

## **Musical Electronics Limited**

Application  
For  
Certification  
**(FCC ID: AUIFRS220A)**

April 25, 2002

WO# 0205037  
WL/Sandy  
April 25, 2002

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**Intertek Testing Services Hong Kong Ltd.**  
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# INTERTEK TESTING SERVICES

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# INTERTEK TESTING SERVICES

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## MEASUREMENT/TECHNICAL REPORT

**Application** : Musical Electronics Limited  
**Trade Name/Model No.:** MUSICAL FRS220A  
COLEMAN FRS14/38 (Art No. 801.417)  
COLEMAN FRS14/38 (Art No. 801.424)  
**Date** : April 25, 2002

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

Equipment Type: Family Radio Service, FRS

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

Report prepared by:

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Intertek Testing Services  
2/F., Garment Centre,  
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# INTERTEK TESTING SERVICES

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## INTERTEK TESTING SERVICES

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List of attached file

| Exhibit type          | File Description                | Filename            |
|-----------------------|---------------------------------|---------------------|
| Operation Description | Technical Description           | descri.pdf          |
| Test Report           | Bandwidth Plot                  | bw.pdf              |
| Test Report           | Modulation Frequency Response   | mfr.pdf             |
| Test Report           | Modulation Limit Characteristic | mlc.pdf             |
| Test Report           | Spurious Emission               | spurious.pdf        |
| Block Diagram         | Block Diagram                   | block.pdf           |
| Schematics            | Circuit Diagram                 | circuit.pdf         |
| ID Label/Location     | Label Artwork and Location      | label.pdf           |
| User Manual           | User Manual                     | manual.pdf          |
| Test Report           | Test Report                     | report.pdf          |
| Test Setup Photo      | Radiated Emission               | radiated photos.doc |
| Internal Photo        | Internal Photo                  | internal photos.doc |
| External Photo        | External Photo                  | external photos.doc |
| Test Report           | Tune Up Procedure               | tuneup.pdf          |
| Test Report           | Part List                       | partlist.pdf        |
| Test Report           | Audio Low Pass Filter Response  | lpf.pdf             |

**INTERTEK TESTING SERVICES**

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**EXHIBIT 1**

**GENERAL DESCRIPTION**

# INTERTEK TESTING SERVICES

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## 1.0 General Description

### 1.1 Product Description

The Equipment Under Test (EUT) is a 14-Channel Family Radio Service (FRS) Transceiver operating between 462.5625 and 467.7125MHz. The EUT is powered by 6V d.c. (4 x 1.5V “AAA” battery).

#### Transmitter Portion

- i) Type of Emission : 10K5F3E
- ii) Frequency Range : 462.5625 to 467.7125MHz
- iii) Maximum Power Rating : 0.21W ERP
- iv) Type of Antenna : Integral, external

The Model: COLEMAN FRS14/38 (Art No. 801.417) and COLEMAN FRS14/38 (Art No. 801.424) are same as the Model: Musical FRS220A except that they have different cosmetic.

The brief circuit description is saved with filename: descri.pdf

## INTERTEK TESTING SERVICES

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### 1.2 Related Submittal(s) Grants

This is an Application for Certification of the transmitter portion of a FRS Transceiver. The receiver section of the FRS Transceiver is subject to verification process.

### 1.3 Test Methodology

Radiated emission measurements were performed according to the procedures in ANSI C63.4 (1992) and ANSI/TIA/EIA-603-1992. All measurement were performed in Open Area Test Sites. Preliminary scans were performed in the Open Area Test Sites only to determine worst case modes. For each scan, the procedure of maximizing emissions in Appendices D and E were followed. All Radiated tests were performed at an antenna the 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 emission data is located at Garment Centre, 576 Castle Peak Road, Kowloon, Hong Kong. The test facility and site measurement data have been fully placed on file with the FCC.



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**EXHIBIT 2**

**SYSTEM TEST CONFIGURATION**

## INTERTEK TESTING SERVICES

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### 2.0 System Test Configuration

#### 2.1 Justification

The device was configured for testing in a typical fashion (as a customer would normally use it). The device was placed on a turntable, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes. When the radiated emissions are measured.

The device was powered by 4 x fully charged 1.5V "AAA" battery.

The frequency range from 30 MHz to 4.68 GHz was searched for spurious emissions from the device. Only those emissions reported were detected. All other emissions were at least 20 dB below the applicable limits.

## INTERTEK TESTING SERVICES

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### 2.2 EUT Exercising Software

There was no special software to exercise the device. Once the unit is powered on, a signal is transmitted.

