On your side

TEST REPORT

CE WLAN (2 400 MHz ~ 2 483.5 MHz) Test for SRM200A

APPLICANT
SEONG JI INDUSTRIAL CO.,LTD

REPORT NO.
HCT-RF-1911-CE017

DATE OF ISSUE
November 08, 2019

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Applicant	**SEONG JI INDUSTRIAL CO.,LTD** 54-33, DongtanHana 1-gil, Hwaseong-si, Gyeonggi-do, 18423, Korea
Eut Type Model Name	Monarch Quad-mode module SRM200A
Date of Test	September 09, 2019 ~ November 06, 2019
Test Standard Used	ETSI EN 300 328 V2.1.1 (2016-11)
Test Results	Approval for CE Temperature : (22.5 ± 3.0) °C, Relative Humidity : (54.6 ± 3.0) % R. H. Results, Measurement uncertainty : Refer to the attachment
Manufacturer Operating frequency range	SEONG JI INDUSTRIAL CO.,LTD 2 400 MHz ~2 483.5 MHz

The result shown in this test report refer only to the sample(s) tested unless otherwise stated.
This test results were applied only to the test methods required by the standard.

Tested by
Hyeong Hoon Lee

Technical Manager
Seul Ki Lee

HCT CO., LTD.
Soo Chan Lee
SooChan Lee / CEO

REVISION HISTORY

The revision history for this test report is shown in table.

Revision No.	Date of Issue	Description
0	November 08, 2019	Initial Release

CONTENTS

1. CLIENT INFORMATION

The EUT has been tested by request of

Company	SEONG JI INDUSTRIAL CO.,LTD 54-33, DongtanHana 1-gil, Hwaseong-si, Gyeonggi-do, 18423, Korea

2. EQUIPMENT UNDER TEST (EUT)

Equipment	Monarch Quad-mode module
Model	SRM200A
Additional Model	-
Serial number	-
Manufacturer	SEONG JI INDUSTRIAL CO.,LTD
Rating	DC 3.30 V

3. DESCRIPTION OF THE EQUIPMENT UNDER TEST

3.1 Manufacturers declarations

No. of units:	One (Transceiver)	
No. of deviating variants:	None	
Application:	Monarch Quad-mode module	
Equipment category:	Short Range Device	
Model No.:	SRM200A	
Additional Model No.:	-	
Serial No.:	-	
Type of modulation:	DSSS (802.11b) & OFDM (802.11g, 802.11n(HT20))	
Specification(s):	ETSI EN 300 328 V2.1.1 (2016-11)	
Receiver Category:	1	
Type of unit:	Stand-alone equipment	
Type of Equipment	☒ Adaptive Equipment without the possibility to switch to a non-adaptive mode	
	☐ Non-adaptive Equipment	
	☐ Adaptive Equipment which can also operate in a non-adaptive mode	
Operating frequency range:	2 400 MHz ~2 483.5 MHz	
Frequency alignment range:	2 412 MHz ~ 2 472 MHz	
Beam forming	Not Applicable	
Channels :	13	
Version	Hardware : v1.4	
	Software : v1.0.1	
Power source:	Normal voltage :	DC 3.3 V
	Extreme lower voltage :	DC 2.7 V
	Extreme upper voltage :	DC 3.6 V
Temperature range:	Normal Temperature :	+22.5°C
	Extreme lower Temperature :	-30.0°C
	Extreme upper Temperature :	+85.0°C
Operating mode :	802.11b : Smart Antenna Systems – Single Antenna	
	802.11g : Smart Antenna Systems - Single Antenna	
	802.11n (HT20) : Smart Antenna Systems - Single Antenna	
Antenna type:	External antenna (Dipole Antenna)	
Max. antenna gain:	4.44 dBi	

Note:

1. At the request of the customer, all test requirements were performed ETSI EN 300 328 V2.1.1 (2016-11)

3.2 Channel List

802.11b/g/n Working Frequency of Each Channel	
Channel	Frequency(MHz)
01	2 412
02	2 417
03	2 422
04	2 427
05	2 432
06	2 437
07	2 442
08	2 447
09	2 452
10	2 457
11	2 462
12	2 467
13	2 472

3.3 Operating frequency range during under the test

Operating frequency	Frequency(MHz)
Bottom	2 412
Middle	2 442
Top	2 472

3.4 The EUT was operation in special test mode.

- The value of the power parameters of the test software, please refer to the table below.

- Maximum Power

Test Mode	2 412 MHz	2 442 MHz	2 472 MHz
802.11b	20	20	20
802.11g	18	18	18
802.11n(HT20)	18	18	18

3.5 Data rate of the worst

All tests conducted in this report were made at the worst case data rate of each modulation.
For each modulation data rate of the worst, please refer to the table below.

Modulation	Data Rate (Mbps)
802.11b	1
802.11g	12
802.11n(HT20)	MCS1

Parameter	Modulation	Data Rate (Mbps)
Adaptivity	802.11b	1

Parameter	Modulation	Data Rate (Mbps)
Receiver Blocking	802.11b	1

Parameter	Modulation	Data Rate (Mbps)
Receiver spurious emissions	802.11b	1
	802.11g	6

4. TEST SUMMARY

Clause	Parameter	Test method	Result
4.3.2.2	RF Output Power	Conducted	Pass
4.3.2.3	Power Spectral Density	Conducted	Pass
4.3.2.4	Duty cycle, Tx-Sequence, Tx-gap	N/A	(See note1)
4.3.2.5	Medium Utilisation	N/A	(See note1)
4.3.2.6	Adaptivity	Conducted	Pass
4.3.2.7	Occupied Channel Bandwidth	Conducted	Pass
4.3.2.8	Transmitter unwanted emissions in the OOB domain	Conducted	Pass
4.3.2.9	Transmitter unwanted emissions in the spurious domain	Radiated	Pass (See note4)
4.3.2.10	Receiver Spurious emissions	Radiated	Pass (See note4)
4.3.2.11	Receiver Blocking	Conducted	Pass
4.3.2.12	Geo-location capability	N/A	(See note2)

Note:

1. These requirements does not apply to Adaptive Equipment without the possibility to switch to a non-adaptive mode.
2. Geo-location capability is implemented in this product and can’t be accessible to the user.
3. At the request of the customer, all test requirements were performed EN 300 328 V2.1.1 (2016-11).
4. This item was tested in the worst case and the results recorded.

5. TEST EQUIPMENT

No.	Instrument	Model No.	Due to Calibration	Manufacture	Serial No.
☒	Signal Analyzer (20 Hz ~ 40.0 GHz)	FSV40-N	2020-09-26	ROHDE & SCHWARZ	101068-SZ
☒	Signal Analyzer (20 Hz ~ 26.5 GHz)	N9020A	2019-12-24	AGILENT	MY50200666
☒	SIGNAL GENERATOR (100kHz~40GHz)	SMB100A	2020-07-15	Rohde&Schwarz	177633
☒	SIGNAL GENERATOR (9kHz~6GHz)	SMBV100A	2020-09-24	Rohde&Schwarz	255727
☒	Communication Tester	CMW500	2020-05-23	Rohde&Schwarz	127521
☒	Power Measurement Set	OSP 120(See note3)	2020-07-24	Rohde&Schwarz	101231
☒	High Pass Filter	WHKX10-2700-3000-18000-40SS	2020-07-22	WAINWRIGHT INSTRUMET	3
☒	Band rejection filter	WRCJV2400/2483.5-2370/2520-60/12SS	2020-06-19	WAINWRIGHT INSTRUMET	2
☒	Band rejection filter (5 100 MHz ~ 5 800 MHz)	WRCJV5100/5850-40/50-8EEK	2020-01-03	WAINWRIGHT INSTRUMET	2
☒	BI-LOG Antenna (25 MHz ~ 1 GHz)	VULB9160	2020-08-09	Schwarzbeck	9160-3368
☒	Full anechoic chamber	10m×5m×5m	-	EMERSON&CUMING	-
☒	STEP ATTENUATOR (1 W, DC ~ 18 GHz)	AF9003-69-31	2020-10-14	WEINSCHEL	5701
☒	Fixed Attenuator (10 dB, DC ~ 26.5 GHz)	56-10	2020-09-24	WEINSCHEL	72324
☒	Fixed Attenuator (20 dB, DC ~ 26.5 GHz)	8493C	2020-06-04	HP	17280
☒	Turn Table	DE 3260	-	INNCO GmbH	7860504
☒	DC power supply	E3632A	2020-06-18	HP	KR75303960
☒	Temp & Humidity Chamber	SU-642	2020-03-12	ESPEC	0093008124
☒	POWER SPLITTER (Dc to 26.5 GHz)	11667B	2020-05-03	HP	11275
☒	Power Divider-2way (DC ~ 26.5 GHz)	11636B	2020-02-15	HP	51942
☒	POWER DIVIDER-4WAY (0.5 ~ 18 GHz)	Narda 4426-4	2020-01-30	Narda	11927
☒	POWER AMP (0.1 GHz ~ 18 GHz)	CBLU1183540B-01	2020-03-20	CERNEX	28548
☒	Horn Antenna (1 GHz ~ 18 GHz)	BBHA9120D	2021-09-25	Schwarzbeck	9120D-1298
☒	Companion device (Access Point)	WEA453e	-	SAMSUNG	-

