

TEST REPORT

Report No.: 20060404HKG-001

Ideavillage Products Corporation

Application For Certification
(Original Grant)

FCC ID: 2AJKH-JOCUBEWTC

Transceiver

Prepared and Checked by:

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Date: June 30, 2020

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TEST REPORT

GENERAL INFORMATION

Grantee:	Ideavillage Products Corporation
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Contact Person:	Eric Langberg
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Manufacturer:	Wonders Technology Co., Ltd.
Manufacturer Address:	4/F., Tower A, 3 rd Building, Tian'an Cloud Park, Bantian Avenue, Longgang District, Shenzhen 518129, China
Brand Name:	Joel Osteen Inspiration Cube
Model:	JOCUBE
Type of EUT:	Transmitter
Description of EUT:	Joel Osteen Inspiration Cube
Serial Number:	N/A
FCC ID:	2AJKH-JOCUBEWTC
Date of Sample Submitted:	June 08, 2020
Date of Test:	June 08, 2020 to June 29, 2020
Report No.:	20060404HKG-001
Report Date:	June 30, 2020
Environmental Conditions:	Temperature: +10 to 40°C Humidity: 10 to 90%
Conclusion:	Test was conducted by client submitted sample. The submitted sample as received complied with the 47 CFR Part 15 Certification.

TEST REPORT

SUMMARY OF TEST RESULT

Test Specification	Reference	Results
Transmitter Power Line Conducted Emissions	15.207	Pass
Radiated Emission	15.249, 15.209	Pass
Radiated Emission on the Bandedge		
Radiated Emission in Restricted Bands	15.205	Pass

The equipment under test is found to be complying with the following standards:
FCC Part 15, October 1, 2018 Edition

Note: 1. The EUT uses a permanently attached antenna which, in accordance to section 15.203, is considered sufficient to comply with the provisions of this section.
2. Pursuant to FCC part 15 Section 15.215(c), the 20 dB bandwidth of the emission was contained within the frequency band designated (mentioned as above) which the EUT operated. The effects, if any, from frequency sweeping, frequency hopping, other modulation techniques and frequency stability over excepted variations in temperature and supply voltage were considered.

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1.0 GENERAL DESCRIPTION

1.1 Product Description

The Equipment Under Test (EUT) is the Joel Osteen Inspiration Cube which is the audio cube that delivered motivational quotes daily to provide daily inspiration. The EUT contains a Bluetooth music playing feature which operates at frequency range between 2402MHz and 2480MHz. The EUT is powered by an internal 3.7V rechargeable battery. The USB port is for charging internal battery purpose only that does not have data transfer.

Antenna Type: Internal, Integral

For electronic filing, the brief circuit description is saved with filename: descri.pdf.

1.2 Related Submittal(s) Grants

This is a single application for certification of a transmitter.

1.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.10 (2013). All radiated measurements were performed in an 3m Chamber. Preliminary scans were performed in the 3m Chamber only to determine worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the “**Justification Section**” of this Application.

1.4 Test Facility

The 3m Chamber and conducted measurement facility used to collect the radiated data is located at Workshop No. 3, G/F., World-Wide Industrial Centre, 43-47 Shan Mei Street, Fo Tan, Sha Tin, N.T., Hong Kong SAR, China. This test facility and site measurement data have been placed on file with the FCC.

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2.0 SYSTEM TEST CONFIGURATION

2.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it), and in the confines as outlined in ANSI C63.10 (2013).

The device was powered by 120VAC.

For maximizing emissions, the EUT was rotated through 360°, the antenna height was varied from 1 meter to 4 meters above the ground plane, and the antenna polarization was changed. This step by step procedure for maximizing emissions led to the data reported in Exhibit 3.0.

The rear of unit shall be flushed with the rear of the table.

The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). The EUT was mounted to a plastic stand if necessary and placed on the wooden turntable, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes.

2.2 EUT Exercising Software

The EUT exercise program (if any) used during radiated testing was designed to exercise the various system components in manner similar to a typical use.

2.3 Special Accessories

There are no special accessories necessary for compliance of this product.

2.4 Measurement Uncertainty

When determining of the test conclusion, the Measurement Uncertainty of test has been considered.

Uncertainty and Compliance - Unless the standard specifically states that measured values are to be extended by the measurement uncertainty in determining compliance, all compliance determinations are based on the actual measured value.

2.5 Support Equipment List and Description

1. Adaptor (Provided by Applicant)
Model: LX050100
Input: 100-240VAC 50/60Hz 0.35A
Output: 5VDC 1A
2. USB cable of 1m in length (Provided by Applicant)

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3.0 EMISSION RESULTS

Data is included of the worst-case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

3.1 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any), Average Factor (optional) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG - AV$$

where FS = Field Strength in dB μ V/m

RA = Receiver Amplitude (including preamplifier) in dB μ V

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB

AG = Amplifier Gain in dB

AV = Average Factor in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows:

$$FS = RR + LF$$

where FS = Field Strength in dB μ V/m

RR = RA - AG - AV in dB μ V

LF = CF + AF in dB

Assume a receiver reading of 52.0 dB μ V is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB are added. The amplifier gain of 29 dB and average factor of 5 dB are subtracted, giving a field strength of 27 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

$$RA = 52.0 \text{ dB}\mu\text{V/m}$$

$$AF = 7.4 \text{ dB}$$

$$CF = 1.6 \text{ dB}$$

$$AG = 29.0 \text{ dB}$$

$$AV = 5.0 \text{ dB}$$

$$FS = RR + LF$$

$$FS = 18 + 9 = 27 \text{ dB}\mu\text{V/m}$$

$$RR = 18.0 \text{ dB}\mu\text{V}$$

$$LF = 9.0 \text{ dB}$$

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm } [(27 \text{ dB}\mu\text{V/m})/20] = 22.4 \mu\text{V/m}$$

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3.2 Radiated Emission Configuration Photograph

The worst case in radiated emission was found at 4804.000 MHz

For electronic filing, the worst case radiated emission configuration photographs are saved with filename: radiated photos.pdf.

