

FCC Test Report

Application No.: HKEM1811000932AV
Applicant: KAS GLOBAL TRADING PTY LIMITED
Address: UNIT 601-608, 6/F TRADE SQUARE, 681 CHEUNG SHA WAN ROAD, CHEUNG SHA WAN, KOWLOON, Hong Kong
Vendor Name: The Crest Company
Vendor Code: V001418
Product Information:
Product Description: BLUETOOTH HEADPHONE PLUM
Key Code.: 42568568
Product Class : Low Power Communication Device – Transceiver (2.4 GHz)
FCC ID: 2AQYH-BT-42568568
Country of Destination: US
Requirement: CFR 47 FCC PART 15 SUBPART C, 2018
- Intentional Radiators (Section 15.249)
Date of Receipt: 2018-11-22
Date of Test: 2018-12-11
Date of Issue: 2018-12-28

Test Result :	PASS*
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In the configuration tested, the EUT complied with the requirements for the relevant clauses of Federal Communications Commission Rules as specified above

Authorized Signature:



Ivan Toa

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. All test results in this report can be traceable to National or International Standards.

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2 Test Summary

Test	Test Requirement	Test Method	Result
Radiated Emission (9kHz to 1GHz)	FCC PART 15, SUBPART C: 2018	ANSI C63.10:2013	PASS
Radiated Emission above 1 GHz	FCC PART 15, SUBPART C: 2018	ANSI C63.10:2013	PASS
Restricted-band band- edge measurements (Radiated Emission)	FCC PART 15, SUBPART C: 2018	ANSI C63.10:2013	PASS
20dB bandwidth	FCC PART 15, SUBPART C: 2018	ANSI C63.10:2013	PASS

Remark: This device is battery operated.

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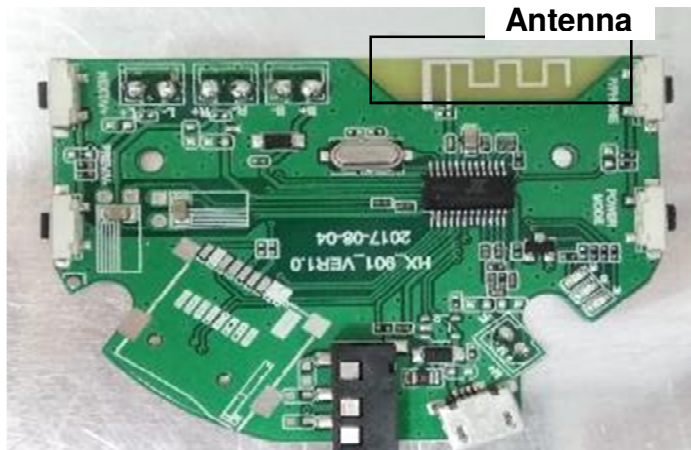
4 General Information

4.1 General Description of EUT

Product Description: BLUETOOTH HEADPHONE PLUM)
Model No.: 42568568
Serial No.: --

4.2 Details of EUT

Power Supply: DC 3.7V (Rechargeable li-ion battery x 1 pc)
Operating Frequency 2402-2480MHz
Antenna Type: Unreplaceable internal Integral antenna



Modulation Type: GFSK

For BLE

Test frequency tested are the lowest channel: 0 channel (2402MHz), middle channel: 20 channel (2442MHz) and highest channel: 39 channel (2480MHz)

For BR/EDR

Test frequency tested are the lowest channel: 0 channel (2402MHz), middle channel: 39 channel (2442MHz) and highest channel: 78 channel (2480MHz)

Operation of EUT:

Connect the EUT to the test computer via an USB to TTL converter, then the EUT shall be able to be controlled to transmit at different channels by the test software FCCAssist.exe provided by client.

4.3 Conditions of EUT

Good condition

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4.4 Description of Support Units

1. USB to TTL converter provided by client
2. Laptop (EMC 2: Dell Inspiron 15 3000) rprovided by SGS IECC Ltd.

4.5 Standards Applicable for Testing

CFR 47, FCC Part 15, 2018
ANSI C63.10:2013

4.6 Test Location

All tests were performed at:
SGS IECC Limited (Member of the SGS Group (SGS SA))
16-B, Yip Wo Street, On Lok Cheun, Fanling, Hong Kong.
Tel: +852 2305 2570 Fax: +852 2756 4480
No tests were sub-contracted

4.7 Test Facility

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

- **HOKLAS (Lab Code: 125)**

SGS IECC Limited has been accepted by HKAS Executive, on the recommendation of the Accreditation Advisory Board, as a HOKLAS Accredited Laboratory, this laboratory meets the requirements of ISO/IEC 17025:2005 an it has been accredited for performing specific test as listed in the scope of accreditation within the test category of Electrical and Electronic Products.