Note:

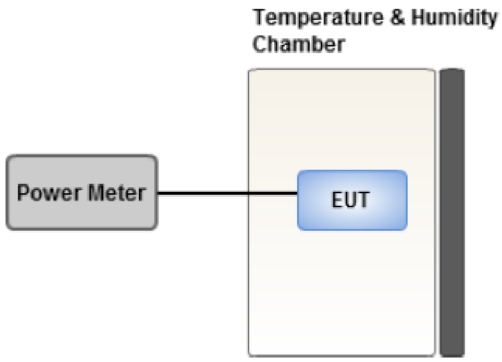
1. All equipment is calibrated with traceable calibrations.
2. Each calibration is traceable to the national or international standards.
3. OSP120 spec :

- RMS integration over a significant portion of signal
- Fast response time for accurate burst detection
- Sampling rate 1 MS/s
- Storage of max. 32 Million samples in total
- Synchronous measurement channels for 4 antenna port
- Maximum DUT output power 12 dBm linear without attenuator, with included attenuators 22 dBm linear (and 32 dBm linear optional)
- Measurement tolerances better than ETSI requirements

6. TRANSMITTER MEASUREMENTS – RESULTS

6.1 RF output power

6.1.1 Test Setup



6.1.2 Test Procedure

Refer to ETSI EN 300 328 V2.1.1 (2016-11) Clause 5.4.2.2

Step 1:

• Use a fast power sensor suitable for 2,4 GHz and capable of minimum 1 MS/s.

• Use the following settings:

- Sample speed 1 MS/s or faster.

- The samples shall represent the RMS power of the signal.

- Measurement duration: For non-adaptive equipment: equal to the observation period defined in clause 4.3.1.3.2 or clause 4.3.2.4.2. For adaptive equipment, the measurement duration shall be long enough to ensure a minimum number of bursts (at least 10) is 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 Pburst values (value A in dBm) will be used for maximum e.i.r.p. calculations.

Step 6:

• Add the (stated) antenna assembly gain G in dBi of the individual antenna.
• If applicable, add the additional beamforming gain Y in dB.
• If more than one antenna assembly is intended for this power setting, the maximum overall antenna gain (G or G + Y) shall be used.
• The RF Output Power (P) shall be calculated using the formula below:

$$P = A + G + Y$$

• This value, which shall comply with the limit given in clause 4.3.1.2.3 or clause 4.3.2.2.3, shall be recorded in the test report.

6.1.3 Limit

For adaptive equipment using wide band modulations other than FHSS, the maximum RF output power shall be 20 dBm.

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

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

6.1.4 Test Result

TEST CONDITIONS:		RF Output Power (dBm)		
		2 412 MHz	2 442 MHz	2 472 MHz
T nom	V nom	15.01	14.42	13.96
T low		19.36	18.73	18.21
T high		12.08	11.51	11.05
Measurement Uncertainty : 0.35 dB (about 95 %, k = 2)				

Note:

1. Modulation type : 802.11b
2. P = A + G + Y

(P : RF Output Power, A : Highest of all Pburst values. G : Antenna assembly gain, Y : Beamforming gain)

TEST CONDITIONS:		RF Output Power (dBm)		
		2 412 MHz	2 442 MHz	2 472 MHz
T nom	V nom	14.73	14.66	13.55
T low		19.05	19.01	17.82
T high		12.10	11.70	10.65
Measurement Uncertainty : 0.35 dB (about 95 %, k = 2)				

Note:

1. Modulation type : 802.11g
2. P = A + G + Y

(P : RF Output Power, A : Highest of all Pburst values. G : Antenna assembly gain, Y : Beamforming gain)

TEST CONDITIONS:		RF Output Power (dBm)		
		2 412 MHz	2 442 MHz	2 472 MHz
T nom	V nom	14.69	14.64	13.54
T low		19.04	18.98	17.82
T high		11.71	11.90	10.64
Measurement Uncertainty : 0.35 dB (about 95 %, *k* = 2)				

Note:

1. Modulation type : 802.11n(HT20)

2. P = A + G + Y

(P : RF Output Power, A : Highest of all Pburst values. G : Antenna assembly gain, Y : Beamforming gain)

6.2 Power Spectral Density

6.2.1 Test Setup

6.2.2 Test Procedure

Refer to ETSI EN 300 328 V2.1.1 (2016-11) Clause 5.4.3.2

Step 1:

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

- Centre Frequency: The centre frequency of the channel under test
- RBW: 1 MHz
- VBW: 3 MHz
- Frequency Span: 2 × Nominal Bandwidth (e.g. 40 MHz for a 20 MHz channel)
- Detector Mode: Peak
- Trace Mode: Max Hold

Step 2:

When the trace is complete, find the peak value of the power envelope and record the frequency.

Step 3:

Make the following changes to the settings of the spectrum analyser:

- Centre Frequency: Equal to the frequency recorded in step 2
- Frequency Span: 3 MHz
- RBW: 1 MHz
- VBW: 3 MHz
- Sweep Time: 1 minute
- Detector Mode: RMS
- Trace Mode: Max Hold

Step 4:

- When the trace is complete, the trace shall be captured using the "Hold" or "View" option on the spectrum
analyser.
- Find the peak value of the trace and place the analyser marker on this peak. This level is recorded as the highest mean power (power spectral density) D in a 1 MHz band.
- Alternatively, where a spectrum analyser is equipped with a function to measure power spectral density, this function may be used to display the power spectral density D in dBm / MHz.
- In case of conducted measurements on smart antenna systems operating in a mode with multiple transmit
chains active simultaneously, the power spectral density of each transmit chain shall be measured separately to calculate the total power spectral density (value D in dBm / MHz) for the UUT.

Step 5:

The maximum Power Spectral Density (PSD) e.i.r.p. is calculated from the above measured power spectral
density D, the observed Duty Cycle (DC) (see clause 5.4.2.2.1.3, step 4), the applicable antenna assembly gain G in dBi and if applicable the beamforming gain Y in dB, according to the formula below. This value shall be recorded in the test report. If more than one antenna assembly is intended for this power setting, the gain of the antenna assembly with the highest gain shall be used.

$$PSD = D + G + Y + 10 \times \log (1 / DC) \text{ (dBm / MHz)}$$

6.2.3 Limit

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

6.2.4 Test Result

TEST CONDITIONS:		Power Spectral Density (dBm/MHz)		
		2 412 MHz	2 442 MHz	2 472 MHz
T nom	V nom	6.04	5.26	4.61
Measurement Uncertainty : 1.18 dB (about 95 %, *k* = 2)				

Note:

1. Modulation type : 802.11b

TEST CONDITIONS:		Power Spectral Density (dBm/MHz)		
		2 412 MHz	2 442 MHz	2 472 MHz
T nom	V nom	1.69	1.81	0.34
Measurement Uncertainty : 1.18 dB (about 95 %, *k* = 2)				

Note:

1. Modulation type : 802.11g

TEST CONDITIONS:		Power Spectral Density (dBm/MHz)		
		2 412 MHz	2 442 MHz	2 472 MHz
T nom	V nom	1.42	1.53	0.06
Measurement Uncertainty : 1.18 dB (about 95 %, *k* = 2)				

Note:

1. Modulation type : 802.11n(HT20)

6.3 Occupied channel bandwidth

6.3.1 Test Setup

6.3.2 Test Procedure

Refer to ETSI EN 300 328 V2.1.1 (2016-11) 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
• Detector Mode: RMS
• Trace Mode: Max Hold
• Sweep time: 1 s

Step 2:
Wait until the trace is completed.
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.
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.

