



FCC PART 15C

TEST AND MEASUREMENT REPORT

For

Q-Track Corporation

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Huntsville, Alabama 35805, USA

FCC ID:VJ3-QDOSE-XL

Report Type: Original Report	Product Type: AM Transmitter with ZigBee Module
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* This report may contain data that are not covered by the NVLAP accreditation and are marked with an asterisk “*”

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1112191-15C	Initial Report	2011-01-18

1 General Description

1.1 Product Description for Equipment under Test (EUT)

This test and measurement report was prepared on behalf of *Q-Track Corporation* and their product, *model: Q-Does-XL, FCC ID: VJ3-Q-Does-XL*, which will henceforth be referred to as the EUT “Equipment Under Test”. The EUT is an AM broadcast transmitter that operates from 600 to 1600 kHz. The microprocessor is controlled and powered by a rechargeable lithium ion battery and cannot transmit while it's being charged it also includes a 2.4 GHz ZigBee certified module with FCC ID: U6TZIGBIT-A2.

1.2 Mechanical Description of EUT

The EUT measures approximately 11.5cm (L) x 11cm (W) x 3cm (H) and weighs 20g.

The data gathered are from a production sample provided by the manufacturer. Serial number: 1112191 assigned by BACL.

1.3 Objective

This report is prepared on behalf of *Q-Track Corporation* in accordance with Part 15, Subpart C of the Federal Communication Commissions rules – Causing Equipment Standards for Digital Apparatus.

1.4 Related Submittal(s)/Grant(s)

No Related Submittals.

1.5 Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

All tests were performed at Bay Area Compliance Laboratories Corp.

1.6 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on CISPR16-4-2:2003, The Treatment of Uncertainty in EMC Measurements, the values ranging from ± 2.0 dB for Conducted Emissions tests and ± 4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL Corp.

1.7 Test Facility

The test site used by BACL Corp. to collect radiated and conducted emissions measurement data is located at its facility in Sunnyvale, California, USA.

The test site at BACL Corp. has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997, and Article 8 of the VCCI regulations on December 25, 1997. The test site also complies with the test methods and procedures set forth in CISPR 22:2008 §10.4 for measurements below 1 GHz and §10.6 for measurements above 1 GHz as well as ANSI C63.4-2003, ANSI C63.4-2009, TIA/EIA-603 & CISPR 24:2010.

The Federal Communications Commission and Voluntary Control Council for Interference have the reports on file and they are listed under FCC registration number: 90464 and VCCI Registration No.: R-3729, C-4176, G-469, and T-1206. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL Corp. is a National Institute of Standards and Technology (NIST) accredited laboratory under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The current scope of accreditations can be found at <http://ts.nist.gov/Standards/scopes/2001670.htm>

2 System Test Configuration

2.1 Justification

The EUT was configured for testing according to ANSI C63.4-2003.

The EUT was tested in an operating mode to represent worst-case results during the final qualification test.

2.2 EUT Exercise Software

N/A

2.3 Equipment Modifications

No modifications were made to the EUT.

2.4 Special Accessories

No special equipment was used during testing.

2.5 Local Support Equipment

Manufacturers	Descriptions	Models	Serial Numbers
-	-	-	-

2.6 EUT Internal Configuration Details

Manufacturers	Descriptions	Models	Serial Numbers
The Q-Track Corporation	Main PCB Board	QDose XL Rev B	-

2.7 Power Supply and Line Filters

Manufacturer	Description	Model	Serial Number
Emerson Network Power	AC/DC Power Adapter	DCH3-05OUS-0002	CD97P8

2.8 External I/O Cabling List and Details

Cable Descriptions	Length (m)	From	To
-	-	-	-

3 Summary of Test Results

FCC Rules	Descriptions of Test	Result (s)
§15.203	Antenna Requirements	Compliance
§15.207	Conducted Emissions	N/A
§15.209	Radiated Emissions	Compliance

Note: N/A, The EUT is battery powered during operating mode, conducted emissions is not required.

4 FCC §15.203 – Antenna Requirements

4.1 Applicable Standard

According to FCC §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

- a. Antenna must be permanently attached to the unit.
- b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

4.2 Result

Compliance, both antennas of AM transmitter and ZigBee radio are built inside the device and are not acceptable by the end user.

5 FCC §15.207 – Conducted Emissions

5.1 Applicable Standards

As per FCC §15.207: Conducted Limits

As per FCC Section 15.207, For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 to 0.5	66 to 56	56 to 46
0.5 to 5	56	46
5 to 30	60	50

Note 1: The lower limit shall apply at the transition frequency.

Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

5.2 Test Results

N/A, the EUT is battery powered when it is on operating mode.

6 FCC §15.209 – Radiated Emissions

6.1 Applicable Standard

As per FCC §15.209(a): Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (micro volts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100 ^{Note 2}	3
88 - 216	150 ^{Note 2}	3
216 - 960	200 ^{Note 2}	3
Above 960	500	3

Note 2: Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

6.2 Test Setup

The radiated emissions tests were performed in the 10-meter Chamber, using the setup in accordance with ANSI C63.4-2003. The specification used was the FCC 15 Subpart C limits.

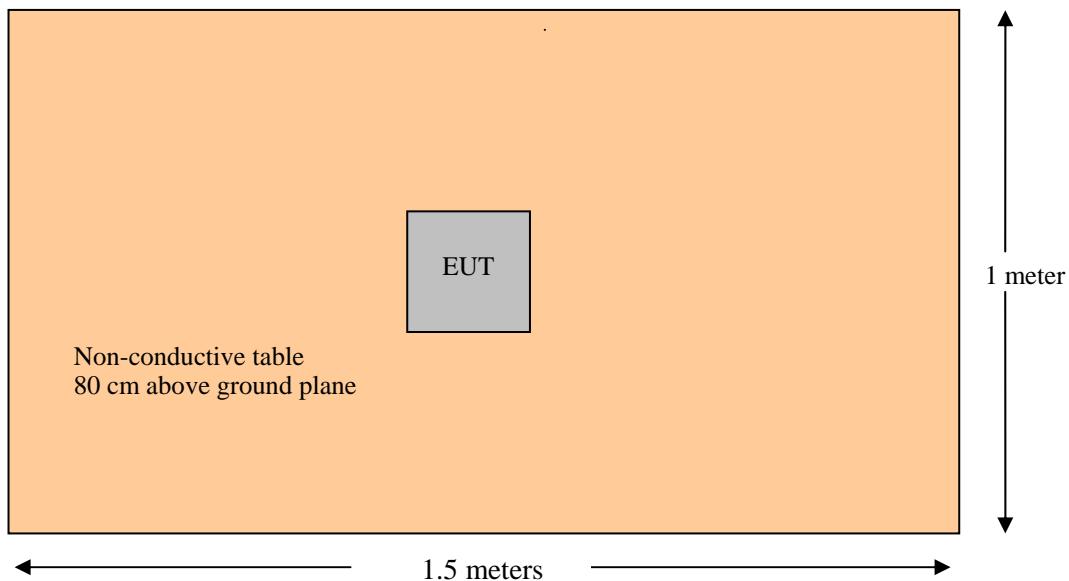
6.3 Test Procedure

For the radiated emissions test, the EUT host was battery powered.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

The EUT is set 3 meter (above 1GHz) and 10 meter (below 1GHz) away from the testing antenna, which is varied from 1-4 meter, and the EUT is placed on a turntable, which is 0.8 meter above ground plane, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna should be changed the polarization both of horizontal and vertical.

6.4 Test Setup Block Diagram



6.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the Antenna Factor (AF), the Cable Loss (CL), the Attenuator Factor (Atten) and subtracting the Amplifier Gain (Ga) to indicated Amplitude (Ai) reading. The basic equation is as follows:

$$CA = Ai + AF + CL + Atten - Ga$$

For example, a corrected amplitude of 40.3 dBuV/m = Indicated Reading (32.5 dBuV) + Antenna Factor (+23.5dB) + Cable Loss (3.7 dB) + Attenuator (10 dB) - Amplifier Gain (29.4 dB)

The “Margin” column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the maximum limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corrected Amplitude} - \text{Limit}$$

6.6 Test Equipment List and Details

Manufacturers	Descriptions	Model Numbers	Serial Numbers	Calibration Dates
Sonoma Instrument	Pre-amplifier	315	303125	2011-04-12
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100338	2011-06-24
Hewlett Packard	Pre-amplifier	8447D	2944A07030	2011-04-11
HP	Pre-amplifier	8449B	3147A00400	2011-02-01
Sunol Science Corp	System Controller	SC99V	122303-1	N/R
EMCO	Antenna, Horn	3115	9511-4627	2011-10-03
Sunol Science Corp	Combination Antenna	JB1	A020106-1	2011-05-17
EMCO	Antenna, Loop Passive	6512	34167	2010-04-08 ¹
ETS-Lindgren	Antenna, Loop Passive	6511	128222	2010-09-30 ¹
Agilent	Spectrum Analyzer	E4440A	MY44303352	2011-05-10

Note¹: Based on a two year calibration cycle

Statement of Traceability: BACL attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

6.7 Test Environmental Conditions

Temperature:	17 ° C
Relative Humidity:	40 %
ATM Pressure:	101.79 kPa

The testing was performed by Quinn Jiang on 2012-01-12 in chamber 1.

