

Abstract Submitted  
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**Using Higher Order Statistics to Find Instances of Nonlinear Couplings in LIGO Data** BERNARD HALL, Washington State Univ, LIGO COLLABORATION — Previously, we have worked on developing a robust tool to analyze digital signals using higher order statistics, specifically, bicoherence. This method differs from other more commonly employed linear methods of signal analysis, such as coherence or autocohereance, in that it is able to see characteristics of data that the former methods are unable to detect conclusively. In particular, quadratic phase coupling—in which two signals may combine nonlinearly to create sidebands and some additional frequencies—can be detected with the bicoherence statistic. In contrast, such a relationship cannot be confirmed with, for example, coherence, or by looking at a power spectrum. Once our tool was able to successfully function on test data, we then incorporated it into the analysis of real data from the LIGO interferometers. We have been able to scan large stretches of data, revealing a number of transient nonlinear features. Such a study has provided an additional dimension of understanding of LIGO data, as we emerge into the era of gravitational wave astronomy.

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