

## Seminar

of the Department of complex matter F7

**Friday, 25.5.2018 at 13:00,**

Seminar room F7

# Charged lattice gas of polarons in $1T\text{-TaS}_2$

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Motivation for this work comes from the discovery of a new metastable amorphous (A) state in  $1T\text{-TaS}_2$  (TAS)<sup>1</sup>. The A state represents a disordered polaron pattern, which exhibits metallic behavior. We employed a classical charged lattice gas of polarons with screened Coulomb interaction and a fixed polaron concentration as a model for the A state. The idea has been used successfully in the work of Brazovskii<sup>2</sup> who first proposed the model and used it to model the commensurate state. Karpov et al.<sup>3</sup> also used it to model the hidden state, observed in TAS<sup>4</sup>. Our work has shown that the A state can be successfully modeled using classical charged polarons. Further investigation of the model has shown that there exists an infinite number of crystalline phases within the model as a function of polaron concentration. There also exist other amorphous phases which lie in between the crystalline phases. They exhibit glassy behavior and in contrast to the current paradigm of glass formation<sup>5</sup> appear to be the ground state of the system.

1. Gerasimenko, Y. *et al.* Ultrafast jamming of electrons into an amorphous entangled state. *arXiv preprint arXiv:1803.00255* (2018).
2. Brazovskii, S. Modeling of Evolution of a Complex Electronic System to an Ordered Hidden State: Application to Optical Quench in  $1T\text{-TaS}_2$ . *Journal of Superconductivity and Novel Magnetism* **28**, 1349–1353 (2015).
3. Karpov, P. & Brazovskii, S. Modeling of networks and globules of charged domain walls observed in pump and pulse induced states. *Scientific reports* **8**, 4043 (2018).
4. Stojchevska, L. *et al.* Ultrafast switching to a stable hidden quantum state in an electronic crystal. *Science* **344**, 177–180 (2014).
5. Debenedetti, P. G. & Stillinger, F. H. Supercooled liquids and the glass transition. *Nature* **410**, 259 (2001).

The lecture will be held in English.

Cordially invited to attend.