### 2.3 Special Accessories

A special headset is provided by client for compliance of this device.

### 2.4 Measurement Uncertainty

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

### 2.5 Equipment Modification

Any modification installed previous to testing by Musical Electronics Limited will be incorporated in each production model sold/leased in the United States.

No modification were installed by Intertek Testing Services.

*Confirmed by:*

*Wilson Loke  
Manager  
Intertek Testing Services  
Agent for Musical Electronics Limited*



\_\_\_\_\_ Signature

\_\_\_\_\_ April 25, 2002 \_\_\_\_\_ Date

**INTERTEK TESTING SERVICES**

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**EXHIBIT 3**

**RF POWER OUTPUT**

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## INTERTEK TESTING SERVICES

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### 3.0 **RF Power Output (Section 2.1046(a))**

#### A. Equipment Used

| <b>Equipment</b>     | <b>Brand Name</b> | <b>Model No.</b> |
|----------------------|-------------------|------------------|
| Biconical Antenna    | CDI               | B300             |
| Test receiver        | Rohde & Schwarz   | ESVS30           |
| RF Filter            | Tailithic         | 3VF              |
| Tuned Dipole Antenna | CDI               | Robert Antenna 4 |
| Signal Generator     | Maconi            | 2024             |

#### B. Testing Procedure

1. On a test site, the EUT shall be placed at 1.5m height on a turn table, and in the position closest to normal use as declared by the applicant.
2. The test antenna shall be oriented initially for vertical polarisation located 3m from EUT to correspond to the frequency of the transmitter.
3. The output of the test antenna shall be connected to the measuring receiver and the quasi-peak detector is used for the measurement.
4. The transmitter shall be switched on, if possible, without modulation and the measuring receiver shall be tuned to the frequency of the transmitter under test.
5. The test antenna shall be raised and lowered through the specified range of height until a maximum signal level is detected by the measuring receiver.

## INTERTEK TESTING SERVICES

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6. The transmitter shall then be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
7. The test antenna shall be raised and lowered again through the specified range of height until a maximum signal level is detected by the measuring receiver.
8. The maximum signal level detected by the measuring receiver shall be noted.
9. The transmitter shall be replaced by a tuned dipole (substitution antenna).
10. The substitution antenna shall be orientated for vertical polarisation and the length of the substitution antenna shall be adjusted to correspond to the frequency of the transmitter.
11. The substitution antenna shall be connected to a calibrated signal generator.
12. If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
13. The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
14. The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuator setting of the measuring receiver.
15. The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.
16. The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarisation.
17. The measure of the effective radiated power is the larger of the two levels recorded, at the input to the substitution antenna, corrected for gain of the substitution antenna if necessary.

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## INTERTEK TESTING SERVICES

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**Table 1**

**Musical Electronics Limited  
MUSICAL FRS220A**

**Transmission Power**

| Channel | Frequency<br>(MHz) | Effective Radiated Power |      | Limit<br>(W) | Margin<br>(W) |
|---------|--------------------|--------------------------|------|--------------|---------------|
|         |                    | (dBm)                    | (W)  |              |               |
| 1       | 462.5625           | 23.2                     | 0.21 | 0.5          | -0.29         |
| 2       | 462.5875           | 23.2                     | 0.21 | 0.5          | -0.29         |
| 3       | 462.6125           | 23.2                     | 0.21 | 0.5          | -0.29         |
| 4       | 462.6375           | 23.2                     | 0.21 | 0.5          | -0.29         |
| 5       | 462.6625           | 23.2                     | 0.21 | 0.5          | -0.29         |
| 6       | 462.6875           | 23.2                     | 0.21 | 0.5          | -0.29         |
| 7       | 462.7125           | 23.2                     | 0.21 | 0.5          | -0.29         |
| 8       | 467.5625           | 23.2                     | 0.21 | 0.5          | -0.29         |
| 9       | 467.5875           | 23.2                     | 0.21 | 0.5          | -0.29         |
| 10      | 467.6125           | 23.2                     | 0.21 | 0.5          | -0.29         |
| 11      | 467.6375           | 23.2                     | 0.21 | 0.5          | -0.29         |
| 12      | 467.6625           | 23.2                     | 0.21 | 0.5          | -0.29         |
| 13      | 467.6875           | 23.2                     | 0.21 | 0.5          | -0.29         |
| 14      | 467.7125           | 23.2                     | 0.21 | 0.5          | -0.29         |

Notes: Negative sign in the margin column shows the value below limits.

