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# 1 SCOPE

#### 1.1 Objective

This procedure describes the activities to be carried out for the Conducted EMC Test of the satellite. The objective of this activity is to confirm the system level compatibility margins concerning the conducted EMC requirements.

#### 1.2 Test Flow

A general test flow is shown in the **Table 1-1** below.



Table 1-1: Satellite Conducted EMC Test Flow



#### 1.3 Test Specimen

The test specimen is the satellite. The model is the PFM.

# 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	H-P-2-ASP-ID-0621	HERSCHEL PLM Electrical Interface Control Document, EICD	Issue 3
AD4	H-P-IC-AI-0003	HERSCHEL/PLANCK SVM Electrical ICD	Issue 6
AD5	H-P-1-ASPI-SP-0027	General Design and Interface Requirements	Issue 5
AD6	H-P-1-ASPI-SP-0037	HERSCHEL/PLANCK EMC Specification	Issue 4.0
AD7	H-P-1-ASPI-PL-0038	HERSCHEL/PLANCK EMC/ESD Control Plan	Issue 3
AD8	H-P-2-ASP-TS-0819	HERSCHEL FM EMC Test Requirements Speci- fication	Issue 4
AD9	H-P-DW-AI-0004	HERSCHEL FM EGSE to SVM connection dia- grams	Issue 1

#### 2.2 Reference Documents

In this section all documents are given which either

- could serve as reference for the conducted tests, or
- may be referred in the test report for clarification/justification of an outcome (result) of the test.

RD1	H-P-PR-AI-0091	HERSCHEL PFM SVM – EMC Confidence Test Procedure	01
RD2	H-P-RP-AI-0176	HERSCHEL PFM SVM – EMC Confidence Test Report	01
RD3	H-P-RP-AI-0166	Conducted Susceptibility CM on RWL's TOCO and TD lines Test Report	01
RD4	HP-2-ASED-PR-0100	Herschel EGSE & Satellite & Instrument Proce- dure for the SAT EMC CE Test in Warm Condi- tions	1.0
RD5	H-P-2-ASP-TN-1406	Herschel FM EMC CE Data Collection	1



# 3 CONFIGURATION

## 3.1 EGSE Configuration

The configuration is the PFM of the satellite in combination with the EGSE and SCOE in accordance to the AD9.

The configuration of the used EGSE as used for the REFERENCE, NOISIEST and SENSITIVE Mode are shown in the next tables. In OFF Mode, all EGSE is switched off.

Subsystem	Configuration for REFERENCE Mode
TM/TC DFE	Online
	TM Chain A
	TC Chain A
	Archiving ON
CDMU SCOE	Not used
Power SCOE	Battery Simulator Nominal Set:
	Offline but the SCOE is switched on
	• Vbat = 24 V
	<ul> <li>Icharge = 10 A</li> </ul>
	<ul> <li>Idisch = 16 A</li> </ul>
	• OVP = 27 V
	• OCP = ON
	Solar Array Simulator Nominal Set:
	Offline but the SCOE is switched on
	• Voc = 43 V
	• lsc = 2.0 A
	• Rs = 0.1
	• N = 100
	<ul> <li>Vprot = 45 V</li> </ul>
	<ul> <li>Iprot (FPCS) less than 3.3 A</li> </ul>
	<ul> <li>AIT BDR 1 and BDR 2 = ON</li> </ul>
	<ul> <li>Separation Straps 1 to 8 = not separated</li> </ul>
	<ul> <li>SA Temp simulation set to 110 °C</li> </ul>
ACMS SCOF	<ul> <li>Closed loop configuration to support OCM_RWLs not running</li> </ul>
TT&C SCOE	All instruments ON and RF cables connected to TT&C subsystem in order to provide
	RF downlink signal spectrum monitoring

Table 3-1: EGSE Configuration for the REFERENCE Mode



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1

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Subsystem	Configuration for NOISIEST Mode
TM/TC DFE	Online
	TM Chain A
	TC Chain A
	Archiving ON
CDMU SCOE	Not used
Power SCOE	Battery Simulator Nominal Set:
	Online
	• Vbat = 24 V
	<ul> <li>Icharge = 10 A</li> </ul>
	<ul> <li>Idisch = 16 A</li> </ul>
	• OVP = 27 V
	• OCP = ON
	Solar Array Simulator Nominal Set:
	Online
	• Voc = 43 V
	• Isc = 2.0 A
	• Rs = 0.1
	• N = 100
	<ul> <li>Vprot = 45 V</li> </ul>
	Iprot (FPCS) less than 3.3 A
	<ul> <li>AIT BDR 1 and BDR 2 = ON</li> </ul>
	<ul> <li>Separation Straps 1 to 8 = separated</li> </ul>
	<ul> <li>SA Temp simulation set to 110 °C</li> </ul>
	Closed loop configuration to support OCM
	BWI 's spin up at 1000 rpm
TT&C SCOE	All instruments ON and RF cables connected to TT&C subsystem in order to
	provide
	RF downlink signal spectrum monitoring

Table 3-2: EGSE Configuration for the NOISIEST Mode



EMC Test Procedure



Datum: Date:

Ausgabe: Issue:

1

nt Nr.: HP-2

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16.11.07

Subsystem	Configuration for SENSITIVE Mode		
TM/TC DFE	Online		
	TM Chain A		
	TC Chain A		
	Archiving ON		
CDMU SCOE	Not used		
Power SCOE	Battery Simulator Nominal Set:		
	Online		
	• Vbat = 24 V		
	<ul> <li>Icharge = 10 A</li> </ul>		
	<ul> <li>Idisch = 16 A</li> </ul>		
	• OVP = 27 V		
	• OCP = ON		
	Solar Array Simulator Nominal Set:		
	Online		
	• Voc = 43 V		
	• lsc = 2.0 A		
	• Rs = 0.1		
	• N = 100		
	<ul> <li>Vprot = 45 V</li> </ul>		
	<ul> <li>Iprot (FPCS) less than 3.0 A</li> </ul>		
	<ul> <li>AIT BDR 1 and BDR 2 = ON</li> </ul>		
	<ul> <li>Separation Straps 1 to 8 = separated</li> </ul>		
	<ul> <li>SA Temp simulation set to 110 °C</li> </ul>		
ACMS SCOE	Closed loop configuration to support OCM (RWLs not running)		
TT&C SCOE	All instruments ON and RF cables connected to TT&C subsystem in order to provide		
	RF downlink signal spectrum monitoring		

Table 3-3: EGSE Configuration for the SENSITIVE Mode



# 3.2 Satellite Configuration

The configuration of the used satellite as used for the REFERENCE, NOISIEST and SENSITIVE Mode is shown in the next tables. In OFF Mode the satellite is switched off.

Subsystem/ Unit	Configuration for REFERENCE Mode
Power Panel	
CDMU	OFF
ACC	OFF
PCDU	OFF
Battery	OFF
TTC Panel	
EPC1	OFF
TWT1	OFF
EPC2	OFF
TWT2	OFF
XPND1	OFF
XPND2	OFF
RFDN	OFF
AOCS sensors	
STR1	OFF
STR2	OFF
CRS1	OFF
CRS2	OFF
RWL-1	OFF
RWL-2	OFF
RWL-3	OFF
RWL-4	OFF
GYRO A	OFF
GYRO B	OFF
SAS	OFF
AAD	OFF
Propulsion	
РТ	OFF
20N thrusters cat bed	OFF
Latch valve	OFF
Miscellaneous	
SREM	OFF
VMC	OFF
SPIRE Panel	
HSDPU N	OFF
HSDPU R	OFF
HSFCU N	OFF
HSFCU R	OFF
HSDCU N	OFF
HSDCU R	OFF





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Subsystem/ Unit	Configuration for REFERENCE Mode
CCU A	OFF
CCU B	OFF
PACS Panel	
FPSPU N	OFF
FPSPU R	OFF
FPDPU N	OFF
FPDPU R	OFF
FPDEC/MEC1	OFF
FPDEC/MEC2	OFF
FPBOLC N	OFF
FPBOLC R	OFF
HIFI Panels	
FHWEH	OFF
FHWEV	OFF
FHLCU N	OFF
FHLCU R	OFF
FHHRH	OFF
FHHRV	OFF
FHICU N	OFF
FHICU R	OFF

Table 3-4: Satellite Configuration for the REFERENCE Mode





1

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Subsystem/ Unit	Configuration for NOISIEST Mode		
Power Panel	See RD4 for Mode definition		
CDMU	ON, NOM		
ACC	ON, in STANDBY		
PCDU	ON		
Battery	Not connected		
TTC Panel			
EPC1	ON		
TWT1	ON		
EPC2	OFF		
TWT2	OFF		
XPND1	ON, RX + TX		
XPND2	ON, but only RX		
RFDN	/		
AOCS sensors	See RD4 for Mode definition		
STR1	ON, Dumping Mode		
STR2	STB		
CRS1	ON		
CRS2	ON		
RWL-1	ON		
RWL-2	ON		
RWL-3	ON		
RWL-4	ON		
GYRO A	ON		
GYRO B	OFF		
SAS	/		
AAD	/		
Propulsion	See RD4 for Mode definition		
PT	ON		
20N thrusters cat bed	OFF		
Latch valve	OFF		
Miscellaneous			
SREM	ON		
VMC	ON		
SPIRE Panel	Set the mode according to RD4 IMPORTANT: SPIRE in Science Mode for tests on SPIRE power lines. Else SPIRE in Standby Mode		
HSDPU N	ON		
HSDPU R	OFF		
HSFCU N	ON		
HSFCU R	OFF		
HSDCU N	ON		
HSDCU R	OFF		
CCU A	ON set mode according to RD4		
CCU B	ON set mode according to RD4		



**EMC Test Procedure** 



Ausgabe: Issue:

1

Project: Projekt: HERSCHEL

Dokument Nr.: Document No.:

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Datum: Date:

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Subsystem/ Unit	Configuration for NOISIEST Mode
PACS Panel	Set the mode according to RD4 IMPORTANT: PACS in Science Mode for tests on PACS power lines. Else PACS in Standby Mode
FPSPU N	ON
FPSPU R	OFF
FPDPU N	ON
FPDPU R	OFF
FPDEC/MEC1	ON
FPDEC/MEC2	OFF
FPBOLC N	ON
FPBOLC R	OFF
HIFI Panels	Set the mode according to RD4 <u>IMPORTANT:</u> HIFI in Science Mode for tests on HIFI power lines and for tests on AOCS signal lines. Else HIFI in Standby Mode
FHWEH	ON
FHWEV	ON
FHLCU N	ON
FHLCU R	OFF
FHHRH	ON
FHHRV	ON
FHICU N	ON
FHICU R	OFF

Table 3-5: Satellite Configuration for the NOISIEST Mode







1

Project: Projekt: HERSCHEL Dokument Nr.: Document No.:

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Subsystem/ Unit	Configuration for SENSITIVE Mode		
Power Panel	See RD4 for Mode definition		
СДМИ	ON, NOM		
ACC	ON, in STANDBY		
PCDU	ON		
Battery	Not connected		
TTC Panel	See RD4 for Mode definition		
EPC1	ON		
TWT1	ON		
EPC2	OFF		
TWT2	OFF		
XPND1	ON, RX + TX		
XPND2	ON, but only RX		
RFDN	/		
AOCS sensors	See RD4 for Mode definition		
STR1	ON, Dumping Mode		
STR2	STB		
CRS1	ON		
CRS2	ON		
RWL-1	ON		
RWL-2	ON		
RWL-3	ON		
RWL-4	ON		
GYRO A	ON		
GYRO B	OFF		
SAS	/		
AAD	/		
Propulsion	See RD4 for Mode definition		
РТ	ON		
20N thrusters cat bed	OFF		
Latch valve	OFF		
Miscellaneous	See RD4 for Mode definition		
SREM	ON		
VMC	ON		
SPIRE Panel			
HSDPU N	OFF		
HSDPU R	OFF		
HSFCU N	OFF		
HSFCU R	OFF		
HSDCU N	OFF		
HSDCU R	OFF		
CCU A	ON set mode according to RD4		
CCU B	ON set mode according to RD4		
PACS Panel			
FPSPU N	OFF		





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Subsystem/ Unit	Configuration for SENSITIVE Mode
FPSPU R	OFF
FPDPU N	OFF
FPDPU R	OFF
FPDEC/MEC1	OFF
FPDEC/MEC2	OFF
FPBOLC N	OFF
FPBOLC R	OFF
HIFI Panels	
FHWEH	OFF
FHWEV	OFF
FHLCU N	OFF
FHLCU R	OFF
FHHRH	OFF
FHHRV	OFF
FHICU N	OFF
FHICU R	OFF

### Table 3-6: Satellite Configuration for the SENSITIVE Mode

#### 3.3 Instrumentation Selection and Calibration

Instrumentation used during the test shall be within its certification period and selected for use in tests such that it meets the specified accuracy requirements. Each instrument Model/Type number and Invent No. shall be recorded with its certification status into the equipment list for every test. The functionality of the test article shall be systematically verified during hardware acceptance testing. The test equipment list shall be included in the test report.

Equipment:	Manufacturer:	Туре:	Inventar No:	Next Cal

# Table 3-7: Test Equipment List

#### 3.4 Facility

The activities as detailed in this procedure shall be carried out in the EADS Astrium clean room class 100 in Friedrichshafen. See Figure 3-1 below.



Figure 3-1: Cleanroom of Astrium Friedrichshafen



EMC Test Procedure



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# 4 CONDITIONS

# 4.1 General Requirements

- The handling of the test set-up shall be in accordance with controlled procedure only
- Handling, mechanical and electrical, has to be done only by qualified personnel
- Test item has to be switched-off when changing the Test Configuration

# 4.2 Environmental Conditions

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

Temperature:22°C +/- 3°CRelative Humidity:40% to 60%

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 Receiver/Analyser Settings

Using the MIL-STD-461E, the following table shall serve as guideline for receiver bandwidth and data presentation. It is strongly recommended to show only about 2 decades within one plot.

Conducted Emissions, NB:						
MIL-STD-461E		Analyser Settings (Peak detection Mode/Max. Hold)				
Plot	f- range	Min. Meas. Time	ResBW Video Sweep Points/		Sweep Points/	Sweep-
			(3 dB)	BW	virtual Stepp size	time
Plot 1	30 Hz – 1 kHz	0,015 s/Hz (ca. 15 s)	10 Hz	30 Hz	251/3,9 Hz < ResBW	20 s
Plot 1	1 kHz – 10 kHz	0,15 s/kHz (ca. 1,5 s)	100 Hz	300 Hz	251/36 Hz < ResBW	10 s
Plot 2	10 kHz – 150 kHz	0,015 s/kHz (ca. 2,2 s)	1 kHz	3 kHz	251/560 Hz < ResBW	10 s
Plot 2	150 kHz – 1 MHz	1,5 s/MHz (ca. 1,5 s)	10 kHz	30 kHz	251/3,4 kHz < ResBW	10 s
Plot 3	1 MHz – 30 MHz	1,5 s/MHz (ca. 45 s)	10 kHz	30 kHz	4001/7,25 kHz < ResBW	50 s
Plot 4	30 MHz – 50 MHz	0,15 s/MHz (ca. 3 s)	100 kHz	300 kHz	501/40 kHz < ResBW	10 s

Table 4-1: Receiver/Analyser Settings



### 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.

Any open waveguides of HIFI shall be closed by copper tape or a dummy load, details on the configuration to be defined during the TRR.

The RF antennas shall be covered by the antenna test caps or removed and the antenna ports loaded by suitable RF load in order to avoid RF transmission in command failure case.

#### Special precautions concerning EMC test:

During the EMC test, special measurement adapters on power- and signal lines shall be installed to get access to the lines under test.

# It is absolutely mandatory to fix the EMC adapter connectors mechanically against disconnecting by accident or stress!

Pay special attention when clamping and unclamping the measurement transducers (e.g. voltage- and current probes) to and from the EMC adapter wires. Wires may breake under stress.

# 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 Management Activities

### 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.

# 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.

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:

- PFM 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 whose contents shall be as follows:

- Brief summary of the test results
- "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).



# 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.

# 4.7 Personnel

Title	Function	Name
Test Director	Overall Responsible	Marc Burlas
Test Conductor	EMC Test Responsibility	Michael Hopfgarten
Test Engineer	EMC Test Definition	Clemens Kalde
Test Engineer	EMC Test Equipment Responsible	Hubert Stiehle
EGSE Operator	Operate EGSE	See TRR
Mech. Operator(s)	All mech. Integration activities, handles the Satellite during testing	See TRR
Satellite Operators	Operate the satellite during testing	See TRR
PA Representative	To ensure PA requirements	Dave Hendry

Table 4-2: Personnel



# 5 TEST REQUIREMENTS

# 5.1 CE Current on Satellite Ground Line

No (significant) current shall flow through the satellites ground line. Object of this test is to check the current on the satellites ground line and compare the measured value with the expected value of about 50 mApp. DC currents shall also be measured with this measurement (min. DC current detectable will be about 10 ... 20 mApp).

The measurement shall be done with the S/C in REFERENCE Mode prior to the reference tests on power

lines.

Measure the current ripple in time domain (TD). The measurement shall be taken in the frequency range from DC to 50 MHz.

# 5.1.1 CE Current on Satellite Ground Line Test Set-Up

The grounding wire shall be connected to the power panel grounding starpoint location (insert at the right side below the panel when panel is opened). For the change of the grounding starpoint from the trolly to the grounding starpoint connection, it must be ensured by parallel connection that the satellite will never be without grounding (floating).

### 5.2 CE Current on Primary Power Lines

Objective of this test is to provide confirmation that the conducted **current** emissions, measured on the primary power lines towards PCDU are compliant with specification.

This test is performed to fulfil EMC requirement EMCPLM-000 and EMCSYS-092 of HERSCHEL EMC Specification [AD6].

The following lines shall be tested:

- HIFI-LCU
- HIFI-ICU
- SPIRE-FCU
- PACS-DPU
- PACS-SPU
- CCU
- PACS-BOLC
- PACS-MEC

Furthermore the tests in accordance to EMCSYS-096 shall be performed:

- TWTA
- STR1

In **frequency domain** the test shall be performed in common mode and differential Mode. In **time domain** only differential measurements are applicable.



A **reference measurement** with Spacecraft OFF / EGSE ON before the test shall identify any emissions generated by the support or external power equipment.



# 5.2.1 Requirements for CE Current on PP Lines

### **CE Current Time Domain:**

The minimum bandwidth used for time domain measurement shall be 50MHz. The actual DC currents shall be measured prior to test and documented in the test procedure/-report.

The results shall be compared with the results as got on subsystem and unit level (refer to RD-7) and analysed by ESA/ TAS.

### **CE Current Frequency domain:**

In the frequency range 30 Hz - 50 MHz, the conducted emission on power lines shall be recorded and provided to the EMC team of ASPI/ESA for analysis. The CE shall be deemed by comparison with subsystem and unit test level results (refer to RD-7), and assessed by TAS and ESA.

# 5.2.2 CE Current Test Set-Up

The power line connection on the PCDU side shall be interrupted by specifically built test aids in order to get access to the power lines and to enable the measurements in time and frequency domain.

The frequency domain measurements shall be taken with a current probe and a spectrum analyser whereas an oscilloscope will be used for the time domain measurements.

A photograph shall be taken from the set-up, showing break-out boxes, the PCDU power connectors, the test cables and the current probe.

The principle to be applied for the common mode and differential mode measurements is shown in the figure below.



# Figure 5-1: Schematic for CM and DM Measurements

# 5.3 CE Voltage on Primary Power Lines

Objective of this test is the measurement of conducted **voltage** emissions on the primary power lines towards PCDU.



This test is performed to fulfil EMC requirement EMCPLM-000 and EMCSYS-092 of HERSCHEL EMC Specification [AD6].

The following lines shall be tested:

- HIFI-LCU
- HIFI-ICU
- SPIRE-FCU
- PACS-DPU
- PACS-SPU
- CCU
- PACS-BOLC
- PACS-MEC

Furhtermore the tests in accordance to EMCSYS-096 shall be added:

- TWTA
- STR1

The test shall be done in **time domain**, differential mode and common mode (between the return line and the satellite structure.

A **background measurement** with Spacecraft OFF / EGSE ON before the test shall identify any emissions generated by the support or external power equipment.



# 5.3.1 Requirements for CE Voltage on PP Lines

The conducted emission voltage on power lines (both, between Plus/Returns and Return/Structure) shall be deemed by comparison with unit/satellite test level results and assessed by the EMC team. The minimum bandwidth used for measurement shall be 50 MHz. Only periodic components are considered to contribute to "ripple".

### 5.3.2 CE Voltage Test Set-Up on PP Lines

The power line connection on the PCDU side shall be interrupted by test adapters in order to get access to the power lines and to enable the time domain voltage measurements.

The measurement shall be taken with an oscilloscope.

A photograph shall be taken from the set-up, showing break-out boxes/test adapter, the test cables and the voltage probe.

### 5.4 CE Current on Signal Lines

Objective of this test is to check that the conducted current emissions on ACC-RWL signal lines TC and TDC are compliant with specification. This test is performed to fulfil EMC requirement EMCSYS-096 of HERSCHEL EMC Specification [AD6].

The following signal lines shall be tested:

- Torque Command (TC)
- Torque Direction Command (TDC)

The test shall be done in **frequency domain, common mode** (CM). A **background measurement** with Spacecraft OFF / EGSE ON before the test shall identify any emissions generated by the support or external power equipment.

#### 5.4.1 Requirements for CE Current on Signal Lines

In the frequency range 30 Hz – 50 MHz, the conducted current emission on signal lines shall not exceed 77 dBµA rms.

# 5.4.2 CE Current Signal Lines Test Set-Up

The TC and TDC signal lines shall be interrupted by a test adapter placed at DB02 level in order to get access to the lines for common mode measurement in accordance to Figure 5-2 and Figure 5-3 below and paragraph 6.3.1.

As an option only the TC and TDC signal lines may be interrupted by a test adapter placed at DB71 level, see Figure 5-4 and paragraph 6.3.2.

The measurement shall be taken with a current probe connected to a spectrum analyser. A photograph shall be taken from the set-up, showing break-out boxes, the PCDU power connectors and the test cables and the voltage probe.







Figure 5-3: TDC Test Adapter arrangement for CE, DB02 level



Figure 5-4: Optional TC/TDC Test Adapter arrangement for CE, DB 71 level



#### 5.5 CE Voltage on Signal Lines

#### ACC-RWL signal lines TC and TDC:

Objective of this test is to check that the conducted voltage emissions on ACC-RWL signal lines TC and TDC are within the values measured at sub system level. This test is performed to fulfil EMC requirement EMCSYS-096 of HERSCHEL EMC Specification [AD6]. The following signal lines shall be tested:

- Torque Command (TC)
- Torque Direction (TDC)

During the emission test on RWL signal lines:

- the TC command shall be set to "500" leading to a read out TLM (MCM) close to 0.5105V,
- the TDC command shall be set to CLOCKWISE direction

#### MILBUS:

In addition the conducted voltage emissions shall be measured on

• ACC/1553 (MILBUS)

During the emission measurements the MILBUS shall be nominal operating.

The tests shall be done in **time domain**, **differential mode** (DM). A **background measurement** with Spacecraft OFF / EGSE ON before the test shall identify any emissions generated by the support or external power equipment.

