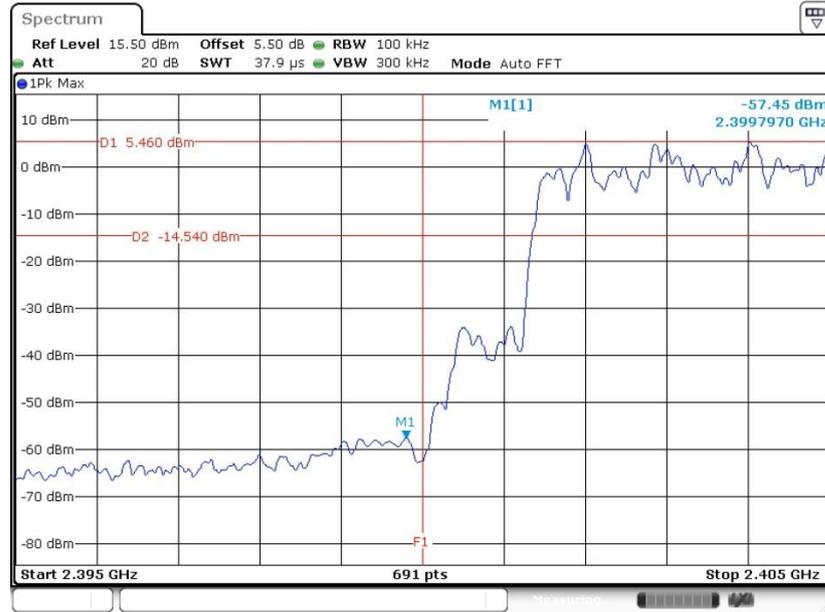




Test Mode :	2Mbps	Temperature :	21~25°C
Test Engineer :	Lion Ran	Relative Humidity :	51~55%

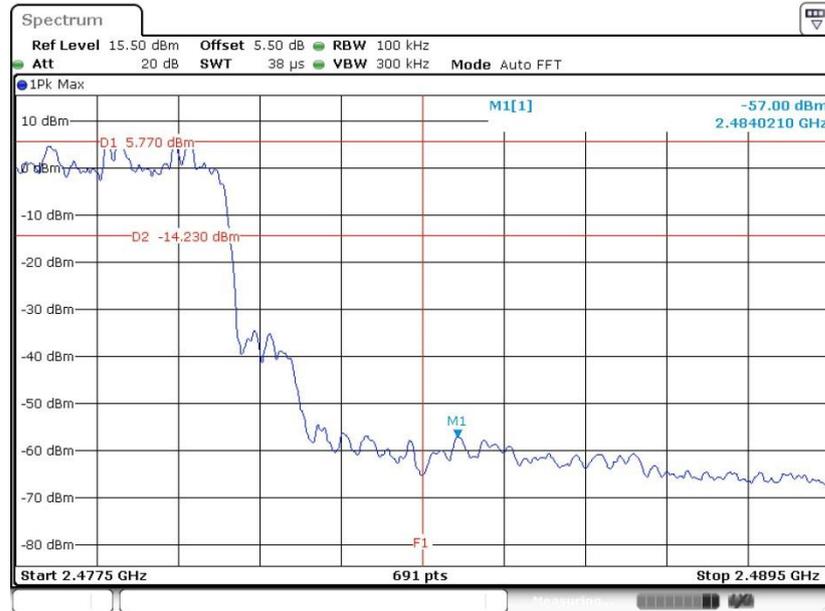
720510

### Hopping Mode Low Band Edge Plot



Date: 23.MAR.2019 04:14:41

### Hopping Mode High Band Edge Plot

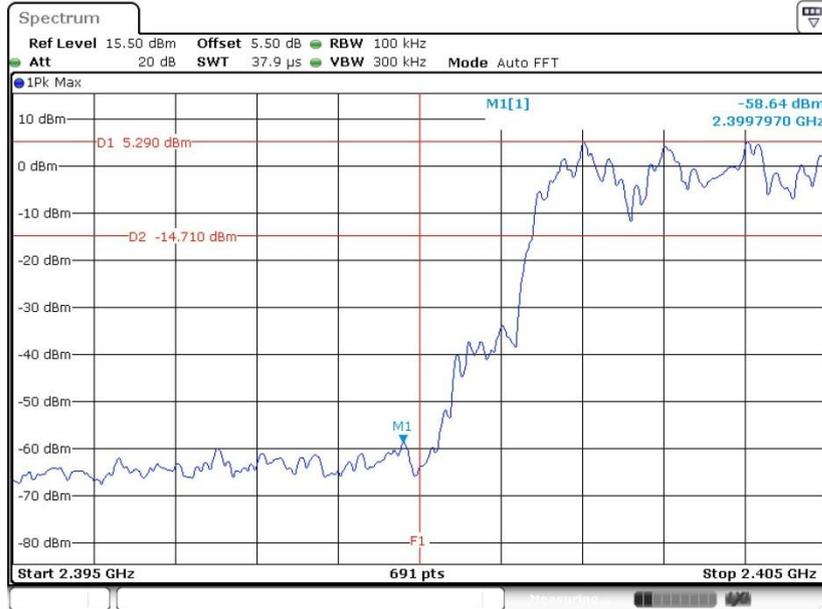


Date: 23.MAR.2019 05:34:28



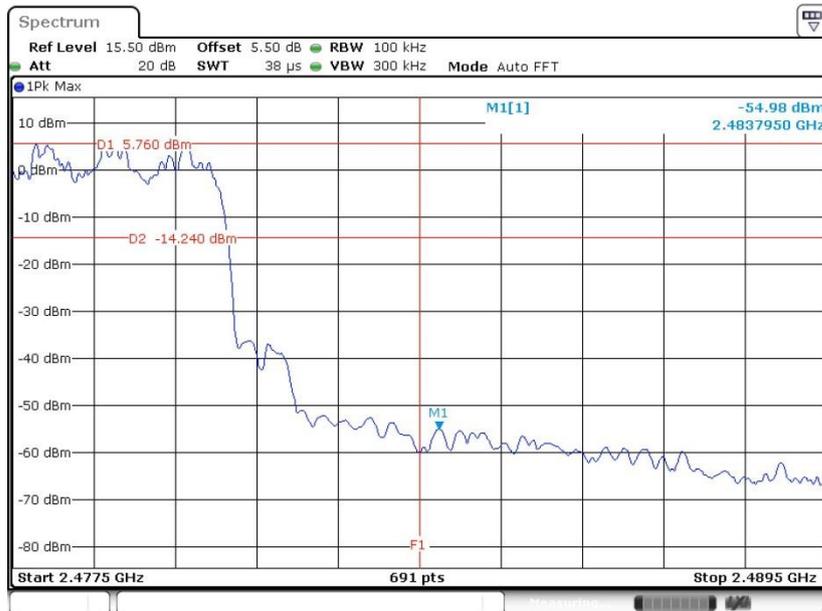
Test Mode :	3Mbps	Temperature :	21~25°C
Test Engineer :	Lion Ran	Relative Humidity :	51~55%

### Hopping Mode Low Band Edge Plot



Date: 23.MAR.2019 04:35:17

### Hopping Mode High Band Edge Plot



Date: 23.MAR.2019 04:54:23

## 3.7 Conducted Spurious Emission Measurement

### 3.7.1 Limit of Spurious Emission Measurement

In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.

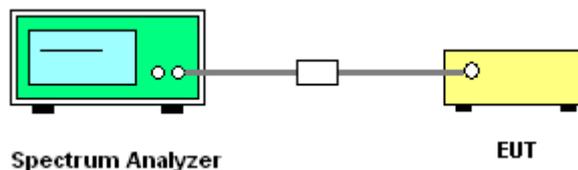
### 3.7.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

### 3.7.3 Test Procedure

1. The testing follows ANSI C63.10-2013 clause 7.8.8.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set RBW = 100 kHz, VBW = 300kHz, scan up through 10th harmonic. All harmonics / spurs must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