6.3.3 Limit

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

• clause 1.: 2,4 GHz to 2,4835 GHz.

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

6.3.4 Test Result

TEST CONDITIONS:		Occupied Channel Bandwidth (MHz)	
		Bottom Frequency	Top Frequency
T nom	V nom	11.18	11.19
Range of OBW(MHz)		2 406.4 ~ 2 477.56	
Limit(MHz)		2 400 ~ 2 483.5	
Measurement Uncertainty : 95 kHz (about 95 %, *k* = 2)			

Note:
1. Modulation type : 802.11b

TEST CONDITIONS:		Occupied Channel Bandwidth (MHz)	
		Bottom Frequency	Top Frequency
T nom	V nom	16.48	16.48
Range of OBW(MHz)		2 403.76 ~ 2 480.2	
Limit(MHz)		2 400 ~ 2 483.5	
Measurement Uncertainty : 95 kHz (about 95 %, *k* = 2)			

Note:
1. Modulation type : 802.11g

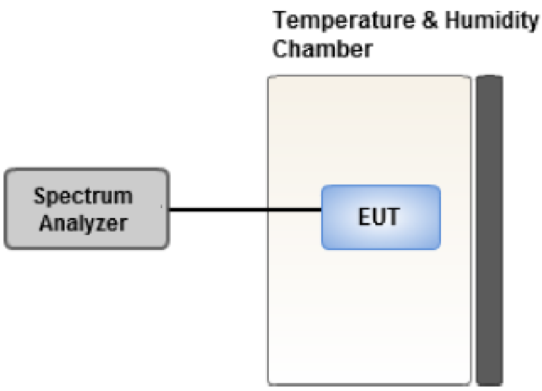
TEST CONDITIONS:		Occupied Channel Bandwidth (MHz)	
		Bottom Frequency	Top Frequency
T nom	V nom	17.61	17.62
Range of OBW(MHz)		2 403.08 ~ 2 480.8	
Limit(MHz)		2 400 ~ 2 483.5	
Measurement Uncertainty : 95 kHz (about 95 %, *k* = 2)			

Note:

1. Modulation type : 802.11n (HT20)

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

6.4.1 Test Setup



6.4.2 Test Procedure

Refer to ETSI EN 300 328 V2.1.1 (2016-11) Clause 5.4.8.2

Step 1:

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

- Centre Frequency: 2 484 MHz
- Span: 0 Hz
- Resolution BW: 1 MHz
- Filter mode: Channel filter
- Video BW: 3 MHz
- Detector Mode: RMS
- Trace Mode: Max Hold
- Sweep Mode: Continuous
- Sweep Points: Sweep Time [s] / (1 µs) or 5 000 whichever is greater
- Trigger Mode: Video trigger

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

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

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

• Adjust the trigger level to select the transmissions with the highest power level.

• For frequency hopping equipment operating in a normal hopping mode, the different hops will result in signal bursts with different power levels. In this case the burst with the highest power level shall be selected.

• Set a window (start and stop lines) to match with the start and end of the burst and in which the RMS power
shall be measured using the Time Domain Power function.

• Select RMS power to be measured within the selected window and note the result which is the RMS power
within this 1 MHz segment (2 483,5 MHz to 2 484,5 MHz). Compare this value with the applicable limit provided by the mask.

• Increase the centre frequency in steps of 1 MHz and repeat this measurement for every 1 MHz segment within the range 2 483,5 MHz to 2 483,5 MHz + BW. The centre frequency of the last 1 MHz segment shall be set to2 483,5 MHz + BW - 0,5 MHz (which means this may partly overlap with the previous 1 MHz segment).

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

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

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

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

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

• Change the centre frequency of the analyser to 2 399,5 MHz - BW and perform the measurement for the first 1 MHz segment within range 2 400 MHz - 2BW to 2 400 MHz - BW. Reduce the centre frequency in 1

MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2 400 MHz - 2BW + 0,5 MHz (which means this may partly overlap with the previous 1 MHz segment).

Step 6:

• In case of conducted measurements on equipment with a single transmit chain, the declared antenna assembly gain G in dBi shall be added to the results for each of the 1 MHz segments and compared with the limits provided by the mask given in figure 1 or figure 3. If more than one antenna assembly is intended for this power setting, the antenna with the highest gain shall be considered.

• In case of conducted measurements on smart antenna systems (equipment with multiple transmit chains), the measurements need to be repeated for each of the active transmit chains. The declared antenna assembly gain G in dBi for a single antenna shall be added to these results. If more than one antenna assembly is intended for this power setting, the antenna with the highest gain shall be considered. Comparison with the applicable limits shall be done using any of the options given below:

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

- Option 2: Option 2: the limits provided by the mask given in figure 1 or figure 3 shall be reduced by 10 × 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: Ach refers to the number of active transmit chains.

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

6.4.3 Limit

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

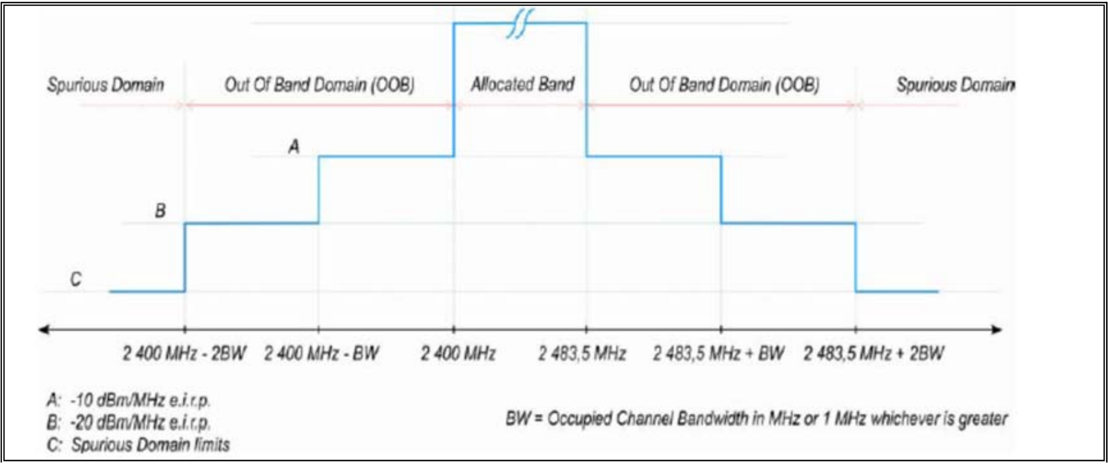


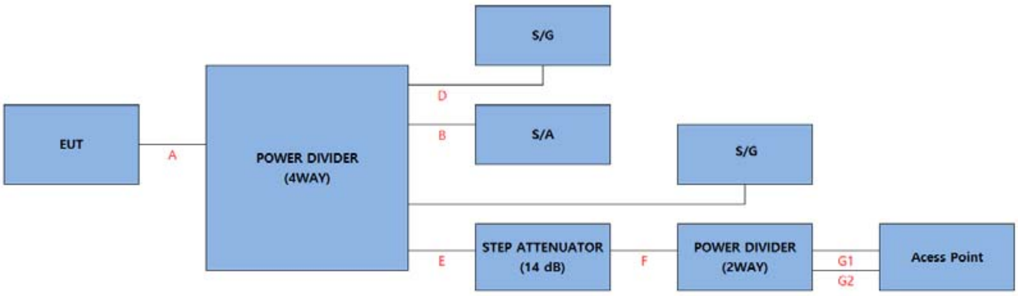
figure 3 : Transmit mask

6.4.4 Test Result

Test Conditions	Modulation	Measured Power (dBm/ MHz)			
		Bottom Frequency		Top Frequency	
		2400 MHz -2 BW ~ 2400 MHz -BW	2400 MHz - BW ~ 2400 MHz	2483.5 MHz ~ 2483.5 MHz + BW	2483.5 MHz + BW ~ 2483.5 MHz + 2BW
T nom	802.11b	-42.47	-39.13	-41.45	-42.40
	802.11g	-41.81	-29.77	-28.98	-42.09
	802.11n(HT20)	-40.78	-29.99	-34.40	-41.93
Measurement Uncertainty : 0.70 dB (about 95 %, k = 2)					

