

## 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 B Cullen  
William Cullen, Assoc EMC Engineer

Date: June 10, 2010

Reviewed by: Jeremy Pickens  
Jeremy Pickens, EMC Lab Manager

Date: June 10, 2010

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**Report No. 100086465DAL-002**

|                              |                                    |
|------------------------------|------------------------------------|
| <b>Equipment Under Test:</b> | XT Automated Fuel Control Terminal |
| <b>Trade Name:</b>           | Automated Fuel Control Terminal    |
| <b>Model No.:</b>            | XT                                 |
| <b>FCC ID:</b>               |                                    |

|                   |   |
|-------------------|---|
| <b>Applicant:</b> | EJ Ward                                   |
| <b>Contact:</b>   | Mr. Eric Scrivner                         |
| <b>Address:</b>   | 8801 Tradeway St<br>San Antonio, TX 78217 |
| <b>Country</b>    | USA                                       |

|                     |              |
|---------------------|--------------|
| <b>Tel. Number:</b> | 210-824-7383 |
| <b>Fax number:</b>  | ---          |

|                               |                        |
|-------------------------------|------------------------|
| <b>Applicable Regulation:</b> | FCC Part 15, Subpart C |
|-------------------------------|------------------------|

|                            |   |
|----------------------------|---|
| <b>Test Site Location:</b> | Intertek<br>1809 10 <sup>th</sup> Street<br>Plano, TX 75074 |
|----------------------------|---|

|                      |                          |
|----------------------|--------------------------|
| <b>Date of Test:</b> | April 12 to May 28, 2010 |
|----------------------|--------------------------|

***We attest to the accuracy of this report:***

A handwritten signature in black ink that reads "William B. Cullen".

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William Cullen  
Assoc EMC Engineer

A handwritten signature in blue ink that reads "Jeremy Pickens".

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Jeremy Pickens  
EMC Lab Manager



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## 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<br>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)

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

Then radiated emission test site and conducted measurement facility used to collect the data is 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

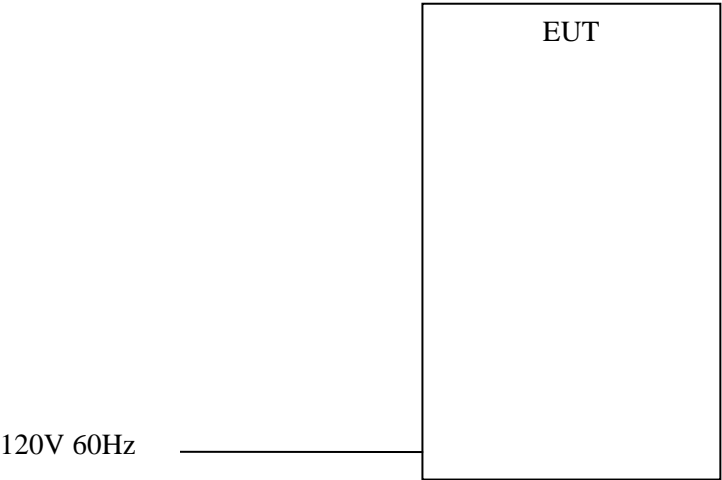


\* Client disconnected the antennas and installed cables for all antenna conducted measurements.

|  |  |
|--|--|
| <b>S</b> = Shielded<br><b>U</b> = Unshielded | <b>F</b> = With Ferrite<br><b>m</b> = Length in Meters |
|--|--|



Test Setup for Radiated measurements



|                       |                             |
|-----------------------|-----------------------------|
| <b>S</b> = Shielded   | <b>F</b> = With Ferrite     |
| <b>U</b> = Unshielded | <b>m</b> = 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.

