Elliott

Elliott Laboratories Inc.
www.elliottlabs.com

684 West Maude Avenue
Sunnyvale, CA 94086-3518

408-245-7800 Phone
408-245-3499 Fax

May 12, 2000

Chief, Equipment Authorization Branch,
Authorization and Evaluation Division,
Office of Engineering and Technology
FEDERAL COMMUNICATIONS COMMISSION
P.O. Box 358315
Pittsburgh, PA 15251-5315

Gentlemen:

The enclosed documents constitute a formal submittal and application for a Grant of Equipment Authorization pursuant to Part 74 of FCC Rules (CFR 47) regarding low power auxiliary stations. Data within this report demonstrates that the equipment tested complies with the FCC technical requirements per section 74.861 of the rules.

Elliott Laboratories, as duly authorized agent prepared this submittal. A copy of the letter of our appointment as agent is enclosed.

If there are any questions or if further information is needed, please contact Elliott Laboratories for assistance.

Sincerely,

David W. Bare
Principal Engineer

DWB/dmg
Enclosures: Agent Authorization Letter
Emissions Test Report with Exhibits

File: R36946

Elliott Laboratories Inc.
www.elliottlabs.com
684 West Maude Avenue
Sunnyvale, CA 94086-3518
408-245-7800 Phone
408-245-3499 Fax

Electromagnetic Emissions Test Report and Application for Grant of Equipment Authorization pursuant to FCC Part 74, Subpart H Specifications for an Wireless Microphone on the TOA Corporation Models: WM-4300, WM-4310, WM-4310A and WM-4310H

FCC ID:	DLAWM-4300-4310
GRANTEE:	TOA Corporation 2-1 Takamatsu-cho, Takarazuka-shi Hyogo-ken 665 Japan
TEST SITE:	Elliott Laboratories, Inc. 684 W. Maude Avenue Sunnyvale, CA 94086
REPORT DATE:	May 12, 2000
FINAL TEST DATE:	February 29, March 5 and March 6, 2000
AUTHORIZED SIGNATORY:	David W Bare David W. Bare Principal Engineer

TABLE OF CONTENTS

SCOPE

An electromagnetic emissions test has been performed on the TOA Corporation Model WM-4300 pursuant to Subpart H of Part 74 of FCC Rules for low power auxiliary stations. Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in ANSI C63.4-1992 as outlined in Elliott Laboratories test procedures.

The wireless microphone above has been tested in a simulated typical installation to demonstrate compliance with the relevant FCC performance and procedural standards.

Final system data was gathered in a mode that tended to maximize emissions by varying orientation of EUT, orientation of power and I/O cabling, antenna search height, and antenna polarization.

Every practical effort was made to perform an impartial test using appropriate test equipment of known calibration. All pertinent factors have been applied to reach the determination of compliance.

The test results recorded herein are based on a single type test of the TOA Corporation model WM-4300 and therefore apply only to the tested sample. The sample was selected and prepared by Hisayuki Okuoka of TOA Electronics, Inc.

OBJECTIVE

The primary objective of the manufacturer is compliance with Subpart H of Part 74 of FCC Rules for the radiated and conducted emissions of low power auxiliary stations. Certification of these devices is required as a prerequisite to marketing as defined in Part 2 the FCC Rules.

Certification is a procedure where the manufacturer or a contracted laboratory makes measurements and submits the test data and technical information to the FCC. The FCC issues a grant of equipment authorization upon successful completion of their review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units that are subsequently manufactured.

STATEMENT OF COMPLIANCE

The tested sample of TOA Corporation model WM-4300 complied with the requirements of Subpart H of Part 74 of the FCC Rules for low power auxiliary stations.

Maintenance of FCC compliance is the responsibility of the manufacturer. Any modification of the product that may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

EMISSION TEST RESULTS

The following emissions tests were performed on the TOA Corporation model WM-4300. The actual test results are contained in an exhibit of this report.

LIMITS OF POWER, MODULATION, AND BANDWIDTH

The EUT tested complied with the limits detailed in FCC Rules Part 74 Section 74.861(e)(1) (3) and (5).

