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TEST REPORT

Report No.: 17020818HKG-001

Acoustic Arc International Ltd.

Application For Certification
(Original Grant)

FCC ID: VHC-AAI-BH1525US

Transceiver

PREPARED AND CHECKED BY:	APPROVED BY:
Signed On File Wong Cheuk Ho, Herbert Lead Engineer	Digitally signed by Koo Wai Ip Location: Intertek Testing Services Hong Kong Ltd. Koo Wai Ip Technical Supervisor Date: December 21, 2017

TEST REPORT

GENERAL INFORMATION

Grantee:	Acoustic Arc International Ltd.
Grantee Address:	Unit 110-112, 1/F.,Philips Electronics Bldg., No.5 Science Park East Avenue, Hong Kong Science Park, Shatin, New Territories, Hong Kong.
Contact Person:	George Chan
Tel:	852-2607 4015
Fax:	852-2607 4016
e-mail:	ckmg8@acousticarc.com
Manufacturer:	ShengHai Electronics (Shenzhen) Ltd.
Manufacturer Address:	Block 17&18, Hui Ming Ying Industry, SongGang, Baoan County, Shenzhen, China 518105
Brand Name:	ARC
Model:	BH1525
Type of EUT:	Transceiver
Description of EUT:	True Wireless Earbuds
Serial Number:	N/A
FCC ID:	VHC-AAI-BH1525US
Date of Sample Submitted:	February 24, 2017
Date of Test:	February 24, 2017 to March 18, 2017
Report No.:	17020818HKG-001
Report Date:	December 21, 2017
Environmental Conditions:	Temperature: +10 to 40°C Humidity: 10 to 90%

TEST REPORT

SUMMARY OF TEST RESULT

TEST SPECIFICATION	REFERENCE	RESULTS
Radiated Emission Radiated Emission on the Bandedge	15.249, 15.209	Pass
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, 2016 Edition

Note:
1. The EUT uses a permanently attached antenna which, in accordance to section 15.203, is considered sufficient to comply with the pervisions 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 Wireless Earbuds which consist of a pair of Bluetooth earphone (Left and Right channel). Only Right Channel Earbud (master) can connect to a Bluetooth device such as a smartphone. After pairing Right Channel Earbud (master) with a Bluetooth device, Left Channel Earbud (slave) will connect to Right Channel Earbud (master) via Bluetooth link automatically. Then stereo signal will split to Left and Right Earbuds accordingly. The EUT occupies a frequency range of 2402MHz to 2480MHz (79 channels with channel spacing of 1MHz). The EUT is powered by 3.7VDC internal rechargeable battery. The circuit of Left and Right Earbuds are identical, except Right Channel Earbud has a microphone for phone call answering. The EUT cannot support Bluetooth 4.0 BLE as declared by applicant.

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

Radiated emission measurements were performed according to the procedures in ANSI C63.10 (2013). All radiated measurements were performed in a 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 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. This test facility and site measurement data have been placed on file with the FCC.

TEST REPORT

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 fully charged 3.7V rechargeable battery.

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 unit was operated standalone and placed in the center of the turntable.

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 and conducted 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

N/A.

TEST REPORT

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 dBµV/m
RA = Receiver Amplitude (including preamplifier) in dBµV
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 dBµV/m
RR = RA - AG - AV in dBµV
LF = CF + AF in dB

Assume a receiver reading of 52.0 dBµV 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 dBµV/m. This value in dBµV/m was converted to its corresponding level in µV/m.

