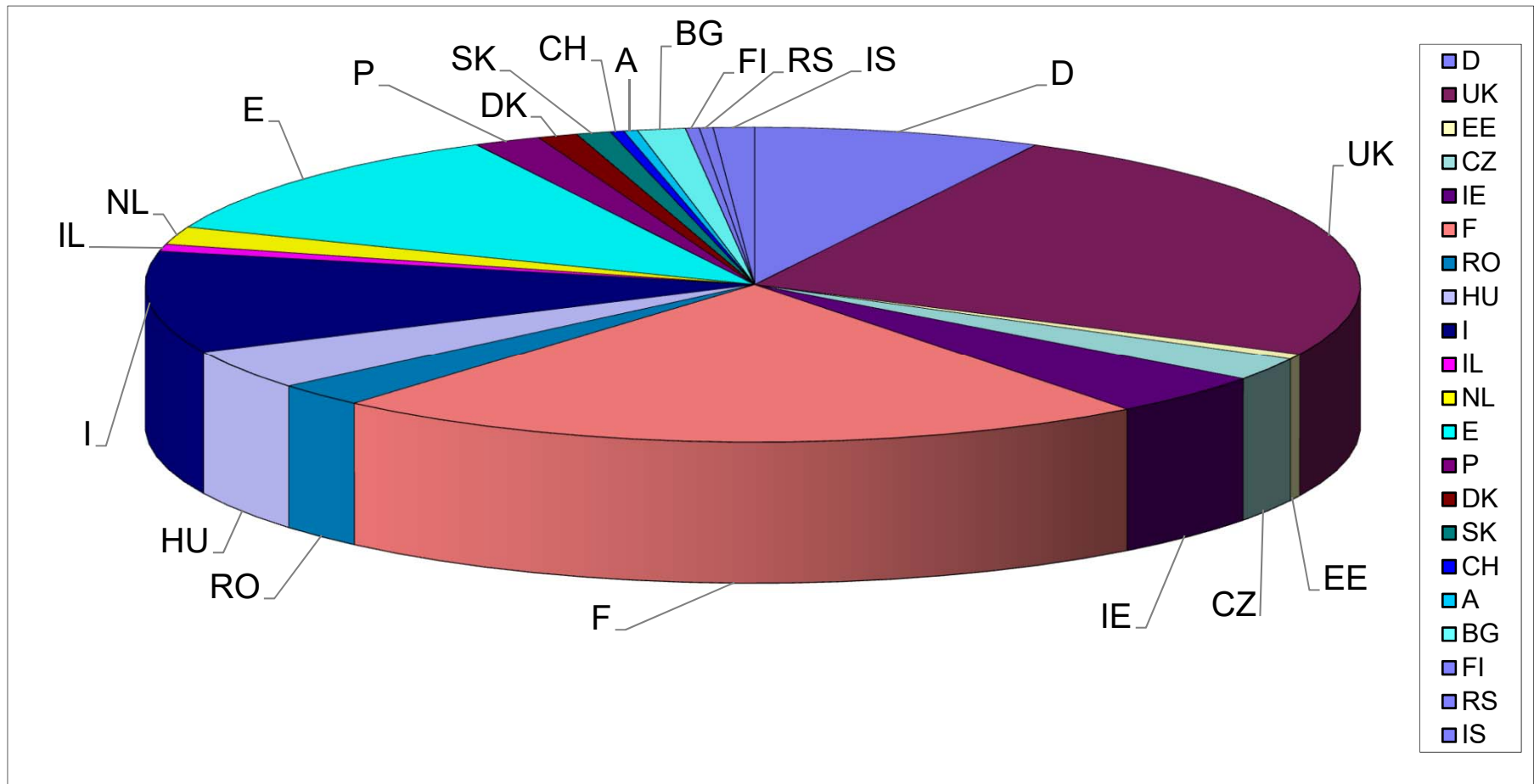


<http://www.laserlab-europe.eu>



Laserlab-Europe: A European Laser Facility at FORTH/IESL

Access provided during 1990-2016



👉 296 projects, 491 researchers from European Research Centers

👉 3397 days of access



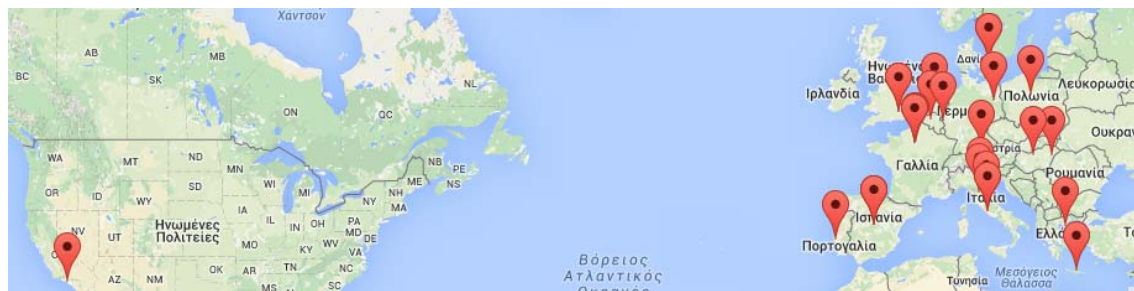
IPERION CH: Integrated Platform for the European Research Infrastructure ON Culture Heritage

Goals

- ☞ To establish a unique European research infrastructure for restoration and conservation of Cultural Heritage
- ☞ To embrace a wide range of research disciplines supporting the various aspects of tangible and intangible Cultural Heritage conservation, interpretation and management
- ☞ To integrate national facilities of recognized excellence in Heritage Science
- ☞ To establish a distributed RI with a sustainable plan of activities, including offering access to a wide range of high-level scientific instruments, methodologies, data and tools for advancing knowledge and innovation in the preservation of Cultural Heritage

☞ IPERION CH

- ✎ 28 organizations
- ✎ 13 European countries + USA



<http://www.iperionch.eu>



IPERION CH



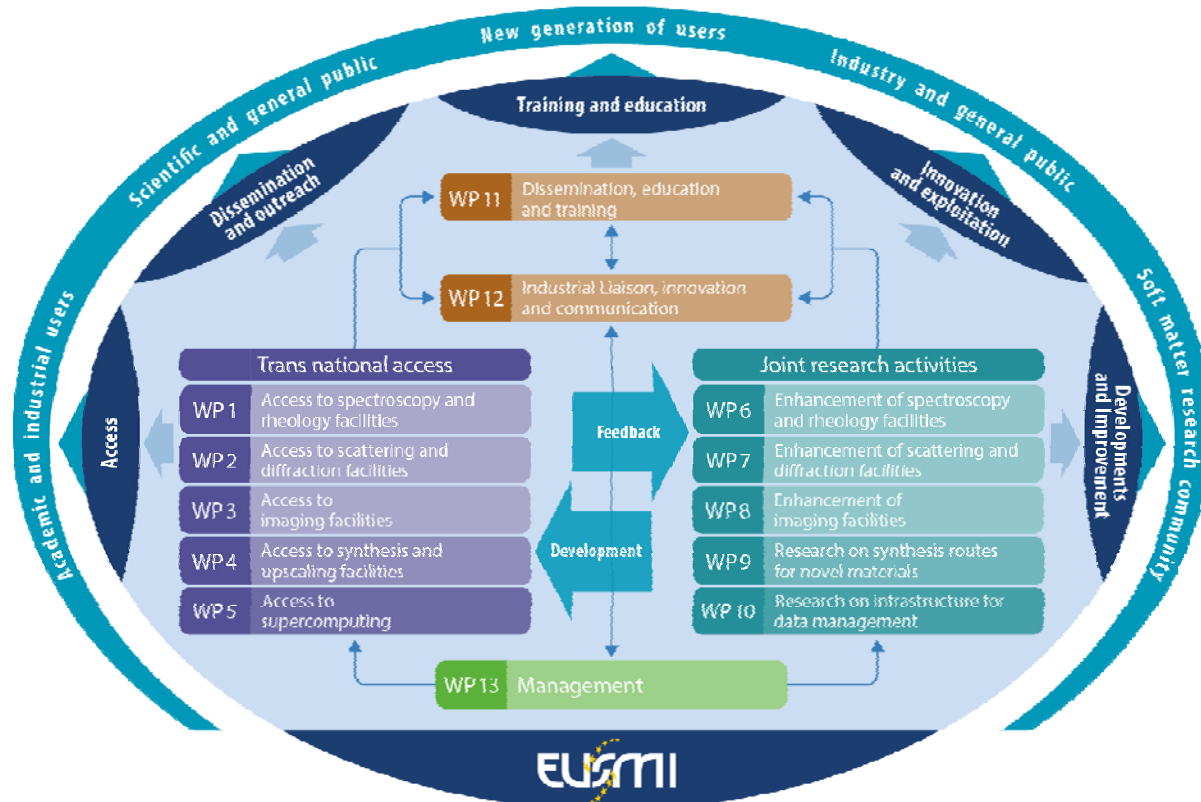
EUSMI: European infrastructure for spectroscopy, scattering & imaging of soft matter

Goals

- To enhance European competitiveness in basic research and innovation in the field of soft matter based consumer products and soft nanotechnology

EUSMI

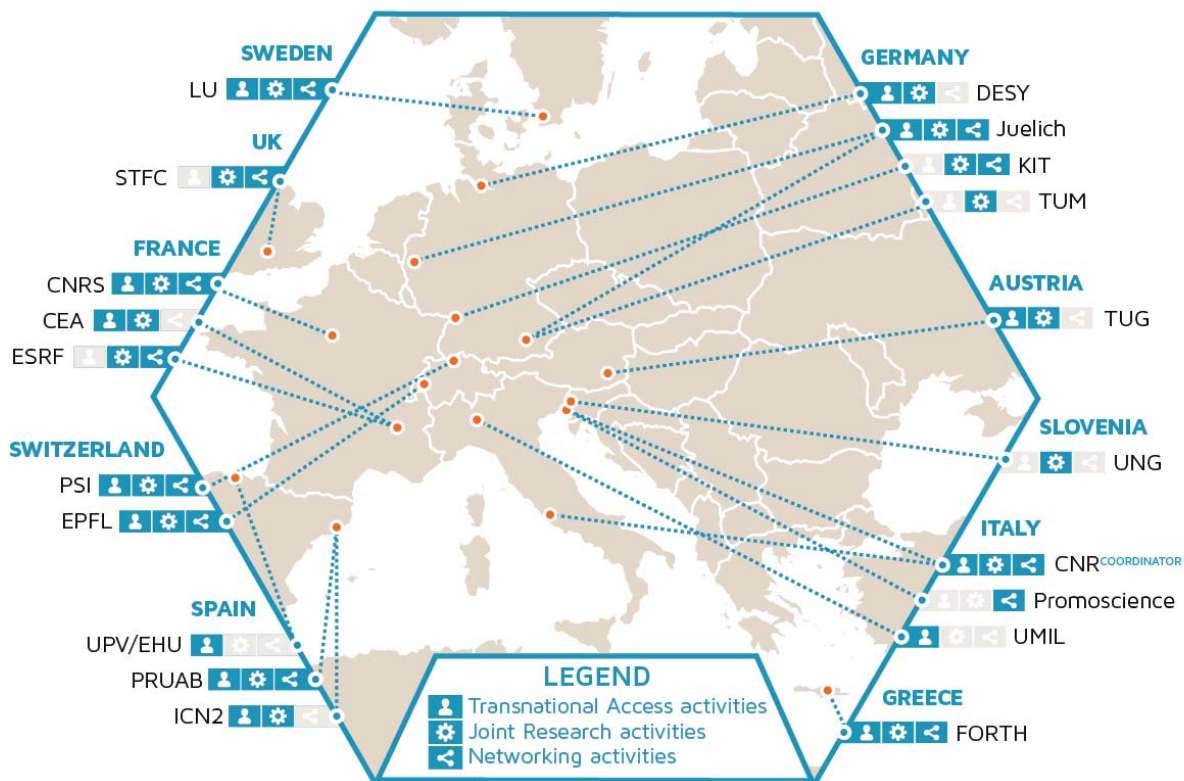
- 23 organizations
- 13 European countries



