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**Null Stream Approach for finding Sky Position of Pulsar Timing Array sources** JEFFREY HAZBOUN, Hendrix College, SHANE LARSON, Center for Interdisciplinary Exploration and Research in Astrophysics at Northwestern University — A null stream is constructed from the timing residuals of three pulsars by noting that the same source polarization amplitudes appear in the data stream from each pulsar. Null stream mapping of gravitational wave sources has been described for LIGO and LISA, relying on the correlated gravitational wave signals between detectors. For a collection of pulsars observing the same source, the gravitational wave signal is common to all pulsars in the array, but modified by geometric factors related to the relative position of the source on the sky. Linear combinations of a set of individual pulsar data streams can be shown to be a two-parameter family (the two sky position angles of the source) that can be minimized to determine the location of the source on the sky. Overlaying a number of null streams allows for an even stronger localization of the gravitational waves source. This presents a large advantage in a PTA where there are more independent signals than interferometric detectors. We show how multiple sub-arrays of pulsars affect the pointing accuracy. Additionally, a simple noise model is used to demonstrate how the presence of noise will change the character of the spectrum, suppressing features related to the gravitational wave signal.

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