TEST REPORT

Report No.: HK10120313-2

Tomoe Electronics Co.

Application
For
Certification
(Original Grant)
(FCC ID: S6LB-BROOKSTONE)

Transmitter

Prepared and Checked by:

Signed On File
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Date: January 19, 2011

GENERAL INFORMATION

Tomoe Electronics Co.
BRAND NAME: BROOKSTONE, MODEL: 656736

FCC ID: S6LB-BROOKSTONE

Grantee:	Tomoe Electronics Co.
Grantee Address:	Room 1902, Stanhope House, 738 King's Road, Quarry Bay, Hong Kong.
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Manufacturer:	Otaki Broad Sound Electronic (Shenzhen) Co., Ltd.
Manufacturer Address:	Broad Sound Industrial Zone, Jin Xiu Road West, Heyi Community, Shajing, Baoan, Shenzhen, Guangdong, P.R. China.
Brand Name:	BROOKSTONE
Model:	656736
Type of EUT:	Transmitter
Description of EUT:	Wireless Outdoor Speaker
Serial Number:	N/A
FCC ID:	S6LB-BROOKSTONE
Date of Sample Submitted:	December 09, 2010
Date of Test:	January 14, 2011
Report No.:	HK10120313-2
Report Date:	January 19, 2011
Environmental Conditions:	Temperature: +10 to 40°C Humidity: 10 to 90%

SUMMARY OF TEST RESULT

Tomoe Electronics Co.
BRAND NAME: BROOKSTONE, MODEL: 656736

FCC ID: S6LB-BROOKSTONE

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
Antenna 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 Emissions	15.109 / ICES-003	N/A
Digital Device Conducted Emissions	15.107 / ICES-003	Pass

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 900MHz wireless transmitter for it corresponding speaker. Transmit carriers are generated by directly modulated frequency synthesizers controlled by a small microprocessor. There are three difference channels available, Channel 1, Channel 2 and Channel 3 and the frequencies are 926.600MHz, 925.800MHz and 927.400MHz respectively. The transmitter is powered by six AA size batteries or an AC/DC adaptor (Model: U035-090F0020, Input: 120VAC, Output: 9VDC 200mA). The blue LED in front on the EUT lighted when the channel switch selected. At the bottom of the EUT, there is a channel select switch to select the optimum channel. At the side of EUT, there is L and R RCA line in jacks and an AUX line in jack for connect the audio signal input.

Antenna Type : Internal, Integral

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

1.2 Related Submittal(s) Grants

The receiver for this transmitter (with FCC ID: S6LBROOKSTONE) has been authorized by Certification procedure.

1.3 Test Methodology

Both AC mains line-conducted 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 device is powered by 6 x 1.5V “AA” new batteries or an AC/DC adaptor (Input: 120VAC 60Hz, Output: 9.0VDC 200mA).

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 Tomoe Electronics Co. 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. Cassette Player (Provided by Intertek)
2. 0.92m audio cable (Provided by Applicant)
3. 1.53m L&R RCA cable (Provided by Applicant)
4. AC/DC adaptor, Input: 120VAC 60Hz 7W max, Output: 9.0VDC 200mA, Model: U035-090F0020 (Provided by Applicant)

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
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 8332.173 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 6.2 dB

3.4 Conducted Emission Configuration Photograph

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 more than >20 dB

Applicant: Tomoe Electronics Co. Date of Test: January 14, 2011
Model: 656736
Worst-Case Operating Mode: Transmitting

Table 1

Radiated Emissions
Pursuant to FCC Part 15 Section 15.249 Requirement

Channel 02 (Lowest Channel)

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)
V	925.797	49.1	16	33.0	66.1	94.0	-27.9
V	462.898	20.5	16	26.0	30.5	46.0	-15.5
H	1851.594	45.2	33	27.2	39.4	54.0	-14.6
H	2777.391	43.4	33	30.4	40.8	54.0	-13.2
H	3703.188	41.3	33	33.3	41.6	54.0	-12.4
H	4628.985	41.1	33	34.9	43.0	54.0	-11.0
H	5554.782	40.4	33	36.6	44.0	54.0	-10.0
H	6480.579	41.5	33	36.9	45.4	54.0	-8.6
H	7406.576	41.4	33	37.9	46.3	54.0	-7.7
H	8332.173	41.8	33	39.0	47.8	54.0	-6.2

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.

