

**Tomoe Electronics Co.**

Application  
For  
Certification  
**(FCC ID: S6LA-BROOKSTONE)**  
Transmitter

0505276  
TC/el  
May 26, 2005

FCC ID: S6LA-BROOKSTONE

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**Intertek Testing Services Hong Kong Ltd.**

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# INTERTEK TESTING SERVICES

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### *INTRODUCTION*

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## INTERTEK TESTING SERVICES

### MEASUREMENT/TECHNICAL REPORT

**Tomoe Electronics Co. - MODEL: OUTDOOR WIRELESS SPEAKER BROOKSTONE**  
**FCC ID: S6LA-BROOKSTONE**

This report concerns (check one:) Original Grant X Class II Change \_\_\_\_\_

Equipment Type: Low Power Transmitter (example: computer, printer, modem, etc.)

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)? Yes \_\_\_\_\_ No X

If yes, defer until: \_\_\_\_\_  
date

Company Name agrees to notify the Commission by: \_\_\_\_\_  
date

of the intended date of announcement of the product so that the grant can be issued on that date.

Transition Rules Request per 15.37? Yes \_\_\_\_\_ No X

If no, assumed Part 15, Subpart C for intentional radiator - the new 47 CFR [12-08-03 Edition] provision.

Report prepared by:

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# INTERTEK TESTING SERVICES

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### List of attached file

| Exhibit type          | File Description               | filename             |
|-----------------------|--------------------------------|----------------------|
| Test Report           | Test Report                    | report.pdf           |
| Operation Description | Technical Description          | descri.pdf           |
| Test Setup Photo      | Radiated Emission              | radiated photos.pdf  |
| Test Setup Photo      | Conduct Emission               | conducted photos.pdf |
| Test Report           | Conducted Emission Test Result | conduct.pdf          |
| External Photo        | External Photo                 | external photos.pdf  |
| Internal Photo        | Internal Photo                 | internal photos.pdf  |
| Block Diagram         | Block Diagram                  | block.pdf            |
| Test Report           | Bandwidth Plot                 | bw.pdf               |
| Schematics            | Circuit Diagram                | circuit.pdf          |
| ID Label/Location     | Label Artwork and Location     | label.pdf            |
| User Manual           | User Manual                    | manual.pdf           |

# **INTERTEK TESTING SERVICES**

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## **EXHIBIT 1**

### **GENERAL DESCRIPTION**

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### 1.0 **General Description**

#### 1.1 Product Description

The Equipment Under Test (EUT) is a 900 MHz 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 926.6MHz, 925.8MHz and 927.4MHz respectively. The transmitter is powered or AC/DC adaptor (Model: 35U-D0915). The blue LED in front on the EUT lighted when the channel switch selected. At the back of EUT, there is a channel select switch to select the optimum channel and L and R RCA Line in jacks for connect the audio signals connected.

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

#### 1.2 Related Submittal(s) Grants

The Certification procedure of receiver for this transmitter (with FCC ID: S6LBROOKSTONE) is being processed as the same time of this application.

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### 1.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.4 (2001). Radiated Emission measurement was performed in Open Area Test Sites and Conducted Emission was performed in shield room. Preliminary scans were performed in the Open Area Test Sites only to determine worst case modes. For each scan, the procedure for maximizing emissions in Appendices D and E were followed. 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.



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### **EXHIBIT 2**

### **SYSTEM TEST CONFIGURATION**

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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 (2001).

The EUT was powered by an AC/DC Adaptor (Model: 35U-D0915). The rear of unit shall be flush with the rear of the table.

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. The step by step procedure for maximizing emissions led to the data reported in Exhibit 3.0.

The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). The EUT was placed on turntable, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes. The worst case bit sequence was applied during test.

#### 2.2 EUT Exercising Software

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

#### 2.3 Special Accessories

There are no special accessories necessary for compliance of this product.

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### 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.

### 2.5 Measurement Uncertainty

When determining the test conclusion, the measurement uncertainty of test has been considered.

### 2.6 Support Equipment List and Description

Cassette Player with 1.5m Audio Cable

All the items listed under section 2.0 of this report are confirmed by:

*Billy Chow*  
*Senior Supervisor - Home Entertainment Electronics*  
*Intertek Testing Services Hong Kong Ltd.*  
*Agent for Tomoe Electronics Co.*



\_\_\_\_\_  
Signature

\_\_\_\_\_  
May 26, 2005 Date

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### **EXHIBIT 3**

### **EMISSION RESULTS**

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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.

