

## FCC CERTIFICATION TEST REPORT

### FOR

<b>Applicant</b>	:	Mitek Corp
<b>Address</b>	:	1 Mitek Plaza, Winslow, IL. 61089
<b>Equipment under Test</b>	:	Bluetooth Speaker
<b>Model No.</b>	:	K-HSB-SG2, K-HSB-BG2, K-HSB-CG2, Y-HSB-X (Y means customer, X means color or finish)
<b>Trade Mark</b>	:	MTX
<b>FCC ID</b>	:	2AAOY-Y-HSB-X
<b>Manufacturer</b>	:	DongGuan Hung Pai Electronics Technology Co., Ltd.
<b>Address</b>	:	No. 18, PoLing Road, Gin Zhu Industrial District, JuXiang Management District, QingXi Town, Dong Guan City, Guang Dong Province, China

**Issued By: Dongguan Dongdian Testing Service Co., Ltd.**

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# REPORT

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## TEST REPORT DECLARE

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<b>Address</b>	:	No. 18, PoLing Road, Gin Zhu Industrial District, JuXiang Management District, QingXi Town, Dong Guan City, Guang Dong Province, China

**Test Standard Used:**

FCC Rules and Regulations Part 15 Subpart C

**Test procedure used:**

ANSI C63.10:2013

**We Declare:**

The equipment described above is tested by Dongguan Dongdian Testing Service Co., Ltd. and in the configuration tested the equipment complied with the standards specified above. The test results are contained in this test report and Dongguan Dongdian Testing Service Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

**After test and evaluation, our opinion is that the equipment provided for test compliance with the requirement of the above FCC standards.**

<b>Report No.:</b>	DDT-R18070602-1E2		
<b>Date of Receipt:</b>	Oct. 30, 2019	<b>Date of Test:</b>	Oct. 30, 2019 ~ Nov. 20, 2019

**Prepared By:**

*Sam Li*

**Sam Li/Engineer**

**Approved By:**



**Damon Hu/EMC Manager**

Note: This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Dongguan Dongdian Testing Service Co., Ltd.

## Revision history

Rev.	Revisions	Issue Date	Revised By
---	Initial issue	Jul. 27, 2018	Sam Li
Rev.01	Changed the power amplifier IC of speaker	Nov. 21, 2019	Sam Li

## 1. Summary of test results

Description of Test Item	Standard	Results
Radiated Emission	FCC Part 15: 15.209 FCC Part 15: 15.247(d) ANSI C63.10:2013	PASS

Note 1: N/A is an abbreviation for Not Applicable, and means this item is not applicable for this device.

Note 2: This report changed the power amplifier IC of speaker based on the original report, this change don't influence the RF performance, so only radiated emission(below 1GHz) was tested and recorded in this report, and the original test data was retained in this report.

## 2. General test information

### 2.1. Description of EUT

EUT* Name	: Bluetooth Speaker
Model Number	: K-HSB-SG2, K-HSB-BG2, K-HSB-CG2, Y-HSB-X (Y means customer, X means color or finish)
Difference of model number	: All models are identical except the model number, therefore the test performed on the model K-HSB-BG2.
EUT function description	: Please reference user manual of this device
Power supply	: DC 12V/5A, Power 60W
Radio Specification	: Bluetooth V4.1
Operation frequency	: 2402MHz-2480MHz
Modulation	: GFSK, $\pi/4$ -DQPSK, 8DPSK
Data rate	: 1Mbps, 2Mbps, 3Mbps
Antenna Type	: Integral PCB antenna, maximum PK gain: 1.927dBi
Sample Type	: Series production

Note: EUT is the ab. of equipment under test.