### 3.7.4 Test Setup

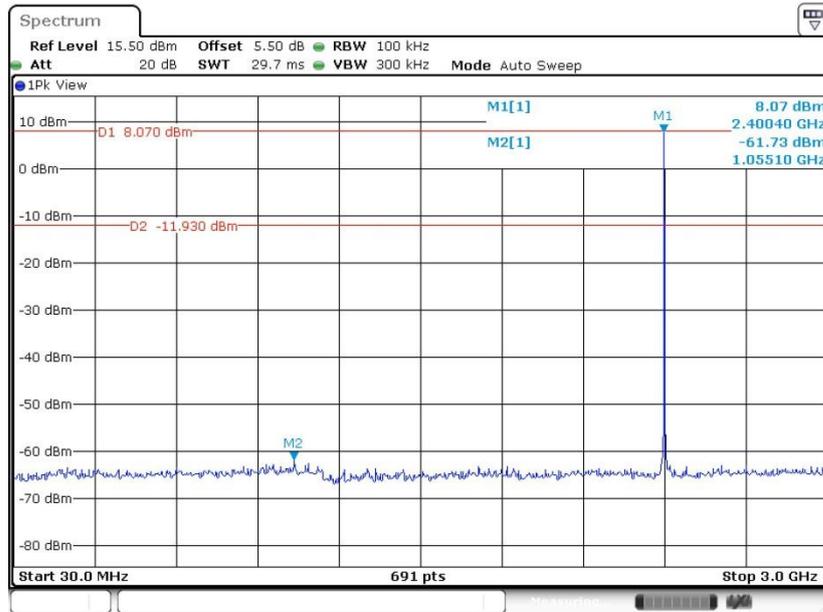




3.7.5 Test Result of Conducted Spurious Emission

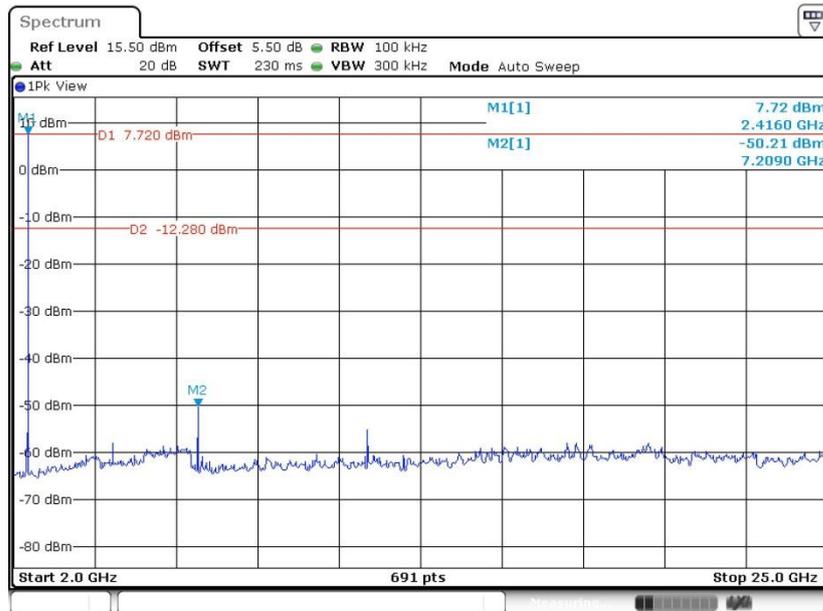
Test Mode :	1Mbps	Temperature :	21~25°C
Test Channel :	00	Relative Humidity :	51~55%
		Test Engineer :	Lion Ran

CSE Plot on Ch 00 between 30MHz ~ 3 GHz



Date: 23.MAR.2019 03:57:15

CSE Plot on Ch 00 between 2 GHz ~ 25 GHz

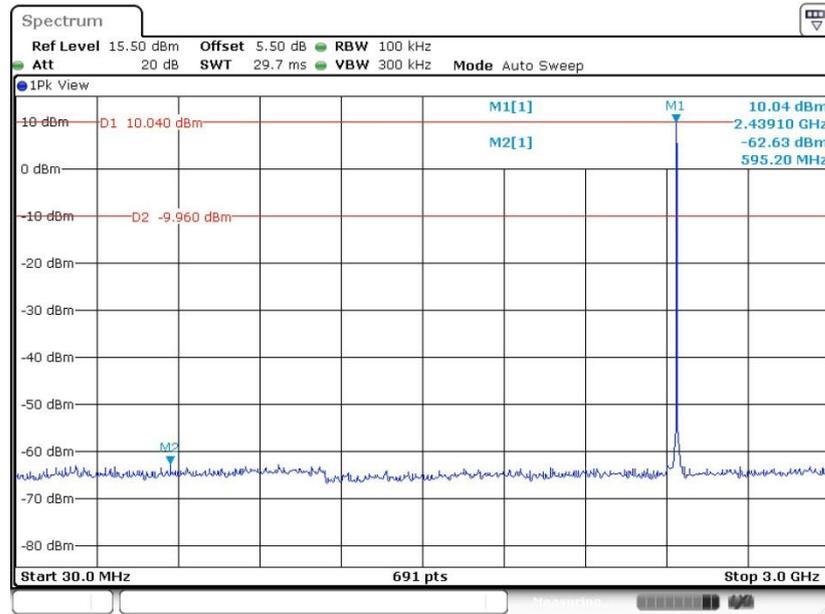


Date: 23.MAR.2019 03:57:47



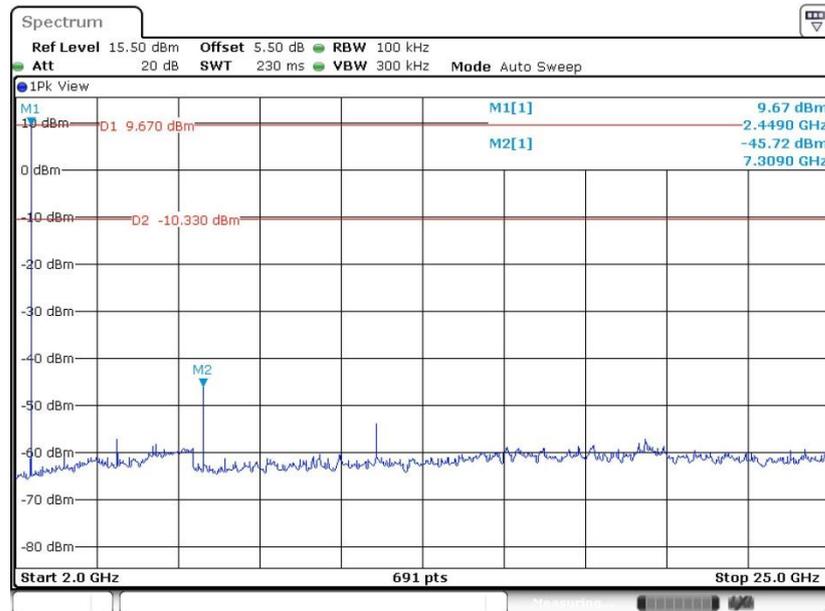
Test Mode :	1Mbps	Temperature :	21~25°C
Test Channel :	39	Relative Humidity :	51~55%
		Test Engineer :	Lion Ran

CSE Plot on Ch 39 between 30MHz ~ 3 GHz



Date: 23.MAR.2019 04:03:51

CSE Plot on Ch 39 between 2 GHz ~ 25 GHz

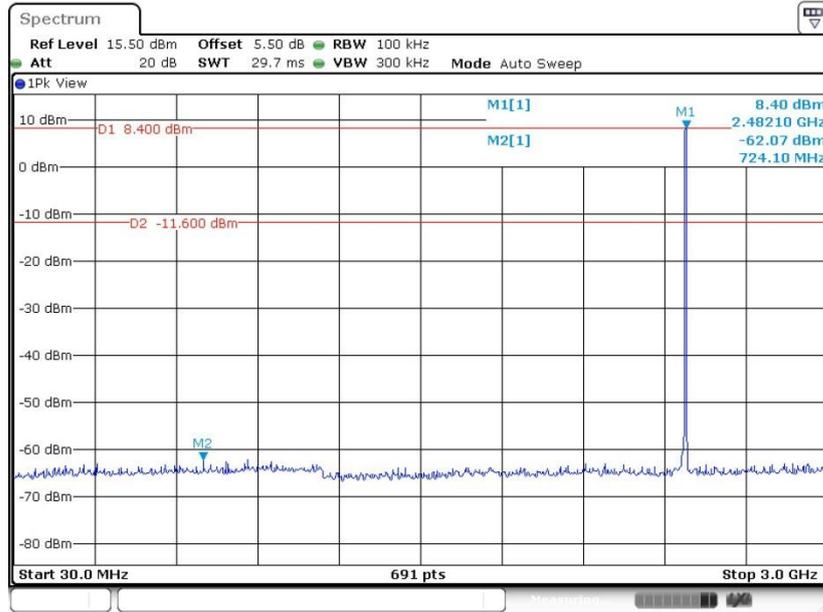


Date: 23.MAR.2019 04:04:23



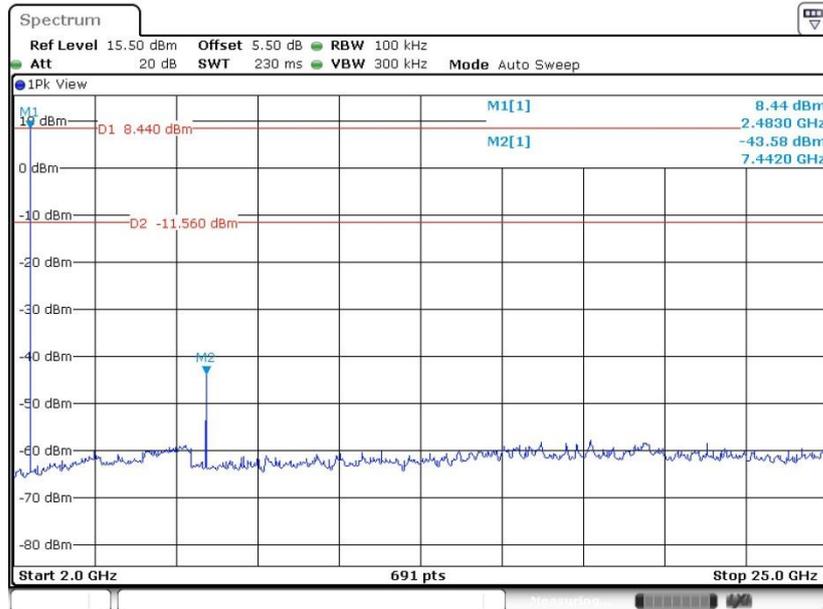
Test Mode :	1Mbps	Temperature :	21~25°C
Test Channel :	78	Relative Humidity :	51~55%
		Test Engineer :	Lion Ran

