TITLE: HERSCHEL S/C Level
Conducted EMC Test Procedure

CI-NO: 100 000

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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.

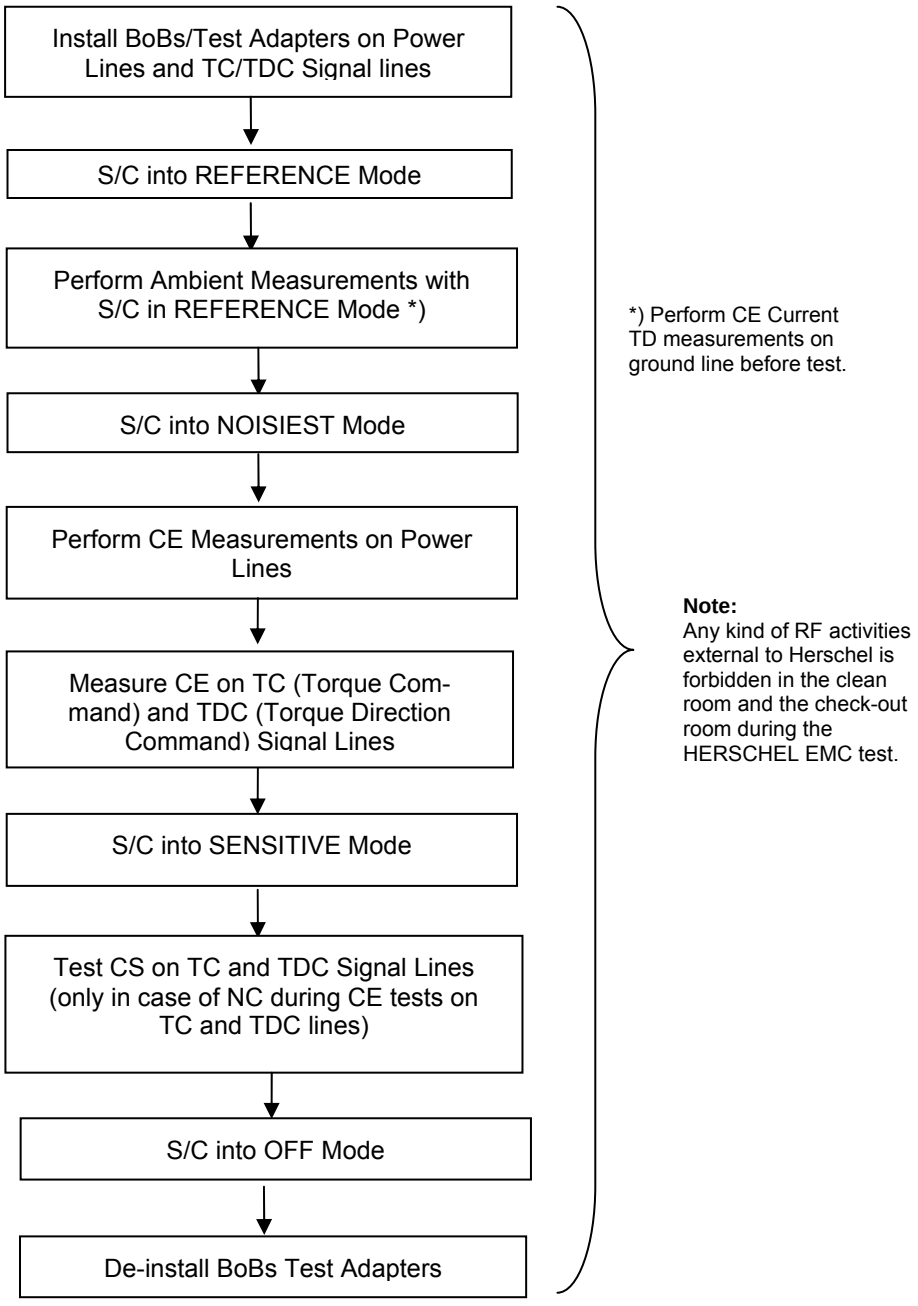


Table 1-1: Satellite Conducted EMC Test Flow

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 Specification	Issue 4
AD9	H-P-DW-AI-0004	HERSCHEL FM EGSE to SVM connection diagrams	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 Procedure for the SAT EMC CE Test in Warm Conditions	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 • Icharge = 10 A • Idisch = 16 A • OVP = 27 V • OCP = ON Solar Array Simulator Nominal Set: • Offline but the SCOE is switched on • Voc = 43 V • Isc = 2.0 A • Rs = 0.1 • N = 100 • Vprot = 45 V • Iprot (FPCS) less than 3.3 A • AIT BDR 1 and BDR 2 = ON • Separation Straps 1 to 8 = not separated • SA Temp simulation set to 110 °C
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 3-1: EGSE Configuration for the REFERENCE Mode

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 • Icharge = 10 A • Idisch = 16 A • OVP = 27 V • OCP = ON Solar Array Simulator Nominal Set: • Online • Voc = 43 V • Isc = 2.0 A • Rs = 0.1 • N = 100 • Vprot = 45 V • Iprot (FPCS) less than 3.3 A • AIT BDR 1 and BDR 2 = ON • Separation Straps 1 to 8 = separated • SA Temp simulation set to 110 °C
ACMS SCOE	• Closed loop configuration to support OCM • RWL'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

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 • Icharge = 10 A • Idisch = 16 A • OVP = 27 V • OCP = ON Solar Array Simulator Nominal Set: • Online • Voc = 43 V • Isc = 2.0 A • Rs = 0.1 • N = 100 • Vprot = 45 V • Iprot (FPCS) less than 3.0 A • AIT BDR 1 and BDR 2 = ON • Separation Straps 1 to 8 = separated • SA Temp simulation set to 110 °C
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	
PT	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

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

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

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 **IMPORTANT: 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

Subsystem/ Unit	Configuration for SENSITIVE Mode
Power Panel	See RD4 for Mode definition
CDMU	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
PT	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

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:	Type:	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.

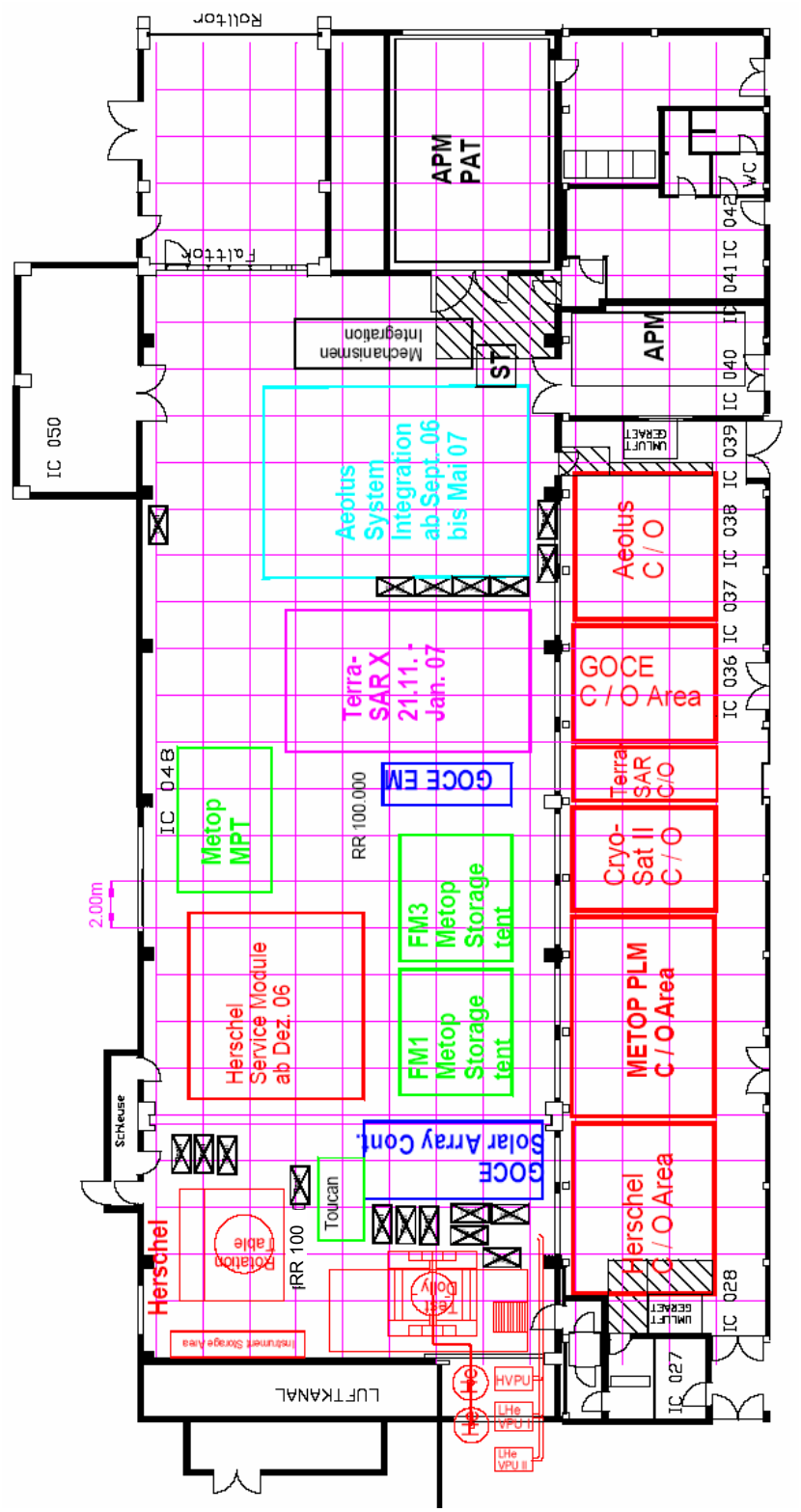


Figure 3-1: Cleanroom of Astrium Friedrichshafen

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°C
Relative 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 (3 dB)**	**Video BW**	**Sweep Points/ virtual Stepp size**	**Sweep-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.

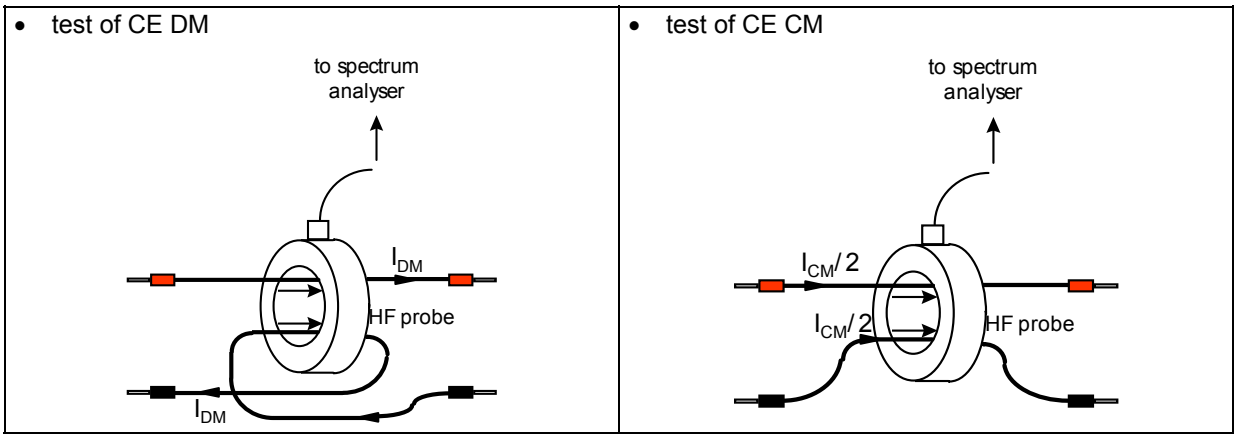


Figure 5-1: Schematic for CM and DM Measurements

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.

