Kraków, 09.02.2021 r.

Recruitment 2021/2022

List of research topics

The Henryk Niewodniczański Institute of Nuclear Physics Polish Academy of Sciences

No.	Research topic	Field and discipline
1	The search of lepton number violating decays B→ hlτ, where h is a hadron e.g. π or Kaon	natural sciences, the discipline of physical sciences
2	Particle acceleration in shocks waves in cosmic plasmas	natural sciences, the discipline of physical sciences
3	Diffractive Charm Meson Production	natural sciences, the discipline of physical sciences
4	Studies of Diffractive Photon+Jet Production Using ATLAS Data	natural sciences, the discipline of physical sciences
5	Studies of photon-photon interactions at LHC	natural sciences, the discipline of physical sciences
6	Searches for New Physics with heavy fermions in final states	natural sciences, the discipline of physical sciences
7	Search for heavy Higgs boson decaying into b quarks	natural sciences, the discipline of physical sciences
8	The Baikal-GVD experiment: search for very-high energy neutrinos from astrophysical sources	natural sciences, the discipline of physical sciences

9	Study of production of particles in proton-proton and nucleus-nucleus collisions in the ATLAS experiment at the LHC	natural sciences, the discipline of physical sciences
10	Development of triggering methods of proton and heavy ion collisions in the ATLAS experiment at the LHC	natural sciences, the discipline of physical sciences
11	Detection of large cosmic ray ensembles through a globally dispersed network of small cosmic ray detectors	natural sciences, the discipline of physical sciences
12	Emission of ultra-high-energy cosmic rays from blazar jets	natural sciences, the discipline of physical sciences
13	Search for the multi-wavelength flaring events quasisimultaneous with the arrival of the UHECR	natural sciences, the discipline of physical sciences
14	Cosmic ray studies at the upgraded Pierre Auger Observatory	natural sciences, the discipline of physical sciences
15	Numerical analysis and experimental verification of quantum electrodynamics equations describing the photon splitting effect	natural sciences, the discipline of physical sciences
16	Early warning of earthquakes through global monitoring of low energy cosmic radiation?	natural sciences, the discipline of physical sciences
17	Anomalous arrival time distributions in cosmic ray ensembles as signatures of interactions of high-energy particles with the quantum structure of space-time	natural sciences, the discipline of physical sciences
18	Investigation of the influence of ionizing radiation from central areas of extensive air showers on the population health	natural sciences, the discipline of physical sciences
19	Development of the event reconstruction algorithms and data analysis in the MUonE experiment at CERN	natural sciences, the discipline of physical sciences
20	Initial conditions for the hydrodynamic evolution of the quark-gluon plasma in the SPS energy range	natural sciences, the discipline of physical sciences
21	Production of pairs of quarkonia: the quest for heavy tetraquark states	natural sciences, the discipline of physical sciences

22	Gamma decay of excited states of atomic nuclei study with proton beams	natural sciences, the discipline of physical sciences
23	Studies of the hadronic matter with neutral mesons registered in the ALICE experiment at LHC energies in Run 3	natural sciences, the discipline of physical sciences
24	Studies of photonic processes in the ultra-peripheric collisions in the ALICE experiment at LHC energies in Run 3	natural sciences, the discipline of physical sciences
25	Study properties of nuclear matter with charmonia producted in photon-proton (lead) collisions with the ALICE detector at the LHC	natural sciences, the discipline of physical sciences
26	Study properties of nuclear matter with Drell-Yan lepton pairs in proton-proton and proton-lead collisions with the ALICE detector at the LHC	natural sciences, the discipline of physical sciences
27	Studies of the longitudinal evolution of matter created ultrarelativistic nuclear collisions	natural sciences, the discipline of physical sciences
28	Search for time reversal symmetry breaking in the decay of free neutron	natural sciences, the discipline of physical sciences
29	Study of nuclear interactions in few-nucleon systems	natural sciences, the discipline of physical sciences
30	Symmetry Energy: from heavy ions to neutron stars	natural sciences, the discipline of physical sciences
31	Symmetry Energy from heavy ion collisions	natural sciences, the discipline of physical sciences
32	Study of the mechanism of nuclear clustering using the pionnucleus reaction	natural sciences, the discipline of physical sciences
33	Investigation of the surface layer obtained by methods of strong plastic deformation in metallic materials using positron annihilation spectroscopy	natural sciences, the discipline of physical sciences
34	Influence of a spatial confinement on the molecular dynamics of systems in various thermodynamic phases	natural sciences, the discipline of physical sciences

