Measurement of RF Emissions from a iDTAD Sensor Tag Reader Transmitter

For	Accutech 10125 S 52nd Street Franklin, WI 53132
P.O. Number	P028121
Date Tested	April 18, 2017
Test Personnel	Richard King
Test Specification	FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Sections 15.207 and 15.209 for Intentional Radiators FCC “Code of Federal Regulations” Title 47, Part15, Subpart 15B, Section 15.107 and 15.109 for Receivers Industry Canada RSS-Gen

Test Report By: RICHARD E. KING

Richard King
EMC Engineer

Approved By: Raymond J Klouda

Raymond J. Klouda
Registered Professional
Engineer of Illinois - 44894

Elite Electronic Engineering Inc.
1516 CENTRE CIRCLE
DOWNERS GROVE, IL 60515
TEL: 630 - 495 - 9770
FAX: 630 - 495 - 9785
www.elitetest.com

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REVISION HISTORY

Revision	Date	Description
—	25 April 2017	Initial release

Measurement of RF Emissions from a Sensor Tag Reader, Model No. iDTAD Transmitter

1. INTRODUCTION

1.1. Scope of Tests

This report presents the results of the RF emissions measurements performed on a Sensor Tag Reader, Model No. iDTAD, Serial No. (no serial number assigned), (hereinafter referred to as the Equipment Under Test (EUT)). The EUT was designed to transmit at approximately 127kHz using an internal antenna and to receive in the 418MHz range using an internal antenna. The EUT was manufactured and submitted for testing by Accutech located in Franklin, WI.

1.2. Purpose

The test series was performed to determine if the EUT meets the conducted and radiated RF emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart B, Sections 15.107 and 15.109, for receivers and Subpart C, Sections 207 and 209 for Intentional Radiators. Testing was performed in accordance with ANSI C63.4-2014.

The test series was also performed to determine if the EUT meets the conducted and radiated RF emission requirements of the Industry Canada Radio Standards Specification RSS-Gen Sections 8.8 and 7.1.2 for receivers and Sections 8.8 and 8.9 for transmitters. Testing was performed in accordance with ANSI C63.4-2014.

1.3. Deviations, Additions and Exclusions

There were no deviations, additions to, or exclusions from the test specification during this test series.

1.4. EMC Laboratory Identification

This series of tests was performed by Elite Electronic Engineering Incorporated of Downers Grove, Illinois. The laboratory is accredited by The American Association for Laboratory Accreditation (A2LA). A2LA Certificate Number: 1786.01.

1.5. Laboratory Conditions

The temperature at the time of the test was 25.6°C and the relative humidity was 20%.

2. APPLICABLE DOCUMENTS

The following documents of the exact issue designated form part of this document to the extent specified herein:

- Federal Communications Commission "Code of Federal Regulations", Title 47, Part 15, Subpart C, dated 1 October 2016
- ANSI C63.4-2014, "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"
- Industry Canada Radio Standards Specification, RSS-Gen, “Spectrum Management and Telecommunications Radio Standards Specification, General Requirements for Compliance of Radio Apparatus”, Issue 4, November 2014
- ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices”

3. EUT SETUP AND OPERATION

3.1. General Description

The EUT is an Accutech, Sensor Tag Reader, Model No. iDTAD. A block diagram of the EUT setup is shown as Figure 1.

3.1.1. Power Input

The EUT obtained 3.7VDC power from a Lithium ION battery.

The EUT could also be powered with 5VDC from the secondary of an Insignia AC to DC power converter, Part No. NSD-IPDWCH. The primary of this converter received 115V 60Hz power through low pass powerline filters on the wall of the shielded enclosure. The 5VDC power from the secondary of the converter was provided to the EUT through a 3 foot long unshielded USB cable. Each primary lead was connected through a line impedance stabilization network (LISN) which was located on the ground plane. The network complies with the requirements of Paragraph 4.1.2 of ANSI C63.4-2014.

3.1.2. Peripheral Equipment

No peripheral equipment was submitted with the EUT.

3.1.3. Signal Input/Output Leads

No interconnect cables were submitted with the EUT.

3.1.4. Grounding

The EUT was ungrounded during the testing.

3.2. Software

For all tests the EUT had Firmware Version V1.0.0 loaded onto the device to provide correct load characteristics.

3.3. Operational Mode

For all tests the EUT was placed on an 80cm high non-conductive stand. The EUT and all peripheral equipment were energized.

All emissions tests were run separately with the EUT programmed to operate in the following modes:

- Receive at 418MHz
- Transmit at 127kHz

3.4. EUT Modifications

No modifications to the EUT were required for compliance.

4. TEST FACILITY AND TEST INSTRUMENTATION

4.1. Shielded Enclosure

All tests were performed in a 32ft. x 20ft. x 18ft. hybrid ferrite-tile/anechoic absorber lined test chamber. With the exception of the floor, the reflective surfaces of the shielded chamber are lined with ferrite tiles on the walls and ceiling. Anechoic absorber material is installed over the ferrite tile. The floor of the chamber is used as the ground plane. The chamber complies with ANSI C63.4-2014 for site attenuation.

4.2. Test Instrumentation

The test instrumentation and auxiliary equipment used during the tests are listed in Table 9-1.

Conducted and radiated emission measurements were performed with a spectrum analyzer. This receiver allows measurements with the bandwidths and detector functions specified by the FCC. The receiver bandwidth was 120kHz for the 30MHz to 1000MHz radiated emissions data and 1MHz for the 1000MHz to 5000MHz radiated emissions data.

4.3. Calibration Traceability

Test equipment is maintained and calibrated on a regular basis with a calibration interval not greater than two years. All calibrations are traceable to the National Institute of Standards and Technology (NIST).

4.4. Measurement Uncertainty

All measurements are an estimate of their true value. The measurement uncertainty characterizes, with a specified confidence level, the spread of values which may be possible for a given measurement system.

The measurement uncertainty for these tests is presented below:

Conducted Emissions Measurements		
Combined Standard Uncertainty	1.06	-1.06
Expanded Uncertainty (95% confidence)	2.12	-2.12

Radiated Emissions Measurements		
Combined Standard Uncertainty	2.09	-2.09
Expanded Uncertainty (95% confidence)	4.19	-4.19

5. Test Procedures

5.1. Receiver

5.1.1. Powerline Conducted Emissions

5.1.1.1 Requirements

All radio frequency voltages on the power lines for any frequency or frequencies of an intentional radiator shall not exceed the limits in the following table:

Frequency MHz	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 – 0.5	66 decreasing with logarithm of frequency to 56	56 decreasing with logarithm of frequency to 46
0.5 - 5	56	46
5 - 30	60	50

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

5.1.1.2 Procedures

The interference on each power lead of the EUT was measured by connecting the measuring equipment to the appropriate meter terminal of the Line Impedance Stabilization Network (LISN). The meter terminal of the LISN not under test was terminated with 50 ohms.

a) The EUT was operated in the receive at 418MHz mode.

b) Measurements were first made on the EUT Voltage high line.

c) The frequency range from 150 kHz to 30 MHz was broken up into smaller frequency sub-bands.

d) Conducted emissions measurements were taken on the first frequency sub-band using a peak detector.

e) The data thus obtained was then searched by the computer for the highest levels. Any emissions levels that were within 10dB of the average limit were then measured again using both a quasi-peak detector and an average detector. (If no peak readings were within 10dB of the average limit, quasi-peak and average readings were taken on the highest emissions levels measured during the peak detector scan.)

f) Steps (d) and (e) were repeated for the remainder of the frequency sub-bands until the entire frequency range from 150kHz to 30MHz was investigated. The peak trace was automatically plotted. The plot also shows quasi-peak and average readings that were taken on discrete frequencies. A table showing the quasi-peak and average readings was also generated. This tabular data compares the quasi-peak and average conducted emissions to the applicable conducted emissions limits. The resultant voltage level (VL) is a summation in decibels (dB) of the receiver meter reading (MTR) and the cable loss factor (CF).

Formula 1: VL (dBuV) = MTR (dBuV) + CF (dB)

g) Steps (c) through (f) were repeated on the EUT Voltage return line.

5.1.1.3 Results

The plots and final data of the peak, quasi-peak, and average conducted voltage levels acquired from each input power line with the EUT operated in the receive at 418MHz mode are shown on pages 20 through 23. All power line conducted emissions measured from the EUT were within the specification limits.

A photograph of the test configuration which yielded the highest or worst case, conducted emission levels is shown in Figure 2.

