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13 April 2018

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Prüfbericht / Test Report

Nr. / No. TR-70464-22758-02 (Edition 1)

Auftraggeber <i>Applicant</i>	Weatherdock AG
Geräteart <i>Type of equipment</i>	AIS Class B SO System
Typenbezeichnung <i>Type designation</i>	GARMIN AIS 800 / easyTRX3
Seriennummer / <i>Serial number</i>	See list of devices under test
Auftragsnummer / <i>Order No.</i>	5444
Prüfgrundlage <i>Test standards</i>	IEC 60945:2002 + Corr. 1:2008, Sections 9 and 10



Summary

Prüfergebnisse / <i>Test Results</i>		Auftragsnummer / <i>Order No.</i> 5444				
Die Prüfungen wurden nach folgenden Vorschriften durchgeführt: <i>Tests were performed according to:</i> IEC 60945:2002 + Corr. 1:2008, Sections 9 and 10						
Durchgeführte Prüfung <i>Test performed</i>	Prüfergebnis <i>Test result</i>					
	Erfüllt <i>Passed</i>	Nicht erfüllt <i>Not Passed</i>	Nicht zutreffend <i>Not applicable</i>	Nicht durchgeführt <i>Not performed</i>	Kriterium <i>Criterion</i>	
Leitungsgebundene Störungen / <i>Conducted emissions</i>	☒	☐	☐	☐		
Gehäusestörstrahlung / <i>Radiated emissions from enclosure port</i>	☒	☐	☐	☐		
Hochfrequenz-Störungen / <i>Conducted radio frequency disturbance</i>	☒	☐	☐	☐	A	
Störeinstrahlungen / <i>Radiated disturbance</i>	☒	☐	☐	☐	A	
Schnelle Impulsstörung / <i>Fast transients (bursts)</i>	☒	☐	☐	☐	B	
Langsame Impulsstörung / <i>Slow transients (surges)</i>	☐	☐	☒	☐	B	
Kurzzeitige Schwankungen der Stromversorgung / <i>Power supply short term variation</i>	☐	☐	☒	☐	B	
Ausfall der Stromversorgung / <i>Power supply failure</i>	☒	☐	☐	☐	C	
Elektrostatische Entladung / <i>Electrostatic discharge</i>	☒	☐	☐	☐	B	

Bemerkungen / Remarks:

Die Prüfergebnisse beziehen sich ausschließlich auf das zur Prüfung vorgestellte Prüfmuster. Ohne schriftliche Genehmigung des Prüflabors darf der Prüfbericht auszugsweise nicht vervielfältigt werden. *The test results relate only to the individual item which has been tested. Without the written approval of the test laboratory this report may not be reproduced in extracts.*

Datum / Date	Geprüft von / Tested by	Freigabe durch / Checked by	Prüfergebnis / Test Result
2018-04-13	<i>Skinell Martin</i> Martin Steindl Responsible for testing	<i>Markus Biberger</i> Markus Biberger Reviewer	
			☒ Erfüllt / Passed
			☐ Nicht erfüllt / Not passed

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1 Administrative Data

Application details

Applicant:	Weatherdock AG Emmericher Straße 17 90411 Nürnberg Germany
Contact person:	Mr. Wolfgang Werner
Order number:	5444
Receipt of EUT:	See list of devices under test
Return of EUT:	See list of devices under test
Date(s) of test:	See list of devices under test
Note(s):	Mr. Werner and Mr. Pirkelmann, representing the applicant, attended all tests.
Responsible for testing:	Mr. Martin Steindl
Responsible for test report:	Mr. Martin Steindl
Test report checked by:	Mr. Markus Bibberger

Report details

Report number:	TR-70464-22758-02
Edition:	1
Issue date:	2018-04-13

2 Details about the Test Laboratory

Details about the Test Laboratory	
Company name:	TÜV SÜD Product Service GmbH
Address:	Äußere Frühlingstraße 45 D-94315 Straubing Germany
Laboratory accreditation:	DAkkS Registration No. D-PL-11321-11-02
Contact:	Mr. Markus Biberger
	Phone: +49 9421 5522-0 Fax: +49 9421 5522-99

3 Description of the Equipment Under Test

Equipment characteristics	
Type designation:	GARMIN AIS 800 / easyTRX3
Parts of the system:	
Options and accessories:	
Type of equipment:	AIS Class B SO System
Serial number:	See list of devices under test
Manufacturer:	Weatherdock AG
Power supply:	External DC supply Nominal: 24.0 V Minimum: 9.6 V Maximum: 31.2 V
Highest internal frequency:	117 MHz
Version of EUT:	See list of devices under test

List of devices under test					
No.	Type designation	Serial number	Version	Receipt of EUT	Return of EUT
1	AIS 800	000000002	According to do documentation of applicant.	2018-01-18	2018-01-19
2	AIS 800	000000002	According to do documentation of applicant.	2018-02-22	2018-02-23
3	AIS 800	000000002	According to do documentation of applicant.	2018-03-13	2018-03-13
4	AIS 800	000000002	According to do documentation of applicant.	2018-03-14	2018-03-14

Marking Plate



4 Operation Mode and Configuration of EUT

Operation Mode(s)

Standard receive-/standby-function

List of ports and cables

No.	Description	Classification ¹	Cable type	Cable length used	maximum ²
S1	DC-Power with NMEA I/O	signal/control port with dc power	Unshielded	10 m	
S2	NMEA 2000	signal/control port	Unshielded	2 m	
S3	ANT	signal/control port	Shielded	5 m	
S4	VHF	signal/control port	Shielded	5 m	
S5	GPS	signal/control port	Shielded	2 m	
S6	USB	signal/control port	Shielded	15 m	

List of devices connected to EUT

No.	Description	Type designation	Serial no. or ID	Manufacturer
1	Laptop PC	N/A	N/A	N/A
2	GPS antenna	N/A	N/A	N/A

List of support devices

No.	Description	Type designation	Serial no. or ID	Manufacturer

¹ Ports shall be classified as ac power, dc power or signal/control port.

² As specified by applicant

5 Performance Criteria and Methods of Observation

Definition of General Performance Criteria	
Referenced Standard:	IEC 60945:2002 + Corr. 1:2008, section 10.1
<i>Performance criterion</i>	<i>Specification</i>
A	The EUT shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed, as defined in the relevant equipment standard and in the technical specification published by the manufacturer
B	the EUT shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed, as defined in the relevant equipment standard and in the technical specification published by the manufacturer. During the test, degradation or loss of function or performance which is self-recoverable is however, allowed, but no change of actual operating state or stored data is allowed.
C	temporary degradation or loss of function or performance is allowed during the test, provided the function is self-recoverable, or can be restored at the end of the test by the operation of the controls, as defined in the relevant equipment standard and in the technical specification published by the manufacturer.

Methods of Observation			
<i>Function</i>	<i>Observed size</i>	<i>Permissible range</i>	<i>Observation method</i>
Receiving mode	Output data	No unintentional changes of data	Visual observation of test software on laptop PC

6 Annotations to Performed Tests

6.1 Conducted emission tests

In general conducted emission tests in the frequency range 10 kHz - 30 MHz are required to be performed with quasi-peak and average detector. To simplify testing the following procedure is used:
First the whole spectrum of emission caused by equipment under test (EUT) is recorded with detector set to peak. After that all emission levels having less margin than 20 dB to or exceeding the appropriate limit (in general average limit is 10 dB lower than quasi-peak limit) are retested with detector set to quasi-peak. If average limit is kept no additional scan with average detector is necessary. In cases of emission levels between quasi-peak and average limit an additional scan with detector set to average has to be recorded.

6.2 Radiated emission tests

Radiated emission tests in the frequency range 30 - 2000 MHz are performed in a semi-anechoic room with groundplane at the required test distance (maximum 10 metres):
First a peak scan is performed in four positions to get the whole spectrum of emission caused by EUT with the measuring antenna raised and lowered from 1 to 4 m to find table position, antenna height and antenna polarisation for the maximum emission levels.
Data reduction is applied to these results to select those levels having less margin than 10 dB to or exceeding the limit using subranges and limited number of maximums. Further maximization is following.
With detector of the test receiver set to quasi-peak final measurements are performed immediately after frequency zoom (for drifting disturbances) and maximum adjustment.

7 Referenced Regulations

<i>European publication</i>	<i>International publication</i>	<i>Title</i>
EN 55016-1-1:2010 + A1:2010	CISPR 16-1-1:2010 + A1:2010 CISPR 16-1-1:2010 Edition 3.1	Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-1: Radio disturbance and immunity measuring apparatus - Measuring apparatus
EN 55016-1-2:2014	CISPR 16-1-2:2014 Edition 2.0	Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-2: Radio disturbance and immunity measuring apparatus - Ancillary equipment - Conducted disturbances
EN 55016-1-4:2010	CISPR 16-1-4:2010 Edition 3.0 + Corrigendum:2010	Specification for radio disturbance and immunity measuring apparatus and methods - Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-4: Radio disturbance and immunity measuring apparatus - Ancillary equipment - Radiated disturbances
EN 55016-2-1:2014	CISPR 16-2-1:2014 Edition 3.0	Specification for radio disturbance and immunity measuring apparatus and methods - Part 2-1: Methods of measurement of disturbances and immunity - Conducted disturbance measurements
EN 55016-2-3:2010 + A1:2010 + A2:2014	CISPR 16-2-3:2010 + A1:2010 + A2:2014 Edition 3.2	Specification for radio disturbance and immunity measuring apparatus and methods - Part 2-3: Methods of measurement of disturbances and immunity - Radiated disturbance measurements
EN 60945:2002	IEC 60945:2002	Maritime navigation and radiocommunication equipment and systems - General requirements - Methods of testing and required test results
EN 61000-4-2:1995 + A1:1998 + A2:2001	IEC 61000-4-2:1995 + A1:1998 + A2:2000	Electromagnetic compatibility (EMC) Part 4-2: Testing and measuring techniques - Electrostatic discharge immunity test
EN 61000-4-3:1996 + A1:1998 + A2:2001	IEC 61000-4-3:1995 + A1:1998 + A2:2000	Electromagnetic compatibility (EMC) Part 4-3: Testing and measuring techniques - Radiated, radio-frequency electromagnetic field immunity test
EN 61000-4-4:1995 + A1:2001 + A2:2001	IEC 61000-4-4:1995 + A1:2000 + A2:2001	Electromagnetic compatibility (EMC) Part 4-4: Testing and measuring techniques - Electrical fast transient/burst immunity test
EN 61000-4-6:1996 + A1:2001	IEC 61000-4-6:1996 + A1:2000	Electromagnetic compatibility (EMC) Part 4-6: Testing and measuring techniques - Conducted disturbances induced by radio-frequency fields immunity test
EN 61000-4-11:1994 + A1:2001	IEC 61000-4-11:1994 + A1:2001	Electromagnetic compatibility (EMC) Part 4-11: Testing and measuring techniques - Voltage dips, short interruptions and voltage variations immunity tests

8 Measurement Uncertainty Values

Radio Interference Emission Testing			
Test	k_p	Expanded Uncertainty	Note
Conducted Voltage Emission			
9 kHz to 150 kHz (50Ω/50μH AMN)	2	± 3.8 dB	1
150 kHz to 30 MHz (50Ω/50μH AMN)	2	± 3.4 dB	1
100 kHz to 200 MHz (50Ω/5μH AMN)	2	± 3.6 dB	1
150 kHz to 30 MHz (Voltage Probe)	2	± 2.9 dB	1
150 kHz to 30 MHz (AAN)	2	± 4.2 dB	1
Discontinuous Conducted Emission			
9 kHz to 150 kHz (50Ω/50μH AMN)	2	± 3.8 dB	1
150 kHz to 30 MHz (50Ω/50μH AMN)	2	± 3.4 dB	1
Conducted Current Emission			
9 kHz to 30 MHz	2	± 2.9 dB	1
Magnetic Fieldstrength			
9 kHz to 30 MHz (with loop antenna)	2	± 3.9 dB	1
9 kHz to 30 MHz (large-loop antenna 2 m)	2	± 3.5 dB	1
Radiated Emission			
Test distance 1 m (ALSE)			
9 kHz to 150 kHz	2	± 4.6 dB	1
150 kHz to 30 MHz	2	± 4.1 dB	1
30 MHz to 200 MHz	2	± 5.2 dB	1
200 MHz to 2 GHz	2	± 4.4 dB	1
2 GHz to 3 GHz	2	± 4.6 dB	1
Test distance 3 m			
30 MHz to 200 MHz	2	± 4.9 dB	1
200 MHz to 1 GHz	2	± 5.1 dB	1
1 GHz to 6 GHz	2	± 4.6 dB	1
Test distance 10 m			
30 MHz to 200 MHz	2	± 4.9 dB	1
200 MHz to 1 GHz	2	± 4.9 dB	1

