TEST REPORT
ETSI EN 300 328 V2.2.0: 2017-11

Report Reference No.....:	**HTT190102090E-2**
Compiled by (position+printed name+signature)..:	**Jack Chen** Jack Chen
Supervised by (position+printed name+signature)..:	**Owen Hu** Owen Hu
Approved by (position+printed name+signature)..:	**Kevin Yang** Kevin Yang
Date of issue.....:	**Jan.11,2019**
Testing Laboratory Name .....:	**Shenzhen HTT Technology Co., Ltd.**
Address .....:	**7F,A Building,Smart valley Science and technology innovation Park,Xixiang,Baoan District,Shenzhen,Guangdong,China**
Applicant's name.....:	**VISSONIC Electronics Limited**
Address .....:	**Room 305,Building No. 9 KeJi St.,Lanyusi St.,Kaifa Rd.,Economic development Zone,Huangpu district,Guangzhou,China**
Test specification	
Standard .....:	**ETSI EN 300 328 V2.2.0: 2017-11**
Test item description .....:	Full Digital DSP Wireless Conference System
Trade Mark .....:	VISSONIC
Manufacturer .....:	VISSONIC Electronics Limited Room 305,Building No. 9 KeJi St.,Lanyusi St.,Kaifa Rd.,Economic development Zone,Huangpu district,Guangzhou,China
Model/Type reference.....:	VIS-DCP2000-W
List Model .....:	VIS-WDC-T, VIS-WDD-T, VIS-WVC-T, VIS-WVD-T, VIS-WSC-T, VIS-WSD-T, VIS-WVCIC-T, VIS-WVDIC-T, VIS-WDC-TD, VIS-WDD-TD, VIS-WVC-TD, VIS-WVD-TD, VIS-WVCIC-TD, VIS-WVDIC-TD,VIS-AP4C, VIS-WCH1,VIS-WBTY1
Operation Frequency.....:	From 2412MHz to 2472MHz
Ratings .....:	Input: 110/220V~ 50/60Hz, 3A,150W Output: 48Vdc, 3.125A
Result.....:	**PASS**

TEST REPORT

Test Report No. :	HTT190102090E-2	Jan.11,2019 Date of issue

Equipment under Test	:	Full Digital DSP Wireless Conference System
Model Name	:	VIS-DCP2000-W
Serial Model	:	VIS-WDC-T, VIS-WDD-T, VIS-WVC-T, VIS-WVD-T, VIS-WSC-T, VIS-WSD-T, VIS-WVCIC-T, VIS-WVDIC-T, VIS-WDC-TD, VIS-WDD-TD, VIS-WVC-TD, VIS-WVD-TD, VIS-WVCIC-TD, VIS-WVDIC-TD,VIS-AP4C, VIS-WCH1, VIS-WBTY1
Trade Mark		VISSONIC
Applicant	:	VISSONIC Electronics Limited
Address	:	Room 305,Building No. 9 KeJi St.,Lanyusi St.,Kaifa Rd., Economic development Zone,Huangpu district, Guangzhou,China
Manufacturer	:	VISSONIC Electronics Limited
Address	:	Room 305,Building No. 9 KeJi St.,Lanyusi St.,Kaifa Rd., Economic development Zone,Huangpu district, Guangzhou,China

Test Result:	**PASS**

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Contents

1. TEST STANDARDS

The tests were performed according to following standards:

ETSI EN 300 328 V2.2.0(2017-11)–Electromagnetic compatibility and Radio spectrum Matters(ERM); Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using wide band modulation techniques; Harmonized EN covering the essential requirements of article 3.2 of the RED Directive

2. SUMMARY

2.1. General Remarks

Date of receipt of test sample	:	Jan.07,2019
Testing commenced on	:	Jan.07,2019
Testing concluded on	:	Jan.11,2019

2.2. Product Description

Product Name:	Full Digital DSP Wireless Conference System
Model:	VIS-DCP2000-W
Serial Model:	VIS-WDC-T, VIS-WDD-T, VIS-WVC-T, VIS-WVD-T, VIS-WSC-T, VIS-WSD-T, VIS-WVCIC-T, VIS-WVDIC-T, VIS-WDC-TD, VIS-WDD-TD, VIS-WVC-TD, VIS-WVD-TD, VIS-WVCIC-TD, VIS-WVDIC-TD,VIS-AP4C, VIS-WCH1,VIS-WBTY1
Model Difference:	All the model are the same circuit and RF module, except the model name and colour.
Trade Mark:	VISSONIC
Power:	Input: 110/220V~ 50/60Hz, 3A,150W Output: 48Vdc, 3.125A
WLAN	Supported 802.11b/802.11g/802.11n HT20/802.11n HT40
WLAN CE Operation frequency	IEEE 802.11b:2412-2472MHz IEEE 802.11g:2412-2472MHz IEEE 802.11n HT20:2412-2472MHz IEEE 802.11n HT40:2422-2462MHz
WLAN CE Modulation Type	IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20: OFDM (64QAM, 16QAM, QPSK,BPSK) IEEE 802.11n HT40: OFDM (64QAM, 16QAM, QPSK,BPSK)

2.3. Equipment Under Test

Power supply system utilised

Power supply voltage	:	●	230V / 50 Hz	○	120V / 60Hz
		○	12 V DC	○	24 V DC
		○	Other : /		

Description of the test mode

IEEE 802.11b/g/n: Thirteen channels are provided to the EUT.

Channel	Frequency(MHz)	Channel	Frequency(MHz)
01	2412	08	2447
02	2417	09	2452
03	2422	10	2457
04	2427	11	2462
05	2432	12	2467
06	2437	13	2472
07	2442		

Test Frequency List

Modulation Type	Test Frequency					
	Lowest		Middle		Highest	
	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
802.11b	01	2412	07	2442	13	2472
802.11g	01	2412	07	2442	13	2472
802.11n HT20	01	2412	07	2442	13	2472
802.11n HT40	03	2422	07	2442	11	2462

2.4. Description of the Equipment under Test (EUT)

Reference documents:	802.11™ WLAN	
Special test descriptions:	None	
Configuration descriptions:	TX tests: performed at the lowest, the middle, and the highest channel	
	RX/Standby tests: WLAN test mode enabled, scan enabled, TX Idle	
Test mode:	☒ Special software is used. EUT is transmitting pseudo random data by itself	
802.11™ WLAN standard capabilities:	channel numbers:	☒ 802.11b:13; ☒ 802.11g:13; ☒ 802.11n HT20:13; ☒ 802.11n HT40:11
	channel separation:	5MHz
	used freq. range:	☒2412-2472MHz; ☒2422-2462MHz
	modulation types:	DSSS,OFDM
	Used Bandwidth:	☒20MHz; ☒40MHz

2.5. EUT Classification:

Type of equipment:	☒	stand alone equipment	
	☐	plug in radio equipment	
	☐	combined equipment	
Modulation types:	☒	Wide Band Modulation (None Hopping – e.g. DSSS, OFDM)	
	☐	Frequency Hopping Spread Spectrum (FHSS)	
Adaptive equipment:	☒	Yes, LBT-based	☐ Frame Based Equipment
			☒Load Based Equipment
	☐	Yes, non-LBT-based	
	☐	Yes (but can be disabled)	
	☐	No	
	☒	q value	32
	☐	COT value	
	☒	CCA value	20μs
Antennas and	☒	Operating mode 1 (single antenna)	

transmit operating modes:		Equipment with 1 antenna, Equipment with 2 diversity antennas operating in switched diversity mode by which at any moment in time only 1 antenna is used, Smart antenna system with 2 or more transmit/receive chains, but operating in a mode where only 1 transmit/receive chain is used)
	☐	Operating mode 2 (multiple antennas, no beamforming)
		Equipment operating in this mode contains a smart antenna system using two or more transmit/receive chains simultaneously but without beamforming.
	☐	Operating mode 3 (multiple antennas, with beamforming)
		Equipment operating in this mode contains a smart antenna system using two or more transmit/receive chains simultaneously with beamforming. In addition to the antenna assembly gain (G), the beamforming gain (Y) may have to be taken into account when performing the measurements.

2.6. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

● - supplied by the manufacturer

○ - supplied by the lab

○	/	M/N:	/
		Manufacturer:	/

2.7. Modifications

No modifications were implemented to meet testing criteria.

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

Shenzhen HTT Technology Co., Ltd..
7F,A Building,Smart valley Science and technology innovation Park,Xixiang,
Baoan District,Shenzhen,Guangdong,China

3.2. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Normal Temperature: 25 °C
High Temperature: 55 °C
Low Temperature: -20 °C
Normal Voltage : DC 230V
High Voltage:DC 253V
Low Voltage:DC 207V
Relative Humidity: 55 %
Air Pressure: 989 hPa

3.3. Test setting of system:

Setting	Value
Modulation	other
Adaptive	Yes
Number Of Transmission Chains	1
Antenna Gain Port 1	0 dBi
Beamforming Gain	0 dB
Nominal Channel Bandwidth	20 MHz/40 MHz
Maximum EIRP	20 dBm
Attenuation / Pathloss File Port 1	DUT cable 12.75Ghz_10dB
Sourious Tx Receiver reference level below power	20 dB
power measurement for radiated	No
DUT Port Occupied Channel Bandwidth	1
LBT Based	Yes
Dual Mode	No
Short Signaling	Yes
Frame Based	No
Load Based	Yes
Adaptivity q Factor	32
CCA	20 us
DUT Port Adaptivity	1
Channel Occupation Time	15 ms

3.4. Test Description

3.4.1 Main Terms

Verdict Verdict of each test cases.
Test Case Test cases identification number and description in 3GPP test specification and ETSI specification.

3.4.2 Terms used in Condition column

NTC Normal voltage, Normal Temperature
HV High voltage, Normal Temperature
LV Low voltage, Normal Temperature
HT High Temperature, Normal voltage
LT Low Temperature, Normal voltage
HTHV High voltage, High Temperature
LTHV High voltage, Low Temperature
HTLV Low voltage, High Temperature

LTLV	Low voltage, Low Temperature
Vib	Vibration

3.4.3 Terms used in Verdict column

Pass	This test cases has been tested, and EUT is conformant to the applied standards in the given frequency band.
Fail	This test cases has been tested, but EUT is not conformant to the applied standards in the given frequency band.
N/A	This test case is either not required/not applicable in the specified band or is not applicable according to the specific PICS/PIXIT for the EUT.
Inc	Test case result is ambiguous in the given frequency band.
Decl	Declaration is received from the client to demonstrate the conformity to the relevant specification in the given frequency band.
BR	This test cases is not tested in the given frequency band, but this testcases was tested with pass result for the initial model in the given frequency band.

3.4.4 Sumarry of measurement results

☒ **No deviations from the technical specifications were ascertained**
☐ **There were deviations from the technical specifications ascertained**

Test Specification Clause	Test Case	Test Condition	Mode	Pass	Fail	N/A	NP	Remark
4.3.2.2	RF output power	NTC	802.11b 802.11g 802.11n HT20 802.11n HT40	☒	☐	☐	☐	
		LT		☒	☐	☐	☐	
		HT		☒	☐	☐	☐	
4.3.2.3	Power Spectral Density	NTC	802.11b 802.11g 802.11n HT20 802.11n HT40	☒	☐	☐	☐	
4.3.2.4	Duty Cycle, Tx-sequence, Tx-gap	NTC	802.11b 802.11g 802.11n HT20 802.11n HT40	☐	☐	☒	☐	
4.3.2.5	Medium Utilisation (MU) factor	NTC	802.11b 802.11g 802.11n HT20 802.11n HT40	☐	☐	☒	☐	
4.3.2.6	Adaptivity (adaptive equipment using modulations other than FHSS)	NTC	802.11b 802.11g 802.11n HT20 802.11n HT40	☒	☐	☐	☐	
4.3.2.7	Occupied Channel Bandwidth	NTC	802.11b 802.11g 802.11n HT20 802.11n HT40	☒	☐	☐	☐	
4.3.2.8	Transmitter unwanted emissions in the out-of-band domain	NTC	802.11b 802.11g 802.11n HT20 802.11n HT40	☒	☐	☐	☐	
		LT		☒	☐	☐	☐	
		HT		☒	☐	☐	☐	
4.3.2.9	Transmitter unwanted emissions in	NTC	802.11b 802.11g 802.11n HT20	☒	☐	☐	☐	

	the spurious domain (conducted & radiated)		802.11n HT40					
4.3.2.10	Receiver spurious emissions (conducted & radiated)	NTC	802.11b 802.11g 802.11n HT20 802.11n HT40	☒	☐	☐	☐	
4.3.2.11	Receiver Blocking	NTC	802.11b 802.11g 802.11n HT20 802.11n HT40	☒	☐	☐	☐	

Remark: The measurement uncertainty is not included in the test result.