5.1.2. Radiated Measurements

5.1.2.1 Requirements

Per the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart B, Section 15.109(a) and Industry Canada RSS-Gen, Section 7.1.2, all radio frequency emissions from a receiver shall be below the limits shown in the following table:

RADIATION LIMITS FOR A RECEIVER

Frequency MHz	Distance between EUT And Antenna in Meters	Field Strength uV/m	Field Strength dBuV/m
30-88	3	100	40
88-216	3	150	43.5
216-960	3	200	46
Above 960	3	500	54

Note: The tighter limit shall apply at the edge between the two frequency bands.

5.1.2.2 Procedures

All tests were performed in a 32ft. x 20ft. x 18ft. hybrid ferrite-tile/anechoic absorber lined test chamber. The walls and ceiling of the shielded chamber are lined with ferrite tiles. Anechoic absorber material is installed over the ferrite tile. The floor of the chamber is used as the ground plane. The chamber complies with ANSI C63.4-2014 for site attenuation.

The shielded enclosure prevents emissions from other sources, such as radio and TV stations from interfering with the measurements. All powerlines and signal lines entering the enclosure pass through filters on the enclosure wall. The powerline filters prevent extraneous signals from entering the enclosure on these leads.

Since a quasi-peak detector and an average detector require long integration times, it is not practical to automatically sweep through the quasi-peak and average levels. Therefore, radiated emissions from the EUT were first scanned using a peak detector and automatically plotted. The frequencies where significant emission levels were noted were then remeasured using the quasi-peak detector or average detector.

The broadband measuring antenna was positioned at a 3 meter distance from the EUT. The frequency range from 30MHz to 1GHz was investigated using a peak detector function with the bilog antenna at several heights, horizontal and vertical polarization, and with several different orientations of the EUT with respect to the antenna. The frequency range from 1GHz to 2GHz was investigated using a peak detector function with the double ridged waveguide antenna at several heights, horizontal and vertical polarization, and with several different orientations of the EUT with respect to the antenna. The maximum levels for each antenna polarization were plotted. The resultant field strength (FS) is a summation in decibels (dB) of the receiver meter reading (MTR), the antenna correction factor (AF), and the cable loss factor (CF). If an external pre-amplifier is used, the total is reduced by its gain (-PA). If a distance correction (DC) is required, it is added to the total.

Formula 1: FS (dBuV/m) = MTR (dBuV) + AF (dB/m) + CF (dB) + (- PA (dB)) + DC (dB)

To convert the Field Strength dBuV/m term to uV/m, the dBuV/m is first divided by 20. The Base 10 AntiLog is taken of this quotient. The result is the Field Strength value in uV/m terms.

Formula 2: FS (uV/m) = AntiLog [(FS (dBuV/m))/20]

Final radiated emissions were performed on all significant broadband and narrowband emissions found in the preliminary sweeps using the following methods:

1) Measurements from 30MHz to 1GHz were made using a quasi-peak detector and a broadband bilog antenna. Measurements above 1GHz were made using an average detector and a broadband double ridged waveguide antenna.

2) To ensure that maximum or worst case, emission levels were measured, the following steps were taken:

    a) The EUT was rotated so that all of its sides were exposed to the receiving antenna.

    b) Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.

    c) The measuring antenna was raised and lowered from 1 to 4 meters for each antenna polarization to maximize the readings.

    d) For hand-held or body-worn devices, the EUT was rotated through three orthogonal axes to determine which orientation produces the highest emission relative to the limit.

5.1.2.3 Results

The preliminary plots and final data with the EUT operating in the receive at 418MHz mode are presented on pages 28 through 33. As can be seen from the final data, all emissions measured from the EUT were within the specification limits.

Photographs of the test configuration which yielded the highest or worst case, radiated emission levels are shown in Figure 3 and Figure 4.

5.2. Transmitter

5.2.1. Powerline Conducted Emissions

5.2.1.1 Requirements

All radio frequency voltages on the power lines for any frequency or frequencies of an intentional radiator shall not exceed the limits in the following table:

Frequency MHz	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 – 0.5	66 decreasing with logarithm of frequency to 56	56 decreasing with logarithm of frequency to 46
0.5 - 5	56	46
5 - 30	60	50

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

5.2.1.2 Procedures

The interference on each power lead of the EUT was measured by connecting the measuring equipment to the appropriate meter terminal of the Line Impedance Stabilization Network (LISN). The meter terminal of the LISN not under test was terminated with 50 ohms.

h) The EUT was operated in the receive at 418MHz mode.

i) Measurements were first made on the EUT Voltage high line.

j) The frequency range from 150 kHz to 30 MHz was broken up into smaller frequency sub-bands.

k) Conducted emissions measurements were taken on the first frequency sub-band using a peak detector.

l) The data thus obtained was then searched by the computer for the highest levels. Any emissions levels that were within 10dB of the average limit were then measured again using both a quasi-peak detector and an average detector. (If no peak readings were within 10dB of the average limit, quasi-peak and average readings were taken on the highest emissions levels measured during the peak detector scan.)

m) Steps (d) and (e) were repeated for the remainder of the frequency sub-bands until the entire frequency range from 150kHz to 30MHz was investigated. The peak trace was automatically plotted. The plot also shows quasi-peak and average readings that were taken on discrete frequencies. A table showing the quasi-peak and average readings was also generated. This tabular data compares the quasi-peak and average conducted emissions to the applicable conducted emissions limits. The resultant voltage level (VL) is a summation in decibels (dB) of the receiver meter reading (MTR) and the cable loss factor (CF).

Formula 1: VL (dBuV) = MTR (dBuV) + CF (dB)

n) Steps (c) through (f) were repeated on the EUT Voltage return line.

5.2.1.3 Results

The plots and final data of the peak, quasi-peak, and average conducted voltage levels acquired from each input power line with the EUT operated in the transmit at 127kHz mode are shown on pages 24 through 27. All power line conducted emissions measured from the EUT were within the specification limits.

A photograph of the test configuration which yielded the highest or worst case, conducted emission levels is shown in Figure 2.

5.2.2. Radiated Measurements

5.2.2.1 Requirements

Per the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Section 15.209(a) and Industry Canada RSS-Gen, Section 8.9, all radio frequency emissions from an intentional radiator shall be below the limits shown on the following table:

Frequency MHz	Field Strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	3
30.0-88.0	100	3
88.0-216.0	150	3
216.0-960.0	200	3
Above 960	500	3

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

In addition, per the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Section 15.209(d) and Industry Canada RSS-Gen, Section 8.9, the emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

5.2.2.2 Procedures

All tests were performed in a 32ft. x 20ft. x 18ft. hybrid ferrite-tile/anechoic absorber lined test chamber. The walls and ceiling of the shielded chamber are lined with ferrite tiles. Anechoic absorber material is installed over the ferrite tile. The floor of the chamber is used as the ground plane. The chamber complies with ANSI C63.4-2014 for site attenuation.

The shielded enclosure prevents emissions from other sources, such as radio and TV stations from interfering with the measurements. All powerlines and signal lines entering the enclosure pass through filters on the enclosure wall. The powerline filters prevent extraneous signals from entering the enclosure on these leads.

A preliminary radiated emissions test was performed to determine the emission characteristics of the EUT. For the preliminary test, an active loop measuring antenna was positioned at a 3 meter distance from the EUT. The entire frequency range from 10kHz to 30MHz was investigated using a peak detector function.

The final open field emission tests were then manually performed over the frequency range of 10kHz to 30MHz using an active loop antenna. All significant broadband and narrowband signals were measured and recorded. A 200Hz bandwidth was used for all measurements below 150kHz. A quasi-peak detector with a 9kHz bandwidth was used for all measurements above 150kHz.

To ensure that maximum or worst case, emission levels were measured, the following steps were taken:

1) The EUT was rotated so that all of its sides were exposed to the receiving antenna.
2) The active loop antenna was placed at a height of 1 meter.
3) Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.
4) With the loop antenna in the vertical polarization, the loop antenna was rotated through 360 degrees.

The resultant field strength (FS) is a summation in decibels (dB) of the receiver meter reading (MTR), the antenna correction factor (AF), and the cable loss factor (CF). If peak reading are taken, and the standard calls out an average limit, the peak readings are converted to average readings by adding a duty cycle correction factor (DC). If an external pre-amplifier is used, the total is reduced by its gain (-PA). If a distance correction (DC) is required, it is added to the total. (Per 15.231(f)(2), at frequencies below 30MHz, measurements may be made at a distance closer than that specified. When performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by using the square of an inverse linear distance extrapolation factor (40 dB/decade).)

Formula 1: FS (dBuV/m) = MTR (dBuV) + AF (dB/m) + CF (dB) + DC (dB) + (- PA (dB)) + DC (dB)

To convert the Field Strength dBuV/m term to uV/m, the dBuV/m is first divided by 20. The Base 10 AntiLog is taken of this quotient. The result is the Field Strength value in uV/m terms.

