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Electromagnetic Emissions Test Report and Application for Grant of Equipment Authorization pursuant to FCC Part 15, Subpart C (15.247) DTS Specifications and Industry Canada RSS 210 Issue 5 for an Intentional Radiator on the Tekkeon Model: ezTalker

FCC ID:	RJ6ET1000S
GRANTEE:	Tekkeon 3002 Dow Ave, Ste 218 Tustin, CA. 92780
TEST SITE:	Elliott Laboratories, Inc. 684 W. Maude Avenue Sunnyvale, CA 94086
REPORT DATE:	November 12, 2003
FINAL TEST DATE:	November 4 and November 7, 2003

AUTHORIZED SIGNATORY: _____

Juan Martinez
Senior EMC Engineer

ACCREDITED

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SCOPE

An electromagnetic emissions test has been performed on the Tekkeon model ezTalker pursuant to Subpart C of Part 15 of FCC Rules for intentional radiators and RSS-210 Issue 5 for licence-exempt low power devices. 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 intentional radiator 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 Tekkeon model ezTalker and therefore apply only to the tested sample. The sample was selected and prepared by Jerry Yang of Tekkeon

OBJECTIVE

The primary objective of the manufacturer is compliance with Subpart C of Part 15 of FCC Rules and RSS-210 Issue 5 for license-exempt low power devices for the radiated and conducted emissions of intentional radiators. 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.

SUMMARY OF RESULTS

Note – remove references in the table below that do not apply to the radio tested

FCC Part 15 Section	RSS 210 Section	Description	Measured Value	Comments	Result
15.247	6.2.2(o)(a)	20dB Bandwidth	875 kHz	The channel spacing shall be greater than the 20dB bandwidth	Complies
15.247	6.2.2(o)(a)	Channel Separation	1000 kHz		Complies
15.247	6.2.2(o)(a)	Number of Channels	79	**2400- 2483.5 MHz**: 75 hopping frequencies: average time of occupancy <0.4 second within a 30 second period. *Less than 75 hopping frequencies: The total span of hopping channels shall be at least 75 MHz. The time of occupancy on any one channel shall be no greater than 0.4 seconds within the time period required to hop through All channels*	Complies
15.247	6.2.2(o)(a)	Channel Dwell Time	0.380 seconds per 30 seconds		Complies
15.247	6.2.2(o)(a)	Channel Utilization	All channels are used equally	Refer to Theory of Operations for detailed description of the hopping algorithm BlueTooth Devices: The system uses the BlueTooth algorithm and, therefore, meets all requirements for channel utilization.	Complies
15.247 (b) (3)	6.2.2(o)(a)	Output Power, 2400 - 2483.5 MHz	6.07 dBm EIRP = 0.004 W	Multi-point applications: **2400 – 2483.5 MHz** Maximum permitted is 1Watt, with EIRP limited to 4 Watts for a 50-channel system. Maximum permitted is *0.125 Watts for a system that uses less than 75 channels*	Complies
15.247(c)	6.2.2(o)(e1)	Spurious Emissions – 30MHz – 25GHz	All spurious emissions < -20dBc	All spurious emissions < -20dBc.	Complies

15.247(c) / 15.209		Radiated Spurious Emissions 30MHz – 25GHz	48.6 dBuV/m @ 4804 MHz (- 5.4 dB)	Emissions in restricted bands must meet the radiated emissions limits detailed in 15.207. All others must be < -20dBc	Complies
15.207		AC Conducted Emissions	35 dBuV @ 0..321 MHz (-14.7dB)		Complies
	6.6	AC Conducted Emissions	35 dBuV @ 0.321 MHz (-13dB)		Complies
15.247 (b) (5)		RF Exposure Requirements	No SAR evaluation required	Refer to Exposure Statement	Complies
15.203		RF Connector	Describe antenna .	Antenna is Permanently attached	Complies

MEASUREMENT UNCERTAINTIES

ISO Guide 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level and were calculated in accordance with NAMAS document NIS 81.

Measurement Type	Frequency Range (MHz)	Calculated Uncertainty (dB)
Conducted Emissions	0.15 to 30	± 2.4
Radiated Emissions	30 to 1000	± 3.6

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Tekkeon model ezTalker is a wireless bluetooth headset, which is designed for hands free cellular conversations. Normally, the EUT would be placed on a tabletop during operation. The EUT was, therefore, treated as tabletop equipment during testing to simulate the end-user environment. The electrical rating of the EUT 3.7Vdc.

The sample was received on November 4, 2003 and tested on November 4 and November 7, 2003. The EUT consisted of the following component(s):

Manufacturer/Model/Description	Serial Number	Proposed FCC ID #
Tekkeon ezTalker Wireless Headset	-	RJ6ET1000S
Tekkeon Audio Gateway Charging cradle	-	-
Tekkeon P925BW06040ADG3 Power supply	-	-

ENCLOSURE

The EUT enclosure is primarily constructed of plastic. It measures approximately .3 cm wide by .75 cm deep by .25 cm high.

MODIFICATIONS

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

SUPPORT EQUIPMENT

The following equipment was used as local support equipment for emissions testing:

Manufacturer/Model/Description	Serial Number	FCC ID Number
Tekkeon BCES301199/1 Interface fixture	3436 31 08 00	-

The following equipment was used as remote support equipment for emissions testing:

Manufacturer/Model/Description	Serial Number	FCC ID Number
IBM 2628 Laptop	99-FWGNA	DoC

No equipment was used as support equipment for Conducted Emissions testing

EUT INTERFACE PORTS

The I/O cabling configuration during emissions testing was as follows:

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
EUT	Interface fixture	4 wire	Unshielded	0.7
RS-232	Laptop	Multiwire	Shielded	1

The I/O cabling configuration during Conducted Emissions testing was as follows:

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
EUT	Charging cradle	N/A	N/A	N/A
Cradle DC input	Power Supply	Multiwire	Unshielded	1.8

EUT OPERATION DURING TESTING

EUT was set to transmit maximum power at low, middle, and high channel. For the remainder of the test it was set to hop on all channels. The EUT was also set to the middle of the operating on Receive mode.

The EUT was set to transmit at the middle of the operating band at maximum power.

ANTENNA REQUIREMENTS

The antenna is permanently attach to PCB transmitter board, which meets the requirements of 15.203.

TEST SITE

GENERAL INFORMATION

Final test measurements were taken on November 4 and November 7, 2003at 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 Federal Communications Commission. In accordance with Industry Canada rules detailed in RSS 210 Issue 5 and RSS-212, construction, calibration, and equipment data for the test sites have been filed with the Federal Communications 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.

CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions testing is performed in conformance with ANSI C63.4-1992. Measurements are made with the EUT connected to the public power network through a nominal, standardized RF impedance, which is provided by a line impedance stabilization network, known as a LISN. A LISN is inserted in series with each current-carrying conductor in the EUT power cord.

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 to support 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 Sample 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 run automated data collection programs which control the receivers. This provides added accuracy since all site correction factors, such as cable loss and antenna factors are added automatically.