The maximum power output was 10.5 dBm on the highest channel. The bandwidth was 155 kilohertz with the modulation set at 16 dB above 50% deviation at the point of maximum baseband frequency response. This maximum frequency deviation of 51.4 kilohertz occurred at 300 Hz. This level was applied at a frequency of 25 kilohertz, which is the limit of the response of the microphone. The actual test data and any correction factors are contained in an exhibit of this report.

LIMITS OF RADIATED SPURIOUS EMISSIONS

The EUT tested complied with the limits detailed in FCC Rules Part 74 Section 74.861 (e)(6).

The following measurement was extracted from the data recorded during the radiated electric field emissions scan and represents the highest amplitude equivalent radiated power relative to the specification limit. The actual test data and any correction factors are contained in an exhibit of this report.

Frequency MHz	Level dBm	Pol v/h	FCC 74.681 Limit	FCC 74.681 Margin	Detector Pk/QP/Avg	Comments
1612.000	-24.6	V	-23.5	-1.1	Pk	Note 1

LIMITS OF FREQUENCY TOLERANCE

The EUT tested complied with the limits detailed in FCC Rules Part 74 Section 74.861 (e)(4).

The frequency of the transmitter varied by less than 0.0027% over the temperature range of –30 to +50 degrees Celsius. The frequency varied by less than 0.0001% over the battery voltage range of 9V to 6V, which was the battery end point specified by TOA Electronics. The actual test data and any correction factors are contained in an exhibit of this report.

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The TOA Corporation model WM-4300 is a wireless microphone. The sample was received on February 29, 2000 and tested on February 29, March 5 and March 6, 2000. The EUT consisted of the following component(s):

Manufacturer	Model	Description	Serial Number
TOA Electronics	WM-4300	Wireless Microphone	Not serialized

OTHER EUT DETAILS

The WM-4300, WM-4310, WM4310A and WM4310H are identical models in all respects except for the connector at the waist unit for different microphone headsets. Only the WM-4300 was tested due to the similarity of models.

ENCLOSURE

The EUT enclosure is primarily constructed of plastic. It measures approximately 4 cm wide by 23.5 cm high.

MODIFICATIONS

The EUT did not require modifications during testing in order to comply with the emission specifications.

SUPPORT EQUIPMENT

No support equipment was used during emissions testing.

EXTERNAL I/O CABLING

The EUT did not use cabling, as there are no ports.

EUT OPERATION

The microphone was powered on during testing. Different levels of modulation were applied as noted during testing.

TEST SITE

GENERAL INFORMATION

Final test measurements were taken on February 29, March 5 and March 6, 2000 at the Elliott Laboratories Open Area Test Site #2 located at 684 West Maude Avenue, Sunnyvale, California. The test site contains separate areas for radiated and conducted emissions testing. Pursuant to section 2.948 of the Rules, construction, calibration, and equipment data has been filed with the Commission.

The FCC recommends that ambient noise at the test site be at least 6 dB below the allowable limits. Ambient levels are below this requirement with the exception of predictable local TV, radio, and mobile communications traffic. The test site contains separate areas for radiated and conducted emissions testing. Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent FCC requirements.

RADIATED EMISSIONS CONSIDERATIONS

The FCC has determined that radiation measurements made in a shielded enclosure are not suitable for determining levels of radiated emissions. Radiated measurements are performed in an open field environment. The test site is maintained free of conductive objects within the CISPR defined elliptical area incorporated in ANSI C63.4 guidelines.

MEASUREMENT INSTRUMENTATION

RECEIVER SYSTEM

An EMI receiver as specified in CISPR 16-1 is used for emissions measurements. The receivers used can measure over the frequency range of 9 kHz up to 2000 MHz. These receivers allow both ease of measurement and high accuracy to be achieved. The receivers' have Peak, Average, and CISPR (Quasi-peak) detectors built into their design so no external adapters are necessary. The receiver automatically sets the required bandwidth for the CISPR detector used during measurements.

For measurements above the frequency range of the receivers, a spectrum analyzer is utilized because it provides visibility of the entire spectrum along with the precision and versatility required supporting engineering analysis. Average measurements above 1000MHz are performed on the spectrum analyzer using the linear-average method with a resolution bandwidth of 1 MHz and a video bandwidth of 10 Hz.