Test Engineer: Ben W. K. Ho

Date of Test: April 23, 2002

**INTERTEK TESTING SERVICES**

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**EXHIBIT 4**

**MODULATION CHARACTERISTICS**



## INTERTEK TESTING SERVICES

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### 4.0 Modulation Characteristics

In order to satisfy the 95.637(a) requirement, Modulation Frequency Response and Modulation Limit Characteristics are attached in Exhibit 4.1 & 4.2.

Plots for each tests are saved with filename: mfr.pdf and mlc.pdf

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## INTERTEK TESTING SERVICES

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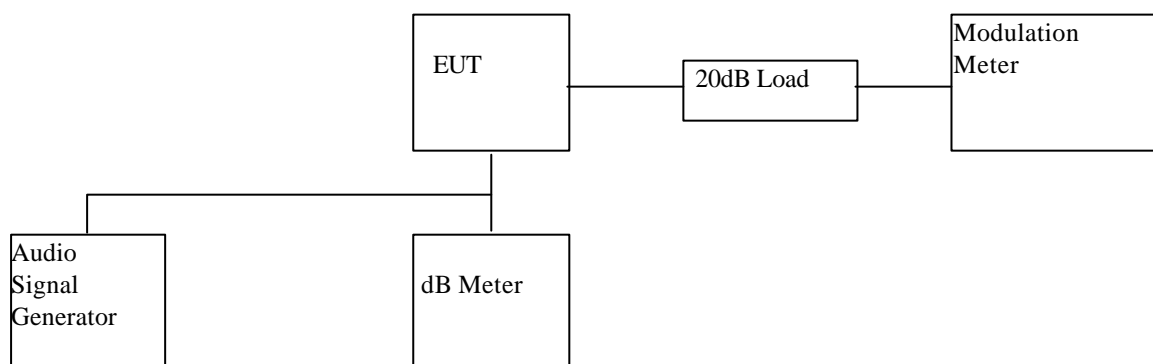
### 4.1 Modulation Frequency Response

#### A. Test Equipment

| Equipment              | Brand Name         | Model No.  |
|------------------------|--------------------|------------|
| Audio Signal Generator | Leader             | LFG-1300S  |
| dB meter               | Leader             | LMV-182A   |
| 20 dB RF Load          | Bird               | 8304-200-N |
| Modulation Meter       | Marconi Instrument | 2945       |

#### B. Testing Procedure

- 1) Set-up the test equipment in the following configuration:



- 2) Set the audio signal generator frequency to the sound pressure level 97.0dB SPL at the microphone of the EUT.
- 3) The frequency of the audio signal generator is changed from 200Hz to 5kHz.
- 4) Record the frequency deviation.

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## INTERTEK TESTING SERVICES

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### C. Test Result

Table 2

**Musical Electronics Limited  
MUSICAL FRS220A**

### Modulation Frequency Response

Test Channel : 4

Input level = 97.0dB SPL

| Modulation Frequency (Hz) | Modulation index (%) |
|---------------------------|----------------------|
| 200                       | 0.40                 |
| 300                       | 0.37                 |
| 400                       | 0.40                 |
| 500                       | 0.70                 |
| 600                       | 0.77                 |
| 700                       | 0.79                 |
| 800                       | 0.79                 |
| 900                       | 0.61                 |
| 1000                      | 0.62                 |
| 1250                      | 0.44                 |
| 1500                      | 0.38                 |
| 1750                      | 0.41                 |
| 2000                      | 0.48                 |
| 2250                      | 0.50                 |
| 2500                      | 0.46                 |
| 2750                      | 0.35                 |
| 3000                      | 0.27                 |
| 3125                      | 0.24                 |
| 3250                      | 0.22                 |
| 3500                      | 0.17                 |
| 4000                      | 0.08                 |
| 5000                      | 0.02                 |

Test Engineer: Ben W. K. Ho

Date of Test: April 23, 2002

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## INTERTEK TESTING SERVICES

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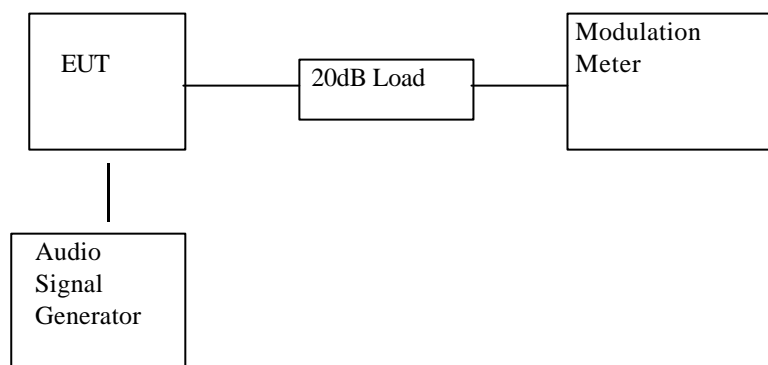
### 4.2 Modulation Limiting Characteristics (Section 2.1047(b))