Applicant: Tomoe Electronics Co. Date of Test: January 14, 2011
Model: 656736
Worst-Case Operating Mode: Transmitting

Table 2

Radiated Emissions
Pursuant to FCC Part 15 Section 15.249 Requirement

Channel 03 (Highest Channel)

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)
V	927.397	49.3	16	33.0	66.3	94.0	-27.7
V	463.698	20.4	16	26.0	30.4	46.0	-15.6
H	1854.794	45.6	33	27.2	39.8	54.0	-14.2
H	2782.191	43.5	33	30.4	40.9	54.0	-13.1
H	3709.588	41.0	33	33.3	41.3	54.0	-12.7
H	4636.985	40.9	33	34.9	42.8	54.0	-11.2
H	5564.382	40.7	33	36.6	44.3	54.0	-9.7
H	6491.779	41.7	33	36.9	45.6	54.0	-8.4
H	7419.176	41.3	33	37.9	46.2	54.0	-7.8
H	8346.573	41.2	33	39.0	47.2	54.0	-6.8

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.

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.

8.1 Measured Bandwidth

From the following plots, they show that the fundamental emissions are confined in the specified band (902MHz and 928MHz). 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

Resultant field strength = Fundamental emissions (peak value) - delta from the plot
= 66.10dBµV/m – 41.88dB = 24.22dBµV/m

Upper bandedge

Resultant field strength = Fundamental emissions (peak value) - delta from the plot
= 66.30dBµV/m – 42.66dB = 23.64dBµV/m

The resultant field strength meets the general radiated emission limit in section 15.209, which does not exceed 46dBµV/m (Average Limit)

8.2 Discussion Pulse Desensitivity

Pulse desensitivity is not applicable for this device. Since the transmitter transmits the RF signal continuously.

8.3 Calculation of Average Factor

The average factor is not applicable for this device as the transmitted signal is a continuously signal.

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 test set-up and procedures described below are designed to meet the requirements of ANSI C63.4 - 2003. A typical or an unmodulated CW signal at the operating frequency of the EUT has been supplied to the EUT for all measurements. Such a signal is supplied by a signal generator and an antenna in close proximity to the EUT. The signal level is sufficient to stabilize the local oscillator of the EUT.

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

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.

9.0 **Equipment List**

1) Radiated Emissions Test

Equipment	EMI Test Receiver	Biconical Antenna	Log Periodic Antenna
Registration No.	EW-2251	EW-0954	EW-0446
Manufacturer	R&S	EMCO	EMCO
Model No.	ESCI	3104C	3146
Calibration Date	Oct. 22, 2009	Apr. 14, 2010	Apr. 26, 2010
Calibration Due Date	Jan. 22, 2011	Apr. 14, 2011	Oct. 26, 2011

Equipment	Spectrum Analyzer	Double Ridged Guide Antenna
Registration No.	EW-2188	EW-1015
Manufacturer	AGILENTTECH	EMCO
Model No.	E4407B	3115
Calibration Date	Dec. 27, 2010	Feb. 09, 2010
Calibration Due Date	Dec. 31, 2011	Aug. 09, 2011

2) Conducted Emissions Test

Equipment	EMI Test Receiver	Artificial Mains Network
Registration No.	EW-2666	EW-2501
Manufacturer	R&S	R&S
Model No.	ESCI7	ENV-216
Calibration Date	Oct. 12, 2010	Sep. 25, 2010
Calibration Due Date	Oct. 12, 2011	Sep. 25, 2011