CTC Laboratories, Inc.

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TEST REPORT

Report No. .....:	**CTC20210068E03**
Applicant .....:	**XonTel Technology Trd. Co. W.L.L**
Address……..:	Kuwait City, Qibla, Aladel Tower, F21, state of Kuwait
Manufacturer.....:	XonTel Technology Trd. Co. W.L.L
Address.....:	Kuwait City, Qibla, Aladel Tower, F21, state of Kuwait
Product Name .....:	**IP Phone**
Trade Mark .....:	XonTel
Model/Type reference.....:	XT-40G
Listed Model(s).....:	N/A
Standard .....:	**ETSI EN 300 328 V2.2.2: 2019-07**
Date of receipt of test sample…:	Mar. 10, 2020
Date of testing……..:	Mar. 11, 2020 to Mar. 24, 2020
Date of issue……....:	Jan. 20, 2021
Result……:	**PASS**

Compiled by: (Printed name+signature)	Terry Su	Terry Su
Supervised by: (Printed name+signature)	Miller Ma	Miller Ma
Approved by: (Printed name+signature)	Walter Chen	Walter Chen

Testing Laboratory Name .....:	**CTC Laboratories, Inc.**
Address.....:	2/F., Building 1 and 1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Longhua District, Shenzhen, Guangdong, China

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1. TEST SUMMARY

1.1. Test Standards

The tests were performed according to following standards:

ETSI EN 300 328 V2.2.2 (2019-07) –Wideband transmission systems; Data transmission equipment operating in the 2.4 GHz ISM band and using wide band modulation techniques; Harmonised Standard for access to radio spectrum

1.2. Report version

Revised No.	Date of issue	Description
01	Jan. 20, 2021	Original

Note: Update applicant, manufacturer, trademark and model name, This report is based on the report of CTC20200268E09.

1.3. Test Description

Radio Spectrum Matter (RSM) Part of Transmitter			
Test Item	**Test require**	**Result**	**Test Engineer**
Maximum transmit power	clause 4.3.2.2	Pass	Rod Lou
Power Spectral Density	clause 4.3.2.3	Pass	Rod Lou
Duty Cycle, Tx-sequence, Tx-gap	clause 4.3.2.4	N/A	N/A
Medium Utilisation (MU) factor	clause 4.3.2.5	N/A	N/A
Adaptivity	clause 4.3.2.6	N/A	N/A
Occupied Channel Bandwidth	clause 4.3.2.7	Pass	Rod Lou
Transmitter unwanted emissions in the out-of-band domain	clause 4.3.2.8	Pass	Rod Lou
Transmitter unwanted emissions in the spurious domain	clause 4.3.2.9	Pass	Rod Lou
Radio Spectrum Matter (RSM) Part of Receiver			
Test Item	**Test require**	**Result**	**Test Engineer**
Receiver spurious emissions	clause 4.3.2.10	Pass	Rod Lou
Receiver Blocking	clause 4.3.2.11	Pass	Rod Lou
Geo-location capability	clause 4.3.2.12	N/A	N/A

Note:

1. The measurement uncertainty is not included in the test result.
2. N/A: means this test item is not applicable for this device according to the technology characteristic of device.

1.4. Test Facility

CTC Laboratories, Inc.

Add: 2/F., Building 1 and 1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Longhua District, Shenzhen, Guangdong, China

Laboratory accreditation

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

CNAS-Lab Code: L5365

CTC Laboratories, Inc. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation.Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories.

A2LA-Lab Cert. No.: 4340.01

CTC Laboratories, Inc. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

Industry Canada (Registration No.: 9783A, CAB Identifier: CN0029)

CTC Laboratories, Inc. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration NO.: 9783A on Jan, 2016.

FCC (Registration No.: 951311, Designation Number CN1208)

CTC Laboratories, Inc. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained inour files. Registration 951311, Aug 26, 2017.

1.5. Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01" Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 2 " and is documented in the CTC Laboratories, Inc. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Below is the best measurement capability for CTC Laboratories, Inc.

Test Items	Measurement Uncertainty	Notes
Maximum transmit power	±1.5dB	(1)
Power Spectral Density	±1.5dB	(1)
Duty Cycle, Tx-sequence, Tx-gap	±5%	(1)
Accumulated Transmit Time, Frequency Occupation and Hopping Sequence	±5%	(1)
Hopping Frequency Separation	±5%	(1)
Medium Utilisation (MU) factor	±5%	(1)
Adaptively	±5%	(1)
Occupied Channel Bandwidth	±5%	(1)
Transmitter unwanted emissions in the out-of-band domain	±2.8dB	(1)
Transmitter unwanted emissions in the spurious domain	±2.8dB	(1)
Receiver spurious emissions	±2.8dB	(1)
Receiver Blocking	±2.8dB	(1)

Note(1): This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

1.6. Environmental conditions

Normal Condition	Temperature	25 °C
	Relative humidity	55 %
	Voltage	The equipment shall be the nominal voltage for which the equipment was designed.
Extreme Condition	Temperature	Measurements shall be made over the extremes of the operating temperature range as declared by the manufacturer
	Voltage	Measurements shall be made over the extremes of the operating temperature range as declared by the manufacturer

Normal Condition	T_N=Normal Temperature	25 °C
Extreme Condition	T_L=Lower Temperature	-20 °C
	T_H=Higher Temperature	55 °C

2. GENERAL INFORMATION

2.1. Client Information

Applicant:	XonTel Technology Trd. Co. W.L.L
Address:	Kuwait City, Qibla, Aladel Tower, F21, state of Kuwait
Manufacturer:	XonTel Technology Trd. Co. W.L.L
Address:	Kuwait City, Qibla, Aladel Tower, F21, state of Kuwait

2.2. General Description of EUT

Product Name:	IP Phone
Trade Mark:	XonTel
Model/Type reference:	XT-40G
Listed Model(s):	N/A
Power supply:	5Vdc/2A from AC/DC Adapter Supplied from POE
Adapter 1 Model:	F12W8-050200SPAV Input: AC100-240V 50/60Hz 0.3A Output:5V/2A
Adapter 2 Model:	F12W8-050200SPAB Input: AC100-240V 50/60Hz 0.3A Output:5V/2A
Hardware version:	N/A
Software version:	N/A
Antenna type:	FPC Antenna
Antenna gain:	2.2dBi
Technical index for Bluetooth	
Supported type:	Bluetooth 4.2/BLE
Modulation:	GFSK
Operation frequency:	2402MHz~2480MHz
Channel number:	40
Channel separation:	2MHz
Test frequency:	CH00: 2402MHz CH19: 2440MHz CH39: 2480MHz
Modulation:	☐ FHSS ☒ Other forms of modulation GFSK
Type of Equipment:	☒ Stand-alone ☐ Combined Equipment ☐ Plug-in radio device ☐ Other
Adaptive / non-adaptive equipment:	☐ non-adaptive Equipment ☒ adaptive Equipment without the possibility to switch to a non-adaptive mode ☐ adaptive Equipment which can also operate in a non-adaptive mode

Receiver categories:	☐ Adaptive equipment with a maximum RF output power greater than 10 dBm e.i.r.p. shall be considered as receiver category 1 equipment.
	☒ Non-adaptive equipment with a Medium Utilization (MU) factor greater than 1 % and less than or equal to 10 % or adaptive equipment with a maximum RF output power of 10 dBm e.i.r.p. shall be considered as receiver category 2 equipment.
	☐ Non-adaptive equipment with a maximum Medium Utilization (MU) factor of 1 % or adaptive equipment with a maximum RF output power of 0 dBm e.i.r.p. shall be considered as receiver category 3 equipment.
Operating mode:	☒ Single Antenna Equipment ☒ Equipment with only 1 antenna ☐ Equipment with 2 diversity antennas but only 1 antenna active at any moment in time ☐ Smart Antenna Systems with 2 or more antennas, but operating in a (legacy) mode where only 1antenna is used.
	☐ Smart Antenna Systems - Multiple Antennas without beam forming ☐ Single spatial stream / Standard throughput ☐ High Throughput (> 1 spatial stream) using Occupied Channel Bandwidth 1 ☐ High Throughput (> 1 spatial stream) using Occupied Channel Bandwidth 2
	☐ Smart Antenna Systems - Multiple Antennas with beam forming ☐ Single spatial stream / Standard throughput ☐ High Throughput (> 1 spatial stream) using Occupied Channel Bandwidth 1 ☐ High Throughput (> 1 spatial stream) using Occupied Channel Bandwidth 2
Antenna type:	☒ Internal Antenna ☐ Temporary RF connector provided ☒ No temporary RF connector provided
	☐ Dedicated Antennas (equipment with antenna connector) ☐ Single power level with corresponding antenna(s) ☐ Multiple power settings and corresponding antenna(s) Number of different Power Levels: ..... Power Level 1: ..... dBm Power Level 2: ..... dBm Power Level 3: ..... dBm
Information is provided by the supplier	
☐In case of FHSS modulation:	☐ In case of non-Adaptive Frequency Hopping equipment: The number of Hopping Frequencies: …….. ☐ In case of Adaptive Frequency Hopping Equipment: The maximum number of Hopping Frequencies: …….. The minimum number of Hopping Frequencies: ……..

	The Dwell Time: ……..
	The Minimum Channel Occupation Time: ……..
☒In case of adaptive equipment:	The Channel Occupancy Time implemented by the equipment:../.. ms
	☒ The equipment has implemented an LBT based DAA mechanism In case of equipment using modulation different from FHSS: ☐ The equipment is Frame Based equipment ☒ The equipment is Load Based equipment ☐ The equipment can switch dynamically between Frame Based and Load Based equipment The CCA time implemented by the equipment: .... µs
	☐ The equipment has implemented an non-LBT based DAA mechanism
	☐ The equipment can operate in more than one adaptive mode
☐In case of non-adaptive Equipment	The maximum RF Output Power (e.i.r.p.): ……. dBm The maximum (corresponding) Duty Cycle: ……. %

2.3. Measurement Instruments List

Tonscend JS0806-2 Test system						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated until
1	Spectrum Analyzer	Rohde & Schwarz	FSU26	100105	Dec. 28, 2019	Dec. 27, 2020
2	Spectrum Analyzer	Rohde & Schwarz	FUV40-N	101331	Mar. 16, 2020	Mar. 15, 2021
3	MXG Vector Signal Generator	Agilent	N5182A	MY47420864	Dec. 28, 2019	Dec. 27, 2020
4	Signal Generator	Agilent	E8257D	MY46521908	Dec. 28, 2019	Dec. 27, 2020
5	Power Sensor	Agilent	U2021XA	MY5365004	Dec. 28, 2019	Dec. 27, 2020
6	Power Sensor	Agilent	U2021XA	MY5365006	Dec. 28, 2019	Dec. 27, 2020
7	Simultaneous Sampling DAQ	Agilent	U2531A	TW54493510	Dec. 28, 2019	Dec. 27, 2020
8	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	116410	Dec. 28, 2019	Dec. 27, 2020
9	Climate Chamber	ESPEC	MT3065	/	Dec. 28, 2019	Dec. 27, 2020
10	300328 V2.2.2 test system	TONSCEND	v2.6	/	/	/

Transmitter spurious emissions & Receiver spurious emissions						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated until
1	EMI Test Receiver	Rohde & Schwarz	ESCI	100658	Dec. 28, 2019	Dec. 27, 2020
2	High pass filter	micro-tranics	HPM50111	142	Dec. 28, 2019	Dec. 27, 2020
3	Log-Bicon Antenna	Schwarzbeck	CBL6141A	4180	Dec. 28, 2019	Dec. 27, 2020
4	Ultra-Broadband Antenna	ShwarzBeck	BBHA9170	25841	Dec. 28, 2019	Dec. 27, 2020
5	Loop Antenna	LAPLAC	RF300	9138	Dec. 28, 2019	Dec. 27, 2020
6	Spectrum Analyzer	Rohde & Schwarz	FSU26	100105	Dec. 28, 2019	Dec. 27, 2020
7	Horn Antenna	Schwarzbeck	BBHA 9120D	647	Dec. 28, 2019	Dec. 27, 2020
8	Pre-Amplifier	HP	8447D	1937A03050	Dec. 28, 2019	Dec. 27, 2020
9	Pre-Amplifier	EMCI	EMC051835	980075	Dec. 28, 2019	Dec. 27, 2020
10	Antenna Mast	UC	UC3000	N/A	N/A	N/A
11	Turn Table	UC	UC3000	N/A	N/A	N/A
12	Cable Below 1GHz	Schwarzbeck	AK9515E	33155	Dec. 28, 2019	Dec. 27, 2020
13	Cable Above 1GHz	Hubersuhner	SUCOFLEX102	DA1580	Dec. 28, 2019	Dec. 27, 2020

Note: The cable loss has calculated in test result which connection between each test instruments.

