MINUTES
of the RadioAstron Teleconference on May 25, 2010

N. Kardashev chaired the teleconference.

The agenda of the teleconference and the list of participants are attached to the Minutes.

N. Kardashev informed the participants on the progress in mission development.

He said that stage of the test of all systems is continuing. While the tests of science payload are over, tests of compatibility between the science payload and service bus are started now.
Kardashev announced a new lunch window prescribed for the mission. The window is November 19-22 2010.

V. Andreyanov presented new information about tests at LA.
During past 3 months assembling and testing of the Flight Payload were continued in Lavochkin. Main tasks were to correct the technical errors and failures detected earlier during systems tests:

- Malfunctioning of the thermostat inside of one flight H-maser unit was corrected by the mother company in N.Novgorod. H-maser was returned to Lavochkin. Now it is all right.
- Flight SRT antenna petals, which were tuned and covered with multi-layer vacuum isolation earlier, now are integrated as a whole reflector. The first measurements of the reflector geometry gave unsatisfactory results. At present time the base (reference) ring construction is being verified.
- Tests of the electronics of the VIRK flight model are finished. The interfaces also were checked.
- Checking of the commands execution and the telemetry outputs were continued via Navigator service system.
- Science payload together with the Navigator bus are being prepared for thermal-vacuum test in a big chamber. The test is planned for July 2010.

Tests of Pushchino TS by the Venus Express satellite (A.Smirnov).

- Tests of the equipment of Pushchino TS were continued. Recently we measured phase fluctuation within simulated up-down link loop. Namely, generated 7.2 GHz up tone signal was transferred to 8.4 GHz and directed to receiver through a directional coupler. Signal received at 8.4 GHz was recorded by the RDR recorder and processed by dedicated software. RMS of random phase fluctuations was found to be below 1 degree in thousand seconds.
- Our plan is to conduct overall test of up-down link using real VIRK transponder located in the area of 22-m radio telescope (on the roof of the main building of the PRAO).

Discussions on Tracking Station outside Russia.

S. Likhchev, who did not participate at the teleconference, presented written information of the following content.

At the end of April of 2010, I have visited Pretoria (South Africa) as a member of Roscosmos delegation. As a result of negotiations parties (Roscosmos and Department of Science and Technology) have signed the protocol. Concerning Southern TS for the RadioAstron mission there was written,: "The technical specifications for the RadioAstron mission tracking stations were given to the South-African Side for assessment. The Parties have agreed to collaborate in the RadioAstron project, namely through the use of a South-African tracking station and SLR facility for mission support. The experts from both Parties will provide the 2nd WG meeting with their proposals for the organizational aspects for the project implementation." The Parties also agreed to discuss the possibility of cooperation in the field of mission "Spectrum-M/Millimetron" at the dedicated workshop to take place after the 2nd WG meeting. The second WG meeting is going to be in June 2010 in Moscow.

S. Gulyaev informed the participants on the discussions taken place during dedicated teleconference between the ASC representatives and Auckland University team on the prospects of creating TS for RadioAstron mission in New Zealand. He stated that there is problem of getting permission for transmission at 7.2 GHz. He also mentioned technical problem of development of special feed construction which would provide both operations with the RadioAstron and geodetic VLBI observations at 2.3 and 8.4 GHz. Sergei also admitted a possibility of operations with mechanical change of the feed for VLBI and RadioAstron modes.

There was some discussion, raised by **K. Kellermann**, on the possibility of TS operations in the mode of "an open loop", i.e. without 7.2 GHz transmission. Such operation is considered to be a main option, unless a failure of on-board H-maser frequency standard.

M. Popov provided information on the results of simulations of science operation comparing the relative efficiency of the usage TS in South Africa or in New Zealand. The simulations demonstrated better efficiency for New Zealand but only by a factor of 10-15%.

There was a pretty long discussion, opened by **R. Preston**, on the influence of Doppler tracking data obtained at the TS on the accuracy of the orbit reconstruction. Corresponding AI was formulated (see AI #4).

V. Kostenko reported on the results of **Correlation of Ground VLBI tests in RA mode.**
There was 4-station VLBI experiment (Effelsberg, Medicna, Noto and Pushcino) at 4.8 GHz with RadioAstron frequency setup (RCP and RCP polarization channels with USB and LSB sidebands, each of 16-MHz width); RDR recording terminal was used in Pushchino, and Mk5A at western radio telescopes. This experiment has been planned by participating parties as to establish observing and processing procedures specific to RadioAstron 2x16 MHz, 2 bit mode, as well as to estimate data quality, different data format exchange and to compare correlated results on different data processor environments'. For nowadays we come to conclusions that:

- We get positive experience with different format data exchange.
- The data has been independently processed by two teams - with Mark-4 Hardware processor at "MPI fur Radioastronomy" in Bonn and ASC software correlator in Moscow.

- At first glance the results looks to be close enough and that positive conclusion has agreed by Bonn and Moscow teams.
- Additionally RDF to VDIF converter is written here at ASC, and data was successfully processed with DiFX correlator in Moscow. As whole a number of converters for different format combinations has been written, tested and gave adequate correlation results with ASC and DiFX processors.

