REPORT No.: SZ18050201W08

TEST REPORT

MANUFACTURER	**:**	Shenzhen Chainway Information Technology Co.,Ltd.
PRODUCT NAME	**:**	Mobile Data Terminal
MODEL NAME	**:**	C75
BRAND NAME	**:**	CHAINWAY
STANDARD(S)	**:**	Draft ETSI EN 300 440 V2.2.0 (2017-09)
TEST DATE	**:**	2018-06-11 to 2018-06-12
ISSUE DATE	**:**	2018-07-16

Tested by: Tu Ya'nan

Tu Ya'nan (Test Engineer)

Approved by: Peng Huarui

Peng Huarui (Supervisor)

DIRECTORY

Change History		
Issue	**Date**	**Reason for change**
1.0	2018-07-16	First edition

1. Technical Information

Note: Provide by manufacturer.

1.1. Manufacturer and Factory Information

Manufacturer:	Shenzhen Chainway Information Technology Co.,Ltd.
Manufacturer Address:	9/F, Building 2, Daqian Industrial Park, Longchang Rd., District 67, Bao'an, Shenzhen
Factory:	Shenzhen Chainway Information Technology Co.,Ltd.
Factory Address:	9/F, Building 2, Daqian Industrial Park, Longchang Rd., District 67, Bao'an, Shenzhen

1.2. Equipment Under Test (EUT) Description

Product Name:	Mobile Data Terminal	
Serial No:	(N/A, marked #1 by test site)	
Hardware Version:	C70_MB_V11	
Software Version:	C75E_MT6737_V1.2_EU_GITe4dc346_201805171136	
Modulation Type:	OFDM	
Wireless Technology:	802.11a, 802.11n(HT20), 802.11n(HT40)	
Operating Frequency Range:	5.745GHz-5.825GHz	
Antenna Type:	PIFA Antenna	
Antenna Gain:	0.49 dBi	
Maximum EIRP:	12.28 dBm	
Receiver category:	1	
Operating voltage:	Normal(NV):	3.8V
	Lowest(LV):	3.6V
	Highest(HV):	4.35V
Operating temperature:	Normal(NT):	25°C
	Lowest(LV):	-20°C
	Highest(HV):	50°C

Note 1: This test report is updated from report SZ17080130W08, based on the similarity between before, the model name, the software and hardware version, the antenna type and the appearance of EUT are changed. The changes only affect the test results of unwanted emissions in the spurious domain and receiver spurious emissions in radiated measurement.

Note 2: The EUT is working at the 5.8GHz ISM band, Refer the operate Model and channel as table1.

Table 1:

802.11a & 802.11 n(HT20) Mode		802.11n(HT40) Mode
Channel149: 5745MHz	Channel161: 5805 MHz	Channel151: 5755MHz
Channel153: 5765 MHz	Channel165: 5825 MHz	Channel159: 5795MHz
Channel157: 5785 MHz		

Note 3: Frequencies 5745MHz, 5785MHz, 5825MHz are chosen for test on 802.11a & 802.11 n (HT20) Mode, Only the worst test result 802.11a were recorded in this report for 20MHz Bandwidth.

Frequencies 5755MHz and 5795MHz are chosen for test on 802.11n (HT40) Mode for 40MHz Bandwidth.

Note 4: Please refer to ANNEX A for the photographs of the EUT. For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacture.

1.3. Test Standards and Results

The EUT has been tested according to Draft ETSI EN 300 440 V2.2.0 (2017-09)

Draft ETSI EN 300 440 V2.2.0 (2017-09)	Short Range Devices (SRD); Radio equipment to be used in the 1 GHz to 40 GHz frequency range; Harmonised Standard for access to radio spectrum

Test items and the results are as bellow:

No.	EN Clause	Test Description	Test Engineer	Result
1	4.2.2	Equivalent isotropically radiated power (e.i.r.p)	Tu Ya'nan	**PASS** Note1
2	4.2.3	Permitted range of operating frequencies	Tu Ya'nan	**PASS** Note1
3	4.2.4	Unwanted emissions in the spurious domain	Peng Xuewei	**PASS**
4	4.2.5.4	Duty cycle	Tu Ya'nan	**PASS** Note1
5	4.3.3	Adjacent channel selectivity	Tu Ya'nan	**PASS** Note1
6	4.3.4	Blocking or desensitization	Tu Ya'nan	**PASS** Note1
7	4.3.5	Spurious radiations	Peng Xuewei	**PASS**
8	4.4	Spectrum access techniques	Tu Ya'nan	**PASS** Note1
Note1: The test results of these test items in this report refer to the test report (Report No.: SZ17080130W08).				

1.4. EUT Setup and Operating Conditions

The EUT is activated and controlled by the System Simulator and software. The EUT is powered by a battery.

1.5. Environmental Conditions

Ambient temperature: +15~+35°C
Relative humidity: 20~75%
Atmosphere pressure: 86-106kPa

2. Test procedure and results

2.1. EN 300 440§4.2.2 Equivalent isotropically radiated power (e.i.r.p)

2.1.1. Applicability

The equivalent isotropically radiated power requirement shall apply to all transmitters.

2.1.2. Description

The e.i.r.p. is defined as the maximum radiated power of the transmitter and its antenna, and is measured and calculated according to the procedure given in the following clause. See clause 5 for the test conditions.

2.1.3. Method of measurement

2.1.3.1 General requirements

To measure e.i.r.p. it is first necessary to determine the appropriate method of measurement: see clauses 4.2.2.3.1 and 4.2.2.3.2. The -6 dB transmitter bandwidth shall be determined using a 100 kHz measuring bandwidth in order to establish which measurement method is applicable:

- clause 4.2.2.3.1 for Non spread spectrum transmitters with a -6 dB bandwidth of up to 20 MHz and spread spectrum transmitters with channel bandwidth of up to 1 MHz;
- clause 4.2.2.3.2 for all other transmitter bandwidths.

Using the applicable measurement procedure as described in clause 4.2.2.3.2 and annex B, the power output shall be measured and recorded in the test report. The method of measurement shall be documented in the test report.

Measurements shall be performed at normal test conditions (see clause 5.6).

Where possible, the equipment shall be able to operate in a continuous transmit mode for testing purposes.

2.1.3.2 Non spread spectrum transmitters with a -6 dB bandwidth of up to 20 MHz and spread spectrum transmitters with channel bandwidth of up to 1 MHz

General

The method of measurement in clauses 4.2.2.3.1.1 or 4.2.2.3.1.2 shall only be used for:

- non spread spectrum equipment with a -6 dB bandwidth of 20 MHz or less and a duty cycle above 50 %;
- spread spectrum equipment with a -6 dB channel bandwidth of 1 MHz or less.

For peak power measurements, a spectrum analyser or frequency-selective voltmeter shall be

used and tuned to the transmitter carrier at which the highest level is detected.
For FHSS systems, the hop frequency which provides the maximum indicated level shall be used. The frequency shall be indicated in the test report.
Other transmitters are tested according to clause 4.2.2.3.2.

Equipment measured as constant envelope modulation equipment

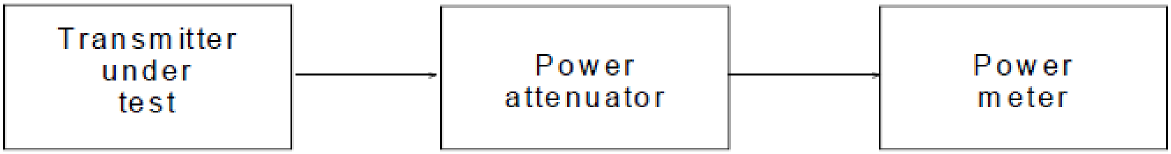


Figure 2: Measurement arrangement

For practical reasons, measurements shall be performed only at the highest power level at which the transmitter is intended to operate. The measurement arrangement in figure 2 shall be used. The measurement shall be performed preferably in the absence of modulation.
When it is not possible to measure it in the absence of modulation, this fact shall be stated in test reports.
The transmitter shall be set in continuous transmission mode. If this is not possible, the measurements shall be carried out in a period shorter than the duration of the transmitted burst. It may be necessary to extend the duration of the burst.
The transmitter shall be connected to an artificial antenna (see clause 5.8.2) and the power delivered to this artificial antenna shall be measured.
The equivalent isotropically radiated power is then calculated from the measured value, the known antenna gain, relative to an isotropic antenna, and if applicable, any losses due to cables and connectors in the measurement system.

Equipment measured as constant envelope modulation equipment

The measurement shall be performed with test signals D-M2 or D-M3 as appropriate.
The transmitter shall be preferably set in continuous transmission mode. If this is not possible, the measurement can be performed in discontinuous mode.
The transmitter shall be connected to an artificial antenna (see clause 5.8.2) and the power delivered to this artificial antenna shall be measured. The measuring instrument shall have a measurement bandwidth not less than sixteen times the channel bandwidth.
The equivalent isotropically radiated power is then calculated from the measured value, the known antenna gain, relative to an isotropic antenna, and if applicable, any losses due to cables and connectors in the measurement system.

2.1.3.3 Transmitters other than those defined in clause 4.2.2.3.1

This method of measurement shall be used for:

a) equipment with a -6 dB bandwidth greater than 20 MHz, and equipment with a duty cycle below 50 %; or for
b) spread spectrum equipment with a channel bandwidth above 1 MHz.

The equivalent isotropically radiated power shall be determined and recorded.
In case of radiated measurements on smart antenna systems using symmetrical power distribution across the available transmit chains, the EUT should, where possible, be configured so that only one transmit chain (antenna) is activated while the other transmit chains are disabled. Where this is not possible, the method used shall be documented in the test report. If only one transmit chain was tested, the result for the active transmit chain shall be corrected to be valid for the whole system (all transmit chains).
NOTE: The power (in mW) for one transmit chain needs to be multiplied with the number of transmit chains to obtain the total power for the system.
The measurement shall be performed using normal operation of the equipment with the test modulation applied (see clause 5.8.1).
The test procedure shall be as follows:

Step 1:

• using a suitable means, the output of the transmitter shall be coupled to a matched diode detector;
• the output of the diode detector shall be connected to the vertical channel of an oscilloscope;
• the combination of the diode detector and the oscilloscope shall be capable of faithfully reproducing the envelope peaks and the duty cycle of the transmitter output signal;
• the observed duty cycle of the transmitter (Tx on/(Tx on + Tx off)) shall be noted as x, $(0 < x < 1)$ and recorded.

Step 2:

• the average output power of the transmitter shall be determined using a wideband, calibrated RF power meter with a matched thermocouple detector or an equivalent thereof and, where applicable, with an integration period that exceeds the repetition period of the transmitter by a factor 5 or more. The observed value shall be recorded as "A" (in dBm);
• the e.i.r.p. shall be calculated from the above measured power output A, the observed duty cycle x, and the applicable antenna assembly gain "G" in dBi, according to the formula:
  - $P = A + G + 10 \log (1/x)$;
  - P shall not exceed the value specified in clause 4.2.2.4.

The measurement shall be repeated at the lowest, the middle, and the highest frequency of the stated frequency range. These frequencies shall be recorded. FHSS equipment shall be made to hop continuously to each of these three frequencies separately.

2.1.4. Limits

The transmitter maximum e.i.r.p. under normal and extreme test conditions is provided in table 2.

Table 2: Maximum radiated peak power (e.i.r.p.)

Frequency Bands	Power	Application	Notes
2400 MHz to 2 483.5 MHz	10mW e.i.r.p	Non-specific short range devices	
2400 MHz to 2 483.5 MHz	25mW e.i.r.p	Radio determination devices	
(a) 2 446 MHz to 2 454 MHz	500mW e.i.r.p	Radio Frequency Identification (RFID) devices	See also table 4 and annex D
(b) 2 446 MHz to 2 454 MHz	4mW e.i.r.p	Radio Frequency Identification (RFID) devices	See also table 4 and annex D
5725MHz to 5875MHz	25mW e.i.r.p.	Non-specific short range devices	
9200 MHz to 9500 MHz	25mW e.i.r.p.	Radio determination devices	
9500 MHz to 9975 MHz	25mW e.i.r.p.	Radio determination devices	
10.5 GHz to 10.6 GHz	500mW e.i.r.p.	Radio determination devices	
13.4 GHz to 14.0 GHz	25mW e.i.r.p.	Radio determination devices	
17.1 GHz to 17.3 GHz	400mW e.i.r.p.	Radio determination devices	See annex F
24.00 GHz to 24.25 GHz	100mW e.i.r.p.	Non-specific short range devices and Radio determination devices	

2.1.5. Conformance

The transmitter maximum e.i.r.p. measurements shall be performed as described in clause 4.2.2.3 and not exceed the limits in clause 4.2.2.4. The values and measurement method utilized shall be stated in the test report.

2.1.6. Test result

802.11 a Mode Maximum e.r.i.p:

Duty Cycle measurement X: (Ton/(Ton+Toff))		=0.96					
Antenna assembly gain		=0.49 dBi					
EIRP		=A(Average Power)+G+10log(1/X)					
Test Conditions		Transmitter Power Level (dBm)					
		Lowest Frequency, 5745MHz		**Middle Frequency, 5785MHz**		**Highest Frequency, 5825MHz**	
		Average Power	**EIRP**	**Average Power**	**EIRP**	**Average Power**	**EIRP**
NT	NV	10.88	11.55	10.25	10.92	11.61	12.28
Limit		25mW or 13.97dBm e.i.r.p.					
Measurement uncertainty		±1.5dB					

802.11 n(HT40) Mode Maximum e.r.i.p:

Duty Cycle measurement X: (Ton/(Ton+Toff))		=0.89			
Antenna assembly gain		=0.49 dBi			
EIRP		=A(Average Power)+G+10log(1/X)			
Test Conditions		Transmitter Power Level (dBm)			
		Lowest Frequency, 5755MHz		**Highest Frequency, 5795MHz**	
		Average Power	**EIRP**	**Average Power**	**EIRP**
NT	NV	11.01	12.01	11.00	12.00
Limit		25mW or 13.97dBm e.i.r.p.			
Measurement uncertainty		±1.5dB			

2.2. EN 300 440 §4.2.3 - Permitted range of operating frequencies

2.2.1. Applicability

The Permitted range of operating frequencies shall apply to all transmitters.

