



TRR 80 Sonderseminar

Am Dienstag, den 29. Mai um 16:00 Uhr

spricht

Dr. Alexander Balatsky

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über das Thema

Superconductivity and quantum paraelectric fluctuations in STO

With the pioneering discovery of the superconductivity in STO interfaces the field of emergent states at interfaces has been rapidly growing. Recently we come to realize that the key to a lot of puzzles in these devices lies in the complicated states of bulk STO. Superconducting state in STO exhibits the superconducting dome as a function of doping. STO is also a known quantum paraelectric. Historically ferroelectric quantum criticality and superconducting dome in STO were assumed to be unrelated. We propose that they are in fact closely connected. We suggest that ferroelectric quantum criticality can induce superconductivity. We will present our results on investigation of the origin of superconductivity in doped STO using a combination of density functional and strong coupling theory [1]. Our approach suggests a model in which the ferroelectric soft mode fluctuations provide the pairing interaction for superconductivity carriers. This approach adds to the range of superconducting states induced by quantum criticality beyond magnetic and valence fluctuations [1,2]. Based on this model we made a prediction that superconducting T_c will *increase* with increasing 18O isotope substitution. This prediction has been verified experimentally [3]. We also discuss proposal to use strain as a tool to control paraelectric fluctuations and thus control superconductivity in STO [4]. We will illustrate the ongoing debate on the nature of the pairing states in bulk STO and in related heterostructure devices: the possibility to realize composite pairing states and multiband superconductivity.

[1] J. Edge et al Phys. Rev. Lett. **115**, 247002 (2015)

[2] CW Rischau et al, Nature Physics, **13**, 643–648 (2017)

[3] A. Stucky, et.al, *Scientific Reports* **6**, Article number: 37582 (2016)

[4] K. Dunnett, et.al, Phys. Rev. B **97**, 144506 (2018)

Gäste sind herzlich willkommen.

Der Vortrag findet im Seminarraum S-288, Institut für Physik,
Universität Augsburg statt.

Gastgeber: Prof. Dr. Arno P. Kampf
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