LINE IMPEDANCE STABILIZATION NETWORK (LISN)

Line conducted measurements utilize a fifty microhenry Line Impedance Stabilization Network as the monitoring point. The LISN used also contains a 250 uH CISPR adapter. This network provides for calibrated radio frequency noise measurements by the design of the internal low pass and high pass filters on the EUT and measurement ports, respectively.

POWER METER

A power meter and peak power sensor are used for all direct output power measurements from transmitters as they provide a broadband indication of the power output.

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.

CONDUCTED EMISSIONS

Conducted emissions are measured at the plug end of the power cord supplied with the EUT. Excess power cord length is wrapped in a bundle between 30 and 40 centimeters in length near the center of the cord. Preliminary measurements are made to determine the highest amplitude emission relative to the specification limit for all the modes of operation. Placement of system components and varying of cable positions are performed in each mode. A final peak mode scan is then performed in the position and mode for which the highest emission was noted on all current carrying conductors of the power cord.

RADIATED EMISSIONS

Radiated emissions measurements are performed in two phases as well. 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 30 MHz 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 is 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 which 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 which have values close to the specification limit may also be measured with a tuned dipole antenna to determine compliance.

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.

Measurement bandwidths (video and resolution) are set in accordance with FCC procedures for the type of radio being tested.

SPECIFICATION LIMITS AND SAMPLE CALCULATIONS

The limits for conducted emissions from the AC power port are given in units of microvolts, the limits for radiated electric field emissions are given in units of microvolts per meter at a specified test distance and the output power limits are given in temrs of Watts, milliwatts or dBm. Data is measured in the logarithmic form of decibels relative to one microvolt, or dB microvolts (dBuV). For radiated emissions, the measured data is converted to the field strength at the antenna in dB microvolts per meter (dBuV/m). The results are then converted to the linear forms of uV and uV/m for comparison to published specifications.

Where the radiated electric field strength is expressed in terms of the equivalent isotropic radiated power (eirp) the following formula is used to determine the field strength limit in terms of microvolts per meter at a distance of 3m from the equipment under test:

$$E = \frac{1000000 \text{ v } 30\ P}{3} \quad \text{microvolts per meter}$$

where P is the eirp (Watts)

For reference, converting the voltage and electric field strength specification limits from linear to decibel form is accomplished by taking the base ten logarithm, then multiplying by 20. Conversion of power specification limits from linear units (in milliwatts) to decibel form (in dBm) is accomplished by taking the base ten logarithm, then multiplying by 10.

FCC 15.407 (a)and RSS 210 (o) OUTPUT POWER LIMITS

The table below shows the limits for output power and output power density. Where the signal bandwidth is less than 20 MHz the maximum output power is reduced to the power spectral density limit plus 10 times the log of the bandwidth (in MHz).

Operating Frequency (MHz)	Number Of Channels	Output Power
902 – 928	>=50	1 W (30 dBm)
902 – 928	< 50	0.25 W (24 dBm)
2400 – 2483.5	>= 75	1 W (30 dBm)
2400 – 2483.5	>= 75	0.125 W (21 dBm)
5725 – 5850	>=75	1 W (30 dBm)

The maximum permitted output power is reduced by 1dB for every dB the antenna gain exceeds 6dBi. Fixed point-to-point applications using the 5725 – 5850 MHz band are not subject to this restriction.

RSS 210 (o) AND FCC 15.247 SPURIOUS RADIATED EMISSIONS LIMITS

T limits for unwanted (spurious) emissions from the transmitter falling in the restricted bands detailed in Part 15.205 and for all spurious emissions from the receiver are:

Frequency Range (MHz)	Limit (uV/m @ 3m)	Limit (dBuV/m @ 3m)
30 to 88	100	40
88 to 216	150	43.5
216 to 960	200	46.0
Above 960	500	54.0

All other unwanted (spurious) emissions shall be at least 20dB below the level of the highest in-band signal level.

FCC AC POWER PORT CONDUCTED EMISSIONS LIMITS

The table below shows the limits for emissions on the AC power line as detailed in FCC Part 15.207.

Frequency (MHz)	Average Limit (dBuV)	Quasi Peak Limit (dBuV)
0.150 to 0.500	Linear decrease on logarithmic frequency axis between 56.0 and 46.0	Linear decrease on logarithmic frequency axis between 66.0 and 56.0
0.500 to 5.000	46.0	56.0
5.000 to 30.000	50.0	60.0

RSS-210 SECTION 6.6 AC POWER PORT CONDUCTED EMISSIONS LIMITS

The table below shows the limits for emissions on the AC power line as detailed in Industry Canada RSS-210 section 6.6.

Frequency Range (MHz)	Limit (uV)	Limit (dBuV)
0.450 to 30.000	250	48

SAMPLE CALCULATIONS - CONDUCTED EMISSIONS

Receiver readings are compared directly to the conducted emissions specification limit (decibel form) as follows:

$$R_r - B = C$$

and

$$C - S = M$$

where:

R_r = Receiver Reading in dBuV

B = Broadband Correction Factor*

C = Corrected Reading in dBuV

S = Specification Limit in dBuV

M = Margin to Specification in +/- dB

* Broadband Level - Per ANSI C63.4, 13 dB may be subtracted from the quasi-peak level if it is determined that the emission is broadband in nature. If the signal level in the average mode is six dB or more below the signal level in the peak mode, the emission is classified as broadband.

SAMPLE CALCULATIONS - RADIATED EMISSIONS

Receiver readings are compared directly to the specification limit (decibel form). The receiver internally corrects for cable loss, preamplifier gain, and antenna factor. The calculations are in the reverse direction of the actual signal flow, thus cable loss is added and the amplifier gain is subtracted. The Antenna Factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements. A distance factor, when used for electric field measurements, is calculated by using the following formula:

$$F_d = 20*LOG_{10} (D_m/D_s)$$

where:

F_d = Distance Factor in dB

D_m = Measurement Distance in meters

D_s = Specification Distance in meters

Measurement Distance is the distance at which the measurements were taken and Specification Distance is the distance at which the specification limits are based. The antenna factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

The margin of a given emission peak relative to the limit is calculated as follows:

$$R_c = R_r + F_d$$

and

$$M = R_c - L_s$$

where:

R_r = Receiver Reading in dBuV/m

F_d = Distance Factor in dB

R_c = Corrected Reading in dBuV/m

L_s = Specification Limit in dBuV/m

M = Margin in dB Relative to Spec

EXHIBIT 1: Test Equipment Calibration Data

2 Pages

Radiated Emissions, 30 - 26,500 MHz, 07-Nov-03
Engineer: Juan Martinez

Manufacturer	Description	Model #	Assett #	Cal Due
Narda West	High Pass Filter 4.0 GHz,	60583 HXF370	247	17-Apr-04
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	24-Jan-04
Hewlett Packard	EMC Spectrum Analyzer, Opt. 026 □9 KHz - 26.5GHz	8593EM	1141	17-Apr-04
EMCO	Horn Antenna, D. Ridge 1-18GHz	3115	1242	30-Nov-03

Conducted Emissions - AC Power Ports, 04-Nov-03
Engineer: Juan Gonzalez

Manufacturer	Description	Model #	Assett #	Cal Due
Elliott Laboratories	FCC / CISPR LISN	LISN-3, OATS	304	01-Jul-04
Rohde & Schwarz	Test Receiver, 0.009-2000 MHz	ESN	1332	24-Jul-04
Rohde& Schwarz	Pulse Limiter	ESH3 Z2	1398	10-Jan-04