6.8 Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC 15.209 radiated emissions limits, and had the worst margin of:

Mode: AM Stand Alone Transmitting			
Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Range
-9.56	105.647	Horizontal	9 kHz – 1000 MHz
Mode: Co-Transmit with Zigbee worst channel			
Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Range
-6.55	105.6378	-	Above 1 GHz ¹

Note¹: All emission levels were on the noise floor or 20 dB below of the limit.

6.9 Radiated Emissions Test Result Data

1) Radiated Emission at 10 meters, 9 kHz – 30 MHz

Mode: AM Stand Alone

Frequency (MHz)	S.A. Reading (dB μ V)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre- Amp. (dB)	Cord. Reading (dB μ V/m)	Part 15.209	
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dB μ V/m)	Margin (dB)
1.055	48.94	248	120	H	47.4	0.2	51.7	44.84	46.22	-1.38
1.055	48.25	360	120	V	47.4	0.2	51.7	44.15	46.22	-2.07
-	-	-	-	-	-	-	-	-	-	Note ¹

Mode: Co-Transmit with Zigbee worst channel (Middle channel)

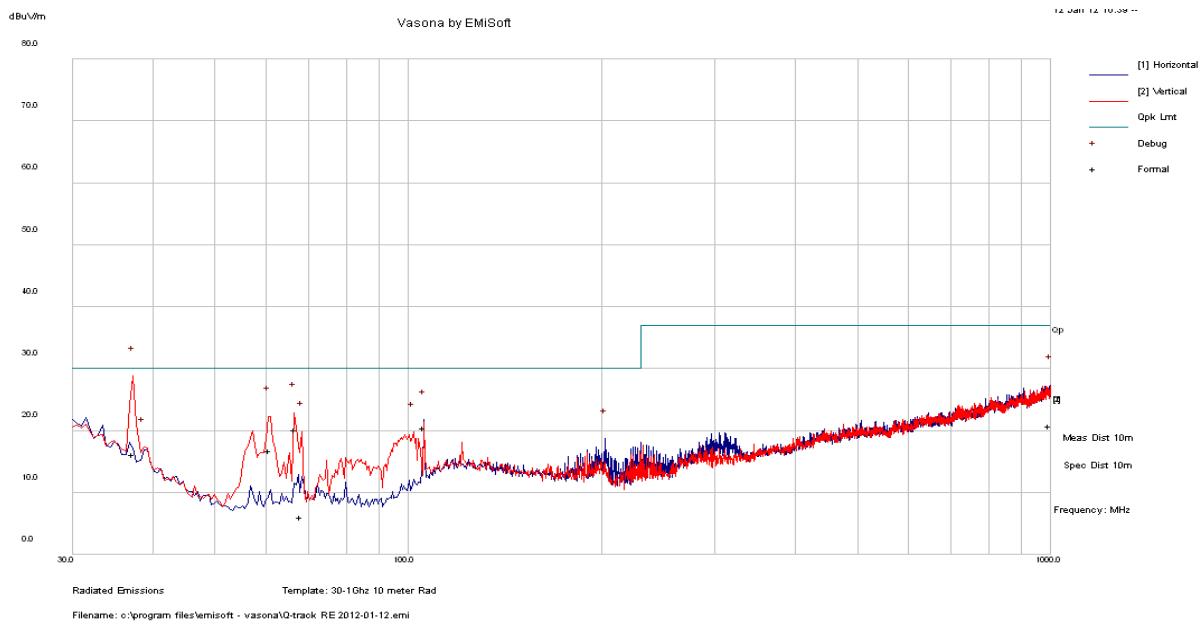
Frequency (MHz)	S.A. Reading (dB μ V)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre- Amp. (dB)	Cord. Reading (dB μ V/m)	Part 15.209	
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dB μ V/m)	Margin (dB)
1.055	49.23	250	120	H	47.4	0.2	51.7	45.13	46.22	-1.09
1.055	48.55	360	120	V	47.4	0.2	51.7	44.45	46.22	-1.77
-	-	-	-	-	-	-	-	-	-	Note ¹

Note: 1.055 MHz is the fundamental frequency

Note¹: All other emissions were on the noise floor or 20 dB below of the limit.

