

## 9.7 RADIATED SPURIOUS EMISSION

### 9.7.1 Applicable Standard

According to FCC Part 15.247(d), 15.209, RSS-247 Clause 3.3, 558074 D01 15.247 Meas Guidance V05r02

### 9.7.2 Conformance Limit

According to FCC Part 15.247(d) & RSS-Gen Table 6 & Table 7: radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

According to FCC Part 15.205, Restricted bands

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
10.495-0.505	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	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	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(2)
13.36-13.41			

According to FCC Part 15.205, the level of any transmitter spurious emission in Restricted bands shall not exceed the level of the emission specified in the following table

Restricted Frequency (MHz)	Field Strength (μV/m)	Field Strength (dBμV/m)	Measurement Distance
0.009-0.490	2400/F (KHz)	20 log (uV/m)	300
0.490-1.705	24000/F (KHz)	20 log (uV/m)	30
1.705-30	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

### 9.7.3 Test Configuration

Test according to clause 7.2 radio frequency test setup 2

### 9.7.4 Test Procedure

This test is required for any spurious emission that falls in a Restricted Band, as defined in Section 15.205. It must be performed with the highest gain of each type of antenna proposed for use with the EUT. Use the following spectrum analyzer settings:

The EUT was placed on a turn table which is 0.8m above ground plane.

Maximum procedure was performed on the highest emissions to ensure EUT compliance.

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for  $f \geq 1$  GHz (1GHz to 25GHz), 100 kHz for  $f < 1$  GHz (30MHz to 1GHz)

VBW  $\geq$  RBW

Sweep = auto

Detector function = peak

Trace = max hold

Follow the guidelines in ANSI C63.10-2013 respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization, etc. A pre-amp and a high pass filter are required for this test, in order to provide the measuring system with sufficient sensitivity. Allow the trace to stabilize. The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, which must comply with the limit specified in Section 15.35(b). Submit this data.

Now set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a "duty cycle correction factor", derived from  $20\log(\text{dwell time}/100 \text{ ms})$ , in an effort to demonstrate compliance with the 15.209 limit. Submit this data.

Repeat above procedures until all frequency measured was complete.

### 9.7.5 Test Results

#### ■ Spurious Emission below 30MHz(9KHz to 30MHz)

Temperature: 27°C Test Date: May 14, 2020  
Humidity: 43 % Test By: XW  
Test mode: TX Mode

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
		PK	AV	PK	AV	PK	AV
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Note: the amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

Distance extrapolation factor =  $40\log(\text{Specific distance}/ \text{test distance})$  (dB);

Limit line=Specific limits(dBuV) + distance extrapolation factor

#### ■ Spurious Emission Above 1GHz(1GHz to 25GHz)

Bluetooth (GFSK, pi/4-DQPSK, 8DPSK, Hopping) mode have been tested, and the worst result(GFSK)was report as below:

Temperature: 27°C Test Date: May 14, 2020  
Humidity: 49 % Test By: XW  
Test mode: GFSK Frequency: Channel 0: 2402MHz

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
		PK	AV	PK	AV	PK	AV
2729.75	V	46.84	31.80	74.00	54.00	-27.16	-22.20
8441.75	V	51.48	36.58	74.00	54.00	-22.52	-17.42
11951.40	V	53.35	37.35	74.00	54.00	-20.65	-16.65
13660.75	V	53.71	37.70	74.00	54.00	-20.29	-16.30
16468.30	V	53.08	36.10	74.00	54.00	-20.92	-17.90
17988.95	V	53.66	38.66	74.00	54.00	-20.34	-15.34
1974.10	H	46.71	32.70	74.00	54.00	-27.29	-21.30
8413.70	H	51.94	36.90	74.00	54.00	-22.06	-17.10
10839.60	H	52.99	37.90	74.00	54.00	-21.01	-16.10
13511.15	H	52.91	37.62	74.00	54.00	-21.09	-16.38
16261.75	H	52.66	38.66	74.00	54.00	-21.34	-15.34
17949.00	H	54.32	39.36	74.00	54.00	-19.68	-14.64

Temperature: 27°C  
Humidity: 49 %  
Test mode: GFSK

Test Date: May 14, 2020  
Test By: XW  
Frequency: Channel 39: 2441MHz

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
		PK	AV	PK	AV	PK	AV
8397.55	V	50.36	35.36	74.00	54.00	-23.64	-18.64
10838.75	V	52.78	37.78	74.00	54.00	-21.22	-16.22
11887.65	V	52.75	37.75	74.00	54.00	-21.25	-16.25
13014.75	V	53.08	37.10	74.00	54.00	-20.92	-16.90
15509.50	V	52.80	37.80	74.00	54.00	-21.20	-16.20
17737.35	V	52.84	37.84	74.00	54.00	-21.16	-16.16
7626.60	H	50.75	35.75	74.00	54.00	-23.25	-18.25
10278.60	H	51.91	36.91	74.00	54.00	-22.09	-17.09
12517.50	H	52.52	38.52	74.00	54.00	-21.48	-15.48
13117.60	H	52.88	37.88	74.00	54.00	-21.12	-16.12
15023.30	H	53.29	38.29	74.00	54.00	-20.71	-15.71
17010.60	H	53.38	37.38	74.00	54.00	-20.62	-16.62

