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Scanning tunneling microscopy study of a new charge density wave phase in VSe_2 thin films DUMING ZHANG, JEONGHOON HA, Center for Nanoscale Science and Technology, National Institute of Standards and Technology/Maryland Nano Center, University of Maryland, HONGWOO BAEK, Center for Nanoscale Science and Technology, NIST/Department of Physics and Astronomy, Seoul National University, FABIAN NATTERER, Center for Nanoscale Science and Technology, National Institute of Standards and Technology, YOUNG KUK, Department of Physics and Astronomy, Seoul National University, NIKOLAI ZHITENEV, JOSEPH STROSCIO, Center for Nanoscale Science and Technology, National Institute of Standards and Technology — Ultra-thin two-dimensional materials of transition metal dichalcogenides have recently attracted great interest due to their diverse electronic properties and potential applications. Upon cooling to low temperature, some materials exhibit interesting phenomena of collective electronic states such as superconductivity and charge density waves. While charge density waves in bulk materials of transition metal dichalcogenides have been extensively studied in the past few decades, the understanding of this collective electronic state in materials with reduced dimensionality is still in its infancy. Here, we report *in-situ* ultra-low temperature scanning tunneling microscopy and spectroscopy measurements on VSe_2 thin films synthesized by molecular beam epitaxy. We observed an unconventional charge density wave which does not follow previous reports of hexagonal symmetry of VSe_2. Spectroscopy results will be discussed in relation to other characterizations using electrical transport and transmission electron microscopy.

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