



TEST REPORT

Reference No. : WTS18S05113608-1W
Manufacturer* : Shenzhen EBELONG Technology Co., Ltd
Address : Shenzhen wisdom innovation center Suite A.607, Qianjin 2nd Road,
Baoan District, ShenZhen, Guangdong, China
Factory : Shenzhen EBELONG Technology Co., Ltd
Address : Shenzhen wisdom innovation center Suite A.607, Qianjin 2nd Road,
Baoan District, ShenZhen, Guangdong, China
Product : RX: WIFI wireless controller
TX: Batteryless wireless switch
Model(s) : RX: ERC309, ERC309-H, ERC609
TX: Refer to section 5.3
Standards : ETSI EN 300 328 V2.1.1 (2016-11)
EN 62311: 2008
Date of Receipt sample : 2018-06-02
Date of Test : 2018-06-02 to 2018-06-11
Date of Issue : 2018-06-12
Test Result : **Pass**

Remarks:

1. The 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. "(*)" **manufacturer** means any natural or legal person who manufactures radio equipment or has radio equipment designed or manufactured, and markets that equipment under his name or trade mark.

Prepared By:

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2 Laboratories Introduction

Waltek Services (Shenzhen) Co., Ltd is a professional third-party testing and certification laboratory with multi-year product testing and certification experience, established strictly in accordance with ISO/IEC 17025 requirements, and accredited by ILAC (International Laboratory Accreditation Cooperation) member. A2LA (American Association for Laboratory Accreditation) of USA, Meanwhile, Waltek has got recognition as registration and accreditation laboratory from EMSD (Electrical and Mechanical Services Department), and American Energy star, FCC(The Federal Communications Commission), CEC(California energy efficiency), IC(Industry Canada). It's the strategic partner and data recognition laboratory of international authoritative organizations, such as Intertek(ETL-SEMKO), TÜV Rheinland, TÜV SÜD, etc.



Waltek Services (Shenzhen) Co., Ltd is one of the largest and the most comprehensive third party testing laboratory in China. Our test capability covered four large fields: safety test. ElectroMagnetic Compatibility(EMC), and energy performance, wireless radio. As a professional, comprehensive, justice international test organization, we still keep the scientific and rigorous work attitude to help each client satisfy the international standards and assist their product enter into globe market smoothly.



2.1 Test Facility

A. Accreditations for Conformity Assessment (International)

| Accreditation for Conformity Assessment (International) | | | |
|---|---|-------------------------------|------|
| Country/Region | Accreditation Body | Scope | Note |
| USA | A2LA (Certificate No.: 4243.01) | FCC ID \ DOC \ VOC | 1 |
| Canada | | IC ID \ VOC | 2 |
| Japan | | MIC-T \ MIC-R | - |
| Europe | | EMCD \ RED | - |
| Taiwan | | NCC | - |
| Hong Kong | | OFCA | - |
| Australia | | RCM | - |
| India | | International Services | WPC |
| Thailand | NTC | | - |
| Singapore | IDA | | - |
| Note: | | | |
| 1. FCC Designation No.: CN1201. Test Firm Registration No.: 523476. | | | |
| 2. IC Canada Registration No.: 7760A | | | |

B.TCBs and Notify Bodies Recognized Testing Laboratory.

| Recognized Testing Laboratory of ... | Notify body number |
|--|--------------------|
| TUV Rheinland | Optional. |
| Intertek | |
| TUV SUD | |
| SGS | |
| Phoenix Testlab GmbH | 0700 |
| Element Materials Technology Warwick Ltd | 0891 |
| Timco Engineering, Inc. | 1177 |
| Eurofins Product Service GmbH | 0681 |



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4 Revision History

| Test report No. | Date of Receipt sample | Date of Test | Date of Issue | Purpose | Comment | Approved |
|-------------------|------------------------|--------------------------|---------------|----------|---------|----------|
| WTS18S05113608-1W | 2018-06-02 | 2018-06-02 to 2018-06-11 | 2018-06-12 | original | - | Valid |



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5 General Information

5.1 General Description of E.U.T

| | |
|----------------------|--|
| Product: | RX: WIFI wireless controller TX: Batteryless wireless switch |
| Model(s): | RX: ERC309, ERC309-H, ERC609 TX: Refer to section 5.3 |
| Model Description: | RX : Only the model names and shapes are different. TX : Refer to section 5.3 |
| Wi-Fi Specification: | 2.4G-802.11b/g/n HT20 |
| Hardware Version: | RX: ERC309, ERC309-H, ERC609: V1.3 TX: N/A |
| Software Version: | RX: ERC309, ERC309-H, ERC609: 1.1 TX: N/A |

5.2 Details of E.U.T

| | |
|-----------------------|--|
| Operation Frequency: | 802.11b/g/n HT20: 2412-2472MHz |
| Max. RF output power: | 9.87dBm |
| Type of Modulation: | DSSS, OFDM |
| Antenna installation: | PCB Printed antenna |
| Antenna Gain: | 0dBi |
| Ratings: | TX: Refer to section 5.3 RX: Input AC 100-240V 50/60Hz Load: Max 5A(LED600W) |

5.3 Details of product

TX:

| Product | Model | Description |
|-----------------------------|--------|--|
| Batteryless wireless switch | ES2154 | S2 series white one-button switch |
| | ES2254 | S2 series white double button switches |
| | ES2354 | S2 series white three-button switches |
| | ES2111 | S2 series grey one-button switch |
| | ES2211 | S2 series grey double button switches |
| | ES2311 | S2 series grey three-button switches |
| | ES2165 | S2 series gold one-button switch |
| | ES2265 | S2 series gold two-button switches |
| | ES2365 | S2 series gold three-button switches |
| | ES2187 | S2 series silver one-button switch |
| | ES2287 | S2 series silver two-button switches |
| | ES2387 | S2 series silver three-button switches |



5.4 Subcontracted

Whether parts of tests for the product have been subcontracted to other labs:

☐ Yes ☒ No

If Yes, list the related test items and lab information:

Test Lab: /

Lab address: /

Test items: /

5.5 Abnormalities from Standard Conditions

None.



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5.6 Channel List

| Channel No. | Frequency (MHz) | Channel No. | Frequency (MHz) | Channel No. | Frequency (MHz) | Channel No. | Frequency (MHz) |
|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|
| 1 | 2412 | 2 | 2417 | 3 | 2422 | 4 | 2427 |
| 5 | 2432 | 6 | 2437 | 7 | 2442 | 8 | 2447 |
| 9 | 2452 | 10 | 2457 | 11 | 2462 | 12 | 2467 |
| 13 | 2472 | | | | | | |



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6 Test Summary

| RF PART | | |
|---|------------------|--------|
| Test Items | Test Requirement | Result |
| RF output power | ETSI EN 300 328 | PASS |
| Duty Cycle, Tx-sequence, Tx-gap | ETSI EN 300 328 | N/A |
| Accumulated Transmit Time, Frequency Occupation and Hopping Sequence | ETSI EN 300 328 | N/A |
| Hopping Frequency Separation | ETSI EN 300 328 | N/A |
| Medium Utilisation (MU) factor | ETSI EN 300 328 | N/A |
| Adaptivity (Adaptive Frequency Hopping) | ETSI EN 300 328 | N/A |
| Receiver Blocking | ETSI EN 300 328 | PASS |
| Occupied Channel Bandwidth | ETSI EN 300 328 | PASS |
| Maximum spectral power density | ETSI EN 300 328 | PASS |
| Transmitter unwanted emissions in the out-of-band domain | ETSI EN 300 328 | PASS |
| Transmitter unwanted emissions in the spurious domain | ETSI EN 300 328 | PASS |
| Receiver spurious emissions | ETSI EN 300 328 | PASS |
| Geo-location capability | ETSI EN 300 328 | N/A |
| Remark: PASS: Test item meets the requirement N/A: Not Applicable | | |

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7 Equipment Used during Test

7.1 Equipments List

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Calibration Date | Calibration Due Date |
|------|--------------------------------|-------------------------|---------------|--------------------------------|-----------------------|----------------------|
| 1. | Spectrum Analyzer | Agilent | N9020A | MY49100060 | 2017-09-22 | 2018-09-21 |
| 2. | Spectrum Analyzer (9k-6GHz) | R&S | FSL6 | 100959 | 2017-09-12 | 2018-09-11 |
| 3. | Humidity Chamber | GF | GTH-225-40-1P | IAA061213 | 2017-08-14 | 2018-08-13 |
| 4. | EXA Signal Analyzer | Keysight | N9010A | MY50520207 526B25MPB W7X | 2018-04-28 | 2019-04-27 |
| 5. | ESG VECTOR SIGNAL GENERATOR | Keysight | 4438C | MY45092536 005506601U NJ | 2018-04-12 | 2019-04-11 |
| 6. | EXG Analog Signal Generator | Keysight | N5171B | MY53050845 503 | 2017-09-12 | 2018-09-11 |
| 7. | USB Wideband Power Sensor | Keysight | U2021XA | SG5440003 | 2018-04-28 | 2019-04-27 |
| 8. | Trilog Broadband Antenna | SCHWARZBECK | VULB9163 | 336 | 2018-04-08 | 2019-04-07 |
| 9. | Coaxial Cable (below 1GHz) | Top | TYPE16(13M) | - | 2017-09-12 | 2018-09-11 |
| 10. | Broad-band Horn Antenna | SCHWARZBECK | BBHA 9120 D | 667 | 2018-04-08 | 2019-04-07 |
| 11. | Broad-band Horn Antenna | SCHWARZBECK | BBHA 9120 D | 669 | 2018-04-08 | 2019-04-07 |
| 12. | Broadband Preamplifier | COMPLIANCE DIRECTION | PAP-1G18 | 2004 | 2018-04-12 | 2019-04-11 |
| 13. | Coaxial Cable (above 1GHz) | Top | 1GHz-25GHz | EW02014-7 | 2018-04-12 | 2019-04-11 |
| 14. | Broad-band Horn Antenna | SCHWARZBECK | BBHA 9170 | 335 | 2017-09-15 | 2018-09-14 |

ETSI Test software

| | |
|------------------|-------------|
| Software name | ETSI family |
| Software version | V2.1.1 |



7.2 Measurement Uncertainty

| Parameter | Uncertainty |
|--------------------------------------|-----------------------|
| Occupied Channel Bandwidth | $\pm 5\%$ |
| RF output power, conducted | $\pm 0.42\text{dB}$ |
| Power Spectral Density, conducted | $\pm 0.7\text{dB}$ |
| Unwanted Emissions, conducted | $\pm 2.76\text{dB}$ |
| Time | $\pm 5\%$ |
| Duty Cycle | $\pm 5\%$ |
| Temperature | $\pm 1^\circ\text{C}$ |
| Humidity | $\pm 2\%$ |
| DC and low frequency voltages | $\pm 0.1\%$ |
| Conduction disturbance(150kHz~30MHz) | $\pm 3.64\text{dB}$ |
| Radiated Emission(30MHz~1GHz) | $\pm 5.08\text{dB}$ |
| Radiated Emission(1GHz~6GHz) | $\pm 4.99\text{dB}$ |

7.3 Test Equipment Calibration

All the test equipments used are valid and calibrated by GUANG ZHOU GRG METROLOGY & TEST CO., LTD.address is No.163, Pingyun Rd. West of Huangpu Ave, Tianhe District, Guangzhou, Guangdong, China.

