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TEST REPORT

Report No.: 16070377HKG-002

Wachsmuth & Krogmann, Inc.

Application
For
Certification
(Original Grant)
(FCC ID: 2ADQU-51445)

Transmitter

Prepared and Checked by:

Signed On File
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Lead Engineer

Approved by:

Digitally signed by
Koo Wai Ip
Location: Intertek
Testing Services
Hong Kong Ltd.

Koo Wai Ip
Assistant Supervisor
Date: September 12, 2016

GENERAL INFORMATION

Grantee:	Wachsmuth & Krogmann, Inc.
Grantee Address:	1015 Hawthorn Drive, Itasca, IL 60143, United States.
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e-mail:	N/A
Manufacturer:	N/A
Manufacturer Address:	N/A
Brand Name:	ALDI
Model:	51445
Type of EUT:	Transmitter
Description of EUT:	Wireless Key Finder
Serial Number:	N/A
FCC ID:	2ADQU-51445
Date of Sample Submitted:	July 07, 2016
Date of Test:	July 07, 2016 to August 05, 2016
Report No.:	16070377HKG-002
Report Date:	September 12, 2016
Environmental Conditions:	Temperature: +10 to 40°C Humidity: 10 to 90%

SUMMARY OF TEST RESULT

TEST SPECIFICATION	REFERENCE	RESULTS
Transmitter Field Strength, Bandwidth and Timing Requirement	15.231(a)	Pass

The equipment under test is found to be complying with the following standards:
FCC Part 15, October 1, 2014 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.

Table of Contents

1.0 General Description

1.1 Product Description

The Equipment-Under-Test (EUT) is the Transmitter of the Wireless Key Finder. It operates at 433.92MHz. When the transmit button of the EUT is depressed, the corresponding receiver (Key fob) will create beeping sound, so that the user knows the location of the Key fob. The EUT is powered by a CR2032 (3VDC) battery.

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.

The Declaration of the Conformity procedure of receiver for this transmitter (with FCC ID: 2ADQU-51445) is being processed as the same time of this application.

1.3 Test Methodology

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 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.

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 3V 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

There was no special software to exercise the device. Once the unit is powered up, it transmits the RF signal continuously.

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

N/A.

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

3.2 Radiated Emission Configuration Photograph

The worst case in radiated emission was found at 433.92 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 2.7 dB

Applicant: Wachsmuth & Krogmann, Inc. Date of Test: August 05, 2016
Model: 51445
Worst-Case Operating Mode: Tx

Table 1
Radiated Emissions
Pursuant to FCC Part 15 Section 15.231(a) Requirement

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp (dB)	Antenna factor (dB)	Average Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	433.920	74.7	16	25.0	5.6	78.1	80.8	-2.7
H	867.840	34.4	16	31.0	5.6	43.8	60.8	-17.0
H	***1301.760***	***55.3***	***34***	***26.1***	***5.6***	***41.8***	***54.0***	***-12.2***
H	1735.680	64.1	34	27.2	5.6	51.7	60.8	-9.1
H	2169.600	62.7	34	29.4	5.6	52.5	60.8	-8.3
H	2603.520	59.9	34	30.4	5.6	50.7	60.8	-10.1
H	3037.440	44.3	34	31.9	5.6	36.6	60.8	-24.2
H	3471.360	54.0	34	31.9	5.6	46.3	60.8	-14.5
H	***3905.280***	***48.7***	***34***	***33.3***	***5.6***	***42.4***	***54.0***	***-11.6***
H	***4339.200***	***46.0***	***34***	***34.8***	***5.6***	***41.2***	***54.0***	***-12.8***

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%.