RA = 52.0 dBµV/m
AF = 7.4 dB
CF = 1.6 dB
AG = 29.0 dB
AV = 5.0 dB
FS = RR + LF
FS = 18 + 9 = 27 dBµV/m

RR = 18.0 dBµV
LF = 9.0 dB

Level in µV/m = Common Antilogarithm [(27 dBµV/m)/20] = 22.4 µV/m

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3.2 Radiated Emission Configuration Photograph

The worst case in radiated emission was found at 35.036 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 11 dB

TEST REPORT

RADIATED EMISSIONS

Model: BH1525 (Left Earbud)
Date of Test: March 18, 2017
Worst-Case Operating Mode: Transmitting (Bluetooth 3.0)

Table 1
Pursuant to FCC Part 15 Section 15.249 Requirement

Lowest Channel

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Average Factor (dB)	Calculated at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	2402.000	97.8	33	29.4	94.2	24	70.2	94.0	-23.8
H	4804.000	42.1	33	34.9	44.0	24	20.0	54.0	-34.0
H	7206.000	41.1	33	37.9	46.0	24	22.0	54.0	-32.0
H	9608.000	40.8	33	40.4	48.2	24	24.2	54.0	-29.8
H	12010.000	42.9	33	40.5	50.4	24	26.4	54.0	-27.6
H	14412.000	44.0	33	40.0	51.0	24	27.0	54.0	-27.0

Polari-zation	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	2402.000	97.8	33	29.4	94.2	114.0	-19.8
H	4804.000	42.1	33	34.9	44.0	74.0	-30.0
H	7206.000	41.1	33	37.9	46.0	74.0	-28.0
H	9608.000	40.8	33	40.4	48.2	74.0	-25.8
H	12010.000	42.9	33	40.5	50.4	74.0	-23.6
H	14412.000	44.0	33	40.0	51.0	74.0	-23.0

NOTES:
1. 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.
6. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

Model: BH1525 (Left Earbud)
Date of Test: March 18, 2017
Worst-Case Operating Mode: Transmitting (Bluetooth 3.0)

Table 2
Pursuant to FCC Part 15 Section 15.249 Requirement

Middle Channel

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Average Factor (dB)	Calculated at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	2442.000	98.0	33	29.4	94.4	24	70.4	94.0	-23.6
H	4884.000	42.3	33	34.9	44.2	24	20.2	54.0	-33.8
H	7326.000	40.7	33	37.9	45.6	24	21.6	54.0	-32.4
H	9768.000	41.2	33	40.4	48.6	24	24.6	54.0	-29.4
H	12210.000	42.5	33	40.5	50.0	24	26.0	54.0	-28.0
H	14652.000	45.6	33	38.4	51.0	24	27.0	54.0	-27.0

Polari-zation	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	98.0	33	29.4	94.4	114.0	-19.6
H	4884.000	42.3	33	34.9	44.2	74.0	-29.8
H	7326.000	40.7	33	37.9	45.6	74.0	-28.4
H	9768.000	41.2	33	40.4	48.6	74.0	-25.4
H	12210.000	42.5	33	40.5	50.0	74.0	-24.0
H	14652.000	45.6	33	38.4	51.0	74.0	-23.0

NOTES:
1. 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.
6. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

Model: BH1525 (Left Earbud)
Date of Test: March 18, 2017
Worst-Case Operating Mode: Transmitting (Bluetooth 3.0)

Table 3
Pursuant to FCC Part 15 Section 15.249 Requirement

Highest Channel

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Average Factor (dB)	Calculated at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	2480.000	98.0	33	29.4	94.4	24	70.4	94.0	-23.6
H	4960.000	41.9	33	34.9	43.8	24	19.8	54.0	-34.2
H	7440.000	41.3	33	37.9	46.2	24	22.2	54.0	-31.8
H	9920.000	41.0	33	40.4	48.4	24	24.4	54.0	-29.6
H	12400.000	42.7	33	40.5	50.2	24	26.2	54.0	-27.8
H	14880.000	45.8	33	38.4	51.2	24	27.2	54.0	-26.8

Polari-zation	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	98.0	33	29.4	94.4	114.0	-19.6
H	4960.000	41.9	33	34.9	43.8	74.0	-30.2
H	7440.000	41.3	33	37.9	46.2	74.0	-27.8
H	9920.000	41.0	33	40.4	48.4	74.0	-25.6
H	12400.000	42.7	33	40.5	50.2	74.0	-23.8
H	14880.000	45.8	33	38.4	51.2	74.0	-22.8