3. TEST ITEM AND RESULTS

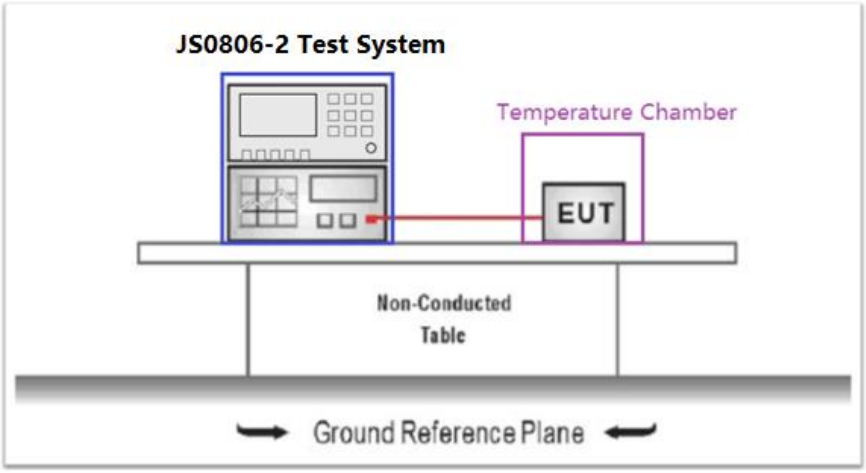
3.1. RF Output Power

Limit

ETSI EN 300 328 V2.2.2 Sub-clause 4.3.2.2.3

1. For adaptive equipment using wide band modulations other than FHSS, the maximum RF output power shall be 20 dBm.
2. The maximum RF output power for non-adaptive equipment shall be declared by the supplier and shall not exceed 20 dBm. 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 supplier.

Test Configuration



Test Procedure

Please refer to ETSI EN 300 328 Sub-clause 5.4.2.2.1 for the measurement method.

Test Results

Test conditions Temperature (°C)	Channel	EIRP (dBm)	Limit (dBm)	Result
T_N	CH00	8.94	20.00	Pass
	CH19	8.05		
	CH39	6.95		
T_L	CH00	8.81		
	CH19	7.95		
	CH39	6.84		
T_H	CH00	8.87		
	CH19	7.93		
	CH39	6.79		

Note:

1) Test bursts: 16.

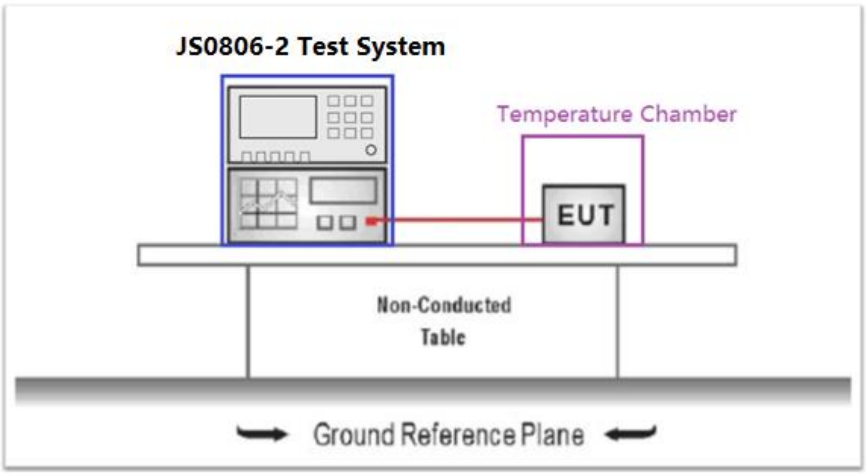
2) Measured Power (EIRP) include the cable loss and antenna gain.

3.2. Power Spectral Density

Limit

ETSI EN 300 328 V2.2.2 Sub-clause 4.3.2.3.3
For equipment using wide band modulations other than FHSS, the maximum Power Spectral Density is limited to10 dBm per MHz.

Test Configuration



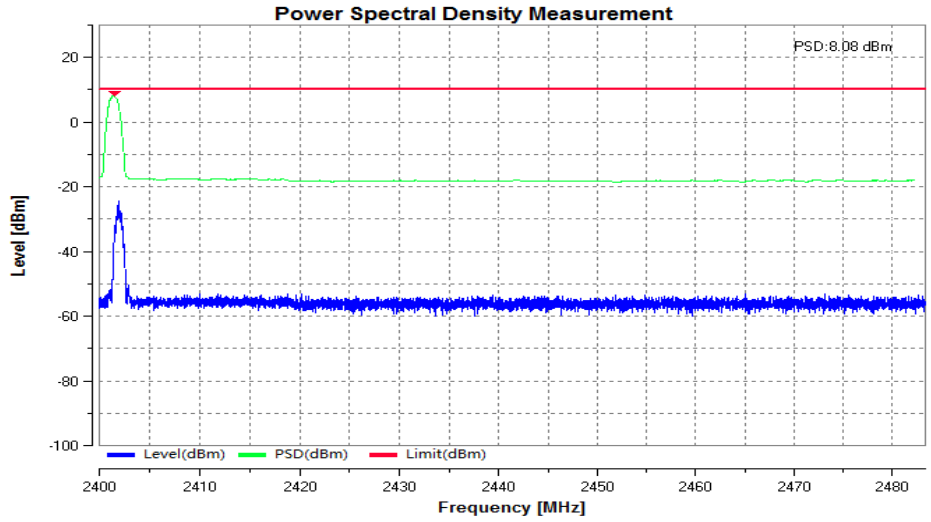
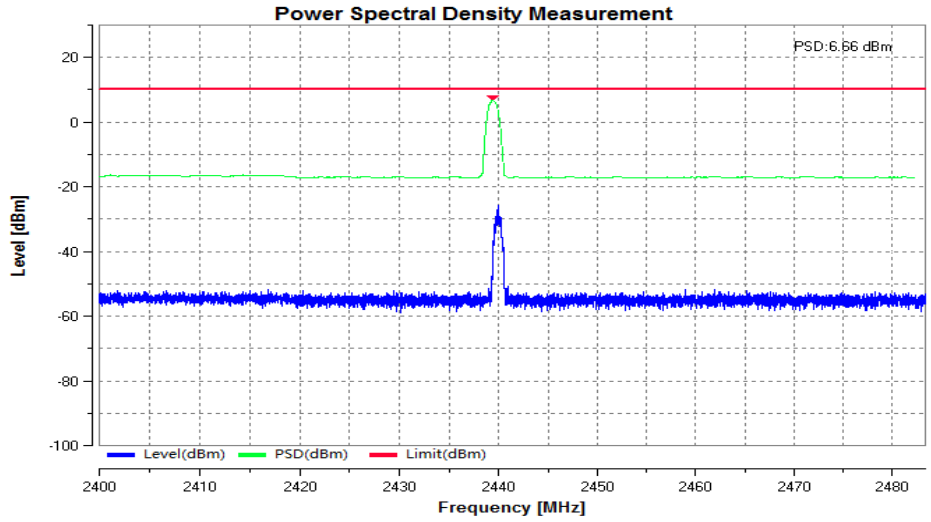
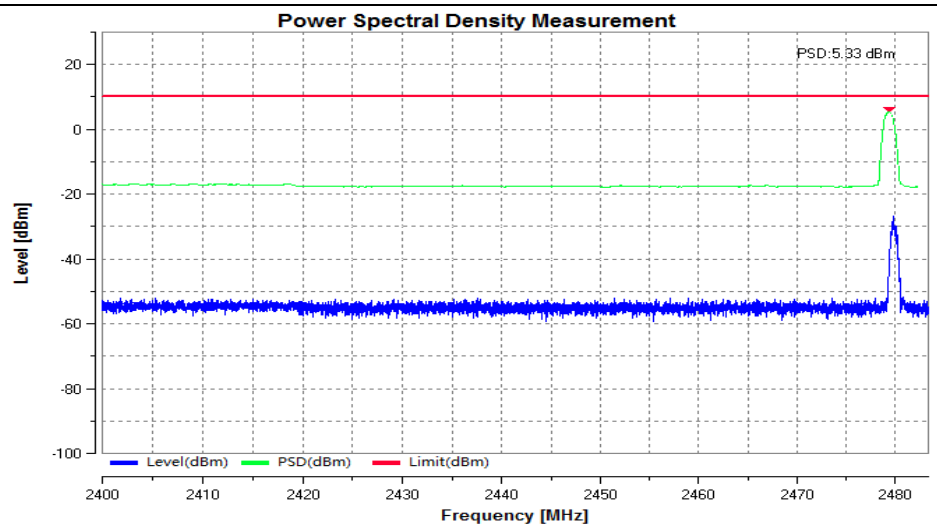
Test Procedure

Please refer to ETSI EN 300 328 Sub-clause 5.4.3.2.1 for the measurement method.

Test Result

Channel	Power Spectral Density (dBm/MHz)	Limit (dBm/MHz)	Result
CH00	8.08	10.00	Pass
CH19	6.66		
CH39	5.33		

Note: Measured level include the cable loss and antenna gain.

CH00	
CH19	
CH39	

3.3. Duty Cycle, Tx-sequence, Tx-gap

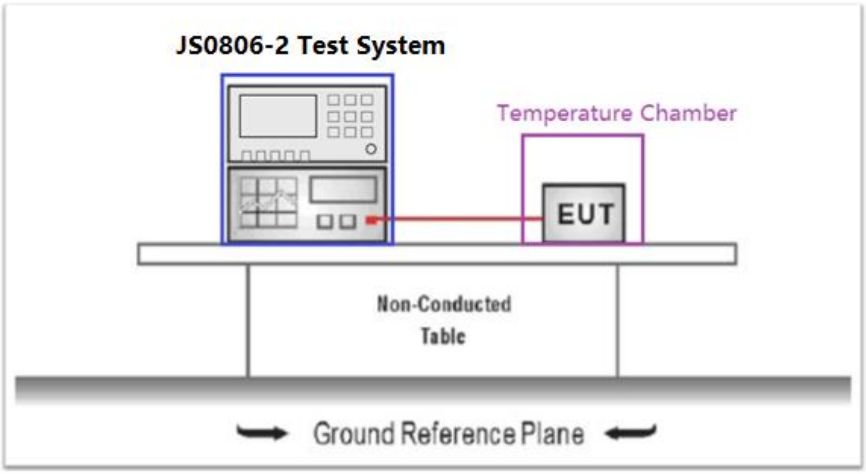
Limit

ETSI EN 300 328 V2.2.2 Sub-clause 4.3.1.3.3 & 4.3.2.4.3

1. For non-adaptive FHSS equipment, the Duty Cycle shall be equal to or less than the maximum value declared by the supplier. In addition, the maximum Tx -sequence time shall be 5 ms while the minimum Tx-gap time shall be 5 ms.
2. For equipment using wide band modulations other than FHSS, the Duty Cycle shall be equal to or less than the maximum value declared by the supplier.

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.

Test Configuration



Test Procedure

Please refer to ETSI EN 300 328 Sub-clause 5.4.2.2.1.3 for the measurement method.

Test Results

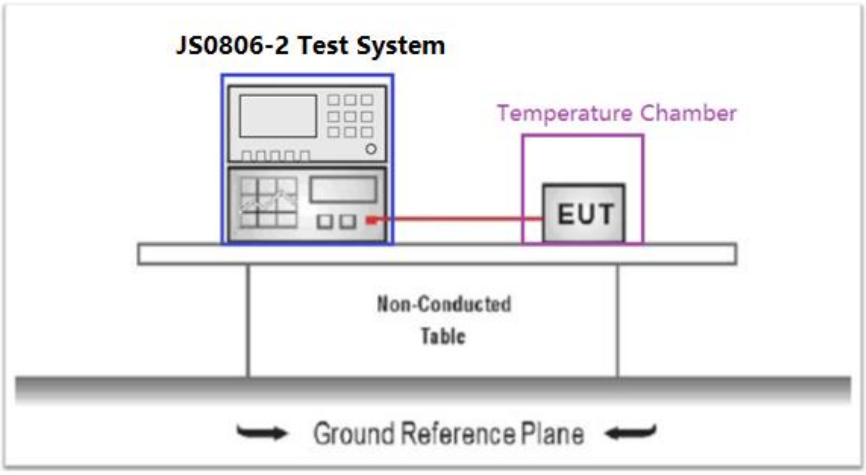
Not applicable to this device which was adaptive equipment and cannot operate in a non-adaptive mode

3.4. Medium Utilisation (MU) factor

Limit

ETSI EN 300 328 V2.2.2 Sub-clause 4.3.1.6.3&4.3.2.5.3
The maximum Medium Utilisation factor for non-adaptive equipment shall be 10 %.

Test Configuration



Test Procedure

Please refer to ETSI EN 300 328 Sub-clause 5.4.2.2.1.4 for the measurement method.

Test Results

Not applicable to this device which cannot operation in a non-adaptive mode.