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### 3.1 Field Strength Calculation

The field strength is calculated by adding the reading on the Spectrum Analyzer to the factors associated with preamplifiers (if any), antennas, cables, pulse desensitization and average factors (when specified limit is in average and measurements are made with peak detectors). A sample calculation is included below.

$$FS = RA + AF + CF - AG + PD + AV$$

where FS = Field Strength in dB $\mu$ V/m

RA = Receiver Amplitude (including preamplifier) in dB $\mu$ V

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB

AG = Amplifier Gain in dB

PD = Pulse Desensitization in dB

AV = Average Factor in -dB

In the radiated emission table which follows, the reading shown on the data table may reflect the preamplifier gain. An example of the calculations, where the reading does not reflect the preamplifier gain, follows:

$$FS = RA + AF + CF - AG + PD + AV$$

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### 3.1 Field Strength Calculation (cont'd)

#### Example

Assume a receiver reading of 62.0 dB $\mu$ V is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted. The pulse desensitization factor of the spectrum analyzer was 0 dB, and the resultant average factor was -10 dB. The net field strength for comparison to the appropriate emission limit is 32 dB $\mu$ V/m. This value in dB $\mu$ V/m was converted to its corresponding level in  $\mu$ V/m.

$$RA = 62.0 \text{ dB}\mu\text{V}$$

$$AF = 7.4 \text{ dB}$$

$$CF = 1.6 \text{ dB}$$

$$AG = 29.0 \text{ dB}$$

$$PD = 0 \text{ dB}$$

$$AV = -10 \text{ dB}$$

$$FS = 62 + 7.4 + 1.6 - 29 + 0 + (-10) = 32 \text{ dB}\mu\text{V/m}$$

$$\text{Level in mV/m} = \text{Common Antilogarithm} [(32 \text{ dB}\mu\text{V/m})/20] = 39.8 \mu\text{V/m}$$

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### 3.2 Radiated Emission Configuration Photograph

Worst Case Radiated Emission  
at  
2781.376 MHz

For electronic filing, the front view and back view of the test configuration photographs are saved with filename: radiated photos.pdf respectively.



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### 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.

Judgement: Passed by 3.2 dB margin

#### **TEST PERSONNEL:**



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*Signature*

Terry C. H. Chan, Compliance Engineer  
*Typed/Printed Name*

May 26, 2005  
*Date*

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## INTERTEK TESTING SERVICES

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Company: Tomoe Electronics Co.

Date of Test: April 11, 2005

Model: OUTDOOR WIRELESS SPEAKER BROOKSTONE

Worst Case Operating Mode: Transmitting (Channel 02)

**Table 1**  
**Radiated Emissions**

**Channel 02**

| Polarization | Frequency (MHz) | Reading (dB $\mu$ V) | Pre-Amp (dB) | Antenna factor (dB) | Net at 3m (dB $\mu$ V/m) | Limit at 3m (dB $\mu$ V/m) | Margin (dB) |
|--------------|-----------------|----------------------|--------------|---------------------|--------------------------|----------------------------|-------------|
| V            | 925.792         | 54.5                 | 16           | 33                  | 71.5                     | 94                         | -22.5       |
| V            | 462.896         | 23.6                 | 16           | 26                  | 33.6                     | 46                         | -12.4       |
| V            | 1389.688        | 50.8                 | 34           | 26.1                | 42.9                     | 54                         | -11.1       |
| V            | 1853.584        | 50.3                 | 34           | 27.2                | 43.5                     | 54                         | -10.5       |
| V            | *2317.480       | 49.1                 | 34           | 29.4                | 44.5                     | 54                         | -9.5        |
| V            | *2781.376       | 54.4                 | 34           | 30.4                | 50.8                     | 54                         | -3.2        |
| V            | 3245.272        | 47.5                 | 34           | 31.9                | 45.4                     | 54                         | -8.6        |
| V            | *3709.168       | 45.3                 | 34           | 33.3                | 44.6                     | 54                         | -9.4        |

- 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 margin column shows emission below limit.
4. Horn antenna is used for the emission over 1000MHz.
5. '\*' Emission within restricted band fulfill the requirement of section 15.205.

