SCIAMACHY	Operation Change Request	OCR No: 051 Issue:

Title: Observation of Venus and Jupiter in 2011

Description of Request:
The observation of Venus in 2009, originally intended for calibration purposes, also proved to be very successful in terms of Venus atmospheric science. Both the measurements in March and June 2009 delivered spectra of the Venus atmosphere displaying detailed absorption features. The different phases of Venus at both dates were even equivalent to different viewing geometries. The scientific value of these measurements is not only to supplement e.g. spectral observations by other spacecraft but also to support studies of exoplanets, e.g. as pursued in the Helmholtz Alliance *Planetary Evolution and Life*.

We propose to observe the bright planets Venus and Jupiter – both being covered by dense atmospheres – in 2011. For Venus it is a repetition, Jupiter should be observed for the first time. The measurements would both be useful for atmospheric studies and instrument characterisation purposes: By selecting appropriate dates both planets, i.e. point sources, can be observed at azimuth angles where the instrument extra mispointing has different effects on pointing accuracy. When the planets rise just in flight direction only the contribution of the pitch mispointing is relevant. Thus we expect to further verify or even improve the current extra mispointing model.

Originator: M. Gottwald, E. Krieg DLR-IMF	Date of Issue: 22/12/2010	Signature: via e-mail 22/12/2010

Assessment of SSAG (necessary for requests by scientists):

SSAG: H. Bovensmann, IFE	Date: 07/01/2011	Signature: via e-mail 07/01/2011

Classification of OCR:

OCR Analysis (incl. Implementation Option):
Since slit width calibration is no longer a driver for observing bright planets (R. Snel, private communication), we propose to use the 'simple' approach from the 2009 Venus observations, i.e. perform a single scan over the planet. Thus the measurement strategy is as follows:

- place IFoV with a certain margin (specified below) above the planet
- start measurement when planet has reached an altitude of 100 km
- move IFoV in elevation with a rate slightly smaller than elevation rate of rising planet, i.e. planet overtakes IFoV and a signal is obtained when the planet is in the IFoV.
- execute this sequence in 5 consecutive orbits

For each observation the elevation difference between the planet and the IFoV should be 0.02° (Venus) / 0.028° (Jupiter). The duration of the complete measurement amounts to about 90 sec.

1) Visibility of the Venus and Jupiter (see Annex 1) and Timeline Definition

In May 2011 both planets can be found in the same area of the morning sky. Therefore selecting this period ensures that in the state and timeline definitions the same rules apply.

The proposed sequence of the timelines in the Venus and Jupiter observation orbits is as follows:

- t/l 01 (routine t/l of set 36): Sun in SO&C window preceded by 4 limb states
- test timelines of set 09: Venus/Jupiter observation starting at a planet's altitude of 100 km with a Sun elevation < 10° (Note: although this is an unusual GEO_NUM value, the SCIACAL specification confirms its applicability. Therefore the 'planet' t/l can be constructed as a *Sun_fixed* timeline). The t/l ends when the planet reaches the upper edge of the limb TCFoV. Five separate timelines, one for each orbit, are needed. Since the Sun is above the Earth's horizon during the

Venus/Jupiter observation, stray light has to be corrected for. Thus the final orbit executes an identical measurement but with the azimuth shifted by 3° to the right. Set 09 test timelines are 03-08 (Venus) and 09-14 (Jupiter).

- t/l 31 & 32: (test timelines of set 09): Alternating limb/nadir measurements between end of planet observation and start eclipse phase. Each test timeline is equivalent to the nominal timelines 47 & 50 but is shorter by about 360 sec. The nominal states not being executed in exchange of the planet observation are about 4 limb and 2 nadir states each orbit. They would have been executed over northern Canada to eastern Siberia.
- t/l 53/44 (routine t/l of set 35): eclipse phase

We propose to schedule

Venus: orbit 47994-47999 (May 5th, 2011 – DoY 124), orbit 47994-47998 (planet), orbit 47999 (stray light)
Jupiter: orbit 48069-48074 (May 10th, 2011 – DoY 129), orbit 48069-48073 (planet), orbit 48074 (stray light)

Jupiter as an outer planet is observed in full illumination. This is also the case for the inner planet Venus since it is located beyond the Sun. The Venus measurements therefore supplement the 2009 observations where Venus illumination amounted to about 3% (March) and 50% (June).

