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Ultrafast Terahertz Probes of Individualized, Chirality-Enriched Single-Walled Carbon Nanotubes LIANG LUO, IOANNIS CHATZAKIS, JIGANG WANG, Department of Physics and Astronomy and Ames Laboratory, Iowa State University — Singled-walled carbon nanotubes (SWNTs) represent a model system to systematically investigate correlated charge excitation in 1-D limits. One of the most outstanding issues both in fundamental nanotube physics and for their technological development is to detect and understand optically-forbidden, dark collective states. Thus far supporting evidence of dark states has been demonstrated in static magneto-optics and light scattering. However, the unique internal transitions from dark excitonic ground states and their dynamic evolution remain highly elusive. We report our investigation of this problem using optical-pump, terahertz probe spectroscopy of individualized, (6,5) and (7,5) SWNTs. We measure transient THz conductivity from 1-15 meV at low temperature down to 4K with resonant and off-resonant excitation at the E_{22} transitions of (6,5) and (7,5) nanotubes. The intra-excitonic spectroscopy with THz pulses represents a fundamentally different spectroscopy tools to study dark excitons and shine new lights on the nature of excitonic ground states.

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