Title: **PLM EQM EMC Test Procedure**

CI-No: *151 000*

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1	05.10.05		First formal issue	

Table of Content

Table of Figures

List of Tables

1   Scope

1.1   Objective

This procedure describes the activities to be carried out for the Radiated Susceptibility (RS) test of the three instruments HIFI, PACS and SPIRE on PLM EQM level as specified in the Instrument PLM EQM Level Test Procedure, AD11. In addition a CS test is planned for HIFI as far as it fits in the 5 days allocated for this instrument.

1.2   Flow

Due to the total allocated testing time of 20 working days the complete test is subdivided in 4 parts allowing each instrument to allocate 5 working days for their dedicated RS testing and performance evaluation activities, plus extra 5 days, allocated as contingency.

The test flow shall consider the offline evaluation time needed to decide whether susceptibility has been detected and the evaluation of its criticality with ASPI and ESA. This is in order to have sufficient time to decide whether additional testing is necessary at the end of the first 15 days or not.

Although Astrium baseline is to perform only RS tests, the test flow considers the wish of HIFI to add some instrument level CS tests to the nominal RS testing program as far as this allows to keep the window of 5 working days. Then, in parallel to the additional HIFI CS testing activities (ref. HIFI-CR 0128 v.1) the HIFI offline characterisation could be performed.
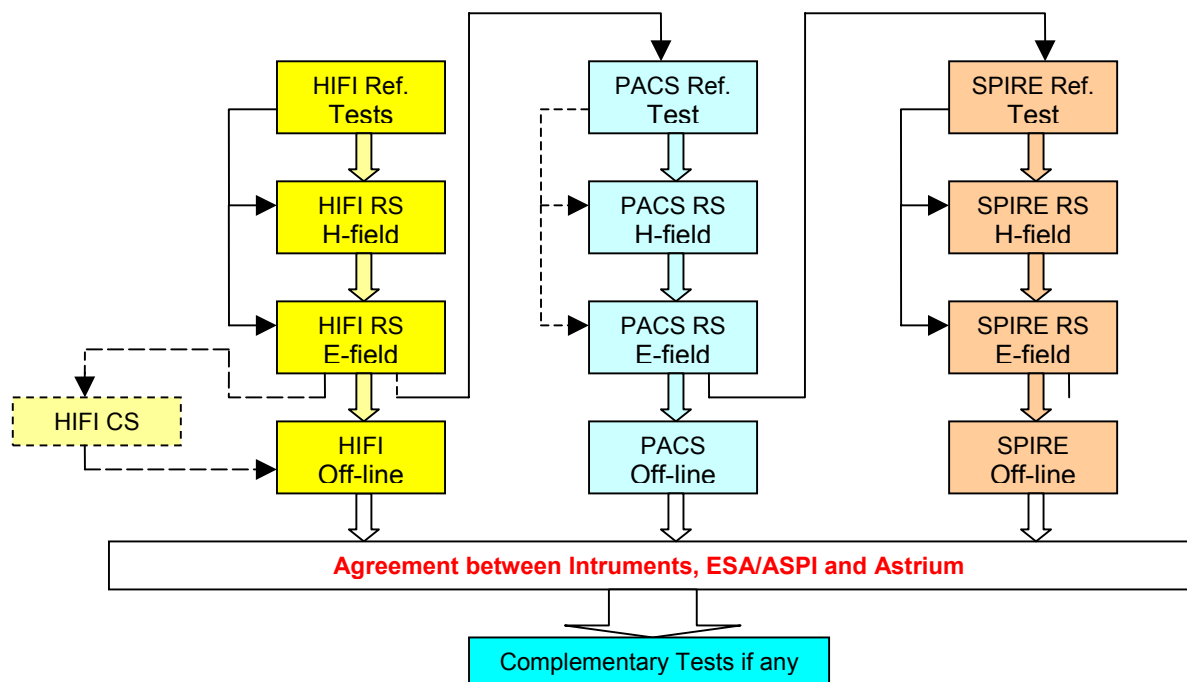
Figure 1.2-1: PLM EQM RS Test Flow

2   Documents/Drawings

2.1   Applicable Documents

The following documents in their latest issue are applicable to this procedure:

AD1	HP-2-ASED-PL-00007	Herschel PA Plan	Issue 2.1
AD2	HP-2-ASED-PL-0023	Herschel Contamination Control Plan	Issue 2
AD3	SCI-PT-IIDA-04624	Herschel/Planck Instrument Interface Document, IID Part A	Issue 3.3
AD4	SCI-PT-IIDB/HIFI-02125	Instrument Interface Control Document Part B, Instrument HIFI	Issue 3.2
AD5	SCI-PT-IIDB/SPIRE-02124	Instrument Interface Control Document Part B, Instrument SPIRE	Issue 3.3
AD6	SCI-PT-IIDB/PACS-02126	Instrument Interface Control Document Part B, Instrument PACS	Issue 3.3
AD7	HP-2-ASED-PL-0021	Herschel PLM EQM AIT Plan	Issue 2.2
AD8	HP-2-ASED-PR-0012	Herschel PLM/EQM General AIT Procedure	Issue 1
AD9	H-P-1-ASPI-SP-0037	HERSCHEL/PLANCK EMC Specification	Issue 4
AD10	H-P-1-ASPI-PL-0038	HERSCHEL/PLANCK EMC/ESD Control Plan	Issue 3
AD11	HP-2-ASED-PR-0051	Instrument PLM EQM Level Test Procedure	Issue 1.1
AD12	HP-2-ASED-PL-0037	EMC Test Plan	Issue 2

2.2   Reference Documents

In this section all documents are given which either

- could serve as reference for the PLM EQM RS test as well as for complementary tests, or

- may be referred in the test report for clarification/justification of an outcome (result) of the test.

RH1	SRON-U/HIFI/PR/2004-001	HIFI EMC Test Specification	Issue 1.3
RH2	SRON-G/HIFI/PR/2005-101	HIFI EQM IST & EMC Test Procedure	Issue 1.4
RH3	SRON-U/HIFI/SP/2005-003	HIFI EQM Grounding Configuration	Issue 1.0
RP1	PACS-ME-PL-015	PACS EMC/ ESD Control Plan and Procedure	Issue 1.2
RP2	PACS-ME-TP-021	PACS Integrated Module Test Procedure	Issue 1.2
RS1	Spire EMC Test Sequence for EQM Testing	SPIRE-RAL-NOT-002402	Issue 1.0
RS2	Spire Cooler Recycling SCOS Procedure	SPIRE –RAL-PRC-002267	Issue 1.0

3 Configuration

3.1 PLM EQM Configuration
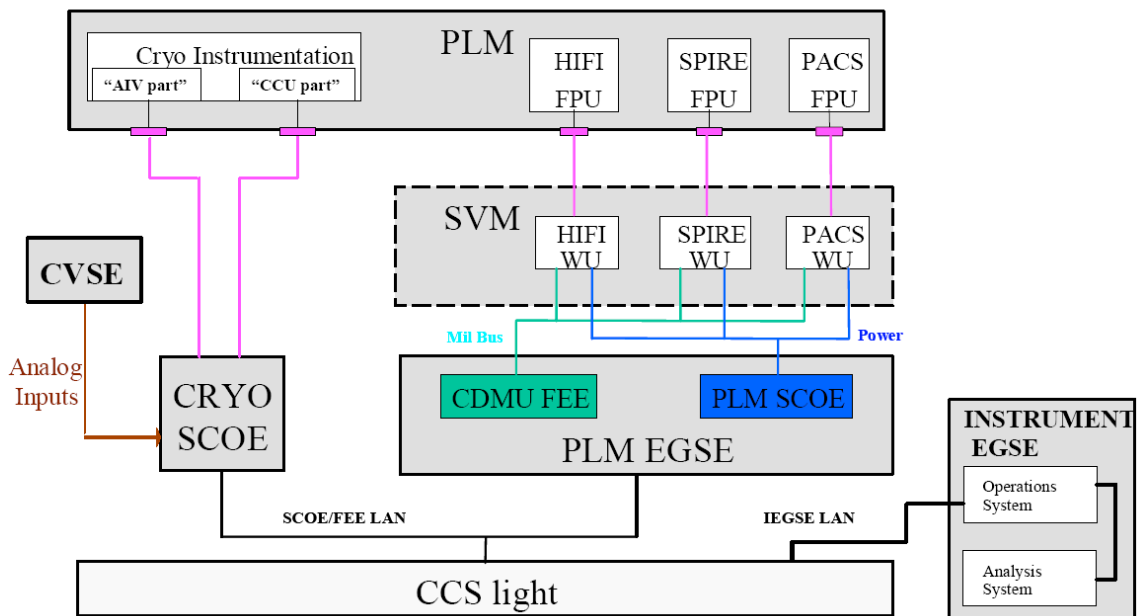
Figure 3.1-1: Principle PLM EQM Configuration

The configuration is the fully Integrated EQM Cryostat in combination with the EGSE and SCOE in accordance to the figure 3.1-1. A detailed description of the configuration can be found in the Instrument PLM EQM Level Test Procedure, AD11.

The actual hardware and software configuration of the GSE shall be validated at the TRR and reported in the test report.

3.2 GSE Configuration

A detailed description of the configuration can be found in the Instrument PLM EQM Level Test Procedure, AD11.

In addition there are some antennas cabling etc. and electrical test equipment necessary from the EMC facility in order to generate and measure the EMI levels. All test hardware shall be calibrated and shall be within the calibration period during the test time.

The test equipment list shall be completed during the test included in the test report.

Test Equipment List					
Item	Manuf.	Model No.	SN No.	Invent No.	Next Calib.

Table 3-1: Test Equipment List

3.3 Facility

The activities detailed in this procedure shall be carried out in the EADS Astrium clean room in Ottobrunn.
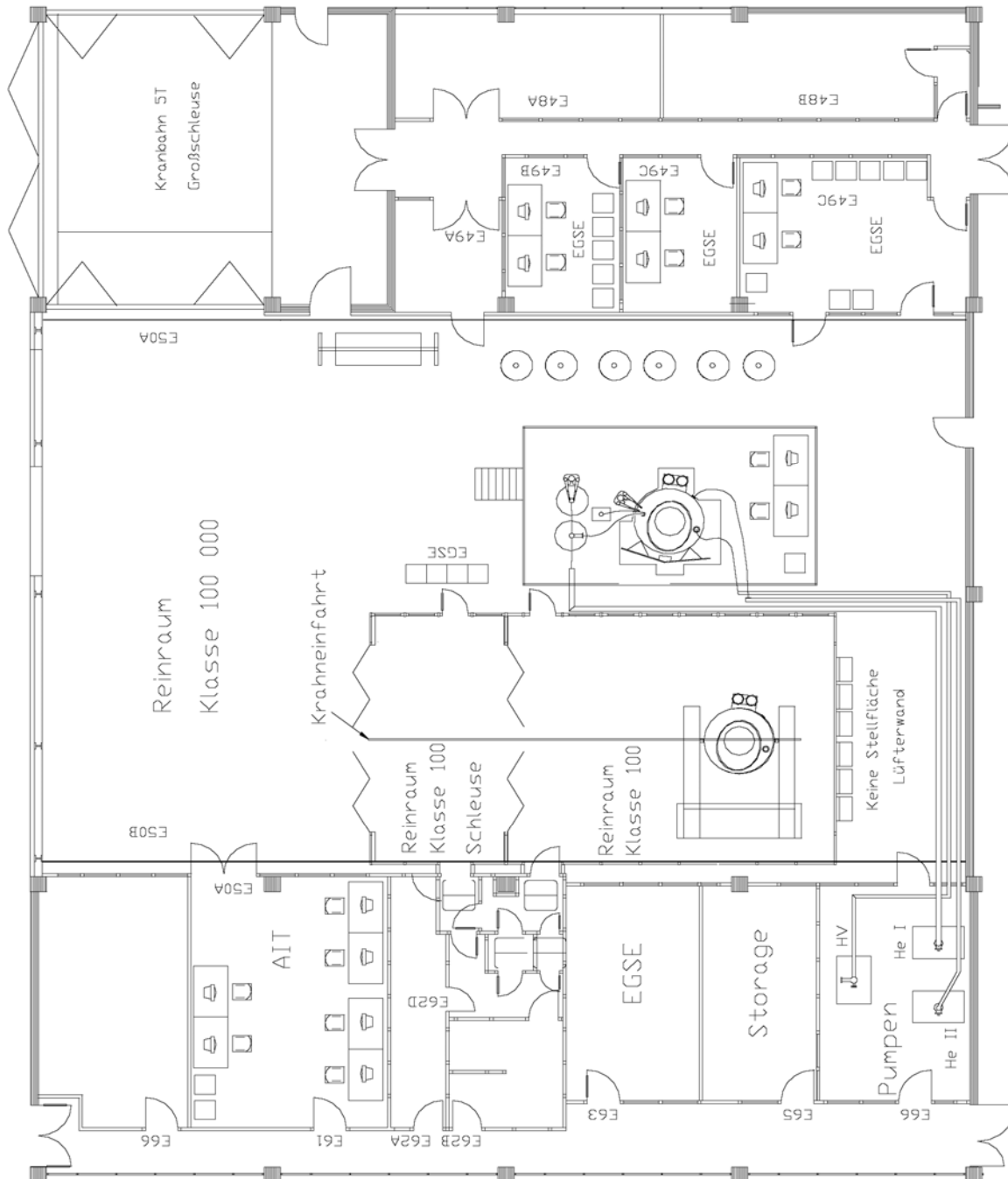
Figure 3.3-1: Set-up in Astrium Clean Room

4   Conditions

4.1   General Requirements

General instructions are given in the Herschel PLM EQM General AIT Procedure, AD8, and have to be respected accordingly.

