EARTH ROTATION PARAMETERS FROM DSN VLBI: 1996

JPL 96 R 01

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A description of the DSN VLBI data set and of most aspects of the data analysis can be found in IERS Technical Note 17, pp. R-19 to R-32 (see also IERS Technical Note 19, pp. R-21 to R-27). The main changes in this year's analysis from last year's are simply due to including another year's data.

This year we have removed one small discrepancy between the IERS standards and our software by computing the equation of equinoxes using the mean of date obliquity rather than the true of date obliquity (see IERS Technical Note 13, pp. 30-31). We still compute the pole tide using the full value of the polar motion in the conventional terrestrial system with no "mean" value removed, since the concept of a "mean" here seems poorly defined (see IERS Technical Note 13, p. 59).

Some changes in processing strategy were tested but were not adopted for the final solution because they did not seem to significantly improve the results. This year these included (a) estimating permanent troposphere gradients at each complex, and (b) adjusting the observable uncertainty based on the scan duration (intended primarily to better account for errors in the delay rate observables induced by tropospheric variations).

Our approach to modeling the tropospheric effects on the VLBI observables was as follows. A priori dry zenith tropospheric delays were determined from barometric pressure measurements at the DSN sites, corrected for height differences between the pressure sensor and the antennas. A priori wet zenith tropospheric delays were derived from tables of monthly average wet zenith delays for each station, which are based on historical radiosonde data. The Lanyi function was used for mapping zenith tropospheric delays to observed elevations. The temperature at the top of the boundary layer, a parameter in the Lanyi function, was taken to be the 24-hour average of the surface temperature at the station. Adjustments to the wet troposphere zenith delays were estimated every two to three hours.

During calendar year 1995, the TEMPO project produced earth rotation measurements from 85 dual frequency observing sessions, with a median standard error along the minor axis of the error ellipse of 0.3 milliarcseconds (mas), and along the major axis of 1.5 mas. During 1995 the median turnaround time for TEMPO measurements, from observation to availability of earth orientation parameters, was 43 hours.

In the Tidal ERP table below the argument conventions are those of Sovers et al. (1993). The formal errors range from 10 to 43 microarcseconds but realistic uncertainties are probably about 70 microarcseconds (one standard deviation).

ACKNOWLEDGEMENTS. We would like to thank each and every one of the many people who contributed to the acquisition and analysis of the DSN VLBI data. The work described in this paper was carried out by the Jet Propulsion Laboratory, California Institute of Technology, under contract with the National Aeronautics and Space Administration.

Short Period [illegible] ERP Variations

Term	Period (hours)	UT1 (microseconds) Cosine	Sine	Polar Motion Amplitude (microarcseconds) prograde	retrograde	Phase (degrees) prograde	retrograde
K2	11.96724	2.2	31	45	76	54	221
S2	12.00000	0.8	9	4	120	134	312
M2	12.42060	- 9.8	16	77	251	116	277
N2	12.65835	- 1.2	1[illegible]	22	38	103	243
K1	23.93447	11.9	22[illegible]	169	0	139	*
P1	24.06589	- 3.1	- 3[illegible]	77	0	316	*
O1	25.81934	-13.5	-14[illegible]	141	0	313	*
Q1	26.86836	3.5	- 0.[illegible]	40	0	311	*

Celestial Ephe[illegible] Pole Motion Model
(nutations [illegible] to ZM0A-1990-2)

IAU-Index	Period days	Phase	Component	Adjustment mas	Formal Error mas	Generalized Error mas
precession			Longitude	3.00/yr	0.04/yr	0.05/yr
obliquity rate			Obliquity	0.26/yr	0.02/yr	0.02/yr
Y-offset			Longitude	- [illegible].19	0.21	0.24
X-offset			Obliquity	+ 5.[illegible]8	0.24	0.25
	6798.[illegible]8	In	Longitude	- 0.10	0.24	0.29
			Obliquity	- 0.06	0.07	0.07
		Out	Longitude	+ 0.21	0.15	0.18
			Obliquity	0.03	0.11	0.11
2	3399.19	In	Obliquity	0.22	0.04	0.04
		Out	Longitude	0.21	0.10	0.11
			Obliquity	0.10	0.05	0.06
10	365.26	In	Longitude	0.22	0.05	0.05
			Obliquity	+ 0.06	0.02	0.02
		Out	Longitude	+ 0.35	0.05	0.06
			Obliquity	0.02	0.02	0.02
9	182.62	In	Longitude	0.30	0.04	0.05
			Obliquity	+ 0.00	0.02	0.02
		Out	Longitude	+ 0.25	0.05	0.06
			Obliquity	+ 0.06	0.02	0.02
31	13.66	In	Longitude	0.25	0.04	0.08
			Obliquity	+ 0.10	0.02	0.03
		Out	Longitude	+ 0.48	0.05	0.09
			Obliquity	+ 0.10	0.02	0.03
	-429.8	In	Longitude	0.18	0.06	0.06
			Obliquity	0.03	0.02	0.02
		Out	Longitude	0.33	0.04	0.05
			Obliquity	0.19	0.02	0.02

Technical description of solution JPL 96 R 01

1 - Technique: VLBI

2 - Analysis Center: JPL

3 Software used : MODEST

4 Data Span : Oct 78 Feb 96

5 - Celestial Reference Frame RSC(JPL) 96 R 01

a - Nature : extragalactic

b - Definition of the orientation:
The Right Ascension and Declination of OJ 287 (0851+202) and the Declination of CTD 20 (0234+285) were held fixed at the values specified in RSC(IERS)94 C 01.

