ENGINEERING TEST REPORT

Dual Deactivator
Model No.: DD1

FCC ID: YQI-DD1

Applicant: **DetecTag Inc.**
16845 Highway 27
Schomberg, ON
Canada, L0G 1T0

In Accordance With

FEDERAL COMMUNICATIONS COMMISSION (FCC)
PART 15, SUBPART C, SEC 15.223

Unlicensed Low Power Transmitter
Operating in the band 7.7 to 8.7 MHz

UltraTech's File No.: DETC-001Q_F15.223_Rev1

This Test report is Issued under the Authority of Tri M. Luu, Professional Engineer, Vice President of Engineering UltraTech Group of Labs Date: September 27, 2010	
Report Prepared by: Dharmajit Solanki Issued Date: September 27, 2010	Tested by: Hung Trinh, RFI Test Technician Test Dates: August 30 to Sept 02, 2010

- *The results in this Test Report apply only to the sample(s) tested, and the sample tested is randomly selected.*
- *This report must not be used by the client to claim product endorsement by NVLAP or any agency of the US Government.*

UltraTech

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91038	1309	46390-2049	NVLAP Lab Code 200093-0	SL2-IN-E-1119R	Korea KCC-RRL CA2049

TABLE OF CONTENTS

EXHIBIT 1. INTRODUCTION

1.1. SCOPE

Reference:	FCC Part 15, Subpart C, Sec. 15.225 - Operation within the band 7.7 to 8.7 MHz.
Title	Telecommunication - Code of Federal Regulations, CFR 47, Part 15, Subpart C
Purpose of Test:	This report is covered test results for Certification compliance with FCC regulations for Unlicensed Low Power Transmitter operating in the 7.7 to 8.7 MHz band.
Test Procedures	Both conducted and radiated emissions measurements were conducted in accordance with American National Standards Institute ANSI C63.4 - 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.
Environmental Classification:	• Light-industry, Commercial • Industry

1.2. RELATED SUBMITAL(S)/GRANT(S)

None

1.3. NORMATIVE REFERENCES

Publication	Year	Title
FCC CFR Parts 0-19	2009	Code of Federal Regulations – Telecommunication
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
KDB Publication No. 447498	2009	Mobile and Portable Device RF Exposure Procedure and Equipment Authorization Policies
CISPR 22 EN 55022	2005 2006	Limits and Methods of Measurements of Radio Disturbance Characteristics of Information Technology Equipment
CISPR 16-1-1	2006	Specification for radio disturbance and immunity measuring apparatus and methods. Part 1-1: Measuring Apparatus
CISPR 16-2-1	2005	Specification for radio disturbance and immunity measuring apparatus and methods. Part 2-1: Conducted disturbance measurement
CISPR 16-2-3	2005	Specification for radio disturbance and immunity measuring apparatus and methods. Part 2-3: Radiated disturbance measurement

EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1. CLIENT INFORMATION

APPLICANT:	
Name:	DetecTag Inc.
Address:	16845 Highway 27 Schomberg, ON Canada, L0G 1T0
Contact Person:	Mr. Mads Pilested Phone #: 905 939 9265 Fax #: 905 939 9266 Email Address: mads@detectag.com

MANUFACTURER:	
Name:	DetecTag Inc.
Address:	16845 Highway 27 Schomberg, ON Canada, L0G 1T0
Contact Person:	Mr. Karsten Pilested Phone #: 905 939 9265 Fax #: 905 939 9266 Email Address: karsten@detectag.com

2.2. EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information (with the exception of the Date of Receipt) has been supplied by the applicant.

Brand Name:	DetecTag Inc.
Product Name:	Dual Deactivator
Model Name or Number:	DD1
Part Number:	N/A
Serial Number:	Preproduction
Equipment Type:	Carrier Hopped Anti-Pilferage System
Primary User Functions of EUT:	Deactivator of Electronic Article Surveillance Security Labels.
Power input source:	12V AC 500mA using 120V, 60Hz AC Adaptor

2.3. EUT'S TECHNICAL SPECIFICATIONS

TRANSMITTER	
Equipment Type:	Portable
Intended Operating Environment:	Commercial, Industrial or Business Environment
Power Supply Requirement:	12V AC 500mA
Field Strength at 10 Meters:	50.12 dBµV/m @ 7.7 MHz
Operating Frequency Range:	7.7 to 8.7 MHz (Except for Restricted Band Frequencies)
Hopping Frequencies:	7.70MHz, 7.76MHz, 7.82MHz, 7.89MHz. 7.95Mhz, 8.01MHz, 8.08MHZ, 8.14MHz, 8.2MHz, 8.26MHz, 8.33MHz, 8.4MHz, 8.47Mhz, 8.54mhz, 8.62MHz, 8.7MHz
RF Output Impedance:	50 Ohms
Duty Cycle:	3.12%
6 dB Bandwidth:	1.03 MHz
Emission Designation:	P0N
Antenna Connector Types:	RJ11
Antennas Description:	**Antenna 1**: Manufacturer: DetecTag Inc. Model: Under-counter Pad Part: 914-20x30 Dimensions 20x30cm circuit board Freq. Range: 7.7 to 8.7 MHz **Antenna 2**: Manufacturer: DetecTag Inc. Model: Counter Top Deactivator Pad Part: 914-8202 Dimensions: 25-30cm. Simple wire loop inside plastic cabinet Freq. Range: 7.7 to 8.7 MHz

2.4. LIST OF EUT'S PORTS

Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
1	Power port	--	Circular Pin Male	Non shielded wire
2	Antenna port	2	RJ-11	Non shielded telephone wire

