# Роль проектов по обмену персоналом в развитии научной лаборатории

*(опыт реализации проектов TerACan, Cacomel, FAEMCAR, NAmiceMC, CANTOR)*


Полина Кужир

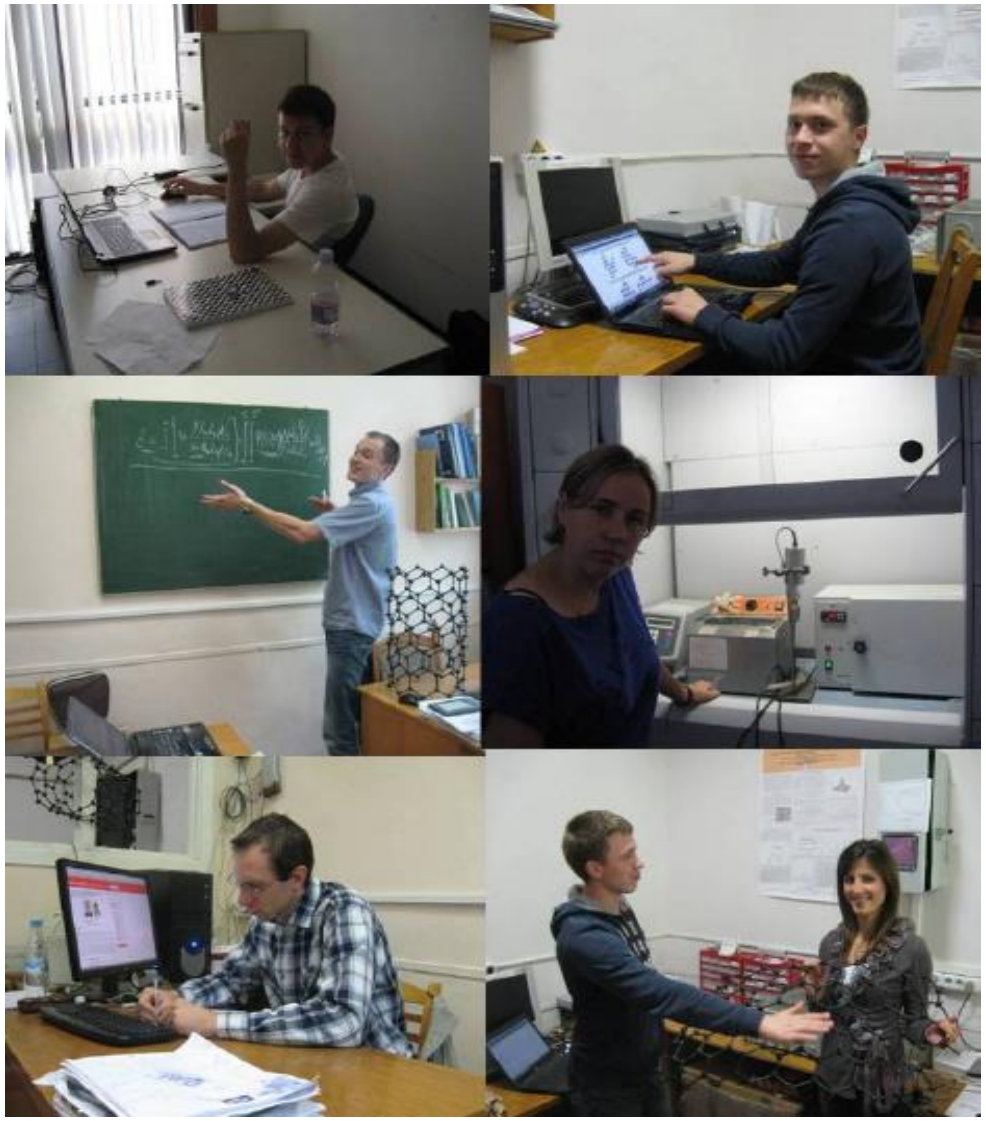
Институт ядерных проблем БГУ

# *Laboratory of electrodynamics of nonhomogeneous mediums*

**~ 20 persons**

**2 ScD (Research professors)**
**4 PhD**
**6 PhD students**
**3 MS students**
**Undergraduate students**

8 INTAS projects
2 NATO SfP
2 NATO linkage
1 ISTC
5 EU FP-7 IRSES
1 EU FP-7 INCO
3 IB BMBF (Germany)



Средний возраст – 36 лет

# Реализуемые и завершенные проекты IRSES

**Terahertz applications of carbon-based nanostructures,** EU FP7 TerACaN project FP7-230778, 2009-2013, Principal Researcher: M. Portnoi (Univer Exeter, UK), team leaders S. Maksimenko, O. Kibis (Novosibirsk, NSTU), I. Luk'yanchuk (Amiens University, France).

**Nano carbon based components and materials for high frequency electronics,** EU FP7 CACOMEL project FP7-247007, Call ID "FP7-PEOPLE-2009-IRSES", 2010-2014, Coordinator: Prof. Ch. Thomsen (Institut fuer Festkoerperphysik, TUB, Berlin, Germany), partners: S. Maksimenko, Y. Svirko (University of Joensuu,Finland), Yu.N. Shunin (University of Latvia, Institute of Solid State Physics). E. Obrazcova (A.M. Prokhorov General Physics Institute of RAS), P. Dyachkov ( Kurnakov Institute of General and Inorganic Chemistry, RAS) G. Miano (Università degli Studi di Napoli Federico II, Italy)

**Fundamental and Applied Electromagnetics of Nano-Carbons,** EU FP7 project FP7- 318617 FAEMCAR, Call ID FP7-PEOPLE-2012-IRSES, 2012-2017, Principal Researcher: Ph. Lambin (Facultes Universitaires Notre-Dame de la paix de Namur, Belgium), team leaders: Y. Banis ( Vilniaus Universitetas, Lithuania), S. Bellucci (Istituto Nazionale di Fisica Nucleare, Frascati, Italia), L. P. Biró (Research Centre for Natural Sciences, Hungarian Academy of Sciences, Budapest, Hungary ), L.A. Chernozatonskii (Institute for Biochemical Physics RAS, Moscow, Russia), G. I. Dovbeshko (Institute of Physics, NASU, Kiev, Ukraine), P. Kuzhir (INP BSU).

**Carbon-nanotube-based terahertz-to-optics rectenna,** EU FP7 project FP7-612285 CANTOR, Call ID FP7-PEOPLE-2013-IRSES, 2013-2017, Principal Researcher: M. Portnoi (University of Exeter, UK), team leaders S. Maksimenko (INP BSU), G. Slepyan (Tel Aviv University, Israel)

**Nano-Thin and Micro-Sized Carbons: Toward Electromagnetic Compatibility Application,** project FP7-610875 NAMICEMC, Call ID FP7-PEOPLE-2013-IRSES, 2013-2017, Principal Researcher: A. Celzard (ENSTIB, Universite de Lorraine, Epinal, Franse), team leaders: S. Bellucci (Istituto Nazionale di Fisica Nucleare, Frascati, Italia), P. Kuzhir (INP BSU).

