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Testing W_{50} as a halo-mass proxy through H I galaxy clustering in ALFALFA + FASHI DR1

We present measurements of H I galaxy clustering for a combined sample of ALFALFA and FASHI galaxies, hereafter **AF+FS**, and compare them with mock galaxy catalogs derived from the MultiDark–Planck simulation, hereafter **MDPL**. The analysis used the two-point correlation function, $\omega_p(r_p)/r_p$, in differential $\log W_{50}$ bins to test whether the clustering length r_0 increases with the observed linewidth proxy W_{50} , while W_{50} was calculated for **MDPL**. We found a positive $r_0 - \log W_{50}$ relation in **AF+FS**, the full **MDPL**, and an observed distribution-matched mock, **MDPL_{sub}**. The latter was constructed by downsampling the full mock in the joint distance— $\log W_{50}$ plane to match the observed distribution while preserving galaxy positions. The inferred trends were consistent within the current uncertainties, with **AF+FS** and **MDPL_{sub}** showing good agreement. Additional monopole, threshold, and halo-spin parameter split tests are presented as robustness checks.

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