


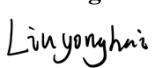



Test Report No.: GJW2022-5229-RF/R3
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# TEST REPORT

**FCC ID** : 2AFGR-ECUC  
**Applicant** : ALTENERGY POWER SYSTEM INC.  
**Product Name** : Energy Communication Unit  
**Mode No.** : ECU-C

**CVC Testing Technology Co., Ltd.**

<b>Applicant</b>		<b>Name:</b> ALTENERGY POWER SYSTEM INC. <b>Address:</b> Building 2, No. 522, Yatai Road, Nanhu District, Jiaxing City, Zhejiang, China	
<b>Manufacturer</b>		<b>Name:</b> ALTENERGY POWER SYSTEM INC. <b>Address:</b> Building 2, No. 522, Yatai Road, Nanhu District, Jiaxing City, Zhejiang, China	
<b>Equipment Under Test</b>		<b>Product Name :</b> Energy Communication Unit <b>Model No. :</b> ECU-C <b>Trade mark :</b> APsystems <b>Serial no. :</b> 215000022009 <b>Sampling :</b> 1-1	
Date of Receipt.	<b>2022.06.22</b>	Date of Testing	<b>2022.08.30</b>
<b>Test Specification</b>		<b>Test Result</b>	
FCC CFR47 Part 15C (2020) Radio Frequency Devices ANSI C63.10 (2013) KDB 558074 D01 DTS Meas Guidance v05 KDB 662911 D01 Multiple Transmitter Output v02r01		<b>PASS</b>	
Evaluation of Test Result		The equipment under test was found to comply with the requirements of the standards applied.  <div style="text-align: right;"> <b>Seal of CVC</b>  <b>Issue Date: 2022.11.14</b> </div>	
Tested by: <b>Xu Zhenfei</b> 		Reviewed by: <b>Liu YongHai</b> 	
Approved by: <b>Chen HuaWen</b> 			
<b>Other Aspects: NONE.</b>			
Abbreviations:OK,    Pass= passed    Fail = failed    N/A= not applicable    EUT= equipment, sample(s) under tested			
Note 1: This test report relates only to the EUT, and shall not be reproduced except in full, without written approval of <b>CVC</b> . Note 2: This report replaces the report No.GJW2022-5229-RF/R2 after issuance.			

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# 1. General Product Information

## 1.1 General information

Product Name	Energy Communication Unit
Model No.	ECU-C
HVIN	ECU-C
Power Supply	AC: 110~277Vac, 50~60Hz DC: 12-16Vdc
Serial Number(SN)	215000022009
firmware	REV1
software	C1
specific power settings	IEEE 802.11b: 24 IEEE 802.11g: 34 IEEE 802.11n(20MHz) : 34 IEEE 802.11n(40MHz): 34 Zigbee: 0
Antenna Replace	EUT has three replaceable antennas, namely AT02, 2.4GHz and 3030
Antenna Type	External Antenna
Antenna Connector	A detachable antenna
Antenna Gain	AT02: 2 dBi (provided by client) 2.4GHz: 2.15 dBi (provided by client) 3030: 2dBi (provided by client)
Beamforming gain	Unsupported (provided by client)
Frequency Range	IEEE 802.11b/g/n(20MHz): 2412~2462MHz IEEE 802.11n(40MHz): 2422~2452MHz Zigbee: 2405~2475MHz
Channel Number	IEEE 802.11b/g/n(20MHz): 11 Channels IEEE 802.11n(40MHz): 7 Channels Zigbee: 15 Channels
Type of Modulation	IEEE 802.11b: DSSS (CCK,DQPSK,DBPSK); IEEE 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK); IEEE 802.11n(HT20 and HT40) : OFDM (256QAM,64QAM, 16QAM,QPSK,BPSK); Zigbee: OQPSK
Max. Conducted Power	IEEE 802.11b: 11.54 dBm IEEE 802.11g: 11.02 dBm IEEE 802.11n(20MHz): 11.14 dBm IEEE 802.11n(40MHz): 10.46 dBm Zigbee:8.32 dBm
Operate Temp.Range	-40°C to +65°C
Note:	<ol style="list-style-type: none"> <li>The information of the EUT is declared by the manufacturer.</li> <li>The laboratory is not responsible for the product technical specification provided by the client.</li> </ol>

## 2. Test Sites

### 2.1 Test Facilities

The tests and measurements refer to this report were performed by EMC testing Lab. of CVC Testing Technology Co., Ltd.

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Telephone : +86-20-32293888

Fax : +86-20-32293889

FCC(Test firm designation number: CN1282)

IC(Test firm CAB identifier number: CN0103)

### 2.2 Description of Non-standard Method and Deviations

The testing and measurement methods used in this report are applied by all standard methods. Not any non-standard method or deviation from the used standards was used.

### 2.3 List of Test and Measurement Instruments

Refer to **Appendix E**.

### 3. Test Configuration

#### 3.1 Test Mode

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

Test Mode	Antenna Delivery	Test Channel
IEEE 802.11b	1TX / 1RX	1,6,11
IEEE 802.11g	1TX / 1RX	1,6,11
IEEE 802.11n 2.4GHz 20MHz	1TX / 1RX	1,6,11
IEEE 802.11n 2.4GHz 40MHz	1TX / 1RX	3,6,9
Zigbee	1TX / 1RX	11,18,25

The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in lie-down position (X axis) and the worst case was recorded.

In order to find the worst case condition, Pre-tests are needed at the presence of different data rate and different channels. Preliminary tests have been done on all the configuration for confirming worst case.

Data rate and channels below means worst-case rate of each test item.

Worst-case data rates and channels are shown as following table.

Test Mode	Data Rate		
	Antenna 1	Antenna 2	MIMO
IEEE 802.11b TX mode	1 Mbps	/	/
IEEE 802.11g TX mode	6 Mbps	/	/
IEEE 802.11n 2.4GHz 20MHz TX mode	6.5 Mbps	/	/
IEEE 802.11n 2.4GHz 40MHz TX mode	13.5 Mbps	/	/
Zigbee TX mode	250 kbps	/	/

Test Items	Test Modes	Test Channels
Conducted Emissions	IEEE 802.11b	1
Radiated Emissions	IEEE 802.11b	1
Radiated Emissions (Band Edge)	IEEE 802.11n40 Zigbee	1,11/ 11,25
Maximum conducted output power	IEEE 802.11b / IEEE 802.11g/ IEEE 802.11n20/ IEEE 802.11n40/ Zigbee	1,6,11/ 1,6,11/ 1,6,11/ 3,6,9/ 11,18,25
Minimum 6 dB bandwidth	IEEE 802.11b / IEEE 802.11g/ IEEE 802.11n20/ IEEE 802.11n40/ Zigbee	1,6,11/ 1,6,11/ 1,6,11/ 3,6,9/ 11,18,25
Occupied Channel Bandwidth	IEEE 802.11b / IEEE 802.11g/ IEEE 802.11n20/ IEEE 802.11n40/ Zigbee	1,6,11/ 1,6,11/ 1,6,11/ 3,6,9/ 11,18,25
Band Edge Measurement	IEEE 802.11b / IEEE 802.11g/ IEEE 802.11n20/ IEEE 802.11n40/ Zigbee	1,11/ 1,11/ 1,11/ 3,9/ 11,25
Maximum Power spectral density	IEEE 802.11b / IEEE 802.11g/ IEEE 802.11n20/ IEEE 802.11n40/ Zigbee	1,6,11/ 1,6,11/ 1,6,11/ 3,6,9/ 11,18,25
Spurious RF Conducted Emissions	IEEE 802.11b / IEEE 802.11g/ IEEE 802.11n20/ IEEE 802.11n40/ Zigbee	1,6,11/ 1,6,11/ 1,6,11/ 3,6,9/ 11,18,25

### 3.2 Duty cycle

TestMode	Antenna	Channel	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]	Limit	Verdict
11B	Ant1	2412	20.00	20.00	100.00	---	---
		2437	20.00	20.00	100.00	---	---
		2462	20.00	20.00	100.00	---	---
11G	Ant1	2412	2.07	2.10	98.57	---	---
		2437	2.06	2.30	89.57	---	---
		2462	2.07	2.16	95.83	---	---
11N20SISO	Ant1	2412	1.92	2.05	93.66	---	---
		2437	1.93	1.99	96.98	---	---
		2462	1.92	2.15	89.30	---	---
11N40SISO	Ant1	2422	0.94	1.11	84.68	---	---
		2437	1.22	1.26	96.83	---	---
		2452	0.94	1.19	78.99	---	---
Zigbee	Ant1	2405	20.00	20.00	100.00	---	---
		2440	20.00	20.00	100.00	---	---
		2475	20.00	20.00	100.00	---	---



## 4. Summary of measurement results

Summary of measurements of results	Clause in FCC rules	Verdict	Note
Conducted Emissions	15.207	PASS	/
Radiated Emissions	15.247(d),15.205,15.209	PASS	/
Maximum conducted output power	15.247(b)(3)	PASS	/
Minimum 6 dB bandwidth	15.247(a)(2)	PASS	/
Occupied Channel Bandwidth	15.247(a)(2)	PASS	/
Band Edge Measurement	15.247(d)	PASS	/
Maximum Power spectral density	15.247(e)	PASS	/
Spurious RF Conducted Emissions	15.247(d)	PASS	/

## 5. Measurement procedure

### 5.1 Conducted Emission

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

#### Method of Measurement:

The EUT was setup according to ANSI C63.10, 2013 for compliance to FCC 47CFR 15.247 requirements. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface. The EUT and simulators are connected to the main power through a line impedance stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs) Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.

The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.

Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.

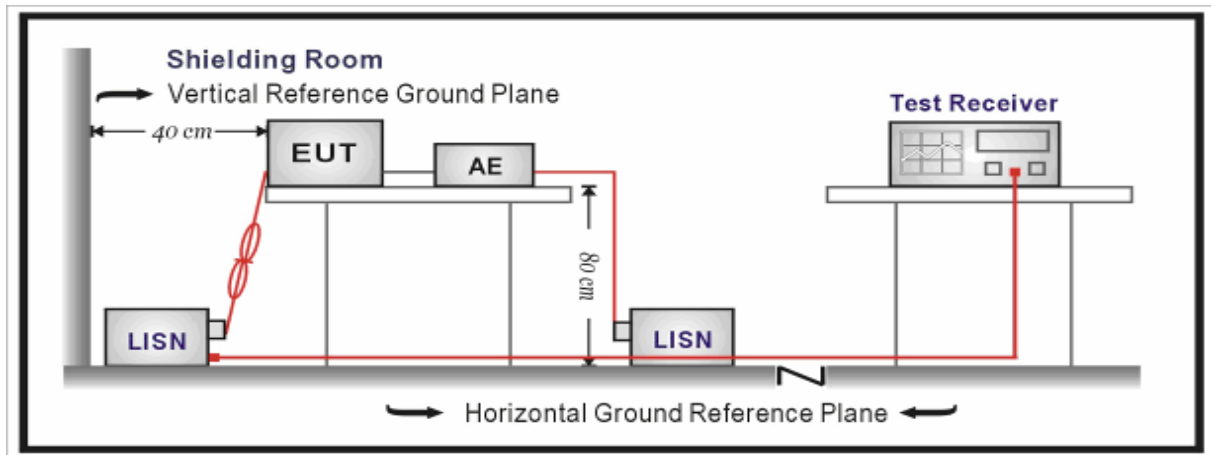
#### Limits:

Frequency (MHz)	Conducted Limits(dBμV)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56 *	56 to 46*
0.5 - 5	56	46
5 - 30	60	50

Note 1: The lower limit shall apply at the transition frequencies.

Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

### Test Setup:



### Measurement Data

An initial pre-scan was performed on the live and neutral lines with peak detector.

Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

Notes:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Level = Reading + Factor.

### Measurement Uncertainty:

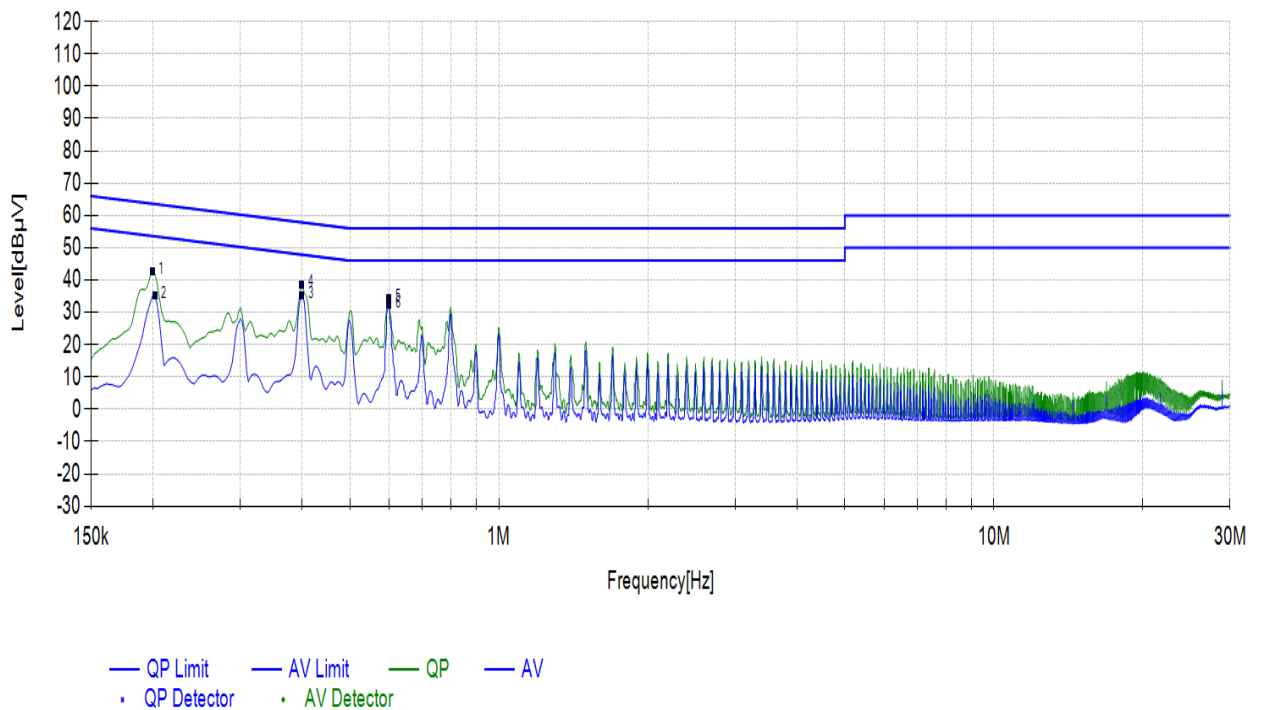
The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor  $k = 1.96$ .  $U = 3.12$  dB.

Test Results:

During the test, the Conducted Emission from 150KHz to 30MHz was performed in all modes with all channels, and all antenna. 802.11b, Channel 1 are selected as the worst condition. The test data of the worst-case condition was recorded in this report.

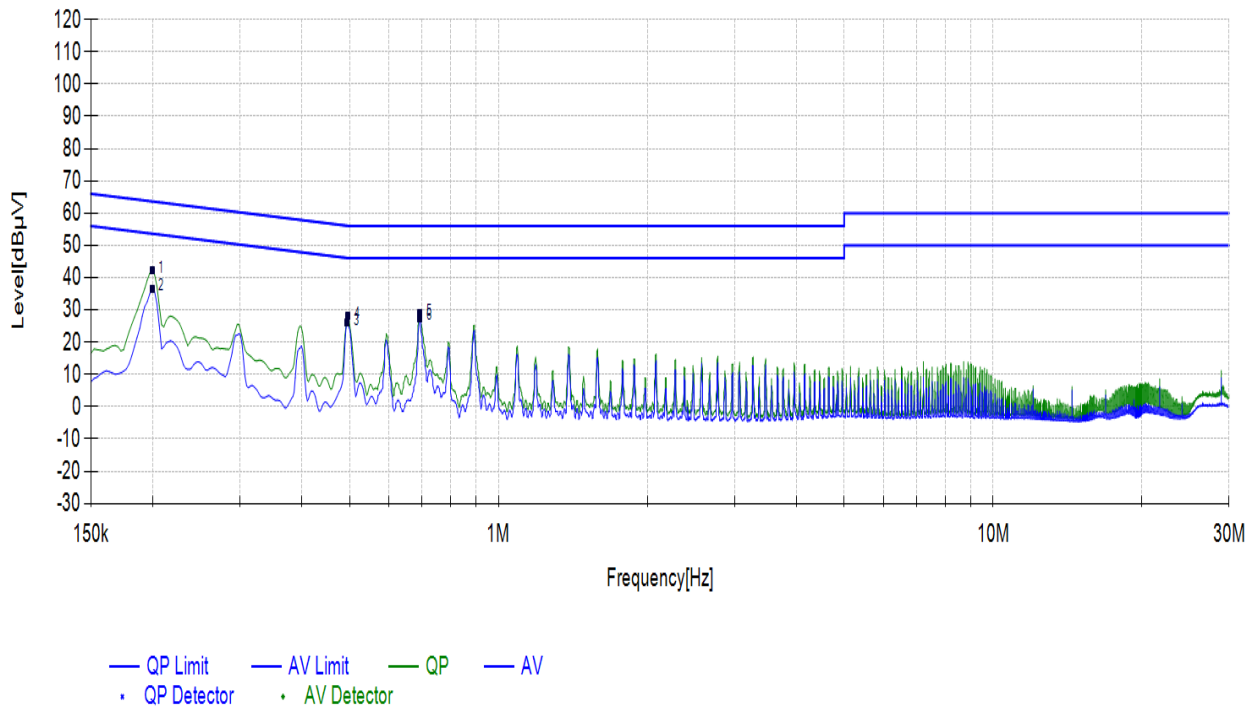
Power Line	L
Test channel	Worst-Case

Suspected List								
NO.	Freq. [MHz]	Factor [dB]	Reading [dBμV]	Level [dBμV]	Limit [dBμV]	Margin [dB]	Detector	Pass/Fail
1	0.1995	10.46	32.27	42.73	63.63	20.90	QP	PASS
4	0.3998	10.48	28.22	38.70	57.86	19.16	QP	PASS
5	0.6000	10.49	23.95	34.44	56.00	21.56	QP	PASS
2	0.2018	10.46	24.75	35.21	53.54	18.33	AV	PASS
6	0.6000	10.49	21.70	32.19	46.00	13.81	AV	PASS
3	0.3998	10.48	24.54	35.02	47.86	12.84	AV	PASS



Power Line	N
Test channel	Worst-Case

Suspected List								
NO.	Freq. [MHz]	Factor [dB]	Reading [dBμV]	Level [dBμV]	Limit [dBμV]	Margin [dB]	Detector	Pass/Fail
1	0.1995	10.27	31.89	42.16	63.63	21.47	QP	PASS
4	0.4965	10.29	17.80	28.09	56.06	27.97	QP	PASS
5	0.6945	10.30	18.68	28.98	56.00	27.02	QP	PASS
2	0.1995	10.27	26.35	36.62	53.63	17.01	AV	PASS
6	0.6945	10.30	17.20	27.50	46.00	18.50	AV	PASS
3	0.4943	10.29	15.65	25.94	46.10	20.16	AV	PASS



## 5.2 Radiated Emission

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

### Method of Measurement:

The EUT was setup and tested according to ANSI C63.10, 2013.