3.3 Radiated Emission Data

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

Judgment: Passed by 0.2 dB

3.4 Conducted Emission Configuration Photograph

The worst case in line-conducted emission was found at 2.756 MHz

For electronic filing, the worst case line-conducted configuration photographs are saved with filename: conducted photo.pdf.

3.5 Conducted Emission Data

For electronic filing, the graph and data table of conducted emission is saved with filename: conducted.pdf.

Judgment: Pass by 1.8 dB

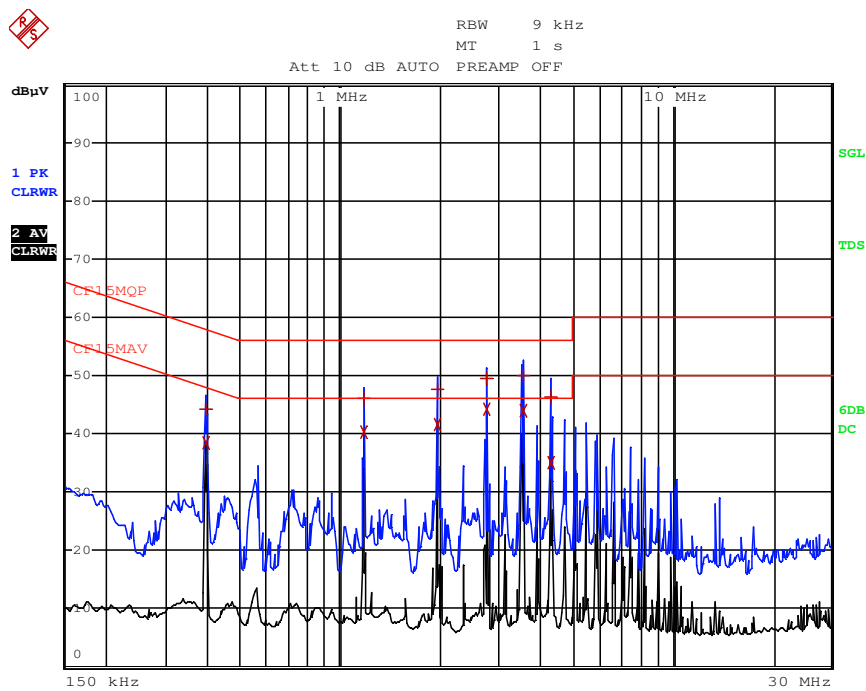
TEST REPORT

CONDUCTED EMISSION

Model: JOCUBE

Date of Test: June 29, 2020

Worst-Case Operating Mode: Powered by adaptor + Bluetooth Audio Playing



EDIT PEAK LIST (Final Measurement Results)				
Trace1:	CF15MQP			
Trace2:	CF15MAV			
Trace3:	---			
TRACE	FREQUENCY	LEVEL dBμV	DELTA	LIMIT dB
1 Quasi Peak	393 kHz	44.11 N	-13.88	
2 CISPR Average	393 kHz	38.50 L1	-9.49	
1 Quasi Peak	1.1805 MHz	46.12 N	-9.87	
2 CISPR Average	1.1805 MHz	40.32 L1	-5.67	
1 Quasi Peak	1.968 MHz	47.52 L1	-8.47	
2 CISPR Average	1.968 MHz	41.72 N	-4.27	
1 Quasi Peak	2.7555 MHz	49.46 N	-6.53	
2 CISPR Average	2.7555 MHz	44.16 N	-1.83	
1 Quasi Peak	3.543 MHz	50.04 L1	-5.95	
2 CISPR Average	3.543 MHz	43.98 L1	-2.01	
2 CISPR Average	4.326 MHz	35.11 N	-10.88	
1 Quasi Peak	4.3305 MHz	46.24 N	-9.75	

Note: Measurement Uncertainty is ± 4.2 dB at a level of confidence of 95%.

TEST REPORT

RADIATED EMISSIONS

Model: JOCUBE

Date of Test: June 29, 2020

Worst-Case Operating Mode: Transmitting (Bluetooth 3.0)

Table 1
Pursuant to FCC Part 15 Section 15.249 Requirement

Lowest Channel

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBμV/m)	Average Limit at 3m (dBμV/m)	Margin (dB)
V	2402.000	97.2	33	29.4	93.6	94.0	-0.4
H	4804.000	51.9	33	34.9	53.8	54.0	-0.2
V	7206.000	44.3	33	37.9	49.2	54.0	-4.8
H	9608.000	40.6	33	40.4	48.0	54.0	-6.0
H	12010.000	38.3	33	40.5	45.8	54.0	-8.2
H	14412.000	30.4	33	40.0	37.4	54.0	-16.6

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBμV/m)	Peak Limit at 3m (dBμV/m)	Margin (dB)
V	2402.000	99.8	33	29.4	96.2	114.0	-17.8
H	4804.000	56.7	33	34.9	58.6	74.0	-15.4
V	7206.000	50.9	33	37.9	55.8	74.0	-18.2
H	9608.000	49.2	33	40.4	56.6	74.0	-17.4
H	12010.000	47.1	33	40.5	54.6	74.0	-19.4
H	14412.000	43.8	33	40.0	50.8	74.0	-23.2

- NOTES:
1. Peak Detector Data unless otherwise stated. Average measurement is according to ANSI C63.10
 2. All measurements were made at 3 meters.
 3. Negative sign in the column shows value below limit.
 4. Horn antenna is used for the emission over 1000MHz.
 5. Emission (the row indicated by **bold italic**) within the restricted band meets the requirement of FCC Part 15 Section 15.205.
 6. Measurement Uncertainty is ± 5.3 dB at a level of confidence of 95%.