<https://eusmi-h2020.eu>

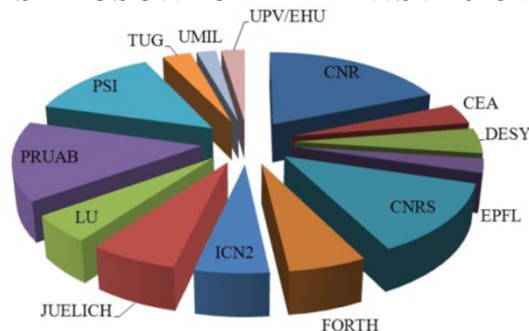
NFFA-EUROPE

Nanoscience Foundries and Fine Analysis for Europe



<http://www.nffa.eu/>

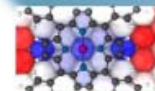
A European Fine Analysis Research Infrastructure



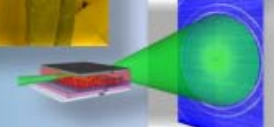
PVD growth / Lithography
Nanopatterning



Theory & numerical simulation



Structural & morphological characterization



ACTPHAST: Access Center for Photonics Innovation Solutions and Technology Support

A unique "plug-and-play" innovation support model connecting European companies to the best in photonics research technology and expertise tailored to specific business opportunities and need

ACTPHAST is designed to support Photonics Companies & Photonics-enabled Companies

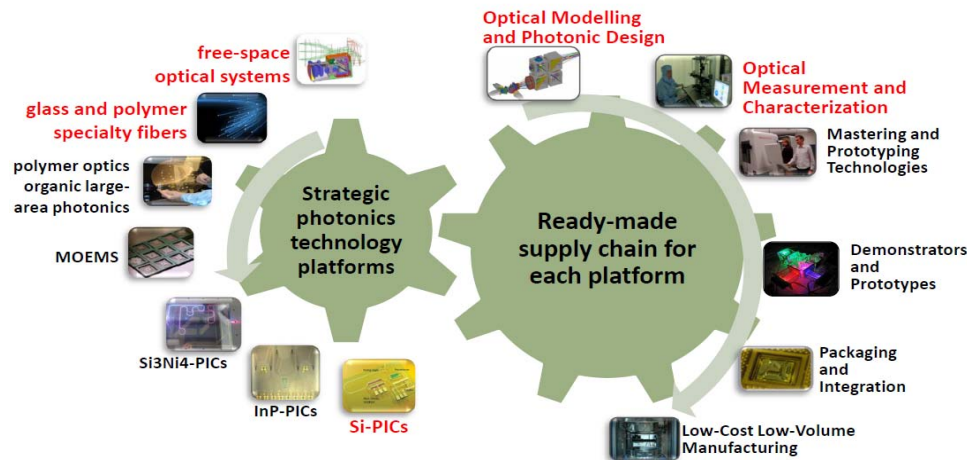
ACTPHAST supports companies with product innovation at pre-competitive level



ACTPHAST

>200 top experts from 23 EU research Institutes

ACTPHAST partners represent 7 strategic technology platforms

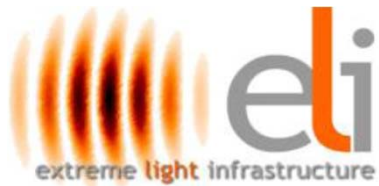


ELI: Extreme Light Infrastructure (ESFRI)



- ☞ The European Strategy Forum on Research Infrastructures (ESFRI) includes in its roadmap two major Laser Research Infrastructures:
 - ✎ ELI (Extreme Light Infrastructure): reaching highest laser intensities and related applications to be implemented as a distributed research infrastructure in 3 complementary facilities located in CZ, HU and RO
 - ✎ HIPER (European High Power laser Energy Research facility): for civilian laser fusion research (“fast ignition scheme”)

- ☞ IESL’s involvement in ELI includes:
 - ✎ Initiatives in including attosecond science in ELI before its preparatory phase (PP)
 - ✎ Member of the ELI-PP (Executive Board, Supporting Actions Leader, attosecond WP)
 - ✎ Involvement in ELI-ALPS (Attosecond Light Pulse Source, HU):
 - ✎ Coordinator of the ELI-GR network
 - ✎ Establishment of an ELI Regional Partner Facility



E-RIHS: European Research Infrastructure for Heritage Science (ESFRI)



- ➡ A pan-European project aiming to support research on heritage interpretation, preservation, documentation and management.
- ➡ It will provide state-of-the-art tools and services to interdisciplinary research communities that advance understanding and preservation of global heritage.
- ➡ It comprises E-RIHS Headquarters and National Hubs, fixed and mobile national infrastructures of recognized excellence, physically accessible collections/archives and virtually accessible heritage data.
- ➡ Both cultural and natural heritage are addressed: collections, buildings, archaeological sites, digital and intangible heritage.



TYPE: distributed
COORDINATING COUNTRY: IT
PROSPECTIVE MEMBER COUNTRIES: BE, CZ, DE, EL, ES, FR, HU, IT, NL, PT, UK

PARTICIPANTS: BG, BR, CY, DK, IE, IL, PL, SE, SI

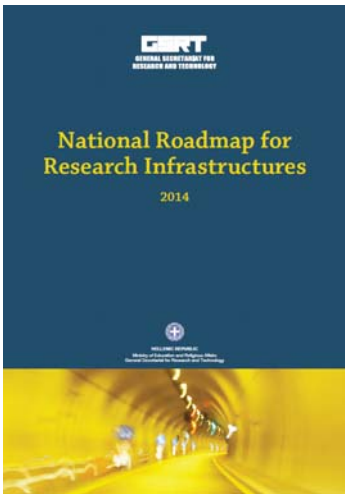
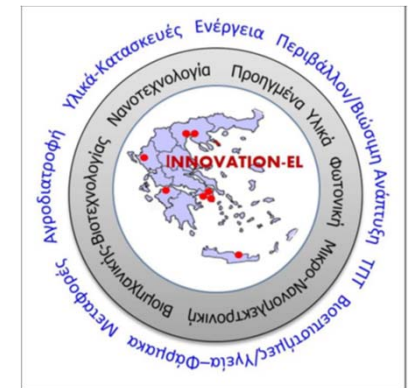


National Research Infrastructures

- 👉 HELLAS-CH
The HiPER, ELI and LASERLAB Europe Synergy
& IPERION-CH.gr

- 👉 INNOVATION-EL
National Infrastructure in Nanotechnology,
Advanced Materials and Micro/Nanoelectronics

- 👉 BIOIMAGING-GR
A Greek Research Infrastructure for Visualizing
and Monitoring Fundamental Biological Processes



Prestigious Research Projects: Excellent Science pillar

👉 ERC Starting Grant

✎ TRICEPS, T. P. Rakitzis

👉 ERC Proof of Concept Grants

✎ BIOCARDE, T. P. Rakitzis

✎ CHIRALSENSE, T. P. Rakitzis

👉 ERC Advanced Grant

✎ PHOTOMETA, C. M. Soukoulis

👉 ERC Consolidator Grant

✎ A_BINGOS, A. Zezas

👉 Future & Emerging Technologies (FET Open)

✎ LiNaBioFluid, E. Stratakis (coordinator)

✎ UltraChiral, T. P. Rakitzis (coordinator)

✎ VisorSurf, M. Kafesaki (coordinator)

✎ MIR-Bose, S. Tzortzakis

👉 Marie Skłodowska-Curie Actions

✎ Supolen, D. Vlassopoulos

✎ MEDEA, D. Charalambidis

✎ DiStruc, G. Petekidis

✎ COLLDENSE, D. Vlassopoulos

✎ DoDyNet, D. Vlassopoulos







European
Research
Council



Prestigious Greek Research Projects

GSRT-ERC

-  EXEL, C. M. Soukoulis
-  HFP-UD-TDRS, P. Tzallas
-  3DNEUROSCAFFOLDS, A. Gravanis
-  ITSSUED, P. Samartzis

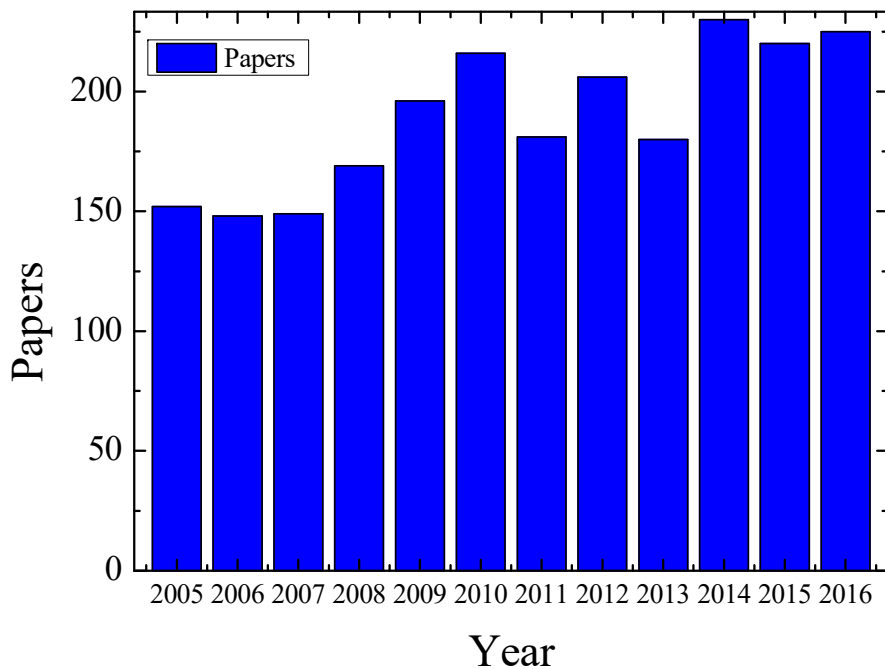
GSRT ARISTEIA I and II

-  APOLLO, P. G. Savvidis
-  FTERA, S. Tzortzakis
-  SophoX, G. Fytas
-  Skin-DOCTOR, J. Ripoli
-  NITROHEMT, A. Georgakilas
-  RINGS, D. Vlassopoulos
-  SMART_SURF, S. H. Anastasiadis
-  OSTEObIOMIMESIS, M. Chatzinikolaidou
-  PHOTOPEPMAT, A. Mitraki
-  NILES, N. Pelekanos
-  MicroSoft, G. Petekidis



