

CORE Operation Center Report

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Abstract

This report gives a synopsis of the activities of the CORE Operation Center from January 2004 to December 2004. The report forecasts activities planned for the year 2005.

1. Changes to the CORE Operation Center's Program

The Earth orientation parameter goal of the IVS program is to attain precision at least as good as $3.5 \mu\text{s}$ for UT1 and $100 \mu\text{as}$ in pole position.

The IVS program was started in 2002 and used the Mark IV recording mode for each session. The IVS program began using the Mark 5 recording mode in mid 2003. Most stations were using the Mark 5 recording mode by the end of 2004. This change resulted in the 2004 sessions being processed more efficiently and freeing up correlator time. As a result, the program became station and media dependent rather than correlator dependent. The following are the network configurations for the sessions for which the CORE Operation Center was responsible:

IVS-R1: 52 sessions, scheduled weekly on Mondays, seven station network

RDV: 6 sessions, scheduled evenly throughout the year, 18 to 20 station network

IVS-R&D: 10 sessions, scheduled monthly, two to eight station networks

2. IVS Sessions January 2004 to December 2004

This section displays the purpose of the IVS sessions for which the CORE Operations Center is responsible.

- IVS-R1: In 2004, the IVS-R1s were scheduled weekly with a seven station network. There was a core network for each day plus three other stations. Matera was scheduled as a core station but Matera went down at the beginning of the year due to rail problems. By the end of 2004, Fairbanks and Tsukuba were the only participating stations recording on Mark IV tapes.

The purpose of the IVS-R1 sessions is to provide weekly EOP results on a timely basis. These sessions provide continuity with the previous CORE series. The "R" stands for rapid turnaround because the stations, correlators, and analysts have a commitment to make the the time delay from the end of recording to results as short as possible. The time delay goal is a maximum of 15 days. Participating stations are requested to ship tapes to the correlator as rapidly as possible. The "1" indicates that the sessions are on Mondays.

- RDV: There are six bi-monthly coordinated astrometric/geodetic experiments each year that use the full 10-station VLBA plus up to 10 geodetic stations.

These sessions are being coordinated by the geodetic VLBI programs of three agencies: 1. USNO will perform repeated imaging and correction for source structure; 2. NASA will analyze this data to determine a high accuracy terrestrial reference frame; and 3. NRAO will use these sessions to provide a service to users who require high quality positions for a

small number of sources. NASA (the CORE Operation Center) prepares the schedules for the RDV sessions.

- R&D: The purpose of the 10 R&D sessions in 2004, as decided by the IVS Program Committee, was to record at 1 Gbit/s data rate to evaluate the geodetic results. Those experiments also tested the entire data flow from scheduling through analysis for the higher data rate. Participating stations varied depending on when stations were equipped with Mark 5 systems. A second type of R&D session was proposed and observed, with the purpose of comparing UT1 from 1-hour Intensive sessions with UT1 from simultaneous 24-hour sessions. In these R&D sessions sequential 1-baseline hour-long Intensive sessions were recorded in parallel with a 6-station network.

3. Current Analysis of the CORE Operation Center's IVS Sessions

Table 1 shows the average formal errors for R1, R4, RDV, and T2 sessions from 2004. The R1, R4, and RDV uncertainties are within 10-15% of the corresponding values from 2003. T2 uncertainties are better by 30-40%.

In Table 2, we show the differences between EOP from the different session types and the IGS combined EOP series. The small number of RDV sessions makes it difficult to draw any statistically significant conclusions. The offset differences are at about the same level in 2003 and 2004 for all sessions. The Y-pole offsets for all sessions are remarkably close together, however the X-pole offset for the R4 sessions should be investigated. WRMS differences are larger in 2004 (only about 10% for the R1s). We should note that comparisons with the IERS C04 series are now problematic because errors have been introduced into the series from other VLBI analysis centers not properly modeling the displacement at Gilcreek due to the Denali Earthquake. For instance, the WRMS differences of our EOP (X,Y, UT1) series relative to C04 are 40% to 100% larger in 2004 than in 2003.

Table 1. Average EOP Formal Uncertainties for 2004

Session Type	X-pole (μas)	Y-pole (μas)	UT1 (μs)	DPSI (μas)	DEPS (μas)
R1	61	62	2.4	138	56
R4	90	78	3.2	177	71
T2	98	85	3.9	215	79
RDV	37	40	1.9	76	30

4. The CORE Operations Staff

Table 3 lists the key technical personnel and their responsibilities so that everyone reading this report will know whom to contact about their particular question.

Table 2. Offset and WRMS Differences (2004) Relative to the IGS Combined Series

	Number	X-pole		Y-pole		LOD	
		Offset (μ as)	WRMS (μ as)	Offset (μ as)	WRMS (μ as)	Offset (μ s/d)	WRMS (μ s/d)
R1	52	2(17)	94(81)	-246(-217)	101(90)	-1(-1)	16(14)
R4	51	-130(-11)	141(114)	-273(-219)	104(84)	3(2)	21(15)
T2	12	-9(40)	176(162)	-224(-222)	129(97)	-2(2)	20(12)
RDV	6	30(-21)	115(75)	-220(-154)	104(80)	-5(0)	20(9)

Values for 2003 are shown in parenthesis

Table 3. Key Technical Staff of the CORE Operations Center

Name	Responsibility	Agency
Tom Buretta	Recorder and electronics maintenance	Haystack
Brian Corey	Analysis	Haystack
Irv Diegel	Maser maintenance	Honeywell
John Gipson	SKED program support and development	NVI, Inc./GSFC
Frank Gomez	Software engineer for the Web site	Raytheon/GSFC
David Gordon	Analysis	Raytheon/GSFC
Ed Himwich	Network Coordinator	NVI, Inc./GSFC
Chuck Kodak	Receiver maintenance	Honeywell
Dan MacMillan	Analysis	NVI, Inc./GSFC
Leonid Petrov	Analysis	NVI, Inc./GSFC
Dan Smythe	Tape recorder maintenance	Haystack
Cynthia Thomas	Coordinate master observing schedule and prepare observing schedules	NVI, Inc./GSFC
Nancy Vandenberg	Organizer of CORE program	NVI, Inc./GSFC
William Wildes	Procurement of materials necessary for CORE operations	GSFC/NASA

5. Planned Activities during 2005

The CORE Operation Center will continue to be responsible for the following IVS sessions during 2005.

- The IVS-R1 sessions will be observed weekly and recorded in a Mark IV mode. Fairbanks will start recording on Mark 5 modules. Tsukuba will record using K5 and e-vlbi. Fortaleza will join the IVS-R1 network in July 2005 after getting a Mark 5.
- The IVS-R&D sessions will be observed 10 times during the year. The purpose of the R&D sessions in 2005 as determined by the IVS Observing Program Committee is to continue studying how to use Gb/s data rate for geodesy. Phase delay will be attempted and the

SNRs will be set high.

- The RDV sessions will be observed 6 times during the year.