The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from Antenna to the EUT was 3 meters.

The Antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the Antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.

The resolution bandwidth below 1GHz setting on the field strength meter is 120 kHz and above 1GHz is 1MHz.

The frequency range from 30MHz to 10th harmonic is checked.

Note: When doing emission measurement above 1GHz, the horn Antenna will be bended down a little (as horn

Antenna has the narrow beamwidth) in order to keeping the Antenna in the “cone of radiation” of EUT. The 3dB beamwidth is 10~60 degrees for H-plane and 10~90 degrees for E-plane.

### Limits:

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a) of FCC part 15, must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Frequency	Limit (μV/m )	Limit (dBμV/m @3m)	Remark
0.009MHz-0.490MHz	2400/F(kHz)@300m	/	Quasi-peak Level
0.490MHz~1.705MHz	24000/F(kHz)@30m	/	Quasi-peak Level
1.705MHz~30.0MHz	30@30m	/	Quasi-peak Level
30MHz-88MHz	100@3m	40.0	Quasi-peak Level
88MHz-216MHz	150@3m	43.5	Quasi-peak Level
216MHz-960MHz	200@3m	46.0	Quasi-peak Level

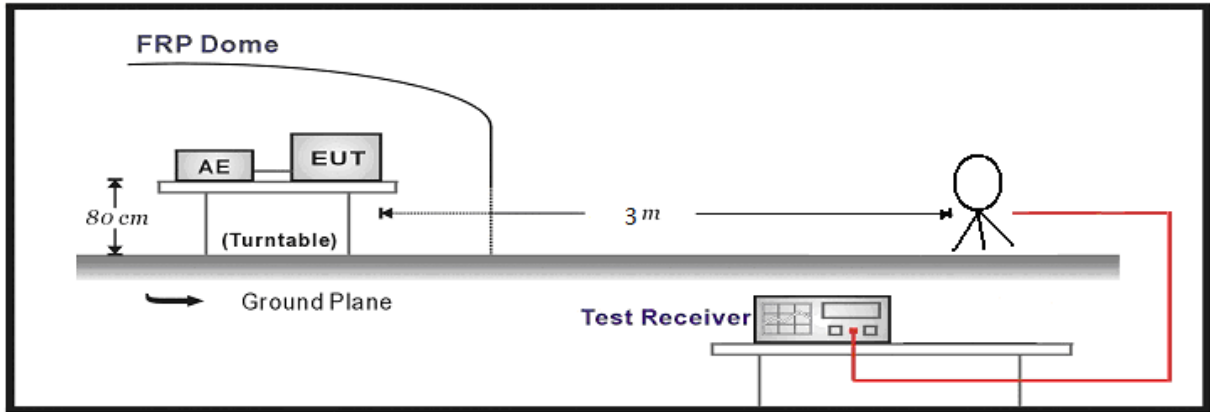
960MHz-1GHz	500@3m	54.0	Quasi-peak Level
Above 1GHz	500@3m	54.0	Average Level
	5000@3m	74.0	Peak Level

Spurious Radiated Emissions are permitted in any of the frequency bands listed below:

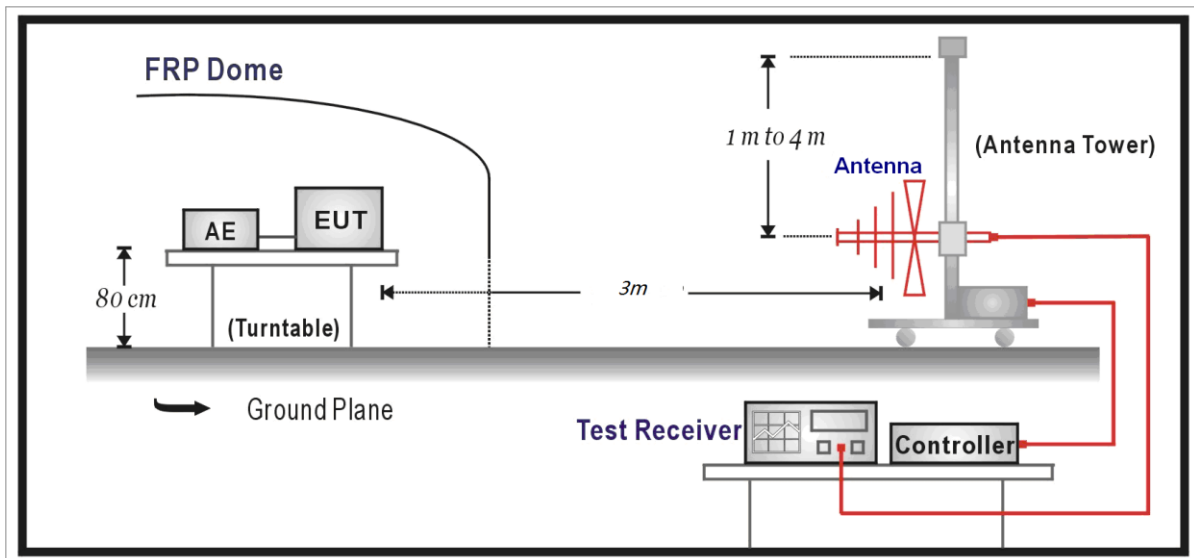
MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.
12.57675-12.57725	322-335.4	3600-4400	/
13.36-13.41	/	/	/

### Test Setup:

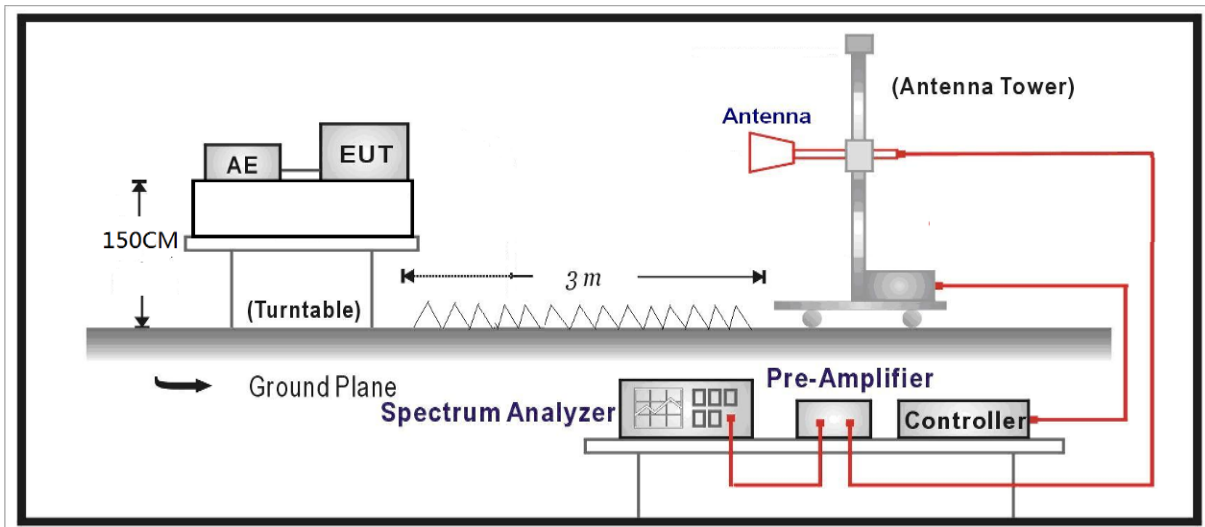
Below 30MHz Test Setup:



Below 1GHz Test Setup:



Above 1GHz Test Setup:





### Measurement Data:

The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

$$\text{Final Level} = \text{Reading} - \text{Factor}$$

$$\text{Factor} = \text{Preamplifier Factor} - \text{Antenna Factor} - \text{Cable Loss}$$

### Measurement Uncertainty:

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor  $k = 1.96$ .

Frequency	Uncertainty
9KHz-30MHz	3.55 dB
30MHz-200MHz	4.19 dB
200MHz-1GHz	3.63 dB
Above 1GHz	3.68 dB

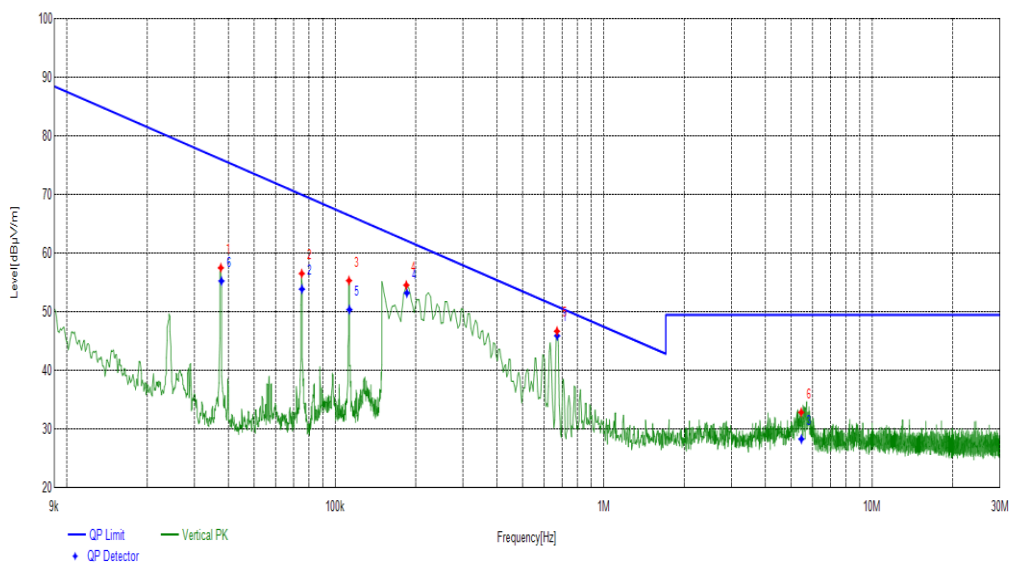
### Test Results:

#### SPURIOUS EMISSIONS:

During the test, the Radiates Emission from 9KHz to 30MHz was performed in all modes (WIFI and Zigbee) with all channels and all antenna. 802.11b, Channel 1 are selected as the worst condition. The test data of the worst-case condition was recorded in this report.

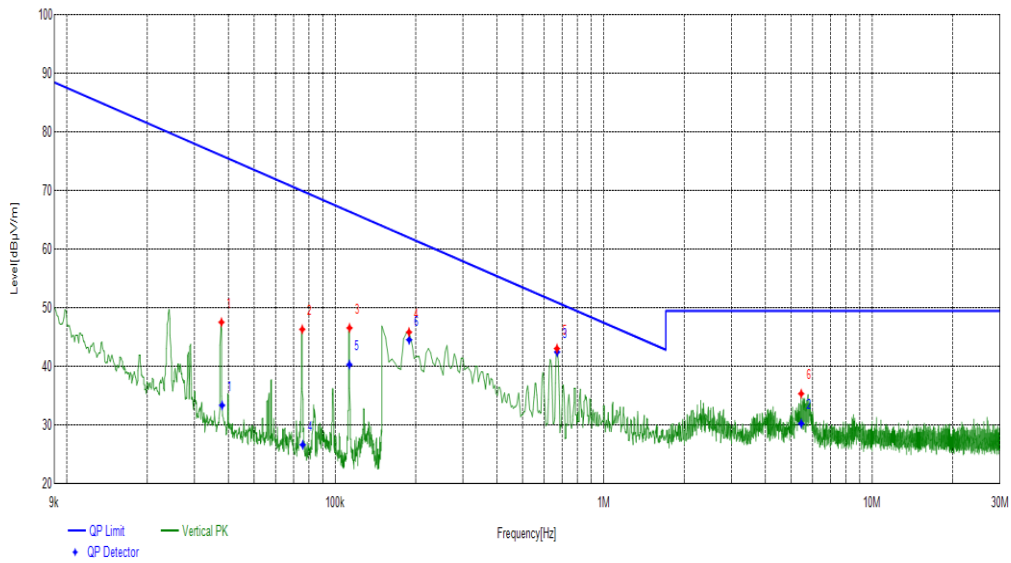
Radiated Emission	9KHz-30MHz
Polarity	X axis
Test channel	Worst-Case

Antenna: AT02								
Final Data List								
Frequency [MHz]	Polarity	Factor [dB]	QP Value [dB $\mu$ V/m]	QP Limit [dB $\mu$ V/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pass/Fail
0.6715	X axis	19.68	45.97	50.97	5.00	100	53	PASS
0.0752	X axis	19.68	53.93	70.02	16.09	100	99	PASS
5.4557	X axis	19.66	28.34	49.50	21.16	100	117	PASS
0.1850	X axis	19.49	53.27	62.18	8.91	100	229	PASS
0.1130	X axis	19.70	50.43	66.47	16.04	100	265	PASS
0.0377	X axis	19.63	55.30	76.03	20.73	100	263	PASS



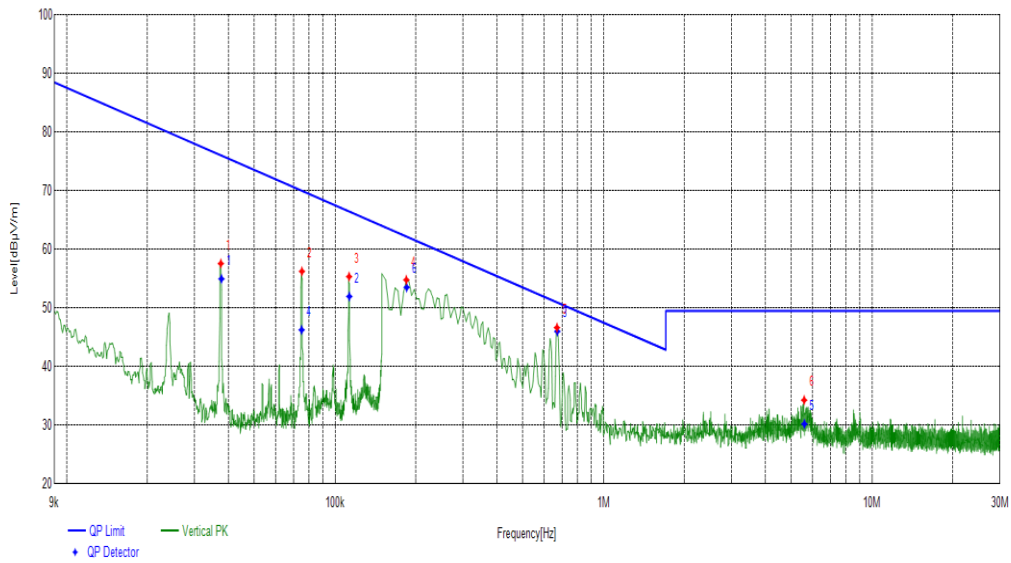
Radiated Emission	9KHz-30MHz
Polarity	Y axis
Test channel	Worst-Case

Antenna: AT02								
Final Data List								
Frequency [MHz]	Polarity	Factor [dB]	QP Value [dB $\mu$ V/m]	QP Limit [dB $\mu$ V/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pass/Fail
0.0379	Y axis	19.63	33.42	75.99	42.57	100	283	PASS
5.4487	Y axis	19.66	30.32	49.50	19.18	100	86	PASS
0.6714	Y axis	19.68	42.50	50.97	8.47	100	42	PASS
0.0757	Y axis	19.68	26.68	69.96	43.28	100	17	PASS
0.1130	Y axis	19.70	40.37	66.47	26.10	100	5	PASS
0.1886	Y axis	19.48	44.60	62.01	17.41	100	4	PASS