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8 RF Requirements

1. Normal Test Conditions:

Ambient Condition: 230VAC, 20 °C

2. Extreme Test Conditions:

Extreme Temperature: -25°C to +55°C;

For tests at extreme temperatures, measurements shall be made over the extremes of the operating temperature range as declared by the manufacturer.

| Test Conditions | Normal | LTLV | LTHV | HTHV | HTLV |
|------------------|--------|------|------|------|------|
| Temperature (°C) | 20 | -25 | -25 | 55 | 55 |

3. Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests, the worst data were recorded and reported.

| Test mode | Low channel | Middle channel | High channel |
|-----------------------------|-------------|----------------|--------------|
| Transmitting(802.11b/g/n20) | 2412MHz | 2442MHz | 2472MHz |
| Receiving(802.11b/g/n20) | 2412MHz | 2442MHz | 2472MHz |



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8.1 RF Output power

8.1.1 Definition

The RF output power is defined as the mean equivalent isotropically radiated power (e.i.r.p.) of the equipment during a transmission burst.

8.1.2 Limit

The maximum RF output power for adaptive Frequency Hopping equipment shall be equal to or less than 20dBm.

The maximum RF output power for non-adaptive equipment shall be declared by the supplier and shall not exceed 20 dBm. See clause 5.4.1 m). For non-adaptive equipment using wide band modulations other than FHSS, the maximum RF output power shall be equal to or less than the value declared by the manufacturer.

This limit shall apply for any combination of power level and intended antenna assembly.

8.1.3 EUT Operation Condition

The EUT was programmed to be in continuously transmitting mode.

8.1.4 Test Procedure

Step 1:

- Use a fast power sensor suitable for 2.4 GHz and capable of minimum 1 MS/s.
- Use the following settings:
 - Sample speed 1 MS/s or faster.
 - The samples shall represent the RMS power of the signal.
 - Measurement duration: For non-adaptive equipment: equal to the observation period defined in clause 4.3.1.3.2 or clause 4.3.2.4.2. For adaptive equipment, the measurement duration shall be long enough to ensure a minimum number of bursts (at least 10) are captured.

NOTE 1: For adaptive equipment, to increase the measurement accuracy, a higher number of bursts may be used.

Step 2:

- For conducted measurements on devices with one transmit chain:
 - Connect the power sensor to the transmit port, sample the transmit signal and store the raw data. Use these stored samples in all following steps.
- For conducted measurements on devices with multiple transmit chains:
 - Connect one power sensor to each transmit port for a synchronous measurement on all transmit ports.
 - Trigger the power sensors so that they start sampling at the same time. Make sure the time difference between the samples of all sensors is less than 500 ns.
 - For each individual sampling point (time domain), sum the coincident power samples of all ports and store them. Use these summed samples in all following steps.

Step 3:

- Find the start and stop times of each burst in the stored measurement samples.

The start and stop times are defined as the points where the power is at least 30 dB below the highest value of the stored samples in step 2.

NOTE 2: In case of insufficient dynamic range, the value of 30 dB may need to be reduced appropriately.

Step 4:

- Between the start and stop times of each individual burst calculate the RMS power over the burst using the formula below. Save these Pburst values, as well as the start and stop times for each burst.



$$P_{burst} = \frac{1}{k} \sum_{n=1}^k P_{sample}(n)$$

with 'k' being the total number of samples and 'n' the actual sample number

Step 5:

- The highest of all Pburst values (value "A" in dBm) will be used for maximum e.i.r.p. calculations.

Step 6:

- Add the (stated) antenna assembly gain "G" in dBi of the individual antenna.
- If applicable, add the additional beamforming gain "Y" in dB.
- If more than one antenna assembly is intended for this power setting, the maximum overall antenna gain (G or G + Y) shall be used.
- The RF Output Power (P) shall be calculated using the formula below:
$$P = A + G + Y$$
- This value, which shall comply with the limit given in clause 4.3.1.2.3 or clause 4.3.2.2.3, shall be recorded in the test report.



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8.1.5 Measurement Record

| Modulation | Test conditions (Temperature) | EIRP (dBm) | | |
|-------------------------------------|----------------------------------|----------------|-------------------|-----------------|
| | | Low Channel | Middle Channel | High Channel |
| 802.11b | Normal | 9.15 | 9.65 | 9.48 |
| | Lower | 9.13 | 9.62 | 9.45 |
| | Upper | 9.17 | 9.67 | 9.51 |
| 802.11g | Normal | 9.28 | 9.57 | 8.98 |
| | Lower | 9.27 | 9.53 | 8.97 |
| | Upper | 9.34 | 9.61 | 9.04 |
| 802.11n(HT20) | Normal | 9.28 | 9.31 | 9.82 |
| | Lower | 9.25 | 9.27 | 9.80 |
| | Upper | 9.32 | 9.35 | 9.87 |
| Limit | | ≤100mW (20dBm) | | |
| Remark: P = A + G + Y,G=0dBi,x=100% | | | | |

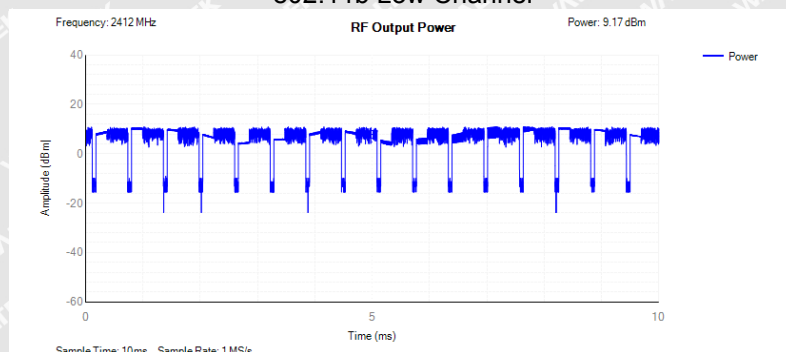


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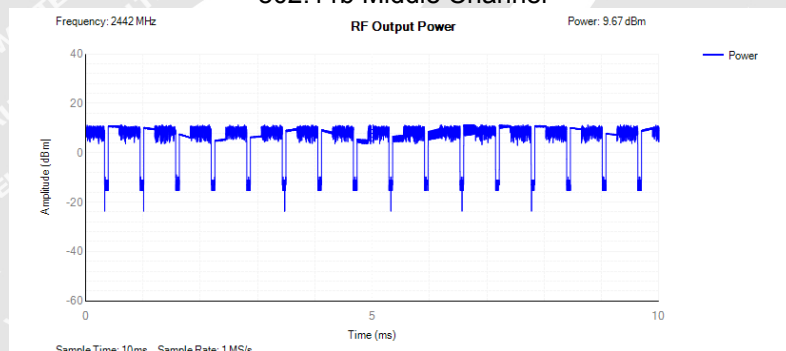