TEST REPORT

Model: JOCUBE

Date of Test: June 29, 2020

Worst-Case Operating Mode: Transmitting (Bluetooth 3.0)

Table 2
Pursuant to FCC Part 15 Section 15.249 Requirement

Middle Channel

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBμV/m)	Average Limit at 3m (dBμV/m)	Margin (dB)
H	2442.000	93.8	33	29.4	90.2	94.0	-3.8
V	4884.000	45.6	33	34.9	47.5	54.0	-6.5
H	7326.000	37.5	33	37.9	42.4	54.0	-11.6
V	9768.000	36.1	33	40.4	43.5	54.0	-10.5
H	12210.000	29.3	33	40.5	36.8	54.0	-17.2
V	14652.000	31.4	33	38.4	36.8	54.0	-17.2

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBμV/m)	Peak Limit at 3m (dBμV/m)	Margin (dB)
H	2442.000	97.4	33	29.4	93.8	114.0	-20.2
V	4884.000	50.9	33	34.9	52.8	74.0	-21.2
H	7326.000	45.5	33	37.9	50.4	74.0	-23.6
V	9768.000	43.1	33	40.4	50.5	74.0	-23.5
H	12210.000	41.9	33	40.5	49.4	74.0	-24.6
V	14652.000	45.8	33	38.4	51.2	74.0	-22.8

- NOTES:
1. Peak Detector Data unless otherwise stated. Average measurement is according to ANSI C63.10
 2. All measurements were made at 3 meters.
 3. Negative sign in the column shows value below limit.
 4. Horn antenna is used for the emission over 1000MHz.
 5. Emission (the row indicated by **bold italic**) within the restricted band meets the requirement of FCC Part 15 Section 15.205.
 6. Measurement Uncertainty is ± 5.3 dB at a level of confidence of 95%.

TEST REPORT

Model: JOCUBE

Date of Test: June 29, 2020

Worst-Case Operating Mode: Transmitting (Bluetooth 3.0)

Table 3
Pursuant to FCC Part 15 Section 15.249 Requirement

Highest Channel

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBμV/m)	Average Limit at 3m (dBμV/m)	Margin (dB)
H	2480.000	93.4	33	29.4	89.8	94.0	-4.2
V	4960.000	42.9	33	34.9	44.8	54.0	-9.2
V	7440.000	34.3	33	37.9	39.2	54.0	-14.8
H	9920.000	41.0	33	40.4	48.4	54.0	-5.6
H	12400.000	27.0	33	40.5	34.5	54.0	-19.5
H	14880.000	30.8	33	38.4	36.2	54.0	-17.8

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBμV/m)	Peak Limit at 3m (dBμV/m)	Margin (dB)
H	2480.000	97.1	33	29.4	93.5	114.0	-20.5
V	4960.000	48.3	33	34.9	50.2	74.0	-23.8
V	7440.000	44.3	33	37.9	49.2	74.0	-24.8
H	9920.000	46.8	33	40.4	54.2	74.0	-19.8
H	12400.000	40.1	33	40.5	47.6	74.0	-26.4
H	14880.000	44.4	33	38.4	49.8	74.0	-24.2

- NOTES:
1. Peak Detector Data unless otherwise stated. Average measurement is according to ANSI C63.10
 2. All measurements were made at 3 meters.
 3. Negative sign in the column shows value below limit.
 4. Horn antenna is used for the emission over 1000MHz.
 5. Emission (the row indicated by **bold italic**) within the restricted band meets the requirement of FCC Part 15 Section 15.205.
 6. Measurement Uncertainty is ± 5.3 dB at a level of confidence of 95%.

TEST REPORT

Model: JOCUBE

Date of Test: June 29, 2020

Worst-Case Operating Mode: Transmitting (Bluetooth 4.0 BLE)

Table 4
Pursuant to FCC Part 15 Section 15.249 Requirement

Lowest Channel

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBμV/m)	Average Limit at 3m (dBμV/m)	Margin (dB)
V	2402.000	94.0	33	29.4	90.4	94.0	-3.6
H	4804.000	47.9	33	34.9	49.8	54.0	-4.2
V	7206.000	37.6	33	37.9	42.5	54.0	-11.5
H	9608.000	37.4	33	40.4	44.8	54.0	-9.2
H	12010.000	31.5	33	40.5	39.0	54.0	-15.0
H	14412.000	30.2	33	40.0	37.2	54.0	-16.8

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBμV/m)	Peak Limit at 3m (dBμV/m)	Margin (dB)
V	2402.000	100.0	33	29.4	96.4	114.0	-17.6
H	4804.000	56.3	33	34.9	58.2	74.0	-15.8
V	7206.000	49.3	33	37.9	54.2	74.0	-19.8
H	9608.000	47.6	33	40.4	55.0	74.0	-19.0
H	12010.000	44.5	33	40.5	52.0	74.0	-22.0
H	14412.000	43.4	33	40.0	50.4	74.0	-23.6

- NOTES:
1. Peak Detector Data unless otherwise stated. Average measurement is according to ANSI C63.10
 2. All measurements were made at 3 meters.
 3. Negative sign in the column shows value below limit.
 4. Horn antenna is used for the emission over 1000MHz.
 5. Emission (the row indicated by **bold italic**) within the restricted band meets the requirement of FCC Part 15 Section 15.205.
 6. Measurement Uncertainty is ± 5.3 dB at a level of confidence of 95%.