6.5 Adaptivity

6.5.1 Test set-up



- S/A: N9020A
- AP : WEA453e
- S/G: SMBV100A (interferer)
- S/G: SMB100A (Blocker)
- 4WAY-DIVIDER : Narda 4426-4
- Step attenuator : AF9003-69-31
- Power Splitter : 11667B
- Cable Loss
    - A : 0.4 dB
    - B : 0.4 dB
    - D : 0.7 dB
    - E : 0.7 dB
    - F : 0.7 dB
    - G1, G2 : 0.4 dB
    - Power Splitter : 6.0 dB

6.5.2 Test Procedure

Refer to ETSI EN 300 328 V2.1.1 (2016-11) Clause 5.4.6.2.1.4

Step 1:

• The UUT shall connect to a companion device during the test. The interference signal generator, the unwanted signal generator, the spectrum analyser, the UUT and the companion device are connected using a set-up equivalent to the example given by figure 5, although the interference and unwanted signal generators do not generate any signals at this point in time. The spectrum analyser is used to monitor the transmissions of both the UUT and the companion device and it should be possible to distinguish between either transmission. In addition, the spectrum analyser is used to monitor the transmissions of the UUT in response to the interfering and the unwanted signals.

• Adjust the received signal level (wanted signal from the companion device) at the UUT to the value defined in table 10 (clause 4.3.2.6.3.2.2) for Frame Based Equipment or in table 11 (clause 4.3.2.6.3.2.3) for Load Based Equipment.

Testing of Unidirectional equipment does not require a link to be established with a companion device.

• The analyser shall be set as follows::

- RBW: ≥ Occupied Channel Bandwidth (if the analyser does not support this setting, the highest available setting shall be used)
- VBW: 3 × RBW (if the analyser does not support this setting, the highest available setting shall be used)
- Detector Mode: RMS
- Centre Frequency: Equal to the centre frequency of the operating channel
- Span: 0 Hz
- Sweep time: > maximum Channel Occupancy Time
- Trace Mode: Clear Write
- Trigger Mode: Video

Step 2:

• Configure the UUT for normal transmissions with a sufficiently high payload resulting in a minimum transmitter activity ratio (TxOn / (TxOn + TxOff)) of 0,3. Where this is not possible, the UUT shall be configured to the maximum payload possible.

• For Load Based equipment, using the procedure defined in clause 5.4.6.2.1.5, it shall be verified that the UUT complies with the maximum Channel Occupancy Time and minimum Idle Period defined in clause 4.3.2.6.3.2.3, step 2 and step 3. When measuring the Idle Period of the UUT, it shall not include the transmission time of the companion device.

For the purpose of testing Load Based Equipment referred to in the first paragraph of clause 4.3.2.6.3.2.3 (IEEE 802.11™ [i.3] or IEEE 802.15.4™ [i.4] equipment), the limits to be applied for the minimum Idle Period and the maximum Channel Occupancy Time are the same as defined for other types of Load Based

Equipment (see clause 4.3.2.6.3.2.3, step 2 and step 3). The Idle Period is considered to be equal to the CCA or Extended CCA time defined in clause 4.3.2.6.3.2.3, step 1 and step 2.

Step 3: Adding the interference signal

• An interference signal as defined in clause B.6 is injected on the current operating channel of the UUT. The power spectral density level (at the input of the UUT) of this interference signal shall be equal to the detection threshold defined in clause 4.3.2.6.3.2.2 step 5) (frame based equipment) or clause 4.3.2.6.3.2.3 step 5) (load based equipment).

Step 4: Verification of reaction to the interference signal

• The spectrum analyser shall be used to monitor the transmissions of the UUT on the selected operating channel with the interfering signal injected. This may require the spectrum analyser sweep to be triggered by

the start of the interfering signal.

• Using the procedure defined in clause 5.4.6.2.1.5, it shall be verified that:

i) The UUT shall stop transmissions on the current operating channel.

The UUT is assumed to stop transmissions within a period equal to the maximum Channel Occupancy Time defined in clause 4.3.2.6.3.2.2 (frame based equipment) or clause 4.3.2.6.3.2.3 (load based equipment).

ii) Apart from Short Control Signalling Transmissions, there shall be no subsequent transmissions while the

interfering signal is present.

To verify that the UUT is not resuming normal transmissions as long as the interference signal is present, the monitoring time may need to be 60 s or more.

iii) The UUT may continue to have Short Control Signalling Transmissions on the operating channel while the interfering signal is present. These transmissions shall comply with the limits defined in clause 4.3.2.6.4.2.

The verification of the Short Control Signalling transmissions may require the analyser settings to be changed (e.g. sweep time).
iv) Alternatively, the equipment may switch to a non-adaptive mode.

Step 5: Adding the blocking signal

• With the interfering signal present, a 100 % duty cycle CW signal is inserted as the unwanted signal. The frequency and the level are provided in table 10 (clause 4.3.2.6.3.2.2) for Frame Based Equipment or in table 11 (clause 4.3.2.6.3.2.3) for Load Based Equipment.

• The spectrum analyser shall be used to monitor the transmissions of the UUT on the selected operating channel. This may require the spectrum analyser sweep to be triggered by the start of the unwanted signal.

• Using the procedure defined in clause 5.4.6.2.1.5, it shall be verified that:
i) The UUT shall not resume normal transmissions on the current operating channel as long as both the interference and unwanted signals remain present.
To verify that the UUT is not resuming normal transmissions as long as the interference and unwanted signals are present, the monitoring time may need to be 60 s or more.
ii) The UUT may continue to have Short Control Signalling Transmissions on the operating channel while the interfering and unwanted signals are present. These transmissions shall comply with the limits defined
in clause 4.3.2.6.4.2.
The verification of the Short Control Signalling transmissions may require the analyser settings to be changed (e.g. sweep time).

Step 6: Removing the interference and blocking signal

• On removal of the interference and unwanted signals the UUT is allowed to start transmissions again on this channel; however, this is not a requirement and, therefore, does not require testing.

Step 7:

• Step 2 to step 6 shall be repeated for each of the frequencies to be tested.

6.5.3 The energy detection threshold

Test Frequency : 2 412 MHz

- The energy detection threshold

802.11b = -70 dBm/MHz + 10 × log10 (100 mW / Pout)= -70 + 10 x log10 (100 mW / 31.70) = -65.01 dBm/MHz

Test Frequency : 2 472 MHz

- The energy detection threshold

802.11b = -70 dBm/MHz + 10 × log10 (100 mW / Pout)= -70 + 10 x log10 (100 mW / 24.89) = -63.96 dBm/MHz

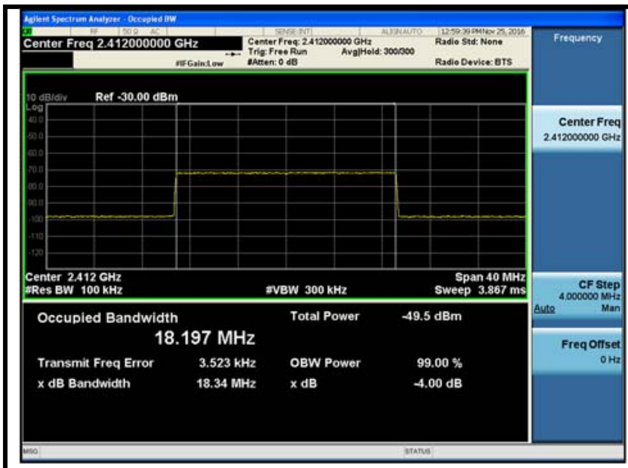
Measurement Uncertainty :

- Time : ± 0.01 % (about 95 %, *k*=2)
- Threshold level : ±1.18 dB (about 95 %, *k*=2)

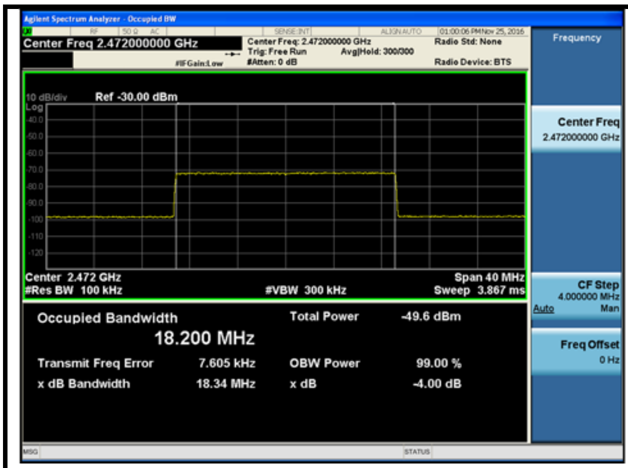
6.5.4 Signal calibration plot

1. Threshold level
2. Test Frequency : 2 412 MHz
3. We tested using the worst-case the interference signal level (-70dBm).

