

RADIO TEST REPORT

for

Dongguan Meiloon Acoustic Equipments Co., Ltd.

Smart Tabletop Radio

Model Number: R2 mk4

Prepared for : Dongguan Meiloon Acoustic Equipments Co., Ltd.
Address : No.80 Yuanlin Road, Fenghuang Gang, Tangxia Town,
Dongguan City, Guangdong Province, P.R. China.

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Report No. : TR21120146-E-002
Date of Test : Jan. 06 ~ Mar. 22, 2022
Date of Report : Mar. 23, 2022

Guangdong Keyway Testing Technology Co., Ltd.

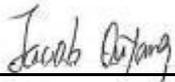
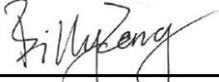
Applicant: Address:	Dongguan Meiloon Acoustic Equipments Co., Ltd. No.80 Yuanlin Road, Fenghuang Gang, Tangxia Town, Dongguan City, Guangdong Province, P.R. China.		
Manufacturer: Address:	Ruark Audio Limited 59 Tailors Court, Temple Farm Industrial Estate, Southend on Sea, Essex, SS2 5TH, United Kingdom		
E.U.T:	Smart Tabletop Radio		
Model Number:	R2 mk4		
Trade Name:	ruark audio	Sample Number:	211209001
Date of Receipt:	Jan. 05, 2022	Date of Test:	Jan. 06 ~ Mar. 22, 2022
Test Specification:	ETSI EN 301 893 V2.1.1 (2017-05)		
Test Result:	The equipment under test was found to be compliance with the requirements of the standards applied.		
	Issue Date: Mar. 23, 2022		
Tested by:	Reviewed by:	Approved by:	
 _____	 _____	 _____	
Jacob Ouyang / Engineer	Billy Zeng / Supervisor	Andy Gao / Manager	
Other Aspects:	None.		
<i>Abbreviations: OK/P=passed fail/F=failed n.a/N=not applicable E.U.T=equipment under tested</i>			
<i>This test report is based on a single evaluation of one sample of above mentioned products. It is not permitted to be duplicated in extracts without written approval of Guangdong Keyway Testing Technology Co., Ltd.</i>			

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1. SUMMARY OF TEST RESULTS

1.1 Test procedures according to the technical standards:

The following essential requirements and test specifications refer to ETSI EN 301 893 V2.1.1 (2017-05)			
Clause	Test Item	Applicable	NOTE
4.2.1	Centre Frequencies	Compliance	
4.2.2	Nominal Channel Bandwidth and Occupied Channel Bandwidth	Compliance	
4.2.3	RF output power	Compliance	
4.2.3	Transmit Power Control (TPC)	Not Applicable	
4.2.3	Power Density	Compliance	
4.2.4.1	Transmitter unwanted emissions outside the 5 GHz RLAN bands	Compliance	
4.2.4.2	Transmitter unwanted emissions within the 5 GHz RLAN bands	Compliance	
4.2.5	Receiver spurious emissions	Compliance	
4.2.6	Dynamic Frequency Selection (DFS)	Compliance	
4.2.7	Adaptivity (Channel Access Mechanism)	Compliance	
4.2.8	Receiver Blocking	Compliance	
4.2.9	User Access Protocol	Compliance*	

Note: Compliance*: Please refer to the product information declared by the manufacturer.

1.2 Test Facility

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

●**Certificated by CNAS China**

Registration No.: CNAS L5783

Date of registration: August 8, 2012

●**Certificated by VCCI**

Registration No.: R-4045

Date of registration: September 10, 2013

1.3 Measurement Uncertainty

Measurement Uncertainty for a Level of Confidence of 95 %, $U=2xUc(y)$

RF frequency	1×10^{-7}
RF power, conducted	± 1.0 dB
Conducted emission of receivers	± 1 dB
Radiated emission of transmitter	± 6 dB
Radiated emission of receiver	± 6 dB
Temperature	± 1 degree
Humidity	± 5 %

2. GENERAL INFORMATION

2.1 General Description Of EUT

Product Name:	Smart Tabletop Radio
Test Model No.:	R2 mk4
Series Model:	N/A
Operation Frequency:	802.11a/n(20MHz): 5180~5700MHz 802.11n(40MHz):5190~5670MHz
Modulation type:	802.11a(OFDM): BPSK,QPSK,16-QAM,64-QAM 802.11n(OFDM): BPSK,QPSK,16-QAM,64-QAM 802.11ac(OFDM): BPSK,QPSK,16-QAM,64-QAM,256-QAM
Antenna Type:	PIFA Antenna
Antenna gain:	2.5dBi
Power Input:	DC 14V/2A from adapter
Power:	28W
Adapter information:	Manufacturer:Dongguan Dongsong Electronic Co., Ltd. Model:DYS830-140200W-K Power Input:100-240V~ 50/60Hz 0.8A MAX Output:14.0V/2.0A, 28.0W

Note:

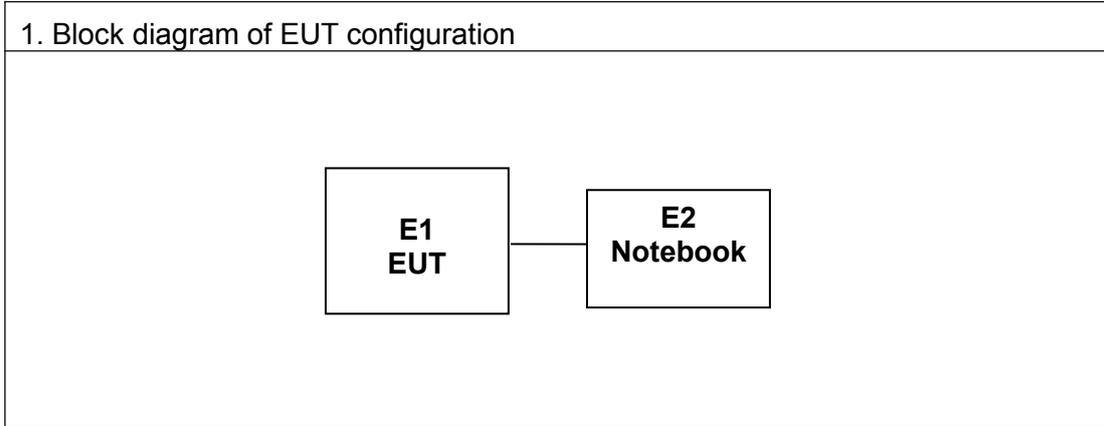
1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

2.

802.11a/n(20MHz) Carrier Frequency Channel					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	40	5200	44	5220
48	5240	52	5220	56	5280
60	5300	64	5320	100	5500
116	5580	140	5700		
802.11n(40MHz) Carrier Frequency Channel					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
38	5190	46	5230	54	5270
62	5310	102	5510	110	5550
134	5670				

2.2 Description Of Test Conditions

(1) EUT was tested in normal configuration (Please See following Block diagram)



2.3 Test Conditions and Channel

	Normal Test Conditions	Extreme Test Conditions
Temperature	15°C - 35°C	0°C ~ 50°C Note: (1)
Relative Humidity	20% - 75%	N/A
Supply Voltage	DC 14V/2A from adapter	N/A

802.11a/n(20MHz)

EUT Channel	Test Frequency (MHz)
CH36	5180
CH40	5200
CH48	5240
CH52	5260
CH64	5320
CH100	5500
CH116	5580
CH140	5700

802.11n(40MHz)

EUT Channel	Test Frequency (MHz)
CH38	5190
CH46	5230
CH54	5270
CH62	5310
CH102	5510
CH110	5550
CH134	5670

Note:

(1) The HT 50°C and LT 0°C was declared by manufacturer, The EUT couldn't be operate normally with higher or lower temperature.

(2) The measurements are performed at the highest, middle, lowest available channels.

2.4 Description Of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
E-1	Smart Tabletop Radio	ruark audio	R2 mk4	N/A	EUT
E-2	Notebook	Lenovo	300-15SK	GB14477457	AE

Item	Shielded Type	Ferrite Core	Length	Note

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in m in 『Length』 column.

2.5 Equipments List for All Test Items

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
MXG Signal Analyzer	Keysight	N9020A	MY56070279	2021/04/06	2022/04/05
MIMO4TX-1	Keysight	MIMO4TX	TW5451101,TW5451102,TW5451103,TW5451104	2021/04/06	2022/04/05
MXG Vector Signal Generator	Agilent	N5182A	MY50143410	2021/04/06	2022/04/05
MXG Analog Signal Generator	Agilent	N5181B	MY53050432	2021/04/06	2022/04/05
Comprehensive tester	R&S	CMW500	106288	2020/04/20	2022/04/19
EMI Test Receiver	Rohde&Schwarz	ESCI	101156	2021/04/06	2022/04/05
TRILOG Broadband Antenna	Schwarzbeck	VULB 9168	00829	2021/04/11	2022/04/10
3m Semi-anechoic Chamber	ETS-LINDGREN	966	170326	2020/04/20	2022/04/19
RF Cable	Junkosha	MWX322-2m	1305G007	2021/04/06	2022/04/05
RF Cable	Junkosha	MWX322-8m	1305G008	2021/04/06	2022/04/05
MULTI-DEVICE Controller	ETS-LINDGREN	2090	126913	N/A	N/A
Antenna Holder	ETS-LINDGREN	2070B	00109601	N/A	N/A
EMI Test Receiver	Rohde&Schwarz	ESCI	101156	2021/04/06	2022/04/05
Horn Antenna	DAZE	ZN30701	11003	2021/04/11	2022/04/10
Spectrum Analyzer	Keysight	N9020A	MY56070279	2021/04/06	2022/04/05
3m anechoic Chamber	ETS-LINDGREN	966	170326	2022/04/20	2022/04/19
Signal Amplifier	ZHINAN	ZN3380C	11001	2021/04/10	2022/04/05
RF Cable	Junkosha	MWX322-1m	1305G006	2021/04/06	2022/04/05
RF Cable	Junkosha	MWX322-2m	1305G007	2021/04/06	2022/04/05
RF Cable	Junkosha	MWX322-8m	1305G008	2021/04/06	2022/04/05
MULTI-DEVICE Controller	ETS-LINDGREN	2090	126913	N/A	N/A
Antenna Holder	ETS-LINDGREN	2070B	00109601	N/A	N/A

3. CENTRE FREQUENCIES

3.1 APPLIED PROCEDURES / LIMIT LIMIT

The actual centre frequency for any given channel declared by the manufacturer shall be maintained within the range $f_c \pm 20$ ppm

3.2 TEST PROCEDURES

Test conditions

These measurements shall be performed under both normal and extreme test conditions (see clause 5.1.3).

The channels on which the conformance requirements in clause 4.2.1 shall be verified are defined in clause 5.3.2.

The UUT shall be configured to operate at a normal RF Output Power level. In addition, the UUT shall be configured to operate on a single channel.

For a UUT with antenna connector(s) and using dedicated external antenna(s), or for a UUT with integral antenna(s) but with a temporary antenna connector(s) provided, conducted measurements shall be used.

In case of conducted measurements on smart antenna systems (devices with multiple transmit chains) the measurements shall be performed on only one of the active transmit chains.

For a UUT with integral antenna(s) and without a temporary antenna connector(s), radiated measurements shall be used

3.3 TEST METHOD

Conducted measurement:

1. Equipment operating without modulation

This test method requires that the UUT can be operated in an unmodulated test mode.

The UUT shall be connected to a suitable frequency measuring device (e.g. a frequency counter or a spectrum analyser) and operated in an unmodulated mode.

The result shall be recorded.

2. Equipment operating with modulation

This method is an alternative to the above method in case the UUT cannot be operated in an un-modulated mode. The UUT shall be connected to spectrum analyser.

Max Hold shall be selected and the centre frequency adjusted to that of the UUT.

The peak value of the power envelope shall be measured and noted. The span shall be reduced and the marker moved in a positive frequency increment until the upper, (relative to the centre frequency), -10 dBc point is reached. This value shall be noted as f1.

The marker shall then be moved in a negative frequency increment until the lower, (relative to the centre frequency), -10 dBc point is reached. This value shall be noted as f2.

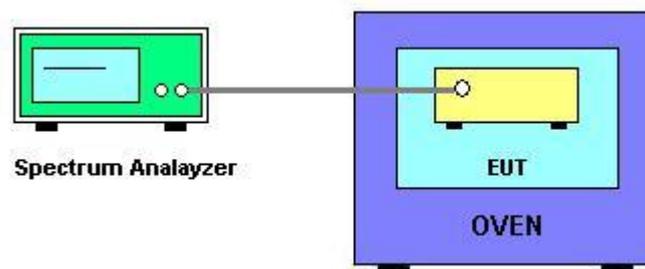
The centre frequency is calculated as $(f1 + f2) / 2$.

Radiated measurement:

The test set up as described in annex B shall be used with a spectrum analyser attached to the test antenna.

The test procedure is as described under clause 5.4.2.2.1.

3.4 TEST SETUP LAYOUT

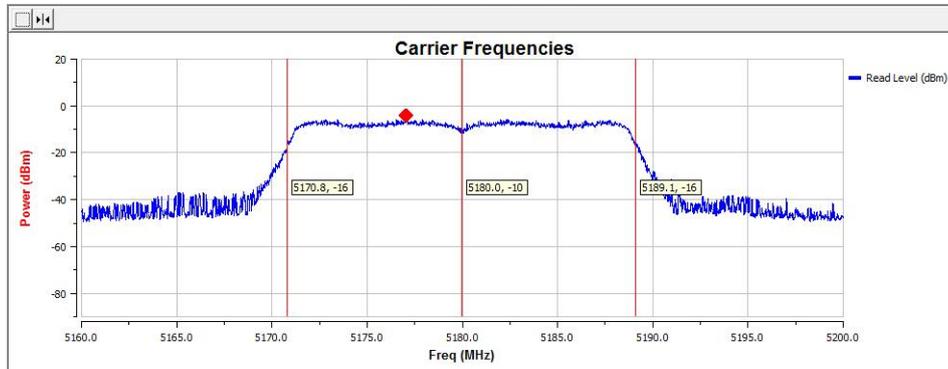


3.5 TEST RESULT 5150-5250MHz

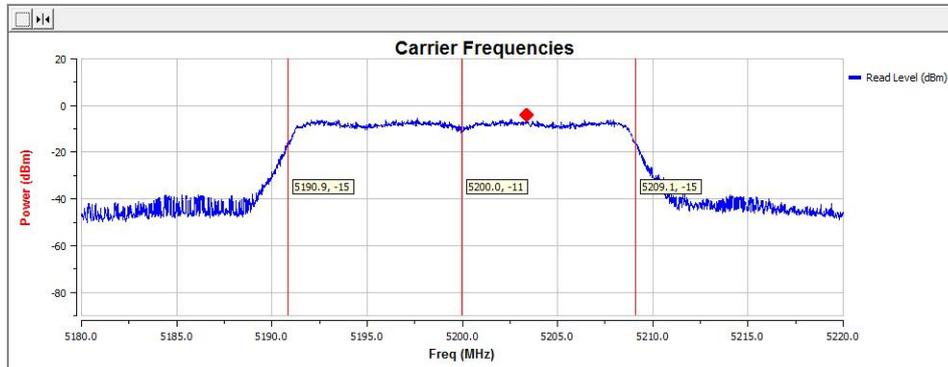
Temperature:	25°C	Relative Humidity:	60 %		
Pressure:	1012 hPa	Test Voltage:	DC 14V/2A from adapter		
Test Mode: 802.11a					
Channel	Voltage	Temperature	Carrier Frequencies (MHz)	Frequency Error (ppm)	Limit (ppm)
5180	Normal	Normal	5179.96	7.72	< 20
5200	Normal	Normal	5199.98	3.85	< 20
5240	Normal	Normal	5240.05	-9.54	< 20

The Test Plots

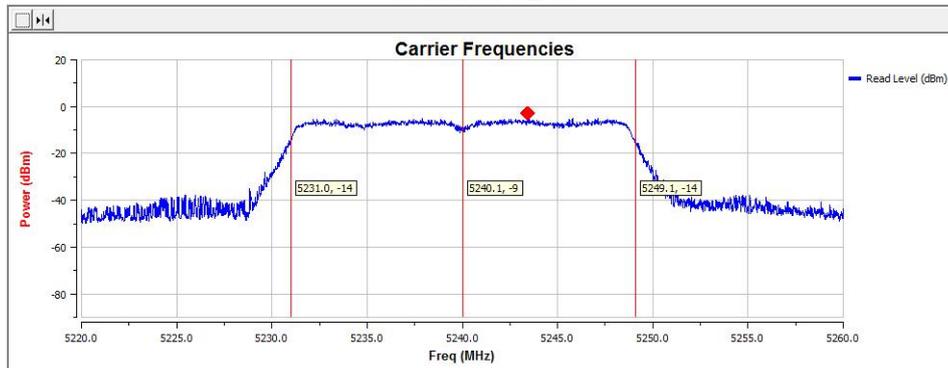
Channel-5180



Channel-5200

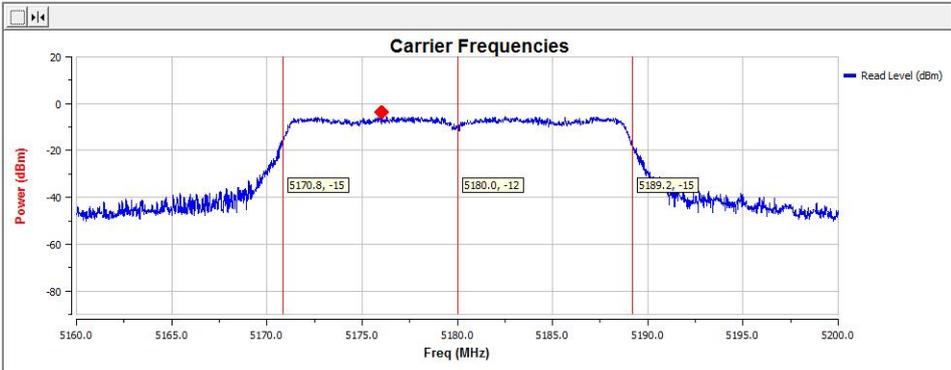


Channel-5240

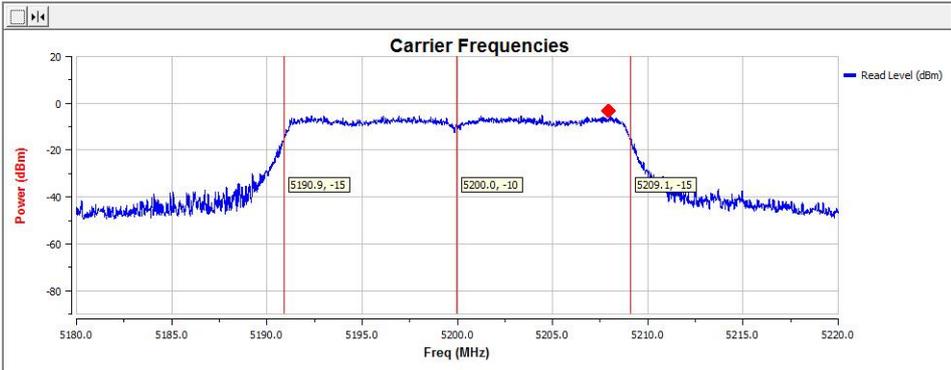


Test Mode: 802.11n(HT20)					
Channel	Voltage	Temperature	Carrier Frequencies (MHz)	Frequency Error (ppm)	Limit (ppm)
5180	Normal	Normal	5180.01	-1.93	< 20
5200	Normal	Normal	5199.99	1.92	< 20
5240	Normal	Normal	5240.00	0.00	< 20

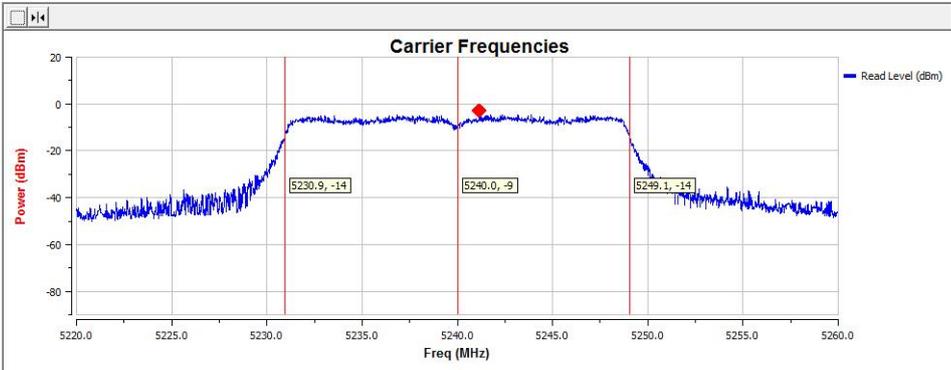
Channel-5180



Channel-5200



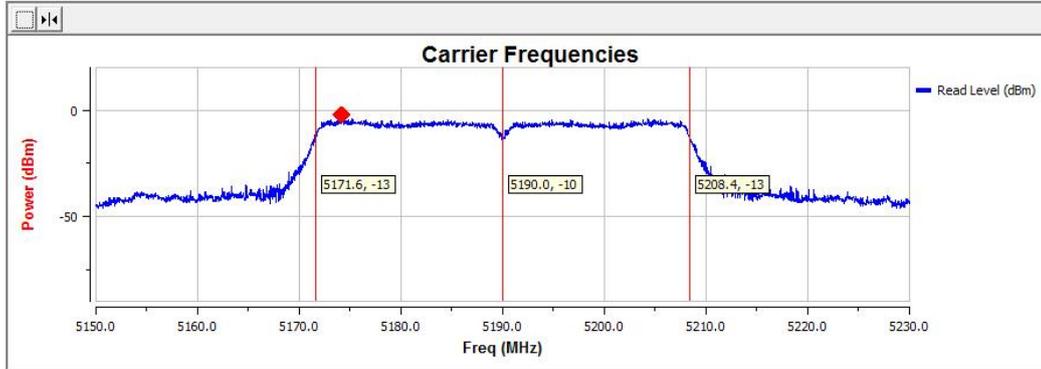
Channel-5240



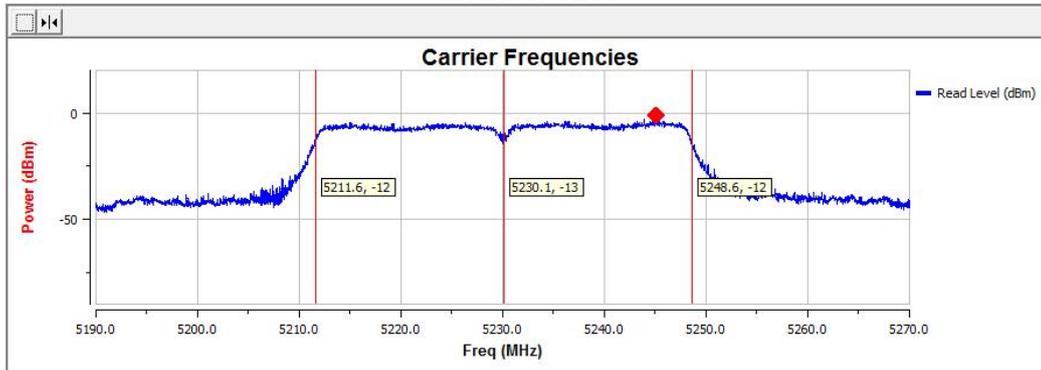
Test Mode: 802.11n(40MHz)					
Channel	Voltage	Temperature	Carrier Frequencies (MHz)	Frequency Error (ppm)	Limit (ppm)
5190	Normal	Normal	5190.02	-3.85	< 20
5230	Normal	Normal	5230.06	-11.47	< 20

