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Astro Space Center
RadioAstron Newsletter
Number 12
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Russian version of the Newsletter can be found here:
http://www.asc.rssi.ru/radioastron/news/news_ru.pdf

First 92 cm RadioAstron interference fringe at the 220,000 km baseline projection!

On January 25, 2012, RadioAstron has successfully detected the first interferometric signal at 92 cm from individual pulses of the pulsar B0950+08 from the longest distance to the space craft - 300,000 km. Projected interferometer baseline was 220,000 km which provided the highest ever achieved resolution at this wave length of about 1/1000 arcsecond. The ground VLBI stations which participated in this experiment are Arecibo (USA), Westerbork (the Netherlands), and Effelsberg (Germany). The interference fringes were found between the space radio telescope and all thee ground telescopes. See some result on the two attached figures.

The observed variations of the correlated signal from the pulsar are due to the propagation effects - pulsar emission scintillation on the inhomogeneous interstellar plasma. Such effect is only seen for emission of very compact objects. Thus, astronomers have got a tool to study characteristics of the interstellar medium and the pulsar itself, to localize the pulsar radiation zone in the magnetosphere of the neutron star - either above the polar cap or near the light cylinder. The conducted experiment has both confirmed RadioAstron capabilities at 92 cm and provided first important scientific data in this band. About 10 brightest radio pulsars of our Galaxy are planned to be studied in the RadioAstron early science program.

Tests of the closed-loop mode of Spektr-R synchronization

A test in a special closed-loop mode of Spektr-R synchronization was successfully performed on January 22, 2012. This mode of operation utilizes the ground based maser clock located at the Pushchino tracking station to synchronize the space radio telescope observations through a special up-down phase link at 7.2 and 8.4 GHz. As a result of these observations at 18 cm, an interference fringe was found by the RadioAstron correlator from the quasar 0212+735 at the projected distance of about 16,000 km.

Successful Spektr-R orbit correction

In order to correct the orbit of Spektr-R, two injections were done on February 22 and March 1, 2012, with a total momentum of about 3 m/sec. The correction was performed successfully. As a result, the perigee of the space craft orbit has increased to about 55,000 km, the ballistic life time of the orbit has increased to 10 years.

The RadioAstron early science program and final steps of the fringe search

Regular experiments within the RadioAstron early science program (ESP) have started in February 2012. Hydroxyl and water masers in our Galaxy (W3OH, Orion KL, etc.), the Crab pulsar as well as bright active galactic nuclei were observed since then. These experiments were supported from the ground by more than ten different VLBI stations: the European VLBI Network telescopes including the Russian ones, the Ukrainian Eupatoria, the Japanese Usuda. The international RadioAstron ESP working groups are reducing and analyzing the data together with the Astro Space Center correlator.

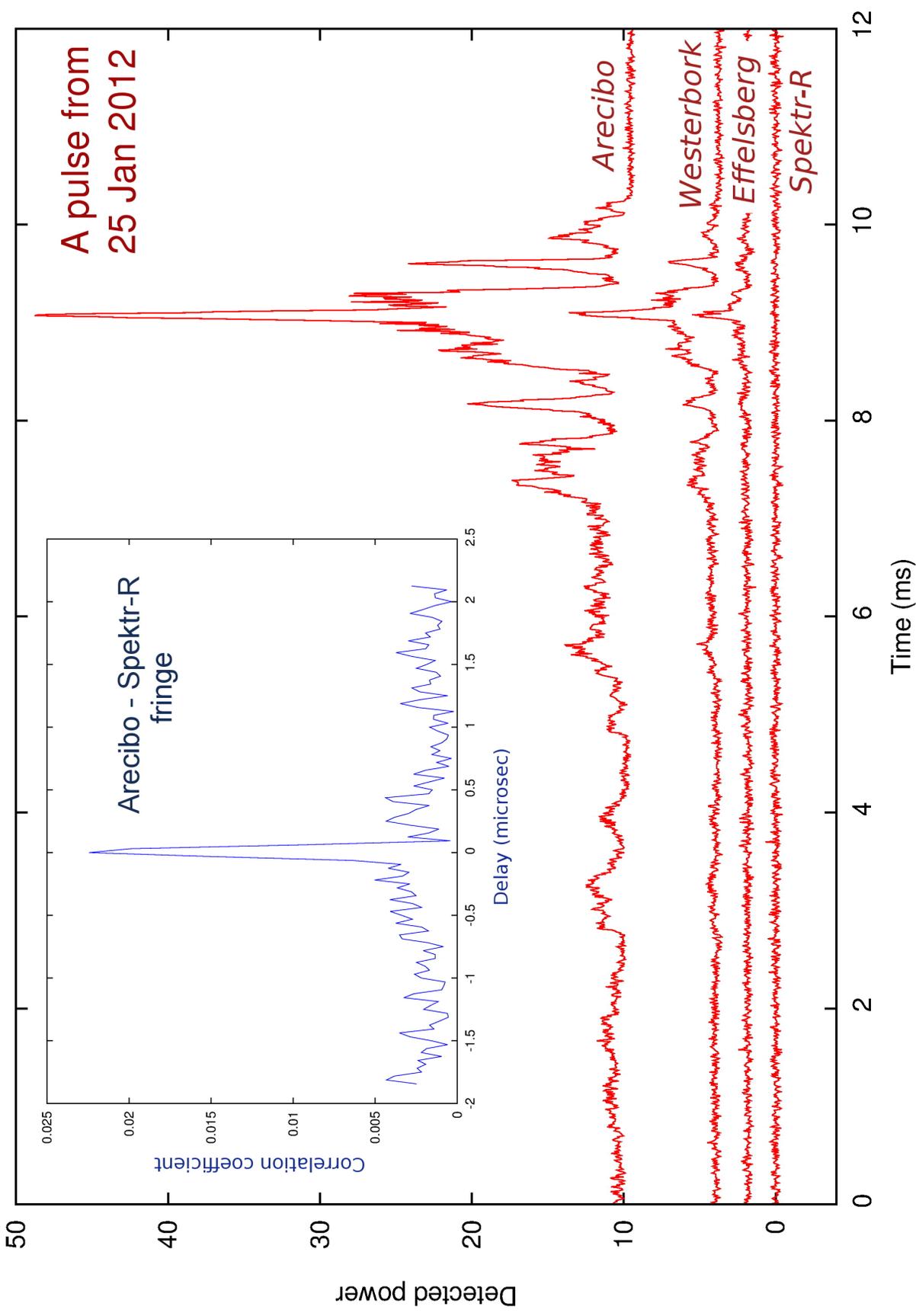
The fringe search experiments are finishing. First segments of 1.3 cm observations have failed due to very bad weather conditions on the ground (GBT, Effelsberg). The search for 1.3 cm fringes continues. Additionally, first test experiments with the Australian VLBI network LBA were performed on March 11, 2012, to prepare for science observations with LBA preliminary planned for May.