In addition, the temperature of the lid must be stabilised before each test and set to a certain value (to be defined by the instruments before start of test). The temperature adjustment can be done by varying the He flow rate through the lid.

4.2   Environmental Conditions

All activities specified in the procedure have to be performed in a clean room class 100 000.

Temperature: 22°C +/- 3°C

Relative Humidity: 40% to 55%

The cleanliness requirements will be observed throughout the activities, and the overall contamination control requirements identified in the Herschel Contamination Control Plan, AD2, will be observed.

4.3   Measurement Accuracies

4.3.1   Receiver Accuracies

Table 4.3.1-1 gives a **guideline** for receiver measuring bandwidths. The **actual** bandwidth of the test equipment shall be provided by the facility personnel during the EMC tests.

Frequency Range	Proposed	Actual	Comment
30 Hz - 2.5 kHz	10 Hz		
2.5 kHz - 5 kHz	30 Hz		
5 kHz - 50 kHz	100 Hz		
50 kHz - 1 MHz	1 kHz		
1 MHz - 100 MHz	3 kHz		
100 MHz - 1 GHz	10 kHz		
1 GHz - 18 GHz	100 kHz		
Frequency Accuracy	$\pm$ 2 %		
Amplitude Accuracy	$\pm$ 2 dB		

Table 4-1: Receiver Measurement Bandwidth

4.4 General Precautions and Safety

4.4.1 General Safety Requirements

No special hazards are expected. The application of the standard technical rules for mechanical and electrical integration and test activities is sufficient.

Lower level procedures called up by this procedure may define their own safety requirement in the relevant chapters which must be respected accordingly

4.4.2 ESD constraints

In order to prevent ESD sensitive H/W from any possible damages by accidental electrostatic discharges an ESD protected area must be defined and setup during ESD sensitive activities:

- Floor and test bench of the ESD protected area has to be covered with anti-static mats

- During all handling activities (as transport, mounting, mating/de-mating of connectors, measurements with individual measurement devices, etc.) the operator has to work on anti static mats with correct clothing and personal grounding-straps
- Adequate ESD clothing is required:
   - Anti static coat
   - Anti static gloves
   - Anti static boots
- Transportation of ESD sensitive H/W will be made only in ESD protective bag or box.

4.5 Activities Management

4.5.1 Pre-Test Activities

At least the following tasks have to be successfully completed before start of integration and test activities according this procedure:

- This procedure released and accepted

- Formal release to start given by the board following review of relevant test procedures and test configurations.

4.5.2 Procedure Variation

Major activities deviating from the approved test procedure require the agreement of Project, AIV and PA responsible, and shall be documented via Activity Control Sheets (ACS). All ACS's generated in

the frame of the execution of this procedure shall be listed in the ACS Summary Sheet in section 9.1 of this procedure.

4.5.3   Criteria for Failure

If the results of any test performed using this procedure or a lower level procedure which this procedure refers to yields a value which lies outside the specified limits, it shall be considered as a non-conformance. Initial analysis of the result will be applied to establish whether the result is due to measurement error or incorrect specification limits. A NCR will then be raised to report the non-conformance. Depending on the magnitude of the non-conformance, and its impact, either a minor or a major NCR will be raised. In case of major NCR the test shall be continued only upon written or verbal authorisation of Customer (Alcatel and ESA). All NCR's raised in the frame of the execution of this procedure shall be listed in the NCR Summary Sheet in section 9.2 of this procedure.

The NCR process is described in the Herschel PA Plan, AD1.

4.5.4   Test Completion and Post-Test Activities

All data that has been recorded during the test activities specified in this procedure shall be collected and retained in a centralised reference volume, and will include:

- EQM PLM logbook
- Relevant CCS logs
- Photographs and plots
- Filled out test procedure
- Activity Control Sheets (ACS), if any
- Copies of NCR's, if any

All these test data shall be available for presentation at the Test Review Board (TRB) which will finally conclude on the test.

A test report shall be produced in accordance to the AIT Plan, AD7, whose contents shall be as follows:

- Brief summary of the test results
- PLM and instrument build standard summary
- "As-run" test procedure as an annex (this includes housekeeping data, temperature curves, etc.).
- List of NCR's raised
- List of ACS's generated.
- Relevant meeting minutes (e. g. TRR, TRB)

- Filled out Sign-off Sheet (see section 9.3 of this procedure).

- Evaluation of test results (might be in separate document)

4.6   PA Requirements

Quality Assurance shall monitor all operations (handling, transportation, disassembly, installation and test) as necessary to assure compliance with this procedure and the applicable requirements of the Herschel PA Plan, AD1.

In the course of this procedure PA shall pay particular attention to:

- the application of adequate protections to critical surfaces

- the records in the log-sheet

- the recording of the serial number of the test equipment used

- ensure that the test equipment used is within actual calibration cycle

PA has to make sure that NCR's are raised when applicable and treated by NRB procedure as defined in the Herschel PA Plan, AD1.

After the conclusion that an activity is successfully completed, this activity has to be signed by the responsible AIT- and PA engineer in the step by step procedure. Also relevant log sheets have to be filled out and signed.

4.7 Personnel

Title	Function	Name*)
Test Director	Overall responsible	Siegmund Idler
Test Conductor	EMC Test Responsibility	Clemens Kalde
EGSE Operator	Operate EGSE (CCS, PLM SCOE, CDMU DFE, Cryo SCOE)	S. Ilsen
EGSE Expert (Alcatel)	Support EGSE operator and EMC	André Luc, Guy Doubrovik
EMC Test Performance (IABG)	Responsible for the EMC facility and operations	Ulf Hülsenbusch
Mech. Operator(s)	All mech. Integration activities, handles the PLM during testing (e.g. tilting of PLM), supports instrument test team	
Cryo Operators	Operate the cryostat during testing and maintain the required temperatures	
ESA Support	Support and supervison of test activities	Filippo Marliani, Astrid Heske, Carsten Scharmberg, Walter Pinter-Krainer
HIFI Engineers	Support test activities and evaluate/analyse instrument data	Bert Joost v. Leeuwen, Nick Whyborn, Norbert Brüning, Albert Naber, Toni Marston
PACS Engineers	Support test activities and evaluate/analyse instrument data	Helmut Feuchtgruber Michael. Leininger
SPIRE Engineers	Support test activities and evaluate/analyse instrument data	Doug Griffin
PA Representative	To ensure PA requirements	Dave Hendry

*) Names to be registered prior to start of test activities

Table 4-1: Personnel

5   Test Requirements

5.1   Radiated Susceptibility H-field

The set-up and performance of the radiated H-field susceptibility.

- Frequency Range: 30 Hz to 50 kHz, IABG Loop Antenna

- 2 antenna positions for HIFI, one for SPIRE, 2 or 3 respectively for PACS (depending on mode) and different for each instrument, to be selected at start of test. Instrument harness should be illuminated. The irradiating antenna shall be placed at a test distance of 1 metre towards the satellite structure.

- Sufficient clearance of the CVV from other metallic structure has to be granted in order to avoid effects from standing waves, refer to the EMC Test Plan AD12, chapter 4.3.

- Level 120 dBpT up to 20 kHz, 110 dBpT from 20 kHz to 50 kHz. The level will be calibrated according to the frequency tables within the anechoic chamber at IABG before RS test in the cleanroom of EADS Astrium. Herewith, we have clear reference, repeatable adjustment of the right disturbance level and no impacts from satellite and EGSE structure. During the RS test at EADS Astrium, a field probe will be installed in the vicinity of the CVV for monitoring and, if possible, reporting of the field level in the frequency control tables or in annex of the test report.

➔ The particular detailed conductance of the RS test is for every instrument different defined and described in the EMC Test Plan, AD12. This is reflected in the step-by-step procedure.

If necessary, susceptibility threshold shall be predicted:

1. Adjust the frequency/frequency range at which the susceptibilities occurred.

2. Repeat the RS test manually for these frequencies and reduce the noise level until no susceptibility occurs.

3. Record the susceptibility threshold.

5.1.1   HIFI Instrument Setting

As for RS E-field tests. Please refer also to RH1. The HIFI configuration is not fully representative due to the absence of the LSU which is substituted by a LSU simulator. For the grounding configuration see RH3.

5.1.2   PACS Instrument Setting

As for RS E-field tests.

5.1.3   SPIRE Instrument Setting

As for RS E-field tests.

5.2   Radiated Susceptibility E-field

The set-up and performance of the radiated E-field susceptibility Test shall be in is accordance to the MIL Std, 461 E, RS 103.

General Frequency Range: 14 kHz to 18 GHz:

  14 kHz - 30 MHz, SML-01 generator, SMX-100 amp, At-3000 antenna, V- pol

  30 MHz - 1 GHz, SML-01 generator SMX-100 amp., BDLP antenna, V- and H- poll

  1 GHz - 6 GHz, WILTRON generator, no ampl., RGA-180 antenna, , V- and H- pol

  6 GHz - 18 GHz, WILTRON generator + 1 W amplifier, RGA 180 antenna, , V- and H- pol

8 GHz Notch (ref. Table 5-1):

  8.45 - 8.5 GHz, WILTRON generator + 1 W amplifier, SGH antenna, V- and H- pol

3 antenna positions for HIFI, 2 for SPIRE, and 2 for PACS and different for each instrument, to be selected at start of test. Instrument harness needs to be illuminated. The irradiating antenna shall be placed at a test distance of 1 metre towards the satellite structure.

- Sufficient clearance of the CVV from other metallic structure has to be granted in order to avoid effects from standing waves, refer to the EMC Test Plan AD12, chapter 4.3.

- Level 2 V/m (126 dBµV/m) over the applicable frequency range except for some notches where the level shall be in accordance to the table 5-1. The level will be calibrated according to the frequency tables within the anechoic chamber at IABG before RS test in the cleanroom of EADS Astrium. Herewith, we have clear reference, repeatable adjustment of the right disturbance level and no impacts from satellite and EGSE structure. During the RS test at EADS Astrium, a field probe will be installed in the vicinity of the CVV for monitoring and, if possible, reporting of the field level in the frequency control tables or in annex of the test report.

- The E-field level shall be 30% amplitude modulated (AM) with 1 kHz square wave.

Frequency Range	RS Level	Comment
8.45 GHz to 8.5 GHz in 10 MHz steps	10 V/m	Spacecraft TM

Table 5-1: RS Notches

➔ The particular detailed conductance of the RS test is for every instrument different defined and described in the EMC Test Plan, AD12. This is reflected in the step-by-step procedure.

If necessary, susceptibility threshold shall be predicted:

1. Adjust the frequency/frequency range at which the susceptibilities occurred.

2. Repeat the RS test manually for these frequencies and reduce the RS level until no susceptibility occurs.

3. Record the susceptibility threshold.

5.2.1 HIFI Instrument Setting

The HIFI configuration is not fully representative due to the absence of the LSU which is substituted by a LSU simulator. Please refer also to RH1. The HIFI instrument setting can be found in RH2, section 11.

Susceptibility tests shall be performed with:
- The reference signal switched on.
- Continuous observation during EMI stimuli. Synchronisation by operators call.
- Instrument settings

HIFI mode: Primary
LO band: 3a
LO Frequency: 807 GHz
HRS mode: High Resolution
HRS band centre frequency: 6.6 GHz
WBS: on
Observing mode: Total Power
Integration time: 1sec.
Chopper: Cold source
For the grounding configuration see RH3.

5.2.2 PACS Instrument Setting

The mode applicable for PACS has been described in the PACS Integrated Module Test Procedure, RP2.

5.2.3 SPIRE Instrument Setting

The mode applicable for SPIRE has been described in the ''Spire EQM Test Sequence'', RS 1.

5.3   HIFI Optional CE/CS Testing

Conducted emission and susceptibility testing shall be performed on the nominal primary power lines of the HIFI LCU and ICU as well as on selected signal lines of the Cryo Harness.

FHICU Power:

Bracket DB05, J05   PIN 2 = PLUS

                                        PIN 4 = RTN

FHLCU Power:

Bracket DB06, J01   PIN 2,7 = PLUS

                                        PIN 4,9 = RTN

FPU Signal Lines:
FP Cryo-H location: View from -Y, Bracket 311100
FP Cryo-H bundles: SIH-IH-01, J03
                                    SIH-IH-02, J01
                                    SIH-IH-05, J02

LOU Signal Lines:
LO Cryo-H location: View from -Y
LO Cryo-H bundles: SIH-IH-07, Bracket 311300, J03

For the test requirements it shall be referred to RH1

The HIFI configuration is not fully representative due to the absence of the LSU which is substituted by a LSU simulator. For the grounding configuration see RH3. The HIFI instrument setting can be found in RH2, section 11.

