NASA SBIR 2006 Phase I Solicitation

S4.05  Data Analysis Technologies for Potential Gravity Wave Signals

Lead Center: GSFC

NASA is developing the Laser Interferometer Space Antenna (LISA) mission to search for gravitational waves from astrophysical phenomena such as the Big Bang, mergers of super massive black holes, and galactic binary inspirals. Detection of gravitational waves would open a new astrophysical window on the universe, with great potential for unexpected discoveries. A number of gravitational wave follow on missions to LISA are also under study.

The disturbance caused by the passage of a gravitational wave is expected to be very small and will be measured with laser interferometry. Technologies are sought to deal with the data analysis of the gravitational wave signals in these measurements. Background information on LISA along with preliminary data analysis discussions can be found in the Proceedings of the 5th International LISA Symposium, Estec, Noordwijk, The Netherlands, 12-15 July 2004, published in the Classical and Quantum Gravity Journal, Vol 22, Number 10, 21 May 2005.

Software development for application of the Hilbert-Huang Transform to gravitational wave data analysis: The Hilbert-Huang Transform (HHT) is a new method of time-series analysis which is specifically target to the analysis of non-linear, transient signals (N. Huang, et al., "The empirical mode decomposition and the Hilbert spectrum for non-linear and non-stationary time series analysis", Proceedings of the Royal Society of London, A (1998) v. 454, 903-995). It will have a direct application to data analysis for LISA, Big Bang Observer (BBO), and other space-based gravitational wave missions in particular, and more generally to any mission with non-linear, transient data. For this task the vendor will be asked to build a software package that will provide a full HHT analysis of the data, using as an example a NASA-provided simulated LISA data stream, and incorporating a user-friendly interface. The vendor will need to familiarize himself with the HHT algorithm, and show relevant experience in the development of related software packages.