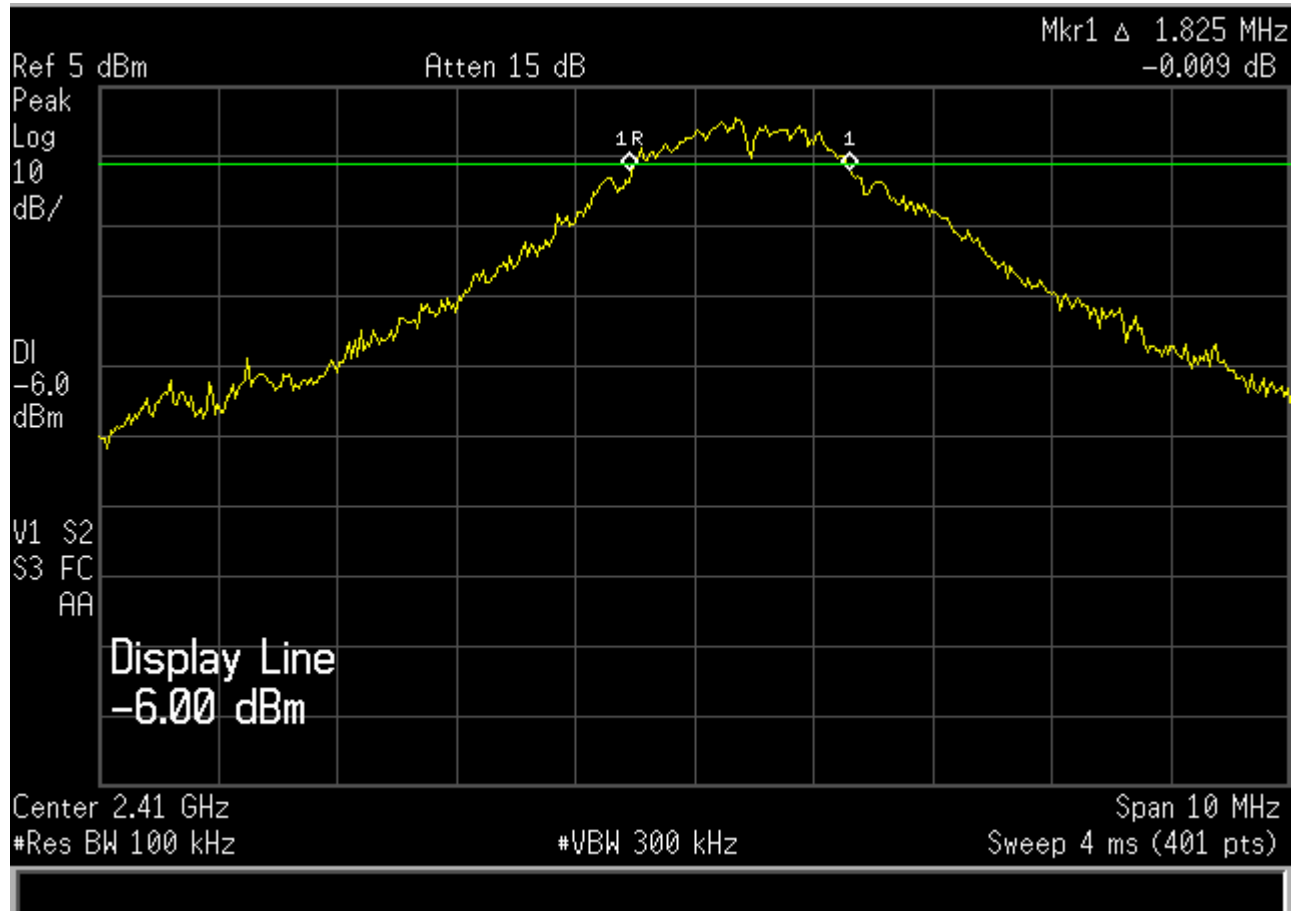
#### Procedure

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<br>(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.