6   Activities Flow

The following table depicts the flow of the activities described in this procedure. The Radiated Susceptibility test for the three instruments is embedded in the overall PLM EQM integration and test flow (refer to the Instrument PLM EQM Level Test Procedure, AD11).

No	Activity	Remark
1	**HIFI EMC Test**	**See para. 7.1**
1.1	Initialise LSU simulator	
1.2	Restart instrument if has been powered down	
1.3	Perform functional test	
1.4	Configure for EMC test	
1.5	Perform RS H-field test (2 positions)	
1.6	Perform RS E-field test (3 antenna positions, each with 2 polarisations)	
1.7	Perform off-line performance evaluation via QLA	
2	**HIFI ADDITIONAL TESTS (acc. to HIFI-CR 0128)**	**See para. 7.2**
2.1	Prepare for CS test	
2.2	Perform CS DM steady state on ICU power lines to 50 KHz	
2.3	Perform CS DM steady state on LCU power lines to 50 KHz	
2.4	Perform CS DM steady state on ICU power lines up to 50 MHz	
2.5	Perform CS DM steady state on LCU power lines to 50 MHz	
2.6	Perform CS CM steady state on ICU power lines to 50 MHz	
2.7	Perform CS CM steady state on LCU power lines to 50 MHz	
2.8	Perform CS DM Transients test on ICU power lines	
2.9	Perform CS DM Transients test on LCU power lines	
2.10	Perform CS CM Transients test on ICU power lines	
2.11	Perform CS CM Transients test on LCU power lines	
2.12	Perform CE/CS signal bundle test for SIH-IH-01, 02 and 05	
2.13	Perform CE/CS signal bundle test for SIH-IH-07	

No	Activity	Remark
3.	**PACS EMC Test**	**See para. 7.3**
3.1	Set-up instrument to safe mode	
3.2	Perform PACS Cooler Recycle during the night before for every testing day in photometer mode	
3.3	Perform cover flushing every morning.	
3.4	Set PACS in photometer mode and perform reference tests	
3.5	Perform RS H-field test in photometer mode (3 antenna positions). Specific threshold tests with about 30 frequencies for each antenna position are to be considered in photometer mode and shall be performed at the beginning of each an automated test session.	
3.6	Set PACS in spectrometer mode and perform reference tests	
3.7	Perform RS H-field test in spectrometer mode (2 antenna positions)	
3.8	Perform PACS Cooler Recycle during the night before for every testing day in photometer mode	
3.9	Perform cover flushing every morning.	
3.10	Set PACS in photometer mode and perform reference tests	
3.11	Perform E-field test in photometer mode (2 antenna positions x 2 polarisations)	
3.12	Set PACS in spectrometer mode and perform reference tests	
3.13	Perform E-field test in spectrometer mode (2 antenna positions x 2 polarisations)	
3.14	Perform off-line performance evaluation via QLA	
4	**SPIRE EMC Test**	**See para. 7.4**
4.1	Set-up instrument into REDY mode	
4.2	Perform Cooler Recycle in the evening before each testing day	
4.3	Facility setting, measurements and SPIRE health check every morning, before test	

No	Activity	Remark
4.4	Set SPIRE in nominal mode.	
4.5	Perform H-field test in nominal mode (1 antenna position), SWEEP case. Repeat reference as necessary.	
4.6	Perform H-field test in nominal mode (1 antenna position), SPOT case. Repeat reference as necessary.	
4.7	Perform E-field test in nominal mode (2 antenna positions each with two polarisations), SWEEP case. Repeat reference as necessary.	
4.8	Perform E-field test in nominal mode (2 antenna positions each with two polarisations), SPOT case. Repeat reference as necessary.	
5	**Pre-and Post Test Activities**	**See para. 7.5**
	Describing all activities to be done at the beginning of the day before test start prepare for CS test	
	Describing all activities to be done at the end of the test day before test switching Instruments OFF.	

Table 6-1: Test Activities Flow

7 Step by Step Procedure

7.1 HIFI EMC Test

Step-No.	Integration-Step-Description	OP / EMC	Nom Val	Tol.	Act. Val.	Comment	P	N
7.1.1	**Initialise LSU simulator for 807 GHz operation**							
7.1.1.1	Refer to RH2, para 11.4.1	OP						
7.1.2	**Restart Instrument if has been powered down**							
7.1.2.1	Refer to RH2, para 11.4.2	OP						
7.1.3	**Perform functional test**							
7.1.3.1	Perform functional test pumped (Refer to RH2, para 11.4.4.1)	OP						
7.1.3.2	Perform functional test unpumped (refer to RH2, para 11.4.4.2)	OP						
7.1.4	**Configure for EMC test**							
7.1.4.1	Configure HIFI for EMC test (refer to RH2, para. 11.4.4.3)	OP						
7.1.5	**Perform RS H-field test in for the frequencies and antenna positions according to the frequency control tables in para. 8.**							
7.1.5.1	Prepare EMC set-up for a test session which shall not last longer than 15 minutes. Refer to RH2 para 11.4.4.4	EMC/ OP						

Step-No.	Integration-Step-Description	OP / EMC	Nom Val	Tol.	Act. Val.	Comment	P	N

7.1.5.2	The frequencies shall be applied as ''stepwise sweep'' into two . sessions of 10 minutes (10 seconds script).
	    - Application of one frequency: 10.0 sec
	    - $f2 = 1.1 \times fprev$ from 30 Hz to 50 kHz
		EMC						

7.1.5.3	Let OP confirm application of the correct SCRIPT file (refer to RH2) (susceptibility setting), data acquisition to be started	EMC						
7.1.5.4	After OP request start immediately the stepwise-sweep and inform OP.	EMC						
7.1.5.5	Tell EMC the time tag for notification in the frequency control table and wait for end of the session (about 10 minutes)	OP						
7.1.5.6	Notify the time tag provided by OP immediately in the frequency control table together with the applied frequency range (to be filled into the control table)	EMC						
7.1.5.7	After the session (end of sweep) inform OP immediately.	EMC						

7.1.5.8	Give to EMC the corresponding time tag to be filled in the table and store the session data with identification of
	    - Field type (H field)
	    - Antenna position
	    - Polarisation
	    - Frequency range
		OP						

7.1.5.9	Note the time tag in the frequency control table and prepare the next session until the complete frequency range, and all antenna positions/ polarisations in accordance to the frequency control table are covered.	EMC						

Step-No.	Integration-Step-Description	OP / EMC	Nom Val	Tol.	Act. Val.	Comment	P	N
7.1.6	**Perform RS E-field test for the frequencies and antenna positions according to the frequency control tables in para. 8.**							
7.1.6.1	Prepare EMC set-up for a test session which shall not last longer than 15 minutes. Refer to RH2 para 11.4.4.4	EMC/ OP						

7.1.6.2	The frequencies shall be applied as ''stepwise sweep'' over a number of test sessions
	      - Application of one frequency: 10.0 sec
	      - f = 1.1 x fprev from 14 kHz to 2.5 GHz
	      - f = 1.05 x fprev from 2.5 GHz to 8.5 GHz
	      - f = 1.1 x fprev from 8.5 GHz to 18 GHz
		EMC						

7.1.6.3	Let OP confirm application of the correct SCRIPT file (refer to RH2) (susceptibility setting), data acquisition to be started	EMC						
7.1.6.4	After OP request start immediately the stepwise-sweep and inform OP.	EMC						
7.1.6.5	Tell EMC the time tag for notification in the frequency control table and wait for end of the session (about 10 minutes)	OP						
7.1.6.6	Notify the time tag provided by OP immediately in the frequency control table together with the applied frequency range (to be filled into the control table)	EMC						
7.1.6.7	After the session (end of sweep) inform OP immediately.	EMC						

Step-No.	Integration-Step-Description	OP / EMC	Nom Val	Tol.	Act. Val.	Comment	P	N
7.1.6.8	Give to EMC the corresponding time tag to be filled in the table and store the session data with identification of - Field type (E-field) - Antenna position - Polarisation - Frequency range	OP						
7.1.6.9	Note the time tag in the frequency control table and prepare the next session until the complete frequency range, and all antenna positions/ polarisations in accordance to the frequency control table are covered.	EMC						

7.2   HIFI ADDITIONAL EMC Test

Step-No.	Integration-Step-Description	OP / EMC	Nom Val	Tol.	Act. Val.	Comment	P	N
7.2.1	**Prepare HIFI for Conducted Susceptibility test power lines**							
7.2.1.1	Switch off HIFI RH2 procedure 11.4.5.5: Configure HIFI to standby RH2 procedure 2.4.4: Power-off HIFI	OP						
7.2.1.2	Install power supplies and LISN's for the primary power lines FHICU, FHLCU, FHHRH and FHWEH	EMC						

7.2.1.3	Connect break-out boxes to the nominal power lines of the ICU and the LCU, test connector:
	FHICU Power:
	Bracket DB05, J05 PIN 2 = PLUS
	    PIN 4 = RTN
	FHLCU Power:
	Bracket DB06, J01 PIN 2,7 = PLUS
	    PIN 4,9 = RTN							

7.2.1.4	Install T-adapters in the Cryo harness in order to enable CE/CS measurements on the FPU signal lines:
	FPU Signal Lines:
	FP Cryo-H location: View from -Y, Bracket 311100
	FP Cryo-H bundles: SIH-IH-01, J03
	    SIH-IH-02, J01
	    SIH-IH-05, J02							

Step-No.	Integration-Step-Description	OP / EMC	Nom Val	Tol.	Act. Val.	Comment	P	N
7.2.1.5	Install T-adapters in the Cryo harness in order to enable CE/CS measurements on the LOU signal lines: **LOU Signal Lines:** LO Cryo-H location: View from -Y LO Cryo-H bundles: SIH-IH-07, Bracket 311300, J03							
7.2.1.6	RH2 procedure 11.4.1: Initialise LSU simulator for 807 GHz	OP						
7.2.1.7	Switch-on ICU power and inform OP Check voltage and current	EMC						
7.2.1.8	RH2 procedure 2.4.2.1: Power on ICU RH2 procedure 2.4.2.2: Check ICU HK RH2 procedure 2.4.2.3: Check FCU HK	OP				PDU power switching to be omitted		
7.2.1.9	Switch-on HRH power and inform OP Check voltage and current	EMC						
7.2.1.10	RH2 procedure 2.4.2.4: Power-on HRH	OP				PDU power switching to be omitted		
7.2.1.11	Switch-on WEH power and inform OP Check voltage and current	EMC						
7.2.1.12	RH2 procedure 2.4.2.5: Power-on WEH	OP				PDU power switching to be omitted		
7.2.1.13	Switch-on LCU power and inform OP Check voltage and current	EMC						
7.2.1.14	RH2 procedure 2.4.2.6: Power-on LCU	OP				PDU power switching to be omitted		
7.2.1.15	RH2 procedure 11.4.1: Initialise LSU simulator	OP						
7.2.1.16	RH2 procedure 11.4.2: Restart HIFI	OP						

Step-No.	Integration-Step-Description	OP / EMC	Nom Val	Tol.	Act. Val.	Comment	P	N
7.2.1.17	RH2 procedure 11.4.3.1: Perform Functional test pumped	OP						
7.2.1.18	RH2 procedure 11.4.3.2: Perform Functional test unpumped	OP						
7.2.1.19	RH2 procedure 11.4.3.3: Configure HIFI for EMC test	OP						
7.2.2	**Perform CS Power Lines test for the ICU, DM, Steady State, Frequency range 30 Hz to 50 kHz**							
7.2.2.1	Install the test set-up for the ICU primary power lines, according to RH1, section 5.4.1.2.1	EMC						
7.2.2.2	Prepare EMC set-up The frequencies shall be applied as ''step-wise-sweep'' over two sessions of 10 minutes (10 seconds script). - Application of one frequency: 10.0 sec - f2 = 1.1 x f1 f3 = 1.1 x f2 Frequency range 30 Hz to 50 kHz	EMC				Total 79 steps		
7.2.2.3	RH2 procedure 11.4.3.4: EMC susceptibility test for the 10 minutes script file	OP						
7.2.2.4	One minute after start of script in previous step: Inform EMC to start EMC source sweep	OP						
7.2.2.5	Start the stepwise-sweep and inform OP.	EMC						
7.2.2.6	Tell EMC the time tag for notification in the frequency control table and wait for end of the session	OP						

Step-No.	Integration-Step-Description	OP / EMC	Nom Val	Tol.	Act. Val.	Comment	P	N
7.2.2.7	Notify the time tag provided by OP immediately in the frequency control table together with the applied frequency range (to be filled into the control table)	EMC						
7.2.2.8	After the session (end of sweep) inform OP immediately.	EMC						