2.2.2. Description

The permitted range of operating frequencies includes all frequencies on which the equipment may operate within an assigned frequency band. The operating frequency range shall be declared by the manufacturer.
The frequency range of the equipment is determined by the lowest and highest frequencies occupied by the power envelope in accordance with clause 4.2.2.4, table 2.
FH is the highest frequency of the power envelope, it is the frequency furthest above the frequency of maximum power where the output power envelope drops below the level of -75 dBm/Hz spectral power density (e.g. -30 dBm if measured in a 30 kHz reference bandwidth) e.i.r.p.
FL is the lowest frequency of the power envelope; it is the frequency furthest below the frequency of maximum power where the output power drops below the level of -75 dBm/Hz spectral power density (e.g. -30 dBm if measured in a 30 kHz reference bandwidth) e.i.r.p.
The occupied bandwidths and OCW of the transmitter shall be declared. Where differing modes of emission are available, all modes and their associated bandwidths shall be stated.
The range of frequencies, determined by clause 4.2.3, shall be specified in the test report.

2.2.3. Method of measurement

The method of measurement for equipment employing FHSS and stepped frequency modulation is given in clause 4.2.3.4.
Using applicable conducted measurement procedures, as described in annex C, the frequency range(s) shall be measured and recorded in the test report.
Where applicable, during these measurements the test data sequence as specified in clauses 5.8.1 and 5.8.1.1 shall be used. The transmitter power level shall be set to the rated power level.
These measurements shall be performed under both normal and extreme operating conditions except for the occupied bandwidth assessment for which measurement at normal operating conditions is sufficient.
The measurement procedure shall be as follows:

a) put the spectrum analyser in video averaging mode with a minimum of 50 sweeps selected;
b) select the lowest operating frequency of the equipment under test and activate the transmitter with modulation applied. The RF emission of the equipment shall be displayed on the

spectrum analyser;

c) using the marker of the spectrum analyser, find the lowest frequency below the operating frequency at which the spectral power density drops below the level given in clause 4.2.3. This frequency shall be recorded in the test report;

d) select the highest operating frequency of the equipment under test and find the highest frequency at which the spectral power density drops below the value given in clause 4.2.3. This frequency shall be recorded in the test report;

e) the difference between the frequencies measured in steps c) and d) is the operating frequency range. It shall be recorded in the test report.

This measurement shall be repeated for each frequency range declared by the manufacturer.

2.2.4. Method of measurement for equipment using FHSS modulation

Using an applicable conducted measurement procedure as described in annex B the frequency range of the equipment shall be measured and recorded in the test report.
During these measurements the test data sequence, as specified in clause 5.8.1, shall be used.
The transmitter power level shall be set to the maximum power level if controllable.
These measurements shall be performed under both normal and extreme operating conditions.
The measurement procedure shall be as follows:

a) put the spectrum analyser in video averaging mode with a minimum of 50 sweeps selected;

b) select the lowest hop frequency of the equipment under test and activate the transmitter with modulation applied;

c) find the lowest frequency below the operating frequency at which the spectral power density drops below the level given in clause 4.2.3. This frequency shall be recorded in the test report;

d) select the highest hop frequency of the equipment under test and find the highest frequency at which the spectral power density drops below the level given in clause 4.2.3. This frequency shall be recorded in the test report;

e) the difference between the frequencies measured in steps c) and d) is the frequency range. It shall be recorded in the test report.

This measurement shall be repeated for each operating frequency range declared by the manufacturer.

2.2.5. Limits

The width of the power spectrum envelope is f_H -f_L for a given operating frequency. In equipment that allows adjustment or selection of different operating frequencies, the power envelope takes up different positions in the allowed band. The frequency range is determined by the lowest value of f_L and the highest value of f_H resulting from the adjustment of the equipment to the lowest and highest operating frequencies.

The occupied bandwidth (i.e. the bandwidth in which 99 % of the wanted emission is contained) of the transmitter shall fall within the assigned frequency band.
For all equipment the frequency range shall lie within the frequency band given by clause 4.2.2.4, table 2. For non-harmonized frequency bands the available frequency range may differ between national administrations.

2.2.6. Test Result

802.11 a Mode:

Test Conditions		Frequency (MHz)			
		Measured Frequency at the Lowest	**Limit of the Lowest**	**Measured Frequency at the Highest**	**Limit of the Highest**
NT	NV	5736.440	5725	5833.760	5875
LT	LV	5736.452		5833.763	
	HV	5736.449		5833.769	
HT	LV	5736.442		5833.752	
	HV	5736.432		5833.556	
Test Result		**PASS**			

802.11 n(HT40) Mode:

Test Conditions		Frequency (MHz)			
		Measured Frequency at the Lowest	**Limit of the Lowest**	**Measured Frequency at the Highest**	**Limit of the Highest**
NT	NV	5736.520	5725	5813.480	5875
LT	LV	5736.532		5813.483	
	HV	5736.521		5813.482	
HT	LV	5736.529		5813.476	
	HV	5736.536		5813.477	
Test Result		**PASS**			

2.3. EN 300 440 §4.2.4- Unwanted emissions in the spurious domain

2.3.1. Applicability

The unwanted emissions in the spurious domain requirement shall apply to all transmitters.

2.3.2. Description

According to CEPT/ERC/Recommendation 74-01E [i.8], and Recommendation ITU-R SM.329-12 [i.7], the boundary between the out-of-band and spurious domains is ±250 % of the necessary bandwidth from the centre frequency of the emission. Out-of-band and spurious emissions are measured as spectral power density under normal operating conditions.
Unwanted emissions in the spurious domain (spurious emissions) are those at frequencies beyond the limit of 250 % of the occupied bandwidth above and below the centre frequency of the emission. The occupied bandwidth is either measured or declared by the manufacturer.

2.3.3. Method of measurement

2.3.3.1 General Requirements

The level of spurious emissions shall be measured as either:

a)
   i) their power level in a specified load (conducted emission); and
   ii) their effective radiated power when radiated by the cabinet and structure of the equipment (cabinet radiation); or

b) their effective radiated power when radiated by the cabinet and the integral or dedicated antenna, in the case of equipment fitted with such an antenna and no permanent RF connector.

For measurements above 1 000 MHz the peak value shall be measured using a spectrum analyser. The "max hold" function of a spectrum analyser shall be used. For measurements up to 1 000 MHz the quasi-peak detector set in accordance with the specification of CISPR 16 [1], [2] and [3] shall be used.
The correction for RBW described in clause 5.8.5 is to be applied to the measured results as applicable.

2.3.3.2 Method of measurement - radiated spurious emission

This method of measurement applies to transmitters having an integral antenna.
Additional requirements for equipment employing FHSS modulation are given in clause 4.2.4.3.4.

a) A test site selected from annex B which fulfils the requirements of the specified frequency range of this measurement shall be used. The test antenna shall be oriented initially for vertical polarization and connected to a measuring receiver, through a suitable filter to avoid overloading of the measuring receiver if required. The bandwidth of the measuring receiver shall be adjusted until the sensitivity of the measuring receiver, after allowing for the coupling loss, is at least 6 dB below the spurious emission limit given in table 3, see clause 4.2.4.4. This bandwidth shall be recorded in the test report.

For the measurement of spurious emissions below the second harmonic of the carrier frequency the optional filter used shall be a high "Q" (notch) filter centred on the transmitter carrier frequency and attenuating this signal by at least 30 dB.

For the measurement of spurious emissions at and above the second harmonic of the carrier frequency the optional filter used shall be a high pass filter with a stop band rejection exceeding 40 dB. The cut-off frequency of the high pass filter shall be approximately 1,5 times the transmitter carrier frequency.

The transmitter under test shall be placed on the support in its standard position and shall be switched on without modulation. If modulation cannot be inhibited then the test shall be carried out with modulation (see clause 6.1) and this fact shall be recorded in the test report.

b) The same method of measurement as steps b) and k) of clause 4.2.4.3.2 shall be used.

2.3.4. Test limit

The maximum power limits of any unwanted emissions in the spurious domain are given in table 3.

Table 3: Spurious emissions

Frequency ranges / State	47MHz to 74MHz 87.5MHz to 108MHz 174MHz to 230MHz 470MHz to 862MHz	Other frequencies ≤1000MHz	Other frequencies >1000MHz
Operating	4nW	250nW	1uW
Standby	2nW	2nW	20nW

2.3.5. Conformance

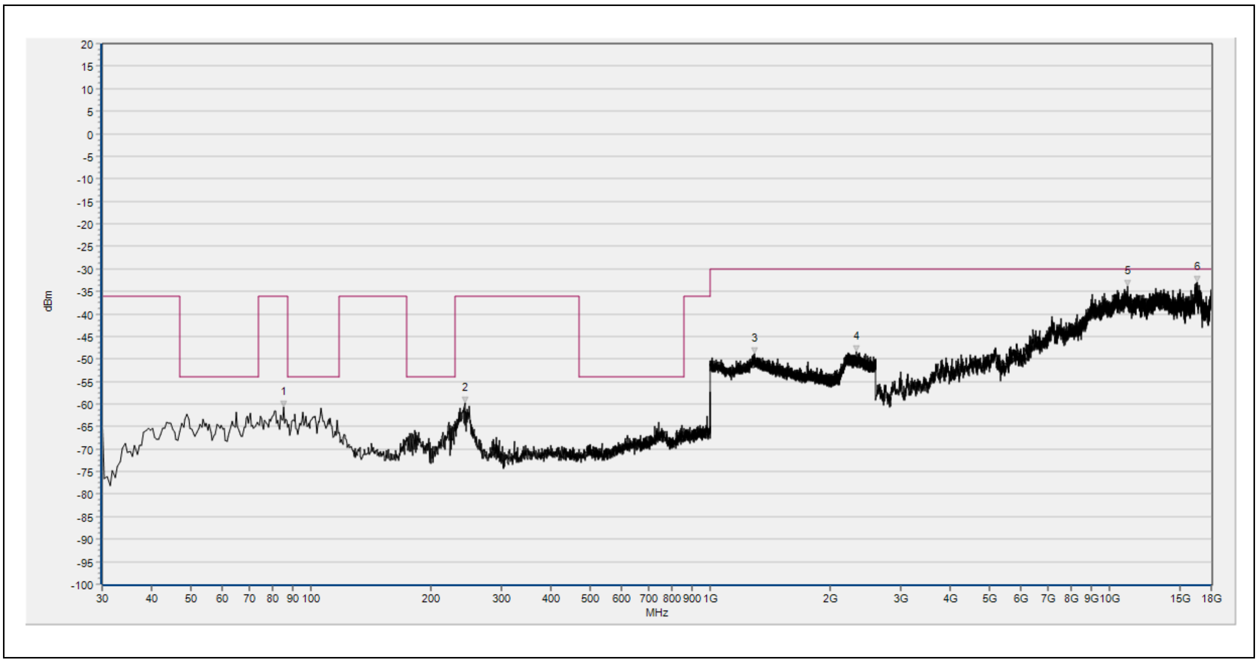
The power of unwanted emissions in the spurious domain shall be performed as described in clause 4.2.4.3 and not exceed the limits in clause 4.2.4.4. The values and measurement method utilized shall be stated in the test report.

2.3.6. Test result

For the frequency, which started from 18G to 40G, was pre-scanned and the result which was 10dB lower than the limit.

