

Autocorrelation dumps for transient searches in DiFX2.0

A late-breaking feature in DiFX1.5 was the ability to squirt the short term accumulations (STAs) from each processing node over a UDP multicast. See the [difaxfilterbank](#) documentation pages for a description of the transient search project. However, the implementation for DiFX1.5 was pretty crude, with a fixed time resolution equal to the STA duration (typically of order 100 ms) divided by the number of threads used at the processing node. As such, time resolution of ~15ms was pretty typical. To get to shorter time resolution, one had to reduce the STA duration - which increases the visibility data rate back to the manager node. At some point this becomes a limitation - and that point is »1ms, which is the ultimately desired time resolution.

Accordingly, in DiFX2.0 the facility was added to explicitly choose an accumulation duration for the STA dumps. It was held to DiFX2.0 because of the need to add extra lines to the control files, breaking backwards compatibility. The implementation is much the same as for the uvshifting/averaging function for the visibilities (see the [multiple phase centre](#) documentation). Each thread proceeds independently, but once it has processed an appropriate number of FFTs, it grabs the autocorrelations, averages them appropriately, sends them out in a binary UDP multicast, and copies the results to the accumulation area used by the main thread (which communicates with the manager node).

Averaging and accumulating autocorrelations is a pretty cheap operation, so it should come as no surprise that reducing the interval between STA dumps to quite short times has a pretty minimal impact on correlator execution time. In some quick tests run on the VLBA cluster, sending one dump every ms (80x more frequently than DiFX1.5 would have done for this particular test) only increased execution time by 1%. Doing a dump every 0.16 ms (equivalent to every 10th FFT) increased execution time by 10%. Thus, in DiFX2.0, very good time resolution can be obtained for autocorrelation filterbank data at minimal cost.

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