New Transregional Collaborative Research Center on Particle Physics

Researchers Want to Uncover Fundamental Theory

The discovery of the "Higgs boson" in 2012 completed the standard model of particle physics. Researchers in the "Phenomenological Elementary Particle Physics after the Higgs Discovery" CRC 257 Transregional Collaborative Research Center, which the German Research Foundation (DFG) has now approved, are dedicating themselves to better understanding the underlying fundamental theory. Karlsruhe Institute of Technology (KIT) is the host university, and the University of Siegen and RWTH Aachen are the partners. The DFG also provides further funding for two Transregional Collaborative Research Centers with KIT participation.

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With the discovery of the Higgs boson at CERN, a major breakthrough in particle physics was achieved in 2012 which provided proof of all the particles predicted by the standard model. The standard model of particle physics is mathematically complete and can describe nature in great detail. However, cosmological and astrophysical observations indicate that there must be an even more fundamental theory beyond this model.

"A series of fundamental questions such as the nature of dark matter or the surplus of matter observed in the universe cannot be answered by the standard model. This points to the existence of 'new physics' beyond this theory," says the spokesman for the new Transregional Collaborative Research Center, Professor Kirill Melnikov from the Institute for Theoretical Particle Physics at KIT. On the one hand, initial results from the Large Hadron Collider (LHC) showed no reference to such physics beyond the standard model; on the other hand, a few anomalies have appeared in some precise experiments (low energy, flavor) that point to a deviation from the standard model – and could develop into heralds for "new physics".

This is where the work of CRC 257 begins. The aim is to gain a comprehensive picture of possible physics beyond the standard model.

With state-of-the-art theoretical methods and newly developed search strategies, the scientists want to lay the theoretical foundation for fu-

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ture data analyses at LHC, flavor factories and other low-energy experiments. This is how they create the option of identifying even the smallest deviations from the standard model, finding references to this “new physics”. Interpreting the results will be the major element in identifying the more fundamental theory on which the standard model is based.

The “Phenomenological Elementary Particle Physics after the Higgs Discovery” CRC 257 will be funded from January 2019, initially for four years with a total of around twelve million euros. Partners of KIT in this group are the University of Siegen and RWTH Aachen, and scientists from the University of Heidelberg are also involved.

This Transregional CRC is one of ten new Collaborative Research Centers in Germany. The DFG has also extended funding for 13 Collaborative Research Centers, including two with scientists from KIT.

CRC 88: Cooperative Effects in Homo- and Heterometallic Complexes (3MET)

Applicant: TU Kaiserslautern together with KIT.

Further information: http://gepris.dfg.de/gepris/projekt/142808194

CRC 150: Turbulent, chemically reacting, multi-phase flows near walls

Applicant: TU Darmstadt together with KIT

Further information: http://gepris.dfg.de/gepris/projekt/237267381?language=en

Press release from the DFG:
http://www.dfg.de/service/presse/pressemitteilungen/2018/pressemitteilung_nr_54/index.html

As “the Research University in the Helmholtz Association”, KIT creates and conveys knowledge for society and the environment. The aim is to make significant contributions to global challenges in the fields of energy, mobility and information. To achieve this, around 9,300 employees are working together on a broad disciplinary basis in natural sciences, engineering, economics, humanities and social sciences. KIT offers research-oriented studies to prepare its 25500 students for responsible tasks

in society, economy and science. Innovations at KIT bridge the gap between knowledge and application for the benefit of society, economic prosperity and the preservation of our natural resources.

This press release is available on the internet at: www.sek.kit.edu/presse.php