

# Test Report of FCC Part 15 C for FCC Certificate

## On Behalf of

### **SHENZHEN COMTECH ELECTRONICS CO.,LTD**

Product description: Wireless Optical Mouse 2.4G

Model No.: MOG3305

FCC ID: VKS-MOG3305

**Prepared for: SHENZHEN COMTECH ELECTRONICS CO.,LTD**

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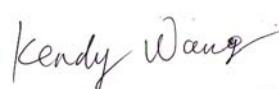
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**Issue Date:** August 21, 2007

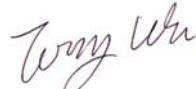
**Test Date:** August 13~19, 2007

**Test by:**

**Reviewed By:**



Kendy Wang



Tony Wu

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## 1. GENERAL INFORMATION

### 1.1 Product Description for Equipment Under Test (EUT)

Applicant:	<b>SHENZHEN COMTECH ELECTRONICS CO.,LTD</b>
Address of applicant:	Bldg A TongFuYu Ind. Zone, HuaChang Rd., DaLang, LongHua, BaoAn, ShenZhen, China.
Manufacturer:	<b>SHENZHEN COMTECH ELECTRONICS CO.,LTD</b>
Address of manufacturer:	Bldg A TongFuYu Ind. Zone, HuaChang Rd., DaLang, LongHua, BaoAn, ShenZhen, China.
EUT Description:	Wireless Optical Mouse 2.4G
Trade Name:	N/A
Model No.:	MOG3305
Rated Voltage	DC 3V (2 x1.5VAA alkaline battery) for Transmitter
Frequency range	2410~2468MHz
Number of channels	70
Channel Separation	None
Product Class:	Low Power Communication Device Transmitter
Measurement Procedure	ANSI C63.4-2003

Remark: \* *The test data gathered are from the production sample provided by the manufacturer.*

### 1.2 Related Submittal(s) / Grant (s)

This submittal(s) is a test report based on the Electromagnetic Interference (EMI) tests performed on the EUT. The EMI measurements were performed according to the measurement procedure described in ANSI C63.4 - 2003.

The tests were performed in order to determine compliance with Section 15.107 and 15.109 under the FCC Rules Part 15 Subpart B and Section 15.207, 15.209, 15.249 under the FCC Rules Part 15 Subpart C.

### 1.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4 - 2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. Radiated testing was performed at an antenna to EUT distance 3 meters.

## **1.4 Test Facility**

All measurement required was performed at laboratory of Shenzhen Huatongwei International Inspection Co., Ltd at Keji Nan No.12 Road, Hi-tech Park, Shenzhen, China

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

### **FCC – Registration No.: 662850**

Shenzhen Huatongwei International Inspection Co., Ltd, EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 662850, November 17, 2003.

## **2. SYSTEM TEST CONFIGURATION**

The tests documented in this report were performed in accordance with ANSI C63.4-2003 and FCC CFR 47 Part 15 Subpart C.

### **2.1 EUT Configuration**

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

### **2.2 EUT Exercise**

The calibrated antennas used to sample the radiated field strength are mounted on a non-conductive, motorized antenna mast 3 or 10 meters from the leading edge of the turntable.

### **2.3 General Test Procedures**

**Conducted Emissions** The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 7.1 of ANSI C63.4-2003. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak detector mode.

**Radiated Emissions** The EUT is placed on the turntable, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of ANSI C63.4-2003.