#### A. Test Equipment

| Equipment              | Brand Name | Model No.  |
|------------------------|------------|------------|
| Audio Signal Generator | Leader     | LFG-1300S  |
| 20 dB RF Load          | Bird       | 8304-200-N |
| Modulation Meter       | Marconi    | 2950       |

#### B. Testing Procedure

- 1) Set-up the test equipment in the following configuration:



- 2) Set the frequency of the audio signal generator to 500Hz and adjust the level from 47dBSPL to 127dBSPL.
- 3) Record the maximum value of plus or minus peak frequency deviation.
- 4) Repeat the above procedure with frequency 1000Hz, 2500Hz & 3125Hz.

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## INTERTEK TESTING SERVICES

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### C. Test Result

**Table 3**

**Musical Electronics Limited  
MUSICAL FRS220A**

#### Modulation Limiting Characteristics

Test Channel : 4

| <b>Modulation<br/>Input<br/>(dB SPL)</b> | <b>Peak Frequency<br/>Deviation (kHz)<br/>at 500Hz</b> | <b>Peak Frequency<br/>Deviation (kHz)<br/>at 1000Hz</b> | <b>Peak Frequency<br/>Deviation (kHz)<br/>at 2500Hz</b> | <b>Peak Frequency<br/>Deviation (kHz)<br/>at 3125Hz</b> |
|--|--|---|---|---|
| 47                                       | 0.04   | 0.04  | 0.04  | 0.04  |
| 57                                       | 0.04   | 0.04  | 0.05  | 0.04  |
| 67                                       | 0.04   | 0.05  | 0.07  | 0.05  |
| 77                                       | 0.04   | 0.08  | 0.14  | 0.10  |
| 87                                       | 0.04   | 0.17  | 0.38  | 0.23  |
| 97                                       | 0.35   | 0.63  | 1.10  | 0.75  |
| 107                                      | 0.95   | 1.62  | 1.85  | 1.35  |
| 117                                      | 1.81   | 1.85  | 1.93  | 1.44  |
| 127                                      | 2.40   | 1.86  | 1.94  | 1.45  |
| 137                                      | 2.46   | 1.86  | 1.95  | 1.46  |

Test Engineer: Ben W. K. Ho

Date of Test: April 23, 2002

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## INTERTEK TESTING SERVICES

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### 4.3 Audio Low Pass Filter Response (Section 95.637(b))

#### A. Test Equipment

| Equipment              | Brand Name | Model No. |
|------------------------|------------|-----------|
| Audio Signal Generator | Leader     | LFG-1300S |
| dB meter               | Leader     | LMV-182A  |

#### B. Testing Procedure

- 1) Connect the audio signal generator to the input of the post limiter low pass filter and the dB meter to the output of the post limiter low pass filter.
- 2) Apply a 1000 Hz tone from the audio signal generator and adjust the level per manufacturer's specifications. Record the dB level of the 1000 Hz tone as  $LEV_{REF}$ .
- 3) Set the audio signal generator to the desired test frequency between 3000 Hz and the upper low pass filter limit. Record the dB level at the test frequency as  $LEV_{FREQ}$ .
- 4) Calculate the audio frequency response at the test frequency as:

$$\text{low pass filter response} = LEV_{FREQ} - LEV_{REF}$$

- 5) Repeat the above procedure for all the desired test frequencies.

#### C. Test Result

For electronic filing, the audio low pass frequency response is saved with filename: lpf.pdf.

**INTERTEK TESTING SERVICES**

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**EXHIBIT 5**

**OCCUPIED BANDWIDTH**

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## INTERTEK TESTING SERVICES

