Abstract Submitted
for the APR15 Meeting of
The American Physical Society

Bayesian semi-blind component separation for foreground removal in interferometric 21cm observations LE ZHANG, PETER TMBIE, Department of Physics, University of Wisconsin-Madison, BENJAMIN WANDELT, Institut d'Astrophysique de Paris, PAUL SUTTER, Center for Cosmology and Astro-Particle Physics, Ohio State University, ATA KARAKCI, Department of Physics, Brown University, EMORY BUNN, Physics Department, University of Richmond, ANDREI KOROTKOV, GREGORY TUCKER, Department of Physics, Brown University — We present a new Bayesian semi-blind approach which is an extension of Independent Component Analysis (ICA) from two-dimensional (2-D) CMB map to the three-dimensional (3-D) 21-cm cosmological signal. This technique provides a fully Bayesian inference of power spectra and maps. Only relying on the statistical independence of the components, this approach can jointly estimate the 3-D power spectrum of the 21-cm signal and, the 2-D angular power spectrum and the frequency dependence of each foreground component, without any prior assumptions about foregrounds. This approach has been tested intensively by applying it to mock data from an interferometric 21-cm intensity mapping observation. Based on the Expectation-Maximization (EM) algorithm, this blind approach provides much better performance in 21-cm power spectrum recovery over all the scales than the commonly used Principal Component Analysis (PCA). This technique could be straightforwardly applied to the epoch of reionization measurements.

Le Zhang
Department of Physics, University of Wisconsin-Madison

Date submitted: 05 Jan 2015 Electronic form version 1.4