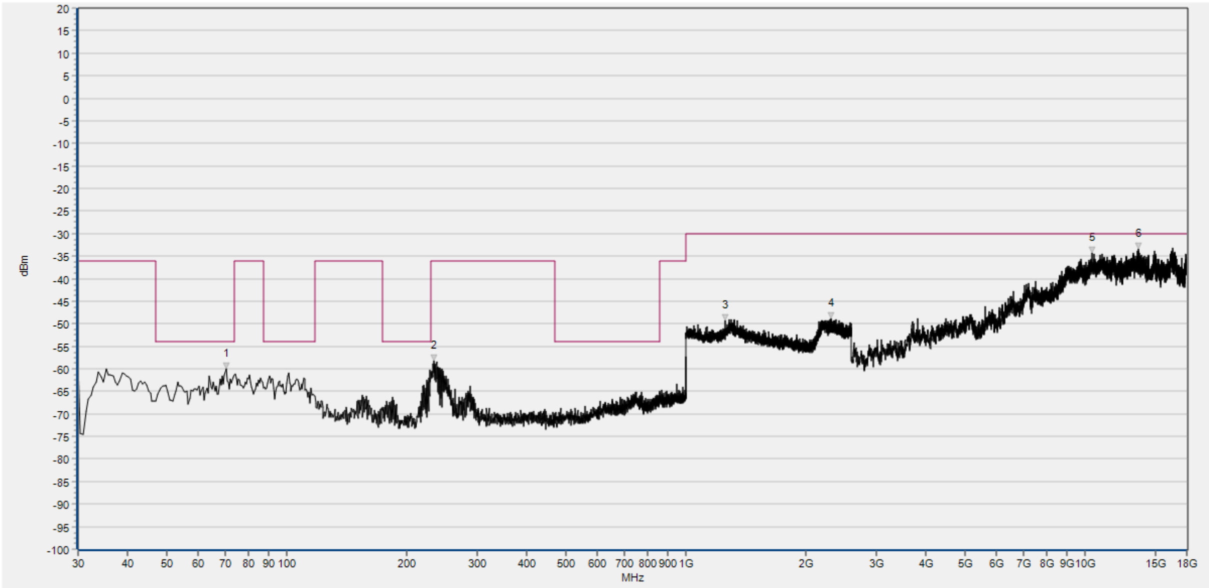
A. 802.11a Mode:

Plots for Channel = 149



(802.11a, 30MHz to 18GHz, Antenna Horizontal, Channel 149)

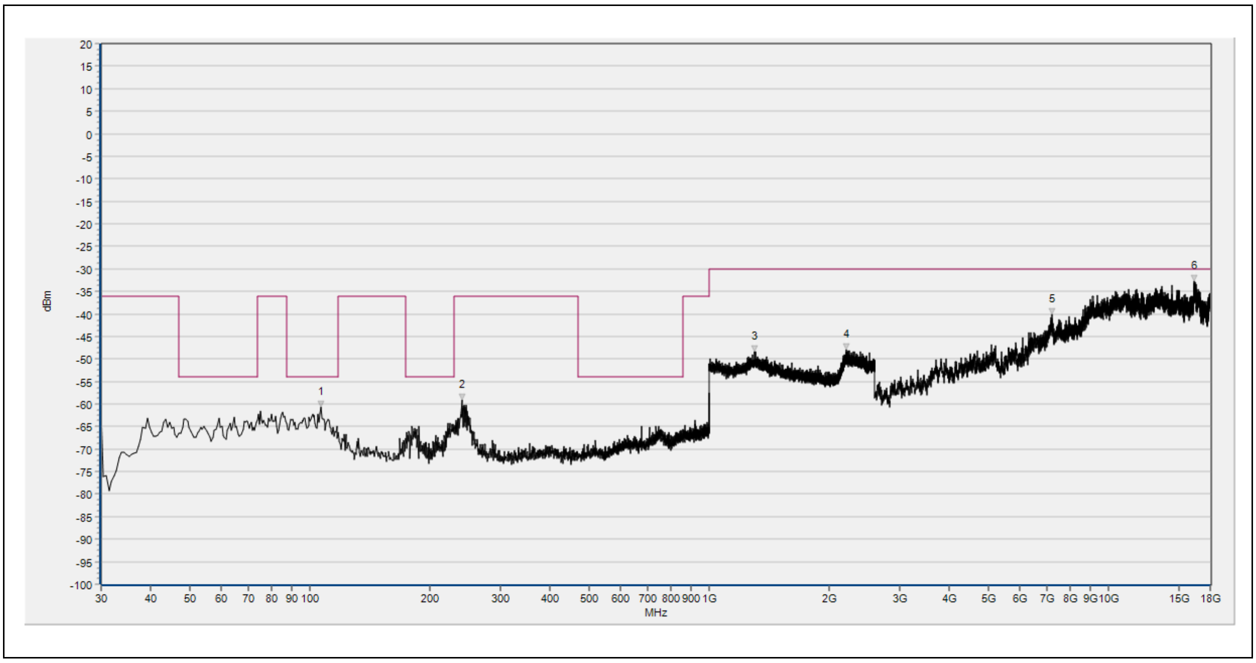
Channel = 149				
Transmitter with modulation Mode at 5745MHz				
Frequency (MHz)	**Peak (dBm)**	**Limit(PK)**	**Antenna**	**Verdict**
85.480	-60.61	-36.00	Horizontal	PASS
243.022	-59.85	-36.00	Horizontal	PASS
1292.898	-48.84	-30.00	Horizontal	PASS
2323.108	-48.47	-30.00	Horizontal	PASS
11133.307	-33.81	-30.00	Horizontal	PASS
16561.352	-33.01	-30.00	Horizontal	PASS



(802.11a, 30MHz to 18GHz, Antenna Vertical, Channel 149)

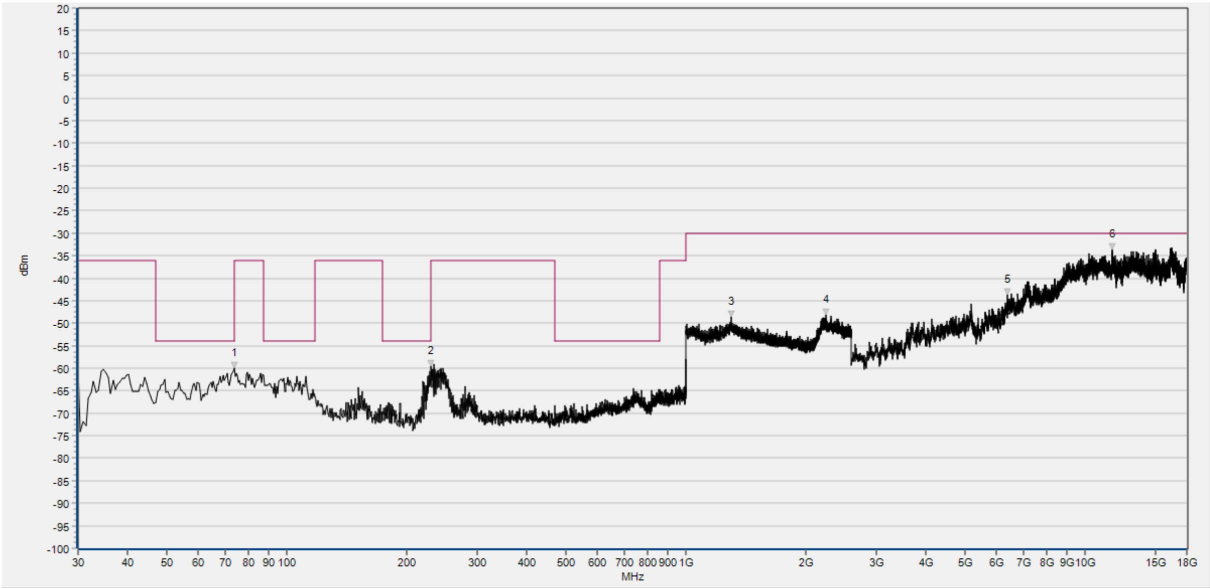
Channel = 149				
Transmitter with modulation Mode at 5745MHz				
Frequency (MHz)	**Peak (dBm)**	**Limit(PK)**	**Antenna**	**Verdict**
70.360	-60.04	-54.00	Vertical	PASS
234.242	-58.12	-36.00	Vertical	PASS
1257.686	-49.33	-30.00	Vertical	PASS
2308.703	-48.93	-30.00	Vertical	PASS
10427.846	-34.24	-30.00	Vertical	PASS
13585.477	-33.16	-30.00	Vertical	PASS

Plot for Channel = 165



(802.11a, 30MHz to 18GHz, Antenna Horizontal, Channel 165)

Channel = 165				
Transmitter with modulation Mode at 5825MHz				
Frequency (MHz)	**Peak (dBm)**	**Limit(PK)**	**Antenna**	**Verdict**
106.453	-60.61	-54.00	Horizontal	PASS
240.095	-59.18	-36.00	Horizontal	PASS
1300.367	-48.28	-30.00	Horizontal	PASS
2205.202	-48.01	-30.00	Horizontal	PASS
7220.924	-40.20	-30.00	Horizontal	PASS
16441.208	-33.12	-30.00	Horizontal	PASS

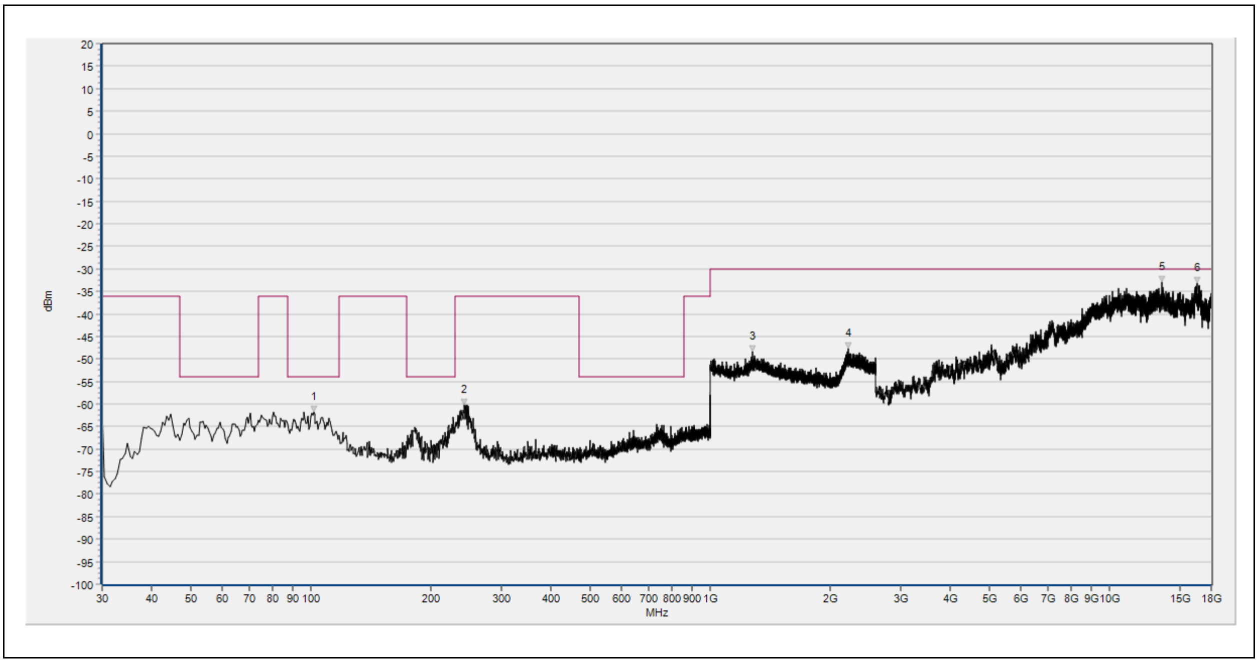


(802.11a, 30MHz to 18GHz, Antenna Vertical, Channel 165)

Channel = 165				
Transmitter with modulation Mode at 5825MHz				
Frequency (MHz)	**Peak (dBm)**	**Limit(PK)**	**Antenna**	**Verdict**
73.774	-59.91	-54.00	Vertical	PASS
229.852	-59.65	-54.00	Vertical	PASS
1298.766	-48.68	-30.00	Vertical	PASS
2247.883	-48.21	-30.00	Vertical	PASS
6392.238	-43.67	-30.00	Vertical	PASS
11727.866	-33.54	-30.00	Vertical	PASS

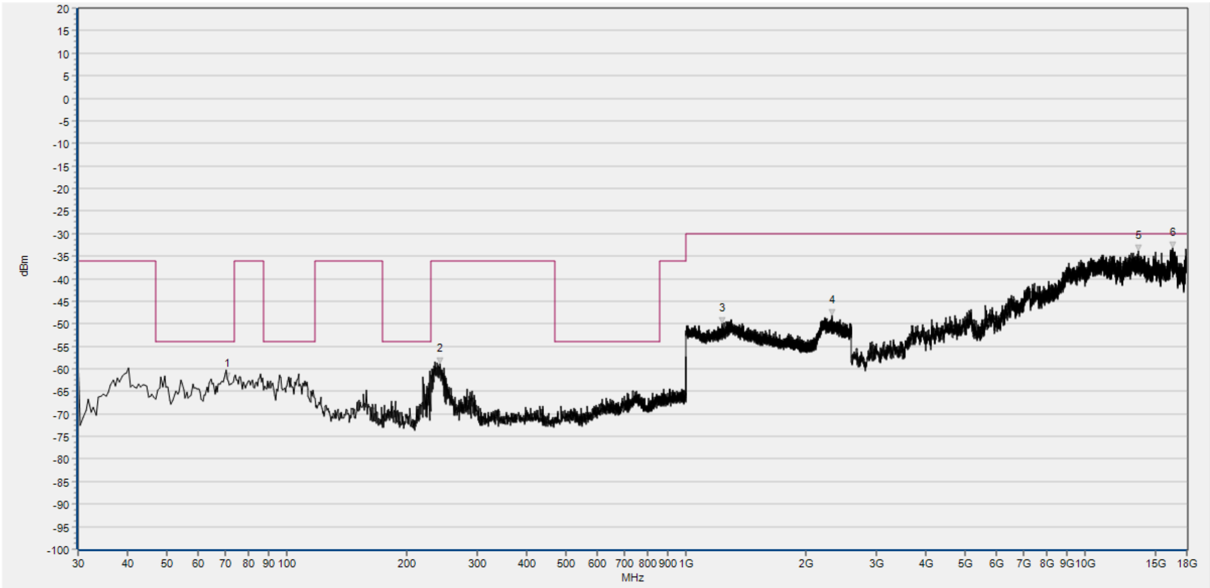
B. 802.11n(HT40) Mode:

Plots for Channel = 151



(802.11n (HT40), 30MHz to 18GHz, Antenna Horizontal, Channel 151)

