

TEST REPORT

Report No.: 18071570HKG-001

Circus World Displays Limited

Application For Certification
(Original Grant)

FCC ID: SMH-CR65

IC: 4593A-CR65

Transceiver

Prepared and Checked by:

Approved by:

Signed On File

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Lead Engineer

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Date: September 28, 2018

TEST REPORT**GENERAL INFORMATION**

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Manufacturer:	Circus World Displays Limited
Manufacturer Address:	4080 Montrose Road Niagara Falls ON L2H 1J9 Canada
Brand Name:	MAGNASONIC
FCC Model:	CR65, CR65W, CR65*, CR65** (where one or two asterisk (*) after model CR65 that may be character A-Z or blank to represent different colour code)
IC PMN:	CR65, CR65W
IC HVIN:	CR65, CR65W
Type of EUT:	Transceiver
Description of EUT:	PROJECTION AM/FM CLOCK RADIO
Serial Number:	N/A
FCC ID / IC:	SMH-CR65 / 4593A-CR65
Date of Sample Submitted:	July 25, 2018
Date of Test:	July 25, 2018 to August 10, 2018
Report No.:	18071570HKG-001
Report Date:	September 28, 2018
Environmental Conditions:	Temperature: +10 to 40°C Humidity: 10 to 90%

TEST REPORT**SUMMARY OF TEST RESULT**

Test Specification	Reference	Results
Transmitter Power Line Conducted Emissions	15.207 / RSS-Gen 8.8	Pass
Radiated Emission	15.249, 15.209 /	Pass
Radiated Emission on the Bandedge	RSS-210 B.10, RSS-210 4.4	
Radiated Emission in Restricted Bands	15.205 / RSS-210 4.1	Pass

The equipment under test is found to be complying with the following standards:

FCC Part 15, October 1, 2017 Edition

RSS-210 Issue 9, August 2016

RSS-Gen Issue 4, November 2014

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 expected 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 a PROJECTION AM/FM CLOCK RADIO (Alarm Clock Radio with USB Charging). It can accept analog input source (3.5mm phone jack aux-in), AM/FM tuner and wireless Bluetooth device. The audio signal is amplified and fed to the built-in passive loudspeakers. The time can be projected on a wall. The EUT is powered by an AC/DC adaptor (5VDC 3A). The EUT has an USB port for charging external device without PC data transfer function. The adaptor can accept 100-240VAC. A CR2032 Lithium battery is for real-time-clock back-up.

For FCC, the Model: CR65W, CR65*, CR65** are the same as the Model: CR65 in software and hardware aspect (including RF portion design).

(where one or two asterisk (*) after model CR65 that may be character A-Z or blank to represent different colour code)

For IC, the Model: CR65W is the same as the Model: CR65 in software and hardware aspect (including RF portion design).

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 transceiver.

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 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China. This test facility and site measurement data have been placed on file with the FCC and IC No. 21600-1.

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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 a 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.

2.5 Support Equipment List and Description

1. 1 X USB cable with length of 0.5 meter long with 2.38-ohm resistive load (2.1A load)
2. 1 X Audio cable with length of 1.2 meter long with termination
(Provided by Union Trust)
3. CR2032 battery (3VDC)
4. Adaptor (Model: PMC5PA; Input: 100-240VAC 50/60Hz; Output: 5VDC 3A)
(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 $\text{dB}\mu\text{V}/\text{m}$

RA = Receiver Amplitude (including preamplifier) in $\text{dB}\mu\text{V}$

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

RR = RA - AG - AV in $\text{dB}\mu\text{V}$

LF = CF + AF in dB

Assume a receiver reading of 52.0 $\text{dB}\mu\text{V}$ 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 32 $\text{dB}\mu\text{V}/\text{m}$. This value in $\text{dB}\mu\text{V}/\text{m}$ was converted to its corresponding level in $\mu\text{V}/\text{m}$.

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

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

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

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

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

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

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

$$FS = RR + LF$$

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

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

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3.2 Radiated Emission Configuration Photograph

The worst case in radiated emission was found at 0.210 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 22.8 dB

3.4 Conducted Emission Configuration Photograph

The worst case in line-conducted emission was found at 34.045 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 7.9 dB