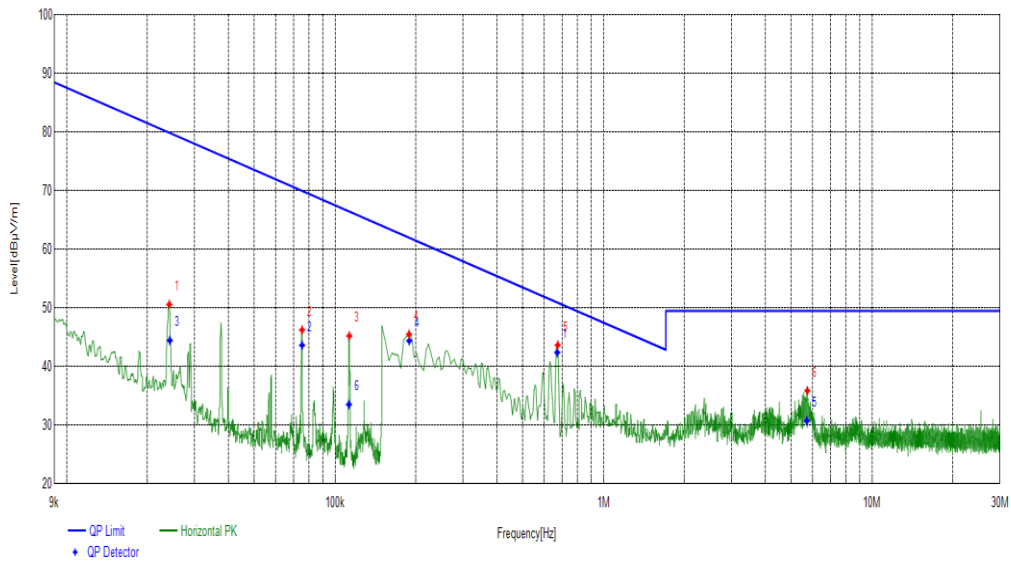
Radiated Emission	9KHz-30MHz
Polarity	X axis
Test channel	Worst-Case

Antenna: 2.4GHz								
Final Data List								
Frequency [MHz]	Polarity	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pass/Fail
0.0377	X axis	19.63	54.99	76.03	21.04	100	259	PASS
0.1129	X axis	19.70	51.99	66.48	14.49	100	150	PASS
0.6725	X axis	19.68	46.03	50.96	4.93	100	116	PASS
0.0750	X axis	19.68	46.29	70.04	23.75	100	91	PASS
5.5994	X axis	19.66	30.24	49.50	19.26	100	61	PASS
0.1847	X axis	19.49	53.55	62.19	8.64	100	360	PASS



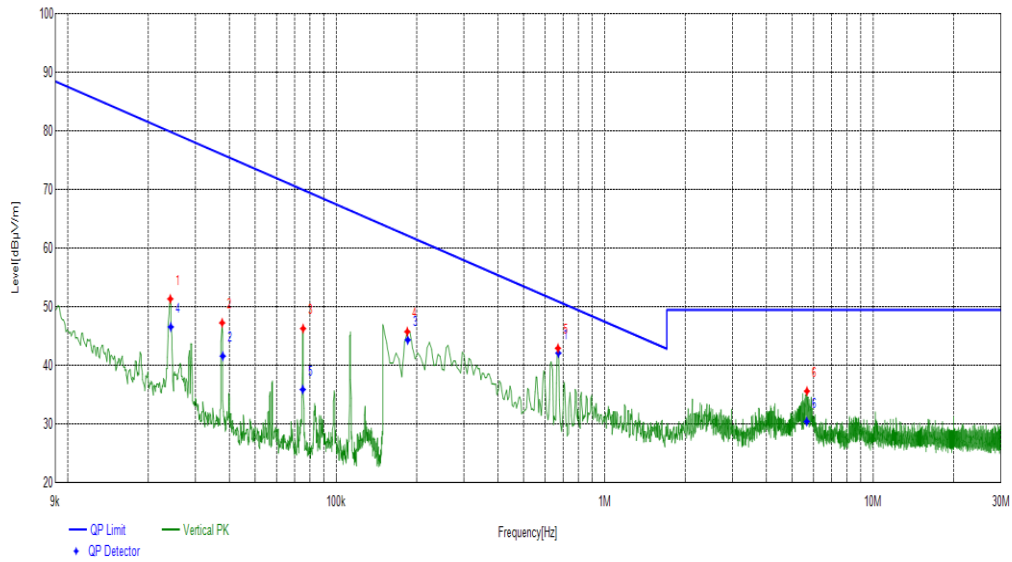
Radiated Emission	9KHz-30MHz
Polarity	Y axis
Test channel	Worst-Case

Antenna: 2.4GHz								
Final Data List								
Frequency [MHz]	Polarity	Factor [dB]	QP Value [dB $\mu$ V/m]	QP Limit [dB $\mu$ V/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pass/Fail
0.6720	Y axis	19.68	42.44	50.96	8.52	100	174	PASS
0.0753	Y axis	19.68	43.67	70.00	26.33	100	208	PASS
0.0242	Y axis	19.62	44.50	79.88	35.38	100	275	PASS
0.1888	Y axis	19.48	44.44	62.00	17.56	100	333	PASS
5.7147	Y axis	19.66	30.79	49.50	18.71	100	352	PASS
0.1125	Y axis	19.70	33.57	66.51	32.94	100	342	PASS



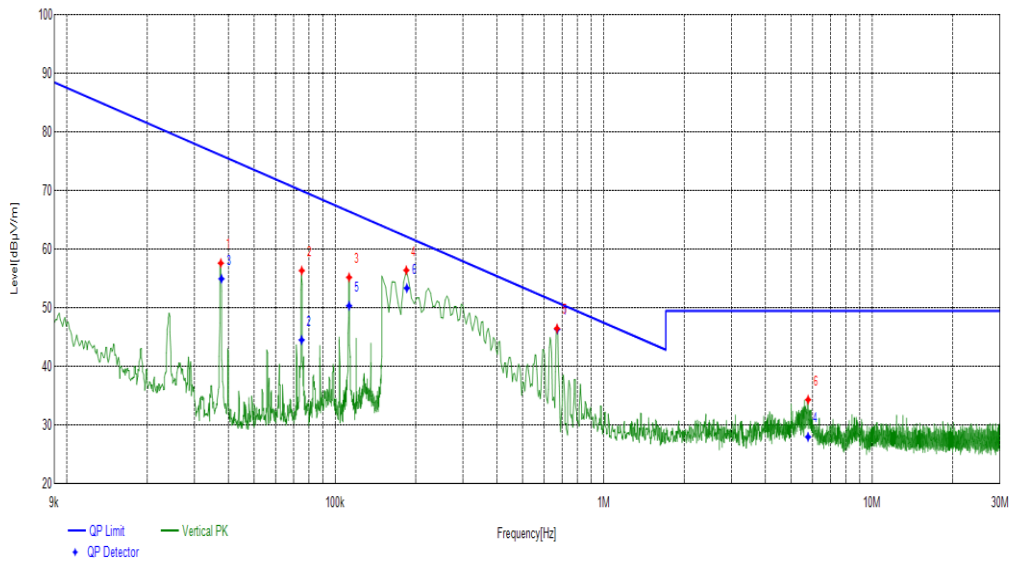
Radiated Emission	9KHz-30MHz
Polarity	X axis
Test channel	Worst-Case

Antenna: 3030								
Final Data List								
Frequency [MHz]	Polarity	Factor [dB]	QP Value [dB $\mu$ V/m]	QP Limit [dB $\mu$ V/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pass/Fail
0.6729	X axis	19.68	42.16	50.95	8.79	100	70	PASS
0.0378	X axis	19.63	41.65	76.01	34.36	100	27	PASS
0.1848	X axis	19.49	44.40	62.19	17.79	100	360	PASS
0.0242	X axis	19.62	46.62	79.88	33.26	100	101	PASS
0.0751	X axis	19.68	35.95	70.03	34.08	100	123	PASS
5.6634	X axis	19.66	30.49	49.50	19.01	100	223	PASS



Radiated Emission	9KHz-30MHz
Polarity	Y axis
Test channel	Worst-Case

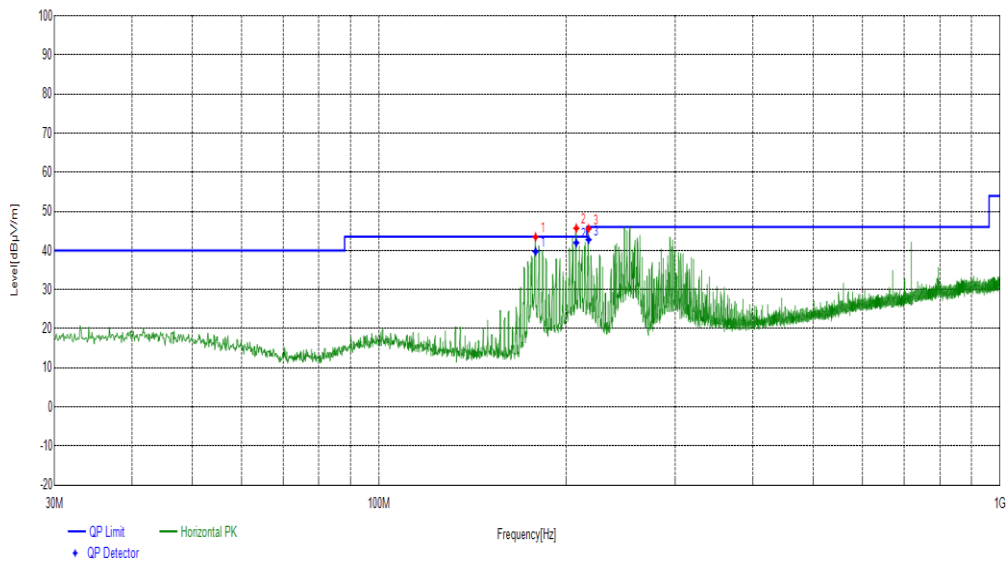
Antenna: 3030								
Final Data List								
Frequency [MHz]	Polarity	Factor [dB]	QP Value [dB $\mu$ V/m]	QP Limit [dB $\mu$ V/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pass/Fail
0.6722	Y axis	19.68	46.39	50.96	4.57	100	303	PASS
0.0750	Y axis	19.68	44.57	70.05	25.48	100	291	PASS
0.0377	Y axis	19.63	55.00	76.03	21.03	100	201	PASS
5.7756	Y axis	19.68	28.04	49.50	21.46	100	175	PASS
0.1127	Y axis	19.70	50.40	66.49	16.09	100	138	PASS
0.1849	Y axis	19.49	53.41	62.19	8.78	100	360	PASS



**WIFI:**

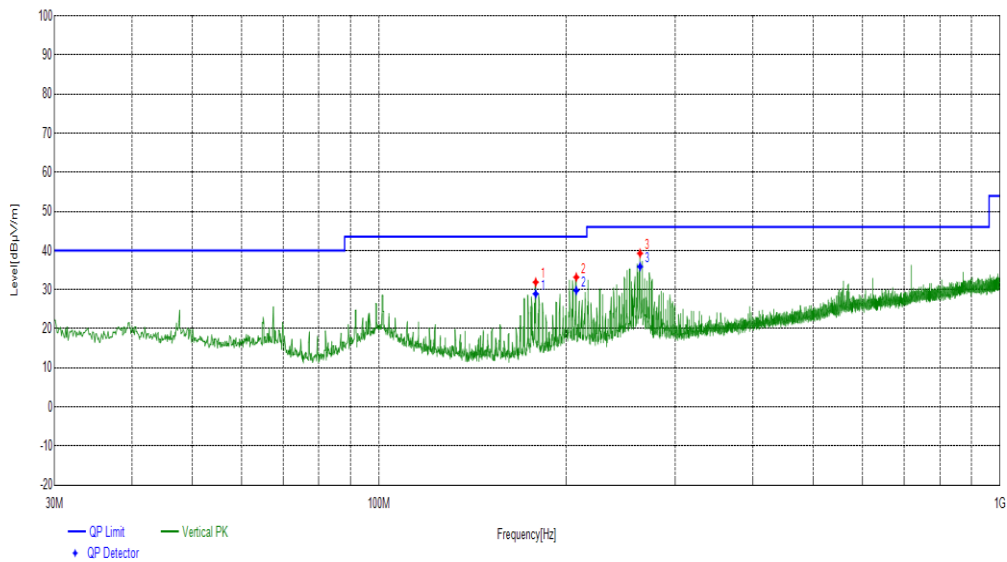
During the test, the Radiates Emission from 30MHz to 40GHz was performed in WIFI and Zigbee all modes with all channels and all antenna. 802.11ax20, Channel 1 are selected as the worst condition. The test data of the worst-case condition was recorded in this report.

Radiates Emission	30M~1G							
Test channel	Worst-Case							
Antenna	AT02							
Final Data List								
Frequency [MHz]	Polarity	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pass/Fail
178.6189	Horizontal	16.89	39.74	43.52	3.78	106	274	PASS
207.7218	Horizontal	19.15	41.99	43.52	1.53	117	202	PASS
217.4227	Horizontal	19.03	42.78	46.02	3.24	122	161	PASS





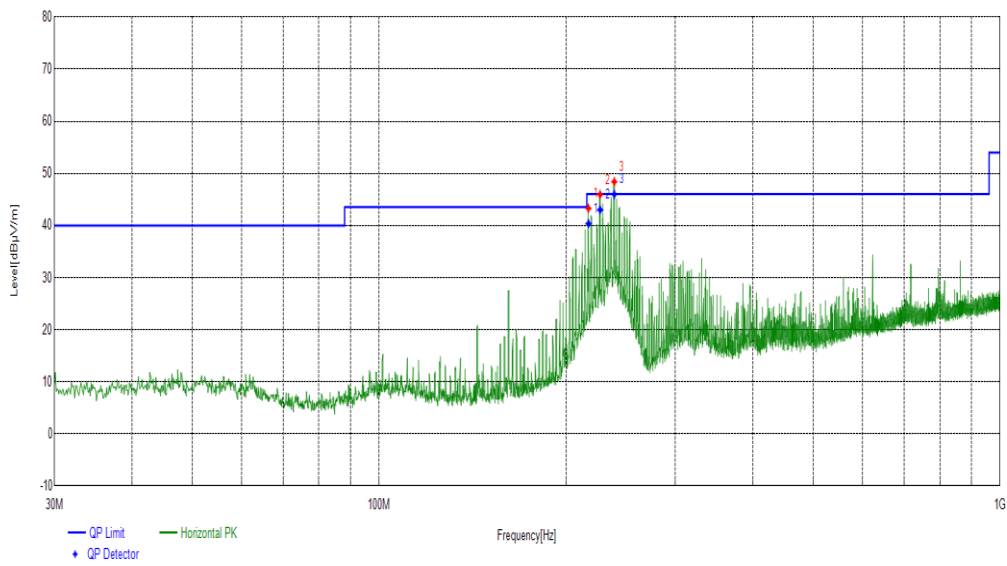
Radiates Emission	30M~1G							
Test channel	Worst-Case							
Antenna	AT02							
Final Data List								
Frequency [MHz]	Polarity	Factor [dB]	QP Value [dB $\mu$ V/m]	QP Limit [dB $\mu$ V/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pass/Fail
178.7159	Vertical	16.90	28.91	43.52	14.61	115	197	PASS
207.7218	Vertical	19.15	29.78	43.52	13.74	122	216	PASS
263.1143	Vertical	20.37	35.88	46.02	10.14	106	356	PASS



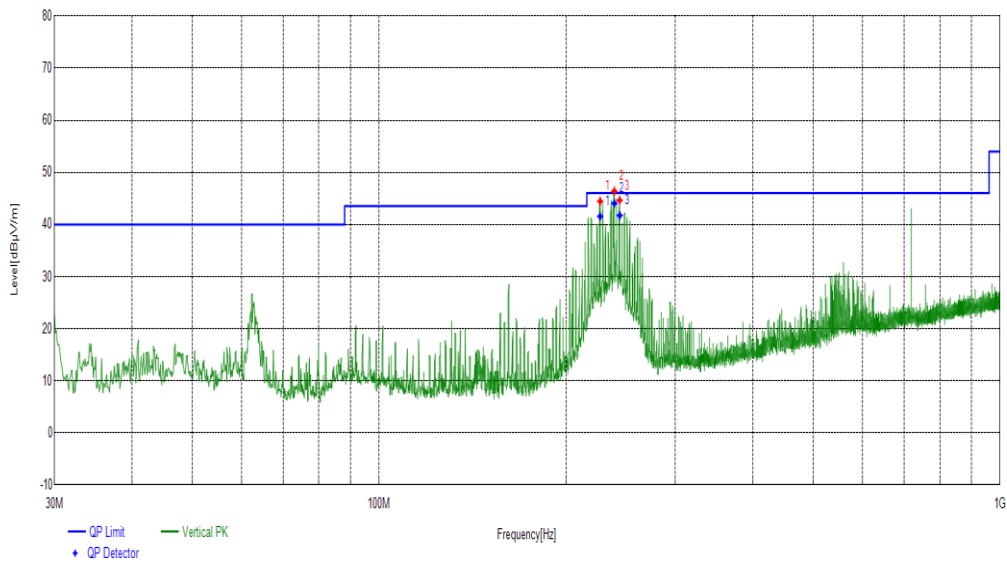
Radiates Emission	30M~1G
Test channel	Worst-Case
Antenna	2.4GHz

**Final Data List**

Frequency [MHz]	Polarity	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pass/Fail
217.3257	Horizontal	13.35	40.35	46.02	5.67	167	156	PASS
226.9297	Horizontal	13.60	43.00	46.02	3.02	122	328	PASS
239.1620	Horizontal	13.92	45.98	46.02	0.04	320	322	PASS