6 - Terrestrial Reference Frame: SSC(JPL) 96 R 01

a - Relativity scale: LET (TDT:geocentric with IAT)
The relativity model used is essentially equivalent to the "consensus model" described by Eubanks.

b - Velocity of light: 299 792 458 m/s

c - Geogravitational constant: 3.9860 0448 *10**14 m**3*s**-2

d - Permanent tidal correction: Yes

e - Definition of the origin:and

f - Definition of the orientation:
Six constraints were applied to the nine coordinates (at epoch 1993.0) of DSS 15, DSS 45, and DSS 65, such that if a seven parameter transformation (3 translations, 3 rotations, 1 scale) between the JPL 1996-1 and ITRF-93 systems were estimated by unweighted least squares applied to the coordinates of DSS 15, 45, and 65, then the resulting 3 translation and 3 rotation parts of the transformation would be zero while the scale could be nonzero and unknown in advance of computing the catalog. (When expressed as the dot product of a nine dimensional unit vector with the nine station coordinates, each constraint is assigned an a priori standard deviation of 5 mm; this does not affect the resulting coordinates but does affect the calculated formal errors, giving them a more spherical distribution than would result if either very large or very small a priori standard deviations were used.)

g - Reference epoch: 1993.0

h - Tectonic plate model: ITRF-93 plus adjustments

i Constraint for time evolution:
Three-dimensional site velocities were estimated for each of the three DSN complexes. All stations in each DSN complex were assumed to have the same site velocity. The velocities were constrained so as to produce no net translation rate and no net rotation rate, for the network composed of the three DSN complexes, relative to the net motion of this network of three sites as expressed in the ITRF-93 velocity field. (When expressed as the dot product of a nine dimensional unit vector with the nine site velocity components, each constraint is assigned an a priori standard deviation of 1.0 mm/yr; this does not affect the resulting velocity components but does affect the calculated formal errors, giving them a more spherical distribution than would result if either very large or very small a priori standard deviations were used.)

7 EarthOrientation: EOP(JPL) 96 R 01

a - A priori precession model: IAU(1976) plus adjustments

b - A priori nutation model: ZMOA-1990-2 plus adjustments

c - Short-period tidal variations in x, y, UT1:
As part of the JPL 1996-1 catalog solution we estimated coefficients of a model of ERP variations at four nearly-diurnal and four nearly-semidiurnal tidal frequencies. (Nearly-diurnal polar motion variations were constrained to have no retrograde part, thus allowing simultaneous estimation of nutation.) The reported earth rotation parameters have had these tidal frequency variations removed according to the parametric model estimated in the catalog solution. (In other words, these effects have NOT been added back in producing EOP(JPL)96 R 01.)

8 - Estimated Parameters:

a - Celestial Frame: right ascension, declination (all sources, but see 5b)

b - Terrestrial Frame: X0, Y0, Z0, $\dot{X}$, $\dot{Y}$, $\dot{Z}$ (by station) (by site)

c - Earth Orientation: UT0-UTC and Variation of latitude of the baseline vector
precession constant, obliquity rate, celestial pole offsets at J2000
coefficients of 23 nutation terms
coefficients of 40 diurnal and semidiurnal tidal terms in ERP

d - Others: wet zenith tropospheric delays
station clock offsets, rates, and frequency offsets

SUMMARY.JPL.96.R.01

JPL. NASA's Deep Space Network operates radio telescopes in three complexes: in Australia, Spain, and the USA (California). VLBI data collected from these sites by JPL between 1978 and 1996 were analyzed for celestial and terrestrial frames and earth rotation parameters, and reported as JPL 96 R 01. The celestial frame gives coordinates for 286 radio sources and is tied to ICC(IERS)94 C 01 through three coordinates of two sources. The terrestrial frame gives station coordinates and velocities for 10 stations in 3 sites, and is tied to ITRF-93 in both location and velocity using one station in each site. The analysis gives a time series EOP(JPL)96 R 01 containing the UT0-UTC and Variation of Latitude of a baseline vector at a frequency of two measurements per week. Additional earth rotation information is provided in estimated corrections to precession, obliquity rate, celestial pole offsets at epoch, 23 coefficients of nutation terms, and 40 coefficients of a parametric model for the nearly diurnal and nearly-semidiurnal tidal frequency variations of UT1 and polar motion.