The Test Plots

Channel-5190



Channel-5230

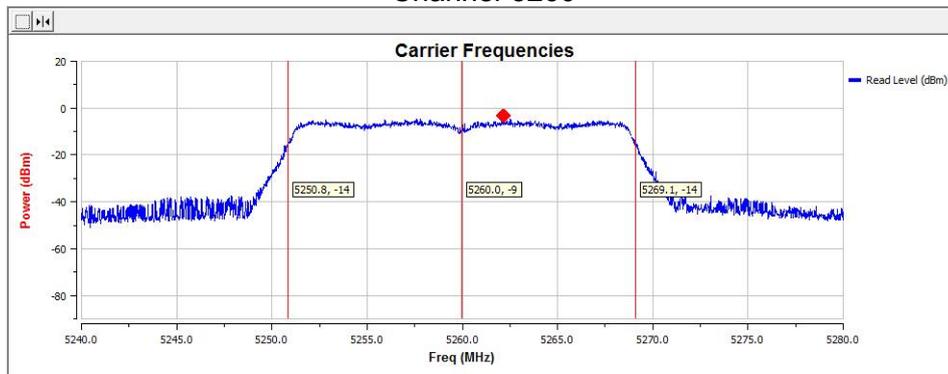


5250-5350MHz

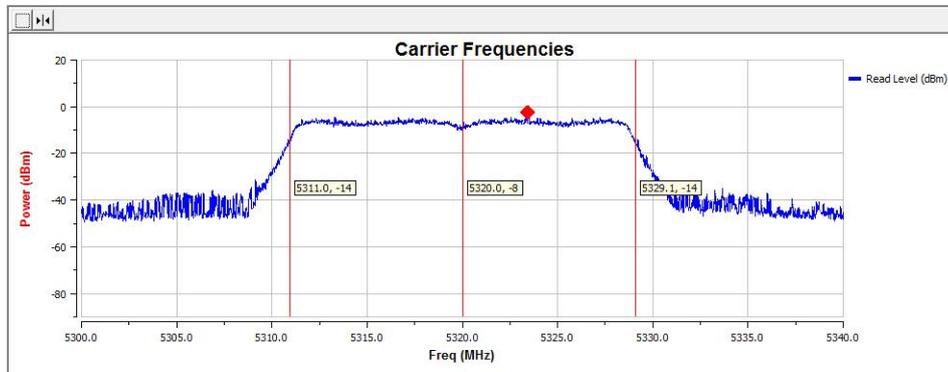
Temperature:	25°C	Relative Humidity:	60 %		
Pressure:	1012 hPa	Test Voltage:	DC 14V/2A from adapter		
Test Mode: 802.11a					
Channel	Voltage	Temperature	Carrier Frequencies (MHz)	Frequency Error (ppm)	Limit (ppm)
5260	Normal	Normal	5259.97	5.70	< 20
5230	Normal	Normal	5320.04	-7.52	< 20

The Test Plots

Channel-5260



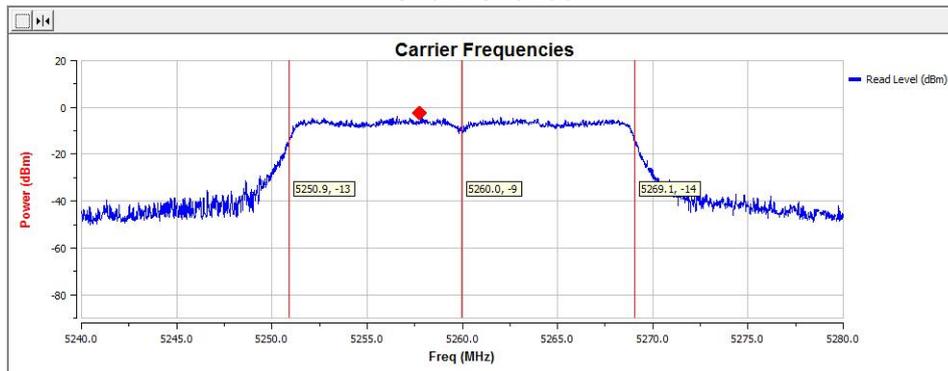
Channel-5320



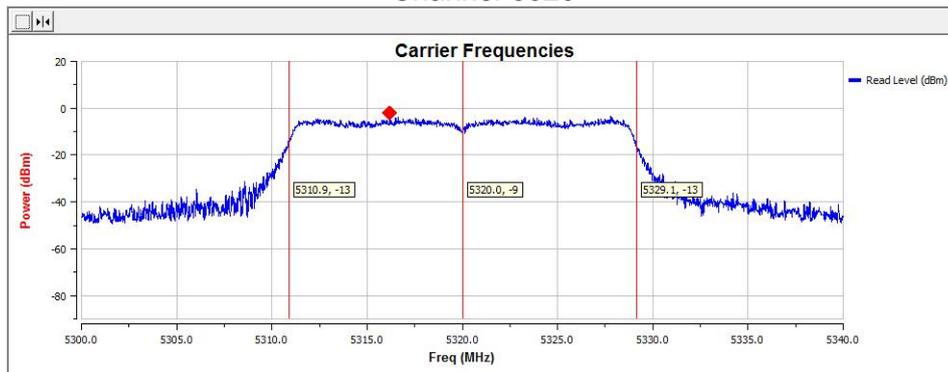
Temperature:	25°C	Relative Humidity:	60 %		
Pressure:	1012 hPa	Test Voltage:	DC 14V/2A from adapter		
Test Mode: 802.11n(20MHz)					
Channel	Voltage	Temperature	Carrier Frequencies (MHz)	Frequency Error (ppm)	Limit (ppm)
5260	Normal	Normal	5259.99	1.90	< 20
5230	Normal	Normal	5320.03	-5.64	< 20

The Test Plots

Channel-5260



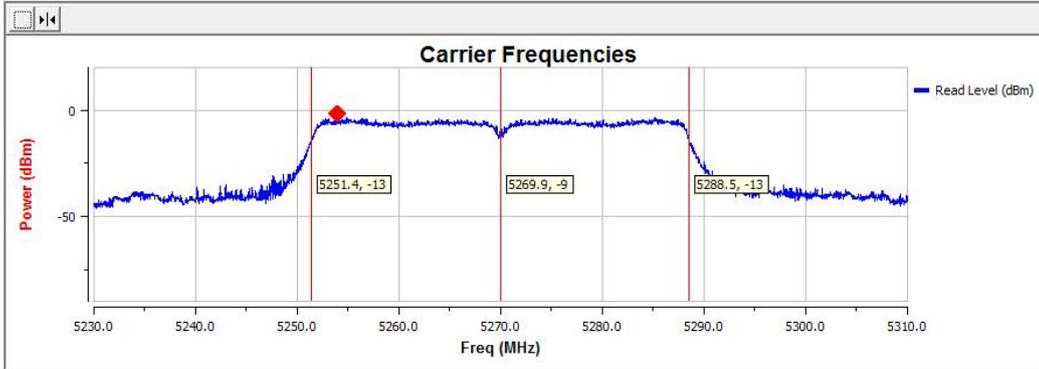
Channel-5320



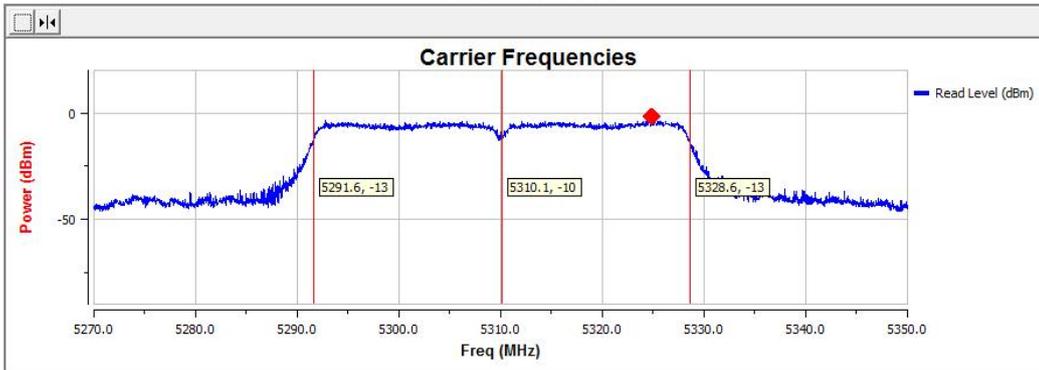
Test Mode: 802.11n(40MHz)					
Channel	Voltage	Temperature	Carrier Frequencies (MHz)	Frequency Error (ppm)	Limit (ppm)
5270	Normal	Normal	5269.94	11.39	< 20
5310	Normal	Normal	5310.06	-11.30	< 20

The Test Plots

Channel-5270



Channel-5310

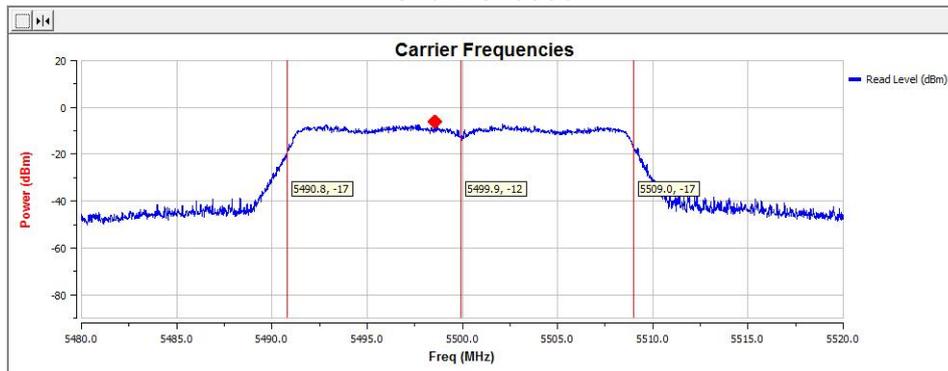


5470-5725MHz

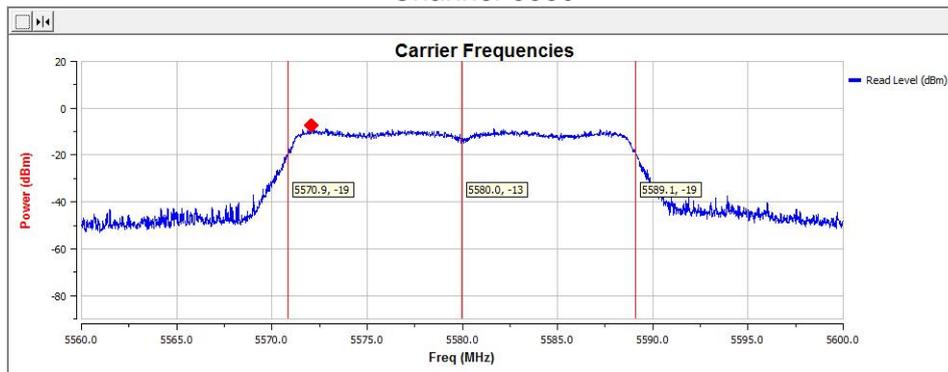
Test Mode: 802.11a					
Channel	Voltage	Temperature	Carrier Frequencies (MHz)	Frequency Error (ppm)	Limit (ppm)
5500	Normal	Normal	5499.91	16.36	< 20
5580	Normal	Normal	5579.97	5.38	< 20
5700	Normal	Normal	5700.02	-3.51	< 20

The Test Plots

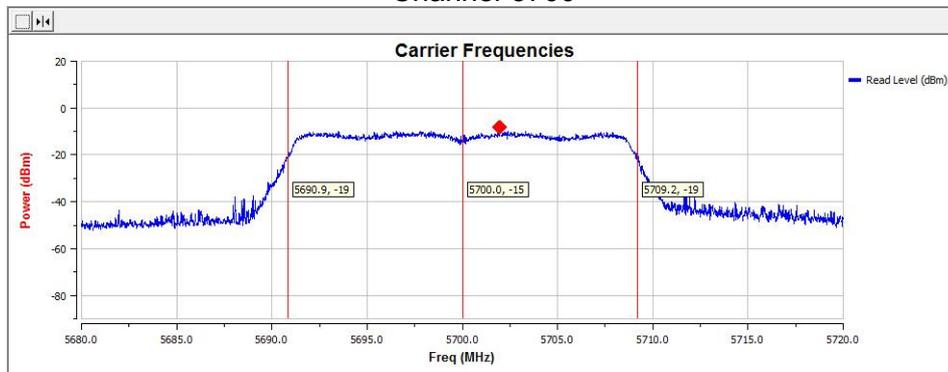
Channel-5500



Channel-5580

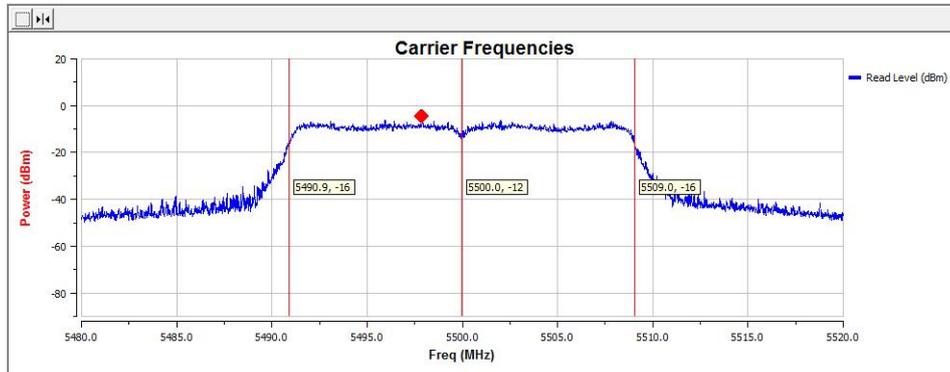


Channel-5700

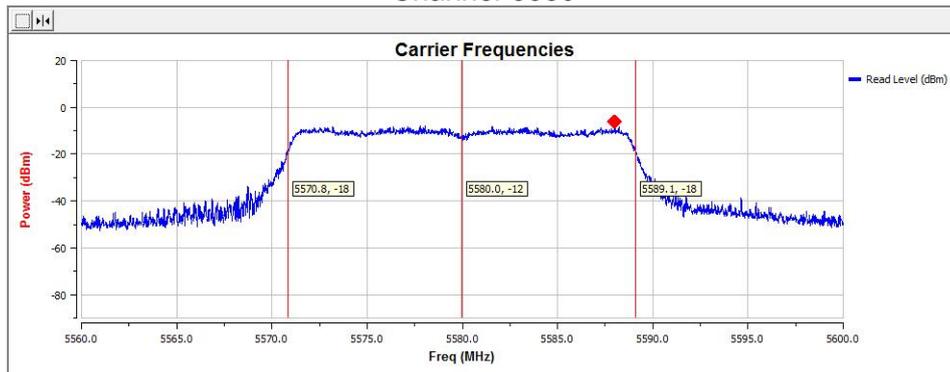


Test Mode: 802.11n(HT20)					
Channel	Voltage	Temperature	Carrier Frequencies (MHz)	Frequency Error (ppm)	Limit (ppm)
5500	Normal	Normal	5499.96	7.27	< 20
5580	Normal	Normal	5579.96	7.17	< 20
5700	Normal	Normal	5700.00	0.00	< 20

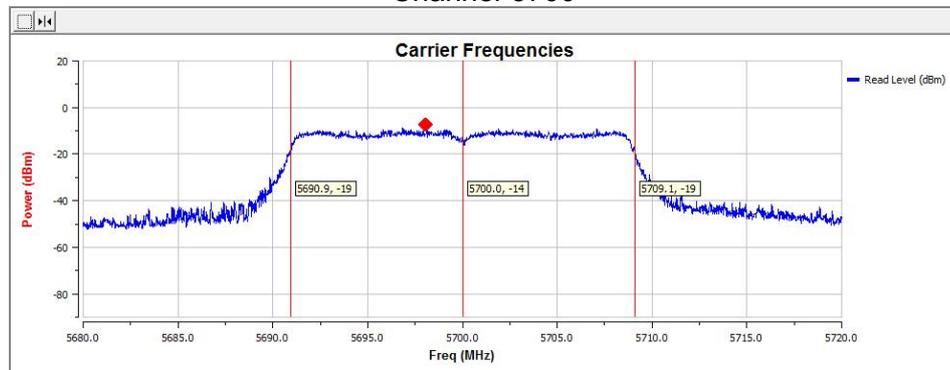
Channel-5500



Channel-5580



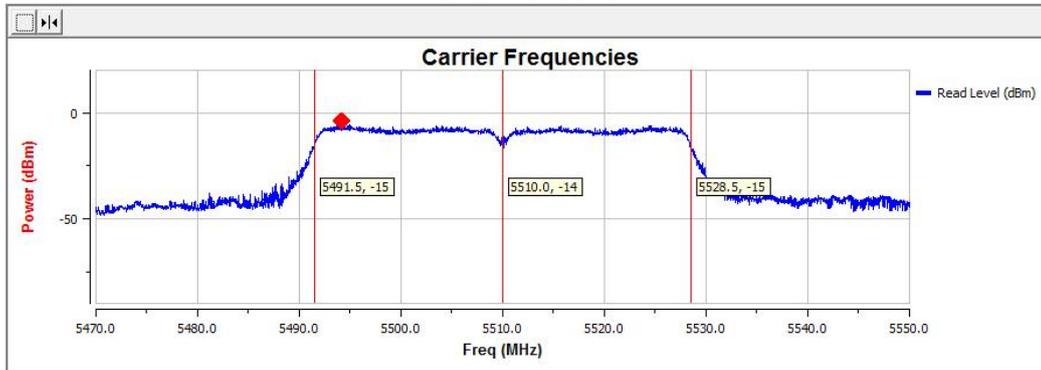
Channel-5700



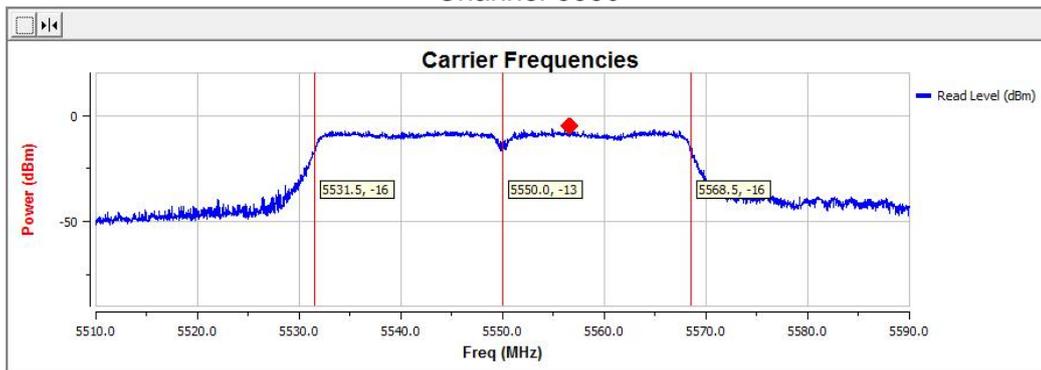
Test Mode: 802.11n(40MHz)					
Channel	Voltage	Temperature	Carrier Frequencies (MHz)	Frequency Error (ppm)	Limit (ppm)
5510	Normal	Normal	5509.99	1.81	< 20
5550	Normal	Normal	5550.02	-3.60	< 20
5670	Normal	Normal	5670.00	0.00	< 20

The Test Plots

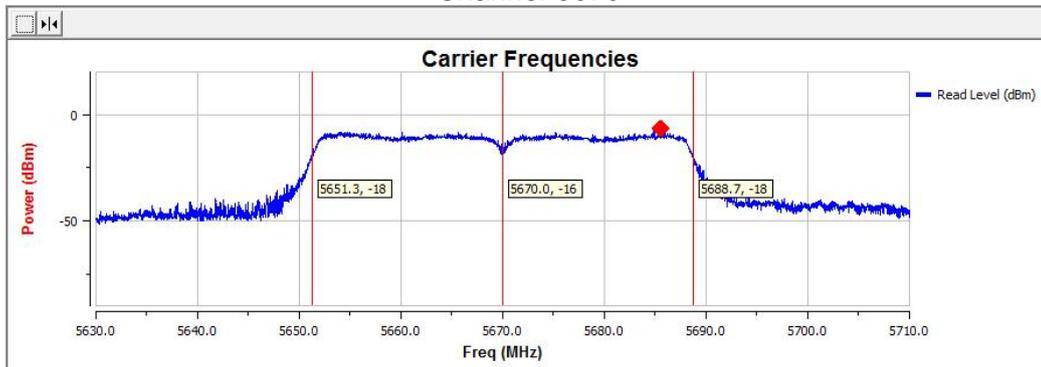
Channel-5510



Channel-5550



Channel-5670



4. NOMINAL CHANNEL BANDWIDTH AND OCCUPIED CHANNEL BANDWIDTH

4.1 APPLIED PROCEDURES / LIMIT

LIMIT

The Nominal Channel Bandwidth shall be at least 5 MHz at all times.

The Occupied Channel Bandwidth shall be between 80 % and 100 % of the declared Nominal Channel Bandwidth. In case of smart antenna systems (devices with multiple transmit chains) each of the transmit chains shall meet this requirement.

NOTE: During an established communication, a device is allowed to operate temporarily in a mode where its Occupied Channel Bandwidth may be reduced to as low as 40 % of its Nominal Channel Bandwidth with a minimum of 4 MHz.

4.2 TEST PROCEDURES

Test conditions

The conformance requirements shall be verified only under normal operating conditions, and on those channels and channel bandwidths defined in clause 5.1.3(ETSI EN 301 893 V2.1.1).

The measurements shall be performed using normal operation of the equipment with the test signal applied.

The UUT shall be configured to operate at a typical RF power output level.

When equipment has simultaneous transmissions in adjacent channels, these transmissions may be considered as one signal with an actual Nominal Channel Bandwidth of 'n' times the individual Nominal Channel Bandwidth where 'n' is the number of adjacent channels. When equipment has simultaneous transmissions in non-adjacent channels, each power envelope shall be considered separately.

For a UUT with antenna connector(s) and using dedicated external antenna(s), or for a UUT with integral antenna(s) but with a temporary antenna connector(s) provided, conducted measurements shall be used.