NOTES:
1. 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.
6. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

Model: BH1525 (Left Earbud)
Date of Test: March 18, 2017
Worst-Case Operating Mode: Bluetooth Music Playing

Table 4
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	35.036	34.0	16	10.0	28.0	40.0	-12.0
V	112.108	27.0	16	14.0	25.0	43.5	-18.5
V	249.950	21.0	16	20.0	25.0	46.0	-21.0
H	355.823	18.4	16	24.0	26.4	46.0	-19.6
V	430.448	19.2	16	25.0	28.2	46.0	-17.8
H	579.015	20.0	16	28.0	32.0	46.0	-14.0

NOTES:
1. 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.
6. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

Model: BH1525 (Right Earbud)
Date of Test: March 18, 2017
Worst-Case Operating Mode: Transmitting (Bluetooth 3.0)

Table 5
Pursuant to FCC Part 15 Section 15.249 Requirement

Lowest Channel

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Average Factor (dB)	Calculated at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	2402.000	98.2	33	29.4	94.6	24	70.6	94.0	-23.4
H	4804.000	42.2	33	34.9	44.1	24	20.1	54.0	-33.9
H	7206.000	41.1	33	37.9	46.0	24	22.0	54.0	-32.0
H	9608.000	40.9	33	40.4	48.3	24	24.3	54.0	-29.7
H	12010.000	43.0	33	40.5	50.5	24	26.5	54.0	-27.5
H	14412.000	44.4	33	40.0	51.4	24	27.4	54.0	-26.6

Polari-zation	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	2402.000	98.2	33	29.4	94.6	114.0	-19.4
H	4804.000	42.2	33	34.9	44.1	74.0	-29.9
H	7206.000	41.1	33	37.9	46.0	74.0	-28.0
H	9608.000	40.9	33	40.4	48.3	74.0	-25.7
H	12010.000	43.0	33	40.5	50.5	74.0	-23.5
H	14412.000	44.4	33	40.0	51.4	74.0	-22.6

NOTES:
1. 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.
6. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

Model: BH1525 (Right Earbud)
Date of Test: March 18, 2017
Worst-Case Operating Mode: Transmitting (Bluetooth 3.0)

Table 6
Pursuant to FCC Part 15 Section 15.249 Requirement

Middle Channel

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Average Factor (dB)	Calculated at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	2442.000	98.4	33	29.4	94.8	24	70.8	94.0	-23.2
H	4884.000	42.4	33	34.9	44.3	24	20.3	54.0	-33.7
H	7326.000	40.9	33	37.9	45.8	24	21.8	54.0	-32.2
H	9768.000	41.2	33	40.4	48.6	24	24.6	54.0	-29.4
H	12210.000	42.7	33	40.5	50.2	24	26.2	54.0	-27.8
H	14652.000	45.8	33	38.4	51.2	24	27.2	54.0	-26.8

Polari-zation	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	98.4	33	29.4	94.8	114.0	-19.2
H	4884.000	42.4	33	34.9	44.3	74.0	-29.7
H	7326.000	40.9	33	37.9	45.8	74.0	-28.2
H	9768.000	41.2	33	40.4	48.6	74.0	-25.4
H	12210.000	42.7	33	40.5	50.2	74.0	-23.8
H	14652.000	45.8	33	38.4	51.2	74.0	-22.8

NOTES:
1. 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.
6. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

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Model: BH1525 (Right Earbud)
Date of Test: March 18, 2017
Worst-Case Operating Mode: Transmitting (Bluetooth 3.0)