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Model: JOCUBE

Date of Test: June 29, 2020

Worst-Case Operating Mode: Transmitting (Bluetooth 4.0 BLE)

Table 5
Pursuant to FCC Part 15 Section 15.249 Requirement

Middle Channel

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBμV/m)	Average Limit at 3m (dBμV/m)	Margin (dB)
H	2442.000	90.4	33	29.4	86.8	94.0	-7.2
V	4884.000	42.3	33	34.9	44.2	54.0	-9.8
H	7326.000	33.6	33	37.9	38.5	54.0	-15.5
H	9768.000	38.0	33	40.4	45.4	54.0	-8.6
H	12210.000	28.3	33	40.5	35.8	54.0	-18.2
V	14652.000	30.8	33	38.4	36.2	54.0	-17.8

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBμV/m)	Peak Limit at 3m (dBμV/m)	Margin (dB)
H	2442.000	97.8	33	29.4	94.2	114.0	-19.8
V	4884.000	51.1	33	34.9	53.0	74.0	-21.0
H	7326.000	45.3	33	37.9	50.2	74.0	-23.8
H	9768.000	45.4	33	40.4	52.8	74.0	-21.2
H	12210.000	42.9	33	40.5	50.4	74.0	-23.6
V	14652.000	44.8	33	38.4	50.2	74.0	-23.8

- NOTES:
1. Peak Detector Data unless otherwise stated. Average measurement is according to ANSI C63.10
 2. All measurements were made at 3 meters.
 3. Negative sign in the column shows value below limit.
 4. Horn antenna is used for the emission over 1000MHz.
 5. Emission (the row indicated by **bold italic**) within the restricted band meets the requirement of FCC Part 15 Section 15.205.
 6. Measurement Uncertainty is ± 5.3 dB at a level of confidence of 95%.

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Model: JOCUBE

Date of Test: June 29, 2020

Worst-Case Operating Mode: Transmitting (Bluetooth 4.0 BLE)

Table 6
Pursuant to FCC Part 15 Section 15.249 Requirement

Highest Channel

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBμV/m)	Average Limit at 3m (dBμV/m)	Margin (dB)
H	2480.000	90.0	33	29.4	86.4	94.0	-7.6
V	4960.000	37.7	33	34.9	39.6	54.0	-14.4
V	7440.000	30.3	33	37.9	35.2	54.0	-18.8
V	9920.000	39.2	33	40.4	46.6	54.0	-7.4
H	12400.000	26.9	33	40.5	34.4	54.0	-19.6
H	14880.000	30.4	33	38.4	35.8	54.0	-18.2

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBμV/m)	Peak Limit at 3m (dBμV/m)	Margin (dB)
H	2480.000	97.4	33	29.4	93.8	114.0	-20.2
V	4960.000	47.5	33	34.9	49.4	74.0	-24.6
V	7440.000	43.3	33	37.9	48.2	74.0	-25.8
V	9920.000	46.0	33	40.4	53.4	74.0	-20.6
H	12400.000	41.1	33	40.5	48.6	74.0	-25.4
H	14880.000	44.0	33	38.4	49.4	74.0	-24.6

- NOTES:
1. Peak Detector Data unless otherwise stated. Average measurement is according to ANSI C63.10
 2. All measurements were made at 3 meters.
 3. Negative sign in the column shows value below limit.
 4. Horn antenna is used for the emission over 1000MHz.
 5. Emission (the row indicated by **bold italic**) within the restricted band meets the requirement of FCC Part 15 Section 15.205.
 6. Measurement Uncertainty is ± 5.3 dB at a level of confidence of 95%.

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Model: JOCUBE

Date of Test: June 29, 2020

Worst-Case Operating Mode: Powered by adaptor + Bluetooth Audio Playing

Table 7
Pursuant to FCC Part 15 Section 15.209 Requirement

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-amp (dB)	Antenna Factor (dB)	Net at 3m (dBμV/m)	Limit at 3m (dBμV/m)	Margin (dB)
V	56.810	32.8	16	11.0	27.8	40.0	-12.2
V	119.210	27.4	16	14.0	25.4	43.5	-18.1
H	168.934	24.5	16	18.0	26.5	43.5	-17.0
H	211.348	32.5	16	17.0	33.5	43.5	-10.0
H	351.016	26.0	16	24.0	34.0	46.0	-12.0
H	546.016	21.5	16	28.0	33.5	46.0	-12.5

- NOTES:
1. Quasi-Peak Detector Data unless otherwise stated.
 2. All measurements were made at 3 meters.
 3. Negative sign in the column shows value below limit.
 4. Horn antenna is used for the emission over 1000MHz.
 5. Emission (the row indicated by **bold italic**) within the restricted band meets the requirement of FCC Part 15 Section 15.205.
 6. Measurement Uncertainty is ± 5.3 dB at a level of confidence of 95%.

TEST REPORT

4.0 EQUIPMENT PHOTOGRAPHS

For electronic filing, the photographs are saved with filename: external photos.pdf and internal photos.pdf.

5.0 PRODUCT LABELLING

For electronics filing, the FCC ID label artwork and the label location are saved with filename: label.pdf.

6.0 TECHNICAL SPECIFICATIONS

For electronic filing, the block diagram and schematic of the tested EUT are saved with filename: block.pdf and circuit.pdf respectively.

7.0 INSTRUCTION MANUAL

For electronic filing, a preliminary copy of the Instruction Manual is saved with filename: manual.pdf.

This manual will be provided to the end-user with each unit sold/leased in the United States.