Radio Interference Emission Testing (continued)

Test	k_p	Expanded Uncertainty	Note
Radio Interference Power			
30 MHz to 300 MHz	2	± 3.7 dB	1
Harmonic Current Emissions			4
Voltage Changes, Voltage Fluctuations and Flicker			4

Immunity Testing

Test	k_p	Expanded Uncertainty	Note
Electrostatic Discharges			4
Radiated RF-Field			
Pre-calibrated field level	2	+32.2 / -24.3 %	5
Dynamic feedback field level	2.05	+21.2 / -17.5 %	3
Electrical Fast Transients (EFT) / Bursts			4
Surges			4
Conducted Disturbances, induced by RF-Fields			
via CDN	2	+15.1 / -13.1 %	6
via EM clamp	2	+42.6 / -29.9 %	6
via current clamp	2	+43.9 / -30.5 %	6
Power Frequency Magnetic Field	2	+20.7 / -17.1 %	2
Pulse Magnetic Field			4
Voltage Dips, Short Interruptions and Voltage Variations			4
Oscillatory Waves			4
Conducted Low Frequency Disturbances			
Voltage setting	2	± 0.9 %	2
Frequency setting	2	± 0.1 %	2
Electrical Transient Transmission in Road Vehicles			4

Note 1:

The expanded uncertainty reported according to CISPR 16-4-2:2011 + A1:2014 is based on a standard uncertainty multiplied by a coverage factor of $k_p = 2$, providing a level of confidence of $p = 95.45\%$

Note 2:

The expanded uncertainty reported according to UKAS Lab 34 (Edition 1, 2002-08) is based on a standard uncertainty multiplied by a coverage factor of $k_p = 2$, providing a level of confidence of $p = 95.45\%$

Note 3:

The expanded uncertainty reported according to UKAS Lab 34 (Edition 1, 2002-08) is based on a standard uncertainty multiplied by a coverage factor of $k_p = 2.05$, providing a level of confidence of $p = 95.45\%$

Note 4:

It has been demonstrated that the used test equipment meets the specified requirements in the standard with at least a 95% confidence.

Note 5:

The expanded uncertainty reported according to IEC 61000-4-3 is based on a standard uncertainty multiplied by a coverage factor of $k_p = 2$, providing a level of confidence of $p = 95.45\%$

Note 6:

The expanded uncertainty reported according to IEC 61000-4-6 is based on a standard uncertainty multiplied by a coverage factor of $k_p = 2$, providing a level of confidence of $p = 95.45\%$

9 Test Results

Emission Tests

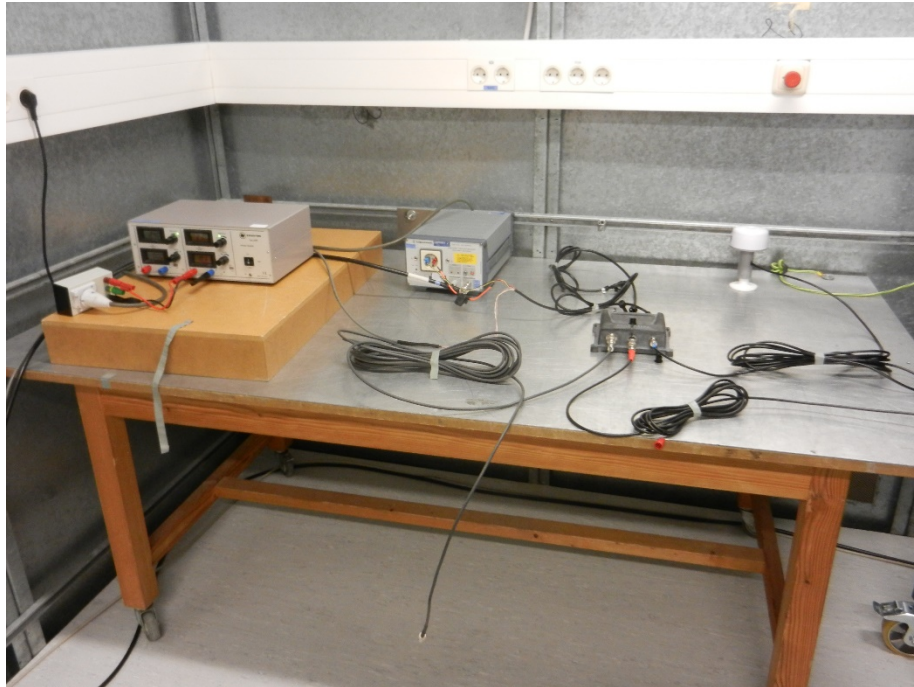
IEC 60945:2002 + Corr. 1:2008				
Section(s)	Test performed	Basic standard	Page	Test Result
9.2	Conducted emissions	CISPR 16-1-2	18	Test passed
9.3	Radiated emissions	CISPR 16-1-4	26	Test passed

Immunity Tests

IEC 60945:2002 + Corr. 1:2008				
Section(s)	Test performed	Basic standard	Page	Test Result
10.3	Conducted radio frequency disturbance	IEC 61000-4-6	43	Test passed
10.4	Radiated disturbance	IEC 61000-4-3	37	Test passed
10.5	Fast transients (bursts)	IEC 61000-4-4	40	Test passed
10.6	Slow transients (surges)	IEC 61000-4-5	---	Not applicable
10.7	Power supply short term variations	IEC 61000-4-11	---	Not applicable
10.8	Power supply failure	IEC 61000-4-11	48	Test passed
10.9	Electrostatic discharge	IEC 61000-4-2	32	Test passed

9.1 Interference Voltage Test

9.1.1 Test Setup



9.1.2 Test Equipment List

Type	Designation	Inv.-no.	Serial No. or ID	Manufacturer
☐ Test receiver	ESHS 10	1028	860043/016	Rohde & Schwarz
☐ EMI test receiver	ESPI7	1711	836914/0002	Rohde & Schwarz
☐ EMI test receiver Cabin no. 3	ESPI7	2010	101018	Rohde & Schwarz
☒ EMI test receiver	ESCI3	1863	100008	Rohde & Schwarz
☐ EMI test receiver	ESR7	22643	101108	Rohde & Schwarz
☐ EMI test receiver	ESU8	2044	100232	Rohde & Schwarz
☐ Preamplifier	CPA9231A	1651	3393	Schaffner
☐ Digital oscilloscope	WaveJet 314	1963	LCRY0101J23209	LeCroy
☐ Digital oscilloscope	Wave Surfer 452	1796	LCRY0301J11938	LeCroy
☐ Digital oscilloscope	WaveRunner 104Xi-A	2075	LCRY0617N51108	LeCroy
☐ V-network	ESH 3-Z5	1060	862770/021	Rohde & Schwarz
☐ V-network	ESH 3-Z5	1059	894785/005	Rohde & Schwarz
☒ V-network	ESH 3-Z5	1218	830952/025	Rohde & Schwarz
☐ V-network	ESH 3-Z6	1594	825993/027	Rohde & Schwarz
☐ V-network	ESH 3-Z6	1220	830722/010	Rohde & Schwarz
☐ Artificial mains network	ESH 2-Z5	1536	842966/004	Rohde & Schwarz
☐ 4 line V-network	ENV4200	2128	100146	Rohde & Schwarz
☐ Pulse limiter	ESH3-Z2	1144	---	Rohde & Schwarz
☐ 4-wire ISN	ENY 41	1652	836077/003	Rohde & Schwarz
☐ 2-wire ISN	ENY 22	1813	100150	Rohde & Schwarz
☐ Impedance stabization network	ISN T800	2080	28597	Teseq
☐ Current probe	EZ-17	1606	830633/010	Rohde & Schwarz
☐ Current probe	EZ-17	2403	100970	Rohde & Schwarz
☐ High impedance probe	TK 9416	1106	---	Schwarzbeck
☐ Shielded room	No. 1	1451	---	Albatross
☐ Fully anechoic room	No. 2	1452	---	Albatross
☐ Semi anechoic room	No. 3	1453	---	Siemens
☒ Shielded room	No. 4	1454	3FD 100 544	Euroshield
☐ Fully anechoic room	No. 6	1865	---	Albatross
☐ Shielded room	No. 7	1866	---	Albatross
☐ Shielded room	No. 9	21083	---	Albatross

9.1.3 Test Results

Results for interference voltage test are documented as listed below.

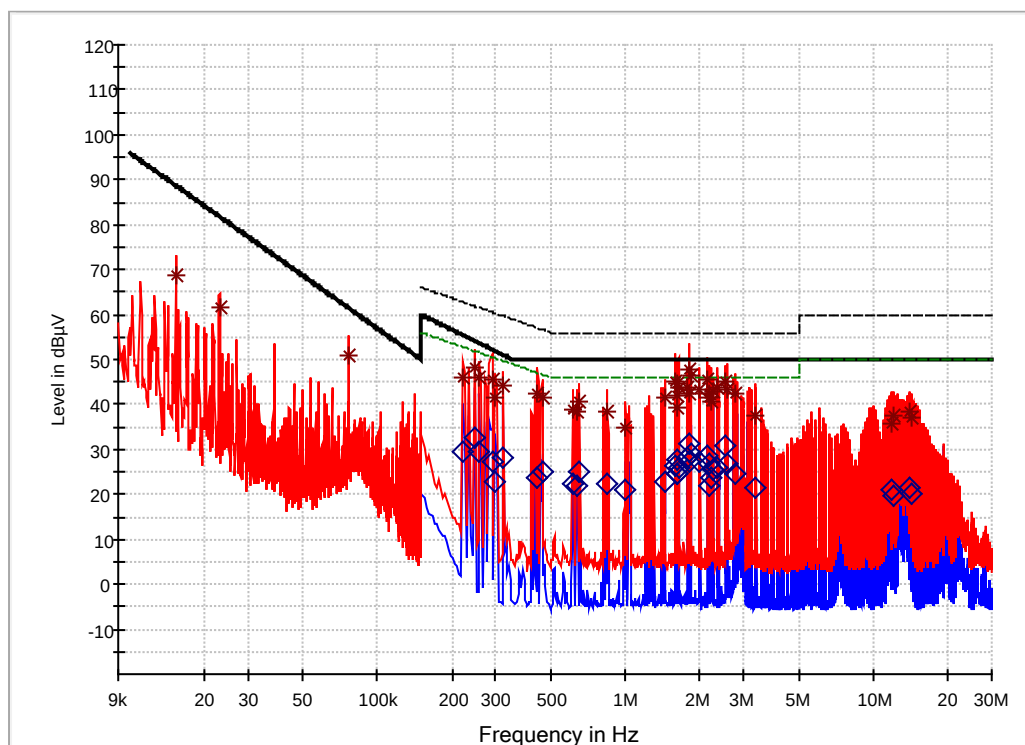
Interference Voltage Test 10 kHz - 30 MHz

Prüfdatum / Date of test:	2018-02-23
Prüfer / Operator:	Martin Steindl
Messplatz / Test site:	Shielded room, cabin no. 4

