TEST REPORT

Report No.: HK12050617-1(R1)

Allied Hill Enterprise Ltd.

Application
For
Certification

(Original Grant)

(FCC ID: A5W20120111BB001R)

Transceiver

Supersede Report No. HK12050617-1 Dated 24 May 2012

Prepared and Checked by:

Signed On File

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GENERAL INFORMATION

Allied Hill Enterprise Ltd.
BRAND NAME: Bandit Buster, MODEL: N/A

FCC ID: A5W20120111BB001R

Grantee:	Allied Hill Enterprise Ltd.
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Manufacturer:	N/A
Manufacturer Address:	N/A
Brand Name:	Bandit Buster
Model:	N/A
Type of EUT:	Transciever
Description of EUT:	Security and surveillance system
Serial Number:	N/A
FCC ID :	A5W20120111BB001R
Date of Sample Submitted:	May 10, 2012
Date of Test:	May 11, 2012
Report No.:	HK12050617-1(R1)
Report Date:	May 30, 2012
Environmental Conditions:	Temperature: +10 to 40°C Humidity: 10 to 90%

SUMMARY OF TEST RESULT

Allied Hill Enterprise Ltd.
BRAND NAME: Bandit Buster, MODEL: N/A

FCC ID: A5W20120111BB001R

TEST SPECIFICATION	REFERENCE	RESULTS
Maximum Peak Output Power	15.247(b), (c) / RSS-210 A8.4	N/A
Hopping Channel Carrier Frequencies Separation	15.247(e) / RSS-210 A8.1	N/A
20dB Bandwidth of the Hopping Channel	15.247(a) / RSS-210 A8.1	N/A
Number of Hopping Frequencies	15.247(e) / RSS-210 A8.1	N/A
Average Time of Occupancy of Hopping Frequency	15.247(e) / RSS-210 A8.1	N/A
Anteann Conducted Spurious Emissions	15.247(d) / RSS-210 A8.5	N/A
Radiated Spurious Emissions	15.247(d) / RSS-210 A8.5	N/A
RF Exposure Compliance	15.247(i) / RSS-Gen 5.5	N/A
Transmitter Power Line Conducted Emissions	15.207 / RSS-Gen 7.2.2	N/A
Transmitter Field Strength	15.227 / RSS-310 3.8	N/A
Transmitter Field Strength	15.229 / RSS-210 A2.7	N/A
Transmitter Field Strength, Bandwidth and Timing Requirement	15.231(a) / RSS-210 A1.1.1	N/A
Transmitter Field Strength, Bandwidth and Timing Requirement	15.231(e) / RSS-210 A1.1.5	N/A
Transmitter Field Strength and Bandwidth Requirement	15.239 / RSS-210 A2.8	N/A
Transmitter Field Strength and Bandwidth Requirement	15.249 / RSS-210 A2.9	Pass
Transmitter Field Strength and Bandwidth Requirement	15.235 / RSS-310 3.9	N/A
Receiver / Digital Device Radiated Eissions	15.109 / ICES-003	N/A
Digital Device Conducted Emissions	15.107 / ICES-003	N/A

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 a 2.4GHz RF transceiver for receiver part of alarm system. The EUT is powered by 4.5V(3 x 1.5V AA battery) or A.C. adaptor. The EUT has an ON/OFF switch, Alarm/Vib/Alarm+vib switch, RESET button, headphone jack and A.C. jack. When the EUT is switched on, the EUT will search for the relative transceiver. After the EUT has found the relative transceiver, the EUT can operate with relative transceiver. When the EUT receive a signal from the relative transceiver, it will generate alarm sound and the motor will vibrate. Also, it has a speaker to receive voice from the relative transceiver.

Antenna Type : Internal, Integral

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

1.2 Related Submittal(s) Grants

The Verification procedure of AC portion for this transceiver is being processed as the same time of this application.

The Certification procedure procedure of transceiver for this transceiver (with FCC ID: A5W20120111BB001T) is being processed as the same time of this application.

The receiver for this transmitter is exempted from the Part 15 technical rules per 15.101(b).

1.3 Test Methodology

Both AC mains line-conducted (Conduct) and Radiated emission measurements were performed according to the procedures in ANSI C63.4 (2003). All radiated measurements were performed in an Open Area Test Site. Preliminary scans were performed in the Open Area Test Site 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 open area test site and conducted measurement facility used to collect the radiated data is located at Garment Centre, 576 Castle Peak Road, Kowloon, 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 C63.4 (2003).

The EUT was powered by 3 x 1.5V AA batteries, AC adaptor during test.

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

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 Equipment Modification

Any modifications installed previous to testing by Allied Hill Enterprise Ltd. will be incorporated in each production model sold/leased in the United States.