Test Engineer: Terry C. H. Chan

## INTERTEK TESTING SERVICES

Company: Tomoe Electronics Co.

Date of Test: April 11, 2005

Model: OUTDOOR WIRELESS SPEAKER BROOKSTONE

Worst Case Operating Mode: Transmitting (Channel 03)

**Table 2**  
**Radiated Emissions**

**Channel 03**

| Polarization | Frequency (MHz) | Reading (dB $\mu$ V) | Pre-Amp (dB) | Antenna factor (dB) | Net at 3m (dB $\mu$ V/m) | Limit at 3m (dB $\mu$ V/m) | Margin (dB) |
|--------------|-----------------|----------------------|--------------|---------------------|--------------------------|----------------------------|-------------|
| V            | 927.446         | 54.8                 | 16           | 33.0                | 71.8                     | 94                         | -22.2       |
| V            | 463.696         | 23.9                 | 16           | 26.0                | 33.9                     | 46                         | -12.1       |
| V            | 1391.088        | 51.0                 | 34           | 26.1                | 43.1                     | 54                         | -10.9       |
| V            | 1854.784        | 50.6                 | 34           | 27.2                | 43.8                     | 54                         | -10.2       |
| V            | *2318.480       | 48.8                 | 34           | 29.4                | 44.2                     | 54                         | -9.8        |
| V            | *2782.176       | 54.3                 | 34           | 30.4                | 50.7                     | 54                         | -3.3        |
| V            | 3245.872        | 47.3                 | 34           | 31.9                | 45.2                     | 54                         | -8.8        |
| V            | *3709.568       | 45.2                 | 34           | 33.3                | 44.5                     | 54                         | -9.5        |

- 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 margin column shows emission below limit.
  4. Horn antenna is used for the emission over 1000MHz.
  5. '\*' Emission within restricted band fulfill the requirement of section 15.205.

Test Engineer: Terry C. H. Chan

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### 3.4 Conducted Emission Configuration Photograph

Worst Case Conducted Emission  
at  
0.15 MHz

For electronic filing, the front view, rear view and side view of the test configuration photographs are saved with filename: conducted photos.pdf.

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Company: Tomoe Electronics Co.

Date of Test: April 11, 2005

Model: OUTDOOR WIRELESS SPEAKER BROOKSTONE

### **Conducted Emissions Section 15.107 Requirements**

For Electronic filing, the conducted emission test result is saved with filename:  
conduct.pdf

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### 3.5 Conducted Emission Data

For electronic filing, the graph and data table of conducted emission are saved with filename: conduct.pdf. The data table lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

Judgement: Passed by at least 20 dB margin

#### **TEST PERSONNEL:**



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*Signature*

Terry C. H. Chan, Compliance Engineer  
*Typed/Printed Name*

May 26, 2005  
*Date*

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### **EXHIBIT 4**

### **EQUIPMENT PHOTOGRAPHS**

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### 4.0 **Equipment Photographs**

For electronic filing, photographs of the tested EUT are saved with filename: external photos.pdf for external photo, and internal photos.pdf for internal photo.



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### **EXHIBIT 5**

### **PRODUCT LABELLING**

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### 5.0 **Product Labelling**

For electronics filing, the FCC ID label artwork and the label location are saved with filename: label.pdf.

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### **EXHIBIT 6**

### **TECHNICAL SPECIFICATIONS**

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### 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.

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## **EXHIBIT 7**

### **INSTRUCTION MANUAL**

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### 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. Moreover, it was said that the declaration which mention in following pages will also be committed at the time.

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### **EXHIBIT 8**

### **MISCELLANEOUS INFORMATION**

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### 8.0 **Miscellaneous Information**

The miscellaneous information includes details of the measured bandwidth, the test procedure.



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### 8.1 Measured Bandwidth

For electronic filing, the plot on saved in bw.pdf shows the fundamental emission which is applied audio input 15KHz modulation. From the plot, it shows the emission is with the band edge 902MHz and 928MHz.

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### 8.2 Discussion of Pulse Desensitization

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.

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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 Low Power 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 - 2001.

The 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 450 kHz to 30 MHz.

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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 - 2001.

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 8.2). Above 1000 MHz, a resolution bandwidth of 1 MHz is used.

Measurements are normally conducted at a measurement distance of three meters. All measurements are extrapolated to three meters using inverse scaling, unless otherwise reported. Measurements taken at a closer distance are so marked.