In case of conducted measurements on smart antenna systems (devices with multiple transmit chains) measurements need only to be performed on one of the active transmit chains (antenna outputs).

For a UUT with integral antenna(s) and without a temporary antenna connector(s), radiated measurements shall be used.

4.3 TEST METHOD

Conducted measurement

The measurement procedure shall be as follows:

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: 100 kHz
- Video BW: 300 kHz
- Frequency Span: 2 x Nominal Bandwidth (e.g. 40 MHz for a 20 MHz channel)
- Detector Mode: Peak
- Trace Mode: Max Hold

Step 2:

Wait for the trace to stabilize.

Step 3:

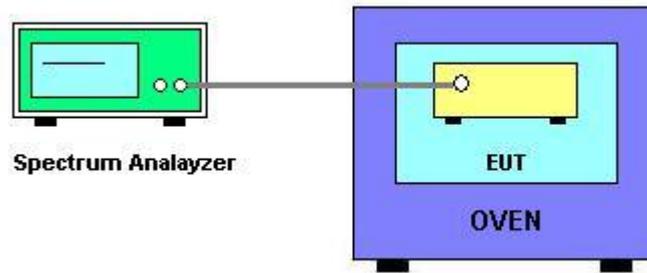
Make sure that the power envelope is sufficiently above the noise floor of the analyser to avoid the noise signals left and right from the power envelope being taken into account by this measurement.

Use the 99 % bandwidth function of the spectrum analyser to measure the Occupied Channel Bandwidth of the UUT. This value shall be recorded.

Radiated measurement

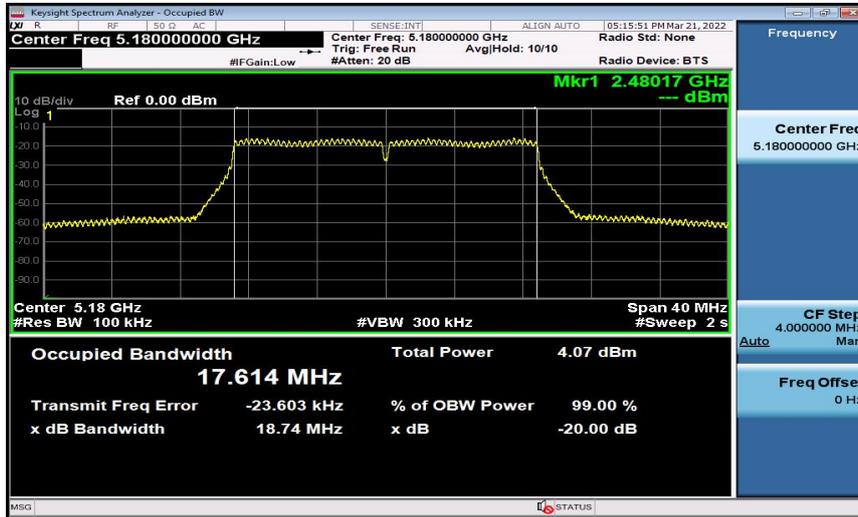
The test set up as described in annex B and the applicable measurement procedures described in annex C shall be used. The test procedure is as described under clause 5.4.3.2.1

4.4 TEST SETUP LAYOUT

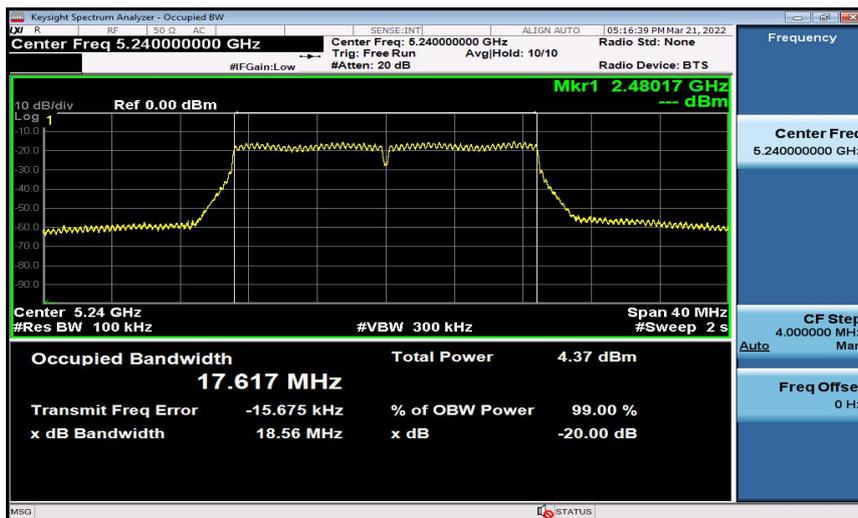


4.5 TEST RESULTS
5150-5250MHz

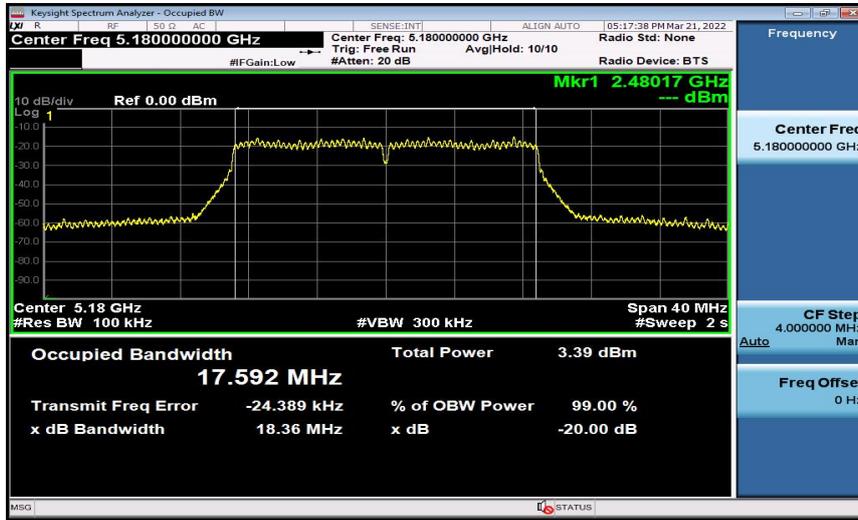
Modulation	Test Channel	Frequency (MHz)	99% Bandwidth (MHz)
802.11a	CH36	5180	17.614



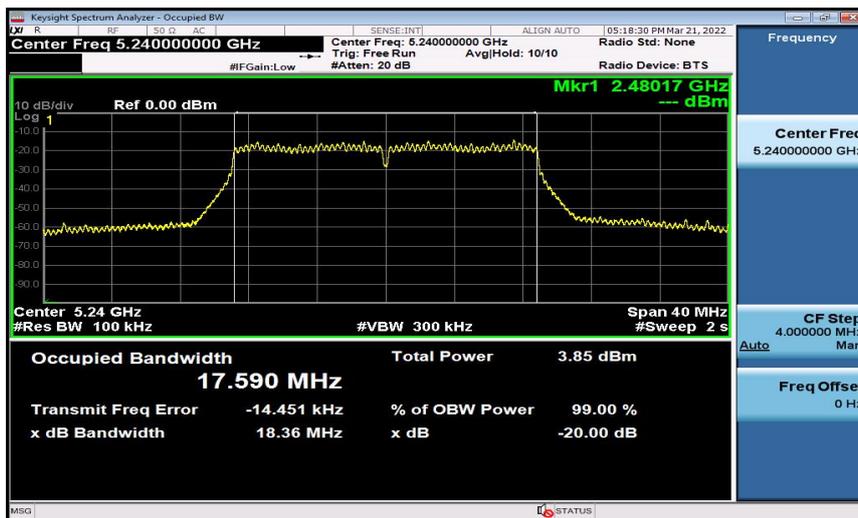
Modulation	Test Channel	Frequency (MHz)	99% Bandwidth (MHz)
802.11a	CH48	5240	17.617



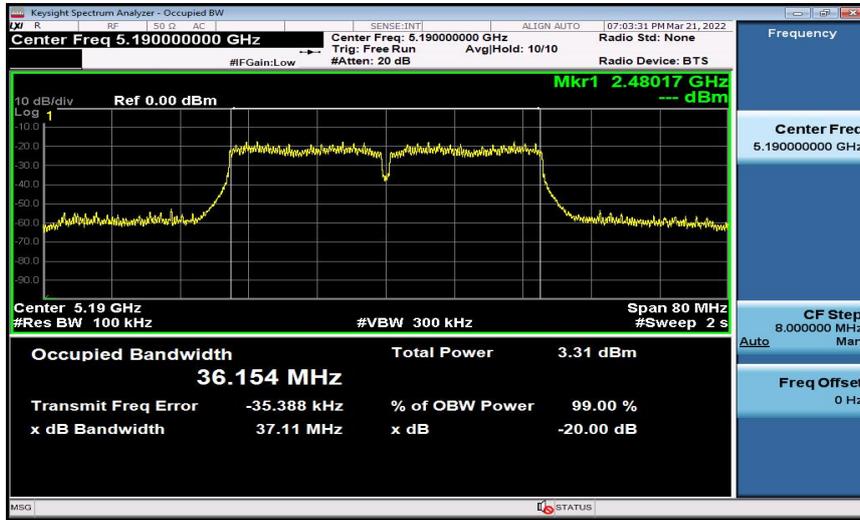
Modulation	Test Channel	Frequency (MHz)	99% Bandwidth (MHz)
802.11n(HT20)	CH36	5180	17.592



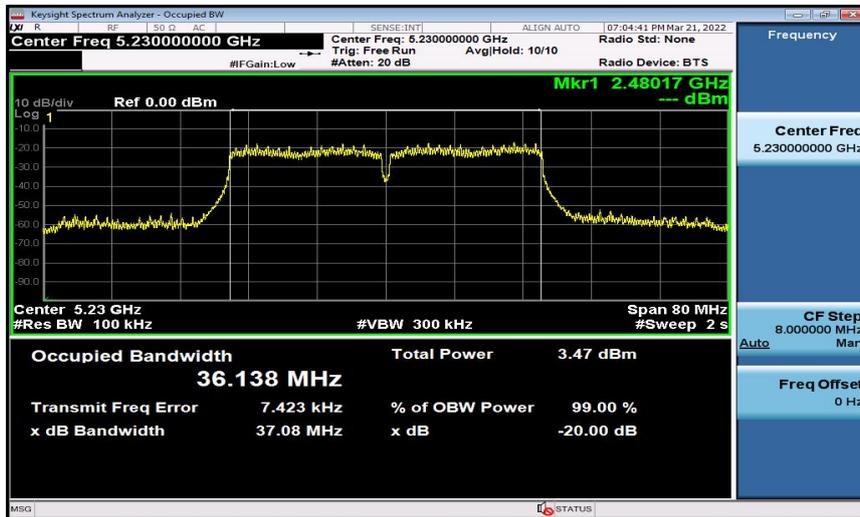
Modulation	Test Channel	Frequency (MHz)	99% Bandwidth (MHz)
802.11n(20MHz)	CH48	5240	17.590



Modulation	Test Channel	Frequency (MHz)	99% Bandwidth (MHz)
802.11n(40MHz)	CH38	5190	36.154

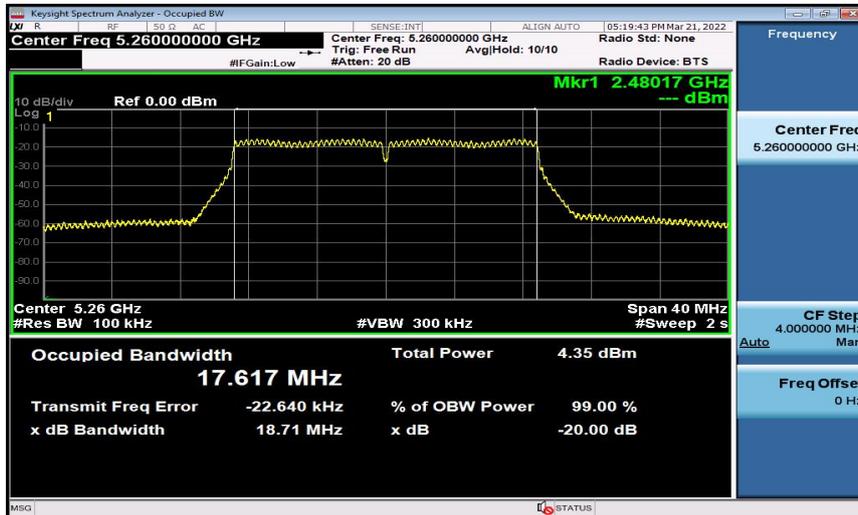


Modulation	Test Channel	Frequency (MHz)	99% Bandwidth (MHz)
802.11n(40MHz)	CH46	5230	36.138

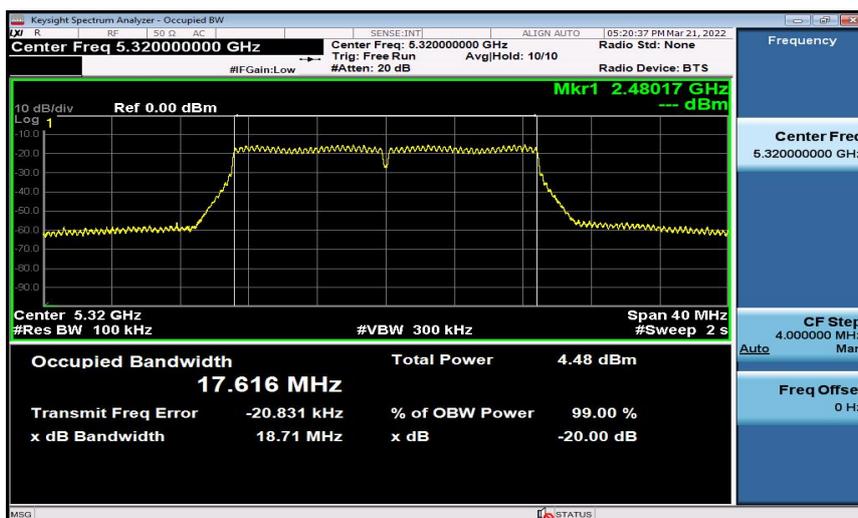


5250-5350MHz

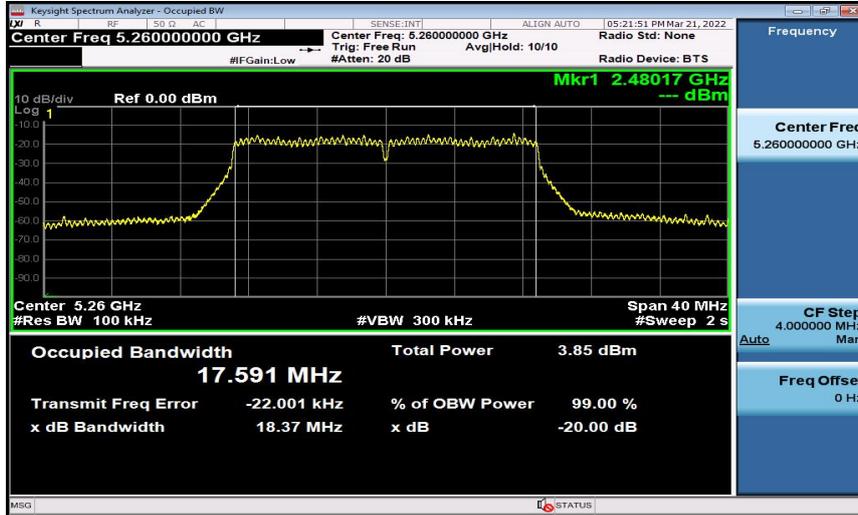
Modulation	Test Channel	Frequency (MHz)	99% Bandwidth (MHz)
802.11a	CH52	5260	17.617



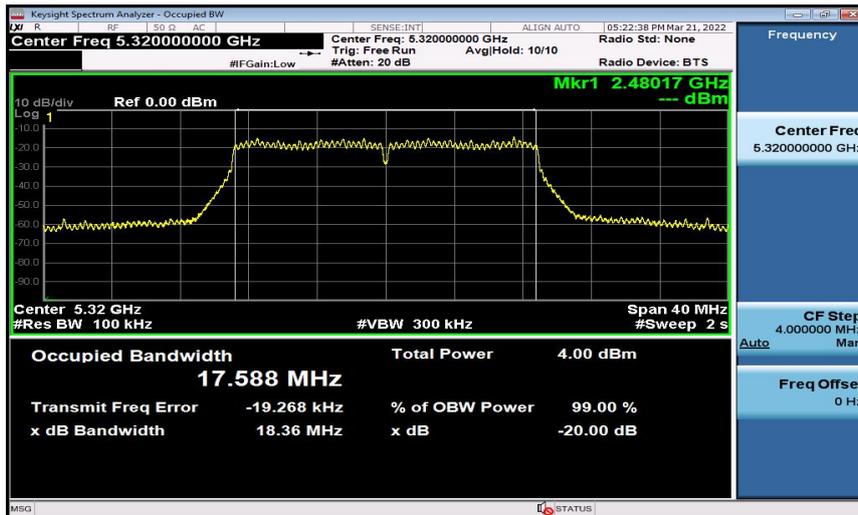
Modulation	Test Channel	Frequency (MHz)	99% Bandwidth (MHz)
802.11a	CH64	5320	17.616



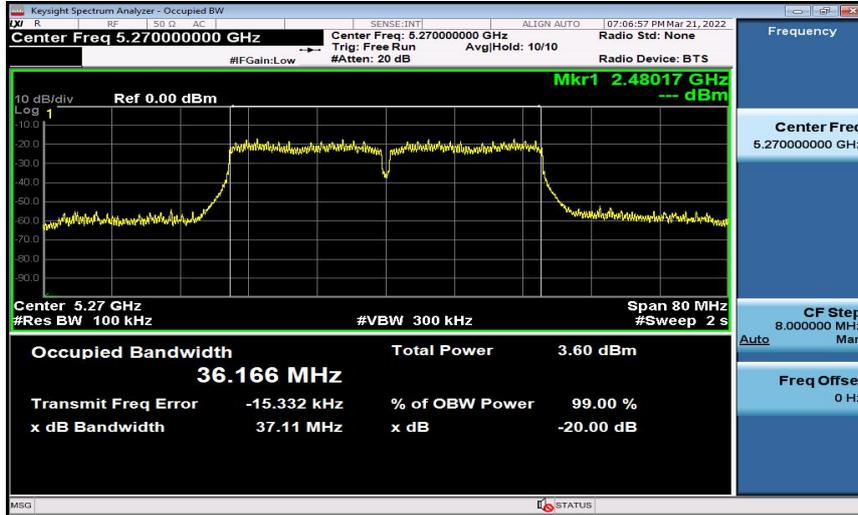
Modulation	Test Channel	Frequency (MHz)	99% Bandwidth (MHz)
802.11n(HT20)	CH52	5260	17.591



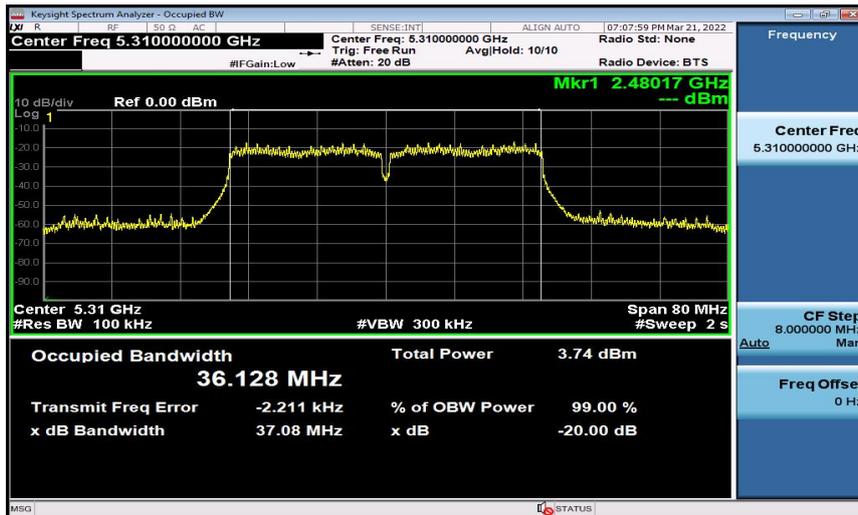
Modulation	Test Channel	Frequency (MHz)	99% Bandwidth (MHz)
802.11n(20MHz)	CH64	5320	17.588



Modulation	Test Channel	Frequency (MHz)	99% Bandwidth (MHz)
802.11n(40MHz)	CH54	5270	36.166

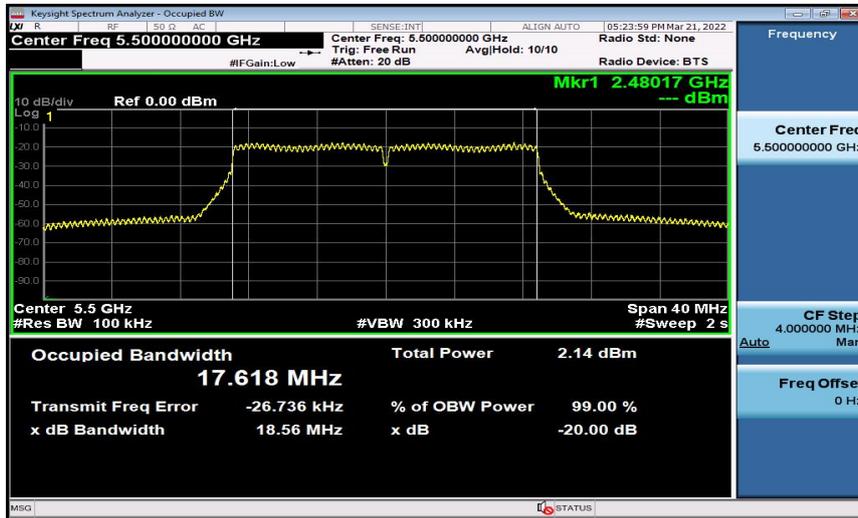


Modulation	Test Channel	Frequency (MHz)	99% Bandwidth (MHz)
802.11n(40MHz)	CH62	5310	36.128

