**VIRTIS PFM**
**Active Check-out #4**
**Observations Report**

**14th March 2012**

| | NAME | FUNCTION | SIGNATURE | DATE |
|---|---|---|---|---|
| PREPARED | F. CAPACCIONI | PI | | |
| PREPARED | S. GIUPPI | TM | | |
| CHECKED | F. CAPACCIONI | PI | | |
| APPROVED | F. CAPACCIONI | PI | | |
| AUTHORIZED | F. CAPACCIONI | PI | | |

## DOCUMENT CHANGE RECORD

| ISSUE | DATE | AFFECTED PAGES | CHANGE DESCRIPTION |
| --- | --- | --- | --- |
| Draft | 11/12/2007 | | |
| Draft-2 | 09/01/2007 | 9 | Better description of V-H b/sight determination |
| Issue 1 | 18/05/2007 | | Updated evaluation of boresight |
| Issue 2 | 14/03/2012 | 18 | Chapters 5-15 added |

TABLE OF CONTENT



## 1. Scope

This document describes the functional performances and main results of VIRTIS during the Active Payload Check-Out#4.

## 2. Reference Documents

| | | |
|---|---|---|
| RD1 | RO-EST-PL-3395_1_b_MSP_Rosetta_Active_Payload_Checkout | PC RSOC Master Science Plan |
| RD2 | RO-EST-TN-3415_2_-_Rosetta_Timeline_Details_Active_PC4 | PC timeline details |
| RD3 | VIR-IAS-TN-009_VIRTIS_Active_Checkout_Details | Active checkout details |
| RD4 | VR_PC4_V004_HBorCal__OBR_OBS02A.doc | OBR First VR02 |
| RD5 | VR_PC4_V005_HBorCal__OBR_OBS02A.doc | OBR Second VR02 |
| RD6 | VR_PC4_V003_ScanMir__OBR_OBS03A.doc | OBR Scan Mirror Test VR03 |
| RD7 | RO-EST-TN-3305 | P/L boresight data |
| RD8 | VIR-IAS-TN-006 issue1 09/03/2006 VIRTIS Request | PC04 VIRTIS Request |

## 3. Activity Summary

The general activities to be carried out during the Check-outs are described in RD1, while the detailed timeline for PC#4 is given in RD2.

The specific VIRTIS activities during Active Check-out #4 were mainly centered on the determination of the V-H boresight (VR02 described in RD4 and VR05 described in RD5) and the determination of VIRTIS-M slit alignment with Y axis (VR03, described in RD6).

## 4. VR02 Pointing Summary

The S/C had Venus at the location of the V-H assumed boresight (see RD7) at the Offset from S/C Z axis:

- X = -22.2 arcmin
- Y = +3.9 arcmin

And the slew was performed over an area spanning 30arcmin in X axis (Pitch axis) and 54arcmin in Y axis (Yaw axis). See Figure 1.

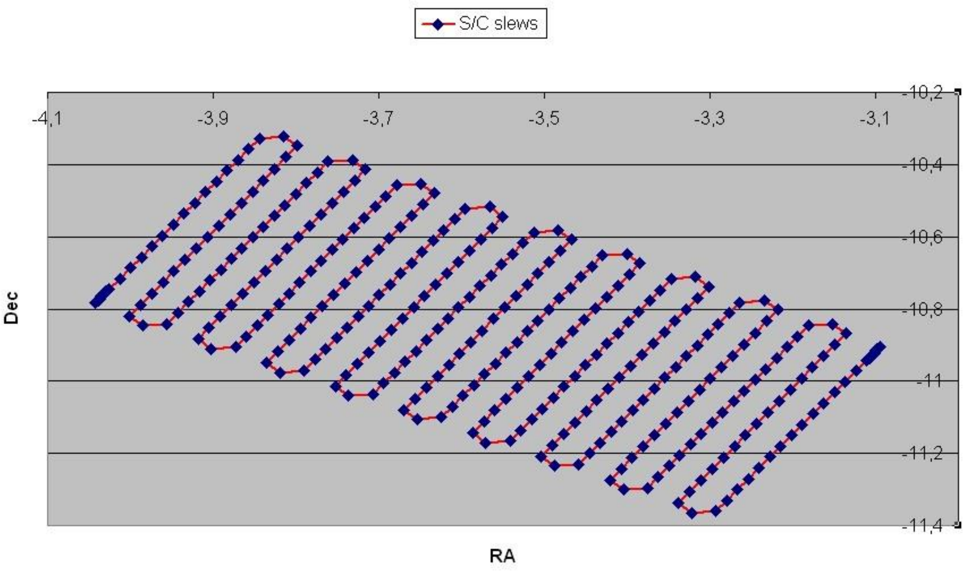


Figure 1. Plan of the Slew Scan in Right Ascension (RA) and Declination (Dec)

An evaluation of the Venus location in the S/C reference frame has been performed using the Spice routines and the following kernels:

- NAIF0008.TLS
- ROS_070312_STEP.TSC
- DE405S.BSP
- ORHR_______________00052.BSP
- ATNR_P040302093352_00053.BC
- ROS_BETA_V08.TF

In figure is shown the result. The orange line represent the location of Venus during the raster scan in the S/C reference frame. In figure are reported the first and last raster points where images with V-M were taken. The X/Y offset of Venus in these two points are the following:

| | X (deg) | X (arcmin) | Y (deg) | Y (arcmin) |
|---|---|---|---|---|
| First Point | -0.6293 | -37.76 | -0.3855 | -23.13 |
| Last Point | -0.121 | -7.26 | 0.5145 | 30.87 |

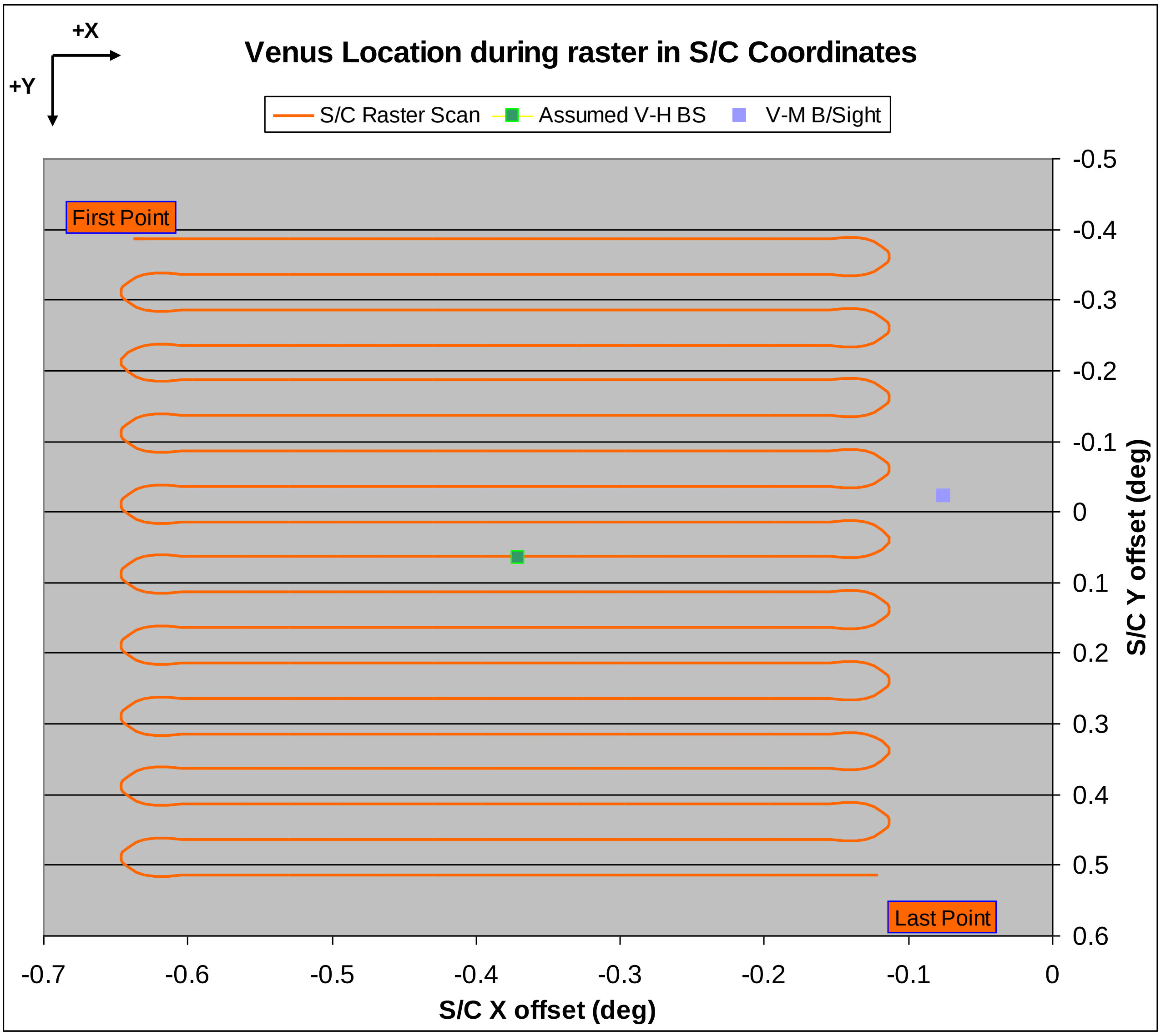


Figure 2

### 4.1 VIRTIS-M Analysis

Two cubes have been acquired, one at the beginning of the slew scan and one at the end. The internal V-M mirror scan was offset to be centered not on the V-M boresight but on the expected location of V-H boresight. We acquired 80 lines centered on it

In figure 3 is reported the spectrum of Venus acquired during this observation. The target was subpixel in size, and we ensured to have a considerably long integration time to guarantee detection of the planet even if saturation would occur, as it did, as our primary goal was to achieve a positive detection.

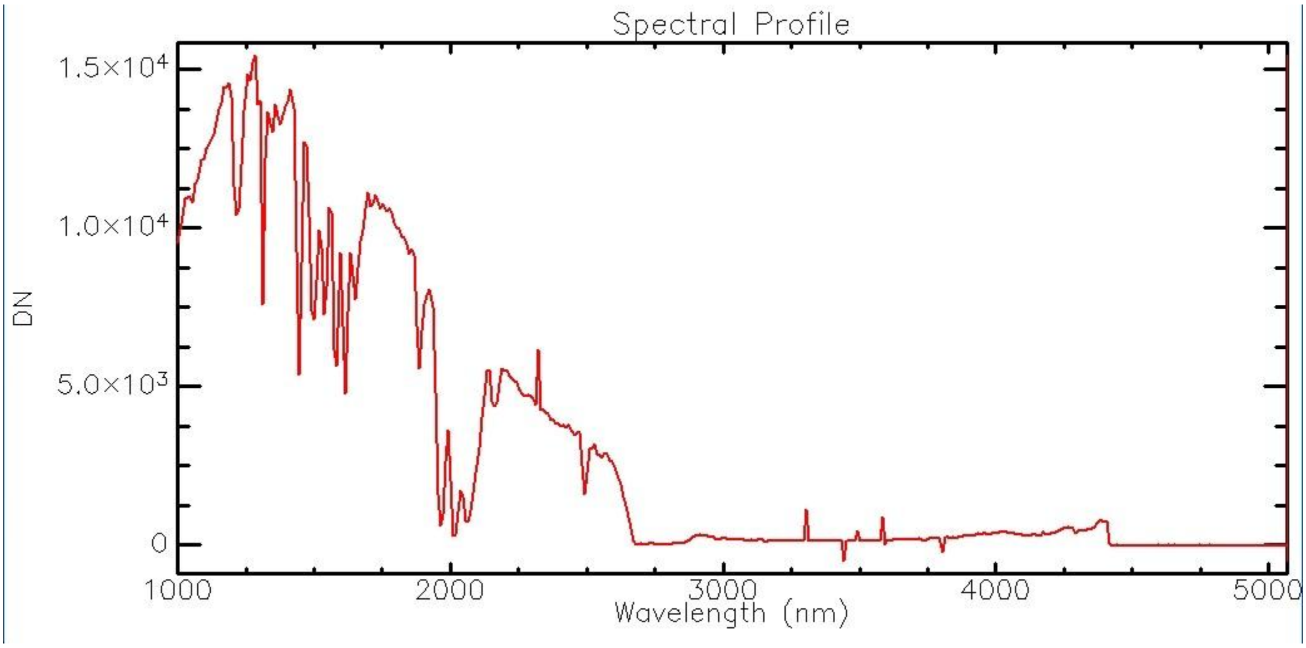


Figure 3. Spectral profile of Venus as seen by VIRTIS-M. The region above 4500nm show saturation due to the long integration time.

