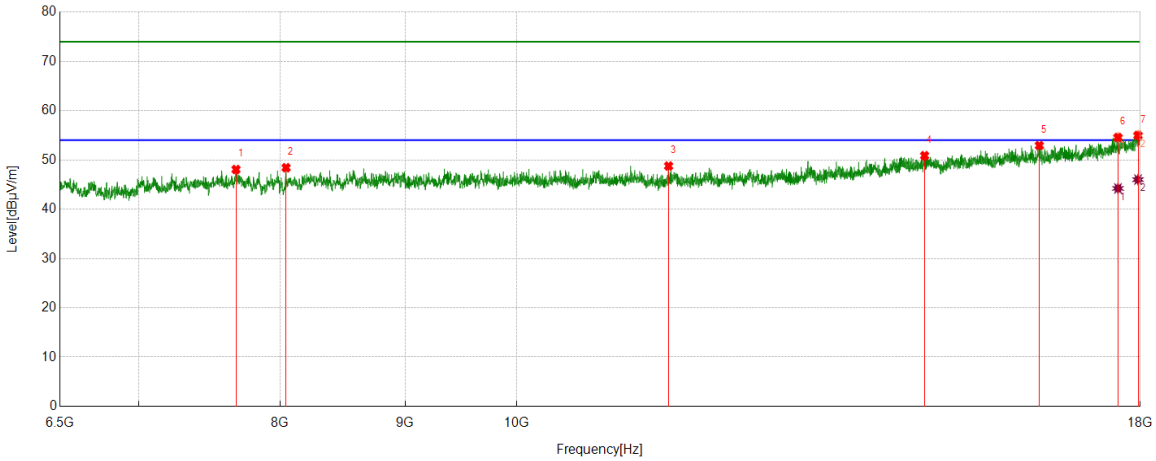
PART 2: 6.5GHz~18GHz

Module	Test Mode	Channel	Polarization	Verdict
Module 1	11B	2437	Horizontal	PASS
Module 2	11A	5180		



PK Result:

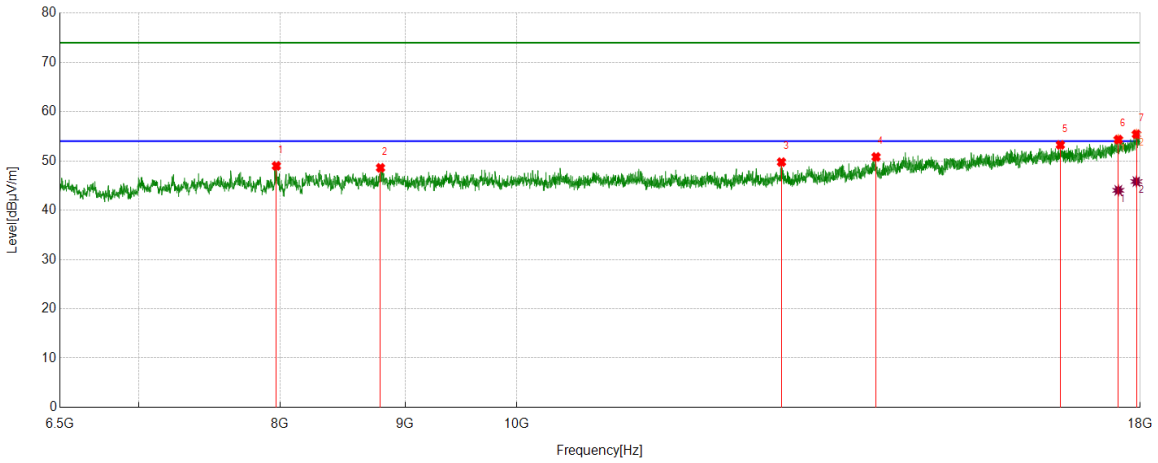
No.	Frequency	Reading Level	Correct Factor	Result	Limit	Margin	Remark
	[MHz]	[dBuV]	[dB/m]	[dBuV/m]	[dBuV/m]	[dB]	
1	7674.5843	42.79	5.27	48.06	74.00	-25.94	Horizontal
2	8045.5057	42.78	5.64	48.42	74.00	-25.58	Horizontal
3	11539.0674	41.08	7.69	48.77	74.00	-25.23	Horizontal
4	14689.0236	38.02	12.85	50.87	74.00	-23.13	Horizontal
5	16366.7958	37.91	15.01	52.92	74.00	-21.08	Horizontal
6	17626.2033	36.50	18.06	54.56	74.00	-19.44	Horizontal
7	17962.6203	35.35	19.63	54.98	74.00	-19.02	Horizontal

AV Result:

No.	Frequency	Reading Level	Correct Factor	Result	Limit	Margin	Remark
	[MHz]	[dBuV]	[dB/m]	[dBuV/m]	[dBuV/m]	[dB]	
1	17626.2033	26.16	18.06	44.22	54.00	-9.78	Horizontal
2	17962.6203	26.38	19.63	46.01	54.00	-7.99	Horizontal

Remark: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
4. Peak: Peak detector.
5. AVG: VBW refer to section 6.2.
6. For above 6.5GHz part, filter losses were only considered in the spurious frequency bands and the authorized band were not corrected for HPF losses. The proper operation of the transmitter prior to adding the filter to the measurement chain.
7. Only the worst case emission was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.
8. Since the non-restricted band peak emissions are less than the average limit, they also comply with the -27dBm/MHz (68.2dBuV/m) limit.

