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Dragan Mihailović

Electronic Phase Transitions Through Time On A Femtosecond Timescale

The study of phase transitions in real time under nonequilibrium conditions is of fundamental interest in many areas of physics. A special category of recent fundamental and practical interest are transitions to metastable hidden states which occur under conditions of particle-hole asymmetry. While such behavior has been invoked in cosmology to explain Baryogenesis, it is not commonly observed elsewhere. In the quasi-two-dimensional dichalcogenide, 1T-TaS2, conditions for the formation of an electronically textured hidden "false vacuum" state are created by femtosecond laser photoexcitation. Femtosecond photoexcited low temperature scanning tunneling microscopy reveals a remarkable quantum duality of polaron behavior with a vivid real-space illustration of Mott physics. The current system is of practical interest for ultrafast low-energy low-temperature non-volatile memory devices with applications in cryogenic computing.

Dragan Mihailovic, a graduate of Oxford University is Head of Department of Complex Matter at the Jozef Stefan institute, Director of the CENN Nanocenter, and Professor of Physics at the University of Ljubljana. His research activities have ranged from high temperature superconductivity, fullerene magnetism, and nanomaterials, with particular emphasis on the study of ultrafast nonequilibrium dynamics. In the last 10 years he has focused on studying nonequilibrium phase transitions, employing some pioneering methods. He is member of the Engineering Science Academy of Slovenia and has spent sabbaticals at Univ. of California Santa Barbara and Oxford University. He was awarded the Zois prize and Zois award for outstanding achievements in science, the Fulbright fellowship and honorary membership of the High table at Christ Church college, Oxford. He is author/coauthor of more than 300 papers, and 11 patents.

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