



esac

European Space Astronomy Centre (ESAC)
P.O. Box, 78
28691 Villanueva de la Cañada, Madrid
Spain

DOCUMENT

HIFI Trend Analysis Data Products: Release notes

Prepared by	David Teyssier, Kevin Edwards
Reference	HERSCHEL-HSC-DOC-2104
Issue	1
Revision	1
Date of Issue	12 May 2016
Status	For release
Document Type	Release note
Distribution	HSC, SAT



APPROVAL

Title HIFI Trend Analysis Data Products: Release notes	
Issue 1	Revision 1
Authors D. Teyssier, K. Edwards	Date 12 May 2016
Approved by: P. Garcia-Lario	Date 7 April 2016

CHANGE LOG

Reason for change	Draft Issue	Revision	Date
First version of document	1	0	7 April 2016
Corrected typo	1	1	12 May 2016



Table of Contents

1	INTRODUCTION	4
2	DESCRIPTION OF THE ANCILLARY DATA PRODUCTS	4
2.1	Scope and method for the product generation	4
2.2	Content of the Ancillary Data Product	4
2.2.1	Deliverable format and structure.....	4
2.2.2	Trend Analysis Data Product queries in the HSA	9
3	APPENDIX MATERIAL	10
3.1	Appendix A: description of HK Trend Data Product parameters	10
3.2	Appendix B: description of Science Trend Data Product Parameters	17

1 INTRODUCTION

This Ancillary Data Product archive consists of a subset of HIFI HouseKeeping (HK) information measured from the *Herschel* Operational Day (OD) 241 onwards. Up to 269 HK parameters belonging to the various HIFI Sub-Systems (see Appendix A) are provided as time series, at the data rate applicable at the time of recording. On top of that, additional parameters resulting from dedicated measurements are provided as so-called “science trend products” (see Appendix B).

These trend analysis data products are particularly relevant to the instrument experts or engineers interested in monitoring the behaviour of any particular instrument HK parameter, and/or investigate correlations between them. The overall product archive provides both a quick-view of the parameter behaviour with time as plots, as well as the tables themselves for users who need to perform more sophisticated manipulation to the data.

2 DESCRIPTION OF THE ANCILLARY DATA PRODUCTS

2.1 Scope and method for the product generation

All the science and HK telemetry from the *Herschel* mission is stored in relatively large files that are not practical to browse through for the non-trained user. While the science telemetry is essentially turned into science data products processed to various levels via the Standard Product Generation (SPG) pipelines, the bulk of the HK information is, however, usually not provided in a practical way in the standard data products. In the course of the mission, the HIFI instrument team performed dedicated HK telemetry extraction in order to monitor the instrument health through a sub-set of relevant HK parameters from the various Sub-Systems. These came essentially as plots of given HK parameters versus time as well as the time series table used to create the plots.

This Ancillary product archive compiles all those plots and time tables, organizing them in chunks of 7 consecutive ODs, as is explained in the next section.

2.2 Content of the Ancillary Data Product

2.2.1 Deliverable format and structure

The plots are separated into two archives. Each archive contains all files at the same directory

level, i.e. there is no separation per OD period other than in the file name:

- **HIFI_HK_TrendData_PLOTS.tar.gz (2 Gb)**: this is the complete archive of all contemplated HIFI HK time series. Each file in this tarball has the form `<HK-parameter-name>_OD_<od-start>-<od-end>.png`, where `<HK-parameter-name>` is one of those listed in Appendix A. In total, there are 40199 files in this archive.
- **HIFI_Science_TrendData_PLOTS.tar.gz (60 Mb)**: this is the complete archive of the so-called “Science” trend analysis plots. These are not directly HK parameters, but either telemetry information coming from other dedicated engineering measurements, or derived from some post-processing of such dedicated measurements. These particular parameters are described in Appendix B. In total there are 2827 plots in this archive.

Figure 1 illustrates a typical time series plot, here for the HK parameter `HF_APR_UCONV_T`. It should be noted that the time scale on the plot is computed as hours since the `<od-start>` (bottom scale) or simply as OD (upper scale). It can also be the case that several HK parameters are gathered into a single plot, as is illustrated in Figure 2. Note that in this case, the corresponding tables will also provide those parameters in the same file.