With best regards,
Nikolai Kardashev (nkardash@asc.rssi.ru)
Yuri Kovalev (yyk@asc.rssi.ru)

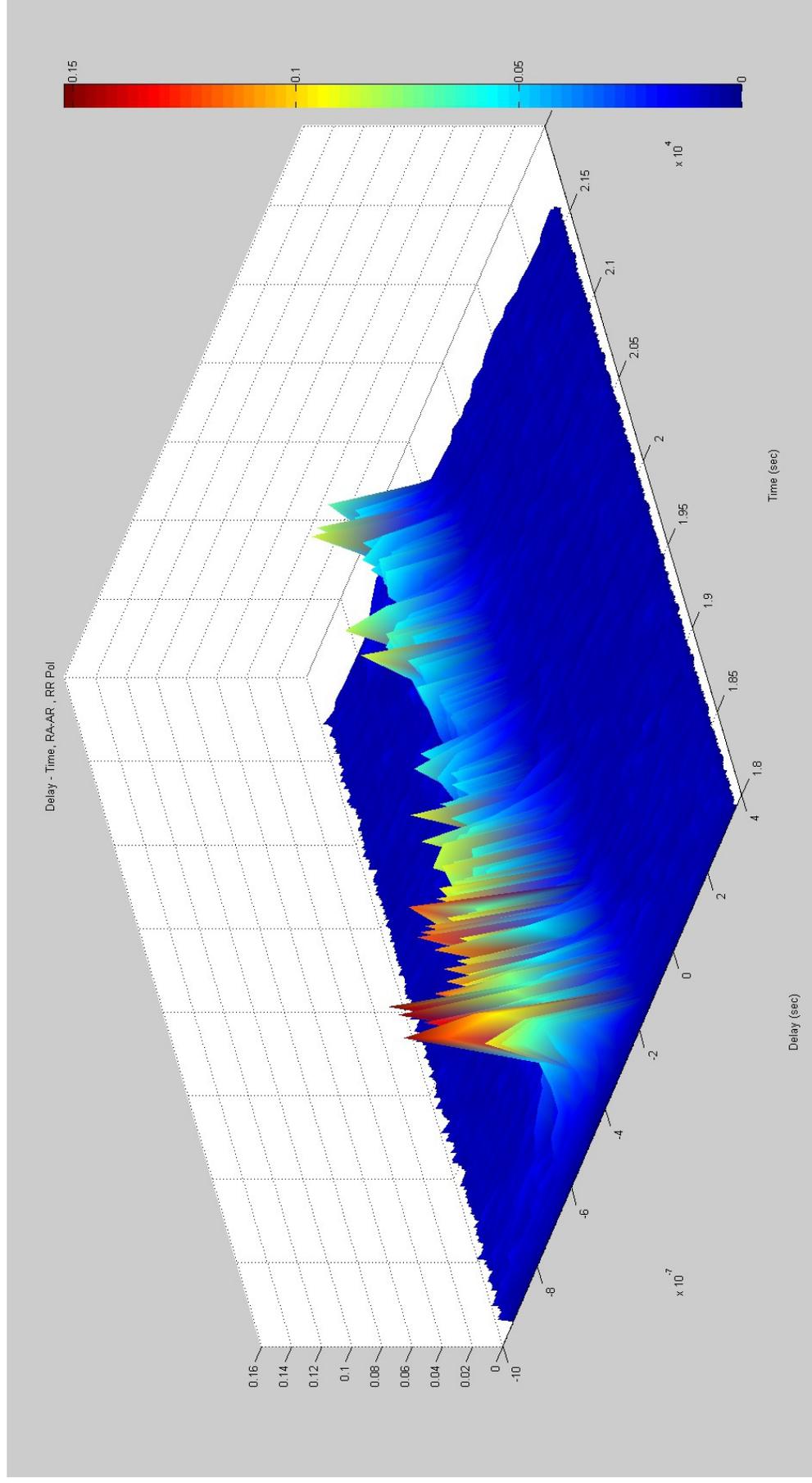
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RadioAstron observations at 92 cm of the pulsar B0950+08

220 000 km projected baseline



Profiles of a single pulse from the pulsar B0950+08 detected by three ground and the space radio telescopes. The inset presents the correlated signal between the space radio telescope and Arecibo for this single pulse.



The correlated signal between the space radio telescope and Arecibo from the pulsar B0950+08 is shown for the full one hour long session. On the axes: time (sec), interferometric delay (sec), correlated signal in color. Significant variations of the signal in time is due to interstellar scintillations of the pulsar emission.