Channel information					
Channel	Frequency	Channel	Frequency	Channel	Frequency
0	2402MHz	27	2429MHz	54	2456MHz
1	2403MHz	28	2430MHz	55	2457MHz
2	2404MHz	29	2431MHz	56	2458MHz
3	2405MHz	30	2432MHz	57	2459MHz
4	2406MHz	31	2433MHz	58	2460MHz
5	2407MHz	32	2434MHz	59	2461MHz
6	2408MHz	33	2435MHz	60	2462MHz
7	2409MHz	34	2436MHz	61	2463MHz
8	2410MHz	35	2437MHz	62	2464MHz
9	2411MHz	36	2438MHz	63	2465MHz
10	2412MHz	37	2439MHz	64	2466MHz
11	2413MHz	38	2440MHz	65	2467MHz
12	2414MHz	39	2441MHz	66	2468MHz
13	2415MHz	40	2442MHz	67	2469MHz
14	2416MHz	41	2443MHz	68	2470MHz
15	2417MHz	42	2444MHz	69	2471MHz
16	2418MHz	43	2445MHz	70	2472MHz
17	2419MHz	44	2446MHz	71	2473MHz
18	2420MHz	45	2447MHz	72	2474MHz
19	2421MHz	46	2448MHz	73	2475MHz
20	2422MHz	47	2449MHz	74	2476MHz
21	2423MHz	48	2450MHz	75	2477MHz
22	2424MHz	49	2451MHz	76	2478MHz
23	2425MHz	50	2452MHz	77	2479MHz
24	2426MHz	51	2453MHz	78	2480MHz
25	2427MHz	52	2454MHz		
26	2428MHz	53	2455MHz		

## 2.2. Accessories of EUT

Description of Accessories	Manufacturer	Model number	Serial No.	Other
N/A	N/A	N/A	N/A	N/A

## 2.3. Assistant equipment used for test

Assistant equipment	Manufacturer	Model number	EMC Compliance	SN
Notebook	DELL	Latitude D610	FCC DOC	00045-534-136-300
Battery	N/A	DC12V	N/A	N/A

## 2.4. Block diagram of EUT configuration for test



Test software: RF control kit.EXE

The test software was used to control EUT work in Continuous Tx mode, and select test channel, wireless mode as below table.

Tested mode, channel, information		
Mode	Channel	Frequency (MHz)
GFSK hopping on Tx mode	CH0 to CH78	2402 to 2480
$\pi/4$ -DQPSK hopping on Tx mode	CH0 to CH78	2402 to 2480
8DPSK hopping on Tx mode	CH0 to CH78	2402 to 2480
GFSK hopping off Tx mode	CH0	2402
	CH39	2441
	CH78	2480
$\pi/4$ -DQPSK hopping off Tx mode	CH0	2402
	CH39	2441
	CH78	2480
8DPSK hopping off Tx mode	CH0	2402
	CH39	2441
	CH78	2480

Note: For  $\pi/4$ -DQPSK its same modulation type with 8DPSK, and based exploratory test, there is no significant difference of that two types test result, so except the RF output power, all other items final test was only performed with the worst case 8DPSK and GFSK.

## 2.5. Deviations of test standard

No Deviation.

## 2.6. Test environment conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature range:	21-25°C
Humidity range:	40-75%
Pressure range:	86-106kPa

## 2.7. Test laboratory

Dongguan Dongdian Testing Service Co., Ltd

Add: No. 17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park, Dongguan City, Guangdong Province, China, 523808

Tel: +86-0769-38826678, <http://www.dgddt.com>, Email: [ddt@dgddt.com](mailto:ddt@dgddt.com)

CNAS Accreditation No. L6451; A2LA Accreditation No. 3870.01

Designation Number: CN1182; Test Firm Registration Number: 540522

Industry Canada site registration number: 10288A-1

## 2.8. Measurement uncertainty

Test Item	Uncertainty
Bandwidth	1.1%
Peak Output Power (Conducted) (Spectrum analyzer)	0.86dB (10 MHz ≤ f < 3.6GHz); 1.38dB (3.6GHz ≤ f < 8GHz)
Peak Output Power (Conducted) (Power Sensor)	0.74dB
Power Spectral Density	0.74dB (10 MHz ≤ f < 3.6GHz); 1.38dB (3.6GHz ≤ f < 8GHz)
Frequencies Stability	6.7 × 10 <sup>-8</sup> (Antenna couple method) 5.5 × 10 <sup>-8</sup> (Conducted method)
Conducted spurious emissions	0.86dB (10 MHz ≤ f < 3.6GHz); 1.40dB (3.6GHz ≤ f < 8GHz) 1.66dB (8GHz ≤ f < 22GHz)
Uncertainty for radio frequency (RBW<20kHz)	3×10 <sup>-8</sup>
Temperature	0.4°C
Humidity	2%
Uncertainty for Radiation Emission test (30MHz-1GHz)	4.70 dB (Antenna Polarize: V) 4.84 dB (Antenna Polarize: H)
Uncertainty for Radiation Emission test (1GHz-40GHz)	4.10dB (1-6GHz) 4.40dB (6GHz-18GHz) 3.54dB (18GHz-26GHz) 4.30dB (26GHz-40GHz)
Uncertainty for Power line conduction emission test	3.32dB (150kHz-30MHz)

Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.