The dates specified above were selected such that Venus and Jupiter appear at an azimuth of 360°. In this direction only the pitch mispointing is applicable. For the first time a point source would cross the IFoV in this configuration. Depending on the pointing performance, i.e. impact of the platform attitude residuals, it might be possible to derive from the shape of the recorded intensity profile further knowledge about the pitch mispointing.

In total 6 test timelines (set 09) are required for each planet in each observation run.

2) Line-of-Sight Control (see Annex 2 and 3)

For the duration of the OCR_051 measurements state ID 24 (nadir_pointing) will be temporarily overwritten. Five CT parameter tables are affected:

- State Duration table
- Scanner State parameter table
- Basic Profile table (here compliance with other state executions needs to be considered)
- Pixel Exposure Time table
- State Index table

The corresponding parameter values will be listed in annex 3.

SOST: M. Gottwald, E. Krieg, DLR-IMF (ESA, Industry if necessary)	Date: 23/2/2011	Signature: via e-mail 23/2/2011

Approval of Proposed Implementation:		
Originator Approval: M. Gottwald, E. Krieg, DLR-IMF	Date: 23/2/2011	Signature: via e-mail 23/2/2011
SSAG Approval: H. Bovensmann	Date: 28.2.2011	Signature: via e-mail 28/2/2011

Decision / Approval: To be implemented as described.		
DLR Approval: A. Friker	Date: 28.02.2011	Signature: via e-mail 28.02.2011

Implementation by SOST: A sequence of 6 orbits (5 observing the planet, 1 for obtaining background stray light information) is scheduled on May 5th, 2011 (orbit 47994-47999) for Venus. Jupiter is observed 5 days later on May 10th, 2011 (orbit 48069-48074), again in 6 orbits (5 observing the planet, 1 for obtaining background stray light information). In total 6 CTI parameter tables are uploaded, both for Venus and Jupiter. For each planet the Basic Scan Profile table needs to be uploaded twice with slightly modified azimuth basic scan positions to account for the planet and background measurement. Timelines use IDs 03, 04, 05, 06, 07, 08 (all Venus), 09, 10, 11, 12,13, 14 (all Jupiter) and 31, 32 (shortened limb/nadir sequences between end of planet t/l and start of eclipse) from test set 09.		
SOST: M. Gottwald, E. Krieg, DLR-IMF	Date: 23/3/2011	Signature: via e-mail 23/3/2011

Annex 1: Venus and Jupiter 2011 Visibility Analysis

Fig. 1 displays the azimuth and elevation difference Sun-Venus for 2011 when Venus is within the limb TCFoV (azimuth = 316° to 44°, elevation = -27.3° to 19.5°). The difference is determined when Venus has reached an elevation which corresponds to an altitude of approx. 100 km. In 2011 Venus superior conjunction (Venus behind Sun) occurs on day 226 (August 16th) and no inferior conjunction (Venus between Earth and Sun) is visible. The apparent brightness on May 5th amounts to -3.84 mag (similar to June 2009 when Venus was at -4.07 mag). The distance of 218 × 10^6 km leads to a diameter of approx. 11” (20” in June 2009), i.e. Venus fits well into the 0.045° high IFoV.

