

CFR Title 47 Parts
Addendum to P806016
Class II Permissive Change to Application

FCC ID: LQC289

EMI TEST REPORT

on

Q-TRON EXCITATION SYSTEM

Prepared For

Q-Tron LTD.
3855 64th Avenue
Calgary, AB T2C 2V5
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Prepared by

Electronic Compliance Laboratories, Inc.
1249 Birchwood Drive
Sunnyvale, CA 94089
408/747-1490

Test Report Number: P806016a

Date of Test: September 30, 1998

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1.0 Certification of Compliance

Description: Q-TRON EXCITATION SYSTEM

Model Number: QES 1000

Serial Number: N/A

Applicant: Q-Tron LTD.

Type of Test: FCC-15, Class A (Class II Permissive Change) parts 15.205 and 15.209

Date of Test: September 30, 1998

Tested By: Shawn McGuiness

The above equipment was tested by Electronic Compliance Laboratories, Inc. and found to be in compliance with the requirements set forth in the FCC Rules and Regulations, Part 15, Subpart C (15.205, 15.209, 15.247). The equipment, in the configuration described in this report, shows that the maximum emission levels emanating from this equipment are within the compliance requirements.

Chris Byleckie
Technical Director

Date

2.0 General Information

Applicant: Q-Tron LTD.
3855 64th Avenue
Contact Person: Shawn Duce
Equipment Under Test: Q-TRON EXCITATION SYSTEM
Model Number: QES 1000
Serial Number: N/A
FCC ID#: LQC289
Report Number: P806016A
Date of Test: September 30, 1998
Manufacturer: Q-Tron

Type of Test: Class II Permissive Change, FCC part 15, Subpart C, (15.205, 15.209), Class A Digital Device.

Frequency Range: 1000 MHz to 10,000 MHz - Radiated Emissions, Class A
902 MHz to 928 MHz - part 15.205
Up to the 10th harmonic of the fundamental (9270 MHz) part 15.35(a)

Summary

Pass/Fail: Passed

15.209 Radiated Emissions:

The Q-TRON EXCITATION SYSTEM meet all the requirements for Part 15.209 Class A limit. **See Appendix D for Data Sheet and plots.**

15.205 Restricted Band:

The Q-TRON EXCITATION SYSTEM met all the requirements for 15.205. **See attached data and plots in Appendix A and Appendix B.**

3.0 Test Facility

Name: Electronic Compliance Laboratories

Location: 1249 Birchwood Drive
Sunnyvale, CA 94089

Site Filing: A site description is on file at the Federal Communications Commission
P.O. Box 429
Columbia, MD 21045

NVLAP Code: 20089

Types of Sites: Open Field Radiated and Indoor (Screen Room).
Line Conducted: All sites are constructed and calibrated to meet
ANSI C63.4-1994 requirements.

4.0 Test Equipment

The following list contains equipment used at EC Laboratories, Inc. for compliance testing. The equipment conforms to the American National Standard Specifications for Electromagnetic Interference and Field Strength Instrumentation from 10 kHz to 1000 MHz.

Description	Manufacturer	N/A	Model No.	Cal. Due Date
EMI Receiver	HP	3325A00137	8456A	5/3/99
Pre-amp	HP	313A06829	8447F	5/10/99
Pre-amp	HP	3008A00527	8449B	4/5/99
LISN	EM	2532	ANS-25/2	6/12/99
Spectrum Analyzer	HP	3137A01183	8563A	5/22/99
Plotter	HP	2644V00365	7470A	N/A
Power Meter	HP	2342A07307	435B	4/4/99
Power Sensor	HP	N/A	8482A	4/12/99
Biconical Antenna	EM	677	EM-6912	3/3/99
Log-Periodic Antenna	EM	858	EM-6950	4/18/99
Horn Antenna	EM	6231	RGA-60	6/6/99

HP = Hewlett Packard

EM = Electro Metrics

The antenna used at the time the data was taken is indicated on each data page. The antenna height and polarization are also noted on the data pages.

The calibration of the measuring instruments, including any accessories that may effect such calibration, are checked frequently to assure their accuracy. Adjustments are made and correction factors applied in accordance with instructions contained in the manual for the measuring instrument.