Module	Test Mode	Channel	Polarization	Verdict
Module 1	11B	2437	Vertical	PASS
Module 2	11A	5180		



PK Result:

No.	Frequency	Reading Level	Correct Factor	Result	Limit	Margin	Remark
	[MHz]	[dBuV]	[dB/m]	[dBuV/m]	[dBuV/m]	[dB]	
1	7972.1840	43.60	5.39	48.99	74.00	-25.01	Vertical
2	8794.5368	42.38	6.22	48.60	74.00	-25.40	Vertical
3	12834.4168	40.68	9.08	49.76	74.00	-24.24	Vertical
4	14032.0040	38.86	11.95	50.81	74.00	-23.19	Vertical
5	16694.5868	37.37	15.88	53.25	74.00	-20.75	Vertical
6	17631.9540	36.29	18.04	54.33	74.00	-19.67	Vertical
7	17935.3044	36.00	19.42	55.42	74.00	-18.58	Vertical

AV Result:

No.	Frequency	Reading Level	Correct Factor	Result	Limit	Margin	Remark
	[MHz]	[dBuV]	[dB/m]	[dBuV/m]	[dBuV/m]	[dB]	
1	17631.9540	25.99	18.04	44.03	54.00	-9.97	Vertical
2	17935.3044	26.40	19.42	45.82	54.00	-8.18	Vertical

Remark: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
4. Peak: Peak detector.
5. AVG: VBW refer to section 6.2.
6. For above 6.5GHz part, filter losses were only considered in the spurious frequency bands and the authorized band were not corrected for HPF losses. The proper operation of the transmitter prior to adding the filter to the measurement chain.
7. Only the worst case emission was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.
8. Since the non-restricted band peak emissions are less than the average limit, they also comply with the -27dBm/MHz (68.2dBuV/m) limit.

8. FREQUENCY STABILITY

LIMITS

The frequency of the carrier signal shall be maintained within band of operation

TEST SETUP AND PROCEDURE

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

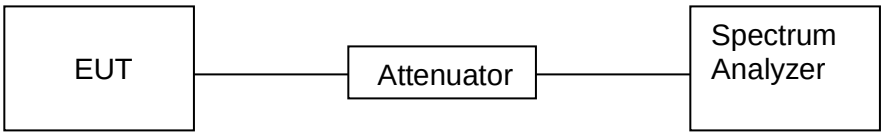
Center Frequency	The center frequency of the channel under test
Detector	PEAK
RBW	10kHz
VBW	≥3 × RBW
Span	Encompass the entire emissions bandwidth (EBW) of the signal
Trace	Max hold
Sweep time	Auto

Allow the trace to stabilize, find the peak value of the power envelope and record the frequency, then calculated the frequency drift.

The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value.

User manual temperature is -20°C~55°C.

TEST SETUP



TEST ENVIRONMENT

Environment Parameter:	Selected Values During Tests	
Relative Humidity:	55 ~ 65%	
Atmospheric Pressure:	101kPa	
Temperature:	TL	-20°C
	TN	23 ~ 28°C
	TH	55°C
Voltage:	VL	AC 102V
	VN	AC 120V
	VH	AC 138V

Note: TL= Lower Extreme Temperature
TN= Normal Temperature
TH= Upper Extreme Temperature
VL= Lower Extreme Test Voltage
VN= Nominal Voltage
VH= Upper Extreme Test Voltage

TEST RESULTS

Not applicable, the customer will declare the extreme used temperature and voltage in the user manual.

TEST RESULTS (WORST-CASE CONFIGURATION)

Frequency Error vs. Voltage:

Frequency Error vs. Temperature									
802.11a: 5200 MHz									
Temp.	Volt.	0 Minute		2 Minute		5 Minute		10 Minute	
		Freq.Error (Hz)	Tolerance (ppm)	Freq.Error (Hz)	Tolerance (ppm)	Freq.Error (Hz)	Tolerance (ppm)	Freq.Error (Hz)	Tolerance (ppm)
TN	VL	-34000.00	-6.538462	-4000.00	-0.769231	4000.00	0.769231	-34000.00	-6.538462
TN	VN	-30000.00	-5.769231	16000.00	3.076923	6000.00	1.153846	-28000.00	-5.384615
TN	VH	-38000.00	-7.307692	-6000.00	-1.153846	8000.00	1.538462	-26000.00	-5.000000

Frequency Error vs. Temperature:

Frequency Error vs. Temperature									
802.11a: 5200 MHz									
Temp.	Volt.	0 Minute		2 Minute		5 Minute		10 Minute	
		Freq.Error (Hz)	Tolerance (ppm)	Freq.Error (Hz)	Tolerance (ppm)	Freq.Error (Hz)	Tolerance (ppm)	Freq.Error (Hz)	Tolerance (ppm)
55	VN	-32000.00	-6.153846	-26000.00	-5.000000	2000.00	0.384615	10000.00	1.923077
45	VN	-32000.00	-6.153846	4000.00	0.769231	6000.00	1.153846	0.00	0.000000
35	VN	-22000.00	-4.230769	6000.00	1.153846	2000.00	0.384615	-4000.00	-0.769231
25	VN	-28000.00	-5.384615	-6000.00	-1.153846	0.00	0.000000	4000.00	0.769231
15	VN	-24000.00	-4.615385	-10000.00	-1.923077	0.00	0.000000	6000.00	1.153846
5	VN	-28000.00	-5.384615	-8000.00	-1.538462	4000.00	0.769231	4000.00	0.769231
-5	VN	-34000.00	-6.538462	6000.00	1.153846	6000.00	1.153846	-2000.00	-0.384615
-15	VN	-28000.00	-5.384615	-6000.00	-1.153846	6000.00	1.153846	0.00	0.000000
-20	VN	-22000.00	-4.230769	6000.00	1.153846	4000.00	0.769231	4000.00	0.769231

Note: All the modulation and channels had been tested, but only the worst data recorded in the report.

Frequency Error vs. Voltage:

Frequency Error vs. Temperature									
802.11a: 5825 MHz									
Temp.	Volt.	0 Minute		2 Minute		5 Minute		10 Minute	
		Freq.Error (Hz)	Tolerance (ppm)	Freq.Error (Hz)	Tolerance (ppm)	Freq.Error (Hz)	Tolerance (ppm)	Freq.Error (Hz)	Tolerance (ppm)
TN	VL	12000.00	2.060086	22000.00	3.776824	14000.00	2.403433	2000.00	0.343348
TN	VN	18000.00	3.090129	10000.00	1.716738	20000.00	3.433476	22000.00	3.776824
TN	VH	18000.00	3.090129	18000.00	3.090129	12000.00	2.060086	8000.00	1.373391

Frequency Error vs. Temperature:

Frequency Error vs. Temperature									
802.11a: 5825 MHz									
Temp.	Volt.	0 Minute		2 Minute		5 Minute		10 Minute	
		Freq.Error (Hz)	Tolerance (ppm)	Freq.Error (Hz)	Tolerance (ppm)	Freq.Error (Hz)	Tolerance (ppm)	Freq.Error (Hz)	Tolerance (ppm)
55	VN	14000.00	2.403433	12000.00	2.060086	12000.00	2.060086	16000.00	2.746781
45	VN	16000.00	2.746781	22000.00	3.776824	24000.00	4.120172	18000.00	3.090129
35	VN	16000.00	2.746781	20000.00	3.433476	28000.00	4.806867	16000.00	2.746781
25	VN	12000.00	2.060086	6000.00	1.030043	20000.00	3.433476	10000.00	1.716738
15	VN	22000.00	3.776824	16000.00	2.746781	10000.00	1.716738	12000.00	2.060086
5	VN	22000.00	3.776824	12000.00	2.060086	26000.00	4.463519	12000.00	2.060086
-5	VN	16000.00	2.746781	18000.00	3.090129	16000.00	2.746781	20000.00	3.433476
-15	VN	18000.00	3.090129	14000.00	2.403433	14000.00	2.403433	16000.00	2.746781
-20	VN	18000.00	3.090129	12000.00	2.060086	18000.00	3.090129	20000.00	3.433476

Note: All the modulation and channels had been tested, but only the worst data recorded in the report.

9. DYNAMIC FREQUENCY SELECTION

APPLICABILITY OF DFS REQUIREMENTS

Table 1: Applicability of DFS Requirements Prior to Use of a Channel

Requirement	Operational Mode		
	☐Master	☒Client Without Radar Detection	☐Client With Radar Detection
Non-Occupancy Period	Yes	Not required	Yes
DFS Detection Threshold	Yes	Not required	Yes
Channel Availability Check Time	Yes	Not required	Not required
U-NII Detection Bandwidth	Yes	Not required	Yes

Table 2: Applicability of DFS requirements during normal operation

Requirement	Operational Mode	
	☐Master Device or Client with Radar Detection	☒Client Without Radar Detection
DFS Detection Threshold	Yes	Not required
Channel Closing Transmission Time	Yes	Yes
Channel Move Time	Yes	Yes
U-NII Detection Bandwidth	Yes	Not required

Additional requirements for devices with multiple bandwidth modes	☐Master Device or Client with Radar Detection	☒Client Without Radar Detection
U-NII Detection Bandwidth and Statistical Performance Check	All BW modes must be tested	Not required
Channel Move Time and Channel Closing Transmission Time	Test using widest BW mode available	Test using the widest BW mode available for the link
All other tests	Any single BW mode	Not required
Remark: Frequencies selected for statistical performance check should include several frequencies within the radar detection bandwidth and frequencies near the edge of the radar detection bandwidth. For 802.11 devices it is suggested to select frequencies in each of the bonded 20 MHz channels and the channel center frequency.		