Formula 2: FS (uV/m) = AntiLog [(FS (dBuV/m))/20]

5.2.2.3 Results

The preliminary plots and final data with the EUT transmitting at 127kHz, are presented on data pages 34 through 36. The plots are presented for reference only, and are not used to determine compliance. As can be seen from the final data, all emissions measured from the EUT were within the specification limits.

Photographs of the test configuration which yielded the highest, or worst case, radiated emission levels are shown in Figure 5.

6. OTHER TEST CONDITIONS

6.1. Test Personnel and Witnesses

All tests were performed by qualified personnel from Elite Electronic Engineering Incorporated.

6.2. Disposition of the EUT

The EUT and all associated equipment were returned to Accutech upon completion of the tests.

7. CONCLUSIONS

It was determined that the Accutech Sensor Tag Reader, Model No. iDTAD, no serial number, did fully meet the conducted and radiated emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart B, Sections 15.107 and 15.109 for receivers and Subpart C, Sections 15.207 and 15.209 for Intentional Radiators when tested per ANSI C63.4-2014.

It was also determined that, the Accutech Sensor Tag Reader did fully meet the conducted and radiated RF emission requirements of the Industry Canada Radio Standards Specification, RSS-Gen, Sections 8.8 and 7.1.2 for receivers and Sections 8.8 and 8.9 for transmitters, when tested per ANSI C63.4-2014.

8. CERTIFICATION

Elite Electronic Engineering Incorporated certifies that the information contained in this report was obtained under conditions which meet or exceed those specified in the test specifications.

The data presented in this test report pertains to the EUT at the test date. Any electrical or mechanical modification made to the EUT subsequent to the specified test date will serve to invalidate the data and void this certification.

This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the Federal Government.

9. EQUIPMENT LIST

Table 9-1 Equipment List

Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Due Date
CDY0	WORKSTATION	ELITE	WORKSTATION		WINDOWS 7	N/A	
NSL0	SLEEVE ANTENNA - 410MHz (NISSAN)	ELITE ELECTRONIC ENG.	410-01	001	385MHz/410MHz	9/27/2016	9/27/2017
NTA3	BILOG ANTENNA	TESEQ	6112D	32853	25-1000MHz	3/23/2016	4/23/2017
PLF1	CISPR16 50UH LISN	ELITE	CISPR16/70A	001	.15-30MHz	5/16/2016	5/16/2017
PLF3	CISPR16 50UH LISN	ELITE	CISPER16/70A	003	.15-30MHz	5/16/2016	5/16/2017
RAKG	RF SECTION	HEWLETT PACKARD	85462A	3549A00284	0.009-6500MHZ	3/8/2017	3/8/2018
RAKH	RF FILTER SECTION	HEWLETT PACKARD	85460A	3448A00324	---	3/8/2017	3/8/2018
RBG2	EMI ANALYZER	ROHDE & SCHWARZ	ESW44	101591	2HZ-44GHZ	11/22/2016	11/22/2017
VBR8	CISPR EN FCC CE VOLTAGE.exe						
WKA1	SOFTWARE, UNIVERSAL RCV EMI	ELITE	UNIV_RCV_EMI	1	---	I/O	
WQB0	RE_8546A						
XLJR	5W, 50 OHM TERMINATION	JFW INDUSTRIES	50T-052	---	DC-2GHZ	7/7/2016	7/7/2018

I/O: Initial Only
N/A: Not Applicable
Note 1: For the purpose of this test, the equipment was calibrated over the specified frequency range, pulse rate, or modulation prior to the test or monitored by a calibrated instrument.

