Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Charge Order Along Mirror Twin Boundaries in $MoSe_2$ FELIX FLICKER, ADOLFO GRUSHIN, University of California, Berkeley, SEBASTIAN WICKENBURG, None, SARA BARJA, ALEXANDER WEBER-BARGIONI, Lawrence Berkeley National Laboratory — One-dimensional systems generically exhibit charge ordering, in which the lattice develops a periodic modulation, through the Peierls instability. The argument assumes an infinite system size. What happens as this assumption is relaxed? Using atomically-resolved scanning tunneling microscopy and atomic force microscopy on semiconducting monolayers of molybdenum diselenide ($MoSe_2$) we see conducting edge states along one-dimensional mirror twin boundaries. Remarkably, these edge states, which are approximately thirty to sixty atoms in length, develop their own energy gap via charge ordering. Self-consistently solving a Hubbard model we demonstrate that these systems exactly at the crossover from charge ordering to quantum well physics, demonstrating features of both simultaneously.

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Date submitted: 10 Nov 2016 Electronic form version 1.4