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## Modeling of High Column Density systems in the Ly- $\alpha$ Forests Correlation Function

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The Lyman- $\alpha$  forest is detected as the series of absorption lines in the quasar spectra, caused by the Lyman- $\alpha$  transitions of neutral hydrogen in the low-density, high-redshift intergalactic medium (IGM). It is a biased continuous tracer of the quasi-linear matter density field, and the auto (cross) correlation function of the forests (with quasars) has been used to detect the Baryon Acoustic Oscillations (BAO) signal. The Damped Lyman- $\alpha$  System (DLAs) is one of the most important systematics in the Lyman- $\alpha$  BAO analysis. DLAs are strong absorption regions in Lyman-alpha forests caused by neutral hydrogen along the sightline with extremely high column densities, usually  $\log(N_{\text{HI}}) \geq 20$ . We present an accurate model to characterize the impact of DLAs on the measurement of the Lyman- $\alpha$  correlation function, as well as the BAO fitting.

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