The first cube, code F68Q630, showed the Venus spot as reported in figure 4. The centre of the spot is located at line 60; however, we have to remove from the count 2 lines corresponding to dark acquisitions (which are counted as lines in the EGSE), thus the effective centre is located at line 58. In terms of location along the Y axis (samples direction) we have that the Venus spot is located at sample 103

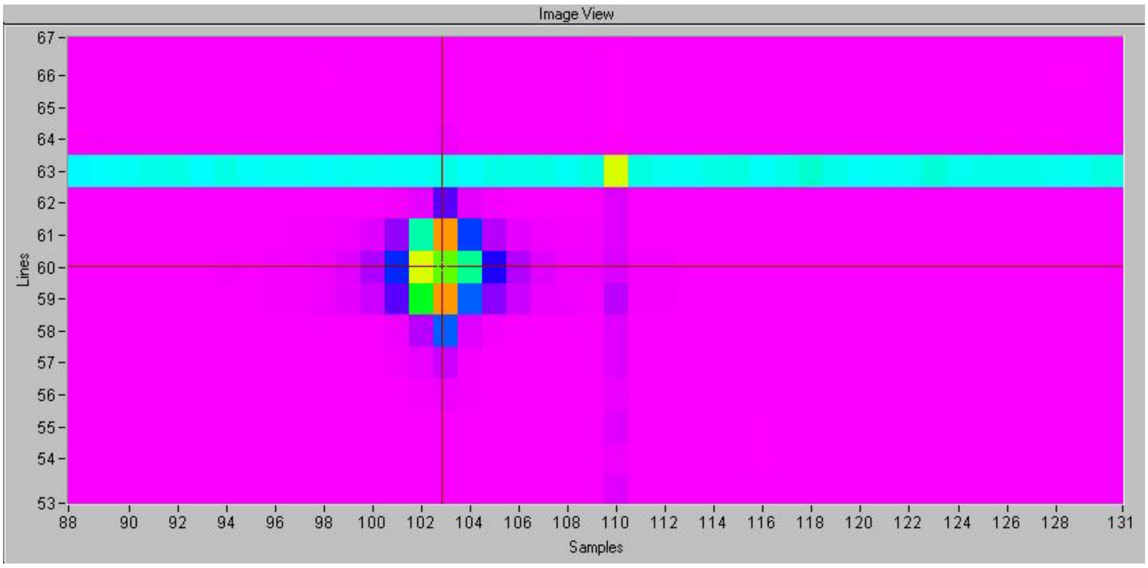


Figure 4. Venus spot on Cube F68Q630

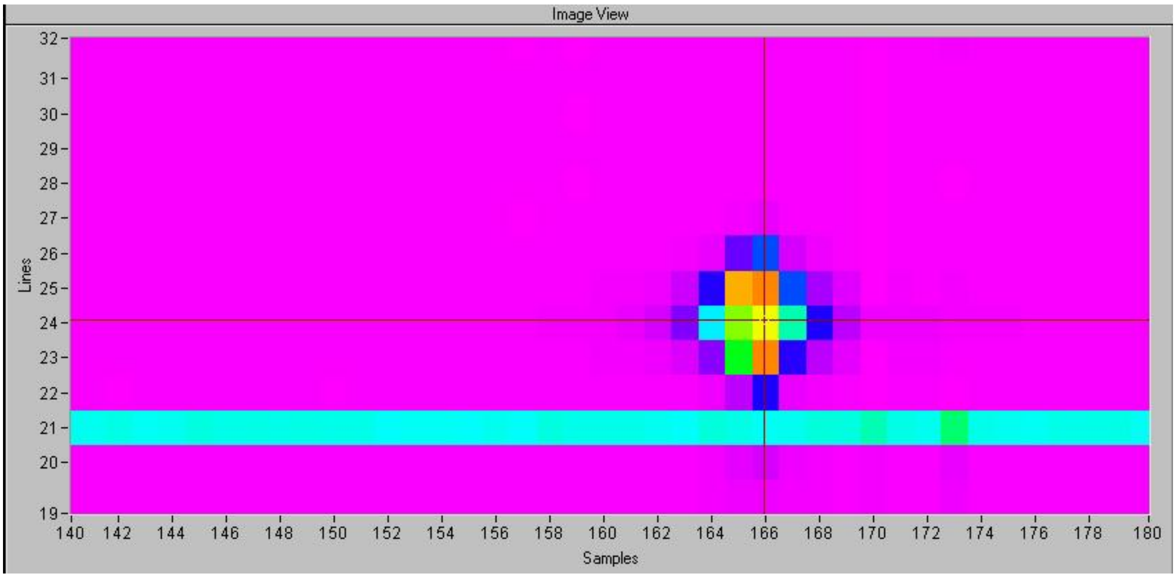


Figure 5. Venus spot on Cube F68QC25

The second cube, F68QC25, had Venus spot, shown in figure 5, centred at line 24; in this case we have to remove one single line of dark acquisition which place Venus at line 23. In terms of location along the Y axis (samples direction) we have that the Venus spot is located between samples 165 and 166

A summary of the locations in line and samples (X and Y) with the relative calculation, using the present evaluation of the V-M boresight offset in X and Y, of the delta offset between the anticipated location of Venus and the calculated one from V-M observation is reported in the next table:

| | Line | X offset (arcmin) | Venus X offset (arcmin) | ΔOffset (arcmin) |
|---|---|---|---|---|
| F68Q630 | 58 | -38.34 | -37.76 | -0.58 |
| F68QC25 | 23 | -8.26 | -7.26 | -1.00 |

| | Sample | Y offset (arcmin) | Venus Y offset (arcmin) | ΔOffset (arcmin) |
|---|---|---|---|---|
| F68Q630 | 103 | -22.785 | -23.13 | 0.345 |
| F68QC25 | 165/166 | 30.93 | 30.87 | -0.06 |

The offset still present in the calculated data and observed data (particularly along the lines direction) correspond to less than two V-M high resolution pixels and can be explained and justified by several sources of error:

1. Inaccuracy in the determination of the V-M boresight offset wrt the S/X Z axis.
2. S/C pointing error.
3. Inaccuracy in the predicted S/C kernels.

We shall perform a rerun of the analysis of the previous commissioning data to minimize the point 1 above, in the meantime we can consider the present calculation sufficiently accurate to the present need.

### 4.2 VIRTIS-H analysis

After the first image taken by V-M, the S/C started its slewing motion and VIRTIS-H began its continuous acquisition. The following data have been analyzed:

- FH6BQ615.QUB : full VIRTIS-H calibration
- FS6BQ615.QUB : calibration in nominal mod e
- FS6BQ71.QUB : dark spectra (28)
  FT6BQ71.QUB : target spectra (3520) on Venus (raster scan)

The first two give a confirmation of the nominal behaviour of VIRTIS-H : detector OK, radiometric and spectral calibration conform to expectations. We see no obvious problem with the pixel map (otherwise the FS6BQ615.QUB would be wrong).

Concerning the targeted observations, a first test over the data (FT6BQ71.QUB) shows the following:

- integration time of 5sec
- Temperature of the prism at ~140K (raising towards the end) – upper limit of the prediction
- dark level at long wavelength at ~20000 ADU
- dark level at short wavelength at ~5000 ADU

This is conform to expectations; a larger integration time could have been chosen but at the expense of a saturation of long wavelengths, and a limitation at less than 20sec was well anticipated.

The cube of target spectra looks very noisy at first approach, and data are not obviously present, but after a little processing, a source signal can be extracted.
Data processing :

1) re-interpolate the dark (due to temperature variations, there are fluctuations in the dark, much larger than the signal)
2) make a summation in wavelengths over the best sensitive area (central parts of each order): the best choice was obtained using a summation on the following spectels of –H (with all orders together, there are 3456 spectels) , in 3 ranges:
   a. 2275-2400
   b. 2650-2820
   c. 3080-3215
3) Then the integrated signal vs frame number (from 0 to 3519) (i.e. time) can be plotted.

The dominant variations are still due to the dark fluctuations, but these are slowly varying, and the signal expected from the source crossing the aperture is expected in only a few frames. There are many glitches, probably due to cosmic rays, which are easily identified, even when “clusters” affect many pixels : they are present only in one frame, the spectral shape they show is not consistent with the instrumental response (low sensitivity at the borders of the detector due to grating MTF). An extraction of the significant portion of the curve is shown in figure 6.

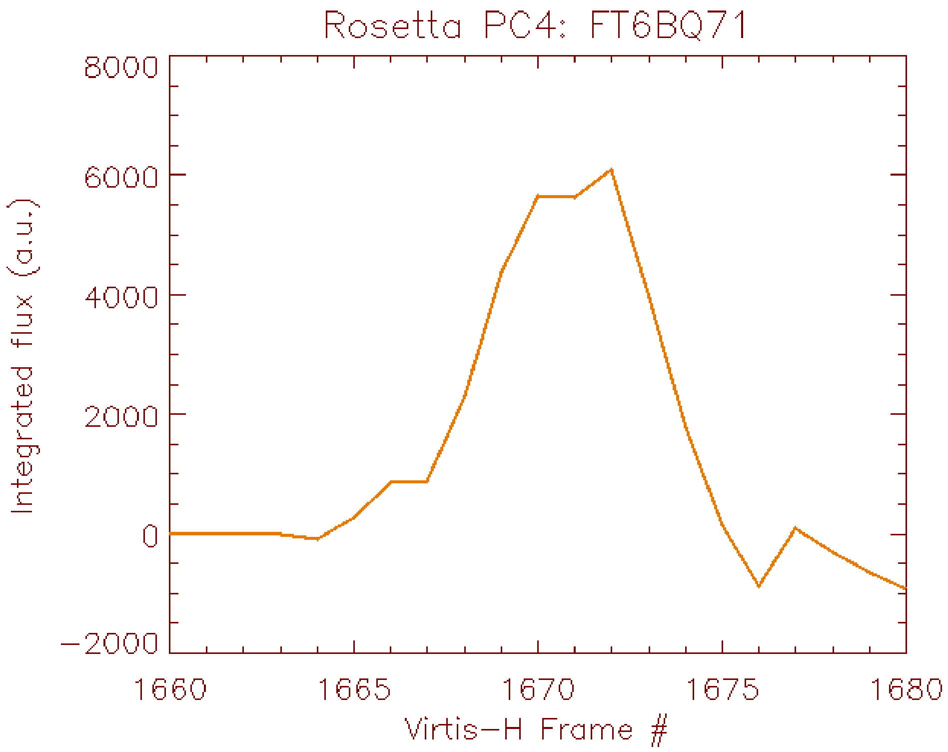


Figure 6. Integrated signal as a function of the Frame number, after processing (summation over many wavelengths to improve SNR).