CSE Plot on Ch 78 between 30MHz ~ 3 GHz



Date: 23.MAR.2019 04:10:19

CSE Plot on Ch 78 between 2 GHz ~ 25 GHz

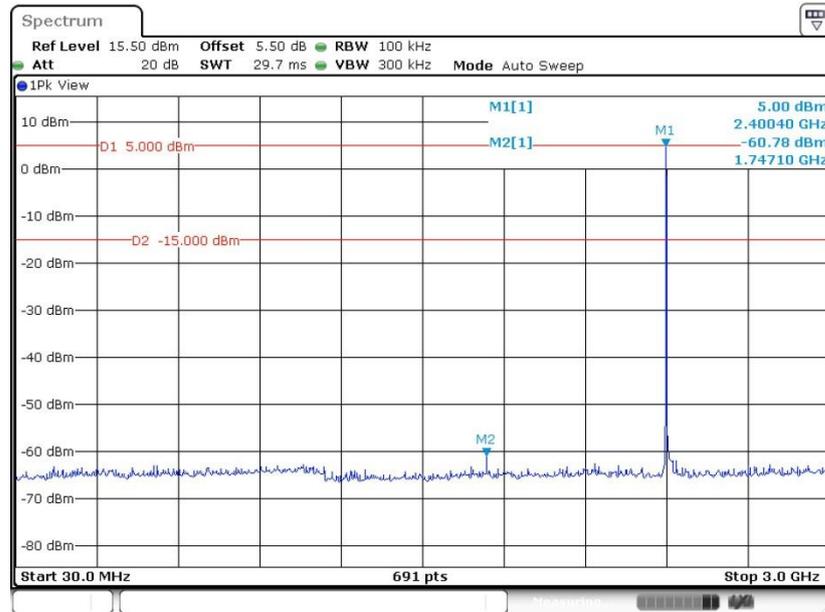


Date: 23.MAR.2019 04:11:00



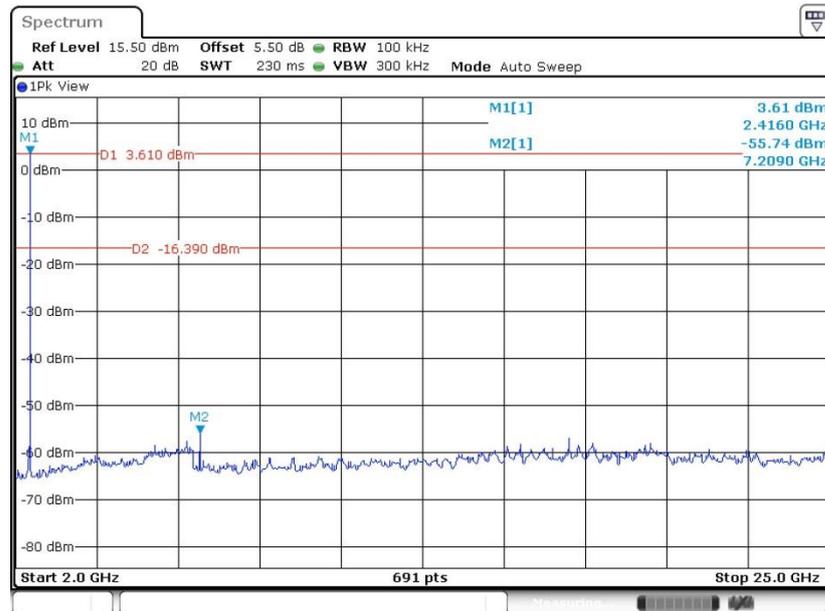
Test Mode :	2Mbps	Temperature :	21~25°C
Test Channel :	00	Relative Humidity :	51~55%
		Test Engineer :	Lion Ran

CSE Plot on Ch 00 between 30MHz ~ 3 GHz



Date: 23.MAR.2019 04:15:58

CSE Plot on Ch 00 between 2 GHz ~ 25 GHz

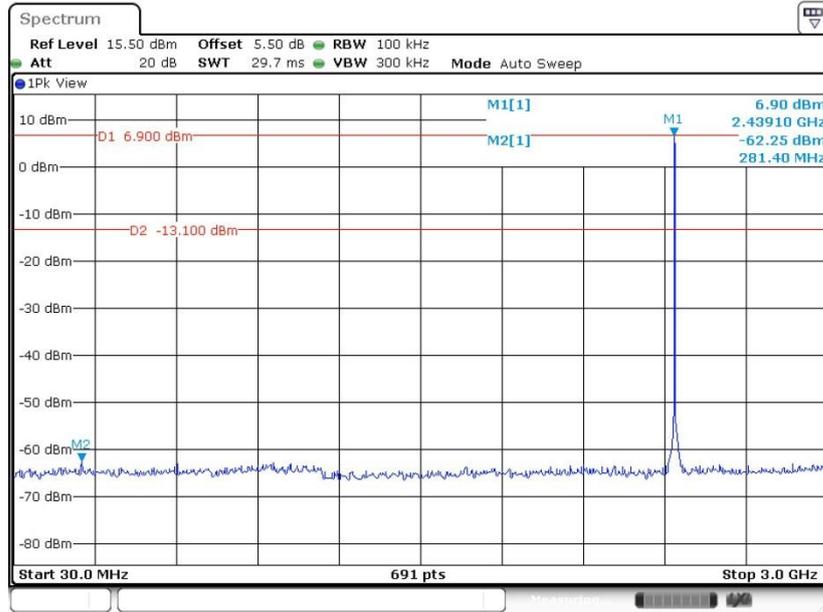


Date: 23.MAR.2019 04:16:25



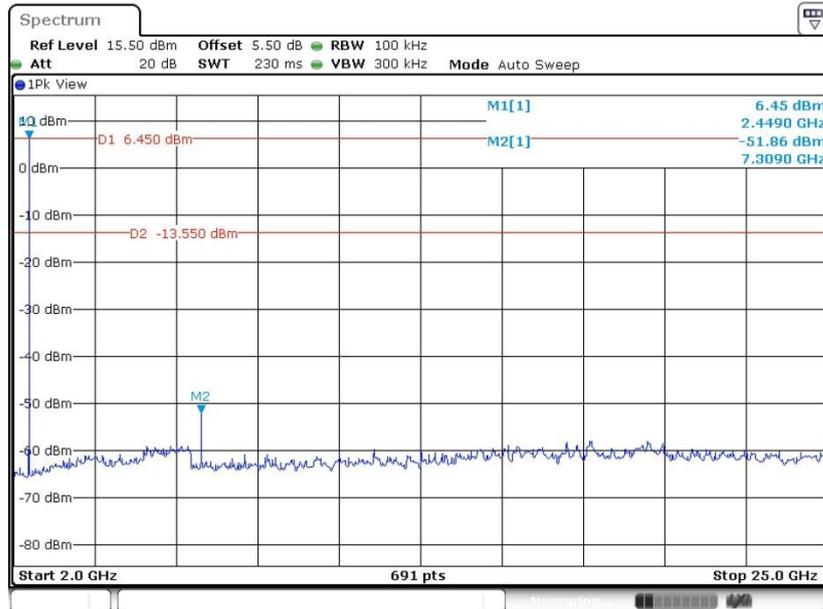
Test Mode :	2Mbps	Temperature :	21~25°C
Test Channel :	39	Relative Humidity :	51~55%
		Test Engineer :	Lion Ran