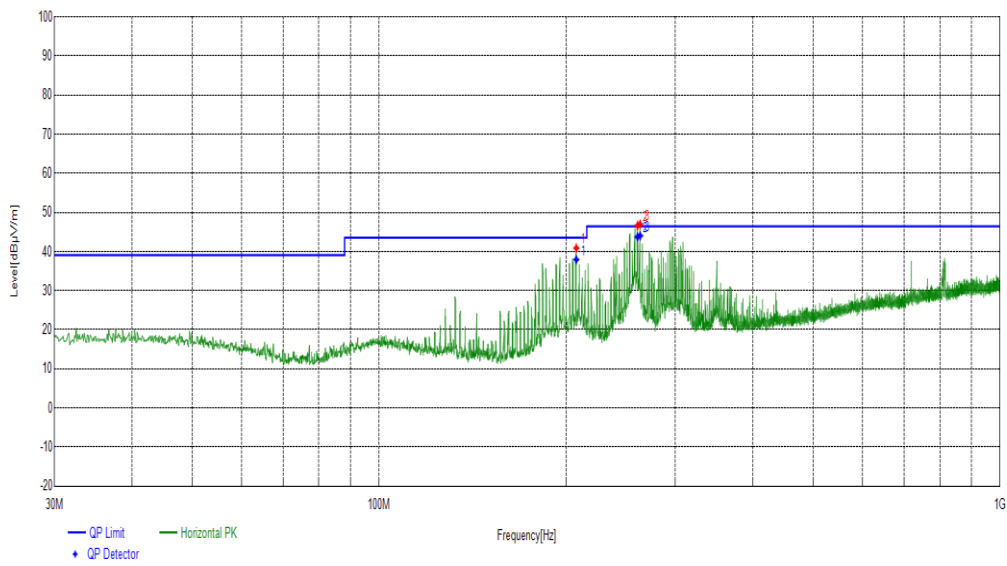
Radiates Emission	30M~1G							
Test channel	Worst-Case							
Antenna	2.4GHz							
Final Data List								
Frequency [MHz]	Polarity	Factor [dB]	QP Value [dB $\mu$ V/m]	QP Limit [dB $\mu$ V/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pass/Fail
226.9297	Vertical	13.60	41.55	46.02	4.47	126	356	PASS
239.1616	Vertical	13.92	44.04	46.02	1.98	280	237	PASS
244.0034	Vertical	14.05	41.73	46.02	4.29	133	276	PASS



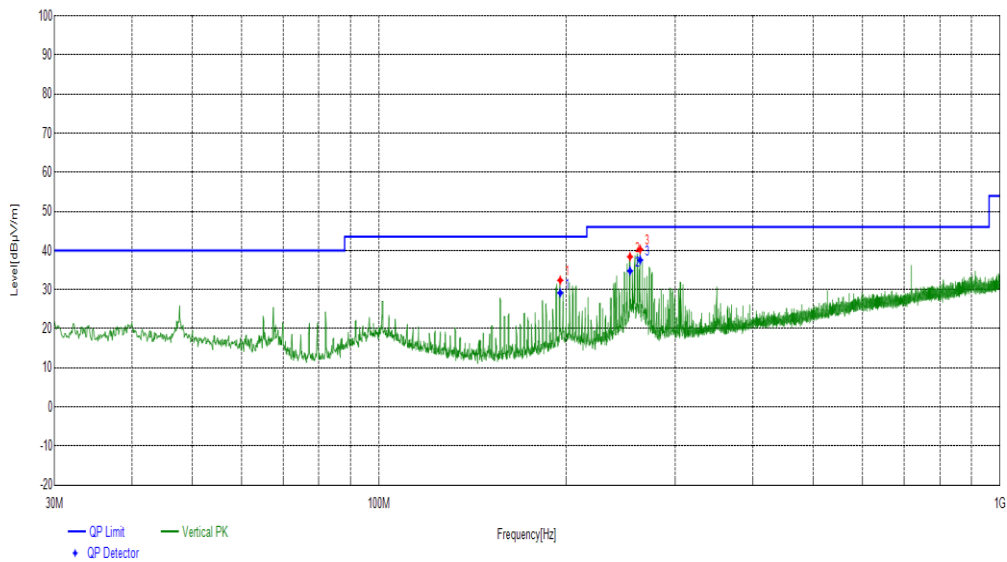
Radiates Emission	30M~1G
Test channel	Worst-Case
Antenna	3030

**Final Data List**

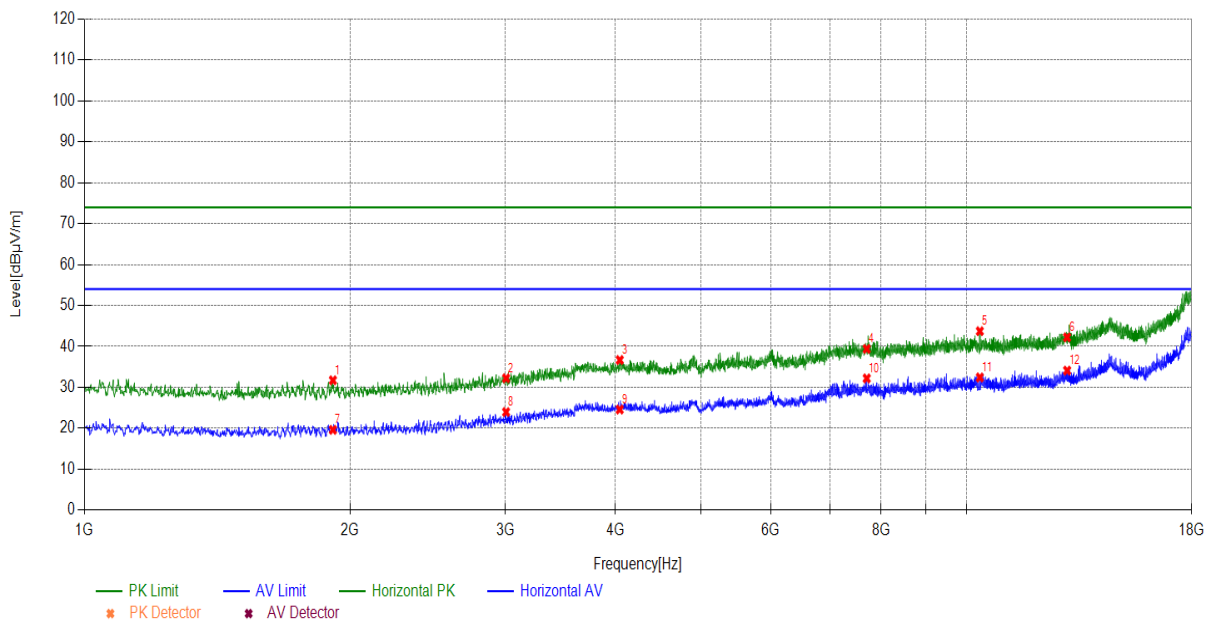
Frequency [MHz]	Polarity	Factor [dB]	QP Value [dB $\mu$ V/m]	QP Limit [dB $\mu$ V/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pass/Fail
207.7218	Horizontal	19.15	37.93	43.52	5.59	109	174	PASS
260.6891	Horizontal	20.28	43.73	46.44	2.71	141	6	PASS
263.2113	Horizontal	20.37	44.03	46.44	2.41	132	2	PASS



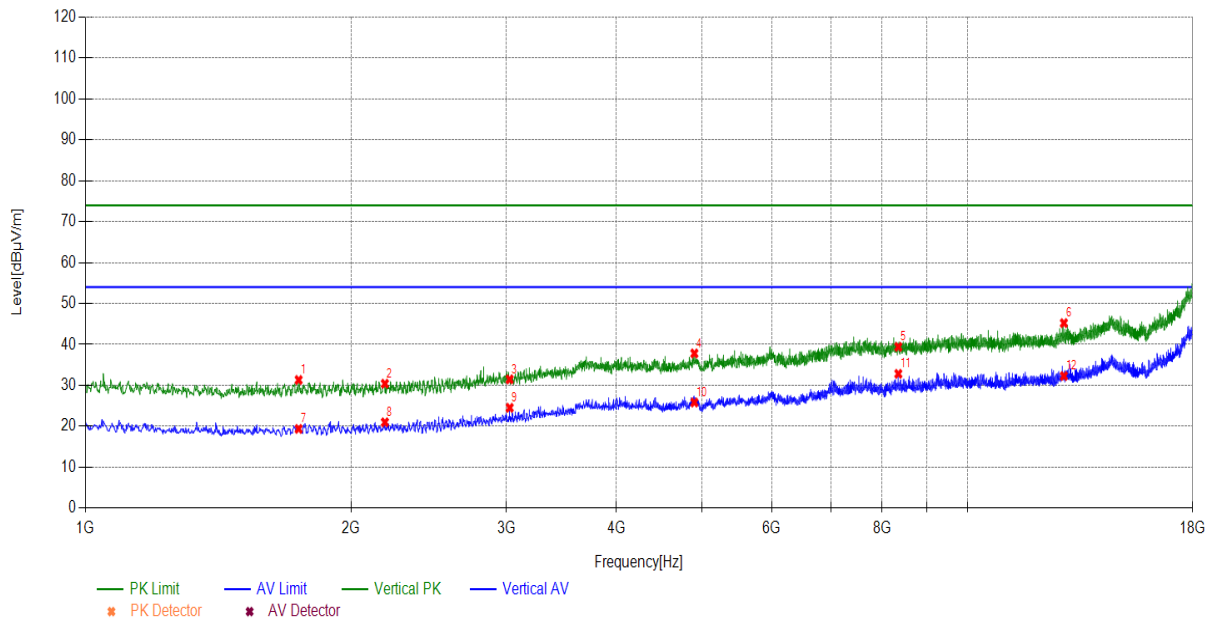
Radiates Emission	30M~1G							
Test channel	Worst-Case							
Antenna	3030							
Final Data List								
Frequency [MHz]	Polarity	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pass/Fail
195.6926	Vertical	18.76	29.17	43.52	14.35	114	185	PASS
253.5104	Vertical	20.18	34.79	46.02	11.23	105	322	PASS
263.2113	Vertical	20.37	37.57	46.02	8.45	126	359	PASS



Radiates Emission	1G~18G								
Test channel	Worst-Case								
polarization	Horizontal								
Antenna	AT02								
Suspected List									
Frequency[MHz]	Factor [dB]	Reading [dB $\mu$ V/m]	Level [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/Fail
1912.9913	-7.99	39.73	31.74	74.00	42.26	PK	150	120	PASS
3006.2006	-4.64	36.87	32.23	74.00	41.77	PK	150	350	PASS
4045.0045	-2.23	38.93	36.70	74.00	37.30	PK	150	200	PASS
7707.1707	4.92	34.49	39.41	74.00	34.59	PK	150	200	PASS
10354.3354	8.36	35.39	43.75	74.00	30.25	PK	150	70	PASS
13003.2003	9.70	32.53	42.23	74.00	31.77	PK	150	350	PASS
1912.9913	-7.99	27.63	19.64	54.00	34.36	AV	150	350	PASS
3006.2006	-4.64	28.63	23.99	54.00	30.01	AV	150	10	PASS
4045.0045	-2.23	26.84	24.61	54.00	29.39	AV	150	320	PASS
7707.1707	4.92	27.29	32.21	54.00	21.79	AV	150	10	PASS
10354.3354	8.36	24.07	32.43	54.00	21.57	AV	150	10	PASS
13003.2003	9.70	24.42	34.12	54.00	19.88	AV	150	10	PASS



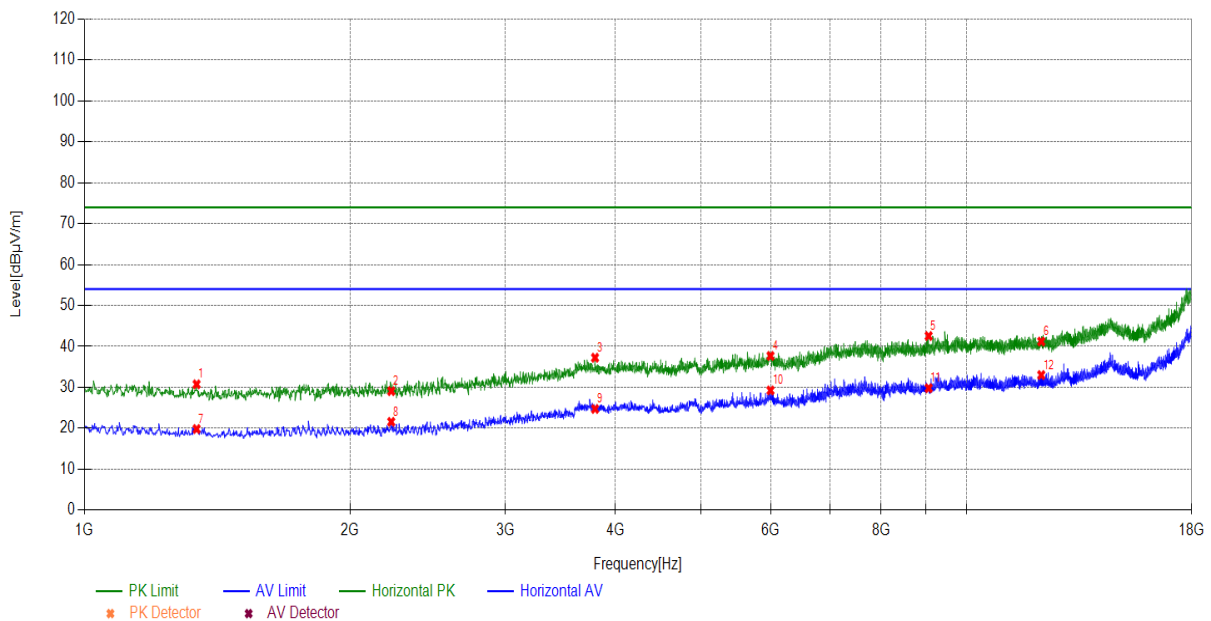
Radiates Emission	1G~18G								
Test channel	Worst-Case								
polarization	Vertical								
Antenna	AT02								
Suspected List									
Frequency[MHz]	Factor [dB]	Reading [dB $\mu$ V/m]	Level [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/Fail
1744.6745	-8.41	39.76	31.35	74.00	42.65	PK	150	260	PASS
2185.0185	-7.40	37.83	30.43	74.00	43.57	PK	150	350	PASS
3026.6027	-4.56	36.05	31.49	74.00	42.51	PK	150	230	PASS
4901.8902	-0.93	38.75	37.82	74.00	36.18	PK	150	80	PASS
8348.1348	5.50	33.93	39.43	74.00	34.57	PK	150	260	PASS
12860.386	9.30	35.93	45.23	74.00	28.77	PK	150	360	PASS
1744.6745	-8.41	27.79	19.38	54.00	34.62	AV	150	30	PASS
2185.0185	-7.40	28.39	20.99	54.00	33.01	AV	150	10	PASS
3026.6027	-4.56	29.10	24.54	54.00	29.46	AV	150	10	PASS
4901.8902	-0.93	26.77	25.84	54.00	28.16	AV	150	330	PASS
8348.1348	5.50	27.34	32.84	54.00	21.16	AV	150	10	PASS
12860.386	9.30	23.00	32.30	54.00	21.70	AV	150	10	PASS



Radiates Emission	1G~18G
Test channel	Worst-Case
polarization	Horizontal
Antenna	2.4GHz

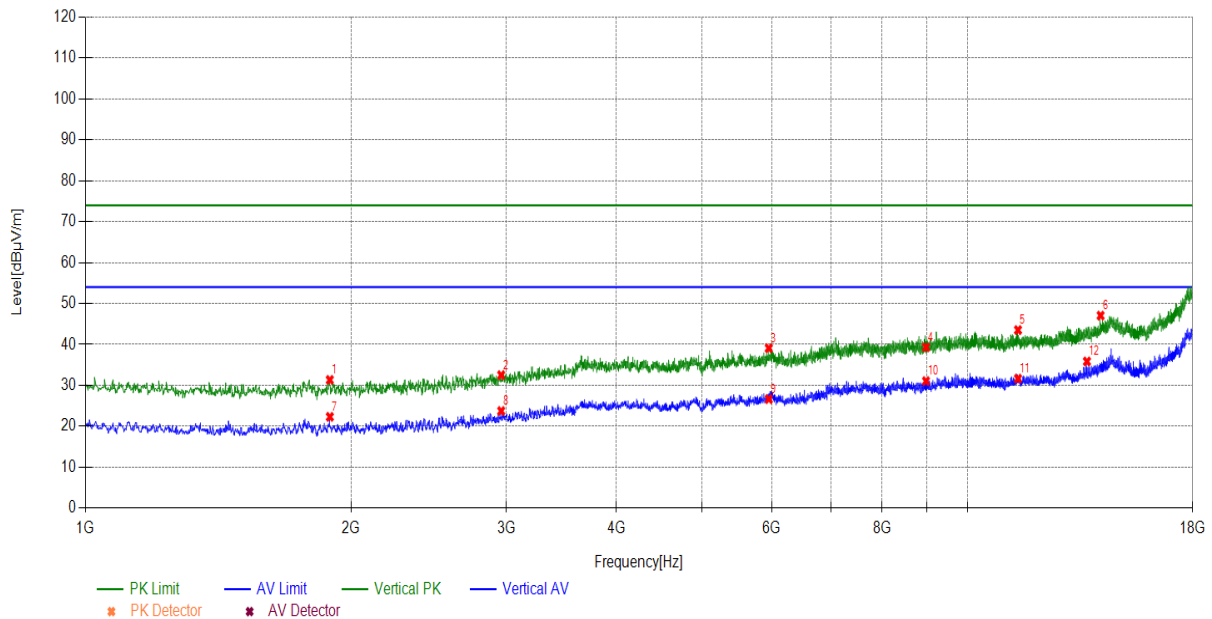
**Suspected List**

Frequency[MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/Fail
1340.034	-9.67	40.44	30.77	74.00	43.23	PK	150	230	PASS
2227.5228	-7.29	36.38	29.09	74.00	44.91	PK	150	10	PASS
3791.6792	-2.56	39.82	37.26	74.00	36.74	PK	150	310	PASS
5995.0995	2.70	34.98	37.68	74.00	36.32	PK	150	170	PASS
9058.8059	6.68	35.88	42.56	74.00	31.44	PK	150	150	PASS
12154.8155	7.55	33.66	41.21	74.00	32.79	PK	150	200	PASS
1340.034	-9.67	29.52	19.85	54.00	34.15	AV	150	70	PASS
2227.5228	-7.29	28.89	21.60	54.00	32.40	AV	150	10	PASS
3791.6792	-2.56	27.30	24.74	54.00	29.26	AV	150	170	PASS
5995.0995	2.70	26.58	29.28	54.00	24.72	AV	150	10	PASS
9058.8059	6.68	23.13	29.81	54.00	24.19	AV	150	360	PASS
12154.8155	7.55	25.48	33.03	54.00	20.97	AV	150	10	PASS