Test Plots

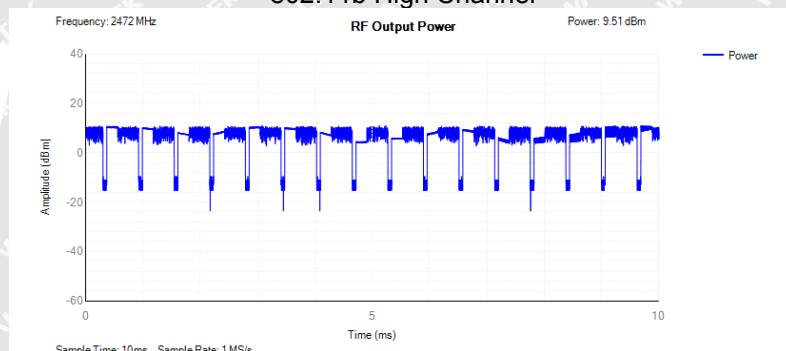
802.11b Low Channel



802.11b Middle Channel

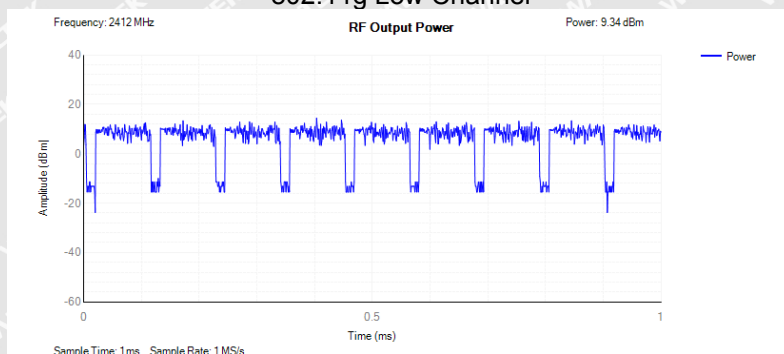


802.11b High Channel

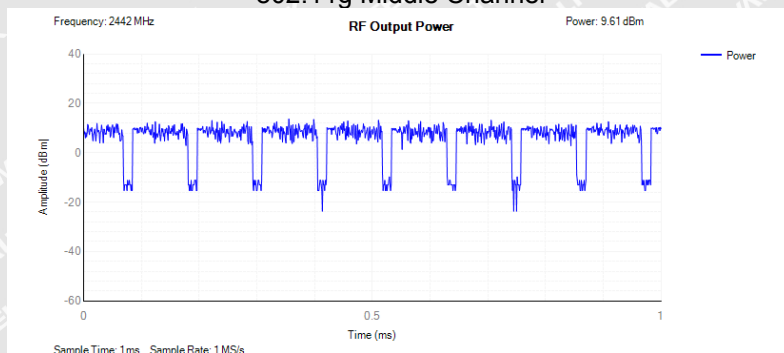




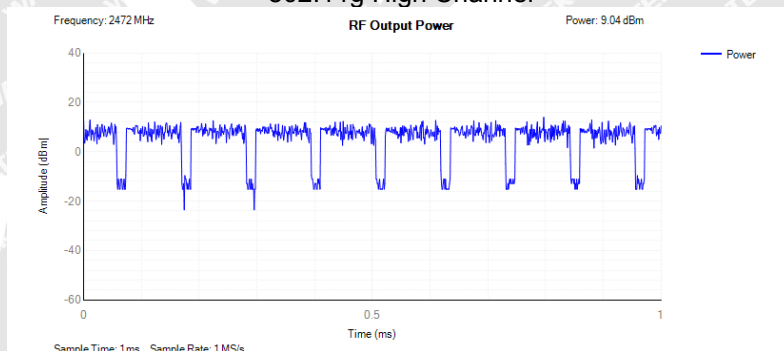
802.11g Low Channel



802.11g Middle Channel

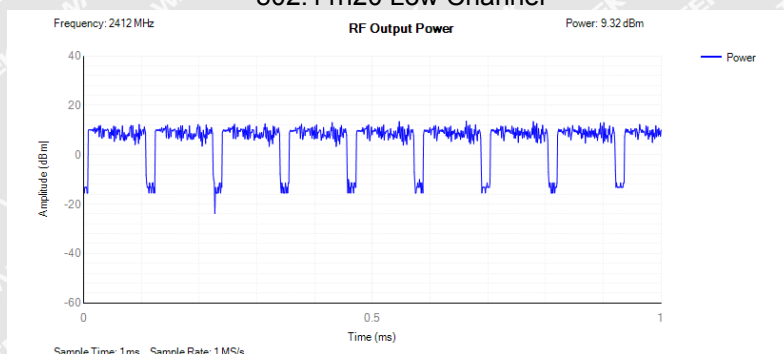


802.11g High Channel

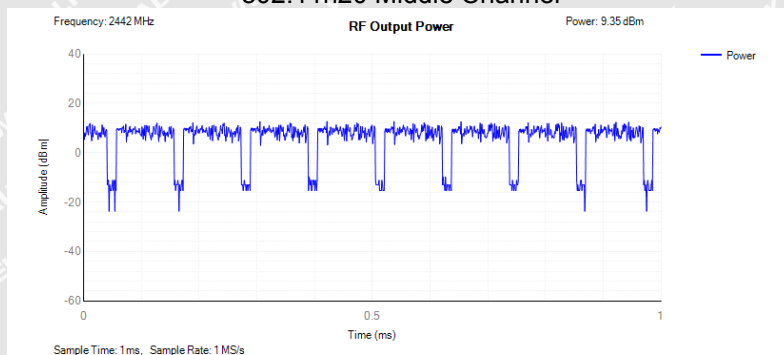




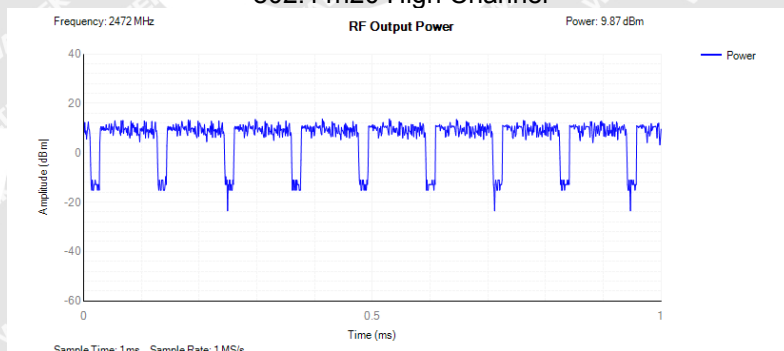
802.11n20 Low Channel



802.11n20 Middle Channel



802.11n20 High Channel





8.2 Power Spectral Density

8.2.1 Definition

The Power Spectral Density is the mean equivalent isotropically radiated power (e.i.r.p.) spectral density in a 1 MHz bandwidth during a transmission burst.

8.2.2 Limit

For equipment using wide band modulations other than FHSS, the maximum Power Spectral Density is limited to 10 dBm per MHz.

8.2.3 EUT Operation Condition

The EUT was programmed to be in continuously transmitting mode.

8.2.4 Test Procedure

Step 1:

Connect the UUT to the spectrum analyser and use the following settings:

- Start Frequency: 2 400 MHz
- Stop Frequency: 2 483,5 MHz
- Resolution BW: 10 kHz
- Video BW: 30 kHz
- Sweep Points: > 8 350

NOTE: For spectrum analysers not supporting this number of sweep points, the frequency band may be segmented.

- Detector: RMS
- Trace Mode: Max Hold
- Sweep time: For non-continuous transmissions: $2 \times \text{Channel Occupancy Time} \times \text{number of sweep points}$

For continuous transmissions: 10 s; the sweep time may be increased further until a value where the sweep time has no further impact anymore on the RMS value of the signal.

For non-continuous signals, wait for the trace to stabilize.

Save the data (trace data) set to a file.

Step 2:

For conducted measurements on smart antenna systems using either operating mode 2 or operating mode 3 (see clause 5.3.2.2), repeat the measurement for each of the transmit ports. For each sampling point (frequency domain), add up the coincident power values (in mW) for the different transmit chains and use this as the new data set.

Step 3:

Add up the values for power for all the samples in the file using the formula below.



$$P_{Sum} = \sum_{n=1}^k P_{sample}(n)$$

with 'k' being the total number of samples and 'n' the actual sample number

Step 4:

Normalize the individual values for power (in dBm) so that the sum is equal to the RF Output Power (e.i.r.p.) measured in clause 5.4.2 and save the corrected data. The following formulas can be used:

$$C_{Corr} = P_{Sum} - P_{e.i.r.p.}$$

$$P_{Samplecorr}(n) = P_{Sample}(n) - C_{Corr}$$

with 'n' being the actual sample number

Step 5:

Starting from the first sample $P_{Samplecorr}(n)$ (lowest frequency), add up the power (in mW) of the following samples representing a 1 MHz segment and record the results for power and position (i.e. sample #1 to sample #100). This is the Power Spectral Density (e.i.r.p.) for the first 1 MHz segment which shall be recorded.

Step 6:

Shift the start point of the samples added up in step 5 by one sample and repeat the procedure in step 5 (i.e. sample #2 to sample #101).

Step 7:

Repeat step 6 until the end of the data set and record the Power Spectral Density values for each of the 1 MHz segments.

From all the recorded results, the highest value is the maximum Power Spectral Density for the UUT. This value, which shall comply with the limit given in clause 4.3.2.3.3, shall be recorded in the test report.

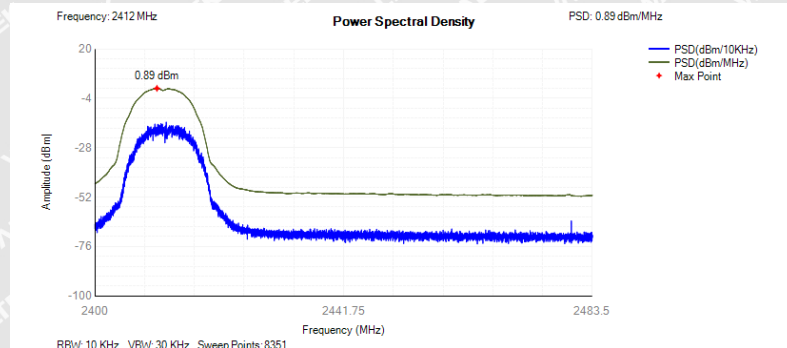
8.2.5 Measurement Record

| Modulation | Test conditions | Maximum e.i.r.p. Spectral Density (dBm/MHz) | | |
|------------|-----------------|---|----------------|--------------|
| | | Low Channel | Middle Channel | High Channel |
| 802.11b | Normal | 0.89 | 1.36 | 1.20 |
| 802.11g | Normal | -1.96 | -1.65 | -2.27 |
| 802.11n20 | Normal | -2.29 | -2.28 | -1.92 |
| Limit | | ≤10dBm/MHz | | |