TEST REPORT

8.0 MISCELLANEOUS INFORMATION

The miscellaneous information includes details of the test procedure and measured bandwidth / calculation of factor such as pulse desensitization and averaging factor (calculation and timing diagram).

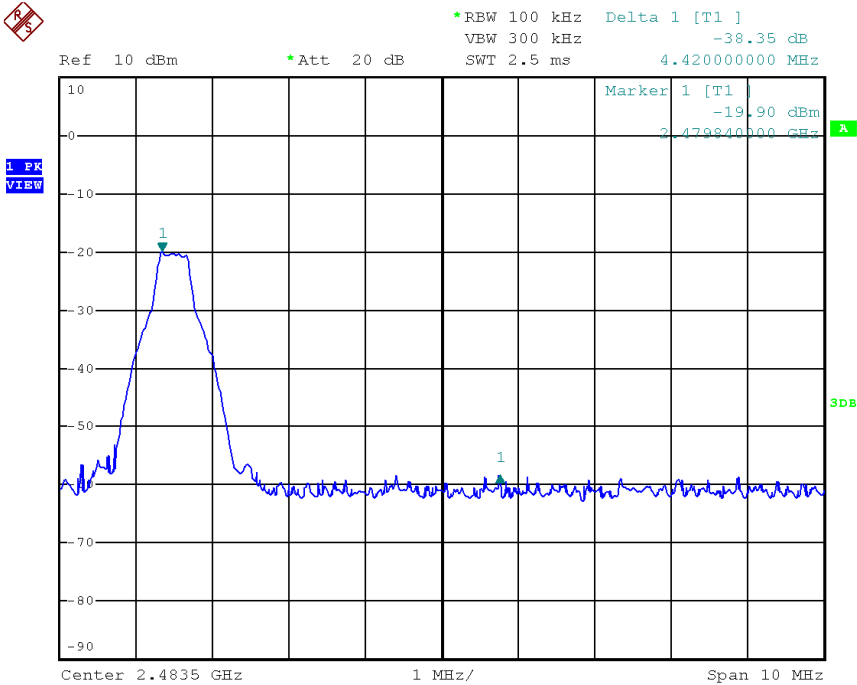
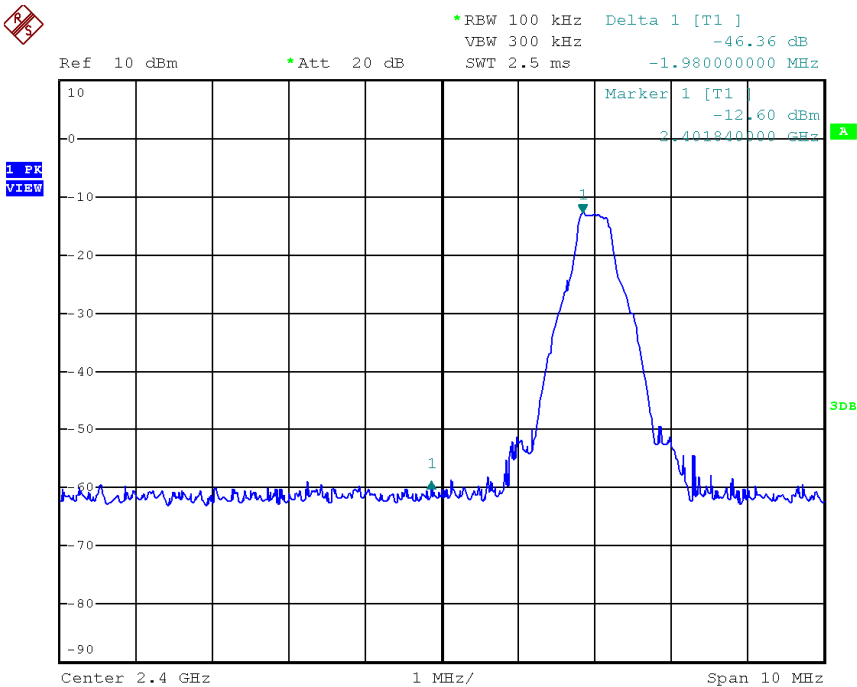
8.1 Radiated Emission on the Bandedge

From the following plots, they show that the fundamental emissions are confined in the specified band (2400MHz to 2483.5MHz). In case of the fundamental emissions are within two standard bandwidths from the bandedge, the delta measurement technique is used for determining bandedge compliance. Standard bandwidth is the bandwidth specified by ANSI C63.10 (2013) for frequency being measured.

Emissions radiated outside of the specified frequency bands, except harmonics, are attenuated by 50dB below the level of the fundamental or to the general radiated emissions limits in Section 15.209, whichever is the lesser attenuation, which meet the requirement of part 15.249(d).

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PEAK MEASUREMENT (Bluetooth 3.0)



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PEAK MEASUREMENT (Bluetooth 3.0)

Bandedge compliance is determined by applying marker-delta method, i.e. (Bandedge Plot).