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

Mode	Data Rate
11b/CCK	1 Mbps
11g/OFDM	6 Mbps
11n HT20/OFDM	6.5 Mbps
11n HT40/OFDM	13.5 Mbps

3.5. Statement of the measurement uncertainty

The reported uncertainty of measurement **y** ± **U**, where expended uncertainty **U** is based on a standard uncertainty multiplied by a coverage factor of **k=2**, providing a level of confidence of approximately **95** %.

Test Items	Measurement Uncertainty	Notes
Frequency error	25 Hz	(1)
Frequency range	25 Hz	(1)
Transmitter power conducted	0.57 dB	(1)
Transmitter power Radiated	2.20 dB	(1)
Adjacent and alternate channel power Conducted	1.20 dB	(1)
Conducted spurious emission	1.60 dB	(1)
Radiated spurious emission	2.20 dB	(1)
Intermodulation attenuation	1.00 dB	(1)
Maximum useable receiver sensitivity	2.80 dB	(1)
Co-channel rejection	2.80 dB	(1)
Adjacent channel selectivity	2.80 dB	(1)
Spurious response rejection	2.80 dB	(1)
Intermodulation response rejection	2.80 dB	(1)
Blcking or desensitization	2.80 dB	(1)

3.6. Equipments Used during the Test

RF output power & PSD & OOB & OBW & Hoping & Duty Cycle, Tx-sequence, Tx-gap & Adaptively						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
1	Signal Analyzer	R&S	FSV-40	101008	2018/05/02	2019/05/01
2	4 Ch. Simultaneous Sampling 14 Bits 2 MS/s	Agilent	U2531A	TW54063513	2018/05/02	2019/05/01
3		Agilent	U2021XA	MY54080019	2018/05/02	2019/05/01
4	vector Signal Generator	R&S	SMU200	105328	2018/05/02	2019/05/01
5	Signal Generator	R&S	SMB100A	177649	2018/05/02	2019/05/01
6	Dc Power Supply	GW	GPR-6030D	/	2018/05/02	2019/05/01
7	Temperature & Humitidy Chamber	GIANT FORCE	GTH-056P	GF-94454-1	2018/05/02	2019/05/01

Transmitter spurious emissions & Receiver spurious emissions						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
1	ULTRA-ROADBAND ANTENNA	Sunol Sciences Corp.	JB1	A061713	2018/05/02	2019/05/01
2	Horn Antenna	Sunol Sciences Corp.	DRH-118	A062013	2018/05/02	2019/05/01
3	EMI Test Receiver	R&S	ESCI	103710	2018/05/02	2019/05/01
4	Controller	EM Electronics	Controller EM 1000	N/A	2018/05/02	2019/05/01
5	Amplifier	Agilent	8349B	3008A02306	2018/05/02	2019/05/01
6	Amplifier	Agilent	8447D	2944A10176	2018/05/02	2019/05/01
7	Temperature/Humidity Meter	Gangxing	CTH-608	02	2018/05/02	2019/05/01
8	High-Pass Filter	K&L	9SH10-2700/X12750-O/O	N/A	2018/05/02	2019/05/01
9	High-Pass Filter	K&L	41H10-1375/U12750-O/O	N/A	2018/05/02	2019/05/01
10	RF Cable	HUBER+SUHNER	RG214	N/A	2018/05/02	2019/05/01

The calibration interval is 1 year.

4. TEST CONDITIONS AND RESULTS

4.1. ETSI EN 300 328 REQUIREMENTS

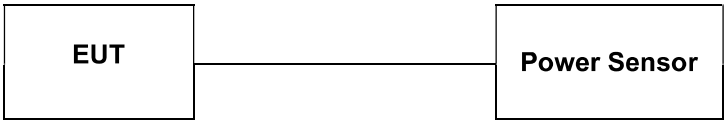
4.1.1. RF Output Power

LIMIT

ETSI EN 300 328 (V2.2.0) Sub-clause 4.3.2.2.3

RF OUTPUT POWER	
Condition	Limit
☐ Non-adaptive frequency hopping systems	Equal to or less than the value declared by the supplier. This declared value shall be equal to or less than 20 dBm.
☒ Adaptive frequency hopping systems	equal to or less than 20 dBm.

TEST CONFIGURATION



TEST PROCEDURE

Please refer to ETSI EN 300 328 (V2.2.0) Sub-clause 5.4.2.2.1.2

Step 1:

● Use a fast power sensor suitable for 2.4 GHz and capable of 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 clauses 4.3.1.3.2 or 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.

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 as the new stored data set.

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.

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. The start and stop points shall be included. 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 P_{burst} 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 clauses 4.3.1.2.3 or 4.3.2.2.3, shall be recorded in the test report.

EUT DESCRIPTION:

Mode:	☒802.11b	☒802.11g	☒802.11n HT20	☒802.11n HT40
Test Channel	☒2412MHz ☒2442MHz ☒2472MHz	☒2412MHz ☒2442MHz ☒2472MHz	☒2412MHz ☒2442MHz ☒2472MHz	☒2422MHz ☒2442MHz ☒2462MHz
Bandwidth	☒20MHz ☐40MHz	☒20MHz ☐40MHz	☒20MHz ☐40MHz	☐20MHz ☒40MHz
Modulation Type	☒DSSS ☐OFDM	☐DSSS ☒OFDM	☐DSSS ☒OFDM	☐DSSS ☒OFDM
Channel Separation	☒5MHz	☒5MHz	☒5MHz	☒5MHz

MEASUREMENT DESCRIPTION

Instrument:	Power Meter measuring burst Power(RMS) of a least 10 packets	
Performed:	☒	Conducted
	☐	Radiated (only if no conducted sample is provided)

TEST RESULTS

Test Mode:802.11b				
Antenna Gain:0 dBi		Total e.i.r.p (dBm)		
Test environmental		Maximum conducted Burst Power in 15 measured Bursts (RMS) [dBm]		
Temperature (℃)	Voltage (V)	CH01 (dBm)	CH07 (dBm)	CH13(dBm)
T Nor (25℃)	230V	13.78	13.99	13.91
T min (-20℃)	230V	13.76	13.96	13.96
T Max (+55℃)	230V	13.71	13.72	13.82
Result		Pass		
Limit		20dBm		

Test Mode:802.11g				
Antenna Gain: 0 dBi		Total e.i.r.p (dBm)		
Test environmental		Maximum conducted Burst Power in 15 measured Bursts (RMS) [dBm]		
Temperature (℃)	Voltage (V)	CH01 (dBm)	CH07 (dBm)	CH13(dBm)
T Nor (25℃)	230V	11.06	11.17	10.98
T min (-20℃)	230V	11.22	11.13	10.85
T Max (+55℃)	230V	11.16	11.07	10.79
Result		Pass		
Limit		20dBm		

Test Mode:802.11 HT20				
Antenna Gain: 0 dBi		Total e.i.r.p (dBm)		
Test environmental		Maximum conducted Burst Power in 15 measured Bursts (RMS) [dBm]		
Temperature (℃)	Voltage (V)	CH01 (dBm)	CH07 (dBm)	CH13(dBm)
T Nor (25℃)	230V	11	11.08	10.96
T min (-20℃)	230V	11.07	11.15	11.02
T Max (+55℃)	230V	10.95	11.12	11.01
Result		Pass		
Limit		20dBm		

Test Mode: 802.11n HT40				
Antenna Gain: 0 dBi		Total e.i.r.p (dBm)		
Test environmental		Maximum conducted Burst Power in 15 measured Bursts (RMS) [dBm]		
Temperature (℃)	Voltage (V)	CH03 (dBm)	CH07 (dBm)	CH11(dBm)
T Nor (25℃)	230V	10.36	10.87	11.2
T min (-20℃)	230V	10.3	10.83	9.87
T Max (+55℃)	230V	10.44	9.73	9.07
Result		Pass		
Limit		20dBm		

4.1.2. Duty Cycle,TX-sequence,TX-gap

LIMIT

ETSI EN 300 328 (V2.2.0) Sub-clause 4.3.2.4.3
The Duty Cycle shall be equal to or less than the maximum value declared by the manufacturer.
The Tx-sequence time shall be equal to or less than 10 ms. The minimum Tx-gap time following a Tx-sequence shall be equal to the duration of that proceeding Tx-sequence with a minimum of 3,5 ms.
Duty Cycle is defined as the ratio of the total transmitter 'on'-time to a 1 second observation period.
Tx-sequence is defined as a period in time during which a single or multiple transmissions may occur and which shall be followed by a Tx-gap.
Tx-gap is defined as a period in time during which no transmissions occur.
NOTE: The maximum Duty Cycle at which the equipment can operate, is declared by the manufacturer.
These requirements apply to non-adaptive equipment or to adaptive equipment when operating in a non-adaptive mode. The equipment is using wide band modulations other than FHSS.
These requirements do not apply for equipment with a maximum declared RF Output power level of less than 10 dBm e.i.r.p. or for equipment when operating in a mode where the RF Output power is less than 10 dBm e.i.r.p.
Medical devices requiring reverse compatibility with other medical devices placed on the market when earlier versions of the present document were harmonised, are allowed to have an operating mode in which they do not have to comply with the requirements for Duty Cycle, Tx-sequence and Tx-gap.

TEST PROCEDURE

Please refer to ETSI EN 300 328 (V2.2.0) Sub-clause 5.4.2.2.1.3
For systems using wide band modulations other than FHSS, the measurement shall be performed at the lowest, the middle, and the highest channel on which the equipment can operate. These frequencies shall be recorded.
The test procedure, which shall only be performed for non-adaptive systems and only to be performed at normal environmental conditions, shall be as follows:
Step 1:
● Use the same stored measurement samples from the procedure described in clause 5.4.2.2.1.2.
● 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 case of insufficient dynamic range, the value of 30 dB may need to be reduced appropriately.
Step 2:
● Between the saved start and stop times of each individual burst, calculate the TxOn time. Save these TxOn values.
● Between the saved stop and start times of two subsequent bursts, calculate the TxOff time. Save these TxOff values.
Step 3:
●Duty Cycle (DC) is the sum of all TxOn times between the end of the first gap (which is the start of the first burst within the observation period) and the start of the last burst (within this observation period) divided by the observation period. The observation period is defined in clause 4.3.1.3.2 or clause 4.3.2.4.2.
Step 4:
●For FHSS equipment using blacklisting, the TxOn time measured for a single (and active) hopping frequency shall be multiplied by the number of blacklisted frequencies. This value shall be added to the sum calculated in step 3 above. If the number of blacklisted frequencies cannot be determined, the minimum number of hopping frequencies (N) as defined in clause 4.3.1.4.3 shall be assumed.
●The calculated value for Duty Cycle (DC) shall be recorded in the test report. This value shall be equal to or less than the maximum value declared by the manufacturer.
Step 5:
● Use the same stored measurement samples from the procedure described in clause 5.4.2.2.1.2.
● Identify any TxOff time that is equal to or greater than the minimum Tx-gap time as defined in clause 4.3.1.3.3 or clause 4.3.2.4.3. These are the potential valid gap times to be further considered in this procedure.
● Starting from the second identified gap, calculate the time from the start of this gap to the end of the preceding gap. This time is the Tx-sequence time for this transmission. Repeat this procedure until the last identified gap within the observation period is reached.
● A combination of consecutive Tx-sequence times and Tx-gap times followed by a Tx-gap time, which is at

least as long as the duration of this combination, may be considered as a single Tx-sequence time and in which case it shall comply with the limits defined in clause 4.3.1.3.3 or clause 4.3.2.4.3.
● It shall be noted in the test report whether the UUT complies with the limits for the maximum Tx-sequence time and minimum Tx-gap time as defined in clause 4.3.1.3.3 or clause 4.3.2.4.3.

EUT DESCRIPTION:

Mode:	☒802.11b	☒802.11g	☒802.11n HT20	☒802.11n HT40
Test Channel	☒2412MHz ☒2442MHz ☒2472MHz	☒2412MHz ☒2442MHz ☒2472MHz	☒2412MHz ☒2442MHz ☒2472MHz	☒2422MHz ☒2442MHz ☒2462MHz
Bandwidth	☒20MHz ☐40MHz	☒20MHz ☐40MHz	☒20MHz ☐40MHz	☐20MHz ☒40MHz
Modulation Type	☒DSSS ☐OFDM	☐DSSS ☒OFDM	☐DSSS ☒OFDM	☐DSSS ☒OFDM
Channel Separation	☒5MHz	☒5MHz	☒5MHz	☒5MHz

MEASUREMENT DESCRIPTION

Instrument:	Power Meter measuring average burst Power of a least 10 packets	
Performed:	☒	Conducted
	☐	Radiated (only if no conducted sample is provided)

TEST RESULTS

Not Applicable

4.1.3. Medium Utilisation (MU) factor

LIMIT

ETSI EN 300 328 (V2.2.0) Sub-clause 4.3.2.5.3
The maximum Medium Utilization factor for non-adaptive non-FHSS equipment shall be 10 %.
The Medium Utilisation (MU) factor is a measure to quantify the amount of resources (Power and Time) used by non-adaptive equipment. The Medium Utilisation factor is defined by the formula:

MU = (P/100 mW) × DC

where: MU is Medium Utilisation.
P is the RF output power as defined in clause 4.3.2.2.2 expressed in mW.
DC is the Duty Cycle as defined in clause 4.3.2.4.2 expressed in %.