7.2.2.9	Give to EMC the corresponding time tag to be filled in the table and store the session data with identification of
	     - CS Power Lines DM
	     - Frequency range
		OP						

7.2.2.10	Note the time tag in the frequency control table.	EMC						
7.2.3	**Perform CS Power Lines test for the LCU, DM, Steady State, Frequency range 30 Hz to 50 kHz**							
7.2.3.1	Install the test set-up for the LCU primary power lines, according to RH1, section 5.4.1.2.1	EMC						
7.2.3.2	Remaining test procedure as above							
7.2.4	**Perform CS Power Lines test for the ICU, DM, Steady, Frequency range 50 kHz to 50 MHz**							
7.2.4.1	Install the test set-up for the ICU primary power lines, according to RH1, section 5.4.1.2.2	EMC						

Step-No.	Integration-Step-Description	OP / EMC	Nom Val	Tol.	Act. Val.	Comment	P	N
7.2.4.2	Prepare EMC set-up according to RH1, section 5.4.1.2.2 The frequencies shall be applied as ''step-wise-sweep'' over two sessions of 10 minutes (10 seconds script). - Application of one frequency: 10.0 sec - f2 = 1.1 x f1 f3 = 1.1 x f2	EMC				Total 12 steps		
7.2.4.3	RH2 procedure 11.4.3.4: EMC susceptibility test for 10 minutes	OP						
7.2.4.4	One minute after start of script in previous step: Inform EMC to start EMC source sweep	OP						
7.2.4.5	Start the stepwise-sweep and inform OP.	EMC						
7.2.4.6	Tell EMC the time tag for notification in the frequency control table and wait for end of the session (about 10 minutes)	OP						
7.2.4.7	Notify the time tag provided by OP immediately in the frequency control table together with the applied frequency range (to be filled into the control table)	EMC						
7.2.4.8	After the session (end of sweep) inform OP immediately.	EMC						
7.2.4.9	Give to EMC the corresponding time tag to be filled in the table and store the session data with identification of - CS Power Lines DM ICU - Frequency range	OP						
7.2.4.10	Note the time tag in the frequency control table. Prepare the next session according to RH1, section 5.4.1.2.2. Continue from step 7.2.4.3.	EMC						
7.2.4.11	Deleted	EMC				Total 8 steps		
7.2.4.12	Deleted	OP						

Step-No.	Integration-Step-Description	OP / EMC	Nom Val	Tol.	Act. Val.	Comment	P	N
7.2.4.13	Deleted	EMC/OP						
7.2.4.14	Deleted	EMC				Total 55 steps		
7.2.4.15	Deleted	OP						
	Repeat steps 7.2.4.4 to 7.2.4.10	EMC/OP						
7.2.5	**Perform CS Power Lines test for the LCU, DM, Steady State, Frequency range 50 kHz to 50 MHz**							
7.2.5.1	Install the test set-up for the LCU primary power lines, according to RH1, section 5.4.1.2.2	EMC						
7.2.5.2	Remaining test procedure as above							
7.2.6	**Perform CS Power Lines test for the ICU, CM, Steady State, Frequency range 10 kHz to 50 MHz**							
7.2.6.1	Install the test set-up for the ICU primary power lines, according to RH1, section 5.4.2.2	EMC						
7.2.6.2	Prepare EMC set-up, according to RH1, section 5.4.2.2 The frequencies shall be applied as ''step-wise-sweep'' over a session of 5 minutes (5 minutes script) and two sessionsof 10 minutes (10 seconds script). - Application of one frequency: 10.0 sec - f2 = 1.1 x f1 f3 = 1.1 x f2	EMC				Total 79 steps		
7.2.6.3	RH2 procedure 11.4.3.4: EMC susceptibility test.	OP						
7.2.6.4	One minute after start of script in previous step: Inform EMC to start EMC source sweep	OP						

Step-No.	Integration-Step-Description	OP / EMC	Nom Val	Tol.	Act. Val.	Comment	P	N
7.2.6.5	Start the stepwise-sweep and inform OP.	EMC						
7.2.6.6	Tell EMC the time tag for notification in the frequency control table and wait for end of the session	OP						
7.2.6.7	Notify the time tag provided by OP immediately in the frequency control table together with the applied frequency range (to be filled into the control table)	EMC						
7.2.6.8	After the session (end of sweep) inform OP immediately.	EMC						

7.2.6.9	Give to EMC the corresponding time tag to be filled in the table and store the session data with identification of
	        - CS Power Lines CM
	        - Frequency range
		OP						

7.2.6.10	Note the time tag in the frequency control table. Prepare the next session according to RH1 section 5.4.2.2 Continue from step 7.2.6.3	EMC						
7.2.7	**Perform CS Power Lines test for the LCU, CM, Steady State, Frequency range 10 kHz to 50 MHz**							
7.2.7.1	Install the test set-up for the LCU primary power lines, according to RH1, section 5.4.2.2	EMC						
7.2.7.2	Remaining test procedure as above							
7.2.8	**Perform CS Power Lines test for the ICU, DM, Transients**							

Step-No.	Integration-Step-Description	OP / EMC	Nom Val	Tol.	Act. Val.	Comment	P	N
7.2.8.1	Install the test set-up for the ICU primary power lines, according to RH1, section 5.4.3	EMC						
7.2.8.2	Prepare EMC set-up, according to RH1, section 5.4.3	EMC						
7.2.8.3	RH2 procedure 11.4.3.4: EMC susceptibility test for 5 minutes	OP						
7.2.8.4	One minute after start of script in previous step: Inform EMC to start EMC injection	OP						
7.2.8.5	Start the EMC injection and inform OP	EMC						
7.2.8.6	After the session inform OP immediately.	EMC						
7.2.8.7	Give to EMC the corresponding time tag to be filled in the table and store the session data with identification of - CS Power Lines DM Transients	OP						
7.2.9	**Perform CS Power Lines test for the LCU, DM, Transients**							
7.2.9.1	Install the test set-up for the LCU primary power lines, according to RH1, section 5.4.3	EMC						
7.2.9.2	Remaining test procedure as above							
7.2.10	**Perform CS Power Lines test for the ICU, CM, Transients**							
7.2.10.1	Install the test set-up for the ICU primary power lines, according to RH1, section 5.4.4	EMC						

Step-No.	Integration-Step-Description	OP / EMC	Nom Val	Tol.	Act. Val.	Comment	P	N
7.2.10.2	Prepare EMC set-up, according to RH1, section 5.4.4	EMC						
7.2.10.3	RH2 procedure 11.4.3.4: EMC susceptibility test for 5 minutes	OP						
7.2.10.4	One minute after start of script in previous step: Inform EMC to start EMC injection	OP						
7.2.10.5	Start the EMC injection and inform OP	EMC						
7.2.10.6	After the session inform OP immediately.	EMC						
7.2.10.7	Give to EMC the corresponding time tag to be filled in the table and store the session data with identification of - CS Power Lines CM Transients	OP						
7.2.11	**Perform CS Power Lines test for the LCU, CM, Transients**							
7.2.11.1	Install the test set-up for the LCU primary power lines, according to RH1 section 5.4.4	EMC						
7.2.11.2	Remaining test procedure as above							
7.2.12	**Perform CE/CS Signal Bundles test for SIH-IH-01, 02 and05, CM, current**							
7.2.12.1	Install EMC test set-up for the cable bundle SIH-IH-01, according to RH1 section 5.5.1							
7.2.12.2	Prepare EMC set-up, according to RH1, section 5.5.1	EMC						

Step-No.	Integration-Step-Description	OP / EMC	Nom Val	Tol.	Act. Val.	Comment	P	N
7.2.12.3	RH2 procedure 11.4.3.4: EMC test.	OP				**EMC test source may remain on, as it will not influence the emission test. _TBC_**		
7.2.12.4	One minute after start of script in previous step: Inform EMC to start EMC measurement	OP						
7.2.12.5	Start EMC emission measurement in the frequency range 10 kHz - 50 MHz	EMC						
7.2.12.6	Analyse emission data, according to RH1 section 5.5.2.	EMC						
7.2.12.7	Prepare EMC set-up, according to RH1, section 5.5.2 - first frequency found in analysis	EMC				Only for frequencies and levels found in previous step, otherwise skip steps		
7.2.12.8	RH2 procedure 11.4.3.4: EMC test for TBD minutes TBD dependant on number of frequencies found in analysis	OP						
7.2.12.9	One minute after start of script in previous step: Inform EMC to start EMC injection	OP						
7.2.12.10	Start the EMC injection and inform OP	EMC						
7.2.12.11	After 30 seconds stop injection and inform OP	EMC						
7.2.12.12 7.2.12.13	Prepare next frequency found in analysis Repeat step 7.3.16.9 to 7.3.16.11 for all other frequencies	EMC/ OP						
7.2.12.14	Give to EMC the corresponding time tags to be filled in the table and store the session data with identification of - CS Signal Bundles	OP						

Step-No.	Integration-Step-Description	OP / EMC	Nom Val	Tol.	Act. Val.	Comment	P	N
7.2.12.15	Repeat step 7.3.16.1 to 7.3.16.13 for the other cable bundles	EMC/ OP						
7.2.13	**Perform CE/CS Signal Bundles test for SIH-IH-07, CM, current**							
7.2.13.1	Install EMC test set-up for the cable bundle SIH-IH-07, according to RH1 section 5.5.1	EMC						
7.2.13.2	Remaining test procedure as in above							

7.3   PACS EMC Test

It follows the step by step procedure for the PACS EMC test. Because the test will last more that oneday after the testing day the procedure shall be started from the beginning every start of the testing day in order to continue with the EMC test where it was interrupted the day before. The frequency control tables as shown in para. 8 shall be filled in during the test and will provide the correlation between the testing time and the achieved progress of the EMC test

Step-No.	Integration-Step-Description	OP / EMC	Nom Val	Tol.	Act. Val.	Comment	P	N
7.3.1	**At the beginning of the day start up instrument and set-up PACS instrument into safe mode**							
7.3.1.1	Command ''PACS_Switch_On_CCS.tcl''	OP	SAFE			Refer to RP2		
7.3.2	**Perform PACS Cooler Recycle (required every day provided that the instrument has to be set in photometer mode)**							
7.3.2.1	Refer to RP2	OP	SAFE			Refer to RP2		
7.3.3	**Perform flushing every morning**		SAFE					
7.3.4	**Set PACS in photometer mode and perform reference tests**							
7.3.4.1	Command ''PHOT_setup_OBS_shell.tcl''	OP	PHOT			Refer to RP2		
	Command ''Chop_mov_abs_obs_shell.tcl''	OP	PHOT			Refer to RP2. Check that science packets are generated and being displayed on QLA grating position 500000 and chopper target =25000.		

Step-No.	Integration-Step-Description	OP / EMC	Nom Val	Tol.	Act. Val.	Comment	P	N
7.3.5	**Perform RS H-field test in photometer mode for the frequencies and antenna positions according to the frequency control tables in para. 8.**							
7.3.5.1	Prepare EMC set-up	OP / EMC						
7.3.5.2	Let OP confirm photometer mode	EMC						
7.3.5.3	Perform threshold measurements on a predefined set of frequencies directly before set-up change in accordance to the normal frequency list from the frequency control table.	EMC						
7.3.5.4	Apply the calibrated frequency according to frequency control table, switch it ON and inform OP.	EMC						
7.3.5.5	START DATA ACQUISITION and tell EMC the time tag for notification in the frequency control table and wait 50 sec. (DWELL time).	OP						
7.3.5.6	Notify the CCS time tag provided by OP immediately in the frequency control table.	EMC						
7.3.5.7	After the about 50 sec (DWELL time) STOP DATA AQUISITION and give EMC the corresponding CCS time.	OP						
7.3.5.8	Store data and give emc the corresponding file name.	EMC						
7.3.5.9	Note CCS time. Switch RS frequency OFF and set to the next frequency step	EMC						

Step-No.	Integration-Step-Description	OP / EMC	Nom Val	Tol.	Act. Val.	Comment	P	N
7.3.5.10	Apply the next frequency according to frequency control table and repeat the above steps until the complete H-field is tested (3 antenna positions). A reference test shall be included in between as far as necessary (about every 90 min.).	OP/ EMC						
7.3.5.11	Return to SAFE mode by commanding ''ENTER_SAFE_Model_Shell.tcl''	OP	SAFE					
7.3.6	**Set PACS in spectrometer mode and perform reference tests**							
7.3.6.1	Command ''SetupSpectroscopyEQMIMT_Shell.tcl'''	OP	SPEC			Refer to RP2		
	Command ''SPEC_Prepare_EMC_Shell.tcl''	OP	PHOT			Refer to RP2. Check that science packets are generated and being displayed on QLA grating position 500000 and chopper target =25000.		
7.3.7	**Perform RS H-field test in spectrometer mode for the frequencies and antenna positions according to the frequency control tables in para. 8.**							
7.3.7.1	Prepare EMC set-up	OP / EMC						
7.3.7.2	Let OP confirm spectrometer mode	EMC						
7.3.7.3	Apply the calibrated frequency according to frequency control table, switch it ON and inform OP.	EMC						
7.3.7.4	START DATA ACQUISITION and tell EMC the time tag for notification in the frequency control table and wait 50 sec. (DWELL time).	OP						