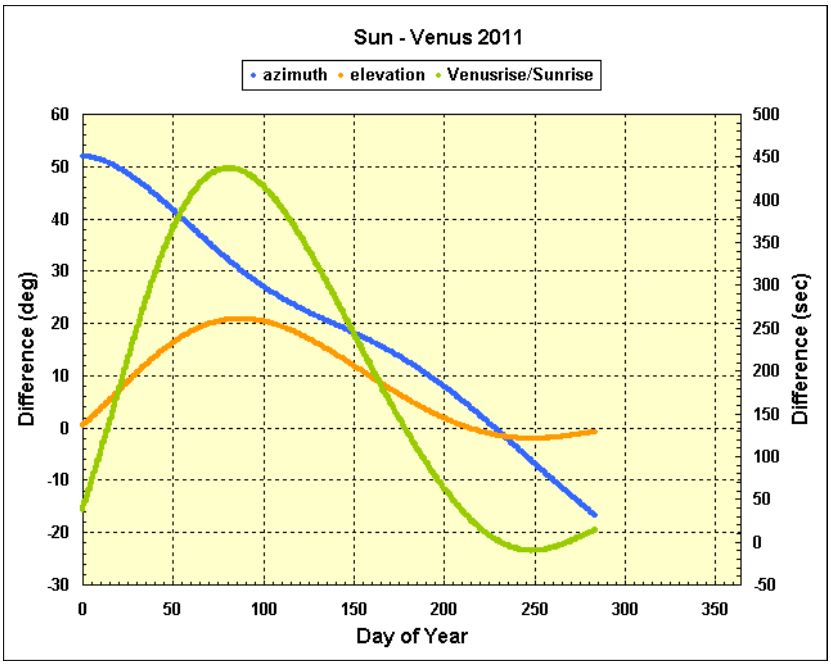

Fig. 1: Venus visibility in the limb TCFoV for the year 2011.

The green curve in fig. 1 (secondary axis) shows the time difference between the Sun at an altitude of 17 km and Venus at 100 km. Positive values represent periods when the Sun rises before Venus, negative values those where Venus precedes the Sun. Since Venus moves with an elevation rate through the limb TCFoV, which is similar to the solar rate, the green curve permits an estimate when measurements between 100 km and the upper edge of the limb TCFoV are possible with the Sun still being either below the horizon or having already left the limb TCFoV. It is obvious from fig. 1 that in all suitable periods in 2011 sunrise occurs before the rise of Venus. Fig. 2 displays the relative positions of the Earth, Venus and Sun at the time of measurement.

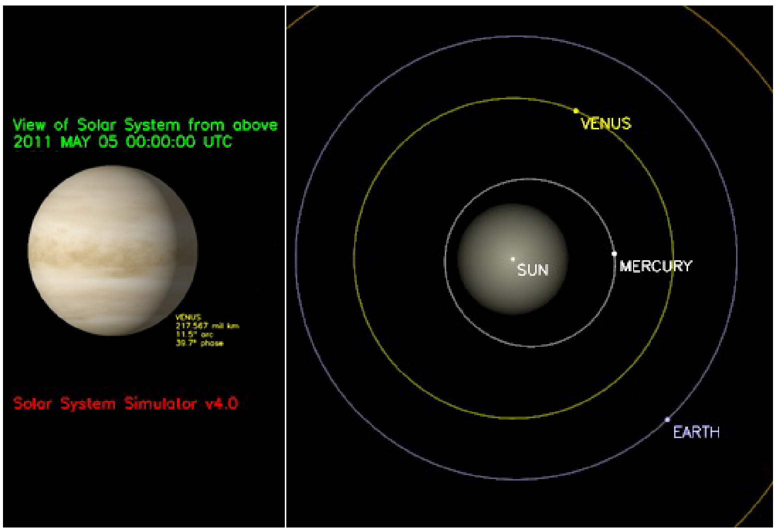

Fig. 2: The inner solar system and Venus’ illumination on 5 May 2011.

Fig. 3 is identical to fig. 1 but now for Jupiter. On April 6th, 2011 Jupiter is in conjunction (Jupiter behind Sun) and cannot be observed. From then on it slowly becomes a target in the morning sky. The apparent brightness on May 10th is -2.07 mag with an apparent diameter of 34”, corresponding to a distance of 877 × 10^6 km. As in the case of Venus the celestial position of Jupiter favours occasions when Jupiter rises after the Sun. The extreme case at the end of the 2011 when the time difference between Jupiter at 100 km and Sun at 17 km of > 3000 sec indicates that Jupiter would be visible in the TCFoV above the southern hemisphere close to the start of the eclipse phase. Fig. 4 is the graphs equivalent to Fig. 2, but now for Jupiter on 10 May 2011 and orbit 48069.