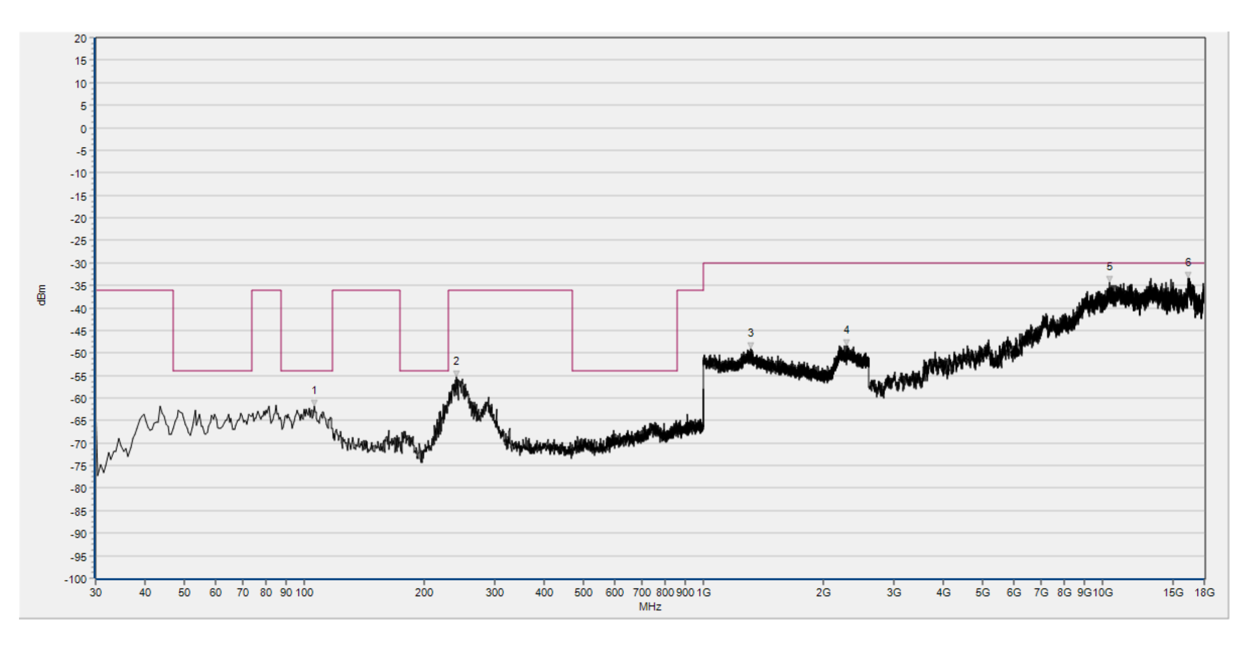
Channel = 151				
Transmitter with modulation Mode at 5755MHz				
Frequency (MHz)	**Peak (dBm)**	**Limit(PK)**	**Antenna**	**Verdict**
101.576	-61.87	-54.00	Horizontal	PASS
242.534	-60.25	-36.00	Horizontal	PASS
1274.758	-48.28	-30.00	Horizontal	PASS
2220.140	-47.62	-30.00	Horizontal	PASS
13523.865	-33.05	-30.00	Horizontal	PASS
16552.110	-33.26	-30.00	Horizontal	PASS



(802.11n (HT40), 30MHz to 18GHz, Antenna Vertical, Channel 151)

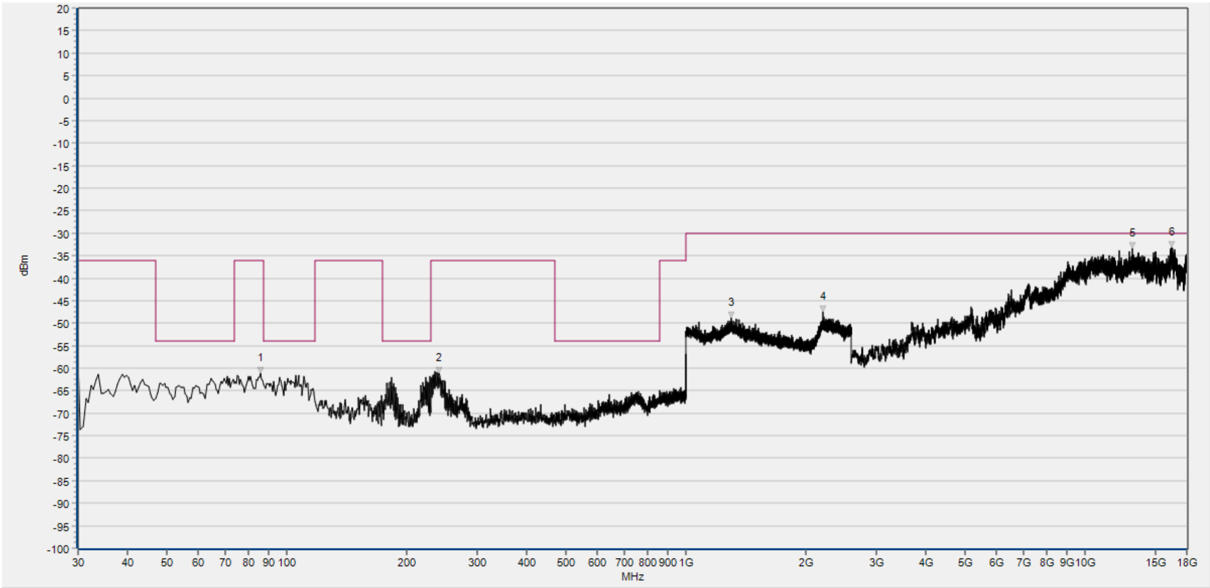
Channel = 151				
Transmitter with modulation Mode at 5755MHz				
Frequency (MHz)	**Peak (dBm)**	**Limit(PK)**	**Antenna**	**Verdict**
70.848	-62.32	-54.00	Vertical	PASS
242.534	-58.83	-36.00	Vertical	PASS
1231.544	-49.84	-30.00	Vertical	PASS
2327.909	-48.15	-30.00	Vertical	PASS
13597.800	-33.96	-30.00	Vertical	PASS
16570.594	-33.13	-30.00	Vertical	PASS

Plot for Channel = 159



(802.11n (HT40), 30MHz to 18GHz, Antenna Horizontal, Channel 159)

Channel = 159				
Transmitter with modulation Mode at 5795MHz				
Frequency (MHz)	**Peak (dBm)**	**Limit(PK)**	**Antenna**	**Verdict**
105.965	-61.69	-54.00	Horizontal	PASS
240.583	-55.41	-36.00	Horizontal	PASS
1316.906	-49.13	-30.00	Horizontal	PASS
2283.628	-48.43	-30.00	Horizontal	PASS
10421.684	-34.38	-30.00	Horizontal	PASS
16398.080	-33.23	-30.00	Horizontal	PASS



(802.11n (HT40), 30MHz to 18GHz, Antenna Vertical, Channel 159)

Channel = 159				
Transmitter with modulation Mode at 5795MHz				
Frequency (MHz)	Peak (dBm)	Limit(PK)	Antenna	Verdict
85.968	-61.12	-36.00	Vertical	PASS
241.071	-61.10	-36.00	Vertical	PASS
1298.766	-48.73	-30.00	Vertical	PASS
2211.070	-47.54	-30.00	Vertical	PASS
13126.465	-33.46	-30.00	Vertical	PASS
16505.901	-33.13	-30.00	Vertical	PASS

2.4. EN 300 440 §4.2.5.4- Duty cycle

2.4.1. Applicability

Duty Cycle (DC) shall apply to all transmitting equipment except those which utilize Listen Before Talk (LBT) clause 4.4.2, or Detect And Avoid (DAA), clause 4.4.3. RFID transmitters operating in the 2 446 MHz to 2 454 MHz frequency band that transmit at a maximum radiated peak power level of less than 500 mW e.i.r.p. are also excluded..

2.4.2. Description

Duty cycle is the ratio expressed as a percentage, of the cumulative duration of transmissions $_{Ton\_cum}$ within an observation interval

T_{obs}. $DC = \left(\frac{T_{on\_cum}}{T_{obs}}\right)_{Fobs}$

on an observation bandwidth F_{obs}.

Unless otherwise specified, T_{obs} is 1 hour and the observation bandwidth Fobs is the operational frequency band Each transmission consists of an RF emission, or sequence of RF emissions separated by intervals < $T_{Dis.}$

An equipment may operate on several bands simultaneously (i.e. multi transmissions), Duty Cycle of each band applies to each transmission.

In case of a multicarrier modulation in a band, the duty cycle applies to the whole signal used for a transmission (e.g. OFDM).

It has to be noted that on some bands Duty Cycle value may depend on the presence of a primary radio service.

Equipment may be triggered manually, by internal timing or by external stimulus. Depending on the method of triggering the timing may be predictable or random.

2.4.3. Method of measurement

An assessment of the overall Duty Cycle shall be made for a representative period of T_{obs} over the observation bandwidth F_{obs}. Unless otherwise specified, T_{obs} is 1 hour and the observation bandwidth Fobs is the operational frequency band. The representative period shall be the most active one in normal use of the device. As a guide "Normal use" is
considered as representing the behavior of the device during transmission of 99 % of the [emissions] generated during its operational lifetime.

Procedures such setup, commissioning, and maintenance are not considered part of normal operation.

For manual operated or event dependant devices, with or without software controlled functions, the manufacturer shall declare whether the device once triggered, follows a pre-programmed cycle, or whether the transmitter remains on until the trigger is released or the device is manually reset. The manufacturer shall also give a description of the application for the device and include a typical usage pattern. The typical usage pattern as declared by the manufacturer shall be used to determine the duty cycle and compare to the limit in table 4.
Where an acknowledgement is required, the additional transmitter on-time shall be included and declared by the manufacturer.

2.4.4. Limits

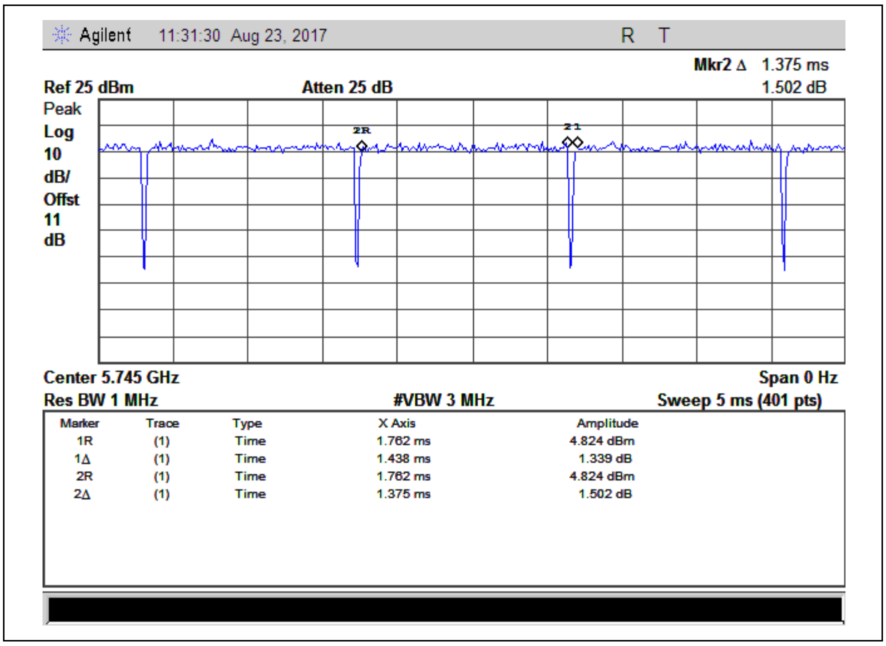
Table 4 defines the maximum duty cycle within a 1 hour period.

Table 4: Duty cycle limits

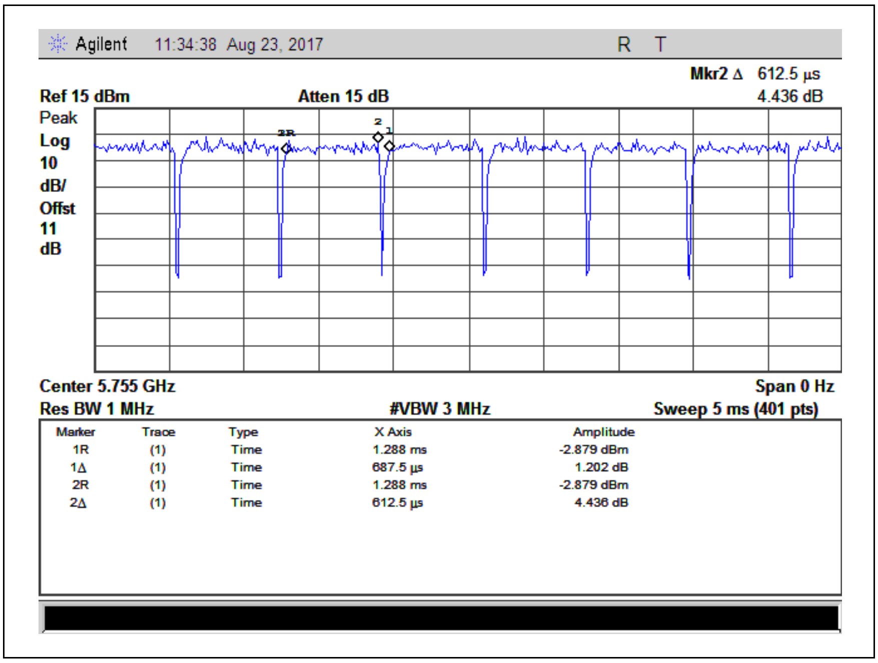
Frequency Band	Duty cycle	Application	Notes
2 400 MHz to 2 483,5 MHz	No Restriction	Generic use	
2 400 MHz to 2 483,5 MHz	No Restriction	Detection, movement and alert applications	
(a) 2 446 MHz to 2 454 MHz	No Restriction	RFID	Limits shown in annex D shall apply
(b) 2 446 MHz to 2 454 MHz	≤ 15 %	RFID	Limits shown in annex D shall apply
5 725 MHz to 5 875 MHz	No Restriction	Generic use	
9 200 MHz to 9 500 MHz	No Restriction	Radiodetermination: radar, detection, movement and alert applications	
9 500 MHz to 9 975 MHz	No Restriction	Radiodetermination: radar, detection, movement and alert applications	
10,5 GHz to 10,6 GHz	No Restriction	Radiodetermination: radar, detection, movement and alert applications	
13,4 GHz to 14,0 GHz	No Restriction	Radiodetermination: radar, detection, movement and alert applications	
17,1 GHz to 17,3 GHz	DAA or equivalent techniques	Radiodetermination: GBSAR detecting and movement and alert applications	Limits shown in annex F shall apply
24,00 GHz to 24,25 GHz	No Restriction	Generic use and for Radiodetermination: radar, detection, movement and alert applications	

2.4.5. Test Result

Mode	Frequency(MHz)	TX(on+of)	TXon	Duty Cycle
802.11a	5745	1.438ms	1.375ms	95.62%
802.11n (HT40)	5755	687.5us	612.5us	89.09%



(Duty cycle for 802.11n (HT20) mode)



(Duty cycle for 802.11n (HT40) mode)

2.5. EN 300 440 §4.3.3 - Adjacent channel selectivity

2.5.1. Applicability

This requirement applies to channelized Equipment Category 1 receivers, when invoked as defined in clause 4.3.1.