5.0 Data Reporting Format

The measurement results are expressed in accordance with FCC Part-15, Subpart B Class B limits, where applicable, are presented in tabular or graphical form.

6.0 Detector Functions

On any frequency or frequencies below or equal to 1000 MHz, the limits shown below are based on measuring equipment employing a CISPR quasi-peak detector function and related measurement bandwidths.

On any frequency or frequencies above 1000 MHz, the radiated limits shown below are based on the use of measuring equipment employing an average detector function.

EC Laboratories uses the Peak detection mode for normal testing and initial screening of the Q-TRON EXCITATION SYSTEM. The Peak detection mode will produce a measurement value that is always greater than, or equal to, the quasi-peak or average detection mode. Whenever the measurement value is 6 dB below the applicable limit or greater, the appropriate detector function will be employed and recorded.

7.0 Frequency Range of Investigation

The spectrum was investigated up to the frequency specified in the following table according to the highest clock frequency generated in the device.

<u>Highest Frequency Used (Clock)</u>	<u>Upper Limit of Range Measured</u>
Below 1.705 MHz	30 MHz
1.705 to 108 MHz	1000 MHz
108 to 500 MHz	2000 MHz
500 to 1000 MHz	5000 MHz
Above 1000 MHz	5th Harmonic or 40 GHz (Whichever is Lower)

8.0 FCC Class Types

Class A Digital Device

A digital device that is marketed for use in a commercial, industrial or business environment, exclusive of a device which is marketed for use by the general public or is intended to be used in the home.

Class B Digital Device

A digital device that is marketed for use in a residential environment notwithstanding use in a commercial, business and industrial environments. Examples of such devices include, but are not limited to, personal computers, calculators, and similar electronic devices that are marketed for use by the general public.

Note: The responsible party may also qualify a device intended to be marketed in a commercial, business or industrial environment as a Class B device, and in fact is encouraged to do so, provided the device complies with the technical specifications for a Class B digital device. In the event that a particular type of device has been found to repeatedly cause harmful interference to radio communications, the Commission may classify such a device a Class B digital device, regardless of its intended use.

(Code of Federal Regulations, 47, Part 15, Subpart A, Sect. H&I)

(CFR 47, Parts 0 TO 19, Revised as of October 1,1990)

9.0 FCC Limits

9.1 Conducted Emission Limits

For a digital device that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back into the AC power line on any frequency or frequencies within the band 450 kHz to 30 MHz shall not exceed the limits in the following table for the appropriate class. Compliance shall be based on the measurement of the Radio Frequency voltage between each power line and ground at the power terminals. The lower limit applies at the band edges.

Frequency (MHz)	Class A Limit (μ V)	Class A Limit (dB μ V)	Class B Limit (μ V)	Class B Limit (dB μ V)
0.45 to 1.705	1000	60.0	250	48.0
1.705 to 30.0	3000	69.5	250	48.0

9.2 Radiated Emission Limits

The field strength of radiated emissions for a Class B Digital Device, when measured at a distance of 10 meters, shall not exceed the limits given in the table below. The lower limit applies at the band edge.

The field strength of radiated emissions for a Class B Digital Device, when measured at a distance of 3 meters, shall not exceed the limits given in the table below. The lower limit applies at the band edge.

Frequency (MHz)	Class A (3m) Limit (μ V/m)	Class A (3m) Limit (dB μ V/m)	Class A (10m) Limit (μ V/m)	Class A (10m) Limit (dB μ V/m)	Class B (3m) Limit (μ V/m)	Class B (3m) Limit (dB μ V/m)
30-88	300	49.6	90	39.1	100	40.0
88-216	500	54.0	150	43.5	150	43.5
216-960	700	56.0	210	46.4	200	46.0
Above 960	1000	60.0	300	49.5	500	54.0

10.0 Test Methods

10.1 Line Conducted Emissions Test Procedure

1. EUT and any other equipment and cables were placed on a wood table one meter above a ground screen.
2. The EUT's Input Power line cord was connected to a Line Impedance Stabilization Network (LISN) under the table.
3. All other (Non-EUT) equipment received power from a separate AC Power Source. The LISN assembly has two monitoring points: Line 1 (AC-Hot) and Line 2 (AC-Neutral). Each monitoring point was scanned by the measuring equipment (the other point was terminated in 50 ohms) over the frequency range of 450 kHz to 30 MHz for conducted emissions.
4. When an emission is found, the following takes place:
 - a. The emission levels are maximized by equipment/cable placement.
 - b. Frequency and emission level data are entered into computer in dBm.
 - c. The monitoring point (Line 1 or 2) is entered into the computer.
 - d. The computer converts dBm to micro volts and uses a look-up table to find cable losses (in dB) at that frequency, calculates a corrected emission level, and compares the corrected emission level to the appropriate limit. The data is then printed out in tabular form.