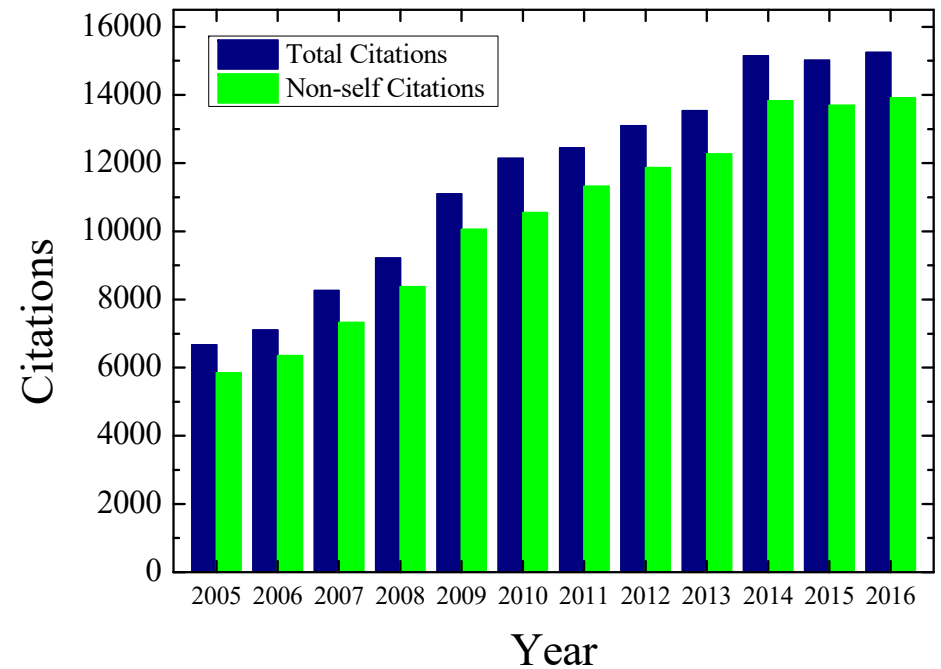
IESL Bibliometrics

👉 Publications in refereed journals



Total 2005-2016: 2272 papers
(3.40 per researcher per year)

👉 Citations


















(125-280 per researcher per year)



Awards and Distinctions

Awards and Distinctions

-  John H. Dillon Medal 1998 from the American Physical Society to Dr. S. H. Anastasiadis
-  Alexander von Humboldt Award 2002 to Dr. C. Soukoulis
-  Alexander von Humboldt Award 2002 to Dr. G. Fytas
-  Alexander von Humboldt Award 2004 to Dr. T. Kitsopoulos
-  Leadership Award/New Focus Prize 2004 from the Optical Society of America to Dr. C. Fotakis
-  Descartes Research Prize 2005 of the EU to project EXEL, with Dr. C. Soukoulis as the PI
-  "3rd Best Innovation by an Individual Researcher" Award during the European Photonics Innovation Village, Brussels 2010 to Dr. M. Vamvakaki and Dr. M. Farsari
-  2012 Keck Award of the International Institute for Conservation of Historic and Artistic Works for the Laser Cleaning of the Caryatids and the Parthenon Marbles
-  2013 James C. McGroddy Prize for New Materials of the American Physical Society to Dr. C. Soukoulis
-  2013 Rozhdestvensky Medal of the Russian Optical Society to Dr. S. Tzortzakis
-  Max Born Award 2014 of the Optical Society of America to Dr. C. Soukoulis
-  Weissenberg Award 2015 of the European Society of Rheology to Dr. D. Vlassopoulos
-  Rolf Landauer International ETOPIIM Association Medal 2015 to Dr. C. Soukoulis
-  Dr. G. Kiriakidis elected President of European Materials Research Society (E-MRS) for 2017-2019
-  Dr. S. H. Anastasiadis elected President of European Polymer Federation (EPF) for 2018-2019



APS James C. McGroddy Prize for New Materials 2013

☞ C. M. Soukoulis, D. R. Smith & J. B. Pendry
win the 2013 James C. McGroddy Prize for
New Materials

☞ Citation: *“For the discovery of metamaterials”*



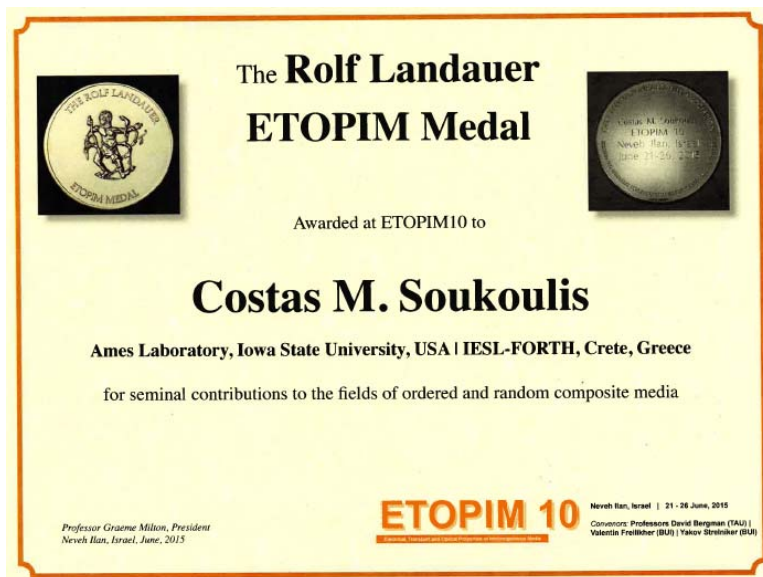
Max Born Award of the Optical Society of America 2014

- ☞ C. M. Soukoulis wins the 2014 Max Born Award of the Optical Society of America
- ☞ Citation: *“For creative and outstanding theoretical and experimental research in the fields of photonic crystals and left-handed metamaterials, and for novel applications of these materials to manipulate electromagnetic radiation”*



Rolf Landauer Medal 2015 of the ETOPIIM Association

- ☞ C. M. Soukoulis & V. Shalaev win the 2015 Rolf Landauer International ETOPIIM [Electrical, Transport and Optical Properties of Inhomogeneous Media] Association Medal for Research Excellence in the field of Composite Science
- ☞ Citation: *“For seminal contributions to the fields of ordered and random composite media”*





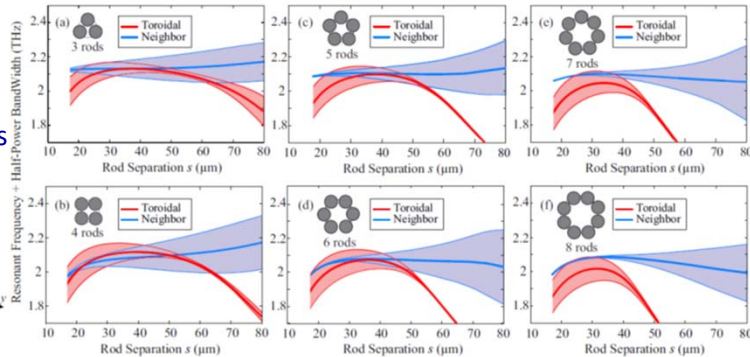
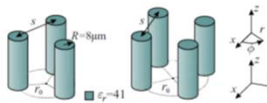
New generation metamaterial devices

PHYSICAL REVIEW B 94, 205433 (2016)

Toroidal eigenmodes in all-dielectric metamolecules

Anna C. Tasolamprou,^{1,*} Odysseas Tsilipakos,¹ Maria Kafesaki,^{1,2} Costas M. Soukoulis,^{1,3} and Eleftherios N. Economou^{1,4}

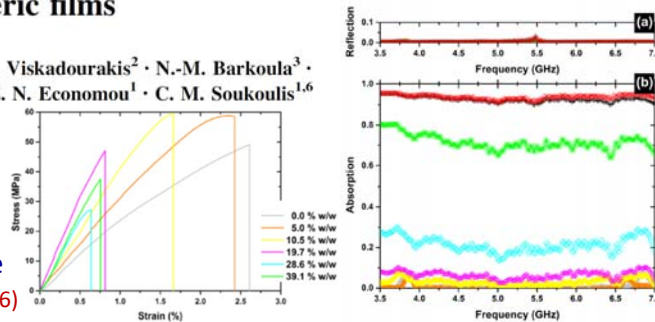
Investigation of the electromagnetic resonant modes supported by systems of polaritonic rods



Electromagnetic shielding effectiveness and mechanical properties of graphite-based polymeric films

G. Kenanakis¹ · K. C. Vasilopoulos¹ · Z. Viskadourakis² · N.-M. Barkoula³ · S. H. Anastasiadis^{1,4} · M. Kafesaki^{1,5} · E. N. Economou¹ · C. M. Soukoulis^{1,6}

Demonstration of electromagnetic shielding and mechanical properties of polymer composite samples containing graphite filler *Appl. Phys. A* 122, 802 (2016)

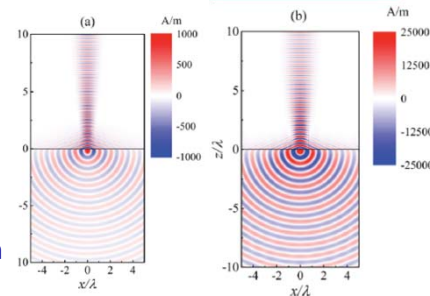


PHYSICAL REVIEW B 93, 245118 (2016)

Metamaterial-based lossy anisotropic epsilon-near-zero medium for energy collimation

Nian-Hai Shen,^{1,*} Peng Zhang,¹ Thomas Koschny,¹ and Costas M. Soukoulis^{1,2}

Use of metamaterials to realize the special category of a epsilon-near-zero (ENZ) anisotropic medium, for a decent effect of energy collimation and wave-front manipulation



