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Second Order Expansion for Parameter Estimation Improvement in High Noise (ISNR) for future Laser Interferometers. JONATHAN WESTHOUSE, Embry Riddle Aeronautical University Prescott — Following the discovery of Gravitational Waves from Black Holes and Neutron Star Collision in 2015, the international community is anticipating a multibillion-dollar investment towards future detectors on Earth and in Space. A critical element involving future detectors is understanding how precisely some measurements can be taken. This limit on precision is tied to the methods of estimation, which in the past has been the Fisher Information Matrix. However, that method is only reliable with low noise (low ISNR). Any measurement that involves high noise requires a different and more realistic method. In this project we apply an asymptotic expansion technique, referred to as the Second Order Fisher Information Matrix, to improve estimation in parameters for future work with Space and Ground interferometers. LIGO currently relies on two, multimillion-dollar detectors in Livingston and Hanford and collaborate with other detector groups (VIRGO, Kagra). Future, large scale detectors have been planned such as the Laser Interferometer Space Antenna (LISA) and TianGO but the community is still indecisive about specifics and investment towards them. A Second Order Fisher Information Matrix approach will contribute towards determining the parameters and cost effectiveness of these future detector projects.

Jonathan Westhouse
Embry Riddle Aeronautical University Prescott

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