Temperature: 27°C  
Humidity: 49 %  
Test mode: GFSK

Test Date: May 14, 2020  
Test By: XW  
Frequency: Channel 78: 2480MHz

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
		PK	AV	PK	AV	PK	AV
8275.15	V	51.23	36.23	74.00	54.00	-22.77	-17.77
10278.60	V	52.07	36.10	74.00	54.00	-21.93	-17.90
13345.40	V	53.11	37.11	74.00	54.00	-20.89	-16.89
14254.90	V	53.39	37.39	74.00	54.00	-20.61	-16.61
15863.95	V	53.40	37.40	74.00	54.00	-20.60	-16.60
17970.25	V	53.50	37.50	74.00	54.00	-20.50	-16.50
1170.85	H	46.22	31.22	74.00	54.00	-27.78	-22.78
10930.55	H	52.34	37.34	74.00	54.00	-21.66	-16.66
12950.15	H	53.71	38.71	74.00	54.00	-20.29	-15.29
14877.10	H	54.13	39.13	74.00	54.00	-19.87	-14.87
16320.40	H	53.60	38.60	74.00	54.00	-20.40	-15.40
18000.00	H	55.01	39.10	74.00	54.00	-18.99	-14.90

**Note:** (1) All Readings are Peak Value (VBW=3MHz) and Average Value (VBW=10Hz).  
(2) Emission Level= Reading Level+Probe Factor +Cable Loss.  
(3) The reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

■ Spurious Emission in Restricted Band 2310-2390MHz and 2483.5-2500MHz

Bluetooth (nonhopping , Hopping) mode have been tested, and the worst result(GFSK, nonhopping) was report as below:

Temperature:	27℃	Test Date:	May 14, 2020
Humidity:	43 %	Test By:	XW
Test mode:	GFSK	Frequency:	Channel 0: 2402MHz

Frequency (MHz)	Polarity H/V	PK(dBuV/m) (VBW=3MHz)	Limit 3m (dBuV/m)	Over(dB)	AV(dBuV/m) (VBW=10Hz)	Limit 3m (dBuV/m)	Over (dB)
2381.124	H	52.26	74.00	-21.74	37.20	54.00	-16.80
2374.068	V	53.71	74.00	-20.29	37.70	54.00	-16.30

Temperature:	27℃	Test Date:	May 14, 2020
Humidity:	43 %	Test By:	XW
Test mode:	GFSK	Frequency:	Channel 78: 2480MHz

Frequency (MHz)	Polarity H/V	PK(dBuV/m) (VBW=3MHz)	Limit 3m (dBuV/m)	Over(dB)	AV(dBuV/m) (VBW=10Hz)	Limit 3m (dBuV/m)	Over (dB)
2483.714	H	52.13	74.00	-21.87	37.10	54.00	-16.90
2483.752	V	53.15	74.00	-20.85	38.10	54.00	-15.90

Temperature:	24℃	Test Date:	May 14, 2020
Humidity:	53 %	Test By:	XW
Test mode:	GFSK	Frequency:	Hopping

