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Press release

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Cooperation agreements, Research projects
Physics / astronomy
transregional, national

New German-Japanese Cooperation for Highest Precision

MPG-PTB-RIKEN Centre for Time, Constants and Fundamental Symmetries In the new MPG-PTB-RIKEN Centre for Time, Constants and Fundamental Symmetries, experimental physicists with a passion for precision will jointly tackle forefront topics in fundamental physics such as the question for the constancy in time of natural constants or the subtle differences between matter and antimatter. This new initiative started on January 1, 2019; the official opening ceremony will be on April 8, 2019 at RIKEN in Tokyo, Japan.

In the MPG-PTB-RIKEN Centre, worldwide leading experimental groups in atomic and nuclear physics, antimatter research, quantum optics and metrology closely collaborate in order to measure time and natural constants even more accurately using their ultra-precise equipment. The goal is to find answers to fundamental questions of physics. One of these questions is whether natural constants really are constant or eventually change in time by tiny amounts. Another question deals with the subtle differences in the properties of matter and antimatter (besides the reversed charge), which did not yet show up, although they intrinsically must exist. Otherwise, the universe would practically consist of pure radiation, since the matter and antimatter particles created in equal amounts in the big bang would have annihilated. Closely related to this test of fundamental symmetries is the search for 'new physics' beyond the Standard Model of elementary particle physics. "Here, a unique combination of outstanding scientists has joined their forces to solve these fascinating puzzles of physics", Klaus Blaum, director at the MPI for nuclear physics and one of the spokespersons of the Centre, looks forward to this research collaboration.

The broad research portfolio particularly aims for the development of novel clocks based on atoms, nuclei and highly charged ions. In addition, improved measurements of fundamental constants such as the Rydberg constant, the fine-structure constant or the proton charge radius are envisaged. Further parts of the research initiative deal with stringent tests of fundamental interactions and symmetries using protons und antiprotons. To reach these goals, it is required to enhance further the presently achieved experimental precision. Therefore, the researchers intend to develop novel experimental techniques, which will outperform the state-of-the-art of contemporary methods and enable measurements at even shorter time scales and with improved sensitivity. "The combined expertise of the individual groups with their in part complementary approaches and different methods has the potential for substantial progress", hopefully emphasizes Stefan Ulmer, chief scientist at RIKEN und another spokesperson of the Centre. "It is fascinating, that nowadays manageable laboratory experiments by means of their high precision make it possible to investigate such fundamental questions in physics and cosmology", says Ekkehard Peik, leader of the department time and frequency at PTB and the third spokesperson of the Centre. An essential element of synergy arises from an intense exchange programme for young scientists, who thereby will become familiar with the experiments of the partner institutes.

The new initiative started on January 1, 2019; the official opening ceremony will be on April 8, 2019 at RIKEN in Tokyo, Japan. Partners are the Max Planck Institutes for nuclear physics (MPIK, divisions Blaum and Pfeifer) and for quantum optics (MPQ, division Hänsch, Udem), the National Metrology Institute of Germany (Physikalisch-Technische Bundesanstalt, PTB) with two departments and the QUEST institute (Peik and Schmidt) as well as RIKEN with two research groups (Katori and Ulmer). The scientific activities will be coordinated at MPIK. The three partners agreed to fund the MPG-PTB-RIKEN Centre in equal amounts with overall about 7.5 million Euro for five years.

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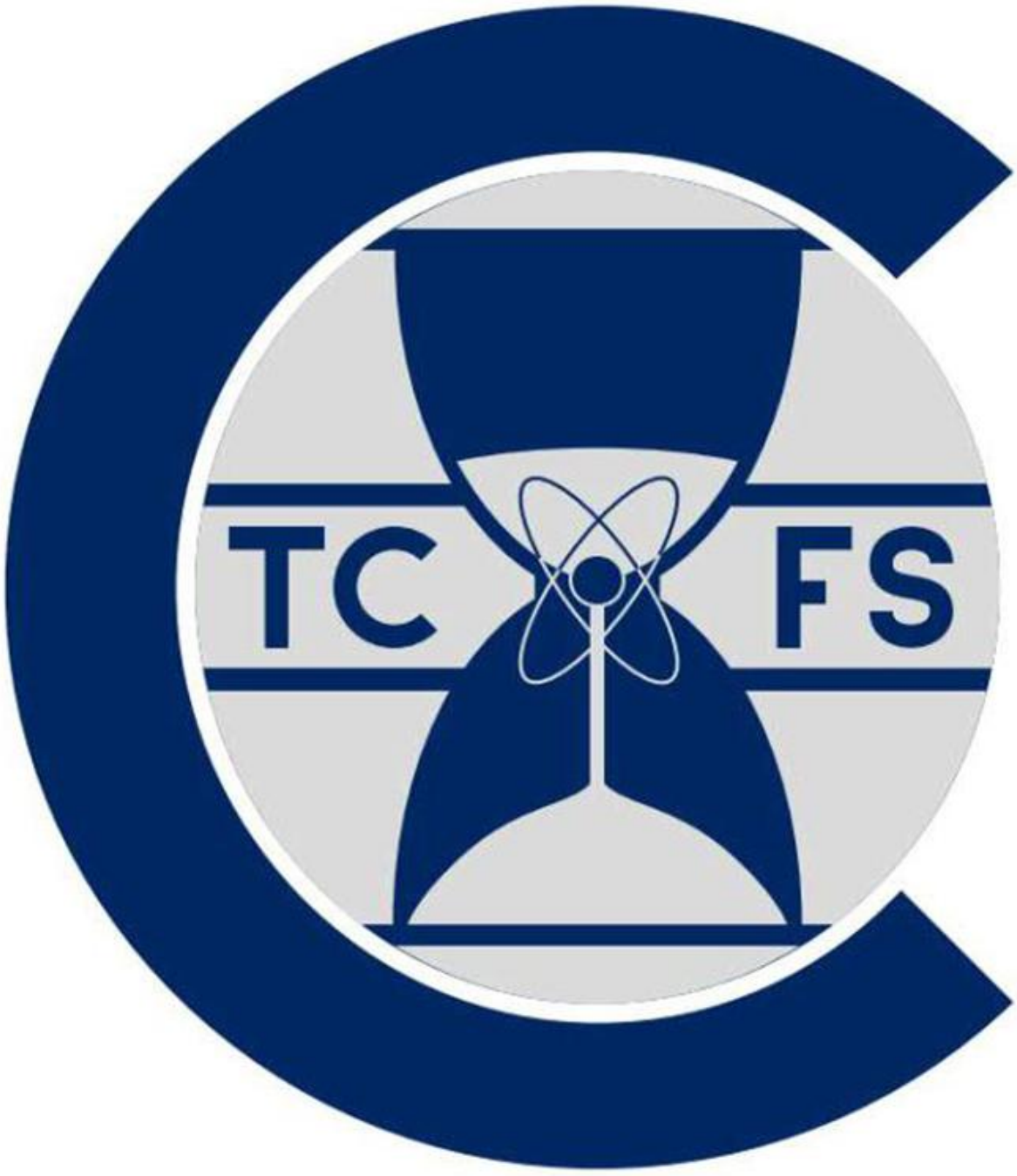

Logo of the MPG-PTB-RIKEN Centre
MPG-PTB-RIKEN Centre for Time, Constants and Fundamental Symmetries