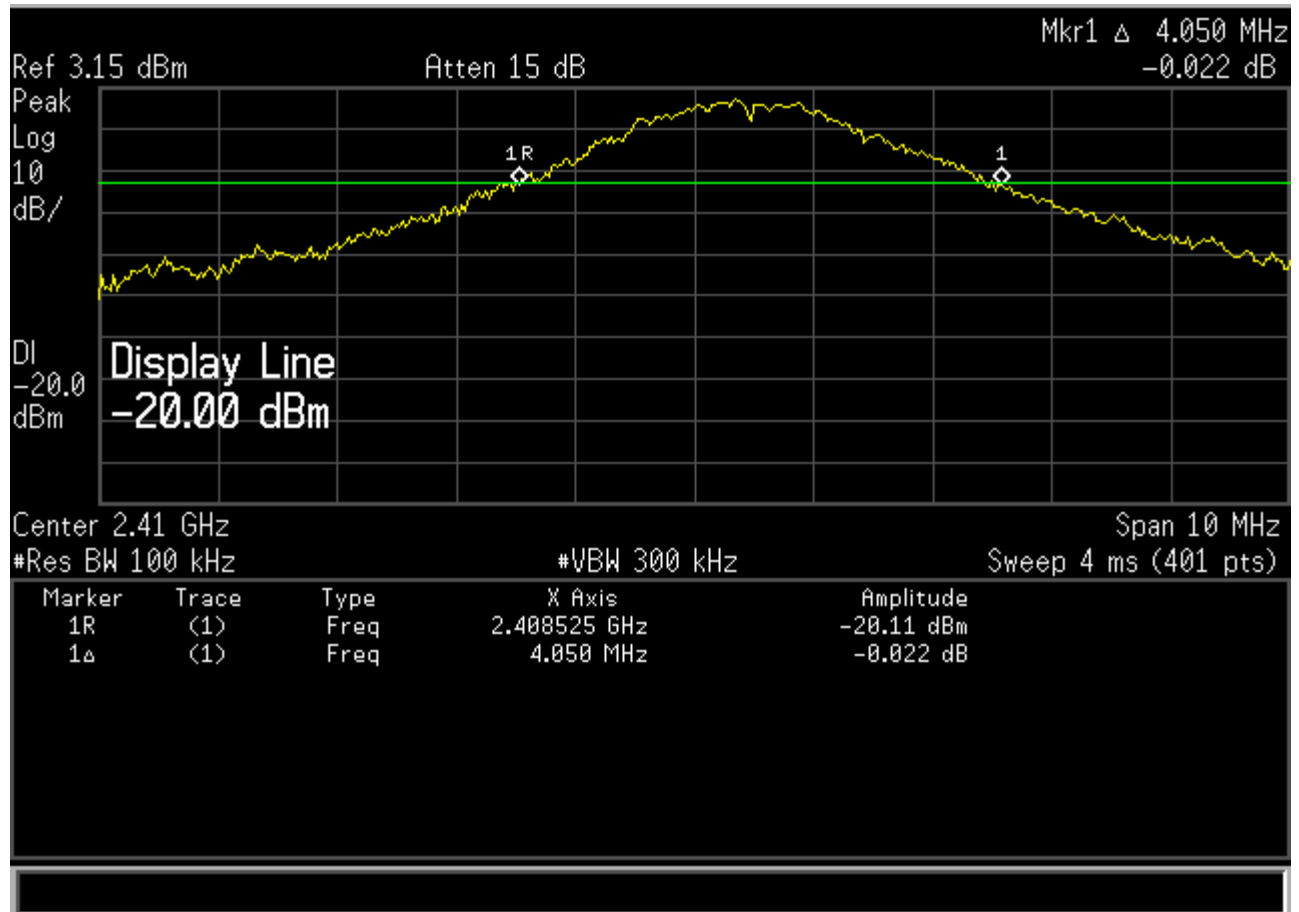
The resolution bandwidth was set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth was set to 3 times the resolution bandwidth. Video averaging was not used. If practical, a sampling detector was used since a peak or peak hold may produce a wider bandwidth 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<br>(GHz) | Output in dBm | Output in mW | Plot number                    |
|--------------------|---------------|--------------|--------------------------------|
| 2.41               | 3.15          | 2.07         | N/A - Peak Power Meter<br>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

