

TEST REPORT

Report Number: 100086465DAL-002
Project Number: G100086465

Testing performed on the
XT Automated Fuel Control Terminal (2.41GHz)
FCC ID:

to
47 CFR Part 15. 247:2008

For
EJ Ward

Test Performed by:

Intertek
1809 10th Street Suite 400
Plano, TX 75074

Test Authorized by:

EJ Ward
8801 Tradeway St
San Antonio, TX 78217

Prepared by:



William Cullen, Assoc EMC Engineer

Date: June 10, 2010

Reviewed by:



Jeremy Pickens, EMC Lab Manager

Date: June 10, 2010

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to copy or distribute this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program. This report must not be used to claim product endorsement by A2LA, NIST nor any other agency of the U.S. Government.

Report No. 100086465DAL-002

Equipment Under Test:	XT Automated Fuel Control Terminal
Trade Name:	Automated Fuel Control Terminal
Model No.:	XT
FCC ID:	
Applicant:	EJ Ward
Contact:	Mr. Eric Scrivner
Address:	8801 Tradeway St San Antonio, TX 78217
Country	USA
Tel. Number:	210-824-7383
Fax number:	---
Applicable Regulation:	FCC Part 15, Subpart C
Test Site Location:	Intertek 1809 10 th Street Plano, TX 75074
Date of Test:	April 12 to May 28, 2010

We attest to the accuracy of this report:



William Cullen
Assoc EMC Engineer



Jeremy Pickens
EMC Lab Manager

TABLE OF CONTENTS

1.0	Introduction	4
1.1	Summary of Tests	4
2.0	General Description.....	5
2.1	Product Description.....	5
2.2	Related Submittal(s) Grants	5
2.3	Test Methodology	6
2.4	Test Facility	6
3.0	System Test Configuration	7
3.1	Support Equipment	7
3.2	Block Diagram of Test Setup.....	7
3.3	Justification.....	9
3.4	Software Exercise Program	9
3.5	Mode of Operation During Test.....	9
3.6	Modifications Required for Compliance	9
4.0	Measurement Results	10
4.1	6-dB Bandwidth	10
4.2	Occupied Bandwidth.....	12
4.3	Conducted Output Power.....	14
4.4	Power Spectral Density	15
4.5	Out of Band Emissions.....	17
4.6	Restricted Band	19
4.8	AC Line Conducted Emission.....	23
5.0	List of test equipment	24
6.0	Document History	25

1.0 Introduction

The Equipment under Test (EUT) is a transceiver operating at 2.41GHz

This report is designed to show compliance of the 2.41GHz transceiver with FCC Part 15.247 requirements.

1.1 Summary of Tests

TEST	REFERENCE FCC 17.247	RESULTS
6-dB Bandwidth	15.247(a)(2)	Complies
20-dB Bandwidth	15.247(a)(1)	Complies
Peak Conducted Output Power (< 1W)	15.247(b)(3)	Complies
Power Spectral Density	15.247(e)	Complies
Out of Band Emissions	15.247(c)	Complies
Restricted Band	15.205	Complies
Radiated Emission from Digital Parts and receiver	15.209	Complies
AC Conducted Emission	15.207	Complies

2.0 General Description

2.1 Product Description

The XT terminal is an automated fuel management system whose main purpose is to help protect vehicle fleet assets while improving productivity and expense control. The XT Terminal provides all the necessary tools a fleet manager needs to collect, store, and manage a multitude of fleet fueling and vehicle-specific information.

Overview of the EUT (XT Terminal)

Applicant	EJ Ward 8801 Tradeway St San Antonio, TX 78217
Manufacturer name & address	EJ Ward 8801 Tradeway St San Antonio, TX 78217
Trade Name & Part No.	XT Automated Fuel Control Terminal
FCC Identifier	
Use of Product	Automated fuel management system
Type of Transmission	Spread Spectrum, Frequency Hopping
Rated RF Output	2.52 mW
Frequency Range	2.41 GHz
Number of Channel(s)	one
Modulation Type	FSK
Antenna(s) type & Gain	Vertical, 4 dBi

A production version of the sample was received on February 15, 2010 in good condition.

Test start date: April 12, 2010

Test end date: May 28, 2010

2.2 Related Submittal(s) Grants

The FCC Part 15.247 application for digital transmitter with the FCC ID:

2.3 Test Methodology

Radiated and AC Line conducted emissions measurements were performed according to the procedures in ANSI C63.4 (2003). Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Data Sheet**" of this Application. All other measurements were made in accordance with the procedures described in KDB Publication No. 558074.

2.4 Test Facility

The radiated emission test site and conducted measurement facility used to collect the data is a 3m semi-anechoic chamber located in Plano, TX. This test facility and site measurement data have been fully placed on file with the FCC.

