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HERSCHEL / PLANCK

Test specification for Herschel Instruments FM tests performed at satellite level. H-P-2-ASP-TS-1083

Rédigé par/*Written by*	**Responsabilité-Service-Société** ***Responsibility-Office -Company***	**Date**	**Signature**
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T.Passvogel	ESA Project Manager		

Entité Emettrice : Thales Alenia Space - France
(détentrice de l'original) :

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ENREGISTREMENT DES EVOLUTIONS / *CHANGE RECORDS*

ISSUE	DATE	§ : DESCRIPTION DES EVOLUTIONS *§ : CHANGE RECORD*	REDACTEUR *AUTHOR*
1_draft 1.0 2.0	8/9/06 29/09/06 13/12/2007	Initial issue After review by all parties. See details next page See change log. Comments from all parties Test tables now based on Instruments test procedures or test plan Remove references to AVM test program (finished)	B.Collaudin B.Collaudin B.Collaudin

on issue	ID	Ref	Comment from	Origin	Section Nb	Page	title, fig, table, or req	Remarks	Action	Industry Reply, or ref	reply	Modify spec (Y/N)	Done
1_draft	11	Mail CS from 15/7	ESA	CS	1.2.2	8		1: The IST shall be performed before AND after environmental tests. --> remove "/or" from the remarks.		Yes , of course. To be corrected	y	y	y
1_draft	12	Mail CS from 15/7	ESA	CS	1.2.2	8		2: Cryostat tilt limit inside LSS has been confirmed to be 22° (Ref. email from S. Idler on 14/09/2006) --> Update tilt limit during TB/TV Test.		OK See comment ID 2	y	y	y
1_draft	24		ASP	BC	2.1	9	AD's	Add H/P IST (WU) thermal predictions - H-P-1-ASP-TN-1170. Add reference to this also in the text, new section 3.6		OK: included as RD-06: H-P-1-ASP-TN-1170_1.0 - H/P IST (SVM) thermal predictions	y	y	y
1_draft	7		AAS-F	BC	2.1	9	Applicable documents	AD41..43: Change all SVM to WU electrical integration specifications issues from draft to 1			y	y	y
1_draft	8		AAS-F	BC	2.1	9	Applicable documents	Add Herschel AIT Plan eference		HP-2-ASED-PL-0026_2.2	y	y	y
1_draft	21	Mail WL 15/9	HIFI		2.1	10	HIFI IST & TV	AD-87 ? HIFI FM IST procedures ? TBW AD-103 ? HIFI TV test procedures - TBW Regarding the procedures and scripts for I refer to "FM-IST-Integration-and-Functional-Test-Procedure-0.4a" (attached) and http://www.sron.rug.nl/hifi_icc/protected/documentation/index.html Note that these are draft versions. The update has to happen after the ILT experience. We already know that an update is needed. The missing procedures are the Very short performance test (for TV tests). But as indicated in the Excel sheet the testmodes names are already in place. Should we give the numbers already?		Included as AD-65 – SRON-G/HIFI/PR/2006-0xx - HIFI FM Integration & Functional procedures – (draft 4 available) Remove IST from the title (this is misleading), and provide reference number, + date of readiness. Include AVM sequence (ICU AVM SFT) sent by Luc Dubbledam.	y	y	y
1_draft	26		ASP	BC	3.1	12	instrument deliveries	Clarify the need of FPU Simulator for WU WFT		HIFI needs an FPU & LOU Simulator to test the WU. The other not (TBC). What about AVM ?	y	y	y
1_draft	13	Mail CS from 15/7	ESA	CS	3.1.1	12		3: During AVM TRR telecon held on 15/09/2006, it has been agreed not to use the HIFI resistor network. --> Please update table 3-1 accordingly.		This is minuted in the TRR, & decided at this time. This should be sufficient. I do not think we need to modify the HIFI proposed configuration	y	N	
1_draft	1		ASED	SI	3.5.1:	17		A potential bias depends on the HTT filling level. If filled up > 90%, which should be the case, all PACS pods are covered with He, i. e. no bias. At +90° the HOT can only be filled up to about 50%, i. e with about 4 kg. With about 100 mg/sec this would lead to refill after about 12 h (needs to turn the cryostat to vertical position).		Thismean that our proposition to run the Run the RMS Horizontal does not work. The limitation of 12h continuous operation for IST is a serious limitation, in particular for the reference mission scenario, where 36h Continuous operation is required. We have to go to 90° only when SPIRE is operating in Spectrometer mode. --> Move this test at the very end of the RMS. Or we remove the SPIRE spectrometer mode from the RMS (already removed from TV test	y	y	y

on issue	ID	Ref	Comment from	Origin	Section Nb	Page	title, fig, table, or req	Remarks	Action	Industry Reply, or ref	reply	Modify spec (Y/N)	Done
1_draft	2		ASED	SI	3.5.2	18		High drift case: with delta mass flow 3 mg/s, m He 280 kg, T He 1.65 K, cp He 1881 J/kg K, H vap 23544 J/kg we get a temp drift of 0.000483 K/h Low drift case: with delta mass flow 1.8 mg/s, m He 300 kg, T He 1.8 K, cp He 2938 J/kg K, H vap 24201 J/kg we get a temp drift of 0.000178 K/h. The tilting constraints are about 22 deg as regards envelope but we should add some margin (still TBD) in order to avoid bumping of the HSS to the LSS due to e. g. overshoot when stopping rotation, etc.)		OK. To be included. I thought that the tilting was limitted to <20° in LSS (from STM TV test)	y	y	y
1_draft	14	Mail CS from 15/7	ESA	CS	3.5.2	18		4: see my comment no. 2. --> update last sentence of the page accordingly.		OK See comment ID 2 & 12	y	y	y
1_draft	3		ASED	SI	§ 3.5.3:	19		Is the RE/RS test inside a unechoic chamber? Cryostat operaion as for IST (HTT closed, ...). HOT to be re-filled every day, when tilted to 90° after about 12 h.		Your Choice. I guess it will be Similar test conditions than during QM test, unless you ask specific environment. Test objective is similar: Radiated amission = to get the background from SVM Radiated susceptibility: re-apply the measured level (+ margins) to verify the peak up from cryoharness	y	n	
1_draft	15	Mail CS from 15/7	ESA	CS	3.5.3	19		5: typo in last line --> tilted not tolted.		OK. To be corrected	y	y	y
1_draft	28		AAS-F	BC	4.1	20		add integration flow diagram			y	n	
1_draft	4		ASED	SI	4.1	20	fig. 4-1/table 4-1:	It might be useful to perform an SFT cold He II priot to SVT 1 / SVT 2 and to perform an SFT cold He II just prior to LSS chamber closure. What tests will be performed during the launch campaign?		1: SFT prior to IST. Agrred. I add it. 2: Launch campaign: Not defined yet, but I anticipate we will run an SFT	y	y	y
1_draft	9		AAS-F	BC	4.1	20	Test flow	Move SVT before FAR			y	y	y
1_draft	10		AAS-F	BC	4.1	20	Test flow	add AVM test flow			y	y	y
1_draft	18	Mail WL 15/9	HIFI	WL	4.3	22	Incoming Inspection	The incoming inspection is to be done by the receiving party. In this case 'ESA'. From the test spec TS-1083 (section 4.3) I gather that the shipment test is considered part of the incoming inspection. We will update the post shipment tests for FPU, LO, WU's. These will be similar to the ones used during the QM program. When do you need the update? Note that we can check the FPU with a FCU (testunit #5) and the FP SCOE after integration of the FPU on the optical bench and after of the harness from HIFI FPU to FCU FM. We cannot check the FPU at the cryostat wall feedthrough!		OK. This will be included. But you will have to re-issue/ Update the procedure for FM.	y	y	y
1_draft	16	Mail CS from 15/7	ESA	CS	4.4.2	24		6: Instrument full software image patch: After patching a small area in RAM, the entire memory area shall be dumped and verified rather than only the patched area, in order to exclude patching into undesired area's. --> update the 9 steps accordingly.		The current OBSM tool does not allow this: It will dump the zone whch has been patched. Memory overall integruty is verified by thechecksum. In case this is not correct, this will be investigated, but on case by case basis (through the NCR process) I add this remark: (*) The OBSM tool dump only the area that has been patched. The integrity of the memory is verified by checksum.	y	y	y

on issue	ID	Ref	Comment from	Origin	Section Nb	Page	title, fig, table, or req	Remarks	Action	Industry Reply, or ref	reply	Modify spec (Y/N)	Done
1_draft	27	PM37	AAS-F	BC	4.4.3	25		Change UFT to UFT/SIT (Subsystem Intégration test). Split UFT into UFT (during WU integration) & SIT (when all units are integrated).			y	y	y
1_draft	5		ASED	SI	4.5	27		Is IEGSE operation required for SFT? For EQM SPIRE managed to provide SFT scripts which didn't need TC parameters from IEGSE.		This should be very similar to QM. We can add such requirement. (this mean that all TC parameters should be included in the scripts, and not gathered from I-EGSE	y	y	y
1_draft	20	Mail WL 15/9	HIFI		4.5.3	29	HIFI SFT	> AD-63 - HIFI ICU SFT ? TBW The SFT (FT) of the OBS is still under discussion. We think we need a couple of weeks to get this sorted out.		OK	y	N	
1_draft	25		ASP	BC	4.6.1	32	RMS	Add Time line graph for RMS from RMS meeting presentation (14/9 G.Beaufils)		OK	y	y	y
1_draft	22	Mail WL 15/9	HIFI		4.6.4	39	AVM IST	> AD-88 ? HIFI AVM IST Procedures - TBW I think that this is covered by the current AVM campaign and documentation. As you know it cannot act as a testbed for IST scripts.		I'm not sure. We have only the ICU SFT. The aim of the AVM IST was to run (rehearse) the FM IST. However, with the ICU Alone (it was decided not to use the resistors, as they do not fit with the SVM interface), we do not know what can be done. At least we fould try the RMS, and the peak up mode	y	N	
1_draft	19	Mail WL 15/9	HIFI		4.6.4.1	40	HIFI RMS	Re: HCSS steering committee (ESA: P. Estaria?). Or Peter Roelfsema +31 50 363 4043		We want to have one interface for the instrument testing. RMS is part of IST. Please collect the information & provide.	y	N	
1_draft	6	Mail HF from 13/9	PACS	HF	4.7	58	EMC	In principle I would provide only a procedure which covers the measurements for the nominal PACS instrument. Is this the correct base line, or should I also provide a procedure for the redundant system ?		I confirm that for EMC test, only one of the Nominal/Redundant Instrument will be tested. Il will be the Nominal, except if, as a result of the ILT, the other part of the instruments is either more noisy or more susceptible. I'll add these remarks in the test specification H-P-ASP-TS-1083	y	y	y
1_draft	17	Mail CS from 15/7	ESA	CS	5.1.2	63		7: please add: Instrument teams shall define contingency actions (not necessarily abort of sequence) for each defined soft OOL.		in which section does this needs to be added (not found p63) - What is OOL ?	y	t	
1_draft	23	Mail WL 15/9	HIFI		4.8.3	66	EMC	AD-93 ? HIFI EMC test procedures - TBW QM test procedure is available		I'm not sure teh QM fit your objectives for FM EMC tests. I guess tou want to verify the susceptibility of all 14 chanels. So please update this document to FM, and indicate when it can be ready	y	N	
1_draft	27	review before signature	ASP	DM	1.2.2	10	objectives	add TBC for temperature of He Tank for SVT1. (SVT may be performed in He I, ESA to confirm			y	y	y
1_draft	28	review before signature	ASP	DM	2.1	11	AD's	add ASED for FPU integration procedures			y	y	y
1_draft	29	review before signature	ASP	DM	3.2.2	16	EGSE	Change warm SFT by Warm units functional tests			y	y	
1_draft	30	review before signature	ASP	YR	3.5.2	21	figyre 3.4	Replace figure of Herschel in LSS by one with +Z oriented toward sun		None available. Add comments	y	y	n

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1_draft	31	review before signature	ASP	DM	4.1	23	Intégration & test flow diagram	Split Cryostat closing in 2 parts: Cryostat Provisional closing, before mating & cryostat Closing -Evacuation & Leak check after SFT. Change SFT 1 to SIT/SFT1 Change Planck FM Delivery to Herschel FM Delivery			y	y	y
1_draft	32	review before signature	ASP	DM	4.2	25	Time Allocation	For commissioning, precise 1 day per instrument			y	y	y
1_draft	33	review before signature	ASP	YR	6.1	72	Organisation	Title: Change Responsabilities to Responsibilities Diagram: Change Instruments test teams by Instruments Test/Evaluation teams			y	y	y
1_draft	34	review before signature	ASP	DM	6.4	74	Task distributions	precise test procedures, execution, and report difference for AVM & FM, between AAS-I & ASED			y	y	y
1_draft	35	review before signature	ASP	DM	7.3	76	Test reports	add delay for delivery of reports: 1 month test reports, 2 months test evaluation reports			y	y	y
1	37	HIFI RMS meeting			4.7.3.2		RMS	1: SPIRE cannot be operated in spectrometer mode in FM RMS. HIFI AVM RMS is useless as HIFI cannot generate science TM --> Propose specific AVM RMS: Herschel AVM RMS - PACS Prime / Burst Mode (30mn) - DTCP1: Switch PACS to SPIRE & include SPIRE cooler recycling (3h) - SPIRE Prime Spectrometer (12h) (OD=3+12 =15) - DTCP2 : Switch SPIRE to PACS + PACS cooler recycle (3h) - PACS Prime (13h) (OD=3+13 =16) - DTCP3 : Switch PACS to SPIRE + SPIRE cooler recycle (3h) - SPIRE Prime Photometre (include peak-up) (13h) (OD=3+13 =16) - DTCP4 : Switch SPIRE to PACS + PACS cooler recycle (optional) (3h) - PACS Prime (30mn) Herschel FM RMS - PACS Prime / Burst Mode (30mn) - DTCP1: Switch PACS to HIFI (3h) - HIFI (12h) (OD=3+12 =15) - DTCP2 : Switch SPIRE to PACS + PACS cooler recycle (3h) - PACS Prime (13h) (OD=3+13 =16) - DTCP3 : Switch PACS to SPIRE + SPIRE cooler recycle (3h) - SPIRE Prime Photometre (include peak-up) (13h) (OD=3+13 =16) - DTCP4 : Switch SPIRE to PACS + PACS cooler recycle (optional) (3h) - PACS Prime (30mn)			y	y	y
1	37		ASP	BC	3.51		3.5.1 Cryostat Operation during IST:	Cryostat will be tilted of 23° during RMS. SPIRE Spectrometer mode will not be used.		Updated	y	y	y

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1	37		ASP	BC	2.1	10	Documents	General note: the current version of the ILT procedures are split in: - HIFI ILT Short Functional Test Warm Procedure SRON-G/HIFI/PR/2006-023 - HIFI ILT Short Functional Test Cold Procedure SRON-G/HIFI/PR/2006-024 - HIFI ILT Integration and Functional Test Cold Procedure SRON-G/HIFI/PR/2006-025 - HIFI ILT Radiometry Test Procedure SRON-G/HIFI/PR/2006-026 - HIFI ILT Stability Test Procedure SRON-G/HIFI/PR/2006-027 - HIFI ILT Gas Cell Test Procedure SRON-G/HIFI/PR/2006-028 - HIFI ILT AOT Observing Modes Test Procedure SRON-G/HIFI/PR/2006-029 - HIFI ILT Spectral test Procedures SRON-G/HIFI/PR/2006-101. To split the procedures in a similar way seems the way forward. This will only be implemented after HIFI ILT. Then the most recent updates can be incorporated as well. A preliminary version SRON-G/HIFI/PR/2006-0xx: HIFI IST Integration and Functional Test Procedure contains most of the procedures above. This version was made available quite some time ago.		These document need to be customised for the Satellite IST. (clear objectives and duration to be followed). We gave a frame for satellite test. - SFT: OK with your ILT SFT, except that we need a He I SFT. SFT shall be <2h, and should be able to be run by satellite operator only (no instrument presence necessary (except for the few first for training). Ie no parameters sent to the script by the IEGSE, and clear succes criteria. - FFT: OK (duration ?) but then we need IST commissioning and RMS. The other procedure may be used in the SPT as far as compatible. I guess we do not need the gas cell procedure (EGSE ?)	y	n	y
1	38	Comments from HIFI on draft (06/10/2007)	HIFI	WL	2.1			AD 63: HIFI ICU SFT (assuming that this is the OBS SFT: open. This procedure will be part of part of SRON-G/HIFI/PR/2006-0xx: HIFI IST Integration and Functional Test Procedure. It is also needed for ILT, but is not available as of today.		Please provide dedicated document	y	n	y
1	39	Comments from HIFI on draft (06/10/2007)	HIFI	WL	2.1			AD 73: HIFI SFT (for IST) → for the time being in: SRON-G/HIFI/PR/2006-0xx: HIFI IST Integration and Functional Test Procedure		Please provide dedicated document	y	n	y
1	40	Comments from HIFI on draft (06/10/2007)	HIFI	WL	2.1			AD 87: HIFI FM IST procedures → for the time being in: SRON-G/HIFI/PR/2006-0xx: HIFI IST Integration and Functional Test Procedure		Please provide dedicated document	y	n	y
1	41	Comments from HIFI on draft (06/10/2007)	HIFI	WL	2.1			AD 88: HIFI AVM IST Procedure: obsolete, the AVM campaign is on its way.		A document was provided just before the test: added AD-6_4 - SRON-U-HIFI-PR-2007-003_1.1 - HIFI AVM2 UFT	y	y	y
1	42	Comments from HIFI on draft (06/10/2007)	HIFI	WL	2.1			AD 93: HIFI EMC test procedure (..)		Please provide dedicated document	y	n	y
1	43	Comments from HIFI on draft (06/10/2007)	HIFI	WL	2.1			AD 103: HIFI TV test procedure (contents by HIFI → for the time being in: SRON-G/HIFI/PR/2006-0xx: HIFI IST Integration and Functional Test Procedure)		Please provide dedicated document	y	n	y

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1	44	Comments from HIFI on draft (06/10/2007)	HIFI	WL	3.1.1		Table 3-1	Note that Product tree id occurs twice. For Focal Planer Control Unit and for Bridging waveguides. Product Id. 111230 for the FCU: VM should be Simulator instead of N/A Product Id. 111313 AVM should be QM instead of N/A		OK Typo: Bridging wage-guides: New product tree for = 111227 FCU AVM=Simulator (as per comment) ICU to FCU cable = QM	y	y	y
1	45	Comments from HIFI on draft (06/10/2007)	HIFI	WL	3.2.2	15		LOA simulator is missing from HIFI EGSE list.		There was a LOU simulator, now changed to LOA simulator	y	y	y
1	46	Comments from HIFI on draft (06/10/2007)	HIFI	WL	3.2.2			Also the use of FP-SCOE and FCU TU5 is an option for integration tests (see separate email, dd. 29/09/2006). The EGSE mentioned here is also used for the FPU post shipment test.		Included as an option. Can be used to check the FPU and cryoharness	y	y	y
1	47	Comments from HIFI on draft (06/10/2007)	HIFI	WL	3.2.2	16		The I-EGSE versions appear to be very old. At least HCSS will have to be ≥ 0.3.6 for HIFI IA.		remove reference to IEGSE Software	y	y	
1	48	Comments from HIFI on draft (06/10/2007)	HIFI	WL	4.1			Fig 4.1 is not consistent with Table 4.1: - microvibration is missing between IST1/SPT, - LOR integration missing (and other steps) missing before transport to ESTEC, - SPT missing after IST2		The schedule table is removed from issue 2 (Scedule delivered by ESA)	y	y	
1	49	Comments from HIFI on draft (06/10/2007)	HIFI	WL	4.1			Note that we did not cross correlate the duration in Table 4 – 1 with the values in the Excel sheet.		Table 4.1 is the schedule. The duration specified for instruments tests are given in section 4.2.	y	n	
1	50	Comments from HIFI on draft (06/10/2007)	HIFI	WL	4.7	24		“For AVM, the core of the IST (commissioning and Reference mission scenario, see below) will be run as a rehearsal for FM” Note that the functionality of the HIFI AVM is very limited. The HIFI AVM is the ICU AVM2 and a power simulator. Back ends and other control units are not part of the AVM delivery. In our opinion it can hardly serve for dry-runs of commissioning and Ref mission scenario.		True, but the desision to propose such a limited AVM was your decision, and the drawback is that you got very little debug from the AVM.	y	n	
1	51	Comments from HIFI on draft (06/10/2007)	HIFI	WL	4.3	24		HIFI has defined a post shipment test after integration of the WU’s on the panels and the WIH in place, but still with dummies for (one) LOA and FPU. See also email, dd. 29/09/2006.		OK Statement included, but test procedure shall be provided	y	y	y
1	52	Comments from HIFI on draft (06/10/2007)	HIFI	WL	4.4			Regarding electrical integration we propose integrate the warm units as was done in the QM campaign. Do not have a post shipment test for each unit after shipment. But mount the units (ICU, FCU, Upconverter, LCU, LSU, HRS (2x), WBS (2x), WIH) on the SVM panels. Connect them the PDU simulator, and the IEGSE with CDMS simulator and run the WU FT including the check on communication. After that the units can be connected to the space craft EGSE. This approach is more efficient than testing each WU separately, each with its own SCOE. The electrical integration procedure will have the details.		This is also our approach. The main difference wrt PACS & SPIRE is that you need the FPU simulator.	y	n	

on issue	ID	Ref	Comment from	Origin	Section Nb	Page	title, fig, table, or req	Remarks	Action	Industry Reply, or ref	reply	Modify spec (Y/N)	Done
1	53	Comments from HIFI on draft (06/10/2007)	HIFI	WL	4.4.1.2			A reference to the document H-P-2-ASP-SP-1036_2.0 Herschel warm units interconnecting harness mechanical integration specification is missing.		Added, + there are new references to integration procedures in the AD list.	y	y	y
1	54	Comments from HIFI on draft (06/10/2007)	HIFI	WL	4.4.3.2.3 and 4.5.3			The row in the tables with: "SFT on redundant FCU, ICU" must be deleted. Before switching on HIFI redundant, HIFI must be switched off. The sentence under the table is correct.		Corrected	y	y	y
1	55	Comments from HIFI on draft (06/10/2007)	HIFI	WL	General			Diplexer scans are not needed for bands 1,2,5; magnet tunings are not needed for bands 6-7. These may not have been implemented in all scripts		The content of the table has been provided by HIFI. If it is wrong, please provuide an updated table.	y	n	
1	56	Comments from HIFI on draft (06/10/2007)	HIFI	WL	General			A SCR has been issued regarding naming convention: 6L/H to 6a,6b,7a,7b		Same as above	y	n	
1	57	action from HIFI RMS meeting	HIFI	PR	4.7.4.2			Proposition for HIFI RMS		Please provide dedicated document	y	n	
1	58	SPIRE DRB	ASP	BC	4.6.3.3			Add Microvibration test in list of FM tests (1 day with reaction wheels & SPIRE) (spectro), satellite horizontal. (Add at the end of SPIRE SPT		Added in a new section 4.6.3.4 SPIRE Micro-vibration tests A microvibration test of the susceptibility of SPIRE (instrument in spectrometer mode) the the expeorted vibration of the reaction wheel shall be performed after the SPT, taking advantage of the cryostat being in the right state (horizontal, ½ full). The test shall be performed as follow. 1: Set the Satellite horizontal (if not already there) 2: Set SPIRE is Spectrometer observation mode (if not already there) 3: Perform frequency sweep on all reaction wheels (one after each other) 4: Observe effect on the SPIRE bolometers, and on the SMEC (SPIRE to define criteria) 5: Measure the acceleration level on OBP, and near the reaction wheels 6: Optionally, set a worst combination of the reaction wheel repeat observations 4 & 5.	y	y	y

on issue	ID	Ref	Comment from	Origin	Section Nb	Page	title, fig, table, or req	Remarks	Action	Industry Reply, or ref	reply	Modify spec (Y/N)	Done
1	59	Comments from F.Pedersen (Mail 16/1/07)	ESA	FP	All		general	From a Spacecraft AIV point of view it will be important that we keep the number of transitions between He-I and He-II conditions to a minimum. To this end it is my goal to have the spacecraft operational and functional tests performed in He-I conditions and only the activities related to instrument performance executed in He-II conditions (SPT's, EMC and TB/TV)		It is agreed that the number of transition HeI <-->HeII shall be minimized. However, the IST have been designed to be operated at He II conditions: all tests are besed on the use of the instrument in observing photometer / spectrometer modes, using the functions such as 0.3K sorption coolers recycling and operation, detection chain, calibration sources. These tests have to be compared with similar test run in ILT. We loose 90% of the tests prepared if we run them at He I (remains only switch-on / off sequences (Off to standby), + may be actuation of mechanisms. Number of transition can also be reduced if vibration tests are performed in He II. Why running a test with wrong boundary conditions, as it can easily be run in proper conditions. Test return is immensely better.	y	N	y
1	60	Comments from F.Pedersen (Mail 16/1/07)	ESA	FP	1.2.2	9		Update table 1-1 to be in line with the attached comments.	IST Spec table 1-1.pdf	Corrected, but I do not agree with all comments. In particular tilting and cover flushing (TBC) are needed to run instruments IST in He II.	y	y	y
1	61	Comments from F.Pedersen (Mail 16/1/07)	ESA	FP	3.2.2	16		It will not be possible to perform the parallel operations (one or two active instruments, the other(s) in stand-by) foreseen throughout the FM environmental campaign with only one common set of I-EGSE. Is there any reason not to deliver one set of I-EGSE's together with each instrument and to be commissioned during I&T/UFT.		This has been performed with this configuration during CQM Tests. However, the IEGSE configuration has been changed during the AVM test to support 3 parallele IEGSE (adding 2 machines to get 8 work stations : 3 for PACS, 3 for SPIRE, and 2 for HIFI; and modifying the database to declare the 3 IEGSE's), The new configuration is now described in section 3.2.2.	y	y	y
1	62	Comments from F.Pedersen (Mail 16/1/07)	ESA	FP	3.5.1	19		The RMS test is a primarily a Spacecraft functional performance test rather than an instrument scientific performance test, the requirements on temperatures / tilting should reflect that.		The RMS is both a satellite test (mainly for ACMS & data processing), but as well an instrument test. IRMS sequences have been build to be true observations, in representative conditions. Therefore, the tilting (required to recycle the coolers), and the He II temperatures are mandatory to complete the test.	y	n	y
1	63	Comments from F.Pedersen (Mail 16/1/07)	ESA	FP	3.5.1	20		90 degree tilting is not be possible with a fill level above 50 %, the unique needs have to be covered in a dedicated SPIRE SPT session.		SMEC test now remove from IST. Dedicated SMEC mechanical test (He I, 50% fill, horizontal)	y	y	y
1	64	Comments from F.Pedersen (Mail 16/1/07)	ESA	FP	3.5.3	21		The CE measurements for each instrument have to be performed during the WU integration whilst there is still access to the individual power harness wires. (breakout box ?).		Agreed	y	y	y

on issue	ID	Ref	Comment from	Origin	Section Nb	Page	title, fig, table, or req	Remarks	Action	Industry Reply, or ref	reply	Modify spec (Y/N)	Done
1	65	Comments from F.Pedersen (Mail 16/1/07)	ESA	FP	3.5.3	21		The SPIRE need for 90 deg tilting may be in conflict with fill level constraints / need of PACS - HIFI to have the POD's submerged / time allocated to EMC test (He-II topup during EMC test from below 50 % to about 90 %)		Now SPIRE SMEC is tested apart from IST (in He I, Filling 50%)	y	y	y
1	66	Comments from F.Pedersen (Mail 16/1/07)	ESA	FP	4.1	23		Please remove the comment at the bottom of the page about the launch campaign activity flow.		Removed	y	y	y
1	67	Comments from F.Pedersen (Mail 16/1/07)	ESA	FP	4.2	25		The 78 hours test with HIFI during TV has presumably yet to be detailed and then formalized.		This is described in section 4.7.3. Add a reference to this section here. This has been already agreed with HIFI, as this is the only test in the FM sequence where both teh FPU and the LOU have the correct environment. As a consequence, the Commissioning was to be performed within the time allocation (24h) Note this will be further detailed in the HIFI TV test procedure (TBW, as the other HIFI procedures)	y	y	y
1	68	Comments from F.Pedersen (Mail 16/1/07)	ESA	FP	4.4.2	27		It is not understood why the test is limited to AVM only, how will instruments be patched during the FM campaign, if needed ? (tools and file exchange formats ?)		It has been agreed that the satellite IST test DTCP worst case (section 5.8.8) contains a instrument memory patch test that verify the software upload capability (not in this spec but in satellite IST). The (therma) OBSM tool has been debugged on the AVM. It will certainly be used on the FM, on case by case basis, to patch the softwares that the instruments will for sure modify.	y	y	y
1	69	Comments from F.Pedersen (Mail 16/1/07)	ESA	FP	4.5	31		It is requested that the AIT contractor can execute the SFT's at any time in the AIT programme and that the SFT's can be executed and assessed on the data available in the HK datastreams only, without needing to look into the scientific TM packets. (this does not preclude a feedback by instrument teams to the test report on what was observed in the scientific data streams)		Agreed. This is exactly the purpose of the last paragraph in section 4.5. Corrected to insist on this requirement, and ask for self consistant scripts.	y	y	y
1	70	Comments from F.Pedersen (Mail 16/1/07)	ESA	FP	4.8	67		The CE measurements for each instrument have to be performed during the WU integration whilst there is still access to the individual power harness wires. (breakout box ?).		same as comment 64. Agreed	y	y	

on issue	ID	Ref	Comment from	Origin	Section Nb	Page	title, fig, table, or req	Remarks	Action	Industry Reply, or ref	reply	Modify spec (Y/N)	Done
1	71	Comments from C.Jewell Mail 25/4/07	ESA	CJ	3.6	19		1) page 19: The cryostat constraints should include: a. The cryo-cover flushing requires extra CVSE around the cryostat, and access through the cut-outs in the cryo-cover baffle. b. The 23 degree tilting is the optimised tilt for 3He cooler re-cycling. However if we are not verifying the hold time of the 3He cooler we can re-cycle with the cryostat vertical. Therefore depending on the objectives of the test I would identify the need for tilting or not. c. The internal PODs start to exit the superfluid helium at around 80% fill level. Some test objectives will be compromised if the internal PODs are not in the liquid. d. The level 1 temperature is a function of the cryo-cover temperature!! e. We cannot go from horizontal (<50% fill) to 3He cooler re-cycling (> 80% fill) without a few days of “top-up” operations. f. The time constants to reach thermal equilibrium on the detectors, the OBP, and if necessary the cryo-cover need to be assessed and considered as a constraint for the amount of time the instruments will be able to log real data. Go back to the lessons learnt during the EQM		a, b, During IST (1d/instrument) and RMS, (48h), SPT (PACS/SPIRE), EMC (RE) the cryostat shall be tilted 20°, and cover flushed. During TV: cryostat tilted, cover not flushed. Included c: Pods wetting is driven by required temperature d: but more easily to mass flow e: Understood. It has in addition 12h autonomy only (HOT).This is the reason of removing the SPIRE spectro from RMS. We may have to remove iSPIRE Spectro verification also from commissioning, and test Spire spectrometer only in SPT, to isolate the test where half tank is needed. f: Time constant is expected to be similar to the one measures in QM, IST and IST2 tests.	y	y	y
1	72	Comments from C.Jewell Mail 25/4/07	ESA	CJ	4.5	31		2) Page 31: We have 9 SFT’s . Are they all technically justifiable?		Updated in line with new SFT spec	y	y	y
1	73	Comments from C.Jewell Mail 25/4/07	ESA	CJ	4.1	36		3) Page 36: Clearly with the cryostat horizontal it will be impossible to re-cycle the PACS 3He cooler with the PODS out of the liquid. I would strongly recommend that the status of the cryostat is outlined for each script you or the instruments plan to run.		Agreed with SPIRE. See comment 63. SMEC (mechanical) test now considered as an independant test (S/C horizontal, HE I, 90°)	y	y	y
1	74	Comments from C.Jewell Mail 25/4/07	ESA	CJ	4.1	36		4) Page 36: Have the instruments been given possible constraints coming from the cryostat as input to defining their SPT’s. I would suggest that the SPTs should not lead to a change in the cryostats configuration.		Included	y	y	y

on issue	ID	Ref	Comment from	Origin	Section Nb	Page	title, fig, table, or req	Remarks	Action	Industry Reply, or ref	reply	Modify spec (Y/N)	Done
1	75	Comments from C.Jewell Mail 25/4/07	ESA	CJ	4.7			5) Pages 37-77: Many of the tests proposed during IST, RMS, SPT, and TV/TB are re-runs of identical scripts. I would not necessarily understand or agree to the technical justification for this. For instance: a. The instruments wish to verify the 48hour hold time for the 3He cooler. Why do we perform a full cooler re-cycling 6 times for both PACS and SPIRE during one IST campaign, and perform 4 full 3He cooler re-cycling during the TB/TV test. b. Do the instruments always need to be at 0.3K ? Can we not perform short re-cycling scripts – remember the lessons learnt during the STM2 straylight and EMC testing in ESTEC. c. What are we testing during the SPIRE/PACS parallel mode that we have not already tested individually for both SPIRE and PACS?		SFT: = health check See above IST: Formal run before & after environment test SPT: Contains all what did not enter in IST frame. Nice to have, Mostly redundant with TV. We can simplify either of them. EMC: a) Cooler recycling: The test sequences have been build to minimize the number of cooler recycling. To be rechecked. b) Once the cooler has been recycled, the detectors are at 0.3K for the next 48h. Cooler recycle script (2h time tagged heating sequences on pump, & switches) is defined & will be executed as a whole. There is no need to customize it to the test duration. c) Parallele mode: This is a specific mode for both the instruments, and the satellite (dedicated bus mode). The main objective of this test is the parallel way to operate (commands), and to transmit / receive for PACS & SPIRE together the science TM. There is more that eaxh individual instrument, and this test shall be kept.	y	n	y
1	76	Comments from C.Jewell Mail 25/4/07	ESA	CJ	4.8	62		6) Page 62: a. The objective of the FM TV/TB test is not to correlate the thermal model. This has been done during STM1/2, and the FM test is a verification test. b. The scripts outlined are identical to the IST scripts !! c. Why in near orbit conditions are we doing two 3He cooler re-cyclings in less than 34 hours? If the cooler is working correctly we should have a hold time of > 46 hours ??		a) Agreed. and corrected. However, I mean instruments thermal models. As this is the first time that instruments FM will be used, I would not be surprized if there are some adjustments needed. b) No. Although similar, as the test sequence is not the same, tghe tests scripts are specific. c) I tried to optimise the use of sorption cooler with the information I had at the time. I guess this needs to be consolidated with test results from ILT.	y	y	y
1	77	Comments from C.Jewell Mail 25/4/07	ESA	CJ	all			The proposed instrument tests to be performed at satellite level have not been optimised with respect to duration, or duplication of effort. Further discussions between Industry/Instruments/ESA are recommended. The constraints associated with the cryostat are not systematically mentioned. I would propose including a small section for each proposed test indicating the cryostat configuration and any constraints that may arise. We should always take into consideration the long time constants we had during the EQM and STM test campaigns.		- SFT = health check: has to be repeated - PLM SIT = IST commissioning - IST= formal run. Repeated 2 times. - SPT= Nice to have. Can be probably optimised wrt TV test. - TV: has the most flight representative environment (LOU, Straylight, harness, …).	y	y	y
1	78		TAS-F	BC	4.7			Add a short description of the instrument observation in the RMS. Based on the mail from L.O'Rourke from 26/4/07		done. Updated in Sept 07 with FM RMS issue 1, then in Nov 07 with FM RMS issue 2)	y	y	y

on issue	ID	Ref	Comment from	Origin	Section Nb	Page	title, fig, table, or req	Remarks	Action	Industry Reply, or ref	reply	Modify spec (Y/N)	Done
1	79		TAS-F	BC	2.1			add the documentation for OBSM tool (TAS-I/terma tool as well as ESOC tool)		done. OBSM tool documentation AD-11_1 - OBSM_terma tool description.doc (not configured) AD-11_2 - S2K-MCS-ICD-0014-TOS-GCI_1.3 - SCOS-2000 OBSM External Interfaces Control Document Terma tool documentation not configured.	y	y	y
1	80		TAS-F	BC	3.8			Add the SVM configuration specification in AD List - H-P-2-ASP-TS-1315 - Herschel instrument turn ON test sheet.DOC		done: 3.8 SVM Electrical Configuration for Integration, IST/EMC and TV test.	y	y	y
2 draft 2	81		TAS-F	BC	All			Remove specification for AVM tests		done	y	y	y
2 draft 2	82		TAS-F	BC	all			Change 23° tilt to 20°		done	y	y	y
2 draft 2	83		TAS-F	BC	2.1		Applicable documents	Update all Applicable & reference document with most recent procedures		done	y	y	y
2 draft 2	84		TAS-F	BC	2.2		Test Scripts	Include a section for Scripts list		done	y	y	y
2 draft 2	85		TAS-F	BC	3.1.4		Launch locks	Add section on launch lock (PACS launch lock as limited life item, SPIRE launch lock Power box to be tested in launch mode a vibration)		done	y	y	y
2 draft 2	86		TAS-F	BC	3.2.2		IEGSE	Change IEGSE from 1 common IEGSE to 3 dedicated PACS SPIRE HIFI IEGSE, + add firewall. Add HIFI FPU simulator + dummy LOA + add PACS Solar array simulator		done	y	y	y
2 draft 2	88		TAS-F	BC	3.5		Instruments Test scripts configuration	Add a section for test scripts configuration & configuration control + Annex 1 (rules for scripts)		done	y	y	y
2 draft 2	89		TAS-F	BC	3.6		Cryostat Configuration for IST and TV test.	Add detailed table for Cryostat configuration during tests (Flemming's Magic table)		done	y	y	y
2 draft 2	90		TAS-F	BC	3.6.1		Cryostat Operation during IST	Remove the possibility to perform test with Cryostat full, in He II, and horizontal (safety reasons). (Horizontal --><60% and He I, as for transport) As a consequence SPIRE Spectrometer canot be tested End to End, and shall be split to Spectriometer detector tests (SPT) and dedicated SMEC mechanical test. Microvibration test needs also to be split		done	y	y	y
2 draft 2	91		TAS-F	BC	3.8		SVM Electrical Configuration for Integration, IST/EMC and TV test.	Add a section on SVM Electrical comfiguration. Include "SVM minimal configuration" for SFT and SPT, and refer to other specification for other tests.		done	y	y	y
2 draft 2	92		TAS-F	BC	4		Test Definition	Update all tables based on instruments procedures		done	y	y	y
2 draft 2	93		TAS-F	BC	4.1		Overview of Herschel FM tests sequence	Update test flow chart (manly rationalisation of SFT's, and S/C IST now warm, He I, He II		done	y	y	y
2 draft 2	94		TAS-F	BC	4.1			Add overall summary table of Instruments tests (from procedures)		done	y	y	y
2 draft 2	95		TAS-F	BC	4.2		Time Allocation for instruments tests	Time allocation: Move all tests after UFT/SFT warm to 3 shift activities. + Demand to organise long tests un quantum of 8h (1 shift)		done	y	y	y