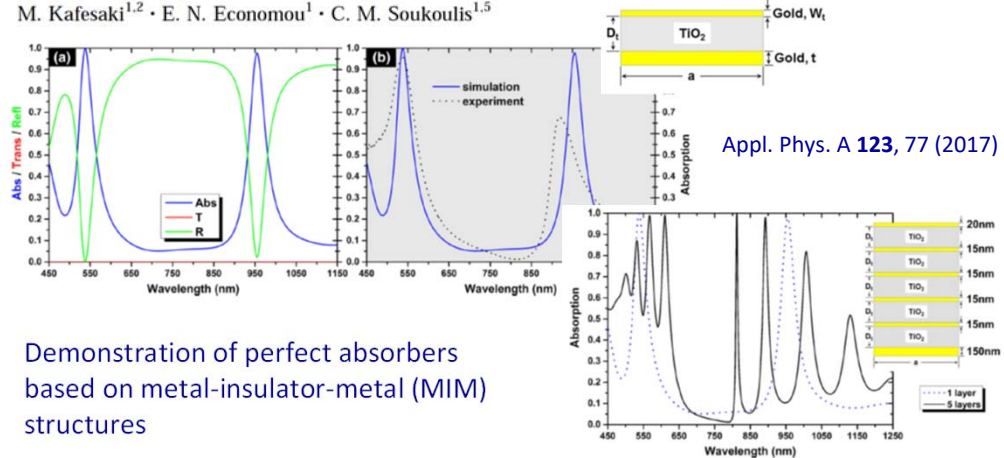
Appl. Phys. A (2017) 123:77
DOI 10.1007/s00339-016-0711-6

Applied Physics A
Materials Science & Processing



Perfect absorbers based on metal-insulator-metal structures in the visible region: a simple approach for practical applications

G. Kenanakis¹ · Ch. P. Mavidis^{1,2} · E. Vasilaki³ · N. Katsarakis^{1,4} · M. Kafesaki^{1,2} · E. N. Economou¹ · C. M. Soukoulis^{1,5}



Demonstration of perfect absorbers based on metal-insulator-metal (MIM) structures

PRL 118, 073901 (2017)

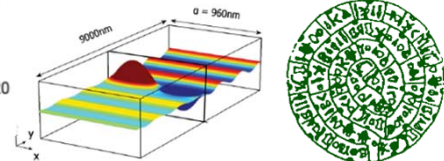
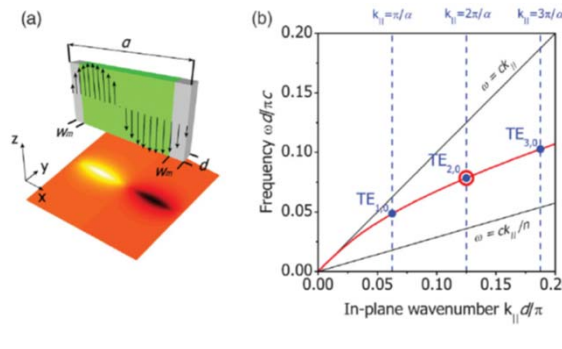
PHYSICAL REVIEW LETTERS

week ending
17 FEBRUARY 2017

Novel Lasers Based on Resonant Dark States

Sotiris Droulias,^{1,*} Aditya Jain,² Thomas Koschny,² and Costas M. Soukoulis^{1,2}

Demonstration of a metamaterial laser system, with directionality, subwavelength integration, and simple layer-by-layer fabrication



Rozhdestvensky Medal of the Russian Optical Society 2013

- ☞ S. Tzortzakis wins the 2013 Rozhdestvensky Medal of the Russian Optical Society
- ☞ Citation: *“For key contributions in strong laser and Terahertz (THz) field optics”*

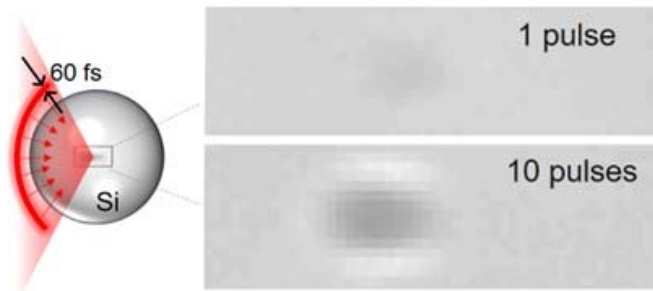


Strong field interactions with matter



Crossing the threshold of ultrafast laser writing in bulk silicon

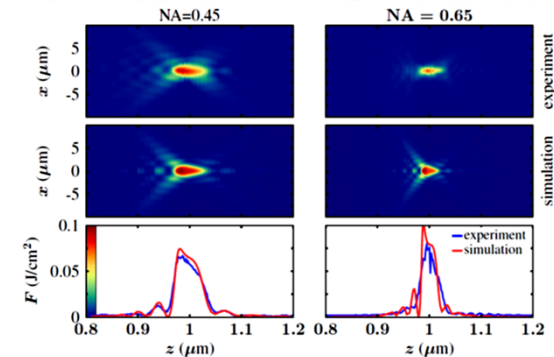
Margaux Chanal¹, Vladimir Yu. Fedorov^{2,3}, Maxime Chambonneau¹, Raphaël Clady¹, Stelios Tzortzakis^{2,4,5} & David Grojo¹



Nat. Commun. 8, 773 (2017)

Accessing Extreme Spatiotemporal Localization of High-Power Laser Radiation through Transformation Optics and Scalar Wave Equations

V. Yu. Fedorov,^{1,2,*} M. Chanal,³ D. Grojo,³ and S. Tzortzakis^{1,4,5,†}

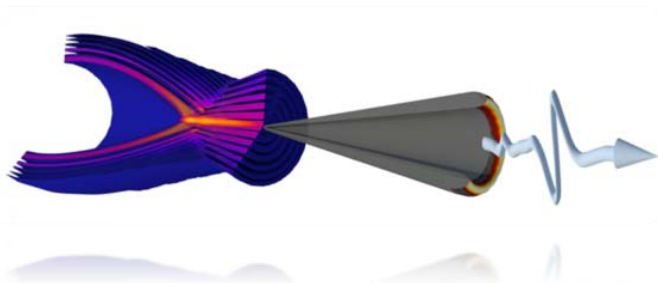


PRL 117, 043902 (2016)

PHYSICAL REVIEW LETTERS

Enhanced terahertz wave emission from air-plasma tailored by abruptly autofocusing laser beams

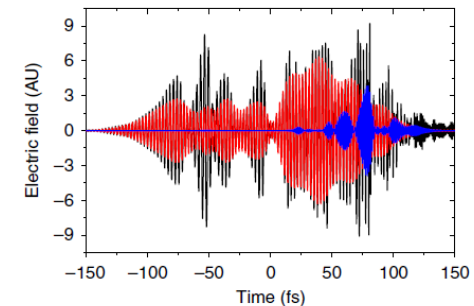
KANG LIU,¹ ANASTASIOS D. KOULOUKLIDIS,^{2,3} DIMITRIOS G. PAPAZOGLU,^{2,3} STELIOS TZORTZAKIS,^{2,3,4} AND XI-CHENG ZHANG^{1,*}



Optica 3, 605-608 (2016)

Highly efficient broadband terahertz generation from ultrashort laser filamentation in liquids

Indranuj Dey¹, Kamalesh Jana¹, Vladimir Yu. Fedorov^{2,3}, Anastasios D. Koulouklidis⁴, Angana Mondal¹, Moniruzzaman Shaikh¹, Deep Sarkar¹, Amit D. Lad¹, Stelios Tzortzakis^{2,4,5}, Arnaud Couairon⁶ and G. Ravindra Kumar^{1,*}.



Nat. Commun. to appear (2017)

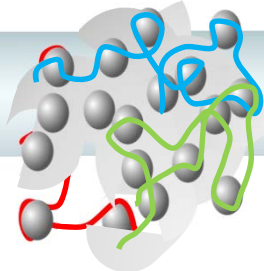
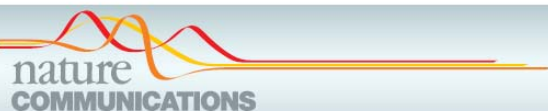


Weissenberg Award of the European Society of Rheology 2015

- ☞ D. Vlassopoulos wins the 2015 Weissenberg Award of the European Society of Rheology for outstanding, long-term achievements in the field of rheology
- ☞ Citation: *“For seminal contributions to the rheology and rheophysics of architecturally complex polymers and colloids in bulk and at interfaces”*



Molecular Rheology of Soft Matter



ARTICLE

Received 6 Oct 2015 | Accepted 21 Mar 2016 | Published 25 Apr 2016

DOI: 10.1038/ncomms11368 OPEN

Network dynamics in nanofilled polymers

Guilhem P. Baeza¹, Claudia Dessi^{1,2}, Salvatore Costanzo^{1,2}, Dan Zhao³, Shushan Gong⁴, Angel Alegria⁵, Ralph H. Colby⁴, Michael Rubinstein⁶, Dimitris Vlassopoulos^{1,2} & Sanat K. Kumar³

PHYSICAL REVIEW FLUIDS 2, 043301 (2017)

Nonuniform flow in soft glasses of colloidal rods

J. K. G. Dhont*

Forschungszentrum Jülich, Institute of Complex Systems (ICS-3), D-52425 Jülich, Germany and Heinrich-Heine Universität Düsseldorf, Department of Physics, D-40225 Düsseldorf, Germany

K. Kang and H. Kriegs

Forschungszentrum Jülich, Institute of Complex Systems (ICS-3), D-52425 Jülich, Germany

O. Danko

Taras Shevchenko National University Kyiv, Kyiv, Ukraine

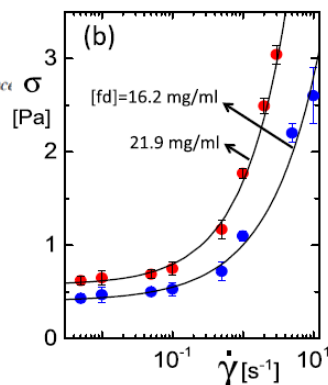
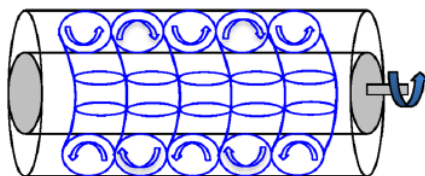
J. Marakis and D. Vlassopoulos

Foundation for Research and Technology–Hellas (FORTH),

Institute of Electronic Structure and Laser (IESL), GR-70013 Crete, Greece

and University of Crete, Department of Materials Science and Technology, GR-71003 Crete, Greece

(Received 13 December 2016; published 11 April 2017)



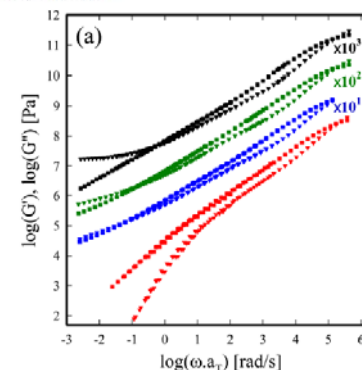
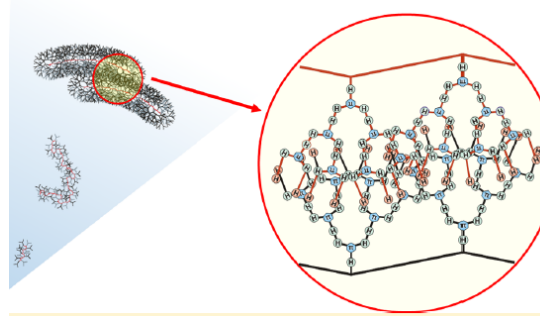
Macromolecules