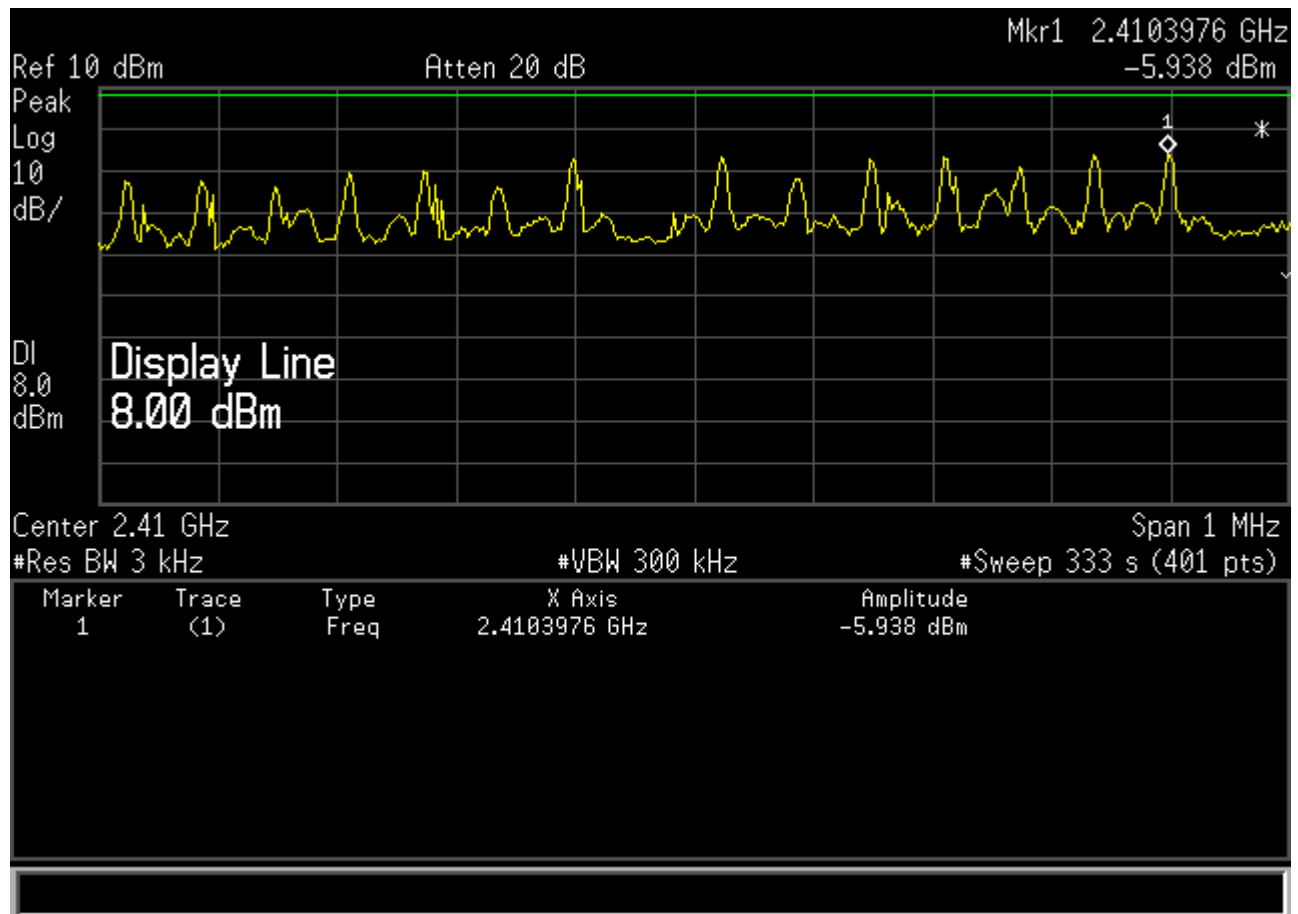
A peak search was performed on the resultant trace. The amplitude of that peak was recorded as the maximum power density in dBm. If applicable, the power spectral density was measured for all data rates and modulation modes on the middle channel.

##### 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.

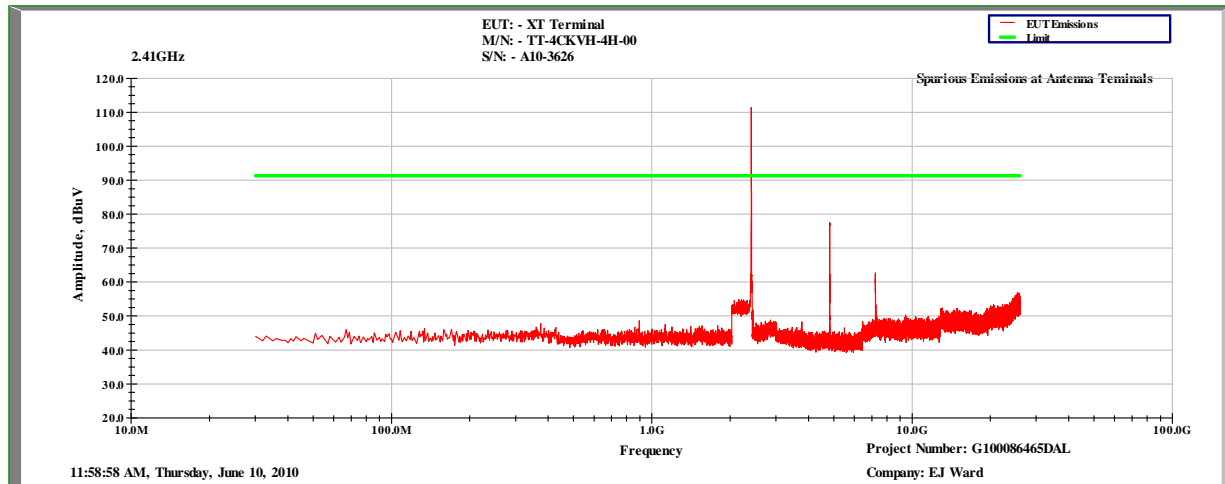
##### Procedure

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.