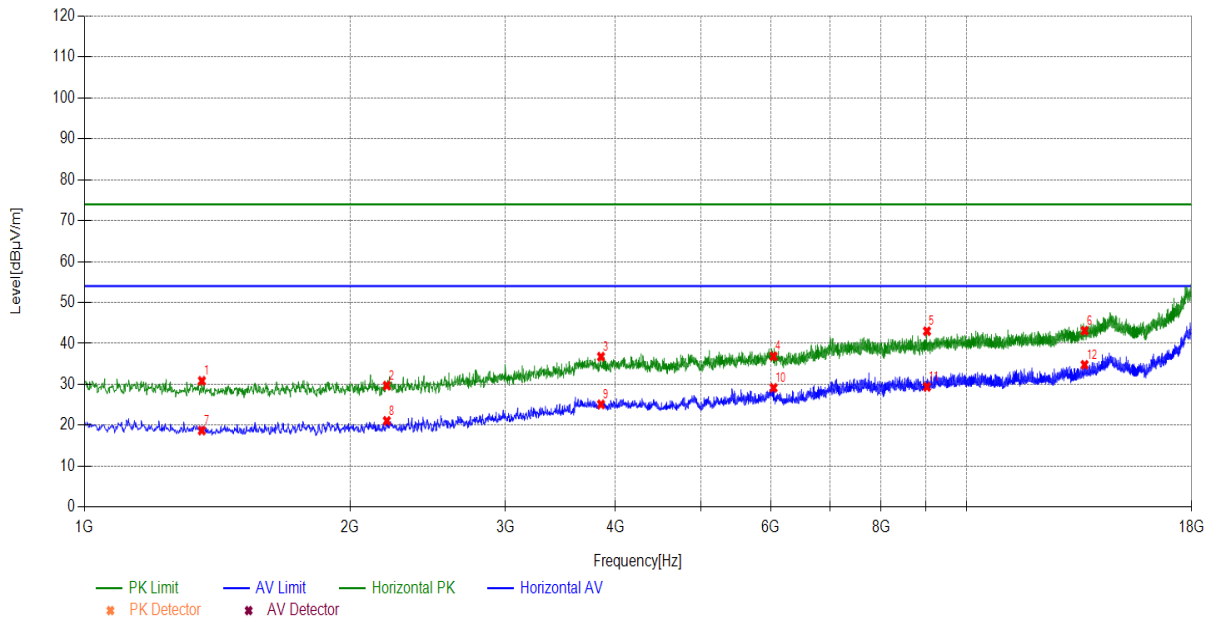
Radiates Emission	1G~18G								
Test channel	Worst-Case								
polarization	Vertical								
Antenna	2.4GHz								
Suspected List									
Frequency[MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/Fail
1892.5893	-8.02	39.37	31.35	74.00	42.65	PK	150	260	PASS
2960.296	-4.82	37.34	32.52	74.00	41.48	PK	150	300	PASS
5952.5953	2.53	36.57	39.10	74.00	34.90	PK	150	270	PASS
8973.7974	6.46	32.85	39.31	74.00	34.69	PK	150	270	PASS
11408.4408	7.20	36.32	43.52	74.00	30.48	PK	150	10	PASS
14154.2154	11.72	35.34	47.06	74.00	26.94	PK	150	330	PASS
1892.5893	-8.02	30.35	22.33	54.00	31.67	AV	150	10	PASS
2960.296	-4.82	28.59	23.77	54.00	30.23	AV	150	10	PASS
5952.5953	2.53	24.13	26.66	54.00	27.34	AV	150	200	PASS
8973.7974	6.46	24.61	31.07	54.00	22.93	AV	150	10	PASS
11408.4408	7.20	24.45	31.65	54.00	22.35	AV	150	10	PASS
13659.4659	10.27	25.59	35.86	54.00	18.14	AV	150	10	PASS



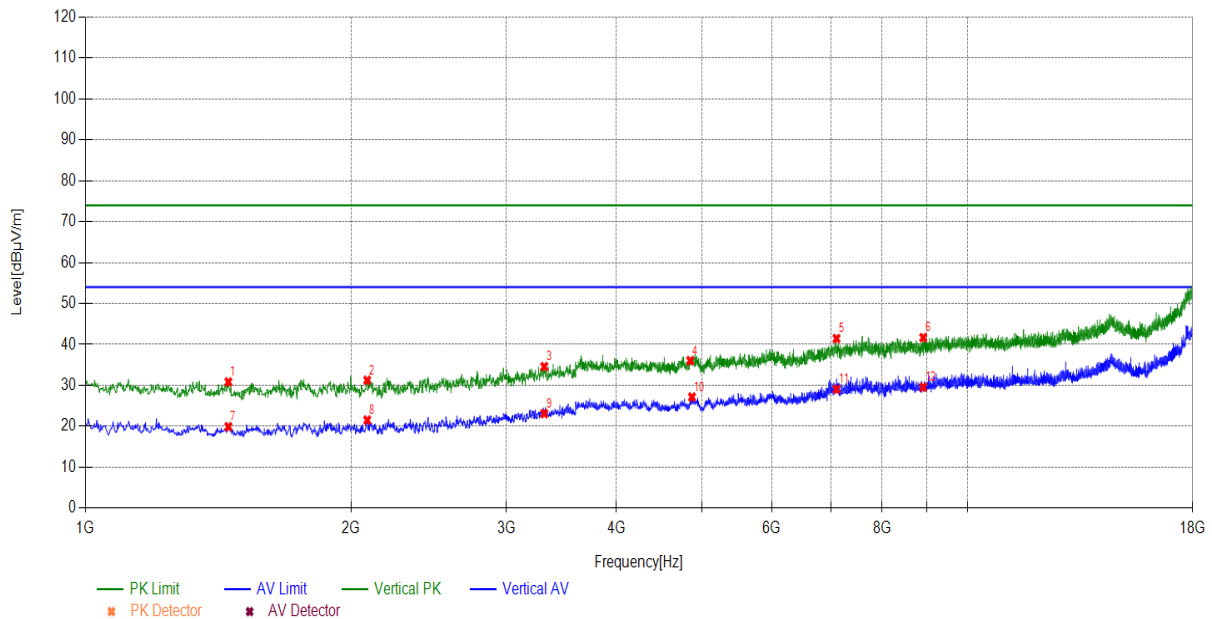
Radiates Emission	1G~18G
Test channel	Worst-Case
polarization	Horizontal
Antenna	3030

**Suspected List**

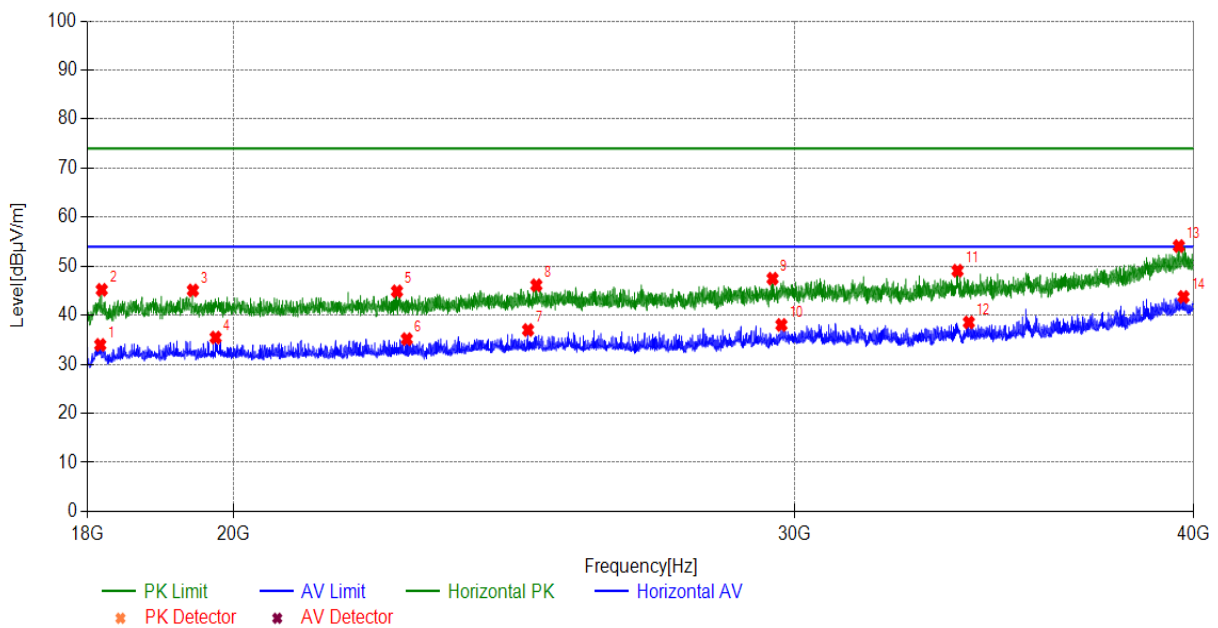
Frequency[MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/Fail
1358.7359	-9.64	40.51	30.87	74.00	43.13	PK	150	340	PASS
2202.0202	-7.36	37.06	29.70	74.00	44.30	PK	150	50	PASS
3851.1851	-2.46	39.23	36.77	74.00	37.23	PK	150	220	PASS
6042.7043	2.72	34.15	36.87	74.00	37.13	PK	150	30	PASS
9019.702	6.55	36.46	43.01	74.00	30.99	PK	150	120	PASS
13610.161	10.15	32.99	43.14	74.00	30.86	PK	150	210	PASS
1358.7359	-9.64	28.39	18.75	54.00	35.25	AV	150	140	PASS
2202.0202	-7.36	28.45	21.09	54.00	32.91	AV	150	10	PASS
3851.1851	-2.46	27.58	25.12	54.00	28.88	AV	150	30	PASS
6042.7043	2.72	26.43	29.15	54.00	24.85	AV	150	10	PASS
9019.702	6.55	22.86	29.41	54.00	24.59	AV	150	230	PASS
13610.161	10.15	24.65	34.80	54.00	19.20	AV	150	10	PASS



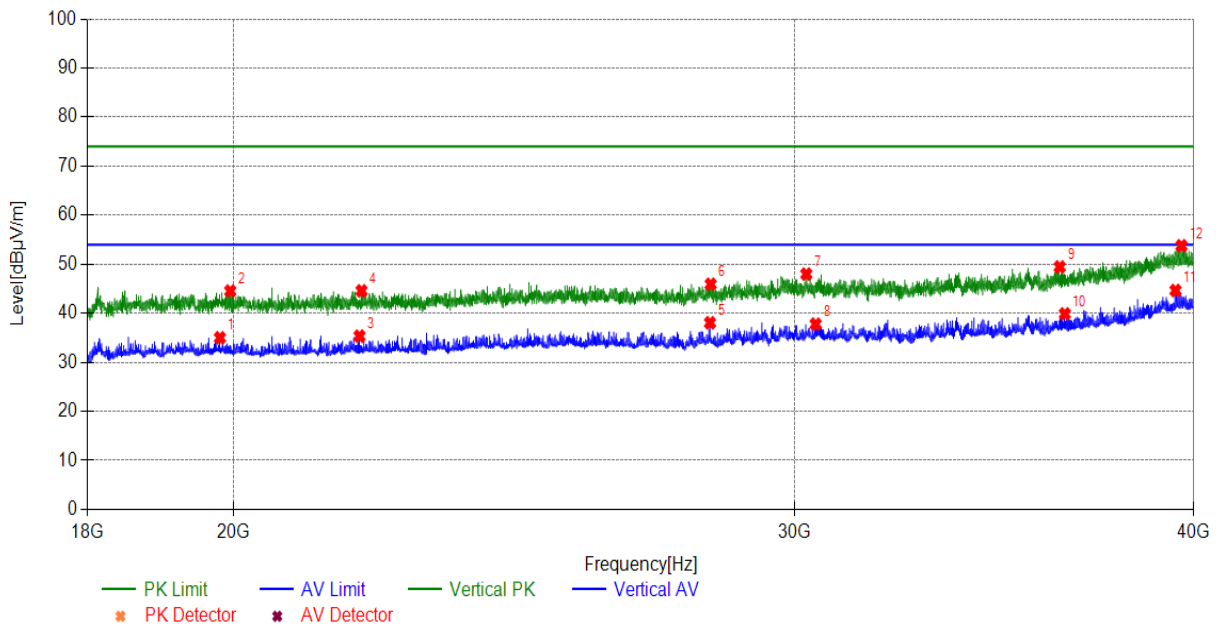
Radiates Emission	1G~18G								
Test channel	Worst-Case								
polarization	Vertical								
Antenna	3030								
Suspected List									
Frequency[MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/Fail
1452.2452	-9.49	40.32	30.83	74.00	43.17	PK	150	80	PASS
2086.4086	-7.64	38.89	31.25	74.00	42.75	PK	150	80	PASS
3312.2312	-3.53	38.12	34.59	74.00	39.41	PK	150	200	PASS
4849.1849	-1.12	37.16	36.04	74.00	37.96	PK	150	190	PASS
7103.6104	4.68	36.77	41.45	74.00	32.55	PK	150	150	PASS
8907.4907	6.38	35.30	41.68	74.00	32.32	PK	150	40	PASS
1452.2452	-9.49	29.40	19.91	54.00	34.09	AV	150	10	PASS
2086.4086	-7.64	29.17	21.53	54.00	32.47	AV	150	10	PASS
3312.2312	-3.53	26.64	23.11	54.00	30.89	AV	150	360	PASS
4871.2871	-1.04	28.19	27.15	54.00	26.85	AV	150	40	PASS
7103.6104	4.68	24.38	29.06	54.00	24.94	AV	150	200	PASS
8907.4907	6.38	23.20	29.58	54.00	24.42	AV	150	10	PASS



Radiates Emission	18G~40G								
Test channel	Worst-Case								
polarization	Horizontal								
Antenna	AT02								
Suspected List									
Frequency[MHz]	Factor [dB]	Reading [dB $\mu$ V/m]	Level [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/Fail
19423.5424	1.33	43.74	45.07	74.00	28.93	PK	150	100	PASS
24888.8889	4.06	42.06	46.12	74.00	27.88	PK	150	60	PASS
39575.3575	10.78	43.33	54.11	74.00	19.89	PK	150	150	PASS
18187.0187	1.15	44.03	45.18	74.00	28.82	PK	150	60	PASS
33731.5732	6.52	42.56	49.08	74.00	24.92	PK	150	180	PASS
22506.0506	2.41	42.47	44.88	74.00	29.12	PK	150	90	PASS
29515.9516	6.36	41.10	47.46	74.00	26.54	PK	150	170	PASS
19744.7745	1.31	34.14	35.45	54.00	18.55	AV	150	10	PASS
22666.6667	2.57	32.56	35.13	54.00	18.87	AV	150	10	PASS
24739.2739	4.00	32.99	36.99	54.00	17.01	AV	150	10	PASS
39709.5710	10.79	32.95	43.74	54.00	10.26	AV	150	10	PASS
29705.1705	6.49	31.53	38.02	54.00	15.98	AV	150	10	PASS
34008.8009	6.60	31.94	38.54	54.00	15.46	AV	150	10	PASS
18167.2167	1.14	32.82	33.96	54.00	20.04	AV	150	10	PASS