Start OD: 2010.02.20 at 17:55:30 UTC
End OD: 2010.02.27 at 18:49:53 UTC

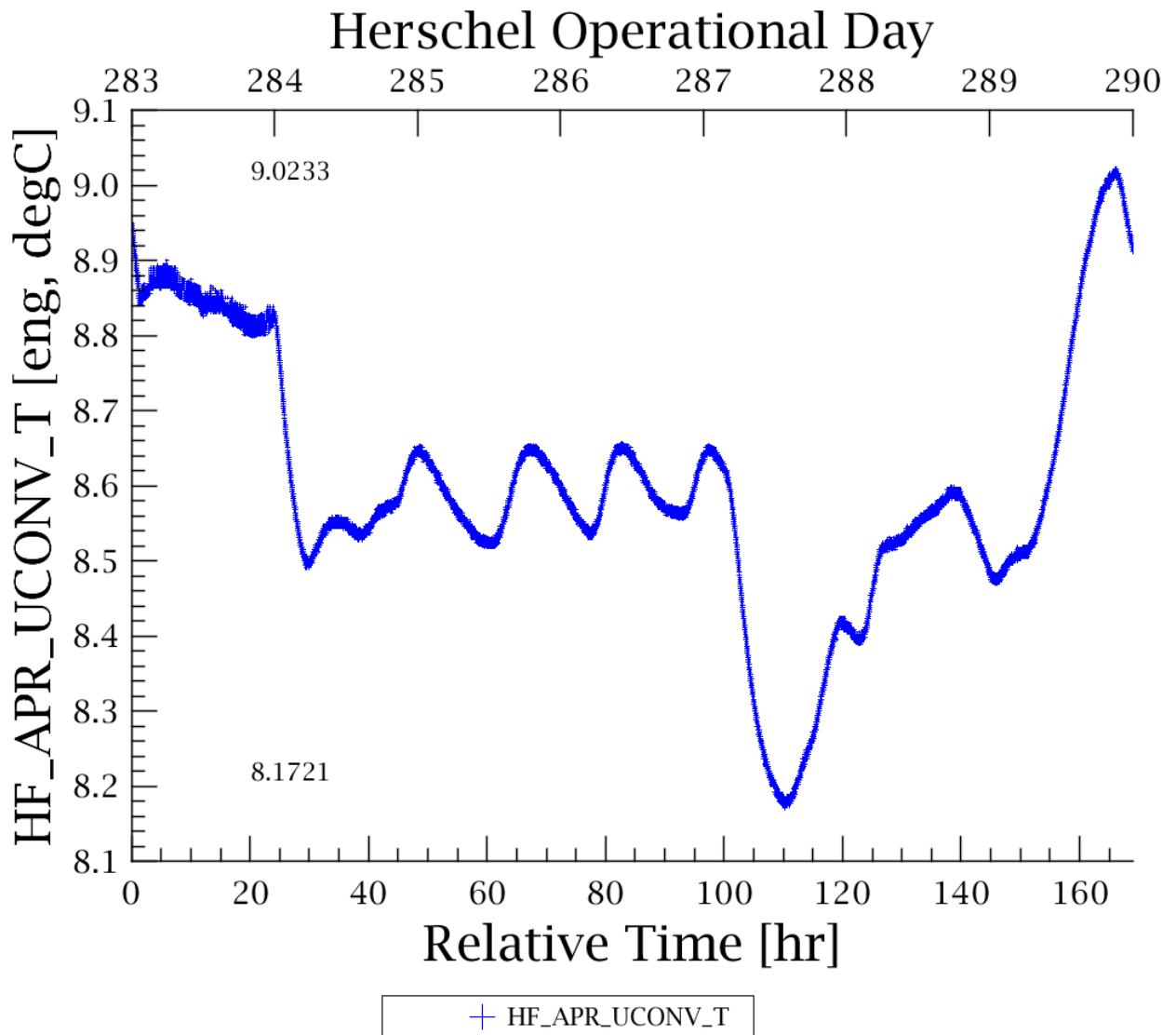


Figure 1: Example of trend analysis plot for HK parameter HF_APR_UCONV_T (HEB band IF up-converter temperature), between OD 283 and 290.

Start OD: 2013.02.23 at 22:11:14 UTC
 End OD: 2013.03.02 at 13:44:22 UTC

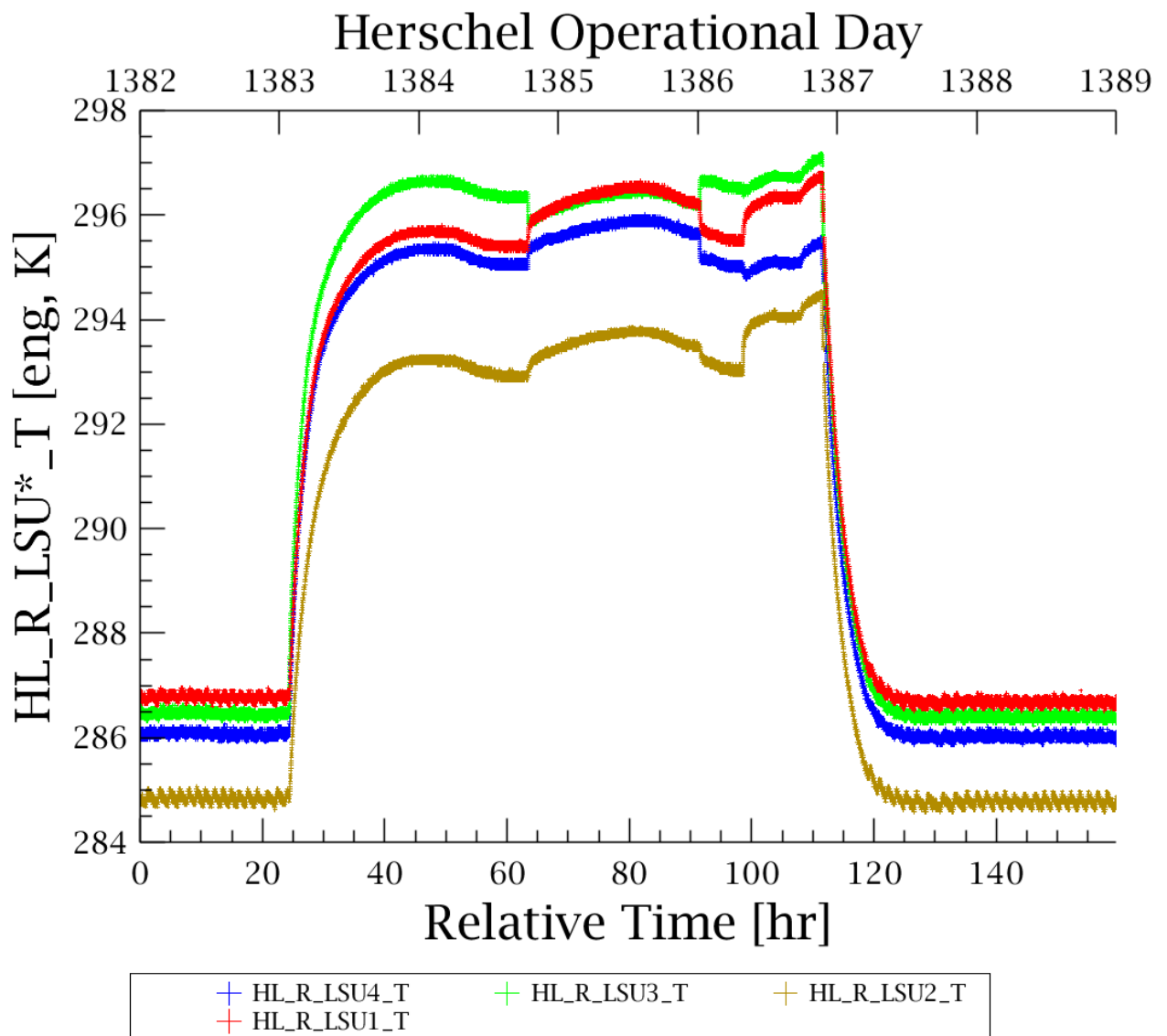


Figure 2: Example of trend analysis plot where several HK parameters (here temperature sensors in the Local Oscillator Source Unit – LSU) are plotted together.



In order to facilitate the manipulation of relatively large files, the trend analysis product tables are organized in periods of 7 consecutive ODs, starting from OD-241 (inclusive). Within each of these sub-archives, the file naming convention is as follows: `<HK-parameter-name>_OD_<od-start>-<od-end>.csv`. Files come as coma-separated tables, with a header indicating the contained parameters.