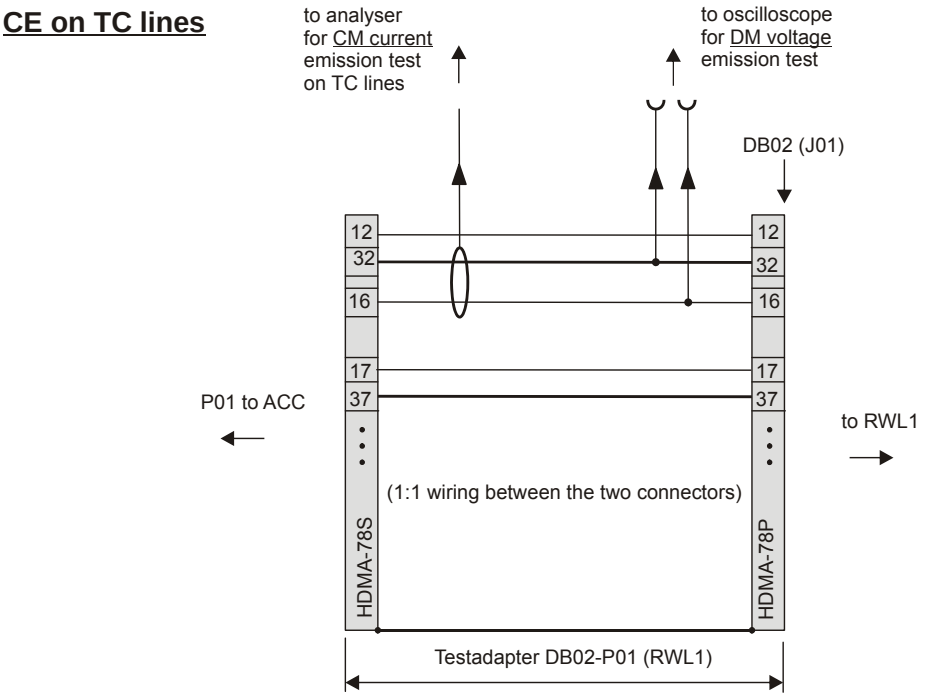


Figure 5-2: TC Test Adapter arrangement for CE, DB02 level

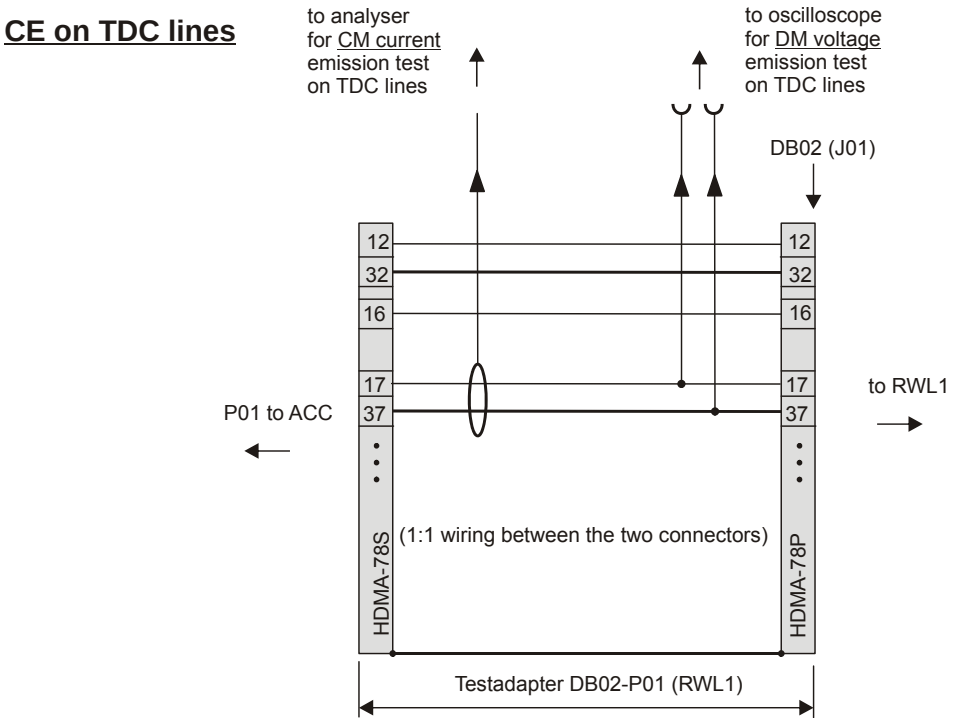


Figure 5-3: TDC Test Adapter arrangement for CE, DB02 level

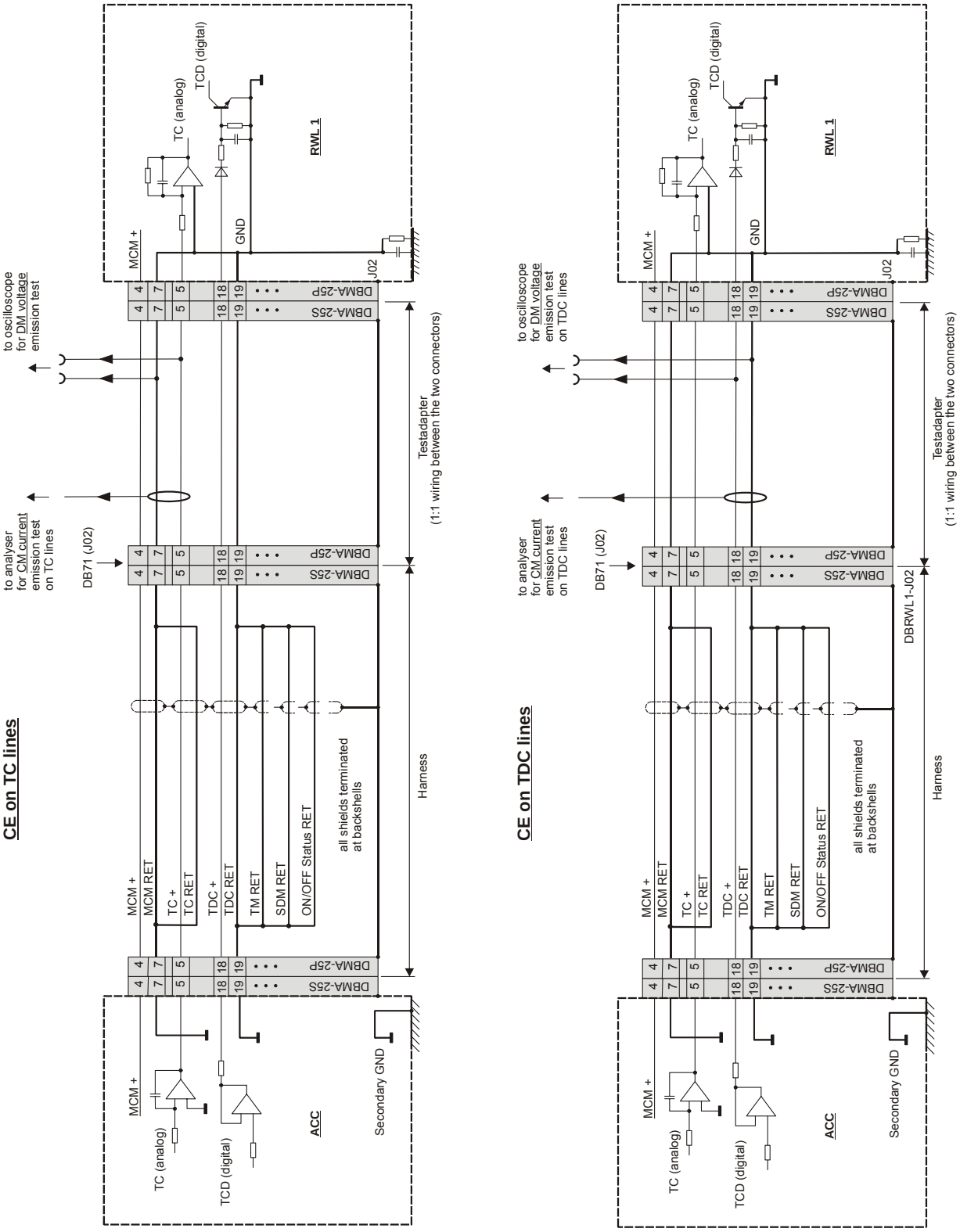


Figure 5-4: Optional TC/TDC Test Adapter arrangement for CE, DB 71 level

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

TC/TDC: 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.

CS on TC lines

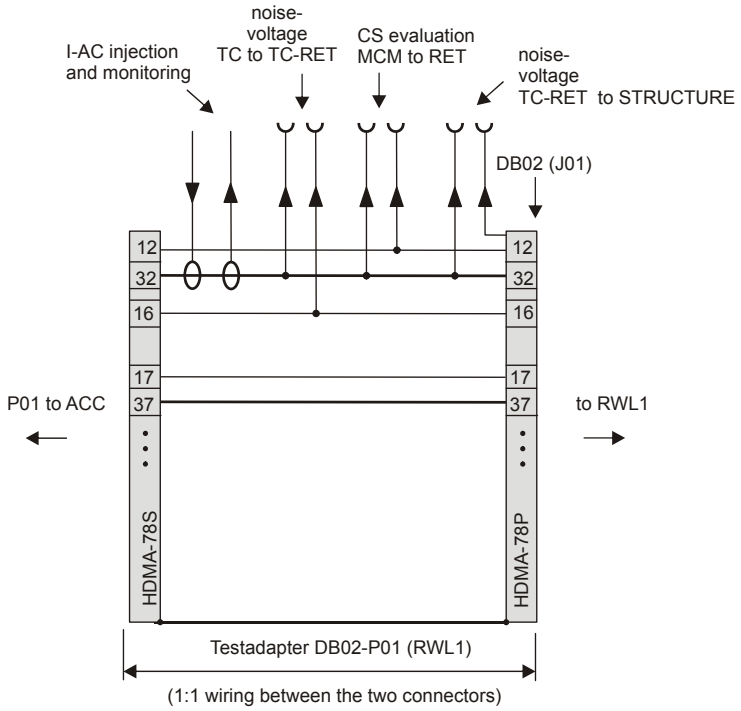


Figure 5-5: TC Test Adapter arrangement for CS, DB02 level

CS on TDC lines

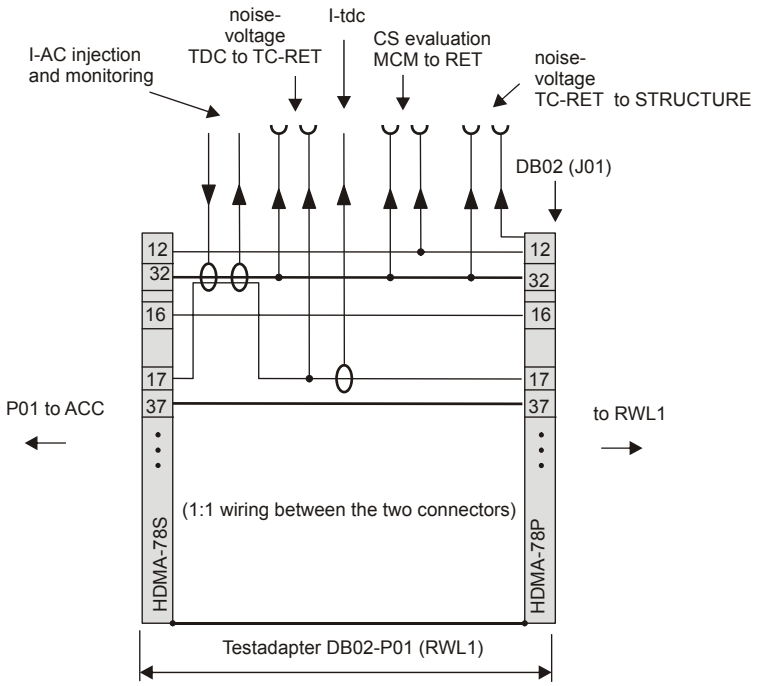


Figure 5-6: TDC Test Adapter arrangement for CS, DB02 level

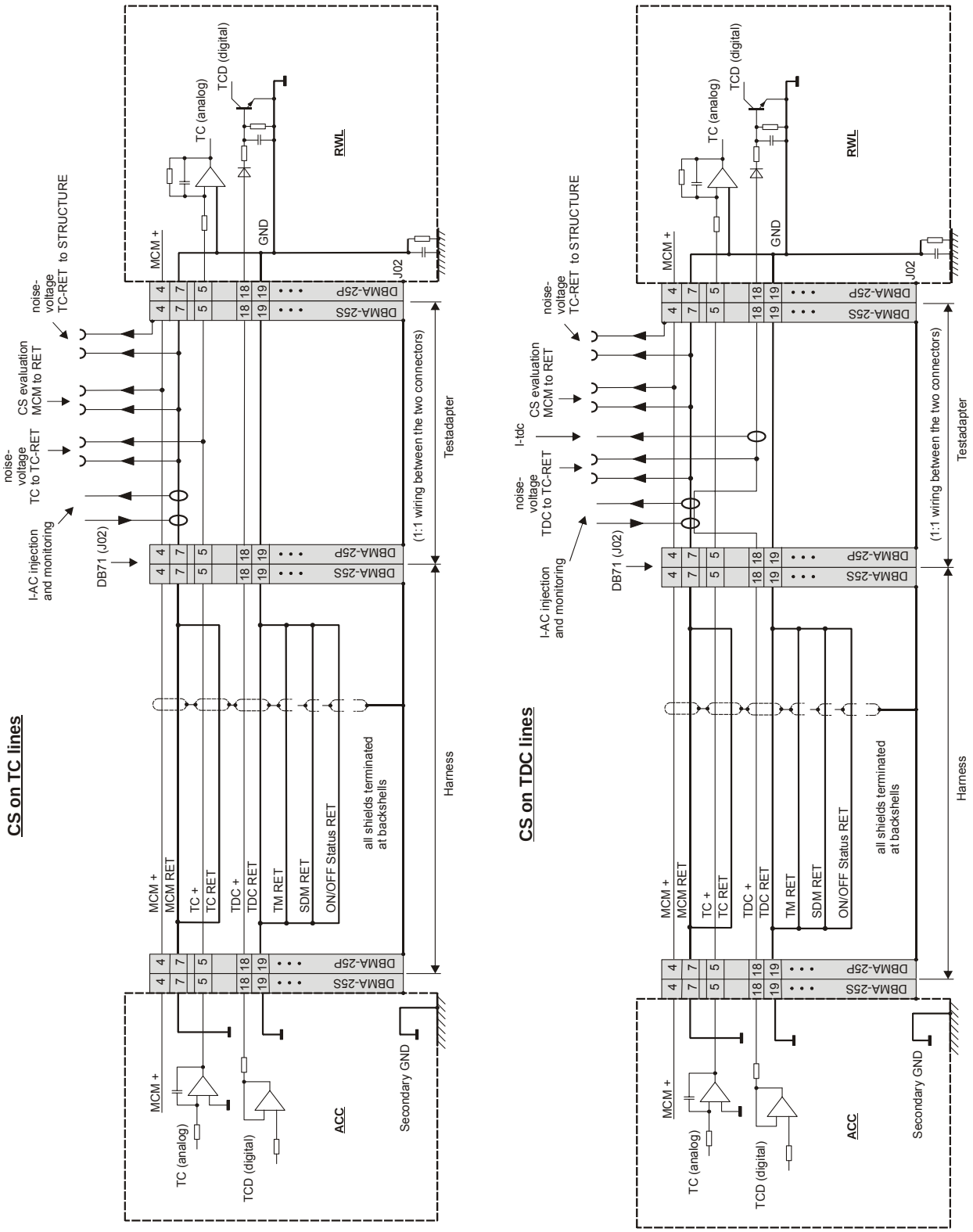


Figure 5-7: TC/TDC Test Adapter arrangement for CS (optional, for measurements on the RWL panel)