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2 draft 2	96		TAS-F	BC	4.3		Incoming Inspection	Remove SPIRE incoming inspection (replaced by UFT)		done	y	y	y
2 draft 2	97		TAS-F	BC	4.4.2		Instruments full software image patch with OBSM	Full software image removed (was AVM only, will be used for FM on case by case basis)		done	y	y	y
2 draft 2	98		TAS-F	BC	4.5		SFT	SFT: Now referes to AD-2_4 (SFT Spec), intoduce AFT, and rationalise the number of SFT. Confirm Instruments SFT <1 shift		done	y	y	y
2 draft 2	99		TAS-F	BC	4.5		SFT	Change SFT approach with all instruments switched on to stanby at the start, & execute SFT of an instrument while the other are in standby.		done	y	y	y
2 draft 2	100		TAS-F	BC	4.5			add SPIRE launch lock test (in SPIRE cold SFT		done	y	y	y
2 draft 2	101		TAS-F	BC	4.5.2		SPIRE SFT	Agreement that SPIRE WFT is run instead of Warm SFT to fully check the cryo-harness. Section includes WFT and all SFT's SPIRE SFT to be further reduced to <2h		done	y	y	y
2 draft 2	102		TAS-F	BC	4.5.3		HIFI SFT	Update HIFI SFT's HIFI SFT's duration to be further reduced to <2h		done	y	y	y
2 draft 2	103		TAS-F	BC	4.6		Mechanism Tuning tests	Add new section on Instruments mechanism tuning (with new cryoharness wrt ILT): PACS Chopper & Grating (new test), HIFI Diplexer (new test), and SPIRE SMEC (removed from SPT)		done	y	y	y
2 draft 2	104		TAS-F	BC	4.7		IST	Move SPIRE and HIFI Peak up Mode tests from RMS to Commissioning		done	y	y	y
2 draft 2	105		TAS-F	BC	4.7.2.3		PACS SPT	Move PACS RS to H-field test from EMC to iPACS SPT.		done	y	y	y
2 draft 2	106		TAS-F	BC	4.7.3.3		SPIRE SPT	Add SPIRE CS test (in SPIRE SPT)		done	y	y	y
2 draft 2	107		TAS-F	BC	4.7.3.4		SPIRE Microvibration tests	Now Split between SPT (detectors microphonics) and SMEC test		done	y	y	y
2 draft 2	108		TAS-F	BC	4.7.4.3		HIFI SPT	No content yet from HIFI - Title only, to be further detailed.		done	y	y	y
2 draft 2	109		TAS-F	BC	4.7.5		PACS-SPIRE parallel mode during IST/Commissioning.	Test moved to SOVT		done	y	y	y
2 draft 2	110		TAS-F	BC	4.7.6		Additional instruments tests during S/C IST	Refere to AD-2_1. Include the demand for generic standalone test scripts OFF<-->Standby <-->Observation. Change numbering of section 5.8.11 & 5.8.12. Add the Instruments OBCP/FDIR test (5.8.13).		done	y	y	y
2 draft 2	111		TAS-F	BC	4.8		TV test	Update test spec (to issue 2) Update TV test overview table, add test phases Add instrument tests overview Add test table for instrument states during TV		done	y	y	y
2 draft 2	112		TAS-F	BC	4.8.1		PACS TV test	Update PACS TV test table		done	y	y	y
2 draft 2	113		TAS-F	BC	4.8.2		SPIRE TV test	TSPIRE TV test still to be updated		done	y	y	y

on issue	ID	Ref	Comment from	Origin	Section Nb	Page	title, fig, table, or req	Remarks	Action	Industry Reply, or ref	reply	Modify spec (Y/N)	Done
2 draft 2	114		TAS-F	BC	4.8.3		HIFI TV test	Increase HIFI T test phase from 72h to 165h + 4 Interleaved processing periods --> Needs to reorganise the TV est PACS/SPIRE/HIFI		done	y	y	y
2 draft 3	115		TAS-F	BC	4.8.5		Organisation of TV tests	New section for organisation of TV test (interleave instruments tests)		done	y	y	y
2 draft 2	115		TAS-F	BC	Annex 1			Include Scripts rules in annex 1		done	y	y	y
2 draft 2	116		TAS-F	BC	Annex 2		Instrument test sequence	Table Added		Added in issue 2 draft 3, Removed in issue 2 see comment 121	y	y	y
2 draft 3	87		TAS-F	BC	3.2.2		IEGSE	Add demand from PACS to have the TC history in the IEGSE Room: = Observer CCS workstation to be moved to Instrument room Add the demand to have merged Instruments + Cryo data on IEGSE Add requirements for IEGSE room (internet, phone, voice communication to CCS room, ...)		done	y	y	y
2 draft 3	117		TAS-F	BC	4.7		RMS	Update the RMS tables with the new tables from ESOC (2nd FM Run)		done	y	y	y
2 draft 3	118		TAS-F	BC	5.1.3			Specify that PACS does not use CCS monitoring, but relies on PACS FDIR		add section 5.1.3 Special case of PACS Monitoring	y	y	y
2 draft 3	119	mail E.Sawyer 23/11	SPIRE	BS	all			Page numbers don't show		OK, for pages > 10. Corrected.	y	y	y
2 draft 3	120	mail E.Sawyer 23/11	SPIRE	BS	all			Don't like version numbers on AD's and RD's - define at TRR		The problem is that the table are based on certain issues of the procedures. I prefere to keep the procedure with issues to be consistent, and specify thet the latest issue of the procedure available before the test is applicable.	y	n	y
2 draft 3	121	mail E.Sawyer 23/11	SPIRE	BS	all			Why have annex 2 0 this information is already in the earlier tables?		True. This was to compile per instrument what is distributed in the text. OK to remove.	y	y	
2 draft 3	122	mail E.Sawyer 23/11	SPIRE	BS	1.2.2	10	tests definition & objectives	Table defines themral conditions as "Tank Temperature 1.7" This causes confusion with the later table in section 3.6 which defines the actual temperatures to be expected? See also comments on this table.		OK. Temperature conditions removed from here & ferer to § 3.6	y	y	y
2 draft 3	123	mail E.Sawyer 23/11	SPIRE	BS	3.1.4.1		SPIRE SMEC launch lock	Typo "clild" - what should this say?		Typo. Clid-->cold (He I)	y	y	y
2 draft 3	124	mail E.Sawyer 23/11	SPIRE	BS	3.2.2		IEGSE	First row in table should read "secure access to and from internet."		OK. Corrected	y	y	y
2 draft 3	125	mail E.Sawyer 23/11	SPIRE	BS	3.2.2		IEGSE	I-EGSE configuration - versions are wrong for HCSS at least - better to leave them out and put a comment that the versions of the software will be confirmed and frozen at TRR otherwise this document will just have to be constantly updated.		change to "The I-EGSE Software configuration shall be reviewed at tests TRR."	y	y	y
2 draft 3	126	mail E.Sawyer 23/11	SPIRE	BS	3.2.2		IEGSE	Under figure caption - typo - "The interaction…. here bellow…" - should be "below"?		typo. Corrected	y	y	y

on issue	ID	Ref	Comment from	Origin	Section Nb	Page	title, fig, table, or req	Remarks	Action	Industry Reply, or ref	reply	Modify spec (Y/N)	Done
2 draft 3	127	mail E.Sawyer 23/11	SPIRE	BS	3.6		Cryostat Configuration for IST and TV test.	Table of temperatures - SPIRE requires <1.7 K on the tank during cooler recycle - we would like the tank pumped just before we start the SPIRE SPT then closed of. We are happy with the gentle increase in L0 temperature.		Not agreed. We do not want to re-pump too often, and we offer you T<1.9K (Agreement with SPIRE was <2.0K for ground test in IID-A). I'll make it consistent to <1.9K (Objective 1.7-1.8K, up to I.9K to avoid repumping too often). We believe it is sufficient to recycle the cooler. This will affect only the efficiencyt. For cooler hold time test during TV, the temperature will be <1.75K. See comment 150 (cryosta conditions removed from test objectives, & moved to section 3.6)	y	y	y
2 draft 3	128	mail E.Sawyer 23/11	SPIRE	BS	3.6		Cryostat Configuration for IST and TV test.	The lid temperature is not specified here - it would be helpful if the nominal (unflushed) temperature of the reflector was given in the table.		OK, to be added: - Flushed: <15K - Unflushed: 240K - TV: <70K There is no stable position at 70-80K. Transient during QM was 15K to 200K & back to 15K	y	y	y
2 draft 3	129	mail E.Sawyer 23/11	SPIRE	BS	3.6		Cryostat Configuration for IST and TV test.	Next table - although the PACS/SPIRE cooler recycle has 0 time scheduled the thermal configuration is still wrong - it should be V or III not IV. The first parallel recycle test will actually take place during the SOVT-1 when the condition is indeed listed as III		The parallele mode PACS SPIRE functional test is moved to SOVT. We have no details on the sequence for this parallel testbut assume that there is a parallel recycling (ie PACS then SPIRE shifted by 30mn) For S/C test, parallele cooler recycling is kept during TV.. I correct the table.	y	y	y
2 draft 3	130	mail E.Sawyer 23/11	SPIRE	BS	3.6.2		Cryostat Operation during TV	It is not clear which level the drift rates apply to? Can we have the expected drift rates for L1 and L2?		Drift is on Main He II tank (HTT). I precise it in the text. HTT Temperature is nearly stable if we leave the natural mass flow of 4mg/s, it will raise if we throttle this mass flow to orbital flow.	y	y	y
2 draft 3	131	mail E.Sawyer 23/11	SPIRE	BS	3.6.3		Cryostat Operation during EMC	Typo in first line - should read "performed"		Corrected. Thank you.	y	y	y
2 draft 3	132	mail E.Sawyer 23/11	SPIRE	BS	4		Test Definition	Flow diagram - should be SOVT 1 not SVOT 1		Corrected. Thank you.	y	y	y
2 draft 3	133	mail E.Sawyer 23/11	SPIRE	BS	4		Test Definition	SPIRE Table - The timing for EMC tests and TV/TB tests are not specified in SPIRE-RAL-PRC-002704 - only some of the procedures to be used - see other docs (not sure which)		Understood. Although the SPT procedure includes the instrument stat during the EMC test, I add a new document(s) AD-9_6 SPIRE EMC procedure for EMC CS, RE, RS (TBW). Test duration is driven by EMC test (frequency sweep). I allocated 2h per test as a starting point.	y	y	y
2 draft 3	134	mail E.Sawyer 23/11	SPIRE	BS	4.2		Time Allocation for instruments tests	SPIRE expects SPT to be 3 days of 3 shifts		We need some time for the cryostat operations. For SPIRE it is specified in the SPT (4.7.3.3) Night shifts 1 a 3 for EMC CE, night shift 2 for overnight noise test. But these shifts will have to be shared with cryostat operation	y	n	y

on issue	ID	Ref	Comment from	Origin	Section Nb	Page	title, fig, table, or req	Remarks	Action	Industry Reply, or ref	reply	Modify spec (Y/N)	Done
2 draft 3	135	mail E.Sawyer 23/11	SPIRE	BS	4.7.1.		S/C IST	Table from AD2_1 - Entry for "SPIRE commisioing" is wrong - shows HIFI is operational!		OK. Local correction. The order is not rozen…	y	y	y
2 draft 3	136	mail E.Sawyer 23/11	SPIRE	BS	4.7.1.		S/C IST	Ditto for HIFI commissioning.		OK. Local correction	y	y	y
2 draft 3	137	mail E.Sawyer 23/11	SPIRE	BS	4.7.3.3		SPIRE SPT	Here and elsewhere both AD# and the document name are refered to in the text - we don't need both and certainly not with the wrong version number (or any version number) as here.		see comment However, the SPT procedure is going to be updated as it is not complete (missing test sequence and details of the procedures, and scripts), so I remove the issue here. See not at start of section 2.1: "As these documents may be subject to update after this procedure, the latest issue available at the TRR will be applicable. Most recent issue of these document will be made available on ftp "	y	y	y
2 draft 3	138	mail E.Sawyer 23/11	SPIRE	BS	4.7.3.4			This test outline will be including in a future version of the test spec.		OK	y	n	y
2 draft 3	139	mail E.Sawyer 23/11	SPIRE	BS	4.7.5 and 4.8.4		Parallel (IST & TV)	We agree that parallel cooler recycle should be done during TV test - we will provide the procedure.		OK.	y	n	y
2 draft 3	140	mail E.Sawyer 23/11	SPIRE	BS	4.8.2		SPIRE TV test	The outline test sequence is o.k. we will provide a definitive one in the near future - note just sent out for comment.		OK. Could be groupped with SPT as it will refere to similar procedures.	y	n	y
2 draft 3	141	mail E.Sawyer 23/11	SPIRE	BS	6.2		Organisation	We expect 24h/day 7d/7d working for SPT etc.		I forgot to make it compliant to section 3.8. Corrected.	y	y	y
2 draft 3	142		TAS-F	BC	7.1		T7.1 Documents required before the test	add section on documentation configuration control & delivery rules		added: 7.1 General rules for documentation configuration and delivery	y	y	y
2 draft 3	143	E.mail Axel Koppe on 26/11	ASED	AK	All			Page numberings from page 10 on are no more legible		Already corrected. See comment 120		y	y
2 draft 3	144	E.mail Axel Koppe on 26/11	ASED	AK	2.2			AD-8_4 - SPIRE-RAL-PRC-002880 is at issue 1.3		SPIRE-RAL-PRC-002880_1.3 - SPIRE IST SAT Debug Procedure - OK. Agreed Thank you - Corrected in issue 2.0		y	y
2 draft 3	145	E.mail Axel Koppe on 26/11	ASED	AK	2.1			correct issue of AD-12_3 - SPIRE-RAL-PRC-002841 is at issue 2.2		SPIRE-RAL-DOC-002841_2.2 - SPIRE I-EGSE Set up Procedure - OK Corrected.		y	y
2 draft 3	146	E.mail Axel Koppe on 26/11	ASED	AK	4.5.2			SPIRE SFT: AD-7_1 - SPIRE-RAL-PRC-002494 is at issue 2.4		SPIRE-RAL-PRC-002494_2.4 - SPIRE_SFT_Procedures - OK Corrected.		y	y
2 draft 3	147	E.mail Axel Koppe on 26/11	ASED	AK	4.7.3.3			SPIRE SPT: ref. should read AD-8_3 - SPIRE-RAL-PRC-002704_2.2		SPIRE-RAL-PRC-002704_2.2 - SPIRE_SPT_Procedures. This document will be updated by SPIRE		y	y
2 draft 3	148	E.mail Axel Koppe on 26/11	ASED	AK	Annex 1			Use of Master Scripts and proposed: end of first sentence should read " wrong script execution during test."		I included the synthesis proposed by Simon after fes iteration with us & instrument. I correct.		y	y

on issue	ID	Ref	Comment from	Origin	Section Nb	Page	title, fig, table, or req	Remarks	Action	Industry Reply, or ref	reply	Modify spec (Y/N)	Done
2 draft 3	149	E.mail Axel Koppe on 26/11	ASED	AK	Annex 1			Error Handling: last sentence should read "It shall not terminate without any feedback"		Corrected		y	y
	150		TAS-F	BC	4.1		fig 4.1 test flow diagram	Move transport to Estec (warm now) before IST1, and add (for information only)		Corrected		y	y
2 draft 3	151		TAS-F	BC	1.2.2			Remove cryostat conditions from table 1.1, and refer to section 3.6 for more detailed conditions..		Corrected		y	y
2 draft 3	152	E.mail P.Dieleman 28/12	HIFI	PD	3.2.2	22	IEGSE	on I-EGSE config: how many visitor laptops can be connected to I-EGSE network, and how much space/desks is available. We need to have at least 4 spaces available for hifi during TV test - that may increase as we detail the analysis needs. Secondly: specifying versions may be misleading, since updates will be made, eg to HCSS user releases.		OK. I add "(base=4 people per instruments, may be together). Version of IEGSE are removed in issue 2		y	y
2 draft 3	153	E.mail P.Dieleman 28/12	HIFI	PD	3.6.2		Cryostat Operation during TV/TB test:	LOU temp appears not defined. We need 90K < T_LOU <150K.We have stability requirements too.		This is will be the case. See HEPLM TV test reports (STM1): HP-2-ASED-PR-110_1: LOU baseplate at 110.1K without dissipation & 139.6K with 6.2W dissipated. To be added to the table: "LOU temperature will be around 1&0K with no dissipation and 140K with 6.2W dissipated (ref STM TV test, RD31)"		y	y
2 draft 3	154	E.mail P.Dieleman 28/12	HIFI	PD	3.6	23		1) HIFI performance tests: The temps quoted (1.9, 2.6, 7K) are even colder than in flight, why? 2) If we need to choose in TV between a) roughly similar temperatures as in flight but drifting (therefore available for limited time), or b) stable conditions with the temperatures listed above, we prefer stable temperatures.		1: During functional tests, the Gas He flow in the vent line is provided by an external dewar (or HOT) at a mich higher mass flow rate than in space (few 100mg/s), which explains the colder temperature on L1, 2, 3 (but also a lower sensitivity to dissipation pulses) 2: During TV, the flow can be either (near) the natural mass flow rate in TV chamber condition (4mg/s for LN2 cooled chamber), but can be throttled to mimic flight conditions, at the price os a resonably small drift up of L0. The 2 are possible, but we need a common agreement for all 3 instruments as the tests are now interleaved. Natural equilibrium flow is easier for us as it needs no adjustment.		n	
2 draft 3	156	E.mail P.Dieleman 28/12	HIFI	PD	3.6	24	table	tilt diplexers 0 not correct, can be any, but the other entries should be : "same as diplexer test"		OK. I change it to 20° for diplexer tuning, Commissioning, SPT & TV (driven by constraint on TV tests). I add also in section 4.6 (mechanisms tuining tests): "For PACS & HIFI mechanism tuning tests, the cryostat orientation shall be the same that the next functional tests (IST & TV), therefore 20°"		y	y
2 draft 3	157	E.mail P.Dieleman 28/12	HIFI	PD	3.6	25	same table	same comment From TV test detail looks like 20degree tilt is optimal for compatibility with other two instruments. If that is selected for TV then we should have the same for all other tests.		same as above		y	y

on issue	ID	Ref	Comment from	Origin	Section Nb	Page	title, fig, table, or req	Remarks	Action	Industry Reply, or ref	reply	Modify spec (Y/N)	Done
2 draft 3	158	E.mail P.Dieleman 28/12	HIFI	PD	4.1	32	fig 4.1	EMC2 test is now _before_ TV test in master flow - this diagram needs to be updated according to the reference schedule (lastest to date is Nov. 15th) since 1) SOVT-1 is taking place after the full IST, 2) SVT-1 is taking place after SOVT-1, and clearly is not well located before instrument IST.		Master flow is for information. It should not be considered as a requirement both for instrument and AIT.		n	y
2 draft 3	159	E.mail P.Dieleman 28/12	HIFI	PD	4.7.1		table IST	- remember that RMS needs to be done after instrument IST1. It is now in the same block, but there is some time needed to update the MTL with settings learned from the IST part.		This is agreed.this is included below the table of section 5.7.1: "The reference mission scenario shall take place only after the full functional test of the instruments (ie after commissioning AND SPT)."		y	y
2 draft 3	160	E.mail P.Dieleman 28/12	HIFI	PD	4.2		page 38 SFT:	2h mentioned, HIFI SFT duration is 4 hours		we maintain an allocation of 2h		n	y
2 draft 3	161	E.mail P.Dieleman 28/12	HIFI	PD	4.5		page 39 SFT without IEGSE	HIFI did not agree to this		We know, but this is our requirement		n	y
2 draft 3	162	E.mail P.Dieleman 28/12	HIFI	PD	4.5.3		page 45 SFT duration	HIFI agreed to minimise SFT time, not make it 2h		we maintain an allocation of 2h		n	y
2 draft 3	163	E.mail P.Dieleman 28/12	HIFI	PD	4.7.4.2		HIFI RMS	HIFI move to standby is covered by MTL. Also, MTL for HIFI's OD (80) in the document will need to be updated once MOC has provided the updated POS to Industry.		Understood. I got the updated table from MOC, included in issue 2.0		y	y
2 draft 3	164	E.mail P.Dieleman 28/12	HIFI	PD	4.6.2		page 47 diplexers	vertical orientation incorrect, see remarks on diplexer orientations above		Corrected to 20°		y	y
2 draft 3	166	E.mail P.Dieleman 28/12	HIFI	PD	4.7.6		SAT-IST	getting into standby or prime, without uploading the LO safety tables		2 modes: - Simple ICU only in dummy science mode to get Science telemetry. - Complete HIFI switch on (using known switch on procedure SRON-G-HIFI-PR-2007-017_1.5.3 - HIFI Power on for IST & TV), + set up to some observation mode (TBD).		?	y
2 draft 3	167	E.mail P.Dieleman 28/12	HIFI	PD	4.7.6		DTCP worst case	IST-5.8.8 - OBS maintenance activities are not well understood by HIFI, needs dedicated discussion		This refers to a dedicated demand sent to all instruments last year. See the mail I sent recently (31/10 to David Teyssier, copy to you) which contains the demand		y	
2 draft 3	168	E.mail P.Dieleman 28/12	HIFI	PD	4.7.6		DTCP worst case	IST-5.8.8 - Define sub-set of RMS MTL		The objective was to use the 1st part (2-3h) and to stop to an agreed point (between 2 observation) stop the MTL and set the instrument to standby. . But the tendency is now to use dummy MTL		n	y
2 draft 3	169	E.mail P.Dieleman 28/12	HIFI	PD	4.7.6			which S/S shall be turned on when checking the HIFI_safe and/or HIFI_reset OBCP ?		You to define. I would suggest from an observation configuration where all your systems are operating, Check spec H-P-1-ASP-TN-1072_02 - Payload Management and OBCP		n	y
2 draft 3	170	E.mail P.Dieleman 28/12	HIFI	PD	4.7.6		RMS	IST-5.8.9 - still some residuals of old RMS scheme: HIFI is in fact no used during DTCP-4, and peak-up is not covered in RMS		OK Corrected (HIFI remain in standby during DTCP4, and is switched off)		y	y

on issue	ID	Ref	Comment from	Origin	Section Nb	Page	title, fig, table, or req	Remarks	Action	Industry Reply, or ref	reply	Modify spec (Y/N)	Done
2 draft 3	171	Mail from M.Langferman 29/11	ASED	ML	1.2.2			all "cold" test conditions call for 1.7 K and only the SVT has a tbc behind. From my memory I cannot confirm that we ever had 1.7 K in ground conditions at all.		1.7K has been removed from this objective table to refer to section 3.6. Here <1.9K (with goal 1.7-1.8K for cooler recycling). See comment 121 & 15&		y	y
2 draft 3	172	Mail from M.Langferman 29/11	ASED	ML	1.2.2			some of the "warm" tests already have been performed?		Yes. This is the update of the procedure. They are kept to be consistent. AVM tests have been removed.		n	y
2 draft 3	173	Mail from M.Langferman 29/11	ASED	ML	2.1			How can docs, which are TBW, be applicable?		The TBW documents are procedure not needed now, but will be needed later. We expect (and work for) them to be ready in due time. One goal of this specification (toward instruments teams) was to identify the procedures to be prepared.		n	y
2 draft 3	174	Mail from M.Langferman 29/11	ASED	ML	3.6.1			Don't know what "usually in ground lifetime conditions" means, but shurely not the HTT @ 1.7 K!!! (see above)		True. "Ground lifetime" probably referes to ISO. I replace by "On ground, the cryostat is usually in Nominal He II conditions (type III on table above). This means that the CVV is at 295K (temperature of the clean room), and the temperature of the HTT is maintained at < 1.9K by external pumping "		y	y
2 draft 3	175	Mail from M.Langferman 29/11	ASED	ML	3.6.2			this is a Spec also covering TB/TV. A seperate Spec for TB/TV is also existing. This should be clearly expressed and Priority mentioned. Some text and pics are old.		Issue 1 was written at a time where no information was available to instrument in the draft TV test spec.Yes, this is clearly inditeted in the AD section 2.1, and when the instruments TV are described (4.8). I add here a reference to the tV test spec.:"The Herschel TV test is covered by AD-2_2 – Herschel TV test specification - H-P-2-ASP-TS-0997_2.0."		y	y
2 draft 3	176	Mail from M.Langferman 29/11	ASED	ML	4.1 and 4.2			same test durations are different in both chapters (TBH (to be homogenized))		Agreed. 4.2 is the allocation, 4.1 in the compilation of the instrument test procedure (or test plans) We are working to reduce the SFT to 3x2h, HIFI durations are overestimated here.		n	y
2 draft 3	177	Mail from M.Langferman 29/11	ASED	ML	All			In general my understanding is that the test conditions are needed for the test durations given in the Spec. Meaning that we shall provide them accordingly, finally decided at TRR. The time does NOT include any evaluation. Re-run a test means starting to establish the conditions again.		Agreed. I add in section 3.6: "The details of these conditions shall be agreed at each TRR."		y	y

on issue	ID	Ref	Comment from	Origin	Section Nb	Page	title, fig, table, or req	Remarks	Action	Industry Reply, or ref	reply	Modify spec (Y/N)	Done
2 draft 3	178	Mail from Bruce Swingyard 21/11	SPIRE	BS	4.8.2			Update SPIRE TV test sequence according to draft proposal. Time is 48h allocation.		SPIRE Instrument functional test during TV (48h) Instrument Switch on and Mode Transitions SPIRECooler recycle (automatic) Photometer Scan Mode Observation Photometer chop mode observation Photometer PCAL source observation Switch from Photometer to pseudo-Spectrometer mode Spectrometer PCAL source observation Spectrometer SCAL source operation SPIRE // PACS mode specific test cold TBD SPIRE FPU thermal interfaces		y	y
2 draft 3	179	Mail from Bruce Swingyard 30/11	SPIRE	BS	2.1			Update SPIRE SPT procedure from issue 2.2 to issue 2.4.		AD-8_3 - SPIRE-RAL-PRC-002704_2.4 - SPIRE Special Performance Test Procedures		y	y
2 draft 3	180	mail from O.B 6/12	PACS	OB	2.1			add reference for PACS user manual		AD-5_2 – PACS-ME-UM-002_1_2 - PACS User Manual		y	y
2 draft 3	181	PACS system meeting n°4	PACS	OB	7.4.5			Include PACS microvibration test		Proposition to include it together with SPIRE SPT photometer detector microvibration test. Use parallele mode, with both instruments observing. "Following a recent demand by PACS of similar micro-vibration tests, it is proposed to perform the microvibration test of SPIRE photometer in parallele mode (ie both PACS & SPIRE switched ON)"		y	y
2 draft 3	182		TAS-F	BC	4.8			Update TV test tables according to TV test spec issue 2.2				y	y
2 draft 3	183		TAS-F	BC	4.8.5			New section to describe the thermal interface test				y	y
2 draft 4	184		TAS-F	PC	3.6			remove time column from table in section 3.6				y	y
2 draft 4	185		TAS-F	PC	3 & 4			replace will by shall in all text				y	y
2 draft 4	186		TAS-F	PC	4.5			Remove List of SFT's as already specified in SFT spec		No. Add "for information"		y	y
2 draft 4	187		TAS-F	PC	4.7.1			Remove unnecessary details of IST description table		Not possible to edit. Remove table & refere to IST: replavce by: "The use of instrument during IST is described in next section 4.7.6. An overview & summary table of the IST, give instrument usage and time scales., can be found in AD-2_1, section 5.1.2."		y	y
2 draft 4	188		TAS-F	PC	4.7.6			Simplify table		No. Add "for information"		y	y
2 draft 4	189		TAS-F	PC	5.1			Already included in AD-2_1 section 6.3. Remove		OK		y	y
2 draft 4	190		TAS-F	PC	6.2			add that the organisation of test working hours shall be defined in the individual test specification.				y	y
2 draft 4	191		TAS-F	PC	6.4.1			TAS-F: Add test specification ASED: Remove test management				y	y
2 draft 4	192		TAS-F	PC	7.2			add a section on SVT/SOVT to specify how to switch on /off instruments				y	y

TO DO LIST

Input missing

-
- Specification/procedures to be written Instruments to provide a plan for document issue dates:

AD-8_2 - SPIRE-RAL-PRC-002398_2.2 – SPIRE Cold Functional Test Procedures
(To be updated, to include standalone SMEC test with Microvibtation SMEC test
AD-8_5 - SPIRE-RAL-NOT-xxxx_1.0 - SPIRE Peak-up Mode Test Procedure (TBW)
AD-8_6 - SPIRE-RAL-NOT-xxxx_1.0 - SPIRE SMEC Cold functional test (incl Microvibration (TBW)
AD-8_7 – SRON-G-HIFI-AIV-2007-009_draft 0.2 - HIFI IST commissioning (to be finalized)
AD-8_8 - SRON-G-HIFI-AIV -xxxx_1.0 - HIFI Peak-up Mode Test Procedure (TBW)
AD-9_4 – HIFI EMC procedure for EMC RE/RS (TBW)
AD-9-5 – PACS: Description of the Solar array simulator (TBW)
AD-9_6 SPIRE EMC procedure for EMC CS, RE, RS (TBW)
AD-10_2 – SPIRE TV test procedures - TBW
AD-10_3 – HIFI TV test procedures – TBW
AD-14-3 – HIFI switch On/Off for S/C IST: TBW (or AD-7_4)

ESA/ESOC

AD-1_5 – PT-HMOC-OPS-PL-6204-OPS-OAH_1.draft – Herschel SVT1 test plan
AD-1.6 – PT-CMOC-OPS-PL-6212-OPS-OAH_0.2 draft - Herschel SOVT-1 Test Plan

1. TEST OBJECTIVE

1.1 Introduction

This test specification defines the instrument tests sequences to be performed at satellite level during the Herschel S/C PFM test programme.
It is complementary to the Herschel IST specification AD-21 for IST, but extends also to integration and environment tests.
It has a double objective:

- To instruments: To define and explain the types of test that will be performed during the Herschel S/C test program, in order to prepare the related input (test plan, procedures, test scripts)
- To industry: to collect the instrument tests, define the content, objective and duration, identify the procedures and scripts to be integrated to satellite level procedures.

This includes the instrument incoming inspections after delivery to Industry, the activities and interface tests planned for the instrument integration on the satellite (FPU in PLM Cryostat and warm units in SVM) and the instrument related tests to be performed during the various Herschel satellite test phases (SFT, IST, TV test & EMC). All these activities and tests are described per instrument and per test activity.
These tests sequences have been defined together with instruments teams, and in close collaboration with TAS-F and ASED engineering team responsible of the IST preparation, during dedicated IST preparation meeting where the objectives and constraints from both satellite and instrument sides have been explained.

This document is based on the Instrument Interface Documents (AD 1, AD 2, AD 3 and AD 4) and the Satellite AIT Plan (AD 5), instruments test plan (AD6) and takes into account the current status of the satellite AIT schedule and the information on desired test sequences provided by the instrument teams.

1.2 Test objectives

1.2.1 Herschel FM Satellite Test Programme General Objectives

The objective of Herschel IST is twofold :

- to verify the correct performance of the satellite and the compatibility between all the integrated electrical subsystems and instruments,
- to validate the operation procedures which will be exercised during the different phases of the satellite mission.

More details in section 2.1 of IST specification AD 21

1.2.2 Instrument Specific Test Definitions and Objectives

The following table gives an overview of the instrument tests to be carried out on PLM PFM and satellite level with their instrument related objectives.

Test	Test Objectives	Remarks
Instruments Integration tests	Check of instruments units during the integration process and UFT	3 types of verifications: - Integration tests: Electrical IF to SVM (1553, Power lines, clocks, insulation), - UFT: Unit Functional test IF to SVM (verification

Test	Test Objectives	Remarks
		of all TM & TC types) and communication between warm units - SIT: Subsystem Integration test: Test of complete instrument.
Instrument Short Functional Test (SFT)	Test performed after connection of Warm units with FPU's. Check of cryoharness. Instrument switch-on and functional verification of instrument interfaces. Evaluation should preferably be based on housekeeping data. Two different types of instrument SFT's: warm and cold. Integrated to S/C SFT's & AFT's	SFT warm: Before cool down of the cryostat. SFT cold: After cool down (He1) and after HeII production.
Integrated System Test (IST)	Verification of the functional performance of the integrated instrument in all possible modes. Check of the instrument performance as far as possible with satellite configuration. 2 sequences are proposed : • Simulation of instrument commissioning. • Reference Mission Scenario.	Before the environmental tests for reference After environmental tests to confirm that instruments have not been degraded. → Accelerated verification of instrument commissioning (24h) → 2 days simulated mission (13h/instruments + DTCP).
Instrument Special Performance Test (SPT)	Verification of dedicated aspects of the performance of the integrated instrument that are not verified during IST. Tests may require a specific spacecraft configuration. SPT is part of the IST	
EMC Test	Check of functional performance of the integrated instrument under electromagnetic worst case conditions (radiated susceptibility) and measurement of instrument electromagnetic emissions (conducted and radiated emission).	2 tests - EMC1: CE Only - EMC2: RE (instruments in most noisy mode), then RS based on RE + margins(instruments in most sensitive mode)
Sine Vibration and Acoustic Noise Test	Verification of workmanship. Verification of alignment stability.	Instruments are Off during test (except SPIRE LPU powered by S/C) SFT shall be performed before and after.
TB/TV Test	TMM validation. TB test : Equilibrium of cryostat under simulated (near) flight conditions . Verification of instrument performance in nearly flight conditions.	In LSS TV chamber. Cryostat tilt limited to 20°

Test	Test Objectives	Remarks
	TV test: Verification of instrument operation at when warm units are near limits of operating range.	
System Validation Test (SVT)	Validation of ESOC S/C operational procedures including verification of instrument commanding, telemetry and science data from/to the Mission Operation Centre (indirect validation of SOC-ESOC I/F).	Satellite level test. This test is under the responsibility of ESA/ESOC. Not covered in this specification

Table 1-1: Instrument related Tests on Herschel Satellite Level

(rem: Cryostat conditions moved to section 3.6)

2. DOCUMENTS

2.1 Applicable documents

Rem: _Documents outlined in yellow are still to be issued
Documents outlined in green are to be updated.
As these documents may be subject to update after this procedure, the latest issue available at the TRR shall be applicable.
Most recent issue of these document shall be made available on ftp
ftp://ftp.hp-instruments.as-b2b.com/industry_to_instruments/Herschel%20FM%20tests/

Specifications
AD-0_1 – IID-A_4.0
AD-0_2 – PACS IID-B_4.0
AD-0_3 – SPIRE IID-B_4.0
AD-0_4 – HIFI IID-B_3.3
AD-0_5 - H-P-1-ASPI-SP-0018_3.3 - PA Requirements for Subcontractors
AD-0_6 - H-P-1-ASPI-PL-0055_2.2 – PA Plan

Test Plans :
AD-1_1 – HP-2-ASED-PL-0026_2_2 - Herschel AIT Plan - Part 2 EPLM & SC-PFM Acceptance Phase (RD 29 of IID-A)
AD-1_2 – HP-2-ASED-PL-0031_2 - Instrument Testing on Herschel PLM PFM and Satellite Level
AD-1_3 – H-P-1-ASP-TN-0852_1_0 - Instrument Testing on AVM level
AD-1_4 – SCI-PT-12759_3_0 - Reference Mission scenario
AD-1_5 – PT-HMOC-OPS-PL-6204-OPS-OAH_1.draft – Herschel SVT1 test plan
AD-1.6 – PT-CMOC-OPS-PL-6212-OPS-OAH_0.2 draft - Herschel SOVT-1 Test Plan

Test Specifications:
AD-2_1 – H-P-2-ASP-SP-0939_5.0 - Herschel IST test specification
AD-2_2 – H-P-2-ASP-TS-0997_2.0 - Herschel TV test specification -
AD-2_3 – H-P-2-ASP-TS-0819_4 - Herschel FM Spacecraft EMC Test Requirement Specification
AD-2_4 - H-P-2-ASP-SP-1411_2 - Herschel SFT specification
AD-2_5 - H-P-1-ASP-TN-1072_02 - Payload Management and OBCP

Test sheet translated from Planck test for Herschel
AD-2_4 - H-P-2-ASP-TS-1315_1 - Herschel instrument turn ON test sheet

References to be modified
AD-2_5 - H-P-2-ASP-TS-8010_1 - Herschel SC IST Routine Mission Scenario – General requirements
AD-2_6 - H-P-2-ASP-TS-8011_1 - Herschel SC IST Routine Mission Scenario – Initialisation specific operations
AD-2_7 - H-P-2-ASP-TS-8020_1 - Herschel SC IST Routine Mission Scenario – Initialisation

Mechanical Integration specifications/procedures
AD-3_1 - Herschel Warm units Integration specification – H-P-2-ASP-SP-1009_1
AD-3_2 – Herschel Instruments WIH integration specification – H-P-2-ASP-SP-1036_2

AD-3_4 - HP-2-ASED-PR-0073_1 – PFM SVM CCH & SPIRE-SIH-WIH Integration procedure
AD-3_5 - HP-2-ASED-PR-0077_1 – PFM SVM PACS SIH WIH Integration & SVM Harness Mating procedure
AD-3_6 - HP-2-ASED-PR-0078_1 – PFM SVM HIFI SIH WIH Integration & SVM Harness Mating procedure

AD-3_7 - HP-2-ASED-PR-0074_1 - Mechanical & Thermal Integration procedure of HIFI Warm Units
AD-3_8 - HP-2-ASED-PR-0075_1 - Mechanical & Thermal integration procedure of PACS warm units
AD-3_9 - HP-2-ASED-PR-0076_1 - Mechanical & Thermal integration procedure of SPIRE warm units

AD-3_10 - HP-2-ASED-PR-0083_1 – Mechanical Thermal Integration procedure of PFM SPIRE FPU & JFETs
AD-3_11 - HP-2-ASED-PR-0086_1 - PACS LO Flexible Links exchange
AD-3_12 - HP-2-ASED-PR-0089_1 – Mechanical Thermal Integration procedure of PFM PACS FPU
AD-3_13 - HP-2-ASED-PR-0090_1 - Mechanical -Thermal Integration of PFM HIFI FPU

FM Instruments Electrical integration specifications/procedures:
AD-4_1 - H-P-2-ASP-TS-1127_1.0 - HIFI WU to SVM Electrical Integration Specification (FM)
AD-4_2 - H-P-2-ASP-TS-1155_1.0 - PACS WU to SVM Electrical Integration Specification (FM)
AD-4_3 - H-P-2-ASP-TS-1160_1.0 - SPIRE WU to SVM Electrical Integration Specification (FM)

AD-4_4 - HP-2-ASED-TP-0125_1 - SPIRE FM Electrical Integration procedure
AD-4_5 - HP-2-ASED-TP-0145_01 - FM PACS Warm Units Electrical Integration
AD-4_6 - HP-2-ASED-TP-0146_01 - FM HIFI Warm Units Electrical Integration

AD-4_7 - HP-2-ASED-TP-0150_1 – PFM CVV internal SPIRE-FPU-SIH Electrical Integration procedure
AD-4_8 - HP-2-ASED-TP-0151_1 – PFM CVV internal PACS-FPU-SIH Electrical Integration procedure
AD-4_9 - HP-2-ASED-TP-0152_1 - PFM CVV internal HIFI-FPU-SIH Electrical Integration procedure

AVM Instruments Electrical integration specification/procedure.
AD-4_10 - H-P-SP-AI-0083 - HP Warm Units AVM Test Spec
AD-4_11 - WI 220.3 - Herschel Instrument WU integration on AVM (procedure)

Instruments User manuals
AD-5_1 – HIFI User Manual - SRON-U-HIFI-UM-2004-001_1_1.3
AD-5_2 – PACS-ME-UM-002_1_2 - PACS User Manual
AD-5_3 – SPIRE User Manual - SPIRE-RAL-PRJ-002395_1

Instruments test Procedures

Post-shipment tests, Integration, UFT's, and SIT

AD-6_1 - SPIRE-RAL-PRC-002951_2.1 - SPIRE PFM SIH Electrical Integration Procedure
AD-6_2 - SPIRE-RAL-PRC-002680_1.3 - SPIRE WU Integration Test Procedures
AD-6_3 - PACS-ME-TP-016_1_4 - Test Procedure for PACS Warm Electronics Tests (includes incoming inspection & UFT)
AD-6_4 – SRON-U-HIFI-PR-2006-005-30 - HIFI WIH-FM handling and integration
AD-6_5 - SRON-U_HIFI_PR_2006-006_10 - WU Electrical Integration
AD-6_6 – SRON-U-HIFI-PR-2007-001_4 - HIFI Electrical Integration FPU to warm units
(see also AD_7.4 for HIFI UFT)
AD-6_7 - HP-2-ASED-TP-0154_1 - FM PACS UFT Procedure

SFT's FFT

AD-7_1 - SPIRE-RAL-PRC-002494_2.4 – SPIRE Short Functional Test Procedures
AD-7_2 - SPIRE-RAL-PRC-002422_2.4 - SPIRE_WFT_Procedures (used to check all harness)
AD-7_3 - PACS-ME-TP-017_1.7 – PACS SFTs test procedures
AD-7-4 - SRON-G-HIFI-PR-2007-017_1.5.3 - HIFI Power on for IST & TV (used for all tests)
AD-7-5 - SRON-G-HIFI-PR-2007-018_1.5 - HIFI IST SFT UFT

IST

AD-8_1 – PACS-ME-TP-021_2.5 - PACS IST test procedures (incl. Commissioning, RMS and SPT, and TV)

AD-8_2 - SPIRE-RAL-PRC-002398_2.2 – SPIRE Cold Functional Test Procedures (To be updated)
AD-8_3 - SPIRE-RAL-PRC-002704_2.4 - SPIRE Special Performance Test Procedures
AD-8_4 - SPIRE-RAL-PRC-002880_1.3 - SPIRE IST SATellite Debug Procedures
AD-8_5 - SPIRE-RAL-NOT-xxxx_1.0 - SPIRE Peak-up Mode Test Procedure (TBW)
AD-8_6 - SPIRE-RAL-NOT-xxxx_1.0 - SPIRE SMEC Cold functional test (incl Microvibration (TBW or part of AD8_2)

AD-8_7 – SRON-G-HIFI-AIV-2007-009_draft 0.2 - HIFI IST commissioning
AD-8_8 - SRON-G-HIFI-AIV -xxxx_1.0 - HIFI Peak-up Mode Test Procedure (TBW)

EMC

AD-9_1 – PACS-ME-TP-032_1.5 - PACS EMC procedures
AD-9_2 – SPIRE-RAL-PRC-002946_1.1 - SPIRE Warm Units EMC Conductive Emissions Procedures for IST
AD-9_3 _– SRON-G-HIFI-PR-2007-019_1.5.3 - HIFI conducted emissivity procedures for IST tests
AD-9_4 – HIFI EMC procedure for EMC RE/RS
AD-9-5 – PACS: Description of the Solar array simulator (TBW)
AD-9_6 SPIRE EMC procedure for EMC CS, RE, RS (see AD8_3)

TV test

PACS: see AD-8_1
AD-10_2 – SPIRE TV test procedures - TBW
AD-10_3 – HIFI TV test procedures – TBW

OBSM tool documentation

AD-11_1 - OBSM_terma tool description.doc (not configured)
AD-11_2 - S2K-MCS-ICD-0014-TOS-GCI_1.3 - SCOS-2000 OBSM External Interfaces Control Document

IEGSE Set up procedures

AD-12_1 - SRON-G-HIFI-AIV-2007_005_2.0 - Running HIFI I-EGSE for IST without HIFI staff support
AD-12_2 - Removed
AD-12_3 - SPIRE-RAL-DOC-002841_2.2 - SPIRE I-EGSE Set up Procedure
AD-12_4 – PICC-ME-TN-021_1 - PACS IEGSE-setup at FN
AD-12_5 – PICC-ME-MN-010_1 - PACS IEGSE-User-Manual

Software upload procedures
AD-13_1: PACS MemoryLoadProcedures_20070205 (Extract from PACS user manual document to be under configuration control)
AD-13_2: - SPIRE-RAL-PRC-002866_1.0 - SPIRE OBSW Upload Procedure
AD13_3: - SRON_U_HIFI_PR_2007_007_1.1 - HIFI OBS upload procedure

Satellite switch on during S/C IST ((OFF←→ Standby←→Observation)
AD14-1 – No PACS documents:
use scripts set SAT_IST_Debugging_PACS_20070417.zip
AD-14_2 – SPIRE-RAL-PRC-002946_1.1 - SPIRE Warm Units EMC Conductive Emissions Procedures for IST
+ test scripts pack: SPIRE-IST-DBG-Scripts.tar.gz
AD-14-3 – HIFI switch On/Off for S/C IST: TBW (or AD-7_4)

2.2 Test scripts

2.2.1 PACS:

Scripts for Satellite IST (see section 4.7.6 below), simple and standalone scripts to set instrument to standby and observation). (Off←→Standby Off←→PRIME)
- SAT_IST_Debugging_PACS_20070417.zip

Scripts for Instrument UFT, in link to AD-6_3 - PACS-ME-TP-016_1_4 - Test Procedure for PACS Warm Electronics Tests
- PACS-ME-TP-016_1_4_tclscripts_20070205.zip

Scripts for the rest of the tests: (SFT, IST, EMC, TV)
- PACS_CCS_templates-2007-10-11-13-44.zip

PACS Scripts = Complete

2.2.2 SPIRE

Scripts for Satellite IST (see section 4.7.6 below, and AD2-1+ associated procedure AD-8_4))
- SPIRE-IST-DBG-Scripts-31Jul2007.tar.gz
- SPIRE_IST_DBG_31Jul2007.release_note

Scripts for Integration & UFT (AD 6-2)
- SPIRE_WU_INT_TEMPLATES.tar

Scripts for SFT_AD7_1
- SPIRE_FM_SFT_Scripts_10Sep2007.zip
- SPIRE_FM_SFTs_10Sep2007.release_note.txt

Scripts for WFT AD7_2
- SPIRE_FM_WFT_Scripts_17Oct2007.zip

- SPIRE_FM_WFTs_17Oct2007.release_note.txt

Scripts for EMC CE test:

- SPIRE-IST-WU-EMC-CE-Scripts_07Aug2007.tar.gz

Scripts for Instruments IST commissioning (AD8_2 + AD8_5 + AD-8_6)

- Scripts =TBW

Scripts for SPT, EMC, TV): AD8_3

- Scripts =TBW

2.2.3 HIFI:

Scripts for Power on procedure

- PowerOn.hot.lodummy.tcl.zip
- PowerOff.hot.warm.atten.cold.alldummy.lodummy.tcl.zip

Scripts for SFT warm, UFT procedures

- SFT.lodummy.tcl.zip

Scripts for Rest :SFT cold, S/C IST, Commissioning, SPT, TV, EMC

- Scripts =TBW

2.3 Reference documents

Herschel FM design descriptions

RD-01: H-P-TN-AI-0052_2 - Herschel/Planck SVM AVM Technical Description
RD-02: HP-2-ASED-RP-0011_5; H-EPLM Thermal Model and Analysis – (RD 81 of IID-A)
RD-03: HP-2-ASED-TN-0115 - Thermal Environment for (Herschel) Instruments testing on Ground – (RD99 of IID-A)
RD-04: HP-2-ASED-RP-0003 - H-EPLM Design Description (RD48 of IID-A)
RD-05: H-P-RP-AI-0005_3_0 - SVM Design Report (RD46 of IID-A)
RD-06: H-P-1-ASP-TN-1170_1.0 - H/P IST (SVM) thermal predictions

Herschel QM test procedures and test reports

RD-21 Herschel EQM Summary report HP-2-ASED-TR-0092_1 (1/2/06)
All detailed QM test procedures and reports references are compiled in RD21, and are available on ftp:
ftp://ftp.hp-instruments.as-b2b.com/industry_to_instruments/Herschel%20EQM%20tests/EQM%20Test%20-%20Reference%20Documents/

Herschel STM test reports

RD-30: HP-2-ASED-RP-0110_1 - Herschel STM TB-TV Test Results
RD-31: HP-2-ASED-RP-0174_1 - Herschel STM TB-TV Test Results Evaluation -

RD-32 : HP-2-ASED-RP-0180_1 - Herschel STM TV test - Evaluation of Herschel Instruments Thermal interface results.
RD-33 – HP-2-ASED-TR-0181_1 - Test report for Herschel PLM STM2 TV test

Herschel Instruments DPU AVM test report
RD-41 - H-P-RP-AI-0170_01 - Herschel Instruments AVM Test Report (PACS, SPIRE, HIFI)

2.4 Acronyms

AD: Applicable document
AVM: AVionic Model
CFT: Cold Functional Test
DTCP: Daily Tele-Communication Period
DRB: Delivery Review Board
EGSE: Electrical Ground Support Equipment.
FM: Flight Model
HOT: Helium One Tank (=Auxiliary tank of Herschel cryostat)
HTT: Helium Two Tank (=Main tank of Herschel cryostat)
I-EGSE Instrument EGSE
ILT: Instrument Level Test
IST: Integrated System test
MTL: Mission Time Line
RD: Reference Document
OOL: Out Of Limit
RMS: Reference Mission Scenario
SFT: Short Functional Test
SIT: Subsystem Integration Test. (Functional Test performed when all instruments units are integrated)
SOVT System & Operation Validation Test (from ESOC)
SPT: Special Performance Test
SVT: System Validation Test (from ESOC)
TV/TB: Thermal Vacuum/Thermal Balance test
UFT: Unit Functional Test (Test performed during integration of instruments Units)
W(F/S)FT: Warm (Full/short) Functional test
WU: (Instruments) Warm units

Instruments warm units acronyms are defined in the next section.