LIMITS

(1) DFS Detection Thresholds

Table 3: DFS Detection Thresholds for Master Devices and Client Devices with Radar Detection

Maximum Transmit Power	Value (See Remarks 1, 2, and 3)
EIRP ≥ 200 milliwatt	-64 dBm
EIRP < 200 milliwatt and power spectral density < 10 dBm/MHz	-62 dBm
EIRP < 200 milliwatt that do not meet the power spectral density requirement	-64 dBm
Remark 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna. Remark 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response. Remark3: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.	

(2) DFS Response Requirements

Table 4: DFS Response Requirement Values

Parameter	Value
Non-occupancy period	Minimum 30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds See Remark 1.
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Remarks 1 and 2.
U-NII Detection Bandwidth	Minimum 100% of the U-NII 99% transmission power bandwidth. See Remark 3.
Remark 1: Channel Move Time and the Channel Closing Transmission Time should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst. Remark 2: The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required facilitating a Channel move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions. Remark 3: During the U-NII Detection Bandwidth detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.	

PARAMETERS OF RADAR TEST WAVEFORMS

This section provides the parameters for required test waveforms, minimum percentage of successful detections, and the minimum number of trials that must be used for determining DFS conformance. Step intervals of 0.1 microsecond for Pulse Width, 1 microsecond for PRI, 1 MHz for chirp width and 1 for the number of pulses will be utilized for the random determination of specific test waveforms.

Table 5 Short Pulse Radar Test Waveforms

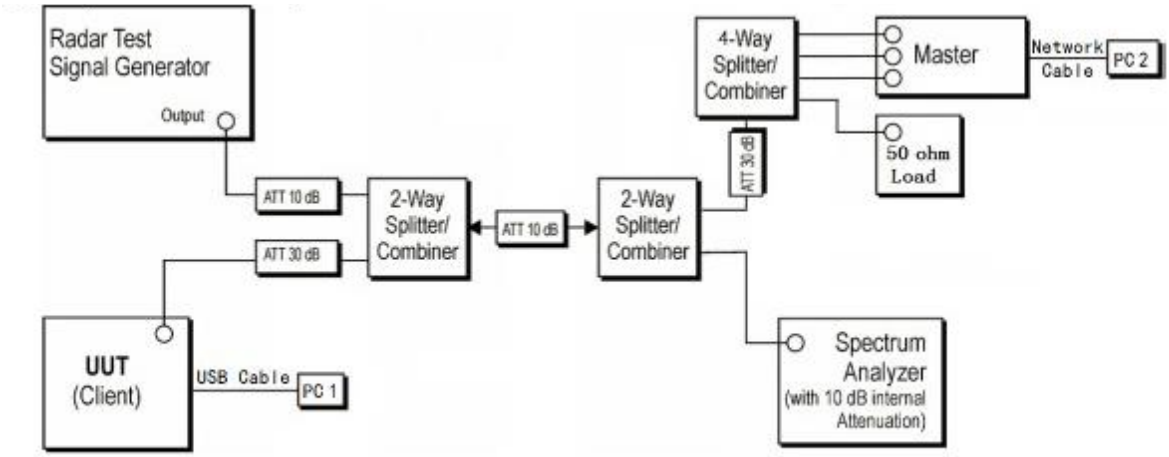
Radar Type	Pulse Width (µsec)	PRI (µsec)	Number of Pulses	Minimum Percentage of Successful Detection	Minimum Number of Trials
0	1	1428	18	See Note 1	See Note 1
1	1	Test A	$\text{Roundup}\left\{\left(\frac{1}{360}\right)\cdot\left(\frac{19\cdot10^6}{\text{PRI}_{\mu sec}}\right)\right\}$	60%	30
		Test B			
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Radar Types 1-4)				80%	120

Note 1: Short Pulse Radar Type 0 should be used for the detection bandwidth test, channel move time, and channel closing time tests.
Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in Table 5a
Test B: 15 unique PRI values randomly selected within the range of 518-3066 µsec, with a minimum increment of 1 µsec, excluding PRI values selected in Test A

A minimum of 30 unique waveforms are required for each of the Short Pulse Radar Types 2 through 4. If more than 30 waveforms are used for Short Pulse Radar Types 2 through 4, then each additional waveform must also be unique and not repeated from the previous waveforms. If more than 30 waveforms are used for Short Pulse Radar Type 1, then each additional waveform is generated with Test B and must also be unique and not repeated from the previous waveforms in Tests A or B. Test aggregate is average of the percentage of successful detections of short pulse radar types 1-4

