ALCATEL SPACE	HERSCHEL/PLANCK	REF. : H-P-ASP-MN-4392	
		DATE : 29-01-2004	PAGE : 1/50
COMPTE RENDU DE REUNION / *MINUTES OF MEETING*		LIEU / *PLACE* : CANNES	

OBJET / *PURPOSE* :

EMC WG meeting #17 - HERSCHEL

CLASSIFICATION :

PARTICIPANTS *ATTENDEES*	SOCIETE *FIRM*	SIGNATURE *SIGNATURE*	PARTICIPANTS *ATTENDEES*	SOCIETE *FIRM*	SIGNATURE *SIGNATURE*
~~Bert-Joost van LEEUWEN~~	SRON		~~Martin von BERG~~	MPE	
Albert P.NABER	SRON		Clemens KALDE	ASTRIUM	
~~Doug GRIFFIN~~	RAL		André LUC	ASP	
~~John DELDERFIELD~~	RAL		~~Bob HIBBERD~~	ASP	
Bernard JACKSON	ESTEC		Dennis BOSCHETTI	Alenia	
Filippo MARLIANI	ESTEC		JOSEPH GALLAGHER	ASP	
REDACTEUR / *WRITTEN BY* :					

CONCLUSION :

NOTE: FOLLOWING THE COMPLETION OF THE EMC WG#17, A PRESENTATION WAS RECEIVED FROM SPIRE. THIS PRESENTATION HAS BEEN ATTACHED TO THESE MINUTES AS ATTACHMENT #4

DISTRIBUTION : PARTICIPANTS / *ATTENDEES*	POUR ACTION : *FOR FURTHER ACTION*
	POUR INFORMATION : *FOR INFORMATION*

APPROUVE PAR / *APPROVED BY*				
NOM / *NAME*				
SIGNATURE / *SIGNATURE*				

SUITE / CONTINUED :

ACTION

Review of actions from EMC WG #16.

AI #1. ASTRIUM STATED ALL EXTERNAL HARNESS ARE OVERSHIELDED — ONLY NON CONFORMANCE IS SPIRE HARNESS WHICH HAS GORE-TEX VISIBLE — UNDER GORE-TEX IS AN OVERALL SHIELD — DISCUSSION OF THE CONSTRUCTION OF THE SPIRE HARNESS RESULTED IN A ADDITIONAL ACTION BY ASTRIUM TO CONTACT SPIRE TEAM AND CONFIRM THE NECESSITY OF THE GORE-TEX OVERSHIELD

ASTRIUM. 14/07/2004

AI#2. ASP CONFIRM THAT THE CRYOSTAT COVER IS CLOSED DURING THE TRANSFER ORBIT. — ~~Redundant~~ ELECTRICAL CONTACT OF THE COVER IS STILL NOT A FLIGHT ITEM — FURTHER ACTION IS PLACED ON ASP TO CONTINUE TO INVESTIGATE

ASP. 14/07/2004

AI#3 ASTRIUM PLACED MEASURING ANTENNA INTO THE CLEAN ROOM — PERFORMANCE TEST CONDUCTED — LEVELS MEASURED ARE LOW BUT SEVERAL NB SPIKES MEASURED WHICH ARE BELIEVED TO BE EXTERNAL MOBILE TELEPHONES — WITH THE EXCEPTION OF THESE EMISSIONS THE BACKGROUND NOISE LEVEL FALLS BELOW THE REQUIRED THRESHOLD. — MEASURED GRAPHS ARE ATTACHED TO THESE MEETING MINUTES. — FACILITY IS THEREFORE CONFIRMED TO BE COMPATIBLE WITH HI-FI TEST.

ACTION: CLOSED (FOR ASTRIUM) PENDING HIFI CONFORMANCE 01/03/2004

SUITE / CONTINUED :

ACTION

AI #4. COMMENTS RECEIVED TO ASTRIUM PRESENTATION;

HI-FI COMMENTED THAT CE/CS COMMON MODE TEST CURRENT ON SIGNAL BUNDLES IS MISSING FROM THE TEST PLAN — PARTICULARLY ON THE CMO HARNESS — HI-FI TO CONFIRM THE DETAILS OF THE TEST MEASUREMENT REQUIRED. AND IF THE TEST IS REALLY REQUIRED OR IF THE RS TEST IS SUFFICIENT.

HI FI 01/03/2004

AI #5 ASTRIUM CONCERNED ABOUT THE UNCERTAINTY OF THE MEASUREMENT RESULT AND AS A RESULT ARE NOT PROPOSING A MEASUREMENT. — HIFI RAISED CONCERN THAT IF A MEASUREMENT IS NOT PERFORMED THEN THERE IS A SIGN. FLIGHT RISK TO THE INSTRUMENT PERFORMANCE.

ASTRIUM TO CONTACT ESTEC OUTSIDE OF MEETING TO DISCUSS MEASUREMENT DETAILS /FEASIBILITY

ACTION CLOSED

SUMMARY OF EMC STATUS

HIFI — NO NEW STATUS CHANGE
— PLAN ISSUED
— TEST PROCEDURES ARE IN PROCESS.

PACS — NO REPRESENTATIVE

SPIRE — NO REPRESENTATIVE

SUITE / CONTINUED :

ACTION

EPLM EMC TEST DEFINITIONS

ASTRIUM PROVIDED LIST OF QUESTIONS (ATTACHED TO THESE MINUTES) — TO BE FORMALLY SENT TO THE INSTRUMENTS VIA BERNARD COLLAUDIN (INSTRUMENT LEGISLATIVE AT ASP) (NOTE: COMPLETE E-MAIL FROM ASTRIUM TO BE ATTACHED).

#1-FI/PACS/SPIRE 15/03/2004

ACTION PLACED ON THE INSTRUMENTS TO PROVIDE COMMENTS TO THESE QUESTIONS

ASTRIUM STATED THAT CE/CS TESTS WILL NOT BE MADE ON EQM LEVEL DUE TO THE LACK OF PCDU AVAILABILITY ON THE PLATFORM. CONCERN IS RAISED ON BOTH INSTRUMENT AND PLATFORM SIDE THAT THIS INCREASES RISK.

ASTRIUM CONCERNED ABOUT THE GROUNDING/BONDING OF THE AVM NOT BEING TRULY REPRESENTATIVE, MAY IMPACT THE VALIDITY OF THE EMC TEST RESULTS — LABORATORY POWER SUPPLIED USED

PACS GROUNDING CONCEPT IS NOT CLEAR AND SHOULD BE INVESTIGATED FURTHER

UPDATE OF HERSCHEL GROUNDING DIAGRAM REQUIRED FOR DELIVERY AT CDR.

ASP. 30/03/2004

ALSO THAT PACS AND SPIRE WILL NOT HAVE COMPATIBLE POWER SUPPLIES (LABORATORY SUPPLIES).

11D-A CLARIFICATION OF RE/RS TEST LEVEL

~~UNCLEAR~~

IN ABSENCE OF PACS REPRESENTATIVE, THE DISCUSSION OF THE WG CONCLUDED THAT THE RE/RS LEVELS ARE APPLICABLE TO THE WHOLE INSTRUMENT. ANY SUB UNIT TESTING WILL BE SUBJECT TO PACS DEFINED TEST LEVELS TO ENSURE THEIR COMPLIANCE TO THE OVERALL INSTRUMENT REQUIREMENT.

M052-1

SUITE / CONTINUED :

ACTION

CE/CS COMMON MODE CURRENT ON SIGNAL BUNDLES

THIS ITEM PREVIOUSLY DISCUSSED AND MINUTED UNDER THE ITEM "ERLM EMC TEST DEFINITIONS"

ESD ARC DISCHARGE REQUIREMENT — HIFI TO ONLY TO TEST QM — NO TEST ON FM.

HI FI PROPOSAL TO TEST ONLY BOXES INDIVIDUALLY — NOT INTERCONNECTED — GROUNDING OF THE QM IS NOT SIMILAR TO THE REAL CONFIGURATION — NOT TOTALLY REPRESENTATIVE THEREFORE NOT VALID RESULT.

TEST ~~COULD~~ BE PERFORMED AT CQM LEVEL WHERE HARNESS/GROUNDING IS THEN REPRESENTATIVE

HI FI IS COMPLETELY 'OFF' DURING TRANSFER PHASE. — SO TESTED THIS WAY.

ASTRIUM ~~COULD~~ PERFORM ESD TEST AT CQM

SPIRE AND PACS TO BE CONSULTED ~~TO~~ BECAUSE THEY WILL BE INTEGRATED AT CQM.