Prüfergebnis / Test Result	
☒	Erfüllt / Passed
☐	Nicht erfüllt / Not passed

Prüfgrundlage / Specifications:	IEC 60945:2002 + Corr. 1:2008, section 9.2
Basisnorm / Basic standard:	CISPR 16-1-4
Prüfling / Test sample:	EUT No. 2, as described in table of devices unter test
Betriebsart / Operation mode:	Receiving / Standby
Kommentar / Comment:	

Messbezug / Tested on:	Power line, plus
------------------------	------------------



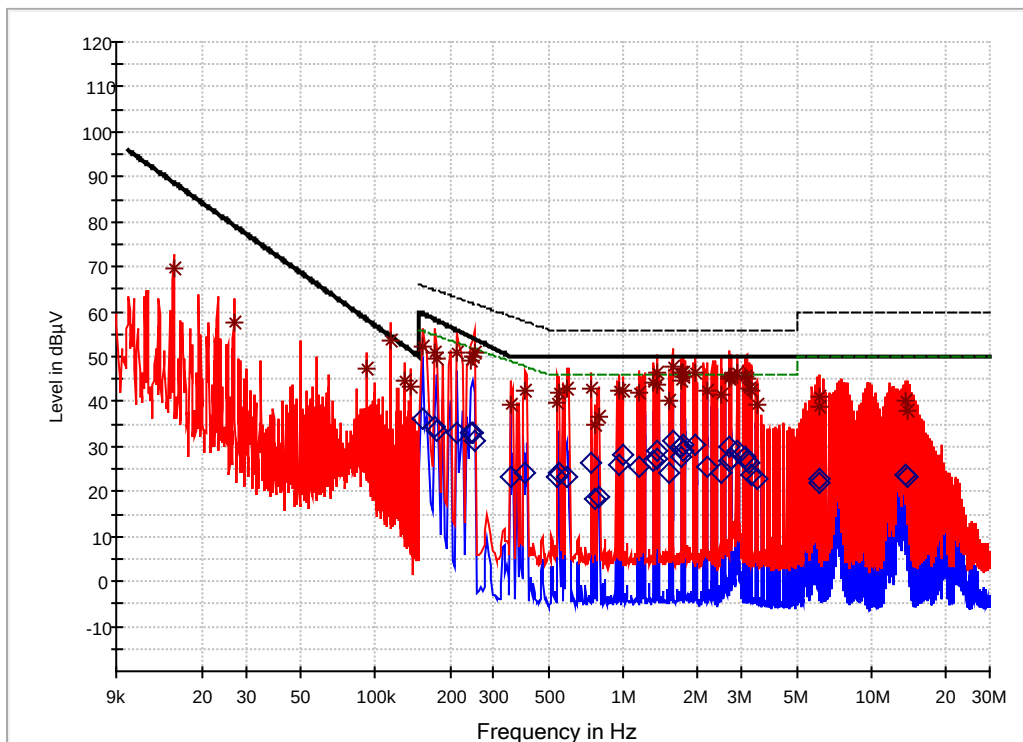
- Preview Result 2-AVG
- Preview Result 1-PK+
- EN 60945 Conducted emission QP
- EN 55032 Class B Conducted Voltage on mains ports QP
- EN 55032 Class B Conducted Voltage on mains ports AV
- * Final_Result QPK
- ◇ Final_Result AVG

Frequency MHz	QuasiPeak dBµV	Average dBµV	Limit dBµV	Margin dB	Meas. Time ms	Bandwidth kHz	Corr. dB
0.015400	68.75		88.67	19.92	1000	0.2	0.0
0.023080	61.56		81.79	20.23	1000	0.2	0.0
0.076840	50.78		61.36	10.58	1000	0.2	0.0
0.222000		29.34			1000	9	0.0
0.222000	45.85		55.37	9.52	1000	9	0.0
0.246000		32.58			1000	9	0.0
0.246000	48.23		54.16	5.93	1000	9	0.0
0.258000		29.66			1000	9	0.0
0.258000	46.19		53.60	7.41	1000	9	0.0
0.290000		27.13			1000	9	0.0
0.290000	45.51		52.22	6.71	1000	9	0.0
0.298000		22.78			1000	9	0.0
0.298000	41.34		51.90	10.56	1000	9	0.0
0.322000		28.04			1000	9	0.0
0.322000	44.17		50.98	6.81	1000	9	0.0
0.442000		23.76			1000	9	0.0
0.442000	42.47		50.00	7.53	1000	9	0.0
0.462000		25.17			1000	9	0.0
0.462000	41.72		50.00	8.28	1000	9	0.0
0.614000		22.52			1000	9	0.0
0.614000	39.07		50.00	10.93	1000	9	0.0
0.634000		21.99			1000	9	0.0
0.634000	38.48		50.00	11.52	1000	9	0.0
0.654000		25.05			1000	9	0.1
0.654000	40.69		50.00	9.31	1000	9	0.1
0.846000		22.43			1000	9	0.1
0.846000	38.47		50.00	11.53	1000	9	0.1
1.002000		21.24			1000	9	0.1
1.002000	34.79		50.00	15.21	1000	9	0.1
1.438000		22.96			1000	9	0.1
1.438000	41.46		50.00	8.54	1000	9	0.1
1.594000		26.25			1000	9	0.1
1.594000	44.92		50.00	5.08	1000	9	0.1
1.602000		24.46			1000	9	0.1
1.602000	41.76		50.00	8.24	1000	9	0.1
1.618000		24.64			1000	9	0.1
1.618000	39.29		50.00	10.71	1000	9	0.1
1.626000		27.70			1000	9	0.1
1.626000	44.79		50.00	5.21	1000	9	0.1
1.634000		25.84			1000	9	0.1
1.634000	43.71		50.00	6.29	1000	9	0.1
1.786000		27.94			1000	9	0.1
1.786000	43.85		50.00	6.15	1000	9	0.1
1.798000		27.04			1000	9	0.1
1.798000	42.47		50.00	7.53	1000	9	0.1
1.806000		31.32			1000	9	0.1
1.806000	47.77		50.00	2.23	1000	9	0.1
1.826000		29.09			1000	9	0.1
1.826000	46.44		50.00	3.56	1000	9	0.1
1.982000		27.05			1000	9	0.1
1.982000	43.35		50.00	6.65	1000	9	0.1
2.150000		28.67			1000	9	0.1
2.150000	45.32		50.00	4.68	1000	9	0.1
2.186000		21.93			1000	9	0.1
2.186000	41.70		50.00	8.30	1000	9	0.1
2.190000		27.00			1000	9	0.1
2.190000	42.51		50.00	7.49	1000	9	0.1
2.226000		23.69			1000	9	0.1

Frequency MHz	QuasiPeak dBμV	Average dBμV	Limit dBμV	Margin dB	Meas. Time ms	Bandwidth kHz	Corr. dB
2.226000	40.77		50.00	9.23	1000	9	0.1
2.250000		25.38			1000	9	0.1
2.250000	42.83		50.00	7.17	1000	9	0.1
2.358000		25.96			1000	9	0.1
2.358000	43.91		50.00	6.09	1000	9	0.1
2.534000		31.01			1000	9	0.1
2.534000	45.04		50.00	4.96	1000	9	0.1
2.574000		26.63			1000	9	0.1
2.574000	43.37		50.00	6.63	1000	9	0.1
2.782000		24.61			1000	9	0.1
2.782000	42.29		50.00	7.71	1000	9	0.1
3.314000		21.29			1000	9	0.1
3.314000	37.63		50.00	12.37	1000	9	0.1
11.938000		20.97			1000	9	0.2
11.938000	35.61		50.00	14.39	1000	9	0.2
12.038000		19.52			1000	9	0.2
12.038000	37.31		50.00	12.69	1000	9	0.2
13.998000		21.45			1000	9	0.2
13.998000	38.47		50.00	11.53	1000	9	0.2
14.210000		20.14			1000	9	0.2
14.210000	37.16		50.00	12.84	1000	9	0.2

Messbezug / Tested on:

Power line, minus



- Preview Result 2-AVG
- Preview Result 1-PK+
- EN 60945 Conducted emission QP
- EN 55032 Class B Conducted Voltage on mains ports QP
- EN 55032 Class B Conducted Voltage on mains ports AV
- * Final_Result QPK
- ◇ Final_Result AVG

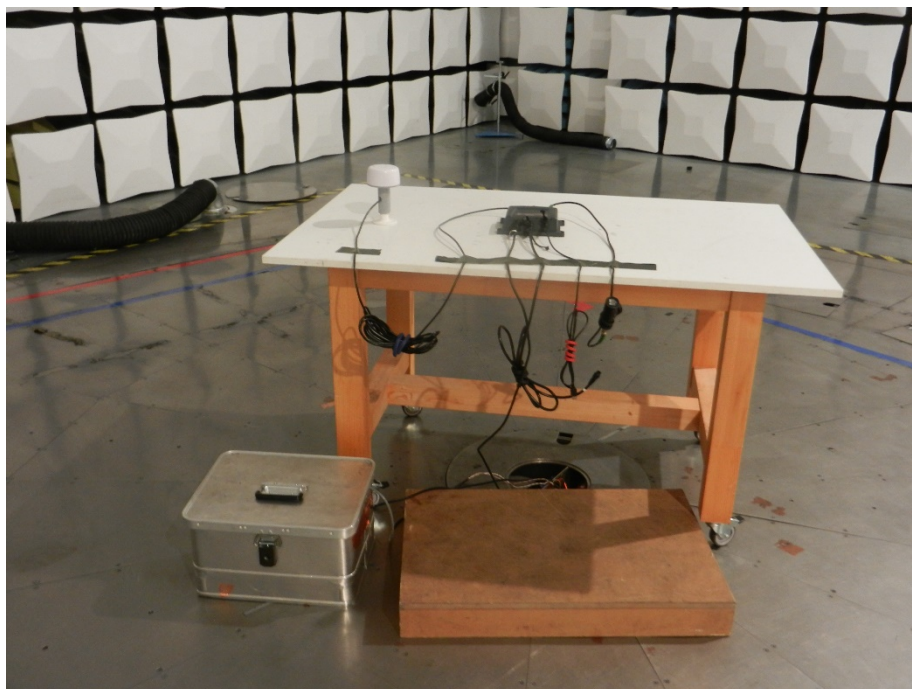
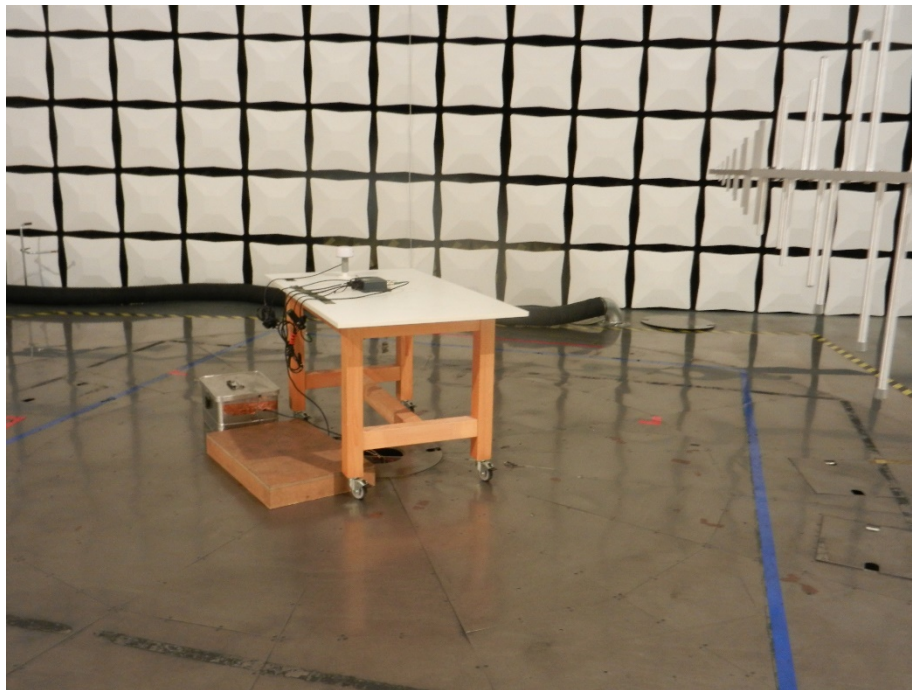
Frequency MHz	QuasiPeak dBµV	Average dBµV	Limit dBµV	Margin dB	Meas. Time ms	Bandwidth kHz	Corr. dB
0.015320	69.56		88.75	19.19	1000	0.2	0.0
0.026920	57.49		79.18	21.69	1000	0.2	0.0
0.092200	47.14		58.27	11.13	1000	0.2	0.0
0.115240	53.59		54.48	0.89	1000	0.2	0.0
0.130600	44.57		52.35	7.78	1000	0.2	0.0
0.138200	43.50		51.39	7.89	1000	0.2	0.0
0.154000		36.35			1000	9	0.0
0.154000	52.04		59.69	7.65	1000	9	0.0
0.174000		34.38			1000	9	0.0
0.174000	51.00		58.25	7.25	1000	9	0.0
0.178000		33.65			1000	9	0.0
0.178000	49.35		57.98	8.63	1000	9	0.0
0.214000		33.07			1000	9	0.0
0.214000	50.73		55.81	5.08	1000	9	0.0
0.242000		33.10			1000	9	0.0
0.242000	48.91		54.36	5.45	1000	9	0.0
0.246000		32.85			1000	9	0.0
0.246000	49.94		54.16	4.22	1000	9	0.0
0.250000		31.21			1000	9	0.0
0.250000	50.70		53.97	3.27	1000	9	0.0
0.350000		23.32			1000	9	0.0

