The 2nd International Conference on Particle Physics and Astrophysics

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Abstract. The 2nd International Conference on Particle Physics and Astrophysics (ICPPA-2016) was held in Moscow, Russia, from October 10 to 14, 2016. The conference is organized by the National Research Nuclear University "MEPhI". The aim of the Conference is to promote contacts between scientists and to develop new ideas in fundamental research. We bring together experts and young scientists working on experimental and theoretical aspects of nuclear, particle and astroparticle physics and cosmology.

1. Preface
The 2nd International Conference on Particle Physics and Astrophysics (ICPPA-2016) was held in Moscow, Russia, from October 10 to 14, 2016. The conference is organized by the National Research Nuclear University "MEPhI". The aim of the Conference is to promote contacts between scientists and to develop new ideas in fundamental research. We bring together experts and young scientists working on experimental and theoretical aspects of nuclear, particle and astroparticle physics and cosmology (figure 1 and 2).

The conference covers a wide range of topics such as accelerator physics, (astro) particle physics, cosmic rays, cosmology and methods of experimental physics: detectors and instruments. These directions are unified by development of the Standard Model which is evidently not complete. There are deviations from the Standard Model: neutrino oscillations, the dark matter existence. Together with strong interactions they are main subjects of the Conference.

New results from leading high energy physics collaborations are discussed. Main LHC experiments (ATLAS, CMS, ALICE) presented their results and detector upgrade prospects on the conference. Various aspects of Standard Model testing and search for new phenomena are main subjects of the conference. Among them: flavor physics at B factories, precision multi-boson production measurements, dark matter searches.

Electroweak interaction was discussed in the talks given by participants of neutrino physics experiments (Borexino, Neutrino-4, SOX, T2K and others). Enigmatic properties of neutrinos such as their tiny masses, oscillations between different neutrino types, cannot be explained in frame of the modern theory and require new approaches. Properties of neutrinos influenced the formation of the large-scale structure of the Universe and may be neutrinos are partially responsible for the excess of matter over anti-matter. Also our current challenge is the nature of the Dark matter. Many opportunities arise with the development of neutrino detection technologies comprising: measurements
Figure 1. Conference photo in Milan hotel.
of neutrinos from the Sun, measurements of geo-neutrino from the deep interior of the Earth, detecting neutrino fluxes from supernovae and different astrophysical sources. They were the subject of discussion which have been held at the conference. Neutrino physics experiments make huge demands to technologies like ultra-high precision measurements, huge detector size, excellent reliability and ultra-low radioactive background.

Strong interaction was covered by the talks from the existing and proposed heavy-ion physics experiments (STAR, PHENIX, NICA and others). Recent experimental and theoretical developments in a field of relativistic heavy-ion collisions have been discussed. The highlights by main running experiments at RHIC and the LHC were complemented by status reports on preparation of the future heavy-ion experiments at FAIR and NICA facilities. A special attention was drawn to the studies of collective effects in heavy-ion as well as in high multiplicity proton-nucleus and proton-proton collisions. A special heavy-ion junior session held at MEPhI campus has brought together young scientists who are participating in the analysis and interpretation of experimental data from the LHC, RHIC, SPS and SIS-18 as well as in the development of the analysis tools for future experiments at FAIR and NICA facilities.

The section “NEVOD” has been devoted to results of experimental investigations being fulfilled at the Experimental complex NEVOD and further development of this Unique Scientific Facility. Both basic and applied investigations are conducted at this complex. New unique detectors are being constructed around the central part of the NEVOD complex. Many young students and post-graduate students participated in this section and presented talks. For them this was the first (but not the last!) step in the Science.

Physics of cosmic rays as well as cosmology made the giant step ahead with the obtained last year results. The main contribution has been done by PAMELA experiment which continued during nearly 10 years and provided us with absolutely new results in all fields of space physics, Solar physics and dark matter physics as well.
The next important research in the field of gamma-ray astronomy will be opened by GAMMA-400 telescope which will begin the new era of high energy galactic and extragalactic gamma radiation study. The new principles of gamma ray detector construction as well as new detector themselves will give rise to the interest explosion to the problems of cosmology and problems which this experiment will be able to open up.

Also $\gamma$-quanta and charged particles generation in astrophysical sources and planet magnetospheres were discussed in the frameworks of Cosmic Rays subsection. Cosmological problems such as the origin and features of the dark matter, space reionization, smallness of the cosmological constant and black hole origin were discussed at the theoretical section of the conference.

The discovery of the gravitational waves was discussed at the Cosmological session. New results on the evolution of the early Universe were presented. It was shown that multi dimensional gravity could explain observable features and predict new phenomena. There were several talks on the inflation and internal structure of wormholes.

Special workshop is devoted to applications of the particle physics.

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Figure 3. Russian Academic Excellence Project logo.

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