

# LSC Six-Month Progress Report

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**Organization** Inter-University Centre for Astronomy and Astrophysics (IUCAA)

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During the six month period pertaining to this report the following activities and tasks were performed by the IUCAA Gravitational Wave Data Analysis group:

1. Sanjeev Dhurandhar visited the LIGO Laboratory for six weeks beginning 25th April 2001 with a view to closely work with the LIGO on data analysis problems. During this visit the main effort has been to extend the hierarchical search of Mohanty and Dhurandhar to include another parameter namely, the time-of-arrival and hence to extend the hierarchical scheme to three dimensions consisting of the two masses and the time-of-arrival. The hierarchical scheme analysed in the previous period for the Newtonian chirp was extended to the post-Newtonian case. The scheme takes advantage of the fact that the dominant power in the waveform is at low frequencies, which allows one to cut the waveform off at a relatively low frequency and down sample it reducing the FFT costs. This procedure only marginally compromises the computational gain factor in the hierarchy over the masses, and moreover adds an extra gain factor resulting from down sampling. The cost reduction factor can be as much as 130 if the parameter space can be optimally scanned by the first stage templates.
2. It was then found that because of boundary effects the cost reduction factor is significantly reduced to about 70 for the mass range we chose – minimum individual mass of one solar mass. Increasing the mass range tends to improve the gain factor. Understanding first hand the placement of the templates is an important issue, and this work is in progress. The people involved in this work are Anand Sengupta, Sanjeev Dhurandhar, Albert Lazzarini, and Tom Prince.
3. A poster based on this work was exhibited at the 4th Eduardo Amaldi conference held in July 2001 in Australia. This work is being written up and is expected to be published in the journal of Classical and Quantum gravity.
4. A proposal has been submitted to the DST (India) and NSF (US) with the idea of generating funds for collaboration between IUCAA and the LIGO Laboratory. The PIs are S. V. Dhurandhar and A. Lazzarini, and the Co-PI is Sam Finn. The main objectives of the proposal are to address the hierarchical search and the network analysis problems with the end goal of coming up with tested and working codes.