35	Studies on dynamics of supercooled phases and glassy states of various molecular systems	natural sciences, the discipline of physical sciences
36	Correlated Phases from Flat Electronic Bands in van der Waals Heterostructures	natural sciences, the discipline of physical sciences
37	Generalized SYK Models	natural sciences, the discipline of physical sciences
38	Study of the topological states induced by non-trivial topology	natural sciences, the discipline of physical sciences
39	Platinum- and noble metal free catalytic nanoparticles for ethanol oxidation and oxygen reduction reactions in a fuel cell	natural sciences, the discipline of physical sciences
40	In situ observations of dynamic processes such as: absorption, accumulation place and interaction of gold nanoparticles having different sizes and shapes, with living cells, in liquid environments directly in the Nanolive 3D CX-A microscope	natural sciences, the discipline of physical sciences
41	Analysis of the phase, thermal, time and chemical stability of nanoparticle-ligand systems used as drug carriers	natural sciences, the discipline of physical sciences
42	Composite particles based on silicon and its compounds - laser synthesis, structural and optical properties	natural sciences, the discipline of physical sciences
43	Ferrite/polymer composites - laser synthesis, structural, magnetic properties and their potential applications in fuel cells	natural sciences, the discipline of physical sciences
44	Ferrite particles - laser synthesis, structural and magnetic properties and their possible biosensor application	natural sciences, the discipline of physical sciences
45	Noncollinear spin textures in hybrid metallic materials	natural sciences, the discipline of physical sciences
46	Vibrational dynamics of polar alcohols in various thermodynamic states. Description of 3D – hydrogen bonded system	natural sciences, the discipline of physical sciences
47	Influence of fluorine on the vibrational dynamics of liquid crystals in various thermodynamic states	natural sciences, the discipline of physical sciences

48	Novel materials for photonics: tuneable miltifunctionalized porous silica layers	natural sciences, the discipline of physical sciences
49	Multifunctional porous silica-based nanomaterials as novel filters for environmental remediation of soil and groundwater	natural sciences, the discipline of physical sciences
50	High precision studies charge asymmetry near Z resonance	natural sciences, the discipline of physical sciences
51	Methods of precision measurements of invisible decays of Z Boson	natural sciences, the discipline of physical sciences
52	New approaches for obtaining QCD predictions for LHC	natural sciences, the discipline of physical sciences
53	Precision calculation for Bhabha process at electron colliders	natural sciences, the discipline of physical sciences
54	Explorations in the causal structure of quantum theory	natural sciences, the discipline of physical sciences
55	Nanospectroscopic imaging of ultra-thin lipid membranes using the AFM-IR technique	natural sciences, the discipline of physical sciences
56	The effect of a local electromagnetic field enhancement in the study of membrane vesicles using the AFM-IR technique	natural sciences, the discipline of physical sciences
57	Studies on conformation and orientation of molecules in biological membranes using nanospectroscopy with modulated polarization	natural sciences, the discipline of physical sciences
58	Assessment of physicochemical properties of various dosage forms during drug release –comprehensive approach using NMR/MRI	natural sciences, the discipline of physical sciences
59	Application of MAS NMR spectroscopy in material research	natural sciences, the discipline of physical sciences
60	Application of MR imaging spectroscopy techniques in the study of new theanostic agents in vitro and in vivo	natural sciences, the discipline of physical sciences

61	Impact of the impurity distribution on tokamak plasma performance in various plasma scenarios	natural sciences, the discipline of physical sciences
62	The phenomenon of radiation compression in the gas mixtures for the PF-24 device	natural sciences, the discipline of physical sciences
63	Radiation transport modelling for experiments with neutrons at the IFMIF-DONES laboratory	natural sciences, the discipline of physical sciences
64	The study of the proton boron (pB) reaction rate in the Plasma-Focus device	natural sciences, the discipline of physical sciences
65	Modeling of the response of detection systems of the STUMM test module dedicated to the IFMIF-DONES neutron source	natural sciences, the discipline of physical sciences
66	The study of the dynamics of neutron emission in PF-24 with using neutron pinhole camera	natural sciences, the discipline of physical sciences
67	Microdosimetry of Fluorescence Nuclear Track Detectors for Dose Assessment in Proton Therapy and Space Flights	natural sciences, the discipline of physical sciences
68	Dosimetry of ultra-high intensity proton beams for proton FLASH radiotherapy	natural sciences, the discipline of physical sciences
69	Proton beam dosimetry for electronics radiation hardness tests	natural sciences, the discipline of physical sciences
70	Neutron dosymetry for BNCT therapy in dedicated 3D printing phantoms	natural sciences, the discipline of physical sciences
71	Luminescent micro-imaging of ionizing radiation dose distribution	natural sciences, the discipline of physical sciences
72	Phosphors for real-time ionizing radiation dose measurement	natural sciences, the discipline of physical sciences
73	Tritium bounded organically and in water phase, present in plant material	natural sciences, the discipline of physical sciences