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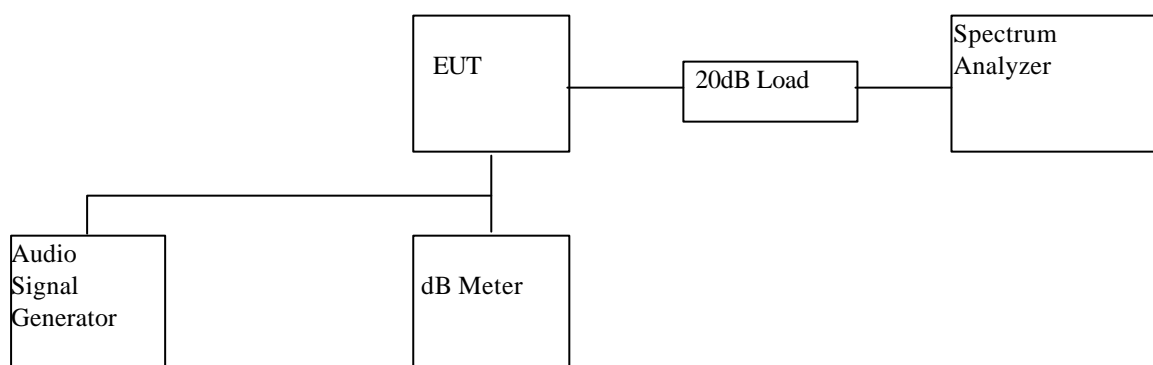
### 5.0 Occupied Bandwidth (Section 95.633(c))

#### A. Test Equipment

| Equipment              | Brand Name      | Model No.  |
|------------------------|-----------------|------------|
| Audio Signal Generator | Leader          | LFG-1300S  |
| dB meter               | Leader          | LMV-182A   |
| 20 dB RF Load          | Bird            | 8304-200-N |
| Spectrum Analyzer      | Hewlett Packard | 8951EM     |

#### B. Testing Procedure

- 1) Set-up the test equipment in the following configuration:



- 2) Set the level of audio signal generator to obtain 16 dB greater than required for 50% modulation.
- 3) The occupied bandwidth is measured with the spectrum analyzer set at 5kHz/div scan and 10dB/div.

#### C. Test Result

The occupied Bandwidth is measured to be 10.5 kHz.

For the electronic filing, the bandwidth plot is saved with filename:  
bw.pdf

Test Engineer: Ben W. K. Ho

Date of Test: April 23, 2002



**INTERTEK TESTING SERVICES**

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**EXHIBIT 6**

**SPURIOUS EMISSION**

## INTERTEK TESTING SERVICES

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### 6.0 Spurious Emission (Section 95.635)

In order to satisfy the 95.635 requirement, the spurious emission from the EUT are measured and shown in the Exhibit 6.1.

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## INTERTEK TESTING SERVICES

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### 6.1 Field Strength of Spurious Radiation (Section 95.635)

#### A. Test Equipment

| Equipment     | Brand Name      | Model No.            |
|---------------|-----------------|----------------------|
| Antenna       | CDI             | B100,B200,B300, Horn |
| Test receiver | Rohde & Schwarz | ESVS30               |
| RF Filter     | Tailithic       | 3VF                  |

#### B. Testing Procedure

Radiated emission measurements were performed according to the procedures in ANSI C63.4(1992). All measurements were performed in Open Area Test Sites located at Roof Top of Garment Centre, 576 Castle Peak Road, Kowloon, Hong Kong.

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### **C. Radiated Emission Configuration Photograph**

#### Worst Case Radiated Emission

For electronic filing, the radiated emission configurations photograph is saved with filename: radiated photos.doc

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## INTERTEK TESTING SERVICES

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### C. Test Result

**Musical Electronics Limited  
MUSICAL FRS220A**

**Table 4(a)**

1. Unwanted emission from CARRIER  $\pm 6.25\text{kHz}$  to CARRIER  $\pm 31.25\text{kHz}$

(Refer to the plots which is saved with filename: spurious.pdf)

| <b>Region</b>   | <b>Unwanted emission</b> |                   |
|---|--------------------------|-------------------|
|   | <b>Channel 4</b>         | <b>Channel 11</b> |
| CARRIER $\pm 6.25\text{kHz}$ to $\pm 12.5\text{kHz}$  | $<25\text{dB}$           | $<25\text{dB}$    |
| CARRIER $\pm 12.5\text{kHz}$ to $\pm 31.25\text{kHz}$ | $<35\text{dB}$           | $<35\text{dB}$    |

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## INTERTEK TESTING SERVICES

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**Table 4(b): Channel 4**

| <b>Frequency</b><br><b>(MHz)</b> | <b>Effective Radiated Power</b><br><b>(dBm)</b> | <b>Transmission Power</b><br><b>(dBm)</b> | <b>Attenuation</b><br><b>(dB)</b> | <b>Limit</b><br><b>(dB)</b> | <b>Margin</b><br><b>(dB)</b> |
|----------------------------------|---|---|-----------------------------------|-----------------------------|------------------------------|
| 925.320                          | -24.8   | 23.2                                      | 48.1                              | 36.2                        | 11.8                         |
| 1387.908                         | -25.1   | 23.2                                      | 48.4                              | 36.2                        | 12.1                         |
| 1850.564                         | -27.4   | 23.2                                      | 50.7                              | 36.2                        | 14.4                         |
| 2313.206                         | -38.4   | 23.2                                      | 61.7                              | 36.2                        | 25.4                         |
| 2775.863                         | -48.4   | 23.2                                      | 71.7                              | 36.2                        | 35.4                         |