Step-No.	Integration-Step-Description	OP / EMC	Nom Val	Tol.	Act. Val.	Comment	P	N
7.3.7.5	Notify the CCS time tag provided by OP immediately in the frequency control table	EMC						
7.3.7.6	After the about 50 sec (DWELL time) STOP DATA AQUISITION and give EMC the corresponding CCS time.	OP						
7.3.7.7	Store data and give emc the corresponding file name.	EMC						
7.3.7.8	Note CCS time. Switch RS frequency OFF and set to the next frequency step	EMC						
7.3.7.9	Apply the next frequency according to frequency control table and repeat the above steps until the complete H-field is tested (2 antenna positions). A reference test shall be included in between as far as necessary (abput every 90 min.).	OP/ EMC						
7.3.7.10	Return to SAFE mode by commanding ''ENTER_SAFE_Model_Shell.tcl''	OP	SAFE					
7.3.8	**Perform PACS Cooler Recycle (required every day provided that the instrument has to be set in photometer mode)**							
7.3.8.1	Refer to RP2	OP	SAFE			Refer to RP2		
7.3.9	**Perform flushing every morning**		SAFE					
7.3.10	**Set PACS in photometer mode and perform reference tests**							
7.3.10.1	Command ''PHOT_setup_OBS_shell.tcl''	OP	PHOT			Refer to RP2		

Step-No.	Integration-Step-Description	OP / EMC	Nom Val	Tol.	Act. Val.	Comment	P	N
7.3.10.2	Command ''Chop_mov_abs_obs_shell.tcl''	OP	PHOT			Refer to RP2. Check that science packets are generated and being displayed on QLA grating position 500000 and chopper target =25000.		
7.3.11	**Perform RS E-field test in photometer mode for the frequencies and antenna positions according to the frequency control tables in para. 8.**							
7.3.11.1	Prepare EMC set-up	OP / EMC						
7.3.11.2	Let OP confirm photometer mode	EMC						
7.3.11.3	Apply the calibrated frequency according to frequency control table, switch it ON and inform OP.	EMC						
7.3.11.4	START DATA ACQUISITION and tell EMC the time tag for notification in the frequency control table and wait 50 sec. (DWELL time).	OP						
7.3.11.5	Notify the CCS time tag provided by OP immediately in the frequency control table	EMC						
7.3.11.6	After the about 50 sec (DWELL time) STOP DATA AQUISITION and give EMC the corresponding CCS time.	OP						
7.3.11.7	Store data and give emc the corresponding file name.	EMC						
7.3.11.8	Note CCS time. Switch RS frequency OFF and set to the next frequency step	EMC						

Step-No.	Integration-Step-Description	OP / EMC	Nom Val	Tol.	Act. Val.	Comment	P	N
7.3.11.9	Apply the next frequency according to frequency control table and repeat the above steps until the complete E-field is tested (2 antenna positions). A reference test shall be included in between as far as necessary (about every 90 min.).	OP/ EMC						
7.3.11.10	Return to SAFE mode by commanding ''ENTER_SAFE_Model_Shell.tcl''	OP	SAFE					
7.3.12	**Set PACS in spectrometer mode and perform reference tests**							
7.3.12.1	Command ''SetupSpectroscopyEQMIMT_Shell.tcl'''	OP	SPEC			Refer to RP2		
	Command ''SPEC_Prepare_EMC_Shell.tcl''	OP	PHOT			Refer to RP2. Check that science packets are generated and being displayed on QLA grating position 500000 and chopper target =25000.		
7.3.13	**Perform RS E-field test in spectrometer mode for the frequencies and antenna positions according to the frequency control tables in para. 8.**							
7.3.13.1	Prepare EMC set-up	OP / EMC						
7.3.13.2	Let OP confirm spectrometer mode	EMC						
7.3.13.3	Apply the calibrated frequency according to frequency control table, switch it ON and inform OP.	EMC						
7.3.13.4	START DATA ACQUISITION and tell EMC the time tag for notification in the frequency control table and wait 50 sec. (DWELL time).	OP						

Doc. No: HP-2-ASED-PR-0033   Page **45**
Issue: 1
Date: 05.10.05   File: HP-2-ASED-PR-0033_1.doc

Step-No.	Integration-Step-Description	OP / EMC	Nom Val	Tol.	Act. Val.	Comment	P	N
7.3.13.5	Notify the CCS time tag provided by OP immediately in the frequency control table	EMC						
7.3.13.6	After the about 50 sec (DWELL time) STOP DATA AQUISITION and give EMC the corresponding CCS time.	OP						
7.3.13.7	Store data and give emc the corresponding file name.	EMC						
7.3.13.8	Note CCS time. Switch RS frequency OFF and set to the next frequency step	EMC						
7.3.13.9	Apply the next frequency according to frequency control table and repeat the above steps until the complete E-field is tested (2 antenna positions). A reference test shall be included in between as far as necessary (every 90 min. TBC).	OP/ EMC						
7.3.13.10	Return to SAFE mode by commanding ''ENTER_SAFE_Model_Shell.tcl''	OP	SAFE					
7.3.14	**Perform offline evaluation.**	**OP**						

7.4   SPIRE EMC Test

It follows the step by step procedure for the SPIRE RS test. Because the test will last more that one day, after a testing day the procedure shall be started from the beginning every start of the testing day in order to continue with the EMC test where it was interrupted the day before. The frequency control tables as shown in para. 8 shall be filled in during the test and will provide the correlation between the testing time and the achieved progress of the EMC test.

Step-No.	Integration-Step-Description	OP / EMC	Nom Val	Tol.	Act. Val.	Comment	P	N
7.4.1	**Start up SPIRE and set-up instrument into REDY mode**							
7.4.1.1	Refer to RS2	OP	REDY					
7.4.2	**Perform cooler recycle at the evening of each testing day**							
7.4.2.1	Refer to RS2	OP						
7.4.3	**Perform facility measurements and SPIRE health check and the beginning of each testing day**							
7.4.3.1	Refer to RS2	OP						
7.4.4	**Set SPIRE into nominal mode**							
7.4.4.1	Refer to RS2	OP OP						

Step-No.	Integration-Step-Description	OP / EMC	Nom Val	Tol.	Act. Val.	Comment	P	N
7.4.5	**Perform H-field test in nominal mode SWEEP**							
7.4.5.1	Perform SPIRE REFERENCE TEST (necessary about every 90 min on OP request), refer to RS2.	OP						
7.4.5.2	Prepare RS H-field set-up with calibrated EMI values. Use the frequency tables for the definition of the respective sweep start and end frequency. The sweep shall be a step-wise sweep in accordance to the law: $f = f_{prev.} \times 1.15$. The particular single frequencies of each sweep subset will be presented by the facility personnel at test.	EMC						
7.4.5.3	Start SWEEP SCRIPT file for the sweep SPIRE-CCS-EMC-SWEEP.tcl and 10 sec. later the EMC sweep and note the corresponding CCS time in the frequency table, both EMC and OP.	OP/ EMC						
7.4.5.4	Stop SWEEP SCRIPT file simultaneously with the end of the EMC sweep and 1. Note the corresponding CCS time, both OP and EMC. 2. Note the STEP Number of the SWEEP, both OP and EMC.	EMC/ OP						
7.4.5.5	Generate ASCI file with the QLA routines when after a number of sweep test cases.	OP						
7.4.5.6	After a certain number of SWEEPs a reference test in accordance to RS 2 have to be performed. If all sweeps from the frequency table are performed go to the next step below.	OP/ EMC						

Step-No.	Integration-Step-Description	OP / EMC	Nom Val	Tol.	Act. Val.	Comment	P	N
7.4.6	**Perform H-field test in nominal mode, SPOT**							
7.4.6.1	The frequency table shall be completed by OP in order to show maximum 30 SPOTS as result of this sweep test analysis.	OP						
7.4.6.2	Perform SPIRE REFERENCE TEST in accordance to RS2.	EMC						
7.4.6.4	Start SPOT SCRIPT file for the SPOT SPIRE-CCS-EMC-SPOT.tcl simultaneously with the start of the EMC SPOT application and note the corresponding CCS time in the frequency table, both OP and EMC.	OP						
7.4.6.5	Stop SPOT SCRIPT file simultaneously with the EMC SPOT exactly after 3 minutes and 1. Note the corresponding CCS time, both OP and EMC 2. Note the STEP Number of the SPOT, both OP and EMC.	OP/ EMC						
7.4.6.6	Generate ASCI file with the QLA routines when after a number of SPOT test cases	OP						
7.4.6.7	After a certain number of SPOTs a reference test in accordance to RS 2 have to be performed. If all SPOTs from the frequency table are performed go to the next step below.	EMC / OP						
7.4.6.8	If all applicable EMC set-ups have been performed the test is completed, otherwise go back to step 7.4.5 for a sweep with the other EMC set-up, in accordance to the frequency table in chapter 8.	EMC/ OP						

Step-No.	Integration-Step-Description	OP / EMC	Nom Val	Tol.	Act. Val.	Comment	P	N
7.4.7	**Perform E-field test in nominal mode, SWEEP**							
7.4.7.1	Perform SPIRE REFERENCE TEST (necessary about every 90 min on OP request), refer to RS2.	EMC						
7.4.7.2	Prepare RS E-field set-up for this antenna position with calibrated EMI values. Use the frequency tables for the definition of the respective sweep start and end frequency. The sweep shall be a step-wise sweep in accordance to the law: $f = f_{prev.} \times 1.15$. The particular single frequencies of each sweep subset will be presented by the facility personnel at test.	OP						
7.4.7.3	Start SWEEP SCRIPT file for the sweep SPIRE-CCS-EMC-SWEEP.tcl and 10 sec. later the EMC sweep and note the corresponding CCS time in the frequency table, both EMC and OP.	OP/ EMC						
7.4.7.4	Stop SWEEP SCRIPT file simultaneously with the end of the EMC sweep and 1. Note the corresponding CCS time, both OP and EMC. 2. Note the STEP Number of the SWEEP, both OP and EMC.	EMC/ OP						
7.4.7.5	Generate ASCI file with the QLA routines when after a number of sweep test cases.							
7.4.7.6	After a certain number of SWEEPs a reference test in accordance to RS 2 have to be performed. If all sweeps from the frequency table are performed go to the next step below.	OP/ EMC						

Step-No.	Integration-Step-Description	OP / EMC	Nom Val	Tol.	Act. Val.	Comment	P	N
7.4.8	**Perform E-field test in nominal mode, SPOT**							
7.4.8.1	The frequency table shall be completed by OP in order to show maximum 30 SPOTS as result of this sweep test analysis.	OP						
7.4.8.2	Perform SPIRE REFERENCE TEST in accordance to RS2.	EMC						
7.4.8.3	Start SPOT SCRIPT file for the SPOT SPIRE-CCS-EMC-SPOT.tcl simultaneously with the start of the EMC SPOT application and note the corresponding CCS time in the frequency table, both OP and EMC.	OP						
7.4.8.4	Stop SPOT SCRIPT file simultaneously exactly after 3 minutes and 1. Note the corresponding CCS time, both OP and EMC. 2. Note the STEP Number of the SPOT, both OP and EMC	OP						
7.4.8.5	Generate ASCI file with the QLA routines when after a number of SPOT test cases	OP						
7.4.8.6	After a certain number of SPOTs a reference test in accordance to RS 2 have to be performed. If all SPOTs from the frequency table are performed go to the next step below.	EMC / OP						
7.4.8.7	If all antenna positions with the applicable EMC set-up or polarisation have been performed the test is completed, otherwise go back to step 7.4.7 for a sweep with the other EMC set-up or antenna position/polarisation, in accordance to the frequency table in chapter 8.	EMC/ OP						

7.5   Pre- and Post Test Activities

Step-No.	Integration-Step-Description	OP / EMC	Nom Val	Tol.	Act. Val.	Comment	P	N
7.5.1	**Pre- Test activities**							
7.5.1.1	Confirm that every instrument is switched OFF.	OP / EMC						
7.5.1.2	Switch all instruments into Standby mode.	OP / EMC						
7.5.1.3	Hold Pointer meeting in order to clarify the steps to be performed this day (max. 30 min)	OP / EMC						
7.5.2	**Post- Test activities**							
7.5.2.1	Confirm operational mode for the instrument under test.	OP / EMC						
7.5.2.2	Confirm Standby mode for the instruments not under test.	OP / EMC						
7.5.2.3	Confirm that all tests data are available and well stored, respectively available as paper copy or photo.	OP / EMC						
7.5.2.4	Switch all instruments into standby	OP / EMC						
7.5.2.5	Switch-all instruments OFF except if cooler recycling is required. In this case the recycled instrument shall be left in standby or safe mode respectively.	OP / EMC						
7.5.2.6	Hold wash-up meeting (max 60 min): 1. status 2. tasks to be done next day in parallel to the normal test activities.	OP / EMC						