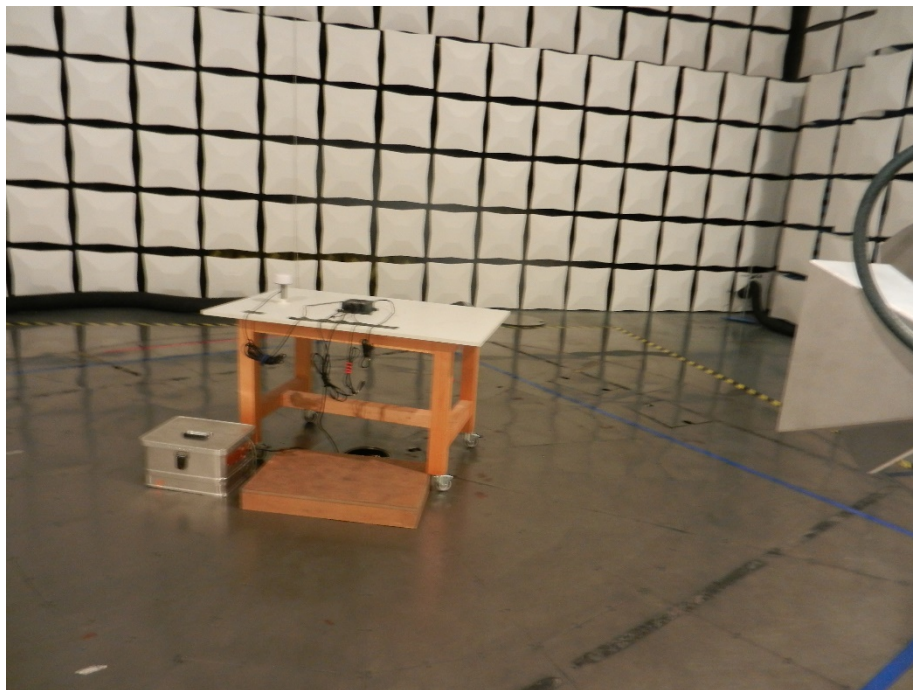
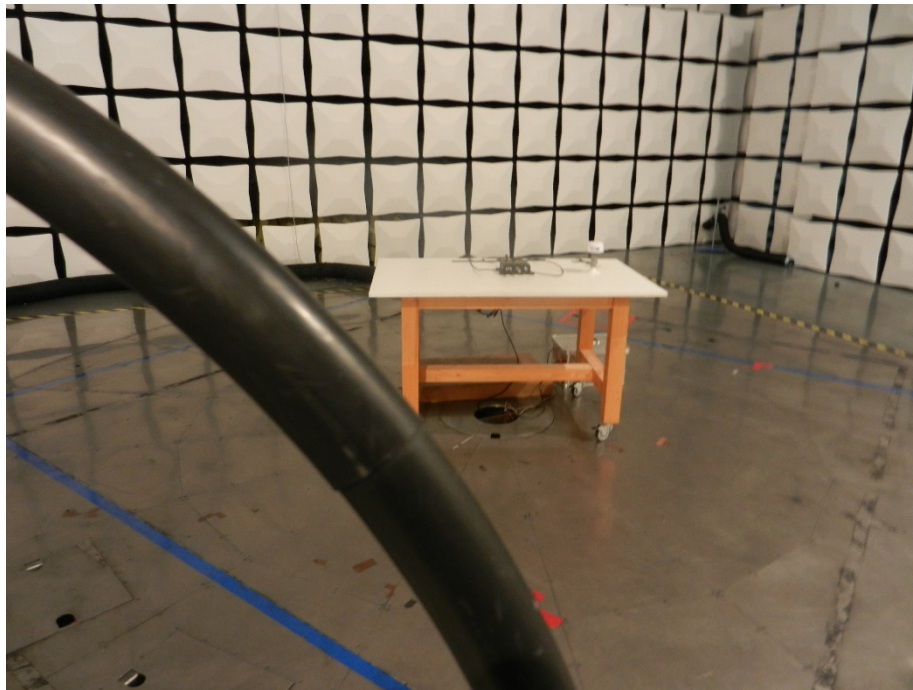
Frequency MHz	QuasiPeak dBµV	Average dBµV	Limit dBµV	Margin dB	Meas. Time ms	Bandwidth kHz	Corr. dB
0.350000	39.08		50.00	10.92	1000	9	0.0
0.402000		24.21			1000	9	0.0
0.402000	42.25		50.00	7.75	1000	9	0.0
0.542000		23.15			1000	9	0.0
0.542000	39.90		50.00	10.10	1000	9	0.0
0.554000		24.19			1000	9	0.0
0.554000	41.89		50.00	8.11	1000	9	0.0
0.594000		23.35			1000	9	0.0
0.594000	42.76		50.00	7.24	1000	9	0.0
0.746000		26.24			1000	9	0.1
0.746000	43.03		50.00	6.97	1000	9	0.1
0.762000		18.20			1000	9	0.1
0.762000	34.99		50.00	15.01	1000	9	0.1
0.794000		18.97			1000	9	0.1
0.794000	36.69		50.00	13.31	1000	9	0.1
0.958000		25.80			1000	9	0.1
0.958000	42.20		50.00	7.80	1000	9	0.1
0.998000		28.25			1000	9	0.1
0.998000	42.25		50.00	7.75	1000	9	0.1
1.154000		25.30			1000	9	0.1
1.154000	41.76		50.00	8.24	1000	9	0.1
1.326000		26.60			1000	9	0.1
1.326000	44.26		50.00	5.74	1000	9	0.1
1.362000		28.89			1000	9	0.1
1.362000	46.53		50.00	3.47	1000	9	0.1
1.370000		27.43			1000	9	0.1
1.370000	43.92		50.00	6.08	1000	9	0.1
1.542000		24.04			1000	9	0.1
1.542000	40.11		50.00	9.89	1000	9	0.1
1.574000		31.38			1000	9	0.1
1.574000	47.91		50.00	2.09	1000	9	0.1
1.714000		29.86			1000	9	0.1
1.714000	46.23		50.00	3.77	1000	9	0.1
1.718000		27.61			1000	9	0.1
1.718000	44.61		50.00	5.39	1000	9	0.1
1.726000		28.85			1000	9	0.1
1.726000	45.36		50.00	4.64	1000	9	0.1
1.750000		30.47			1000	9	0.1
1.750000	46.63		50.00	3.37	1000	9	0.1
1.958000		30.55			1000	9	0.1
1.958000	46.63		50.00	3.37	1000	9	0.1
2.174000		25.41			1000	9	0.1
2.174000	42.42		50.00	7.58	1000	9	0.1
2.462000		24.12			1000	9	0.1
2.462000	41.36		50.00	8.64	1000	9	0.1
2.662000		29.82			1000	9	0.1
2.662000	44.98		50.00	5.02	1000	9	0.1
2.670000		26.86			1000	9	0.1
2.670000	45.69		50.00	4.31	1000	9	0.1
2.706000		27.14			1000	9	0.1
2.706000	45.47		50.00	4.53	1000	9	0.1
2.878000		28.97			1000	9	0.1
2.878000	46.23		50.00	3.77	1000	9	0.1
3.090000		27.80			1000	9	0.1
3.090000	45.37		50.00	4.63	1000	9	0.1
3.130000		26.96			1000	9	0.1
3.130000	45.00		50.00	5.00	1000	9	0.1
3.246000		26.18			1000	9	0.1
3.246000	42.99		50.00	7.01	1000	9	0.1

Frequency MHz	QuasiPeak dB μ V	Average dB μ V	Limit dB μ V	Margin dB	Meas. Time ms	Bandwidth kHz	Corr. dB
3.262000		23.52			1000	9	0.1
3.262000	42.58		50.00	7.42	1000	9	0.1
3.438000		22.74			1000	9	0.1
3.438000	39.48		50.00	10.52	1000	9	0.1
6.154000		22.75			1000	9	0.2
6.154000	38.90		50.00	11.10	1000	9	0.2
6.162000		21.83			1000	9	0.2
6.162000	41.08		50.00	8.92	1000	9	0.2
13.806000		23.86			1000	9	0.2
13.806000	40.11		50.00	9.89	1000	9	0.2
14.106000		23.15			1000	9	0.2
14.106000	37.89		50.00	12.11	1000	9	0.2

9.2 Radiated Emission Test

9.2.1 Test Setup





9.2.2 Test Equipment List

Type		Designation	Inv.-no.	Serial No. or ID	Manufacturer
☐	EMI test receiver	ESPI7	1711	836914/0002	Rohde & Schwarz
☐	EMI test receiver	Cabin no. 3 ESPI7	2010	101018	Rohde & Schwarz
☐	EMI test receiver	ESCI3	1863	100008	Rohde & Schwarz
☐	EMI test receiver	ESR7	22643	101713	Rohde & Schwarz
☐	EMI test receiver	ESU8	2044	100232	Rohde & Schwarz
☒	EMI test receiver	ESW26	28268	101315	Rohde & Schwarz
☐	Spectrum analyzer	FSP30	1666	100063	Rohde & Schwarz
☐	Spectrum analyzer	FSV40	2364	101448	Rohde & Schwarz
☐	Preamplifier	Cabin no. 2 CPA9231A	1716	3557	Schaffner
☐	Preamplifier	Cabin no. 2 AFS3-00100800-32-LN	1684	847743	Miteq
☐	Preamplifier	Cabin no. 2 AFS3-00100800-32-LN	2076	1344017	Miteq
☐	Preamplifier	Cabin no. 2 ACO/180-3530	1484	32641	CTT
☐	Preamplifier	CPA9231A	1651	3393	Schaffner
☐	Preamplifier	R14601	1142	13120026	Advantest
☐	Preamplifier	AMF-4D-005080-25-13P	1685	860149	Miteq
☐	Magnetic Field Pickup Coil	HZ-10	1605	827129/013	Rohde & Schwarz
☒	Loop antenna	HFH2-Z2	1016	882964/1	Rohde & Schwarz
☐	Rod antenna	HFH2-Z6	1017	893053/001	Rohde & Schwarz
☐	Trilog antenna	Cabin no. 2 VULB 9162	2256	9162-048	Schwarzbeck
☐	Trilog antenna	Cabin no. 2 VULB 9163	1802	9163-214	Schwarzbeck
☐	Trilog antenna	Cabin no. 3 VULB 9163	1722	9163-188	Schwarzbeck
☒	Trilog antenna	Cabin no. 8 VULB 9163	2058	9163-408	Schwarzbeck
☒	Horn antenna	HF907	2073	100154	Rohde & Schwarz
☐	Horn antenna	3115	1516	9508-4553	Emco
☐	Shielded room	No. 1	1451	---	Albatross
☐	Fully anechoic room	No. 2	1452	---	Albatross
☐	Semi anechoic room	No. 3	1453	---	Siemens
☐	Shielded room	No. 4	1454	3FD 100 544	Euroshield
☐	Fully anechoic room	No. 6	1865	---	Albatross
☐	Shielded room	No. 7	1866	---	Albatross
☒	Semi anechoic room	No. 8	2057	---	Albatross

9.2.3 Test Results

Results for radiated emission test are documented as listed below.