An example of the printout and definitions follows below.

10.1 Line Conducted Emissions Test Example

Freq (MHz)	Site Reading (dB μ V)	FCC Limit		EUT Level (L1)	
		A	B	A	B
		(dB μ V)		(dB)	
1.85	-57	69.5	48.0	-4.5	+17

Freq. = Frequency of emission in MHz

Reading dB μ V = Reading at Spectrum Analyzer (Uncorrected)

FCC Limit A/B = Conducted Emission level limit in dB μ V

EUT Level A* = Emission relative to the FCC Class A Limit

EUT Level B* = Emission relative to the FCC Class B Limit

Note = L1 is AC-Hot, L2 is AC-Neutral

QP is a Quasi-Peak value

AV is an average value

*A negative value indicates that the emission is below (or meets) the limit and a positive value indicates that the emission is above (or exceeds) the limit.

10.3 Radiated Emissions Test Procedure

1. EUT and any other equipment and cables used with the EUT were placed on a wood table one-meter above a ground screen.
2. The EUT receives the normal AC Power at the base of the table.
3. All equipment and cables are placed in a manner which tends to maximize their emission characteristics in a typical application.
4. The table was rotated 360 degrees to determine the maximum radial emissions.
5. The antenna was varied in height between 1 meter and 4 meters above the ground plane to determine the maximum emissions. Various antennas are used during the test in both the vertical and horizontal polarization.
6. The Spectrum Analyzer is scanned from 30 MHz to 1000 MHz for emissions. The applicable spectrum analyzer settings are:
 - a. Resolution Bandwidth = 100 kHz,
 - b. Normal Detector Mode = Peak (The Quasi-Peak is used when the emissions are near, or over the limit).
7. When an emission is found and maximized, the following actions are performed:
 - a. The emission frequency is entered into the computer.
 - b. The emission level is read from the spectrum analyzer in dBm and entered into the computer.
 - c. The antenna polarization is entered into the computer.
 - d. The computer converts the level in dBm to dB μ V and uses lookup tables to determine the coax cable loss, antenna factor, and pre-amp gain. A site correction factor is calculated for that particular frequency, and the data is printed out in tabular form.

10.4 Radiated Test Example

Freq (MHz)	Site Reading (dB μ V)	FCC Limit		EUT Level (QP)	
		A	B	A	B
		(dB μ V)		(dB)	
65.4	-58	39.1	40.0	-4.6	-5.5

Freq. = Frequency of emission in MHz.

Reading dB μ V = Reading at Spectrum Analyzer (Uncorrected)

FCC Limit A/B = Limit in dB μ V as stated in Part-15, Subpart B

EUT Level A* = Emission level relative to the FCC Class A limit

EUT Level B* = Emission level relative to the FCC Class B limit.

Note = V/H is the antenna polarization (Vertical or Horizontal)

PK indicates a Peak Value

QP indicates the Quasi-Peak value.

*A negative value indicates that the emission is below (or meets) the limit and a positive value indicates that the emission is above (or exceeds) the limit.

11.0 Summary of Measurements

Summary of Measurements for a Spread-Spectrum System, 902-928 MHz

CFR Title 47, Part 15.247

Manufacturer: Q-Tron LTD.
3855 64th Avenue
Contact: Shawn Duce
FCC ID: **LQC289**
Test Report Number: P806016a

15.205 Restricted Bands - Emissions Within Restricted Bands

The Q-TRON EXCITATION SYSTEM was placed on a wooden table resting on a turntable. The wooden table was approximately 1 meter above the ground plane of the 3 meter portion of the 10 meter OATS test site.