# Nano carbon based components and materials for high frequency electronics, EU FP7 **CACOMEL** project FP7-247007, Call ID "FP7-PEOPLE-2009-IRSES", **2010-2014**

**SEVENTH FRAMEWORK PROGRAMME**
**Marie Curie Actions**
*People*
International Research Staff Exchange Scheme

## *Annex I - "Description of Work"*

### 3. Project summary

A strong expansion of the frequency range towards terahertz and infrared is the major trend in the modern electronics and optoelectronics. It relies on the incorporation of modern nanotechnology that has already given the birth to nanoelectronics, a rapidly developing discipline focused on both the dramatic increase of the component integration level and decrease in a power consumption. Performance of nanoelectronic devices is strongly influenced by quantum effects that often even determine properties of nano-sized components. The project aims at understanding of fundamentals of the electromagnetic processes in nanocircuits, theoretical and experimental investigation of underlying mechanisms responsible for their fascinating properties, and development of physical basis for use of these properties in novel nanoelectronic devices. The project focuses on resolving the problem of implementation of CNTs into nanoelectronics, and fabrication of nonlinear devices in fibers and waveguides for signal processing, all-optical switching, etc. The project has the following main objectives:

- to reveal the effects of spatial irregularities in the performance of CNT-based components and nanocircuits;
- to develop EMC theory of the circuits with nano-sized components;
- to perform experimental and theoretical investigation of high frequency and nonlinear optical properties of nano-carbon materials as potential materials for electromagnetic shielding and optical application.

Linear and nonlinear electromagnetic effects in nano-carbon structures, such as onion-like carbon and both single- and multi-wall carbon nanotubes, will be studied. Detail consideration to the performance of nanocircuits based on carbon nanotubes and other nanocarbon materials will be carried out, and fundamentals of the EMC theory as applied to circuits with nano-sized components will be developed. The role of intertube tunnelling in the performance of CNT-based high-frequency circuits will be studied. the second- and third order nonlinear optical effects in CNTs and other $sp^2$ nanocarbons to reveal their performance in nonlinear optical devices will be investigated. Different aspects of the design of materials based on sp2-nanocarbons for photonics and optoelectronics will be considered and the study of electromagnetic response of novel nano-carbon based composites to microwaves, THz, IR and optical frequencies will be undertaken in order to clarify their possible use for electromagnetic coating/shielding for a wide spectrum of technological applications.

The proposed multi-disciplinary research joins in a complimentary way differently experienced teams: electromagnetic theory and nanoelectromagnetism, solid state physics and quantum chemistry, characterization and optical spectroscopy of nano-carbons and nano-carbon materials, and nano-carbon fabrication technology. The composition of the research consortium provides for both successful realization of the project objectives and intensive knowledge exchange between teams. The challenging project relies on the complementary expertise of the consortium teams and is based on the original approach combining electrodynamics of mesoscopic inhomogeneous media and quantum theory of electronic ensembles with reduced dimensionality.

**Full Title:** Nano-carbon based components and materials for high frequency electronics

**Acronym:** CACOMEL

**Proposal Number:** 247007

**Scientific Panel:** PHY: Physics

**Grant Agreement Number:**

**Duration of the project:** 48 months

● Устойчивый научные связи

● Вновь образованные связи

### 2. List of partner organisations

| Partner Number | Partner name | Partner short name | Country |
|---|---|---|---|
| 1 coordinator (*beneficiary*) | Technische Universität Berlin, Institut für Festkörperphysik | TUB | Germany |
| 2 beneficiary | University of Joensuu | UJOE | Finland |
| 3 beneficiary | Università degli Studi di Napoli Federico II | UNF | Italy |
| 4 beneficiary | University of Latvia, Institute of Solid State Physics | ISSP | Latvia |
| 5 partner organisation | Belarus State University, Institute for Nuclear Problems | INP | Belarus |
| 6 partner organisation | A.M. Prokhorov General Physics Institute of Russian Academy of Sciences | GPI | Russia |
| 7 partner organisation | Kurnakov Institute of General and Inorganic Chemistry, Russian Academy of Sciences | IGIC | Russia |

# Fundamental and Applied Electromagnetics of Nano-Carbons, EU FP7 project FP7- 318617 **FAEMCAR**, Call ID FP7-PEOPLE-2012-IRSES, **2012-2016**

**SEVENTH FRAMEWORK PROGRAMME**
**Marie Curie Actions**
People
International Research Staff Exchange Scheme

***Annex I - "Description of Work"***

DESCRIPTION OF WORK

PART A

**1. *Grant agreement* details**

**Full Title:** Fundamental and Applied Electromagnetics of Nano-Carbons

**Acronym:** FAEMCAR

**Proposal Number:** 318617

**Scientific Panel:** Physics

**Grant Agreement Number:** PIRSES-GA-2012-

**Duration of the project:** 48 months

**Project start date:** October 1, 2012

**2. List of participants (*beneficiaries* and *partner organisations*)**

| Participant Number | Participant name | Participant short name | Country |
|---|---|---|---|
| 1 *Beneficiary* 1 | Facultés universitaires Notre-Dame de la Paix | LPS | Belgium |
| 2 *Beneficiary* 2 | Muszaki Fizikai es Anyagtudomanyi Kutatointezet - Magyar Tudomanyos Akademia | MFA | Hungary |
| 3 *Beneficiary* 3 | Istituto nazionale di Fisica Nucleare | LNF | Italy |
| 4 *Beneficiary* 4 | Vilniaus Universitetas | LPTDS | Lithuania |
| 5 Partner 5 | Belarusian State University | INP | Belarus |
| 6 Partner 6 | Emanuel Institute of Biochemical Physics - Russian Academy of Science | IBCP-RAS | Russia |
| 7 Partner 7 | Institute of Physics of National Academy of Science of Ukraine | IP-NASU | Ukraine |

**3. Project summary**

Owing to very small dimensions of nanostructures in one or more directions, spatial confinement of charge carriers is fully achieved, providing thereby a discrete spectrum of their energy states. In addition, intrinsic spatial inhomogeneity of nanostructures dictates nanoscale inhomogeneity of the surrounding electromagnetic fields. Therefore, understanding the properties of nanostructures requires to deal with the intricate characters of their atomic structure, electronic structure and electromagnetic environment. Coming within the scope of this new field of "nano-electromagnetics", the present project aims at understanding how and why carbon nanostructures might have interesting electromagnetic properties. The core of the project is the development, the experimental validation and the exploitation of a consistent theory of the electromagnetic response in radio, microwave and THz frequency ranges of regular carbon nanostructures and polymer composites based on nanocarbons. In particular, the project intends:
- to provide a forum for scientists specialized in different areas of the nanocarbon, and nanocarbon materials synthesis and applications; - to interpret experimental electromagnetic data collected;
- to define physical grounds and to perform experiments for the design of a new generation of ultra-light materials with controlled electromagnetic properties;
- to explore the possibility of using chemically-modified nanocarbons in "thin" bio-medical and nanophotonics applications.
At this aim, seven teams belonging to three different scientific areas will joint efforts. The partners will equally contribute to the achievements of the objective of this multi-disciplinary project by bringing their expertise in condensed-matter physics, electromagnetic theory, and applied electromagnetism. The research efforts, both theoretical and experimental, are articulated around four work packages all involving strong collaborative links and knowledge transfer across the consortium.


