

News about the World Machine

Congress of the German Physical Society in Karlsruhe

From March 28 to April 1, particle physics, mathematical physics, and gravity research will meet at Karlsruhe Institute of Technology (KIT). At a congress of the German Physical Society (DPG), about 1200 experts will speak about dark matter, neutrinos, cosmic rays, and about the experiments at CERN, the European Center for Nuclear and Particle Physics at Geneva, and research centers in Japan and the USA. Apart from experimental fundamental research, current developments in theoretical and mathematical physics will be in the focus. The highlight will be a celebration event with a presentation by the General Director of CERN, Rolf-Dieter Heuer. A public presentation on March 30 will complement the program.

On the occasion of the congress, the media are cordially invited to come to a press conference on Wednesday, March 30, 9.00 hrs:

Karlsruhe Institute of Technology
Audimax, building 30.95, Seminarraum SEMR I
Straße am Forum 1, 76131 Karlsruhe, Germany

The following persons will be present:

Prof. Dr. Rolf-Dieter Heuer, General Director of CERN,
Prof. Dr. Thomas Müller, congress organizer, KIT,
Prof. Dr. Wolfgang Sandner, President of the German Physical Society,
Prof. Dr. Eberhard Umbach, KIT President,
and other congress participants.

After the press conference, a celebration event will take place at the Audimax, to which the media also are cordially invited.

Kindly register on the form enclosed or directly by e-mail to presse@dpg-physik.de.

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Subjects of the Congress:

The World Machine

What happened during the Big Bang? Why does matter exist? What does it consist of? What is “dark matter”? How many spatial dimensions are there and does the Universe also comprise hidden dimensions? Such fundamental questions are in the focus of particle physics. In this connection, the so-called standard model is of crucial importance. It is a theory describing with enormous precision the smallest particles known to us and the forces acting among them. Still, it leaves much room for speculation. The Higgs boson, for instance, has been searched for about 30 years and still remains to be detected. This particle is deemed a central actor in the micro universe, as it is supposed to give other particles their mass. In their hunt for the Higgs boson, research centers on both sides of the Atlantic so far have raced neck and neck: In the USA, Fermilab with the particle accelerator TEVATRON. In Europe, CERN with the LHC, the largest particle accelerator in the world. Now, all signs are in favor of the LHC. Since its commissioning in the past year, the physicists involved, including a working group of KIT, have entered virgin territory already. The results obtained so far can be described well by the conventional theory. But further data acquisition is expected to provide new insights into the early times of the universe.

The congress will also deal with the experiments in Tsukuba, Japan. At the research laboratory there, scientists study the so-called symmetry breaking between matter and antimatter. These studies are aimed at answering the question why the universe contains matter at all.

Oscillating Neutrinos

Neutrinos are elementary particles that change their properties by neutrino oscillations. In Japan, Italy, and France, experiments are being conducted with German participation in order to study this behavior. At the DPG congress, the status of these studies will be discussed. Neutrino oscillations are of interest to science, because this phenomenon so far has not been brought in line with the standard model of particle physics. The oscillating behavior of neutrinos is also studied in Karlsruhe. At KIT, the largest and most precise neutrino scales in the world are being established.

Cosmic Rays

Energetic particles cannot only be found in particle accelerators. As cosmic rays, they reach our planet from the depth of the universe. Sometimes, gigantic amounts of energy are encountered, which cannot even be reached in the LHC. Which natural events release such energies? Science suspects that star explosions and black holes are the causes. To study cosmic rays, observation instruments are being set up all around the globe. During the DPG congress, measurement data of observatories located in the Antarctic, on the ground of the Mediterranean Sea, at Karlsruhe, in the highlands of Namibia or in the Argentine pampa will be discussed. KIT plays a major role at the latter observatory.

Dark Matter

Another topic will be the search for dark matter. Astronomic observations suggest that the universe does not only contain matter in the form of stars and gas clouds. This dark matter does not release any radiation, it is only noticeable by its gravity. Most researchers think that this dark matter represents elementary particles that have not yet been identified. At the LHC, it is tried to generate them artificially and to study their properties. The other approach pursued is to track down existing particles of dark matter. At Karlsruhe, it will be reported about both approaches.

Quantum Gravity

Presentations in the field of gravity research will focus on one dilemma in particular: While gravity on the astronomic scale is described best by Einstein's theory of relativity, a description equally valid for the quantum world is still lacking. Quantum theory can precisely represent the behavior of elementary particles, but leaves the influence of gravity unconsidered. Under the heading of "quantum gravity", scientists are therefore working on a description of gravity for smallest spatial dimensions, a model combining quantum theory with the theory of relativity. The frequently mentioned "string theory" or "loop quantum gravity" might be suitable approaches. The congress will focus on current developments in this field.

Mathematical Physics

In addition, current developments in mathematical physics will be discussed at the conference. Discussions will concentrate on entangled quantum states and their usability for future quantum computers and on a cosmological model that might explain the dynamics of the universe without dark energy.

Celebration Highlight

On March 30, the Ph. D. award for excellent Ph. D. theses in the fields of gravity research, nuclear or particle physics will be handed over during the celebration event. The awardee will be chosen from a group of candidates who will present their research results to an expert panel on the day before. The program will additionally include presentations by the Director General of CERN, Rolf-Dieter Heuer, and the particle physicist Günter Wolf from the DESY Research Center, Hamburg. Wolf is this year's winner of the Stern-Gerlach medal, the highest DPG honor for experimental physics.

Public Evening Presentation

The general public also will have the opportunity to get into contact with physics at the DPG congress. Congress organizer Thomas Müller will make a public evening presentation. The Karlsruhe particle physicist and his institute are involved in experiments at CERN, in the USA, and in Japan.

Wednesday, March 30, 20:00 hrs

„Von den höchsten Energien zu den kleinsten Teilchen: dem Urknall auf der Spur“ (From highest energies to smallest particles: Tracking down the Big Bang)

Prof. Dr. Thomas Müller

Karlsruhe Institute of Technology

Venue:

Karlsruhe Institute of Technology

Building 30.21, Gerthsen-Hörsaal

Engesserstraße 9, Karlsruhe

Admittance will be free.

Further Information:

The proceedings comprise about 1000 contributions. Journalists will find an overview at:

www.dpg-physik.de/presse/tagungen/2011/

Karlsruhe Institute of Technology (KIT) is a public corporation and state institution of Baden-Wuerttemberg, Germany. It fulfills the mission of a university and the mission of a national research center of the Helmholtz Association. KIT focuses on a knowledge triangle that links the tasks of research, teaching, and innovation.

This press release is available on the internet at www.kit.edu.