3. TEST SPECIMEN DEFINITION

The Satellite, SVM and cryostat configurations are described in the following documents.
RD-04: HP-2-ASED-RP-0003 - H-EPLM Design Description (RD48 of IID-A)
RD-05: H-P-RP-AI-0005_3_0 - SVM Design Report (RD46 of IID-A)

For IST, the satellite configuration is described in AD-21 (IST Specification).
Only the instruments configuration for FM and the Herschel Cryostat configuration during the tests is given here.

The most recent S/C and instrument state (ABCL) shall be reviewed during individual test readiness reviews

3.1 Instruments Configurations for FM tests

3.1.1 HIFI:

Table 3-1: HIFI AVM & FM Configuration

Satellite	Instrument	Product tree id	description	code	code	AVM	PFM	Comments
Herschel	HIFI	111110	Focal Plane Unit	FH	FPU	N/A	FM	
Herschel	HIFI	111230	Focal Plane Control Unit	FH	FCU	Simulator	FM	AVM=Resistor 53 Ohms
Herschel	HIFI	111260	Instrument Control Unit	FH	ICU	AVM2	FM	
Herschel	HIFI	111270	IF upconverter Horizontal	FH	IFH	N/A	FM	
Herschel	HIFI	111271	IF up converter Vertical	FH	IFV	N/A	FM	
Herschel	HIFI	111120	Local Oscillator Unit	FH	LOU	N/A	FM	
Herschel	HIFI	111125	Local Oscillator Radiator	FH	LOR	N/A	FM	
Herschel	HIFI	111210	Local Oscillator Control Unit	FH	LCU	Simulator	FM	AVM=Resistor 9.5 Ohms
Herschel	HIFI	111220	Local Oscillator Source Unit	FH	LSU	N/A	FM	
Herschel	HIFI	111227	Bridging wave-guides	FH	BWG	N/A	FM	
Herschel	HIFI	111241	HRS ACS Horizontal polarisation	FH	HRH	Simulator	FM	AVM=Resistor 11.5 Ohms
Herschel	HIFI	111242	HRS ACS Vertical polarisation	FH	HRV	Simulator	FM	AVM=Resistor 11.5 Ohms
Herschel	HIFI	111251	WBS Electronics for Horizontal Polarisation	FH	WEH	Simulator	FM	AVM=Resistor 25.3 Ohms
Herschel	HIFI	111252	WBS Electronic for Vertical Polarisation	FH	WEV	Simulator	FM	AVM=Resistor 25.3 Ohms
Herschel	HIFI	111253	WBS Optic for Horizontal Polarisation	FH	WOH	N/A	FM	
Herschel	HIFI	111254	WBS Optic for Vertical Polarisation	FH	WOV	N/A	FM	
Herschel	HIFI	111311	LCU to LSU secondary Power Main	FH	WIH	N/A	FM	
Herschel	HIFI	111312	LCU to LSU secondary Redundant	FH	WIH	N/A	FM	
Herschel	HIFI	111313	ICU to FCU secondary Main	FH	WIH	QM	FM	
Herschel	HIFI	111314	ICU to FCU secondary Redundant	FH	WIH	N/A	FM	
Herschel	HIFI	111321	ICU Main to LCU Main	FH	WIH	N/A	FM	
Herschel	HIFI	111322	ICU redundant to LCU Redundant	FH	WIH	N/A	FM	
Herschel	HIFI	111323	ICU main to FCU Main	FH	WIH	N/A	FM	
Herschel	HIFI	111324	ICU redundant to FCU Redundant	FH	WIH	N/A	FM	
Herschel	HIFI	111325	ICU Main to HRH	FH	WIH	N/A	FM	
Herschel	HIFI	111326	ICU Main to HRV	FH	WIH	N/A	FM	
Herschel	HIFI	111327	ICU Main to WEH	FH	WIH	N/A	FM	
Herschel	HIFI	111328	ICU Main to WEV	FH	WIH	N/A	FM	
Herschel	HIFI	111329	ICU Redundant to HRH	FH	WIH	N/A	FM	
Herschel	HIFI	111330	ICU Redundant to HRV	FH	WIH	N/A	FM	
Herschel	HIFI	111331	ICU Redundant to WEH	FH	WIH	N/A	FM	
Herschel	HIFI	111332	ICU Redundant to WEV	FH	WIH	N/A	FM	
Herschel	HIFI	111333	LCU main to LSU Main	FH	WIH	N/A	FM	
Herschel	HIFI	111334	LCU redundant to LSU Redundant	FH	WIH	N/A	FM	
Herschel	HIFI	111341	LSU to HRH	FH	WIH	N/A	FM	
Herschel	HIFI	111342	LSU to HRV	FH	WIH	N/A	FM	
Herschel	HIFI	111343	LSU to WEH	FH	WIH	N/A	FM	
Herschel	HIFI	111344	LSU to WEV	FH	WIH	N/A	FM	
Herschel	HIFI	111345	HRH to HRV	FH	HRS	N/A	FM	
Herschel	HIFI	111346	HRV to HRH	FH	HRS	N/A	FM	
Herschel	HIFI	111347	3DH to HRH	FH	WIH	N/A	FM	
Herschel	HIFI	111348	3DH to WEH	FH	WIH	N/A	FM	
Herschel	HIFI	111349	3DV to HRV	FH	WIH	N/A	FM	
Herschel	HIFI	111350	3DV to WEV	FH	WIH	N/A	FM	
Herschel	HIFI	111351	WEH to WOH	FH	WBS	N/A	FM	
Herschel	HIFI	111352	WEV to WOV	FH	WBS	N/A	FM	
Herschel	HIFI	111510	HIFI MGSE	FH			FPU handling frame	same QM-FM
Herschel	HIFI	111520	HIFI Unit transport Container	FH		yes	yes	
Herschel	HIFI	111530	HIFI EGSE	FH				Common I-EGSE for all Herschel Instruments

3.1.2 SPIRE

Table 3-2: SPIRE AVM & FM Configuration

Satellite	Instrument	Product tree id	description	code	code	AVM	PFM	Comments
Herschel	SPIRE	112110	Focal Plane Unit	HS	FPU	DRCU Simulator .(one computersimulating FPU/DCU/FCU)	PFM	FPU + JFET to be integrated
Herschel	SPIRE	112122	JFET (Spectrometer)	HS	JFP		PFM	
Herschel	SPIRE	112121	JFET (Photometer)	HS	JFS		PFM	
Herschel	SPIRE	112220	Focal Plane Control unit	HS	FCU		PFM	
Herschel	SPIRE	112230	Detector Control unit	HS	DCU		PFM	
Herschel	SPIRE	112210	Digital Processing Unit	HS	DPU	AVM2	PFM	
Herschel	SPIRE	112311	W1 HSDPU-P to HSDCU-P	HS	W1	QM1	PFM	harnesses
Herschel	SPIRE	112312	W2 HSDPU-R to HSDCU-R	HS	W2	QM1	PFM	harnesses
Herschel	SPIRE	112313	W3 HSDPU-P to HSSCU-P	HS	W3	QM1	PFM	harnesses
Herschel	SPIRE	112314	W4 HSDPU-R to HSSCU-R	HS	W4	QM1	PFM	harnesses
Herschel	SPIRE	112315	W5 HSDPU-P to HSMCU-P	HS	W5	QM1	PFM	harnesses
Herschel	SPIRE	112316	W6 HSDPU-R to HSMCU-R	HS	W6	QM1	PFM	harnesses
Herschel	SPIRE	112317	W7 HSFCU-P to HSDCU-P	HS	W7	QM1	PFM	harnesses
Herschel	SPIRE	112318	W8 HSFCU-R to HSDCU-R	HS	W8	QM1	PFM	harnesses
Herschel	SPIRE	112131	JFP to FPU	HS	BP	QM1	PFM	harnesses
Herschel	SPIRE	112132	JFS to FPU	HS	BS	QM1	PFM	harnesses
Herschel	SPIRE	112510	SPIRE MGSE	HS			FPU handling frame	same QM-FM
Herschel	SPIRE	112511	SPIRE unit transport containers	HS		yes	yes	
Herschel	SPIRE	112512	SPIRE instrument/cryostat integration Jig/equipment	HS				
Herschel	SPIRE	112530	SPIRE EGSE	HS			- FPU Simulator - QLA software	Common I-EGSE for all Herschel Instruments

3.1.3 PACS

Table 3-3: PACS AVM & FM Configuration

Satellite	Instrument	Product tree id	description	code	code	AVM	PFM	Comments
Herschel	PACS	113110	Focal Plane Unit	FP	FPU	Simulator	PFM	
Herschel	PACS	113210	Detector & Mechanism Control (DEC/MEC)	FP	DECMEC	EM (Form Fit)	PFM	EM fits FM envelop
Herschel	PACS	113230	Bolometer Cooler Control unit	FP	BOLC	QM1 (Form Fit)	PFM	No Power supply layer
Herschel	PACS	113240	Data Processing Unit	FP	DPU	AVM (Form Fit Function)	PFM	AVM type TBC
Herschel	PACS	113250	Signal processing unit Nominal (stacked with redundar	FP	SPU1	AVM (Form Fit)	PFM	stacked
Herschel	PACS	113260	Signal processing unit Redundant	FP	SPU2	N/A	PFM	
Herschel	PACS	113311	DPU nominal to MEC1	FP		AVM	PFM	
Herschel	PACS	113312	DPU redundant to MEC2	FP		AVM	PFM	
Herschel	PACS	113313	DPU nominal to SWL SPU nominal	FP		AVM	PFM	
Herschel	PACS	113314	DPU nominal to LWL SPU nominal	FP		AVM	PFM	
Herschel	PACS	113315	DPU redundant to SWL SPU redundant	FP		AVM	PFM	
Herschel	PACS	113316	DPU redundant to LWL SPU redundant	FP		AVM	PFM	
Herschel	PACS	113321	SPU nominal to MEC1	FP		AVM	PFM	
Herschel	PACS	113322	SPU redundant to MEC2	FP		AVM	PFM	
Herschel	PACS	113331	MEC1 to SWL SPU (nominal)	FP		AVM	PFM	
Herschel	PACS	113332	MEC1 to LWL SPU (nominal)	FP		AVM	PFM	
Herschel	PACS	113333	MEC2 to SWL SPU (redundant)	FP		AVM	PFM	
Herschel	PACS	113334	MEC2 to LWL SPU (redundant)	FP		AVM	PFM	
Herschel	PACS	113335	MEC1 to BOLC data (nominal)	FP		AVM	PFM	
Herschel	PACS	113336	MEC1 to BOLC Sync (nominal)	FP		AVM	PFM	
Herschel	PACS	113337	MEC2 to BOLC data (redundant)	FP		AVM	PFM	
Herschel	PACS	113338	MEC2 to BOLC Sync (redundant)	FP		AVM	PFM	
Herschel	PACS	113339	MEC1 to DEC1 data (nominal)	FP		AVM	PFM	Internal do DECMEC
Herschel	PACS	113340	MEC1 to DEC1 Sync (nominal)	FP		AVM	PFM	Internal do DECMEC
Herschel	PACS	113341	MEC1 to DEC2 data (nominal)	FP		AVM	PFM	Internal do DECMEC
Herschel	PACS	113342	MEC1 to DEC2 Sync (nominal)	FP		AVM	PFM	Internal do DECMEC
Herschel	PACS	113343	MEC2 to DEC1 data (redundant)	FP		AVM	PFM	Internal do DECMEC
Herschel	PACS	113344	MEC2 to DEC1 Sync (redundant)	FP		AVM	PFM	Internal do DECMEC
Herschel	PACS	113345	MEC2 to DEC2 data (redundant)	FP		AVM	PFM	Internal do DECMEC
Herschel	PACS	113346	MEC2 to DEC2 Sync (redundant)	FP		AVM	PFM	Internal do DECMEC
Herschel	PACS	113510	PACS MGSE	FP			FPU handling frame	same QM-FM
Herschel	PACS	113511	PACS unit transport containers	FP		yes	yes	
Herschel	PACS	113520	PACS EGSE	FP				Common I-EGSE for all Herschel Instruments

3.1.4 Instruments FPU Launch lock during tests

PACS and SPIRE have launch locks for respectively the PACS grating and the SMEC.

3.1.4.1 SPIRE SMEC Launch lock

SPIRE SMEC launch lock shall be Open only during dedicated tests with the SMEC

- SPIRE WFT horizontal (during cryostat integration)
- SPIRE Horizontal cold (He I) SMEC test before and after environment tests

The SMEC shall be closed at the end of each of these tests. The instrument test sequence shall include this open and close commands.

3.1.4.2 PACS Grating launch lock

PACS Grating launch lock has a limited number of OPEN CLOSE cycles during PACS testing life (typically 15 remain for satellite tests.
It shall be closed for any satellite displacement (not including tilt to 20°)
The proposed OPEN/Close sequence is the following.

1. OPEN for SFT Cold He I →CLOSE at the end of SFT Cold He II
2. OPEN for IST Commissioning, SPT, RMS →Close at the end of RMS
3. OPEN/CLOSE for Sat SFT1
4. OPEN for SAT AFT1(in EMC facility) → Close at the end of EMC 2(RE/RS)
5. OPEN for SAT AFT2 (in TV chamber) → Close at the end of TV test
6. OPEN CLOSE for AFT3
7. OPEN/CLOSE for AFT4
8. OPEN for AFT5, → Close for SFT2
9. OPEN for IST2, → CLOSE for SOVT2
10. OPEN/CLOSE for SFT in Kourou.

The number of OPEN/CLOSE cycles shall be recorded (as for Limited life items)

3.2 EGSE Configurations for AVM & FM tests

3.2.1 Satellite EGSE configuration

The EGSE configuration during the Herschel Satellite test phase is the following.

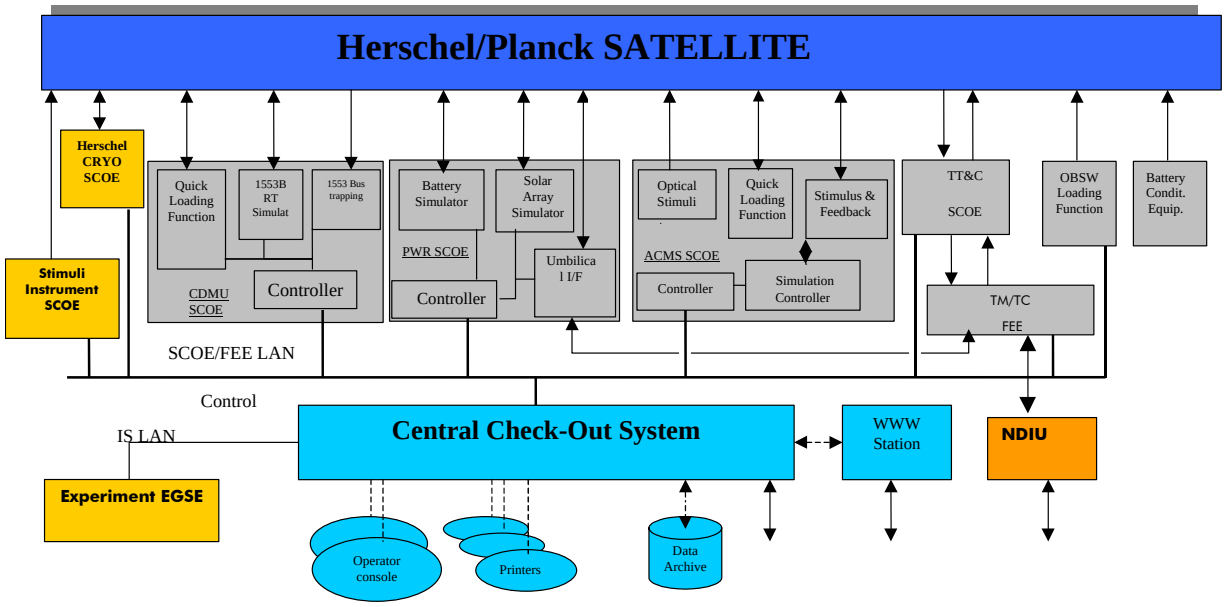


Figure 3-1: Satellite EGSE Configuration

3.2.2 Instruments EGSE

Instrument I-EGSE shall be used by instrument teams during most of the tests mainly to analyse the instrument science and housekeeping data, using the QLA (Quick Look Analysis) tool, or dedicated analysis software.

The instrument IEGSE has been modified during the AVM test to have one IEGSE per instrument during the test. The objective is to be able to follow tests such as RMS, commissioning, IST, without loosing time to reconfigure the IEGSE.

The EGSE configuration is given here below:

Instrument	GSE	Remarks
IEGSE: **HIFI/PACS/SPIRE**	HIFI: 2 PCs (SCOS, Data Server) PACS: 3 PCs (SCOS, Data Server, QLA) SPIRE 3 PCs (SCOS, Data Server, QLA) + 1 firewall added to allow secure access from and to internet	One EGSE Station operated in real time, the other one used as backup or for post processing tasks
HIFI	FPU simulator, LOA Simulator; FCU + FPU SCOE can be used to check integrated FPU + cryoharness LOA simulator + LCU to check LOU cryoharness	To be connected on HIFI WU for warm units functional tests.
PACS	no FPU Simulator No EGSE to check integrated FPU EMC RS H field EGSE provided by PACS	WU + SFT to check FPU + cryoharness RS H-field included in SPT
SPIRE	no FPU Simulator No EGSE to check integrated FPU	WU + SFT/WFT to check FPU + cryoharness

Table 3-4: Instrument EGSE Items

The Instrument EGSE Station is composed by the following items:

- SCOS workstation – used primarily to run the SCOS-2000 software. This will be a PC running Linux with a dual display card driving two displays.
- Analysis workstation – used to run the instrument analysis software (QLA/IA/PCSS). This will be a PC running Linux with a dual display card driving two displays.
- Data Server – used primarily to run the HCSS software. This will be a PC running Linux with a single display and large disk drives with backup facility (to tape/CD TBD).
- Colour laser printer.
- LAN switch - protects the Operational System from the Analysis System allowing access to the external internet from the Analysis System.
- Laptops – used to run instrument specific analysis tools. These are not provided as part of the EGSE but may be used by instrument experts as necessary during testing.

The I-EGSE Software configuration shall be reviewed at tests TRR.

For QM test 2 complete (Nominal & Redundant) IEGSE were used.
After EQM, the Nominal I-EGSE is following the Herschel Cryostat (sent to ASED-FN, then to Estec), and shall be used for FM test, and the redundant I-EGSE has been sent to Alenia, and shall be used for the AVM tests.
During AVM tests, 2 new machines added to form 3 IEGSE operating in parallel.
Database has been updated to reflect this configuration, and allow real time distribution of TM to IEGSE.

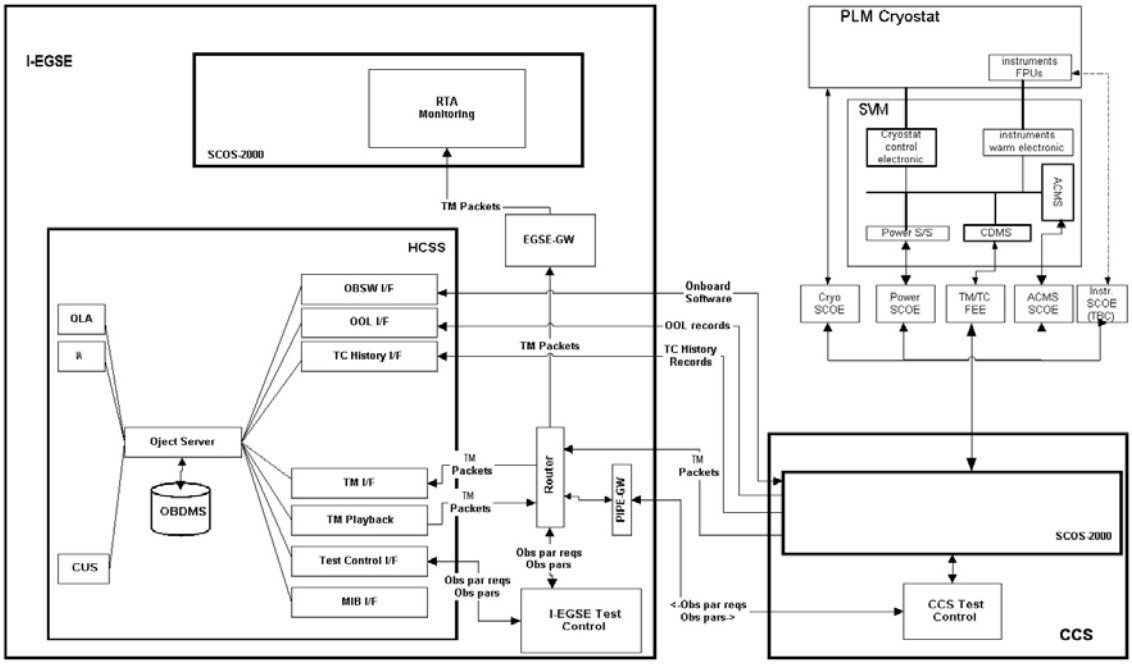


Figure 3-2: Herschel Instruments I-EGSE configuration.

In addition to the function of real time data analysis, the I-EGSE is used to provide the TC parameters to the CCS for test driven by TCL scripts.

The interaction between CCS and I-EGSE is described here below (managed by the CCS handler process running on IEGSE):

The Herschel instrument commanding during IST is done as follows:.

Test script running on CCS sends a "running test procedure x" TC to IEGSE.
IEGSE start test execution
Test script running on CCS sends a "request observation x" TC to IEGSE (OBSID).
IEGSE requests observation x
IEGSE retrieves TC sequence
IEGSE extracts number of TCs, sequences of TCs names, TC parameters and execution times
IEGSE sends all this information as TM packets to CCS
Test script running on CCS waits for all TM packets to arrive
Test script checks that number of expected TCs has not changed
Test script checks that sequence of TCs (names) has not changed
Test script fills all TC parameters with those actual values received from IEGSE
Test script maintains TC timing as received from IEGSE
Test script executes than the TC sequence
Finally at the end the test script sends a TC to IEGSE to indicate end of test
IEGSE closes test execution

Summary:
CCS sends TCs to IEGSE to trigger actions
IEGSE responds by sending TM packets.
Those TM packets contains information about TCs send from CCS to instrument_
CCS extract data from IEGSE TM packets to construct TCs to be send to the instrument
CCS send the resulting TCs to the instrument.

IEGSE's shall be set together in a dedicated area (in FN for integration, Estec for environment tests, and Kourou for launch campaign) with enough room for the work stations, and at least 4 persons per instrument.
This IEGSE area shall be equipped with an internet connection to the CCS (for the pipe protocol), and an internet connection to outside (through a secured instruments delivered firewall) to allow IEGSE set-up and update, and near real time transfer of data.
It shall also be equipped with desks, telephone and external internet connection for instruments teams (base=4 people per instruments, may be together).
Voice communication shall be set up between the instruments test responsibles in the IEGSE room (up to 3 people) and the test Operator, the test conductor, and the test director in the S/C control room, to allow interaction during all phases of a test sequence: Launch of test script from CCS, Go ahead to next step after test results interpretation on QLA.
A CCS workstation shall be set up in the IEGSE room to allow instrument to receive the TC history window (execution and acknowledgement of Instruments TC's).
The cryostat data (Cryoscoe and CCU) shall be made available to instrument through the pipe protocol. This requires to deliver back to instrument a merged database (Instruments + Cryo-data) to be installed in IEGSE SCOS machine.

3.3 Instruments database configuration.

The instrument database shall be Part of the instrument AVM or FM EIDP

It shall be under Configuration control.
It shall be sent to TAS-F (F.Chatte) for compatibility check with, and to be integrated to HPSDB at least 3 weeks before the test.
As the database version is likely to change after checking, the database issue to be used for the test shall be frozen at the TRR.

3.4 Instruments software configuration.

The instruments boot and application software version used in the DPU/ICU and other warm units when applicable shall be described in the instrument AVM or FM EIDP, and acknowledged at the DRB, and TRR.
Each instruments software update shall be performed through a delta DRB.

3.5 Instruments Test scripts configuration.

Test scripts to run the instruments tests shall be prepared by instrument, and delivered together with the associated procedure.
These scripts shall either be combined with satellite commands (Switch on / Off) inside merged scripts, or be executed as is (test sequences).
These test scripts, together with the TC parameters sent by the IEGSE to the CCS to generate the TC's shall be under strict configuration control (ie delivered with version number, identification of changes, release note, …).
Use of master script to run a dedicated test is strongly recommended (to reduce execution time, and avoid handling errors). Master script should allow to run, skip, or rerun any sub sequence.
To facilitate the management of scripts, minimize handling errors and be compatible with the script configuration control on CCS, some rules to generate, name, and deliver scripts have been compiled in annex 1.
These rules are applicable.

3.6 Cryostat Configuration for IST and TV test.

The cryostat cryogenics conditions (IF temperatures a mass flow rate) will not be fully representative of the flight, because either on ground, or during TV test, the heat load distribution inside the cryostat and expected mass flow rate will be different from Orbit.

The following table identify the cryostat conditions that will be seen by instruments during the various tests. The details of these conditions shall be agreed at each TRR.

Cryostat configurations for the Herschel S/C AIV campaign and the predicted cryogenic environments

No.:	Used when:	HTT configurations:	He	HTT (L-0)	PACS L-0 Evapor	OBA (L-1)	OBA (L-2)	OBA (L-3)	TS1	TS2	TS3	CVV
I		Ambient or cool-down or unspecifed	Any	Any	Any	Any	Any	Any	Any	Any	Any	~ 293
II	Whenever He-II is not mandatory	He-I, HTT venting, > 20mg/sec	He-I	4.2	~ 6.5	~ 8	~ 17		50 - 70	120 - 160	190 - 230	~ 293
III	Nominal He-II conditions	He-II, HTT venting, > 20mg/sec	He-II	< 1.9	< 2.3	~ 7	~ 15		~ 75	~ 145	~ 210	~ 293
IV	HIFI performance tests	He-II, HTT closed, shield cooling via HOT or Dewar	He-II	< 1.9	< 2.1	< 2.6	< 6		20 - 25	30-35	50-80	~ 293
V	PACS and SPIRE Photometer performance tests	He-II, HTT closed, shield cooling via HOT or Dewar, cover cooling	He-II	< 1.9	< 2.1	< 2.6	< 6		20 - 25	30-35	50-80	~ 293
VI	SPIRE SMEC performance tests (S/C +Y up)	He-I, HTT venting, > 20mg/sec	He-I	4.2	~ 6.5	~ 8	~ 17		50 - 70	120 - 160	190 - 230	~ 293
VII	Instrument tests during TB/TV (tilting not more than 20 deg.)	He-II, HTT venting, > 4mg/sec, TB/TV conditions	He-II	< 1.8		< 4	~ 12.5		~ 40	~ 55	~ 75	90 - 110

Cryostat issues:
Spacecraft orientations will be restricted such that the Rupture Disc of the HTT will not be immersed in the helium bath.
Spacecraft orientations will be restricted such that SV123 can operate in the gas phase.
The He-II filling level will be below 60% when operating with the S/C horizontally, +YS up.
Additional cooling of the OBA/shields will nominally be performed using an external dewar.

The cryostat cover shall have the following states:
- Flushed: <15K
- Unflushed: 240K
- TV: <70K

There is no stable position at 70-80K. Transient during QM was 15K to 200K & back to 15K

The following table details the cryostat configuration

Test	Title	Cryo enviro	He	S/C orientation	Repeated for IST2	Notes
UFT	UFT, WU only					
UFT PACS	UFT PACS	I	n.a.	n.a.		
UFT SPIRE	UFT SPIRE	I	n.a.	n.a.		
UFT HIFI	UFT HIFI	I	n.a.	n.a.		
SFT Warm	SFT warm	I				
SFT	PACS, SFT warm	I	n.a.	n.a.		
SFT	SPIRE , FPU Electrical Integration Test	I			n	includes SFT nom
SFT	SPIRE, Warm Functional Test	I		0 deg	n	w/o SMEC test
SFT	SPIRE, Warm Functional Test with SMEC test	I		90 deg, +Y up	n	repeat with Horizontal, with SMEC & WFT
SFT	HIFI, SFT warm (w/o LOU)	I	n.a.	n.a.		with FPU & LOU dummy
SFT	HIFI, LOU integ + LOU harness check	I	n.a.	n.a.		LOU can be integrated only after closing CVV Test includes LOU SFT with LOA dummy
SFT	SPIRE LPU check	I		n.a.	y	Does not open the latch, Needs CDMS SW >3.1.2, is also in SFT
SFT	HIFI, SFT LOU	I		n.a.	n	LOU can be integrated only after closing CVV
EMC, CE					**n**	Incl. SVM units and instruments
EMC, CE	PACS, EMC, CE	I	n.a.	n.a.		Now with FPU's connected!
EMC, CE	SPIRE, EMC, CE	I	n.a.	n.a.		Now with FPU's connected!
EMC, CE	HIFI, EMC, CE	I	n.a.	n.a.		Now with FPU's connected!
SFT Cold, He-I					**y**	
SFT	SFT cold, He-I	II	He-I	n.a.		Group all instruments SFT in 1 shift
SFT	SFT cold, He-I	II	He-I	n.a.		
SFT	SFT cold, He-I	II	He-I	n.a.		
SFT Cold, He-II					**y**	
SFT	PACS, SFT cold, He-II	III	He-II	n.a.		Group all instruments SFT in 1 shift
SFT	SPIRE, SFT cold, He-II	III	He-II	n.a.		
SFT	HIFI, SFT cold, He-II	III	He-II	n.a.		
IST-1						
S/C IST	Launch, separation, post separation	I	n.a.			
S/C IST	Launch clean run	I	n.a.			One - off ? During mech. test ?
S/C IST	Satellite Commissioning	I	n.a.	n.a.		CCU will be done separately.
S/C IST	Degraded Cases	I	n.a.	n.a.		
S/C IST	Instrument FDIR	I	n.a.	n.a.		IST Spec 4, chapter 5.8.13
SPT, special	PACS Chopper tuning	II	He-I	20 deg	y	New perf. test, also for IST-II
SPT, special	PACS Grating tuning	II	He-I	20 deg	y	New perf. test, also for IST-II
SPT, special	HIFI Diplexer Tuning	II	He-I	0 deg	y	separated fro HIFI commissioning
S/C IST	Mode transitions	III	He-I	n.a.		
S/C IST	S/C reconfiguration	III	He-I	n.a.		
S/C IST	CDMS Management	IV	He-II	n.a.		need He II only if instruments RMS MTL are used
S/C IST	DTCP worst case scenario	IV	He-II	n.a.		
Inst IST	HIFI Commissioning (perf test + peak up)	III	He-II	n.a.	y	Incl. peak-up verif.
Inst IST	SPIRE Commissioning (CFT + peak up)	III	He-II	20 deg	y	Incl. peak-up verif.
Inst IST	PACS // SPIRE Commissioning	V	He-II	20 deg	y	IST objective, run during SOVT includes Parallel Cooler recycling
Inst IST	PACS Commissioning (FFT)	IV	He-II	20 deg	y	
SPT	HIFI SPT	IV	He-II	0 or 20 deg ?	y	Split into Diplexer tuning & commissioning
EMC	PACS H-field EMC test	V	He-II	20 deg	n	EMC, to be run during IST (Solar Array simulator)
SPT	PACS SPT	V	He-II	20 deg	y	PACS SPT's ~3 shifts, OK
SPT	SPIRE SPT	V	He-II	20 deg	y	
EMC	SPIRE EMC CS tests	V	He-II	20 deg	n	EMC, to be run with SPT, use night shifts 1 & 3 during SPT
S/C + Inst IST	Reference Mission Scenario	III	He-II	20 deg	y	(48h MTL + preparation & end)
SPT, special	SPIRE SMEC Functional Test	II	He-I	90 deg, +Y up	y	Performed prior to cryostat transport
SVT-1	All	I / II	warm / He-I		y	Check ESOC sequence for instrument parts.
SOVT-1	All	III	He-II	20 deg	y	He-II part of SVT (if any) to be added
EMC					n	
EMC, RE	PACS, EMC, RE	V	He-II	20 deg		test duration driven by EMC specification
EMC, RE	SPIRE, EMC, RE	V	He-II	20 deg		test duration driven by EMC specification
EMC, RE	HIFI, EMC, RE	V	He-II	20 deg		test duration driven by EMC specification
EMC, RS	PACS, EMC, RS	V	He-II	20 deg		test duration driven by EMC specification
EMC, RS	SPIRE, EMC, RS	V	He-II	20 deg		test duration driven by EMC specification
EMC, RS	HIFI, EMC, RS	V	He-II	20 deg		test duration driven by EMC specification

Test	Title	Cryo enviro	He	S/C orientation	Repeated for IST2	Notes
TB/TV					n	
TB/TV	PACS TB/TV	VII	He-II	20 deg		
TB/TV	SPIRE TB/TV	VII	He-II	20 deg		
TB/TV	HIFI TB/TV	VII	He-II	20 deg		Sliced (need analysis period), to be interleave with PACS & SPIRE
TB/TV	TB/TV, PACS / SPIRE parallel test	VII	He-II	20 deg		Need = TBC, Mainly parallel coolers recycling
TB/TV	Instrument TV test hot & Cold soak-> Run Instruments SFT	VII	He-II	20 deg		Included inside TV test sequence
TB/TV	Instruments Thermal Interface test	VII	He-II	20 deg		Use instrument sequence with minimal mass flow rate (throttling)

3.6.1 Cryostat Operation during IST:

On ground, the cryostat is usually in Nominal He II conditions (type III on table above). This means that the CVV is at 295K (temperature of the clean room), and the temperature of the HTT is maintained at ≤ 1.9K by external pumping (bypassing the Phase separator via V104, and the nozzles via V502). The nominal mass flow rate with these conditions is about 26mg/s, and the temperature of the Optical bench is high.

The Instruments thermal interfaces conditions are described in the document RD-03: HP-2-ASED-TN-0115 - Thermal Environment for (Herschel) Instruments testing on Ground – (RD99 of IID-A, available on IIDA reference documents ftp site)
For most of the satellite IST (AD 2_1, the instruments are used in a simple way (production od science telemetry, main phases transitions). The cryostat can be either warm (Type I), Cold He I (type II) or Cold He II (type III, IV or V).
This later condition may needed only for CDMS management and DTCP worst case (section 4.7.6), if instruments MTL (starting with cooler recycling) are used.

For dedicated instruments IST(RMS, SPT), the main tank shall be closed (ie V102, V104, 103, 106 closed), and the cooling of the OBA and shields shall be provided by an external Dewar (baseline) or HOT (Optional), with a gas Helium flow forced to about 100mg/s to 1g/s.
The Dewar has a longer autonomy than the HOT (limited to 24h)
This mean that the conditions will be "quasi stationary": the main tank temperature will slowly drift up (about 0.3mK/h).

The satellite shall be either vertical or tilted to about 20° (20° is the maximum allowable during TV test)

The tilt of the Satellite to 90° (to test SPIRE spectrometer) shall be limited to He I (4.2K) conditions, with the +Y axis upward (to be able to use the filling port), and with a filling level <55% (for safety reasons, to avoid that the Tank exhaust to the Safety valve is in the liquid).
The cryostat shall be prepared in these conditions for transport (ASED to ESTEC, and ESTEC to Kourou)
The consequence is that the end to end test of the SPIRE spectrometer is not possible on ground, and that all SPIRE test involving SMEC operation must be isolated from the rest of the instrument tests, to be run in He I conditions.