- Устойчивый научные связи
- Вновь образованные связи

# Carbon-nanotube-based terahertz-to-optics rectenna, EU FP7 project FP7-612285 **CANTOR**, Call ID FP7-PEOPLE-2013-IRSES, **2013-2017**

**SEVENTH FRAMEWORK PROGRAMME**
**THE PEOPLE PROGRAMME**

International Research Staff Exchange Scheme

***Annex I - "Description of Work"***

**PART A**

**1. *Grant agreement* details**

**Full Title:** Carbon-nanotube-based terahertz-to-optics rectenna

**Acronym:** CANTOR

**Proposal Number:** 612285

**Scientific Panel:** Physics

**Grant Agreement Number:** PIRSES-GA-2013-612285

**Duration of the project:** 48 months

- Устойчивый научные связи
- Вновь образованные связи

**2. List of participants (*beneficiaries* and partner organisations)**

| Participant Number | Participant name | Participant short name | Country |
|---|---|---|---|
| 1 *Beneficiary* 1 (coordinator) | University of Exeter | UNEXE | United Kingdom |
| 2 *Beneficiary* 2 | Tel Aviv University, School of Electrical Engineering, Faculty of Engineering, Department of Physical Electronics, | TAU | Israel |
| 3 Partner* 3 | Belarusian State University, Institute for Nuclear Problems | Belorussian State Uni | Belarus |

**in Part B of Annex I, the abbreviation INP is used as participant short name instead Belorussian State Uni*

**3. Project summary**

The efficiency of traditional semiconductor solar cells is the subject of a fundamental limitation known as the Shockley-Queisser recombination limit, and is found to be near 30%. The invention in the early eighties of solar cell rectifying antennas (rectennas) – a combination of an optical antenna and a rectifying diode to efficiently absorb the incident solar radiation and directly convert the ac field across the antenna into the dc power - provides a way to overcome the limitation. Recent rapid technological progress in the design of different nano-dimensional structures gives rise to a new promising possibility in designing nanorectennas. A solar cell will incorporate a large array of such elements, which provide high conversion efficiency, and can be produced cheaply in a roll-to-roll process. However, practical realization of such devices requires precise theoretical modeling and experimental study to provide optimization of the antenna and nanocontact configuration. The project focuses on the physics and theoretical modelling of nanorectenna performance. The rectification effect comes from the photo-assisted charge carrier tunneling through a nanogap. For the efficiency enhancement, we propose using the coherent effect of the photon dressing of the electron-hole pairs. Theoretical modeling will be carried out on the basis of the Landauer- Büttiker formalism extended to the case of photon-dressed electrons. The fundamental thermodynamic limitation of the rectenna efficiency and prospective applications of the device are to be studied. This multidisciplinary and challenging project relies on the complementary expertise of the consortium teams and is based on the original approach - nanoelectromagnetics - combining electrodynamics of mesoscopic inhomogeneous media and the quantum theory of electronic ensembles with reduced dimensionality.

# Nano-Thin and Micro-Sized Carbons: Toward Electromagnetic Compatibility Application, project FP7-610875 **NAMICEMC**, Call ID FP7-PEOPLE-2013-IRSES, **2013-2017**

- Устойчивый научные связи
- Вновь образованные связи

SEVENTH FRAMEWORK PROGRAMME
THE PEOPLE PROGRAMME

International Research Staff Exchange Scheme

***Annex I - "Description of Work"***

PART A

**1. *Grant agreement* details**

**Full Title:** Nano-thin and micro-sized carbons: Toward electromagnetic compatibility application

**Acronym:** NAmiceMC

**Proposal Number:** 610875

**Scientific Panel:** physics

**Grant Agreement Number:** PIRSES-GA-2013-610875

**Duration of the project:** 48 months

## 2. List of participants (*beneficiaries* and partner organisations)

| Participant Number | Participant name | Participant short name | Country |
|---|---|---|---|
| 1 *Beneficiary** 1 (coordinator) | University of Lorraine | UL | France |
| 2 *Beneficiary* 2 | Frascati National Laboratory at the National Institute of Nuclear Physics | LNF INFN | Italy |
| 4 Partner** 3 | Belarus State University, Institute for Nuclear Problems | INP BSU | Belarus |

** Beneficiary: EU/AC Institution*
*** Partner: Other Third Country Institution*

## 3. Project summary

The remarkable properties of high-surface area carbons, compatible in that with carbon nanotubes, provide a tremendous opportunity for fabrication, even at very low filler concentrations, of composites with outstanding electrical and electromagnetic properties. Due to their multifunctional properties, carbon/polymer composites can be widely used as relatively low weight and ultra-thin effective electric and optical components, as well as electromagnetic (EM) shielding and absorbing coatings. At the same time, ultra-lightweight carbon foams, being highly conductive, are expected to have very high EM shielding ability due to their cellular structure. Moreover, carbon foams have extremely low cost, and demonstrate outstanding thermal insulation / fire resistant and good mechanical properties. Along with polymer/carbon composites and highly conducting porous carbon monoliths, one more very attractive object for investigation its electromagnetic properties is ultrathin carbonaceous film - pyrolytic carbon or a few layer graphene. We expect that they could absorb up to 50% of the incident microwave power despite the fact that their thickness is only a small fraction of the skin depth. The idea of the project is to provide comparative study of EM shielding effectiveness of carbon foams, carbon ultra-thin films and epoxy/carbon composites with low filler concentration in microwave frequency range and to support the experimental data with an adequate theoretical model of materials' electromagnetics. On the basis of our theoretical simulations and experimental database collected within the project implementation, we intent to contribute into solution of one of the most challenging problem in material science: to develop EM coating through design-oriented-approach.

# Institutional Development of Applied Nanoelectromagnetics: Belarus in ERA Widening, EU FP7 **BY-NanoERA** project FP7-266529, Call ID FP7-**INCO**-2010-6, **2010-2013**
## Coordinator Prof. S. Maksimenko






- Устойчивый научные связи
- Вновь образованные связи

**Graphene-Based Revolutions in ICT And Beyond**
**GRAPHENE**
**Grant agreement number 604391**
**CP-CSA**

February 2, 2014

Multi-layered sandwich graphene devices
(MILESAGE)

Université de Nam
61 Rue de Bruxell
B-5000 Namur, Belgiu
Philippe Lamb
+32-817247
philippe.lambin@unamur.

# Поданные на конкурсы европейские проекты: **Graphene Flagship**

**Основой стали текущие проекты**
**IRSES**
*FP7 IRSES Cacomel,*
*FP7 IRSES FAEMCAR,*
*FP7 IRSES NAmiceMC*

**и проект INCO By-NanoERA**

*Table 2.2a. Recent and ongoing scientific projects involving at least two of the present partners P1 to P8.*

| Project | Period | P1 | P2 | P3 | P4 | P5 | P6 | P7 | P8 |
|---|---|---|---|---|---|---|---|---|---|
| FP7-ICT-2007.8.1 FET Proactive 1: Nano-scale ICT devices and systems "Carbon nanotube technology for high-speed nano-interconnects" CATHERINE | 2009-2011 | | | | | x | x | | |
| FP7-INCO-2010-6 "Institutional Development of Applied Nanoelectromagnetics: Belarus in ERA Widening" BY-NanoERA | 2010-2013 | | | | x | | x | x | x |
| FP7-PEOPLE-2009-IRSES "Nano carbon based components and materials for high frequency electronics" CACOMEL | 2010-2014 | | | x | x | | | | |
| FP7-PEOPLE-2012-IRSES "Fundamental and Applied Electromagnetics of Nano-Carbons" FAEMCAR | 2012-2016 | x | x | | x | | x | | |
| FP7-PEOPLE-2013-IRSES "Nano-Thin and Micro-Sized Carbons: Toward Electromagnetic Compatibility Application" NAMICEMC | 2013-2017 | | | | x | | x | | |

201303

Received

NATO Internal use

SPS:

Emerging Security Challenges Division

## Science for Peace and Security Programme

## PROJECT Application

NATO Emerging Security Challenges Division, SPS Programme, Bd. Léopold III, B-1110 Brussels, Belgium
Send applications to sps.applications@hq.nato.int

**Project Title** *80 characters maximum, including spaces. Please select a title that is comprehensible to the non-specialist*

Electromagnetic Interference Shield based on High Surface Area Carbon

**SPS Key Priority/Priorities** *please use the numbering and nomenclature from the guidelines*

1) Facilitate mutually beneficial cooperation on issues of common interest, including international efforts to meet emerging security challenges
a) Counter-Terrorism
i) Methods for the protection of critical infrastructure, supplies and personnel