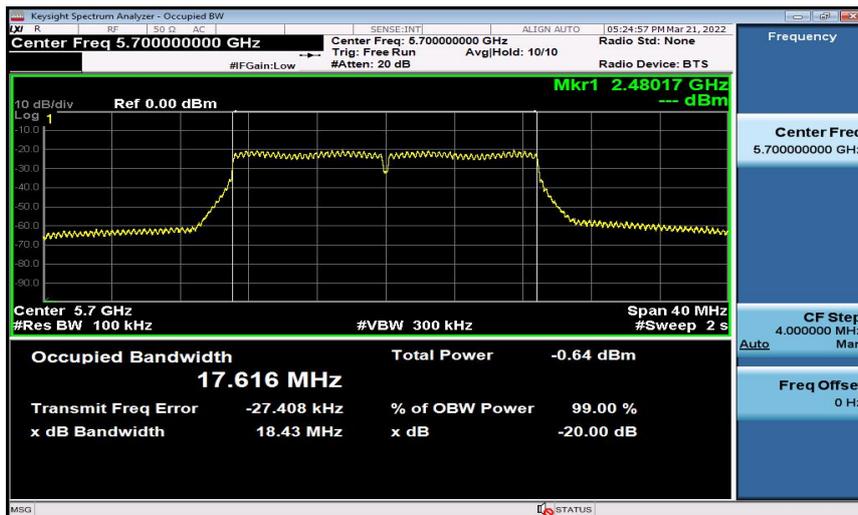


5470-5725MHz

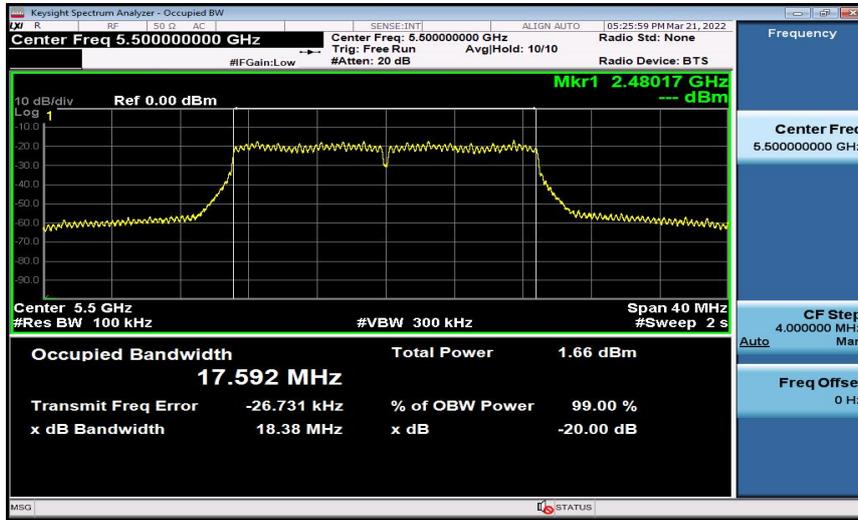
Modulation	Test Channel	Frequency (MHz)	99% Bandwidth (MHz)
802.11a	CH100	5500	17.618



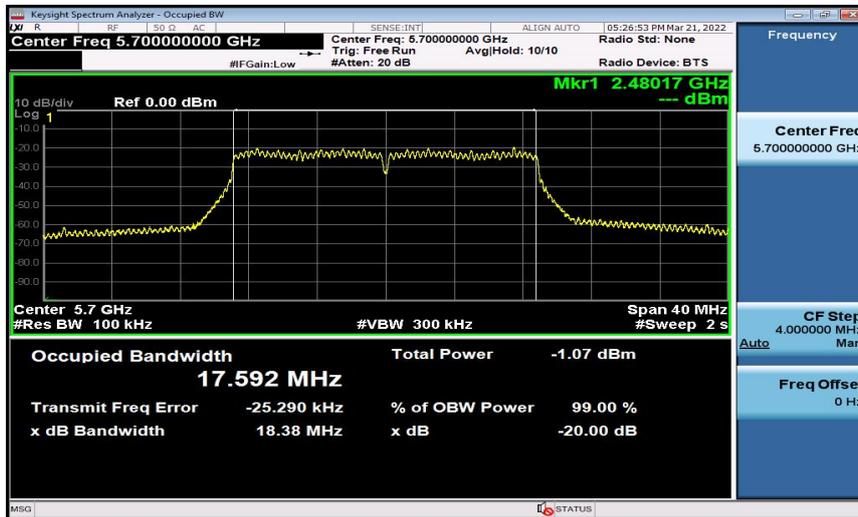
Modulation	Test Channel	Frequency (MHz)	99% Bandwidth (MHz)
802.11a	CH140	5700	17.616



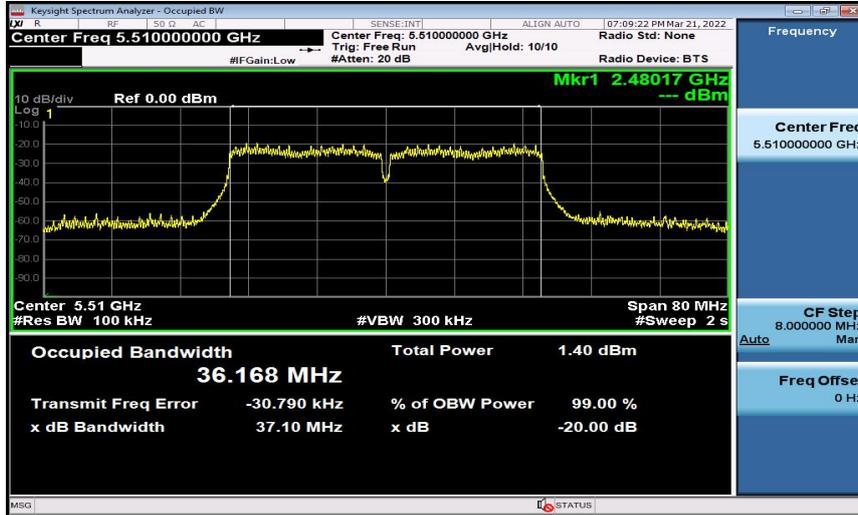
Modulation	Test Channel	Frequency (MHz)	99% Bandwidth (MHz)
802.11n(HT20)	CH100	5500	17.592



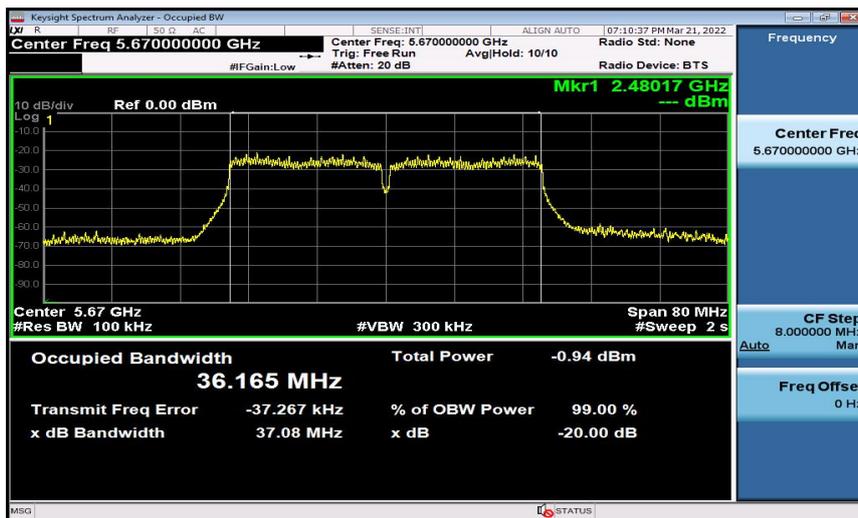
Modulation	Test Channel	Frequency (MHz)	99% Bandwidth (MHz)
802.11n(20MHz)	CH140	5700	17.592



Modulation	Test Channel	Frequency (MHz)	99% Bandwidth (MHz)
802.11n(40MHz)	CH102	5510	36.168



Modulation	Test Channel	Frequency (MHz)	99% Bandwidth (MHz)
802.11n(40MHz)	CH134	5670	36.165



5. RF OUTPUT POWER, TPC AND POWER DENSITY

5.1 APPLIED PROCEDURES / LIMIT LIMIT

TPC is not required for channels whose nominal bandwidth falls completely within the band 5 150MHz to 5 250 MHz. For devices with TPC, the RF output power and the Power Density when configured to operate at the highest stated power level (PH) of the TPC range shall not exceed the levels given in table 2. Devices are allowed to operate without TPC. See table 2 for the applicable limits that shall apply in this case.

Table 2: Mean e.i.r.p. limits for RF output power and Power Density at the highest power level (P_H)

Frequency range (MHz)	Mean e.i.r.p. limit for P _H (dBm)		Mean e.i.r.p. density limit (dBm/MHz)	
	with TPC	without TPC	with TPC	without TPC
5 150 to 5 350	23	20/23 (see note 1)	10	7/10 (see note 2)
5 470 to 5 725	30 (see note 3)	27 (see note 3)	17 (see note 3)	14 (see note 3)

NOTE 1: The applicable limit is 20 dBm, except for transmissions whose nominal bandwidth falls completely within the band 5 150 MHz to 5 250 MHz, in which case the applicable limit is 23 dBm.

NOTE 2: The applicable limit is 7 dBm/MHz, except for transmissions whose nominal bandwidth falls completely within the band 5 150 MHz to 5 250 MHz, in which case the applicable limit is 10 dBm/MHz.

NOTE 3: Slave devices without a *Radar Interference Detection* function shall comply with the limits for the frequency range 5 250 MHz to 5 350 MHz.

For devices using TPC, the RF Output Power during a transmission burst when configured to operate at the lowest stated power level (PL) of the TPC range shall not exceed the levels given in table 3. For devices without TPC, the limits in table 3 do not apply.

Table 3: Mean e.i.r.p. limits for RF Output Power at the lowest power level of the TPC range

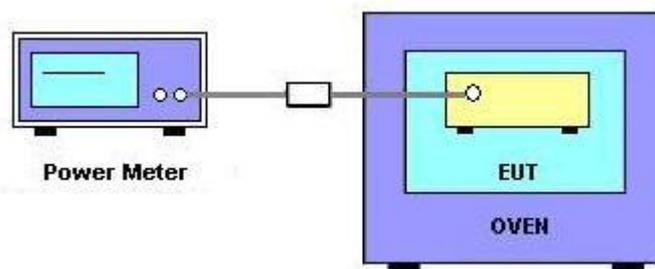
Frequency range	Mean e.i.r.p. (dBm) limit for P _L
5 250 MHz to 5 350 MHz	17
5 470 MHz to 5 725 MHz	24 (see note)

NOTE: Slave devices without a *Radar Interference Detection* function shall comply with the limits for the band 5 250 MHz to 5 350 MHz.

5.2 TEST PROCEDURES

According to ETSI EN 301 893 V2.1.1 (2017-05) §5.4.4

5.3 TEST SETUP LAYOUT



5.4 TEST RESULTS

5150-5250MHz

RF Output Power			
Temperature:	25°C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	DC 14V/2A from adapter

Test Mode: 802.11a					
TEST CONDITIONS			Total e.i.r.p (dBm)		
			CH36	CH40	CH48
Normal voltage	T nom (°C)	25.00	8.58	7.54	7.53
	T min (°C)	0.00	8.33	7.31	7.28
	T max (°C)	50.00	8.14	7.09	7.01
Max RF Power			8.58		
Limits			23dBm		
Result			Complies		

Test Mode: 802.11n(20MHz)					
TEST CONDITIONS			Total e.i.r.p (dBm)		
			CH36	CH40	CH48
Normal voltage	T nom (°C)	25.00	8.06	7.69	7.49
	T min (°C)	0.00	7.86	7.45	7.23
	T max (°C)	50.00	7.63	7.24	6.98
Max RF Power			8.06		
Limits			23dBm		
Result			Complies		

Test Mode: 802.11n(40MHz)					
TEST CONDITIONS			Total e.i.r.p (dBm)		
			CH38	CH46	
Normal voltage	T nom (°C)	25.00	8.38	8.16	
	T min (°C)	0.00	8.15	7.86	
	T max (°C)	50.00	7.96	7.53	
Max RF Power			8.38		
Limits			23dBm		
Result			Complies		

5250-5350MHz

RF Output Power			
Temperature:	25°C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	DC 14V/2A from adapter

Test Mode: 802.11a				
TEST CONDITIONS			Total e.i.r.p (dBm)	
			CH52	CH64
Normal voltage	T nom (°C)	25.00	8.58	8.49
	T min (°C)	0.00	8.33	8.27
	T max (°C)	50.00	8.06	8.02
Max RF Power			7.58	
Limits			23dBm	
Result			Complies	

Test Mode: 802.11n(20MHz)				
TEST CONDITIONS			Total e.i.r.p (dBm)	
			CH52	CH64
Normal voltage	T nom (°C)	25.00	8.05	7.84
	T min (°C)	0.00	7.83	7.57
	T max (°C)	50.00	7.41	7.29
Max RF Power			8.05	
Limits			23dBm	
Result			Complies	

Test Mode: 802.11n(40MHz)				
TEST CONDITIONS			Total e.i.r.p (dBm)	
			CH54	CH62
Normal voltage	T nom (°C)	25.00	8.06	7.75
	T min (°C)	0.00	7.79	7.55
	T max (°C)	50.00	7.41	7.23
Max RF Power			8.06	
Limits			23dBm	
Result			Complies	

Test Mode: 802.11a					
TEST CONDITIONS			Total e.i.r.p (dBm)		
			CH100	CH116	CH140
Normal voltage	T nom (°C)	25.00	7.58	7.63	7.49
	T min (°C)	0.00	7.34	7.41	7.29
	T max (°C)	50.00	7.11	7.21	7.08
Max RF Power			7.63		
Limits			30dBm		
Result			Complies		

Test Mode: 802.11n(20MHz)					
TEST CONDITIONS			Total e.i.r.p (dBm)		
			CH100	CH116	CH140
Normal voltage	T nom (°C)	25.00	8.06	7.59	7.43
	T min (°C)	0.00	7.49	7.35	7.28
	T max (°C)	50.00	7.26	7.17	6.09
Max RF Power			8.06		
Limits			30dBm		
Result			Complies		

Test Mode: 802.11n(40MHz)					
TEST CONDITIONS			Total e.i.r.p (dBm)		
			CH102	CH110	CH134
Normal voltage	T nom (°C)	25.00	7.39	7.08	7.12
	T min (°C)	0.00	7.12	6.73	6.62
	T max (°C)	50.00	6.86	6.46	6.27
Max RF Power			7.39		
Limits			30dBm		
Result			Complies		

5150-5250MHz

RF Output Power			
Temperature:	25°C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	DC 14V/2A from adapter

Test Mode: 802.11a			
Channel Frequency (MHz)	Power Density (dBm/MHz)	Limit (dBm/1 MHz) (E.I.R.P)	PASS/FAIL
5180	-4.71	10	PASS
5200	-5.48	10	PASS
5240	-5.63	10	PASS

Test Mode: 802.11n(20MHz)			
Channel Frequency (MHz)	Power Density (dBm/MHz)	Limit (dBm/1 MHz) (E.I.R.P)	PASS/FAIL
5180	-4.16	10	PASS
5200	-5.47	10	PASS
5240	-6.07	10	PASS

Test Mode: 802.11n(40MHz)			
Channel Frequency (MHz)	Power Density (dBm/MHz)	Limit (dBm/1 MHz) (E.I.R.P)	PASS/FAIL
5190	-6.74	10	PASS
5230	-8.36	10	PASS

5250-5350MHz

RF Output Power			
Temperature:	25°C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	DC 14V/2A from adapter

Test Mode: 802.11a			
Channel Frequency (MHz)	Power Density (dBm/MHz)	Limit (dBm/1 MHz) (E.I.R.P)	PASS/FAIL
5260	-5.74	10	PASS
5320	-5.42	10	PASS

Test Mode: 802.11n(20MHz)			
Channel Frequency (MHz)	Power Density (dBm/MHz)	Limit (dBm/1 MHz) (E.I.R.P)	PASS/FAIL
5260	-5.17	10	PASS
5320	-6.35	10	PASS

Test Mode: 802.11n(40MHz)			
Channel Frequency (MHz)	Power Density (dBm/MHz)	Limit (dBm/1 MHz) (E.I.R.P)	PASS/FAIL
5270	-6.28	10	PASS
5310	-7.49	10	PASS

5470-5725MHz

Test Mode: 802.11a			
Channel Frequency (MHz)	Power Density (dBm/MHz)	Limit (dBm/1 MHz) (E.I.R.P)	PASS/FAIL
5500	-4.63	17	PASS
5580	-5.71	17	PASS
5700	-5.83	17	PASS

Test Mode: 802.11n(20MHz)			
Channel Frequency (MHz)	Power Density (dBm/MHz)	Limit (dBm/1 MHz) (E.I.R.P)	PASS/FAIL
5500	-5.89	17	PASS
5580	-5.74	17	PASS
5700	-6.82	17	PASS

Test Mode: 802.11n(40MHz)			
Channel Frequency (MHz)	Power Density (dBm/MHz)	Limit (dBm/1 MHz) (E.I.R.P)	PASS/FAIL
5510	-6.89	17	PASS
5550	-5.71	17	PASS
5670	-6.22	17	PASS

6. TRANSMITTER UNWANTED EMISSIONS OUTSIDE THE 5 GHz RLAN BANDS

6.1 APPLIED PROCEDURES / LIMIT

LIMIT

The level of transmitter unwanted emissions outside the 5 GHz RLAN bands shall not exceed the limits given in table 4.

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

Table 4: Transmitter unwanted emission limits outside the 5 GHz RLAN bands

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 5,15 GHz	-30 dBm	1 MHz
5,35 GHz to 5,47 GHz	-30 dBm	1 MHz
5,725 GHz to 26 GHz	-30 dBm	1 MHz

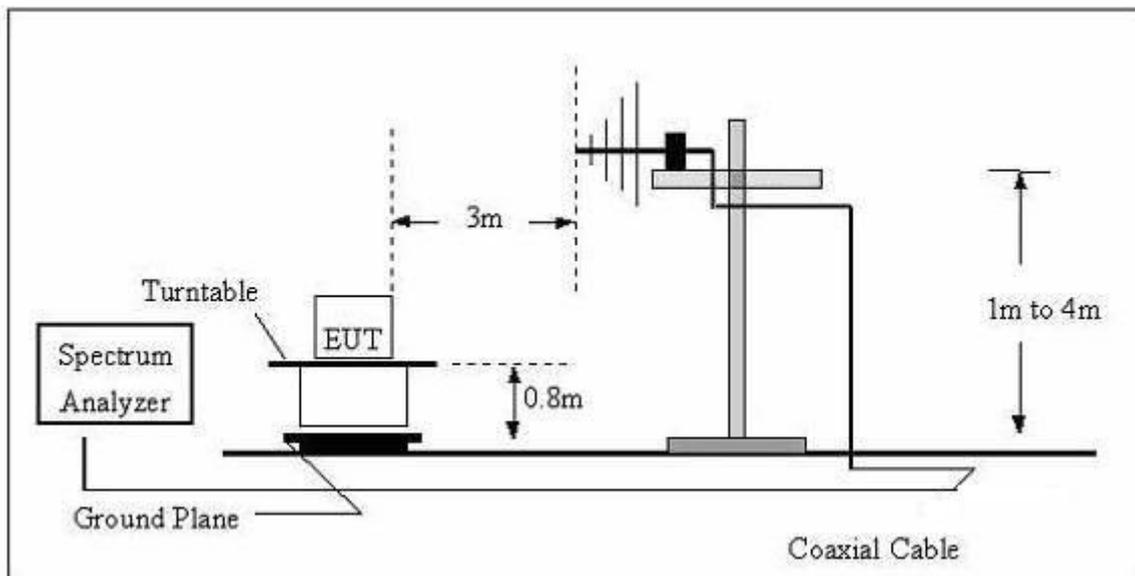
6.2 CONFORMANCE

Conformance tests as defined in clause 5.4.5 shall be carried out.

6.3 TEST METHOD

According to ETSI EN 301 893 V2.1.1 (2017-05) §5.4.4

6.4 TEST SETUP LAYOUT



6.5 TEST RESULTS

Below 1GHz

Test Mode:802.11a mode-Low			
Temperature:	25°C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	DC 14V/2A from adapter

(MHz)	(dBm)	Factor(dB)	(dBm)	(dBm)	(dB)	Remark	Polarization
131.6395	-60.35	2.37	-57.98	-36	-21.98	peak	Horizontal
242.4852	-62.41	3.56	-58.85	-36	-22.85	peak	Horizontal
358.1426	-61.43	3.64	-57.79	-36	-21.79	peak	Horizontal
538.9865	-77.63	4.05	-73.58	-54	-19.58	peak	Horizontal
729.2471	-76.38	4.65	-71.73	-54	-17.73	peak	Horizontal
834.2653	-75.49	5.58	-69.91	-54	-15.91	peak	Horizontal
112.2145	-67.53	2.21	-65.32	-54	-11.32	peak	Vertical
241.6359	-61.43	3.55	-57.88	-36	-21.88	peak	Vertical
442.1248	-64.33	3.64	-60.69	-36	-24.69	peak	Vertical
542.2253	-75.89	4.05	-71.84	-54	-17.84	peak	Vertical
669.6983	-74.16	4.65	-69.51	-54	-15.51	peak	Vertical
833.1425	-73.66	5.58	-68.08	-54	-14.08	peak	Vertical

Test Mode:802.11a mode-High			
Temperature:	25°C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	DC 14V/2A from adapter

Frequency	Reading	Correct	Result	Limit	Margin	Remark	Polarization
(MHz)	(dBm)	Factor(dB)	(dBm)	(dBm)	(dB)		
135.6354	-61.35	2.35	-59.00	-36	-23.00	peak	Horizontal
243.5216	-60.43	3.54	-56.89	-36	-20.89	peak	Horizontal
367.8541	-61.23	3.63	-57.60	-36	-21.60	peak	Horizontal
538.1429	-75.43	4.04	-71.39	-54	-17.39	peak	Horizontal
727.4639	-75.46	4.63	-70.83	-54	-16.83	peak	Horizontal
845.6391	-74.18	5.57	-68.61	-54	-14.61	peak	Horizontal
113.2654	-65.83	2.22	-63.61	-54	-9.61	peak	Vertical
238.4961	-59.36	3.56	-55.80	-36	-19.80	peak	Vertical
437.5916	-60.33	3.63	-56.70	-36	-20.70	peak	Vertical
542.1369	-77.18	4.04	-73.14	-54	-19.14	peak	Vertical
671.5496	-75.49	4.64	-70.85	-54	-16.85	peak	Vertical
834.5214	-75.63	5.57	-70.06	-54	-16.06	peak	Vertical

Note:

1. The emission behaviour belongs to narrowband spurious emission.
2. Calculation of result is: Result (dBm)= Reading (dBm)+ Correct Factor (dB).
3. Recorded the worst data 802.11a mode for 5150-5250MHz in report.