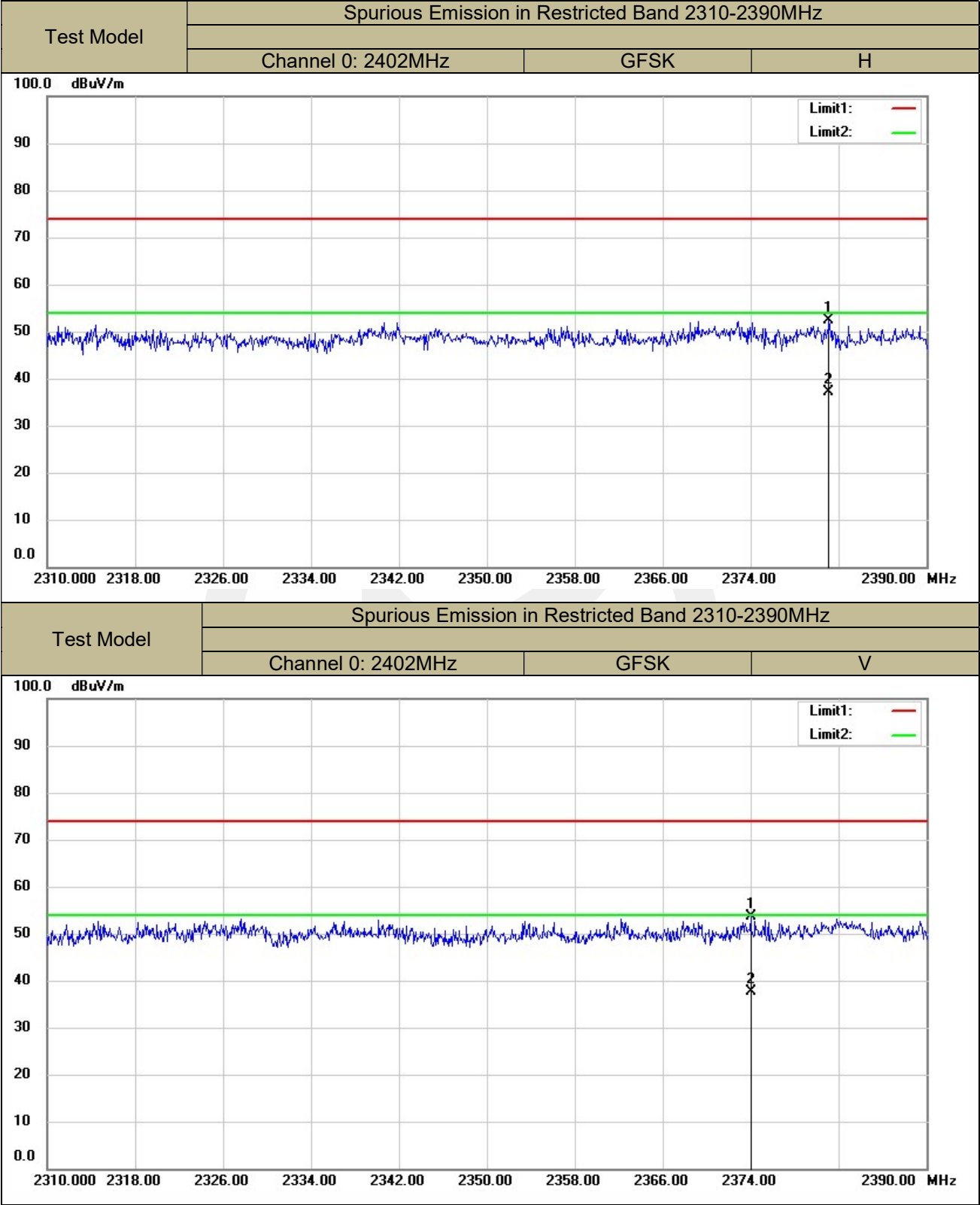
Frequency (MHz)	Polarity H/V	PK(dBuV/m) (VBW=3MHz)	Limit 3m (dBuV/m)	Over(dB)	AV(dBuV/m) (VBW=10Hz)	Limit 3m (dBuV/m)	Over (dB)
2390.00	H	49.33	74.00	-24.67	34.30	54.00	-19.70
2483.50	H	48.96	74.00	-25.04	34.90	54.00	-19.10
2390.00	V	48.94	74.00	-25.06	35.90	54.00	-18.10
2483.50	V	49.58	74.00	-24.42	34.60	54.00	-19.40

**Note:** (1) All Readings are Peak Value (VBW=3MHz) and Average Value (VBW=10Hz).

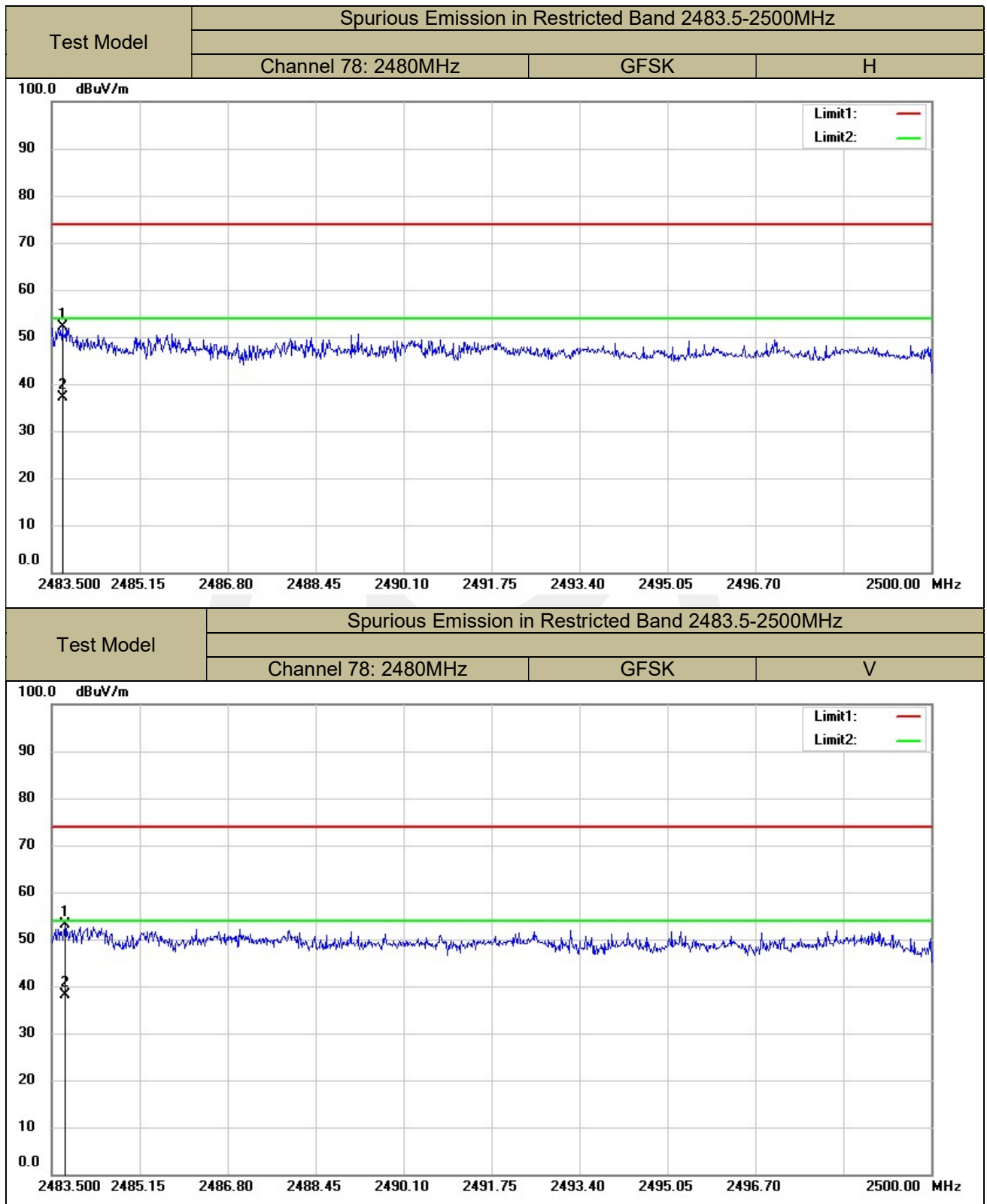
(2) Emission Level= Reading Level+Probe Factor +Cable Loss.

