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TEST REPORT

Report No.: 18060943HKG-001

Stanley Black & Decker, Inc.

Application For Certification
(Original Grant)

FCC ID: 2ANWFCMST17510
IC: 23237-CMST17510

Transceiver

Prepared and Checked by:	**Approved by:**
Signed On File Wong Cheuk Ho, Herbert Lead Engineer	Digitally signed by Kenneth Wong Location: Intertek Testing Services Hong Kong Ltd. Wong Kwok Yeung, Kenneth Senior Lead Engineer Date: August 21, 2018

TEST REPORT

GENERAL INFORMATION

Grantee:	Stanley Black & Decker, Inc.
Grantee Address:	400 Executive Blvd S, Southington, Connecticut 06489, United States.
Contact Person:	Adam Rolfe
Tel:	(860) 406 9227
Fax:	N/A
e-mail:	Adam.rolfe@sbdinc.com
Manufacturer:	Stanley Black & Decker, Inc.
Manufacturer Address:	400 Executive Blvd S, Southington, Connecticut 06489, United States.
Brand Name:	CRAFTSMAN
Model / HVIN:	CMST17510
PMN:	CMST17510
Type of EUT:	Transceiver
Description of EUT:	VERSASTACK™ RADIO + CHARGER
Serial Number:	N/A
FCC ID / IC:	2ANWFCMST17510 / 23237-CMST17510
Date of Sample Submitted:	June 15, 2018
Date of Test:	June 15, 2018 to August 18, 2018
Report No.:	18060943HKG-001
Report Date:	August 21, 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 Radiated Emission on the Bandedge	15.249, 15.209 / RSS-210 B.10, RSS-210 4.4	Pass
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 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.

TEST REPORT

TABLE OF CONTENTS

TEST REPORT

1.0 GENERAL DESCRIPTION

1.1 Product Description

The Equipment Under Test (EUT) is a VERSASTACK™ RADIO + CHARGER. It can accept analog input source (3.5mm phone jack aux-in), tuner and wireless Bluetooth device. The audio signal is amplified and fed to the built-in passive loudspeakers. The EUT is powered by an AC/DC adaptor (24VDC 2A) and/or 20VDC rechargeable battery. The EUT has an USB port (for charging purpose only). The adaptor can accept 120VAC only.

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 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 and IC No. 2042V-1.

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 120VAC and/or 20VDC 4AH rechargeable battery. Both powering method were tested. The worse-case data is shown in this report (Powering by 120VAC and charging 20VDC 4AH 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 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.

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. 1 X USB cable with length of 1 meter long with 2.38-ohm resistive load (2.1A load)
2. 1 X Audio cable with length of 1 meter long with termination
   (Provided by Intertek)
3. 20V 4AH Rechargeable battery (Model: CMCB204)
4. Adaptor (Model: S048HU2400200 with 2 ferrites; Input: 100-240VAC 1.5A 50/60Hz; Output: 24VDC 2A)
   (Provided by Applicant)

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

TEST REPORT

3.2 Radiated Emission Configuration Photograph

The worst case in radiated emission was found at 337.975 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 5.0 dB

3.4 Conducted Emission Configuration Photograph

The worst case in line-conducted emission was found at 1.689 MHz

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

3.5 Conducted Emission Data

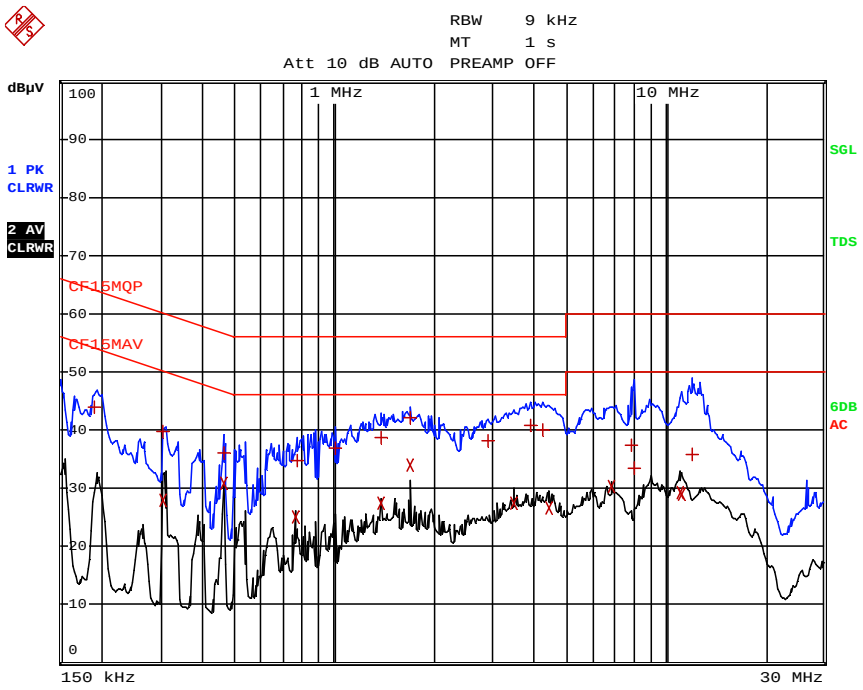
For electronic filing, the graph and data table of conducted emission is saved with filename: conducted.pdf.