Radiated Emissions, 30 - 1,000 MHz, 07-Nov-03
Engineer: Juan Martinez

Manufacturer	Description	Model #	Assett #	Cal Due
Elliott Laboratories	Biconical Antenna, 30-300 MHz	EL30.300	773	18-Mar-04
EMCO	Log Periodic Antenna, 0.2-2 GHz	3148	1321	31-Mar-04
Rohde & Schwarz	Test Receiver, 0.009-2000 MHz	ESN	1332	24-Jul-04

EXHIBIT 2: Test Data Log Sheets

ELECTROMAGNETIC EMISSIONS

TEST LOG SHEETS

AND

MEASUREMENT DATA

T53361 22 Pages

Elliott

EMC Test Data

Client:	Tekkeon	Job Number:	J53262
Model:	EZ Talker	T-Log Number:	T53361
		Account Manager:	Danni Olivas
Contact:	Jerry Yang		
Emissions Spec:	FCC 15.247, 15.207, RSS-210	Class:	FHSS
Immunity Spec:	-	Environment:	-

EMC Test Data

For The

Tekkeon

Model

EZ Talker

Date of Last Test: 11/7/03

Client:	Tekkeon	Job Number:	J53262
Model:	EZ Talker	T-Log Number:	T53361
		Account Manager:	Danni Olivas
Contact:	Jerry Yang		
Emissions Spec:	FCC 15.247, 15.207, RSS-210	Class:	FHSS
Immunity Spec:	-	Environment:	-

EUT INFORMATION

General Description

The EUT is a wireless bluetooth headset which is designed for hands free cellular conversations. Normally, the EUT would be placed on a table top during operation. The EUT was, therefore, treated as table-top equipment during testing to simulate the end-user environment. The electrical rating of the EUT 3.7Vdc.

Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
Tekkeon	EZ Talker	Wireless Headset	-	TBD
Tekkeon	Audio gateway	Charging cradle	-	-
Tekkeon	P925BW06040ADG3	Power Supply	-	-

Other EUT Details

EUT Enclosure

The EUT enclosure is primarily constructed of plastic. It measures approximately .3 cm wide by .75 cm deep by .25 cm high.

Modification History

Mod. #	Test	Date	Modification
1			
2			
3			

Modifications applied are assumed to be used on subsequent tests unless otherwise stated as a further modification.

Client:	Tekkeon	Job Number:	J53262
Model:	EZ Talker	T-Log Number:	T53361
		Account Manager:	Danni Olivas
Contact:	Jerry Yang		
Emissions Spec:	FCC 15.247, 15.207, RSS-210	Class:	FHSS
Immunity Spec:	-	Environment:	-

Test Configuration #1

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Tekkeon	BCES301199/1	Interface fixture	3436 31 08 00	N/A

Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
IBM	2628	Laptop	99-FWGNA	DoC

Interface Cabling and Ports

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
EUT	Interface fixture	4 wire	Unshielded	0.7
RS-232	Laptop	Multiwire	Shielded	1

EUT Operation During Radio

EUT was set to transmit maximum power at low, middle, and high channel. For the remainder of the test it was set to hop on all channels. The EUT was also set to the middle of the operating on Receive mode.

EUT Operation During Emissions

EUT was set to receive and set to the middle of the operating band.

Client:	Tekkeon	Job Number:	J53262
Model:	EZ Talker	T-Log Number:	T53361
		Account Manager:	Danni Olivas
Contact:	Jerry Yang		
Emissions Spec:	FCC 15.247, 15.207, RSS-210	Class:	FHSS
Immunity Spec:	-	Environment:	-

Test Configuration #2

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
None				

Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
None				

Interface Cabling and Ports

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
EUT	Charging cradle	N/A	N/A	N/A
Cradle DC input	Power Supply	Multiwire	Unshielded	1.8

EUT Operation During Emissions

The EUT was set to transmit at the middle of the operating band at maximum power.

Client:	Tekkeon	Job Number:	J53262
Model:	EZ Talker	T-Log Number:	T53361
		Account Manager:	Danni Olivas
Contact:	Jerry Yang		
Spec:	FCC 15.247, 15.207, RSS-210	Class:	N/A

Radiated Emissions

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 11/7/03
Test Engineer: Juan Martinez
Test Location: SVOATS #2
Config. Used: 1
Config Change: None
EUT Voltage: Battery operated

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing.

For radiated emissions testing the measurement antenna was located 3 meters from the EUT.

Unless stated otherwise the EUT was operating such that it constantly hopped on either the low, center or high channels.

Ambient Conditions:

Temperature: 17 °C
Rel. Humidity: 62 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1a-1c	RE, 30 - 26,000 MHz - Spurious Emissions	FCC Part 15.209 / 15.247(c)	Pass	-5.4dB @ 4804 MHz
2	20dB Bandwidth	15.247(a)	Pass	875 kHz
3	Output Power	15.247(b)	Pass	6.07 dBm
4	Channel Occupanc	15.247(a)	Pass	0.380 Seconds
4	Separation	15.247(a)	Pass	1000 kHz
5	Number of Channels	15.247(a)	Pass	79
6	Bandedges	15.205/15.209	Pass	Refer to run

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Tekkeon	Job Number:	J53262
Model:	EZ Talker	T-Log Number:	T53361
		Account Manager:	Danni Olivas
Contact:	Jerry Yang		
Spec:	FCC 15.247, 15.207, RSS-210	Class:	N/A

Run #1a: Radiated Spurious Emissions, 30 - 26,000 MHz. Low Channel @ 2402 MHz

	H	V
Fundamental emission level @ 3m in 100kHz RBW:	92.91	97.82
Limit for emissions outside of restricted bands:	77.82 dBµV/m	

EUT was tested Standing up. As this was the highest fundamental measurement axis.

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4804.000	53.0	v	74.0	-21.0	Pk	167	1.4	Note 2
4804.000	48.6	v	54.0	-5.4	Avg	167	1.4	Note 2
7206.000	51.2	v	74.0	-22.8	Pk	24	1.4	Note 2
7206.000	37.6	v	54.0	-16.4	Avg	24	1.4	Note 2
12010.00	56.6	v	74.0	-17.4	Pk	177	1.4	Note 2, Noise Floor
12010.00	44.2	v	54.0	-9.8	Avg	177	1.4	Note 2, Noise Floor
14410.00	58.7	v	74.0	-15.3	Pk	180	1.4	Note 2, Noise Floor
14410.00	46.0	v	54.0	-8.0	Avg	180	1.4	Note 2, Noise Floor
4804.000	50.3	h	74.0	-23.7	Pk	172	1.1	Note 2
4804.000	43.4	h	54.0	-10.6	Avg	172	1.1	Note 2
7206.000	51.7	h	74.0	-22.3	Pk	212	1.3	Note 2
7206.000	40.8	h	54.0	-13.2	Avg	212	1.3	Note 2, Noise Floor
12010.00	56.0	h	74.0	-18.0	Pk	0	1.3	Note 2, Noise Floor
12010.00	44.0	h	54.0	-10.0	Avg	0	1.3	Note 2, Noise Floor
14410.00	59.1	h	74.0	-14.9	Pk	0	1.1	Note 2, Noise Floor
14410.00	46.2	h	54.0	-7.8	Avg	0	1.1	Note 2, Noise Floor

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.
Note 2:	No harmonic emission detected 20-dB from the limit after the second harmonic.

