

# TEST REPORT

**Applicant:** Shenzhen Sunricher Technology Limited

**Address of Applicant:** 3F & 5F, Building E, Qihang Innovation Industrial Park, No. 1008 Songbai Road, Nanshan District, Shenzhen, Guangdong 518055 China

**Manufacturer/Factory:** Shenzhen Sunricher Technology Limited

**Address of Manufacturer/Factory:** 3F & 5F, Building E, Qihang Innovation Industrial Park, No. 1008 Songbai Road, Nanshan District, Shenzhen, Guangdong 518055 China

**Equipment Under Test (EUT)**

Product Name: LED Controller

Model No.: See section 5.1

**Applicable standards:** ETSI EN 300 220-1 V3.1.1 (2017-02)  
ETSI EN 300 220-2 V3.1.1 (2017-02)

**Date of sample receipt:** August 11, 2022

**Date of Test:** August 12, 2022-September 05, 2022

**Date of report issue:** September 05, 2022

**Test Result :** PASS \*

\*In the configuration tested, the EUT complied with the standards specified above.

The CE mark as shown below can be used, under the responsibility of the manufacturer, after completion of an EC Declaration of Conformity and compliance with all relevant EC Directives. The protection requirements with respect to electromagnetic compatibility contained in Directive 2014/53/EU are considered.



**Robinson Luo**

**Laboratory Manager**

This results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

## 2 Version

Version No.	Date	Description
00	September 05, 2022	Original

Prepared By:



Project Engineer

Date:

September 05, 2022

Check By:



Reviewer

Date:

September 05, 2022

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## 4 Test Summary

Radio Spectrum Matter (RSM) Part of Tx				
Test item	Test Requirement	Test method	Limit/Severity	Result
Operating frequency	ETSI EN 300 220-2	ETSI EN 300 220-1	Annexes B or C of EN 300 220-2	Pass
Effective Radiated Power	ETSI EN 300 220-2	ETSI EN 300 220-1	Annexes B or C of EN 300 220-2	Pass
Maximum e.r.p. Spectral Density	ETSI EN 300 220-2	ETSI EN 300 220-1	Annexes B or C of EN 300 220-2	N/A
Duty cycle	ETSI EN 300 220-2	ETSI EN 300 220-1	Annexes B or C of EN 300 220-2	Pass
Occupied Bandwidth	ETSI EN 300 220-2	ETSI EN 300 220-1	Annexes B or C of EN 300 220-2	Pass
Frequency Error	ETSI EN 300 220-2	ETSI EN 300 220-1	Clause 5.7	N/A
Tx Out of Band Emissions	ETSI EN 300 220-2	ETSI EN 300 220-1	Clause 5.8.2	Pass
Transmit Spurious Emmissions	ETSI EN 300 220-2	ETSI EN 300 220-1	Clause 5.9.2	Pass
Transient Power	ETSI EN 300 220-2	ETSI EN 300 220-1	Clause 5.10.2	Pass
Adjacent Channel Power	ETSI EN 300 220-2	ETSI EN 300 220-1	Clause 5.11.2	N/A
TX behaviour under Low Voltage Conditions	ETSI EN 300 220-2	ETSI EN 300 220-1	Clause 5.12.2	Pass
Adaptive Power Control	ETSI EN 300 220-2	ETSI EN 300 220-1	Clause 5.13.2	N/A
Short Term Behaviour	ETSI EN 300 220-2	N/A	annex C, table C.1	N/A
FHSS Equipment Requirements	ETSI EN 300 220-2	N/A	Clause 4.3.10.2	N/A
Radio Spectrum Matter (RSM) Part of Rx				
Test item	Test Requirement	Test method	Limit/Severity	Result
Receiver sensitivity	ETSI EN 300 220-2	ETSI EN 300 220-1	Clause 5.14.2	N/A
Adjacent channel selectivity	ETSI EN 300 220-1	ETSI EN 300 220-1	Clause 5.15.2	N/A
Receiver saturation at Adjacent Channel	ETSI EN 300 220-1	ETSI EN 300 220-1	Clause 5.16.2	N/A
Spurious response rejection	ETSI EN 300 220-1	ETSI EN 300 220-1	Clause 5.17.2	N/A
Blocking	ETSI EN 300 220-2	ETSI EN 300 220-1	Clause 5.18	Pass
Behaviour at high wanted signal level	ETSI EN 300 220-1	ETSI EN 300 220-1	Clause 5.19.2	N/A
Clear Channel Assessment threshold	ETSI EN 300 220-2	ETSI EN 300 220-1	Clause 5.21.2.2	N/A
Polite spectrum access timing parameters	ETSI EN 300 220-2	ETSI EN 300 220-1	Clause 5.21.3.1	N/A
Adaptive Frequency Agility	ETSI EN 300 220-2	N/A	N/A	N/A
Receive Spurious emmissions	ETSI EN 300 220-2	ETSI EN 300 220-1	Clause 5.9.2	Pass
Bi-Directional Operation Verification	ETSI EN 300 220-1	ETSI EN 300 220-1	Clause 5.22.2	N/A

Pass: The EUT complies with the essential requirements in the standard.

N/A: not applicable.

## 5 General Information

### 5.1 General Description of EUT

Product Name:	LED Controller
Model No.:	Receiver: SR-1009MS-RGBW, 80495, SR-1009MS-MONO,80494 SR-1009XXX-YYYY, SR-1029XXX-YYYY "X", "Y" indicates the customer code for market purpose, it could be alphanumeric characters or blank.  Transmitter: SR-1009MS-RGBW-REMOTE, SR-1009MS-MONO-REMOTE, SR-1009MS-MONO Kit,80579, SR-2833K4, SR-2833K1, SR-2833K2, SR-2833K5, SR-2833K8, SR-2833K-CCT, SR-2833T1, SR-2833T2, SR-2833CCT, SR-2833N-Z3, SR-2833N-Z4, SR-2833N-Z5, SR-2801, SR-2801F, SR-2833N-K5-CCT, 80578, SR-1009MS-RGBW Kit, SR-2839WK, SR-2839CCT, SR-2839RGB, SR-2839DIM, SR-2839W Kit, SR-2839RGB Kit, SR-2833N-K5-RGBW, SR-1009XX-YYYY-ZZZZZZ, SR-28XXXXXX, SR-28XXXXXX-YYY, "X", "Y", "Z" indicates the customer code for market purpose, it could be alphanumeric characters or blank.
Test Model No:	Receiver: SR-1009MS-RGBW Transmitter: SR-1009MS-RGBW-REMOTE
Remark: All above models are identical in the same PCB layout, interior structure and electrical circuits. The differences are appearance color and model name for commercial purpose.	
Operation Frequency:	869.5MHz
Number of Channels:	1
Modulation type:	FSK
Antenna type:	TX: PCB Antenna RX: Integral Antenna
Antenna Gain:	TX/RX: 0dBi
Power supply:	TX: DC 3V RX: DC 12-24V

### 5.2 Test mode

Transmitting mode	Keep the EUT in continuously transmitting mode
Receiving mode	Keep the EUT in continuously receiving mode

### 5.3 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **FCC—Registration No.: 381383**

Designation Number: CN5029

Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files.

- **IC —Registration No.: 9079A**

CAB identifier: CN0091

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

- **NVLAP (LAB CODE:600179-0)**

Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP).

### 5.4 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.

Address: No. 123-128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102

Tel: 0755-27798480

Fax: 0755-27798960

### 5.5 Description of Support Units

None

### 5.6 Deviation from Standards

None

### 5.7 Abnormalities from Standard Conditions

None

### 5.8 Other Information Requested by the Customer

None

### 5.9 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	$\pm 7.25 \times 10^{-8}$
2	Duty cycle	$\pm 0.37\%$
3	Occupied Bandwidth	$\pm 3\%$
4	RF conducted power	$\pm 0.75\text{dB}$
5	RF power density	$\pm 3\text{dB}$
6	Conducted Spurious emissions	$\pm 2.58\text{dB}$
7	AC Power Line Conducted Emission	$\pm 3.44\text{dB}$ (0.15MHz ~ 30MHz)
8	Radiated Spurious emission test	$\pm 3.1\text{dB}$ (9kHz-30MHz)
		$\pm 3.8039\text{dB}$ (30MHz-200MHz)
		$\pm 3.9679\text{dB}$ (200MHz-1GHz)
		$\pm 4.29\text{dB}$ (1GHz-18GHz)
		$\pm 3.30\text{dB}$ (18GHz-40GHz)
9	Temperature test	$\pm 1^\circ\text{C}$
10	Humidity test	$\pm 3\%$
11	Time	$\pm 3\%$

## 6 Test Instruments list

Radiated Emission:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	July 02, 2020	July 01, 2025
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	April 22, 2022	April 21, 2023
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9168	GTS640	March 21, 2022	March 20, 2023
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	June 12, 2022	June 11, 2023
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	June 23, 2022	June 22, 2023
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
8	Coaxial Cable	GTS	N/A	GTS213	April 22, 2022	April 21, 2023
9	Coaxial Cable	GTS	N/A	GTS211	April 22, 2022	April 21, 2023
10	Coaxial cable	GTS	N/A	GTS210	April 22, 2022	April 21, 2023
11	Coaxial Cable	GTS	N/A	GTS212	April 22, 2022	April 21, 2023
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	April 22, 2022	April 21, 2023
13	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June 23, 2022	June 22, 2023
14	Band filter	Amindeon	82346	GTS219	June 23, 2022	June 22, 2023
15	Power Meter	Anritsu	ML2495A	GTS540	June 23, 2022	June 22, 2023
16	Power Sensor	Anritsu	MA2411B	GTS541	June 23, 2022	June 22, 2023
17	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	April 22, 2022	April 21, 2023
18	Splitter	Agilent	11636B	GTS237	June 23, 2022	June 22, 2023
19	Loop Antenna	ZHINAN	ZN30900A	GTS534	Nov. 30, 2021	Nov. 29, 2022
20	Broadband Preamplifier	SCHWARZBECK	BBV9718	GTS535	April 22, 2022	April 21, 2023
21	Breitband hornantenna	SCHWARZBECK	BBHA 9170	GTS579	Oct. 17, 2021	Oct. 16, 2022
22	Amplifier	TDK	PA-02-02	GTS574	Oct. 17, 2021	Oct. 16, 2022
23	Amplifier	TDK	PA-02-03	GTS576	Oct. 17, 2021	Oct. 16, 2022
24	PSA Series Spectrum Analyzer	Rohde & Schwarz	FSP	GTS578	June 23, 2022	June 22, 2023
25	Amplifier(1GHz-26.5GHz)	HP	8449B	GTS601	April 22, 2022	April 21, 2023

