Conductivity anisotropy in strained VO$_2$ thin films, probed by THz Time Domain Spectroscopy$^1$ MENGKUN LIU, mengkun@buphy.bu.edu, ELSA ABREU, JIWEI LU, KEVIN WEST, SALINPORT KITTIWATANAKUL, WENJING YIN, STUART WOLF, RICHARD AVERITT, DEPARTMENT OF PHYSICS, BOSTON UNIVERSITY, BOSTON MA COLLABORATION, DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING, UNIVERSITY OF VIRGINIA, CHARLOTTESVILLE VA COLLABORATION, DEPARTMENT OF PHYSICS, UNIVERSITY OF VIRGINIA, CHARLOTTESVILLE VA COLLABORATION — We used THz time domain spectroscopy to measure the temperature and polarization dependent far-infrared conductivity of high quality strained VO$_2$ thin films epitaxially grown on (100) TiO$_2$ substrates. A large conductivity anisotropy is observed in the metallic phase of our VO$_2$ films with the conductivity along the rutile axis $\sim$30 times larger than the orthogonal direction. The MIT temperature also exhibits anisotropy with a value of 360K along the rutile c axis and 340K along the perpendicular direction. Our results are consistent with substrate induced strain modulation of the energy and bandwidth associated with the vanadium 3d orbitals.

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