EOP(JPL) 96 R 01

DEEP SPACE NETWORK VLBI EARTH ORIENTATION DATA FROM REFERENCE FRAME JPL 1996-1 IN THE IERS FORMAT

MJD	VAR LAT SECONDS OF ARC		UT0-UTC SECONDS OF TIME			VAR LAT ERROR ARC SEC		UT0 ERR SECONDS OF TIME			RMS DELAY NSEC	CORR VAR LAT -UT0				BSLN	CODE
43809.020	-0.31544	0.	+0.214934	0.	0.	0.00042	0.	0.000115	0.	0.	0.31	-0.1811	0.	0.	0.	1443	220
43816.758	-0.28753	0.	+0.239686	0.	0.	0.00061	0.	0.000235	0.	0.	0.30	0.1111	0.	0.	0.	1443	220
43873.422	-0.12166	0.	+0.407639	0.	0.	0.00027	0.	0.000096	0.	0.	0.34	-0.1320	0.	0.	0.	1443	220
44200.813	-0.34957	0.	+0.258823	0.	0.	0.00184	0.	0.000495	0.	0.	0.57	0.2208	0.	0.	0.	1443	220
44203.301	-0.04372	0.	+0.260473	0.	0.	0.00184	0.	0.000114	0.	0.	0.62	-0.8660	0.	0.	0.	1463	220
44227.570	-0.30165	0.	+0.329633	0.	0.	0.00037	0.	0.000132	0.	0.	0.51	0.0405	0.	0.	0.	1443	220
44228.707	-0.01248	0.	+0.326839	0.	[illegible]	[illegible]	[illegible]	[illegible]	0.	0.	0.54	0.8947	0.	0.	0.	1463	220
44234.801	-0.00916	0.	+0.342822	0.	0.	0.00319	0.	0.000182	0.	0.	0.54	-0.9456	0.	0.	0.	1463	220
44236.652	-0.28450	0.	0.353177	0.	0.	0.00052	0.	0.000183	0.	0.	0.41	-0.0349	0.	0.	0.	1443	220
44250.928	[illegible]	[illegible]	0.412475	0.	0.	0.00047	0.	0.000160	0.	0.	0.44	0.1396	0.	0.	0.	1443	220
44263.388	[illegible]	[illegible]	0.481703	0.	0.	0.00441	0.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
44265.613	-0.28471	0.	0.573462	0.	0.	0.00070	0.	0.000230	0.	0.	0.39	0.1319	0.	0.	0.	1443	220
44283.211	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	

50103.164	+0.30467	0.	0.518881	0.	0.	0.00224	0.	0.000113	0.	0.	0.09	-0.9015	0.	0.	0.	1463	120
50107.418	+0.19757	0.	0.527259	0.	0.	0.00027	0.	0.000099	0.	0.	0.09	-0.1655	0.	0.	0.	1443	120
50110.141	+0.32956	0.	0.505409	0.	0.	0.00215	0.	0.000084	0.	0.	0.20	-0.8528	0.	0.	0.	1463	120
50113.414	+0.21735	0.	0.518509	0.	0.	0.00038	0.	0.000132	0.	0.	0.18	0.2755	0.	0.	0.	1443	120
50118.082	+0.34925	0.	0.493376	0.	0.	0.00117	0.	0.000054	0.	0.	0.06	-0.9279	0.	0.	0.	1463	120
50119.473	+0.23803	0.	0.509558	0.	0.	0.00058	0.	0.000233	0.	0.	0.27	-0.3939	0.	0.	0.	1443	120
50124.066	+0.35738	0.	0.481001	0.	0.	0.00361	0.	0.000131	0.	0.	0.09	-0.8771	0.	0.	0.	1463	120
50128.391	+0.26646	0.	0.491522	0.	0.	0.00025	0.	0.000107	0.	0.	0.05	-0.4298	0.	0.	0.	1443	120
50133.094	+0.37741	0.	0.461858	0.	0.	0.00140	0.	0.000060	0.	0.	0.10	-0.9050	0.	0.	0.	1463	120
50135.422	0.29197	0.	0.475268	0.	0.	0.00024	0.	0.000094	0.	0.	0.06	-0.4723	0.	0.	0.	1443	120
50139.031	+0.38615	0.	0.448662	0.	0.	0.00114	0.	0.000052	0.	0.	0.05	-0.9234	0.	0.	0.	1463	120
50142.371	+0.31958	0.	0.462498	0.	0.	0.00023	0.	0.000083	0.	0.	0.07	-0.2800	0.	0.	0.	1443	120
50145.898	+0.39250	0.	0.435348	0.	0.	0.00079	0.	0.000039	0.	0.	0.09	-0.8821	0.	0.	0.	1463	120
50149.359	+0.35006	0.	0.445953	0.	0.	0.00023	0.	0.000080	0.	0.	0.10	-0.1948	0.	0.	0.	1443	120
50152.879	+0.39700	0.	0.417693	0.	0.	0.00085	0.	0.000039	0.	0.	0.04	-0.9070	0.	0.	0.	1463	120