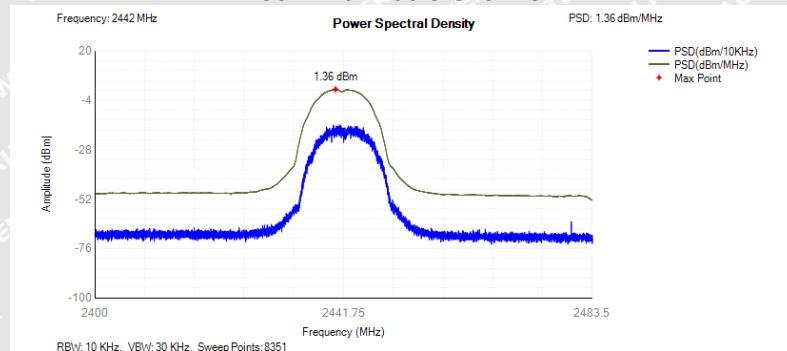


Test Plots

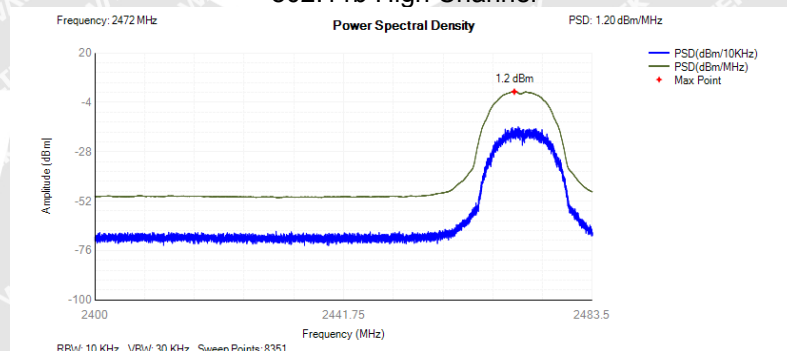
802.11b Low Channel



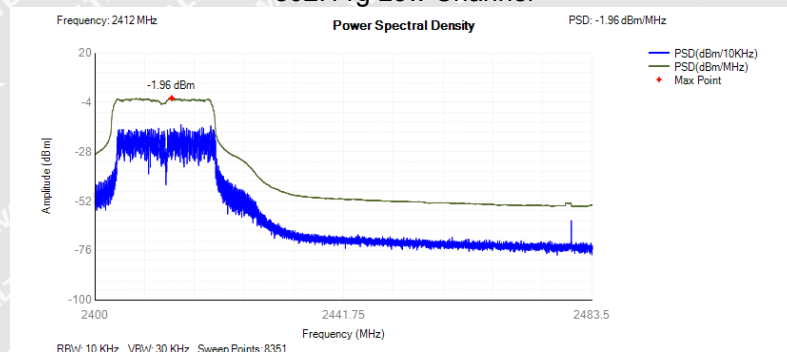
802.11b Middle Channel



802.11b High Channel

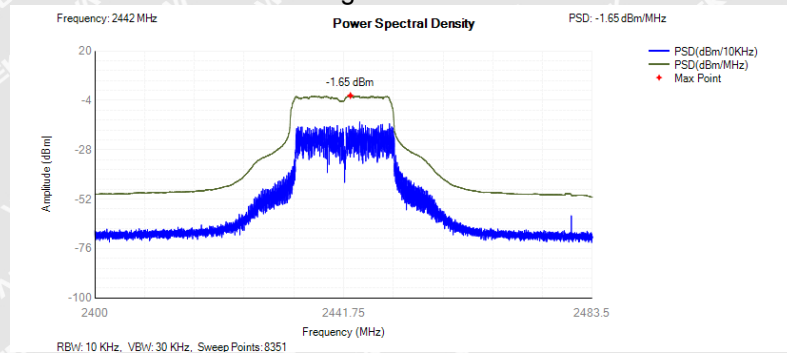


802.11g Low Channel

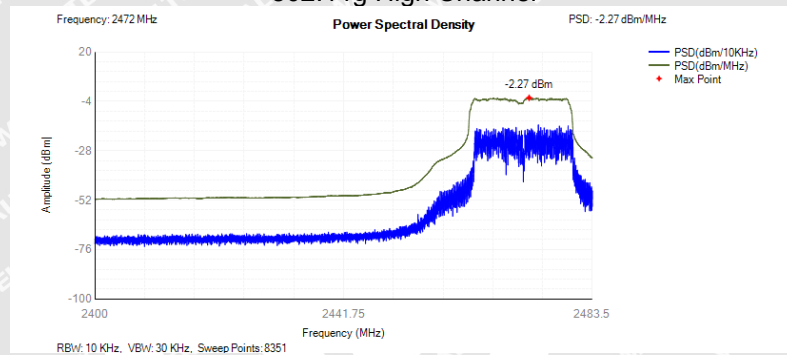




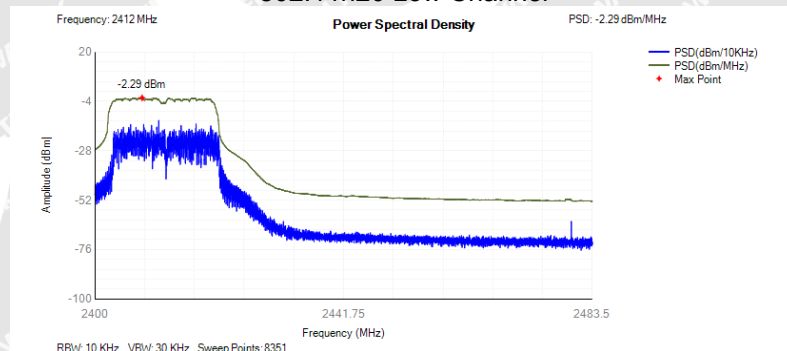
802.11g Middle Channel



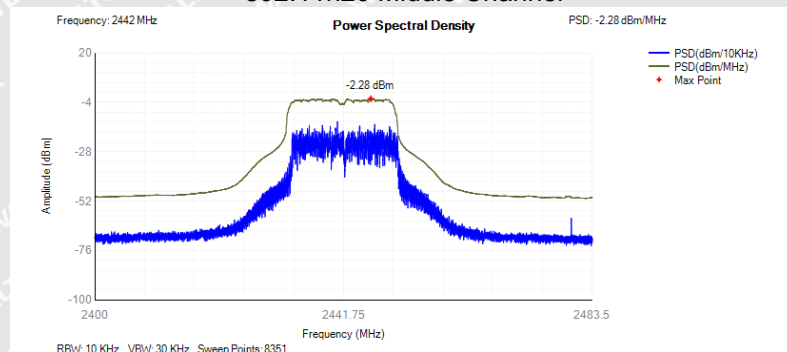
802.11g High Channel



802.11n20 Low Channel

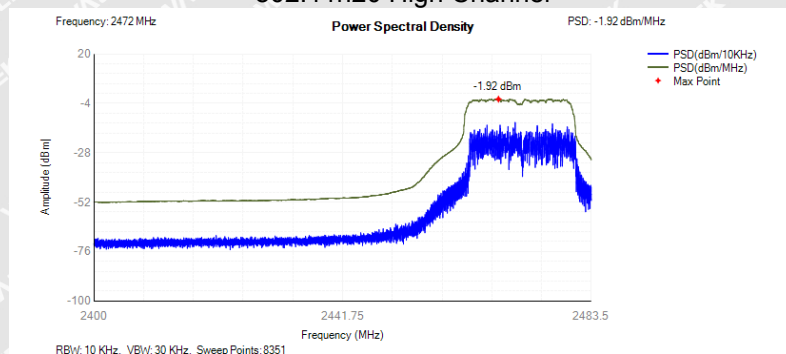


802.11n20 Middle Channel





802.11n20 High Channel



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8.3 Adaptivity (adaptive equipment using modulations other than FHSS)

8.3.1 Adaptivity Definition

Non-LBT based Detect and Avoid is a mechanism for equipment using wide band modulations other than FHSS and by which a given channel is made 'unavailable' because an interfering signal was reported after the transmission in that channel. This mechanism shall operate as intended in the presence of an unwanted signal on frequencies other than those of the operating band.

LBT based Detect and Avoid is a mechanism by which equipment using wide band modulations other than FHSS, avoids transmissions in a channel in the presence of an interfering signal in that channel. This mechanism shall operate as intended in the presence of an unwanted signal on frequencies other than those of the operating band.

Short Control Signalling Transmissions are transmissions used by adaptive equipment to send control signals (e.g. ACK/NACK signals, etc.) without sensing the operating channel for the presence of other signals.

Adaptive equipment may or may not have Short Control Signalling Transmissions.

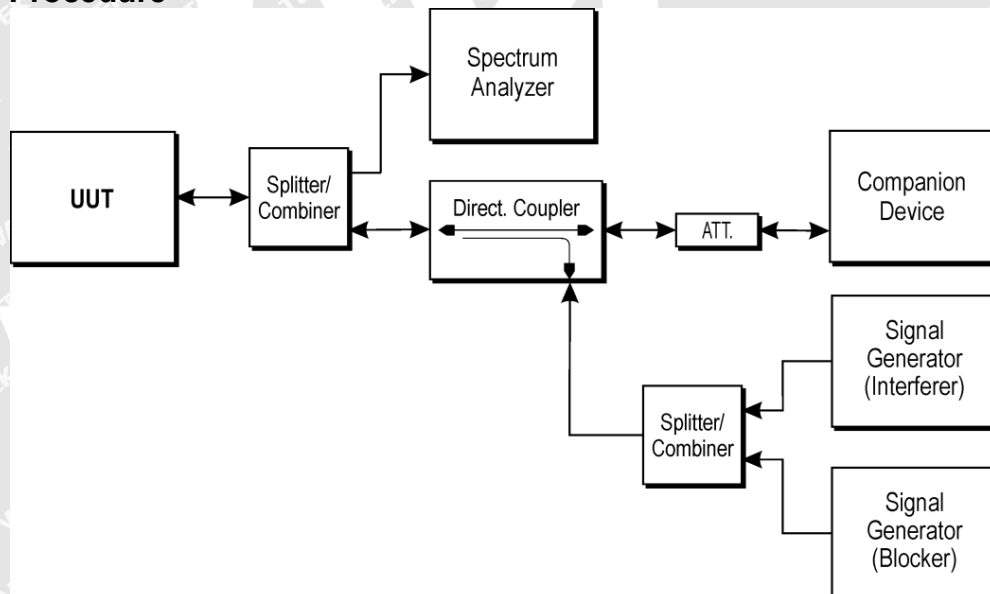
8.3.2 Adaptivity Limit

Refer to section 4.3.2.6.2.2 and 4.3.2.6.3.2 and 4.3.2.6.4.2 of ETSI EN 300 328 V2.1.1

8.3.3 EUT Operation Condition

The EUT was programmed to be in transmitting on mode.

8.3.4 Test Procedure



8.3.5 Measurement Record

N/A



8.4 Occupied Channel Bandwidth

8.4.1 Definition

The Occupied Channel Bandwidth is the bandwidth that contains 99 % of the power of the signal.

8.4.2 Limit

The Occupied Channel Bandwidth shall fall completely within the band given in clause 1.

In addition, for non-adaptive equipment using wide band modulations other than FHSS and with e.i.r.p greater than 10 dBm, the occupied channel bandwidth shall be less than 20 MHz...

8.4.3 EUT Operation Condition

The EUT was programmed to be in continuously transmitting mode.

8.4.4 Test Procedure

Step 1:

Connect the UUT to the spectrum analyser and use the following settings:

- Centre Frequency: The centre frequency of the channel under test
- Resolution BW: $\sim 1\%$ of the span without going below 1%
- Video BW: $3 \times \text{RBW}$
- Frequency Span: $2 \times \text{Nominal Channel Bandwidth}$
- Detector Mode: RMS
- Trace Mode: Max Hold
- Sweep time: 1 s

Step 2:

Wait for the trace to stabilize.

Find the peak value of the trace and place the analyser marker on this peak.

Step 3:

Use the 99 % bandwidth function of the spectrum analyser to measure the Occupied Channel Bandwidth of the UUT.

This value shall be recorded.

NOTE: Make sure that the power envelope is sufficiently above the noise floor of the analyser to avoid the noise signals left and right from the power envelope being taken into account by this measurement.



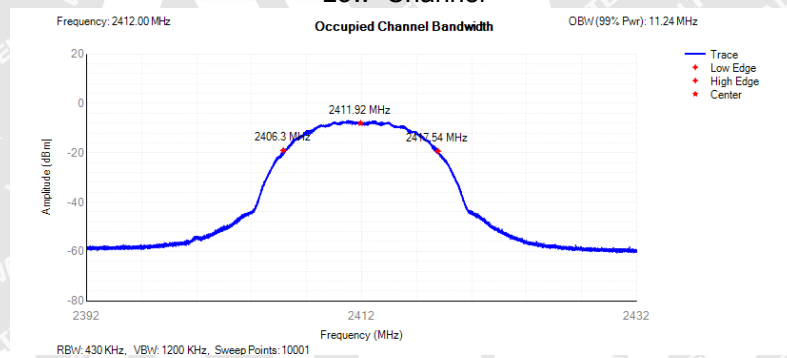
8.4.5 Measurement Record

| Modulation | Frequency (MHz) | Frequency Range (MHz) | | Occupied Channel (MHz) |
|------------|--------------------|--------------------------|---------|---------------------------|
| 802.11b | Low | 2406.30 | / | 11.24 |
| | High | / | 2477.54 | 11.25 |
| 802.11g | Low | 2403.65 | / | 16.62 |
| | High | / | 2480.28 | 16.63 |
| 802.11n20 | Low | 2403.04 | / | 17.78 |
| | High | / | 2480.82 | 17.79 |

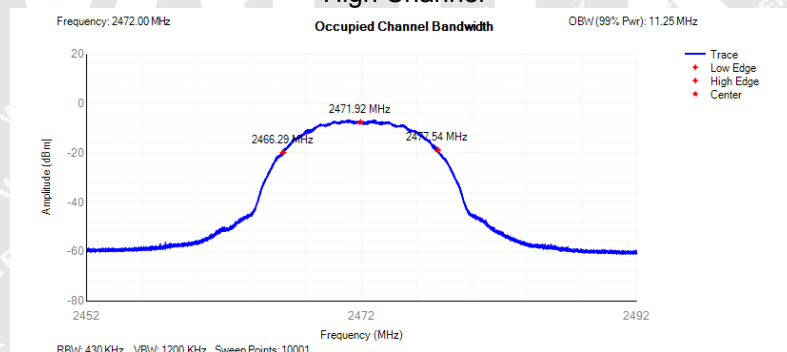
Test Plot

802.11b:

Low Channel



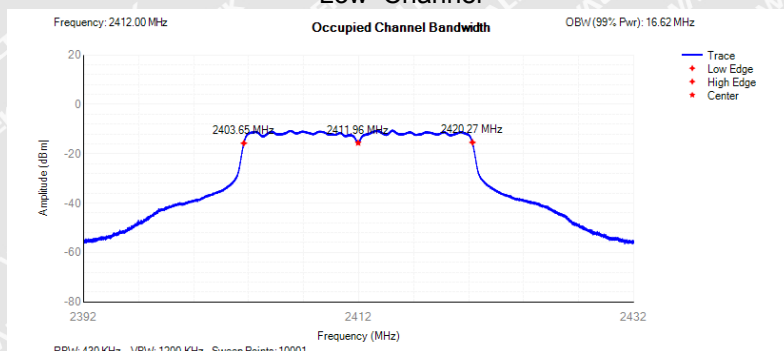
High Channel



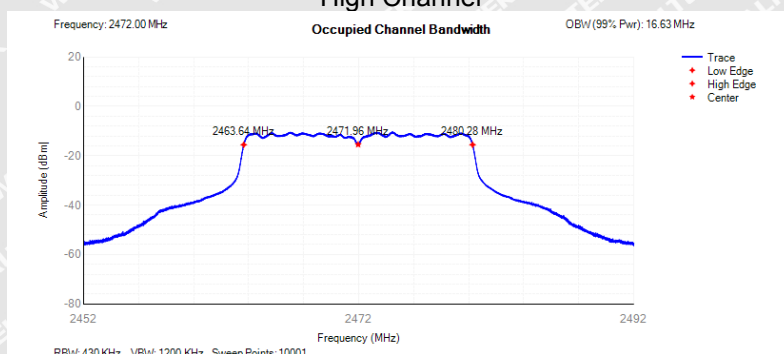
802.11g:



Low Channel

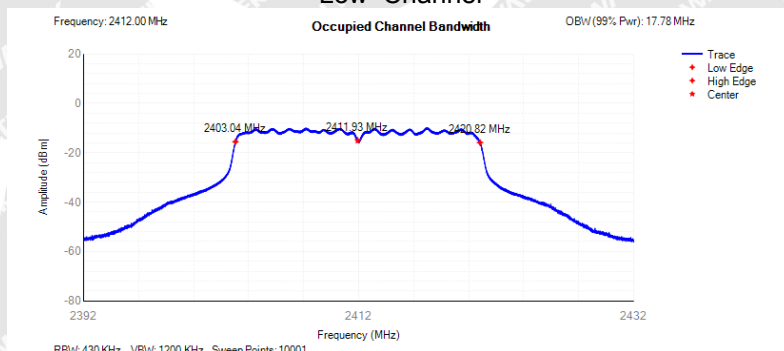


High Channel

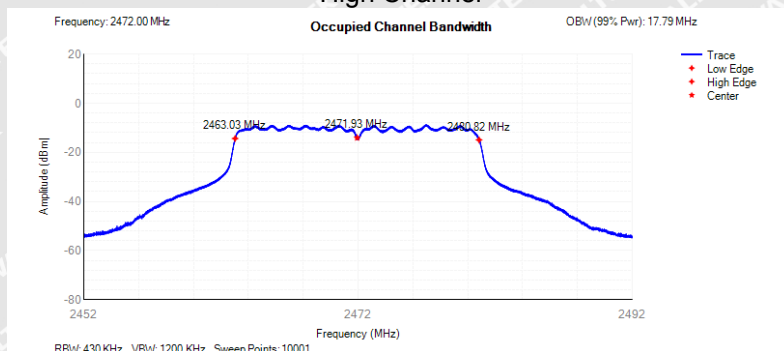


802.11n20:

Low Channel



High Channel





8.5 Transmitter unwanted emissions in the out-of-band domain

8.5.1 Definition

Transmitter unwanted emissions in the out-of-band domain are emissions when the equipment is in Transmit mode, on frequencies immediately outside the necessary bandwidth which results from the modulation process, but excluding spurious.

8.5.2 Limit

The transmitter unwanted emissions in the out-of-band domain but outside the allocated band, shall not exceed the values provided by the mask in figure 3.

NOTE: Within the 2 400 MHz to 2 483,5 MHz band, the Out-of-band emissions are fulfilled by compliance with the Occupied Channel Bandwidth requirement in clause 4.3.2.7.

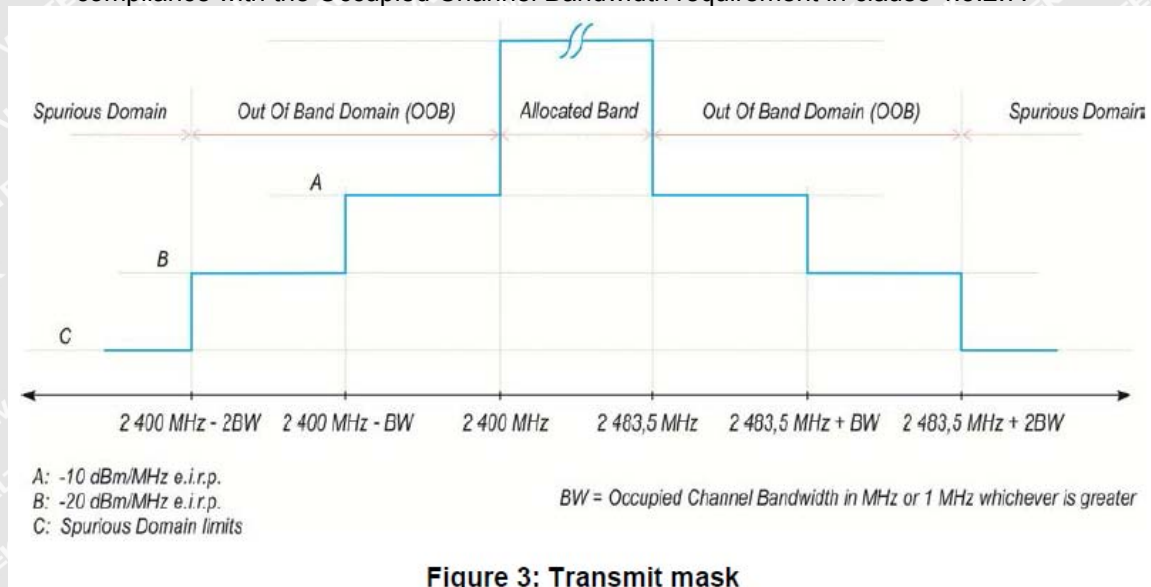


Figure 3: Transmit mask

8.5.3 EUT Operation Condition

The EUT was programmed to be in continuously transmitting mode.

8.5.4 Test Procedure

The applicable mask is defined by the measurement results from the tests performed under clause 5.3.8 (Occupied Channel Bandwidth).

The test procedure is further as described under clause 5.3.9.2.1.

The Out-of-band emissions within the different horizontal segments of the mask provided in figures 1 and 3 shall be measured using the steps below. This method assumes the spectrum analyser is equipped with the Time Domain Power option.

Step 1:

- Connect the UUT to the spectrum analyser and use the following settings:

- Centre Frequency: 2 484 MHz
- Span: 0 Hz
- Resolution BW: 1 MHz
- Filter mode: Channel filter
- Video BW: 3 MHz



- Detector Mode: RMS
- Trace Mode: Max Hold
- Sweep Mode: Continuous
- Sweep Points: Sweep Time [s] / (1 μ s) or 5 000 whichever is greater
- Trigger Mode: Video trigger

NOTE 1: In case video triggering is not possible, an external trigger source may be used.

- Sweep Time: > 120 % of the duration of the longest burst detected during the measurement of the RF Output Power

Step 2 (segment 2 483,5 MHz to 2 483,5 MHz + BW):

- Adjust the trigger level to select the transmissions with the highest power level.
- For frequency hopping equipment operating in a normal hopping mode, the different hops will result in signal bursts with different power levels. In this case the burst with the highest power level shall be selected.
- Set a window (start and stop lines) to match with the start and end of the burst and in which the RMS power shall be measured using the Time Domain Power function.
- Select RMS power to be measured within the selected window and note the result which is the RMS power within this 1 MHz segment (2 483,5 MHz to 2 484,5 MHz). Compare this value with the applicable limit provided by the mask.
- Increase the centre frequency in steps of 1 MHz and repeat this measurement for every 1 MHz segment within the range 2 483,5 MHz to 2 483,5 MHz + BW. The centre frequency of the last 1 MHz segment shall be set to 2 483,5 MHz + BW - 0,5 MHz (which means this may partly overlap with the previous 1 MHz segment).

Step 3 (segment 2 483,5 MHz + BW to 2 483,5 MHz + 2BW):

- Change the centre frequency of the analyser to 2 484 MHz + BW and perform the measurement for the first 1 MHz segment within range 2 483,5 MHz + BW to 2 483,5 MHz + 2BW. Increase the centre frequency in 1 MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2 483,5 MHz + 2 BW - 0,5 MHz (which means this may partly overlap with the previous 1 MHz segment).

Step 4 (segment 2 400 MHz - BW to 2 400 MHz):

- Change the centre frequency of the analyser to 2 399,5 MHz and perform the measurement for the first 1 MHz segment within range 2 400 MHz - BW to 2 400 MHz. Reduce the centre frequency in 1 MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2 400 MHz - BW + 0,5 MHz (which means this may partly overlap with the previous 1 MHz segment).

Step 5 (segment 2 400 MHz - 2BW to 2 400 MHz - BW):

- Change the centre frequency of the analyser to 2 399,5 MHz - BW and perform the measurement for the first 1 MHz segment within range 2 400 MHz - 2BW to 2 400 MHz - BW. Reduce the centre frequency in 1 MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2 400 MHz - 2BW + 0,5 MHz (which means this may partly overlap with the previous 1 MHz segment).

Step 6:

- In case of conducted measurements on equipment with a single transmit chain, the declared antenna assembly gain "G" in dBi shall be added to the results for each of the 1 MHz segments and compared with the limits

provided by the mask given in figure 1 or figure 3. If more than one antenna assembly is intended for this power setting, the antenna with the highest gain shall be considered.

- In case of conducted measurements on smart antenna systems (equipment with multiple transmit chains), the measurements need to be repeated for each of the active transmit chains. The declared antenna assembly gain "G" in dBi for a single antenna shall be added to these results. If



more than one antenna assembly is intended for this power setting, the antenna with the highest gain shall be considered. Comparison with the applicable limits shall be done using any of the options given below:

- Option 1: the results for each of the transmit chains for the corresponding 1 MHz segments shall be added. The additional beamforming gain "Y" in dB shall be added as well and the resulting values compared with the limits provided by the mask given in figure 1 or figure 3.

- Option 2: the limits provided by the mask given in figure 1 or figure 3 shall be reduced by $10 \times \log_{10}(A_{ch})$ and the additional beamforming gain "Y" in dB. The results for each of the transmit chains shall be individually compared with these reduced limits.

NOTE 2: A_{ch} refers to the number of active transmit chains.

It shall be recorded whether the equipment complies with the mask provided in figure 1 or figure 3.



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8.5.5 Measurement Record

Condition: Normal

| Mode | 802.11b Low channel | | Mode | 802.11b High channel | |
|-----------------|---------------------|-------------|-----------------|----------------------|-------------|
| Frequency (MHz) | Level (dBm) | Limit (dBm) | Frequency (MHz) | Level (dBm) | Limit (dBm) |
| 2399.50 | -48.92 | -10 | 2484.00 | -49.84 | -10 |
| 2398.50 | -50.22 | -10 | 2485.00 | -50.89 | -10 |
| 2397.50 | -50.64 | -10 | 2486.00 | -51.08 | -10 |
| 2396.50 | -51.04 | -10 | 2487.00 | -52.10 | -10 |
| 2395.50 | -51.41 | -10 | 2488.00 | -52.79 | -10 |
| 2394.50 | -51.94 | -10 | 2489.00 | -52.86 | -10 |
| 2393.50 | -51.65 | -10 | 2490.00 | -53.03 | -10 |
| 2392.50 | -51.75 | -10 | 2491.00 | -53.55 | -10 |
| 2391.50 | -51.42 | -10 | 2492.00 | -53.44 | -10 |
| 2390.50 | -52.13 | -10 | 2493.00 | -53.66 | -10 |
| 2389.50 | -51.84 | -10 | 2494.00 | -53.84 | -10 |
| 2389.26 | -51.94 | -10 | 2494.25 | -53.57 | -10 |
| 2388.26 | -51.94 | -10 | 2495.25 | -53.82 | -10 |
| 2387.26 | -51.63 | -10 | 2496.25 | -53.71 | -10 |
| 2386.26 | -51.85 | -10 | 2497.25 | -54.18 | -10 |
| 2385.26 | -51.75 | -20 | 2498.25 | -53.84 | -10 |
| 2384.26 | -51.56 | -20 | 2499.25 | -54.03 | -20 |
| 2383.26 | -51.71 | -20 | 2500.25 | -54.08 | -20 |
| 2382.26 | -51.84 | -20 | 2501.25 | -54.04 | -20 |
| 2381.26 | -51.68 | -20 | 2502.25 | -54.40 | -20 |
| 2380.26 | -51.66 | -20 | 2503.25 | -54.38 | -20 |
| 2379.26 | -51.62 | -20 | 2504.25 | -54.29 | -20 |
| 2378.26 | -51.55 | -20 | 2505.25 | -54.50 | -20 |
| 2378.02 | -51.66 | -20 | 2505.50 | -54.61 | -20 |
| 2399.50 | -48.92 | -20 | 2484.00 | -49.84 | -20 |
| 2398.50 | -50.22 | -20 | 2485.00 | -50.89 | -20 |
| 2397.50 | -50.64 | -20 | 2486.00 | -51.08 | -20 |
| 2396.50 | -51.04 | -20 | 2487.00 | -52.10 | -20 |
| 2395.50 | -51.41 | -20 | 2488.00 | -52.79 | -20 |
| 2394.50 | -51.94 | -20 | 2489.00 | -52.86 | -20 |