- Remark:
1. Transmission power is 23.2 dBm or -6.8 dB(W).
  2. According to Section 95.635(b7), the unwanted emission should be attenuated below TP by at least  $43 + 10 \log_{10}(\text{TP})$  dB or 36.2 dB.
  3. The test is performed according to ANSI/TIA/EIA-603-1992.

Test Engineer: Ben W. K. Ho

Date of Test: April 23, 2002

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## INTERTEK TESTING SERVICES

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**Table 4(b): Channel 11**

| <b>Frequency<br/>(MHz)</b> | <b>Effective<br/>Radiated<br/>Power<br/>(dBm)</b> | <b>Transmission<br/>Power<br/>(dBm)</b> | <b>Attenuation<br/>(dB)</b> | <b>Limit<br/>(dB)</b> | <b>Margin<br/>(dB)</b> |
|----------------------------|---|---|-----------------------------|-----------------------|------------------------|
| 935.320                    | -24.7   | 23.2                                    | 48.0                        | 36.2                  | 11.7                   |
| 1402.980                   | -24.6   | 23.2                                    | 47.9                        | 36.2                  | 11.6                   |
| 1870.640                   | -28.3   | 23.2                                    | 51.6                        | 36.2                  | 15.3                   |
| 2338.300                   | -38.3   | 23.2                                    | 61.6                        | 36.2                  | 25.3                   |
| 2805.960                   | -48.0   | 23.2                                    | 71.3                        | 36.2                  | 35.0                   |

- Remark:
1. Transmission power is 23.2 dBm or -6.8 dB(W).
  2. According to Section 95.635(b7), the unwanted emission should be attenuated below TP by at least  $43 + 10 \log_{10} (TP)$  dB or 36.2 dB.
  3. The test is performed according to ANSI/TIA/EIA-603-1992.

Test Engineer: Ben W. K. Ho

Date of Test: April 23, 2002

**INTERTEK TESTING SERVICES**

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**EXHIBIT 7**

**FREQUENCY STABILITY**



## INTERTEK TESTING SERVICES

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### 7.0 Frequency Stability

The frequency tolerance was tested in normal condition & over extreme ambient conditions with respect to voltage and temperature variation.

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## INTERTEK TESTING SERVICES

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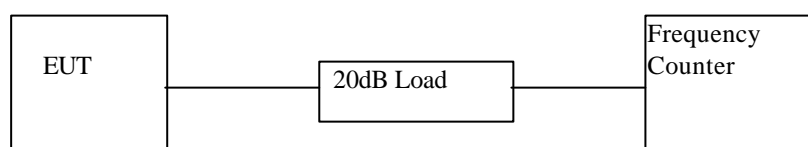
### 7.1 Frequency Tolerance (Section 95.627)

#### A. Test Equipment

| Equipment              | Brand Name | Model No.  |
|------------------------|------------|------------|
| Regulated Power Supply | PAD        | 30-35L     |
| 20 dB RF Load          | Bird       | 8304-200-N |
| Frequency Counter      | Phillips   | PM6668     |

#### B. Testing Procedure

- 1) Set-up the test equipment in the following configuration:



- 2) Measure all transmit channel frequencies in MHz.

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## INTERTEK TESTING SERVICES

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### C. Test Result

**Table 5**

**Musical Electronics Limited  
MUSICAL FRS220A**

**Frequency Tolerance**

| Channel | Frequency (MHz) | Measured Frequency (MHz) | Tolerance (%) |
|---------|-----------------|--------------------------|---------------|
| 1       | 462.5625        | 462.56261                | -0.000024     |
| 2       | 462.5875        | 462.58761                | -0.000024     |
| 3       | 462.6125        | 462.61260                | -0.000022     |
| 4       | 462.6375        | 462.63759                | -0.000019     |
| 5       | 462.6625        | 462.66258                | -0.000017     |
| 6       | 462.6875        | 462.68757                | -0.000015     |
| 7       | 462.7125        | 462.71257                | -0.000015     |
| 8       | 467.5625        | 467.56257                | -0.000015     |
| 9       | 467.5875        | 467.58756                | -0.000013     |
| 10      | 467.6125        | 467.61256                | -0.000013     |
| 11      | 467.6375        | 467.63755                | -0.000011     |
| 12      | 467.6625        | 467.66254                | -0.000009     |
| 13      | 467.6875        | 467.68754                | -0.000009     |
| 14      | 467.7125        | 467.71254                | -0.000009     |