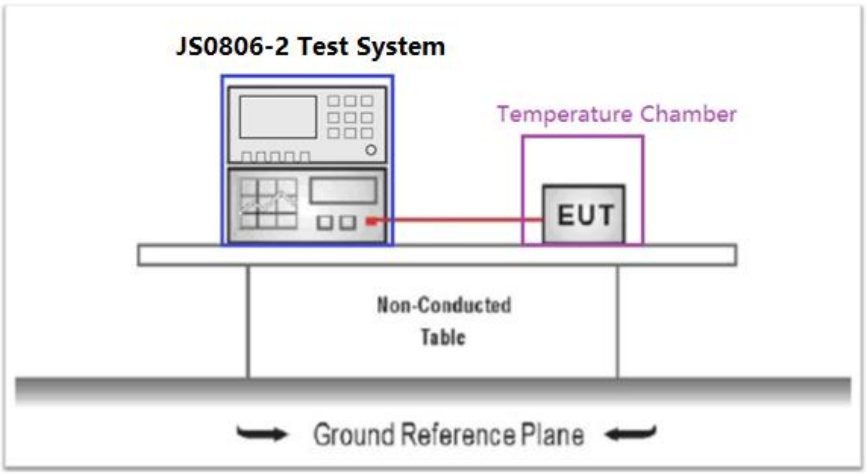
3.5. Occupied Channel Bandwidth

Limit

ETSI EN 300 328 V2.2.2 Sub-clause 4.3.2.7.3

1. The Occupied Channel Bandwidth shall fall completely within the band given in the band 2,4 GHz to 2,4835 GHz.
2. In addition, for non-adaptive equipment using wide band modulations other than FHSS and with e.i.r.p greater than10 dBm, the occupied channel bandwidth shall be less than 20 MHz.

Test Configuration

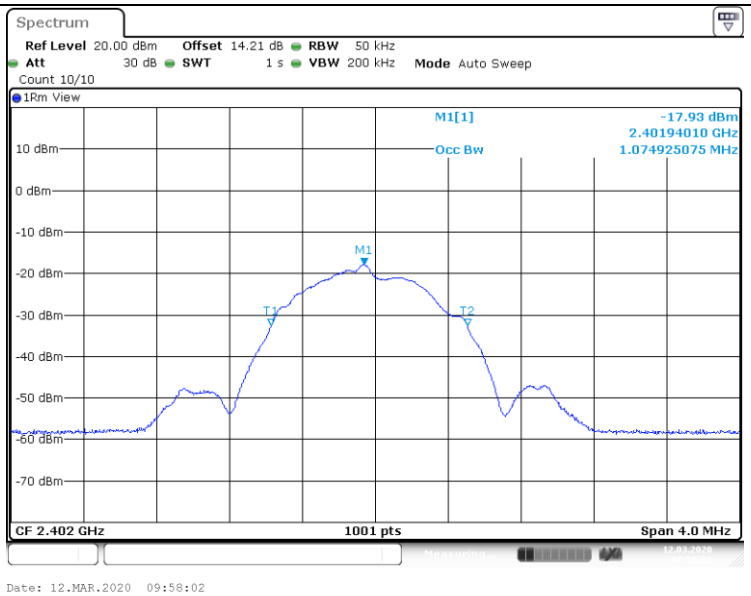
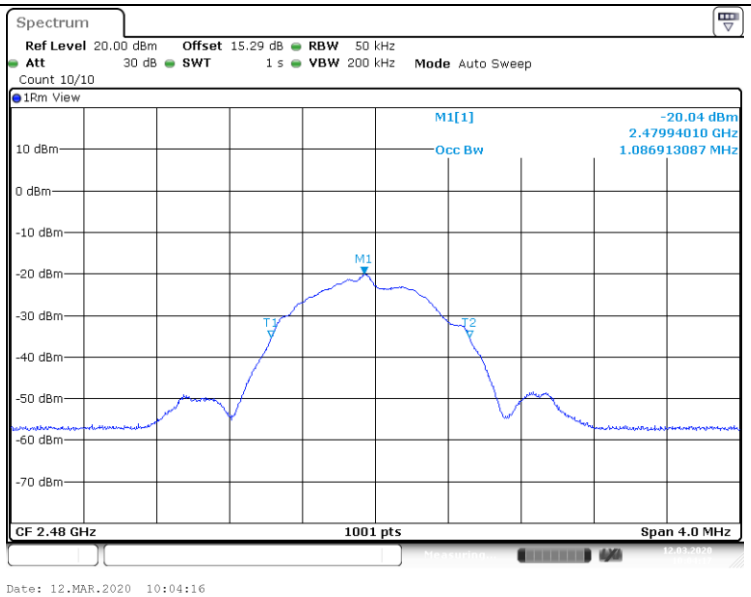


Test Procedure

Please refer to ETSI EN 300 328 Sub-clause 5.4.7.2.1 for the measurement method.

Test Result

Channel	99 % Bandwidth (MHz)	Measured Frequency (MHz)		Limit (MHz)	Result
		F_{lower}	F_{higher}		
CH00	1.075	2401.43	2402.50	2400.00~2483.50	Pass
CH39	1.087	2479.43	2480.52		

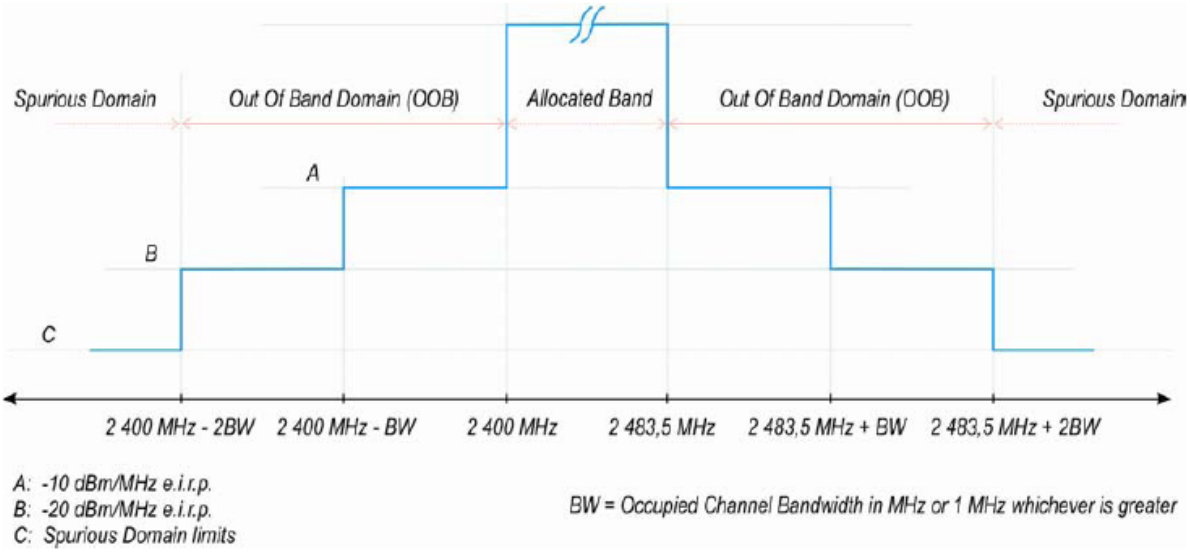
CH00	 Spectrum Ref Level 20.00 dBm Offset 14.21 dB RBW 50 kHz Att 30 dB SWT 1 s VBW 200 kHz Mode Auto Sweep Count 10/10 1Rm View M1[1] -17.93 dBm 2.40194010 GHz Occ Bw 1.074925075 MHz 10 dBm 0 dBm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm -60 dBm -70 dBm M1 T1 T2 CF 2.402 GHz 1001 pts Span 4.0 MHz Date: 12.MAR.2020 09:58:02
CH39	 Spectrum Ref Level 20.00 dBm Offset 15.29 dB RBW 50 kHz Att 30 dB SWT 1 s VBW 200 kHz Mode Auto Sweep Count 10/10 1Rm View M1[1] -20.04 dBm 2.47994010 GHz Occ Bw 1.086913087 MHz 10 dBm 0 dBm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm -60 dBm -70 dBm M1 T1 T2 CF 2.48 GHz 1001 pts Span 4.0 MHz Date: 12.MAR.2020 10:04:16

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

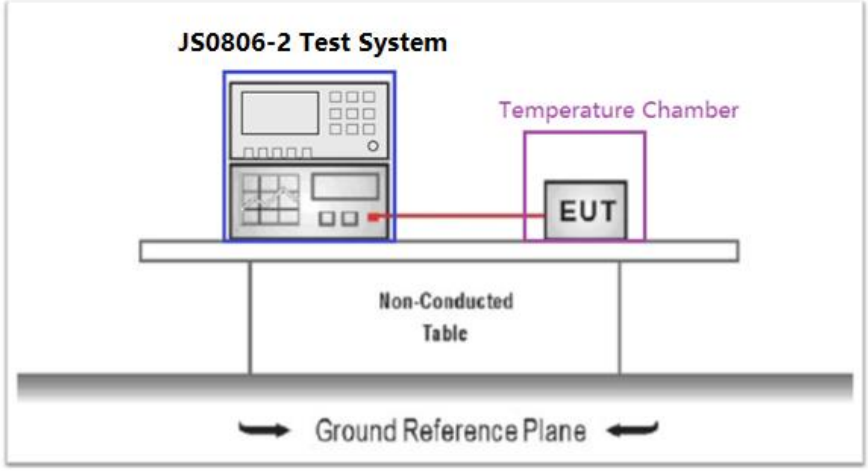
Limit

ETSI EN 300 328 V2.2.2 Sub-clause 4.3.1.9.3&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.



Test Configuration



Test Procedure

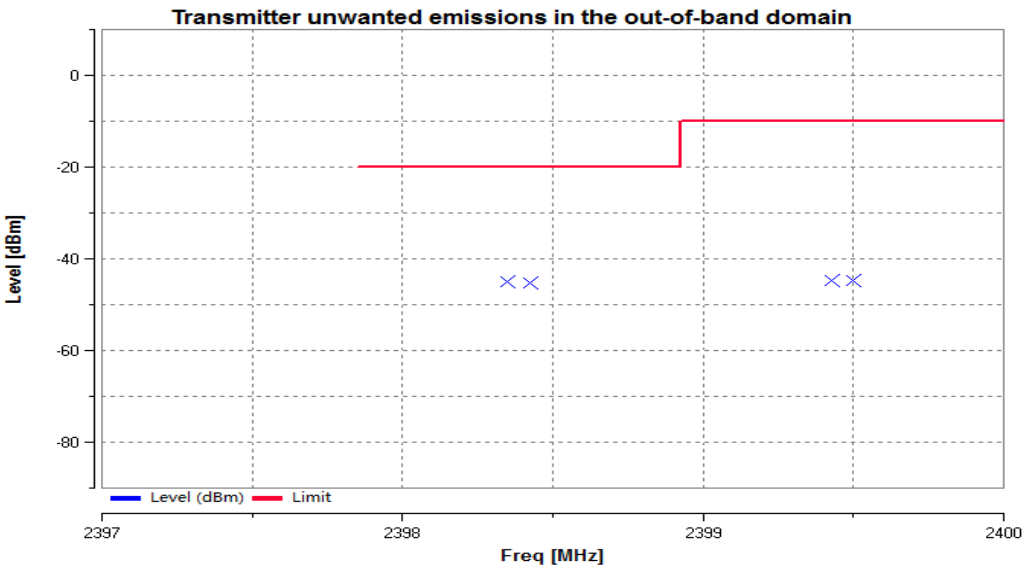
Please refer to ETSI EN 300 328 Sub-clause 5.4.8.2.1 for the measurement method.

Test Result

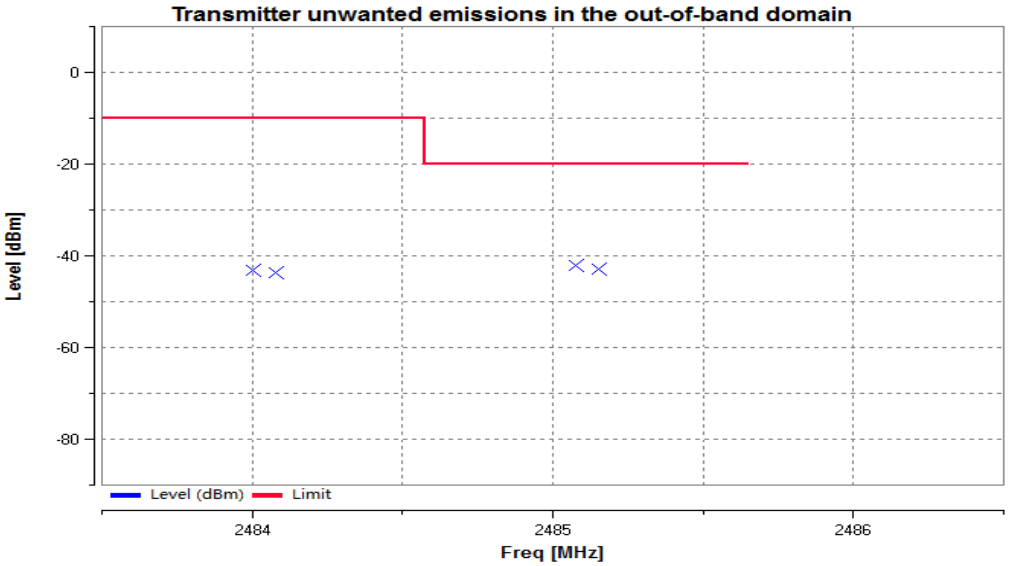
Remark: The datum recorded below represents the worst emission level in each segment and the plot for normal condition.

