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Deconvolving Pulsar Signals with Cyclic Spectroscopy: A Systematic Evaluation TIMOTHY DOLCH, Hillsdale College, DAN STINEBRING, Oberlin College, GLENN JONES, Rigetti Computing, HENGRUI ZHU, Oberlin College, RYAN LYNCH, Green Bank Observatory, TYLER COHEN, New Mexico Institute of Mining and Technology, PAUL DEMOREST, National Radio Astronomy Observatory, MICHAEL LAM, Rochester Institute of Technology, LINA LEVIN, University of Manchester, MAURA MCLAUGHLIN, West Virginia University, NIPUNI PALLIYAGURU, Texas Tech University, NANOGRAV PHYSICS FRONTIERS CENTER COLLABORATION — Radio pulsar signals are significantly perturbed by their propagation through the ionized interstellar medium. In addition to the frequency-dependent pulse times of arrival due to dispersion, pulse shapes are also distorted and shifted, having been scattered by the interstellar plasma, affecting arrival times. Understanding the degree to which scattering affects pulsar timing is important for gravitational wave detection with pulsar timing arrays (PTAs), which depend on the reliability of pulsars as stable clocks. In previous studies, the technique of cyclic spectroscopy (CS) has been applied to pulsar signals to deconvolve the effects of scattering from the original emitted signals. We present an analysis of simulated data to test the quality of deconvolution using CS over a range of parameters characterizing interstellar scattering and pulsar signal-to-noise ratio. We show that CS is most effective for high-S/N and/or highly scattered pulsars. We conclude that CS could play an important role in scattering correction to distant populations of highly scattered pulsars not currently included in PTAs. For future telescopes, CS could potentially double the number of PTA-quality pulsars.

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