Client:	Tekkeon	Job Number:	J53262
Model:	EZ Talker	T-Log Number:	T53361
		Account Manager:	Danni Olivas
Contact:	Jerry Yang		
Spec:	FCC 15.247, 15.207, RSS-210	Class:	N/A

Run #1b: Radiated Spurious Emissions, 30 - 26,000 MHz. Center Channel @ 2441 MHz

	H	V
Fundamental emission level @ 3m in 100kHz RBW:	101.37	94.49
Limit for emissions outside of restricted bands:	81.37 dBµV/m	

EUT was tested Laying Flat up. As this was the highest fundamental measurement axis.

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4882.000	53.8	v	74.0	-20.2	Pk	91	1.2	Note 2
4882.000	48.5	v	54.0	-5.5	Avg	91	1.2	Note 2
7323.000	53.6	v	74.0	-20.4	Pk	317	1.5	Note 2
7323.000	41.2	v	54.0	-12.8	Avg	317	1.5	Note 2
12200.00	57.4	v	74.0	-16.6	Pk	3	1.1	Note 2, Noise Floor
12200.00	44.4	v	54.0	-9.6	Avg	3	1.1	Note 2, Noise Floor
4882.000	53.7	h	74.0	-20.3	Pk	159	1.7	Note 2
4882.000	48.1	h	54.0	-5.9	Avg	159	1.7	Note 2
7323.000	51.2	h	74.0	-22.8	Pk	13	1.4	Note 2
7323.000	38.7	h	54.0	-15.3	Avg	13	1.4	Note 2
12200.00	57.2	h	74.0	-16.8	Pk	359	1.1	Note 2, Noise Floor
12200.00	44.1	h	54.0	-9.9	Avg	359	1.1	Note 2, Noise Floor

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.
Note 2:	No harmonic emission detected 20-dB from the limit after the second harmonic.

Elliott

EMC Test Data

Client:	Tekkeon	Job Number:	J53262
Model:	EZ Talker	T-Log Number:	T53361
		Account Manager:	Danni Olivas
Contact:	Jerry Yang		
Spec:	FCC 15.247, 15.207, RSS-210	Class:	N/A

Run #1c: Radiated Spurious Emissions, 30 - 26,000 MHz. High Channel @ 2480 MHz

	H	V
Fundamental emission level @ 3m in 100kHz RBW:	92.98	98.83
Limit for emissions outside of restricted bands:	78.83 dBµV/m	

EUT was tested Standing up. As this was the highest fundamental measurement axis.

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4960.000	51.1	v	74.0	-22.9	Pk	94	1.6	Note 2
4960.000	44.0	v	54.0	-10.0	Avg	94	1.6	Note 2
7439.000	51.0	v	74.0	-23.0	Pk	0	1.1	Note 2
7439.000	38.1	v	54.0	-15.9	Avg	0	1.1	Note 2
12339.00	56.7	v	74.0	-17.3	Pk	360	1.2	Note 2, Noise Floor
12339.00	44.2	v	54.0	-9.8	Avg	360	1.2	Note 2, Noise Floor
4960.000	52.2	h	74.0	-21.8	Pk	211	1.5	Note 2
4960.000	45.9	h	54.0	-8.1	Avg	211	1.5	Note 2
7439.000	52.0	h	74.0	-22.0	Pk	117	1.5	Note 2
7439.000	39.3	h	54.0	-14.7	Avg	117	1.5	Note 2
12339.00	56.6	h	74.0	-17.4	Pk	117	1.5	Note 2, Noise Floor
12339.00	44.4	h	54.0	-9.6	Avg	117	1.5	Note 2, Noise Floor

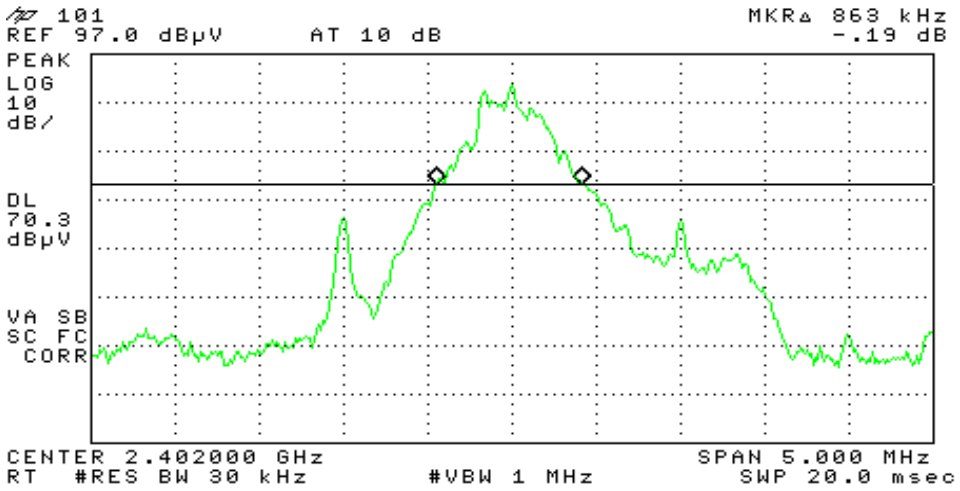
Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.
Note 2:	No harmonic emission detected 20-dB from the limit after the second harmonic.

Client:	Tekkeon	Job Number:	J53262
Model:	EZ Talker	T-Log Number:	T53361
		Account Manager:	Danni Olivas
Contact:	Jerry Yang		
Spec:	FCC 15.247, 15.207, RSS-210	Class:	N/A