3.0 System Test Configuration

3.1 Support Equipment

Item #	Description	Model No.	Serial No.
	None		

3.2 Block Diagram of Test Setup

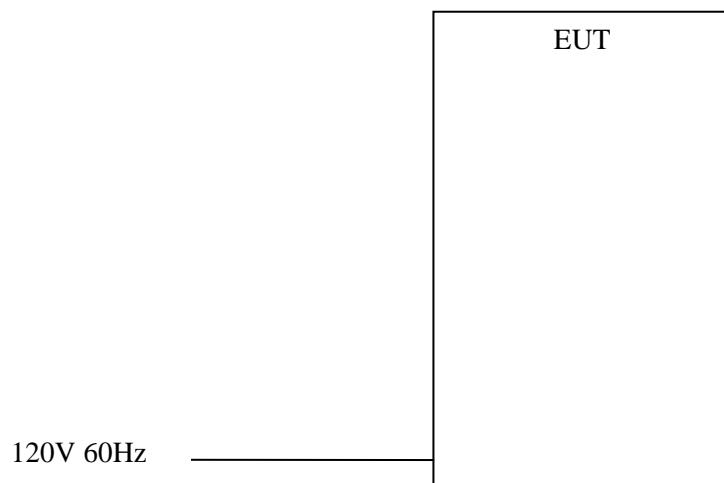
Test Setup for RF Conducted measurements



* Client disconnected the antennas and installed cables for all antenna conducted measurements.

S = Shielded	F = With Ferrite
U = Unshielded	m = Length in Meters

Test Setup for Radiated measurements



S = Shielded
U = Unshielded

F = With Ferrite
m = Length in Meters

3.3 Justification

For radiated emission measurements the EUT was placed on a wooden pallet, it is a floor standing EUT. The EUT is attached to peripherals and they are connected and operational (as typical as possible). The EUT is wired to transmit full power.

In normal operation, the EUT is powered up and the necessary mode for testing is activated.

3.4 Software Exercise Program

The EUT exercise program used during radiated and conducted testing was provided by the Applicant.

3.5 Mode of Operation During Test

The EUT was tested in one mode: transmitting at its operating frequency of 2.41GHz.

3.6 Modifications Required for Compliance

A shielded ribbon cable was installed internally to the sample by the client at Intertek Testing Services during compliance testing in order to bring the product into compliance with radiated emissions.

4.0 Measurement Results

4.1 6-dB Bandwidth FCC 15.247(a)(2) and RSS-210 A8.2(a)

Requirements

The 6dB bandwidth must be greater than 500 kHz.