74	Selected bird species as biomonitors of radioactive contamination	natural sciences, the discipline of physical sciences
75	Search and obtaining of radionuclides for nuclear medicine	natural sciences, the discipline of physical sciences
76	Identification of natural and artificial radioactive isotopes in the atmosphere, a study of the variability of their activity concentrations and the search for the causes of the observed phenomena over the decades	natural sciences, the discipline of physical sciences
77	Cryoconites as indicators of radioactive contamination	natural sciences, the discipline of physical sciences
78	Nanoscale modelling of radiation interactions with biological systems	natural sciences, the discipline of physical sciences
79	Characteristics of Linear Energy Transfer spectra in mixed radiation fields in proton therapy	natural sciences, the discipline of physical sciences

Jerzy Haber Institute of Catalysis and Surface Chemistry Polish Academy of Sciences

No.	Research topic	Field and discipline
1	Iron-dependent enzymes catalyzing cyclization reactions - biochemical and structural studies	natural sciences, the discipline of chemical sciences
2	Self-Assembly Behavior of Proteins	natural sciences, the discipline of chemical sciences
3	Design of receptor layers of optical biosensors	natural sciences, the discipline of chemical sciences
4	Analysis of the interactions of selected proteins with phospholipid bilayers towards modern therapies	natural sciences, the discipline of chemical sciences
5	Determination of binding /releasing process of macromolecular ligands to/ from biocompatible multilayers formed by chitosan derivatives	natural sciences, the discipline of chemical sciences

6	Surface modification of magnesium alloys in terms of antibacterial and anti-corrosive properties	natural sciences, the discipline of chemical sciences
7	Oxygen electrode materials for reversible solid oxide cells	natural sciences, the discipline of chemical sciences
8	Inhibition of protein fibrillation processes with the use of gold nanoparticles conjugated with biologically active substances	natural sciences, the discipline of chemical sciences
9	Activation and transformations of small molecules on transition metal ions/support systems	natural sciences, the discipline of chemical sciences
10	Adsorption of gases on monocrystalline surfaces of transition metal oxides.	natural sciences, the discipline of chemical sciences
11	External fields-assisted Molecular Beam Epitaxy of spintronic heterostructures	natural sciences, the discipline of chemical sciences
12	New multifunctional nanohybrid systems with graphene oxide as components of SPR biosensors	natural sciences, the discipline of chemical sciences
13	Functional polymeric nanocarriers of anticancer drugs - synthesis and evaluation of their potential anticancer properties	natural sciences, the discipline of chemical sciences
14	New experimental electron density-based scoring functions for molecular docking	natural sciences, the discipline of chemical sciences
15	Development of technologies of the production of conductive inks and/or pastes and their application in printed electrical circuits	natural sciences, the discipline of chemical sciences
16	Interaction of heteropoly compounds with support - DFT calculations	natural sciences, the discipline of chemical sciences
17	Multiscale analysis of surface roughness in model systems	natural sciences, the discipline of chemical sciences

Maj Institute of Pharmacology Polish Academy of Sciences

No.	Research topic	Field and discipline
1	The assessment of neuroprotective and neuroregenerative potential of new low-basicity 5-HT7 receptor agonists- in vitro studies	medical and health sciences, the discipline of medical sciences

2	The role of glia and its activation in the processes of regeneration and compensation of nigrostriatal system degeneration	medical and health sciences, the discipline of medical sciences
3	Molecular profiling of novel antipsychotic drug candidates	medical and health sciences, the discipline of medical sciences
4	The role of cognitive bias in individual vulnerability to the transition from controlled use to uncontrolled abuse of alcohol in an animal model	medical and health sciences, the discipline of medical sciences
5	The neuroprotective role of new steroid and xenobiotic receotors ligands in the protection of mammalian brain neuronal cells against neurodegeneration	medical and health sciences, the discipline of medical sciences
6	Significance of glutamatergic NMDA receptors in the regulation of liver cytochrome P450	medical and health sciences, the discipline of pharmaceutical sciences
7	Zinc deficient diet as a trigger for treatment-resistant depression in chronically stressed mice	medical and health sciences, the discipline of medical sciences
8	Combined administration of muscarinic receptor antagonists and group II/III metabotropic glutamate (mGlu) receptor ligands as a novel efficacious method to treat depression - the preclinical studies	medical and health sciences, the discipline of pharmaceutical sciences
9	Novel biased opioid receptor agonists for treatment of opioid use disorder	medical and health sciences, the discipline of medical sciences
10	Endocannabinoid regulation of the motivational tone at the mesolimbic system driven by inflammation	medical and health sciences, the discipline of pharmaceutical sciences
11	Role of intracellular signaling pathways linked with activation of the ghrelin receptor and RET tyrosine kinase in neuroprotection of catecholaminergic	medical and health sciences, the discipline of medical sciences
12	Molecular characterization of habenular nuclei in a genetic model of drug resistance depression	medical and health sciences,

		the discipline of medical sciences
13	In silico polypharmacology in neurodegenerative diseases - searching for new molecular targets and antitargets	medical and health sciences, the discipline of pharmaceutical sciences
14	New experimental electron density-based scoring functions for molecular docking	medical and health sciences, the discipline of pharmaceutical sciences

