SCIAMACHY	Operation Change Request	OCR No: 053
		Issue:

Title: Observation of the Venus transit 2012

Description of Request:

Venus transits occur in pairs being separated by 8 years with elapsed time between successive pairs exceeding a century. In 2004 SCIAMACHY tried to obtain spectral information of Venus during the first of the current transit pair (OCR_016). Because operational skills and in-orbit instrument characterization was at an early stage the results remained ambiguous. However with improved knowledge, particularly concerning the line-of-sight (LoS) pointing performance, Venus observations were successfully executed in 2009 and 2011. Besides providing valuable calibration information they delivered data for science investigations of the Venus atmosphere (e.g. *Vasquez et al.: Venus Observations from ENVISAT-SCIAMACHY, Measurements and Modeling*, submitted).

We propose to observe Venus while transiting the solar disk on June 6th. This is a once-in-a-lifetime opportunity for SCIAMACHY. The goal of the measurements is to detect the absorption features of the solar spectrum while the Sun shines through the ring-like Venusian atmosphere. Simulations illustrate that features should be detectable in channel 6 between 1400-1600 nm with a SN-ratio sufficiently high to be detectable (R. Snel, private communication). The scientific case for such measurements is not only to investigate the Venus atmosphere when viewed under limb conditions but also to obtain a rather rare test case for exoplanet searches exploiting the transit method. Related studies are conducted e.g. in the Helmholtz Alliance *Planetary Evolution and Life*.

Originator: M. Gottwald, G. Lichtenberg, DLR-IMF	Date of Issue: 14/02/2012	Signature: via e-mail 14/02/2012

Assessment of SSAG (necessary for requests by scientists):

SSAG recommends the observation of the Venus transit on June 6th, 2012, assuming that impact on regular Earth oriented observations is very small and lessons learned from earlier Venus observations w.r.t. calibration (straylight etc.) are taken into account.

SSAG: H. Bovensmann, IUP-IFE	Date: 17/02/2012	Signature: via e-mail 17/02/2012

Classification of OCR:

OCR Analysis (incl. Implementation Option):

Conceptually the measurement shall follow the same strategy as the Venus measurement in 2011, i.e.

- place IFoV with a margin of 0.020° 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 4 consecutive orbits (transit lasts from June 5th, 23:30 UTC to June 6th, 04:31 UTC)
- in each orbit the duration of the measurement amounts to about 65 sec

For each observation the elevation difference between Venus and the IFoV at the start of the measurement should be 0.02°.

1) Venus Transit Visibility

For ENVISAT/SCIAMACHY the transit is visible from June 5th, 23:29 UTC to June 6th, 04:33 UTC (annex 1).

2) State Design

The state design for the transit observation has to differ from the year 2009 and 2011 definitions due to the fact that our LoS points towards the solar disk. Therefore the RTCS setting must comply with regular solar

measurements, i.e. RTCS STT_02 with **small aperture** and **NDFM in**.
It is proposed to change the settings of the solar occultation state 49 (sos01) for the time of the transit. Five CT parameter tables are affected:

- Scanner State parameter table
- Basic Profile table (update each orbit)
- State Duration table
- State Index table

The corresponding parameter values will be listed in annex 2. The exposure settings are the same as for solar measurements, i.e. 62.5 msec in all channels except channels 6 and 7 (both 31.25 msec).
Note: This Venus transient state is a mix between two already existing and regularly executed Sun states (Sun pointing and scanning).

After discussions with calibration experts it was decided to add for reference purposes measurements without having the planet in front of the solar disk. This adds 4 more orbits (53706/53707 and 53712/53713) with the same scanning approach. Scanner State, State Duration and State Index tables are identical to the transit case. Because the transit occurs in a season where the solar azimuth does not change within the pointing accuracy (see tables 1a and 1b), the Basic Profile tables for the transit can be used as well. They only have to be swapped according to

orbit 53706: basic profile for orbit 53708
orbit´53707: basic profile for orbit 53709
orbit 53712: basic profile for orbit 53710
orbit 53713: basic profile for orbit 53711

Since the measurement starts when Venus has reached an altitude of 100 km, the solar occultation observations in the same orbits must stop well below that height at about 55 km. Therefore the solar occultation state 47 (sos02) needs to be shortened for the same period. This includes modifying the tables:

- Scanner State parameter table
- State Duration table
- State Index table

The corresponding settings are given in annex 2, too.