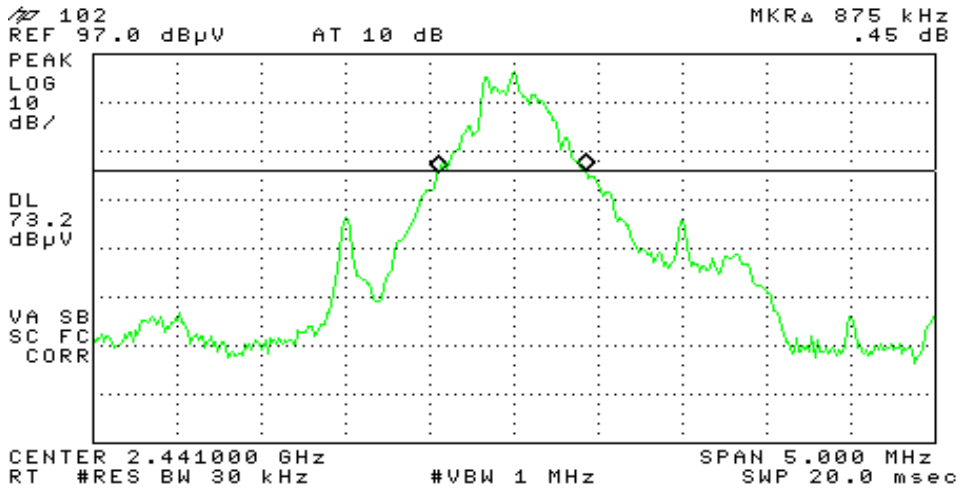
Run #2: Signal Bandwidth

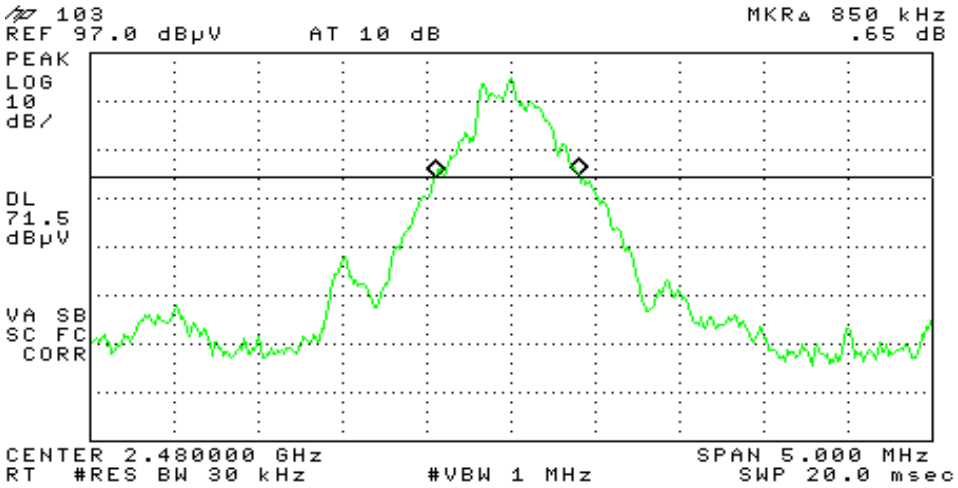
Channel	Frequency (MHz)	Resolution Bandwidth	20dB Signal Bandwidth	Graph reference #
Low	2402	30kHz	863 kHz	101
Mid	2441	30kHz	875 kHz	102
High	2480	30kHz	850 kHz	103

Note 1:	Add note here
Note 2:	



Client:	Tekkeon	Job Number:	J53262
Model:	EZ Talker	T-Log Number:	T53361
		Account Manager:	Danni Olivas
Contact:	Jerry Yang		
Spec:	FCC 15.247, 15.207, RSS-210	Class:	N/A





Client:	Tekkeon	Job Number:	J53262
Model:	EZ Talker	T-Log Number:	T53361
		Account Manager:	Danni Olivas
Contact:	Jerry Yang		
Spec:	FCC 15.247, 15.207, RSS-210	Class:	N/A

Run #3: Output Power

Channel	Frequency	Field Strength at 3m (EIRP)	Antenna Pol.	Res BW	Output Power (EIRP)
	(MHz)	(dBuV/m)	(H/V)	(MHz)	(dBm)
Laying Flat					
Low	2402	88.69	V	1	-6.61
Low	2402	96.34	H	1	1.04
Laying on side					
Low	2402	91.37	V	1	-3.93
Low	2402	96.76	H	1	1.46
Standing up					
Low	2402	97.82	V	1	2.52
Low	2402	92.91	H	1	-2.39
Laying Flat					
Middle	2441	94.49	V	1	-0.81
Middle	2441	101.37	H	1	6.07
Laying on side					
Middle	2441	97.22	V	1	1.92
Middle	2441	100.76	H	1	5.46
Standing up					
Middle	2441	99.82	V	1	4.52
Middle	2441	98.61	H	1	3.31
Laying Flat					
High	2480	93.96	V	1	-1.34
High	2480	99.4	H	1	4.1
Laying on side					
High	2480	91.48	V	1	-3.82
High	2480	99.58	H	1	4.28
Standing up					
High	2480	98.83	V	1	3.53
High	2480	92.98	H	1	-2.32

Client:	Tekkeon	Job Number:	J53262
Model:	EZ Talker	T-Log Number:	T53361
		Account Manager:	Danni Olivas
Contact:	Jerry Yang		
Spec:	FCC 15.247, 15.207, RSS-210	Class:	N/A

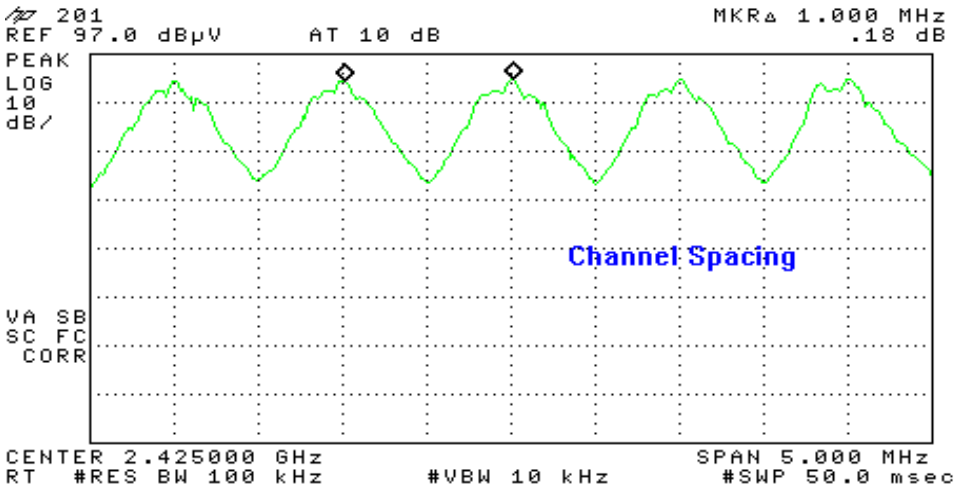
Run #4: Channel Occupancy And Spacing

The channel occupancy was measured with the radio transmitting normally (i.e. In hopping mode)

The channel occupancy was measured with the radio transmitting normally (i.e. In hopping mode)