- **FCC Recognized Accredited Test Firm(CAB Registration No.: 446297)**

SGS IECC Limited has been accredited and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Designation Number: HK0010, Test Firm Registration Number: 446297.

- **Industry Canada (Registration No.: 5193A-2)**

The 3m Alternative Semi-anechoic chamber of SGS IECC Limited has been registered by Certification and Engineering of Industry Canada for radio equipment testing with Registration No. **5193A-2**.

4.8 Deviation from Standards

None.

4.9 Abnormalities from Standard Conditions

None.

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4.10 Declaration of Family Grouping

None.

4.11 Abbreviations

N/A: Not Applicable

EUT: Equipment Under Test

4.12 Measurement Uncertainty (95% confidence levels, k=2)

No.	Item	Measurement Uncertainty
1	Radiated disturbance (below 1GHz)	$\pm 5.26\text{dB}$
2	Radiated disturbance (above 1GHz)	$\pm 5.11\text{dB}$

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5 Equipments Used during Test

Radiated Emission			
Equipment	Manufacturer	Model / Serial No.	Cal. Due Date
3m Semi-Anechoic Chamber	ChamPro	N/A	2020/09/14
Test Receiver	Rohde & Schwarz	ESCS 30 / 100388	2019/09/26
EMI Test Receiver	Rohde & Schwarz	ESR3	2019/08/15
Signal Generator	Rohde & Schwarz	SMT03 / 832939/017	2019/06/04
Spectrum Analyzer	Rohde & Schwarz	FSP 30 / 101474	2019/05/30
Loop Antenna	Rohde & Schwarz	HFH2-Z2 / 871336/48	2019/01/22
Antenna 30-1000MHz	Schaffner	CBL6111C / 2791	2019/10/26
Antennas (30MHz-300MHz)	Schwarzbeck	BBA9106, VHA9103	2019/11/14
Log-periodic Antennas (300MHz-1000MHz)	Schwarzbeck	UHALP9107	2019/11/14
Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D / 9120D-1070	2019/01/22
Double Ridge Horn Antenna 2-18 GHz	Schwarzbeck	BBHA 9120 C	2020/03/13
Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170 / 9170-492	2019/11/23
Highpass Filter	Wainwright	WHNX3.5/26.5G-6SS / nil	2018/12/18
Band Reject Filter	Wainwright	WRCJV 2400/2500-2100/2800-40/3SS / nil	2018/12/18
Preamplifier 10MHz – 6GHz	Schwarzbeck	BBV9743 / 9743-052	2019/04/18
Preamplifier 1-18GHz	Schwarzbeck	BBV9718 / 9718-223	2019/01/22
Preamplifier 18-26.5GHz	Schwarzbeck	BBV9719 / 9719-019	2019/11/18
Coaxial Cable	--	E167	2019/10/09
RF Cable	HUBER+SUHNER	E207	2019/11/16
Boresight Mast Controller	ChamPro	AM-BS-4500-E / 060860-ABS	--
Turntable with Controller	ChamPro	EM1000 / 60860	--

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6 Test Results

6.1 Radiated Emissions, 9kHz to 1GHz

Test Requirement:	FCC Part15 Subpart C Section 15.209 and 15.249(d)
Test Method:	ANSI C63.10
Frequency Range:	The lowest frequency generated by EUT to 1GHz
Measurement Distance:	3m
Detector:	Peak for pre-scan (200Hz resolution bandwidth and 1kHz video bandwidth for measurement between 9kHz – 150kHz) (9kHz resolution bandwidth and 100kHz video bandwidth for measurement between 150kHz – 30MHz) 120kHz resolution bandwidth and 1MHz video bandwidth for measurement between 30MHz to 1GHz) Quasi-Peak if maximised peak within 6dB of limit

Limit :

Frequency range MHz	Quasi-peak limits dB (µV/m)
0.009 – 0.490	-72.4 – 20logF (MHz)
0.490 – 1.705	-12.4 – 20logF (MHz)
1.705 – 30.0	-10.5
30 to 88	40
88 to 216	43.5
216 to 960	46
Above 960	54
Note: 1) At transitional frequencies the lower limit applies. 2) F is the frequency of the spurious emission measured in MHz. 3) Limit from 0.009 – 30 MHz is converted from measuring distance 300m or 30m to 3m with the formula provided in FCC Part 15, section 15.31(f)(2)	