Judgment: Pass by 12.1 dB

TEST REPORT

CONDUCTED EMISSION

Model: CMST17510
Date of Test: August 18, 2018
Worst-Case Operating Mode: Charging 20V battery + Bluetooth Audio Playing + USB Charging



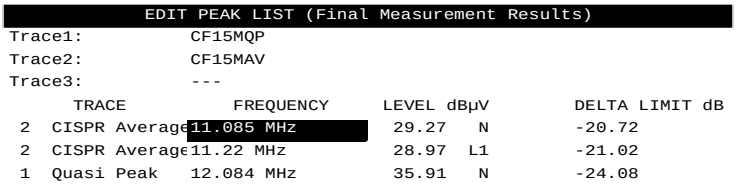
EDIT PEAK LIST (Final Measurement Results)

Trace1: CF15MQP
Trace2: CF15MAV
Trace3: ---

	TRACE	FREQUENCY	LEVEL dBµV		DELTA LIMIT dB
1	Quasi Peak	190.5 kHz	43.88	N	-20.13
1	Quasi Peak	307.5 kHz	39.64	N	-20.39
2	CISPR Average	307.5 kHz	27.96	L1	-22.07
1	Quasi Peak	460.5 kHz	36.16	N	-20.52
2	CISPR Average	460.5 kHz	30.72	L1	-15.95
2	CISPR Average	766.5 kHz	25.11	L1	-20.88
1	Quasi Peak	771 kHz	34.70	N	-21.29
1	Quasi Peak	1.005 MHz	36.77	L1	-19.22
2	CISPR Average	1.3785 MHz	27.40	L1	-18.59
1	Quasi Peak	1.383 MHz	38.62	L1	-17.37
1	Quasi Peak	1.689 MHz	42.08	L1	-13.91
2	CISPR Average	1.689 MHz	33.94	N	-12.05
1	Quasi Peak	2.904 MHz	38.14	N	-17.85
2	CISPR Average	3.498 MHz	27.40	L1	-18.59
1	Quasi Peak	3.8985 MHz	40.71	L1	-15.28
1	Quasi Peak	4.263 MHz	40.11	L1	-15.88
2	CISPR Average	4.4565 MHz	26.62	L1	-19.37
2	CISPR Average	6.891 MHz	30.21	L1	-19.78
1	Quasi Peak	7.9755 MHz	37.40	L1	-22.59
1	Quasi Peak	8.0835 MHz	33.57	N	-26.42

TEST REPORT

Model: CMST17510
Date of Test: August 18, 2018
Worst-Case Operating Mode: Charging 20V battery + Bluetooth Audio Playing + USB Charging



EDIT PEAK LIST (Final Measurement Results)

Trace1: CF15MQP
Trace2: CF15MAV
Trace3: ---

	TRACE	FREQUENCY	LEVEL dBµV		DELTA LIMIT dB
2	CISPR Average	11.085 MHz	29.27	N	-20.72
2	CISPR Average	11.22 MHz	28.97	L1	-21.02
1	Quasi Peak	12.084 MHz	35.91	N	-24.08

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

TEST REPORT

RADIATED EMISSIONS

Model: CMST17510
Date of Test: August 18, 2018
Worst-Case Operating Mode: Transmitting (Bluetooth 3.0)

Table 1
Pursuant to FCC Part 15 Section 15.249 / RSS-210 B10.0 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	101.6	33	29.4	98.0	24	74.0	94.0	-20.0
H	***4804.000***	***66.1***	***33***	***34.9***	***68.0***	***24***	***44.0***	***54.0***	***-10.0***
H	7206.000	38.9	33	37.9	43.8	24	19.8	54.0	-34.2
H	9608.000	36.8	33	40.4	44.2	24	20.2	54.0	-33.8
H	***12010.000***	***39.3***	***33***	***40.5***	***46.8***	***24***	***22.8***	***54.0***	***-31.2***
H	14412.000	41.9	33	40.0	48.9	24	24.9	54.0	-29.1

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	101.6	33	29.4	98.0	114.0	-16.0
H	***4804.000***	***66.1***	***33***	***34.9***	***68.0***	***74.0***	***-6.0***
H	7206.000	38.9	33	37.9	43.8	74.0	-30.2
H	9608.000	36.8	33	40.4	44.2	74.0	-29.8
H	***12010.000***	***39.3***	***33***	***40.5***	***46.8***	***74.0***	***-27.2***
H	14412.000	41.9	33	40.0	48.9	74.0	-25.1

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 / RSS-210 4.1.
6. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

Model: CMST17510
Date of Test: August 18, 2018
Worst-Case Operating Mode: Transmitting (Bluetooth 3.0)

Table 2
Pursuant to FCC Part 15 Section 15.249 / RSS-210 B10.0 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	102.0	33	29.4	98.4	24	74.4	94.0	-19.6
H	***4884.000***	***64.3***	***33***	***34.9***	***66.2***	***24***	***42.2***	***54.0***	***-11.8***
H	***7326.000***	***38.2***	***33***	***37.9***	***43.1***	***24***	***19.1***	***54.0***	***-34.9***
H	9768.000	37.4	33	40.4	44.8	24	20.8	54.0	-33.2
H	***12210.000***	***38.9***	***33***	***40.5***	***46.4***	***24***	***22.4***	***54.0***	***-31.6***
H	14652.000	43.1	33	38.4	48.5	24	24.5	54.0	-29.5

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	2442.000	102.0	33	29.4	98.4	114.0	-15.6
H	***4884.000***	***64.3***	***33***	***34.9***	***66.2***	***74.0***	***-7.8***
H	***7326.000***	***38.2***	***33***	***37.9***	***43.1***	***74.0***	***-30.9***
H	9768.000	37.4	33	40.4	44.8	74.0	-29.2
H	***12210.000***	***38.9***	***33***	***40.5***	***46.4***	***74.0***	***-27.6***
H	14652.000	43.1	33	38.4	48.5	74.0	-25.5

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 / RSS-210 4.1.
6. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

Model: CMST17510
Date of Test: August 18, 2018
Worst-Case Operating Mode: Transmitting (Bluetooth 3.0)

Table 3
Pursuant to FCC Part 15 Section 15.249 / RSS-210 B10.0 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	102.6	33	29.4	99.0	24	75.0	94.0	-19.0
H	***4960.000***	***64.5***	***33***	***34.9***	***66.4***	***24***	***42.4***	***54.0***	***-11.6***
H	***7440.000***	***38.4***	***33***	***37.9***	***43.3***	***24***	***19.3***	***54.0***	***-34.7***
H	9920.000	37.2	33	40.4	44.6	24	20.6	54.0	-33.4
H	***12400.000***	***38.7***	***33***	***40.5***	***46.2***	***24***	***22.2***	***54.0***	***-31.8***
H	14880.000	42.9	33	38.4	48.3	24	24.3	54.0	-29.7