6 TEST- AID/ADAPTER ARRANGEMENTS

6.1 General Test- Aid/Adapter Types

General configuration for power- and signal line adapters:

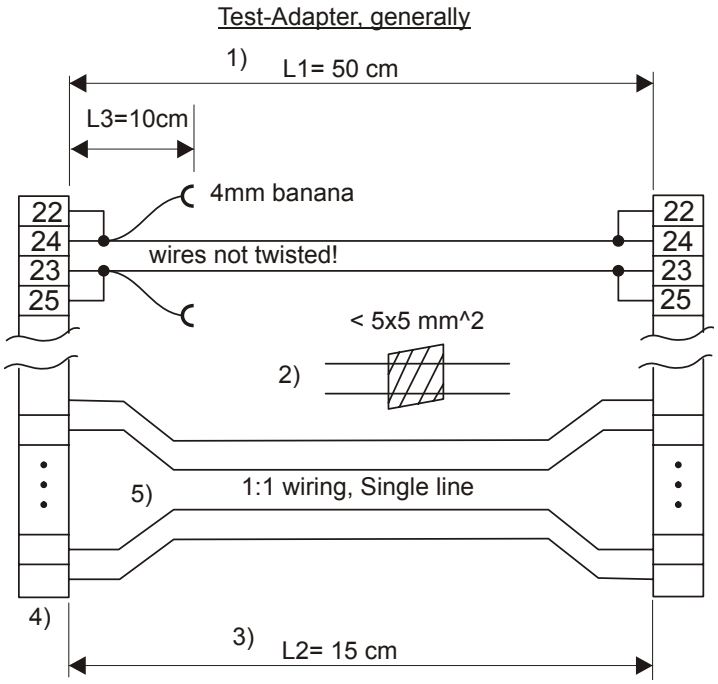


Figure 6-1: Test Adapter, General Configuration

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.

