A Search for Terrestrial Exoplanets around Four White Dwarfs with HST/COS

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Since white dwarfs are just as prevalent as sun-like stars, they can be turned to in the ongoing search for exoplanets. In addition to this, they have radii similar to that of earth, theoretically providing a basis for a deeper analysis of earth-sized planets. White dwarfs are particularly bright in the ultraviolet, thus the Cosmic Origins Spectrograph (COS) on the Hubble Space Telescope (HST) which looks into the near and far ultraviolet is good for looking into the spectra data of white dwarfs. As the first step in this proof-of-concept experiment, I looked into the sensitivity of the Hubble instrument COS by using a sample of about one hundred targets and comparing the expected standard deviation to the measured standard deviation. This determined that COS was seemingly photon-limited when observations had moderate to high count rates. Next, I proceeded to look at the light curves of the white dwarfs GD153, GD71, G191-B2b and WD0308-565 and look for outliers beyond five standard deviations away from the mean, which could potentially indicate a planetary transit. While no such deviations were found in this analysis, I only had a full period's worth of data for periods of shorter lengths, so it is a possibility that if there had been a planet with a longer period, it would go undetected. Although a planetary transit is yet to be discovered around a white dwarf, there are many upcoming missions that are designed to specifically target earth-sized planets through means of transit photometry (i.e. JWST, TESS). If these missions do find a transiting exoplanet around a white dwarf, then the instrument COS could be used to further investigate these planetary transits.

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