INSTRUMENT CONTROL COMPUTER

The receivers utilize either a Rohde and Schwarz EZM Spectrum Monitor/Controller or contain an internal Spectrum Monitor/Controller to view and convert the receiver measurements to the field strength at an antenna or voltage developed at the LISN measurement port, which is then compared directly with the appropriate specification limit. This provides faster, more accurate readings by performing the conversions described under Calculations within the Test Procedures section of this report. Results are printed in a graphic and/or tabular format, as appropriate. A personal computer is used to record all measurements made with the receivers.

The Spectrum Monitor provides a visual display of the signal being measured. In addition, the controller or a personal computer runs automated data collection programs that control the receivers. This provides added accuracy since all site correction factors, such as cable loss and antenna factors are added automatically.

FILTERS/ATTENUATORS

External filters and precision attenuators are often connected between the receiving antenna or LISN and the receiver. This eliminates saturation effects and non-linear operation due to high amplitude transient events.

ANTENNAS

A biconical antenna is used to cover the range from 30 MHz to 300 MHz and a log periodic antenna is utilized from 300 MHz to 1000 MHz. Narrowband tuned dipole antennas are used over the entire 30 to 1000 MHz range for precision measurements of field strength. Above 1000 MHz, a horn antenna is used. The antenna calibration factors are included in site factors programmed into the test receivers.

ANTENNA MAST AND EQUIPMENT TURNTABLE

The antennas used to measure the radiated electric field strength are mounted on a non-conductive antenna mast equipped with a motor-drive to vary the antenna height.

ANSI C63.4 specifies that the test height above ground for table mounted devices shall be 80 centimeters. Floor mounted equipment shall be placed on the ground plane if the device is normally used on a conductive floor or separated from the ground plane by insulating material from 3 to 12 mm if the device is normally used on a non-conductive floor. During radiated measurements, the EUT is positioned on a motorized turntable in conformance with this requirement.

INSTRUMENT CALIBRATION

All test equipment is regularly checked to ensure that performance is maintained in accordance with the manufacturer's specifications. All antennas are calibrated at regular intervals with respect to tuned half-wave dipoles. An exhibit of this report contains the list of test equipment used and calibration information.

TEST PROCEDURES

EUT AND CABLE PLACEMENT

The FCC requires that interconnecting cables be connected to the available ports of the unit and that the placement of the unit and the attached cables simulate the worst case orientation that can be expected from a typical installation, so far as practicable. To this end, the position of the unit and associated cabling is varied within the guidelines of ANSI C63.4, and the worst case orientation is used for final measurements.

RADIATED EMISSIONS

Radiated emissions measurements are performed in two phases. A preliminary scan of emissions is conducted in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed from the lowest frequency generated in the device up to the frequency required by the regulation specified on page 1. One or more of these is with the antenna polarized vertically while the one or more of these are with the antenna polarized horizontally. During the preliminary scans, the EUT is rotated through 360°, the antenna height is varied and cable positions are varied to determine the highest emission relative to the limit.

A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

Final maximization is a phase in which the highest amplitude emissions identified in the spectral search are viewed while the EUT azimuth angle is varied from 0 to 360 degrees relative to the receiving antenna. The azimuth that results in the highest emission is then maintained while varying the antenna height from one to four meters. The result is the identification of the highest amplitude for each of the highest peaks. Each recorded level is corrected in the receiver using appropriate factors for cables, connectors, antennas, and preamplifier gain. Emissions that have values close to the specification limit may also be measured with a tuned dipole antenna to determine compliance.

The recorded level is then reproduced using a signal generator and antenna located where the device was on the test table. The power necessary to reproduce the amplitude of the measured emissions from the device was recorded. The effective radiated power (ERP) is then calculated based on the signal generator level and the gain of the substitution antenna relative to a dipole antenna.

CONDUCTED EMISSIONS FROM ANTENNA PORT

Direct measurements are performed with the antenna port of the EUT connected to either the power meter or spectrum analyzer via a suitable attenuator and/or filter. These are used to ensure that the front end of the measurement instrument is not overloaded by the fundamental transmission.