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	102.6	33	29.4	99.0	114.0	-15.0
H	***4960.000***	***64.5***	***33***	***34.9***	***66.4***	***74.0***	***-7.6***
H	***7440.000***	***38.4***	***33***	***37.9***	***43.3***	***74.0***	***-30.7***
H	9920.000	37.2	33	40.4	44.6	74.0	-29.4
H	***12400.000***	***38.7***	***33***	***40.5***	***46.2***	***74.0***	***-27.8***
H	14880.000	42.9	33	38.4	48.3	74.0	-25.7

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 / RSS-210 4.1.
6. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

Model: CMST17510
Date of Test: August 18, 2018
Worst-Case Operating Mode: Transmitting (Bluetooth 4.0 BLE)

Table 4
Pursuant to FCC Part 15 Section 15.249 / RSS-210 B10.0 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	102.6	33	29.4	99.0	49.1	49.9	94.0	-44.1
H	***4804.000***	***64.1***	***33***	***34.9***	***66.0***	***49.1***	***16.9***	***54.0***	***-37.1***
H	7206.000	39.9	33	37.9	44.8	49.1	-4.3	54.0	-58.3
H	9608.000	37.2	33	40.4	44.6	49.1	-4.5	54.0	-58.5
H	***12010.000***	***39.3***	***33***	***40.5***	***46.8***	***49.1***	***-2.3***	***54.0***	***-56.3***
H	14412.000	41.8	33	40.0	48.8	49.1	-0.3	54.0	-54.3

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	102.6	33	29.4	99.0	114.0	-15.0
H	***4804.000***	***64.1***	***33***	***34.9***	***66.0***	***74.0***	***-8.0***
H	7206.000	39.9	33	37.9	44.8	74.0	-29.2
H	9608.000	37.2	33	40.4	44.6	74.0	-29.4
H	***12010.000***	***39.3***	***33***	***40.5***	***46.8***	***74.0***	***-27.2***
H	14412.000	41.8	33	40.0	48.8	74.0	-25.2

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 / RSS-210 4.1.
6. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

Model: CMST17510
Date of Test: August 18, 2018
Worst-Case Operating Mode: Transmitting (Bluetooth 4.0 BLE)

Table 5
Pursuant to FCC Part 15 Section 15.249 / RSS-210 B10.0 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	103.0	33	29.4	99.4	49.1	50.3	94.0	-43.7
H	***4884.000***	***63.5***	***33***	***34.9***	***65.4***	***49.1***	***16.3***	***54.0***	***-37.7***
H	***7326.000***	***38.9***	***33***	***37.9***	***43.8***	***49.1***	***-5.3***	***54.0***	***-59.3***
H	9768.000	37.4	33	40.4	44.8	49.1	-4.3	54.0	-58.3
H	***12210.000***	***39.0***	***33***	***40.5***	***46.5***	***49.1***	***-2.6***	***54.0***	***-56.6***
H	14652.000	43.4	33	38.4	48.8	49.1	-0.3	54.0	-54.3

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	103.0	33	29.4	99.4	114.0	-14.6
H	***4884.000***	***63.5***	***33***	***34.9***	***65.4***	***74.0***	***-8.6***
H	***7326.000***	***38.9***	***33***	***37.9***	***43.8***	***74.0***	***-30.2***
H	9768.000	37.4	33	40.4	44.8	74.0	-29.2
H	***12210.000***	***39.0***	***33***	***40.5***	***46.5***	***74.0***	***-27.5***
H	14652.000	43.4	33	38.4	48.8	74.0	-25.2

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 / RSS-210 4.1.
6. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

Model: CMST17510
Date of Test: August 18, 2018
Worst-Case Operating Mode: Transmitting (Bluetooth 4.0 BLE)

Table 6
Pursuant to FCC Part 15 Section 15.249 / RSS-210 B10.0 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	103.6	33	29.4	100.0	49.1	50.9	94.0	-43.1
H	***4960.000***	***62.5***	***33***	***34.9***	***64.4***	***49.1***	***15.3***	***54.0***	***-38.7***
H	***7440.000***	***38.7***	***33***	***37.9***	***43.6***	***49.1***	***-5.5***	***54.0***	***-59.5***
H	9920.000	37.4	33	40.4	44.8	49.1	-4.3	54.0	-58.3
H	***12400.000***	***39.3***	***33***	***40.5***	***46.8***	***49.1***	***-2.3***	***54.0***	***-56.3***
H	14880.000	43.0	33	38.4	48.4	49.1	-0.7	54.0	-54.7

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	103.6	33	29.4	100.0	114.0	-14.0
H	***4960.000***	***62.5***	***33***	***34.9***	***64.4***	***74.0***	***-9.6***
H	***7440.000***	***38.7***	***33***	***37.9***	***43.6***	***74.0***	***-30.4***
H	9920.000	37.4	33	40.4	44.8	74.0	-29.2
H	***12400.000***	***39.3***	***33***	***40.5***	***46.8***	***74.0***	***-27.2***
H	14880.000	43.0	33	38.4	48.4	74.0	-25.6

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 / RSS-210 4.1.
6. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

Model: CMST17510
Date of Test: August 18, 2018
Worst-Case Operating Mode: Charging 20V battery + Bluetooth Audio Playing + USB charging

Table 7
Pursuant to FCC Part 15 Section 15.209 / RSS-210 4.4 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	34.746	29.9	16	10.0	23.9	40.0	-16.1
V	47.910	29.0	16	11.0	24.0	40.0	-16.0
V	68.904	32.2	16	8.0	24.2	40.0	-15.8
V	90.382	33.3	16	11.0	28.3	43.5	-15.2
V	***112.796***	***28.2***	***16***	***14.0***	***26.2***	***43.5***	***-17.3***
V	150.626	30.4	16	14.0	28.4	43.5	-15.1
H	182.012	22.2	16	20.0	26.2	43.5	-17.3
H	233.978	21.1	16	19.0	24.1	46.0	-21.9
H	286.010	20.4	16	22.0	26.4	46.0	-19.6
H	337.975	33.0	16	24.0	41.0	46.0	-5.0
H	359.974	22.0	16	24.0	30.0	46.0	-16.0
V	455.864	20.9	16	26.0	30.9	46.0	-15.1
V	479.872	23.3	16	26.0	33.3	46.0	-12.7
V	728.746	17.0	16	30.0	31.0	46.0	-15.0

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 ±5.3dB 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 and Canada.

