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Title:

Using a multidimensional likelihood algorithm like the Critical Coupling Likelihood to passively estimate effective transfer function like qualities in a running interferometric type gravitational wave detector.

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Abstract:

The effective spectrum of a gravitational wave (GW) detector without signals present, is the product of instrumental noise sources. Different components of the spectrum are related to different sources of noise. Using a high dimensional likelihood algorithm, like the Critical Coupling Likelihood method one should be able to probe the properties of instrumental noise. This passive probing of the system inputs and outputs, in principle, allows for the measurement of noise propagation without disturbing the running state of a GW detector. From the results of this probing one can infer the average strength of coupled noise as a function of detector frequency. This information along with basic calibration information of individual GW detector components can be used to create a pseudo-transfer function (PTF). These PTFs reveal the manner in which noise sources external to the GW detector manifest themselves in the final output of the GW detector. Computing a rigorous traditional transfer function for a series of non-linear systems in a live GW detector is not possible without disturbing the operational state of the detector. Using passively obtained PTFs, one would hope to be able to make incremental improvements to a GW detector thereby improving its noise suppression capabilities. We plan on introducing one particular method for creating these pseudo-transfer functions which should describe noise coupling in a live GW detector.