CSE Plot on Ch 39 between 30MHz ~ 3 GHz



Date: 23.MAR.2019 04:21:15

CSE Plot on Ch 39 between 2 GHz ~ 25 GHz

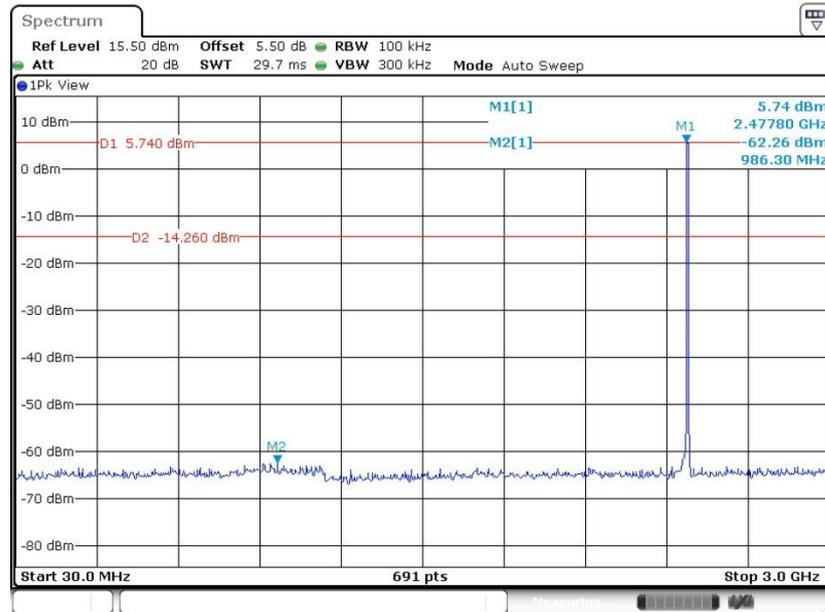


Date: 23.MAR.2019 04:22:26



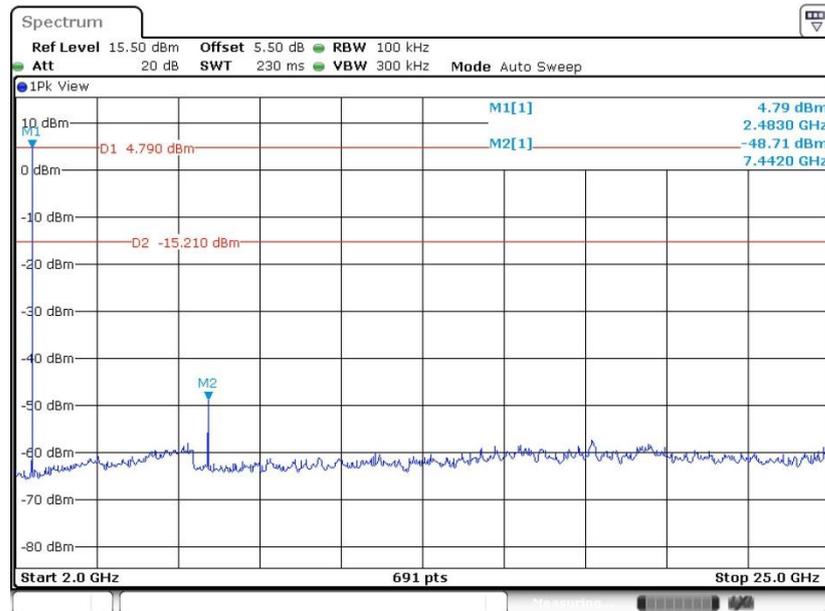
Test Mode :	2Mbps	Temperature :	21~25°C
Test Channel :	78	Relative Humidity :	51~55%
		Test Engineer :	Lion Ran

CSE Plot on Ch 78 between 30MHz ~ 3 GHz



Date: 23.MAR.2019 04:27:10

CSE Plot on Ch 78 between 2 GHz ~ 25 GHz

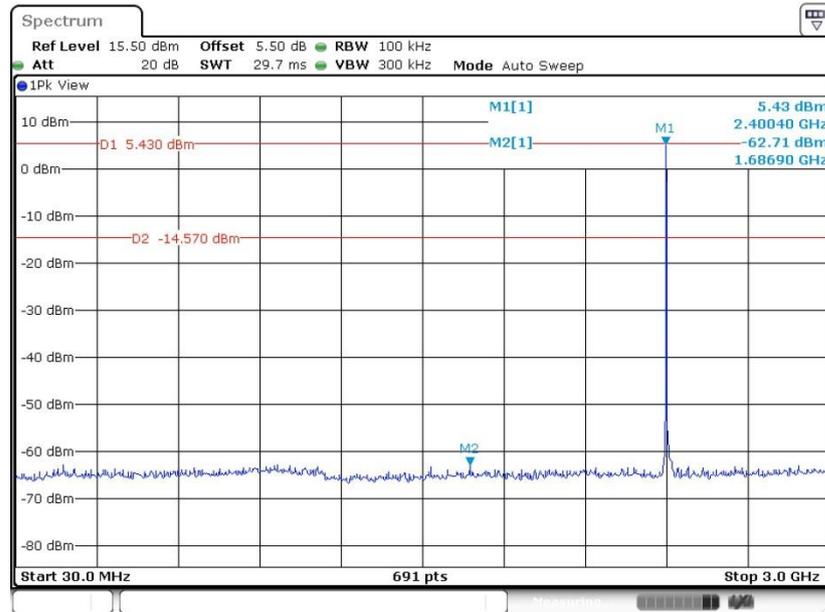


Date: 23.MAR.2019 04:27:41



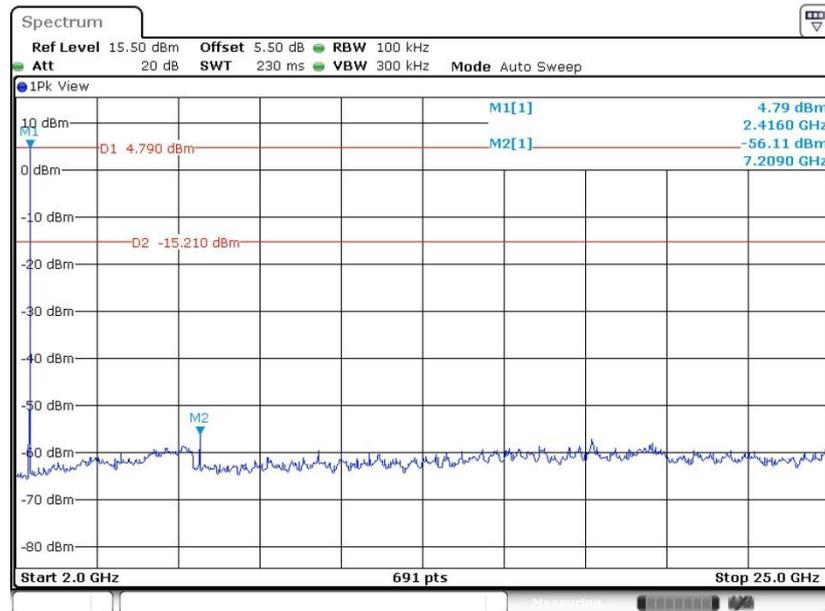
Test Mode :	3Mbps	Temperature :	21~25°C
Test Channel :	00	Relative Humidity :	51~55%
		Test Engineer :	Lion Ran

CSE Plot on Ch 00 between 30MHz ~ 3 GHz



Date: 23.MAR.2019 04:34:28

CSE Plot on Ch 00 between 2 GHz ~ 25 GHz

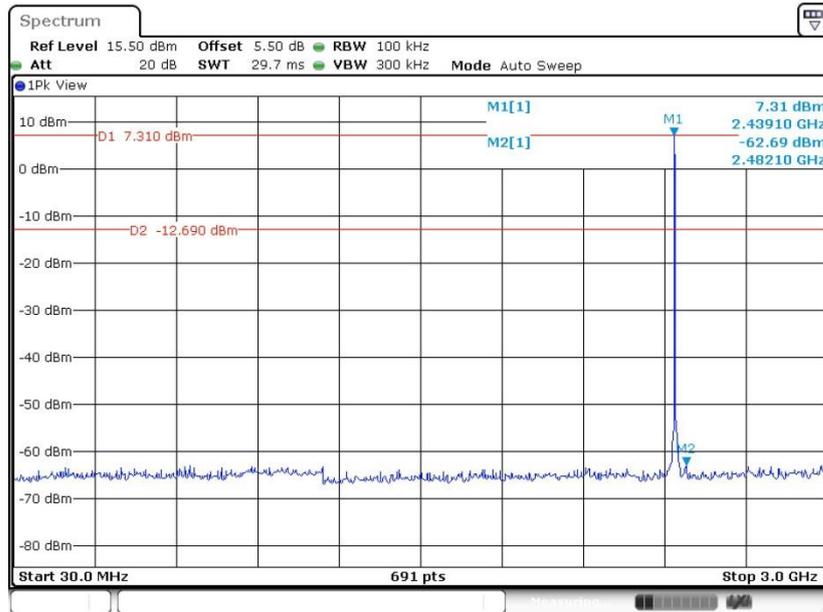


Date: 23.MAR.2019 04:34:55



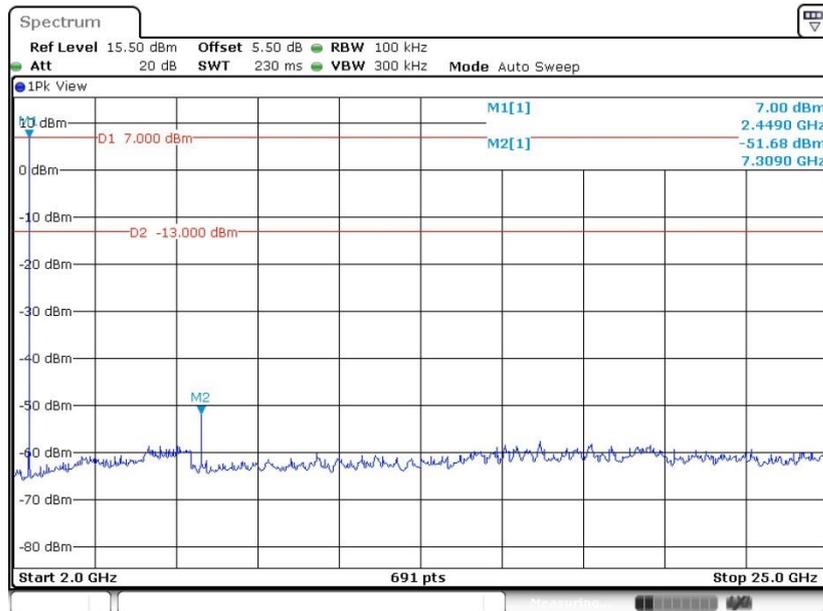
Test Mode :	3Mbps	Temperature :	21~25°C
Test Channel :	39	Relative Humidity :	51~55%
		Test Engineer :	Lion Ran