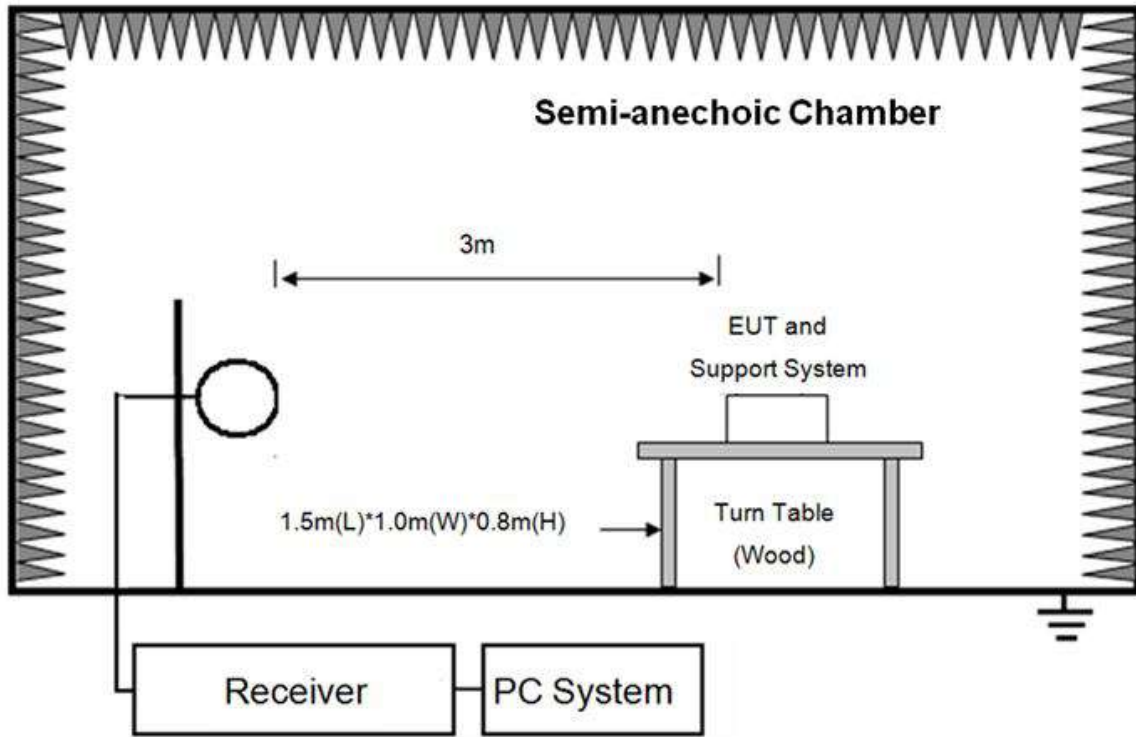
### 3. Equipment used during test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<b>Radiated Emission Test Chamber 2# (30MHz~1GHz)</b>					
EMI Test Receiver	R&S	ESU8	100551	Sep. 29, 2019	1 Year
Trilog Broadband Antenna	Schwarzbeck	VULB9163	9163-994	Sep. 29, 2019	1 Year
RF Cable	HUBSER	CP-X2+ CP-X1	W11.03+ W12.02	Sep. 29, 2019	1Year
Test software	Audix	E3	V 6.11111b	N/A	N/A

