LIM25 - Annecy



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21-cm LIM with MWA: The case of the missing channels

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The Murchison Widefield Array (MWA) is an excellent radio-interferometer for 21-cm line intensity mapping from the epoch of reionization (EoR). A major challenge in MWA data analysis is the periodic pattern of flagged channels in the visibility data, which leads to severe foreground contamination in the EoR window. We have developed a novel technique to mitigate this challenge, and realistic simulations show that our method can put reliable constraints on the 21-cm power spectrum even in the presence of periodically flagged channels. The key idea is that we first correlate the visibilities to estimate $C_{\ell}(\Delta \nu)$, and Fourier transform it to get the power spectrum $P(k_{\perp}, k_{\parallel})$. $C_{\ell}(\Delta \nu)$ does not have a gap even when we have many frequency channels (ν) missing. We have put a significantly tight upper limit of $\Delta^2(k) < 934 \,\mathrm{mk}^2$ at $k = 0.4 \,\mathrm{Mpc}^{-1}$ for z = 8, with just 17 minutes of observation. Ongoing analysis of the entire 55 hours of the data indicates tighter constraints. We also see residual systematics due to limitations in our methods, and these necessitate further investigations.

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