Table 7
Pursuant to FCC Part 15 Section 15.249 Requirement

Highest Channel

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Average Factor (dB)	Calculated at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	2480.000	98.1	33	29.4	94.5	24	70.5	94.0	-23.5
H	4960.000	42.0	33	34.9	43.9	24	19.9	54.0	-34.1
H	7440.000	41.3	33	37.9	46.2	24	22.2	54.0	-31.8
H	9920.000	41.1	33	40.4	48.5	24	24.5	54.0	-29.5
H	12400.000	42.8	33	40.5	50.3	24	26.3	54.0	-27.7
H	14880.000	46.1	33	38.4	51.5	24	27.5	54.0	-26.5

Polari-zation	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	98.1	33	29.4	94.5	114.0	-19.5
H	4960.000	42.0	33	34.9	43.9	74.0	-30.1
H	7440.000	41.3	33	37.9	46.2	74.0	-27.8
H	9920.000	41.1	33	40.4	48.5	74.0	-25.5
H	12400.000	42.8	33	40.5	50.3	74.0	-23.7
H	14880.000	46.1	33	38.4	51.5	74.0	-22.5

NOTES:
1. 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.
6. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

Model: BH1525 (Right Earbud)
Date of Test: March 18, 2017
Worst-Case Operating Mode: Bluetooth Music Playing

Table 8
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	35.036	35.0	16	10.0	29.0	40.0	-11.0
V	112.108	27.5	16	14.0	25.5	43.5	-18.0
V	249.950	21.1	16	20.0	25.1	46.0	-20.9
H	355.823	18.5	16	24.0	26.5	46.0	-19.5
V	430.448	19.5	16	25.0	28.5	46.0	-17.5
H	579.015	20.4	16	28.0	32.4	46.0	-13.6

NOTES:
1. 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.
6. Measurement Uncertainty is ±5.3dB 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).

