IAA Correlator Center

Igor Surkis, Yuriy Rusinov, Violetta Shantir, Vladimir Zimovsky

Abstract

Development of the new correlator MicroPARSEC was continued in 2004. Some experiments were carried out on the single unit MicroPARSEC. The development of the new correlator was continued. This correlator will be based on many MicroPARSEC devices. The old correlator TISS-1M was maintained.

1. Introduction

The correlator MicroPARSEC was developed in 2002-2003. It can be directly connected to the Canadian playback terminal S2-PT. This device can process two frequency channels with bandwidth of 16 MHz under 1- or 2- bit sampling conditions. It has 64 complex delays in every frequency channel. MicroPARSEC was developed as PCI plate for IBM PC.

The development of the control computer software and the programmable MicroPARSEC microchip algorithms were continued in 2004. Now MicroPARSEC can be used as two-channel correlator and spectral analyzer. We also continued the development of the new multistation, multichannel correlator. It will consist of a set of MicroPARSEC units, inserted into some computers and synchronized in a local network.

The correlator TISS-1M was also operated in 2004. This multistation, multichannel unit was developed in 1988-1993. It can process 2 MHz bandwidth channels. During 2004 this correlator was used to process tapes of previous observations and for MicroPARSEC testing.

2. Using MicroPARSEC as Spectral Analyzer

MicroPARSEC can be used for spectral analysis. High resolution spectra can be obtained using special control computer software under stable signal conditions. It can be achieved by processing the autocorrelation function at different parts and in different time periods. The example of this spectrum with resolution 244.1 Hz from 2 MHz bandwidth is presented in Figure 1 (observations of the source W3OH at station Svetloe, under 1.35 cm wave).

Also MicroPARSEC can be used as mobile spectral analyzer. In particular it was used so during the experiment 01/29/2005 at Svetloe. The S2-RT recording terminal was connected to the Mark IV video converter through sampling device developed at IAA RAS. The MicroPARSEC got data through S2-RT and made spectral analysis. The experiment was controlled in this way. In particular, picosecond generator level presented on the obtained spectrum can be controlled.

3. Usage MicroPARSEC Device for Crosscorrelation Process

Two channel observations were processed by crosscorrelation technique through MicroPARSEC correlator. Example of obtained power spectrum is shown at Figure 2. The source 0552+398 was observed on the baseline Svetloe-Zelenchukskaya at 01/30/2005 1:30:00 on reference frequency 8232.99 MHz with 2 MHz bandwidth, accumulation period 0.5 seconds, and accumulation time 128 seconds.

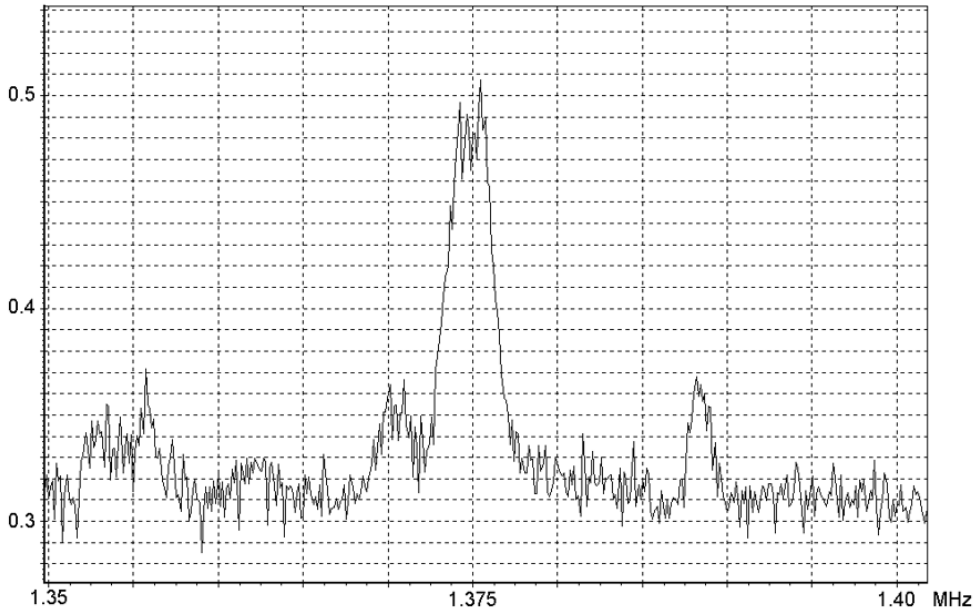

Figure 1. Spectrum of the source W3OH, wave 1.35 cm, station Svetloe. The fragment of spectral is shown, y-axis has conventional units