SPECIFICATION LIMITS AND CALCULATIONS

The limits for radiated emissions are based on the power of the transmitter at the operating frequency. Data is measured in the logarithmic form of decibels relative to one milliwatt, or dB milliwatts (dBm). For radiated emissions, the measured data is obtained by the substitution method. The field strength of the emissions from the EUT are measured on a test site with a receiver. A signal generator and antenna are then substituted for the EUT. The output of the signal generator is adjusted to a level such that the same field strength as was measured from the EUT is observed. The power level is corrected by the difference between the gain of the antenna and the gain of a dipole antenna. This level is recorded as the equivalent radiated power (ERP) of the EUT.

RADIATED EMISSIONS SPECIFICATION LIMITS, SECTION 74.861(e)(6)

Frequency Range (MHz)	Limit
Operating frequency	24.0 dBm
Operating frequency ± 50% of the bandwidth	25 dB below the amplitude at the operating frequency
Operating frequency ± 100% of the bandwidth	35 dB below the amplitude at the operating frequency
Operating frequency ± 250% of the bandwidth	$43+10\log_{10}$ (mean output power in watts) dB below the amplitude at the operating frequency

EXHIBIT 1:Test Equipment Calibration Data

Conducted Emissions, 806 MHz, Radiated Emissions, 690 - 8060 MHz, 05-Mar-00 01:03 PM
Engineer: David W. Bare

Manufacturer	Description	Model #	Assett #	Cal interval	Last Calibrated	Cal Due
EMCO	D. Ridge Horn Antenna, 1-18GHz	3115	786	12	01/08/2000	01/08/2001
Filtek	High Pass Filter	HP12/1000-5BA	955	12	04/17/1999	04/17/2000
Hewlett Packard	EMC Spectrum Analyzer, Opt. 026 ¸9 KHz -26.5GHz	8593EM	1141	12	12/22/1999	12/22/2000
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	870	12	11/15/1999	11/15/2000
Hewlett Packard	Power Meter	432A	259, (F304)	12	02/17/2000	02/17/2001
Hewlett Packard	Thermistor Mount	478A	652	12	02/17/2000	02/17/2001
Rohde & Schwarz	Test Receiver, 0.009-2000 MHz	ESN	775	12	06/10/1999	06/10/2000
Hewlett Packard	Test Oscillator	651B	264	N/A	None	None
Hewlett Packard	Sweep Oscillator	8350B	1001	N/A	None	None
Hewlett Packard	RF Plug-in	83595A	1002	N/A	None	None

Radiated Emissions, 1 - 9 GHz, 07-Mar-00 01:26 AM
Engineer: Mbirgani

Manufacturer	Description	Model #	Assett #	Cal interval	Last Calibrated	Cal Due
EMCO	D. Ridge Horn Antenna, 1-18GHz	3115	868	12	09/25/1999	09/25/2000
Filtek	High Pass Filter	HP12/1000-5BA	957	12	04/17/1999	04/17/2000
Hewlett Packard	EMC Spectrum Analyzer, Opt. 026 ¸9 KHz -26.5GHz	8593EM	1141	12	12/22/1999	12/22/2000
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	12	12/02/1999	12/02/2000
Hewlett Packard	Sweep Oscillator	8350B	1001	N/A	None	None
Hewlett Packard	RF Plug-in	83595A	1002	N/A	None	None
EMCO	D. Ridge Horn Antenna, 1-18GHz	3115	786	12	01/08/2000	01/08/2001
Hewlett Packard	Power Meter	432A	259, (F304)	12	02/17/2000	02/17/2001
Hewlett Packard	Thermistor Mount	478A	652	12	02/17/2000	02/17/2001

EXHIBIT 2:Test Data Log Sheets

ELECTROMAGNETIC EMISSIONS

TEST LOG SHEETS

AND

MEASUREMENT DATA

T36210 9 Pages

Client:	TOA Electronics	Job Number:	J36175
Model:	WM-43xx	T-Log Number:	T36210
		Proj Eng:	David W. Bare
Contact:	Hisayuki Okuoka		
Emissions Spec:	FCC 74.681, IC RSS-123	Class:	-
Immunity Spec:	None	Environment:	Commercial

EMC Test Data

For The

TOA Electronics

Model

WM-43xx

Client:	TOA Electronics	Job Number:	J36175
Model:	WM-43xx	T-Log Number:	T36210
		Proj Eng:	David W. Bare
Contact:	Hisayuki Okuoka		
Emissions Spec:	FCC 74.681, IC RSS-123	Class:	-
Immunity Spec:	None	Environment:	Commercial

EUT INFORMATION

General Description

The EUT is a wireless microphone. Normally, the EUT would be worn by the user during operation. The EUT was placed on a tabletop during emissions testing to approximate the end user environment. The electrical rating of the EUT is 9 VDC supplied from a battery.

Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
TOA Electronics	WM-4300	Wireless Microphone	Not serialized	-

Other EUT Details

WM-4300, WM-4310, WM4310A and WM4310H are identical models in all respects except for the connector at the waist unit for different microphone headsets.

EUT Enclosure

The EUT enclosure is primarily constructed of plastic. It measures approximately 4 cm wide by 23.5 cm high.

Modification History

Mod. #	Test	Date	Modificaiton
1	N/A	-	-
2			
3			

Elliott

EMC Test Data

Client:	TOA Electronics	Job Number:	J36175
Model:	WM-43xx	T-Log Number:	T36210
		Proj Eng:	David W. Bare
Contact:	Hisayuki Okuoka		
Emissions Spec:	FCC 74.681, IC RSS-123	Class:	-
Immunity Spec:	None	Environment:	Commercial

Test Configuration Information (1)

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
None	-	-	-	-

Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
None	-	-	-	-

EUT Interface Ports

		Cable(s)		
EUT Port	Connected To	Description	Shielded or Unshielded	Length(m)
There are no ports on the EUT.	-	-	-	-

EUT Operation During Emissions

The microphone was powered on during testing. Several types of modulation were applied as noted during testing.

Elliott

EMC Test Data

Client:	TOA Electronics	Job Number:	J36175
Model:	WM-43xx	T-Log Number:	T36210
		Proj Eng:	David W. Bare
Contact:	Hisayuki Okuoka		
Spec:	FCC 74.681, IC RSS-123	Class:	-

Radiated Emissions

Test Specifics

Objective: The objective of this test session is to perform final qualification testing the EUT relative to the specification(s) defined above.

Date of Test: 03/05/2000
Test Engineer: David W. Bare
Test Location: SVOATs #2

Config. Used: 1
Config Change: None
EUT Voltage: 9V DC

General Test Configuration

The EUT was located on the turntable for radiated emissions testing with a microphone connected. The measurement antenna was located at 3 meters distance from the EUT.

Ambient Conditions:

Temperature (C): 9.4
Rel. Humidity: 73%

Modifications Made During Testing: None

Run #1: Radiated emissions at the fundamental

Frequency	Level	Pol			Detector	Azimuth	Height	Comments
MHz	dBuV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
806.000	108.6	V	N/A	N/A	Pk	160	1.3	Note 1
748.000	108.1	V	N/A	N/A	Pk	150	1.4	Note 2
690.000	104.0	V	N/A	N/A	Pk	90	1.5	Note 3

Note 1:	High channel (substitution measurement yielded 4.8 dBm into 7.3 dBi antenna) So ERP is 10.5 dBm or 11mW
Note 2:	Middle channel
Note 3:	Low channel
Note 4:	Measurements at 120 kHz BW

From above data using far field calculation

Channel	Field Strength @3m dBuV/m	Measurement Bandwidth (MHz)	ERP dBm	Ouput Power Watts
806	108.6	0.12	11.7	0.0148
748	108.1	0.12	11.2	0.0132
690	104	0.12	7.1	0.0051

Client:	TOA Electronics	Job Number:	J36175
Model:	WM-43xx	T-Log Number:	T36210
		Proj Eng:	David W. Bare
Contact:	Hisayuki Okuoka		
Spec:	FCC 74.681, IC RSS-123	Class:	-