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).

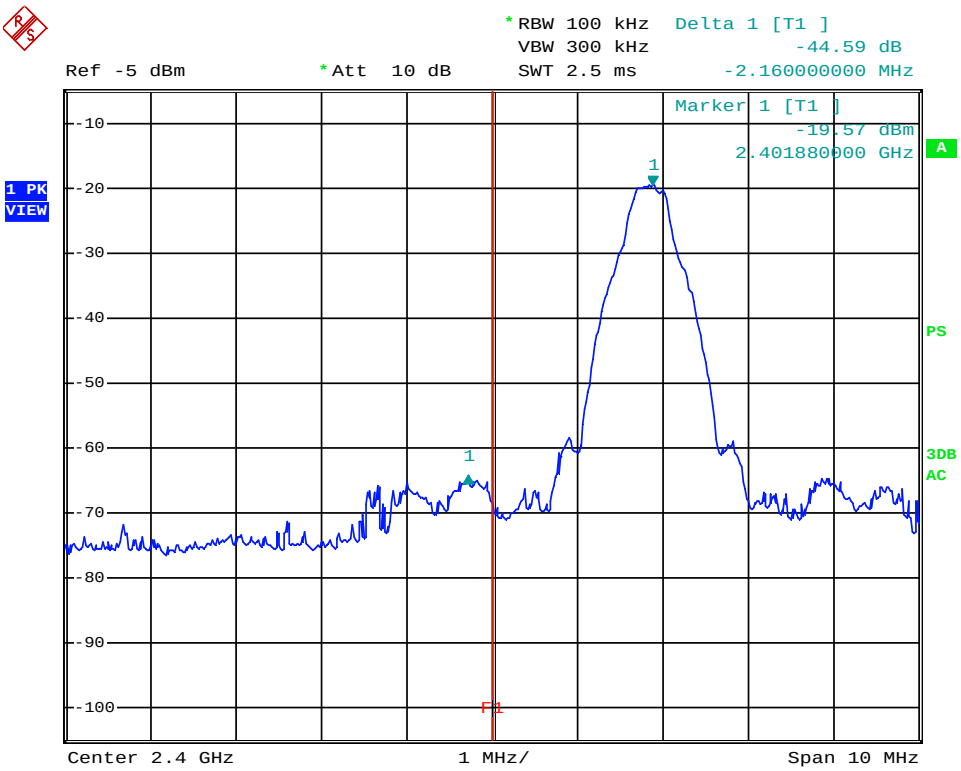
8.1 Radiated Emission on the Bandedge

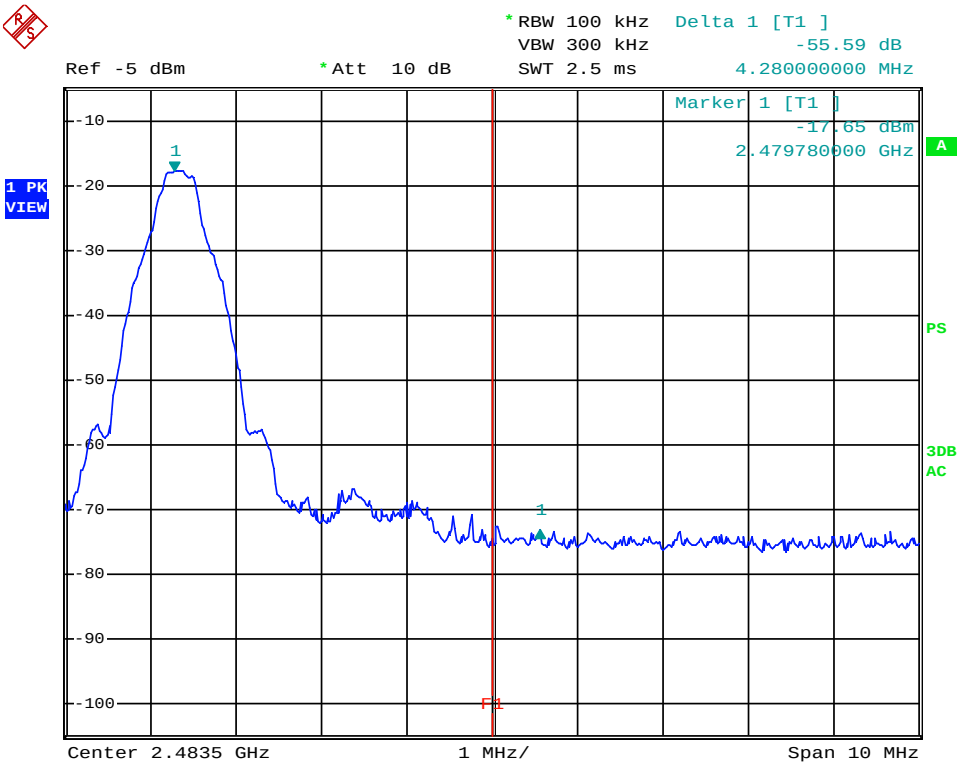
From the following plots, they show that the fundamental emissions are confined in the specified band (2400MHz to 2483.5MHz). In case of the fundamental emissions are within two standard bandwidths from the bandedge, the delta measurement technique is used for determining bandedge compliance. Standard 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 / RSS-210 4.4, whichever is the lesser attenuation, which meet the requirement of part 15.249(d) / RSS-210 B.10.