Applicant: Wachsmuth & Krogmann, Inc. Date of Test: August 05, 2016
Model: 51445
Worst-Case Operating Mode: Tx Other

Table 2
Radiated Emissions
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)
H	61.222	34.4	16	10.0	28.4	40.0	-11.6
H	216.802	26.8	16	17.0	27.8	46.0	-18.2
H	***325.604***	***19.8***	***16***	***24.0***	***27.8***	***46.0***	***-18.2***
H	542.020	22.8	16	28.0	34.8	46.0	-11.2
H	651.002	19.8	16	29.0	32.8	46.0	-13.2
H	***977.004***	***15.4***	***16***	***33.0***	***32.4***	***54.0***	***-21.6***

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%.

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.

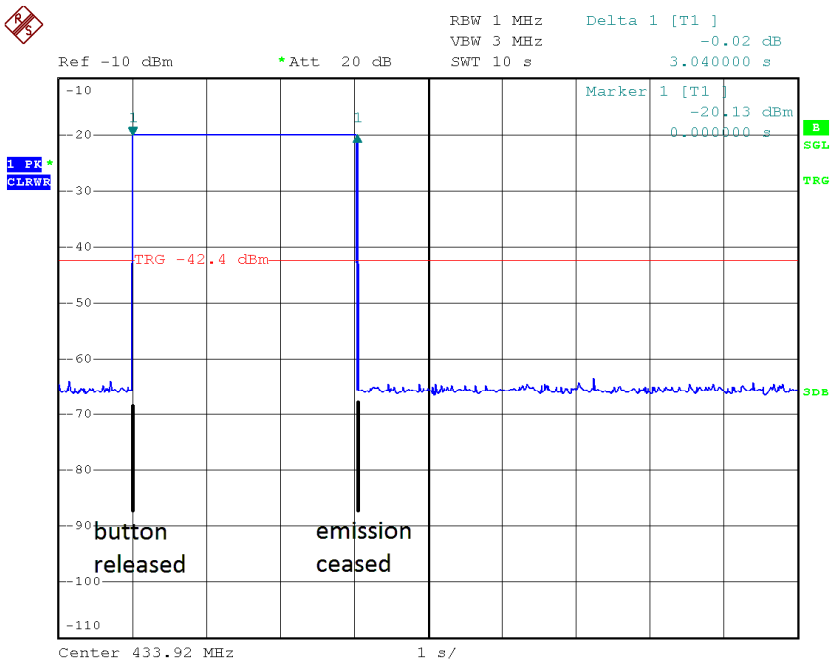
This manual will be provided to the end-user with each unit sold/leased in the United States.

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).

Timing Plot - Pursuant to FCC Part 15 Section 15.231(a1) - A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

Result: Transmission Duration = 3.04 seconds (Pass)



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8.1 Measured Bandwidth

The plot shows the fundamental emission when modulated. From the plot, the bandwidth is observed to be 1.18kHz, at 20dBc where the bandwidth limit is 1085kHz.

8.2 Discussion of Pulse Desensitization

Pulse desensitivity is not applicable for this device. The effective period (Teff) is approximately 52.3ms 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

The duty cycle is simply the on-time divided by the period:

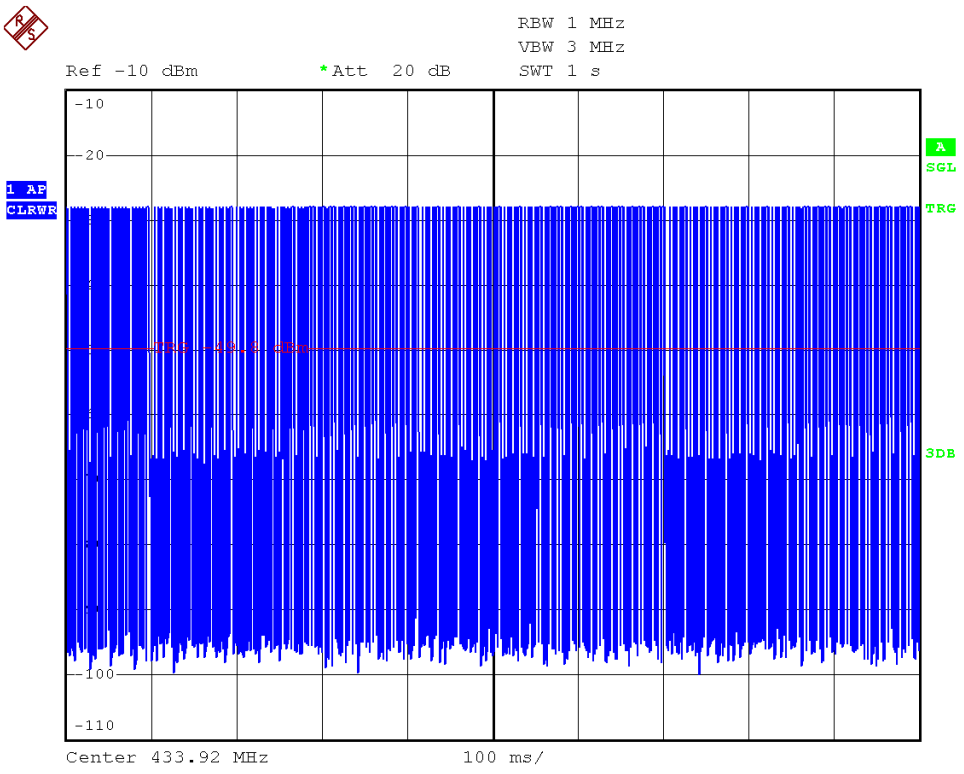
The duration of one cycle = 100ms

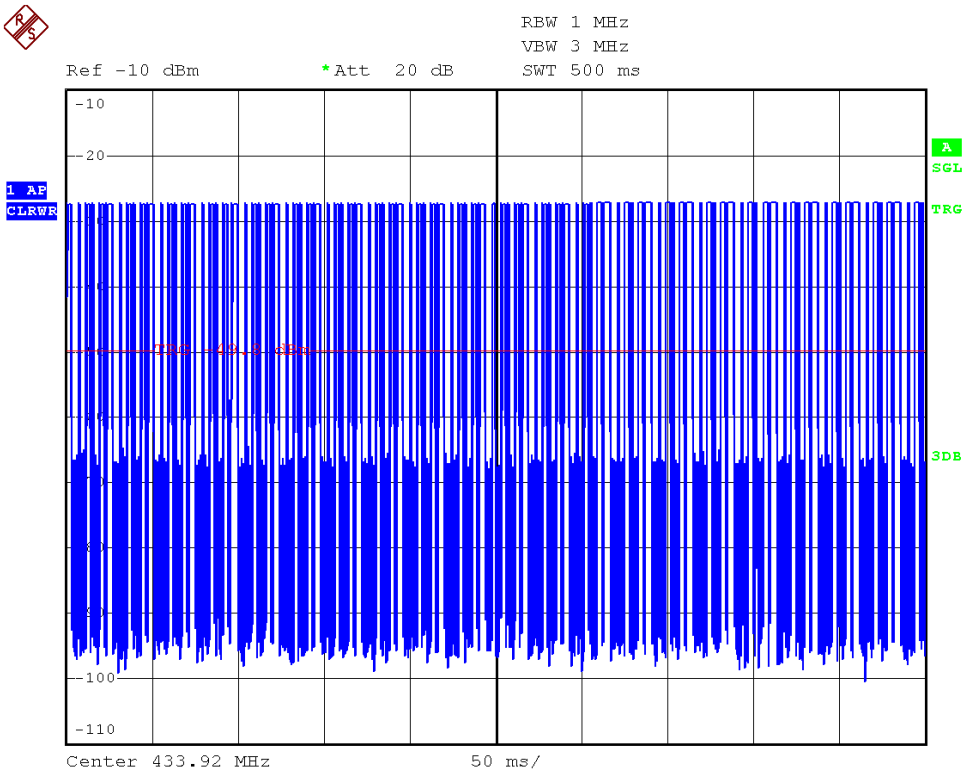
Effective period of the cycle = 4 x 3.9ms + 9 x 3.1ms + 8 x 1.1ms