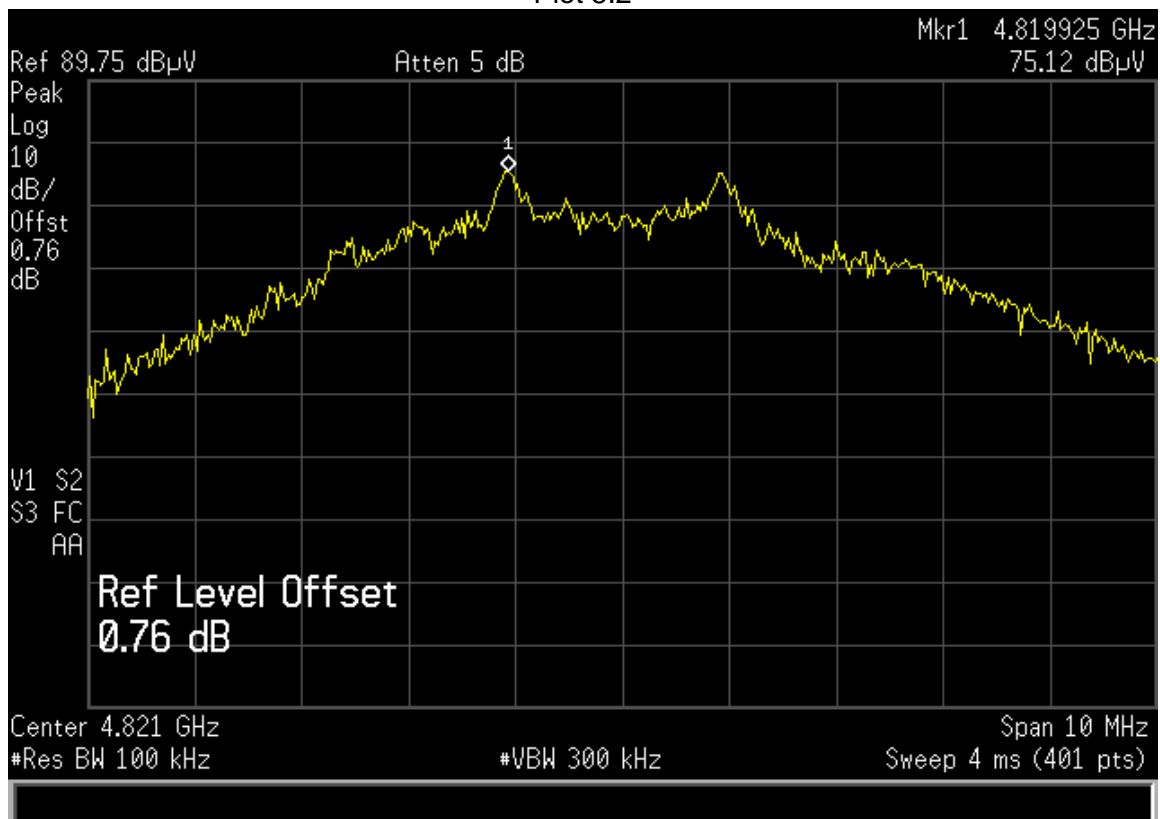
##### Test Results

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.