**Project Duration** *maximum 36 months*

36

### NATO and Partner Country Project Directors

NATO Country Project Director (NPD)

| Family Name | First Name | Title | Job Title |
|---|---|---|---|
| Celzard | Alain | Prof. | Professor |

| Institution | Address | Country |
|---|---|---|
| University of Lorraine | 27 rue Philippe Séguin, CS 60036, 88026 Épinal Cedex | France |

| Telephone | Fax | Email |
|---|---|---|
| +33 03 29 29 61 14 | +33 03 29 29 61 38 | alain.celzard@univ-lorraine.fr |

Partner Country Project Director (PPD)

| Family Name | First Name | Title | Job Title |
|---|---|---|---|
| Kuzhir | Polina | Dr. | Head of Laboratory |

| Institution | Address | Country |
|---|---|---|
| Research Institute for Nuclear Problems of Belarusian State University | Bobruiskaya Str., 11 220030 Minsk | Belarus |

| Telephone | Fax | Email |
|---|---|---|
| +375 17 200 74 10 | +375 17 226 51 24 | polina.kuzhir@gmail.com |

# Поданные на конкурсы европейские проекты: **NATO SfP**

**Основой стали текущие проекты IRSES**
*FP7 IRSES FAEMCAR,*
*FP7 IRSES NAmiceMC*

**и проект INCO By-NanoERA**

# Планируемые к подаче на конкурс H2020 RISE
# Research and Innovation Staff Exchange
# Call: H2020-MSCA-RISE-2014 проекты

## Terahertz and Microwave Applications of Novel Carbon/Inorganic hybrid Nanostructures

| Partnership Member | Legal Entity Short Name | Academic (Y/N) | Country |
|---|---|---|---|
| **Beneficiaries** | | | |
| Center of Physical Science and technology | CPST | Y | Lithuania |
| **WEIZMANN INSTITUTE OF SCIENCE** | **WIS** | **Y** | **Israel** |
| Institute of Mechanics, Bulgarian Academy of Sciences | IM-BAS | N | Bulgaria |
| **Partner Organisations** | | | |
| Belarusian State University, Research Instiotute for Nuclear Problems | INP BSU | Y | Belarus |

**Основой станут проекты IRSES**

*FP7 IRSES FAEMCAR*

*FP7 IRSES CANTOR*

и проект INCO By-NanoERA

## Collective Excitations in Advanced Nanostructures

| Partnership Member | Legal Entity Short Name | Academic (Y/N) | Country |
|---|---|---|---|
| **Beneficiaries** | | | |
| **Mediterranean Institute of Fundamental Physics** | **MIFP** | **Y** | **Italy** |
| University of Exseter | EU | Y | UK |
| University of Eastern Finland | UEF | Y | Finland |
| **University of Iceland** | **UI** | **Y** | **Iceland** |
| **Partner Organisations** | | | |
| Belarus State University, Institute for Nuclear Problems | INP BSU | Y | Belarus |
| Erevan State University | ESU | Y | Armenia |
| De La Salle University | DLSU | Y | Philippines |

**Основой станут проекты IRSES**

*FP7 IRSES TerACaN*

*FP7 IRSES Cacomel*

*FP7 IRSES CANTOR*

Устойчивый научные связи

Вновь образованные связи

# Поданные на конкурсы европейские проекты: COST

**Основой стали роекты IRSES**

*FP7 IRSES TerACaN,*
*FP7 IRSES Cacomel,*
*FP7 IRSES FAEMCAR,*
*FP7 IRSES NAmiceMC*
*FP7 IRSES CANTOR*

**и проект INCO By-NanoERA**

Title: Nanoelectromagnetics facing societal challenges

Acronym: NEMASO

Abstract:

The potential of nanosized elements and nanostructured materials for the manipulation of electromagnetic fields motivates the recent introduction of a new research discipline – nanoelectromagnetics (NEM) – which conceptually is a fusion of classical electrodynamics with novel methods and approaches of condensed matter physics. To move towards societal challenges for further ERA development, NEM needs an intensive interdisciplinary knowledge exchange between different scientific communities. As the crucial issue for success is involvement of industry along with academic research, actions targeting industry will be taken. We have letters of interest by several industries. The platform yielded by the project will be made available. Close contact with users will be kept through workshops, a web forum dealing with NEM fundamentals; NEM for electromagnetic, Biomedical and ICT applications; nanophotonics, photovoltaics and metamaterials, by a network of research groups as contact points.