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CONDUCTED EMISSION

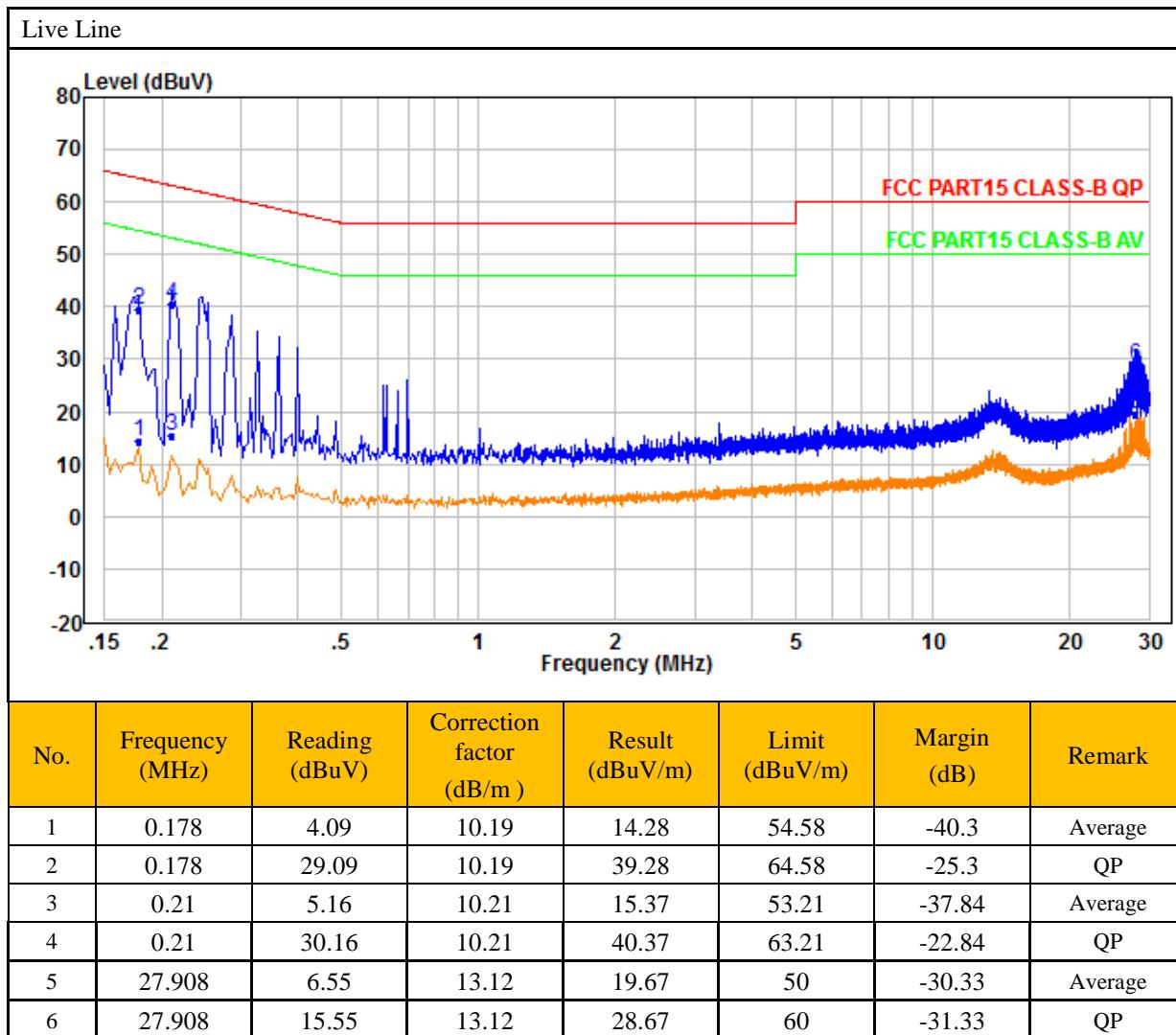
Model: CR65

Date of Test: August 10, 2018

Worst-Case Operating Mode: Charging + Bluetooth Play

Polarity: Live

Table 1



TEST REPORT

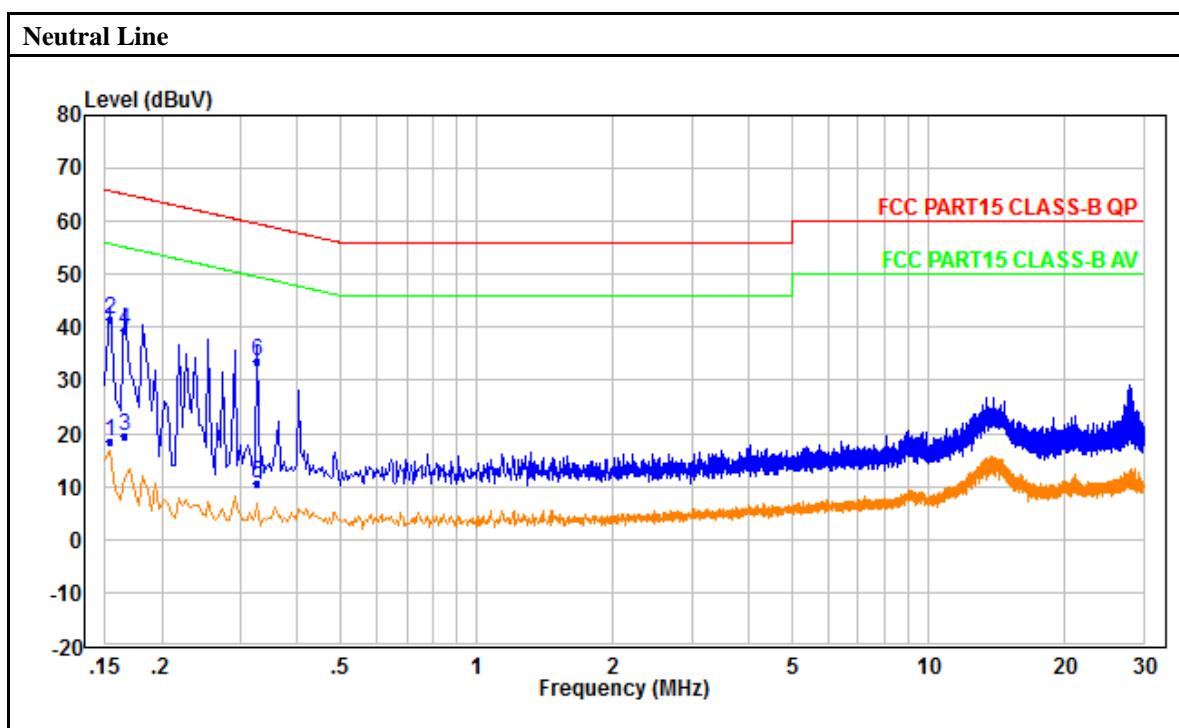
CONDUCTED EMISSION

Model: CR65

Date of Test: August 10, 2018

Worst-Case Operating Mode: Charging + Bluetooth Play

Polarity: Neutral

Table 2


No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.154	8.41	10.21	18.62	55.78	-37.16	Average
2	0.154	31.41	10.21	41.62	65.78	-24.16	QP
3	0.166	9.21	10.22	19.43	55.16	-35.73	Average
4	0.166	29.21	10.22	39.43	65.16	-25.73	QP
5	0.32599	0.14	10.35	10.49	49.55	-39.06	Average
6	0.32599	23.14	10.35	33.49	59.55	-26.06	QP

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Model: CR65

Date of Test: August 10, 2018

Worst-Case Operating Mode: Transmitting

Table 3
Pursuant to FCC Part 15 Section 15.249 / RSS-210 B10.0 Requirement

Lowest Channel

Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
2402.00	86.38	-0.65	87.03	114.00	-26.97	Peak	Horizontal
2402.00	81.98	-0.65	82.63	94.00	-11.37	Average	Horizontal
4804.00	55.05	2.86	52.19	74.00	-21.81	Peak	Horizontal
4804.00	38.05	2.86	35.19	54.00	-18.81	Average	Horizontal
7206.00	62.56	6.67	55.89	74.00	-18.11	Peak	Horizontal
7206.00	44.56	6.67	37.89	54.00	-16.11	Average	Horizontal
9608.00	65.27	7.95	57.32	74.00	-16.68	Peak	Horizontal