NOTE: The equipment may have dynamic a behaviour with regard to duty cycle and corresponding power level. See clause 5.4.1 e).
This requirement does not apply to adaptive equipment unless operating in a non-adaptive mode.
In addition, this requirement does not apply for non-FHSS equipment with a maximum declared RF Output power level of less than 10 dBm e.i.r.p. or for non-FHSS equipment when operating in a mode where the RF Output power is less than 10 dBm e.i.r.p.

TEST PROCEDURE

Please refer to ETSI EN 300 328 (V2.2.0) Sub-clause 5.4.2.2.1.4

Step 1:
● Use the same stored measurement samples from the procedure described in clause 5.4.2.2.1.2.

Step 2:
● For each burst calculate the product of (P_{burst}/100 mW) and the TxOn time.
NOTE: P_{burst} is expressed in mW. TxOn time is expressed in ms.

Step 3:
● Medium Utilisation is the sum of all these products divided by the observation period (expressed in ms) which is defined in clauses 4.3.1.3.2 or 4.3.2.4.2. This value, which shall comply with the limit given in clauses 4.3.1.6.3 or 4.3.2.5.3, shall be recorded in the test report.
If, in case of FHSS equipment, operation without blacklisted frequencies is not possible, the power of the bursts on blacklisted hopping frequencies (for the calculation of the Medium Utilization) is assumed to be equal to the average value of the RMS power of the bursts on all active hopping frequencies.

EUT DESCRIPTION:

Mode:	☒802.11b	☒802.11g	☒802.11n HT20	☒802.11n HT40
Test Channel	☒2412MHz ☒2442MHz ☒2472MHz	☒2412MHz ☒2442MHz ☒2472MHz	☒2412MHz ☒2442MHz ☒2472MHz	☒2422MHz ☒2442MHz ☒2462MHz
Bandwidth	☒20MHz ☐40MHz	☒20MHz ☐40MHz	☒20MHz ☐40MHz	☐20MHz ☒40MHz
Modulation Type	☒DSSS ☐OFDM	☐DSSS ☒OFDM	☐DSSS ☒OFDM	☐DSSS ☒OFDM
Channel Separation	☒5MHz	☒5MHz	☒5MHz	☒5MHz

MEASUREMENT DESCRIPTION

Instrument:	Power Meter measuring average burst Power of a least 10 packets	
Performed:	☒	Conducted
	☐	Radiated (only if no conducted sample is provided)

TEST RESULTS
Not Applicable

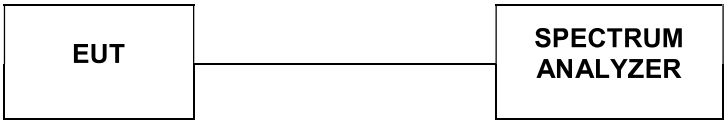
4.1.4. Power Spectral Density

LIMIT

ETSI EN 300 328 (V2.2.0) Sub-clause 4.3.2.3.3

For equipment using wide band modulations other than FHSS, the maximum Power Spectral Density is limited to 10 dBm per MHz
The Power Spectral Density (PSD) is the mean equivalent isotropically radiated power (e.i.r.p.) spectral density in a 1 MHz bandwidth during a transmission burst.
These measurements shall only be performed at normal test conditions.
The measurement shall be repeated for the equipment being configured to operate at the lowest, the middle, and the highest frequency of the stated frequency range. These frequencies shall be recorded.

TEST CONFIGURATION



TEST PROCEDURE

Please refer to ETSI EN 300 328 (V2.2.0) Sub-clause 5.4.3.2.1
The transmitter shall be connected to a spectrum analyser and the Power Spectral Density as defined in clause 4.3.2.3 shall be measured and recorded.
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 × Channel Occupancy Time × 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 be completed. Save the (trace) data set to a file.
Step 2:
For conducted measurements on smart antenna systems using either operating mode 2 or 3 (see clause 5.3.2.2), repeat the measurement for each of the transmit ports. For each frequency point, 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 in the file (lowest frequency), add up the power of the following samples representing a 1 MHz segment and record the results for power and position (i.e. sample #1 to #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 radiated 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.

EUT DESCRIPTION:

Mode:	☒802.11b	☒802.11g	☒802.11n HT20	☒802.11n HT40
Test Channel	☒2412MHz ☒2442MHz ☒2472MHz	☒2412MHz ☒2442MHz ☒2472MHz	☒2412MHz ☒2442MHz ☒2472MHz	☒2422MHz ☒2442MHz ☒2462MHz
Bandwidth	☒20MHz ☐40MHz	☒20MHz ☐40MHz	☒20MHz ☐40MHz	☐20MHz ☒40MHz
Modulation Type	☒DSSS ☐OFDM	☐DSSS ☒OFDM	☐DSSS ☒OFDM	☐DSSS ☒OFDM
Channel Separation	☒5MHz	☒5MHz	☒5MHz	☒5MHz

MEASUREMENT DESCRIPTION

Instrument:	Spectrum Analyzer	
Detector:	RMS	
Sweep time:	auto	
Video bandwidth:	30KHz	
Resolution bandwidth:	10KHz	
Span:	83.5MHz	
Frequency range	2400-2483.5MHz	
Sweep Points	15000	
Performed:	☒	Conducted
	☐	Radiated (only if no conducted sample is provided)

TEST RESULTS

Test Mode:802.11b				
Antenna Gain: 0 dBi		Test Method: Conducted		
Test Temperature: 25℃		Test Voltage: 230V		
The Maximum Power Spectral Density				
Test Channel Number	Test Frequency (MHz)	Measured Power Density (dBm/MHZ)	Antenna Gain(dBi)	EIRP Density (dBm/MHz)
01	2412	5.02	0	5.02
07	2442	4.93	0	4.93
13	2472	4.72	0	4.72
Result		Pass		
Limit		10dBm/MHz		

Test Mode:802.11g				
Antenna Gain: 0 dBi		Test Method: Conducted		
Test Temperature: 25℃		Test Voltage: 230V		
The Maximum Power Spectral Density				
Test Channel Number	Test Frequency (MHz)	Measured Power Density (dBm/MHZ)	Antenna Gain(dBi)	EIRP Density (dBm/MHz)
1	2412	-2.77	0	-2.77
7	2442	-2.61	0	-2.61
13	2472	-2.33	0	-2.33
Result		PASS		
Limit		10dBm/MHz		

Test Mode:802.11n HT20				
Antenna Gain: 0 dBi		Test Method: Conducted		
Test Temperature: 25℃		Test Voltage: 230V		
The Maximum Power Spectral Density				
Test Channel Number	Test Frequency (MHz)	Measured Power Density (dBm/MHZ)	Antenna Gain(dBi)	EIRP Density (dBm/MHz)
1	2412	-2.71	0	-2.71
7	2442	-2.97	0	-2.97
13	2472	-2.69	0	-2.69
Result		Pass		
Limit		10dBm/MHz		

Test Mode:802.11n HT40MHz				
Antenna Gain: 0 dBi		Test Method: Conducted		
Test Temperature: 25℃		Test Voltage: 230V		
The Maximum Power Spectral Density				
Test Channel Number	Test Frequency (MHz)	Measured Power Density (dBm/MHZ)	Antenna Gain(dBi)	EIRP Density (dBm/MHz)
3	2422	-4.02	0	-4.02
7	2442	-4.50	0	-4.50
11	2462	-4.52	0	-4.52
Result		PASS		
Limit		10dBm/MHz		

4.1.5. Adaptivity and Recever blocking

Requirements & Limits

ETSI EN 300 328 (V2.2.0) Sub-4.3.2.6 and Sub-clause 5.4.6.2.1.4

Requirement	Operational Mode			
	☐Non-LBT based Detect and Avoid	☐LBT based Detect and Avoid		
		☐Frame Based Equipment	☐Load Based Equipment (CCA using 'energy detect')	☐Load Based Equipment (CCA not using any of the mechanisms referenced as note 2)
Minimum Clear Channel Assessment (CCA) Time	NA	not less than 18 us (see note 1)	(see note 2)	not less than 18 us (see note 1)
Maximum Channel Occupancy (COT) Time	＜40 ms	1ms to 10 ms	(see note 2)	(13/32)*q ms (see note 3)
Minimum Idle Period	5 % minimum of 100 μs	5% of COT	(see note 2)	NA
Extended CCA check	NA	NA	(see note 2)	R*CCA (see note 4)
Short Control Signalling Transmissions	Maximum duty cycle of 10% within an observation period of 50 ms (see note 5)			
Note 1: The CCA time used by the equipment shall be declared by the supplier. Note 2: Load Based Equipment may implement an LBT based spectrum sharing mechanism based on the Clear Channel Assessment (CCA) mode using energy detect as described in IEEE 802.11™-2012 [i.3], clause 9, clause 10, clause 16, clause 17, clause 19 and clause 20, or in IEEE 802.15.4™-2011 [i.4], clause 4, clause 5 and clause 8 providing the equipment complies with the conformance requirements referred to in clause 4.3.2.6.3.4. Note 3: q is selected by the manufacturer in the range [4…32] Note 4: The value of R shall be randomly selected in the range [1…q] Note 5: Adaptive equipment may or may not have Short Control Signaling Transmissions.				

Interference threshold level

The detection threshold shall be proportional to the transmit power of the transmitter: for a 20 dBm e.i.r.p. transmitter the detection threshold level (TL) shall be equal to or less than -70 dBm/MHz at the input to the receiver assuming a 0 dBi (receive) antenna assembly. This threshold level (TL) may be corrected for the (receive) antenna assembly gain (G); however, beamforming gain (Y) shall not be taken into account. For power levels less than 20 dBm e.i.r.p., the detection threshold level may be relaxed to:

TL = -70 dBm/MHz + 10 × log10 (100 mW / Pout) (Pout in mW e.i.r.p.)

Table 9: Unwanted Signal parameters

Wanted signal mean power from companion device (dBm)	Unwanted signal frequency (MHz)	Unwanted CW signal power (dBm)
-30/ sufficient to maintain the link(see note 2)	2 395 or 2 488,5 (see note 1)	-35 (see note 2)
NOTE 1: The highest frequency shall be used for testing operating channels within the range 2 400 MHz to 2 442 MHz, while the lowest frequency shall be used for testing operating channels within the range 2 442 MHz to 2 483,5 MHz. See clause 5.4.6.1. NOTE 2: A typical value which can be used in most cases is -50 dBm/MHz. NOTE 3: The level specified is the level in front of the UUT antenna. In case of conducted measurements, this level has to be corrected by the actual antenna assembly gain.		

Receiver Blocking

ETSI EN 300 328 (V2.2.0) Sub-4.3.2.11.4 and Sub-clause 5.4.11.2

Receiver Blocking parameters for Receiver Category 1 equipment

Wanted signal mean power from companion device (dBm)	Blocking signal Frequency (MHz)	Blocking signal power (dBm) (see note 2)	Type of blocking signal
P_{min} + 6 dB	2 380 2 503,5	-53	CW
P_{min} + 6 dB	2 300 2 330 2 360	-47	CW
P_{min} + 6 dB	2 523,5 2 553,5 2 583,5 2 613,5 2 643,5 2 673,5	-47	CW
NOTE 1: P_{min} is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.2.11.3 in the absence of any blocking signal. NOTE 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.			