Article
pubs.acs.org/Macromolecules

DOI: 10.1021/acs.macromol.6b01311
Macromolecules 2016, 49, 7054–7068

Rheology and Packing of Dendronized Polymers

Salvatore Costanzo,^{1,2} Leon F. Scherz,³ Thomas Schweizer,³ Martin Kröger,³ George Floudas,^{1,4} A. Dieter Schlüter,³ and Dimitris Vlassopoulos^{1,2}



Stress growth and relaxation of dendritically branched macromolecules in shear and uniaxial extension

Q. Huang¹

Department of Chemical and Biochemical Engineering, Technical University of Denmark (DTU), Kongens Lyngby 2800, Denmark

S. Costanzo

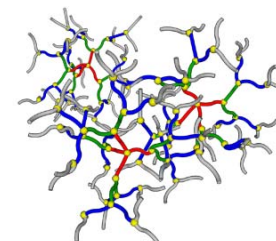
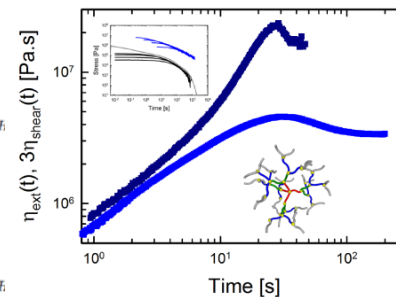
Institute of Electronic Structure and Laser, Foundation for Research and Technology Hellas (FORTH), Heraklion, Crete 70013, Greece and Department of Materials Science and Technology, University of Crete, Heraklion, Crete 71003, Greece

C. Das

School of Mathematics, University of Leeds, Leeds LS2 9JT, United Kingdom

D. Vlassopoulos^{1,2}

Institute of Electronic Structure and Laser, Foundation for Research and Technology Hellas (FORTH), Heraklion, Crete 70013, Greece and Department of Materials Science and Technology, University of Crete, Heraklion, Crete 71003, Greece




Laser rejuvenation of Caryatids opens to the public at the Acropolis museum

A link between ancient and modern Greece



2012 IIC Keck Award | Intern x
https://www.iiconservation.org/node/3362



INTERNATIONAL INSTITUTE FOR CONSERVATION OF HISTORIC AND ARTISTIC WORKS

27 June 2013

Home | About | News | Publications | Dialogues | Conferences | Contact

Text size: A+ | A-

2012 IIC Keck Award

Submitted by Graham Voce on 10 Dec 2012

The 2012 IIC Keck Award was awarded jointly to the Acropolis Museum in Athens, Greece, for the conservation and restoration of the Caryatids with the use of laser technology, in collaboration with the Institute of Electronic Structure & Laser at the [Foundation for Research and Technology in Crete \(IESL-FORTH\)](#) and to Anglo-Saxon CSI: Sittingbourne in Kent in the United Kingdom. IIC's Council in making the award recognised that both institutions had, from their respective status, made a positive contribution to public awareness of the practice and beneficial results of heritage conservation.

Since 1994, the IIC Council has generously endowed by Sheldo Keck's words - the individual or Council contributed most toward and appreciation of the accomplishment. More details of the found at www.iiconservation.org

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Conserving the Caryatids



Interest from the Palace Museum

- 👉 Memorandum of Understanding with the Palace Museum (Forbidden City) of Beijing, China
- 👉 Objectives
 - ✎ Establishment of a Common Research Laboratory
 - ✎ Perform cooperative research focused on specific analytical, diagnostic and conservation challenges in Cultural Heritage of Greece and China



Common Laboratory with the Palace Museum

- 👉 Opening Ceremony during the visit of the Greek PM (07/2016)
- 👉 How do we proceed?
 - ✍ FORTH researchers visit the Palace Museum to discuss needs
 - ✍ Researchers from the Palace Museum visit FORTH to attend training
 - ✍ FORTH researchers to Palace Museum to help establish the experimental platform of laser cleaning technology



 故宫博物院
THE PALACE MUSEUM

 FORTH
INSTITUTE OF ELECTRONIC STRUCTURE AND LASER

中国-希腊文物激光技术联合实验室
NIKI: China-Greece Laser Technology Joint Laboratory on Cultural Heritage

故宫博物院
THE PALACE MUSEUM

希腊研究与技术基金会
FOUNDATION FOR RESEARCH AND
TECHNOLOGY - HELLAS



Photonics for Cultural Heritage



Studies in Conservation

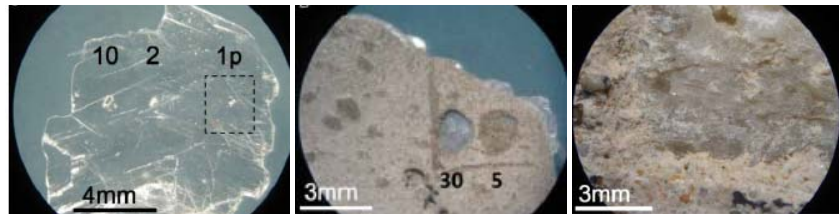
Volume 60, Supplement 1, 2015

Special Issue: Issue S1: Proceedings of the LACONA 10 Conference, Sharjah 2014, August 2015

Original research paper

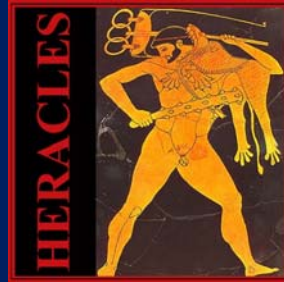
Laser-assisted removal of dark cement crusts from mineral gypsum (selenite) architectural elements of peripheral monuments at Knossos

Giannis Grammatikakis^{1,2,3}, Konstantinos D. Demadis², Kristalia Melessanaki³, Paraskevi Pouli³



Greek Participation to the HERACLES Consortium

1. FORTH (IESL & IACM)
2. UniCrete, Department of Chemistry
3. Ephorate of Antiquities of Heraklion



HERACLES Heritage Resilience Against CLimate Events on Site

HERACLES aims to design, validate and promote responsive systems for effective resilience of CH against climate change effects, through the development of an ICT platform able to collect and integrate multisource information in order to effectively provide complete and updated situational awareness and support decision for innovative measurements improving CH resilience.

In HERACLES, FORTH-IESL develops methodologies and instruments for in-situ analysis and mapping of deterioration phenomena on the monuments using Multispectral imaging, Raman, LIBS and 4D surface Volume topography



On-site campaign @ Venetian fortress "Koules", Oct 17





Photodissociation for Fusion and PNC

PRL 118, 233401 (2017)

PHYSICAL REVIEW LETTERS

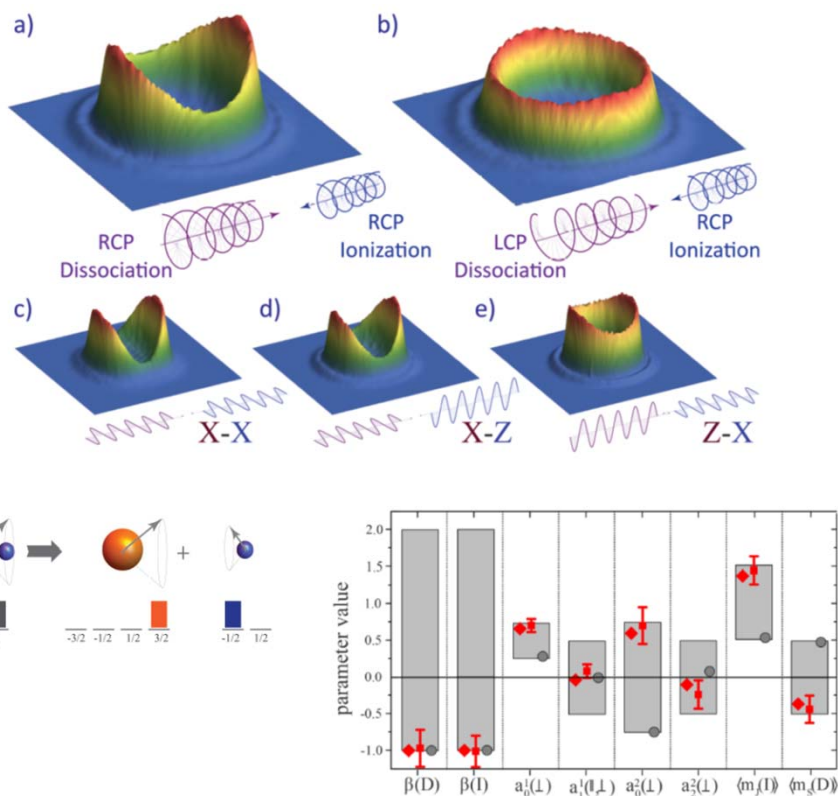
week ending
9 JUNE 2017

Highly Nuclear-Spin-Polarized Deuterium Atoms from the UV Photodissociation of Deuterium Iodide

Dimitris Sofikitis,^{1,2} Pavle Glodic,^{1,3} Greta Koumariou,^{1,3} Hongyan Jiang,⁴ Lykourgos Bougas,^{1,2,*} Peter C. Samartzis,¹ Alexander Andreev,^{5,6} and T. Peter Rakitzis^{1,2,7}

Highly Spin-Polarized, high-density, deuterium production from DI photodissociation, for investigation of feasibility of polarized nuclear fusion (D-T, D-D, D-³He).

Up to 50% increase in reactivity and strong product-recoil directionality for improved reactor efficiency.

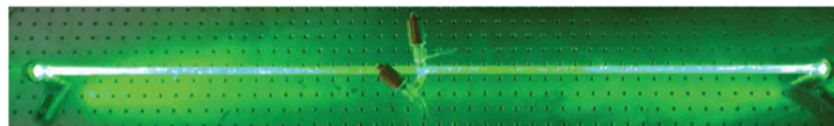
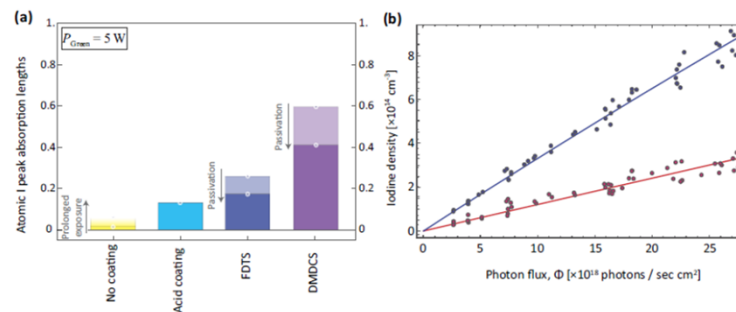
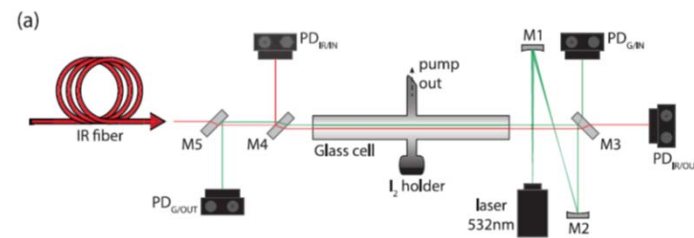


SCIENTIFIC REPORTS

High steady-state column density of $I(^2P_{3/2})$ atoms from I_2 photodissociation at 532 nm: Towards parity non-conservation measurements

Coating glass cells with hydrophobic silanes, to achieve $10^{17}/\text{cm}^2$ column densities of $I(^2P_{3/2})$ atoms at 295 K, needed for cavity-based atomic parity non-conservation measurements.

