PACS
Herschel

Document: `PTD_0.7.6_spec`
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Page 1

Test 0.7.6. PACS Chopper synchronous operation with detectors (spectroscopy)

Objectives

The main goal of this test is to check if the CRE read-out is synchronous with the chopper movement. For the last ramp on a chopper plateau including the chopper transition we will investigate how this ramp is disturbed and if this disturbance is reproducible or jitters. Doing rectangular chopping, we will perform the test in the calibration window where the chopper transition lasts 30 ms. In addition to the default reset interval of 1/4 sec (=250 ms), we will choose extreme RIs which are as long (in the case of RI of 1/32s=31.25 ms) as or shorter (in the case of RI of 1/64s=15.63 ms) than the chopper transition.

Priority

A

When performed / frequency

PFM-ILT
PFM-IST

Inputs, prerequisites

PTD 0.7.5 Verification of Chopper Functionalities;
PTD 2.3.2 Chopper PID optimization and performance test;
PTD 0.7.3 CRE functional check-out;

Interconnections

    A. Fulfilled By

    B. Fulfilling

OGSE Setup, astr. sources, OBSW Compr./Red.

OGSE BBs are not needed;
CSs will be used for illuminating the detectors, use the default temperature values which are set-up in PACS spectroscopy default mode;
Loss-less compression mode to get the full time resolution of detector signals;

Test Implementation Procedure (TIP)

Three settings (= 3 different RIs: 1/64s, 1/32s, 1/4s) will be used with the OBCP 13 which will chop between the two calibration windows. For each setting we will have 8 (commanded) ramps per chopper plateau. Use default integration capacity.

Step #	Test Implementation Procedure	OGSE Setup	Products Online Analysis	Pass/Fail & Remarks
	FM ILT TIP for			
	req. 0.7.6.spec PACS Chopper synchronous operation with detectors (spectroscopy)			
	Setup the instrument for this PTD			
0.01	Switch on PACS (if not already done).			
0.02	Setup spectroscopy mode			CSs have to be stabilized at default temperatures;
0.03	Set diagnostic HK for chopper measures at readout frequency. synchronize on blue spectrometer readout Chopper: 209 DMC_CHOP_CTRL_ST - Chopper Control Status 244 DMC_CHOP_CUR_POS - Chopper: Actual position from readout by HK 245 DMC_CHOP_SETPOIN - Chopper: Position servo setpoint 246 DMC_CHOP_TARGET - Chopper: Final position for move CRE: 290 DMC_DECB_RO_RA_3 Number of readouts per ramp (blue-group 3) 291 DMC_DECB_CR_ST_3 CRE group 3 status 298 DMC_DECB_RA_CO_3 ramp counter, increments until reset (blue-group 3) 324 DMC_DECB_RO_RA_4 Number of readouts per ramp (blue-group 4) 325 DMC_DECB_CR_ST_4 CRE group 4 status 332 DMC_DECB_RA_CO_4 ramp counter, increments until reset (blue-group 4) 358 DMC_DECR_RO_RA_1 Number of readouts per ramp (red-group 1) 359 DMC_DECR_CR_ST_1 CRE group 1 status 366 DMC_DECR_RA_CO_1 ramp counter, increments until reset (red-group 1) 392 DMC_DECR_RO_RA_2 Number of readouts per ramp (red-group 2) 393 DMC_DECR_CR_ST_2 CRE group 2 status 399 DMC_DECR_RO_CO_2 ramp counter, increments until reset (red-group 2)			
0.04	Setup the SPU compression / reduction: Spectroscopy loss-less compression mode having raw data for 14 pixels in blue and red array.			

0.05	Select detector selection table select appropriate detector selection tables (DXS7602) for the loss-less compression mode with 14 pixels in blue and red array having raw data.			
	Step 1: Square wave modulation with different RIs			

1.01	Chop between the two calibration windows for three different RIs; Set 8 ramps per chopper plateau in OBCP 13
	
	`Loop over RIs 1/64, 1/32 and 1/4 sec`
	`  Loop repeat 50 (OBCP 13)`
	`  End loop OBCP 13`
	`End loop RIs`
			Check OBCP status;	

	Step 2: End of Test			
2.01	`Set PACS in default starting mode.` stop diagnostic housekeeping set PACS back to its default starting mode			

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Document: `PTD_0.7.6_spec`
Date: December 7, 2006
Version:

Page 4

Estimated time needed

3 settings: for RI 1/64 sec duration of ... sec; for RI 1/32 sec duration of ... sec; for RI 1/4 sec duration of ... sec. Taking into account OBCP overheads, we will need a total time of ... for this test procedure.

Success criteria, required accuracy

Synchronization is successful if timing is consistent and chopper movement is recognizable and reproducible triggered by the CRE reset signal.

Test Analysis Procedure (TAP)

For all three RIs the TAP below is the same.

Step #	Test Analysis Procedure (Offline)	Online Analysis Input	Output, Products	Requirements on IA
	FM ILT TAP for req. 0.7.6.spec PACS Chopper synchronous operation with detectors (spectroscopy)			
1.01	plot ramps of one pixel in a time line; overplot chopper position and labels; demonstrate effect of chopper transition on ramps;			
1.02	calculate mean time difference of label change and start of flat plateau; calculate mean time difference of label change and end of flat plateau; calculate mean time difference between start of chopper plateau and start of next ramp; calculate mean time difference between label change and start of next ramp;			
1.03	calculate the signals by linearly fitting the ramp slopes; plot signals and overplot labels and chopper positions rebinned on signal time steps; demonstrate effect of chopper transitions on signals;			
1.04	average signals on chopper plateaux excluding the first signal and subtract the first; signal → plot these signal difference for all chopper phases;			
1.05	check if disturbance of last ramp is reproducible or jitters.			

Output, products

Coding Strategy

Version number

Revision : 1.1