The maximum of the signal is found at frame #1671. The width of the peak is of 4 frames (FWHM), from 1669 to 1673 (about 20.8 sec).

With the knowledge of the position of the source in the sequence of frame, it is possible to make a summation of the “best centred” spectra; this gives the spectrum in figure 7 (in spectel # of VIRTIS-H):

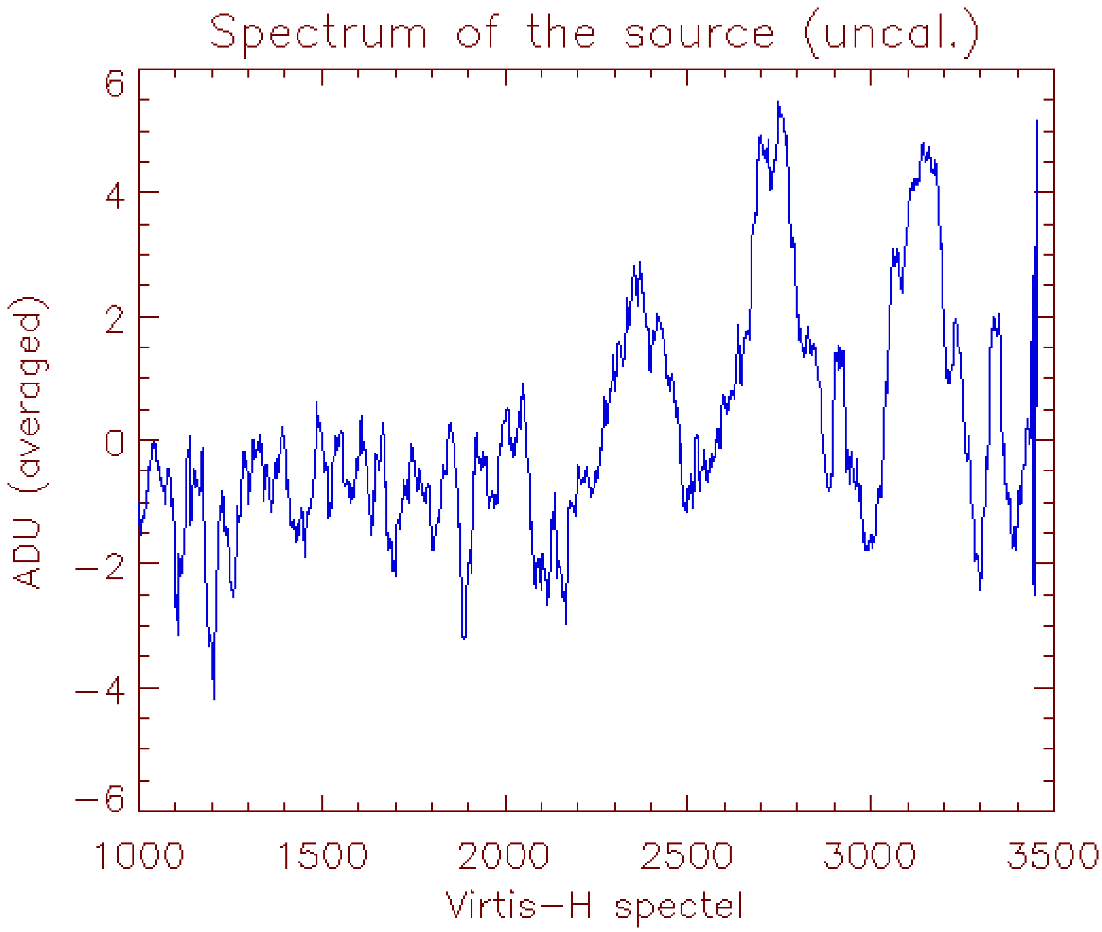


Figure 7. Venus uncalibrated spectrum observed by VIRTIS-H.

The three peaks correspond to flux in the three shortest orders of VIRTIS-H (in the range 2.1-2.5 micron). A calibration of the spectra will be tried, but obviously at this stage, no spectral feature of the source can be obtained.

As said above the FWHM of the detection is 4 frames, and the total crossing of Venus inside V-H FOV is about 10 frames, or 53sec.; from the geometry we expect an object to cross the field of view at a speed of 0.57mrad/min or 2arcsec/s, which is exactly the speed of the S/C during the raster.

According to the proposed plan (RD3) as the slit is 6arcmin long in the Y direction, while the separation between slews is 3arcmin, we would have expected to observe Venus during two consecutive slews. This is shown in figure 8 which reports the V-H slit as crossed by two subsequent slews.

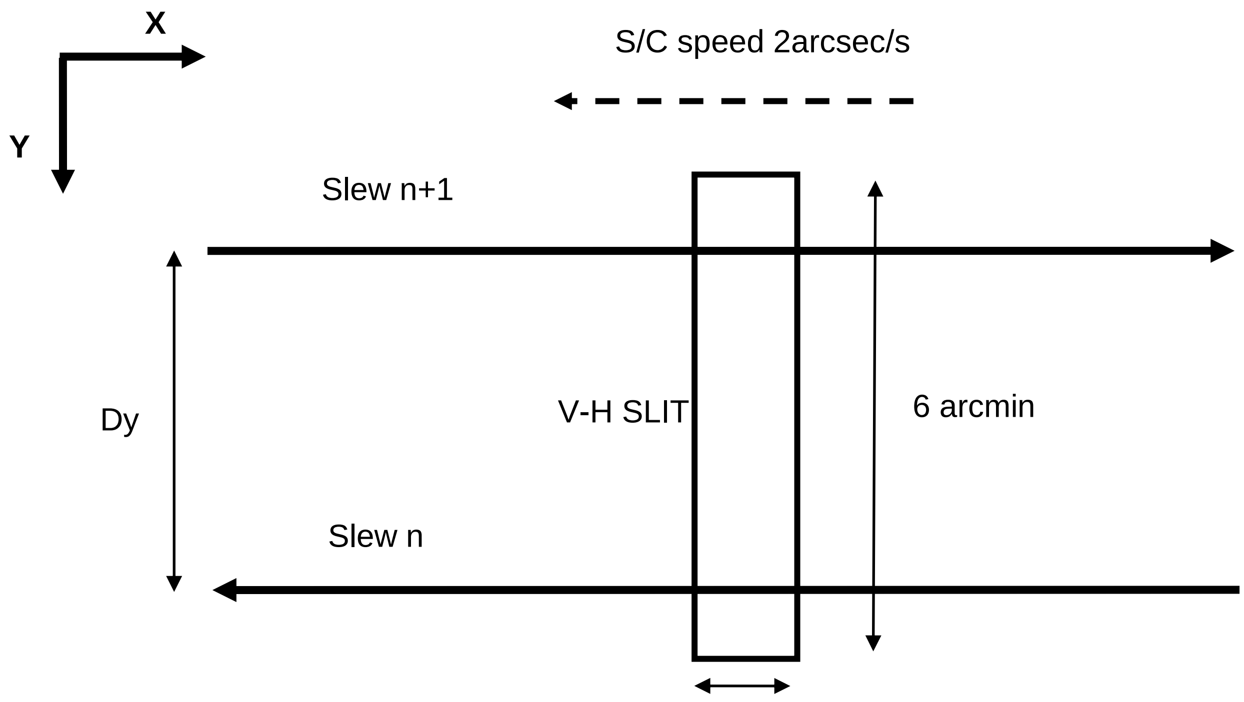


Figure 8. Diagram of the details of the V-H slit motion during the slew.

This view doesn't take into account any rotation around the Z axis of the V-H slit. As the observation was done at one of the extremes of the slews, and as we do not know the effective alignment of the slit wrt the Y axis, an even small rotation could have caused missing the target.

### 4.3 VIRTIS-H Boresight evaluation.

The most accurate estimate of the observation time as retrieved from the VIRTIS-H data analysis is **2006-11-26T09:33:38**. When we evaluate the position of Venus at this time, in the reference frame of the S/C, we get the result shown in figure 9, where the blue square marks the position of Venus at the time of V-H observation.

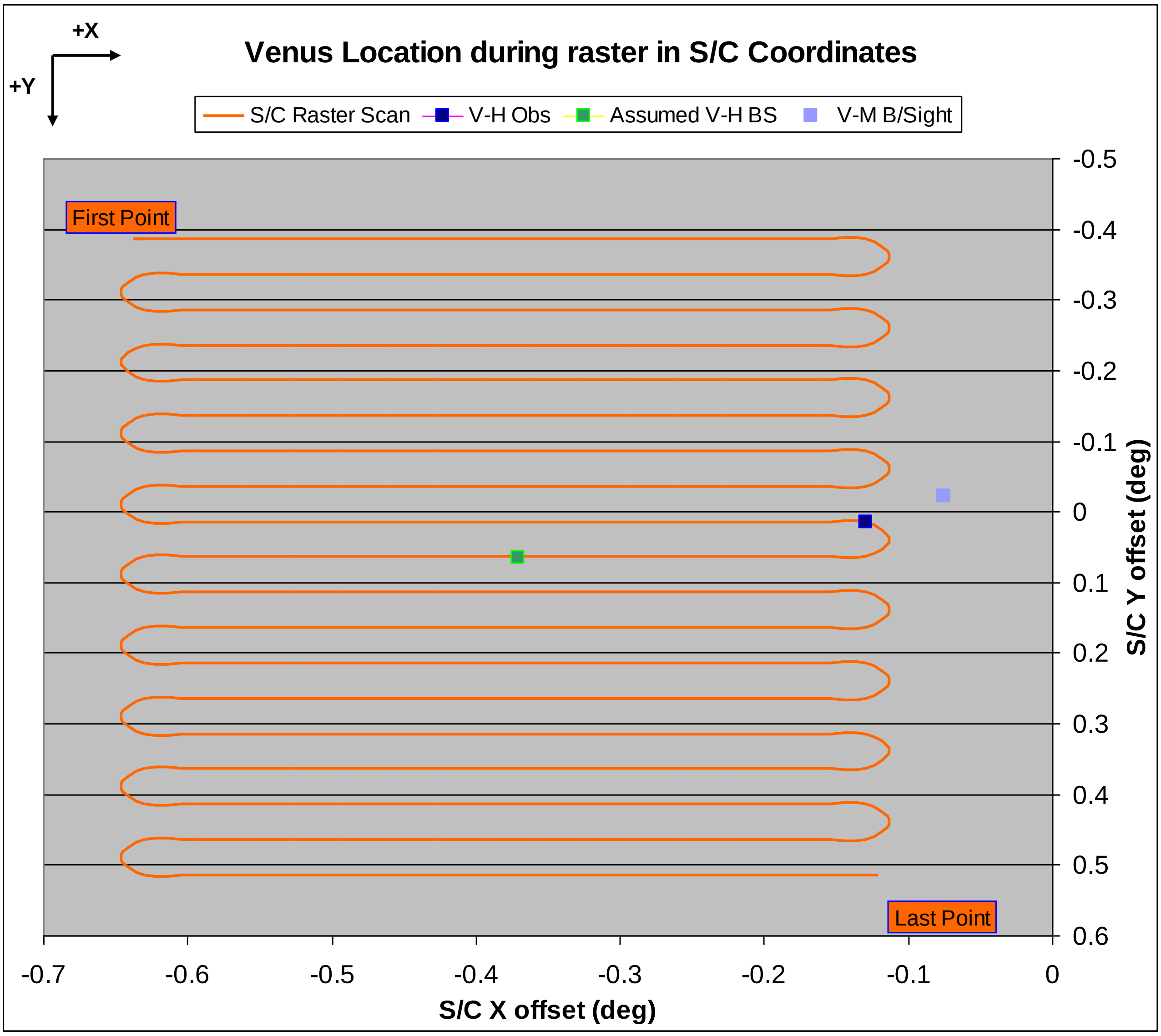


Figure 9. Venus location in the S/C frame; the figure shows also, in dark blue, the location of the Venus at the time of V-H observation.