#### 5.5.1 Requirements for CE Voltage Requirements on Signal Lines

<u>TC/TDC:</u> The voltage ripple shall be compared to 300 mVpp. The minimum bandwidth used for measurement shall be 50MHz.

MILBUS: No requirement exists. The measurement is for information only.

# 5.5.2 CE Voltage Signal Lines Test Set-Up

#### TC and TDC:

The TC and TDC signal lines shall be interrupted by a test adapter placed at DB02 level in order to get access to the lines for common mode measurement in accordance to Figure 5-2 and Figure 5-3 and paragraph 6.3.1.

As an option only the TC and TDC signal lines may be interrupted by a test adapter placed at DB71 level, see Figure 5-4 and paragraph 6.3.2.

#### MILBUS:

The MILBUS signal lines shall be interrupted by a test adapter (see paragraph 6.3.3) in order to get access to the lines for differential mode voltage measurements.

All the measurement shall be taken with an oscilloscope.



A photograph shall be taken from the set-up, showing break-out boxes, the PCDU power connectors and the test cables and the voltage probe.

# 5.6 CS Voltage on Signal Lines (optional)

#### TC and TDC:

Objective of this test is to check that the ACC-RWL signal lines TC and TDC present no risk of susceptibility when submitted to the levels specified in [AD01] EMCEQ-650. This test is performed to fulfil EMC requirement EMCSYS-094 of HERSCHEL EMC Specification [AD6] The following lines shall be tested:

- Torque Command (TC)
- Torque Direction Command (TDC)

#### The test shall be done in time domain, differential mode.

As **reference measurement** before the test the TLM values shall be monitored at RWL side without injecting any noise. During the emission test

- the TC command shall be set to "500" leading to a read out TLM (MCM) close to 0.5105V.
- the TDC command shall be set to: CLOCKWISE direction

The frequencies to be tested are listed in the step by step procedure.

#### 5.6.1 Requirements for CS Voltage on Signal Lines

In the frequency range 50 kHz – 50 MHz, the injected voltage should not exceed 2 Vpp either on the signal or the AGND line. In any case, even if the level of 2 Vpp is not reached the imposed current has to be monitored and it **should not exceed 100 mApp** at injection point.

Monitoring of the frequency and current amplitude shall be done by use of a spectrum analyser. The 100 mApp limit applies **only** for the injected spectral frequency; amplitudes of other signal parts of the emission spectrum are not relevant.

All along the tests sequence the TLM (MCM) read out monitoring shall be recorded.

#### Success Criteria:

- 1. The RWL shall not exhibit any failures malfunctions or unintended responses when submitted to the injected signals.
- 2. The motor current TLM (MCM) shall keep inside the range +/-12.5 mV around the value without noise injection when submitted to the injected signals.

#### 5.6.2 CS Signal Voltage Test Set-Up

The TC and TDC signal lines shall be interrupted by a test adapter

The torque command and -direction lines shall be interrupted by a test adapter placed at DB02 level in order to get access to the signal lines and to enable the injection and the time domain voltage measurements in accordance to Figure 5-5 and Figure 5-6 below and paragraph 6.3.1.

As an option only the TC and TDC signal lines may be interrupted by a test adapter placed at DB71 level near the RWL, see Figure 5-7 and paragraph 6.3.2.

A photograph shall be taken from the set-up, showing the position of the break-out box, the voltage probe and the concerned signal lines.





Figure 5-5: TC Test Adapter arrangement for CS, DB02 level



Figure 5-6: TDC Test Adapter arrangement for CS, DB02 level



Figure 5-7: TC/TDC Test Adapter arrangement for CS (optional, for measurements on the RWL panel)



# 6 TEST- AID/ADAPTER ARRANGEMENTS

# 6.1 General Test- Aid/Adapter Types

General configuration for power- and signal line adapters:



Figure 6-1: Test Adapter, General Configuration

1) L1 > L2 to avoid breaking the wire under test during differential measurements with (large) current probes (see extra sketch below). If all wires have the same length, the stress is only on the tested wire!

2) Maximum alowed cross-section of two wires to match for the feed through current clamp.

3) L3 as short as possible/meaningfull to save place, see 1) also.

4) Material: standard wires and connectors. However connector savers shall be used in addition! Manufactoring via external supplier.

5) 1:1 single line wiring of all other pins. Twisting respecting the flight harness not neccessary due to the shortness of the wires.

6) All wires of every adapter shall be AWG 20.





Figure 6-2: Test Adapter, Current Probe Arrangement

# 6.1.1 Power line Test Adapters

The following adapter types shall be used for testing on power lines:



Figure 6-3: Test Adapter DB01-J01


all lines under test shall be labeled with PIN- No. here

Connector type: DDMA50S

Connector label: to DB01-J02

.

DDMA50P



Figure 6-4: Test Adapter DB01-J02

Figure 6-5: Test Adapter DB01-J04





Figure 6-6: Test Adapter DB01-J05





Figure 6-7: Test Adapter for DB01-J06

CE Voltage measurement in Time Domain, Pwr-Return to Structure:

For this measurement the voltage probe "-" shall be connected to the satellite structure. The access pont is ...tbd during test...



## 6.1.2 Signal line Test Adapter

#### Note that the signal lines are shielded and the shield is rooted via the connector shells.

The following adapter type shall be used for CE/CS on TC/TDC signal lines:



Figure 6-8: Test adapter DB02-P01



Connector label: to DB71-J02 (RWL1)

Figure 6-9: Optional test adapter DB71-J02 (for RWL panel only!)

The following adapter type shall be used for CE on MIL-BUS signal lines:





## 6.2 Arrangements for Power Lines

The following table shows the relation between test equipment, test adapter type and accessability of the lines under test.

Equipment		Test Adap-	Accessible per:			Comment/
		ter	Bracket – Connector (Adapter Name)	Туре	Pin	Current Cap. (A)
HIFI	LCU main	Figure 6-7	DB01 - J06	DDMA-50P	PLS: 1 (*) RTN: 2	AWG 18/4
- " -	- " -	Figure 6-5	DB01 – J04	DDMA-50P	PLS: 11 (*) RTN: 12	AWG 18/4
- " -	ICU main	Figure 6-6	DB01 - J05	DDMA-50P	PLS: 9 RTN: 10	AWG 20/2
SPIRE	FCU main	Figure 6-5	DB01 - J04	DDMA-50P	PLS: 7 RTN: 8	AWG 20/4
PACS	DPU main	Figure 6-6	DB01 - J05	DDMA-50P	PLS: 47/49 RTN: 48/50	AWG 20/2
- " -	SPU main	Figure 6-6	DB01 - J05	DDMA-50P	PLS: 01/03 RTN: 02/04	AWG 20/1,5
CCU	CCU main	Figure 6-3	DB01 - J01	DDMA-50P	PLS: 18 RTN: 19	AWG 20/1,5
TWTA	EPC1	Figure 6-4	DB01 - J02	DDMA-50P	PLS: 22/24 RTN: 23/25	AWG 20/3
STR	STR1	Figure 6-7	DB01 - J06	DDMA-50P	PLS: 27 RTN: 28	AWG 20/1
PACS	MEC main	Figure 6-6	DB01 - J05	DDMA-50P	PLS: 13/17 RTN: 14/18	AWG 20/2
- " -	BOLC main	Figure 6-7	DB01 - J06	DDMA-50P	PLS: 13/17 RTN: 14/18	AWG 20/1,2

In detail:

HIFI-LCU-main Power Lines (\*):

- The measurement shall be done on the PCDU/FHLCU\_Pwrs SUP/RTN lines.
- The test aids Figure 6-7 and Figure 6-5 shall be placed at DB01 level on harness side. The connectors to be disconnected for installing the adapter are J06 and J04.
- Attention! The power lines to be tested are rooted in <u>parallel</u> via two connectors (J06 and J04). Take care to install the current probe correctly.

#### HIFI-ICU main Power Lines:

- The measurement shall be done on the PCDU/FHICU\_Nom\_Pwr SUP/RTN lines.
- The test aid shall be placed at DB01 level on harness side. The connector to be disconnected for installing the adapter is J05.

SPIRE-FCU main Power Lines:

- The measurement shall be done on the PCDU/HSFCU\_Nom\_Pwr SUP/RTN lines.
- The test aid Figure 6-5 shall be placed at DB01 level on harness side. The connector to be disconnected for installing the adapter is J04.

PACS-DPU main Power Lines:



- The measurement shall be done on the PCDU/FPDPU\_Nom\_Pwrs SUP/RTN lines.
- The test aid Figure 6-6 shall be placed at DB01 level on harness side. The connector to be disconnected for installing the adapter is J05.

### PACS-SPU main Power Lines:

- The measurement shall be done on the PCDU/FPSPU1\_ Pwrs SUP/RTN lines.
- The test aid Figure 6-6 shall be placed at DB01 level on harness side. The connector to be disconnected for installing the adapter is J05.

#### PACS-MEC main Power Lines:

- The measurement shall be done on the PCDU/FPMEC1\_ Pwrs SUP/RTN lines.
- The test aid Figure 6-6 shall be placed at DB01 level on harness side. The connector to be disconnected for installing the adapter is J05.

### PACS-BOLC main Power Lines:

- The measurement shall be done on the PCDU/FPBOLC\_ Pwrs SUP/RTN lines.
- The test aid Figure 6-7 shall be placed at DB01 level on harness side. The connector to be disconnected for installing the adapter is J06.

#### CCU main Power Lines:

- The measurement shall be done on the PCDU/CCU\_A\_ Pwrs SUP/RTN lines.
- The test aid Figure 6-3 shall be placed at DB01 level on harness side. The connector to be disconnected for installing the adapter is J01.

#### TWTA-EPC1 Power Lines:

- The measurement shall be done on the PCDU/EPC1\_Pwrs SUP/RTN lines.
- The test aid Figure 6-4 shall be placed at DB01 level on harness side. The connector to be disconnected for installing the adapter is J02.

#### STR1 Power Lines:

- The measurement shall be done on the PCDU/STR1\_Pwr SUP/RTN lines.
- The test aid Figure 6-7 shall be placed at DB01 level on harness side. The connector to be disconnected for installing the adapter is J06.

## 6.3 Arrangements for Signal Lines

The following shows the test adapter arrangement, test adapter type and accessability of the lines under test.

#### 6.3.1 RWL adapter arrangement for measuring on DB02 Bracket

- The test aid Figure 6-8 shall be placed at DB02 level. The connector to be disconnected for installing the adapter is DB02-J01.
- The conducted emission measurement (CE testing) shall be done on the Torque\_Cmd SUP/RET (16+32) and Torque\_Direction\_Cmd SUP/RET (17+32) lines (see also Figure 5-2 and Figure 5-3).
- The conducted susceptibility test (CS testing) shall be done on the MCM/TC\_RET (32) line for the TCinterface (see also Figure 5-5).
- The conducted susceptibility test (CS testing) shall be done on the MCM/TC\_RET (32) and TDC + (17) lines for the TDC- interface (see also Figure 5-6).



## 6.3.2 Optional RWL adapter arrangement for measuring on DB71 Bracket (RWL panel)

- The test aid Figure 6-9 (see also Figure 5-4) shall be placed at DB71 level. The connector to be disconnected for installing the adapter is DB71-J02.
- The conducted emission measurement (CE testing) shall be done on the Torque\_Cmd SUP/RET (5+7) and Torque\_Direction\_Cmd SUP/RET (18+19) lines.
- The conducted susceptibility test (CS testing) shall be done on the **MCM/TC\_RET (7)** line for the TCinterface.
- The conducted susceptibility test (CS testing) shall be done on the MCM/TC\_RET (7) and TDC + (18) lines for the TDC- interface.

## 6.3.3 MILBUS adapter arrangement for measuring on ACC level

- The test aid Figure 6-10 shall be placed at ACC level. The connector to be disconnected for installing the adapter is ACC-J23.
- The conducted emission measurement (CE testing) shall be done differentially between the MIL 1553\_A\_Nom (1) and MIL 1553Rtn\_A\_Nom (11) lines.



## 6.4 Test- Aid/Adapter locations/accessability on HERSCHEL

### 6.4.1 Adapter arrangement for CE tests on power- and signal lines





Bracket DB02: Access to connector: J01 for CE measurements on RWL1 signal lines. Insert Test Adapter on this side of the bracket. Connector savers shall be used! Bracket DB01: Access to connectors: J01, J02, J03, J04, J05, J06 for CE measurements on power lines. Insert Test Adapter on this side of the bracket. Connector type at DB01 on this side is "DyMA-xxP". So the test adapter connector type must be" DyMAxxS". Connector savers shall be used!

#### **Pecautions:**

It is absolutely mandatory to fix the EMC adapter connectors (power and signal) mechanically against disconnecting by accident or stress!

Note that the signal lines are shielded and the shield is rooted via the connector shells. So, when installing the EMC adapters and later performing the measurements, take care and measures that the shielding path is conductively not interrupted!



# 6.4.2 Optional adapter arrangement for CE/CS tests on signal lines



## Test adapter placement at DB71 level:

			11
			· · · · · · · · · · · · · · · · · · ·
PØ2 DBMA-25P EGSE/RWL1_OFF_Nom_Cmd_SUP []2 EGSE/RWL1_OFF_Nom_Cmd_RIN_13 EGSE/RWL1_OFF_Nom_Cmd_RIN_13 EGSE/RWL1_ON_Nom_Cmd_RIN_13 EGSE/RWL1_Torque_Omd_SUP []3 EGSE/RWL1_Torque_Cmd_SUP []3 EGSE/RWL1_Torque_Direction_Cmd_RIN_[]9 EGSE/RWL1_Torque_Direction_Cmd_RIN_19 RWL1/EGSE_ON/OFF_Sts_RIN_19 RWL1/EGSE_Speed_Direction_Mnt_SUP []7 RWL1/EGSE_Speed_Direction_Mnt_RIN_19 RWL1/EGSE_Tachometer_Mnt_SUP []2	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	HP Grid Nom     #26       HP Crid Nom     #26       HP Crid Nom     #26       HP Crid Nom     #26       RdL T Nom     #26       RdL T Nom     #26       RdL T Nom     #26       RdL T Nom     #26       RdL To Nom     #26       RdL To Nom     #26       RdL Pats Nom #26     RdL 9ats Nom #26       RdL Sd Nom     #26       RdL Sd Nom     #26       RdL Sd Nom     #26	$\begin{array}{c c c c c c c c c c c c c c c c c c c $
RWL1/EGSE Tachometer_Mnt RTN 19 RWL1/EGSE Motor_Current_Mnt SUP 04 RWL1/EGSE Motor_Current_Mnt SUP 04	02 ↓ 2 1025 XX 19 ↓ 1 04 ↓ 1 07 ↓ 2 1023 XX	RML B Nom #26 RML M Nom #26 RML M Nom #26	$\begin{array}{c c} 1 & 0 \\ \hline 1 & 0 \\$
EGSE/RWLION Red Cmd SUP 23 EGSE/RWLION Red Cmd RTN 25 EGSE/RWLIOF Red Cmd SUP 24	23 ¥ <sup>1</sup> 25 ¥ ₂ Ø616 xx 25 ¥ 1 24 ¥ 1	HP Cmd Red #26 HP Cmd Red #26 HP Cmd Red #26	$\begin{array}{c} Y & 1 \\ \hline 23 \\ \hline 2616 \\ \hline 2 \hline$
EGSE/RWL1_OFF_Red_Cmd_RTN 25		HP_Cmd Red #26	
	Insert Test Adapter		

### Pecautions: See previouse chapter.



# 7 ACTIVITIES FLOW

The following tables depict the flow of the activities described in this procedure.

## 7.1 General Operational Procedures

The following table describes the general procedures to be followed followed by the SCOE operators in order to switch the satellite into the required configuration for the conducted tests.

Test Step No/ Info		Description/Comments	
Α		REFERENCE MODE	
A.1	OP	Switch satellite EGSE into the REFERENCE mode Configuration according to the configu-	
ration table in chapter 3.1: perform Section 8.1.1 of RD4		ration table in chapter 3.1: perform Section 8.1.1 of RD4	
A.2	OP	Confirm that all satellite equipment is OFF (unpowered): perform Section 8.1.2 of RD4	
A.3	OP	Confirm that HIFI, PACS and SPIRE are OFF (unpowered): perform Section 8.1.3 of RE	

Test Step No/		Description/Comments	
mo			
В		NOISIEST MODE	
B.1	OP	Switch satellite EGSE into the NOISIEST mode Configuration according to the configura-	
B.2	OP	SVM NOISIEST mode	
B.2.1	OP	Switch on into noisiest mode: perform section 8.2.1 steps 1 through 61 (TBC) of RD4	
B.2.2	OP	Switch PACS to STANDBY: perform Section 8.2.3.1 of RD4	
B.2.3	OP	Switch SPIRE to STANDBY: perform Section 8.2.4.1 of RD4	
B.2.4	OP	Switch HIFI to STANDBY: perform Section 8.2.5.1 of RD4	
B.2.5	OP	Confirm that SVM & CCU equipment is operating correctly in NOISIEST mode and Instru-	
		ments powered in STANDBY: perform Section 8.2.2 of RD4	
B.3	OP	PACS NOISIEST mode	
B.3.1		If SVM OFF: perform B.2	
B.3.2	OP	If SPIRE is in NOISIES I mode then return to STANDBY: perform section 8.2.4.3 of RD4	
B.3.3	OP	If HIFI is in NOISIEST mode then return to STANDBY: perform section 8.2.5.3 of RD4	
B.3.4	OP	PACS to NOISY mode and confirm: perform section 8.2.3.2 of RD4	
D 4			
D.4	UP	HIFI NOISIEST III000	
D.4.1		IT SVM UFF: perform B.2	
D.4.2		IF AUG IS IN NOISIEST mode then return to STANDBY: perform section 8.2.3.3 of RD4	
D.4.3		HIEL to NOISY mode and confirm: perform contion 9.2.5.2 of PD4	
0.4.4			





Project: Projekt: HERSCHEL Dokument Nr.: Document No.:

HP-2-ASED-TP-0155

1 Datum: Date:

Ausgabe: Issue:

Test Step No/		Description/Comments
Info		
B.5	OP	SPIRE NOISIEST mode
B.5.1	OP	If SVM OFF: perform B.2
B.5.2	OP	If HIFI is in NOISIEST mode then return to STANDBY: perform section 8.2.5.3 of RD4
B.5.3	OP	If PACS is in NOISIEST mode then return to STANDBY: perform section 8.2.3.3 of RD4
B.5.4	3.5.4 <b>OP</b> SPIRE to NOISY mode and confirm: perform section 8.2.4.2 of RD4	
B.6	<b>OP</b> RWL-1-4 noisiest mode @ 15 min : perform section 8.2.6 of RD4	

Test Step No/ Info		Description/Comments	
С		<b>SENSITIVE MODE (</b> according to the configuration table in chapter 3.1)	
C.1	OP	If SATELLITE initially OFF	
C.1.1	OP	Switch on into sensitive mode: perform section 8.2.1 steps 1 through 53 (TBC) of RD4	
C.2	OP	If SATELLITE ON in NOISIEST mode	
C.2.1	OP	If SPIRE is in NOISIEST mode then return to STANDBY: perform section 8.2.4.3 of RD4	
C.2.2	OP	Switch OFF SPIRE and confirm: perform section 8.2.4.4 of RD4	
C.2.3	OP	If HIFI is in NOISIEST mode then return to STANDBY: perform section 8.2.5.3 of RD4	
C.2.4	OP	Switch OFF HIFI and confirm: perform section 8.2.5.4 of RD4	
C.2.5	OP	If PACS is in NOISIEST mode then return to STANDBY: perform section 8.2.3.3 of RD4	
C.2.6	OP	Switch OFF PACS and confirm: perform section 8.2.3.4 of RD4	
C.2.7	OP	Spin down reaction wheels: perfom section 8.3.1 of RD4	
C.3	OP	Confirm sensitive mode: perform section 8.3.2	

Test Step No/		Description/Comments	
Info			
D		OFF MODE	
D.1	OP	SPIRE OFF	
D.1.1	OP	If SPIRE is in NOISIEST mode then return to STANDBY: perform section 8.2.4.3 of RD4	
D.1.2	OP	Switch OFF SPIRE and confirm: perform section 8.2.4.4 of RD4	
D.2	OP	HIFI OFF	
D.2.1	OP	If HIFI is in NOISIEST mode then return to STANDBY: perform section 8.2.5.3 of RD4	
D.2.2	OP	Switch OFF HIFI and confirm: perform section 8.2.5.4 of RD4	
D.3	OP	PACS OFF	
D.3.1	OP	If PACS is in NOISIEST mode then return to STANDBY: perform section 8.2.3.3 of RD4	
D.3.2	OP	Switch OFF PACS and confirm: perform section 8.2.3.4 of RD4	
D.4	OP	SVM & CCU OFF	
D.4.1	OP	Switch OFF SVM: perform section 8.4.1.1 of RD4	
D.4.2	OP	Confirm that all satellite equipment is OFF (unpowered) : perform section 8.4.1.2 of RD4	





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Test Step No/ Info		Description/Comments
D.5	OP	Switch all EGSE OFF

# 7.2 Tests Activities Flow

The following table depicts the flow of the activities described in this procedure.