Aleksander Krupkowski Institute of Metallurgy and Materials Science of the Polish Academy of Sciences

No.	Research topic	Field and discipline
1	Grain boundaries orientation and ionic conductivity in solid oxide electrolytes	engineering and technology, the discipline of materials engineering
2	Analysis of residual stresses in mono and polycrystalline materials after ion milling	engineering and technology, the discipline of materials engineering
3	Influence of physical parameters of selected metal oxides on their optical and electrical properties in order to applied for photovoltaic cells	engineering and technology, the discipline of materials engineering
4	Materials dedicated to contact with blood under conditions of strong shearing forces	engineering and technology, the discipline of materials engineering
5	Role of heterophase interfaces in the strengthening process of multi-layered metallic composites	engineering and technology, the discipline of materials engineering
6	The effect of structure and morphology of halide perovskites on opto-electronic parameters of photovoltaic cells	engineering and technology, the discipline of materials engineering

7	Implementation of advanced XRD tomography for non-destructive stress-texture investigation of crystalline biomaterials	engineering and technology, the discipline of materials engineering
8	Influence of surface treatment, material selection and quality control on mechanical and structural properties and lifetime of mating engine parts	engineering and technology, the discipline of materials engineering
9	Fundamentals and Applications of micro-Raman Spectroscopy to Analysis of Metallic Materials	engineering and technology, the discipline of materials engineering
10	Influence of alloying elements on dynamic and static recrystallization processes in bioabsorbable zinc alloys - in situ investigations	engineering and technology, the discipline of materials engineering
11	Physical and mechanical properties of Ni-Mn-Ga based alloys after rapid crystallization	engineering and technology, the discipline of materials engineering
12	Multifunctional composite coatings reinforced with cerium oxide particles of enhanced mechanical properties	engineering and technology, the discipline of materials engineering

AGH University of Science and Technology
Faculty of Physics and Applied Computer Science

No.	Research topic	Field and discipline
1	Nuclear magnetic resonance (NMR) studies of hightemperature superconductors	natural sciences, the discipline of physical sciences
2	Study of quark-gluon plasma and search for new particles from beyond Standard Model using heavy-ion collisions in the ATLAS experiment at the LHC	natural sciences, the discipline of physical sciences
3	Investigations of hyperfine parameters of iron in multicomponent alloys, towards high entropy alloys	natural sciences, the discipline of physical sciences
4	Gender differences in biodistribution and biokinetics of intravenously administered SPIONs. The assessment of biochemical changes occurring in selected organs as a	natural sciences, the discipline of physical sciences

	result of exposure to nanoparticles with the use of the methods of atomic and molecular spectroscopy	
5	Electronic transport in nanoscopic Josephson junctions	natural sciences, the discipline of physical sciences
6	Superconductivity, topology, and strong electronic correlations in twisted bilayer graphene	natural sciences, the discipline of physical sciences

AGH University of Science and Technology in Krakow
Faculty of Materials Science and Ceramics

No.	Research topic	Field and discipline
1a	Ultra High Temperature Ceramics Composites	engineering and technology, the discipline of materials engineering
2a	Thermoelectric modules for conversion of low-grade heat	engineering and technology, the discipline of materials engineering
3a	Nanostructural materials/layers for energy conversion	engineering and technology, the discipline of materials engineering
4a	Materials based on Mg2Si modified by electrochemical methods	engineering and technology, the discipline of materials engineering
5a	Degradable delivery systems of drugs and biologically active molecules to the lungs	engineering and technology, the discipline of materials engineering
6a	Thermodynamics and corrosion kinetics of newly developed oxide refractories with the use of marker experiments	engineering and technology, the discipline of materials engineering
7a	Additive manufacturing of nitride-carbide advanced ceramic in Si3N4/SiC system	engineering and technology, the discipline of materials engineering

8a	Surface modification of selected magnesium alloys to obtain bio-functional coatings	engineering and technology, the discipline of materials engineering
9a	Properties of electrical conductivity in polymer composites with carbon nanoforms	engineering and technology, the discipline of materials engineering
10a	Development of materials for use in cardiac surgery, in particular for the manufacture of a therapeutic device for Ventricular Septal Rupture (VSR)	engineering and technology, the discipline of materials engineering
11a	Hybrid coatings on titanium implants	engineering and technology, the discipline of materials engineering
12a	Development of composite layers with antibacterial properties used for medical implants	engineering and technology, the discipline of materials engineering