RF Conducted Test:						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	MXA Signal Analyzer	Agilent	N9020A	GTS566	April 22, 2022	April 21, 2023
2	EMI Test Receiver	R&S	ESCI 7	GTS552	April 22, 2022	April 21, 2023
3	Spectrum Analyzer	Agilent	E4440A	GTS536	April 22, 2022	April 21, 2023
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	April 22, 2022	April 21, 2023
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	April 22, 2022	April 21, 2023
6	USB RF Power Sensor	DARE	RPR3006W	GTS569	April 22, 2022	April 21, 2023
7	RF Switch Box	Shongyi	RFSW3003328	GTS571	April 22, 2022	April 21, 2023
8	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	April 22, 2022	April 21, 2023

EN300220 Blocking:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Signal Generator	Rohde & Schwarz	SML03	GTS561	April 24, 2022	April 23, 2023
2	Signal Generator	Rohde & Schwarz	SML03	GTS562	April 24, 2022	April 23, 2023

General used equipment:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Humidity/ Temperature Indicator	KTJ	TA328	GTS243	April 25, 2022	April 24, 2023
2	Barometer	KUMAO	SF132	GTS647	July 26, 2022	July 25, 2023

## 7 Radio Technical Requirements Specification in ETSI EN 300 220-2

### 7.1 Test conditions

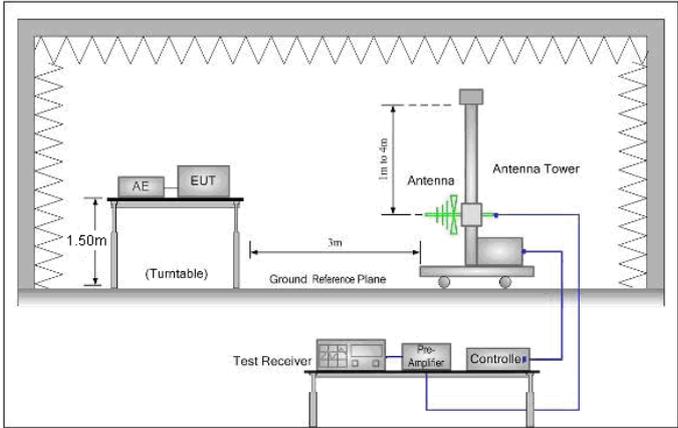
Item	Normal condition	Extreme condition			
		HVHT	LVHT	HVLT	LVLT
Temperature	+25°C	+50°C	+50°C	-20°C	-20°C
Voltage(DC)	3.0	3.2	2.8	3.2	2.8
Humidity	20%-95%				
Atmospheric Pressure:	1008 mbar				

### 7.2 Transmitter Requirement

#### 7.2.1 Operation Frequency

Measurement Conditions		Operating frequency	Nominal Operating Frequency	OCW	Limit (dBm)	Result
Tnormal(25°C)	Vnorm: 3Vdc	869.5MHz	869.5MHz	136kHz	869,400MHz to 869,650MHz	PASS

## 7.2.2 Effective Radiated Power

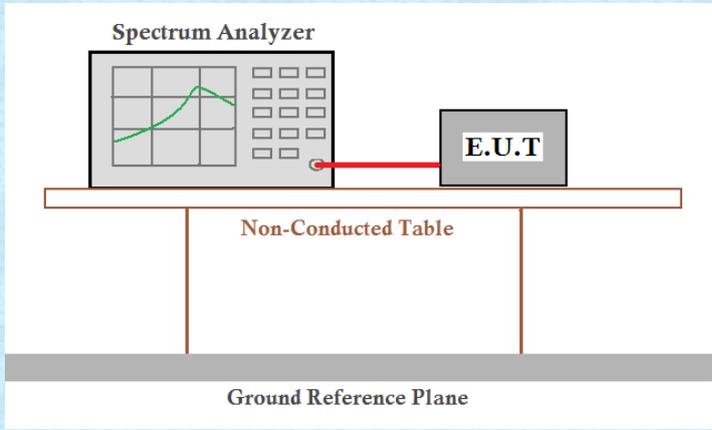
Test Requirement:	ETSI EN 300 220-2 clause 4.3.1
Test Method:	ETSI EN 300 220-1 clause 5.2.2
Test site:	Measurement Distance: 3m (Semi-Anechoic Chamber)
Receiver setup:	RBW=120kHz, VBW=300kHz, Detector= peak
Limit:	25mW=14dBm
Test setup:	
Test procedure:	<p>Substitution method was performed to determine the actual ERP emission levels of the EUT.</p> <p>The following test procedure as below:</p> <ol style="list-style-type: none"> <li>1. On the test site as test setup graph above, the EUT shall be placed at the 1.5m support on the turntable and in the position closest to normal use as declared by the provider.</li> <li>2. The test antenna shall be oriented initially for vertical polarization and shall be chosen to correspond to the frequency of the transmitter. The output of the test antenna shall be connected to the measuring receiver.</li> <li>3. 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.</li> <li>4. The test antenna shall be raised and lowered from 1m to 4m until a maximum signal level is detected by the measuring receiver. Then the turntable should be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.</li> <li>5. Repeat step 4 for test frequency with the test antenna polarized horizontally.</li> <li>6. Remove the transmitter and replace it with a substitution antenna (the antenna should be half-wavelength for each frequency involved). The center of the substitution antenna should be approximately at the same location as the center of the transmitter. At the lower frequencies, where the substitution antenna is very long, this will be impossible to achieve when the antenna is polarized vertically. In such case the lower end of the antenna should be 0.3 m above the ground.</li> <li>7. Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a nonradiating cable. With the antennas at both ends vertically polarized, and with the signal</li> </ol>

	<p>generator tuned to a particular test frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained. This should be done carefully repeating the adjustment of the test antenna and generator output.</p> <p>8. Repeat step 7 with both antennas horizontally polarized for each test frequency.</p> <p>9. Calculate power in dBm into a reference ideal half-wave dipole antenna by reducing the readings obtained in steps 7 and 8 by the power loss in the cable between the generator and the antenna, and further corrected for the gain of the substitution antenna used relative to an ideal half-wave dipole antenna by the following formula:  <math display="block">ERP(dBm) = Pg(dBm) + \text{antenna gain (dBd)}</math>                     where:                      Pg is the generator output power into the substitution antenna.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

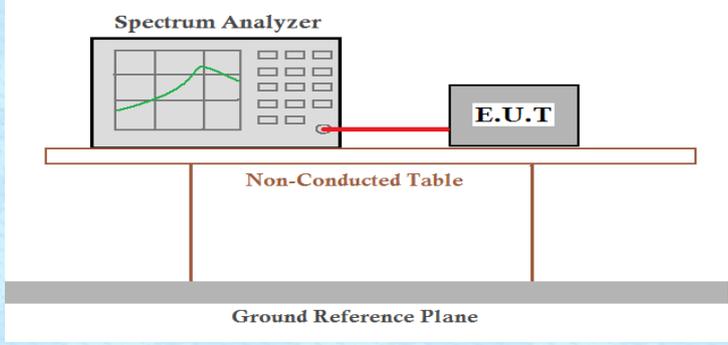
## Measurement Data

Measurement Conditions	Operation Frequency(MHz)	ERP(dBm)	Limit	Result
TNVN	869.50	1.53	25mW (i.e. 14.0 dBm)	PASS
TLVL	869.50	1.36	25mW (i.e. 14.0 dBm)	PASS
TLVH	869.50	1.43	25mW (i.e. 14.0 dBm)	PASS
THVL	869.50	1.42	25mW (i.e. 14.0 dBm)	PASS
THVH	869.50	1.39	25mW (i.e. 14.0 dBm)	PASS

## 7.2.3 Duty Cycle

Test Requirement:	ETSI EN 300 220-2 clause 4.3.3
Test Method:	ETSI EN 300 220-1 clause 5.4
Limit:	0.1%
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both are placed on a Non-Conducted Table, which is supported by a Ground Reference Plane.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	≤0.1%. The equipment met the requirement of this clause.

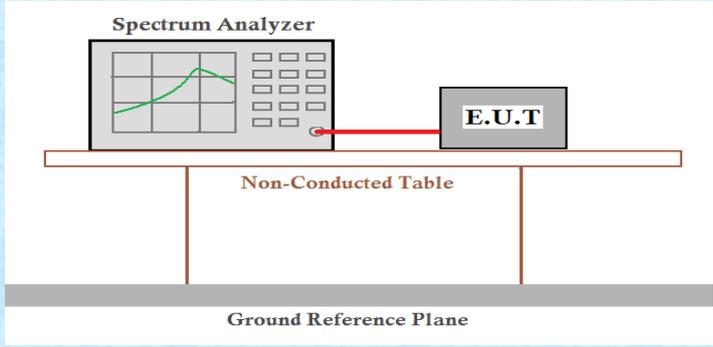
## 7.2.4 Occupied Bandwidth

Test Requirement:	ETSI EN 300 220-2 clause 4.3.4																					
Test Method:	ETSI EN 300 220-1 clause 5.6																					
Receive setup:	<p style="text-align: center;"><b>Table 12: Test Parameters for Max Occupied Bandwidth Measurement</b></p> <table border="1"> <thead> <tr> <th>Setting</th> <th>Value</th> <th>Notes</th> </tr> </thead> <tbody> <tr> <td>Centre frequency</td> <td>The nominal Operating Frequency</td> <td>The highest or lowest Operating Frequency as declared by the manufacturer</td> </tr> <tr> <td>RBW</td> <td>1 % to 3 % of OCW without being below 100 Hz</td> <td></td> </tr> <tr> <td>VBW</td> <td>3 x RBW</td> <td>Nearest available analyser setting to 3 x RBW</td> </tr> <tr> <td>Span</td> <td>At least 2 x Operating Channel width</td> <td>Span should be large enough to include all major components of the signal and its side bands</td> </tr> <tr> <td>Detector Mode</td> <td>RMS</td> <td></td> </tr> <tr> <td>Trace</td> <td>Max hold</td> <td></td> </tr> </tbody> </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	
Setting	Value	Notes																				
Centre frequency	The nominal Operating Frequency	The highest or lowest Operating Frequency as declared by the manufacturer																				
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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																					
Limit:	<p>The Operating Channel shall be declared and shall reside entirely within the Operational Frequency Band.</p> <p>The Maximum Occupied Bandwidth at 99 % shall reside entirely within the Operating Channel defined by <math>F_{low}</math> and <math>F_{high}</math>.</p> <p>Note: For 865 MHz to 868 MHz FHSS equipment. The Maximum occupied bandwidth per hopping channel shall be less or equal to 50kHz. For 863 MHz to 870 MHz FHSS equipment. The Maximum occupied bandwidth per hopping channel shall be less or equal to 100kHz.</p>																					
Test setup:	 <p style="text-align: center;">Spectrum Analyzer</p> <p style="text-align: center;">E.U.T</p> <p style="text-align: center;">Non-Conducted Table</p> <p style="text-align: center;">Ground Reference Plane</p>																					
Test Instruments:	Refer to section 6.0 for details																					
Test mode:	Refer to section 5.2 for details																					
Test results:	Pass																					