Test	Activity	SATELLITE Operational Mode
Step		
NO	Install PaPa/Test Adapter to Dower, and Signal Lines	OFF Mode
0 1	Test adapter "DB01- I01" for CE on CCU-MAIN	
0.1	Test adapter "DB01-101" for CE on TWTA-EPC1	
0.2	Test adapter "DB01-002" for CE on HIEL CIL-MAIN and	
0.5	SPIRE-FCU-main	
0.4	Test adapter "DB01-J05" for CE on HIFI-ICU-MAIN, PACS-	
	DPU-MAIN, PACS-SPU-MAIN and PACS-MEC1-MAIN	
0.5	Test adapter "DB01-J06" for CE on HIFI-LCU-MAIN, PACS- BOLC-MAIN and STR1	
0.6	Test adapter "DB02-P01" for CE/CS on Signal Lines: RWL1 TC/TDC	
0.7	Test adapter "ACC-J23" for CE on Signal Lines: MILBUS	
1	Reference Test on Satellite Ground Line	REFERENCE Mode
1.1	CE Current Ripple in Time Domain	
2	Reference Test on HIFI-LCU-main Power Lines	REFERENCE Mode
2.1	If not already done switch into REFERENCE Mode according	
	to chapter 7.1 "A" and confirm the mode.	
2.2	CE Current in Frequency Domain Common Mode	
2.3	CE Current in Frequency Domain Differential Mode	
2.4	CE Current in Time Domain Differential Mode	
2.5	CE Voltage in Time Domain Differential Mode	
2.6	CE Voltage in Time Domain, Pwr-Return to Structure	
3	Reference Test on HIFI-ICU-main Power Lines	REFERENCE Mode
3.1	If not already done switch into REFERENCE Mode according	
	to chapter 7.1 "A" and confirm the mode.	
3.2	CE Current in Frequency Domain Common Mode	
3.3	CE Current in Frequency Domain Differential Mode	
3.4	CE Current in Time Domain Differential Mode	
3.5	CE Voltage in Time Domain Differential Mode	
3.6	CE Voltage in Time Domain, Pwr-Return to Structure	
4	Reference Test on SPIRE-FCU-main Power Lines	REFERENCE Mode
4.1	If not already done switch into REFERENCE Mode according	
	to chapter 7.1 "A" and confirm the mode.	
4.2	CE Current in Frequency Domain Common Mode	
4.3	CE Current in Frequency Domain Differential Mode	
4.4	CE Current in Time Domain Differential Mode	





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Test Step No	Activity	SATELLITE Operational Mode
4.5	CE Voltage in Time Domain Differential Mode	
4.6	CE Voltage in Time Domain, Pwr-Return to Structure	
5	Reference Test on PACS-DPU-main Power Lines	REFERENCE Mode
5.1	If not already done switch into REFERENCE Mode according to chapter 7.1 "A" and confirm the mode.	
5.2	CE Current in Frequency Domain Common Mode	
5.3	CE Current in Frequency Domain Differential Mode	
5.4	CE Current in Time Domain Differential Mode	
5.5	CE Voltage in Time Domain Differential Mode	
5.6	CE Voltage in Time Domain, Pwr-Return to Structure	
6	Reference Test on PACS-SPII-main Power Lines	
61	If not already done switch into REFERENCE Mode according	
0.1	to chapter 7.1 "A" and confirm the mode.	
6.2	CE Current in Frequency Domain Common Mode	
6.3	CE Current in Frequency Domain Differential Mode	
6.4	CE Current in Time Domain Differential Mode	
6.5	CE Voltage in Time Domain Differential Mode	
6.6	CE Voltage in Time Domain, Pwr-Return to Structure	
7	Reference Test on PACS-BOLC-main Power Lines	REFERENCE Mode
7.1	If not already done switch into REFERENCE Mode according	
7.0	to chapter 7.1 "A" and confirm the mode.	
7.2	CE Current in Frequency Domain Common Mode	
7.3	CE Current in Frequency Domain Differential Mode	
7.4	CE Current in Time Domain Differential Mode	
7.5	CE Voltage in Time Domain Dure Poture to Structure	
7.0	CE voltage in Time Domain, PWI-Return to Structure	
8	Reference Test on PACS-MEC-main Power Lines	REFERENCE Mode
8.1	If not already done switch into REFERENCE Mode according	
	to chapter 7.1 "A" and confirm the mode.	
8.2	CE Current in Frequency Domain Common Mode	
8.3	CE Current in Frequency Domain Differential Mode	
8.4	CE Current in Time Domain Differential Mode	
8.5	CE Voltage in Time Domain Differential Mode	
8.6	CE Voltage in Time Domain, Pwr-Return to Structure	
9	Reference Test on CCU-main Power Lines	REFERENCE Mode
9.1	If not already done switch into REFERENCE Mode according	
	to chapter 7.1 "A" and confirm the mode.	
9.2	CE Current in Frequency Domain Common Mode	
9.3	CE Current in Frequency Domain Differential Mode	
9.4	CE Current in Time Domain Differential Mode	
9.5	CE Voltage in Time Domain Differential Mode	
9.6	CE Voltage in Time Domain, Pwr-Return to Structure	



Title:

**EMC Test Procedure** 



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Test Step	Activity	SATELLITE Operational Mode
No		
10	Reference Test on TWTA-EPC1 Power Lines	
10.1	If not already done switch into REFERENCE Mode according to chapter 7.1 "A" and confirm the mode.	
10.2	CE Current in Frequency Domain Common Mode	
10.3	CE Current in Frequency Domain Differential Mode	
10.4	CE Current in Time Domain Differential Mode	
10.5	CE Voltage in Time Domain Differential Mode	
10.6	CE Voltage in Time Domain, Pwr-Return to Structure	
11	Reference Test on STR1 Power Lines	REFERENCE mode
11.1	If not already done switch into REFERENCE Mode according to chapter 7.1 "A" and confirm the mode.	
11.2	CE Current in Frequency Domain Common Mode	
11.3	CE Current in Frequency Domain Differential Mode	
11.4	CE Current in Time Domain Differential Mode	
11.5	CE Voltage in Time Domain Differential Mode	
11.6	CE Voltage in Time Domain, Pwr-Return to Structure	
12	Reference Test on TC Signal Lines (RWL1)	REFERENCE Mode
12.1	If not already done switch into REFERENCE Mode according	
40.0	to chapter 7.1 "A" and confirm the mode.	
12.2	CE Current in Frequency Domain Common Mode	
12.3	CE voltage in Time Domain Common Mode	
13	Reference Test on TDC Signal Lines (RWL1)	REFERENCE Mode
13.1	If not already done switch into REFERENCE Mode according	
	to chapter 7.1 "A" and confirm the mode.	
13.2	CE Current in Frequency Domain Common Mode	
13.3	CE Voltage in Time Domain Common Mode	
14	Reference Test on ACC/1553 (MILBUS) Signal Lines	REFERENCE Mode
14.1	If not already done switch into REFERENCE Mode according	
	to chapter 7.1 "A" and confirm the mode.	
14.2	CE Voltage in Time Domain Differential Mode	
15	Reference Test on Satellite Ground Line DELETED	
15 1	CE Current Ripple in Time Domain	
10.1		
16	Test on HIFI-LCU-main Power Lines	NOISIEST Mode with <b>HIFI in SCI-</b> <b>ENCE</b> and PACS and SPIRE in STANDBY: " <b>B4</b> "
16.1	If not already done switch into NOISIEST mode according to chapter 7.1 "B4" and confirm the mode	
16.2	CE Current in Frequency Domain Common Mode	
16.3	CE Current in Frequency Domain Differential Mode	
16.4	CE Current in Time Domain Differential Mode	
16.5	CE Voltage in Time Domain Differential Mode	
16.6	CE Voltage in Time Domain, Pwr-Return to Structure	





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Test Step No	Activity	SATELLITE Operational Mode
17	Test on HIFI-ICU-main Power Lines	NOISIEST Mode with <b>HIFI in SCI-</b> <b>ENCE</b> and PACS and SPIRE in STANDBY: " <b>B4</b> "
17.1	If not already done switch into NOISIEST mode according to chapter 7.1 "B4" and confirm the mode	
17.2	CE Current in Frequency Domain Common Mode	
17.3	CE Current in Frequency Domain Differential Mode	
17.4	CE Current in Time Domain Differential Mode	
17.5	CE Voltage in Time Domain Differential Mode	
17.6	CE Voltage in Time Domain, Pwr-Return to Structure	
18	Test on SPIRE-FCU-main Power Lines	NOISIEST Mode with <b>SPIRE in</b> <b>SCIENCE</b> and HIFI and PACS in STANDBY: " <b>B5</b> "
18.1	If not already done switch into NOISIEST mode according to chapter 7.1 "B5" and confirm the mode	
18.2	CE Current in Frequency Domain Common Mode	
18.3	CE Current in Frequency Domain Differential Mode	
18.4	CE Current in Time Domain Differential Mode	
18.5	CE Voltage in Time Domain Differential Mode	
18,6	CE Voltage in Time Domain, Pwr-Return to Structure	
19	Test on PACS-DPU-main Power Lines	NOISIEST Mode with <b>PACS in</b> <b>SCIENCE</b> and HIFI and SPIRE in STANDBY: " <b>B3</b> "
19.1	If not already done switch into NOISIEST mode according to chapter 7.1 "B3" and confirm the mode	
19.2	CE Current in Frequency Domain Common Mode	
19.3	CE Current in Frequency Domain Differential Mode	
19.4	CE Current in Time Domain Differential Mode	
19.5	CE Voltage in Time Domain Differential Mode	
19.5	CE Voltage in Time Domain, Pwr-Return to Structure	
20	Test on PACS-SPU-main Power Lines	NOISIEST Mode with <b>PACS in</b> <b>SCIENCE</b> and HIFI and SPIRE in STANDBY: " <b>B3</b> "
20.1	If not already done switch into NOISIEST mode according to chapter 7.1 "B3" and confirm the mode	
20.2	CE Current in Frequency Domain Common Mode	
20.3	CE Current in Frequency Domain Differential Mode	
20.4	CE Current in Time Domain Differential Mode	
20.5	CE Voltage in Time Domain Differential Mode	
20.6	CE Voltage in Time Domain, Pwr-Return to Structure	
21	Test on PACS-BOLC-main Power Lines	NOISIEST Mode with <b>PACS in</b> <b>SCIENCE</b> and HIFI and SPIRE in STANDBY: " <b>B3</b> "
21.1	If not already done switch into NOISIEST mode according to chapter 7.1 "B3" and confirm the mode	





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Test Step No	Activity	SATELLITE Operational Mode
21.2	CE Current in Frequency Domain Common Mode	
21.3	CE Current in Frequency Domain Differential Mode	
21.4	CE Current in Time Domain Differential Mode	
21.5	CE Voltage in Time Domain Differential Mode	
21.6	CE Voltage in Time Domain, Pwr-Return to Structure	
	<u> </u>	
22	Test on PACS-MEC-main Power Lines	NOISIEST Mode with <b>PACS in</b> <b>SCIENCE</b> and HIFI and SPIRE in STANDBY: " <b>B3</b> "
22.1	If not already done switch into NOISIEST mode according to	
	chapter 7.1 "B3" and confirm the mode	
22.2	CE Current in Frequency Domain Common Mode	
22.3	CE Current in Frequency Domain Differential Mode	
22.4	CE Current in Time Domain Differential Mode	
22.5	CE Voltage in Time Domain Differential Mode	
22.6	CE Voltage in Time Domain, Pwr-Return to Structure	
23	Test on CCU-main Power Lines	NOISIEST Mode with <b>HIFI in SCI-</b> <b>ENCE</b> and PACS and SPIRE in STANDBY: " <b>B4</b> "
23.1	If not already done switch into NOISIEST mode according to chapter 7.1 "B4" and confirm the mode	
23.2	CE Current in Frequency Domain Common Mode	
23.3	CE Current in Frequency Domain Differential Mode	
23.4	CE Current in Time Domain Differential Mode	
23.5	CE Voltage in Time Domain Differential Mode	
23.6	CE Voltage in Time Domain Pwr-Return to Structure	
20.0		
24	Test on TWTA-EPC1 Power Lines	NOISIEST Mode with <b>HIFI in SCI-</b> <b>ENCE</b> and PACS and SPIRE in STANDBY: " <b>B4</b> "
24.1	If not already done switch into NOISIEST mode according to	
	chapter 7.1 "B4" and confirm the mode	
24.2	CE Current in Frequency Domain Common Mode	
24.3	CE Current in Frequency Domain Differential Mode	
24.4	CE Current in Time Domain Differential Mode	
24.5	CE Voltage in Time Domain Differential Mode	
24.6	CE Voltage in Time Domain, Pwr-Return to Structure	
25	Test on STR1 Power Lines	NOISIEST Mode with <b>HIFI in SCI-</b> <b>ENCE</b> and PACS and SPIRE in STANDBY: " <b>B4</b> "
25.1	If not already done switch into NOISIEST mode according to chapter 7.1 "B4" and confirm the mode	
25.2	CE Current in Frequency Domain Common Mode	
25.3	CE Current in Frequency Domain Differential Mode	
25.4	CE Current in Time Domain Differential Mode	
25.5	CE Voltage in Time Domain Differential Mode	
25.6	CE Voltage in Time Domain, Pwr-Return to Structure	





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Test Step No	Activity	SATELLITE Operational Mode
26	Deference Test on Satellite Cround Line DELETED	
20	Reference Test on Satellite Ground Line DELETED	
20.1		
27	CE Test on TC Signal Lines (RWL1)	NOISIEST Mode with <b>HIFI in SCI-</b> <b>ENCE</b> and PACS and SPIRE in STANDBY: " <b>B4</b> "
27.1	If not already done switch into NOISIEST mode according to chapter 7.1 "B4" and confirm the mode	
27.2	CE Current in Frequency Domain Common Mode	
27.3	CE Voltage in Time Domain Common Mode	
28	CE Test on TDC Signal Lines (RWL1)	NOISIEST Mode with <b>HIFI in SCI-</b> <b>ENCE</b> and PACS and SPIRE in STANDBY: " <b>B4</b> "
28.1	If not already done switch into NOISIEST mode according to chapter 7.1 "B4" and confirm the mode	
28.2	CE Current in Frequency Domain Common Mode	
28.3	CE Voltage in Time Domain Common Mode	
29	CE Test on ACC/1553 (MILBUS) Signal Lines	NOISIEST Mode with <b>HIFI in SCI-</b> <b>ENCE</b> and PACS and SPIRE in STANDBY: " <b>B4</b> "
29.1	If not already done switch into NOISIEST Mode according to chapter 7.1 "B4" and confirm the mode.	
29.2	CE Voltage in Time Domain Differential Mode	
30	CS Test on TC Signal Lines (RWL1)	SENSITIVE Mode (to be performed only in case of NC on CE test): "C"
30.1	If not already done switch into SENSITIVE mode according to chapter 7.1 "C" and confirm the mode	
30.2	Arrangement of the test equipment	
30.3	Reference Measurements	
30.4	CS testing	
30.5	Susceptibility evaluation	
31	CS Test on TDC Signal Lines (RWL1)	SENSITIVE Mode (to be performed only in case of NC on CE test): "C"
31.1	If not already done switch into SENSITIVE mode according to chapter 7.1 "C" and confirm the mode	
31.2	Arrangement of the test equipment	
31.3	Reference Measurements	
31.4	CS testing	
31.5	Susceptibility evaluation	
32	De-install BoBs/Test adapters	OFF Mode
	See also step No. 1	

Table 7-1: Test Activities Flow



#### **STEP BY STEP PROCEDURE/REPORT** 8

The step by step procedure table shall be filled in during the test to be the basis for the test report. Unless otherwise noted, the test activities shall be performed by the EMC team. If helpful the following editorial aids may be inserted into the procedure table by "copy and paste":

- $\mathbf{\nabla}$ "Done" sign
- "Pass" status for meeting a requirement Pass
- "Fail" status for not meeting a requirement Fail
- OP Executant: Satellite /EGSE and operational responsibles
- EMC Executant: EMC responsible

	Table row for <b>comments</b> , if any
Ĩ	Table row for <b>photos</b> , when taken
	Table row for <b>plots</b> , when taken

#### 8.1 Installation of Test Adapters to Power- and Signal Lines

Test Step No/ Info		Description/Comments
0		INSTALL TEST ADAPTER ON POWER- AND SIGNAL LINES LINES
		In additional see paragraph 6.4: Test- Aid/Adapter locations/accessability on HERSCHEL"
		Pecautions:
		Any open waveguides of HIFI shall be closed by copper tape or a dummy load, de- tails on the configuration to be defined during the TRR.
		The RF antennas shall be covered by the antenna test caps or removed and the an- tenna ports loaded by suitable RF load in order to avoid RF transmission in com- mand failure case.
		It is absolutely mandatory to fix the EMC adapter connectors (power and signal) mechanically against disconnecting by accident or stress!
		Note that the signal lines are shielded and the shield is rooted via the connector shells. So, when installing the EMC adapters, take care and measures that the shielding path is conductively not interrupted!
Date/Time		
0.1		Test adapter "DB01-J01" for CE on <u>CCU-MAIN</u>
		The test aid Figure 6-3 shall be placed at DB01 level on harness side. The connector to be





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Test	Stop No/	Description/Commont					
Info	Step NO/	Description/Comments	5				
		disconnected for installing	ng the adapter is J01.				
		The adaper supports me PCDU/CCU_A_ Pwrs S	easurements on the <i>UP/RTN</i> lines.				
		Comments if any					
	Ĩ	Photos:					
Deter	<b>T</b> ime e						
Date/	Time	Test adapter "DB01- I0	2" for CE on TWTA-EPC1				
0.2							
		The test aid Figure 6-4 s disconnected for installing	shall be placed at DB01 level ng the adapter is J02.	on harness	side.	The conr	ector to be
		The adaper supports me PCDU/EPC1_Pwrs SUP	easurements on the P/RTN lines.				
		Comments if any					
	6	Photos:					
	·						
Date/	Time	Tost adaptor "DB01-10	M" for CE on HIELI CILMAI	N and SDIE		Il-main	
0.5		Test adapter DB01-50		in and <u>SFIR</u>		<u>0-mam</u>	
		The test aids Figure 6-5 be disconnected for inst	shall be placed at DB01 leve alling the adapter is J04.	el on harnes	s side	e. The con	inector to
		The adaper supports me	easurements on the				
		PCDU/FHLCU_Pwrs SU	JP/RTN and				
		PCDU/HSFCU_Nom_P	wr SUP/RTN lines.				
		Comments if any					
	Ť	Photos:					
Data	Time						
0.4		Test adapter "DB01-J0 MAIN and PACS-MEC1	95" for CE on <u>HIFI-ICU-MAIN</u> I-MAIN	N, <u>PACS-DF</u>	PU-M/	AIN, PAC	S-SPU-
		The test aid shall be pla nected for installing the	ced at DB01 level on harness adapter is J05.	s side. The	conne	ctor to be	discon-
		The adaper supports me PCDU/FHICU_Nom_Pv PCDU/FPDPU_Nom_P PCDU/FPSPU1_Pwrs PCDU/FPMEC1_Pwrs	easurements on the vr SUP/RTN, wrs SUP/RTN and SUP/RTN lines SUP/RTN lines				
		Comments if any					





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Test Step No/ Info		Description/Comments
	Ť	Photos:
Date/Tim	e	
0.5		Test adapter "DB01-J06" for CE on <u>HIFI-LCU-MAIN, PACS-BOLC-MAIN and STR1</u>
		The test aid Figure 6-7 shall be placed at DB01 level on harness side. The connector to be disconnected for installing the adapter is J06.
		The adaper supports measurements on the PCDU/FHLCU_Pwrs_SUP/RTN.
		PCDU/FPBOLC Pws SUP/RTN and
		PCDU/STR1_Pwr SUP/RTN lines.
		Comments if any
	Ť	Photos:
Date/Tim	е	
0.6		Test adapter "DB02-P01" for CE/CS on Signal Lines: <u>RWL1 TC/TDC</u>
		The test aid Figure 6-8 shall be placed at DB02 level. The connector to be disconnected for installing the adapter is DB02-P01.
		The adaper supports measurements on the
		Torque Cmd SUP/RET and
		Torque_Direction_Cmd SUP/RET lines.
	Ð	Comments if any
	to	Photos:
Data/Ti~		
0.7		Test adapter "ACC-123" for CE on Signal Lines: MIL BUS
0.7		
		The test aid Figure 6-10 shall be placed at ACC level. The connector to be disconnected for installing the adapter is ACC-J23.
		The adaper supports measurements on the <i>MIL1553/1553Rtn</i> lines.
		Comments if any
	ŤŐ	Photos:



## 8.2 Reference/Ambient Tests on Satellite Ground Line

This test shall be performed prior to the ambient measurements on power- and signal lines.

Test Step No.,		Description/Comments
Executant		
1		Reference/Ambient Test on <u>Satellite Ground</u> Line
1.1		REFERENCE Mode
OP		If not already done switch into REFERENCE mode according to chapter 7.1 "A" and con- firm the mode
Date/Tim	е	
		The measurement shall be done on the <b>Satellite Ground</b> line.
		The ground line is accessible from underneath the power panel.
		Take care to install the probes correctly.
Date/Tim	е	
1.2		CE Current in Time Domain, single line measurement
		Set the current clamp on the satellite ground line for single line measurements. Measure the ambient DC current and the current ripple with an oscilloscope (BW $\ge$ 50 MHz).
		Plot 0xx:
		Measured Ambient DC current:I-DCamb = xxx mAMeasured current ripple :I-amb = xxx mApp
	76	Photos:
		Remove the current probe.





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#### 8.3 **Reference/Ambient Tests on Power Lines**

Test Step No., Executant		Description/Comments
		<b>REFERENCE/AMBIENT TEST ON POWER LINES LINES</b> In additional see paragraph 6.2 "Arrangements for Power Lines".
		Before starting an EMC test:
		Any open waveguides of HIFI shall be closed by copper tape or a dummy load, de- tails on the configuration to be defined during the TRR.
		The RF antennas shall be covered by the antenna test caps or removed and the an- tenna ports loaded by suitable RF load in order to avoid RF transmission in com- mand failure case.
		Ckeck that all the EMC adapter connectors are mechanically secured against dis- connecting by accident or stress!
		Pay special attention and take precautions when clamping and unclamping the measurement transducers (e.g. voltage- and current probes) to and from the EMC adapter wires. Wires may breake under stress.
2		Reference/Ambient Test on <u>HIFI-LCU-main</u> Power Lines
2.1		REFERENCE Mode
	OP	If not already done switch into REFERENCE mode according to chapter 7.1 "A" and con- firm the mode.
		On Power SCOE verify the spacecraft OFF condition:
		Measured: U =
Date/Time		
Date, Time	,	The measurement shall be done on the PCDU/FHLCU_Pwrs SUP/RTN lines.
		The power lines are accessible via the test adapter DB01-J06 (Figure 6-7) and DB01–J04 (Figure 6-5).
		<b>Attention!</b> The power lines under test were rooted in <u>parallel</u> via the two connectors (J06 and J04).
		"plus": DB01-J06 pin 1, parallel to DB01–J04 pin 11 "return": DB01-J06 pin 2, parallel to DB01–J04 pin 12
		Take care to install the probes correctly.
Data/Time	<u>,                                     </u>	
2.2	5	CE Current in Frequency Domain, Common Mode
		Set the current clamp on the HIFI-LCU-main power lines for CM measurements in accor- dance to the CM set-up Figure 5-1: Schematic for CM and DM Measurements. Measure the ambient current from 30 Hz to 50 MHz.





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Test Step No., **Description/Comments** Executant Plot 0xx: 30 Hz – 10 kHz, CM-ambient, HIFI-LCU-main -PWR  $\sim$ Plot 0xx: 10 kHz – 1 MHz, CM-ambient, HIFI-LCU-main -PWR Plot 0xx: 1 MHz – 30 MHz, CM-ambient, HIFI-LCU-main -PWR Plot 0xx: 30 MHz – 50 MHz, CM-ambient, HIFI-LCU-main -PWR Photos: 76 Remove the current probe. Date/Time CE Current in Frequency Domain, Differential Mode 2.3 Set the current clamp on the HIFI-LCU-main power lines for DM measurements in accordance to the DM set-up Figure 5-1: Schematic for CM and DM Measurements. Measure the ambient current from 30 Hz to 50 MHz. Plot 0xx: 30 Hz – 10 kHz. DM-ambient. HIFI-LCU-main -PWR Plot 0xx: 10 kHz – 1 MHz, DM-ambient, HIFI-LCU-main -PWR Plot 0xx: 1 MHz - 30 MHz, DM-ambient, HIFI-LCU-main -PWR Plot 0xx: 30 MHz – 50 MHz. DM-ambient. HIFI-LCU-main -PWR Photos: 76 Remove the current probe. Date/Time 2.4 CE Current in Time Domain, Differential Mode Set the current clamp on the HIFI-LCU-main power lines for DM measurements as before. Measure the ambient DC current and the current ripple with an oscilloscope (BW  $\ge$  50 MHz). Plot 0xx: Measured Ambient DC current: I-DCamb = xxx mA Measured current ripple : I-amb = xxx mApp Photos: 76 Remove the current probe. Date/Time CE Voltage in Time Domain Differential Mode 2.5 Set the voltage probe on the HIFI-LCU-main power lines for DM voltage measurements and measure the differential ambient voltage ripple with an oscilloscope (BW  $\geq$  50 MHz) in adequate time-/amplitude scaling. "plus": DB01-J06 pin 1 "return": DB01-J06 pin 2 and/or





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Test Step No., Executant	Description/Comments
	"plus": DB01–J04 pin 11 "return": DB01–J04 pin 12
	Plot 0xx:
	Measured Ambient voltage ripple: u-amb = xxx Vpp (>/< 2,5 V)
1	Photos:
	Remove the oscilloscope connection from the test adapter.
Date/Time	
2.6	CE Voltage in Time Domain, Pwr-Return to Structure
	Connect the differential voltage probe "+" input to the HIFI-LCU-main RETURN power line and the differential voltage probe "-" input to the satellite structure.
	Measure the differential voltage ripple with an oscilloscope (BW $\ge$ 50 MHz) in adequate time-/amplitude scaling.
	"return": DB01-J06 pin 2 "satellite structure":tbd during test
	and/or
	"return": DB01–J04 pin 12 "satellite structure":tbd during test
	Plot 0xx:
	Measured Ambient voltage ripple: u-amb = xxx Vpp
6	Photos:
	Remove the oscilloscope connection from the test adapter.

