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TEST REPORT

Report No.: 14110970HKG-002R1

Branford Limited

Application
For
Certification
(Original Grant)
(FCC ID: 2ADMY2-4GHZAB5016T)
(IC: 12572A-4GZAB5016ZT)

Transceiver (Train)

This report supersedes previous report with report number(s) 14110970HKG-002 dated December 22, 2014.

Prepared and Checked by:

Wong Kwok Yeung, Kenneth
Lead Engineer

Approved by:

Chan Chi Hung, Terry
Supervisor
Date: January 02, 2015

GENERAL INFORMATION

Grantee:	Branford Limited
Grantee Address:	15th Floor, Railway Plaza, 39 Chatham Road South, Tsim Sha Tsui, Kowloon, Hong Kong.
Contact Person:	Ringo Chan
Tel:	(852) 2368-0613
Fax:	(852) 2368-2087
e-mail:	N/A
Manufacturer:	Dong Guan Guan Ting Toys Co., Ltd.
Manufacturer Address:	36# YinHu Road, JiaoYiTang, TangXia Town, DongGuan City, Guangdong, China
Brand Name:	Maison Joseph Battat
FCC Model:	AB5016
IC Model:	AB5016ZT
Type of EUT:	Transceiver (Train)
Description of EUT:	Remote Control Locomotive
Serial Number:	N/A
FCC ID / IC:	2ADMY2-4GHZAB5016T / 12572A-4GZAB5016ZT
Date of Sample Submitted:	November 25, 2014
Date of Test:	November 25, 2014 to December 09, 2014
Report No.:	14110970HKG-002R1
Report Date:	January 02, 2015
Environmental Conditions:	Temperature: +10 to 40°C Humidity: 10 to 90%

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SUMMARY OF TEST RESULT

TEST SPECIFICATION	REFERENCE	RESULTS
Radiated Emission Radiated Emission on the Bandedge	15.249 / RSS-210 A2.9	Pass
Radiated Emission in Restricted Bands	15.205 / RSS-210 2.2	Pass

The equipment under test is found to be complying with the following standards:
FCC Part 15, October 1, 2013 Edition
RSS-210 Issue 8, December 2010
RSS-Gen Issue 4, December 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.

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1.0 General Description

1.1 Product Description

The Equipment Under Test (EUT) is a 2.4GHz transceiver (i.e. Train) for a RC Train. The EUT is powered by DC3.0V (2X1.5V AAA batteries). The operating frequencies are 2425MHz, 2445MHz, and 2465MHz. After pairing with controller, the train can be controlled to run forward and backward. There are also a light and a speaker on the EUT, which can be controlled by the controller's light and sound buttons

Antenna Type: Internal, Integral

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

1.2 Related Submittal(s) Grants

The Certification procedure of transceiver (with FCC ID: 2ADMY2-4GHZAB5016R and IC: 12572A-4GZAB5016ZR) for this transceiver (with FCC ID: 2ADMY2-4GHZAB5016T and IC: 12572A-4GZAB5016ZT) 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 C63.4 (2009). 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 and IC.

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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 C63.4 (2009).

The device was powered by new 2 x 1.5V AAA batteries.

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.

2.5 Support Equipment List and Description

N/A.

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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 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 27 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
RR = 18.0 dBµV
LF = 9.0 dB
FS = RR + LF
FS = 18 + 9 = 27 dBµV/m

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 2483.5 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 13.8 dB

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Applicant: Branford Limited
FCC Model: AB5016 / IC Model: AB5016ZT
Worst-Case Operating Mode: Transmitting

Date of Test: December 09, 2014

Table 1
Radiated Emissions
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	2425.200	84.9	33	29.4	81.3	42.7	38.6	94.0	-55.4
H	2400.000	63.6	33	29.4	60.0	42.7	17.3	54.0	-36.7
V	***4850.400***	***49.6***	***33***	***34.9***	***51.5***	***42.7***	***8.8***	***54.0***	***-45.2***
V	***7275.600***	***49.0***	***33***	***37.9***	***53.9***	***42.7***	***11.2***	***54.0***	***-42.8***
V	9700.800	48.0	33	40.4	55.4	42.7	12.7	54.0	-41.3
V	***12126.000***	***49.4***	***33***	***40.5***	***56.9***	***42.7***	***14.2***	***54.0***	***-39.8***
V	14551.200	54.4	33	38.4	59.8	42.7	17.1	54.0	-36.9

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	2425.200	84.9	33	29.4	81.3	114.0	-32.7
H	2400.000	63.6	33	29.4	60.0	74.0	-14.0
V	***4850.400***	***49.6***	***33***	***34.9***	***51.5***	***74.0***	***-22.5***
V	***7275.600***	***49.0***	***33***	***37.9***	***53.9***	***74.0***	***-20.1***
V	9700.800	48.0	33	40.4	55.4	74.0	-18.6
V	***12126.000***	***49.4***	***33***	***40.5***	***56.9***	***74.0***	***-17.1***
V	14551.200	54.4	33	38.4	59.8	74.0	-14.2

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 Section 2.2.