6.1.1 EUT Operation

Operating Environment:

Temperature: 20 °C Humidity: 52 %

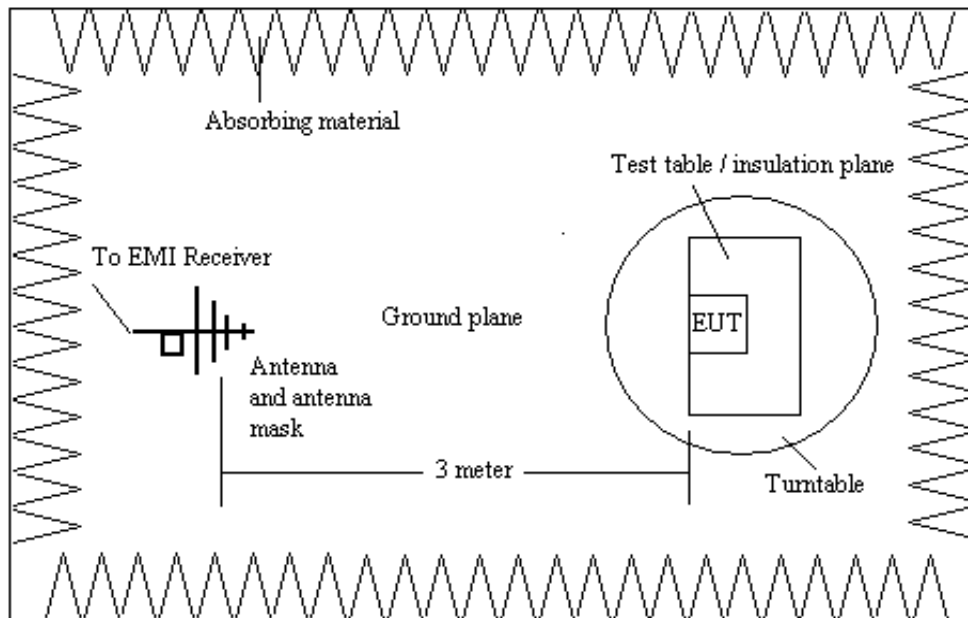
EUT Operation: Pre-test with Peak detector with the following mode(s):
 1. Transmission in continuous transmitting mode
 2. Test was performed at the lowest, middle and highest channel

Final test with Quasi-Peak detector with the following mode(s):
 1. Transmission in continuous transmitting mode
 2. Test was performed at the lowest, middle and highest channel

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6.1.2 Test Setup and Procedure



1. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
7. Test the EUT in the lowest channel, the middle channel, the Highest channel
8. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, And found the Y axis positioning which it is worse case.
9. Repeat above procedures until all frequencies measured was complete.

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6.1.3 Measurement Data

Lowest Channel

Frequency (MHz)	Antenna Polarization	Correction Factor (dB/m)	Receiver QP Reading (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Over Limit (dB)
37.3	V	13.7	9.5	23.3	40.0	-16.8
72.5	V	11.0	7.0	18.0	40.0	-22.0
156.9	V	14.6	5.4	19.9	40.0	-20.1
264.6	V	12.6	6.9	19.5	46	-26.5
460.0	V	18.6	5.0	23.7	46	-22.3
726.4	V	23.6	7.9	31.5	46	-14.5

Middle Channel

Frequency (MHz)	Antenna Polarization	Correction Factor (dB/m)	Receiver QP Reading (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Over Limit (dB)
37.0	V	13.7	10.3	24.0	40.0	-16.0
73.9	V	11.0	6.7	17.7	40.0	-22.3
156.0	V	14.6	3.9	18.5	40.0	-21.5
265.3	V	12.6	6.4	19.0	46	-27.0
460.0	V	18.6	4.8	23.4	46	-22.6
728.8	V	23.6	8.9	32.5	46	-13.5

Highest Channel

Frequency (MHz)	Antenna Polarization	Correction Factor (dB/m)	Receiver QP Reading (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Over Limit (dB)
33.2	V	13.7	9.4	23.1	40.0	-16.9
69.2	V	11.0	6.5	17.5	40.0	-22.5
155.3	V	14.6	4.3	18.9	40.0	-21.1
270.1	V	12.6	6.6	19.2	46	-26.8
458.3	V	18.6	5.9	24.5	46	-21.5
720.0	V	23.6	6.5	30.1	46	-15.9

Remark:

- 1) All readings are Peak values.
- 2) Correction Factor = Antenna Factor + Cable Loss.
- 3) The above results were the worst case results with the EUT positioned in all 3 axis during the test. The EUT was positioned vertically and horizontally on the table for vertical and horizontal measurement respectively.
- 4) Other emissions more than 20dB below the limit are not shown on the above table and only worst six emissions below 1GHz are listed.