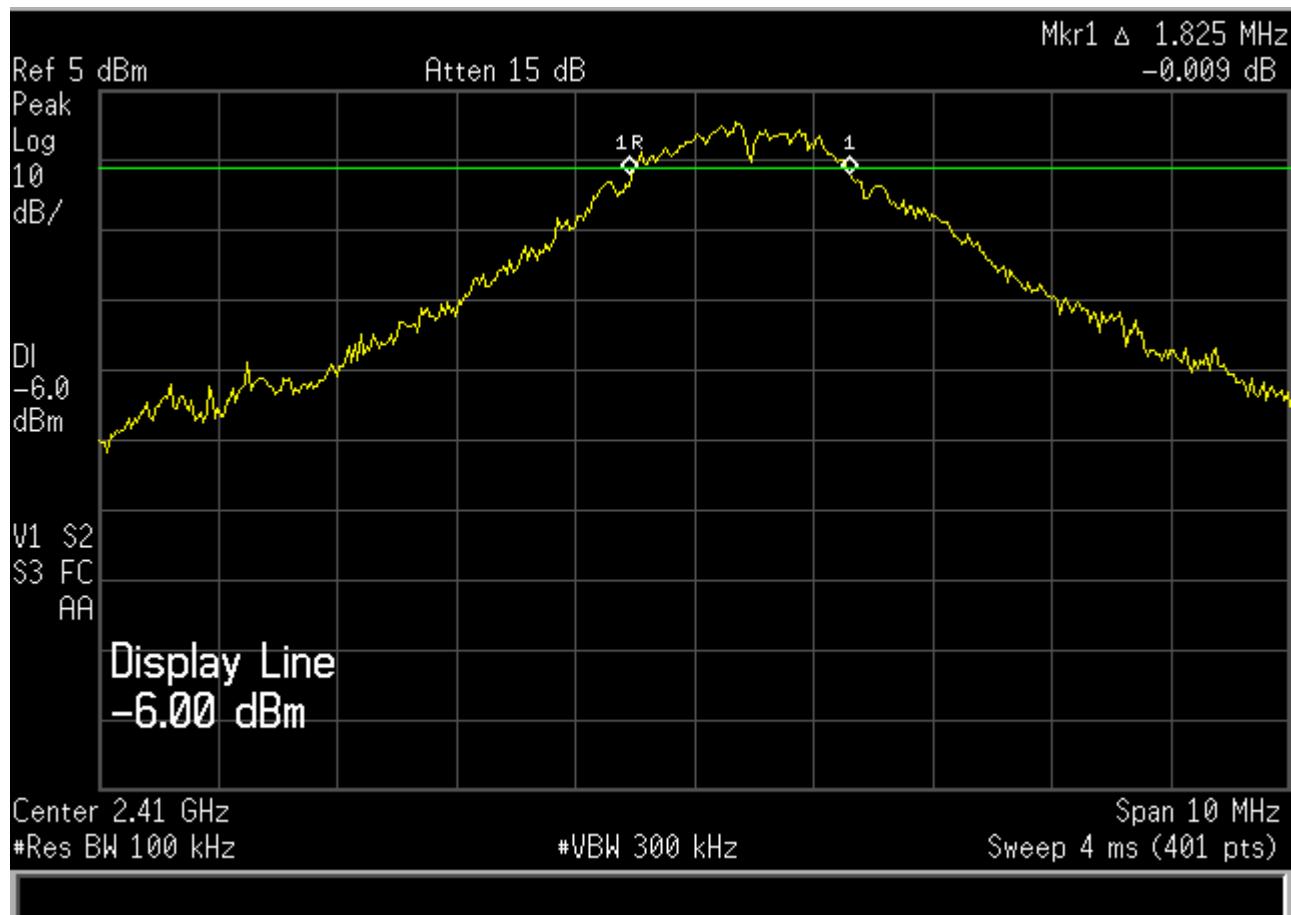
Procedure

The antenna port of the EUT was connected to the input of a spectrum analyzer. The measurement was made with the spectrum analyzer's resolution bandwidth (RBW) equal to 100 kHz. In order to make an accurate measurement, the span was set to greater than RBW. The 6-dB Bandwidth was measured by using the DELTA MARKER function of the analyzer.

Test Results

Frequency (MHz)	6-dB channel bandwidth (MHz)	Plot
2.41 GHz	1.825	1.1

Plot 1.1



4.2 Occupied Bandwidth RSS-GEN Section 4.6

Procedure

The antenna port of the EUT was connected to the input of a spectrum analyzer. The transmitter was operated at its maximum carrier power measured under normal test conditions.

The span of the analyzer was set to capture all products of the modulation process, including the emission skirts.

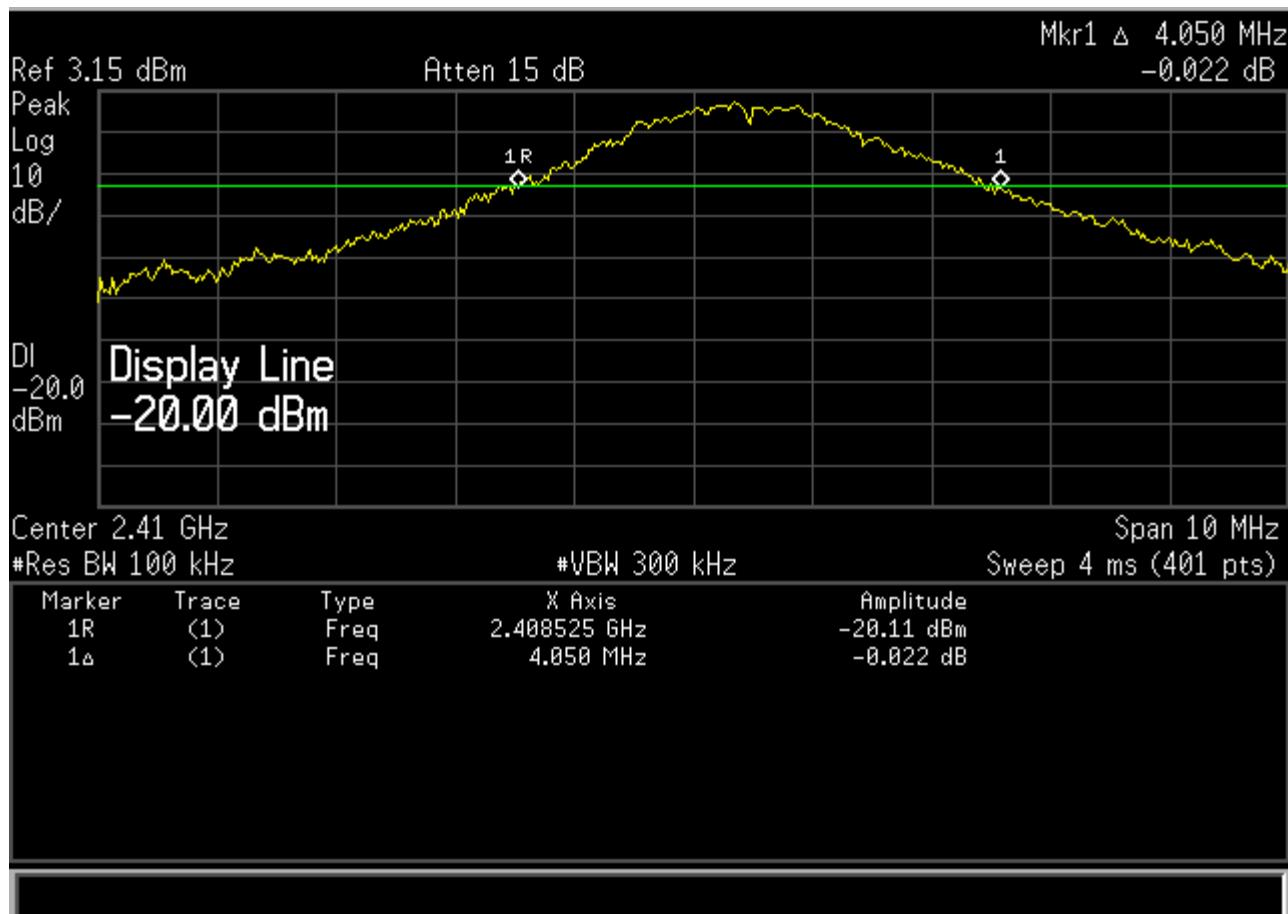
The resolution bandwidth was set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth was set to 3 times the resolution bandwidth. Video averaging was not used. If practical, a sampling detector was used since a peak or peak hold may produce a wider bandwidth than actual.