## 2.4 List of Measuring Equipments Used

Items	Equipment	Manufacturer	Model No.	Serial No.	Last Cal	Calibration Period
1	EMI Test Receiver	ROHDE & SCHWARZ	ESCS30	100038	2006/11	1 year
2	Spectrum Analyzer	Agilent	E4446A	US42510252	2006/11	1 year
3	EMI Test Receiver	ROHDE & SCHWARZ	ESI 26	100009	2006/11	1 year
4	Receiver/ Spectrum Analyzer	ROHDE & SCHWARZ	ESCI	100106	2006/11	1 year
5	Spectrum Analyzer	HP	8593EM	3536A00107	2006/11	1 year
6	Spectrum Analyzer	HP	7405	US39440156	2006/11	1 year
7	Artificial Mains	ROHDE & SCHWARZ	ESH2-Z5	100028	2006/11	1 year
8	Pulse Limiter	ROHDE & SCHWARZ	ESHSZ2	100044	2006/11	1 year
9	LISN	COM Power	LI-200	12212	2006/11	1 year
10	LISN	COM Power	LI-200	12019	2006/11	1 year
11	3m/5m Semi-Anechoic Chamber	ETS	N/A	N/A	2006/11	1 year
12	Ultra-Broadband Antenna	R/S	HL562	100015	2006/11	1 year
13	Horn Antenna	R/S	HF906	100039	2006/11	1 year
14	RF Test Panel	R/S	TS / RSP	335015/0017	N/A	N/A
15	Turntable	ETS	2088	2149	N/A	N/A
16	Antenna Mast	ETS	2075	2346	N/A	N/A

### 3. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
15.207	Disturbance Voltage at The Mains Terminals	N/A, without AC power supply
15.249	Band Edges Measurement	Pass
15.249	Spurious Emission	Pass

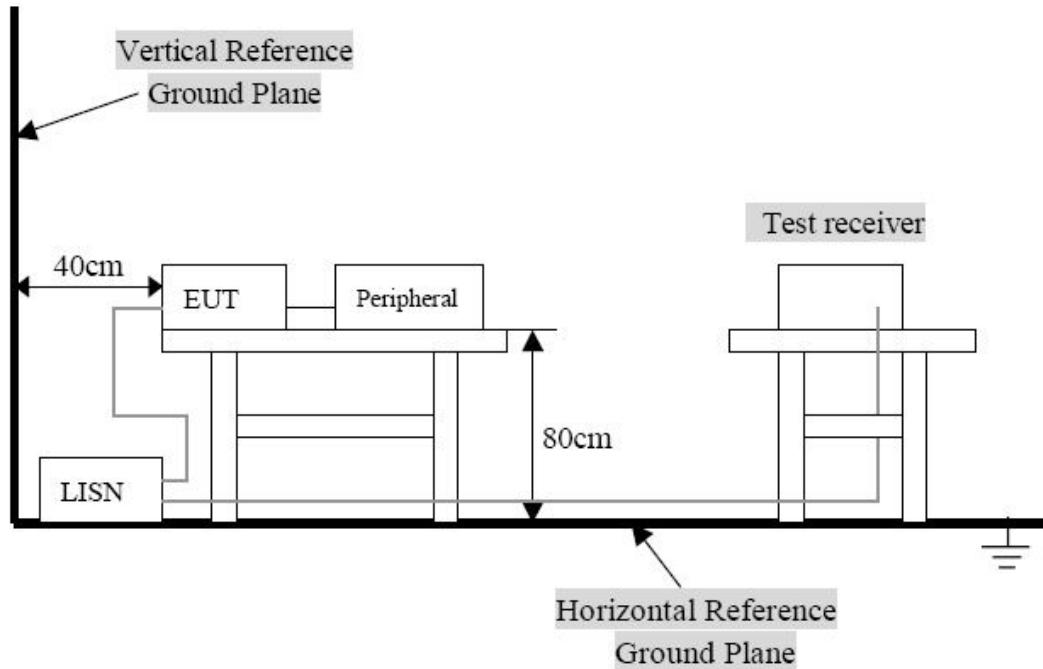
## 4. TEST OF CONDUCTED EMISSION

### 4.1 Applicable Standard

Section 15.207: For a Low-power Radio-frequency Device is designed to be connected to the 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 below limits table.

Frequency Range (MHz)	Limits ( dBuV)	
	Quasi-Peak	Average
0.150~0.500	66~56	56~46
0.500~5.000	56	46
5.000~30.00	60	50

### 4.2 Test Setup Diagram



Remark:

1. The setup of EUT is according with per ANSI C63.4-2003 measurement procedure. The specification used was with the FCC 15.207 limits.
2. The EUT is excluded from investigation of Disturbance Voltage at The Mains Terminals, for it is powered by DC 3V (2 x1.5VAA alkaline) battery. According to the Section 15.207(d), measurement to demonstrate compliance with the limits of Disturbance Voltage at The Mains Terminals are not required to the devices which only employed battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines.