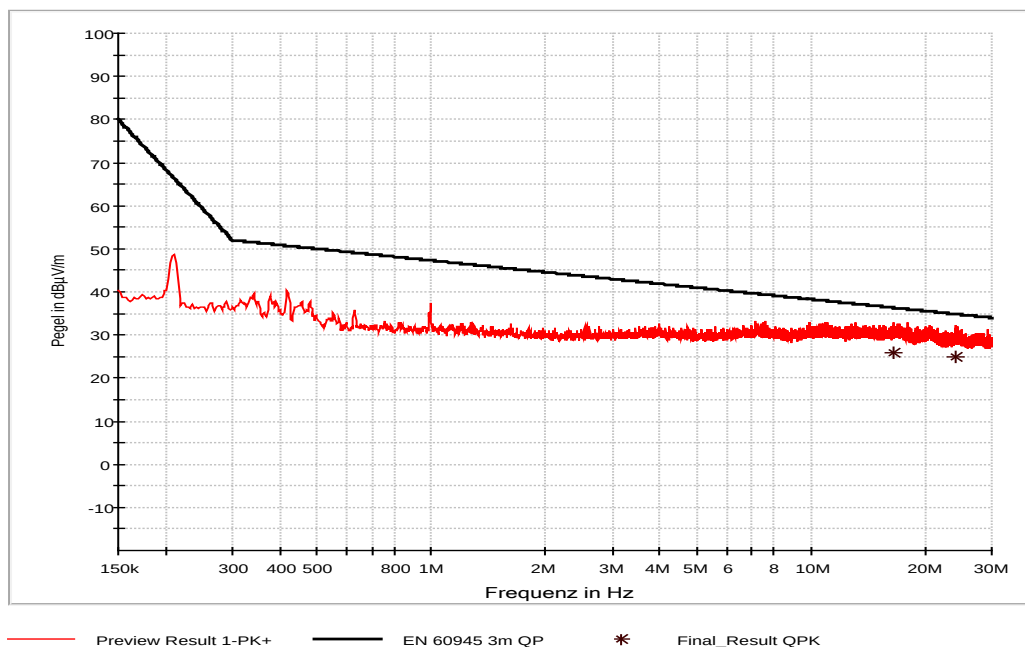
Radiated Emission Test 150 kHz – 30 MHz

Prüfdatum / Date of test:	2018-01-19
Prüfer / Operator:	Martin Steindl
Messplatz / Test site:	Semi anechoic room, cabin no. 8

Prüfergebnis / Test Result	
☒	Erfüllt / Passed
☐	Nicht erfüllt / Not passed

Prüfgrundlage / Specifications:	IEC 60945:2002 + Corr. 1:2008, section 9.3
Basisnorm / Basic standard:	CISPR 16-1-4
Messumgebung / Test environment:	Semi anechoic room
Prüfling / Test sample:	EUT No. 1, as described in table of devices unter test
Betriebsart / Operation mode:	Receiving / Standby
Kommentar / Comment:	

Messentfernung / Test distance:	3 m
Polarisation / Polarization:	horizontal / vertical



Frequeny MHz	QuasiPeak dBµV/m	Limit dBµV/m	Margin dB	Dwellt. ms	RBW kHz	Pol.	Azimut deg	Corr. dB
16.595500	25.91	36.31	10.40	1000	9	V	158.0	20.6
24.060750	24.76	34.86	10.10	1000	9	V	-55.0	20.7

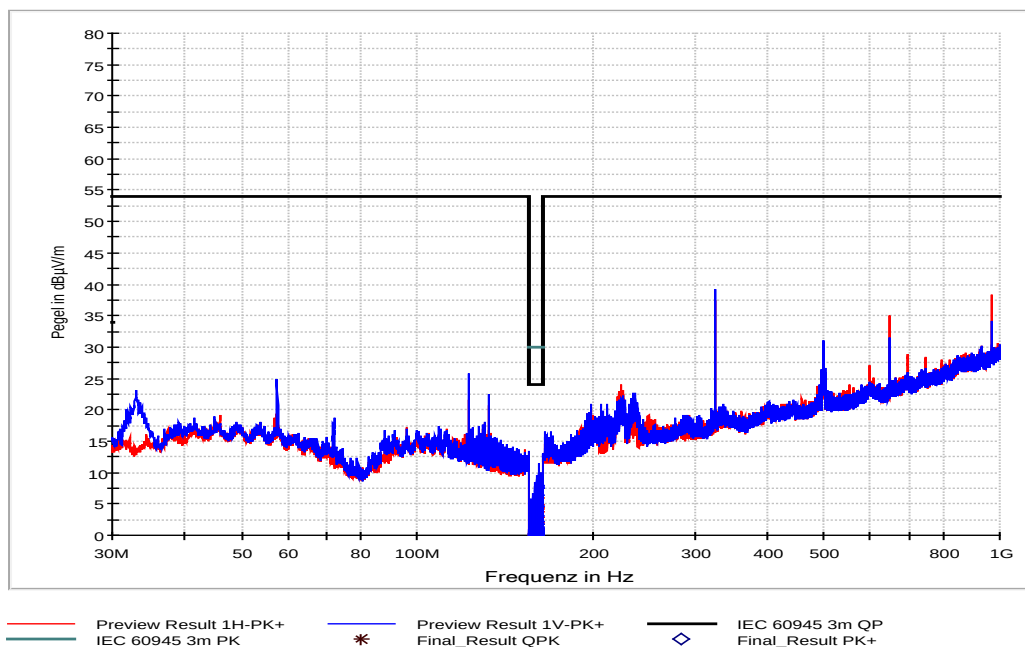
Radiated Emission Test 30 MHz - 1 GHz

Prüfdatum / Date of test:	2018-01-19
Prüfer / Operator:	Martin Steindl
Messplatz / Test site:	Semi anechoic room, cabin no. 8

Prüfergebnis / Test Result	
☒	Erfüllt / Passed
☐	Nicht erfüllt / Not passed

Prüfgrundlage / Specifications:	IEC 60945:2002 + Corr. 1:2008, section 9.3
Basisnorm / Basic standard:	CISPR 16-1-4
Messumgebung / Test environment:	Semi anechoic room
Prüfling / Test sample:	EUT No. 1, as described in table of devices unter test
Betriebsart / Operation mode:	Receiving / Standby
Kommentar / Comment:	

Messentfernung / Test distance:	3 m
Polarisation / Polarization:	horizontal / vertical



All emissions at pre-scan showed more than 10 dB margin from the limit,
no final measurements performed

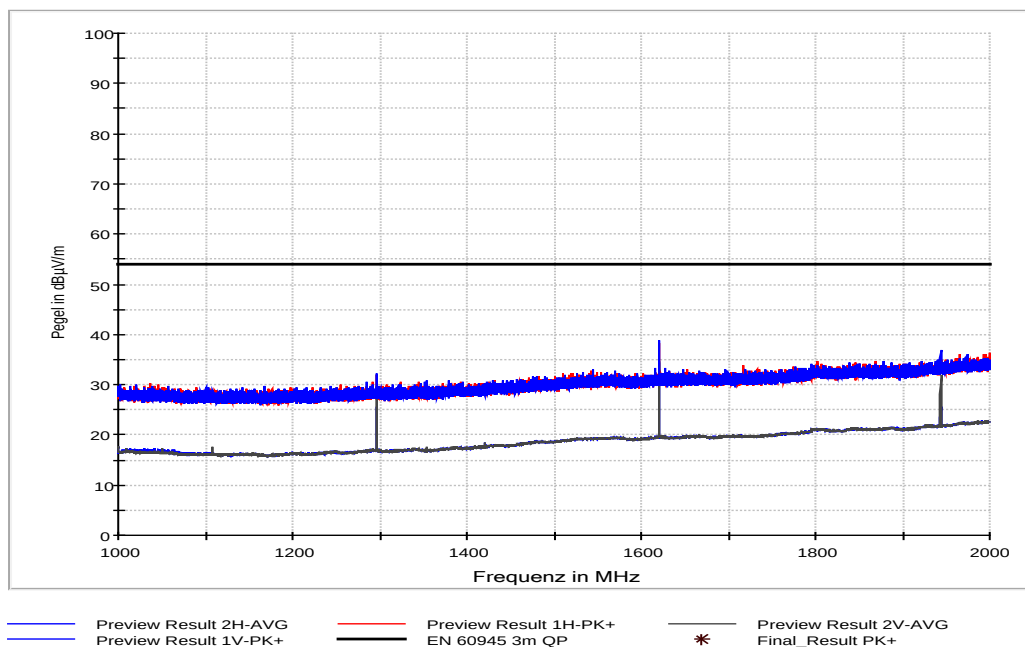
Radiated Emission Test 1 GHz – 2 GHz

Prüfdatum / Date of test:	2018-01-19
Prüfer / Operator:	Martin Steindl
Messplatz / Test site:	Semi anechoic room, cabin no. 8

Prüfergebnis / Test Result	
☒	Erfüllt / Passed
☐	Nicht erfüllt / Not passed

Prüfgrundlage / Specifications:	IEC 60945:2002 + Corr. 1:2008, section 9.3
Basisnorm / Basic standard:	CISPR 16-1-4
Messumgebung / Test environment:	Semi anechoic room
Prüfling / Test sample:	EUT No. 1, as described in table of devices unter test
Betriebsart / Operation mode:	Receiving / Standby
Kommentar / Comment:	

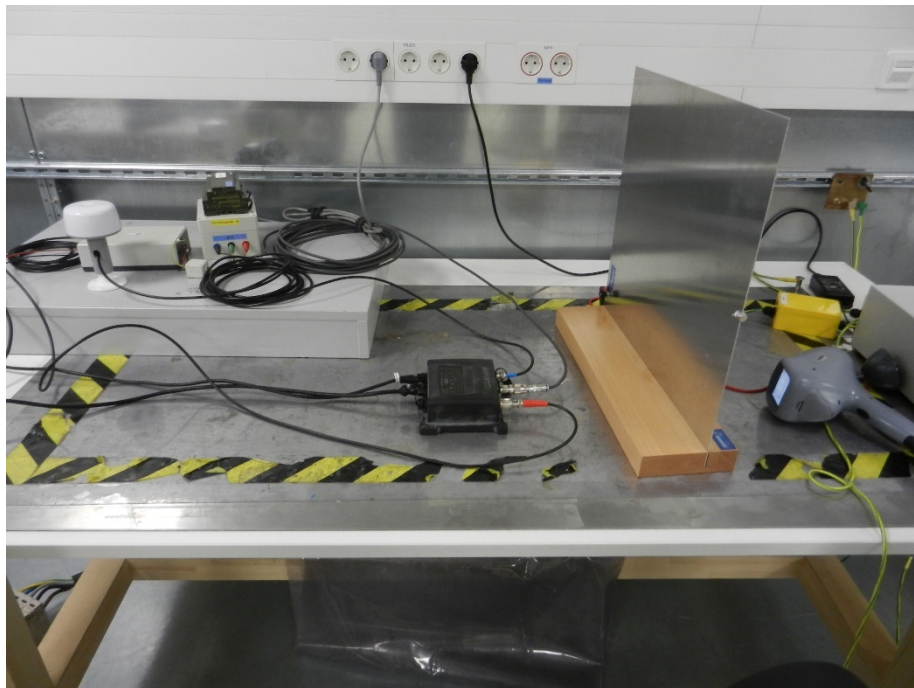
Messentfernung / Test distance:	3 m
Polarisation / Polarization:	horizontal / vertical



All peak emissions at pre-scan showed more than 10 dB margin from the limit,
no final measurements performed

9.3 Electrostatic Discharge

9.3.1 Test Setup



9.3.2 Test Equipment List

Type	Designation	Inv.-no.	Serial No. or ID	Manufacturer
☐ ESD simulator	ESD NX30	23191	22821	Ametek
☒ ESD simulator	NSG 438A	2117	101	Teseq
☒ RC network 150 pF / 330 Ω	INA 4380	2117-1	101	Teseq
☐ RC network 150 pF / 2 k Ω	INA 4381	2117-2	485	Teseq
☐ RC network 330 pF / 2 k Ω	INA 4382	2117-3	512	Teseq
☐ RC network 330 pF / 330 Ω	INA 4553	2117-4	264	Teseq
☐ ESD simulator	NSG 435	1223	000290	Schaffner
☐ Shielded room	No. 1	1451	---	Albatross
☐ Fully anechoic room	No. 2	1452	---	Albatross
☐ Semi anechoic room	No. 3	1453	---	Siemens
☐ Shielded room	No. 4	1454	3FD 100 544	Euroshield
☐ Fully anechoic room	No. 6	1865	---	Albatross
☐ Shielded room	No. 7	1866	---	Albatross
☒ Shielded room	No. 9	21083	---	Albatross

9.3.3 Test Results

Results for electrostatic discharge test are documented as listed below.