2.5. ANCILLARY EQUIPMENT

None

2.6. GENERAL RADIATED EMISSION TEST SETUP

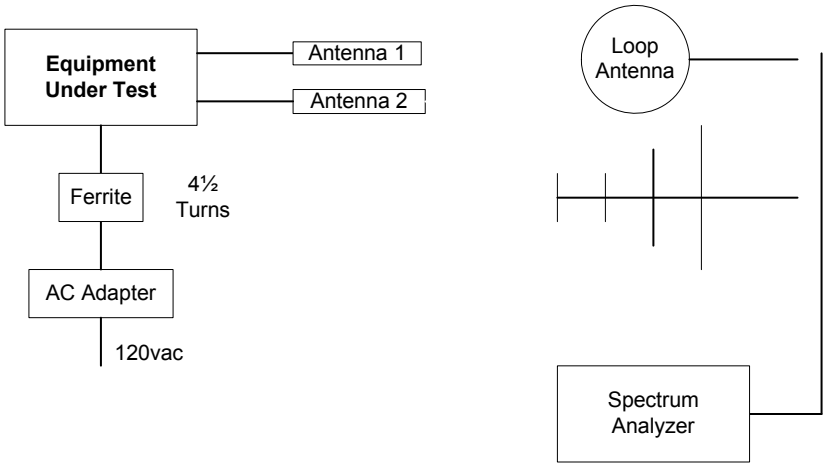


EXHIBIT 3. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

3.1. CLIMATE TEST CONDITIONS

The climate conditions of the test environment are as follows:

Temperature:	21°C
Humidity:	52%
Pressure:	102 kPa
Power input source:	12V AC, 500mA

3.2. OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TESTS

Operating Modes:	Transmit RF signal
Special Test Software:	None
Special Hardware Used:	None
Transmitter Test Antenna:	The EUT was tested with two different antennas fitted in a manner typical of normal intended use.

Transmitter Test Signals:	
Frequencies:	7.7 & 8.7 MHz

EXHIBIT 4. SUMMARY OF TEST RESULTS

4.1. LOCATION OF TESTS

All of the measurements described in this report were performed at Ultratech Group of Labs located in the city of Oakville, Province of Ontario, Canada.

- Radiated Emissions were performed at the Ultratech's 3-10 TDK Semi-Anechoic Chamber situated in the Town of Oakville, province of Ontario. This test site been calibrated in accordance with ANSI C63.4, and found to be in compliance with the requirements of Sec. 2.948 of the FCC Rules. The descriptions and site measurement data of the Oakville 3-10 TDK Semi-Anechoic Chamber has been filed with FCC office (FCC File No.: 31040/SIT 1300B3) and Industry Canada office (Industry Canada Site No.: 2049A-3, Expiry Date: May 1, 2011)

- AC Power Line Conducted Emissions were performed in UltraTech's shielded room, 24'(L) by 16'(W) by 8'(H).

4.2. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC PARAGRAPH.	TEST REQUIREMENTS	COMPLIANCE (YES/NO)
15.203 & 15.204	Transmitter Antenna Requirement	Yes
15.223(a)	6 dB Bandwidth	Yes
15.223(a)	Field Strength of Emissions inside the permitted band 1.705 to 10.0 MHz	Yes
15.223(b)	Field Strength of Emissions outside of the band 1.705 to 10.0 MHz	Yes
15.107 & 15.207	Class B - AC Power Conducted Emissions	Yes
15.109(a)	Class B - Radiated Emissions from Unintentional Radiators	Yes
1.1307, 2.1091 & 2.1091	RF Exposure Requirement	Yes

4.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

A Steward ferrite 28A5776 0A2 (4 ½ turns) was wrapped on the wire of an AC Power Adaptor (Make: Triad, Model: WAU12-500) as supplied by the applicant for compliance.

EXHIBIT 5. MEASUREMENTS, EXAMINATIONS & TEST DATA FOR EMC EMISSIONS

5.1. TEST PROCEDURES

This section contains test results only. Details of test methods and procedures can be found in ANSI C63.4 and ULTR-P001-2004.

5.2. MEASUREMENT UNCERTAINTIES

The measurement uncertainties stated were calculated in accordance with the requirements of CISPR 16-4-2 @ IEC:2003 and JCGM 100:2008 (GUM 1995) – Guide to the Expression of Uncertainty in Measurement with a confidence level of 95%. Please refer to Exhibit 6 for Measurement Uncertainties.

5.3. MEASUREMENT EQUIPMENT USED:

The measurement equipment used complied with the requirements of the Standards referenced in the Methods & Procedures ANSI C63.4 and CISPR 16-1.

5.4. COMPLIANCE WITH FCC PART 15 – GENERAL TECHNICAL REQUIREMENTS

FCC Section	FCC Rules	Compliance
15.203	Described how the EUT complies with the requirement that either its antenna is permanently attached, or that it employs a unique antenna connector, for every antenna proposed for use with the EUT. The exception is in those cases where EUT must be professionally installed. In order to demonstrate that professional installation is required, the following 3 points must be addressed: • The application (or intended use) of the EUT • The installation requirements of the EUT • The method by which the EUT will be marketed	Antennas must be professionally installed as declared by the applicant. Refer to Page 3 of the user manual.
15.204	Provided the information for every antenna proposed for use with the EUT: (a) type (e.g. Yagi, patch, grid, dish, etc…), (b) manufacturer and model number (c) gain with reference to an isotropic radiator	Details are as given in sec 2.3.

5.5. AC POWER LINE CONDUCTED EMISSIONS [§15.107(A) & 15.207(A)]

5.5.1. Limit(s)

The equipment shall meet the limits of the following table:

Frequency of emission (MHz)	Conducted Limits (dBμV)		Measuring Bandwidth
	Quasi-peak	Average	
0.15–0.5 .....……..	66 to 56*	56 to 46*	RBW = 9 kHz
0.5–5 .....……..	56	46	VBW ≥ 9 kHz for QP
5-30 ……..	60 ...……..	50	VBW = 1 Hz for Average

*Decreases linearly with the logarithm of the frequency

5.5.2. Method of Measurements

Details of test methods and procedures can be found in ANSI C63.4.