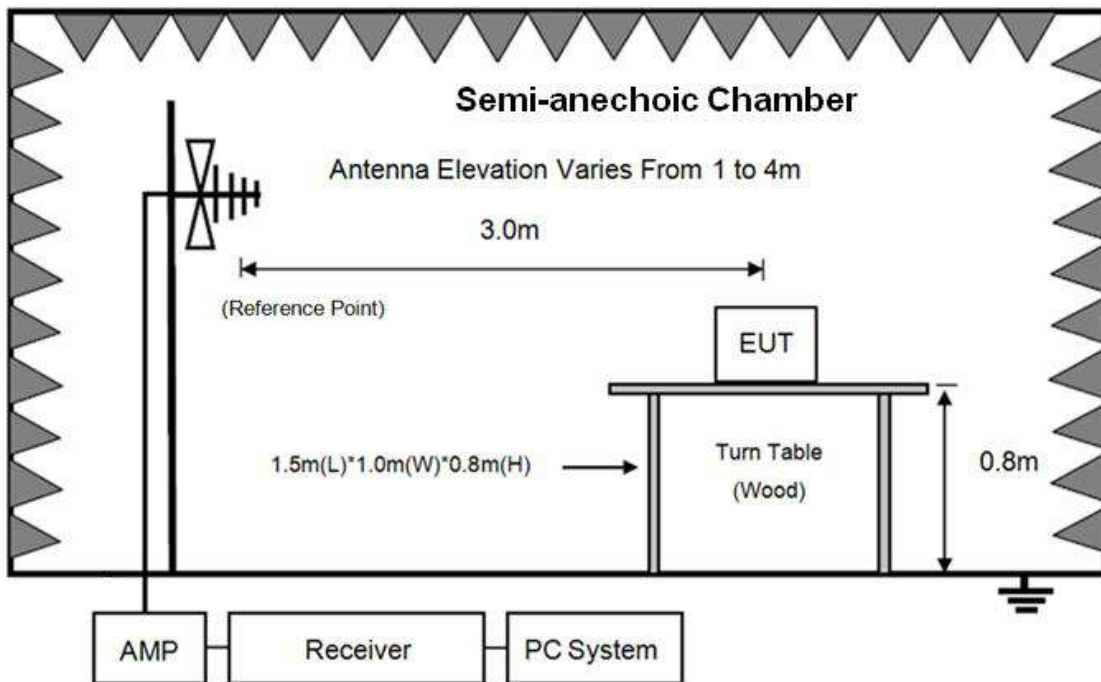
#### 4. Radiated emission

##### 4.1. Block diagram of test setup

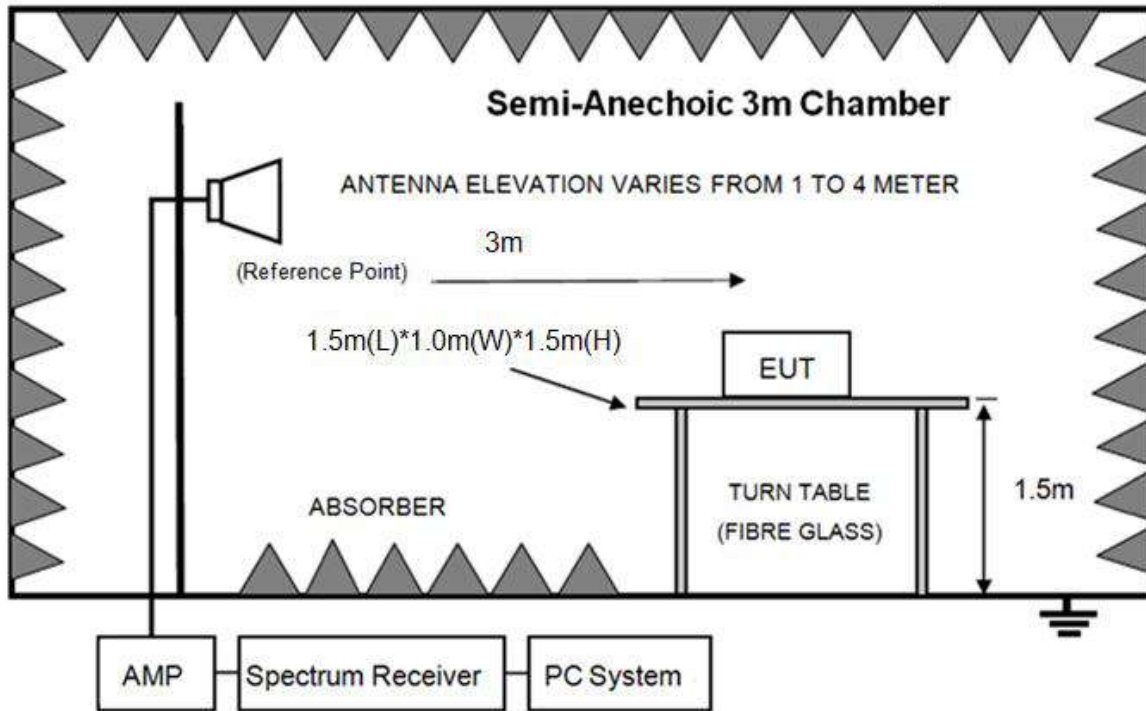
In 3m Anechoic Chamber Test Setup Diagram for 9kHz-30MHz



