TEST REPORT

Short Range Devices (SRD) operating in the frequency range 25 MHz to 1 000 MHz;
Part 4: Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU;
Metering devices operating in designated band 169,400 MHz to 169,475 MHz

Report Reference No.....:	344088-1TRFWL	
Tested by (name, function and signature).....:	D. Guarnone	(project handler)
Approved by (name, function and signature).....:	P. Barbieri	(verifier)
Date of issue.....:	2018-03-30	
Testing Laboratory.....:	**Nemko Spa**	
Address.....:	Via del Carroccio, 4 – 20853 Biassono (MB) – Italy	
Testing location	Nemko Spa	
Address.....:	Via del Carroccio, 4 – 20853 Biassono (MB) – Italy	
Applicant's name.....:	**Energy Team Spa**	
Address.....:	Via della Repubblica 9 20090 Trezzano Sul Naviglio MI - Italy	
Test specification:		
Standard.....:	ETSI EN 300 220-4 V1.1.1 (2017-02)	
	Full application of the standards	☒
	Partial application of the standards	☐
Test procedure.....:	Nemko WM L0077, WM L0177 and WM L1002	
Test Report Form No.....:	300220TRFEMC	
TRF Originator.....:	Nemko Spa	
Master TRF.....:	2017-05	

Test item description ..... :	Gateway Radio device
Trade Mark .....:	EnergyTeam S.p.A.
Manufacturer.....:	**Energy Team Spa**
Address of manufacturer .....:	Via della Repubblica 9 20090 Trezzano Sul Naviglio MI - Italy
Model .....:	NG-W169
Ratings.....:	1,5 W / 24-120 VDC / 100-240 VAC 50-60 Hz

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The test report merely corresponds to the tested sample.
The phase of sampling / collection of equipment under test is carried out by the customer.

Test Report No. :	344088-1TRFWL	2018-03-30 Date of issue

Short description of the EuT	Copy of marking plate
Gateway Radio device: equipment to receive and acquire measurement concerning environmental parameters from various measuring instruments as: Temperature, Humidity, etc. The data acquired can be processed and sent via RS-485 to one or more server set for energetic measurement publication. RF connectivity to the sensors at 169MHz.	

Number of tested samples:	1
Serial number:	161213GR153832
Receiver categories:	--
Operational Frequency band:	169.4 MHz to 169.475 MHz
Nominal Operating Frequency:	169.40625 MHz, 169.41875 MHz, 169.43125 MHz, 169.44375 MHz, 169.45625 MHz, 169.46875 MHz, 169.4375 MHz
Operating Channel Width (OCW):	25 kHz and 50 KHz (169.4375 MHz)
Equipment classification:	Fixed
Accessories and detachable parts included:	antenna

Testing

Date of receipt of test sample:	2018-01-29
Testing commenced on:	2018-01-29
Testing concluded on:	2018-03-30

Possible test case verdicts:

test case does not apply to the test object:	N (Not applicable)
test object does meet the requirement:	P (Pass)
test object does not meet the requirement:	F (Fail)

Symbols used in this test report

☒ The crossed square indicates that the listed condition or equipment is applicable for this report.

☐ The empty square indicates that the listed condition or equipment is not applicable for this report.

Throughout this report point is used as decimal separator.

The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.

Verdict according to the standards on page 5:	**Pass**

PROJECT HISTORY		
Report number	**Modification to the report / comments**	**Date**
344088-1TRFWL	First release	2018-03-30
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REMARKS		

PRODUCT VARIANTS		
Variant model	**Difference against the main model**	**Additional test performed**
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REMARKS		

Contents

1 TEST STANDARDS

The tests were performed according to following standards and procedures.

NEMKO WM L0177: General routines for using instruments at Nemko

NEMKO WM L1002: Measurement Uncertainty - Policy and Statement

NEMKO WM L0077: General routines to perform EMC tests

ETSI EN 300 220-4 V1.1.1 (2017-02)
Short Range Devices (SRD) operating in the frequency range 25 MHz to 1 000 MHz;
Part 4: Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU;
Metering devices operating in designated band 169,400 MHz to 169,475 MHz

EN 62311 (2008)
Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz - 300 GHz)

The main standard(s) above contains references to other standards, which are listed below.

ETSI EN 300 220-1 V3.1.1 (2017-02)
Short Range Devices (SRD) operating in the frequency range 25 MHz to 1 000 MHz; Part 1: Technical characteristics and methods of measurement

2 SUMMARY OF TEST RESULTS

Harmonised Standard ETSI EN 300 220-4					
Requirement			Requirement Conditionality		Verdict
No.	Description	Reference: Clause No.	U/C	Condition	
1	Operating frequency	4.2.1	U	--	P
2	Unwanted emissions in the spurious domain	4.2.2	U	--	P
3	TX Transmitter effective radiated power	4.3.1	U	--	P
4	TX Duty cycle	4.3.2	C		P
5	TX Occupied bandwidth	4.3.3	U	--	P
6	TX out of band emissions	4.3.4	C	Applies to EUT with OCW > 25 kHz.	P
7	TX Transient power	4.3.5	U	--	P
8	TX Adjacent channel power	4.3.6	C	Applies to EUT with OCW ≤ 25 kHz.	P
9	TX behaviour under low voltage conditions	4.3.7	C	Applies to battery powered EUT.	N
10	RX sensitivity	4.4.1	C	Applies to EUT with adaptive power control using annex C band AA.	N
11	Clear channel assessment threshold	4.4.3	C	Applies to EUT with polite spectrum access.	N
12	Polite spectrum access timing parameters	4.5.3	C	Applies to EUT with polite spectrum access.	N
17	RX Blocking	4.4.2	U	--	P

Symbols:

U/C indicates whether the requirement is to be unconditionally applicable (U) or is conditional upon the manufacturers claimed functionality of the equipment (C).

Remarks:

NOTE 1: <= 10%

NOTE 2:

As show in the following pages the EM field radiated emissions of the EUT are less than _25_ mW, so the equipment is deemed to comply with the requirements in the EN 62479 standard without further assessment. Refer to clause 4.1 and clause 4.2 of EN 62479 standard. Method D of clause 4.1 is used.”.

3 EQUIPMENT UNDER TEST

3.1 Power supply system utilised

Power supply voltage:	☒	230V/50 Hz / 1ϕ	☐	115V/60Hz / 1ϕ
	☐	400V/50 Hz 3PE	☐	400V/50 Hz 3NP
	☐	4.5 V DC	☐	12.0 V DC

3.2 EuT specifications

Extreme temperature range	: -10 °C ÷ +65 °C
Extreme test source voltages	: 90÷250 Vac
TX frequency	169.40625 MHz, 169.41875 MHz, 169.43125 MHz, 169.44375 MHz, 169.45625 MHz, 169.46875 MHz, 169.4375 MHz
TX Antenna type	:
Modulation	: GMSK, GFSK, 4GFSK (169.46875 MHz)
Frequency Band	: 169.4 MHz to 169.475 MHz
Testing frequency	: 169.40625 MHz, 169.41875 MHz, 169.43125 MHz, 169.44375 MHz, 169.45625 MHz, 169.46875 MHz, 169.4375 MHz
Number of channels	: 7
RX frequency	: --

3.3 EuT operation modes

Mode	Description
1	TX mode
2	RX mode

3.4 EuT Configuration modes

The EuT was configured to measure its highest possible radiation level. The test modes selected are according to EuT instruction manual.

The EuT was configured to have its highest possible susceptibility against tested phenomena. The test modes selected are according to EuT instruction manual.

Mode	Description
1	EUT has been tested supplied by its AC mains power supply

3.5 Input/Output Ports

Port	Name	Type*	Cable Max. >3m	Cable Shielded	Description
0	Enclosure	N/E	—	—	—
1	Power supply	AC/DC	☐	☐	Two wires
2	RS485	I/O	☐	☐	Two wires
3	Antenna	RF	☐	☐	Sma

*Note:

AC = AC Power Port DC = DC Power Port N/E = Non-Electrical

I/O = Signal/Control Input or Output Port TP = Telecommunication Ports

3.6 Equipment Used During Test

Use*	Product Type	Manufacturer	Model	Comments
—	—	—	—	—

Note: * Use

EUT - Equipment Under Test

AE - Auxiliary/Associated Equipment (Not Subjected to Test)

SIM - Simulator (Not Subjected to Test)

3.8 Test signals for data

D-M1: A test signal consisting of an unmodulated carrier. This test signal is optional but helps to simplify some tests.

D-M2: A test signal consisting of a modulated carrier representative of normal operation and generating the greatest occupied RF bandwidth. The preferred test signal consists of a pseudo-random bit sequence of at least 511 bits in accordance with Recommendation ITU-T O.153. This sequence shall be continuously repeated.

D-M2a: A test signal as described in D-M2 but generated intermittently. The generated RF signals shall be the same for each transmission except for the data sequence, occur regularly in time, be accurately repeatable and their timing duration shall represent normal operation of the EUT except for compliance with a duty cycle limit.

D-M3: A test signal representative of normal operation of the EUT. This signal shall be agreed between the test laboratory and the manufacturer in case selective messages are used and are generated or decoded within the equipment. The agreed test signal may be formatted and may contain error detection and correction.

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

Nemko Spa
Via del Carroccio, 4
20853 Biassono (MB) - Italy

Tests site/benches are in accordance with applicable standard/s, and have been utilized under Nemko Spa testing engineer

4.2 Environmental conditions

Unless different values are declared in the test case, following ambient conditions apply for the tests:

Ambient temperature:	18÷33 °C
Relative Humidity:	30÷60 %
Atmospheric pressure:	980÷1060 hPa

4.3 Test equipment used for the monitoring of the environmental conditions

Equipment	Manufacturer	Model	Serial N°
Thermohygrometer data loggers	Testo	175-H2	20012380/305
Thermohygrometer data loggers	Testo	175-H2	38203337/703
Barometer	MSR	MSR145B	330080

4.4 Statement of the measurement uncertainty

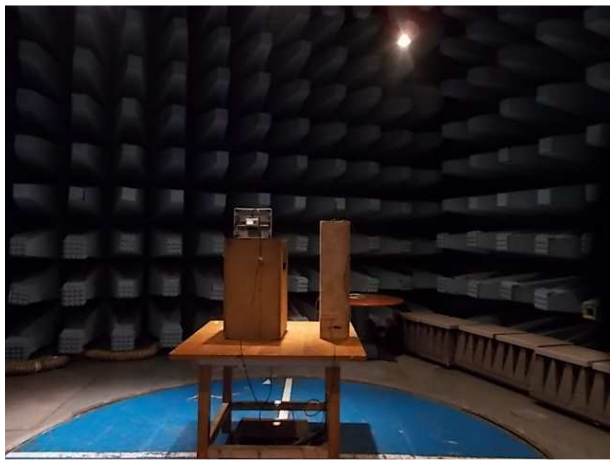
EUT	Type	Test	Range and Setup features	Measurement Uncertainty	Notes
Transmitter	Conducted	Frequency error	0.001MHz ÷ 18 GHz	0.08 ppm	(1)
		Carrier power RF Output Power	1MHz ÷ 18 GHz With power meter	1.6 dB	(1)
			1MHz ÷ 18 GHz With spectrum/receiver	3.0 dB	(1)
		Adjacent channel power	1MHz ÷ 18 GHz	1.6 dB	(1)
		Conducted spurious emissions	1MHz ÷ 18 GHz	4.2 dB	(1)
		Intermodulation attenuation	1MHz ÷ 18 GHz	2.2 dB	(1)
		Attack time – frequency behaviour	1MHz ÷ 18 GHz	2.0 ms	(1)
		Attack time – power behaviour	1MHz ÷ 18 GHz	2.5 ms	(1)
		Release time – frequency behaviour	1MHz ÷ 18 GHz	2.0 ms	(1)
		Release time – power behaviour	1MHz ÷ 18 GHz	2.5 ms	(1)
		Transient behaviour of the transmitter– Transient frequency behaviour	1MHz ÷ 18 GHz	0.2 kHz	(1)
		Transient behaviour of the transmitter – Power level slope	1MHz ÷ 18 GHz	9%	(1)
		Frequency deviation - Maximum permissible frequency deviation	0.001MHz ÷ 18 GHz	1.3%	(1)
		Frequency deviation - Response of the transmitter to modulation frequencies above 3 kHz	0.001MHz ÷ 18 GHz	0.5 dB	(1)
		Dwell time	-	3%	(1)
		Hopping Frequency Separation	0.01MHz ÷ 18 GHz	1%	(1)
		Occupied Channel Bandwidth	0.01MHz ÷ 18 GHz	2%	(1)
		Modulation Bandwidth	0.01MHz ÷ 18 GHz	2%	(1)
	Radiated	Radiated spurious emissions	30MHz ÷ 18 GHz	6.0 dB	(1)
		Effective radiated power transmitter	30MHz ÷ 18 GHz	6.0 dB	(1)
Receiver	Radiated	Radiated spurious emissions	30MHz ÷ 18 GHz	6.0 dB	(1)
		Sensitivity measurement	1MHz ÷ 18 GHz	6.0 dB	(1)
	Conducted	Conducted spurious emissions	1MHz ÷ 18 GHz	4.2 dB	(1)

NOTES:
(1) The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k = 2 which has been derived from the assumed normal probability distribution with infinite degrees of freedom and for a coverage probability of 95 %;

5 TEST CONDITIONS AND RESULTS

5.1 Operating frequency

5.1.1 Photo documentation of the test set-up



5.1.2 Test method according to clause 5.1.2 of ETSI EN 300 220-1

The nominal Operating Frequency is the centre of a channel of width OCW.
The conformance for this requirement shall be as defined in ETSI EN 300 220-1 [1], clause 5.1.2.

Value	Notes
Operational Frequency band or bands	Declared by the manufacturer
Nominal Operating Frequency or Frequencies	Declared by the manufacturer
Operating Channel width(s) - OCW	Declared by the manufacturer

5.1.4 Limits

The manufacturer may declare either one or more operating frequencies and operating channels.
Operating channel(s) shall be entirely within operational frequency bands allowed by annex B.

Table B.1: EU designated frequency band for metering equipment

Frequency Band		Maximum radiated power, e.r.p.	Channel access and occupation rules	Maximum occupied bandwidth	Band number from EC Decision 2013/752/EU [i.2]	Class 1 sub-class number according Commission Decision 2000/299/EU [i.5]
A	169,400 MHz to 169,475 MHz	500 mW e.r.p.	≤ 10 % duty cycle	50 kHz	37b	123

5.1.4 Test result

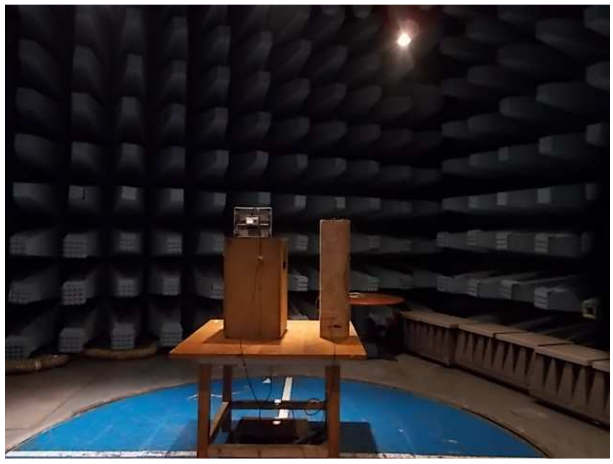
Verdict:	Pass
Test frequency:	169.40625 MHz, 169.41875 MHz, 169.43125 MHz, 169.44375 MHz, 169.45625 MHz, 169.46875 MHz, 169.4375 MHz
Operation mode:	1
Configuration mode:	1
Kind of test site:	anechoic
Remarks: see 5.3 of this report.	

5.1.5 Test equipment used

Equipment	Manufacturer	Model	Serial N°
Trilog Broadband Antenna	Schwarzbeck	VULB 9168	9168-242
EMI receiver (20 Hz ÷ 8 GHz)	R&S	ESU8	100202
Turning-table	R&S	HCT	835 803/03
Antenna mast	R&S	HCM	836 529/05
Controller	R&S	HCC	836 620/7
Semi-anechoic chamber	Nemko	10m semi-anechoic chamber	530
Shielded room	Siemens	10m control room	1947
Climatic Chamber	MSL	EC500DA	15022

5.2 Effective radiated power (radiated measurement)

5.2.1 Photo documentation of the test set-up



5.2.2 Test method according to clause 5.2 of ETSI EN 300 220-1

The effective radiated power (e.r.p) is the power radiated in the direction of the maximum radiated power under specified conditions of measurements for any condition of modulation.

The measurement shall be performed on the lowest and the highest Operating Frequencies declared by the manufacturer. Additional frequencies may be tested. These measurements shall be performed at the highest power level at which the transmitter is intended to operate. The transmitter shall be switched on, if possible, without modulation and the measuring receiver shall be tuned to the frequency of the transmitter under test. D-M1 test signal (unmodulated carrier) shall not be used for equipment with non-constant envelope modulation. The RBW of the spectrum analyser shall be wide enough to cover the complete power envelope (≥ OCW) of the signal of the EUT.In the case of a removable antenna, the antenna shall be fitted in a manner representative of normal use. For measurement in extreme temperature conditions, it is preferable to use an internal or a temporary connector rather than a test fixture.