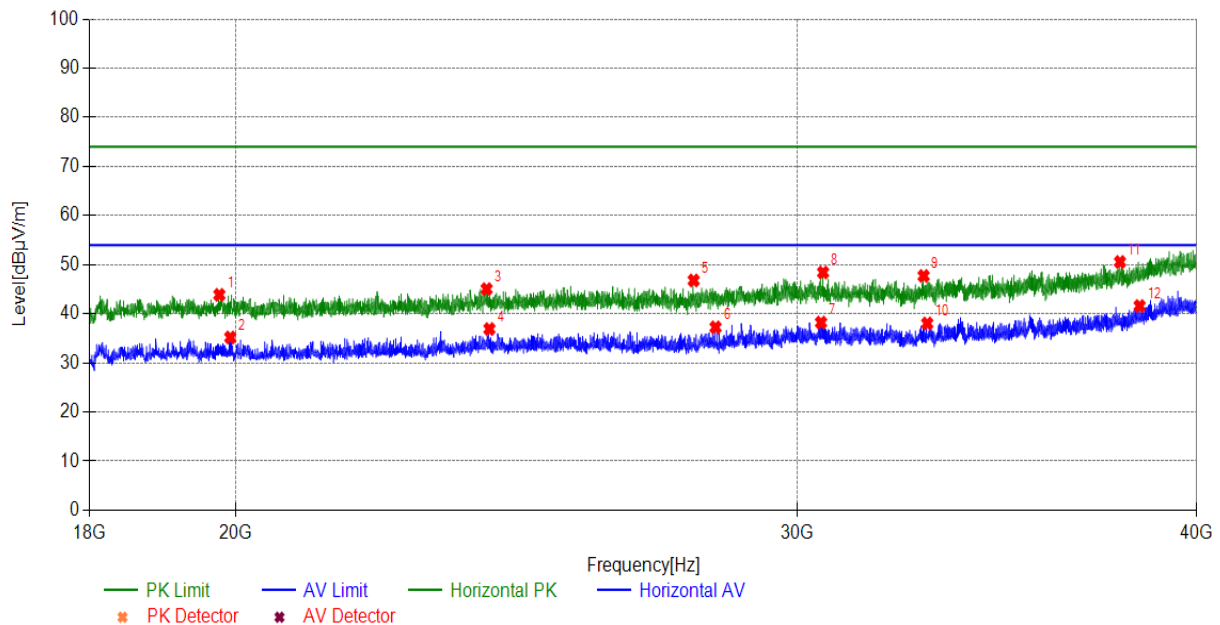
Radiates Emission	18G~40G								
Test channel	Worst-Case								
polarization	Vertical								
Antenna	AT02								
Suspected List									
Frequency[MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/Fail
39650.1650	10.78	42.97	53.75	74.00	20.25	PK	150	230	PASS
19953.7954	1.30	43.22	44.52	74.00	29.48	PK	150	150	PASS
28226.6227	5.54	40.37	45.91	74.00	28.09	PK	150	190	PASS
30244.2244	6.59	41.39	47.98	74.00	26.02	PK	150	200	PASS
36314.6315	7.38	42.06	49.44	74.00	24.56	PK	150	30	PASS
21938.3938	1.88	42.69	44.57	74.00	29.43	PK	150	270	PASS
39480.7481	10.77	33.87	44.64	54.00	9.36	AV	150	10	PASS
28213.4213	5.53	32.52	38.05	54.00	15.95	AV	150	10	PASS
21905.3905	1.88	33.45	35.33	54.00	18.67	AV	150	10	PASS
36448.8449	7.48	32.39	39.87	54.00	14.13	AV	150	10	PASS
30448.8449	6.50	31.27	37.77	54.00	16.23	AV	150	10	PASS
19806.3806	1.31	33.68	34.99	54.00	19.01	AV	150	10	PASS



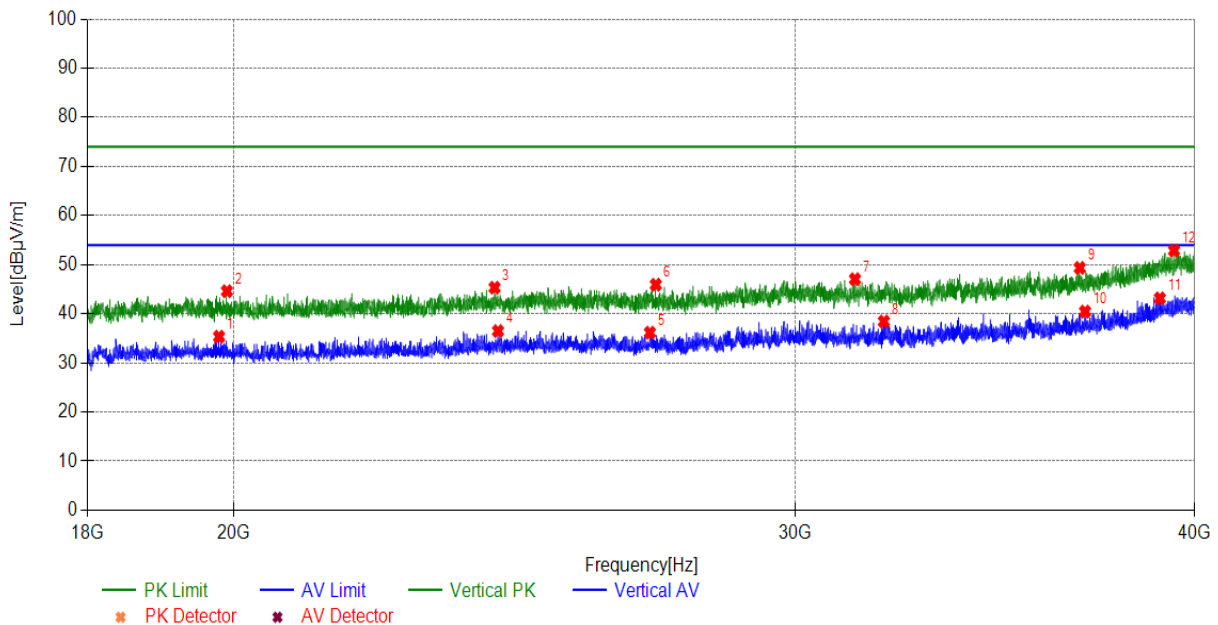
Radiates Emission	18G~40G
Test channel	Worst-Case
polarization	Horizontal
Antenna	2.4GHz

**Suspected List**

Frequency[MHz]	Factor [dB]	Reading [dB $\mu$ V/m]	Level [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/ Fail
19766.7767	1.31	42.54	43.85	74.00	30.15	PK	150	10	PASS
30554.4554	6.45	41.95	48.40	74.00	25.60	PK	150	40	PASS
37850.3850	8.58	41.96	50.54	74.00	23.46	PK	150	90	PASS
23969.1969	3.68	41.34	45.02	74.00	28.98	PK	150	90	PASS
32851.4851	6.24	41.46	47.70	74.00	26.30	PK	150	20	PASS
27830.5831	5.32	41.47	46.79	74.00	27.21	PK	150	100	PASS
24017.6018	3.71	33.18	36.89	54.00	17.11	AV	150	10	PASS
19922.9923	1.30	33.88	35.18	54.00	18.82	AV	150	10	PASS
38389.4389	9.50	32.08	41.58	54.00	12.42	AV	150	10	PASS
30508.2508	6.47	31.74	38.21	54.00	15.79	AV	150	10	PASS
32937.2937	6.27	31.75	38.02	54.00	15.98	AV	150	10	PASS
28272.8273	5.56	31.68	37.24	54.00	16.76	AV	150	10	PASS



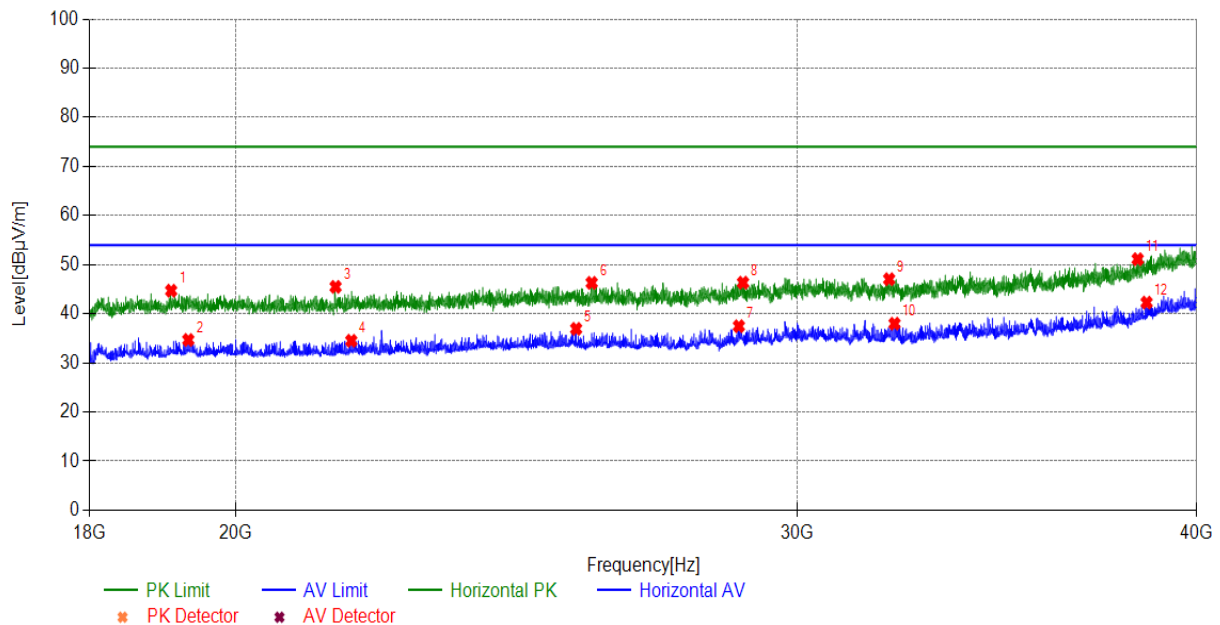
Radiates Emission	18G~40G								
Test channel	Worst-Case								
polarization	Vertical								
Antenna	2.4GHz								
Suspected List									
Frequency[MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/Fail
39412.5413	10.77	42.10	52.87	74.00	21.13	PK	150	30	PASS
24143.0143	3.76	41.55	45.31	74.00	28.69	PK	150	30	PASS
27119.9120	4.96	40.96	45.92	74.00	28.08	PK	150	30	PASS
19903.1903	1.30	43.30	44.60	74.00	29.40	PK	150	10	PASS
36820.6821	7.74	41.60	49.34	74.00	24.66	PK	150	80	PASS
31309.1309	6.14	40.90	47.04	74.00	26.96	PK	150	70	PASS
24202.4202	3.78	32.70	36.48	54.00	17.52	AV	150	10	PASS
27005.5006	4.90	31.26	36.16	54.00	17.84	AV	150	10	PASS
39009.9010	10.75	32.40	43.15	54.00	10.85	AV	150	10	PASS
36961.4962	7.85	32.59	40.44	54.00	13.56	AV	150	10	PASS
31969.1969	5.91	32.52	38.43	54.00	15.57	AV	150	10	PASS
19790.9791	1.31	34.02	35.33	54.00	18.67	AV	150	10	PASS



Radiates Emission	18G~40G
Test channel	Worst-Case
polarization	Horizontal
Antenna	3030

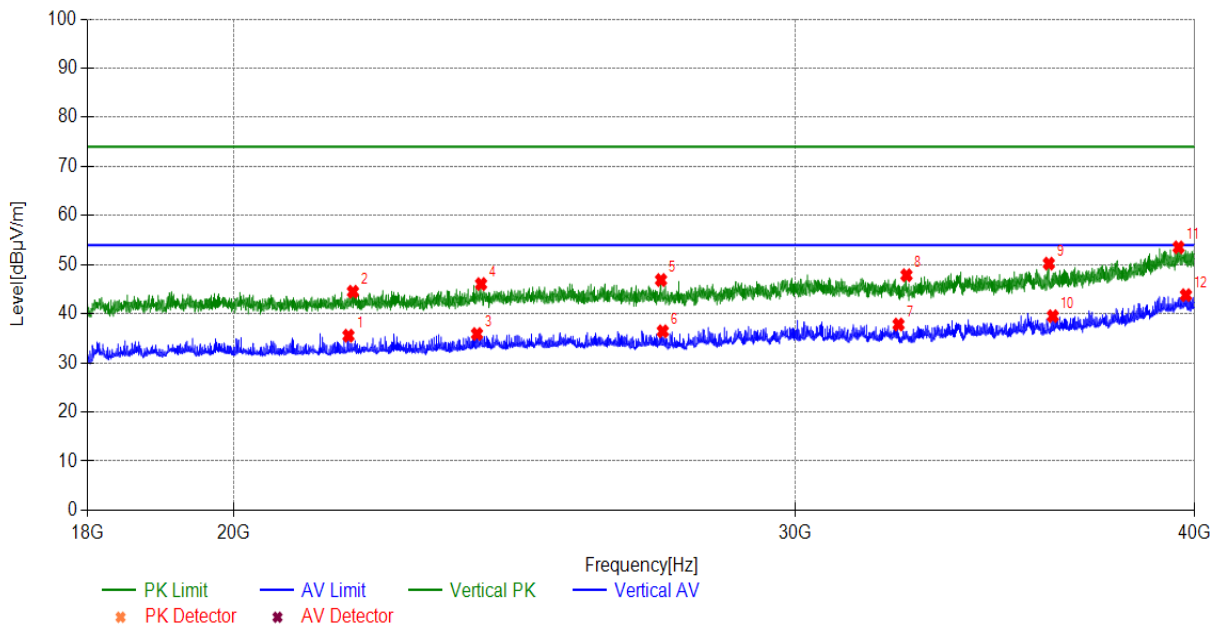
**Suspected List**

Frequency[MHz]	Factor [dB]	Reading [dB $\mu$ V/m]	Level [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/ Fail
19091.3091	1.35	43.35	44.70	74.00	29.30	PK	150	10	PASS
25856.9857	4.44	41.85	46.29	74.00	27.71	PK	150	260	PASS
38336.6337	9.39	41.72	51.11	74.00	22.89	PK	150	30	PASS
28838.2838	5.90	40.43	46.33	74.00	27.67	PK	150	60	PASS
32044.0044	5.92	41.12	47.04	74.00	26.96	PK	150	120	PASS
21496.1496	1.77	43.71	45.48	74.00	28.52	PK	150	160	PASS
21740.3740	1.84	32.66	34.50	54.00	19.50	AV	150	10	PASS
19328.9329	1.33	33.34	34.67	54.00	19.33	AV	150	10	PASS
25568.7569	4.33	32.60	36.93	54.00	17.07	AV	150	10	PASS
32169.4169	5.97	32.01	37.98	54.00	16.02	AV	150	10	PASS
28752.4752	5.85	31.62	37.47	54.00	16.53	AV	150	10	PASS
38585.2585	9.90	32.37	42.27	54.00	11.73	AV	150	10	PASS





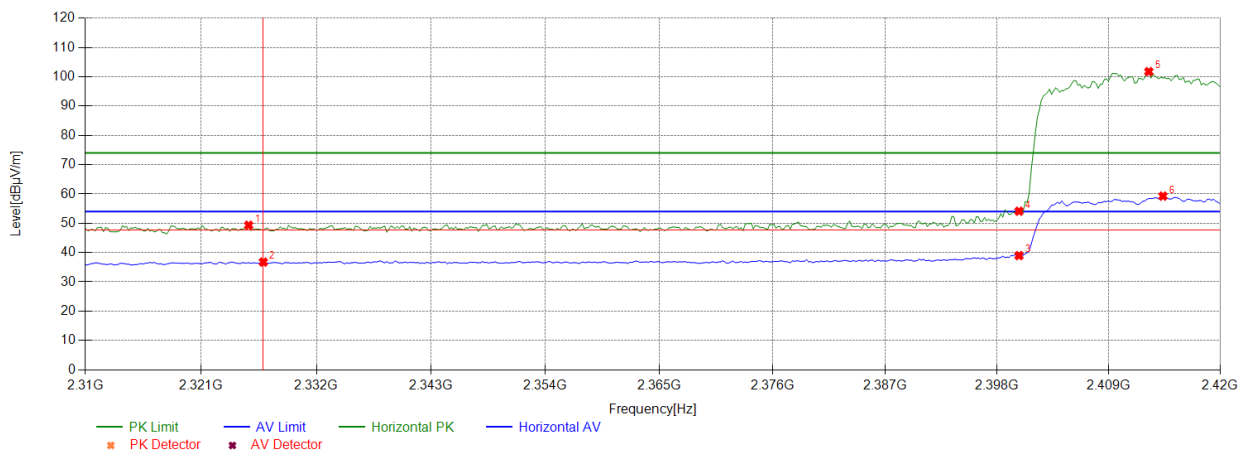
Radiates Emission	18G~40G								
Test channel	Worst-Case								
polarization	Vertical								
Antenna	3030								
Suspected List									
Frequency[MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/Fail
27221.1221	5.01	41.86	46.87	74.00	27.13	PK	150	270	PASS
32495.0495	6.10	41.75	47.85	74.00	26.15	PK	150	320	PASS
39540.1540	10.78	42.75	53.53	74.00	20.47	PK	150	320	PASS
23907.5908	3.63	42.42	46.05	74.00	27.95	PK	150	60	PASS
36008.8009	7.16	43.06	50.22	74.00	23.78	PK	150	220	PASS
21797.5798	1.85	42.63	44.48	74.00	29.52	PK	150	90	PASS
32308.0308	6.02	31.79	37.81	54.00	16.19	AV	150	10	PASS
27256.3256	5.03	31.40	36.43	54.00	17.57	AV	150	10	PASS
23837.1837	3.57	32.31	35.88	54.00	18.12	AV	150	10	PASS
39751.3751	10.79	33.00	43.79	54.00	10.21	AV	150	10	PASS
36112.2112	7.23	32.28	39.51	54.00	14.49	AV	150	10	PASS
21727.1727	1.83	33.70	35.53	54.00	18.47	AV	150	10	PASS



**Band Edge:**

During the test, the Band Edge was performed in WIFI and Zigbee all modes with all channels and all antenna. 802.11n40 and Zigbee of the antenna named 2.4GHz are selected as the worst condition. The test data of the worst-case condition was recorded in this report.