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Table 2
Radiated Emissions
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	2445.200	84.7	33	29.4	81.1	42.7	38.4	94.0	-55.6
V	***4890.400***	***49.8***	***33***	***34.9***	***51.7***	***42.7***	***9.0***	***54.0***	***-45.0***
V	***7335.600***	***48.8***	***33***	***37.9***	***53.7***	***42.7***	***11.0***	***54.0***	***-43.0***
V	9780.800	48.4	33	40.4	55.8	42.7	13.1	54.0	-40.9
V	***12226.000***	***49.2***	***33***	***40.5***	***56.7***	***42.7***	***14.0***	***54.0***	***-40.0***
V	14671.200	54.0	33	38.4	59.4	42.7	16.7	54.0	-37.3

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	2445.200	84.7	33	29.4	81.1	114.0	-32.9
V	***4890.400***	***49.8***	***33***	***34.9***	***51.7***	***74.0***	***-22.3***
V	***7335.600***	***48.8***	***33***	***37.9***	***53.7***	***74.0***	***-20.3***
V	9780.800	48.4	33	40.4	55.8	74.0	-18.2
V	***12226.000***	***49.2***	***33***	***40.5***	***56.7***	***74.0***	***-17.3***
V	14671.200	54.0	33	38.4	59.4	74.0	-14.6

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 Section 2.2.

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Table 3
Radiated Emissions
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	2465.200	84.8	33	29.4	81.2	42.7	38.5	94.0	-55.5
H	2483.500	63.8	33	29.4	60.2	42.7	17.5	54.0	-36.5
V	***4930.400***	***50.0***	***33***	***34.9***	***51.9***	***42.7***	***9.2***	***54.0***	***-44.8***
V	***7395.600***	***48.5***	***33***	***37.9***	***53.4***	***42.7***	***10.7***	***54.0***	***-43.3***
V	9860.800	48.5	33	40.4	55.9	42.7	13.2	54.0	-40.8
V	***12326.000***	***49.0***	***33***	***40.5***	***56.5***	***42.7***	***13.8***	***54.0***	***-40.2***
V	14791.200	54.2	33	38.4	59.6	42.7	16.9	54.0	-37.1

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	2465.200	84.8	33	29.4	81.2	114.0	-32.8
H	2483.500	63.8	33	29.4	60.2	74.0	-13.8
V	***4930.400***	***50.0***	***33***	***34.9***	***51.9***	***74.0***	***-22.1***
V	***7395.600***	***48.5***	***33***	***37.9***	***53.4***	***74.0***	***-20.6***
V	9860.800	48.5	33	40.4	55.9	74.0	-18.1
V	***12326.000***	***49.0***	***33***	***40.5***	***56.5***	***74.0***	***-17.5***
V	14791.200	54.2	33	38.4	59.6	74.0	-14.4

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 Section 2.2.

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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 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.

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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

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 2.5, whichever is the lesser attenuation, which meet the requirement of part 15.249(d) / RSS-210 A2.9.

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Peak Measurement

Lower bandedge

Peak Resultant field strength at 2400MHz, which data can also be found on table 1 (i.e. page 5)

=60.0 dBµV/m

Average Resultant field strength;
=60.0 dBµV/m - 42.7 dB
=17.3 dBµV/m

Upper bandedge

Peak Resultant field strength at 2483.5MHz, which data can also be found on table 3 (i.e. page 7)

=60.2 dBµV/m

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

=60.2 dBµV/m - 42.7 dB
=17.5 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).

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8.2 Discussion of Pulse Desensitization

Pulse desensitivity is not applicable for this device. The effective period (Teff) is approximately 0.245ms 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 = 3*0.245 = 0.735ms

DC = 0.735 / 100 = 0.00735

Therefore, the averaging factor is found by 20log 0.00735 = -42.7dB.