**Measurement Data**

Measurement Conditions	Operating Frequency	OBW	Limit	Result
TNVN	869.5MHz	135.56kHz	869,400 MHz to 869,650 MHz	PASS
TLVL	869.5MHz	134.65kHz	869,400 MHz to 869,650 MHz	PASS
TLVH	869.5MHz	134.34kHz	869,400 MHz to 869,650 MHz	PASS
THVL	869.5MHz	135.36kHz	869,400 MHz to 869,650 MHz	PASS
THVH	869.5MHz	135.74kHz	869,400 MHz to 869,650 MHz	PASS

## 7.2.5 TX Out Of Band Emissions

Test Requirement:	ETSI EN 300 220-2 clause 4.3.5																																																
Test Method:	ETSI EN 300 220-1 clause 5.8.3																																																
Receive setup:	<p style="text-align: center;"><b>Table 16: Test Parameters for Out Of Band for Operating Channel Measurement</b></p> <table border="1"> <thead> <tr> <th>Spectrum Analyser Setting</th> <th>Value</th> <th>Notes</th> </tr> </thead> <tbody> <tr> <td>Centre frequency</td> <td>Operating Frequency</td> <td></td> </tr> <tr> <td>Span</td> <td>6 x Operating Channel width</td> <td></td> </tr> <tr> <td>RBW</td> <td>1 kHz (see note)</td> <td>Resolution bandwidth for Out Of Band domain measurements</td> </tr> <tr> <td>Detector Function</td> <td>RMS</td> <td></td> </tr> <tr> <td rowspan="2">Trace Mode</td> <td>Linear AVG</td> <td>Applies only for EUT generating D-M2 test signal. An appropriate number of samples should be averaged to give a stable reading</td> </tr> <tr> <td>Max Hold</td> <td>Applies only for EUT generating D-M2a or D-M3 test signal.</td> </tr> </tbody> </table> <p>NOTE: If the value of RBW used is different from <math>RBW_{REF}</math> in clause 5.8.2, use the bandwidth correction in clause 4.3.10.1.</p>	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.																												
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.																																															
Limit:	<p style="text-align: center;"><b>Table 15: Emission limits in the Out Of Band domains</b></p> <table border="1"> <thead> <tr> <th>Domain</th> <th>Frequency Range</th> <th><math>RBW_{REF}</math></th> <th>Max power limit</th> </tr> </thead> <tbody> <tr> <td rowspan="7">OOB limits applicable to Operational Frequency Band (See Figure 6)</td> <td><math>f \leq f_{low\_OFB} - 400 \text{ kHz}</math></td> <td>10 kHz</td> <td>-36 dBm</td> </tr> <tr> <td><math>F_{low\_OFB} - 400 \text{ kHz} \leq f \leq f_{low\_OFB} - 200 \text{ kHz}</math></td> <td>1 kHz</td> <td>-36 dBm</td> </tr> <tr> <td><math>f_{low} - 200 \text{ kHz} \leq f &lt; f_{low\_OFB}</math></td> <td>1 kHz</td> <td>See Figure 6</td> </tr> <tr> <td><math>f = f_{low\_OFB}</math></td> <td>1 kHz</td> <td>0 dBm</td> </tr> <tr> <td><math>f = f_{high\_OFB}</math></td> <td>1 kHz</td> <td>0 dBm</td> </tr> <tr> <td><math>F_{high\_OFB} &lt; f \leq f_{high\_OFB} + 200 \text{ kHz}</math></td> <td>1 kHz</td> <td>See Figure 6</td> </tr> <tr> <td><math>F_{high\_OFB} + 200 \text{ kHz} \leq f \leq f_{high\_OFB} + 400 \text{ kHz}</math></td> <td>1 kHz</td> <td>-36 dBm</td> </tr> <tr> <td rowspan="7">OOB limits applicable to Operating Channel (See Figure 5)</td> <td><math>F_{high\_OFB} + 400 \text{ kHz} \leq f</math></td> <td>10 kHz</td> <td>-36 dBm</td> </tr> <tr> <td><math>f = f_c - 2.5 \times \text{OCW}</math></td> <td>1 kHz</td> <td>-36 dBm</td> </tr> <tr> <td><math>f_c - 2.5 \times \text{OCW} \leq f \leq f_c - 0.5 \times \text{OCW}</math></td> <td>1 kHz</td> <td>See Figure 5</td> </tr> <tr> <td><math>f = f_c - 0.5 \times \text{OCW}</math></td> <td>1 kHz</td> <td>0 dBm</td> </tr> <tr> <td><math>f = f_c + 0.5 \times \text{OCW}</math></td> <td>1 kHz</td> <td>0 dBm</td> </tr> <tr> <td><math>f_c + 0.5 \times \text{OCW} \leq f \leq f_c + 2.5 \times \text{OCW}</math></td> <td>1 kHz</td> <td>See Figure 5</td> </tr> <tr> <td><math>f = f_c + 2.5 \times \text{OCW}</math></td> <td>1 kHz</td> <td>-36 dBm</td> </tr> </tbody> </table> <p>NOTE: <math>f</math> is the measurement frequency.  <math>f_c</math> is the Operating Frequency.  <math>F_{low\_OFB}</math> is the lower edge of the Operational Frequency Band.  <math>F_{high\_OFB}</math> is the upper edge of the Operational Frequency Band.  OCW is the operating channel bandwidth.</p>	Domain	Frequency Range	$RBW_{REF}$	Max power limit	OOB limits applicable to Operational Frequency Band (See Figure 6)	$f \leq f_{low\_OFB} - 400 \text{ kHz}$	10 kHz	-36 dBm	$F_{low\_OFB} - 400 \text{ kHz} \leq f \leq f_{low\_OFB} - 200 \text{ kHz}$	1 kHz	-36 dBm	$f_{low} - 200 \text{ kHz} \leq f < f_{low\_OFB}$	1 kHz	See Figure 6	$f = f_{low\_OFB}$	1 kHz	0 dBm	$f = f_{high\_OFB}$	1 kHz	0 dBm	$F_{high\_OFB} < f \leq f_{high\_OFB} + 200 \text{ kHz}$	1 kHz	See Figure 6	$F_{high\_OFB} + 200 \text{ kHz} \leq f \leq f_{high\_OFB} + 400 \text{ kHz}$	1 kHz	-36 dBm	OOB limits applicable to Operating Channel (See Figure 5)	$F_{high\_OFB} + 400 \text{ kHz} \leq f$	10 kHz	-36 dBm	$f = f_c - 2.5 \times \text{OCW}$	1 kHz	-36 dBm	$f_c - 2.5 \times \text{OCW} \leq f \leq f_c - 0.5 \times \text{OCW}$	1 kHz	See Figure 5	$f = f_c - 0.5 \times \text{OCW}$	1 kHz	0 dBm	$f = f_c + 0.5 \times \text{OCW}$	1 kHz	0 dBm	$f_c + 0.5 \times \text{OCW} \leq f \leq f_c + 2.5 \times \text{OCW}$	1 kHz	See Figure 5	$f = f_c + 2.5 \times \text{OCW}$	1 kHz	-36 dBm
Domain	Frequency Range	$RBW_{REF}$	Max power limit																																														
OOB limits applicable to Operational Frequency Band (See Figure 6)	$f \leq f_{low\_OFB} - 400 \text{ kHz}$	10 kHz	-36 dBm																																														
	$F_{low\_OFB} - 400 \text{ kHz} \leq f \leq f_{low\_OFB} - 200 \text{ kHz}$	1 kHz	-36 dBm																																														
	$f_{low} - 200 \text{ kHz} \leq f < f_{low\_OFB}$	1 kHz	See Figure 6																																														
	$f = f_{low\_OFB}$	1 kHz	0 dBm																																														
	$f = f_{high\_OFB}$	1 kHz	0 dBm																																														
	$F_{high\_OFB} < f \leq f_{high\_OFB} + 200 \text{ kHz}$	1 kHz	See Figure 6																																														
	$F_{high\_OFB} + 200 \text{ kHz} \leq f \leq f_{high\_OFB} + 400 \text{ kHz}$	1 kHz	-36 dBm																																														
OOB limits applicable to Operating Channel (See Figure 5)	$F_{high\_OFB} + 400 \text{ kHz} \leq f$	10 kHz	-36 dBm																																														
	$f = f_c - 2.5 \times \text{OCW}$	1 kHz	-36 dBm																																														
	$f_c - 2.5 \times \text{OCW} \leq f \leq f_c - 0.5 \times \text{OCW}$	1 kHz	See Figure 5																																														
	$f = f_c - 0.5 \times \text{OCW}$	1 kHz	0 dBm																																														
	$f = f_c + 0.5 \times \text{OCW}$	1 kHz	0 dBm																																														
	$f_c + 0.5 \times \text{OCW} \leq f \leq f_c + 2.5 \times \text{OCW}$	1 kHz	See Figure 5																																														
	$f = f_c + 2.5 \times \text{OCW}$	1 kHz	-36 dBm																																														
Test setup:																																																	
Test Procedure:	Refer to clause 5.8.3.4 of ETSI EN300220-1																																																
Test Instruments:	Refer to section 6.0 for details																																																
Test mode:	Refer to section 5.2 for details																																																
Test results:	Pass																																																