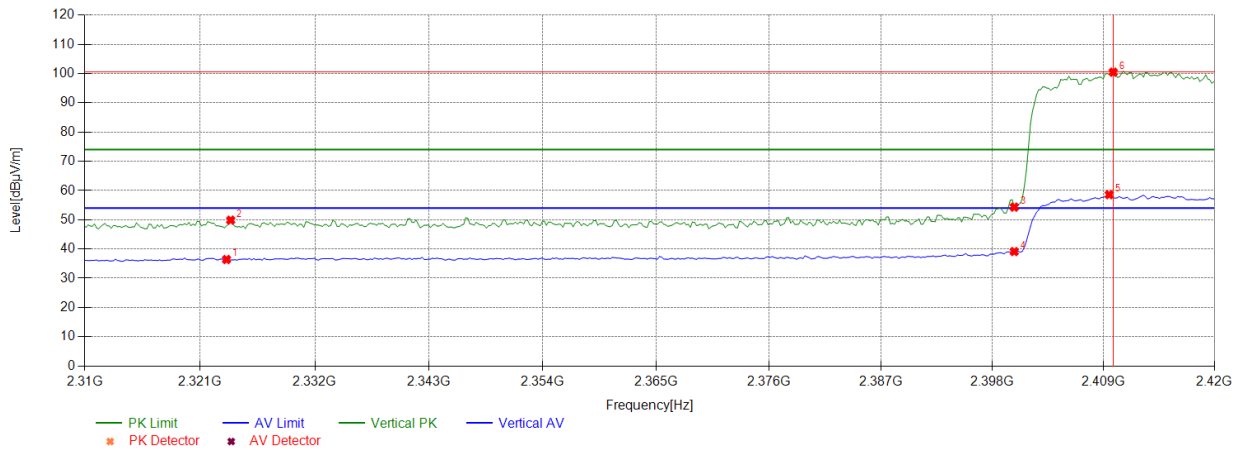
Test mode	802.11n40								
Test channel	Lowest channel								
polarization	Horizontal								
Antenna	2.4GHz								
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/Fail
2325.5326	35.27	14.05	49.32	74.00	24.68	PK	150	98	PASS
2326.9327	35.29	1.45	36.74	54.00	17.26	AV	150	297	PASS
2390.1400	35.87	3.09	38.96	54.00	15.04	AV	150	319	PASS
2390.1400	35.87	18.26	54.13	74.00	19.87	PK	150	340	PASS
2412.9413	35.92	65.86	101.78	74.00	-27.78	PK	150	340	-
2414.3414	35.93	23.34	59.27	54.00	-5.27	AV	150	319	-



Test mode	802.11n40
Test channel	Lowest channel
polarization	Vertical
Antenna	2.4GHz

**Suspected List**

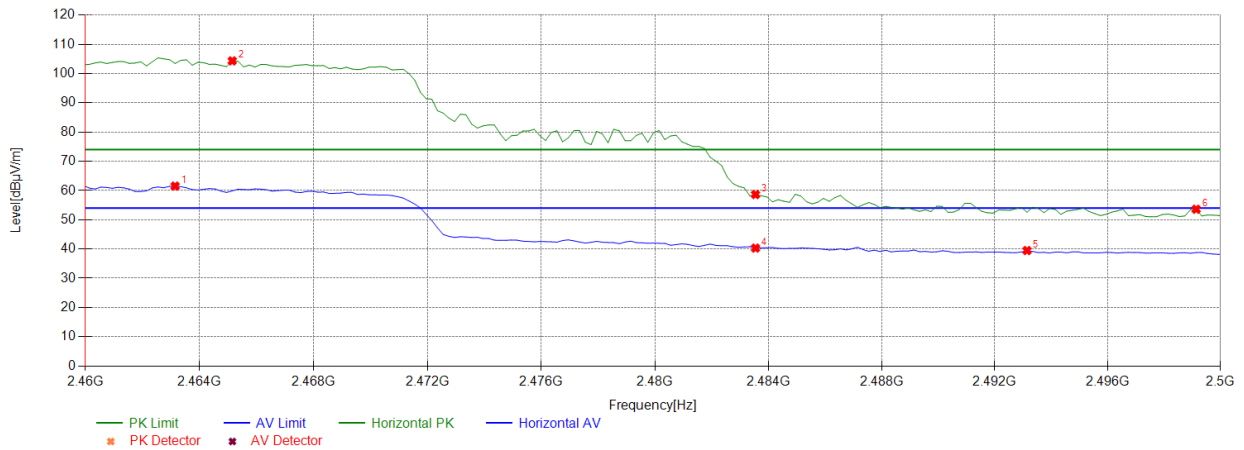
Frequency [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/Fail
2323.5324	35.26	1.15	36.41	54.00	17.59	AV	150	190	PASS
2323.9324	35.26	14.61	49.87	74.00	24.13	PK	150	33	PASS
2390.1400	35.87	18.45	54.32	74.00	19.68	PK	150	345	PASS
2390.1400	35.87	3.25	39.12	54.00	14.88	AV	150	301	PASS
2409.5410	35.91	22.68	58.59	54.00	-4.59	AV	150	301	-
2409.9410	35.91	64.59	100.50	74.00	-26.50	PK	150	345	-



Test mode	802.11n40
Test channel	Highest channel
polarization	Horizontal
Antenna	2.4GHz

**Suspected List**

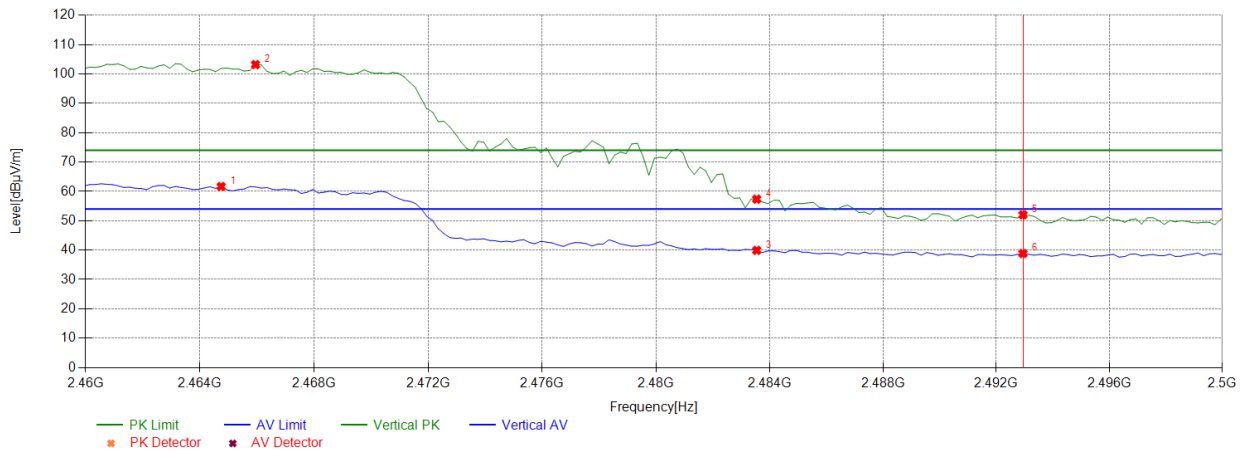
Frequency [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/Fail
2463.1463	36.12	25.41	61.53	54.00	-7.53	AV	150	240	-
2465.1465	36.13	68.24	104.37	74.00	-30.37	PK	150	210	-
2483.5484	36.20	22.44	58.64	74.00	15.36	PK	150	160	PASS
2483.5484	36.20	4.11	40.31	54.00	13.69	AV	150	70	PASS
2493.1493	36.24	3.23	39.47	54.00	14.53	AV	150	160	PASS
2499.1499	36.27	17.33	53.60	74.00	20.40	PK	150	180	PASS



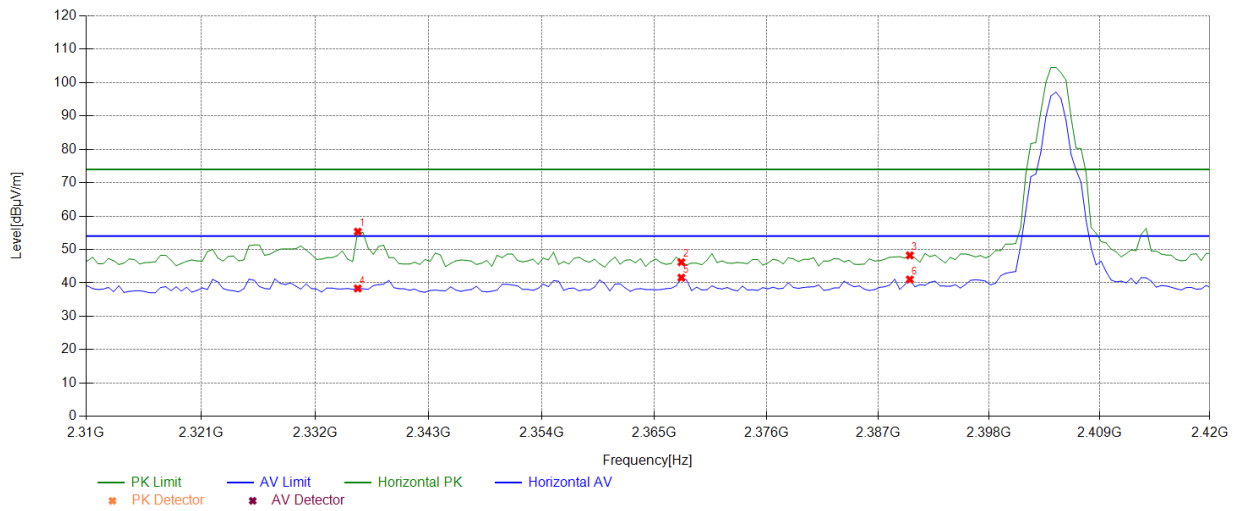
Test mode	802.11n40
Test channel	Highest channel
polarization	Vertical
Antenna	2.4GHz

**Suspected List**

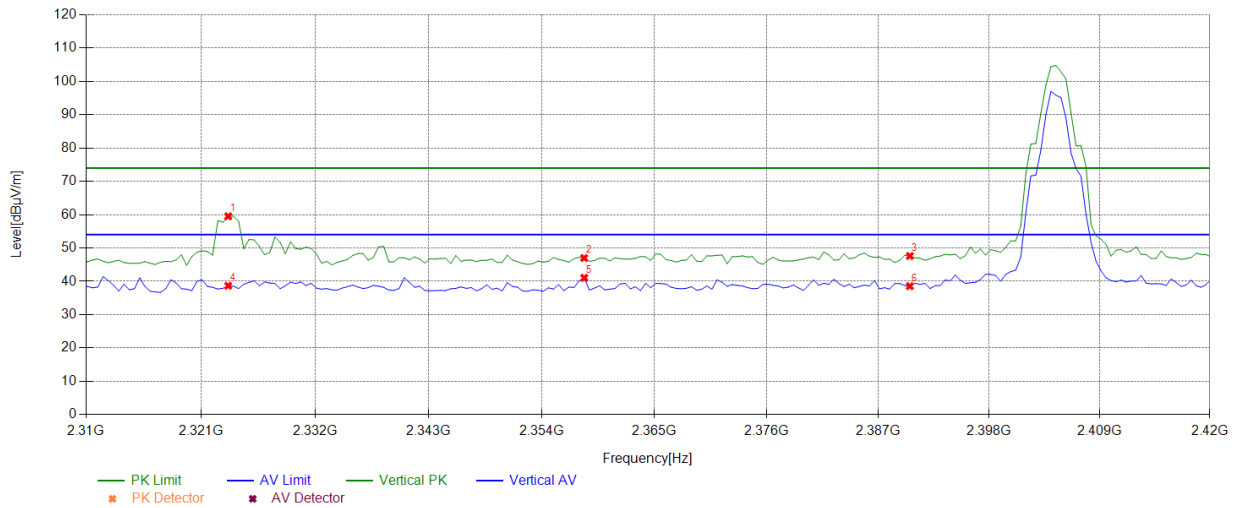
Frequency [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/Fail
2464.7465	36.13	25.55	61.68	54.00	-7.68	AV	150	10	-
2465.9466	36.13	67.08	103.21	74.00	-29.21	PK	150	30	-
2483.5484	36.20	3.71	39.91	54.00	14.09	AV	150	30	PASS
2483.5484	36.20	21.17	57.37	74.00	16.63	PK	150	30	PASS
2492.9493	36.24	15.78	52.02	74.00	21.98	PK	150	30	PASS
2492.9493	36.24	2.60	38.84	54.00	15.16	AV	150	10	PASS



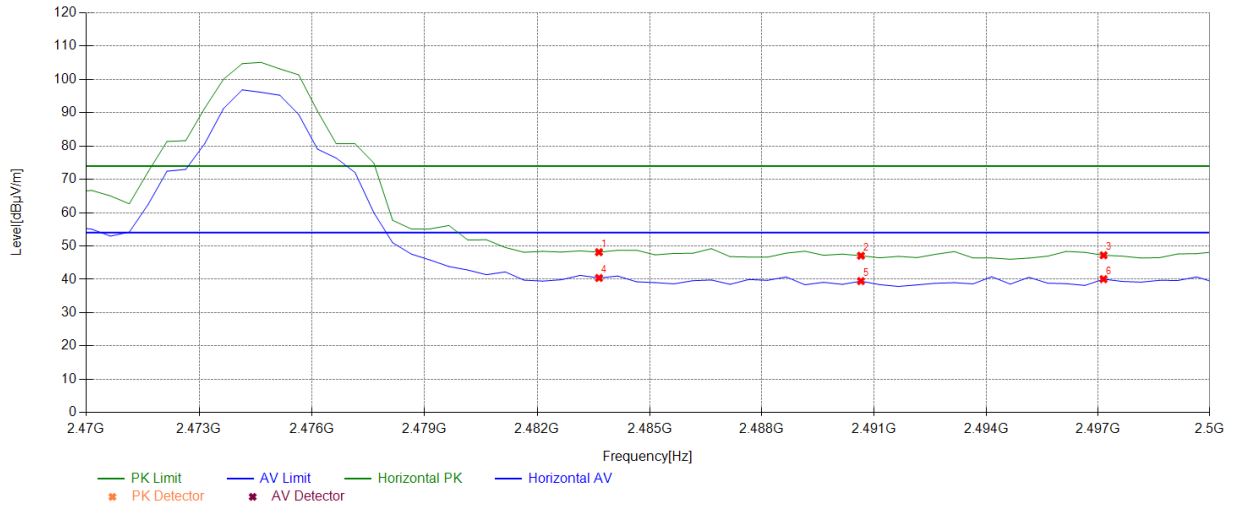
Test mode	Zigbee								
Test channel	Lowest channel								
polarization	Horizontal								
Antenna	2.4GHz								
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dB $\mu$ V/m]	Level [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/Fail
2336.1336	30.98	24.37	55.35	74.00	18.65	PK	150	160	PASS
2367.6368	31.09	15.12	46.21	74.00	27.79	PK	150	150	PASS
2390.139	31.17	17.08	48.25	74.00	25.75	PK	150	200	PASS
2336.1336	30.98	7.37	38.35	54.00	15.65	AV	150	180	PASS
2367.6368	31.09	10.48	41.57	54.00	12.43	AV	150	10	PASS
2390.139	31.17	9.85	41.02	54.00	12.98	AV	150	10	PASS



Test mode	Zigbee								
Test channel	Lowest channel								
polarization	Vertical								
Antenna	2.4GHz								
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dB $\mu$ V/m]	Level [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/Fail
2323.6324	30.94	28.58	59.52	74.00	14.48	PK	150	290	PASS
2358.1358	31.06	15.94	47.00	74.00	27.00	PK	150	300	PASS
2390.139	31.17	16.43	47.60	74.00	26.40	PK	150	260	PASS
2323.6324	30.94	7.74	38.68	54.00	15.32	AV	150	20	PASS
2358.1358	31.06	10.00	41.06	54.00	12.94	AV	150	10	PASS
2390.139	31.17	7.41	38.58	54.00	15.42	AV	150	220	PASS

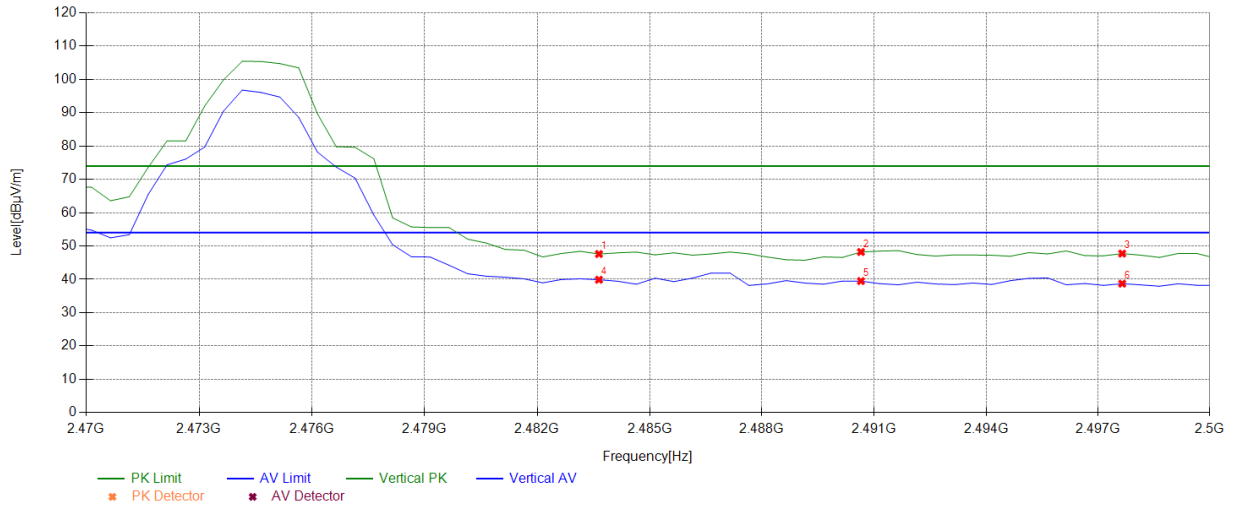


Test mode	Zigbee								
Test channel	Highest channel								
polarization	Horizontal								
Antenna	2.4GHz								
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/Fail
2483.6484	31.49	16.66	48.15	74.00	25.85	PK	150	240	PASS
2490.6491	31.52	15.56	47.08	74.00	26.92	PK	150	140	PASS
2497.1497	31.54	15.69	47.23	74.00	26.77	PK	150	100	PASS
2483.6484	31.49	8.93	40.42	54.00	13.58	AV	150	10	PASS
2490.6491	31.52	7.95	39.47	54.00	14.53	AV	150	30	PASS
2497.1497	31.54	8.52	40.06	54.00	13.94	AV	150	10	PASS





Test mode	Zigbee								
Test channel	Highest channel								
polarization	Vertical								
Antenna	2.4GHz								
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dB $\mu$ V/m]	Level [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/Fail
2483.6484	31.49	16.11	47.60	74.00	26.40	PK	150	60	PASS
2490.6491	31.52	16.69	48.21	74.00	25.79	PK	150	180	PASS
2497.6498	31.54	16.19	47.73	74.00	26.27	PK	150	360	PASS
2483.6484	31.49	8.40	39.89	54.00	14.11	AV	150	60	PASS
2490.6491	31.52	7.97	39.49	54.00	14.51	AV	150	60	PASS
2497.6498	31.54	7.17	38.71	54.00	15.29	AV	150	20	PASS



### 5.3 Maximum conducted output power

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

#### Method of Measurement:

The EUT was tested according to DTS test procedure of ANSI C63.10 for compliance to FCC 47CFR 15.247 requirements. The maximum conducted output power using ANSI C63.10 section 11.9.2.3 AVGPMAverage power meter method.