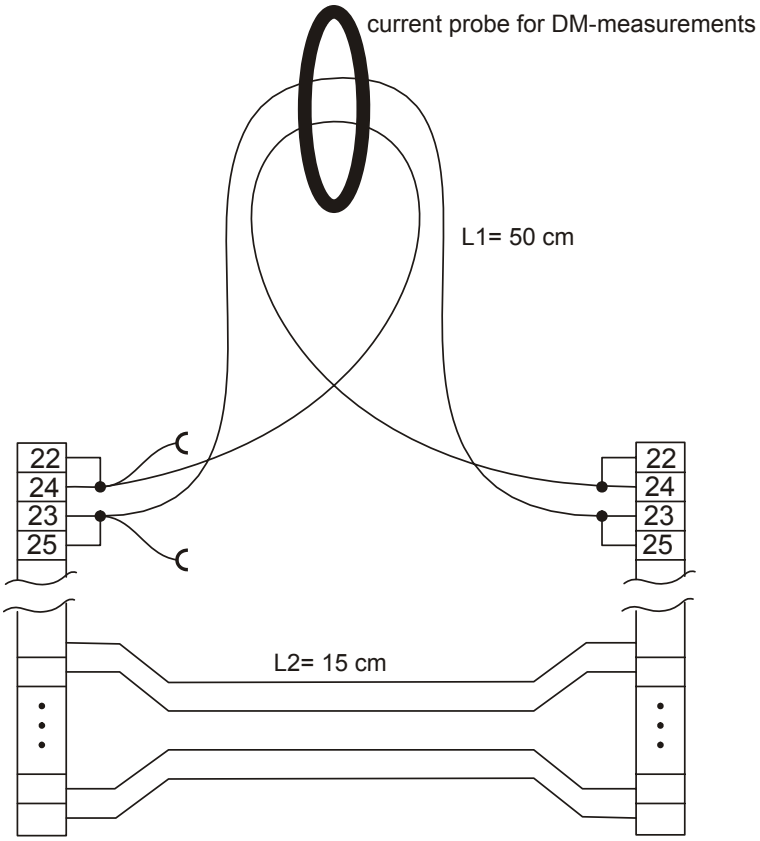


Figure 6-2: Test Adapter, Current Probe Arrangement

6.1.1 Power line Test Adapters

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

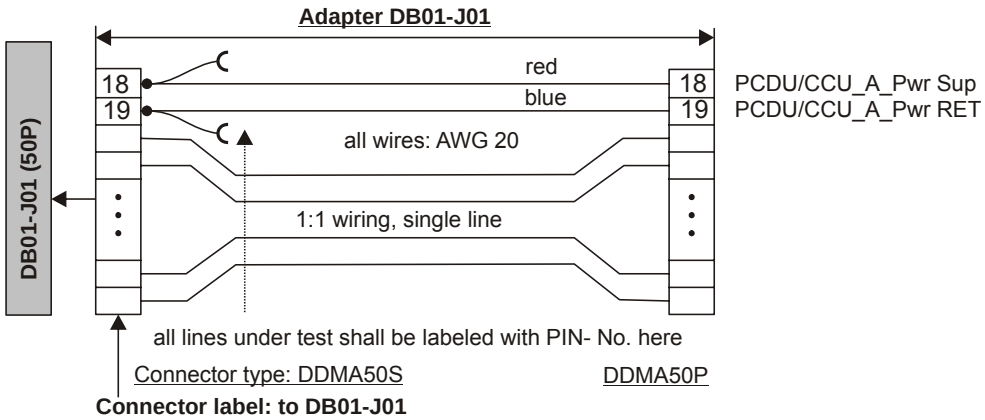


Figure 6-3: Test Adapter DB01-J01

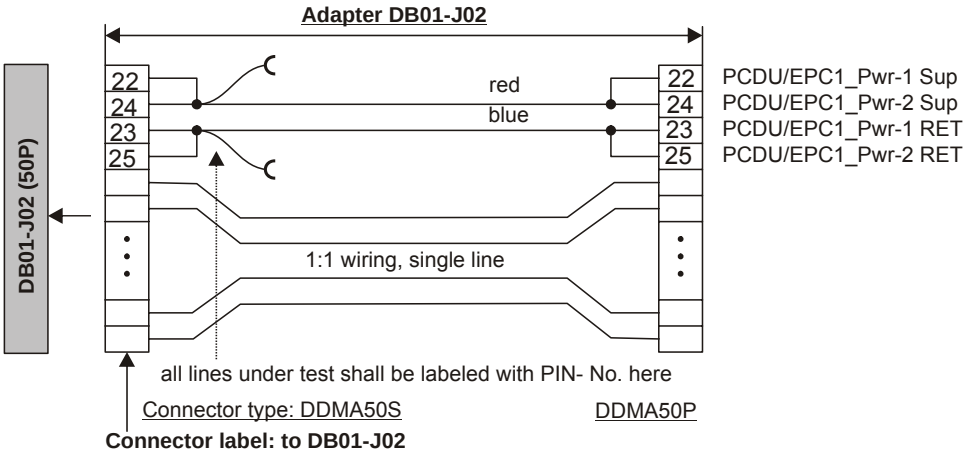


Figure 6-4: Test Adapter DB01-J02

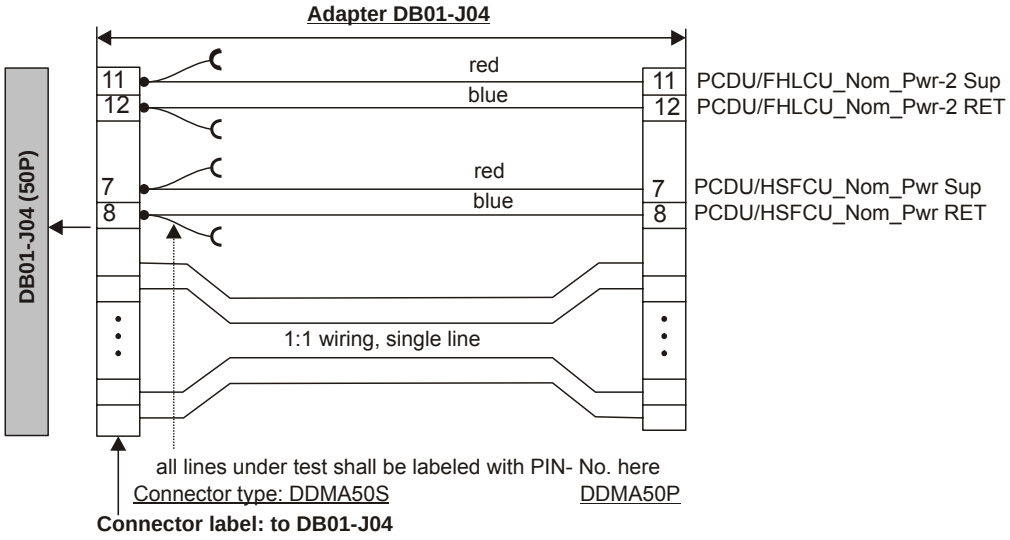


Figure 6-5: Test Adapter DB01-J04

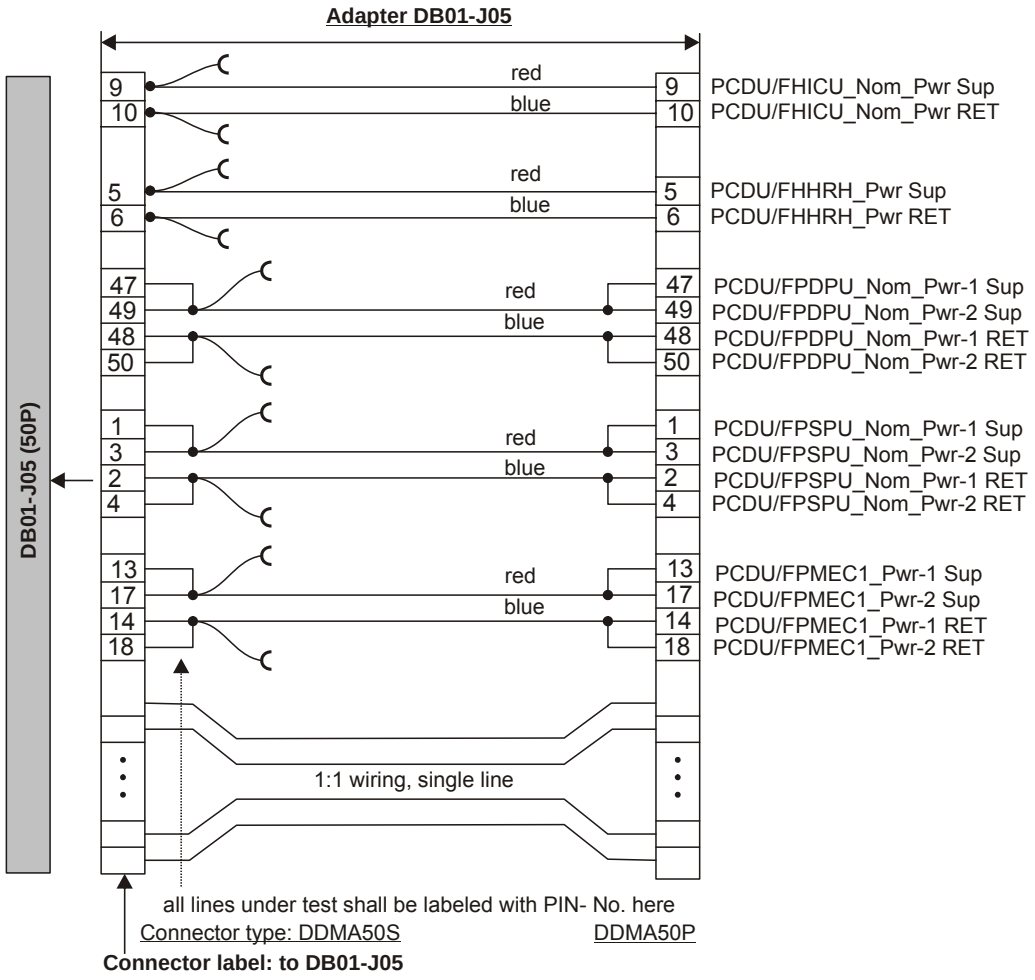


Figure 6-6: Test Adapter DB01-J05

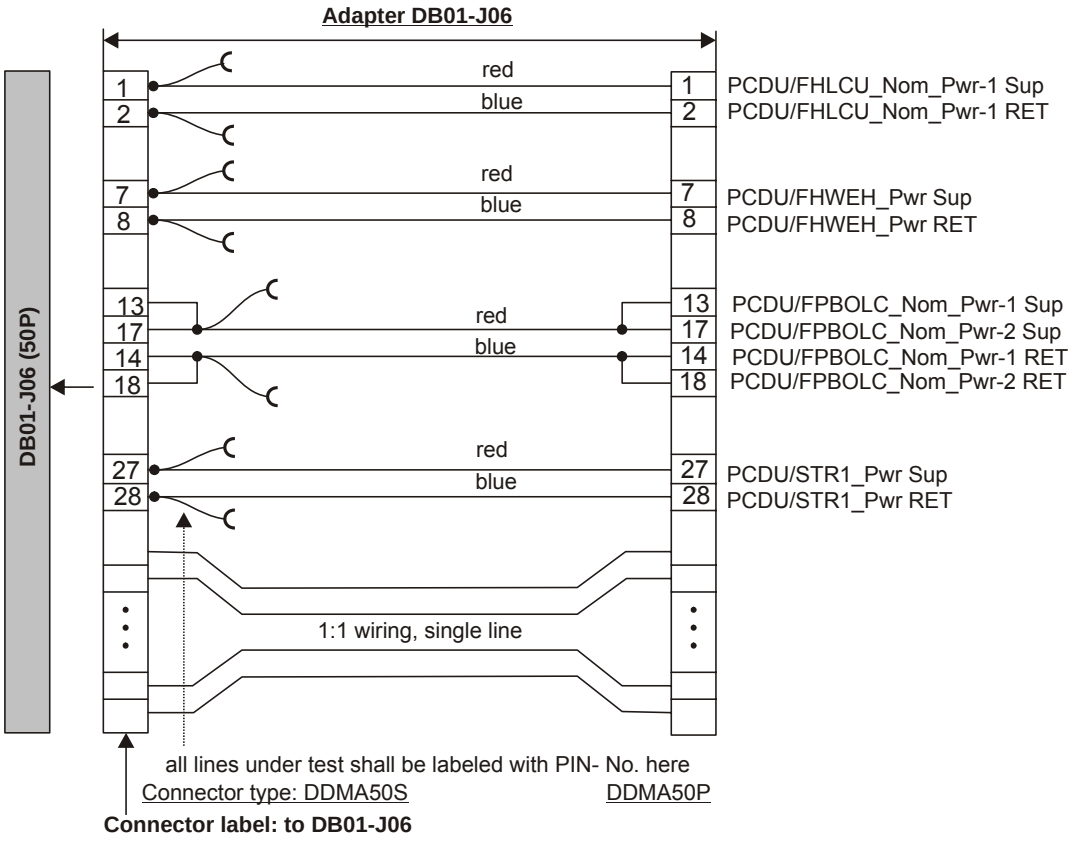


Figure 6-7: Test Adapter for DB01-J06

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

For this measurement the voltage probe "-" shall be connected to the satellite structure.
The accsess 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:

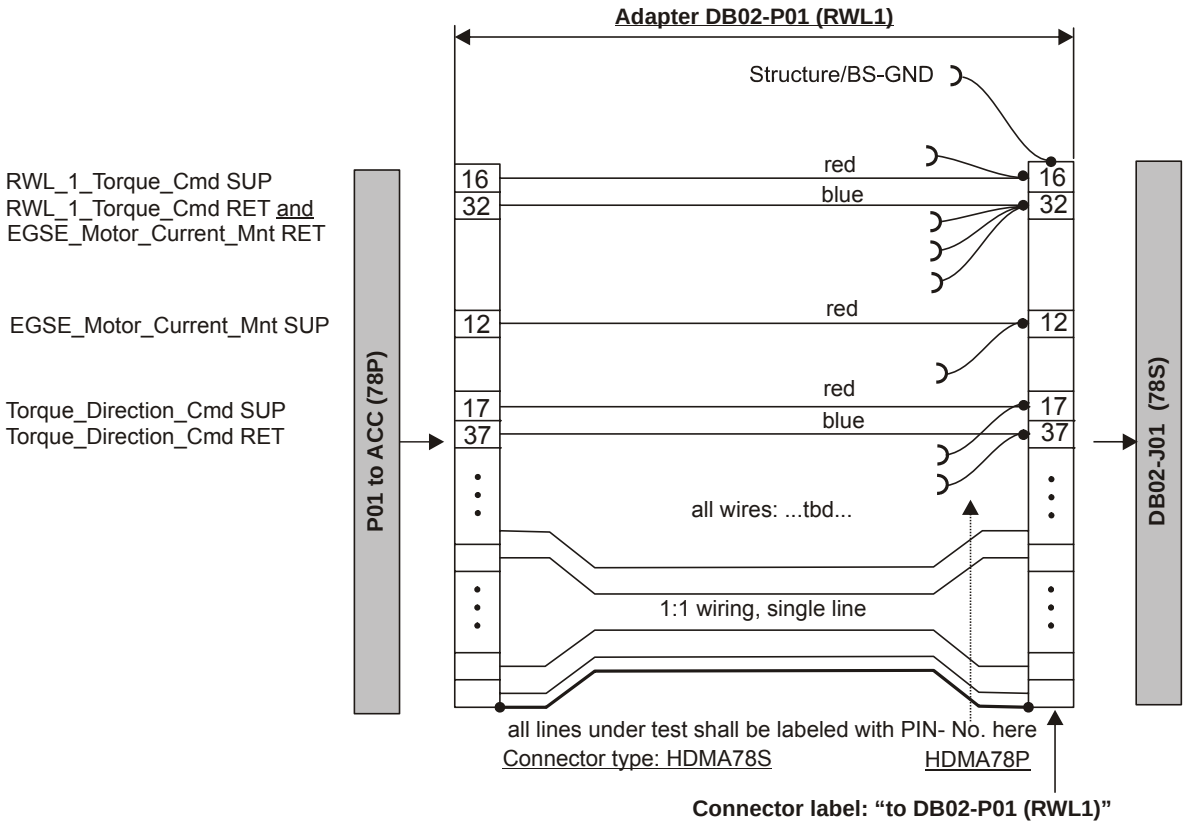


Figure 6-8: Test adapter DB02-P01

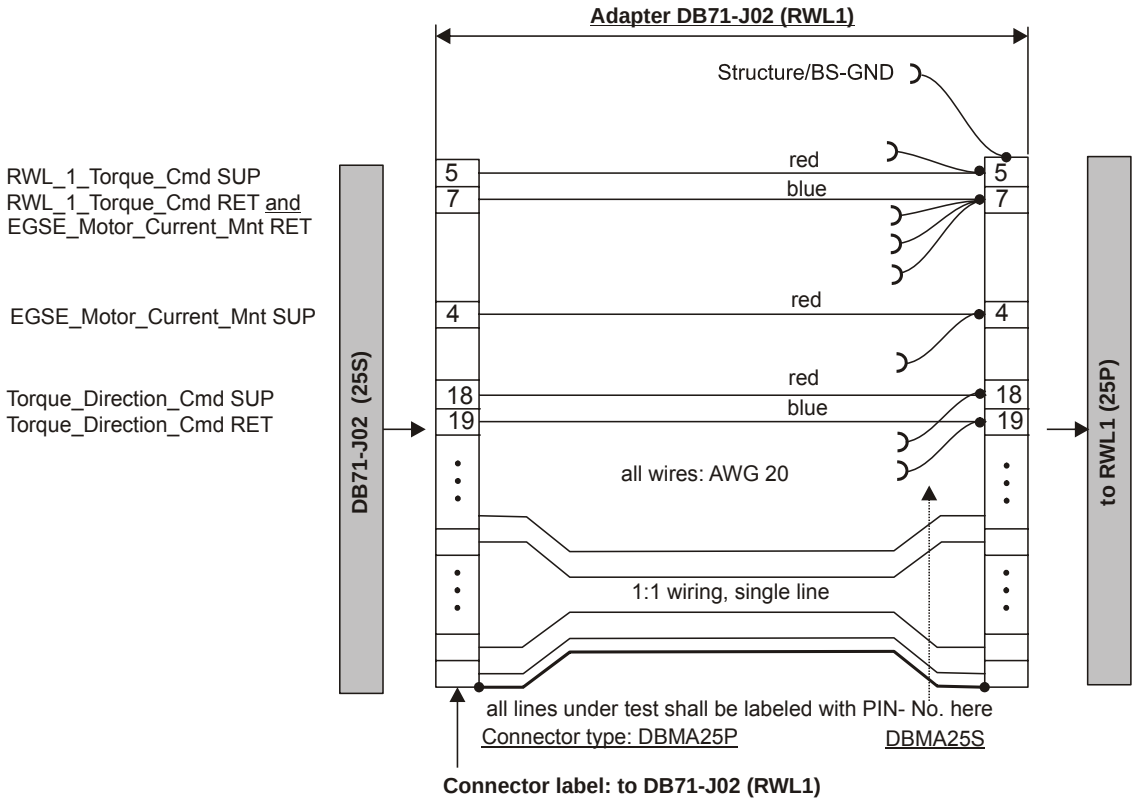


Figure 6-9: Optional test adapter DB71-J02 (for RWL panel only!)

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

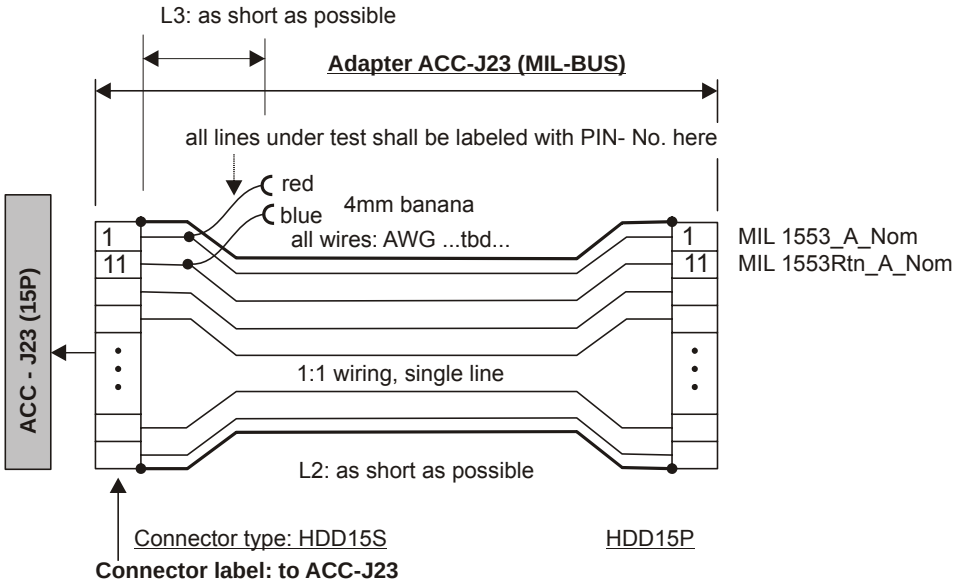


Figure 6-10: Test adapter ACC-J23 (L3 is < 10 cm, L2 is < 5 cm)

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 Adapter	Accessible per:			Comment/ Current Cap. (A)
			Bracket – Connector (Adapter Name)	Type	Pin	
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 parallel 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 TC-interface (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 TC-interface.
- The conducted susceptibility test (CS testing) shall be done on the **MCM/TC_RET (7) and TDC + (18)** lines for the TDC- interface.

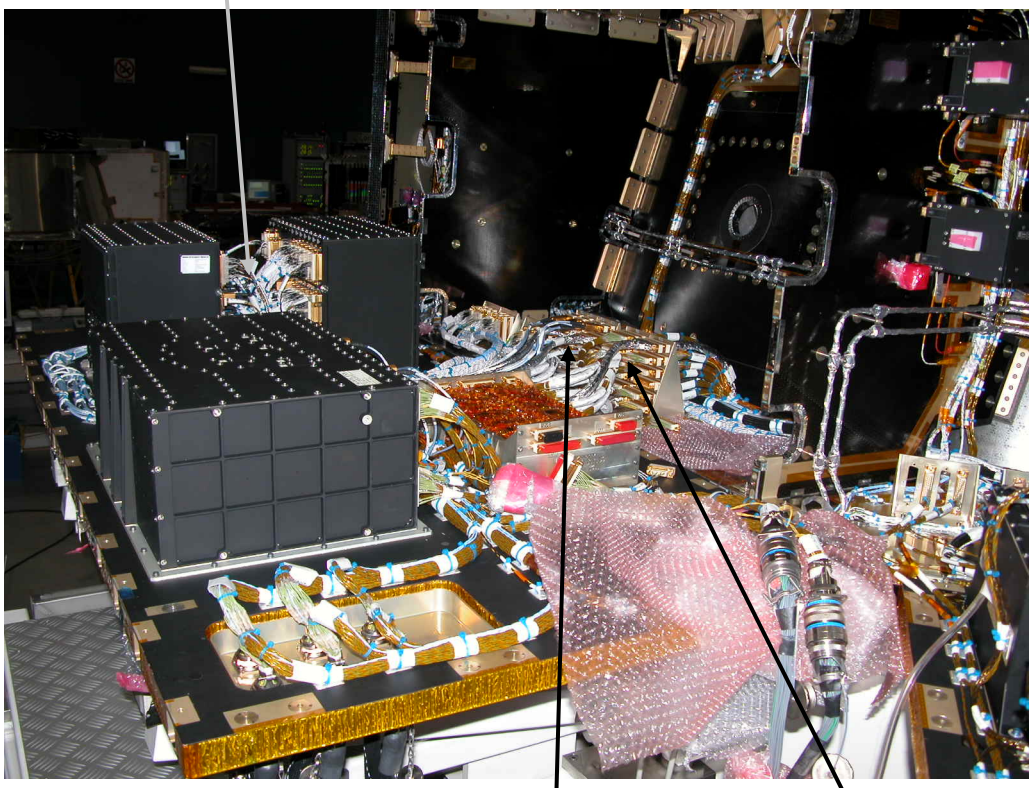
6.3.3 MILBUS adapter arrangement for measuring on ACC level

- 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

ACC:
Access to connector:
J23 for CE measurements on MILBUS signal lines. Insert Test Adapter on the ACC.
Connector savers shall be used!



