LXX International conference "NUCLEUS – 2020. Nuclear physics and elementary particle physics. Nuclear physics technologies"

Sunday, October 11, 2020 - Saturday, October 17, 2020

Online

Scientific Programme

Scientific Focus

The conference covers a broad range topics:

Section 1. Experimental and theoretical studies of the properties of atomic nuclei.
Section 2. Experimental and theoretical studies of nuclear reactions.
Section 3. Modern nuclear physics methods and technologies.
Section 4. Relativistic nuclear physics, elementary particle physics and high-energy physics.
Section 5. Neutrino physics and astrophysics.
Section 6. Plasma physics and thermonuclear fusion.
Section 7. Synchrotron and neutron studies and infrastructure for their implementation.
Section 8. Nuclear medicine.
Section 9. Nuclear-physical methods in the study of cultural heritage objects.

Section 1. Experimental and theoretical studies of the properties of atomic nuclei.

evolution of shells in neutron-rich nuclei;
nuclei remote from the valley of stability and nucleosynthesis processes;
giant and pigmy resonances;
multiphonon and multiquasiparticle states of nuclei;
high-spin and superdeformed states of nuclei;
binding energy of nuclei;
beta decay of nuclei and decay of highly charged ions;
synthesis of superheavy elements;
processes on the border of atomic and nuclear physics.
the nuclear problem of many bodies;
a microscopic description of collective degrees of freedom and their interaction with single-particle degrees of freedom;
nonlinear nuclear dynamics;
meson and quark degrees of freedom in the nuclei, mesic atoms;
hypernuclei and other exotic systems;
interaction of the nucleus with the electrons of the atomic shell;
verification of theories of interaction of elementary particles and conservation laws;
clusters in nuclei and Bose-Einstein condensation.

Section 2. Experimental and theoretical studies of nuclear reactions.

reactions with radioactive nuclear beams;
reactions with polarized particles;
reactions with electrons and gamma rays;
reactions with heavy ions;
fusion and fission of nuclei;
multifragmentation of nuclei;
the theory of direct nuclear reactions;
multiple scattering theory;
statistical theory of nuclear reactions;
the theory of reactions involving clusters and heavy ions;
relativistic theory of nuclear collisions;

the theory of polarization phenomena in nuclear reactions;
theories of proton, two-proton and cluster radioactivity and fission cores;
theory of photonuclear reactions.

Section 3. Modern nuclear physics methods and technologies.

instruments and methods of nuclear physics experiments;
modeling of a nuclear physics experiment and data analysis;
nuclear databases;
detector technologies;
accelerator technologies in low energy physics;
radiation technologies in micro- and nanoelectronics to create new materials;
problems of radiation reliability and radiation resistance of microelectronics products and spacecraft systems;
radiation materials science;
nuclear and radiation safety, radioecology;
problems of nuclear reactors and radioactive waste;
experience and problems of training specialists in the field of nuclear physics and nuclear energy.

Section 4. Relativistic nuclear physics, elementary particle physics and high-energy physics.

experimental methods in high energy physics and relativistic nuclear physics;
theory in elementary particle physics and relativistic nuclear physics;
computer technology and processing of experimental information in high-energy physics;
research and development of accelerators and storage rings of charged particles.

Section 5. Neutrino physics and astrophysics.

cosmology and astrophysics of high energies;
the theory of astrophysical nucleosynthesis;
physics of the nucleus and particles as applied to astrophysical objects;
theoretical and experimental studies in the field of neutrino physics.

Section 6. Plasma physics and thermonuclear fusion.

experimental and theoretical studies of plasma physics and thermonuclear fusion;
fundamental problems of thermonuclear energy.

Section 7. Synchrotron and neutron studies and infrastructure for their implementation.

sources of neutrons and synchrotron radiation;
reactions with neutrons and ultracold neutrons;
tasks and prospects of research using synchrotron radiation and neutrons;
new experimental research methods and new results;
infrastructure for conducting synchrotron and neutron studies: state and prospects.

Section 8. Nuclear medicine.

methods of nuclear physics in medicine;
methods for producing radiopharmaceuticals;
nuclear-physical aspects of hadron and ion therapy;
fundamental aspects of gamma therapy;
fundamental problems of radioinuclide therapy;
the use of nuclear physical methods for the diagnosis of diseases;
theranostics: problems and prospects.

Section 9. Nuclear-physical methods in the study of cultural heritage objects.

historical materials science, modern nuclear physics techniques for conducting research on cultural heritage sites;
the use of nuclear-physical research methods to obtain new information about museum collections, archaeological and historical monuments;
neutron physics methods in the study of cultural heritage objects,
radioisotope dating of artifacts.