No modifications were installed by Intertek Testing Services Hong Kong Ltd.

2.5 Measurement Uncertainty

When determining of the test conclusion, the Measurement Uncertainty of test has been considered.

2.6 Support Equipment List and Description

1 x 1.23m long cable with earphone (provided by Intertek)

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

3.1 Field Strength Calculation (cont'd)

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 RR = 18.0 dBµV
CF = 1.6 dB LF = 9.0 dB
AG = 29.0 dB
AV = 5.0 dB
FS = RR + LF
FS = 18 + 9 = 27 dBµV/m

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

3.2 Radiated Emission Configuration Photograph

Worst Case Radiated Emission at 2441.000 & 2479.000 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 1.0 dB

3.4 Conducted Emission Configuration Photograph

Worst Case Line Conducted Configuration at 348 kHz.

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

3.5 Conducted Emission Data

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

Judgment: Passed by 19.45 dB

Applicant: Allied Hill Enterprise Ltd. Date of Test: May 11, 2012
Model: N/A
Mode: TX

Table 1

Radiated Emissions

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	2404.000	114.6	33	29.4	111.0	29.4	81.6	94.0	-12.4
H	4808.000	61.3	33	34.9	63.2	29.4	33.8	54.0	-20.2
H	7212.000	56.1	33	37.9	61.0	29.4	31.6	54.0	-22.4
H	9616.000	43.4	33	40.4	50.8	29.4	21.4	54.0	-32.6
H	12020.000	45.0	33	40.5	52.5	29.4	23.1	54.0	-30.9
H	14424.000	46.3	33	40.0	53.3	29.4	23.9	54.0	-30.1

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	2404.000	114.6	33	29.4	111.0	114.0	-3.0
H	4808.000	61.3	33	34.9	63.2	74.0	-10.8
H	7212.000	56.1	33	37.9	61.0	74.0	-13.0
H	9616.000	43.4	33	40.4	50.8	74.0	-23.2
H	12020.000	45.0	33	40.5	52.5	74.0	-21.5
H	14424.000	46.3	33	40.0	53.3	74.0	-20.7

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 emissions over 1000MHz.

Applicant: Allied Hill Enterprise Ltd. Date of Test: May 11, 2012
Model: N/A
Mode: TX

Table 2

Radiated Emissions

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	2441.000	116.6	33	29.4	113.0	29.4	83.6	94.0	-10.4
H	4882.000	61.8	33	34.9	63.7	29.4	34.3	54.0	-19.7
H	7323.000	57.6	33	37.9	62.5	29.4	33.1	54.0	-20.9
H	9764.000	43.6	33	40.4	51.0	29.4	21.6	54.0	-32.4
H	12205.000	45.3	33	40.5	52.8	29.4	23.4	54.0	-30.6
H	14646.000	48.5	33	38.4	53.9	29.4	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	2441.000	116.6	33	29.4	113.0	114.0	-1.0
H	4882.000	61.8	33	34.9	63.7	74.0	-10.3
H	7323.000	57.6	33	37.9	62.5	74.0	-11.5
H	9764.000	43.6	33	40.4	51.0	74.0	-23.0
H	12205.000	45.3	33	40.5	52.8	74.0	-21.2
H	14646.000	48.5	33	38.4	53.9	74.0	-20.1

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 emissions over 1000MHz.

Applicant: Allied Hill Enterprise Ltd. Date of Test: May 11, 2012
Model: N/A
Mode: TX

Table 3

Radiated Emissions

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	2479.000	116.6	33	29.4	113.0	29.4	83.6	94.0	-10.4
H	4958.000	63.3	33	34.9	65.2	29.4	35.8	54.0	-18.2
H	7437.000	58.1	33	37.9	63.0	29.4	33.6	54.0	-20.4
H	9916.000	44.0	33	40.4	51.4	29.4	22.0	54.0	-32.0
H	12395.000	45.3	33	40.5	52.8	29.4	23.4	54.0	-30.6
H	14874.000	48.5	33	38.4	53.9	29.4	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	2479.000	116.6	33	29.4	113.0	114.0	-1.0
H	4958.000	63.3	33	34.9	65.2	74.0	-8.8
H	7437.000	58.1	33	37.9	63.0	74.0	-11.0
H	9916.000	44.0	33	40.4	51.4	74.0	-22.6
H	12395.000	45.3	33	40.5	52.8	74.0	-21.2
H	14874.000	48.5	33	38.4	53.9	74.0	-20.1

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 emissions over 1000MHz.

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

This miscellaneous information includes details of the measured bandwidth, the test procedure and calculation of factors such as pulse desensitization and averaging factor.

8.1 **Measured Bandwidth**

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 C63.4 (2003) 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).