8 RS Frequency Control Tables

8.1 HIFI Frequency Control Tables H-field

				HIFI RS H-Field, Antenna Position 1				
i	Frequency Range	Date	CCS Start Time	CCS Stop Time	Script File	Session Name	Sensor	Observations
1	30 Hz – 1.23 kHz (< 7 min)							
2	1.23 kHz - 50 kHz (< 7 min)							
3								
4								
5								
6								
7								
8								
9								
10								

Table 8.1-1: HIFI @ Susceptibility Mode // H-field // 1st Antenna Position

HIFI RS H-Field, Antenna Position 2								
i	**Frequency Range**	**Date**	**CCS Start Time**	**CCS Stop Time**	**Script File**	**Session Name**	**Sensor**	**Observations**
1	30 Hz – 1.23 kHz (< 7 min)							
2	1.23 kHz - 50 kHz (< 7 min)							
3								
4								
5								
6								
7								
8								
9								
10								

Table 8.1-2: HIFI @ Susceptibility Mode // H-field // 2nd Antenna Position

8.2 HIFI Frequency Control Tables E-field

HIFI RS E-Field, Antenna Position 1 Horizontal Polarization								
i	Frequency Range	Date	CCS Start Time	CCS Stop Time	Script File	Session Name	Sensor	Observations
1	30 MHz – 1 GHz (< 7 min)							
2	1 GHz – 6 GHz (< 5 min)							
3	6 GHz – 18 GHz (< 3 min)							
4	8.45 GHz – 8.5 GHz (in steps of 10 MHz)							
5								
6								
7								
8								
9								
10								

Table 8.2-1: HIFI @ Susceptibility Mode // E-field // 1st Antenna Position, Horizontal Polarization

HIFI RS E-Field, Antenna Position 1, Vertical Polarization								
i	Frequency Range	Date	CCS Start Time	CCS Stop Time	Script File	Session Name	Sensor	Observations
1	14 kHz – 600 kHz (< 8 min)							
2	600 kHz – 30 MHz (< 7 min)							
3	30 MHz – 1 GHz (< 7 min)							
4	1 GHz – 6 GHz (< 5 min)							
5	6 GHz – 18 GHz (< 3 min)							
6	8.45 GHz – 8.5 GHz (in steps of 10 MHz)							
7								
8								
9								
10								

Table 8.2-2: HIFI @ Susceptibility Mode // E-field // 1ˢᵗ Antenna Position, Vertical Polarization

	HIFI RS E-Field, Antenna Position 2 Horizontal Polarization							
i	Frequency Range	Date	CCS Start Time	CCS Stop Time	Script File	Session Name	Sensor	Observations
1	30 MHz – 1 GHz (< 7 min)							
2	1 GHz – 6 GHz (< 5 min)							
3	6 GHz – 18 GHz (< 3 min)							
4	8.45 GHz – 8.5 GHz (in steps of 10 MHz)							
5								
6								
7								
8								
9								
10								

Table 8.2-3: HIFI @ Susceptibility Mode // E-field // 2nd Antenna Position, Horizontal Polarization

Doc. No: HP-2-ASED-PR-0033   Page   **57**
Issue: 1
Date: 05.10.05   File: HP-2-ASED-PR-0033_1.doc

	HIFI RS E-Field, Antenna Position 2, Vertical Polarization							
i	Frequency Range	Date	CCS Start Time	CCS Stop Time	Script File	Session Name	Sensor	Observations
1	14 kHz – 600 kHz (< 8 min)							
2	600 kHz – 30 MHz (< 7 min)							
3	30 MHz – 1 GHz (< 7 min)							
4	1 GHz – 6 GHz (< 5 min)							
5	6 GHz – 18 GHz (< 3 min)							
6	8.45 GHz – 8.5 GHz (in steps of 10 MHz)							
7								
8								
9								
10								

Table 8.2-4: HIFI @ Susceptibility Mode // E-field // 2nd Antenna Position, Vertical Polarization

	HIFI RS E-Field, Antenna Position 3 Horizontal Polarization							
i	Frequency Range	Date	CCS Start Time	CCS Stop Time	Script File	Session Name	Sensor	Observations
1	30 MHz – 1 GHz (< 7 min)							
2	1 GHz – 6 GHz (< 5 min)							
3	6 GHz – 18 GHz (< 3 min)							
4	8.45 GHz – 8.5 GHz (in steps of 10 MHz)							
5								
6								
7								
8								
9								
10								

Table 8.2-5: HIFI @ Susceptibility Mode // E-field // 3rd Antenna Position, Horizontal Polarization

HIFI RS E-Field, Antenna Position 3, Vertical Polarization							
i	Frequency Range	Date	CCS Start Time	CCS Stop Time	Script File	Session Name	Sensor	Observations
1	14 kHz – 600 kHz (< 8 min)							
2	600 kHz – 30 MHz (< 7 min)							
3	30 MHz – 1 GHz (< 7 min)							
4	1 GHz – 6 GHz (< 5 min)							
5	6 GHz – 18 GHz (< 3 min)							
6	8.45 GHz – 8.5 GHz (in steps of 10 MHz)							
7								
8								
9								
10								

Table 8.2-6: HIFI @ Susceptibility Mode // E-field // 3rd Antenna Position, Vertical Polarization

8.3   HIFI Control Tables Conducted Susceptibility Power Lines

				HIFI CS Test ICU Power Lines				
i	Frequency Range	Date	CCS Start Time	CCS Stop Time	Script File	Session Name	Sensor	Observations
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

Table 8.3-1: HIFI @ Susceptibility Mode // CS ICU Power Lines

HIFI CS Test LCU Power Lines								
i	**Frequency Range**	**Date**	**CCS Start Time**	**CCS Stop Time**	**Script File**	**Session Name**	**Sensor**	**Observations**
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

Table 8.3-2: HIFI @ Susceptibility Mode // CS LCU Power Lines

8.4   HIFI Control Tables Conducted Susceptibility on Instrument Cryo Harness Bundles

Corresponding tables and figures to be prepared during the test because they would be specific (the CS value has to be adjusted 6 dB above the value measured at every particular frequency at given instrument Cryo Harness bundle).

8.5 PACS Frequency Control Tables H-field

	PACS RS H-field Photometer Mode 1st Position							
i	Frequency	Date	CCS Start Time	CCS Stop Time	Script	Session	Sensor	Observations
1	30 Hz							
2	40 Hz							
3	50 Hz							
4	64 Hz							
5	80 Hz							
6	100 Hz							
7	125 Hz							
8	256 Hz							
9	350 Hz							
10	500 Hz							
11	750 Hz							
12	1 kHz							
13	1.5 kHz							
14	2 kHz							
15	2.5 kHz							
16	3 kHz							
17	3.5 kHz							
18	4 kHz							
19	4.5 kHz							
20	5 kHz							
21	5.5 kHz							

PACS RS H-field Photometer Mode 1st Position							
i	Frequency	Date	CCS Start Time	CCS Stop Time	Script	Session	Sensor	Observations
22	6 kHz							
23	6.5 kHz							
24	7 kHz							
25	7.5 kHz							
26	8 kHz							
27	8.5 kHz							
28	9 kHz							
29	9.5 kHz							
31	10 kHz							
31	11.47 kHz							
32	15.6 kHz							
33	17.0 kHz							
34	20.0 kHz							
35	25.0 kHz							
36	30 kHz							
37	35 kHz							
38	40 kHz							
39	45.8 kHz							
40	50 kHz							
	40 Hz							Threshold Prediction

PACS RS H-field Photometer Mode 1st Position								
i	Frequency	Date	CCS Start Time	CCS Stop Time	Script	Session	Sensor	Observations
	100 Hz							Threshold Prediction
	350 Hz							Threshold Prediction
	1 kHz							Threshold Prediction
	2.5 kHz							Threshold Prediction
	3.5 kHz							Threshold Prediction
	6 kHz							Threshold Prediction
	8 kHz							Threshold Prediction
	20 kHz							Threshold Prediction
	30 kHz							Threshold Prediction

Table 8.5-1: PACS @ Photometer Mode// H-field // 1st Antenna Position

PACS RS H-field Photometer Mode 2nd Position								
i	Frequency	Date	CCS Start Time	CCS Stop Time	Script	Session	Sensor	Observations
1	30 Hz							
2	40 Hz							
3	50 Hz							
4	64 Hz							
5	80 Hz							
6	100 Hz							
7	125 Hz							
8	256 Hz							
9	350 Hz							

PACS RS H-field Photometer Mode 2nd Position							
i	Frequency	Date	CCS Start Time	CCS Stop Time	Script	Session	Sensor	Observations
10	500 Hz							
11	750 Hz							
12	1 kHz							
13	1.5 kHz							
14	2 kHz							
15	2.5 kHz							
16	3 kHz							
17	3.5 kHz							
18	4 kHz							
19	4.5 kHz							
20	5 kHz							
21	5.5 kHz							
22	6 kHz							
23	6.5 kHz							
24	7 kHz							
25	7.5 kHz							
26	8 kHz							
27	8.5 kHz							
28	9 kHz							
29	9.5 kHz							
31	10 kHz							
31	11.47 kHz							
32	15.6 kHz							
33	17.0 kHz							
34	20.0 kHz							

				PACS RS H-field Photometer Mode 2nd Position				
i	Frequency	Date	CCS Start Time	CCS Stop Time	Script	Session	Sensor	Observations
35	25.0 kHz							
36	30 kHz							
37	35 kHz							
38	40 kHz							
39	45.8 kHz							
40	50 kHz							
	40 Hz							Threshold Prediction
	100 Hz							Threshold Prediction
	350 Hz							Threshold Prediction
	1 kHz							Threshold Prediction
	2.5 kHz							Threshold Prediction
	3.5 kHz							Threshold Prediction
	6 kHz							Threshold Prediction
	8 kHz							Threshold Prediction
	20 kHz							Threshold Prediction
	30 kHz							Threshold Prediction

Table 8.5-2: PACS @ Photometer Mode// H-field // 2nd Antenna Position

PACS RS H-field Photometer Mode 3rd Position
i	**Frequency**	**Date**	**CCS Start Time**	**CCS Stop Time**	**Script**	**Session**	**Sensor**	**Observations**
1	30 Hz							
2	40 Hz							
3	50 Hz							
4	64 Hz							
5	80 Hz							
6	100 Hz							
7	125 Hz							
8	256 Hz							
9	350 Hz							
10	500 Hz							
11	750 Hz							
12	1 kHz							
13	1.5 kHz							
14	2 kHz							
15	2.5 kHz							
16	3 kHz							
17	3.5 kHz							
18	4 kHz							
19	4.5 kHz							
20	5 kHz							
21	5.5 kHz							
22	6 kHz							
23	6.5 kHz							
24	7 kHz							
25	7.5 kHz							

Doc. No: HP-2-ASED-PR-0033   Page **69**
Issue: 1
Date: 05.10.05   File: HP-2-ASED-PR-0033_1.doc

| PACS RS H-field Photometer Mode 3rd Position |
i	Frequency	Date	CCS Start Time	CCS Stop Time	Script	Session	Sensor	Observations
26	8 kHz							
27	8.5 kHz							
28	9 kHz							
29	9.5 kHz							
31	10 kHz							
31	11.47 kHz							
32	15.6 kHz							
33	17.0 kHz							
34	20.0 kHz							
35	25.0 kHz							
36	30 kHz							
37	35 kHz							
38	40 kHz							
39	45.8 kHz							
40	50 kHz							
	40 Hz							Threshold Prediction
	100 Hz							Threshold Prediction
	350 Hz							Threshold Prediction
	1 kHz							Threshold Prediction
	2.5 kHz							Threshold Prediction

Doc. No: HP-2-ASED-PR-0033   Page **70**

Issue: 1

Date: 05.10.05   File: HP-2-ASED-PR-0033_1.doc

PACS RS H-field Photometer Mode 3rd Position								
i	Frequency	Date	CCS Start Time	CCS Stop Time	Script	Session	Sensor	Observations
	3.5 kHz							Threshold Prediction
	6 kHz							Threshold Prediction
	8 kHz							Threshold Prediction
	20 kHz							Threshold Prediction
	30 kHz							Threshold Prediction

Table 8.5-3: PACS @ Photometer Mode// H-field // 3rd[t] Antenna Position

PACS RS H-field Spectrometer Mode 1st Position								
i	Frequency	Date	CCS Start Time	CCS Stop Time	Script	Session	Sensor	Observations
1	30 Hz							
2	40 Hz							
3	50 Hz							
4	64 Hz							
5	80 Hz							
6	100 Hz							
7	125 Hz							
8	256 Hz							
9	350 Hz							
10	500 Hz							
11	750 Hz							
12	1 kHz							
13	1.5 kHz							