The 20 dB bandwidth was considered to equal the 99% bandwidth and was used to determine the occupied bandwidth.

Test Results

Frequency (MHz)	Occupied bandwidth (MHz)	Plot
2.41 GHz	4.05	2.1

Plot 2.1



4.3 Conducted Output Power FCC Ref: 15.247(b)(3)

Requirement

For systems operating in the 2400 to 2483.5 MHz band using digital modulation, the maximum peak output power is 1 watt (30 dBm).

Procedure

The antenna port of the EUT was connected directly to a Peak Power Meter.

Test Results

Frequency (GHz)	Output in dBm	Output in mW	Plot number
2.41	3.15	2.07	N/A - Peak Power Meter used

4.4 Power Spectral Density FCC Ref: 15.247(a)(1)(iii)

Requirement

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band.

Procedure

The antenna port of the EUT was connected to the input of a spectrum analyzer. A reference level offset was applied to the analyzer amplitude to account for the associated cable loss.

The span was set to cover the entire emission bandwidth. The detector was set to PEAK, with a resolution bandwidth of 100 kHz or greater, the marker frequency was set to the peak emission and then moved to the center of the display. The span was set to encompass the peak emission envelope. The analyzer resolution and video bandwidth were then set to 3 kHz. The total sweep time was calculated as follows:

Sweep time (Sec.) = Span/Resolution Bandwidth

Example:

Sweep time (Sec.) = 300 kHz/ 3 kHz

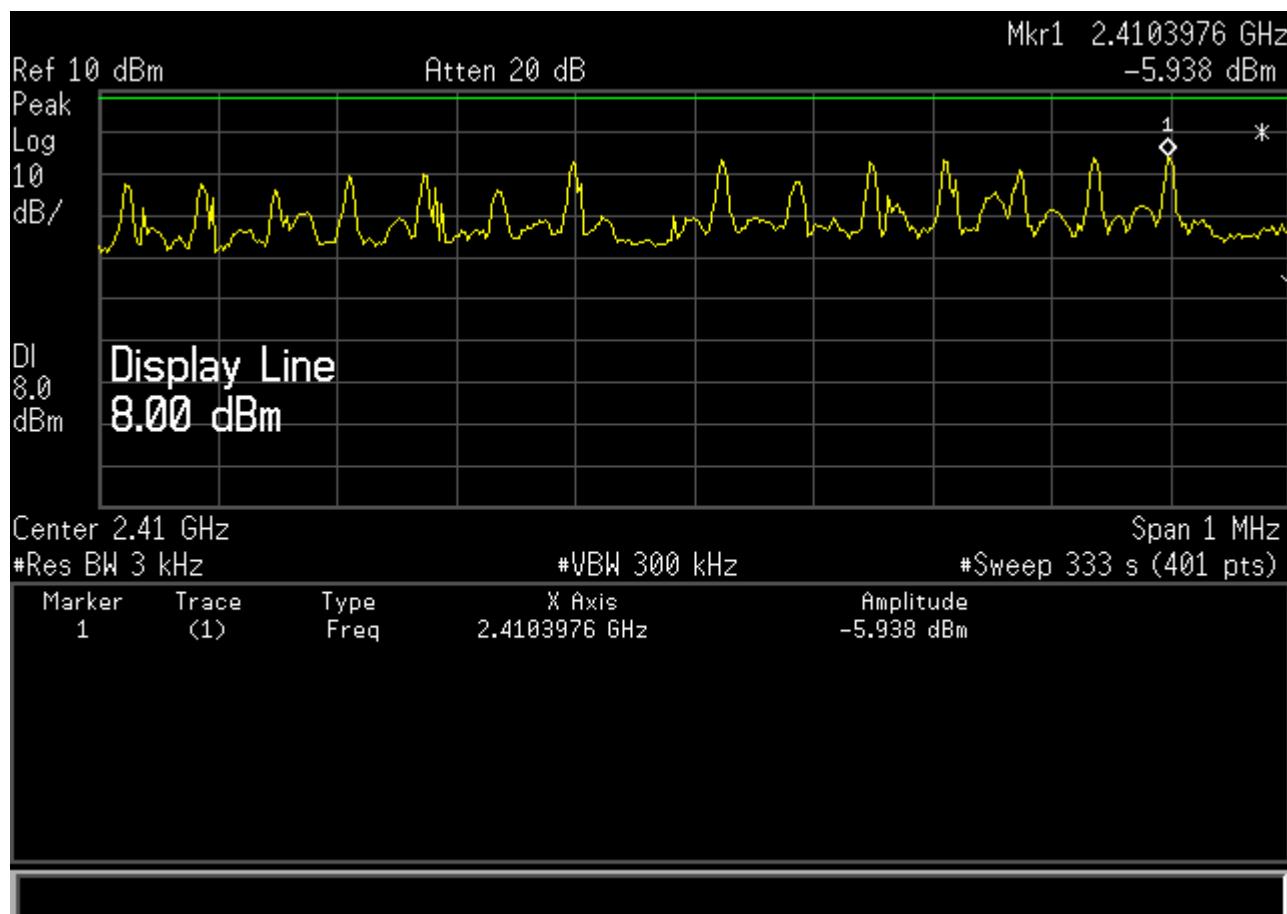
Sweep time (Sec.) = 100 Seconds

A peak search was performed on the resultant trace. The amplitude of that peak was recorded as the maximum power density in dBm. If applicable, the power spectral density was measured for all data rates and modulation modes on the middle channel.

Test Results

Frequency (MHz)	Power Spectral Density (dBm)	Plot
2.41 GHz	-5.938	4.1

Plot 4.1



4.5 Out of Band Emissions FCC Ref: 15.247(c)

Requirement

In any 100 kHz bandwidth outside the frequency band in which the transmitter is operating, the RF power shall be at least 20dB below that of the carrier.

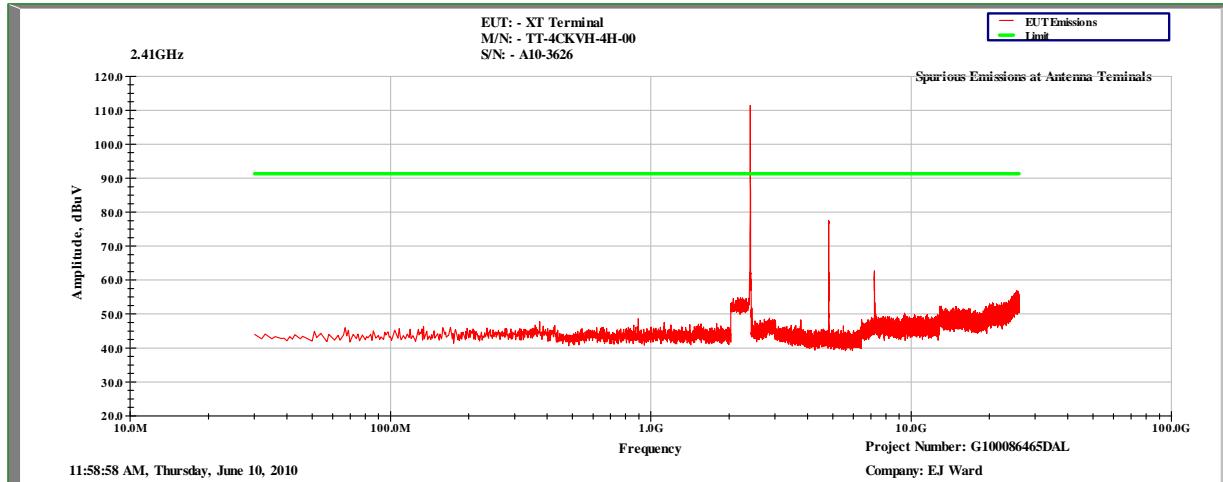
Procedure

The antenna port of the XT terminal was connected to the input of a spectrum analyzer. The analyzer resolution and video bandwidths were set to 100 kHz. The output was set to transmit at its highest output power level and produced the highest conducted output power level. The spectrum analyzer was scanned from 30MHz to 26GHz using the max hold function to detect any out of band spurious emissions. The resulting trace was corrected for the cable loss between the test sample and the spectrum analyzer.

Test Results

The EUT met the out of band emission at antenna terminal requirements. The graphs in Plot 5.1 through Plot 5.2 illustrate the output power and also show that there are no spurious emissions within 20dB of the peak carrier power.

Plot 5.1



Plot 5.2



4.6 Restricted Band FCC Ref: 15.247(c) and 15.205

Requirement

Radiated emissions in the restricted bands listed in Section 15.205 shall meet the general emissions limits of 15.209.