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## INTERTEK TESTING SERVICES

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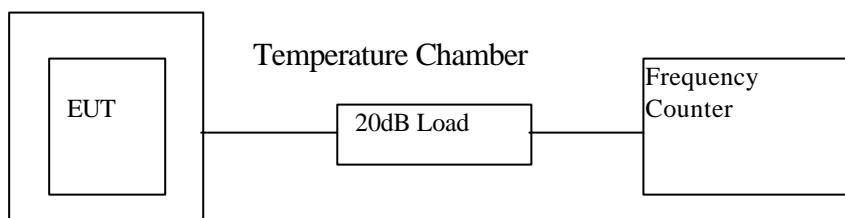
### 7.2 Frequency Stability - Temperature (Section 2.1055)

#### A. Test Equipment

| Equipment         | Brand Name | Model No.  |
|-------------------|------------|------------|
| 20 dB RF Load     | Bird       | 8304-200-N |
| Frequency Counter | Phillips   | PM6668     |

#### B. Testing Procedure

- 1) Set-up the test equipment in the following configuration:



- 2) Set the Temperature Chamber to  $-20^{\circ}\text{C}$  and stabilize the EUT temperature for one hour. Set transmitter ON for two minutes.
- 3) Measure the channel frequency of channel 4, 11 in MHz.
- 4) Turn the EUT OFF
- 5) Repeat the above procedure from  $-20^{\circ}\text{C}$  to  $50^{\circ}\text{C}$  with  $10^{\circ}\text{C}$  increment.

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## INTERTEK TESTING SERVICES

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### C. Test Result

**Table 6(a)**

**Musical Electronics Limited  
MUSICAL FRS220A**

**Frequency Deviation with Temperature Variation**

Channel : 4

| Temperature (°C) | Assigned Frequency (MHz) | Measured Frequency (MHz) | % Deviation |
|------------------|--------------------------|--------------------------|-------------|
| -20              | 462.6375                 | 462.63735                | 0.000032    |
| -10              | 462.6375                 | 462.63771                | -0.000045   |
| 0                | 462.6375                 | 462.63777                | -0.000058   |
| 10               | 462.6375                 | 462.63767                | -0.000037   |
| 20               | 462.6375                 | 462.63759                | -0.000019   |
| 30               | 462.6375                 | 462.63706                | 0.000095    |
| 40               | 462.6375                 | 462.63723                | 0.000058    |
| 50               | 462.6375                 | 462.63732                | 0.000039    |

Test Engineer: Ben W. K. Ho

Date of Test: April 23, 2002

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## INTERTEK TESTING SERVICES

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### C. Test Result

**Table 6(b)**

**Musical Electronics Limited  
MUSICAL FRS220A**

#### Frequency Deviation with Temperature Variation

Channel : 11

| Temperature (°C) | Assigned Frequency (MHz) | Measured Frequency (MHz) | % Deviation |
|------------------|--------------------------|--------------------------|-------------|
| -20              | 467.6375                 | 467.63731                | 0.000041    |
| -10              | 467.6375                 | 467.63775                | -0.000053   |
| 0                | 467.6375                 | 467.63773                | -0.000049   |
| 10               | 467.6375                 | 467.63756                | -0.000013   |
| 20               | 467.6375                 | 467.63755                | -0.000011   |
| 30               | 467.6375                 | 467.63704                | 0.000098    |
| 40               | 467.6375                 | 467.63728                | 0.000047    |
| 50               | 467.6375                 | 467.63733                | 0.000036    |

Test Engineer: Ben W. K. Ho

Date of Test: April 23, 2002

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## INTERTEK TESTING SERVICES