## 5- BAND EDGES MEASUREMENT

### 5.1 Limit of Band Edges Measurement

1. In the above emission table, the tighter limit applies at the band edges.
2. As shown in Section 15.35(b), for frequencies above 1000 MHz, the above field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak field strength shall not exceed 2500 millivolts/meter at 3 meters along the antenna azimuth.

Frequency (MHz)	Field Strength ( $\mu\text{V/m}$ at 3-meter)	Field Strength ( $\text{dB}\mu\text{V/m}$ at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Note: (1) The tighter limit shall apply at the edge between two frequency bands.

(2) The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

### 5.2 EUT Setup

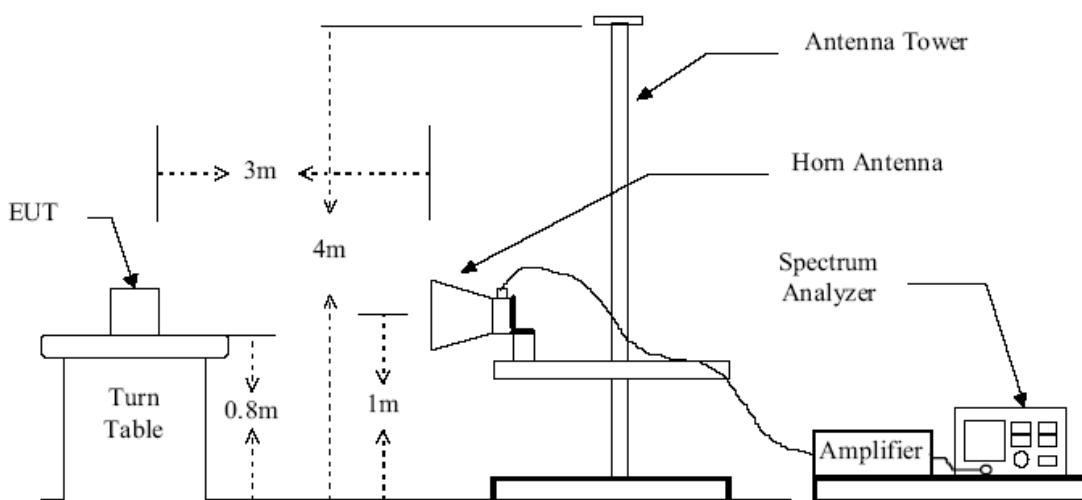


Figure 2 : Frequencies measured above 1 GHz configuration

### 5.3 Test Procedure

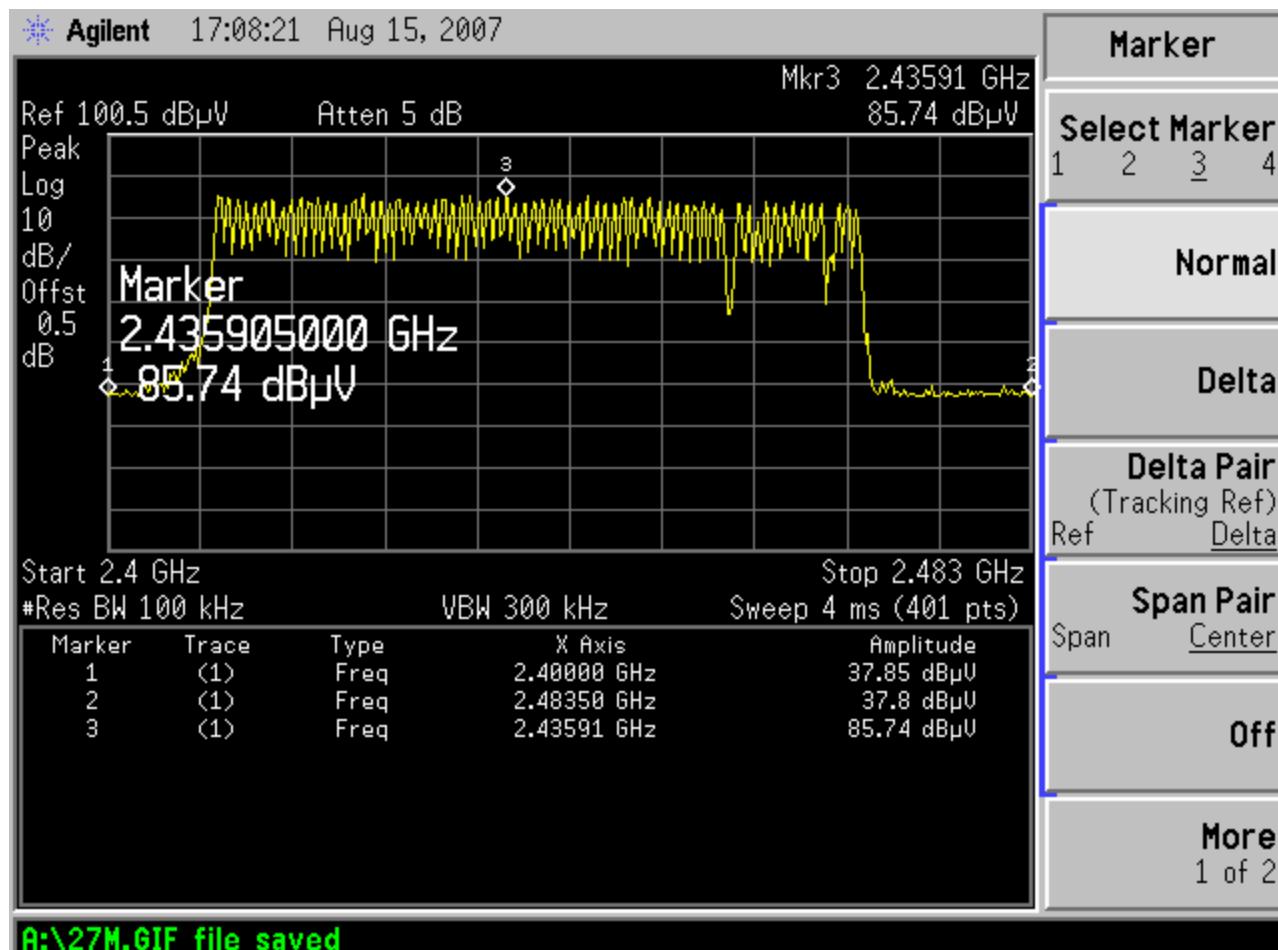
Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

- 1). Configure the EUT according to ANSI C63.4:2003.
- 2). The EUT was placed on the top of the turntable 0.8 meter above ground.
- 3). The receiving antenna was placed 3 meters far away from the turntable.
- 4). The turntable was rotated by 360 degrees to determine the position of the highest radiation.
- 5). The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emission field strength of both horizontal and vertical polarization. For each suspected emission, the antenna tower was scanned (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.

### 5.4 Test Result

Temperature ( °C ) : 22~23	EUT: Wireless Optical Mouse 2.4G
Humidity (%RH ): 50~54	M/N: MOG3305
Barometric Pressure ( mbar ): 950~1000	Operation Condition: Continuous Transmitting

## Fundamental Emission Test Data



## 6- SPURIOUS EMISSIONS

### 6.1 Limit of Spurious Emissions

1. In the section 15.249(a): Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:
2. Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Fundamental Frequency (MHz)	Field Strength of Fundamental Field Strength (mV/m)	Field Strength of Harmonics (μV/m)
902-928 MHz	50	500
2400 - 2483.5 MHz	50	500
5725 - 5875 MHz	50	500
24.0 - 24.25 GHz	250	2500

Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
30-88	100*	3
88-216	150*	3
216-960	200*	3
Above 960	500	3

Remark: Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

3. In the above emission table, the tighter limit applies at the band edges.

Frequency (MHz)	Field Strength (μV/m at 3-meter)	Field Strength (dBμV/m at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