Note: Runs 2 and 3 completed by Mehran Birgani on 3-6-00

Run #2a: Radiated spurious emissions, 806 - 8060 MHz, 1 MHz BW

Frequency	Level	Pol	spec	spec	Detector	Azimuth	Height	Comments
MHz	dBuV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
1612.000	72.3	V	N/A	N/A	Pk	0	1.0	
2418.000	67.3	V	N/A	N/A	Pk	41	1.5	
3224.000	63.1	V	N/A	N/A	Pk	43	1.3	
4030.000	64.8	V	N/A	N/A	Pk	268	1.0	
4836.000	62.2	V	N/A	N/A	Pk	16	1.2	
5642.000	61.2	V	N/A	N/A	Pk	8	1.0	
6448.000	61.7	V	N/A	N/A	Pk	0	1.0	Noise Floor
7254.000	65.2	V	N/A	N/A	Pk	0	1.0	Noise Floor
8060.000	66.2	V	N/A	N/A	Pk	0	1.0	Noise Floor
1612.000	66.2	H	N/A	N/A	Pk	189	1.8	
2418.000	71.7	H	N/A	N/A	Pk	0	1.8	
3224.000	63.7	H	N/A	N/A	Pk	325	1.2	
4030.000	64.3	H	N/A	N/A	Pk	318	1.2	
4836.000	61.2	H	N/A	N/A	Pk	327	1.0	
5642.000	61.4	H	N/A	N/A	Pk	0	1.0	Noise Floor
6448.000	58.1	H	N/A	N/A	Pk	0	1.0	Noise Floor
7254.000	60.4	H	N/A	N/A	Pk	0	1.0	Noise Floor
8060.000	62.6	H	N/A	N/A	Pk	0	1.0	Noise Floor

Run #2b: Radiated spurious emissions, 806 - 8060 MHz, substitutions

Fundamental power 10.5 dBm

Frequency	Level	Gain	Level	FCC 74.861		Detector	Pol	Comments
MHz	dBm	dBi	ERP	Limit	Margin	Avg/Pk	V/H	
1612.000	-29.7	6.7	-24.6	-23.5	-1.1	Pk	V	
2418.000	-35.3	7.3	-29.6	-23.5	-6.1	Pk	V	
3224.000	-39.8	7.6	-33.8	-23.5	-10.3	Pk	V	
4030.000	-37.7	7.2	-32.1	-23.5	-8.6	Pk	V	
4836.000	-42.1	9.0	-34.7	-23.5	-11.2	Pk	V	
5642.000	-43.2	9.1	-35.7	-23.5	-12.2	Pk	V	
1612.000	-35.6	6.5	-30.7	-23.5	-7.2	Pk	H	
2418.000	-30.9	7.3	-25.2	-23.5	-1.7	Pk	H	
3224.000	-39.2	7.6	-33.2	-23.5	-9.7	Pk	H	
4030.000	-38.2	7.2	-32.6	-23.5	-9.1	Pk	H	
4836.000	-43.1	9.0	-35.7	-23.5	-12.2	Pk	H	

Elliott

EMC Test Data

Client:	TOA Electronics	Job Number:	J36175
Model:	WM-43xx	T-Log Number:	T36210
		Proj Eng:	David W. Bare
Contact:	Hisayuki Okuoka		
Spec:	FCC 74.681, IC RSS-123	Class:	-

Run #3a: Radiated spurious emissions, 806 - 8060 MHz, 30 kHz BW for RSS-123

Frequency	Level	Pol	RSS-123		Detector	Azimuth	Height	Comments
MHz	dBuV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
1612.000	71.9	V	N/A	N/A	Pk	0	1.0	
2418.000	66.1	V	N/A	N/A	Pk	41	1.5	
3224.000	60.0	V	N/A	N/A	Pk	43	1.3	
4030.000	61.2	V	N/A	N/A	Pk	268	1.0	
4836.000	51.0	V	N/A	N/A	Pk	16	1.2	
5642.000	51.5	V	N/A	N/A	Pk	8	1.0	
6448.000	47.5	V	N/A	N/A	Pk	0	1.0	Noise Floor
7254.000	52.3	V	N/A	N/A	Pk	0	1.0	Noise Floor
8060.000	49.5	V	N/A	N/A	Pk	0	1.0	Noise Floor
1612.000	65.4	H	N/A	N/A	Pk	189	1.8	
2418.000	70.9	H	N/A	N/A	Pk	0	1.8	
3224.000	61.5	H	N/A	N/A	Pk	325	1.2	
4030.000	59.6	H	N/A	N/A	Pk	318	1.2	
4836.000	51.9	H	N/A	N/A	Pk	327	1.0	
5642.000	42.3	H	N/A	N/A	Pk	0	1.0	Noise Floor
6448.000	44.2	H	N/A	N/A	Pk	0	1.0	Noise Floor
7254.000	45.3	H	N/A	N/A	Pk	0	1.0	Noise Floor
8060.000	48.8	H	N/A	N/A	Pk	0	1.0	Noise Floor