PACS RS H-field Spectrometer Mode 1st Position
i	Frequency	Date	CCS Start Time	CCS Stop Time	Script	Session	Sensor	Observations
14	2 kHz							
15	2.5 kHz							
16	3 kHz							
17	3.5 kHz							
18	4 kHz							
19	4.5 kHz							
20	5 kHz							
21	5.5 kHz							
22	6 kHz							
23	6.5 kHz							
24	7 kHz							
25	7.5 kHz							
26	8 kHz							
27	8.5 kHz							
28	9 kHz							
29	9.5 kHz							
31	10 kHz							
31	11.47 kHz							
32	15.6 kHz							
33	17.0 kHz							
34	20.0 kHz							
35	25.0 kHz							
36	30 kHz							
37	35 kHz							
38	40 kHz							

PACS RS H-field Spectrometer Mode 1st Position
i	**Frequency**	**Date**	**CCS Start Time**	**CCS Stop Time**	**Script**	**Session**	**Sensor**	**Observations**
---	---	---	---	---	---	---	---	---
39	45.8 kHz							
40	50 kHz							

Table 8.5-1: PACS @ Spectrometer Mode// H-field // 1st Antenna Position

PACS RS H-field Spectrometer Mode 2nd Position
i	**Frequency**	**Date**	**CCS Start Time**	**CCS Stop Time**	**Script**	**Session**	**Sensor**	**Observations**
---	---	---	---	---	---	---	---	---
1	30 Hz							
2	40 Hz							
3	50 Hz							
4	64 Hz							
5	80 Hz							
6	100 Hz							
7	125 Hz							
8	256 Hz							
9	350 Hz							
10	500 Hz							
11	750 Hz							
12	1 kHz							

PACS RS H-field Spectrometer Mode 2nd Position
i	**Frequency**	**Date**	**CCS Start Time**	**CCS Stop Time**	**Script**	**Session**	**Sensor**	**Observations**
13	1.5 kHz							
14	2 kHz							
15	2.5 kHz							
16	3 kHz							
17	3.5 kHz							
18	4 kHz							
19	4.5 kHz							
20	5 kHz							
21	5.5 kHz							
22	6 kHz							
23	6.5 kHz							
24	7 kHz							
25	7.5 kHz							
26	8 kHz							
27	8.5 kHz							
28	9 kHz							
29	9.5 kHz							
31	10 kHz							
31	11.47 kHz							
32	15.6 kHz							
33	17.0 kHz							
34	20.0 kHz							
35	25.0 kHz							
36	30 kHz							
37	35 kHz							

PACS RS H-field Spectrometer Mode 2nd Position								
i	Frequency	Date	CCS Start Time	CCS Stop Time	Script	Session	Sensor	Observations
38	40 kHz							
39	45.8 kHz							
40	50 kHz							

Table 8.5-2: PACS @ Spectrometer Mode// H-field // 2nd Antenna Position

8.6   PACS Frequency Control Tables E-field

I	Frequency	Pol.	Date	CCS Time Start	CCS Time Stop	Script	Session	Sensor	Comment
1	0.1 MHz	V							
2	0.131 MHz	V							
3	0.18 MHz	V							
4	0.2 MHz	V							
5	0.22 MHz	V							
6	0.312 MHz	V							
7	0.5 MHz	V							
8	1 MHz	V							
9	2 MHz	V							
10	4 MHz	V							
11	6.88 MHz	V							
12	9.623 MHz	V							
13	10 MHz	V							
14	12 MHz	V							
15	12.8 MHz	V							
16z	14 MHz	V							
17	16 MHz	V							
18	17.28 MHz	V							
19	19.246 MHz	V							
20	20 MHz	V							
21	20.6478 MHz	V							
	CHANGE								**SETUP CHANGE**
22	36 MHz	V							

I	Frequency	Pol.	Date	CCS Time Start	CCS Time Stop	Script	Session	Sensor	Comment
23	38.49 MHz	V							
24	40 MHz	V							
25	48 MHz	V							
26	60 MHz	V							
27	80 MHz	V							
28	100 MHz	V							
29	200 Mhz	V							
30	300 MHz	V							
31	384.93 MHz	V							
32	481 MHz	V							
33	550 MHz	V							
34	577.38 MHz	V							
35	673.61 MHz	V							
36	769.86 MHz	V							
	CHANGE								**SETUP CHANGE**
37	1.1 GHz	V							
38	1.25 GHz	V							
39	2.30959 GHz	V							
40	4 GHz	V							
41	5 GHz	V							
42	6.15891 GHz	V							
	CHANGE								**SETUP CHANGE**
43	6.600 GHz	V							
44	7.600 GHz	V							
45	8.4685 GHz	V							
46	8.600 GHz	V							

I	Frequency	Pol.	Date	CCS Time Start	CCS Time Stop	Script	Session	Sensor	Comment
47	9.600 GHz	V							
48	10.36375 GHz	V							
49	15.173565 GHz	V							
50	16.690921 GHz	V							
	CHANGE								**SETUP CHANGE**
51	**8.45 GHz**	**V**							**TX Notch**
52	**8.475 GHz**	**V**							**TX Notch**
53	**8.5 GHz**	**V**							**TX Notch**
1	36 MHz	H							
2	38.49 MHz	H							
3	40 MHz	H							
4	48 MHz	H							
5	60 MHz	H							
6	80 MHz	H							
7	100 MHz	H							
8	200 Mhz	H							
9	300 MHz	H							
10	384.93 MHz	H							
11	481 MHz	H							
12	550 MHz	H							
13	577.38 MHz	H							
14	673.61 MHz	H							
15	769.86 MHz	H							
	CHANGE								**SETUP CHANGE**

I	Frequency	Pol.	Date	CCS Time Start	CCS Time Stop	Script	Session	Sensor	Comment
16	1.1 GHz	H							
17	1.25 GHz	H							
18	2.30959 GHz	H							
19	4 GHz	H							
20	5 GHz	H							
	CHANGE								**SETUP CHANGE**
21	6.15891 GHz	H							
22	6.600 GHz	H							
23	7.600 GHz	H							
24	8.4685 GHz	H							
25	8.600 GHz	H							
26	9.600 GHz	H							
27	10.36375 GHz	H							
28	15.173565 GHz	H							
29	16.690921 GHz	H							
	CHANGE								**SETUP CHANGE**
30	**8.45 GHz**	**H**							**TX Notch**
31	**8.475 GHz**	**H**							**TX Notch**
32	**8.5 GHz**	**H**							**TX Notch**

Table 8.6-1 : PACS @ Photometer Mode// E-field // 1st Antenna Position

i	Frequency	Pol.	Date	CCS Time Start	CCS Time Stop	Script	Session	Sensor	Comment
1	0.1 MHz	V							
2	0.131 MHz	V							
3	0.18 MHz	V							
4	0.2 MHz	V							
5	0.22 MHz	V							
6	0.312 MHz	V							
7	0.5 MHz	V							
8	1 MHz	V							
9	2 MHz	V							
10	4 MHz	V							
11	6.88 MHz	V							
12	9.623 MHz	V							
13	10 MHz	V							
14	12 MHz	V							
15	12.8 MHz	V							
16z	14 MHz	V							
17	16 MHz	V							
18	17.28 MHz	V							
19	19.246 MHz	V							
20	20 MHz	V							
21	20.6478 MHz	V							
	CHANGE								**SETUP CHANGE**
22	36 MHz	V							
23	38.49 MHz	V							
24	40 MHz	V							

i	Frequency	Pol.	Date	CCS Time Start	CCS Time Stop	Script	Session	Sensor	Comment
25	48 MHz	V							
26	60 MHz	V							
27	80 MHz	V							
28	100 MHz	V							
29	200 Mhz	V							
30	300 MHz	V							
31	384.93 MHz	V							
32	481 MHz	V							
33	550 MHz	V							
34	577.38 MHz	V							
35	673.61 MHz	V							
36	769.86 MHz	V							
	CHANGE								**SETUP CHANGE**
37	1.1 GHz	V							
38	1.25 GHz	V							
39	2.30959 GHz	V							
40	4 GHz	V							
41	5 GHz	V							
	CHANGE								**SETUP CHANGE**
42	6.15891 GHz	V							
43	6.600 GHz	V							
44	7.600 GHz	V							
45	8.4685 GHz	V							
46	8.600 GHz	V							
47	9.600 GHz	V							
48	10.36375 GHz	V							

i	Frequency	Pol.	Date	CCS Time Start	CCS Time Stop	Script	Session	Sensor	Comment
49	15.173565 GHz	V							
50	16.690921 GHz	V							
	CHANGE								**SETUP CHANGE**
51	**8.45 GHz**	**V**							**TX Notch**
52	**8.475 GHz**	**V**							**TX Notch**
53	**8.5 GHz**	**V**							**TX Notch**
1	36 MHz	H							
2	38.49 MHz	H							
3	40 MHz	H							
4	48 MHz	H							
5	60 MHz	H							
6	80 MHz	H							
7	100 MHz	H							
8	200 Mhz	H							
9	300 MHz	H							
10	384.93 MHz	H							
11	481 MHz	H							
12	550 MHz	H							
13	577.38 MHz	H							
14	673.61 MHz	H							
15	769.86 MHz	H							
	CHANGE								**SETUP CHANGE**
16	1.1 GHz	H							
17	1.25 GHz	H							

i	Frequency	Pol.	Date	CCS Time Start	CCS Time Stop	Script	Session	Sensor	Comment
18	2.30959 GHz	H							
19	4 GHz	H							
20	5 GHz	H							
	CHANGE								**SETUP CHANGE**
21	6.15891 GHz	H							
22	6.600 GHz	H							
23	7.600 GHz	H							
24	8.4685 GHz	H							
25	8.600 GHz	H							
26	9.600 GHz								
27	10.36375 GHz	H							
28	15.173565 GHz	H							
29	16.690921 GHz	H							
	CHANGE								**SETUP CHANGE**
30	**8.45 GHz**	**H**							**TX Notch**
31	**8.475 GHz**	**H**							**TX Notch**
32	**8.5 GHz**	**H**							**TX Notch**

Table 8.6-2 : PACS @ Photometer Mode// E-field // 2nd Antenna Position

i	Frequency	Pol.	Date	CCS Time Start	CCS Time Stop	Script	Session	Sensor	Comment
1	0.1 MHz	V							
2	0.131 MHz	V							
3	0.18 MHz	V							
4	0.2 MHz	V							
5	0.22 MHz	V							
6	0.312 MHz	V							
7	0.5 MHz	V							
8	1 MHz	V							
9	2 MHz	V							
10	4 MHz	V							
11	6.88 MHz	V							
12	9.623 MHz	V							
13	10 MHz	V							
14	12 MHz	V							
15	12.8 MHz	V							
16z	14 MHz	V							
17	16 MHz	V							
18	17.28 MHz	V							
19	19.246 MHz	V							
20	20 MHz								
21	20.6478 MHz	V							
	CHANGE								**SETUP CHANGE**
22	36 MHz	V							
23	38.49 MHz	V							
24	40 MHz	V							

i	Frequency	Pol.	Date	CCS Time Start	CCS Time Stop	Script	Session	Sensor	Comment
25	48 MHz	V							
26	60 MHz	V							
27	80 MHz	V							
28	100 MHz	V							
29	200 Mhz	V							
30	300 MHz	V							
31	384.93 MHz	V							
32	481 MHz	V							
33	550 MHz	V							
34	577.38 MHz	V							
35	673.61 MHz	V							
36	769.86 MHz	V							
	CHANGE								**SETUP CHANGE**
37	1.1 GHz	V							
38	1.25 GHz	V							
39	2.30959 GHz	V							
40	4 GHz	V							
41	5 GHz	V							
	CHANGE								**SETUP CHANGE**
42	6.15891 GHz	V							
43	6.600 GHz	V							
44	7.600 GHz	V							
45	8.4685 GHz	V							
46	8.600 GHz	V							
47	9.600 GHz	V							
48	10.36375 GHz	V							

i	Frequency	Pol.	Date	CCS Time Start	CCS Time Stop	Script	Session	Sensor	Comment
49	15.173565 GHz	V							
50	16.690921 GHz	V							
	CHANGE								**SETUP CHANGE**
51	**8.45 GHz**	**V**							**TX Notch**
52	**8.475 GHz**	**V**							**TX Notch**
53	**8.5 GHz**	**V**							**TX Notch**
1	36 MHz	H							
2	38.49 MHz	H							
3	40 MHz	H							
4	48 MHz	H							
5	60 MHz	H							
6	80 MHz	H							
7	100 MHz	H							
8	200 Mhz	H							
9	300 MHz	H							
10	384.93 MHz	H							
11	481 MHz	H							
12	550 MHz	H							
13	577.38 MHz	H							
14	673.61 MHz	H							
15	769.86 MHz	H							
	CHANGE								**SETUP CHANGE**
16	1.1 GHz	H							
17	1.25 GHz	H							

i	Frequency	Pol.	Date	CCS Time Start	CCS Time Stop	Script	Session	Sensor	Comment
18	2.30959 GHz	H							
19	4 GHz	H							
20	5 GHz	H							
	CHANGE								**SETUP CHANGE**
21	6.15891 GHz	H							
22	6.600 GHz	H							
23	7.600 GHz	H							
24	8.4685 GHz	H							
25	8.600 GHz	H							
26	9.600 GHz	H							
27	10.36375 GHz	H							
28	15.173565 GHz	H							
29	16.690921 GHz	H							
	CHANGE								**SETUP CHANGE**
30	**8.45 GHz**	**H**							**TX Notch**
31	**8.475 GHz**	**H**							**TX Notch**
32	**8.5 GHz**	**H**							**TX Notch**