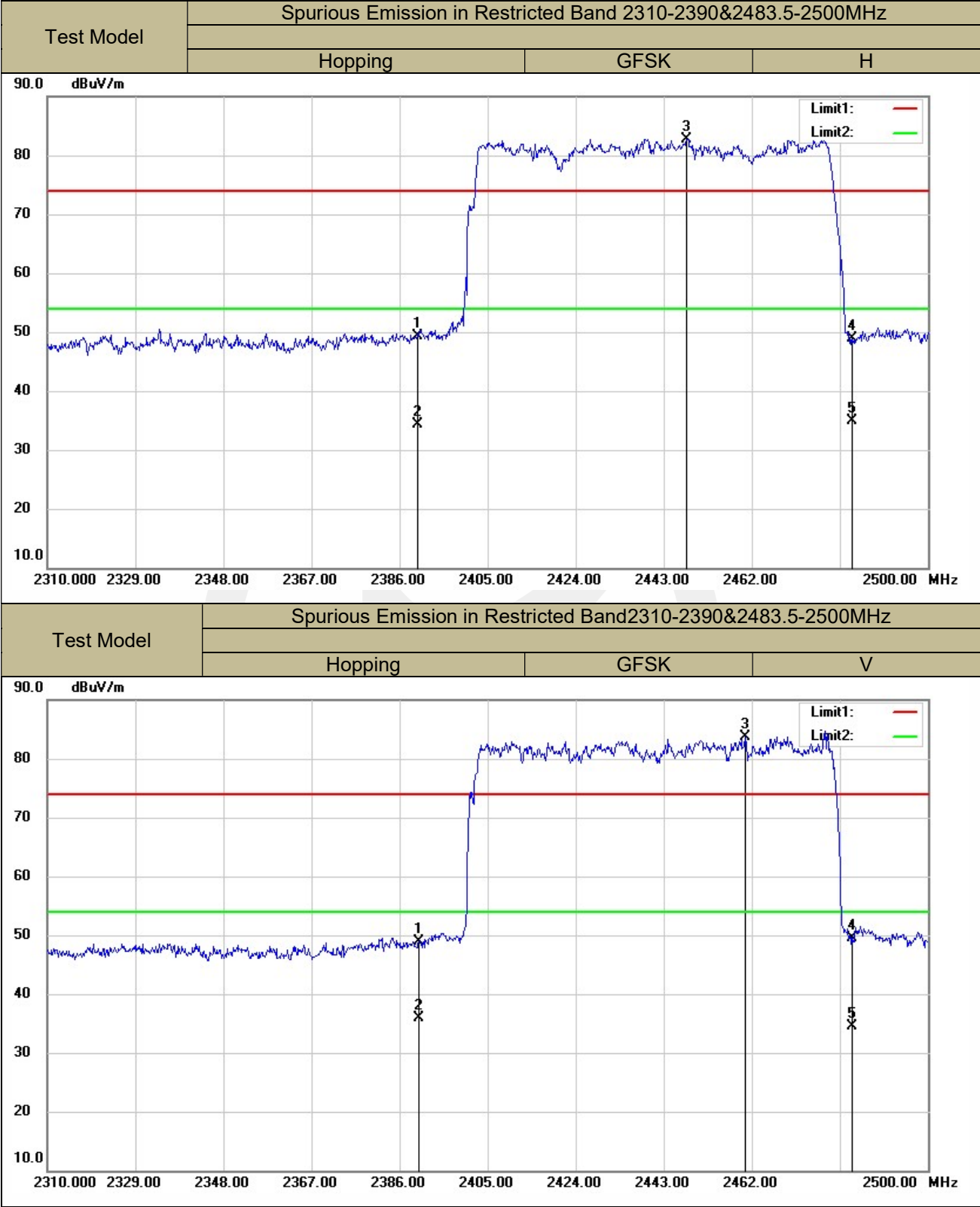
(3) The reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.