A suitable test site shall be selected from those described in clause C.1 of ETSI EN 300 220-1 and the radiated power established using the procedures described in clause C.5.2 of ETSI EN 300 220-1, followed by clause C.5.3 of ETSI EN 300 220-1. In the case of non-constant envelope modulation, a peak detector shall be used.

The conformance tests for this requirement shall be as defined in ETSI EN 300 220-1 [1], clause 5.2.2. Conformance shall be established under normal and extreme test conditions.

5.2.3 Limits

The effective radiated power shall not be greater than the value allowed in the following table

Table B.1: EU designated frequency band for metering equipment

Frequency Band		Maximum radiated power, e.r.p.	Channel access and occupation rules	Maximum occupied bandwidth	Band number from EC Decision 2013/752/EU [i.2]	Class 1 sub-class number according Commission Decision 2000/299/EU [i.5]
A	169,400 MHz to 169,475 MHz	500 mW e.r.p.	≤ 10 % duty cycle	50 kHz	37b	123

5.2.4 Test result

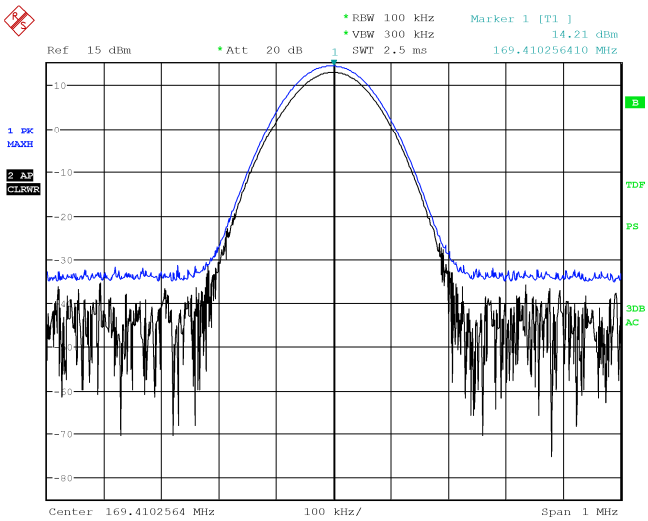
Verdict:	☒ P ☐ F ☐ N
Test environment:	Normal operation
Centre frequency:	169.4 MHz to 169.475 MHz
Effective Radiated Power:	-
Operation mode:	1
Configuration mode:	1
Kind of test site:	Semi anechoic chamber and climatic chamber
Measurement distance:	10 m
Remarks:	

5.2.5 Test equipment used

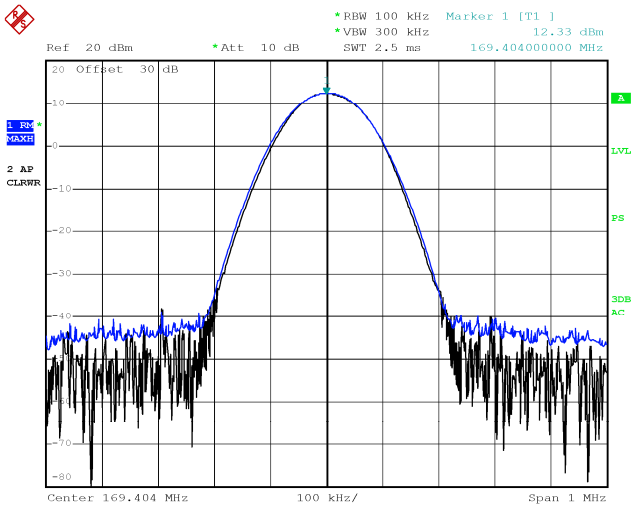
Equipment	Manufacturer	Model	Serial N°
Trilog Broadband Antenna	Schwarzbeck	VULB 9168	9168-242
EMI receiver (20 Hz ÷ 8 GHz)	R&S	ESU8	100202
Turning-table	R&S	HCT	835 803/03
Antenna mast	R&S	HCM	836 529/05
Controller	R&S	HCC	836 620/7
Semi-anechoic chamber	Nemko	10m semi-anechoic chamber	530
Shielded room	Siemens	10m control room	1947
Climatic Chamber	MSL	EC500DA	15022

5.2.6 Test protocol

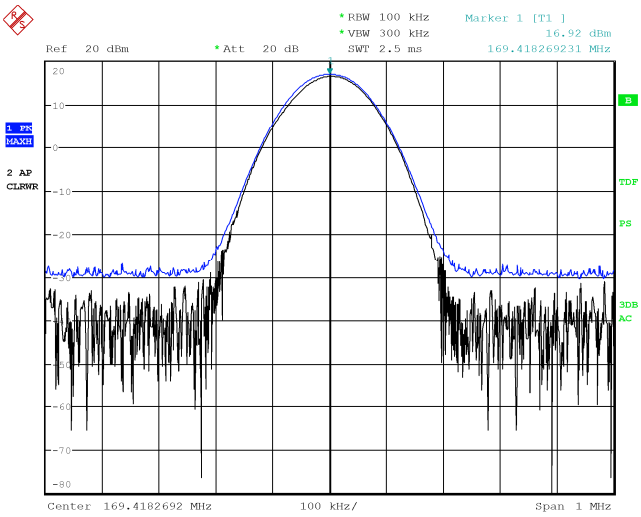
Channel: 0 Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: Vertical



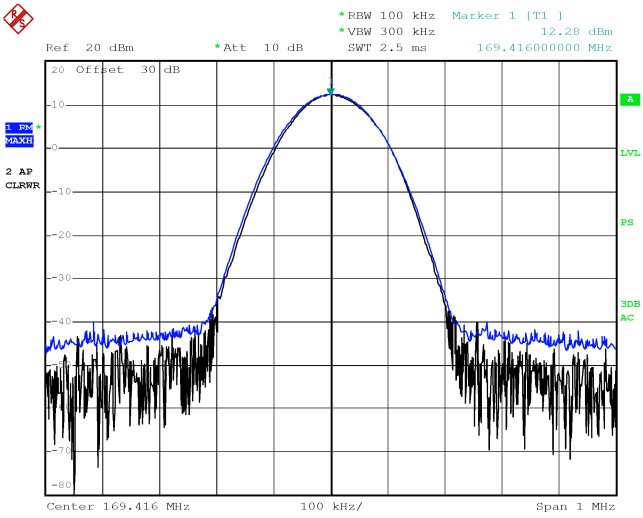
Channel: 0 Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: conducted



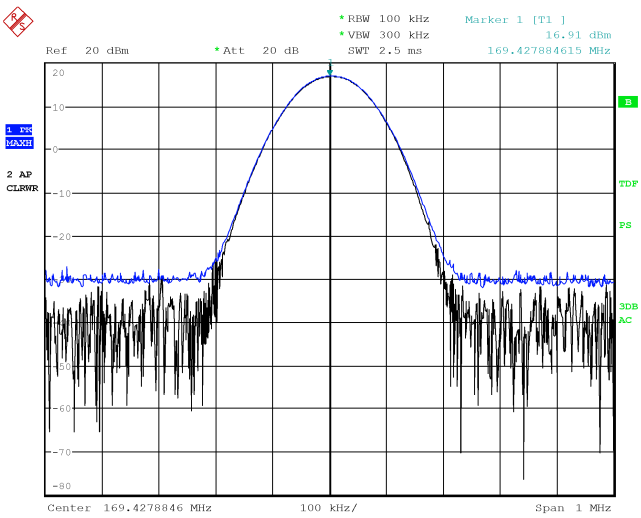
Channel: 1 Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: Vertical



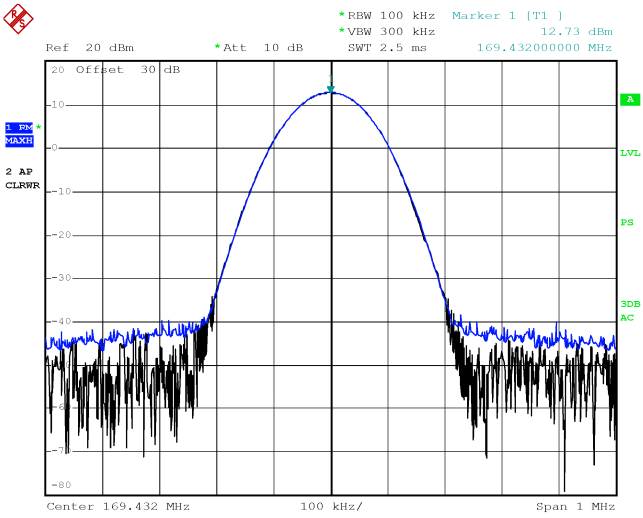
Channel: 1 Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: conducted



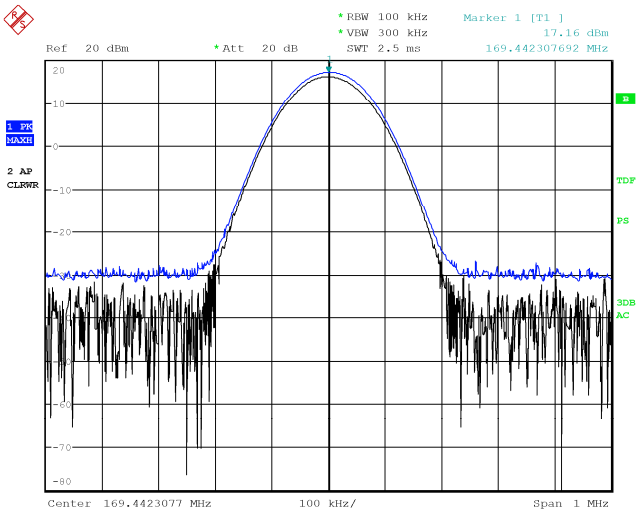
Channel: 2 Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: Vertical



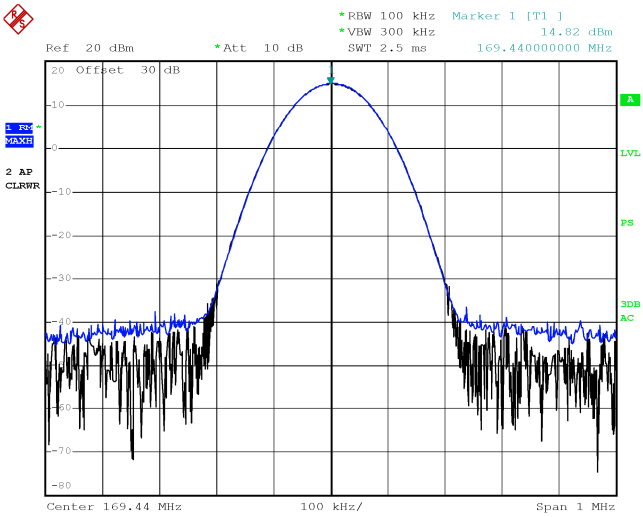
Channel: 2 Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: conducted



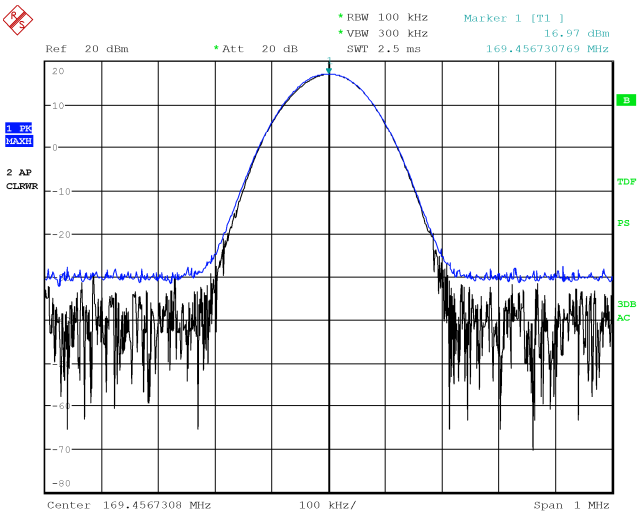
Channel: 3 Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: Vertical



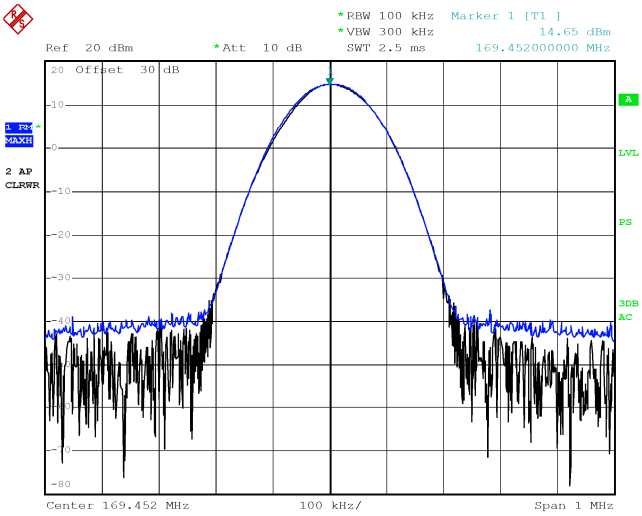
Channel: 3 Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: conducted



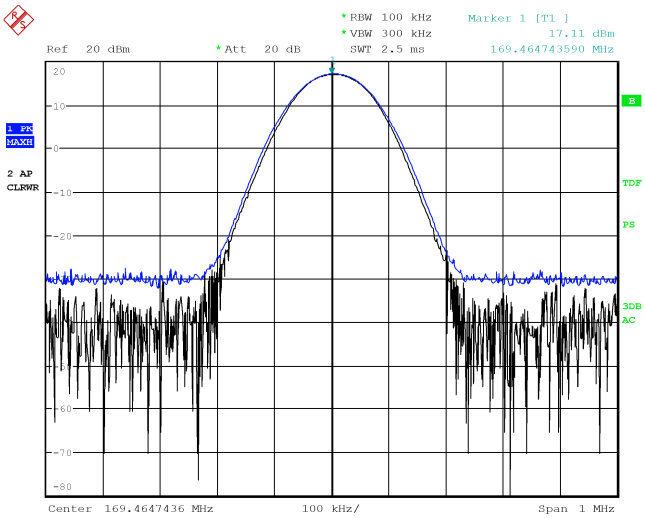
Channel: 4 Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: Vertical



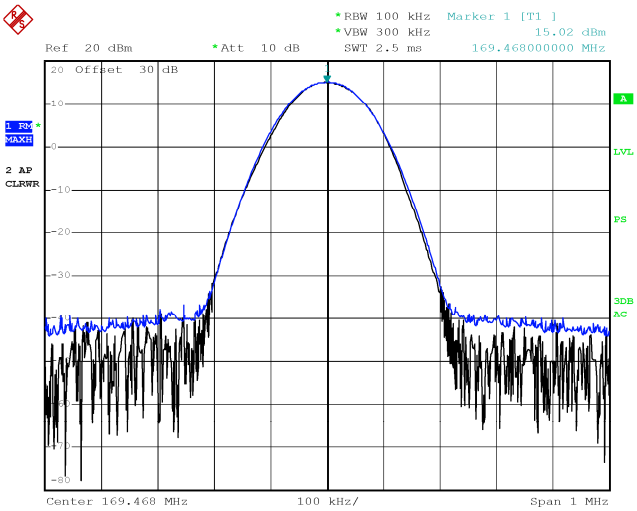
Channel: 4 Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: conducted



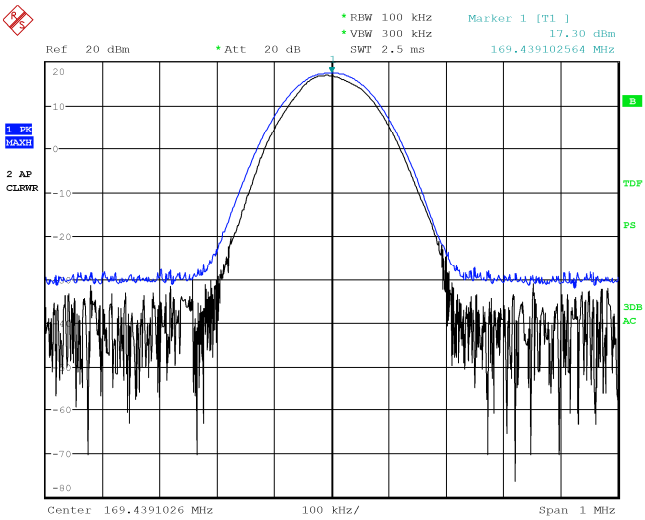
Channel: 5 Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: Vertical



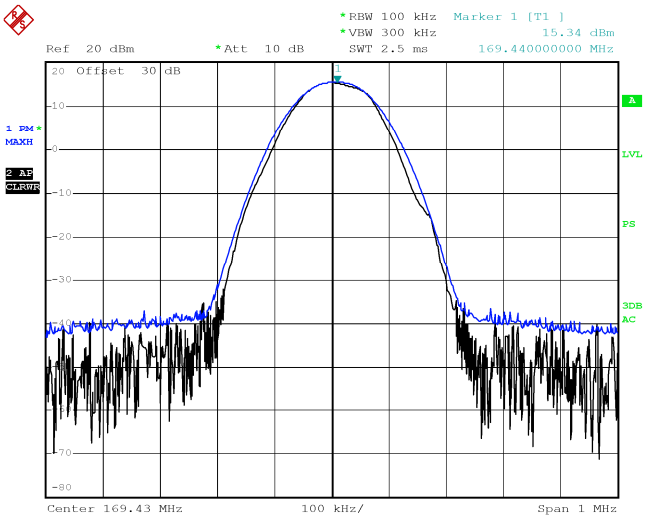
Channel: 5 Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: conducted