ASP. 7/02/2004.

HI FI TO PROVIDE TEST PROCEDURE DETAILS TO ASTRIUM.

HIFI 15/03/2004

ASTRIUM TO INVESTIGATE THE IMPACT ON CQM TESTING ONCE THE DETAILS ARE PROVIDED BY HI-FI

ASTRIUM 30/03/2004

EXTERNAL CABLE SHIELDING

ITEM COVERED UNDER REFERENCE TO PREVIOUS ACTION ITEM #1. COMMENTS

SUITE / CONTINUED :

ACTION

ACC EMC TEST RESULTS.

ALENIA PROVIDED A SUMMARY OF THE TEST RESULTS OF THE RECENT TEST CAMPAIGN OF THE ACC.

DATE OF NEXT HERSCHEL EMC WG MEETING

17/06/2004 IN CANNES.

ALCATEL SPACE	**LISTE D'ACTIONS** / *ACTION ITEM LIST*	REF. : H-P-ASPI-MN-4392
	OBJET / *PURPOSE* : **HERSCHEL/PLANCK**	DATE : 29–01–2004
		PAGE : 7/50

Origine	ACTION			DATE
	N°	Description	Responsable / *Responsible*	Echéance / *Due*
	1	To contact SPIRE and confirm the necessity of GORE-TEX overshield	ASTRIUM	14/02/2004
	2	Further investigate electrical contact of cryostat cover in transfer orbit	ASP	14/02/2004
	3	To confirm that the measured clean room noise floor (ambient) is sufficiently low to allow the required HI-FI tests to be conducted	HI-FI	01/03/2004
	4	To confirm details of signal line CE/CS measurement required for HI-FI, and to further evaluate if these requirements may be satisfied using the data gathered during the RS test.	HI-FI	01/03/2004
	5	Instruments to provide formal comments to the operational questions raised by ASTRIUM	HI-FI/PACS/SPIRE	15/03/2004
	6	Preparation of the update of the HERSCHEL grounding diagram, prior to delivery at CDR	ASP	30/03/2004
	7	SPIRE and PACS to be consulted regarding the impact of performing an ESD test on HI-FI during CQM test	ASP	07/02/2004
	8	HI-FI to provide ASTRIUM with procedure details for a CQM level ESD test	HI-FI	15/03/2004
	9	ASTRIUM to investigate the impact on CQM testing, once ESD test details are provided by HI-FI	ASTRIUM	30/03/2004

ALCATEL SPACE

Herschel

EMC /Power WG meeting #17 - Cannes, 29 January 2004

AGENDA

- Review of actions from previous EMC WG meeting
- Summary of Instrument EMC status
- EPLM EMC test definitions
- IID-A clarification of RE/RS test levels
- CE/CS common mode current on signal bundles
- External Cable shielding
- ACC EMC Test Results
- AOB

ALCATEL SPACE

Herschel

EMC /Power WG meeting #17

▼ Review of actions from previous EMC WG #16

	LISTE D'ACTIONS / ACTION ITEM LIST		REF. : H-P-ASPI-MN
ALCATEL SPACE	OBJET / PURPOSE : HERSCHEL/PLANCK		DATE : 18-9-2002
			PAGE : 7/9

Origine	ACTION N°	ACTION Description	Responsable / Responsible	DATE Echéance / Due
	1	TO VERIFY THAT ALL EXTERNAL HEATERS IS SWITCHED OFF	ASTRIUM	15/10/02
	2	VERIFY THAT CRYOSTAT COVER IS CLOSED DURING TRANSFER	ASE	30/9/02
	3	CHECK IF FACILITIES CAN BE USE COMPATIBLE WITH AIT HEATING	ASTRIUM	15/10/02
	4	CONFIRM ABSENCE REDUNDANCY OF FTC SENSING	ASTRIUM/ESA/ASE	30/9/02
	5	DETAIL HOW CRYOGENIC SHIELDING ERRORBARS CAN BE HANDLED	ASTRIUM	15/10/02

ALCATEL SPACE

Herschel

EMC /Power WG meeting #17

- Summary by each Instrument of their EMC status
  - Test plan
  - Compliance matrix
  - Analyses
  - Test Results

ALCATEL SPACE

Herschel

EMC /Power WG meeting #17

- EPLM EMC test definitions
  - Reference tests before and after EMC test
  - Modes of operation for Emission and Susceptibility tests
  - Duration of susceptibility test
  - Definition of susceptibility criteria
  - Constraints on the test duration
  - Duration of off-line evaluation after susceptibility test

ALCATEL SPACE

Herschel

EMC /Power WG meeting #17

- IID-A clarification of RE/RS test levels
  - Are the RE/RS test levels valid for the complete instruments
  - What test levels are applicable to instrument sub-units
  - Is there any safety margin applicable to sub-unit tests

ALCATEL SPACE

Herschel

EMC /Power WG meeting #17

- CE/CS common mode current on signal bundles
  - Missing from Astrium test plan
  - Cryo-Harness tests cannot be performed at instrument level
  - How are the susceptibility test levels to be defined (very low levels)

ALCATEL SPACE

Herschel

EMC /Power WG meeting #17

- ESD Arc discharge requirement clarification
  - Requirement, IID-A §5.14.3.13

    To be interpreted by HIFI as follows;

    Degradation of performance is tolerated during the discharge and "short" thereafter

  - Proposed that the test is to be performed on QM units only in a stand alone configuration, with the instrument switched OFF

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EMC /Power WG meeting #17

- External Cable shielding
  - For harness outside cryostat overall shielding not possible
  - Harness under MLI not exposed to plasma

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EMC /Power WG meeting #17

- ACC EMC Test Results
  - Summary of the EMC test results obtained for the ACC

ALCATEL SPACE

Herschel

EMC /Power WG meeting #17

- Any Other Business
  - Open discussion of any related topics
  - Review of the meeting actions

ATTACHMENT 1

MEASUREMENT OF CLEAN ROOM EMISSIONS

EADS ASTRIUM — EMV und Messtechnik

EMC Facility Report

Project: Herschel — Document No.: HP-2-ASED-TN-0087 — Issue: 1 — Date: 27.10.2003

TITLE: RE E-Field Environment Check - EMC Facility Report -

PROJEKT: Herschel

PREPARED BY: K. Karnetzky — DATE: 27.10.2003

CHECKED BY: K. Tigges — DATE: 28.10.2003

PROJEKT MANAGEMENT: C. Kalde — DATE:

DATE:

TEST LOCATION: Cleanroom H11, Astrium GmbH Friedrichshafen

DATE OF TEST: 23. Oct. 2003

TEST ENGINEER/ OPERATOR: K. Karnetzky

Filename: Facility Report Herschel RE Reinraumcheck internal use only.doc — Blatt/Sheet: 1 — Anzahl/ 18

EADS ASTRIUM

EMV und Messtechnik

Project: Herschel
Projekt:

Title:
Titel:

Document No.:
Dokument No.: HP-2-ASED-TN-0087

Issue:
Ausgabe: 1

Date:
Datum: 27.10.2003

EMC Facility Report

Table of Contents:

EADS ASTRIUM — EMV und Messtechnik

Projekt: Herschel — Titel: EMC Facility Report — Ausgabe: 1 — Datum: 27.10.2003

Dokument No.: HP-2-ASED-TN-0087

1 DAILY REPORT

1.1 Objective

Objective of this test is to check the electromagnetic environment inside the clean room under nominal conditions.
The result can be used to decide whether it makes sense to test RE E-field inside the facility up to define the minimum RS level required to withstand for electronic equipment operated in this environment.

1.2 Radiated NB E- Field Emission, Clean room ambient check (2 – 8 GHz)

1.2.1 Test Results Summary

The Radiated Emissions measurements performed in the Astrium GmbH cleanroom H11 showed the electrical field noise floor in the range from 20 dBµV/m (2GHz) to 34 dBµV/m (8GHz) with a low noise amplifier connected direct to the antenna and the spectrum analyzer settings due to §1.2.4. Several peaks could be observed with a field strength up to 56dBµV/m (3.8GHz). However some of these peaks were not steady state, that means they disappeared and reappeared during the measurements. The most significant frequencies were 3.24 GHz, 3.78 GHz, 4.64 GHz and 5.43 GHz. Potential sources could be amongst others the wireless phones in the cleanroom and/or the MetOp payload module.