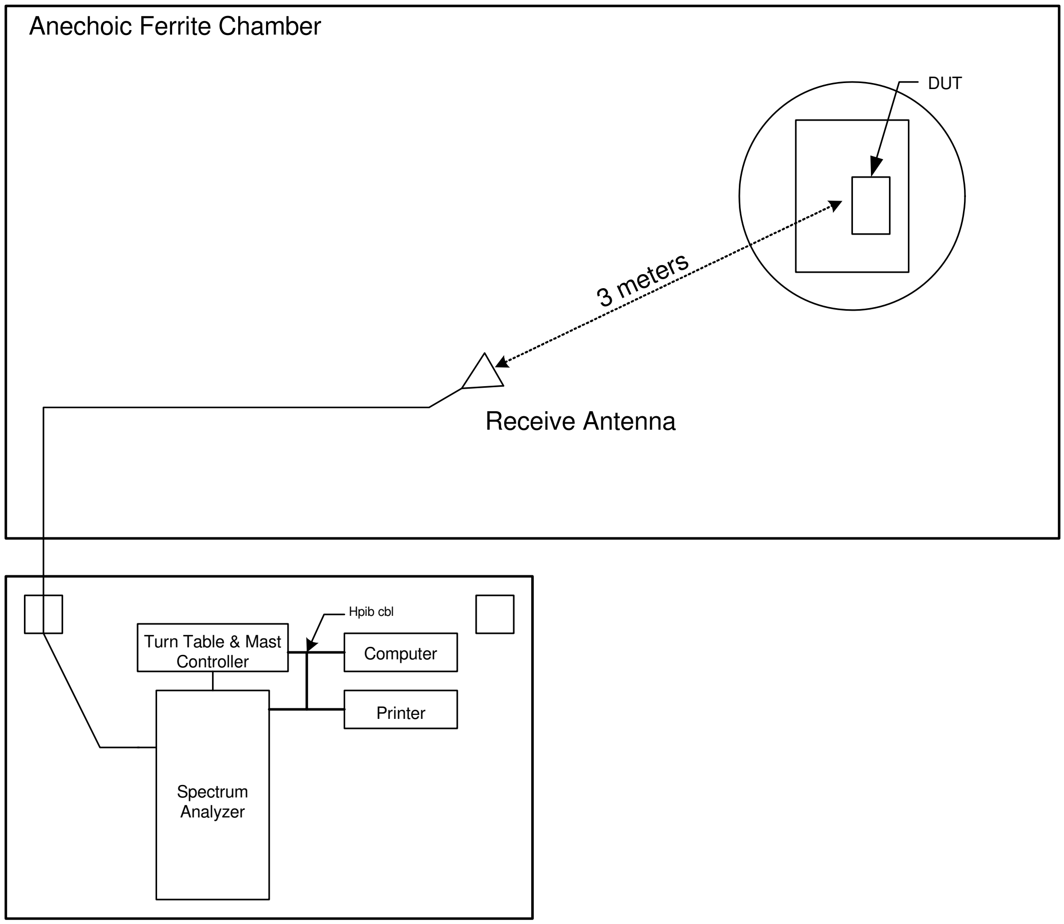


FIGURE 1 BLOCKDIAGRAM OF TEST SETUP

Figure 2

Test Setup for Conducted Emissions

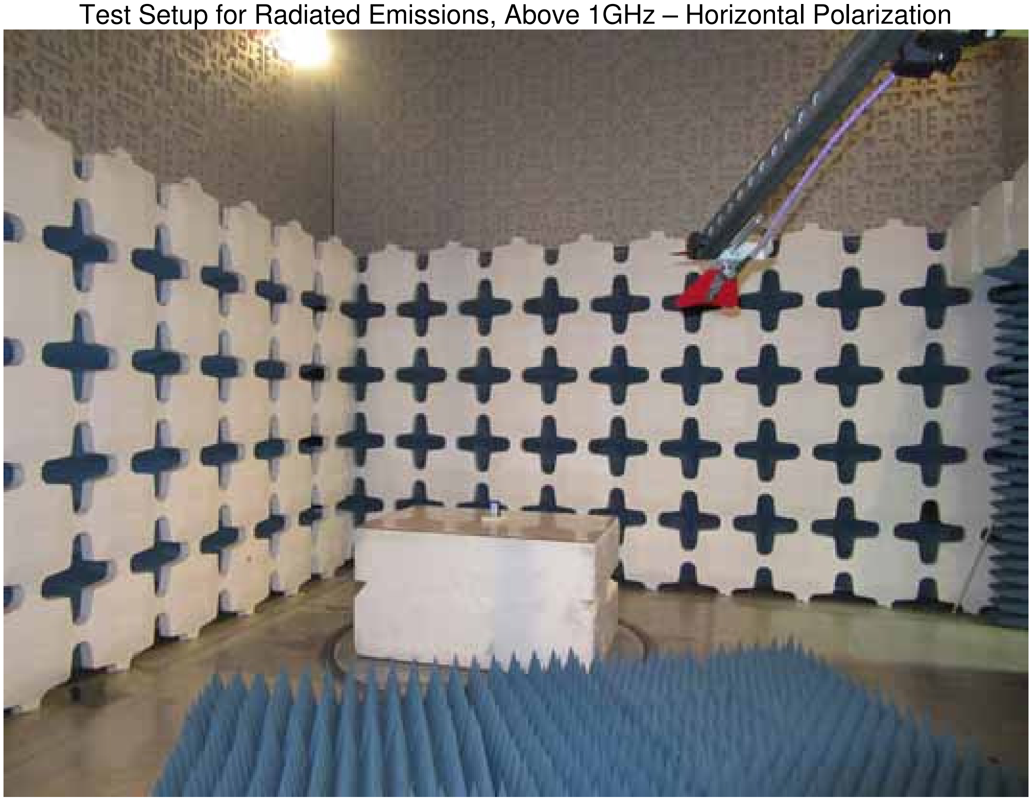
Figure 3

Test Setup for Radiated Emissions, 30MHz to 1GHz – Horizontal Polarization

Test Setup for Radiated Emissions, 30MHz to 1GHz – Vertical Polarization

Figure 4

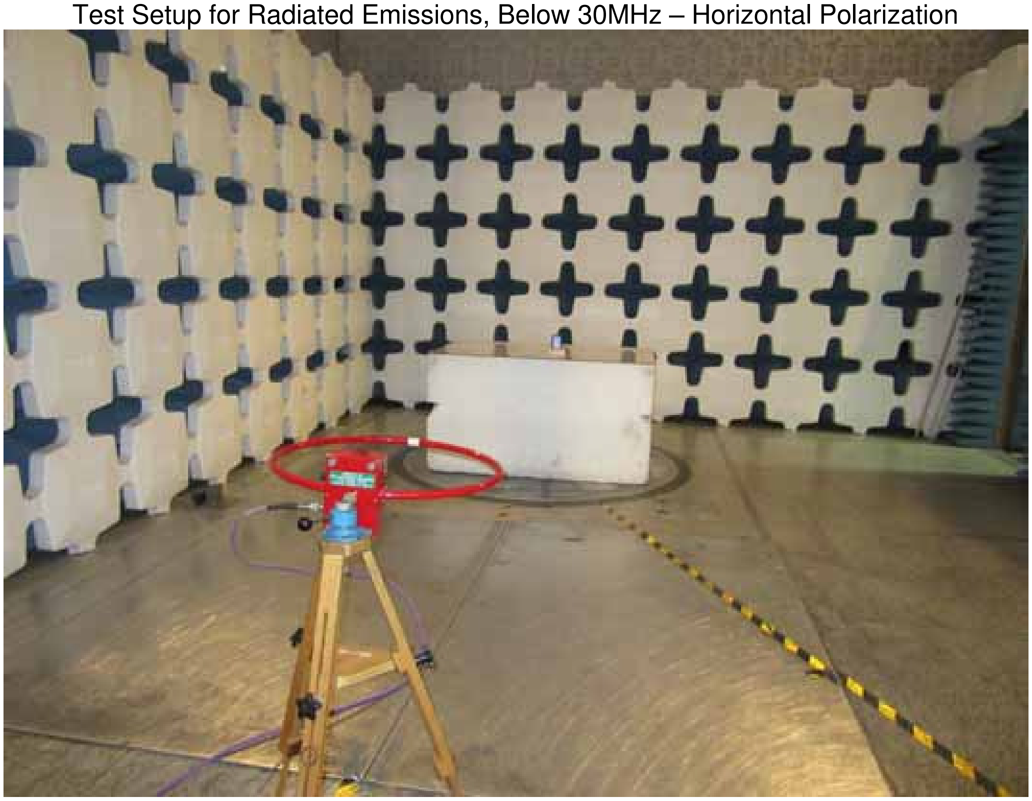
Test Setup for Radiated Emissions, Above 1GHz – Horizontal Polarization



Test Setup for Radiated Emissions, Above 1GHz – Vertical Polarization

Figure 5

Test Setup for Radiated Emissions, Below 30MHz – Horizontal Polarization



Test Setup for Radiated Emissions, Below 30MHz – Vertical Polarization

FCC Part 15 Subpart B Conducted Emissions Test

Significant Emissions Data

VBR8 04/23/2015

Manufacturer	:	ACCUTECH
Model	:	iDTAD
DUT Mode	:	Rx @ 418MHz
Line Tested	:	L1
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	
Test Engineer	:	R. King
Limit	:	Receiver
Test Date	:	Apr 18, 2017 02:46:54 PM
Data Filter	:	Up to 80 maximum levels detected with 6 dB level excursion threshold over 10 dB margin below limit

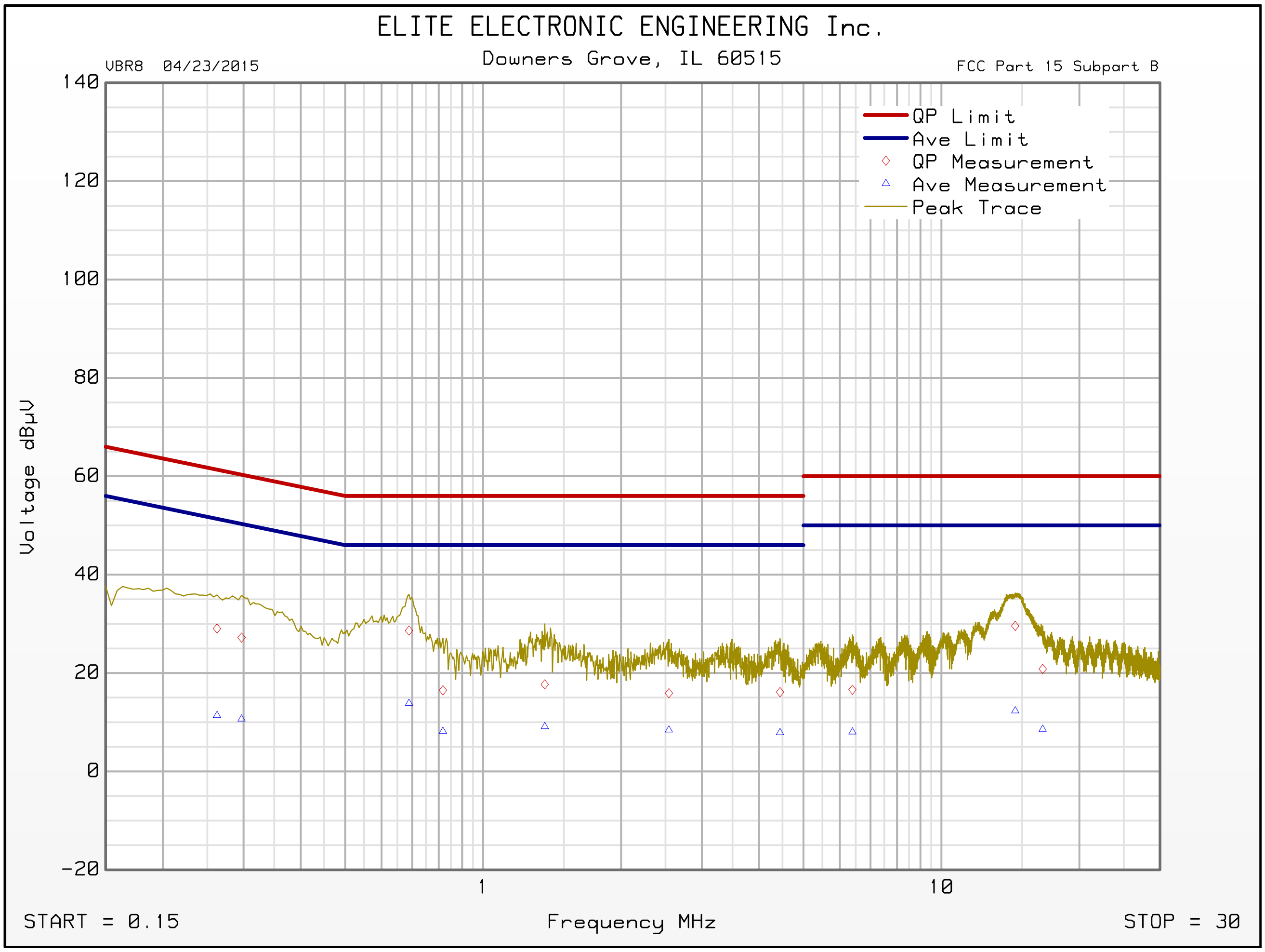
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.263	29.0	61.4		11.4	51.4	
0.297	27.2	60.3		10.7	50.3	
0.689	28.6	56.0		13.9	46.0	
0.817	16.5	56.0		8.1	46.0	
1.363	17.7	56.0		9.1	46.0	
2.543	15.9	56.0		8.4	46.0	
4.445	16.1	56.0		7.9	46.0	
6.395	16.6	60.0		8.0	50.0	
14.490	29.6	60.0		12.3	50.0	
16.637	20.8	60.0		8.6	50.0	