Receiver Blocking parameters receiver category 2 equipment

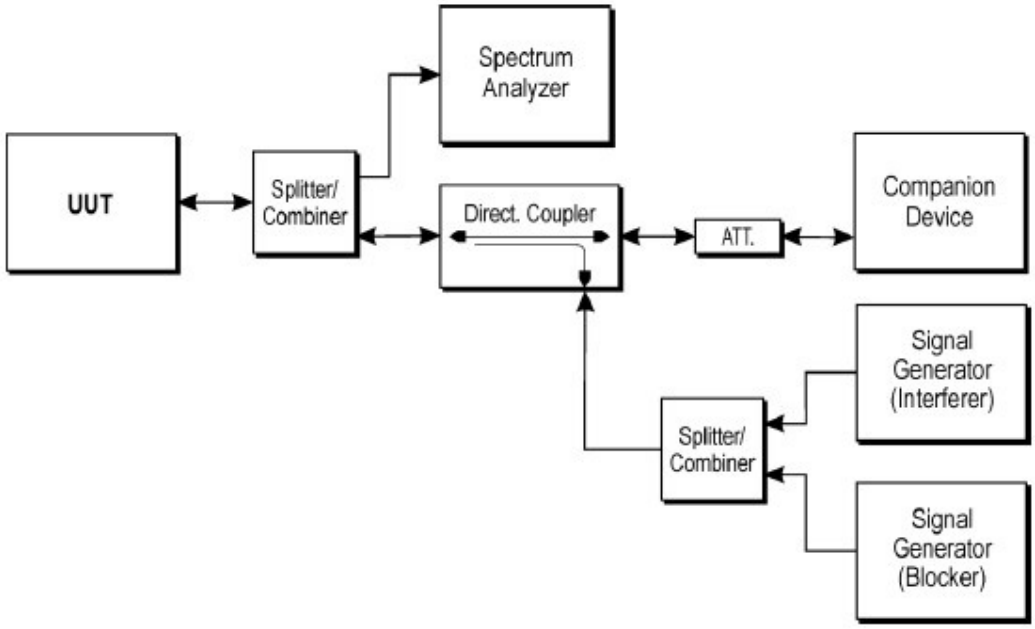
Wanted signal mean power from companion device (dBm)	Blocking signal Frequency (MHz)	Blocking signal power (dBm) (see note 2)	Type of blocking signal
P_{min} + 6 dB	2 380 2 503,5	-57	CW
P_{min} + 6 dB	2 300 2 583,5	-47	CW
NOTE 1: P_{min} is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.2.11.3 in the absence of any blocking signal. NOTE 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.			

Table 16: Receiver Blocking parameters receiver category 3 equipment

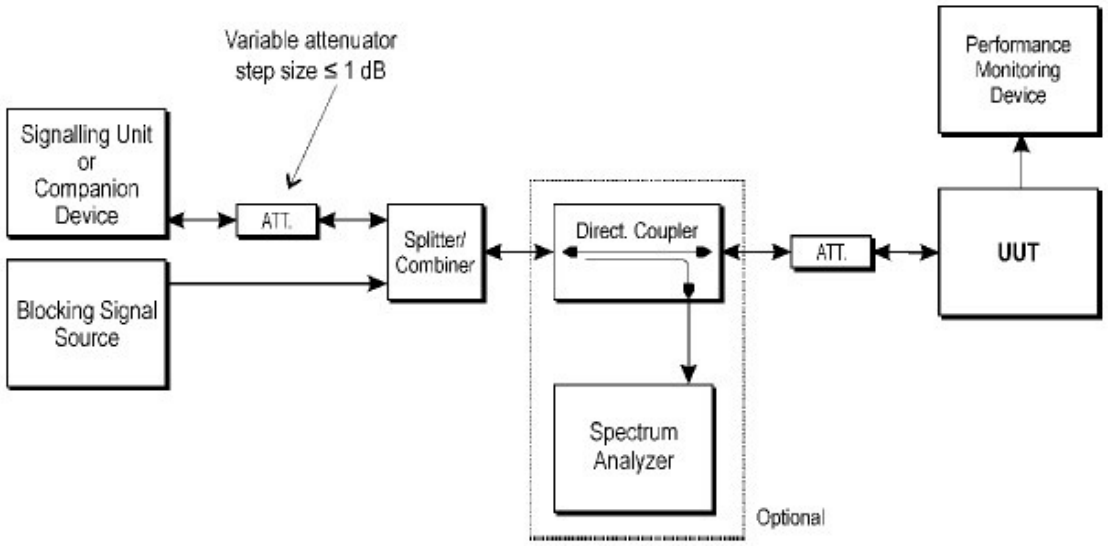
Wanted signal mean power from companion device (dBm)	Blocking signal Frequency (MHz)	Blocking signal power (dBm) (see note 2)	Type of blocking signal
P_{min} + 12 dB	2 380 2 503,5	-57	CW
P_{min} + 12 dB	2 300 2 583,5	-47	CW
NOTE 1: P_{min} is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.2.11.3 in the absence of any blocking signal. NOTE 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.			

TEST CONFIGURATION

Adaptivity



Receiver Blocking



TEST PROCEDURE

Adaptivity Refer to chapter 5.4.6.2 of ETSI EN 300 328 V2.2.0 (2017-11)
Receiver Blocking Refer to chapter 5.4.11.2 of ETSI EN 300 328 V2.2.0 (2017-11)

TEST RESULTS

Remark: 802.11n(H40) is not application (RF Output Power(e.i.r.p)is less than 10dBm)

Adaptivity

802.11b:

Frequency (MHz)	Test Step	COT(ms)	Limit (ms)	CCA Time (μs)	Limit (μs)	Result
2412.000000	Test Step 1	0.055	<13.000	58.000	>20.000	PASS
2472.000000	Test Step 1	0.059	<13.000	46.000	>20.000	PASS

Receiver Blocking:

802.11b:2412 MHz

receiver category 1

Wanted signal mean power from companion device (dBm)$_{Note(1)}$	**Blocking signal Frequency (MHz)**	**Blocking signal power (dBm)**	**PER %$_{Note(2)}$**	**PER Limit %**
-72 + 6 dB	2 380	-53	0.472	≤10%
	2 503,5		0.469	
-72 + 6 dB	2 300	-47	0.456	≤10%
	2 330		0.468	
	2 360		0.471	
-72 + 6 dB	2 523,5	-47	0.473	≤10%
	2 553,5		0.461	
	2 583,5		0.455	
	2 613,5		0.469	
	2 643,5		0.472	
	2 673,5		0.468	

2472 MHz

receiver category 1

Wanted signal mean power from companion device (dBm)$_{Note(1)}$	**Blocking signal Frequency (MHz)**	**Blocking signal power (dBm)**	**PER %$_{Note(2)}$**	**PER Limit %**
-72 + 6 dB	2 380	-53	0.462	≤10%
	2 503,5		0.475	
-72 + 6 dB	2 300	-47	0.456	≤10%
	2 330		0.468	
	2 360		0.471	
-72 + 6 dB	2 523,5	-47	0.473	≤10%
	2 553,5		0.471	
	2 583,5		0.455	
	2 613,5		0.459	
	2 643,5		0.472	
	2 673,5		0.468	

802.11g: 2412 MHz

receiver category 2

Wanted signal mean power from companion device (dBm) Note(1)	Blocking signal Frequency (MHz)	Blocking signal power (dBm)	PER % Note(2)	PER Limit %
-75+ 6 dB	2 380	-57	0.374	≤10%
	2 503,5		0.352	
-75 + 6 dB	2 300	-47	0.412	≤10%
	2 583,5		0.407	

2472 MHz

receiver category 2

Wanted signal mean power from companion device (dBm) Note(1)	Blocking signal Frequency (MHz)	Blocking signal power (dBm)	PER % Note(2)	PER Limit %
-75+ 6 dB	2 380	-57	0.494	≤10%
	2 503,5		0.472	
-75 + 6 dB	2 300	-47	0.532	≤10%
	2 583,5		0.527	

802.11n(H20): :2412 MHz

receiver category 2

Wanted signal mean power from companion device (dBm) Note(1)	Blocking signal Frequency (MHz)	Blocking signal power (dBm)	PER % Note(2)	PER Limit %
-75+ 6 dB	2 380	-57	0.355	≤10%
	2 503,5		0.347	
-75 + 6 dB	2 300	-47	0.410	≤10%
	2 583,5		0.425	

2472 MHz

receiver category 2

Wanted signal mean power from companion device (dBm) Note(1)	Blocking signal Frequency (MHz)	Blocking signal power (dBm)	PER % Note(2)	PER Limit %
-75+ 6 dB	2 380	-57	0. 475	≤10%
	2 503,5		0. 467	
-75 + 6 dB	2 300	-47	0. 53	≤10%
	2 583,5		0. 545	

802.11n(H40): 2422 MHz

receiver category 2

Wanted signal mean power from companion device (dBm) Note(1)	Blocking signal Frequency (MHz)	Blocking signal power (dBm)	PER % Note(2)	PER Limit %
-75+ 6 dB	2 380	-57	0. 475	≤10%
	2 503,5		0. 467	
-75 + 6 dB	2 300	-47	0. 53	≤10%
	2 583,5		0. 545	

2462 MHz

receiver category 2

Wanted signal mean power from companion device (dBm) Note(1)	Blocking signal Frequency (MHz)	Blocking signal power (dBm)	PER % Note(2)	PER Limit %
-75+ 6 dB	2 380	−57	0. 505	≤10%
	2 503,5		0. 462	
-75 + 6 dB	2 300	−47	0. 572	≤10%
	2 583,5		0. 539	

4.1.6. Occupied Channel Bandwidth

LIMIT

ETSI EN 300 328 (V2.2.0) Sub-clause 4.3.2.7.3

OCCUPIED CHANNEL BANDWIDTH		
Condition		Limit
All types of equipment		Shall fall completely within the band 2400 to 2483.5 MHz
Additional requirement	For non-adaptive using wide band modulations other than FHSS system and E.I.R.P >10 dBm	Less than 20 MHz
	For non-adaptive frequency hopping system and E.I.R.P >10 dBm	Less than 5 MHz

TEST PROCEDURE

Please refer to ETSI EN 300 328 (V2.2.0) Sub-clause 5.4.7.2
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: ~ 1 % of the span without going below 1 %
● Video BW: 3 × RBW
● Frequency Span: 2 × Occupied Channel Bandwidth (e.g. 40 MHz for a 20 MHz channel)
● Detector Mode: RMS
● Trace Mode: Max Hold
●Sweep time: 1s

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.

EUT DESCRIPTION:

Mode:	☒802.11b	☒802.11g	☒802.11n HT20	☒802.11n HT40
Test Channel	☒2412MHz ☒2472MHz	☒2412MHz ☒2472MHz	☒2412MHz ☒2472MHz	☒2422MHz ☒2462MHz
Bandwidth	☒20MHz ☐40MHz	☒20MHz ☐40MHz	☒20MHz ☐40MHz	☐20MHz ☒40MHz
Modulation Type	☒DSSS ☐OFDM	☐DSSS ☒OFDM	☐DSSS ☒OFDM	☐DSSS ☒OFDM
Channel Separation	☒5MHz	☒5MHz	☒5MHz	☒5MHz

MEASUREMENT DESCRIPTION

Instrument:	Spectrum Analyzer	
Detector:	RMS	
Sweep time:	auto	
Video bandwidth:	☒20 MHz(Bandwith):1.5MHz	☒40 MHz(Bandwith):3MHz

Resolution bandwidth:	☒20 MHz(Bandwith):410KHz	☒40 MHz(Bandwith):820KHz
Span:	☒20 MHz(Bandwith):40MHz	☒40 MHz(Bandwith):80MHz
Center:	Transmit channel	
Trace:	Max hold	
Performed:	☒ Conducted	
	☐ Radiated (only if no conducted sample is provided)	

TEST RESULTS

Mode	Channel	Frequency (MHz)	99% Bandwidth (MHz)	Limits (MHz)	Verdict
802.11b	1	2412	13.26	/	PASS
	13	2472	12.77	/	PASS
802.11g	1	2412	18.09	/	PASS
	13	2472	17.76	/	PASS
802.11n(H20)	1	2412	18.91	/	PASS
	13	2472	18.66	/	PASS
802.11n(H40)	1	2422	37.19	/	PASS
	13	2462	37.05	/	PASS

4.1.7. Transmitter unwanted emissions in the out-of-band domain

LIMIT

ETSI EN 300 328 (V2.2.0) Sub-clause 4.3.2.8.3
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 1.
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.