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6.2 Radiated Emissions above 1 GHz

Test Requirement: FCC Part15 Subpart C Section 15.209 & 15.249(a) & (d)
Test Method: ANSI C63.10
Frequency Range: 1GHz – 26GHz
Measurement Distance: 3m
Detector: Peak for pre-scan (1MHz resolution bandwidth, 1MHz video bandwidth)
Average and Peak detector for final test

Limit :

Fundamental Frequency :

Frequency range MHz	Limits (Peak) dB (μV/m)	Limits (Average) dB (μV/m)
2400 to 2483.5	114	94

Spurious Emission :

Frequency range MHz	Limits (Peak) dB (μV/m)	Limits (Average) dB (μV/m)
Over 1000	74	54

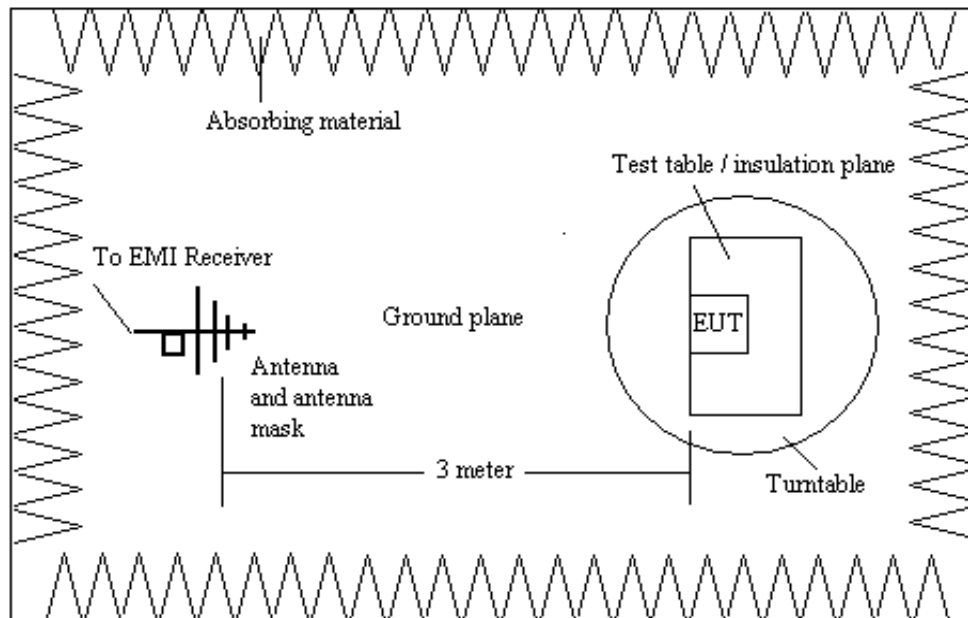
6.2.1 EUT Operation

Operating Environment:

Temperature: 23 °C Humidity: 63 %

EUT Operation: Test with Peak detector with the following mode(s):
1. Transmission in continuous transmitting mode
2. Test was performed at the lowest, middle and highest channel

6.2.2 Test Setup and Procedure



1. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
7. Test the EUT in the lowest channel, the middle channel, the Highest channel
8. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, And found the Y axis positioning which it is worse case.
9. Repeat above procedures until all frequencies measured was complete.