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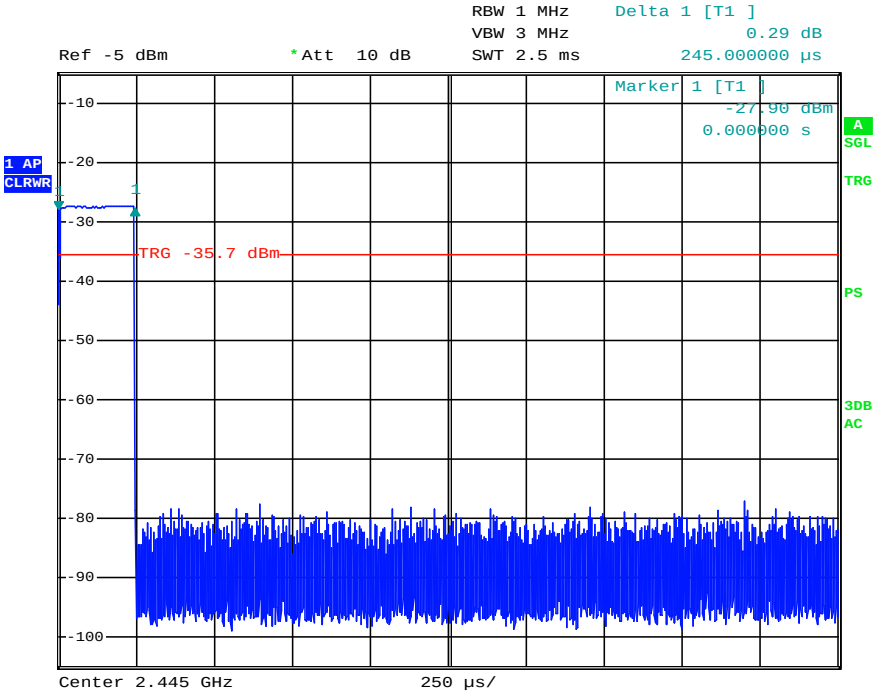