Procedure

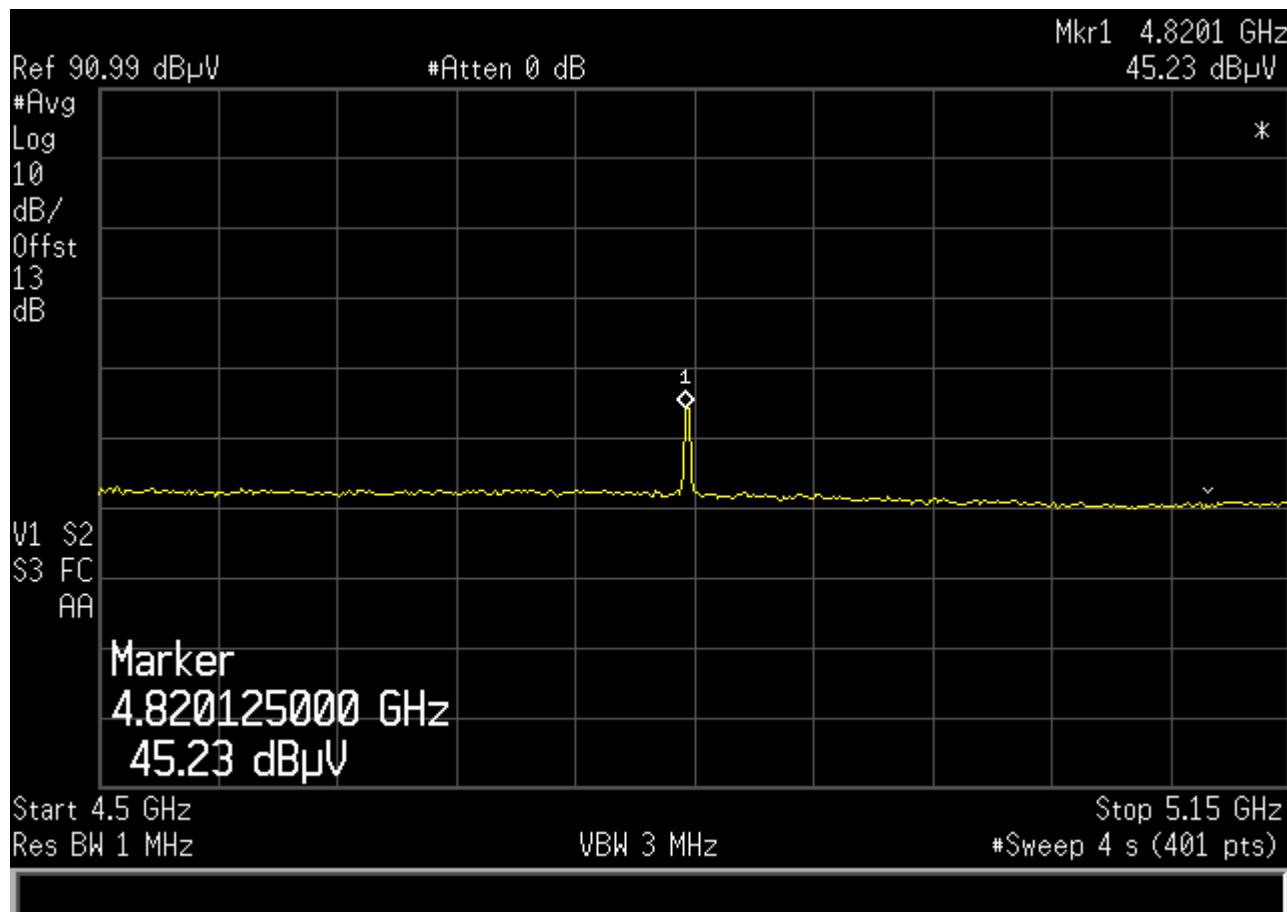
The EUT was set to maximum transmit power. The radiated emissions were measured from 30 MHz to 26 GHz. Any emissions within the restricted bands were compared to the general emissions limits of 15.209.

For the restricted band close to the fundamental emission, the spectrum analyzer was manually set to show the band edge of the 2.41GHz as well as the entire adjacent restricted band. The amplitude was offset to account for cable loss.