Like for the plots, the table archives are separated into two different categories:

- **HIFI_HK_TrendData_TABLES.tar.gz (33 Gb)**: this is the complete archive of all contemplated HIFI HK time series tables. This tarball consists of other smaller zipped archives organized by groups of 7 ODs, given as `<od-number>.zip` – there are 171 of those zipped archives. Each file in these archives has the form `<HK-parameter-name>_OD_<od-start>-<od-end>.png`, where `<HK-parameter-name>` is one of those listed in Appendix A.
- **HIFI_Science_TrendData_TABLES.tar.gz (475 Mb)**: this is the complete archive of the so-called “Science” trend analysis data. Unlike the above HK tarballs, those data are grouped into categories that were relevant for these particular parameters at the time when the HIFI instrument team was monitoring them. The following large *csv* files are present in this archive:
 - `lo.csv.gz`: collection of Local Oscillator Unit (LOU) HK parameters
 - `comb.csv.gz`: collection of parameters extracted from the WBS COMB measurements
 - `fpu.csv.gz`: collection of Focal Plane Unit (FPU) HK parameters
 - `hl_r_s_17_p5_v_fast.csv.gz`: dedicated measurement at high data rate of the voltage of one of the Local Oscillator Control Unit (LCU) bias lines.
 - `hl_s_17_p5_c_fast.csv.gz`: dedicated measurement at high data rate of the current of one of the Local Oscillator Control Unit (LCU) bias lines.
 - `wbsfreqcoeff.csv.gz`: time series of the WBS frequency calibration coefficients resulting from the WBS COMB measurements
 - `tsys.csv.gz`: time series of the computed System noise temperatures

The time information in those tables is given in two forms:

- The so-called *Herschel* on-board time, in unit of microseconds computed since `00:00:00 01-Jan-1958`.
- A more intuitive version of the above in the form of a so-called “Fine Time”: `YYYY-MM-DDThh:mm:ss`, which is a TAI time (International Atomic Time) for epoch 1958.



2.2.2 Trend Analysis Data Product queries in the HSA

Like any other Ancillary Data Product archives served by the HSA, the trend analysis data products are provided as a single (relatively large here – ~400 Gb), compressed archive from the Ancillary Data Product query menu. This archive contains all the tarballs mentioned above.

Alternatively, the products can also be fetched from the Herschel Science Centre portal – see <http://www.cosmos.esa.int/web/herschel/ancillary-data-products>.

3 APPENDIX MATERIAL

3.1 Appendix A: description of HK Trend Data Product parameters

Mnemonic	Name	Description	SubType	Group
WMT06565	TM1_VBUS	LCL spacecraft 28V voltage	SAT	NONE
KM212303	Temp_T237_1	Cryostat L1 (4K) on Ventline downstream strap 5 to HIFI temperature	SAT	NONE
KM207302	Temp_T228	Cryostat L0 (2K) Cooling Strap 8 to HIFI FPU temperature	SAT	NONE
KM221303	Temp_T208	Cryostat L2 (10K) Optical bench near HIFI mounting foot temperature	SAT	NONE
TM076601	TCS_THM_76	Service module panel close to FHIFV temperature	SAT	NONE
TM068601	TCS_THM_68	Service module panel close to FHLSU temperature	SAT	NONE
TM067601	TCS_THM_67	Service module panel close to FHLCU temperature	SAT	NONE
TM066601	TCS_THM_66	Service module panel close to FHHRH temperature	SAT	NONE
TM065601	TCS_THM_65	Service module panel close to FHWEH temperature	SAT	NONE
TM064601	TCS_THM_64_ciB	Service module panel close to FHWOH temperature	SAT	NONE
TM063601	TCS_THM_63	Service module panel close to FHWEV temperature	SAT	NONE
TM061601	TCS_THM_61	Service module panel close to FHHRV temperature	SAT	NONE
TM060601	TCS_THM_60_ciB	Service module panel close to FHWOV temperature	SAT	NONE
HM067193	HWV_Laser2_P	WBS-V Laser #2 power	HWV	NONE
HM065193	HWV_Laser2_C	WBS-V Laser #2 current	HWV	NONE
HM066193	HWV_Laser1_P	WBS-V Laser #1 power	HWV	NONE
HM064193	HWV_Laser1_C	WBS-V Laser #1 current	HWV	NONE
HM062193	HWV_Laser_T	WBS-V Laser temperature	HWV	HWV_*_T
HM069193	HWV_D_5P_V	WBS-V digital +5V supply voltage	HWV	NONE
HM071193	HWV_D_3P3_V	WBS-V digital +3.3V supply voltage	HWV	NONE
HM070193	HWV_D_15P_V	WBS-V digital +15V supply voltage	HWV	NONE
HM061193	HWV_CCD_T	WBS-V CCD temperature	HWV	HWV_*_T
HM063193	HWV_ADC_T	WBS-V ADC board temperature	HWV	HWV_*_T
HM072193	HWV_A_5P_V	WBS-V analog +5V supply voltage	HWV	NONE
HM073193	HWV_A_5M_V	WBS-V analog -5V supply voltage	HWV	NONE
HM074193	HWV_A_15P_V	WBS-V analog +15V supply voltage	HWV	NONE
HM068193	HWV_A_15M_V	WBS-V analog -15V supply voltage	HWV	NONE
HM028193	HWH_Laser2_P	WBS-H Laser #2 power	HWH	NONE
HM026193	HWH_Laser2_C	WBS-H Laser #2 current	HWH	NONE
HM027193	HWH_Laser1_P	WBS-H Laser #1 power	HWH	NONE
HM025193	HWH_Laser1_C	WBS-H Laser #1 current	HWH	NONE
HM023193	HWH_Laser_T	WBS-H Laser temperature	HWH	HWH_*_T
HM030193	HWH_D_5P_V	WBS-H digital +5V supply voltage	HWH	NONE
HM032193	HWH_D_3P3_V	WBS-H digital +3.3V supply voltage	HWH	NONE
HM031193	HWH_D_15P_V	WBS-H digital +15V supply voltage	HWH	NONE
HM022193	HWH_CCD_T	WBS-H CCD temperature	HWH	HWH_*_T



