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Is the large-scale structure traced by the BOSS LOWZ galaxies consistent with Planck?

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Recently, several studies reported a significant discrepancy between the clustering and lensing of the Baryon Oscillation Spectroscopic Survey (BOSS) galaxies in the *Planck* cosmology. We construct a simple yet powerful model based on the linear theory to assess whether this discrepancy points toward deviations from *Planck*. Focusing on scales $10<R<30\,h^{-1}\mathrm{Mpc}$, we model the amplitudes of clustering and lensing of BOSS LOWZ galaxies using three parameters: galaxy bias $b_{\rm g}$, galaxy-matter cross-correlation coefficient $r_{\rm gm}$, and A, defined as the ratio between the true and *Planck* values of σ_8. Using the cross-correlation matrix as a diagnostic, we detect systematic uncertainties that drive spurious correlations among the low-mass galaxies. After building a clean LOWZ sample with $r_{\rm gm}\sim1$, we derive a joint constraint of $b_{\rm g}$ and A from clustering+lensing, yielding $b_{\rm g}=2.47^{+0.36}_{-0.30}$ and $A=0.81^{+0.10}_{-0.09}$, i.e., a 2σ tension with *Planck*. However, due to the strong degeneracy between $b_{\rm g}$ and A, systematic uncertainties in $b_{\rm g}$ could masquerade as a tension with $A=1$. To ascertain this possibility, we develop a new method to measure $b_{\rm g}$ from the cluster-galaxy cross-correlation and cluster weak lensing using an overlapping cluster sample. By applying the independent bias measurement ($b_{\rm g}=1.76\pm0.22$) as a prior, we successfully break the degeneracy and derive stringent constraints of $b_{\rm g}=2.02^{+0.16}_{-0.15}$ and $A=0.96\pm0.07$. Therefore, our result suggests that the large-scale clustering and lensing of LOWZ galaxies are consistent with *Planck*, while the different bias estimates may be related to some observational systematics that needs to be mitigated in future surveys.

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