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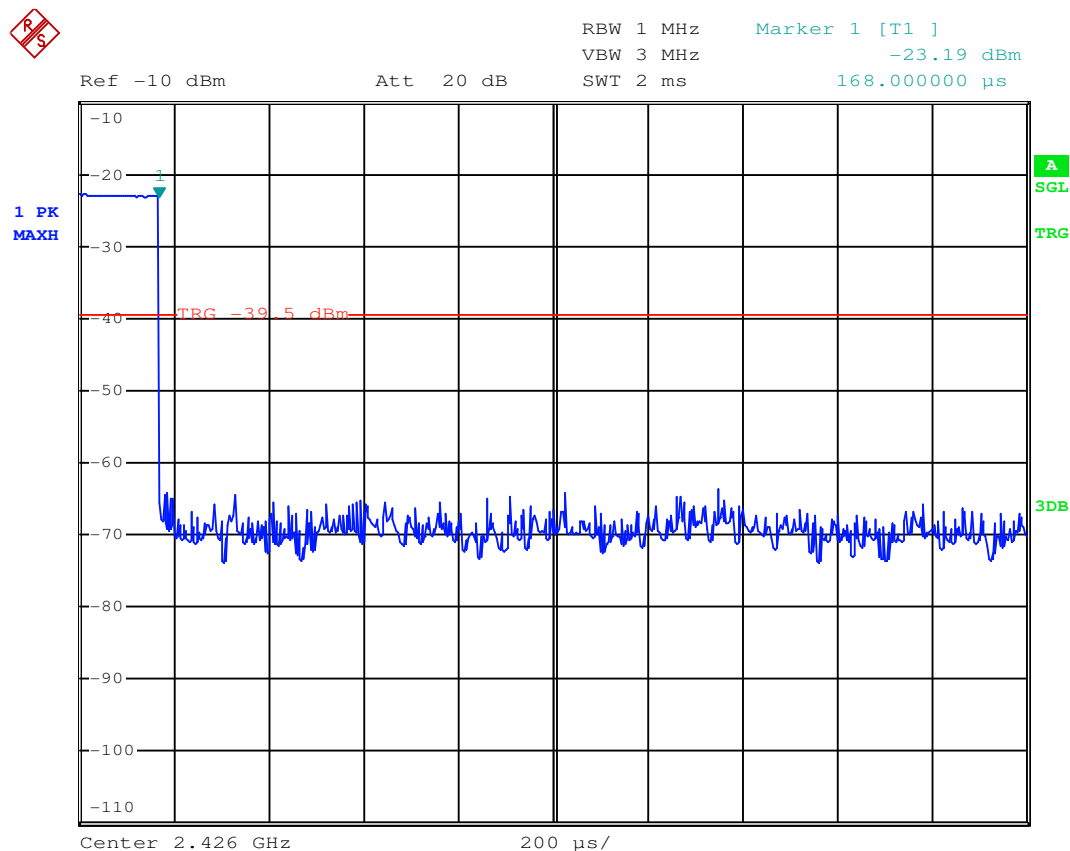
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6.2.3 Measurement Data

An initial pre-scan was performed in the 3m chamber using the spectrum analyser in peak detection mode. The EUT was measured with 3 orthogonal polarities and frequencies of average emissions from the EUT were measured as follows:

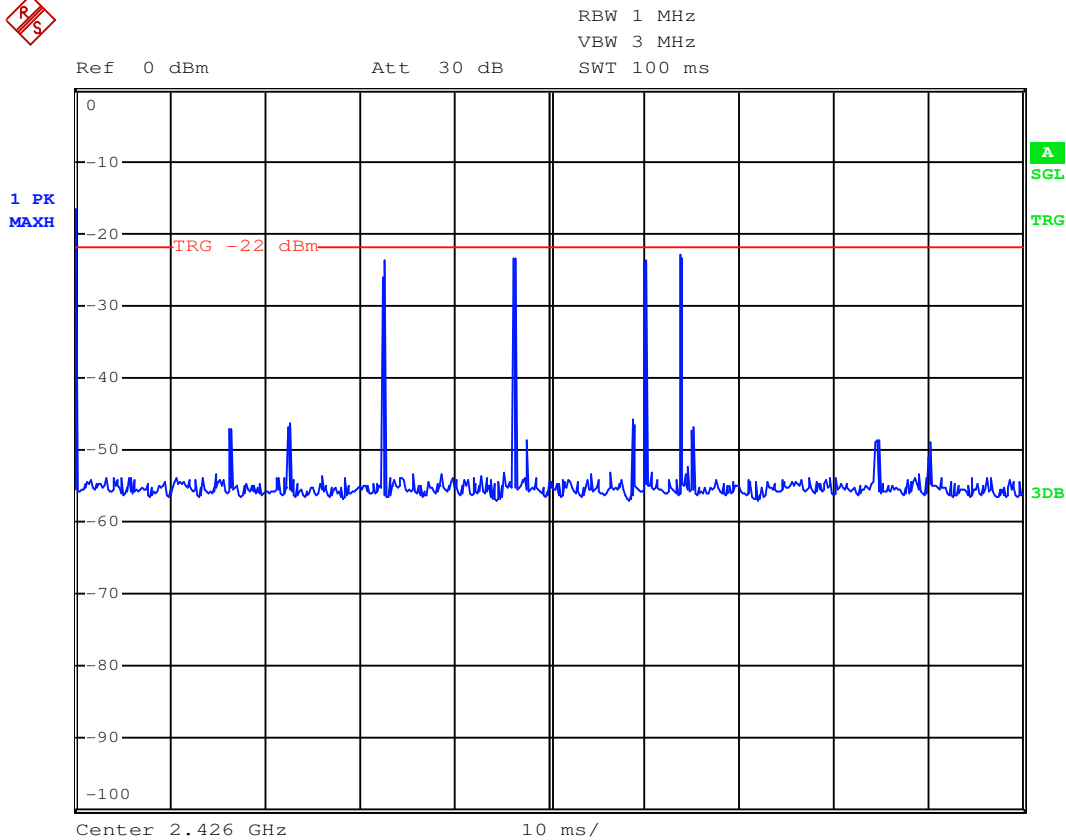
Emission at the fundamental frequency for the pulse modulated device was measured with the peak detector function of the test receiver and was properly adjusted for the duty cycle correction factor as pulse desensitization to calculate the average emission value.