This represent then the best possible evaluation of the V-H boresight in terms of its offset from the +Z S/C axis.

- **X = - 0.114919 degrees = - 6.9 arcmin**
- **Y = 0.02634 degrees = 1.58 arcmin**

As the target was observed only once we do not have any constraint neither on the orientation of the slit in the XY plane, nor on the error estimate in the Y direction.
This imply that the error could be fairly large, of the order of 3arcmin, in the Y direction.
On the other hand the error on the X direction is considerably smaller, of the order of 1arcmin (half the slit size in the X direction).

## 5. VR03 Results summary

This observation serves two scopes:

1- Verify the correctness of scan mirror read-out circuit. In fact, although the scanning is always performed correctly, due to an electronic offset, the readout circuit reaches saturation on one side of the scanning at about 4/5 of the full scan. See figure 10. It has been already verified that this is only a problem of the read-out H/K, the motor correctly moves to the assigned position with the required accuracy.

2- Verify alignment of VIRTIS-M slit with the S/C Y axis. It has been verified on VIRTIS-VEX that this is an important measurement which could provide information on the geometric distortion if any of the image. This verification was not performed during the ROSETTA commissioning.

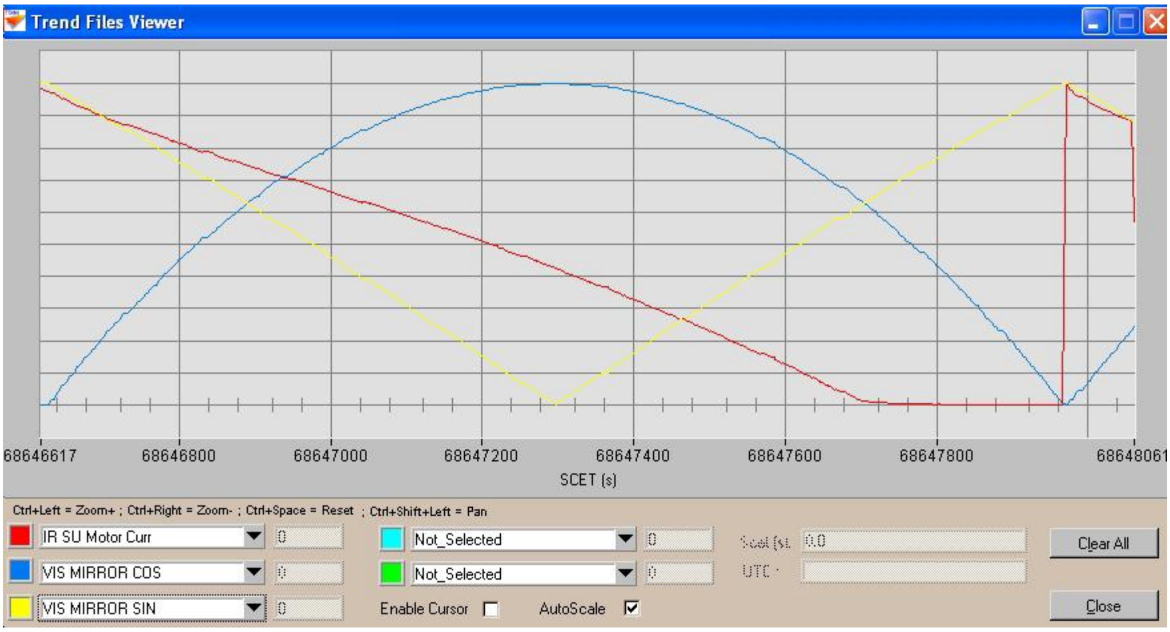


Figure 10. H/K Mirror COS (yellow), SIN (Blue) and motor current (red). It can be noticed that at about time (on the X axis) 68647700 the red curve saturates. Boresight location is at about time 68647300.

Details on the S/C motion are given in RD6 and RD8, and a sketch is reported in figure 11. The S/C pointed 6 independent location at 100arcmin (= 29mrad) in pitch (rotation around Y) and 200 arcmin (= 58mrad) in Yaw (rotation around X).
At each location in pitch a constant offset has been commanded to V-M scan mirror, to acquire a 15 lines image around the point. As the S/C pointing accuracy is much smaller than the VIRTIS-M pixel size, by measuring the shift of the centroid of the

target image along the lines we can calculate the rotation of the slit respect to the Y axis. This has been done in the full FOV, the three points in pitch, to point out any geometric distortion.

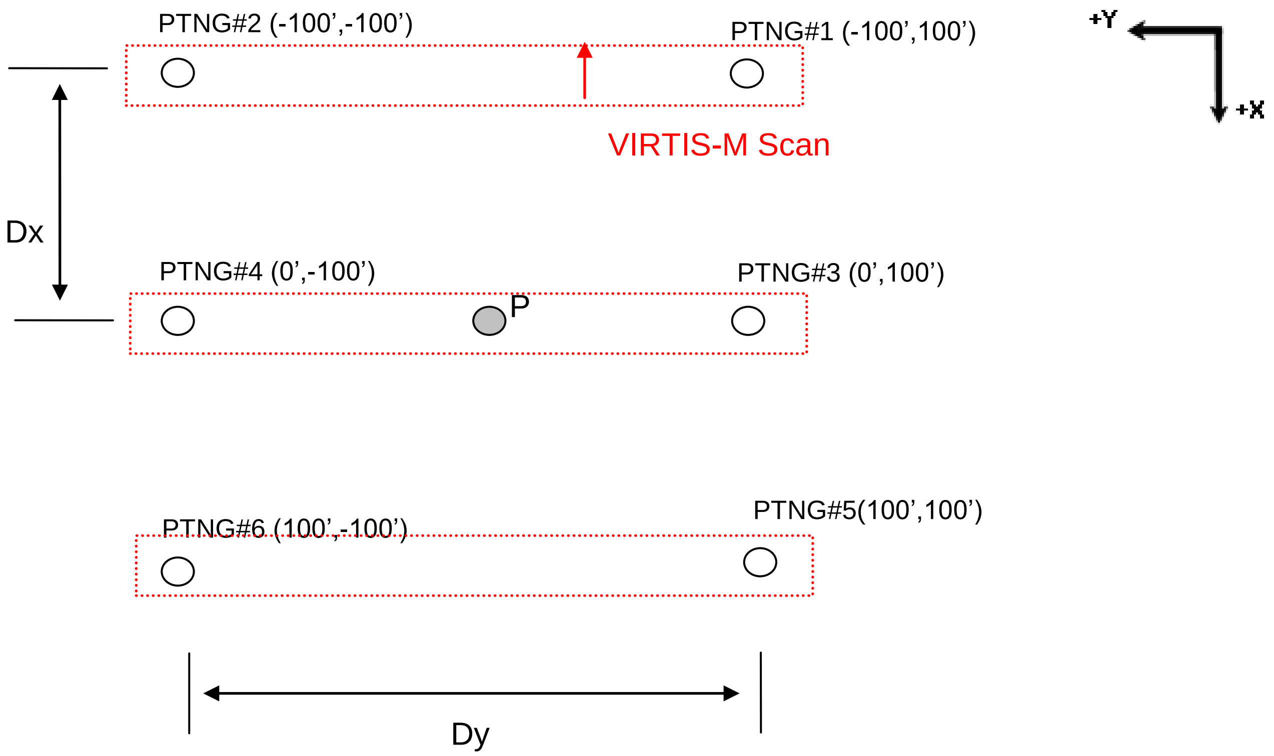


Figure 11. Diagram showing the sequence for VR03A. In red are reported the scan performed by VIRTIS-M around each location.

As for the verification of the scan mirror read-out circuit, we simply need to verify the H/K as compared to the science data content. Proper pointing by the scan mirror is verified by the presence of the target, as compared to the H/K read-out.

## 6. VR05 Results summary

Regarding VR05 analysis and results are the same shown for VR02.

# 7. Cubes Generated

## 7.1 VR02

The following cubes were acquired :

| Cube | EGSE | PDS |
|---|---|---|
| M Calibration | PV6BQ549_QUB | V1_00123141067_QUB |
| M Calibration | PI6BQ549_QUB | I1_00123141067_QUB |
| M1 | PV6BQ629_QUB | V1_00123143443_QUB |
| M2 | PI6BQ629_QUB | I1_00123143440_QUB |
| M3 | PV6BQC24_QUB | V1_00123164721_QUB |
| M4 | PI6BQC24_QUB | I1_00123164718_QUB |

Table 1 M Cubes for VR02 H Boresight Calibration

| Cube | EGSE | PDS |
|---|---|---|
| H Calibration | PH6BQ615_QUB | H1_00115473629_QUB |
| H Calibration | PS6BQ615_QUB | S1_00115473870_QUB |
| H1 | PS6BQ701_QUB | S1_00115475347_QUB |
| H2 | PT6BQ701_QUB | T1_00115475444_QUB |

Table 2 H Cubes for VR02 H Boresight Calibration

### 7.2 VR03

| Cube | EGSE | PDS |
|---|---|---|
| M1 | PV6BQG29_QUB | V1_00123179421_QUB |
| M2 | PI6BQG29_QUB | I1_00123141067_QUB |
| M3 | PV6BQG36_QUB | V1_00123179841_QUB |
| M4 | PI6BQG36_QUB | I1_00123179838_QUB |
| M5 | PV6BQG43_QUB | V1_00123180261_QUB |
| M6 | PI6BQG43_QUB | I1_00123180258_QUB |
| M7 | PV6BQG50_QUB | V1_00123180681_QUB |
| M8 | PI6BQG50_QUB | I1_00123180678_QUB |
| M9 | PV6BQG57_QUB | V1_00123181101_QUB |
| M10 | PI6BQG57_QUB | I1_00123181098_QUB |
| M11 | PV6BQH04_QUB | V1_00123181521_QUB |
| M12 | PI6BQH04_QUB | I1_00123181518_QUB |

Table 3 M Cubes for VR03 M scan mirror and slit orientation verification

### 7.3 VR05

| Cube | EGSE | PDS |
|---|---|---|
| M Calibration | PV6CA544_QUB | V1_00124350368_QUB |
| M Calibration | PI6CA544_QUB | I1_00124350368_QUB |
| M1 | PV6CA624_QUB | V1_00124352743_QUB |
| M2 | PI6CA624_QUB | I1_00124352740_QUB |
| M3 | PV6CAC19_QUB | V1_00124374021_QUB |
| M4 | PI6CAC19_QUB | I1_00124374018_QUB |

Table 4 M Cubes for VR05 H Boresight Calibration

| Cube | EGSE | PDS |
|---|---|---|
| H Calibration | PH6CA610_QUB | H1_00124351829_QUB |
| H Calibration | PS6CA610_QUB | S1_00124352071_QUB |
| H1 | PS6CA656_QUB | S1_00124354635_QUB |
| H2 | PT6CA656_QUB | T1_00124354979_QUB |