The search antenna was located 3 meters from the Q-TRON EXCITATION SYSTEM. With the Q-TRON EXCITATION SYSTEM in the TRANSMIT mode and transmitting continuously, with the spectrum analyzer in the MAX HOLD mode, the turntable was rotated and the search antenna was raised and lowered in an attempt to maximize the received radiated emissions level. The Q-TRON EXCITATION SYSTEM was set in the continuous transmit mode at the low (906 MHz) middle (916 MHz) and the high (924 MHz) channels. The attached chart entitled "FCC Radiated Data Sheet" shows that emissions falling into restricted bands are below the limit of 54 dB_u V/m. Peak measurements were made using 12BW=VBW=1MHz. Avg measurements were made with AY RBW= 1MHz and VBW=10Hz. **Data Sheets are in Appendix A**

The Q-TRON EXCITATION SYSTEM was found to be in compliance with the applicable regulations.

15.209 RADIATED EMISSIONS

The attached table shows that the Class A radiated limits from 30 - 1000 MHz are not exceeded by the Q-TRON EXCITATION SYSTEM. The Q-TRON EXCITATION SYSTEM was operating normally with a combination of transmission and reception and hopping one of the fifteen pseudorandom sequences during this test. The Q-TRON EXCITATION SYSTEM was placed near one edge of a wooden table resting on a turntable. The wooden table was approximately 1 meter above the groundplane of the 3 meter test site. The search antennas were located at 3 meters. Measurements were made in accordance with ANSI C63.4-1994. **Test Data is in Appendix B.**

APPENDIX A
Restricted Band Data

EUT:	QES 1000, MODEL Q89217				CUSTOMER NAME: QTRON					
RULE PART:	FCC15.205				WORK ORDER: 8093001					
ANTENNA:	Horn				FILE: 8093001					
POLARIZATION:	Vertical				ATTN dB: 0					
MODULATION TYPE:					DUTY dB: 0					
TESTED BY:	SURESH				HP IL dB: 0					
COMMENT:					DIST dB: 0					
FREQ. MHz	READING dB(uV)	PK NF	A.F. or Av	Cbl dB	FLTR dB	AMP dB	TOTAL, dB(uV/m)	LIMIT dB(uV/m)	DELTA dB	
Ch 1 / 906.08 MHz										
2716.47	54.00		Pk	30.6	-5.3	-0.4	35.6	54.7	74.0	-19.3
2716.47	43.00		Avg	30.6	-5.3	-0.4	35.6	43.7	54.0	-10.3
3622.00	60.60		Pk	32.5	-6.2	-0.4	35.1	64.6	74.0	-9.4
3622.00	48.83		Avg	32.5	-6.2	-0.4	35.1	52.8	54.0	-1.2
4530.00	44.00		Pk	34.2	-7.0	-0.4	35.1	50.5	74.0	-23.5
4530.00	33.67		Avg	34.2	-7.0	-0.4	35.1	40.1	54.0	-13.9
7248.00	47.83	*	Pk	36.8	-10.6	-0.4	35.5	60.2	74.0	-13.8
7248.00	25.83	*	Avg	36.8	-10.6	-0.4	35.5	38.2	54.0	-15.8
8154.00	48.67	*	Pk	38.4	-11.4	-0.4	35.5	63.4	74.0	-10.6
8154.00	25.50	*	Avg	38.4	-11.4	-0.4	35.5	40.2	54.0	-13.8
9060.00	47.33	*	Pk	40.4	-12.1	-0.4	35.5	64.7	74.0	-9.3
9060.00	25.50	*	Avg	40.4	-12.1	-0.4	35.5	42.9	54.0	-11.1
CH 4/ 915.20MHz										
2743.47	55.67		Pk	30.6	-5.3	-0.4	35.5	56.5	74.0	-17.5
2743.47	45.00		Avg	30.6	-5.3	-0.4	35.5	45.8	54.0	-8.2
3657.47	55.33		Pk	32.5	-6.2	-0.4	35.1	59.3	74.0	-14.7
3657.47	44.17		Avg	32.5	-6.2	-0.4	35.1	48.2	54.0	-5.8
4572.83	42.17		Pk	34.2	-7.0	-0.4	35.2	48.6	74.0	-25.4
4572.83	32.83		Avg	34.2	-7.0	-0.4	35.2	39.3	54.0	-14.7
7323.23	48.00	*	Pk	36.8	-10.6	-0.4	35.4	60.4	74.0	-13.6
7323.23	26.33	*	Avg	36.8	-10.6	-0.4	35.4	38.8	54.0	-15.3
8236.60	48.00	*	Pk	38.4	-11.4	-0.4	35.5	62.7	74.0	-11.3
8236.60	28.17	*	Avg	38.4	-11.4	-0.4	35.5	42.8	54.0	-11.2
9151.80	47.33	*	Pk	40.4	-12.1	-0.4	35.5	64.7	74.0	-9.3
9151.80	26.00	*	Avg	40.4	-12.1	-0.4	35.5	43.4	54.0	-10.6
CH 3 / 924.06MHz										
2773.62	55.83		Pk	30.6	-5.3	-0.4	35.5	56.6	74.0	-17.4
2773.62	45.00		Avg	30.6	-5.3	-0.4	35.5	45.8	54.0	-8.2
3698.86	52.00		Pk	32.5	-6.2	-0.4	35.1	56.0	74.0	-18.0
3698.86	40.67		Avg	32.5	-6.2	-0.4	35.1	44.7	54.0	-9.3
4617.62	43.67		Pk	34.2	-7.0	-0.4	35.2	50.1	74.0	-23.9
4617.61	33.67		Avg	34.2	-7.0	-0.4	35.2	40.1	54.0	-13.9
7388.04	47.50	*	Pk	36.8	-10.6	-0.4	35.4	59.9	74.0	-14.1
7388.04	37.00	*	Avg	36.8	-10.6	-0.4	35.4	49.4	54.0	-4.6
8312.57	48.00	*	Pk	38.4	-11.4	-0.4	35.5	62.7	74.0	-11.3
8312.57	27.00	*	Avg	38.4	-11.4	-0.4	35.5	41.7	54.0	-12.3

