

Plans for PhD stay in ILL

Charles University, Department of Condensed Matter Physics

28.4.2017

- title - Behavior of systems with f electrons on the verge of magnetism
 - single crystal growth (Czochralski method, Floating zone method, Bridgman method)
 - study of the uranium based intermetallics (mostly)
 - $U_4Ru_7Ge_6$, $UIrGe$, UAu_2Si_2 , UNi_4B , $UCo_{1-x}Ru_xGe$, $UIrSi_3, \dots$

plans for the stay in ILL

- Supervisor at ILL: Martin Boehm
- participation in the project of upgrade of ThALES within the ILL Endurance phase 2
- already accepted proposals for the upcoming cycles in 2017
- another proposals will be submitted for the September round
- finalizing PhD thesis for submission process

Proposals

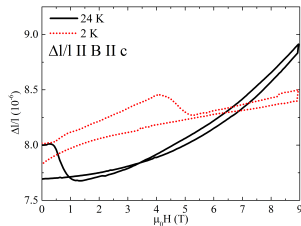
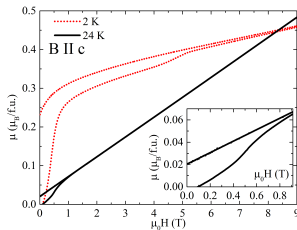
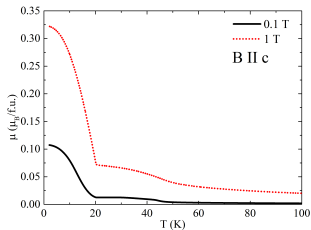
- Mapping of magnetic excitations and phonons of UAu_2Si_2 - IN4
- Study of the ferromagnetic phase in the UAu_2Si_2 single crystal - D3
- Investigation of magnetic structure of UIrSi_3 without inversion symmetry in the crystal structure - D10

UAu₂Si₂ - background

- URu₂Si₂ - well studied \Rightarrow hidden order transition at 17.5 K
- previously, only contradictory results on the polycrystalline samples of the UAu₂Si₂
- Floating zone method in the optical furnace \Rightarrow the very first single crystals!!!
- collaboration with the group of prof. Amitsuka
- bulk properties already published, Tabata et al. PRB 94, 214414 (2016)

UAu₂Si₂ - recent results

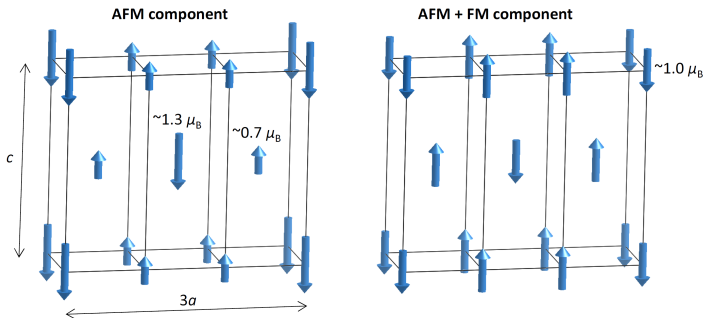
- tetragonal structure, ThCr₂Si₂ - type, space group *I4/mmm*
- FM transition at 50 K and AFM-like at 19 K



- evidences for the intrinsic nature of the 50 K anomaly

UAu₂Si₂ - case - recent results

- previous D10 and CYCLOPS experiment $\Rightarrow q = (\frac{2}{3}, 0, 0)$, moments most probably along the c axis

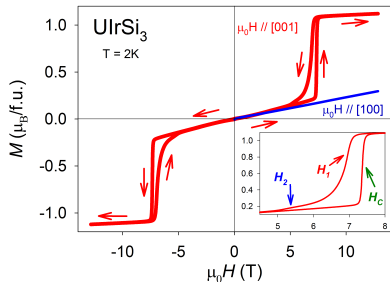
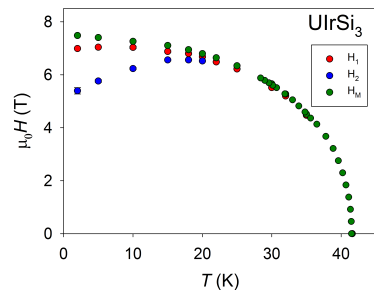


\Rightarrow D3 proposal \Rightarrow polarized neutron diffraction experiment in the AFM+FM and FM state

\Rightarrow IN4 proposal \Rightarrow powder, TOF experiment, crystal field and magnetic excitations, phonons \Rightarrow basis for the later triple-axis experiment

UIrSi₃ - background

- part of the PhD work of J. Valenta
- together with UNiGa₃ - tetragonal BaNiSn₃ structure type, without inversion symmetry
- Floating zone method in the optical furnace \Rightarrow the very first single crystal of UIrSi₃
- AFM state below 41.5 K \Rightarrow metamagnetic transitions along the [001] direction



- large hysteresis (below 30 K, 6 T) on magnetization, magnetoresistance and magnetostriction data
- possible presence of the tricritical point ($2^{\text{nd}} \rightleftharpoons 1^{\text{st}}$ order transition)

- Laue diffraction on CYCLOPS \Rightarrow propagation vector
- single crystal diffraction on D10 \Rightarrow magnetic structure at the ground state
- important step to understand the effect of magnetic field on UIrSi₃
- further high field experiments will be planed

- UNi₄B - work of H. Saito
 - AFM ground state below 20 K
 - high quality single crystals, even with ¹¹B
 - CYCLOPS experiment (M. Klicpera) ⇒ orthorhombic structure (not hexagonal), $q = (0, \frac{2}{3}, 0)$
 - presence of toroidal order, magnetization change controlled by the applied electric current
- different systems studied at our department

Thank you for your attention