1. Power meter and sensor’s minimum video bandwidth is 50MHz, larger than 802.11n(40MHz) bandwidth;
2. Fast responding diode sensors respond immediately to changes in power level to reduce total test time.
3. Use average detector to test.

During the process of the testing, The EUT was connected to Spectrum Analyzer with a known loss. The EUT is max power transmission with proper modulation. The Average detector is used. We use Maximum Average Conducted Output Power Level Method AVGSA-2 in KDB 558074 D01 /KDB662911 D01 for this test.

The conducted Power is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically.

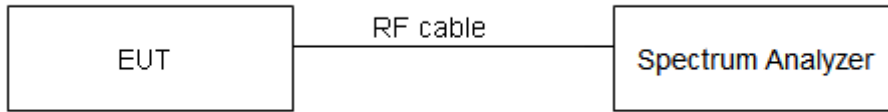
#### Limits:

Average Output Power	≤ 1W (30dBm)
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Note: the conducted output power limit specified above is based on the use the antennas with directional gains that do not exceed 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated Levels above, as appropriate, by the amount in dB that the directional gain of antenna exceeds 6 dBi.

Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

Test Setup:



Measurement Uncertainty:

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor  $k = 2$ ,  $U = 0.44$  dB.

Test Results:

TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
11B	Ant1	2412	11.54	$\leq 30$	PASS
	Ant1	2437	10.16	$\leq 30$	PASS
	Ant1	2462	9.51	$\leq 30$	PASS
11G	Ant1	2412	11.02	$\leq 30$	PASS
	Ant1	2437	10.43	$\leq 30$	PASS
	Ant1	2462	9.23	$\leq 30$	PASS
11N20SISO	Ant1	2412	11.14	$\leq 30$	PASS
	Ant1	2437	9.58	$\leq 30$	PASS
	Ant1	2462	9.21	$\leq 30$	PASS
11N40SISO	Ant1	2422	10.46	$\leq 30$	PASS
	Ant1	2437	4.11	$\leq 30$	PASS
	Ant1	2452	6.38	$\leq 30$	PASS
Zigbee	Ant1	2405	7.86	$\leq 30$	PASS
	Ant1	2440	8.32	$\leq 30$	PASS
	Ant1	2475	7.76	$\leq 30$	PASS

### 5.4 Minimum 6 dB Bandwidth

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement:

The EUT was connected to the spectrum analyzer through an external attenuator (20dB) and a known loss cable. RBW is set to 100 kHz; VBW is set to 300 kHz on spectrum analyzer.

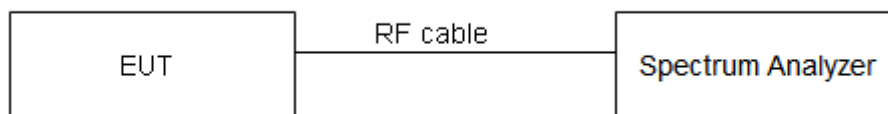
Detector=Peak, Trace mode=Max hold.

Limits:

Rule Part 15.247 (a) (2) specifies that “Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.”

Minimum 6dB Bandwidth	≥ 500 kHz
-----------------------	-----------

Test Setup:



Measurement Uncertainty:

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor  $k = 2$ ,  $U = 936$  Hz.

Test Results:

TestMode	Antenna	Channel	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	8.04	2407.44	2415.48	0.5	PASS
		2437	9.08	2432.40	2441.48	0.5	PASS
		2462	9.04	2457.44	2466.48	0.5	PASS
11G	Ant1	2412	16.28	2403.80	2420.08	0.5	PASS
		2437	16.32	2428.76	2445.08	0.5	PASS
		2462	16.36	2453.76	2470.12	0.5	PASS
11N20SISO	Ant1	2412	17.32	2403.16	2420.48	0.5	PASS
		2437	17.56	2428.16	2445.72	0.5	PASS
		2462	17.56	2453.16	2470.72	0.5	PASS
11N40SISO	Ant1	2422	35.44	2404.08	2439.52	0.5	PASS
		2437	35.36	2419.24	2454.60	0.5	PASS
		2452	35.92	2433.84	2469.76	0.5	PASS
Zigbee	Ant1	2405	1.59	2404.08	2405.67	0.5	PASS
		2440	1.59	2439.07	2440.66	0.5	PASS
		2475	1.59	2474.06	2475.65	0.5	PASS

## 5.5 Occupied Channel Bandwidth

Ambient condition:

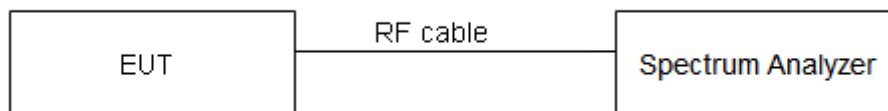
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

### Method of Measurement:

The EUT was connected to the spectrum analyzer through an external attenuator (20dB) and a known loss cable. RBW is set to 50 kHz; VBW is set to 200 kHz on spectrum analyzer.

Detector=Peak, Trace mode=Max hold.

### Test Setup:



### Measurement Uncertainty:

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor  $k = 2$ ,  $U = 936$  Hz.

Test Results:

TestMode	Antenna	Channel	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	13.506	2405.127	2418.633	---	---
		2437	13.506	2430.127	2443.633	---	---
		2462	13.467	2455.167	2468.633	---	---
11G	Ant1	2412	17.502	2403.169	2420.671	---	---
		2437	17.383	2428.249	2445.631	---	---
		2462	17.383	2453.249	2470.631	---	---
11N20SISO	Ant1	2412	18.302	2402.769	2421.071	---	---
		2437	18.342	2427.809	2446.151	---	---
		2462	18.182	2452.889	2471.071	---	---
11N40SISO	Ant1	2422	36.523	2403.538	2440.062	---	---
		2437	36.603	2418.618	2455.222	---	---
		2452	36.523	2433.618	2470.142	---	---
Zigbee	Ant1	2405	2.617	2403.561	2406.179	---	---
		2440	2.607	2438.561	2441.169	---	---
		2475	2.607	2473.561	2476.169	---	---

## 5.6 Band Edge Measurement

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

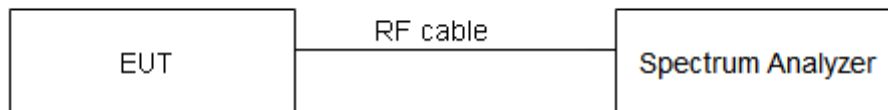
### Method of Measurement:

The EUT was connected to the spectrum analyzer through an external attenuator (20dB) and a known loss cable the band edge of the lowest and highest channels were measured. The peak detector is used and RBW is set to 100 kHz and VBW is set to 300 kHz on spectrum analyzer.

### Limits:

Rule Part 15.247(d) specifies that “In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

### Test Setup:



### Measurement Uncertainty:

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor  $k = 1.96$ ,  $U = 936 \text{ Hz}$ ,  $2 \text{ GHz} - 3 \text{ GHz} = 1.407 \text{ dB}$ .



Test Results:

TestMode	Antenna	ChName	Channel	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
11B	Ant1	Low	2412	2.58	-45.34	<=-27.42	PASS
		High	2462	1.13	-47.79	<=-28.87	PASS
11G	Ant1	Low	2412	-0.03	-39.27	<=-30.03	PASS
		High	2462	-2.06	-46.36	<=-32.06	PASS
11N20SISO	Ant1	Low	2412	0.06	-37.48	<=-29.94	PASS
		High	2462	-2.17	-46.18	<=-32.17	PASS
11N40SISO	Ant1	Low	2422	-2.89	-38.14	<=-32.89	PASS
		High	2452	-4.23	-46.95	<=-34.23	PASS
Zigbee	Ant1	Low	2405	0.61	-48.42	<=-29.39	PASS
		High	2475	0.96	-48.27	<=-29.04	PASS

## 5.7 Maximum Power Spectral Density

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

### Method of Measurement:

During the process of the testing, The EUT was connected to Spectrum Analyzer with a known loss. The EUT is max power transmission with proper modulation. The Average detector is used. We use Method AVGPSD-2 in KDB 558074 D01 for this test.

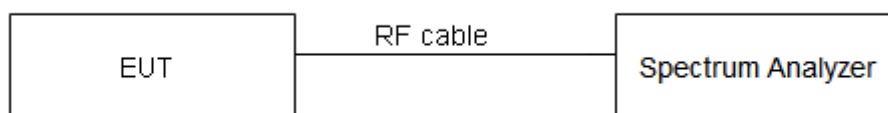
The conducted Power is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically.

### Limits:

Rule Part 15.247(e) specifies that" For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

Maximum Power Spectral Density	$\leq 8 \text{ dBm} / 3\text{kHz}$
--------------------------------	------------------------------------

### Test Setup:



### Measurement Uncertainty:

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor  $k = 2$ ,  $U = 0.75\text{dB}$ .

Test Results:

TestMode	Antenna	Channel	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
11B	Ant1	2412	-18.49	<=8	PASS
		2437	-19.7	<=8	PASS
		2462	-20.22	<=8	PASS
11G	Ant1	2412	-17.75	<=8	PASS
		2437	-18.27	<=8	PASS
		2462	-19.57	<=8	PASS
11N20SISO	Ant1	2412	-17.38	<=8	PASS
		2437	-18.94	<=8	PASS
		2462	-19.01	<=8	PASS
11N40SISO	Ant1	2422	-19.65	<=8	PASS
		2437	-22.91	<=8	PASS
		2452	-19.77	<=8	PASS
Zigbee	Ant1	2405	-9.58	<=8	PASS
		2440	-8.14	<=8	PASS
		2475	-8.6	<=8	PASS

## 5.8 Spurious RF Conducted Emissions

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

### Method of Measurement:

The EUT was connected to the spectrum analyzer with a known loss. The spectrum analyzer scans from 30MHz to the 10th harmonic of the carrier. The peak detector is used. Set RBW to 100kHz and VBW to 300 kHz, Sweep is set to AUTO. The test is in transmitting mode.

### Limits:

Rule Part 15.247(d) specifies that "In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power."

### Test Setup:



### Measurement Uncertainty:

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor  $k = 1.96$ .

Frequency	Uncertainty
100kHz-2GHz	0.684 dB
2GHz-26GHz	1.407 dB

Test Results:

TestMode	Antenna	Channel	FreqRange [Mhz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
11B	Ant1	2412	Reference	2.79	2.79	---	PASS
			30~1000	2.79	-59.74	≤-27.21	PASS
			1000~26500	2.79	-34.67	≤-27.21	PASS
		2437	Reference	1.49	1.49	---	PASS
			30~1000	1.49	-58.91	≤-28.51	PASS
			1000~26500	1.49	-37.6	≤-28.51	PASS
		2462	Reference	1.00	1.00	---	PASS
			30~1000	1.00	-59.32	≤-29	PASS
			1000~26500	1.00	-40.48	≤-29	PASS
11G	Ant1	2412	Reference	0.31	0.31	---	PASS
			30~1000	0.31	-60.07	≤-29.69	PASS
			1000~26500	0.31	-39.78	≤-29.69	PASS
		2437	Reference	-0.69	-0.69	---	PASS
			30~1000	-0.69	-59.34	≤-30.69	PASS
			1000~26500	-0.69	-43.52	≤-30.69	PASS
		2462	Reference	-2.29	-2.29	---	PASS
			30~1000	-2.29	-59.24	≤-32.29	PASS
			1000~26500	-2.29	-44.61	≤-32.29	PASS
11N20SISO	Ant1	2412	Reference	0.38	0.38	---	PASS
			30~1000	0.38	-59.63	≤-29.62	PASS
			1000~26500	0.38	-40.55	≤-29.62	PASS
		2437	Reference	-0.66	-0.66	---	PASS
			30~1000	-0.66	-60.05	≤-30.66	PASS
			1000~26500	-0.66	-41.94	≤-30.66	PASS
		2462	Reference	-3.29	-3.29	---	PASS
			30~1000	-3.29	-59.37	≤-33.29	PASS
			1000~26500	-3.29	-44.2	≤-33.29	PASS
11N40SISO	Ant1	2422	Reference	-2.97	-2.97	---	PASS
			30~1000	-2.97	-59.92	≤-32.97	PASS
			1000~26500	-2.97	-43.93	≤-32.97	PASS
		2437	Reference	-2.11	-2.11	---	PASS
			30~1000	-2.11	-59.47	≤-32.11	PASS
			1000~26500	-2.11	-48.67	≤-32.11	PASS
		2452	Reference	-4.29	-4.29	---	PASS
			30~1000	-4.29	-59.11	≤-34.29	PASS
			1000~26500	-4.29	-48.3	≤-34.29	PASS
Zigbee	Ant1	2405	Reference	1.79	1.79	---	PASS
			30~1000	1.79	-59.39	≤-28.21	PASS
			1000~26500	1.79	-48.8	≤-28.21	PASS
		2440	Reference	2.72	2.72	---	PASS
			30~1000	2.72	-56.74	≤-27.28	PASS
			1000~26500	2.72	-49.68	≤-27.28	PASS
		2475	Reference	3.32	3.32	---	PASS
			30~1000	3.32	-58.81	≤-26.68	PASS
			1000~26500	3.32	-48.44	≤-26.68	PASS

## 6. Appendix E

Test Equipment	Type/Mode	SERIAL NO.	Equipment No.	Manufacturer	Cal. Due
Spectrum Analyzer	FSV40	101580	DZ-000238-3	R&S	2023/06/05
Comprehensive Test Instrument	CMW270	100304	DZ-000240-1	R&S	2022/12/09
Analog Signal Generator	SMB100A	181858	DZ-000238-2	R&S	2023/06/05
Vector Signal Generator	SGT100A	111661	DZ-000238-1	R&S	2023/06/05
RF Radio Frequency Switch	JS0806-2	19H9080187	DZ-000241	Tonscend	2023/06/06
Programmable DC Power Supply	E3644A	MY58036222	DZ-000178	KEYSIGHT	2023/04/21
3m Semi-Anechoic Chamber	FACT-4	ST08035	WKNA-0024	ETS	2024/12/12
5m Semi-Anechoic Chamber	SAC-5	SAC-5-2.0	EM-000557	COMTEST	2024/11/02
Spectrum Analyzer	N9010B	MY57470323	DZ-000174	KEYSIGHT	2023/03/02
EMI Test Receiver	N9038A-508	MY532290079	EM-000397	Agilent	2023/03/02
Broadband Antenna	VULB 9163	9163-530	EM-000342	SCHWARZBECK	2023/06/25
Waveguide Horn Antenna	HF906	360306/008	WKNA-0024-8	R&S	2023/03/04
Waveguide Horn Antenna	BBHA9170	00949	EM-000383	SCHWARZBECK	2023/08/26
EMI Test Receiver	ESR7	102235	VG DY-0956	R&S	2023/03/03
Broadband Antenna	VULB 9163	9163-676	EM-000382	SCHWARZBECK	2023/05/06
Bandstop Filters	SW-BSF-2400-100-7-A1	/	EM-000495	/	2023/08/20
5G Bandstop Filters	WRCJV12-4900-5100-5900-6100-50EE	1	DZ-000186	WI	2022/12/20
Preamplifier	BBV 9721	9721-050	DZ-000209-1	SCHWARZBECK	2023/06/05
annulus Antenna	FMZB1513	1513-170	EM-000384	SCHWARZBECK	2023/03/04

The End