Electrostatic Discharge

Prüfdatum / Date of test:	2018-03-14
Prüfer / Operator:	Martin Steindl
Messplatz / Test site:	Shielded room, cabin no. 9

Prüfergebnis / Test Result	
☒	Erfüllt / Passed
☐	Nicht erfüllt / Not passed

Luftdruck / Barometric pressure:	974 hPa
Relative Luftfeuchtigkeit / Relative humidity:	35 %
Temperatur / Ambient temperature:	24 °C

Prüfgrundlage / Specifications:	IEC 60945:2002 + Corr. 1:2008, section 10.9		
Bewertungskriterium / Performance criterion:	B		
Anforderung / Requirement:	Contact discharge:	± 6 kV	
	Air discharge:	± 8 kV	
Anzahl der Entladungen / Number of discharges:	Contact discharge:	≥ 10 per polarity and test point	
	Air discharge:	≥ 10 per polarity and test point	
Basisnorm / Basic standard:	IEC 61000-4-2		
Prüfling / Test sample:	EUT No. 4 acc. to list of test samples		
Betriebsart / Operation mode:	Receiving / Standby		
Kommentar / Comment:			

Discharge method	Discharge voltage	Test points	Result	Note
Via contact to horizontal coupling plane	± 2 kV, ± 4 kV, ± 6 kV	Several points on horizontal coupling plane (around EUT)	Passed	
Via contact to vertical coupling plane	± 2 kV, ± 4 kV, ± 6 kV	On vertical coupling plane placed in the vicinity of EUT	Passed	
Via direct contact to EUT	± 2 kV, ± 4 kV, ± 6 kV	All conductive parts of EUT accessible to normal user	Passed	
Via air gap to EUT	± 2 kV, ± 4 kV, ± 8 kV	All non conductive parts of EUT accessible to normal user	Passed	

Note(s):

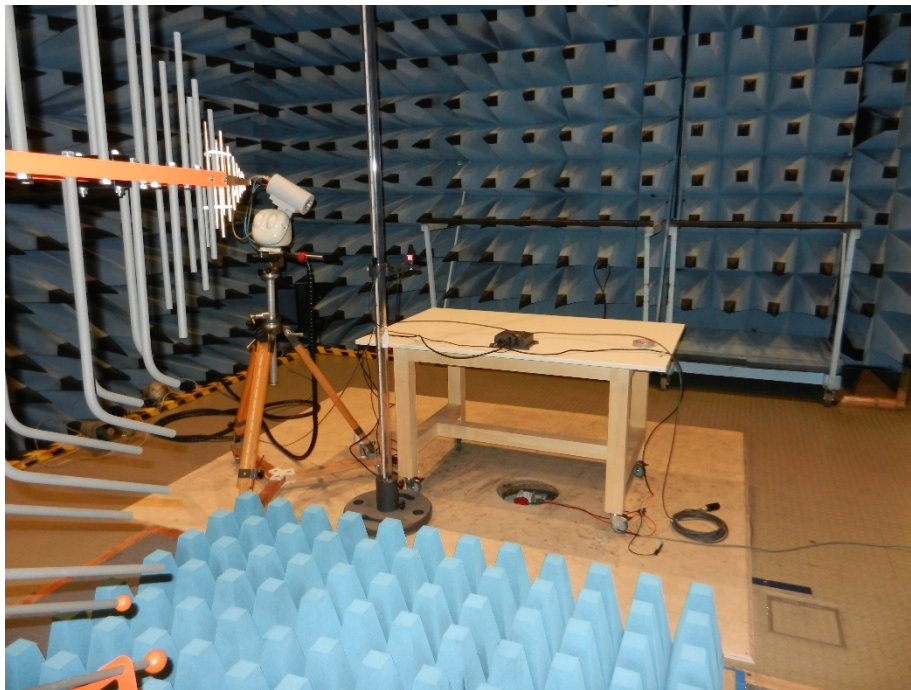
Electrostatic Discharge - Test points



Contact discharge →
Air discharge →

9.4 RF-Electromagnetic Fields

9.4.1 Test Setup



9.4.2 Test Equipment List

Type	Designation	Inv.-no.	Serial No. or ID	Manufacturer	
☐ Signal generator	Cabin no. 2	SML 02	1759	836926/016	Rohde & Schwarz
☐ Signal generator	Cabin no. 3	SML 03	1729	101495	Rohde & Schwarz
☐ Signal generator	Cabin no. 6	SML 03	1867	102131	Rohde & Schwarz
☒ Signal generator		SMB100A	2027	100112	Rohde & Schwarz
☐ Signal generator		SMB100A	2360	178189	Rohde & Schwarz
☐ Power amplifier	Cabin no. 6	HVV 250	1508	836956/004	Rohde & Schwarz
☐ Power amplifier	Cabin no. 3	1000L	1704	8923	Amplifier Research
☐ Power amplifier	Cabin no. 2	10W1000	1119	5239	Amplifier Research
☐ Power amplifier	Cabin no. 3	200W1000	1225	12904	Amplifier Research
☒ Power amplifier	Cabin no. 3	BBA100-A1700C450	2356	101760	Rohde & Schwarz
☐ Power amplifier	Cabin no. 6	1000W1000B	1827	307669	Amplifier Research
☐ Power amplifier		25S1G4	1587	23171	Amplifier Research
☐ Power amplifier		BLMA 1040-450D	2074	097733	Bonn
☒ Power amplifier		BLMA 1060-100D	2179	118695	Bonn
☐ Power amplifier	Cabin no. 6	TD81-250	1829	H040-0204	IFI
☐ Power amplifier	Cabin no. 6	T188-20	1864	G119-0703	IFI
☐ Power meter	Cabin no. 2	NRVS	1726	100808	Rohde & Schwarz
☒ Power meter	Cabin no. 3	NRVD	1985	837333/029	Rohde & Schwarz
☐ Power meter	Cabin no. 6	NRP	1818	100006	Rohde & Schwarz
☐ Power sensor	Cabin no. 2	NRV-Z4	1727	100179	Rohde & Schwarz
☒ Power sensor	Cabin no. 3	NRV-Z4	1798	100238	Rohde & Schwarz
☒ Power sensor	Cabin no. 3	NRV-Z4	1799	100236	Rohde & Schwarz
☐ Power sensor	Cabin no. 6	NRP-Z91	1819	100064	Rohde & Schwarz
☐ Power sensor	Cabin no. 6	NRP-Z91	1820	100065	Rohde & Schwarz
☐ Directional coupler	Cabin no. 3	DC2000	1226	12502	Amplifier Research
☐ Directional coupler	Cabin no. 3	DC6100	1227	12643	Amplifier Research
☒ Directional coupler	Cabin no. 3	BDC 2080-40/500	2012	076951	Bonn
☐ Directional coupler	Cabin no. 6	DC6280M6	1828	306877	Amplifier Research
☐ Directional coupler	Cabin no. 6	DC7144M1	1808	310890	Amplifier Research
☐ E-field generator		3107 B	1019	2302	Emco
☐ High power broadband balun		VHBD 9134	2098	9134-050	Schwarzbeck
☐ Antenna elements		BBFA 9146	2099	---	Schwarzbeck
☐ Trilog antenna	Cabin no. 6	VULB 9163	1824	9163-233	Schwarzbeck
☐ Hybrid log. periodic antenna		HLP-2603	1655	120500	EMC Automation
☐ Stacked log. per. antenna		STLP 9128 E special	1854	019	Schwarzbeck
☒ Logarithmic periodic antenna		ATR26M6G-1M2	2392	0340286	Amplifier Research
☐ Horn antenna		3115	1516	9508-4553	Emco
☐ Horn antenna		HF907	2073	100154	Rohde & Schwarz
☐ Horn antenna		ATH1G4	2078	0330665	Amplifier Research
☐ Horn antenna		3160-03	1010	9112-1003	Emco
☐ Horn antenna		3160-04	1011	9112-1001	Emco
☐ Horn antenna		3160-05	1012	9112-1001	Emco
☐ Horn antenna		3160-06	1013	9112-1001	Emco
☐ Horn antenna		3160-07	1014	9112-1008	Emco
☐ Horn antenna		3160-08	1015	9112-1002	Emco
☐ Horn antenna		3161-01	1749	1091	Emco
☐ Stripline 90 Ohms (3.2 m)		SL 090	1811	---	Stimpfl

Type	Designation	Inv.-no.	Serial No. or ID	Manufacturer
☒ Isotropic field probe	HI-6105	2350	169660	ETS-Lindgren
☒ Field monitor	HI-6100	2349	152119	ETS-Lindgren
☐ Isotropic field probe	FP 2000	1228	12847	Amplifier Research
☐ Field monitor	FM 2004	1229	12632	Amplifier Research
☐ Electromagnetic radiation meter	EMR-200	1723	AT-0023	Narda
☐ Electric field probe	Type 8.3	1724	AU-0008	Narda
☐ Electric field probe	Type 9.2	1876	AG-0010	Narda
☐ Fully anechoic room	No. 2	1452	---	Albatross
☒ Semi anechoic room	No. 3	1453	---	Siemens
☐ Fully anechoic room	No. 6	1865	---	Albatross
☐ Semi anechoic room	No. 8	2057	---	Albatross
☐ Shielded room	No. 8b	2057-2	---	Albatross

9.4.3 Test Results

Results for RF-electromagnetic fields test are documented as listed below.