| Mode | 802.11g Low channel | | Mode | 802.11g High channel | |
|--------------------|---------------------|----------------|--------------------|----------------------|----------------|
| Frequency (MHz) | Level (dBm) | Limit (dBm) | Frequency (MHz) | Level (dBm) | Limit (dBm) |
| 2399.50 | -32.49 | -10 | 2484.00 | -31.30 | -10 |
| 2398.50 | -33.14 | -10 | 2485.00 | -32.67 | -10 |
| 2397.50 | -35.60 | -10 | 2486.00 | -35.11 | -10 |
| 2396.50 | -39.04 | -10 | 2487.00 | -38.27 | -10 |
| 2395.50 | -41.76 | -10 | 2488.00 | -41.00 | -10 |
| 2394.50 | -44.56 | -10 | 2489.00 | -44.15 | -10 |
| 2393.50 | -47.03 | -10 | 2490.00 | -46.42 | -10 |
| 2392.50 | -48.03 | -10 | 2491.00 | -47.12 | -10 |
| 2391.50 | -48.26 | -10 | 2492.00 | -48.63 | -10 |
| 2390.50 | -49.75 | -10 | 2493.00 | -49.60 | -10 |
| 2389.50 | -51.11 | -10 | 2494.00 | -50.99 | -10 |
| 2388.50 | -50.79 | -10 | 2495.00 | -50.69 | -10 |
| 2387.50 | -51.58 | -10 | 2496.00 | -52.33 | -10 |
| 2386.50 | -51.55 | -10 | 2497.00 | -52.80 | -10 |
| 2385.50 | -51.84 | -10 | 2498.00 | -52.44 | -10 |
| 2384.50 | -51.65 | -10 | 2499.00 | -51.71 | -10 |
| 2383.88 | -50.85 | -10 | 2499.63 | -52.94 | -10 |
| 2382.88 | -51.48 | -20 | 2500.63 | -53.44 | -20 |
| 2381.88 | -51.69 | -20 | 2501.63 | -52.85 | -20 |
| 2380.88 | -51.89 | -20 | 2502.63 | -52.83 | -20 |
| 2379.88 | -51.41 | -20 | 2503.63 | -53.11 | -20 |
| 2378.88 | -51.25 | -20 | 2504.63 | -52.83 | -20 |
| 2377.88 | -52.52 | -20 | 2505.63 | -52.73 | -20 |
| 2376.88 | -52.01 | -20 | 2506.63 | -53.52 | -20 |
| 2375.88 | -52.57 | -20 | 2507.63 | -54.66 | -20 |
| 2374.88 | -51.57 | -20 | 2508.63 | -53.57 | -20 |
| 2373.88 | -52.55 | -20 | 2509.63 | -54.44 | -20 |
| 2372.88 | -53.46 | -20 | 2510.63 | -54.68 | -20 |
| 2371.88 | -51.90 | -20 | 2511.63 | -54.04 | -20 |
| 2370.88 | -53.35 | -20 | 2512.63 | -54.46 | -20 |
| 2369.88 | -52.14 | -20 | 2513.63 | -54.37 | -20 |
| 2368.88 | -53.20 | -20 | 2514.63 | -54.89 | -20 |
| 2367.88 | -52.25 | -20 | 2515.63 | -54.41 | -20 |
| 2367.26 | -52.86 | -20 | 2516.26 | -54.39 | -20 |

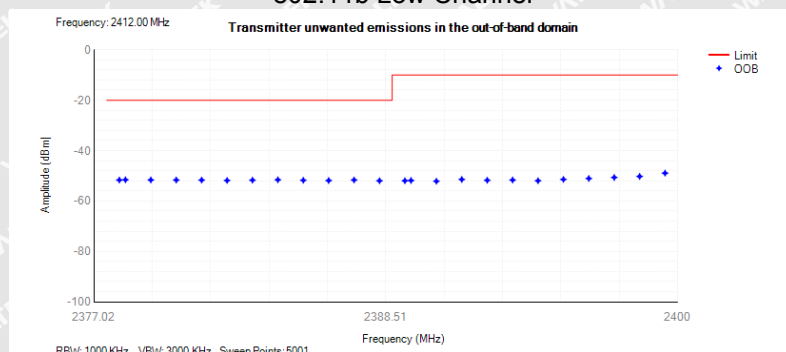


| Mode | 802.11n20 Low channel | | Mode | 802.11n20 High channel | |
|--------------------|-----------------------|----------------|--------------------|------------------------|----------------|
| Frequency (MHz) | Level (dBm) | Limit (dBm) | Frequency (MHz) | Level (dBm) | Limit (dBm) |
| 2399.50 | -30.46 | -10 | 2484.00 | -29.34 | -10 |
| 2398.50 | -32.15 | -10 | 2485.00 | -31.21 | -10 |
| 2397.50 | -35.11 | -10 | 2486.00 | -33.71 | -10 |
| 2396.50 | -38.49 | -10 | 2487.00 | -36.74 | -10 |
| 2395.50 | -41.40 | -10 | 2488.00 | -40.05 | -10 |
| 2394.50 | -44.56 | -10 | 2489.00 | -43.23 | -10 |
| 2393.50 | -46.15 | -10 | 2490.00 | -44.51 | -10 |
| 2392.50 | -47.38 | -10 | 2491.00 | -46.38 | -10 |
| 2391.50 | -48.43 | -10 | 2492.00 | -47.42 | -10 |
| 2390.50 | -49.02 | -10 | 2493.00 | -47.37 | -10 |
| 2389.50 | -49.51 | -10 | 2494.00 | -48.70 | -10 |
| 2388.50 | -49.63 | -10 | 2495.00 | -49.24 | -10 |
| 2387.50 | -50.54 | -10 | 2496.00 | -49.56 | -10 |
| 2386.50 | -50.56 | -10 | 2497.00 | -50.10 | -10 |
| 2385.50 | -50.93 | -10 | 2498.00 | -50.44 | -10 |
| 2384.50 | -50.81 | -10 | 2499.00 | -50.53 | -10 |
| 2383.50 | -50.96 | -10 | 2500.00 | -50.71 | -10 |
| 2382.72 | -51.21 | -10 | 2500.79 | -50.84 | -10 |
| 2381.72 | -51.58 | -20 | 2501.79 | -51.03 | -20 |
| 2380.72 | -50.94 | -20 | 2502.79 | -52.02 | -20 |
| 2379.72 | -50.93 | -20 | 2503.79 | -51.35 | -20 |
| 2378.72 | -51.54 | -20 | 2504.79 | -51.98 | -20 |
| 2377.72 | -51.91 | -20 | 2505.79 | -51.99 | -20 |
| 2376.72 | -50.95 | -20 | 2506.79 | -52.25 | -20 |
| 2375.72 | -51.66 | -20 | 2507.79 | -52.34 | -20 |
| 2374.72 | -51.80 | -20 | 2508.79 | -52.37 | -20 |
| 2373.72 | -52.22 | -20 | 2509.79 | -52.53 | -20 |
| 2372.72 | -51.91 | -20 | 2510.79 | -52.44 | -20 |
| 2371.72 | -52.58 | -20 | 2511.79 | -52.90 | -20 |
| 2370.72 | -52.31 | -20 | 2512.79 | -53.10 | -20 |
| 2369.72 | -51.94 | -20 | 2513.79 | -53.06 | -20 |
| 2368.72 | -52.83 | -20 | 2514.79 | -52.91 | -20 |
| 2367.72 | -52.77 | -20 | 2515.79 | -53.56 | -20 |
| 2366.72 | -52.47 | -20 | 2516.79 | -53.30 | -20 |
| 2365.72 | -52.45 | -20 | 2517.79 | -53.42 | -20 |
| 2364.94 | -52.56 | -20 | 2518.58 | -53.00 | -20 |