DC = 52.3ms / 100ms = 0.523

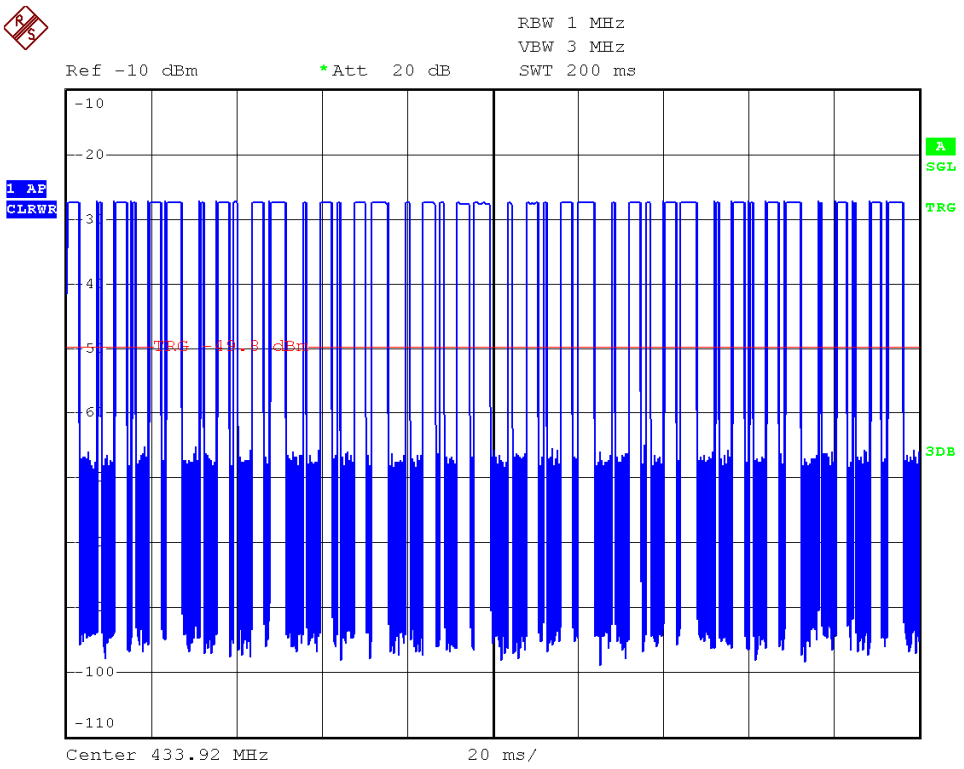
Therefore, the averaging factor is found by 20log 0.523 = -5.6dB.

