Minutes of Meeting

Date:	09.12.2005	**Herschel**	
Doc.-No.:	HP-2-ASED-MN-1134		
Meeting place:	EADS Astrium OTN	Chairman:	D. Hendry / S. Idler
Date/Time:	09.12.2005 / 14:00	Secretary	S. Idler
Agenda dated:	PTR Standard Agenda	Close of Meeting:	09.12.2005
Subject:	PTR for Instruments Thermal Behaviour and Straylight Test & Completion of Instrument PLM EQM Level Testing		
Participants:	H. Feuchtgruber (MPE) B. Collaudin (ASP) C. Scharmberg (ESA) D. Hendry (ASED) C. Schlosser (ASED) S. Ilsen (ASED) S. Idler (ASED)	Additional Distribution:	ESA ASP

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☐ Brief-Minutes (except following sheets) ☐ Summary of Results of Sheets 2 till

Conclusion:

The Instruments Thermal Behaviour and Straylight Test has been successfully completed. The test objectives have been fully met. No repeat test is foreseen for EQM.

Herewith also the overall instrument PLM EQM level test program is completed with the exception of the SPIRE EMC test remainders and the PACS and SPIRE SFT He I.

For the warm-up release a dedicated TRR will be hold subsequently to this PTR.

Reference	Results	Remarks
	PTR Agenda: 1. Introduction 2. Identification of Test Item 3. Review of Procedure Variations / Test Data / Test Reports 4. Review of NCR / RFW Status 5. Open Work / Open Actions 6. Completion Status of Instrument PLM EQM Level Testing 7. Conclusion	

Reference	Results	Remarks
	1. Introduction The Instruments Thermal Behaviour and Straylight Test was performed from 05.12.2005 until 09.12.2005. These tests are considered as the last instrument tests on PLM EQM level, apart from the SPIRE EMC test remainders and the PACS and SPIRE SFT He I to be performed in CW 50/2005. The tests comprised the following main steps: • Instrument thermal behaviour test with the following switching sequence: HIFI - PACS - HIFI - SPIRE - HIFI. • HIFI FPU thermal behaviour test with loading the HIFI FPU with predefined power and switching between band 3 and a dummy band. • Background radiation measurements with modulated radiation through the Band 3 LO window using a torch light as heat source and a reflective metal plate as "cold source" in front of the window; and switching on and off the clean room lights. Measurements have been done with PACS in photometry mode. • Background radiation measurements with different heat shield temperatures. Measurements have been done with PACS in spectroscopy mode (several "Planck curves" have been recorded). • Background radiation measurements after cryocover decontamination (heating up to 230 K). PACS in spectroscopy mode (several "Planck curves" have been recorded). • Background radiation measurements with heated cryoharness. The supply lines to the Pt 1000 sensor T253 have been used as "heating lines". The supply current was 50 mA, the total line resistance was 560 Ohms leading to an injected power of 1.4 W. Measurements have been done with PACS in photometry mode.	

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	The related TRR minutes are HP-2-ASED-MN-1132, dated 05.12.2005. In this PTR it will be also decided on the completion of the EQM level instrument test campaign in total (agenda point 6) in order to release the cryostat warm-up and the de-integration of the instrument warm units. As already agreed the formal close out meeting for the instrument PLM EQM level testing will be held at ESTEC in January next year, when all test reports and performance analyses have been delivered and reviewed. **2. Identification of Test Item** **Configuration of instruments H/W** As per TRR (HP-2-ASED-MN-1132). After completion of the thermal behaviour tests the HIFI LSU simulator has been de-integrated (07.12. morning), since no more needed. Also the HIFI RF rack (HIFI SCOE) has been removed. The 10 MHz signal for the ICU is supplied by a dedicated generator installed beneath the PLM. HIFI will be left in stand-by mode during the rest of the EQM test program. **Configuration of instruments S/W** As per TRR (HP-2-ASED-MN-1132). No change during test.	

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	Configuration of facility As per TRR (HP-2-ASED-MN-1132). During the thermal behaviour test dedicated power supplies have been used to supply the HIFI FPU heaters (dummy loads) via t-adapters (details see test procedure and report). For the cryoharness heating one connector at the CVV connector ring was removed and an appropriate adapter was inserted. For details see test report. ## 3. Review of Procedure Variations / Test Data / Test Reports **Procedure variations** During thermal behaviour tests the stabilisation times could be minimised due to relatively short transients. The HIFI FPU thermal tests (step 6.2.13) have been extended: HIFI has been operated also with both polarisations and the de-magnetisation function (high peak dissipation) has been activated. Furthermore additional heat loads (up to 72 mW) have been applied than originally foreseen (using the dummy heaters), in order to allow better characterisation of the thermal impact on L0 and L1 and to see an effect despite of the large mass flow. The sequence of the straylight tests has been changed to 6.4 - 6.3 - 6.5. Reason was to use the very stable cryocover temperature situation as much as possible. Finally it was not a problem to achieve a stable cryocover temperature. For the additional straylight test with the cryoharness heating a dedicated ACS has been generated	