Frequency range (MHz)		Level (dBm)	Limit (dBm)	Result
Start	Stop			
2400-2OBW	2400-OBW	-45.04	<-20.00	Pass
2400-OBW	2400	-44.64	<-10.00	Pass
2483.5	2483.5+OBW	-43.21	<-10.00	Pass
2483.5+OBW	2483.5+2OBW	-42.19	<-20.00	Pass

Test plot as follows:



CH00



CH39

3.7. Transmitter unwanted emissions in the spurious domain-Conducted measurements

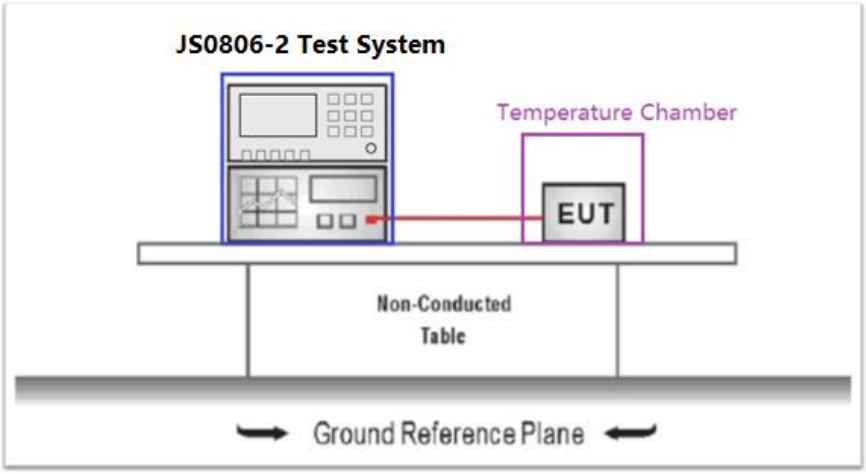
Limit

ETSI EN 300 328 V2.2.2 Sub-clause 4.3.2.9.3

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

Frequency range	Maximum power	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 694 MHz	-54 dBm	100 kHz
694 MHz to 1 GHz	-36 dBm	100 kHz
1 GHz to 12,75 GHz	-30 dBm	1 MHz

Test Configuration

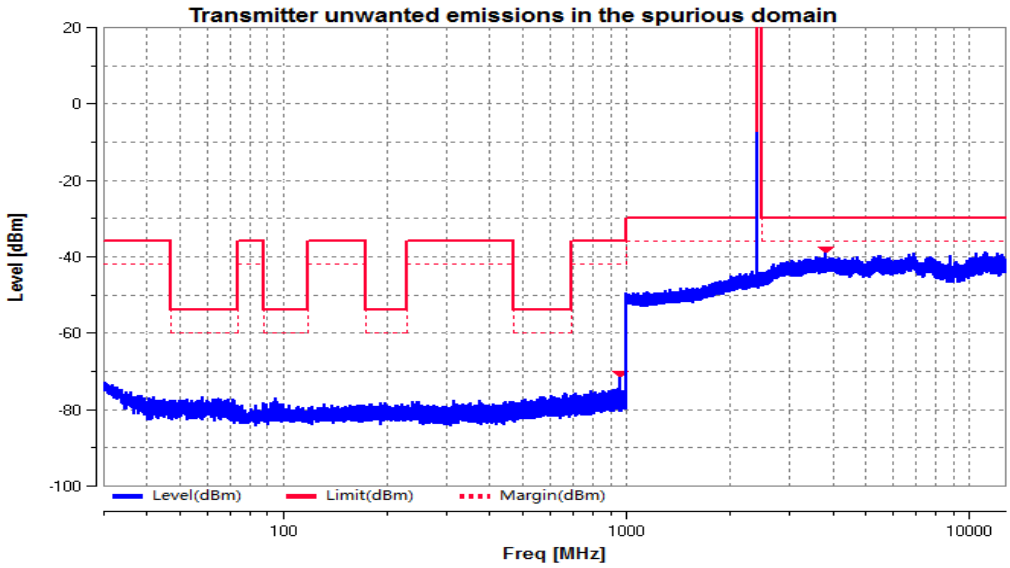


Test Procedure

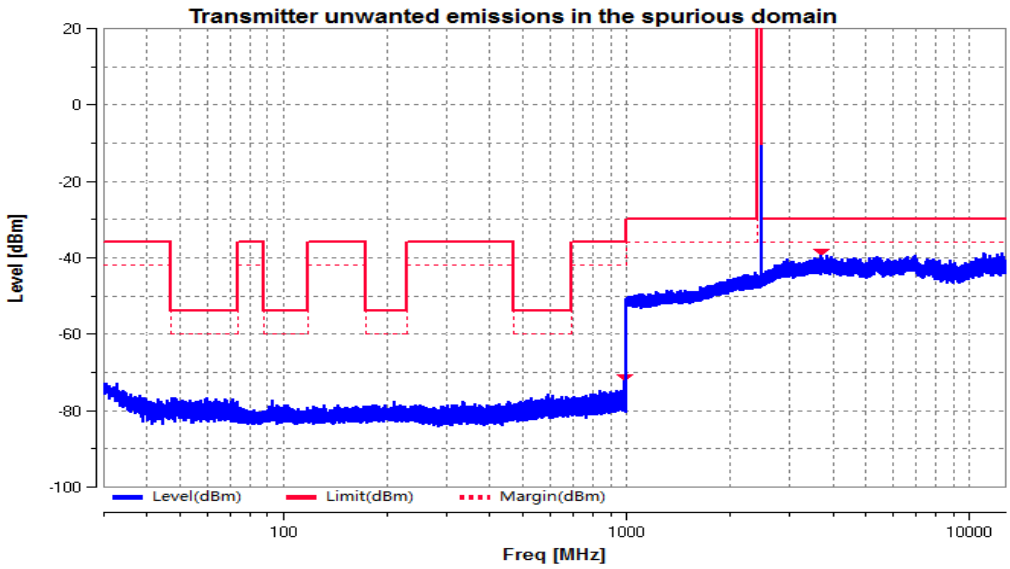
Please refer to ETSI EN 300 328 Sub-clause 5.4.9.2.1 for the measurement method.

Test Result

Test channel:	CH00



Test channel:	CH39



3.8. Transmitter unwanted emissions in the spurious domain-Radiated measurements

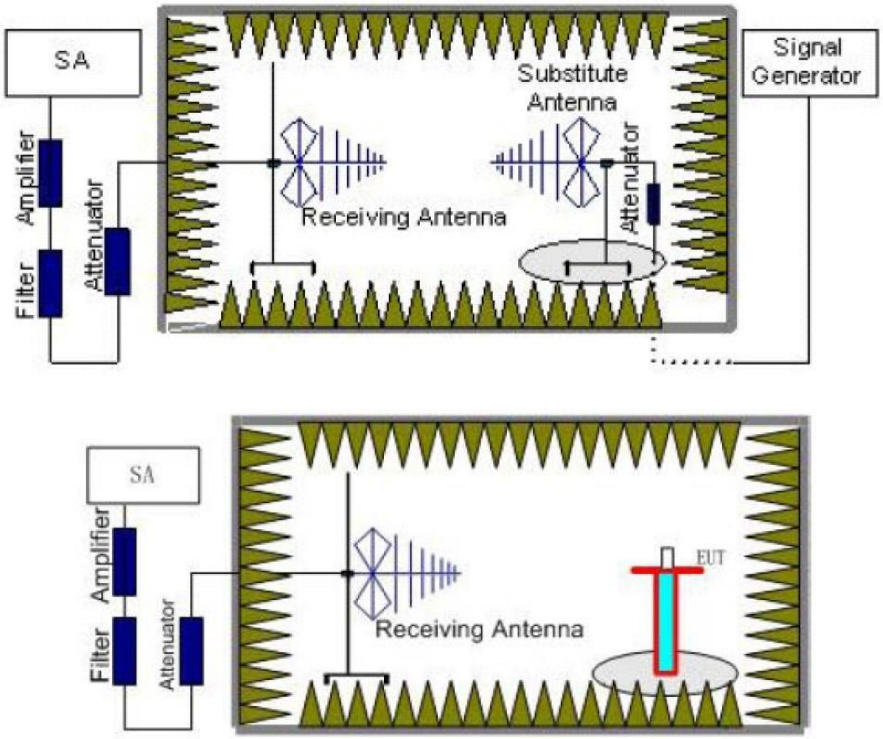
Limit

ETSI EN 300 328 V2.2.2 Sub-clause 4.3.2.9.3

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

Frequency range	Maximum power	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 694 MHz	-54 dBm	100 kHz
694 MHz to 1 GHz	-36 dBm	100 kHz
1 GHz to 12,75 GHz	-30 dBm	1 MHz

Test Configuration



Test Procedure

Please refer to ETSI EN 300 328 Sub-clause 5.4.9.2.2 for the measurement method.

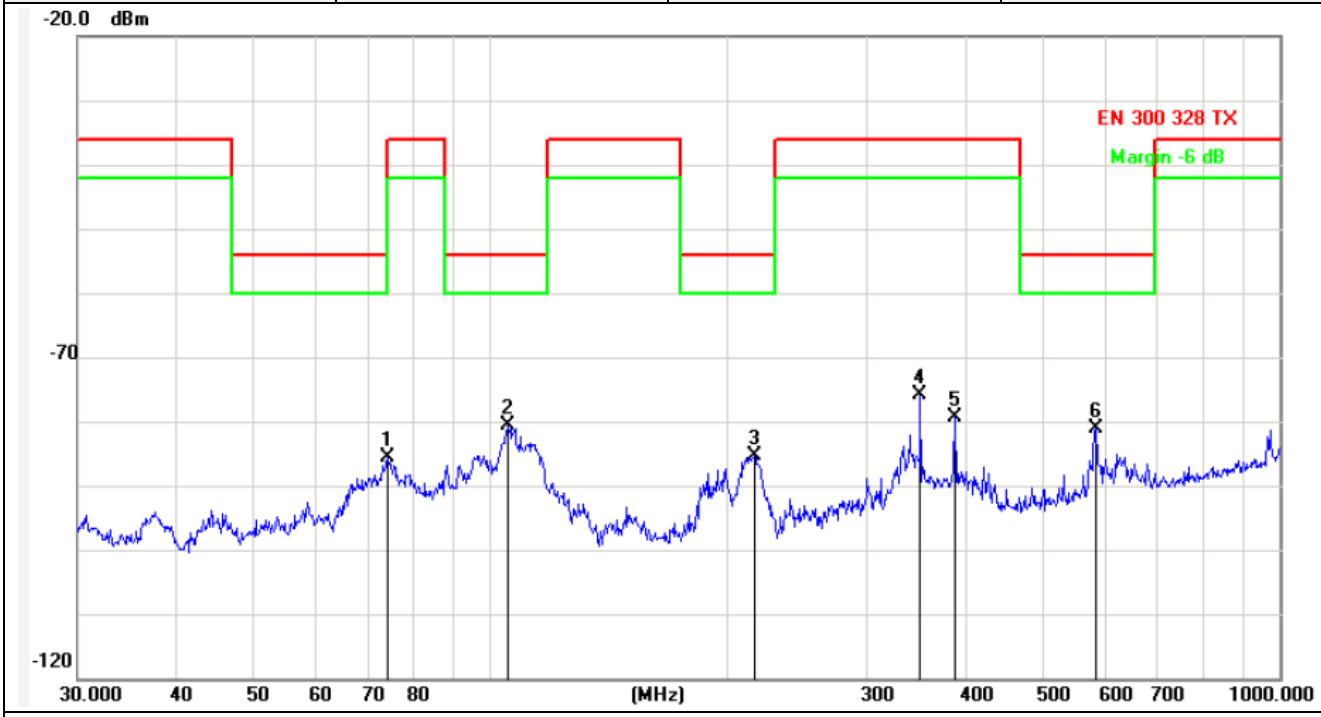
Test Result

Note:

1. By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that “Z axis” position was the worst, and test data recorded in this report.