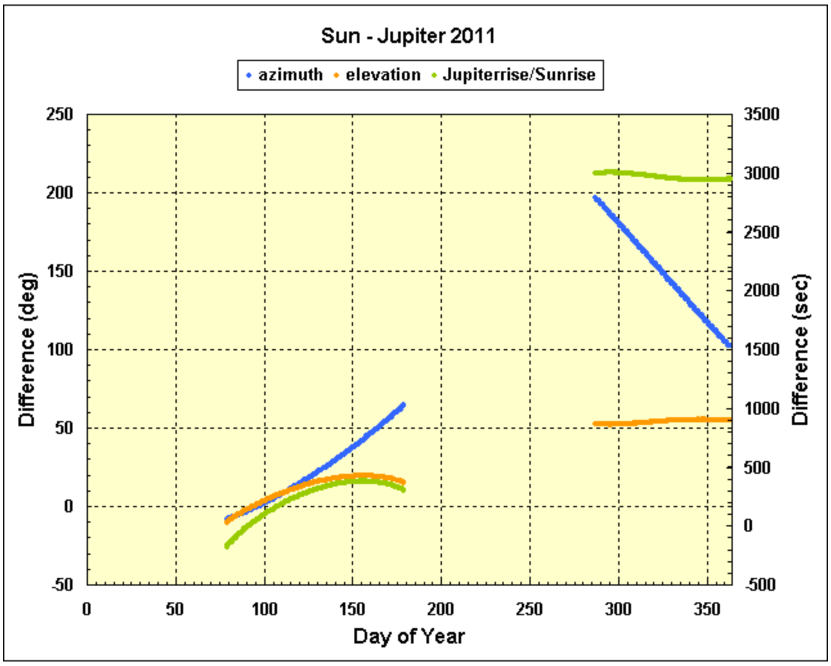

Fig. 4: Jupiter visibility in the limb TCFoV for the year 2011.

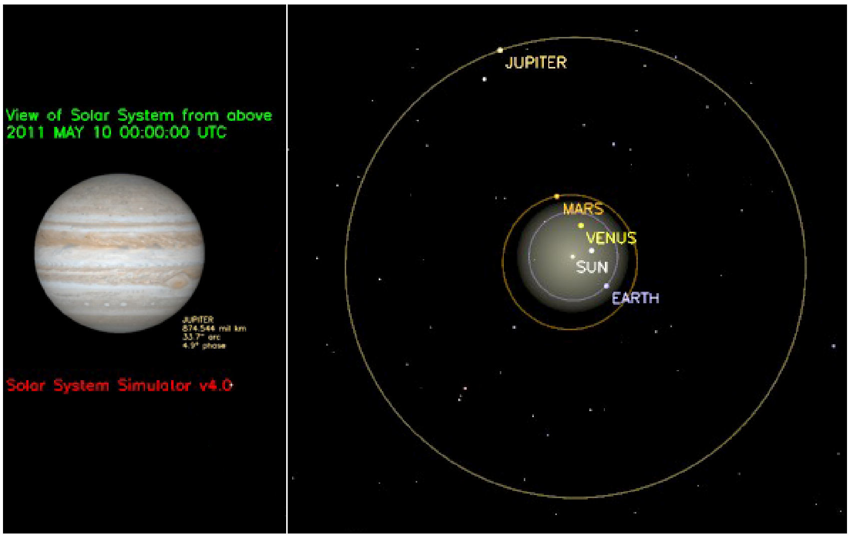

Fig. 4: The inner solar system and Jupiter’s illumination on 10 May 2011.

Planet/Sun Visibility Parameters:

Venus (mispointing) - DoY 124 diameter 11.4" - brightness -3.84 mag	47994	47995	47996	47997	47998	47999
azimuth (°)	0,080	0,078	0,075	0,072	0,069	3,066
azimuth rate (°/sec)	-0,0026	-0,0026	-0,0026	-0,0026	-0,0026	-0,0026
elevation (°)	25,057	25,060	25,062	25,059	25,062	25,058
elevation rate (°/sec)	-0,0598	-0,0598	-0,0598	-0,0598	-0,0598	-0,0598
altitude (km)	100,1	100,0	99,9	100,0	99,9	100,0
time (UTC)	06:09:28,4	07:49:41,8	09:29:55,2	11:10:08,7	12:50:22,1	14:30:35,6
time Sun (22.5°)	06:04:57,4	07:45:11,1	09:25:24,8	11:05:38,5	12:45:52,2	14:26:05,9
Δ time (sec)	271,0	270,7	270,4	270,2	269,9	269,7
azimuth Sun (Venus 100 km)	337,764	337,773	337,782	337,791	337,800	337,808
azimuth rate Sun (Venus 100 km)	-0,0002	-0,0002	-0,0002	-0,0002	-0,0002	-0,0001
elevation Sun (Venus 100 km)	7,797	7,812	7,826	7,836	7,850	7,860
elevation rate Sun (Venus 100 km)	-0,0545	-0,0545	-0,0545	-0,0545	-0,0545	-0,0545
altitude Sun (Venus 100 km)	709,1	708,9	708,6	708,4	708,2	708,0
Jupiter (mispointing) - DoY 129 diameter 33.7" - brightness -2.07 mag	**48069**	**48070**	**48071**	**48072**	**48073**	**48074**
azimuth (°)	359,153	359,212	359,271	359,330	359,388	362,447
azimuth rate (°/sec)	-0,0019	-0,0019	-0,0019	-0,0020	-0,0020	-0,0020
elevation (°)	25,052	25,05	25,054	25,052	25,049	25,053
elevation rate (°/sec)	-0,0598	-0,0598	-0,0598	-0,0598	-0,0598	-0,0598
altitude (km)	100,0	100,1	99,9	100,0	100,1	99,9
time (UTC)	11:25:58,6	13:06:12,7	14:46:26,7	16:26:40,8	18:06:54,9	19:47:08,9
time Sun (22.5°)	11:22:04,4	13:02:18,1	14:42:31,8	16:22:45,5	18:02:59,2	19:43:12,9
Δ time (sec)	234,2	234,6	234,9	235,3	235,7	236,0
azimuth Sun (Jupiter 100 km)	338,372	338,380	338,387	338,395	338,403	338,411
azimuth rate Sun (Jupiter 100 km)	0,0008	0,0007	0,0007	0,0007	0,0007	0,0007
elevation Sun (Jupiter 100 km)	9,739	9,717	9,700	9,678	9,656	9,640
elevation rate Sun (Jupiter 100 km)	-0,0547	-0,0547	-0,0547	-0,0547	-0,0547	-0,0547
altitude Sun (Jupiter 100 km)	671,3	671,8	672,1	672,6	673,0	673,4

Table 1: Venus, Jupiter and Sun parameters for proposed orbits for a planet altitude of 100 km. The azimuth in the last orbit for each planet is shifted by 3° in order to obtain a stray light measurement under almost identical conditions.

Annex 2: Detailed State Design

For elaborating the required parameters for the selected one-scan approach, table 1 lists the Line-of-Sight parameters and ephemeris data of Venus, Jupiter and the Sun at the start of the observations. LoS parameters have been derived using the ENVISAT CFIs with a time resolution of 0.1 sec corresponding to a planet altitude resolution of 0.3 km. The full instrument mispointing in pitch, roll and yaw has been taken into account.

The measurement duration is given by the time it takes the planet to rise from 100 km to the upper edge of the limb TCFoV, i.e. to cover an elevation width of 5.9°. The resulting duration amounts to 93 sec both for Venus and Jupiter. How long the planet appears in the slit, i.e. the time it takes from start to stop of signal, depends on the selected elevation margin, the differential elevation rate between planet and slit (slit rises slower than planet) and on the planet's diameter. For the selected date – based on the experience gained from the March 2009 Venus observations – a margin of 0.020° for Venus and 0.028° for Jupiter are selected. Together with a differential elevation rate[1] of -0.001°/sec (Venus) and -0.00125°/sec (Jupiter) 'signal' durations amount to 49.8 sec (Venus) and 47.2 sec (Jupiter). The planet is centred in the slit 42.5 sec (Venus) / 40.5 sec (Jupiter) after starting the measurement at a planet's altitude of 100 km.

[1] Note: The differential elevation rate is defined by *elevation rate (Venus) – elevation rate (IFoV)* in the CFI system. Commanded are values in the scanner system which have the opposite signs.