## 6.2 EUT Setup

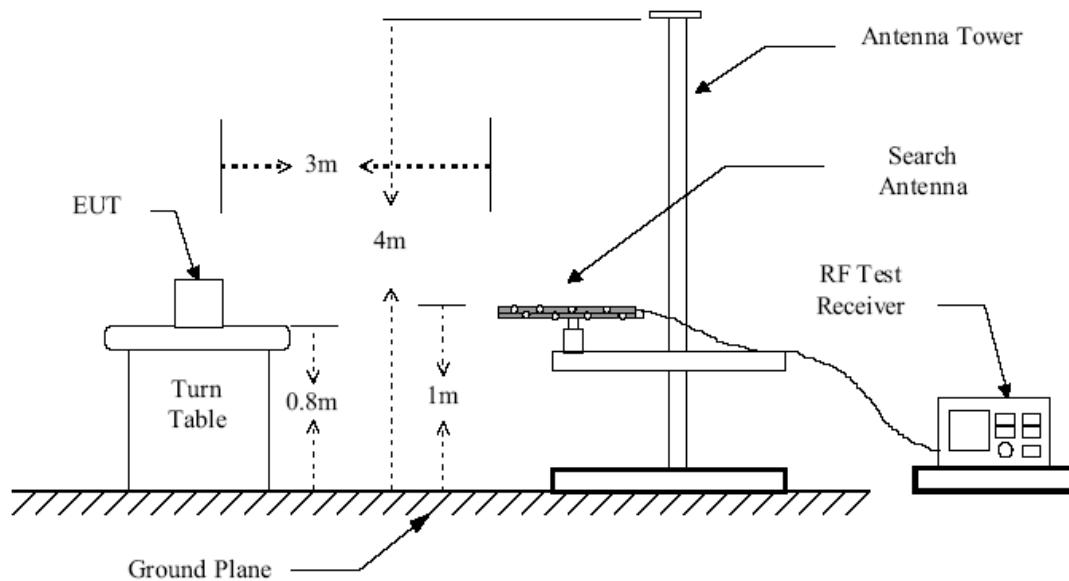


Figure 1 : Frequencies measured below 1 GHz configuration

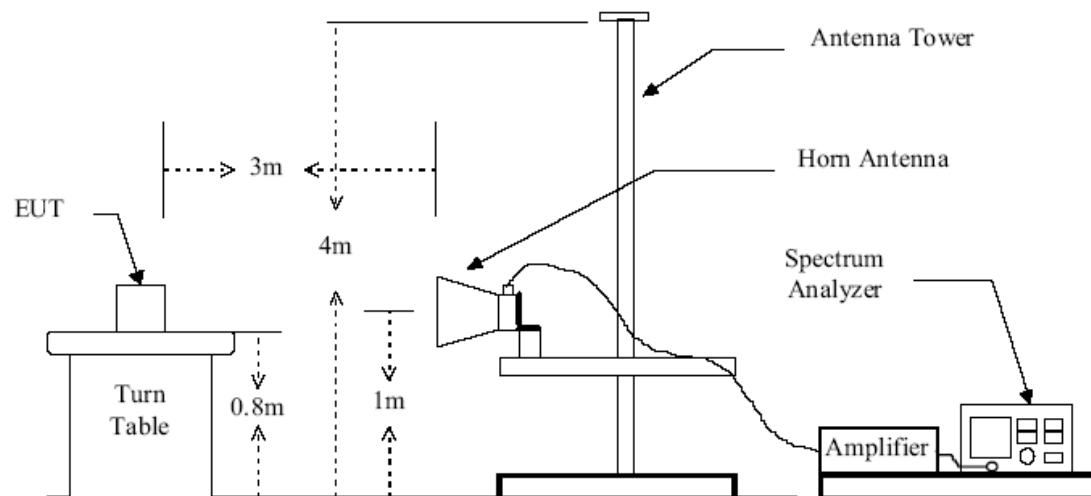


Figure 2 : Frequencies measured above 1 GHz configuration

### 6.3 Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

- 1). Configure the EUT according to ANSI C63.4:2003.
- 2). The EUT was placed on the top of the turntable 0.8 meter above ground.
- 3). The receiving antenna was placed 3 meters far away from the turntable.
- 4). The turntable was rotated by 360 degrees to determine the position of the highest radiation.
- 5). The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emission field strength of both horizontal and vertical polarization. For each suspected emission, the antenna tower was scanned (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.