RF-Electromagnetic Fields

Prüfdatum / Date of test:	2018-01-18
Prüfer / Operator:	Martin Steindl
Messplatz / Test site:	Semi anechoic room, cabin no. 3

Prüfergebnis / Test Result	
☒	Erfüllt / Passed
☐	Nicht erfüllt / Not passed

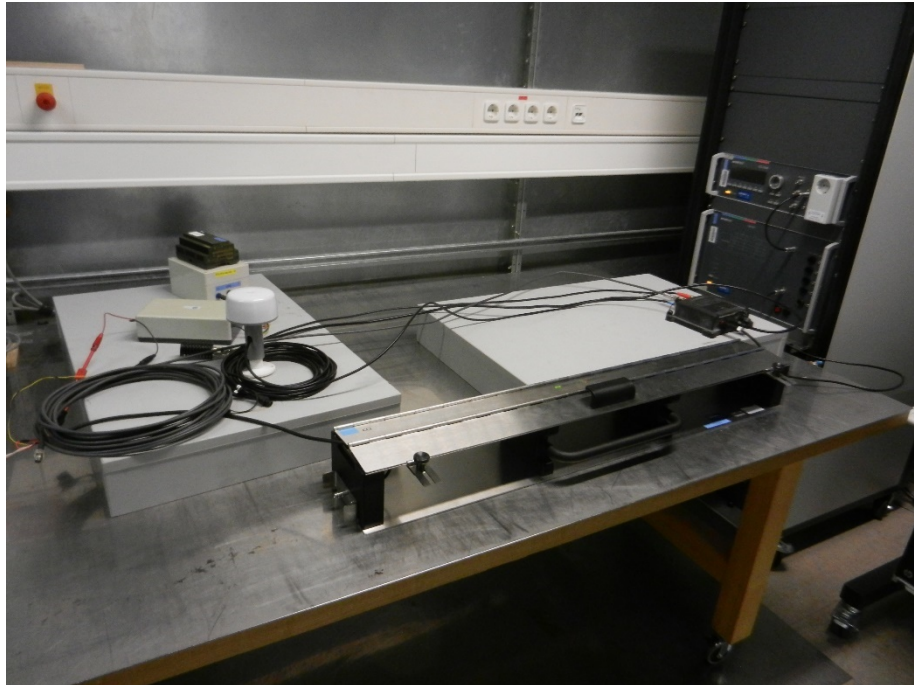
Luftdruck / Barometric pressure:	960 hPa
Relative Luftfeuchtigkeit / Relative humidity:	29 %
Temperatur / Ambient temperature:	23 °C

Prüfgrundlage / <i>Specifications:</i>	IEC 60945:2002 + Corr. 1:2008, section 10.4		
Bewertungskriterium / <i>Performance criterion:</i>	A		
Anforderung / <i>Requirement:</i>	80 MHz - 2 GHz:	10 V/m	
Störsignal / <i>Interfering signal:</i>	Modulation:	AM	
	Modulation depth:	80 %	
	Modulation frequency:	400Hz	
Schrittweite / <i>Step size:</i>	1 %		
Verweildauer / <i>Dwell time:</i>	80 MHz – 1 GHz:	3 s ($1.5 \cdot 10^{-3}$ dec. / s)	
	1 GHz – 2.7 GHz	9 s ($0.5 \cdot 10^{-3}$ dec. / s)	
Antennenpolarisation / <i>Antenna polarization:</i>	☒ horizontal	☒ vertical	
Basisnorm / <i>Basic standard:</i>	IEC 61000-4-3:		
Prüfling / <i>Test sample:</i>	EUT No. 1, as described in table of devices unter test		
Betriebsart / <i>Operation mode:</i>	Receiving / Standby		
Kommentar / <i>Comment:</i>			

Position of EUT	Frequency range	Field strength level	Result	Note
Front to antenna	80 MHz – 2.7 GHz	10 V/m	Passed	
Rear side to antenna	80 MHz – 2.7 GHz	10 V/m	Passed	
Left side to antenna	80 MHz – 2.7 GHz	10 V/m	Passed	
Right side to antenna	80 MHz – 2.7 GHz	10 V/m	Passed	
Note(s):				

9.5 Electrical fast Transients (Bursts)

9.5.1 Test Setup



9.5.2 Test Equipment List

Type	Designation	Inv.-no.	Serial No. or ID	Manufacturer
☐ High energy pulse generator	NSG 2050	1680	200104-005AR	Schaffner
☐ Pulse network module	PNW 2225	1806	200448-527LU	Schaffner
☐ Ultra compact simulator	UCS500M4	1898	V0602101058	EM Test
☒ Ultra compact simulator	UCS500N5	2283	P1330120736	EM Test
☒ Coupling network	CNI 503A3	2151	V1150111228	EM Test
☐ Coupling network	CNI 503	1591	0796-04	EM Test
☐ Coupling clamp Cabin no. 1	CCI	28378	P1723199614	EM Test
☐ Coupling clamp	CDN 8014	1221	131	Schaffner
☐ Coupling clamp Cabin no. 4	SL 400-071D	1076	007	Schaffner
☐ Shielded room	No. 1	1451	---	Albatross
☐ Fully anechoic room	No. 2	1452	---	Albatross
☐ Semi anechoic room	No. 3	1453	---	Siemens
☐ Shielded room	No. 4	1454	3FD 100 544	Euroshield
☐ Fully anechoic room	No. 6	1865	---	Albatross
☐ Shielded room	No. 7	1866	---	Albatross
☐ Shielded room	No. 9	21083	---	Albatross

9.5.3 Test Results

Results for electrical fast transients test are documented as listed below.

Electrical fast Transients (Bursts)

Prüfdatum / Date of test:	2018-03-15
Prüfer / Operator:	Martin Steindl
Messplatz / Test site:	Shielded room, cabin no. 1

Prüfergebnis / Test Result	
☒	Erfüllt / Passed
☐	Nicht erfüllt / Not passed

Luftdruck / Barometric pressure:	960 hPa
Relative Luftfeuchtigkeit / Relative humidity:	29 %
Temperatur / Ambient temperature:	23 °C

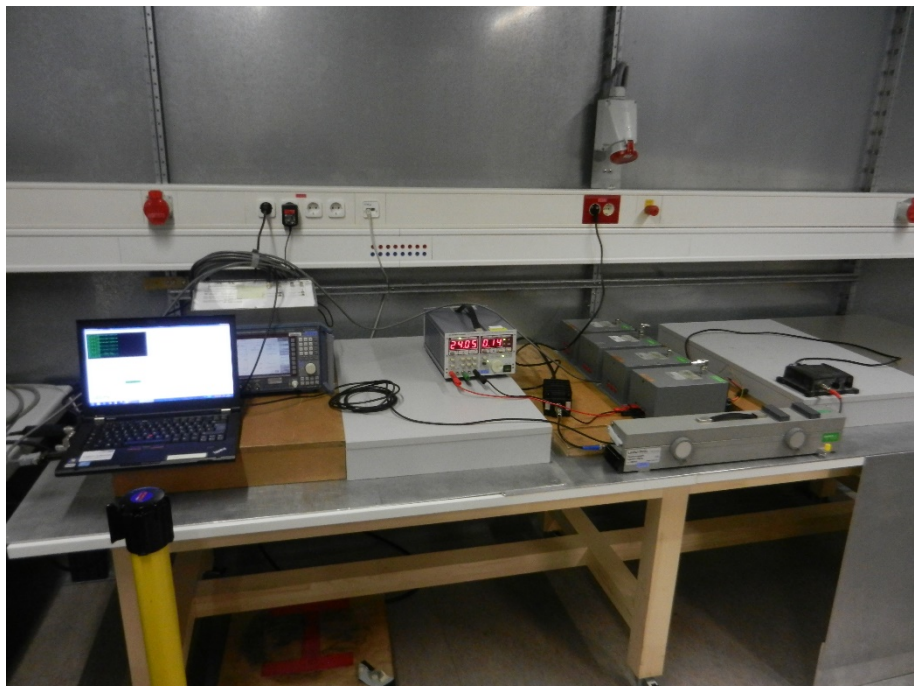
Prüfgrundlage / <i>Specifications:</i>	IEC 60945:2002 + Corr. 1:2008, section 10.5		
Bewertungskriterium / <i>Performance criterion:</i>	B		
Anforderung / <i>Requirement:</i>	Signal and control lines:	± 1.0 kV	
	AC mains inputs and outputs:	± 2.0 kV	
Störsignal / <i>Interfering signal:</i>	Test pulse:	5 ns / 50 ns	
	Pulse frequency:	5 kHz (1 kV)	
		2.5 kHz (2 kV)	
	Burst duration:	15 ms	
	Repetition period:	300 ms	
Prüfdauer / <i>Test time:</i>	5 min per polarity		
Basisnorm / <i>Basic standard:</i>	IEC 61000-4-4		
Prüfling / <i>Test sample:</i>	EUT No. 4 acc. to list of test samples		
Betriebsart / <i>Operation mode:</i>	Receiving / Standby		
Kommentar / <i>Comment:</i>			

Port	Voltage level	Coupling	Coupling mode	Result	Note
S1	± 0.5 kV	(50 Ω)	Coupling clamp	Passed	
S2	± 0.5 kV	(50 Ω)	Coupling clamp	Passed	
S3	± 0.5 kV	(50 Ω)	Coupling clamp	Passed	
S4	± 0.5 kV	(50 Ω)	Coupling clamp	Passed	
S5	± 0.5 kV	(50 Ω)	Coupling clamp	Passed	

Note(s):

9.6 Induced conducted disturbances

9.6.1 Test Setup



9.6.2 Test Equipment List

Type		Designation	Inv.-no.	Serial No. or ID	Manufacturer
☒ Signal generator	Cabin no. 1	SML 02	1759	836926/0016	Rohde & Schwarz
☒ Signal generator	Cabin no. 8b	SML 02	1772	101023	Rohde & Schwarz
☒ Power amplifier	Cabin no. 1	M-100	1896	J164-1105	ifi
☐ Power amplifier	Cabin no. 8b	411 LA	1122	299	ENI
☒ Power amplifier	Cabin no. 8b	BSA 0125-125	2136	118535	Bonn
☐ Power amplifier		HVV250	1508	836956/004	Rohde & Schwarz
☐ Power amplifier		10W1000	1119	5239	Amplifier Research
☐ Power amplifier		200W1000	1225	12904	Amplifier Research
☐ Power meter		NRVS	1726	100808	Rohde & Schwarz
☒ Power meter	Cabin no. 1	NRVS	1502	838624/016	Rohde & Schwarz
☐ Power meter	Cabin no. 8b	NRVD	1797	101092	Rohde & Schwarz
☒ Sensor hub	Cabin no. 8b	NRP-Z5	2133	101511	Rohde & Schwarz
☒ Power sensor	Cabin no. 1	NRV-Z4	1727	100179	Rohde & Schwarz
☐ Power sensor	Cabin no. 8b	NRV-Z4	2043	100496	Rohde & Schwarz
☐ Power sensor	Cabin no. 8b	NRV-Z4	1034	863828/015	Rohde & Schwarz
☐ Power sensor	Cabin no. 8b	URV5-Z4	1116	826775/010	Rohde & Schwarz
☒ Power sensor	Cabin no. 8b	NRP-Z91	2134	101493	Rohde & Schwarz
☒ Power sensor	Cabin no. 8b	NRP-Z91	2135	101494	Rohde & Schwarz
☒ Directional coupler	Cabin no. 1	BDC 0110-40/100	1916	066248	Bonn
☒ Directional coupler	Cabin no. 8b	BDC 0125-40/250	2137	118535	Bonn
☐ Coupling network		FCC-801-AF4	1550	47	FCC
☐ Coupling network		FCC-801-M5-25	1551	16	FCC
☐ Coupling network		FCC-801-C1	1552	64	FCC
☐ Coupling network		FCC-801-AF4	1553	48	FCC
☐ Coupling network		FCC-801-M3-25	1554	117	FCC
☒ Coupling network		FCC-801-M4-25	1555	17	FCC
☐ Coupling network		CDN 801-M3	1572	---	TÜV SÜD PS
☐ Coupling network		CDN 801-S37	1573	---	TÜV SÜD PS
☐ Coupling network		CDN L-801 M2/M3	1862	2443	Lüthi
☐ Coupling network		CDN M1-10	2171	32253	Teseq
☒ Coupling network		CDN M216-10	2172	31986	Teseq
☐ Coupling network		CDN M316-10	2173	30386	Teseq
☐ Coupling network		CDN M4/80A-HV	2174	A2490001/2012	Schlöder
☒ EM injection clamp	Cabin no. 1	EM 101	1917	35785	Lüthi
☒ EM injection clamp	Cabin no. 8b	EM 101	1568	35354	Lüthi
☐ Ferrite tube clamp		FTC 101	1564	4413	Lüthi
☐ Current clamp		F-120-9B	1514	15	FCC
☐ Current clamp		F-55	1700	51	FCC
☐ Audio analyzer		UPP 200	2187	120194	Rohde & Schwarz
☒ Shielded room		No. 1	1451	---	Albatross
☐ Fully anechoic room		No. 2	1452	---	Albatross
☐ Semi anechoic room		No. 3	1453	---	Siemens
☐ Shielded room		No. 4	1454	3FD 100 544	Euroshield
☐ Fully anechoic room		No. 6	1865	---	Albatross
☐ Shielded room		No. 7	1866	---	Albatross
☐ Shielded room		No. 8b	2057-2	---	Albatross
☒ Shielded room		No. 9	21083	---	Albatross

9.6.3 Test Results

Results for induced conducted disturbance test are documented as listed below.