9608.00	41.27	7.95	33.32	54.00	-20.68	Average	Horizontal
12010.00	67.20	9.43	57.77	74.00	-16.23	Peak	Horizontal
12010.00	43.20	9.43	33.77	54.00	-20.23	Average	Horizontal
14412.00	69.30	9.57	59.73	74.00	-14.27	Peak	Horizontal
14412.00	45.30	9.57	35.73	54.00	-18.27	Average	Horizontal
2402.00	78.06	-0.65	78.71	114.00	-35.29	Peak	Vertical
2402.00	73.33	-0.65	73.98	94.00	-20.02	Average	Vertical
4804.00	51.50	2.75	48.75	74.00	-25.25	Peak	Vertical
4804.00	34.50	2.75	31.75	54.00	-22.25	Average	Vertical
7206.00	59.68	6.34	53.34	74.00	-20.66	Peak	Vertical
7206.00	38.68	6.34	32.34	54.00	-21.66	Average	Vertical
9608.00	62.41	7.86	54.55	74.00	-19.45	Peak	Vertical
9608.00	38.41	7.86	30.55	54.00	-23.45	Average	Vertical
12010.00	64.94	9.16	55.78	74.00	-18.22	Peak	Vertical
12010.00	40.94	9.16	31.78	54.00	-22.22	Average	Vertical
14412.00	66.89	9.33	57.56	74.00	-16.44	Peak	Vertical
14412.00	42.89	9.33	33.56	54.00	-20.44	Average	Vertical

NOTES:

1. Peak detector is used for the peak emission measurement.
2. Average measurement method is according to ANSI C63.10
3. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.
4. Negative sign in the column shows value below limit.
5. Horn antenna is used for the emission over 1000MHz.
6. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205 / RSS-210 4.1.
7. Measurement Uncertainty is $\pm 5.3\text{dB}$ at a level of confidence of 95%.