## Measurement Data

Domain	Frequency Range	Measured Power (dBm/kHz)	Result
OOB limits applicable to Operational Frequency Band (See Figure6)	$f \leq f_{\text{low\_OFB}} - 400\text{kHz}$	-71.15	PASS
	$F_{\text{low\_OFB}} - 400\text{kHz} \leq f \leq f_{\text{low\_OFB}} - 200\text{kHz}$	-46.65	PASS
	$f_{\text{low}} - 200\text{kHz} \leq f < f_{\text{low\_OFB}}$		
	$f = f_{\text{low\_OFB}}$		
	$f = f_{\text{high\_OFB}}$	-48.68	PASS
	$F_{\text{high\_OFB}} < f \leq f_{\text{high\_OFB}} + 200\text{kHz}$		
	$F_{\text{high\_OFB}} + 200\text{kHz} \leq f \leq f_{\text{high\_OFB}} + 400\text{kHz}$		
$F_{\text{high\_OFB}} + 400\text{kHz} \leq f$	-68.85	PASS	
OOB limits applicable to Operating Channel (See Figure5)	$f = f_c - 2.5 \times \text{OCW}$	-72.65	PASS
	$f_c - 2.5 \times \text{OCW} \leq f \leq f_c - 0.5 \times \text{OCW}$	-61.34	PASS
	$f = f_c - 0.5 \times \text{OCW}$	-44.83	PASS
	$f = f_c + 0.5 \times \text{OCW}$	-44.86	PASS
	$f_c + 0.5 \times \text{OCW} \leq f \leq f_c + 2.5 \times \text{OCW}$	-60.21	PASS
	$f = f_c + 2.5 \times \text{OCW}$	-69.52	PASS

## 7.2.6 Transient power

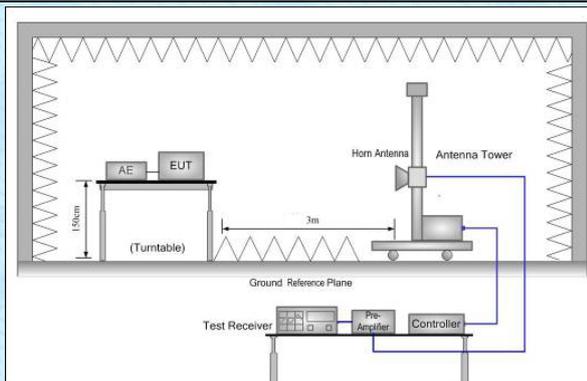
Test Requirement:	ETSI EN 300 220-2 Clause 4.3.6																																							
Test Method:	ETSI EN 300 220-1 Clause 5.10.3																																							
Limit:	<p style="text-align: center;"><b>Table 23: Transmitter Transient Power limits</b></p> <table border="1"> <thead> <tr> <th>Absolute offset from centre frequency</th> <th>RBW<sub>REF</sub></th> <th>Peak power limit applicable at measurement points</th> </tr> </thead> <tbody> <tr> <td>≤ 400 kHz</td> <td>1 kHz</td> <td>0 dBm</td> </tr> <tr> <td>&gt; 400 kHz</td> <td>1 kHz</td> <td>-27 dBm</td> </tr> </tbody> </table>	Absolute offset from centre frequency	RBW <sub>REF</sub>	Peak power limit applicable at measurement points	≤ 400 kHz	1 kHz	0 dBm	> 400 kHz	1 kHz	-27 dBm																														
Absolute offset from centre frequency	RBW <sub>REF</sub>	Peak power limit applicable at measurement points																																						
≤ 400 kHz	1 kHz	0 dBm																																						
> 400 kHz	1 kHz	-27 dBm																																						
Test procedure:	<p>The output of the EUT shall be connected to a spectrum analyser or equivalent measuring equipment.</p> <p>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 Table 24.</p> <p style="text-align: center;"><b>Table 24: RBW for Transient Measurement</b></p> <table border="1"> <thead> <tr> <th>Measurement points: offset from centre frequency</th> <th>Analyser RBW</th> <th>RBW<sub>REF</sub></th> </tr> </thead> <tbody> <tr> <td>-0,5 x OCW - 3 kHz 0,5 x OCW + 3 kHz Not applicable for OCW &lt; 25 kHz</td> <td>1 kHz</td> <td>1kHz</td> </tr> <tr> <td>±12,5 kHz or ±OCW whichever is the greater</td> <td>Max (RBW pattern 1, 3, 10 kHz) ≤ Offset frequency/6 (see note)</td> <td>1 kHz</td> </tr> <tr> <td>-0,5 x OCW - 400 kHz 0,5 x OCW + 400 kHz</td> <td>100 kHz</td> <td>1 kHz</td> </tr> <tr> <td>-0,5 x OCW -1 200 kHz 0,5 x OCW + 1 200 kHz</td> <td>300 kHz</td> <td>1 kHz</td> </tr> </tbody> </table> <p>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.</p> <p>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.</p> <p style="text-align: center;"><b>Table 25: Parameters for Transient Measurement</b></p> <table border="1"> <thead> <tr> <th>Spectrum Analyser Setting</th> <th>Value</th> <th>Notes</th> </tr> </thead> <tbody> <tr> <td>VBW/RBW</td> <td>10</td> <td>At higher RBW values VBW may be clipped to its maximum value</td> </tr> <tr> <td>Sweep time</td> <td>500 ms</td> <td></td> </tr> <tr> <td>RBW filter</td> <td>Gaussian</td> <td></td> </tr> <tr> <td>Trace Detector Function</td> <td>RMS</td> <td></td> </tr> <tr> <td>Trace Mode</td> <td>Max hold</td> <td></td> </tr> <tr> <td>Sweep points</td> <td>501</td> <td></td> </tr> <tr> <td>Measurement mode</td> <td>Continuous sweep</td> <td></td> </tr> </tbody> </table> <p>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.</p> <p>The used modulation shall be D-M3. The analyser shall be set to the settings of Table 25 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 Table 24.</p> <p>The recorded power values shall be converted to power values measured in RBWREF by the formula in clause 4.3.10.1.</p>	Measurement points: offset from centre frequency	Analyser RBW	RBW <sub>REF</sub>	-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	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	
Measurement points: offset from centre frequency	Analyser RBW	RBW <sub>REF</sub>																																						
-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																																						
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Trace Detector Function	RMS																																							
Trace Mode	Max hold																																							
Sweep points	501																																							
Measurement mode	Continuous sweep																																							
Test Instruments:	Refer to section 6.0 for details																																							
Test mode:	Refer to section 5.2 for details																																							
Test results:	Pass																																							

**Measurement Data**

Frequency offset	Peak Power level (dBm)	Limit (dBm)	Result
$F_c - 0.5 * OCW - 1200kHz$	-71.34	-27	Pass
$F_c - 0.5 * OCW - 400kHz$	-70.34	-27	
$F_c - OCW$	-68.62	0	
$F_c - 0.5 * OCW - 3kHz$	-66.56	0	
$F_c + 0.5 * OCW + 3kHz$	-66.38	0	
$F_c + OCW$	-68.57	0	
$F_c + 0.5 * OCW + 400kHz$	-69.86	-27	
$F_c + 0.5 * OCW + 1200kHz$	-68.64	-27	

## 7.2.7 Transmit spurious emissions

Test Requirement:	ETSI EN 300 220-2 Clause 4.2.2		
Test Method:	ETSI EN 300 220-1 Clause 5.9.1.2		
Receiver setup:	<b>Table 20: Parameters for TX Spurious Radiations Measurement</b>		
	<b>Operating Mode</b>	<b>Frequency Range</b>	<b>RBW<sub>REF</sub> (see note 2)</b>
	Transmit mode	$9 \text{ kHz} \leq f < 150 \text{ kHz}$	1 kHz
		$150 \text{ kHz} \leq f < 30 \text{ MHz}$	10 kHz
		$30 \text{ MHz} \leq f < f_c - m$	100 kHz
		$f_c - m \leq f < f_c - n$	10 kHz
		$f_c - n \leq f < f_c - p$	1 kHz
		$f_c + p < f \leq f_c + n$	1 kHz
		$f_c + n < f \leq f_c + m$	10 kHz
		$f_c + m < f \leq 1 \text{ GHz}$	100 kHz
		$1 \text{ GHz} < f \leq 6 \text{ GHz}$	1 MHz
	<p>NOTE 1: f is the measurement frequency.  <math>f_c</math> 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.</p> <p>NOTE 2: If the value of RBW used for measurement is different from RBW<sub>REF</sub>, use bandwidth correction from clause 4.3.10.1.</p>		
Test Frequency range:	25MHz to 6GHz		
Limit:	Frequency	Limit(operation)	Limit(standby)
	47 MHz to 74 MHz 87.5 MHz to 118 MHz 174 MHz to 230 MHz 470 MHz to 790 MHz	4nW(-54dBm)	2nW(-57dBm)
	Other frequencies below 1000 MHz	250nW(-36dBm)	2nW(-57dBm)
	Above 1000 MHz	1uW(-30dBm)	20nW(-47dBm)
Test setup:	Below 1GHz		
	Above 1GHz		



Test procedure:

Substitution method was performed to determine the actual ERP emission levels of the EUT.

The following test procedure as below:

**Below 1GHz:**

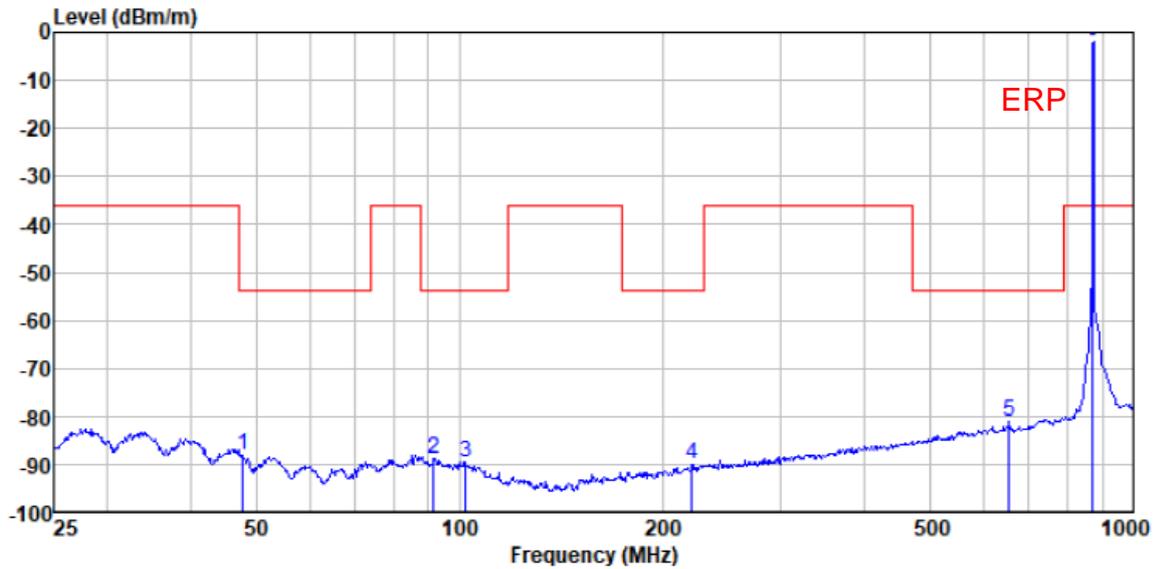
1. On the test site as test setup graph above, the EUT shall be placed at the 1.5m support on the turntable and in the position closest to normal use as declared by the provider.
2. The test antenna shall be oriented initially for vertical polarization and shall be chosen to correspond to the frequency of the transmitter. The output of the test antenna shall be connected to the measuring receiver.
3. 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.
4. The test antenna shall be raised and lowered from 1m to 4m until a maximum signal level is detected by the measuring receiver. Then the turntable should be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
5. Repeat step 4 for test frequency with the test antenna polarized horizontally.
6. Remove the transmitter and replace it with a substitution antenna (the antenna should be half-wavelength for each frequency involved). The center of the substitution antenna should be approximately at the same location as the center of the transmitter. At the lower frequencies, where the substitution antenna is very long, this will be impossible to achieve when the antenna is polarized vertically. In such case the lower end of the antenna should be 0.3 m above the ground.
7. Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a nonradiating cable. With the antennas at both ends vertically polarized, and with the signal generator tuned to a particular test frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained. This should be done carefully repeating the adjustment of the test antenna and generator output.
8. Repeat step 7 with both antennas horizontally polarized for each test frequency.
9. Calculate power in dBm into a reference ideal half-wave dipole antenna by reducing the readings obtained in steps 7 and 8 by the power loss in