3		Reference/Ambient Test on <u>HIFI-ICU-main</u> Power Lines
3.1		REFERENCE mode
	OP	If not already done switch into REFERENCE mode according to chapter 7.1 "A" and con- firm the mode
		On Power SCOE verify the spacecraft OFF condition.:
		Measured: U =
Date/Tim	е	
		The measurement shall be done on the <b>PCDU/FHICU_Nom_Pwr SUP/RTN</b> lines.
		The power lines are accessible via the test adapter DB01-J05 (Figure 6-6).
		"plus": DB01-J05 pin 9 "return": DB01-J05 pin 10





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Date/Time	
3.2	CE Current in Frequency Domain, Common Mode
	Set the current clamp on the HIFI-ICU-main power lines for CM measurements in accor- dance to the CM set-up Figure 5-1: Schematic for CM and DM Measurements. Measure the ambient current from 30 Hz to 50 MHz.
	Plot 0xx: 30 Hz – 10 kHz, CM-ambient, HIFI-ICU-main -PWR Plot 0xx: 10 kHz – 1 MHz, CM-ambient, HIFI- ICU -main -PWR Plot 0xx: 1 MHz – 30 MHz, CM-ambient, HIFI- ICU -main -PWR Plot 0xx: 30 MHz – 50 MHz, CM-ambient, HIFI- ICU -main -PWR
Ť	Photos:
	Remove the current probe.
Date/Time	OF Operatin Francisco Description Differential Mark
3.3	CE Current in Frequency Domain, Differential Mode
	Set the current clamp on the HIFI-ICU-main power lines for DM measurements in accor- dance to the DM set-up Figure 5-1: Schematic for CM and DM Measurements. Measure the ambient current from 30 Hz to 50 MHz.
	Plot 0xx: 30 Hz – 10 kHz, DM-ambient, HIFI- ICU -main -PWR Plot 0xx: 10 kHz – 1 MHz, DM-ambient, HIFI- ICU -main -PWR Plot 0xx: 1 MHz – 30 MHz, DM-ambient, HIFI- ICU -main -PWR Plot 0xx: 30 MHz – 50 MHz, DM-ambient, HIFI- ICU -main -PWR
<b>1</b>	Photos:
	Remove the current probe.
Date/Time	CE Current in Time Demain Differential Made
3.4	<u>CE Current in Time Domain, Dinerential Mode</u>
	Set the current clamp on the HIFI-ICU-main power lines for DM measurements as before. Measure the ambient DC current and the current ripple with an oscilloscope (BW $\ge$ 50 MHz).
	Plot 0xx:
	Measured current ripple : I-amb = xxx mApp
<b></b>	Photos:
	Remove the current probe.
Date/Time	
3.5	CE Voltage in Time Domain Differential Mode
	Set the voltage probe on the HIFI-ICU-main power lines_for DM voltage measurements and measure the differential ambient voltage ripple with an oscilloscope (BW $\geq$ 50 MHz) in adequate time-/amplitude scaling.





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"plus": DB01-J05 pin 9 "return": DB01-J05 pin 10 Plot 0xx:  $\sim$ Measured Ambient voltage ripple: u-amb = xxx Vpp (>/< 2,5 V) Photos: ŤŐ Remove the oscilloscope connection from the test adapter. Date/Time 3.6 CE Voltage in Time Domain, Pwr-Return to Structure Connect the differential voltage probe "+" input to the HIFI-ICU-main RETURN power line and the differential voltage probe "-" input to the satellite structure. Measure the differential voltage ripple with an oscilloscope (BW ≥ 50 MHz) in adequate time-/amplitude scaling. "return": DB01-J05 pin 10 "satellite structure": ...tbd during test... Plot 0xx:  $\sim$ Measured Ambient voltage ripple: u-amb = xxx Vpp Photos: ŤÔ Remove the oscilloscope connection from the test adapter.

4		Reference/Ambient Test on SPIRE-FCU-main Power Lines
4.1		REFERENCE Mode
	OP	If not already done switch into REFERENCE mode according to chapter 7.1 "A" and con- firm the mode
		On Power SCOE verify the spacecraft OFF condition:
		Measured: U =
Date/Tim	е	
		The measurement shall be done on the <b>PCDU/HSFCU_Nom_Pwr SUP/RTN</b> lines.
		The power lines are accessible via the test adapter DB01-J04 (Figure 6-5).
		"plus": DB01-J04 pin 7
		"return": DB01-J04 pin 8
Date/Tim	е	
4.2		CE Current in Frequency Domain, Common Mode
		Set the current clamp on the SPIRE-FCU-main power lines for CM measurements in ac- cordance to the CM set-up Figure 5-1: Schematic for CM and DM Measurements. Measure the ambient current from 30 Hz to 50 MHz.





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		Plot 0xx: 3 Plot 0xx: 1 Plot 0xx: 1 Plot 0xx: 3	0 Hz – 10 kHz 0 kHz – 1 MH MHz – 30 MH 0 MHz – 50 M	z, CM-ambient, SPIF z, CM-ambient, SPII łz, CM-ambient, SP IHz, CM-ambient, SF	RE-FCU -m RE-FCU -n IRE-FCU -I PIRE-FCU	ain -PWR nain -PWF main -PW -main -PV	≀ R VR		
	Ťõ	Photos:	a aurrant prot						
		Remove tr		Je.					
Date/	Time								
4.3		CE Curren	t in Frequency	y Domain, Differentia	al Mode				
		Set the cu cordance t the ambier	rrent clamp or to the DM set- nt current from	the SPIRE-FCU -m up Figure 5-1: Schel 30 Hz to 50 MHz.	ain power matic for C	lines_for D M and DM	0M me 1 Mea:	asureme surement	nts in ac- s. Measure:
		Plot 0xx: 3 Plot 0xx: 1 Plot 0xx: 1 Plot 0xx: 3	0 Hz – 10 kHz 0 kHz – 1 MH MHz – 30 MF 0 MHz – 50 M	z, DM-ambient, SPIF z, DM-ambient, SPII Hz, DM-ambient, SPI IHz, DM-ambient, SP	RE-FCU -m RE-FCU -n IRE-FCU -I PIRE-FCU	iain -PWR nain -PWF main -PW -main -PV	R R VR		
		Photos:							
		Remove th	ne current prot	De.					
	·								
4.4	TIMe	CE Curren	it in Time Dom	nain, Differential Moo	le				
		Set the cu before. Me 50 MHz).	rrent clamp or easure the am	the SPIRE-FCU -m bient DC current and	ain power I the currei	lines_for D nt ripple w	)M me ith an	asureme oscillosc	nts as ope (BW ≥
		Plot 0xx:							
		Measured Measured	Ambient DC c current ripple	current: I-DCamb = : I-amb = xx	xxx mA x mApp				
	Eð	Photos:							
		Remove th	ne current prot	De.					
Date/	Time								
4.5		CE Voltag	e in Time Don	nain Differential Mod	<u>e</u>				
		Set the vo and measu adequate	Itage probe or ure the differen time-/amplitud	the SPIRE-FCU-manual ntial ambient voltage e scaling.	ain power l ripple with	ines_for D n an oscille	M volt oscope	age mea: e (BW ≥ t	surements 50 MHz) in
		"plus": DB "return": D	01-J04 pin 7 B01-J04 pin 8						
		Plot 0xx:	Ambient volta	ae rinnle: u-amh - x		< 2 5 \/)			
		weasured		ge rippie. u-arrin – x	~~ ^ hh (~/	~ 2,3 V)			





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	Photos:
	Remove the oscilloscope connection from the test adapter.
Date/Time	
4.6	CE Voltage in Time Domain, Pwr-Return to Structure
	Connect the differential voltage probe "+" input to the SPIRE-FCU-main RETURN power line and the differential voltage probe "-" input to the satellite structure.
	Measure the differential voltage ripple with an oscilloscope (BW $\ge$ 50 MHz) in adequate time-/amplitude scaling.
	"return": DB01-J04 pin 8 "satellite structure":tbd during test
	Plot 0xx:
	Measured Ambient voltage ripple: u-amb = xxx Vpp
6	Photos:
	Remove the oscilloscope connection from the test adapter.

5		Reference/Ambient Test on PACS-DPU-main Power Lines				
5.1		REFERENCE Mode				
	OP	If not already done switch into REFERENCE mode according to chapter 7.1 "A" and con- firm the mode				
	OP	On Power SCOE verify the spacecraft OFF condition by SCOE parameters:				
		Main Bus Voltage= 0 V,Measured: U =Main Bus Current Output = = A,Measured: I =				
Date/Tim	е					
		The measurement shall be done on the PCDU/FPDPU_Nom_Pwrs SUP/RTN lines.				
		The power lines are accessible via the test adapter DB01-J05 (Figure 6-6).				
		"plus": DB01-J05 pin 47//49 "return": DB01-J05 pin 48//50				
Date/Tim	е					
5.2		CE Current in Frequency Domain, Common Mode				
		Set the current clamp on the PACS-DPU-main power lines for CM measurements in ac- cordance to the CM set-up Figure 5-1: Schematic for CM and DM Measurements. Measure the ambient current from 30 Hz to 50 MHz.				
		Plot 0xx: 30 Hz – 10 kHz, CM-ambient, PACS-DPU -main -PWR Plot 0xx: 10 kHz – 1 MHz, CM-ambient, PACS-DPU -main -PWR Plot 0xx: 1 MHz – 30 MHz, CM-ambient, PACS-DPU -main -PWR Plot 0xx: 30 MHz – 50 MHz, CM-ambient, PACS-DPU -main -PWR				
		Photos:				





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		Remove the current probe.
Data/Tim	~~~~	
5.3		CE Current in Frequency Domain, Differential Mode
	1	Set the current clamp on the PACS-DPU -main power lines for DM measurements in ac- cordance to the DM set-up Figure 5-1: Schematic for CM and DM Measurements. Measure the ambient current from 30 Hz to 50 MHz.
		Plot 0xx: 30 Hz – 10 kHz, DM-ambient, PACS-DPU -main -PWR Plot 0xx: 10 kHz – 1 MHz, DM-ambient, PACS-DPU -main -PWR Plot 0xx: 1 MHz – 30 MHz, DM-ambient, PACS-DPU -main -PWR Plot 0xx: 30 MHz – 50 MHz, DM-ambient, PACS-DPU -main -PWR
		Photos:
		Remove the current probe.
Date/Tin	no	
5.4		CE Current in Time Domain, Differential Mode
		Set the current clamp on the PACS-DPU -main power lines_for DM measurements as be- fore. Measure the ambient DC current and the current ripple with an oscilloscope (BW $\ge$ 50 MHz).
		Plot 0xx: Measured Ambient DC current: I-DCamb = xxx mA Measured current ripple : I-amb = xxx mApp
		Photos:
		Remove the current probe.
Date/Tin	ne	
5.5		CE Voltage in Time Domain Differential Mode
		Set the voltage probe on the PACS-DPU -main power lines for DM voltage measurements and measure the differential ambient voltage ripple with an oscilloscope (BW $\ge$ 50 MHz) in adequate time-/amplitude scaling.
		"plus": DB01-J05 pin 47//49 "return": DB01-J05 pin 48//50
		Plot 0xx:
		Measured Ambient voltage ripple: u-amb = xxx Vpp (>/< 2,5 V)
		Photos:
		Remove the oscilloscope connection from the test adapter.
Date/Tin	ne	
5.6		CE Voltage in Time Domain, Pwr-Return to Structure





			Title:		U				
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		Connec line and	t the differentia I the differentia	al voltage probe "+" input t I voltage probe "-" input to	to the PA the sate	CS-DPU	J -main cture.	RETUR	RN power
		Measur time-/ar	e the differentian plitude scaling	al voltage ripple with an o g.	scilloscop	)e (BW ≧	≥ 50 M	Hz) in ac	lequate
		"return" satellite	: DB01-J05 pin e structure":	48//50 tbd during test…					
		Plot 0xx	C.						
		Measur	ed Ambient vo	ltage ripple: u-amb = xxx '	Vpp				
	Eð	Photos:							
		Remove	e the oscillosco	ope connection from the te	est adapte	ər.			

6		Reference/Ambient Test on PACS-SPU-main Power Lines
6.1		REFERENCE Mode
	OP	If not already done, switch into REFERENCE mode according to chapter 7.1 "A" and con- firm the mode
	OP	On Power SCOE verify the spacecraft OFF condition by SCOE parameters:
		Main Bus Voltage= 0 V,Measured: U =Main Bus Current Output = = A,Measured: I =
Date/Tim	е	
	-	The measurement shall be done on the <b>PCDU/FPSPU1_Pwrs SUP/RTN</b> lines.
		The power lines are accessible via the test adapter DB01-J05 (Figure 6-6).
		"plus": DB01-J05 pin 1//3 "return": DB01-J05 pin 2//4
Date/Tim	е	
6.2		CE Current in Frequency Domain, Common Mode
		Set the current clamp on the PACS-SPU-main power lines for CM measurements in accor- dance to the CM set-up Figure 5-1: Schematic for CM and DM Measurements. Measure the ambient current from 30 Hz to 50 MHz.
		Plot 0xx: 30 Hz – 10 kHz, CM-ambient, PACS-SPU -main -PWR Plot 0xx: 10 kHz – 1 MHz, CM-ambient, PACS-SPU -main -PWR
		Plot 0xx: 1 MHz – 30 MHz, CM-ambient, PACS-SPU -main -PWR
		Plot 0xx: 30 MHz – 50 MHz, CM-ambient, PACS-SPU -main -PWR
	56	Photos:
		Remove the current probe.
Date/Tim	e	
6.3	-	CE Current in Frequency Domain, Differential Mode
		Set the current clamp on the PACS-SPU -main power lines for DM measurements in ac-

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<b></b>	
	the ambient current from 30 Hz to 50 MHz.
	Plot 0xx: 30 Hz – 10 kHz, DM-ambient, PACS-SPU -main -PWR Plot 0xx: 10 kHz – 1 MHz, DM-ambient, PACS-SPU -main -PWR Plot 0xx: 1 MHz – 30 MHz, DM-ambient, PACS-SPU -main -PWR Plot 0xx: 30 MHz – 50 MHz, DM-ambient, PACS-SPU -main -PWR
Ť	Photos:
	Remove the current probe.
Date/Time	
6.4	CE Current in Time Domain, Differential Mode
	Set the current clamp on the PACS-SPU -main power lines for DM measurements as before. Measure the ambient DC current and the current ripple with an oscilloscope (BW $\ge$ 50 MHz).
	Plot 0xx:
	Measured Ambient DC current:I-DCamb = xxx mAMeasured current ripple :I-amb = xxx mApp
<b>1</b>	Photos:
	Remove the current probe.
Date/Time	
6.5	CE Voltage in Time Domain Differential Mode
	Set the voltage probe on the PACS-SPU -main power lines_for DM voltage measurements and measure the differential ambient voltage ripple with an oscilloscope (BW $\ge$ 50 MHz) in adequate time-/amplitude scaling.
	"plus": DB01-J05 pin 1//3 "return": DB01-J05 pin 2//4
	Plot 0xx:
	Measured Ambient voltage ripple: u-amb = xxx Vpp (>/< 2,5 V)
1	Photos:
	Remove the oscilloscope connection from the test adapter.
Date/Time	
6.6	CE Voltage in Time Domain, Pwr-Return to Structure
	Connect the differential voltage probe "+" input to the PACS-SPU -main RETURN power line and the differential voltage probe "-" input to the satellite structure.
	Measure the differential voltage ripple with an oscilloscope (BW $\ge$ 50 MHz) in adequate time-/amplitude scaling.
	"return": DB01-J05 pin 2//4 "satellite structure":tbd during test





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		Plot 0xx:
		Measured Ambient voltage ripple: u-amb = xxx Vpp
	5	Photos:
		Remove the oscilloscope connection from the test adapter.
7 Reference/Ambient Test on PACS-BOLC-main Power Lines		
7.1		REFERENCE Mode
	OP	If not already done, switch into REFERENCE mode according to chapter 7.1 "A" and con- firm the mode
		On Power SCOE verify the spacecraft OFF condition:
		Measured: U =
Date/Tim	e	
		The measurement shall be done on the <b>PCDU/FPBOLC_Pwrs SUP/RTN</b> lines.
		The power lines are accessible via the test adapter DB01-J06 (Figure 6-7).
		"plus": DB01-J06 pin 13//17 "return": DB01-J06 pin 14//18
Doto/Tim	0	
	e	CE Current in Frequency Domain, Common Mode
1.2		<u>CE Current in Frequency Domain, Common Mode</u>
		Set the current clamp on the PACS-BOLC-main power lines for CM measurements in ac- cordance to the CM set-up Figure 5-1: Schematic for CM and DM Measurements. Measure the ambient current from 30 Hz to 50 MHz.
		Plot 0xx: 30 Hz – 10 kHz, CM-ambient, PACS-BOLC -main -PWR Plot 0xx: 10 kHz – 1 MHz, CM-ambient, PACS- BOLC -main -PWR Plot 0xx: 1 MHz – 30 MHz, CM-ambient, PACS- BOLC -main -PWR Plot 0xx: 30 MHz – 50 MHz, CM-ambient, PACS- BOLC -main -PWR
	7	Photos:
		Remove the current probe.
Date/Tim	e	
7.3		CE Current in Frequency Domain, Differential Mode





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6	Photos:
	Remove the current probe.
Date/Time	CE Current in Time Domain, Differential Mode
7.4	
	Set the current clamp on the PACS-BOLC-main power lines_for DM measurements as before. Measure the ambient DC current and the current ripple with an oscilloscope (BW $\geq$ 50 MHz).
	Plot 0xx:
	Measured Ambient DC current:I-DCamb = xxx mAMeasured current ripple :I-amb = xxx mApp
ŤŐ	Photos:
	Remove the current probe.
Date/Time	
7.5	CE Voltage in Time Domain Differential Mode
	Set the voltage probe on the PACS-BOLC-main power lines_for DM voltage measurements and measure the differential ambient voltage ripple with an oscilloscope (BW $\ge$ 50 MHz) in adequate time-/amplitude scaling.
	"plus": DB01-J06 pin 13//17 "return": DB01-J06 pin 14//18
	Plot 0xx:
	Measured Ambient voltage ripple: u-amb = xxx Vpp (>/< 2,5 V)
Ťõ	Photos:
	Remove the oscilloscope connection from the test adapter.
Date/Time	
7.6	CE Voltage in Time Domain, Pwr-Return to Structure
	Connect the differential voltage probe "+" input to the PACS-BOLC-main RETURN power line and the differential voltage probe "-" input to the satellite structure.
	Measure the differential voltage ripple with an oscilloscope (BW $\ge$ 50 MHz) in adequate time-/amplitude scaling.
	"return": DB01-J06 pin 14//18 "satellite structure":tbd during test
	Plot 0xx:
	Measured Ambient voltage ripple: u-amb = xxx Vpp
5	Photos:





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Remove the oscilloscope connection from the test adapter. 8 Reference/Ambient Test on PACS-MEC-main Power Lines 8.1 **REFERENCE** Mode OP If not already done, switch into REFERENCE mode according to chapter 7.1 "A" and confirm the mode On Power SCOE verify the spacecraft OFF condition: Measured: U = Date/Time The measurement shall be done on the PCDU/FPMEC1\_ Pwrs SUP/RTN lines. The power lines are accessible via the test adapter DB01-J05 (Figure 6-6). "plus": DB01-J06 pin 13//17 "return": DB01-J06 pin 14//18 Date/Time 8.2 CE Current in Frequency Domain, Common Mode Set the current clamp on the PACS-MEC-main power lines for CM measurements in accordance to the CM set-up Figure 5-1: Schematic for CM and DM Measurements. Measure the ambient current from 30 Hz to 50 MHz. Plot 0xx: 30 Hz – 10 kHz, CM-ambient, PACS-MEC -main -PWR Plot 0xx: 10 kHz - 1 MHz, CM-ambient, PACS- MEC -main -PWR Plot 0xx: 1 MHz - 30 MHz, CM-ambient, PACS- MEC -main -PWR Plot 0xx: 30 MHz - 50 MHz, CM-ambient, PACS- MEC -main -PWR Photos: 76 Remove the current probe. Date/Time 8.3 CE Current in Frequency Domain, Differential Mode Set the current clamp on the PACS-MEC-main power lines for DM measurements in accordance to the DM set-up Figure 5-1: Schematic for CM and DM Measurements. Measure the ambient current from 30 Hz to 50 MHz. Plot 0xx: 30 Hz - 10 kHz, DM-ambient, PACS- MEC -main -PWR  $\sim$ Plot 0xx: 10 kHz - 1 MHz, DM-ambient, PACS- MEC -main -PWR Plot 0xx: 1 MHz - 30 MHz, DM-ambient, PACS- MEC -main -PWR Plot 0xx: 30 MHz - 50 MHz, DM-ambient, PACS- MEC -main -PWR Photos: 76 Remove the current probe. Date/Time CE Current in Time Domain, Differential Mode 8.4



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		Set the current clamp on the PACS-MEC-main power lines for DM measurements as before. Measure the ambient DC current and the current ripple with an oscilloscope (BW $\ge$ 50 MHz).
		Plot 0xx:
		Measured Ambient DC current: I-DCamb = xxx mA Measured current ripple : I-amb = xxx mApp
	ŤŐ	Photos:
		Remove the current probe.
Date/Tim	е	
8.5		CE Voltage in Time Domain Differential Mode
		Set the voltage probe on the PACS-MEC-main power lines_for DM voltage measurements and measure the differential ambient voltage ripple with an oscilloscope (BW ≥ 50 MHz) in adequate time-/amplitude scaling. "plus": DB01-J05 pin 13//17
		"return": DB01-J05 pin 14//18
		Plot 0xx: Measured Ambient voltage ripple: u-amb = xxx Vpp (>/< 2,5 V)
	76	Photos:
		Remove the oscilloscope connection from the test adapter.
Date/Tim	е	
8.6		CE Voltage in Time Domain, Pwr-Return to Structure
		Connect the differential voltage probe "+" input to the PACS-MEC-main RETURN power line and the differential voltage probe "-" input to the satellite structure.
		Measure the differential voltage ripple with an oscilloscope (BW $\ge$ 50 MHz) in adequate time-/amplitude scaling.
		"return": DB01-J06 pin 14//18 "satellite structure":tbd during test
		Plot 0xx:
		Measured Ambient voltage ripple: u-amb = xxx Vpp
	Ť	Photos:
		Remove the oscilloscope connection from the test adapter.
9		Reference/Ambient Test on <u>CCU-main</u> Power Lines




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		firm the mode.
		On Power SCOE verify the spacecraft OFF condition:
		Measured: U =
Data/Tim		
Date/ IIII	6	The measurement shall be done on the PCDU/CCULA Pwrs SUP/RTN lines
		The power lines are accessible via the test adapter DB01-J01 (Figure 6-3).
		"plus": DB01-J01 pin 18 "return": DB01-J01 pin 19
Date/Time	е	
9.2		CE Current in Frequency Domain, Common Mode
		Set the current clamp on the CCU-main power lines for CM measurements in accordance to the CM set-up Figure 5-1: Schematic for CM and DM Measurements. Measure the ambient current from 30 Hz to 50 MHz.
		Plot 0xx: 30 Hz – 10 kHz, CM-ambient, CCU -main -PWR Plot 0xx: 10 kHz – 1 MHz, CM-ambient, CCU -main -PWR Plot 0xx: 1 MHz – 30 MHz, CM-ambient, CCU -main -PWR Plot 0xx: 30 MHz – 50 MHz, CM-ambient, CCU -main -PWR
	1	Photos:
		Remove the current probe
Date/Time	е	
9.3		CE Current in Frequency Domain, Differential Mode
		Set the current clamp on the CCU -main power lines_for DM measurements in accordance to the DM set-up Figure 5-1: Schematic for CM and DM Measurements. Measure the ambient current from 30 Hz to 50 MHz.
		Plot 0xx: 30 Hz – 10 kHz, DM-ambient, CCU -main -PWR Plot 0xx: 10 kHz – 1 MHz, DM-ambient, CCU -main -PWR Plot 0xx: 1 MHz – 30 MHz, DM-ambient, CCU -main -PWR Plot 0xx: 30 MHz – 50 MHz, DM-ambient, CCU -main -PWR
	56	Photos:
		Remove the current probe.
Date/Tim		
9.4	U	CE Current in Time Domain, Differential Mode
		Set the current clamp on the CCU -main power lines_for DM measurements as before. Measure the ambient DC current and the current ripple with an oscilloscope (BW $\ge$ 50 MHz).
		Plot 0xx:
		INICASULEU AITINIETIL DE CUTTETIL. I-DEATIN - XXX TIA





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	Measured current ripple : I-amb = xxx mApp
<b>5</b>	Photos:
	Remove the current probe.
Date/Time	
9.5	CE Voltage in Time Domain Differential Mode
	Set the voltage probe on the CCU -main power lines_for DM voltage measurements and measure the differential ambient voltage ripple with an oscilloscope (BW $\ge$ 50 MHz) in adequate time-/amplitude scaling.
	"plus": DB01-J01 pin 18 "return": DB01-J01 pin 19
	Plot 0xx:
	Measured Ambient voltage ripple: u-amb = xxx Vpp (>/< 2,5 V)
<b>1</b>	Photos:
	Remove the oscilloscope connection from the test adapter.
Date/Time	
9.6	CE Voltage in Time Domain, Pwr-Return to Structure
	Connect the differential voltage probe "+" input to the CCU-main RETURN power line and the differential voltage probe "-" input to the satellite structure.
	Measure the differential voltage ripple with an oscilloscope (BW $\ge$ 50 MHz) in adequate time-/amplitude scaling.
	<pre>"return": DB01-J01 pin 19 "satellite structure":tbd during test</pre>
	Plot 0xx:
	Measured Ambient voltage ripple: u-amb = xxx Vpp
<b>5</b>	Photos:
	Remove the oscilloscope connection from the test adapter.