2.5.2. Description

The adjacent channel selectivity is a measure of the capability of the receiver to operate satisfactorily in the presence of an unwanted signal that differs in frequency from the wanted signal by an amount equal to the adjacent channel separation for which the equipment is intended.

2.5.3. Method of measurement

This measurement shall be conducted under normal conditions.
Two signal generators A and B shall be connected to the receiver via a combining network to the receiver, either:
a) via a test fixture or a test antenna to the receiver integrated, dedicated or test antenna; or
b) directly to the receiver permanent or temporary antenna connector.
The method of coupling to the receiver as showed in Figure a.

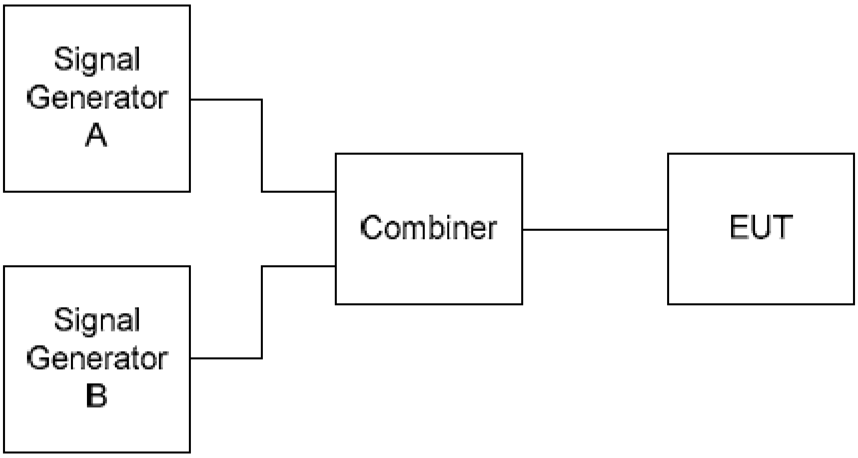


Figure a: Adjacent channel selectivity measurement arrangement

Signal generator A shall be at the nominal frequency of the receiver, with normal modulation of the wanted signal.
Signal generator B shall be unmodulated and shall be adjusted to the adjacent channel centre frequency immediately
above that of the wanted signal.
Initially signal generator B shall be switched off and using signal generator A the level that still

gives sufficient response shall be established. The output level of generator A shall then be increased by 3 dB.

Signal generator B is then switched on and adjusted until the wanted criteria are met. This level shall be recorded.

The measurements shall be repeated with signal generator B unmodulated and adjusted to the adjacent channel centre immediately below the wanted signal.

The adjacent channel selectivity shall be recorded for the upper and lower adjacent channels as the level in dBm of the unwanted signal.

For tagging systems (e.g. RF identification, anti-theft, access control, location and similar systems) signal generator A may be replaced by a physical tag positioned at 70 % of the measured system range in metres. In this case, the adjacent selectivity shall be recorded as the level in dBm of lowest level of the unwanted signal (generator B) resulting in a non-read of the tag.

2.5.4. Limits

The adjacent channel selectivity of the equipment under specified conditions shall not be less than -30 dBm + k. The correction factor, *k,* is as follows:

$$k = -20\log f - 10\log BW$$

Where:

- f is the frequency in GHz;
- BW is the channel bandwidth in MHz.

The factor k is limited within the following:

- $-40\text{ dB} < k < 0\text{ dB}$.

2.5.5. Conformance

The adjacent channel selectivity measurements shall be performed as described in clause 4.3.3.3 and not exceed the limits in clause 4.3.3.4. The values and measurement method utilized shall be stated in the test report.

2.5.6. Test result

Receiver category: 1							
Test Channel		The signal of adjacent channel(signal generator B)					
		Adjacent channel		Test Value (dBm)	Limit(dBm)	Verdict	
157	5785MHz	153	5765MHz(lower)	-40	≥-58.25	PASS	
		161	5805MHz(upper)	-40	≥-58.25	PASS	
Note: k=-28.25dB, BW=20MHz							

2.6. Blocking or desensitization

2.6.1. Applicability

This requirement applies to Equipment Category 1 and Category 2 receivers, when invoked, as defined in clause 4.3.1.

2.6.2. Description

Blocking is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted input signal at any frequencies other than those of the spurious responses or the adjacent channels or bands, see clauses 4.3.3 and 4.3.4.

2.6.3. Method of measurement

This measurement shall be conducted under normal conditions.
Two signal generators A and B shall be connected to the receiver via a combining network to the receiver, either:
a) via a test fixture or a test antenna to the receiver integrated, dedicated or test antenna; or
b) directly to the receiver permanent or temporary antenna connector.
The method of coupling to the receiver as showed in Figure b.

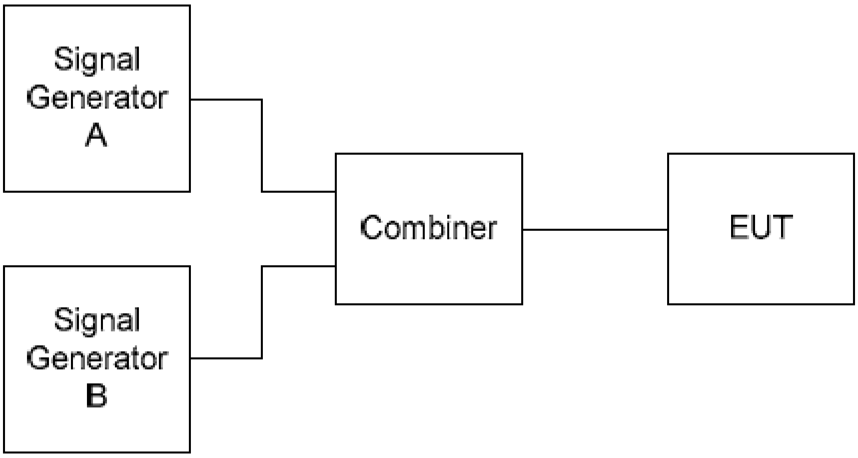


Figure b: Blocking measurement arrangement

Signal generator A shall be at the nominal frequency of the receiver, with normal modulation of the wanted signal.
Signal generator B shall be unmodulated and shall be adjusted to a test frequency at approximately 10 times, 20 times and 50 times of the receive channel bandwidth above upper band edge of the receive channel.

Initially signal generator B shall be switched off and using signal generator A the level which still gives sufficient response shall be established. The output level of generator A shall then be increased by 3 dB.
Signal generator B is then switched on and adjusted until the wanted criteria are met. This level shall be recorded.
The measurement shall be repeated with the test frequency for signal generator B at approximately 10 times, 20 times and 50 times of the receive channel bandwidth below the lower band edge of the receive channel.
The blocking or desensitization shall be recorded as the level in dBm of lowest level of the unwanted signal (generator B).
For tagging systems (e.g. RF identification, anti-theft, access control, location and similar systems) signal generator A may be replaced by a physical tag positioned at 70 % of the measured system range in metres. In this case, the blocking or desensitization shall be recorded as the ratio in dB of lowest level of the unwanted signal (generator B) resulting in a non-read of the tag. to the declared sensitivity of the receiver +3 dB.

2.6.4. Limits

The blocking level, for any frequency within the specified ranges, shall not be less than the values given in table 6, except at frequencies on which spurious responses are found.

Table 6: Limits for blocking or desensitization

Receiver category	Limit
1	-30 dBm + k
2	-45 dBm + k
3	-60 dBm + k

The correction factor, k, is as follows:

$$k = -20\log f - 10\log BW$$

Where:

- f is the frequency in GHz;
- BW is the occupied bandwidth in MHz.

The factor k is limited within the following:

- -40 dB ≤ k ≤ 0 dB.

The measured blocking level shall be stated in the test report.

2.6.5. Conformance

The blocking or desensitization measurements shall be performed as described in clause 4.3.4.3 and not exceed the limits in clause 4.3.4.4. The values and measurement method utilized shall be stated in the test report.

2.6.6. Test Result

Receiver category: 1							
Test Channel		**Blocking Signal(signal generator B)**					
		Lower or Upper	**Spacing**	**Frequency (MHz)**	**Test Value (dBm)**	**Limit (dBm)**	**Verdict**
157	5785MHz	Lower	10*BW	5575	-19	≥-58.25	PASS
			20*BW	5375	-17	≥-58.25	PASS
			50*BW	4775	-14	≥-58.25	PASS
		Upper	10*BW	5995	-22	≥-58.25	PASS
			20*BW	6195	-10	≥-58.25	PASS
			50*BW	6795	-1	≥-58.25	PASS
Note: k=-28.25dB, BW=20MHz							

2.7. EN 300 440 §4.3.5 - Spurious radiations

2.7.1. Applicability

This requirement applies to all receivers, except receivers used in combination with permanently co-located transmitters continuously transmitting. Co-located is defined as < 3 m. In these cases the receivers will be tested together with the transmitter in operating mode.

2.7.2. Description

Spurious radiations from the receiver are components at any frequency, radiated by the equipment and antenna.
The level of spurious radiations shall be measured by either:

a) their power level in a specified load (conducted spurious emission) and their effective radiated power when radiated by the cabinet and structure of the equipment (cabinet radiation); or
b) their effective radiated power when radiated by the cabinet and the integral or dedicated antenna, in the case of portable equipment fitted with such an antenna and no permanent RF connector.

2.7.3. Method of measurement for spurious radiation

2.7.3.1 General Requirements

For measurements above 1 000 MHz the peak value shall be measured using a spectrum analyser. The "max hold" function of a spectrum analyser shall be used. For measurements up to 1 000 MHz the quasi-peak detector set in accordance with the specification of CISPR 16 [1], [2] and [3] shall be used.

2.7.3.2 Method of measurement radiated spurious components

This method of measurement applies to receivers having an integral antenna.

a) A test site selected from annex B which fulfils the requirements of the specified frequency range of this measurement shall be used. The test antenna shall be oriented initially for vertical polarization and connected to a measuring receiver. The bandwidth of the measuring receiver shall be adjusted until the sensitivity of the measuring receiver is at least 6 dB below the spurious emission limit given in clause 4.3.5.4. This bandwidth shall be recorded in the test report.
The receiver under test shall be placed on the support in its standard position.
b) The same method of measurement as items b) to i) of clause 4.3.5.3.2 shall apply.

2.7.4. Limits

The power of any spurious emission shall not exceed 2 nW in the range 25 MHz to 1 GHz and shall not exceed 20 nW on frequencies above 1 GHz.

2.7.5. Conformance

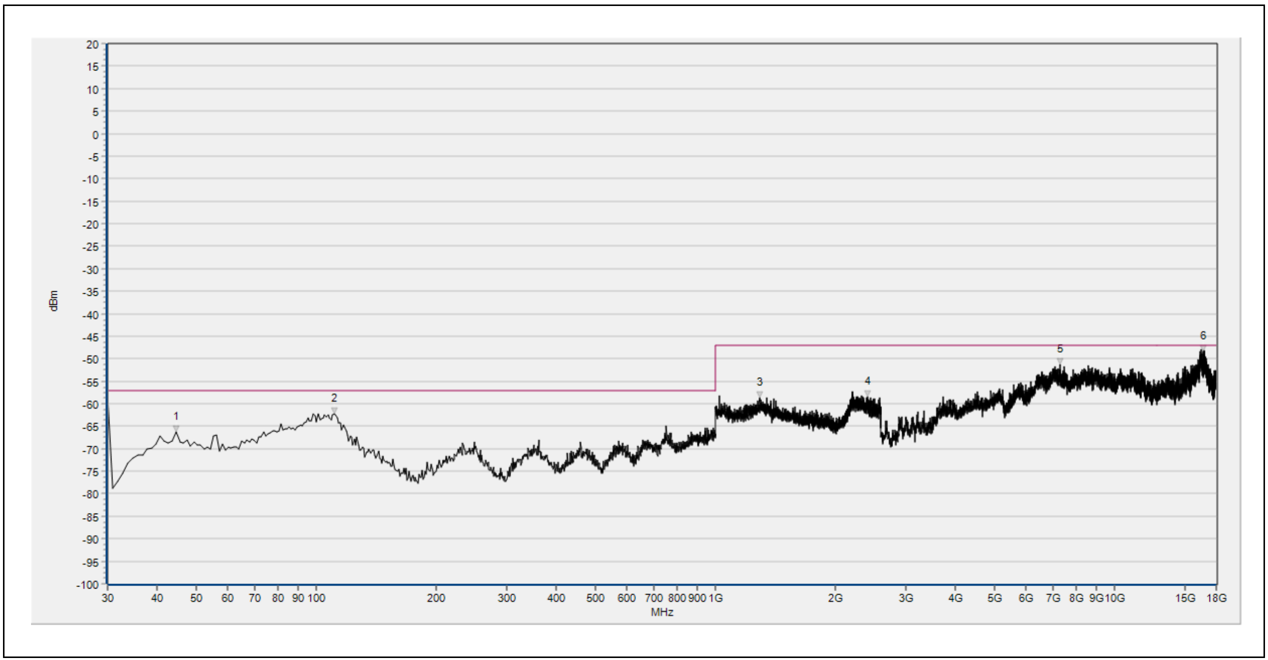
The spurious radiations measurements shall be performed as described in clause 4.3.5.3 and not exceed the limits in clause 4.3.5.4. The values and measurement method utilized shall be stated in the test report.