PARTICIPANTS

Dr. Stefano Bellucci, coordinator, INFN, Italy

Dr. Maria Kafesaki, FORTH, Greece

Prof. Raluca Muller, IMT Bucharest, Romania

Prof. Rumiana Kostilkova, IMech-BAS (OLEM), Bulgaria

Prof. Alain Celzard, CNRS Institut Jean Lamour, France

Prof. Yuri Shunin, ISSP, Latvia

Prof. Irina Hussainova, University of Tartu, Estonia

Prof. Juras Banys, VU, Lithuania

Prof. Gregory Slepyan, TU, Tel Aviv, Israel

Prof. Yuri Svirko, UEF, Finland

Dr. Mikhail Portnoi, University of Exeter, UK

Prof. Sergey Maksimenko, INP BSU, Belarus

Prof. Akhlesh Lakhtakia, Penn. State Univ., USA

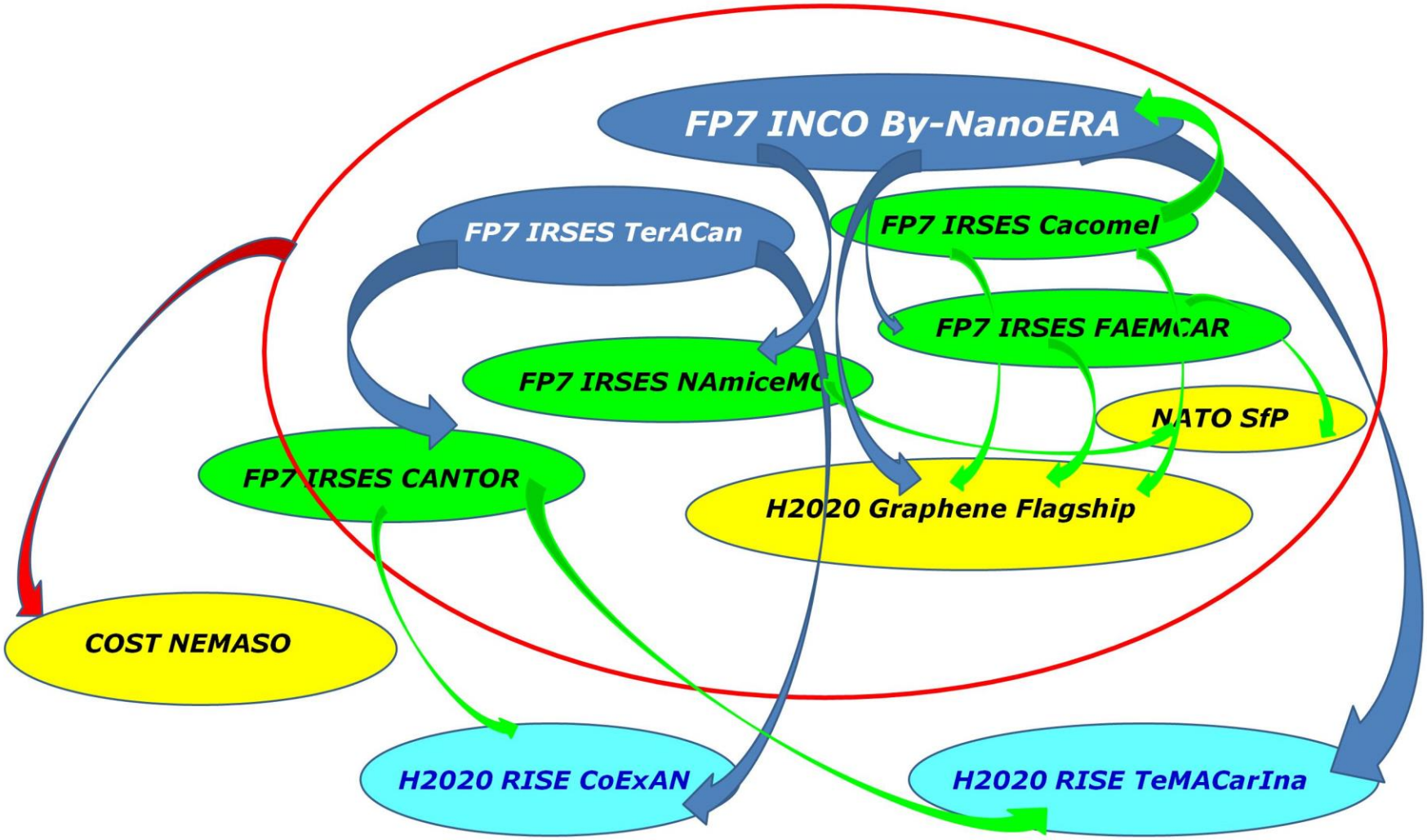
Dr. Geza Mark, MFA, Budapest, Hungary

Prof. Philippe Lambin, U Namur, Belgium

Prof. Axel Hoffmann, TUB, Berlin, Germany

Средний **h-фактор** = **23**

# Взаимные связи между проектами



PHYSICAL REVIEW B **85**, 165435 (2012)

**Experimental evidence of localized plasmon resonance in composite materials containing single-wall carbon nanotubes**

M. V. Shuba, A. G. Paddubskaya, A. O. Plyushch, P. P. Kuzhir, G. Ya. Slepyan, and S. A. Maksimenko
*Institute for Nuclear Problems, Belarus State University, Bobruiskaya 11, 220050 Minsk, Belarus*

V. K. Ksenevich and P. Buka
*Department of Physics, Belarus State University, Nezalezhnastsi Avenue 4, 220030 Minsk, Belarus*

D. Seliuta, I. Kasalynas, J. Macutkevic, and G. Valusis
*Center for Physical Sciences and Technology, A. Gostauto 11, LT-01108 Vilnius, Lithuania*

C. Thomsen
*Institut für Festkörperphysik, Technische Universität Berlin, Hardenbergstraße 36, D-10623 Berlin, Germany*

A. Lakhtakia
*Nanoengineered Metamaterials Group, Department of Engineering Science and Mechanics, Pennsylvania State University, University Park, Pennsylvania 16802-6812, USA*

PHYSICAL REVIEW B **81**, 205423 (2010)

**Terahertz conductivity peak in composite materials containing carbon nanotubes: Theory and interpretation of experiment**

G. Ya. Slepyan, M. V. Shuba, and S. A. Maksimenko
*Institute for Nuclear Problems, Belarus State University, Bobruiskaya 11, 220050 Minsk, Belarus*

C. Thomsen
*Institut für Festkörperphusik, Technische Universität Berlin, Hardenbergstr. 36, D-10623 Berlin, Germany*

A. Lakhtakia

## Projects visibility (2010-2013)

**Invited talks**: 10 (INP)
e.g. *2013 International Symposium on Electromagnetic Theory (Berlin)*

**Talks**: 73 in total, most of them are oral presentations

**Papers published**: 114 in total in PRB, APL, JAP, Nanotechnology,etc

Thin Solid Films 519 (2011) 4114–4118

Contents lists available at ScienceDirect

Thin Solid Films

journal homepage: www.elsevier.com/locate/tsf

Microwave probing of nanocarbon based epoxy resin composite films: Toward electromagnetic shielding

P. Kuzhir [a,*], A. Paddubskaya [a], D. Bychanok [a], A. Nemilentsau [a], M. Shuba [a], A. Plusch [a], S. Maksimenko [a], S. Bellucci [b], L. Coderoni [b], F. Micciulla [b], I. Sacco [b], G. Rinaldi [c], J. Macutkevic [d], D. Seliuta [d], G. Valusis [d], J. Banys [e]

Diamond & Related Materials 19 (2010) 91–99

Contents lists available at ScienceDirect

Diamond & Related Materials

journal homepage: www.elsevier.com/locate/diamond

Dielectric properties of a novel high absorbing onion-like-carbon based polymer composite

J. Macutkevic [a,*], P. Kuzhir [b,2], D. Seliuta [a,1], G. Valusis [a,1], J. Banys [c,3], A. Paddubskaya [b,2], D. Bychanok [b,2], G. Slepyan [b,2], S. Maksimenko [b,2], V. Kuznetsov [d,4], S. Moseenkov [d,4], O. Shenderova [e,5], A. Mayer [f,6], Ph. Lambin [f,6]

APPLIED PHYSICS LETTERS **97**, 073116 (2010)

**Terahertz sensing with carbon nanotube layers coated on silica fibers: Carrier transport versus nanoantenna effects**

Dalius Seliuta,[1,2,a)] Irmantas Kašalynas,[1] Jan Macutkevic,[1] Gintaras Valušis,[1] Mikhail V. Shuba,[3] Polina P. Kuzhir,[3] Gregory Ya. Slepyan,[3] Sergey A. Maksimenko,[3] Vitaly K. Ksenevich,[4] Vladimir Samuilov,[5] and Qi Lu[5]

# Fundamental and Applied NanoElectroMagnetics

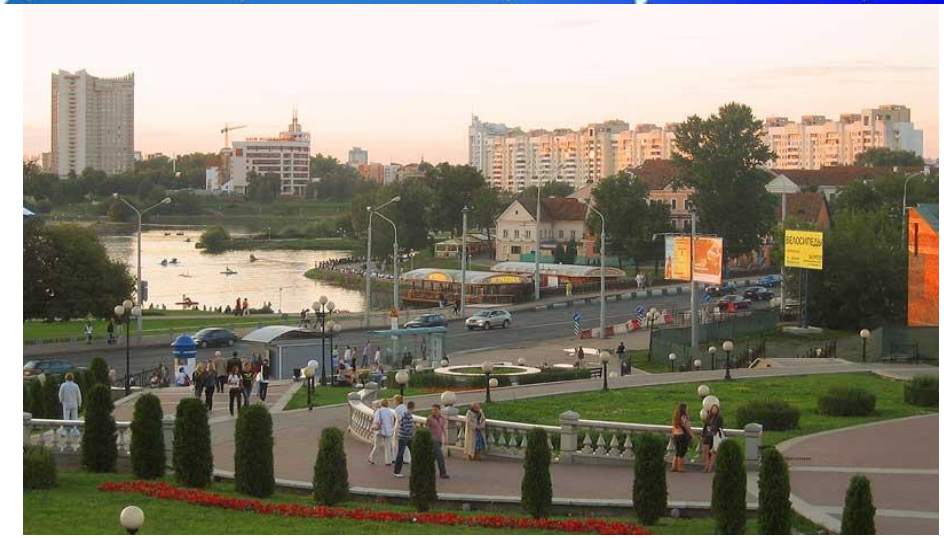
# FANEM' 12

25th anniversary of the Research Institute for Nuclear Problems BSU

Belarusian State University, Minsk, Belarus, May 22-25, 2012

Chairmen: O. Ivashkevich
S.Maksimenko

Средний **h-фактор приглашенного лектора = 28**



Помимо FANEM 2012, НИИ ЯП БГУ организовал ряд Успешных спец-секций на международных конференциях, Включая Nanomeeting 2011 и 2013

***www.nano.bsu.by/***

# Молодежные гранты

## Гранты международной федерации ученых (World Federation of Scientists, National Scholarship Programme in the frame of the topic "Science and Technologies for Developing Countries")