10		Reference/Ambient Test on <u>TWTA-EPC1</u> Power Lines
10.1		REFERENCE Mode
OP		If not already done switch into REFERENCE mode according to chapter 7.1 "A" and con- firm the mode.
		On Power SCOE verify the spacecraft OFF condition by SCOE parameters:
		Measured: U =
Date/Tim	е	

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	<b>EMC Test Procedure</b>
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	The measurement shall be done on the PCDU/EPC1 Pwrs SUP/RTN lines.
	The power lines are accessible via the test adapter DB01-J02 (Figure 6-4).
	"plus": DB01-J02 pin 22//24 "return": DB01-J02 pin 23/25
Date/Time	CE Current in Frequency Domain, Common Mode
	Set the current clamp on the TWTA-EPC1-main power lines for CM measurements in ac- cordance to the CM set-up Figure 5-1: Schematic for CM and DM Measurements. Measure the ambient current from 30 Hz to 50 MHz.
	Plot 0xx: 30 Hz – 10 kHz, CM-ambient, TWTA-EPC1-main -PWR Plot 0xx: 10 kHz – 1 MHz, CM-ambient, TWTA-EPC1-main -PWR Plot 0xx: 1 MHz – 30 MHz, CM-ambient, TWTA-EPC1-main -PWR Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TWTA-EPC1-main -PWR
<b>5</b>	Photos:
	Remove the current probe.
Date/Time	
10.3	CE Current in Frequency Domain, Differential Mode
	Set the current clamp on the TWTA-EPC1-main power lines_for DM measurements in ac- cordance to the DM set-up Figure 5-1: Schematic for CM and DM Measurements. Measure the ambient current from 30 Hz to 50 MHz.
	Plot 0xx: 30 Hz – 10 kHz, DM-ambient, TWTA-EPC1-main -PWR Plot 0xx: 10 kHz – 1 MHz, DM-ambient, TWTA-EPC1-main -PWR Plot 0xx: 1 MHz – 30 MHz, DM-ambient, TWTA-EPC1-main -PWR Plot 0xx: 30 MHz – 50 MHz, DM-ambient, TWTA-EPC1-main -PWR
<b>5</b>	Photos:
	Remove the current probe.
Date/Time	
10.4	CE Current in Time Domain, Differential Mode
	Set the current clamp on the TWTA-EPC1-main power lines_for DM measurements as before. Measure the ambient DC current and the current ripple with an oscilloscope (BW ≥ 50 MHz).
	Plot 0xx:
	Measured Ambient DC current:I-DCamb = xxx mAMeasured current ripple :I-amb = xxx mApp
Tõ.	Photos:
	Remove the current probe.
Date/Time	







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10.5	CE Voltage in Time Dor	main Differential Mode				
	Set the voltage probe o and measure the differe adequate time-/amplitud "plus": DB01-J02 pin 22 "return": DB01-J02 pin 2	n the TWTA-EPC1-main powe ential ambient voltage ripple w de scaling. 2//24 23/25	er lines_for ith an oscill	DM vol loscope	tage mea e (BW ≥ \$	asurements 50 MHz) in
	Plot 0xx: Measured Ambient volt	age ripple: u-amb = xxx Vpp (:	>/< 2,5 V)			
	Photos:					
	Remove the oscilloscop	be connection from the test ad	apter.			
Date/Time						
10.6	CE Voltage in Time Do	main, Pwr-Return to Structure				
	Connect the differential line and the differential	voltage probe "+" input to the voltage probe "-" input to the s	TWTA-EP	C1-mai ucture.	in RETUI	RN power
	Measure the differential time-/amplitude scaling	voltage ripple with an oscillos	scope (BW	≥ 50 M	Hz) in ac	lequate
	"return": DB01-J02 pin 2 "satellite structure":tt	23/25 od during test				
	Plot 0xx:					
	Measured Ambient volt	age ripple: u-amb = xxx Vpp				
<b>1</b>	Photos:					
	Remove the oscilloscop	be connection from the test ad	apter.			

11		Reference/Ambient Test on <u>STR1</u> Power Lines
11.1		REFERENCE Mode
	OP	If not already done switch into REFERENCE mode according to chapter 7.1 "A" and con- firm the mode
		On Power SCOE verify the spacecraft OFF condition by SCOE parameters:
		Measured: U =
Date/Tim	е	
		The measurement shall be done on the <b>PCDU/STR1_Pwr SUP/RTN</b> lines.
		The power lines are accessible via the test adapter DB01-J06 (Figure 6-7).
		"plus": DB01-J06 pin 27
		"return": DB01-J06 pin 28
Date/Tim	е	

EAD	S S E F	шп	Titel: Title:	E	ЕМС Т	est Proc	edure		EM	V und M	lesstechnik
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11.2		CE Cu	rent in Frequ	uency D	Domain	<u>, Commoi</u>	n Mode				
		Set the to the 0 bient cr	current clam CM set-up Fig urrent from 3	np on th gure 5-′ 80 Hz to	ne STR 1: Sche 50 MH	1-main po ematic for Iz.	ower lines CM and D	for CM me M Measur	asurer ement	nents in a s. Measu	accordance re the am-
		Plot 0x Plot 0x Plot 0x Plot 0x	x: 30 Hz – 10 x: 10 kHz – 1 x: 1 MHz – 3 x: 30 MHz –	0 kHz, 0 1 MHz, 0 80 MHz, 50 MHz	CM-aml CM-am CM-ar z, CM-a	bient, STI nbient, ST mbient, S <sup>-</sup> ambient, S	R1-main -F R1-main - FR1-main STR1-mair	PWR PWR -PWR 1 -PWR			
	1	Photos	:								
		Remov	e the current	t probe.							
Date/11 11.3	ime	CE Cu	rent in Frequ	uency D	Domain	, Different	ial Mode				
		Set the to the I bient cr	current clam OM set-up Fig urrent from 3	np on th gure 5-′ 80 Hz to	ne STR 1: Sche 50 MH	1-main po ematic for Iz.	ower lines <u></u> CM and D	for DM me M Measur	asurer ement	nents in a s. Measu	accordance re the am-
		Plot 0x Plot 0x Plot 0x Plot 0x	x: 30 Hz – 10 x: 10 kHz – 1 x: 1 MHz – 3 x: 30 MHz –	0 kHz, [ 1 MHz,   80 MHz, 50 MHz	DM-aml DM-am DM-ar z, DM-a	bient, STI nbient, ST mbient, S <sup>-</sup> ambient, S	R1-main -F R1-main - FR1-main STR1-mair	PWR PWR -PWR 1 -PWR			
	Ť	Photos	:								
		Remov	e the current	t probe.							
	~										
Date/T	ime	CE Cu	rrent in Time	Domair	n, Diffe	erential Mo	<u>ode</u>				
		Set the Measu MHz).	current clam re the ambier	np on th nt DC c	ne STR current a	1-main po and the c	ower lines <u></u> urrent ripp	for DM me le with an o	asurer	nents as scope (BV	before. V ≥ 50
		Plot 0x	x:								
		Measu Measu	red Ambient red current ri	DC curi ipple :	rent:	I-DCamb I-amb = x	= xxx mA xx mApp				
	ŤŐ	Photos	:								
		Remov	e the current	t probe.							
Date/T	ime										
11.5		CE Vol	tage in Time	Domai	n Differ	rential Mo	de				
		Set the measur adequa	voltage prot re the different ate time-/amp	be on th ntial am plitude s	ne STR nbient v scaling.	1-main po voltage rip	ower lines_ ple with a	for DM vol n oscillosc	tage m ope (B	easurem W ≥ 50 №	ents and IHz) in
		"plus":   "return"	DB01-J06 pir ': DB01-J06 r	n 27 pin 28							

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Plot 0xx:  $\sim$ Measured Ambient voltage ripple: u-amb = xxx Vpp (>/< 2,5 V) Photos: ŤŐ Remove the oscilloscope connection from the test adapter. Date/Time 11.6 CE Voltage in Time Domain, Pwr-Return to Structure Connect the differential voltage probe "+" input to the STR1-main RETURN power line and the differential voltage probe "-" input to the satellite structure. Measure the differential voltage ripple with an oscilloscope (BW ≥ 50 MHz) in adequate time-/amplitude scaling. "return": DB01-J06 pin 28 "satellite structure": ...tbd during test... Plot 0xx: Measured Ambient voltage ripple: u-amb = xxx Vpp Photos: ĦÊ Remove the oscilloscope connection from the test adapter.





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## 8.4 Reference/Ambient Tests on Signal Lines

Executant       REFERENCE/AMBIENT TEST ON SIGNAL LINES         In additional see paragraph 6.3 "Arrangements for Signal Lines", Figure 5-2 and Figure 5-3.         Before starting an EMC test:         Ckeck that all the EMC adapter connectors are mechanically secured against disconnecting by accident or stress!         Pay special attention and take precautions when clamping and unclamping the measurement transducers (e.g. voltage- and current probes) to and from the EMC adapter wires. Wires may breake under stress.         Note that the signal lines are shielded and the shield is rooted via the connector shells. So, when installing the EMC adapters and later performing the measurements, take care and measures that the shielding path is conductively not interrupted!         12       Reference/Ambient Test on TC Signal Lines (RWL1)         The measurement shall be done on the Torque_Cmd SUP/RET lines.         The signal lines are accessible via the test adapter DB02-P01 (Figure 6-8, Figure 5-2).         "plus": DB71- J02 pin 16         "returm": DB71- J02 pin 32         Date/Time         12.1       REFERENCE Mode         12.2       CE Current in Ereguency Domain, Common Mode         Set the current clamp on the TC signal lines for CM measurements. In accordance to the CM set-up Figure 5-1: Schematic for CM and DM Measurements.         Measure the ambient current from 30 Hz to 50 MHz and compare the results with the limit of 77 dByA. The ambient missions shall be at least 6 db below the requirement limit.         Measure the ambient current	Test Step No.,		Description/Comments
REFERENCE/AMBIENT TEST ON SIGNAL LINES In additional see paragraph 6.3 "Arrangements for Signal Lines", Figure 5-2 and Figure 5-3.         Before starting an EMC test:         Ckeck that all the EMC adapter connectors are mechanically secured against disconnecting by accident or stress!         Pay special attention and take precautions when clamping and unclamping the measurement transducers (e.g. voltage and current probes) to and from the EMC adapter wires. Wires may breake under stress.         Note that the signal lines are shielded and the shield is rooted via the connector shells. So, when installing the EMC adapters and later performing the measurements, take care and measures that the shielding path is conductively not interrupted!         12       Reference/Ambient Test on TC Signal Lines (RWL1)         The measurement shall be done on the Torque_Cmd SUP/RET lines.         The signal lines are accessible via the test adapter DB02-P01 (Figure 6-8, Figure 5-2). "plus": DB71- J02 pin 16 "return": DB71- J02 pin 32         Date/Time       12.1         REFERENCE Mode         12.2       CE Current in Frequency Domain, Common Mode         Date/Time       2         CE Current in Frequency Domain, Common Mode         Set the current clamp on the TC signal lines for CM measurements in accordance to the CM set-up Figure 5-1: Schematic for CM and DM Measurements.         Measure the ambient current from 30 Hz to 50 MHz and compare the results with the limit of 77 dBµA. The ambient measurement, TC-signal Plot 0x: 10 KHz - 1 MHz, CM-ambient, TC-signal Plot 0x: 10 KHz - 1 MHz, CM-ambient, TC-si	Executar	nt	
In additional see paragraph 6.3 "Arrangements for Signal Lines", Figure 5-2 and Figure 5-3.         Before starting an EMC test:         Ckeck that all the EMC adapter connectors are mechanically secured against disconnecting by accident or stress!         Pay special attention and take precautions when clamping and unclamping the measurement transducers (e.g. voltage- and current probes) to and from the EMC adapter wires. Wires may breake under stress.         Note that the signal lines are shielded and the shield is rooted via the connector shells. So, when installing the EMC adapters and later performing the measurements, take care and measures that the shielding path is conductively not interrupted!         12       Reference/Ambient Test on TC Signal Lines (RWL1)         The measurement shall be done on the Torque_Cmd SUP/RET lines.         The signal lines are accessible via the test adapter DB02-P01 (Figure 6-8, Figure 5-2).         "plus": DB71- J02 pin 16         "return": DB71- J02 pin 32         Date/Time         12.1       REFERENCE Mode         12.1       REFERENCE Mode         12.2       CE Current in Frequency Domain. Common Mode         Set the current clamp on the TC signal lines for CM measurements in accordance to the CM set-up Figure 5-1: Schematic for CM and DM Measurements.         12.2       CE Current in Frequency Domain. Common Mode         Set the current clamp on the TC signal lines for CM measurements in accordance to the CM set-up Figure 5-1: Schematic for CM and DM Measurements.      <			DECEDENCE/AMDIENT TEST ON SIGNAL LINES
Before starting an EMC test:         Ckeck that all the EMC adapter connectors are mechanically secured against disconnecting by accident or stress!         Pay special attention and take precautions when clamping and unclamping the measurement transducers (e.g. voltage- and current probes) to and from the EMC adapter wires. Wires may breake under stress.         Note that the signal lines are shielded and the shield is rooted via the connector shells. So, when installing the EMC adapters and later performing the measurements, take care and measures that the shielding path is conductively not interments, take care and measures that the shielding path is conductively not interments, take care and measures that the shielding path is conductively not interments, take care and measures that the shielding path is conductively not interments, take care and measures that the shielding path is conductively not interments, take care and measures that the shielding path is conductively not interments, take care and measures that the shielding path is conductively not interments; take care and measures that the shielding path is conductively not interments; take care and measures that the shielding path is conductively not interments; take care and measures that the shielding path is conductively not intermetry inputs": DB71- J02 pin 16 The signal lines are accessible via the test adapter DB02-P01 (Figure 6-8, Figure 5-2).         Plus": DB71- J02 pin 16 Treturn": DB71- J02 pin 16 Treturn": DB71- J02 pin 32         Date/Time         12.1       REFERENCE Mode         If not already done switch into REFERENCE mode according to chapter 7.1 "A" and confirm the mode         Date/Time       CE Current in Frequency Domain, Common Mode         Set the			In additional see paragraph 6.3 "Arrangements for Signal Lines", Figure 5-2 and Figure 5-3.
Ckeck that all the EMC adapter connectors are mechanically secured against disconnecting by accident or stress!         Pay special attention and take precautions when clamping and unclamping the measurement transducers (e.g. voltage and current probes) to and from the EMC adapter wires. Wires may breake under stress.         Note that the signal lines are shielded and the shield is rooted via the connector shells. So, when installing the EMC adapters and later performing the measurements, take care and measures that the shielding path is conductively not interrupted!         12       Reference/Ambient Test on TC Signal Lines (RWL1)         The measurement shall be done on the Torque_Cmd SUP/RET lines.         The signal lines are accessible via the test adapter DB02-P01 (Figure 6-8, Figure 5-2).         "plus": DB71- J02 pin 16         "return": DB71- J02 pin 32         Date/Time         12.1       REFERENCE Mode         If not already done switch into REFERENCE mode according to chapter 7.1 "A" and confirm the mode         Date/Time         12.2       CE Current in Frequency Domain, Common Mode         Set the current clamp on the TC signal lines for CM measurements. Measurements. Measure the ambient current from 30 Hz to 50 MHz and compare the results with the limit of 77 dBµA. The ambient missions shall be at least 6 dB below the requirement limit.         Plot 0x: 10 kHz – 10 kHz, CM-ambient, TC-signal Plot 0x: 10 kHz – 30 MHz, CM-ambient, TC-signal Plot 0x: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0x: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0x: 30 MHz – 50 MHz, CM-ambient, TC-signal P			Before starting an EMC test:
Pay special attention and take precautions when clamping and unclamping the measurement transducers (e.g. voltage- and current probes) to and from the EMC adapter wires. Wires may breake under stress.         Note that the signal lines are shielded and the shield is rooted via the connector shells. So, when installing the EMC adapters and later performing the measurements, take care and measures that the shielding path is conductively not interrupted!         12       Reference/Ambient Test on TC Signal Lines (RWL1)         The measurement shall be done on the Torque_Cmd SUP/RET lines.         The signal lines are accessible via the test adapter DB02-P01 (Figure 6-8, Figure 5-2).         "plus": DB71- J02 pin 16         "return": DB71- J02 pin 32         Date/Time         12.1       REFERENCE Mode         12.1       CE Current in Frequency Domain, Common Mode         Date/Time       Set the current clamp on the TC signal lines for CM measurements in accordance to the CM set-up Figure 5-1: Schematic for CM and DM Measurements.         Measure the ambient current from 30 Hz to 50 MHz and compare the results with the limit of 77 dBµA. The ambient corrent from 30 Hz to 50 MHz and compare the results with the limit of 77 dBµA. The ambient current, TC-signal         Plot 0x:: 30 MHz – 30 MHz, CM-ambient, TC-signal       Plot 0x:: 30 MHz – 50 MHz, CM-ambient, TC-signal         Plot 0x:: 30 MHz – 50 MHz, CM-ambient, TC-signal       Plot 0x:: 1 MHz – 30 MHz, CM-ambient, TC-signal			Ckeck that all the EMC adapter connectors are mechanically secured against dis- connecting by accident or stress!
Note that the signal lines are shielded and the shield is rooted via the connector shells. So, when installing the EMC adapters and later performing the measurements, take care and measures that the shielding path is conductively not interrupted!         12       Reference/Ambient Test on TC Signal Lines (RWL1)         12       Reference/Ambient Test on TC Signal Lines (RWL1)         14       The measurement shall be done on the Torque_Cmd SUP/RET lines.         The signal lines are accessible via the test adapter DB02-P01 (Figure 6-8, Figure 5-2).       "plus": DB71- J02 pin 16         "return": DB71- J02 pin 16       "return": DB71- J02 pin 32         Date/Time       12.1       REFERENCE Mode         12.1       REFERENCE Mode         12.2       CE Current in Frequency Domain. Common Mode         Date/Time       Set the current clamp on the TC signal lines for CM measurements in accordance to the CM set-up Figure 5-1: Schematic for CM and DM Measurements. Measure the ambient current from 30 Hz to 50 MHz and compare the results with the limit of 77 dBµA. The ambient emissions shall be at least 6 dB below the requirement limit.         Plot 0xx: 30 Hz - 10 kHz, CM-ambient, TC-signal       Plot 0xx: 30 Hz - 10 kHz, CM-ambient, TC-signal         Plot 0xx: 30 HHz - 50 MHz, CM-ambient, TC-signal       Plot 0xx: 30 MHz - 50 MHz, CM-ambient, TC-signal			Pay special attention and take precautions when clamping and unclamping the measurement transducers (e.g. voltage- and current probes) to and from the EMC adapter wires. Wires may breake under stress.
12       Reference/Ambient Test on TC Signal Lines (RWL1)         12       Reference/Ambient Test on TC Signal Lines (RWL1)         12       The measurement shall be done on the Torque_Cmd SUP/RET lines. The signal lines are accessible via the test adapter DB02-P01 (Figure 6-8, Figure 5-2). "plus": DB71- J02 pin 16 "return": DB71- J02 pin 32         Date/Time       12.1         12.1       REFERENCE Mode If not already done switch into REFERENCE mode according to chapter 7.1 "A" and confirm the mode         Date/Time       12.2         12.2       CE Current in Frequency Domain, Common Mode         Set the current clamp on the TC signal lines for CM measurements in accordance to the CM set-up Figure 5-1: Schematic for CM and DM Measurements. Measure the ambient current from 30 Hz to 50 MHz and compare the results with the limit of 77 dBµA. The ambient emissions shall be at least 6 dB below the requirement limit.         Plot 0xx: 30 Hz – 10 kHz, CM-ambient, TC-signal Plot 0xx: 1 MHz – 30 MHz, CM-ambient, TC-signal Plot 0xx: 30 Hz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal         Photos:       Photos:			Note that the signal lines are shielded and the shield is rooted via the connector shells. So, when installing the EMC adapters and later performing the measurements, take care and measures that the shielding path is conductively not interrupted!
12       Reference/Ambient Test on TC Signal Lines (RWL1)         The measurement shall be done on the Torque_Cmd SUP/RET lines.         The signal lines are accessible via the test adapter DB02-P01 (Figure 6-8, Figure 5-2).         "plus": DB71- J02 pin 16         "return": DB71- J02 pin 32         Date/Time         12.1         REFERENCE Mode         If not already done switch into REFERENCE mode according to chapter 7.1 "A" and confirm the mode         Date/Time         12.2         CE Current in Frequency Domain, Common Mode         Set the current clamp on the TC signal lines for CM measurements in accordance to the CM set-up Figure 5-1: Schematic for CM and DM Measurements.         Measure the ambient current from 30 Hz to 50 MHz and compare the results with the limit of 77 dBµA. The ambient emissions shall be at least 6 dB below the requirement limit.         Plot 0xx: 30 Hz – 10 kHz, CM-ambient, TC-signal         Plot 0xx: 10 kHz – 1 MHz, CM-ambient, TC-signal         Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal         Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal         Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal         Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal         Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal         Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal         Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal         Plot 0xx: 30 MHz –			
The measurement shall be done on the Torque_Cmd SUP/RET lines.         The signal lines are accessible via the test adapter DB02-P01 (Figure 6-8, Figure 5-2).         "plus": DB71- J02 pin 16         "return": DB71- J02 pin 32         Date/Time         12.1       REFERENCE Mode         If not already done switch into REFERENCE mode according to chapter 7.1 "A" and confirm the mode         Date/Time         12.2       CE Current in Frequency Domain, Common Mode         I2.2       CE Current clamp on the TC signal lines for CM measurements in accordance to the CM set-up Figure 5-1: Schematic for CM and DM Measurements. Measure the ambient current from 30 Hz to 50 MHz and compare the results with the limit of 77 dBµA. The ambient emissions shall be at least 6 dB below the requirement limit.         Plot 0xx: 30 Hz – 10 kHz, CM-ambient, TC-signal Plot 0xx: 30 Hz – 10 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 30 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 10 MHz – 50 MHz, CM-ambient, TC	12		Reference/Ambient Test on <u>TC</u> Signal Lines (RWL1)
The signal lines are accessible via the test adapter DB02-P01 (Figure 6-8, Figure 5-2).         "plus": DB71- J02 pin 16         "return": DB71- J02 pin 32         Date/Time         12.1       REFERENCE Mode         If not already done switch into REFERENCE mode according to chapter 7.1 "A" and confirm the mode         Date/Time         12.2       CE Current in Frequency Domain, Common Mode         12.2       CE Current clamp on the TC signal lines for CM measurements in accordance to the CM set-up Figure 5-1: Schematic for CM and DM Measurements. Measure the ambient current from 30 Hz to 50 MHz and compare the results with the limit of 77 dBµA. The ambient emissions shall be at least 6 dB below the requirement limit.         Plot 0xx: 30 Hz – 10 kHz, CM-ambient, TC-signal Plot 0xx: 10 KHz – 1 MHz, CM-ambient, TC-signal Plot 0xx: 10 kHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient,			The measurement shall be done on the <b>Torque_Cmd SUP/RET</b> lines.
"plus": DB71- J02 pin 16         "return": DB71- J02 pin 32         Date/Time         12.1       REFERENCE Mode         If not already done switch into REFERENCE mode according to chapter 7.1 "A" and confirm the mode         Date/Time         12.2       CE Current in Frequency Domain, Common Mode         12.2       CE Current in Frequency Domain, Common Mode         Set the current clamp on the TC signal lines for CM measurements in accordance to the CM set-up Figure 5-1: Schematic for CM and DM Measurements. Measure the ambient current from 30 Hz to 50 MHz and compare the results with the limit of 77 dBµA. The ambient emissions shall be at least 6 dB below the requirement limit.         Plot 0xx: 30 Hz – 10 kHz, CM-ambient, TC-signal Plot 0xx: 10 kHz – 1 MHz, CM-ambient, TC-signal Plot 0xx: 10 kHz – 30 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 10 KHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 10 KHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 10 KHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 10 KHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 10 KHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 10 KHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 10 KHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 10 KHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 10 KHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 10 KHz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 10 KHz – 50 MHz, CM-			The signal lines are accessible via the test adapter DB02-P01 (Figure 6-8, Figure 5-2).
Date/Time         12.1       REFERENCE Mode         12.1       OP         If not already done switch into REFERENCE mode according to chapter 7.1 "A" and confirm the mode         Date/Time         12.2       CE Current in Frequency Domain, Common Mode         12.2       CE Current clamp on the TC signal lines for CM measurements in accordance to the CM set-up Figure 5-1: Schematic for CM and DM Measurements. Measure the ambient current from 30 Hz to 50 MHz and compare the results with the limit of 77 dBµA. The ambient emissions shall be at least 6 dB below the requirement limit.         Plot 0xx: 30 Hz – 10 kHz, CM-ambient, TC-signal Plot 0xx: 10 kHz – 1 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 30 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, C			"plus": DB71- J02 pin 16 "return": DB71- J02 pin 32
12.1       REFERENCE Mode         OP       If not already done switch into REFERENCE mode according to chapter 7.1 "A" and confirm the mode         Date/Time	Date/Tim	е	
OP       If not already done switch into REFERENCE mode according to chapter 7.1 "A" and confirm the mode         Date/Time	12.1		REFERENCE Mode
Date/Time         12.2       CE Current in Frequency Domain, Common Mode         12.2       Set the current clamp on the TC signal lines for CM measurements in accordance to the CM set-up Figure 5-1: Schematic for CM and DM Measurements. Measure the ambient current from 30 Hz to 50 MHz and compare the results with the limit of 77 dBµA. The ambient emissions shall be at least 6 dB below the requirement limit.         Image: Plot 0xx: 30 Hz - 10 kHz, CM-ambient, TC-signal Plot 0xx: 10 kHz - 1 MHz, CM-ambient, TC-signal Plot 0xx: 10 kHz - 30 MHz, CM-ambient, TC-signal Plot 0xx: 30 Hz - 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz - 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz - 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz - 50 MHz, CM-ambient, TC-signal         Image: Photos:       Photos:		OP	If not already done switch into REFERENCE mode according to chapter 7.1 "A" and con- firm the mode
12.2       CE Current in Frequency Domain, Common Mode         12.2       Set the current clamp on the TC signal lines for CM measurements in accordance to the CM set-up Figure 5-1: Schematic for CM and DM Measurements. Measure the ambient current from 30 Hz to 50 MHz and compare the results with the limit of 77 dBµA. The ambient emissions shall be at least 6 dB below the requirement limit.         Image: Plot 0xx: 30 Hz – 10 kHz, CM-ambient, TC-signal Plot 0xx: 10 kHz – 1 MHz, CM-ambient, TC-signal Plot 0xx: 1 MHz – 30 MHz, CM-ambient, TC-signal Plot 0xx: 30 Hz – 50 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal Plot 0xx –	Doto/Tim	0	
Set the current clamp on the TC signal lines for CM measurements in accordance to the CM set-up Figure 5-1: Schematic for CM and DM Measurements. Measure the ambient current from 30 Hz to 50 MHz and compare the results with the limit of 77 dBµA. The ambient emissions shall be at least 6 dB below the requirement limit.         Plot 0xx: 30 Hz – 10 kHz, CM-ambient, TC-signal Plot 0xx: 10 kHz – 1 MHz, CM-ambient, TC-signal Plot 0xx: 1 MHz – 30 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MH	12.2	e	CE Current in Frequency Domain, Common Mode
Plot 0xx: 30 Hz – 10 kHz, CM-ambient, TC-signal         Plot 0xx: 10 kHz – 1 MHz, CM-ambient, TC-signal         Plot 0xx: 1 MHz – 30 MHz, CM-ambient, TC-signal         Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal         Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal         Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal         Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal			Set the current clamp on the TC signal lines for CM measurements in accordance to the CM set-up Figure 5-1: Schematic for CM and DM Measurements. Measure the ambient current from 30 Hz to 50 MHz and compare the results with the limit of 77 dB $\mu$ A. The ambient emissions shall be at least 6 dB below the requirement limit.
Plot 0xx: 10 kHz – 1 MHz, CM-ambient, TC-signal         Ambient       Plot 0xx: 1 MHz – 30 MHz, CM-ambient, TC-signal         Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal         Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal         Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal         Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal			Plot 0xx: 30 Hz – 10 kHz, CM-ambient, TC-signal
Ambient       Plot 0xx: 1 MHz – 30 MHz, CM-ambient, TC-signal         Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal         Photos:			Plot 0xx: 10 kHz – 1 MHz, CM-ambient, TC-signal
Photos:	Ambient		Plot 0xx: 1 MHz – 30 MHz, CM-ambient, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TC-signal
	<b>1</b>		Photos:
Remove the current probe.			Remove the current probe.
Date/Time	Date/Tim	e	