Above 1GHz

Test Mode:802.11a mode-Low			
Temperature:	25°C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	DC 14V/2A from adapter

Frequency (MHz)	Reading (dBm)	Correct Factor(dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark	Polarization
5121.45	-63.35	14.25	-49.1	-30	-19.1	peak	Horizontal
7523.25	-60.24	16.54	-43.7	-30	-13.7	peak	Horizontal
11122.25	-62.35	18.66	-43.69	-30	-13.69	peak	Horizontal
14154.14	-64.72	20.39	-44.33	-30	-14.33	peak	Horizontal
19859.21	-63.12	23.22	-39.9	-30	-9.9	peak	Horizontal
21223.77	-65.89	24.25	-41.64	-30	-11.64	peak	Horizontal
5121.45	-63.49	14.25	-49.24	-30	-19.24	peak	Vertical
7523.25	-64.31	16.54	-47.77	-30	-17.77	peak	Vertical
11122.25	-66.38	18.66	-47.72	-30	-17.72	peak	Vertical
14154.14	-65.89	20.39	-45.5	-30	-15.5	peak	Vertical
19859.21	-67.19	23.22	-43.97	-30	-13.97	peak	Vertical
21223.77	-68.33	24.25	-44.08	-30	-14.08	peak	Vertical

Test Mode: Band I 802.11a mode-High			
Temperature:	25°C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	DC 14V/2A from adapter

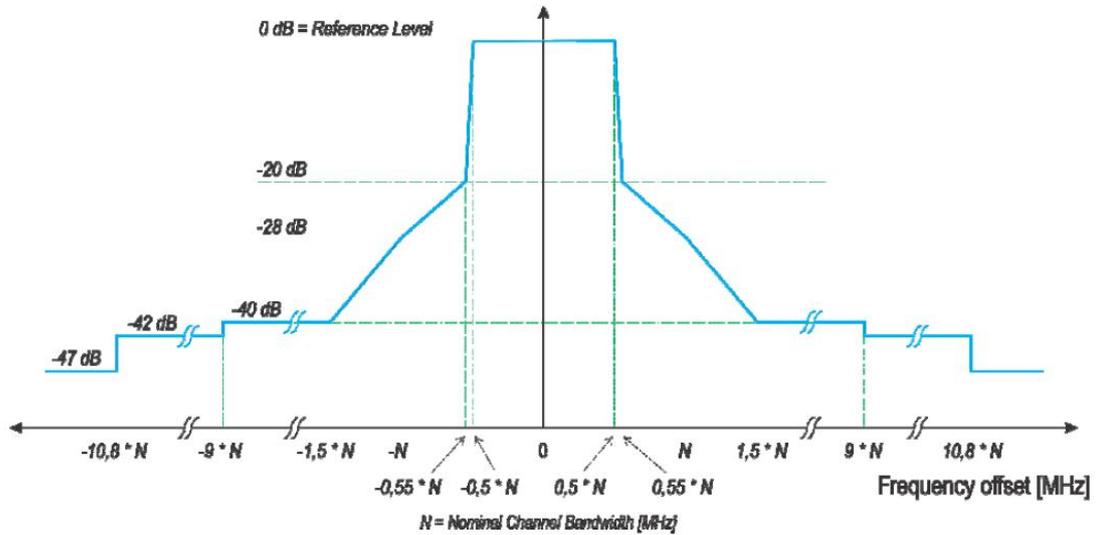
Frequency (MHz)	Reading (dBm)	Correct Factor(dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark	Polarization
5121.45	-62.33	14.25	-48.08	-30	-18.08	peak	Horizontal
7523.25	-64.35	16.54	-47.81	-30	-17.81	peak	Horizontal
11122.25	-65.82	18.66	-47.16	-30	-17.16	peak	Horizontal
14154.14	-65.43	20.39	-45.04	-30	-15.04	peak	Horizontal
19859.21	-64.39	23.22	-41.17	-30	-11.17	peak	Horizontal
21223.77	-66.83	24.25	-42.58	-30	-12.58	peak	Horizontal
5121.45	-64.75	14.25	-50.5	-30	-20.5	peak	Vertical
7523.25	-64.71	16.54	-48.17	-30	-18.17	peak	Vertical
11122.25	-66.39	18.66	-47.73	-30	-17.73	peak	Vertical
14154.14	-66.83	20.39	-46.44	-30	-16.44	peak	Vertical
19859.21	-67.49	23.22	-44.27	-30	-14.27	peak	Vertical
21223.77	-67.19	24.25	-42.94	-30	-12.94	peak	Vertical

Note:

1. The emission behaviour belongs to narrowband spurious emission.
2. Calculation of result is: Result (dBm)= Reading (dBm)+ Correct Factor (dB).
3. Recorded the worst data 802.11a mode for 5150-5250MHz in report.

7. TRANSMITTER UNWANTED EMISSIONS WITHIN THE 5 GHZ RLAN BANDS

7.1 APPLIED PROCEDURES / LIMIT LIMIT



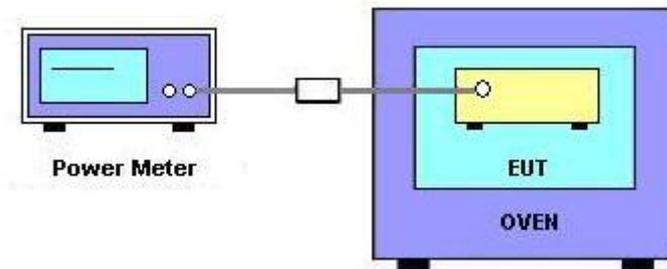
NOTE: dBc is the spectral density relative to the maximum spectral power density of the transmitted signal.

Figure 1: Transmit spectral power mask

7.2 TEST PROCEDURES

According to ETSI EN 301 893 V2.1.1 (2017-05) §5.4.6.2

7.3 TEST SETUP LAYOUT

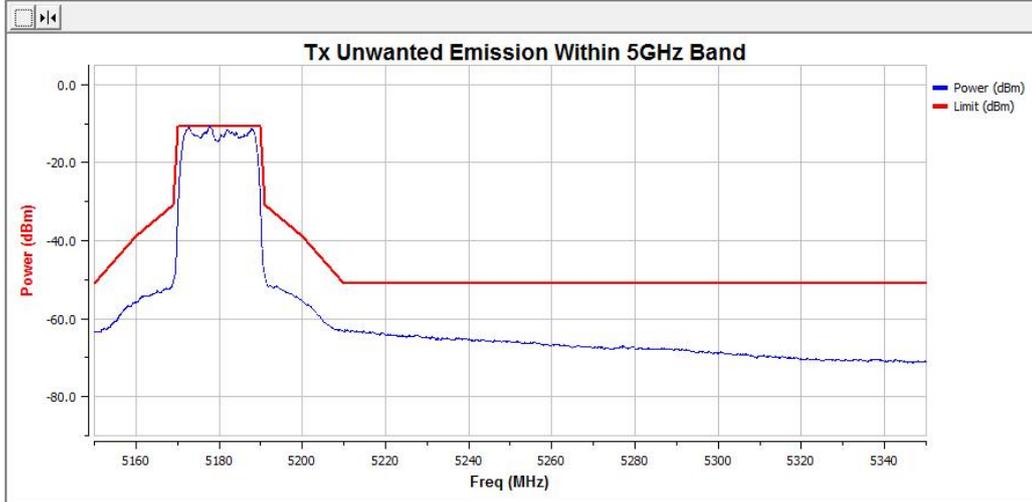


7.4 TEST RESULTS
5150-5250MHz

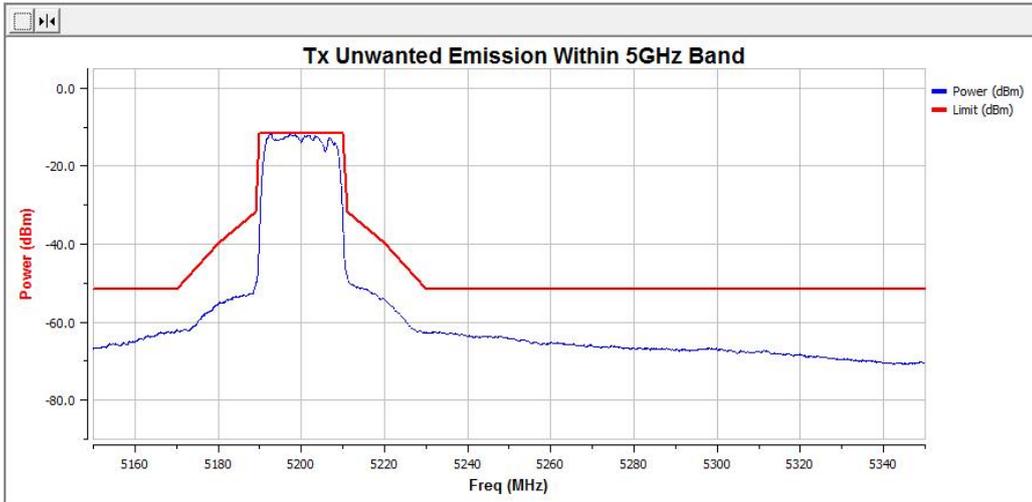
Test Mode: 802.11a

The Test Plots

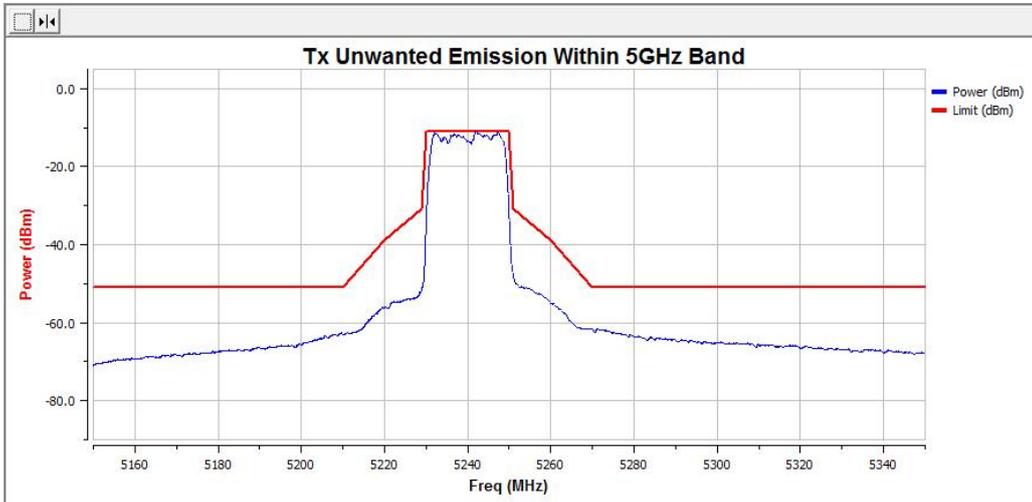
Channel-5180



Channel-5200

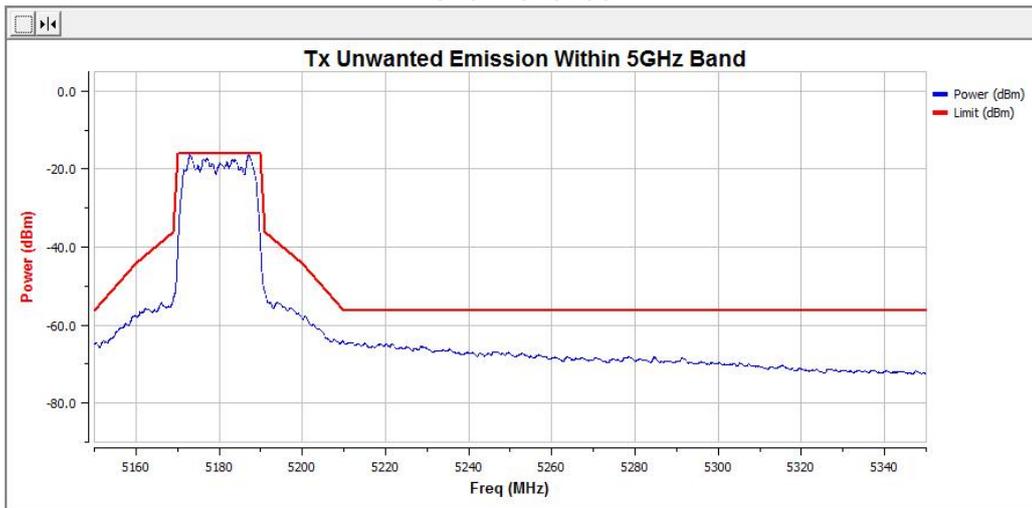


Channel-5240

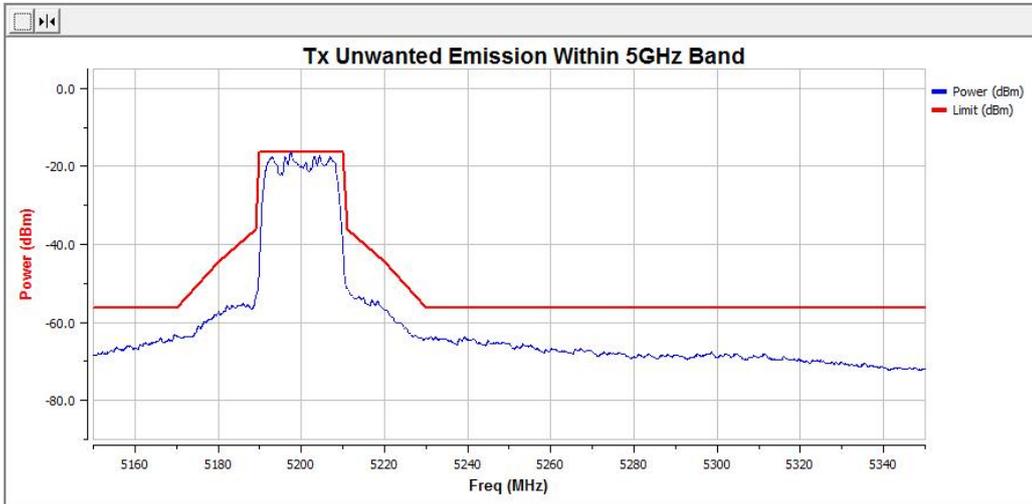


Test Mode: 802.11n(20MHz)

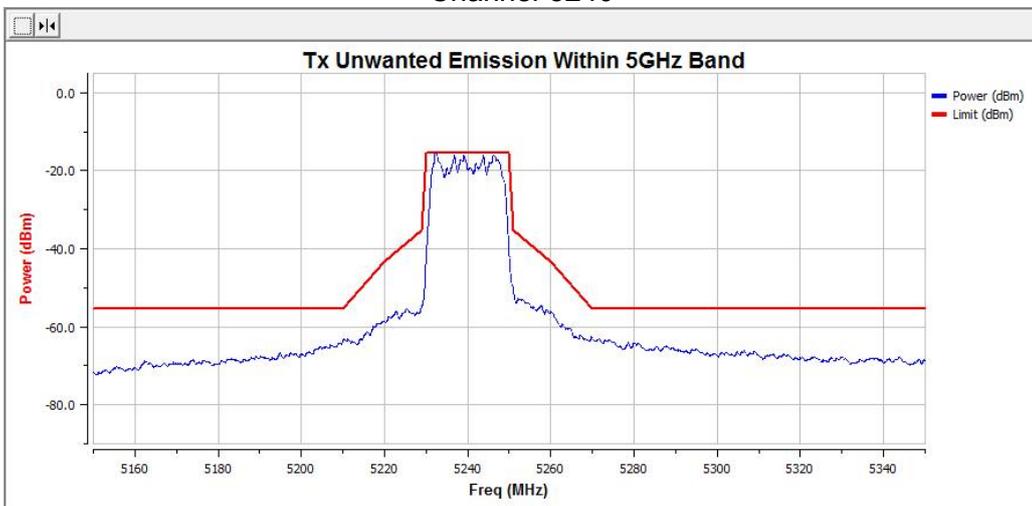
Channel-5180



Channel-5200



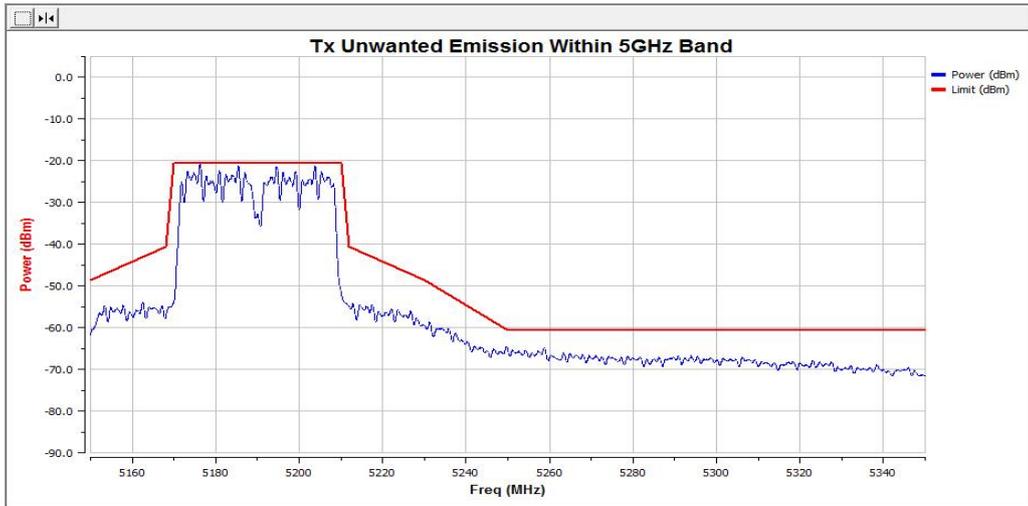
Channel-5240



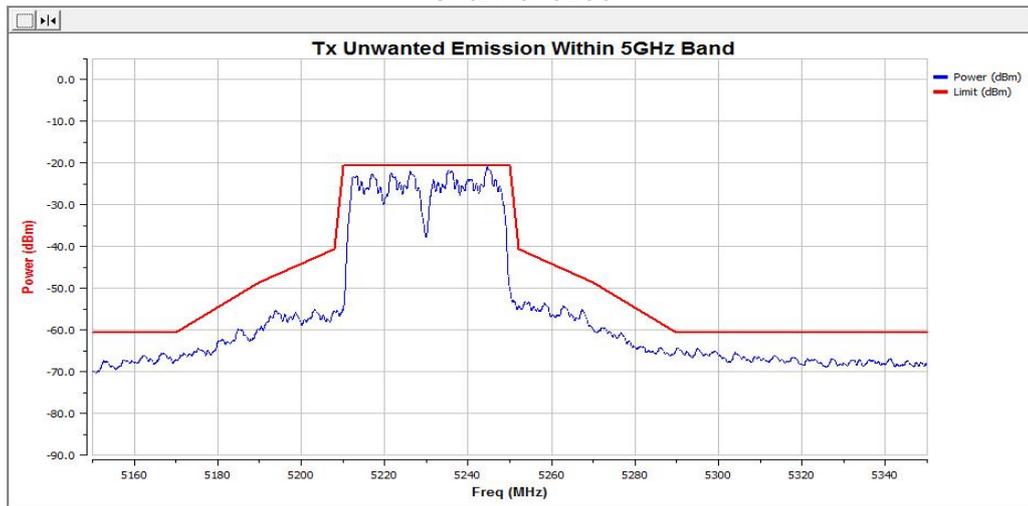
Test Mode: 802.11n(40MHz)

The Test Plots

Channel-5190



Channel-5230

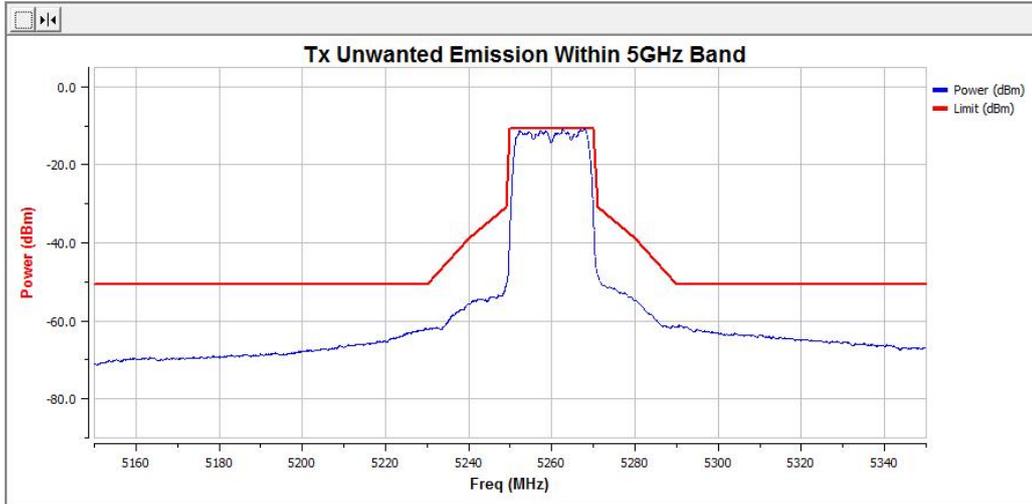


5250-5350MHz

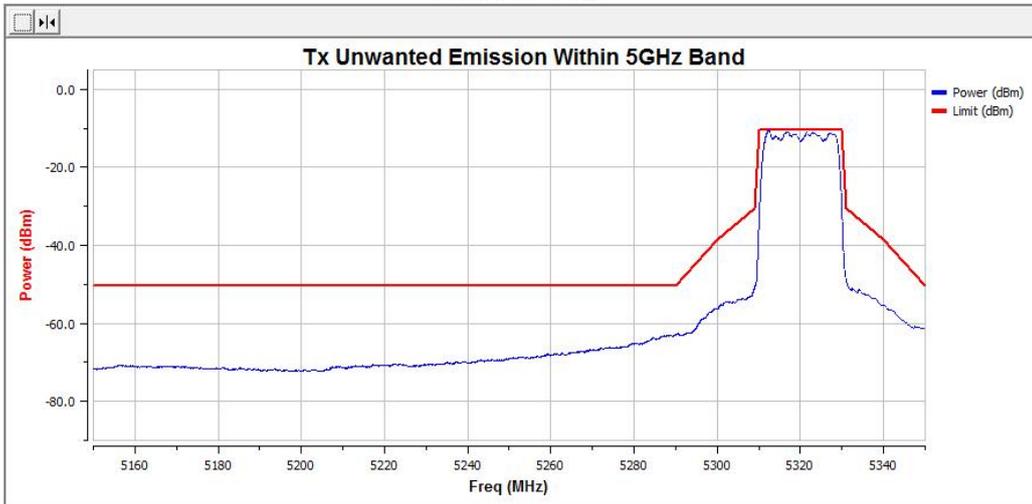
Test Mode: 802.11a

The Test Plots

Channel-5260

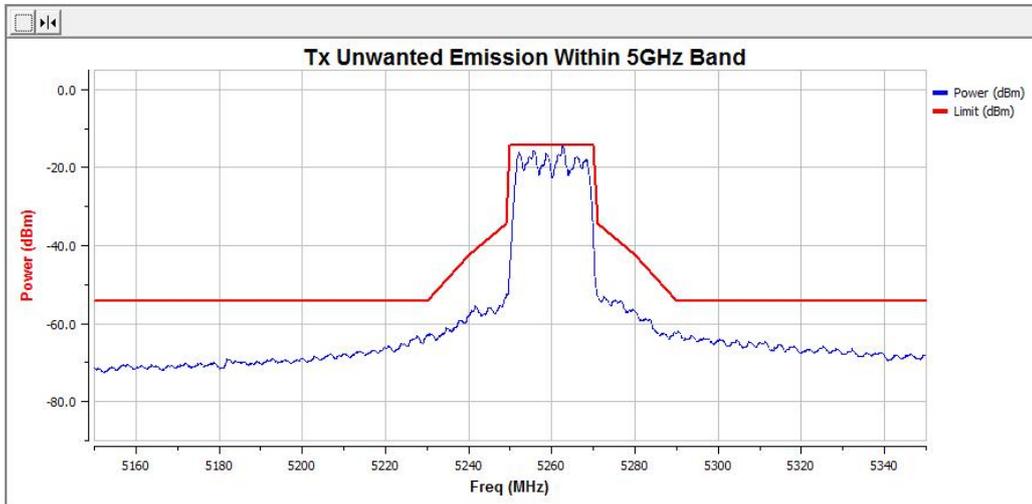


Channel-5320

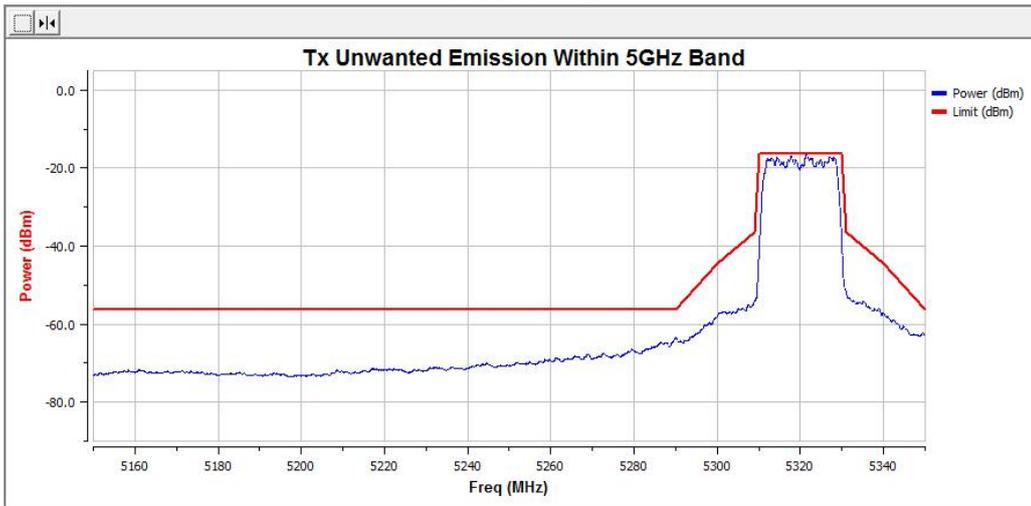


Test Mode: 802.11n(20MHz)