	<p>the cable between the generator and the antenna, and further corrected for the gain of the substitution antenna used relative to an ideal half-wave dipole antenna by the following formula:</p> $\text{ERP(dBm)} = \text{Pg(dBm)} - \text{cable loss (dB)} + \text{antenna gain (dBi)}$ <p>where:</p> <p>Pg is the generator output power into the substitution antenna.</p> <p><b>Above 1GHz:</b></p> <p>Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber, and the test antenna do not need to raise from 1 to 4m, just test in 1.5m height.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

**Measurement Data**

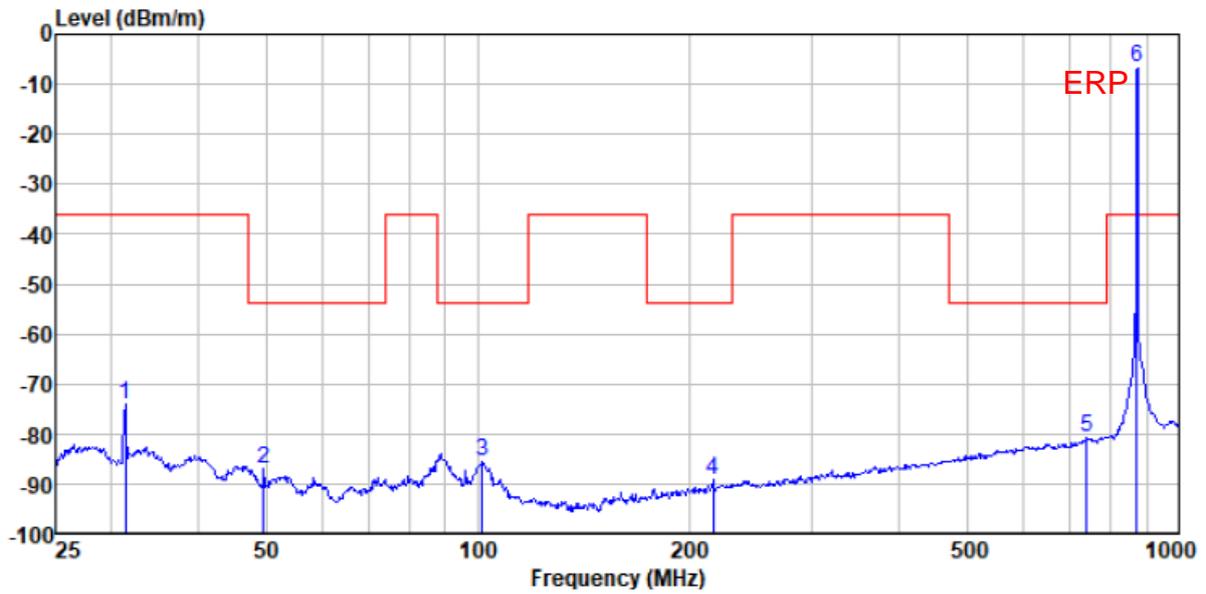
**Below 1GHz**

Test mode	Transmitting mode	Polarity	Horizontal
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	ReadAntenna	Preamp	Cable	Limit	Over	Remark			
Freq	Level	Factor	Loss	Line	Limit				
MHz	dBm	dB/m	dB	dBm/m	dBm/m	dB			
1	47.676	-78.20	25.44	36.07	0.75	-88.08	-54.00	-34.08	Peak
2	91.594	-78.36	25.13	36.65	1.12	-88.76	-54.00	-34.76	Peak
3	102.312	-79.32	25.13	36.74	1.21	-89.72	-54.00	-35.72	Peak
4	221.186	-79.28	24.55	37.35	1.96	-90.12	-54.00	-36.12	Peak
5	654.279	-79.17	31.82	37.59	3.93	-81.01	-54.00	-27.01	Peak
6 *	869.500	-3.06	34.05	37.61	4.74	-1.88	-36.00	34.12	Peak

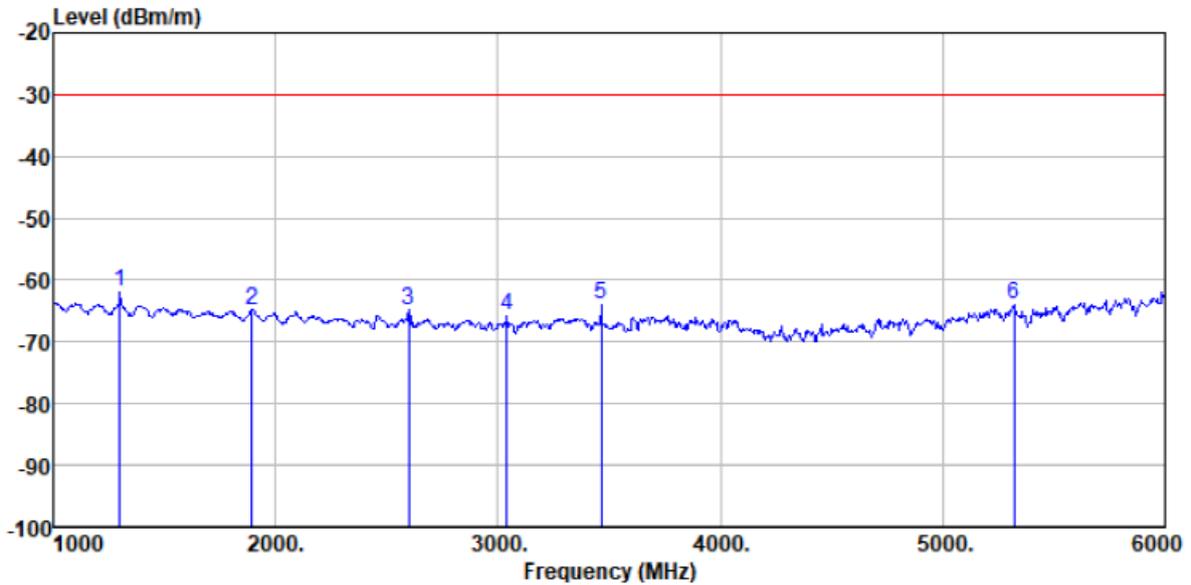
Test mode	Transmitting mode	Polarity	Vertical
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	Read	Antenna	Preamp	Cable	Level	Limit	Over	Remark
	Freq	Level	Factor	Loss	Level	Line	Limit	
	MHz	dBm	dB/m	dB	dBm/m	dBm/m	dB	
1	31.424	-65.69	25.89	35.11	0.57	-74.34	-36.00	-38.34 Peak
2	49.468	-77.27	25.44	36.16	0.77	-87.22	-54.00	-33.22 Peak
3	101.560	-75.38	25.13	36.73	1.20	-85.78	-54.00	-31.78 Peak
4	216.344	-78.31	24.55	37.35	1.94	-89.17	-54.00	-35.17 Peak
5	738.977	-79.97	32.73	37.63	4.23	-80.64	-54.00	-26.64 Peak
6 *	869.500	-7.68	34.05	37.61	4.74	-6.50	-36.00	29.50 Peak

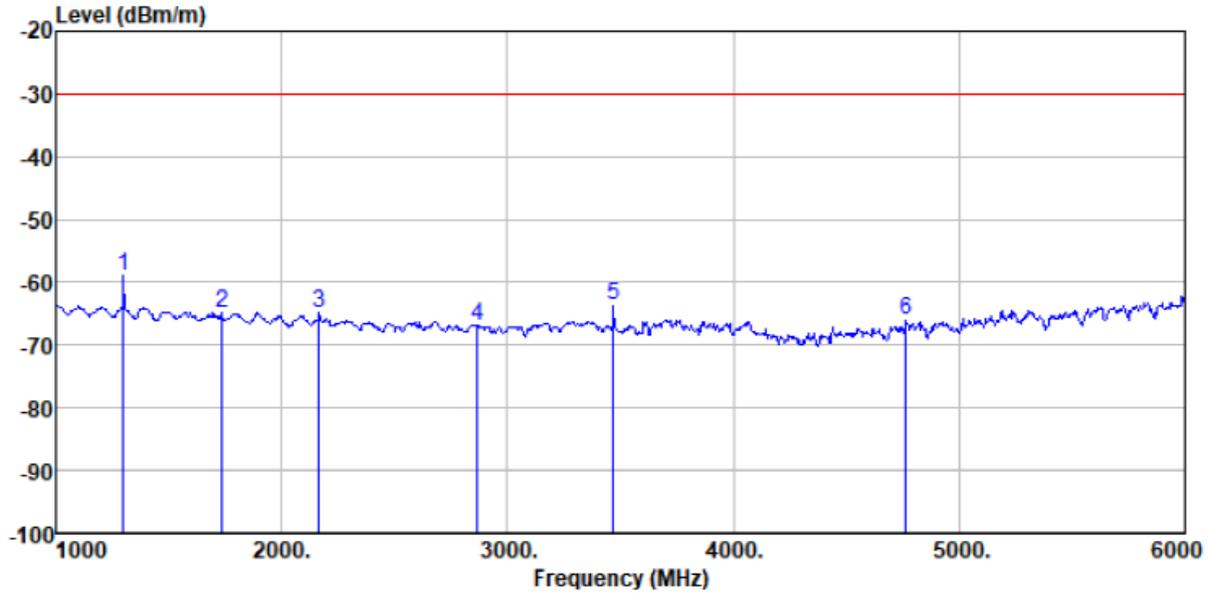
**Above 1GHz:**

Test mode	Transmitting mode	Polarity	Horizontal
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	Read	Antenna	Preamp	Cable	Limit	Over		
Freq	Level	Factor	Factor	Loss	Line	Limit	Remark	
MHz	dBm	dB/m	dB	dB	dBm/m	dBm/m	dB	
1	1300.000	-68.55	40.32	36.00	2.20	-62.03	-30.00	-32.03 Peak
2	1895.000	-71.84	40.99	36.44	2.51	-64.78	-30.00	-34.78 Peak
3	2600.000	-72.67	41.79	37.02	3.11	-64.79	-30.00	-34.79 Peak
4	3040.000	-74.16	42.24	37.31	3.45	-65.78	-30.00	-35.78 Peak
5	3465.000	-73.31	42.84	37.35	3.71	-64.11	-30.00	-34.11 Peak
6	5320.000	-77.95	46.07	37.33	5.08	-64.13	-30.00	-34.13 Peak