### 6.4 Spurious Emissions Test Result

Temperature ( °C ) : 22~23	EUT: Wireless Optical Mouse 2.4G
Humidity (%RH ): 50~54	M/N: MOG3305
Barometric Pressure ( mbar ): 950~1000	Operation Condition: Continuous Transmitting

Test plots see following:

Spurious Emissions Below 1 GHz							
Frequency (MHz)	Ant.Pol. (H/V)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
181.28	V	12.57	11.54	24.11	43.50	-19.39	Peak
221.13	V	6.32	13.19	19.51	46.00	-26.49	Peak
250.23	V	15.89	14.27	30.16	46.00	-15.84	Peak
264.00	V	8.32	14.52	22.84	46.00	-23.16	Peak
333.65	V	16.42	16.32	32.73	46.00	-13.27	Peak
499.78	V	11.99	19.57	31.57	46.00	-14.43	Peak
178.88	H	10.40	11.42	21.83	43.50	-21.67	Peak
233.48	H	12.91	13.64	26.55	46.00	-19.45	Peak
248.10	H	20.51	14.20	34.71	46.00	-11.29	QP
333.68	H	19.67	16.32	35.98	46.00	-10.02	Peak
417.18	H	9.38	17.97	27.35	46.00	-18.65	Peak
498.63	H	6.09	19.55	25.64	46.00	-20.36	Peak

Remark:

- 1). Measuring frequencies from 30 MHz to the 1GHz.
- 2). Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using peak/quasi-peak detector mode.
- 3). Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.
- 4). Measurements above show only up to 6 maximum emissions noted, or would be lesser, with "N/A" remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
- 5). Margin (dB) = Remark result (dBuV/m) – Quasi-peak limit (dBuV/m).

Spurious Emissions under CH Low										
Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Result		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
2410.00	V	98.29	33.40	-4.37	93.92	29.03	113.97	93.97	-64.94	AVG
1420.00	V	45.00	---	-8.76	36.24	---	74.00	54.00	-17.76	Peak
1492.00	V	45.69	---	-8.43	37.27	---	74.00	54.00	-16.73	Peak
1800.00	V	47.03	---	-6.67	40.36	---	74.00	54.00	-13.64	Peak
2340.00	V	45.43	---	-4.76	40.67	---	74.00	54.00	-13.33	Peak
2448.00	V	48.29	---	-4.52	43.77	---	74.00	54.00	-10.23	Peak
2588.00	V	43.04	---	-4.00	39.05	---	74.00	54.00	-14.95	Peak
4810.00	V	62.35	29.62	1.84	64.20	31.46	74.00	54.00	-22.54	AVG
5350.00	V	49.03	25.64	3.08	52.10	28.72	74.00	54.00	-25.28	AVG
<hr/>										
2410.00	H	96.85	33.33	-4.37	92.48	28.96	113.97	93.97	-65.01	AVG
1080.00	H	45.59	---	-10.33	35.26	---	74.00	54.00	-18.74	Peak
1248.00	H	46.04	---	-9.55	36.48	---	74.00	54.00	-17.52	Peak
1488.00	H	44.34	---	-8.45	35.90	---	74.00	54.00	-18.10	Peak
1928.00	H	44.14	---	-5.94	38.19	---	74.00	54.00	-15.81	Peak
3570.00	H	43.78	---	-0.37	43.41	---	74.00	54.00	-10.59	Peak
5320.00	H	42.62	---	3.02	45.64	---	74.00	54.00	-8.36	Peak
7220.00	H	44.71	---	6.38	51.09	---	74.00	54.00	-2.91	Peak

Remark:

- 1). Measuring frequencies from 30 MHz to the 1GHz.
- 2). Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using peak/quasi-peak detector mode.
- 3). Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.
- 4). Measurements above show only up to 6 maximum emissions noted, or would be lesser, with "N/A" remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
- 5). Margin (dB) = Remark result (dBuV/m) – Quasi-peak limit (dBuV/m).