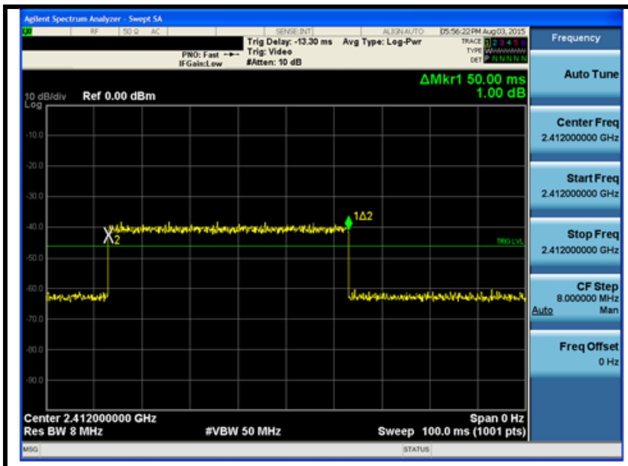
1. Threshold level
2. Test Frequency : 2 472 MHz
3. We tested using the worst-case the interference signal level (-70dBm).



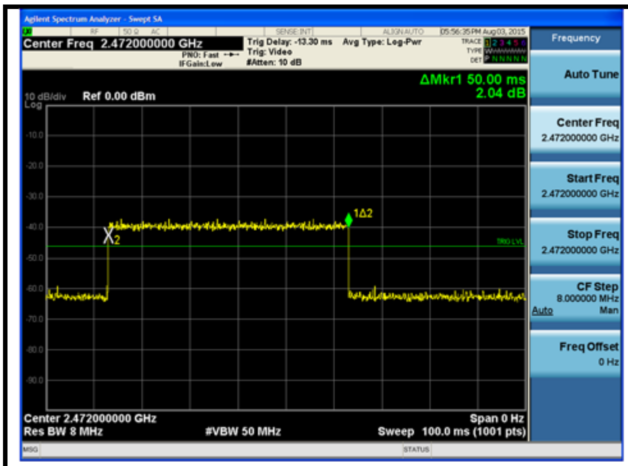
1. Interference Signal (bandwidth)
2. Test Frequency : 2 412 MHz
3. Modulation : 802.11b



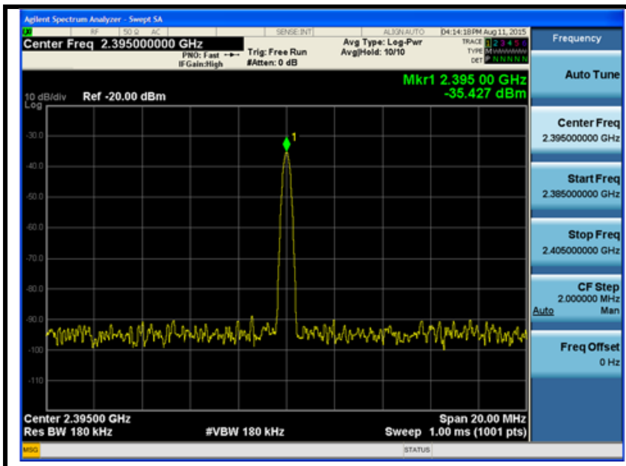
1. Interference Signal (bandwidth)
2. Test Frequency : 2 472 MHz
3. Modulation : 802.11b

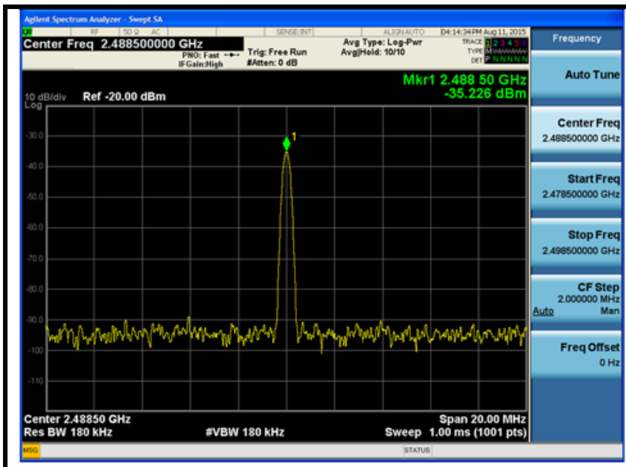


1. Interference Signal (length) : 50ms
2. Test Frequency : 2 412 MHz



1. Interference Signal (length) : 50ms
2. Test Frequency : 2 472 MHz

	1. Unwanted Signal 2. Blocking frequency: 2 395.0 MHz 3. Limit : -35 dBm 4. Type of interfering signal : CW 5. This level has to be corrected by the actual antenna assembly gain

	1. Unwanted Signal 2. Blocking frequency: 2 488.5 MHz 3. Limit : -35 dBm 4. Type of interfering signal : CW 5. This level has to be corrected by the actual antenna assembly gain

6.5.5 Limit

Adaptivity Limit
☒ LBT based Detect and Avoid(Load Based Equipment) √ Channel Occupancy Time shall be less than 13 ms; √ Detection threshold level = -70dBm/MHz + 10 × log10 (100 mW / Pout) (Pout in mW e.i.r.p.)
☒ Short Control Signalling Transmissions: √ Short Control Signalling Transmissions shall have a maximum TxOn / (TxOn + TxOff) ratio of 10 % within any observation period of 50 ms.

Unwanted Signal parameters		
Wanted signal mean power from companion device (dBm)	Unwanted signal frequency (MHz)	Unwanted signal frequency (MHz)
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.		

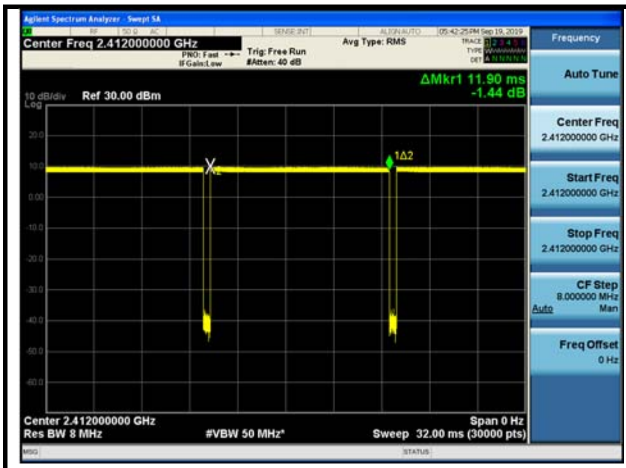
6.5.6 Test Result

Minimum requirements test		
Modulation Mode	Frequency (MHz)	Maximum Occupancy time (ms)
802.11b	2 412	11.90
	2 472	11.90
Test Result : Pass		

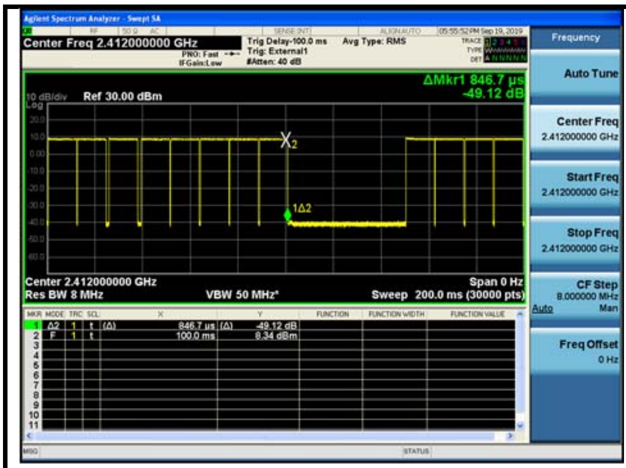
Adaptivity test				
Modulation Mode	Freq. (MHz)	interference Signal Frequency (MHz)	Transmission (ms)	Short Control Signalling Transmissions (ms)
802.11b	2 412	2 412	0.8467	0.28
	2 472	2 472	1.473	0.28
Test Result : Pass				

