Physical Sciences Seminar

Physical processes in disordered superconductors

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Host: Johannes Fink

The development of nanostructures patterned on highly disordered superconducting thin films attracts significant scientific attention nowadays. Such nanostructures exhibit unique properties with no analog in nature. Real materials are built from atoms and molecules, which are quantum objects. An artificial analog to them are two level systems, so called quantum bits (qubits). Recent studies have revealed, that disordered superconducting nanostructures provide strong nonlinearity, which is necessary in order to detect the separated qubit states. Suitable materials to form the basis of such structures are thin films with high sheet resistance (~1k?).
The presentation deals with the deposition of the molybdenum carbide (MoC) superconducting thin films, patterning of micro - and nanostructures and their experimental and theoretical analysis. Superconducting properties of thin films were optimized by tuning the reactive magnetron sputtering process, which allows for preparation of samples with thickness down to 1nm. Afterwards, they were analyzed by transport and tunneling methods, which revealed decreased quasiparticle lifetime. These results were confirmed by microwave and terahertz spectroscopy measurements and an extension of stated Mattis-Bardeen theory was developed in order to describe the results. Applicability was outlined on a nanobridge patterned on 10nm film with desired properties. Its transport measurements exhibited quantum phase-slip like behavior.

Tuesday, February 28, 2017 11:00am - 12:30pm
Seminar room Big Ground floor / Office Bldg West (I21.EG.101)

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