3) Timeline Definition

Because of the transit the measurement occupies only a part of the SO&C window it does not extend into the phase when nadir and limb states are executed. Five timelines are needed: One for executing the shortened solar occultation state and four Venus transit timelines, each invoking the modified state 49 but with adapted GEO_NUM values due to the apparent motion of Venus.
The proposed sequence of the timelines in the Venus transit observation orbits is as follows:

- test timeline of set 09: Shortened Sun state in SO&C window preceded by 4 limb states (annex 3)
- test timelines of set 09: Venus observation starting at a planet's altitude of 100 km. Each t/l can be constructed as a *Sun_fixed* timeline with GEO_TYPE = tangent_height and GEO_NUM<km> = 100 (annex 3). The t/l ends when the planet reaches the upper edge of the limb TCFoV. Four separate timelines, one for each orbit, are needed. They can also be used for the reference measurement orbits according to

  - t/l orbit 53706: equivalent to t/l for orbit 53708
  - t/l orbit 53707: equivalent to t/l for orbit 53709
  - t/l orbit 53712: equivalent to t/l for orbit 53710
  - t/l orbit 53713: equivalent to t/l for orbit 53711

SOST: M. Gottwald, E. Krieg, DLR-IMF (ESA, Industry if necessary)	Date: 17/02/2012	Signature: via e-mail 17/02/2012

Approval of Proposed Implementation:		
Originator Approval: M. Gottwald, G. Lichtenberg, DLR-IMF	Date: 17/02/2012	Signature: by OCR analysis
SSAG Approval: H. Bovensmann, IUP-IFE	Date: 17/02/2012	Signature: via e-mail 17/02/2012
Decision / Approval:		
DLR Approval: A. Friker, DLR	Date: 09/03/2012	Signature: via e-mail 09/03/2012
Implementation by SOST: **Because of the ENVISAT anomaly (loss of communication links) in orbit 52868 (April 8th, 12:28:00 UTC) the Venus transit observation had to be cancelled.**		
SOST: M. Gottwald, DLR-IMF	Date: 27/04/2012	Signature: via e-mail 27/04/2012

Annex 1: Venus transit visibility

The Venus transit occurs between June 5, 2012 22:09 UTC and June 6, 2012 4:49 UTC. This period is covered by the orbits 53708-53711 with the SO&C window times at

- 53708: 23:29 UTC – 23:32 UTC
- 53709: 01:09 UTC – 01:12 UTC
- 53710: 02:50 UTC – 02:53 UTC
- 53711: 04:30 UTC – 04:33 UTC

Viewing geometries will be as displayed in Fig. 1. The blue rectangle indicates the size and orientation of the IFoV (0.72° × 0.045°) when the azimuth is centered on Venus. Note that the IFoV is parallel to the horizon. It appears tilted in this figure because of the figure's usual orientation with North up.