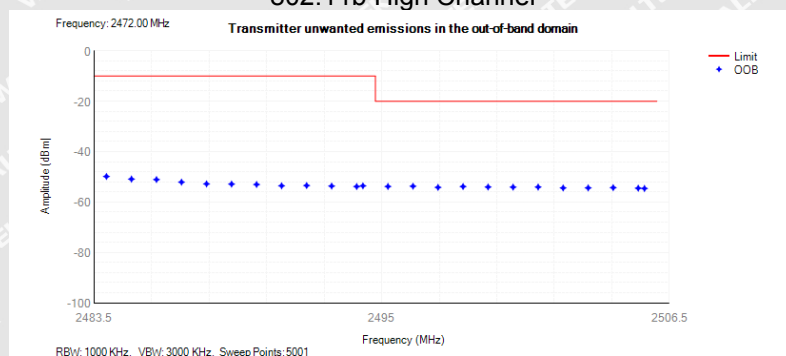


Test Plots

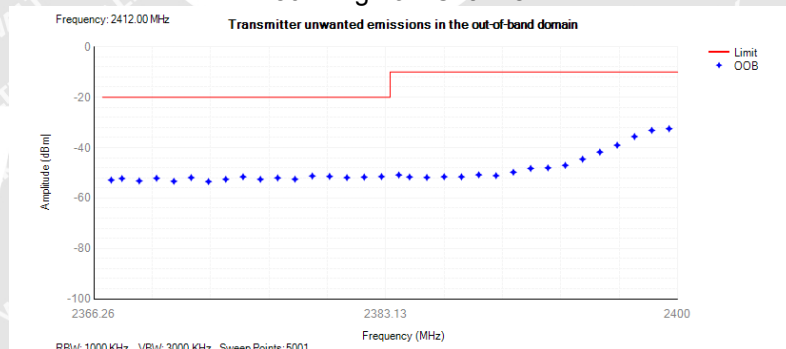
802.11b Low Channel



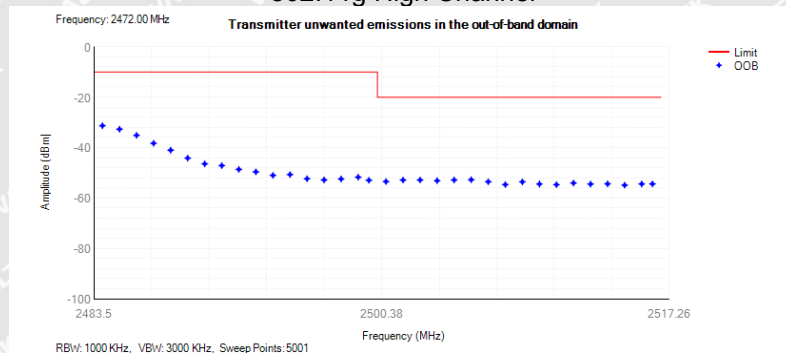
802.11b High Channel



802.11g Low Channel

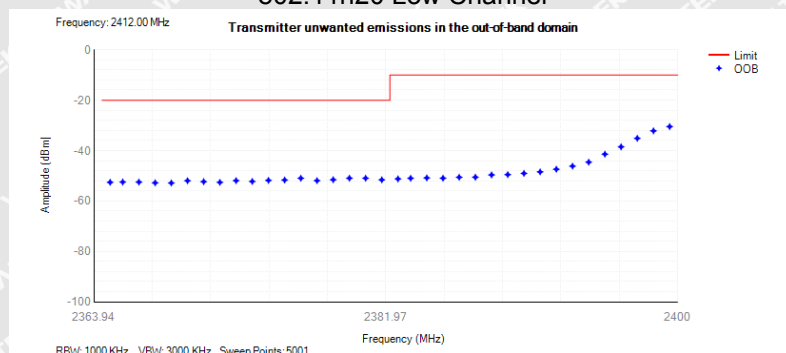


802.11g High Channel

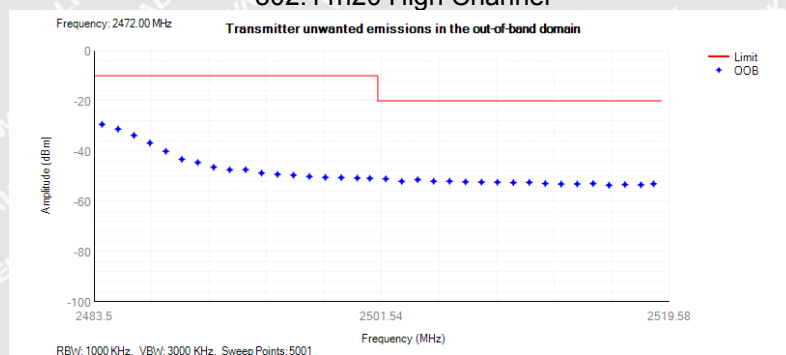




802.11n20 Low Channel



802.11n20 High Channel



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8.6 Transmitter unwanted emissions in the spurious domain

8.6.1 Definition

Transmitter unwanted emissions in the spurious domain are emissions outside the allocated band and outside the out-of-band domain as indicated in figure 1 when the equipment is in Transmit mode.

8.6.2 Limit

The transmitter unwanted emissions in the spurious domain shall not exceed the values given in table 12.

In case of equipment with antenna connectors, these limits apply to emissions at the antenna port (conducted). For emissions radiated by the cabinet or emissions radiated by integral antenna equipment (without antenna connectors), these limits are e.r.p. for emissions up to 1 GHz and as e.i.r.p. for emissions above 1 GHz.

Table 12: Transmitter limits for spurious emissions

| Frequency range | Maximum power, e.r.p. (≤ 1 GHz) e.i.r.p. (> 1 GHz) | Bandwidth |
|---------------------|--|-----------|
| 30 MHz to 47 MHz | -36 dBm | 100 kHz |
| 47 MHz to 74 MHz | -54 dBm | 100 kHz |
| 74 MHz to 87.5 MHz | -36 dBm | 100 kHz |
| 87.5 MHz to 118 MHz | -54 dBm | 100 kHz |
| 118 MHz to 174 MHz | -36 dBm | 100 kHz |
| 174 MHz to 230 MHz | -54 dBm | 100 kHz |
| 230 MHz to 470 MHz | -36 dBm | 100 kHz |
| 470 MHz to 862 MHz | -54 dBm | 100 kHz |
| 862 MHz to 1 GHz | -36 dBm | 100 kHz |
| 1 GHz to 12.75 GHz | -30 dBm | 1 MHz |

8.6.3 EUT Operation Condition

The EUT was programmed to be in continuously transmitting mode.

8.6.4 Test Procedure

The test site as described in annex B and applicable measurement procedures as described in annex C shall be used.

The test procedure is further as described under clause 5.4.9.2.1



8.6.5 Measurement Record

| Frequency | Receiver Reading | Turn table Angle | RX Antenna | | Substituted | | | Absolute Level | Result | |
|----------------------|------------------|------------------|------------|-------|-------------|-------|--------------|----------------|--------|--------|
| | | | Height | Polar | SG Level | Cable | Antenna Gain | | Limit | Margin |
| (MHz) | (dBμV) | Degree | (m) | (H/V) | (dBm) | (dB) | (dB) | (dBm) | (dBm) | (dB) |
| 802.11b low channel | | | | | | | | | | |
| 524.37 | 35.93 | 149 | 1.8 | H | -61.42 | 0.16 | 0.00 | -61.58 | -54 | -7.58 |
| 524.37 | 33.97 | 15 | 1.9 | V | -64.53 | 0.16 | 0.00 | -64.69 | -54 | -10.69 |
| 4824.00 | 52.17 | 349 | 1.8 | H | -57.29 | 2.64 | 12.70 | -47.23 | -30 | -17.23 |
| 4824.00 | 49.02 | 135 | 1.4 | V | -59.17 | 2.64 | 12.70 | -49.11 | -30 | -19.11 |
| 7236.00 | 47.25 | 159 | 1.5 | H | -60.39 | 3.22 | 11.70 | -51.91 | -30 | -21.91 |
| 7236.00 | 45.42 | 117 | 1.8 | V | -62.10 | 3.22 | 11.70 | -53.62 | -30 | -23.62 |
| 802.11b High channel | | | | | | | | | | |
| 524.37 | 35.29 | 119 | 1.1 | H | -62.06 | 0.16 | 0.00 | -62.22 | -54 | -8.22 |
| 524.37 | 33.34 | 272 | 1.9 | V | -65.16 | 0.16 | 0.00 | -65.32 | -54 | -11.32 |
| 4944.00 | 52.70 | 301 | 1.5 | H | -56.33 | 2.40 | 11.60 | -47.13 | -30 | -17.13 |
| 4944.00 | 47.54 | 329 | 1.3 | V | -61.02 | 2.40 | 11.60 | -51.82 | -30 | -21.82 |
| 7416.00 | 46.87 | 52 | 1.3 | H | -59.67 | 3.28 | 11.90 | -51.05 | -30 | -21.05 |
| 7416.00 | 45.00 | 164 | 1.3 | V | -61.71 | 3.28 | 11.90 | -53.09 | -30 | -23.09 |

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| Frequency | Receiver Reading | Turn table Angle | RX Antenna | | Substituted | | | Absolute Level | Result | |
|----------------------|------------------|------------------|------------|-------|-------------|-------|--------------|----------------|--------|--------|
| | | | Height | Polar | SG Level | Cable | Antenna Gain | | Limit | Margin |
| (MHz) | (dBμV) | Degree | (m) | (H/V) | (dBm) | (dB) | (dB) | (dBm) | (dBm) | (dB) |
| 802.11g low channel | | | | | | | | | | |
| 524.37 | 37.15 | 157 | 1.1 | H | -60.20 | 0.16 | 0.00 | -60.36 | -54 | -6.36 |
| 524.37 | 33.91 | 14 | 1.2 | V | -64.59 | 0.16 | 0.00 | -64.75 | -54 | -10.75 |
| 4824.00 | 51.05 | 8 | 1.6 | H | -58.41 | 2.64 | 12.70 | -48.35 | -30 | -18.35 |
| 4824.00 | 50.42 | 135 | 1.7 | V | -57.77 | 2.64 | 12.70 | -47.71 | -30 | -17.71 |
| 7236.00 | 46.28 | 275 | 1.8 | H | -61.36 | 3.22 | 11.70 | -52.88 | -30 | -22.88 |
| 7236.00 | 45.40 | 196 | 1.5 | V | -62.12 | 3.22 | 11.70 | -53.64 | -30 | -23.64 |
| 802.11g High channel | | | | | | | | | | |
| 524.37 | 36.65 | 159 | 2.0 | H | -60.70 | 0.16 | 0.00 | -60.86 | -54 | -6.86 |
| 524.37 | 34.17 | 192 | 1.6 | V | -64.33 | 0.16 | 0.00 | -64.49 | -54 | -10.49 |
| 4944.00 | 50.68 | 70 | 1.2 | H | -58.35 | 2.40 | 11.60 | -49.15 | -30 | -19.15 |
| 4944.00 | 49.97 | 328 | 1.7 | V | -58.59 | 2.40 | 11.60 | -49.39 | -30 | -19.39 |
| 7416.00 | 46.57 | 356 | 1.6 | H | -59.97 | 3.28 | 11.90 | -51.35 | -30 | -21.35 |
| 7416.00 | 44.57 | 59 | 1.1 | V | -62.14 | 3.28 | 11.90 | -53.52 | -30 | -23.52 |

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| Frequency | Receiver Reading | Turn table Angle | RX Antenna | | Substituted | | | Absolute Level | ETSI EN 300 328 | |
|------------------------|------------------|------------------|------------|-------|-------------|-------|--------------|----------------|-----------------|--------|
| | | | Height | Polar | SG Level | Cable | Antenna Gain | | Limit | Margin |
| (MHz) | (dBμV) | Degree | (m) | (H/V) | (dBm) | (dB) | (dB) | (dBm) | (dBm) | (dB) |
| 802.11n20 low channel | | | | | | | | | | |
| 524.37 | 35.90 | 225 | 1.5 | H | -61.45 | 0.16 | 0.00 | -61.61 | -54 | -7.61 |
| 524.37 | 33.81 | 283 | 1.4 | V | -64.69 | 0.16 | 0.00 | -64.85 | -54 | -10.85 |
| 4824.00 | 53.24 | 165 | 1.2 | H | -56.22 | 2.64 | 12.70 | -46.16 | -30 | -16.16 |
| 4824.00 | 49.03 | 3 | 1.5 | V | -59.16 | 2.64 | 12.70 | -49.10 | -30 | -19.10 |
| 7236.00 | 47.97 | 316 | 1.7 | H | -59.67 | 3.22 | 11.70 | -51.19 | -30 | -21.19 |
| 7236.00 | 44.79 | 340 | 1.6 | V | -62.73 | 3.22 | 11.70 | -54.25 | -30 | -24.25 |
| 802.11n20 High channel | | | | | | | | | | |
| 524.37 | 35.87 | 202 | 1.5 | H | -61.48 | 0.16 | 0.00 | -61.64 | -54 | -7.64 |
| 524.37 | 34.82 | 116 | 2.0 | V | -63.68 | 0.16 | 0.00 | -63.84 | -54 | -9.84 |
| 4944.00 | 51.67 | 138 | 1.8 | H | -57.36 | 2.40 | 11.60 | -48.16 | -30 | -18.16 |
| 4944.00 | 48.22 | 203 | 2.0 | V | -60.34 | 2.40 | 11.60 | -51.14 | -30 | -21.14 |
| 7416.00 | 46.93 | 145 | 1.1 | H | -59.61 | 3.28 | 11.90 | -50.99 | -30 | -20.99 |
| 7416.00 | 44.25 | 1 | 1.3 | V | -62.46 | 3.28 | 11.90 | -53.84 | -30 | -23.84 |

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8.7 Receiver spurious emissions

8.7.1 Definition

Receiver spurious emissions are emissions at any frequency when the equipment is in receive mode.

