

## **Signal Communications Limited**

### **Application For Certification (FCC ID: NAGCTE-991209)**

**Audio Monitoring System**

**WO# 9913210**

**DY/sa**

**February 1, 2000**

- The test results reported in this test report shall refer only to the sample actually tested and shall not refer or be deemed to refer to bulk from which such a sample may be said to have been obtained.
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## INTERTEK TESTING SERVICES

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#### *INTRODUCTION*

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## MEASUREMENT/TECHNICAL REPORT

### Signal Communications Limited - MODEL: CAMERIO TeleEAR ATU-1 FCC ID: NAGCTE-991209

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

Equipment Type: Computer Peripheral (example: computer, printer, modem, etc.)

requested per 47 CFR 0.457(d)(1)(ii)?      Yes       Deferred       grant       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.

Transition Rules Request per 15.37?      Yes       No

If no, assumed Part 15, Subpart B for unintentional radiator - the new 47 CFR [10-1-96 Edition] provision.

Report prepared by:

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## List of attached file

Exhibit type	File Description	filename
Cover Letter	Letter of Agency	letter.pdf
Test Report	Test Report	report.doc
Operation Description	Technical Description	descri.pdf
Test Setup Photo	Radiated Emission	radiated1.jpg, radiated2.jpg
Test Setup Photo	Conducted Emission	conduct1.jpg, conduct2.jpg and conduct3.jpg
Test Report	Conducted Emission Test Result	conduct.pdf
External Photo	External Photo	ophoto1.jpg to ophoto2.jpg
Internal Photo	Internal Photo	iphoto1.jpg to iphoto2.jpg
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

**EXHIBIT 1**

**GENERAL DESCRIPTION**

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## 1.0 General Description

### 1.1 Product Description

This EUT is an audio monitoring system which consists of a transmission unit and a reception software. The EUT is powered by AC 120V to DC 9V adaptor. There are a power switch, AUX IN, AUX OUT, AUDIO OUT and four AUDIO IN channels. The transmission unit can be fed up to four audio sources such as microphone and cassette player. The reception software runs on PC, PC receives the digital voice and then recover the voice to PC loudspeaker.

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

### 1.2 Related Submittal(s) Grants

This is a single application for Certification of an audio monitoring system.

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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 (1992). All radiated measurements and conducted measurement were performed in an Open Area Test Site and shield room respectively. Preliminary scans were performed in the Open Area Test Site only to determine worst case modes. For each scan, the procedure for maximizing emissions in Appendices D and E were followed. 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.

**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 ANSIC63.4 (1992).

The device was powered from AC120V to DC 9V adaptor.

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 unit was placed in the center of the turntable.

#### 2.2 EUT Exercising Software

A specific program, TeleEAR, is needed for the operation of this EUT. This software can be copied to a hard disk from a floppy disk in a floppy drive channel was selected through this software.

#### 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 Signal Communications Limited will be incorporated in each production model sold/leased in the United States.  
No modifications were installed by Intertek Testing Services.

### 2.5 Support Equipment List and Description

1. HP COMPUTER: Model: DTPC-17  
S/N: SG94482658
2. HP MONITOR: Model: CM643ET-051  
S/N: T9G000030
3. HP MOUSE: Model: M-S34  
S/N: LZE 93708518  
FCCID: DZL211029
4. HP KEYBOARD: Model: SK-2502C  
S/N: M991112642
5. EPSON PRINTER: Model: P112A  
S/N: BDC0002963
  
6. 5 x RCA cables (3m)
7. Microphone with 1m cable
8. 3 x 600Ω terminators
9. 16Ω speaker
10. Cassette player with 28cm cable
11. Software floppy disk: TeleEAR
12. RS232 cable (3m)
13. 9 pins NULL modern cable (>3m)
14. 9 pins male to 25 pins female converter
15. RS 232 MINI-TESTER

All the items listed under section 2.0 of this report are

*Confirmed by:*

*Daniel Yau*  
*Technical Manager - Home Entertainment Electronics*  
*Intertek Testing Services Hong Kong Ltd.*  
*Agent for Signal Communications Limited*