RSC(JPL) 96 R 01

DEEP SPACE NETWORK VLBI RADIO SOURCE POSITIONS FROM REFERENCE FRAME JPL 1996-1 IN THE IERS 1993 FORMAT

IAU name	Alt. name	Right ascension hr mn	Right ascension sec	Declination dg mn	Declination arc sec	RA error time sec	Dec error arc sec	Corr. RA-Dec	Mean MJD	First MJD	Last MJD	No. Sns	Delay Obs	Rate Obs
0003-066	0003-066	0 6	13.89287833	- 6 23	35.3344667	0.00000919	0.0002144	-0.2522	48990.9	48196.0	50054.0	44	95	95
0007+171	GC 0007+17	0 10	33.99062672	17 24	18.7612475	0.00001231	0.0002074	-0.2897	49055.2	48196.0	49791.0	18	31	31
0008-264	P 0008-264	0 11	1.24678587	-26 12	33.3772045	0.00006372	0.0007717	-0.8935	46063.4	44227.0	48196.0	20	42	42
0013-005	P 0013-00	0 16	11.08854933	-0 15	12.4450888	0.00001154	0.0002271	-0.4476	48892.4	47381.0	50098.0	31	64	64
0014+813	0014+813	0 17	8.47482983	81 35	8.1361301	0.00008980	0.0001435	0.0410	48607.3	48352.0	48732.0	5	14	14
0016+731	0016+731	0 19	45.78634951	73 27	30.0172252	0.00003704	0.0001141	-0.0388	48929.3	48158.0	50097.0	38	82	82
0019+058	P 0019+058	0 22	32.44121301	6 8	4.2694442	0.00001402	0.0002511	-0.5781	47017.0	45151.0	50054.0	39	79	79
0048-097	P 0048-09	0 50	41.31737410	- 9 29	5.2097552	0.00001079	0.0002234	-0.4193	48956.9	46609.0	50047.0	100	184	184
0104-408	P 0104-408	1 6	45.10803219	-40 34	18.9001170	0.00002795	0.0001172	-0.4701	47790.0	43909.0	50098.0	103	245	245
0106+01	P 0106+01	1 9	39.77103041	1 33	0.3175158	0.00000912	0.0001593	0.1940	46849.1	43909.0	50097.0	170	367	369
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0133+476	DA 55	1 36	58.594778	47 51	29.1003197	0.00001368	0.0001223	-0.0411	47294.9	43873.0	50097.0	167	309	311
0146+056	0146+056	1 49	22.[illegible]	5 55	53.5691520	0.00002097	0.0003183	-0.8579	48260.9	47254.0	50054.0	19	40	40
0149+218	P 0149+2	1 52	18.05903872	22 7	7.7001537	0.00000922	0.0001170	0.2119	48752.4	47001.0	50054.0	43	86	86
0159+723	0159+723	2 3	33.38492903	72 32	53.6675236	0.00004310	0.0001523	-0.1059	48913.5	48352.0	49431.0	[illegible]	[illegible]	[illegible]
0201+113	P 0201+113	2 3	46.65706198	11 34	45.4097786	0.00000846	0.0001297	-0.3183	48541.2	45432.0	50098.0	48	101	101
0202+149	P 0202+14	2 4	50.41890479	15 14	11.0433478	0.00000787	0.0001003	-0.1729	47999.8	44203.0	50097.0	140	290	293
0202+319	DW 0202+31	2 5	4.92534200	32 12	31.0957452	0.00001201	0.0001248	-0.2250	48970.0	48126.0	50054.0	25	49	49
0212+735	0212+735	2 17	30.81326414	73 49	32.6219021	0.00003436	0.0001156	-0.3279	47966.7	45301.0	50113.0	312	626	629
0221+067	GC 0221+06	2 24	29.42918352	6 59	23.3418565	0.00000992	0.0001402	-0.4595	48952.6	47254.0	50054.0	41	80	80
0224+671	DW 0224+67	2 29	50.05143701	67 21	3.0297032	0.00002640	0.0001607	-0.2394	47609.9	44203.0	50098.0	204	399	405
0229+131	P 0229+13	2 31	45.89404713	13 22	54.7162030	0.00000758	0.0001049	-0.1749	48[illegible]	47254.0	50098.0	[illegible]	142	142
0234+285	CTD 20	2 37	52.40566900	28 48	8.9902100	0.00000842	0.0000849	0.1661	47935.6	44203.0	50113.0	388	947	947

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2345-167	P 2345-16	23 48	2.60849984	-16 31	12.0215164	0.00001289	0.0002835	-0.4315	47770.3	43809.0	50098.0	93	181	190
2351+456	2351+456	23 54	21.68026061	45 53	4.2365484	0.00001634	0.0001908	0.2561	48834.8	47941.0	50054.0	20	39	39
2351-154	2351-154	23 54	30.19518896	-15 13	11.2126686	0.00001330	0.0002819	-0.4796	48519.4	47381.0	49444.0	33	60	6[illegible]
2355-106	P 2355-106	23 58	10.88240398	-10 20	8.6109738	0.00001125	0.0002468	-0.4080	48335.8	46337.0	50098.0	56	118	118

