



Seminars of Condensed-Matter Physics

Monday, 12th of November 2012 – CH B3 31 – 12h30

Broadband femtosecond spectroscopy studies on tantalum disulfide

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The transition metal dichalcogenide tantalum disulfide (TaS_2), which shows a charge density wave (CDW), has been the subject of numerous studies during the past years due to its intriguing combination of electron-electron and electron-phonon correlations. Time-resolved ARPES [1,2] and electron diffraction measurements [3] have shown that below 200K TaS_2 enters an insulating phase with features of both the Mott and the Peierls mechanism [4]. Furthermore, superconducting phases can appear in TaS_2 and related compounds under certain conditions [5], opening the question of the mechanism of superconductivity and its relation to (or competition with) the CDW mechanism.

I will give an introduction into the concepts of the correlation phenomena under discussion and summarize the current insights into the physics in the various phases of 1T- TaS_2 . I will discuss how our ongoing study using femtosecond pump-probe spectroscopy with a broadband visible probe pulse can help to complete our picture of the material, and how we can disentangle the present combination of electron-electron and electron-phonon effects.

[1] Perfetti et al., New Journal of Physics **10**, 053019 (2008)

[2] Petersen et al., PRL **107**, 177402 (2011)

[3] Eichberger et al., Nature **468**, 799-802 (2010)

[4] Hellmann et al., Nat. Commun. **3**:1069 (2012)

[5] Sipos et al., Nat. Mater. **7**, 960–965 (2008)