G. E. Katsoprinakis¹, G. Chatzidrosos², J. A. Kyriotakis², E. Stratakis¹ & T. P. Rakitzis^{1,2}



Published: 15 September 2016

SCIENTIFIC REPORTS | 6:33261 | DOI: 10.1038/srep33261





ABINGOS

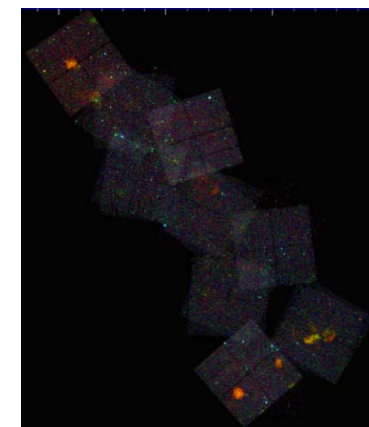
Accreting Binaries in Nearby Galaxies

Goal: A systematic study of accreting binary formation and evolution

- Dissect star-forming activity in galaxies
- A census of accreting binaries in nearby galaxies
- Development of theoretical models for accreting binaries & tools for multi-wavelength data analysis
- Constrain:
 - Gravitational-wave progenitors
 - short γ -ray burst progenitors
 - importance of accreting binaries in Reionization
- Team: 4 postdocs; 6 PhD, 1 MSc, 3 BSc students

Key Results

- The first direct measurement of the formation efficiency of neutron star accreting binaries in our nearest galaxy [1]
- Caught in the act: Discovery of a pulsar crossing the circumstellar disk of its donor star [2]
- A systematic study of the sub-galactic and nuclear main sequences for local star-forming Galaxies [3]
- The first hard X-ray observations of nearby galaxies [4] (in collaboration with NASA/GSFC and Caltech)



[1] Antoniou & Zezas, 2016, MNRAS, 459, 528

[2] Hong et al, 2016, ApJ, 826

[3] Maragkoudakis, et al, 2017, MNRAS, 466, 1192

[4] Yukita, et al., 2017, ApJ, 838, 47; Yukita, et al. 2016, ApJ, 824, 107

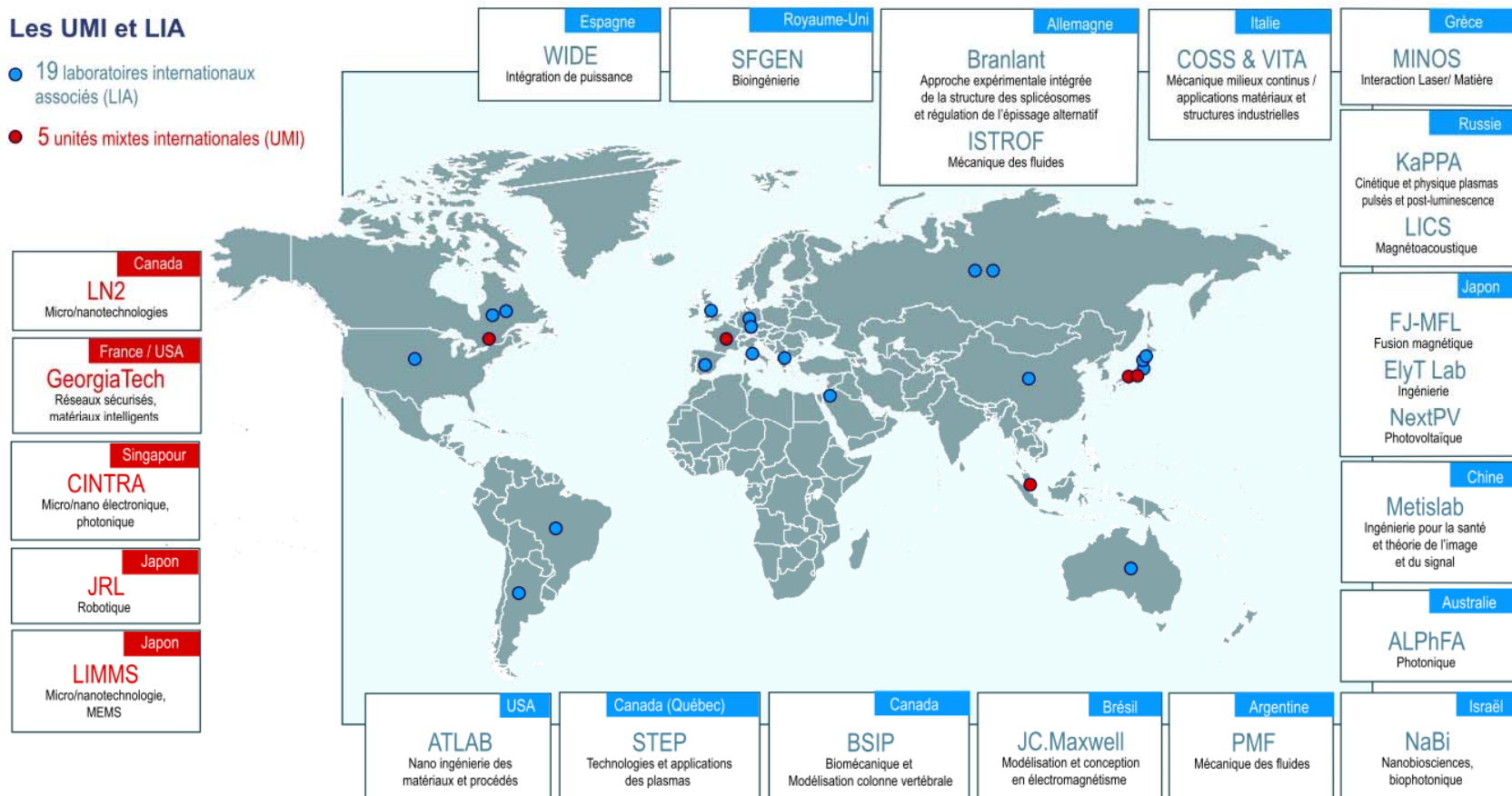


“MINOS” Greek-French CNRS Associated Lab



Les UMI et LIA

- 19 laboratoires internationaux associés (LIA)
- 5 unités mixtes internationales (UMI)



- 👉 Coordinators: Mark Sentis (LP3) & Stelios Tzortzakis (IESL)
- 👉 Participants: Th. Sarnet, Ph. Delaporte, D. Grojo, A. Kabashin (LP3), E. Stratakis, M. Farsari, D. Anglos, M. Kafesaki, A. Klini (IESL)



Attosecond Science and Technology

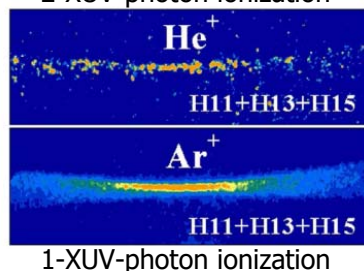
Generation of intense XUV pulses

SCIENTIFIC REPORTS | 6:21556 | DOI: 10.1038/srep21556
2-XUV-photon ionization

The ion microscope as a tool for quantitative measurements in the extreme ultraviolet

N. Tsatrafyllis^{1,2}, B. Bergues³, H. Schröder³, L. Veisz^{3,4}, E. Skantzakis¹, D. Gray¹, B. Bodi⁵, S. Kuhn⁶, G. D. Tsakiris⁷, D. Charalambidis^{1,2,6} & P. Tzallas^{1,6}

Sci. Rep. **6**, 21556 (2016).



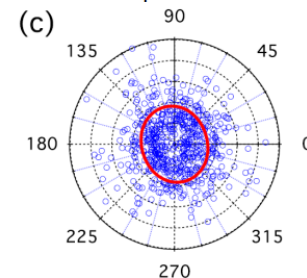
HHG with controllable ellipticity

SCIENTIFIC REPORTS | 6:39295 | DOI: 10.1038/srep39295

Polarization shaping of high-order harmonics in laser-aligned molecules

E. Skantzakis¹, S. Chatziathanasiou^{1,2}, P. A. Carpegiani³, G. Sansone^{3,4,5}, A. Nayak³, D. Gray¹, P. Tzallas^{1,3}, D. Charalambidis^{1,2,3}, E. Hertz⁶ & O. Faucher^{3,6}

Sci. Rep. **6**, 39295 (2016).

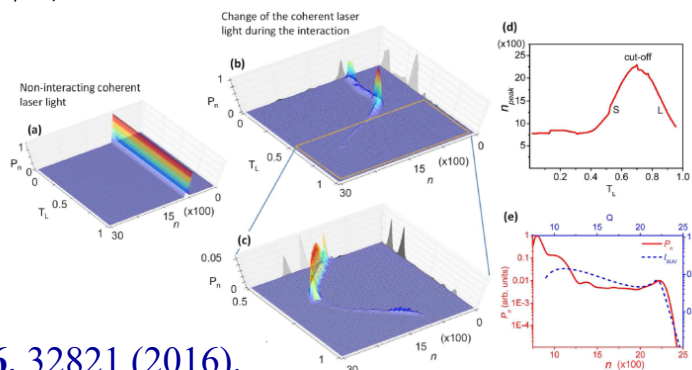


Quantum optical intricacies of HHG (theory)

SCIENTIFIC REPORTS | 6:32821 | DOI: 10.1038/srep32821

Quantum optical signatures in strong-field laser physics: Infrared photon counting in high-order-harmonic generation

I. A. Gonoskov^{1,2}, N. Tsatrafyllis^{1,3}, I. K. Komini³ & P. Tzallas¹



Sci. Rep. **6**, 32821 (2016).

