**Mock Abstract:**

Title: Constraining the supermassive black hole growth and probing the epoch of reionization with a recently discovered quasar at z=7.00.

Observations of high-redshift quasars put rigorous constraints on supermassive black hole seeds and provides efficient probes of the intergalactic medium (IGM) evolution during the epoch of reionization. The IGM damping wing absorption imprinted in z>7 quasar Lyman α emission can be directly used to measure the IGM neutral fraction. However, due to limited bright quasars at z>7, only two such measurements have been achieved at z>7. We have discovered a new quasar DES J025216.64-050331.8 (hereafter J0252) at z=7.00 and its Gemini/GMOS optical spectroscopy shows a strong absorption feature near the Lyman α emission, requiring high quality NIR observations to investigate the origin of the absorption. We propose to take Keck/NIRES spectra of J0252. This program will allow us to (1) measure the black hole mass and the Eddington ratio of J0252; (2) study the origin of the absorption features near the J0252 Lyman α emission; (3) reconstruct the intrinsic emission of J0252 using the state-of-the-art model developed by Davis et al., and further measure the IGM neutral fraction at z=7.0. This program will shed light on the growth of supermassive black holes in the early universe and will be critical for the IGM study at z=7.

**Paper:**

# Wang et al., 2020: A Significantly Neutral Intergalactic Medium Around the Luminous *z* = 7 Quasar J0252–0503 Link: <https://ui.adsabs.harvard.edu/abs/2020ApJ...896...23W>

**Original Abstract:**

