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Observation of impact ionization in vanadium dioxide[1] JOSHUA HOLLEMAN, Florida State University/NHMFL, MICHAEL BISHOP, National High Magnetic Field Laboratory, CARLOS GARCIA, CHRISTIANNE BEEKMAN, Florida State University/NHMFL, SHINBUHM LEE, HO NYUNG LEE, Oak Ridge National Laboratory, EFSTRATIOS MANOUSAKIS, Florida State University/NHMFL, STEPHEN MCGILL, National High Magnetic Field Laboratory — Pump-probe optical spectroscopy was used to investigate the possibility of charge carrier multiplication by impact ionization in a 100 nm film of VO_2 in the M_1 insulating phase. The film was excited by pump pulses with energies above and below twice the band gap energy and observed with two different probe wavelengths. The transient reflectivities of the film were then compared. We observed an enhancement of the reflectivity for the higher energy pump pulses near zero delay compared to the reflectivity for the lower energy pump pulses for both probe wavelengths. Additionally, we identified and described multiple timescales within the charge dynamics. This experiment demonstrated that impact ionization acts as a carrier multiplication process in this prototypical strongly-correlated system.

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