Table 5 H Cubes for VR05 H Boresight Calibration

## 8. PC04 Command History

| PC04 Command history printout from time: 2006.330.03.20.00 to time: 2006.344.16.25.00 | | | | | |
|---|---|---|---|---|---|
| | | | | | |
| **OIOR** | **TC** | **Mnemonic** | **Sequense** | **Execution Time** | |
| | | | | | |
| **VR ON** | ZDMX0047 | Define Nom/Red branch for VIRTIS | AVRF001A | 2006.330.03.20.00.000 | |
| | ZSKA8121 | START VIRTIS Power On OBCP | AVRF001A | 2006.330.03.20.10.000 | |
| | | | | | |
| | ZVR00113 | Coolers ON in Closed Loop | AVRS003A | 2006.330.03.30.00.000 | |
| | ZVR00110 | Switch PEMs ON | AVRS003A | 2006.330.03.30.10.000 | |
| | | | | | |
| | **H Boresight Calibration** | | | | |
| **VR02** | ZVR00061 | MTC_DefaultConf | AVRF005A | 2006.330.05.50.00.000 | **M Calibration** |
| | ZVR00143 | M Set Calibration DP in RAM | AVRF005A | 2006.330.05.50.01.000 | |
| | ZVR00016 | MTC_ChangeOpe_R | AVRF005A | 2006.330.05.50.02.000 | |
| | ZVR00018 | MTC_ChangeCal_R | AVRF005A | 2006.330.05.50.03.000 | |
| | ZVR00104 | Enable M Science on SSMM | AVRF005A | 2006.330.05.50.04.000 | |
| | | | | | |
| | ZVR00106 | Disable M Science on SSMM | AVRF005A | 2006.330.06.10.04.000 | |
| | | | | | |
| | ZVR00135 | H Cover Close | AVRS004A | 2006.330.06.15.00.000 | |
| | ZVR00042 | HTC_DefaultConf | AVRS004A | 2006.330.06.15.30.000 | **H Calibration** |
| | ZVR00149 | H Set Calibration DP in RAM | AVRS004A | 2006.330.06.15.31.000 | |
| | ZVR00047 | HTC_ChangeOpe_R | AVRS004A | 2006.330.06.15.32.000 | |
| | ZVR00045 | HTC_ChangeFun_R | AVRS004A | 2006.330.06.15.33.000 | |
| | ZVR00053 | HTC_ChangePix_R | AVRS004A | 2006.330.06.15.34.000 | |
| | ZVR00105 | Enable H Science on SSMM | AVRS004A | 2006.330.06.15.35.000 | |
| | | | | | |
| | ZVR00107 | Disable H Science on SSMM | AVRS004A | 2006.330.06.25.35.000 | |
| | | | | | |
| | ZVR00061 | MTC_DefaultConf | AVRF010A | 2006.330.06.30.00.000 | **M Cube M1** |

| | | | | | |
|---|---|---|---|---|---|
| | ZVR00142 | M Set Science DP in RAM | AVRF010A | 2006.330.06.30.01.000 | |
| | ZVR00016 | MTC_ChangeOpe_R | AVRF010A | 2006.330.06.30.02.000 | |
| | ZVR00014 | MTC_ChangeFun_R | AVRF010A | 2006.330.06.30.03.000 | |
| | ZVR00020 | MTC_ChangeAlt_R | AVRF010A | 2006.330.06.30.04.000 | |
| | ZVR00104 | Enable M Science on SSMM | AVRF010A | 2006.330.06.30.05.000 | |
| | | | | | |
| | ZVR00106 | Disable M Science on SSMM | AVRF009A | 2006.330.07.00.00.000 | |
| | | | | | |
| | ZVR00042 | HTC_DefaultConf | AVRS005A | 2006.330.07.01.00.000 | **H Cube H1** |
| | ZVR00134 | H Cover Open | AVRS005A | 2006.330.07.01.01.000 | |
| | ZVR00148 | H Set Nom Observation DP in RAM | AVRS005A | 2006.330.07.01.31.000 | |
| | ZVR00045 | HTC_ChangeFun_R | AVRS005A | 2006.330.07.01.32.000 | |
| | ZVR00047 | HTC_ChangeOpe_R | AVRS005A | 2006.330.07.01.33.000 | |
| | ZVR00053 | HTC_ChangePix_R | AVRS005A | 2006.330.07.01.34.000 | |
| | ZVR00105 | Enable H Science on SSMM | AVRS005A | 2006.330.07.01.35.000 | |
| | | | | | |
| | ZVR00107 | Disable H Science on SSMM | AVRF009B | 2006.330.12.23.00.000 | |
| | | | | | |
| | ZVR00061 | MTC_DefaultConf | AVRF010A | 2006.330.12.25.00.000 | **M Cube M2** |
| | ZVR00142 | M Set Science DP in RAM | AVRF010A | 2006.330.12.25.01.000 | |
| | ZVR00016 | MTC_ChangeOpe_R | AVRF010A | 2006.330.12.25.02.000 | |
| | ZVR00014 | MTC_ChangeFun_R | AVRF010A | 2006.330.12.25.03.000 | |
| | ZVR00020 | MTC_ChangeAlt_R | AVRF010A | 2006.330.12.25.04.000 | |
| | ZVR00104 | Enable M Science on SSMM | AVRF010A | 2006.330.12.25.05.000 | |
| | | | | | |
| | ZVR00106 | Disable M Science on SSMM | AVRF009A | 2006.330.12.55.00.000 | |
| | | | | | |
| **M scan mirror and slit orientation verification** | | | | | |
| **VR03** | ZVR00061 | MTC_DefaultConf | AVRF010A | 2006.330.16.30.00.000 | **M Cube M1** |
| | ZVR00142 | M Set Science DP in RAM | AVRF010A | 2006.330.16.30.01.000 | |
| | ZVR00016 | MTC_ChangeOpe_R | AVRF010A | 2006.330.16.30.02.000 | |
| | ZVR00014 | MTC_ChangeFun_R | AVRF010A | 2006.330.16.30.03.000 | |
| | ZVR00020 | MTC_ChangeAlt_R | AVRF010A | 2006.330.16.30.04.000 | |
| | ZVR00104 | Enable M Science on SSMM | AVRF010A | 2006.330.16.30.05.000 | |
| | | | | | |
| | ZVR00106 | Disable M Science on SSMM | AVRF009A | 2006.330.16.35.00.000 | |
| | | | | | |
| | ZVR00061 | MTC_DefaultConf | AVRF010A | 2006.330.16.37.00.000 | **M Cube M2** |
| | ZVR00142 | M Set Science DP in RAM | AVRF010A | 2006.330.16.37.01.000 | |

| | | | | | |
|---|---|---|---|---|---|
| | ZVR00016 | MTC_ChangeOpe_R | AVRF010A | 2006.330.16.37.02.000 | |
| | ZVR00014 | MTC_ChangeFun_R | AVRF010A | 2006.330.16.37.03.000 | |
| | ZVR00020 | MTC_ChangeAlt_R | AVRF010A | 2006.330.16.37.04.000 | |
| | ZVR00104 | Enable M Science on SSMM | AVRF010A | 2006.330.16.37.05.000 | |
| | | | | | |
| | ZVR00106 | Disable M Science on SSMM | AVRF009A | 2006.330.16.42.00.000 | |
| | | | | | |
| | ZVR00061 | MTC_DefaultConf | AVRF010A | 2006.330.16.44.00.000 | **M Cube M3** |
| | ZVR00142 | M Set Science DP in RAM | AVRF010A | 2006.330.16.44.01.000 | |
| | ZVR00016 | MTC_ChangeOpe_R | AVRF010A | 2006.330.16.44.02.000 | |
| | ZVR00014 | MTC_ChangeFun_R | AVRF010A | 2006.330.16.44.03.000 | |
| | ZVR00020 | MTC_ChangeAlt_R | AVRF010A | 2006.330.16.44.04.000 | |
| | ZVR00104 | Enable M Science on SSMM | AVRF010A | 2006.330.16.44.05.000 | |
| | | | | | |
| | ZVR00106 | Disable M Science on SSMM | AVRF009A | 2006.330.16.49.00.000 | |
| | | | | | |
| | ZVR00061 | MTC_DefaultConf | AVRF010A | 2006.330.16.51.00.000 | **M Cube M4** |
| | ZVR00142 | M Set Science DP in RAM | AVRF010A | 2006.330.16.51.01.000 | |
| | ZVR00016 | MTC_ChangeOpe_R | AVRF010A | 2006.330.16.51.02.000 | |
| | ZVR00014 | MTC_ChangeFun_R | AVRF010A | 2006.330.16.51.03.000 | |
| | ZVR00020 | MTC_ChangeAlt_R | AVRF010A | 2006.330.16.51.04.000 | |
| | ZVR00104 | Enable M Science on SSMM | AVRF010A | 2006.330.16.51.05.000 | |
| | | | | | |
| | ZVR00106 | Disable M Science on SSMM | AVRF009A | 2006.330.16.56.00.000 | |
| | | | | | |
| | ZVR00061 | MTC_DefaultConf | AVRF010A | 2006.330.16.58.00.000 | **M Cube M5** |
| | ZVR00142 | M Set Science DP in RAM | AVRF010A | 2006.330.16.58.01.000 | |
| | ZVR00016 | MTC_ChangeOpe_R | AVRF010A | 2006.330.16.58.02.000 | |
| | ZVR00014 | MTC_ChangeFun_R | AVRF010A | 2006.330.16.58.03.000 | |
| | ZVR00020 | MTC_ChangeAlt_R | AVRF010A | 2006.330.16.58.04.000 | |
| | ZVR00104 | Enable M Science on SSMM | AVRF010A | 2006.330.16.58.05.000 | |
| | | | | | |
| | ZVR00106 | Disable M Science on SSMM | AVRF009A | 2006.330.17.03.00.000 | |
| | | | | | |
| | ZVR00061 | MTC_DefaultConf | AVRF010A | 2006.330.17.05.00.000 | **M Cube M6** |
| | ZVR00142 | M Set Science DP in RAM | AVRF010A | 2006.330.17.05.01.000 | |
| | ZVR00016 | MTC_ChangeOpe_R | AVRF010A | 2006.330.17.05.02.000 | |
| | ZVR00014 | MTC_ChangeFun_R | AVRF010A | 2006.330.17.05.03.000 | |
| | ZVR00020 | MTC_ChangeAlt_R | AVRF010A | 2006.330.17.05.04.000 | |