Receiver Blocking test				
Modulation Mode	Freq. (MHz)	Blocking Signal Frequency (MHz)	Blocking Signal Mean power (dBm)	Verification of reaction
802.11b	2 412	2 488.5	-35	Maintain the transmission stop state
	2 472	2 395.0	-35	Maintain the transmission stop state
Test Result : Pass				

6.5.7 Test Plot



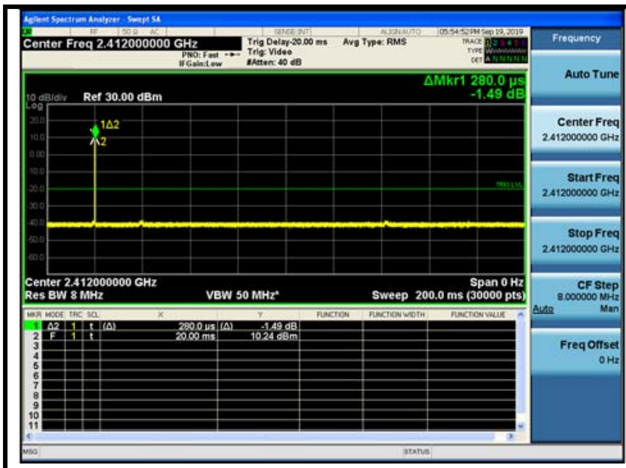
1. Maximum Occupancy time
2. Modulation type : 802.11b
3. Test Frequency : 2 412 MHz
4. Result : 11.90 ms

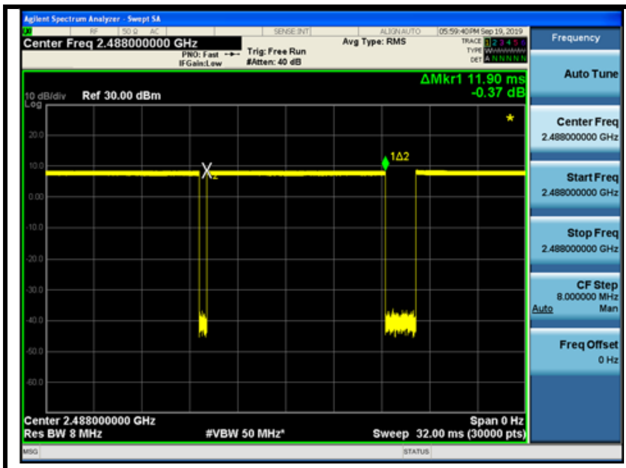


1. Adaptivity
2. Modulation type : 802.11b
3. Test Frequency : 2 412 MHz
4. Marker(1△2)

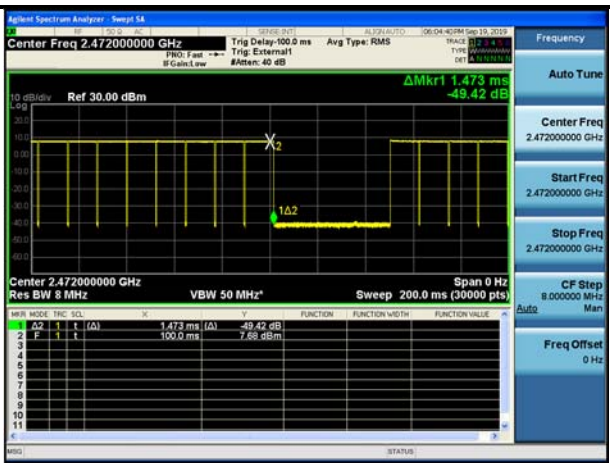
   : Transmission time after the interference signal injected = 0.8467 ms
5. Result

   : Stopped the transmissions on the current operating channel.

	1. Monitoring 2. Modulation type : 802.11b 3. Test Frequency : 2 412 MHz 4. Marker(1△2) : Monitoring time = 60s 5. Result : There is no transmissions while the interference & blocking signal injected.
	1. Short Control Signaling 2. Modulation type : 802.11b 3. Test Frequency : 2 412 MHz 4. Result : 0.28 ms



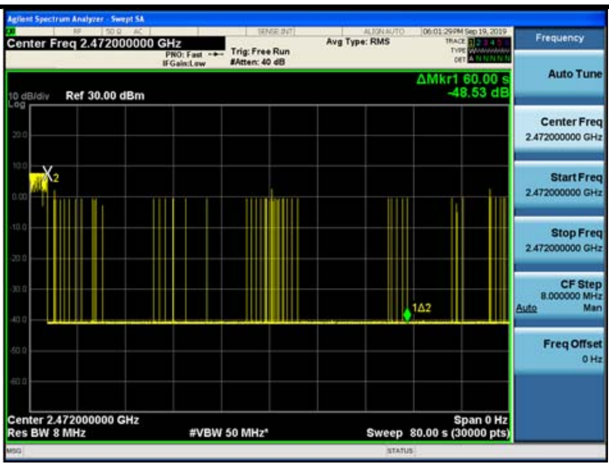
1. Maximum Occupancy time
2. Modulation type : 802.11b
3. Test Frequency : 2 472 MHz
4. Result : 11.90 ms



1. Adaptivity
2. Modulation type : 802.11b
3. Test Frequency : 2 472 MHz
4. Marker(1△2)

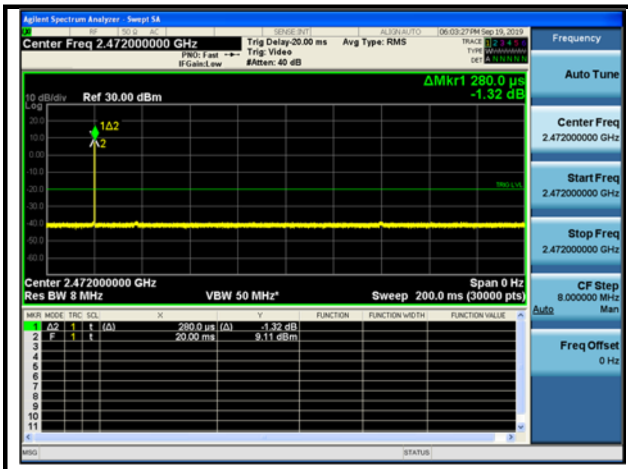
   : Transmission time after the interference signal injected = 1.473 ms
5. Result

   : Stopped the transmissions on the current operating channel.



1. Monitoring
2. Modulation type : 802.11b
3. Test Frequency : 2 472 MHz
4. Marker(1△2) : Monitoring time = 60s
5. Result

   : There is no transmissions while the interference & blocking signal injected.

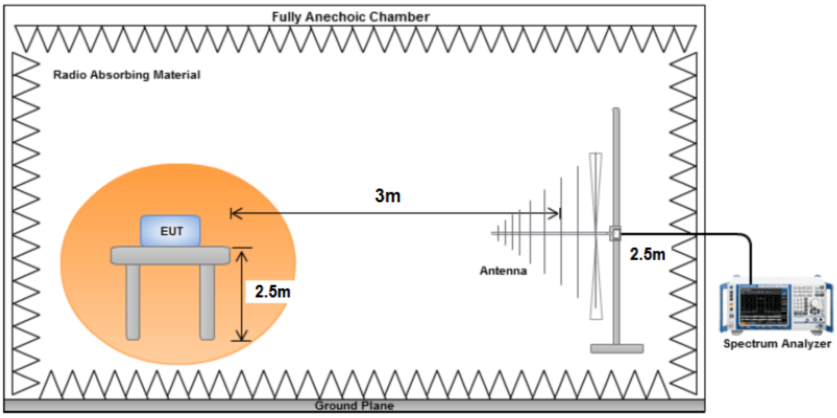


1. Short Control Signaling
2. Modulation type : 802.11b
3. Test Frequency : 2 472 MHz
4. Result : 0.28 ms

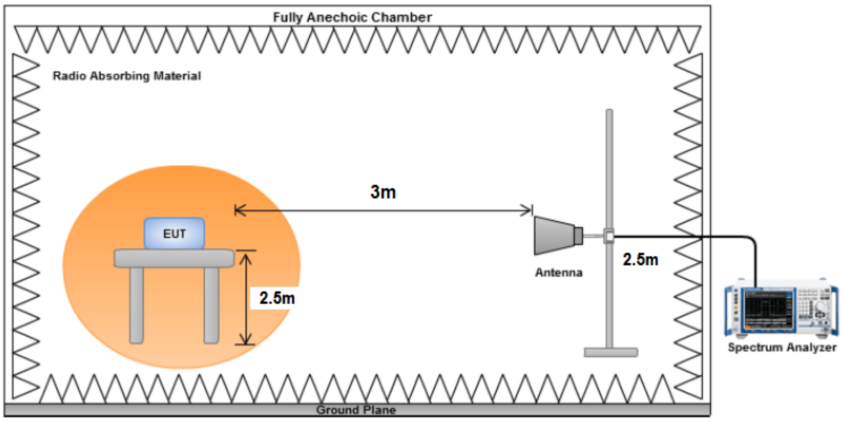
6.6 Transmitter unwanted emissions in the spurious domain

