GRAVITY GRADIOMETER DESIGN COMPARISON BY THREE DIFFERENT METHODS

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Two gravity gradiometer designs are currently available for commercial survey operations and other instruments are in the late stages of pre-deployment research. These gradiometer systems differ from one another with respect to the number and orientation of sensing accelerometer pairs. There is a need for a theoretical framework to evaluate how these design variations, affect the expected performance of these devices

Three methods of design comparison will be presented: 1) Transformation of noise, a calculation of the degree of noise reduction produced by the method of transforming and combining measured gradient components. 2) Inversion errors, comparison of the degree to which noise induces errors in the values of parameters determined in a parametric inversion calculation. 3) Sensitivity, analysis of the response of each system to a point source and how that source varies as a function of location in 3D space. Each of these methods focuses on a different aspect of the practice of gravity gradiometry. Specifically, noise, inversion and source detection.

Analysis will be centered on comparison between the two gravity gradiometer designs manufactured by Lockheed-Martin. The full tensor gradiometer (FTG) and the horizontal partial tensor gradiometer that is part of the Falcon survey system. All three methods predict that in order for these two gradiometer designs to yield equivalent results the noise level of the horizontal partial tensor gradiometer must be less than that of each of the three sub-gradiometers of the FTG by a factor of 3.08.