1.2.2 Test Equipment List

Equipment:	Manufacturer:	Type:	Inventar No:	Next Cal
Spectrum Analyzer	H.P.	8566 B	DS 30898	
Preselector	H.P.	85685 A	DS 10001483	13.10.04
Amplifier, Pre-, 0.1 GHz - 20 GHz	MITEC/Astrium	LNA 3 (AFS 44)	10003401	02. Sept. 04
Fernspeisevekhe, 30 Hz - 40 GHz	MITEC/Astrium	FSP 1 (ARN 5110)	10003402	02. Sept. 04
Antenna, Horn, (1 - 18) GHz	Eaton	96001	DS 33323	

EADS ASTRIUM — EMC Facility Report — EMV und Messtechnik

Project: Herschel — Test Title: — Document Nr: HP-2-ASED-TN-0087 — Avoidance Issue: 1 — Datum: 27.10.2003

1.2.3 Task Record Sheet

Date:	23.10.2003
Test Article:	Astrium ED, Friedrichshafen Cleanroom 1C
Project:	Herschel
Test Engineer:	Klaus Kamlebky
Proj. Support:	Clemens Kalde
Time:	**Comments:**
23.10.2003 13:20	RE E-field, 2.4 GHz - 8 GHz Activities in the cleanroom: - MetOp PLM FM2 operational - CryoSat, mechanical integration only

General comment:
Since the electric field environment within the cleanroom is not stable, measurements in same antenna position and polarisation were repeated, to give an impression of the repeatability of the measurements.

Antenna **position 1**, southern part of the cleanroom, antenna in horizontal and vertical polarisation, antenna pointing towards control room.

FD plot 01, horizontal polarization
FD plot 02, vertical pol.
FD plot 03, hor. (repeated)
FD plot 04, hor. (repeated)
Foto no's: ant_pos1_1 ... _3

Antenna **position 2**, northern part of the cleanroom, antenna in horizontal and vertical polarisation, antenna pointing towards control room

FD plot 05, hor. pol.
FD plot 06, vert. pol.
FD plot 07, vert. pol. (rep.)
FD plot 08, hor. pol. (rep.)
Foto no's: ant_pos2_1 ... 2_3

Antenna **position 3**, northern part of the cleanroom, antenna in horizontal and vertical polarisation, antenna pointing towards MetOp PLM (to south)

FD plot 09, hor. pol.
FD plot 10, vert. pol.
FD plot 11, vert. pol. (rep.)
FD plot 12, hor. pol. (rep.)
Foto no's: ant_pos3_1 ... 3_3

Filename: Facility Report "Facility Report Herschel RE Rohrausmessbock antenna use only.doc" — Blatt/Sheet: 4 von/of 16

EADS ASTRIUM — EMC Facility Report — EMV und Messtechnik

Project: Herschel — Test Type: — Document No.: HP-2-ASED-TN-0087 — Issue: 1 — Date: 27.10.2003

1.2.4 Spectrum Analyzer Setup

EMI-TEST
TEST SETUP TABLE

Library File: RE E NB 2.0-8.0 GHz LNA3

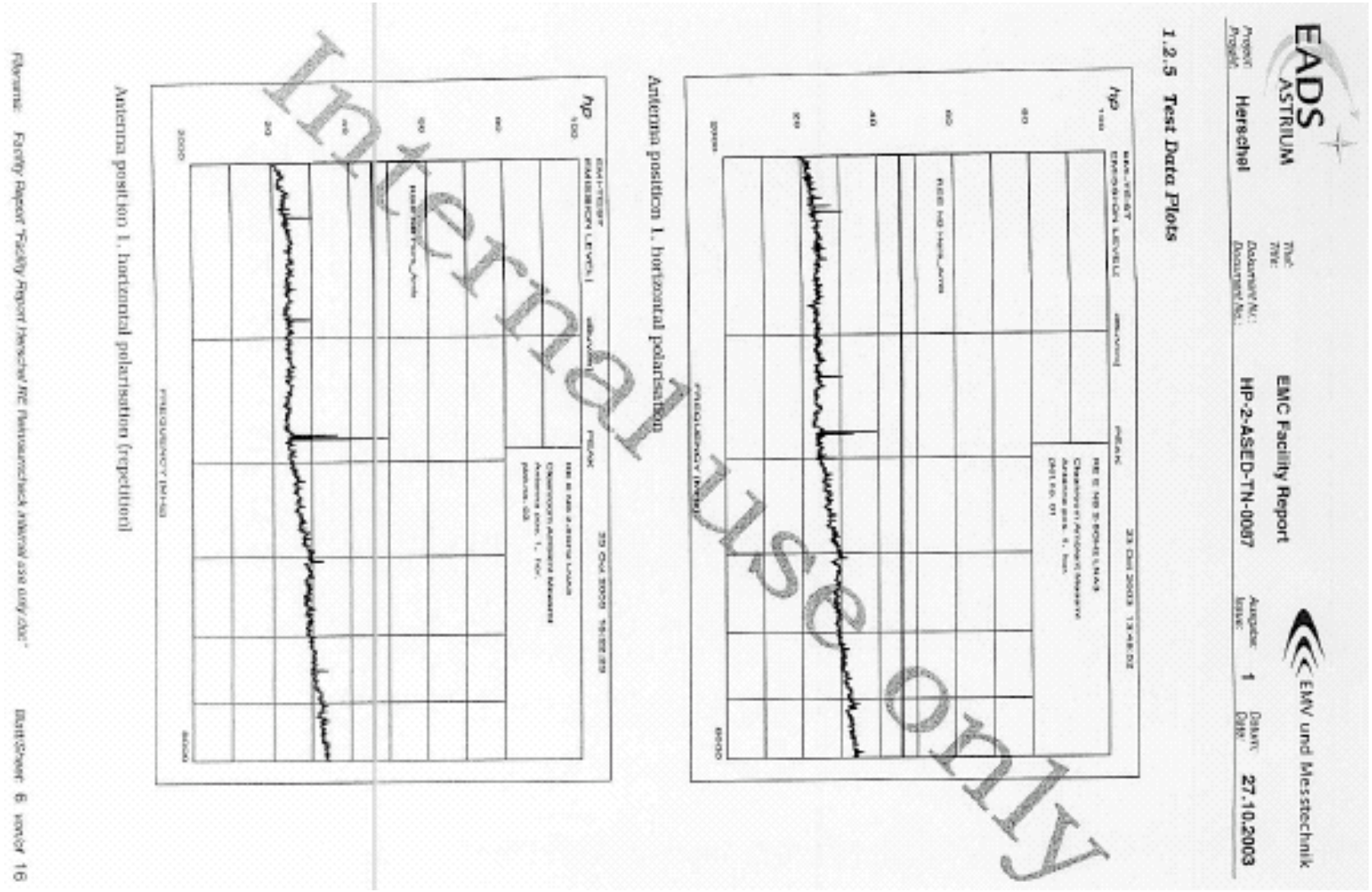
Display Title:	RE E NB 2-8GHz LNA3
Units Label:	dBuV/m
Disp Ref Lvl (dB):	100
Test Type:	PEAK
Freq Uncert. (%):	.5
Min Meas Time/MHz:	.015