HM024193	HWH_ADC_T	WBS-H ADC board temperature	HWH	HWH_*_T
HM033193	HWH_A_5P_V	WBS-H analog +5V supply voltage	HWH	NONE
HM034193	HWH_A_5M_V	WBS-H analog -5V supply voltage	HWH	NONE
HM035193	HWH_A_15P_V	WBS-H analog +15V supply voltage	HWH	NONE
HM029193	HWH_A_15M_V	WBS-H analog -15V supply voltage	HWH	NONE
HM190192	HRV_IF_8P_V	HRS-V +8V IF supply voltage	HRV	NONE
HM193192	HRV_IF_6P_V	HRS-V +6V IF supply voltage	HRV	NONE
HM191192	HRV_IF_5P_V	HRS-V +5V IF supply voltage	HRV	NONE
HM192192	HRV_IF_5M_V	HRS-V -5V IF supply voltage	HRV	NONE
HM195192	HRV_IF_2_T	HRS-V IF 2 temperature	HRV	HRV_*_T
HM189192	HRV_IF_18P_V	HRS-V +18V IF supply voltage	HRV	NONE
HM194192	HRV_IF_1_T	HRS-V IF 1 temperature	HRV	HVV_*_T
HM182192	HRV_Dig_3P3_V	HRS-V +3.3V digital supply voltage	HRV	NONE
HM178192	HRV_DCDC_2_T	HRS-V DC-DC convertor 2 temperature	HRV	HVV_*_T
HM177192	HRV_DCDC_1_T	HRS-V DC-DC convertor 1 temperature	HRV	HVV_*_T
HM186192	HRV_Ana_2_3P3_V	HRS-V +3.3V analog supply #2 voltage	HRV	NONE
HM183192	HRV_Ana_1P1_V	HRS-V +1.1V analog supply voltage	HRV	NONE
HM185192	HRV_Ana_1_3P3_V	HRS-V +3.3V analog supply #1 voltage	HRV	NONE
HM188192	HRV_ACS_2_T	HRS-V Autocorrelator 2 temperature	HRV	HRV_*_T
HM187192	HRV_ACS_1_T	HRS-V Autocorrelator 1 temperature	HRV	HRV_*_T
HM180192	HRV_8P_V	HRS-V +8V supply voltage	HRV	NONE
HM172192	HRV_8P_C	HRS-V +8V supply current	HRV	NONE
HM181192	HRV_5P_V	HRS-V +5V supply voltage	HRV	NONE
HM173192	HRV_5P_C	HRS-V +5V supply current	HRV	NONE
HM184192	HRV_5M_V	HRS-V -5V supply voltage	HRV	NONE
HM176192	HRV_5M_C	HRS-V -5V supply current	HRV	NONE
HM174192	HRV_3P3_C	HRS-V +3.3V supply current	HRV	NONE
HM175192	HRV_1P1_C	HRS-V +1.1V supply current	HRV	NONE
HM179192	HRV_18P_V	HRS-V +18V supply voltage	HRV	NONE
HM171192	HRV_18P_C	HRS-V +18V supply current	HRV	NONE
HM065192	HRH_IF_8P_V	HRS-H +8V IF supply voltage	HRH	NONE
HM068192	HRH_IF_6P_V	HRS-H +6V IF supply voltage	HRH	NONE
HM066192	HRH_IF_5P_V	HRS-H +5V IF supply voltage	HRH	NONE
HM067192	HRH_IF_5M_V	HRS-H -5V IF supply voltage	HRH	NONE
HM070192	HRH_IF_2_T	HRS-H IF 2 temperature	HRH	HRH_*_T
HM064192	HRH_IF_18P_V	HRS-H +18V IF supply voltage	HRH	NONE
HM069192	HRH_IF_1_T	HRS-H IF 1 temperature	HRH	HRH_*_T
HM057192	HRH_Dig_3P3_V	HRS-H +3.3V digital supply voltage	HRH	NONE
HM053192	HRH_DCDC_2_T	HRS-H DC-DC convertor 2 temperature	HRH	HRH_*_T
HM052192	HRH_DCDC_1_T	HRS-H DC-DC convertor 1 temperature	HRH	HRH_*_T
HM061192	HRH_Ana_2_3P3_V	HRS-H +3.3V analog supply #2 voltage	HRH	NONE
HM058192	HRH_Ana_1P1_V	HRS-H +1.1V analog supply voltage	HRH	NONE



HM060192	HRH_Ana_1_3P3_V	HRS-H +3.3V analog supply #1 voltage	HRH	NONE
HM063192	HRH_ACS_2_T	HRS-H Autocorrelator 2 temperature	HRH	HRH_*_T
HM062192	HRH_ACS_1_T	HRS-H Autocorrelator 1 temperature	HRH	HRH_*_T
HM055192	HRH_8P_V	HRS-H +8V supply voltage	HRH	NONE
HM047192	HRH_8P_C	HRS-H +8V supply current	HRH	NONE
HM056192	HRH_5P_V	HRS-H +5V supply voltage	HRH	NONE
HM048192	HRH_5P_C	HRS-H +5V supply current	HRH	NONE
HM059192	HRH_5M_V	HRS-H -5V supply voltage	HRH	NONE
HM051192	HRH_5M_C	HRS-H -5V supply current	HRH	NONE
HM049192	HRH_3P3_C	HRS-H +3.3V supply current	HRH	NONE
HM050192	HRH_1P1_C	HRS-H +1.1V supply current	HRH	NONE
HM054192	HRH_18P_V	HRS-H +18V supply voltage	HRH	NONE
HM046192	HRH_18P_C	HRS-H +18V supply current	HRH	NONE
HM231194	HL_VS_5P_V	LCU +5V supply voltage	HL	NONE
HM233194	HL_VS_15P_V	LCU +15V supply voltage	HL	NONE
HM235194	HL_VS_15M_V	LCU -15V supply voltage	HL	NONE
HM031194	HL_Sensor7B_T	LOU band 7B multiplier chain temperature	HL	HL_Sensor**_T
HM029194	HL_Sensor7A_T	LOU band 7A multiplier chain temperature	HL	HL_Sensor**_T
HM027194	HL_Sensor6B_T	LOU band 6B multiplier chain temperature	HL	HL_Sensor**_T
HM025194	HL_Sensor6A_T	LOU band 6A multiplier chain temperature	HL	HL_Sensor**_T
HM023194	HL_Sensor5B_T	LOU band 5B multiplier chain temperature	HL	HL_Sensor**_T
HM021194	HL_Sensor5A_T	LOU band 5A multiplier chain temperature	HL	HL_Sensor**_T
HM019194	HL_Sensor4B_T	LOU band 4B multiplier chain temperature	HL	HL_Sensor**_T
HM017194	HL_Sensor4A_T	LOU band 4A multiplier chain temperature	HL	HL_Sensor**_T
HM015194	HL_Sensor3B_T	LOU band 3B multiplier chain temperature	HL	HL_Sensor**_T
HM013194	HL_Sensor3A_T	LOU band 3A multiplier chain temperature	HL	HL_Sensor**_T
HM011194	HL_Sensor2B_T	LOU band 2B multiplier chain temperature	HL	HL_Sensor**_T
HM009194	HL_Sensor2A_T	LOU band 2A multiplier chain temperature	HL	HL_Sensor**_T
HM007194	HL_Sensor1B_T	LOU band 1B multiplier chain temperature	HL	HL_Sensor**_T
HM005194	HL_Sensor1A_T	LOU band 1A multiplier chain temperature	HL	HL_Sensor**_T
HM203194	HL_S_17P5_C	LSU +17.5V standby supply current	HL	NONE
HM237194	HL_REF_2P5_V	LCU +2.5V reference voltage	HL	NONE
HM933194	HL_R_S_17P5_V	LSU redundant +17.5V standby supply voltage	HL	NONE
HM931194	HL_R_RF_power	LSU redundant RF power level (gain control feedback) voltage	HL	NONE
HM921194	HL_R_M3_6A_C	LOU redundant band 6A multiplier 3 bias voltage	HL	HL_R_M*_6A_C
HM920194	HL_R_M3_3B_C	LOU redundant band 3B multiplier 3 bias voltage	HL	HL_R_M*_3B_C
HM919194	HL_R_M3_3A_C	LOU redundant band 3A multiplier 3 bias voltage	HL	HL_R_M*_3A_C
HM918194	HL_R_M3_2B_C	LOU redundant band 2B multiplier 3 bias voltage	HL	HL_R_M*_2B_C
HM917194	HL_R_M3_2A_C	LOU redundant band 2A multiplier 3 bias voltage	HL	HL_R_M*_2A_C
HM915194	HL_R_M2_7B_C	LOU redundant band 7B multiplier 2 bias voltage	HL	HL_R_M*_6A_C
HM914194	HL_R_M2_7A_C	LOU redundant band 7A multiplier 2 bias voltage	HL	HL_R_M*_6A_C
HM913194	HL_R_M2_6B_C	LOU redundant band 6B multiplier 2 bias voltage	HL	HL_R_M*_6B_C