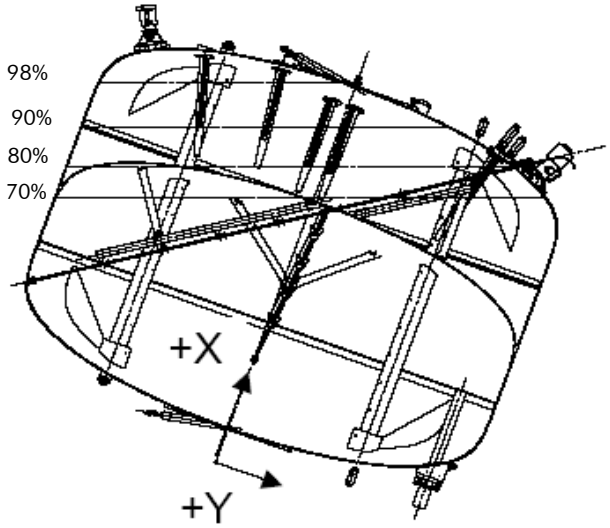


Figure 3-3: Herschel cryostat HTT. Tilted & L0 interfaces , vs filling level

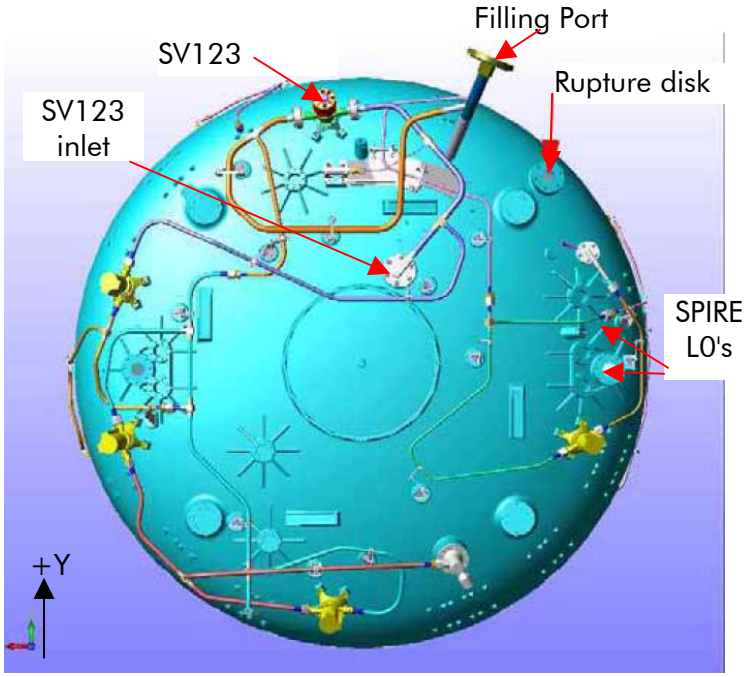


Figure 3-4: Herschel cryostat horizontal, and safety components

During the IST / Commissioning, the satellite shall be tilted, from X vertical, of about +20° around +Z axis (ie +Y goes down) for cooler recycling.

During IST, the cryo-cover can be actively cooled to <20K by circulation of liquid Helium (similar to EQM test). On FM cryostat, the cover shield has been re-polished (which means that it has a low emissivity, lower than the telescope).

3.6.2 Cryostat Operation during TV/TB test:

The Herschel TV test is covered by AD-2_2 – Herschel TV test specification - H-P-2-ASP-TS-0997_2.0.
During the TV test, the simulated TV conditions will not be the space conditions, as the shrouds are cooled by LN2 to approximately 90K. Therefore, the CVV equilibrium temperature is about 100K (compared to 70K in space), and the equilibrium mass flow rate will be about 4mg/s (compared to 2.2 in space). However, for a limited amount of time, the mass flow rate can be throttled to the expected flight mass flow rate, but with a subsequent small temperature drift on the Helium II tank (HTT). The HTT temperature drift is estimated to be between 0.18mK/h (with assumptions: 300kg He at 1.8K, 3mg/s) to 0.48mK/h (with assumptions: 280kg He at 1.6K, 3mg/s)
The cover will be passively cooled during this phase, and a temperature of 85K can be achieved passively on the inner shield.
LOU temperature will be around 110K with no dissipation and 140K with 6.2W dissipated (ref STM TV test, RD31)
An other limitation during the TV test is that the satellite can only be tilted by 20° (TBC) wrt vertical.
Refer also to Herschel PLM TV test report for actual test conditions (RD 31 & 32). Note that the cryostat performances has been improved between STM test and STM2 test, and that STM2 test results might (not available before end 2006) be more relevant for actual cryostat performances.

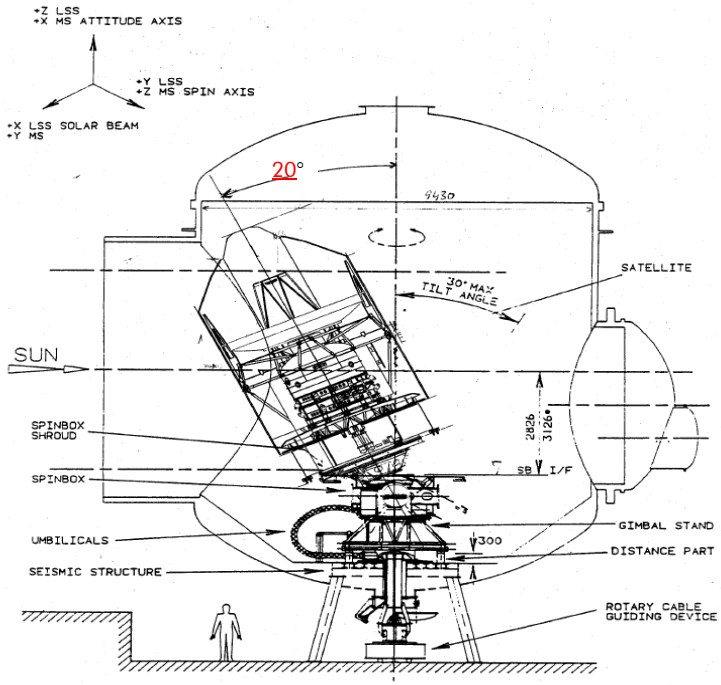


Figure 3-5: Herschel max tilt in LSS (note that the satellite +Z axis will be turned toward the sun) (drawing to be updated)

3.6.3 Cryostat Operation during EMC tests:

EMC CE test can be performed in warm condition, with or without FPU connected.

During the susceptibility EMC test, the approach applied successfully during the QM test shall be used:
The cover is continuously flushed to low temperature (day & night). (CS, RS tests only)

The PACS or SPIRE sorption cooler shall be recycled the evening preceding the instrument test.

The satellite shall not be tilted by 90° for SPIRE spectrometer test within EMC test. (ie SMEC shall not be used)

3.7 SVM thermal Configuration for Integration, IST/EMC and TV test.

The SVM has been designed for flight conditions. When using the SVM on ground, the temperature of the warm units might rise to unacceptable temperature, due to inefficiency of the radiator in clean-room conditions.
For this purpose, air conditioning systems shall be used to blow cold air on the SVM panels., in order to provide as much as possible warm units temperature inside the specified operating range.
However, there are some units for which operating temperatures cannot be reached:
The HIFI WOH & WOV, with operating range [5°C, 15°C] will be at about 25°C
The HIFI HRH & HRV with operating range [0°C-30°C] will be at about 32°C during IST

The details of the expected IST/EMC test conditions are given in the following technical note:
RD-06: H-P-1-ASP-TN-1170_1.0 - H/P IST (SVM) thermal predictions

For EMC, it shall be checked the compatibility of air conditioning equipment with the EMC test objectives, or find a way to move away these units while transporting cold air to the panels through dedicated pipes..

For TV test, the Radiators will be operating nominally, and units should be inside the temperature range. Refer to SVM TV test prediction when it will be available.

3.8 SVM Electrical Configuration for Integration, IST/EMC and TV test.

The SVM electrical configuration shall be in minimum configuration (CDMU & PCDU) for instruments SFTs, and SPT, according to the following tables:

Table 3-5: SVM configuration for instruments tests

Instrument Test	SVM Configuration
UFT /SFT:	Minimum configuration (see table below)
IST Commissioning:	refer to IST specification AD 21, section 5.8.4
IST RMS:	refer to IST specification AD 21, section 5.8.9
IST / SPT:	Minimum configuration (see table below)
TV test:	refer to TV test specification section 4.5 (depend on the phase)
EMC tests:	*refer to EMC test spec refer to AD-2_3, section 5*

The SVM switch on specification for the minimal configuration is given in document AD-2_4 - H-P-2-ASP-TS-1315_1 - Herschel instrument turn ON test sheet

CDMS mode	LAUNCH	note:	BDR enabled	ACMS mode	N/A
TM / OBT	A	Rx1 /Rx2 rate	4kbps	PM & SW & B	A1N [B1S] A
PM & SW	A1N [B1N]	TME / Tx rate	150k / N/A	CRS / FDIR	OFF
SCBP / MTL	A-xx (1) / stopped	Tx chain	OFF	GYROs	OFF
FDIR / SrvCBH	AFS / OFF	Rx 1 Ant.	LGA1	STRs	OFF
launch straps	not separated	Rx 2 Ant.	LGA2	RWs	OFF
PCDU IF / HPS	A / A	CCU	A B ON (2) 8s-Hk	LV	A & B OFF
Battery	VEOC max	SPIRE	As necessary (3)	THR	OFF
Power domain	SA	HIFI	As necessary (3)	SREM	OFF
Mass Memory	1 banks (0)	PACS	As necessary (3)	VMC	OFF

GSE support

Power source	SAS 1700W	TM / TC source	UMB 4k VC0	ENV simulator	stand by

(1): Bus profile Depending of instrument & test: ref to
(2): CCU Off for warm tests, ON for cold tests
(3) Off, standby or tested mode depending of test

Table 3-6: SVM Minimal configuration (for dedicated instruments tests)

4. TEST DEFINITION

4.1 Overview of Herschel FM tests sequence

The Herschel Spacecraft, after integration (and instruments integration tests and UFT), shall be submitted to Acceptance environment tests (TV test, EMC test, and Mechanical tests).
Before and after Environment test, the satellite shall be submitted to Integrated System Tests (IST, ref RD21), with the aim to verify all (or at least most of) functionalities and modes of the Spacecraft and Instruments are performing correctly, and that they are not altered by the environmental tests.
Before and after each environment test, SFT (Short Functional tests) or AFT (Abreviated functional tests) shall be performed to health check of the satellite and instruments.

The overall test logic on the FM is described in the following flow diagram.

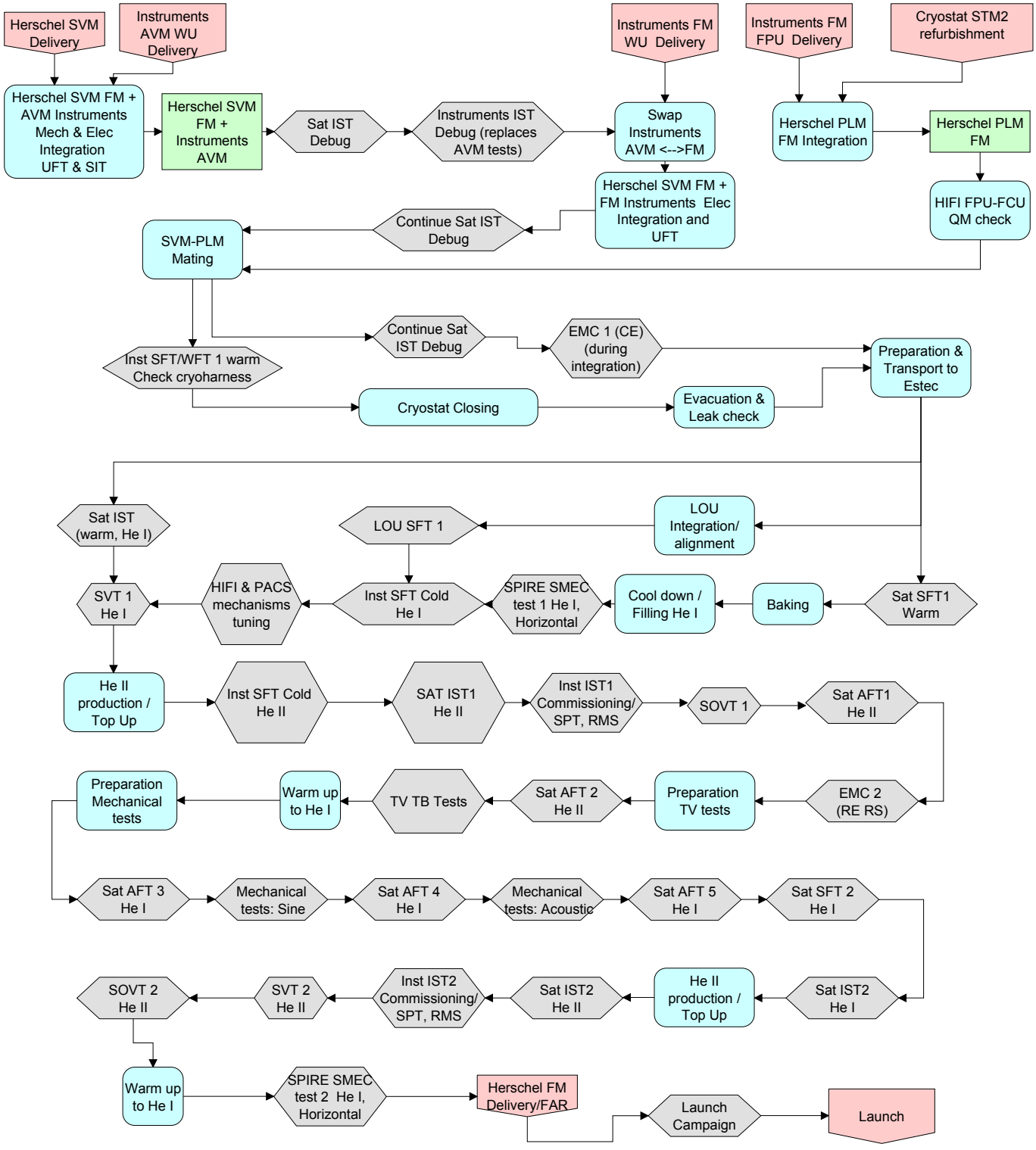


Figure 4-1: Herschel FM test sequence flow chart (for information)

The launch campaign is not defined yet (out of contract), but it is likely that SFT or Cold functional tests will be performed after transport to Kourou, and on launcher.

The instruments tests sequences have been prepared in dedicated procedures. The following table give the estimated duration for each sequences, together with the most recent procedures. These tables are detailed in this section 4 for each instrument tests, and compiled per instrument (developed to level 2) in annex 2.
From the experience of first UFT & SFT, the duration for PACS & SPIRE tests should be extended by 10-20%, while the duration for HIFI test should be reduced (Switch on / Off have already been reduced to realistic valued but not yet the test sequences)

PACS:

Title	Content	Duration used	Procedure for FM
Test with PACS WU connected to IEGSE (Optional)		2:00:00	PACS-ME-TP-016_1_4 - Test Procedure for PACS Warm Electronics Tests
Test with PACS WU connected to SVM & CCS		2:00:00	PACS-ME-TP-016_1_4 - Test Procedure for PACS Warm Electronics Tests
PACS nominal and Redundant SFT (warm)		2:40:00	PACS-ME-TP-017_1_8 - PACS Short Functional Tests
PACS nominal and Redundant SFT (He I)		2:40:00	PACS-ME-TP-017_1_8 - PACS Short Functional Tests
PACS nominal and Redundant SFT (He II)		2:40:00	PACS-ME-TP-017_1_8 - PACS Short Functional Tests
PACS Mechanisms Tuning		16:30:00	PACS-ME-TP-021_2_5 - PACS Integrated System Test Procedures
PACS Commissioning		12:22:48	PACS-ME-TP-021_2_5 - PACS Integrated System Test Procedures
PACS Special Performance Test		35:58:42	PACS-ME-TP-021_2_5 - PACS Integrated System Test Procedures
PACS Reference Mission Scenario		15:42:20	PACS-ME-TP-021_2_5 - PACS Integrated System Test Procedures
PACS EMC Testing		15:55:57	PACS-ME-TP-032_1.4 - EMC Test Procedure on Integrated System Level
PACS TB/TV Testing		31:55:12	PACS-ME-TP-021_2_5 - PACS Integrated System Test Procedures
Use of instrument during S/C IST		0:00:00	No procedure; use scripts from SAT_IST_Debugging_PACS_20070417.zip

SPIRE

Title	Content	Duration used	Procedure for FM
AVM or FM WU EIT (Electrical integration tests)		8:00:00	
SPIRE Warm units UFT (warm units on SVM)		2:00:00	SPIRE-RAL-PRC-002680_1.3 - SPIRE WU Integration Test Procedure
SPIRE FPU-SIH Integration Test		6:00:00	SPIRE-RAL-PRC-002951_2.1 - SPIRE PFM SIH Electrical Integration P
SPIRE SFT Prime & redundant (warm, Hel, He II)		3:20:00	SPIRE-RAL-PRC-002494_2.4 - SPIRE_SFT_Procedures
SPIRE Instrument PRIME & Redundant Warm Functional Test (WFT)		7:53:00	SPIRE-RAL-PRC-002422_2.4 - SPIRE_WFT_Procedures
SPIRE Commissioning		5:30:00	SPIRE-RAL-PRC-002398_2.2 - SPIRE_CFT_Procedures
SPIRE SMEC Cold Functional test (nominal, incl microvib test)		3:00:00	TBW, Test sequence anticipated here, taken from CFT
SPIRE // PACS mode test during IST			Moved to SOVT
SPIRE Special Performance Test (SPT/IMT) during IST1 (3 days) + EMC CS		69:15:00	SPIRE-RAL-PRC-002704_2.4 - SPIRE_SPT_Procedures
SPIRE Reference Mission Scenario (RMS)		15:43:00	MTL from ESOC
SPIRE EMC test 1: CE		1:20:00	SPIRE-RAL-PRC-002946_1.1 - SPIRE Warm Units EMC Conductive Emissions Procedures for IST
SPIRE EMC Testing 2 (RE/RS)		5:00:00	SPIRE-RAL-PRC-002704_2.2 - SPIRE_SPT_Procedures
SPIRE TB/TV Testing		48:00:00	SPIRE-RAL-PRC-002704_2.2 - SPIRE_SPT_Procedures
Use of instrument during S/C IST			SPIRE-RAL-PRC-002880_1.3 - SPIRE IST SAT Debug Procedure

HIFI

Title	Content	Duration used	procedure
HIFI UFT (=SFT with FPU & LOU dummy)		21:04:00	SRON-G-HIFI-PR-2007-017_1.5.3 - HIFI Power on for IST & TV SRON-G-HIFI-PR-2007-018_1.5 - HIFI IST SFT UFT
HIFI SFT's = HIFI SFT with FPU Warm & LOU Dummy		16:46:00	SRON-G-HIFI-PR-2007-017_1.5.3 - HIFI Power on for IST & TV SRON-G-HIFI-PR-2007-018_1.5 - HIFI IST SFT UFT
HIFI SFT's = HIFI SFT with FPU & LOU Warm		8:50:00	SRON-G-HIFI-PR-2007-017_1.5.3 - HIFI Power on for IST & TV SRON-G-HIFI-PR-2007-018_1.5 - HIFI IST SFT UFT
HIFI SFT's = HIFI SFT with FPU Cold & LOU Warm		4:20:00	SRON-G-HIFI-PR-2007-017_1.5.3 - HIFI Power on for IST & TV SRON-G-HIFI-PR-2007-018_1.5 - HIFI IST SFT UFT
HIFI Diplexer Tuning (Warm units connected to Cold FPU (He I		23:51:38	SRON-G-HIFI-AIV-2007-009_draft-0.2 - IST commissioning
HIFI Commissioning		6:14:10	SRON-G-HIFI-AIV-2007-009_draft-0.2 - IST commissioning
HIFI Special Performance Test		21:25:00	SRON-G-HIFI-AIV-2007-009_draft-0.2 - IST commissioning
HIFI Reference Mission Scenario		15:03:00	MTL ready via MOC & ESOC
HIFI EMC Testing during IST		8:45:00	SRON-G-HIFI-PR-2007-019_1.5.3 - HIFI conducted emissivity procedures for IST tests - RE/RS missing
HIFI TB/TV Testing		196:20:00	TBD
Use of instrument during S/C IST			TBW

Note, in the rest of the document, the instruments test tables shall indicate

- Title of the test
- Duration
- Procedure to be used
- Relevant Section of the procedure

4.2 Time Allocation for instruments tests

The time allocation for various instruments tests during the satellite FM sequence is the following. All sequences below are in agreement with this, except the HIFI TV test (78h, see section 4.7.3)

Test	Allocation	type of AIT operation (to be defined in dedicated test specification)
SFT	2h/Instruments (all instruments SFT in 1 shift)	Normal days 5d/7
Commissioning	10h/Instrument	3 shifts, 7d/7
RMS	14h/instrument	3 shifts, 7d/7
SPT	3 days of 2 shifts /Instrument	3 shifts, 7d/7
TV	48h/instrument	3 shifts, 7d/7
EMC	2 days/Instruments	3 shifts, 7d/7

For organisation of long tests, such as SPT and TV test, instruments tests should be prepared using test lumps of about 8h (1 shift), starting and ending in Standby or ready mode.
This shall allow to alternate tests between instruments (if teams are not sized to support full 3 shift operation).

4.3 Incoming Inspection

At reception of instruments, there shall be an incoming inspection aimed to check that the instrument survived the transport, and is still operational.
The inspection (visual inspection) may be followed by an incoming inspection test, where the warm units are connected to each other, and to the I-EGSE, and a verification sequence is run.

For FM,
Incoming inspection shall be performed for all instruments by the receiving party.
Post shipment test shall be performed according to instrument procedures:

PACS:
The test procedure is included in AD-6_3 (PACS-ME-TP-016_1_4 - Test Procedure for PACS Warm Electronics Tests) section 11.1 (Nominal) and 11.2 (Redundant).

The sequence is the following:

Test with PACS WU connected to IEGSE (Optional)		**2:00:00**	PACS-ME-TP-016_1_4 - Test Procedure for PACS Warm Electronics Tests	11.1..11.2
	UFT PACS nominal	**1:00:00**		11.1.1
	Switchon (Nominal)			11.1.2
	Simulated Spectroscopy Mode			11.1.3
	Simulated Photometry mode			11.1.4
	Switch off			11.1.5
	UFT PACS Redundant	**1:00:00**		11.2
	Switchon (Redundant)			11.2.2
	Simulated Spectroscopy Mode			11.2.3
	Simulated Photometry mode			11.2.4
	Switch off			11.2.5

SPIRE:
No incoming Inspection. Replaced by UFT

HIFI
AD-6_5 - SRON-U_HIFI_PR_2006-006_10 - WU Electrical Integration
HIFI has defined a post shipment test after integration of the WU's on the panels and the WIH in place, but still with dummies for (one) LOA and FPU.

4.4 Instruments WU Integration tests, UFT (Unit Functional Test), and SIT (Subsystem Integration Test)

Integration test , UFT, and SIT take place after instrument delivery, incoming inspections & post shipment tests, and shall be performed on warm units only (ie no connection to the FPU yet). Instruments may require to integrate an FPU simulator for the UFT (only HIFI).

These tests are to be split into 3 phases:

4.4.1 Electrical Integration tests

Integration tests shall be performed to validate the electrical interfaces between the instruments warm units, and the SVM, in a non loaded, then loaded configuration. It is limited to units having a direct interface to the SVM.
They consist in verification of
1: the power interface between PCDU, and all warm units connected to primary power lines.
2: The 1553 Interface between the CDMU and the instruments DPU's (or ICU)
3: The clock interface between the CDMU and any warm unit connected to the clock (PACS DECMEC).

4.4.1.1 Herschel FM Instruments:

The mechanical integration specification are:
AD-3_1 - Herschel Warm units Integration specification – H-P-2-ASP-SP-1009_1
AD-3_2 – Herschel Instruments WIH integration specification – H-P-2-ASP-SP-1036_2

The electrical Integration specifications are the following:
AD-4_1 - H-P-2-ASP-TS-1127_1.0 - HIFI WU to SVM Electrical Integration Specification (FM)
AD-4_2 - H-P-2-ASP-TS-1155_1.0 - PACS WU to SVM Electrical Integration Specification (FM)
AD-4_3 - H-P-2-ASP-TS-1160_1.0 - SPIRE WU to SVM Electrical Integration Specification (FM)

4.4.2 Instruments full software image patch with OBSM (AVM only)

Removed from issue 2. Has been tested on FM, and will be used on FM whenever software has to be updated.

4.4.3 UFT's (Unit Functional Test)/ SIT (Subsystem Integration Test)

UFT
During the integration sequence, allunits having no direct interface to the SVM, are to be connected usually to the DPU via WIH (data link and/or Secondary Power).
The sequence shall be such that the warm units are connected one by one, and a sequence is run to check that the unit get the power, and is able to communicate with the DPU

SIT
After completion of the instruments warm units electrical integration, a global test on instrument warm units has to be performed to verify that the instruments warm units, as a subsystem, are operational, and ready to execute further tests.. This is the SIT. It is usually a full warm functional test of the instrument operating together, as for flight.

To simplify the sequence, if the integration sequence has been performed many times at ILT without problems, instruments have the possibility to connect all instruments WU with WIH, and run only the SIT at the end.

The UFT/IST sequence have been elaborated by instruments teams with the aim to be common for AVM and for FM.

4.4.3.1 Instruments UFT/SIT for FM

4.4.3.1.1 SPIRE FM UFT:

The procedure to use for SPIRE FM UFT is:
AD-6_2 - SPIRE-RAL-PRC-002680_1.3 - SPIRE WU Integration Test Procedure

The sequence to be run on SPIRE FM in the following:

Warm units UFT (warm units on SVM)			**2:00:00**	SPIRE-RAL-PRC-002680_1.3 - SPIRE WU Integration Test Procedure	section
SPIRE UFT Nominal			**0:55:00**		
	1	DPU PRIME Power up and OBS start	0:05:00	SPIRE-WU-INT-DPU-ON-P	4.1.1.1
	2	DRCU PRIME Power up	0:05:00	SPIRE-WU-INT-DRCU-ON-P	4.1.1.2
	3	SCU Low Speed Link check	0:05:00	SPIRE-WU-INT-SCU-01-P	4.1.1.3
	4	SCU High Speed Link check	0:05:00	SPIRE-WU-INT-SCU-02-P	4.1.1.4
	5	MCU Low Speed Link check	0:05:00	SPIRE-WU-INT-MCU-01-P	4.1.1.5
	6	MCU High Speed Link check	0:05:00	SPIRE-WU-INT-MCU-02-P	4.1.1.6
	7	DCU Low Speed Link check	0:05:00	SPIRE-WU-INT-DCU-01-P	4.1.1.7
	8	DCU High Speed Link check	0:05:00	SPIRE-WU-INT-DCU-02-P	4.1.1.8
	9	MCU power off	0:05:00	SPIRE-WU-INT-MCU-OFF-P	4.1.1.9
	10	DRCU PRIME power off	0:05:00	SPIRE-WU-INT-DRCU-OFF-P	4.1.1.10
	11	DPU PRIME power off	0:05:00	SPIRE-WU-INT-DPU-OFF-P	4.1.1.11
SPIRE UFT Redundant			**1:05:00**		
	12	Reconfigure the 1553 Spacecraft bus from SPIRE DPU PRIME (RT = 21) to SPIRE DPU REDUNDANT (RT = 22).	0:05:00		
	13	Change to SPIRE Redundant MIB on the CCS (If applicable)	0:05:00		
	14	DPU RED Power up and OBS start	0:05:00	SPIRE-WU-INT-DPU-ON-R	4.1.2.1
	15	DRCU RED Power up	0:05:00	SPIRE-WU-INT-DRCU-ON-R	4.1.2.2
	16	SCU Low Speed Link check	0:05:00	SPIRE-WU-INT-SCU-01-R	4.1.2.3
	17	SCU High Speed Link check	0:05:00	SPIRE-WU-INT-SCU-02-R	4.1.2.4
	18	MCU Low Speed Link check	0:05:00	SPIRE-WU-INT-MCU-01-R	4.1.2.5
	19	MCU High Speed Link check	0:05:00	SPIRE-WU-INT-MCU-02-R	4.1.2.6
	20	DCU Low Speed Link check	0:05:00	SPIRE-WU-INT-DCU-01-R	4.1.2.7
	21	DCU High Speed Link check	0:05:00	SPIRE-WU-INT-DCU-02-R	4.1.2.8
	22	MCU power off	0:05:00	SPIRE-WU-INT-MCU-OFF-R	4.1.2.9
	23	DRCU RED power off	0:05:00	SPIRE-WU-INT-DRCU-OFF-R	4.1.2.10
	24	DPU RED power off	0:05:00	SPIRE-WU-INT-DPU-OFF-R	4.1.2.11

4.4.3.1.2 PACS FM UFT:

The procedure to use for PACS FM UFT is:
AD-62 - PACS-ME-TP-016_1_4 - Test Procedure for PACS Warm Electronics Tests

The sequences to be run are in section 11.3 (nominal), and 11.4 (redundant)
It is similar to the incoming inspection test, but the command / Powering is performed from the CCS, through the SVM CDMU/PCDU.
The sequence is the following:

Test with PACS WU connected to SVM & CCS		**2:00:00**	PACS-ME-TP-016_1_4 - Test Procedure for PACS Warm Electronics Tests	11.3..11.4
UFT PACS nominal		**1:00:00**		11.3.1
	Switchon (Nominal)			11.3.2
	Simulated Spectroscopy Mode			11.3.3
	Simulated Photometry mode			11.3.4
	Switch off			11.3.5
UFT PACS Redundant		**1:00:00**		11.4.1
	Switchon (Redundant)			11.4.2
	Simulated Spectroscopy Mode			11.4.3
	Simulated Photometry mode			11.4.4
	Switch off			11.4.5

4.4.3.1.3 HIFI FM UFT

The procedure to use for HIFI FM UFT is:
AD-65 – SRON-G/HIFI/PR/2006-0xx - HIFI FM Integration & Functional procedures

HIFI UFT (=SFT with FPU & LOU dummy)		**21:04:00**	SRON-G-HIFI-PR-2007-017_1.5.3 - HIFI Power on for IST & TV SRON-G-HIFI-PR-2007-018_1.5 - HIFI IST SFT UFT
Nominal Instrument UFT		**10:32:00**	
Procedure for HIFI PowerOn dummy FPU and LOU		**0:30:00**	SRON-G-HIFI-PR-2007-017_1.5.3 - HIFI Power on for IST & TV
UFT Procedure for HIFI SFT dummy FPU and dummy LOU		**9:57:00**	SRON-G-HIFI-PR-2007-018_1.5 - HIFI IST SFT UFT
preparation		**0:05:00**	
CSA SFT		**0:02:00**	
Chopper SFT		**0:04:00**	
FCU SFT		**0:34:00**	
WBS SFT		**0:26:00**	
HRS SFT		**0:24:00**	
LCU-LSU SFT		**8:22:00**	
Procedure for HIFI PowerOff		**0:05:00**	SRON-G-HIFI-PR-2007-017_1.5.3 - HIFI Power on for IST & TV
Repeat all sequence for Redundant Instrument		**10:32:00**	

As indicated in the table, the complete UFT procedure is to be repeated on redundant Instrument.

4.5 SFT (Short Functional tests)

SFT (short functional tests) is a test sequence (short, as indicated by the name), aimed to verify the health check of the instrument.
This test shall be performed at various stage of the satellite integration and environment test:

- During the integration of the FPU, prior to close the CVV upper bulkhead (SFT warm, used to verify the cryoharness)
- After cooldown, to verify that the FPU has all its connections (SFT cold (He I or He II)
- Before and after any environment test: EMC, Vibration, and TV test.
- Before the IST

The SFT are described more precisely in AD-2_4 - H-P-2-ASP-SP-1411_2 - Herschel SFT specification
This specification now splits Short functional test into
SFT with complete satellite test + instruments SFT (performed after transport to Estec (between IST & environment tests), and at the end of environment tests
AFT (Abbreviated Functional test, with simplified Satellite test and Instruments SFT, performed between environment tests.
So as far as instruments are concerned these tests are similar.

Here is, for information (ref AD-2_4), the agreed distribution of Satellites SFT (consistent with flow chart fig 4-1) during the test sequence, in addition to the 3 Instruments SFT performed at the beginning (Warm, He I, He II)

- SFT#1: one major reference SFT at arrival,

- AFT#1: before the Radiated EMC tests,
- AFT#2: before the TV/TB test (after installation of Herschel in the LSS), until end of TV
- AFT#3: before the mechanical sine test,
- AFT#4: before the mechanical acoustic test,
- AFT#5: after the mechanical acoustic test, and before the SFT 2.
- SFT#2: one SFT after mechanical tests

In addition, 2 instruments SFT's shall be performed during TV/TB test (during hot and cold soak of instruments warm units), and an SFT cold will be performed at Kourou (TBC).

Instruments SFT's shall be organised in one shift, executing the SFT of one instrument while the other instruments are left in standby.

- Switch ON Instruments (OFF to Standby/Safe) PACS, SPIRE HIFI
- Execute 1 Instrument SFT and return to standby , then next instrument SFT (sequence: PACS, SPIRE, HIFI)
- Switch Off the instruments (PACS, SPIRE, HIFI)

The SFT shall be able to be run by Industry AIT team only, and preferably without using the I-EGSE: ie SFT scripts shall be self-consistent: run directly on CCS, without requesting TC parameters to IEGSE. This can be done either by training (during the first SFT), or by a proper diagnostic included in the SFT test scripts (for each test step, a visual statement OK or NOK).

The following sections describe the content of each instruments SFT (to be reorganised (Switch ON-SFT-Switch off).

4.5.1 PACS SFT

The test procedure to be used for PACS SFT is:
AD-7_3 - PACS-ME-TP-017_1.7 – PACS SFTs test procedures

The sequence is similar for warm and cold conditions. Only the parameters to be checked need to be adapted to the FPU temperature.

Overview of PACS Short Functional Tests
This sequence is repeated for the redundant chain.

PACS SFT Warm

PACS nominal and Redundant SFT (warm)			**2:40:00**	PACS-ME-TP-017_1_8 - PACS Short Functional Tests	11	1
	SFT PACS nominal (warm)		**1:20:00**		11.1	1
		PACS Switch on "Nominal"			11.1	2
		Chopper			11.1	3
		Grating (Open Launch Lock, optional only if previous state is closed)			11.1	4
		Grating Health Check			11.1	5
		Calibration sources			11.1	6
		Filterwheel Spectroscopy			11.1	7
		Filterwheel Photometry			11.1	8
		FPU Temperature sensors			11.1	9
		Detector Heaters			11.1	10
		Detector Flashers			11.1	11
		Ge:Ga Detector Chain			11.1	12
		Sorption Cooler			11.1	13
		Bolometer Detector Chain			11.1	14
		Switch off			11.1	15
	Repeat SFT for PACS Redundant (Warm)		**1:20:00**		11.1	16
		PACS Switch on "Redundant"			11.1	17
		Chopper			11.1	18
		Grating (Open Launch Lock, optional only if previous state is closed)			11.1	19
		Grating Health Check			11.1	20
		Calibration sources			11.1	21
		Filterwheel Spectroscopy			11.1	22
		Filterwheel Photometry			11.1	23
		FPU Temperature sensors			11.1	24
		Detector Heaters			11.1	25
		Detector Flashers			11.1	26
		Ge:Ga Detector Chain			11.1	27
		Sorption Cooler			11.1	28
		Bolometer Detector Chain			11.1	29
		Switch off			11.1	30

PACS SFT Cold He I

PACS nominal and Redundant SFT (He I)			**2:40:00**	PACS-ME-TP-017_1_8 - PACS Short Functional Tests	11.3
	SFT PACS nominal (He I)		**1:20:00**		11.3.1
		PACS Switch on "Nominal"			11.3.2
		Chopper			11.3.3
		Grating (Open Launch Lock, optional only if previous state is closed)			11.3.4
		Grating Health Check			11.3.5
		Close Launch Lock			11.3.6
		Calibration sources			11.3.7
		Filterwheel Spectroscopy			11.3.8
		Filterwheel Photometry			11.3.9
		FPU Temperature sensors			11.3.10
		Detector Heaters			11.3.11
		Detector Flashers			11.3.12
		Ge:Ga Detector Chain			11.3.13
		Sorption Cooler			11.3.14
		Bolometer Detector Chain			11.3.15
		Switch off			11.3.16
	Repeat SFT for PACS Redundant (He I)		**1:20:00**		11.3.17
		PACS Switch on "Redundant"			11.3.18
		Chopper			11.3.19
		Grating (Open Launch Lock, optional only if previous state is closed)			11.3.20
		Grating Health Check			11.3.21
		Close Launch Lock			11.3.22
		Calibration sources			11.3.23
		Filterwheel Spectroscopy			11.3.24
		Filterwheel Photometry			11.3.25
		FPU Temperature sensors			11.3.26
		Detector Heaters			11.3.27
		Detector Flashers			11.3.28
		Ge:Ga Detector Chain			11.3.29
		Sorption Cooler			11.3.30
		Bolometer Detector Chain			11.3.31
		Switch off			11.3.32

PACS SFT Cold He II

PACS nominal and Redundant SFT (He II)			**2:40:00**	PACS-ME-TP-017_1_8 - PACS Short Functional Tests	11.2
	SFT PACS nominal (He II)		**1:20:00**		11.2.1
		PACS Switch on "Nominal"			11.2.2
		Chopper			11.2.3
		Grating (Open Launch Lock, optional only if previous state is closed)			11.2.4
		Grating Health Check			11.2.5
		Close Launch Lock			11.2.6
		Calibration sources			11.2.7
		Filterwheel Spectroscopy			11.2.8
		Filterwheel Photometry			11.2.9
		FPU Temperature sensors			11.2.10
		Detector Heaters			11.2.11
		Detector Flashers			11.2.12
		Ge:Ga Detector Chain			11.2.13
		Sorption Cooler			11.2.14
		Bolometer Detector Chain			11.2.15
		Switch off			11.2.16
	Repeat SFT for PACS Redundant (He II)		**1:20:00**		11.2.17
		PACS Switch on "Redundant"			11.2.18
		Chopper			11.2.19
		Grating (Open Launch Lock, optional only if previous state is closed)			11.2.20
		Grating Health Check			11.2.21
		Close Launch Lock			11.2.22
		Calibration sources			11.2.23
		Filterwheel Spectroscopy			11.2.24
		Filterwheel Photometry			11.2.25
		FPU Temperature sensors			11.2.26
		Detector Heaters			11.2.27
		Detector Flashers			11.2.28
		Ge:Ga Detector Chain			11.2.29
		Sorption Cooler			11.2.30
		Bolometer Detector Chain			11.2.31
		Switch off			11.2.32

4.5.2 SPIRE SFT

SPIRE SFT has been judged not sufficient to verify the harness after FPU integration, therefore a complete warm Functional test shall be run instead.
Moreover, the SPIRE WFT check for the SMEC mechanism control, and shall be performed with a satellite horizontal, otherwise the SMEC tests have to be skipped.