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Test Step No., Executant		Description/Comments
12.3		CE Voltage in Time Domain Differential Mode
		Set the voltage probe on the TC signal lines in accordance to the DM voltage set-up and measure the ambient voltage ripple with an oscilloscope (BW $\ge$ 50 MHz). The ambient emissions shall be at least 6 dB below the requirement limit of 300 mVpp.
		Plot 0xx:
4	Ambient	Measured Ambient voltage ripple:u-amb = xxx Vpp (>/< 300 mVpp)
	Ť	Photos:
		Remove the oscilloscope connection from the test adapter.
13		Reference/Ambient Test on <u>TDC</u> Signal Lines (RWL1)
	1	The measurement shall be done on the <b>Torque_Direction_Cmd SUP/RET</b> lines.
		The signal lines are accessible via the test adapter DB02- P01 (Figure 6-8, Figure 5-3).
		"plus": DB71- J02 pin 17 "return": DB71- J02 pin 37
Date/Tin	ne	
13.1		REFERENCE Mode
	OP	If not already done switch into REFERENCE mode according to chapter 7.1 "A" and con- firm the mode.
Date/Tin	າຍ	
13.2		CE Current in Frequency Domain, Common Mode
	1	Set the current clamp on the TDC signal lines for CM measurements in accordance to the CM set-up Figure 5-1: Schematic for CM and DM Measurements. Measure the ambient current from 30 Hz to 50 MHz and compare the results with the limit of 77 dB $\mu$ A. The ambient emissions shall be at least 6 dB below the requirement limit.
Ambient		Plot 0xx: 30 Hz – 10 kHz, CM-ambient, TDC-signal Plot 0xx: 10 kHz – 1 MHz, CM-ambient, TDC -signal Plot 0xx: 1 MHz – 30 MHz, CM-ambient, TDC -signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TDC -signal
	Ť	Photos:
		Remove the current probe.
Date/Tin	ne	
13.3		CE Voltage in Time Domain Differential Mode
		Set the voltage probe on the TDC signal lines in accordance to the DM voltage set-up and measure the ambient voltage ripple with an oscilloscope (BW $\ge$ 50 MHz). The ambient emissions shall be at least 6 dB below the requirement limit of 300 mVpp.





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Test Step No., Executant	Description/Comments
	Plot 0xx:
Ambient	Measured Ambient voltage ripple:u-amb = xxx Vpp (>/< 150 mVpp)
<b>5</b>	Photos:
	Remove the oscilloscope connection from the test adapter.
Xxxx	

14		Reference/Ambient Test on <u>ACC/1553</u> Signal Lines (MILBUS)				
		The measurement shall be done on the <b>MILBUS</b> lines.				
		The signal lines are accessible via the test adapter ACC-J23 (Figure 6-10).				
		"MIL1553_A_Nom": ACC-J23 pin 1 "MIL1553Rtn_A_Nom": ACC-J23 pin 11				
Date/Tim	е					
14.1	14.1     REFERENCE Mode					
	OP	If not already done switch into REFERENCE mode according to chapter 7.1 "A" and con- firm the mode.				
Date/Tim	е					
14.2		CE Voltage in Time Domain Differential Mode				
		Set the voltage probe on the MILBUS signal lines in accordance to the DM voltage set-up and measure the ambient voltage ripple with an oscilloscope (BW $\ge$ 50 MHz).				
		Plot 0xx:				
Ambient		Measured Ambient voltage ripple:u-amb = xxx Vpp				
1		Photos:				
		Remove the oscilloscope connection from the test adapter.				



### 8.5 Tests on Satellite Ground Line

Test Step No., Executant		Description/Comments
15		Test on Satellite Ground Line: This Test is deleted!





1

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## 8.6 Conducted Emission Tests on Power Lines

Test Step No.,		Description/Comments
Executal	n	
		CONDUCTED EMISSION TEST ON POWER LINES
		In additional see paragraph 5 "Test Requirements". The power lines under test accessability and the current-/voltage probe arrangements are described in the previouse chapter for "Reference/Ambient- measurements" and will not be repeated here!
		Before starting an EMC test:
		Ckeck that all the EMC adapter connectors are mechanically secured against dis- connecting by accident or stress!
		Pay special attention and take precautions when clamping and unclamping the measurement transducers (e.g. voltage- and current probes) to and from the EMC adapter wires. Wires may breake under stress.
16		CE Test on <u>HIFI-LCU-main</u> Power Lines
		The measurement shall be done on the PCDU/FHLCU_Pwrs SUP/RTN lines.
16.1		NOISIEST Mode
	OP	If not already done, switch into NOISIEST mode according to chapter 7.1 "B4" and confirm the mode
	OP	Give nominal DC current to EMC. The value shall be recorded into the test report.
		WM709565 HiFiLCU_N_L53_I Nominal DC current: I-DCnom = xxx mA
Date/Tim	е	
16.2		CE Current in Frequency Domain, Common Mode
		Measure the CM current from 30 Hz to 50 MHz.
	Pass/ Fail	Plot 0xx: 30 Hz – 10 kHz, CM-NomMode, HIFI-LCU-main -PWR Plot 0xx: 10 kHz – 1 MHz, CM- NomMode, HIFI-LCU-main -PWR Plot 0xx: 1 MHz – 30 MHz, CM- NomMode, HIFI-LCU-main -PWR Plot 0xx: 30 MHz – 50 MHz, CM- NomMode, HIFI-LCU-main -PWR
		Comments/Limit exceedings if any
	Ť	Photos:
		Remove the current probe.
Date/Tim	е	
16.3		CE Current in Frequency Domain, Differential Mode
		Measure the CM current from 30 Hz to 50 MHz.

FADE	
	The: EMC Test Procedure
Project: HERSCH	EL Dokument Nr.: HP-2-ASED-TP-0155 Ausgabe: 1 Datum: 16.11.07 Document No.: 16.11.07
Toot Stop No	Description/Comments
Executant	Description/Comments
	Plot 0xx: 30 Hz – 10 kHz, DM- NomMode, HIFI-LCU-main -PWR Plot 0xx: 10 kHz – 1 MHz, DM- NomMode, HIFI-LCU-main -PWR
Pass/	Plot 0xx: 1 MHz – 30 MHz, DM- NomMode, HIFI-LCU-main -PWR
Fail	Plot 0xx: 30 MHz – 50 MHz, DM- NomMode, HIFI-LCO-main -PWR
	Comments/Limit exceedings if any
Tõ	Photos:
	Remove the current probe.
Date/Time	
16.4	CE Current in Time Domain, Differential Mode
	Measure the DC current and the current ripple with an oscilloscope (BW $\ge$ 50 MHz).
	Measured Nominal DC current: I-DCnom = xxx mA
Pass/ Fail	I-DCnom ≤ 1 A → Max ripple: I-nom ≤ 60 mApp I-DCnom > 1 A → Max ripple: I-nom ≤ [60 mApp x sqr (I-DCnom)] = xxx
	Plot 0xx: Current ripple
	Measured current ripple: I-nom = xxx mApp, ≤/> I-max ?
ŤŐ	Photos:
	Remove the current probe.
Date/Time	
16.5	CE Voltage in Time Domain Differential Mode
	Measure the differential voltage ripple with an oscilloscope (BW $\ge$ 50 MHz) in adequate time-/amplitude scaling.
	The expected voltage ripple shall be compared to 2,5 Vpp. This test for information only. No limit exists.
	Plot 0xx:
For info only	Measured voltage ripple: u-amb = xxx Vpp (>/< 2,5 V)
Tõ	Photos:
	Remove the oscilloscope connection from the test adapter.
Date/Time	
16.6	CE Voltage in Time Domain, Pwr-Return to Structure
	Connect the differential voltage probe "+" input to the HIFI-LCU-main RETURN power line and the differential voltage probe "-" input to the satellite structure.
	Measure the differential voltage ripple with an oscilloscope (BW $\geq$ 50 MHz) in adequate time-/amplitude scaling.





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Test Step No., Executant	Description/Comments
	"return": DB01-J06 pin 2 "satellite structure":tbd during test and/or
	"return": DB01–J04 pin 12 "satellite structure":tbd during test
	Plot 0xx: Measured voltage ripple: u-amb = xxx Vpp
Tõ	Photos:
	Remove the oscilloscope connection from the test adapter.

17		CE Test on <u>HIFI-ICU-main</u> Power Lines		
		The measurement shall be done on the the PCDU/FHICU_Nom_Pwr SUP/RTN lines.		
17.1	7.1 NOISIEST Mode			
	OP	If not already done, switch into NOISIEST mode according to chapter 7.1 "B4" and confirm the mode		
	OP	Give nominal DC current to EMC. The value shall be recorded into the test report.		
		WM509565 HiFiICU_N_L64_I Nominal DC current: I-DCnom = xxx mA		
Date/Tim	e			
17.2		CE Current in Frequency Domain, Common Mode		
	1	Measure the CM current from 30 Hz to 50 MHz.		
		Plot 0xx: 30 Hz – 10 kHz, CM-NomMode, HIFI-ICU-main -PWR		
		Plot 0xx: 10 kHz – 1 MHz, CM- NomMode, HIFI-ICU-main -PWR		
	Pass/ Fail	Plot 0xx: 1 MHz – 30 MHz, CM- NomMode, HIFI-ICO-main -PWR Plot 0xx: 30 MHz – 50 MHz, CM- NomMode, HIFI-ICU-main -PWR		
	Ē	Comments/Limit exceedings if any		
	ŤŐ	Photos:		
		Remove the current probe.		
Date/Tim	e			
17.3		CE Current in Frequency Domain, Differential Mode		
		Measure the CM current from 30 Hz to 50 MHz.		
		Plot 0xx: 30 Hz – 10 kHz, DM- NomMode, HIFI-ICU-main -PWR		
		Plot 0xx: 10 kHz – 1 MHz, DM- NomMode, HIFI-ICU-main -PWR		
	Pass/ Fail	Plot 0xx: 1 MHz – 30 MHz, DM- NomMode, HIFI-ICU-main -PWR Plot 0xx: 30 MHz – 50 MHz, DM- NomMode, HIFI-ICU-main -PWR		





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	Comments/Limit exceedings if any
6	Photos:
	Remove the current probe.
Date/Time	
17.4	CE Current in Time Domain, Differential Mode
	Measure the DC current and the current ripple with an oscilloscope (BW $\ge$ 50 MHz).
	Measured Nominal DC current: I-DCnom = xxx mA
Pass/ Fail	I-DCnom ≤ 1 A $\rightarrow$ Max ripple: I-nom ≤ 60 mApp I-DCnom > 1 A $\rightarrow$ Max ripple: I-nom ≤ [60 mApp x sqr (I-DCnom)] = xxx
	Plot 0xx: Current ripple
	Measured current ripple: I-nom = xxx mApp, ≤/> I-max ?
	Photos:
	Remove the current probe.
Date/Time	
17.5	CE Voltage in Time Domain Differential Mode
	Measure the differential voltage ripple with an oscilloscope (BW $\ge$ 50 MHz) in adequate time-/amplitude scaling.
	The expected voltage ripple shall be compared to 2,5 Vpp. This test for information only. No limit exists.
	Plot 0xx:
For info only	Measured voltage ripple: u-amb = xxx Vpp (>/< 2,5 V)
6	Photos:
	Remove the oscilloscope connection from the test adapter.
Date/Time	
17.6	CE Voltage in Time Domain, Pwr-Return to Structure
	Connect the differential voltage probe "+" input to the HIFI-ICU-main RETURN power line and the differential voltage probe "-" input to the satellite structure.
	Measure the differential voltage ripple with an oscilloscope (BW $\ge$ 50 MHz) in adequate time-/amplitude scaling.
	"return": DB01-J05 pin 10 "satellite structure":tbd during test
	Plot 0xx:
	Measured voltage ripple: u-amb = xxx Vpp





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		Photos:
	0	Demove the excillence represtion from the test edeptor
		Remove the oscilloscope connection from the test adapter.
18		CE Test on SPIRE-FCU-main Power Lines
		The measurement shall be done on the the <b>PCDU/HSFCU_Nom_Pwr SUP/RTN</b> lines.
18.1		NOISIEST Mode
	OP	If not already done, switch into NOISIEST mode according to chapter 7.1 "B5" and confirm the mode
	OP	Give nominal DC current to EMC. The value shall be recorded into the test report.
		W/M408565SpireHefN   51
		Nominal DC current: I-DCnom = xxx mA
Date/Tin	1e	CE Current in Frequency Domain, Common Mode
10.2		CE Current in Frequency Domain, Common Mode
		Measure the CM current from 30 Hz to 50 MHz.
		Plot 0xx: 30 Hz – 10 kHz, CM-NomMode, SPIRE-FCU-main -PWR
		Plot 0xx: 10 kHz – 1 MHz, CM- NomMode, SPIRE-FCU -main -PWR
	Pass/	Plot 0xx: 1 MHZ = 50 MHZ, CM- NomMode, SPIRE-FCU -Inalit -PWR
	Fall	
	Þ	Comments/Limit exceedings if any
	Ť	Photos:
		Remove the current probe.
Date/Tim	ne	
18.3		CE Current in Frequency Domain, Differential Mode
		Measure the CM current from 30 Hz to 50 MHz.
		Plot 0xx: 30 Hz – 10 kHz, DM- NomMode, SPIRE-FCU -main -PWR
		Plot 0xx: 10 KHZ – 1 MHZ, DM- NomMode, SPIRE-FCU -main -PWR
	Pass/ Fail	Plot 0xx: 30 MHz – 50 MHz, DM- NomMode, SPIRE-FCU -main -PWR
		Comments/Limit exceedings if any
	76	Photos:
		Remove the current probe.
Date/Tim	ne	
18.4		CE Current in Time Domain, Differential Mode
		Measure the DC current and the current ripple with an oscilloscope (BW $\ge$ 50 MHz).
		Measured Nominal DC current: I-DCnom = xxx mA
		I-DCnom $\leq$ 1 A $\rightarrow$ Max ripple: I-nom $\leq$ 60 mApp



19         CE Test on PACS-DPU-main         Power Lines		CE Test on PACS-DPU-main Power Lines
		The measurement shall be done on the the <b>PCDU/FPDPU_Nom_Pwrs SUP/RTN</b> lines.
19.1		NOISIEST Mode
	OP	If not already done, switch into NOISIEST mode according to chapter 7.1 "B3" and confirm the mode





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	OP	Give nominal DC current to EMC. The value shall be recorded into the test report.
		WM707565 PACSD_N_L41_I Nominal DC current: LDCnom = xxx mA
Date/Tim	9	OE Ourrent in Engrue neu Demain, Common Made
19.2		CE Current in Frequency Domain, Common Mode
		Measure the CM current from 30 Hz to 50 MHz.
		Plot 0xx: 30 Hz – 10 kHz, CM-NomMode, PACS-DPU-main -PWR
	Pass/	Plot 0xx: 1 MHz – 30 MHz, CM- NomMode, PACS-DPU -main -PWR
	Fail	Plot 0xx: 30 MHz – 50 MHz, CM- NomMode, PACS-DPU -main -PWR
	Ē	Comments/Limit exceedings if any
	ŤŐ	Photos:
		Remove the current probe.
Date/Tim	e	
19.3		<u>CE Current in Frequency Domain, Differential Mode</u>
		Measure the CM current from 30 Hz to 50 MHz.
		Plot 0xx: 30 Hz – 10 kHz, DM- NomMode, PACS-DPU -main -PWR
		Plot 0xx: 10 kHz – 1 MHz, DM- NomMode, PACS-DPO -main -PWR Plot 0xx: 1 MHz – 30 MHz, DM- NomMode, PACS-DPU -main -PWR
	Fail	Plot 0xx: 30 MHz – 50 MHz, DM- NomMode, PACS-DPU -main -PWR
		Comments/Limit exceedings if any
	6	Photos:
		Remove the current probe.
Date/Tim	Э	
19.4		<u>CE Current in Time Domain, Differential Mode</u>
		Measure the DC current and the current ripple with an oscilloscope (BW $\ge$ 50 MHz).
		Measured Nominal DC current: I-DCnom = xxx mA
	Pass/	I-DCnom $\leq$ 1 A $\rightarrow$ Max ripple: I-nom $\leq$ 60 mApp
	Fail	I-DCnom > 1 A $\rightarrow$ Max ripple: I-nom $\leq$ [60 mApp x sqr (I-DCnom)] = xxx
		Plot 0xx: Current ripple
		Measured current ripple: I-nom = xxx mApp, ≤/> I-max ?
	Ť	Photos:
		Remove the current probe.
Date/Tim	Э	
19.5		CE Voltage in Time Domain Differential Mode





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	Measure the differential time-/amplitude scaling	l voltage ripple with an oscillo	scope (BW	≥ 50 I	MHz) in a	dequate
	The expected voltage ri No limit exists.	ipple shall be compared to 2,	5 Vpp. This	test fo	or informa	tion only.
	Plot 0xx:					
For info only	Measured voltage ripple	e: u-amb = xxx Vpp (>/< 2,5 \	/)			
Ť	Photos:					
	Remove the oscilloscop	be connection from the test a	dapter.			
Date/Time						
19.6	CE Voltage in Time Do	main, Pwr-Return to Structure	2			
	Connect the differential line and the differential	voltage probe "+" input to the voltage probe "-" input to the	e PACS-DP satellite stru	U -ma ucture	in RETUF	RN power
	Measure the differential time-/amplitude scaling	l voltage ripple with an oscillo	escope (BW	≥ 50 I	MHz) in a	dequate
	"return": DB01-J05 pin 4 "satellite structure":tt	48//50 bd during test				
	Plot 0xx:					

	Measured voltage ripple: u-amb = xxx Vpp
76	Photos:
	Remove the oscilloscope connection from the test adapter.