| | | | | | |
|---|---|---|---|---|---|
| | ZVR00104 | Enable M Science on SSMM | AVRF010A | 2006.330.17.05.05.000 | |
| | | | | | |
| | ZVR00106 | Disable M Science on SSMM | AVRF009A | 2006.330.17.10.00.000 | |
| | | | | | |
| | ZDM10144 | SSMM-Stop Write Operation from User | AVRF016A | 2006.330.17.30.00.000 | |
| VR OFF | | | | | |
| | ZVR00124 | M Cover Close | AVRF004C | 2006.330.17.32.00.000 | |
| | ZVR00135 | H Cover Close | AVRF004C | 2006.330.17.34.00.000 | |
| | ZVR00111 | Switch PEMs OFF | AVRF004C | 2006.330.17.36.00.000 | |
| | ZVR00115 | Coolers OFF | AVRF004C | 2006.330.17.37.30.000 | |
| | | | | | |
| | ZDMX0224 | Stop Time Update to VIRTIS 51 | AVRF004D | 2006.330.17.37.30.000 | |
| | ZVR00037 | VTC_EnterSafe | AVRF004D | 2006.330.17.37.40.000 | |
| | ZDMX0213 | Send Time to VIRTIS 51 | AVRF004D | 2006.330.17.38.10.000 | |
| | ZSKA8122 | START VIRTIS Power Off OBCP | AVRF006A | 2006.330.17.40.00.000 | |
| | | | | | |
| VR ON | ZDMX0047 | Define Nom/Red branch for VIRTIS | AVRF001A | 2006.344.02.35.00.000 | |
| | ZSKA8121 | START VIRTIS Power On OBCP | AVRF001A | 2006.344.02.35.10.000 | |
| | | | | | |
| | ZVR00113 | Coolers ON in Closed Loop | AVRS003A | 2006.344.02.45.00.000 | |
| | ZVR00110 | Switch PEMs ON | AVRS003A | 2006.344.02.45.10.000 | |
| | | | | | |
| | **H Boresight Calibration** | | | | |
| VR05 | ZVR00061 | MTC_DefaultConf | AVRF005A | 2006.344.05.45.00.000 | **M Calibration** |
| | ZVR00143 | M Set Calibration DP in RAM | AVRF005A | 2006.344.05.45.01.000 | |
| | ZVR00016 | MTC_ChangeOpe_R | AVRF005A | 2006.344.05.45.02.000 | |
| | ZVR00018 | MTC_ChangeCal_R | AVRF005A | 2006.344.05.45.03.000 | |
| | ZVR00104 | Enable M Science on SSMM | AVRF005A | 2006.344.05.45.04.000 | |
| | | | | | |
| | ZVR00106 | Disable M Science on SSMM | AVRF005A | 2006.344.06.05.04.000 | |
| | | | | | |
| | ZVR00135 | H Cover Close | AVRS004A | 2006.344.06.10.00.000 | |
| | ZVR00042 | HTC_DefaultConf | AVRS004A | 2006.344.06.10.30.000 | **H Calibration** |
| | ZVR00149 | H Set Calibration DP in RAM | AVRS004A | 2006.344.06.10.31.000 | |
| | ZVR00047 | HTC_ChangeOpe_R | AVRS004A | 2006.344.06.10.32.000 | |
| | ZVR00045 | HTC_ChangeFun_R | AVRS004A | 2006.344.06.10.33.000 | |
| | ZVR00053 | HTC_ChangePix_R | AVRS004A | 2006.344.06.10.34.000 | |
| | ZVR00105 | Enable H Science on SSMM | AVRS004A | 2006.344.06.10.35.000 | |
| | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| | ZVR00107 | Disable H Science on SSMM | AVRS004A | 2006.344.06.20.35.000 | |
| | | | | | |
| | ZVR00061 | MTC_DefaultConf | AVRF010A | 2006.344.06.25.00.000 | **M Cube M1** |
| | ZVR00142 | M Set Science DP in RAM | AVRF010A | 2006.344.06.25.01.000 | |
| | ZVR00016 | MTC_ChangeOpe_R | AVRF010A | 2006.344.06.25.02.000 | |
| | ZVR00014 | MTC_ChangeFun_R | AVRF010A | 2006.344.06.25.03.000 | |
| | ZVR00020 | MTC_ChangeAlt_R | AVRF010A | 2006.344.06.25.04.000 | |
| | ZVR00104 | Enable M Science on SSMM | AVRF010A | 2006.344.06.25.05.000 | |
| | | | | | |
| | ZVR00106 | Disable M Science on SSMM | AVRF009A | 2006.344.06.55.00.000 | |
| | | | | | |
| | ZVR00042 | HTC_DefaultConf | AVRS005A | 2006.344.06.56.00.000 | **H Cube H1** |
| | ZVR00134 | H Cover Open | AVRS005A | 2006.344.06.56.01.000 | |
| | ZVR00148 | H Set Nom Observation DP in RAM | AVRS005A | 2006.344.06.56.31.000 | |
| | ZVR00045 | HTC_ChangeFun_R | AVRS005A | 2006.344.06.56.32.000 | |
| | ZVR00047 | HTC_ChangeOpe_R | AVRS005A | 2006.344.06.56.33.000 | |
| | ZVR00053 | HTC_ChangePix_R | AVRS005A | 2006.344.06.56.34.000 | |
| | ZVR00105 | Enable H Science on SSMM | AVRS005A | 2006.344.06.56.35.000 | |
| | | | | | |
| | ZVR00107 | Disable H Science on SSMM | AVRF009B | 2006.344.12.18.00.000 | |
| | | | | | |
| | ZVR00061 | MTC_DefaultConf | AVRF010A | 2006.344.12.20.00.000 | **M Cube M2** |
| | ZVR00142 | M Set Science DP in RAM | AVRF010A | 2006.344.12.20.01.000 | |
| | ZVR00016 | MTC_ChangeOpe_R | AVRF010A | 2006.344.12.20.02.000 | |
| | ZVR00014 | MTC_ChangeFun_R | AVRF010A | 2006.344.12.20.03.000 | |
| | ZVR00020 | MTC_ChangeAlt_R | AVRF010A | 2006.344.12.20.04.000 | |
| | ZVR00104 | Enable M Science on SSMM | AVRF010A | 2006.344.12.20.05.000 | |
| | | | | | |
| | ZVR00106 | Disable M Science on SSMM | AVRF009A | 2006.344.12.50.00.000 | |
| | | | | | |
| | ZDM10144 | SSMM-Stop Write Operation from User | AVRF016A | 2006.344.16.15.00.000 | |
| **VR OFF** | | | | | |
| | ZVR00124 | M Cover Close | AVRF004C | 2006.344.16.17.00.000 | |
| | ZVR00135 | H Cover Close | AVRF004C | 2006.344.16.19.00.000 | |
| | ZVR00111 | Switch PEMs OFF | AVRF004C | 2006.344.16.21.00.000 | |
| | ZVR00115 | Coolers OFF | AVRF004C | 2006.344.16.22.30.000 | |
| | | | | | |
| | ZDMX0224 | Stop Time Update to VIRTIS 51 | AVRF004D | 2006.344.16.22.30.000 | |
| | ZVR00037 | VTC_EnterSafe | AVRF004D | 2006.344.16.22.40.000 | |

| | | | | | |
|---|---|---|---|---|---|
| | ZDMX0213 | Send Time to VIRTIS 51 | AVRF004D | 2006.344.16.23.10.000 | |
| | ZSKA8122 | START VIRTIS Power Off OBCP | AVRF006A | 2006.344.16.25.00.000 | |

Table 6 VIRTIS Active Payload 04 Observation Sequence

## 9. VR02 Parameter List

| | VR02 H Boresight Calibration | | | | |
|---|---|---|---|---|---|
| | | | | | |
| **Parameter List** | | **M1** | | **M2** | |
| | | | | | |
| M_ERT | Repetition Time | 1 | 20 sec | 1 | 20 sec |
| M_ACQ_MODE | Acquisition Mode | 5 | All pix full window | 5 | All pix full window |
| M_COMP_MODE | Compression | 1 | Lossless compression | 1 | Lossless compression |
| M_IR_EXPO | IR Exposure | 100 | 10 sec | 100 | 10 sec |
| M_CCD_EXPO | CCD Exposure | 130 | 13 sec | 130 | 13 sec |
| M_IR_WIN_Y1 | Start Spatial Pixel | 7 | | 7 | |
| M_IR_WIN_Y2 | Stop Spatial Pixel | 262 | | 262 | |
| M_CCD_WIN_Y1 | Start Spatial Pixel | 0 | | 0 | |
| M_CCD_WIN_Y2 | Stop Spatial Pixel | 255 | | 255 | |
| M_SU_MODE | Mirror Mode | 1 | scan | 1 | scan |
| M_Alpha_first | Start Angle | 28447 | 80 slices around | 28447 | 80 slices around |
| M_Alpha_last | Stop Angle | 46307 | H Boresight | 46307 | H Boresight |
| M_D_BCK_RATE | Dark Rate | ----- | | ----- | |
| Expected duration (sec) | | | 1800 | | 1800 |
| Expected Number of Science Lines | | | 85 | | 85 |
| Expected Number of Dark | | | 5 | | 5 |
| Expected Data Volume (kbit) | | | 150000 | | 150000 |
| | | | | | |

Table 7.1 M Cube Parameters for VR02 H Boresight Calibration

| | VR02 H Boresight Calibration | | |
|---|---|---|---|
| | | | |
| **Parameter List** | | **H1** | |
| | | | |
| H_DPT | Data Production Mode | 0 | Nominal |
| H_int_Science | Integration Time | 550 | 5 sec |
| H_Sum | Frame Summing | 0 | NO |
| H_NR_Frame | Number of Frames | 1 | |
| H_DARK_RATE | Dark Rate | 128 | |
| H_Comp | Compression | 1 | Lossless |
| Expected duration (sec) | | | 19320 |
| Expected Number of Image Slices | | | 0 |
| Expected Number of Spectral Slices | | | 56 |
| Expected Number of Dark | | | 28 |
| Expected Data Volume (kbit) | | | 100000 |
| | | | |

Table 7.2 H Cube Parameters for VR02 H Boresight Calibration

## 10. VR03 Parameter List

| | VR03 M scan mirror and slit orientation verification | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| **Parameter List** | | **M1** | | **M2** | | **M3** | |
| | | | | | | | |
| M_ERT | Repetition Time | 1 | 20 sec | 1 | 20 sec | 1 | 20 sec |
| M_ACQ_MODE | Acquisition Mode | 5 | All pix full window | 5 | All pix full window | 5 | All pix full window |
| M_COMP_MODE | Compression | 1 | Lossless compression | 1 | Lossless compression | 1 | Lossless compression |
| M_IR_EXPO | IR Exposure | 100 | 10 sec | 100 | 10 sec | 100 | 10 sec |
| M_CCD_EXPO | CCD Exposure | 130 | 13 sec | 130 | 13 sec | 130 | 13 sec |
| M_IR_WIN_Y1 | Start Spatial Pixel | 7 | | 7 | | 7 | |
| M_IR_WIN_Y2 | Stop Spatial Pixel | 262 | | 262 | | 262 | |
| M_CCD_WIN_Y1 | Start Spatial Pixel | 0 | | 0 | | 0 | |
| M_CCD_WIN_Y2 | Stop Spatial Pixel | 255 | | 255 | | 255 | |
| M_SU_MODE | Mirror Mode | 1 | scan | 1 | scan | 1 | scan |
| M_Alpha_first | Start Angle | 2687 | 15 slices around ???? | 2687 | 15 slices around ???? | 29712 | 15 slices around Z Axis |
| M_Alpha_last | Stop Angle | 5977 | | 5977 | | 33002 | |
| M_D_BCK_RATE | Dark Rate | ----- | | ----- | | ----- | |
| Expected duration (sec) | | | 300 | | 300 | | 300 |
| Expected Number of Science Lines | | | 14 | | 14 | | 14 |
| Expected Number of Dark | | | 1 | | 1 | | 1 |
| Expected Data Volume (kbit) | | | 25000 | | 25000 | | 25000 |
| | | | | | | | |