TEST SETUP

Setup for Client with injection at the Master

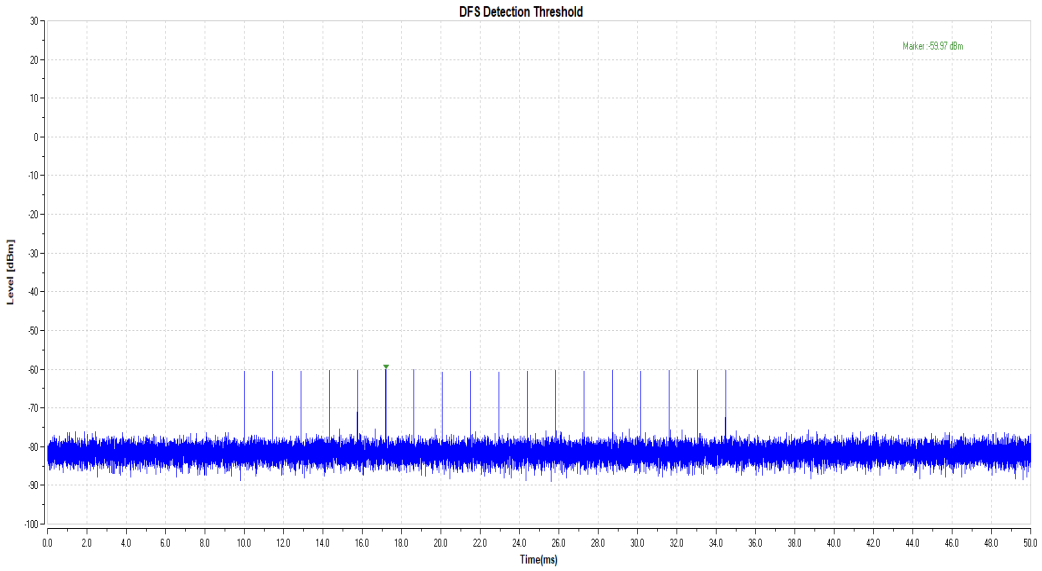


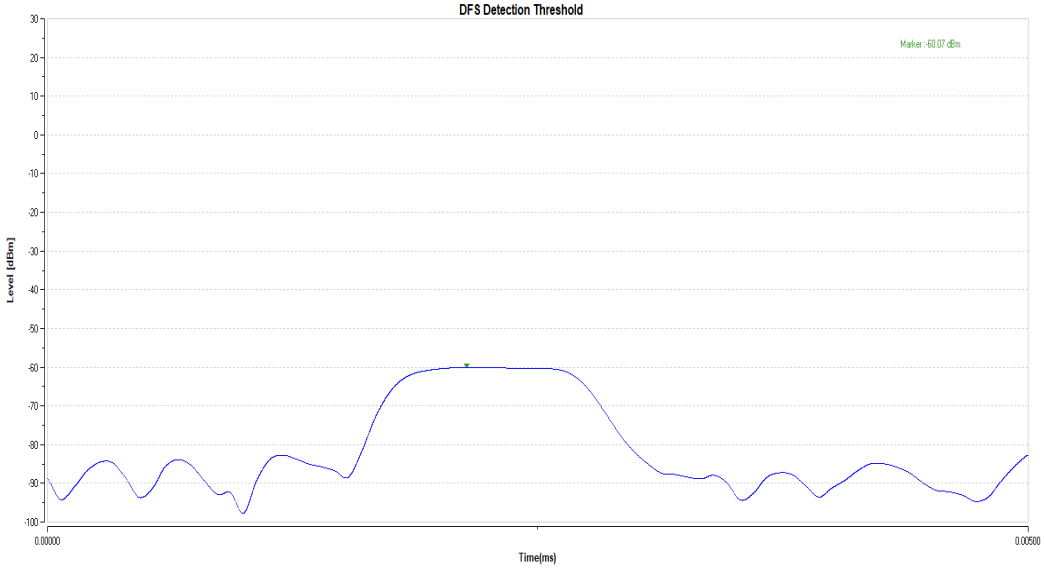
TEST ENVIRONMENT

Environment Parameter	Selected Values During Tests
Relative Humidity	60%
Atmospheric Pressure:	101kPa
Temperature	22.2°C
Test Voltage	AC 120V
Test Date	11/17/2024

TEST RESULTS

Test Mode	Channel	Radar Type	Result	Limit [dBm]	Verdict
11ac VHT40	5510	Type 0	-59.97	-59.92	Pass