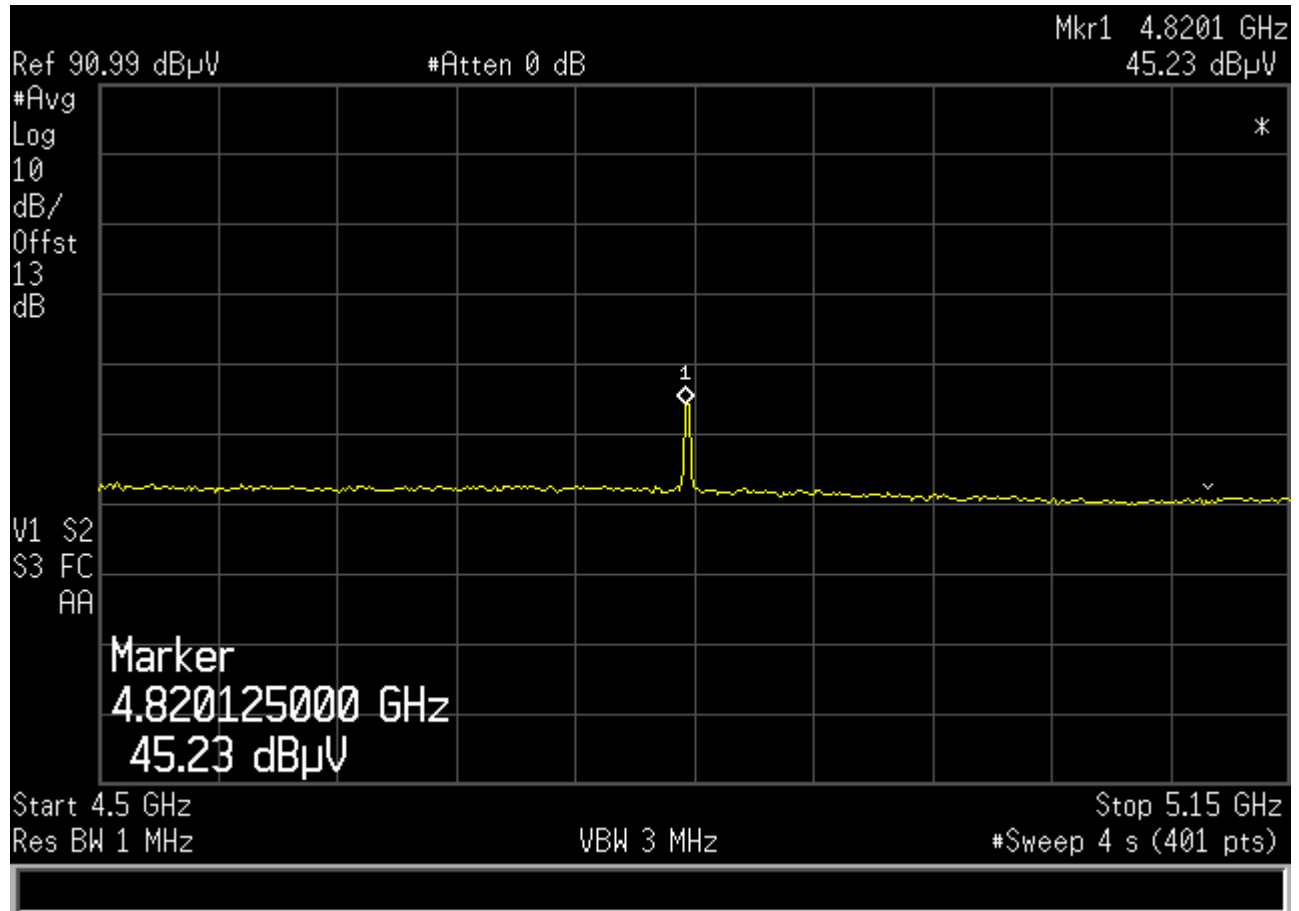
For the restricted band close to the fundamental emission, the spectrum analyzer was manually set to show the band edge of the 2.41GHz as well as the entire adjacent restricted band. The amplitude was offset to account for cable loss.