FCC Part 15 Subpart B Conducted Emissions Test

Cumulative Data

VBR8 04/23/2015

Manufacturer	:	ACCUTECH
Model	:	iDTAD
DUT Mode	:	Rx @ 418MHz
Line Tested	:	L1
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	
Test Engineer	:	R. King
Limit	:	Receiver
Test Date	:	Apr 18, 2017 02:46:54 PM



Emissions Meet QP Limit
Emissions Meet Ave Limit

FCC Part 15 Subpart B Conducted Emissions Test

Significant Emissions Data

VBR8 04/23/2015

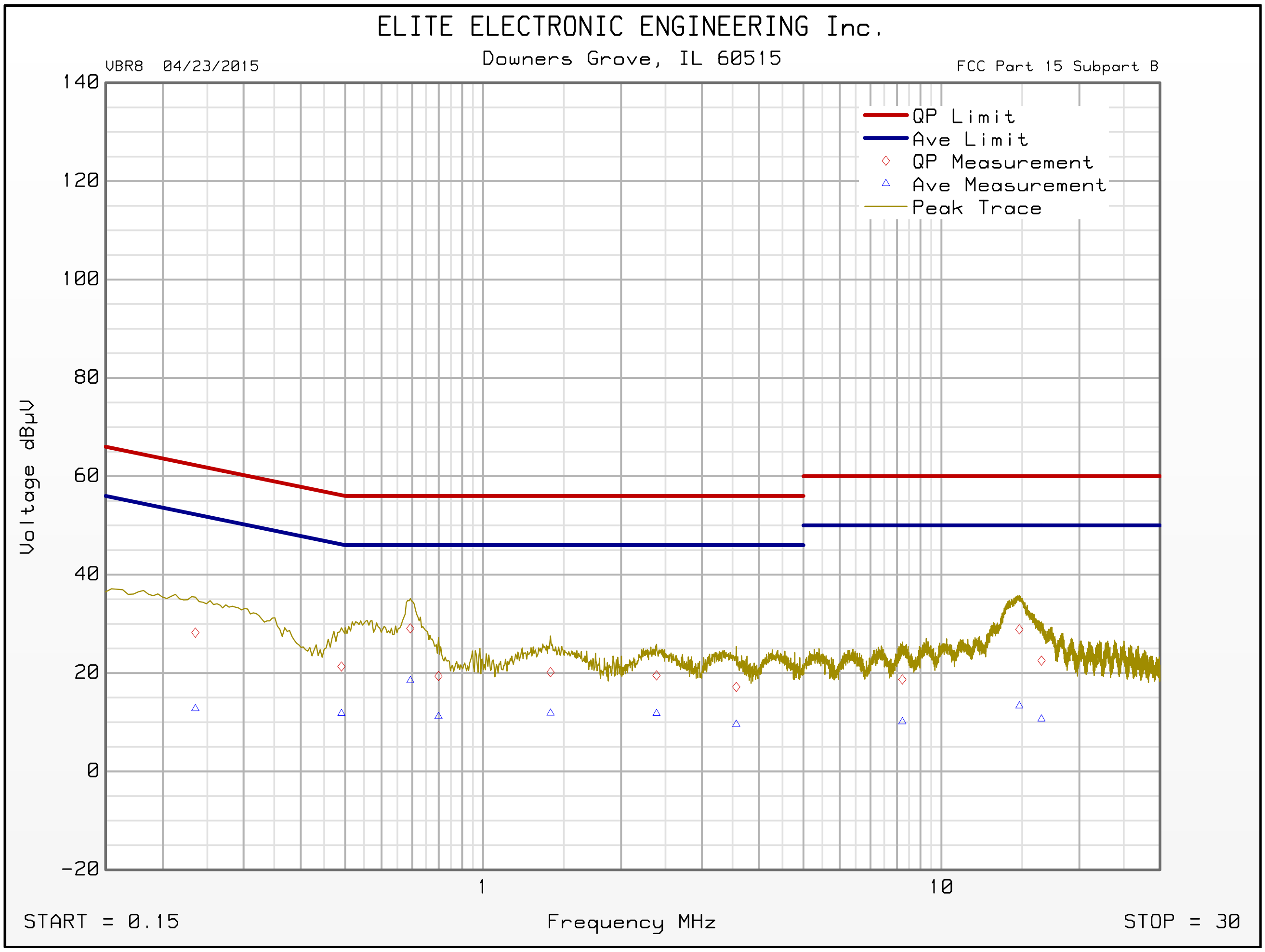
Manufacturer	:	ACCUTECH
Model	:	iDTAD
DUT Mode	:	Rx @ 418MHz
Line Tested	:	L2
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	
Test Engineer	:	R. King
Limit	:	Receiver
Test Date	:	Apr 18, 2017 02:53:58 PM
Data Filter	:	Up to 80 maximum levels detected with 6 dB level excursion threshold over 10 dB margin below limit

Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.236	28.2	62.3		12.7	52.3	
0.491	21.3	56.2		11.8	46.2	
0.694	29.1	56.0		18.5	46.0	
0.799	19.4	56.0		11.2	46.0	
1.403	20.2	56.0		11.9	46.0	
2.390	19.5	56.0		11.8	46.0	
3.568	17.2	56.0		9.6	46.0	
8.218	18.7	60.0		10.1	50.0	
14.796	28.9	60.0		13.3	50.0	
16.534	22.5	60.0		10.7	50.0	

FCC Part 15 Subpart B Conducted Emissions Test
Cumulative Data

VBR8 04/23/2015

Manufacturer	:	ACCUTECH
Model	:	iDTAD
DUT Mode	:	Rx @ 418MHz
Line Tested	:	L2
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	
Test Engineer	:	R. King
Limit	:	Receiver
Test Date	:	Apr 18, 2017 02:53:58 PM



Emissions Meet QP Limit
Emissions Meet Ave Limit

FCC Part 15 Subpart B Conducted Emissions Test

Significant Emissions Data

VBR8 04/23/2015

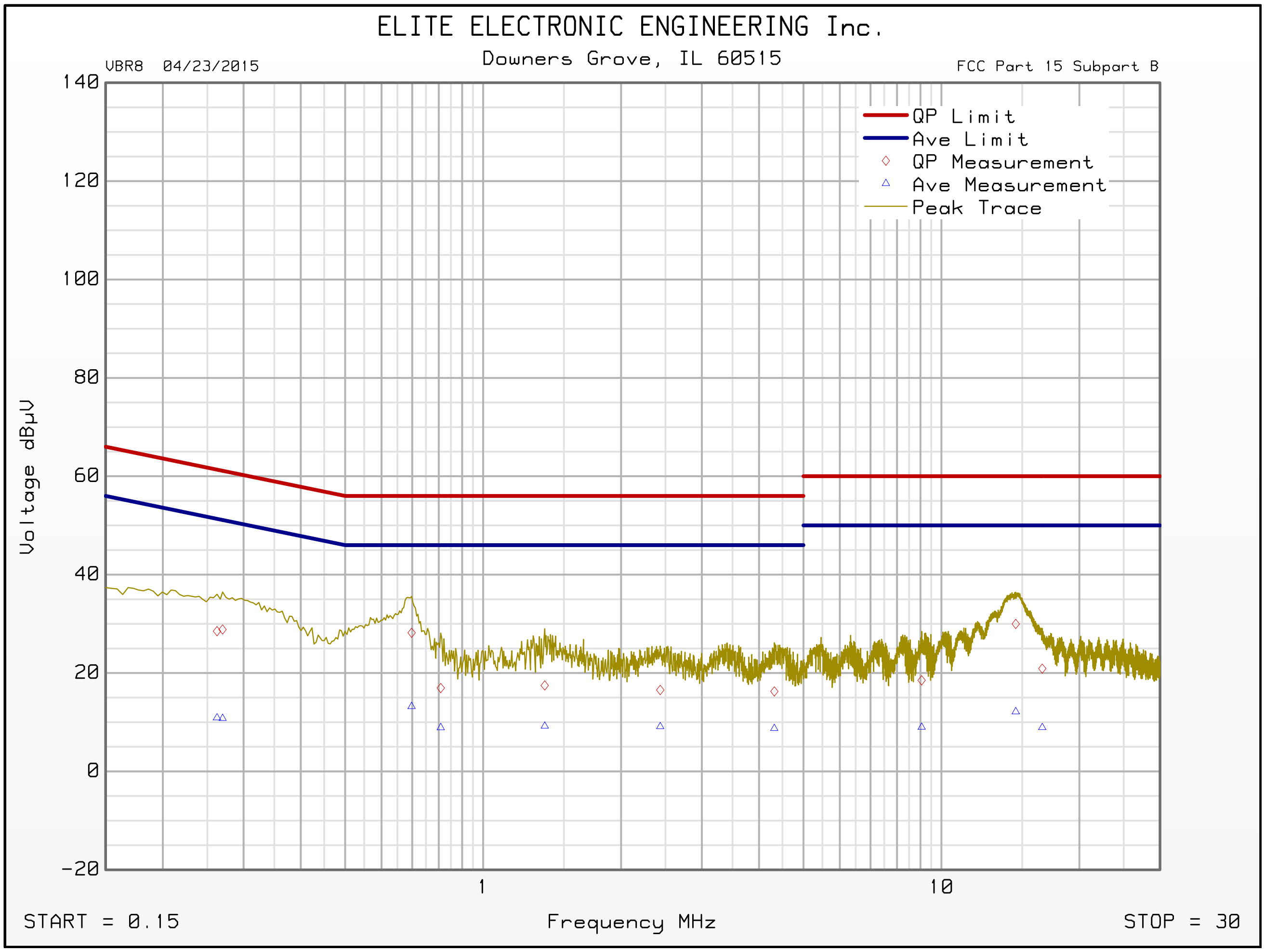
Manufacturer	:	ACCUTECH
Model	:	iDTAD
DUT Mode	:	Tx @ 127kHz
Line Tested	:	L1
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	
Test Engineer	:	R. King
Limit	:	Transmitter
Test Date	:	Apr 18, 2017 03:09:07 PM
Data Filter	:	Up to 80 maximum levels detected with 6 dB level excursion threshold over 10 dB margin below limit

Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.270	28.9	61.1		10.8	51.1	
0.698	28.2	56.0		13.2	46.0	
0.808	16.9	56.0		8.9	46.0	
1.363	17.5	56.0		9.2	46.0	
2.435	16.6	56.0		9.1	46.0	
4.319	16.3	56.0		8.7	46.0	
9.055	18.5	60.0		9.0	50.0	
14.531	30.0	60.0		12.1	50.0	
16.601	20.9	60.0		8.9	50.0	

FCC Part 15 Subpart B Conducted Emissions Test
Cumulative Data

VBR8 04/23/2015

Manufacturer	:	ACCUTECH
Model	:	iDTAD
DUT Mode	:	Tx @ 127kHz
Line Tested	:	L1
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	
Test Engineer	:	R. King
Limit	:	Transmitter
Test Date	:	Apr 18, 2017 03:09:07 PM



Emissions Meet QP Limit
Emissions Meet Ave Limit

FCC Part 15 Subpart B Conducted Emissions Test
Significant Emissions Data

VBR8 04/23/2015

Manufacturer	:	ACCUTECH
Model	:	iDTAD
DUT Mode	:	Tx @ 127kHz
Line Tested	:	L2
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	
Test Engineer	:	R. King
Limit	:	Transmitter
Test Date	:	Apr 18, 2017 03:00:43 PM
Data Filter	:	Up to 80 maximum levels detected with 6 dB level excursion threshold over 10 dB margin below limit

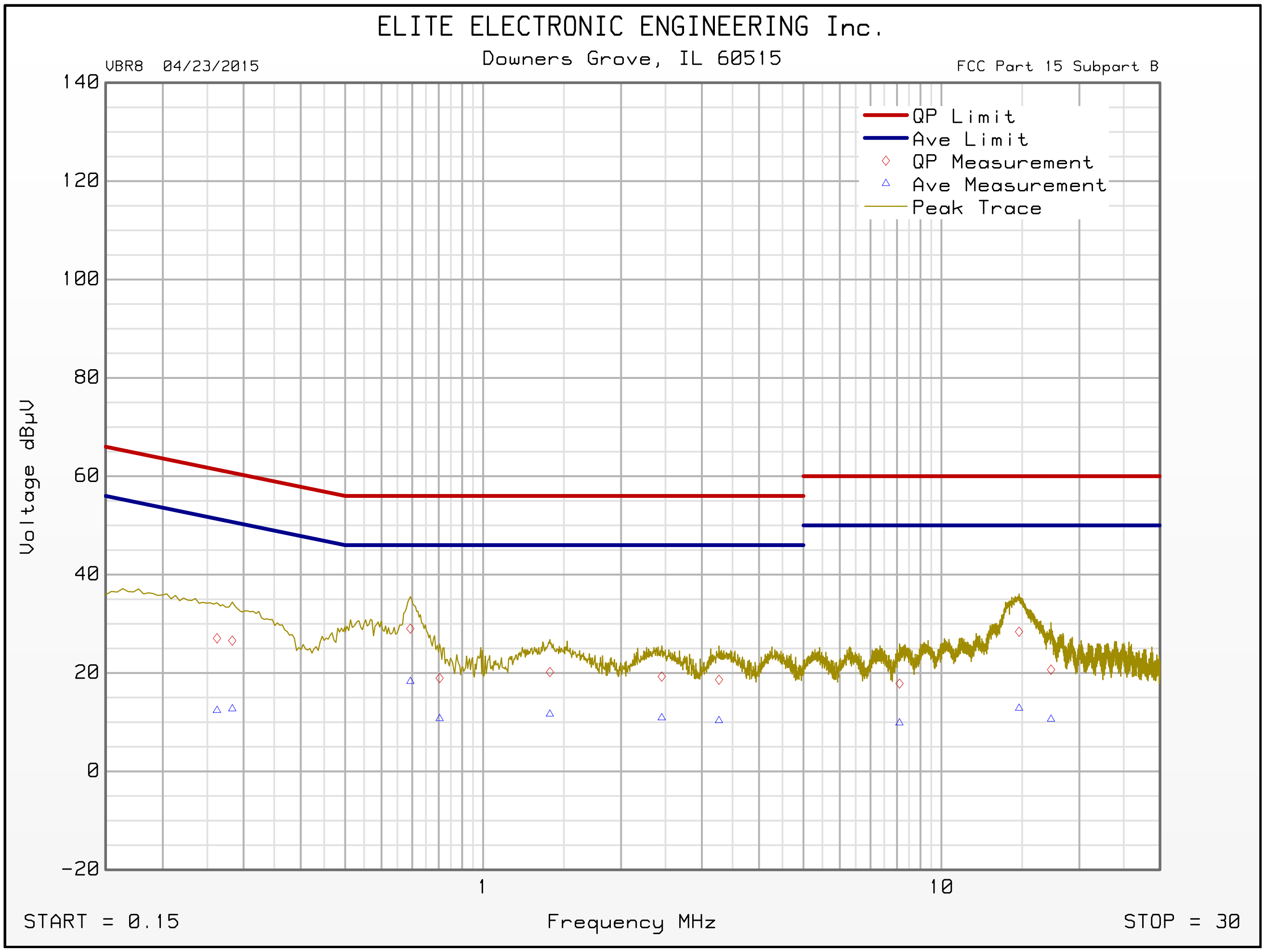
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.263	27.1	61.4		12.4	51.4	
0.284	26.6	60.7		12.7	50.7	
0.694	29.0	56.0		18.3	46.0	
0.804	19.0	56.0		10.7	46.0	
1.399	20.2	56.0		11.7	46.0	
2.453	19.3	56.0		10.9	46.0	
3.271	18.6	56.0		10.3	46.0	
8.101	17.9	60.0		9.9	50.0	
14.774	28.4	60.0		12.8	50.0	
17.348	20.7	60.0		10.6	50.0	

