Opponent Report on the Habilitation Thesis of

RNDr. Jan Prokleška, Ph.D.

MAGNETISM IN UTX COMPOUNDS

The thesis of RNDr. Jan Prokleška, Ph.D. is conceived as the selection of papers based on studies of magnetism in UTX compounds where T is the transition metal, and X is p-metal with stress on quantum critical transitions (QPT) and points (QPC). The thesis contains short inductory chapter briefly describing phase transitions and critical behaviour in studied compounds. The UTX compounds are a system widely studied in detail earlier due to its strong uniaxial magnetism. However, it still possesses many unanswered questions. The studied issues are highly actual and very interesting. It is important to mention that all enclosed papers are published in prestigious reviewed journals.

Published results have been obtained during study of the 3 compounds. 1. $UCo_xRu_{1-x}Al$ is a pseudoternary system prepared in polycrystalline form, where a ferromagnetic dome was found. 2. UCoGa orders ferromagnetically, and it was now prepared in a single crystalline form. 3. URhGa compounds was now also prepared in single crystalline form. Previously polycrystalline samples have shown different transition temperatures. The technological aspects of sample preparation were analysed in all studied sample first. Form results it is concluded that the way of preparation and number of impurities significantly influenced the main physical parameters. The prepared U-samples enable to study more precisely of magnetic characteristics and formation of magnetic domains. The critical exponents suggest that UCoGa belongs to the universality class of the 2D Ising system with long-range magnetic order.

The study of pressure effects on these samples enabled to move systems to their critical point. In UCoGe sample, they identified the tricritical point at about 6 GPa. The determined phase diagram follows expectations for clean itinerant ferromagnetic systems. The author used not only mechanical pressure but also the chemical pressure made by substitution interchangeability. By this way, he was able to deeply study the-phase diagram in these systems and to determine the quantum critical effects. Then he was able to determine the universality classes for studied UTX systems. The last part of the thesis is devoted to the relation between spin fluctuation and pressure evolution.

I would like to special stress that all presented results were obtained the home laboratory of the habilitant. I know him as a very clever experimentalist who can work on all devices in the Joint magnetic laboratory at Charles University.

The author also fulfils parameters in teaching duties.

I would like to comment on the results of the obligate test made by the Turnitin system. The results of this test confirm faultiness of such a system. The result shows only conformity with author's own texts, which he published. The system cannot take into account the style of preparation of habilitation thesis as a collection of papers with a short description of main results. Therefore, the test results are not relevant, and the thesis is not plagiarism.

In the end, I would like to ask the author the following questions:

- Which are other systems on the base of UTX, which the author plans to study next?
- It is possible to expect other systems from the UTX family, which could show quantum critical effects?

In conclusion, I would like to claim that the results obtained in the habilitation thesis are at a high level, and I consider them as a significant contribution to the study of magnetism of UTX systems, especially by the influence of high pressure and magnetic fields, in order to determine phase diagrams and quantum critical effects. I conclude that the submitted thesis and the achieved scientific results meet all the requirements imposed on the habilitation procedure. Therefore, I recommend appointing RNDr. Jan Prokleška, Ph.D. as associate professor.

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