20		CE Test on PACS-SPU-main Power Lines
	<u> </u>	The measurement shall be done on the the the PCDU/FPSPU1_ Pwrs SUP/RTN lines.
20.1 <u>NOIS</u>		NOISIEST Mode
	OP	If not already done, switch into NOISIEST mode according to chapter 7.1 "B3" and confirm the mode
	OP	Give nominal DC current to EMC. The value shall be recorded into the test report. WM506565 PacsS_N_L35_I Nominal DC current: I-DCnom = xxx mA
Date/Tim	е	
20.2		CE Current in Frequency Domain, Common Mode
		Measure the CM current from 30 Hz to 50 MHz.
	Pass/	Plot 0xx: 30 Hz – 10 kHz, CM-NomMode, PACS-SPU-main -PWR Plot 0xx: 10 kHz – 1 MHz, CM- NomMode, PACS-SPU -main -PWR Plot 0xx: 1 MHz – 30 MHz, CM- NomMode, PACS-SPU -main -PWR
	Fail	Plot 0xx: 30 MHz – 50 MHz, CM- NomMode, PACS-SPU -main -PWR





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	Comments/Limit exceedings if any			
6	Photos:			
	Remove the current probe.			
Date/Time				
20.2	CE Current in Erequency Domain, Differential Mode			
20.3				
	Measure the CM current from 30 Hz to 50 MHz.			
	Plot 0xx: 30 Hz – 10 kHz, DM- NomMode, PACS-SPU -main -PWR			
	Plot 0xx: 10 kHz – 1 MHz, DM- NomMode, PACS-SPU -main -PWR			
Pass/	Plot 0xx: 1 MHz – 30 MHz, DM- NomMode, PACS-SPU -main -PWR			
Fail	Plot 0xx: 30 MHz – 50 MHz, DM- NomMode, PACS-SPU -main -PWR			
	Comments/Limit exceedings if any			
	Photos:			
	Remove the current probe			
Date/Time				
20.4	CE Current in Time Domain, Differential Mode			
20.1				
	Measure the DC current and the current ripple with an oscilloscope (BW $\ge$ 50 MHz).			
	Measured Nominal DC current: I-DCnom = xxx mA			
Pass/	I-DCnom $\leq$ 1 A $\rightarrow$ Max ripple: I-nom $\leq$ 60 mApp			
Fail	I-DCnom > 1 A → Max ripple: I-nom ≤ [60 mApp x sqr (I-DCnom)] = xxx			
	Plot Uxx: Current ripple			
	Management simpley and the second second second second			
	Measured current ripple: I-nom = xxx mApp, ≤/> I-max ?			
	Photos:			
	Remove the current probe.			
Date/Time				
20.5	CE Voltage in Time Domain Differential Mode			
	Measure the differential voltage ripple with an oscilloscope ( $RW > 50 MHz$ ) in adequate			
	time-/amplitude scaling.			
	The expected voltage ripple shall be compared to 2.5 V/nn. This test for information only			
	No limit exists			
	Plot 0xx:			
For info only	Measured voltage ripple: u-amb = xxx Vpp (>/< 2,5 V)			
5	Photos:			
	Demosive the enables composition from the tast a demos			
	Remove the oscilloscope connection from the test adapter.			





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20.6	CE Voltage in Time Domain, Pwr-Return to Structure
	Connect the differential voltage probe "+" input to the PACS-SPU -main RETURN power line and the differential voltage probe "-" input to the satellite structure.
	Measure the differential voltage ripple with an oscilloscope (BW $\ge$ 50 MHz) in adequate time-/amplitude scaling.
	"return": DB01-J05 pin 2//4 "satellite structure":tbd during test
	Plot 0xx:
	Measured voltage ripple: u-amb = xxx Vpp
ŤŐ	Photos:
	Remove the oscilloscope connection from the test adapter.

21		CE Test on PACS-BOLC-main Power Lines
		The measurement shall be done on the the the PCDU/FPBOLC_Pwrs SUP/RTN lines.
21.1		NOISIEST Mode
	OP	If not already done, switch into NOISIEST mode according to chapter 7.1 "B3" and confirm the mode
	OP	Give nominal DC current to EMC. The value shall be recorded into the test report.
		WM809565 PacsB_N_L27_I Nominal DC current: I-DCnom = xxx mA
Dat	te/Time	
21.2		CE Current in Frequency Domain, Common Mode
		Measure the CM current from 30 Hz to 50 MHz.
		Plot 0xx: 30 Hz – 10 kHz, CM-NomMode, PACS-BOLC -main -PWR
		Plot 0xx: 10 kHz – 1 MHz, CM- NomMode, PACS-BOLC -main -PWR
	Pass/ Fail	Plot 0xx: 1 MHz – 30 MHz, CM- NomMode, PACS-BOLC -main -PWR Plot 0xx: 30 MHz – 50 MHz, CM- NomMode, PACS-BOLC -main -PWR
		Comments/Limit exceedings if any
	1	Photos:
		Remove the current probe.
Date/Tim	е	
21.3		CE Current in Frequency Domain, Differential Mode
		Measure the CM current from 30 Hz to 50 MHz.
		Plot 0xx: 30 Hz – 10 kHz, DM- NomMode, PACS-BOLC -main -PWR
		Plot 0xx: 10 kHz – 1 MHz, DM- NomMode, PACS-BOLC -main -PWR
	Pass/ Fail	Plot 0xx: 1 MHz – 30 MHz, DM- NomMode, PACS-BOLC -main -PWR Plot 0xx: 30 MHz – 50 MHz, DM- NomMode, PACS-BOLC -main -PWR





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	Comments/Limit exceedings if any
	Photos:
	Remove the current probe.
Data/Tima	
	CE Current in Time Domain, Differential Mode
21.4	
	Measure the DC current and the current ripple with an oscilloscope (BW $\ge$ 50 MHz).
	Measured Nominal DC current: I-DCnom = xxx mA
Pass/ Fail	I-DCnom ≤ 1 A → Max ripple: I-nom ≤ 60 mApp I-DCnom > 1 A → Max ripple: I-nom ≤ [60 mApp x sqr (I-DCnom)] = xxx
	Plot 0xx: Current ripple
	Measured current ripple: I-nom = xxx mApp, ≤/> I-max ?
5	Photos:
	Remove the current probe.
Data/Tima	
21 5	CE Voltage in Time Domain Differential Mode
21.5	
	Measure the differential voltage ripple with an oscilloscope (BW $\ge$ 50 MHz) in adequate time-/amplitude scaling.
	The expected voltage ripple shall be compared to 2,5 Vpp. This test for information only. No limit exists.
	Plot 0xx:
For info only	Measured voltage ripple: u-amb = xxx Vpp (>/< 2,5 V)
6	Photos:
	Remove the oscilloscope connection from the test adapter.
Date/Time	
21.6	CE Voltage in Time Domain, Pwr-Return to Structure
	Connect the differential voltage probe "+" input to the PACS-BOLC-main RETURN power line and the differential voltage probe "-" input to the satellite structure.
	Measure the differential voltage ripple with an oscilloscope (BW $\ge$ 50 MHz) in adequate time-/amplitude scaling.
	"return": DB01-J06 pin 14//18 "satellite structure":tbd during test
	Plot 0xx:





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	Measured voltage ripple: u-amb = xxx Vpp
5	Photos:
	Remove the oscilloscope connection from the test adapter.

22		CE Test on <u>PACS-MEC-main</u> Power Lines
		The measurement shall be done on the the the PCDU/FPMEC1_ Pwrs SUP/RTN lines.
22.1	2.1 NOISIEST Mode	
OP		If not already done, switch into NOISIEST mode according to chapter 7.1 "B3" and confirm the mode
	OP	Give nominal DC current to EMC. The value shall be recorded into the test report.
		WM510565 PacsMec1_L65_I Nominal DC current: I-DCnom = xxx mA
Dat	te/Time	
22.2		CE Current in Frequency Domain, Common Mode
		Measure the CM current from 30 Hz to 50 MHz.
		Plot 0xx: 30 Hz – 10 kHz, CM-NomMode, PACS- MEC -main -PWR
		Plot 0xx: 10 kHz – 1 MHz, CM- NomMode, PACS- MEC -main -PWR
	Pass/	Plot 0xx: 1 MHz – 30 MHz, CM- NomMode, PACS- MEC -main -PWR
	Fail	Plot 0xx: 30 MHz – 50 MHz, CM- NomMode, PACS- MEC -main -PWR
		Comments/Limit exceedings if any
	Ť	Photos:
		Remove the current probe.
Date/Tim	е	
22.3		CE Current in Frequency Domain, Differential Mode
		Measure the CM current from 30 Hz to 50 MHz.
		Plot 0xx: 30 Hz – 10 kHz, DM- NomMode, PACS- MEC -main -PWR
		Plot 0xx: 10 kHz – 1 MHz, DM- NomMode, PACS- MEC -main -PWR
	Pass/	Plot 0xx: 1 MHz – 30 MHz, DM- NomMode, PACS- MEC -main -PWR
	Fail	Plot 0xx: 30 MHz – 50 MHz, DM- NomMode, PACS- MEC -main -PWR
	Ð	Comments/Limit exceedings if any
	76	Photos:
	-	Remove the current probe.
Date/Tim	е	
22.4		CE Current in Time Domain, Differential Mode
		Measure the DC current and the current ripple with an oscilloscope (BW $\ge$ 50 MHz).

7							
EADS					<b>E</b> M	V und M	esstechnik
TASEL	Titel:	EMC Test Proce	edure		-		
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	Measured Nominal D	C current: I-DCnom	= xxx mA				
Pass/ Fail	I-DCnom ≤ 1 A → Ma I-DCnom > 1 A → Ma	x ripple: I-nom ≤ 60 m x ripple: I-nom ≤ [60 n	App nApp x sqr	· (I-DCnom	)] = xx	x	
	Plot 0xx: Current ripp	e					
	Measured current ripp	ble: I-nom = x	xx mApp, :	≤/> I-max î	?		
Ĩ	Photos:						
	Remove the current p	robe.					
Date/Time							
22.5	CE Voltage in Time D	omain Differential Mo	<u>de</u>				
	Measure the different time-/amplitude scalir	ial voltage ripple with a	an oscillos	cope (BW	≥ 50 N	1Hz) in ac	Jequate
	The expected voltage No limit exists.	ripple shall be compa	ared to 2,5	Vpp. This	test fo	r informat	ion only.
	Plot 0xx:						
For info only	Measured voltage rip	ole: u-amb = xxx Vpp	(>/< 2,5 V)				
ŤŐ	Photos:						
	Remove the oscillosc	ope connection from t	he test ada	apter.			
Date/Time							
22.6	CE Voltage in Time D	omain, Pwr-Return to	Structure				
	Connect the differenti line and the differentiation	al voltage probe "+" in al voltage probe "-" inp	put to the out to the s	PACS-ME atellite stru	C-maii ucture.	n RETUR	N power
	Measure the different time-/amplitude scalir	ial voltage ripple with a	an oscillos	cope (BW	≥ 50 N	1Hz) in ac	lequate
	"return": DB01-J06 pir "satellite structure":	n 14//18 .tbd during test…					
	Plot 0xx:						
	Measured voltage rip	ole: u-amb = xxx Vpp					
5	Photos:						
	Remove the oscillosc	ope connection from t	he test ada	apter.			
23	CE Test on <u>CCU-ma</u>	in Power Lines					
· · · · ·	The measurement of	all be done on the the	the DCDU		Dure		Llinge

	The measurement shall be done on the the the PCDU/CCU_A_Pwrs SUP/RTN lines.
23.1	NOISIEST Mode





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	OP	It not already done, switch into NOISIEST mode according to chapter 7.1 "B3" and confirm the mode
	OP	Give nominal DC current to EMC. The value shall be recorded into the test report.
		WM106565 Ccu_A_L37_I
Date/T	ime	
23.2		CE Current in Frequency Domain, Common Mode
		Measure the CM current from 30 Hz to 50 MHz.
		Plot 0xx: 30 Hz – 10 kHz, CM-NomMode, CCU-main -PWR
		Plot 0xx: 10 kHz – 1 MHz, CM- NomMode, CCU -main -PWR
	Pass/	Plot 0xx: 1 MHz – 30 MHz, CM- NomMode, CCU -main -PWR
	Fail	
	ED	Comments/Limit exceedings if any
	76	Photos:
		Remove the current probe.
D = ( = /T	••	
Date/ I	Ime	CE Current in Frequency Domain, Differential Mode
20.0		<u>CE current in requency bomain, binerentiar mode</u>
		Measure the CM current from 30 Hz to 50 MHz.
		Plot 0xx: 30 Hz – 10 kHz, DM- NomMode, CCU -main -PWR
		Plot 0xx: 10 kHz – 1 MHz, DM- NomMode, CCU -main -PWR
	Fass/	Plot 0xx: 30 MHz – 50 MHz, DM- NomMode, CCU -main -PWR
	B	Comments/Limit exceedings if any
		Photos:
	10	
		Remove the current probe.
Date/T	ime	
23.4		CE Current in Time Domain, Differential Mode
		Measure the DC surrent and the surrent ripple with an assillance $(P M  > 50$ MHz)
		measure the DC current and the current hpple with an oscilloscope ( $BW \ge 50$ MHz).
		Measured Nominal DC current: I-DCnom = xxx mA
		$ $ DCnom < 1 A $\rightarrow$ Max ripple:   nom < 60 mAnn
	Pass/	$ -DCnom > 1 A \rightarrow Max ripple:  -nom ≤ 160 mApp x sgr ( -DCnom)] = xxx$
	i an	
		Plot 0xx: Current ripple
		Measured current ripple: I-nom = xxx mApp, ≤/> I-max ?
	-	Photos:
		Remove the current probe.
Date/T	ime	





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23.5	CE Voltage in Time Do	main Differential Mode				
	Measure the differential time-/amplitude scaling	l voltage ripple with an oscillos	scope (BW	≥ 50 N	/Hz) in ac	lequate
	The expected voltage ri No limit exists.	pple shall be compared to 2,5	5 Vpp. This	test fo	r informat	ion only.
	Plot 0xx:					
For info only	Measured voltage ripple	e: u-amb = xxx Vpp (>/< 2,5 V	)			
Ť	Photos:					
	Remove the oscilloscop	be connection from the test ad	lapter.			
Date/Time						
23.6	CE Voltage in Time Do	main, Pwr-Return to Structure	<u>!</u>			
	Connect the differential the differential voltage p	voltage probe "+" input to the probe "-" input to the satellite s	CCU-main structure.	RETU	JRN powe	er line and
	Measure the differential time-/amplitude scaling	l voltage ripple with an oscillo:	scope (BW	≥ 50 N	/Hz) in ac	lequate
	"return": DB01-J01 pin "satellite structure":tt	19 od during test…				
	Plot 0xx:					
	Measured voltage ripple	e: u-amb = xxx Vpp				
ŤŐ	Photos:					
	Remove the oscilloscop	be connection from the test ad	lapter.			
	1					

24		CE Test on <u>TWTA-EPC1</u> Power Lines		
		The measurement shall be done on the the the PCDU/EPC1_Pwrs SUP/RTN lines.		
24.1		NOISIEST Mode		
	OP	If not already done, switch into NOISIEST mode according to chapter 7.1 "B4" and confirm the mode		
	OP	Give nominal DC current to EMC. The value shall be recorded into the test report.		
		WM210565 Twta_1_L49_I Nominal DC current: I-DCnom = xxx mA		
Date/Tim	е			
24.2		CE Current in Frequency Domain, Common Mode		
		Measure the CM current from 30 Hz to 50 MHz.		
		Plot 0xx: 30 Hz – 10 kHz, CM-NomMode, TWTA-EPC1-main -PWR		
		Plot 0xx: 10 kHz – 1 MHz, CM- NomMode, TWTA-EPC1-main -PWR		
		Plot 0xx: 1 MHz – 30 MHz, CM- NomMode, TWTA-EPC1-main -PWR		



EMV und Messtechnik

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Plot 0xx: 30 MHz - 50 MHz, CM- NomMode, TWTA-EPC1-main -PWR Pass/ Fail Comments/Limit exceedings if any Þ Photos: -8 Remove the current probe. Date/Time 24.3 CE Current in Frequency Domain, Differential Mode Measure the CM current from 30 Hz to 50 MHz. Plot 0xx: 30 Hz – 10 kHz. DM- NomMode. TWTA-EPC1-main -PWR Plot 0xx: 10 kHz – 1 MHz, DM- NomMode, TWTA-EPC1-main -PWR Plot 0xx: 1 MHz - 30 MHz, DM- NomMode, TWTA-EPC1-main -PWR Pass/ Plot 0xx: 30 MHz - 50 MHz, DM- NomMode, TWTA-EPC1-main -PWR Fail Comments/Limit exceedings if any B Photos: Ħ Remove the current probe. Date/Time 24.4 CE Current in Time Domain, Differential Mode Measure the DC current and the current ripple with an oscilloscope (BW ≥ 50 MHz). Measured Nominal DC current: I-DCnom = xxx mA  $\sim$ I-DCnom  $\leq$  1 A  $\rightarrow$  Max ripple: I-nom  $\leq$  60 mApp Pass/ I-DCnom > 1 A  $\rightarrow$  Max ripple: I-nom  $\leq$  [60 mApp x sqr (I-DCnom)] = xxx Fail Plot 0xx: Current ripple Measured current ripple: I-nom = xxx mApp,  $\leq >$  I-max ? Photos: 7Ê Remove the current probe. Date/Time 24.5 CE Voltage in Time Domain Differential Mode Measure the differential voltage ripple with an oscilloscope (BW ≥ 50 MHz) in adequate time-/amplitude scaling. The expected voltage ripple shall be compared to 2,5 Vpp. This test for information only. No limit exists. Plot 0xx:  $\sim$ Measured voltage ripple: u-amb = xxx Vpp (>/< 2.5 V)For info only Photos: 76





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	Remove the oscilloscope connection from the test adapter.
Date/Time	
24.6	CE Voltage in Time Domain, Pwr-Return to Structure
	Connect the differential voltage probe "+" input to the TWTA-EPC1-main RETURN power line and the differential voltage probe "-" input to the satellite structure.
	Measure the differential voltage ripple with an oscilloscope (BW $\ge$ 50 MHz) in adequate time-/amplitude scaling.
	"return": DB01-J02 pin 23/25 "satellite structure":tbd during test
	Plot 0xx:
	Measured voltage ripple: u-amb = xxx vpp
Ť	Photos:
	Remove the oscilloscope connection from the test adapter.

25		CE Test on <u>STR1</u> Power Lines			
		The measurement shall be done on the the the PCDU/STR1_Pwr SUP/RTN lines.			
25.1		VOISIEST Mode			
	OP	If not already done, switch into NOISIEST mode according to chapter 7.1 "B4" and confirm the mode			
	OP	Give nominal DC current to EMC. The value shall be recorded into the test report.			
		WMA08565 STR_1_L21_I Nominal DC current: I-DCnom = xxx mA			
Date/Tim	e				
25.2		CE Current in Frequency Domain, Common Mode			
		Measure the CM current from 30 Hz to 50 MHz.			
		Plot 0xx: 30 Hz – 10 kHz, CM-NomMode, STR1-main -PWR			
	$\mathbf{M}$	Plot 0xx: 10 kHz – 1 MHz, CM- NomMode, STR1-main -PWR			
	Pass/	Plot 0xx: 1 MHz – 30 MHz, CM- NomMode, STR1-main -PWR			
	Fail	Plot 0xx: 30 MHz – 50 MHz, CM- NomMode, STR1-main -PWR			
		Comments/Limit exceedings if any			
		Photos:			
		Remove the current probe.			
Date/Tim	е				
25.3		CE Current in Frequency Domain, Differential Mode			
'		Measure the CM current from 30 Hz to 50 MHz.			
		Plot 0xx: 30 Hz – 10 kHz, DM- NomMode, STR1-main -PWR			
	$\sim$	Plot 0xx: 10 kHz – 1 MHz, DM- NomMode, STR1-main -PWR			



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	Pass/ Fail	Plot 0xx: 1 MHz – 30 M Plot 0xx: 30 MHz – 50	IHz, DM- NomMode, STR1-ma MHz, DM- NomMode, STR1-m	ain -PWR nain -PWR			
		Comments/Limit excee	dings if any				
	Ť	Photos:					
		Remove the current pro	obe.				
Date/	Time						
25.4		CE Current in Time Do	main, Differential Mode				
		Measure the DC currer	nt and the current ripple with a	n oscillosco	pe (BV	V ≥ 50 M	Hz).
		Measured Nominal DC	current: I-DCnom = xxx mA				
	Pass/ Fail	I-DCnom ≤ 1 A $\rightarrow$ Max I-DCnom > 1 A $\rightarrow$ Max	ripple: I-nom $\leq$ 60 mApp ripple: I-nom $\leq$ [60 mApp x sq	r (I-DCnom	)] = xxx	(	
		Plot 0xx: Current ripple					
		Measured current ripple	e: I-nom = xxx mApp,	≤/> I-max ?	)		
	ŦŐ	Photos:					
		Remove the current pro	obe.				
Date/	Time						
25.5		CE Voltage in Time Do	main Differential Mode				
		Measure the differentia time-/amplitude scaling	I voltage ripple with an oscillos I.	scope (BW	≥ 50 M	Hz) in ac	lequate
		The expected voltage r No limit exists.	ipple shall be compared to 2,5	Vpp. This	test for	informat	ion only.
		Plot 0xx:					
Fo	r info only	Measured voltage rippl	e: u-amb = xxx Vpp (>/< 2,5 V	)			
	6	Photos:					
		Remove the oscilloscop	pe connection from the test ad	apter.			
Date/	Time						
25.6		CE Voltage in Time Do	main, Pwr-Return to Structure				
		Connect the differential the differential voltage	l voltage probe "+" input to the probe "-" input to the satellite s	STR1-maii structure.	n RETU	JRN pow	er line and
		Measure the differentia time-/amplitude scaling	l voltage ripple with an oscillos	scope (BW	≥ 50 M	Hz) in ac	lequate
		"return": DB01-J06 pin "satellite structure":t	28 bd during test…				





### 8.7 Tests on Satellite Ground Line

Test Step No., Executant		Description/Comments
26		Test on Satellite Ground Line: This test is deleted!