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*-----------------------------------------------------------------------------
+FILE/REFERENCE
 DESCRIPTION          SSC(JPL)96 R 1     from Annual Report to IERS
 OUTPUT               Jet Propulsion Lab, California Institute of Technology
 CONTACT              as@logos.jpl.nasa.gov    (Alan Steppe)
 SOFTWARE             MODEST
 HARDWARE             Digital
 INPUT                Deep Space Network VLBI data
-FILE/REFERENCE
*-----------------------------------------------------------------------------
+FILE/COMMENT
*This file is part of the annual report to the IERS for 1995 from the VLBI
*group at JPL.  For more details see the Text and Technical Description parts
*of the report.  The apriori values and covariance matrix reflect the frame-
*defining constraints in both position and velocity and the restriction of
*station velocities to be equal for all stations within each site (DSN complex).
*The intra-complex position vectors are derived from radio interferometry data;
*no ground surveys were used
F ILE/COMMENT
A ..........................
+SITE/ID
* CODE PT  DOMES_   T _ STATION DESCRIPTION_    APPROX_LON    APPROX_LAT_   APP_H
 1512  1 40405  s003  R DSS12 antenna ef  pt    243 11 43.4   35 17 59.9   1001.
 1513  1 40405  S014  R DSS13 antenna  ef  pt.   243 12 21.6   35 14 51 .8   1094.
 1514  1 40405  s001  R DSS14 antenna ef  pt    243 06 40.9   35 25 33.3   1032.
 7231  1 40405 S019 R DSS15 antenna ef  pt. .   243 06 49.5   35 25 18.9    994·
 1542  1   50103   s005   R   DSS42 antenna f pt. .   148 58 48.2  -35 24 08.0    664.
 1543  1 50103S001 R DSS43 antenna ef  pt    148 58 48.2  -35 24 14.3    6"10.
 1545  1 50103S 010  R  DSS45 antenna ref. pt.   148 58 35.5  -35 24 00.2    672.
 1561  1  3340  '/s003  R  DSS61 antenna ef ].)1. .   355 45 08.3   40 25 47.7    796.
 1563  1 13407S001 R 1)ss63 antenna ref. pt.   355 45 ,,,0   40 25 56.6    812.
 1565  1 1340'/  s010  R DSS65  antenna ef pt   355 44 59.7   40 25 42.1    781.
-SITE/ID
i..........................
,SOLUTION/EPOCHS
*CODE PT SOLN T _DATA_START_  _DATA_END_   _MEAN_EPOCH_
 1512  1    1 R 82:183:28596 84:238:51477 84:060:01837
 1513  1    1 R 81:343:20410 85:273:25643 83:297:68255
 1514  1    1 R 78:300:55235 96:036:12319 88:314:35864
 7231  1    1 R 87:276:48805 96:037:45985 92:127:09731
 1542  1    1 R 83:046:34900 87:293:51094 85:357:36876
 1543  1    1 R 78:300:55235 96:037:45985 88:057:32430
 1545  1    1 R 88:164:00698 96:016:16302 92:275:52378
 1561  1    1 R 82:262:00350 87:214:02075 86:005:33216
 1563  1    1 R 79:329:68994 96:036:12319 88:068:21094
 1565  1    1 R 88:219:36926 96:016:20089 92:207:54487
-SOLUTION/EPOCHS
*-----------------------
+SOLUTION/STATISTICS
*. STATISTICAL, PARAMETER_          _VALUE
 VAR 1 ANCE FACTOR                  0.9243112D-00
```

NUMBER OF OBSERVATIONS 85575
NUMBER OF UNKNOWNS 12598
SOLUTION/STATISTICS

SOLUTION/ESTIMATE

INDEX	TYPE	CODE	PT	SOLN	REF EPOCH	UNIT	S	ESTIMATED VALUE	STD DEV
1	STAX	1512	1	1	93:001:00000		2	2.350443799348 3D+06	1.0193D-02
2	STAY	1512	1	1	93:001:00000		2	4.651930808260 3D+06	1.3067D-02
3	STAZ	1512	1	1	93:001:00000		2	3.665630961699 0D+06	1.2668D-02
4	VELX	1512	1	1	93:001:00000	m/y	2	1.997006206024 7D-02	8.9710D-04
5	VELY	1512	1	1	93:001:00000	m/y	2	6.060348129404 1D-03	1.2559D-03
6	VELZ	1512	1	1	93:001:00000	m/y	2	5.141182359885 4D-03	1.2154D-03
7	STAX	1513	1	1	93:001:00000		2	2.351129171406 6D+06	7.3609D-03
8	STAY	1513	1	1	93:001:00000		2	4.655477076393 4D+06	1.0541D-02
9	STAZ	1513	1	1	93:001:00000		2	3.660956942427 2D+06	1.0005D-02
10	VELX	1513	1	1	93:001:00000	m/y	2	1.997006206494 6D-02	8.9710D-04
11	VELY	1513	1	1	93:001:00000	m/y	2	6.060348108093 2D-03	1.2559D-03
12	VELZ	1513	1	1	93:001:00000	m/y	2	5.141182369341 0D-03	1.2154D-03
13	STAX	1514	1	1	93:001:00000		2	2.353621236634 8D+06	5.7875D-03
14	STAY	1514	1	1	93:001:00000		2	4.641341512376 2D+06	6.8689D-03
15	STAZ	1514	1	1	93:001:00000		2	3.677052344051 7D+06	7.6569D-03
16	VELX	1514	1	1	93:001:00000	m/y	2	1.997006205782 7D-02	8.9710D-04
17	VELY	1514	1	1	93:001:00000	m/y	2	6.060348124622 4D-03	1.2559D-03
18	VELZ	1514	1	1	93:001:00000	m/y	2	5.141182358413 5D-03	1.2154D-03
19	STAX	7231	1	1	93:001:00000		2	2.353538775079 3D+06	4.1994D-03
20	STAY	7231	1	1	93:001:00000		2	4.641649477745 5D+06	5.2866D-03
21	STAZ	7231	1	1	93:001:00000		2	3.676670016754 1D+06	5.8502D-03
22	VELX	7231	1	1	93:001:00000	m/y	2	1.997006207024 2D-02	8.9710D-04
23	VELY	7231	1	1	93:001:00000	m/y	2	6.060348109050 3D-03	1.2559D-03
24	VELZ	7231	1	1	93:001:00000	m/y	2	5.141182365151 9D-03	1.2154D-03
25	STAX	1542	1	1	93:001:00000		2	4.460981007439 4D+06	1.6826D-02
26	STAY	1542	1	1	93:001:00000		2	2.682413518178 7D+06	1.2283D-02
27	STAZ	1542	1	1	93:001:00000		2	3.674582064367 1D+06	1.4000D-02
28	VELX	1542	1	1	93:001:00000	m/y	2	3.802719060079 2D-02	1.9130D-03
29	VELY	1542	1	1	93:001:00000	m/y	2	1.190901602295 5D-03	1.0050D-03
30	VELZ	1542	1	1	93:001:00000	m/y	2	3.932466176793 1D-02	1.3601D-03
31	STAX	1543	1	1	93:001:00000		2	4.460894578877 3D+06	1.0507D-02
32	STAY	1543	1	1	93:001:00000		2	2.682361548359 3D+06	7.2021D-03
33	STAZ	1543	1	1	93:001:00000		2	3.674748575256 0D+06	7.9619D-03
34	VELX	1543	1	1	93:001:00000	m/y	2	3.802719060104 2D-02	1.9130D-03