Time Domain Plots (Fundamental frequency of Transceiver) :



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According to above plot , the duty cycle of the this device is 0.84%, plused operation according to C63.10 clause 7.5 is employed and the average correction calculation is applied on this report.

Accorrding to C63.10 clause 7.5 the average factor is caculated as below:

$$\delta(dB) = 20\log(\Delta)$$

δ is the duty cycle correction factor (dB)

Δ is the duty cycle (dimensionless)

Hence the calculation of the average factor is as below:

Duration of one cycle is 100 ms.

Total transmittion ON time is 0.168 ms * 5 = 0.84 ms

Duty cycle is 0.84 ms/ 100 ms = 0.0084

Averaging factor is $20\log(0.0084) = -41.5dB$

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Test results :

(1) Fundamental Frequency

Frequency (MHz)	Antenna Polarization	Emission Level (dB μ V/m)		Limit (dB μ V/m)		Remark
		Peak	Average	Peak	Average	
2402.0	H	90.1	48.6	114	94	Pass
2442.0	H	92.0	50.5	114	94	Pass
2480.0	H	91.9	50.4	114	94	Pass

Remark: Only worst case data are listed.

(2) Spurious Emission

Lowest Channel

Frequency (MHz)	Antenna Polarization	Emission Level (dB μ V/m)		Limit (dB μ V/m)		Remark
		Peak	Average	Peak	Average	
2398	H	59.1	17.6	74.0	54.0	Pass
4804	H	54.8	13.2	74.0	54.0	Pass
7206	H	49.9	8.4	74.0	54.0	Pass
9608	H	53.9	12.4	74.0	54.0	Pass
12010	H	56.9	15.4	74.0	54.0	Pass
14412	H	60.3	18.8	74.0	54.0	Pass

Middle Channel

Frequency (MHz)	Antenna Polarization	Emission Level (dB μ V/m)		Limit (dB μ V/m)		Remark
		Peak	Average	Peak	Average	
2380	V	46.2	4.7	74.0	54.0	Pass
4884	H	48.2	6.6	74.0	54.0	Pass
7326	H	52.0	10.5	74.0	54.0	Pass
9768	H	55.5	13.9	74.0	54.0	Pass
12210	H	57.9	16.4	74.0	54.0	Pass
14652	H	59.2	17.7	74.0	54.0	Pass

Highest Channel

Frequency (MHz)	Antenna Polarization	Emission Level (dB μ V/m)		Limit (dB μ V/m)		Remark
		Peak	Average	Peak	Average	
1666	V	41.7	0.2	74.0	54.0	Pass
4960	H	57.1	15.5	74.0	54.0	Pass
7440	H	54.5	13.0	74.0	54.0	Pass
9920	H	54.7	13.2	74.0	54.0	Pass
12400	H	57.2	15.7	74.0	54.0	Pass
14880	H	59.0	17.5	74.0	54.0	Pass

Remark:

1. The above results were the worst case results with the EUT positioned in all 3 axis during the test. The EUT was positioned vertically and horizontally on the table for vertical and horizontal measurement respectively.
2. Other emissions more than 20dB below the limit are not shown on the above table and only worst six emissions below 1GHz are listed.
3. There is not any other emission which falls in restricted bands which set out in Section 15.205 Restricted bands can be detected and reported.