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!

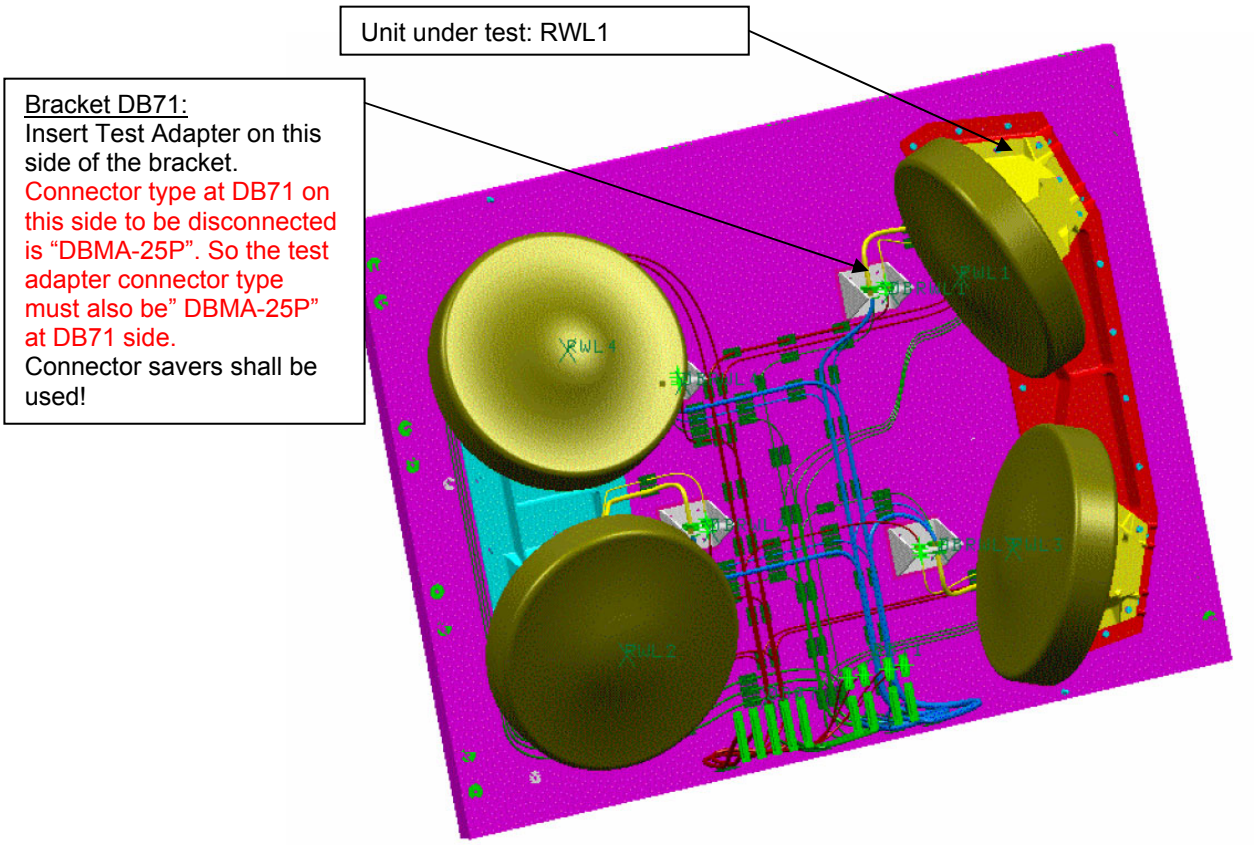
Bracket DB01:
Access to connectors:
J01, J02, J03, J04, J05, J06 for CE measurements on power lines.
Insert Test Adapter on this side of the bracket.
Connector type at DB01 on this side is “DyMA-xxP”. So the test adapter connector type must be” DyMA-xxS”.
Connector savers shall be used!

Pecautions:

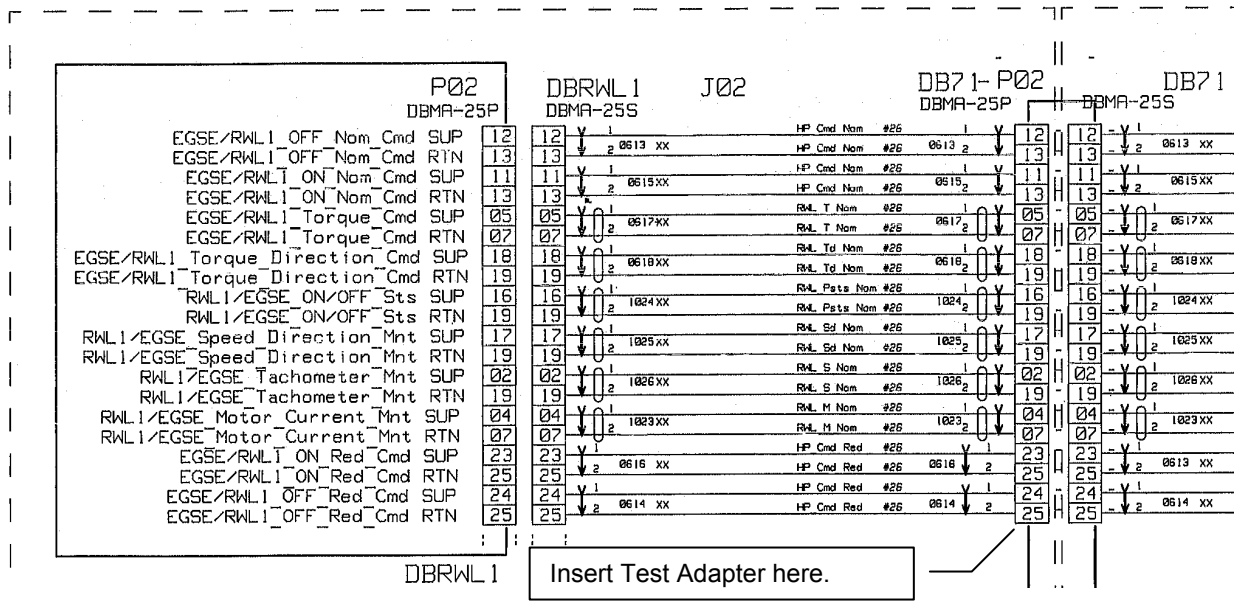
It is absolutely mandatory to fix the EMC adapter connectors (power and signal) mechanically against disconnecting by accident or stress!

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:



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 follwed by the SCOE operators in order to switch the satellite into the required configuration for the conducted tests.

Test Step No/ Info		Description/Comments
A		**REFERENCE MODE**
A.1	**OP**	Switch satellite EGSE into the REFERENCE mode Configuration according to the configuration 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 RD4

Test Step No/ Info		Description/Comments
B		**NOISIEST MODE**
B.1	**OP**	Switch satellite EGSE into the NOISIEST mode Configuration according to the configuration table in chapter 3.1. No actions required here as performed in B.2 below
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 Instruments 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 NOISIEST 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
B.4	**OP**	HIFI NOISIEST mode
B.4.1		If SVM OFF: perform B.2
B.4.2	**OP**	If PACS is in NOISIEST mode then return to STANDBY: perform section 8.2.3.3 of RD4
B.4.3	**OP**	If SPIRE is in NOISIEST mode then return to STANDBY: perform section 8.2.4.3 of RD4
B.4.4	**OP**	HIFI to NOISY mode and confirm: perform section 8.2.5.2 of RD4

Test Step No/ Info		Description/Comments
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	**OP**	SPIRE to NOISY mode and confirm: perform section 8.2.4.2 of RD4
B.6	**OP**	RWL-1-4 noisiest mode @ 15 min : perform section 8.2.6 of RD4

Test Step No/ Info		Description/Comments
C		**SENSITIVE MODE (**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/ Info		Description/Comments
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

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 Step No	Activity	SATELLITE Operational Mode
0	**Install BoBs/Test Adapter to Power- and Signal Lines**	OFF Mode
0.1	Test adapter “DB01-J01” for CE on CCU-MAIN	
0.2	Test adapter “DB01-J02” for CE on TWTA-EPC1	
0.3	Test adapter “DB01-J04” for CE on HIFI-LCU-MAIN and 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	

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-SPU-main Power Lines**	REFERENCE Mode
6.1	If not already done switch into REFERENCE Mode according 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 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 Differential Mode	
7.6	CE Voltage in Time Domain, Pwr-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	

Test Step No	Activity	SATELLITE Operational Mode
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 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	
16	**Test on HIFI-LCU-main Power Lines**	NOISIEST Mode with **HIFI in SCIENCE** and PACS and SPIRE in STANDBY: **''B4''**
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	

Test Step No	Activity	SATELLITE Operational Mode
17	**Test on HIFI-ICU-main Power Lines**	NOISIEST Mode with **HIFI in SCIENCE** and PACS and SPIRE in STANDBY: **''B4''**
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 **SPIRE in SCIENCE** and HIFI and PACS in STANDBY: **''B5''**
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 **PACS in SCIENCE** and HIFI and SPIRE in STANDBY: **''B3''**
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 **PACS in SCIENCE** and HIFI and SPIRE in STANDBY: **''B3''**
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 **PACS in SCIENCE** and HIFI and SPIRE in STANDBY: **''B3''**
21.1	If not already done switch into NOISIEST mode according to chapter 7.1 ''B3'' and confirm the mode	

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	
22	**Test on PACS-MEC-main Power Lines**	NOISIEST Mode with **PACS in SCIENCE** and HIFI and SPIRE in STANDBY: **''B3''**
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 **HIFI in SCIENCE** and PACS and SPIRE in STANDBY: **''B4''**
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	
24	**Test on TWTA-EPC1 Power Lines**	NOISIEST Mode with **HIFI in SCIENCE** and PACS and SPIRE in STANDBY: **''B4''**
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 **HIFI in SCIENCE** and PACS and SPIRE in STANDBY: **''B4''**
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	

Test Step No	Activity	SATELLITE Operational Mode
26	**Reference Test on Satellite Ground Line DELETED**	
26.1	CE Current Ripple in Time Domain	
27	**CE Test on TC Signal Lines (RWL1)**	NOISIEST Mode with **HIFI in SCIENCE** and PACS and SPIRE in STANDBY: **''B4''**
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 **HIFI in SCIENCE** and PACS and SPIRE in STANDBY: **''B4''**
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 **HIFI in SCIENCE** and PACS and SPIRE in STANDBY: **''B4''**
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

8 STEP BY STEP PROCEDURE/REPORT

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":

☑ "Done" sign
Pass "Pass" status for meeting a requirement
Fail "Fail" status for not meeting a requirement
OP Executant: Satellite /EGSE and operational responsibles
EMC Executant: EMC responsible

	Table row for **comments,** if any
	Table row for **photos,** when taken
	Table row for **plots,** 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, 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.** **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 CCU-MAIN**
		The test aid Figure 6-3 shall be placed at DB01 level on harness side. The connector to be

Test Step No/ Info	Description/Comments
	disconnected for installing the adapter is J01. The adaper supports measurements on the *PCDU/CCU_A_ Pwrs SUP/RTN* lines.
	Comments if any
	Photos:
Date/Time	
0.2	**Test adapter "DB01-J02" for CE on TWTA-EPC1**
	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. The adaper supports measurements on the *PCDU/EPC1_Pwrs SUP/RTN* lines.
	Comments if any
	Photos:
Date/Time	
0.3	**Test adapter "DB01-J04" for CE on HIFI-LCU-MAIN and SPIRE-FCU-main**
	The test aids Figure 6-5 shall be placed at DB01 level on harness side. The connector to be disconnected for installing the adapter is J04. The adaper supports measurements on the *PCDU/FHLCU_Pwrs SUP/RTN and* *PCDU/HSFCU_Nom_Pwr SUP/RTN* lines.
	Comments if any
	Photos:
Date/Time	
0.4	**Test adapter "DB01-J05" for CE on HIFI-ICU-MAIN, PACS-DPU-MAIN, PACS-SPU-MAIN and PACS-MEC1-MAIN**
	The test aid shall be placed at DB01 level on harness side. The connector to be disconnected for installing the adapter is J05. The adaper supports measurements on the *PCDU/FHICU_Nom_Pwr SUP/RTN,* *PCDU/FPDPU_Nom_Pwrs SUP/RTN and* *PCDU/FPSPU1_ Pwrs SUP/RTN lines* *PCDU/FPMEC1_ Pwrs SUP/RTN lines*
	Comments if any

Test Step No/ Info		Description/Comments
		Photos:
Date/Time		
0.5		**Test adapter "DB01-J06" for CE on HIFI-LCU-MAIN, PACS-BOLC-MAIN and STR1**
		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_Pwrs SUP/RTN and* *PCDU/STR1_Pwr SUP/RTN* lines.
		Comments if any
		Photos:
Date/Time		
0.6		**Test adapter "DB02-P01" for CE/CS on Signal Lines: RWL1 TC/TDC**
		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.
		Comments if any
		Photos:
Date/Time		
0.7		**Test adapter "ACC-J23" for CE on Signal Lines: MILBUS**
		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 *MIL1553/1553Rtn* lines.
		Comments if any
		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., Executant		Description/Comments
1		**Reference/Ambient Test on Satellite Ground Line**
1.1		REFERENCE Mode
	OP	If not already done switch into REFERENCE mode according to chapter 7.1 ‘’A’’ and confirm the mode
Date/Time		
		The measurement shall be done on the **Satellite Ground** line. The ground line is accessible from underneath the power panel. Take care to install the probes correctly.
Date/Time		
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 ≥ 50 MHz).
		Plot 0xx: Measured Ambient DC current: I-DCamb = xxx mA Measured current ripple : I-amb = xxx mApp
		Photos:
		Remove the current probe.