Nonlinear optical properties of carbon nanotube composites, World Federation of Scientists, National Scholarship Programme in the frame of the topic "Science and Technologies for Developing Countries", 2004. Grant holder A. Nemilentsau under supervision of S.A. Maksimenko

Optical properties of carbon nanotube based composite medium, World Federation of Scientists, National Scholarship Programme in the frame of the topic "Science and Technologies for Developing Countries", 2008. Grant holder M. Shuba under supervision of S.A. Maksimenko

Грант международной федерации ученых (World Federation of Scientists, National Scholarship Programme in the frame of the topic "Science and Technologies for Developing Countries"). «Диэлектрические свойства полимерных композитных матермалов на основе наноуглерода», 2010/2011, Получатель гранта: аспирант Д.С. Быченок, научный руководитель: С. А. Максименко

Грант международной федерации ученых (World Federation of Scientists, National Scholarship Programme in the frame of the topic "Science and Technologies for Developing Countries"). «Rabi waves in quantum dot-based nanostructures», 2011/2012, Получатель гранта: аспирант Е.Ерчак, научный руководитель: Г.Я.Слепян

Грант международной федерации ученых (World Federation of Scientists, National Scholarship Programme in the frame of the topic "Science and Technologies for Developing Countries"). 2012/2013, Получатель гранта: аспирант О.Г. Поддубская, научный руководитель: С. А. Максименко.

Грант международной федерации ученых WFS Belarus National Scholarship Programme "Experimental study and theoretical simulations of electromagnetic response of carbon foams and polymer/nanocarbon composites", Получатель гранта Плющ А.О. Научный руководитель – Максименко С.А.

# Молодежные гранты

## Гранты РФФИ, конкурс "Научная работа молодых ученых из стран СНГ в российских научных организациях"

Грант РФФИ, конкурс "Научная работа молодых ученых из стран СНГ в российских научных организациях" МОБ_СНГ_СТ 2010 Г. "Научная работа молодого ученого немиленцева Андрея Михайловича из Белоруссии в Институте неорганической химии им. Курнакова РАН".

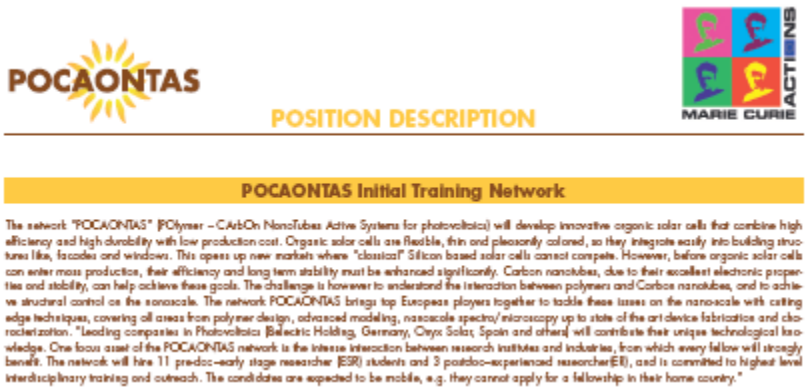
Грант РФФИ, конкурс "Научная работа молодых ученых из стран СНГ в российских научных организациях" МОБ_СНГ_СТ 2010 Г. и МОБ_СНГ_СТ 2011 Г. "Научная работа молодого ученого Быченка Дмитрия Сергеевича из Белоруссии в Институте Неорганической химии СО РАН"., Новосибирск, Грантополучатель Быченок Д.С.

Грант РФФИ № 13-02-90919 "Электронные свойства графеновых нанолент с зигзагообразно модифицированными краями", выполняемый Сороко В.А. в Федеральном государственном бюджетном учреждении науки Институте биохимической физики им. Н.М. Эмануэля Российской академии наук (ИБХФ РАН).

Грант РФФИ "мол_ин_нр" №13-03-90915, выполняемый Волынец Н.И. в Институте неорганической химии СО РАН (г. Новосибирск) в 2013 году под руководством доктора физ.-мат. наук А.В. Окотруба: «*Взаимодействие микроволнового излучения с композиционными материалами на основе химически модифицированного графена в полимерной матрице*».

## Lithuanian State scholarship – 2 аспиранта

## Гранты БРФФИ для молодых ученых, Гранты Минобразования для студентов, аспирантов, магистрантов, гранты БГУ


POCAONTAS

POSITION DESCRIPTION

MARIE CURIE ACTIONS

POCAONTAS Initial Training Network

The network "POCAONTAS" (POlymer – CArbOn NanoTubes Active Systems for photovoltaics) will develop innovative organic solar cells that combine high efficiency and high durability with low production cost. Organic solar cells are flexible, thin and pleasantly colored, so they integrate easily into building structures like, facades and windows. This opens up new markets where "classical" Silicon based solar cells cannot compete. However, before organic solar cells can enter mass production, their efficiency and long term stability must be enhanced significantly. Carbon nanotubes, due to their excellent electronic properties and stability, can help achieve these goals. The challenge is however to understand the interaction between polymers and Carbon nanotubes, and to achieve structural control on the nanoscale. The network POCAONTAS brings top European players together to tackle these issues on the nano-scale with cutting edge techniques, covering all areas from polymer design, advanced modeling, nanoscale spectro/microscopy up to state of the art device fabrication and characterization. "Leading companies in Photovoltaics (Eckectric Holding, Germany, Oryx Solar, Spain and others) will contribute their unique technological knowledge. One focus asset of the POCAONTAS network is the intense interaction between research institutes and industries, from which every fellow will strongly benefit. The network will hire 11 predoc-early stage researcher (ESR) students and 3 postdoc-experienced researcher(ER), and is committed to highest level interdisciplinary training and outreach. The candidates are expected to be mobile, e.g. they cannot apply for a fellowship in their home country."

Лучшая СНИЛ 2008 – 2010, 2011 и 2012 в БГУ в номинации Научно-исследовательская и инновационная деятельность

РЭСПУБЛІКА БЕЛАРУСЬ

БЕЛОРУССКИЙ ГОСУДАРСТВЕННЫЙ УНИВЕРСИТЕТ

# ДИПЛОМ

*Конкурс на лучшую студенческую научно-исследовательскую лабораторию по итогам 2008 – 2010 гг.*

НАГРАЖДАЕТСЯ

Студенческая научно-исследовательская лаборатория

«Электромагнитные процессы в наноструктурах»

Руководители:

**Максименко Сергей Афанасьевич,**

**Кужир Полина Павловна**

Научно-исследовательский институт ядерных проблем

**Победитель конкурса в номинации**

**Научно-исследовательская и инновационная деятельность**

Ректор С. В. Абламейко

Приказ ректора БГУ
от 12.04.2011 г. № 538-ЛК

Theory of optical scattering by achiral carbon nanotubes and their potential as optical nanoantennas

GY Slepyan, **MV Shuba**, SA Maksimenko, A Lakhtakia - Physical Review B, 2006 - APS

Among a variety of different nanostructures, quasione-dimensional carbon macromolecules called carbon nanotubes1 CNTs are the subject of intense research worldwide—largely because of their unique electronic properties. It is well known that, depending on the ...

Цитируется: 131 Похожие статьи Все версии статьи (3) Импортировать в BibTeX Ещё

Electromagnetic wave propagation in an almost circular bundle of closely packed metallic carbon nanotubes

**MV Shuba**, SA Maksimenko, A Lakhtakia - Physical Review B, 2007 - APS

Carbon nanotubes CNTs have been the subjects of intensive research in the area of nanotechnology for about 15 years, 1 yet understanding of their fundamental physics is far from complete. One topic under intensive investigation is their electromagnetic response. ...