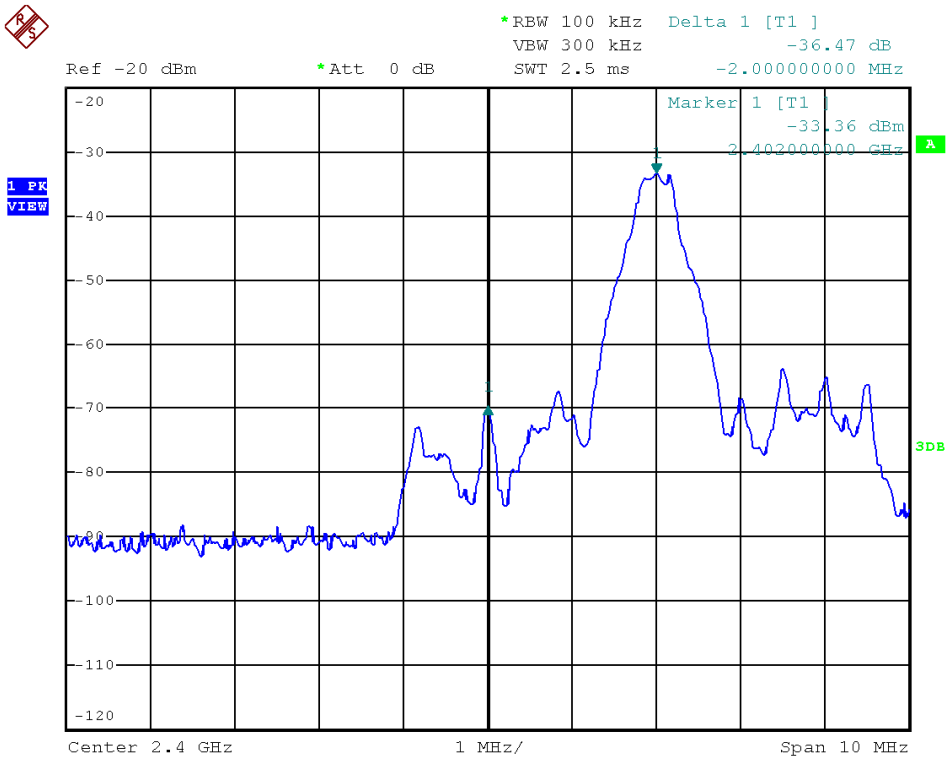
8.1 Radiated Emission on the Bandedge

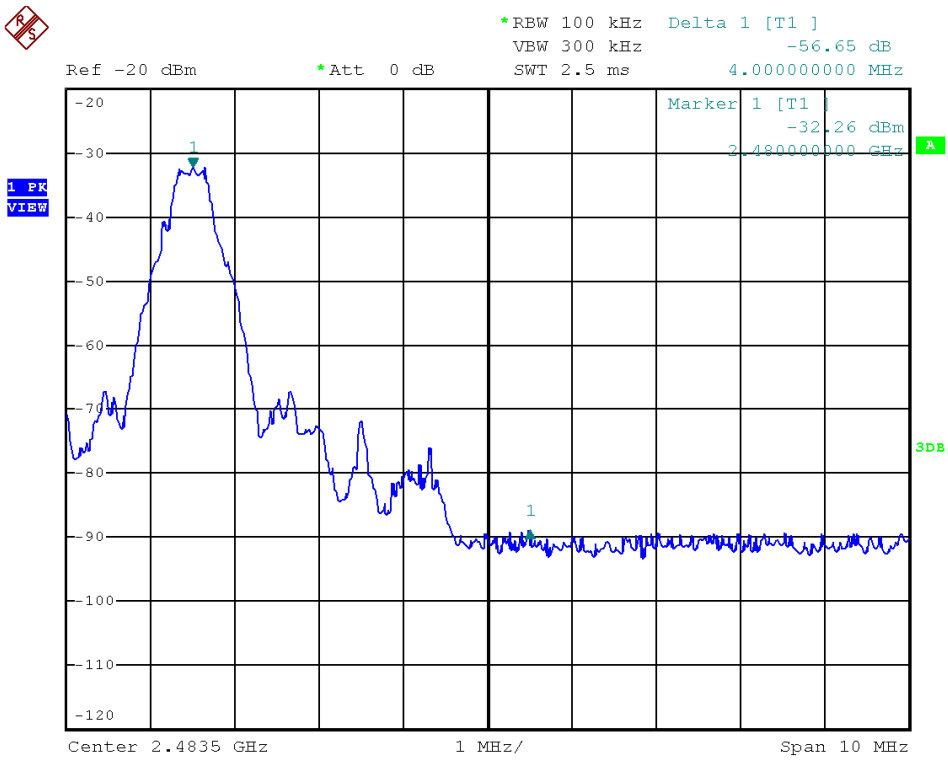
From the following plots, they show that the fundamental emissions are confined in the specified band (2400MHz to 2483.5MHz). In case of the fundamental emissions are within two standard bandwidths from the bandedge, the delta measurement technique is used for determining bandedge compliance. Standard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