Table 8.1 M Cube Parameters for VR03 M scan mirror and slit orientation verification

| | VR03 M scan mirror and slit orientation verification | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| **Parameter List** | | **M4** | | **M5** | | **M6** | |
| | | | | | | | |
| M_ERT | Repetition Time | 1 | 20 sec | 1 | 20 sec | 1 | 20 sec |
| M_ACQ_MODE | Acquisition Mode | 5 | All pix full window | 5 | All pix full window | 5 | All pix full window |
| M_COMP_MODE | Compression | 1 | Lossless compression | 1 | Lossless compression | 1 | Lossless compression |
| M_IR_EXPO | IR Exposure | 100 | 10 sec | 100 | 10 sec | 100 | 10 sec |
| M_CCD_EXPO | CCD Exposure | 130 | 13 sec | 130 | 13 sec | 130 | 13 sec |
| M_IR_WIN_Y1 | Start Spatial Pixel | 7 | | 7 | | 7 | |
| M_IR_WIN_Y2 | Stop Spatial Pixel | 262 | | 262 | | 262 | |
| M_CCD_WIN_Y1 | Start Spatial Pixel | 0 | | 0 | | 0 | |
| M_CCD_WIN_Y2 | Stop Spatial Pixel | 255 | | 255 | | 255 | |
| M_SU_MODE | Mirror Mode | 1 | scan | 1 | scan | 1 | scan |
| M_Alpha_first | Start Angle | 29712 | 15 slices around Z Axis | 57207 | 15 slices around ???? | 57207 | 15 slices around ???? |
| M_Alpha_last | Stop Angle | 33002 | | 60497 | | 60497 | |
| M_D_BCK_RATE | Dark Rate | ----- | | ----- | | ----- | |
| Expected duration (sec) | | | 300 | | 300 | | 300 |
| Expected Number of Science Lines | | | 14 | | 14 | | 14 |
| Expected Number of Dark | | | 1 | | 1 | | 1 |
| Expected Data Volume (kbit) | | | 25000 | | 25000 | | 25000 |
| | | | | | | | |

Table 8.2 M Cube Parameters for VR03 M scan mirror and slit orientation verification

## 11. VR05 Parameter List

| | VR05 H Boresight Calibration | | | | |
|---|---|---|---|---|---|
| | | | | | |
| **Parameter List** | | **M1** | | **M2** | |
| | | | | | |
| M_ERT | Repetition Time | 1 | 20 sec | 1 | 20 sec |
| M_ACQ_MODE | Acquisition Mode | 5 | All pix full window | 5 | All pix full window |
| M_COMP_MODE | Compression | 1 | Lossless compression | 1 | Lossless compression |
| M_IR_EXPO | IR Exposure | 100 | 10 sec | 100 | 10 sec |
| M_CCD_EXPO | CCD Exposure | 130 | 13 sec | 130 | 13 sec |
| M_IR_WIN_Y1 | Start Spatial Pixel | 7 | | 7 | |
| M_IR_WIN_Y2 | Stop Spatial Pixel | 262 | | 262 | |
| M_CCD_WIN_Y1 | Start Spatial Pixel | 0 | | 0 | |
| M_CCD_WIN_Y2 | Stop Spatial Pixel | 255 | | 255 | |
| M_SU_MODE | Mirror Mode | 1 | scan | 1 | scan |
| M_Alpha_first | Start Angle | 28447 | 80 slices around | 28447 | 80 slices around |
| M_Alpha_last | Stop Angle | 46307 | H Boresight | 46307 | H Boresight |
| M_D_BCK_RATE | Dark Rate | ----- | | ----- | |
| Expected duration (sec) | | | 1800 | | 1800 |
| Expected Number of Science Lines | | | 85 | | 85 |
| Expected Number of Dark | | | 5 | | 5 |
| Expected Data Volume (kbit) | | | 150000 | | 150000 |
| | | | | | |

Table 9.1 M Cube Parameters for VR05 H Boresight Calibration

| | VR05 H Boresight Calibration | | |
|---|---|---|---|
| | | | |
| **Parameter List** | | **H1** | |
| | | | |
| H_DPT | Data Production Mode | 0 | Nominal |
| H_int_Science | Integration Time | 550 | 5 sec |
| H_Sum | Frame Summing | 0 | NO |
| H_NR_Frame | Number of Frames | 1 | |
| H_DARK_RATE | Dark Rate | 128 | |
| H_Comp | Compression | 1 | Lossless |
| Expected duration (sec) | | | 19320 |
| Expected Number of Image Slices | | | 0 |
| Expected Number of Spectral Slices | | | 56 |
| Expected Number of Dark | | | 28 |
| Expected Data Volume (kbit) | | | 100000 |
| | | | |

Table 9.2 H Cube Parameters for VR05 H Boresight Calibration

## 12. VIRTIS OIOR VR02

```
# $Log: OIOR_PIIRSO_D_0006_VR_02____.ITL,v $
# Revision 1.5  2006/10/16 05:56:59  vdhiri
# Mode corrections from VR.
#
# Revision 1.4  2006/10/11 12:38:15  vdhiri
# Updates to timing and parameters by VR team.
#
# Revision 1.3  2006/09/26 15:11:45  vdhiri
# RSOC: Changed Ref Date only for allow some checks. Date can be arbitrary.
#
# Revision 1.2  2006/08/28 08:12:39  vdhiri
# RSOC Corrections
#
# Revision 1.1  2006/08/25 10:56:34  vdhiri
# Initial inputs from VR. Filename updated for consistency.
#
#=========================================================================================#
# Filename:        OIOR_ PIIRSO_D_0006_VR_02_.ROS
# Type:            Input Timeline file
#
# Description:     VIRTIS VR02 H Boresight Calibration
#
#                  name:     RSOC - Viney Dhiri
#                  email:    rsoc@rssd.esa.int
#
#                  name: Virtis team - Fabrizio Capaccioni
#                  email:    fabrizio.capaccioni@iasf-roma.inaf.it
#
# Date:            25 July 2006
#
#
#=========================================================================================#

Version: 00002

#Init_mode: VIRTIS IDLE

Ref_date:  25-aug-2006

Start_time:  -000_00:40:00
End_time:    000_06:25:00
#=========================================================================================#
Description: "VR02 H Boresight Calibration"
#=========================================================================================#


-000_00:40:00    VIRTIS    IDLE    AVRF005A           # VIRTIS-M Calibration
-000_00:15:00    VIRTIS    IDLE    AVRS004A( \        # VIRTIS-H Calibration
                                   VVRG0093 = 929 \ # Telescope Cal Int. time=1s
                                   VVRG0094 = 1   \   #
                                   VVRG0097 = 929 \ # Radiometric Cal Int. time=1s
                                   VVRG0098 = 1   \
                                   VVRG0179 = 0x421E87E2    \        # H_Pix_Map_C11
                                   VVRG0180 = 0x3E00FA15 \  # H_Pix_Map_C12
                                   VVRG0181 = 0x38BC3DCC    \        # H_Pix_Map_C13
                                   VVRG0182 = 0x42B9C019    \        # H_Pix_Map_C21
                                   VVRG0183 = 0x3DC985C7    \        # H_Pix_Map_C22
                                   VVRG0184 = 0x387DD8E4    \        # H_Pix_Map_C23
                                   VVRG0185 = 0x43010418    \        # H_Pix_Map_C31
                                   VVRG0186 = 0x3D9EA323    \        # H_Pix_Map_C32
```

```
                                                       VVRG0187 = 0x38290589    \         # H_Pix_Map_C33
                                                       VVRG0188 = 0x43194CCC    \         # H_Pix_Map_C41
                                                       VVRG0189 = 0x3D9329F8    \         # H_Pix_Map_C42
                                                       VVRG0190 = 0x3773EE3E    \         # H_Pix_Map_C43
                                                       VVRG0191 = 0x432BE624 \  # H_Pix_Map_C51
                                                       VVRG0192 = 0x3D73B695    \         # H_Pix_Map_C52
                                                       VVRG0193 = 0x3716EDFF    \         # H_Pix_Map_C53
                                                       VVRG0194 = 0x4339DA1C    \         # H_Pix_Map_C61
                                                       VVRG0195 = 0x3D49E251    \         # H_Pix_Map_C62
                                                       VVRG0196 = 0x371AA135    \         # H_Pix_Map_C63
                                                       VVRG0197 = 0x43459EB7    \         # H_Pix_Map_C71
                                                       VVRG0198 = 0x3D104A64    \         # H_Pix_Map_C72
                                                       VVRG0199 = 0x37AD1197    \         # H_Pix_Map_C73
                                                       VVRG0200 = 0x434DEF9D    \         # H_Pix_Map_C81
                                                       VVRG0201 = 0x3CF4F9DC    \         # H_Pix_Map_C82
                                                       VVRG0202 = 0x37B67469    )         # H_Pix_Map_C83
#
# Data Volume of the above 145 Mbits = 18.125 MBytes
#

000_00:00:00    VIRTIS      IDLE       AVRF010A( \              # VIRTIS Start-M Nominal Science
                                       VVRG0051 = 1 \    # M_ERT          (repetition time 20s)
                                       VVRG0053 = 5 \    # M_ACQ_MODE     (All pix full window)
                                       VVRG0054 = 1 \    # lossless compression
                                       VVRG0029 = 100 \          # M_IR_EXPO         (10s integration time)
                                       VVRG0035 = 130 \     # M_CCD_EXPO            (13s integration time)
                                       VVRG0037 = 28447 \        # M_ALPHA_FIRST (80 slices around H boresight)
                                       VVRG0038 = 46307 )  # M_ALPHA_LAST

000_00:30:00    VIRTIS      SCIENCE         AVRF009A                    # VIRTIS-M Stop acquisition SSMM
#
# Data Volume of the above 165 Mbits = 20.60 MBytes
#
000_00:31:00    VIRTIS      IDLE       AVRS005A(\               # VIRTIS Start-H Nominal acquisition Science
                                                       VVRG0117 = 550 \ # Integration time = 5s
                                                       VVRG0118 = 9  \
                                                       VVRG0121 = 1\      # H_NR_Frame = 1
                                                       VVRG0123 = 128 \ #           H_DARK_RATE
                                                       VVRG0124 = 1\      # lossless compression
                                                       VVRG0179 = 0x421E87E2    \         # H_Pix_Map_C11
                                                       VVRG0180 = 0x3E00FA15 \  # H_Pix_Map_C12
                                                       VVRG0181 = 0x38BC3DCC    \         # H_Pix_Map_C13
                                                       VVRG0182 = 0x42B9C019    \         # H_Pix_Map_C21
                                                       VVRG0183 = 0x3DC985C7    \         # H_Pix_Map_C22
                                                       VVRG0184 = 0x387DD8E4    \         # H_Pix_Map_C23
                                                       VVRG0185 = 0x43010418    \         # H_Pix_Map_C31
                                                       VVRG0186 = 0x3D9EA323    \         # H_Pix_Map_C32
                                                       VVRG0187 = 0x38290589    \         # H_Pix_Map_C33
                                                       VVRG0188 = 0x43194CCC    \         # H_Pix_Map_C41
                                                       VVRG0189 = 0x3D9329F8    \         # H_Pix_Map_C42
                                                       VVRG0190 = 0x3773EE3E    \         # H_Pix_Map_C43
                                                       VVRG0191 = 0x432BE624 \  # H_Pix_Map_C51
                                                       VVRG0192 = 0x3D73B695    \         # H_Pix_Map_C52
                                                       VVRG0193 = 0x3716EDFF    \         # H_Pix_Map_C53
                                                       VVRG0194 = 0x4339DA1C    \         # H_Pix_Map_C61
                                                       VVRG0195 = 0x3D49E251    \         # H_Pix_Map_C62
                                                       VVRG0196 = 0x371AA135    \         # H_Pix_Map_C63
                                                       VVRG0197 = 0x43459EB7    \         # H_Pix_Map_C71
                                                       VVRG0198 = 0x3D104A64    \         # H_Pix_Map_C72
                                                       VVRG0199 = 0x37AD1197    \         # H_Pix_Map_C73
                                                       VVRG0200 = 0x434DEF9D    \         # H_Pix_Map_C81
                                                       VVRG0201 = 0x3CF4F9DC    \         # H_Pix_Map_C82
                                                       VVRG0202 = 0x37B67469    )         # H_Pix_Map_C83
000_05:53:00    VIRTIS      SCIENCE         AVRF009B                    # VIRTIS-H Stop acquisition SSMM
#
# Data Volume of the above 100 Mbits = 12.5 MBytes
#
000_05:55:00    VIRTIS      IDLE       AVRF010A( \              # VIRTIS Start-M Nominal Science
                                       VVRG0051 = 1 \    # M_ERT          (repetition time 20s)
                                       VVRG0053 = 5 \    # M_ACQ_MODE     (All pix full window)
                                       VVRG0054 = 1 \    # lossless compression
```

```
                                        VVRG0029 = 100 \          # M_IR_EXPO      (10s integration time)
                                        VVRG0035 = 130 \      # M_CCD_EXPO         (13s integration time)
                                        VVRG0037 = 28447 \        # M_ALPHA_FIRST (80 slices around H boresight)
                                        VVRG0038 = 46307 )    # M_ALPHA_LAST

000_06:25:00     VIRTIS        SCIENCE       AVRF009A                # VIRTIS-M Stop acquisition SSMM
#
# Data Volume of the above 165 Mbits = 20.60 MBytes
#
# Total Data Volume 18.125+18.75+12.5+18.75 = 68.125 MBytes
#
# VIRTIS is left in IDLE mode
#
```