TEST REPORT

PEAK MEASUREMENT (Bluetooth 3.0)





TEST REPORT

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

=98.0 dBµV/m – 44.6 dB
=53.4 dBµV/m

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

=74.0 dBµV/m – 44.6 dB
=29.4 dBµV/m

Upper bandedge

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

=99.0 dBµV/m – 55.6 dB
=43.4 dBµV/m

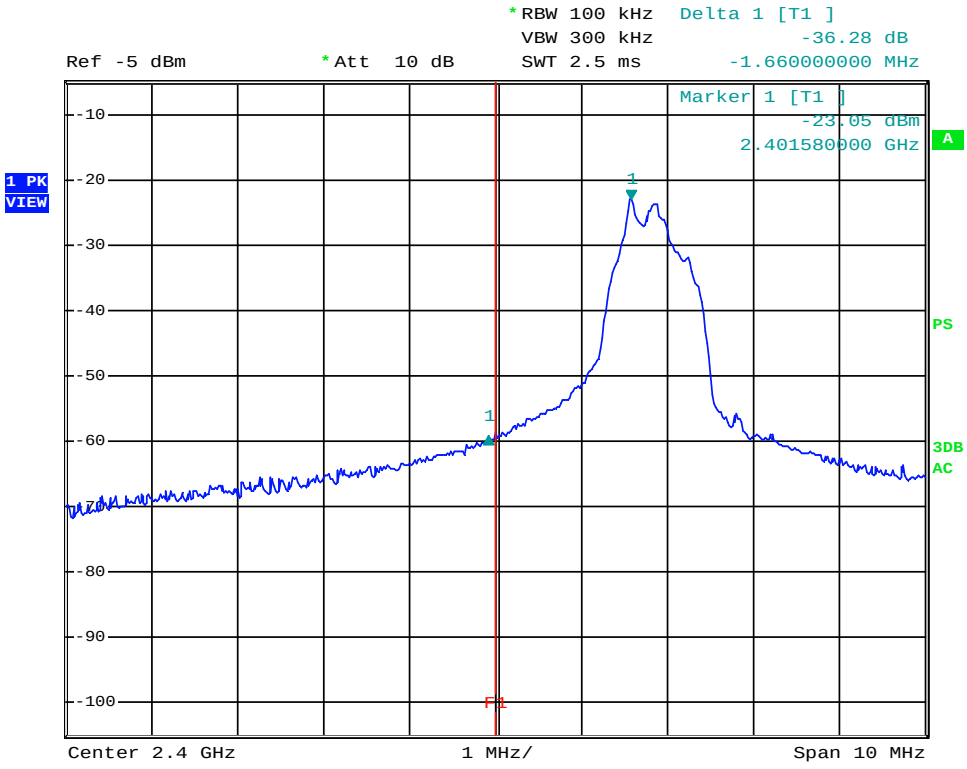
Average Resultant field strength = Fundamental emissions (average value) – delta from the plot

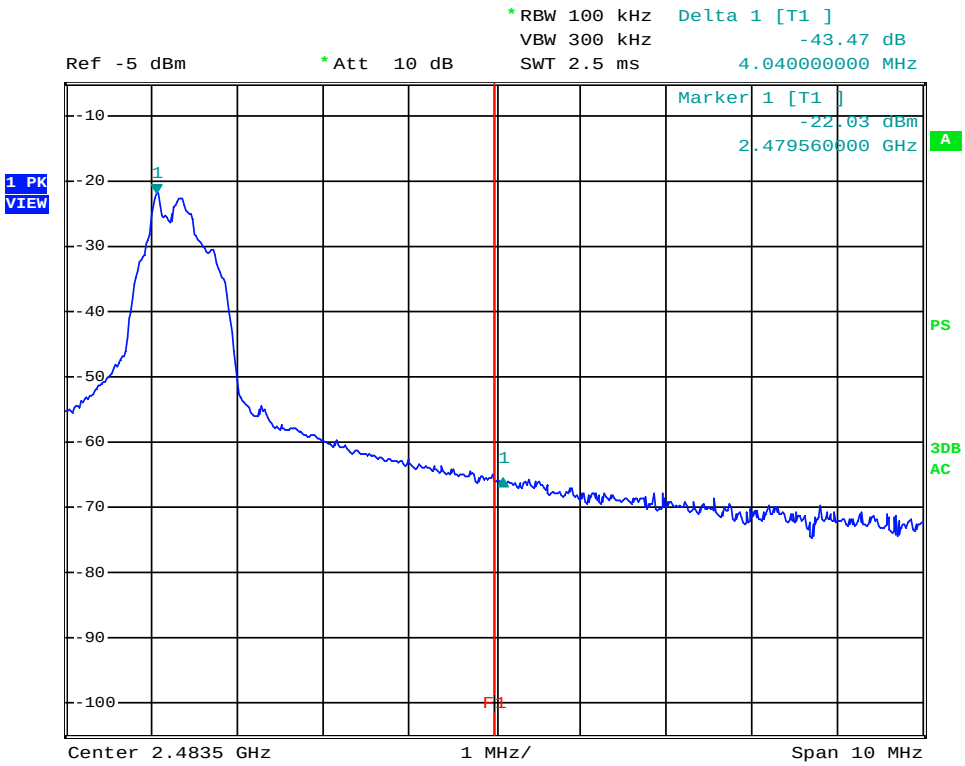
=75.0 dBµV/m – 55.6 dB
=19.4 dBµV/m

The resultant field strength meets the general radiated emission limit in Section 15.209 / RSS-210 4.4, which does not exceed 74 dBµV/m (Peak Limit) and 54 dBµV/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

=99.0 dBµV/m – 36.3 dB
=62.7dBµV/m

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

=49.9 dBµV/m – 36.3 dB
=13.6 dBµV/m

Upper bandedge

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

=100.0 dBµV/m – 43.5 dB
=56.5 dBµV/m

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

=50.9 dBµV/m – 43.5 dB
=7.4 dBµV/m

The resultant field strength meets the general radiated emission limit in Section 15.209 / RSS-210 4.4, which does not exceed 74 dBµV/m (Peak Limit) and 54 dBµV/m (Average Limit).