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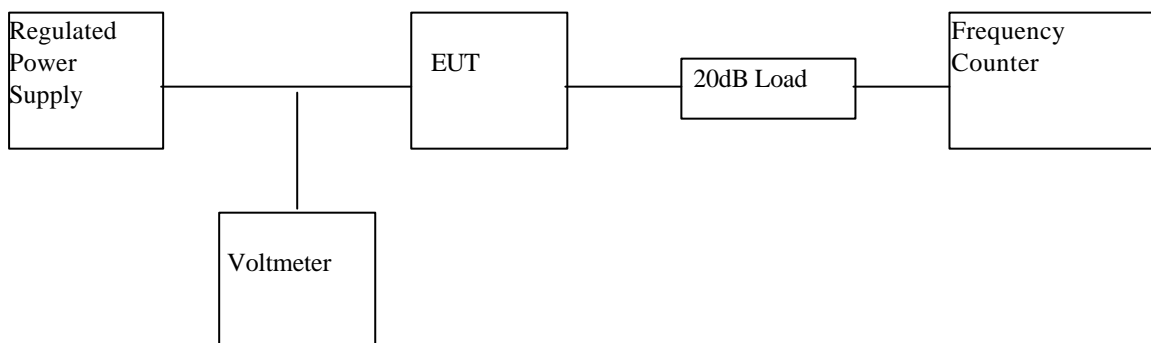
### 7.3 Frequency Stability - Voltage (Section 2.995)

#### A. Test Equipment

| Equipment              | Brand Name | Model No.  |
|------------------------|------------|------------|
| Regulated Power Supply | PAD        | 30-35L     |
| 20 dB RF Load          | Bird       | 8304-200-N |
| Voltage meter          | Fluke      | 87         |
| Frequency Counter      | Phillips   | PM6668     |

#### B. Testing Procedure

- 1) Set-up the test equipment in the following configuration:



- 2) Vary the level of regulated power supply to the manufacturer specified battery end point of the EUT.
- 3) Measure the channel frequency for channels 4 and 11 in MHz.

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## INTERTEK TESTING SERVICES

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### C. Test Result

**Table 7**

**Musical Electronics Limited  
MUSICAL FRS220A**

**Frequency Deviation with Voltage Variation**

The manufacturer specified battery end point 4.5V

| Channel | Frequency (MHz) | Measured Frequency (MHz) | Tolerance (%) |
|---------|-----------------|--------------------------|---------------|
| 4       | 462.6375        | 462.63764                | 0.000030      |
| 11      | 467.6375        | 467.63760                | 0.000021      |



**INTERTEK TESTING SERVICES**

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**EXHIBIT 8**

**TECHNICAL SPECIFICATIONS**

## INTERTEK TESTING SERVICES

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### 8.0 Technical Specifications

## INTERTEK TESTING SERVICES

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### 8.1 Block Diagram

For electronic filing, the block diagram of the FRS is saved with filename:  
block.pdf

Figure 8.1 Block Diagram

## INTERTEK TESTING SERVICES

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### 8.2 Schematic Diagram

For electronic filing, the schematic diagram of the FRS is saved with filename: circuit.pdf

Figure 8.2 Schematic Diagram

**INTERTEK TESTING SERVICES**

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**EXHIBIT 9**

**PRODUCT LABELLING**

## INTERTEK TESTING SERVICES

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### 9.0 Product Labelling

## INTERTEK TESTING SERVICES

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### 9.1 Label Artwork & Location

Figure 9.1 Label Artwork & Location

An engineering drawing of the label which will be permanently affixed to the unit. For electronic filing, the label artwork & location are saved with filename: label.pdf

**INTERTEK TESTING SERVICES**

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**EXHIBIT 10**  
**PHOTOGRAPHS**



## INTERTEK TESTING SERVICES

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### 10.0 Equipment Photographs

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

**INTERTEK TESTING SERVICES**

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**EXHIBIT 11**

**INSTRUCTION MANUAL**

## INTERTEK TESTING SERVICES

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### 11.0 Instruction Manual

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

For electronic filing, a preliminary copy of the Instruction Manual is saved with filename: manual.pdf

**INTERTEK TESTING SERVICES**

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**EXHIBIT 12**

**TUNE UP PROCEDURE**

## INTERTEK TESTING SERVICES

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### 12.0 Tune Up Procedure

For electronic filing, a preliminary copy of the Tune Up Procedure is saved with filename: tuneup.pdf

**INTERTEK TESTING SERVICES**

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**EXHIBIT 13**

**PART LIST**

## INTERTEK TESTING SERVICES

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### 13.0 Part List

For electronic filing, a preliminary copy of the Part List is saved with filename: partlist.pdf

**EXHIBIT 14**  
**INPUT CURRENT**



## INTERTEK TESTING SERVICES

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### 14.0 Input Current

The input current to the final r.f. stage at 6.0V d.c. is 250 mA max.

**INTERTEK TESTING SERVICES**

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**EXHIBIT 15**

**RF EXPOSURE INFO**

## INTERTEK TESTING SERVICES

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### 15.0 **RF Exposure Info**

The RF Safety information is provided on P.1 of the user manual.