Quantum optical emblems of HHG(experiment)

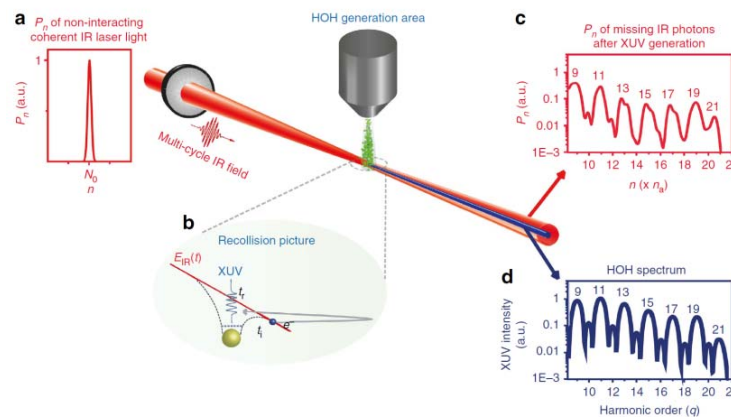


| 8:15170 | DOI: 10.1038/ncomms15170

High-order harmonics measured by the photon statistics of the infrared driving-field exiting the atomic medium

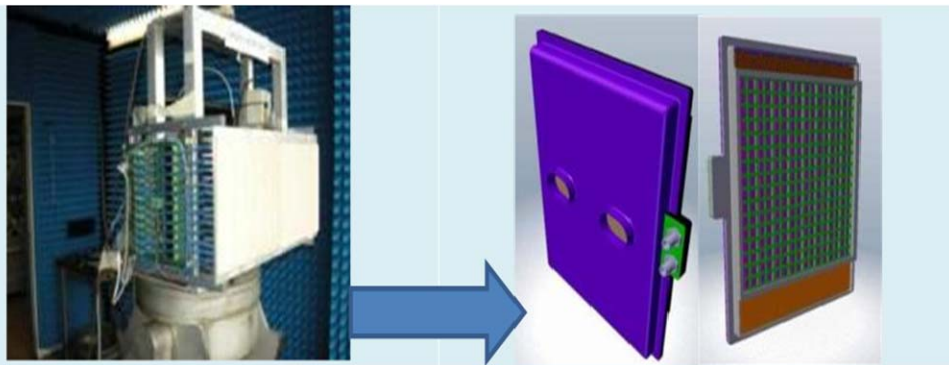
N. Tsatrafyllis^{1,2}, I. K. Komini^{2,3}, I. A. Gonoskov⁴ & P. Tzallas¹

Nature Commun. **8**, 15170 (2017)

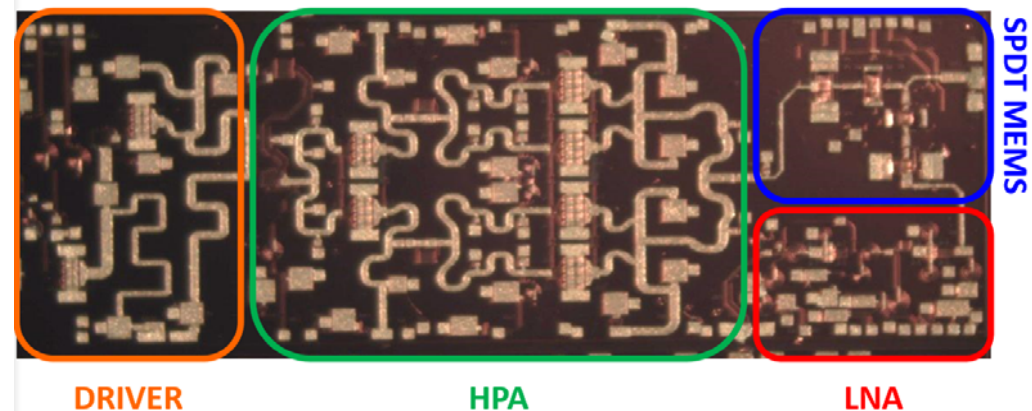


“Smart” monolithically integrated microwave power microsystems

- FORTH has developed “smart” microsystems for reconfigurable power microwave transceivers based on monolithic and coplanar integration of microwave circuits from III-nitrides with RF MEMS-type switches and acoustic-type temperature sensors (from III-nitrides) for the 1st time worldwide.
- Microwave performance at par with existing commercial solutions due to innovative design and fabrication approaches.
- Major application in new generation “tile” technology based weather radars necessary for the implementation of the new European flight safety protocols RECAT-EU2 και RECAT-EU3.
- Pilot line on the drawing board in collaboration with **Thales SA**



“Tile” technology for new generation radars

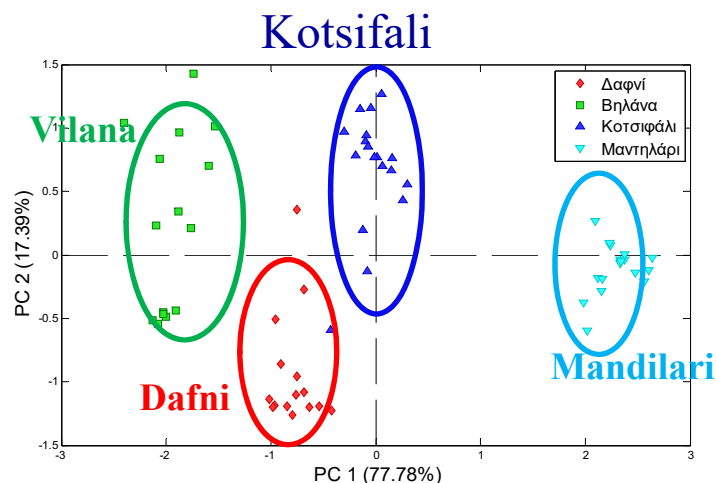


X-band Transceiver (FORTH)

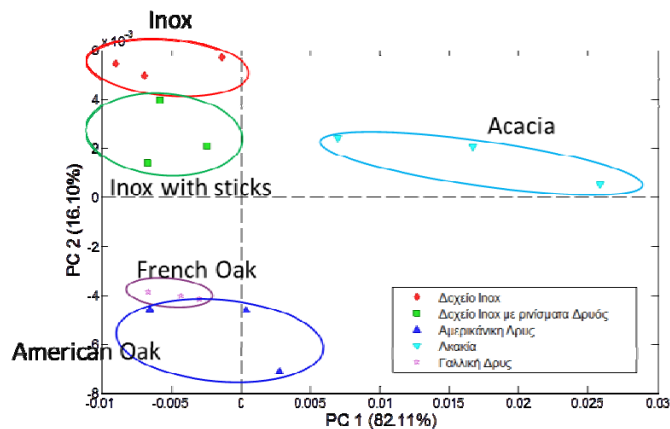


Applied Spectroscopy in Foods

“Identity” of Cretan Wines



Vilana Maturation in different barrels



Purity of Creta Olive Oil

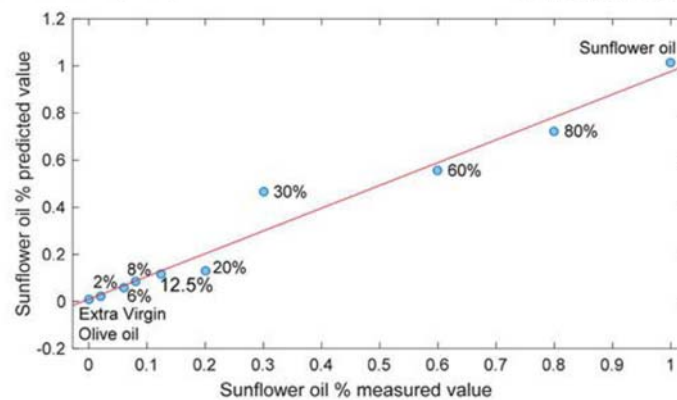
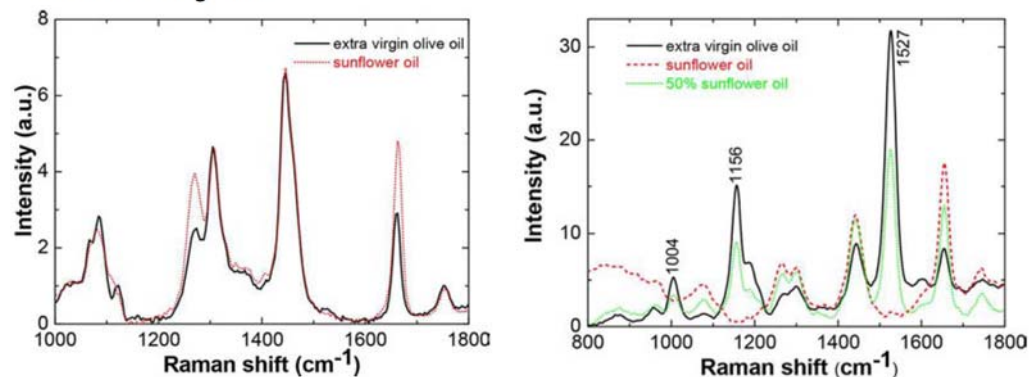
ANALYTICAL LETTERS
 2017, VOL. 50, NO. 7, 1182–1195
<https://doi.org/10.1080/00032719.2016.1208212>



SPECTROSCOPY

Comparative Study using Raman and Visible Spectroscopy of Cretan Extra Virgin Olive Oil Adulteration with Sunflower Oil

Aggelos Philippidis^a, Emmanouil Poulakis^{a,b}, Antigoni Papadaki^{a,c}, and Michalis Velegarakis^a





Polariton condensates for device applications

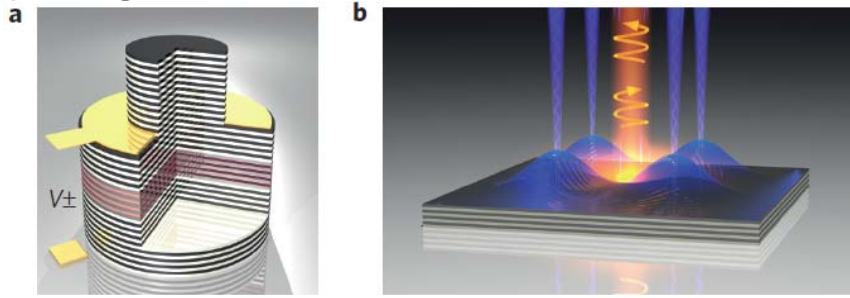
nature materials

LETTERS

PUBLISHED ONLINE: 8 AUGUST 2016 | DOI: 10.1038/NMAT4722

A sub-femtojoule electrical spin-switch based on optically trapped polariton condensates

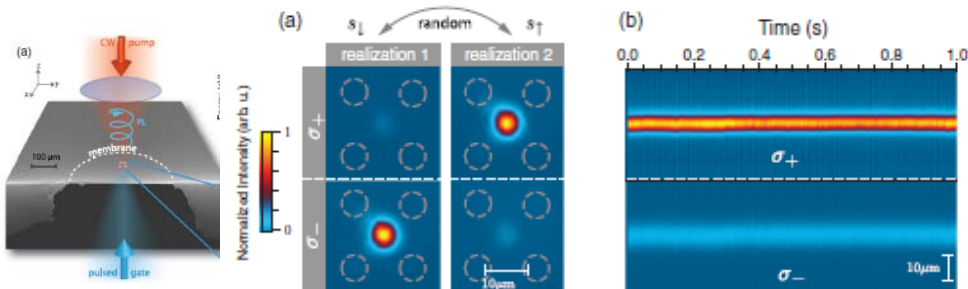
Alexander Dreismann¹, Hamid Ohadi¹, Yago del Valle-Inclan Redondo¹, Ryan Balili¹, Yuri G. Rubo², Simeon I. Tsintzos³, George Deligeorgis⁴, Zacharias Hatzopoulos^{3,4}, Pavlos G. Savvidis^{1,4,5} and Jeremy J. Baumberg^{1*}