5.5.3. Test Data

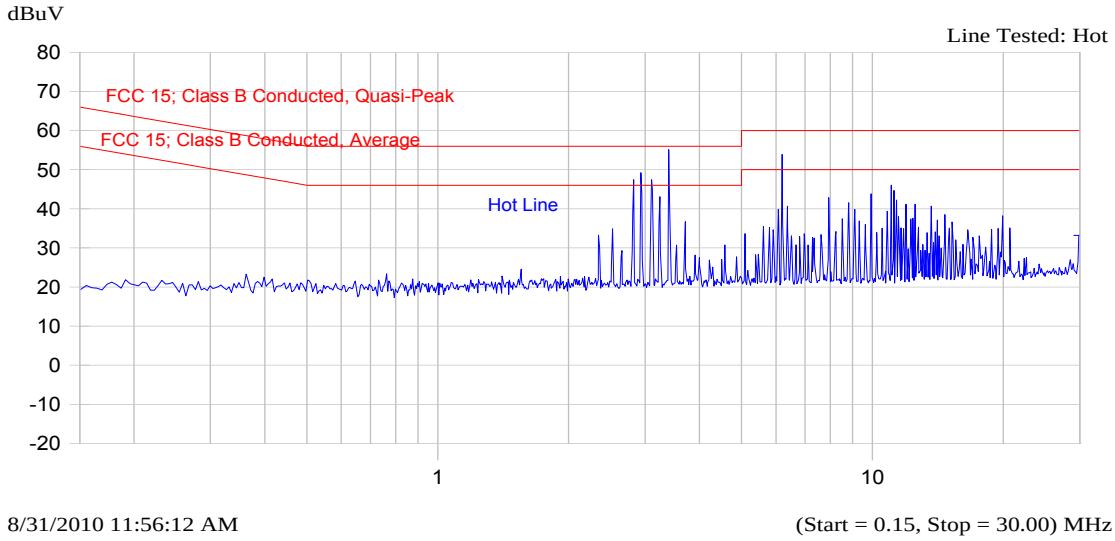
See the following test data plots for details.

Plot #1: AC Power Line Conducted Emissions, Mode: TX ON

Test Header

Description: Power Input: 120 Vac (Tx Mode)
Customer Name: Detectag Inc
Project Number: DETC-001Q
Operator Name: William Truong
EUT Name: Dual De-Activator, 8.2 MHz Transmitter
Date Created: 8/31/2010 10:28:35 AM

Current Graph



Current List

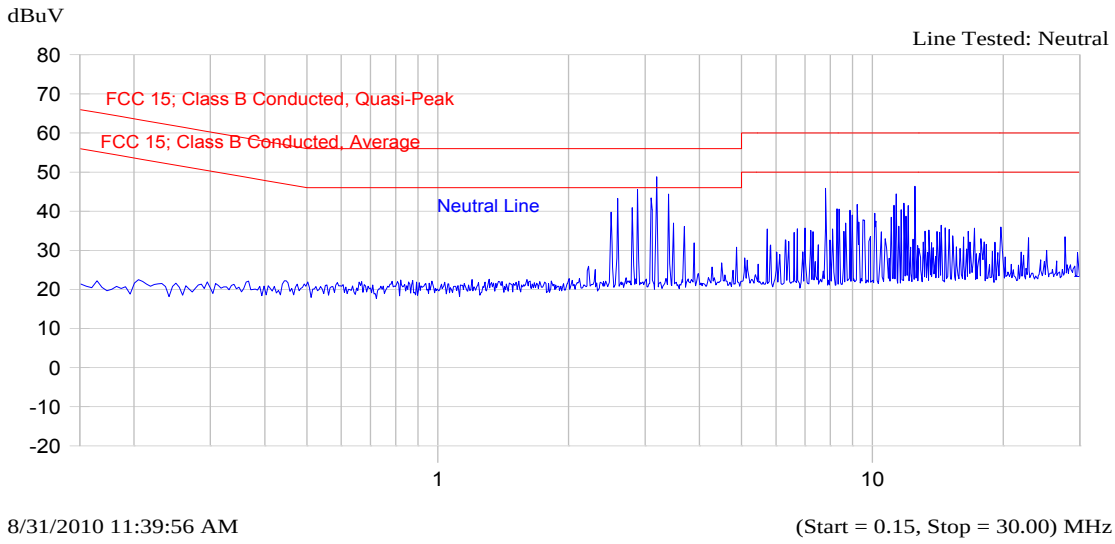
Frequency MHz	Peak dBuV	QP dBuV	Delta Qp-Qp Limit dB	Avg dBuV	Delta Avg-Avg Limit dB	Trace Name
2.822	58.8	46.0	-10.0	6.1	-39.9	Hot Line
2.927	57.1	44.8	-11.2	10.8	-35.2	Hot Line
3.247	56.0	43.8	-12.2	6.4	-39.6	Hot Line
3.104	58.5	45.5	-10.5	7.0	-39.0	Hot Line
3.396	55.3	41.6	-14.4	3.9	-42.1	Hot Line
6.197	53.3	39.6	-20.4	1.1	-48.9	Hot Line
7.930	46.7	33.8	-26.2	1.5	-48.5	Hot Line
9.928	42.6	32.9	-27.1	4.2	-45.8	Hot Line
11.036	49.0	37.5	-22.5	6.3	-43.7	Hot Line

Plot #2: AC Power Line Conducted Emissions, Mode: TX ON

Test Header

Description: Power Input: 120 Vac (Tx Mode)
Customer Name: Detectag Inc
Project Number: DETC-001Q
Operator Name: William Truong
EUT Name: Dual De-Activator, 8.2 MHz Transmitter
Date Created: 8/31/2010 10:28:35 AM
Date Modified: 8/31/2010 11:53:53 AM

Current Graph



Current List

Frequency MHz	Peak dBuV	QP dBuV	Delta Qp-Qp Limit dB	Avg dBuV	Delta Avg-Avg Limit dB	Trace Name
2.510	40.6	29.4	-26.6	2.9	-43.1	Neutral Line
2.586	42.6	30.4	-25.6	3.6	-42.4	Neutral Line
2.802	59.2	45.7	-10.3	-2.2	-48.2	Neutral Line
2.874	59.2	44.8	-11.2	4.6	-41.4	Neutral Line
3.082	58.8	46.6	-9.4	6.4	-39.6	Neutral Line
3.188	57.7	44.0	-12.0	7.6	-38.4	Neutral Line
3.400	55.6	40.3	-15.7	-2.5	-48.5	Neutral Line
7.797	44.4	32.0	-28.0	2.0	-48.0	Neutral Line
11.337	55.0	40.4	-19.6	-0.3	-50.3	Neutral Line
12.516	48.6	35.5	-24.5	1.5	-48.5	Neutral Line

5.6. 6 DB BANDWIDTH

5.6.1. Limits

The 6 dB bandwidth of the fundamental emission shall be measured in order to find out the exact allowed limit of the field strength of any emission within the band 1.705-10.0 MHz.