##### 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.

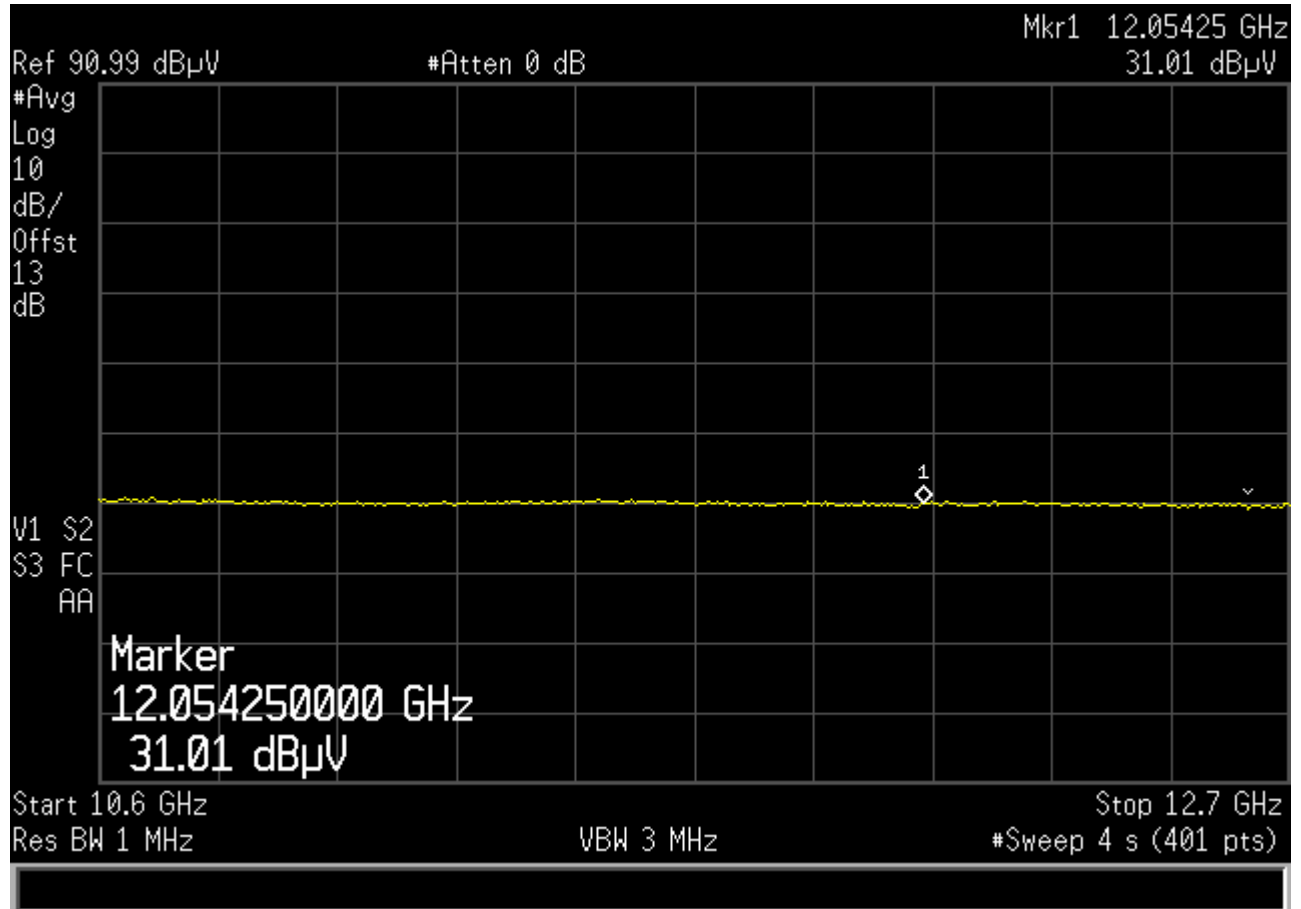


Plot 6.1



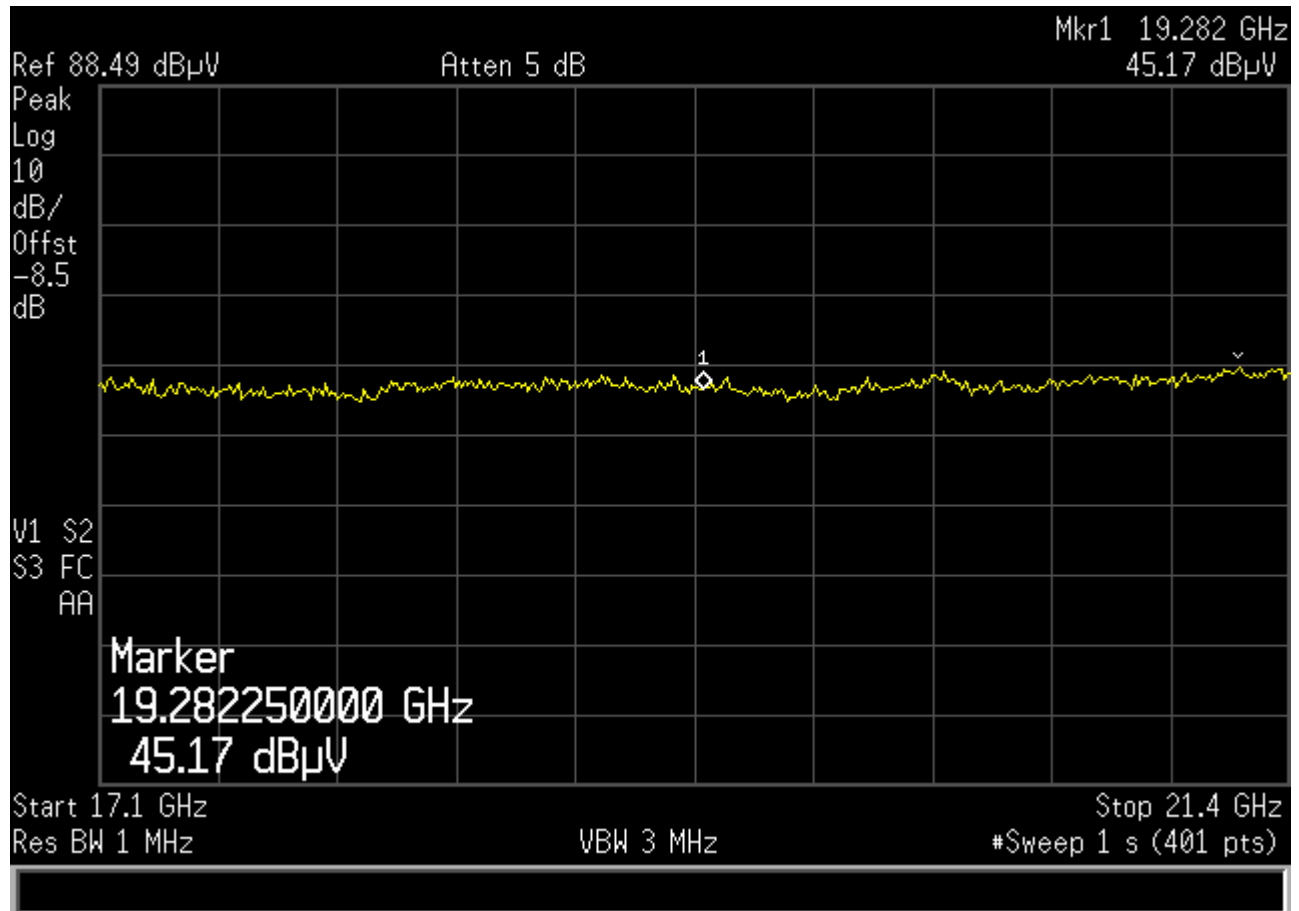
4.5 to 5.15 GHz restricted bandwidth; 2<sup>nd</sup> Harmonic

Plot 6.2



10.6 to 12.7 GHz restricted bandwidth; 5<sup>th</sup> Harmonic

Plot 6.3



17.7 to 21.4 GHz restricted bandwidth; 8<sup>th</sup> Harmonic

#### 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  
Thursday, May 6, 2010

Model Number: XT Automated Fuel Control Terminal  
Company: EJ Ward

| A                  | B            | C              | D                           | E                          | F                               | G                              | H           | J     |
|--------------------|--------------|----------------|-----------------------------|----------------------------|---------------------------------|--------------------------------|-------------|-------|
| Frequency<br>(MHz) | QP<br>dB(uV) | L1 Avg<br>dBuV | Class B QP<br>LIMIT<br>dBuV | Class B<br>QP Margin<br>dB | Class B<br>Avg<br>LIMIT<br>dBuV | Class B<br>Avg<br>Margin<br>dB | Cable<br>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  
Thursday, May 6, 2010

Model Number: XT Automated Fuel Control Terminal  
Company: EJ Ward

| A                  | B            | C              | D                           | E                          | F                               | G                              | H           | J     |
|--------------------|--------------|----------------|-----------------------------|----------------------------|---------------------------------|--------------------------------|-------------|-------|
| Frequency<br>(MHz) | QP<br>dB(uV) | L2 Avg<br>dBuV | Class B QP<br>LIMIT<br>dBuV | Class B<br>QP Margin<br>dB | Class B<br>Avg<br>LIMIT<br>dBuV | Class B<br>Avg<br>Margin<br>dB | Cable<br>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/<br>Job Number | Writer<br>Initial<br>s | Date          | Change            |
|-------------------------|------------------------|---------------|-------------------|
| 0/ G100086465           | WBC                    | June 10, 2010 | Original document |
|                         |                        |               |                   |
|                         |                        |               |                   |
|                         |                        |               |                   |
|                         |                        |               |                   |
|                         |                        |               |                   |