Annex 3: CTI Parameter Tables

A state simulation has successfully been performed using the CTI tables listed below. It proved the feasibility of the concept.

Both for the Venus and Jupiter measurements the following common CTI tables apply:

Scanner State parameter table:

Scanner State Parameter #24	24	Venus/Jupiter observation							
	Common Param.	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
STATE ID	24								
spare									
Relative Scan Profile 1 Factor	0								
Relative Scan Profile 2 Factor	0								
Relative Scan Profile 3 Factor	0								
Relative Scan Profile 4 Factor	0								
Relative Scan Profile 5 Factor	0								
Relative Scan Profile 6 Factor	0								
Number of Scan Phases	3								
Duration of Phase [msec]		1300	90000	840	0	0	0	0	0
Phase Type		0	1	0	0	0	0	0	0
Azimuth Centering of Relative Scan Profile		0	0	0	0	0	0	0	0
Azimuth Filtering		0	0	0	0	0	0	0	0
Az. Inverse Rel. Scan Profile for Even Scan		0	0	0	0	0	0	0	0
Azimuth Correction of nominal Scan Profile		1	1	0	0	0	0	0	0
Azimuth Relative Scan Profile Identifier		6	6	0	0	0	0	0	0
H/W constellation		3	3	3	0	0	0	0	0
Azimuth Basic Scan Profile Identifier		4	4	0	0	0	0	0	0
Azimuth Number of Repetition of Rel. Scan		0	44	0	0	0	0	0	0
spare									
Elevation Centering of Relative Scan Profile		1	1	0	0	0	0	0	0
Elevation Filtering		0	0	0	0	0	0	0	0
El. Inverse Rel. Scan Profile for Even Scan		0	0	0	0	0	0	0	0
Elevation Correction of nominal Scan Profile		1	1	0	0	0	0	0	0
Elevation Relative Scan Profile Identifier		6	6	0	0	0	0	0	0
spare									
Elevation Basic Scan Profile Identifier		11	11	0	0	0	0	0	0
Elevation Number of Repetition of Rel. Scan		0	44	0	0	0	0	0	0

State Index table:

	State ID	Cluster Definition Index	Coadding Index High Data Rate	Coadding Index Low Data Rate	Measurement Category ID
Venus/Jupiter observation OCR_051	24	1	6	6	31

State Duration table:

	State ID	Restart Time	(SDPU) Mode	SDPU Duration (Number of BCPS)	Wait Measurement Execution	State Duration	Scanner Reset Wait
Venus/Jupiter observation OCR_051	24	255	STANDARD	1440	23016	23952	174

PET table:

	State ID	Data Rate	Channel 1a	Channel 1b	Channel 2b	Channel 2a	Channel 3	Channel 4	Channel 5	Channel 6	Channel 7	Channel 8
Venus/Jupiter observation OCR_051	24	Low	1	1	1	1	1	1	1	1	1	1
		High	1	1	1	1	1	1	1	1	1	1

The Basic Profile table differs between Venus and Jupiter because of the slightly different planet's azimuth angles on May 5th and May 10th. In addition for the background measurement in each of the final orbit of the measurement sequence a different azimuth angle has to be uploaded.

Basic Profile table (Venus orbit 47994-47998):

Basic Scan Profile ID	Basic Scan Rate		Basic Scan Position	
	Azimuth [10-6 rad/sec]	Elevation [10-6 rad/sec]	Azimuth [10-6 rad]	Elevation [10-6 rad]
4	23	0	-786053	986111
11	-008145	000513	3228859	-218319

Basic Profile table (Venus background orbit 47999):

Basic Scan Profile ID	Basic Scan Rate		Basic Scan Position	
	Azimuth [10-6 rad/sec]	Elevation [10-6 rad/sec]	Azimuth [10-6 rad]	Elevation [10-6 rad]
4	23	0	-812451	986111
11	-008145	000513	3228859	-218319

Basic Profile table (Jupiter orbit 48069-48073):

Basic Scan Profile ID	Basic Scan Rate		Basic Scan Position	
	Azimuth [10-6 rad/sec]	Elevation [10-6 rad/sec]	Azimuth [10-6 rad]	Elevation [10-6 rad]
4	17	0	-779028	986111
11	-008145	000513	3228859	-218249

Basic Profile table (Jupiter background orbit 48074):

Basic Scan Profile ID	Basic Scan Rate		Basic Scan Position	
	Azimuth [10-6 rad/sec]	Elevation [10-6 rad/sec]	Azimuth [10-6 rad]	Elevation [10-6 rad]
4	17	0	-806342	986111
11	-008145	000513	3228859	-218249

The timing inputs listed below for the timeline generation are identical for Venus and Jupiter.