8.3 Reference/Ambient Tests on Power Lines

Test Step No., Executant		Description/Comments
		REFERENCE/AMBIENT TEST ON POWER LINES LINES 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, 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.** **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.**
2		**Reference/Ambient Test on HIFI-LCU-main Power Lines**
2.1		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/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). **Attention!** The power lines under test were rooted in parallel 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.
Date/Time		
2.2		CE Current in Frequency Domain, Common Mode
		Set the current clamp on the HIFI-LCU-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.

Test Step No., Executant	Description/Comments
	Plot 0xx: 30 Hz – 10 kHz, CM-ambient, HIFI-LCU-main -PWR 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:
	Remove the current probe.
Date/Time	
2.3	CE Current in Frequency Domain, Differential Mode
	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:
	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 ≥ 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/Time	
2.5	CE Voltage in Time Domain Differential Mode
	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 ≥ 50 MHz) in adequate time-/amplitude scaling. “plus”: DB01-J06 pin 1 “return”: DB01-J06 pin 2 and/or

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)
	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 ≥ 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
	Photos:
	Remove the oscilloscope connection from the test adapter.

3		**Reference/Ambient Test on HIFI-ICU-main Power Lines**
3.1		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/FHICU_Nom_Pwr SUP/RTN** 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

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 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, 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
		Photos:
		Remove the current probe.
Date/Time		
3.3		CE Current in Frequency Domain, Differential Mode
		Set the current clamp on the HIFI-ICU-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- 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
		Photos:
		Remove the current probe.
Date/Time		
3.4		CE Current in Time Domain, Differential Mode
		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 ≥ 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/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 ≥ 50 MHz) in adequate time-/amplitude scaling.

		"plus": DB01-J05 pin 9 "return": DB01-J05 pin 10
		Plot 0xx: Measured Ambient voltage ripple: u-amb = xxx Vpp (>/< 2,5 V)
		Photos:
		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: Measured Ambient voltage ripple: u-amb = xxx Vpp
		Photos:
		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 confirm the mode
		On Power SCOE verify the spacecraft OFF condition: Measured: U = _____
Date/Time		
		The measurement shall be done on the **PCDU/HSFCU_Nom_Pwr SUP/RTN** 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/Time		
4.2		CE Current in Frequency Domain, Common Mode
		Set the current clamp on the SPIRE-FCU-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, SPIRE-FCU -main -PWR Plot 0xx: 10 kHz – 1 MHz, CM-ambient, SPIRE-FCU -main -PWR Plot 0xx: 1 MHz – 30 MHz, CM-ambient, SPIRE-FCU -main -PWR Plot 0xx: 30 MHz – 50 MHz, CM-ambient, SPIRE-FCU -main -PWR
		Photos:
		Remove the current probe.
Date/Time		
4.3		CE Current in Frequency Domain, Differential Mode
		Set the current clamp on the SPIRE-FCU -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, SPIRE-FCU -main -PWR Plot 0xx: 10 kHz – 1 MHz, DM-ambient, SPIRE-FCU -main -PWR Plot 0xx: 1 MHz – 30 MHz, DM-ambient, SPIRE-FCU -main -PWR Plot 0xx: 30 MHz – 50 MHz, DM-ambient, SPIRE-FCU -main -PWR
		Photos:
		Remove the current probe.
Date/Time		
4.4		CE Current in Time Domain, Differential Mode
		Set the current clamp on the SPIRE-FCU -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 mA Measured current ripple : I-amb = xxx mApp
		Photos:
		Remove the current probe.
Date/Time		
4.5		CE Voltage in Time Domain Differential Mode
		Set the voltage probe on the SPIRE-FCU-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-J04 pin 7 “return”: DB01-J04 pin 8
		Plot 0xx: Measured Ambient voltage ripple: u-amb = xxx Vpp (>/< 2,5 V)

	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 ≥ 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
	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 confirm 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/Time		
		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/Time		
5.2		CE Current in Frequency Domain, Common Mode
		Set the current clamp on the PACS-DPU-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-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:

	Remove the current probe.
Date/Time	
5.3	CE Current in Frequency Domain, Differential Mode
	Set the current clamp on the PACS-DPU -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-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/Time	
5.4	CE Current in Time Domain, Differential Mode
	Set the current clamp on the PACS-DPU -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 mA Measured current ripple : I-amb = xxx mApp
	Photos:
	Remove the current probe.
Date/Time	
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 ≥ 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/Time	
5.6	CE Voltage in Time Domain, Pwr-Return to Structure

	Connect the differential voltage probe "+" input to the PACS-DPU -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 48//50 "satellite structure": …tbd during test…
	Plot 0xx: Measured Ambient voltage ripple: u-amb = xxx Vpp
	Photos:
	Remove the oscilloscope connection from the test adapter.

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 confirm 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/Time		
		The measurement shall be done on the **PCDU/FPSPU1_ Pwrs SUP/RTN** 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/Time		
6.2		CE Current in Frequency Domain, Common Mode
		Set the current clamp on the PACS-SPU-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-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
		Photos:
		Remove the current probe.
Date/Time		
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-

	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-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
	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 ≥ 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/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 ≥ 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)
	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 ≥ 50 MHz) in adequate time-/amplitude scaling. “return”: DB01-J05 pin 2//4 "satellite structure": …tbd during test…

	Plot 0xx: Measured Ambient voltage ripple: u-amb = xxx Vpp
	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 confirm the mode
		On Power SCOE verify the spacecraft OFF condition: Measured: U = _____
Date/Time		
		The measurement shall be done on the **PCDU/FPBOLC_ Pwrs SUP/RTN** 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
Date/Time		
7.2		CE Current in Frequency Domain, Common Mode
		Set the current clamp on the PACS-BOLC-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-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
		Photos:
		Remove the current probe.
Date/Time		
7.3		CE Current in Frequency Domain, Differential Mode
		Set the current clamp on the PACS-BOLC-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- BOLC -main -PWR Plot 0xx: 10 kHz – 1 MHz, DM-ambient, PACS- BOLC -main -PWR Plot 0xx: 1 MHz – 30 MHz, DM-ambient, PACS- BOLC -main -PWR Plot 0xx: 30 MHz – 50 MHz, DM-ambient, PACS- BOLC -main -PWR

	Photos:
	Remove the current probe.
Date/Time	
7.4	CE Current in Time Domain, Differential Mode
	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 ≥ 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/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 ≥ 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)
	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 ≥ 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
	Photos:

	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:
		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 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:
		Remove the current probe.
Date/Time		
8.4		CE Current in Time Domain, Differential Mode

	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 ≥ 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/Time	
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)
	Photos:
	Remove the oscilloscope connection from the test adapter.
Date/Time	
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 ≥ 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
	Photos:
	Remove the oscilloscope connection from the test adapter.

9		**Reference/Ambient Test on CCU-main Power Lines**
9.1		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		
		The measurement shall be done on the **PCDU/CCU_A_ 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		
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
		Photos:
		Remove the current probe.
Date/Time		
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
		Photos:
		Remove the current probe.
Date/Time		
9.4		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 ≥ 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/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 ≥ 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)
	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 ≥ 50 MHz) in adequate time-/amplitude scaling. “return”: DB01-J01 pin 19 "satellite structure": …tbd during test…
	Plot 0xx: Measured Ambient voltage ripple: u-amb = xxx Vpp
	Photos:
	Remove the oscilloscope connection from the test adapter.

10		**Reference/Ambient Test on TWTA-EPC1 Power Lines**
10.1		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 by SCOE parameters: Measured: U = _____
Date/Time		

		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		
10.2		CE Current in Frequency Domain, Common Mode
		Set the current clamp on the TWTA-EPC1-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, 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
		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 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, 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
		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 mA Measured current ripple : I-amb = xxx mApp
		Photos:
		Remove the current probe.
Date/Time		

10.5		CE Voltage in Time Domain Differential Mode
		Set the voltage probe on the TWTA-EPC1-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-J02 pin 22//24 “return”: DB01-J02 pin 23/25
		Plot 0xx: Measured Ambient voltage ripple: u-amb = xxx Vpp (>/< 2,5 V)
		Photos:
		Remove the oscilloscope connection from the test adapter.
Date/Time		
10.6		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 ≥ 50 MHz) in adequate time-/amplitude scaling. “return”: DB01-J02 pin 23/25 "satellite structure": …tbd during test…
		Plot 0xx: Measured Ambient voltage ripple: u-amb = xxx Vpp
		Photos:
		Remove the oscilloscope connection from the test adapter.

11		**Reference/Ambient Test on STR1 Power Lines**
11.1		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 by SCOE parameters: Measured: U = _____
Date/Time		
		The measurement shall be done on the **PCDU/STR1_Pwr SUP/RTN** 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/Time		

11.2		CE Current in Frequency Domain, Common Mode
		Set the current clamp on the STR1-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, STR1-main -PWR Plot 0xx: 10 kHz – 1 MHz, CM-ambient, STR1-main -PWR Plot 0xx: 1 MHz – 30 MHz, CM-ambient, STR1-main -PWR Plot 0xx: 30 MHz – 50 MHz, CM-ambient, STR1-main -PWR
		Photos:
		Remove the current probe.
Date/Time		
11.3		CE Current in Frequency Domain, Differential Mode
		Set the current clamp on the STR1-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, STR1-main -PWR Plot 0xx: 10 kHz – 1 MHz, DM-ambient, STR1-main -PWR Plot 0xx: 1 MHz – 30 MHz, DM-ambient, STR1-main -PWR Plot 0xx: 30 MHz – 50 MHz, DM-ambient, STR1-main -PWR
		Photos:
		Remove the current probe.
Date/Time		
11.4		CE Current in Time Domain, Differential Mode
		Set the current clamp on the STR1-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 mA Measured current ripple : I-amb = xxx mApp
		Photos:
		Remove the current probe.
Date/Time		
11.5		CE Voltage in Time Domain Differential Mode
		Set the voltage probe on the STR1-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-J06 pin 27 “return”: DB01-J06 pin 28

	Plot 0xx: Measured Ambient voltage ripple: u-amb = xxx Vpp (>/< 2,5 V)
	Photos:
	Remove the oscilloscope connection from the test adapter.
Date/Time	
11.6	<u>CE Voltage in Time Domain, Pwr-Return to Structure</u>
	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:
	Remove the oscilloscope connection from the test adapter.

8.4 Reference/Ambient Tests on Signal Lines

Test Step No., Executant		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
	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
		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.
	Ambient	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
		Photos:
		Remove the current probe.
Date/Time		

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 ≥ 50 MHz). The ambient emissions shall be at least 6 dB below the requirement limit of 300 mVpp.
Ambient	Plot 0xx: Measured Ambient voltage ripple:u-amb = xxx Vpp (>/< 300 mVpp)
	Photos:
	Remove the oscilloscope connection from the test adapter.
13	**Reference/Ambient Test on TDC Signal Lines (RWL1)**
	The measurement shall be done on the **Torque_Direction_Cmd SUP/RET** 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/Time	
13.1	REFERENCE Mode
OP	If not already done switch into REFERENCE mode according to chapter 7.1 ‘’A’’ and confirm the mode.
Date/Time	
13.2	CE Current in Frequency Domain, Common Mode
	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 dBµA. 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
	Photos:
	Remove the current probe.
Date/Time	
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 ≥ 50 MHz). The ambient emissions shall be at least 6 dB below the requirement limit of 300 mVpp.

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

Xxxx

14		**Reference/Ambient Test on ACC/1553 Signal Lines (MILBUS)**
		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 “MIL1553Rtn_A_Nom”: ACC-J23 pin 11
Date/Time		
14.1		REFERENCE Mode
	OP	If not already done switch into REFERENCE mode according to chapter 7.1 ‘’A’’ and confirm the mode.
Date/Time		
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 ≥ 50 MHz).
	 **Ambient**	Plot 0xx: Measured Ambient voltage ripple:u-amb = xxx Vpp
		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!