Lower bandedge

Peak Resultant field strength = Fundamental emissions (peak value) – delta from the plot

$$=96.2 \text{ dB}\mu\text{V/m} - 46.4 \text{ dB}$$

$$=49.8 \text{ dB}\mu\text{V/m}$$

Average Resultant field strength = Fundamental emissions (average value) – delta from the plot

$$=93.6 \text{ dB}\mu\text{V/m} - 46.4 \text{ dB}$$

$$=47.2 \text{ dB}\mu\text{V/m}$$

Upper bandedge

Peak Resultant field strength = Fundamental emissions (peak value) – delta from the plot

$$=93.5 \text{ dB}\mu\text{V/m} - 38.4 \text{ dB}$$

$$=55.1 \text{ dB}\mu\text{V/m}$$

Average Resultant field strength = Fundamental emissions (average value) – delta from the plot

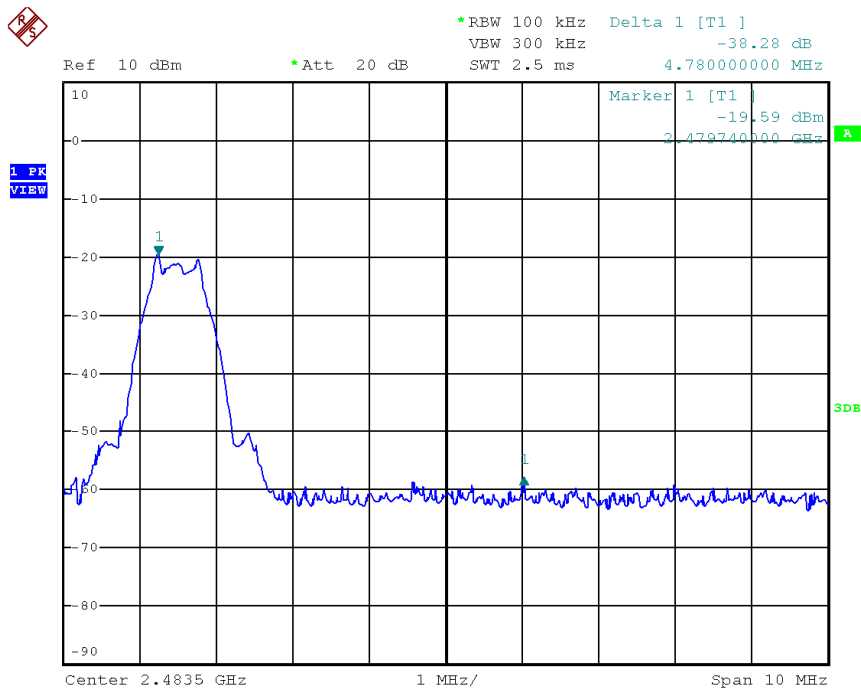
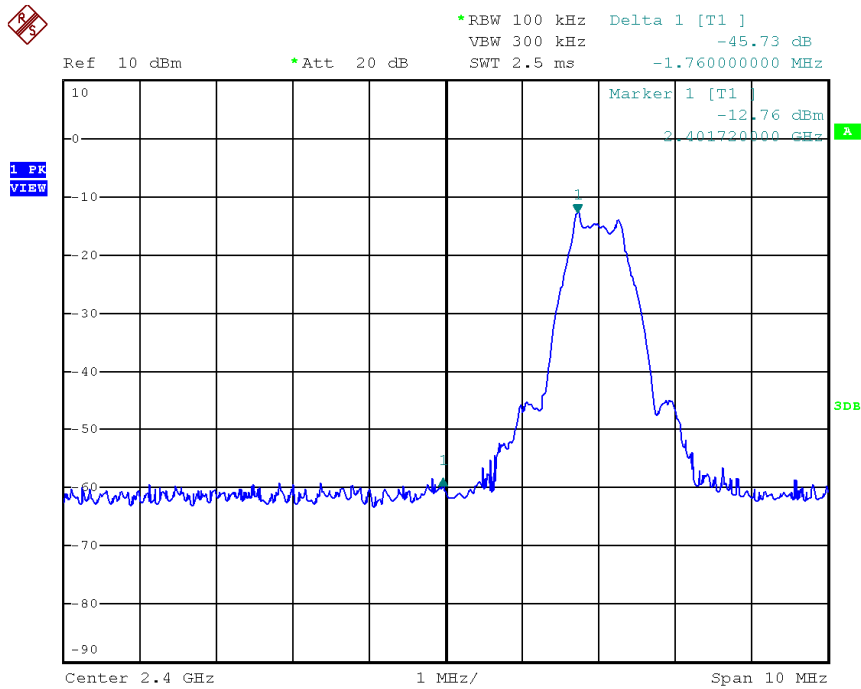
$$=89.8 \text{ dB}\mu\text{V/m} - 38.4 \text{ dB}$$

$$=51.4 \text{ dB}\mu\text{V/m}$$

The resultant field strength meets the general radiated emission limit in Section 15.209, which does not exceed 74 dB μ V/m (Peak Limit) and 54 dB μ V/m (Average Limit).

TEST REPORT

PEAK MEASUREMENT (Bluetooth 4.0 BLE)



TEST REPORT

PEAK MEASUREMENT (Bluetooth 4.0 BLE)

Bandedge compliance is determined by applying marker-delta method, i.e. (Bandedge Plot).

Lower bandedge

Peak Resultant field strength = Fundamental emissions (peak value) – delta from the plot

=96.4 dB μ V/m – 45.7 dB

=50.7 dB μ V/m

Average Resultant field strength = Fundamental emissions (average value) – delta from the plot

=90.4 dB μ V/m – 45.7 dB

=44.7 dB μ V/m

Upper bandedge

Peak Resultant field strength = Fundamental emissions (peak value) – delta from the plot

=93.8 dB μ V/m – 38.3 dB

=55.5 dB μ V/m

Average Resultant field strength = Fundamental emissions (average value) – delta from the plot

=86.4 dB μ V/m – 38.3 dB

=48.1 dB μ V/m

The resultant field strength meets the general radiated emission limit in Section 15.209, which does not exceed 74 dB μ V/m (Peak Limit) and 54 dB μ V/m (Average Limit).

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8.2 Discussion of Pulse Desensitization

Pulse desensitivity is not applicable for this device. Since the transmitter transmits the RF signal continuously.