Run #3b: Radiated spurious emissions, 806 - 8060 MHz, calculations for RSS-123

Fundamental power 10.5 dBm

Frequency	Level	Corr	Level	RSS-123		Detector	Pol	Comments
MHz	dBuV/m	dB	EIRP	Limit	Margin	Avg/Pk	V/H	
1612.000	71.9	95.3	-23.4	-35.5	12.1	Pk	V	
2418.000	66.1	95.3	-29.2	-35.5	6.3	Pk	V	
3224.000	60.0	95.3	-35.3	-35.5	0.2	Pk	V	
4030.000	61.2	95.3	-34.1	-35.5	1.4	Pk	V	
4836.000	51.0	95.3	-44.3	-35.5	-8.8	Pk	V	
5642.000	51.5	95.3	-43.8	-35.5	-8.3	Pk	V	
1612.000	65.4	95.3	-29.9	-35.5	5.6	Pk	H	
2418.000	70.9	95.3	-24.4	-35.5	11.1	Pk	H	
3224.000	61.5	95.3	-33.8	-35.5	1.7	Pk	H	
4030.000	59.6	95.3	-35.7	-35.5	-0.2	Pk	H	
4836.000	51.9	95.3	-43.4	-35.5	-7.9	Pk	H	

Note 1:	Correction of 95.3 dB based on formula TP = (FS * D)^2 / 30 * G when D=3

Elliott

EMC Test Data

Client:	TOA Electronics	Job Number:	J36175
Model:	WM-43xx	T-Log Number:	T36210
		Proj Eng:	David W. Bare
Contact:	Hisayuki Okuoka		
Spec:	FCC 74.681, IC RSS-123	Class:	-

Conducted Emissions

Test Specifics

Objective: The objective of this test session is to perform final qualification testing the EUT relative to the specification(s) defined above.

Date of Test: 03/05/2000
Test Engineer: David W. Bare
Test Location: SVOATS #2

Config. Used: 1
Config Change: None
EUT Voltage: 9V DC

General Test Configuration

The output of the transmitter was connected to the modulation analyzer and the microphone input was connected to a test oscillator.

Ambient Conditions

Temp (C): 23
Rel. Humidity: 71%

Summary of Results

Run #1: Frequency response measurements
The point of maximum response was 300 Hz and the 3dB down point was 25 kHz

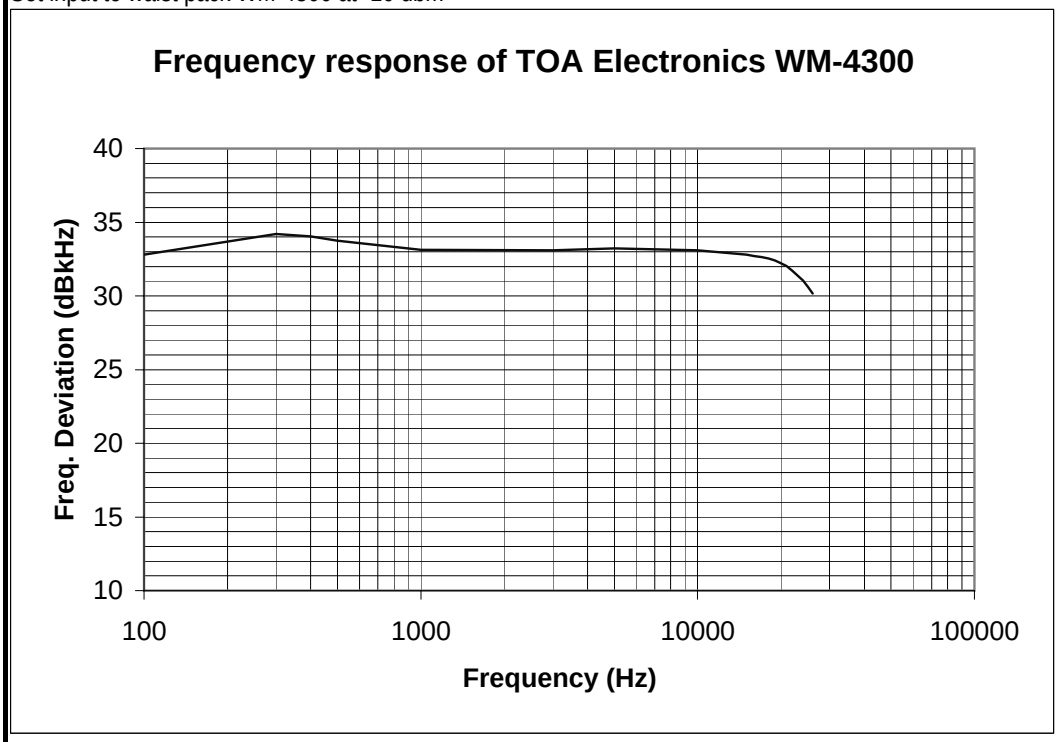
Run #2: 26 dB Bandwidth measurement at 25 kHz
The bandwidth was measured as 155 kHz using 25kHz modulation at an input level 16 dB above the 50% modulation level at 300 Hz

