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Overview of Geodetic Experiments at the Bonn Correlator

Alessandra Bertarini, Arno Müskens, Alexandra Höfer

Geodetic Institute, Bonn Unversity

Contact author: Alessandra Bertarini, e-mail: abertari@mpifr-bonn.mpg.de

Abstract

We present an overview of the Bonn correlator status during the years 2002 to 2003 showing the efficiency improvements achieved over that period giving particular emphasis to the geodetic experiments.

1. Introduction

The Bonn correlator is a facility founded by the Max-Plank Institute for Radioastronomy (MPIfR) and the Federal Agency for Cartography and Geodesy (BKG) and is operated in cooperation with the Geodetic Institute of Bonn University (GIUB). Every year about 25% of the geodetic experiments scheduled by IVS, the MPIFfR astronomical projects, and part of the coordinated millimeter VLBI array experiments are correlated in Bonn.

2. Correlator Time Allocation

The manpower present in Bonn to operate the correlator comprises two day-time operators and ten students who take over correlation during the night and weekends. They correlate for a maximum of 5840 h/y, divided equally between geodetic and astronomical experiments.

A script to log the time usage was written in 2002 and used during 2002 and 2003. The log shows that the correlator operated for about 4120 h in 2002 and 4600 h in 2003. As shown in figure 1, geodetic experiments in 2002 accounted for about 73% of the time used for production correlation, which is more than the equal division of time that was agreed. This led to an agreement between the GIUB and the MPIfR to pay for this extra time. The remaining time was divided between maintenance and idle time. Maintenance is counted only when it interrupts production correlation. Since production correlation continues to run in parallel for most of the maintenance procedures, maintenance causes only about 100 h/y of downtime. Idle time is counted when correlation is stopped, while waiting for tapes, setting up the correlator control files, fringe fitting and other causes.

A comparison between figure 1(a) and 1(b) shows clearly the improvements achieved during 2003. Geodetic experiments in 2003 accounted for about 57% of the time used for production correlation, nevertheless the number of correlated experiments increased from 42 (in 2002) to 46 (in 2003). The correlation time decreased principally thanks to three factors.

- The effort of Roger Cappallo who solved the so called *STC-error* timing problem involving the Delay Compensation Module (DCM). This led to a huge amount of recorrelation.
- The Track Recovery Module (TRM) byte slip, which caused a loss of fringes in the affected tracks, was solved by METRUM (contracted by JIVE).

- Introduction of Mark 5A helped to streamline correlation.

The idle time decreased principally thanks to the effort of the stations who helped reduce the shipping time, by preparing correct paperwork (e.g. customs declaration); and thanks to software development that streamlined the data processing.

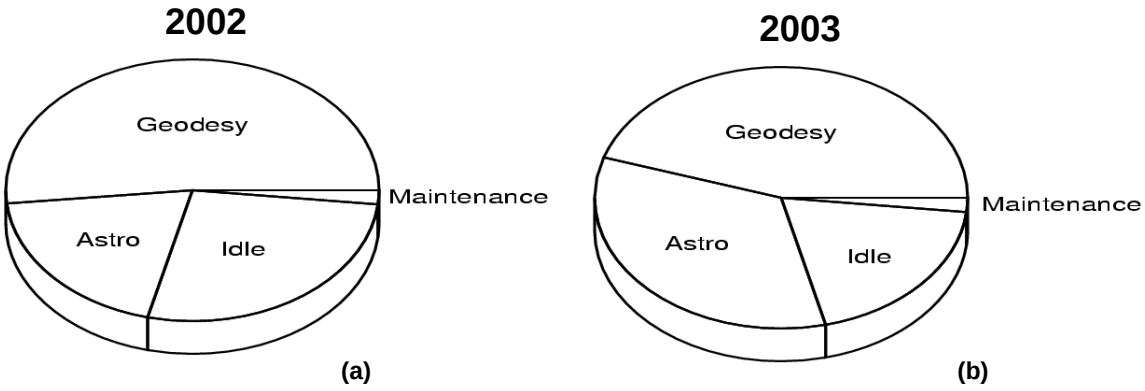

Figure 1. Pie charts describing the correlator time allocation in 2002 and 2003.

3. Processing Factor

The Processing Factor (PF) is defined to be the ratio between the hours spent correlating and the hours spent recording the data. In figure 2 the annual average of the PF calculated over all the experiments correlated in Bonn, has been plotted against the year in which the experiments were processed. This plot confirms the efficiency improvements described in the previous section.

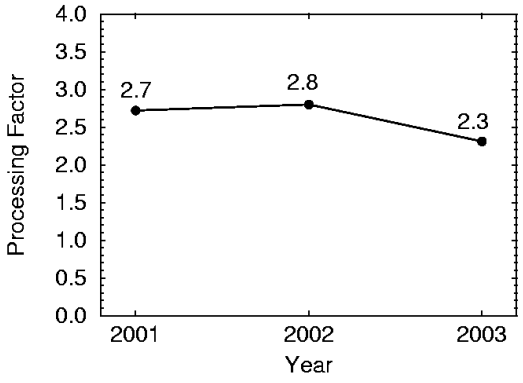

Figure 2. Annual averaged PF plotted against the year in which the experiments were processed.

We can attempt to predict how the PF will reduce with the continuing migration of stations to Mark 5A, using the experiment IVS-R1104 for a timing test. In R1104 there were 337 scans recorded in 24 hours by six stations. Of those six stations, four are equipped with Mark 5A recording system, which is the largest number of Mark 5A modules yet seen in Bonn in a single experiment. Of the 337 scans recorded, 151 were Mark 5A only and 186 had at least one tape.

Mark 5A is faster than tape because it does not need to peak, and so the scan setup time was measured to be about one minute shorter than the equivalent setup time when at least one tape is present. Had the 186 scans with tapes been Mark 5A only, we would have spared 186 minutes. That would have reduced the correlation time from 30.3 h to 27.2 h, leading to a 10% decrease in correlation time.

This 10% is an underestimate since we did not include the time lost due to tape slewing, and possible search for tracks, which vary from experiment to experiment. The PF will be further reduced due to the future plan of equipping all the stations with Mark 5 recording systems.

Further, we would like to reduce the idle time by parallelizing the fringe fitting process. This will reduce the waiting time between correlation and possible recorrelation.

4. Conclusion

Considering the nominal 2920 h/y of correlator time for geodesy, a decrease of 10% in the PF will allow correlation of more experiments than in the previous years. The Bonn correlator is ready to meet the IVS plan of increasing the number of experiments per year.