Another test experiment has been initiated by ASC at 1.35 cm between Puschino and Simeiz on February 23 - 25 this year. The observing schedule includes two potentially unresolved quasars and water line Orion-A source. It was short 3 x 15 min scans for each source per day.
In spite rather bad weather and poor system parameters in Puschino (SEFD is 4 times worse in Pushchino than in Simeiz) auto and cross spectra in Orion-A was obtained, the fluxes, fringe rate spectra and upper bounds of sizes of bright spectral components were estimated.

In near future, after including line processing in ASC editor, we intend to do more thoroughly analysis including fringe rate spectra of the line components in Orion-A.

Unfortunately no correlation has been obtained for any of the continuum sources. As was mentioned before in terms of the Puschino station parameters the interferometer sensitivity appeared to be 5 to 6 time worse then required in terms of S/N ratio estimations.

What's our plans on the future ground based pre launch tests:

- Now we intend to repeat in end of July – early August an experiment at 1.35 cm with upgraded equipment in Puschino.
- Our another step is to investigate current status of Evpatoria 70-m antenna at RadioAstron frequencies. We hope at least that this antenna will take part in the ground based RadioAstron" network.

Concerning **correlators outside Russia,** J. Romney, A. Lobanov and Y.Y. Kovalev discussed alternatives for a more direct route into DiFX, with the main alternative under consideration being an RDF unpacker for DiFX. The second way considered was to translate RDF files to VDIF. VLBI Data Interchange Format is a flexible, packet-based format which is being adopted increasingly by next-generation VLBI recorders, and also has the advantage of being easily readable/writeable from/to standard Linux file systems. However, no final suggestions were formulated.

Another important issue, raised by J. Romney, was request to Russians to provide formats of the presentation of the reconstructed orbit to be used by the correlator, correlator Log-file for RadioAstron (especially, time-corrections file). Corresponding AIs were given (see AI #5-7).

E. Fomalont informed the participants about positive decision of the VLBA Program Committee on the pre-launch VLBA proposal, granting requested amount of observing time (8 hours) at P, L, C, and K bands, both for continuum sources and OH &H2O masers. The condition for VLBA scheduling group will be successful launch and engineering tests. The same positive decision was given by the IRA on the commitment of observing time at Noto and Medicina radio telescopes. The objective of the observations is to determine which sources are the best for the fringe searching with the RadioAstron at small space-ground baseline projections.

The modified **RadioAstron activities time line** (RA ATL), presented by M. Popov, was again subjected to certain criticism. The main difference between the old and a new versions of the ATL was late AO date in the new version, which plans the first AO for regular (general) proposals to be issued after successful fringe detections at all baselines, i.e. on the 10-th month after launch date. It was recommended to continue discussions on the RA ATL.

Action items

There were two AI from the previous teleconference.

1. To organize a special teleconference for discussion of **RadioAstron activities time line.**
2. To present detailed report on results of correlation of the VLBI observations Effelsberg-Pushchino-Noto-Medicina.

Both AIs have been done.

New action items

1. To provide more drawings of the feed cabin,
   S.Gulyaev
2. To make request on the possibility of radio transmission at 7.2 GHz,
   S.Gulyaev
3. To organize discussions of "the time-line of activities",
   Y.Y.Kovalev
4. To investigate the advantage of close loop against open loop communication at TS on the accuracy of the reconstructed orbit,
   ASC, ballistic team
5. To provide description of the formats of reconstructed orbit,
   ASC-correlator
6. To provide description of the RDR data format,
   ASC-correlator
7. To provide description of the "time-corrections file" format,
   ASC-correlator
8. To present detailed report on results of correlation of the VLBI observations Effelsberg-Pushchino-Noto-Medicina.

Next teleconference to be held in August 2010.

Agenda of the RadioAstron teleconference
May 25, 2010

	Corrections to the Agenda	N. Kardashev
1	Project status	N. Kardashev
2	Present status of tests of science payload in LA	V. Andreyanov
3	Tests of Pushchino TS equipment	Kanevski

4	TS outside Russia	Discussion
5	Correlation of Ground VLBI tests in RA mode	Likhachev/Kostenko
6	Corelators outside Russia	Likhachev/Lobanov/Romney
7	Pre-launch VLBA proposal	E.Fomalont
9	RadioAstron activities time line	M.Popov
10	Action items	M.Popov

Chairman: N.Kardashev

List of participants:

Andreyanov V.	ASC, Russia
Bartel N.	York Univ., Canada
Fomalont E.	NRAO USA
Gulyaev S.	Oukland Univ., New Zeland
Gurvits L.	JIVE, The Netherlands
Hirabayashi H.	JAXA, Japan
Kanevsky B.	ASC, Russia
Kardashev N.	ASC, Russia
Kellermann K.	NRAO, USA
Vant Klooster K.	ESA, The Netherlands
Kogan L.	NRAO, USA
Kostenko V.	ASC, Russia
Kovalev Y.Y.	ASC, Russia
Langston G.	NRAO, USA
Larionov M.	ASC, Russia
Lobanov A.	MPIfR, Germany
Murata Y.	JAXA, Japan
Popov M.	ASC, Russia
Preston R.	JPL, USA
Romney J.	NRAO, USA