## 13. VIRTIS OIOR VR03

```
# $Log: OIOR_PIIRSO_D_0006_VR_03____.ITL,v $
# Revision 1.6  2006/10/16 05:56:59  vdhiri
# Mode corrections from VR.
#
# Revision 1.5  2006/10/11 13:32:58  vdhiri
# Corrected to remove blank line in line 68
#
# Revision 1.4  2006/10/11 12:43:29  vdhiri
# Updates to timing and parameters by VR team. And commentry and ref data updated by RSOC.
#
# Revision 1.3  2006/09/26 15:11:45  vdhiri
# RSOC: Changed Ref Date only for allow some checks. Date can be arbitrary.
#
# Revision 1.2  2006/08/28 08:12:39  vdhiri
# RSOC Corrections
#
# Revision 1.1  2006/08/25 10:56:34  vdhiri
# Initial inputs from VR. Filename updated for consistency.
#
#
#
#
#==========================================================================================#
# Filename:       OIOR_ PIIRSO_D_0001_VR_03_xxxxx.ROS
# Type:           Input Timeline file
#
# Description:    VIRTIS VR03 Scan Mirror and V-M Slit alignment
#
#                 name:     RSOC - Viney Dhiri
#                 email:    rsoc@rssd.esa.int
#
#                 name: Virtis team - Fabrizio Capaccioni
#                 email:    fabrizio.capaccioni@iasf-roma.inaf.it
#
# Date:           25 July 2006
#
#
#==========================================================================================#

Version: 00002

Ref_date: 25-aug-2006

Start_time:  000_00:00:00
End_time:    000_00:40:00
```

```
#Init_mode: VIRTIS IDLE

#==========================================================================================#
Description: "VR03 M scan mirror and slit orientation verification"
#==========================================================================================#


#
# S/C moves to PTR#1 X=-100' Y= - 100'
#
000_00:00:00    VIRTIS    IDLE    AVRF010A( \             # VIRTIS Start-M Nominal Science
                                  VVRG0051 = 1 \          # M_ERT       (repetition time 20s)
                                  VVRG0053 = 5 \          # M_ACQ_MODE  (All pix full window)
                                  VVRG0054 = 1 \          # lossless compression
                                  VVRG0029 = 100 \        # M_IR_EXPO   (10s integration time)
                                  VVRG0035 = 130 \        # M_CCD_EXPO  (13s integration time)
                                  VVRG0037 = 2687 \       # M_ALPHA_FIRST (15 slices around ?????)
                                  VVRG0038 = 5977 )       # M_ALPHA_LAST

000_00:05:00    VIRTIS    SCIENCE    AVRF009A             # VIRTIS-M Stop acquisition SSMM
#
# Data Volume of the above 27.5 Mbits = 3.5 MBytes
#
#
# S/C moves to PTR#1 X=-100' Y= + 100'
#
000_00:07:00    VIRTIS    IDLE    AVRF010A( \             # VIRTIS Start-M Nominal Science
                                  VVRG0051 = 1 \          # M_ERT       (repetition time 20s)
                                  VVRG0053 = 5 \          # M_ACQ_MODE  (All pix full window)
                                  VVRG0054 = 1 \          # lossless compression
                                  VVRG0029 = 100 \        # M_IR_EXPO   (10s integration time)
                                  VVRG0035 = 130 \        # M_CCD_EXPO  (13s integration time)
                                  VVRG0037 = 2687 \       # M_ALPHA_FIRST (15 slices around ?????)
                                  VVRG0038 = 2687 )       # M_ALPHA_LAST
000_00:12:00    VIRTIS    SCIENCE    AVRF009A             # VIRTIS-M Stop acquisition SSMM
#
# Data Volume of the above 27.5 Mbits = 3.5 MBytes
#
#
# S/C moves to PTR#1 X= 0' Y= - 100'
#
000_00:14:00    VIRTIS    IDLE    AVRF010A( \             # VIRTIS Start-M Nominal Science
                                  VVRG0051 = 1 \          # M_ERT       (repetition time 20s)
                                  VVRG0053 = 5 \          # M_ACQ_MODE  (All pix full window)
                                  VVRG0054 = 1 \          # lossless compression
                                  VVRG0029 = 100 \        # M_IR_EXPO   (10s integration time)
                                  VVRG0035 = 130 \        # M_CCD_EXPO  (13s integration time)
                                  VVRG0037 = 29712 \      # M_ALPHA_FIRST (15 slices around Z Axis)
                                  VVRG0038 = 33002)       # M_ALPHA_LAST
000_00:19:00    VIRTIS    SCIENCE    AVRF009A             # VIRTIS-M Stop acquisition SSMM
#
# Data Volume of the above 27.5 Mbits = 3.5 MBytes
#
#
# S/C moves to PTR#1 X= 0' Y= + 100'
#
000_00:21:00    VIRTIS    IDLE    AVRF010A( \             # VIRTIS Start-M Nominal Science
                                  VVRG0051 = 1 \          # M_ERT       (repetition time 20s)
                                  VVRG0053 = 5 \          # M_ACQ_MODE  (All pix full window)
                                  VVRG0054 = 1 \          # lossless compression
                                  VVRG0029 = 100 \        # M_IR_EXPO   (10s integration time)
                                  VVRG0035 = 130 \        # M_CCD_EXPO  (13s integration time)
                                  VVRG0037 = 29712\       # M_ALPHA_FIRST (15 slices around Z axis)
                                  VVRG0038 = 33002)       # M_ALPHA_LAST

000_00:26:00    VIRTIS    SCIENCE    AVRF009A             # VIRTIS-M Stop acquisition SSMM
#
# Data Volume of the above 27.5 Mbits = 3.5 MBytes
#
#
# S/C moves to PTR#1 X= + 100' Y= - 100'
```

```
#
000_00:28:00    VIRTIS    IDLE    AVRF010A( \              # VIRTIS Start-M Nominal Science
                                      VVRG0051 = 1 \       # M_ERT            (repetition time 20s)
                                      VVRG0053 = 5 \       # M_ACQ_MODE    (All pix full window)
                                      VVRG0054 = 1 \       # lossless compression
                                      VVRG0029 = 100 \            # M_IR_EXPO       (10s integration time)
                                      VVRG0035 = 130 \       # M_CCD_EXPO          (13s integration time)
                                      VVRG0037 = 57207\           # M_ALPHA_FIRST (15 slices around ?????)
                                      VVRG0038 = 60497)   # M_ALPHA_LAST

000_00:33:00    VIRTIS    SCIENCE    AVRF009A              # VIRTIS-M Stop acquisition SSMM
#
# Data Volume of the above 27.5 Mbits = 3.5 MBytes
#
#
# S/C moves to PTR#1 X= + 100' Y= + 100'
#
000_00:35:00    VIRTIS    IDLE    AVRF010A( \              # VIRTIS Start-M Nominal Science
                                      VVRG0051 = 1 \       # M_ERT            (repetition time 20s)
                                      VVRG0053 = 5 \       # M_ACQ_MODE    (All pix full window)
                                      VVRG0054 = 1 \       # lossless compression
                                      VVRG0029 = 100 \            # M_IR_EXPO       (10s integration time)
                                      VVRG0035 = 130 \       # M_CCD_EXPO          (13s integration time)
                                      VVRG0037 = 57207\           # M_ALPHA_FIRST (15 slices around ?????)
                                      VVRG0038 = 60497 )   # M_ALPHA_LAST

000_00:40:00    VIRTIS    SCIENCE    AVRF009A              # VIRTIS-M Stop acquisition SSMM
#
# Data Volume of the above 27.5 Mbits = 3.5 MBytes
#
#
# Total Data Volume 3.5 * 6 = 21.0 MBytes
#
# VIRTIS is left in IDLE Mode
```

## 14. VIRTIS OIOR SWON

```
# $Log: OIOR_PIIRSO_D_0000_VR_SWON__.ITL,v $
# Revision 1.2  2006/09/26 14:29:19  vdhiri
# RSOC added 40 mins margin to allow for main ops specific initial set-up
#
# Revision 1.1  2006/09/01 15:53:09  vdhiri
# Generic files.
#
#
#===========================================================================================#
# Description:      Switch-on VR. Initial State OFF, Final State Idle, duration 2h30m
#
# Author: V.Dhiri / RSOC
#===========================================================================================#

Version: 00002

Init_mode: VIRTIS OFF

Ref_date: 31-Dec-2006

Start_time:  -001_00:00:00
End_time:    000_00:00:00

#-----------------------------------------------------------------------------------------#
Description: 1 "Switch on VIRTIS"
```

```
#-----------------------------------------------------------------------------------------#

-000_03:10:00    VIRTIS    OFF    AVRF001A    # VIRTIS POWER-ON OBCP
-000_03:00:00    VIRTIS    IDLE   AVRS003A    # VIRTIS-M and VIRTIS-H Initialisation

# 40 minute margin given to allow for main observation specific set up.
```

## 15. VIRTIS OIOR SWOFF

```
# $Log: OIOR_PIIRSO_D_0000_VR_SWOFF_.ITL,v $
# Revision 1.1  2006/09/01 15:53:09  vdhiri
# Generic files.
#
#
#=========================================================================================#
# Description:    Switch-off VR. Initial State IDLE, Final State OFF, duration 10m plus OBCP time.
#
# Author: V.Dhiri / RSOC
#=========================================================================================#

Version: 00002

Ref_date: 31-Dec-2006

Start_time:  000_00:00:00
End_time:    001_00:00:00

#-----------------------------------------------------------------------------------------#
Description: 1 "Switch off VIRTIS"
#-----------------------------------------------------------------------------------------#


000_00:00:00    VIRTIS    IDLE    AVRF016A        # VIRTIS Stop Link to SSMM
000_00:02:00    VIRTIS    IDLE    AVRF004C        # VIRTIS PEM-M and PEM-H OFF
000_00:07:30    VIRTIS    IDLE    AVRF004D    # VIRTIS trans Idle to Safe
000_00:10:00    VIRTIS    SAFE    AVRF006A        # VIRTIS power OFF OBCP
```