FCC Part 15 Subpart B Conducted Emissions Test

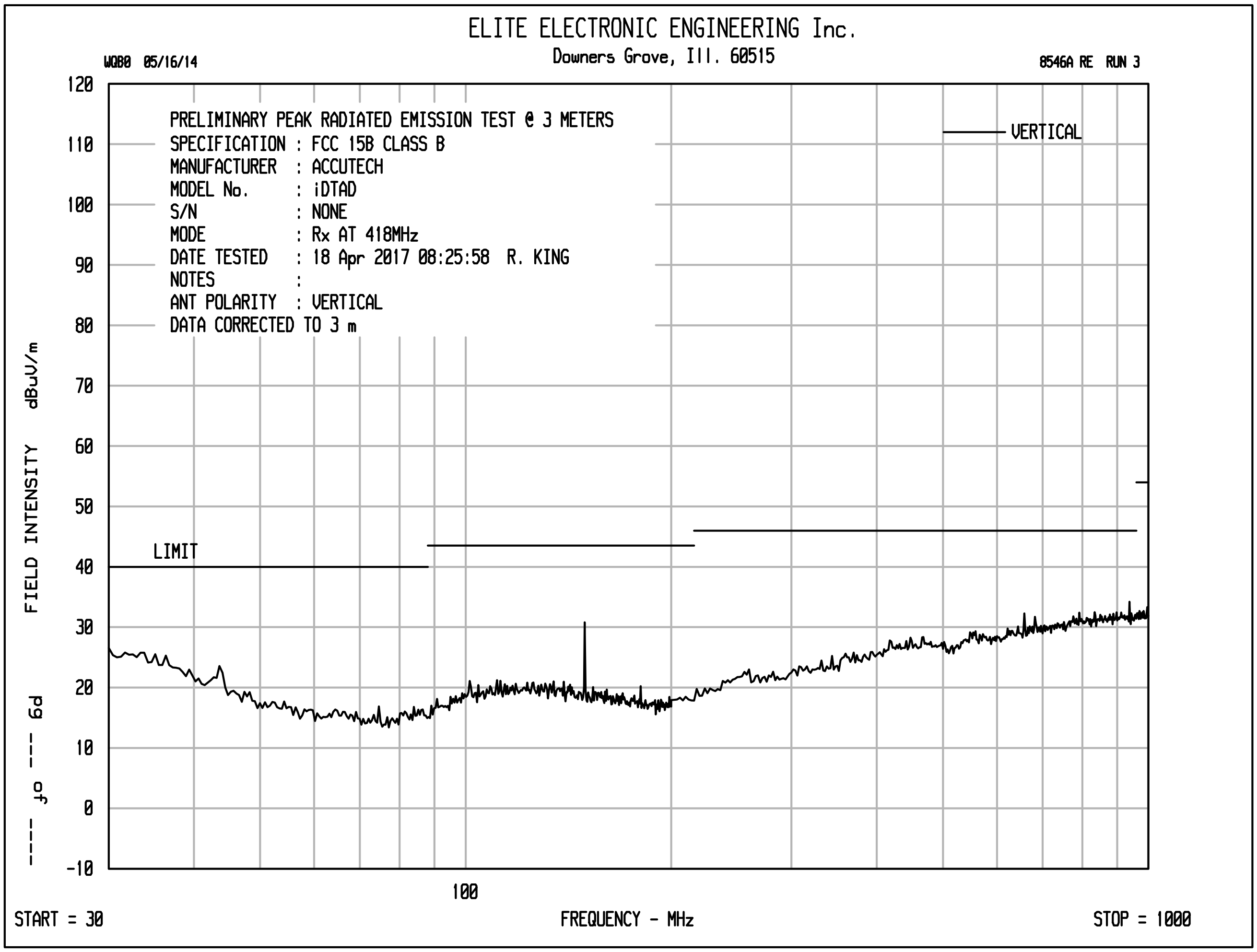
Cumulative Data

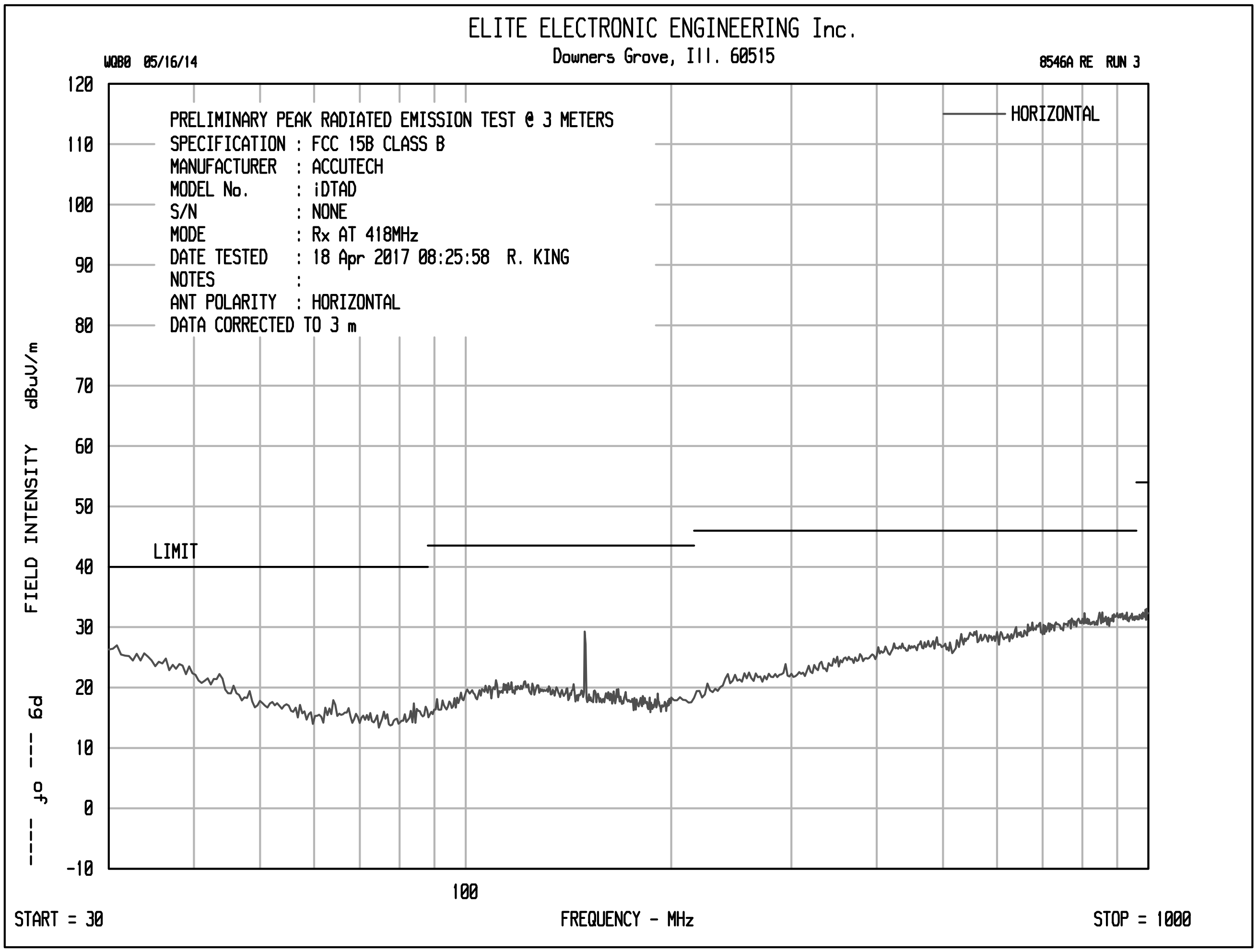
VBR8 04/23/2015

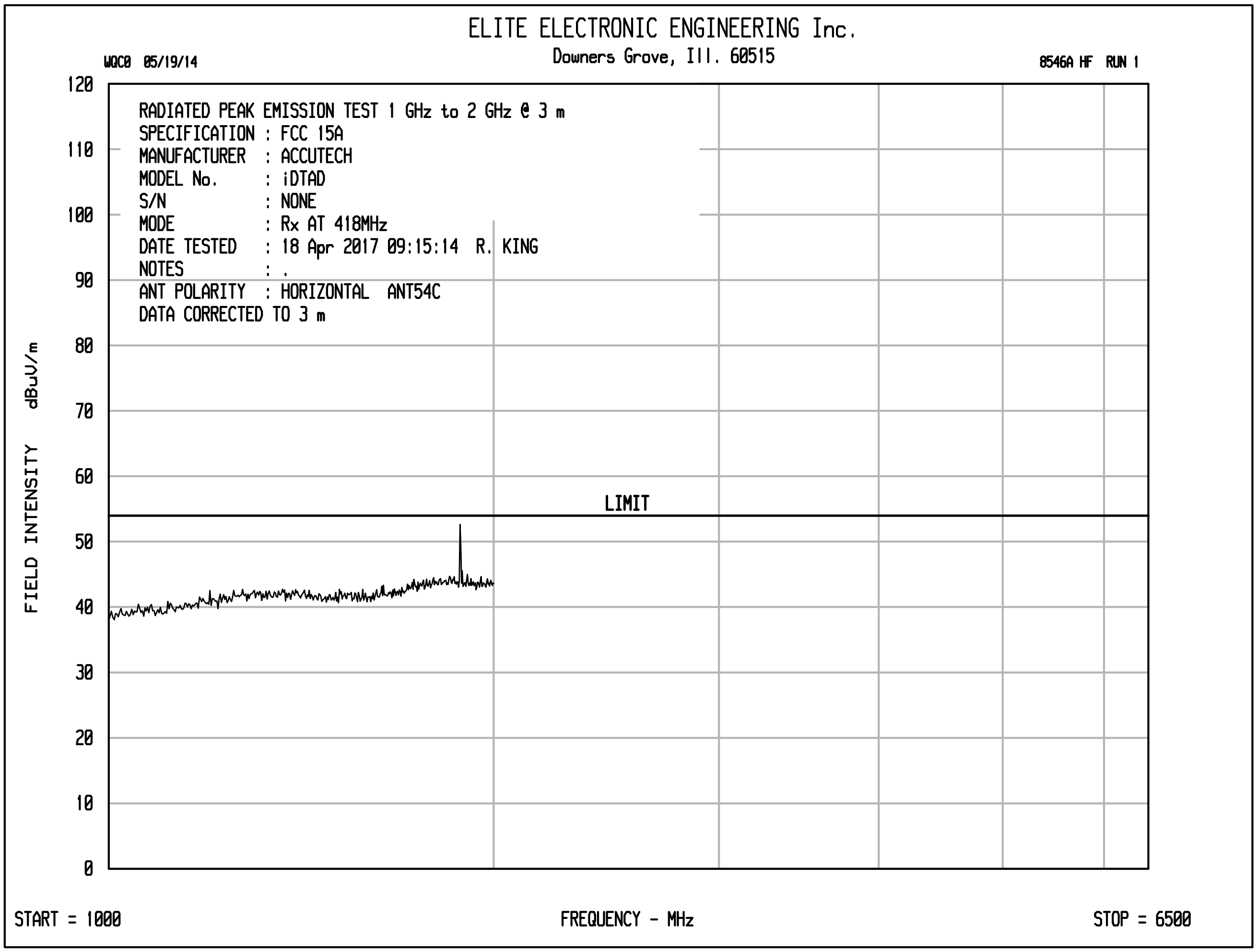
Manufacturer	:	ACCUTECH
Model	:	iDTAD
DUT Mode	:	Tx @ 127kHz
Line Tested	:	L2
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	
Test Engineer	:	R. King
Limit	:	Transmitter
Test Date	:	Apr 18, 2017 03:00:43 PM