Channel: 6 Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: Vertical

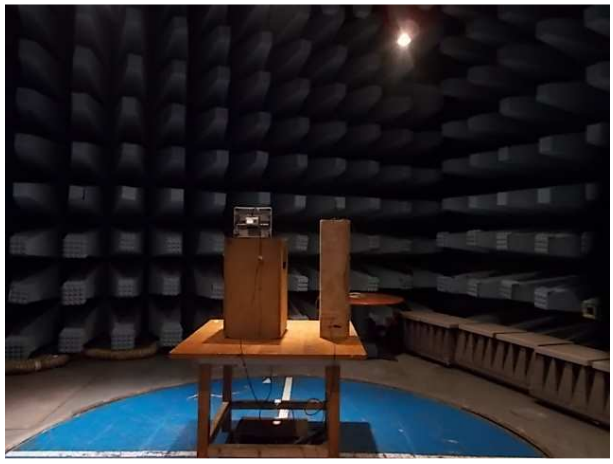


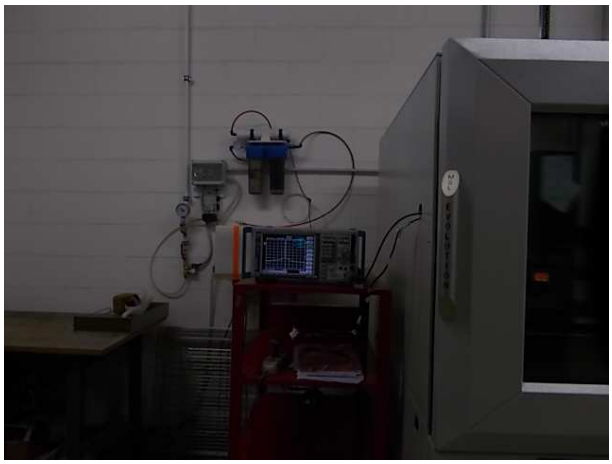
Channel: 6 Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: conducted



5.3 Occupied Bandwidth

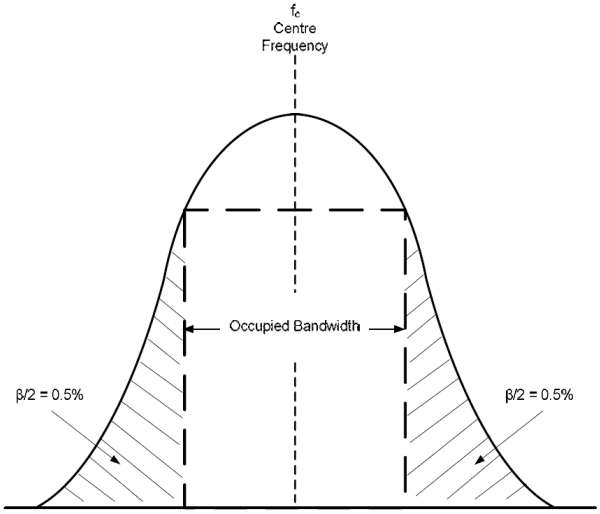
5.3.1 Photo documentation of the test set-up





5.3.2 Test method according to clause 5.6 of ETSI EN 300 220-1

The occupied bandwidth (OBW) is the Frequency Range in which 99 % of the total mean power of a given emission falls. The residual part of the total power being denoted as β, which, in cases of symmetrical spectra, splits up into β/2 on each side of the spectrum. Unless otherwise specified, β/2 is taken as 0,5 % as described in the following figure.



The maximum occupied bandwidth includes all associated side bands above the appropriate emissions level and the frequency error or drift under extreme test conditions. The measurement shall be performed on the lowest and the highest Operating Frequencies declared by the manufacturer. Additional frequencies may be tested. The measurement shall be performed with a spectrum analyser. For devices with e.r.p. ≤ -30 dBm, OBW may be either measured or taken as equal to the OCW within the operational frequency band. For radiated measurement, a suitable test site shall be selected from those described in clause C.1 of ETSI EN 300 220-1 and the measurements in clause 5.6.3.4 of ETSI EN 300 220-1 shall be performed using corresponding radiated measurement methods described in clause C.5 of ETSI EN 300 220-1. For conducted measurement, the EUT shall be connected to an artificial antenna which shall be connect to the test equipment via an appropriate attenuator.
The spectrum analyser shall be configured as appropriate for the parameters shown in the following table.

Setting	Value	Notes
Centre frequency	The nominal Operating Frequency	The highest or lowest Operating Frequency as declared by the manufacturer
RBW	1 % to 3 % of OCW without being below 100 Hz	
VBW	3 x RBW	Nearest available analyser setting to 3 x RBW
Span	At least 2 x Operating Channel width	Span should be large enough to include all major components of the signal and its side bands
Detector Mode	RMS	
Trace	Max hold	

If the equipment is capable of producing an unmodulated carrier and the test in clause 5.7 is performed, then the OBW measurements need only be performed under normal test conditions. Any required results for Maximum OBW under extreme conditions are obtained by addition and substraction of the upper and lower frequency error results to each bandwidth measurement obtained in this test.

5.3.3 Limits

The occupied bandwidth of the EUT shall comply with the limits in the following table.
Limits apply under normal and extreme conditions

5.3.4 Test result

Verdict:	☒ P ☐ F ☐ N
Operational Frequency Band:	169.4 MHz to 169.475 MHZ
Operation mode:	1
Configuration mode:	1
Kind of test site:	Semi-anechoic chamber
Remarks: no variation under extreme conditions	

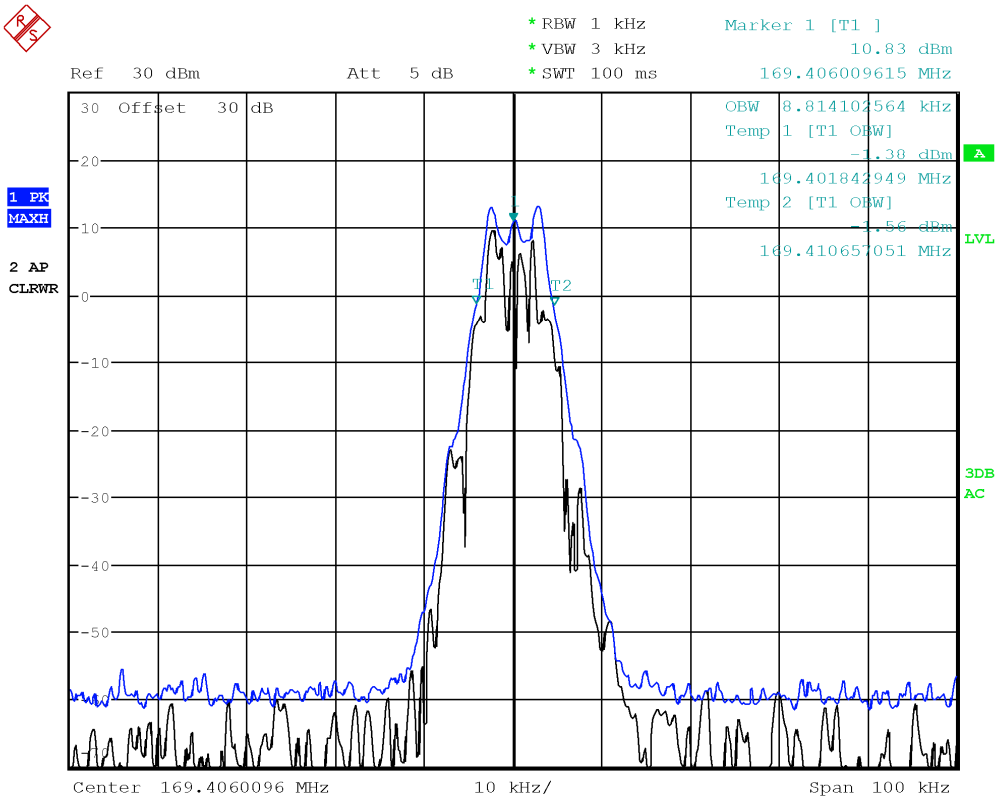
5.3.5 Test equipment used

Equipment	Manufacturer	Model	Serial N°
Trilog Broadband Antenna	Schwarzbeck	VULB 9168	9168-242
EMI receiver (20 Hz ÷ 8 GHz)	R&S	ESU8	100202
Turning-table	R&S	HCT	835 803/03
Antenna mast	R&S	HCM	836 529/05
Controller	R&S	HCC	836 620/7
Semi-anechoic chamber	Nemko	10m semi-anechoic chamber	530
Shielded room	Siemens	10m control room	1947
Climatic Chamber	MSL	EC500DA	15022

5.3.6 Test protocol

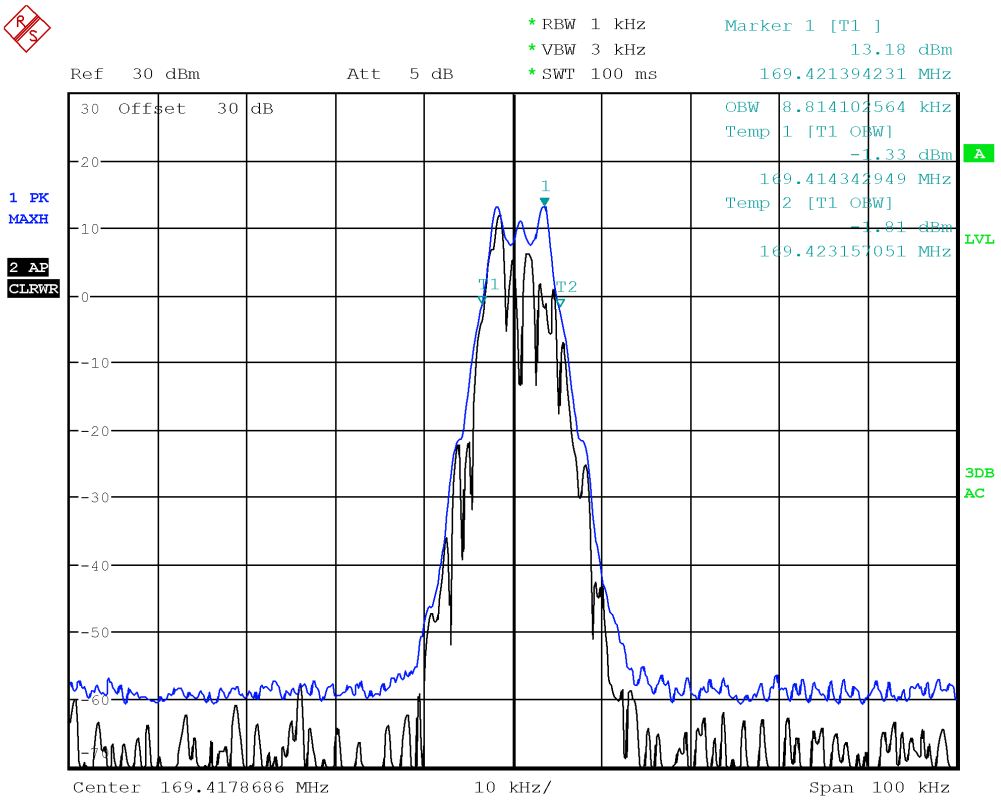
Verdict: Pass

Channel: 0
Operation mode: 1
Configuration mode: 1
Remarks:



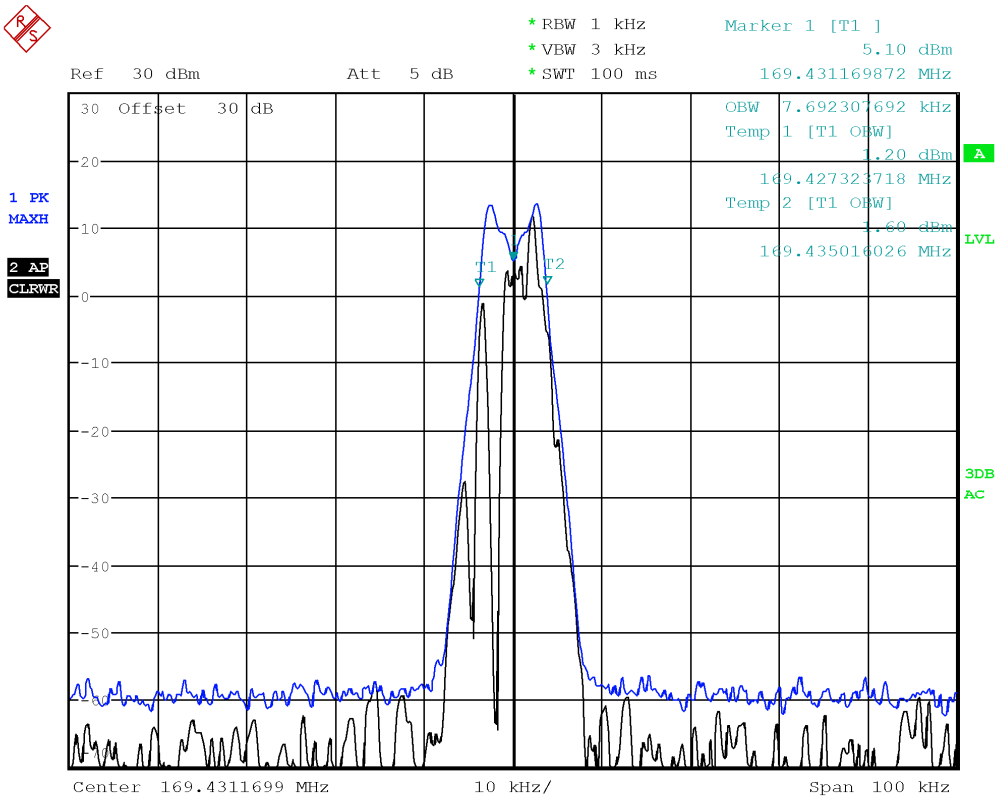
Verdict: Pass

Channel: 1
Operation mode: 1
Configuration mode: 1
Remarks:



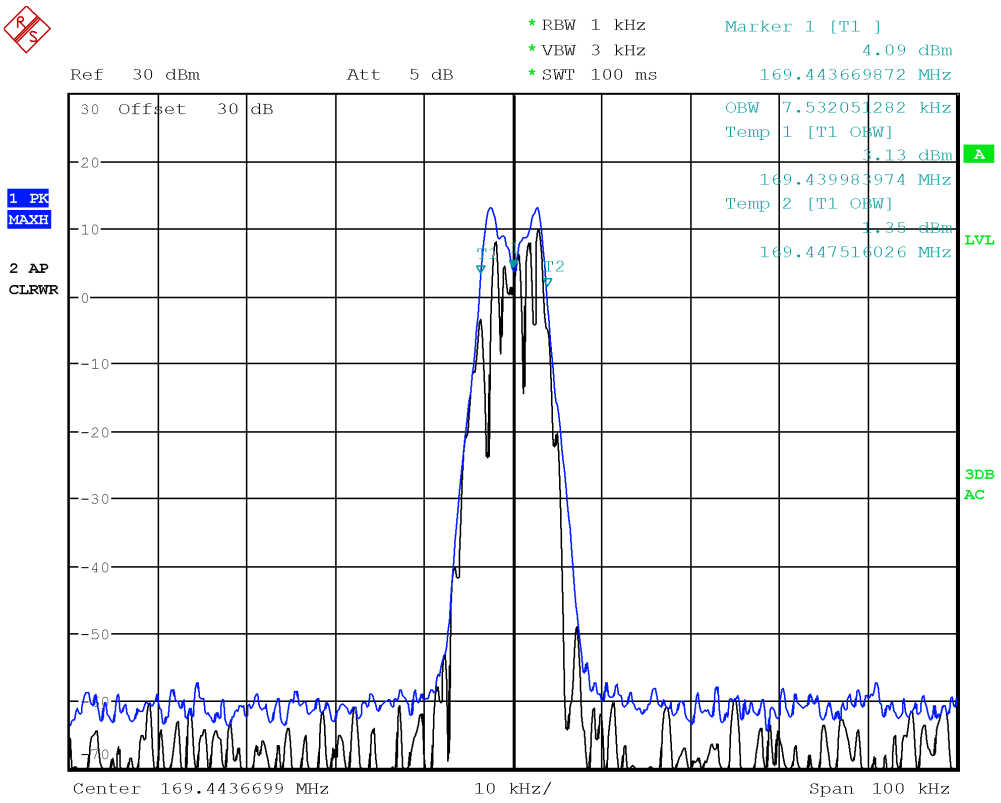
Verdict: Pass

Channel: 2
Operation mode: 1
Configuration mode: 1
Remarks:



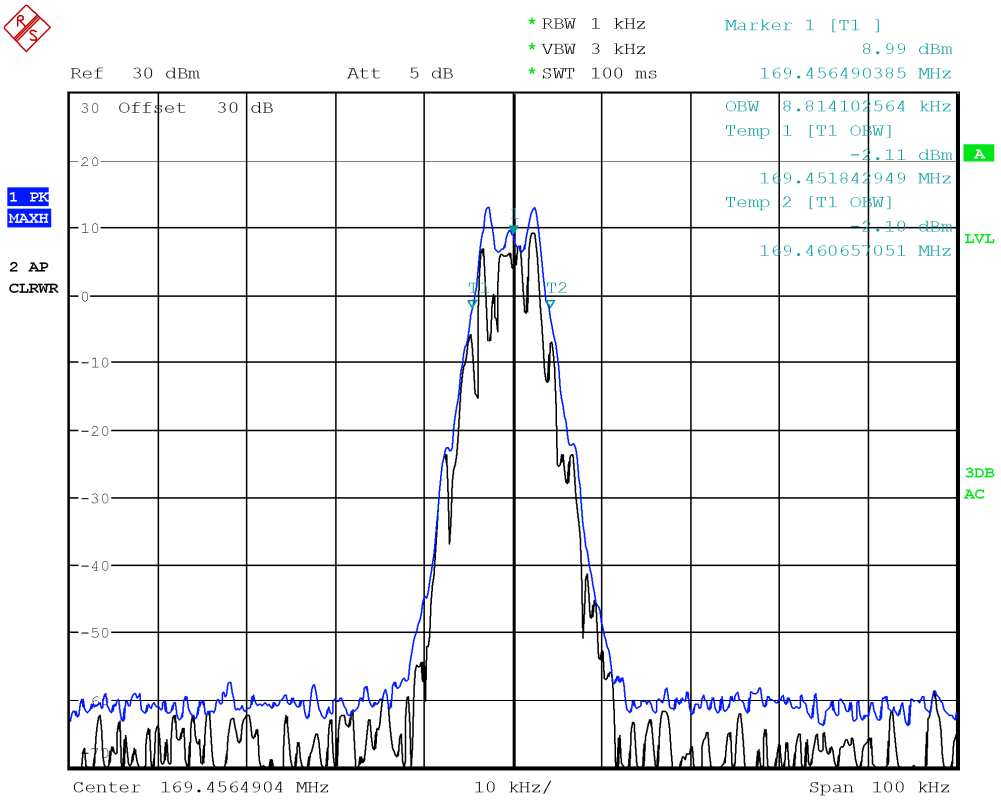
Verdict: Pass

Channel: 3
Operation mode: 1
Configuration mode: 1
Remarks:



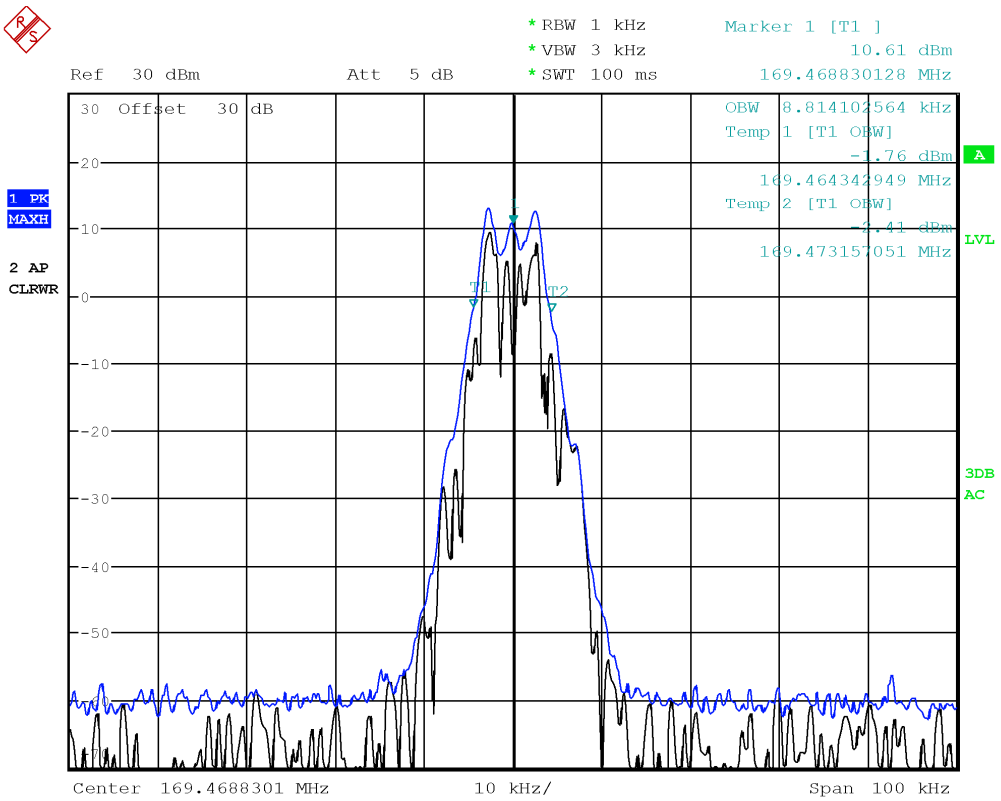
Verdict: Pass

Channel: 4
Operation mode: 1
Configuration mode: 1
Remarks:



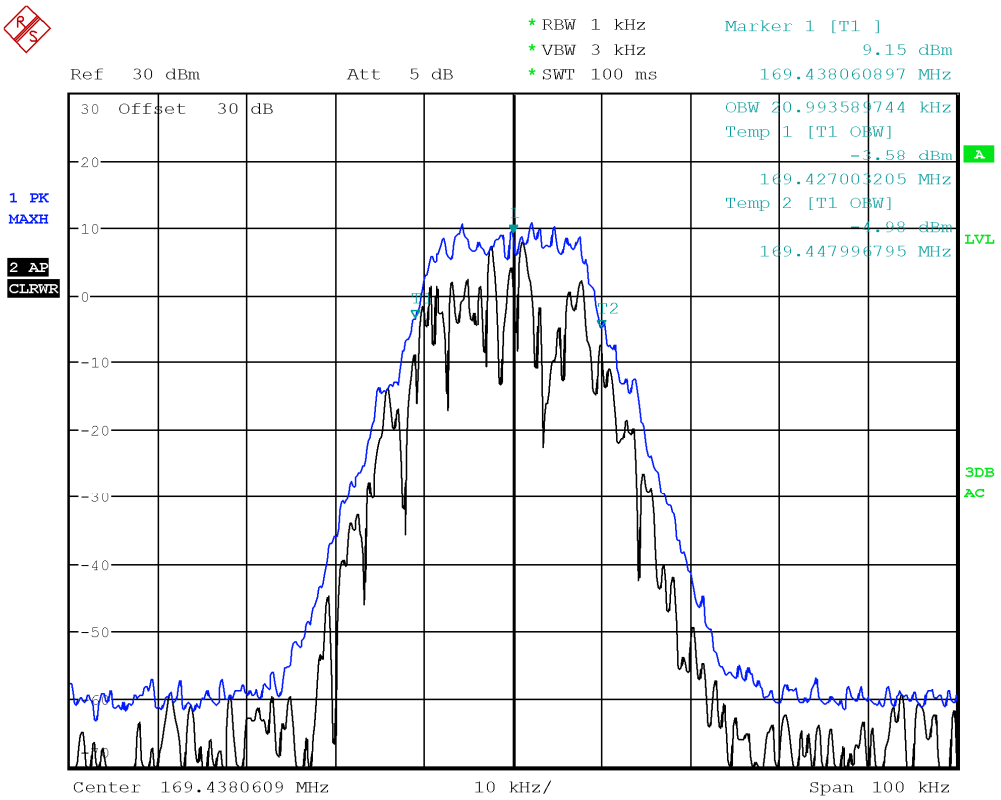
Verdict: Pass

Channel: 5
Operation mode: 1
Configuration mode: 1
Remarks:



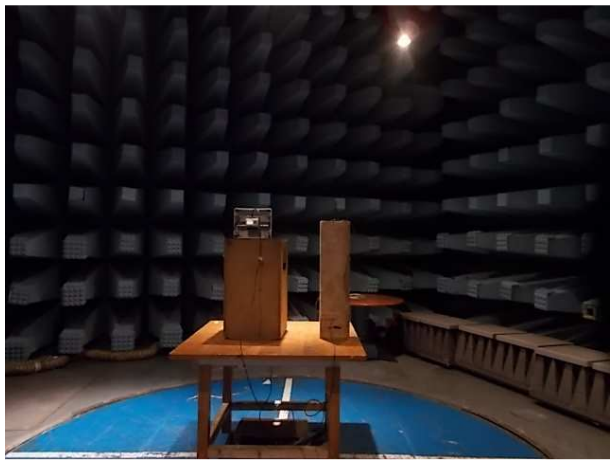
Verdict: Pass

Channel: 6
Operation mode: 1
Configuration mode: 1
Remarks:



5.4 Transient power

5.4.1 Photo documentation of the test set-up



5.4.2 Test method according to clause 5.10 of ETSI EN 300 220-1

Transmitter transient power is power falling into frequencies other than the operating channel as a result of the transmitter being switched on and off. Conformance shall be established under normal test conditions.

The measurement shall be performed on the lowest and the highest operating Frequency declared by the manufacturer. Additional frequencies may be tested. These measurements shall be performed at the highest power level at which the transmitter is intended to operate.

The output of the EUT shall be connected to a spectrum analyser or equivalent measuring equipment. The measurement shall be undertaken in zero span mode. The analyser's centre frequency shall be set to an offset from the operating centre frequency. These offset values and their corresponding RBW configurations are listed in the following table.

Measurement points: offset from centre frequency	Analyser RBW	RBW_{REF}
-0,5 x OCW - 3 kHz 0,5 x OCW + 3 kHz Not applicable for OCW < 25 kHz	1 kHz	1kHz
±12,5 kHz or ±OCW whichever is the greater	Max (RBW pattern 1, 3, 10 kHz) ≤ Offset frequency/6 (see note)	1 kHz
-0,5 x OCW - 400 kHz 0,5 x OCW + 400 kHz	100 kHz	1 kHz
-0,5 x OCW -1 200 kHz 0,5 x OCW + 1 200 kHz	300 kHz	1 kHz
NOTE: Max (RBW pattern 1, 3, 10 kHz) means the maximum bandwidth that falls into the commonly implemented 1, 3, 10 kHz RBW filter bandwidth incremental pattern of spectrum analysers. EXAMPLE: If OCW is 25 kHz then the RBW value corresponding to one OCW offset frequency is 3 kHz. The rest of the analyser settings are listed in Table 25, and if OCW is 250 kHz then the RBW value corresponding to one OCW offset frequency is 30 kHz.		

The used modulation shall be D-M3. The analyser shall be set to the settings of the following table and a measurement shall be started for each offset frequency. The EUT shall transmit at least five D-M3 test signal. The peak value shall be recorded and the measurement shall be repeated at each offset frequency mentioned in the above table. The recorded power values shall be converted to power values measured in RBWREF by the formula in clause 4.3.10.1 of ETSI EN 300 220-1.

Spectrum Analyser Setting	Value	Notes
VBW/RBW	10	At higher RBW values VBW may be clipped to its maximum value
Sweep time	500 ms	
RBW filter	Gaussian	
Trace Detector Function	RMS	
Trace Mode	Max hold	
Sweep points	501	
Measurement mode	Continuous sweep	
NOTE: The ratio between the number of sweep points and the sweep time shall be the same ratio as above if different number of sweep points is used.		

5.4.3 Limits

The transient power shall not exceed the values given in the following table.

Absolute offset from centre frequency	RBW_{REF}	Peak power limit applicable at measurement points
≤ 400 kHz	1 kHz	0 dBm
> 400 kHz	1 kHz	-27 dBm

5.4.4 Test result

Frequency (MHz)	Level (dBm)	Level @ RBW_{REF} (dBm)	Limit (dBm)
169.4095	-68.0 @ 1 kHz	-68	0
169.4655	-65.7 @ 1 kHz	-65.7	0
169.3875	-64.9 @ 10 kHz	-74.9	0
169.4875	-52.3 @ 10 kHz	-62.3	0
169.0125	-56 @ 100 kHz	-76	-27
169.8625	-57.8 @ 100 kHz	-77.8	-27
168.2125	-58.5 @ 300 kHz	-83.2	-27
170.6625	-58.0 @ 300 kHz	-82.7	-27

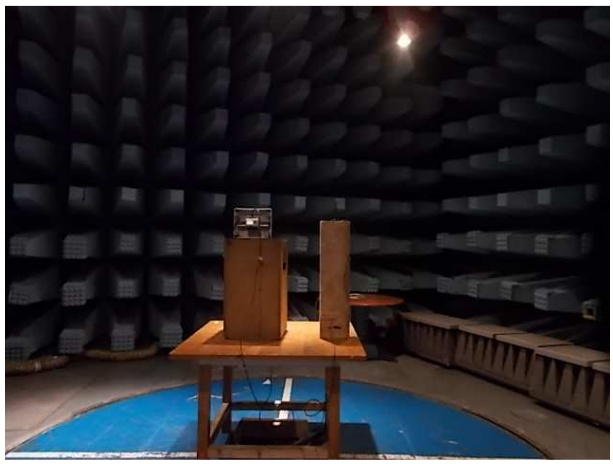
Verdict:	☒ P ☐ F ☐ N
Operation mode:	1
Configuration mode:	1
Kind of test site:	Shielded room
Remarks: no variation under extreme conditions	

5.4.5 Test equipment used

Equipment	Manufacturer	Model	Serial N°
Trilog Broadband Antenna	Schwarzbeck	VULB 9168	9168-242
EMI receiver (20 Hz ÷ 8 GHz)	R&S	ESU8	100202
Turning-table	R&S	HCT	835 803/03
Antenna mast	R&S	HCM	836 529/05
Controller	R&S	HCC	836 620/7
Semi-anechoic chamber	Nemko	10m semi-anechoic chamber	530
Shielded room	Siemens	10m control room	1947
Climatic Chamber	MSL	EC500DA	15022

5.5 Tx Out of Band Emissions

5.5.1 Photo documentation of the test set-up



5.5.2 Test method according to clause 5.8 of ETSI EN 300 220-1

TX Out of Band Emissions applies to all transmitters with OCW > 25 kHz. Two OOB domains are defined, one for OC (see Figure 5) and one for Operational Frequency band (see Figure 6). The spectrum masks for these two OOB domains may overlap.

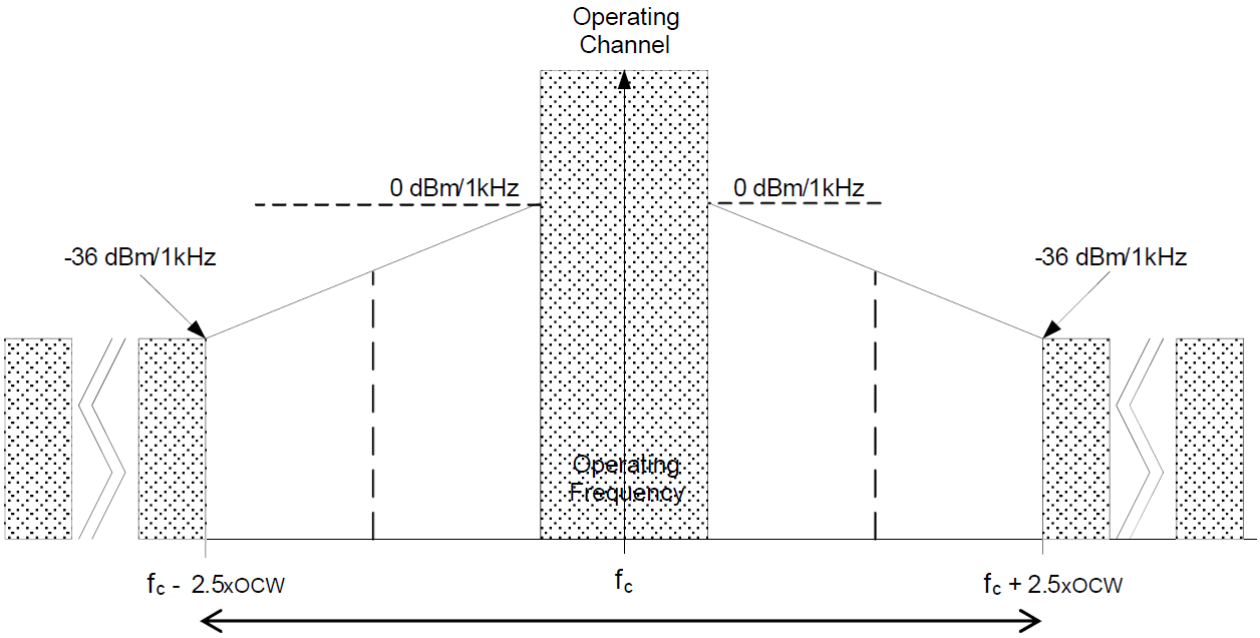


Figure 5: Out Of Band Domain for Operating Channel with reference BW

Unwanted emissions in the Out Of Band domain are those falling in the frequency range immediately below the lower, and above the upper, frequency of the Operating Channel. The OOB domain includes both frequencies outside the Operating Channel within the Operational Frequency Band and frequencies outside the Operational Frequency Band. The relevant Out Of Band domain is shown in Figure 5 and applies within the Operational Frequency Band.