In 3m Anechoic Chamber Test Setup Diagram for below 1GHz



In 3m Anechoic Chamber Test Setup Diagram for frequency above 1GHz



Note: For harmonic emissions test an appropriate high pass filter was inserted in the input port of AMP.

**4.2. Limit**

(1) FCC 15.205 Restricted frequency band

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
<sup>1</sup> 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.1772&4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.2072&4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	( <sup>2</sup> )
13.36-13.41			

## (2) FCC 15.209 Limit.

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		$\mu\text{V}/\text{m}$	$\text{dB}(\mu\text{V})/\text{m}$
0.009 ~ 0.490	300	2400/F(kHz)	67.6-20log(F)
0.490 ~ 1.705	30	24000/F(kHz)	87.6-20log(F)
1.705 ~ 30.0	30	30	29.54
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000	3	74.0 $\text{dB}(\mu\text{V})/\text{m}$ (Peak) 54.0 $\text{dB}(\mu\text{V})/\text{m}$ (Average)	

Note: (1) The emission limits shown in the above table are based on measurements employing a CISPR QP detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000MHz. Radiated emissions limits in these three bands are based on measurements employing an average detector.

(2) At frequencies below 30MHz, measurement may be performed at a distance closer than that specified, and the limit at closer measurement distance can be extrapolated by below formula:

$$\text{Limit}_{3\text{m}}(\text{dB}\mu\text{V}/\text{m}) = \text{Limit}_{30\text{m}}(\text{dB}\mu\text{V}/\text{m}) + 40\text{Log}(30\text{m}/3\text{m})$$

## (3) Limit for this EUT

All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

**4.3. Test Procedure**

(1) EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber for below 1G and 150 cm above the ground plane inside a semi-anechoic chamber for above 1G.

(2) Test antenna was located 3m from the EUT on an adjustable mast, and the antenna used as below table.

Test frequency range	Test antenna used	Test antenna distance
9kHz-30MHz	Active Loop antenna	3m
30MHz-1GHz	Trilog Broadband Antenna	3m
1GHz-18GHz	Double Ridged Horn Antenna(1GHz-18GHz)	3m
18GHz-40GHz	Horn Antenna(18GHz-40GHz)	1m

According ANSI C63.10:2013 clause 6.4.4.2 and 6.5.3, for measurements below 30 MHz, the loop antenna was positioned with its plane vertical from the EUT and rotated about its vertical axis for maximum response at each azimuth position around the EUT. And the loop antenna also

be positioned with its plane horizontal at the specified distance from the EUT. The center of the loop is 1 m above the ground. For measurement above 30MHz, the Trilog Broadband Antenna or Horn Antenna was located 3m from EUT, Measurements were made with the antenna positioned in both the horizontal and vertical planes of Polarization, and the measurement antenna was varied from 1 m to 4 m. in height above the reference ground plane to obtain the maximum signal strength.

(3) Below pre-scan procedure was first performed in order to find prominent frequency spectrum radiated emissions from 9kHz to 25GHz:

(a) Scanning the peak frequency spectrum with the antenna specified in step (3), and the EUT was rotated 360 degree, the antenna height was varied from 1m to 4m (Except loop antenna, it's fixed 1m above ground.)

(b) Change work frequency or channel of device if practicable.

(c) Change modulation type of device if practicable.

(d) Change power supply range from 85% to 115% of the rated supply voltage

(e) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions.

Spectrum frequency from 9kHz to 25GHz (tenth harmonic of fundamental frequency) was investigated, and no any obvious emission were detected from 18GHz to 25GHz, so below final test was performed with frequency range from 9kHz to 18GHz.

(4) For final emissions measurements at each frequency of interest, the EUT was rotated and the antenna height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10:2013 on Radiated Emission test.