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Model: CR65

Date of Test: August 10, 2018

Worst-Case Operating Mode: Transmitting

Table 4
Pursuant to FCC Part 15 Section 15.249 / RSS-210 B10.0 Requirement

Middle Channel

Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
2441.00	82.88	-0.57	82.31	114.00	-31.69	Peak	Horizontal
2441.00	79.19	-0.57	78.62	94.00	-15.38	Average	Horizontal
4882.00	49.43	2.73	52.16	74.00	-21.84	Peak	Horizontal
4882.00	32.43	2.73	35.16	54.00	-18.84	Average	Horizontal
7323.00	49.50	6.56	56.06	74.00	-17.94	Peak	Horizontal
7323.00	30.50	6.56	37.06	54.00	-16.94	Average	Horizontal
9764.00	49.56	7.98	57.54	74.00	-16.46	Peak	Horizontal
9764.00	25.56	7.98	33.54	54.00	-20.46	Average	Horizontal
12205.00	50.46	8.67	59.13	74.00	-14.87	Peak	Horizontal
12205.00	26.46	8.67	35.13	54.00	-18.87	Average	Horizontal
14646.00	48.86	9.02	57.88	74.00	-16.12	Peak	Horizontal
14646.00	24.86	9.02	33.88	54.00	-20.12	Average	Horizontal
2441.00	76.39	-0.57	75.82	114.00	-38.18	Peak	Vertical
2441.00	70.81	-0.57	70.24	94.00	-23.76	Average	Vertical
4882.00	45.42	2.73	48.15	74.00	-25.85	Peak	Vertical
4882.00	30.42	2.73	33.15	54.00	-20.85	Average	Vertical
7323.00	53.08	6.56	59.64	74.00	-14.36	Peak	Vertical
7323.00	31.08	6.56	37.64	54.00	-16.36	Average	Vertical
9764.00	52.69	7.98	60.67	74.00	-13.33	Peak	Vertical
9764.00	28.69	7.98	36.67	54.00	-17.33	Average	Vertical
12205.00	50.31	8.67	58.98	74.00	-15.02	Peak	Vertical
12205.00	26.31	8.67	34.98	54.00	-19.02	Average	Vertical
14646.00	51.74	9.02	60.76	74.00	-13.24	Peak	Vertical
14646.00	27.74	9.02	36.76	54.00	-17.24	Average	Vertical

NOTES:

1. Peak detector is used for the peak emission measurement.
2. Average measurement method is according to ANSI C63.10
3. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.
4. Negative sign in the column shows value below limit.
5. Horn antenna is used for the emission over 1000MHz.
6. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205 / RSS-210 4.1.
7. Measurement Uncertainty is $\pm 5.3\text{dB}$ at a level of confidence of 95%.

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Model: CR65

Date of Test: August 10, 2018

Worst-Case Operating Mode: Transmitting

Table 5
Pursuant to FCC Part 15 Section 15.249 / RSS-210 B10.0 Requirement

Highest Channel

Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
2480.00	84.88	-0.45	84.43	114.00	-29.57	Peak	Horizontal
2480.00	80.66	-0.45	80.21	94.00	-13.79	Average	Horizontal
4960.00	47.87	2.64	50.51	74.00	-23.49	Peak	Horizontal
4960.00	32.87	2.64	35.51	54.00	-18.49	Average	Horizontal
7440.00	50.17	6.53	56.70	74.00	-17.30	Peak	Horizontal
7440.00	32.17	6.53	38.70	54.00	-15.30	Average	Horizontal
9920.00	50.11	7.87	57.98	74.00	-16.02	Peak	Horizontal
9920.00	26.11	7.87	33.98	54.00	-20.02	Average	Horizontal
12400.00	50.80	8.63	59.43	74.00	-14.57	Peak	Horizontal
12400.00	26.80	8.63	35.43	54.00	-18.57	Average	Horizontal
14880.00	48.67	9.89	58.56	74.00	-15.44	Peak	Horizontal
14880.00	24.67	9.89	34.56	54.00	-19.44	Average	Horizontal
2480.00	81.38	-0.45	80.93	114.00	-33.07	Peak	Vertical
2480.00	75.37	-0.45	74.92	94.00	-19.08	Average	Vertical
4960.00	46.87	2.64	49.51	74.00	-24.49	Peak	Vertical
4960.00	29.87	2.64	32.51	54.00	-21.49	Average	Vertical
7440.00	51.50	6.53	58.03	74.00	-15.97	Peak	Vertical
7440.00	31.50	6.53	38.03	54.00	-15.97	Average	Vertical
9920.00	51.80	7.87	59.67	74.00	-14.33	Peak	Vertical
9920.00	27.80	7.87	35.67	54.00	-18.33	Average	Vertical
12400.00	50.82	8.63	59.45	74.00	-14.55	Peak	Vertical
12400.00	26.82	8.63	35.45	54.00	-18.55	Average	Vertical
14880.00	48.00	9.89	57.89	74.00	-16.11	Peak	Vertical
14880.00	24.00	9.89	33.89	54.00	-20.11	Average	Vertical

