

Press Release

Garching, March 31, 2010

Neutron Research in Garching is Further Consolidated

Astrophysical Experiments with Cold and Ultracold Neutrons

The DFG Deutsche Forschungsgemeinschaft (German Research Foundation) intensifies its commitment to neutron research, which is already well represented in Garching: Within the framework of the priority program "Precision Experiments in Particle and Astrophysics with Cold and Ultracold Neutrons," scientists of the Excellence Cluster Universe at Technische Universität München (TUM) recently procured funding in the amount of 3.72 million euros. This DFG program was founded in 2009 and is based in Munich and Vienna. The scientific experiments are to be performed at the research neutron sources in Munich (FRM II), Switzerland (PSI, Villigen) and France (ILL, Grenoble).

One focus of the priority program is on experiments aimed at providing evidence of an electric dipole moment (EDM) of a neutron. This is a key experiment to the understanding of fundamental symmetries (CP symmetry) and matter/anti-matter asymmetry in the Universe. In addition to the TUM chair E18 of Professor Stephan Paul, the junior research group of Professor Peter Fierlinger of the Universe Cluster is also participating in the experiment. This group is currently working on the construction of a magnetically shielded room for high-precision measurements. Inside magnetic fields in the femto-Tesla range will be stabilized. The experiment should thus be capable of measuring tiny deviations in the movement of a neutron in the magnetic field, just as they would be caused by a possible electric dipole moment.

A precursor experiment for the measurement of the dipole moment is currently being realized within the framework of an international collaboration at PSI (Switzerland). The new experiment is intended to be located in Garching: At the neutron source Heinz Maier-Leibnitz (FRM II) a new high-performance source for ultracold neutrons is currently being developed. It is to produce about 10,000 of these particles per cubic centimeter per second as of 2011. Thus it would be the most powerful neutron source of its kind in the world, even exceeding the planned source at the PSI.. By comparison: Current sources produce approximately 50 neutrons per cubic centimeter per second.

The second main focus is the precise examination of neutron decay. These experiments are to provide new insights into the structure of the weak interaction and its effects in cosmology. For the measurement of asymmetries in the neutron decay, the development of an innovative

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large apparatus is planned in an alliance with other scientists. It is to be implemented at ILL or at the planned new particle beam for cold neutrons at FRM II. As in the case of the new EDM experiment, here as well and during the measurement of the lifetime of neutrons, the scientists want to increase the measuring accuracy that has been attained so far by a factor of 10 to 100. Another experiment is to examine a hitherto unobserved decay mode of the neutron.

Stephan Paul, coordinator of the Excellence Cluster Universe, is pleased with the success in the current application round: "In 2008 and 2009, neutron research in Garching already received DFG funding in the amount of 2.7 million euros, which means that this area is well established at our research center. Along with the new funds, the research region Munich/Garching is very well equipped to tackle important questions in particle and astrophysics complementary to the studies at LHC in Geneva. At the same time, the financial aid for our partners in the priority program also plays an important role, as the measurements planned can only be realized in a strong consortium."

Technische Universität München (TUM) is one of Germany's leading universities. It has roughly 420 professors, 7,500 academic and non-academic staff (including those at the university hospital "Rechts der Isar"), and 24,000 students. It focuses on the engineering sciences, natural sciences, life sciences, medicine, and economic sciences. After winning numerous awards, it was selected as an "Elite University" in 2006 by the Science Council (Wissenschaftsrat) and the German Research Foundation (DFG). The university's global network includes an outpost in Singapore. TUM is dedicated to the ideal of a top-level research based entrepreneurial university. <http://www.tum.de>

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