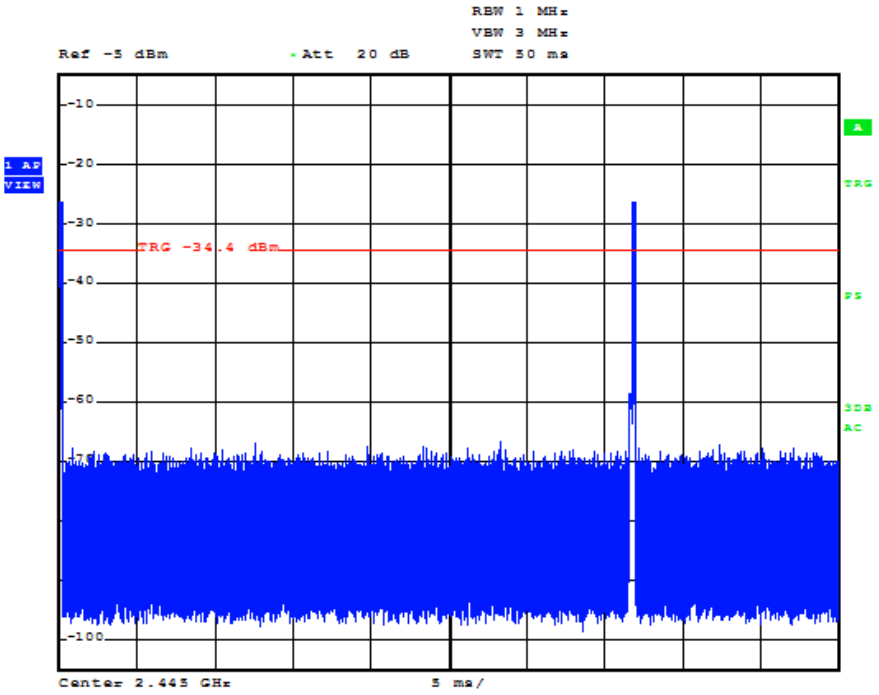

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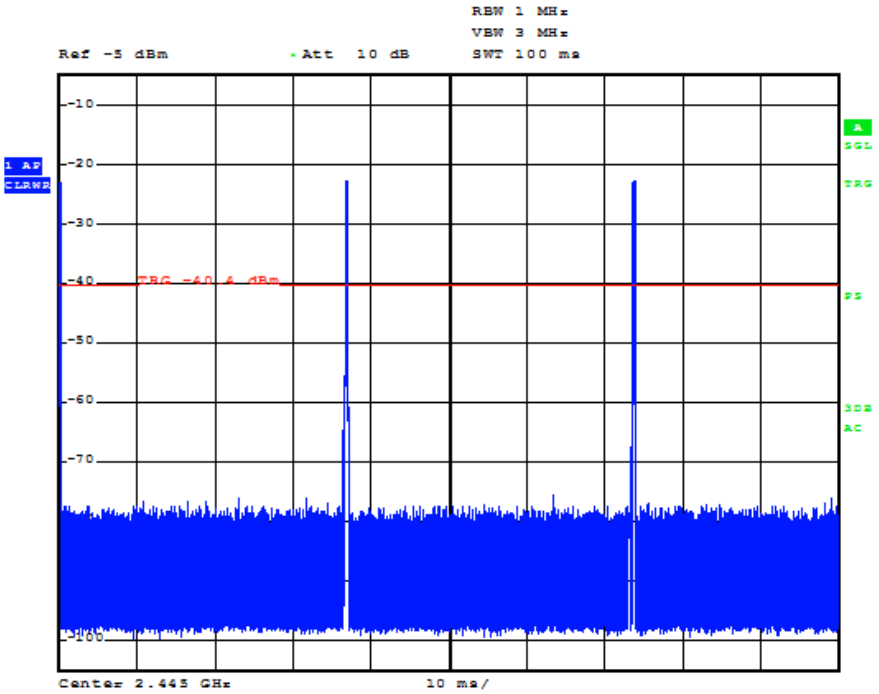

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8.4 Emissions Test Procedures

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

The transmitting equipment under test (EUT) is placed on a wooden turntable which is four feet in diameter and approximately one meter in height above the ground plane. 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.

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8.4 Emissions Test Procedures (cont'd)

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

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

Conducted measurements were made as described in ANSI C63.4 (2009).

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

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

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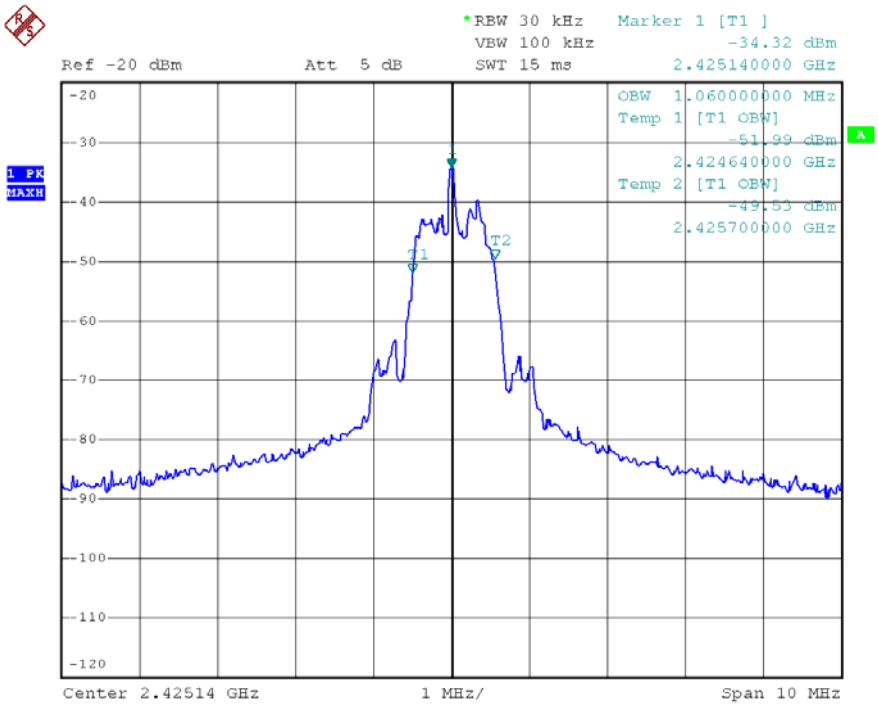
8.5 Occupied Bandwidth

Occupied Bandwidth Results:

Bluetooth	Occupied Bandwidth (kHz)
Low Channel: 2425	1060
Middle Channel: 2445	1080
High Channel: 2465	1080