8.3 Calculation of Average Factor

N/A.

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8.4 Emissions Test Procedures

The following is a description of the test procedure used by Intertek Testing Services Hong Kong Ltd. in the measurements of transmitter operating under the Part 15, Subpart C rules.

The transmitting equipment under test (EUT) is placed on a wooden turntable which is four feet in diameter and approximately 0.8m in height above the ground plane for emission measurement at or below 1GHz and 1.5m in height above the ground plane for emission measurement above 1GHz. During the radiated emissions test, the turntable is rotated and any cables leaving the EUT are manipulated to find the configuration resulting in maximum emissions. The EUT is adjusted through all three orthogonal axis to obtain maximum emission levels. The antenna height and polarization are also varied during the testing to search for maximum signal levels. The height of the antenna is varied from one to four meters.

Detector function for radiated emissions is in peak mode. Average readings, when required, are taken by measuring the duty cycle of the equipment under test and subtracting the corresponding amount in dB from the measured peak readings. A detailed description for the calculation of the average factor can be found in Exhibit 8.3.

The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower. For line conducted emissions, the range scanned is 150 kHz to 30 MHz.

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8.4 Emissions Test Procedures (cont'd)

The EUT is warmed up for 15 minutes prior to the test.

AC power to the unit is varied from 85% to 115% nominal and variation in the fundamental emission field strength is recorded. If battery powered, a new, fully charged battery is used.

Conducted measurements were made as described in ANSI C63.10 (2013).

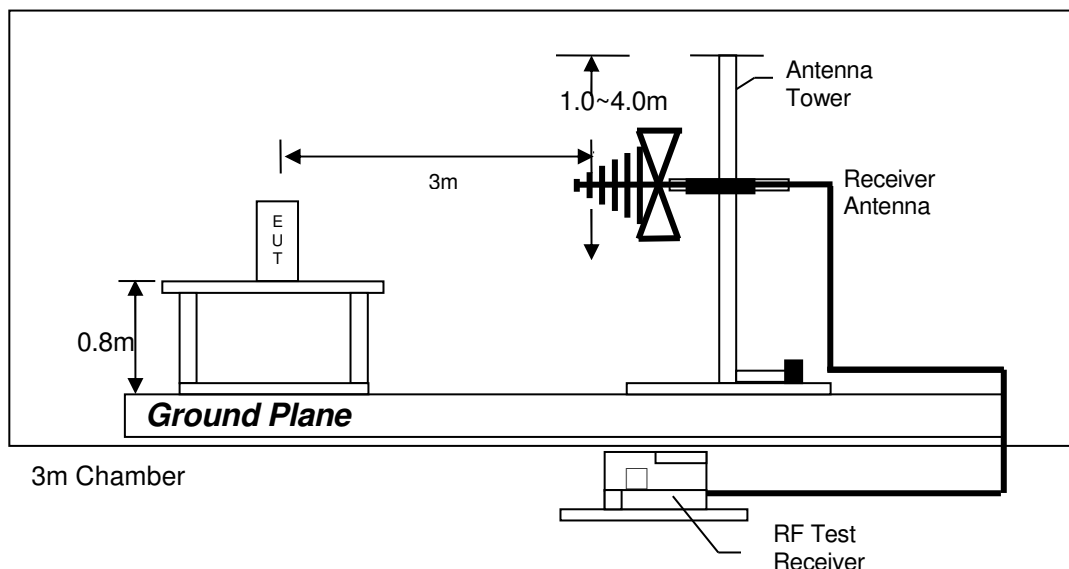
The IF bandwidth used for measurement of radiated signal strength was 100 kHz or greater when frequency is below 1000 MHz. Where pulsed transmissions of short enough pulse duration warrant, a greater bandwidth is selected according to the recommendations of Hewlett Packard Application Note 150-2. A discussion of whether pulse desensitivity is applicable to this unit is included in this report (See Exhibit 8.1). Above 1000 MHz, a resolution bandwidth of 3 MHz is used.

Transmitter measurements are normally conducted at a measurement distance of three meters. However, to assure low enough noise floor in the forbidden bands and above 1 GHz, signals are acquired at a distance of one meter or less. All measurements are extrapolated to three meters using inverse scaling, unless otherwise reported. Measurements taken at a closer distance are so marked.

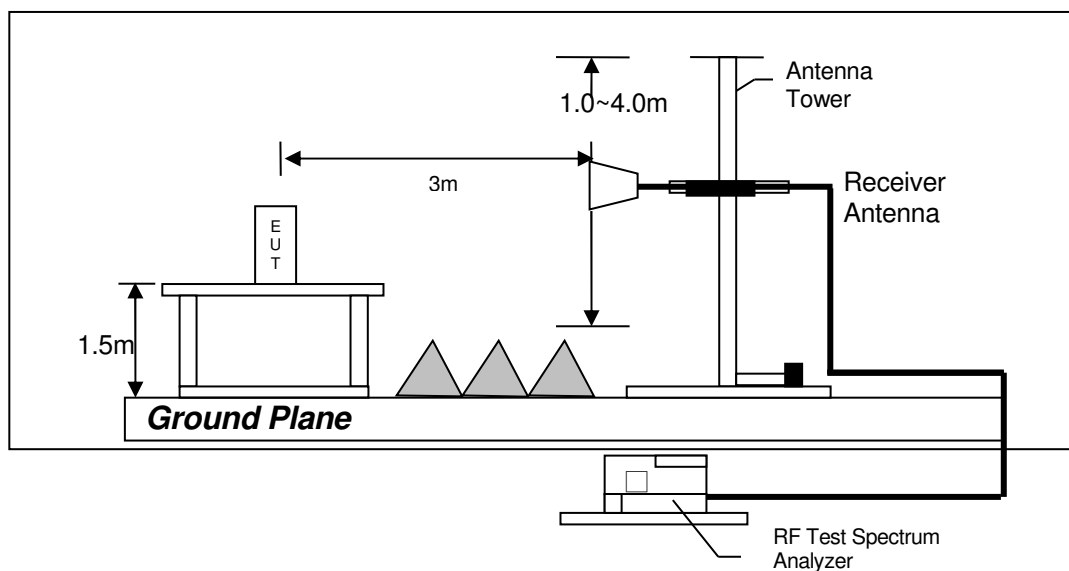
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8.4.1 Radiated Emission Test Setup

The figure below shows the test setup, which is utilized to make these measurements.