TEST REPORT

8.2 Discussion of Pulse Desensitization

(Bluetooth 3.0)
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 3MHz, so the pulse desensitivity factor is 0dB.

(Bluetooth 4.0 BLE)
Pulse desensitivity is not applicable for this device. The effective period (Teff) is approximately 352µs 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

(Bluetooth 3.0)
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

(Bluetooth 4.0 BLE)
The duty cycle is simply the on-time divided by the period:

The duration of one cycle = 100 ms

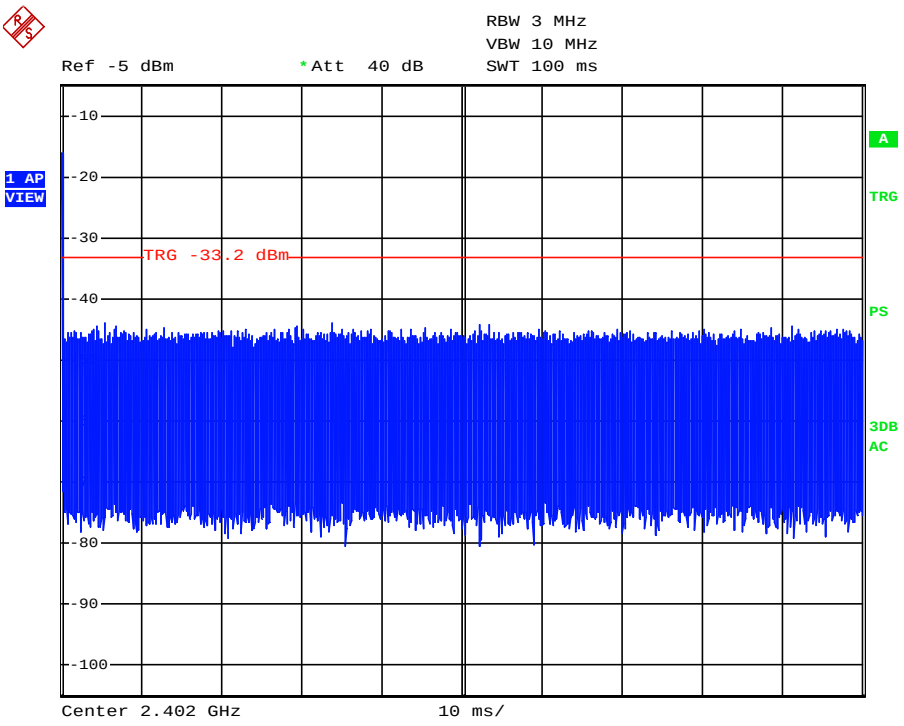
Effective period of the cycle = 352 µs

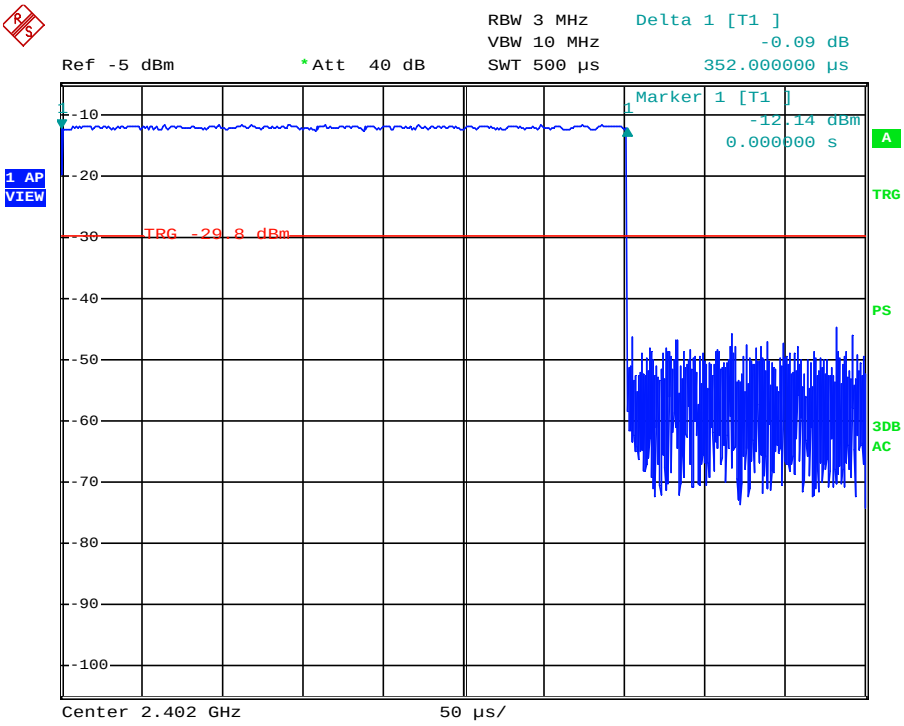
DC = 352µs/100ms = 0.00352

Therefore, the averaging factor is found by 20log 0.00352 = -49.1dB.

TEST REPORT

AVERAGE FACTOR





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).

