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A geometrical interpretation of foreground filters for HI intensity

We give a new geometrical interpretation of HI intensity mapping foreground filters in harmonic space, for both single-dish and interferometer mode surveys. We derive the foreground-filtered HI auto power spectrum and then extend this to the cross-power spectrum of HI with CMB lensing. Foreground filtering leads to a loss of isotropy in Fourier space, resulting in harmonic space non-diagonal correlations, which we show are small compared to the diagonal ones. On large scales, foreground filters lead to a major loss of power in the HI $\times$ CMB lensing correlations.

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