HM912194	HL_R_M2_6A_C	LOU redundant band 6A multiplier 2 bias voltage	HL	HL_R_M*_6A_C
HM911194	HL_R_M2_5B_C	LOU redundant band 5B multiplier 2 bias voltage	HL	HL_R_M*_5B_C
HM910194	HL_R_M2_5A_C	LOU redundant band 5A multiplier 2 bias voltage	HL	HL_R_M*_5A_C
HM909194	HL_R_M2_4B_C	LOU redundant band 4B multiplier 2 bias voltage	HL	HL_R_M*_4B_C
HM908194	HL_R_M2_4A_C	LOU redundant band 4A multiplier 2 bias voltage	HL	HL_R_M*_4A_C
HM907194	HL_R_M2_3B_C	LOU redundant band 3B multiplier 2 bias voltage	HL	HL_R_M*_3B_C
HM906194	HL_R_M2_3A_C	LOU redundant band 3A multiplier 2 bias voltage	HL	HL_R_M*_3A_C
HM905194	HL_R_M2_2B_C	LOU redundant band 2B multiplier 2 bias voltage	HL	HL_R_M*_2B_C
HM904194	HL_R_M2_2A_C	LOU redundant band 2A multiplier 2 bias voltage	HL	HL_R_M*_2A_C
HM903194	HL_R_M2_1B_C	LOU redundant band 1B multiplier 2 bias voltage	HL	HL_R_M*_1B_C
HM902194	HL_R_M2_1A_C	LOU redundant band 1A multiplier 2 bias voltage	HL	HL_R_M*_1A_C
HM900194	HL_R_M1_7B_C	LOU redundant band 7B multiplier 1 bias voltage	HL	HL_R_M*_7B_C
HM899194	HL_R_M1_7A_C	LOU redundant band 7A multiplier 1 bias voltage	HL	HL_R_M*_7A_C
HM898194	HL_R_M1_6B_C	LOU redundant band 6B multiplier 1 bias voltage	HL	HL_R_M*_6B_C
HM897194	HL_R_M1_6A_C	LOU redundant band 6A multiplier 1 bias voltage	HL	HL_R_M*_6A_C
HM896194	HL_R_M1_5B_C	LOU redundant band 5B multiplier 1 bias voltage	HL	HL_R_M*_5B_C
HM895194	HL_R_M1_5A_C	LOU redundant band 5A multiplier 1 bias voltage	HL	HL_R_M*_5A_C
HM894194	HL_R_M1_4B_C	LOU redundant band 4B multiplier 1 bias voltage	HL	HL_R_M*_4B_C
HM893194	HL_R_M1_4A_C	LOU redundant band 4A multiplier 1 bias voltage	HL	HL_R_M*_4A_C
HM892194	HL_R_M1_3B_C	LOU redundant band 3B multiplier 1 bias voltage	HL	HL_R_M*_3B_C
HM891194	HL_R_M1_3A_C	LOU redundant band 3A multiplier 1 bias voltage	HL	HL_R_M*_3A_C
HM890194	HL_R_M1_2B_C	LOU redundant band 2B multiplier 1 bias voltage	HL	HL_R_M*_2B_C
HM889194	HL_R_M1_2A_C	LOU redundant band 2A multiplier 1 bias voltage	HL	HL_R_M*_2A_C
HM888194	HL_R_M1_1B_C	LOU redundant band 1B multiplier 1 bias voltage	HL	HL_R_M*_1B_C
HM887194	HL_R_M1_1A_C	LOU redundant band 1A multiplier 1 bias voltage	HL	HL_R_M*_1A_C
HM945194	HL_R_LSU4_T	LSU redundant Ka-band amplifier box temperature	T	HL_R_LSU*_T
HM943194	HL_R_LSU3_T	LSU redundant X-band amplifier box temperature	T	HL_R_LSU*_T
HM941194	HL_R_LSU2_T	LSU redundant interface and regulators box temperature	T	HL_R_LSU*_T
HM939194	HL_R_LSU1_T	LSU redundant X-band synthesizer box temperature	T	HL_R_LSU*_T
HM925194	HL_R_Gate2_C	LOU redundant amplifier 2 gate current	HL	NONE
HM923194	HL_R_Gate1_C	LOU redundant amplifier 1 gate current	HL	NONE
HM929194	HL_R_Drain2_C	LOU redundant amplifier 2 drain current	HL	NONE
HM927194	HL_R_Drain1_C	LOU redundant amplifier 1 drain current	HL	NONE
HM935194	HL_R_7P5_V	LSU redundant +7.5V supply voltage	HL	NONE
HM937194	HL_R_7P5_C	LSU redundant +7.5V supply current	HL	NONE
HM278194	HL_PWR_INT_S	LCU power fail interrupt flag	HL	NONE
HM225194	HL_PT500_T	LCU TBS temperature	HL	NONE
HM244194	HL_PROM_version	LCU software version (in hex digits model-release-month-year)	HL	NONE
HM221194	HL_NTC_T	LCU TBS temperature	T	NONE
HM258194	HL_MODE_S	LCU mode status	HL	NONE
HM279194	HL_MAINRED_S	LCU main/redundant flag	HL	NONE
HM081194	HL_M3_6A_V	LOU main band 6A multiplier 3 bias voltage	HL	HL_M*_6A_V