Test mode	Transmitting mode	Polarity	Vertical
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	Read Freq	Antenna Level	Preamplifier Factor	Cable Loss	Limit Level	Over Limit	Remark	
	MHz	dBm	dB/m	dB	dBm/m	dBm/m	dB	
1	1300.000	-65.62	40.32	36.00	2.20	-59.10	-30.00	-29.10 Peak
2	1735.000	-71.76	40.82	36.34	2.43	-64.85	-30.00	-34.85 Peak
3	2165.000	-72.28	41.30	36.65	2.66	-64.97	-30.00	-34.97 Peak
4	2865.000	-74.94	42.07	37.21	3.28	-66.80	-30.00	-36.80 Peak
5	3470.000	-73.01	42.84	37.35	3.71	-63.81	-30.00	-33.81 Peak
6	4765.000	-77.80	44.88	37.71	4.59	-66.04	-30.00	-36.04 Peak

## 7.3 Receiver Requirements

Receiver Classification, Table 1 of ETSI EN 300 220-1.

Rx Class	Risk assessment of Rx performance
1	Category 1 is a high performance level of receiver. In particular to be used where the operation of a SRD may have inherent safety of human life implications.
1.5	Category 1.5 is an improved performance level of receiver category 2.
2	Category 2 is standard performance level of receiver.
3	Category 3 is a low performance level of receiver. Manufacturers have to be aware that category 3 receivers are not able to work properly in case of coexistence with some services such as a mobile radio service in adjacent bands. The manufacturer shall provide another mean to overcome the weakness of the radio link or accept the failure.

NOTE: The receiver category should be stated in both the test report and in the user's manual for the equipment. Receiver category 3 will be withdrawn after December 31<sup>st</sup>, 2018.

**The EUT (Receiver part) belong to Category 2 with no Polite spectrum access function.**

### 7.3.1 Receiver sensitivity

Not applicable, since the test applied to Polite spectrum access equipment.

### 7.3.2 Clear Channel Assessment threshold

Not applicable, since the test applied to Polite spectrum access equipment.

### 7.3.3 Polite spectrum access timing parameters

Not applicable, since the test applied to Polite spectrum access equipment.

### 7.3.4 Adaptive Frequency Agility

Not applicable, since the test applied to AFA quipment.

### 7.3.5 Adjacent channel selectivity

Not applicable, since the test applied to Category 1 equipment.

### 7.3.6 Receiver saturation at Adjacent Channel

Not applicable, since the test applied to Category 1 equipment.

### 7.3.7 Spurious response rejection

Not applicable, since the test applied to Category 1 equipment.

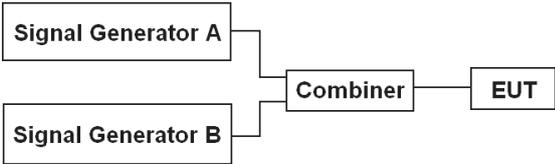
### 7.3.8 Behaviour at high wanted signal level

Not applicable, since the test applied to Category 1 equipment.

### 7.3.9 Bi-Directional Operation Verification

Not applicable, since this product is not support Bi-Directional operation function.

## 7.3.10 Blocking

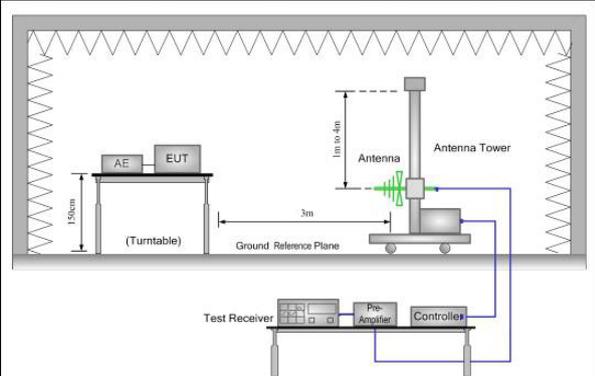
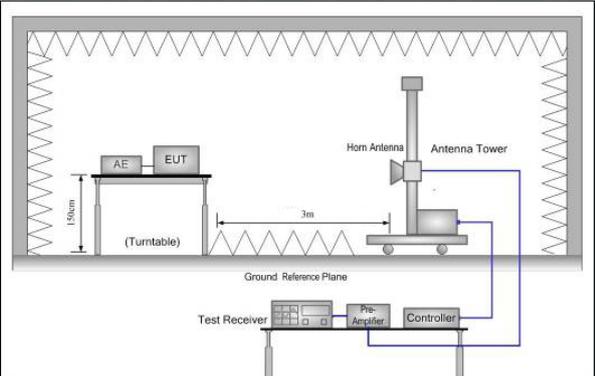
Test Requirement:	ETSI EN 300 220-2 Clause 4.4.2																																								
Test Method:	ETSI EN 300 220-1 clause 5.18																																								
Limit:	<p style="text-align: center;"><b>Table 43: Blocking level parameters for RX category 1</b></p> <table border="1"> <thead> <tr> <th>Requirement</th> <th>Limits</th> </tr> <tr> <th colspan="2" style="text-align: center;">Receiver category 1</th> </tr> </thead> <tbody> <tr> <td>Blocking at <math>\pm 2</math> MHz from Centre Frequency</td> <td><math>\geq -20</math> dBm</td> </tr> <tr> <td>Blocking at <math>\pm 10</math> MHz from Centre Frequency</td> <td><math>\geq -20</math> dBm</td> </tr> <tr> <td>Blocking at <math>\pm 5\%</math> of Centre Frequency or 15 MHz, whichever is the greater</td> <td><math>\geq -20</math> dBm</td> </tr> </tbody> </table> <p style="text-align: center;"><b>Table 42: Blocking level parameters for RX category 1.5</b></p> <table border="1"> <thead> <tr> <th>Requirement</th> <th>Limits</th> </tr> <tr> <th colspan="2" style="text-align: center;">Receiver category 1.5</th> </tr> </thead> <tbody> <tr> <td>Blocking at <math>\pm 2</math> MHz from OC edge <math>f_{high}</math> and <math>f_{low}</math></td> <td><math>\geq -43</math> dBm</td> </tr> <tr> <td>Blocking at <math>\pm 10</math> MHz from OC edge <math>f_{high}</math> and <math>f_{low}</math></td> <td><math>\geq -33</math> dBm</td> </tr> <tr> <td>Blocking at <math>\pm 5\%</math> of Centre Frequency or 15 MHz, whichever is the greater</td> <td><math>\geq -33</math> dBm</td> </tr> </tbody> </table> <p style="text-align: center;"><b>Table 41: Blocking level parameters for RX category 2</b></p> <table border="1"> <thead> <tr> <th>Requirement</th> <th>Limits</th> </tr> <tr> <th colspan="2" style="text-align: center;">Receiver category 2</th> </tr> </thead> <tbody> <tr> <td>Blocking at <math>\pm 2</math> MHz from OC edge <math>f_{high}</math> and <math>f_{low}</math></td> <td><math>\geq -69</math> dBm</td> </tr> <tr> <td>Blocking at <math>\pm 10</math> MHz from OC edge <math>f_{high}</math> and <math>f_{low}</math></td> <td><math>\geq -44</math> dBm</td> </tr> <tr> <td>Blocking at <math>\pm 5\%</math> of Centre Frequency or 15 MHz, whichever is the greater</td> <td><math>\geq -44</math> dBm</td> </tr> </tbody> </table> <p style="text-align: center;"><b>Table 40: Blocking level parameters for RX category 3</b></p> <table border="1"> <thead> <tr> <th>Requirement</th> <th>Limits</th> </tr> <tr> <th colspan="2" style="text-align: center;">Receiver category 3</th> </tr> </thead> <tbody> <tr> <td>Blocking at <math>\pm 2</math> MHz from OC edge <math>f_{high}</math> and <math>f_{low}</math></td> <td><math>\geq -80</math> dBm</td> </tr> <tr> <td>Blocking at <math>\pm 10</math> MHz from OC edge <math>f_{high}</math> and <math>f_{low}</math></td> <td><math>\geq -60</math> dBm</td> </tr> <tr> <td>Blocking at <math>\pm 5\%</math> of Centre Frequency or 15 MHz, whichever is the greater</td> <td><math>\geq -60</math> dBm</td> </tr> </tbody> </table> <p><math>A = 10 \log (BW_{kHz} / 16 \text{ kHz})</math> BW is the receiver bandwidth</p>	Requirement	Limits	Receiver category 1		Blocking at $\pm 2$ MHz from Centre Frequency	$\geq -20$ dBm	Blocking at $\pm 10$ MHz from Centre Frequency	$\geq -20$ dBm	Blocking at $\pm 5\%$ of Centre Frequency or 15 MHz, whichever is the greater	$\geq -20$ dBm	Requirement	Limits	Receiver category 1.5		Blocking at $\pm 2$ MHz from OC edge $f_{high}$ and $f_{low}$	$\geq -43$ dBm	Blocking at $\pm 10$ MHz from OC edge $f_{high}$ and $f_{low}$	$\geq -33$ dBm	Blocking at $\pm 5\%$ of Centre Frequency or 15 MHz, whichever is the greater	$\geq -33$ dBm	Requirement	Limits	Receiver category 2		Blocking at $\pm 2$ MHz from OC edge $f_{high}$ and $f_{low}$	$\geq -69$ dBm	Blocking at $\pm 10$ MHz from OC edge $f_{high}$ and $f_{low}$	$\geq -44$ dBm	Blocking at $\pm 5\%$ of Centre Frequency or 15 MHz, whichever is the greater	$\geq -44$ dBm	Requirement	Limits	Receiver category 3		Blocking at $\pm 2$ MHz from OC edge $f_{high}$ and $f_{low}$	$\geq -80$ dBm	Blocking at $\pm 10$ MHz from OC edge $f_{high}$ and $f_{low}$	$\geq -60$ dBm	Blocking at $\pm 5\%$ of Centre Frequency or 15 MHz, whichever is the greater	$\geq -60$ dBm
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Test setup:	 <pre> graph LR     A[Signal Generator A] --- C[Combiner]     B[Signal Generator B] --- C     C --- EUT[EUT]     </pre>																																								
Test procedure:	<ol style="list-style-type: none"> <li>Two signal generators A and B shall be connected to the receiver via a combining network to the receiver antennaconnector.</li> <li>Signal generator A shall be at the nominal frequency of the receiver, with normal modulation of the wanted signal. Signal generator B shall be unmodulated.</li> <li>Measurements shall be carried out at frequencies of the unwanted signal at approximately <math>\pm 2</math> MHz and <math>\pm 10</math> MHz, avoiding those frequencies at which spurious responses occur.</li> <li>Initially signal generator B shall be switched off and using signal generator A the level which still gives sufficient response shall be established, however, the level at the receiver input shall not be adjusted below the sensitivity limit given in clause 8.1.4. The output level of generator A shall then be increased by 3 dB.</li> <li>Signal generator B is then switched on and adjusted until the wanted criteria (see clause 8.1.1) is just exceeded. With signal generator B settings unchanged the power into the receiver is measured by replacing the receiver with a power meter or spectrum analyzer. This level shall be recorded. Alternatively, equipment having a dedicated or</li> </ol>																																								