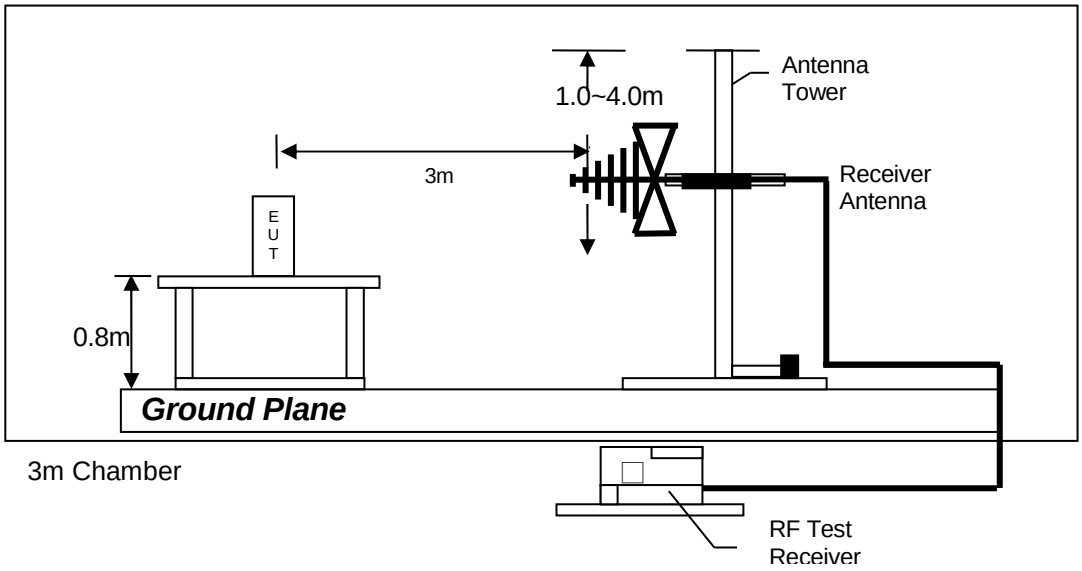
The IF bandwidth used for measurement of radiated signal strength was 100 kHz or greater when frequency is below 1000 MHz. Where pulsed transmissions of short enough pulse duration warrant, a greater bandwidth is selected according to the recommendations of Hewlett Packard Application Note 150-2. A discussion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

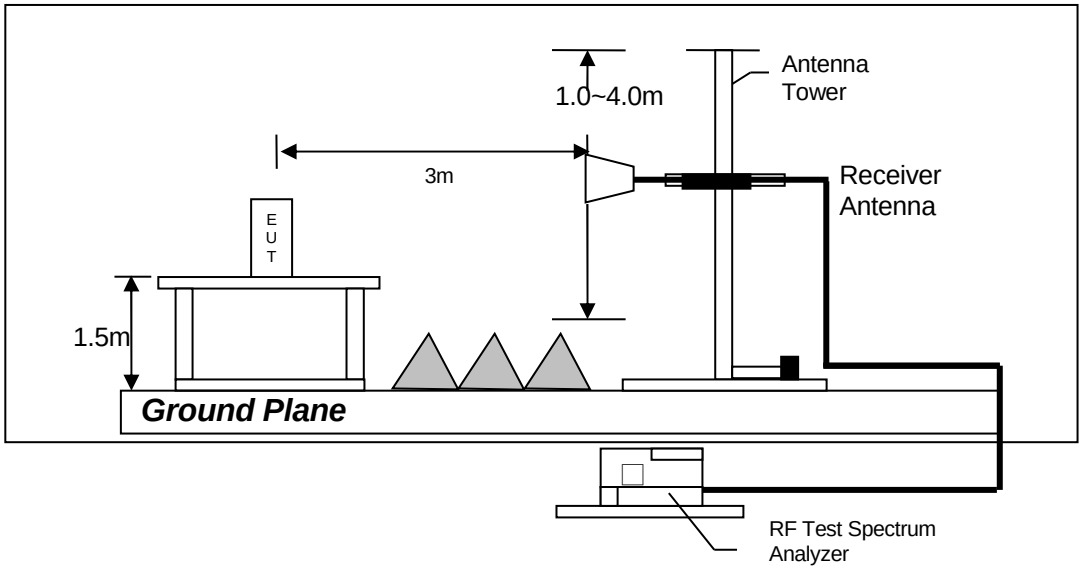
TEST REPORT

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

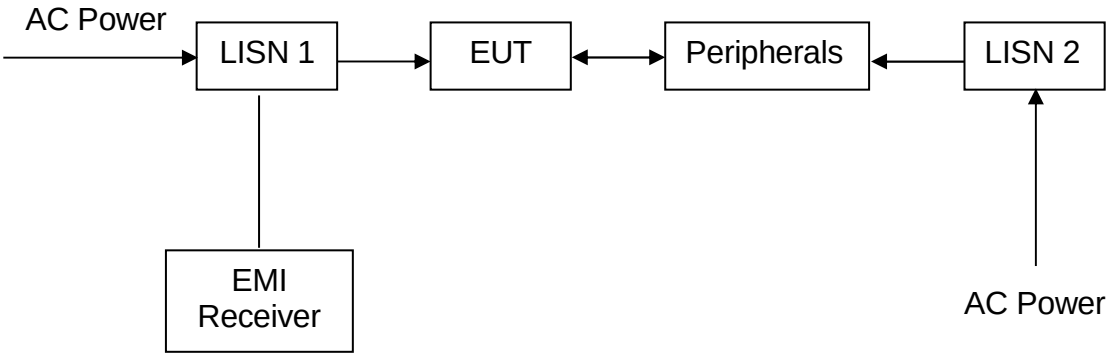
TEST REPORT

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



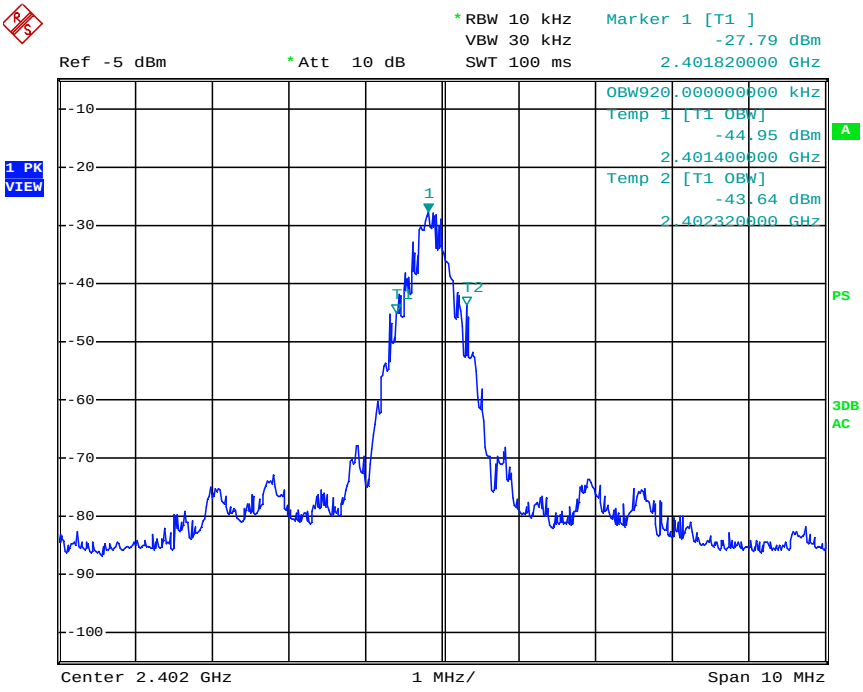
TEST REPORT

8.5 Occupied Bandwidth

Occupied Bandwidth Results: (Bluetooth 3.0)