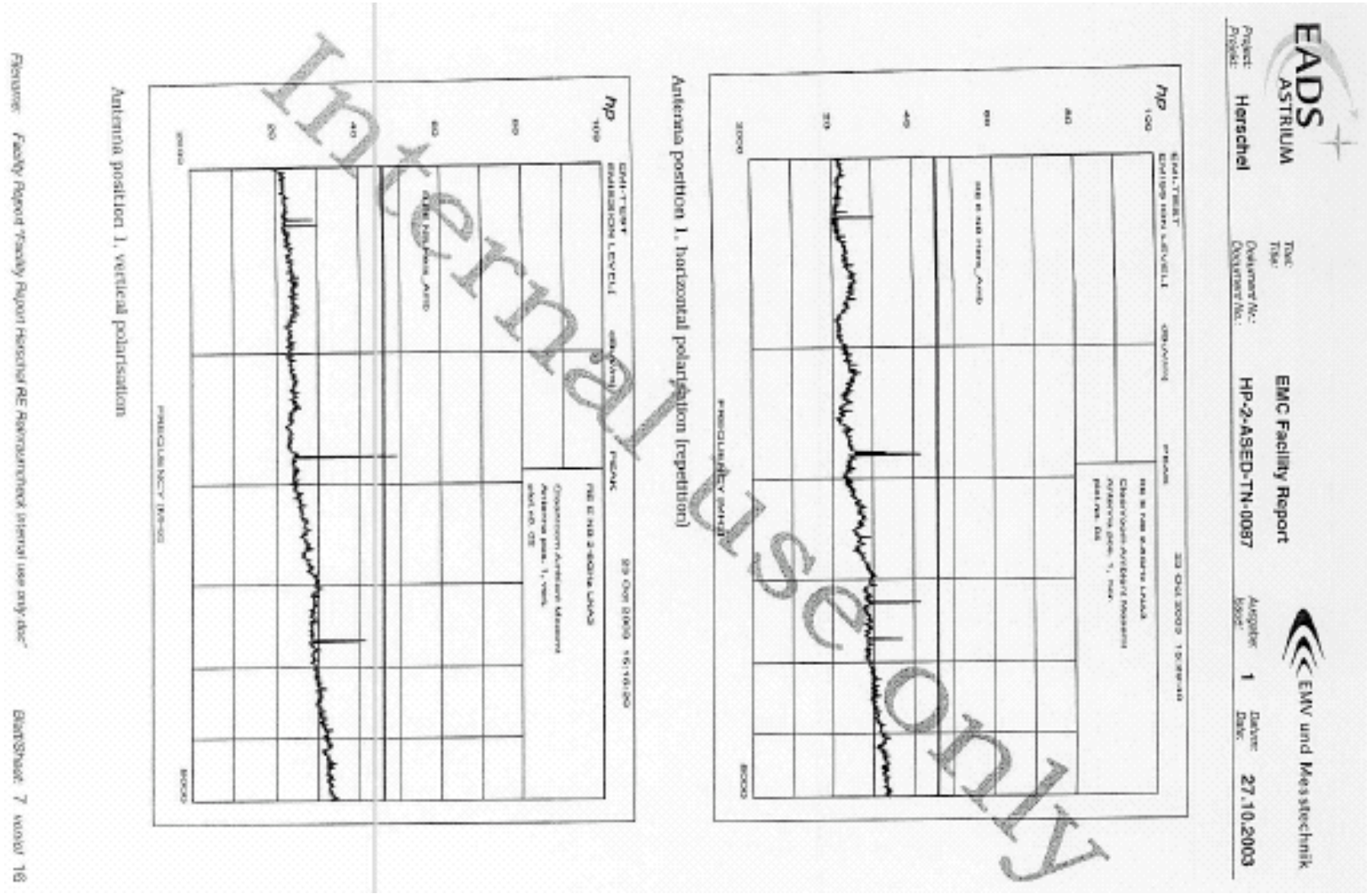
Range 1 of 1

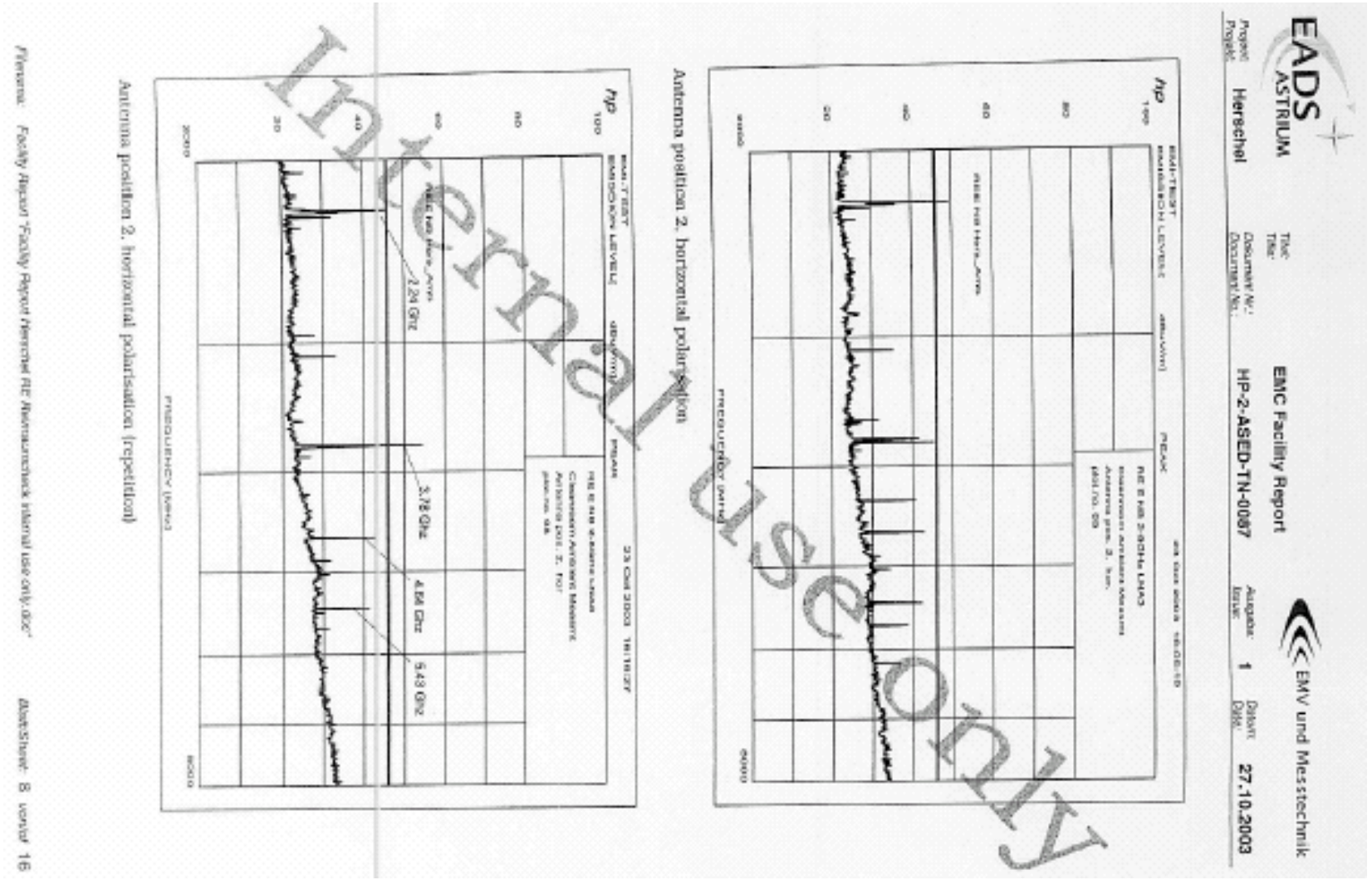
Start Freq(MHz):	2000
Stop Freq (MHz):	8000
Transducer:	EATON HORN ANT
Gain/Loss:	FSP1+HF016+LNA3 1-18GHz
SA Input:	RIGHT
Preset/Inputs:	BYPASS
Quasi-Peak Bw:	BYPASS
SA Res Bw (Hz):	100000
Video Bw (Hz):	300000
Ref Lvl (dBuV):	80
Int Atten (dB):	0
Preset Atten:	0
Ext Atten (dB):	0
# Setups:	1
# Sweeps/Setup:	1
Msg,Sub,Cont:	MESSAGE
Line #1 :	Preselector Input Right
Line #2 :	