Each SPIRE SFT duration is currently about 3:30, and shall be reduced to 2h (by simplifying either the redundant or nominal side of the test, and alternating along the SFT sequence between simplified redundant or simplified nominal)

The test procedure to be used for SPIRE SFT is:
For warm SFT
AD-7_2 - SPIRE-RAL-PRC-002422_2.4 - SPIRE_WFT_Procedures

Or for cold SFT's
AD-7_1 - SPIRE-RAL-PRC-002494_2.4 – SPIRE Short Functional Test Procedures

SPIRE Warm SFT = WFT (agreed in order to fully check the cryoharness)
Nominal part (SMEC test to be performed with satellite horizontal)
See table below)

SPIRE Instrument PRIME & Redundant Warm Functional Test (WFT)			7:53:00	SPIRE-RAL-PRC-002422_2.4 - SPIRE_WFT_Procedur	section
SPIRE PRIME WFT			3:53:00		
	1	DPU PRIME Power up and OBS start	0:05:00	SPIRE-FM-WFT-DPU-ON-P	4.1.1
	2	DRCU PRIME Power up	0:04:00	SPIRE-FM-WFT-DRCU-ON-P	4.1.2
	3	SCU Nominal Science Packet Generation Check PRIME	0:03:00	SPIRE-FM-WFT-FUNC-SCU-01-P	4.1.3
	4	SCU DC Thermometry Check PRIME	0:08:00	SPIRE-FM-WFT-FUNC-SCU-03-P	4.1.4
	5	SCU AC Thermometry Check PRIME	0:02:00	SPIRE-FM-WFT-FUNC-SCU-06-P	4.1.5
	6	SCU Nominal Science Contents Check PRIME	0:05:00	SPIRE-FM-WFT-FUNC-SCU-02-P	4.1.6
	7	Photometer Calibrator Check PRIME	0:03:00	SPIRE-FM-WFT-FUNC-SCU-04-P	4.1.8
	8	Spectrometer Calibrator Check PRIME	0:05:00	SPIRE-FM-WFT-FUNC-SCU-05-P	4.1.9
	9	Sorption Cooler Heaters Check PRIME	0:05:00	SPIRE-FM-WFT-FUNC-SCU-07-P	4.1.7
	10	SCU Test Pattern Check PRIME	0:05:00	SPIRE-FM-WFT-FUNC-SCU-08-P	4.1.10
	11	MCU Boot Check PRIME	0:05:00	SPIRE-FM-WFT-FUNC-MCU-01-P	4.1.11
	12	MCU Nominal Science Packet Generation Check PRIME	0:05:00	SPIRE-FM-WFT-FUNC-MCU-02-P	4.1.12
	13	MCU Nominal Science Contents Check PRIME	0:05:00	SPIRE-FM-WFT-FUNC-MCU-03-P	4.1.13
	14	MCU Test Pattern Check PRIME	0:05:00	SPIRE-FM-WFT-FUNC-MCU-04-P	4.1.14
	15	BSM Chop/Jiggle Sensors Check PRIME	0:05:00	SPIRE-FM-WFT-FUNC-BSM-01-P	4.1.15
	16	BSM Chop Sensor Polarity Check PRIME	0:05:00	SPIRE-FM-WFT-FUNC-BSM-02C-P	4.1.16
	17	BSM Jiggle Sensor Polarity Check PRIME	0:05:00	SPIRE-FM-WFT-FUNC-BSM-02J-P	4.1.17
	18	BSM Open Loop Dynamics Check PRIME	0:05:00	SPIRE-FM-WFT-FUNC-BSM-03-P	4.1.18
	19	BSM Open Loop Chop Test PRIME	0:05:00	SPIRE-FM-WFT-FUNC-BSM-05A-P	4.1.19
	20	BSM Close Loop Chop Test PRIME	0:05:00	SPIRE-FM-WFT-FUNC-BSM-05B-P	4.1.20
	21	BSM Operational Mode Check PRIME	0:05:00	SPIRE-FM-WFT-FUNC-BSM-06-P	4.1.21
	22	BSM Switch OFF PRIME	0:03:00	SPIRE-FM-WFT-BSM-0FF-P	4.1.22
	23	DCU Nominal Science Packet Generation Check PRIME	0:05:00	SPIRE-FM-WFT-FUNC-DCU-01-P	4.1.31
	24	DCU High Speed Link Check PRIME	0:05:00	SPIRE-FM-WFT-FUNC-DCU-02-P	4.1.32
	25	DCU Test pattern Check PRIME	0:05:00	SPIRE-FM-WFT-FUNC-DCU-03-P	4.1.33
	26	Photometer LIAs Check PRIME	0:05:00	SPIRE-FM-WFT-FUNC-DCU-04-PHOT-P	4.1.34
	27	Photometer BDAs Switch ON Check PRIME	0:05:00	SPIRE-FM-WFT-FUNC-DCU-11-PHOT-P	4.1.35
	28	Photometer BDAs Integrity Check PRIME	0:15:00	SPIRE-FM-WFT-FUNC-DCU-13-PHOT-P	4.1.36
	29	Photometer BDAs Noise Check PRIME	0:05:00	SPIRE-FM-WFT-FUNC-DCU-14-PHOT-P	4.1.37
	30	Photometer BDAs Switch OFF PRIME	0:03:00	SPIRE-FM-WFT-PDET-OFF-P	4.1.38
	31	Spectrometer LIAs Check PRIME	0:05:00	SPIRE-FM-WFT-FUNC-DCU-04-SPEC-P	4.1.39
	32	Spectrometer BDAs Integrity Check PRIME	0:05:00	SPIRE-FM-WFT-FUNC-DCU-11-SPEC-P	4.1.40
	33	Spectrometer BDAs Integrity Check PRIME	0:12:00	SPIRE-FM-WFT-FUNC-DCU-13-SPEC-P	4.1.41
	34	Spectrometer BDAs Noise Check PRIME	0:05:00	SPIRE-FM-WFT-FUNC-DCU-14-SPEC-P	4.1.42
	35	Spectrometer BDAs Switch OFF PRIME	0:03:00	SPIRE-FM-WFT-SDET-OFF-P	4.1.43
	36	SMEC Encoder and LVDT check PRIME	0:05:00	SPIRE-FM-WFT-FUNC-SMEC-01-P	4.1.23
	37	SMEC Encoder Levels Check PRIME	0:05:00	SPIRE-FM-WFT-FUNC-SMEC-03-P	4.1.24
	38	SMEC Open Launch Latch PRIME	0:05:00	SPIRE-FM-WFT-FUNC-SMEC-02A-P	4.1.25
	39	SMEC Open Loop Position check PRIME	0:05:00	SPIRE-FM-WFT-FUNC-SMEC-04A-P	4.1.26
	40	SMEC Open Loop Scan check PRIME	0:05:00	SPIRE-FM-WFT-FUNC-SMEC-09-P	4.1.27
	41	SMEC Closed Loop Scan check PRIME	0:05:00	SPIRE-FM-WFT-FUNC-SMEC-07-P	4.1.28
	42	SMEC Close Launch Latch PRIME	0:05:00	SPIRE-FM-WFT-FUNC-SMEC-02B-P	4.1.29
	43	SMEC Switch OFF PRIME	0:03:00	SPIRE-FM-WFT-SMEC-OFF-P	4.1.30
	44	MCU Switch OFF PRIME	0:02:00	SPIRE-FM-WFT-MCU-OFF-P	4.1.44
	45	SCU Switch OFF PRIME	0:02:00	SPIRE-FM-WFT-SCU-OFF-P	4.1.45
	46	DRCU Power OFF PRIME	0:05:00	SPIRE-FM-WFT-DRCU-OFF-P	4.1.46
	47	DPU Power OFF PRIME	0:05:00	SPIRE-FM-WFT-DPU-OFF-P	4.1.47

Redundant part

SPIRE REDUNDANT WFT			4:00:00		
	48	Change to SPIRE Redundant MIB on nthe CCS (If required)	0:00:00	Change to SPIRE Redundant MIB on nthe CCS (If required)	
	49	Change to SPIRE Redundant MIB on the I-EGSE (If required)	0:00:00	Change to SPIRE Redundant MIB on the I-EGSE (If required)	
	50	Configure 1553 Spacecraft bus from SPIRE DPU PRIME to SPIRE DPU REDUNDANT.	0:05:00	Configure 1553 Spacecraft bus from SPIRE DPU PRIME to SPIRE DPU REDUNDANT.	
	51	DPU REDUNDANT Power up and OBS start	0:05:00	SPIRE-FM-WFT-DPU-ON-R	4.2.1
	52	DRCU REDUNDANT Power up	0:04:00	SPIRE-FM-WFT-DRCU-ON-R	4.2.2
	53	SCU Nominal Science Packet Generation Check REDUN.	0:03:00	SPIRE-FM-WFT-FUNC-SCU-01-R	4.2.3
	54	SCU DC Thermometry Check REDUN.	0:08:00	SPIRE-FM-WFT-FUNC-SCU-03-R	4.2.4
	55	SCU AC Thermometry Check REDUN.	0:02:00	SPIRE-FM-WFT-FUNC-SCU-06-R	4.2.5
	56	SCU Nominal Science Contents Check REDUN.	0:05:00	SPIRE-FM-WFT-FUNC-SCU-02-R	4.2.6
	57	Photometer Calibrator Check REDUN.	0:03:00	SPIRE-FM-WFT-FUNC-SCU-04-R	4.2.8
	58	Spectrometer Calibrator Check REDUN.	0:05:00	SPIRE-FM-WFT-FUNC-SCU-05-R	4.2.9
	59	Sorption Cooler Heaters Check REDUN.	0:05:00	SPIRE-FM-WFT-FUNC-SCU-07-R	4.2.7
	60	SCU Test Pattern Check REDUN.	0:05:00	SPIRE-FM-WFT-FUNC-SCU-08-R	4.2.10
	61	MCU Boot Check REDUN.	0:05:00	SPIRE-FM-WFT-FUNC-MCU-01-R	4.2.11
	62	MCU Nominal Science Packet Generation Check REDUN.	0:05:00	SPIRE-FM-WFT-FUNC-MCU-02-R	4.2.12
	63	MCU Nominal Science Contents Check REDUN.	0:05:00	SPIRE-FM-WFT-FUNC-MCU-03-R	4.2.13
	64	MCU Test Pattern Check REDUN	0:05:00	SPIRE-FM-WFT-FUNC-MCU-04-R	4.2.14
	65	BSM Chop/Jiggle Sensors Check REDUN.	0:05:00	SPIRE-FM-WFT-FUNC-BSM-01-R	4.2.15
	66	BSM Chop Sensor Polarity Check REDUN.	0:05:00	SPIRE-FM-WFT-FUNC-BSM-02c-R	4.2.16
	67	BSM Jiggle Sensor Polarity Check REDUN.	0:05:00	SPIRE-FM-WFT-FUNC-BSM-02j-R	4.2.17
	68	BSM Open Loop Dynamics Check REDUN.	0:05:00	SPIRE-FM-WFT-FUNC-BSM-03-R	4.2.18
	69	BSM Open Loop Chop Test REDUN.	0:05:00	SPIRE-FM-WFT-FUNC-BSM-05A-R	4.2.19
	70	BSM Closed Loop Chop Test REDUN.	0:05:00	SPIRE-FM-WFT-FUNC-BSM-05B-R	4.2.20
	71	BSM Operational Mode Check REDUN	0:05:00	SPIRE-FM-WFT-FUNC-BSM-06-R	4.2.21
	72	BSM Switch OFF REDUN.	0:05:00	SPIRE-FM-WFT-BSM-OFF-R	4.2.22
	73	DCU Nominal Science Packet Generation Check REDUN.	0:05:00	SPIRE-FM-WFT-FUNC-DCU-01-R	4.2.31
	74	DCU High Speed Link Check REDUN.	0:05:00	SPIRE-FM-WFT-FUNC-DCU-02-R	4.2.32
	75	DCU Test pattern Check REDUN.	0:05:00	SPIRE-FM-WFT-FUNC-DCU-03-R	4.2.33
	76	Photometer LIAs Check REDUN.	0:05:00	SPIRE-FM-WFT-FUNC-DCU-04-PHOT-R	4.2.34
	77	Photometer BDAs Switch ON Check REDUN.	0:05:00	SPIRE-FM-WFT-FUNC-DCU-11-PHOT-R	4.2.35
	78	Photometer BDAs Integrity Check REDUN.	0:15:00	SPIRE-FM-WFT-FUNC-DCU-13-PHOT-R	4.2.36
	79	Photometer BDAs Noise Check REDUN.	0:05:00	SPIRE-FM-WFT-FUNC-DCU-14-PHOT-R	4.2.37
	80	Photometer BDAs Switch OFF REDUN.	0:03:00	SPIRE-FM-WFT-PDET-OFF-R	4.2.38
	81	Spectrometer LIAs Check REDUN.	0:05:00	SPIRE-FM-WFT-FUNC-DCU-04-SPEC-R	4.2.39
	82	Spectrometer BDAs Integrity Check REDUN.	0:05:00	SPIRE-FM-WFT-FUNC-DCU-11-SPEC-R	4.2.40
	83	Spectrometer BDAs Integrity Check REDUN.	0:12:00	SPIRE-FM-WFT-FUNC-DCU-13-SPEC-R	4.2.41
	84	Spectrometer BDAs Noise Check REDUN.	0:05:00	SPIRE-FM-WFT-FUNC-DCU-14-SPEC-R	4.2.42
	85	Spectrometer BDAs switch OFF REDUN.	0:03:00	SPIRE-FM-WFT-SDET-OFF-R	4.2.43
	86	SMEC Encoder and LVDT Check REDUN.	0:05:00	SPIRE-FM-WFT-FUNC-SMEC-01-R	4.2.23
	87	SMEC Encoder Levels Check REDUN.	0:05:00	SPIRE-FM-WFT-FUNC-SMEC-03-R	4.2.24
	88	SMEC Open Launch Latch REDUN.	0:05:00	SPIRE-FM-WFT-FUNC-SMEC-02A-R	4.2.25
	89	SMEC Open Loop Position Check REDUN.	0:05:00	SPIRE-FM-WFT-FUNC-SMEC-04A-R	4.2.26
	90	SMEC Open Loop Scan Check REDUN.	0:05:00	SPIRE-FM-WFT-FUNC-SMEC-09-R	4.2.27
	91	SMEC Closed Loop Scan Check REDUN.	0:05:00	SPIRE-FM-WFT-FUNC-SMEC-07-R	4.2.28
	92	SMEC Close Launch Latch REDUN.	0:05:00	SPIRE-FM-WFT-FUNC-SMEC-02B-R	4.2.29
	93	SMEC Switch OFF REDUN.	0:03:00	SPIRE-FM-WFT-SMEC-OFF-R	4.2.30
	94	MCU Switch OFF REDUN.	0:02:00	SPIRE-FM-WFT-MCU-OFF-R	4.2.44
	95	SCU Switch OFF REDUN.	0:02:00	SPIRE-FM-WFT-SCU-OFF-R	4.2.45
	96	DRCU Power OFF REDUN.	0:05:00	SPIRE-FM-WFT-DRCU-OFF-R	4.2.46
	97	DPU Power OFF REDUN.	0:05:00	SPIRE-FM-WFT-DPU-OFF-R	4.2.47

For Cold SFT, the sequence is the following

SPIRE SFT Prime & redundant (warm, HeI, He II)			**3:20:00**	SPIRE-RAL-PRC-002494_2.4 - SPIRE_SFT_Procedures	
SPIRE SFT Nominal (warm, HeI, He II)			**1:35:00**		
	1	DPU PRIME Power up and OBS start	0:05:00	SPIRE-FM-SFT-DPU-ON-P	4.1.1
	2	DRCU PRIME Power up	0:04:00	SPIRE-FM-SFT-DRCU-ON-P	4.1.2
	3	SCU Nominal Science Packet Generation Check PRIME	0:03:00	SPIRE-FM-SFT-FUNC-SCU-01-P	4.1.3
	4	SCU DC Thermometry check PRIME	0:08:00	SPIRE-FM-SFT-FUNC-SCU-03-P	4.1.4
	5	SCU AC Thermometry check PRIME	0:02:00	SPIRE-FM-SFT-FUNC-SCU-06-P	4.1.5
	6	Sorption Cooler Heaters Check PRIME	0:05:00	SPIRE-FM-SFT-FUNC-SCU-07-P	4.1.6
	7	Photometer Calibrator Check PRIME	0:03:00	SPIRE-FM-SFT-FUNC-SCU-04-P	4.1.7
	8	Spectrometer Calibrator Check PRIME	0:05:00	SPIRE-FM-SFT-FUNC-SCU-05-P	4.1.8
	9	MCU Boot Check PRIME	0:05:00	SPIRE-FM-SFT-FUNC-MCU-01-P	4.1.9
	10	MCU Nominal Science Packet Generation Check PRIME	0:05:00	SPIRE-FM-SFT-FUNC-MCU-02-P	4.1.10
	11	BSM Chop/Jiggle Sensors check PRIME	0:03:00	SPIRE-FM-SFT-FUNC-BSM-01-P	4.1.11
	12	BSM switch OFF PRIME	0:03:00	SPIRE-FM-SFT-BSM-OFF-P	4.1.12
	13	SMEC Encoder and LVDT check PRIME	0:03:00	SPIRE-FM-SFT-FUNC-SMEC-01-P	4.1.13
	14	SMEC switch OFF	0:03:00	SPIRE-FM-SFT-SMEC-OFF-P	4.1.14
	15	DCU Science Packet Generation Check PRIME	0:05:00	SPIRE-FM-SFT-FUNC-DCU-01-P	4.1.15
	16	Photometer LIAs Check PRIME	0:05:00	SPIRE-FM-SFT-FUNC-DCU-04-PHOT-P	4.1.16
	17	Photometer LIAs Switch OFF PRIME	0:02:00	SPIRE-FM-SFT-PLIA-OFF-P	4.1.17
	18	Spectrometer LIAs Check PRIME	0:05:00	SPIRE-FM-SFT-FUNC-DCU-04-SPEC-P	4.1.18
	19	Spectrometer LIAs Switch OFF PRIME	0:02:00	SPIRE-FM-SFT-SLIA-OFF-P	4.1.19
	20	MCU switch OFF PRIME	0:02:00	SPIRE-FM-SFT-FUNC-MCU-OFF-P	4.1.20
	21	SCU Switch OFF PRIME	0:02:00	SPIRE-FM-SFT-FUNC-SCU-OFF-P	4.1.21
	22	DRCU Power OFF PRIME	0:05:00	SPIRE-FM-SFT-DRCU-OFF-P	4.1.22
	23	DPU Power OFF PRIME	0:05:00	SPIRE-FM-SFT-DPU-OFF-P	4.1.23
	24	Checkout of LPU PRIME	0:05:00	SPIRE-FM-SFT-LPU-01-P	4.1.24
SPIRE SFT redundant (warm, HeI, He II)			**1:45:00**		
	25	Change to SPIRE Redundant MIB on the CCS (If required)	0:05:00		
	26	Configure 1553 Spacecraft bus from SPIRE DPU PRIME to SPIRE DPU REDUNDANT.	0:05:00		
	27	DPU REDUNDANT Power up and OBS start	0:05:00	SPIRE-FM-SFT-DPU-ON-R	4.2.1
	28	DRCU REDUNDANT Power up	0:04:00	SPIRE-FM-SFT-DRCU-ON-R	4.2.2
	29	SCU Nominal Science Packet Generation Check REDUNDANT	0:03:00	SPIRE-FM-SFT-FUNC-SCU-01-R	4.2.3
	30	SCU DC Thermometry Check REDUNDANT	0:08:00	SPIRE-FM-SFT-FUNC-SCU-03-R	4.2.4
	31	SCU AC Thermometry Check REDUNDANT	0:02:00	SPIRE-FM-SFT-FUNC-SCU-06-R	4.2.5
	32	Sorption Cooler Heaters Check REDUNDANT	0:05:00	SPIRE-FM-SFT-FUNC-SCU-07-R	4.2.6
	33	Photometer Calibrator Check REDUNDANT	0:03:00	SPIRE-FM-SFT-FUNC-SCU-04-R	4.2.7
	34	Spectrometer Calibrator Check REDUNDANT	0:05:00	SPIRE-FM-SFT-FUNC-SCU-05-R	4.2.8
	35	MCU Boot Check REDUNDANT	0:05:00	SPIRE-FM-SFT-FUNC-MCU-01-R	4.2.9
	36	MCU Nominal Science Packet Generation Check REDUNDANT	0:05:00	SPIRE-FM-SFT-FUNC-MCU-02-R	4.2.10
	37	BSM Chop/Jiggle Sensors check REDUNDANT	0:03:00	SPIRE-FM-SFT-FUNC-BSM-01-R	4.2.11
	38	BSM Switch OFF REDUNDANT	0:03:00	SPIRE-FM-SFT-BSM-OFF-R	4.2.12
	39	SMEC Encoder and LVDT check REDUNDANT	0:03:00	SPIRE-FM-SFT-FUNC-SMEC-01-R	4.2.13
	40	SMEC Switch OFF	0:03:00	SPIRE-FM-SFT-SMEC-OFF-R	4.2.14
	41	DCU Science Packet Generation Check REDUNDANT	0:05:00	SPIRE-FM-SFT-FUNC-DCU-01-R	4.2.15
	42	Photometer LIAs Check REDUNDANT	0:05:00	SPIRE-FM-SFT-FUNC-DCU-04-PHOT-R	4.2.16
	43	Photometer LIAs Switch OFF REDUNDANT	0:02:00	SPIRE-FM-SFT-PLIA-OFF-R	4.2.17
	44	Spectrometer LIAs Check REDUNDANT	0:05:00	SPIRE-FM-SFT-FUNC-DCU-04-SPEC-R	4.2.18
	45	Spectrometer LIAs Switch OFF REDUNDANT	0:02:00	SPIRE-FM-SFT-SLIA-OFF-R	4.2.19
	46	MCU Switch OFF REDUNDANT	0:02:00	SPIRE-FM-SFT-FUNC-MCU-OFF-R	4.2.20
	47	SCU Switch OFF REDUNDANT	0:02:00	SPIRE-FM-SFT-FUNC-SCU-OFF-R	4.2.21
	48	DRCU Power OFF REDUNDANT	0:05:00	SPIRE-FM-SFT-DRCU-OFF-R	4.2.22
	49	DPU Power OFF REDUNDANT	0:05:00	SPIRE-FM-SFT-DPU-OFF-R	4.2.23
	50	Checkout of LPU REDUNDANT	0:05:00	SPIRE-FM-SFT-LPU-01-R	4.2.24

4.5.3 HIFI SFT

HIFI Procedures are split between Switch ON/OFF procedures and Test procedures.
The applicable procedures for SFT's are:
AD-7-4 - SRON-G-HIFI-PR-2007-017_1.5.3 - HIFI Power on for IST & TV (used for all tests)
AD-7-5 - SRON-G-HIFI-PR-2007-018_1.5 - HIFI IST SFT UFT

The warm SFT is executed at the connection of the FPU (cryostat Still Open), and cannot include the LOU SFT (to be executed after CVV Closing. This test will have to be split into 2 parts.

NB: All HIFI sequences are to be repeated on redundant part of the Instrument, as shown in the following table.
The duration of all tests are overestimated by HIFI and shall be reduced by better estimation and use of master Script.
Cold SFT with duration < 2h for nominal & redundant shall be prepared bu HIFI.

HIFI SFT's = HIFI SFT with FPU Warm & LOU Dummy			**16:46:00**	SRON-G-HIFI-PR-2007-017_1.5.3 - HIFI Power on for IST & TV SRON-G-HIFI-PR-2007-018_1.5 - HIFI IST SFT UFT
Nominal Instrument SFT warm & LOU Dummy			**8:23:00**	
	Procedure for HIFI PowerOn FPU warm and LOU dummy		**0:30:00**	SRON-G-HIFI-PR-2007-017_1.5.3 - HIFI Power on for IST & TV
		Preparation		
		Power on ICU		
		Switch on and verify Focal plane subsystem		
		Power on backends		
		LO switchon and safety tables		
		End of Procedure **end**	**0:00:00**	
	SFT Procedure for HIFI SFT FPU warm and LOU dummy		**7:48:00**	SRON-G-HIFI-PR-2007-018_1.5 - HIFI IST SFT UFT
		Preparation	**0:05:00**	
		CSA SFT	**0:02:00**	
		Chopper SFT	**0:09:00**	
		FCU SFT	**0:34:00**	
		WBS SFT	**0:26:00**	
		HRS SFT	**0:24:00**	
		Upconvertor test	**0:06:00**	
		LCU LSU SFT	**6:00:00**	
		reconfigure HIFI to longterm standby	**0:02:00**	
		End of Procedure	**0:00:00**	
	Procedure for HIFI PowerOff		**0:05:00**	SRON-G-HIFI-PR-2007-017_1.5.3 - HIFI Power on for IST & TV
Repeat all sequence for Redundant Instrument			**8:23:00**	
HIFI SFT's = HIFI SFT with FPU & LOU Warm			**8:50:00**	SRON-G-HIFI-PR-2007-017_1.5.3 - HIFI Power on for IST & TV SRON-G-HIFI-PR-2007-018_1.5 - HIFI IST SFT UFT
Nominal Instrument SFT with FPU & LOU Warm			**4:25:00**	
	Procedure for HIFI PowerOn both FPU and LOU warm		**0:30:00**	SRON-G-HIFI-PR-2007-017_1.5.3 - HIFI Power on for IST & TV
		Preparation		
		Power on ICU		
		Switch on and verify Focal plane subsystem		
		Power on backends		
		LO switchon and safety tables		
		End of Procedure	**0:00:00**	
	SFT Procedure for HIFI SFT FPU warm and LOU Warm		**3:50:00**	SRON-G-HIFI-PR-2007-018_1.5 - HIFI IST SFT UFT
		Preparation	**0:05:00**	
		CSA SFT	**0:02:00**	
		Chopper SFT	**0:04:00**	
		FCU SFT	**0:34:00**	
		WBS SFT	**0:26:00**	
		HRS SFT	**0:24:00**	
		LCU LSU SFT	**2:11:00**	
		reconfigure HIFI to longterm standby	**0:04:00**	
		End of Procedure	**0:00:00**	
	Procedure for HIFI PowerOff		**0:05:00**	SRON-G-HIFI-PR-2007-017_1.5.3 - HIFI Power on for IST & TV
Repeat all sequence for Redundant Instrument			**4:25:00**	
HIFI SFT's = HIFI SFT with FPU Cold & LOU Warm			**8:40:00**	SRON-G-HIFI-PR-2007-017_1.5.3 - HIFI Power on for IST & TV SRON-G-HIFI-PR-2007-018_1.5 - HIFI IST SFT UFT
Nominal Instrument SFT with FPU Cold & LOU Warm			**4:20:00**	
	Procedure for HIFI PowerOn FPU cold and LOU warm without attenuat		**0:30:00**	SRON-G-HIFI-PR-2007-017_1.5.3 - HIFI Power on for IST & TV
		Preparation		
		Power on ICU		
		Switch on and verify Focal plane subsystem		
		Power on backends		
		LO switchon and safety tables		
		End of Procedure	**0:00:00**	
	SFT Procedure for HIFI SFT FPU cold and LOU warm with or without a		**3:45:00**	SRON-G-HIFI-PR-2007-018_1.5 - HIFI IST SFT UFT
		Preparation	**0:05:00**	
		CSA SFT	**0:02:00**	
		Chopper SFT	**0:04:00**	
		FCU SFT	**0:34:00**	
		WBS SFT	**0:26:00**	
		HRS SFT	**0:24:00**	
		LCU LSU SFT	**2:08:00**	
		reconfigure HIFI to longterm standby	**0:04:00**	
		End of Procedure	**0:00:00**	
	Procedure for HIFI PowerOff		**0:05:00**	SRON-G-HIFI-PR-2007-017_1.5.3 - HIFI Power on for IST & TV
Repeat all sequence for Redundant Instrument			**4:20:00**	

4.6 Instruments FPU Mechanism Tuning tests

Between Short Functional tests, and Integrated system tests, instruments have asked some test time to tune the instrument.
This is needed because the configuration inside Herschel is different that during the ILT: The harness is different, the cryogenic conditions are different, the orientation of the instrument is different…

In this section, we have identified the PACS grating and chopper parameter verification and determination, the HIFI diplexer calibration, and the SPIRE SMEC testing in cold.

All these test can be performed in He I conditions.
For PACS & HIFI mechanism tuning tests, the cryostat orientation shall be the same that the next functional tests (IST & TV), therefore 20°
For SPIRE SMEC, the cryostat shall be horizontal (agreed to be +Y up)

4.6.1 PACS Mechanisms tuning

During this test, the control parameter of the chopper and of the grating will be adjusted.
This test has to be performed between Cold SFT (HE I) and IST (can be in He I)
The satellite shall be tilted to 20° to have a similar orientation that during IST, SPT or TV.

The parameter used by the test sequence prepared by PACS will need to be adjusted by repeating the sequence as needed.

The procedure used for this test is the following:
AD8_1 – PACS-ME-TP-021_2.5 - PACS IST test procedures (incl. Commissioning, RMS and SPT, and TV)

The related test sequence shall be as follows:

PACS Mechanisms Tuning			**16:30:00**	PACS-ME-TP-021_2_5 - PACS Integrated System Test Procedures	11.1..3
	PACS FDIR Verification		**0:30:00**		11.1
		PACS Switch on	0:06:00		11.1.2
		Request Autonomous SAFE Transition	0:06:00		11.1.3
		Request Autonomous OFF Mode Transition (OOL)	0:06:00		11.1.4
		PACS Switch on	0:06:00		11.1.5
		Request Autonomous OFF Mode Transition (HK loss)	0:06:00		11.1.6
	Chopper Controller Parameter Verification and Determination		**8:00:00**		11.2
		PACS Chopper Controller Parameter Verfication and Determinatior	**4:00:00**		11.2.1
		PACS Switch on	0:06:00		11.2.2
		Chopper Zero-Point Offset Nulling	0:30:00		11.2.3
		Verify Stability of the Chopper	0:18:00		11.2.4
		Chopper Controller Optimization	3:00:00		11.2.5
		Switch off	0:06:00		11.2.6
		PACS Chopper Controller Parameter Verfication and Determinatior	**4:00:00**		11.2.7
		PACS Switch on	0:06:00		11.2.8
		Chopper Zero-Point Offset Nulling	0:30:00		11.2.9
		Verify Stability of the Chopper	0:18:00		11.2.10
		Chopper Controller Optimization	3:00:00		11.2.11
		PACS Switch off	0:06:00		11.2.12
	Grating Controller Parameter Verification and Determination		**8:00:00**		11.3
		Grating Controller Parameter Verfication and Determination (nomi	**4:00:00**		11.3.1
		PACS Switch on	0:06:00		11.3.2
		Grating Phase Check	0:30:00		11.3.3
		Grating Amplitude Check	0:36:00		11.3.4
		Verify Stability of Grating	2:06:00		11.3.5
		Characterization of selected PID Grating Controller Parameters	0:36:00		11.3.6
		Switch off	0:06:00		11.3.7
		Grating Controller Parameter Verfication and Determination (redur	**4:00:00**		11.3.8
		PACS Switch on	0:06:00		11.3.9
		Grating Phase Check	0:30:00		11.3.10
		Grating Amplitude Check	0:36:00		11.3.11
		Verify Stability of Grating	2:06:00		11.3.12
		Characterization of selected PID Grating Controller Parameters	0:36:00		11.3.13
		Switch off	0:06:00		11.3.14

4.6.2 HIFI diplexer Calibration

This test is to optimise the HIFI FPU diplexers.
It can be performed in He I conditions, with the cryostat Tilted 20°

The test is plit into 3 sequences separated by 2 steps of 8h of data analysis and parameters calculation.

The test procedure for diplexer calibration is AD-8_7 – SRON-G-HIFI-AIV-2007-009_draft 0.2 - HIFI IST commissioning

HIFI Diplexer Tuning (Warm units connected to Cold FPU (He I			**23:51:38**	SRON-G-HIFI-AIV-2007-009_draft-0.2 - IST commissioning
	Procedure for HIFI PowerOn FPU cold and LOU warm without a		**0:30:00**	SRON-G-HIFI-PR-2007-017_1.5.3 - HIFI Power on for IST & TV
		Preparation		
		Power on ICU		
		Switch on and verify Focal plane subsystem		
		Power on backends		
		LO switchon and safety tables		
		End of Procedure	**0:00:00**	
	Diplexer Calibration		**23:16:38**	SRON-G-HIFI-AIV-2007-009_draft 0.2 - HIFI IST commissioning
		Initial calibration of chopper and diplexers	**5:16:33**	
		Analysis and CUS update	**8:00:00**	
		Second diplexer calibration	**2:00:05**	
		Analysis and CUS update	**8:00:00**	
	Procedure for HIFI PowerOff		**0:05:00**	SRON-G-HIFI-PR-2007-017_1.5.3 - HIFI Power on for IST & TV

4.6.3 SPIRE SMEC test:

It has been agreed with SPIRE to remove all cold tests of the SMEC from commissioning and SPT, and to run them in a dedicated sequence , when the cryostat is Horizontal, and in He I, prior to transport to Estec (before environment tests) or to Kourou (after environment tests.

The sequence to be run is a subset of the SPIRE cold functional test procedure, limited to SMEV operation.

However, as SPIRE SMEC is susceptible to micro-vibrations, part of this test shall be performed

The test is currently described in AD-8_2 - SPIRE-RAL-PRC-002398_2.2 – SPIRE Cold Functional Test Procedures (To be updated)
+ AD-8_6 - SPIRE-RAL-NOT-xxxx_1.0 - SPIRE SMEC Cold functional test (incl Microvibration (TBW)

The proposed sequence shall be (TBC by SPIRE):

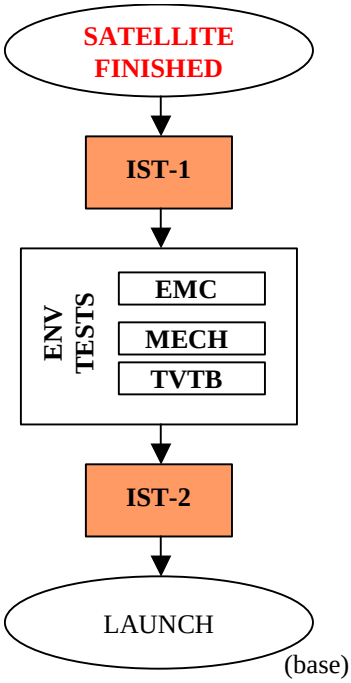
SPIRE SMEC Cold Functional test (nominal, incl microvib test)			3:00:00	TBW, Test sequence anticipated here, taken from CFT
	1	DPU PRIME Power up and OBS start	0:05:00	SPIRE-FM-DPU-ON-P
	2	DRCU PRIME Power up	0:05:00	SPIRE-FM-DRCU-ON-P
		unlatch SMEC ?	0:00:00	
	18	SMEC Encoder and LVDT check PRIME	0:05:00	SPIRE-FM-FUNC-SMEC-01-P
	19	SMEC Open Loop Position check PRIME	0:05:00	SPIRE-FM-FUNC-SMEC-04A-P
	20	SMEC Open Loop Scan check PRIME	0:05:00	SPIRE-FM-FUNC-SMEC-09-P
	21	SMEC Close Loop Position check PRIME	0:05:00	SPIRE-FM-FUNC-SMEC-04B-P
	22	SMEC Close Loop Scan check PRIME	0:05:00	SPIRE-FM-FUNC-SMEC-07-P
		SMEC Microvibration test to be included here	2:00:00	TBW
	23	SMEC switch OFF	0:05:00	SPIRE-FM-SMEC-OFF-P
		re-latch SMEC ?	0:00:00	
	30	MCU switch OFF PRIME	0:05:00	SPIRE-FM-MCU-OFF-P
	31	SCU switch OFF PRIME	0:05:00	SPIRE-FM-SCU-OFF-P
	32	DRCU power OFF PRIME	0:05:00	SPIRE-FM-DRCU-OFF-P
	33	DPU power OFF PRIME	0:05:00	SPIRE-FM-DPU-OFF-P

For reaction wheel configuration, see section 4.7.3.4.

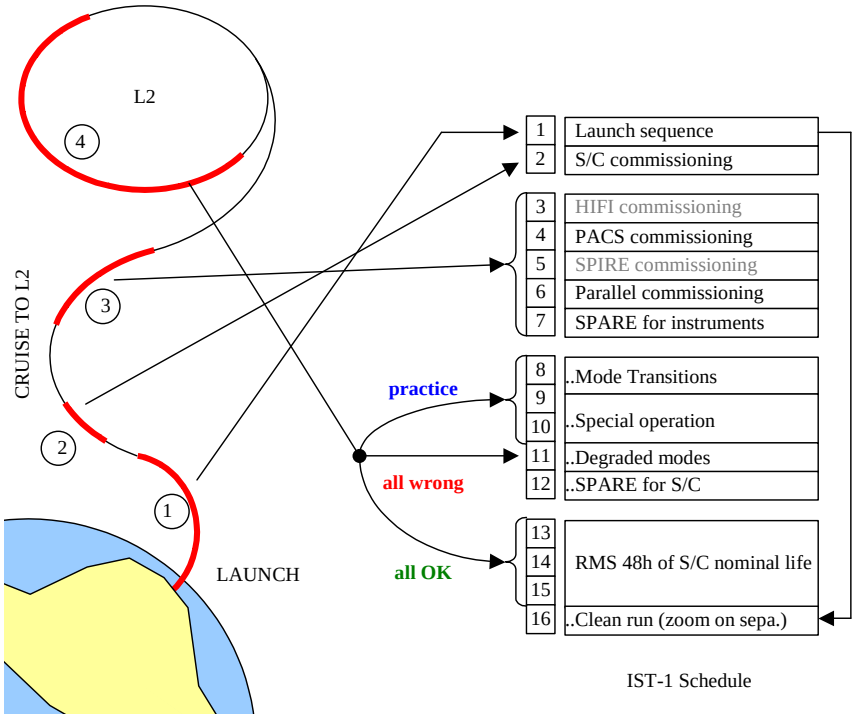
4.7 IST (Integrated System Test)

4.7.1 S/C IST overall description

Integrated System test is a satellite level verification, aimed to verify in an accelerated manner the main satellite functions that will be used during launch, commissioning, and operation. The IST shall be performed 2 times: before (IST1) and after (IST2) the satellite environment tests.
A short summary of the IST is given here for information. For more details, refer to
AD-2_1 – Herschel IST test specification - H-P-2-ASP-SP-0939_5.0.



The complete IST sequence is summarized on the following figure:



IST-1 Schedule

The use of instrument during IST is described in next section 4.7.6. An overview & summary table of the IST, give instrument usage and time scales., can be found in AD-2_1, section 5.1.2.

During S/C IST, Instruments will be mainly involved in the Instruments commissioning phase, and in the Reference Mission scenario
(described in AD 1_4 & AD 2_1).

Special Performance Test (SPT) shall be executed after the IST commissioning, for each instrument.
The reference mission scenario shall take place only after the full functional test of the instruments (ie after commissioning AND SPT).

Commissioning phase objective is to verify the S/C ability to support the instrument commissioning and performance verification operations.
So instruments have to prepare typical sequences that will be used during this phase, compacted to fit in the 8h allocated per instrument.
Commissioning phase sequence can be build with standard test scripts to generate the TC's (no MTL).

The **Special Performance Test** (SPT) includes any verification of the instrument functionalities, that do not fit in the Commissioning or RMS, either because of the limited time slot, or because it would not fit with the test objectives.
3 days (including 2 instruments shifts + 1 cryo-Operation shift/ day) are allocated for each instruments for SPT.

The objective of the **Reference Mission Scenario** is to test the satellite during its nominal long term operation, especially comprising the scientific instruments operations.

It is organised around the Reference Mission Scenario (AD14) which defines the activities to be carried out during a typical operational day, defined and prepared between ESOC and instruments.
It will be a 48h continuous operation, controlled by mission timeline (MTL=time tagged sequences). Each instrument will be allocated 14h simulated observation, separated by Slots of 3h DTCP simulation (Daily Tele-Communication Phase, including coolers recycling)). Inside this phase, instruments are free to prepare sequence using various observation modes.
The satellite shall be tilted 20°, to allow cooler recycling without moving during the test.
The instruments test scripts to switch on Instruments to be ready to start the MTL are defined in section 2.2: Scripts for S/C IST.

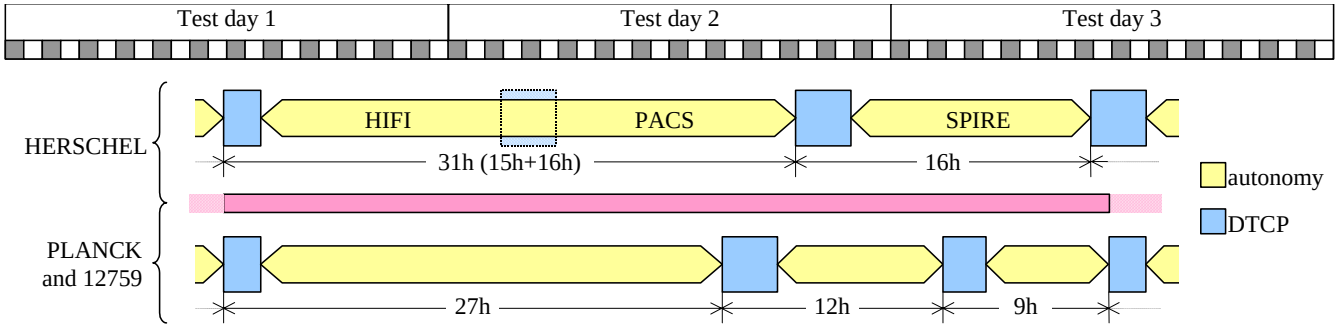
The sequence is the following.

For FM:

- PACS Prime / Burst Mode (30mn)
- DTCP1: Switch PACS to HIFI (3h)
- HIFI Prime (14h)
- DTCP2 : Switch HIFI to PACS + PACS cooler recycle (part of MTL) (3h)
- PACS Prime (14h)
- DTCP3 : Switch PACS to SPIRE + SPIRE cooler recycle (part of MTL) (3h)
- SPIRE Prime Photometre (14h)
- DTCP4 : Switch SPIRE to PACS (3h)

Note: Peak up test has been moved from RMS to commissioning

The detailed sequence of RMS is given in table of next section 4.7.6, and section 5.8.9.3 of AD 21.



For Commissioning, RMS, and SPT phases, instrument shall provide dedicated test procedures and test scripts.
For the RMS, the test sequence shall be time tagged, ie shall be given in AOT (Astronomical Observation Templates). The translation from AOT to MTL shall be performed by MOC/ESOC.

The test sequences to be performed on instruments during the IST are defined in the next sections.
During all SPT and RMS, when one instrument is prime, the other are in Standby mode (and not OFF)
During commissioning, when one instrument is tested, the other instruments shall be off.

