IAA Correlator Center

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Abstract

The construction of the ARC (Astrometric Radiointerferometric Correlator) has been completed. ARC is a 6-station VSI-H XF-type hardware VLBI correlator.

The VLBI data of the 3-station sessions of the Russian Quasar network was processed using the ARC correlator. Mark 5B units were used for recording the VLBI data at the stations and for play back at the correlator.

1. Introduction

The IAA Correlator Center is located and staffed by the Institute of Applied Astronomy in Saint Petersburg, Russia.

The IAA Correlator Center is devoted to processing geodetic, astrometric, and astrophysical observations made with the Russian VLBI network Quasar.

2. Summary of Activities

The production of the ARC, the VLBI XF hardware correlator, has been completed in 2009.

The ARC is a 6-station, 15-baseline correlator. It is able to process up to 16 frequency channels on each baseline, for a total of 240 channels. The correlator accesses two-bit VLBI signals with a 32 MHz maximal TAC frequency. The maximal data range from each station is 1 Gbit per second. The correlator requires VSI-H input VLBI signals, and it is equipped with Mark 5B playback terminals.

The ARC hardware is based on FPGA technology. Data processing and data transfer boards are placed in the Compact PCI 6U crates. All of the ARC hardware is mounted in four racks. Figure 1 shows a photo ofthe correlator.

The correlator hardware control is performed with a desktop computer, which is connected to the crates via a correlator local network. The ARC software is a distributed system between the control computer and the crates. The software runs under GNU/Linux and has a GUI.

From February 2009, the ARC has been used in a minimal 2-station assembly to process observation data. In July 2009 it was expanded to a 3-station correlator. The full scale 6-station correlator was completed in October 2009. In 2010 we are planning to impove the ARC software.

3. Experiments Done

In the past year the IAA Correlation Center processed the national observations of the 3-station VLBI network Quasar.

In January 2009 two Ru-E and two Ru-U sessions were observed and processed at the IAA Correlation Center. The 24-hour 3-station Ru-E VLBI sessions are intended for EOP estimation. The eight-hour 2-station Ru-U VLBI sessions are intended for UT1-UTC estimation. S2 terminals were used at the sites to record one-bit sampling data from 2 MHz bandwidth VC's. The total bit

Figure 1. The 6-station ARC correlator

rate from each station was 64 Mbit/s. The scan length was 150 seconds. About 12 scans per hour were observed. These series were processed with the 12-board MicroPARSEC correlator.

The Quasar network stations started recording national VLBI observations on Mark 5B units in February 2009 and the ARC was used for data processing. The VC's bandwidth for the Ru-E and the Ru-U sessions has grown up to 16 MHz and 8 MHz, respectively. One-bit sampling was used. The total bit rate was 512 Mbit/s for the Ru-E sessions and 256 Mbit/s for the Ru-U sessions. The scan lengths were 60 seconds for both the Ru-E and the Ru-U sessions. Nearly 20 scans per hour were observed. The duration of the Ru-U sessions was initially two hours; then, starting in July 2009, it was decreased to one hour. Some of the one-hour Ru-U sessions were transferred from the stations to the correlator in e-VLBI mode.

From February to December 2009, 22 Ru-E sessions and 27 Ru-U sessions were processed, and EOP and UT1-UTC were estimated.

Several experiments with the Crimea (Sm) station have been observed. Four 4-station 24-hour

sessions were observed in 2009. The 4 MHz bandwidth VC's were recorded with one-bit sampling, and the total bit rate was 128 Mbit/s. These sessions were processed at the IAA Correlation Center using the ARC correlator.

4. Staff

- Igor Surkis — leading investigator, software developer;
- Artemy Fateev — software developer;
- Voitsekh Ken — hardware developer;
- Alexey Melnikov — software developer, scheduler;
- Vladimir Mishin — software developer, post processing;
- Violet Shantyr — software developer, post processing;
- Vladimir Zimovsky — hardware developer.