

Quantum Physics

THE PUZZLE OF MULTIPLE ENERGY SCALES



QUANTUMPUZZLE

Quantum Criticality – The Puzzle of Multiple Energy Scales

Programm: 7. EU-Rahmenprogramm für Forschung, technologische Entwicklung und Demonstration

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Projektkoordinator: Technische Universität Wien, Prof. Silke Bühler-Paschen

Matter at the absolute zero in temperature may reach a highly exotic state: Where two distinctly different ground states are separated by a second order phase transition the system is far from being frozen; it is undecided in which state to be and therefore undergoes strong collective quantum fluctuations.

Quantum criticality describes these fluctuations and their extension to finite temperature. Quantum critical behaviour has been reported in systems as distinct as high-temperature superconductors, metamagnets, multilayer 3He films, or heavy fermion compounds. The latter have emerged as prototypical systems in the past few years. A major puzzle represents the recent discovery of a new energy scale in one such system, that vanishes at the quantum critical point and is in addition to the second-order phase transition scale. Completely new theoretical approaches are called for to describe this situation.

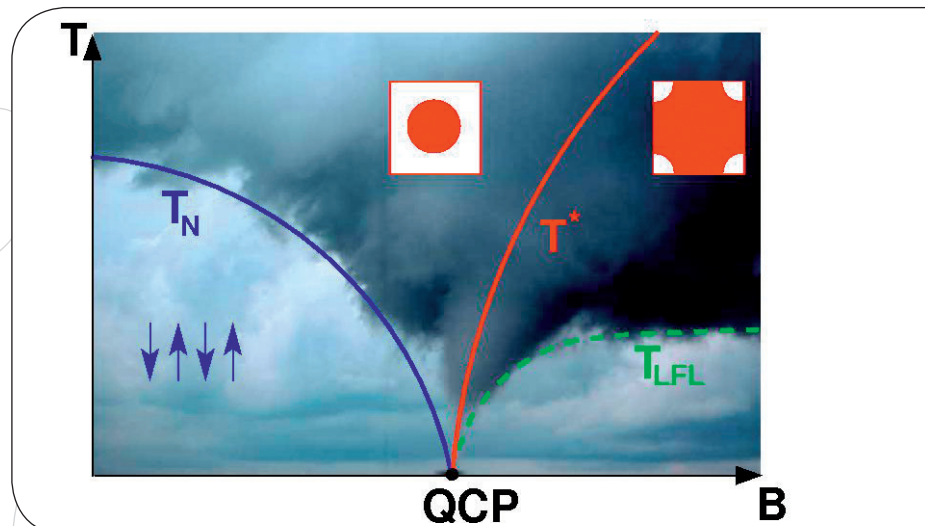
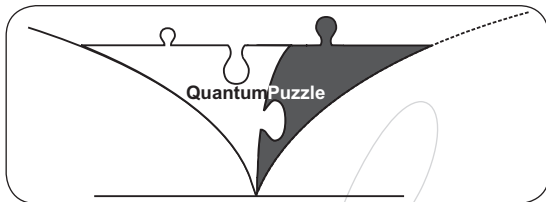
Quantum criticality is at the forefront of modern condensed matter physics. Our recent discovery of an entirely unexpected energy scale in the phase diagram of a prototypical quantum critical compound mystified the community. With this project, we address the key issues of the recent discovery and set out to solve the “quantum puzzle” with techniques that go drastically beyond the state-of-the-art in the field. We expect ramifications to the general theory of quantum phase transitions and to our understanding of emergent quantum phases in complex materials.

With the ERC Advanced Researcher Grant the European Research Council has established a tool to “support excellent, innovative investigator-initiated research projects by leading advanced investigators”. This gives grant holders the fantastic opportunity to set up an ambitious fundamental research programme and accomplish it with ample flexibility to react on new trends and own discoveries. I am glad this was invented and convinced that, on the long run, it will be just as profitable for Europe as programmes in support of thematic priorities.

SERVICE

Ihr Wegweiser durch die Europäischen und Internationalen Programme: Information, Beratung, Coaching von der Projektidee bis zum Projektabschluss bieten Ihnen die ExpertInnen der FFG.

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