2.7.6. Test result

For the frequency, which started from 18G to 40G, was pre-scanned and the result which was 10dB lower than the limit.

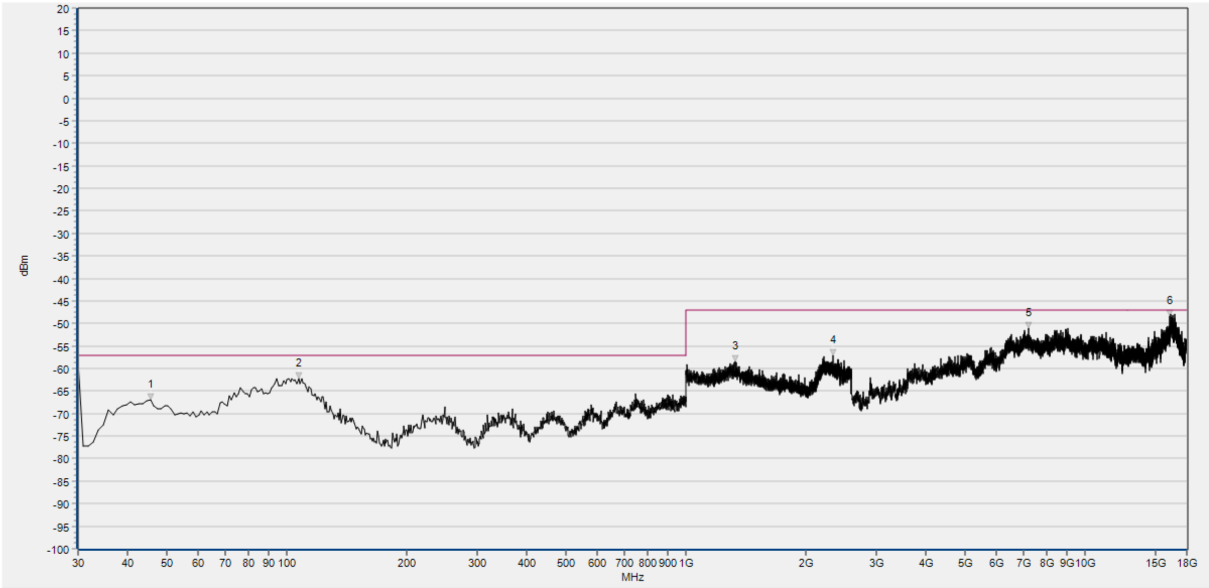
A. 802.11a Mode:

Plot for Channel = 149



(802.11a, 30MHz to 18GHz, Antenna Horizontal, Channel 149)

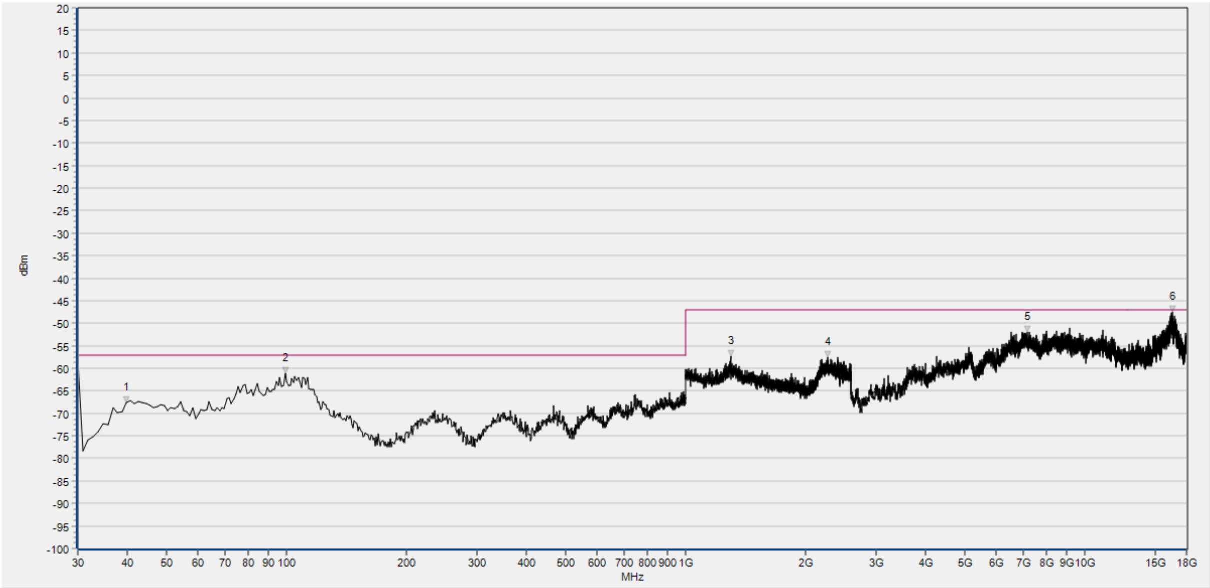
Channel = 149				
Receiving Mode at 5745MHz				
Frequency (MHz)	**Peak (dBm)**	**Limit(PK)**	**Antenna**	**Verdict**
44.520	-66.25	-57.00	Horizontal	PASS
110.886	-62.19	-57.00	Horizontal	PASS
1289.745	-58.56	-47.00	Horizontal	PASS
2410.305	-58.33	-47.00	Horizontal	PASS
7291.778	-51.38	-47.00	Horizontal	PASS
16736.947	-49.48	-47.00	Horizontal	PASS



(802.11a, 30MHz to 18GHz, Antenna Vertical, Channel 149)

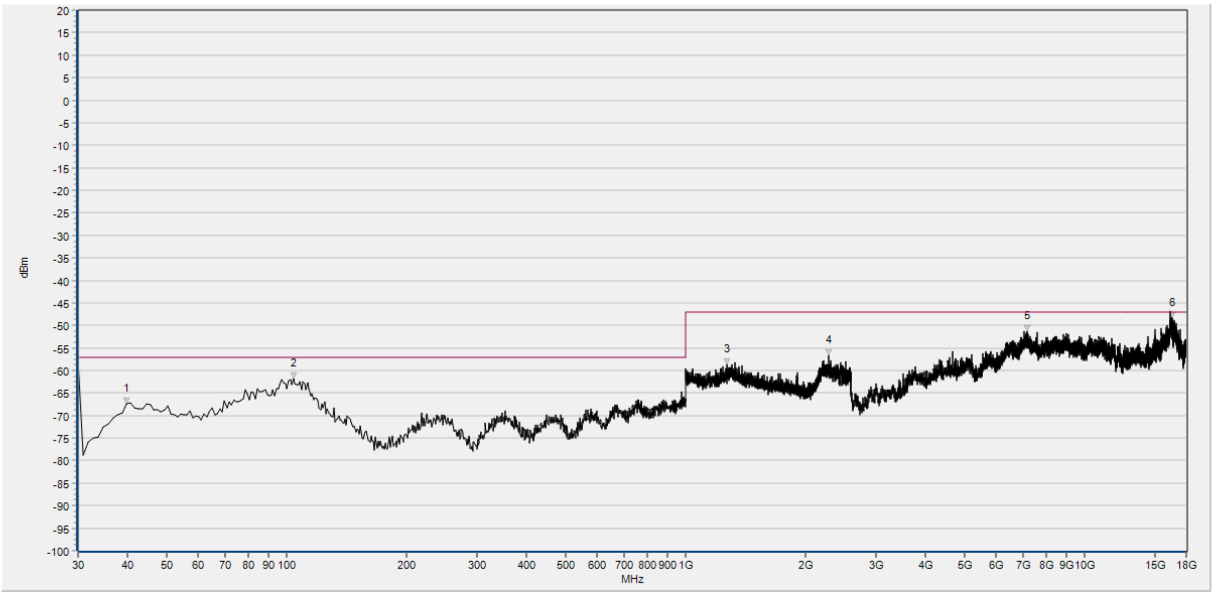
Channel = 149				
Receiving Mode at 5745MHz				
Frequency (MHz)	**Peak (dBm)**	**Limit(PK)**	**Antenna**	**Verdict**
45.495	-66.84	-57.00	Vertical	PASS
106.982	-62.22	-57.00	Vertical	PASS
1328.964	-58.50	-47.00	Vertical	PASS
2342.271	-57.12	-47.00	Vertical	PASS
7224.005	-51.08	-47.00	Vertical	PASS
16311.822	-48.40	-47.00	Vertical	PASS

Plot for Channel = 165



(802.11a, 30MHz to 18GHz, Antenna Horizontal, Channel 165)

Channel = 165				
Receiving Mode at 5825MHz				
Frequency (MHz)	**Peak (dBm)**	**Limit(PK)**	**Antenna**	**Verdict**
39.640	-67.55	-57.00	Horizontal	PASS
99.174	-61.01	-57.00	Horizontal	PASS
1296.148	-57.33	-47.00	Horizontal	PASS
2271.836	-57.53	-47.00	Horizontal	PASS
7199.360	-51.91	-47.00	Horizontal	PASS
16564.433	-47.49	-47.00	Horizontal	PASS

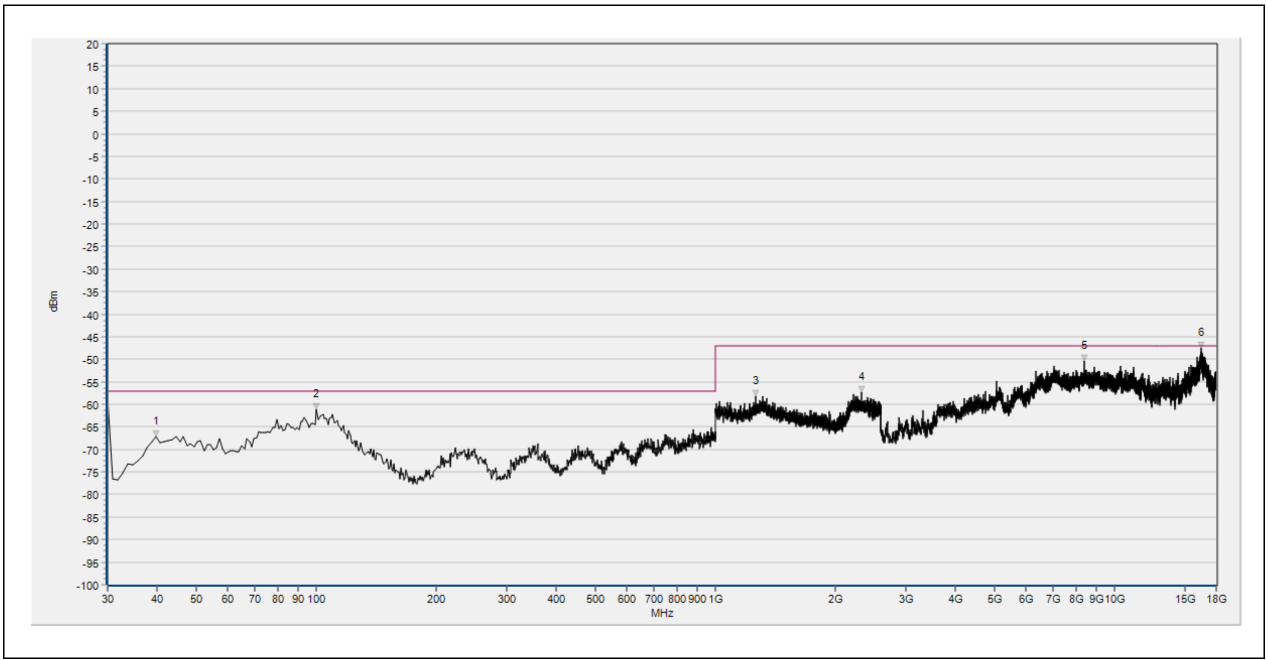


(802.11a, 30MHz to 18GHz, Antenna Vertical, Channel 165)

Channel = 165				
Receiving Mode at 5825MHz				
Frequency (MHz)	**Peak (dBm)**	**Limit(PK)**	**Antenna**	**Verdict**
39.640	-67.34	-57.00	Vertical	PASS
104.054	-61.75	-57.00	Vertical	PASS
1272.936	-58.77	-47.00	Vertical	PASS
2282.241	-56.72	-47.00	Vertical	PASS
7187.037	-51.31	-47.00	Vertical	PASS
16549.030	-48.43	-47.00	Vertical	PASS