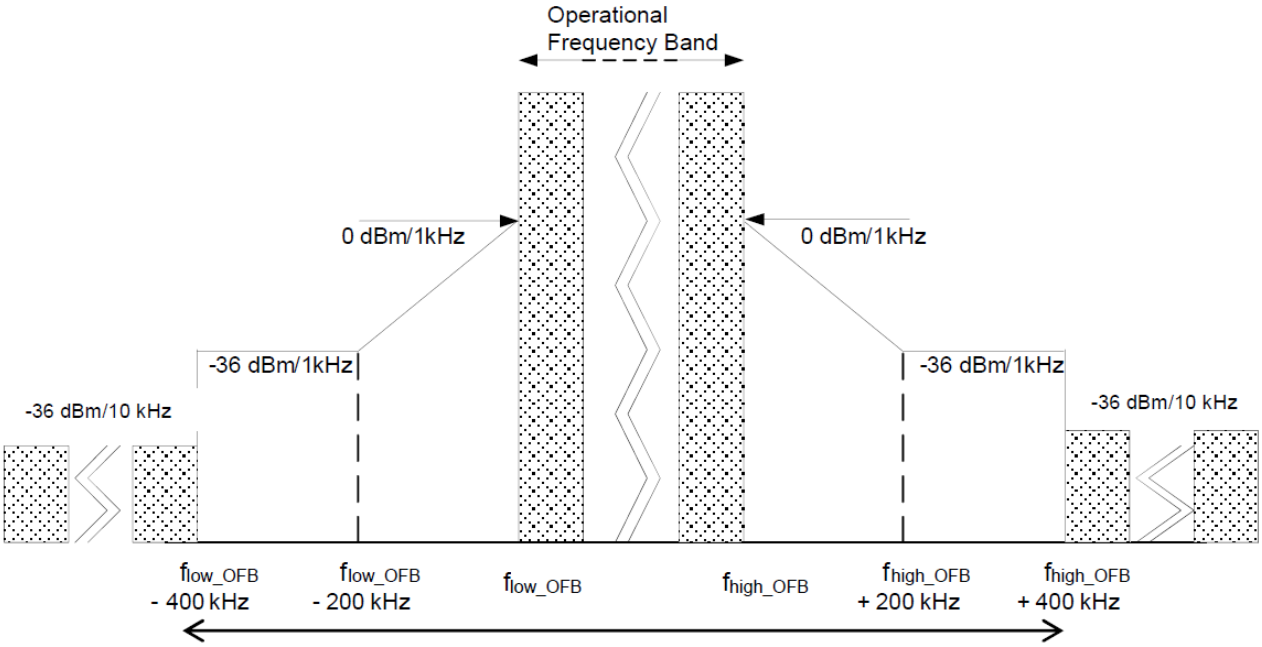


Figure 6: Out Of Band Domain for Operational Frequency Band with reference BW

Specific limits apply at frequencies immediately above and below the Operational Frequency Band as shown in Figure 6. NOTE: f_{low}_OFB is the lower edge of the Operational Frequency Band. f_{high}_OFB is the upper edge of the Operational Frequency Band.

If frequency error test is performed then the measurements may be made under normal test conditions only, with the upper and lower frequency error results added and subtracted to the masks of this test. An EUT without a permanent or temporary antenna connector shall be tested according to radiated measurement method. An EUT with a permanent or temporary antenna connector shall be tested according to conducted measurement method. For measurement in extreme temperature conditions, it is preferable to use an internal or a temporary connector rather than a test fixture.

For radiated measurement, the measurements shall be performed using a suitable test site from those described in clause C.1 of ETSI EN 300 220-1 and using corresponding radiated measurement methods described in clause C.5.2 of ETSI EN 300 220-1 (SAR), followed by clause C.5.3 if ETSI EN 300 220-1. For conducted measurement, the EUT shall be connected to an artificial antenna which shall be connect to the test equipment via an appropriate attenuator. The test equipment shall be configured as appropriate for the parameters shown in the following table.

Spectrum Analyser Setting	Value	Notes
Centre frequency	Operating Frequency	
Span	6 x Operating Channel width	
RBW	1 kHz (see note)	Resolution bandwidth for Out Of Band domain measurements
Detector Function	RMS	
Trace Mode	Linear AVG	Applies only for EUT generating D-M2 test signal. An appropriate number of samples should be averaged to give a stable reading
	Max Hold	Applies only for EUT generating D-M2a or D-M3 test signal.
NOTE: If the value of RBW used is different from RBW_{REF} in clause 5.8.2, use the bandwidth correction in clause 4.3.10.1.		

STEP 1. Operation of the EUT shall be started, on the highest operating frequency as declared by the manufacturer, with the appropriate test signal. The signal shape is recorded when stable and shall be below the spectrum mask Out Of Band for operating channel.

STEP 2. The test equipment shall be reconfigured as appropriate for the parameter shown in the following table. Operation of the EUT is restarted, with the appropriate test signal, on the lowest operating frequency as declared by the manufacturer. If the equipment is using only one operating Frequency in the operational Frequency Band, measurement shall be performed the nominal operating frequency. The signal shape is recorded when stable; and shall be below the spectrum mask for operating channel and the spectrum mask for operational frequency band.

Spectrum Analyser Setting	Value	Notes
Centre frequency	fc_{low}	The lowest Operating Frequency in the band
Span	2 x (500 kHz + fc_{low} - f_{low_OFB})	Ensures that the left most mask specification remains within the span
NOTE: f_{low_OFB} is the lower edge of the Operational Frequency Band.		

STEP 3. The test equipment shall be reconfigured as appropriate for the parameter shown in the following table. Operation of the EUT is restarted, with the appropriate test signal, on the highest Operating Frequency as declared by the manufacturer. If the equipment is using only one Operating Frequency in the Operational Frequency Band, measurement shall be performed at the nominal Operating Frequency The signal shape is recorded when stable and shall be below the spectrum mask for Out Of Band emissions for operating channel and for operational Frequency Band.

Spectrum Analyser Setting	Value	Notes
Centre frequency	fc_{high}	the highest Operating Frequency in the band
Span	2 x (500 kHz + f_{high_OFB} - fc_{high})	Ensures that the rightmost mask specification remains within the span
NOTE: f_{high_OFB} is the higher edge of the operational frequency Band.		

STEP 4. For frequency agile devices, the measurement shall be repeated in each Operational Frequency Band.
STEP 5. Where required, the measurements in step 1 to step 5 shall be repeated under extreme test conditions.

5.5.3 Limits

The EUT emissions level in OOB domains for the Operating Channel and the Operational Frequency Band shall be less or equal to the following table spectrum mask.
The conformance tests for this requirement shall be as defined in ETSI EN 300 220-1 [1], clause 5.8.3.
Conformance shall be established under normal and extreme test conditions

Domain	Frequency Range	RBW_{REF}	Max power limit
OOB limits applicable to Operational Frequency Band (See Figure 6)	$f \le f_{low\_OFB}$ - 400 kHz	10 kHz	-36 dBm
	F_{low_OFB} - 400 kHz $\le f \le f_{low\_OFB}$ - 200 kHz	1 kHz	-36 dBm
	f_{low} - 200 kHz $\le f < f_{low\_OFB}$	1 kHz	See Figure 6
	$f = f_{low\_OFB}$	1 kHz	0 dBm
	$f = f_{high\_OFB}$	1 kHz	0 dBm
	$F_{high\_OFB} < f \le f_{high\_OFB}$ + 200 kHz	1 kHz	See Figure 6
	F_{high_OFB} + 200 kHz $\le f \le f_{high\_OFB}$ + 400 kHz	1 kHz	-36 dBm
	F_{high_OFB} + 400 kHz $\le f$	10 kHz	-36 dBm
OOB limits applicable to Operating Channel (See Figure 5)	$f = f_c$- 2.5 x OCW	1 kHz	-36 dBm
	f_c - 2,5 x OCW $\le f \le f_c$ - 0,5 x OCW	1 kHz	See Figure 5
	$f = f_c$ - 0,5 x OCW	1 kHz	0 dBm
	$f = f_c$ + 0,5 x OCW	1 kHz	0 dBm
	f_c + 0,5 x OCW $\le f \le f_c$ + 2,5 x OCW	1 kHz	See Figure 5
	$f = f_c$+ 2,5 x OCW	1 kHz	-36 dBm
NOTE: f is the measurement frequency. f_c is the Operating Frequency. F_{low_OFB} is the lower edge of the Operational Frequency Band. F_{high_OFB} is the upper edge of the Operational Frequency Band. OCW is the operating channel bandwidth.			

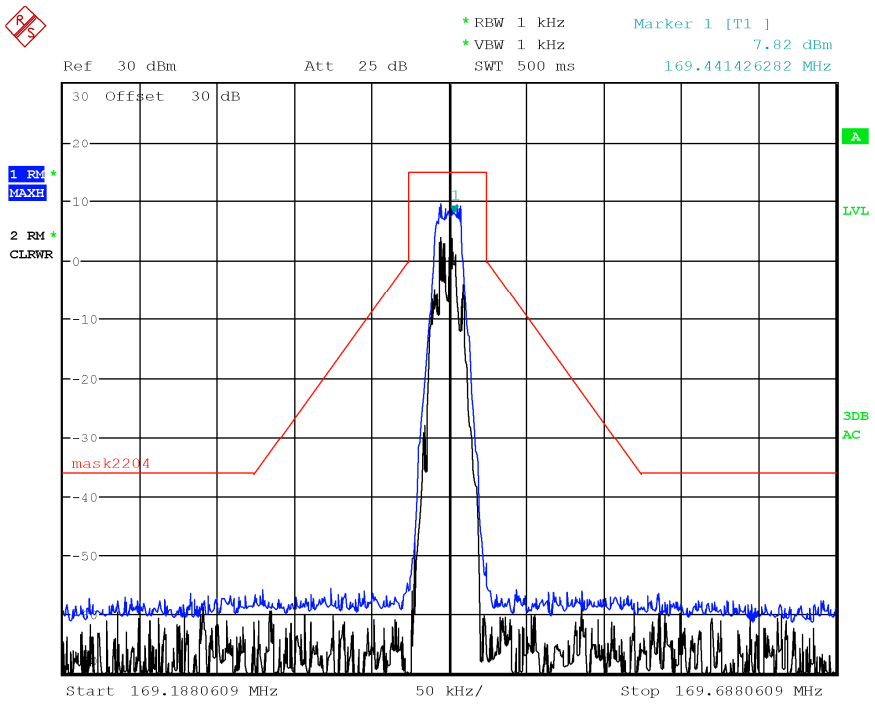
5.5.4 Test result

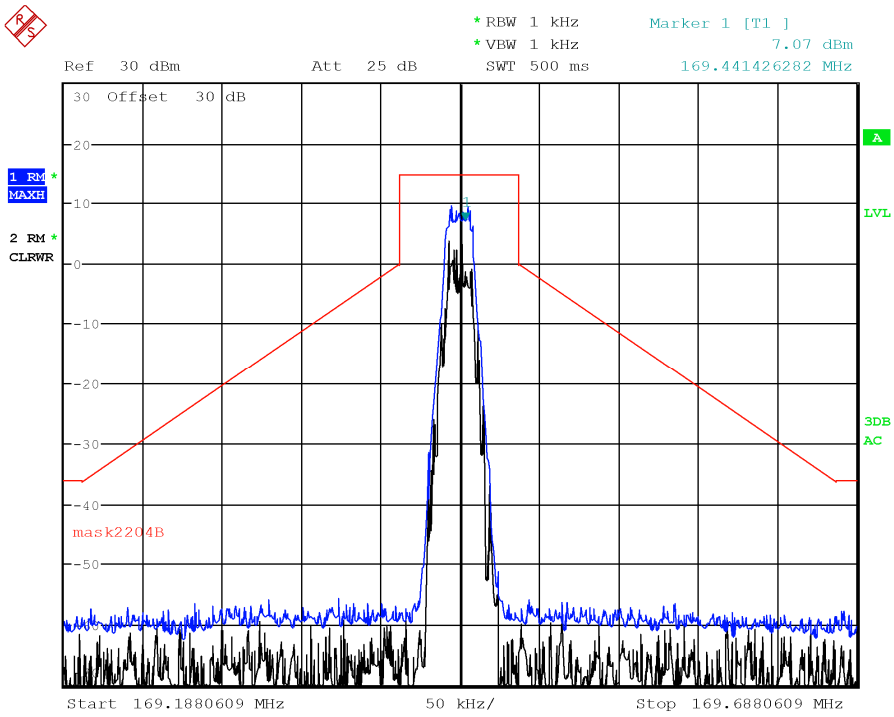
Verdict:	☒ P ☐ F ☐ N
Operational Frequency Band:	169.4 MHz to 169.475 MHz
Operation mode:	1
Configuration mode:	1
Kind of test site:	Semi-anechoic chamber
Remarks: no variation under extreme conditions	

5.5.5 Test equipment used

Equipment	Manufacturer	Model	Serial N°
Trilog Broadband Antenna	Schwarzbeck	VULB 9168	9168-242
EMI receiver (20 Hz ÷ 8 GHz)	R&S	ESU8	100202
Turning-table	R&S	HCT	835 803/03
Antenna mast	R&S	HCM	836 529/05
Controller	R&S	HCC	836 620/7
Semi-anechoic chamber	Nemko	10m semi-anechoic chamber	530
Shielded room	Siemens	10m control room	1947
Climatic Chamber	MSL	EC500DA	15022

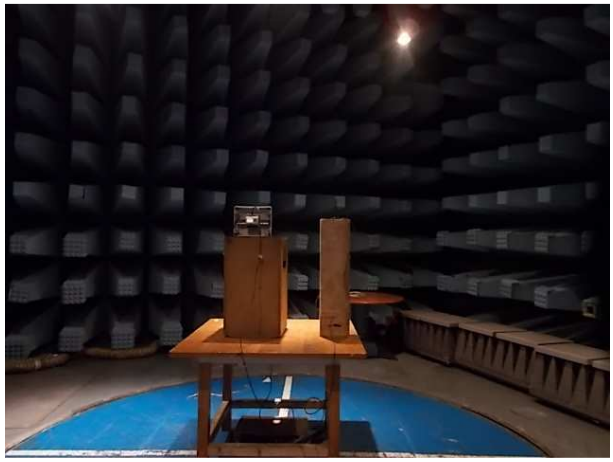
5.5.6 Test protocol





5.6 Unwanted emissions in the spurious domain

5.6.1 Photo documentation of the test set-up



5.6.2 Test method according to clause 5.9 of ETSI EN 300 220-1

Spurious emissions are unwanted emissions in the spurious domain at frequencies other than those of the Operating Channel and its Out Of Band Domain. Spurious radiations from the EUT are components, at any frequency, radiated by the equipment and antenna.

For EUT without an external conventional 50 Ω coaxial antenna connector, the spurious emissions levels shall be established by the radiated measurement procedure. For all other EUT the spurious emissions levels shall be established as both the conducted measurement procedure and the radiated measurement procedure with the antenna port terminated in a dummy load.

The transmitter shall be performed on the lowest and the highest Operating Frequency declared by the manufacturer. Additional frequencies may be tested. The measurement shall be performed with the EUT operating at its maximum operating power level, as declared by the manufacturer, and also with the EUT in powered-on stand-by mode and in RX mode. The RBW of measuring receiver are shown in the following table (Table 20 of ETSI EN 300 220-1).

Operating Mode	Frequency Range	RBW_{REF} (see note 2)
Transmit mode	9 kHz ≤ f < 150 kHz	1 kHz
	150 kHz ≤ f < 30 MHz	10 kHz
	30 MHz ≤ f < f_c - m	100 kHz
	f_c - m ≤ f < f_c - n	10 kHz
	f_c - n ≤ f < f_c - p	1 kHz
	f_c + p < f ≤ f_c + n	1 kHz
	f_c + n < f ≤ f_c + m	10 kHz
	f_c + m < f ≤ 1 GHz	100 kHz
	1 GHz < f ≤ 6 GHz	1 MHz

NOTE 1: f is the measurement frequency.
f_c is the Operating Frequency.
m is 10 x OCW or 500 kHz, whichever is the greater.
n is 4 x OCW or 100 kHz, whichever is the greater.
p is 2,5 x OCW.

NOTE 2: If the value of RBW used for measurement is different from RBW_{REF}, use bandwidth correction from clause 4.3.10.1.

For conducted measurement, the antenna port of the EUT shall be connected to the dummy load and the output of the dummy load connected to the measuring receiver. The measuring receiver shall be tuned over the frequency range shown in the following table.

Frequency Range
9 kHz to 6 GHz
NOTE: The measurements need only to be performed over the frequency range 4 GHz to 6 GHz if emissions are detected within 10 dB of the specified limit between 1.5 GHz and 4 GHz.

At each frequency at which a spurious component is detected, the power level shall be measured and noted.
For radiated measurement, a suitable test site shall be selected from those described in clause C.1 of ETSI EN 300 220-1. The output of the test antenna shall be connected to a measuring receiver. The measuring receiver shall be tuned over the frequency range shown in the following table.

Frequency Range
25 MHz to 6 GHz
NOTE: The measurements need only to be performed over the frequency range 4 GHz to 6 GHz if emissions are detected within 10 dB of the specified limit between 1.5 GHz and 4 GHz.