Цитируется: 68 Похожие статьи Все версии статьи (6) Импортировать в BibTeX Ещё

Theory of multiwall carbon nanotubes as waveguides and antennas in the infrared and the visible regimes

**MV Shuba**, GY Slepyan, SA Maksimenko, C Thomsen... - Physical Review B, 2009 - APS

Their unusual physical and chemical properties and their potential applications in a variety of nanotechnologies make carbon nanotubes CNTs very interesting objects to technoscientists 1, 2 despite possible health hazards. 3 In particular, CNTs have been ...

Цитируется: 56 Похожие статьи Все версии статьи (7) Импортировать в BibTeX Ещё

Terahertz conductivity peak in composite materials containing carbon nanotubes: Theory interpretation of experiment

GY Slepyan, **MV Shuba**, SA Maksimenko, C Thomsen... - Physical Review B, 2010 - APS

Carbon nanotubes CNTs Ref. 1—single-or multiwalled hexagonal networks of carbon atoms rolled up into cylinders—are extensively studied as potential components of high-frequency electronic circuits, such as transmission lines, 2 interconnects, 3 and antennas. 4–11 ...

Цитируется: 46 Похожие статьи Все версии статьи (4) Импортировать в BibTeX Ещё

Carbon nanotube antenna: far-field, near-field and thermal-noise properties

..., GY Slepyan, AM Nemilentsau, **MV Shuba** - Physica E: Low- ..., 2008 - Elsevier

A theory of the metallic achiral carbon nanotube (CNT) as a vibrator antenna is presented. The Leontovich–Levin integral equations method has been extended to the case of CNTs. Integral equations for the finite-length CNT and CNT bundles have been solved ...

Цитируется: 25 Похожие статьи Все версии статьи (3) Импортировать в BibTeX Ещё

Substitutional doping of carbon nanotubes to control their electromagnetic characteristic

AM Nemilentsau, **MV Shuba**, GY Slepyan, PP Kuzhir... - Physical Review B, 2010 - APS

Materials containing metallic carbon nanotubes CNTs can be used for the effective manipulation of the electromagnetic fields in the megahertz MHz, gigahertz GHz, and terahertz THz regimes. Particularly, for the rapidly emerging areas of THz sensing and ...

Цитируется: 13 Похожие статьи Все версии статьи (3) Импортировать в BibTeX Ещё

Radiofrequency field absorption by carbon nanotubes embedded in a conductive host

**MV Shuba**, GY Slepyan, SA Maksimenko... - Journal of Applied ..., 2010 - ieeexplore.ieee.org

Abstract Understanding the electromagnetic response of carbon nanotubes (CNTs) in the radio frequency range is very important for experimental development of therapeutic and diagnostic CNT applications, including selective thermolysis of cancer cells and ...

Цитируется: 14 Похожие статьи Все версии статьи (6) Импортировать в BibTeX Ещё

Absorption cross-section and near-field enhancement in finite-length carbon nanotubes i terahertz-to-optical range

**MV Shuba**, SA Maksimenko, GY Slepyan - arXiv preprint arXiv:0806.2954, 2008 - arxiv.org

Abstract: Electromagnetic characteristics of single-walled finite-length carbon nanotubes-absorption cross-section and field enhancement in the near zone-are theoretically studied in a wide frequency range from terahertz to visible. The analysis is based on the impedance- ...

Цитируется: 10 Похожие статьи Все версии статьи (4) Импортировать в BibTeX Ещё

Ведущий научный сотрудник Шуба М.В. получил премию БГУ им. А.Н. Севченко для молодых ученых.

**Shuba, Mikhail V.** (Mikhail V. Shuba)

Find potential author matches

**Personal**

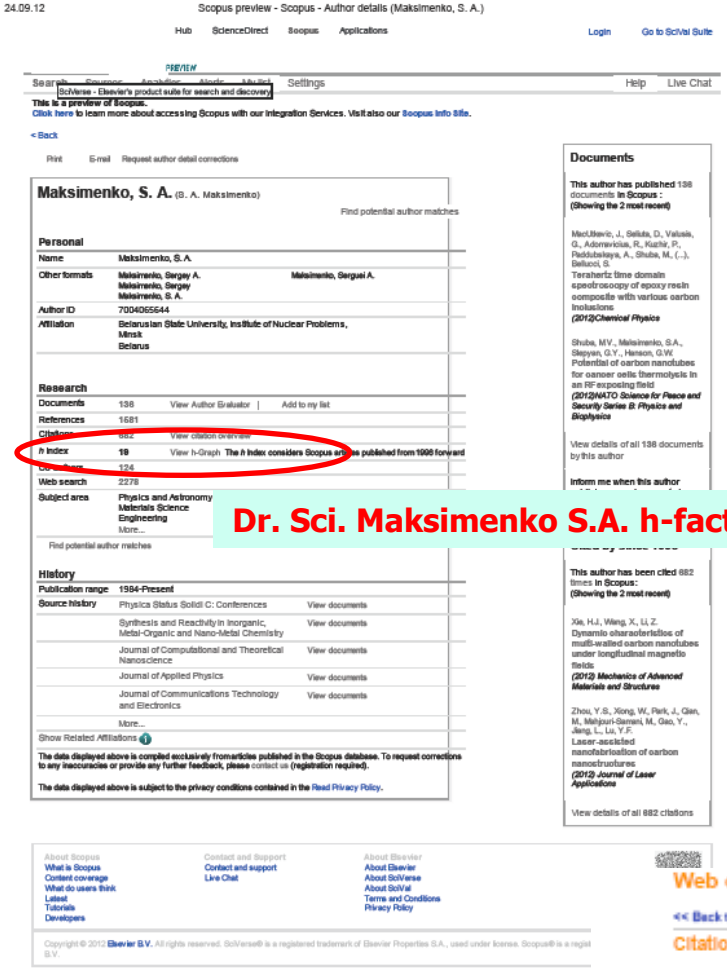
| | |
|---|---|
| Name | Shuba, Mikhail V. |
| Other formats | Shuba, M.<br>Shuba, M. V.<br>Shuba, Mikhail |
| Author ID | 13609773100 |
| Affiliation | Institute of Nuclear Problems Belarus,<br>Minsk<br>Belarus |

**Research**

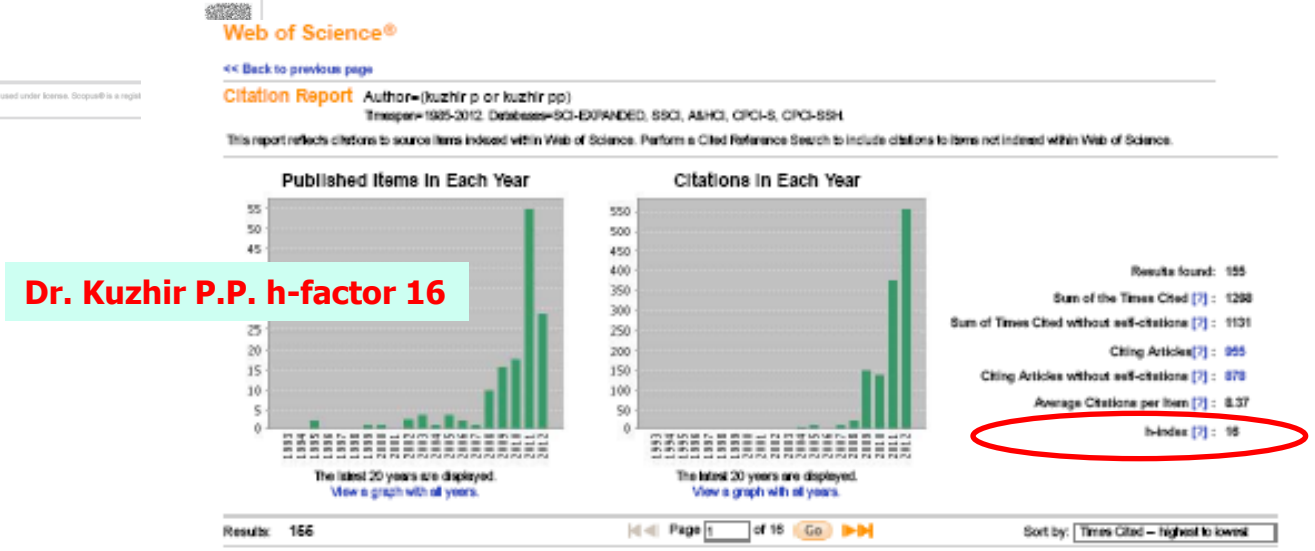
| | | |
|---|---|---|
| Documents | 33 | View Author Evaluator \| Add to my list |
| References | 535 | |
| Citations | 201 | View citation overview |
| *h* Index | 9 | View h-Graph The *h* index considers Scopus articles published from 1996 forward |
| Co-authors | 64 | |
| Web search | 75 | |
| Subject area | Physics and Astronomy<br>Materials Science<br>Engineering<br>More... | |