35	VELY	1543	1	1	93:001:00000	m/y	2	1.190901602351 1D-03	1.0050D-03
36	VELZ	1543	1	1	93:001:00000	m/y	2	3.932466176784 1D-02	1.3601D-03
37	STAX	1545	1	1	93:001:00000		2	4.460935245572 6D+06	8.1991D-03
38	STAY	1545	1	1	93:001:00000		2	2.682765706221 6D+06	5.0818D-03
39	STAZ	1545	1	1	93:001:00000		2	3.674381398807 7D+06	5.8090D-03
40	VELX	1545	1	1	93:001:00000	m/y	2	3.802719060245 1D-02	1.9130D-03
41	VELY	1545	1	1	93:001:00000	m/y	2	1.190901601974 2D-03	1.0050D-03
42	VELZ	1545	1	1	93:001:00000	m/y	2	3.932466176674 9D-02	1.3601D-03
43	STAX	1561	1	1	93:001:00000		2	4.849245196317 0D+06	1.2878D-02
44	STAY	1561	1	1	93:001:00000		2	3.602781737326 3D+05	8.9890D-03
45	STAZ	1561	1	1	93:001:00000		2	4.114884441355 7D+06	1.3883D-02
46	VELX	1561	1	1	93:001:00000	m/y	2	-1.062283213204 8D-02	1.5157D-03
47	VELY	1561	1	1	93:001:00000	m/y	2	2.177307598535 6D-02	1.3504D-03
48	VELZ	1561	1	1	93:001:00000	m/y	2	2.243901468765 8D-02	1.8644D-03
49	STAX	1563	1	1	93:001:00000		2	4.849092632463 7D+06	7.2518D-03
50	STAY	1563	1	1	93:001:00000		2	3.601805769688 5D+05	7.4386D-03
51	STAZ	1563	1	1	93:001:00000		2	4.115109108842 9D+06	9.9705D-03

52	VELX	1563	1	1	93:001:0[illegible]	[illegible]/y	2	0622832136158D-02	1.5157I-0[illegible]
53	VELY	1563	1	1	93:001:0[illegible]	/y	2	2.1773075982090D-02	1.3504I-03
54	VELZ	1563	1	1	93:001:0[illegible]	/y	2	2.2439014687878D-02	1.8644I-03
55	STAX	1565	1	1	93:001:00000		2	4.8493367141293D+06	5.8178I-0[illegible]
56	STAY	1565	1	1	93:001:00000		2	3.6048886038797D+05	6.2520I-03
57	STAZ	1565	1	1	93:001:[illegible]		2	4.1147487696754D+06	8.4695D-03
58	VELX	1565	1	1	93:001:[illegible]	/y	2	1.0622832110211D-02	1.5157D-03
59	VELY	1565	1	1	93:001:[illegible]	/y	2	2.[illegible]773075[illegible]99751D-02	1.3504D-03
60	VELZ	1565	1	1	93:[illegible]	/y	2	2.2439014692239D-02	1.8644D-03

SOLUTION/ESTIMATE

*

+SOLUTION/APRIORI

*INDEX	TYPE	CODE	PT	SOLN	REF [illegible]	UNIT	S	ESTIMATED VALUE	STD DEV
1	STAX	1512	1	1	93:001 [illegible]		2	2.3504438120000D+06	2.9979D+05
2	STAY	1512	1	1	93:001 [illegible]		2	-4.6519808070000D+06	2.[illegible]979D+[illegible]
3	STAZ	1512	1	1	93:001 [illegible]		2	3.6656309560000D+06	2.9979D+05
4	VELX	1512	[illegible]	1	93:001 [illegible]	/y	2	-2.0136834309553D-02	3.7658D+07
5	VELY	1512	1	1	93:001 [illegible]	/y	2	4.7987857562075D-03	3.7599D+07
6	VELZ	1512	1	1	93:001 [illegible]	/y	2	4.1654610737913D-03	3.0689D+07
7	STAX	1513	1		93:001 [illegible]		2	-2.3511291820000D+06	2.9979D+05
8	STAY	1513			93:001 [illegible]		2	-4.6554770830000D+06	2.9979D+05
9	STAZ	1513			93:001 [illegible]		2	3.6609569410000D+06	2.9979D+05
10	VELX	1513	1	1	93:001:[illegible]	/y	2	2.0136834309553D-02	3.7658D+07
11	VELY	1513	1	1	93:001:[illegible]	/y	2	4.7987857562075D-03	3.7599D+07
12	VELZ	1513	1	1	93:001:[illegible]	/y	2	4.1654610737913D-03	[illegible].0689D+07
13	STAX	1514	1	1	93:001:[illegible]		2	2.3[illegible]36212[illegible]30000D+06	2.9979D+05
14	STAY	1514	1	1	93:001:[illegible]		2	4.6413415370000D+06	2.9979D+05
15	STAZ	1514	[illegible]	1	93:001 [illegible]		2	3.6770523540000D+06	2.9979D+05
16	VELX	1514	1	1	93:00 [illegible]	/y	2	2.0136834309553D-02	3.7658D+07
17	VELY	1514	1	1	93:001 [illegible]	/y	2	4.7987857562075D-03	3.7599D+07
18	VELZ	1514	1	1	93:001 [illegible]	/y	2	4.1654610737913D-[illegible]	3.0689D+07
19	STAX	7231	1	1	93:00 [illegible]		2	2.3[illegible]5387910000D+06	1.[illegible]782D+05
20	STAY	7231	1	1	93:001:[illegible]		2	4.6416494940000D+06	2.0704D+05
21	STAZ	7231	1	[illegible]	93:10[illegible]		2	3.6766700240000D+06	1.7600D+05
22	VELX	7231	1	1	93:001:[illegible]	/y	2	2.0136834309553D-02	3.7658D+07
23	VELY	7231	1	1	93:001:[illegible]	/y	2	4.7987857562075D-03	3.7599D+07
24	VELZ	7231	1	1	93:001:[illegible]	/y	2	4.[illegible]5461[illegible]7579[illegible]3D-[illegible]	3.0689D+07
25	STAX	1542	1	1	93:001:[illegible]		2	4.4609810200000D+06	2.[illegible]979D+05
26	STAY	1542	1	1	[illegible]3:001:[illegible]		2	2.6824135290000D+06	2.9979D+05
27	STAZ	1542	1	1	[illegible]3:001 [illegible]		2	-3.6745820760000D+06	2.9979D+05
28	VELX	1542	1	1	93:001:[illegible]	m/y	2	-3.4545304921440D-02	3.4518D+07
29	VELY	1542	1	1	93:001 [illegible]	m/y	2	-1.4277789674446D-03	2.8774D+07
30	VELZ	1542	1	1	93:001 [illegible]	m/y	2	4.1475331031303D-02	3.5202D+07
31	STAX	1543	1	1	[illegible]3:00 [illegible]		2	4.4608945920000D+06	2.[illegible]7[illegible]D+05
32	STAY	1543	1	1	93:001 [illegible]		2	2.68236[illegible]59[illegible]0D+06	2.[illegible]979D+05
33	STAZ	1543	1	1	93:[illegible]		2	-3.6747485870000D+06	2.9979D+05
34	VELX	1543	[illegible]	1	93:001 [illegible]	/y	2	-3.4545304921440D-02	3.4518D+07
35	VELY	1543	[illegible]	1	[illegible]3:001 [illegible]	m/y	2	-1.4277789674446D-03	2.8774D+07
36	VELZ	1543	1	1	93:001:[illegible]	m/y	2	4.1475331031303D-02	3.5202D+07
37	STAX	1545	1	1	93:001:[illegible]		2	-4.4609352500000D+06	1.7447D+05
38	STAY	1545	1	1	93:001:[illegible]		2	2.6827[illegible]100000D+06	1.3203D+05
39	STAZ	1545	1	1	93:00 [illegible]		2	3.6743814020000D+06	1.3930D+05
40	VELX	1545	1	1	93:00 [illegible]	m/y	2	3.4545304921440D-02	3.4518D+07
41	VELY	1545	1	1	93:001 [illegible]	m/y	2	1.4277789674446D-03	2.8774D+07
42	VELZ	1545		1	93:001 [illegible]	m/y	2	4.1475331031303D-02	3.5202D+07
43	STAX	1561		1	93:001 [illegible]		2	4.8492452020000D+06	2.9979D+05
44	STAY	1561		1	93:001 [illegible]		2	3.6027816200000D+05	2.997[illegible]+05