4.7.2 PACS IST

The procedure to be used for PACS IST is the following:
AD8_1 – PACS-ME-TP-021_2.5 - PACS IST test procedures (incl. Commissioning, RMS and SPT, and TV)
(This has to be combined with the Commissioning requirements from AD-2_1 – H-P-2-ASP-SP-0939_5.0 - Herschel IST test specification)

This procedure includes the 3 sub-sequences: Commissioning, RMS, and SPT (+ TV & instrument states during EMC tests

PACS IST Sequence:

4.7.2.1 PACS Commissioning:

PACS Commissioning			12:22:48	PACS-ME-TP-021_2_5 - PACS Integrated System Test Procedures	11.1 11.4
PACS FDIR Verification			0:30:00		11.1
		PACS Switch on	0:06:00		11.1.2
		Request Autonomous SAFE Transition	0:06:00		11.1.3
		Request Autonomous OFF Mode Transition (OOL)	0:06:00		11.1.4
		PACS Switch on	0:06:00		11.1.5
		Request Autonomous OFF Mode Transition (HK loss)	0:06:00		11.1.6
1: PACS Full Functional Test (FFT) at Hell conditions			11:52:48		11.4
		Switch-on (OFF – SAFE Transition)	0:06:00		11.4.2
		PACS Setup of Spectroscopy with CSs off and Open Grating Laun	0:18:00		11.4.3
		Grating Test	0:12:00		11.4.4
		Thermal Behaviour Test in Spectroscopy	2:18:00		11.4.5
		Setup Spectroscopy, FW SPEC, data rates and background adju	2:00:00		11.4.6
		Ge:Ga Heater Test	0:18:00		11.4.7
		Ge:Ga Flasher Test	0:15:00		11.4.8
		Chopper Full FOV Scan in Spectroscopy	0:30:00		11.4.9
		Medium sampling grating scan (2 filters)	0:54:00		11.4.10
		Reconfiguration and Optional Switch-off/on Cycle	0:12:00		11.4.11
		Cooler recycling	2:24:00		11.4.12
		Thermal Behaviour Test in Photometry	1:36:00		11.4.13
		PACS Setup of Photometry, Filterwheel Photometry and Data Rate	0:36:00		11.4.14
		Bolometers saturation check	0:06:00		11.4.15
		Enter Safe Mode	0:01:48		11.4.16
		Switchoff	0:06:00		11.4.17

Note that PACS commissioning includes the cooler recycling, and therefore shall be executed with 20° tilt

4.7.2.2 PACS RMS

The RMS overall sequence is typically as follows:

PACS Reference Mission Scenario			16:13:00	PACS-ME-TP-021_2_5 - PACS Integrated System Test Procedures + MOC/ESOC MTL	11.5
		HIFI Switch ON + Standby	0:00:00		
		PACS Switch ON + Standby	0:10:00		
		SPIRE Switch On + Standby	0:00:00		
		OD79 (PACS Burst Mode (30mn)	0:30:00		
		DTCP	0:00:00		
		OD 80 (HIFI)	0:00:00		
		DTCP	0:00:00		
		OD 81 (PACS)	15:23:00	Only PACS time counted here	
		DTCP	0:00:00		
		OD82 - SPIRE Photometer reference mission scenario	0:00:00		
		DTCP	0:00:00		
		Dummy OD 83	0:00:00		
		HIFI Standby + Switch Off	0:00:00		
		PACS Standby + Switch Off	0:10:00		
		SPIRE Standby + Switch Off	0:00:00		

The PACS RMS detailed sequence to be run for IST shall be prepared by ESOC based on PACS AOT's, and is included in the OD 81 of the FM MTL
For information, the sequence is described below:

OD = 81 15:23

ID	Start time	Slew	Sec	Title	Mode	Time	duration	time end
484	2008-05-19T04:41:00Z	0	8530	eng_14	PacsEng_BOLO_cool_recycl	19/5/08 4:41	2:22:10	2:22:10
489	2008-05-19T07:03:10Z	0	1969	eng_19	PacsEng_PHOT_orbit_prolo	19/5/08 7:03	0:37:34	2:59:44
443	2008-05-19T07:40:44Z	285	853	PPhoto-RMS-04	PacsPhoto	19/5/08 7:40	0:16:10	3:15:54
440	2008-05-19T07:56:54Z	117	159	PPhoto-RMS-01	PacsPhoto	19/5/08 7:56	0:04:33	3:20:27
445	2008-05-19T08:01:27Z	114	2174	PPhoto-RMS-06	PacsPhoto	19/5/08 8:01	0:38:03	3:58:30
465	2008-05-19T08:39:30Z	109	702	PPhoto-RMS-07_copy_1	PacsPhoto	19/5/08 8:39	0:12:49	4:11:19
462	2008-05-19T08:52:19Z	67	702	PPhoto-RMS-07	PacsPhoto	19/5/08 8:52	0:13:40	4:24:59
464	2008-05-19T09:05:59Z	118	159	PPhoto-RMS-01 _copy_2	PacsPhoto	19/5/08 9:05	0:05:07	4:30:06
463	2008-05-19T09:11:06Z	148	159	PPhoto-RMS-01_copy_1	PacsPhoto	19/5/08 9:11	0:04:49	4:34:55
442	2008-05-19T09:15:55Z	130	2708	PPhoto-RMS-03	PacsPhoto	19/5/08 9:15	0:48:08	5:23:03
441	2008-05-19T10:04:03Z	180	636	PPhoto-RMS-02	PacsPhoto	19/5/08 10:04	0:12:39	5:35:42
444	2008-05-19T10:16:42Z	123	2174	PPhoto-RMS-05	PacsPhoto	19/5/08 10:16	0:36:14	6:11:56
486	2008-05-19T10:52:56Z	0	13	eng_16	PacsEng_orbit_epilogue	19/5/08 10:52	0:00:13	6:12:09
488	2008-05-19T10:53:09Z	0	2097	eng_18	PacsEng_SPEC_orbit_prolo	19/5/08 10:53	0:38:13	6:50:22
461	2008-05-19T11:31:22Z	196	486	PSpecL-RMS-09	PacsLineSpec	19/5/08 11:31	0:10:31	7:00:53
451	2008-05-19T11:41:53Z	145	1392	PSpecL-RMS-06	PacsLineSpec	19/5/08 11:41	0:25:02	7:25:55
446	2008-05-19T12:06:55Z	110	283	PSpecL-RMS-01	PacsLineSpec	19/5/08 12:06	0:07:09	7:33:04
447	2008-05-19T12:14:04Z	146	2640	PSpecL-RMS-02	PacsLineSpec	19/5/08 12:14	0:47:17	8:20:21
467	2008-05-19T13:01:21Z	197	486	PSpecL-RMS-09_copy_2	PacsLineSpec	19/5/08 13:01	0:10:09	8:30:30
466	2008-05-19T13:11:30Z	123	486	PSpecL-RMS-09_copy_1	PacsLineSpec	19/5/08 13:11	0:09:41	8:40:11
450	2008-05-19T13:21:11Z	95	2340	PSpecL-RMS-05	PacsLineSpec	19/5/08 13:21	0:41:36	9:21:47
453	2008-05-19T14:02:47Z	156	900	PSpecL-RMS-08	PacsLineSpec	19/5/08 14:02	0:17:25	9:39:12
452	2008-05-19T14:20:12Z	145	4184	PSpecL-RMS-07	PacsLineSpec	19/5/08 14:20	1:11:34	10:50:46
449	2008-05-19T15:31:46Z	110	2340	PSpecL-RMS-04	PacsLineSpec	19/5/08 15:31	0:41:26	11:32:12
470	2008-05-19T16:13:12Z	146	1692	PSpecL-RMS-03_copy_1	PacsLineSpec	19/5/08 16:13	0:30:48	12:03:00
448	2008-05-19T16:44:00Z	156	1692	PSpecL-RMS-03	PacsLineSpec	19/5/08 16:44	0:28:12	12:31:12
485	2008-05-19T17:12:12Z	0	1408	eng_15	PacsEng_SPEC_curing	19/5/08 17:12	0:25:28	12:56:40
454	2008-05-19T17:37:40Z	120	93	PSpecR-RMS-01	PacsRangeSpec	19/5/08 17:37	0:04:42	13:01:22
455	2008-05-19T17:42:22Z	189	4331	PSpecR-RMS-02	PacsRangeSpec	19/5/08 17:42	1:14:05	14:15:27
468	2008-05-19T18:56:27Z	114	324	PSpecR-RMS-06_copy_1	PacsRangeSpec	19/5/08 18:56	0:07:49	14:23:16
469	2008-05-19T19:04:16Z	145	93	PSpecR-RMS-07_copy_1	PacsRangeSpec	19/5/08 19:04	0:03:48	14:27:04
456	2008-05-19T19:08:04Z	135	655	PSpecR-RMS-03	PacsRangeSpec	19/5/08 19:08	0:13:22	14:40:26
457	2008-05-19T19:21:26Z	147	321	PSpecR-RMS-04	PacsRangeSpec	19/5/08 19:21	0:07:15	14:47:41
460	2008-05-19T19:28:41Z	114	93	PSpecR-RMS-07	PacsRangeSpec	19/5/08 19:28	0:03:22	14:51:03
458	2008-05-19T19:32:03Z	109	868	PSpecR-RMS-05	PacsRangeSpec	19/5/08 19:32	0:16:59	15:08:02
459	2008-05-19T19:49:02Z	151	324	PSpecR-RMS-06	PacsRangeSpec	19/5/08 19:49	0:05:24	15:13:26
487	2008-05-19T19:54:26Z	0	13	eng_17	PacsEng_orbit_epilogue	19/5/08 19:54	0:09:34	15:23:00
SLEW	2008-05-19T20:04:00Z	313	0			19/5/08 20:04		

4.7.2.3 PACS SPT

The test sequence for PACS SPTshall be as described in the following table.
Note that the PACS RS susceptibility to H field has been included here.
It requires a dedicated EGSE to simulate the Solar array switching provided by PACS.

PACS Special Performance Test			**35:58:42**	PACS-ME-TP-021_2_0 - PACS Integrated System Test Procedures	11.6..11.9
	Short Performance Test at HeII, SPEC		**6:10:48**		11.6.1
		Switchon (OFF to SAFE Transition)	0:06:00		11.6.2
		Ge:Ga dark currents on internal Calibration sources	0:30:00		11.6.3
		Grating performance test	0:33:00		11.6.4
		Chopper performance test Spectroscopy	0:15:00		11.6.5
		Emissivity of internal Calibration Sources	2:00:00		11.6.6
		Quick Wavelength check	0:18:00		11.6.7
		S/N as function of reset interval	0:15:00		11.6.8
		Different bias settings for Ge:Ga detectors	0:18:00		11.6.9
		Time constants for flux changes spectroscopy	0:42:00		11.6.10
		Internal Calibration sources performance test	1:12:00		11.6.11
		Switch Off or Safe	0:01:48		11.6.12
	Short Performance Test at HeII, PHOT		**6:42:00**		11.6.13
		Switch On (Optional)	0:00:00		11.6.14
		Cooler recycling	2:24:00		11.6.15
		SetupPhotometry	0:36:00		11.6.16
		Test of internal calibration recipes Photometry	0:36:00		11.6.17
		Focal plane map with Calibration Sources and representative background	0:30:00		11.6.18
		Staring measurement on CS for low frequency noise	2:12:00		11.6.19
		Time constants for flux changes photometry	0:18:00		11.6.20
		Test pattern photometry	0:06:00		11.6.23
	Red Bolometer Tuning		**8:01:48**		11.7
		Red Bolometer Direct Mode	1:30:00		11.7.1
		Red Bolometer DDCS Mode	1:30:00		11.7.2
		Red Bolometer Alternate Polarization Direct Mode	2:30:00		11.7.3
		Red Bolometer Alternate Polarization DDCS Mode	2:30:00		11.7.4
		Switch Off or Safe	0:01:48		
	AOT Tests (Astronomical Observation template)		**4:19:48**		11.8
		Switchon (Nominal)	0:00:00		11.8.2
		Cooler recycling	0:00:00		11.8.3
		SetupPhotometry	0:36:00		11.8.4
		Tutti Frutti AOT test PHOT	0:30:00		11.8.5
		PHOT AOT concepts	0:42:00		11.8.6
		Enter SAFE mode	0:01:48		11.8.7
		satellite shall be tilted to 90° here			
		SetupSpectroscopy	0:36:00		11.8.8
		Tutti Frutti AOT test SPEC	0:48:00		11.8.9
		SPEC AOT concepts	0:30:00		11.8.10
		Ge:Ga detector curing procedure	0:30:00		11.8.11
		Switch off	0:06:00		11.8.12
	Test of redundant PACS instrument		**4:37:48**		11.9
		Switchon (redundant)	0:06:00		11.9.2
		Cooler recycling	2:24:00		11.9.3
		Setup Photometry	0:36:00		11.9.4
		Two/Three position chopping with/without internal Calibration Block	0:24:00		11.9.5
		satellite shall be tilted to 90° here			
		Setup Spectroscopy	0:12:00		11.9.6
		Chopper Performance Test Spectroscopy	0:18:00		11.9.7
		Chopper-Detector Synchronization Test	0:30:00		11.9.8
		Safe Mode	0:01:48		11.9.9
		Close the Grating Launch Lock (Optional)	0:00:00		11.9.10
		Switch Off	0:06:00		11.9.11
	PACS RS test (susceptibility to H field)		**6:06:30**	PACS-ME-TP-032_1.5 - EMC Test Procedure on Integrated System Level	
		PACS Most Sensitive Mode Spectroscopy			12.8
		PACS Most Sensitive Mode Photometry			12.9

4.7.3 SPIRE IST

4.7.3.1 SPIRE Commissioning

For FM SPIRE commissioning, the SPIRE Cold Functional test + Peak up test shall be run.
The applicable test procedure shall be the following:

AD-8-2 - SPIRE-RAL-PRC-002398_2.2 – SPIRE Cold Functional Test Procedures (to be updated)
+ AD-8_5 - SPIRE-RAL-NOT-xxxx_1.0 - SPIRE Peak-up Mode Test Procedure (TBW)
+ AD-8_6 - SPIRE-RAL-NOT-xxxx_1.0 - SPIRE SMEC Cold functional test (incl Microvibration (TBW)

The test sequence for SPIRE commissioning shall be the following:

SPIRE Commissioning			**5:30:00**	SPIRE-RAL-PRC-002398_2.2 - SPIRE_CFT_Procedures	
SPIRE PRIME CFT (Hel, He II)			**2:40:00**	SPIRE-RAL-PRC-002398_2.2 - SPIRE_CFT_Procedures	
	1	DPU PRIME Power up and OBS start	0:05:00	SPIRE-FM-DPU-ON-P	4.1.1
	2	DRCU PRIME Power up	0:05:00	SPIRE-FM-DRCU-ON-P	4.1.2
	3	SCU Nom. Science Contents check PRIME	0:05:00	SPIRE-FM-FUNC-SCU-02-P	4.1.3
	4	SCU DC Thermometry check PRIME	0:05:00	SPIRE-FM-FUNC-SCU-03-P	4.1.4
	5	SCU AC Thermometry check PRIME	0:05:00	SPIRE-FM-FUNC-SCU-06-P	4.1.5
	6	Sorption Cooler Heaters Check PRIME	0:05:00	SPIRE-FM-FUNC-SCU-07-P	4.1.6
	7	PCAL Characterisation Test PRIME	0:05:00	SPIRE-FM-FUNC-PCAL-01-P	4.1.7
	8	SCAL Characterisation Test PRIME	0:05:00	SPIRE-FM-FUNC-SCAL-01-P	4.1.8
	9	SCAL PID Check PRIME (TBC)	0:05:00	SPIRE-FM-FUNC-SCAL-02-P (TBC)	4.1.9
	10	MCU Boot Check PRIME	0:05:00	SPIRE-FM-FUNC-MCU-01-P	4.1.10
	11	MCU Nom. Science Contents Check PRIME	0:05:00	SPIRE-FM-FUNC-MCU-03-P	4.1.11
	12	BSM Chop/Jiggle Sensors check PRIME	0:05:00	SPIRE-FM-FUNC-BSM-01-P	4.1.12
	13	BSM Open Loop Dynamics Check PRIME	0:05:00	SPIRE-FM-FUNC-BSM-03-P	4.1.13
	14	BSM Open Loop Chop Test PRIME	0:05:00	SPIRE-FM-FUNC-BSM-05A-P	4.1.14
	15	BSM Close Loop Chop Test PRIME	0:05:00	SPIRE-FM-FUNC-BSM-05B-P	4.1.15
	16	BSM switch OFF	0:05:00	SPIRE-FM-BSM-OFF-P	4.1.16
	17	SMEC Encoder Levels Check PRIME	0:05:00	SPIRE-FM-FUNC-SMEC-03-P	4.1.17
		unlatch SMEC ?	0:00:00		
	18	SMEC Encoder and LVDT check PRIME	0:00:00	SPIRE-FM-FUNC-SMEC-01-P	4.1.18
	19	SMEC Open Loop Position check PRIME	0:00:00	SPIRE-FM-FUNC-SMEC-04A-P	4.1.19
	20	SMEC Open Loop Scan check PRIME	0:00:00	SPIRE-FM-FUNC-SMEC-09-P	4.1.20
	21	SMEC Close Loop Position check PRIME	0:00:00	SPIRE-FM-FUNC-SMEC-04B-P	4.1.21
	22	SMEC Close Loop Scan check PRIME	0:00:00	SPIRE-FM-FUNC-SMEC-07-P	4.1.22
	23	SMEC switch OFF	0:00:00	SPIRE-FM-SMEC-OFF-P	4.1.23
		re-latch SMEC ?	0:00:00		
	24	DCU Nominal Sci. Contents Check PRIME	0:05:00	SPIRE-FM-FUNC-DCU-02-P	4.1.24
		Photometer LLIA Check Prime	0:05:00	SPIRE-FM-FUNC-DCU-04-PHOT-P	4.1.25
	25	Phot. BDAs Switch ON Check PRIME	0:05:00	SPIRE-FM-FUNC-DCU-11-PHOT-P	4.1.26
	26	Phot. BDAs Integrity Check PRIME	0:05:00	SPIRE-FM-FUNC-DCU-13-PHOT-P	4.1.27
	27	Phot. BDAs Noise Check PRIME	0:05:00	SPIRE-FM-FUNC-DCU-14-PHOT-P	4.1.28
		Phot. BDAs Switch Off PRIME	0:05:00	SPIRE-FM-PDET-OFF-P	4.1.29
		Spectrometer LLIA Check PRIME	0:05:00	SPIRE-FM-FUNC-DCU-04-SPEC-P	4.1.30
	28	Spec. BDAs Switch ON Check PRIME	0:05:00	SPIRE-FM-FUNC-DCU-11-SPEC-P	4.1.31
	27	Spec. BDAs Integrity Check PRIME	0:05:00	SPIRE-FM-FUNC-DCU-13-SPEC-P	4.1.32
	28	Spec. BDAs Noise Check PRIME	0:05:00	SPIRE-FM-FUNC-DCU-14-SPEC-P	4.1.33
	29	Spec. BDAs switch OFF	0:05:00	SPIRE-FM-SDET-OFF-P	4.1.34
	30	MCU switch OFF PRIME	0:05:00	SPIRE-FM-MCU-OFF-P	4.1.35
	31	SCU switch OFF PRIME	0:05:00	SPIRE-FM-SCU-OFF-P	4.1.36
	32	DRCU power OFF PRIME	0:05:00	SPIRE-FM-DRCU-OFF-P	4.1.37
	33	DPU power OFF PRIME	0:05:00	SPIRE-FM-DPU-OFF-P	4.1.38

SPIRE REDUNDANT CFT (HeI, He II)			**2:50:00**	SPIRE-RAL-PRC-002398_2.2 - SPIRE_CFT_Procedures	
	34	Change to SPIRE Redundant MIB on the CCS (If required)	0:05:00		
	35	Configure 1553 Spacecraft bus from SPIRE DPU PRIME to SPIRE DPU REDUNDANT.	0:05:00		
	36	DPU REDUN. Power up and OBS start	0:05:00	SPIRE-FM-DPU-ON-R	4.2.1
	37	DRCU REDUN. Power up	0:05:00	SPIRE-FM-DRCU-ON-R	4.2.2
	38	SCU Nom. Science Contents check REDUN.	0:05:00	SPIRE-FM-FUNC-SCU-02-R	4.2.3
	39	SCU DC Thermometry check REDUN.	0:05:00	SPIRE-FM-FUNC-SCU-03-R	4.2.4
	40	SCU AC Thermometry check REDUN.	0:05:00	SPIRE-FM-FUNC-SCU-06-R	4.2.5
	41	Sorption Cooler Heaters Check REDUN.	0:05:00	SPIRE-FM-FUNC-SCU-07-R	4.2.6
	42	PCAL Characterisation Test REDUN.	0:05:00	SPIRE-FM-FUNC-PCAL-01-R	4.2.7
	43	SCAL Characterisation Test REDUN.	0:05:00	SPIRE-FM-FUNC-SCAL-01-R	4.2.8
	44	SCAL PID Check REDUN. (TBC)	0:05:00	SPIRE-FM-FUNC-SCAL-02-R	4.2.9
	45	MCU Boot Check REDUN.	0:05:00	SPIRE-FM-FUNC-MCU-01-R	4.2.10
	46	MCU Nom. Science Contents Check REDUN.	0:05:00	SPIRE-FM-FUNC-MCU-03-R	4.2.11
	47	BSM Chop/Jiggle Sensors check REDUN.	0:05:00	SPIRE-FM-FUNC-BSM-01-R	4.2.12
	48	BSM Open Loop Dynamics Check REDUN.	0:05:00	SPIRE-FM-FUNC-BSM-03-R	4.2.13
	49	BSM Open Loop Chop Test REDUN.	0:05:00	SPIRE-FM-FUNC-BSM-05A-R	4.2.14
	50	BSM Close Loop Chop Test REDUN.	0:05:00	SPIRE-FM-FUNC-BSM-05B-R	4.2.15
	51	BSM switch OFF	0:05:00	SPIRE-FM-BSM-OFF-R	4.2.16
	52	SMEC Encoder Levels Check REDUN.	0:05:00	SPIRE-FM-FUNC-SMEC-03-R	4.2.17
		unlatch SMEC ?	0:00:00		
	53	SMEC Encoder and LVDT check REDUN.	0:00:00	SPIRE-FM-FUNC-SMEC-01-R	4.2.18
	54	SMEC Open Loop Position check REDUN.	0:00:00	SPIRE-FM-FUNC-SMEC-04A-R	4.2.19
	55	SMEC Open Loop Scan check REDUN.	0:00:00	SPIRE-FM-FUNC-SMEC-09-R	4.2.20
	56	SMEC Close Loop Position check REDUN.	0:00:00	SPIRE-FM-FUNC-SMEC-04B-R	4.2.21
	57	SMEC Close Loop Scan check REDUN.	0:00:00	SPIRE-FM-FUNC-SMEC-07-R	4.2.22
	58	SMEC switch OFF	0:00:00	SPIRE-FM-SMEC-OFF-R	4.2.23
		re-latch SMEC ?	0:00:00		
	59	DCU Nominal Sci. Contents Check REDUN.	0:05:00	SPIRE-FM-FUNC-DCU-02-R	4.2.24
		Photometer LLIA Check Redundant	0:05:00	SPIRE-FM-FUNC-DCU-04-PHOT-R	4.2.25
	60	Phot. BDAs Switch ON Check REDUN.	0:05:00	SPIRE-FM-FUNC-DCU-11-PHOT-R	4.2.26
	61	Phot. BDAs Integrity Check REDUN.	0:05:00	SPIRE-FM-FUNC-DCU-13-PHOT-R	4.2.27
	62	Phot. BDAs Noise Check REDUN.	0:05:00	SPIRE-FM-FUNC-DCU-14-PHOT-R	4.2.28
		Phot. BDAs Switch Off Redundant	0:05:00	SPIRE-FM-RDET-OFF-R	4.2.29
		Spectrometer LLIA Check Redundant	0:05:00	SPIRE-FM-FUNC-DCU-04-SPEC-R	4.2.30
	63	Spec. BDAs Integrity Check REDUN.	0:05:00	SPIRE-FM-FUNC-DCU-11-SPEC-R	4.2.31
	64	Spec. BDAs Integrity Check REDUN.	0:05:00	SPIRE-FM-FUNC-DCU-13-SPEC-R	4.2.32
	65	Spec. BDAs Noise Check REDUN.	0:05:00	SPIRE-FM-FUNC-DCU-14-SPEC-R	4.2.33
	66	Spec. BDAs switch OFF	0:05:00	SPIRE-FM-SDET-OFF-R	4.2.34
	67	MCU switch OFF REDUN.	0:05:00	SPIRE-FM-MCU-OFF-R	4.2.35
	68	SCU switch OFF REDUN.	0:05:00	SPIRE-FM-SCU-OFF-R	4.2.36
	69	DRCU power OFF REDUN.	0:05:00	SPIRE-FM-DRCU-OFF-R	4.2.37
	70	DPU power OFF REDUN.	0:05:00	SPIRE-FM-DPU-OFF-R	4.2.38
SPIRE Peak up test			**TBD**		

4.7.3.2 SPIRE RMS

The SPIRE Reference Mission Scenario overall sequence is typically as follows:

SPIRE Reference Mission Scenario (RMS)			**15:43:00**	MTL from ESOC
	HIFI Switch ON + Standby		0:00:00	only spire relevant included here
	PACS Switch ON + Standby		0:00:00	
	SPIRE Switch On + Standby		0:10:00	
	OD79 (PACS Burst Mode (30mn)		0:00:00	
	DTCP		0:00:00	
	OD 80 (HIFI)		0:00:00	
	DTCP		0:00:00	
	OD 81 (PACS)		0:00:00	
	DTCP		0:00:00	
	OD82 - SPIRE Photometer reference mission scenario		**15:23:00**	
	Dummy OD 83		0:00:00	
	HIFI Standby + Switch Off		0:00:00	
	PACS Standby + Switch Off		0:00:00	
	SPIRE Standby + Switch Off		0:10:00	

from this SPIRE (OD 82) is built by ESOC/MOC based on SPIRE AOT's input.
It is given here for information:

OD = 82 **15:23**

ID	Start time	Slew	Sec	Title	Mode	Time	duration	time end
490	2008-05-19T20:41:00Z	0	8406	eng_20	SpireEngCoolerRecycle	19/5/08 20:41	3:53:00	3:53:00
491	2008-05-20T00:34:00Z	0	70	eng_21	SpireEngREDYtoPHOT_STBY	20/5/08 0:34	0:05:38	3:58:38
421	2008-05-20T00:39:38Z	268	6147	SPhoto-0001	SpirePhotoLargeScan	20/5/08 0:39	1:44:29	5:43:07
433	2008-05-20T02:24:07Z	122	3484	SPhoto-0002_copy_1	SpirePhotoLargeScan	20/5/08 2:24	0:58:54	6:42:01
430	2008-05-20T03:23:01Z	50	399	SPhoto-0007_copy_3	SpirePhotoPointJiggle	20/5/08 3:23	0:08:28	6:50:29
425	2008-05-20T03:31:29Z	109	1419	SPhoto-0005	SpirePhotoPointJiggle	20/5/08 3:31	0:25:55	7:16:24
427	2008-05-20T03:57:24Z	136	399	SPhoto-0007	SpirePhotoPointJiggle	20/5/08 3:57	0:09:01	7:25:25
423	2008-05-20T04:06:25Z	142	3643	SPhoto-0003	SpirePhotoSmall	20/5/08 4:06	1:02:32	8:27:57
426	2008-05-20T05:08:57Z	109	739	SPhoto-0006	SpirePhotoPointJiggle	20/5/08 5:08	0:14:34	8:42:31
422	2008-05-20T05:23:31Z	135	3484	SPhoto-0002	SpirePhotoLargeScan	20/5/08 5:23	1:00:46	9:43:17
435	2008-05-20T06:24:17Z	162	739	SPhoto-0006_copy_2	SpirePhotoPointJiggle	20/5/08 6:24	0:14:22	9:57:39
436	2008-05-20T06:38:39Z	123	3484	SPhoto-0002_copy_2	SpirePhotoLargeScan	20/5/08 6:38	1:00:18	10:57:57
434	2008-05-20T07:38:57Z	134	1851	SPhoto-0004_copy_2	SpirePhotoSmall	20/5/08 7:38	0:31:54	11:29:51
424	2008-05-20T08:10:51Z	63	1851	SPhoto-0004	SpirePhotoSmall	20/5/08 8:10	0:31:56	12:01:47
431	2008-05-20T08:42:47Z	65	1851	SPhoto-0004_copy_1	SpirePhotoSmall	20/5/08 8:42	0:33:35	12:35:22
429	2008-05-20T09:16:22Z	164	399	SPhoto-0007_copy_2	SpirePhotoPointJiggle	20/5/08 9:16	0:09:05	12:44:27
428	2008-05-20T09:25:27Z	146	260	SPhoto-0007_copy_1	SpirePhotoLargeScan	20/5/08 9:25	0:06:09	12:50:36
420	2008-05-20T09:31:36Z	109	7039	SPhoto-0000	SpirePhotoLargeScan	20/5/08 9:31	1:59:45	14:50:21
432	2008-05-20T11:31:21Z	146	739	SPhoto-0006_copy_1	SpirePhotoPointJiggle	20/5/08 11:31	0:12:19	15:02:40
492	2008-05-20T11:43:40Z	0	38	eng_22	SpireEngPHOT_STBYtoREDY	20/5/08 11:43	0:20:20	15:23:00
SLEW	2008-05-20T12:04:00Z	260	0			20/5/08 12:04		

4.7.3.3 SPIRE SPT

SPIRE SPT procedure is the following (for SPIRE FM Only):
AD-8-3 - SPIRE-RAL-PRC-002704_2.4 - SPIRE Special Performance Test Procedures

The SPIRE test sequence during the SPT shall be:

SPIRE Special Performance Test (SPT/IMT) during IST1 (3 days) + EMC CS				69:15:00	SPIRE-RAL-PRC-002704_2.4 - SPIRE_SPT_Procedures	section
SPIRE SPT Day 1				24:00:00		
			SVM and SPIRE Switch ON	1:00:00		
D1		1	Cooler recycle (manual)	2:00:00	Procedure: Cooler recycle (manual)	2.2
D1		2	Switch to PHOT STBY	0:15:00		
D1		3	Wait for stabilisation	0:00:00		
D1		4	BSM Control Loop Setting	1:00:00	Procedure: BSM Control Loop Setting	2.1
D1		5	Photometer bias phase optimisation	2:00:00	Procedure: Photometer bias phase optimisation	2.4
D1			**SHIFT 1 CONTINGENCY**	1:00:00		
D1		6	Photometer noise stability versus bias frequency	2:00:00	Procedure: Photometer noise stability versus bias frequency	2.6
D1		7	Photometer bias noise optimisation	2:00:00	Procedure: Photometer bias noise optimisation	2.5
D1		8	Photometer Ambient Background Verification	1:00:00	Procedure: Photometer Ambient Background Verification	2.8
D1		9	PTC Headroom Characterisation	3:00:00	Procedure: PTC Headroom Characterisation	2.9
D1		10	PCAL Photometer Characterisation	0:30:00	Procedure: PCAL Photometer Characterisation	2.11
D1			**SHIFT 2 CONTINGENCY**	1:00:00		
D1		11	**Overnight EMC CS test (frequency search)**	8:15:00		
SPIRE SPT Day 2				22:00:00		
D2			Test preparation	0:00:00		
D2		12	PCAL Flash	0:15:00		
D2		13	Photometer thermal stability versus bias amplitude	3:00:00	Procedure: Photometer thermal stability versus bias amplitude	2.7
D2		14	Change lid temperature	2:00:00		
D2		15	Photometer Thermal Control Verification	0:00:00	Procedure: Photometer Thermal Control Verification	2.10
D2			**SHIFT 1 CONTINGENCY**	1:00:00		
D2		16	Photometer bias phase optimisation	1:00:00	Procedure: Photometer bias phase optimisation	2.4
D2		17	Photometer Ambient Background Verification	1:00:00	Procedure: Photometer Ambient Background Verification	2.8
D2		18	SPIRE to REDY Mode	0:15:00		
D2		19	Switch to SPEC STBY	0:15:00		
D2		20	Spectrometer bias phase optimisation	1:00:00	Procedure: Spectrometer bias phase optimisation	2.12
D2		21	Spectrometer bias noise optimisation	1:00:00	Procedure: Spectrometer bias noise optimisation	2.13
D2		22	Spectrometer noise stability versus bias frequency	1:00:00	Procedure: Spectrometer noise stability versus bias frequency	2.14
D2		23	Spectrometer Ambient Background Verification	1:00:00	Procedure: Spectrometer Ambient Background Verification	2.15
D2		24	PCAL Spectrometer Characterisation	0:30:00	Procedure: PCAL Spectrometer Characterisation	2.16
D2			**SHIFT 2 CONTINGENCY**	1:00:00		
D2		25	**Overnight Hold on Test Activities**	7:45:00		
SPIRE SPT Day 3				22:15:00		
D3			Test preparation	0:00:00		
D3		26	Switch to REDY	0:15:00		
D3		27	Cooler recycle (automatic)	2:00:00	Procedure: Cooler recycle (automatic)	2.3
D3		28	Wait for stabilisation	1:00:00		
D3		29	Spectrometer bias phase optimisation	1:00:00	Procedure: Spectrometer bias phase optimisation	2.12
D3		30	Spectrometer bias noise optimisation	1:00:00	Procedure: Spectrometer bias noise optimisation	2.13
D3		31	Spectrometer noise stability versus bias frequency	2:00:00	Procedure: Spectrometer noise stability versus bias frequency	2.14
D3			**SHIFT 1 CONTINGENCY**	1:00:00		
D3		32	SCAL Characteristion	2:00:00		
D3		33	Spectometer Detector Microphonics Test	1:30:00	Procedure: Spectometer Detector Microphonics Test	2.21
D3		34	SPIRE to REDY Mode	0:15:00		
D3		35	SPIRE to PHOT STBY Mode	0:15:00		
D3		36	Photometer Detector Microphonics Test	1:30:00	Procedure: Photometer Detector Microphonics Test	2.20
D3			**SHIFT 2 CONTINGENCY**	2:00:00		
D3			**Overnight EMC CS test (susceptibility level at spot**	6:00:00		
D3		37	**Switch SPIRE to OFF**	0:30:00		

4.7.3.4 SPIRE Micro-vibration tests

SPIRE Microvibration test, included in SPT is now split in 2 tests:
Test of the susceptibility of detectors to microvibrations included in above SPT test table: Spectrometer D3-33) and Photometer (D3-36)
Test of the susceptibility of the Spectrometer mechanism (SMEC)), to be executed

The test shall be performed as follow.
1: Set the Satellite in a proper mode to be able to activate the reaction wheels
2: Set SPIRE in the desired observation mode (Spectrometer, Photometer) or SMEC operation
3: Perform frequency sweep on all reaction wheels (Option 1: one wheel after each other, Option 2 all wheels together, TBC)
4: Observe effect on the SPIRE bolometers, and on the SMEC (SPIRE to define criteria)

5: Measure the acceleration level on OBP, and near the reaction wheels
6: Optionally, set a worst combination of the reaction wheel
repeat observations 4 & 5 for each wheel.

Following a recent demand by PACS of similar micro-vibration tests, the microvibration test of SPIRE photometer shall be replaced by PACS/SPIRE parallele mode (ie both PACS & SPIRE switched ON).
This shall require a PACS cooler recycling before this test.
PACS and SPIRE shall propose the relevant common procedure to set up both instruments in the relevant mode for the test.

4.7.4 HIFI IST

4.7.4.1 HIFI Commissioning

The relevant test procedure for HIFI are

AD-8_7 – SRON-G-HIFI-AIV-2007-009_draft 0.2 - HIFI IST commissioning
AD-8_8 - SRON-G-HIFI-AIV -xxxx_1.0 - HIFI Peak-up Mode Test Procedure (TBW)

The sequence for HIFI commissioning shall be the following:

HIFI Commissioning				**6:14:10**	SRON-G-HIFI-AIV-2007-009_draft-0.2 - IST commissioning
	Procedure for HIFI PowerOn FPU cold and LOU warm without a			**0:30:00**	SRON-G-HIFI-PR-2007-017_1.5.3 - HIFI Power on for IST & TV
		Preparation			
		Power on ICU			
		Switch on and verify Focal plane subsystem			
		Power on backends			
		LO switchon and safety tables			
		End of Procedure		0:00:00	
	Performance test			**5:39:10**	SRON-G-HIFI-AIV-2007-009_draft 0.2 - HIFI IST commissioning
			run tcl script	5:39:10.0	
	Peak Up mode test			TBD	TBW
	Procedure for HIFI PowerOff			**0:05:00**	SRON-G-HIFI-PR-2007-017_1.5.3 - HIFI Power on for IST & TV

4.7.4.2 HIFI RMS

The RMS overall sequence for HIFI RMS is typically as follows

HIFI Reference Mission Scenario				**15:03:00**	MTL ready via MOC & ESOC
		HIFI Switch ON + Standby		0:30:00	
		PACS Switch ON + Standby		0:00:00	
		SPIRE Switch On + Standby		0:00:00	
		OD79 (PACS Burst Mode (30mn)		0:00:00	
		DTCP		0:00:00	
		OD 80 (HIFI)		**14:23:00**	
		DTCP		0:00:00	
		OD 81 (PACS)		0:00:00	
		DTCP		0:00:00	
		OD82 - SPIRE Photometer reference mission scenario		0:00:00	
		Dummy OD 83		0:00:00	
		HIFI Standby + Switch Off		0:10:00	
		PACS Standby + Switch Off		0:00:00	
		SPIRE Standby + Switch Off		0:00:00	

The HIFI RMS detailed MTL to be run during the RMS shall be prepared by ESOC/MOC based on HIFI AOT's.
It is described here for information:

OD = 80 **14:23**

ID	Start time	Slew	Sec	Title	Mode	Time	duration	time end
471	2008-05-18T13:41:00Z	0	21	eng_1	HifiEngSetInstrumentStan	18/5/08 13:41	0:00:21	0:00:21
473	2008-05-18T13:41:21Z	0	11	eng_3	HifiEngSetLONominal	18/5/08 13:41	0:00:11	0:00:32
482	2008-05-18T13:41:32Z	0	910	eng-7a_12	HifiEngSwitchonLO	18/5/08 13:41	2:27:15	2:27:47
416	2008-05-18T16:08:47Z	287	2206	PointFSwitch-Band7aWarm-Pos1-RMS	HifiPointModeFSwitch	18/5/08 16:08	0:36:46	3:04:33
477	2008-05-18T16:45:33Z	0	910	eng-2b_7	HifiEngSwitchonLO	18/5/08 16:45	0:17:13	3:21:46
417	2008-05-18T17:02:46Z	123	1446	PointFSwitch-Band2bWarm-Pos1-RMS	HifiPointModeFSwitch	18/5/08 17:02	0:26:09	3:47:55
414	2008-05-18T17:28:55Z	123	82	PointFSwitchNoRef-Band2bWarm-Pos1	HifiPointModeFSwitchNoRe	18/5/08 17:28	0:02:46	3:50:41
404	2008-05-18T17:31:41Z	84	1848	PointFastDBS-Band2bWarm-Pos1-RMS	HifiPointModeFastDBS	18/5/08 17:31	0:30:48	4:21:29
476	2008-05-18T18:02:29Z	0	910	eng-2a_6	HifiEngSwitchonLO	18/5/08 18:02	0:16:38	4:38:07
406	2008-05-18T18:19:07Z	88	643	PointDBS-Band2aWarm-Pos1-RMS	HifiPointModeDBS	18/5/08 18:19	0:10:43	4:48:50
481	2008-05-18T18:29:50Z	0	910	eng-5a_11	HifiEngSwitchonLO	18/5/08 18:29	0:18:01	5:06:51
415	2008-05-18T18:47:51Z	171	1501	PointFSwitchNoRef-Band5aWarm-Pos1	HifiPointModeFSwitchNoRe	18/5/08 18:47	0:25:01	5:31:52
474	2008-05-18T19:12:52Z	0	910	eng-1a_4	HifiEngSwitchonLO	18/5/08 19:12	0:16:38	5:48:30
407	2008-05-18T19:29:30Z	88	1986	PointDBS-Band1aWarm-Pos1-RMS	HifiPointModeDBS	18/5/08 19:29	0:36:12	6:24:42
418	2008-05-18T20:05:42Z	186	1446	PointFSwitch-Band1aWarm-Pos2-RMS	HifiPointModeFSwitch	18/5/08 20:05	0:24:06	6:48:48
478	2008-05-18T20:29:48Z	0	910	eng-3b_8	HifiEngSwitchonLO	18/5/08 20:29	0:16:38	7:05:26
409	2008-05-18T20:46:26Z	88	1988	PointLoadChop-Band3bWarm-Pos2-RM	HifiPointModeLoadChop	18/5/08 20:46	0:34:36	7:40:02
410	2008-05-18T21:21:02Z	88	1963	PointLoadChopNoRef-Band3bWarm-Pc	HifiPointModeLoadChopNoR	18/5/08 21:21	0:32:43	8:12:45
475	2008-05-18T21:53:45Z	0	910	eng-1b_5	HifiEngSwitchonLO	18/5/08 21:53	0:16:34	8:29:19
408	2008-05-18T22:10:19Z	84	1925	PointFastDBS-Band1bWarm-Pos2-RMS	HifiPointModeFastDBS	18/5/08 22:10	0:34:00	9:03:19
419	2008-05-18T22:44:19Z	115	2848	MappingFSwitchOTF-Band1bWarm-Pos	HifiMappingModeFSwitchOT	18/5/08 22:44	0:47:28	9:50:47
479	2008-05-18T23:31:47Z	0	910	eng-4a_9	HifiEngSwitchonLO	18/5/08 23:31	0:16:34	10:07:21
413	2008-05-18T23:48:21Z	84	1530	MappingFastDBSCross-Band4aWarm-F	HifiMappingModeFastDBSCr	18/5/08 23:48	0:26:54	10:34:15
405	2008-05-19T00:15:15Z	84	3316	MappingOTF-Band4aWarm-Pos3-RMS	HifiMappingModeOTF	19/5/08 0:15	0:55:16	11:29:31
480	2008-05-19T01:10:31Z	0	910	eng-4b_10	HifiEngSwitchonLO	19/5/08 1:10	0:16:34	11:46:05
411	2008-05-19T01:27:05Z	84	7360	MappingOTF-Band4bWarm-Pos3-RMS	HifiMappingModeOTF	19/5/08 1:27	2:31:54	14:17:59
472	2008-05-19T03:58:59Z	0	21	eng_2	HifiEngSetInstrumentStan	19/5/08 3:58	0:05:01	14:23:00
SLEW	2008-05-19T04:04:00Z	280	0			19/5/08 4:04		

4.7.4.3 HIFI SPT

The HIFI Special performance test shall be:

HIFI Special Performance Test			**21:25:00**	SRON-G-HIFI-AIV-2007-009_draft-0.2 - IST commissioning
	Procedure for HIFI PowerOn FPU cold and LOU warm without a		**0:30:00**	SRON-G-HIFI-PR-2007-017_1.5.3 - HIFI Power on for IST & TV
		Preparation		
		Power on ICU		
		Switch on and verify Focal plane subsystem		
		Power on backends		
		LO switchon and safety tables		
		End of Procedure	**0:00:00**	
	Special performance test		**20:50:00**	SRON-G-HIFI-AIV-2007-009_draft 0.2 - HIFI IST commissioning
		IF feedback test	3:30:00.0	
		FPU thermal test	7:00:00.0	
		peakup test	2:00:00.0	
		IF stability test	8:20:00.0	
		End of procedure		
	Procedure for HIFI PowerOff		**0:05:00**	SRON-G-HIFI-PR-2007-017_1.5.3 - HIFI Power on for IST & TV

This HIFI SPT shall be further prepared by HIFI (only titles here)

4.7.5 PACS-SPIRE parallel mode during Instruments IST/Commissioning.

Instruments have realized that the SPIRE & PACS parallel mode test is only relevant with an Observation controlled by MTL. As it was not planed to have it during RMS, it has been commonly agreed to move this test from IST/Commissioning to SOVT.
However, one slot remains during TV test to verify the parallel PACS & SPIRE cooler recycling in flight representative conditions.