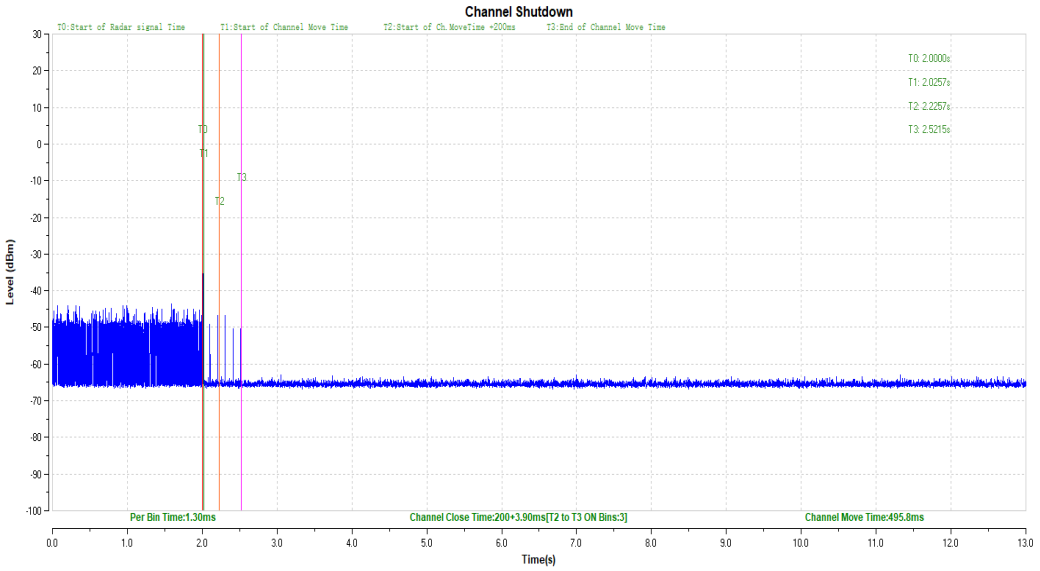




BW/Channel	Test Item	Test Result	Limit	Results
40MHz / 5510MHz	Channel Move Time	0.4958 s	＜10 s	pass
	Channel Closing Transmission Time	200 ms+3.90 ms	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period.	pass

Test plots as follows:

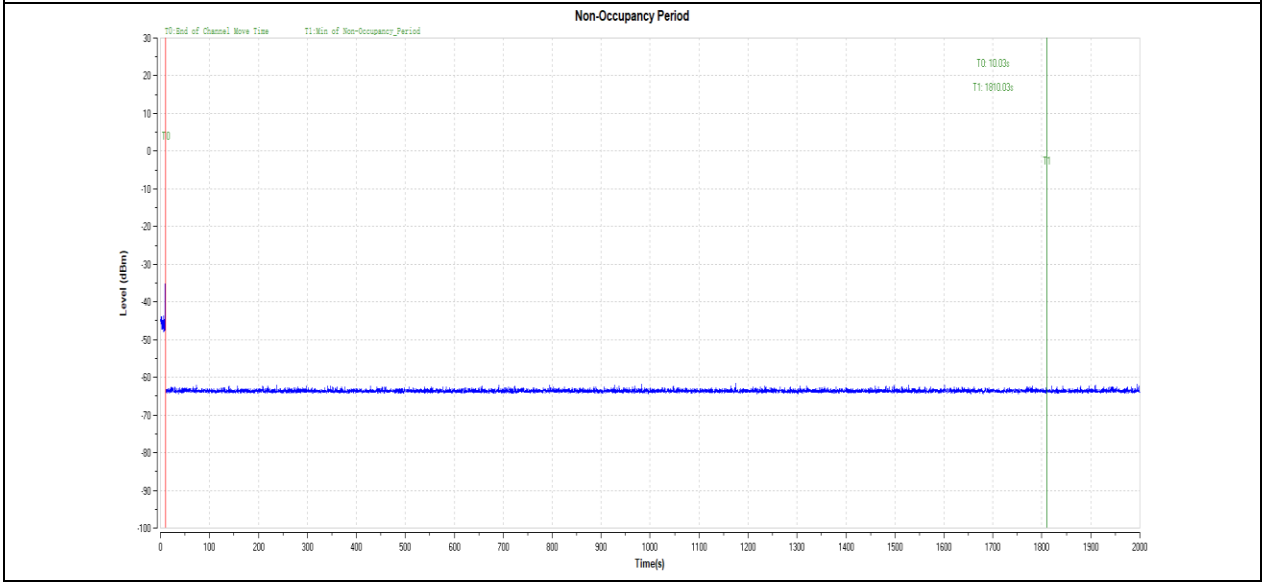
Channel Move Time & Channel Closing Transmission Time



BW/Channel	Test Item	Test Result	Limit	Results
40MHz / 5510MHz	Non-Occupancy Period	see test graph	≥1800	PASS

Test plots as follows:

Non-Occupancy Period



Note: All the modulation and channels had been tested, but only the worst data recorded in the report.