(1) Below 1G

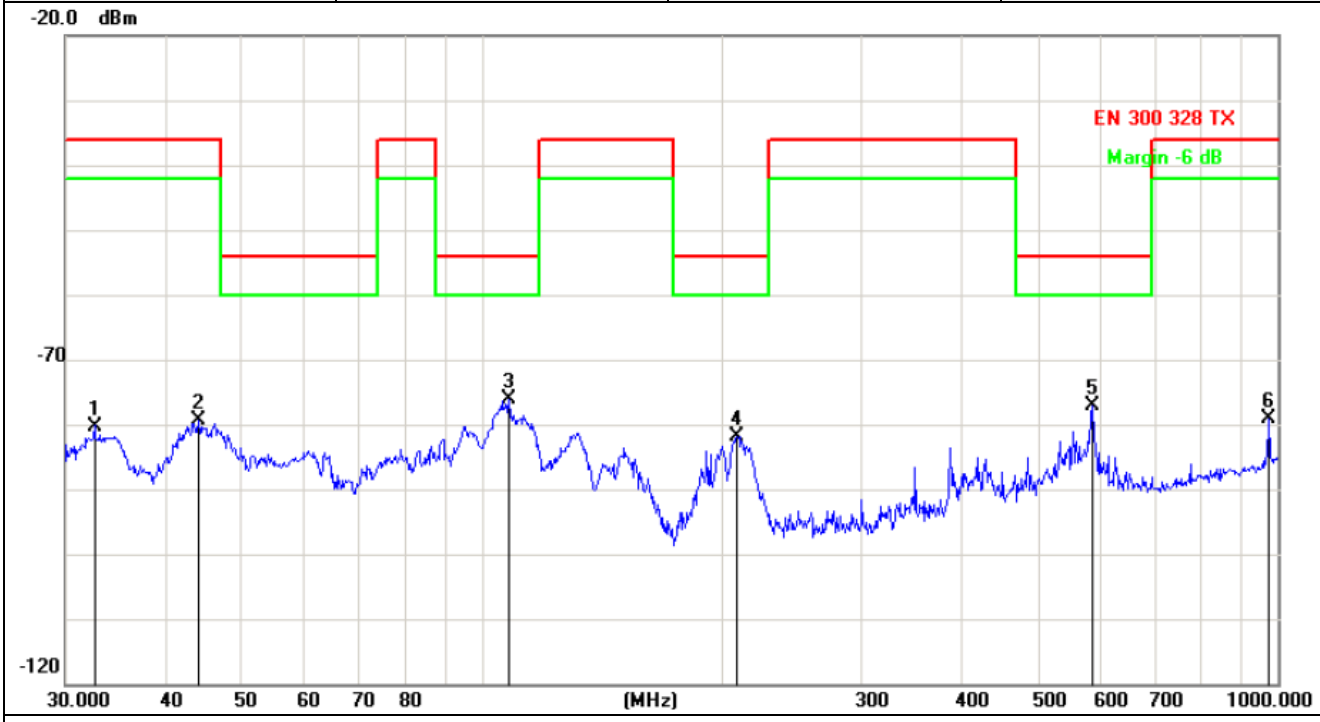
Test Channel:	CH00	Polarity:	Horizontal



No.	Frequency (MHz)	Factor (dB)	Reading (dBm)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector
1	74.1351	-21.04	-64.65	-85.69	-36.00	-49.69	peak
2	105.2718	-20.53	-60.21	-80.74	-54.00	-26.74	peak
3	216.0240	-20.32	-65.14	-85.46	-54.00	-31.46	peak
4	350.4768	-16.71	-59.23	-75.94	-36.00	-39.94	peak
5	387.9920	-16.02	-63.29	-79.31	-36.00	-43.31	peak
6	584.7895	-12.50	-68.72	-81.22	-54.00	-27.22	peak

Remarks:
1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
2.Margin value = Level -Limit value

Test Channel:	CH00	Polarity:	Vertical

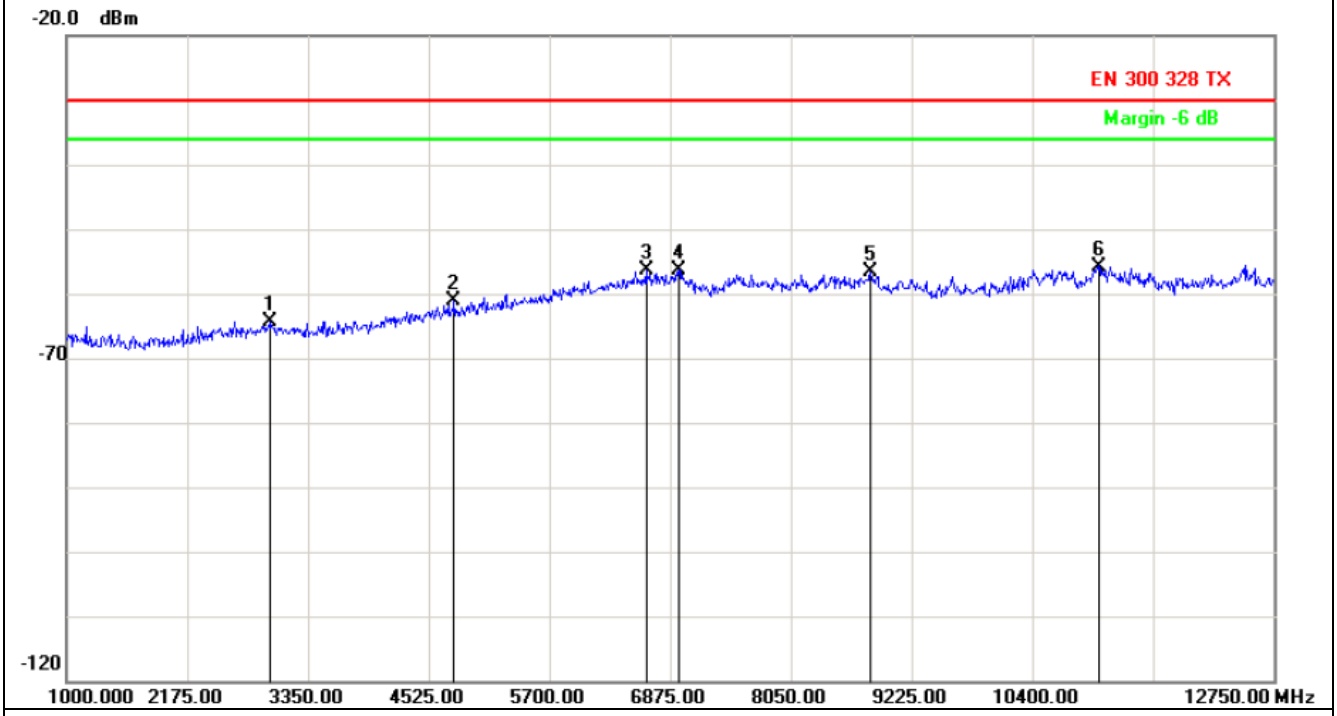


No.	Frequency (MHz)	Factor (dB)	Reading (dBm)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector
1	32.6340	-18.08	-62.17	-80.25	-36.00	-44.25	peak
2	44.1202	-17.60	-61.87	-79.47	-36.00	-43.47	peak
3	108.2667	-20.29	-55.93	-76.22	-54.00	-22.22	peak
4	209.3129	-20.57	-61.21	-81.78	-54.00	-27.78	peak
5	584.7895	-12.50	-64.68	-77.18	-54.00	-23.18	peak
6	975.7529	-7.12	-72.12	-79.24	-36.00	-43.24	peak

Remarks:
1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
2.Margin value = Level -Limit value

(2) Above 1G

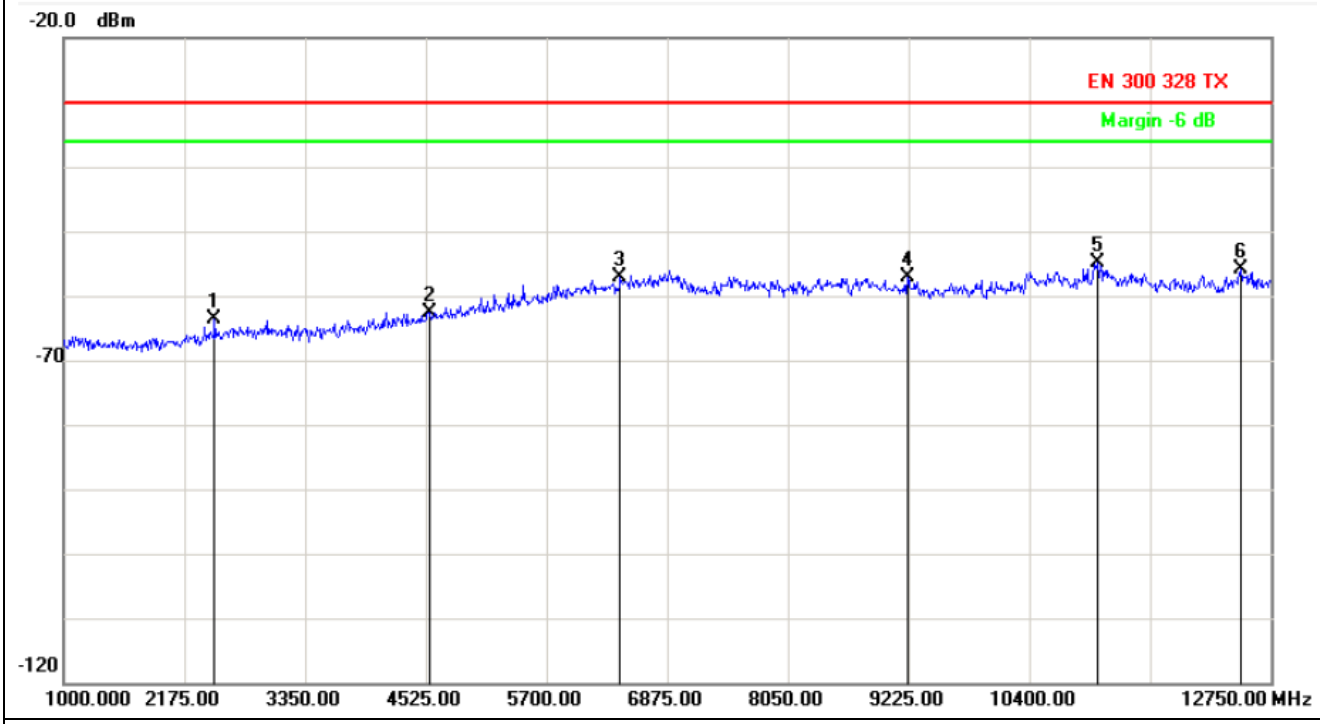
Test Channel:	CH00	Polarity:	Horizontal



No.	Frequency (MHz)	Factor (dB)	Reading (dBm)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector
1	2985.750	-6.56	-57.84	-64.40	-30.00	-34.40	peak
2	4771.750	-2.91	-58.32	-61.23	-30.00	-31.23	peak
3	6640.000	2.49	-58.89	-56.40	-30.00	-26.40	peak
4	6957.250	3.04	-59.30	-56.26	-30.00	-26.26	peak
5	8825.500	4.87	-61.49	-56.62	-30.00	-26.62	peak
6	11046.250	8.01	-63.76	-55.75	-30.00	-25.75	peak

Remarks:
1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
2.Margin value = Level -Limit value

Test Channel:	CH00	Polarity:	Vertical



No.	Frequency (MHz)	Factor (dB)	Reading (dBm)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector
1	2468.750	-7.74	-55.99	-63.73	-30.00	-33.73	peak
2	4560.250	-3.51	-59.02	-62.53	-30.00	-32.53	peak
3	6416.750	2.02	-59.06	-57.04	-30.00	-27.04	peak
4	9213.250	5.20	-62.35	-57.15	-30.00	-27.15	peak
5	11069.750	7.98	-62.97	-54.99	-30.00	-24.99	peak
6	12456.250	7.63	-63.53	-55.90	-30.00	-25.90	peak

Remarks:
1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
2.Margin value = Level -Limit value

3.9. Receiver spurious emissions-Conducted measurements

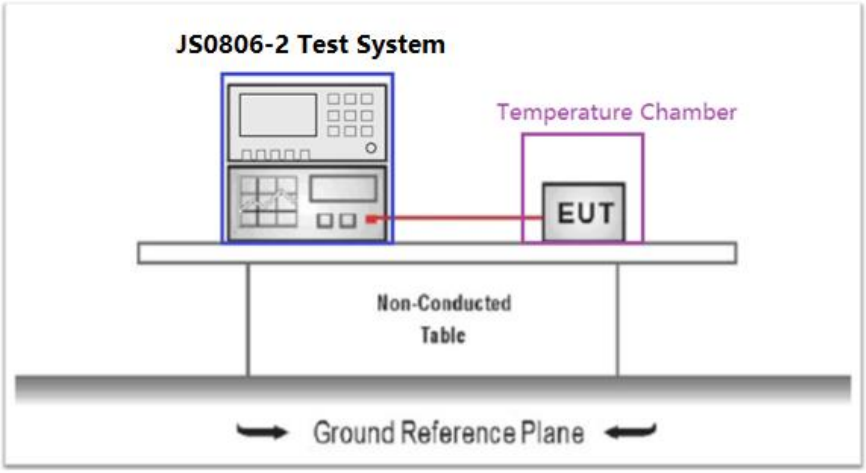
Limit

ETSI EN 300 328 V2.2.2 Sub-clause 4.3.2.10.3

The spurious emissions of the receiver shall not exceed the values given in the below table