NOTES:

1. Peak detector is used for the peak emission measurement.
2. Average measurement method is according to ANSI C63.10
3. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.
4. Negative sign in the column shows value below limit.
5. Horn antenna is used for the emission over 1000MHz.
6. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205 / RSS-210 4.1.
7. Measurement Uncertainty is $\pm 5.3\text{dB}$ at a level of confidence of 95%.

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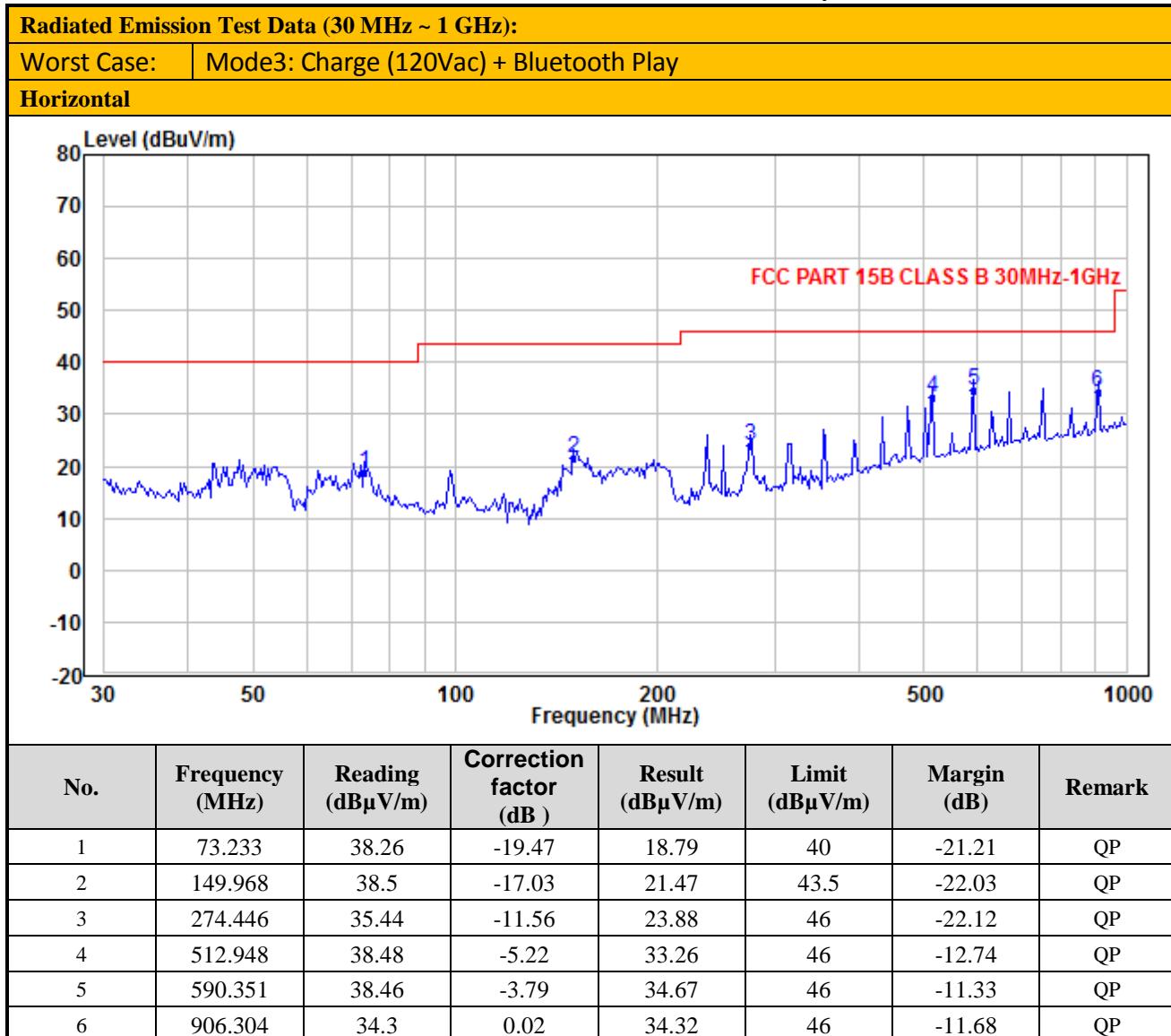
Model: CR65

Date of Test: August 10, 2018

Worst-Case Operating Mode: Charging + Bluetooth Play

Polarity: Horizontal

Table 6
Pursuant to FCC Part 15 Section 15.209 / RSS-210 4.4 Requirement



NOTES:

1. Quasi-Peak Detector Data unless otherwise stated.
2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.
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 / RSS-210 4.1.
6. Measurement Uncertainty is ± 5.3 dB at a level of confidence of 95%.