HM080194	HL_M3_3B_V	LOU main band 3B multiplier 3 bias voltage	HL	HL_M*_3B_V
HM079194	HL_M3_3A_V	LOU main band 3A multiplier 3 bias voltage	HL	HL_M*_3A_V
HM078194	HL_M3_2B_V	LOU main band 2B multiplier 3 bias voltage	HL	HL_M*_2B_V
HM077194	HL_M3_2A_V	LOU main band 2A multiplier 3 bias voltage	HL	HL_M*_2A_V
HM075194	HL_M2_7B_V	LOU main band 7B multiplier 2 bias voltage	HL	HL_M*_7B_V
HM074194	HL_M2_7A_V	LOU main band 7A multiplier 2 bias voltage	HL	HL_M*_7A_V
HM073194	HL_M2_6B_V	LOU main band 6B multiplier 2 bias voltage	HL	HL_M*_6B_V
HM072194	HL_M2_6A_V	LOU main band 6A multiplier 2 bias voltage	HL	HL_M*_6A_V
HM071194	HL_M2_5B_V	LOU main band 5B multiplier 2 bias voltage	HL	HL_M*_5B_V
HM070194	HL_M2_5A_V	LOU main band 5A multiplier 2 bias voltage	HL	HL_M*_5A_V
HM069194	HL_M2_4B_V	LOU main band 4B multiplier 2 bias voltage	HL	HL_M*_4B_V
HM068194	HL_M2_4A_V	LOU main band 4A multiplier 2 bias voltage	HL	HL_M*_4A_V
HM067194	HL_M2_3B_V	LOU main band 3B multiplier 2 bias voltage	HL	HL_M*_3B_V
HM066194	HL_M2_3A_V	LOU main band 3A multiplier 2 bias voltage	HL	HL_M*_3A_V
HM065194	HL_M2_2B_V	LOU main band 2B multiplier 2 bias voltage	HL	HL_M*_2B_V
HM064194	HL_M2_2A_V	LOU main band 2A multiplier 2 bias voltage	HL	HL_M*_2A_V
HM063194	HL_M2_1B_V	LOU main band 1B multiplier 2 bias voltage	HL	HL_M*_1B_V
HM062194	HL_M2_1A_V	LOU main band 1A multiplier 2 bias voltage	HL	HL_M*_1A_V
HM060194	HL_M1_7B_V	LOU main band 7B multiplier 1 bias voltage	HL	HL_M*_7B_V
HM059194	HL_M1_7A_V	LOU main band 7A multiplier 1 bias voltage	HL	HL_M*_7A_V
HM058194	HL_M1_6B_V	LOU main band 6B multiplier 1 bias voltage	HL	HL_M*_6B_V
HM057194	HL_M1_6A_V	LOU main band 6A multiplier 1 bias voltage	HL	HL_M*_6A_V
HM056194	HL_M1_5B_V	LOU main band 5B multiplier 1 bias voltage	HL	HL_M*_5B_V
HM055194	HL_M1_5A_V	LOU main band 5A multiplier 1 bias voltage	HL	HL_M*_5A_V
HM054194	HL_M1_4B_V	LOU main band 4B multiplier 1 bias voltage	HL	HL_M*_4B_V
HM053194	HL_M1_4A_V	LOU main band 4A multiplier 1 bias voltage	HL	HL_M*_4A_V
HM052194	HL_M1_3B_V	LOU main band 3B multiplier 1 bias voltage	HL	HL_M*_3B_V
HM051194	HL_M1_3A_V	LOU main band 3A multiplier 1 bias voltage	HL	HL_M*_3A_V
HM050194	HL_M1_2B_V	LOU main band 2B multiplier 1 bias voltage	HL	HL_M*_2B_V
HM049194	HL_M1_2A_V	LOU main band 2A multiplier 1 bias voltage	HL	HL_M*_2A_V
HM048194	HL_M1_1B_V	LOU main band 1B multiplier 1 bias voltage	HL	HL_M*_1B_V
HM047194	HL_M1_1A_V	LOU main band 1A multiplier 1 bias voltage	HL	HL_M*_1A_V
HM219194	HL_LSU4_T	LSU main Ka-band amplifier box temperature	T	HL_LSU*_T
HM217194	HL_LSU3_T	LSU main X-band amplifier box temperature	T	HL_LSU*_T
HM280194	HL_LSU3_S	LSU phase lock #3 flag	HL	NONE
HM215194	HL_LSU2_T	LSU main interface and regulators box temperature	T	HL_LSU*_T
HM281194	HL_LSU2_S	LSU phase lock #2 flag	HL	NONE
HM213194	HL_LSU1_T	LSU main X-band synthesizer box temperature	T	HL_LSU*_T
HM282194	HL_LSU1_S	LSU phase lock #1 flag	HL	NONE
HM288194	HL_LSU_f_offset	LSU offset synthesizer chip setting	HL	NONE
HM287194	HL_LSU_f_main	LSU main synthesizer chip setting	HL	NONE
HM002194	HL_LCU_Status	LCU combined status	HL	NONE



HM243194	HL_hk_cntr	LCU number of received HK requests	HL	NONE
HM083194	HL_Gate1_1A_V	LOU band 1A amplifier 1 gate voltage	HL	HL_Gate*_V
HM199194	HL_Frequency_V	LSU analog frequency indicator voltage	HL	NONE
HM257194	HL_Freq_known_S	LCU freq setting OK status	HL	NONE
HM240194	HL_false_hk	LCU number of rejected HK requests	HL	NONE
HM259194	HL_error_word_S	LCU digital error status word	HL	NONE
HM113194	HL_Drain1_1A_V	LOU band 1A amplifier 1 drain voltage	HL	HL_Drain*_V
HM223194	HL_CTSENSE_T	LOU temperature ???	HL	NONE
HM242194	HL_cmd_cntr	LCU number of executed+failed commands	HL	NONE
HM245194	HL_checksum	LCU memory checksum	HL	NONE
HM003194	HL_Channel_S	LCU band status	HL	NONE
HM239194	HL_AGNDREF_V	LCU analog ground reference voltage	HL	NONE
HM195194	HL_9P5_V	LSU +9.5V supply voltage	HL	NONE
HM207194	HL_9P5_C	LSU +9.5V supply current	HL	NONE
HM211194	HL_7M5_C	LSU -7.5V supply current	HL	NONE
HM189194	HL_17P5_V	LSU +17.5V supply voltage	HL	NONE
HM201194	HL_17P5_C	LSU +17.5V supply current	HL	NONE
HM193194	HL_10P5_V	LSU +10.5V supply voltage	HL	NONE
HM205194	HL_10P5_C	LSU +10.5V supply current	HL	NONE
WM306565	HiFiWEV_L44_I	LCL WEV + WOV current	SAT	NONE
WM806565	HiFiWEH_L43_I	LCL WEH + WHO current	SAT	NONE
WM409565	HiFiLCU_R_L54_I	LCL LCU + LSU redundant current	SAT	NONE
WM709565	HiFiLCU_N_L53_I	LCL LCU + LSU main current	SAT	NONE
WM609565	HiFiICU_R_L68_I	LCL ICU + FCU redundant current	SAT	NONE
WM509565	HiFiICU_N_L64_I	LCL ICU + FCU main current	SAT	NONE
WM608565	HiFiHRV_L67_I	LCL HRS-V current	SAT	NONE
WM508565	HiFiHRH_L63_I	LCL HRS-H current	SAT	NONE
HM181191	HF_AV2_IF_B_T	FCU V IF amplifier board temperature	HF	NONE
HM180191	HF_AV2_G_SIF3_V	FCU V second IF amplifier stage 3 gate voltage	HF	NONE
HM177191	HF_AV2_G_SIF2_V	FCU V second IF amplifier stage 2 gate voltage	HF	NONE
HM174191	HF_AV2_G_SIF1_V	FCU V second IF amplifier stage 1 gate voltage	HF	NONE
HM171191	HF_AV2_G_FIF2_V	FCU V first IF amplifier stage 2 gate voltage	HF	NONE
HM168191	HF_AV2_G_FIF1_V	FCU V first IF amplifier stage 1 gate voltage	HF	NONE
HM131191	HF_AV1_MXMG_C	FPU V Mixer Magnet current	HF	NONE
HM120191	HF_AV1_MXBIAS_V	FPU V Mixer junction bias voltage	HF	NONE
HM121191	HF_AV1_MXBIAS_C	FPU V Mixer junction current	HF	NONE
HM136191	HF_AV1_MXB_T	FCU V Mixer Board temperature	HF	HF_A**_**B_T
HM119191	HF_AV1_DPACT_V	FPU V Diplexer actuator voltage	HF	NONE
HM118191	HF_AV1_DPACT_C	FPU V Diplexer actuator current	HF	NONE
HM246191	HF_AR_SCHS_CT	FPU redundant hot black body temperature	HF	NONE
HM251191	HF_AR_4K_IF_CT	FPU L-1 (4K) thermal strap at s/c end temperature	HF	NONE
HM249191	HF_AR_2K_END_CT	FPU L-0 (2K) thermal strap at FPU end temperature	HF	NONE