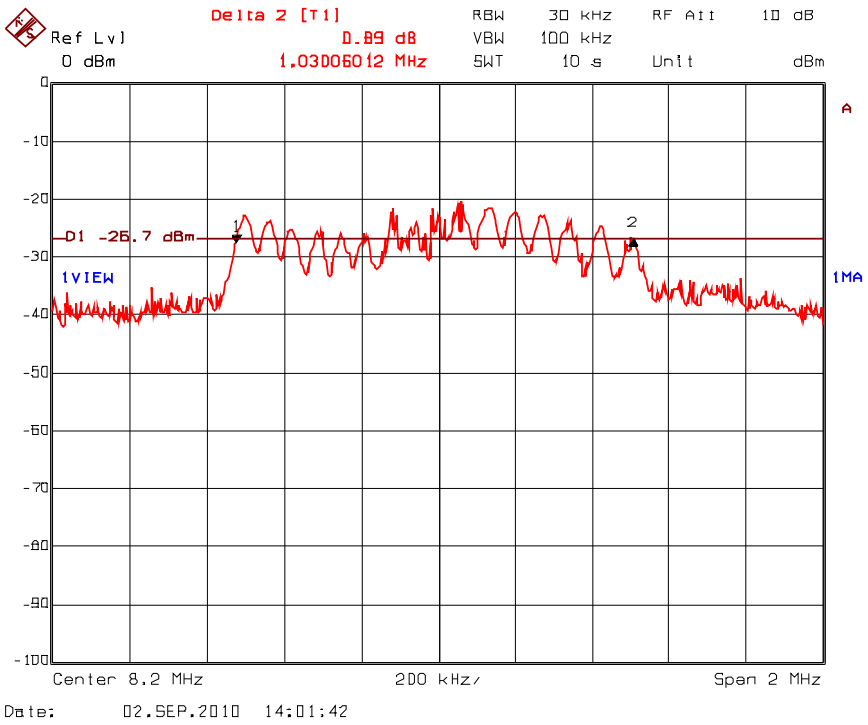
5.6.2. Method of Measurements

Refer to Ultratech Test Procedures, File # ULTR P001-2004 and ANSI C63.4 for measurement methods

5.6.3. Test Data

Centre Frequency (MHz)	6 dB Bandwidth (MHz)
8.2	1.03

Plot #3: 6 dB Bandwidth Measurement



5.7. FIELD STRENGTH OF EMISSIONS INSIDE THE PERMITTED BAND 1.705 TO 10.0 MHZ @ 10 METERS, FCC 15.223(A)

5.7.1. Limits

The field strength of any emission within the band 1.705–10.0 MHz shall not exceed 100 microvolts/meter at a distance of 30 meters. However, if the bandwidth of the emission is less than 10% of the center frequency, the field strength shall not exceed 15 microvolts/meter or (the bandwidth of the device in kHz) divided by (the center frequency of the device in MHz) microvolts/meter at a distance of 30 meters, whichever is the higher level. For the purposes of this section, bandwidth is determined at the points 6 dB down from the modulated carrier. The emission limits in this paragraph are based on measurement instrumentation employing an average detector. The provisions in § 15.35(b) for limiting peak emissions apply.

The measured 6 dB bandwidth is 1.03 MHz which is more than 0.82 MHz (10% of the 8.2 MHz of center frequency), hence the limit for the field strength is 100 microvolts/meter at a distance of 30 meters.

Limit 100µV/m@30m = 20*log(100)=40dBµV/m@30m
Extrapolation factor for 10m will be 40 log(30/10) = 19.1 dB
So Limit @ 10m will be 40dBµV/m + 19.1dB = 59.1dBµV/m @10m (average limit)

Note: As per Sec 15.31(f)(2) : At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade).

Sec 15.205(a): Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

FCC CFR 47, Part 15, Subpart C, Para. 15.205(a) - Restricted Frequency Bands

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
[1] 0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2690–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	([2])
13.36–13.41.			

[1] Until February 1, 1999, this restricted band shall be 0.490–0.510 MHz.
[2] Above 38.6

5.7.2. Method of Measurements

Refer to Ultratech Test Procedures, File # ULTR P001-2004 and ANSI C63.4 for measurement methods

5.7.3. Photographs of Test Setup

Refer to test setup photos in Annex.

5.7.4. Test Data

(a) EUT Operating at Lowest Frequency of 7.7 MHz

FREQUENCY (MHz)	RF LEVEL (dBµV/m)	EMI DETECTOR	ANTENNA PLANE	LIMIT 15.223(a) (dBµV/m)	MARGIN (dB)	PASS/ FAIL	Distance (m)
7.70	39.9	Peak	0º	59.1	-19.2	Pass	10
7.70	50.1	Peak	90º	59.1	-9.0	Pass	10

Note: The emissions are scanned in the permitted band from 1.705–10.0 MHz and are recorded as shown in the above table.

(b) EUT Operating at Highest Frequency of 8.7 MHz

FREQUENCY (MHz)	RF LEVEL (dBµV/m)	EMI DETECTOR	ANTENNA PLANE	LIMIT 15.223(a) (dBµV/m)	MARGIN (dB)	PASS/ FAIL	Distance (m)
8.70	34.0	Peak	0º	59.1	-25.1	Pass	10
8.70	44.1	Peak	90º	59.1	-15.0	Pass	10

Note: The emissions are scanned in the permitted band from 1.705–10.0 MHz and are recorded as shown in the above table.

(c) Restricted band operation:

The EUT is a Carrier hopped system and its hopping frequencies are 7.70MHz, 7.76MHz, 7.82MHz, 7.89MHz, 7.95Mhz, 8.01MHz, 8.08MHZ, 8.14MHz, 8.2MHz, 8.26MHz, 8.33MHz, 8.4MHz, 8.47Mhz, 8.54mhz, 8.62MHz, 8.7MHz. These hopping frequencies are outside of the restricted band frequencies.