Peak Measurement

Bandedge compliance is determined by applying marker-delta method, i.e. (Bandedge Plot).

Lower bandedge

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

=111.00 dBµV/m - 41.43 dB
=69.57 dBµV/m

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

=81.60 dBµV/m - 41.43 dB
=40.17 dBµV/m

Upper bandedge

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

=113.00 dBµV/m – 45.59 dB
=67.41 dBµV/m

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

=83.60 dBµV/m - 45.59 dB
=38.01 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).

8.2 Discussion of Pulse Desensitization

Pulse desensitivity is not applicable for this device. The effective period (Teff) is approximately 170μs for a digital "1" bit which illustrated on technical specification, with a resolution bandwidth (3dB) of 100kHz, so the pulse desensitivity factor is 0dB.

8.3 Calculation of Average Factor

Averaging factor in dB = 20 log (duty cycle)

The specification for output field strengths in accordance with the FCC rules specify measurements with an average detector. During testing, a spectrum analyzer incorporating a peak detector was used. Therefore, a reduction factor can be applied to the resultant peak signal level and compared to the limit for measurement instrumentation incorporating an average detector.

The time period over which the duty cycle is measured is 100 milliseconds, or the repetition cycle, whichever is a shorter time frame. The worst case (highest percentage on) duty cycle is used for the calculation. The duty cycle is measured by placing the spectrum analyzer in zero scan (receiver mode) and linear mode at maximum bandwidth (3 MHz at 3 dB down) and viewing the resulting time domain signal output from the analyzer on a Tektronix oscilloscope. The oscilloscope is used because of its superior time base and triggering facilities.

A plot of the worst-case duty cycle as detected in this manner are saved with filename: af.pdf

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

The duration of one cycle = 100ms
Effective period of the cycle = 170us x 20

DC = 3.4 / 100

Therefore, the averaging factor is found by 20 $\log_{10}$ 0.034 = 29.4 dB

8.4 Emissions Test Procedures

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

The test set-up and procedures described below are designed to meet the requirements of ANSI C63.4 - 2003.

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 axes to obtain maximum emission levels. The antenna height and polarization are varied during the testing to search for maximum signal levels.

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.

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 are made as described in ANSI C63.4 - 2003.

The IF bandwidth used for measurement of radiated signal strength was 10 kHz for emission below 30 MHz and 120 kHz for emission from 30 MHz to 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 8.2). 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 restricted 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, but those measurements taken at a closer distance are so marked.

9.0 **Equipment List**

1) Radiated Emissions Test

Equipment	EMI Test Receiver	Log Periodic Antenna	Biconical Antenna
Registration No.	EW-2500	EW-0446	EW-2512
Manufacturer	ROHDESCHWARZ	EMCO	EMCO
Model No.	ESCI	3146	3104C
Calibration Date	February 24, 2011	October 31, 2011	November 15, 2011
Calibration Due Date	February 24, 2013	April 30, 2013	May 15, 2013

Equipment	14m Double Shield RF Cable	14m Double Shield RF Cable	Spectrum Analyzer
Registration No.	EW-2528	EW-2375	EW-2188
Manufacturer	RADIALL	RADIALL	AGILENTTECH
Model No.	nm / br5d / sma 14m	n m/br56/bnc m 14m	E4407B
Calibration Date	November 29, 2011	September 9, 2011	September 26, 2011
Calibration Due Date	December 14, 2012	September 12, 2012	September 26, 2012

Equipment	Double Ridged Guide Antenna	14m RF High Frequency Cable
Registration No.	EW-1133	EW-2552
Manufacturer	EMCO	RADIALL
Model No.	3115	SHF5M sma m - sma m ra
Calibration Date	March 2, 2011	August 17, 2011
Calibration Due Date	September 2, 2012	September 03, 2012

Equipment	RF Amplifiers	High Pass Filter
Registration No.	EW-1779	EW-1835
Manufacturer	MITEQ	KLMICROWAVE
Model No.	AMF-4D-001120-34-13P	11SH10-3000/T12000-0/OP
Calibration Date	August 4, 2011	November 2, 2011
Calibration Due Date	August 1, 2012	November 8, 2012

2) Conducted Emissions Test

Equipment	EMI Test Receiver	Artificial Mains Network	RF Cable 80cm (RG142)
Registration No.	EW-2500	EW-2501	EW-2452
Manufacturer	ROHDESCHWARZ	ROHDESCHWARZ	RADIALL
Model No.	ESCI	ENV-216	bnc m st / 142 / bnc m st 80cm
Calibration Date	February 24, 2011	Mar 30, 2011	June 20, 2011
Calibration Due Date	February 24, 2013	Jun 29, 2012	June 20, 2012