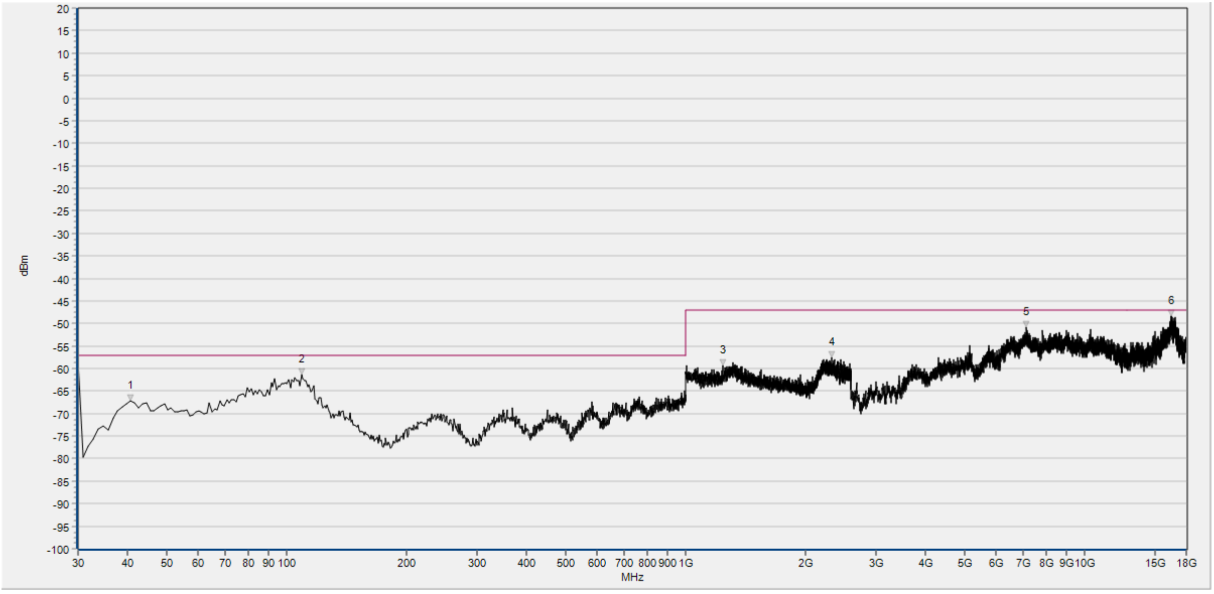
B. 802.11n(HT40) Mode:

Plot for Channel = 151



(802.11n (HT40), 30MHz to 18GHz, Antenna Horizontal, Channel 151)

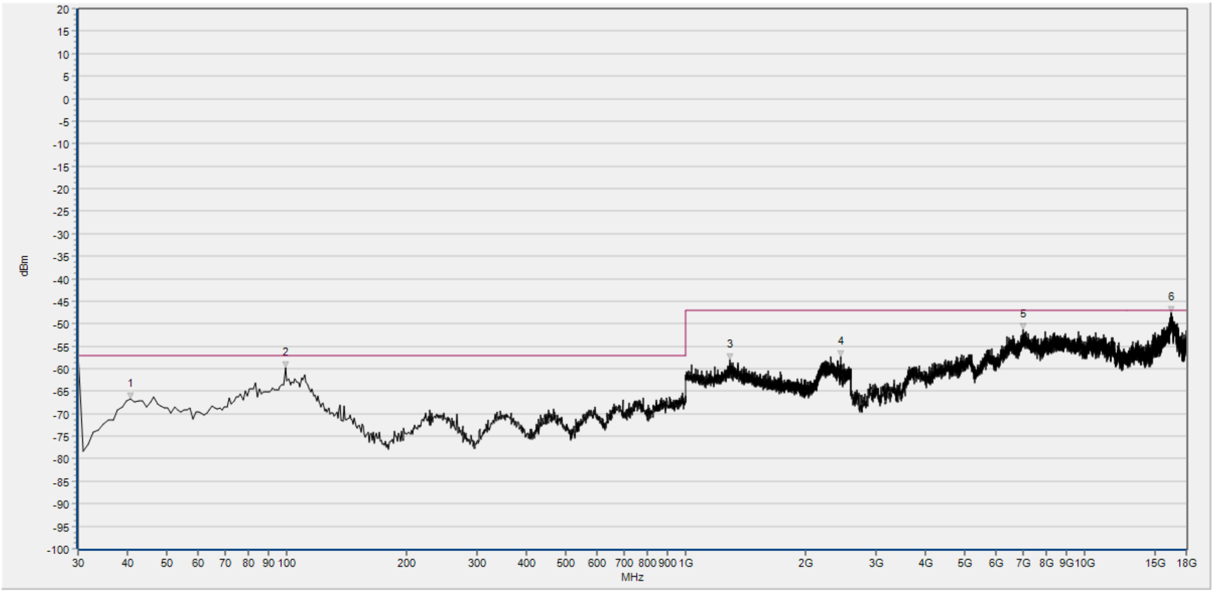
Channel = 151				
Receiving Mode at 5755MHz				
Frequency (MHz)	**Peak (dBm)**	**Limit(PK)**	**Antenna**	**Verdict**
39.640	-67.22	-57.00	Horizontal	PASS
100.150	-61.22	-57.00	Horizontal	PASS
1262.531	-58.31	-47.00	Horizontal	PASS
2324.662	-57.38	-47.00	Horizontal	PASS
8385.397	-50.50	-47.00	Horizontal	PASS
16539.788	-47.56	-47.00	Horizontal	PASS



(802.11n (HT40), 30MHz to 18GHz, Antenna Vertical, Channel 151)

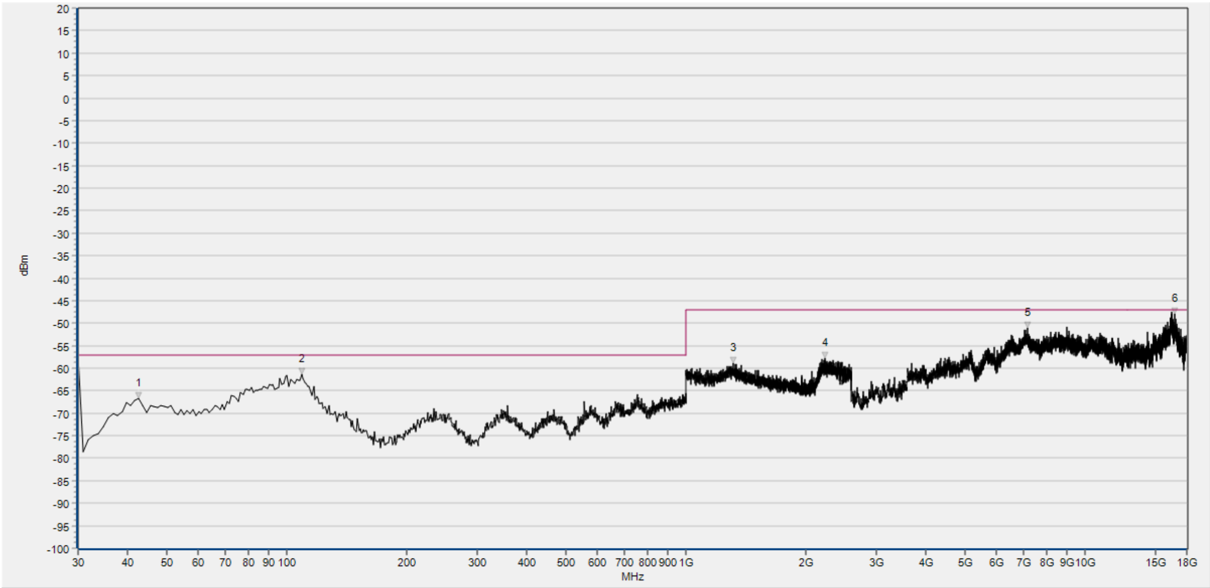
Channel = 151				
Receiving Mode at 5755MHz				
Frequency (MHz)	**Peak (dBm)**	**Limit(PK)**	**Antenna**	**Verdict**
40.616	-67.17	-57.00	Vertical	PASS
108.934	-61.38	-57.00	Vertical	PASS
1237.719	-59.44	-47.00	Vertical	PASS
2327.864	-57.51	-47.00	Vertical	PASS
7159.312	-50.73	-47.00	Vertical	PASS
16533.627	-48.48	-47.00	Vertical	PASS

Plot for Channel = 159



(802.11n (HT40), 30MHz to 18GHz, Antenna Horizontal, Channel 159)

Channel = 159				
Receiving Mode at 5795MHz				
Frequency (MHz)	**Peak (dBm)**	**Limit(PK)**	**Antenna**	**Verdict**
40.616	-66.72	-57.00	Horizontal	PASS
99.174	-59.71	-57.00	Horizontal	PASS
1288.144	-57.90	-47.00	Horizontal	PASS
2454.327	-57.25	-47.00	Horizontal	PASS
7029.926	-51.26	-47.00	Horizontal	PASS
16527.465	-47.41	-47.00	Horizontal	PASS



(802.11n (HT40), 30MHz to 18GHz, Antenna Vertical, Channel 159)

Channel = 159				
Receiving Mode at 5795MHz				
Frequency (MHz)	**Peak (dBm)**	**Limit(PK)**	**Antenna**	**Verdict**
42.568	-66.71	-57.00	Vertical	PASS
108.934	-61.32	-57.00	Vertical	PASS
1312.156	-58.80	-47.00	Vertical	PASS
2231.816	-57.79	-47.00	Vertical	PASS
7193.199	-51.04	-47.00	Vertical	PASS
16832.446	-47.86	-47.00	Vertical	PASS

2.8. EN 300 440 §4.4 -Spectrum access techniques

2.8.1. Applicability

For the present document, the following access mechanisms are specified:
• Listen Before Talk (LBT) which is used to share spectrum between SRD transceiver equipment with similar power and bandwidth; or
• 17,1 GHz to 17,3 GHz GBSAR only, Detect And Avoid (DAA) which is used to protect radio communication services.
Receiver Category 2 or better shall be used for all LBT and DAA applications.
For equipment with radiated power of less than 100 μW e.i.r.p., no access technique is specified.
Equipment utilizing LBT or DAA, do not have to comply with the duty cycle conditions stated in clause 4.2.5..

2.8.2. Listen Before Talk (LBT)

In order to make maximum use of the available channels intelligent or polite equipment may use a Listen Before Talk (LBT) protocol with a preferred option of Adaptive Frequency Agility (AFA). AFA is defined as the capability of equipment to dynamically change channel within its available frequencies for proper operation.
For LBT equipment, the device shall listen on the next intended frequency before transmitting. If it is intended to move to a different channel then this channel can be monitored whilst still transmitting at its first channel. If it is not intended to move to a different channel then it should be treated as a single frequency device waiting for a free channel.
The channel occupancy timings refer to the maximum time a device can transmit on a channel, in any one period, and the minimum "listening" period before the device can retransmit either on the same or, for frequency agile equipment, on another channel.
For a device with LBT some of the receiver parameters become essential requirements under the RE-D [i.1]. The receiver requirements are the following:
LBT threshold, for further details, see clause 4.4.2.2.
Blocking or desensitization, for further details, see clause 4.3.4.
Adjacent channel selectivity, see clause 4.3.3, is not a mandatory requirement for equipment using LBT. However, it shall be noted that insufficient adjacent channel selectivity may reduce the apparent channel availability.
For spread spectrum systems, LBT may be used if the required timing and threshold limits can be met; if not, then a duty cycle requirement applies, see clause 4.2.5.
It shall be noted that the use of LBT may be restricted by the dwell time for Frequency Hopping Spread Spectrum systems. In case of fast frequency hopping where the dwell time is shorter than the LBT minimum listening time then a duty cycle requirement applies, see clause 4.2.5.

2.8.2.1 LBT timing parameters:

Minimum transmitter off-time:

The minimum TX off-time allows other users with LBT facility to get access to a channel.

The minimum TX-off time is defined as the period where a specific transmitter shall remain off after a transmission or a communication dialogue between units or a polling sequence of other units.

Limit:

The limit for the minimum TX-off time is > 25 ms.

The TX-off time shall be declared in the test report by the equipment manufacturer

2.8.2.2 LBT minimum listening time:

The minimum listening time is defined as the minimum time that the equipment listens for a received signal at or above the LBT threshold level (see clause 4.4.3) immediately prior to transmission to determine whether the intended channel is available for use.

The listening time shall consist of the "minimum fixed listening time" and an additional pseudo random part. If during the listening mode another user is detected on the intended channel, the listening time shall commence from the instant that the intended channel is free again. Alternatively, the equipment may select another channel and again start the listen time before transmission.

Limit for minimum listening time:

The total listen time, tL, consists of a fixed part, tF, and a pseudo random part, tPS, as the following:

$$t_L = t_F + t_{PS}$$

a) The fixed part of the minimum listening time, t_F, shall be 5 ms.

b) The pseudo random listening time t_{PS} shall be randomly varied between 0 ms and a value of 5 ms or more in equal steps of approximately 0,5 ms as the following:

- If the channel is free from traffic at the beginning of the listen time, t_L, and remains free throughout the fixed part of the listen time, t_F, then the pseudo random part, t_{PS}, is automatically set to zero by the equipment itself.
- If the channel is occupied by traffic when the equipment either starts to listen or during the listen period, then the listen time commences from the instant that the intended channel is free. In this situation the total listen time t_L shall comprise tF and the pseudo random part, t_{PS}.

The limit for total listen time for the receiver consists of the sum of a) and b) together.

Algorithmic details and values for a) and b) shall be declared by the manufacturer of the equipment.

2.8.2.3 Acknowledge transmissions

An acknowledge transmission is defined as a receipt for a received message.

There is no requirement for a listen time before an acknowledge can be performed. However, it shall be noted that if the start of an acknowledge is not received before the end of normal fixed part of the listen time (5 ms) then the channel might be taken by another transmitter.

