

**PLAN OF THE RESEARCH PROJECTS FOR 2009
INSTITUTE OF SOLID STATE PHYSICS - BAS**

| Number | Title of the project | Project leader Total number of participants, number of participants from ISSP | Funding provided by /institution, reg. № or code of the project/contract, etc. | Expected funds for 2009 |
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| 1 | 2 | 3 | 4 | 5 |

I. Projects, funded only by the budget subsidy of BAS

| 1 | 2 | 3 | 4 | 5 |
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| 1 | Phases and phase transitions in systems with competing interactions (superconductivity, superfluidity, magnetism) | Prof. D.I. Uzunov, 2 ISSP-2 | BAS | |
| 2 | “Structural investigations (X-ray and neutron diffractions, electron microscopy and electron diffraction) of polycrystalline and single-crystal substances” | Assos.Prof. Malina Baeva, Ph.D. Total-5 participants IFTT-5 participants | BAS | |
| 3 | Experimental and theoretical study of many-electron and multicomponent systems | Assoc. Prof. PhD K. Christova; 9; 6. | BAS | |
| 4 | BIOMATERIALS AND SURFACES: MODIFICATION OF SOLID SURFACES BY NANODIAMOND AS MODEL FOR THE GROWTH OF IMPLANT COATINGS | Assoc. Prof. Dr. L. Pramatarova 3 participants, 3 participants | budget subsidy of BAS | - |
| 5 | Semiconductor nanoparticles in amorphous thin film matrix: formation, structure and properties | Assoc. Prof. Dr. D. Nesheva, 14 participants from ISSP | | |

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| 6 | Structure and properties of semiconductor heterostructures with nano-sized and nano-structured dielectric and semiconductor films | Assoc. Prof. Dr P. Danesh 7 participants from ISSP | | |
| 7 | Physics and technology of thin films suitable for contemporary microelectronics | Prof. G.Beshkov 19 participants | budget subsidy | - |
| 8 | Applications of Surface Transverse Waves (STW), Rayleigh Surface Acoustic Waves (RSAW) and Bulk Acoustic Waves (BAW) in Low Noise Microwave Oscillators, Communications and Sensor Systems using Thin Polymers Layers Obtained by Plasma | Assoc. Prof. PhD Ivan Avramov Total number of participants : 6 Number of participants from ISSP : 2 | Project funded by : Budget | |
| 9 | New multifunctional magnetic materials | Prof. DSc. N. Tonchev 11 participants | budget subsidy of BAS | no |
| 10 | Cryogenics, superconductivity and superconducting materials | Prof. DSc. V. Kovachev 11 participants + 1 PhD student | budget subsidy of BAS | no |
| 11 | Environmental physics | Assoc.Prof.V.Lovchinov 4 participants from ISSP | Budget subsidy | |
| 12 | Optic and spectroscopy of the anisotropic and nonlinear media | Prof. M. Petrov, D.Sc. 14 | budget subsidy | |
| 13 | Physical optics. Photonics | Prof. S.Rashev, D.Sc. 15 | budget subsidy | |
| 14 | Lyotropic liquid crystalline nanostructures for the physics, biology and medicine | Acad. A.G. Petrov (6 participants) | | |
| 15 | Mechanical and flexoelectric properties and phenomena in thermotropic and | Assoc. Prof. Dr. M. D. Mitov (7 participants) | | |

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| | lyotropic liquid crystal systems | | | |
| 16 | Physics of atoms, molecules and plasma | Prof. DSc. K. Blagoev 8, 1 PhD student | | |
| 17 | Observation of the nano-sized structure of two-dimensional surface crystalline formations and the nano-sized structure of immobilized on the surface biomacromolecules using purposely-modified scanning probe microscopes | Gencho Minchev Minchev, Assoc. Prof., Ph.D. total number of participants-5 number of participants from ISSP-3 | - | - |