Frequency range	Maximum power	Measurement bandwidth
30 MHz to 1 GHz	-57 dBm	100 kHz
1 GHz to 12,75 GHz	-47 dBm	1 MHz

Test Configuration

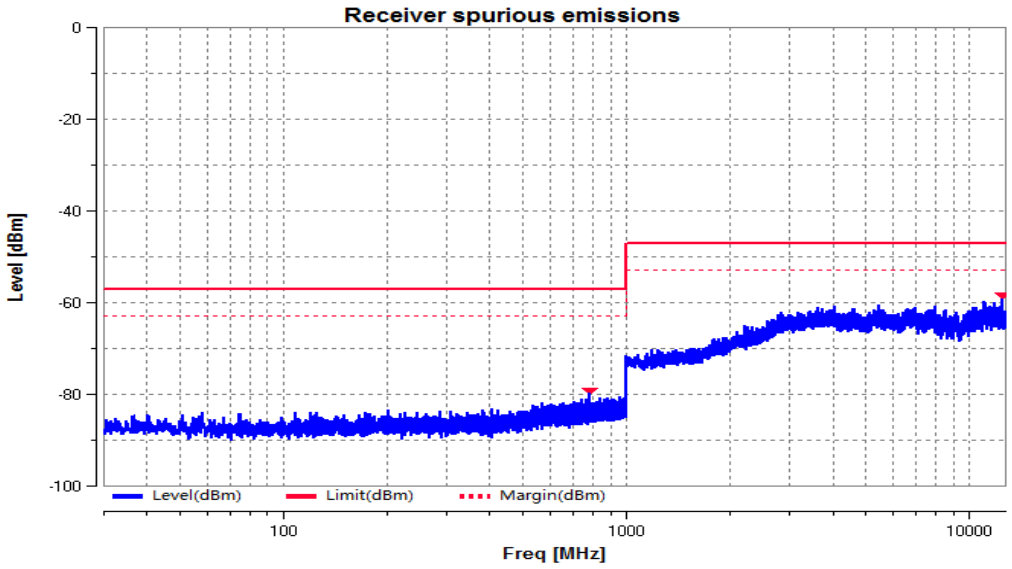


Test Procedure

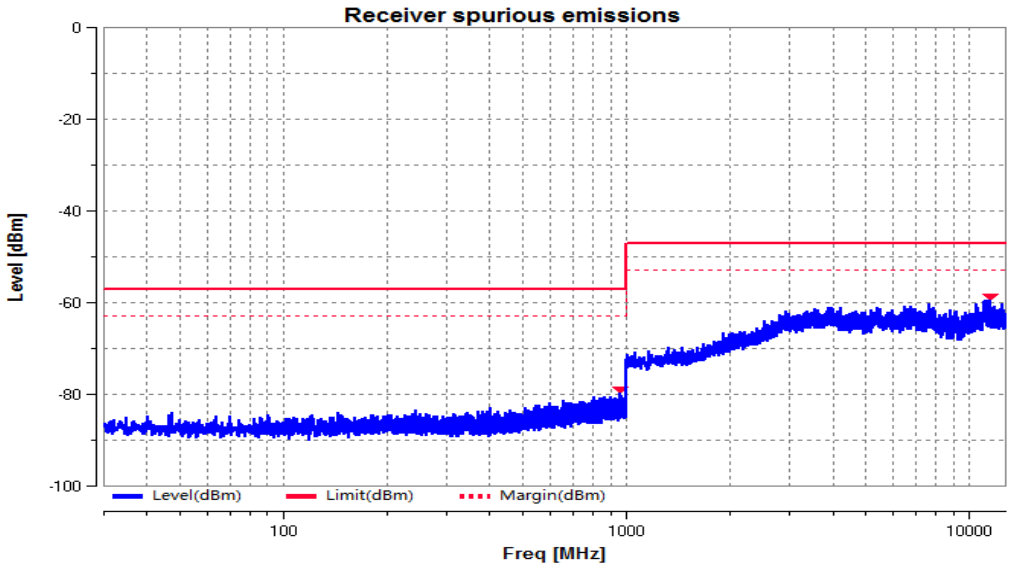
Please refer to ETSI EN 300 328 Sub-clause 5.4.10.2.1 for the measurement method.

Test Result

Test channel:	CH00



Test channel:	CH39



3.10. Receiver spurious emissions-Radiated measurements

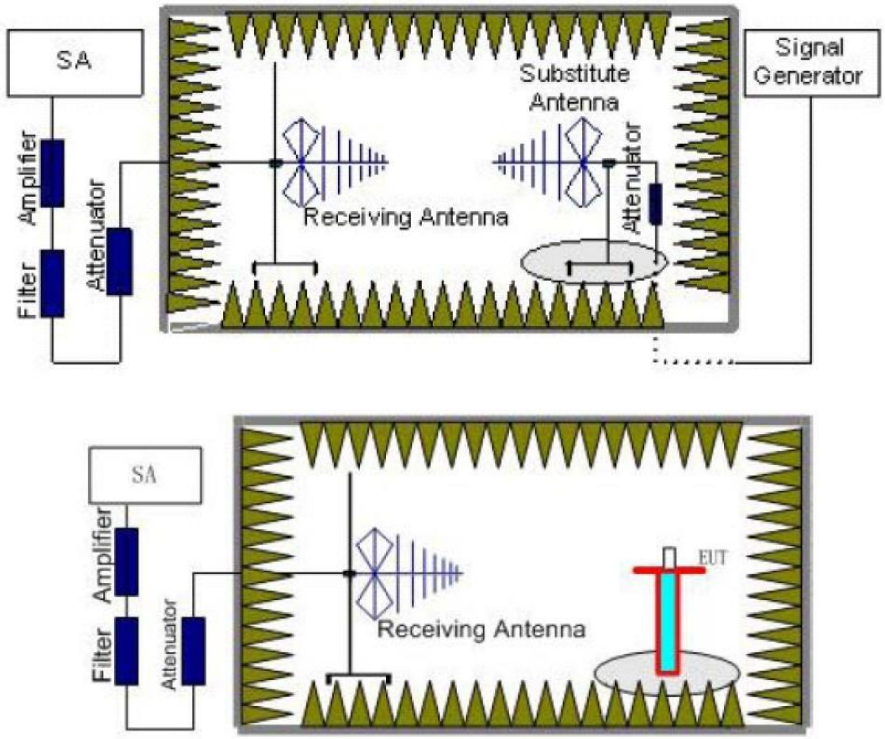
Limit

ETSI EN 300 328 V2.2.2 Sub-clause 4.3.2.10.3

The spurious emissions of the receiver shall not exceed the values given in the below table

Frequency range	Maximum power	Measurement bandwidth
30 MHz to 1 GHz	-57 dBm	100 kHz
1 GHz to 12,75 GHz	-47 dBm	1 MHz

Test Configuration



Test Procedure

Please refer to ETSI EN 300 328 Sub-clause 5.4.10.2.2 for the measurement method.

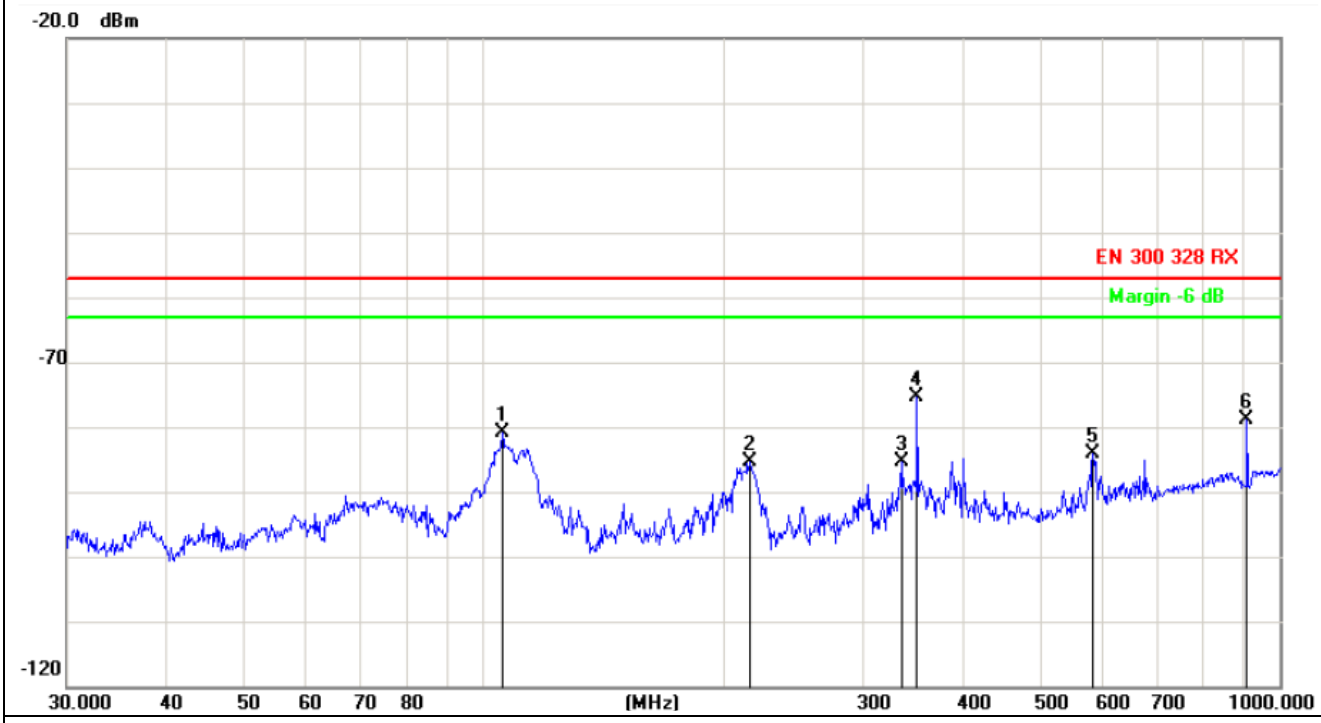
Test Result

Note:

1. By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that “Z axis” position was the worst, and test data recorded in this report.

(1) Below 1G

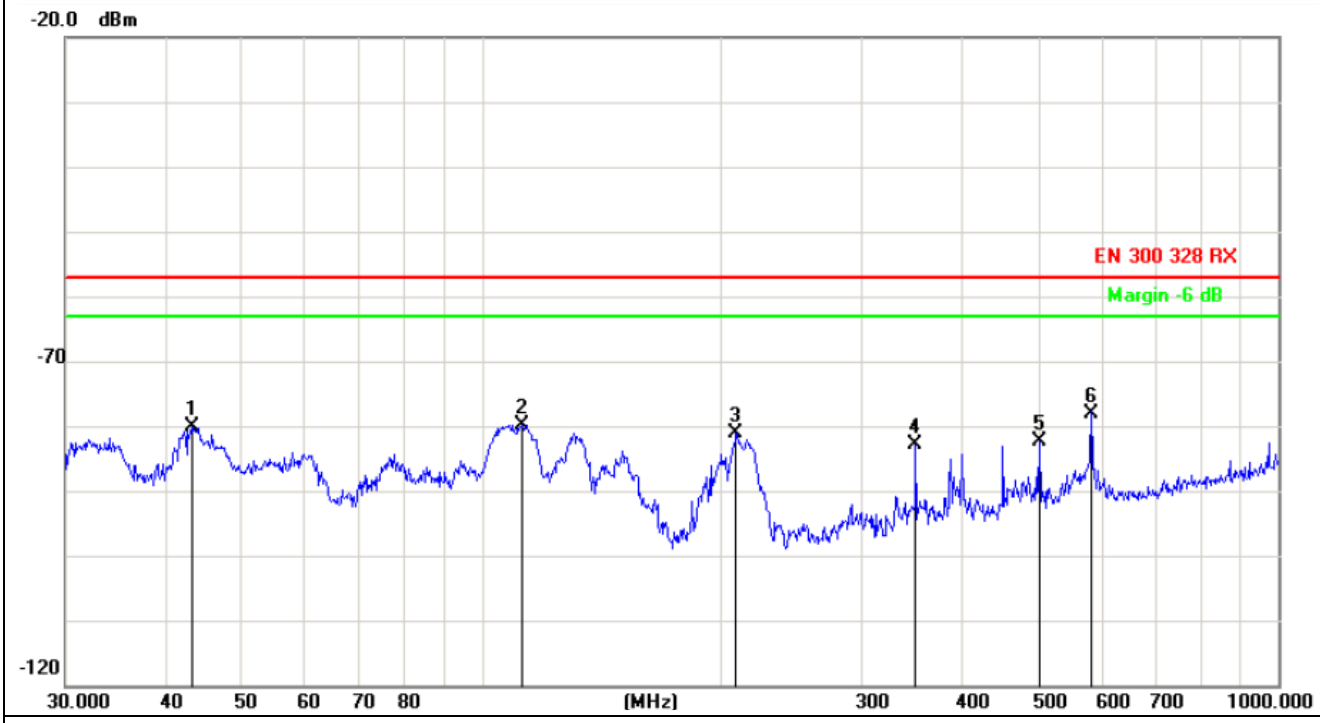
Test Channel:	CH00	Polarity:	Horizontal



No.	Frequency (MHz)	Factor (dB)	Reading (dBm)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector
1	105.6415	-20.50	-60.25	-80.75	-57.00	-23.75	peak
2	216.0240	-20.32	-65.07	-85.39	-57.00	-28.39	peak
3	334.8589	-17.07	-68.36	-85.43	-57.00	-28.43	peak
4	350.4768	-16.71	-58.71	-75.42	-57.00	-18.42	peak
5	582.7425	-12.53	-71.57	-84.10	-57.00	-27.10	peak
6	909.6667	-8.13	-70.64	-78.77	-57.00	-21.77	peak