RTCS	=	STT_01
RTCS set-up	=	636 cts
RTCS cleanup	=	279 cts (762-636-(8+8+(28-23))+174)
total RTCS-duration	=	762 cts
WME	=	23016 cts (90×16×16-24)
WSR	=	174 cts
state duration	=	23952 cts (762+23016+174 = total RTCS-duration + WME +WSR)

set-up	=	636 cts	=	2.48437500 sec
cleanup	=	276 cts	=	1.07812500 sec
measurement	=	23040 cts	=	90.0000000 sec
total duration	=	23952 cts	=	93.5625000 sec
SDPU duration	=	1440 bcps		
phase 1	=	1300 msec		
phase 2	=	90000 msec		
phase 3	=	840 msec		

H:\scia\timing\timeline_set_09\tl_09_03_03.xls		Venus_100km_Venus_end - orbit 47994		Table start ID =	129	Event_type =	s_05
DURATION <s>=	97,42578125	DTX0 <s>=	-265,74609375	DTX1 <s>=	0,00000000	DTX2 <s>=	n/a
SCHED_TYPE =	SF_FI	GEO_TYPE =	elevation_forward	GEO_NUM <deg>=	22,50	FOV_CHECK =	NO
RATE_TYPE =	LOW	DTX3 <s>=	n/a	DTX4 <s>=	n/a	TL_PAD <s>=	1,00000000
State Running Index	**State ID**	**State Description**	**State TT (relative, ct)**	**State TT (relative, sec)**	**Start Time (absolute, sec) T1 +**	**State Duration (sec)**	**End Time (absolute, sec) T1 +**
		T/L setup			0	2,77	
1	24	nad24	709	2,77	2,77	93,56	96,33
2	End of Timeline	End of Timeline	23952	93,56			
3	End of Timeline	End of Timeline	0				
4	End of Timeline	End of Timeline	0				
5	End of Timeline	End of Timeline	0				
6	End of Timeline	End of Timeline	0				
7	End of Timeline	End of Timeline	0				
8	End of Timeline	End of Timeline	0				
9	End of Timeline	End of Timeline	0				
10	End of Timeline	End of Timeline	0				
11	End of Timeline	End of Timeline	0				
12	End of Timeline	End of Timeline	0				
13	End of Timeline	End of Timeline	0				
14	End of Timeline	End of Timeline	0				
15	End of Timeline	End of Timeline	0				
16	End of Timeline	End of Timeline	0				
17	End of Timeline	End of Timeline	0				
18	End of Timeline	End of Timeline	0				
19	End of Timeline	End of Timeline	0				
20	End of Timeline	End of Timeline	0				
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22	End of Timeline	End of Timeline	0				
23	End of Timeline	End of Timeline	0				
24	End of Timeline	End of Timeline	0				
25	End of Timeline	End of Timeline	0				
26	End of Timeline	End of Timeline	0				
27	End of Timeline	End of Timeline	0				
28	End of Timeline	End of Timeline	0				
29	End of Timeline	End of Timeline	0				
30	End of Timeline	End of Timeline	0				
31	End of Timeline	End of Timeline	0				
32	End of Timeline	End of Timeline	0				
33	End of Timeline	End of Timeline	0				
34	End of Timeline	End of Timeline	0				
35	End of Timeline	End of Timeline	0				
36	End of Timeline	End of Timeline	0				
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38	End of Timeline	End of Timeline	0				
39	End of Timeline	End of Timeline	0				
40	End of Timeline	End of Timeline	0				
41	End of Timeline	End of Timeline	0				
42	End of Timeline	End of Timeline	0				
43	End of Timeline	End of Timeline	0				
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52	End of Timeline	End of Timeline	0				
53	End of Timeline	End of Timeline	0				
54	End of Timeline	End of Timeline	0				
55	End of Timeline	End of Timeline	0				
56	End of Timeline	End of Timeline	0				
57	End of Timeline	End of Timeline	0				
58	End of Timeline	End of Timeline	0				
59	End of Timeline	End of Timeline	0				
60	End of Timeline	End of Timeline	0				
61	End of Timeline	End of Timeline	0				
62	End of Timeline	End of Timeline	0				
63	End of Timeline	End of Timeline	0				
64	End of Timeline	End of Timeline	0				
		T/L Cleanup	24661		96,33	0,09	96,43