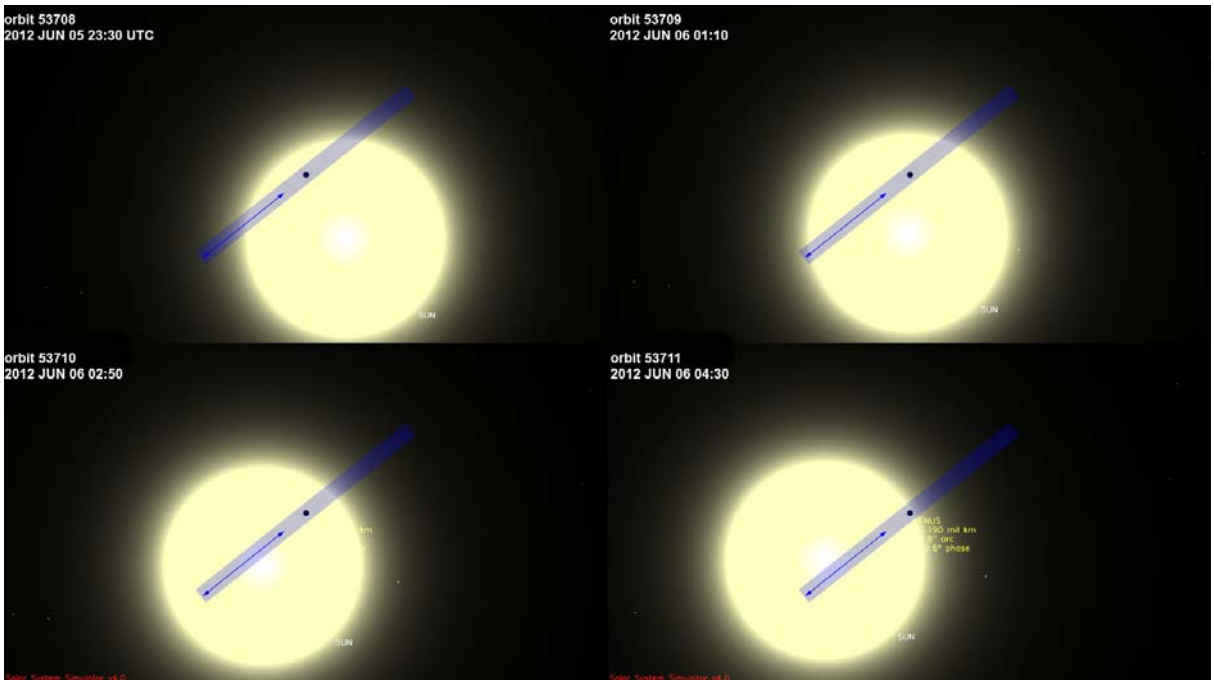

Fig. 1: Venus visibility during the transit. An optional azimuth offset of +0.250 mdeg is illustrated by the blue arrow. If applied, it would shift the IFoV to the right (towards Venus) such that the solar background irradiance could be reduced by a factor of up to 3-4.

The Venus and Sun visibility parameters are given in table 1a:

	53708	53709	53710	53711
	Venus (100 km)	Venus (100 km)	Venus (100 km)	Venus (100 km)
Diameter (")	57,8	57,8	57,8	57,8
Date	05-June-2012	06-June-2012	06-June-2012	06-June-2012
Time (UTC)	23:30:59,93	01:11:15,16	02:51:30,37	04:31:45,60
Azimuth	339,146	339,245	339,345	339,446
Azimuth Rate (°/sec)	0,0092	0,0091	0,0091	0,0090
Azimuth misalignment + offset	0,100	0,200	0,200	0,300
Commanded azimuth	339,246	339,445	339,545	339,746
Elevation	24,998	24,998	24,999	24,998
Elevation Rate (°/sec)	-0,0548	-0,0548	-0,0549	-0,0549
	Sun	Sun	Sun	Sun
Diameter (")	1891,4	1891,4	1891,4	1891,4
Azimuth	339,125	339,138	339,151	339,164
Azimuth Rate (°/sec)	0,0093	0,0092	0,0092	0,0091
Elevation	25,192	25,113	25,035	24,956
Elevation Rate (°/sec)	-0,0548	-0,0548	-0,0548	-0,0548
Altitude (km)	89,73	93,92	98,07	102,23
Date (Sun 100 km)	05-June-2012	06-June-2012	06-June-2012	06-June-2012
Time (UTC - Sun 100 km)	23:31:03,46	01:11:17,25	02:51:31,04	04:31:44,83
Δt (Sun 100km - Venus transit)	3,53	2,09	0,67	-0,77

Table 1a: Venus and Sun visibility parameters (FLO1) for the time when Venus crosses the tangent height of 100 km (extra mispointing included). For the azimuth a correction for the additionally known ASM-only mispointing of 0.1° together with a variable offset is included. This additional offset moves Venus more to the left edge of the IFoV thus reducing the solar background illumination.

	Sun (at virtual transit)			
	53706	53707	53712	53713
Diameter (")	1891,4	1891,4	1891,4	1891,4
Azimuth	339,125	339,138	339,151	339,164
Azimuth Rate (°/sec)	0,0093	0,0092	0,0092	0,0091
Elevation	25,192	25,113	25,035	24,956
Elevation Rate (°/sec)	-0,0548	-0,0548	-0,0548	-0,0548
Altitude (km)	89,73	93,92	98,07	102,23
Date	05-June-2012	05-June-2012	06-June-2012	06-June-2012
Time (UTC)	20:10:32,35	21:50:47,58	06:11:57,96	07:52:13,19
Date (Sun 100 km)	05-June-2012	05-June-2012	06-June-2012	06-June-2012
Time (UTC - Sun 100 km)	20:10:35,88	21:50:49,67	06:11:58,62	07:52:12,42
Δt (Sun 100km - virtual transit)	3,53	2,09	0,66	-0,77

Table 1b: Sun visibility parameters (FLO1) for the time of the reference measurements. Within the achievable accuracy azimuth/elevation and timing properties are the same as for the transit orbits..

Annex 2: CTI parameter table settings

The measurement duration is given by the time it takes the planet to rise from 100 km up to leaving the upper edge of the IFoV. It depends on the selected elevation margin and the differential elevation rate between Venus and the IFoV. Table 2 lists the values commanded for the Venus transit measurement.