TEST REPORT

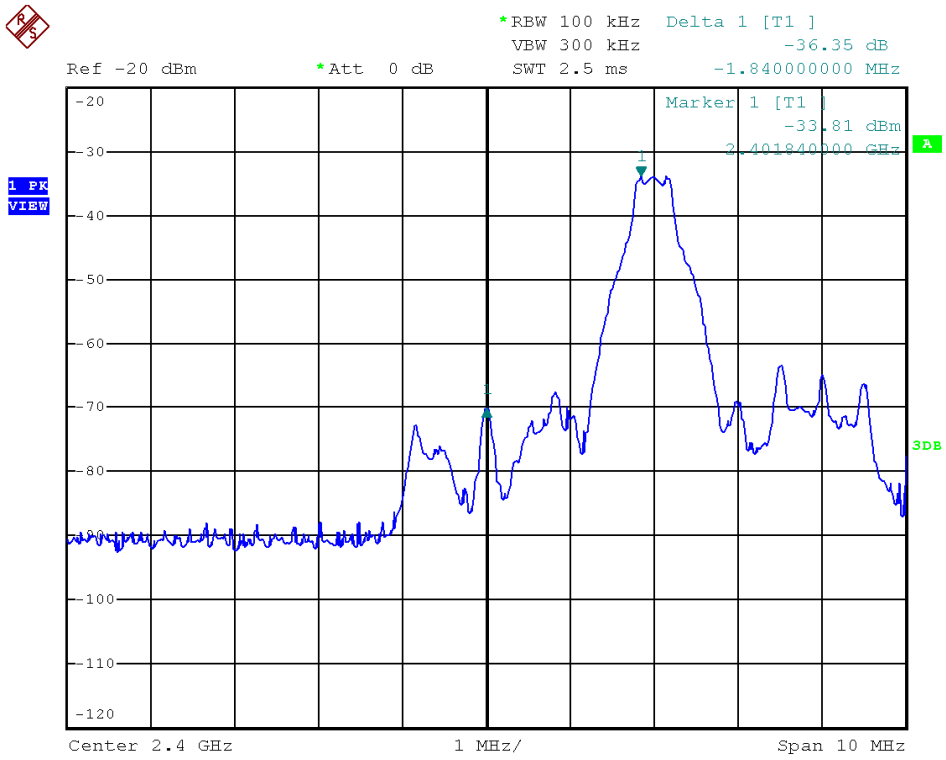
Peak Measurement (Bluetooth 3.0) (Left Earbud)

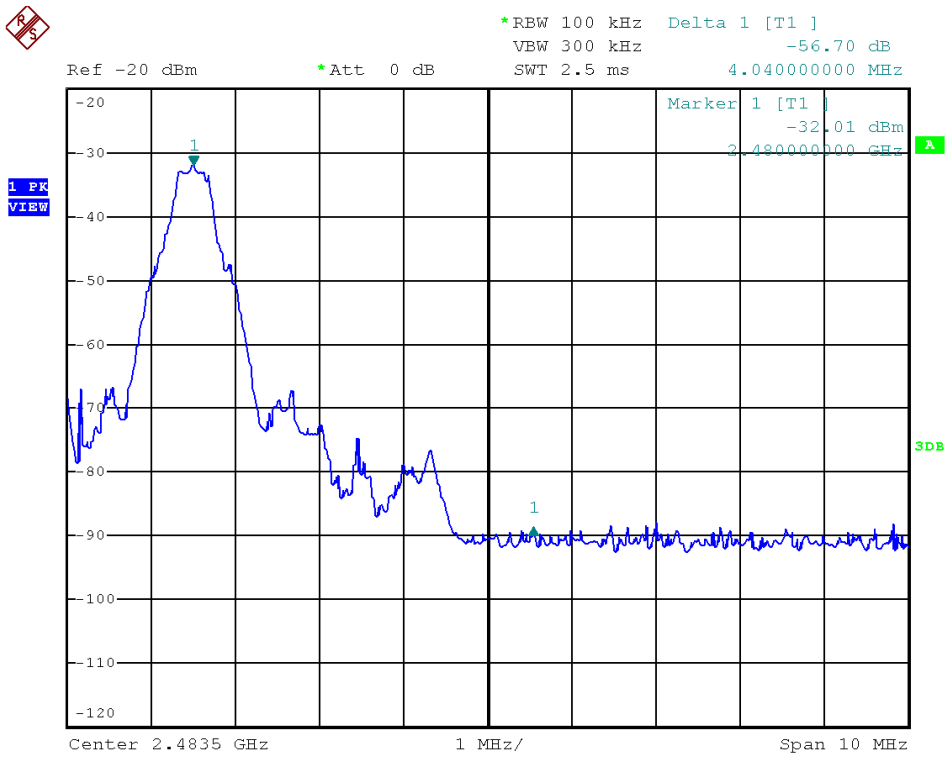




TEST REPORT

Peak Measurement (Bluetooth 3.0) (Right Earbud)