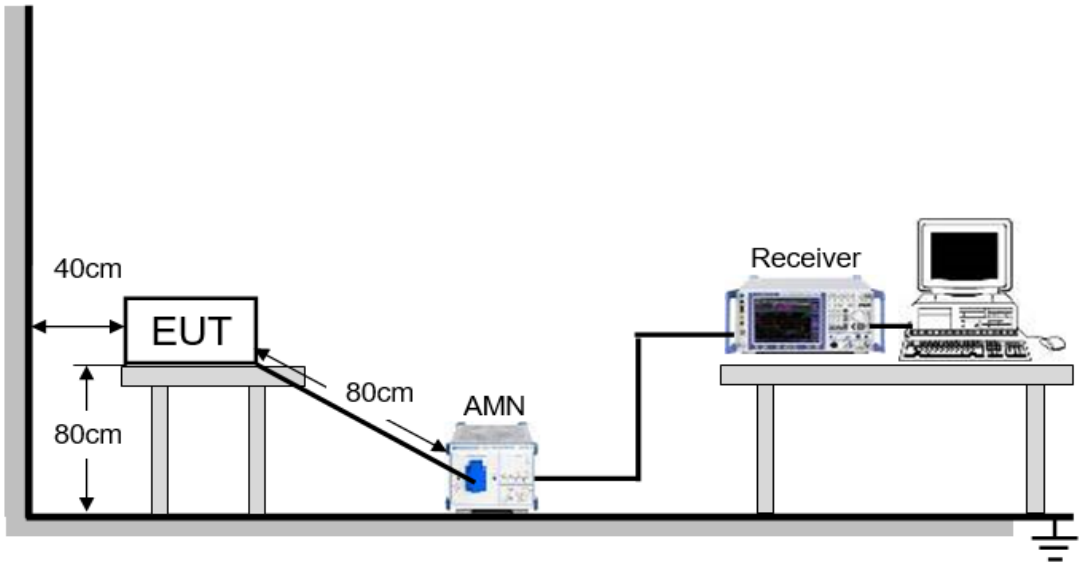
10. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

Please refer to FCC §15.207 (a)

FREQUENCY (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.50 -5.0	56.00	46.00
5.0 -30.0	60.00	50.00

TEST SETUP AND PROCEDURE



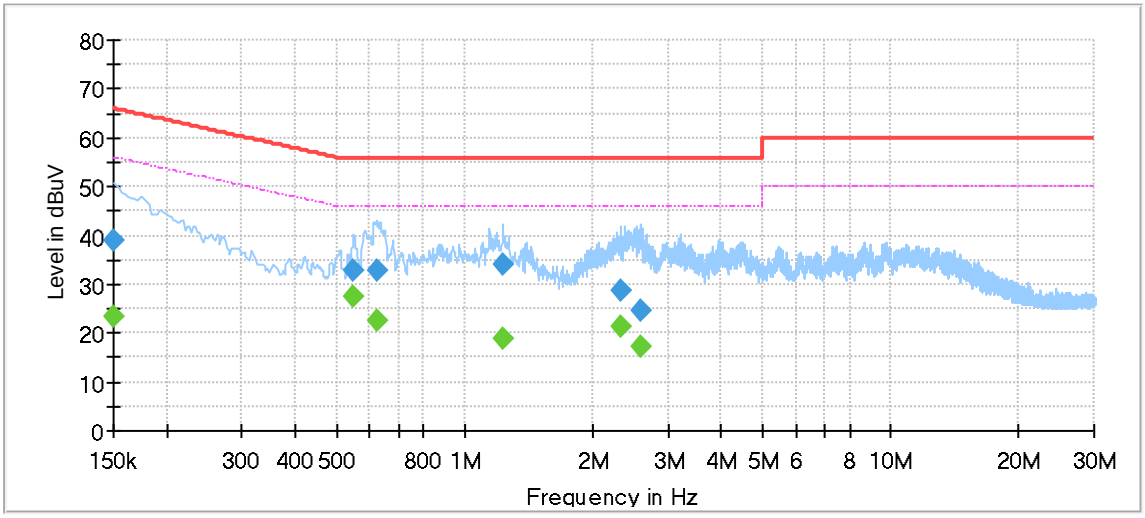
The EUT is put on a table of non-conducting material that is 80cm high. The vertical conducting wall of shielding is located 40cm to the rear of the EUT. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.). A EMI Measurement Receiver (R&S Test Receiver ESR3) is used to test the emissions from both sides of AC line. According to the requirements in Section 6.2 of ANSI C63.10-2013.Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and average detector mode. The bandwidth of EMI test receiver is set at 9kHz.

The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application.

TEST ENVIRONMENT

Environment Parameter	Selected Values During Tests
Relative Humidity	65%
Atmospheric Pressure:	100.2kPa
Temperature	25°C
Test Voltage	AC 120V
Test Date	12/13/2022

LINE L RESULTS (WORST-CASE CONFIGURATION)

