Abstract Submitted
for the TSF17 Meeting of
The American Physical Society

Electrical switching, loop hysteresis and charge oscillation in VO_2 micro-channel devices MILINDA PATTANAYAK, Department of Physics and Astronomy, Texas Tech University/ Nano Tech Center, Texas Tech University, NADIM HOQUE, ZHAOYANG FAN, AYRTON BERNUSSI, Department of Electrical Computer Engineering, Texas Tech University/ Nano Tech Center, Texas Tech University — Functional metal oxides are essential materials to realize novel electronic and optoelectronic devices with unique tunable characteristics. Vanadium dioxide (VO_2) is of particular importance due to its well-known reversible metal-to-insulator phase transition which occurs at ˜68C temperature. In this work we investigated the electrical switching characteristics, loop hysteresis and negative differential resistance (NDR) of micro-channel devices using VO_2 thin films deposited on sapphire (c-cut) substrates. The devices exhibited self-sustained charge oscillations with large amplitude modulation when connected to a DC power source and does not require any external capacitive or inductive components. We demonstrate that the device oscillation frequency can be systematically tuned by varying the optical power of a CW external laser source focused on the top of the VO_2 micro-channels. This result is attributed to changes in electrical resistivity of the VO_2 channel under illumination which in turn changes the NDR voltage width region and therefore the oscillation frequency.

Milinda Pattanayak
Dept. of Physics and Astronomy & Nano Tech Ctr, Texas Tech Univ.

Date submitted: 28 Sep 2017 Electronic form version 1.4