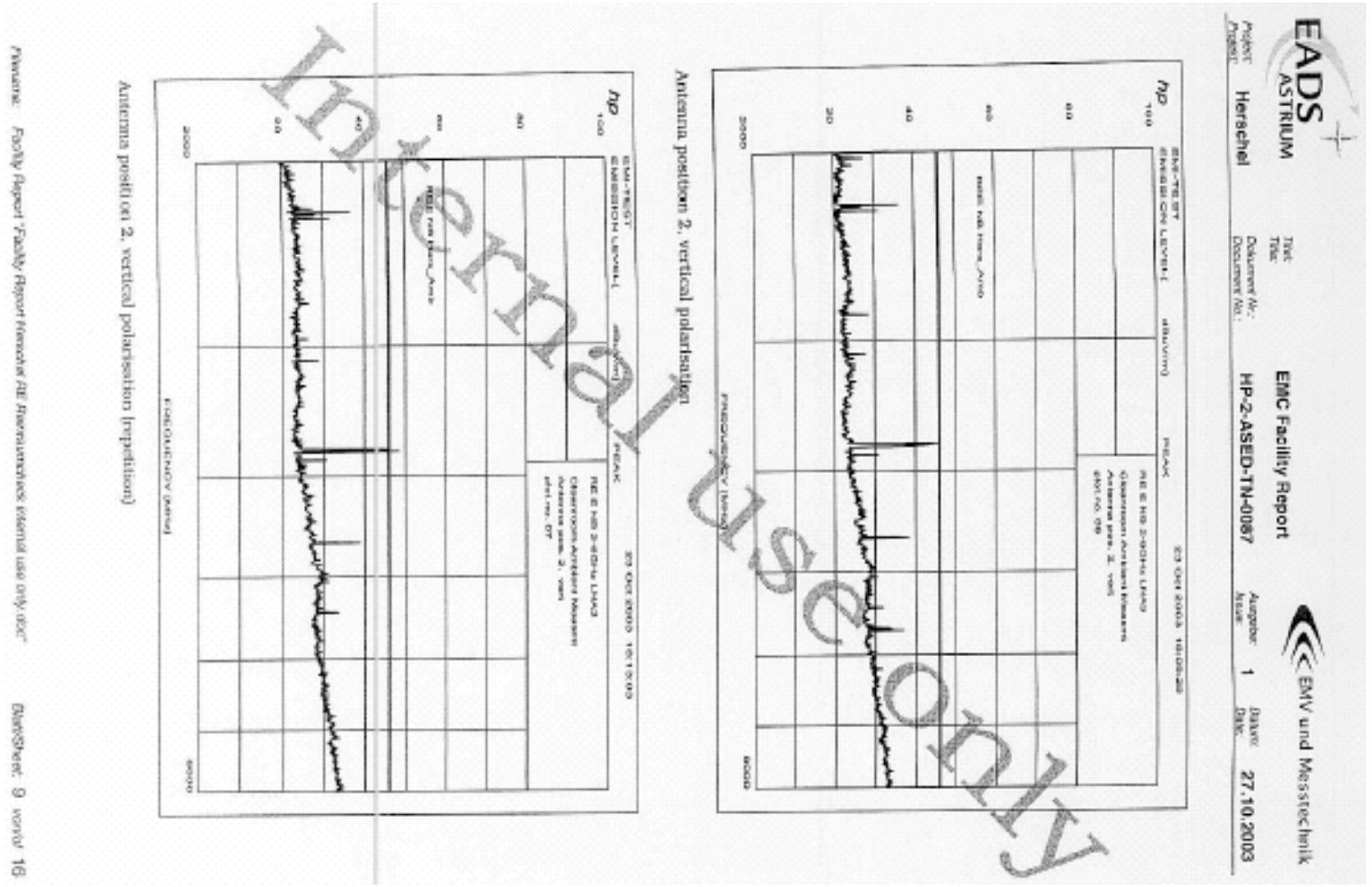
Limit #1 Label:	RBE NB Hers_Amb
Limit #2 Label:	NONE
Limit #3 Label:	NONE

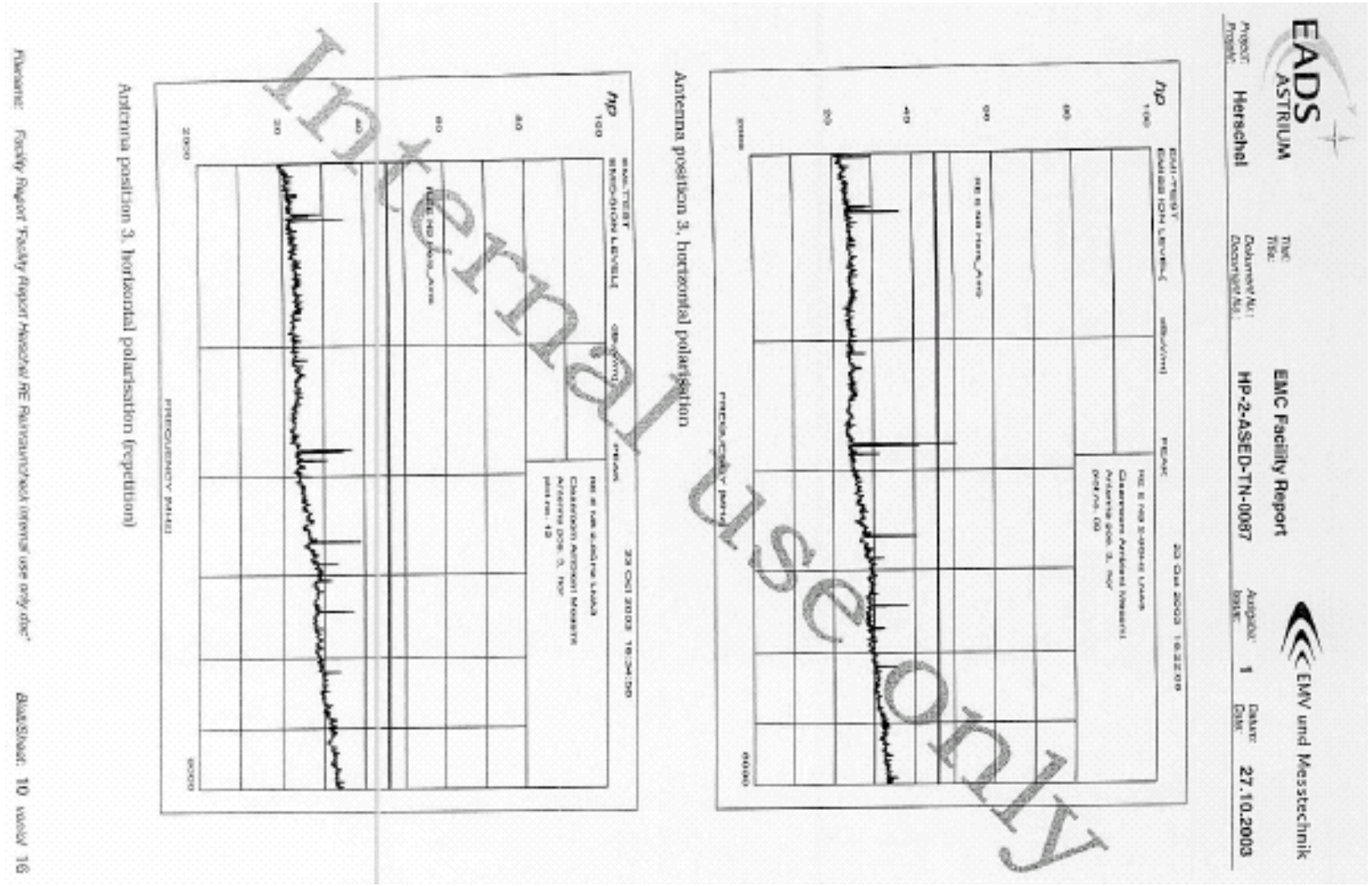
Filename: Facility Report "Facility Report Herschel RE Reinraumcheck internal use only.doc" — Sheet: 5 von/of 16