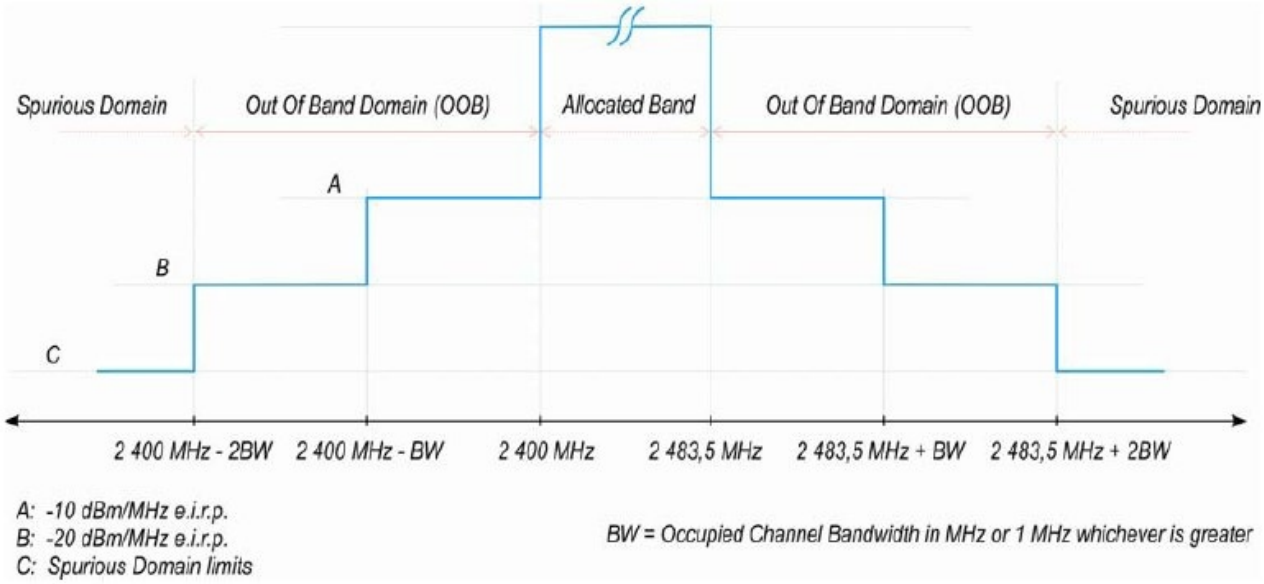


Figure 1: Transmit mask

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.
These measurements have to be performed at normal environmental conditions and shall be repeated at the extremes of the operating temperature range.
In the case of equipment intended for use with an integral antenna and where no external (temporary) antenna connectors are provided, a test fixture as described in clause B.3 may be used to perform relative measurements at the extremes of the operating temperature range.
For systems using FHSS modulation, the measurements shall be performed during normal operation (hopping).
For systems using wide band modulations other than FHSS, the measurement shall be performed at the lowest and the highest channel on which the equipment can operate. These frequencies shall be recorded.
The equipment shall be configured to operate under its worst case situation with respect to output power.
If the equipment can operate with different Occupied Channel Bandwidths (e.g. 20 MHz and 40 MHz), than each channel bandwidth shall be tested separately.

TEST PROCEDURE

Please refer to ETSI EN 300 328 (V2.2.0) Sub-clause 5.4.8.2
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:
●Measurement Mode: Time Domain Power
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: Single Sweep
Sweep Points: Sweep time [µs] / (1 µs) with a maximum of 30 000
Trigger Mode: Video (burst signals) or Manual (continuous signals)
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.

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 - 2BW + 0,5 MHz.

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.

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 figures 1 or 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 figures 1 or 3.
Option 2: the limits provided by the mask given in figures 1 or 3 shall be reduced by 10 x log10(Ach) 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.

EUT DESCRIPTION:

Mode:	☒802.11b	☒802.11g	☒802.11n HT20	☒802.11n HT40

Test Channel	☒2412MHz ☒2472MHz	☒2412MHz ☒2472MHz	☒2412MHz ☒2472MHz	☒2422MHz ☒2462MHz
Bandwidth	☒20MHz ☐40MHz	☒20MHz ☐40MHz	☒20MHz ☐40MHz	☐20MHz ☒40MHz
Modulation Type	☒DSSS ☐OFDM	☐DSSS ☒OFDM	☐DSSS ☒OFDM	☐DSSS ☒OFDM
Channel Separation	☒5MHz	☒5MHz	☒5MHz	☒5MHz

MEASUREMENT DESCRIPTION

Instrument:	Spectrum Analyzer	
Detector:	RMS	
Sweep time:	depending on packet length	
Video bandwidth:	3MHz	
Resolution bandwidth:	1MHz	
Span:	0Hz	
Trace:	Trigger to burst	
Sweep points:	5000	
Performed:	☒	Conducted
	☐	Radiated (only if no conducted sample is provided)

TEST RESULTS

802.11b							
Test conditions		Channel	Frequency range (MHz)		Level (dBm)	Limit (dBm)	Result
Temperature (℃)	Voltage (V)		Start	Stop			
Tnor=25	230	01	2400-2OBW	2400-OBW	-49.79	-20	Pass
			2400-OBW	2400	-34.64	-10	Pass
		13	2483.5	2483.5+OBW	-32.98	-10	Pass
			2483.5+OBW	2483.5+2OBW	-48.38	-20	Pass
Tlow=-20	207	01	2400-2OBW	2400-OBW	-49.8	-20	Pass
			2400-OBW	2400	-34.65	-10	Pass
		13	2483.5	2483.5+OBW	-33	-10	Pass
			2483.5+OBW	2483.5+2OBW	-48.41	-20	Pass
	253	01	2400-2OBW	2400-OBW	-49.82	-20	Pass
			2400-OBW	2400	-34.69	-10	Pass
		13	2483.5	2483.5+OBW	-33	-10	Pass
			2483.5+OBW	2483.5+2OBW	-48.4	-20	Pass
Thigh=+55	207	01	2400-2OBW	2400-OBW	-49.82	-20	Pass
			2400-OBW	2400	-34.66	-10	Pass
		13	2483.5	2483.5+OBW	-33	-10	Pass
			2483.5+OBW	2483.5+2OBW	-48.37	-20	Pass
	253	01	2400-2OBW	2400-OBW	-49.82	-20	Pass
			2400-OBW	2400	-34.69	-10	Pass
		13	2483.5	2483.5+OBW	-33.02	-10	Pass
			2483.5+OBW	2483.5+2OBW	-48.41	-20	Pass

802.11g							
Test conditions		Channel	Frequency range (MHz)		Level (dBm)	Limit (dBm)	Result
Temperature (℃)	Voltage (V)		Start	Stop			
Tnor=25	230	01	2400-2OBW	2400-OBW	-46.02	-20	Pass
			2400-OBW	2400	-33.53	-10	Pass
		13	2483.5	2483.5+OBW	-27.86	-10	Pass
			2483.5+OBW	2483.5+2OBW	-41.64	-20	Pass
Tlow=-20	207	01	2400-2OBW	2400-OBW	-46.04	-20	Pass
			2400-OBW	2400	-33.55	-10	Pass
		13	2483.5	2483.5+OBW	-27.88	-10	Pass
			2483.5+OBW	2483.5+2OBW	-41.65	-20	Pass
	253	01	2400-2OBW	2400-OBW	-46.09	-20	Pass
			2400-OBW	2400	-33.59	-10	Pass
		13	2483.5	2483.5+OBW	-27.9	-10	Pass
			2483.5+OBW	2483.5+2OBW	-41.69	-20	Pass
Thigh=+55	207	01	2400-2OBW	2400-OBW	-46.05	-20	Pass
			2400-OBW	2400	-33.57	-10	Pass
		13	2483.5	2483.5+OBW	-27.91	-10	Pass
			2483.5+OBW	2483.5+2OBW	-41.67	-20	Pass
	253	01	2400-2OBW	2400-OBW	-46.05	-20	Pass
			2400-OBW	2400	-33.62	-10	Pass
		13	2483.5	2483.5+OBW	-27.89	-10	Pass
			2483.5+OBW	2483.5+2OBW	-41.65	-20	Pass

802.11n(H20)							
Test conditions		Channel	Frequency range (MHz)		Level (dBm)	Limit (dBm)	Result
Temperature (℃)	Voltage (V)		Start	Stop			
Tnor=25	230	01	2400-2OBW	2400-OBW	-45.94	-20	Pass
			2400-OBW	2400	-46.79	-10	Pass
		13	2483.5	2483.5+OBW	-32.24	-10	Pass
			2483.5+OBW	2483.5+2OBW	-42.25	-20	Pass
Tlow=-20	207	01	2400-2OBW	2400-OBW	-45.95	-20	Pass
			2400-OBW	2400	-46.82	-10	Pass
		13	2483.5	2483.5+OBW	-32.26	-10	Pass
			2483.5+OBW	2483.5+2OBW	-42.3	-20	Pass
	253	01	2400-2OBW	2400-OBW	-45.99	-20	Pass
			2400-OBW	2400	-46.8	-10	Pass
		13	2483.5	2483.5+OBW	-32.29	-10	Pass
			2483.5+OBW	2483.5+2OBW	-42.32	-20	Pass
Thigh=+55	207	01	2400-2OBW	2400-OBW	-46.01	-20	Pass
			2400-OBW	2400	-46.79	-10	Pass
		13	2483.5	2483.5+OBW	-32.3	-10	Pass
			2483.5+OBW	2483.5+2OBW	-42.27	-20	Pass
	253	01	2400-2OBW	2400-OBW	-45.97	-20	Pass
			2400-OBW	2400	-46.81	-10	Pass
		13	2483.5	2483.5+OBW	-32.3	-10	Pass
			2483.5+OBW	2483.5+2OBW	-42.28	-20	Pass

802.11n(H40)							
Test conditions		Channel	Frequency range (MHz)		Level (dBm)	Limit (dBm)	Result
Temperature (℃)	Voltage (V)		Start	Stop			
Tnor=25	230	03	2400-2OBW	2400-OBW	-50.62	-20	Pass
			2400-OBW	2400	-43.77	-10	Pass
		11	2483.5	2483.5+OBW	-40.94	-10	Pass
			2483.5+OBW	2483.5+2OBW	-47.77	-20	Pass
Tlow=-20	207	03	2400-2OBW	2400-OBW	-50.68	-20	Pass
			2400-OBW	2400	-43.77	-10	Pass
		11	2483.5	2483.5+OBW	-40.98	-10	Pass
			2483.5+OBW	2483.5+2OBW	-47.76	-20	Pass
	253	03	2400-2OBW	2400-OBW	-50.64	-20	Pass
			2400-OBW	2400	-43.79	-10	Pass
		11	2483.5	2483.5+OBW	-40.98	-10	Pass
			2483.5+OBW	2483.5+2OBW	-47.79	-20	Pass
Thigh=+55	207	03	2400-2OBW	2400-OBW	-50.66	-20	Pass
			2400-OBW	2400	-43.79	-10	Pass
		11	2483.5	2483.5+OBW	-40.98	-10	Pass
			2483.5+OBW	2483.5+2OBW	-47.79	-20	Pass
	253	03	2400-2OBW	2400-OBW	-50.67	-20	Pass
			2400-OBW	2400	-43.78	-10	Pass
		11	2483.5	2483.5+OBW	-40.96	-10	Pass
			2483.5+OBW	2483.5+2OBW	-47.79	-20	Pass

4.1.8. Transmitter unwanted emissions in the spurious domain

LIMIT

ETSI EN 300 328 (V2.2.0) Sub-clause 4.3.2.9.3

The transmitter unwanted emissions in the spurious domain shall not exceed the values given in table 4

Table 4: 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
18 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

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.
These measurements shall only be performed at normal test conditions.
For systems using FHSS modulation, the measurements may be performed when normal hopping is disabled. In this case measurements need to be performed when operating at the lowest and the highest hopping frequency. When this is not possible, the measurement shall be performed during normal operation (hopping).
For systems using wide band modulations other than FHSS, the measurement shall be performed at the lowest and the highest channel on which the equipment can operate. These frequencies shall be recorded.
The equipment shall be configured to operate under its worst case situation with respect to output power.
If the equipment can operate with different Occupied Channel Bandwidths (e.g. 20 MHz and 40 MHz), then the equipment shall be configured to operate under its worst case situation with respect to spurious emissions.

TEST PROCEDURE

Please refer to ETSI EN 300 328 (V2.2.0) Sub-clause 5.4.9.2.1

In case of conducted measurements, the radio equipment shall be connected to the measuring equipment via a suitable attenuator.
The spectrum in the spurious domain (see figures 1 or 3) shall be searched for emissions that exceed the limit values given in tables 1 or 4 or that come to within 6 dB below these limits. Each occurrence shall be recorded.

Pre-scan

The test procedure below shall be used to identify potential unwanted emissions of the UUT.

Step 1:

The sensitivity of the spectrum analyser should be such that the noise floor is at least 12 dB below the limits given in tables 1 or 4.

Step 2:

The emissions over the range 30 MHz to 1 000 MHz shall be identified.
Spectrum analyser settings:

- Resolution bandwidth: 100 kHz
- Video bandwidth: 300 kHz
- Detector mode: Peak
- Trace Mode: Max Hold
- Sweep Points: ≥19 400; for spectrum analysers not supporting this high number of sweep points, the frequency band may be segmented
- Sweep time:

For non continuous transmissions (duty cycle less than 100 %), the sweep time shall be sufficiently long, such that for each 100 kHz frequency step, the measurement time is greater than two transmissions of the UUT.

For Frequency Hopping equipment operating in a normal operating (hopping not disabled) mode, the sweep time shall be further increased to capture multiple transmissions on the same hopping frequency in different hopping sequences.