5.8. FIELD STRENGTH OF EMISSIONS OUTSIDE THE PERMITTED BAND 1.705 TO 10.0 MHZ, FCC 15.223(B) & CLASS B UNINTENTIONAL EMISSIONS 15.109(A)

5.8.1. Limits

The field strength of any emissions appearing outside of the 1.705-10.0 MHz band shall not exceed the general radiated emission limits in Sec 15.209.

FCC CFR 47, Part 15, Subpart C, Para. 15.209(a)
-- Field Strength Limits within Restricted Frequency Bands --

FREQUENCY (MHz)	FIELD STRENGTH LIMITS (microvolts/m)	DISTANCE (Meters)
0.009 - 0.490	2,400 / F (KHz)	300
0.490 - 1.705	24,000 / F (KHz)	30
1.705 - 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

5.8.2. Method of Measurements

Refer to Ultratech Test Procedures, File # ULTR P001-2004 and ANSI C63.4 for measurement methods

The maximum permitted average field strength is listed in Section 15.209. A Pre-Amp and high-pass filters are used for this measurement.

- Measurements from 9 KHz to 150 KHz @ 10m, set RBW = 200 Hz, VBW ≥ RBW, SWEEP=AUTO.
- Measurements from 150 KHz to 30 MHz @ 10m, set RBW = 10 KHz, VBW ≥ RBW, SWEEP=AUTO.
- Measurements from 30 MHz to 1 GHz @ 3m, set RBW = 100 KHz, VBW ≥ RBW, SWEEP=AUTO.

5.8.3. Photographs of Test Setup

Refer to test setup photos in Annex.

5.8.4. Test Data

(a) Transmitter Harmonic Emissions

FREQUENCY (MHz)	RF LEVEL (dBµV/m)	EMI DETECTOR	ANTENNA PLANE	LIMIT 15.209 (dBµV/m)	MARGIN (dB)	PASS/ FAIL	Distance (m)
17.40	23.7	Peak	0º	48.6	-24.9	Pass	10
23.10	21.6	Peak	0º	48.6	-27.0	Pass	10

(b) Transmitter Spurious Emissions

FREQUENCY (MHz)	RF LEVEL (dBµV/m)	EMI DETECTOR	ANTENNA PLANE	LIMIT 15.209 (dBµV/m)	MARGIN (dB)	PASS/ FAIL	Distance (m)
32.70	31.3	QP	V	40.0	-8.7	PASS	3
32.70	29.2	QP	H	40.0	-10.8	PASS	3
45.60	33.7	PEAK	V	40.0	-6.3	PASS	3
61.80	27.4	PEAK	V	40.0	-12.6	PASS	3
61.80	19.0	PEAK	H	40.0	-21.0	PASS	3
82.20	30.2	PEAK	V	40.0	-9.8	PASS	3
82.20	23.7	PEAK	H	40.0	-16.3	PASS	3
116.40	41.7	QP	V	43.5	-1.8	PASS	3
123.30	42.2	PEAK	H	43.5	-1.3	PASS	3
138.60	39.6	PEAK	V	43.5	-3.9	PASS	3
138.60	25.6	PEAK	H	43.5	-17.9	PASS	3
309.00	37.7	PEAK	V	46.0	-8.3	PASS	3
309.00	34.9	PEAK	H	46.0	-11.1	PASS	3
316.50	39.0	PEAK	V	46.0	-7.0	PASS	3
316.50	35.8	PEAK	H	46.0	-10.2	PASS	3
324.00	40.0	QP	V	46.0	-6.0	PASS	3
324.00	40.6	PEAK	H	46.0	-5.4	PASS	3
332.30	41.0	QP	V	46.0	-5.0	PASS	3
332.30	39.7	PEAK	H	46.0	-6.3	PASS	3
339.80	40.0	QP	V	46.0	-6.0	PASS	3
339.80	39.9	PEAK	H	46.0	-6.1	PASS	3
347.30	40.4	PEAK	V	46.0	-5.7	PASS	3
347.30	39.8	PEAK	H	46.0	-6.2	PASS	3
354.80	37.6	PEAK	V	46.0	-8.4	PASS	3
354.80	36.9	PEAK	H	46.0	-9.1	PASS	3
363.00	38.8	PEAK	V	46.0	-7.2	PASS	3
363.00	35.7	PEAK	H	46.0	-10.3	PASS	3
370.50	36.1	PEAK	V	46.0	-9.9	PASS	3
370.50	32.8	PEAK	H	46.0	-13.2	PASS	3
378.00	33.4	PEAK	V	46.0	-12.6	PASS	3
378.00	29.3	PEAK	H	46.0	-16.7	PASS	3
393.80	36.2	PEAK	V	46.0	-9.8	PASS	3
393.80	28.2	PEAK	H	46.0	-17.8	PASS	3
408.80	37.1	PEAK	V	46.0	-8.9	PASS	3
408.80	28.6	PEAK	H	46.0	-17.4	PASS	3
424.50	38.6	PEAK	V	46.0	-7.5	PASS	3
424.50	27.7	PEAK	H	46.0	-18.3	PASS	3
432.00	33.0	PEAK	V	46.0	-13.0	PASS	3
432.00	27.9	PEAK	H	46.0	-18.1	PASS	3
439.50	38.6	PEAK	V	46.0	-7.4	PASS	3
439.50	30.9	PEAK	H	46.0	-15.1	PASS	3
516.80	36.2	PEAK	V	46.0	-9.9	PASS	3
516.80	30.8	PEAK	H	46.0	-15.3	PASS	3

