Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Controlling non-equilibrium CDW states in 1T-TaS_2 nano-thick crystals MASARO YOSHIDA, YIJIN ZHANG, RYUJI SUZUKI, Quantum-Phase Electronics Center (QPEC) and Department of Applied Physics, The University of Tokyo, Japan, JIANTING YE, Zernike Institute for Advanced Materials, University of Groningen, The Netherlands, YOSHIHIRO IWASA, Quantum-Phase Electronics Center (QPEC) and Department of Applied Physics, The University of Tokyo, Japan
— Two-dimensional (2D) crystals provide an ideal platform for exotic electronic band structures in mono- or multi-layer forms. The thinning to nanoscale may also affect collective phenomena in interacting electron systems and can lead to unconventional states that are dramatically different from those in bulk. In this presentation, we report the systematic control of charge-density-wave (CDW) transitions by changing thickness and cooling rate in nano-thick crystals of 1T-type tantalum disulfide (1T-TaS_2). First, we discovered a new super-cooled nearly-commensurate CDW state, which shows metallic behavior at low temperatures. Furthermore, we achieved current-induced switching between various CDW states. The glassy behavior and non-linear response, possibly due to the reduced dimensionality, manifest the emergent complex nature of correlated electrons in 2D crystals with nanometer thickness.

Masaro Yoshida
Quantum-Phase Electronics Center (QPEC) and
Department of Applied Physics, The University of Tokyo, Japan

Date submitted: 13 Nov 2014 Electronic form version 1.4