CSE Plot on Ch 39 between 30MHz ~ 3 GHz



Date: 23.MAR.2019 04:45:33

CSE Plot on Ch 39 between 2 GHz ~ 25 GHz

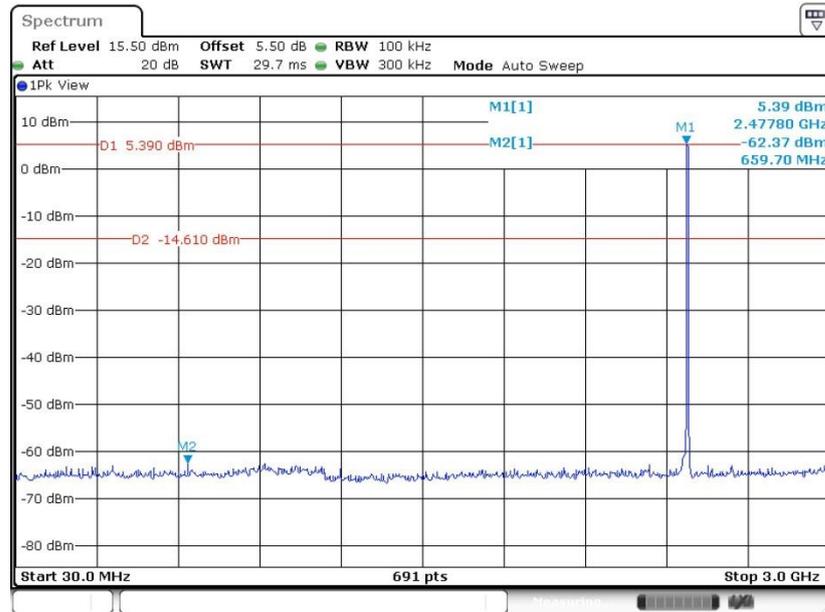


Date: 23.MAR.2019 04:46:13



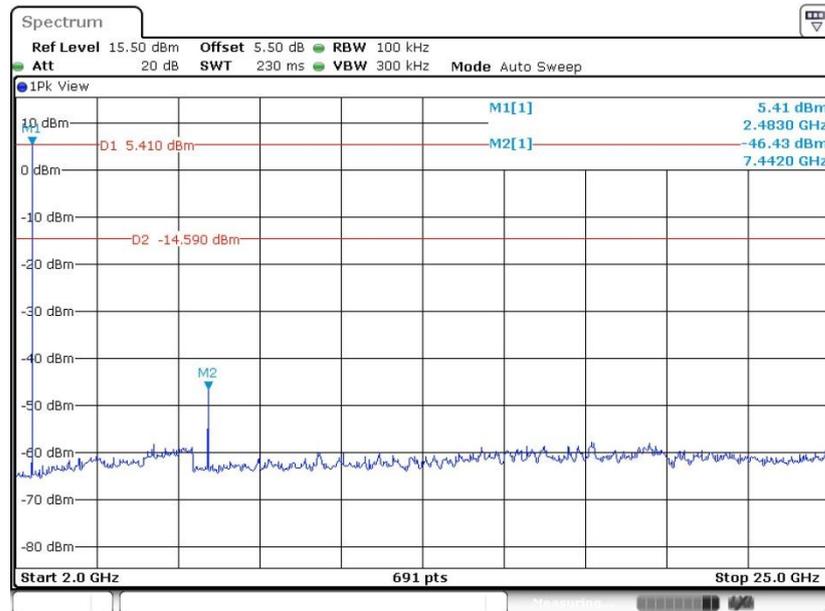
Test Mode :	3Mbps	Temperature :	21~25°C
Test Channel :	78	Relative Humidity :	51~55%
		Test Engineer :	Lion Ran

CSE Plot on Ch 78 between 30MHz ~ 3 GHz



Date: 23.MAR.2019 04:53:05

CSE Plot on Ch 78 between 2 GHz ~ 25 GHz



Date: 23.MAR.2019 04:53:33



### 3.8 Radiated Band Edges and Spurious Emission Measurement

#### 3.8.1 Limit of Radiated Band Edges and Spurious Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

#### 3.8.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.



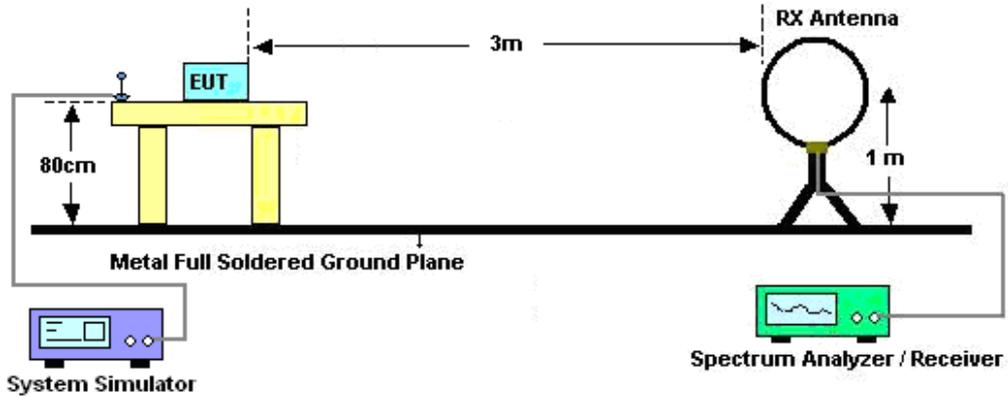
### 3.8.3 Test Procedures

1. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
4. Set to the maximum power setting and enable the EUT transmit continuously.
5. Use the following spectrum analyzer settings:
  - (1) Span shall wide enough to fully capture the emission being measured;
  - (2) Set RBW=100 kHz for  $f < 1 \text{ GHz}$ , RBW=1MHz for  $f > 1\text{GHz}$  ; VBW  $\geq$  RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak
  - (3) For average measurement: use duty cycle correction factor method per 15.35(c).  
Duty cycle = On time/100 milliseconds  
On time =  $N_1 * L_1 + N_2 * L_2 + \dots + N_{n-1} * L_{n-1} + N_n * L_n$   
Where  $N_1$  is number of type 1 pulses,  $L_1$  is length of type 1 pulses, etc.  
Average Emission Level = Peak Emission Level +  $20 * \log(\text{Duty cycle})$
6. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
7. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
8. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

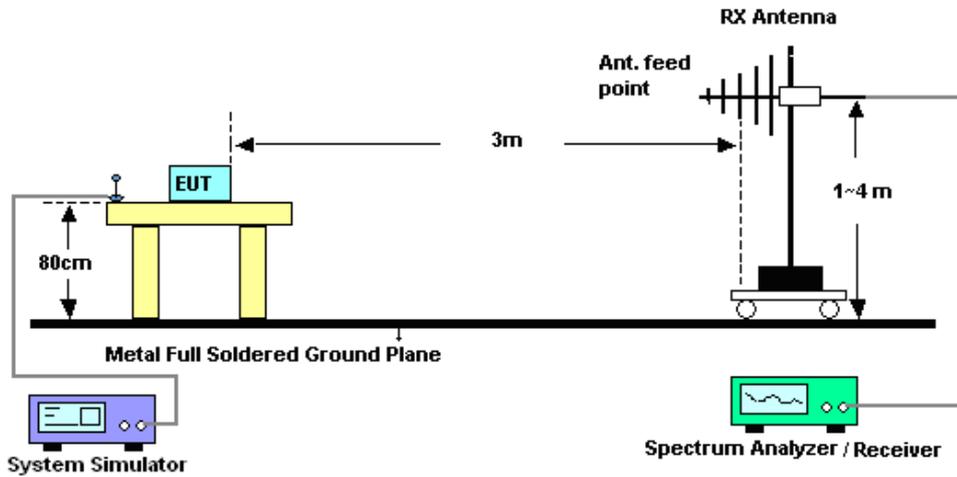
Note: The average levels were calculated from the peak level corrected with duty cycle correction factor (-24.79dB) derived from  $20 \log(\text{dwell time}/100\text{ms})$ . This correction is only for signals that hop with the fundamental signal, such as band-edge and harmonic. Other spurious signals that are independent of the hopping signal would not use this correction.

### 3.8.4 Test Setup

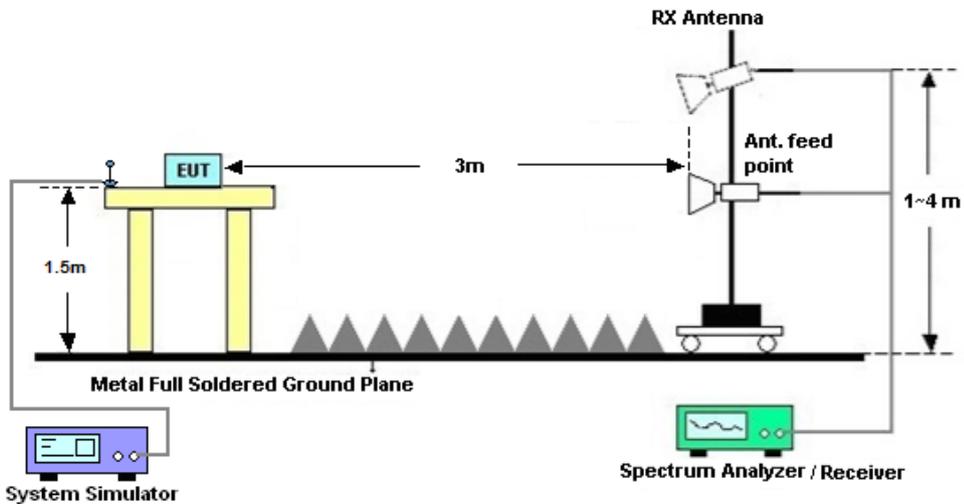
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz





### **3.8.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)**

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

### **3.8.6 Test Result of Radiated Spurious at Band Edges**

Please refer to Appendix B.

### **3.8.7 Test Result of Radiated Spurious Emission (30MHz ~ 10<sup>th</sup> Harmonic)**

Please refer to Appendix B.