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#### **Conducted Emission Tests on Signal Lines** 8.8

Test Step No., Executant		Description/Comments				
		CE TEST ON SIGNAL LINES				
In Th de rej		In additional see paragraph 5 "Test Requirements". The power lines under test accessability and the current-/voltage probe arrangements are described in the previouse chapter for "Reference/Ambient- measurements" and will not be repeated here!				
		Before starting an EMC test:				
		Ckeck that all the EMC adapter connectors are mechanically secured against dis- connecting by accident or stress!				
		Pay special attention and take precautions when clamping and unclamping the measurement transducers (e.g. voltage- and current probes) to and from the EMC adapter wires. Wires may breake under stress.				
		Note that the signal lines are shielded and the shield is rooted via the connector shells. So, when installing the EMC adapters and later performing the measurements, take care and measures that the shielding path is conductively not interrupted!				
27		CE Test on <u>TC</u> Signal Lines (RWL1)				
		The measurement shall be done on the <b>Torque_Cmd SUP/RET</b> lines.				
27.1		NOISIEST Mode				
	OP	If not already done, switch into NOISIEST mode according to chapter 7.1 "B4" and confirm the mode				
	OP	Command TC to: 500 acdcording to sect.7.1, B6				
		Command TDC to: Clockwise				
		Remark: The plots have to be recorded in less than 15 min. If not B6 has to be started				
		again. Record and check setup information and give values to the EMC team				
Date/Tim	e					
27.2		CE Current in Frequency Domain, Common Mode				
		Measure the current from 30 Hz to 50 MHz and compare the results with the limit of 77				
		dBµA.				
		Plot 0xx: 30 Hz – 10 kHz, CM-NomMode, TC-signal				
		Plot 0xx: 10 kHz – 1 MHz, CM- NomMode, TC-signal				
Pass/ Fail		Plot 0xx: 1 MHz – 30 MHz, CM- NomMode, TC-signal Plot 0xx: 30 MHz – 50 MHz, CM- NomMode, TC-signal				
		Comments/Limit exceedings if any				
	<b>~</b> 83	Photos:				
	.0					
		Remove the current probe.				





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Test Step No., Executant		Description/Comments				
Dete/Time						
Date/Time		CE Voltage in Time Domain Differential Mode				
21.5						
		Measure the voltage ripple with an oscilloscope (BW $\ge$ 50 MHz). The voltage ripple shall be compared to 300 mVpp. This test is <i>for information only</i> be- cause no requirement limit exists.				
		Plot 0xx:				
For in	fo only	Measured voltage ripple: u-amb = xxx mVpp (>/< 300 mVpp)				
	Ť	Photos:				
		Remove the oscilloscope connection from the test adapter.				
28		CE Test on <u>TDC</u> Signal Lines (RWL1)				
		The measurement shall be done on the <b>Torque_Direction_Cmd SUP/RET</b> lines.				
28.1		NOISIEST Mode				
	OP	If not already done, switch into NOISIEST mode according to chapter 7.1 "B4" and confirm the mode.				
	OP	Command TC to: 500 acdcording to sect.7.1, B6				
		Remark: The plots have to be recorded in less than 15 min. If not B6 has to be started again. Record and check setup information and give values to the EMC team.				
Date/Time	е					
28.2		CE Current in Frequency Domain, Common Mode				
		Measure the current from 30 Hz to 50 MHz and compare the results with the limit of 77 dB $\mu$ A.				
		Plot 0xx: 30 Hz – 10 kHz, CM-ambient, TDC-signal				
	<u></u> ,	Plot 0xx: 10 kHz – 1 MHz, CM-ambient, IDC -signal				
	Pass/ Fail	Plot 0xx: 1 MHz – 30 MHz, CM-ambient, TDC -signal Plot 0xx: 30 MHz – 50 MHz, CM-ambient, TDC -signal				
		Comments/Limit exceedings if any				
	Ť	Photos:				
		Remove the current probe.				
Date/Time						
28.3		CE Voltage in Time Domain Differential Mode				
		Measure the voltage ripple with an oscilloscope (BW $\ge$ 50 MHz). The voltage ripple shall be compared to 300 mVpp. This test is <i>for information only</i> be- cause no requirement limit exists.				
		Plot 0xx:				





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Test Step No., Executant	Description/Comments
For info only	Measured voltage ripple: u-amb = xxx mVpp (>/< 300 mVpp)
Ť	Photos:
	Remove the oscilloscope connection from the test adapter.

29		CE Test on <u>ACC/1553</u> Signal Lines (MILBUS)				
I		The measurement shall be done on the MILBUS lines				
		The signal lines are accessible via the test adapter ACC-J23 (Figure 6-10).				
		"MIL1553_A_Nom": ACC-J23 pin 1 "MIL4553_Hand And And And And And And And And And A				
		MIL 1553Rtn_A_NOM : ACC-J23 pin 11				
Date/Time	•					
29.1		NOISIEST Mode				
	OP	If not already done switch into NOISIEST mode according to chapter 7.1 "B4" and confirm				
		the mode.				
OP		Verify that MILBUS is active.				
		Record and check setup information and give values to the EMC team.				
Date/Time						
29.2		<u>CE Voltage in Time Domain Differential Mode</u>				
		Set the veltage probe on the MILPLIS signal lines in accordance to the DM veltage set up				
		and measure the voltage ripple with an oscilloscope ( $BW > 50 \text{ MHz}$ )				
		Plot 0xx:				
	Info	Measured voltage ripple: u-amb = xxx Vpp				
		Photos:				
		Remove the oscilloscope connection from the test adapter.				





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#### **Conducted Susceptibility Tests on Signal Lines** 8.9

Test Step No.,		Description/Comments				
Executar	nt					
		<b>CS TEST ON SIGNAL LINES</b> In additional see paragraph 5.6: "CS Voltage on Signal Lines (optional)", paragraph 6.1.2: "Signal line Test Adapter" and paragraph 6.3: "Arrangements for Signal Lines".				
		Before starting an EMC test:				
		Ckeck that all the EMC adapter connectors are mechanically secured against dis- connecting by accident or stress!				
		Pay special attention and take precautions when clamping and unclamping the measurement transducers (e.g. voltage- and current probes) to and from the EMC adapter wires. Wires may breake under stress.				
		Note that the signal lines are shielded and the shield is rooted via the connector shells. So, when installing the EMC adapters and later performing the measurements, take care and measures that the shielding path is conductively not interrupted!				
30		CS Test on <u>TC</u> Signal Lines (RWL1)				
30.1		SENSITIVE Mode				
	OP	If not already done, switch into SENSITIVE mode according to chapter 7.1 "C" and confirm the mode				
Date/Tim	e					
30.2	OP/	Arrangement of the test equipment:				
	EMC	1) Arrange the test adapter according paragraph 6.3: "Arrangements for Signal Lines" and the test equipment according to Figure 5-5: TC Test Adapter arrangement for CS, DB02 level" and Figure 5-6: TDC Test Adapter arrangement for CS, DB02 level".				
		2) I-AC injection and -monitoring on "Motor-Current-Monitor-Return" (MCM/TC_RET (32).): Fix current injection and -monitoring devices to MCM/TC_RET (32). Monitor the injected current with a spectrum analyser.				
		3) Voltage "Torque-Command-Return to Structure": The voltage between TC-RET (32) and Structure (connector shell) shall be measured with a differential voltage probe and an oscilloscope.				
		4) Voltage "Torque-Command" (TC+ (16) to TC-RET (32)): This TC command (500) shall be set by Sattelite/EGSE operational responsibilities.				
		5) Voltage "Torque-Direction-Command" (MCM/TC_RET (32) to TDC + (17)): The TDC command (CLOCKWISE) shall be set by Sattelite/EGSE operational responsibili- ties.				
		6) Voltage "Motor-Current-Monitor" (MCM (12) to MCM-RET (32)): This voltage (0,5105 V) shall be recorded and checked prior and during test by Sat- telite/EGSE operational responsibilities.				





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Test Step No., Executant		Description/Comments				
20.2		Cature Canditions for TO/TDO Cignal lines				
30.3	OP	Setup Conditions for TC/TDC Signal lines				
		The TC command shall be set to " <b>500</b> " leading to a read out TLM (MCM) close to 0.5105V.				
		The TDC command shall be set to: Clockwise direction				
		Record and check status information and give values to the EMC team.				
		Actual TLM values:				
		1) Command TC to: 500 acdcording to sect.7.1, B6 2) Command TDC to: Clockwise				
		Remark: The plots / measurements have to be recorded in less than 15 min. If not B6 has to be started again.				
		3) Mot Cur. TLM "MCM to MCM-RET: "" (shall be 0,5105 V)				
		Actual TLM values:				
		1) I-inj = 0 mArms 2) TC-RET (7) to Structure (connector shell) = xxx mVpp				
		Osci Plot DXXX:				
		<ul> <li>a) Torque-Command" (TC+ (16) to TC-RET (32)) = xxx V</li> <li>b) Motor-Current-Monitor" (MCM (12) to MCM-RET (32)) = xxx V</li> </ul>				
30.4		CS testing:				
		1) Adjust CS test frequency. Set the test voltage Voltage "Torque-Command-Return to Structure" to <b>2 Vpp</b> by slowly increasing the induced current I-AC.				
2) At the same time monitor the injected curre injected current shall not exceed <b>100 mApp (</b> cannot be reached! The 100 mApp limit applies only for the injecte signal parts of the emission spectrum are not		2) At the same time monitor the injected current with a spectrum analyser. In any case the injected current shall not exceed <b>100 mApp (91 dBµA)</b> even if the 2 Vpp test voltage				
		The 100 mApp limit applies only for the injected spectral frequency; amplitudes of other signal parts of the emission spectrum are not relevant.				
		3) Give test status information to the Sattelite/EGSE operational responsibilities.				
30.5	OP/ EMC	Susceptibility evaluation:				
		- The RWL shall not exhibit any failures malfunctions or unintended responses when sub- mitted to the injected signals.				
		- The motor current TLM shall keep inside the range +/-12.5 mV around the value without noise injection when submitted to the injected signals.				
		4) Failure status and MCM voltage shall be monitored prior and during test by Sat- telite/EGSE operational responsibilities.				
		5) Give susceptibility status information to the EMC test team.				
		Susceptibility evaluation:				
		- The motor current TLM (MCM (12) to MCM-RET (32)) shall keep inside the range +/-12.5 mV around the value without noise injection when submitted to the injected signals.				
		6) The motor current (MCM) voltage shall be monitored prior and during test with a DMM				





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Test Step No., Executant		Description/Comments				
		by the EMC team.				
		7) Fill in the table <b>Fehler! Verweisquelle konnte nicht gefunden werden.</b> below for each tested frequency and check the susceptibility criteria.				
		8) If susceptibility can be detected, reduce the induced voltage level to find the threshold value of susceptibility.				
		9) If no susceptibility can be detected, go on testing with the next frequency.				
		Plot 0xx:				
		Photos:				

Time	f [kHz]	l-inj [dBμA]	Voltage "TC-RET to STRUC- TURE" [Vpp]	"TC to TC- RET" [V]	Mot Cur. TLM "MCM to MCM- RET" [V]	Observations /Comments
	0	91 dBµA	2 Vpp max	Xxxx V	Xxxx V	
		max		nom	nom	
	50					
	100					
	200					
	400					
	600					
	800					
	1000					
	2000					
	3000					
	4000					
	5000					
	6000					
	7000					
	8000					
	9000					
	10000					
	12500					
	15000					
	17500					
	20000					
	25000					
	30000					
	35000					
	40000					
	45000					
	47500					
	48500					
	50000					

Table 8-1: Frequency Table for CS Injection on TC Line


E

**EMC Test Procedure** 



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,	Description/Comments					
	CS Test on <u>TDC</u> Signal Lines (RWL1)					
OP	SENSITIVE Mode If not already done, switch into SENSITIVE mode according to chapter 7.1 "C" and confirm the mode					
OP/ EMC	Arrangement of the test equipment:					
	1) Arrange the test equipment according to Figure 5-6: TDC Test Adapter arrangement for CS, DB02 level".					
	2) I-AC injection and -monitoring on "Motor-Current-Monitor-Return" and "Torque Direction Command" (MCM/TC_RET (32) and TDC+ (17)):					
	tor the injected current with an oscilloscope.					
	3) I-ac monitoring of "Torque Direction Comman" (TDC+ (17)): Fix current monitoring devices to TDC+ (17). Monitor the injected current with a frequency analyser.					
	4) Voltage "Torque-Command-Return to Structure": The voltage between TC-RET (32) and Structure (connector shell) shall be measured with a differential voltage probe and an oscilloscope.					
	5) Voltage "Torque-Direction-Command" (TDC+ (17) to TC-RET (32)): The TDC command CLOCKWISE shall be given by Sattelite/EGSE operational responsi- bilities.					
	6) Voltage "Torque-Command" (TC+ ): The TC command (500) shall be given by the SATELLITE/EGSEoperational responsibili- ties.					
	7) Voltage "Motor-Current-Monitor" (MCM (12) to MCM-RET (32)): This voltage (0,50105V) shall be recorded and checked prior and during test by SATEL- LITE/EGSEoperational responsibilities.					
OP/	Setup Conditions for TC/TDC Signal lines					
EMC	The TC command shall be set to "500" leading to a read out TLM (MCM) close to 0.5105V.					
	The TDC command shall be set to: CLOCKWISE direction					
	Record and check status information and give values to the EMC team.					
	Actual TLM values:					
	1) Command TC to: 500 acdcording to sect.7.1, B6 2) Command TDC to: Clockwise					
	Remark: The plots / measurements have to be recorded in less than 15 min. If not B6 has to be started again. 3) Mot Cur. TLM "MCM to MCM-RET: "…" (shall be 0,5105 V)					



**EMC Test Procedure** 



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Test Step No.,		Description/Comments						
Executar	nt	A stud TI Musluss						
		Actual ILM values:						
		1) I-INJ = 0 mArms 2) TO DET (20) to Otherstein (comparison of all) compared (comparison) (comparison)						
		2) IC-REI (32) to Structure (connector shell) = $xxx mVpp$						
		Osci Plot DXXX:						
		3) Torque-Command" (TC+ (16) to TC-RET (32)) = xxx V						
		4) Motor-Current-Monitor" (MCM (12) to MCM-RET (32)) = xxx V						
31.4		<u>CS testing:</u>						
		1) Adjust CS test frequency. Set the test voltage Voltage "Torque-Command-Return to Structure" to <b>2 Vpp</b> by slowly increasing the induced current I-AC.						
		2) At the same time monitor the injected current on <u>both</u> , the MCM-RET line <u>and</u> TDC+ line with an oscilloscope. To avoid overtesting the injected current shall not exceed <b>tbd</b> mApp ( <b>tbd</b> dB $\mu$ A) even if the 2 Vpp test voltage cannot be reached! The <b>tbd</b> mApp limit applies only for the injected frequency.						
		3) At the same time monitor the current on the TDC+ line <u>alone</u> with a spectrum analyser. In any case the current shall not exceed <b>100 mApp (91 dBμA)</b> even if the 2 Vpp test volt- age cannot be reached! The 100 mApp limit applies only for the injected spectral frequency; amplitudes of other						
		signal parts of the emission spectrum are not relevant.						
		4) Give test status information to the SATELLITE/EGSEoperational responsibilities.						
31.5	OP	Susceptibility evaluation:						
		<ul> <li>The RWL shall not exhibit any failures malfunctions or unintended responses when submitted to the injected signals.</li> <li>The motor current TLM shall keep inside the range +/-12.5 mV around the value without noise injection when submitted to the injected signals.</li> </ul>						
		5) Failure status and MCM voltage shall be monitored prior and during test by SATEL- LITE/EGSEoperational responsibilities.						
		6) Give susceptibility status information to the EMC test team.						
		Susceptibility evaluation:						
		- The motor current TLM (MCM (12) to MCM-RET (32)) shall keep inside the range +/-12.5 mV around the value without noise injection when submitted to the injected signals.						
		7) The motor current (MCM) voltage shall be monitored prior and during test with a DMM be the EMC team.						
		8) Fill in the table <b>Fehler! Verweisquelle konnte nicht gefunden werden.</b> below for each tested frequency and check the susceptibility criteria.						
		9) If susceptibility can be detected, reduce the induced voltage level to find the threshold value of susceptibility.						
		10) If no susceptibility can be detected, go on testing with the next frequency.						
		Plot 0xx:						



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Test Step No., Executant	Description/Comments
ŤŐ	Photos:

Time	f [kHz]	I-inj, TC-RET <u>and</u> TDC+ [App]	I-TDC+, [dBμA]	Voltage "TC-RET to STRUC- TURE" [Vpp]	"TDC to TC-RET" [V]	Mot Cur. TLM "MCM to MCM- RET" [V]	Observati- ons/Comments
	0	ххх Арр	91 dBµA	2 Vpp max	Xxxx V	Xxxx V	
	= 0	max	max		nom	nom	
	50						
	100						
	200						
	400						
	600						
	800						
	2000						
	2000						
	4000						
	5000						
	6000						
	7000						
	8000						
	9000						
	10000						
	12500						
	15000						
	17500						
	20000						
	25000						
	30000						
	35000						
	40000						
	45000						
	47500						
	48500						
	50000				<u> </u>		<u> </u>

Table 8-2: Frequency Table for CS Injection on TDC Line



# 8.10 De-Installation of Test Adapters from Power- and Signal Lines

Test Step No/ Info		Description/Comments				
32		DE-INSTALL TEST ADAPTER ON POWER- AND SIGNAL LINES LINES				
		Use information of paragraph Fehler! Verweisquelle konnte nicht gefunden werden.: "Fehler! Verweisquelle konnte nicht gefunden werden." for deinstallation.				



**EMC Test Procedure** 



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### 9 SUMMARY SHEETS

#### 9.1 **Procedure Variation Summary**

		٦	Fest Change	Curr. No.: Date:	
				Page 1	of 1
Test designation			Test Procedure	Issue	Rev.
Herschel PFM EMC	CE Test			1, dated	
Prepared by:		Resp. Test Leader		Project Engineer	
Clemens Kalde					
PA/QA		Prime		Customer	

## Table 9-1: Procedure Variation Sheet

### 9.2 Non Conformance Report (NCR) Summary

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

## Table 9-2: Non- Conformance Record Sheet

#### 9.3 Sign-off Sheet

	Date	Signature
Test Manager		
Operator		
PA Responsible		
ESA Representative		



END OF DOCUMENT







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	Name	Dep./Comp.		Name	Dep./Comp.
	Alberti von Mathias Dr.	ASG23		Schmidt Thomas	AED15
	Baldock Richard	FAE12		Schweickert Gunn	ASG23
	Barlage Bernhard	AED13	Х	Sonn Nico	ASG51
	Bayer Thomas	ASA42		Steininger Eric	AED32
	Brune Holger	ASA45	Х	Stritter Rene	AED11
	Edelhoff Dirk	AED2		Suess Rudi	OTN/ASA44
	Fehringer Alexander	ASG13	Х	Theunissen Martijn	DSSA
Х	Fricke Wolfgang Dr.	AED 65	Х	Vascotto Riccardo	HE Space
	Geiger Hermann	ASA42		Wagner Klaus	ASG23
	Grasl Andreas	OTN/ASA44	Х	Wietbrock Walter	AET12
	Grasshoff Brigitte	AET12		Wöhler Hans	ASG23
Х	Hamer Simon	Terma		Wössner Ulrich	ASE252
	Hanka, Erhard	FI552		Zumstein Armin	ASQ42
	Hendrikse Jeffrey	HE Space			
	Hendry David	Terma			
	Hengstler Reinhold	ASA42			
	Hinger Jürgen	ASG23			
Х	Hohn Rüdiger	AED65			
	Hölzle Edgar Dr.	AED32			
Х	Hopfgarten Michael	AED32			
	Huber Johann	ASA42			
	Hund Walter	ASE252			
Х	Idler Siegmund	AED312			
	Ivády von András	FAE12			
	Jahn Gerd Dr.	ASG23			
Х	Kalde Clemens	ASM2	Х	ESA/ESTEC	ESA
	Kettner Bernhard	AET42	Х	Thales Alenia Space Cannes	TAS-F
	Klenke Uwe	ASG72	Х	Thales Alenia Space Torino	TAS-I
	Knoblauch August	AET32			
Х	Koelle Markus	ASA43		Instruments:	
Х	Koppe Axel	AED312	Х	MPE (PACS)	MPE
Х	Kroeker Jürgen	AED65	Х	RAL (SPIRE)	RAL
Х	La Gioia Valentina	Terma	Х	SRON (HIFI)	SRON
	Lang Jürgen	ASE252			
	Langenstein Rolf	AED15			
	Langfermann Michael	ASA41		Subcontractors:	
	Martin Olivier	ASA43		Austrian Aerospace	AAE
Х	Maukisch Jan	ASA43		Austrian Aerospace	AAEM
Х	Much Christoph	ASA43		BOC Edwards	BOCE
	Müller Jörg	ASA42		Dutch Space Solar Arrays	DSSA
Х	Müller Martin	ASA43		EADS Astrium Sub-Subsyst. &	ASSE
	Pietroboni Karin	AED65		EADS CASA Espacio	CASA
	Platzer Wilhelm	AED2		EADS CASA Espacio	ECAS
	Reichle Konrad	ASA42		European Test Services	ETS
	Runge Axel	OTN/ASA44		Patria New Technologies Oy	PANT
	Sauer Maximilian Dr.	AED65		SENER Ingenieria SA	SEN
Х	Schink Dietmar	AED32		Thales Alenia Space, Antwerp	TAS-ETCA