## Extracting the global 21-cm signal to study the first luminous objects using observations from the lunar farside

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a given number of SVD signal and systematic parameters/modes. Right panel: BPIC statistic proposed to blindly select/ a model capable of fitting the data well. The chosen model (white rectangle) is the one with the minimum BPIC.





## Results

In Burns et al. (2017; arXiv:1704.02651), we show that our pipeline extracts the 21-cm signal down to a band-averaged RMS of  $\sim 17$  mK.



The extracted 21-cm spectra with 68% confidence intervals for models with primordial Pop II (red) and Pop III (black) stars expected from using a lowfrequency radiometer in lunar orbit for 800 hours of observation. The dark bands represent thermal (statistical) noise from the sky. The total uncertainty, including statistical and systematic effects from the instrument and foreground, is shown by the lighter bands.



The panels illustrate examples of constraints on the global 21-cm extrema frequencies (left), UV photon production efficiency ( $\xi_{\alpha}$ ) and X-ray heating efficiency ( $\xi_x$ ) between models with Pop III and Pop Il stars (top right) using the calibrated 21-cm spectrum. Dotted black lines indicate the "true" input values, and contours the 68% confidence intervals using 23 (black) and 30 (blue) mK average RMS uncertainties over the observed band.

## Acknowledgments

DR is supported by a NASA Postdoctoral Program Senior Fellowship at the NASA Ames Research Center, administered by the Universities Space Research Association under contract with NASA.