### **3.8.8 Duty cycle correction factor for average measurement**

Please refer to Appendix C.



### 3.9 AC Conducted Emission Measurement

#### 3.9.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

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

\*Decreases with the logarithm of the frequency.

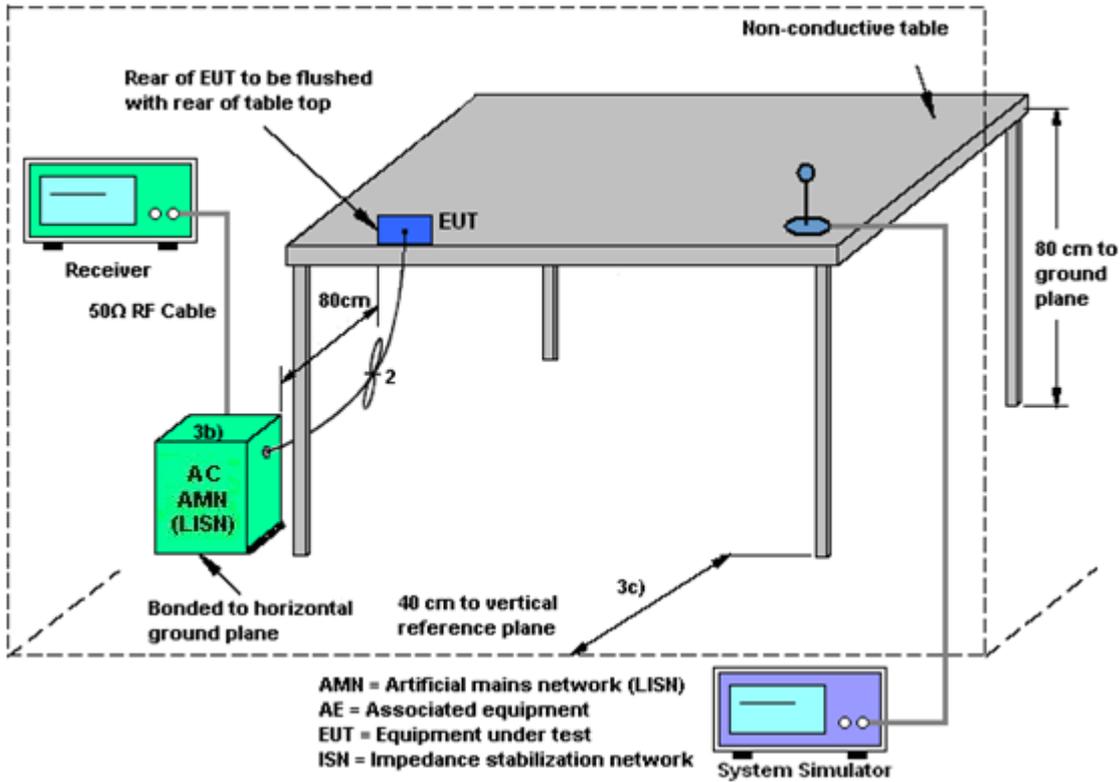
#### 3.9.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

#### 3.9.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

### 3.9.4 Test Setup



### 3.9.5 Test Result of AC Conducted Emission

Please refer to Appendix A.



## **3.10 Antenna Requirements**

### **3.10.1 Standard Applicable**

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. 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 rule.

### **3.10.2 Antenna Anti-Replacement Construction**

An embedded-in antenna design is used.

### **3.10.3 Antenna Gain**

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.



## 4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101040	10Hz~40GHz	Aug. 07, 2018	Mar. 19, 2019~ Mar. 23, 2019	Aug. 06, 2019	Conducted (TH01-KS)
Pulse Power Sensor	Anritsu	MA2411B	0917070	300MHz~40GHz	Jan. 14, 2019	Mar. 19, 2019~ Mar. 23, 2019	Jan. 13, 2020	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 14, 2019	Mar. 19, 2019~ Mar. 23, 2019	Jan. 13, 2020	Conducted (TH01-KS)
RF Cable	HUBER+SUHNER	SUCOFLEX 104	TH01KS001	30MHz~40GHz	Jun. 21, 2018	Mar. 19, 2019~ Mar. 23, 2019	Jun. 20, 2019	Conducted (TH01-KS)
RF Cable	HUBER+SUHNER	SUCOFLEX 104	TH01KS002	30MHz~40GHz	Jun. 21, 2018	Mar. 19, 2019~ Mar. 23, 2019	Jun. 20, 2019	Conducted (TH01-KS)
RF Cable	HUBER+SUHNER	SUCOFLEX 104	TH01KS003	30MHz~40GHz	Jun. 21, 2018	Mar. 19, 2019~ Mar. 23, 2019	Jun. 20, 2019	Conducted (TH01-KS)
EMI Test Receiver	Keysight	N9038A	MY57290151	3Hz~8.5GHz;Max 30dBm	Jun. 25, 2018	Apr. 15, 2019	Jun. 24, 2019	Radiation (03CH05-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55150244	10Hz~44GHz	Apr. 17, 2018	Apr. 15, 2019	Apr.16, 2019	Radiation (03CH05-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 19, 2018	Apr. 15, 2019	Oct. 18, 2019	Radiation (03CH05-KS)
Bilog Antenna	TeseQ	CBL6111D	49922	30MHz-1GHz	Jun. 12, 2018	Apr. 15, 2019	Jun. 11, 2019	Radiation (03CH05-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	75959	1GHz~18GHz	Jan. 27, 2019	Apr. 15, 2019	Jan. 26, 2020	Radiation (03CH05-KS)
SHF-EHF Horn	Com-power	AH-840	101070	18GHz~40GHz	Jan. 05, 2019	Apr. 15, 2019	Jan.04, 2020	Radiation (03CH05-KS)
Amplifier	com-power	PA-103A	161069	1MHz ~1000MHz / 32 dB	Apr 17, 2018	Apr. 15, 2019	Apr 16, 2019	Radiation (03CH05-KS)
Amplifier	MITEQ	TTA1840-35-HG	2014749	18~40GHz	Jan. 14, 2019	Apr. 15, 2019	Jan.13, 2020	Radiation (03CH05-KS)
high gain Amplifier	MITEQ	AMF-7D-00101800-30-10P	2025788	1Ghz-18Ghz	Apr.17.2018	Apr. 15, 2019	Apr.16,2019	Radiation (03CH05-KS)
Amplifier	Keysight	83017A	MY57280106	500MHz~26.5GHz	Apr..18.2018	Apr. 15, 2019	Apr..17.2019	Radiation (03CH05-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Apr. 15, 2019	NCR	Radiation (03CH05-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Apr. 15, 2019	NCR	Radiation (03CH05-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Apr. 15, 2019	NCR	Radiation (03CH05-KS)
RF Cable	HUBER+SUHNER	SUCOFLEX126E	03CH06KS001	30Mhz-18Ghz	Jul. 10, 2018	Apr. 15, 2019	Jul. 09, 2019	Radiation (03CH05-KS)
RF Cable	HUBER+SUHNER	SUCOFLEX126E	03CH06KS002	30Mhz-18Ghz	Jul. 10, 2018	Apr. 15, 2019	Jul. 09, 2019	Radiation (03CH05-KS)
Low Pass Filter	Wainwright Instruments	WLK4-1000-1530-8000-40SS	2	1G Low Pass	Jun. 19, 2018	Apr. 15, 2019	Jun. 18, 2019	Radiation (03CH05-KS)
EMI Receiver	R&S	ESC17	100768	9kHz~7GHz;	Apr. 19, 2018	Apr. 01, 2019	Apr. 18, 2019	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060103	9kHz~30MHz	Oct. 12, 2018	Apr. 01, 2019	Oct. 11, 2019	Conduction (CO01-KS)
AC LISN (for auxiliary)	MessTec	AN3016	060105	9kHz~30MHz	Nov. 19, 2018	Apr. 01, 2019	Nov. 18, 2019	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP00000811	AC 0V~300V, 45Hz~1000Hz	Oct. 12, 2018	Apr. 01, 2019	Oct. 11, 2019	Conduction (CO01-KS)
RF Cable	WOKEN	Y5T	00100N1Q3N1	150kHz~30MHz	Aug. 24 2018	Apr. 01, 2019	Aug. 23, 2019	Conduction (CO01-KS)
Transient limiter	COM-POWER	LIT-153	531040	150kHz~30MHz	Aug. 24, 2018	Apr. 01, 2019	Aug. 23, 2019	Conduction (CO01-KS)

NCR: No Calibration Required



## 5 Uncertainty of Evaluation

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI 63.10-2013. All the measurement uncertainty value were shown with a coverage K=2 to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

### Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	2.9dB
---	-------

### Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.0dB
---	-------

### Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.0dB
---	-------

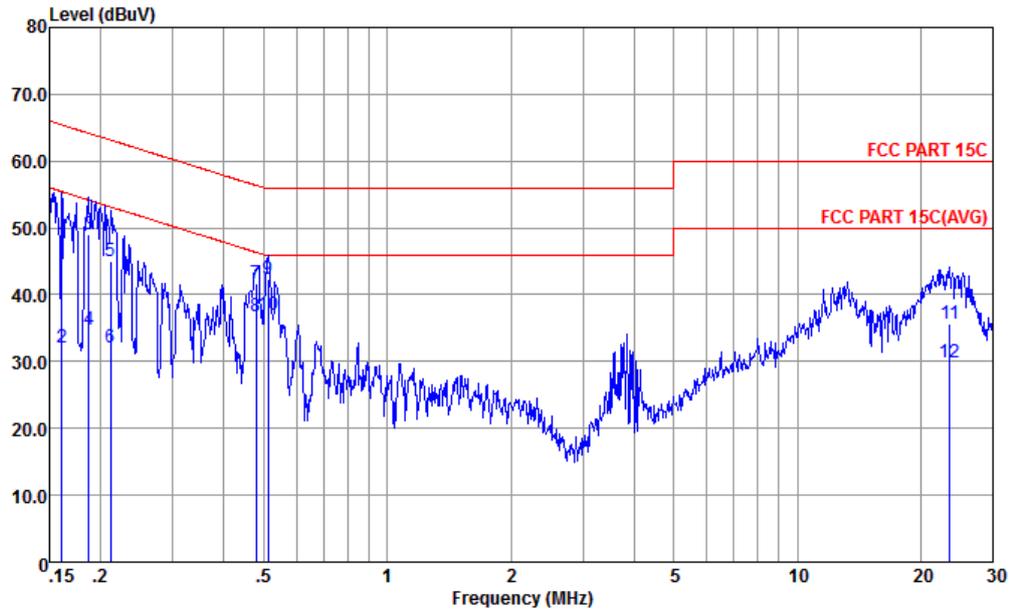
### Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.0dB
---	-------



## Appendix A. AC Conducted Emission Test Results

Test Engineer :	Amos Zhang	Temperature :	23.6~24.2°C
		Relative Humidity :	31~33%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		

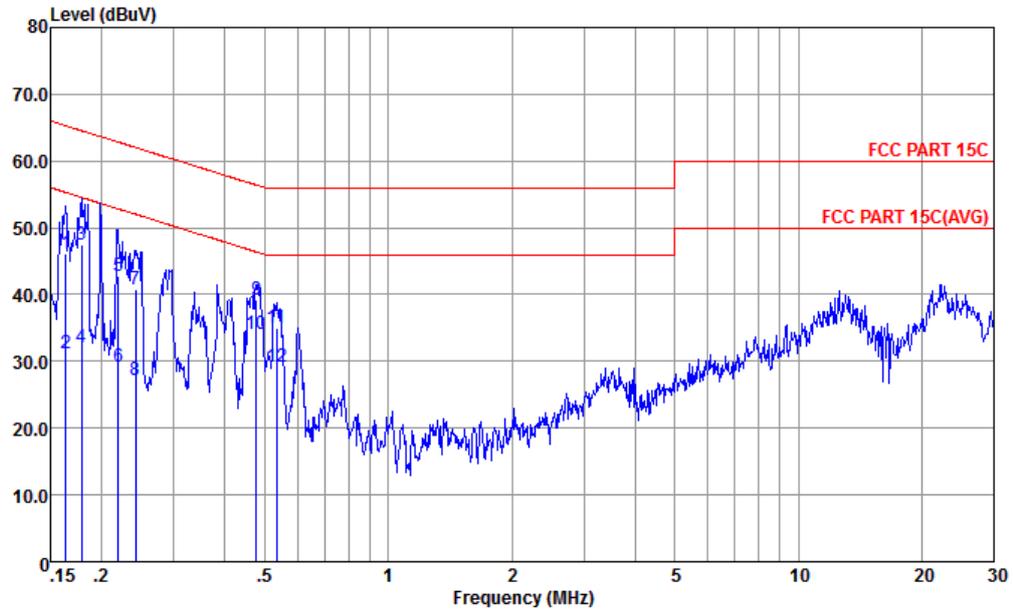


Site : CO01-KS  
 Condition : FCC PART 15C LISN-L-181119-060105 LINE

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.161	47.75	-17.68	65.43	37.20	0.10	10.45	QP
2	0.161	32.15	-23.28	55.43	21.60	0.10	10.45	Average
3	0.187	49.10	-15.05	64.15	38.60	0.11	10.39	QP
4	0.187	34.80	-19.35	54.15	24.30	0.11	10.39	Average
5	0.212	45.08	-18.06	63.14	34.60	0.12	10.36	QP
6	0.212	32.08	-21.06	53.14	21.60	0.12	10.36	Average
7	0.479	41.61	-14.75	56.36	31.20	0.17	10.24	QP
8	0.479	36.71	-9.65	46.36	26.30	0.17	10.24	Average
9	0.513	42.31	-13.69	56.00	31.90	0.17	10.24	QP
10 *	0.513	37.04	-8.96	46.00	26.63	0.17	10.24	Average
11	23.511	35.56	-24.44	60.00	24.20	0.81	10.55	QP
12	23.511	29.96	-20.04	50.00	18.60	0.81	10.55	Average



Test Engineer :	Amos Zhang	Temperature :	23.6~24.2°C
		Relative Humidity :	31~33%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : CO01-KS  
 Condition : FCC PART 15C LISN-N-181119-060105 NEUTRAL

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.163	46.12	-19.18	65.30	35.49	0.18	10.45	QP
2	0.163	31.22	-24.08	55.30	20.59	0.18	10.45	Average
3	0.179	47.39	-17.16	64.55	36.80	0.18	10.41	QP
4	0.179	32.19	-22.36	54.55	21.60	0.18	10.41	Average
5	0.220	42.72	-20.11	62.83	32.20	0.17	10.35	QP
6	0.220	29.12	-23.71	52.83	18.60	0.17	10.35	Average
7	0.242	40.80	-21.24	62.04	30.29	0.17	10.34	QP
8	0.242	27.10	-24.94	52.04	16.59	0.17	10.34	Average
9	0.476	39.29	-17.12	56.41	28.90	0.15	10.24	QP
10 *	0.476	33.99	-12.42	46.41	23.60	0.15	10.24	Average
11	0.535	34.88	-21.12	56.00	24.49	0.15	10.24	QP
12	0.535	29.28	-16.72	46.00	18.89	0.15	10.24	Average

Note:

- Level(dBμV) = Read Level(dBμV) + LISN Factor(dB) + Cable Loss(dB)
- Over Limit(dB) = Level(dBμV) – Limit Line(dBμV)



## Appendix B. Radiated Spurious Emission

2.4GHz 2400~2483.5MHz

BT (Band Edge @ 3m)

BT	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.	
		( MHz )	( dB $\mu$ V/m )	( dB )	( dB $\mu$ V/m )	( dB $\mu$ V )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )	
BT CH00 2402MHz		2320.79	52.78	-21.22	74	50.02	31.97	5.38	34.59	334	155	P	H	
	*	2320.79	27.99	-26.01	54	-	-	-	-	-	-	A	H	
		2402	100.44	-	-	97.47	32	5.48	34.51	334	155	P	H	
		2402	75.65	-	-	-	-	-	-	-	-	A	H	
		2384.62	54.00	-20.00	74	51.03	32.03	5.48	34.54	383	289	P	V	
	*	2384.62	29.21	-24.79	54	-	-	-	-	-	-	-	A	V
		2402	98.78	-	-	95.81	32	5.48	34.51	383	289	P	V	
		2402	73.99	-	-	-	-	-	-	-	-	-	A	V
BT CH 78 2480MHz		2484.25	55.21	-18.79	74	51.71	32.27	5.55	34.32	119	125	P	H	
	*	2484.25	30.42	-23.58	54	-	-	-	-	-	-	A	H	
		2480	100.00	-	-	96.5	32.27	5.55	34.32	119	125	P	H	
		2480	75.21	-	-	-	-	-	-	-	-	A	H	
		2489.92	53.42	-20.58	74	49.99	32.2	5.55	34.32	301	71	P	V	
	*	2489.92	28.63	-25.37	54	-	-	-	-	-	-	-	A	V
		2480	95.42	-	-	91.92	32.27	5.55	34.32	301	71	P	V	
		2480	70.63	-	-	-	-	-	-	-	-	-	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.													



2.4GHz 2400~2483.5MHz

BT (Harmonic @ 3m)

BT	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )
BT CH 00 2402MHz		4806	44.72	-29.28	74	64.55	34.2	8.1	62.13	150	360	P	H
		4806	40.44	-33.56	74	60.27	34.2	8.1	62.13	150	360	P	V
BT CH 39 2441MHz		4878	41.46	-32.54	74	61.35	34.13	8.09	62.11	100	360	P	H
		7320	43.26	-30.74	74	59.68	36.6	9.75	62.77	100	360	P	H
		4878	39.51	-34.49	74	59.4	34.13	8.09	62.11	100	360	P	V
		7320	42.41	-31.59	74	58.83	36.6	9.75	62.77	100	360	P	V
BT CH 78 2480MHz		4962	41.47	-32.53	74	61.4	34.1	8.05	62.08	150	360	P	H
		7440	41.21	-32.79	74	57.75	36.4	9.84	62.78	150	360	P	H
		4962	38.98	-35.02	74	58.91	34.1	8.05	62.08	150	360	P	V
		7440	41.66	-32.34	74	58.2	36.4	9.84	62.78	150	360	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Emission below 1GHz

2.4GHz BT (LF)