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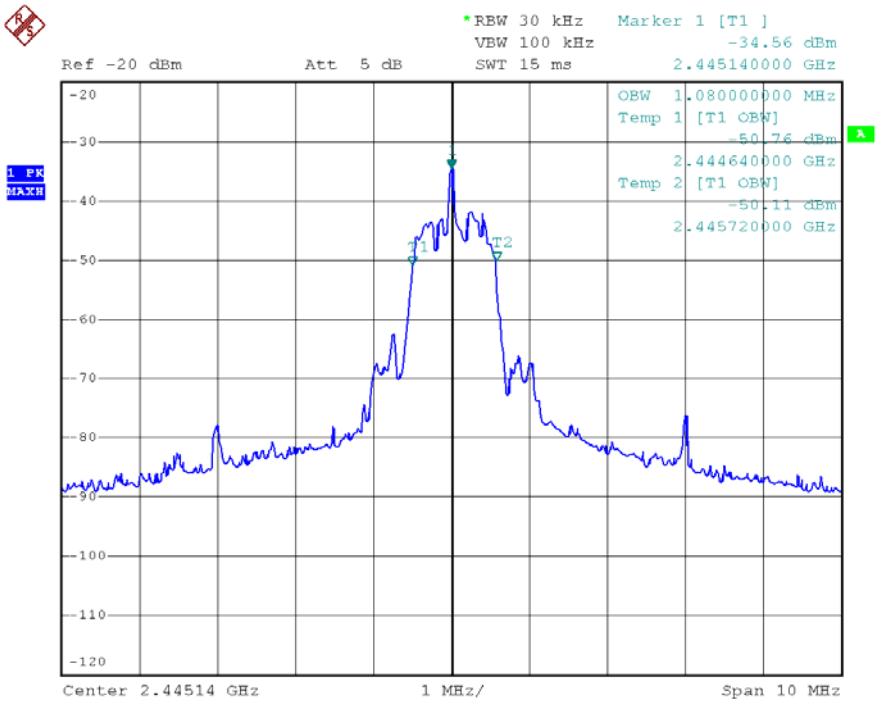

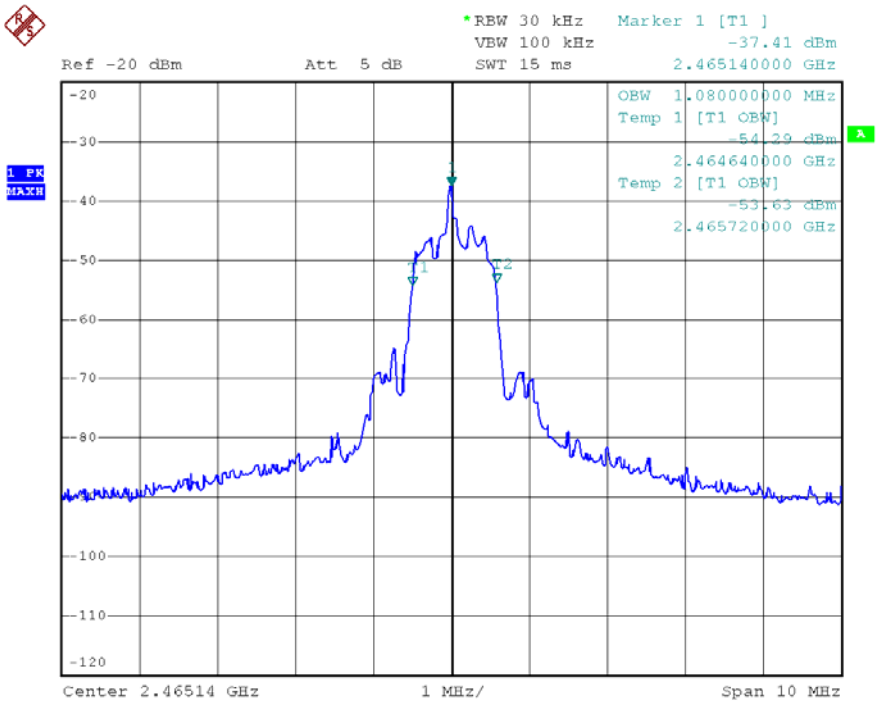

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9.0 **Equipment List**

1) Radiated Emissions Test

Equipment	EMI Test Receiver	BiConiLog Antenna
Registration No.	EW-2666	EW-3061
Manufacturer	R&S	EMCO
Model No.	ESCI7	3412E
Calibration Date	Jun. 20, 2013	Jul. 17, 2014
Calibration Due Date	Dec. 20, 2014	Jul. 17, 2015

Equipment	Spectrum Analyzer	Pyramidal Horn Antenna	Double Ridged Guide Antenna
Registration No.	EW-2253	EW-0905	EW-1133
Manufacturer	R&S	EMCO	EMCO
Model No.	FSP40	3160-09	3115
Calibration Date	May 08, 2014	Jan. 28, 2014	Apr. 30, 2014
Calibration Due Date	May 08, 2015	Jul. 28, 2015	Oct. 30, 2015

2) Bandwidth & average factor Measurement

Equipment	Spectrum Analyzer
Registration No.	EW-2329
Manufacturer	R&S
Model No.	FSP3
Calibration Date	Jun. 19, 2014
Calibration Due Date	Jun. 19, 2015

END OF TEST REPORT

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