II. Projects, additionally funded by contracts with the National Science Fund /NSF/

| 1 | 2 | 3 | 4 | 5 |
|---|---|--|---|-----------------------|
| 1 | Defects and nanoclusters in classical and quantum crystals | Prof. D. Pushkarov, DSc, 6, ISSP – 5 | NSF, F-1517 | 7 400 BGN |
| 2 | Quantum effects in spin systems with strong competing interactions | Prof. N.B. Ivanov, DSc, 10, ISSP - 3 | DO02-264 | 70 000 BGN |
| 3 | Coexistence of spin triplet superconductivity and ferromagnetism in some intermetallic compounds | Prof. D.I. Uzunov, DSc, 2, ISSP-2 | Φ1507 NSF | 8000 BGN |
| 4 | GROWTH, CHARACTERIZATION AND STUDY OF THE PHYSICAL PROPERTIES OF NOVEL SINGLE CRYSTALS FROM THE SYSTEMS BI-CO(NI)-MN(RU)-O AND LA-CO(NI)-MN(RU)-O WITH MAGNETOELECTRIC/ MULTIFERROIC BEHAVIOR | Prof. Dr. Sci. M.M. Gospodinov | № TK-H-1712/ 2007 | 125 000 2007- 2010 |
| 5 | NANOSTRUCTURED COATINGS – NEW BIOMATERIALS FOR BONE IMPLANTS OBTAINED BY A METHOD OF LASER-LIQUID-SOLID INTERACTION (NANOBIOCOMPOSITES) | Assoc. Prof. Dr. L. Pramatarova 19 participants 10 participants | National Science Fund № TK-X 1708/2007 | 45 000 BGN |

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| 6 | Multilayer structures and nanocomposite materials for applications in electronics). Modul 1: Multilayer structures containing silicon nanoparticles, suitable for fabrication of electronic memories and single electron devices | Assoc. Prof. Dr. D. Nesheva, 8 participants from ISSP | NSF, NNP-4-1 | Annual report under evaluation |
| 7 | Three –dimensional assemblies of semiconductor quantum dots : structure, optical, electrical and photoelectrical properties | Assoc. Prof. Dr. D. Nesheva, 4 participants from ISSP | NSF, No BM-1 | 2 600 BGN- |
| 8 | Construction, development and preparation of digital electroluminescent displays | Asist.Prof. L. Yurukova, 6 participants | NSF, D01–202 | Annual report under evaluation |
| 9 | New Ge based amorphous and glassy materials for sensor applications | Head Prof.DSc Venceslav Vassilev, HTMU, total number of members 18. ISSP leader Assoc.Prof. Dr. Diana Nesheva, 4 ISSP | NSF contract DOO 0123/2008, Programme for stimulation of the scientific research in the public Universities | For the next 18 months, starting from 1.01.2009. 21 600 BGN |
| 10 | Multilayer structures and nanocomposite materials for applications in electronics). Modul 1: Multilayer structures containing silicon nanoparticles, suitable for fabrication of electronic memories and single electron devices | Assoc. Prof. Dr. D. Nesheva, 8 participants from ISSP | NSF, NNP-4-1 | Annual report under evaluation |
| 11 | Alternative dielectrics based on (Hf:Ta ₂ O ₅ ; Al:Ta ₂ O ₅ ; Ti:Ta ₂ O ₅) for 65-70 nm for 65-70 nm generation dynamic memories | Prof. E. Atanassova 5 participants + 1 from IGIC | NSF, F1508 | 30 000 BGN |
| 12 | Synthesis and investigation of nanolayers of AlN, BN | Prof. G.Beshkov, 7 participants, 5 – ISSP | NSF, X- 1505 | 48 000 BGN |

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| 13 | Investigation on the electronic states in amorphous silicon and related materials. | Research Associate E.Manolov 6 participansts from BAS 1 from TU Bratislava | NSF, F-1504 | 36 000 BGN |
| 14 | Investigation of the sorption properties of metal-oxide layers by quartz crystal microbalance | Assoc. prof., PhD Velichka Georgieva (Lazarova) 11, ISSP:11 | Project funded by : NSF Project № NT3- 03/06 | 10 000 BGN |
| 15 | Design and creation of sensor elements used in the quartz microbalance | Eng. Zdravka Raicheva 10, ISSP: 10 | Project funded by : NSF Project № NT3- 04/06 | 10 000 BGN |
| 16 | Improving of life quality by sustainable management of surface waters – application for the catchments of the rivers Struma and Mesta | Assoc.Prof.V.Lovchinov number of participants from the unit – 4 | NSF - MES reg. № TK0457/5.1.2008 | 70 000 BGN |
| 17 | Investigation and development of new eco-technological method for electro motors corpuses and details | Partner organization - MES number of participants from the unit – 1 | NSF - MES reg. № TH -1512/05 (№ 812) | 3000 BGN |
| 18 | Lyotropic liquid crystalline nano-structures for the biology and medicine | Acad. A.G. Petrov (6 participants) | DNP1-03/04 | |
| 19 | Mechanical and flexoelectric properties and phenomena in thermotropic and lyotropic liquid crystal systems | Assoc. Prof. Dr. M. D. Mitov (6 participants) | FNI – F1505/05-08 | 5 000 BGN |
| 20 | Theoretical and experimental investigation of information translation at ultracold atoms and molecuels collisions | N. Vitanov Sofia University | NSF | 150000 BGN |
| 21 | Radiative properties of ionic spectra | Prof. K. Blagoev, 3 | NSF | 7100 BGN |
| 22 | Laser diagnostics in archaeology | Assoc. Prof. PhD M. G. Grozeva; 30, ISSP-12 | NSF TK01/0404 | 290 000 BGN |
| 23 | New multi-component telluride glassy matrices possessing variable non-linear optical properties | Assoc. Prof. PhD Todor Petrov Total - 10 ISSP – 3 | NSF, New materials and nanotechnologies TK01/0191 | 180 000 BGN |