6.6.1 Test Setup

Below 1GHz



Above 1GHz



6.6.2 Test Procedure

- Refer to ETSI EN 300 328 V2.1.1 (2016-11) Clause 5.4.9.2
- The test site as described in annex B and applicable measurement procedures as described in annex C shall be used. The test procedure is further as described under clause 5.4.9.2.1.

6.6.3 Test Site

- Fully Anechoic Room

6.6.4 Test Method

- Correction values from a verified site calibration was used.
- During the tests, the measurement antenna polarization and EUT azimuth were varied in order to identify the maximum level of emissions from the EUT.
- The test was performed by placing the EUT on 3 orthogonal axis(X, Y, Z) and shown the worst case on this report.
- If the test data is very low, the data is not reported.

6.6.5 Limit

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 862 MHz	-54 dBm	100 kHz
862 MHz to 1 GHz	-36 dBm	100 kHz
1 GHz to 12,75 Hz	-30 dBm	1 MHz

6.6.6 Test Result

Measurement Frequency(MHz)	Polarization	Level (dBm)	Limit (dBm)	Margin (dB)	Detector
No Peak Found					
Measurement Uncertainty		Below 1 GHz : 5.16 dB (about 95 %, k = 2) Above 1 GHz : 5.57 dB (about 95 %, k = 2)			

Note

1. Modulation type : 802.11b
2. Test Frequency : 2 412 MHz

Measurement Frequency(MHz)	Polarization	Level (dBm)	Limit (dBm)	Margin (dB)	Detector
No Peak Found					
Measurement Uncertainty		Below 1 GHz : 5.16 dB (about 95 %, k = 2) Above 1 GHz : 5.57 dB (about 95 %, k = 2)			

Note

1. Modulation type : 802.11b
2. Test Frequency : 2 472 MHz

Measurement Frequency(MHz)	Polarization	Level (dBm)	Limit (dBm)	Margin (dB)	Detector
No Peak Found					
Measurement Uncertainty		Below 1 GHz : 5.16 dB (about 95 %, k = 2) Above 1 GHz : 5.57 dB (about 95 %, k = 2)			

Note

1. Modulation type : 802.11g
2. Test Frequency : 2 412 MHz
3. The worst case of 802.11g, n modulation was tested.

Measurement Frequency(MHz)	Polarization	Level (dBm)	Limit (dBm)	Margin (dB)	Detector
No Peak Found					
Measurement Uncertainty		Below 1 GHz : 5.16 dB (about 95 %, k = 2) Above 1 GHz : 5.57 dB (about 95 %, k = 2)			

Note

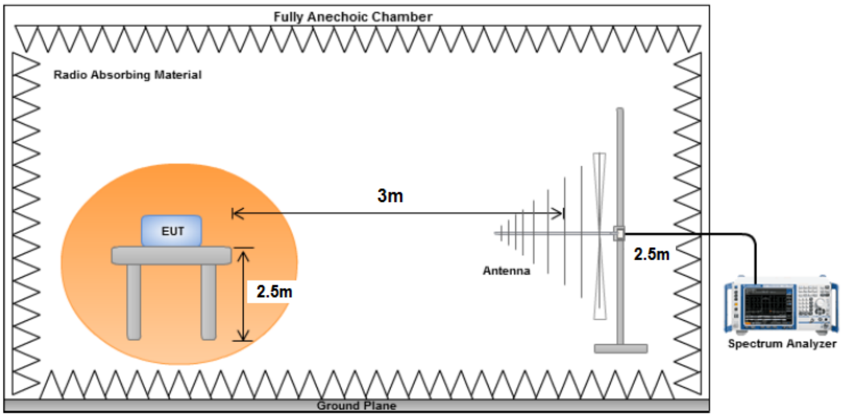
1. Modulation type : 802.11g
2. Test Frequency : 2 472 MHz
3. The worst case of 802.11g, n modulation was tested.

7. RECEIVER MEASUREMENTS – RESULTS

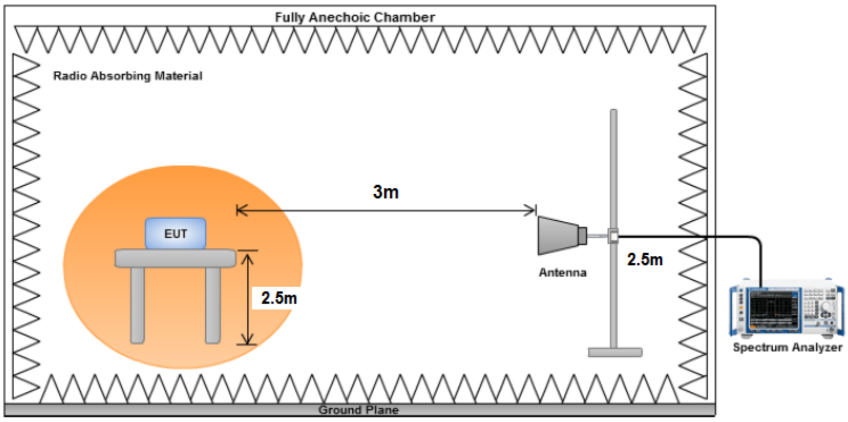
7.1 Receiver spurious emissions

7.1.1 Test Setup

Below 1GHz



Above 1GHz



7.1.2 Test Procedure

- Refer to ETSI EN 300 328 V2.1.1 (2016-11) Clause 5.4.10.2
- The test site as described in annex B and applicable measurement procedures as described in annex C shall be used. The test procedure is further as described under clause 5.4.10.2.1.

7.1.3 Test Site

- Fully Anechoic Room

7.1.4 Test Method

- Correction values from a verified site calibration was used.
- During the tests, the measurement antenna polarization and EUT azimuth were varied in order to identify the maximum level of emissions from the EUT.
- The test was performed by placing the EUT on 3 orthogonal axis(X, Y, Z) and shown the worst case on this report.
- If the test data is very low, the data is not reported.

7.1.5 Limit

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

7.1.6 Test Result

Measurement Frequency(MHz)	Polarization	Level (dBm)	Limit (dBm)	Margin (dB)	Detector
1248.12	H	-54.42	-47.00	7.42	RMS
Measurement Uncertainty		Below 1 GHz : 5.16 dB (about 95 %, k = 2) Above 1 GHz : 5.57 dB (about 95 %, k = 2)			

Note

1. Modulation type : 802.11b
2. Test Frequency : 2 412 MHz

Measurement Frequency(MHz)	Polarization	Level (dBm)	Limit (dBm)	Margin (dB)	Detector
3296.15	H	-57.38	-47.00	10.38	RMS
Measurement Uncertainty		Below 1 GHz : 5.16 dB (about 95 %, k = 2) Above 1 GHz : 5.57 dB (about 95 %, k = 2)			

Note

1. Modulation type : 802.11b
2. Test Frequency : 2 472 MHz

Measurement Frequency(MHz)	Polarization	Level (dBm)	Limit (dBm)	Margin (dB)	Detector
No Peak Found					
Measurement Uncertainty		Below 1 GHz : 5.16 dB (about 95 %, *k* = 2) Above 1 GHz : 5.57 dB (about 95 %, *k* = 2)			