The above sweep time setting may result in long measuring times in case of FHSS equipment. To avoid such long measuring times, an FFT analyser may be used

Allow the trace to stabilize. Any emissions identified during the sweeps above and that fall within the 6 dB range below the applicable limit or above, shall be individually measured using the procedure in clause 5.4.9.2.1.3 and compared to the limits given in tables 1 or 4.

Step 3

The emissions over the range 1 GHz to 12,75 GHz shall be identified.

Spectrum analyser settings:

- Resolution bandwidth: 1 MHz
- Video bandwidth: 3 MHz
- Filter type: 3 dB (Gaussian)
- Detector mode: Peak
- Trace Mode: Max Hold
- Sweep Points: ≥23 500; for spectrum analysers not supporting this high number of sweep points, the frequency band may be segmented.
- Sweep time:

For non continuous transmissions (duty cycle less than 100 %), the sweep time shall be sufficiently long, such that for each 1 MHz frequency step, the measurement time is greater than two transmissions of the UUT.

For Frequency Hopping equipment operating in a normal operating (hopping not disabled) mode, the sweep time shall be further increased to capture multiple transmissions on the same hopping frequency in different hopping sequences.

The above sweep time setting may result in long measuring times in case of FHSS equipment. To avoid such long measuring times, an FFT analyser may be used.

Allow the trace to stabilize. Any emissions identified during the sweeps above that fall within the 6 dB range below the applicable limit or above, shall be individually measured using the procedure in clause 5.4.9.2.1.3 and compared to the limits given in tables 1 or 4.

Frequency Hopping equipment may generate a block (or several blocks) of spurious emissions anywhere within the spurious domain. If this is the case, only the highest peak of each block of emissions shall be measured using the procedure in clause 5.4.9.2.1.3.

Step 4:

- In case of conducted measurements on smart antenna systems (equipment with multiple transmit chains), the steps 2 and 3 need to be repeated for each of the active transmit chains (Ach).The limits used to identifyemissions during this pre-scan need to be reduced with 10 × log10 (Ach) (number of active transmit chains).

Measurement of the emissions identified during the pre-scan

The steps below shall be used to accurately measure the individual unwanted emissions identified during the pre-scan measurements above.

Step 1:

The level of the emissions shall be measured using the following spectrum analyser settings:

- Measurement Mode: Time Domain Power
- Centre Frequency: Frequency of emission identified during the pre-scan
- Resolution Bandwidth: 100 kHz (< 1 GHz) / 1 MHz (> 1 GHz)
- Video Bandwidth: 300 kHz (< 1 GHz) / 3 MHz (> 1 GHz)
- Frequency Span: Zero Span
- Sweep mode: Single Sweep
- Sweep time: > 120 % of the duration of the longest burst detected during the measurement of the RF Output Power
- Sweep Points: Sweep time [µs] / (1 µs) with a maximum of 30 000
- Trigger Mode: Video (burst signals) or Manual (continuous signals)
- Detector: RMS

Step 2:
Set a window where the start and stop indicators match the start and end of the burst with the highest level and record the value of the power measured within this window. If the spurious emission to be measured is a continuous transmission, the measurement window shall be set to match the start and stop times of the sweep.

Step 3:
In case of conducted measurements on smart antenna systems (equipment with multiple transmit chains), step 2 needs to be repeated for each of the active transmit chains (Ach).
Sum the measured power (within the observed window) for each of the active transmit chains.
Step 4:
The measured values shall be compared to the limits defined in tables 1 and 4.

EUT DESCRIPTION:

Mode:	☒802.11b	☒802.11g	☒802.11n HT20	☒802.11n HT40
Test Channel	☒2412MHz ☒2472MHz	☒2412MHz ☒2472MHz	☒2412MHz ☒2472MHz	☒2422MHz ☒2462MHz
Bandwidth	☒20MHz ☐40MHz	☒20MHz ☐40MHz	☒20MHz ☐40MHz	☐20MHz ☒40MHz
Modulation Type	☒DSSS ☐OFDM	☐DSSS ☒OFDM	☐DSSS ☒OFDM	☐DSSS ☒OFDM
Channel Separation	☒5MHz	☒5MHz	☒5MHz	☒5MHz

MEASUREMENT DESCRIPTION

Instrument:	Spectrum Analyzer	
Detector:	Peak for prescan / RMS for emission retest	
Sweep time:	Auto	
Video bandwidth:	Below 1 GHz: 300 kHz / above 3MHz	
Resolution bandwidth:	Below 1 GHz: 100 kHz / above 1MHz	
Trace:	Max hold	
Sweep points:	40001	
Performed:	☒	Conducted
	☐	Radiated (only if no conducted sample is provided)

TEST RESULTS

Pass

Coducted Spurious Emissions

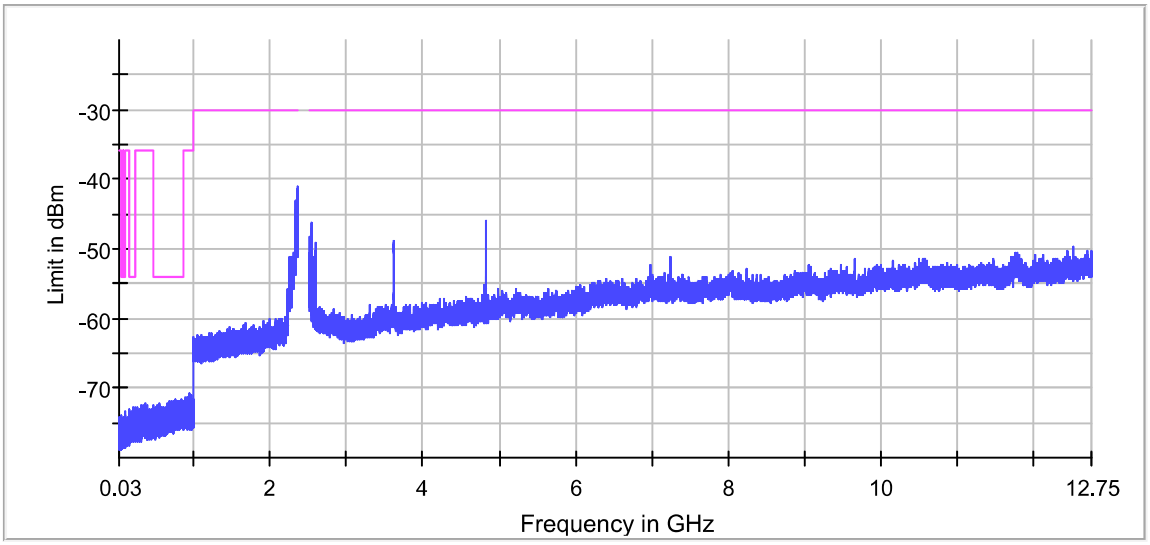
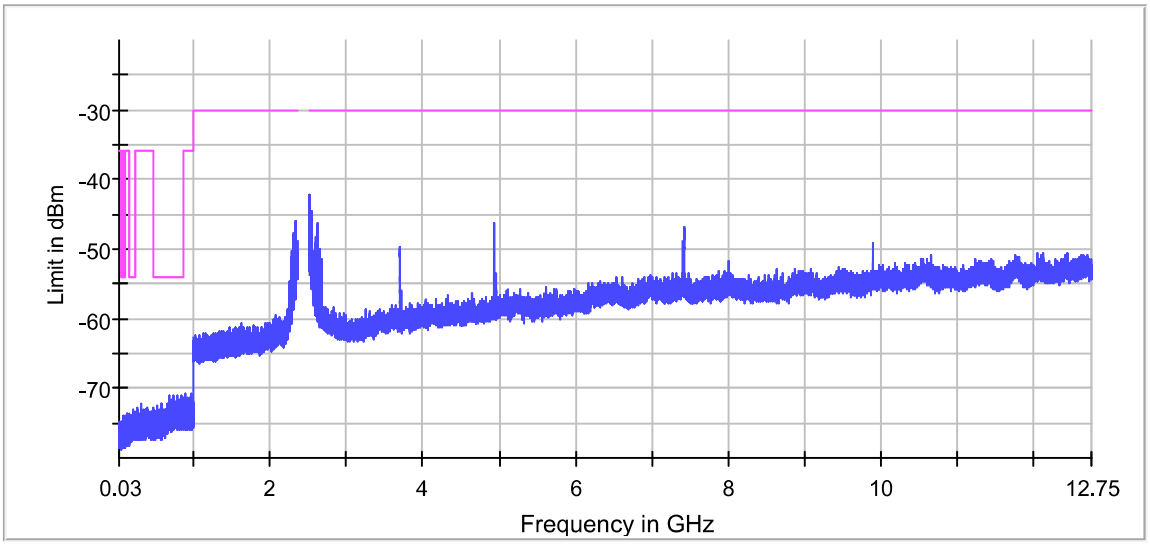
Measured Modulation	☒802.11b	☒802.11g	☒802.11n HT20	☒802.11n HT40

Radioation Spurious Emissions

Measured Modulation	☒802.11b	☒802.11g	☒802.11n HT20	☒802.11n HT40

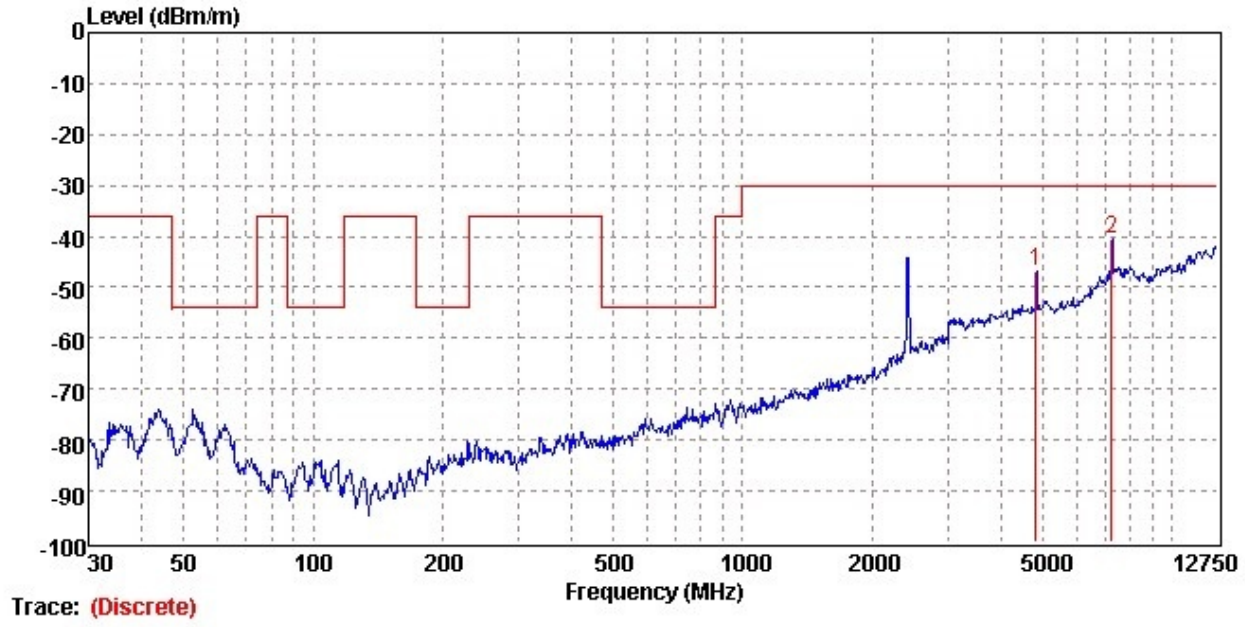
Note:We tested the 11b,11g,11n(20MHz),11n(40MHz) Mode and recorded the worst case at the 11b Mode.