Test setup of radiated emissions up to 1GHz



Test setup of radiated emissions above 1GHz

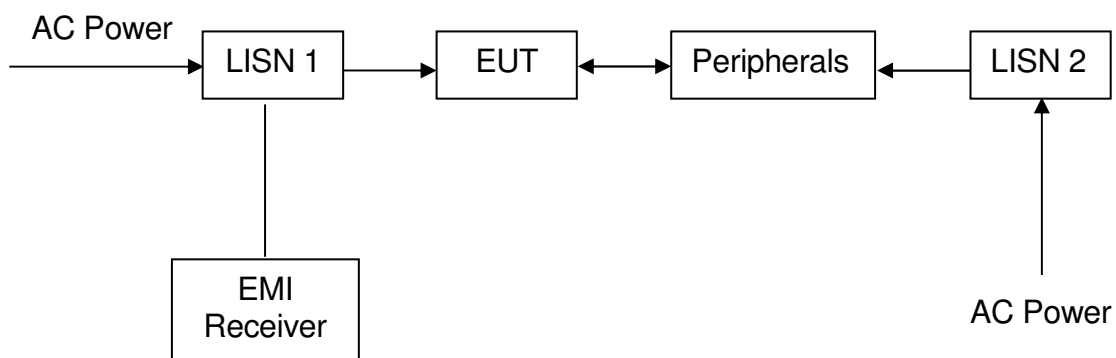
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8.4.2 Conducted Emission Test Procedures

For tabletop equipment, the EUT along with its peripherals were placed on a 1.0m(W)×1.5m(L) and 0.8m in height wooden table. For floor-standing equipment, the EUT and all cables were insulated, if required, from the ground plane by up to 12 mm of insulating material. The EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane. The EUT was connected to power mains through a line impedance stabilization network (LISN), which provided 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room. The excess power cable between the EUT and the LISN was bundled.

All connecting cables of EUT and peripherals were moved to find the maximum emission.

8.4.3 Conducted Emission Test Setup



TEST REPORT

9.0 CONFIDENTIALITY REQUEST

For electronic filing, a preliminary copy of the confidentiality request is saved with filename: request.pdf.

10.0 EQUIPMENT LIST

1) Radiated Emissions Test

Equipment	EMI Test Receiver	Spectrum Analyzer	Biconical Antenna
Registration No.	EW-3156	EW-2253	EW-0571
Manufacturer	R&S	ROHDESCHWARZ	EMCO
Model No.	ESR26	FSP40	3104C
Calibration Date	August 01, 2019	18 Nov 2019	July 23, 2019
Calibration Due Date	August 01, 2020	18 Nov 2020	July 23, 2021

Equipment	Log Periodic Antenna	Double Ridged Guide Antenna	14m Double Shield RF Cable (20MHz - 6GHz)
Registration No.	EW-0447	EW-1015	EW-2528
Manufacturer	EMCO	EMCO	RADIALL
Model No.	3146	3115	Nm-RG142-
Calibration Date	September 25, 2019	16 May 2019	30 Sep 2019
Calibration Due Date	March 25, 2021	16 Nov 2020	30 Sep 2020

Equipment	Active Loop H-field (9kHz to 30MHz)	RF Preamplifier (9kHz to 6000MHz)	RF Cable 14m (1GHz to 26.5GHz)
Registration No.	EW-3326	EW-3424	EW-3151
Manufacturer	EMCO	SCHWARZBECK	GREATBILLION
Model No.	6502	BBV9744	SMA m/SHF5MPU /SMA m ra14m,26G
Calibration Date	March 21, 2019	July 23, 2019	March 04, 2020
Calibration Due Date	September 21, 2020	July 23, 2020	March 04, 2021

Equipment	Pyramidal Horn Antenna
Registration No.	EW-0905
Manufacturer	EMCO
Model No.	3160-09
Calibration Date	July 23, 2019
Calibration Due Date	January 23, 2021

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2) Conducted Emissions Test

Equipment	RF Cable 80cm (RG142) (9kHz to 30MHz)	Artificial Mains Network	EMI Test Receiver
Registration No.	EW-2451	EW-2874	EW-3156
Manufacturer	RADIAL	ROHDE SCHWARZ	R&S
Model No.	RF Cable 80cm (RG142) (9kHz to 30MHz)	ENV-216	ESR26
Calibration Date	December 08, 2019	July 05, 2019	August 01, 2019
Calibration Due Date	December 08, 2020	July 05, 2020	August 01, 2020

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3) Bandedge Measurement

Equipment	RF Cable (up to 40GHz) 1.5m length	Spectrum Analyzer
Registration No.	EW-3104	EW-2253
Manufacturer	NOSUPPLIER	ROHDESCHWARZ
Model No.	SMA-M to SMA-M	FSP40
Calibration Date	August 26, 2019	November 18, 2019
Calibration Due Date	August 26, 2020	November 18, 2020

END OF TEST REPORT