III. Projects, additionally financed by contracts with ministries, organizations and private companies from the country

| 1 | 2 | 3 | 4 | 5 |
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| 1 | Microstructural investigation of complexly-doped Fe-Ni-Mn-Mo-V-C(N) steels by X-ray and neutron diffractions | Assos.Prof. Malina Baeva, Ph.D. Total-6 participants IFTT-3 participants | Nuclear Regulatory Agency, Bulgaria | 1 500 USD |
| 2 | NANOSTRUCTURED COATINGS – NEW BIOMATERIALS FOR BONE IMPLANTS OBTAINED BY A METHOD OF LASER-LIQUID-SOLID INTERACTION (NANOBIOCOMPOSITES) | Assoc. Prof. Dr. L. Pramatarova 8 participants 8 participants | National Innovation Fund at the Ministry of Economy and Energy, 02-54/2007 | 13 000 BGN |
| 3 | PHASE FORMATION AND MICROSTRUCTURE OF BSCCO -HTSC WITH FERROMAGNETIC ADDITIONS | Assist. Prof. A. Stoyanova_Ivanova 4 + 1 PhD student | № IP 01/08 | 2200 BGN |
| 4 | Indo-Bulgarian intergovernmental programme, , “Flexoelectric properties of liquid crystals” | Acad. A.G. Petrov (5 participants) | MES, BIn-5/07, NSF | 10 000 BGN |
| 5 | Shapes and shape fluctuations of lipid vesicles – tool for the study of the properties of their membranes | Prof. I. Bivas, DSc (5 participants) | HTC01-121 | 23 000 BGN |
| 6 | Nanoscope for enterprises and schools | Gencho Minchev Minchev, Assoc. Prof., Ph.D. participants from ISSP-7 | Ministry of Economy and Energy, National Innovation Fund № 5IF-02-51/20.12.2008 | 25000 BGN |

IV. Projects, additionally financed according to contracts and programs of EU, NATO, UNESCO and other international organizations

| 1 | 2 | 3 | 4 | 5 |
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| 1 | MONITORING HIGHER LEVELS OF ELECTROCHEMICAL DOPING OF CARBON NANOSTRUCTURES | ASSOC. PROF. DR. PETER M. RAFAILOV | NATO CBP.EAP.RIG.982322 | 25 000 EUR 2006-2009 |
| 2 | MODIFIED CALCIUM PHOSPHATE IMPLANT COATINGS | Assist. Prof. Dr. E. Pecheva 3 participants 3 participants | NATO-RIG grant No 982693 | 6 500 BGN |
| 3 | NANOBIOCOMPOSITES | Assoc. Prof. Dr. L. Pramatarova 13, 3 persons from ISSP | E!3033 Bionanocomposite, EUREKA EC project | No financing |
| 4 | ANNA TRANSNATIONAL ACCESS SCHEME | Assoc. Prof. Dr. L. Pramatarova 3 persons from ISSP | Project No 026134(RI I3) ANNA | From ANNA project |
| 5 | Electron beam annealing of implantation induced defects in Si-SiO ₂ heterostructures | Prof. DSc. S. Kaschieva | Laboratory of nuclear resonance, Dubna Russia | |
| 6 | Development of leaky surface acoustic wave (LSAW) based liquid phase sensors | Assoc. Prof., PhD Ivan Avramov 6, ISSP: 6 | Project funded by : Research Center Karlsruhe, Germany | 5000 € |
| 7 | Overdoping of 1-2-3 HTS materials and its influence on the ac losses, critical current, flux pinning, activation energy | Prof. DSc. V. Kovachev 4 participants + 1 PhD student | Euratom | 8 000 EUR (20%) |
| 8 | Global and local pollution in particular: Management of water quality | Assoc.Prof. V.Lovchinov 1 participant from ISSP | WFS, Swiss | SF-3000 |
| 9 | Laser-induced breakdown spectroscopy (LIBS) analysis of finds from Trebeniste necropolis | Prof. Kiril Blagoev, 2 | EU- ULF-FORTH 001441/2008 | |