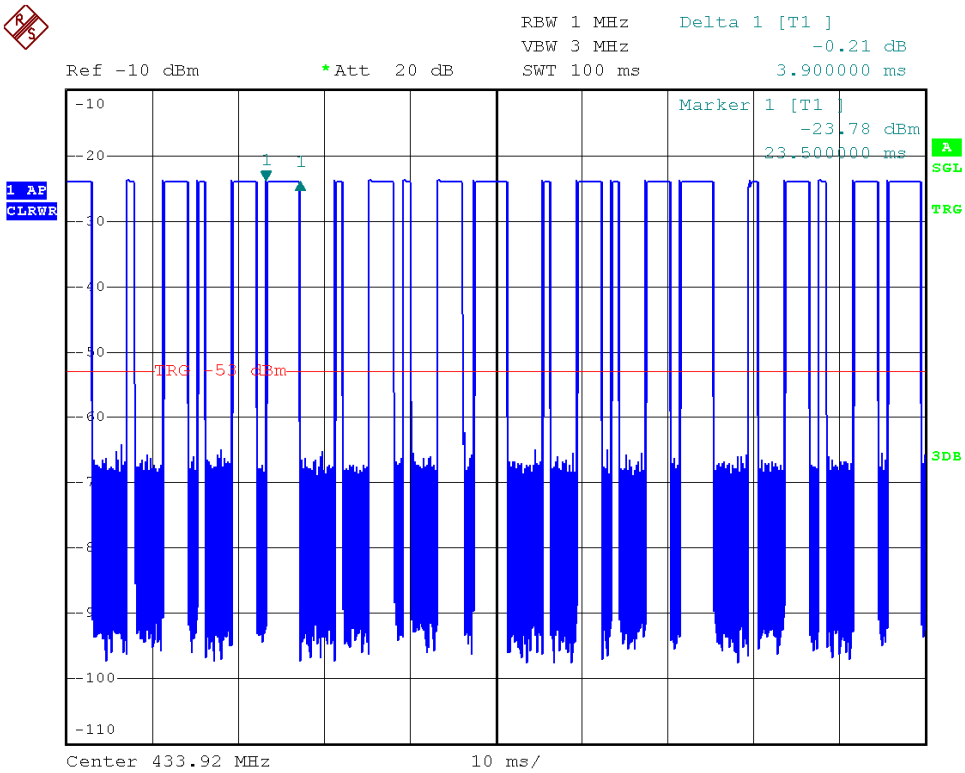
Average Factor



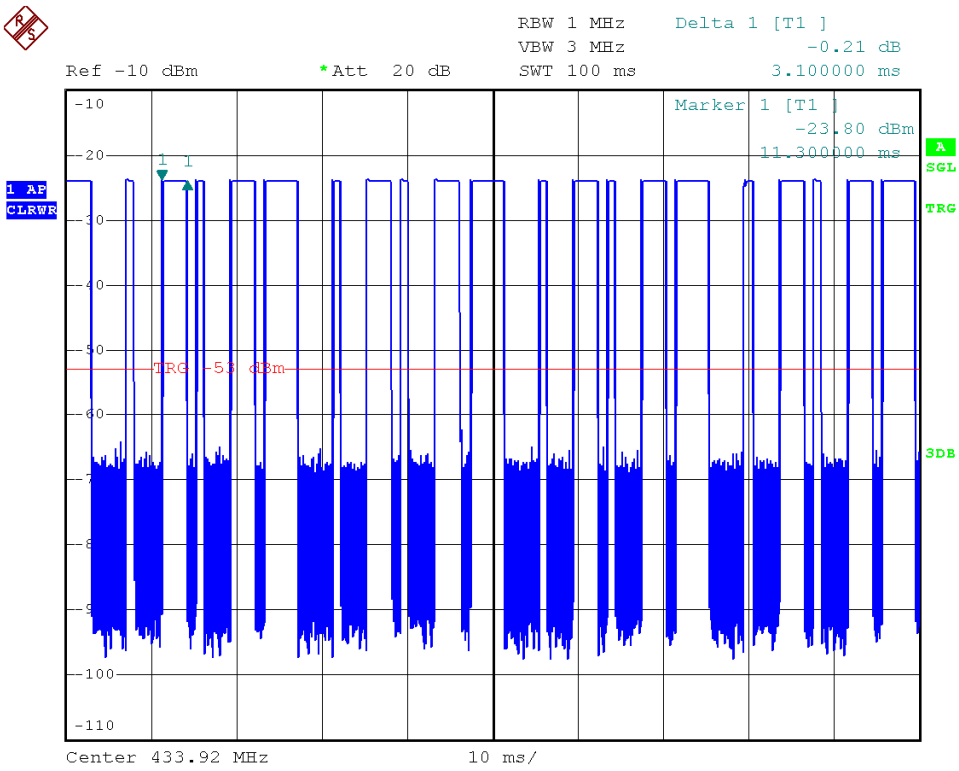


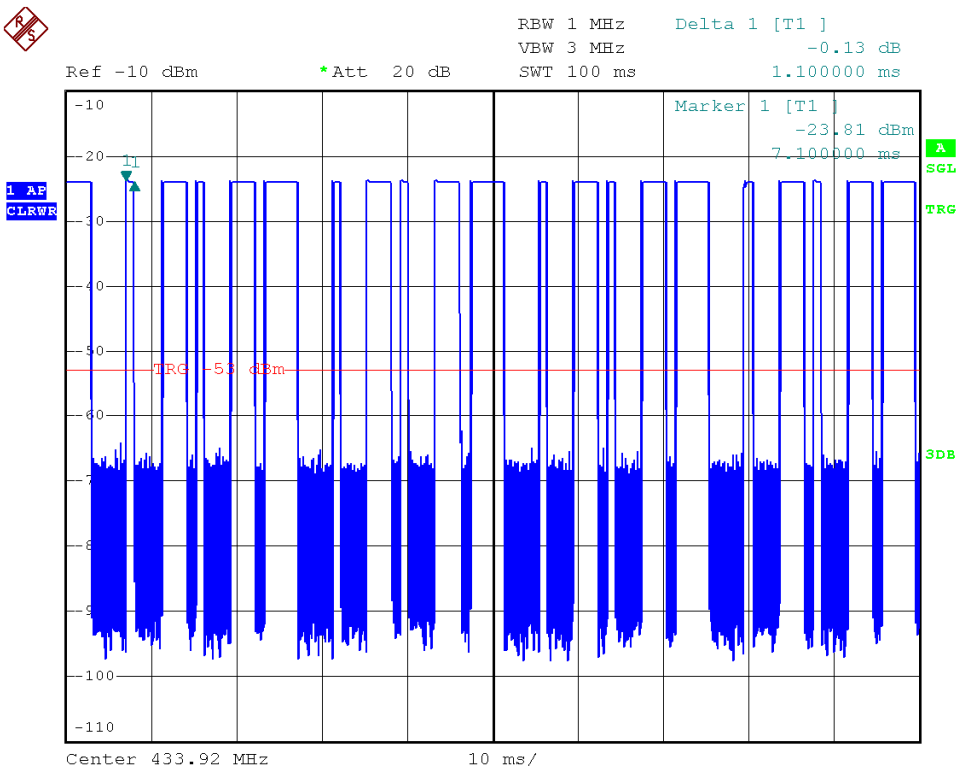
Average Factor





Average Factor





