

Jessica Zebrowski – HEP Seminar – April 11, 2023  
University of Chicago

*Title: Probing Cosmic Acceleration and Particle Physics with SPT-SLIM*

Dark energy, the mysterious force that drives the accelerating expansion of the universe, is one of the great unexplained mysteries in current cosmological models. To truly understand the potentially evolving nature of dark energy we have to probe the gap between measurements of the early Universe as traced by the cosmic microwave background (CMB) 13 billion years ago and the Universe as we see it now through galaxy surveys, by making measurements of the years in between. Measuring a large cosmic volume also is exquisitely sensitive to the physics of the composition of the universe, allowing for constraints on the sum of the neutrino masses and probes the existence of exotic light relics such as sterile neutrinos, axionic dark matter, and other light dark matter candidates. New spectrometer technology is just reaching maturity to enable a new technique, Line Intensity Mapping (LIM) that would be able to probe these yet-unmeasured middle ages, to map an evolving 3D cube of time from now back to 11 billion years in the past. In this talk, I will present SPT-SLIM, a Line Intensity Mapping pathfinder that will deploy on-chip mm-wave spectrometers on the South Pole Telescope to demonstrate technical readiness of detectors that can be scaled to cosmological surveys. Specifically, a spectrometer covering 120-180 GHz is sensitive to the carbon monoxide (CO) line emission from high-redshift galaxies. The data from these detectors on the South Pole Telescope has the potential for a  $10\sigma$  detection of the CO power spectrum. This first science detection and technological proof-of-concept will provide precedence for technology and analysis techniques in this growing field for years to come.