TEST REPORT

Peak Measurement (Bluetooth 3.0) (Left Earbud)

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

=94.2 dBµV/m – 36.5 dB
=57.7 dBµV/m

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

=70.2 dBµV/m – 36.5 dB
=33.7 dBµV/m

Upper bandedge

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

=94.4 dBµV/m – 56.7 dB
=37.7 dBµV/m

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

=70.4 dBµV/m – 56.7 dB
=13.7 dBµV/m

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

TEST REPORT

Peak Measurement (Bluetooth 4.0 BLE) (Right Earbud)

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

=94.6 dBµV/m – 36.4 dB
=58.2 dBµV/m

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

=70.6 dBµV/m – 36.4 dB
=34.2 dBµV/m

Upper bandedge

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

=94.5 dBµV/m – 56.7 dB
=37.8 dBµV/m

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

=70.5 dBµV/m – 56.7 dB
=13.8 dBµV/m

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

TEST REPORT

8.2 Discussion of Pulse Desensitization

Pulse desensitivity is not applicable for this device. The effective period (Teff) is approximately 625µs for a digital "1" bit which illustrated on technical specification, with a resolution bandwidth (3dB) of 1MHz, so the pulse desensitivity factor is 0dB.

8.3 Calculation of Average Factor

Based on the Bluetooth Specification Version 3.0 + EDR, the transmitter ON time for each timeslot of Bluetooth is 625µs. DH5 has the maximum duty cycle, which consists of 5 continuous Tx slots and 1 Rx slot. Therefore one hopset take (5+1) x 625µs = 3.75ms. For one period for a pseudo-random hopping through at least 20 RF channels in adaptive mode (worse case), it take: 20 x 3.75ms = 75ms.

The dwell time for DH5 is 5 x 625µs = 3.125ms.

For the worst case calculation, there are two transmissions might occur in 100ms. Therefore,

Duty Cycle (DC) = Maximum On time in 100ms/100ms
= 3.125ms x 2/100ms
= 0.0625

Average Factor (AF) of Bluetooth in dB = $20 \log_{10} (0.0625)$
= -24 dB

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.

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.

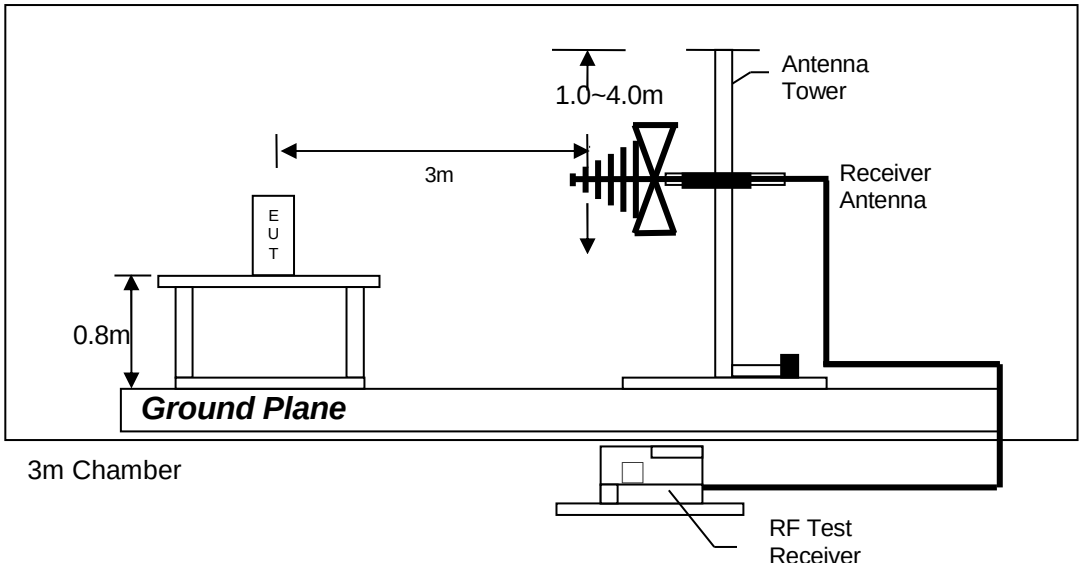
Conducted measurements were made as described in ANSI C63.10 (2013).