	Occupied Bandwidth (kHz)
Low Channel: 2402	920
Middle Channel: 2442	880
High Channel: 2480	900

The worst case is shown as below

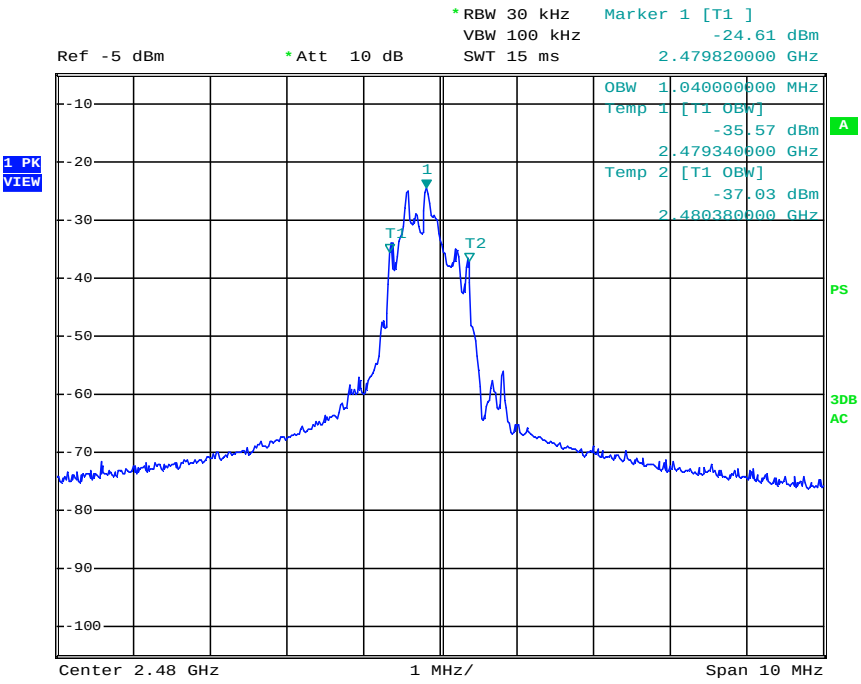


TEST REPORT

Occupied Bandwidth Results: (Bluetooth 4.0 BLE)

	Occupied Bandwidth (MHz)
Low Channel: 2402	1.04
Middle Channel: 2442	1.04
High Channel: 2480	1.04

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

1) Radiated Emissions Test

Equipment	EMI Test Receiver	Biconical Antenna	Log Periodic Antenna
Registration No.	EW-3156	EW-0954	EW-0447
Manufacturer	ROHDESCHWARZ	EMCO	EMCO
Model No.	ESR26	3104C	3146
Calibration Date	November 10, 2017	February 27, 2018	January 17, 2018
Calibration Due Date	November 10, 2018	August 27, 2019	July 17, 2019

Equipment	Active Loop H-field (9kHz to 30MHz)	12m Double Shield RF Cable (20MHz to 6GHz)	RF Cable (up to 40GHz)
Registration No.	EW-2313	EW-1852	EW-3155
Manufacturer	ELECTROMETRI	RADIALL	N/A
Model No.	EM-6876	N(m)-RG142 - N(m)	1-40 GHz
Calibration Date	March 08, 2018	January 19, 2018	January 29, 2018
Calibration Due Date	September 08, 2019	January 19, 2019	January 29, 2019

Equipment	Double Ridged Guide Antenna	Pyramidal Horn Antenna	Spectrum Analyzer
Registration No.	EW-1015	EW-0905	EW-3110
Manufacturer	EMCO	EMCO	R&S
Model No.	3115	3160-09	FSP30
Calibration Date	November 17, 2017	August 18, 2017	March 05, 2018
Calibration Due Date	May 17, 2019	February 18, 2019	March 05, 2019

Equipment	Notch Filter (cutoff frequency 2.4GHz to 2.5GHz)	Solid State Low Noise Preamplifier Assembly (1 - 18)GHz	RF Pre-amplifier (9kHz to 40GHz)
Registration No.	EW-2213	EW-3229	EW-3006
Manufacturer	MICROTRONICS	BONN ELEKTRO	SCHWARZBECK
Model No.	BRM50701-02	BLMA 0118-5G	BBV 9744
Calibration Date	May. 24, 2018	January 30, 2018	April 26, 2018
Calibration Due Date	May. 24, 2019	January 30, 2019	April 26, 2019

TEST REPORT

2) Conducted Emissions Test

Equipment	Artificial Mains Network	RF Cable 120cm (RG142) (9kHz to 30MHz)	EMI Test Receiver
Registration No.	EW-2501	EW-2453	EW-2500
Manufacturer	ROHDESCHWARZ	RADIALL	ROHDESCHWARZ
Model No.	ENV-216	bnc m st / 142 / bnc m st	ESCI
Calibration Date	February 14, 2018	September 15, 2017	October 13, 2017
Calibration Due Date	February 14, 2019	September 15, 2018	October 13, 2018

3) Bandedge/Bandwidth Measurement

Equipment	RF Cable (up to 40GHz) 1.5m length	Spectrum Analyzer
Registration No.	EW-3104	EW-2329
Manufacturer	N/A	R&S
Model No.	SMA-M to SMA-M	FSP3
Calibration Date	July 03, 2018	September 28, 2017
Calibration Due Date	July 03, 2019	September 28, 2018

END OF TEST REPORT