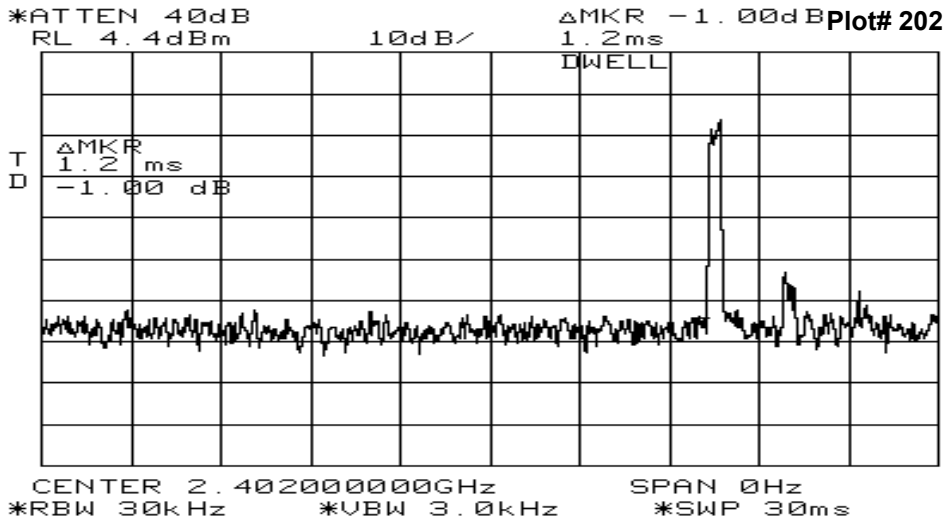
The channel spacing was:	1000	kHz	**Plot# 201**
The minimum channel separation permitted is:	1000	kHz	
The total number of channels (N) was:	79	channels	
The dwell time (Dt) on the center channel was:	0.0012	Seconds	**Plot# 202**
Time between succesive occupancy of a channel (Ot):	0.099	Seconds	**Plot# 203**
Time between succesive occupancy of a channel:	0.095	Seconds	Calculated (Dt * N)
Dwell time calculated :	0.0013	Seconds	Calculated (Ot /* N)
Average time per 30 seconds:	0.380	Seconds	Calculated (30 / N)
Average time per 30 seconds:	0.362	Seconds	Measured (30/Ot * Dt)
The maximum permitted dwell time in a 30 second period for FCC Part 15.247/RSS 210(o), based on a signal bandwidth >250kHz:	0.4	Seconds	

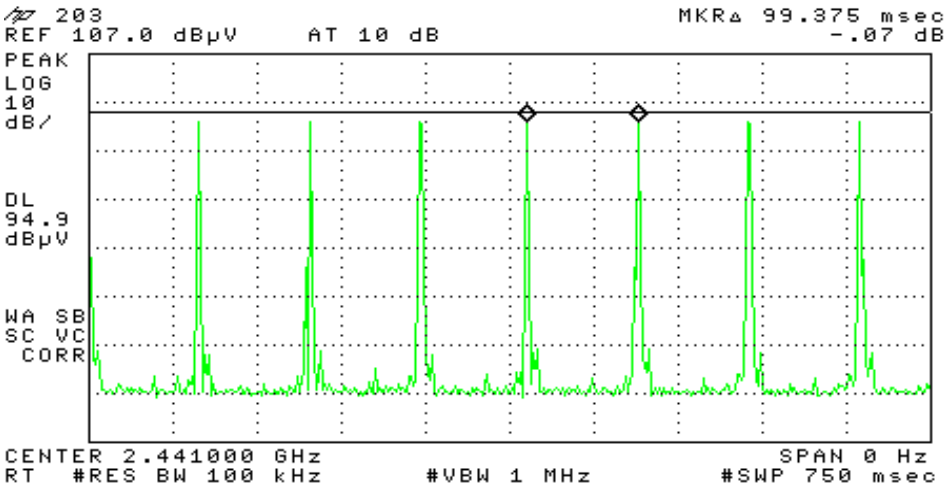
Refer to graph(s) numbered 201 - 103



Client:	Tekkeon	Job Number:	J53262
Model:	EZ Talker	T-Log Number:	T53361
		Account Manager:	Danni Olivas
Contact:	Jerry Yang		
Spec:	FCC 15.247, 15.207, RSS-210	Class:	N/A

Plot# 202





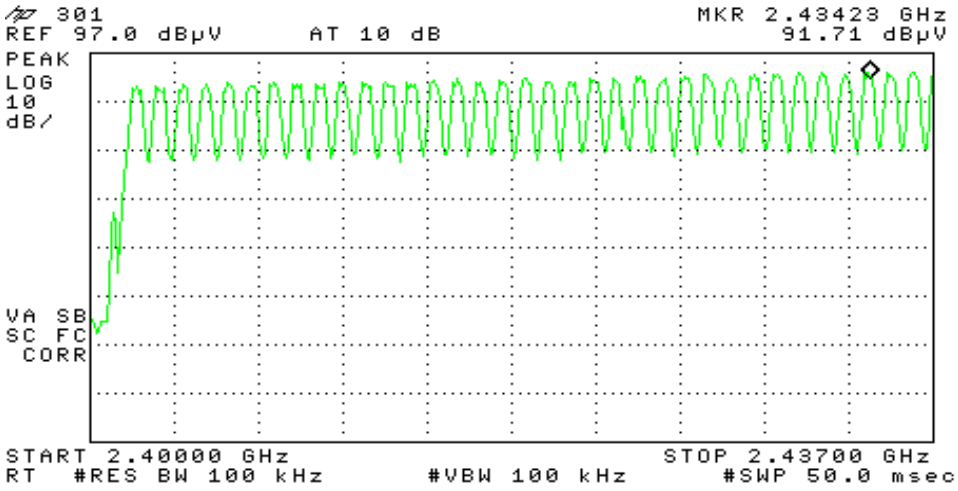
Client:	Tekkeon	Job Number:	J53262
Model:	EZ Talker	T-Log Number:	T53361
		Account Manager:	Danni Olivas
Contact:	Jerry Yang		
Spec:	FCC 15.247, 15.207, RSS-210	Class:	N/A

Run #5: Number of Channels

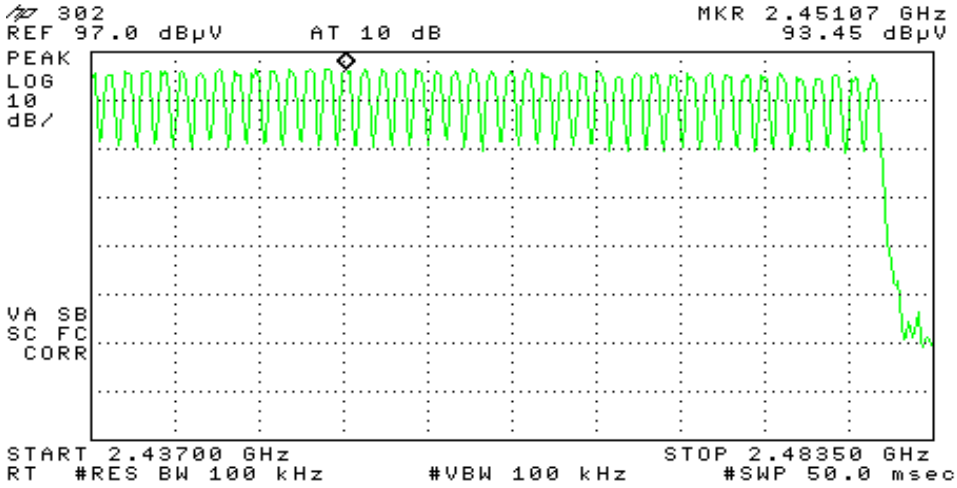
The number of channels was verified with the radio transmitting normally (i.e. In hopping mode)