Channel-5260



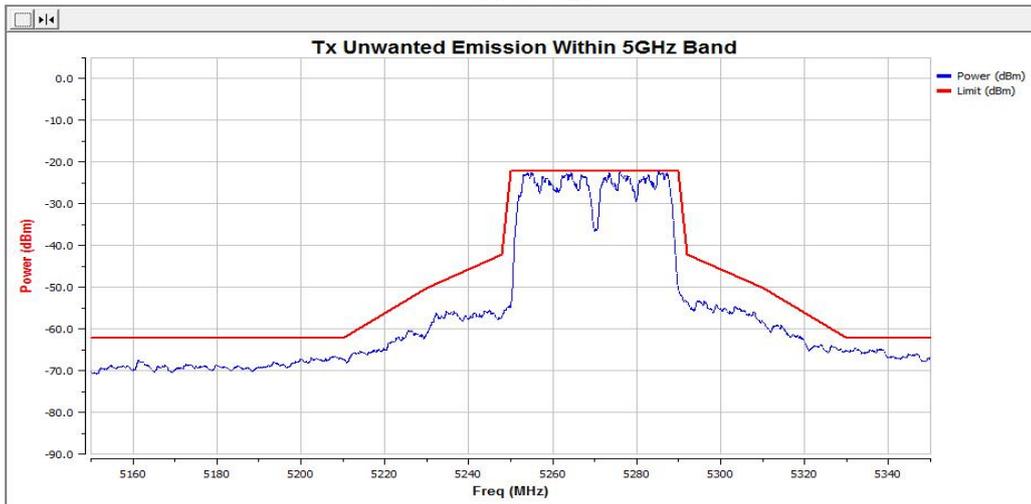
Channel-5320



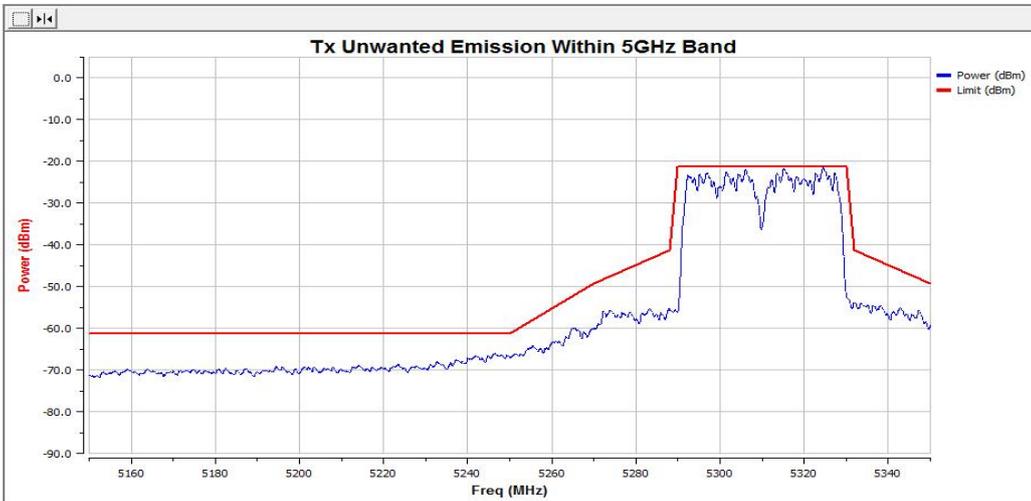
Test Mode: 802.11n(40MHz)

The Test Plots

Channel-5270



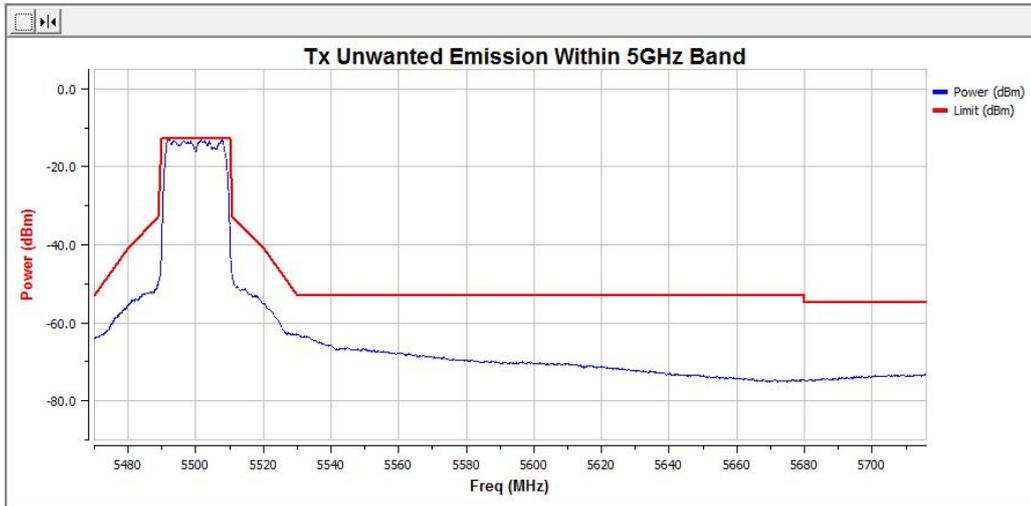
Channel-5310



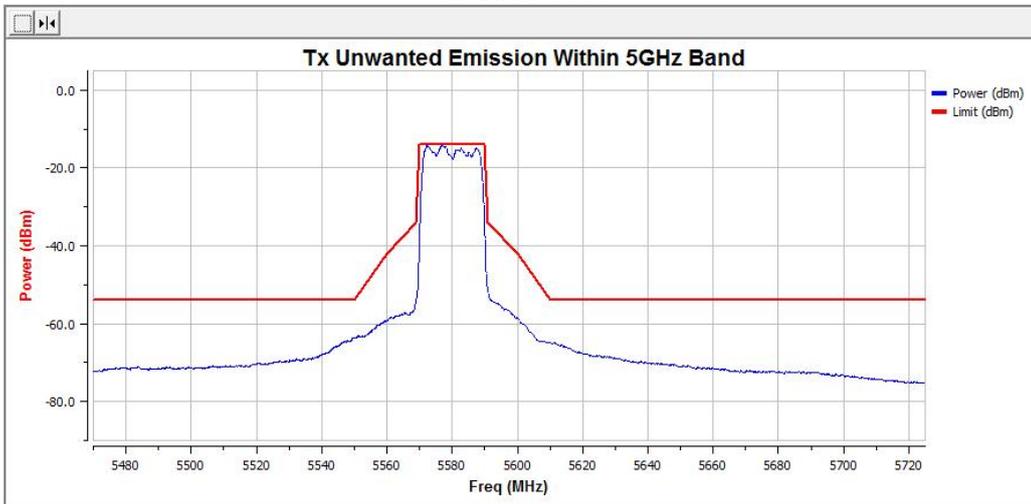
5470-5725MHz

The Test Plots

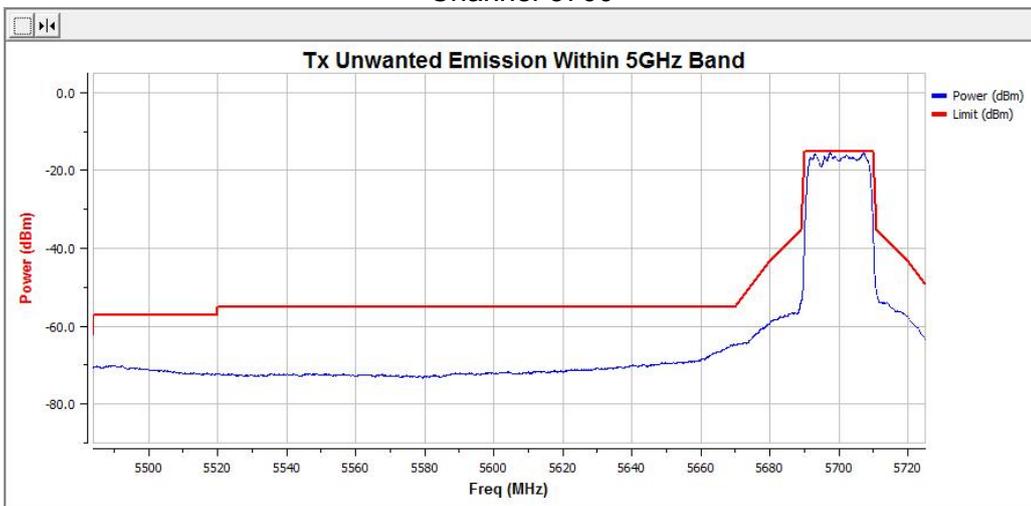
Channel-5500



Channel-5580

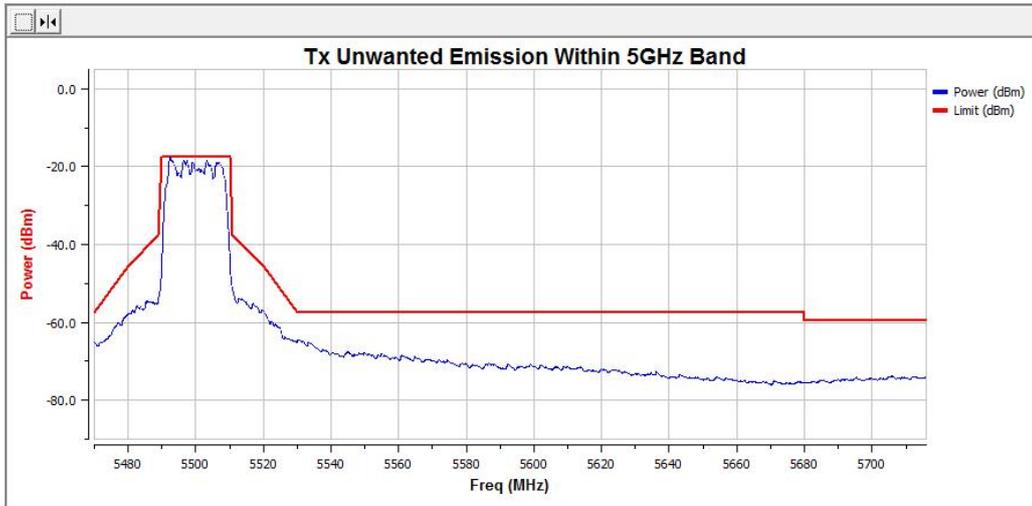


Channel-5700

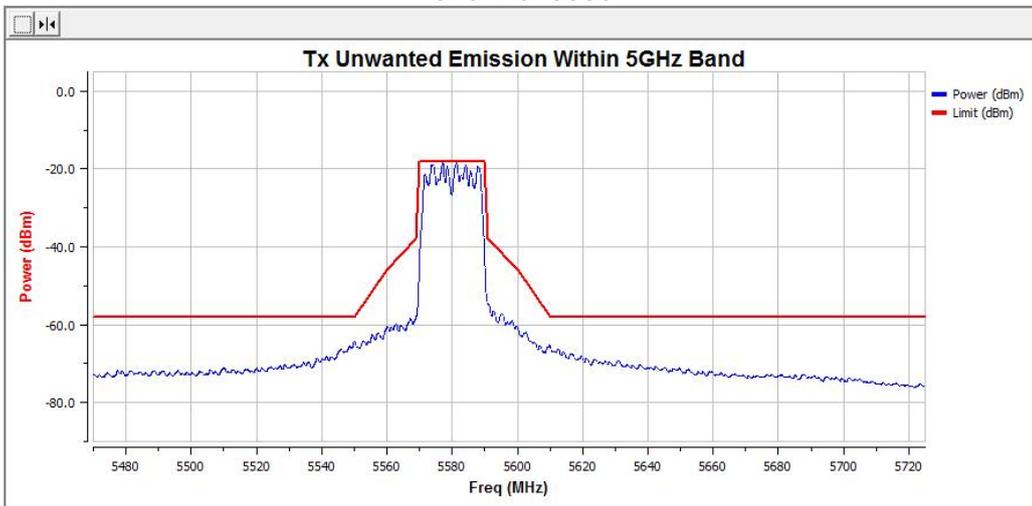


Test Mode: 802.11n(20MHz)

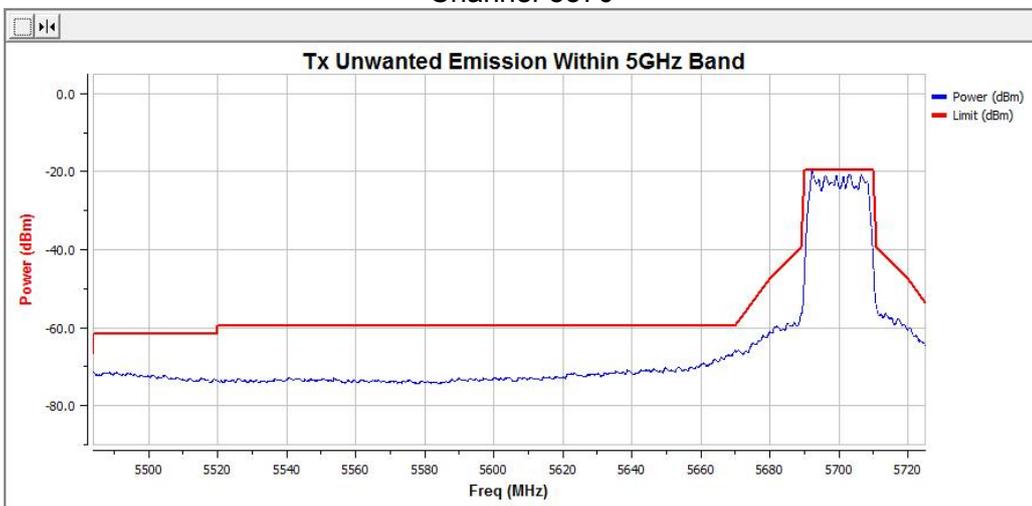
Channel-5500



Channel-5580



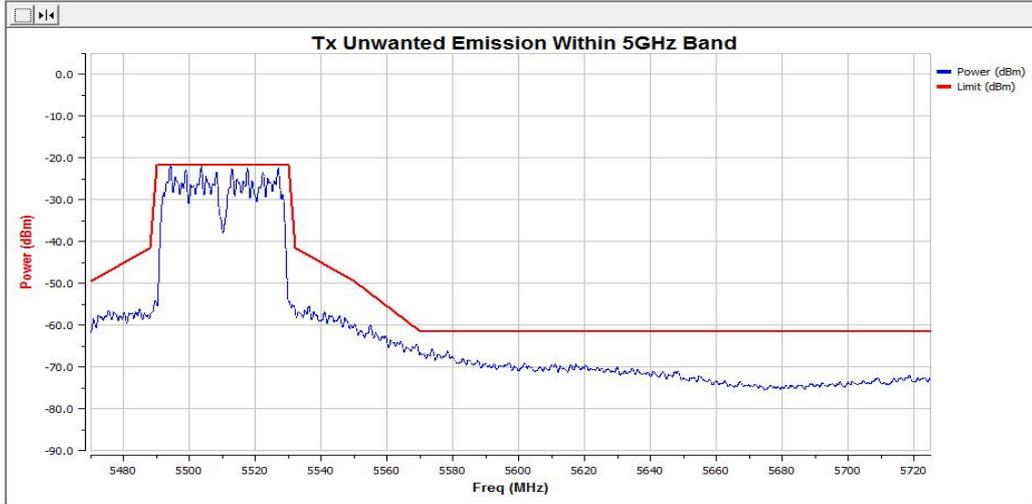
Channel-5570



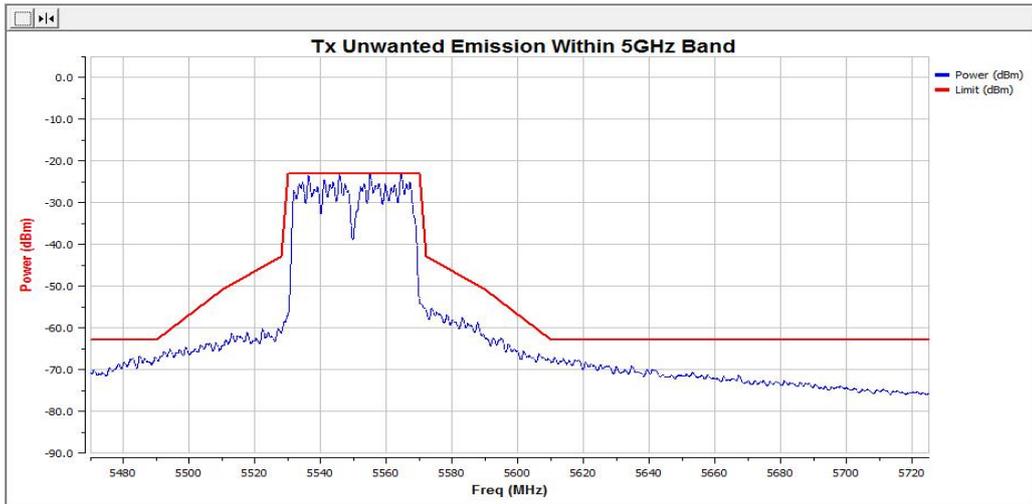
Test Mode: 802.11n(40MHz)

The Test Plots

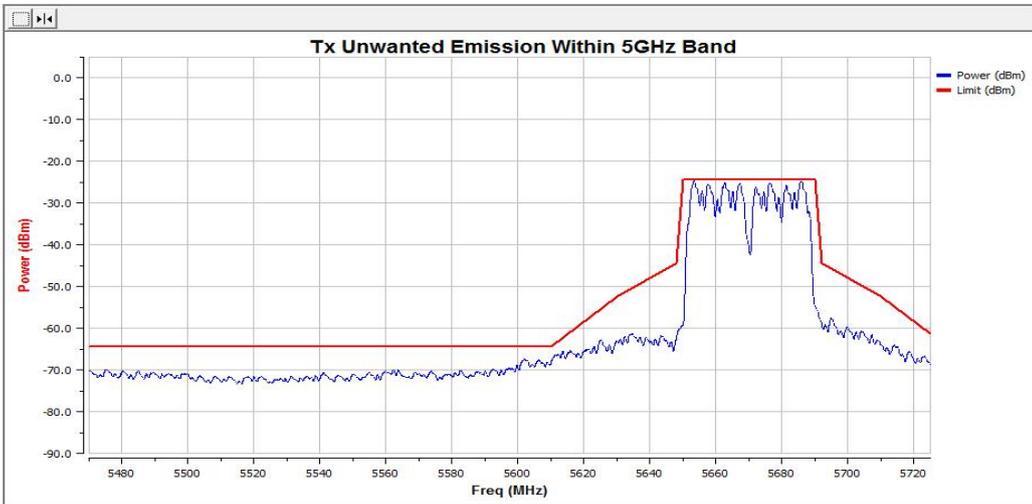
Channel-5510



Channel-5550



Channel-5670



8. RECEIVER SPURIOUS EMISSIONS

8.1 APPLIED PROCEDURES / LIMIT LIMIT

The spurious emissions of the receiver shall not exceed the limits given in table 5.

Table 5: Spurious radiated emission limits

Frequency range	Maximum power	Measurement bandwidth
30 MHz to 1 GHz	-57 dBm	100 kHz
1 GHz to 26 GHz	-47 dBm	1 MHz

8.2 TEST PROCEDURES

According to ETSI EN 301 893 V2.1.1 (2017-05) §5.4.7.2

8.3 TEST SETUP LAYOUT

This test setup layout is the same as that shown in section 6.1.4

8.4 TEST RESULTS

Below 1GHz

Test Mode: 802.11a mode-Low			
Temperature:	25°C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	DC 14V/2A from adapter

Frequency (MHz)	Reading (dBm)	Correct Factor(dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark	Polarization
136.5263	-69.53	2.34	-67.19	-57	-10.19	peak	Horizontal
245.6351	-68.53	3.55	-64.98	-57	-7.98	peak	Horizontal
543.6852	-77.18	3.65	-73.53	-57	-16.53	peak	Horizontal
667.4812	-77.95	4.01	-73.94	-57	-16.94	peak	Horizontal
779.4653	-78.42	4.76	-73.66	-57	-16.66	peak	Horizontal
951.4635	-78.92	5.68	-73.24	-57	-16.24	peak	Horizontal
112.4152	-68.53	2.21	-66.32	-57	-9.32	peak	Vertical
243.6521	-67.83	3.56	-64.27	-57	-7.27	peak	Vertical
523.6254	-77.84	3.65	-74.19	-57	-17.19	peak	Vertical
667.4812	-76.49	4.01	-72.48	-57	-15.48	peak	Vertical
835.6426	-78.42	4.72	-73.7	-57	-16.7	peak	Vertical
895.1246	-77.49	5.62	-71.87	-57	-14.87	peak	Vertical

Test Mode: 802.11a mode-High			
Temperature:	25°C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	DC 14V/2A from adapter

Frequency (MHz)	Reading (dBm)	Correct Factor(dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark	Polarization
247.5863	-66.53	3.36	-63.17	-57	-6.17	peak	Horizontal
394.1526	-67.49	3.58	-63.91	-57	-6.91	peak	Horizontal
547.8163	-77.86	3.85	-74.01	-57	-17.01	peak	Horizontal
685.3412	-76.34	3.94	-72.4	-57	-15.4	peak	Horizontal
812.4563	-75.49	4.51	-70.98	-57	-13.98	peak	Horizontal
941.2536	-78.11	5.51	-72.6	-57	-15.6	peak	Horizontal
110.2636	-69.35	3.21	-66.14	-57	-9.14	peak	Vertical
243.6984	-68.49	3.52	-64.97	-57	-7.97	peak	Vertical
435.1263	-77.82	3.74	-74.08	-57	-17.08	peak	Vertical
547.8612	-75.63	3.84	-71.79	-57	-14.79	peak	Vertical
712.3659	-77.49	4.59	-72.9	-57	-15.9	peak	Vertical
876.3521	-80.16	5.58	-74.58	-57	-17.58	peak	Vertical

Note:

1. The emission behaviour belongs to narrowband spurious emission.
2. Calculation of result is: Result (dBm)= Reading (dBm)+ Correct Factor (dB).
3. Recorded the worst data 802.11a mode for 5150-5250MHz in report.