BT	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
		( MHz )	( dBμV/m )	( dB )	( dBμV/m )	( dBμV )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )
2.4GHz BT LF		30	18.35	-21.65	40	26.89	22.8	0.64	31.98	-	-	P	H
		74.62	18.51	-21.49	40	37.3	12.1	1.01	31.9	100	0	P	H
		498.51	20.14	-25.86	46	26.58	23.27	2.55	32.26	-	-	P	H
		671.17	24.1	-21.9	46	28.43	25.06	2.96	32.35	-	-	P	H
		895.24	24.7	-21.3	46	25.99	26.77	3.44	31.5	-	-	P	H
		940.83	25.58	-28.42	54	25.99	27.13	3.53	31.07	-	-	P	H
		38.73	25.69	-14.31	40	38.28	18.66	0.71	31.96	100	0	P	V
		60.07	24.45	-15.55	40	43.69	11.8	0.88	31.92	-	-	P	V
		76.56	21.92	-18.08	40	40.43	12.37	1.03	31.91	-	-	P	V
		94.99	16.23	-27.27	43.5	31.23	15.8	1.13	31.93	-	-	P	V
		175.5	17.01	-26.49	43.5	31.56	15.84	1.53	31.92	-	-	P	V
		854.5	25.93	-20.07	46	27.8	26.53	3.36	31.76	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												



**Note symbol**

*	<b>Fundamental Frequency</b> which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is <b>over limit</b> line.
P/A	<b>Peak</b> or <b>Average</b>
H/V	<b>Horizontal</b> or <b>Vertical</b>



A calculation example for radiated spurious emission is shown as below:

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1+2		( MHz )	( dBμV/m )	( dB )	( dBμV/m )	( dBμV )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )
802.11b		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
CH 01													
2412MHz		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

- Level(dBμV/m) =  
Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
- Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

**For Peak Limit @ 2390MHz:**

- Level(dBμV/m)  
= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)  
= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)  
= 55.45 (dBμV/m)
- Over Limit(dB)  
= Level(dBμV/m) – Limit Line(dBμV/m)  
= 55.45(dBμV/m) – 74(dBμV/m)  
= -18.55(dB)

**For Average Limit @ 2390MHz:**

- Level(dBμV/m)  
= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)  
= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)  
= 43.54 (dBμV/m)
- Over Limit(dB)  
= Level(dBμV/m) – Limit Line(dBμV/m)  
= 43.54(dBμV/m) – 54(dBμV/m)  
= -10.46(dB)

Both peak and average measured complies with the limit line, so test result is “PASS”.



## Appendix B. Radiated Spurious Emission

2.4GHz 2400~2483.5MHz

BT (Band Edge @ 3m)

BT	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.	
		( MHz )	( dBμV/m )	( dB )	( dBμV/m )	( dBμV )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )	
BT CH00 2402MHz		2320.79	52.78	-21.22	74	50.02	31.97	5.38	34.59	334	155	P	H	
	*	2320.79	27.99	-26.01	54	-	-	-	-	-	-	A	H	
		2402	100.44	-	-	97.47	32	5.48	34.51	334	155	P	H	
		2402	75.65	-	-	-	-	-	-	-	-	A	H	
		2384.62	54.00	-20.00	74	51.03	32.03	5.48	34.54	383	289	P	V	
	*	2384.62	29.21	-24.79	54	-	-	-	-	-	-	-	A	V
		2402	98.78	-	-	95.81	32	5.48	34.51	383	289	P	V	
		2402	73.99	-	-	-	-	-	-	-	-	-	A	V
BT CH 78 2480MHz		2484.25	55.21	-18.79	74	51.71	32.27	5.55	34.32	119	125	P	H	
	*	2484.25	30.42	-23.58	54	-	-	-	-	-	-	A	H	
		2480	100.00	-	-	96.5	32.27	5.55	34.32	119	125	P	H	
		2480	75.21	-	-	-	-	-	-	-	-	A	H	
		2489.92	53.42	-20.58	74	49.99	32.2	5.55	34.32	301	71	P	V	
	*	2489.92	28.63	-25.37	54	-	-	-	-	-	-	-	A	V
		2480	95.42	-	-	91.92	32.27	5.55	34.32	301	71	P	V	
		2480	70.63	-	-	-	-	-	-	-	-	-	A	V
Remark	<ol style="list-style-type: none"> <li>No other spurious found.</li> <li>All results are PASS against Peak and Average limit line.</li> </ol>													



2.4GHz 2400~2483.5MHz

BT (Harmonic @ 3m)

BT	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )
BT CH 00 2402MHz		4806	44.72	-29.28	74	64.55	34.2	8.1	62.13	150	360	P	H
		4806	40.44	-33.56	74	60.27	34.2	8.1	62.13	150	360	P	V
BT CH 39 2441MHz		4878	41.46	-32.54	74	61.35	34.13	8.09	62.11	100	360	P	H
		7320	43.26	-30.74	74	59.68	36.6	9.75	62.77	100	360	P	H
		4878	39.51	-34.49	74	59.4	34.13	8.09	62.11	100	360	P	V
		7320	42.41	-31.59	74	58.83	36.6	9.75	62.77	100	360	P	V
BT CH 78 2480MHz		4962	41.47	-32.53	74	61.4	34.1	8.05	62.08	150	360	P	H
		7440	41.21	-32.79	74	57.75	36.4	9.84	62.78	150	360	P	H
		4962	38.98	-35.02	74	58.91	34.1	8.05	62.08	150	360	P	V
		7440	41.66	-32.34	74	58.2	36.4	9.84	62.78	150	360	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Emission below 1GHz

2.4GHz BT (LF)

BT	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		( MHz )	( dBμV/m )	( dB )	( dBμV/m )	( dBμV )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )
2.4GHz BT LF		30	18.35	-21.65	40	26.89	22.8	0.64	31.98	-	-	P	H
		74.62	18.51	-21.49	40	37.3	12.1	1.01	31.9	100	0	P	H
		498.51	20.14	-25.86	46	26.58	23.27	2.55	32.26	-	-	P	H
		671.17	24.1	-21.9	46	28.43	25.06	2.96	32.35	-	-	P	H
		895.24	24.7	-21.3	46	25.99	26.77	3.44	31.5	-	-	P	H
		940.83	25.58	-28.42	54	25.99	27.13	3.53	31.07	-	-	P	H
		38.73	25.69	-14.31	40	38.28	18.66	0.71	31.96	100	0	P	V
		60.07	24.45	-15.55	40	43.69	11.8	0.88	31.92	-	-	P	V
		76.56	21.92	-18.08	40	40.43	12.37	1.03	31.91	-	-	P	V
		94.99	16.23	-27.27	43.5	31.23	15.8	1.13	31.93	-	-	P	V
		175.5	17.01	-26.49	43.5	31.56	15.84	1.53	31.92	-	-	P	V
		854.5	25.93	-20.07	46	27.8	26.53	3.36	31.76	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												



**Note symbol**

*	<b>Fundamental Frequency</b> which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is <b>over limit</b> line.
P/A	<b>Peak</b> or <b>Average</b>
H/V	<b>Horizontal</b> or <b>Vertical</b>



A calculation example for radiated spurious emission is shown as below:

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1+2		( MHz )	( dBμV/m )	( dB )	( dBμV/m )	( dBμV )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )
802.11b		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
CH 01													
2412MHz		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

- Level(dBμV/m) =  
Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
- Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

**For Peak Limit @ 2390MHz:**

- Level(dBμV/m)  
= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)  
= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)  
= 55.45 (dBμV/m)
- Over Limit(dB)  
= Level(dBμV/m) – Limit Line(dBμV/m)  
= 55.45(dBμV/m) – 74(dBμV/m)  
= -18.55(dB)

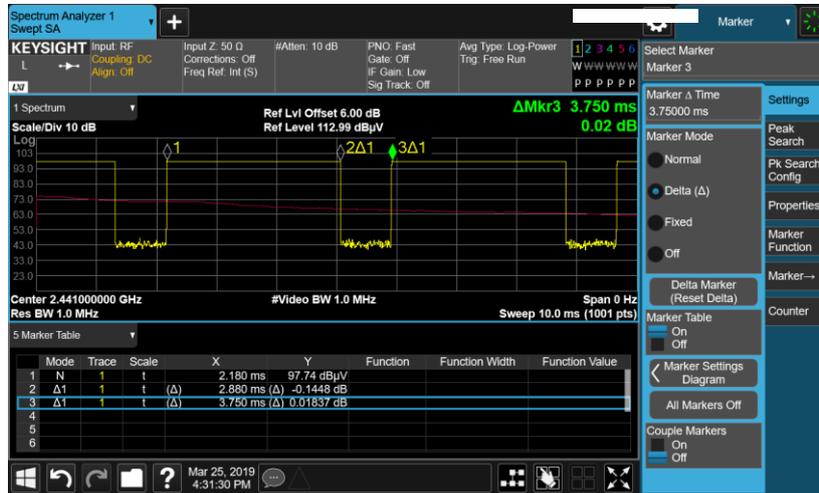
**For Average Limit @ 2390MHz:**

- Level(dBμV/m)  
= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)  
= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)  
= 43.54 (dBμV/m)
- Over Limit(dB)  
= Level(dBμV/m) – Limit Line(dBμV/m)  
= 43.54(dBμV/m) – 54(dBμV/m)  
= -10.46(dB)

Both peak and average measured complies with the limit line, so test result is “PASS”.

## Appendix C. Duty Cycle Plots

DH5 on time (One Pulse) Plot on Channel 39



DH5 on time (Count Pulses) Plot on Channel 39



**Note:**

1. Worst case Duty cycle = on time/100 milliseconds =  $2 * 2.88 / 100 = 5.76 \%$
2. Worst case Duty cycle correction factor =  $20 * \log(\text{Duty cycle}) = -24.79 \text{ dB}$
3. DH5 has the highest duty cycle worst case and is reported.