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6.3 Restricted-band band-edge measurements (Radiated Emission)

Test Requirement: FCC Part15 Subpart C Section 15.215, 15.249(d)
Test Method: ANSI C63.10
Measurement Distance: 3m
Detector: (1MHz resolution bandwidth, 3MHz video bandwidth)
Average and Peak detector
Limit: Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general field strength limits listed in RSS-Gen, whichever is less stringent.

Frequency	Limit (dBuV/m @3m)	Remark
30MHz-88MHz	40.0	Quasi-peak Value
88MHz-216MHz	43.5	Quasi-peak Value
216MHz-960MHz	46.0	Quasi-peak Value
960MHz-1GHz	54.0	Quasi-peak Value
Above 1GHz	54.0	Average Value
	74.0	Peak Value

EUT Operation: Pre-test with Peak detector with the following mode(s):
1. Transmission in continuous transmitting mode
2. Test was performed at the lowest, middle and highest channel

Result: Pass

6.3.1 Measurement Data

Lowest Channel

Frequency (MHz)	Antenna Polarization	Emission Level (dBμV/m)		Limit (dBμV/m)		Remark
		Peak	Average	Peak	Average	
2390	H	60.5	19.0	74	54	Pass

Highest Channel

Frequency (MHz)	Antenna Polarization	Emission Level (dBμV/m)		Limit (dBμV/m)		Remark
		Peak	Average	Peak	Average	
2483.5	H	45.2	3.7	74	54	Pass

According to above bandedge measurement, emissions radiated outside of the specified frequency bands, (2400-2483.5)MHz except for harmonics, are below general field strength limits under 15.209 It is deemed to comply with section 15.215 and 15.249(d)

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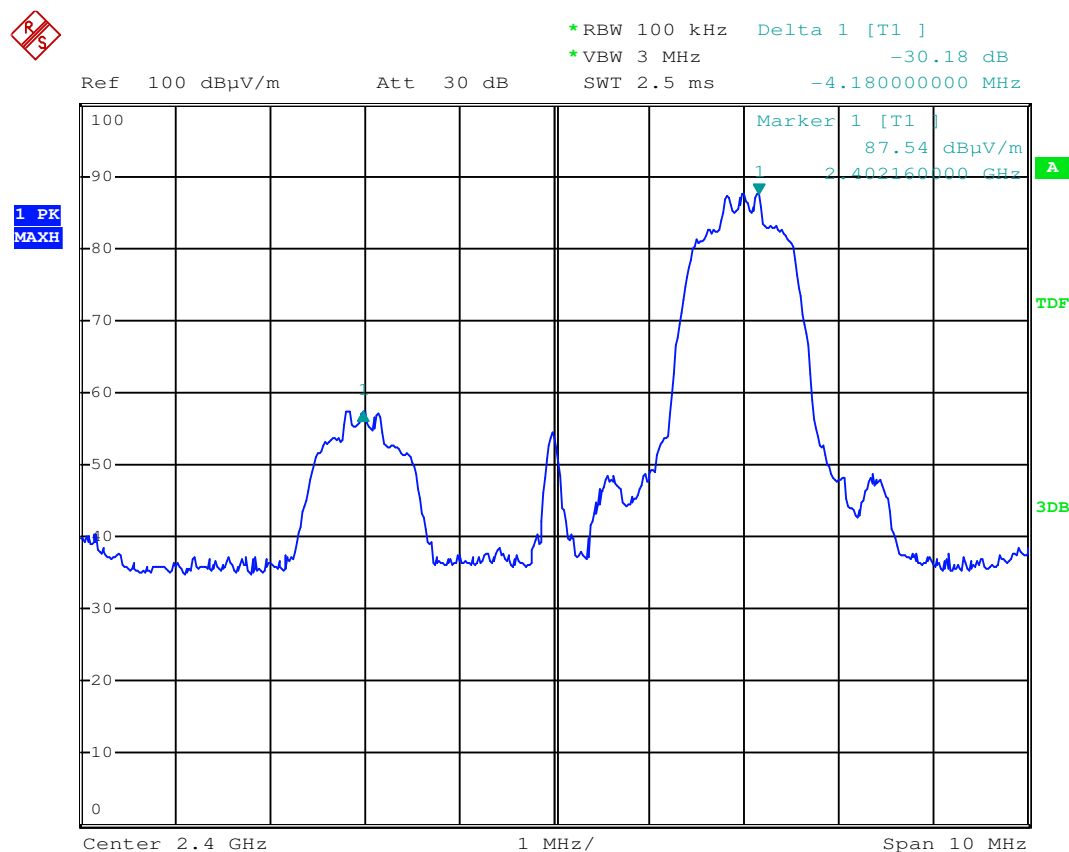
6.4 20 dB Bandwidth