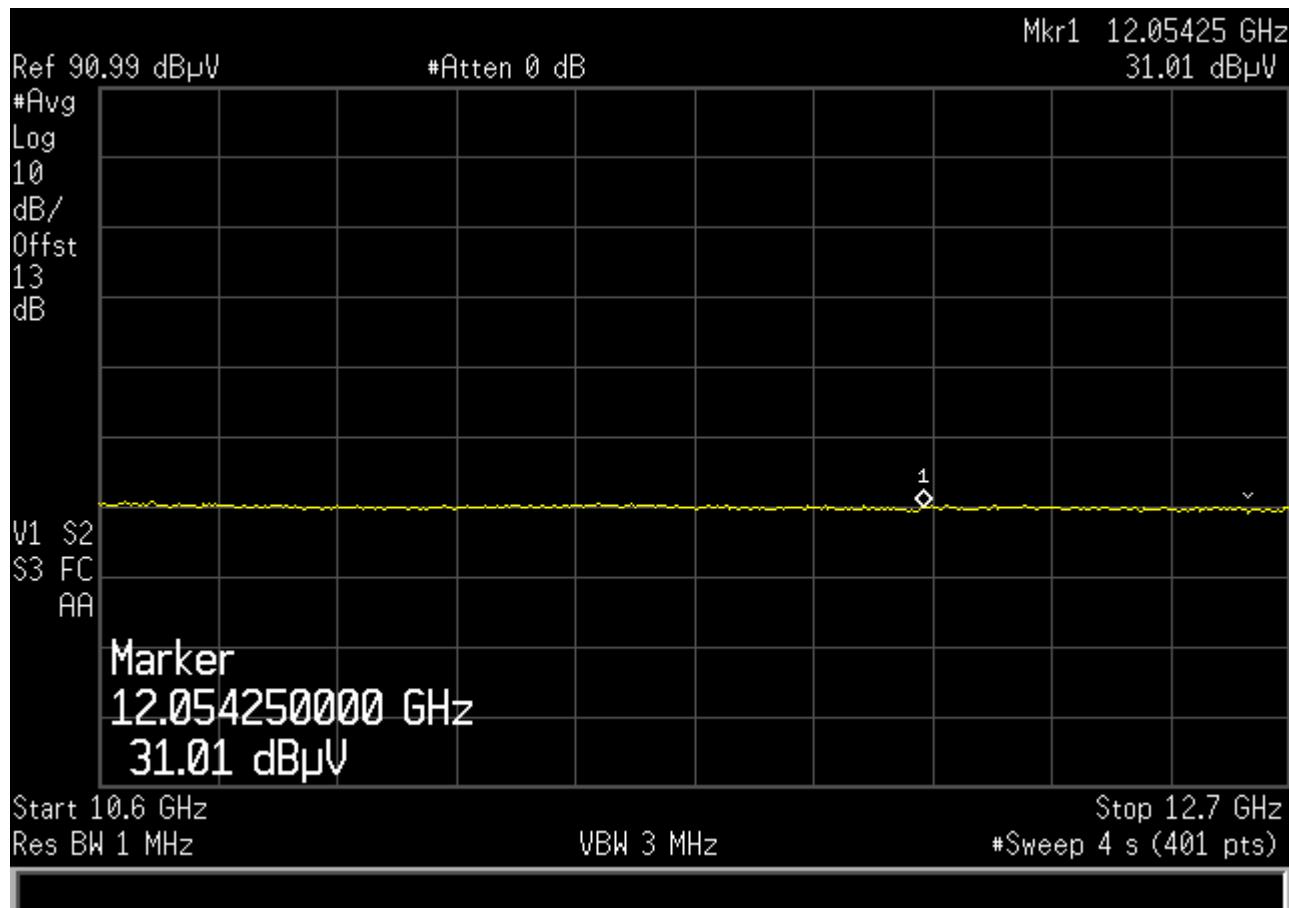
Test Results

The EUT met the restricted band measurements. There were no emissions contained in the restricted bands. See plots 6.1 thru 6.3.