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.

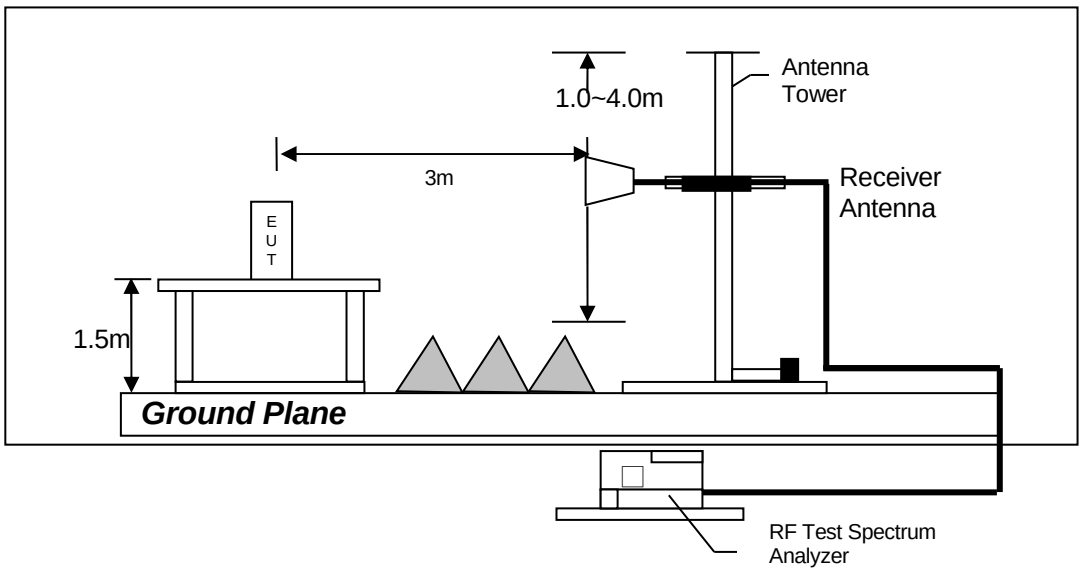
Transmitter measurements are normally conducted at a measurement distance of three meters. However, to assure low enough noise floor in the forbidden bands and above 1 GHz, signals are acquired at a distance of one meter or less. All measurements are extrapolated to three meters using inverse scaling,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

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

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	Log Periodic Antenna	Spectrum Analyzer
Registration No.	EW-3156	EW-0447	EW-2253
Manufacturer	R&S	EMCO	R&S
Model No.	ESR26	3146	FSP40
Calibration Date	Dec. 06, 2016	May 18, 2016	Jun. 15, 2016
Calibration Due Date	Dec. 06, 2017	Nov. 18, 2017	Jun. 15, 2017

Equipment	Biconical Antenna	12m Double Shield RF Cable	Double Ridged Guide Antenna
Registration No.	EW-0571	EW-1852	EW-0194
Manufacturer	EMCO	RADIALL	EMCO
Model No.	3104C	N(m)-RG142 - N(m)	3115
Calibration Date	May 18, 2016	Nov. 21, 2016	Aug. 10, 2016
Calibration Due Date	Nov. 18, 2017	Oct. 13, 2017	Feb. 10, 2018

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2) Bandwidth/Bandwidth Measurement

Equipment	Spectrum Analyzer
Registration No.	EW-2249
Manufacturer	R&S
Model No.	FSP30
Calibration Date	Dec. 23, 2016
Calibration Due Date	Nov. 27, 2017

END OF TEST REPORT