Slit height (°)	0,045			
Elevation margin (°)	0,0200			
Venus diameter (')	57,8			
Orbit	53708	53709	53710	53711
Venus elevation (°)	24,998	24,998	24,999	24,998
Venus elevation rate (°/sec)	-0,0548	-0,0548	-0,0549	-0,0549
Venus azimuth (°)	339,146	339,245	339,345	339,446
Commanded azimuth	339,246	339,445	339,545	339,746
Time planet 100 km - TCFoV top	100,3	100,3	100,2	100,1
Difference elevation rate slit - planet	0,00100	0,00100	0,00100	0,00100
First light	12,0	12,0	12,0	12,0
Start plateau	28,0	28,0	28,0	28,0
Planet centered in slit	42,5	42,5	42,5	42,5
Stop plateau	57,0	57,0	57,0	57,0
Last light	73,0	73,0	73,0	73,0
Duration (sec)	61,1	61,1	61,1	61,1

Table 2: Venus in IFoV for an elevation margin of 0.020° and a differential elevation rate of 0.001°/s.

Scanner State parameter table (state 49):

Scanner State Parameter #49	49	OCR53 Venus_transit2012							
	Common Param.	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
STATE ID	49								
spare									
Relative Scan Profile 1 Factor	0								
Relative Scan Profile 2 Factor	0								
Relative Scan Profile 3 Factor	0								
Relative Scan Profile 4 Factor	2								
Relative Scan Profile 5 Factor	0								
Relative Scan Profile 6 Factor	0								
Number of Scan Phases	3								
Duration of Phase [msec]		1300	85000	780	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	0	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	42	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	42	0	0	0	0	0	0

State Index table (state 49):

	State ID	Cluster Definition Index	Coadding Index High Data Rate	Coadding Index Low Data Rate	Measurement Category ID		
Venus_Sun-transit2012	49	1	32	31	31	OCR53_Venus-2012	

State Duration table (state 49):

	State ID	Restart Time	(SDPU) Mode	SDPU Duration (Number of BCPS)	Wait Measurement Execution	State Duration	Scanner Reset Wait			
Venus_Sun-transit2012	49	255	STANDARD	1360	21736	23034	8	OCR53_Venus-2012; dur_49 = 85sec		

Basic Profile table (state 49 – orbit 53706/53708):

Scanner Basic Profile EU					
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	-000080	000000	-603413	986111	OCR53_Venus transit2012_orbit 53708
11	-008145	000469	3228859	-217778	OCR53_Venus transit2012_orbit 53708

Basic Profile table (state 49 – orbit 53707/53709):

Scanner Basic Profile EU					
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	-000079	000000	-604277	986111	OCR53_Venus transit2012_orbit 53709
11	-008145	000469	3228859	-217778	OCR53_Venus transit2012_orbit 53709

Basic Profile table (state 49 – orbit 53710/53712):

Scanner Basic Profile EU					
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	-000079	000000	-605149	986111	OCR53_Venus transit2012_orbit 53710
11	-008145	000470	3228859	-217787	OCR53_Venus transit2012_orbit 53710

Basic Profile table (state 49 – orbit 53711/53713):

Scanner Basic Profile EU					
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	-000079	000000	-606031	986111	OCR53_Venus transit2012_orbit 53711
11	-008145	000470	3228859	-217778	OCR53_Venus transit2012_orbit 53711

Scanner State parameter table (state 47):

Scanner State Parameter #47	47	SO&C_Scan/Point mod. for OCR53_Venus2012							
	Common Param.	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
STATE ID	47								
spare									
Relative Scan Profile 1 Factor	0								
Relative Scan Profile 2 Factor	0								
Relative Scan Profile 3 Factor	0								
Relative Scan Profile 4 Factor	2								
Relative Scan Profile 5 Factor	0								
Relative Scan Profile 6 Factor	0								
Number of Scan Phases	7								
Duration of Phase [msec]		1300	32000	4000	11000	1000	1000	780	0
Phase Type		0	1	1	1	1	1	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		8	8	4	6	6	6	0	0
Azimuth Relative Scan Profile Identifier		5	5	5	5	5	5	0	0
H/W constellation		3	3	3	3	3	3	3	0
Azimuth Basic Scan Profile Identifier		3	3	3	3	3	3	0	0
Azimuth Number of Repetition of Rel. Scan		0	15	1	5	0	0	0	0
spare									
Elevation Centering of Relative Scan Profile		0	0	0	0	0	0	0	0
Elevation Filtering		0	0	0	0	0	0	0	0
El. Inverse Rel. Scan Profile for Even Scan		1	1	1	1	0	0	0	0
Elevation Correction of nominal Scan Profile		2	2	8	8	4	6	0	0
Elevation Relative Scan Profile Identifier		4	4	4	4	5	5	0	0
spare									
Elevation Basic Scan Profile Identifier		14	14	3	3	3	3	0	0
Elevation Number of Repetition of Rel. Scan		0	15	1	5	0	0	0	0