```
   45 STAZ 1561   1     1 93:001:00000 m     2  4.1148844420000D+06 2.9979D+05
   46 VELX 1561   1     1 93:001:00000 m/y   2  1.3937555943686  02 4.5009D+07
   47 VELY 1561   1     1 93:001:00000 m/y   2  2.3269602943746  02 2.7264D+07
   48 VELZ 1561   1     1 93:001:00000 m/y   2  1.9311732523881D-02 3.0049D+07
   49 STAX 1563   1     1 93:001:00000 m     2  4.8490926300000D+06 2.9979D+05
   50 STAY 1563   1     1 93:001:00000 m     2  3.6018056600000D+05 2.9979D+05
   51 STAZ 1563   1     1 93:001:00000 m     2  4.1151091040000D+06 2.9979D+05
   52 VELX 1563   1     1 93:001:00000 m/y   2  1.3937555943686D-02 4.5009D+07
   53 VELY 1563   1     1 93:001:00000 m/y   2  2.3269602943746D-02 2.7264D+07
   54 VELZ 1563   1     1 93:001:00000 m/y   2  1.9311732523881D-02 3.0049D+07
   55 STAX 1565   1     1 93:001:00000 m     2  4.8493367300000D+06 2.0602D+05
   56 STAY 1565   1     1 93:001:00000 m     2  3.6048885900000D+05 1.3929D+05
   57 STAZ 1565   1     1 93:001:00000 m     2  4.1147487750000D+06 1.6593D+05
   58 VELX 1565   1     1 93:001:00000 m/y   2  1.3937555943686D-02 4.5009D+07
   59 VELY 1565   1     1 93:001:00000 m/y   2  2.3269602943746D-02 2.7264D+07
   60 VELZ 1565   1     1 93:001:00000 m/y   2  1.9311732523881D-02 3.0049D+07
-SOLUTION/APRIORI
*-----------------------------------
+SOLUTION/MATRIX_ESTIMATE L COVA
*PARA1 PARA2 _    PARA2+0_ _              PARA2+1              PARA2+2_
     1      1 0.10388998654876D-03
     2      1 -.14812914026485D-04 0.17674429481588D-03
     3      1 -.19926259921974D-04 -.56[illegible]5839303986D-04 0.16048286978810D-03
     4      1 0.71777741072033D-06 0.40[illegible]71363783633D-06 -.18671469301753D-06
     4      4 0.80479734524442D-06
     5      1 0.43136746923296D-06   12[illegible]6861769449D-05   10943802816384D-05
     5      4 -.20914249313134D-07  .15[illegible]73345358328D-05
     6      1 0.63691648035225D-07  .80[illegible]74526124784D-06 0.79663975005327D-06
     6      4 -.51274967887806D-06  .91[illegible]77677751171D-07 0.14771615415397D-05