Test Requirement: FCC Part15 Subpart C Section 15.215
Test Method: ANSI C63.10:2013
EUT Operation: Test with Peak detector with the following mode(s):
1. Transmission in continuous transmitting mode
2. Test was performed at the lowest and highest channel

Result: Pass

6.4.1 Measurement Data

Lowest Channel

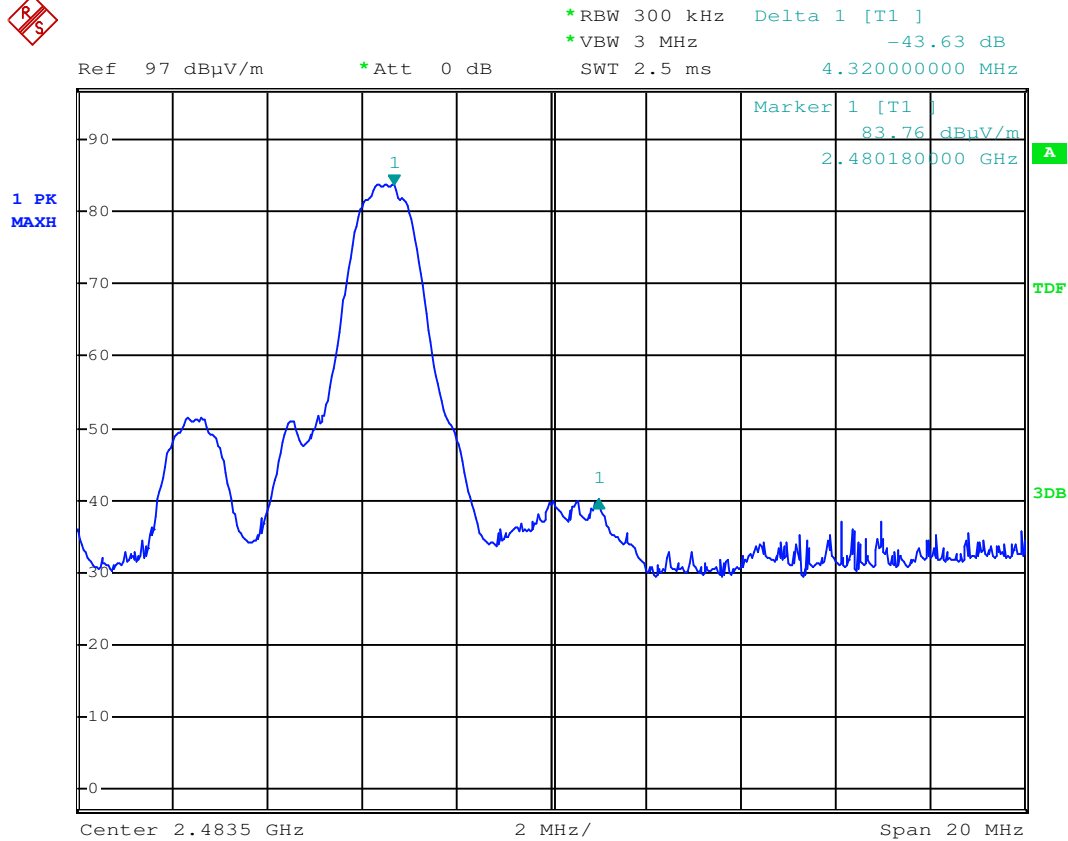


According to above plot, 20dB bandwidth falls in assigned band (2400-2483.5)MHz. It is deemed to comply with section 15.215

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Highest channel



According to above plot, 20dB bandwidth falls in assigned band (2400-2483.5)MHz. It is deemed to comply with section 15.215

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7 Photographs

7.1 7.1 EUT Constructional Details



- END OF REPORT --

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