Modifications Made During Testing: None

Client:	TOA Electronics	Job Number:	J36175
Model:	WM-43xx	T-Log Number:	T36210
		Proj Eng:	David W. Bare
Contact:	Hisayuki Okuoka		
Spec:	FCC 74.681, IC RSS-123	Class:	-

Run #1: Frequency response measurements

Set input to waist pack WM-4300 at -10 dbm



Peak is at 300 Hz. Maximum deviation at this frequency is 51.4 kHz

50% is 25.7 kHz deviation. 16 dB additional drive is added and the modulation applied at 25000 Hz

Run #2: 26 dB Bandwidth measurement at 25 kHz

Channel	Bandwidth kHz	Graph
748 MHz	155	T36210 GPH201

Client:	TOA Electronics	Job Number:	J36175
Model:	WM-43xx	T-Log Number:	T36210
		Proj Eng:	David W. Bare
Contact:	Hisayuki Okuoka		
Spec:	FCC 74.681, IC RSS-123	Class:	-

Frequency Stability

Test Specifics

Objective: The objective of this test session is to perform final qualification testing the EUT relative to the specification defined above.

Date of Test: 02/29/2000
Test Engineer: Davi W. Bare
Test Location: Environmental

Config. Used: Bench testing
Config Change: N/A
EUT Voltage: 9V DC

General Test Configuration

The EUT was located in an environmental chamber during testing. A electric field probe was located in the chamber with the microphone and connected to a spectrum analyzer to measure the frequency from the device.

Run #1: Frequency Stability (WM-4300), Limit is 0.005%

Measured frequency is the lowest frequency measured over a period of 10 minutes after turn on at each temperature point except at 50 C when the highest frequency measured over the 10 minute period is recorded

Temperature (C)	Freqency (MHz)	Deviation from 20°C
-30	747.9827	-0.0025%
-20	747.9893	-0.0016%
-10	747.9942	-0.0009%
0	747.9972	-0.0005%
10	747.9985	-0.0004%
20	748.0012	0.0000%
30	748.0003	-0.0001%
40	748.0005	-0.0001%
50	748.0025	0.0002%

The stabilty was 0.0027% over the range of -30 to +50 C thereby complying with the 0.005% requirment

At 20°C, the voltage to the microphone was set to 6V DC(battery end point specified by TOA Electronics) and the frequency was measured at 748.0005 MHz or -0.0001% from the frequency with the new battery.

EXHIBIT 3: Proposed FCC ID Label & Label Location

EXHIBIT 4: Detailed Photographs of TOA Corporation Model WM-43xx Construction

5 Pages

EXHIBIT 5: Operator's Manual for TOA Corporation Model WM-43xx

4 Pages

EXHIBIT 6: Block Diagram of TOA Corporation Model WM-43xx

2 Pages

EXHIBIT 7: Schematic Diagrams for TOA Corporation Model WM-43xx

4 Pages

EXHIBIT 8: Theory of Operation for TOA Corporation Model WM-43xx

4 Pages