	<p>integral antenna may use a radiated measurement setup. For this, a test site from clause A.1 shall be selected and the requirements from clauses A.2 and A.3 apply.</p> <p>6. Signal generators A and B together with a combiner shall be placed outside the anechoic chamber and a TX test antenna shall be placed with the EUT's antenna polarisation. The EUT shall be placed at the location of the turntable at the orientation of the most sensitive position. Generator A shall be set in order to reach the EUT sensitivity limit +3 dB.</p> <p>7. The procedure shall be the same as for the conducted measurement. Bloking is the difference between signal generator B and signal generator A levels.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

**Measurement data:**

Receiver Category	Frequency Offset	Value(dBm)	Limit(dBm)	Result
2	+2MHz	-58.12	-69	Pass
2	-2MHz	-59.33	-69	Pass
2	+10MHz	-39.62	-44	Pass
2	-10MHz	-38.62	-44	Pass
2	+43.42MHz	-36.31	-44	Pass
2	-43.42MHz	-34.32	-44	Pass

## 7.3.11 Spurious emissions

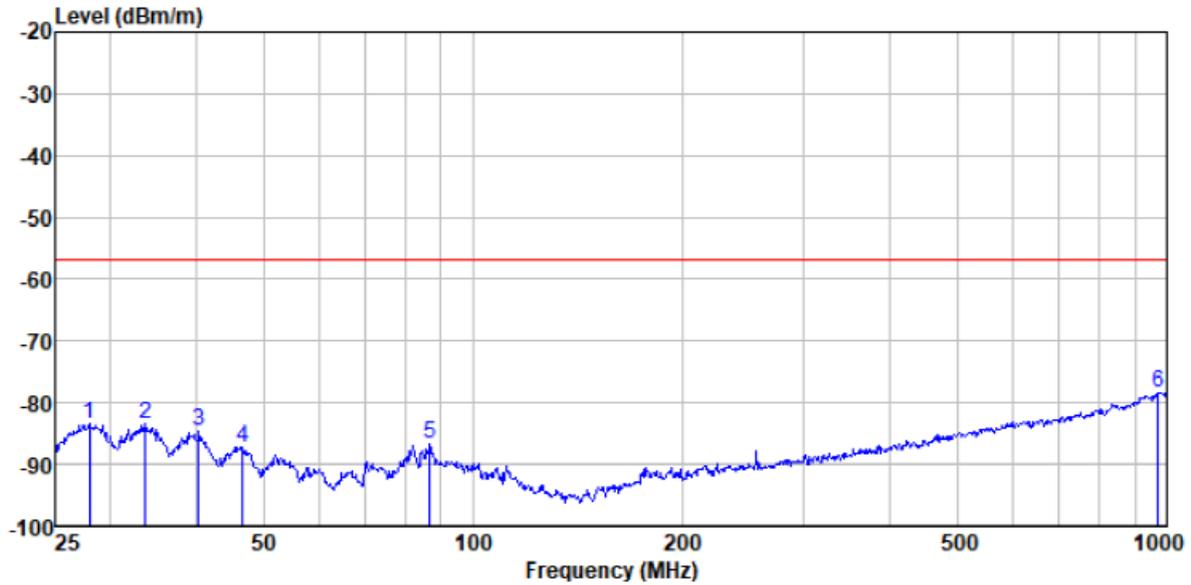
Test Requirement:	ETSI EN 300 220-2 Clause 4.2.2																								
Test Method:	ETSI EN 300 220-1 Clause 5.9.1.2																								
Receiver setup:	<p style="text-align: center;"><b>Table 20: Parameters for TX Spurious Radiations Measurement</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">Operating Mode</th> <th style="width: 40%;">Frequency Range</th> <th style="width: 30%;">RBW<sub>REF</sub> (see note 2)</th> </tr> </thead> <tbody> <tr> <td rowspan="8" style="text-align: center;">Transmit mode</td> <td><math>9 \text{ kHz} \leq f &lt; 150 \text{ kHz}</math></td> <td>1 kHz</td> </tr> <tr> <td><math>150 \text{ kHz} \leq f &lt; 30 \text{ MHz}</math></td> <td>10 kHz</td> </tr> <tr> <td><math>30 \text{ MHz} \leq f &lt; f_c - m</math></td> <td>100 kHz</td> </tr> <tr> <td><math>f_c - m \leq f &lt; f_c - n</math></td> <td>10 kHz</td> </tr> <tr> <td><math>f_c - n \leq f &lt; f_c - p</math></td> <td>1 kHz</td> </tr> <tr> <td><math>f_c + p &lt; f \leq f_c + n</math></td> <td>1 kHz</td> </tr> <tr> <td><math>f_c + n &lt; f \leq f_c + m</math></td> <td>10 kHz</td> </tr> <tr> <td><math>f_c + m &lt; f \leq 1 \text{ GHz}</math></td> <td>100 kHz</td> </tr> <tr> <td></td> <td><math>1 \text{ GHz} &lt; f \leq 6 \text{ GHz}</math></td> <td>1 MHz</td> </tr> </tbody> </table> <p>NOTE 1: f is the measurement frequency.  <math>f_c</math> 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.</p> <p>NOTE 2: If the value of RBW used for measurement is different from RBW<sub>REF</sub>, use bandwidth correction from clause 4.3.10.1.</p>		Operating Mode	Frequency Range	RBW <sub>REF</sub> (see note 2)	Transmit mode	$9 \text{ kHz} \leq f < 150 \text{ kHz}$	1 kHz	$150 \text{ kHz} \leq f < 30 \text{ MHz}$	10 kHz	$30 \text{ MHz} \leq f < f_c - m$	100 kHz	$f_c - m \leq f < f_c - n$	10 kHz	$f_c - n \leq f < f_c - p$	1 kHz	$f_c + p < f \leq f_c + n$	1 kHz	$f_c + n < f \leq f_c + m$	10 kHz	$f_c + m < f \leq 1 \text{ GHz}$	100 kHz		$1 \text{ GHz} < f \leq 6 \text{ GHz}$	1 MHz
Operating Mode	Frequency Range	RBW <sub>REF</sub> (see note 2)																							
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	$f_c + p < f \leq f_c + n$	1 kHz																							
	$f_c + n < f \leq f_c + m$	10 kHz																							
	$f_c + m < f \leq 1 \text{ GHz}$	100 kHz																							
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Test Frequency range:	25MHz to 6GHz																								
Limit:	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;">Frequency</th> <th style="width: 40%;">Limit</th> </tr> </thead> <tbody> <tr> <td>Other frequencies below 1000 MHz</td> <td>2nW(-57dBm)</td> </tr> <tr> <td>Above 1000 MHz</td> <td>20nW(-47dBm)</td> </tr> </tbody> </table>	Frequency	Limit	Other frequencies below 1000 MHz	2nW(-57dBm)	Above 1000 MHz	20nW(-47dBm)																		
Frequency	Limit																								
Other frequencies below 1000 MHz	2nW(-57dBm)																								
Above 1000 MHz	20nW(-47dBm)																								
Test setup:	<p><b>Below 1GHz</b></p>  <p><b>Above 1GHz</b></p> 																								
Test procedure:	Substitution method was performed to determine the actual ERP emission																								

	<p>levels of the EUT. The following test procedure as below:</p> <p><b>Below 1GHz:</b></p> <ol style="list-style-type: none"> <li>1. On the test site as test setup graph above, the EUT shall be placed at the 1.5m support on the turntable and in the position closest to normal use as declared by the provider.</li> <li>2. The test antenna shall be oriented initially for vertical polarization and shall be chosen to correspond to the frequency of the transmitter. The output of the test antenna shall be connected to the measuring receiver.</li> <li>3. 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.</li> <li>4. The test antenna shall be raised and lowered from 1m to 4m until a maximum signal level is detected by the measuring receiver. Then the turntable should be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.</li> <li>5. Repeat step 4 for test frequency with the test antenna polarized horizontally.</li> <li>6. Remove the transmitter and replace it with a substitution antenna (the antenna should be half-wavelength for each frequency involved). The center of the substitution antenna should be approximately at the same location as the center of the transmitter. At the lower frequencies, where the substitution antenna is very long, this will be impossible to achieve when the antenna is polarized vertically. In such case the lower end of the antenna should be 0.3 m above the ground.</li> <li>7. Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a nonradiating cable. With the antennas at both ends vertically polarized, and with the signal generator tuned to a particular test frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained. This should be done carefully repeating the adjustment of the test antenna and generator output.</li> <li>8. Repeat step 7 with both antennas horizontally polarized for each test frequency.</li> <li>9. Calculate power in dBm into a reference ideal half-wave dipole antenna by reducing the readings obtained in steps 7 and 8 by the power loss in the cable between the generator and the antenna, and further corrected for the gain of the substitution antenna used relative to an ideal half-wave dipole antenna by the following formula:  <math display="block">\text{ERP(dBm)} = \text{Pg(dBm)} - \text{cable loss (dB)} + \text{antenna gain (dBd)}</math>                     where:                      Pg is the generator output power into the substitution antenna.</li> </ol> <p><b>Above 1GHz:</b> Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber, and the test antenna do not need to raise from 1 to 4m, just test in 1.5m height.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