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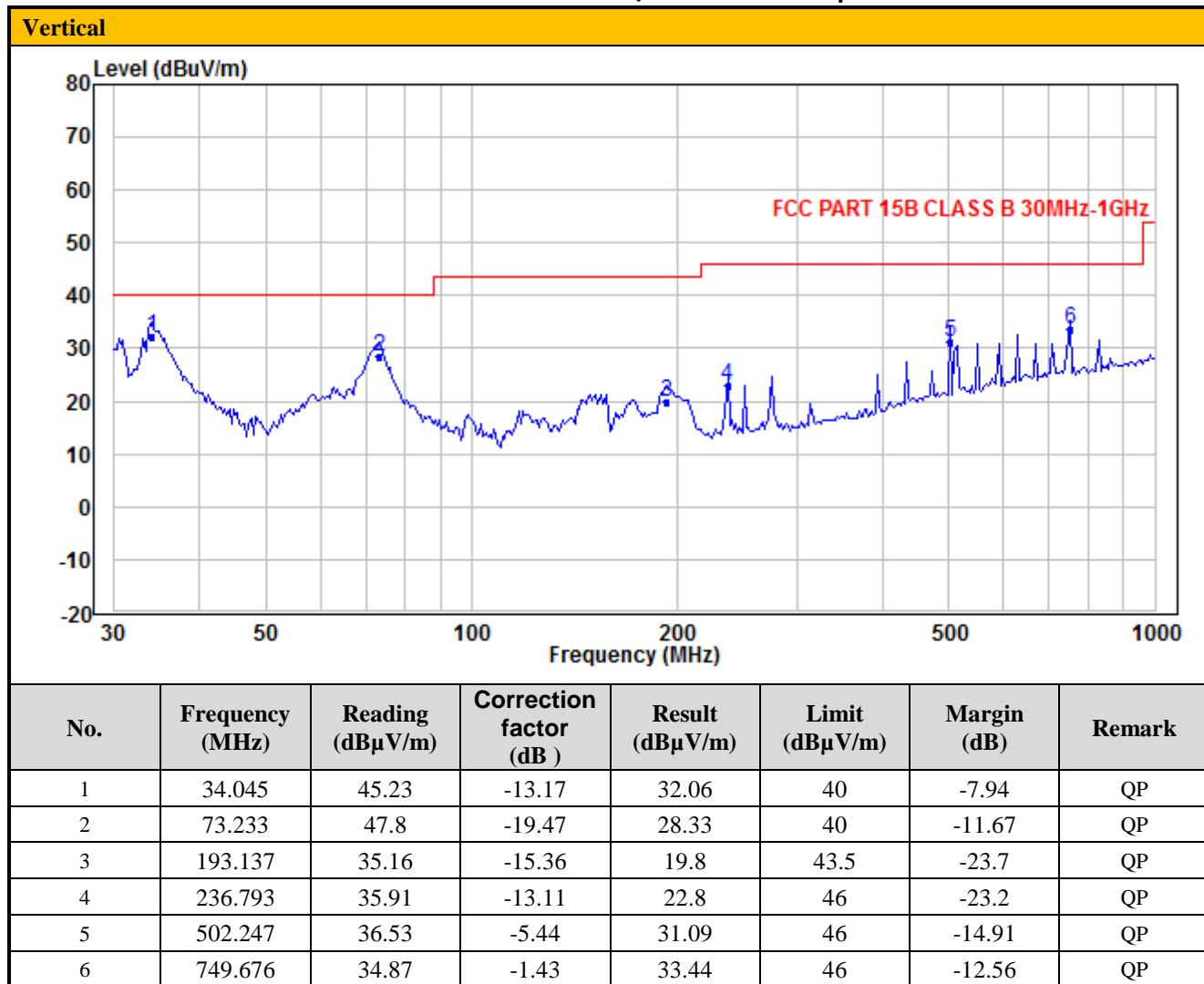
Model: CR65

Date of Test: August 10, 2018

Worst-Case Operating Mode: Charging + Bluetooth Play

Polarity: Vertical

Table 7
 Pursuant to FCC Part 15 Section 15.209 / RSS-210 4.4 Requirement



NOTES:

1. Quasi-Peak Detector Data unless otherwise stated.
2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.
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 / RSS-210 4.1.
6. Measurement Uncertainty is ± 5.3 dB at a level of confidence of 95%.