(5) The emissions from 9kHz to 1GHz were measured based on CISPR QP detector except for the frequency bands 9-90kHz, 110-490kHz, for emissions from 9kHz-90kHz,110kHz-490kHz and above 1GHz were measured based on average detector, for emissions above 1GHz, peak emissions also be measured and need comply with Peak limit.

(6) The emissions from 9kHz to 1GHz, QP or average values were measured with EMI receiver with below RBW.

Frequency band	RBW
9kHz-150kHz	200Hz
150kHz-30MHz	9kHz
30MHz-1GHz	120kHz

(7) For emissions above 1GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1MHz, VBW is set at 3MHz for Peak measure; RBW 1MHz VBW 10Hz for Average measure (according ANSI C63.10:2013 clause 4.1.4.2.2 procedure for average measure).

#### 4.4. Test result

##### **PASS. (See below detailed test result)**

All the emissions except fundamental emission from 9 kHz to 25GHz were comply with 15.209 limits.

Note1: According exploratory test no any obvious emission was detected from 9kHz to 30MHz and 18GHz to 25GHz.

Note2: For emissions below 1GHz, according exploratory explorer test, when change Tx mode and channel, have no distinct influence on emissions level, so for emissions below 1GHz, the final test was only performed with EUT working in 8DPSK, Tx 2480MHz mode.

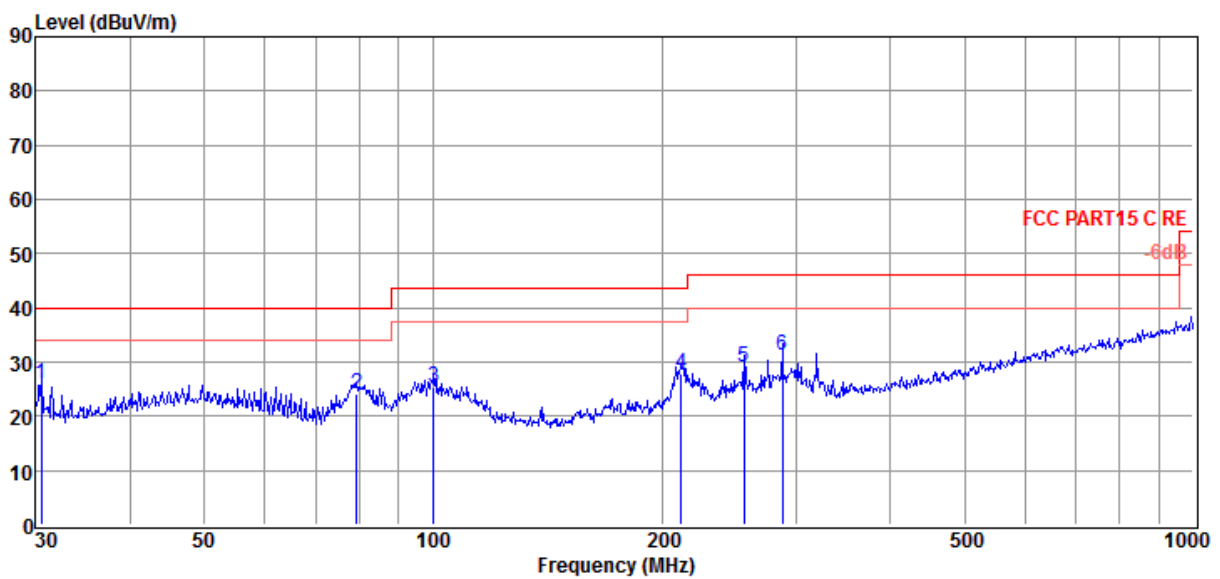
Note3: For emissions above 1GHz. If peak results comply with AV limit, AV Result is deemed to comply with AV limit.

