

# **IVS Memorandum 2007-012v01**

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**“On the IVS2010 transition plan and  
using of old antennas”**

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## IVS Memo

### On the IVS2010 transition plan and using of old antennas

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#### Introduction

IVS have been working on development of the new generation VLBI network, IVS2010, based on the VLBI2010 technology. This network is planned to comprise relatively small (~12 m) fast moving antennas capable to operate in continuous broadband ~2–15 GHz, registering data with the rate up to 8 Gbps, and connected each other and the correlator center(s) via high-speed data transfer network. The main goals of the new network are:

- Providing continuous EOP monitoring with latency less than 1 day.
- Definition of the VLBI TRF (VTRF) core with 1 mm accuracy and collocated with the GGOS network.

It is anticipated that fully deployed IVS2010 network will consist of 32-40 stations met VLBI2010 specifications. Evidently, part of this network will be formed by newly constructed antennas, others will be old antennas updated to the VLBI2010 standard. Now, about 40–50 VLBI stations more or less actively participate in today IVS operations contributing invaluablely to the EOP-TRF-CRF triad. Not all of them can be updated because of technical, financial or scientific reasons. This short memo is aimed at discussion of the optimal transition plan and strategy of using old antennas most effectively at our approach to and during the IVS2010 era.

#### Role of old antennas

To better understand the role of old antennas we should keep in mind some shortcomings of the IVS2010 network which are the following:

- Relatively small antennas have limited capability to observe the faint sources.
- VLBI2010 stations can operate only in the frequency band below ~15 GHz.
- Even fully deployed IVS2010 network may be not sufficient for competitive VLBI TRF realization, reliable collocation with other space geodesy techniques such as GNSS, SLR, DORIS, and fine-scaled regional geodynamical investigations.

Thus the following tasks remain for old antennas:

- ICRF densification for the faint sources.
- Densification of the source position time series, primarily for faint sources and sources not included in the regular IVS2010 programs.
- ICRF extension for the higher frequency bands such as K, Ka, Q.
- VTRF densification for more sites located at geophysically interesting regions, as well as stations collocated with other space geodesy techniques.

Based on this recognition the following plan on using old antennas during the transition phase and after establishment of the IVS2010 network can be proposed.

## Using of old antennas along with IVS2010 network

We can anticipate three stages of transition to the VLBI2010:

1. Number of VLBI2010 station is still small, say 2–5. At this stage, most of the R&D experiments involving VLBI2010-only stations will be performed, such as station operations, optimal scheduling, data registering, data transfer, correlator operations (including digital processing), automated data analysis, etc. Also we can expect that new antennas will be incorporated in the existing networks and observing programs to enhance the IVS network and connect new antenna locations with the VTRF. (I expect, the new antennas will be back compatible with the existing observing modes.)

2. Number of VLBI2010 stations is intermediate, say 6-15. At this stage the VLBI2010 network will be running independent programs for EOP, TRF and CRF, and old antennas will continue the current observing programs aimed at the same IVS products. Part of sessions will be observed at the mixed old-new networks. At this stage, stronger tie between the old and new network will be provided, as well as comparison of the EOP and CRF obtained using old and new technology.

3. Number of new stations is 16+ with good distribution over the globe. At this stage the new network will take the main responsibility for EOP. I expect, at this final stage IVS will support observing programs of three types which are as follows:

a) Core network (VLBI2010 stations): 70-75% of stations in rotation perform continuous operations for EOP, TRF and partly CRF; 5-10% of stations are under maintenance/repair; 15-20% of core stations participate in rotation in the TRF and CRF programs along with old antennas. This program also provides the main IVS contribution to the GGOS.

b) Old antennas participate in the TRF and CRF programs along with the new ones. Proper rotation between old and new antennas should be provided, which is important for the most uniform VLBI TRF realization. For this purpose, sessions with maximum number of stations allowed by correlator limit will be performed 6–12 times a year.

c) Old antennas continue participate in the programs aimed at VLBI TRF densification, regional geodynamics and CRF densification and extension for faint sources and higher frequencies.

Some comments to written above:

- In this memo, 'TRF' is considered not only as the maintenance of the terrestrial reference frame, but also as the investigation of the crustal movements, global and regional tectonics, etc.
- I suppose all three types of observing programs listed above should have equal priorities since all three types of the IVS products, EOP, TRF and CRF, are equally important for Space and Earth sciences and applications.
- Despite the general IVS policy is to encourage existing VLBI stations to upgrade to the VLBI2010 specifications as soon as possible, evidently, it seems to be necessary to save in the IVS observing plan several, say 3-5, stations with large antennas located in both hemispheres, capable to observe in the frequency bands up to ~45 GHz and having wish and possibilities to actively (say 2-4 sessions a month) participate in the CRF programs aimed at CRF extension to faint sources and higher frequencies as well as augmentation of observing history for all other ICRF sources not used actively in the regular IVS2010 programs.