## Measurement Data

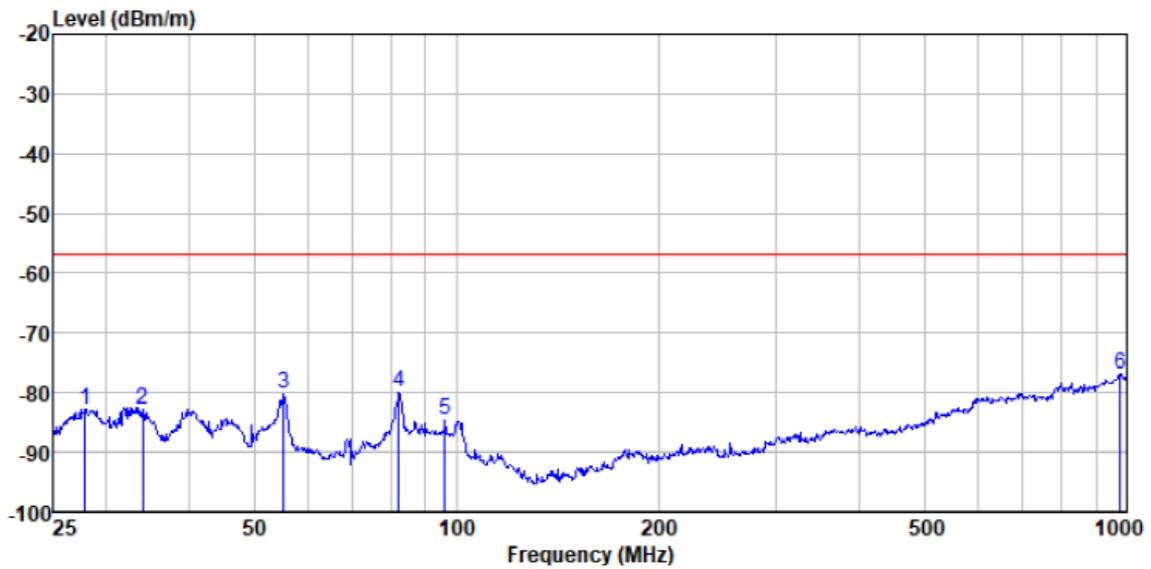
### Below 1GHz

Test mode	Receiving mode	Polarity	Horizontal
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	Read Freq	Antenna Level	Preamp Factor	Cable Loss	Limit Line	Over Limit	Remark		
	MHz	dBm	dB/m	dB	dBm/m	dBm/m	dB		
1	28.029	-74.58	25.89	35.19	0.52	-83.36	-57.00	-26.36	Peak
2	33.706	-74.61	25.89	35.27	0.59	-83.40	-57.00	-26.40	Peak
3	40.235	-74.95	25.44	35.68	0.66	-84.53	-57.00	-27.53	Peak
4	46.632	-77.39	25.44	36.02	0.74	-87.23	-57.00	-30.23	Peak
5	86.663	-72.82	21.65	36.61	1.08	-86.70	-57.00	-29.70	Peak
6	970.920	-81.70	35.81	37.54	5.12	-78.31	-57.00	-21.31	Peak

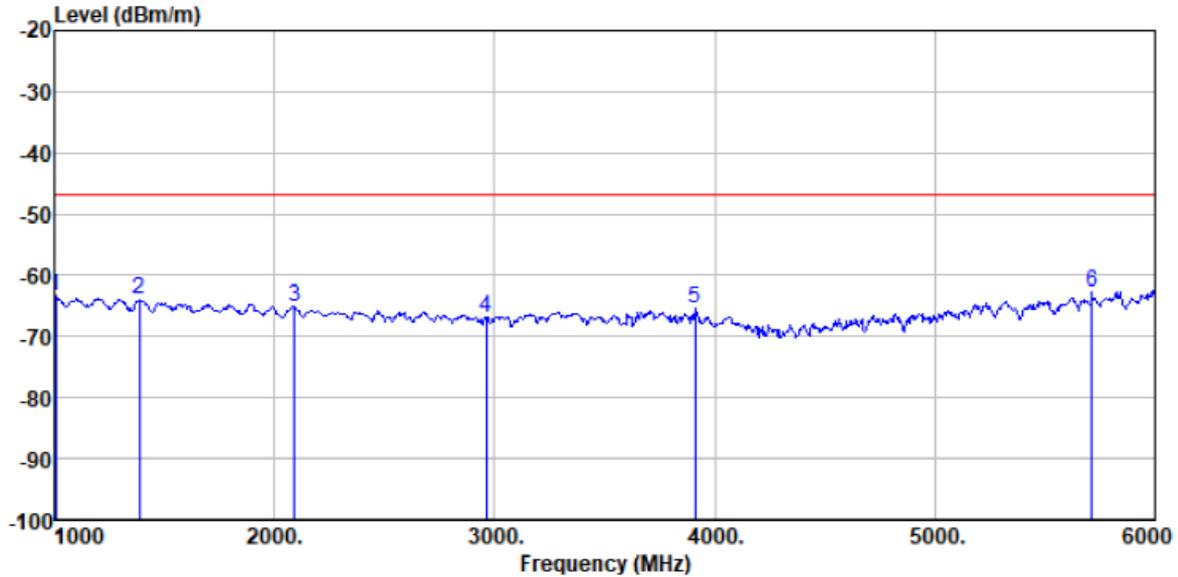
Test mode	Receiving mode	Polarity	Vertical
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	Read Freq	Antenna Level	Preamp Factor	Cable Loss	Limit Line	Over Limit	Remark		
	MHz	dBm	dB/m	dB	dBm/m	dBm/m	dB		
1	27.926	-73.98	25.89	35.20	0.52	-82.77	-57.00	-25.77	Peak
2	34.081	-74.04	25.89	35.29	0.60	-82.84	-57.00	-25.84	Peak
3	55.256	-70.28	25.44	36.26	0.82	-80.28	-57.00	-23.28	Peak
4	81.998	-66.00	21.65	36.57	1.05	-79.87	-57.00	-22.87	Peak
5	96.093	-74.31	25.13	36.69	1.16	-84.71	-57.00	-27.71	Peak
6	978.110	-80.30	35.81	37.53	5.14	-76.88	-57.00	-19.88	Peak

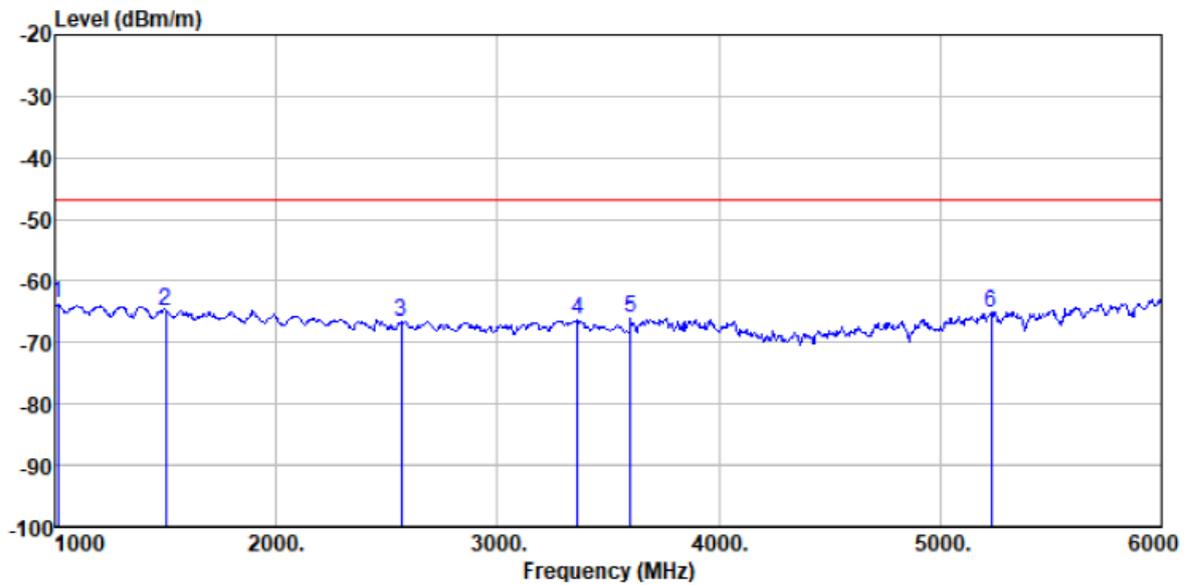
**Above 1GHz**

Test mode	Receiving mode	Polarity	Horizontal
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	Read Freq	Antenna Level	Preamp Factor	Cable Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBm	dB/m	dB	dB	dBm/m	dBm/m	dB	
1	1005.000	-69.56	39.85	35.71	1.98	-63.44	-47.00	-16.44	Peak
2	1385.000	-70.58	40.42	36.08	2.23	-64.01	-47.00	-17.01	Peak
3	2090.000	-72.41	41.21	36.59	2.60	-65.19	-47.00	-18.19	Peak
4	2960.000	-75.13	42.16	37.27	3.37	-66.87	-47.00	-19.87	Peak
5	3910.000	-75.46	43.41	37.39	3.91	-65.53	-47.00	-18.53	Peak
6	5715.000	-78.53	47.02	36.78	5.39	-62.90	-47.00	-15.90	Peak

Test mode	Receiving mode	Polarity	Vertical
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	ReadAntenna	Preamp	Cable	Limit	Over	Remark			
Freq	Level	Factor	Loss	Line	Limit				
MHz	dBm	dB/m	dB	dBm/m	dBm/m	dB			
1	1015.000	-69.98	39.89	35.72	1.99	-63.82	-47.00	-16.82	Peak
2	1500.000	-71.59	40.58	36.17	2.28	-64.90	-47.00	-17.90	Peak
3	2565.000	-74.36	41.77	36.99	3.08	-66.50	-47.00	-19.50	Peak
4	3360.000	-75.46	42.72	37.34	3.63	-66.45	-47.00	-19.45	Peak
5	3600.000	-75.53	43.00	37.36	3.84	-66.05	-47.00	-19.05	Peak
6	5230.000	-78.54	45.85	37.47	5.02	-65.14	-47.00	-18.14	Peak

## 8 Test Setup Photo

Reference to the **appendix I** for details.

## 9 EUT Constructional Details

Reference to the **appendix II** for details.

-----End-----