Signature

February 1, 2000 Date

**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:

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

### 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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## INTERTEK TESTING SERVICES

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### 3.2 Radiated Emission Configuration Photograph

Worst Case Radiated Emission  
at  
39.481 MHz

For electronic filing, the front view and back view of the test configuration photographs are saved with filename: radiated1.jpg and radiated2.jpg 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 12.2 dB margin

### ***TEST PERSONNEL:***



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*Signature*

Prudence S. M. Poon, Compliance Engineer  
*Typed/Printed Name*

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February 1, 2000

Date

# INTERTEK TESTING SERVICES

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Company: Signal Communications Limited  
Model: CAMERIO TeleEAR ATU-1

Date of Test: January 24, 2000

**Table 1**

## Radiated Emissions

Polarity	Frequency (MHz)	Reading (dB $\mu$ V)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Net at 3m (dB $\mu$ V/m)	Limit at 3m (dB $\mu$ V/m)	Margin (dB)
H	39.481	33.8	10	16	27.8	40.0	-12.2
H	44.762	32.5	10	16	26.5	40.0	-13.5
H	49.842	31.4	11	16	26.4	40.0	-13.6
H	54.829	32.2	11	16	27.2	40.0	-12.8
H	59.781	33.5	10	16	27.5	40.0	-12.5
H	69.702	35.9	7	16	26.9	40.0	-13.1
H	109.541	28.2	13	16	25.2	43.5	-18.3
H	159.842	29.3	13	16	26.3	43.5	-17.2
H	209.362	25.4	17	16	26.4	43.5	-17.1
H	259.741	20.2	21	16	25.2	46.0	-20.8

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 and average detector are used for the emission over 1000MHz.

\* The corresponding limit as per 15.109 is based on Quasi peak detector data for frequencies below 1000 MHz and average detector data for frequencies over 1000 MHz.

Test Engineer: Prudence S. M. Poon

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## INTERTEK TESTING SERVICES

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### 3.4 Conducted Emission Configuration Photograph

Worst Case Conducted Emission  
at  
0.460 MHz

For electronic filing, the front view, rear view and side view of the test configuration photographs are saved with filename: conduct1.jpg, conduct2.jpg and conduct3.jpg.

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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 17.0 dB margin

### **TEST PERSONNEL:**



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*Signature*

Prudence S. M. Poon, Compliance Engineer  
*Typed/Printed Name*

February 1, 2000

Date

**EXHIBIT 4**

**EQUIPMENT PHOTOGRAPHS**

### 4.0 **Equipment Photographs**

For electronic filing, photographs of the tested EUT are saved with filename: ophoto1.jpg, ophoto2.jpg for external photo, and iphoto1.jpg, iphoto2.jpg for internal photo.

**EXHIBIT 5**

**PRODUCT LABELLING**

### 5.0 **Product Labelling**

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

**EXHIBIT 6**

**TECHNICAL SPECIFICATIONS**

### 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.

**EXHIBIT 7**

**INSTRUCTION MANUAL**

### 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.

**EXHIBIT 8**

**MISCELLANEOUS INFORMATION**

### 8.0 **Miscellaneous Information**

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

### 8.1 **Discussion of Pulse Desensitization**

The determination of pulse desensitivity was made in accordance with Hewlett Packard Application Note 150-2, *Spectrum Analysis ... Pulsed RF*.

This device is an Audio Monitoring System. The no desensitization of the measurement equipment occurs.

### 8.2 **Calculation of Average Factor**

The emission limits are specified using spectrum analyzers or receivers which incorporate quasi-peak detectors. Typical measurements are made using peak detectors, however, emissions which approach the respective emission limit are measured using a quasi-peak detector.

For measurements above 1 GHz, spectrum analyzers or receivers using average detectors are employed, or the appropriate average factor can be applied.

Measurements using spectrum analyzers with filters other than peak detectors are recorded in the data table section of this report.

This device is an Audio Monitoring System.

It is not necessary to apply average factor to the measurement results.

### 8.3 Emissions Test Procedures

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

The test set-up and procedures described below are designed to meet the requirements of ANSI C63.4 - 1992.

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 8.2.

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.

### 8.3 **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 - 1992.

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.

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.