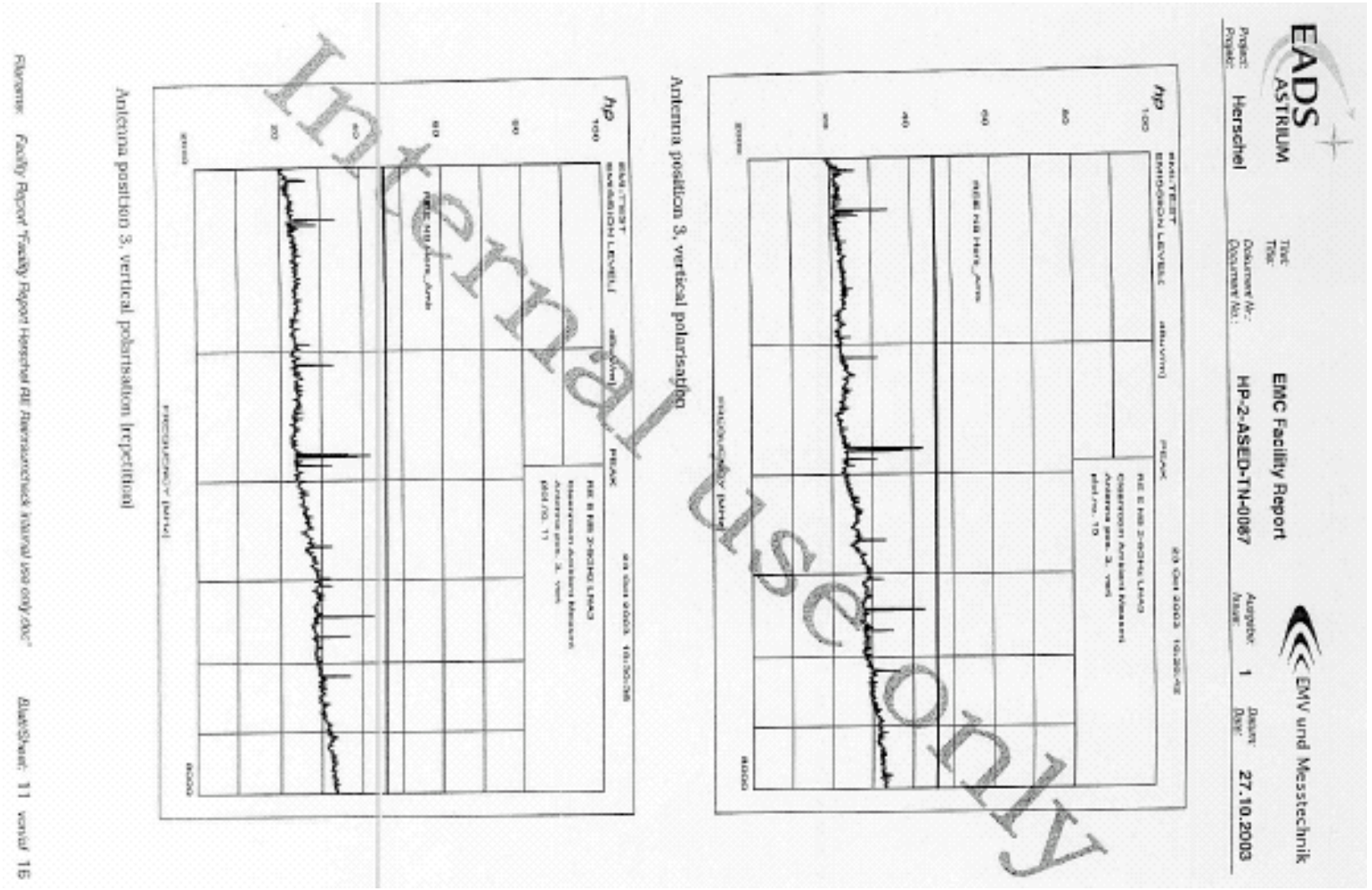












ATTACHMENT 2

ASTRIUM – REQUEST FOR INFORMATION FROM INSTRUMENTS

Subject: HERSCHEL EPLM EMC Test Definitions

In order to define the EMC tests on the HERSCHEL EPLM in more detail and in order to be able to give a first good estimate of the test duration and to allow a more detailed test planning you are kindly requested to answer the following points related to the operation and performance of the HERSCHEL scientific instruments HIFI, SPIRE and PACS under EMC test conditions.

1. Is a reference test necessary before and after each EMC test? If yes please provide a clear justification. Which kind of test is required (please describe in detail)? How much time would this reference test take.

2. Please define the mode of operation for emission tests and for susceptibility testing (A HIFI mode for the EMC tests have already been proposed in the e-mail from Albert Naber to Siegmund Idler 10.07.03).

3. How long should the EPLM be subjected to the EMI during susceptibility testing after performance data can be gathered? 1 second? I.e. can the performance data be obtained every second?

4. Which kind of performance data shall be gathered during susceptibility testing? Please provide a list and define for each parameter the respective success criteria.

5. Which kinds of constraints exist w.r.t. the EMC test duration. E.g. cooler recycle constraints? Is some kind of an overall calibration necessary after a certain time? Durations?

6. How long will an off-line performance evaluation take for one EMI frequency step (after susceptibility test)?

Please provide the answer to the above points for the EMC Workgroup Meeting.

Thank you in advance.

With respect to the Action Items from previous WG meeting the following can be stated:

AI#1: Overall Cryo-harness shield:

- Each outer cryo harness is an electrically conductive shielded.
- Spire cable bundles routed over the U-shaped rail which is grounded to the CVV at the upper mounting interface. These bundles are protected in addition by Gore-Tex braids, exposed to the plasma.

AI closed

AI#3: Astrium Facility

The measurement has been performed and the result has been provided (ref. email Kalde-Jackson/Luc, 29.10.03).

AI closed

AI#5: CVV Shielding effectiveness.

Astrium confirm that the measurement of the shielding effectiveness is regarded unfeasible due to constraints of CVV internal antennas w.r.t. measurement repeatability and measurement accuracy as proven by HIFI measurements already on much more simplified structural cavity than the CVV would be. Refer to "E-field inside the MSA" measurements of HIFI, as attached to EMC Work Group Meeting 11, HP-ASPI-MN-306, 29.08.2001.

AI closed

Misc.: CE/CS on PLM EQM:

It is understood that CE tests on signal lines are not required (ref. H-P-ASP-CR-0417). W.r.t CS/CE tests on primary power lines, we understand that the primary power side of the EQM instruments is not flight representative so that those tests will not make sense. Also under consideration of the time needed for the RS test, CE/CS tests on PLM EQM are no more planned

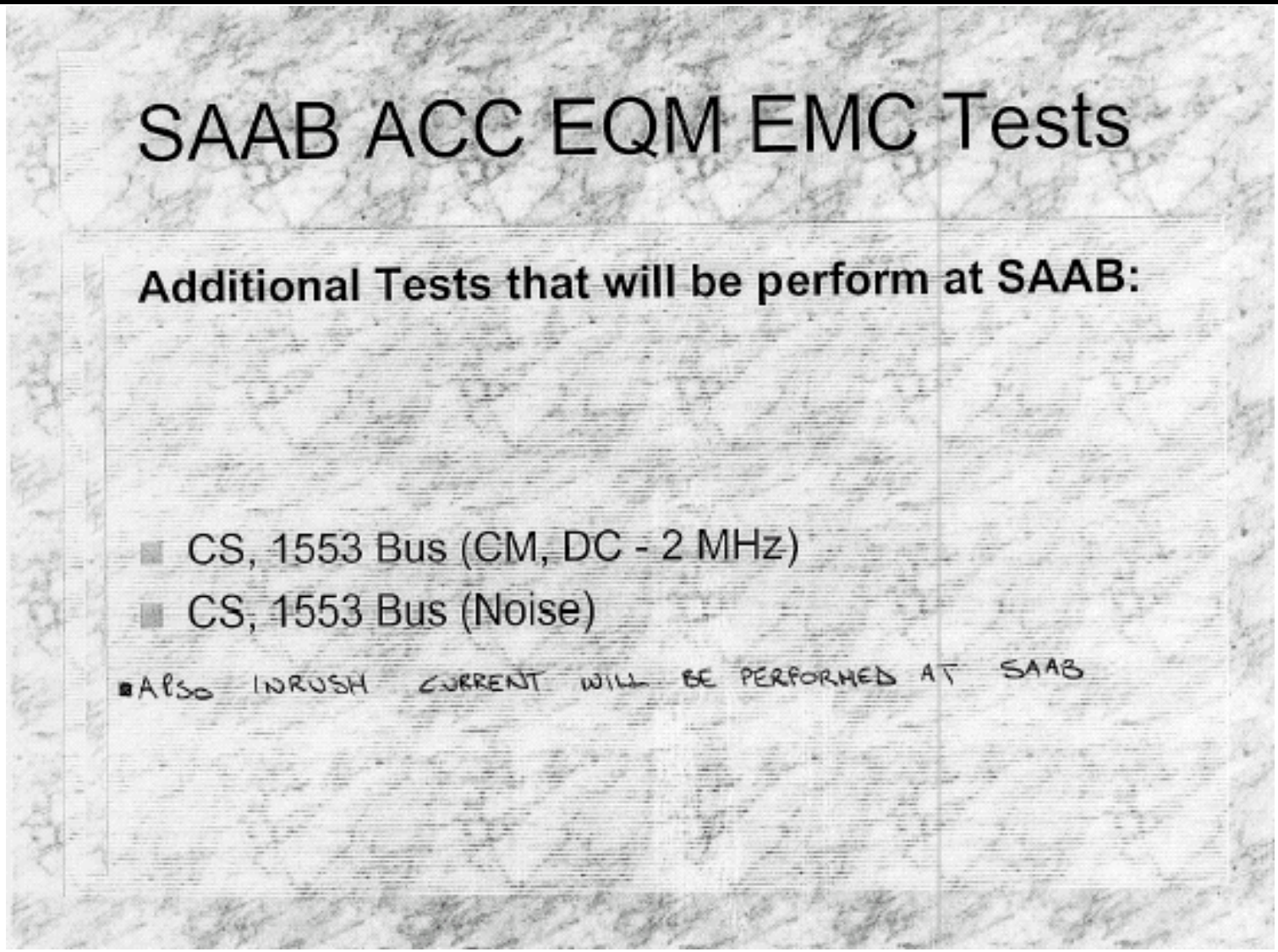
ATTACHMENT 3

ALENIA – SUMMARY OF ACC EMC TEST CAMPAIGN

SAAB ACC EQM EMC Tests

Tests performed:

- RE E-Field (14 kHz - 1 GHz)
- RE H-Field (30 Hz - 50 kHz)
- RS E-Field (14 kHz - 18 GHz)
- RS H-Field (30 Hz - 50 kHz)
- RS H-Field DC
- ESD
- CE, Power Line, BB & NB
- CS, Power line, DM (30 Hz - 50 MHz)
- CS, Power line, CM (30 Hz - 50 MHz)
- CS, Power line, transient, DM & CM
- CE, Signal Lines, DM & CM
- CS, Signal Lines, CM



SAAB ACC EQM EMC Tests

Test Campaign Summary:

Differences between EQM and FM:

- Eight alarm inputs are located in the same connector on each RM (J033 and J043). In Flight condition, five for Planck and four for Herschel of these ALMs will come from the ACC (J132 and J135) and two will come from the umbilical (others are spares).
- All the Harness is without any shielding (with the exceptions of ALMs).