   60     58 ⊖ 16103910668207    5   86[illegible]27029513888D-06 0.34758919519303D-05
-SOLUTION/MATRIX_ESTIMATE L COVA
*-----------------------------------
+SOLUTION/MATRIX_APRIORI    COVA
*PARA1 PARA2 _    PARA2+0_ _              ARA2 1              PARA2+2_
     1      1 ⊖ 89875517873682 +1
     2      1   203373847⊖8476D-15   89[illegible]75517[illegible]3 82D 11
     3      1 -.12005393211418D-15   36 08562546393D-15 0.89875517873682D+11
     4      1 0.29311466084084D-10   38 92364[illegible]58297D-10 0.52474192441564D-10
     4      4 0.14181419311316D+16
     5      1 ⊖ 38974773795746D- 0  [illegible]1[illegible]19814002009D-09 0.69773731149506D-10
     5      4 ⊖ 53686306383017D+15  [illegible]14136697794325D+16
     6      1   16≥67537542219D  0   49[illegible]37569523998D-10   293016≥2179832D 10
     6      4 0.343971⊖⊖527078D+15   88[illegible]11561089028D+15 0 9418336≥≥64288D+15



   60     58 0.90330996458277D+15   47 08735461[illegible]3 )+15 0 902945899711≥⊖ )+15
-SOLUTION/MATRIX_APRIORI L COVA
*-----------------------------------
%ENDSNX
```