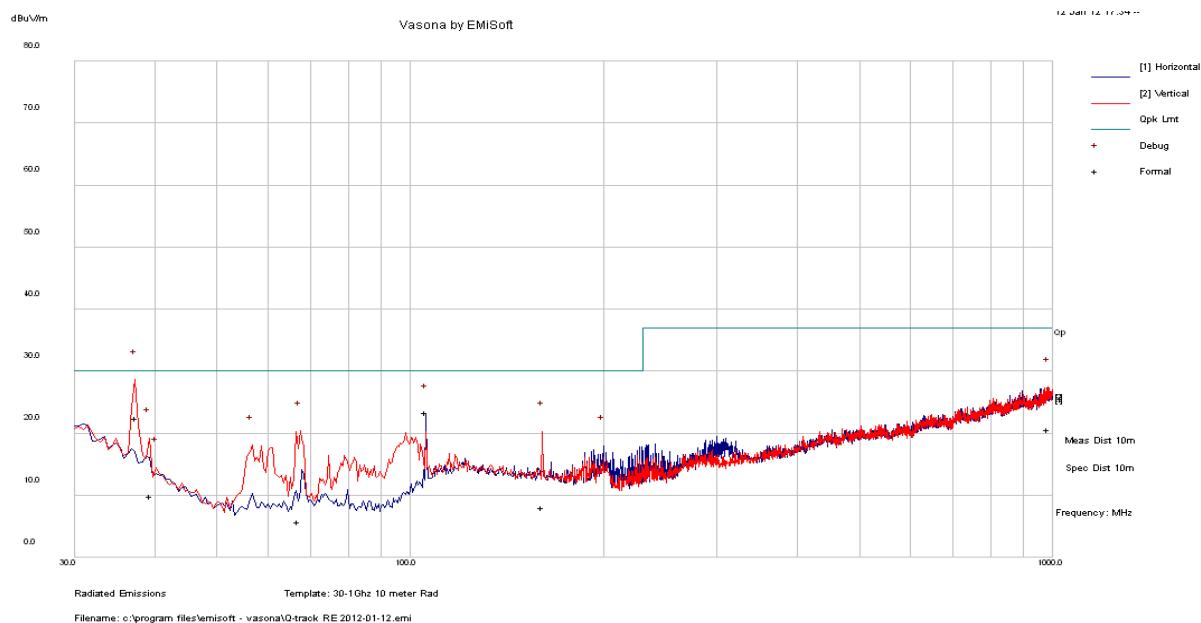
2) Radiated Emission at 10 meters, 30 MHz – 1000 MHz

Mode: AM Stand Alone



Frequency (MHz)	Corrected Amplitude (dB μ V/m)	Test Antenna		Turntable Azimuth (degrees)	Limit (dB μ V/m)	Margin (dB)
		Height (cm)	Polarity (H/V)			
105.647	20.44	325	H	102	30	-9.56
66.6055	20.15	397	V	338	30	-9.85
60.80025	16.75	384	V	122	30	-13.25
37.36275	16.13	174	V	302	30	-13.87
997.43	20.79	215	H	16	37	-16.21
68.2175	6.05	226	V	91	30	-23.95

Mode: Co-Transmit with Zigbee worst channel (Middle channel)



Frequency (MHz)	Corrected Amplitude (dB μ V/m)	Test Antenna		Turntable Azimuth (degrees)	Limit (dB μ V/m)	Margin (dB)
		Height (cm)	Polarity (H/V)			
105.6378	23.45	255	H	300	30	-6.55
37.49525	22.41	220	V	36	30	-7.59
983.8438	20.61	332	V	78	37	-16.39
39.4305	9.87	198	V	130	30	-20.13
160.313	8	253	V	326	30	-22.00
67.095	5.71	402	V	276	30	-24.29

3) Radiated Emission at 3 meters, above 1 GHz

Mode: Co-Transmit with Zigbee worst channel (Middle channel)

Frequency (MHz)	Corrected Amplitude (dB μ V/m)	Test Antenna		Turntable Azimuth (degrees)	Limit (dB μ V/m)	Margin (dB)
		Height (cm)	Polarity (H/V)			
-	-	-	-	-	-	Note ¹

Note¹: All emission levels were on the noise floor or 20 dB below of the limit.