

Analysis of the 21 cm Epoch of Reionization signal is particularly sensitive to calibration errors which contaminate the power spectrum. Data analysis methods are all sensitive to these errors, and preventing them requires the instrument response to have no spectral structure greater than $\sim 10^{-5}$. We implement a Van Vleck correction to mitigate systematic effects due to non-linearity introduced by quantization stages in the Murchison Widefield Array (MWA) digital signal pathway. These non-linear artifacts cannot be removed during calibration and result in imperfect calculation of linear terms. By applying the Van Vleck correction, we not only reduce calibration errors but also improve removal of other instrument artifacts such as digital gains and spectral structure introduced by polyphase filter banks. We present here mathematical underpinning and simulations of the Van Vleck correction, as well as analysis of calibration solutions and power spectra of corrected data. To perform the correction, we first implemented a new reader to ingest raw correlator output files. We then built into the reader the option to apply the Van Vleck correction to the raw data using a Chebyshev polynomial approximation. For this analysis, we process and apply the correction to a set of 2013 MWA data used previously by Barry et al. 2019 and Beardsley et al. 2016 to deepen EOR limits. After removing digital gains and the polyphase filter shape, and flagging radio frequency interference, we take the corrected data through a processing pipeline to obtain calibration solutions and power spectra. To illustrate the impacts of mitigating this non-linear systematic on the EOR limit, the resulting power spectrum is compared with an identical analysis performed on data without the Van Vleck correction applied.