At each frequency at which a spurious component is detected within the frequency range in the table, the spurious emission power level shall be established using the procedures described below and noted in the report. The maximum signal level detected by the measuring receiver for vertical and horizontal polarization shall be noted. The radiated measurements followed by the substitution measurement shall be performed with the frequency of the calibrated signal generator set to the frequency of the spurious component detected and, if necessary, the input attenuator setting of the measuring receiver adjusted in order to increase the sensitivity of the measuring receiver. The measure of the effective radiated power of the spurious component is the larger of the two power levels at the input to the substitution antenna increased by the substitution antenna gain corrected by the cable loss (values in dB). The power measured shall be recorded in the test report for each spurious component.

Radiated measurements shall be performed with the aid of a measurement antenna and a substitution antenna described in clause C.2 of ETSI EN 300 220-1, in Semi Anechoic Room. The EUT and the measurement antenna shall be oriented such as to obtain the maximum emitted power level. This position shall be recorded in the measurement report. The measurement antenna shall be oriented initially for vertical polarization unless otherwise stated and the EUT shall be placed on the support in its standard position and switched on. The measurement equipment shall be connected to the measurement antenna and set-up according to the specifications of the test. The EUT shall be rotated through 360° in a horizontal plane until a maximum signal is received at the measurement equipment. The measurement antenna shall be raised or lowered again through the specified height range until a maximum is obtained at the measurement equipment. This level shall be recorded. This measurement shall be repeated for horizontal polarization.

5.6.3 Limits

The power of any unwanted emission in the spurious domain shall not exceed the values given in following table.

Stae	174 MHz to 230 MHz 470 MHz to 862 MHz 47 MHz to 74 MHz 87.5 to 118 MHz	Other frequencies below 1000 MHz	Frequencies above 1000 MHz
TX mode	-54 dBm	-36 dBm	-30 dBm
RX and all other modes	-57 dBm	-57 dBm	-47 dBm

5.6.4 Test result

Verdict:	☒ P ☐ F ☐ N
Frequency range:	25MHz - 6000MHz
Kind of test site:	Semi anechoic chamber
Measurement distance:	10 m and 3 m
Remarks:	

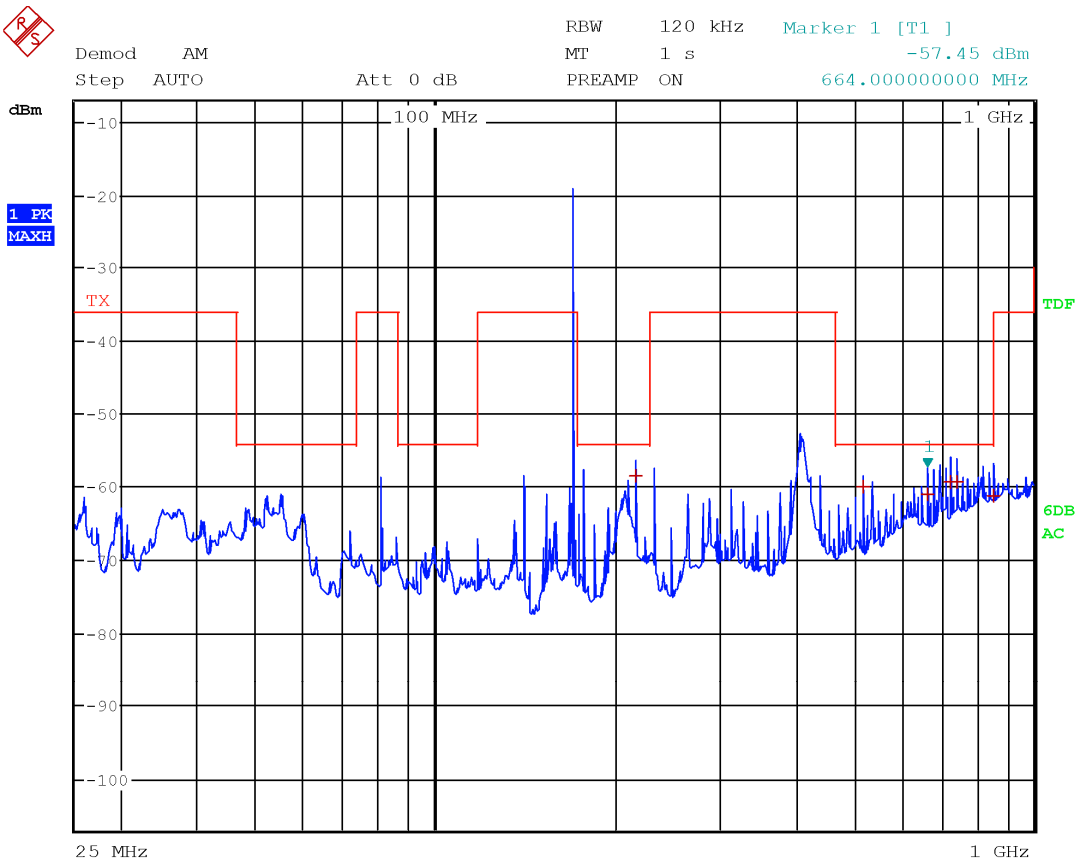
5.6.5 Test equipment used

Equipment	Manufacturer	Model	Serial N°
Trilog Broadband Antenna	Schwarzbeck	VULB 9168	9168-242
Bilog antenna 1 – 18 GHz	Schwarzbeck	STLP 9148-123	123
Broadband preamplifier	Schwarzbeck	BBV 9718	9718-137
EMI receiver (20 Hz ÷ 8 GHz)	R&S	ESU8	100202
Turning-table	R&S	HCT	835 803/03
Antenna mast	R&S	HCM	836 529/05
Controller	R&S	HCC	836 620/7
Semi-anechoic chamber	Nemko	10m semi-anechoic chamber	530
Shielded room	Siemens	10m control room	1947
EMI receiver (2 Hz ÷ 44 GHz)	R&S	ESW44	101620

5.6.6 Test protocol

Antenna polarization: vertical
Operation mode: 1
Configuration mode: 1
Remarks:

Verdict: Pass



Limit exceeded by carrier

Frequency (MHz)	Eirp (dBm)	Limit (dBm)	Margin (dB)
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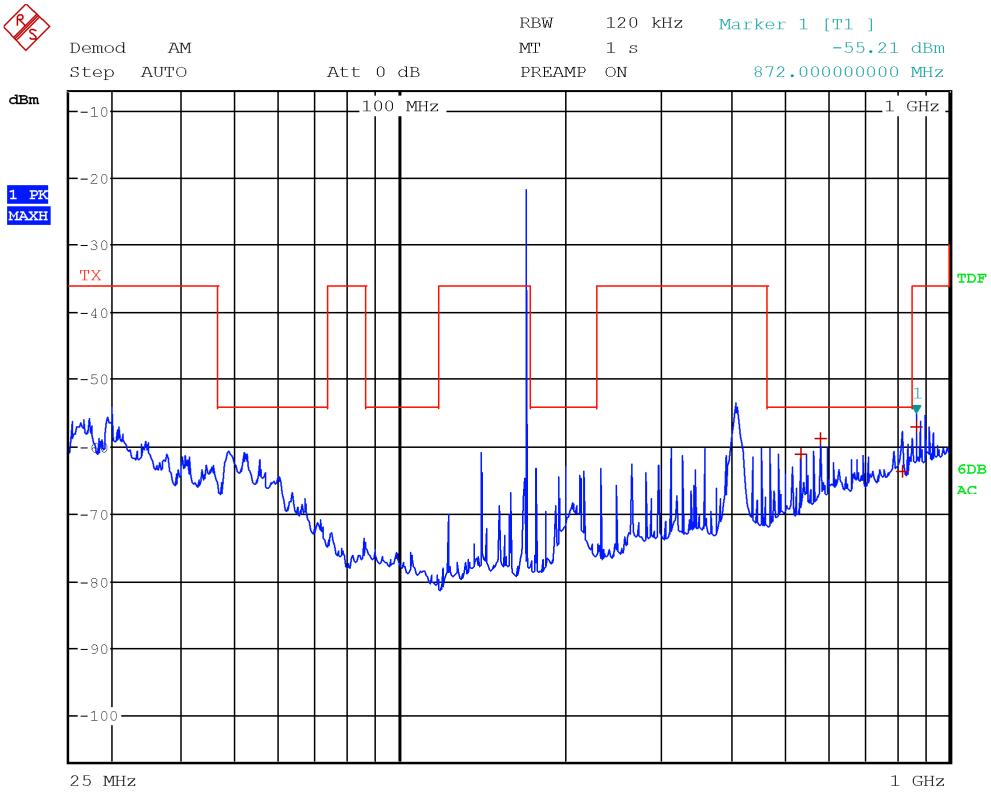
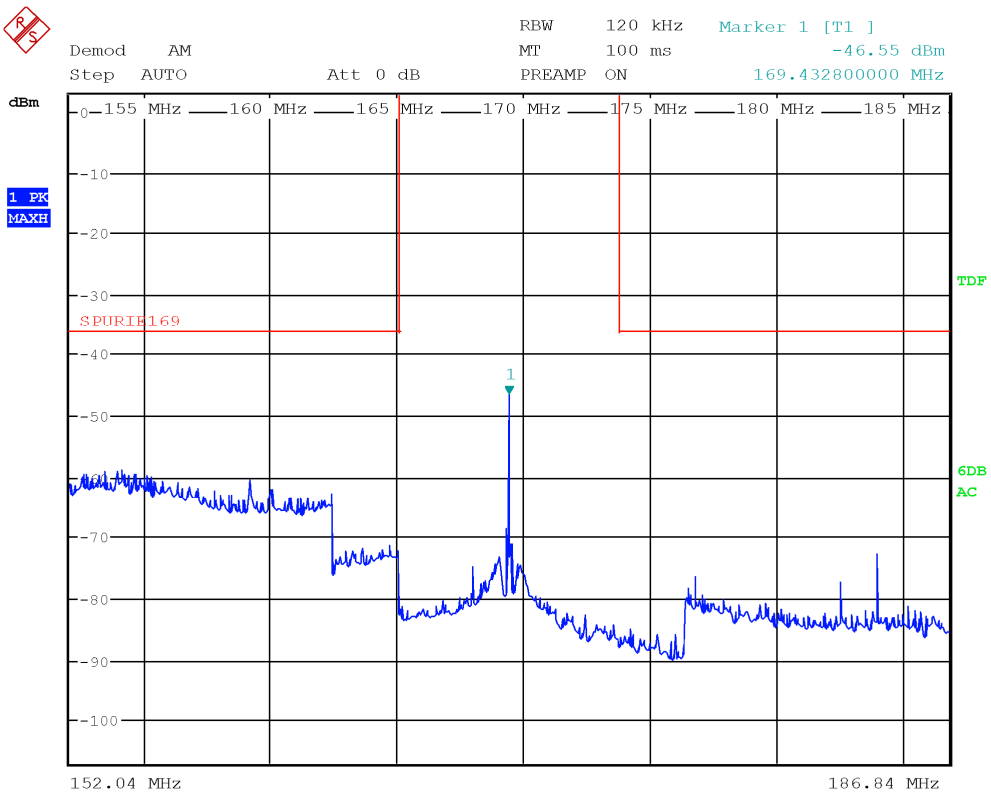
Antenna polarization: horizontal Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks:



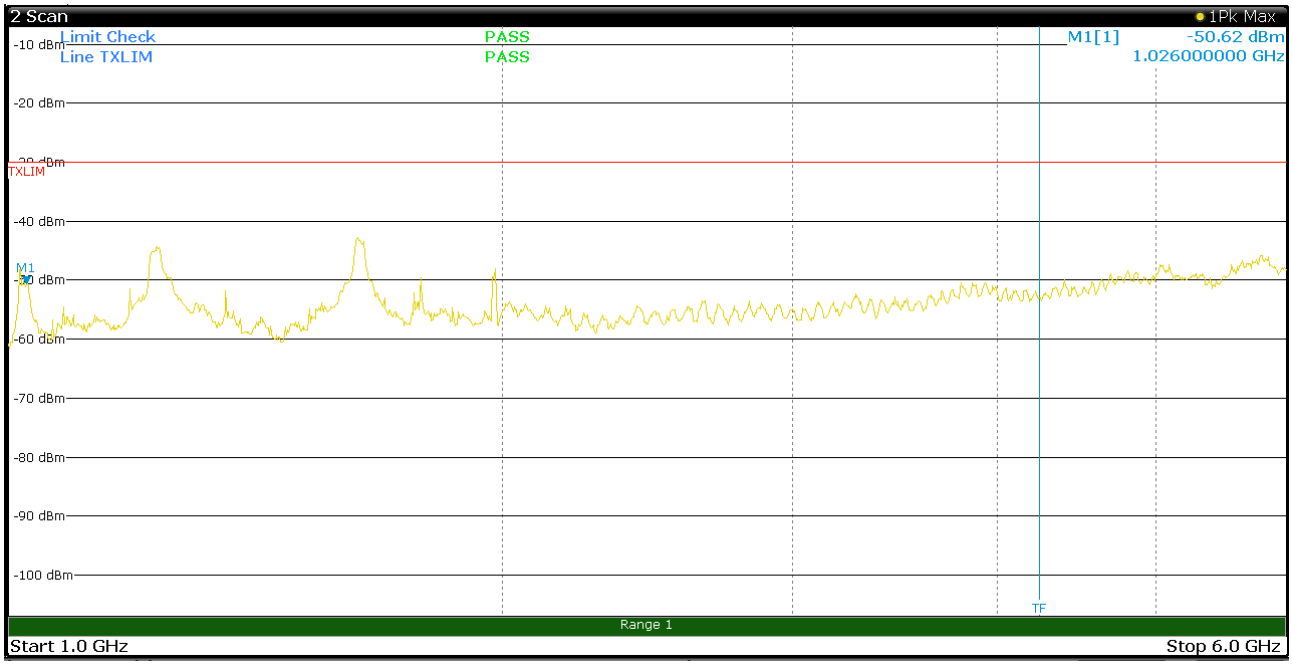
Limit exceeded by carrier

Frequency (MHz)	Eirp (dBm)	Limit (dBm)	Margin (dB)
--	--	--	--

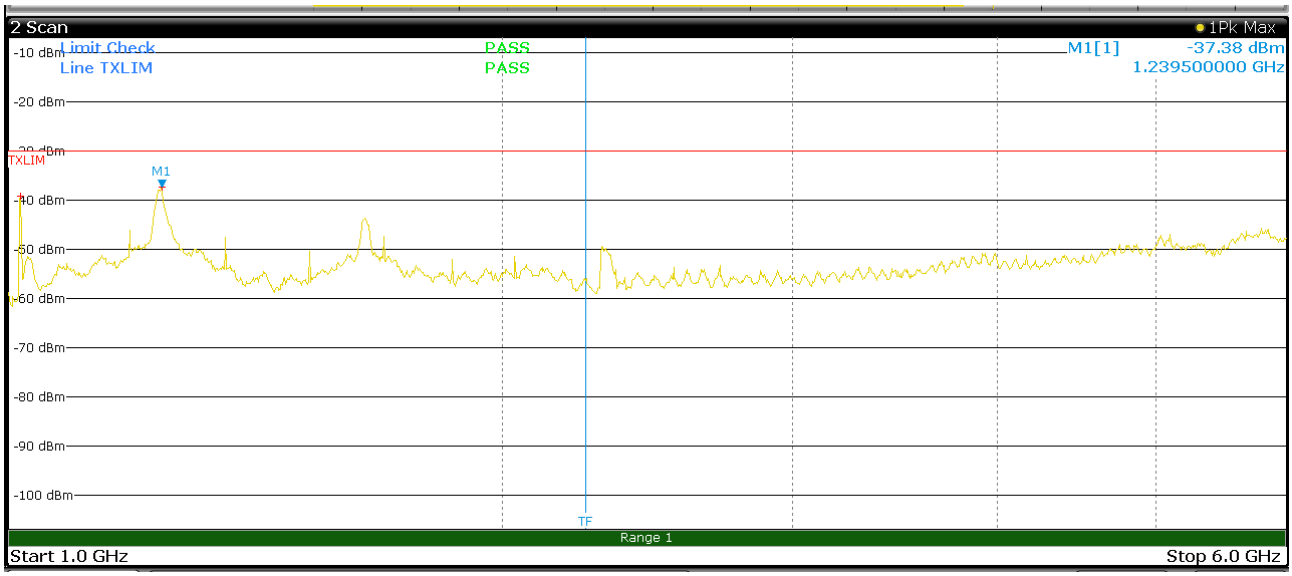
Antenna polarization: horizontal Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: Worst case.



