**Physics** & **Astronomy**

Colloquium

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**Dr. Alejandro Cardenas-Avendano**

Los Alamos National Lab

**3:30 - 4:30 p.m. | Tuesday, Jan. 28**

**Science Building 234**

**Photon Rings and Light Echoes: Delineating Strong Gravity around Black Holes**

Recent observations—from gravitational-wave detections to black hole imaging—have opened new windows on Einstein’s general relativity in extreme regimes. A key prediction of strong gravity is that photons can orbit a black hole in bound orbits, making multiple passes before reaching our detectors. These repeated orbits should leave distinctive “light echoes” in the time autocorrelation of observed light curves, each arriving after a characteristic delay. However, these echoes seem to be absent in current data, particularly for Sgr A\*, the supermassive black hole at the center of our galaxy. In this talk, I will explain how these echoes can be “washed out” when the (effective) variability timescale of the hot gas surrounding the black hole exceeds the echo delay. I will also discuss a new method for detecting echoes by correlating the total light curve with interferometric measurements at high spatial frequencies. Lastly, I will show how future space-based interferometry can resolve photon rings and refine our measurements of black hole parameters.

**Refreshments at 3 p.m. | SC 103**