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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 electronic 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 and Canada.

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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 / RSS-210 4.4, whichever is the lesser attenuation, which meet the requirement of part 15.249(d) / RSS-210 B.10.

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PEAK MEASUREMENT



TEST REPORT**PEAK MEASUREMENT**

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

$$=87.03 \text{ dB}\mu\text{V/m} - 45.83 \text{ dB}$$

$$=41.20 \text{ dB}\mu\text{V/m}$$

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

$$=82.63 \text{ dB}\mu\text{V/m} - 45.83 \text{ dB}$$

$$=36.80 \text{ dB}\mu\text{V/m}$$

Upper bandedge

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

$$=84.43 \text{ dB}\mu\text{V/m} - 56.11 \text{ dB}$$

$$=28.32 \text{ dB}\mu\text{V/m}$$

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

$$=80.21 \text{ dB}\mu\text{V/m} - 56.11 \text{ dB}$$

$$=24.10 \text{ dB}\mu\text{V/m}$$

The resultant field strength meets the general radiated emission limit in Section 15.209 / RSS-210 4.4, 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. The effective period (Teff) is approximately 625 μ s for a digital “1” bit which illustrated on technical specification, with a resolution bandwidth (3dB) of 3MHz, so the pulse desensitivity factor is 0dB.

8.3 Calculation of Average Factor

N/A

TEST REPORT

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.

TEST REPORT

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).

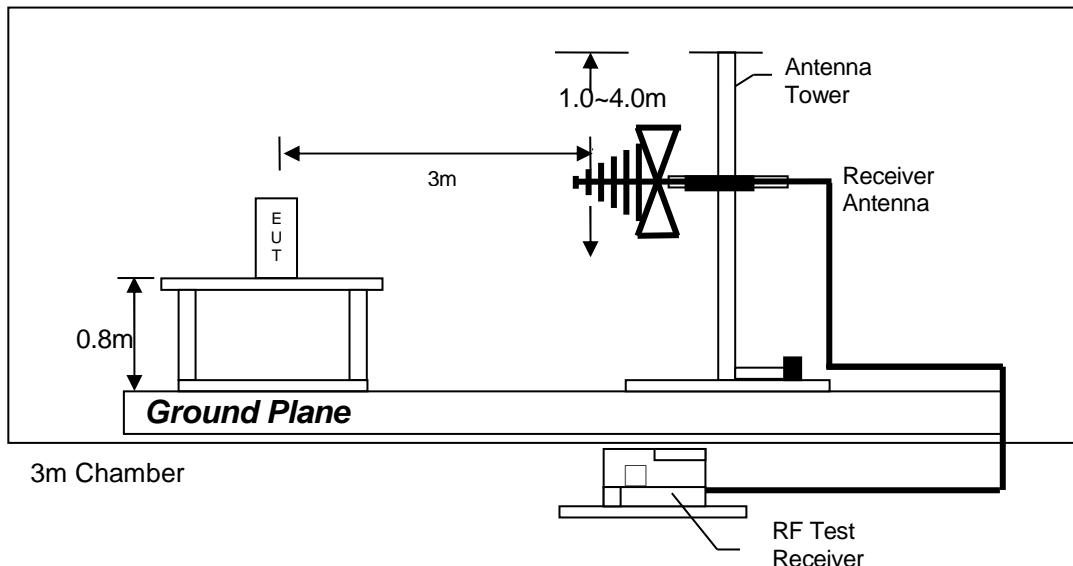
The IF bandwidth used for measurement of radiated signal strength was 100 kHz or greater when frequency is below 1000 MHz. Where pulsed transmissions of short enough pulse duration warrant, a greater bandwidth is selected according to the recommendations of Hewlett Packard Application Note 150-2. A discussion 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.