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| 10 | " Radiative constants of Hf III excited states" | Prof. Kiril Blagoev 2 | EC-lcc001431, LASERLAB EUROPE | |
| 11 | Cold gas target: a novel and precision method for detection of collision processes | Dr. Emiliya Dimova 1 | EAP.RIG.982778 NATO Reintegration Grant | 3400EUR |

V. Projects funded under the Academy's bilateral agreements and in the framework of institute-to-institute cooperation

| 1 | 2 | 3 | 4 | 5 |
|---|--|--|--|---|
| 1 | Radiation defects and ion-beam synthesis of nanoclusters in semiconductors and dielectrics for purposes of microelectronics | Assoc.Prof Maria Kalitzova, Ph.D. Total-3 participants IFTT-2 participants | institute-to-institute cooperation: ISSP – BAS and Department of Energetics, University of Rome “La Sapienza”, Italy | |
| 2 | Growth and characterization of oxide crystals for optical applications | Prof. M. Gospodinov 2 participants | Research Institute of Solid State Physics and optics, Budapest | |
| 3 | PHYSICAL AND CHEMICAL PROCESSES ON THE SURFACE AND THIN FILMS OF CONDENSED MATTER | Assoc. Prof. Dr. L. Pramatarova 11, 3 participants | Project No9 with Hungarian Academy of Sciences | - |
| 4 | STUDY OF LASER-LIQUID-SOLID INTERACTION (LLSI) IN AN <i>IN VITRO</i> SYSTEM FOR HYDROXYAPATITE GROWTH FROM SIMULATED BODY FLUID (SBF) ON A SUBSTRATE | Assist. Prof. Dr. E. Pecheva 10 participants 6 participants | Project with Latvian Academy of Sciences | - |
| 5 | MICRO AND NANOPATTERNED SURFACES AND MAGNETIC NANOPARTICLES AS NEW GENERATION IN BIOMATERIALS | Assoc. Prof. Dr. L. Pramatarova 16 participants 4 participants | Project with Romanian Academy of Sciences | - |
| 6 | Nanostructures semiconductor thin films suitable for application as gas sensors | Assoc. Prof. Dr. D. Nesheva, 4 participants | Institute of Physics, Belgrad, Serbia | |
| 7 | Structural and optical properties of | Assoc. Prof. Dr. V. | Institute of Solid State Physics & | |

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| | multicomponent chalcogenide glasses | Pamukchieva 4 participants | Optics, Budapest, Hungary | |
| 8 | Investigation of Ge-chalcogenide glasses for optoelectronic use, 2008 | Assoc. Prof. Dr. Z. Ivanova, 5 2 participants from ISSP | Joint Laboratory of Solid State Chemistry, Pardubice, Czech Republic | |
| 9 | Gas sensitivity and photoinduced changes of multicomponent chalcogenide films | Assoc. Prof. Dr. D. Arsova 4 participants | Institute of Applied Physics, Moldavian Academy of Sciences, Chisinau | |
| 10 | Optimization of the properties of nanostructures based on Si, metal oxides and nitrides for advanced opto- and nanoelectronic | Assoc. Prof. Dr. A.M. Szekeres, 8 5 participants from ISSP | ELTE University, HAS, Hungary | |
| 11 | Investigation of doped nanostructured oxide films for environmental application purposes | Assoc. Prof. Dr. A.M. Szekeres, 4 participants from ISSP-BAS and 5 from IPC-RAS | Romania | |
| 12 | Preparation of nanostructured dielectric thin films based on Si and investigation of their structure and properties suitable for micro- and nanoelectronics. | Assoc. Prof. Dr. A.M. Szekeres, 4 participants from ISSP-BAS and 5 from ISP- NASU | ISP- NASU, Ukraine | |
| 13 | Innovative nanostructured and nanocomposite media: diluted magnetic semiconductors | Assoc. Prof. Dr. S. Simeonov 7, 3 participants from ISSP | National Institute for Lasers, Plasma and Radiation Physics, Institute of Atomic Physics, Romanian Academy of Sciences, Romania | |
| 14 | Si-based multifunctional structures prepared by physical and chemical methods for opto- and electronic application purposes | Assoc. Prof. Dr. A.M. Szekeres, 4 participants from ISSP | Institute of Physical Chemistry, Romanian Academy of Sciences, Romania | |
| 15 | Constant voltage stress degradation of TaHfO-mixed oxides | Prof. E. Atanassova 9, ISSP - 4 | Serbia, Nish (2009-2011) | |