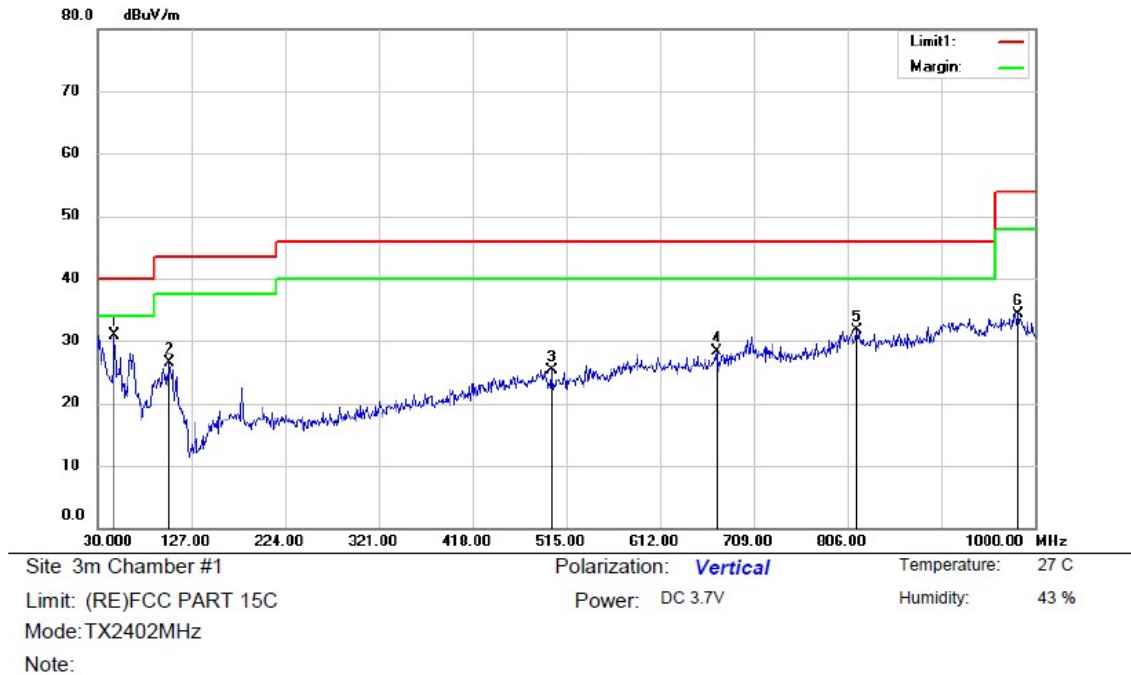




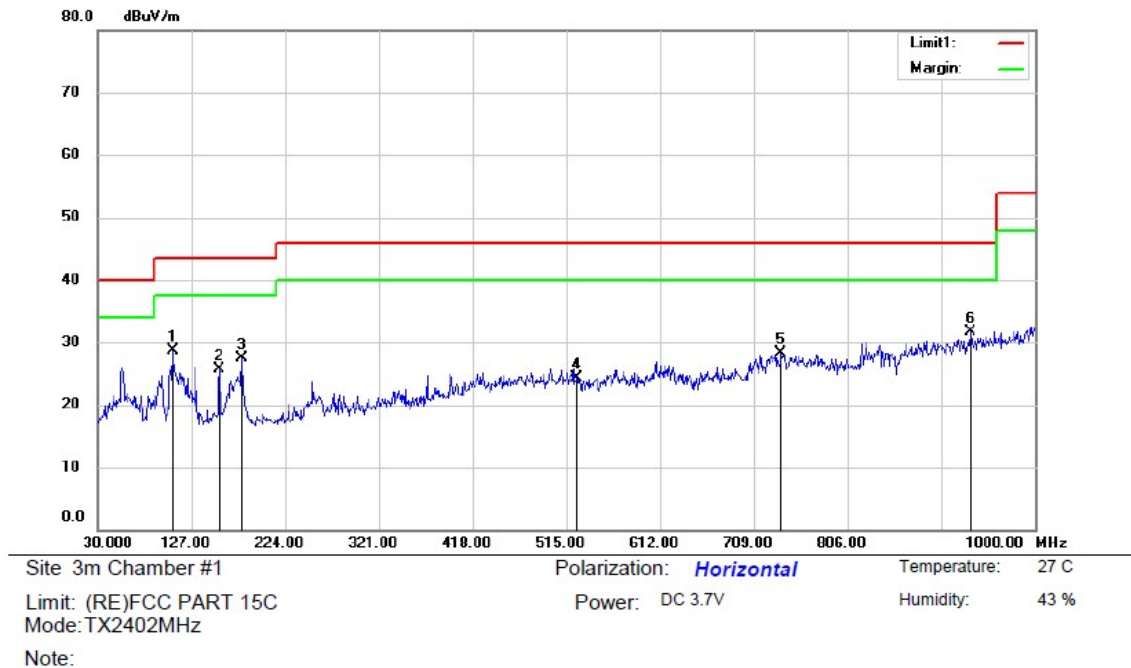


## ■ Spurious Emission below 1GHz(30MHz to 1GHz)

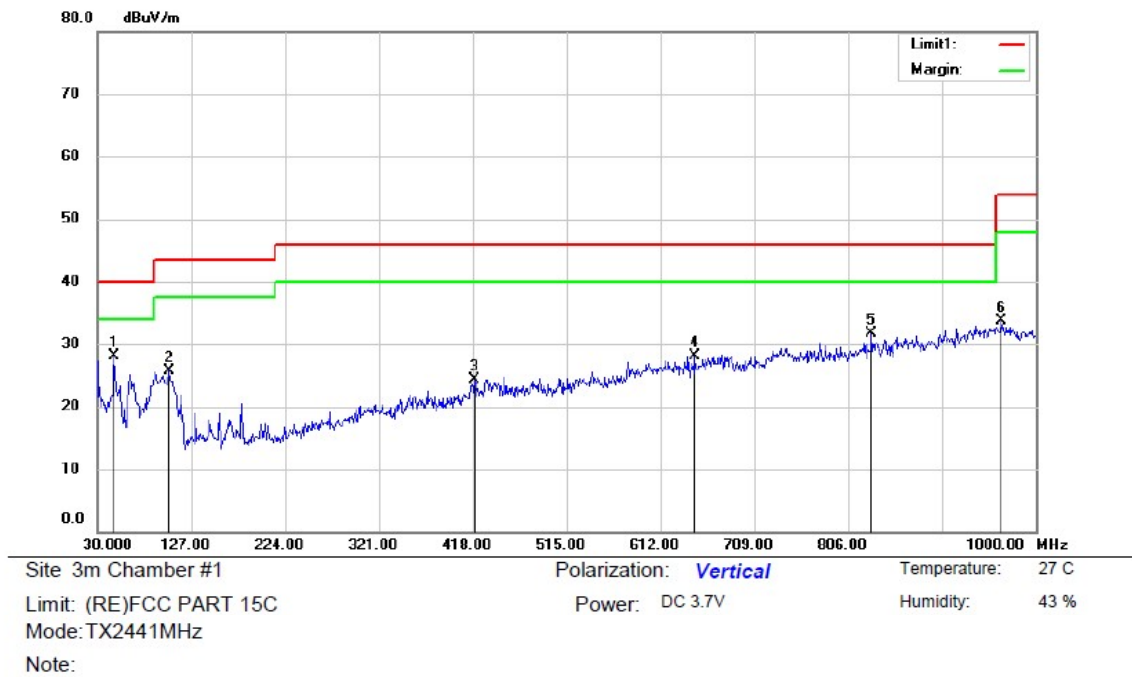
Bluetooth (GFSK, pi/4-DQPSK, 8DPSK)modehave been tested, and the worst result recorded was report as below:



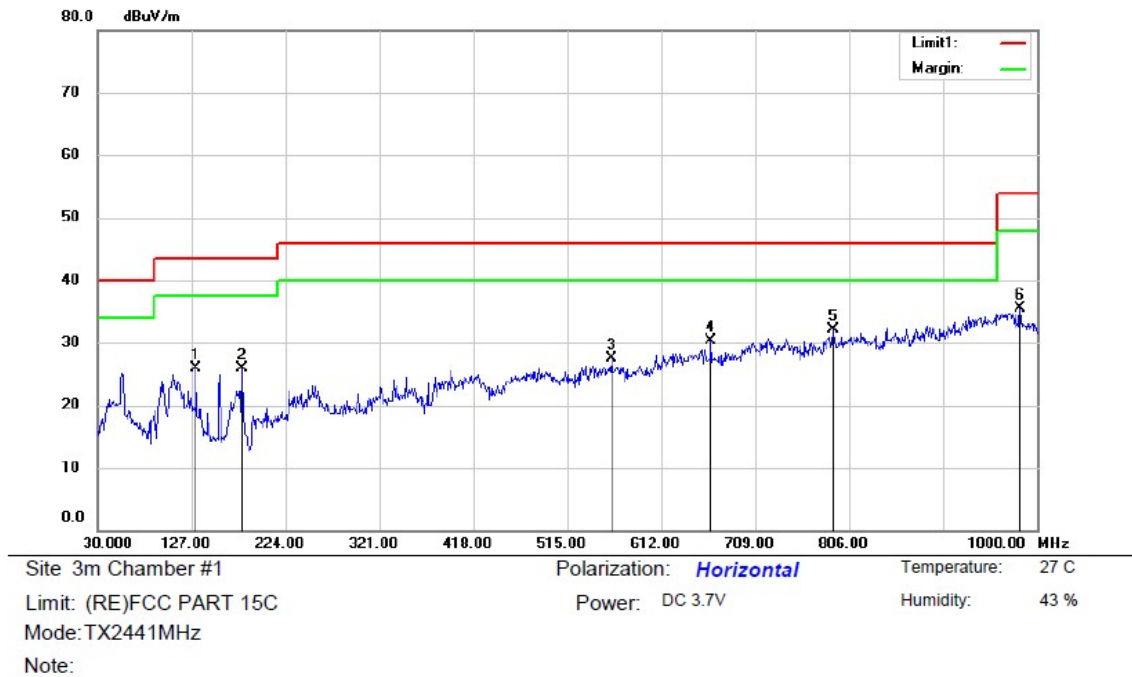
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree degree	Comment
1	*	47.9450	42.13	-11.18	30.95	40.00	-9.05	QP			
2		104.3261	38.88	-12.31	26.57	43.50	-16.93	QP			
3		499.6012	30.09	-4.75	25.34	46.00	-20.66	QP			
4		671.1700	29.82	-1.48	28.34	46.00	-17.66	QP			
5		815.7000	31.34	0.43	31.77	46.00	-14.23	QP			
6		982.6612	30.82	3.58	34.40	54.00	-19.60	QP			