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.

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.

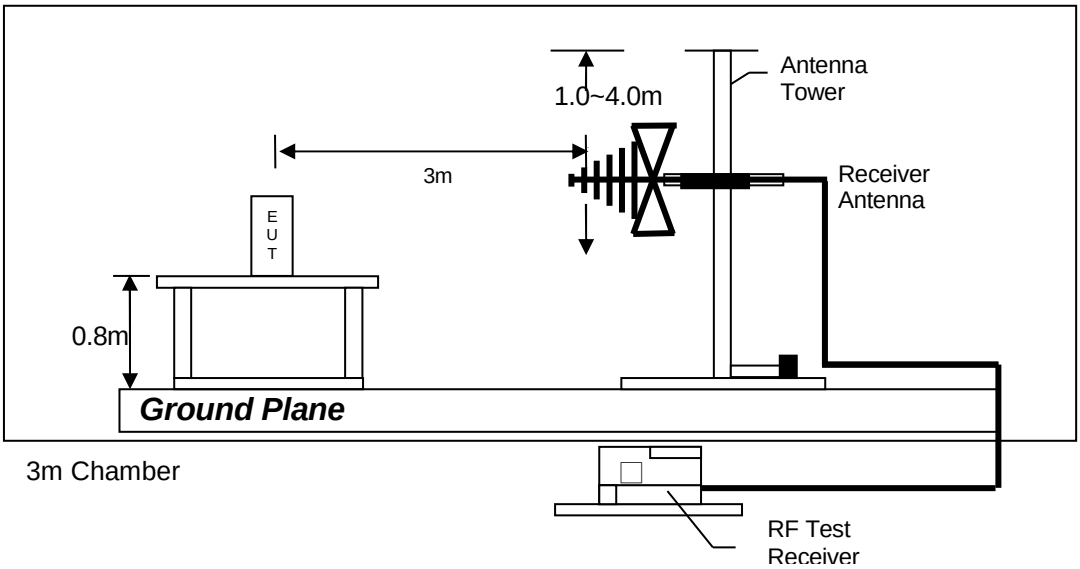
Conducted measurements were made as described in ANSI C63.10 (2013).