The number of channels was: 79

Refer to graph(s) numbered 301 - 302



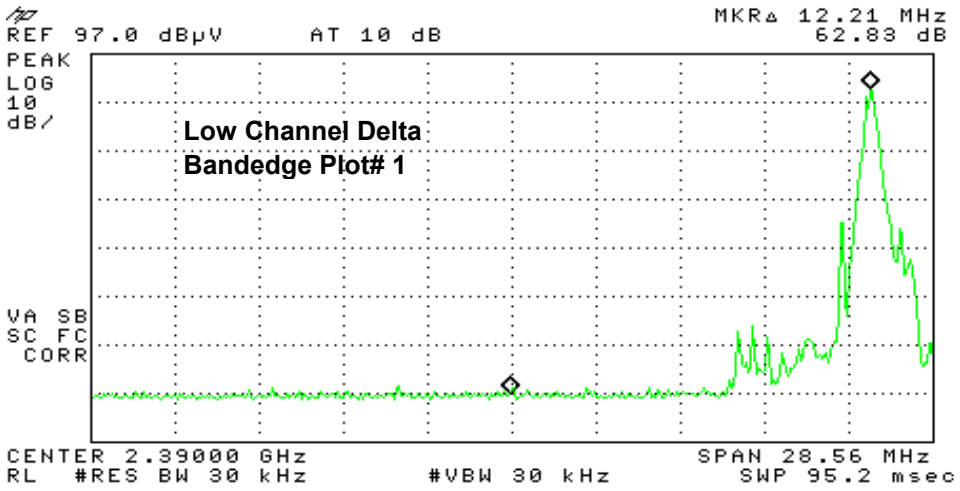
35 Channels

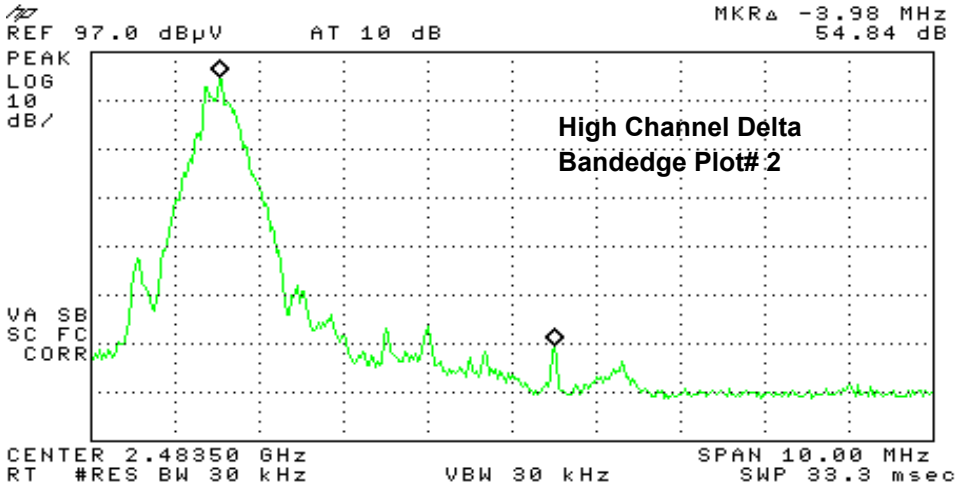


44 Channels

Client:	Tekkeon	Job Number:	J53262
Model:	EZ Talker	T-Log Number:	T53361
		Account Manager:	Danni Olivas
Contact:	Jerry Yang		
Spec:	FCC 15.247, 15.207, RSS-210	Class:	N/A

Run #6: Bandedges





Client:	Tekkeon	Job Number:	J53262
Model:	EZ Talker	T-Log Number:	T53361
		Account Manager:	Danni Olivas
Contact:	Jerry Yang		
Spec:	FCC 15.247, 15.207, RSS-210	Class:	N/A

Bandedge Measurements

Bandedge	Fundamental Level	Detector	Spurious Level		Limit	Margin	Polarization	Comment
MHz	(dBuV/m @3m)	Pk/Avg	-dBc	dBuV/m	dBuV/m	dB		
2390.00	97.8	Pk	62.8	35.0	74.0	-39.0	v	Note 1, 3
2390.00	97.1	Avg	62.8	34.3	54.0	**-19.7**	v	Note 1, 3
2390.00	92.9	Pk	62.8	30.1	74.0	-43.9	h	Note 1, 3
2390.00	92.2	Avg	62.8	29.4	54.0	**-24.6**	h	Note 1, 3
2483.50	91.5	Pk	54.8	36.6	74.0	-37.4	v	Note 2, 3
2483.50	90.8	Avg	54.8	36.0	54.0	**-18.0**	v	Note 2, 3
2483.50	99.6	Pk	54.8	44.7	74.0	-29.3	h	Note 2, 3
2483.50	99.1	Avg	54.8	44.3	54.0	**-9.7**	h	Note 2, 3

Note 1:	EUT operating on the lowest channel 2402 MHz. Bandedge compliance level, at 2390 MHz, was calculated using the relative delta measurement in Plot# 1, of the spreadsheet (-62.8 dBc), and applied to the peak and average field strength measurements of the fundamental signal level.
Note 2:	EUT operating on highest channel available 2480 MHz. Bandedge compliance level, at 2483.5 MHz, was calculated using the relative delta measurement in Plot# 2, of the spreadsheet (-54.8 dBc), and applied to the peak and average field strength measurements of the fundamental signal level.
Note 3:	Peak Fundamental was measured with RBW=1MHz and VBW=1MHz. Average Fundamental was measured with RBW=1MHz and VBW=10Hz.

Client:	Tekkeon	Job Number:	J53262
Model:	EZ Talker	T-Log Number:	T53361
		Account Manager:	Danni Olivas
Contact:	Jerry Yang		
Spec:	FCC 15.247, 15.207, RSS-210	Class:	FHSS

Reciever Radiated Emissions

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 11/7/03
Test Engineer: Juan Martinez
Test Location: SVOATS #2

Config. Used: 1
Config Change: None
EUT Voltage: Battery operated

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated emissions testing.

Note, for testing above 1 GHz, the FCC specifies the limit as an average measurement. In addition, the FCC states that the peak reading of any emission above 1 GHz, can not exceed the average limit by more than 20 dB.

Ambient Conditions:

Temperature: 17 °C
Rel. Humidity: 62 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	RE, 1000 - 10,000 MHz, Maximized Emissions	RSS-210 (7.3)	Pass	-1.5dB @ 2441 MHz

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Elliott

EMC Test Data

Client:	Tekkeon	Job Number:	J53262
Model:	EZ Talker	T-Log Number:	T53361
		Account Manager:	Danni Olivas
Contact:	Jerry Yang		
Spec:	FCC 15.247, 15.207, RSS-210	Class:	FHSS

Run #1: Maximized readings, 1000 - 8000 MHz
Measurements made at 3m per FCC requirements.