FREQUENCY (MHz)	RF LEVEL (dBµV/m)	EMI DETECTOR	ANTENNA PLANE (V/H)	LIMIT 15.209 (dBµV/m)	MARGIN (dB)	PASS/ FAIL	Distance (m)
531.80	35.3	PEAK	V	46.0	-10.7	PASS	3
531.80	31.9	PEAK	H	46.0	-14.1	PASS	3
547.50	38.2	PEAK	V	46.0	-7.8	PASS	3
547.50	31.9	PEAK	H	46.0	-14.2	PASS	3
562.50	35.8	PEAK	V	46.0	-10.2	PASS	3
562.50	32.0	PEAK	H	46.0	-14.0	PASS	3
617.00	36.9	PEAK	V	46.0	-9.1	PASS	3
617.00	33.7	PEAK	H	46.0	-12.3	PASS	3
633.00	37.6	PEAK	V	46.0	-8.4	PASS	3
633.00	40.7	PEAK	H	46.0	-5.3	PASS	3
648.00	40.4	PEAK	V	46.0	-5.6	PASS	3
648.00	36.8	PEAK	H	46.0	-9.2	PASS	3
663.00	38.2	PEAK	V	46.0	-7.8	PASS	3
663.00	35.2	PEAK	H	46.0	-10.9	PASS	3
679.00	36.8	PEAK	V	46.0	-9.3	PASS	3
679.00	32.2	PEAK	H	46.0	-13.8	PASS	3
686.00	41.6	PEAK	V	46.0	-4.4	PASS	3
686.00	38.3	PEAK	H	46.0	-7.7	PASS	3
694.00	37.2	PEAK	V	46.0	-8.8	PASS	3
694.00	30.2	PEAK	H	46.0	-15.8	PASS	3
709.00	38.5	PEAK	V	46.0	-7.5	PASS	3
709.00	30.4	PEAK	H	46.0	-15.6	PASS	3
717.00	41.1	QP	V	46.0	-4.9	PASS	3
717.00	38.2	PEAK	H	46.0	-7.8	PASS	3
732.00	41.0	QP	V	46.0	-5.0	PASS	3
732.00	39.4	PEAK	H	46.0	-6.7	PASS	3
748.00	39.4	PEAK	V	46.0	-6.6	PASS	3
863.00	38.2	PEAK	V	46.0	-7.8	PASS	3
778.00	38.2	PEAK	V	46.0	-7.8	PASS	3
778.00	37.0	PEAK	H	46.0	-9.0	PASS	3
794.00	41.5	QP	V	46.0	-4.5	PASS	3
794.00	34.3	PEAK	H	46.0	-11.7	PASS	3
809.00	41.1	QP	V	46.0	-4.9	PASS	3
809.00	35.2	PEAK	H	46.0	-10.8	PASS	3
817.00	40.0	PEAK	V	46.0	-6.0	PASS	3
817.00	30.5	PEAK	H	46.0	-15.5	PASS	3
824.00	39.4	PEAK	V	46.0	-6.6	PASS	3
824.00	33.1	PEAK	H	46.0	-12.9	PASS	3
832.00	37.1	PEAK	V	46.0	-8.9	PASS	3
832.00	29.4	PEAK	H	46.0	-16.6	PASS	3
840.00	38.7	PEAK	V	46.0	-7.3	PASS	3
840.00	33.6	PEAK	H	46.0	-12.4	PASS	3
848.00	37.7	PEAK	V	46.0	-8.3	PASS	3
848.00	29.3	PEAK	H	46.0	-16.7	PASS	3

The emissions were scanned from 1 MHz to 1 GHz and all emissions less 20 dB below the limits were recorded.

FREQUENCY (MHz)	RF LEVEL (dBµV/m)	EMI DETECTOR	ANTENNA PLANE (V/H)	LIMIT 15.209 (dBµV/m)	MARGIN (dB)	PASS/ FAIL	Distance (m)
855.00	41.1	QP	V	46.0	-4.9	PASS	3
855.00	40.3	PEAK	H	46.0	-5.7	PASS	3
871.00	39.2	QP	V	46.0	-6.8	PASS	3
871.00	38.3	PEAK	H	46.0	-7.7	PASS	3
878.00	39.9	PEAK	V	46.0	-6.1	PASS	3
878.00	32.4	PEAK	H	46.0	-13.6	PASS	3
886.00	41.7	PEAK	V	46.0	-4.3	PASS	3
886.00	34.5	PEAK	H	46.0	-11.5	PASS	3
904.50	36.5	PEAK	V	46.0	-9.5	PASS	3
904.50	29.9	PEAK	H	46.0	-16.1	PASS	3
930.90	39.8	PEAK	V	46.0	-6.2	PASS	3
930.90	32.3	PEAK	H	46.0	-13.7	PASS	3
946.10	38.2	PEAK	V	46.0	-7.8	PASS	3
946.10	31.6	PEAK	H	46.0	-14.4	PASS	3
962.40	39.9	PEAK	V	54.0	-14.1	PASS	3
977.60	41.2	PEAK	V	54.0	-12.8	PASS	3
977.60	31.4	PEAK	H	54.0	-22.6	PASS	3
992.80	39.3	PEAK	V	54.0	-14.8	PASS	3
992.80	31.8	PEAK	H	54.0	-22.2	PASS	3
The emissions were scanned from 1 MHz to 1 GHz and all emissions less 20 dB below the limits were recorded.							

(c) Unintentional Emissions

FREQUENCY (MHz)	RF LEVEL (dBµV/m)	EMI DETECTOR	ANTENNA PLANE (V/H)	LIMIT 15.209 (dBµV/m)	MARGIN (dB)	PASS/ FAIL	Distance (m)
100.00	27.9	PEAK	V	43.5	-15.7	PASS	3
100.00	27.8	PEAK	H	43.5	-15.7	PASS	3
300.30	36.1	PEAK	V	46.0	-9.9	PASS	3
300.30	33.1	PEAK	H	46.0	-12.9	PASS	3
400.60	30.9	PEAK	V	46.0	-15.1	PASS	3
400.60	26.3	PEAK	H	46.0	-19.7	PASS	3
500.80	33.8	PEAK	V	46.0	-12.2	PASS	3
500.80	29.9	PEAK	H	46.0	-16.1	PASS	3
600.00	28.3	PEAK	V	46.0	-17.7	PASS	3
600.00	24.5	PEAK	H	46.0	-21.5	PASS	3
700.00	36.5	PEAK	V	46.0	-9.5	PASS	3
700.00	35.5	PEAK	H	46.0	-10.5	PASS	3
800.00	37.3	PEAK	V	46.0	-8.7	PASS	3
800.00	37.6	PEAK	H	46.0	-8.4	PASS	3
900.00	42.2	PEAK	V	46.0	-3.8	PASS	3
900.00	40.3	PEAK	H	46.0	-5.7	PASS	3
The emissions were scanned from 1 MHz to 1 GHz and all emissions less 20 dB below the limits were recorded.							