Coducted Spurious Emissions:

802.11b mode
CH01

CH13


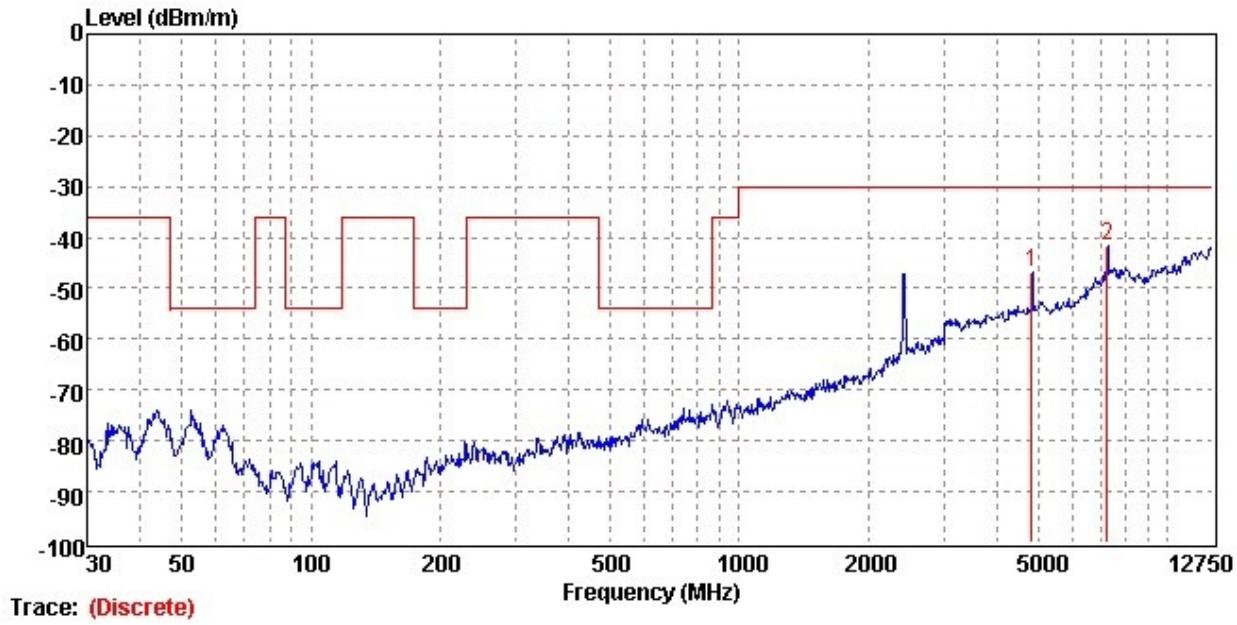
Radioation Spurious Emissions:

11b CH01
Horizontal



Mark	Frequency MHz	Level dBm	Factor dB	Reading dBm	Limit dB	Margin dB	Polarization	Detector
1	4818.24	-46.72	14.24	-60.96	-30.00	16.72	HORIZONTAL	Peak
2	7242.24	-40.69	23.84	-64.53	-30.00	10.69	HORIZONTAL	Peak

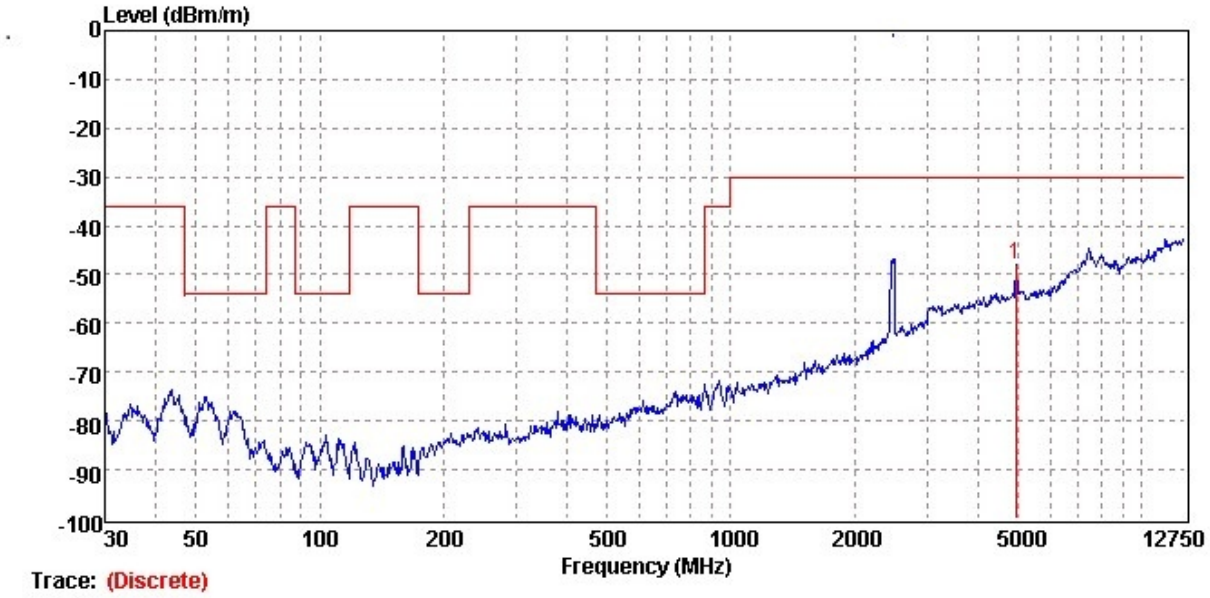
Vertical



Mark	Frequency MHz	Level dBm	Factor dB	Reading dBm	Limit dB	Margin dB	Polarization	Detector
1	4825.23	-46.67	14.27	-60.94	-30.00	16.67	VERTICAL	Peak
2	7242.24	-41.69	23.84	-65.53	-30.00	11.69	VERTICAL	Peak

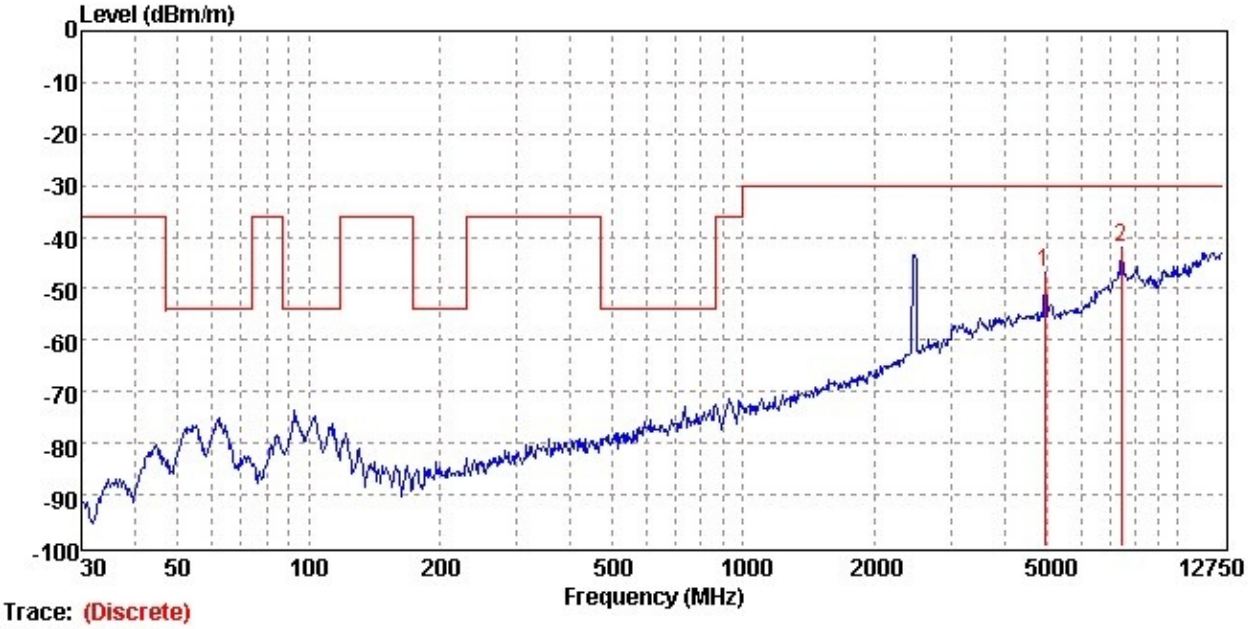
11b CH13

Horizontal



Mark	Frequency MHz	Level dBm	Factor dB	Reading dBm	Limit dB	Margin dB	Polarization	Detector
1	4952.85	-47.79	14.84	-62.63	-30.00	17.79	HORIZONTAL	Peak

Vertical



Mark	Frequency MHz	Level dBm	Factor dB	Reading dBm	Limit dB	Margin dB	Polarization	Detector
1	4938.51	-47.00	14.30	-61.30	-30.00	17.00	VERTICAL	Peak
2	7412.26	-41.96	24.33	-66.29	-30.00	11.96	VERTICAL	Peak

4.1.9. Receiver spurious emissions

LIMIT

ETSI EN 300 328(V2.2.0) Sub-clause 4.3.2.10.3
The spurious emissions of the receiver shall not exceed the values given in table 5.

Table 5: Spurious emission limits for receivers

Frequency range	Maximum power e.r.p. (≤ 1 GHz) e.i.r.p. (> 1 GHz)	Measurement bandwidth
30 MHz to 1 GHz	-57 dBm	100 kHz
1 GHz to 12,75 GHz	-47 dBm	1 MHz

These measurements shall only be performed at normal test conditions.
Testing shall be performed when the equipment is in a receive-only mode.
For systems using wide band modulations other than FHSS, the measurement shall be performed at the lowest and the highest channel on which the equipment can operate. These frequencies shall be recorded.
For systems using FHSS modulation, the measurements may be performed when normal hopping is disabled. In this case measurements need to be performed when operating at the lowest and the highest hopping frequency. These frequencies shall be recorded. When disabling the normal hopping is not possible, the measurement shall be performed during normal operation (hopping).

TEST CONFIGURATION
Refer to chapter 5.4.10 of ETSI EN 300 328 V2.2.0 (2017-11)

TEST PROCEDURE
Refer to chapter 5.4.10 of ETSI EN 300 328 V2.2.0 (2017-11)

EUT DESCRIPTION:

Mode:	☒802.11b	☒802.11g	☒802.11n HT20	☒802.11n HT40
Test Channel	☒2412MHz ☒2472MHz	☒2412MHz ☒2472MHz	☒2412MHz ☒2472MHz	☒2422MHz ☒2462MHz
Bandwidth	☒20MHz ☐40MHz	☒20MHz ☐40MHz	☒20MHz ☐40MHz	☐20MHz ☒40MHz
Modulation Type	☒DSSS ☐OFDM	☐DSSS ☒OFDM	☐DSSS ☒OFDM	☐DSSS ☒OFDM
Channel Separation	☒5MHz	☒5MHz	☒5MHz	☒5MHz

MEASUREMENT DESCRIPTION

Instrument:	Spectrum Analyzer	
Detector:	Peak for prescan / RMS for emission retest	
Sweep time:	Auto	
Video bandwidth:	Below 1 GHz: 300 kHz / above 3MHz	
Resolution bandwidth:	Below 1 GHz: 100 kHz / above 1MHz	
Trace:	Max hold	
Sweep points:	40001	
Performed:	☒	Conducted
	☐	Radiated (only if no conducted sample is provided)

TEST RESULTS
Pass
Coducted Spurious Emissions

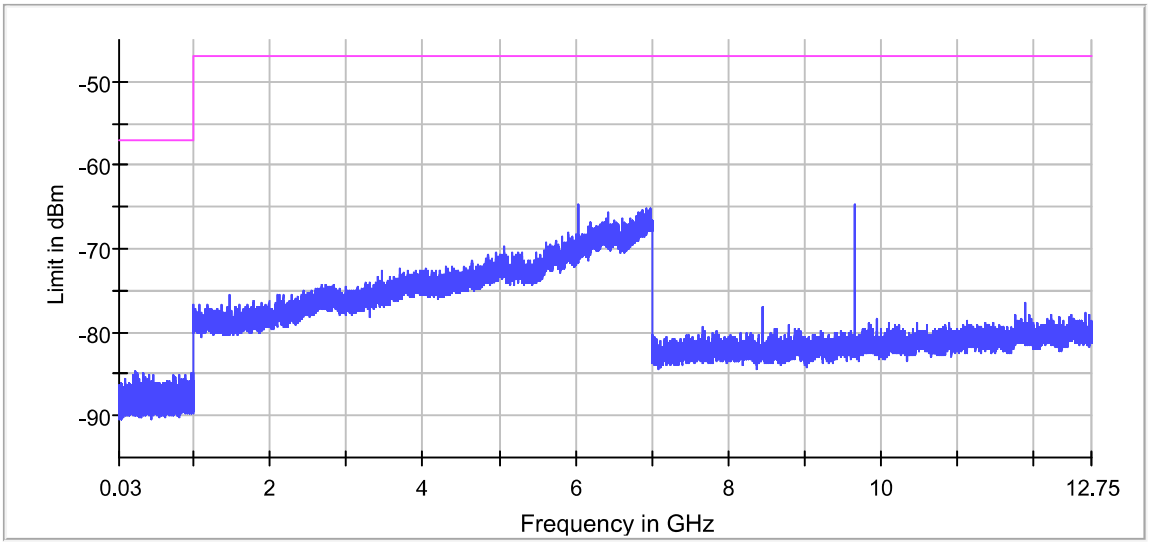
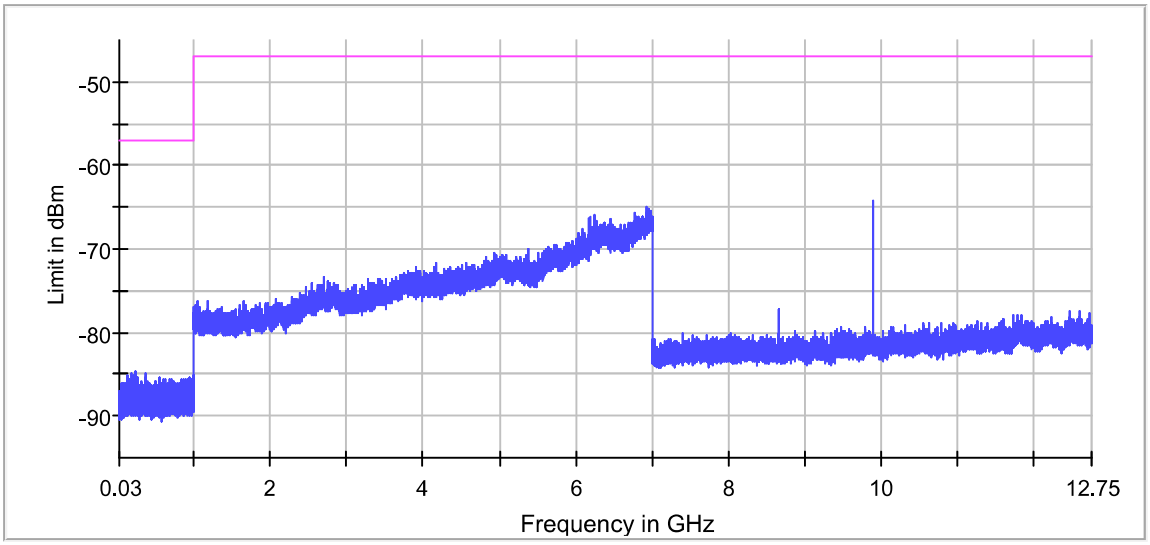
Measured Modulation	☒802.11b	☒802.11g	☒802.11n HT20	☒802.11n HT40