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	(HP-2-ASED-SD-0078), as agreed at the TRR. **Test data** Thermal behaviour tests A large effect of the HIFI operation to PACS and SPIRE L1 has been expected but the observed influence was very little. Reason is that the HIFI FPU EQM built standard deviates considerably from PFM. The thermal tests on L1 showed that the system behaves as expected. Influence of one instrument (incl. cooler recycle) to another is negligible. Influence of cooler recycle to L0 and L1 is as expected. The SPIRE cooler hold time was 45 h without SPIRE operating. The achieved min. evaporator temperature was 276 mK for PACS and 280 mK for SPIRE. Straylight tests No visible variation of straylight through LO windows has been observed. Variation of light input was made simply by alternatively shining with a lamp into the LOU window or covering the window with a shiny metal plate. The straylight variation either was too small to be detected, or is hidden by larger contributions. Thermal Shield 2 temperature variation shows a large effect on the straylight measured by PACS. Variation of Thermal Shield 1 temperature (with Thermal Shield 2 temperature nearly constant)	

Reference	Results	Remarks
	revealed only little straylight variation. This is roughly in line with the findings in the straylight TN. Potential water contamination of the CVV mirrors was tested, by heating these mirrors to above 220 K for about 10 minutes. No change in stray light was observed after this decontamination. It should be noted, however, that the CVV mirrors were at this warm temperature already before until 5.12.05, the test was made on 8.12.05, therefore only 3 days of water contamination can be accounted. The measured pressure inside the CVV was 2*10-8 mbar, which means that a maximum water layer of less than 1 mircometer thickness can have built up in this time, which most likely is too thin to have any effect. An outgasing effect of N2 and H2O has been observed on the isolation vacuum pressure. During the heat-up of the cables in the optical bench no visible change in straylight level was seen with the QLA. The effect on L0, L1 and L2 temperatures could be clearly identified. <u>ASED preliminary assessment</u> " Following the preliminary findings above the measured high absolute straylight level can be explained most likely by one or both of the two following scenarios: • Much higher scattering of the instrument entrance mirrors, caused by severe contamination. Contrary to the CVV mirrors, the instrument entrance mirrors were at cold temperatures all the time since 12.9.05, i.e. about 3 months in total, and therefore could have collected much more water contamination (factor of 30) than the CVV mirrors. Note also that the straylight effect (TIS) goes with about the square of roughness. If the roughness goes with thickness, then the effect onto straylight could be about a factor of 900 higher for the instrument mirrors. However, PACS also explained that severe contamination would probably cause other effects, which would be noted by PACS, if severe. So in total this explanation is unlikely. • Instrument internal reflections mainly at the instrument internal walls are much higher than	

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	expected. This is the more likely case. There is seen a very small bright spot within the PACS FOV, which has proved to be real, because it changes its position on the detector, when the chopper is moved. It indicates that PACS internal reflections are responsible for that spot. It must be a bright spot close to the optical path and close to an intermediate focus, because the only explanation so far for a sharp spot is, that this spot is reflected from near a focus by e.g. the CVV mirrors into the focal plane. Outside of the instrument, all potential point sources are far from any focus, and therefore would cause much more diffuse stray light on the detector. Note: During ILT the cryostat was "dark" and thus no off-axis radiation was existing. If the thermal radiation arriving in total at the instrument entrance from e.g. Thermal Shield 2 is compared with the thermal radiation from M1 + M2, then we find that the thermal radiation from the Thermal Shield 2 is much higher, more than a factor of 1000. The reason is 1st the much larger steradian seen from the instrument entrance, and 2nd the much higher emissivity of the Thermal Shield 2, which overcompensates the somewhat lower temperature by more than a factor of 10. The instrument internal attenuation of off-axis radiation therefore must be at least a factor of about 10-5, otherwise it will contribute significantly to the overall straylight. A final ASED assessment can be made only after further analysis and receipt of the instrument post processed data. " PACS do not necessarily agree with the preliminary ASED assessment and will provide their own input following off-line analysis. **Test reports** During the test an as-run procedure as regards instrument operation and facility setups has been	

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	compiled by ASED. This report will be finalised within the next days. In addition, MPE will write a separate report related to the test data analysis (post processing). Preliminary analysis will start next week. Completion of report planned in January 2006. **4. Review of NCR / RFW Status** The NCR status prior to start of the tests is as per the TRR (HP-2-ASED-MN-1132). The following new NCR's have been raised during the test: <u>ASED-NC-1831 DEC/MEC not responding to commands</u> DECMEC stopped accepting telecommands, telemetry packets are delivered. Recovery by switching off all PACS units with the exception of BOLC in order not to loose the cooler recycle. MPE to investigate. NCR open. **5. Open Work / Open Actions** The following open work has been identified: • Completion of thermal analysis (impact of temperature variations on instrument performance to be analysed and assessed by instrument teams) • Completion of straylight analysis by ASED with support of instrument teams • Finalisation of test report by ASED (operational aspects, facility report). • Compilation of test report by instruments (performance aspects).	

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	• Processing of NCR's. Inputs shall be provided prior to 31.01.2006 at the latest. Work to be done during warm-up and instruments de-integration will be defined in a dedicated TRR prior to warm-up. Basic planning has already been agreed during the telecon on 06.12.2005. **6. Completion Status of Instrument PLM EQM Level Testing** All PLM EQM level testing has been successfully completed with the exception of the following items: • Completion of SPIRE EMC test • SFT He I for PACS and SPIRE Note: Prior to warm up the PACS grating launch lock has to be activated. **7. Conclusion** The Instruments Thermal Behaviour and Straylight Test has been successfully completed. The test objectives have been fully met. No repeat test is foreseen for EQM. Herewith also the overall instrument PLM EQM level test program is completed with the exception of the SPIRE EMC test remainders and the PACS and SPIRE SFT He I. For the warm-up release a dedicated TRR will be hold subsequently to this PTR.	

Action Item List

No.:	Description:	Due Date	Originator Comp./Pers.	Actionee Comp./Pers.	Source	Completion

ANNEX 1