PHYSICAL REVIEW X 5, 031002 (2015)

Spontaneous Spin Bifurcations and Ferromagnetic Phase Transitions in a Spinor Exciton-Polariton Condensate

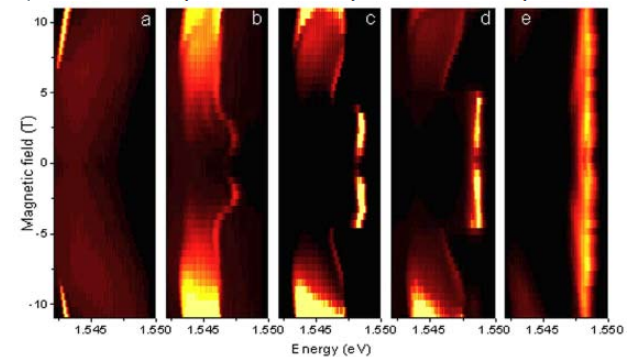
H. Ohadi,^{1*} A. Dreismann,¹ Y. G. Rubo,² F. Pinsker,^{3,4} Y. del Valle-Inclan Redondo,¹ S. I. Tsintzos,⁵ Z. Hatzopoulos,^{5,6} P. G. Savvidis,^{1,5,7} and J. J. Baumberg^{1,7}



SCIENTIFIC REPORTS

OPEN Lasing in Bose-Fermi mixtures

Vladimir P. Kochereshko^{1,2}, Mikhail V. Durnev^{1,2}, Lucien Besombes³, Henri Mariette³, Victor F. Sapega^{1,2}, Alexis Askitopoulos⁴, Ivan G. Savenko^{5,6}, Timothy C. H. Liew⁷, Ivan A. Shelykh⁷, Alexey V. Platonov^{1,2}, Simeon I. Tsintzos⁵, Z. Hatzopoulos⁵, Pavlos G. Savvidis^{8,9}, Vladimir K. Kalevich^{1,2}, Mikhail M. Afanasiev^{1,2}, Vladimir A. Lukoshkin^{1,2}



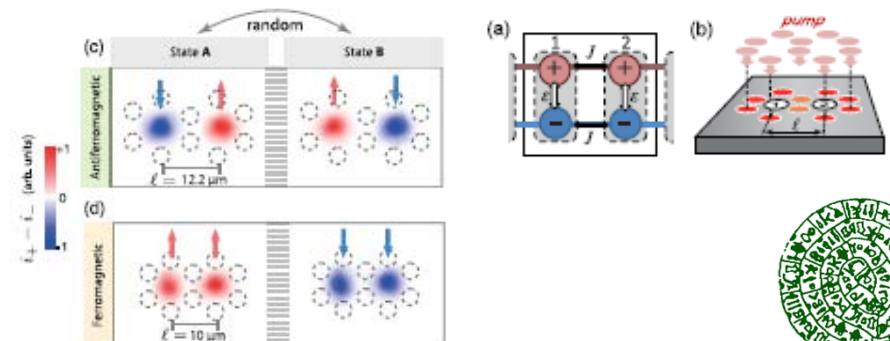
PRL 116, 106403 (2016)

PHYSICAL REVIEW LETTERS

week ending
11 MARCH 2016

Tunable Magnetic Alignment between Trapped Exciton-Polariton Condensates

H. Ohadi,^{1*} Y. del Valle-Inclan Redondo,¹ A. Dreismann,¹ Y. G. Rubo,² F. Pinsker,³ S. I. Tsintzos,⁴ Z. Hatzopoulos,^{4,5} P. G. Savvidis,^{4,6} and J. J. Baumberg^{1,7}



- FOUNDATION for RESEARCH & TECHNOLOGY – HELLAS
- UNIVERSITY OF CRETE
- MAX PLANCK INSTITUTE for EXTRATERRESTRIAL PHYSICS

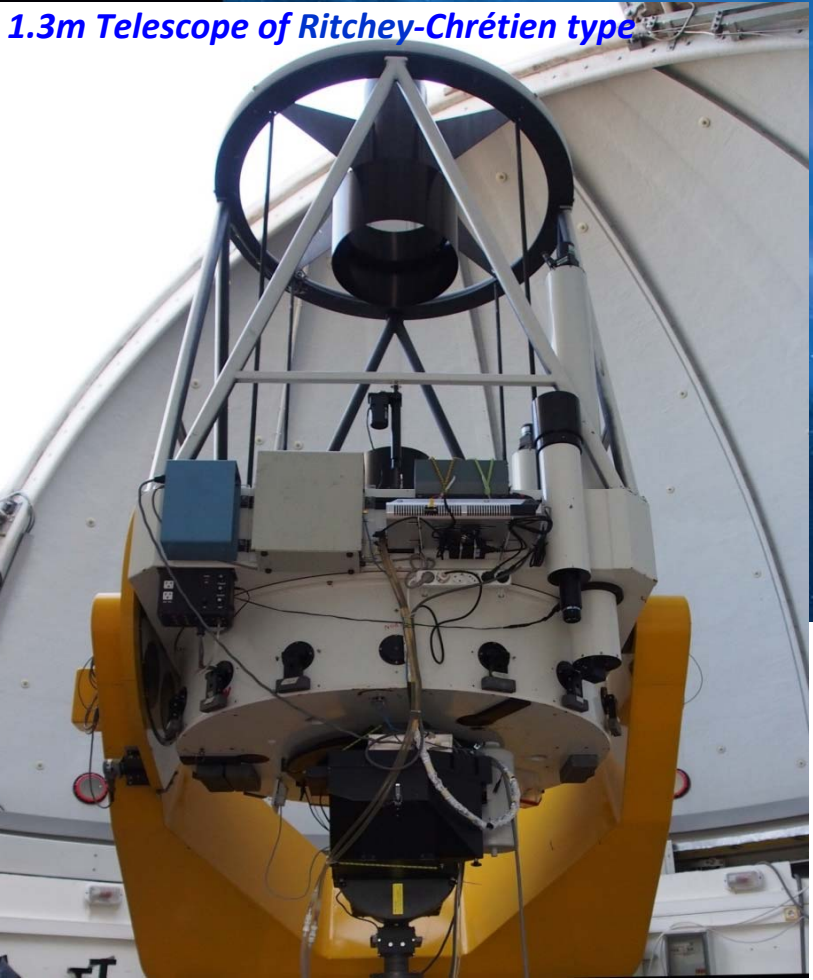
SKINAKAS OBSERVATORY



*Comet Hale-Bopp
Skinakas Observatory*



At an altitude of 1750 m on Psiloritis mountain at an excellent observing site Skinakas Observatory operates 3 telescopes equipped with a large suite of modern astronomical instruments



1.3m Telescope of Ritchey-Chrétien type



Near Infrared Camera



Echelle Spectrograph




Polarimeter





11th FORTH Retreat 2017: IESL Presentations



Session 1: System Biology

-  A. Mitraki, “Combining protein and peptide biomaterials with laser technologies towards tissue engineering scaffolds”


Session 4: Materials & Energy

-  S. Tzortzakis, “Sculptured ultrashort laser beams for materials engineering and energy harvesting”
-  G. Deligeorgis, “Two dimensional materials: A new pathway for electronics and sensing”

Session 5: Technology in the service of Society and Culture

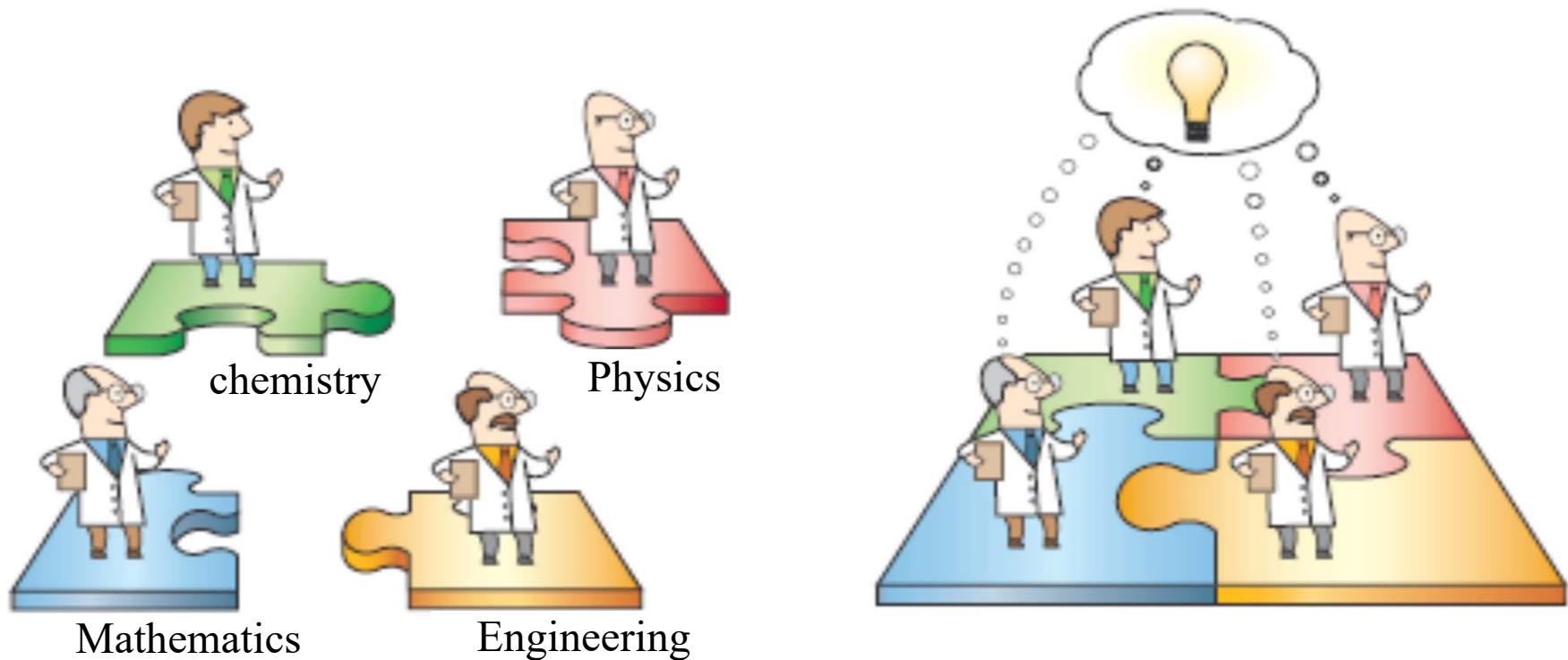
-  B. Brunetti, “Science for heritage studies and conservation” (*apologies*)
-  D. Anglos, “Cross-disciplinary interactions produce enabling tools in the service of Heritage Science”

Session 6: Environment and Natural Disasters

-  E. Stratakis, “Laser Micro/Nano-engineering of Materials for Energy and Tissue Applications”



Interdisciplinarity within IESL



THANK YOU