Frequency	Level	Pol	FCC Class B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2441.000	55.0	v	74.0	-19.0	Pk	82	1.1	
2441.000	52.5	v	54.0	-1.5	Avg	82	1.1	
4880.000	46.6	v	74.0	-27.4	Pk	82	1.1	Noise Floor
4880.000	34.5	v	54.0	-19.5	Avg	82	1.1	Noise Floor
7321.000	49.5	v	74.0	-24.5	Pk	82	1.1	Noise Floor
7321.000	37.6	v	54.0	-16.4	Avg	82	1.1	Noise Floor
5762.000	53.1	v	74.0	-20.9	Pk	82	1.1	Noise Floor
5762.000	40.5	v	54.0	-13.5	Avg	82	1.1	Noise Floor
2441.000	50.6	h	74.0	-23.4	Pk	288	1.9	
2441.000	44.5	h	54.0	-9.5	Avg	288	1.9	
4880.000	46.6	h	74.0	-27.4	Pk	288	1.9	Noise Floor
4880.000	34.2	h	54.0	-19.8	Avg	288	1.9	Noise Floor
7321.000	50.3	h	74.0	-23.7	Pk	288	1.9	Noise Floor
7321.000	37.9	h	54.0	-16.1	Avg	288	1.9	Noise Floor
5762.000	53.6	h	74.0	-20.4	Pk	288	1.9	Noise Floor
5762.000	40.7	h	54.0	-13.3	Avg	288	1.9	Noise Floor

Note 1:	Add note here
Note 2:	

Client:	Tekkeon	Job Number:	J53262
Model:	EZ Talker	T-Log Number:	T53361
		Account Manager:	Danni Olivas
Contact:	Jerry Yang		
Spec:	FCC 15.247, 15.207, RSS-210	Class:	FHSS

Conducted Emissions - Power Ports

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 11/4/03
Test Engineer: Juan Gonzalez
Test Location: SVOATS #2
Config. Used: 2
Config Change: None
EUT Voltage: 120V/60Hz

General Test Configuration

For tabletop equipment, the EUT was located on a wooden table, 40 cm from a vertical coupling plane and 80cm from the LISN.

Ambient Conditions:

Temperature: 11 °C
Rel. Humidity: 74 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	CE, AC Power,120V/60Hz	EN55022 B	Pass	-14.7dB @ 0.321MHz

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Elliott

EMC Test Data

Client:	Tekkeon	Job Number:	J53262
Model:	EZ Talker	T-Log Number:	T53361
		Account Manager:	Danni Olivas
Contact:	Jerry Yang		
Spec:	FCC 15.247, 15.207, RSS-210	Class:	FHSS

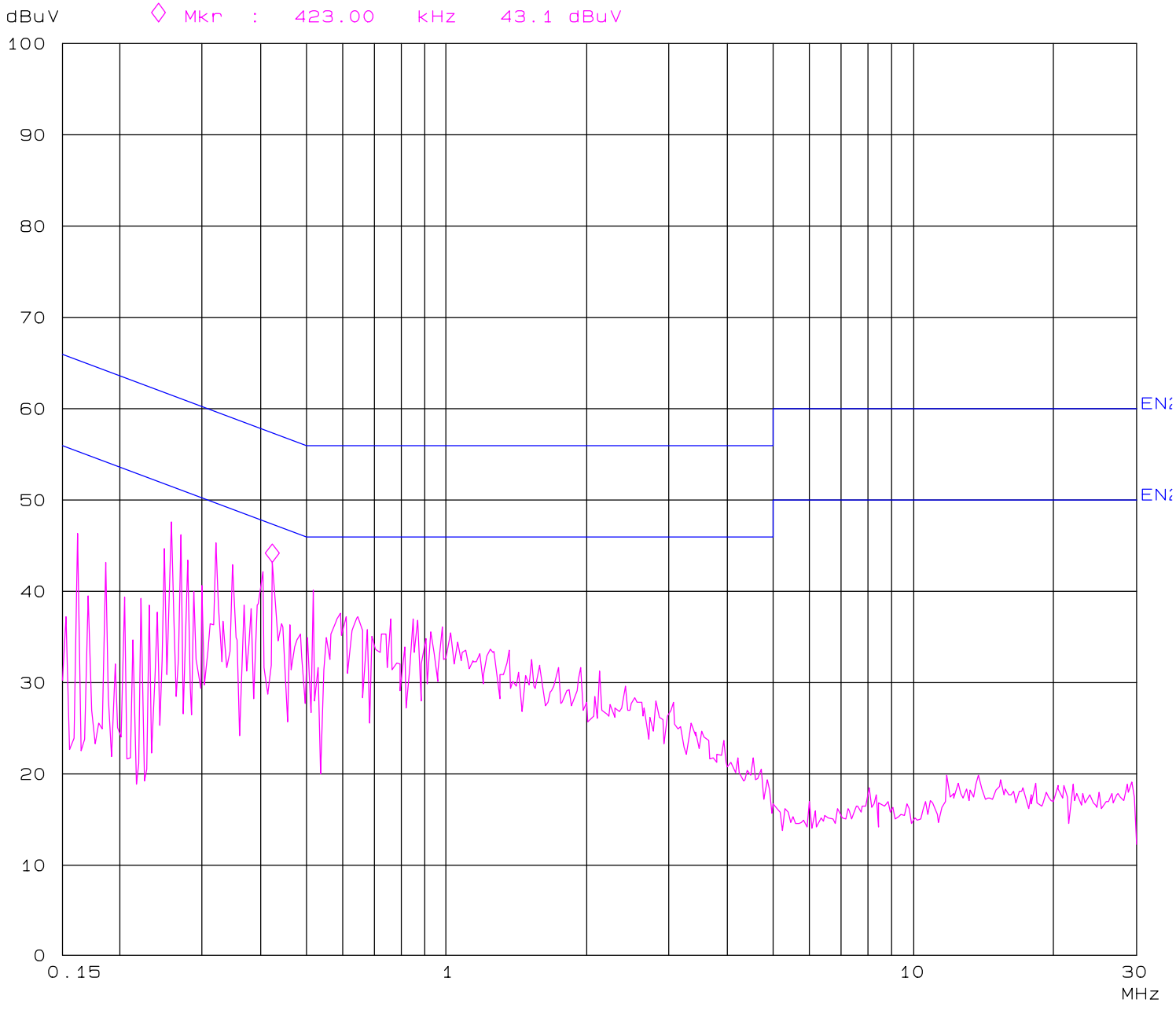
Run #1: AC Power Port Conducted Emissions, 0.15 - 30MHz, 120V/60Hz

Frequency	Level	AC	EN55022 B		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
0.321	35.0	Neutral	49.7	-14.7	Average	
0.321	44.6	Neutral	59.7	-15.1	QP	
0.258	34.5	Line	51.5	-17.0	Average	
0.258	44.2	Line	61.5	-17.3	QP	
0.321	32.1	Line	49.7	-17.6	Average	
0.321	41.6	Line	59.7	-18.1	QP	
0.186	44.0	Neutral	64.2	-20.2	QP	
0.231	42.0	Neutral	62.4	-20.4	QP	
0.423	26.8	Line	47.4	-20.6	Average	
0.423	36.6	Line	57.4	-20.8	QP	
0.231	27.0	Neutral	52.4	-25.4	Average	
0.186	26.5	Neutral	54.2	-27.7	Average	

Elliott Laboratories
AC Conducted Emissions

04. Nov 03 23:05

Operator: Juan Gonzalez
Comment: Tekkeon
EZ Talker, Bluetooth Headsets
EN55022 B
Line
120Vac, 60Hz
J53262 / T53341



Elliott Laboratories
AC Conducted Emissions

04. Nov 03 23:22

Operator: Juan Gonzalez
Comment: Tekkeon
EZ Talker, Bluetooth Headsets
EN55022 B
Neutral
120Vac, 60Hz
J53262 / T53341