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A Polarimetric Approach for Constraining the Dynamic Foreground Spectrum for the Cosmological Global 21-cm Measurement¹ BANG NHAN, Univ of Colorado - Boulder, RICHARD BRADLEY, National Radio Astronomy Observatory - Central Development Laboratory, JACK BURNS, Univ of Colorado - Boulder — The cosmological global (sky-averaged) 21-cm signal is a powerful probe for the intergalactic medium (IGM) evolution in high-redshift Universe ($\sim 380,000-400$ million years after the Big Bang). The biggest observational challenge is to remove the much brighter foreground to reveal the 21-cm background spectrum. Conventional global 21-cm experiments rely on the spectral smoothness of the foreground synchrotron emission to separate it from the distinct 21-cm spectral structure in a total-power spectrum. However, frequency-dependent instrumental and observational effects are known to corrupt such smoothness and complicate the foreground subtraction process. We introduce a polarimetric approach to measure polarization induced by the projection of the anisotropic foreground onto a stationary dual-polarized radio antenna. Due to Earth rotation, by pointing the antenna at a celestial pole, the induced polarization is modulated as function of time by twice the sky rotation rate. By Fourier decomposing this dynamic signature at each observed frequency, we obtain a foreground spectrum independent from the isotropic background signal. This foreground spectrum helps to improve accuracy of constraining the global 21-cm signal and the associated astrophysical quantities.

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