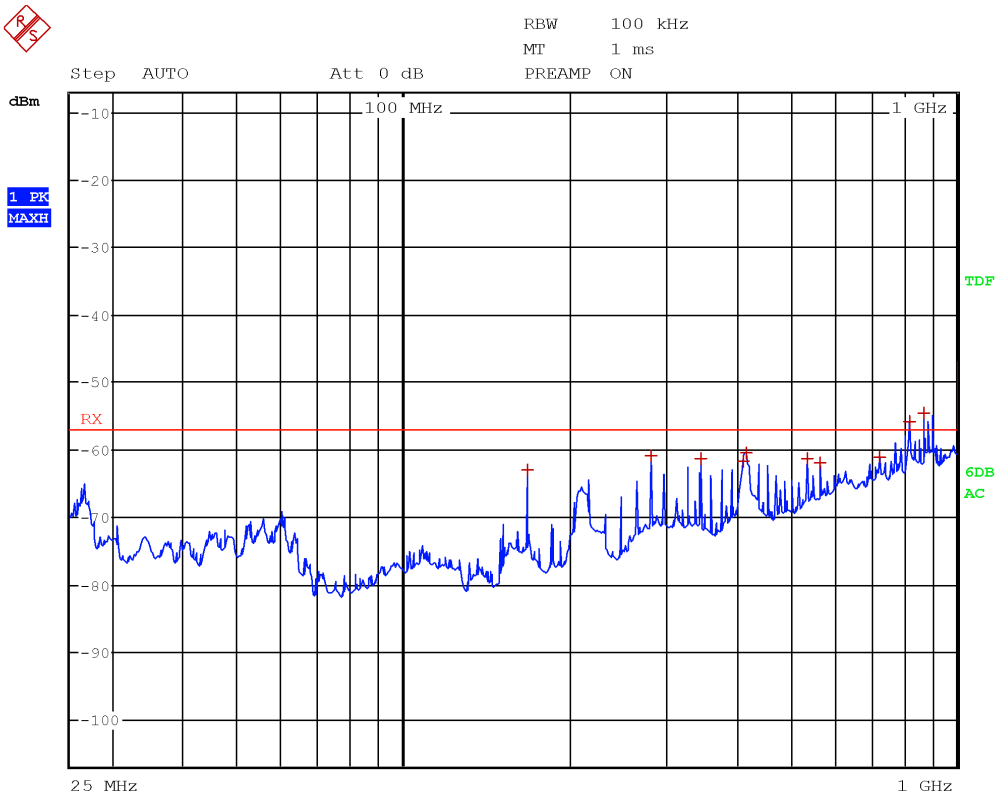
Antenna polarization: horizontal Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks:



Antenna polarization: vertical Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks:



Antenna polarization: horizontal Verdict: Pass
Operation mode: 2
Configuration mode: 1
Remarks: rx

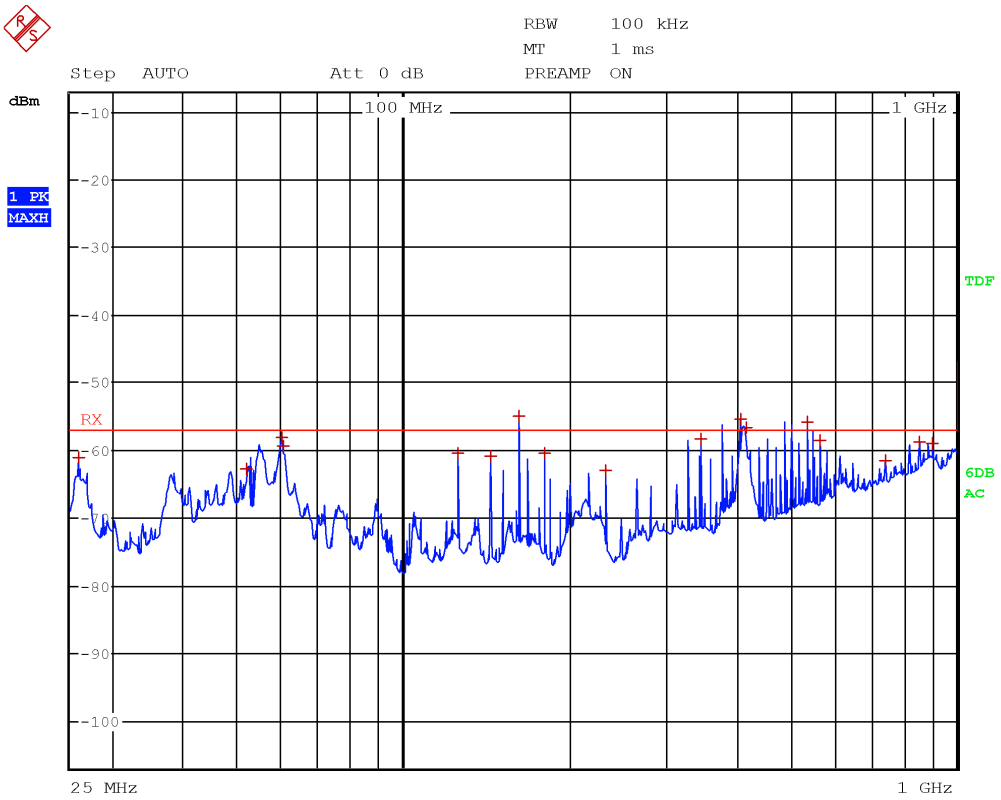


Frequency (MHz)	Eirp (dBm)	Limit (dBm)	Margin (dB)
168.0000	-63.0	-57.0	-5.9
280.0000	-60.9	-57.0	-3.8
344.0000	-61.4	-57.0	-4.3
412.1200	-61.7	-57.0	-4.6
416.0400	-60.5	-57.0	-3.4
536.0000	-61.4	-57.0	-4.3
568.0000	-62.1	-57.0	-5.0
728.0000	-61.1	-57.0	-4.0
824.0000	-55.9	-57.0	1.1
872.0000	-54.7	-57.0	2.3

Emission due to host equipment

Antenna polarization: vertical
Operation mode: 2
Configuration mode: 1
Remarks: rx

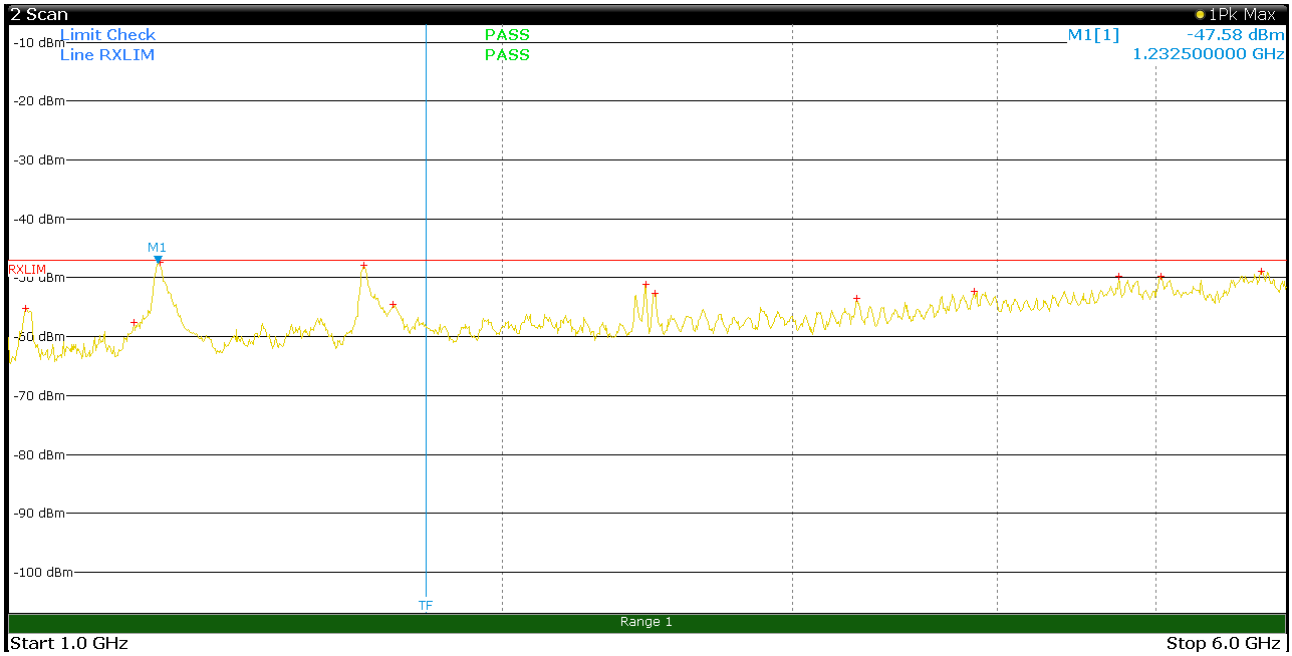
Verdict: Pass



Frequency (MHz)	Eirp (dBm)	Limit (dBm)	Margin (dB)
25.8400	-61.1	-57.0	-4.0
52.2400	-62.8	-57.0	-5.7
60.2800	-58.2	-57.0	-1.1
60.7600	-59.5	-57.0	-2.4
125.4400	-60.6	-57.0	-3.5
144.0000	-60.9	-57.0	-3.8
161.8800	-55.1	-57.0	1.9
180.0000	-60.6	-57.0	-3.5
232.0000	-63.0	-57.0	-5.9
344.0000	-58.3	-57.0	-1.2
408.0000	-55.6	-57.0	1.4
418.0800	-56.7	-57.0	0.3
536.0000	-55.9	-57.0	1.1
568.0000	-58.5	-57.0	-1.4
744.0000	-61.6	-57.0	-4.5
856.0000	-58.9	-57.0	-1.8
903.9600	-59.0	-57.0	-1.9

Emission due to host equipment

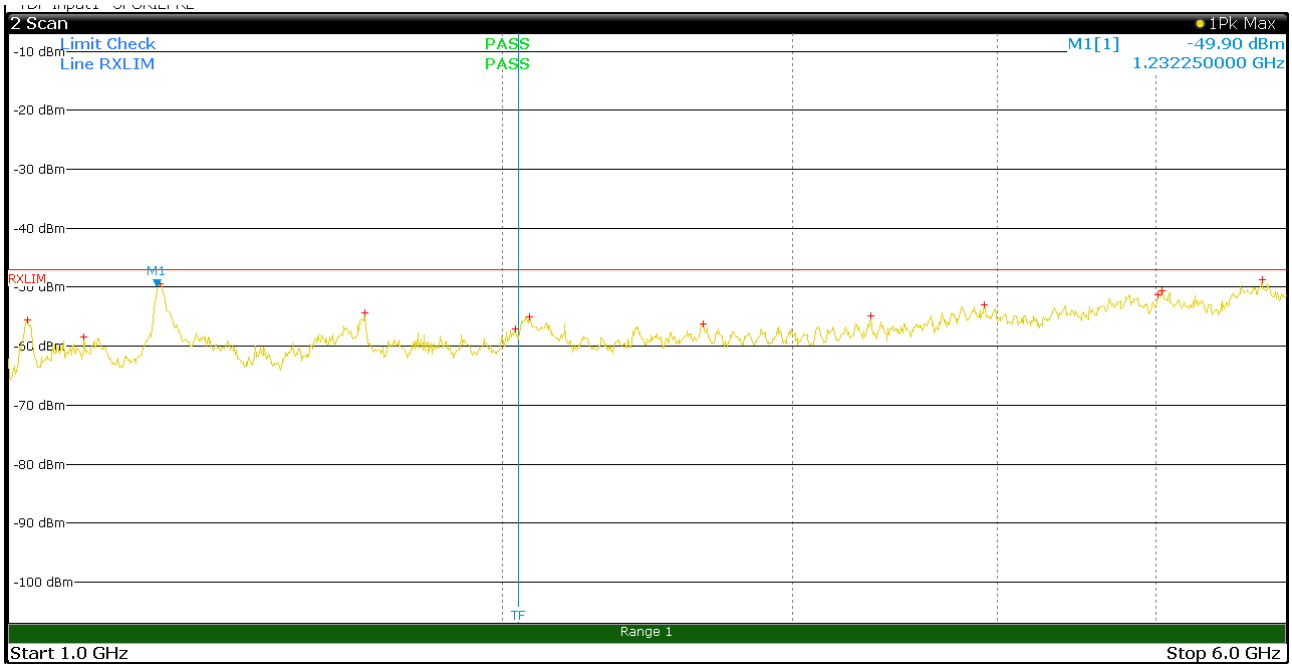
Antenna polarization: horizontal Verdict: Pass
Operation mode: 2
Configuration mode: 1
Remarks: rx



Frequency (MHz)	Eirp (dBm)	Limit (dBm)	Margin (dB)
1024.2500	-55.2	-47.0	-8.2
1192.0000	-57.6	-47.0	-10.5
1236.2500	-47.4	-47.0	-0.3
1645.0000	-48.0	-47.0	-0.9
1714.7500	-54.6	-47.0	-7.5
2443.0000	-51.2	-47.0	-4.1
2474.2500	-52.7	-47.0	-5.6
3282.7500	-53.5	-47.0	-6.4
3873.7500	-52.3	-47.0	-5.2
4744.2500	-49.7	-47.0	-2.7
5030.0000	-49.8	-47.0	-2.7
5789.0000	-49.0	-47.0	-1.9

Antenna polarization: vertical
Operation mode: 2
Configuration mode: 1
Remarks: rx

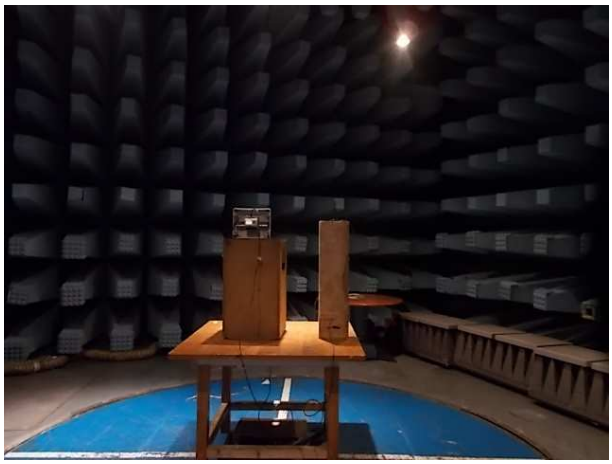
Verdict: Pass



Frequency (MHz)	Eirp (dBm)	Limit (dBm)	Margin (dB)
1027.7500	-55.6	-47.0	-8.5
1112.0000	-58.5	-47.0	-11.4
1236.0000	-49.4	-47.0	-2.3
1647.7500	-54.4	-47.0	-7.3
2034.5000	-57.1	-47.0	-10.0
2077.5000	-55.1	-47.0	-8.0
2649.7500	-56.3	-47.0	-9.2
3348.5000	-55.0	-47.0	-7.9
3928.2500	-53.0	-47.0	-5.9
5013.0000	-51.3	-47.0	-4.2
5038.7500	-50.6	-47.0	-3.6
5801.5000	-48.8	-47.0	-1.7

5.7 Adjacent Channel Power

5.7.1 Photo documentation of the test set-up

5.7.2 Test method according to clause 5.11.1 of ETSI EN 300 220-1

Clause 4.3.6 applies to all transmitters with OCW ≤ 25 kHz
The conformance tests for this requirement shall be as defined in ETSI EN 300 220-1 [1], clause 5.11.3.
The measurement shall be performed on the lowest and the highest Operating Frequency declared by the manufacturer. Additional frequencies may be tested.
2) These measurements shall be performed at the highest power level at which the transmitter is intended to operate.
3) The Adjacent Channel Power shall be measured with a spectrum analyser which conforms with the requirements given in annex A.
4) For FHSS, the test conditions in clause 4.3.5 apply.
5) For measurement in extreme temperature conditions, it is preferable to use an internal or a temporary connector rather than a test fixture.
6) For extreme test conditions, if clause 5.7 Frequency error is performed for EUT generating D-M1 test signal then the measurements may be made under normal test conditions only with the upper and lower frequency error results added and subtracted to each frequency offset of the adjacent and alternate adjacent channel
The spectrum analyser shall be configured as appropriate for the parameters shown in Table 27.
Step 1:
Operation of the EUT shall be started, on the Operating Frequency as declared by the manufacturer. The modulation used shall be set according to Table 2.
The signal attenuation shall be adjusted to ensure that the signal power is not saturating the Spectrum analyser input port.
Step 2:
When the trace is completed, read the integrated power over a bandwidth of RBWREF centered to an offset from centre frequency as specified in Table 28. The spectrum analyser's ACP personality or an integrating marker may be used. If the spectrum analyser's ACP personality is used any additional filtering over the integrating bandwidth shall be disabled.
For extreme test conditions, if the measurement is performed under normal conditions only, for EUT generating D-M1
test signal measurement can be performed with the following frequency offsets from centre frequency:
• +OCW - |Negative Frequency Error| / -OCW + |Positive Frequency Error| apply for the adjacent channel
• +2xOCW - |Negative Frequency Error| / -2xOCW + |Positive Frequency Error| apply for the alternate adjacent channel.
Take the higher power value from the positive and negative offsets at both the adjacent channel and alternate channel results.

Lin Averaging on the trace is an advanced SA feature. It antilogs the results averages them than takes the log again.

Table 27: Test Parameters for Adjacent Channel Power

Setting	Value	Notes
Centre frequency	The nominal Operating Frequency	
RBW	100 Hz	
VBW	≥ 3 x RBW	
Span	At least 5 x Operating Channel width	Span should be large enough to include Adjacent and Alternate Adjacent Channel
Detector Mode	RMS	
Trace mode	Linear Averaging	Applies only for EUT generating D-M2 test signal An appropriate number of samples should be averaged to give a stable reading
	Max hold	Applies only for EUT generating D-M2a or D-M3 test signal
NOTE: The highest and lowest operating frequencies are declared by the manufacturer.		