Table 2: Example of timeline for Venus observation (orbit 47994)

H:\scia\timing\timeline_set_09\tl_09_09_02.xls		Jupiter_100km_Jupiter_end - orbit 48069		Table start ID =	513	Event_type =	s_05
DURATION <s>=	97,42578125	DTX0 <s>=	-228,94609375	DTX1 <s>=	0,00000000	DTX2 <s>=	n/a
SCHED_TYPE =	SF_FI	GEO_TYPE =	elevation_forward	GEO_NUM <deg>=	22,50	FOV_CHECK =	NO
RATE_TYPE =	LOW	DTX3 <s>=	n/a	DTX4 <s>=	n/a	TL_PAD <s>=	1,00000000
State Running Index	**State ID**	**State Description**	**State TT (relative, ct)**	**State TT (relative, sec)**	**Start Time (absolute, sec) T1 +**	**State Duration (sec)**	**End Time (absolute, sec) T1 +**
		T/L setup			0	2,77	
1	24	nad24	709	2,77	2,77	93,56	96,33
2	End of Timeline	End of Timeline	23952	93,56			
3	End of Timeline	End of Timeline	0				
4	End of Timeline	End of Timeline	0				
5	End of Timeline	End of Timeline	0				
6	End of Timeline	End of Timeline	0				
7	End of Timeline	End of Timeline	0				
8	End of Timeline	End of Timeline	0				
9	End of Timeline	End of Timeline	0				
10	End of Timeline	End of Timeline	0				
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28	End of Timeline	End of Timeline	0				
29	End of Timeline	End of Timeline	0				
30	End of Timeline	End of Timeline	0				
31	End of Timeline	End of Timeline	0				
32	End of Timeline	End of Timeline	0				
33	End of Timeline	End of Timeline	0				
34	End of Timeline	End of Timeline	0				
35	End of Timeline	End of Timeline	0				
36	End of Timeline	End of Timeline	0				
37	End of Timeline	End of Timeline	0				
38	End of Timeline	End of Timeline	0				
39	End of Timeline	End of Timeline	0				
40	End of Timeline	End of Timeline	0				
41	End of Timeline	End of Timeline	0				
42	End of Timeline	End of Timeline	0				
43	End of Timeline	End of Timeline	0				
44	End of Timeline	End of Timeline	0				
45	End of Timeline	End of Timeline	0				
46	End of Timeline	End of Timeline	0				
47	End of Timeline	End of Timeline	0				
48	End of Timeline	End of Timeline	0				
49	End of Timeline	End of Timeline	0				
50	End of Timeline	End of Timeline	0				
51	End of Timeline	End of Timeline	0				
52	End of Timeline	End of Timeline	0				
53	End of Timeline	End of Timeline	0				
54	End of Timeline	End of Timeline	0				
55	End of Timeline	End of Timeline	0				
56	End of Timeline	End of Timeline	0				
57	End of Timeline	End of Timeline	0				
58	End of Timeline	End of Timeline	0				
59	End of Timeline	End of Timeline	0				
60	End of Timeline	End of Timeline	0				
61	End of Timeline	End of Timeline	0				
62	End of Timeline	End of Timeline	0				
63	End of Timeline	End of Timeline	0				
64	End of Timeline	End of Timeline	0				
		T/L Cleanup	24661		96,33	0,09	96,43

Table 3: Example of timeline for Jupiter observation (orbit 48069)