Above 1GHz

Test Mode: 802.11a mode-Low			
Temperature:	25°C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	DC 14V/2A from adapter

Frequency (MHz)	Reading (dBm)	Correct Factor(dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark	Polarization
4824.635	-73.46	14.29	-59.17	-47	-12.17	peak	Horizontal
8152.361	-73.62	16.54	-57.08	-47	-10.08	peak	Horizontal
10365.264	-74.19	18.15	-56.04	-47	-9.04	peak	Horizontal
15463.296	-75.43	20.21	-55.22	-47	-8.22	peak	Horizontal
19784.352	-75.33	21.99	-53.34	-47	-6.34	peak	Horizontal
20563.953	-76.88	23.57	-53.31	-47	-6.31	peak	Horizontal
4965.341	-75.63	14.29	-61.34	-47	-14.34	peak	Vertical
8254.635	-72.16	16.54	-55.62	-47	-8.62	peak	Vertical
11426.352	-73.46	18.15	-55.31	-47	-8.31	peak	Vertical
17453.653	-74.19	20.21	-53.98	-47	-6.98	peak	Vertical
19254.362	-75.86	21.99	-53.87	-47	-6.87	peak	Vertical
20159.365	-76.34	23.57	-52.77	-47	-5.77	peak	Vertical

Test Mode: 802.11a mode-High			
Temperature:	25°C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	DC 14V/2A from adapter

Frequency (MHz)	Reading (dBm)	Correct Factor(dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark	Polarization
4963.521	-73.61	14.29	-59.32	-47	-12.32	peak	Horizontal
8142.563	-72.49	16.54	-55.95	-47	-8.95	peak	Horizontal
11245.365	-73.14	18.15	-54.99	-47	-7.99	peak	Horizontal
16534.261	-74.33	20.21	-54.12	-47	-7.12	peak	Horizontal
19245.632	-75.89	21.99	-53.9	-47	-6.9	peak	Horizontal
22436.157	-76.43	23.57	-52.86	-47	-5.86	peak	Horizontal
4753.263	-73.14	14.29	-58.85	-47	-11.85	peak	Vertical
8541.639	-74.59	16.54	-58.05	-47	-11.05	peak	Vertical
12243.351	-72.59	18.15	-54.44	-47	-7.44	peak	Vertical
16453.629	-73.62	20.21	-53.41	-47	-6.41	peak	Vertical
19035.252	-75.11	21.99	-53.12	-47	-6.12	peak	Vertical
21325.172	-75.96	23.57	-52.39	-47	-5.39	peak	Vertical

Note:

1. The emission behaviour belongs to narrowband spurious emission.
2. Calculation of result is: Result (dBm)= Reading (dBm)+ Correct Factor (dB).
3. Recorded the worst data 802.11a mode for 5150-5250MHz in report.

9. ADAPTIVITY (CHANNEL ACCESS MECHANISM)

9.1 APPLICABILITY OF ADAPTIVE REQUIREMENTS AND LILIT

This requirement applies to equipment, testing shall be performed using the highest nominal channel Bandwidth. The manufacturer shall state whether the UUT is capable of operating as a Frame Based Equipment or Load Based Equipment. See tables for the applicability of adaptive requirements and limit for each of the operational modes.

Applicability of adaptive requirements and limit

Requirement	Operational Mode		
	Frame Based Equipment	Load Based Equipment (CCA using 'energy detect')	Load Based Equipment (CCA not using any of the mechanisms referenced)
Minimum Clear Channel Assessment (CCA) Time	20 us (see note 1)	(see note 2)	20 us (see note 1)
Maximum Channel Occupancy (COT) Time	1ms to 10 ms	(see note 2)	(13/32)*q ms (see note 3)
Minimum Idle Period	5% of COT	(see note 2)	N/A
Extended CCA check	N/A	(see note 2)	N*CCA (see note 4)
Short Control Signalling Transmissions	Maximum duty cycle of 5% within an observation period of 50 ms (see note 5)		
<p>Note 1: The CCA time used by the equipment shall be declared by the manufacturer.</p> <p>Note 2: LBT based spectrum sharing mechanism based on the Clear Channel Assessment (CCA) mode using 'energy detect', as described in IEEE 802.11™-2007[9], clauses 15 and 17, in IEEE 802.11n™ -2009[10], clauses 20.</p> <p>Note 3: q is selected by the manufacturer in the range [4...32]</p> <p>Note 4: The value of N shall be randomly selected in the range [1...q]</p> <p>Note 5: Adaptive equipment may or may not have Short Control Signaling Transmissions.</p>			

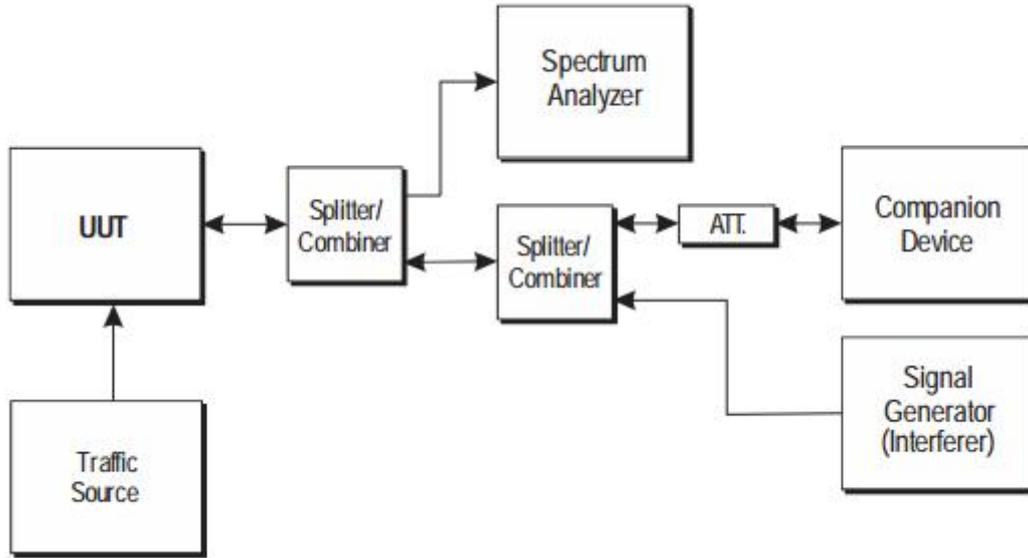
Interference threshold level

Maximum transmit power (P _H) EIRP dBm	Threshold Level (TL) (see note 1 and 2)
23	-73 dBm / MHz
<p>Note 1: TL = -73 dBm / MHz + 23 –PH (assuming a 0 dBi receive antenna and PH specified in dBm e.i.r.p)</p> <p>Note 2: Transmitter the CCA threshold level (TL) shall be equal or lower than -73 dBm / MHz at the input to the receiver (assuming a 0 dBi receive antenna).</p>	

9.2 TEST PROCEDURE

Reference to ETSI EN 301 893 V2.1.1 (2017-05) clause 5.4.9.2

9.3 TEST SETUP CONFIGURATION



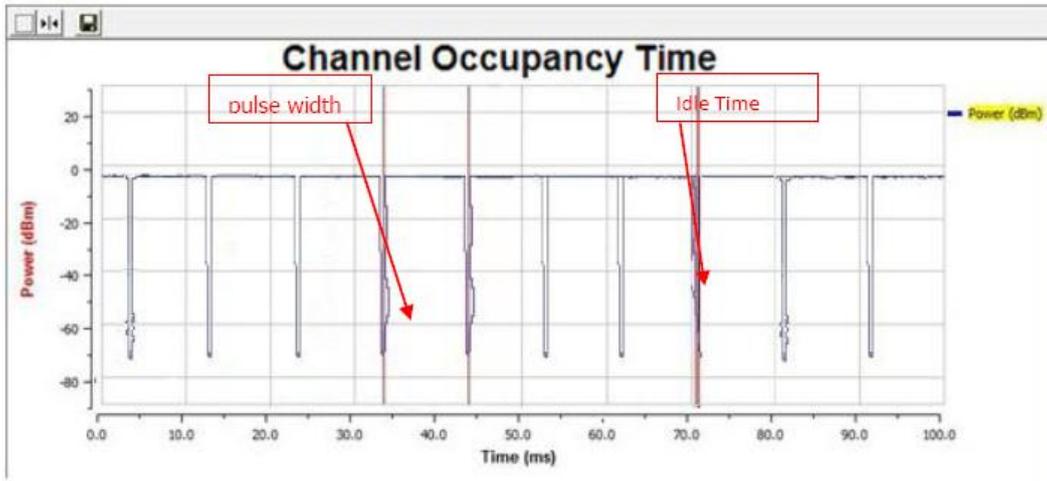
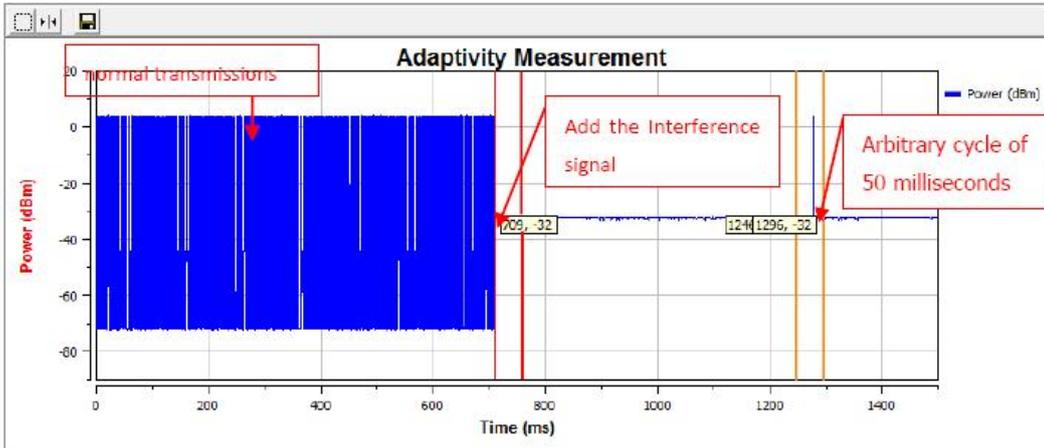
9.4 LIST OF MEASUREMENTS

UUT operational Mode		
Frame Based Equipment	Load Based Equipment (CCA using 'energy detect')	Load Based Equipment (CCA not using any of the mechanisms referenced)
	V	

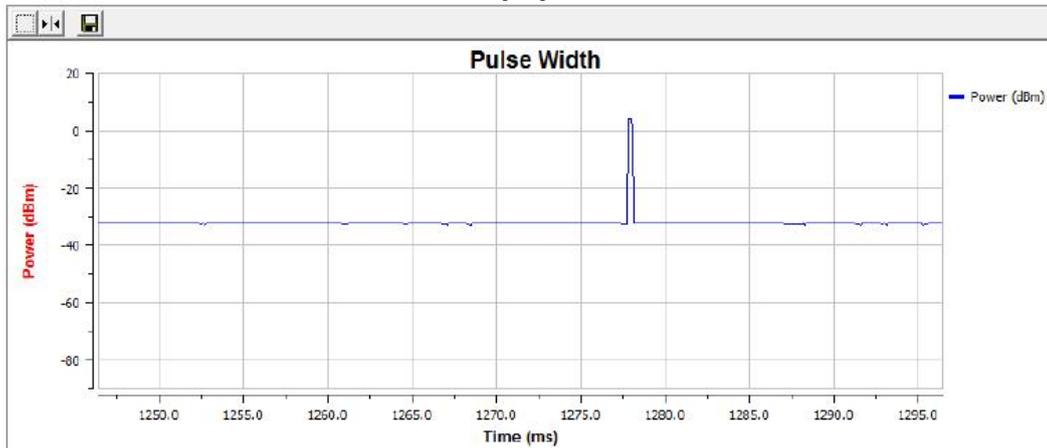
Clause	Test Parameter	Remarks	PASS/FAIL
5.4.9.2.1	Adaptive (Frame Based Equipment)	Not Applicable	N/A
5.4.9.2.2	Adaptive (Load Based Equipment)	Applicable	PASS
5.4.9.2.3	Short Control Signaling Transmissions	Applicable	PASS

9.5 TEST RESULTS

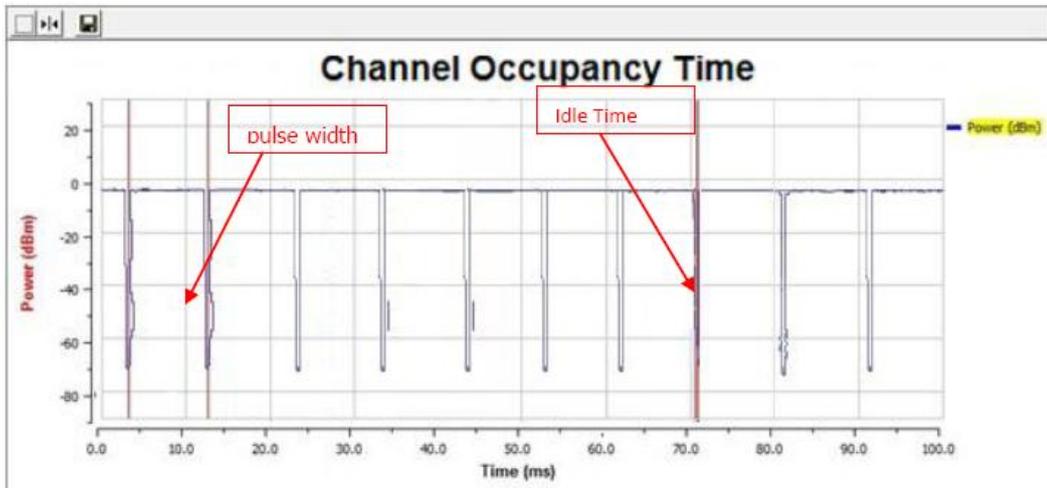
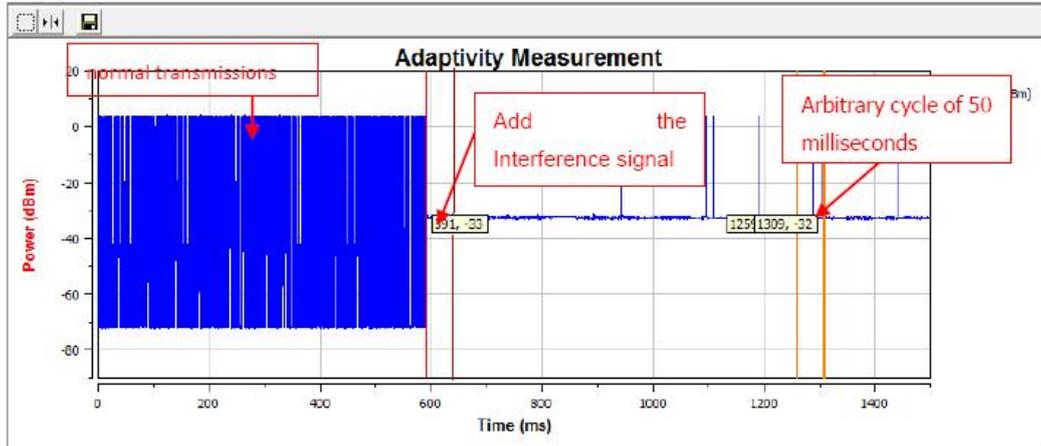
Test Mode: 802.11a Low	
AWGN Interference Level (dBm)	-57.10
Interference Start Time (ms)	709.32
Suggest q Level	0
Max COT (ms)	9.75
Idle Time (ms)	0.12
Duty Cycle (%)	2.23



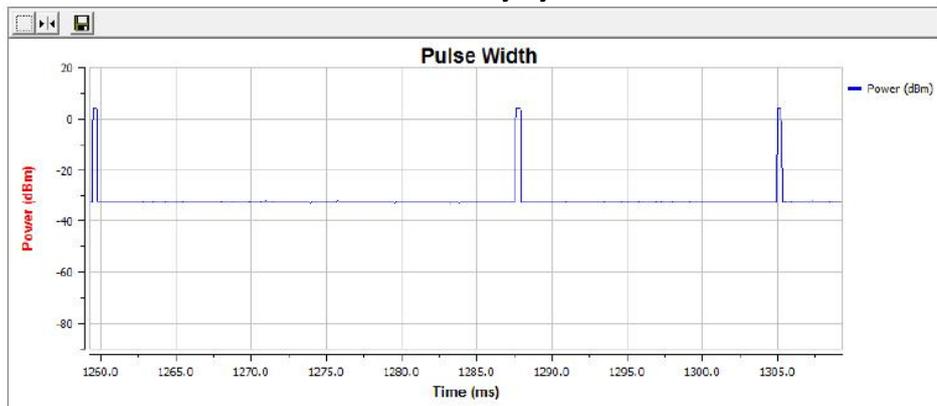
Arbitrary cycle of 50



Test Mode: 802.11a High	
AWGN Interference Level (dBm)	-56.60
Interference Start Time (ms)	591.33
Suggest q Level	0
Max COT (ms)	9.97
Idle Time (ms)	0.35
Duty Cycle (%)	2.21



Arbitrary cycle of 50



Note: We have tested all modes and found that the data of 802.11a mode was the worst; the test data of 802.11a mode was recorded in the report.

10. MEDIUM ACCESS PROTOCOL

10.1 APPLIED PROCEDURES / LIMIT

A medium access protocol is a mechanism designed to facilitate spectrum sharing with other devices in a wireless network.

A medium access protocol shall be implemented by the equipment.

10.2 TEST RESULTS

The EUT is accord with medium access protocol.

11. RECEIVER BLOCKING

11.1 LIMITS

While maintaining the minimum performance criteria as defined in clause 4.2.8.3, the blocking levels at specified frequency offsets shall be equal to or greater than the limits defined in table 9.

Table 9: Receiver Blocking parameters

Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 2)		Type of blocking signal
		Master or Slave with radar detection (see table D.2, note 2)	Slave without radar detection (see table D.2, note 2)	
P _{min} + 6 dB	5 100	-53	-59	Continuous Wave
P _{min} + 6 dB	4 900 5 000 5 975	-47	-53	Continuous Wave

NOTE 1: P_{min} is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined clause 4.2.8.3 in the absence of any blocking signal.

NOTE 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the same levels should be used at the antenna connector irrespective of antenna gain.

11.2 TEST PROCEDURE

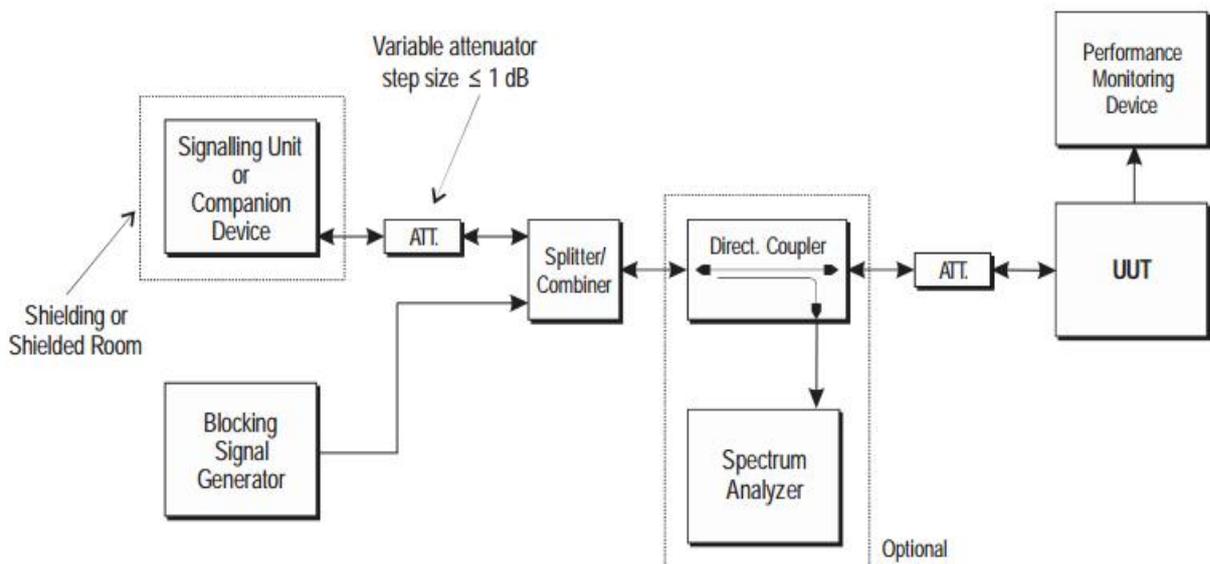
Refer to chapter 5.4.10.2.1 of ETSI EN 301 893 V2.1.1 (2017-05)

Measurement	
<input checked="" type="checkbox"/> Conducted measurement	<input type="checkbox"/> Radiated measurement

11.3 DEVIATION FROM TEST STANDARD

No deviation

11.4 TEST SETUP



11.5 TEST RESULTS

Test Mode	802.11a Low Channel					
Pmin	-82.11dBm					
Wanted signal Mean power From companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal Power (dBm)	Type of blocking signal	PER (%)	PER (%) Limit	Result
Pmin + 6 dB	5100	-59	CW	2.63	≤ 10	Pass
Pmin + 6 dB	4900	-53	CW	1.78	≤ 10	Pass
	5000			0.89		Pass
	5975			2.66		Pass

Test Mode	802.11a Low Channel					
Pmin	-82.11dBm					
Wanted signal Mean power From companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal Power (dBm)	Type of blocking signal	PER (%)	PER (%) Limit	Result
Pmin + 6 dB	5100	-59	CW	1.85	≤ 10	Pass
Pmin + 6 dB	4900	-53	CW	2.46	≤ 10	Pass
	5000			1.69		Pass
	5975			2.74		Pass

Note: We have tested all modes and found that the data of 802.11a mode was the worst; the test data of 802.11a mode was recorded in the report.