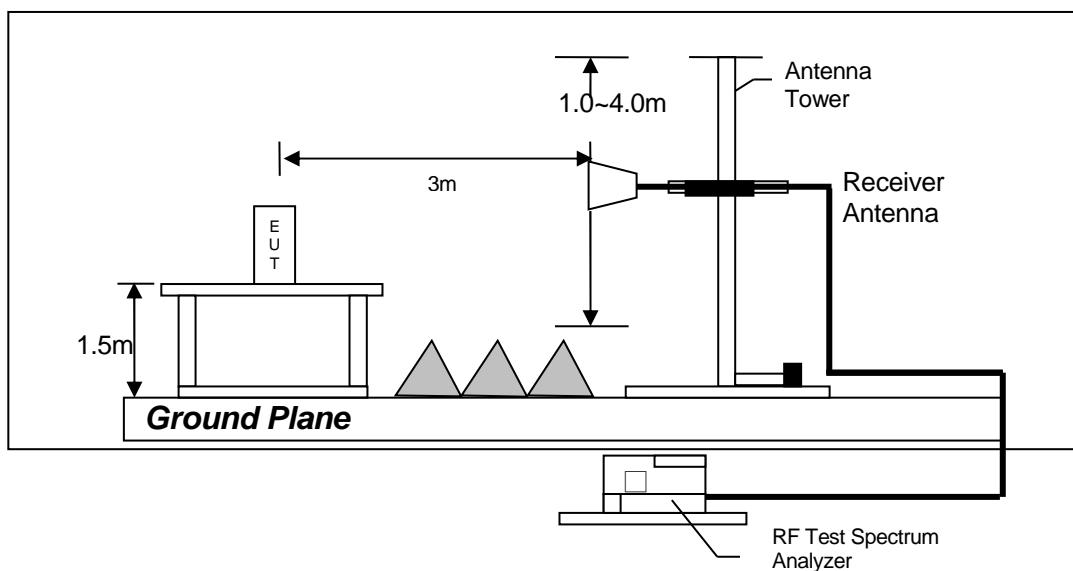
TEST REPORT

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

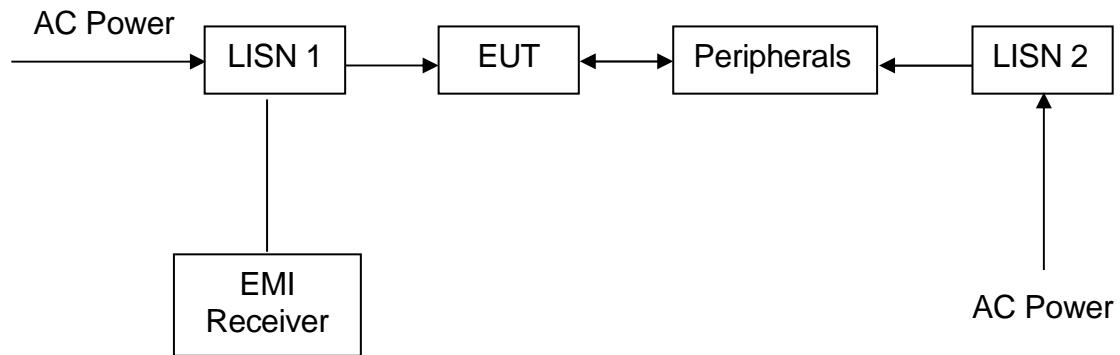
TEST REPORT

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

8.5 Occupied Bandwidth

Occupied Bandwidth Results:

Occupied Bandwidth (kHz)	
Low Channel: 2402	957.92
Middle Channel: 2441	965.03
High Channel: 2480	962.69

The worst case is shown as below



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

Radiated Emission Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm dd, yyyy)	Cal. Due date (mm dd, yyyy)
<input checked="" type="checkbox"/>	3M Chamber & Accessory Equipment	ETS-LINDGREN	3M	N/A	Dec. 20, 2015	Dec. 19, 2018
<input checked="" type="checkbox"/>	Receiver	R&S	ESIB26	100114	Dec. 10, 2017	Dec. 10, 2018
<input checked="" type="checkbox"/>	Broadband Antenna	ETS-LINDGREN	3142E	00201566	Dec. 17, 2017	Dec. 17, 2018
<input checked="" type="checkbox"/>	Preamplifier	HP	8447F	2805A02960	Dec. 10, 2017	Dec. 10, 2018
<input checked="" type="checkbox"/>	Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3117-PA	00201874	May 22, 2018	May 22, 2019
<input checked="" type="checkbox"/>	Multi device Controller	ETS-LINDGREN	7006-001	00160105	N/A	N/A
<input checked="" type="checkbox"/>	Loop Antenna	ETS-LINDGREN	6502	00202525	Dec. 22, 2017	Dec. 22, 2018
<input checked="" type="checkbox"/>	Band Rejection Filter (2400MHz~2500MHz)	Micro-Tronics	BRM50702	G248	June 06, 2018	June 06, 2019
<input checked="" type="checkbox"/>	Test Software	Audix	e3	Software Version: 9.160323		

TEST REPORT

Conducted Emission Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm dd, yyyy)	Cal. Due date (mm dd, yyyy)
<input checked="" type="checkbox"/>	Receiver	R&S	ESR7	1316.3003K07-101181-K3	Dec. 10, 2017	Dec. 10, 2018
<input checked="" type="checkbox"/>	Pulse Limiter	R&S	ESH3-Z2	0357.8810.54	Dec. 10, 2017	Dec. 10, 2018
<input checked="" type="checkbox"/>	LISN	R&S	ESH2-Z5	860014/024	Dec. 10, 2017	Dec. 10, 2018
<input checked="" type="checkbox"/>	Test Software	Audix	e3	Software Version: 9.160323		

END OF TEST REPORT