Table 28: Offset and RBW_{REF} parameters

Measurement	Offset from centre frequency	RBW_{REF}
Adjacent channel	±OCW	0,7 x OCW
Alternate channel	±2 x OCW	0,7 x OCW

5.6.3 Limits

Table 2: Adjacent channel power limits for transmitters with OCW ≤ 25 kHz

		Adjacent Channel power integrated over 0,7 x OCW	Alternate Adjacent Channel power integrated over 0,7 x OCW
OCW < 20 kHz	Normal test conditions	-20 dBm	-20 dBm
	Extreme test conditions	-15 dBm	-20 dBm
OCW ≥ 20 kHz	Normal test conditions	-33 dBm	-36 dBm
	Extreme test conditions	-23 dBm	-26 dBm

5.6.4 Test result

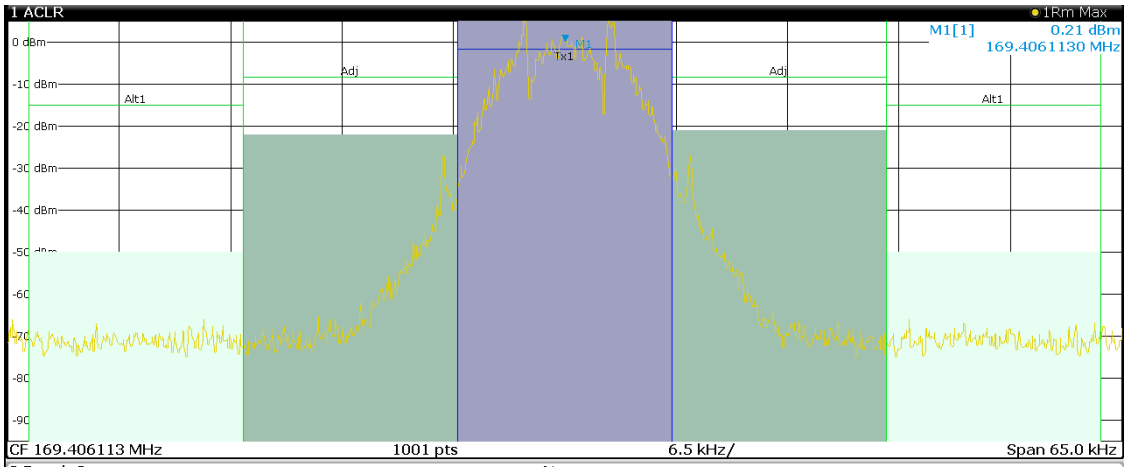
Verdict:	☒ P ☐ F ☐ N
Frequency range:	169.4 MHz to 169.475 MHz
Kind of test site:	Semi anechoic chamber
Measurement distance:	10 m
Remarks: no variation under extreme conditions	

5.6.5 Test equipment used

Equipment	Manufacturer	Model	Serial N°
Trilog Broadband Antenna	Schwarzbeck	VULB 9168	9168-242
Bilog antenna 1 – 18 GHz	Schwarzbeck	STLP 9148-123	123
Broadband preamplifier	Schwarzbeck	BBV 9718	9718-137
EMI receiver (20 Hz ÷ 8 GHz)	R&S	ESU8	100202
Turning-table	R&S	HCT	835 803/03
Antenna mast	R&S	HCM	836 529/05
Controller	R&S	HCC	836 620/7
Semi-anechoic chamber	Nemko	10m semi-anechoic chamber	530
Shielded room	Siemens	10m control room	1947
EMI receiver (2 Hz ÷ 44 GHz)	R&S	ESW44	101620
Climatic Chamber	MSL	EC500DA	15022

5.6.6 Test protocol

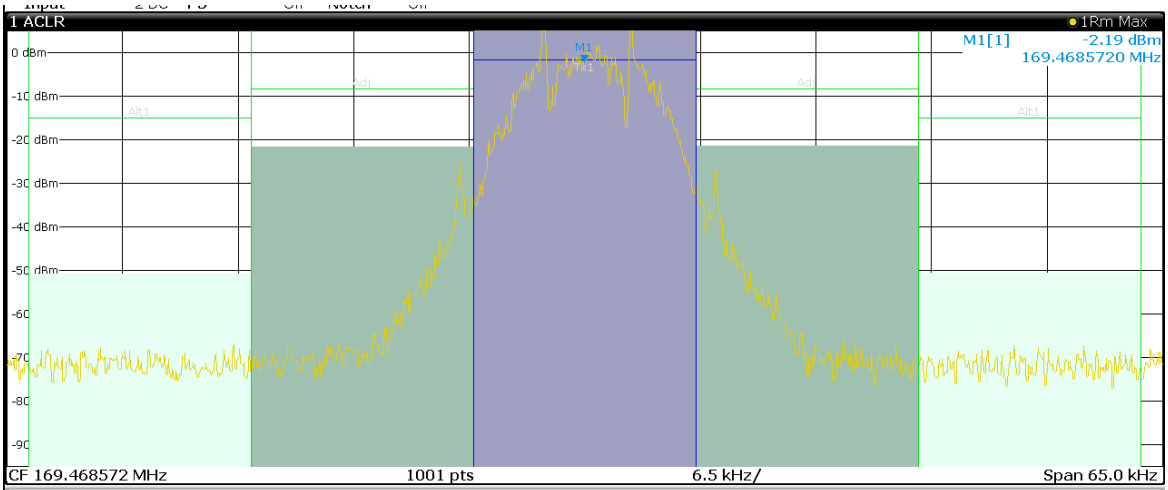
Antenna polarization: vertical Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: Low channel



2 Result Summary — None

Channel	Bandwidth	Offset	Power	
Tx1 (Ref)	12.500 kHz		**18.04 dBm**	
Tx Total			**18.04 dBm**	
Channel	**Bandwidth**	**Offset**	**Lower**	**Upper**
Adj	12.500 kHz	12.500 kHz	**-22.09 dBm**	**-21.10 dBm**
Alt1	12.500 kHz	25.000 kHz	**-50.10 dBm**	**-49.90 dBm**

Antenna polarization: vertical Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: High channel

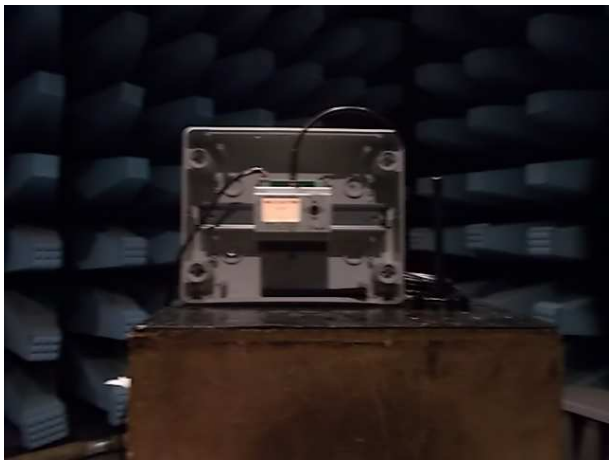


2 Result Summary — None

Channel	Bandwidth	Offset	Power	
Tx1 (Ref)	12.500 kHz		**17.46 dBm**	
Tx Total			**17.46 dBm**	
Channel	**Bandwidth**	**Offset**	**Lower**	**Upper**
Adj	12.500 kHz	12.500 kHz	**-21.60 dBm**	**-21.39 dBm**
Alt1	12.500 kHz	25.000 kHz	**-50.83 dBm**	**-50.55 dBm**

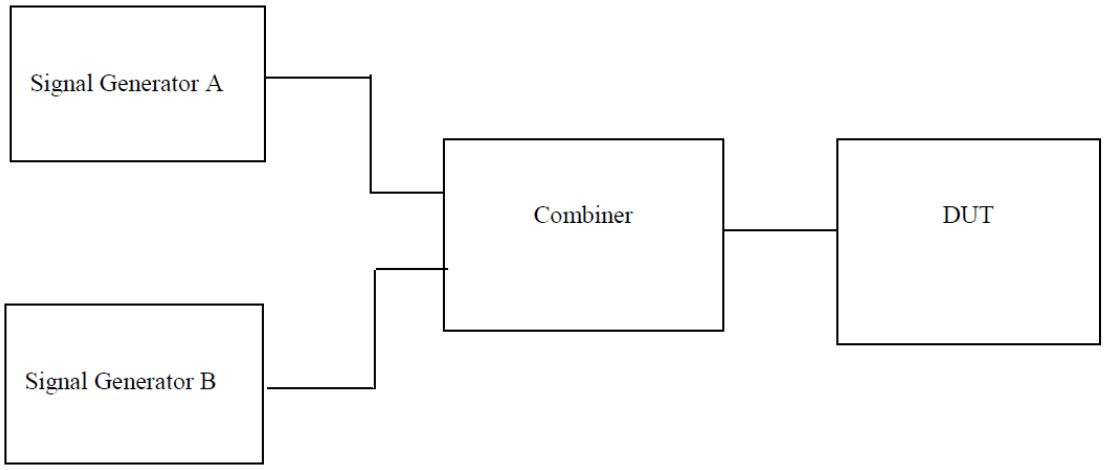
5.8 Blocking

5.8.1 Photo documentation of the test set-up



5.8.2 Test method according to clause 5.18 of ETSI EN 300 220-1

Blocking is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted input signal at any frequencies other than those of the spurious responses or the adjacent channels or bands. Conformance shall be established under normal test conditions. The measurement is performed at an operating frequency declared by the manufacturer. An EUT without a permanent or temporary antenna connector shall be tested according to radiated measurement procedure. An EUT with a permanent or temporary antenna connector shall be tested according to conducted measurement procedure. For conducted measurement, two signal generators A and B shall be connected to the EUT via a combining network as shown in the following figure.



For radiated measurement, a suitable test site shall be selected from those described in clause C.1 of ETSI EN 300 220-1. Signal generators A and B together with the combiner, shall be placed outside the test site. The output of the combiner shall be connected to a transmit test antenna with the same antenna polarization as the EUT. The transmit test antenna shall be placed in the test site. The EUT shall be placed at the location of the turntable at the orientation of the most sensitive position.
Signal generator A shall be set to an appropriate modulated test signal at the operating frequency of the EUT receiver. Signal generator B shall be unmodulated. Measurements shall be carried out at frequencies of the unwanted signal at approximately the frequency(ies) offset(s) defined in technical requirement avoiding those frequencies at which spurious responses occur. Additional measurement points may be requested by

technical requirements clause. If several operational frequency bands are used by the equipment, at least one blocking measurement by bands has to be performed.

STEP 1: Signal generator B shall be powered off. Signal generator A shall be set to the minimum level which gives the wanted performance criterion of EUT or the reference level in Table 32 of ETSI EN 300 220-1, whichever is the higher The output level of generator A shall then be increased by 3 dB unless otherwise specified in technical requirement.

STEP 2: Signal generator B is powered on and set to operate at the nominal operating frequency - offset frequency. Signal generator B is then switched on and the signal amplitude is adjusted to the minimum level at which the wanted performance criterion is not achieved. With signal generator B settings unchanged, the receiver shall be replaced with a suitable RF power measuring equipment. The power into the measuring equipment shall be measured and noted. The blocking level is then the conducted power received from generator B at the EUT antenna connector. This can either be measured on the antenna connector for conducted test or be calculated for radiated test. The blocking level shall be higher or equal to the blocking power level requested in the technical requirement clause.

STEP 3: The measurement in steps 1 to 3 shall be repeated with signal offsets at required frequencies.

5.8.3 Limits

The blocking levels at the specified frequency offsets shall be equal to or greater than the limits of the following table, except at frequencies where spurious responses are found.

Requirement	Receiver category			
Frequency offset	**1**	**1.5**	**2**	**3**
±2 MHz from OC edges	≥ -20 dBm	≥ -43 dBm	≥ -69 dBm	≥ -80 dBm
±10 MHz from OC edges	≥ -20 dBm	≥ -33 dBm	≥ -44 dBm	≥ -60 dBm
±5 % of Centre Frequency or 15 MHz (whichever is the greater)	≥ -20 dBm	≥ -33 dBm	≥ -44 dBm	≥ -60 dBm

5.8.4 Test result

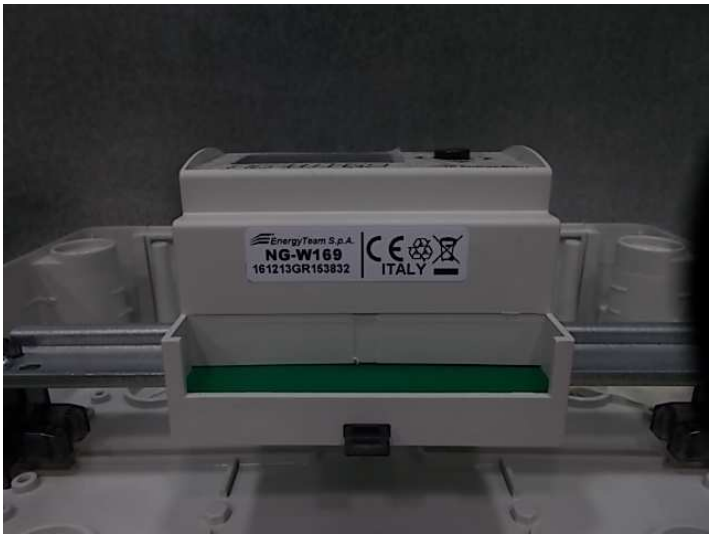
Operating Frequency:	169.40625 MHz					
Signal generator A level:	-91.75 dBm					
Blocking frequency (MHz):	167.40625	171.40625	159.40625	179.40625	154.40625	184.40625
Blocking level (dBm):	- 40	- 44	-1.5	- 4	+ 2	+3

Verdict:	☒ P ☐ F ☐ N
Operation mode:	2
Configuration mode:	1
Kind of test site:	Shielded room
Remarks:	

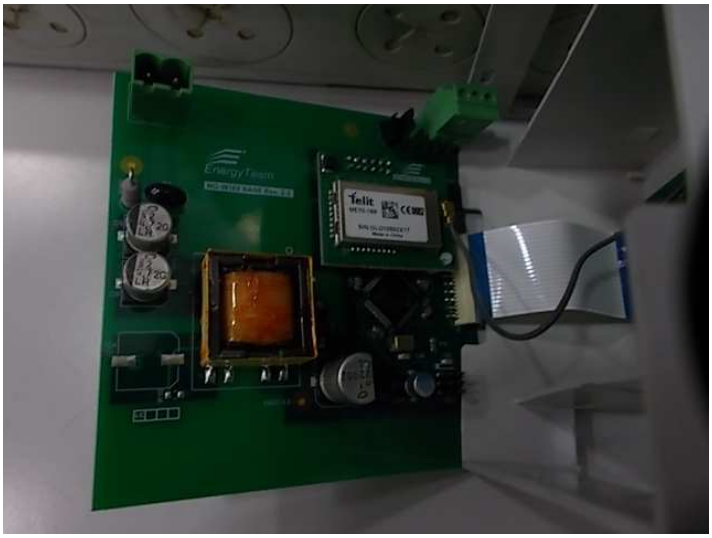
5.8.5 Test equipment used

Equipment	Manufacturer	Model	Serial N°
Spectrum Analyzer 9 kHz ÷ 2 GHz	Advantest	R3261C	51720267
RF generator	R&S	SMX	883 179/009
Power divider	Suhner	DC-2000MHz 50Ω 6dB 1W	-
Step attenuator	R&S	DPSP	880 598/043
Shielded room	Siemens	Conducted emission test room	1862
RF generator (10 ÷ 20000 MHz)	R&S	SMP22	839 762/107
Broadband amplifier (80 ÷ 1000 MHz)	R&S	BBA100	101163
Broadband antenna (80 MHz ÷ 6 GHz)	ETS Lingren	3142E	00213107
Semi-anechoic chamber	Nemko	3m semi-anechoic chamber	70
Shielded room	Siemens	3m control room	3

6 EUT PHOTOS




EnergyTeam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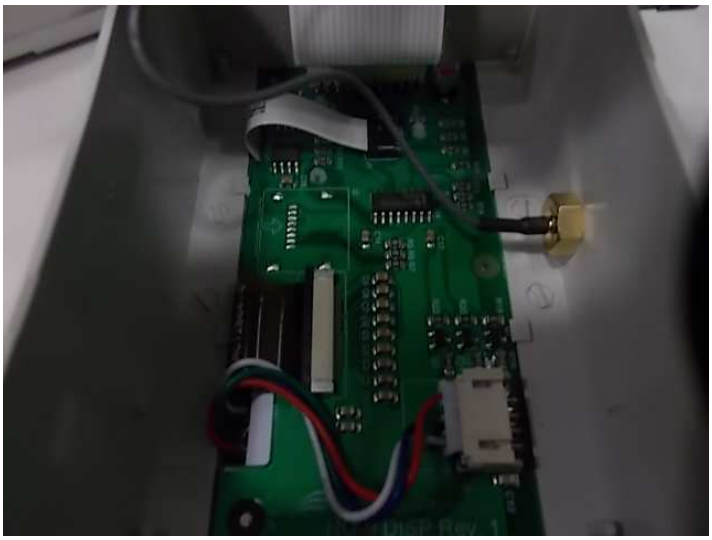

End of report