4.7.6 Additional instruments tests during S/C IST

In addition, during satellite IST, instruments shall be used also during dedicated satellite tests.
Instruments shall be used for 2 main purposes:

1) Generate Science data to test the satellite data handling system: one instrument being in PRIME observation mode, and generating science telemetry, while the other are in Standby (or safe), with only Housekeeping data,
2) To test the mode transition, and the satellite and instrument FDIR.

The following table given here for information is a summary of the IST sequence given in AD21, and indicate in which sequence the instruments will be used, and which type of operation.
Instruments teams have to identify instruments configuration (existing test scripts), or prepare dedicated test sequences (& scripts) to cover these phases. These scripts shall set the instruments to the states compatible with the 2 test objectives described above. They should operate the following transition in a standalone manner (no IEGSE needed): OFF←→Standby ←→Observation.
The relevant test procedures and scripts for S/C IST are the following:.

- PACS: No procedure, test scripts = SAT_IST_Debugging_PACS_20070417.zip
- SPIRE: AD8_4, + test scripts SPIRE-IST-DBG-Scripts-31Jul2007.tar.gz
- HIFI: TBW

These scripts can be used with the FPU connected, in warm or cold conditions.

This table highlights the instrument operations in the different steps of the IST test sequences.
The table refers to AD 2_1: H-P-2-ASP-SP-0939_5

		Test step description (AD-2_1)	action or observed event description >> instrument state (as per "satellite state" table when available in SP-0939)			Comments
			HIFI	**PACS**	**SPIRE**	
5.8.2.	**Launch phase, separation and post separation activities**					SPIRE LPU activated by LCL
		Activity	none	none	none	
		>>	OFF	OFF	OFF	
5.8.3.	**Satellite Commissioning**					
5.8.3.5.	CDMS commissioning	1553 data bus commissioning	The DPU/ICU LCL is turned ON. A BOOT SW TM(5,1) shall be receive. A TC(8,4,112,3,auto) is sent. The ASW boot event, then essential and periodic Hk shall be received. The CDMS bus controller setting is modified for using the bus B. A TC(17,1) is sent on bus B. A TM(17,2) shall be received (on bus B). The DPU/ICU LCL is turned OFF. The operation is repeated for all instrument N and R, one at a time. In practice, the CDMS bus controller setting will be not swapped back to bus A between the instrument accesses, and each activation will begin either on bus A or B at random (and finish on the opposite bus).			First intent was just to turn the DPU ON and send a service 17 TC to check the proper 1553 bus operation. But service 17 is not available from BOOT SW, then it is proposed to try the boot command instead.
5.8.3.7	PCS commissioning					The turn ON is limited to the DPU, and the activation is limited to a SDB (N/R) communication test.
5.8.4.	**Instruments commissioning and performance verification**					
5.8.4.5.	SPIRE commissioning test	Instrument in flight commissioning rehearsal	as per instrument specification	as per instrument specification	as per instrument specification	This document. See section 4.7 (PACS SPIRE parallel mode test moved to SOVT
5.8.4.6.	PACS commissioning test					
5.8.4.7.	HIFI commissioning test					
5.8.5.	**Mode transitions**					
5.8.5.8.	NOM to NOM	Preparation	The instrument is turned ON and sets in STBY by GND TC	The instrument turn ON and set in STBY by GND TC. Then it is configured as PRIME in spectrometer mode, and an observation sequence managed from the MTL is started.	The instrument is turned ON and sets in STBY by GND TC	PACS Spectrometer is chosen in order to get a maximum science packet data flow

		Test step description (AD-2_1)	action or observed event description >> instrument state (as per "satellite state" table when available in SP-0939)			Comments
			HIFI	**PACS**	**SPIRE**	
		>>	STBY	Spectrometer obs (MTL)	STBY	
		NOM to NOM trs.	no effect	no effect	no effect	
		>>	STBY	Spectrometer obs (MTL)	STBY	
5.8.5.9.	NOM to EAM	NOM to EAM trs.	The OBCP to turn the instrument in STBY is run, which shall only re-enforce the instrument state.	The spectrometer observation conducted from MTL is interrupted by the emergency OBCP, and PACS is set in STBY.	The OBCP to turn the instrument in STBY is run, which shall only re-enforce the instrument state.	Maximum science packet data flow is interrupted.
		>>	STBY	STBY	STBY	
5.8.5.10.	EAM to EAM	Preparation	-	-	SPIRE is set-up as PRIME in photometer mode using GND TC (no MTL)	SPIRE test mode may be entered instead of photometer mode if more suitable. But TM(21,x) emission is interesting to check for any action of the CDMS ASW action at TM management table level. Note activating the instrument in EAM is not nominal, but done here to create an observable for checking the expected actions of CDMS ASW.
		>>	STBY	STBY	Photometer mode	
		EAM to EAM trs.	The OBCP to turn the instrument in STBY is run, which shall only re-enforce the instrument state.	The OBCP to turn the instrument in STBY is run, which shall only re-enforce the instrument state.	The instrument operation (photometer mode) is interrupted by the emergency OBCP, and SPIRE is set in STBY.	
		>>	STBY	STBY	STBY	
5.8.5.11.	EAM to NOM	Preparation	-	-	Photometer mode is activated again by GND TC	
		>>	STBY	STBY	Photometer mode	
		EAM to NOM trs.	no effect	no effect	no effect	
		>>	STBY	STBY	Photometer mode	
5.8.5.12.	NOM to SM	Preparation	-	-	An observation sequence from MTL is started.	
		>>	STBY	STBY	Photometer obs (MTL)	

		Test step description (AD-2_1)	action or observed event description >> instrument state (as per "satellite state" table when available in SP-0939)			Comments
			HIFI	**PACS**	**SPIRE**	
		NOM to SM trs.	The emergency OBCP to turn OFF the instrument is run.	The emergency OBCP to turn OFF the instrument is run.	The photometer observation from MTL is interrupted by the emergency OFF OBCP, but MTL do not stop to send TC for a while due to specific commanding of the test sequence.	
		>>	OFF	OFF	OFF	
5.8.5.13.	SM to SM	Preparation	The instrument is turned ON and sets in STBY by GND TC	-	-	
		>>	STBY	OFF	OFF	
		SM to SM trs.	HIFI is returned to OFF state by emergency OFF OBCP	The OBCP to turn OFF the instrument in STBY run, which shall do nothing.	The OBCP to turn OFF the instrument in STBY run, which shall do nothing.	
		>>	OFF	OFF	OFF	
5.8.5.14.	SM to SAM	Preparation	The instrument is turned ON and set in STBY by GND TC	-	-	
		>>	STBY	OFF	OFF	
		SM to SAM trs.	no effect	no effect	no effect	
		>>	STBY	OFF	OFF	
5.8.5.15.	SAM to SM	SM to SM trs.	HIFI is returned to OFF state by emergency OFF OBCP	The OBCP to turn OFF the instrument in STBY run, which shall do nothing.	The OBCP to turn OFF the instrument in STBY run, which shall do nothing.	
		>>	OFF	OFF	OFF	
5.8.5.16.	EAM to SM (needs new SM to SAM, SAM to NOM and NOM to EAM)	Preparation	The instrument is turned ON and sets in STBY by GND TC	-	-	
		>>	STBY	OFF	OFF	
		SM to SAM trs.	no effect	no effect	no effect	

		Test step description (AD-2_1)	action or observed event description >> instrument state (as per "satellite state" table when available in SP-0939)			Comments
			HIFI	**PACS**	**SPIRE**	
		>>	STBY	OFF	OFF	
		SAM to NOM trs.	no effect	no effect	no effect	
		>>	STBY	OFF	OFF	
		Preparation	The instrument is configured as prime, and an observation sequence from MTL is started.	The instrument is turned ON and sets in STBY by GND TC	The instrument is turned ON and sets in STBY by GND TC	
		>>	observation (MTL)	STBY	STBY	
		NOM to EAM trs.	The observation conducted from MTL is interrupted by the emergency OBCP, and HIFI is set in STBY.	The OBCP to turn the instrument in STBY is run, which shall only re-enforce the instrument state.	The OBCP to turn the instrument in STBY is run, which shall only re-enforce the instrument state.	
		>>	STBY	STBY	STBY	
		EAM to SM trs.	The emergency OBCP turns OFF the instrument	The emergency OBCP turns OFF the instrument	The emergency OBCP turns OFF the instrument	
		>>	OFF	OFF	OFF	
5.8.5.17.	EAM to SAM (needs new SM to SAM, SAM to NOM and NOM to EAM)	Preparation	-	-	The instrument is turned ON and sets in STBY by GND TC	SPIRE is tested only in photometer for this sequence (Spectrometer mode can be used if SMEC is not used).
		>>	OFF	OFF	STBY	
		SM to SAM trs.	no effect	no effect	no effect	
		>>	OFF	OFF	STBY	
		SAM to NOM trs.	no effect	no effect	no effect	
		>>	OFF	OFF	STBY	
		Preparation	The instrument is turned ON and set in STBY by GND TC	The instrument is turned ON and set in STBY by GND TC	The instrument is configured as PRIME in photometer mode, and an observation sequence from MTL is started.	
		>>	STBY	STBY	Photometer (MTL)	

		Test step description (AD-2_1)	action or observed event description >> instrument state (as per "satellite state" table when available in SP-0939)			Comments
			HIFI	**PACS**	**SPIRE**	
		NOM to EAM trs.	OBCP to turn the instrument to STBY is re-enforced	OBCP to turn the instrument to STBY is re-enforced	Observation conducted from MTL is interrupted by emergency OBCP, and SPIRE is set in STBY.	
		>>	STBY	STBY	STBY	
		EAM to SAM trs.	emergency OBCP turn OFF the instrument	emergency OBCP turn OFF the instrument	emergency OBCP turn OFF the instrument	
		>>	OFF	OFF	OFF	
5.8.5.18.	NOM to SAM (needs new SAM to NOM)	Preparation	-	The instrument is turned ON and sets in STBY by GND TC	-	
		>>	OFF	STBY	OFF	
		SAM to NOM trs.	no effect	no effect	no effect	
		>>	OFF	STBY	OFF	
		Preparation	The instrument is turned ON and sets in STBY by GND TC	The instrument is configured as PRIME in burst mode, and an observation sequence from MTL is started.	The instrument is turned ON and sets in STBY by GND TC	
		>>	STBY	Observation (MTL/burst)	STBY	
		NOM to SAM trs.	emergency OBCP turn OFF the instrument	The observation conducted from MTL is interrupted by the emergency OBCP, and PACS is set OFF.	emergency OBCP turn OFF the instrument	
		>>	OFF	OFF	OFF	
5.8.6.	**S/C reconfiguration**					
5.8.6.2.	Test start configuration	Preparation	The instrument is turned ON and sets in STBY by GND TC	The instrument is turned ON and sets in STBY by GND TC	The instrument is turned ON and sets in STBY by GND TC	
		>>	STBY	STBY	STBY	

		Test step description (AD-2_1)	action or observed event description >> instrument state (as per "satellite state" table when available in SP-0939)			Comments
			HIFI	**PACS**	**SPIRE**	
5.8.6.3.	NOM Mode to EAM transition (CDMS level 3a)	Preparation	The instrument is configured as prime, and an observation sequence from MTL is started.	-	-	
		>>	observation (MTL)	STBY	STBY	
		CDMS level 3a alarm	The observation conducted from MTL is interrupted by emergency OBCP, and HIFI is set in STBY.	The OBCP to turn the instrument in STBY is run, which shall only re-enforce the instrument state.	The OBCP to turn the instrument in STBY is run, which shall only re-enforce the instrument state.	
		>>	STBY	STBY	STBY	
5.8.6.4.	EAM to SAM (CDMS level 3b)	2nd CDMS level 3a alarm	The OBCP to turn the instrument in STBY is run, which shall only re-enforce the instrument state.	The OBCP to turn the instrument in STBY is run, which shall only re-enforce the instrument state.	The OBCP to turn the instrument in STBY is run, which shall only re-enforce the instrument state.	
		>>	STBY	STBY	STBY	
		CDMS level 3b alarm	The OBCP to turn the instrument in STBY is run, which shall only re-enforce the instrument state.	The OBCP to turn the instrument in STBY is run, which shall only re-enforce the instrument state.	The OBCP to turn the instrument in STBY is run, which shall only re-enforce the instrument state.	
		>>	STBY	STBY	STBY	
5.8.6.5.	NOM mode to SAM (ACMS level 4 (ACMS in Survival Mode))	Preparation	-	-	The instrument is configured as PRIME in photometer mode, and an observation sequence from MTL is started.	
		>>	STBY	STBY	Photometer (MTL)	
		ACMS level 4 alarm	The emergency OBCP turns OFF the instrument	The emergency OBCP turns OFF the instrument	The emergency OBCP turns OFF the instrument	
		>>	OFF	OFF	OFF	

		Test step description (AD-2_1)	action or observed event description >> instrument state (as per "satellite state" table when available in SP-0939)			Comments
			HIFI	**PACS**	**SPIRE**	
5.8.6.7.	NOM Mode to Survival Mode (CDMS level 4)	Preparation	The instrument is turned ON and sets in STBY by GND TC	The instrument is turned ON and sets in STBY by GND TC	The instrument is turned ON and set in STBY by GND TC, then the instrument is configured as PRIME in photometer mode, and an observation sequence from MTL is started.	SPIRE Switched OFF via DNEL !
		>>	STBY	STBY	Photometer (MTL)	
		CDMS level 4 alarm	all the instrument supply LCL are turned OFF by HW DNEL	all the instrument supply LCL are turned OFF by HW DNEL	all the instrument supply LCL are turned OFF by HW DNEL	
		>>	OFF	OFF	OFF	
5.8.7.	**CDMS management**					
	Test start configuration	Preparation	The instrument is turned ON and sets in STBY by GND TC	The instrument is turned ON and sets in STBY by GND TC, then in photometer/burst mode to fill SSMM.	The instrument is turned ON and sets in STBY by GND TC	
				PACS is returned in STBY.	The instrument is configured as PRIME in photometer mode, and an observation sequence from MTL is started.	
		>>	STBY	STBY	Photometer (MTL)	

		Test step description (AD-2_1)	action or observed event description >> instrument state (as per "satellite state" table when available in SP-0939)			Comments
			HIFI	**PACS**	**SPIRE**	
	EAT / FDIR test	EAT test	-	-	The test mode is entered by GND TC while the MTL is active but send no TC, and the generation of a SPIRE-TM(5,2,0xC100) event is commanded. Two minutes later a SPIRE-TM(5,2,0xC110) is generated. Then the instrument is set back in photometer mode.	This test verify the the correct CDMS MOT operation (i.e. OBCP is run as an answer to an instrument generated event). The ideal situation would be to trig the events 5,2,0xC100 and 5,2,0xC110 without living the photometer mode. But this is identified as not possible.
		>>	STBY	STBY	Photometer (MTL)	
		EAT and SPIRE OBCP associated to TM(5,2,0xC100/OxC110) verification	-	-	Next MTL sub-schedule configure back SPIRE for a new operation in photometer mode	
		>>	STBY	STBY	Photometer (MTL)	
	DTCP simulation	Nominal DTCP hand over	-	-	The observation is ended by MTL and SPIRE is returned to STBY	Intensive MTL, OBCP management exercise is led in parallel
		>>	STBY	STBY	STBY	
		Nominal DTCP hand over	The instrument is configured as PRIME by the MTL, and an observation sequence from MTL is started.	-	-	
		>>	observation (MTL)	STBY	STBY	
		OBT is adjusted 3.14s forward in time	the instrument shall copy the new OBT	the instrument shall copy the new OBT	the instrument shall copy the new OBT	OBT operation / problem test
		>>	observation (MTL)	STBY	STBY	

		Test step description (AD-2_1)	action or observed event description >> instrument state (as per "satellite state" table when available in SP-0939)			Comments
			HIFI	**PACS**	**SPIRE**	
		OBT is adjusted 3.14s backward in time	the instrument shall copy the new OBT	the instrument shall copy the new OBT	the instrument shall copy the new OBT	
		>>	observation (MTL)	STBY	STBY	
	Verification of correct behaviour of MTL after delete/add/modify operation	MTL execution verification	-	-	-	MTL has been manipulated in back-ground of previous operation.
		>>	observation (MTL)	STBY	STBY	
	Test end if test not concatenated with sequence 5.8.8	if test not concatenated with sequence 5.8.8	The instrument is returned is STBY, then turned OFF by GND TC	The instrument is turned OFF by GNT TC	The instrument is turned OFF by GNT TC	
		>>	OFF	OFF	OFF	
5.8.8.	**DTCP worst case scenario**					
	Test start configuration	Preparation	The instrument is turned ON and sets in STBY by GND TC	The instrument is turned ON and sets in STBY by GND TC, then in photometer/burst observation sequence from MTL to fill SSMM and load the CMDS	The instrument is turned ON and sets in STBY by GND TC	
		>>	STBY	observation (MTL/burst)	STBY	
	1553 Bust loading phase	start of instrument new ASW image load test	The instrument is turn OFF (clean procedure) then turned ON and running on BOOT SW. A dummy 1Mo SW image up-load (in DM RAM) is started.	-	-	
		>>	loading ASW in DM	observation (MTL/burst)	STBY	
	TM/TC Link load phase	hand-over	A dummy ASW image is loaded	The observation is ended under MTL control and the instrument is sets in STBY	-	SPIRE operation shall use OBCP as much as possible

		Test step description (AD-2_1)	action or observed event description >> instrument state (as per "satellite state" table when available in SP-0939)			Comments
			HIFI	**PACS**	**SPIRE**	
		>>	loading ASW in DM	STBY	STBY	
		hand-over	ASW loading	-	The instrument is configured as PRIME in photometer mode, and an observation sequence from MTL is started with real time science downlink	
		>>	loading ASW in DM	STBY	Photometer (MTL/rl tm sc)	
	SSMM management phase (in parallel to)	hand-over	When the ASW up-load is ended, its transfer in PM RAM is commanded with the load and wait command (no boot). Then the instrument is commanded to boot on EEPROM ASW image.	-	-	The up-loaded dummy image shall be set-up (page header data) so that the pages install themselves PM RAM zones not used by the flight ASW. SO at the end of operation, the normal ASW shall be running, with dummy data present in separate PM RAM area.
		>>	STBY	STBY	Photometer (MTL/rl tm sc)	
		1553 bus release	-	-	The observation is ended under GND control and the instrument is sets in STBY (end of real time science windows)	
		>>	STBY	STBY	STBY	
	Instrument ASW upgrade test verification phase	1553 loaded ASW verification	The PM RAM area containing the uploaded dummy ASW image is dumped.	-	-	
		>>	STBY	STBY	STBY	

		Test step description (AD-2_1)	action or observed event description >> instrument state (as per "satellite state" table when available in SP-0939) HIFI	PACS	SPIRE	Comments
		instrument EEPROM patch capability verification	2 words are written in the instrument EEPROM in an EEPROM page reserved for this test. The words values are chosen to toggle the memory cell values from previous one (i.e. previous test). Then the full EEPROM contain is dumped. The operation repeated for the 3 instruments (one by one).			The reserved area shall be such that even only 2 words are written, the overall affected EEPROM page is use for nothing else, to not impact the re-writing count of any useful memory cell.
		>>	STBY	STBY	STBY	
	Simulacrum of new HIFI ASW image test	hand-over	The instrument is configured as PRIME, and an observation sequence from MTL is started with real time science download enabled by GND TC	-	-	
		>>	observation (MTL/rl tm sc)	STBY	STBY	
	Verification of correct behaviour of system after intensive operations	end of DTCP	The real time sc. in disabled from GND TC	-	-	
		>>	observation (MTL)	STBY	STBY	
		execution verification	-	-	-	
		>>	observation (MTL)	STBY	STBY	
	Test end if test not concatenated with sequence 5.8.8	if test not concatenated with sequence 5.9.3	The instrument is returned is STBY then turned OFF by GND TC	The instrument is turned OFF by GND TC	The instrument is turned OFF by GND TC	
		>>	OFF	OFF	OFF	
5.8.9.	**REFERENCE Mission Scenario**					
5.8.9.2.	Test start configuration	Preparation	The instrument is turned ON and sets in STBY by GND TC	The instrument is turned ON and sets in STBY by GND TC, then in photometer/burst observation sequence from MTL to fill SSMM and load the CMDS	The instrument is turned ON and sets in STBY by GND TC	Note with respect to the instrument OD. The baseline on ACMS side, is that the observation require target and observations which correspond to the sequence given in appendix 5 of SP-0939, as recalled below.
		>>	STBY	observation (MTL)	STBY	

		Test step description (AD-2_1)	action or observed event description >> instrument state (as per "satellite state" table when available in SP-0939)			Comments
			HIFI	**PACS**	**SPIRE**	
	DTCP1	hand-over	The instrument is configured as PRIME, and an observation sequence is started, all under MTL TC	The observation is ended under MTL control and the instrument is set in STBY	-	
		>>	observation (MTL)	STBY	STBY	
5.8.9.4.	HIFI OD		according HIFI specification. The operation shall include an observation with peak-up.	-	-	It would be find that one first observation "needs" a Solar System Object tracking, then a second one "needs" a line scanning with OFF position, then a third one "needs" 4 nodding arranged as 2x2 rasters, then a fourth one "needs" a fixed pointing (near the operation domain limit)
		>>	observation (MTL)	STBY	STBY	
	DTCP2 (no contact with ground)	hand-over	The observation is ended under MTL control and the instrument is set in STBY	The instrument is configured as prime, and an observation sequence is started, all under MTL TC	-	
		>>	STBY	observation (MTL)	STBY	
5.8.9.5.	PACS OD		-	according PACS specification	-	It would be find that one first observation "needs" a Solar System Object tracking, then a second one "needs" a line scanning with OFF position, then a third one "needs" 4 nodding arranged as 2x2 rasters, then a fourth one "needs" a fixed pointing (near the operation domain limit)
		>>	STBY	observation (MTL)	STBY	

		Test step description (AD-2_1)	action or observed event description >> instrument state (as per "satellite state" table when available in SP-0939)			Comments
			HIFI	**PACS**	**SPIRE**	
	DTCP3	hand-over	-	The observation is ended under MTL control and the instrument is set in STBY	The instrument is configured as PRIME, and an observation sequence is started, all under MTL TC	
		>>	STBY	STBY	observation (MTL)	
5.8.9.6.	SPIRE OD		-	-	according SPIRE specification	It would be find that one first observation "needs" a Solar System Object tracking, then a second one "needs" a line scanning with OFF position, then a third one "needs" 4 nodding arranged as 2x2 rasters, then a fourth one "needs" a fixed pointing (near the operation domain limit)
		>>	STBY	STBY	observation (MTL)	
	DTCP4	hand-over	-	-	The observation is ended under MTL control and the instrument is set in STBY	
		>>	STBY	STBY	STBY	
5.8.9.7.	Test end	end of test	The instrument is turned OFF by GNT TC	The instrument is turned OFF by GNT TC	The instrument is turned OFF by GNT TC	
		>>	OFF	OFF	OFF	
5.8.10.	**Launch clean run**					
		Activity	none	none	none	
		>>	OFF	OFF	OFF	
5.8.11	**Launch sequence robustness**					
		Activity	none	none	none	
		>>	OFF	OFF	OFF	
5.8.12.	**NOM mode robustness**					

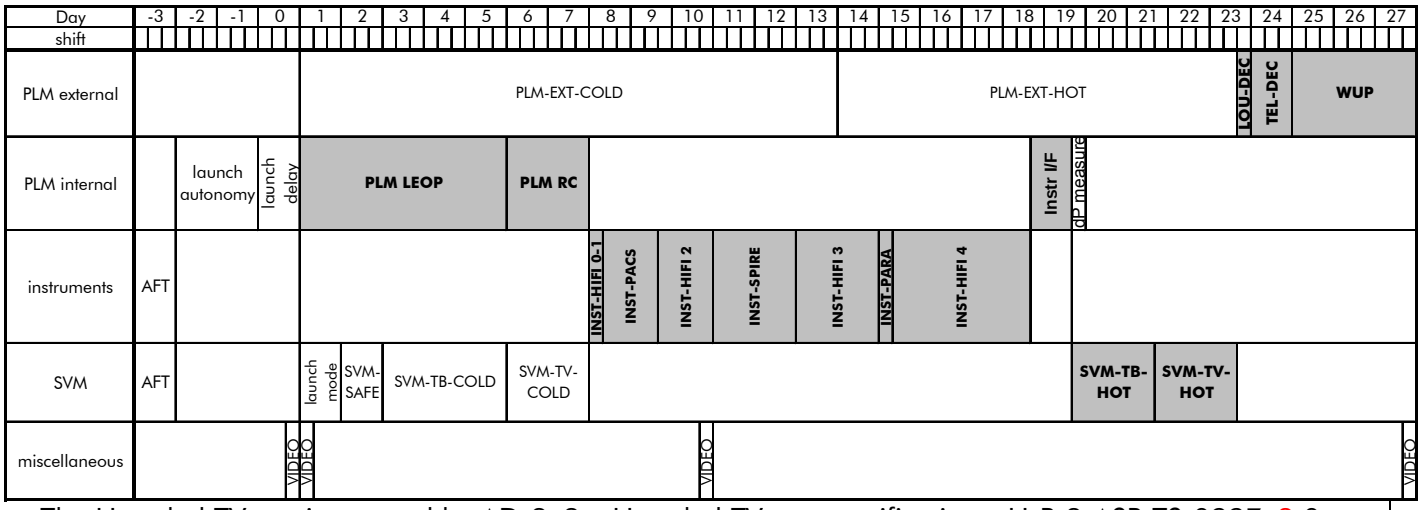
		Test step description (AD-2_1)	action or observed event description >> instrument state (as per "satellite state" table when available in SP-0939)			Comments
			HIFI	**PACS**	**SPIRE**	
	Test start configuration	Preparation	The instrument is turned ON and sets in STBY by GND TC	The instrument is turned ON and sets in STBY by GND TC, then set-up as PRIME in photometer/burst for filling the SSMM during the sequence preparation, then set in usual photometer mode for an observation sequence from MTL.	The instrument is turned ON and sets in STBY by GND TC	
		>>	STBY	observation (MTL)	STBY	
	1553 bus BC failure test	1553 bus cut	The instrument continue observation but 1553 bus is cut (no signal). After several minutes (several successive alarms and reconfiguration attempts by CDMS), the connection is re-established			In the instrument, some TM buffers overrun, OBT discontinuity is likely to be observed, but this shall not jam the recovery.
		>>	STBY	observation (MTL)	STBY	
		recovery	The OBCP to turn the instrument in STBY is run, which shall only re-enforce the instrument state.	The emergency OBCP shall turn the instrument to STBY despite its likely unstable state	The OBCP to turn the instrument in STBY is run, which shall only re-enforce the instrument state.	
		>>	STBY	STBY	STBY	
	ACC RT failure test	Preparation	-	-	The instrument is set as PRIME in photometer mode for an observation sequence from MTL	The ACC RT failure case shall be transparent with respect to the instrument operation (standard interruption by OBCP).
		>>	STBY	STBY	observation (MTL)	
		ACMS RT access corruption and subsequent CDMS alarm 3a	The OBCP to turn the instrument in STBY is run, which shall only re-enforce the instrument state.	The OBCP to turn the instrument in STBY is run, which shall only re-enforce the instrument state.	The OBCP to turn the instrument in STBY is run, which shall return the instrument to a coherent state.	
		>>	STBY	STBY	STBY	

		Test step description (AD-2_1)	action or observed event description >> instrument state (as per "satellite state" table when available in SP-0939)			Comments
			HIFI	**PACS**	**SPIRE**	
		ACC recovery	The instrument is turned OFF by GND TC	The instrument is turned OFF by GND TC	The instrument is turned OFF by GND TC	
		>>	OFF	OFF	OFF	
		end of recovery	-	-	-	
		>>	OFF	OFF	OFF	
	Test end if test not concatenated with an another sequence	end of test	-	-	-	
		>>	OFF	OFF	OFF	
5.8.13.	**Test of INstrument FDIR OBCP**					
	5.8.13.4. SPIRE FDIR OBCP		-	-	The instrument is set to Standby or switched off by OBCP, triggered either by Instrument Event, CDMS FDIR error, CDMS instrument monitoring error	
		>>	STBY	STBY	PRIME	
	5.8.13.5. PACS FDIR OBCP		-	The instrument is set to Standby or switched off by OBCP, triggered either by Instrument Event, CDMS FDIR error, CDMS instrument monitoring error	-	
		>>	STBY	PRIME	STBY	
	5.8.13.6. HIFI FDIR OBCP		The instrument is set to Standby or switched off by OBCP, triggered either by Instrument Event, CDMS FDIR error, CDMS instrument monitoring error	-	-	
		>>	PRIME	STBY	STBY	

		Test step description (AD-2_1)	action or observed event description >> instrument state (as per "satellite state" table when available in SP-0939)			Comments
			HIFI	**PACS**	**SPIRE**	
		obs = observation				
		trs. = transition				
		rl tm sc = real time science				
		sc = science				

4.8 TV/TB test

The Herschel TV/TB test will take place in the LSS, with the objective to test the satellite and instruments near the extreme cold and warm temperature, and test the cryostat in near orbital conditions.
It will be for instrument a good opportunity to test the instrument in a near flight conditions. (only near flight, as the test will be in LN2 cooled shroud, with CVV at 100K compared to 70K, and mass flow 4mg/s compared to 2.2 in orbit. (see section 3.2.1 & RD 31 & 32).



The Herschel TV test is covered by AD-2_2 – Herschel TV test specification - H-P-2-ASP-TS-0997_2.0.
The test sequence proposed is the following:
and the associated phases as defined in AD-2_2

Phase & Estimated duration (h)	total (under vacuum) 650 Duration (h)	Satellite Step	
		SVM Step	PLM Step
Phase 0	**128**	**Functional tests & pre-TVTB activities**	
Phase 1		**Final check before chamber closure**	
Phase 2	**24**	**PUMP DOWN & LEOP start**	
Phase 3	**24**	**SAFE MODE AND RECOVERY TO NOM**	
Phase 4	**72**	**SVM TB COLD and LEOP END**	
Phase 5	**48**	**SVM TV COLD, RCD**	
Phase 6	**11**	**HIFI TEST**	
Phase 7	**32**	**PACS TEST**	
Phase 8	**28**	**HIFI TEST**	
Phase 9	**48**	**SPIRE TEST**	
Phase 10	**53**	**HIFI TEST and START EXTERNAL PLM HOT**	
Phase 11	**8**	**PARALLEL TEST**	
Phase 12	**78**	**HIFI TEST**	
Phase 13	**24**	**INSTRUMENT I/F TEST**	
Phase 14	**48**	**SVM TB HOT & dP measurement**	
Phase 15	**48**	**SVM TV HOT**	
Phase 16	**8**	**LOU Decontamination**	
Phase 17	**24**	**Telescope Decontamination**	
Phase 18	**72**	**PLM warm up**	
Phase 19	**12**	**End of test**	
Phase 20		**Preparation of S/C removal from LSS**	

Instruments shall be used in the following sections:

- Instruments functional test in TV test conditions: Two full days (48h) are allocated for dedicated instruments test. However, the demand of HIFI to increase the test time to 165h has been agreed as it the the only opportunity to test the instrument with a cold LOU.
- Instruments Thermal interface acceptance test, where it is proposed to run SFT and/ cooler recycling with the minimum mass flow rate (in Levels 1, 2, 3)

In addition:

- SVM TV test cold and warm: SVM units including instruments warm units will be operated near minimum and maximum operating temperatures. For instruments, SFT cold will be used for this test:
- SVM TB hot & cold (thermal balance): Instruments will be set to PRIME mode

- + dedicated LOU decontamination (but a S/C test).

As for SFT, instruments shall be all switched on to standby/ready at the beginning of TV Cold test (phase 5) up to the end of the TV hot test (phase 12)

The following table give the instruments switch ON/OFF state during the TV test:

Phase & Estimated duration (h)	Satellite Step		Instrument states		
	SVM Step	PLM Step	HIFI	PACS	SPIRE
Phase 0	**Functional tests & pre-TVTB activities**				
24	Satellite AFT		various	various	various
8	Satellite to Launch Mode		OFF	OFF	OFF
	Heater line verification		OFF	OFF	OFF
72	Launch Autonomy		OFF	OFF	OFF
	HOT depletion		OFF	OFF	OFF
	Switch ON SPIRE LPU		OFF	OFF	OFF
	Switch OFF SPIRE LPU		OFF	OFF	OFF
24	Launch Delay		OFF	OFF	OFF
	Videogrammetry measurement		OFF	OFF	OFF
	Switch ON SPIRE LPU		OFF	OFF	OFF
	HOT evacuation		OFF	OFF	OFF
	Switch OFF SPIRE LPU		OFF	OFF	OFF
Phase 1	**Final check before chamber closure**				
	LSS Check		OFF	OFF	OFF
	Final check before pumping & Close door		OFF	OFF	OFF
Phase 2	**PUMP DOWN & LEOP start**				
24	Pump down and facility leak check	Cool down	OFF	OFF	OFF
	Facility Leak check	Cool down	OFF	OFF	OFF
	Videogrammetry measurement		OFF	OFF	OFF
	Start LEOP (iniate separation by Power SCOE), CDMS to SAM	LEOP, Cool down	OFF	OFF	OFF
	Shrouds ON	LEOP, Cool down	OFF	OFF	OFF
Phase 3	**SAFE MODE AND RECOVERY TO NOM**				
24	Transition to Safe Mode	LEOP, Cool down	OFF	OFF	OFF
	Safe Mode, stabilised	LEOP, Cool down	OFF	OFF	OFF
	Transition to SAM	LEOP, Cool down	OFF	OFF	OFF
	Transition to CDMU NOM	LEOP, Cool down	OFF	OFF	OFF
	Transition to ACC OCM	LEOP, Cool down	OFF	OFF	OFF
	Transition to ACC SCM	LEOP, Cool down	OFF	OFF	OFF
	CDMU Reconfiguration B to A	LEOP, Cool down	OFF	OFF	OFF
	ACC Reconfiguration B to A	LEOP, Cool down	OFF	OFF	OFF
	TTC Reconfiguration to A	LEOP, Cool down	OFF	OFF	OFF
	Transition to CDMU NOM	LEOP, Cool down	OFF	OFF	OFF
	Transition to ACC OCM	LEOP, Cool down	OFF	OFF	OFF
	Transition to ACC SCM	LEOP, Cool down	OFF	OFF	OFF
Phase 4	**SVM TB COLD and LEOP END**				
72	Switch ON instruments (// mode)	LEOP, Cool down	S. By	//	//
	Stabilisation in // mode	LEOP, Cool down	S. By	//	//
	HIFI Prime	LEOP, Cool down	**Prime**	S. By	S. By
	Stabilisation 1 in // HIFI prime	LEOP, Cool down	**Prime**	S. By	S. By
	Add power on HIFI panels	LEOP, Cool down	**Prime**	S. By	S. By
	Stabilisation 2 in // HIFI prime	LEOP, Cool down	**Prime**	S. By	S. By
Phase 5	**SVM TV COLD, RCD**				
48	Instruments in Stand By	Rapid Cool Down	S. By	S. By	S. By
	TV cold, TT&C cell	Rapid Cool Down	S. By	S. By	S. By
	TV cold, Power cell	Rapid Cool Down	S. By	S. By	S. By
	TV cold, RW cell	Rapid Cool Down	S. By	S. By	S. By
	TV cold, HIFI cells	Rapid Cool Down	**Prime**	S. By	S. By
	TV cold, PACS cell	Rapid Cool Down	S. By	**Prime**	S. By
	TV cold, SPIRE cell	Rapid Cool Down	S. By	S. By	**Prime**
	-	Switch big => small nozzles	S. By	S. By	S. By
	DLCM & LLP measurement		S. By	S. By	S. By

Phase & Estimated duration (h)	Satellite Step		Instrument states		
	SVM Step	PLM Step	HIFI	PACS	SPIRE
Phase 6	**HIFI TEST**				
11	HIFI TVTB test 1		**Prime**	S. By	S. By
	HIFI to Stand By mode		S. By	S. By	S. By
Phase 7	**PACS TEST**				
32	PACS TVTB test		S. By	**Prime**	S. By
	PACS to Stand By mode		S. By	S. By	S. By
Phase 8	**HIFI TEST**				
28	HIFI TVTB test 2		**Prime**	S. By	S. By
	HIFI to Stand By mode		S. By	S. By	S. By
Phase 9	**SPIRE TEST**				
48	SPIRE TVTB test		S. By	S. By	**Prime**
	SPIRE to Stand By mode		S. By	S. By	S. By
Phase 10	**HIFI TEST and START EXTERNAL PLM HOT**				
53	HIFI TVTB test 3		**Prime**	S. By	S. By
	HIFI to Stand By mode		S. By	S. By	S. By
	Videogrammetry measurement		S. By	S. By	S. By
	-	Heat up PLM	S. By	S. By	S. By
Phase 11	**PARALLEL TEST**				
8	Parallel test		S. By	//	//
	PACS to St. By (TBC, depending on definition of phase 10)		S. By	S. By	**Prime**
	SPIRE to St. By (TBC, depending on definition of phase 10)		S. By	S. By	S. By
Phase 12	**HIFI TEST**				
78	HIFI TVTB test 4		**Prime**	S. By	S. By
	HIFI to Stand By mode		S. By	S. By	S. By
Phase 13	**INSTRUMENT I/F TEST**				
24	Set mass flow to 2.2 mg/s		S. By	S. By	S. By
	Switch ON/OFF HIFI instrument for thermal I/F test		**Prime**	S. By	S. By
	Switch ON/OFF PACS instrument for thermal I/F test		S. By	**Prime**	S. By
	Switch ON/OFF SPIRE instrument for thermal I/F test		S. By	S. By	**Prime**
Phase 14	**SVM TB HOT & dP measurement**				
48	Transition to instrument parallel mode		S. By	//	//
	Stabilisation in // mode	external hot	S. By	//	//
	HIFI Prime	external hot	**Prime**	S. By	S. By
	Stabilisation 1 in // HIFI prime	external hot	**Prime**	S. By	S. By
	Add power on HIFI panels	external hot	**Prime**	S. By	S. By
	Stabilisation 2 in // HIFI prime	external hot	**Prime**	S. By	S. By
	-	dP measurement	**Prime**	S. By	S. By
Phase 15	**SVM TV HOT**				
48	DLCM & LLP measurement		S. By	S. By	S. By
	TV hot, TT&C cell	external hot	S. By	S. By	S. By
	TV hot, Power cell	external hot	S. By	S. By	S. By
	TV hot, RW cell	external hot	S. By	S. By	S. By
	TV hot, HIFI cells	external hot	S. By	S. By	S. By
	TV hot, PACS cell	external hot	S. By	S. By	S. By
	TV hot, SPIRE cell	external hot	S. By	S. By	S. By
	Switch OFF instruments		S. By	S. By	S. By
	Transition to SAM		S. By	S. By	S. By