Spurious Emissions under CH Mid.										
Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Result		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
2439.00	V	97.32	33.35	-4.37	92.95	28.98	113.97	93.97	-64.99	AVG
1080.00	V	47.33	---	-10.33	37.00	---	74.00	54.00	-17.00	Peak
1172.00	V	48.79	---	-9.91	38.88	---	74.00	54.00	-15.12	Peak
1500.00	V	45.77	---	-8.39	37.38	---	74.00	54.00	-16.62	Peak
1800.00	V	47.69	---	-6.67	41.01	---	74.00	54.00	-12.99	Peak
2488.00	V	46.10	---	-4.43	41.67	---	74.00	54.00	-12.33	Peak
4880.00	V	48.42	---	2.05	50.46	---	74.00	54.00	-3.54	Peak
7330.00	V	46.26	29.80	6.67	52.94	36.47	74.00	54.00	-17.53	AVG
9760.00	V	42.19	---	7.95	50.14	---	74.00	54.00	-3.86	Peak
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2439.00	H	97.96	33.38	-4.37	93.59	29.01	113.97	93.97	-64.96	AVG
1072.00	H	47.32	---	-10.37	36.95	---	74.00	54.00	-17.05	Peak
1244.00	H	44.96	---	-9.57	35.39	---	74.00	54.00	-18.61	Peak
1792.00	H	44.61	---	-6.72	37.89	---	74.00	54.00	-16.11	Peak
2320.00	H	43.17	---	-4.81	38.36	---	74.00	54.00	-15.64	Peak
2488.00	H	47.94	---	-4.43	43.51	---	74.00	54.00	-10.49	Peak
4880.00	H	47.88	---	2.05	49.92	---	74.00	54.00	-4.08	Peak

Remark:

- 1). Measuring frequencies from 30 MHz to the 1GHz.
- 2). Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using peak/quasi-peak detector mode.
- 3). Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.
- 4). Measurements above show only up to 6 maximum emissions noted, or would be lesser, with “N/A” remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
- 5). Margin (dB) = Remark result (dBuV/m) – Quasi-peak limit (dBuV/m).

Spurious Emissions under CH High										
Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Result		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
2467.64	V	98.45	33.63	-4.37	94.08	29.26	113.97	93.97	-64.71	AVG
1076.00	V	46.21	---	-10.3	35.86	---	74.00	54.00	-18.14	Peak
1192.00	V	45.98	---	-9.81	36.17	---	74.00	54.00	-17.83	Peak
1492.00	V	44.96	---	-8.43	36.53	---	74.00	54.00	-17.47	Peak
1576.00	V	44.10	---	-7.96	36.15	---	74.00	54.00	-17.85	Peak
1800.00	V	47.16	---	-6.67	40.49	---	74.00	54.00	-13.51	Peak
2524.00	V	44.18	---	-4.29	39.89	---	74.00	54.00	-14.11	Peak
4960.00	V	49.29	---	2.28	51.58	---	74.00	54.00	-2.42	Peak
<hr/>										
2467.64	H	97.35	33.28	-4.37	92.98	28.91	113.91	93.97	-65.06	AVG
1080.00	H	45.86	---	-10.33	35.53	---	74.00	54.00	-18.47	Peak
1780.00	H	43.98	---	-6.79	37.20	---	74.00	54.00	-16.80	AVG
2576.00	H	44.35	---	-4.05	40.30	---	74.00	54.00	-13.70	AVG
2676.00	H	48.00	---	-3.59	44.41	---	74.00	54.00	-9.59	AVG
4950.00	H	55.21	33.20	2.25	57.47	35.45	74.00	54.00	-18.55	Peak
N/A	---	---	---	---	---	---	---	---	---	---

Remark:

- 1). Measuring frequencies from 30 MHz to the 1GHz.
- 2). Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using peak/quasi-peak detector mode.
- 3). Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.
- 4). Measurements above show only up to 6 maximum emissions noted, or would be lesser, with "N/A" remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
- 5). Margin (dB) = Remark result (dBuV/m) – Quasi-peak limit (dBuV/m).