Remarks:
1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
2.Margin value = Level -Limit value

Test Channel:	CH00	Polarity:	Vertical

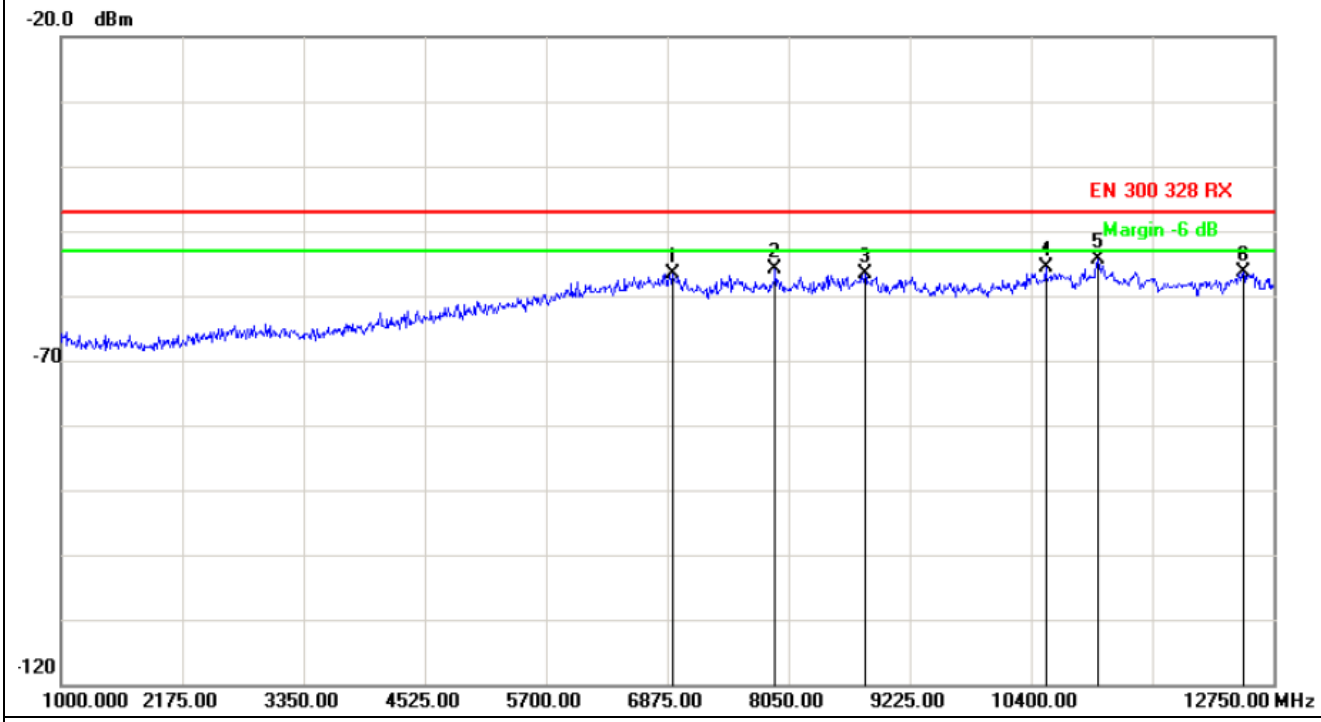


No.	Frequency (MHz)	Factor (dB)	Reading (dBm)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector
1	43.3534	-17.54	-62.49	-80.03	-57.00	-23.03	peak
2	112.5243	-19.94	-59.84	-79.78	-57.00	-22.78	peak
3	208.5801	-20.59	-60.56	-81.15	-57.00	-24.15	peak
4	350.4767	-16.71	-66.26	-82.97	-57.00	-25.97	peak
5	501.1790	-13.82	-68.64	-82.46	-57.00	-25.46	peak
6	582.7424	-12.53	-65.47	-78.00	-57.00	-21.00	peak

Remarks:
1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
2.Margin value = Level -Limit value

(2) Above 1G

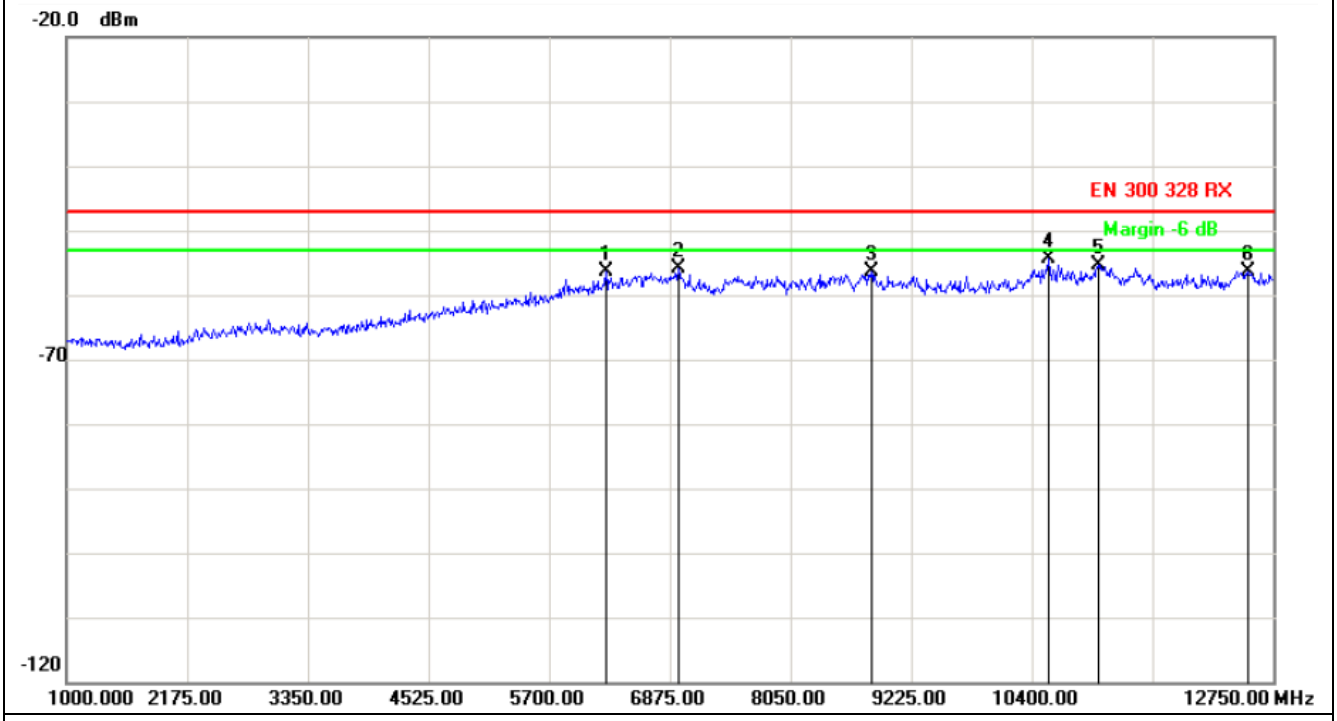
Test Channel:	CH00	Polarity:	Horizontal



No.	Frequency (MHz)	Factor (dB)	Reading (dBm)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector
1	6922.000	2.98	-59.53	-56.55	-47.00	-9.55	peak
2	7920.750	4.52	-60.38	-55.86	-47.00	-8.86	peak
3	8790.250	4.84	-61.44	-56.60	-47.00	-9.60	peak
4	10541.000	7.14	-62.65	-55.51	-47.00	-8.51	peak
5	11046.250	8.01	-62.29	-54.28	-47.00	-7.28	peak
6	12456.250	7.63	-64.09	-56.46	-47.00	-9.46	peak

Remarks:
1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
2.Margin value = Level -Limit value

Test Channel:	CH00	Polarity:	Vertical



No.	Frequency (MHz)	Factor (dB)	Reading (dBm)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector
1	6252.250	1.55	-57.99	-56.44	-47.00	-9.44	peak
2	6957.250	3.04	-58.98	-55.94	-47.00	-8.94	peak
3	8837.250	4.88	-61.20	-56.32	-47.00	-9.32	peak
4	10564.500	7.19	-61.51	-54.32	-47.00	-7.32	peak
5	11046.250	8.01	-63.41	-55.40	-47.00	-8.40	peak
6	12503.250	7.68	-64.12	-56.44	-47.00	-9.44	peak

Remarks:
1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
2.Margin value = Level -Limit value

3.11. Adaptivity

Limit

ETSI EN 300 328 V2.2.2 Sub-clause 4.3.2.6

Non-LBT based Detect and Avoid

1) During normal operation, the equipment shall evaluate the presence of a signal on its current operating channel. Ifit is determined that a signal is present with a level above the detection threshold defined in step 5 the channelshall be marked as 'unavailable'.
2) The channel shall remain unavailable for a minimum time equal to 1 s after which the channel may be consideredagain as an 'available' channel.
3) The total time during which an equipment has transmissions on a given channel without re-evaluating theavailability of that channel, is defined as the Channel Occupancy Time.
4) The Channel Occupancy Time shall be less than 40 ms. Each such transmission sequence shall be followed by anIdle Period (no transmissions) of minimum 5 % of the Channel Occupancy Time with a minimum of 100 µs. Afterthis, the procedure as in step 1 needs to be repeated.
5) 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 thereceiver 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 lessthan 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 mWe.i.r.p.)
6) The equipment shall comply with the requirements defined in step 1 to step 4 of the present clause in the presenceof an unwanted CW signal as defined in below table .

Wanted signal mean power from companion device (dBm)	Unwanted signal frequency (MHz)	Unwanted CW signal power (dBm)
-30	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: 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.		

LBT based Detect and Avoid- Frame Based Equipment

1) Before transmission, the equipment shall perform a Clear Channel Assessment (CCA) check using energy detect. The equipment shall observe the operating channel for the duration of the CCA observation time which shall be not less than 18 µs. The channel shall be considered occupied if the energy level in the channel exceeds the threshold given in step 5 below. If the equipment finds the channel to be clear, it may transmit immediately.
2) If the equipment finds the channel occupied, it shall not transmit on this channel during the next Fixed Frame Period.
   The equipment is allowed to switch to a non-adaptive mode and to continue transmissions on this channel providing it complies with the requirements applicable to non-adaptive equipment. See clause 4.3.2.6.1. Alternatively, the equipment is also allowed to continue Short Control Signalling Transmissions on this channel providing it complies with the requirements given in clause 4.3.2.6.4.
3) The total time during which an equipment has transmissions on a given channel without re-evaluating the availability of that channel, is defined as the Channel Occupancy Time.
   The Channel Occupancy Time shall be in the range 1 ms to 10 ms followed by an Idle Period of at least 5 % of the Channel Occupancy Time used in the equipment for the current Fixed Frame Period.
4) An equipment, upon correct reception of a packet which was intended for this equipment can skip CCA and immediately (see also next paragraph) proceed with the transmission of management and control frames (e.g. ACK and Block ACK frames are allowed but data frames are not allowed). A consecutive sequence of

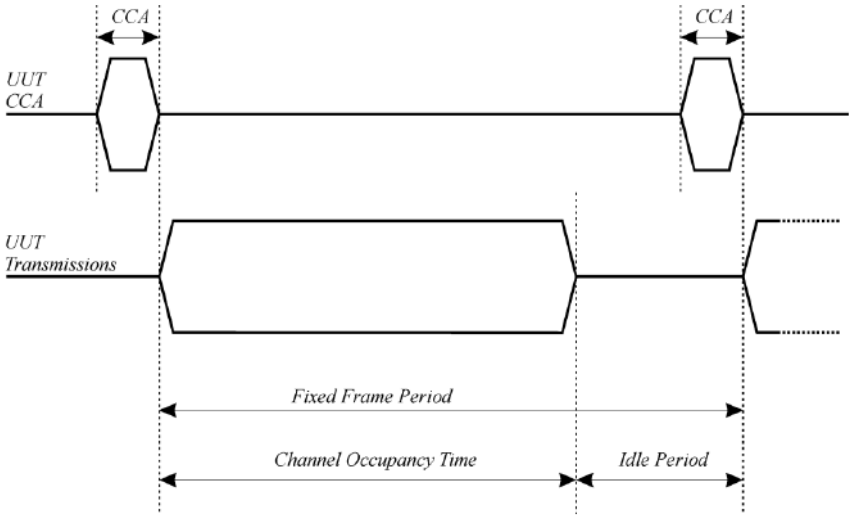
such transmissions by the equipment without a new CCA shall not exceed the maximum Channel Occupancy Time.