12. DYNAMIC FREQUENCY SELECTION (DFS)

12.1 DFS PARAMETERS

Table D.1: DFS requirement values

Parameter	Value
Channel Availability Check Time	60 s (see note 1)
Minimum Off-Channel CAC Time	6 minutes (see note 2)
Maximum Off-Channel CAC Time	4 hours (see note 2)
Channel Move Time	10 s
Channel Closing Transmission Time	1 s
Non-Occupancy Period	30 minutes
NOTE 1: For channels whose nominal bandwidth falls completely or partly within the band 5 600 MHz to 5 650 MHz, the <i>Channel Availability Check Time</i> shall be 10 minutes.	
NOTE 2: For channels whose nominal bandwidth falls completely or partly within the band 5 600 MHz to 5 650 MHz, the <i>Off-Channel CAC Time</i> shall be within the range 1 hour to 24 hours.	

Table D.2: Radar Detection Threshold Levels

e.i.r.p. Spectral Density (dBm/MHz)	Value (see note 1 and note 2)
10	-62 dBm
NOTE 1: This is the level at the input of the receiver of an RLAN device with a maximum e.i.r.p. density of 10 dBm/MHz and assuming a 0 dBi receive antenna. For devices employing different e.i.r.p. spectral density and/or a different receive antenna gain G (dBi) the Radar Detection Threshold Level at the receiver input follows the following relationship: DFS Detection Threshold (dBm) = -62 + 10 - e.i.r.p. Spectral Density (dBm/MHz) + G (dBi); however the Radar Detection Threshold Level shall not be less than -64 dBm assuming a 0 dBi receive antenna gain.	
NOTE 2: Slave devices with a maximum e.i.r.p. of less than 23 dBm do not have to implement radar detection unless these devices are used in fixed outdoor point to point or fixed outdoor point to multipoint applications (see clause 4.2.6.1.3).	

Table D.3: Parameters of the reference DFS test signal

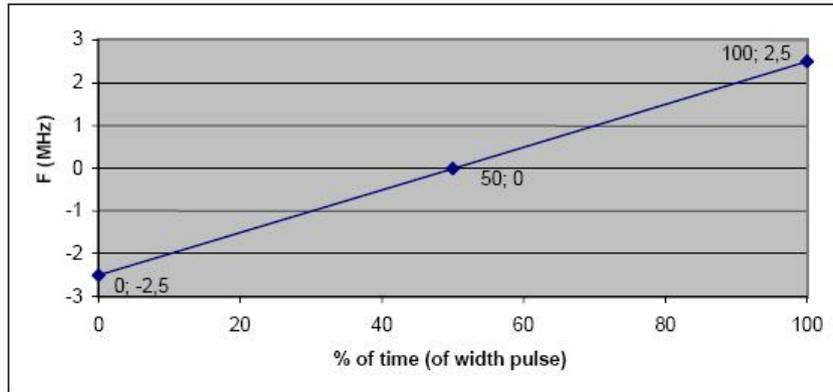
Pulse width W (μs)	Pulse repetition frequency PRF (PPS)	Pulses per burst (PPB)
1	700	18

Table D.4: Parameters of radar test signals

Radar test signal # (see note 1 to note 3)	Pulse width W (µs)		Pulse repetition frequency PRF (PPS)		Number of different PRFs	Pulses per burst for each PRF (PPB) (see note 5)
	Min	Max	Min	Max		
1	0,5	5	200	1 000	1	10 (see note 6)
2	0,5	15	200	1 600	1	15 (see note 6)
3	0,5	15	2 300	4 000	1	25
4	20	30	2 000	4 000	1	20
5	0,5	2	300	400	2/3	10 (see note 6)
6	0,5	2	400	1 200	2/3	15 (see note 6)

NOTE 1: Radar test signals #1 to #4 are constant PRF based signals. See figure D.1. These radar test signals are intended to simulate also radars using a packet based Staggered PRF. See figure D.2.

NOTE 2: Radar test signal #4 is a modulated radar test signal. The modulation to be used is a chirp modulation with a ±2,5 MHz frequency deviation which is described below.



NOTE 3: Radar test signals #5 and #6 are single pulse based Staggered PRF radar test signals using 2 or 3 different PRF values. For radar test signal #5, the difference between the PRF values chosen shall be between 20 PPS and 50 PPS. For radar test signal #6, the difference between the PRF values chosen shall be between 80 PPS and 400 PPS. See figure D.3.

NOTE 4: Apart for the Off-Channel CAC testing, the radar test signals above shall only contain a single burst of pulses. See figure D.1, figure D.3 and figure D.4. For the Off-Channel CAC testing, repetitive bursts shall be used for the total duration of the test. See figure D.2 and figure D.5. See also clause 4.2.6.2.3, clause 5.4.8.2.1.4.2 and clause 5.4.8.2.1.4.3.

NOTE 5: The total number of pulses in a burst is equal to the number of pulses for a single PRF multiplied by the number of different PRFs used.

NOTE 6: For the CAC and Off-Channel CAC requirements, the minimum number of pulses (for each PRF) for any of the radar test signals to be detected in the band 5 600 MHz to 5 650 MHz shall be 18.

Table D.5: Detection probability

Parameter	Detection Probability (P_d)	
	Channels whose nominal bandwidth falls partly or completely within the 5 600 MHz to 5 650 MHz band	Other channels
CAC, Off-Channel CAC	99,99 %	60 %
In-Service Monitoring	60 %	60 %

NOTE: P_d gives the probability of detection per simulated radar burst and represents a minimum level of detection performance under defined conditions. Therefore P_d does not represent the overall detection probability for any particular radar under real life conditions.

12.2 APPLICABILITY

Table 6 lists the DFS related technical requirements and their applicability for every operational mode. If the RLAN device is capable of operating in more than one operational mode then every operating mode shall be assessed separately.

Table 6: Applicability of DFS requirements

Requirement	DFS Operational mode		
	Master	Slave without radar detection (see table D.2, note 2)	Slave with radar detection (see table D.2, note 2)
Channel Availability Check	Required	Not required	Required (see note 2)
Off-Channel CAC (see note 1)	Required	Not required	Required (see note 2)
In-Service Monitoring	Required	Not required	Required
Channel Shutdown	Required	Required	Required
Non-Occupancy Period	Required	Not required	Required
Uniform Spreading	Required	Not required	Not required
NOTE 1: Where implemented by the manufacturer.			
NOTE 2: A slave with radar detection is not required to perform a CAC or <i>Off-Channel CAC</i> at initial use of the channel but only after the slave has detected a radar signal on the <i>Operating Channel</i> by <i>In-Service Monitoring</i> and the <i>Non-Occupancy Period</i> resulting from this detection has elapsed.			

12.3 CHANNEL AVAILABILITY CHECK LIMIT

The Channel Availability Check shall be performed during a continuous period in time (Channel Availability Check Time) which shall not be less than the value defined in table D.1. During the Channel Availability Check, the RLAN device shall be capable of detecting any of the radar test signals that fall within the ranges given by table D.4 with a level above the Radar Detection Threshold Level defined in table D.2. The RLAN device shall comply with the minimum detection probability as defined in table D.5.

12.4 OFF-CHANNEL CAC (OFF-CHANNEL CHANNEL AVAILABILITY CHECK) LIMIT

Where implemented, the Off-Channel CAC Time shall be declared by the manufacturer. However, the declared Off-Channel CAC Time shall be within the range specified in table D.1.

During the Off-Channel CAC, the RLAN device shall be capable of detecting any of the radar test signals that fall within the ranges given by table D.4 with a level above the Radar Detection Threshold Level defined in table D.2.

The RLAN device shall comply with the minimum detection probability as defined in table D.5.

12.5 IN-SERVICE MONITORING LIMIT

The In-Service Monitoring shall be used to monitor each Operating Channel.

The In-Service-Monitoring shall start immediately after the RLAN device has started transmissions on a channel.

During the In-Service Monitoring, the RLAN device shall be capable of detecting any of the radar test signals that fall within the ranges given by table D.4 with a level above the Radar Detection Threshold Level defined in table D.2.

The RLAN device shall comply with the minimum detection probability associated with a given radar test signal as defined in table D.5.

12.6 CHANNEL SHUTDOWN

LIMIT

The Channel Move Time shall not exceed the limit defined in table D.1. The Channel Closing Transmission Time shall not exceed the limit defined in table D.1.

12.7 NON-OCCUPANCY

LIMIT

The Non-Occupancy Period shall not be less than the value defined in table D.1.

12.8 UNIFORM SPREADING

LIMIT

Each of the declared Channel Plans (see clause 3.1) shall make use of at least 60 % of the spectrum available in the applicable sub-band(s).

The Uniform Spreading is limited to the usable channels being declared as part of the channel plan.

Usable channels do not include channels which are precluded by either:

the intended outdoor usage of the RLAN; or

previous detection of a radar on the channel (Unavailable Channel or Unusable Channel); or

national regulations; or

the restriction to only operate in the band 5 150 MHz to 5 250 MHz for RLAN devices without a radar detection capability.

Each of the Usable Channels shall be used with approximately equal probability. RLAN equipment for which the declared channel plan includes channels whose nominal bandwidth falls completely or partly within the band 5 600 MHz to 5 650 MHz may omit these channels from the list of Usable Channels at initial power up or at initial installation. Channels being used by other RLAN equipment may be omitted from the list of Usable Channels.

12.9 TEST PROCEDURE

Refer to chapter 5.4.8.2 of ETSI EN 301 893 V2.1.1 (2017-05)

12.10 TEST SETUP

Set-up A

Set-up A is a set-up whereby the UUT is an RLAN device operating in master mode. Radar test signals are injected into the UUT. This set-up also contains an RLAN device operating in slave mode which is associated with the UUT.

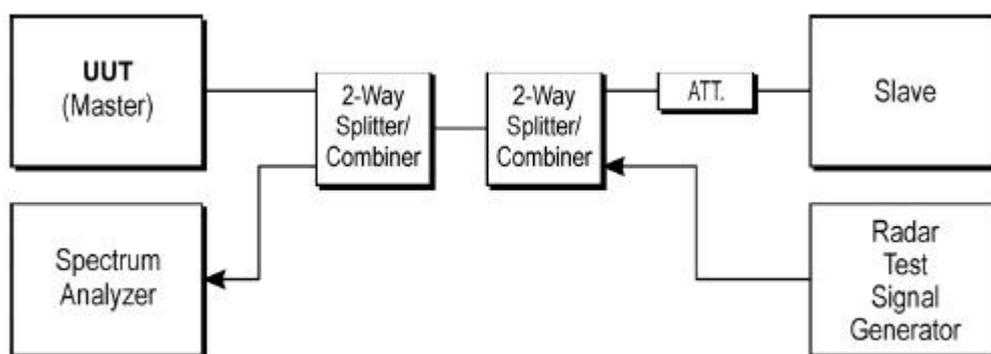


Figure 5: Set-up A

Set-up B

Set-up B is a set-up whereby the UUT is an RLAN device operating in slave mode, with or without Radar Interference Detection function. This set-up also contains an RLAN device operating in master mode. The radar test signals are injected into the master device. The UUT (slave device) is associated with the master device.

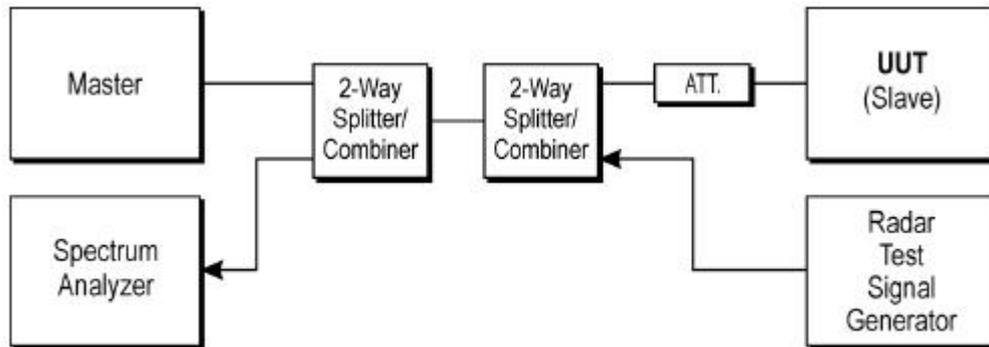


Figure 6: Set-up B

Set-up C

The UUT is an RLAN device operating in slave mode with Radar Interference Detection function. Radar test signals are injected into the slave device. This set-up also contains an RLAN device operating in master mode. The UUT (slave device) is associated with the master device.

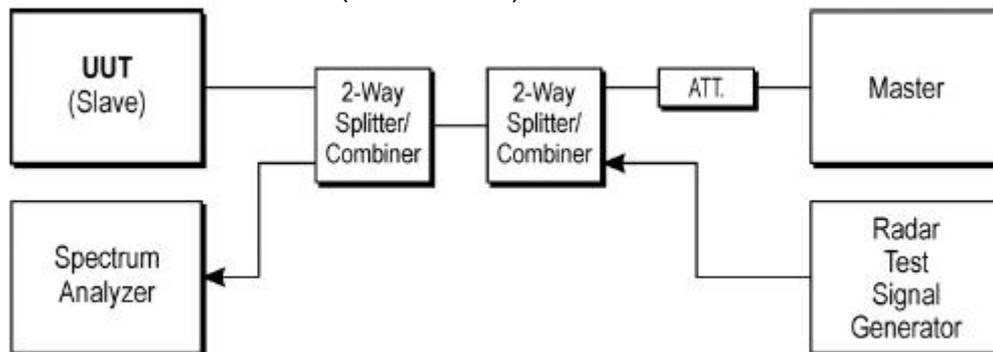


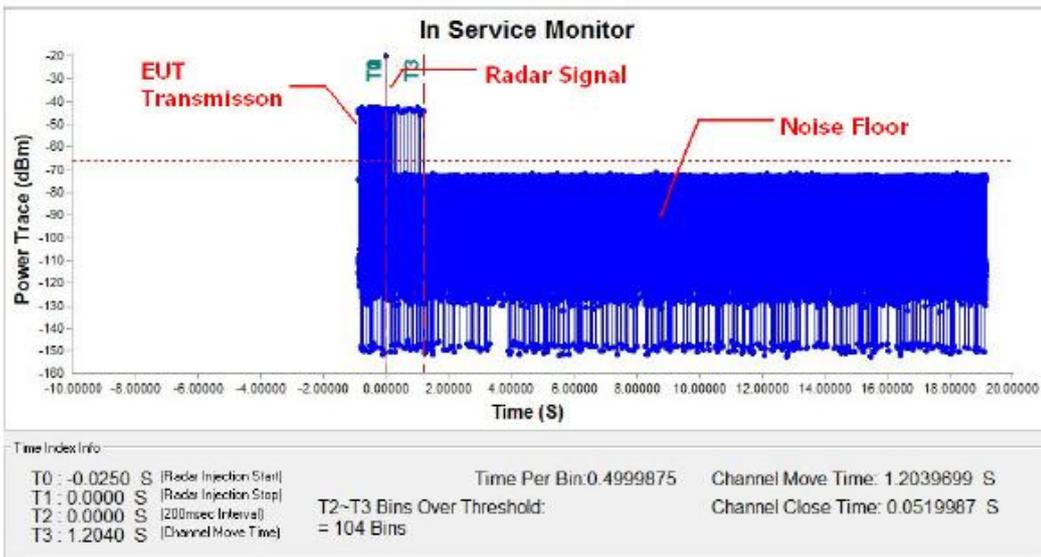
Figure 7: Set-up C

12.11 TEST RESULTS

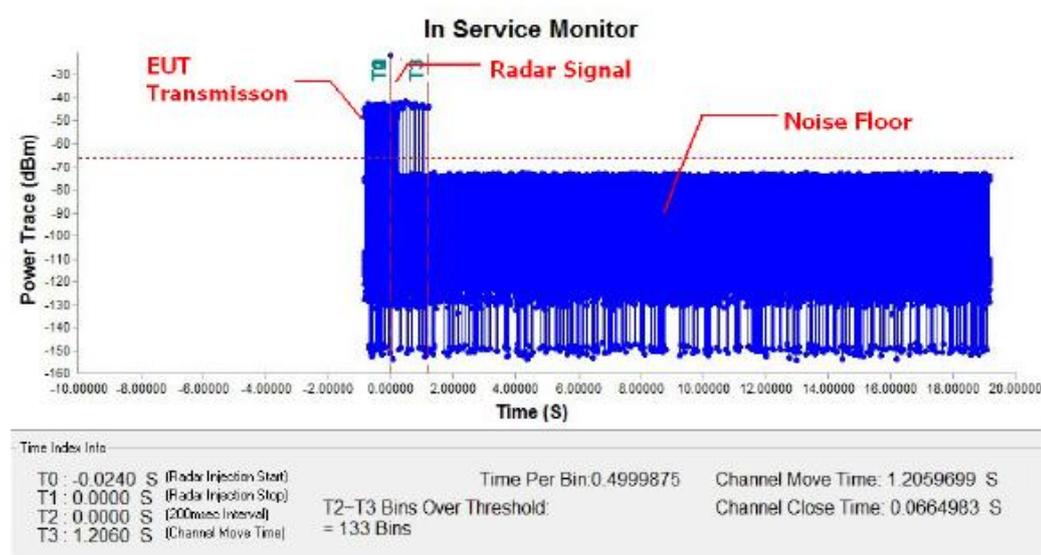
Temperature:	25°C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	DC 14V/2A from adapter

Test Mode: 802.11a		
Test Frequency	Channel Closing Transmission Time (s)	Channel Move Time (s)
within 5250 MHz to 5350 MHz 5200MHz	0.0519987	<10
(within 5470 MHz to 5725 MHz band) 5700 MHz	0.0664983	<10

CH36

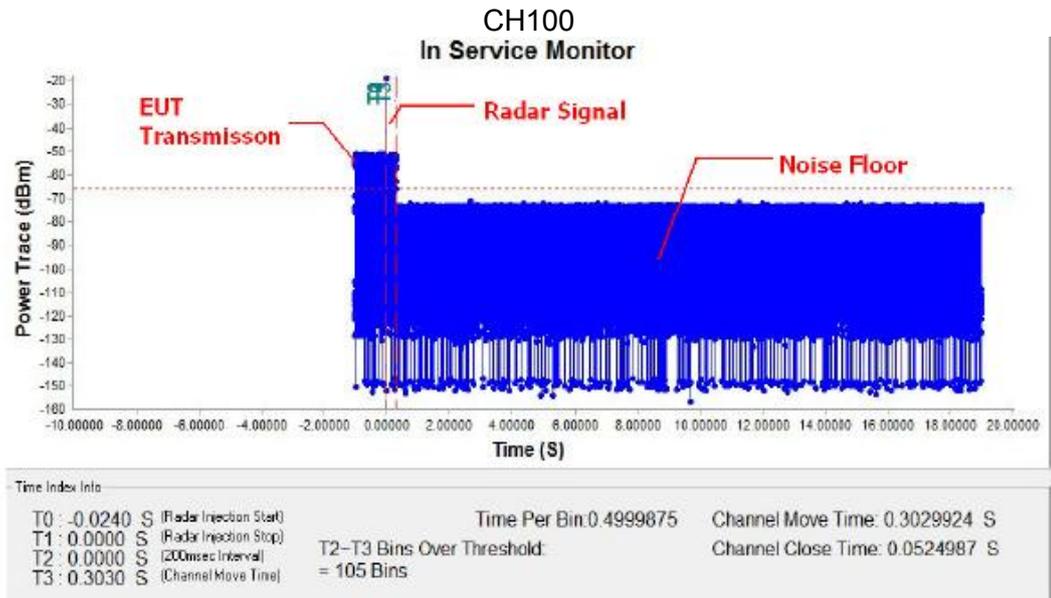
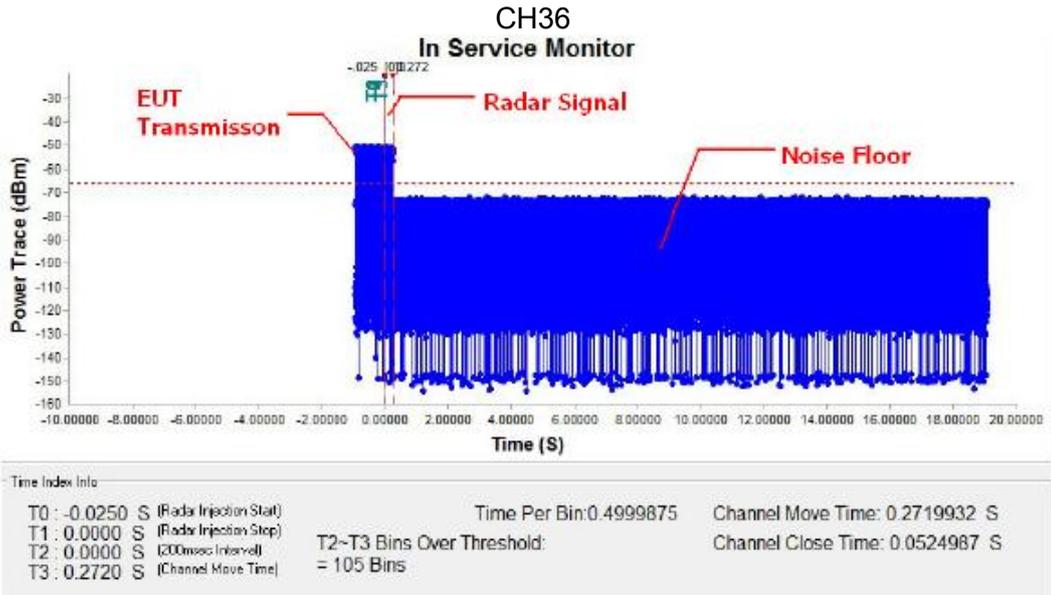


CH100



Note: 1. According to EN 301 893, clause 5.1.3, DFS testing shall be performed on one channel within the range 5250 MHz to 5350 MHz and one channel within 5470 MHz to 5725 MHz range. The choice of the channel is at the discretion of the test house
 2. DFS client device without radar detection capability.

Test Mode: 802.11n(20MHz)		
Test Frequency	Channel Closing Transmission Time (s)	Channel Move Time (s)
within 5250 MHz to 5350 MHz 5200MHz	0.0554986	<10
(within 5470 MHz to 5725 MHz band) 5700 MHz	0.0524987	<10



Note: 1. According to EN 301 893, clause 5.1.3, DFS testing shall be performed on one channel within the range 5250 MHz to 5350 MHz and one channel within 5470 MHz to 5725 MHz range. The choice of the channel is at the discretion of the test house.
2. DFS client device without radar detection capability.

13. TEST PHOTOGRAPH

Spurious Emission Test



14. EUT Constructional Details

Reference to the test report No. TR21120146-E-004.

*** the end of report ***