8.6 Conducted Emission Tests on Power Lines

Test Step No., Executant		Description/Comments
		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 HIFI-LCU-main 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/Time		
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
		Photos:
		Remove the current probe.
Date/Time		
16.3		CE Current in Frequency Domain, Differential Mode
		Measure the CM current from 30 Hz to 50 MHz.

Test Step No., Executant	Description/Comments
 Pass/ Fail	Plot 0xx: 30 Hz – 10 kHz, DM- NomMode, HIFI-LCU-main -PWR Plot 0xx: 10 kHz – 1 MHz, DM- NomMode, HIFI-LCU-main -PWR Plot 0xx: 1 MHz – 30 MHz, DM- NomMode, HIFI-LCU-main -PWR Plot 0xx: 30 MHz – 50 MHz, DM- NomMode, HIFI-LCU-main -PWR
	Comments/Limit exceedings if any
	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 ≥ 50 MHz).
 Pass/ Fail	Measured Nominal DC current: I-DCnom = xxx mA 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 ?
	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 ≥ 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.
 **For info only**	Plot 0xx: Measured voltage ripple: u-amb = xxx Vpp (>/< 2,5 V)
	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 ≥ 50 MHz) in adequate time-/amplitude scaling.

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
	Photos:
	Remove the oscilloscope connection from the test adapter.

17		**CE Test on HIFI-ICU-main Power Lines**
		The measurement shall be done on the the **PCDU/FHICU_Nom_Pwr SUP/RTN** lines.
17.1		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/Time		
17.2		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-ICU-main -PWR Plot 0xx: 10 kHz – 1 MHz, CM- NomMode, HIFI-ICU-main -PWR Plot 0xx: 1 MHz – 30 MHz, CM- NomMode, HIFI-ICU-main -PWR Plot 0xx: 30 MHz – 50 MHz, CM- NomMode, HIFI-ICU-main -PWR
		Comments/Limit exceedings if any
		Photos:
		Remove the current probe.
Date/Time		
17.3		CE Current in Frequency Domain, Differential Mode
		Measure the CM current from 30 Hz to 50 MHz.
	 **Pass/ Fail**	Plot 0xx: 30 Hz – 10 kHz, DM- NomMode, HIFI-ICU-main -PWR Plot 0xx: 10 kHz – 1 MHz, DM- NomMode, HIFI-ICU-main -PWR Plot 0xx: 1 MHz – 30 MHz, DM- NomMode, HIFI-ICU-main -PWR Plot 0xx: 30 MHz – 50 MHz, DM- NomMode, HIFI-ICU-main -PWR

	Comments/Limit exceedings if any
	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 ≥ 50 MHz).
Pass/ Fail	Measured Nominal DC current: I-DCnom = xxx mA 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 ?
	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 ≥ 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.
For info only	Plot 0xx: Measured voltage ripple: u-amb = xxx Vpp (>/< 2,5 V)
	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 ≥ 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

	Photos:
	Remove the oscilloscope connection from the test adapter.

18		**CE Test on <u>SPIRE-FCU-main</u> Power Lines**
		The measurement shall be done on the the **PCDU/HSFCU_Nom_Pwr SUP/RTN** lines.
18.1		<u>NOISIEST Mode</u>
	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. WM408565SpireHsfN_L51_I Nominal DC current: I-DCnom = xxx mA
Date/Time		
18.2		<u>CE Current in Frequency Domain, Common Mode</u>
		Measure the CM current from 30 Hz to 50 MHz.
	 **Pass/ Fail**	Plot 0xx: 30 Hz – 10 kHz, CM-NomMode, SPIRE-FCU-main -PWR Plot 0xx: 10 kHz – 1 MHz, CM- NomMode, SPIRE-FCU -main -PWR Plot 0xx: 1 MHz – 30 MHz, CM- NomMode, SPIRE-FCU -main -PWR Plot 0xx: 30 MHz – 50 MHz, CM- NomMode, SPIRE-FCU -main -PWR
		Comments/Limit exceedings if any
		Photos:
		Remove the current probe.
Date/Time		
18.3		<u>CE Current in Frequency Domain, Differential Mode</u>
		Measure the CM current from 30 Hz to 50 MHz.
	 **Pass/ Fail**	Plot 0xx: 30 Hz – 10 kHz, DM- NomMode, SPIRE-FCU -main -PWR Plot 0xx: 10 kHz – 1 MHz, DM- NomMode, SPIRE-FCU -main -PWR Plot 0xx: 1 MHz – 30 MHz, DM- NomMode, SPIRE-FCU -main -PWR Plot 0xx: 30 MHz – 50 MHz, DM- NomMode, SPIRE-FCU -main -PWR
		Comments/Limit exceedings if any
		Photos:
		Remove the current probe.
Date/Time		
18.4		<u>CE Current in Time Domain, Differential Mode</u>
		Measure the DC current and the current ripple with an oscilloscope (BW ≥ 50 MHz).
		Measured Nominal DC current: I-DCnom = xxx mA I-DCnom ≤ 1 A → Max ripple: I-nom ≤ 60 mApp

Pass/ Fail	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 ?
	Photos:
	Remove the current probe.
Date/Time	
18.5	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.
For info only	Plot 0xx: Measured voltage ripple: u-amb = xxx Vpp (>/< 2,5 V)
	Photos:
	Remove the oscilloscope connection from the test adapter.
Date/Time	
18.6	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 ≥ 50 MHz) in adequate time-/amplitude scaling. “return”: DB01-J04 pin 8 "satellite structure": …tbd during test…
	Plot 0xx: Measured voltage ripple: u-amb = xxx Vpp
	Photos:
	Remove the oscilloscope connection from the test adapter.

19		**CE Test on PACS-DPU-main Power Lines**
		The measurement shall be done on the the **PCDU/FPDPU_Nom_Pwrs SUP/RTN** lines.
19.1		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. WM707565 PACSD_N_L41_I Nominal DC current: I-DCnom = xxx mA
Date/Time		
19.2		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, PACS-DPU-main -PWR Plot 0xx: 10 kHz – 1 MHz, CM- NomMode, PACS-DPU -main -PWR Plot 0xx: 1 MHz – 30 MHz, CM- NomMode, PACS-DPU -main -PWR Plot 0xx: 30 MHz – 50 MHz, CM- NomMode, PACS-DPU -main -PWR
		Comments/Limit exceedings if any
		Photos:
		Remove the current probe.
Date/Time		
19.3		CE Current in Frequency Domain, Differential Mode
		Measure the CM current from 30 Hz to 50 MHz.
	Pass/ Fail	Plot 0xx: 30 Hz – 10 kHz, DM- NomMode, PACS-DPU -main -PWR Plot 0xx: 10 kHz – 1 MHz, DM- NomMode, PACS-DPU -main -PWR Plot 0xx: 1 MHz – 30 MHz, DM- NomMode, PACS-DPU -main -PWR Plot 0xx: 30 MHz – 50 MHz, DM- NomMode, PACS-DPU -main -PWR
		Comments/Limit exceedings if any
		Photos:
		Remove the current probe.
Date/Time		
19.4		CE Current in Time Domain, Differential Mode
		Measure the DC current and the current ripple with an oscilloscope (BW ≥ 50 MHz).
	Pass/ Fail	Measured Nominal DC current: I-DCnom = xxx mA 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 ?
		Photos:
		Remove the current probe.
Date/Time		
19.5		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.
 **For info only**	Plot 0xx: Measured voltage ripple: u-amb = xxx Vpp (>/< 2,5 V)
	Photos:
	Remove the oscilloscope connection from the test adapter.
Date/Time	
19.6	CE Voltage in Time Domain, Pwr-Return to Structure
	Connect the differential voltage probe "+" input to the PACS-DPU -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 48//50 "satellite structure": …tbd during test…
	Plot 0xx: Measured voltage ripple: u-amb = xxx Vpp
	Photos:
	Remove the oscilloscope connection from the test adapter.

20		**CE Test on PACS-SPU-main Power Lines**
		The measurement shall be done on the the the **PCDU/FPSPU1_ Pwrs SUP/RTN** lines.
20.1		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. WM506565 PacsS_N_L35_I Nominal DC current: I-DCnom = xxx mA
Date/Time		
20.2		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, 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 Plot 0xx: 30 MHz – 50 MHz, CM- NomMode, PACS-SPU -main -PWR

		Comments/Limit exceedings if any
		Photos:
		Remove the current probe.
Date/Time		
20.3		CE Current in Frequency Domain, Differential Mode
		Measure the CM current from 30 Hz to 50 MHz.
	Pass/ Fail	Plot 0xx: 30 Hz – 10 kHz, DM- NomMode, PACS-SPU -main -PWR Plot 0xx: 10 kHz – 1 MHz, DM- NomMode, PACS-SPU -main -PWR Plot 0xx: 1 MHz – 30 MHz, DM- NomMode, PACS-SPU -main -PWR 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
		Measure the DC current and the current ripple with an oscilloscope (BW ≥ 50 MHz).
	Pass/ Fail	Measured Nominal DC current: I-DCnom = xxx mA 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 ?
		Photos:
		Remove the current probe.
Date/Time		
20.5		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.
	For info only	Plot 0xx: Measured voltage ripple: u-amb = xxx Vpp (>/< 2,5 V)
		Photos:
		Remove the oscilloscope connection from the test adapter.

Date/Time	
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 ≥ 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
	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
	Date/Time	
21.2		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, PACS-BOLC -main -PWR Plot 0xx: 10 kHz – 1 MHz, CM- NomMode, PACS-BOLC -main -PWR 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
		Photos:
		Remove the current probe.
Date/Time		
21.3		CE Current in Frequency Domain, Differential Mode
		Measure the CM current from 30 Hz to 50 MHz.
	 **Pass/ Fail**	Plot 0xx: 30 Hz – 10 kHz, DM- NomMode, PACS-BOLC -main -PWR Plot 0xx: 10 kHz – 1 MHz, DM- NomMode, PACS-BOLC -main -PWR Plot 0xx: 1 MHz – 30 MHz, DM- NomMode, PACS-BOLC -main -PWR Plot 0xx: 30 MHz – 50 MHz, DM- NomMode, PACS-BOLC -main -PWR

	Comments/Limit exceedings if any
	Photos:
	Remove the current probe.
Date/Time	
21.4	CE Current in Time Domain, Differential Mode
	Measure the DC current and the current ripple with an oscilloscope (BW ≥ 50 MHz).
Pass/ Fail	Measured Nominal DC current: I-DCnom = xxx mA 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 ?
	Photos:
	Remove the current probe.
Date/Time	
21.5	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.
For info only	Plot 0xx: Measured voltage ripple: u-amb = xxx Vpp (>/< 2,5 V)
	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 ≥ 50 MHz) in adequate time-/amplitude scaling. “return”: DB01-J06 pin 14//18 "satellite structure": …tbd during test…
	Plot 0xx:

	Measured voltage ripple: u-amb = xxx Vpp
	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		<u>NOISIEST Mode</u>
	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
	Date/Time	
22.2		<u>CE Current in Frequency Domain, Common Mode</u>
		Measure the CM current from 30 Hz to 50 MHz.
	 **Pass/ Fail**	Plot 0xx: 30 Hz – 10 kHz, CM-NomMode, PACS- MEC -main -PWR Plot 0xx: 10 kHz – 1 MHz, CM- NomMode, PACS- MEC -main -PWR Plot 0xx: 1 MHz – 30 MHz, CM- NomMode, PACS- MEC -main -PWR Plot 0xx: 30 MHz – 50 MHz, CM- NomMode, PACS- MEC -main -PWR
		Comments/Limit exceedings if any
		Photos:
		Remove the current probe.
Date/Time		
22.3		<u>CE Current in Frequency Domain, Differential Mode</u>
		Measure the CM current from 30 Hz to 50 MHz.
	 **Pass/ Fail**	Plot 0xx: 30 Hz – 10 kHz, DM- NomMode, PACS- MEC -main -PWR Plot 0xx: 10 kHz – 1 MHz, DM- NomMode, PACS- MEC -main -PWR Plot 0xx: 1 MHz – 30 MHz, DM- NomMode, PACS- MEC -main -PWR Plot 0xx: 30 MHz – 50 MHz, DM- NomMode, PACS- MEC -main -PWR
		Comments/Limit exceedings if any
		Photos:
		Remove the current probe.
Date/Time		
22.4		<u>CE Current in Time Domain, Differential Mode</u>
		Measure the DC current and the current ripple with an oscilloscope (BW ≥ 50 MHz).

 **Pass/ Fail**	Measured Nominal DC current: I-DCnom = xxx mA 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 ?
	Photos:
	Remove the current probe.
Date/Time	
22.5	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.
 **For info only**	Plot 0xx: Measured voltage ripple: u-amb = xxx Vpp (>/< 2,5 V)
	Photos:
	Remove the oscilloscope connection from the test adapter.
Date/Time	
22.6	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 ≥ 50 MHz) in adequate time-/amplitude scaling. “return”: DB01-J06 pin 14//18 "satellite structure": …tbd during test…
	Plot 0xx: Measured voltage ripple: u-amb = xxx Vpp
	Photos:
	Remove the oscilloscope connection from the test adapter.

