CNR-STM FINAL REPORT

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Department: Physics

Host Team Leader: Professor Marian Reiffers

Starting date: 10/01/2017 **Ending date:** 30/01/2017

Title: electronic phase diagram of $Yb_2Pd_2(In_{1-x}Sn_x)$ heavy fermion compound

Report:

During my stay in Prešov I had the great opportunity to work with the research team lead by Prof. Marian Raiffers to unveil the magnetic field-temperature (B-T) phase diagram of the heavy fermion solid solution $Yb_2Pd2In_{1-x}Sn_x$. Following the approved research program, our research activity started with low temperature heat capacity measurements on the optimum doped compound (x=0.6). These measurements were done in Slovak Academy of Science (SAS) laboratories in Košice. In figure 1a we show the experimental results obtained for several applied magnetic field. From these data it was possible to determine the B-T phase diagram (see figure 1b).

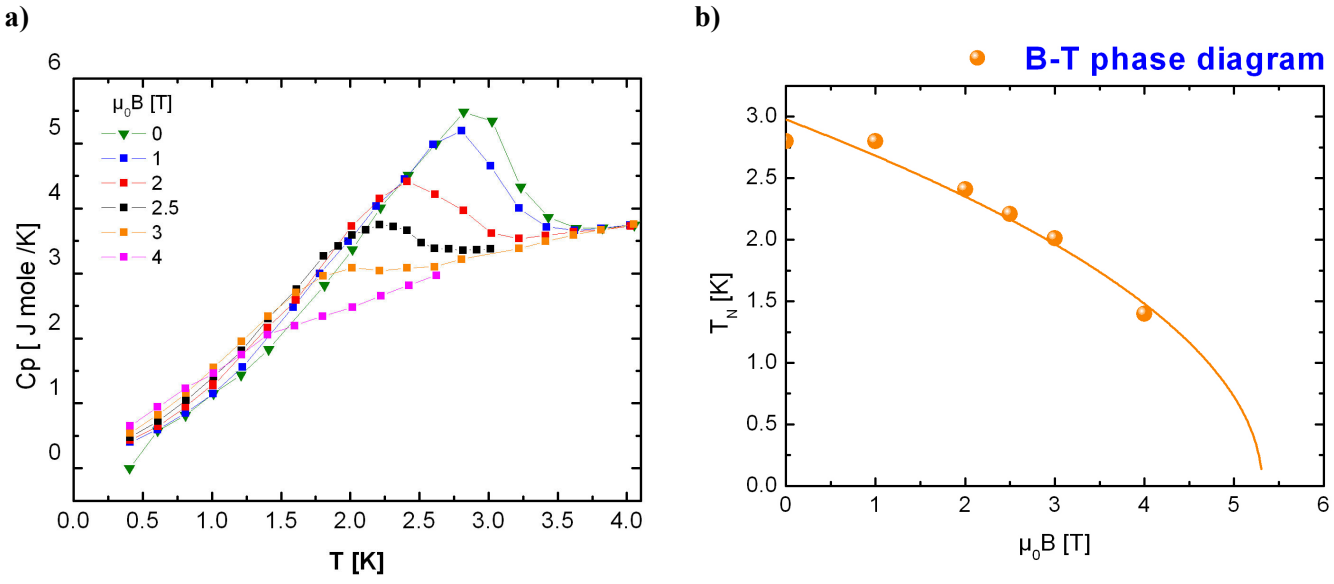

Figure 1: (a) low temperature behavior of the specific heat measured on x=0.6 sample at several applied magnetic field and the relative B-T phase diagram (b); the continuous line is a guide for the eyes.

Suddenly, the measurements were interrupted because the experimental system was blocked probably because of the presence of some frozen neon impurity in the He_3-He_4 mixture circuit. Since it was necessary to warm up the system, our research on the B-T field diagram continued in Prešov by measuring the T-dependence heat capacity at several applied magnetic field for the x=0.6 and 0.8 samples in the temperature range 2<T<100 K. The data cannot be shown because the experimental results are under consideration for several analysis.

At the same time we measured the isothermal magnetization of the x=0.8 sample by applying a magnetic field up to 9 T at both 2 and 6 K, that means below and above the magnetic transition temperature T_N=2.7 K. Interestingly, we discovered the presence of a metamagnetic-like transition at T=2 K and μ_0H=1.5 T, that was never put in evidence in this compound up to now. This experimental finding will be the object of further joint studies in the next future.

a) **b)**

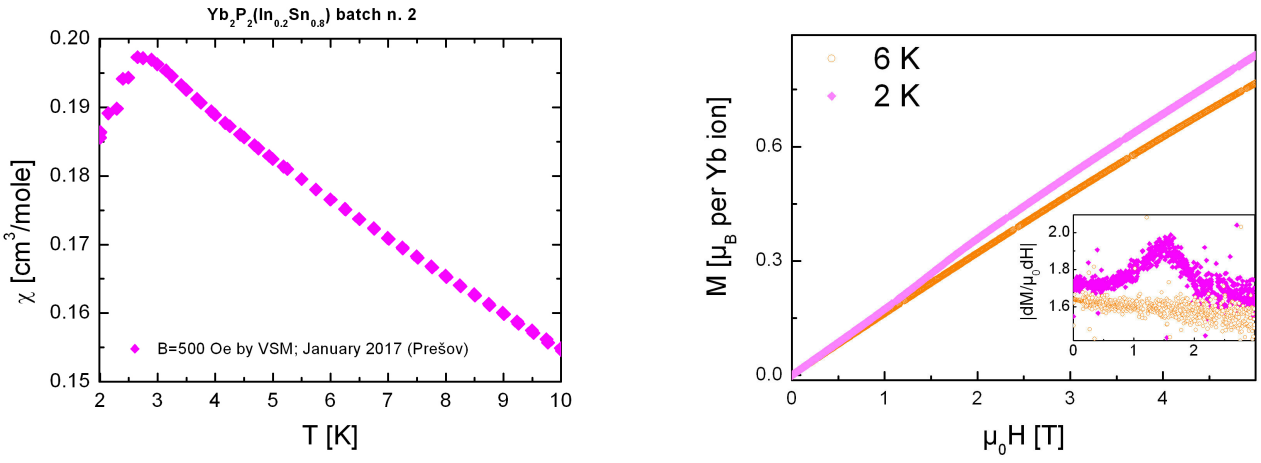

Figure 1: (a) temperature behavior of the dc magnetic susceptibility and (b) isothermal magnetization measured at T=2 and 6 K. In the inset the magnetic field derivative of the magnetization is displayed. The peak is indicative of a metamagnetic-like transition.

My stay in Prešov was also a good occasion to extend the collaboration between Marian Reiffers' team and CNR-SPIN counterparts in Genoa also on other research subjects such as superconductivity in hydrogen based compounds. It was possible to put together the guidelines of a joint proposal that it will be presented to the next QUANTERA call.

Fellow Signature
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