Note

1. Modulation type : 802.11g
2. Test Frequency : 2 412 MHz
3. The worst case of 802.11g, n modulation was tested.

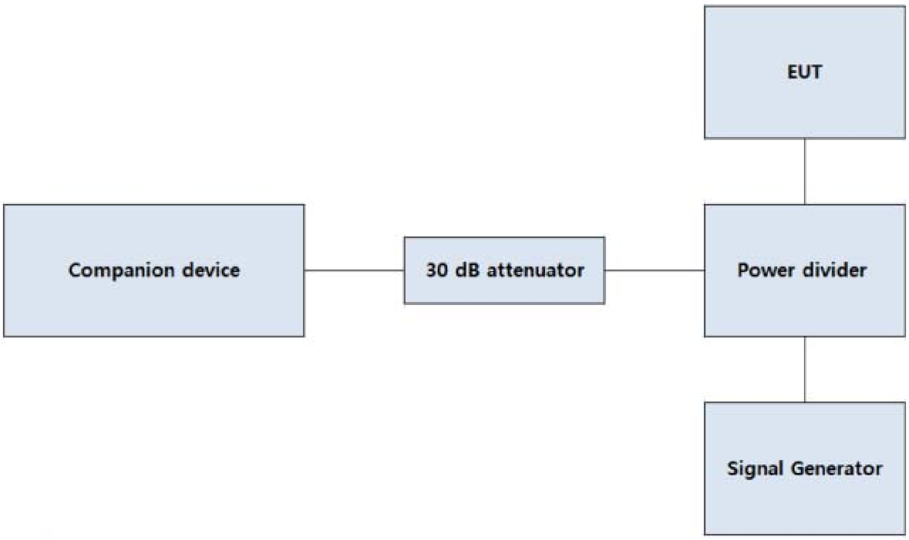
Measurement Frequency(MHz)	Polarization	Level (dBm)	Limit (dBm)	Margin (dB)	Detector
3296.15	H	-57.03	-47.00	10.03	RMS
Measurement Uncertainty		Below 1 GHz : 5.16 dB (about 95 %, *k* = 2) Above 1 GHz : 5.57 dB (about 95 %, *k* = 2)			

Note

1. Modulation type : 802.11g
2. Test Frequency : 2 472 MHz
3. The worst case of 802.11g, n modulation was tested.

7.2 Receiver Blocking

7.2.1 Test Setup



- Companion device : CMW500
- Signal Generator : SMB100A
- 30 dB attenuator : 8493C
- Power divider : 11636B
- We performed PER test using the Companion device.

7.2.2 Test Procedure

Step 1:

• For non-frequency hopping equipment, the UUT shall be set to the lowest operating channel.

Step 2:

• The blocking signal generator is set to the first frequency as defined in the appropriate table corresponding to the receiver category and type of equipment.

Step 3:

• With the blocking signal generator switched off, a communication link is established between the UUT and the associated companion device using the test setup shown in figure 6. The attenuation of the variable attenuator shall be increased in 1 dB steps to a value at which the minimum performance criteria as specified in clause 4.3.1.12.3 or clause 4.3.2.11.3 is still met. The resulting level for the wanted signal at the input of the UUT is Pmin.

• This signal level (Pmin) is increased by the value provided in the table corresponding to the receiver category and type of equipment.

Step 4:

• The blocking signal at the UUT is set to the level provided in the table corresponding to the receiver category and type of equipment. It shall be verified and recorded in the test report that the performance criteria as specified in clause 4.3.1.12.3 or clause 4.3.2.11.3 is met.

Step 5:

• Repeat step 4 for each remaining combination of frequency and level for the blocking signal as provided in the table corresponding to the receiver category and type of equipment.

Step 6:

• For non-frequency hopping equipment, repeat step 2 to step 5 with the UUT operating at the highest operating channel.

7.2.3 Limit

The minimum performance criterion shall be a PER less than or equal to 10 %.

While maintaining the minimum performance criteria, the blocking levels at specified frequency offsets shall be equal to or greater than the limits defined for the applicable receiver category provided in table below.

▪ Receiver Category 1

Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm)	Type of blocking signal
Pmin + 6 dB	2 380 2 503,5	-53	CW
Pmin + 6 dB	2 300 2 330 2 360	-47	CW
Pmin + 6 dB	2 523,5 2 553,5 2 583,5 2 613,5 2 643,5 2 673,5	-47	CW

▪ Receiver Category 2

Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm)	Type of blocking signal
Pmin + 6 dB	2 380 2 503,5	-57	CW
Pmin + 6 dB	2 300 2 583,5	-47	CW

▪ Receiver Category 3

Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm)	Type of blocking signal
Pmin + 12 dB	2 380 2 503,5	-57	CW
Pmin + 12 dB	2 300 2 583,5	-47	CW

7.2.4 Test Result

Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm)	Type of blocking signal	Verification of performance criterion (%)
Pmin + 6 dB	2 380.0 2 503.5	-53	CW	0.00 0.00
Pmin + 6 dB	2 300.0 2 330.0 2 360.0	-47	CW	0.00 0.00 0.00
Pmin + 6 dB	2 523.5 2 553.5 2 583.5 2 613.5 2 643.5 2 673.5	-47	CW	0.33 0.67 0.00 0.00 1.00 0.00

Note:

1. Receiver Category : 1
2. Pmin : Pmin is the minimum level of wanted signal (in dBm) required to meet the minimum performance criteria in the absence of any blocking signal = -94.01 dBm
3. Minimum performance criterion : PER less than or equal to 10 %.
4. Test Frequency : 2 412 MHz
5. Modulation type : 802.11b
6. Data Rate : 1Mbps
7. The smallest channel bandwidth shall be used together with the lowest data rate for this channel bandwidth.(Refer to ETSI EN 300 328 V2.1.1 (2016-11) Clause 5.4.11.1)

<table>
<tr><th>Wanted signal mean power from companion device (dBm)</th><th>Blocking signal frequency (MHz)</th><th>Blocking signal power (dBm)</th><th>Type of blocking signal</th><th>Verification of performance criterion (%)</th></tr>
<tr><td rowspan="2">Pmin + 6 dB</td><td rowspan="2">2 380.0
2 503.5</td><td rowspan="2">-53</td><td rowspan="2">CW</td><td>0.33</td></tr>
<tr><td>0.33</td></tr>
<tr><td rowspan="3">Pmin + 6 dB</td><td rowspan="3">2 300.0
2 330.0
2 360.0</td><td rowspan="3">-47</td><td rowspan="3">CW</td><td>0.33</td></tr>
<tr><td>0.67</td></tr>
<tr><td>0.33</td></tr>
<tr><td rowspan="6">Pmin + 6 dB</td><td rowspan="6">2 523.5
2 553.5
2 583.5
2 613.5
2 643.5
2 673.5</td><td rowspan="6">-47</td><td rowspan="6">CW</td><td>1.33</td></tr>
<tr><td>0.67</td></tr>
<tr><td>0.33</td></tr>
<tr><td>0.33</td></tr>
<tr><td>1.00</td></tr>
<tr><td>0.00</td></tr>
</table>

Note:

1. Receiver Category : 1
2. Pmin : Pmin is the minimum level of wanted signal (in dBm) required to meet the minimum performance criteria in the absence of any blocking signal = -93.92 dBm
3. Minimum performance criterion : PER less than or equal to 10 %.
4. Test Frequency : 2 472 MHz
5. Modulation type : 802.11b
6. Data Rate : 1Mbps
7. The smallest channel bandwidth shall be used together with the lowest data rate for this channel bandwidth.(Refer to ETSI EN 300 328 V2.1.1 (2016-11) Clause 5.4.11.1)

8. GEO-LOCATION CAPABILITY

8.1 Definition

Geo-location capability is a feature of the equipment to determine its geographical location with the purpose to configure itself according to the regulatory requirements applicable at the geographical location where it operates.

The geo-location capability may be present in the equipment or in an external device (temporary) associated with the equipment operating at the same geographical location during the initial power up of the equipment. The geographical location may also be available in equipment already installed and operating at the same geographical location.

8.2 Requirements

The geographical location determined by the equipment as defined in clause 8.1 shall not be accessible to the user.

8.3 Declaration by the Manufacturer

Geo-location capability is implemented in this product and can’t be accessible to the user.

9. PHOTOGRAPHS OF THE EUT

Photographs is described in Appendix A. Please refer to Appendix A.

10. SETUP PHOTO

Setup photo is described in Appendix B. Please refer to Appendix B.