HM240191	HF_APR_UCONV_T	FCU V Upconverter temperature	HF	NONE
HM239191	HF_APR_UCONH_T	FCU H Upconverter H temperature	HF	NONE
HM243191	HF_APR_SCCS_CT	FPU cold black body temperature	HF	NONE
HM247191	HF_APR_S2K_CT	FPU L-0 (2K) temperature	HF	NONE
HM244191	HF_APR_S10K_CT	FPU L-2 (10K) optics assembly near connectors J63 and J64 temperature	HF	NONE
HM253191	HF_APR_CHB_T	FCU Chopper board temperature	HF	HF_A**_**B_T
HM245191	HF_AP_SCHS_CT	FPU main hot black body temperature	HF	NONE
HM090191	HF_AH2_IFB_T	FCU H IF amplifier board temperature	HF	HF_A**_**B_T
HM089191	HF_AH2_G_SIF3_V	FCU H second IF amplifier stage 3 gate voltage	HF	NONE
HM086191	HF_AH2_G_SIF2_V	FCU H second IF amplifier stage 2 gate voltage	HF	NONE
HM083191	HF_AH2_G_SIF1_V	FCU H second IF amplifier stage 1 gate voltage	HF	NONE
HM080191	HF_AH2_G_FIF2_V	FCU H first IF amplifier stage 2 gate voltage	HF	NONE
HM077191	HF_AH2_G_FIF1_V	FCU H first IF amplifier stage 1 gate voltage	HF	NONE
HM040191	HF_AH1_MXMG_C	FPU H Mixer Magnet current	HF	NONE
HM029191	HF_AH1_MXBIAS_V	FPU H Mixer junction bias voltage	HF	NONE
HM030191	HF_AH1_MXBIAS_C	FPU H Mixer junction current	HF	NONE
HM045191	HF_AH1_MXB_T	FCU H Mixer Board temperature	HF	HF_A**_**B_T
HM028191	HF_AH1_DPACT_V	FPU H Diplexer actuator voltage	HF	NONE
HM027191	HF_AH1_DPACT_C	FPU H Diplexer actuator current	HF	NONE

3.2 Appendix B: description of Science Trend Data Product Parameters

Parameter Name	Description	Group
obsid	Observation ID	COMB
apid	Application process ID	COMB
ccd	WBS sub band CCD number (1 to 4)	COMB
linemean	Mean intensity of COMB lines	COMB
linestddev	COMB line intensities standard deviation	COMB
linemin	Minimum of COMB line intensities	COMB
linemax	Maximum of COMB line intensities	COMB
resolmean	Mean spectral resolution	COMB
resolstddev	Spectral resolution standard deviation	COMB
resolmin	Minimum spectral resolution	COMB
resolmax	Maximum spectral resolution	COMB
zeromean	Mean of ZERO intensities	COMB
zerostddev	ZERO intensity standard deviation	COMB
zeromin	Minimum of ZERO intensities	COMB
zeromax	Maximum of ZERP intensities	COMB
position	Channel number of the COMB line fitted peak	COMB
obsid	Observation ID	FPU
hf_ah1_mxbias_c	FPU H mixer junction voltage	FPU
hf_av1_mxbias_c	FPU H mixer junction current	FPU
hf_ah1_mxbias_v	FPU V mixer junction voltage	FPU
hf_av1_mxbias_v	FPU V mixer junction current	FPU
hf_ah1_mxmng_v	FPU H mixer magnet voltage	FPU
hf_ah1_mxmng_c	FPU H mixer magnet current	FPU
hf_av1_mxmng_v	FPU V mixer magnet voltage	FPU
hf_av1_mxmng_c	FPU V mixer magnet current	FPU
hf_ah1_dpact_v	FPU H diplexer actuator voltage	FPU
hf_ah1_dpact_c	FPU H diplexer actuator current	FPU
hf_av1_dpact_v	FPU V diplexer actuator voltage	FPU
hf_av1_dpact_c	FPU V diplexer actuator current	FPU
hf_ah2_g_fif1_v	FCU H first amplifier stage 1 gate voltage	FPU
hf_ah2_g_fif2_v	FCU H first amplifier stage 2 gate voltage	FPU
hf_ah2_g_sif1_v	FCU H second amplifier stage 1 gate voltage	FPU
hf_ah2_g_sif2_v	FCU H second amplifier stage 2 gate voltage	FPU
hf_ah2_g_sif3_v	FCU H second amplifier stage 3 gate voltage	FPU
hf_av2_g_fif1_v	FCU V first amplifier stage 1 gate voltage	FPU
hf_av2_g_fif2_v	FCU V first amplifier stage 2 gate voltage	FPU
hf_av2_g_sif1_v	FCU V second amplifier stage 1 gate voltage	FPU
hf_av2_g_sif2_v	FCU V second amplifier stage 2 gate voltage	FPU