Differences from the Test Procedure:

- EMON-S has been reduced, for all susceptibility test to shorten the cycle time. Two sub-tests were removed (the 1553 Bus Controller and High Priority Command Ones.)
- EMON-E has been expanded for all emission tests adding the flow control valve sub-test.

SAAB ACC EQM EMC Tests

Test Campaign Summary (Cont'd):

- During the first run, the RE-E Field test has been performed by using unshielded cables. Test revealed peak at 16 MHz of around 62-64 dBuV/m (requirement < 50) and some peaks in the region of 420-480 Mhz (Ariane notch) of around 42-43 dBuV/m (requirement < 35 dBuV/m).
- Four 16 MHz oscillators are present in the ACC – one on each PM and one on each RM.
- Measurements on individual cables showed that the main problem was the presence of the 16 MHz on the cables connected to the RM.
- Experiments with overall shielding (metal foil) reduced the peaks in the Ariane notch to only 1-2 dB above the requirement.

SAAB ACC EQM EMC Tests

Test Campaign Summary (Cont'd):

Other Points to be investigated:

- **CS, Power Line, DM, 30 Hz – 50 MHz:** One failure was reported by EMON-S at around 4.3 MHz during test on COLD POWER LINE. The acquired value on AAD1 was 1 uA below the expected. Test was re-run from 6.0 MHz without any new error.
- **CS, Power Line, CM, 30 Hz – 50 MH:** Twelve (12) failures were reported by the EMON-S test between 1.5 and 1.0 MHz during test on COLD POWER LINE. The acquired values on AAD1 were between 1 and 9 uA above the expected. Test was re-run with a Vpp=1.5 without any errors.
- **CS, Signal lines, CM:** any interfaces (RWL01_TH, SAS01_N01_A and AAD1 inputs) , have not been tested..

SAAB ACC EQM EMC Tests

Test Campaign Summary (Cont'd):

Test successfully performed:

- RE H-Field (30 Hz - 50 kHz)*
- RS E-Field (14 kHz - 18 GHz)
- RS H-Field (30 Hz - 50 kHz)
- RS H-Field DC
- ESD
- CE, Power Line, BB & NB
- CS, Power line, transient, DM & CM
- CE, Signal Lines, CM & DM**

Notes:

*An alternative test setup for frequencies below 250 Hz were used (as mentioned in the EMC Test Procedure). The antenna was moved from one meter to 10 cm distance and the required limit was raised with 40 dB. One failure reported by the test equipment at 4.877-4590 GHz (acquired 0.000 mA instead of 0.475 mA). Test repeated successfully.

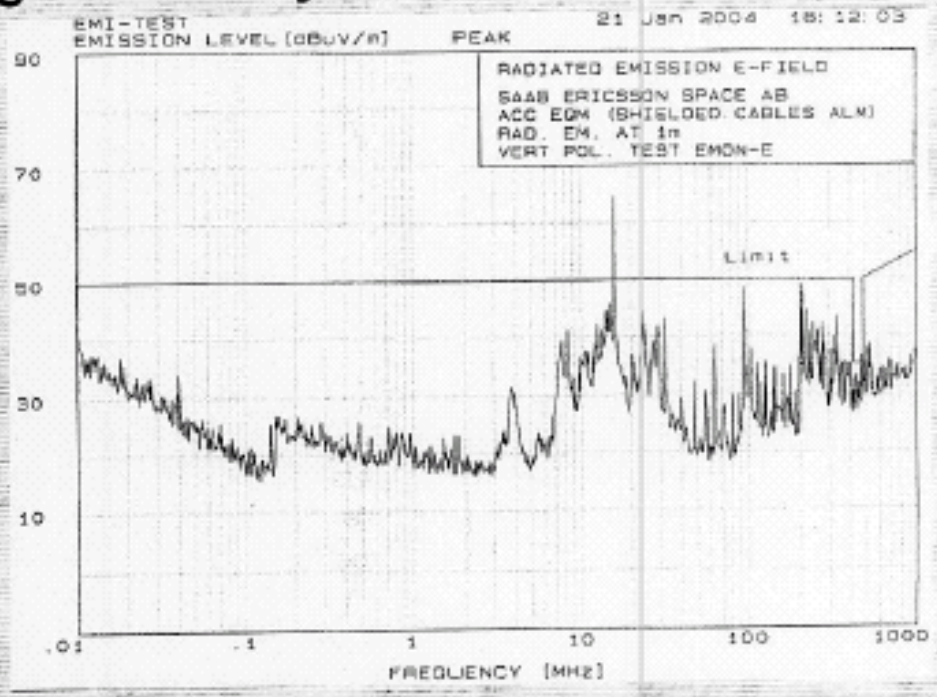
** DR TM Output (STS1_RELAY_STS), DM; measured peaks around 400mVpp.

SAAB ACC EQM EMC Tests

Test Campaign Summary :

RE E-Field,

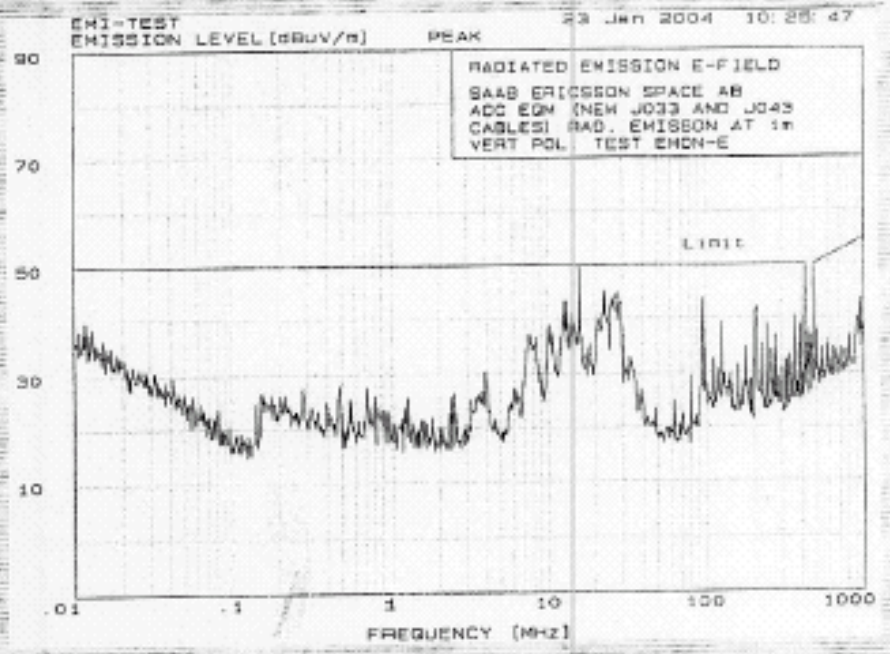
with overall shield (Aluminium foil) on J033/J043 CABLES "ALM".



SAAB ACC EQM EMC Tests

Test Campaign Summary (Cont'd):

- The test has been repeated, by using for the ALM signals twisted shielded pairs, as foreseen from the actual baseline.
- The peak at 16 MHz was now below the required limit!
- There were peaks in the Ariane notch (around 2-3 dBuV/m above the required limit).