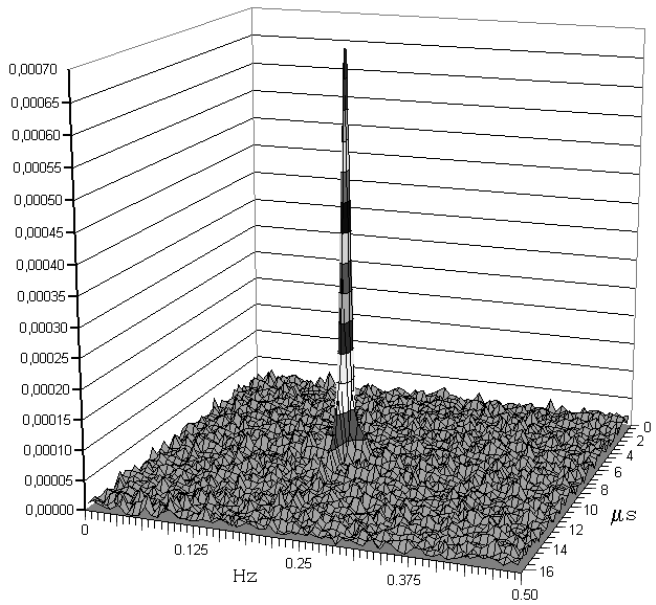

Figure 2. Power spectrum of source 0552+398, baseline Svetloe-Zelenchukskaya at 01/30/2005 1:30:00

4. The New Correlator Project by Using the Set of MicroPARSEC Units

At first it was planned to use MicroPARSEC devices for test purposes only. It was assumed to process some experiments through MicroPARSEC and develop new similar devices with 16 fre-

quency channels and manufactured as CompactPCI U6 plates. But there were too many technical problems and this project was frozen.

Currently correlation based on MicroPARSEC devices inserted into some IPM PC (4-6 MicroPARSEC plates in every computer) is under development. 21 MicroPARSEC plate and 4-6 computers are needed for 3-station, 14-channel correlator. Scheme of such correlator is shown in Figure 3. MicroPARSEC plates are connected to the playback terminals through special base commutation device. Synchronization between computers and playback terminals is realized by local network. The operator can fully control the whole correlator from one of the computers.

At first the S2-PT will be used as playback system. Finally Mark 5A playbacks will be used. The development of the special coupling devices to use Mark 5A terminals with MicroPARSECs is required.

We suppose to produce new correlator during 2005-2006.

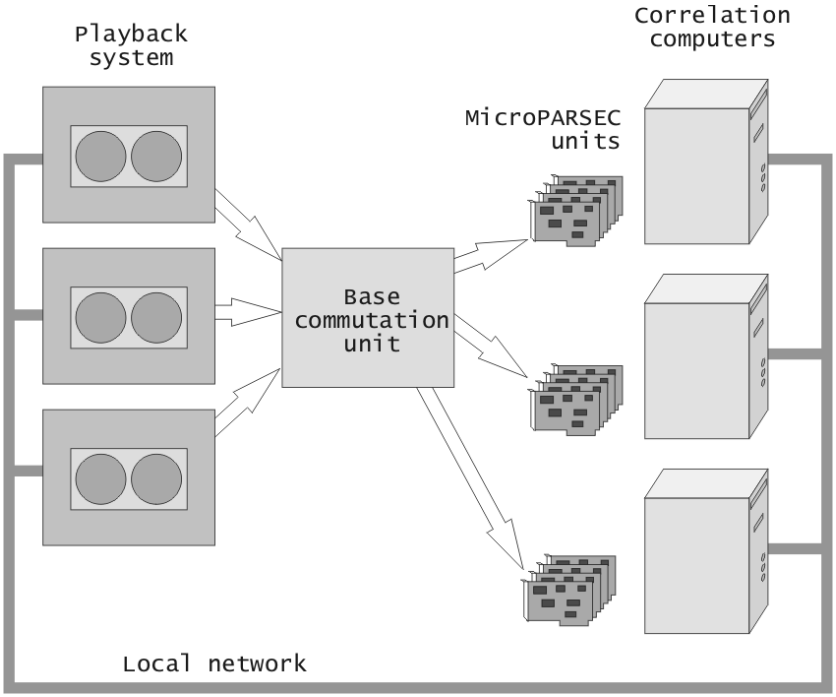

Figure 3. The new correlators scheme

5. Staff

- Dmitriy Plotnikov — hardware development, plate design, microchips programs
- Yuriy Rusinov — software development, correlator operator
- Violetta Shantir — software development, post processing
- Igor Surkis — principle investigator, system integration, software development
- Vladimir Zimovsky — software development, system integration, correlator operator

6. Conclusion

The development of the new generation correlator based on the MicroPARSEC units allows to process full volume VLBI data.

The old correlator TISS-1M will be used until putting into operation the new correlator.