Radioation Spurious Emissions

Measured Modulation	☒802.11b	☒802.11g	☒802.11n HT20	☒802.11n HT40

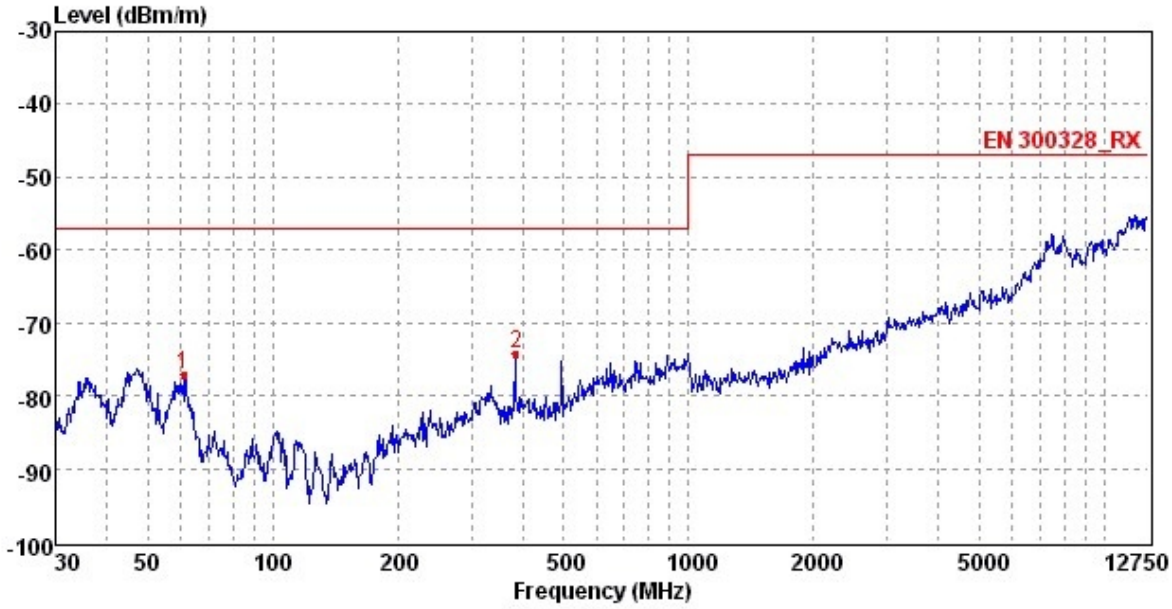
Note:We tested the 11b,11g,11n(20MHz),11n(40MHz) Mode and recorded the worst case at the 11b Mode.

Coducted Spurious Emissions：

802.11b mode
CH01

CH13


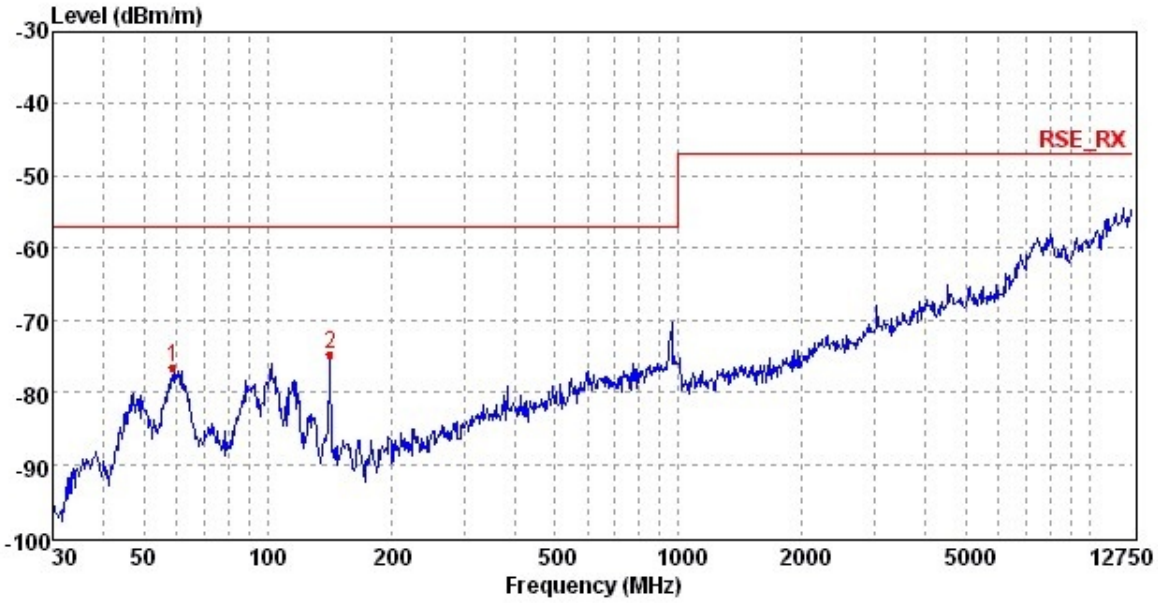
Radioation Spurious Emissions：

11b CH01
Horizontal



Mark	Frequency MHz	Level dBm	Factor dB	Reading dBm	Limit dB	Margin dB	Polarization	Det.
1	61.04	-77.19	-2.58	-74.61	-57.00	20.19	HORIZONTAL	Peak
2	384.01	-74.22	-0.54	-73.68	-57.00	17.22	HORIZONTAL	Peak

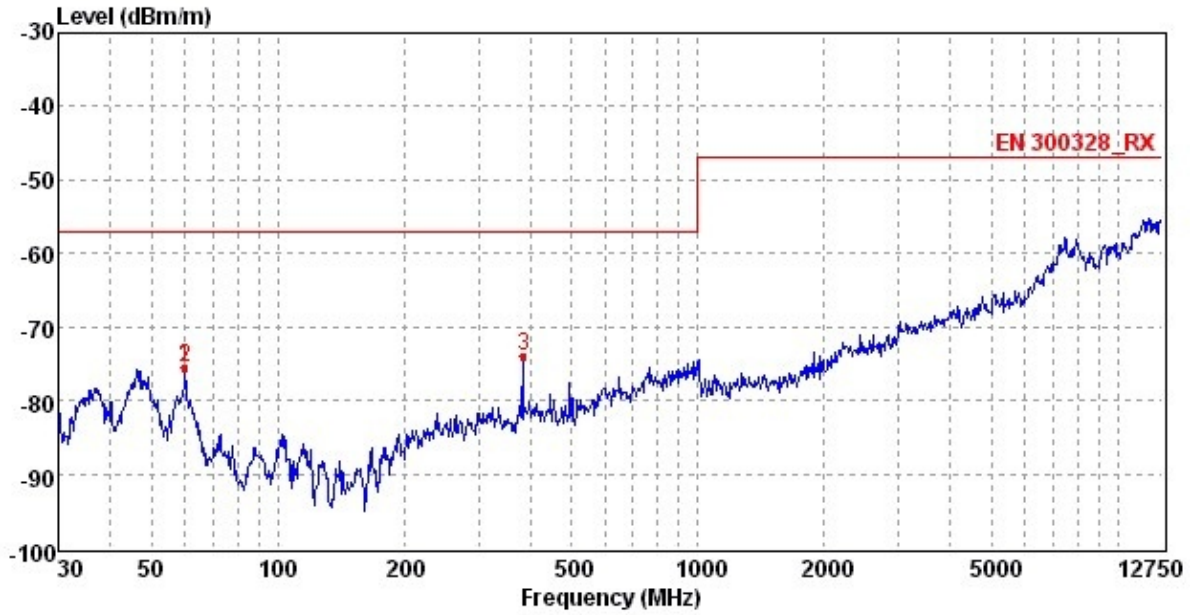
Vertical



Mark	Frequency MHz	Level dBm	Factor dB	Reading dBm	Limit dB	Margin dB	Polarization	Det.
1	58.93	-76.48	-0.80	-75.68	-57.00	19.48	VERTICAL	Peak
2	141.95	-74.77	-6.55	-68.22	-57.00	17.77	VERTICAL	Peak

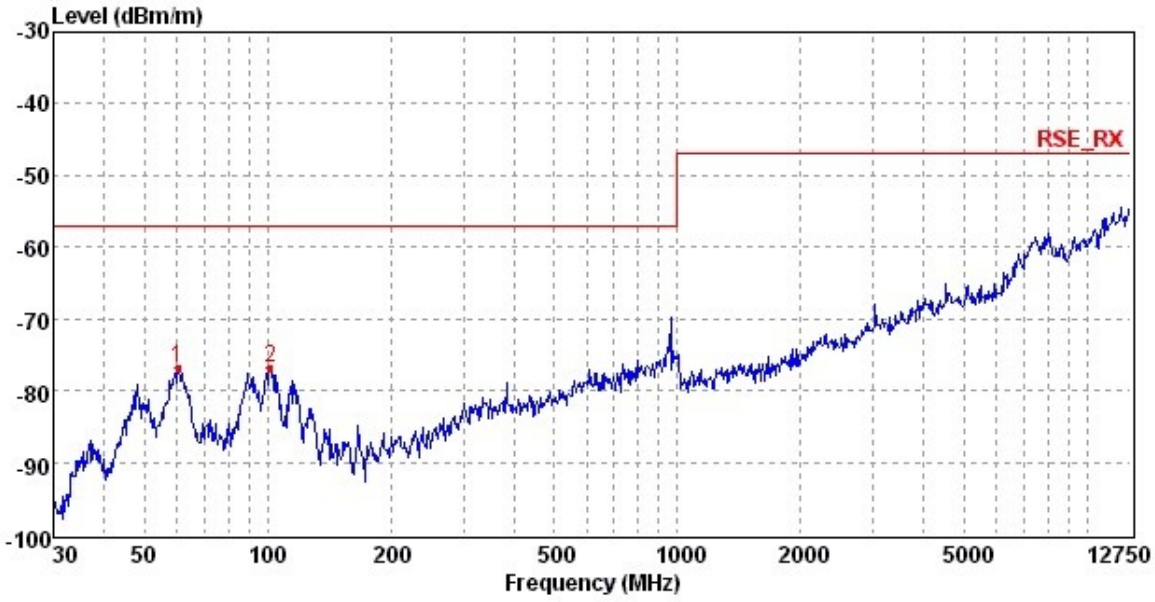
11b CH13

Horizontal



Mark	Frequency MHz	Level dBm	Factor dB	Reading dBm	Limit dB	Margin dB	Polarization	Det.
2	59.98	-75.61	-2.09	-73.52	-57.00	18.61	HORIZONTAL	Peak
3	384.01	-73.88	-0.54	-73.34	-57.00	16.88	HORIZONTAL	Peak

Vertical



Mark	Frequency MHz	Level dBm	Factor dB	Reading dBm	Limit dB	Margin dB	Polarization	Det.
1	60.40	-76.76	-0.83	-75.93	-57.00	19.76	VERTICAL	Peak
2	101.28	-76.95	0.91	-77.86	-57.00	19.95	VERTICAL	Peak

5. Test Setup Photos of the EUT

Reference to the test report No. HTT190102090E-1

6. External and Internal Photos of the EUT

Reference to the test report No. HTT190102090E-1

.....End of Report.....