2.8.2.4 Maximum transmitter on-time

A transmitter shall only be allowed to transmit continuously for a maximum specified period. This will prevent a transmitter from occupying a channel for an extended period.

The maximum on-time shall always be as short as possible for the application since SRD applications are often battery operated.

The maximum transmitter on-time is defined as the maximum time the transmitter can be on during:

a) A single transmission.

b) Multiple transmissions and acknowledgements for a communication dialogue or polling sequence of other units under the condition that the channel is free.

An equipment intended for very long messages shall be capable of switching to a "free" channel before the maximum transmitter on-time is reached for each channel of operation

Limit

The limit for a single transmission TX on-time is 2 s.

For further information on measurements of maximum transmitter on-time, see clause 4.4.2.2.

The time for the transmission dialogue or a polling sequence shall be less than 10 s.

In the case of the above timing, t, reaches the limit then the minimum TX-off time limit shall apply automatically

2.8.2.5 Declaration of LBT parameters

For automatic operated LBT devices, either software controlled or pre-programmed devices, the manufacturer shall declare all the channel LBT timings for the equipment under test.

2.8.2.6 Equipment with or without LBT using transmitter time-out-timer

For manual operated or event dependant devices, with or without software controlled functions, the manufacturer shall declare whether the transmission once triggered, follows a pre-programmed time-out-timer, or whether the transmitter

remains on until the trigger is released or the device is manually reset.

The manufacturer shall also give a description of the application for the device and include a typical usage pattern. The typical usage pattern as declared by the manufacturer shall be used to determine the channel occupancy timings

2.8.3. Receiver LBT threshold and transmitter max on-time

2.8.3.1 Applicability

The measurements and limits apply to a transceiver that facilitates a receiver with a LBT protocol.

2.8.3.2 Descriptions

The LBT threshold is defined as the received signal level above which the equipment can determine that the channel is not available for use. If the received signal is below the LBT threshold then the equipment can determine that the channel is available for use.

The definition of the maximum transmitter on-time for equipment with an LBT facility is defined in clause 4.4.2.1.4.1.

2.8.3.3 Method of measurements

A signal generator and a power meter are each combined via appropriate attenuators into the

equipment antenna
connector. The test set-up in figure 3 shall be used.

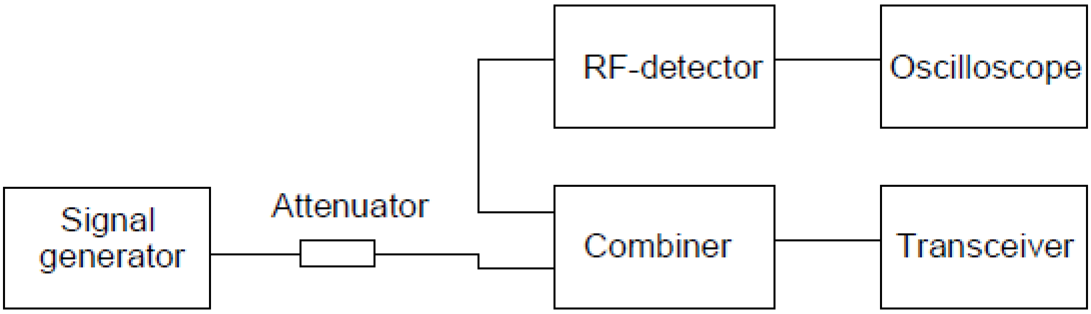


Figure 3: Measurement arrangement

For equipment with integral antenna the connection to the equipment is made either to a temporary 50 Ω antenna connector, see clause 4.2.3.1, or via a calibrated test fixture, see clause 5.8.3:

a) the LBT function of the transceiver shall be active;

b) the attenuator shall provide sufficient attenuation to protect the signal generator from burn-out by the transmitter of the transceiver;

c) the signal generator with normal test modulation is adjusted to the receiving frequency. The level is increased to approximately 20 dB above the receiver sensitivity;

d) the equipment is switched to an intended transmit mode. The equipment shall not be transmitting as the transceiver recognizes a busy channel from the signal generator;

e) the level of the signal generator is reduced in steps of 1 dB until the equipment starts to transmit. This specific signal generator level present at the receiver input of the transceiver is the LBT threshold.

The level of the received LBT threshold shall be recorded in the test report.

f) the steps c) and d) shall be repeated; and

g) the level of the signal generator is reduced in steps of 1 dB until the equipment starts to transmit and the duration of the transmit on-time is measured at the oscilloscope.

The transmit on-time is recorded in the test report.

2.8.3.4 Limits

The LBT maximum thresholds for the receiver in listen mode are given in table 8.

Table 8: Receiver LBT threshold limit versus transmit power and channel spacing

TX power	**< 100 mW**	**500 mW**
LBT threshold	-80 dBm + c	-87 dBm + c
NOTE 1: The limit is independent of the receiver category, see clause 4.1.1. NOTE 2: The limits are based on an antenna gain of +2 dBi maximum. For other antenna gains greater than +2 dBi the limits shall be adjusted accordingly.		

The correction factor, c, is given by the following formula: c =10*logBW

Where:

- BW is the bandwidth in MHz.

2.8.3.5 Conformance

The measured LBT threshold shall be less than the limits given table 8 and stated in the test report

2.8.4. Detect and Avoid techniques (DAA)

2.8.4.1 General requirements

DAA is specified for use with Ground Based Synthetic Aperture Radar (GBSAR) systems. It provides protection to other radio communication services by utilizing the following parameters:

a) Receiver minimum listen time before the transmitter can be switched on, immediately prior to any intended transmission.

b) Receiver detect and avoid threshold.

c) An appropriate long listen-time after detection of a service to be protected is detected.

d) Maximum transmitter on-time without interruption.

e) Minimum transmitter off-time after a transmitter on-time period.

It shall be noted that DAA can only be applied if the SRD equipment is using a common antenna for both receive and transmit, or the same antenna type is used for both receive and transmit with both antennas pointing in the same direction.

The DAA function and limits are depending of the services to be protected. Requirements for the implementation of Detect And Avoid (DAA) technique for Ground Based Synthetic Aperture Radar (GBSAR) systems operating in the frequency range 17,1 GHz to 17,3 GHz are given in annex F.

2.8.5. Adaptive Frequency Agility (AFA)

2.8.5.1 General requirements

SRD equipment with LBT or DAA may also employ an Adaptive Frequency Agility (AFA) function to:

• avoid co-channel operation with other systems after detection of interference from these other systems;

• where possible, provide on aggregate a uniform loading of the spectrum across all devices.

The equipment shall only use the channels dedicated for the application.

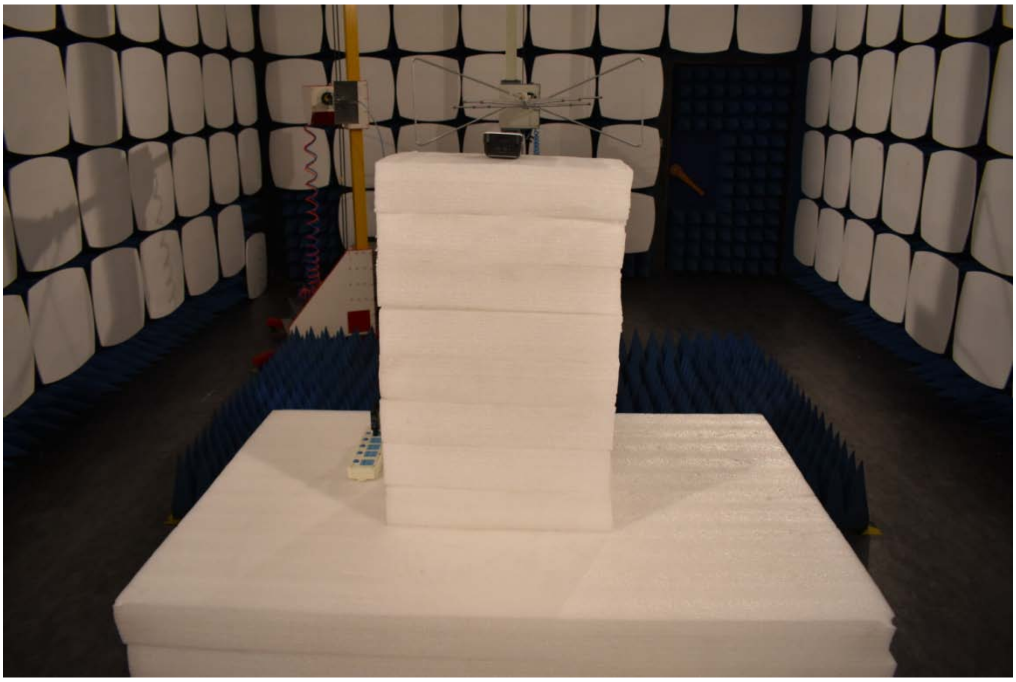
Additionally, the equipment shall either follow the restrictions for LBT given in clause 4.4.2 or the restrictions for DAA as appropriate.

2.8.6. Test Result

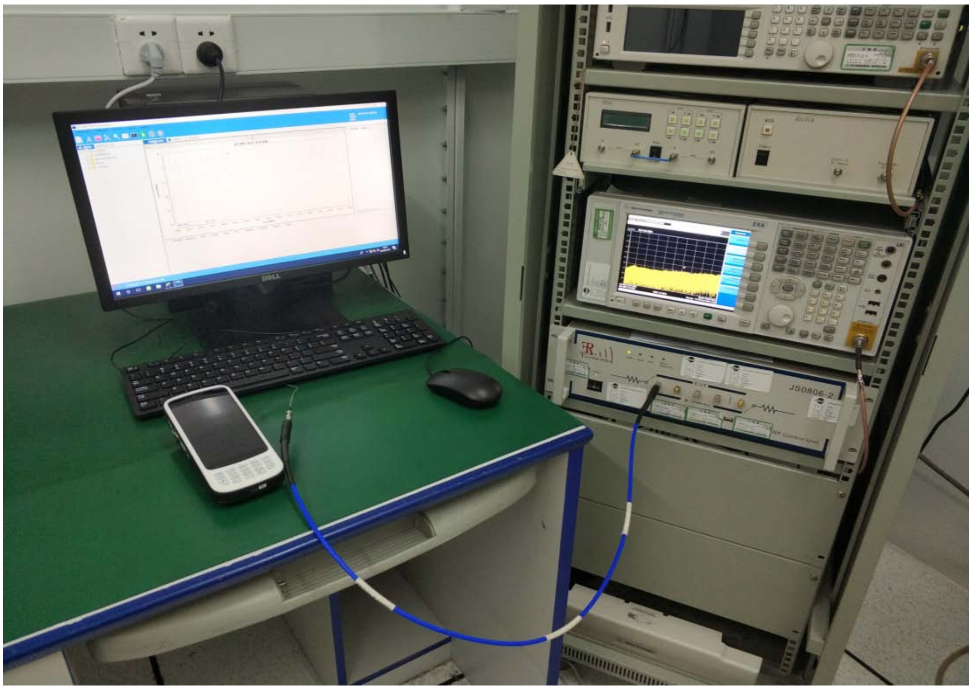
The EUT have Adaptive Frequency Agility Technology, It complies with the requirements of the Spectrum access techniques.

Annex A Photographs of Test Setup

1. Radiated Measurement Setup



2. Conducted Measurement Setup



Annex B Test Uncertainty

Parameter	Uncertainty
RF output power, conducted	±1.5dB
RF frequency	$\pm 1 \times 10^{-5}$
Unwanted Emissions, conducted	±3dB
All emissions, radiated	±6dB
Temperature	±1°C
Humidity	±5%
DC and low frequency voltages	±3%
Time	±5%
Duty Cycle	±5%

Annex C Testing Laboratory Information

1. Identification of the Responsible Testing Laboratory

Company Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Department:	Morlab Laboratory
Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China
Responsible Test Lab Manager:	Mr. Su Feng
Telephone:	+86 755 36698555
Facsimile:	+86 755 36698525

2. Identification of the Responsible Testing Location

Name:	Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory
Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China

3. Test Equipments Utilized

3.1 Conducted Test system

Description	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Temperature Chamber	CHONGQING HANBA EXPERIMENTAL EQUIPMENT CO.,LTD	HUT705P	(N/A.)	2018.04.17	2019.04.16
Power Splitter	Mini-Circuits	ZFRSC-183+	SF808201417	2018.04.17	2019.04.16
DC Power Supply	Good Will Instrument Co.,Ltd.	(N/A)	(N/A)	2018.04.17	2019.04.16
Attenuator 1	Resnet	20dB	(N/A)	2018.04.17	2019.04.16
MXG Vector Signal Generator	Angilent	N5182B	MY53050961	2018.04.17	2019.04.16
EXG Analog Signal Generator	Angilent	N5171B	MY53050558	2018.04.17	2019.04.16
EXA Signal analyzer	Angilent	N9010A	MY53470836	2017.12.02	2018.12.01
USB Power Sensor	Angilent	U2021XA	MY54210011	2018.04.17	2019.04.16

3.2 List of Software Used

Description	Manufacturer	Software Version
Test system	Tonscend	V2.6
Power Panel	Agilent	V3.8
MORLAB EMCR V1.2	MORLAB	V 1.0

3.3 RSE Test System

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Cal. Due
MXE EMI Receiver	MY54130016	N9038A	Agilent	2018.05.08	2019.05.07
Test Antenna - Bi-Log	9163-519	VULB 9163	Schwarzbeck	2018.05.08	2019.05.07
Test Antenna - Horn	01774	BBHA 9120D	Schwarzbeck	2017.09.13	2018.09.12
Anechoic Chamber	N/A	9m*6m*6m	CRT	2017.11.19	2020.11.18

——— END OF REPORT ———