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| 16 | Piezoelectric crystal microsensors at cryogenic temperatures | Dr. Tsvetan Jordanov 11, ISSP: 6 | Project funded by : JINR № 02-0-1065-2007/2009 | 10 725 \$ |
| 17 | Flux dynamics studies in superconducting tapes obtained by OPT technology with overdoped core | Assoc. Prof. E. Nazarova 4 participants. + 1 PhD student | Bilateral agreement - Rumania 2007 -2009 | |
| 18 | Preparation and studies of thin film structures based on magnetic oxides NdBaCo ₂ O ₅ +X and La _{0.7} Sr _{0.3} MnO ₃ | Assoc. Prof. E. Vlachov 3 participants | Bilateral agreement - Poland 2009 -2011 | |
| 19 | Syntheses and structural investigations of multifunctional materials | Assist. Prof. A. Stoyanova-Ivanova, 2 participants | Bilateral agreement - Estonia 2009 -2011 | |
| 20 | Thermal and magnetic properties of HT superconducting and related magnetic materials | Assoc. Prof. V. Lovchinov number of participants from ISSP – 4 | Bilateral agreement between BAS and CGRI, Belgium | |
| 21 | Colour investigations of the light sources (LED) | T. Kehlibarov 2 | BAS-HAS joint project | |
| 22 | Analysis of the shape fluctuations of giant vesicles – tool for the study of the properties of their membranes | Prof. I. Bivas, DSc (5 participants) | BAS and Slovenian Academy of Sciences (bilateral exchange) | |
| 23 | Biophysical properties (structure, elasticity, interactions) of erythrocyte ghosts and drug influence on them; Giant lipid vesicles – physical model of erythrocyte ghosts | Assist. Prof. Dr. V. Vitkova (2 participants) | BAS and Austrian Academy of Sciences (bilateral exchange) | |
| 24 | Etude des propriétés mécaniques de la membrane vésiculaire par holographie digitale | Assist. Prof. Dr. V. Vitkova (2 participants) | BAS and Université libre de Bruxelles (bilateral exchange) | |
| 25 | Dynamic optogalvanic signals as a tool for plasma diagnostic | DSc. R. Dyulgerova, 2 | Serbia | |
| 26 | High-power copper and copper halide laser of high beam quality for industrial applications | Assoc. Prof. Dr. Dimo Astadjov, 6 - ISSP, BAS | Bilateral Collaboration in Science and Technology between Bulgaria and India | 20 000 BGN |

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| 27 | Plasma technologies and their applications | Prof.Dr.N.V.Sabotinov, Total – 4, ISSP - 2 | Cooperation between the Polish Academy of Sciences and BAS | |
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VI. Projects/contracts and commissions assigned from outsourcers, including state or private companies from the country or abroad

| 1 | 2 | 3 | 4 | 5 |
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| 1 | Studying of the possibilities for scanning of metal surfaces as to develop hidden codes | Assoc. Prof. PhD O. Ivanov; 3; 3. | “KATE” Inc. Ltd. | 1200 BGN |
| 2 | Studying of the possibilities for carbon quantity control at brick manufacturing | Assoc. Prof. PhD O. Ivanov; 3; 3. | Prolife technology firm | 5000 BGN |
| 3 | Formation and investigation of solid state and organic thin layers for sensor function | PhD, DSc, Prof. Vesselin Strashilov Total 19, from ISSP - 2 | Project funded by : NSF D01-871/2006 | - |
| 4 | Scanning Probe Microscopy employing novel cantilevers | Gencho Minchev Minchev, Assoc. Prof., Ph.D. participants from ISSP-3 | “VG merged” Ltd. № 4/29.10.2008 | 1400 BGN |