23		**CE Test on CCU-main Power Lines**
		The measurement shall be done on the the the **PCDU/CCU_A_ Pwrs SUP/RTN** lines.
23.1		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. WM106565 Ccu_A_L37_I Nominal DC current: I-DCnom = xxx mA
Date/Time		
23.2		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, CCU-main -PWR Plot 0xx: 10 kHz – 1 MHz, CM- NomMode, CCU -main -PWR Plot 0xx: 1 MHz – 30 MHz, CM- NomMode, CCU -main -PWR Plot 0xx: 30 MHz – 50 MHz, CM- NomMode, CCU -main -PWR
		Comments/Limit exceedings if any
		Photos:
		Remove the current probe.
Date/Time		
23.3		CE Current in Frequency Domain, Differential Mode
		Measure the CM current from 30 Hz to 50 MHz.
	Pass/ Fail	Plot 0xx: 30 Hz – 10 kHz, DM- NomMode, CCU -main -PWR Plot 0xx: 10 kHz – 1 MHz, DM- NomMode, CCU -main -PWR Plot 0xx: 1 MHz – 30 MHz, DM- NomMode, CCU -main -PWR Plot 0xx: 30 MHz – 50 MHz, DM- NomMode, CCU -main -PWR
		Comments/Limit exceedings if any
		Photos:
		Remove the current probe.
Date/Time		
23.4		CE Current in Time Domain, Differential Mode
		Measure the DC current and the current ripple with an oscilloscope (BW ≥ 50 MHz).
	Pass/ Fail	Measured Nominal DC current: I-DCnom = xxx mA 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 ?
		Photos:
		Remove the current probe.
Date/Time		

23.5	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.
For info only	Plot 0xx: Measured voltage ripple: u-amb = xxx Vpp (>/< 2,5 V)
	Photos:
	Remove the oscilloscope connection from the test adapter.
Date/Time	
23.6	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 ≥ 50 MHz) in adequate time-/amplitude scaling. “return”: DB01-J01 pin 19 "satellite structure": …tbd during test…
	Plot 0xx: Measured voltage ripple: u-amb = xxx Vpp
	Photos:
	Remove the oscilloscope connection from the test adapter.

24		**CE Test on TWTA-EPC1 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/Time		
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

	Pass/ Fail	Plot 0xx: 30 MHz – 50 MHz, CM- NomMode, TWTA-EPC1-main -PWR
		Comments/Limit exceedings if any
		Photos:
		Remove the current probe.
Date/Time		
24.3		<u>CE Current in Frequency Domain, Differential Mode</u>
		Measure the CM current from 30 Hz to 50 MHz.
	Pass/ Fail	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 Plot 0xx: 30 MHz – 50 MHz, DM- NomMode, TWTA-EPC1-main -PWR
		Comments/Limit exceedings if any
		Photos:
		Remove the current probe.
Date/Time		
24.4		<u>CE Current in Time Domain, Differential Mode</u>
		Measure the DC current and the current ripple with an oscilloscope (BW ≥ 50 MHz).
	Pass/ Fail	Measured Nominal DC current: I-DCnom = xxx mA 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 ?
		Photos:
		Remove the current probe.
Date/Time		
24.5		<u>CE Voltage in Time Domain Differential Mode</u>
		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.
	For info only	Plot 0xx: Measured voltage ripple: u-amb = xxx Vpp (>/< 2,5 V)
		Photos:

	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 ≥ 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
	Photos:
	Remove the oscilloscope connection from the test adapter.

25		**CE Test on STR1 Power Lines**
		The measurement shall be done on the the the **PCDU/STR1_Pwr SUP/RTN** lines.
25.1		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. WMA08565 STR_1_L21_I Nominal DC current: I-DCnom = xxx mA
Date/Time		
25.2		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, STR1-main -PWR Plot 0xx: 10 kHz – 1 MHz, CM- NomMode, STR1-main -PWR Plot 0xx: 1 MHz – 30 MHz, CM- NomMode, STR1-main -PWR Plot 0xx: 30 MHz – 50 MHz, CM- NomMode, STR1-main -PWR
		Comments/Limit exceedings if any
		Photos:
		Remove the current probe.
Date/Time		
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 Plot 0xx: 10 kHz – 1 MHz, DM- NomMode, STR1-main -PWR

Pass/ Fail	Plot 0xx: 1 MHz – 30 MHz, DM- NomMode, STR1-main -PWR Plot 0xx: 30 MHz – 50 MHz, DM- NomMode, STR1-main -PWR
	Comments/Limit exceedings if any
	Photos:
	Remove the current probe.
Date/Time	
25.4	CE Current in Time Domain, Differential Mode
	Measure the DC current and the current ripple with an oscilloscope (BW ≥ 50 MHz).
Pass/ Fail	Measured Nominal DC current: I-DCnom = xxx mA 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 ?
	Photos:
	Remove the current probe.
Date/Time	
25.5	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.
For info only	Plot 0xx: Measured voltage ripple: u-amb = xxx Vpp (>/< 2,5 V)
	Photos:
	Remove the oscilloscope connection from the test adapter.
Date/Time	
25.6	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 voltage ripple: u-amb = xxx Vpp
	Photos:
	Remove the oscilloscope connection from the test adapter.

8.7 Tests on Satellite Ground Line

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

8.8 Conducted Emission Tests on Signal Lines

Test Step No., Executant		Description/Comments
		CE TEST ON SIGNAL 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.** **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 measure-ments, take care and measures that the shielding path is conductively not inter-rupted!**
27		**CE Test on TC Signal Lines (RWL1)**
		The measurement shall be done on the **Torque_Cmd SUP/RET** 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/Time		
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.
	Pass/ Fail	Plot 0xx: 30 Hz – 10 kHz, CM-NomMode, TC-signal Plot 0xx: 10 kHz – 1 MHz, CM- NomMode, TC-signal 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
		Photos:
		Remove the current probe.

Test Step No., Executant	Description/Comments
Date/Time	
27.3	CE Voltage in Time Domain Differential Mode
	Measure the voltage ripple with an oscilloscope (BW ≥ 50 MHz). The voltage ripple shall be compared to 300 mVpp. This test is *for information only* because no requirement limit exists.
For info only	Plot 0xx: Measured voltage ripple: u-amb = xxx mVpp (>/< 300 mVpp)
	Photos:
	Remove the oscilloscope connection from the test adapter.
28	**CE Test on TDC Signal Lines (RWL1)**
	The measurement shall be done on the **Torque_Direction_Cmd SUP/RET** 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 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/Time	
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 dBµA.
Pass/ Fail	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
	Comments/Limit exceedings if any
	Photos:
	Remove the current probe.
Date/Time	
28.3	CE Voltage in Time Domain Differential Mode
	Measure the voltage ripple with an oscilloscope (BW ≥ 50 MHz). The voltage ripple shall be compared to 300 mVpp. This test is *for information only* because no requirement limit exists.
	Plot 0xx:

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

29		**CE Test on ACC/1553 Signal Lines (MILBUS)**
		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 “MIL1553Rtn_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		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 voltage ripple with an oscilloscope (BW ≥ 50 MHz).
	 **Info**	Plot 0xx: Measured voltage ripple: u-amb = xxx Vpp
		Photos:
		Remove the oscilloscope connection from the test adapter.

8.9 Conducted Susceptibility Tests on Signal Lines

Test Step No., Executant		Description/Comments
		CS TEST ON SIGNAL LINES 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 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!**
30		**CS Test on TC 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/Time		
30.2	**OP/ EMC**	Arrangement of the test equipment: 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 responsibilities. 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 Sattelite/EGSE operational responsibilities.

Test Step No., Executant		Description/Comments
30.3	**OP**	Setup Conditions for TC/TDC 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** 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: 3) Torque-Command” (TC+ (16) to TC-RET (32)) = xxx V 4) Motor-Current-Monitor” (MCM (12) to MCM-RET (32)) = xxx V
30.4		CS testing: 1) Adjust CS test frequency. Set the test voltage Voltage “Torque-Command-Return to Structure” to **2 Vpp** by slowly increasing the induced current I-AC. 2) At the same time monitor the injected current with a spectrum analyser. In any case the injected current shall not exceed **100 mApp (91 dBµA)** even if the 2 Vpp test voltage 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. 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 submitted 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 Sattelite/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

Test Step No., Executant		Description/Comments
		by the EMC team. 7) Fill in the table **Fehler! Verweisquelle konnte nicht gefunden werden.**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]	I-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 max**	**2 Vpp max**	**Xxxx V nom**	**Xxxx V 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

Test Step No., Executant		Description/Comments
31		**CS Test on TDC Signal Lines (RWL1)**
31.1		SENSITIVE Mode
	OP	If not already done, switch into SENSITIVE mode according to chapter 7.1 ''C'' and confirm the mode
Date/Time		
31.2	**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)): Fix current injection and -monitoring devices to MCM/TC_RET (32) and TDC+ (17). Monitor 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 responsibilities. 6) Voltage "Torque-Command" (TC+): The TC command (500) shall be given by the SATELLITE/EGSEoperational responsibilities. 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 SATELLITE/EGSEoperational responsibilities.
31.3	**OP/ EMC**	Setup Conditions for TC/TDC 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** 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)

Test Step No., Executant		Description/Comments
		Actual TLM values: 1) I-inj = 0 mArms 2) TC-RET (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		CS testing: 1) Adjust CS test frequency. Set the test voltage Voltage "Torque-Command-Return to Structure" to **2 Vpp** by slowly increasing the induced current I-AC. 2) At the same time monitor the injected current on both, the MCM-RET line and TDC+ line with an oscilloscope. To avoid overtesting the injected current shall not exceed **tbd** mApp (**tbd** dBµA) even if the 2 Vpp test voltage cannot be reached! The **tbd** mApp limit applies only for the injected frequency. 3) At the same time monitor the current on the TDC+ line alone with a spectrum analyser. In any case the current shall not exceed **100 mApp (91 dBµA)** even if the 2 Vpp test voltage 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: - The RWL shall not exhibit any failures malfunctions or unintended responses when submitted 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. 5) Failure status and MCM voltage shall be monitored prior and during test by SATELLITE/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 **Fehler! Verweisquelle konnte nicht gefunden werden.**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:

Test Step No., Executant	Description/Comments
	Photos:

Time	f [kHz]	I-inj, TC-RET and 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	**xxx App max**	**91 dBµA max**	**2 Vpp max**	**Xxxx V nom**	**Xxxx V 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 8-2: 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.

9 SUMMARY SHEETS

9.1 Procedure Variation Summary

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

Table 9-1: Procedure Variation Sheet

9.2 Non Conformance Report (NCR) Summary

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

Table 9-2: Non- Conformance Record Sheet

9.3 Sign-off Sheet

	Date	Signature
Test Manager		
Operator		
PA Responsible		
ESA Representative		

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

	Name	Dep./Comp.		Name	Dep./Comp.
	Alberti von Mathias Dr.	ASG23		Schmidt Thomas	AED15
	Baldock Richard	FAE12		Schweickert Gunn	ASG23
	Barlage Bernhard	AED13	X	Sonn Nico	ASG51
	Bayer Thomas	ASA42		Steininger Eric	AED32
	Brune Holger	ASA45	X	Stritter Rene	AED11
	Edelhoff Dirk	AED2		Suess Rudi	OTN/ASA44
	Fehringer Alexander	ASG13	X	Theunissen Martijn	DSSA
X	Fricke Wolfgang Dr.	AED 65	X	Vascotto Riccardo	HE Space
	Geiger Hermann	ASA42		Wagner Klaus	ASG23
	Grasl Andreas	OTN/ASA44	X	Wietbrock Walter	AET12
	Grasshoff Brigitte	AET12		Wöhler Hans	ASG23
X	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			
X	Hohn Rüdiger	AED65			
	Hölzle Edgar Dr.	AED32			
X	Hopfgarten Michael	AED32			
	Huber Johann	ASA42			
	Hund Walter	ASE252			
X	Idler Siegmund	AED312			
	Ivády von András	FAE12			
	Jahn Gerd Dr.	ASG23			
X	Kalde Clemens	ASM2	X	ESA/ESTEC	ESA
	Kettner Bernhard	AET42	X	Thales Alenia Space Cannes	TAS-F
	Klenke Uwe	ASG72	X	Thales Alenia Space Torino	TAS-I
	Knoblauch August	AET32			
X	Koelle Markus	ASA43		**Instruments:**	
X	Koppe Axel	AED312	X	MPE (PACS)	MPE
X	Kroeker Jürgen	AED65	X	RAL (SPIRE)	RAL
X	La Gioia Valentina	Terma	X	SRON (HIFI)	SRON
	Lang Jürgen	ASE252			
	Langenstein Rolf	AED15			
	Langfermann Michael	ASA41		**Subcontractors:**	
	Martin Olivier	ASA43		Austrian Aerospace	AAE
X	Maukisch Jan	ASA43		Austrian Aerospace	AAEM
X	Much Christoph	ASA43		BOC Edwards	BOCE
	Müller Jörg	ASA42		Dutch Space Solar Arrays	DSSA
X	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
X	Schink Dietmar	AED32		Thales Alenia Space, Antwerp	TAS-ETCA