5.9. RF EXPOSURE REQUIRMENTS [§§ 1.1307(B)(1) & 2.1093]

The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation.

FCC 47 CFR § 1.1310:

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*($900/f^2$)	6
30–300	61.4	0.163	1.0	6
300–1500	.....	.....	f/300	6
1500–100,000	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*($180/f^2$)	30
30–300	27.5	0.073	0.2	30
300–1500	.....	.....	f/1500	30
1500–100,000	.....	.....	1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

5.9.1. Method of Measurements

Refer to Sections 1.1310, 2.1091.

Transmitters operating under section 15.223 are categorically excluded from routine environmental evaluation to demonstrating RF exposure compliance with respect to MPE and/or SAR limits. These devices are not exempted from compliance as exposure to public users and nearby persons does not exceed the commission's RF exposure guidelines (see Section 1.1307 and 2.1093). Unless a device operates at substantially low power levels, with a low gain antenna(s), supporting information is generally needed to establish the various potential operating configurations and exposure conditions of a transmitter and its antenna(s) in order to determine compliance with the RF exposure guidelines.

For portable transmitters (see Section 2.1093), or devices designed to operate next to a person's body, compliance is determined with respect to the SAR limit (define in the body tissues) for near-field exposure conditions. If the maximum average output power, operating condition configurations and exposure conditions are comparable to those of existing cellular and PCS phones, SAR evaluation may be required in order to determine if such a device complies with SAR limit. When SAR evaluation data is not available, and the additional supporting information cannot assure compliance, the Commission may request that an SAR evaluation be performed, as provided for in Section 1.1307(d).

5.9.2. RF Evaluation

This device is categorically excluded form routine environmental evaluation for RF Exposure requirement as per section 2.1093.

This device may be used in portable exposure conditions with no restrictions when the source-based time-averaged output power is ≤ $60/f_{(GHz)}$ mW as per 2(a)(1) of FCC KDB 447498 v04.

Measured Maximum E-field = 50.12dBµV/m @ 10m

Using formula for converting measured e-field in dBµV/m to EIRP in dBm,

EIRP dBm = E dBµV/m - 104.77 + 20*log(D)

for D = 10 m, EIRP dBm = E dBµV/m – 84.77dB = 50.12 – 84.77 = -34.65 dBm = 0.0004 mW

Total Peak Power (0.0004 mW) is well below the low threshold value calculated as per below.

Threshold Value = [60/f(GHz)] mW
= (60/0.008) mW
= 7500 mW

5.10. TEST EQUIPMENT LIST

Test Instruments	Manufacturer	Model No.	Serial No.	Operating Range	Calibration Due
Loop Antenna	EMCO	6502	2611	10 kHz – 30 MHz	27 July 2011
Biconi-Log Antenna	EMCO	3142C	00026873	26 – 3000 MHz	18 April 2011
RF Amplifier	AH System	PAM-0118	225	20 MHz – 18 GHz	18 April 2011
Spectrum Analyzer	Rohde & Schwarz	FSEK30	100077	20 Hz – 40 GHz	14 Aug 2011
Spectrum Analyzer	Rohde & Schwarz	ESU40	100037	20 Hz – 40 GHz	Mar 09 2011
EMI Receiver	Hewlett Packard	8546A	3650A00371	9KHz-6.5GHz	25 January 2011
Attenuator	Pasternack	PE7010-20	---	DC to 2 GHz 20dB attenuation	04 January 2011
L.I.S.N. Used	EMCO	3810/2	2209	9 KHz – 30 MHz	18 December 2010

EXHIBIT 6. MEASUREMENT UNCERTAINTY

6.1. LINE CONDUCTED EMISSION MEASUREMENT UNCERTAINTY (0.15-30 MHZ)

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Due Date
EMI Receiver System/Spectrum Analyzer with built-in Amplifier	Hewlett Packard	8546A	3650A00371	9KHz-6.5GHz	January 25, 2011
Attenuator	Pasternack	PE7010-20	---	DC to 2 GHz 20dB attenuation	January 04, 2011
L.I.S.N. Used	EMCO	3810/2	2209	9 KHz – 30 MHz	December 18, 2010

	Line Conducted Emission Measurement Uncertainty (150 KHz – 30 MHz):	Measured	Limit
u_c	**Combined standard uncertainty:** $u_c(y) = \sqrt{\sum_{I=1}^{m} u_i^2(y)}$	**± 1.57**	**± 1.8**
U	**Expanded uncertainty U:** $U = 2u_c(y)$	**± 3.14**	**± 3.6**

6.2. RADIATED EMISSION MEASUREMENT UNCERTAINTY

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Due Date
EMI Receiver	Rohde & Schawrz	ESU40	100037	20 Hz to 40 GHz	March 09, 2011
Pre Amplifier	AH System	PAM-0118	225	20 MHz to 18 GHz	March 08, 2011
Biconilog Antenna	EMCO	3142C	00026873	26 – 3000 MHz	April 18, 2011
Horn Antenna	EMCO	3115	5955	1GHz – 18 GHz	October 09, 2010
Semi-Anechoic Chamber	TDK	FCC: 91038 IC: 2049A-3	--	--	May 01, 2011

	Radiated Emission Measurement Uncertainty @ 3m, Horizontal (30-1000 MHz):	Measured	Limit
u_c	**Combined standard uncertainty:** $u_c(y) = \sqrt{\sum_{i=1}^{m} u_i^2(y)}$	**± 2.15**	**± 2.6**
U	**Expanded uncertainty U:** $U = 2u_c(y)$	**± 4.30**	**± 5.2**

	Radiated Emission Measurement Uncertainty @ 3m, Vertical (30-1000 MHz):	Measured	Limit
u_c	**Combined standard uncertainty:** $u_c(y) = \sqrt{\sum_{i=1}^{m} u_i^2(y)}$	**± 2.39**	**± 2.6**
U	**Expanded uncertainty U:** $U = 2u_c(y)$	**± 4.78**	**± 5.2**

	Radiated Emission Measurement Uncertainty @ 3 m, Horizontal & Vertical (1 – 18 GHz):	Measured	Limit
u_c	**Combined standard uncertainty:** $u_c(y) = \sqrt{\sum_{i=1}^{m} u_i^2(y)}$	**± 1.87**	Under consideration
U	**Expanded uncertainty U:** $U = 2u_c(y)$	**± 3.75**	Under consideration

EXHIBIT 7. MEASUREMENT METHODS

7.1. GENERAL TEST CONDITIONS

The following test conditions shall be applied throughout the tests covered in this report.