8.7.2 Limit

The spurious emissions of the receiver shall not exceed the values given in table 13. In case of equipment with antenna connectors, these limits apply to emissions at the antenna port (conducted). For emissions radiated by the cabinet or for emissions radiated by integral antenna equipment (without antenna connectors), these limits are e.r.p. for emissions up to 1 GHz and e.i.r.p. for emissions above 1 GHz.

Table 13: Spurious emission limits for receivers

| Frequency range | Maximum power e.r.p. (≤ 1 GHz) | Measurement bandwidth |
|--------------------|--------------------------------------|-----------------------|
| | e.i.r.p. (> 1 GHz) | |
| 30 MHz to 1 GHz | -57 dBm | 100 kHz |
| 1 GHz to 12.75 GHz | -47 dBm | 1 MHz |

8.7.3 EUT Operation Condition

The EUT was programmed to be in continuously transmitting mode.

8.7.4 Test Procedure

The test site as described in annex B and applicable measurement procedures as described in annex C shall be used.

The test procedure is further as described under clause 5.4.10.2.1.

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8.7.5 Measurement Record

| Frequency | Receiver Reading | Turn table Angle | RX Antenna | | Substituted | | | Absolute Level | Result | |
|----------------------|------------------|------------------|------------|-------|-------------|-------|--------------|----------------|--------|--------|
| | | | Height | Polar | SG Level | Cable | Antenna Gain | | Limit | Margin |
| (MHz) | (dBμV) | Degree | (m) | (H/V) | (dBm) | (dB) | (dB) | (dBm) | (dBm) | (dB) |
| 802.11b low channel | | | | | | | | | | |
| 288.66 | 43.29 | 171 | 1.9 | H | -64.10 | 0.16 | 0.00 | -64.26 | -57 | -7.26 |
| 288.66 | 40.04 | 105 | 1.8 | V | -65.39 | 0.16 | 0.00 | -65.55 | -57 | -8.55 |
| 1174.26 | 45.95 | 239 | 1.1 | H | -63.51 | 2.15 | 7.50 | -58.16 | -47 | -11.16 |
| 1174.26 | 45.36 | 269 | 1.6 | V | -62.83 | 2.15 | 7.50 | -57.48 | -47 | -10.48 |
| 802.11b High channel | | | | | | | | | | |
| 288.66 | 42.50 | 357 | 1.1 | H | -64.89 | 0.16 | 0.00 | -65.05 | -57 | -8.05 |
| 288.66 | 38.83 | 273 | 1.6 | V | -66.60 | 0.16 | 0.00 | -66.76 | -57 | -9.76 |
| 1174.26 | 47.03 | 350 | 1.5 | H | -62.43 | 2.15 | 7.50 | -57.08 | -47 | -10.08 |
| 1174.26 | 44.19 | 47 | 1.5 | V | -64.00 | 2.15 | 7.50 | -58.65 | -47 | -11.65 |

Remark: only the worst case 802.11b mode is recorded.

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8.8 Receiver Blocking

8.8.1 Receiver Blocking Definition

Receiver blocking is a measure of the ability of the equipment to receive a wanted signal on its operating channel without exceeding a given degradation in the presence of an unwanted signal (blocking signal) on frequencies other than those of the operating band provided in table 1.

8.8.2 Receiver Blocking Limit

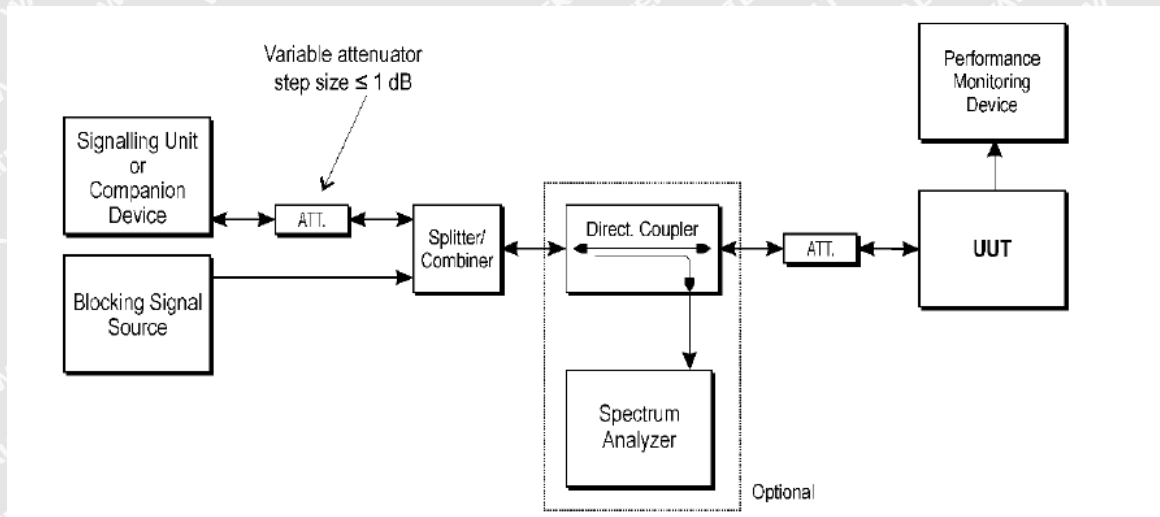
Refer to section 4.3.1.7.3.2 of EN 300 328 V2.1.1.

8.8.3 EUT Operation Condition

These measurements shall only be performed at normal test conditions.

The EUT was programmed to be in hopping on mode.

8.8.4 Test Procedure





8.8.5 Measurement Record

P_{\min} : -84dBm

Receiver category: 2

| 802.11b | Wanted Signal mean Power(dBm) | Blocking Frequency(MHz) | Blocking Power(dB) | Performance Criteria |
|--------------|-------------------------------------|----------------------------|-----------------------|-------------------------|
| Low channel | $P_{\min} + 6\text{dB}$ | 2380 | -57 | Compliance |
| Low channel | $P_{\min} + 6\text{dB}$ | 2503.5 | -57 | Compliance |
| Low channel | $P_{\min} + 6\text{dB}$ | 2300 | -47 | Compliance |
| Low channel | $P_{\min} + 6\text{dB}$ | 2583.5 | -47 | Compliance |
| High channel | $P_{\min} + 6\text{dB}$ | 2380 | -57 | Compliance |
| High channel | $P_{\min} + 6\text{dB}$ | 2503.5 | -57 | Compliance |
| High channel | $P_{\min} + 6\text{dB}$ | 2300 | -47 | Compliance |
| High channel | $P_{\min} + 6\text{dB}$ | 2583.5 | -47 | Compliance |

| 802.11g | Wanted Signal mean Power(dBm) | Blocking Frequency(MHz) | Blocking Power(dB) | Performance Criteria |
|--------------|-------------------------------------|----------------------------|-----------------------|-------------------------|
| Low channel | $P_{\min} + 6\text{dB}$ | 2380 | -57 | Compliance |
| Low channel | $P_{\min} + 6\text{dB}$ | 2503.5 | -57 | Compliance |
| Low channel | $P_{\min} + 6\text{dB}$ | 2300 | -47 | Compliance |
| Low channel | $P_{\min} + 6\text{dB}$ | 2583.5 | -47 | Compliance |
| High channel | $P_{\min} + 6\text{dB}$ | 2380 | -57 | Compliance |
| High channel | $P_{\min} + 6\text{dB}$ | 2503.5 | -57 | Compliance |
| High channel | $P_{\min} + 6\text{dB}$ | 2300 | -47 | Compliance |
| High channel | $P_{\min} + 6\text{dB}$ | 2583.5 | -47 | Compliance |



| 802.11n HT20 | Wanted Signal mean Power(dBm) | Blocking Frequency(MHz) | Blocking Power(dB) | Performance Criteria |
|--------------|-------------------------------------|----------------------------|-----------------------|-------------------------|
| Low channel | Pmin + 6dB | 2380 | -57 | Compliance |
| Low channel | Pmin + 6dB | 2503.5 | -57 | Compliance |
| Low channel | Pmin + 6dB | 2300 | -47 | Compliance |
| Low channel | Pmin + 6dB | 2583.5 | -47 | Compliance |
| High channel | Pmin + 6dB | 2380 | -57 | Compliance |
| High channel | Pmin + 6dB | 2503.5 | -57 | Compliance |
| High channel | Pmin + 6dB | 2300 | -47 | Compliance |
| High channel | Pmin + 6dB | 2583.5 | -47 | Compliance |



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9 Health Requirements

9.1 Limits

According to Council Recommendation: the criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation.

Reference levels for electric, magnetic and electromagnetic fields (0Hz to 300GHz, unperturbed RMS values)

| Frequency range | E-field strength (V/m) | H-field strength (A/m) | B-field (μT) | Equivalent plane wave power density Seq (W/m2) |
|-----------------|------------------------|-------------------------|-----------------------|--|
| 0-1 Hz | - | 3.2×10^4 | 4×10^4 | - |
| 1-8 Hz | 10000 | $3.2 \times 10^4 / f^2$ | $4 \times 10^4 / f^2$ | - |
| 8-25 Hz | 10000 | $4000 / f$ | $5000 / f$ | - |
| 0.025-0.8 kHz | $250 / f$ | $4 / f$ | $5 / f$ | - |
| 0.8-3 kHz | $250 / f$ | 5 | 6.25 | - |
| 3-150 kHz | 87 | 5 | 6.25 | - |
| 0.15-1 MHz | 87 | $0.73 / f$ | $0.92 / f$ | - |
| 1-10 MHz | $87 / f^{1/2}$ | $0.73 / f$ | $0.92 / f$ | - |
| 10-400 MHz | 28 | 0.073 | 0.095 | 2 |
| 400-2000 MHz | $1.375 f^{1/2}$ | $0.0037 f^{1/2}$ | $0.0046 f^{1/2}$ | $f / 200$ |
| 2-300 GHz | 61 | 0.16 | 0.2 | 10 |

Note:

1. f as indicated in the frequency range column.
2. For frequencies between 100 kHz and 10 GHz, Seq, E^2 , H^2 and B^2 are to be averaged over any six-minute period.
3. For frequencies exceeding 10 GHz, Seq, E^2 , H^2 and B^2 are to be averaged over any $68 / f^{1.05}$ minute period (f in GHz).



9.2 RF Exposure Evaluations

From Council Recommendation 1999/519/EC table 2, the maximum power density is 10 W/m².

Power density (S) is calculated by the following formula:

$$S = PG * \text{Duty factor} / 4\pi R^2$$

P = Peak Power Input to antenna (Watts)

G = Antenna Gain (numeric)

R = distance to the center of radiation of antenna (in meter) = 0.20 m

Note:

1) $P \text{ (Watts)} = (10^{(dBm/10)})/1000$

2) $G \text{ (Antenna gain in numeric)} = 10^{(\text{Antenna gain in dBi}/10)}$

3) Duty factor = 1.0

4) $\pi = 3.142$

9.3 Test Result of RF Exposure Evaluation

| Antenna Gain (dBi) | Antenna Gain (numeric) | Max. Output Power (dBm) | Max. Output Power (W) | Duty factor | Calculated RF Exposure (W/ m ²) | Limit (W/ m ²) |
|--------------------|------------------------|-------------------------|-----------------------|-------------|---|----------------------------|
| 0.00 | 1.000 | 9.87 | 0.010 | 1.00 | 0.0193 | 10 |

Compliance.

=====End of Report=====

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