Phase & Estimated duration (h)	Satellite Step		Instrument states		
	SVM Step	PLM Step	HIFI	PACS	SPIRE
Phase 16	**LOU Decontamination**				
8	Swith instruments OFF		OFF	OFF	OFF
	Reset max temperature threshold, select heater lines 1+2		OFF	OFF	OFF
	Switch ON LOU decontamination (lines 1+2)		OFF	OFF	OFF
	Switch OFF decontamination		OFF	OFF	OFF
	select heater lines 1+3		OFF	OFF	OFF
	Switch ON LOU decontamination (lines 1+3)		OFF	OFF	OFF
	Switch OFF decontamination		OFF	OFF	OFF
	Reset max temperature threshold to default value		OFF	OFF	OFF
Phase 17	**Telescope Decontamination**				
24	Initiate Tel decontamination with heater line mask		OFF	OFF	OFF
	Set mask to all lines active		OFF	OFF	OFF
	Tel decontamination		OFF	OFF	OFF
Phase 18	**PLM warm up**				
72	-	Switch ON CVV warm-up heaters	OFF	OFF	OFF
	Videogrammetry measurement		OFF	OFF	OFF
	-	Switch OFF CVV warm-up heaters	OFF	OFF	OFF
Phase 19	**End of test**				
10	Chamber repressurisation		OFF	OFF	OFF
	Videogrammetry measurement		OFF	OFF	OFF
	Chamber opening		OFF	OFF	OFF
2	S/C switch OFF		OFF	OFF	OFF
Phase 20	**Preparation of S/C removal from LSS**				
	Installation of basic scaffolding, installation of Tel cover, cryo SCOE activities, harness disconnection, …		OFF	OFF	OFF

The Instruments functional test sequence to be run during the TV test with instruments are very similar to the SPT, except for HIFI where it is the only opportunity to run the instrument with a cold LOU.
The satellite shall be tilted to 20° to allow PACS & SPIRE cooler recycling.
The SVM temperatures shall be in the middle of the operating range (intermediate Cold/Warm).
The Cryostat mass flow rate shall be throttle to mimic Flight mass flow rate (TBC)

The instrument sequences to be run during the Instrument functional tests are described in the following sections:

4.8.1 PACS TV Test

Applicable procedure for PACS TV test:
AD-8_1 – PACS-ME-TP-021_2.5 - PACS IST test procedures (incl. Commissioning, RMS and SPT, and TV)
The test sequence to be run during PACS TV test is similar to SPT (only red bolometer tuning is removed):

PACS TB/TV Testing			**31:55:12**	PACS-ME-TP-021_2_5 - PACS Integrated System Test Procedures	11
	PACS FDIR Verification		**0:30:00**		11.1
		PACS Switch on	0:06:00		11.1.2
		Request Autonomous SAFE Transition	0:06:00		11.1.3
		Request Autonomous OFF Mode Transition (OOL)	0:06:00		11.1.4
		PACS Switch on	0:06:00		11.1.5
		Request Autonomous OFF Mode Transition (HK loss)	0:06:00		11.1.6
	1: PACS Full Functional Test (FFT) at HeII conditions		**11:52:48**		11.4
		Switch-on (OFF – SAFE Transition)	0:06:00		11.4.2
		PACS Setup of Spectroscopy with CSs off and Open Grating Launch Loc	0:18:00		11.4.3
		Grating Test	0:12:00		11.4.4
		Thermal Behaviour Test in Spectroscopy	2:18:00		11.4.5
		Setup Spectroscopy, FW SPEC, data rates and background adjustmen	2:00:00		11.4.6
		Ge:Ga Heater Test	0:18:00		11.4.7
		Ge:Ga Flasher Test	0:15:00		11.4.8
		Chopper Full FOV Scan in Spectroscopy	0:30:00		11.4.9
		Medium sampling grating scan (2 filters)	0:54:00		11.4.10
		Reconfiguration and Optional Switch-off/on Cycle	0:12:00		11.4.11
		Cooler recycling	2:24:00		11.4.12
		Thermal Behaviour Test in Photometry	1:36:00		11.4.13
		PACS Setup of Photometry, Filterwheel Photometry and Data Rate	0:36:00		11.4.14
		Bolometers saturation check	0:06:00		11.4.15
		Enter Safe Mode	0:01:48		11.4.16
		Switchoff	0:06:00		11.4.17
	Short Performance Test at HeII, SPEC		**6:10:48**		11.6.1
		Switchon (OFF to SAFE Transition)	0:06:00		11.6.2
		Ge:Ga dark currents on internal Calibration sources	0:30:00		11.6.3
		Grating performance test	0:33:00		11.6.4
		Chopper performance test Spectroscopy	0:15:00		11.6.5
		Emissivity of internal Calibration Sources	2:00:00		11.6.6
		Quick Wavelength check	0:18:00		11.6.7
		S/N as function of reset interval	0:15:00		11.6.8
		Different bias settings for Ge:Ga detectors	0:18:00		11.6.9
		Time constants for flux changes spectroscopy	0:42:00		11.6.10
		Internal Calibration sources performance test	1:12:00		11.6.11
		Switch Off or Safe	0:01:48		11.6.12
	Short Performance Test at HeII, PHOT		**4:18:00**		11.6.13
		Switch On (Optional)	0:00:00		11.6.14
		Cooler recycling	0:00:00		11.6.15
		SetupPhotometry	0:36:00		11.6.16
		Test of internal calibration recipes Photometry	0:36:00		11.6.17
		Focal plane map with Calibration Sources and representative	0:30:00		11.6.18
		Staring measurement on CS for low frequency noise	2:12:00		11.6.19
		Time constants for flux changes photometry	0:18:00		11.6.20
		Test pattern photometry	0:06:00		11.6.23
	AOT Tests (Astronomical Observation template)		**4:19:48**		11.8
		Switchon (Nominal)	0:00:00		11.8.2
		Cooler recycling	0:00:00		11.8.3
		SetupPhotometry	0:36:00		11.8.4
		Tutti Frutti AOT test PHOT	0:30:00		11.8.5
		PHOT AOT concepts	0:42:00		11.8.6
		Enter SAFE mode	0:01:48		11.8.7
		SetupSpectroscopy	0:36:00		11.8.8
		Tutti Frutti AOT test SPEC	0:48:00		11.8.9
		SPEC AOT concepts	0:30:00		11.8.10
		Ge:Ga detector curing procedure	0:30:00		11.8.11
		Switch off	0:06:00		11.8.12
	Test of redundant PACS instrument		**4:43:48**		11.9
		Switchon (redundant)	0:06:00		11.9.2
		Cooler recycling	2:24:00		11.9.3
		Setup Photometry	0:36:00		11.9.4
		Two/Three position chopping with/without internal Calibration Block	0:24:00		11.9.5
		Setup Spectroscopy	0:12:00		11.9.6
		Chopper Performance Test Spectroscopy	0:18:00		11.9.7
		Chopper-Detector Synchronization Test	0:30:00		11.9.8
		Safe Mode	0:01:48		11.9.9
		Close the Grating Launch Lock (Optional)	0:06:00		11.9.10
		Switch Off	0:06:00		11.9.11

4.8.2 SPIRE TV Test

The SPIRE TV test procedures are :
AD-10_2 – SPIRE TV test procedures – TBW
And/or
AD-8_3 - SPIRE-RAL-PRC-002704_2.4 - SPIRE Special Performance Test Procedures

The (last proposed) SPIRE TV test sequence is the following:

SPIRE TB/TV Testing			**48:00:00**	SPIRE-RAL-PRC-002704_2.4 - SPIRE_SPT_Procedures
	SPIRE Instrument functional test during TV (48h)			
		Instrument Switch on and Mode Transitions	**TBD**	
		SPIRECooler recycle (automatic)	**6:40:00**	
		Photometer Scan Mode Observation	**TBD**	
		Photometer chop mode observation	**TBD**	
		Photometer PCAL source observation	**TBD**	
		Switch from Photometer to pseudo-Spectrometer mode	**TBD**	TBW
		Spectrometer PCAL source observation	**TBD**	TBW
		Spectrometer SCAL source operation	**TBD**	TBW
	SPIRE // PACS mode specific test cold TBD		**2:10:00**	
	SPIRE FPU thermal interfaces		**2:00:00**	

4.8.3 HIFI TV test

HIFI TV test procedure is the following
AD-103 – HIFI TV test procedures - TBW

HIFI test sequence to be run during TV test is the following:
The fact that HIFI exceeds the 48h allocated has been agreed (similar test performed during commissioning has been reduced.

HIFI TB/TV Testing			**196:20:00**	TBD
	Procedure for HIFI Power ON with both FPU and LOU cold (TV t		**0:30:00**	SRON-G-HIFI-PR-2007-017_1.5.3 - HIFI Power on for IST & TV
		Preparation		
		Power on ICU		
		Switch on and verify Focal plane subsystem		
		Power on backends		
		LO switchon and safety tables		
		End of Procedure		
	HIFI TV step 1 = Cold SFT		**2:00:00**	Ref HIFI AIT meeting n°1 SCI-PT-49562 (5/11/07)
	off line processing 1		**4:00:00**	
	HIFI TV step 2= Initial diplexer calibration		**5:10:00**	
	off line processing 2		**8:00:00**	PACS TV test to take place (40:00)
	HIFI TV step 3= Second Diplexer Calibration		**28:30:00**	
	off line processing 3		**8:00:00**	SPIRE TV test to take plave here (50:00)
	HIFI TV step 4= Initial performance tests		**52:50:00**	
	off line processing 4		**8:00:00**	PACS/SPIRE parallele tost to take place here (8:00)
	HIFI TV step 5= Final Performance Tests		**78:30:00**	
	Procedure for HIFI PowerOff		**0:05:00**	SRON-G-HIFI-PR-2007-017_1.5.3 - HIFI Power on for IST & TV

4.8.4 SPIRE/PACS parallel TV test

The PACS & SPIRE parallel mode during TV test is TBC.
Parallel mode test has been moved from IST to SOVT

This test is TBD.
Proposition: PACS & SPIRE parallele cooler recycling (shifted by 30mn).

4.8.5 Instruments FPU thermal interface test

At the end of the instruments functional tests, a verification of the thermal interface of the FPU's will be executed (duration: 3 shifts)
Instruments shall provide set up sequence that allow to dissipate during a certain time (Adjustable by command, typically 1 hour) a known amount of heat in each of the FPU thermal straps.
For L0 straps, the test will be done at current HTT temperature
For L1, L2, and L3 straps, the test will be performed at minimum pass flow rate.
These sequences shall be included in a dedicated section of the instrument TV test procedure.

4.8.6 Organisation of Instruments TV test sequences

Due to the proposed HIFI test sequence (long sequences + interleaved processing period), the following sequence has been agreed with instruments, and ins included in the TV test specification. (included here for information)

• HIFI TV 0 (= IST Cold (0)	2:00	
• HIFI off Line Processing 1 :	4:00	
• HIFI TV 1 (= IST Cold (0)	5:00	= 2 shift
• PACS TV test	32:00 (includes HIFI off line processing 2)	= 4 shifts
• HIFI TV 2 (= IST Cold (0)	28:00	= 3 shifts
• SPIRE TV test	48:00 (includes HIFI off line processing 3)	= 6 shifts
• HIFI TV 3 (= IST Cold (0)	53:00	=7 shifts
• PARALLEL MODE testing	8:00 (includes HIFI off line processing 4)	=1 shift
• HIFI TV 4 (= IST Cold (0)	78:00	= 3 shifts
• Total Instruments TV		= 30 shifts
Then Thermal interface test	24:00	=3 shifts

4.9 EMC tests

The overall Herschel FM EMC test specification is AD-2_3 – Herschel EMC test specification - H-P-2-ASP-TS-0819_4.
The configuration specified here are only to define in which state instruments have to be set up during EMC tests:

- Most noisy state for Emission tests (CE, RE)
- Most sensitive state for susceptibility tests (CS (SPIRE only) and RS)

It identifies also dedicated demand from instruments (SPIRE CS & PACS RS to H field, see below)

The EMC test will be split in 2 phases:.

EMC test 1, Conducted Emission (CE) on power lines test, shall be performed, early in the program, when access to power lines is easier (SVM panel needs to be open to install current probes).
This test need to be prepared with various configuration (FPU connected or not) to offer flexibility with respect to the integration process.

EMC2 test, will consist in Radiated Emission (RE) test (mainly measurement of the emission of the SVM), followed by Radiated susceptibility (RS) test, where the previously measured levels + margin (8 to 20dB) will be re-injected around the satellite, with dedicated antennas.

Exception for the PACS RS to H field test that need a dedicated Solar array simulator EGSE, and that shall be performed within the SPT.

In addition to this, SPIRE & ESA asks for a dedicated SPIRE Conducted Susceptibility (CS) test (.SCI-PT-4867 from 6/9/07)
For this test, the EMC probes on the Power lines shall be left in place after the CE test.
SPIRE CS test shall be executed during the SPIRE SPT (ref section 4.7.3.3)

For these 3 EMC tests, instruments provide dedicated test sequence, where the instruments will have to be set up either in the most noisy mode (RE) or in the most sensitive mode (RS).
As for SFT, and TV, instruments not under EMC test remain in standby mode.
These sequences shall be combined together with a satellite procedure to be run in parallel to the EMC procedure.

For all EMC test, only one of the nominal/Redundant part of the instrument will be used. Instruments teams to decide (from ILT results) which one is most suitable for this test (more noisy or more sensitive).

4.9.1 PACS EMC Tests

The test procedure to be used for all PACS EMC test is:
AD-9_1 – PACS-ME-TP-032_1.5 - PACS EMC procedures

The test sequence to be run during PACS EMC test shall be:

PACS EMC Testing			15:55:57	PACS-ME-TP-032_1.5 - EMC Test Procedure on Integrated System Level	section
CE Test: PACS Most Noisy Mode (With FPU connected and Cold)			**0:00:00**	not used	12.6
		PACS Switch-on	0:00:00		12.6.2
		Spectroscopy Most Noisy Mode Configuration	0:00:00		12.6.3
		Background adjustment	0:00:00		12.6.3
		Stays in spectroscopy mode as long as needed by EMC tests, execute most noisy mode test scripts as requested by EMC test flow	0:00:00		12.6.3
		Enter SAFE mode	0:00:00		12.6.3
		Close the Grating Launch Lock	0:00:00		12.6.4
		Switch off	0:00:00		12.6.5
CE Test: PACS Most Noisy Mode (Without FPU, or with FPU warm)			**2:19:00**	used	12.7
		PACS Switch-on	0:06:00		12.7.2
		Spectroscopy Most Noisy Mode Configuration without FPU	0:01:00		12.7.3
		Stays in spectroscopy mode as long as needed by EMC tests, execute most noisy mode test scripts as requested by EMC test flow	2:00:00		12.7.3
		Enter SAFE mode	0:06:00		12.7.3
		Switch off	0:06:00		12.7.5
RE Test: Same as CE Test: Most Noisy mode, but FPU connected only			**3:16:57**		12.6
		PACS Switch-on	0:06:00		12.6.2
		Spectroscopy Most Sensitive Mode Configuration	0:36:00		12.6.3
		Background adjustment	0:21:57		12.6.3
		Stays in spectroscopy mode as long as needed by EMC tests, execute most noisy mode test scripts as requested by EMC test flow	2:00:00		12.6.3
		Enter SAFE mode	0:06:00		12.6.3
		Close the Grating Launch Lock	0:01:00		12.6.4
		Switch off	0:06:00		12.6.5
RS Test: Most Sensitive mode Spectroscopy, FPU Cold			**2:55:00**		12.8
		PACS Switch-on	0:06:00		12.8.2
		Spectroscopy Most Noisy Mode Configuration	0:36:00		12.8.3
		Stays in spectroscopy mode as long as needed by EMC tests, execute most noisy mode test scripts as requested by EMC test flow	2:00:00		12.8.3
		Enter SAFE mode	0:06:00		12.8.3
		Close the Grating Launch Lock	0:01:00		12.8.4
		Switch off	0:06:00		12.8.5
RS Test: Most Sensitive mode Photometryy, FPU Cold			**7:25:00**	both are to be combined	12.9
		PACS Switch-on	0:06:00		12.9.2
		Cooler Recycling	4:24:00		12.9.3
		Photometry Most Sensitive Configuration Direct Mode	0:36:00		12.9.4
		Stays in spectroscopy mode as long as needed by EMC tests, execute most noisy mode test scripts as requested by EMC test flow	1:00:00		12.9.4
		Enter SAFE mode	0:06:00		12.9.4
		Photometry Most Sensitive Configuration DDCS Mode	0:01:00		12.9.5
		Stays in Photometry mode as long as needed by EMC tests	1:00:00		12.9.4
		Enter SAFE mode	0:06:00		12.9.4
		Switch off	0:06:00		12.9.5

4.9.2 SPIRE EMC Tests

The SPIRE EMC test procedure are:
CE test
AD-9_2 – SPIRE-RAL-PRC-002946_1.1 - SPIRE Warm Units EMC Conductive Emissions Procedures for IST

CS, RE, RS:
AD-9_6 SPIRE EMC procedure for EMC CS, RE, RS (TBW)
AD-8_3 - SPIRE-RAL-PRC-002704_2.4 - SPIRE Special Performance Test Procedures

The SPIRE test sequence to be run during Herschel EMC tests shall be the following:

SPIRE EMC test 1: CE				**1:20:00**	SPIRE-RAL-PRC-002946_1.1 - SPIRE Warm Units EMC Conductive Emissions Procedures for IST	**section**
	CE Test			**1:20:00**		
			To switch SPIRE from OFF to STBY mode	0:05:00	SPIRE-IST-WU-EMC-CE-OFF-TO-STBY	4.1.1
			To switch SPIRE from STBY to "PHOTOPS" mode	0:05:00	SPIRE-IST-WU-EMC-CE-STBY-TO-PHOTOPS	4.1.2
			EMC test goes here	1:00:00	stays on Photometer PRIME mode	
			To switch SPIRE from "PHOTOPS" to STBY mode	0:05:00	SPIRE-IST-WU-EMC-CE-PHOTOPS-TO-STBY	4.1.3
			To switch SPIRE from STBY to OFF	0:05:00	SPIRE-IST-WU-EMC-CE-STBY-TO-2OFF	4.1.4
SPIRE EMC Testing 2 (RE/RS)				**5:00:00**	SPIRE-RAL-PRC-002704_2.4 - SPIRE_SPT_Procedures	
	CS Test			**2:00:00**	(performed in the frame of the SPT)	
			Photometer most sensitive mode	1:00:00	Procedure: EMC - Photometer most sensitive mode	2.24
			Spectrometer most sensitive mode	1:00:00	Procedure: EMC – Spectrometer most sensitive mode	2.25
	RE Test			**1:00:00**		
			SPIRE Most Emissive Mode	1:00:00	Procedure: EMC – SPIRE most Emissive mode	2.26
	RS Test			**2:00:00**		
			Photometer most sensitive mode	1:00:00	Procedure: EMC - Photometer most sensitive mode	2.24
			Spectrometer most sensitive mode	1:00:00	Procedure: EMC – Spectrometer most sensitive mode	2.25

4.9.3 HIFI EMC tests

The HIFI EMC test procedure are:
AD-9_3 – SRON-G-HIFI-PR-2007-019_1.5.3 - HIFI conducted emissivity procedures for IST tests
AD-9_4 – HIFI EMC procedure for EMC RE/RS

The HIFI test sequence to be run during Herschel EMC test shall be the following: (Typical duration of 2h for EMC sequence are used here, to be adjusted to actual need)

HIFI EMC Testing during IST			**8:45:00**	SRON-G-HIFI-PR-2007-019_1.5.3 - HIFI conducted emissivity procedures for IST tests - RE/RS missing
EMC CE Test (LOU not Here)			**2:15:00**	SRON-G-HIFI-PR-2007-019_1.5.3 - HIFI conducted emissivity procedures for IST tests - RE/RS missing
	Procedure for HIFI PowerOn FPU warm and LOU dummy		**0:30:00**	SRON-G-HIFI-PR-2007-017_1.5.3 - HIFI Power on for IST & TV
	Set up HIFI for EMC CE test (most emissive Mode)			
	ASED CE test		**2:00:00**	
	Set HIFI To Standby			
	Procedure for HIFI PowerOff		**0:05:00**	SRON-G-HIFI-PR-2007-017_1.5.3 - HIFI Power on for IST & TV
RE Test			**3:00:00**	TBW
	HIFI Switchon (FPU Cold, LOU Warm		0:30:00	SRON-G-HIFI-PR-2007-017_1.5.3 - HIFI Power on for IST & TV
	Set up HIFI to most Noisy Mode		0:10:00	
	EMC RE take plave Here		2:00:00	
	Set HIFI to Standby		0:10:00	
	Switch Off		0:10:00	SRON-G-HIFI-PR-2007-017_1.5.3 - HIFI Power on for IST & TV
RS Test			**3:00:00**	TBW
	HIFI Switchon (FPU Cold, LOU Warm		0:30:00	SRON-G-HIFI-PR-2007-017_1.5.3 - HIFI Power on for IST & TV
	Set up HIFI to most Sensitive Mode		0:10:00	
	EMC RE take plave Here		2:00:00	
	Set HIFI to Standby		0:10:00	
	Switch Off		0:10:00	SRON-G-HIFI-PR-2007-017_1.5.3 - HIFI Power on for IST & TV

4.10 SVT/SOVT.

SVT (System Validation Test) and SOVT (System & Operation Validation Test) are test specified and run by ESOC, and are not detailed here.
The applicable document for these tests are:
AD-1_5 – PT-HMOC-OPS-PL-6204-OPS-OAH_1.draft – Herschel SVT1 test plan
AD-1.6 – PT-CMOC-OPS-PL-6212-OPS-OAH_0.2 draft - Herschel SOVT-1 Test Plan

During SVT & SOVT, the satellite + instruments will be submitted to a test sequence elaborated by ESOC/MOC and instrument, and will be controlled remotely from ESOC
SVT & SOVT are also repeated before and after environment tests (as for IST)

SVT is a 10 working days test where instruments will be used 2 days, running MTL built by ESOC & MOC based on instruments AOTs

- Day 3 (PACS, SPIRE, in sequence)
- Day 4 (HIFI)

Cryostat will be in He I conditions (may be relaxed to warm conditions, depending on instruments test sequences selected)

SOVT is a 5 working days test with extensive use of instruments.
In particular SOVT contains the validation of PACS/SPIRE parallel mode.

MTL-OD	***Contents***
MTL-0	Activities by TAS leading to DTCP-1 and to fill up SSMM (PACS burst mode)
MTL-1	PACS photometer (50%) and spectrometer (50%); Δv-manoeuvre (SOPS slot only or manoeuvre TCs?)
MTL-2	HIFI operations
MTL-3	SPIRE/ PACS scenarios A (PACS photometer, SPIRE photometer, parallel mode)
MTL-4	SPIRE/ PACS scenarios B (PACS photometer, SPIRE photometer, parallel mode)

Herschel cryostat shall be in He II condition & tilted 20° to run instruments MTL (cooler recycling is used)

The preparation of the satellite and instruments to start the SVT and SOVT are similar to the IST RMS:
The instruments test scripts to switch on Instruments to be ready to start the MTL are defined in section 2.2: Scripts for S/C IST.

5. SUCCESS CRITERIA

(Similar to AD21)
Considering that the present specification is a top level document which call after many sequences, the detailed success criteria are listed for each step of the sequence and sub sequence as part of the test definition, and shall be included in each test procedures.

For each instrument test step, the Instrument support team shall analyse the results (HK+Science) with the I-EGSE/QLA or dedicated science data analysis tool, and give the go ahead to proceed with the next step of the test.

5.1 "out of limit" and TC checking

5.1.1 use of soft and hard limits monitoring on CCS

The principle of the monitoring of relevant telemetry by CCS with soft (yellow) and hard (red) limits to warn the operator and/or initiate preventive or recovery actions are described in section 6.1 of AD-2_1., and are not repeated here.

Instrument teams shall define contingency actions (not necessarily abort of sequence) for each defined soft OOL.

5.1.2 Special case of PACS Monitoring

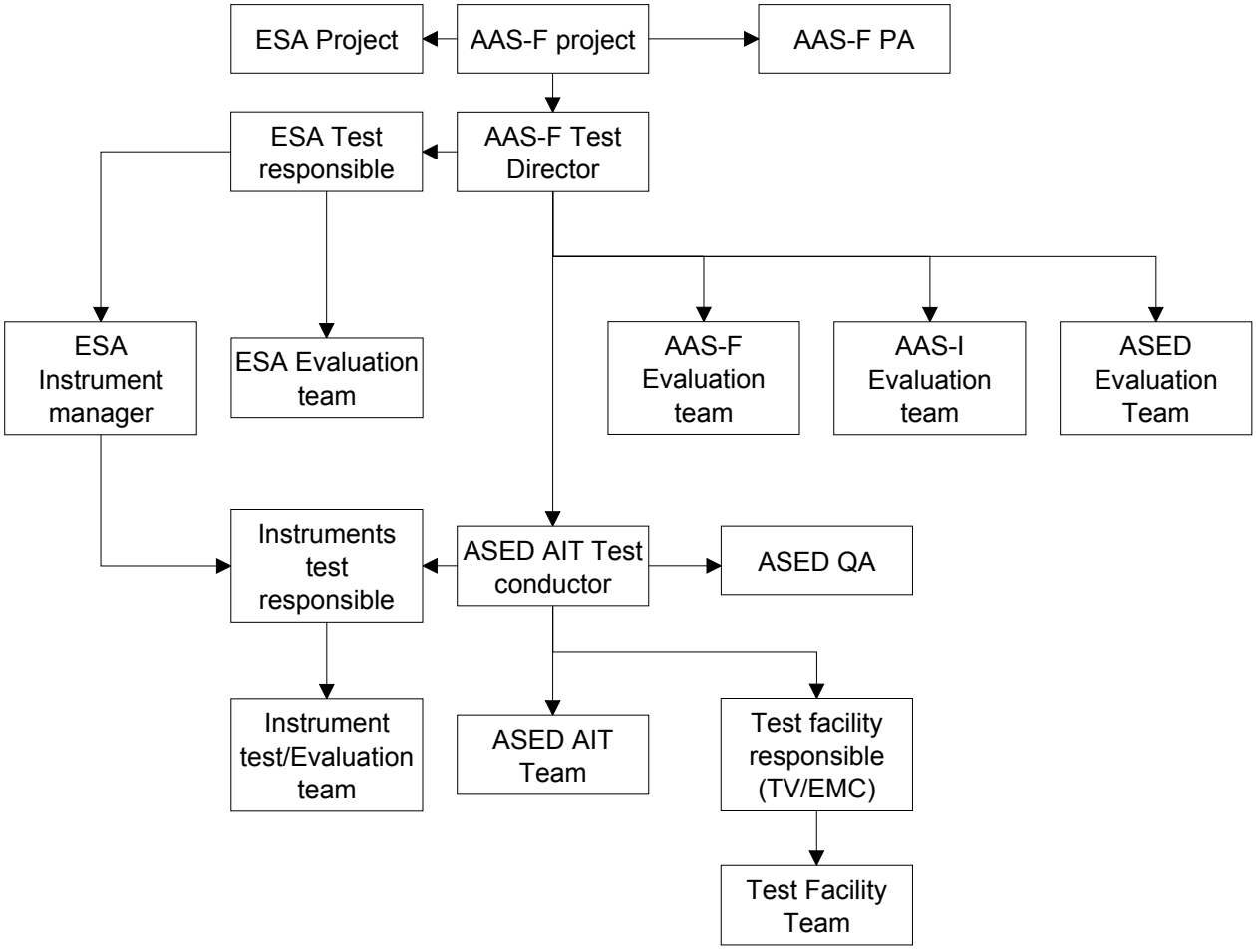
Following discussion with PACS, it has been mutually agreed that the PACS instrument monitoring, once the instrument FPU is cold, will rely on the instrument & S/C FDIR rather than on the CCS monitoring system.
As a consequence,

- the PACS database does not include the monitoring limits
- The FDIR system shall be tested berore PACS IST (currently included in PACS Mechanism tuning test).

6. ORGANISATION & RESPONSIBILITIES

6.1 Organisation

The test organisation and review shall follow the rules defined in the PA plan (AD-6) and PA
The overall organisation during the test is as follows:



6.2 Test organisation

During the FM satellite / instrument test, the organisation of the working day will change with the test phase:
It shall be defined in each individual test specification.
It is given in section 4.2 for information (

The sequence for instrument tests, unless otherwise specified shall be
PACS →SPIRE →HIFI → (PACS/SPIRE parallel).

6.3 Responsibilities

The overall responsibility during the test is as follows:
The responsibilities linked to the test progress shall be mentioned in the TAS-F test leading procedure.

Organization	Name	Responsibility
TAS-F Project Representative	xxx	Thales project interface Represents TAS-F during the test and he is also the I/F point with the ESA representative
ESA Project Representative	xxx	ESA project interface Represents ESA during the test and he is also the I/F point with the TAS-F representative
TAS-F PA	xxx	TAS-F Project Assurance Manager
TAS-F Test Director	xxx	Issue the test specification of the relevant test to be performed Go ahead for the test reviews (TRR, key point, PTR) Single point of contact with the TAS-F Evaluation team concerning the test result status.
ESA Test Responsible	xxx	ESA point of contact I/F with ESA project I/F with TAS-F test director & ESA Payload Engineering Co-ordination
ESA Instruments I/F	xxx	I/F with TAS-F test director & Instruments evaluation teams
ASED AIT Conductor	xxx	Responsible of the ASED AIT Team Issue the leading procedure of all activities Manage all activities done during the test including "key point" meeting. I/F point with the Test Facility Team Responsible I/F point with the Instrument AIT Team Responsible Organize the Daily meeting Initialize NCR…
ASED AIT Team	xxx	Realize all S/C AIT activities within the arrival and the leaving Issue of the relevant test procedures Operate the GSE (except I-EGSE) Provide the test data Issue the test report.
Instruments TAS-F I/F	xxx	Issue section of the test specification relevant to the instrument. TAS-F instrument expert
TAS-F QA	xxx	Organize the review (TRR/PTR…) Minute the running meeting (Key point)
Instrument AIT Team Responsible	xxx	Is in charge of I/F point with the ASED test conductor Provide relevant test data in order to help the test director concerning the "Key point" status.
Instrument AIT Team	xxx	I.EGSE full use Issue the relevant test procedures Process the instrument test data and Test data analysis Issue the test report.

Organization	Name	Responsibility
Evaluation teams		Evaluate the test results (depending of test: electrical integration, IST, TV, EMC, ….)

6.4 Tasks distribution

	Herschel satellite					
	Test Specification	Test Procedure	Test Execution	test report (filled procedure)	Instrument test report	Test Evaluation report
WU + WIH + test harness (mechanical integration)	TAS-I (AVM) TAS-F (FM)	TAS-I (AVM) ASED (FM)	TAS-I (AVM) ASED (FM)	TAS-I (AVM) ASED (FM)	-	-
Electrical Intégration test (WU having I/F with SVM)	TAS-I (AVM) TAS-F (FM)	TAS-I (AVM) ASED (FM)	TAS-I (AVM) ASED (FM)	TAS-I (AVM) ASED (FM)	-	-
UFT (functional tests WU together)	TAS-F (leading)	ASED + Instrument	ASED	ASED	Instrument	TAS-F (synthesis report)
SFT (Short functional tests WU+FPU)	TAS-F	ASED + Instrument	ASED	ASED	Instrument	TAS-F (synthesis report)
IST (functional tests WU+FPU)	TAS-F	ASED + Instrument	ASED	ASED	Instrument	TAS-F
TV test	TAS-F	ASED + Instrument	ASED	ASED	Instrument	TAS-F
EMC tests	TAS-F	ASED + Instrument	ASED	ASED	Instrument	TAS-F

6.4.1 General Tasks breakdown

TAS-F is in charge of Herschel FM AIV

- the satellite activities and test management:
- Responsible of the test specification, test management and for interfaces between the satellite, instruments and facility.

ASED is in charge of Herschel FM AIT

- Preparation (tests definition, except for instruments) and execution
- S/C Cleaning, handling, mechanical mounting, electrical checkout, instruments modes set-up.
- Dedicated GSE installation/validations and use
- S/C data analysis.
- Running the test (Satellite & Instruments Operator)

TAS-I is in charge of SVM FM & Instruments AVM AIT as defined above

Instruments teams are in charge of:

- Preparation, tests definition for the instruments
- Dedicated GSE installation/validations and use (I.EGSE)
- Responsible for interfaces between the instrument GSE and test facility.
- Execution and interpretation of instrument performance data
- Provide relevant test data in order to help the test director concerning the "Key point" status.
- Instrument test report

7. DOCUMENTATION

7.1 General rules for documentation configuration and delivery

Documents should be properly configured (with issue numbers, change logs, and identification of changes (redlined, change-bars)
Final Documents delivered for the test should be approved and signed.

Document names shall use the following convention:
Document Reference_issue number – Document title
The delivery should consist in:

- A pdf version signed on the front page (scan signature or pdf signature)
- + a MS word version to facilitate utilisation of the material (check of copy in S/C procedure)
- Associated script & release note

The document shall be delivered to TASF either my mail of through the instrument ftp:

- ftp://ftp.hp-instruments.as-b2b.com/xxx_to_industry/xxx FM Integration and test procedures (xxx=pacs, spire or hifi)

The mailing list indicating the availability of the documentation shall include:
TASF (B.Collaudin, G.Doubrovik), ESA (C.Sharmberg), ASED (S.Idler (All + PACS)+ S.Hamer+Relevant ASED instrument enginner (N.Sonn for HIFI or A.Koppe for SPIRE).

Once accepted, documents are placed on a repository (procedures, reports, data).

- ftp:// ftp.hp-instruments.as-b2b.com/industry_to_instruments/Herschel FM Integration & tests/

This ftp site needs access right that are available at the local instruments interface enginner, project manager

7.2 Documents required before the test

Instruments test procedures and associated scripts shall be available at least 15 days before the relevant test to prepare the satellite procedures.

- S/C configuration (CIDL, etc)
- Test set-up configuration (CIDL, Definition drawings)
- Test Set-up validation and calibration status
- Test specification
- Test predictions
- Instrumentation plan
- Test leading procedure + elementary procedures + test scripts

7.3 Data acquired during the test

7.3.1 S/C housekeeping

A listing (paper format) shall provide the following information (output frequency TBD) about each type of specimen sensors (thermal, μ-vibration):

- Test phase designation
- Acquisition date/time

- Temperature sensor number
- Sensor designation
- Measured value (time & frequency domain for μ-vib)
- Alarms status

An excel file grouping information <Time, Temperature> of all specimen thermal sensors shall be updated at a given frequency (TBD) and delivered on request to TAS-F thermal team.
An excel file grouping information <Time, Time domain> of all μ-vib sensors shall be updated at a given frequency (TBD) and delivered on request to TAS-F evaluation team.
An excel file grouping <Time, Power / Amperage> of all specimen heating lines (including RAA Dummy) shall be updated at a given frequency (TBD) and delivered on request to TAS-F evaluation team.

7.3.2 Instrument housekeeping

A listing (paper format) shall provide the following information (output frequency TBD) about each type of specimen sensors (thermal, μ-vibration):

- Test phase designation
- Acquisition date/time
- Temperature sensor number
- Sensor designation
- Measured value
- Alarms status

An excel file grouping information <Time, Temperature> of all specimen thermal sensors shall be updated at a given frequency (TBD) and delivered on request TAS-F/ESA evaluation team.

7.4 Documents issued after the test

7.4.1 Test Reports

To be delivered < one month after the test

7.4.1.1 Specimen AIT reports (ASED(FM),

As a minimum, the specimen AIT reports shall include:

- Filled test procedure
- Test progress description
- Contamination control report
- Logbook reporting all significant events about specimen
- Pictures taken on the specimen in test configuration
- Record (CD-ROM) of all acquired data during test
- Test measurements devices calibration reports

7.4.1.2 Test environment (EMC, TV)

As a minimum, the specimen AIT reports shall include:

- Test progress description
- Pictures taken on the test set-up
- Logbook reporting all significant events about test set-up

- Record (CD-ROM) of all acquired data during test
- Test measurements devices calibration reports

7.4.2 Evaluation reports

To be delivered < 2 months after the test

7.4.2.1 Evaluation report for satellite test

The deliverable are :
Logbook reporting all significant events about each sequence success criteria,
SFT, IST, TV/TB, EMC report including :

- measured values for success criteria associated with analogue values (ex. DoD, pointing errors, at key steps etc.),
- test results processing for all phases (plots and specific data processing possibly required step per step).

7.4.2.2 Evaluation report for instrument test

As a minimum, the instrument evaluation reports (provided by the instrument support team) shall include:

Logbook reporting all significant events about each sequence success criteria, and specifically the ones only available from monitoring at IEGSE level,

a short S/C test report including:

- measured values for success criteria associated with analogue values (ex. DoD, pointing errors, at key steps etc.),
- test results processing for all phases (plots and specific data processing possibly required step per step), specifically for the ones only available from processing at IEGSE level.

END OF DOCUMENT

ANNEX 1: PROPOSAL FOR MANAGING OF INSTRUMENT TEST SCRIPT DELIVERED TO ASED FOR USE ON HPCCS

(Summarized by S.Hamer)
This note consolidates a number of emails on the subject that have distributed in recent weeks by ASED and TAS-F:

Basics

- For any Instrument release, all scripts shall be delivered in one zip file, and when unzipped by default, shall be written to just one folder.
- The zip file name of the scripts provided shall clearly identify the release version/date and instrument concerned.
- All scripts required for a particular test shall be included in the zip even if they haven't been updated for the current release.
- The accompanying release note must include a list of all scripts provided and where appropriate identify the test /procedure they are applicable to.
- The scripts that have changed since the previous release shall also be clearly identified so that PA audit can check by random selection that the correct scripts are loaded on the HPCCS.
- The release shall also identify the tool used to generate the scripts (e.g. MOIS, CUS), and its version.
- The release note shall be a formally configured document with proper reference number, issue and date.
- If scripts are no longer required, they shall be clearly identified as so in the release note and removed from the delivered zip file.

Script Names

- Script names shall reflect directly the names called up in the corresponding test procedure.
- All script names must start with the name of the instrument concerned in CAPITALS, i.e. **SPIRE**, **PACS** or **HIFI**.
- If the scripts are applicable to a specific test then this test shall be identified in the script.
- Where there are similar test names (e.g. SFT, WFT, FFT, CFT) then these names shall be expanded to reduce the risk of inadvertently selecting the wrong script. For example SFT changes to **ShortFT**, WFT changes to **WarmFT**. It does not matter where this test identifier appears in the script name.
- Where possible the use of upper & lower case letters shall be consistent (CCS is case sensitive for ordering scripts so makes it harder to locate the required script).
- Script name shall not include the script version number (makes configuration control impossible).
- The use of master scripts has been proposed (see below), and if adopted then the script name shall also indicate if it is a master script by including **MASTER** in the name.

Script Release Information Headers

- All scripts shall include a header comment including the as a minimum the following information:
  - Name of script
  - Issue/Release
  - Date of Issue/Release
  - Instrument Model on I-EGSE (where appropriate)
  - Brief description of change
- Use of CVS to track script releases is recommend as it is possible to generate a header as provided in the example from SPIRE script below:

```
Extract from SPIRE CVS configured script:
```

```
#
#$Id: SPIRE-FM-WFT-BSM-INIT-P.tcl,v 1.4 2007/10/17 00:07:25 ssidher Exp $
#
# Script $Name:  $
# Issue $Revision: 1.4 $
# $Date: 2007/10/17 00:07:25 $
# $Author: ssidher $
#
#
# This script is generated by HCSS software. There are no
# user maintainable parts in it.
# Breaking the seals stops warranty.
#
# Second issue of CcsHandler: unlimited number of instrument TCs
# Third issue: instrument dependent template
#              configurable leap seconds count
#
```

- Automated checking of Instruments scripts running on the HPCCS by the IEGSE at execution, would be the best way to prevent the wrong scripts being run. This could be achieved by the CCS resident script send a unique indicator of the script issue or instrument model to the I-EGSE. If different from what expected then the script shall be forced to abort with message to the operator. However, it is clear implementing this will require all instruments to agree on a common approach and needs some effort to implement and test.

Use of Master Scripts and proposed

- Due the significantly large amount of scripts being provided by instruments (order of 100s) it is proposed to use Master scripts to reduce risk of wrong script execution during. Ideally the Master scripts shall embed all individual scripts (e.g. as procedures) as this will reduce the number of scripts to be managed on the HPCCS (from both configuration control and operational viewpoint). However, this is understood not to be a viable solution for the instruments.

  Therefore as an alternative solution, or at least a first try, it is proposed that for a specific section of an instrument test, a Master script will call all the test specific scripts for that part of the test. Although, this does not reduce the number of scripts that have to be installed/managed on the HPCCS on each delivery (actually it will increase the number of scripts) it reduces the number of script selections that have to be made during the test, thereby reducing the risk of selecting the wrong script for execution during test.

- It is further proposed that the Master script will prompt the operator before any sub-script is executed such that the test can be properly managed between CCS and IEGSE operators. Furthermore, the Master script will give the option to skip a script shall it be necessary. This gives the added benefit if the test has to be restarted at a certain point then the all test scripts up to the script required can be easily jumped over without need to execute the remaining scripts manually. The Master script will also give the option to abort prior to the start of the next test step if there are problems.

  A set of dummy scripts have been provided to PACS to assess how feasible it will be to implement the above proposal. If technically feasible, then the dummy scripts (with any enhancements) shall be distributed to all Instrument teams so they can assess the usage of the Master script approach for their own test procedures.

As discussed at the PACS progress meeting, the update of instrument test procedures shall be minimal to include the use of the Master script. This can be achieved by simply adding a step to call the Master at the start of the appropriate section, indicating that it will call the scripts identified in the subsequent steps (i.e. the test steps calling the individual scripts remain in the procedure).

Error Handling

- Instrument scripts running on the HPCCS shall support reasonable error handling. i.e. if the script fails to complete for whatever reason the HPCCS operator shall have some indication of this. For example the script could force a halt, or prompt to "Quit" the script after displaying a message. It shall not terminate with any feedback to the operator (as is currently the case).