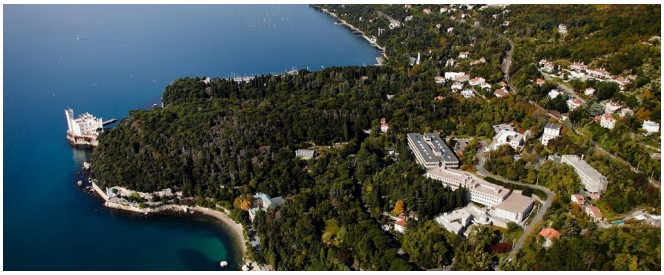

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Constraining astrophysics and cosmology via the kinematic Sunyaev-Zel'dovich effect

The kinematic SZ Sunyaev-Zel'dovich (kSZ) effect is produced by the peculiar motion of electrons in galaxy cluster when they scatter off of cosmic microwave background (CMB) photons. As such, the kSZ effect carries information about the cosmic velocity field on large-scales and the gastrophysics of galaxy clusters, providing potentially powerful tests of gravity and structure formation. Measuring this signal is challenging due to its small amplitude (compared to primary CMB and other foregrounds) and spectral degeneracy with the CMB temperature fluctuations, however the kSZ imprint can be isolated by cross-correlating CMB maps with large-scale structure datasets. In this talk, I will present a 4.1 \sigma measurement of the kSZ effect using a catalog of optically-selected galaxy clusters from the Year-3 Dark Energy Survey data and CMB temperature maps from SPT-3G, the third generation receiver on the South Pole Telescope. This measurement is based on a pairwise statistical approach that allows to extract the kSZ signal as function of the comoving separation between clusters pairs. By comparing the recovered signal to theoretical expectations, we can infer the mean optical depth of the cluster sample, an important quantity that relates to the clusters' mean thermal SZ (tSZ) effect. Finally, I will also provide a comparison between the optical depths inferred from the tSZ effect, showing that external measurements of the optical depth will enable accurate cosmological constraints from future surveys. I will also give a forecast on the capabilities of measuring the pairwise kSZ with CMBS4 and future large scale structure surveys.

Presenter: SCHIAPPUCCI, Eduardo

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