hf_av2_g_sif3_v	FCU V second amplifier stage 3 gate voltage	FPU
hf_apr_sccs_ct	FPU cold black body temperature	FPU
hf_apr_s2k_ct	FPU L-0 (2K) temperature	FPU
hf_dpr_ch_rot2	FPU commanded chopper voltage	FPU
hf_ap_schs_ct	FPU Prime hot black body temperature	FPU
hf_ar_schs_ct	FPU Redundant hot black body temperature	FPU
hf_apr_ch_rot	FPU measured chopper voltage	FPU
hl_r_m1_7b_c	LOU Redundant Multiplier 1 Voltage for 7B	FPU
hl_r_m1_1a_c	LOU Redundant Multiplier 1 Voltage for 1A	FPU
hl_r_m2_3b_c	LOU Redundant Multiplier 2 Voltage for 3B	FPU
hl_r_m1_7a_c	LOU Redundant Multiplier 1 Voltage for 7A	FPU
obsid	Observation ID	LO
band	HIFI Band	LO
lof_code	Code of the LO Frequency	LO
lofrequency	Local Oscillator Frequency	LO
hl_sensor_t	LOU Multiplier Chain Temperature	LO
hl_gate1_v	LOU Amplifier 1 Gate Voltage	LO
hl_gate1_c	LOU Amplifier 1 Gate Current	LO
hl_gate2_v	LOU Amplifier 2 Gate Voltage	LO
hl_gate2_c	LOU Amplifier 2 Gate Current	LO
hl_drain1_v	LOU Amplifier 1 Drain Voltage	LO
hl_drain1_c	LOU Amplifier 1 Drain Current	LO
hl_drain2_v	LOU Amplifier 1 Drain Voltage	LO
hl_drain2_c	LOU Amplifier 1 Drain Current	LO
hl_m1_v	LOU Multiplier 1 Voltage	LO
hl_m1_c	LOU Multiplier 1 Current	LO
hl_m2_v	LOU Multiplier 2 Voltage	LO
hl_m2_c	LOU Multiplier 2 Current	LO
hl_m3_v	LOU Multiplier 3 Voltage	LO
hl_m3_c	LOU Multiplier 3 Current	LO
obsid	Observation ID	TSYS
backend	Spectrometer name (WBS or HRS)	TSYS
subband	Spectrometer sub band number	TSYS
lofrequency	Local Oscillator Frequency	TSYS
central_if	Value of the central Intermediate Frequency	TSYS
resolution	Spectral resolution	TSYS
tsys_median	Median Tsys value across the IF	TSYS
tsys_stdev	Standard Deviation of the Tsys across the IF	TSYS
obsid	Observation ID	WBSFREQCOEFF
apid	Application process ID	WBSFREQCOEFF
ccd_1_1	WBS Frequency calibration coefficient 1 for subband 1	WBSFREQCOEFF
ccd_1_2	WBS Frequency calibration coefficient 2 for subband 1	WBSFREQCOEFF



ccd_1_3	WBS Frequency calibration coefficient 3 for subband 1	WBSFREQCOEFF
ccd_1_4	WBS Frequency calibration coefficient 4 for subband 1	WBSFREQCOEFF
ccd_1_5	WBS Frequency calibration coefficient 5 for subband 1	WBSFREQCOEFF
ccd_2_1	WBS Frequency calibration coefficient 1 for subband 2	WBSFREQCOEFF
ccd_2_2	WBS Frequency calibration coefficient 2 for subband 2	WBSFREQCOEFF
ccd_2_3	WBS Frequency calibration coefficient 3 for subband 2	WBSFREQCOEFF
ccd_2_4	WBS Frequency calibration coefficient 4 for subband 2	WBSFREQCOEFF
ccd_2_5	WBS Frequency calibration coefficient 5 for subband 2	WBSFREQCOEFF
ccd_3_1	WBS Frequency calibration coefficient 1 for subband 3	WBSFREQCOEFF
ccd_3_2	WBS Frequency calibration coefficient 2 for subband 3	WBSFREQCOEFF
ccd_3_3	WBS Frequency calibration coefficient 3 for subband 3	WBSFREQCOEFF
ccd_3_4	WBS Frequency calibration coefficient 4 for subband 3	WBSFREQCOEFF
ccd_3_5	WBS Frequency calibration coefficient 5 for subband 3	WBSFREQCOEFF
ccd_4_1	WBS Frequency calibration coefficient 1 for subband 4	WBSFREQCOEFF
ccd_4_2	WBS Frequency calibration coefficient 2 for subband 4	WBSFREQCOEFF
ccd_4_3	WBS Frequency calibration coefficient 3 for subband 4	WBSFREQCOEFF
ccd_4_4	WBS Frequency calibration coefficient 4 for subband 4	WBSFREQCOEFF
ccd_4_5	WBS Frequency calibration coefficient 5 for subband 4	WBSFREQCOEFF
entry	Either of Sample, Average or Stddev	HL_R_S_17_P5_V_FAST
remark	Optional, instrument expert comment on the particular sample	HL_R_S_17_P5_V_FAST
base	Minimum level of the 17.5V supply line voltage	HL_R_S_17_P5_V_FAST
ampl	Amplitude of the 17.5V supply line voltage above the base	HL_R_S_17_P5_V_FAST
period	Period of the 17.5V supply line voltage trapezoidal oscillation	HL_R_S_17_P5_V_FAST
lead	Time it takes to the 17.5V supply line voltage to move from base to base+ampl	HL_R_S_17_P5_V_FAST
level	Time the 17.5V supply line voltage stays at level base+ampl	HL_R_S_17_P5_V_FAST
trail	Time it takes the 17.5V supply line voltage to move back to the base level	HL_R_S_17_P5_V_FAST
phase	Phase of the periodic trapezoidal oscillation for the 17.5V supply line voltage	HL_R_S_17_P5_V_FAST
residue	Fit residual	HL_R_S_17_P5_V_FAST
samples	Time series of the 17.5V supply line voltage	HL_R_S_17_P5_V_FAST
entry	Either of Sample, Average or Stddev	HL_R_S_17_P5_C_FAST
remark	Optional, instrument expert comment on the particular sample	HL_R_S_17_P5_C_FAST
base	Minimum level of the 17.5V supply line current	HL_R_S_17_P5_C_FAST
ampl	Amplitude of the 17.5V supply line current above the base	HL_R_S_17_P5_C_FAST
period	Period of the 17.5V supply line current trapezoidal oscillation	HL_R_S_17_P5_C_FAST
lead	Time it takes to the 17.5V supply line current to move from base to base+ampl	HL_R_S_17_P5_C_FAST
level	Time the 17.5V supply line current stays at level base+ampl	HL_R_S_17_P5_C_FAST
trail	Time it takes the 17.5V supply line current to move back to the base level	HL_R_S_17_P5_C_FAST
phase	Phase of the periodic trapezoidal oscillation for the 17.5V supply line current	HL_R_S_17_P5_C_FAST
residue	Fit residual	HL_R_S_17_P5_V_FAST
samples	Time series of the 17.5V supply line current	HL_R_S_17_P5_V_FAST