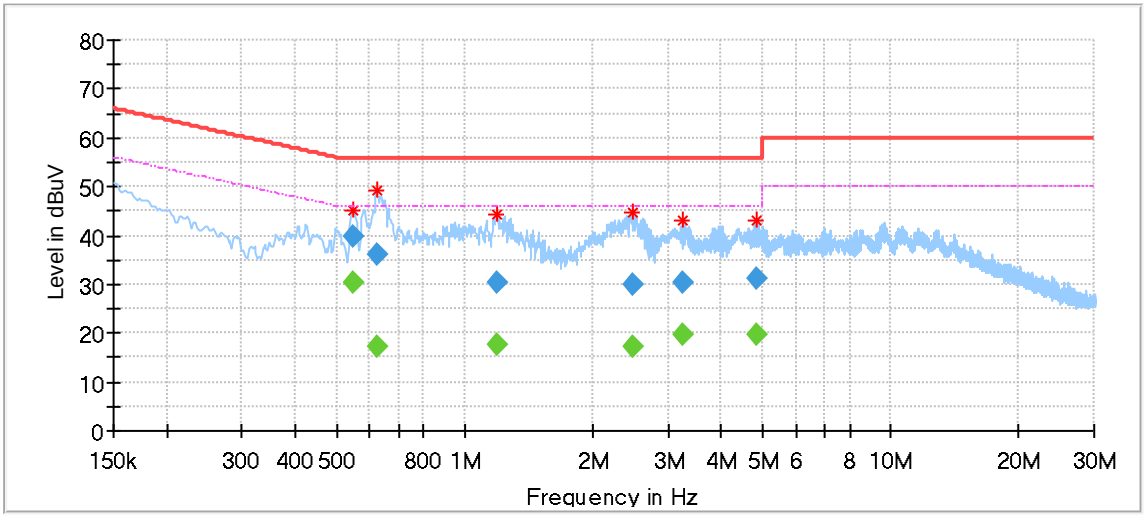


Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.150000	---	23.45	56.00	32.55	1000.0	9.000	L1	OFF	9.6
0.150000	38.82	---	66.00	27.18	1000.0	9.000	L1	OFF	9.6
0.550488	---	27.30	46.00	18.70	1000.0	9.000	L1	OFF	9.5
0.550488	32.84	---	56.00	23.16	1000.0	9.000	L1	OFF	9.5
0.620138	---	22.49	46.00	23.51	1000.0	9.000	L1	OFF	9.5
0.620138	32.94	---	56.00	23.06	1000.0	9.000	L1	OFF	9.5
1.229575	---	19.02	46.00	26.98	1000.0	9.000	L1	OFF	9.5
1.229575	33.85	---	56.00	22.15	1000.0	9.000	L1	OFF	9.5
2.331538	---	21.20	46.00	24.80	1000.0	9.000	L1	OFF	9.5
2.331538	28.87	---	56.00	27.13	1000.0	9.000	L1	OFF	9.5
2.580288	---	17.10	46.00	28.90	1000.0	9.000	L1	OFF	9.5
2.580288	24.76	---	56.00	31.24	1000.0	9.000	L1	OFF	9.5

Note: 1. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
2. Test setup: RBW: 200 Hz (9 kHz—150 kHz), 9 kHz (150 kHz—30 MHz).
3. Step size: 80Hz (0.009MHz-0.15MHz), 4 kHz (0.15MHz-30MHz), Scan time: auto.
4. The extension cord/outlet strip was calibrated with the LISN as required by ANSI C63.10:2013 Clause 6.2.2.
5. Pre-testing all test modes and channels, and find the 5745MHz of 11a mode which is the worst case, so only the worst case is included in this test report.

LINE N RESULTS (WORST-CASE CONFIGURATION)



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.548000	---	30.28	46.00	15.72	1000.0	9.000	N	OFF	9.5
0.548000	39.90	---	56.00	16.10	1000.0	9.000	N	OFF	9.5
0.622625	---	17.12	46.00	28.88	1000.0	9.000	N	OFF	9.5
0.622625	36.15	---	56.00	19.85	1000.0	9.000	N	OFF	9.5
1.184800	---	17.70	46.00	28.30	1000.0	9.000	N	OFF	9.4
1.184800	30.31	---	56.00	25.69	1000.0	9.000	N	OFF	9.4
2.490738	---	17.03	46.00	28.97	1000.0	9.000	N	OFF	9.4
2.490738	29.97	---	56.00	26.03	1000.0	9.000	N	OFF	9.4
3.261863	---	19.81	46.00	26.19	1000.0	9.000	N	OFF	9.4
3.261863	30.30	---	56.00	25.70	1000.0	9.000	N	OFF	9.4
4.846400	---	19.70	46.00	26.30	1000.0	9.000	N	OFF	9.4
4.846400	31.20	---	56.00	24.80	1000.0	9.000	N	OFF	9.4

Note: 1. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
2. Test setup: RBW: 200 Hz (9 kHz—150 kHz), 9 kHz (150 kHz—30 MHz).
3. Step size: 80Hz (0.009MHz-0.15MHz), 4 kHz (0.15MHz-30MHz), Scan time: auto.
4. The extension cord/outlet strip was calibrated with the LISN as required by ANSI C63.10:2013 Clause 6.2.2.
5. Pre-testing all test modes and channels, and find the 5745MHz of 11a mode which is the worst case, so only the worst case is included in this test report.

11. ANTENNA REQUIREMENTS

APPLICABLE REQUIREMENTS

Please refer to FCC §15.203
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Please refer to FCC §15.247(b)(4)
The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

ANTENNA GAIN

The antenna gain of EUT is more than 6 dBi, so the power and power density limit shall be reduced amount in dB that the directional gain of the antenna exceeds 6dBi.

END OF REPORT