Find potential author matches

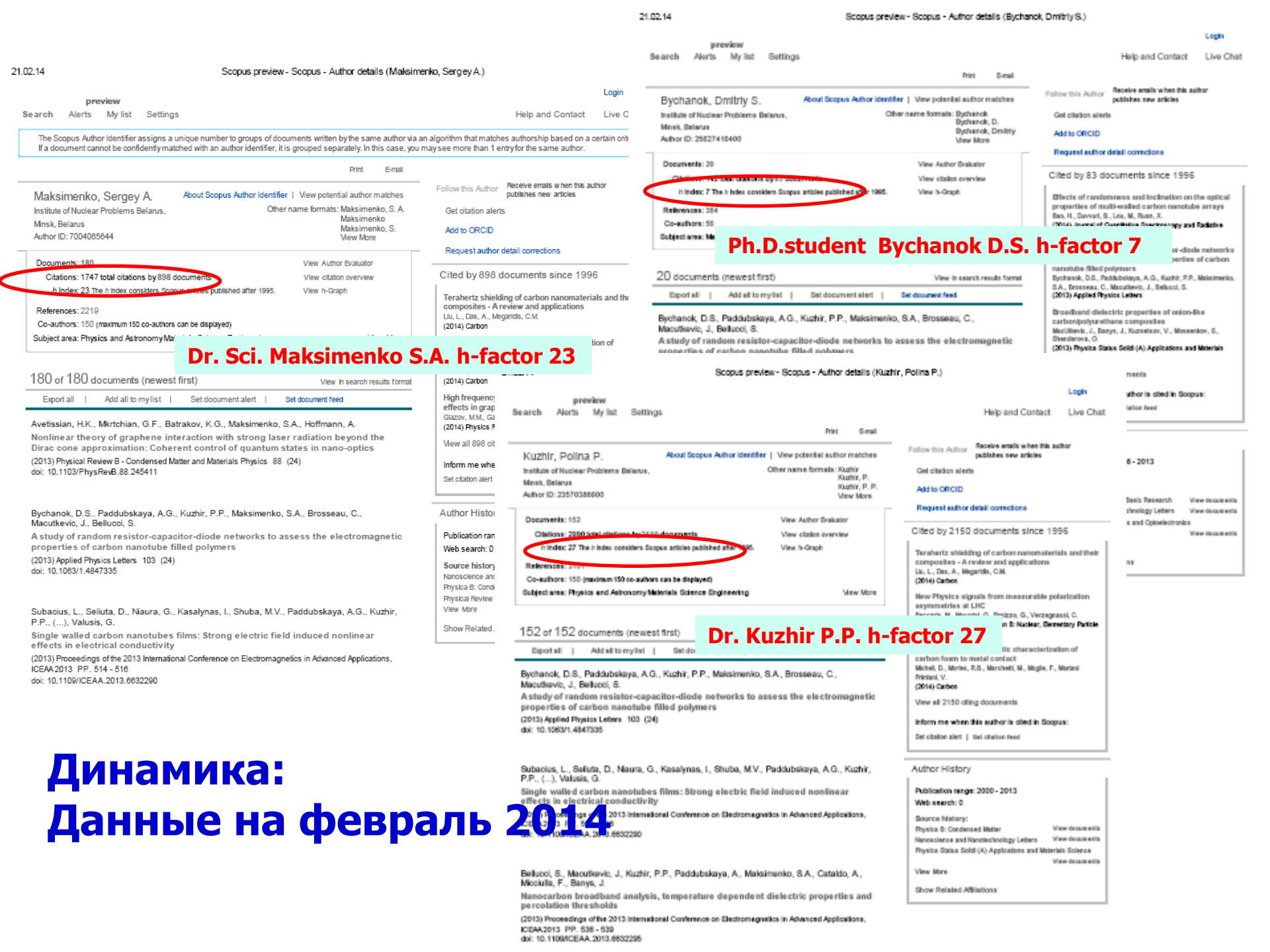
# Данные на сентябрь 2012




**Dr. Sci. Maksimenko S.A. h-factor 19**




**Dr. Kuzhir P.P. h-factor 16**


21.02.14
Scopus preview - Scopus - Author details (Maksimenko, Sergey A.)
Maksimenko, Sergey A.
Institute of Nuclear Problems Belarus,
Minsk, Belarus
Author ID: 7004065644
Documents: 180
Citations: 1747 total citations by 898 documents
h index: 23 The h index considers Scopus articles published after 1995.
References: 2219
Co-authors: 150 (maximum 150 co-authors can be displayed)
Dr. Sci. Maksimenko S.A. h-factor 23
180 of 180 documents (newest first)
Cited by 898 documents since 1996
Bychanok, Dmitriy S.
Author ID: 25627416400
Documents: 20
h index: 7 The h index considers Scopus articles published after 1995.
References: 384
Ph.D.student Bychanok D.S. h-factor 7
20 documents (newest first)
Kuzhir, Polina P.
Author ID: 23570388600
Documents: 152
h index: 27 The h index considers Scopus articles published after 1995.
References: 2161
Co-authors: 150 (maximum 150 co-authors can be displayed)
Subject area: Physics and Astronomy Materials Science Engineering
Dr. Kuzhir P.P. h-factor 27
152 of 152 documents (newest first)
Cited by 2150 documents since 1996
Динамика:
Данные на февраль 2014

# ВОЗМОЖНОСТИ в РФ:
# Европа отнесла РФ к Индустриальным странам

1. **Российский научный фонд** «Проведение фундаментальных научных исследований и поисковых научных исследований отдельными научными группами»: **фундаментальные и поисковые НИР**
2. **Программа развития регионов**, и, в том числе науки в регионах: **прикладные НИР**
3. **Попадание** крупного университета в число 15-ти ВУЗов, которые РФ продвигает **в ТОП-100**. В них формируются или модернизируются "Центры исследований" и "Лаборатории мирового уровня", как структурные единицы Ведущего исследовательского университета под специально выделенные для этого средства: **международное сотрудничество с учеными с высоким рейтингом**

# Роль международной мобильности в развитии научной лаборатории

рост авторитета в профессиональной среде

(H-factor, публикации в высоко-рейтинговых журналах,

организация конференций (спецсекций),

участие в профессиональных сообществах),

Новые источники финансирования,

подготовка, подача, получение и выполнение новых проектов

возможность привлечения научной молодежи и зрелых специалистов

к выполнению проектов,

углубление и/или расширение поля деятельности.

**Рост и усиление научной команды**

**Стратегия развития должна прийти на смену стратегии выживания**

# Спасибо за внимание!

http://inp.bsu.by/

http://nano.bsu.by/