5) The energy detection threshold for the CCA shall be proportional to the transmit power of the transmitter: for a 20 dBm e.i.r.p. transmitter the CCA 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 CCA threshold level may be relaxed to:TL = -70 dBm/MHz + 10 × log10 (100 mW / Pout) (Pout in mWe.i.r.p.)

6) The equipment shall comply with the requirements defined in step 1 to step 4 in the present clause in the presence of an unwanted CW signal as defined in below table.

Wanted signal mean power from companion device	Unwanted signal frequency (MHz)	Unwanted signal power (dBm)
sufficient to maintain the link (see note 2)	2 395 or 2 488,5 (see note 1)	-35 (see note 3)
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.		

An example of the timing for Frame Based Equipment is provided in below figure .



LBT based Detect and Avoid-Load Based Equipment

1) Before a transmission or a burst of transmissions, the equipment shall perform a Clear Channel Assessment (CCA) check using energy detect. The equipment shall observe the operating channel for the duration of the CCA observation time which shall be not less than 18 µs. The channel shall be considered occupied if the energy level in the channel exceeds the threshold given in step 5 below. If the equipment finds the channel to be clear, it may transmit immediately.

2) If the equipment finds the channel occupied, it shall not transmit on this channel (see also the next paragraph). The equipment shall perform an Extended CCA check in which the channel is observed for a random duration in the range between 18 µs and at least 160 µs. If the extended CCA check has determined the channel to be no longer occupied, the equipment may resume transmissions on this channel. If the Extended CCA time has determined the channel still to be occupied, it shall perform new Extended CCA checks until the channel is no longer occupied.

NOTE: The Idle Period in between transmissions is considered to be the CCA or the Extended CCA check as there are no transmissions during this period.

The equipment is allowed to switch to a non-adaptive mode and to continue transmissions on this channel providing it complies with the requirements applicable to non-adaptive equipment. Alternatively, the equipment is also allowed to continue Short Control Signalling Transmissions on this channel providing it complies with the requirements given in clause 4.3.2.6.4.

3) The total time that an equipment makes use of a RF channel is defined as the Channel Occupancy Time. This Channel Occupancy Time shall be less than 13 ms, after which the device shall perform a new CCA as described in step 1 above.

4) The equipment, upon correct reception of a packet which was intended for this equipment can skip CCA and immediately (see also next paragraph) proceed with the transmission of management and control frames (e.g. ACK and Block ACK frames are allowed but data frames are not allowed). A consecutive sequence of transmissions by the equipment without a new CCA shall not exceed the maximum channel occupancy time as defined in step 3 above.
For the purpose of multi-cast, the ACK transmissions (associated with the same data packet) of the individual devices are allowed to take place in a sequence.

5) The equipment, upon correct reception of a packet which was intended for this equipment can skip CCA andimmediately (see note 3) proceed with the transmission of management and control frames (e.g. ACK and BlockACK frames are allowed but data frames are not allowed). A consecutive sequence of transmissions by theequipment without a new CCA shall not exceed the maximum channel occupancy time as defined in step 3)above.

6) The energy detection threshold for the CCA shall be proportional to the transmit power of the transmitter: for a 20 dBm e.i.r.p. transmitter the CCA 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 CCA threshold level may be relaxed to:TL = -70 dBm/MHz + 10 × log10 (100 mW / Pout) (Pout in mWe.i.r.p.)

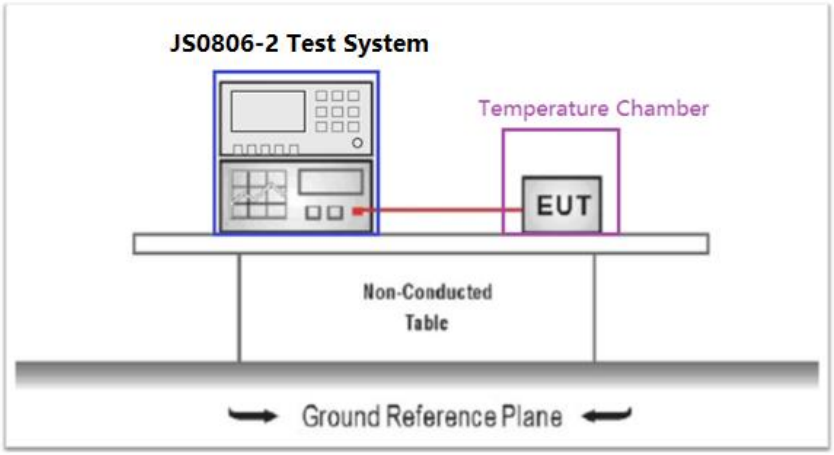
7) The equipment shall comply with the requirements defined in step 1 to step 4 of the present clause in the presence of an unwanted CW signal as defined in below table.

Wanted signal mean power from companion device	Unwanted signal frequency (MHz)	Unwanted signal power (dBm)
sufficient to maintain the link (see note 2)	2 395 or 2 488,5 (see note 1)	-35 (see note 3)
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.		

Short Control Signalling Transmissions

If implemented, Short Control Signalling Transmissions of adaptive equipment using wide band modulations other than FHSS shall have a maximum TxOn / (TxOn + TxOff) ratio of 10 % within any observation period of 50 ms.

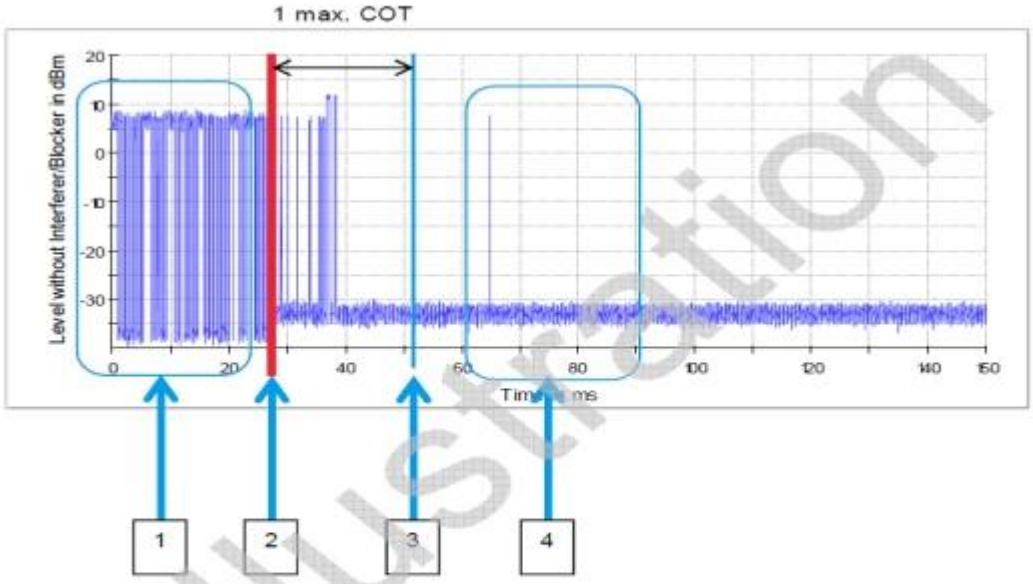
Test Configuration



Test Procedure

Please refer to ETSI EN 300 328 Sub-clause5.4.6.2.1 for the measurement method.

Adaptivity Test schematic graphic



1. Reference measurement (interferer off / Blocker off trace)
2. Interferer switched on (rise of the noise floor)
3. Arming of the video trigger one max. COT after interferer is switched on
4. Monitoring measurement triggered by the short signaling (interferer on / Blocker off traceor interferer on / Blocker on trace)

Test Results

Not applicable.

This requirement does not apply to adaptive equipment which maximum RF Output power level is less than 10 dBm e.i.r.p.

3.12. Receiver Blocking

Limit

ETSI EN 300 328 V2.2.2 Sub-clause 4.3.2.11

Performance Criteria: For equipment that supports a PER or FER test to be performed, the minimum performance criterion shall be a PER or FER less than or equal to 10 %.
For equipment that does not support a PER or a FER test to be performed, the minimum performance criterion shall be no loss of the wireless transmission function needed for the intended use of the equipment.

Receiver Category 1: Adaptive equipment with a maximum RF output power greater than 10 dBm e.i.r.p. shall be considered as receivercategory 1 equipment.

Wanted signal mean power from companion device (dBm) (see notes 1 and 4)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 4)	Type of blocking signal
(-133 dBm + 10 × $\log_{10}$(OCBW)) or -68 dBm whichever is less (see note 2)	2 380 2 504	-34	CW
(-139 dBm + 10 × $\log_{10}$(OCBW)) or -74 dBm whichever is less (see note 3)	2 300 2 330 2 360 2 524 2 584 2 674		
NOTE 1: OCBW is in Hz. NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P_{min} + 26 dB where P_{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal. NOTE 3: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P_{min} + 20 dB where P_{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal. NOTE 4: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.			

Receiver Category 2: Non-adaptive equipment with a Medium Utilization (MU) factor greater than 1 % and less than or equal to 10 % oradaptive equipment with a maximum RF output power of 10 dBm e.i.r.p. shall be considered as receiver category 2 equipment.

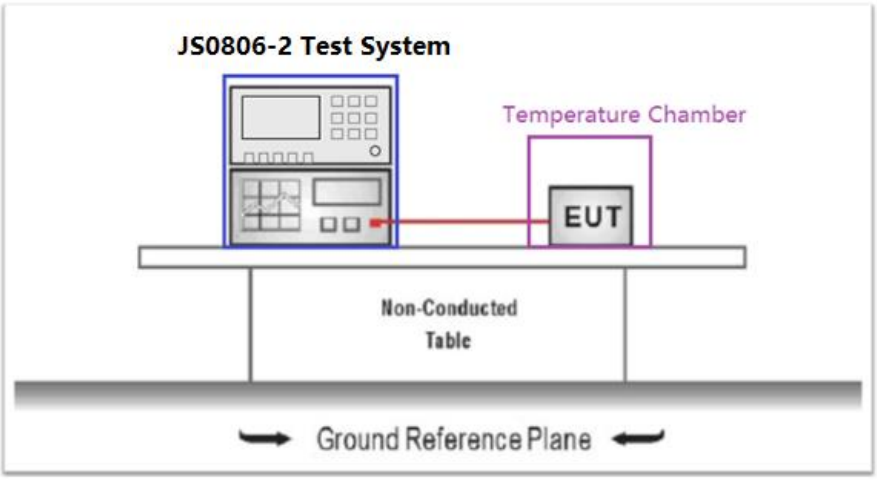
Wanted signal mean power from companion device (dBm) (see notes 1 and 3)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 3)	Type of blocking signal
(-139 dBm + 10 × $\log_{10}$(OCBW) + 10 dB) or (-74 dBm + 10 dB) whichever is less (see note 2)	2 380 2 504 2 300 2 584	-34	CW
NOTE 1: OCBW is in Hz. NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P_{min} + 26 dB where P_{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal. NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.			

Receiver Category 3: Non-adaptive equipment with a maximum Medium Utilization (MU) factor of 1 % or adaptive equipment with amaximum RF output power of 0 dBm e.i.r.p. shall be considered as receiver category 3 equipment.

Wanted signal mean power from companion device (dBm) (see notes 1 and 3)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 3)	Type of blocking signal
(-139 dBm + 10 × $\log_{10}$(OCBW) + 20 dB) or (-74 dBm + 20 dB) whichever is less (see note 2)	2 380 2 504 2 300 2 584	-34	CW

NOTE 1: OCBW is in Hz.
NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative the test may be performed using a wanted signal up to P_{min} + 30 dB where P_{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.
NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.

Test Configuration



Test Procedure

Please refer to ETSI EN 300 328 Sub-clause 5.4.11.2.1 for the measurement method.

Test Results

Test channel	Wanted signal power (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm)	Test PER (%)	Limit (%)	Result
CH00	-139 dBm + 10 × log10(OCBW) + 10 dB	2300	-34.00	3.6	<10.00	Pass
		2380	-34.00	3.1		
		2504	-34.00	2.5		
		2584	-34.00	2.6		
CH39	-139 dBm + 10 × log10(OCBW) + 10 dB	2300	-34.00	3.4	<10.00	Pass
		2380	-34.00	3.6		
		2504	-34.00	2.4		
		2584	-34.00	2.6		

Note:

1. The EUT is belong to category 2.

4. EUT TEST PHOTOS

Radiated Measurements

Below 1GHz

Above 1GHz

5. PHOTOGRAPHS OF EUT CONSTRUCTIONAL

Reference to the test report No.: CTC20210068E02.

**************************THE END**************************