ATTACHMENT 4

SPIRE – EMC PRESENTATION

Herschel/Plank EMC WG #17
SPIRE EMC Submissions

Douglas Griffin

RAL

SPIRE EPLM RS Testing

General comments (1)

- Susceptibility levels defined in the detector chain noise budget
- RS can manifest itself as either:
  - Excess noise on the output from the Analogue signal amplifiers, or
  - Ohmic heating of the detectors.
- In either case, EMI in the detection chain can be monitored in quasi-real time with the SPIRE QLA (Quick Look Analysis)
- SPIRE QLA monitors DC signal levels (Detector heating) and can perform spectral analysis of detector signals (RF pickup on cryoharness)
- During EMC testing, the instrument is to be placed in it's most sensitive mode
- The only detector present in the CQM SPIRE is PLW
- The detector sampling frequency is set to the maximum (approx. 80Hz)
- Subsystems turned off: BSM, S-Cal, P-Cal, SMEC, JFS and any non functional JFP modules

SPIRE EPLM RS Testing

General comments (2)

- At the start of any test, the cooler needs to be recycled (approx 2 hour)
- IID-B specifies the cooler hold time at > 48 hours
  - which would imply recycle after two days of EMC testing
- It is highly unlikely that this will be achieved as the SPIRE thermal architecture is currently under ECR
  - PFM thermal architecture should achieve 48 hour
- 36 hour hold time to achieve two working days hold time, but this is still TBD.
- Hence for the sake of planning, assume ~ 24 hour hold time, therefore need to recycle every morning prior to the start of testing

SPIRE EPLM RS Testing

General comments (3)

- If it is possible for the cryostat to provide I/F temperatures below flight levels then the following advantages could be achieved:
  - Cooler hold time could possibly be increased to 48 hours
  - Noise integration times could be reduced and the spot frequency dwell times could be reduced by a TBD amount
  - The deviation (improvement) from Flight-like conditions would not compromise the validity of the test
- Instrument thermal transients will manifest themselves as 1/f noise hence after cooler recycle, need to wait for the bulk of the transients to settle before commencing testing
- Dark noise measurements provide the reference noise levels for comparison with noise levels under test
- RS E-Field, 14kHz to 18GHz. 60 Spot frequencies, 2.07dB frequency steps
- RS H-Field, 30Hz to 50kHz. 30 Spot frequencies, 2.22dB frequency steps
- Noise integration time at each spot frequency – 3 minutes

SPIRE EPLM RS Testing

First cut testing schedule for E and H RS Testing

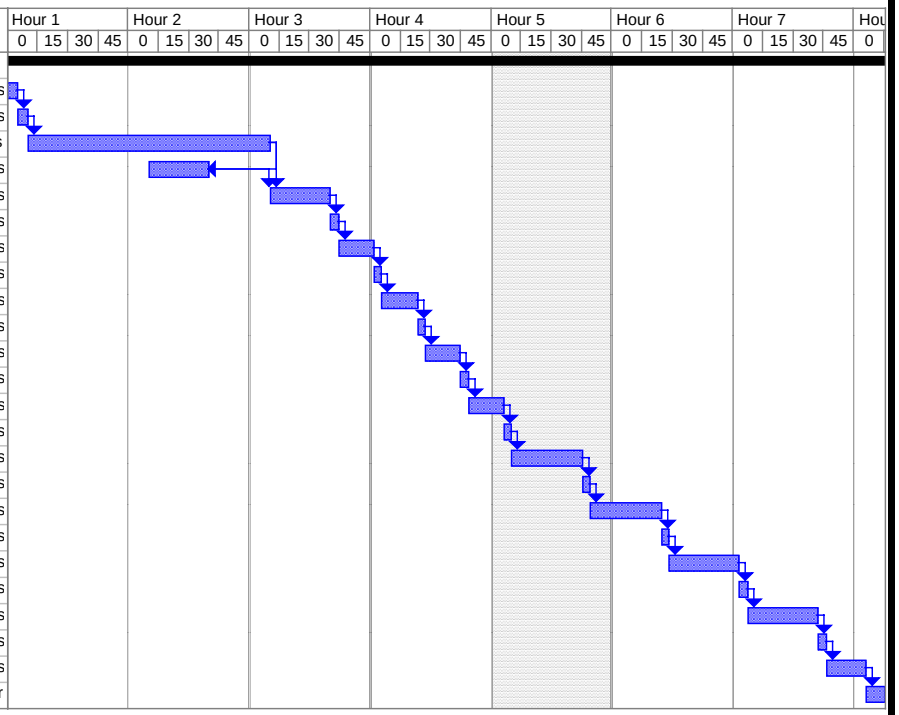
- Switch on WE (10 mins)
- Cooler recycle + switch on JFETs (2 hours)
- Wait for thermal transients to decay (30 minutes)
- Enter cycle frequency stepping - dark noise measurements
- Data analysis – review (20 minutes)
- Detailed surveys near to susceptible frequencies (60 minutes)

SPIRE

Herschel/Planck Power/EMC WG #17 — 29 Jan. 2004

E-Field RS Test First-cut timeline

ID	Task Name	Duration
1	**E-Field, Position One, H-Polarisation**	**1.01 days**
2	Switch on DPU	5 mins
3	Switch on DRCU	5 mins
4	Recycle Cooler	2 hrs
5	Switch on PLW Jfet Module	30 mins
6	Wait for thermal transients	30 mins
7	Dark noise measurement	4 mins
8	E-Field Spot Frequencies 1-5	17.5 mins
9	Dark noise measurement	4 mins
10	E-Field Spot Frequencies 6-10	17.5 mins
11	Dark noise measurement	4 mins
12	E-Field Spot Frequencies 11-15	17.5 mins
13	Dark noise measurement	4 mins
14	E-Field Spot Frequencies 16-20	17.5 mins
15	Dark noise measurement	4 mins
16	E-Field Spot Frequencies 21-30	35 mins
17	Dark noise measurement	4 mins
18	E-Field Spot Frequencies 31-40	35 mins
19	Dark noise measurement	4 mins
20	E-Field Spot Frequencies 41-50	35 mins
21	Dark noise measurement	4 mins
22	E-Field Spot Frequencies 51-60	35 mins
23	Dark noise measurement	4 mins
24	Review of data with SPIRE QLA	20 mins
25	Revisit spot frequencies / amplitudes	1 hr



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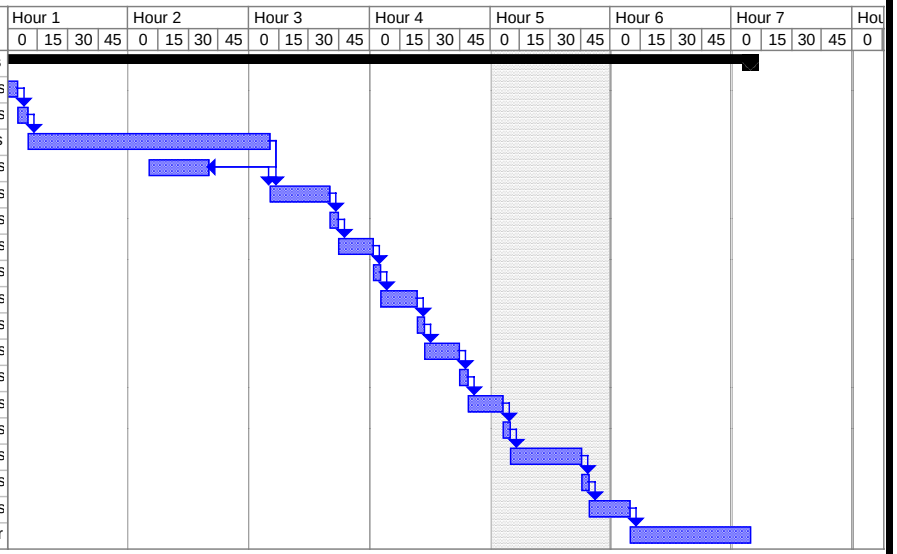
Herschel/Planck Power/EMC WG #17 — 29 Jan. 2004

H-Field RS Test First-cut timeline

ID	Task Name	Duration
27	**H-Field, Position One, H-Polarisation**	**0.77 days**
28	Switch on DPU	5 mins
29	Switch on DRCU	5 mins
30	Recycle Cooler	2 hrs
31	Switch on PLW Jfet Module	30 mins
32	Wait for thermal transients	30 mins
33	Dark noise measurement	4 mins
34	E-Field Spot Frequencies 1-5	17.5 mins
35	Dark noise measurement	4 mins
36	E-Field Spot Frequencies 6-10	17.5 mins
37	Dark noise measurement	4 mins
38	E-Field Spot Frequencies 11-15	17.5 mins
39	Dark noise measurement	4 mins
40	E-Field Spot Frequencies 16-20	17.5 mins
41	Dark noise measurement	4 mins
42	E-Field Spot Frequencies 21-30	35 mins
43	Dark noise measurement	4 mins
44	Review of data with SPIRE QLA	20 mins
45	Revisit spot frequencies / amplitudes	1 hr



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