

## **LSC Six-Month Progress Report**

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

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Extended hierarchical search for inspiraling binaries

The extended hierarchical scheme involves searching in two steps:

- (i) Trigger stage: the parameter space is coarsely sampled along with a low threshold;
- (ii) Follow up the first threshold crossings with a fine search with a high threshold.

During this period the focus was on implementing the hierarchical algorithm on real data - the S2 data. (i) The template placement algorithm was speeded up to accommodate frequent changes in the noise curve so that the placement could be carried out online. (ii) The stand-alone search DSO has been fully implemented on the LDAS environment. For this purpose some of the modules had to be adapted from existing LAL code and some new modules had to be added. (iii) Progress was made in the problem of 'condensing' the cloud of trigger events obtained from the coarse bank of templates. Connected graphs were used for this purpose along with a simple weighting formula. This formula needs to be improved for non-uniform sampling of parameter-space.

Chebyshev interpolation of the detection statistic in searching for inspiraling binaries

The filtered outputs of the template bank employed in the flat search for inspirals at the minimal match of 0.97 are not statistically independent. This means that one is using far too many templates than are actually necessary. In order to remedy this situation we employ Chebyshev polynomials to interpolate the ambiguity function. We use Chebyshev polynomials because of their minimax property. We have so far applied this method to the Newtonian waveform for which the intrinsic parameter space is one-dimensional and so that we try this method for a simpler situation. We also use a one template hierarchy, which improves the results. In this preliminary investigation we save on the number of templates by a factor of about 3.5. We now need to compare the false alarm verses false dismissal curve for the Chebyshev interpolation method with the normal flat search method. This work is being done by Sanjit Mitra, S. Dhurandhar and S. Finn.