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 1 MHz is used.

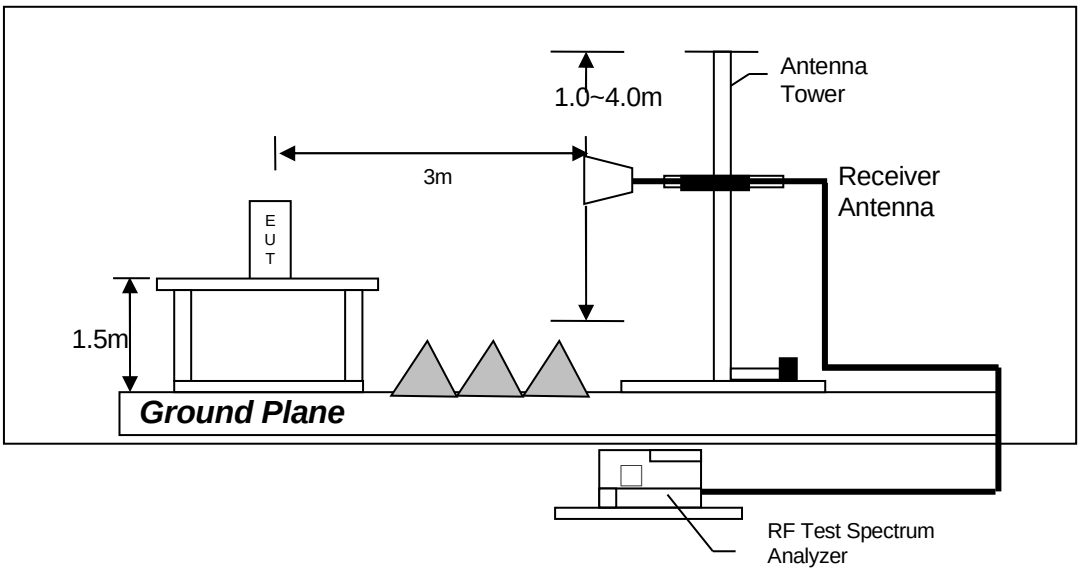
Transmitter measurements are normally conducted at a measurement distance of three meters. However, to assure low enough noise floor in the forbidden bands and above 1 GHz, signals are acquired at a distance of one meter or less. All measurements are extrapolated to three meters using inverse scaling,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

9.0 **Confidentiality Request**

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

10.0 **Equipment List**

1) Radiated Emissions Test

Equipment	EMI Test Receiver	Spectrum Analyzer	Biconical Antenna
Registration No.	EW-3156	EW-2249	EW-0571
Manufacturer	R&S	R&S	EMCO
Model No.	ESR26	FSP30	3104C
Calibration Date	Nov. 03, 2015	Nov. 27, 2015	Jun. 23, 2015
Calibration Due Date	Nov. 03, 2016	Nov. 27, 2016	Dec. 23, 2016

Equipment	Pyramidal Horn Antenna	Double Ridged Guide Antenna	Log Periodic Antenna
Registration No.	EW-0905	EW-1133	EW-0447
Manufacturer	EMCO	EMCO	EMCO
Model No.	3160-09	3115	3146
Calibration Date	Feb. 12, 2016	Nov. 05, 2015	Mar. 16, 2015
Calibration Due Date	Aug. 12, 2017	May 05, 2017	Sep. 16, 2016

2) Bandedge Measurement

Equipment	Spectrum Analyzer
Registration No.	EW-2249
Manufacturer	R&S
Model No.	FSP30
Calibration Date	Nov. 27, 2015
Calibration Due Date	Nov. 27, 2016

END OF TEST REPORT