Table 8.6-3 : PACS @ Spectrometer Mode// E-field // 1st Antenna Position

i	Frequency	Pol.	Date	CCS Time Start	CCS Time Stop	Script	Session	Sensor	Comment
1	0.1 MHz	V							
2	0.131 MHz	V							
3	0.18 MHz	V							
4	0.2 MHz	V							
5	0.22 MHz	V							
6	0.312 MHz	V							
7	0.5 MHz	V							
8	1 MHz	V							
9	2 MHz	V							
10	4 MHz	V							
11	6.88 MHz	V							
12	9.623 MHz	V							
13	10 MHz	V							
14	12 MHz	V							
15	12.8 MHz	V							
16z	14 MHz	V							
17	16 MHz	V							
18	17.28 MHz	V							
19	19.246 MHz								
20	20 MHz	V							
21	20.6478 MHz	V							
	CHANGE								**SETUP CHANGE**
22	36 MHz	V							
23	38.49 MHz	V							
24	40 MHz	V							

i	Frequency	Pol.	Date	CCS Time Start	CCS Time Stop	Script	Session	Sensor	Comment
25	48 MHz	V							
26	60 MHz	V							
27	80 MHz	V							
28	100 MHz	V							
29	200 Mhz	V							
30	300 MHz	V							
31	384.93 MHz	V							
32	481 MHz	V							
33	550 MHz	V							
34	577.38 MHz	V							
35	673.61 MHz	V							
36	769.86 MHz	V							
	CHANGE								**SETUP CHANGE**
37	1.1 GHz	V							
38	1.25 GHz	V							
39	2.30959 GHz	V							
40	4 GHz	V							
41	5 GHz	V							
	CHANGE								**SETUP CHANGE**
42	6.15891 GHz	V							
43	6.600 GHz	V							
44	7.600 GHz	V							
45	8.4685 GHz	V							
46	8.600 GHz	V							
47	9.600 GHz	V							
48	10.36375 GHz	V							

i	Frequency	Pol.	Date	CCS Time Start	CCS Time Stop	Script	Session	Sensor	Comment
49	15.173565 GHz	V							
50	16.690921 GHz	V							
	CHANGE								**SETUP CHANGE**
51	**8.45 GHz**	**V**							**TX Notch**
52	**8.475 GHz**	**V**							**TX Notch**
53	**8.5 GHz**	**V**							**TX Notch**
1	36 MHz	H							
2	38.49 MHz	H							
3	40 MHz	H							
4	48 MHz	H							
5	60 MHz	H							
6	80 MHz	H							
7	100 MHz	H							
8	200 Mhz	H							
9	300 MHz	H							
10	384.93 MHz	H							
11	481 MHz	H							
12	550 MHz	H							
13	577.38 MHz	H							
14	673.61 MHz	H							
15	769.86 MHz	H							
	CHANGE								**SETUP CHANGE**
16	1.1 GHz	H							
17	1.25 GHz	H							

i	Frequency	Pol.	Date	CCS Time Start	CCS Time Stop	Script	Session	Sensor	Comment
18	2.30959 GHz	H							
19	4 GHz	H							
20	5 GHz	H							
	CHANGE								**SETUP CHANGE**
21	6.15891 GHz	H							
22	6.600 GHz	H							
23	7.600 GHz	H							
24	8.4685 GHz	H							
25	8.600 GHz	H							
26	9.600 GHz	H							
27	10.36375 GHz	H							
28	15.173565 GHz	H							
29	16.690921 GHz	H							
	CHANGE								**SETUP CHANGE**
30	**8.45 GHz**	**H**							**TX Notch**
31	**8.475 GHz**	**H**							**TX Notch**
32	**8.5 GHz**	**H**							**TX Notch**

Table 8.6-4 : PACS @ Spectrometer Mode// E-field // 2nd Antenna Position

8.7   SPIRE Frequency Control Tables H-field

SPIRE RS H-Field								
i	**Frequency**	**Date**	**CCS Start Time**	**CCS Stop Time**	**Script**	**QLA / STEP**	**Sensor**	**Observations**
1	30 Hz – 750 Hz (< 5 min)							
2	750 Hz – 50 kHz (< 5 min)							
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								

SPIRE RS H-Field							
i	Frequency	Date	CCS Start Time	CCS Stop Time	Script	QLA / STEP	Sensor	Observations
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								
32								
33								
34								

Table 8.7-1: SPIRE RS H-field

8.8   SPIRE Frequency Control Tables E-field

SPIRE RS E-Field, Antenna Position 1 Horizontal Polarization								
i	**Frequency**	**Date**	**CCS Start Time**	**CCS Stop Time**	**Script**	**QLA**	**Sensor**	**Observations**
1	30 MHz – 1 GHz (< 5 min)							
2	1 GHz – 6 GHz (< 3 min)							
3	6 GHz – 18 GHz (< 2 min)							
4	8.45 GHz – 8.5 GHz (in steps of 10 MHz)							
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								

SPIRE RS E-Field, Antenna Position 1 Horizontal Polarization							
i	**Frequency**	**Date**	**CCS Start Time**	**CCS Stop Time**	**Script**	**QLA**	**Sensor**	**Observations**
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								
32								
33								
34								
35								
36								
37								
38								

Table 8.8-1: SPIRE @ RS E-field // Antenna Position 1, Horizontal Polarization

I	Frequency	Date	CCS Start Time	CCS Stop Time	Script	QLA/STEP	Sensor	Observations
- SPIRE RS E-Field, Antenna Position 1, Vertical Polarization								

I	Frequency	Date	CCS Start Time	CCS Stop Time	Script	QLA/STEP	Sensor	Observations
1	14 kHz – 600 kHz (< 5 min)							
2	600 kHz – 30 MHz (< 5 min)							
3	30 MHz – 1 GHz (< 5 min)							
4	1 GHz – 6 GHz (< 3 min)							
5	6 GHz – 18 GHz (< 2 min)							
6	8.45 GHz – 8.5 GHz (in steps of 10 MHz)							
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								

	SPIRE RS E-Field, Antenna Position 1, Vertical Polarization							
I	**Frequency**	**Date**	**CCS Start Time**	**CCS Stop Time**	**Script**	**QLA/STEP**	**Sensor**	**Observations**
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								
32								
33								
34								
35								
36								
37								
38								

Table 8.8-2: SPIRE @ RS E-field // Antenna Position 1, Vertical Polarization

i	Frequency	Date	CCS Start Time	CCS Stop Time	Script	QLA/STEP	Sensor	Observations
SPIRE RS E-Field, Antenna Position 2 Horizontal Polarization								
1	30 MHz – 1 GHz (< 5 min)							
2	1 GHz – 6 GHz (< 3 min)							
3	6 GHz – 18 GHz (< 2 min)							
4	8.45 GHz – 8.5 GHz (in steps of 10 MHz)							
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								

	SPIRE RS E-Field, Antenna Position 2 Horizontal Polarization							
i	Frequency	Date	CCS Start Time	CCS Stop Time	Script	QLA/STEP	Sensor	Observations
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								
32								
33								
34								
35								
36								
37								
38								

Table 8.8-3: SPIRE @ RS E-field // Antenna Position 2, Horizontal Polarization

SPIRE RS E-Field, Antenna Position 2, Vertical Polarization							
I	Frequency Range	Date	CCS Start Time	CCS Stop Time	Script	QLA/STEP	Sensor	Observations
1	14 kHz – 600 kHz (< 5 min)							
2	600 kHz – 30 MHz (< 5 min)							
3	30 MHz – 1 GHz (< 5 min)							
4	1 GHz – 6 GHz (< 3 min)							
5	6 GHz – 18 GHz (< 2 min)							
6	8.45 GHz – 8.5 GHz (in steps of 10 MHz)							
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								

	SPIRE RS E-Field, Antenna Position 2, Vertical Polarization							
I	**Frequency Range**	**Date**	**CCS Start Time**	**CCS Stop Time**	**Script**	**QLA/STEP**	**Sensor**	**Observations**
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								
32								
33								
34								
35								
36								
37								
38								

Table 8.8-4: SPIRE @ RS E-field // Antenna Position 2, Vertical Polarization

Doc. No: HP-2-ASED-PR-0033   Page   **101**
Issue: 1
Date: 05.10.05   File: HP-2-ASED-PR-0033_1.doc

9   Summary Sheets

9.1   Procedure Variation Summary

		Test Change	Curr. No.: Date Page of	
Test designation		Test Procedure	Issue	Rev.
Test step changed		Reason for Change		
Prepared by:		Resp. Test Leader	Project Engineer	
PA/QA		Prime	Customer	

Table 9-1: Procedure Variation Sheet

9.2   Non Conformance Report (NCR) Summary

NCR - No.	NCR - Title	Date	Open Closed	PA sig.

Table 9-1: Non-Conformance Record Sheet

9.3   Sign-off Sheet

	Date	Signature
Test Manager		
Operator		
PA Responsible		
ESA Representative		

I

E N D   O F   D O C U M E N T

	Name	Dep./Comp.		Name	Dep./Comp.
	Alberti von Mathias Dr.	AOE22		Schmidt Rudolf	FAE22
	Barlage Bernhard	AED11		Schweickert Gunn	AOE22
	Bayer Thomas	AOA52		Sonn Nico	AOE51
	Brune Holger	AOA55		Steininger Eric	AED32
	Fehringer Alexander	AOE13	x	Stritter Rene	AED11
	Fricke Wolfgang Dr.	AED 65		Thörmer Klaus-Horst Dr.	OTN/AED65
	Geiger Hermann	AOA52		Wagner Klaus	AOE22
	Gerner Willi	AED11	x	Wietbrock Walter	AET12
	Grasl Andreas	OTN/AOA54		Wöhler Hans	AOE22
	Grasshoff Brigitte	AET12		Wössner Ulrich	ASE442
	Hauser Armin	AOE22			
	Hendry David	Terma Resid.			
	Hengstler Reinhold	AOA 5	x	Alcatel	ASP
	Hinger Jürgen	AOE22	x	ESA/ESTEC	ESA
	Hofmann Rolf	ASE442		**Instruments:**	
	Hohn Rüdiger	AED65	x	MPE (PACS)	MPE
	Huber Johann	AOA52	x	RAL (SPIRE)	RAL
	Hund Walter	ASE442	x	SRON (HIFI)	SRON
x	Idler Siegmund	AED312		**Subcontractors:**	
x	Ilsen Stijn	Terma Resid.		Air Liquide, Space Department	AIR
	Ivády von András	FAE22		Air Liquide, Space Department	AIRS
	Jahn Gerd Dr.	AOE22		Air Liquide, Orbital System	AIRT
x	Kalde Clemens	APE3		Alcatel Bell Space	ABSP
x	Kameter Rudolf	OTN/AOA54		Astrium Sub-Subsyst. & Equipment	ASSE
	Kettner Bernhard	AET42		Austrian Aerospace	AAE
x	Knoblauch August	AET32		Austrian Aerospace	AAEM
	Koelle Markus	AOA53		APCO Technologies S. A.	APCO
x	Kroeker Jürgen	AED65		Bieri Engineering B. V.	BIER
	Kunz Oliver Dr.	AOE22		BOC Edwards	BOCE
	Lamprecht Ernst	OTN/ASI21		Dutch Space Solar Arrays	DSSA
	Lang Jürgen	ASE442		EADS CASA Espacio	CASA
	Langenstein Rolf	AED15		EADS CASA Espacio	ECAS
	Langfermann Michael	AOA51		EADS Space Transportation	ASIP
	Mack Paul	OTN/AOA54		Eurocopter	ECD
	Müller Jörg	AOA52		European Test Services	ETS
	Müller Martin	AOA53		HTS AG Zürich	HTSZ
	Müller Ralf	FAE22		Linde	LIND
	Peltz Heinz-Willi	AOE13		Patria New Technologies Oy	PANT
	Pietroboni Karin	AED65		Phoenix, Volkmarsen	PHOE
	Platzer Wilhelm	AED22		Prototech AS	PROT
	Reichle Konrad	AOA52		QMC Instruments Ltd.	QMC
	Reuß Friedhelm	AED62		Rembe, Brilon	REMB
	Rühe Wolfgang	AED65		Rosemount Aerospace GmbH	ROSE
	Runge Axel	OTN/AOA54		RYMSA, Radiación y Microondas	RYM
	Sachsse Bernt	AED21		SENER Ingenieria SA	SEN
x	Schink Dietmar	AED44		Stöhr, Königsbrunn	STOE
x	Schlosser Christian	OTN/AOA54		Terma A/S, Herlev	TER