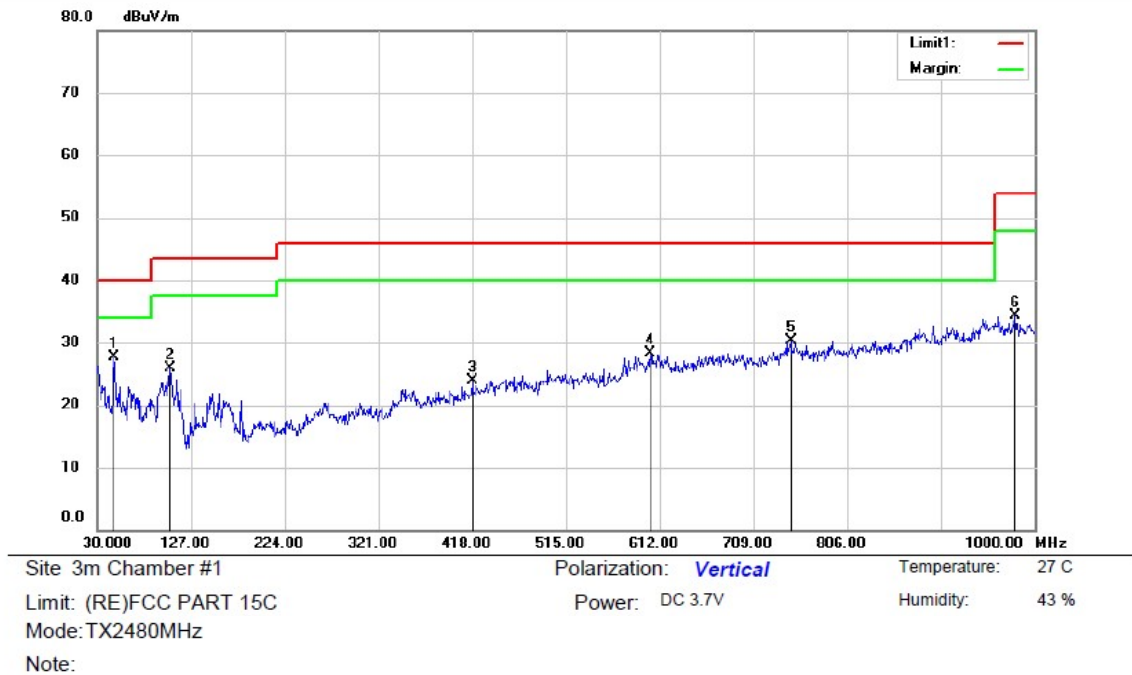
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Antenna Height cm	Table Degree degree	Comment
1		108.0850	41.16	-12.45	28.71	43.50	-14.79	QP		
2		156.1000	40.62	-14.99	25.63	43.50	-17.87	QP		
3		180.1074	41.09	-13.52	27.57	43.50	-15.93	QP		
4		526.0334	28.52	-4.23	24.29	46.00	-21.71	QP		
5		737.2512	28.74	-0.40	28.34	46.00	-17.66	QP		
6	*	933.5550	28.99	2.68	31.67	46.00	-14.33	QP		



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Antenna Height cm	Table Degree degree	Comment
1	*	47.7025	39.22	-11.19	28.03	40.00	-11.97	QP		
2		105.1750	38.03	-12.26	25.77	43.50	-17.73	QP		
3		420.3036	29.93	-5.57	24.36	46.00	-21.64	QP		
4		648.1325	29.82	-1.66	28.16	46.00	-17.84	QP		
5		830.9773	31.18	0.60	31.78	46.00	-14.22	QP		
6		964.5950	30.39	3.23	33.62	54.00	-20.38	QP		