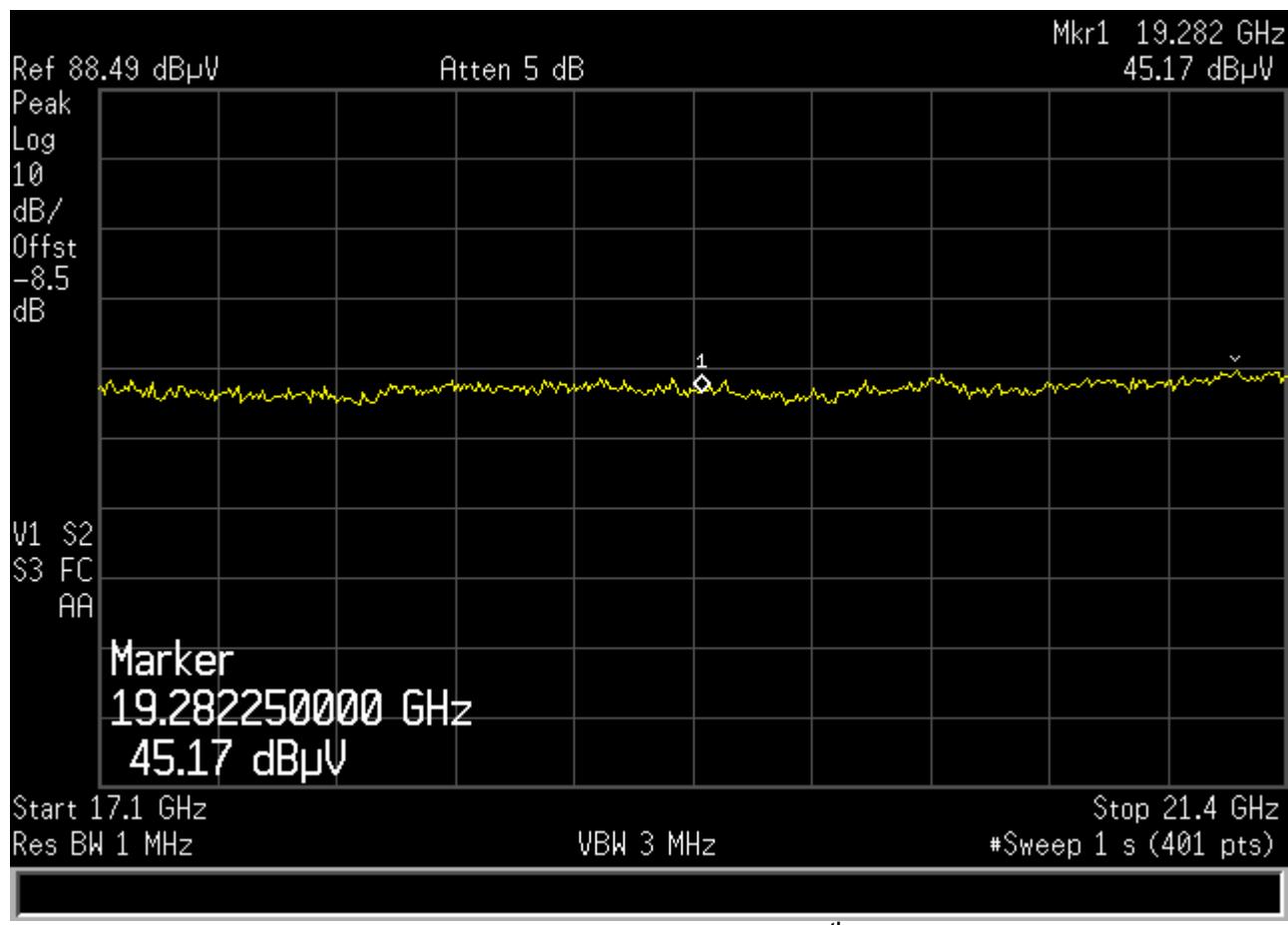
Plot 6.1



Plot 6.2



Plot 6.3



4.8 AC Line Conducted Emission

FCC 15.207: In accordance with ANSI C63.4 (2009), conducted emissions were performed from 150 kHz to 30 MHz.

Intertek Testing Services
 Conducted Emissions 150 kHz - 30 MHz
 FCC Part 15 meets Class B Line 1

Operator: WBC

Model Number: XT Automated Fuel Control Terminal

Thursday, May 6, 2010

Company: EJ Ward

A	B	C	D	E	F	G	H	J
Frequency (MHz)	QP dB(uV)	L1 Avg dBuV	Class B QP LIMIT dBuV	Class B QP Margin dB	Class B Avg LIMIT dBuV	Class B Avg Margin dB	Cable dB	LISN
0.5510	30.61	23.38	56.00	-25.39	46.00	-22.62	0.04	10.37
0.3120	35.35	25.29	61.37	-26.02	51.37	-26.08	0.04	10.68
0.2431	46.09	37.63	63.34	-17.25	53.34	-15.71	0.03	10.92
0.2234	52.47	51.59	63.90	-11.44	53.90	-2.31	0.03	11.04
0.2098	52.15	49.59	64.29	-12.14	54.29	-4.70	0.03	11.12
0.2017	51.62	47.73	64.52	-12.90	54.52	-6.80	0.04	11.17
0.1933	39.20	24.83	64.76	-25.57	54.76	-29.94	0.03	11.25
0.1863	47.66	24.89	64.96	-17.30	54.96	-30.07	0.03	11.31
0.1615	52.92	25.11	65.67	-12.75	55.67	-30.56	0.03	11.54
0.1507	43.77	38.70	65.98	-22.20	55.98	-17.27	0.02	11.64

Intertek Testing Services
 Conducted Emissions 150 kHz - 30 MHz
 FCC Part 15 meets Class B Line 2

Operator: WBC

Model Number: XT Automated Fuel Control Terminal

Thursday, May 6, 2010

Company: EJ Ward

A	B	C	D	E	F	G	H	J
Frequency (MHz)	QP dB(uV)	L2 Avg dBuV	Class B QP LIMIT dBuV	Class B QP Margin dB	Class B Avg LIMIT dBuV	Class B Avg Margin dB	Cable dB	LISN
1.2451	34.02	23.74	56.00	-21.98	46.00	-22.26	0.04	10.18
0.4357	30.02	21.58	57.84	-27.82	47.84	-26.26	0.04	10.34
0.2554	43.45	36.08	62.99	-19.54	52.99	-16.91	0.03	10.56
0.2435	46.57	39.04	63.33	-16.76	53.33	-14.29	0.03	10.60
0.2232	47.31	44.53	63.91	-16.60	53.91	-9.37	0.03	10.69
0.2045	47.05	44.37	64.44	-17.39	54.44	-10.08	0.04	10.76
0.1906	42.79	24.44	64.84	-22.05	54.84	-30.40	0.03	10.86
0.1834	44.53	24.51	65.04	-20.51	55.04	-30.54	0.03	10.93
0.1612	52.19	51.49	65.68	-13.49	55.68	-4.19	0.03	11.12
0.1508	45.88	42.75	65.98	-20.09	55.98	-13.22	0.02	11.21

Test Mode: Transmitting

Temperature: 22.3 C

Humidity : 41.2 %

Sample calculations:

B = raw spectrum analyzer reading + H + J

C = raw spectrum analyzer reading + H + J

E = B - D

G = C - F

5.0 List of test equipment

Measurement equipment used for emission compliance testing utilized the equipment on the following list:

Equipment	Manufacturer	Model/Type	Serial #	Cal Int	Cal Due
EMI Receiver	R&S	ES17	100044	12	03/17/11
Spectrum Analyzer	Agilent	E7405A	US40240235	12	03/17/11
Bi-Log Antenna	Schaffner	CBL6112B	2726	12	07/15/10
Horn Antenna	AH Systems	SAS-571	787	12	04/06/11
Pre-Amplifier	Miteq	AMF-5D-00501800-28-13P	1469795	12	07/13/10
LISN	FCC	FCC-LISN-50-25-2-01	01020	12	06/17/10

No Calibration required

6.0 Document History

Revision/ Job Number	Writer Initial s	Date	Change
0/ G100086465	WBC	June 10, 2010	Original document