Induced conducted disturbances- frequency range 150 kHz – 80 MHz

Prüfdatum / Date of test:	2018-02-26; 2018-03-1
Prüfer / Operator:	Martin Steindl
Messplatz / Test site:	Shielded room, cabin no. 9,, Shielded room, cabin no. 1,

Prüfergebnis / Test Result	
☒	Erfüllt / Passed
☐	Nicht erfüllt / Not passed

Luftdruck / Barometric pressure:	974 hPa
Relative Luftfeuchtigkeit / Relative humidity:	35 %
Temperatur / Ambient temperature:	24 °C

Prüfgrundlage / <i>Specifications:</i>	IEC 60945:2002 + Corr. 1:2008, section 10.3		
Bewertungskriterium / <i>Performance criterion:</i>	A		
Anforderung / <i>Requirement:</i>	Frequency range:	0.15 - 80 MHz	
	Signal and control lines:	3 V _{rms}	
	DC mains inputs and outputs:	3 V _{rms}	
	AC mains inputs and outputs:	3 V _{rms}	
Störsignal / <i>Interfering signal:</i>	Modulation:	AM	
	Modulation depth:	80 %	
	Modulation frequency:	400 Hz	
Schrittweite / <i>Step size:</i>	1 %		
Verweildauer / <i>Dwell time:</i>	3 s (1.5 ·10 ⁻³ dec. / s)		
Basisnorm / <i>Basic standard:</i>	IEC 61000-4-6:2013		
Prüfling / <i>Test sample:</i>	EUT No. 2 and No.3, as described in table of devices unter test		
Betriebsart / <i>Operation mode:</i>	Receiving / Standby		
Kommentar / <i>Comment:</i>			

Port	EUT No.	Voltage level	Coupling via	Result	Note
S1	2	3 V _{rms}	EM-Clamp EM 101	Passed	1
S2	2	3 V _{rms}	EM-Clamp EM 101	Passed	1
S3	3	3 V _{rms}	EM-Clamp EM 101	Passed	2, 3
S4	3	3 V _{rms}	EM-Clamp EM 101	Passed	2
S5	2	3 V _{rms}	EM-Clamp EM 101	Passed	1, 4

Note(s):

- Test performed with test setup in cabin no. 9 on 2018-02-26
- Test performed with test setup in cabin no. 1 on 2018-03-13
- Additional monitoring of GPS-signal received by EUT
- Additional monitoring of RF-signal received by EUT

Induced conducted disturbances – single frequencies

Prüfdatum / Date of test:	2018-02-26; 2018-03-13
Prüfer / Operator:	Martin Steindl
Messplatz / Test site:	Shielded room, cabin no. 9, Shielded room, cabin no. 1

Prüfergebnis / Test Result	
☒	Erfüllt / Passed
☐	Nicht erfüllt / Not passed

Luftdruck / Barometric pressure:	974 hPa
Relative Luftfeuchtigkeit / Relative humidity:	35 %
Temperatur / Ambient temperature:	24 °C

Prüfgrundlage / <i>Specifications:</i>	IEC 60945:2002 + Corr. 1:2008, section 10.3		
Bewertungskriterium / <i>Performance criterion:</i>	A		
Anforderung / <i>Requirement:</i>	Frequency range:	2 MHz, 3 MHz, 4 MHz, 6.2 MHz, 8.2 MHz, 12.6 MHz, 16.5 MHz, 18.8 MHz, 22 MHz, 25 MHz	
	Signal and control lines:	10 V _{rms}	
	DC mains inputs and outputs:	10 V _{rms}	
	AC mains inputs and outputs:	10 V _{rms}	
Störsignal / <i>Interfering signal:</i>	Modulation:	AM	
	Modulation depth:	80 %	
	Modulation frequency:	400 Hz	
Schrittweite / <i>Step size:</i>	1 %		
Verweildauer / <i>Dwell time:</i>	3 s (1.5 ·10 ⁻³ dec. / s)		
Basisnorm / <i>Basic standard:</i>	IEC 61000-4-6:2013		
Prüfling / <i>Test sample:</i>	EUT No. 2 and No.3, as described in table of devices unter test		
Betriebsart / <i>Operation mode:</i>	Receiving / Standby		
Kommentar / <i>Comment:</i>			

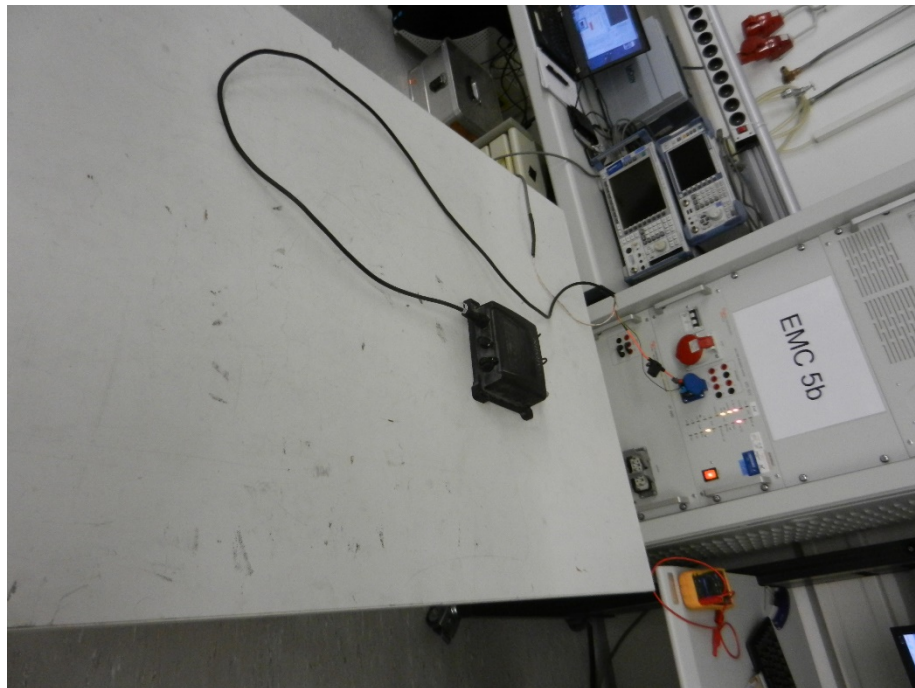
Port	EUT No.	Voltage level	Coupling via	Result	Note
S1	2	10 V _{rms}	EM-Clamp EM 101	Passed	1
S2	2	10 V _{rms}	EM-Clamp EM 101	Passed	1
S3	3	10 V _{rms}	EM-Clamp EM 101	Passed	2, 3
S4	3	10 V _{rms}	EM-Clamp EM 101	Passed	2
S5	2	10 V _{rms}	EM-Clamp EM 101	Passed	1, 4

Note(s):

- Test performed with test setup in cabin no. 9 on 2018-02-26
- Test performed with test setup in cabin no. 1 on 2018-03-13
- Additional monitoring of GPS-signal received by EUT
- Additional monitoring of RF-signal received by EUT

9.7 Voltage Interruptions

9.7.1 Test Setup



9.7.2 Test Equipment List

Type	Designation	Inv.-no.	Serial No. or ID	Manufacturer
☐ Ultra compact simulator	UCS500M4	1898	V0602101058	EM Test
☐ Ultra compact simulator	UCS500N5	2283	P1330120736	EM Test
☐ Transformer	EAC/MT27016/ATE/PCG1	1590	96.24.934	ET System Electronic
☐ Oscilloscope	54602B	1535	US35060304	Hewlett Packard
☐ Analyzer reference system (including mains impedance)	ARS 16/3/TPM	2197	A4990 07/1 1112	Spitzenberger & Spies
☐ Additional mains impedance	AIP 75/3/P/TPM	2198	A4990 07/2 1112	Spitzenberger & Spies
☐ Control unit (synthesizers)	SyCore 1k4	2196	A4235 12/0 0209	Spitzenberger & Spies
☐ Amplifier	PAS 10000	2038-1	A4235 01/1 0209	Spitzenberger & Spies
☐ Amplifier	PAS 10000	2038-2	A4235 01/2 0209	Spitzenberger & Spies
☐ Amplifier	PAS 10000	2038-3	A4235 01/3 0209	Spitzenberger & Spies
☐ Additional transformer	UT 5000/400/B	2090	A4609 03/0 1110	Spitzenberger & Spies
☐ RLC load	RLC 37500/2.5/SM	2199	A4991	Spitzenberger & Spies
☐ Photovoltaic simulator	PVS 25000	2200	A4989 01/0 1112	Spitzenberger & Spies
☐ Oscilloscope	TDS2014B	2039	C041606	Tektronix
☒ Analyzer reference system (including mains impedance)	ARS 16/3	2115	A4235 07/0 0209	Spitzenberger & Spies
☒ Control unit (synthesizers)	SyCore 1k1	2407	UO355 12/0 1109	Spitzenberger & Spies
☒ Amplifier	PAS 5000	2406-1	UO355 01/0 1109 UO355 02/0 1109	Spitzenberger & Spies
☐ Shielded room	No. 1	1451	---	Albatross
☐ Fully anechoic room	No. 2	1452	---	Albatross
☐ Semi anechoic room	No. 3	1453	---	Siemens
☐ Shielded room	No. 4	1454	3FD 100 544	Euroshield
☐ Fully anechoic room	No. 6	1865	---	Albatross
☐ Shielded room	No. 7	1866	---	Albatross
☐ Shielded room	No. 9	21083	---	Albatross

9.7.3 Test Results

Results for voltage dips and interruptions test are documented as listed below.

Voltage Dips and Interruptions

Prüfdatum / Date of test:	2018-3-14
Prüfer / Operator:	Martin Steindl
Messplatz / Test site:	Non shielded room

Prüfergebnis / Test Result	
☒	Erfüllt / Passed
☐	Nicht erfüllt / Not passed

Luftdruck / Barometric pressure:	974 hPa
Relative Luftfeuchtigkeit / Relative humidity:	35 %
Temperatur / Ambient temperature:	24 °C

Prüfgrundlage / <i>Specifications:</i>	IEC 60945:2002 + Corr. 1:2008, section 10.8			
Kopplung auf / <i>Coupling to:</i>	AC and DC mains inputs			
Nennspannung / <i>Nominal voltage:</i>	U _N = 24 V DC			
Nennfrequenz / <i>Nominal frequency:</i>	f _N = 0 Hz (DC)			
Anforderung / <i>Requirement:</i>	Voltage reduction in % of U _N 100	Duration in periods of f _N ---	s 60	Performance criterion C
Prüfparameter / <i>Test parameters:</i>	Count: Repetition:	≥ 3 per angle 60 s		
Basisnorm / <i>Basic standard:</i>	IEC 61000-4-11			
Prüfling / <i>Test sample:</i>	EUT No. 4, as described in table of devices under test			
Betriebsart / <i>Operation mode:</i>	Receiving / Standby			
Kommentar / <i>Comment:</i>				

Port	Voltage reduction in % of U_N	Duration in periods of f_N	Duration in s	Result	Note
S1	100	--	60	Passed	

Note(s):

10 Revision History

Revision History			
<i>Edition</i>	<i>Date</i>	<i>Issued by</i>	<i>Modifications</i>
1	2018-04-13	Martin Steindl	First Edition