7.1.1. Normal temperature and humidity

- Normal temperature: +15°C to +35°C
- Relative Humidity: +20% to 75%

The actual values during tests shall be recorded in the test report.

7.1.2. Normal power source

7.1.2.1. Mains Voltage

The nominal test voltage of the equipment to be connected to mains shall be the nominal mains voltage which is the declared voltage or any of the declared voltages for which the equipment was designed.

The frequency of test power source corresponding to the AC mains shall be between 59 Hz and 61 Hz.

7.1.2.2. Battery Power Source.

For operation from battery power sources, the nominal test voltage shall be as declared by the equipment manufacturer. This shall be recorded in the test report.

7.1.3. Operating Condition of Equipment under Test

- All tests were carried out while the equipment operated at the following frequencies:
  - The lowest operating frequency,
  - The middle operating frequency and
  - The highest operating frequency

- Modulation were applied using the Test Data sequence
- The transmitter was operated at the highest output power, or in the case the equipment able to operate at more than one power level, at the lowest and highest output powers

7.2. SPURIOUS EMISSIONS

For both conducted and radiated measurements, the spurious emissions were scanned from the lowest frequency generated by the EUT or 10 MHz whichever is lower to 10th harmonic of the highest frequency generated by the EUT.

- The radiated emission measurements were performed at the UltraTech's 3 Meter Open Field Test Site (OFTS) situated in the Town of Oakville, province of Ontario. The Attenuation Characteristics of OFTS have been filed to FCC, Industry Canada, ACA/Austel, NVLap and ITI.
- Radiated emissions measurements were made using the following test instruments:

1. Calibrated EMCO BiconiLog antenna in the frequency range from 30 MHz to 2000 MHz.
2. Calibrated Emco Horn antennas in the frequency range above 1000 MHz (1GHz - 40 GHz).
3. The test is required for any spurious emission or modulation product that falls in a Restricted Band, as defined in Section 15.205. It must be performed with the highest gain of each type of antenna proposed for use with the EUT. Use the following spectrum analyzer settings:

   - RBW = 100 kHz for f < 1GHz and RBW = 1 MHz for f ≥ 1 GHz
   - VBW = RBW
   - Sweep = auto
   - Detector function = peak
   - Trace = max hold
   - Follows the guidelines in ANSI C63.4-1992 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization, etc.. A pre-amp and highpass filter are required for this test, in order to provide the measuring system with sufficient sensitivity.
   - Allow the trace to stabilize.
   - The peak reading of the emission, after being corrected by the antenna correction factor, cable loss, pre-amp gain, etc…. is the peak field strength which comply with the limit specified in Section 15.35(b)

   Calculation of Field Strength:

   The field strength is calculated by adding the calibrated antenna factor and cable factor, and subtracting the Amplifier gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

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

Where FS = Field Strength
RA = Receiver/Analyzer Reading
AF = Antenna Factor
CF = Cable Attenuation Factor
AG = Amplifier Gain

Example: If a receiver reading of 60.0 dBuV is obtained, the antenna factor of 7.0 dB/m and cable factor of 1.0 dB are added, and the amplifier gain of 30 dB is subtracted. The actual field strength will be:

Field Level = 60 + 7.0 + 1.0 - 30 = 38.0 dBuV/m.
Field Level = $10^{(38/20)}$ = 79.43 uV/m.

- Submit this Test Data
- Now set the VBW to 10Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the dwell time per channel of the hopping signal is less than 100ms, then the reading obtained may be further adjusted by a "duty cycle correction factor", derived from 10log(dwell time/100mS) in an effort to demonstrate compliance with the 15.209.
- Submit Test Data

Maximizing The Radiated Emissions:

- The frequencies of emissions was first detected. Then the amplitude of the emissions was measured at the specified measurement distance using required antenna height, polarization, and detector characteristics.
- During this process, cables and peripheral devices were manipulated within the range of likely configuration.
- For each mode of operation required to be tested, the frequency spectrum was monitored. Variations in antenna heights (from 1 meter to 4 meters above the ground plane), antenna polarization (horizontal plane and vertical plane), cable placement and peripheral placement were explored to produce the highest amplitude signal relative to the limit.

  The maximum radiated emission for a given mode of operation was found by using the following step-by-step procedure:

  Step1: Monitor the frequency range of interest at a fixed antenna height and EUT azimuth.

  Step2: Manipulate the system cables to produce highest amplitude signal relative to the limit. Note the amplitude and frequency of the suspect signal.

  Step3: Rotate the EUT 360 degrees to maximize the suspected highest amplitude signal. If the signal or another at a different frequency is observed to exceed the previously noted highest amplitude signal by 1 dB or more, go back to the azimuth and repeat Step 2. Otherwise, orient the EUT azimuth to repeat the highest amplitude observation and proceed.

  Step4: Move the antenna over its full allowable range of travel (1 to 4 meters) to maximize the suspected highest amplitude signal. If the signal or another at a different frequency is observed to exceed the previously noted highest amplitude signal by 1 dB or more, return to Step 2 with the highest amplitude observation and proceed.

  Step5: Change the polarization of the antenna and repeat Step 2 through 4. Compare the resulting suspected highest amplitude signal with that found for the other polarization. Select and note the higher of the two signals. This signal is termed the highest observed signal with respect to the limit for this EUT operational mode.

  Step6: The effects of various modes of operation is examined. This is done by varying the equipment modes as steps 2 through 5 are being performed.

  Step7: After completing steps 1 through 6, record the final highest emission level, frequency, antenna polarization and detector mode of the measuring instrument.