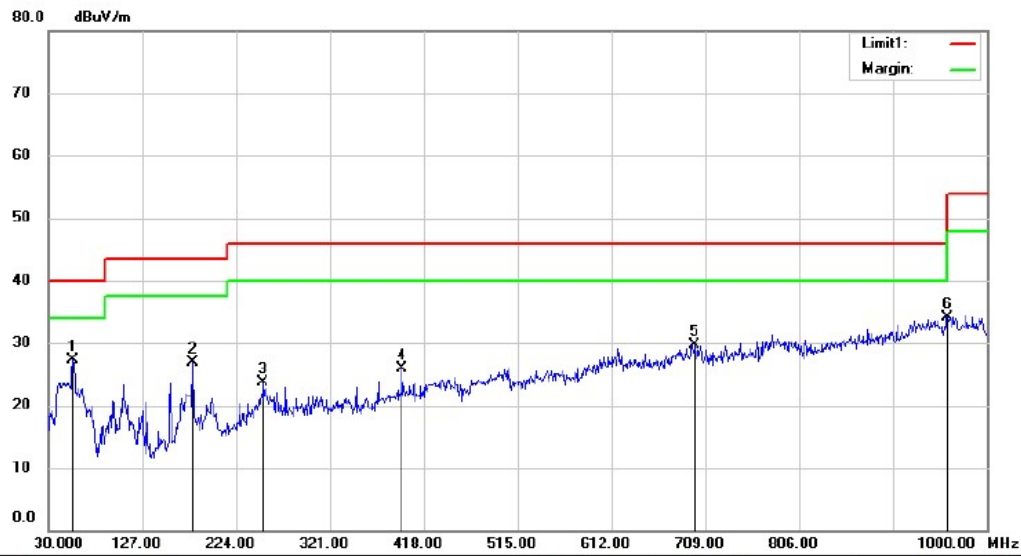


No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Antenna	Table
		MHz	Level	Factor	ment			Height	Degree
			dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree
							Detector		Comment
1		132.0925	41.34	-15.48	25.86	43.50	-17.64	QP	
2		180.1074	39.36	-13.52	25.84	43.50	-17.66	QP	
3		560.9537	30.99	-3.56	27.43	46.00	-18.57	QP	
4		663.7735	31.76	-1.50	30.26	46.00	-15.74	QP	
5	*	789.5100	31.99	0.15	32.14	46.00	-13.86	QP	
6		983.0250	31.82	3.60	35.42	54.00	-18.58	QP	



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Antenna Height cm	Table Degree degree	Detector	Comment
1	*	47.7025	38.95	-11.19	27.76	40.00	-12.24	QP			
2		106.2660	38.18	-12.33	25.85	43.50	-17.65	QP			
3		418.2425	29.62	-5.62	24.00	46.00	-22.00	QP			
4		603.0275	30.35	-2.11	28.24	46.00	-17.76	QP			
5		748.1635	30.64	-0.27	30.37	46.00	-15.63	QP			
6		980.3573	30.74	3.53	34.27	54.00	-19.73	QP			





Site 3m Chamber #1 Polarization: **Horizontal** Temperature: 27 C  
 Limit: (RE)FCC PART 15C Power: DC 3.7V Humidity: 43 %  
 Mode: TX2480MHz  
 Note:

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Antenna	Table	
		MHz	Level	Factor	ment			Height	Degree	
			dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		55.8262	39.17	-11.83	27.34	40.00	-12.66	QP		
2		180.1074	40.50	-13.52	26.98	43.50	-16.52	QP		
3		252.2512	33.51	-9.77	23.74	46.00	-22.26	QP		
4		396.2961	32.02	-6.14	25.88	46.00	-20.12	QP		
5		698.3300	30.86	-1.07	29.79	46.00	-16.21	QP		
6	*	959.3812	30.96	3.19	34.15	46.00	-11.85	QP		

## 9.8 CONDUCTED EMISSION TEST

### 9.8.1 Applicable Standard

According to FCC Part 15.207(a) and RSS-Gen Clause 8.8

### 9.8.2 Conformance Limit

Frequency(MHz)	Conducted Emission Limit	
	Quasi-peak	Average
0.15-0.5	66-56	56-46
0.5-5.0	56	46
5.0-30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies  
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

### 9.8.3 Test Configuration

Test according to clause 7.3 conducted emission test setup

### 9.8.4 Test Procedure

The EUT was placed on a table which is 0.8m above ground plane.  
Maximum procedure was performed on the highest emissions to ensure EUT compliance.  
Repeat above procedures until all frequency measured were complete.

### 9.8.5 Test Results

N/A.

## 9.9 ANTENNA APPLICATION

### 9.9.1 Antenna Requirement

Standard	Requirement
FCC Part 15.247(b)(4) and Part 15.203 and RSS-Gen Clause 6.8	An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

### 9.9.2 Result

The EUT'S antenna is PCB antenna. The antenna's gain is 2dBi, and the antenna can't be replaced by the user which in accordance to section 15.203, please refer to the photos.

\*\*\* End of Report \*\*\*

## 声 明 Statement

1. 本报告无授权批准人签字及“检验报告专用章”无效；

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2. 未经许可本报告不得部分复制；

This report shall not be copied partly without authorization.

3. 本报告的检测结果仅对送测样品有效，委托方对样品的代表性和资料的真实性负责；

The test results or observations are applicable only to tested sample. Client shall be responsible for representativeness of the sample and authenticity of the material.

4. 本检测报告中检测项目标注有特殊符号则该项目不在资质认定范围内，仅作为客户委托、科研、教学或内部质量控制等目的使用；

The observations or tests with special mark fall outside the scope of accreditation, and are only used for purpose of commission, research, training, internal quality control etc.

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The test results or observations are provided in accordance with measured value, without taking risks caused by uncertainty into account. Without explicit stipulation in special agreements, standards or regulations, EMTEK shall not assume any responsibility.

6. 对本检测报告若有异议，请于收到报告之日起 20 日内提出；

Objections shall be raised within 20 days from the date receiving the report.