State Index table (state 47):

	State ID	Cluster Definition Index	Coadding Index High Data Rate	Coadding Index Low Data Rate	Measurement Category ID		
Venus_Sun-transit2012	47	1	32	31	31	OCR53_Venus-2012	

State Duration table (state 47):

	State ID	Restart Time	(SDPU) Mode	SDPU Duration (Number of BCPS)	Wait Measurement Execution	State Duration	Scanner Reset Wait			
SO&C_Scan/Point mod. for OCR53	47	255	STANDARD	784	12520	13818	8	OCR53_Venus-2012; dur_47 = 49sec		

Annex 3: Venus and shortened SO&C timelines

The timing inputs for the generation of the Venus timelines are as follows.

RTCS	=	STT_02
RTCS set-up	=	900 cts
RTCS cleanup	=	377 cts (762-636-(8+8+(28-23))+174)
total RTCS-duration	=	1290 cts
WME	=	21736 cts (85×16×16-24)
WSR	=	8 cts
state duration	=	23034 cts (1290+21736+8 = total RTCS-duration + WME +WSR)

set-up	=	900 cts	=	3.51562500 sec
cleanup	=	374 cts	=	1.46093750 sec
measurement	=	21760 cts	=	85.0000000 sec
total duration	=	23034 cts	=	89.9765625 sec
SDPU duration	=	1360 bcps		
phase 1	=	1300 msec		
phase 2	=	85000 msec		
phase 3	=	780 msec		

And for the generation of the modified (shortened) SO&C timeline:

RTCS	=	STT_02
RTCS set-up	=	900 cts
RTCS cleanup	=	377 cts (762-636-(8+8+(28-23))+174)
total RTCS-duration	=	1290 cts
WME	=	12520 cts ((32+4+11+1+1)×16×16-24)
WSR	=	8 cts
state duration	=	13818 cts (1290+12520+8 = total RTCS-duration + WME +WSR)

set-up	=	900 cts	=	3.51562500 sec
cleanup	=	374 cts	=	1.46093750 sec
measurement	=	12544 cts	=	49.0000000 sec
total duration	=	13818 cts	=	53.9765625 sec
SDPU duration	=	784 bcps		
phase 1	=	1300 msec		
phase 2	=	32000 msec		
phase 3	=	4000 msec		
phase 4	=	11000 msec		
phase 5	=	1000 msec		
phase 6	=	1000 msec		
phase 7	=	780 msec		

H:\scia\timing\timeline_set_09\tl_09_02_08.xls		Venus_100km_Venus_end - orbit 53708		Table start ID =	65	Event_type =	s_09
DURATION <s>=	93,83984375	DTX0 <s>=	9,81515625	DTX1 <s>=	0,00000000	DTX2 <s>=	85,78000000
SCHED_TYPE =	SF_FI	GEO_TYPE =	tangent_height	GEO_NUM <km>=	100,00	FOV_CHECK =	NO
RATE_TYPE =	HIGH	DTX3 <s>=	1,38476563	DTX4 <s>=	91,95507813	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	49	sos01	709	2,77	2,77	89,98	92,75
2	End of Timeline	End of Timeline	23034	89,98			
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				
21	End of Timeline	End of Timeline	0				
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				
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	23743		92,75	0,09	92,84

Table 3: Example of timeline for Venus transit observation (orbit 53708)

H:\scia\timing\timeline_set_09\tl_09_01_08.xls		SOC_beg_Venus_start_limb_sun_ns		Table start ID =	1	Event_type =	s_03
DURATION <s>=	281,32421875	DTX0 <s>=	261,76953125	DTX1 <s>=	32,00000000	DTX2 <s>=	21,00000000
SCHED_TYPE =	SF_FI	GEO_TYPE =	tangent_height	GEO_NUM <km>=	17,20	FOV_CHECK =	NO
RATE_TYPE =	HIGH	DTX3 <s>=	224,86914063	DTX4 <s>=	55,95507813	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	28	limb01	709	2,77	2,77	55,87	58,64
2	28	limb01	14303	55,87	58,64	55,87	114,51
3	28	limb01	14303	55,87	114,51	55,87	170,38
4	28	limb01	14303	55,87	170,38	55,87	226,25
5	47	sos02	14303	55,87	226,25	53,98	280,23
6	End of Timeline	End of Timeline	13818	53,98			
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				
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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	71739		280,23	0,09	280,32

Table 4: Timeline for SO&C measurements during Venus transit period (orbit 53708-53711)