APPENDIXB

15.209 Radiated Emissions Data

Electronic Compliance Laboratories, Inc.
1249 Birchwood Ave.
Sunnyvale, CA
Radiated Emissions
Frequency range: 30MHz-1000MHz

3 Meter Open Site
Site Calibrated: June 1997

Government Agency and Limit: FCC Class B

QP = Quasi-Peak Note: Ignore peak readings when Quasi-Peak reading exists
PK = Peak

Customer: Q-TRON Operator: SURESH
Date: 09-30-1998 Time: 12:23:09
Temperature Range: 75 Deg F Percent Humidity: 55
E.U.T.: QES 1000
Serial Number:
Support Devices:
Serial Number:
FCC ID:
Exercise Program:
Modifications: NONE
Report File Name: F:\TESTDATA\8093001.RF

Antenna Type: BICONICAL

TEST DETECTOR	TEST	ACTUAL	CLASS B	VERSUS	TABLE	ANTENNA	POLAR-	
FREQ	dBuV	dBuV/m	LIMIT	B LIMIT	DEGREES	HEIGHT	IZATION	Type
=====	=====	=====	=====	=====	=====	=====	=====	=====
CHANGED ANTENNA TO 1-18Gig HORN								
2.74	49.7	49.0	54.0	-5.0	01	1.0	H	PK
2.74	45.3	44.6	54.0	-9.4	01	1.0	H	QP
3.66	54.4	54.7	54.0	0.7	0	1.0	H	PK
3.66	50.7	51.0	54.0	-3.0	0	1.0	H	QP
4.57	45.3	46.3	54.0	-7.7	0	1.0	H	PK
2.71	49.1	48.1	54.0	-5.9	0	1.0	H	PK
2.71	41.9	40.9	54.0	-13.1	0	1.0	H	QP
3.63	45.1	45.7	54.0	-8.3	0	1.0	H	PK
2.78	44.9	44.6	54.0	-9.4	0	1.0	H	PK
3.70	43.3	43.3	54.0	-10.7	0	1.0	H	PK

APPENDIX C
SET- UP PHOTOGRAPHS



FCC B 15.209 Radiated Emissions



FCC 15.205 Restricted Band Emissions