## Radiated Emission test (below 1GHz) TR-4-E-009 Radiated Emission Test Result

**Test Site** : DDT 3m Chamber 2# **E:\2019 RE2# Report Data\Q19102601-1E\RE.EM6**  
**Test Date** : 2019-11-20 **Tested By** : Telamon  
**EUT** : Bluetooth Speaker **Model Number** : K-HSB-BG2  
**Power Supply** : DC 12V **Test Mode** : Tx mode  
**Condition** : Temp:24.5°C, Humi:55%, Press:101.4kPa **Antenna/Distance** : 2018 VULB 9163 2#/3m/HORIZONTAL

**Memo** :

Data: 18



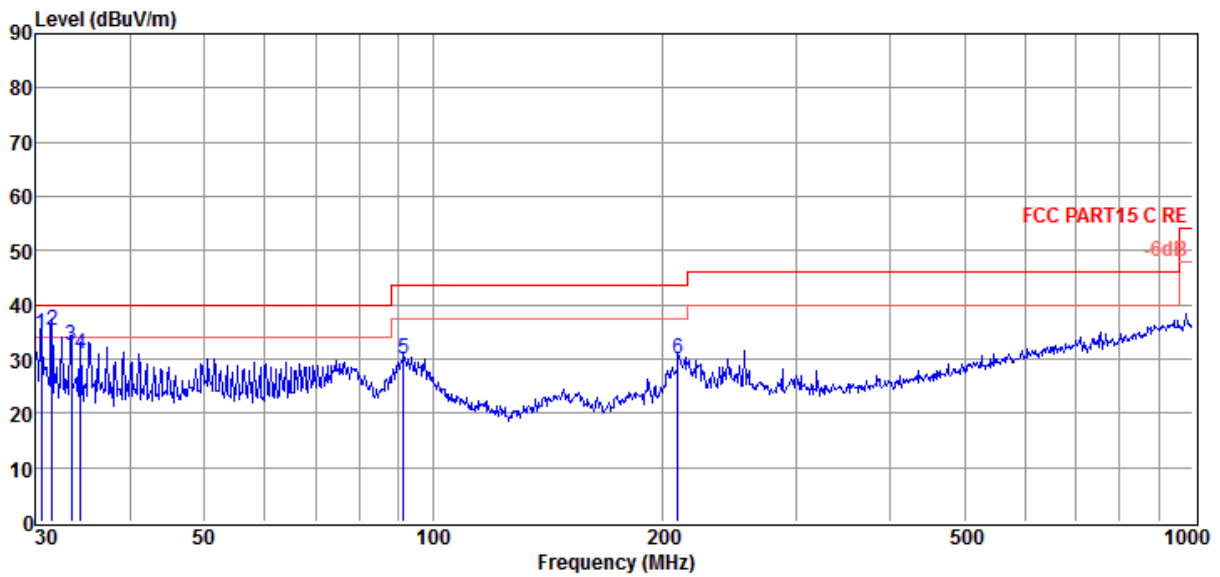
Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	30.53	11.32	10.96	3.62	25.90	40.00	-14.10	QP	HORIZONTAL
2	79.24	11.85	8.14	4.07	24.06	40.00	-15.94	QP	HORIZONTAL
3	100.23	9.07	12.11	4.23	25.41	43.50	-18.09	QP	HORIZONTAL
4	212.27	11.16	11.61	4.91	27.68	43.50	-15.82	QP	HORIZONTAL
5	256.52	11.10	12.92	5.14	29.16	46.00	-16.84	QP	HORIZONTAL
6	287.99	12.27	13.72	5.30	31.29	46.00	-14.71	QP	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.  
 2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.  
 3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

# TR-4-E-009 Radiated Emission Test Result

**Test Site** : DDT 3m Chamber 2# E:\2019 RE2# Report Data\Q19102601-1E\RE.EM6  
**Test Date** : 2019-11-20 **Tested By** : Telamon  
**EUT** : Bluetooth Speaker **Model Number** : K-HSB-BG2  
**Power Supply** : DC 12V **Test Mode** : Tx mode  
**Condition** : Temp:24.5°C, Humi:55%, Press:101.4kPa **Antenna/Distance** : 2018 VULB 9163 2#/3m/VERTICAL  
**Memo** :

Data: 19



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	30.53	20.20	10.96	3.62	34.78	40.00	-5.22	QP	VERTICAL
2	31.51	20.45	11.24	3.63	35.32	40.00	-4.68	QP	VERTICAL
3	33.45	16.96	11.78	3.66	32.40	40.00	-7.60	QP	VERTICAL
4	34.40	15.33	12.04	3.67	31.04	40.00	-8.96	QP	VERTICAL
5	91.50	15.07	10.75	4.16	29.98	43.50	-13.52	QP	VERTICAL
6	210.05	13.49	11.54	4.90	29.93	43.50	-13.57	QP	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.  
 2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.  
 3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.