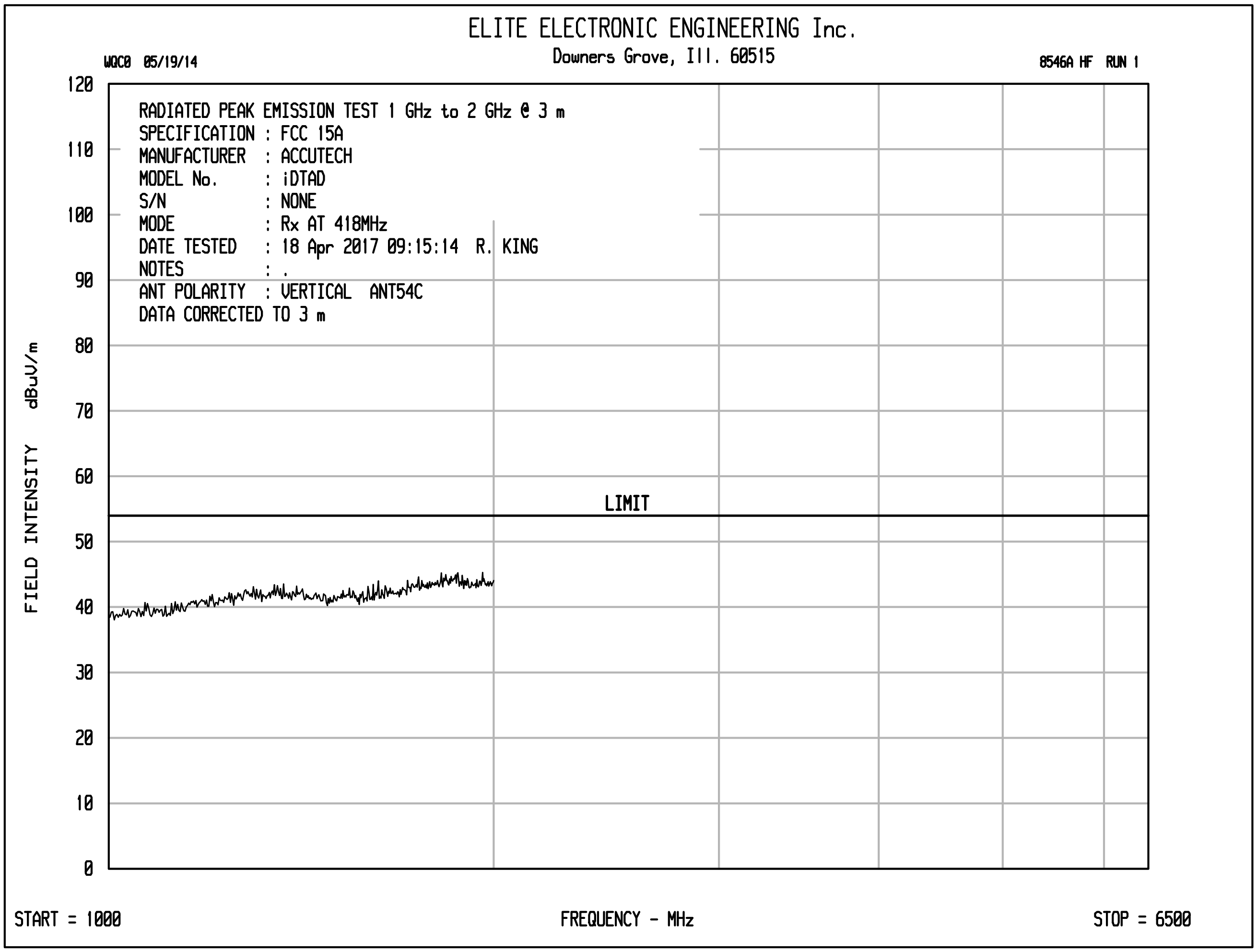


Emissions Meet QP Limit
Emissions Meet Ave Limit


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WQ88 05/16/14
8546A RE RUN 3
PRELIMINARY PEAK RADIATED EMISSION TEST @ 3 METERS
SPECIFICATION : FCC 15B CLASS B
MANUFACTURER : ACCUTECH
MODEL No. : iDTAD
S/N : NONE
MODE : Rx AT 418MHz
DATA TESTED : 18 Apr 2017 08:25:58 R. KING
NOTES :
ANT POLARITY : VERTICAL
DATA CORRECTED TO 3 m
VERTICAL
LIMIT
FIELD INTENSITY dBuV/m
---- of ---- pg
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
100
START = 30
FREQUENCY - MHz
STOP = 1000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WQ80 05/16/14
8546A RE RUN 3
PRELIMINARY PEAK RADIATED EMISSION TEST @ 3 METERS
SPECIFICATION : FCC 15B CLASS B
MANUFACTURER : ACCUTECH
MODEL No. : iDTAD
S/N : NONE
MODE : Rx AT 418MHz
DATE TESTED : 18 Apr 2017 08:25:58 R. KING
NOTES :
ANT POLARITY : HORIZONTAL
DATA CORRECTED TO 3 m
HORIZONTAL
LIMIT
FIELD INTENSITY dBuV/m
---- of --- pd
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
100
START = 30
FREQUENCY - MHz
STOP = 1000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WQC0 05/19/14
8546A HF RUN 1
RADIATED PEAK EMISSION TEST 1 GHz to 2 GHz @ 3 m
SPECIFICATION : FCC 15A
MANUFACTURER : ACCUTECH
MODEL No. : iDTAD
S/N : NONE
MODE : Rx AT 418MHz
DATE TESTED : 18 Apr 2017 09:15:14 R. KING
NOTES : .
ANT POLARITY : HORIZONTAL ANT54C
DATA CORRECTED TO 3 m
LIMIT
FIELD INTENSITY dBuV/m
120
110
100
90
80
70
60
50
40
30
20
10
0
START = 1000
FREQUENCY - MHz
STOP = 6500


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WQC0 05/19/14
8546A HF RUN 1
RADIATED PEAK EMISSION TEST 1 GHz to 2 GHz @ 3 m
SPECIFICATION : FCC 15A
MANUFACTURER : ACCUTECH
MODEL No. : iDTAD
S/N : NONE
MODE : Rx AT 418MHz
DATE TESTED : 18 Apr 2017 09:15:14 R. KING
NOTES : .
ANT POLARITY : VERTICAL ANT54C
DATA CORRECTED TO 3 m
FIELD INTENSITY dBuV/m
120
110
100
90
80
70
60
50
40
30
20
10
0
LIMIT
START = 1000
FREQUENCY - MHz
STOP = 6500

ETR No. 8546A
DATA SHEET TEST NO. 3

RADIATED QP EMISSION MEASUREMENTS in a 3 m SEMI-ANECHOIC ROOM

SPECIFICATION : FCC 15B CLASS B
MANUFACTURER : ACCUTECH
MODEL NO. : iDTAD
SERIAL NO. : NONE
TEST MODE : Rx AT 418MHz
NOTES :
TEST DATE : 18 Apr 2017 08:25:58
TEST DISTANCE : 3 m

FREQUENCY MHz	QP READING dBuV	ANT FAC dB	CBL FAC dB	EXT ATTN dB	DIST FAC dB	TOTAL dBuV/m	QP LIMIT dBuV/m	AZ deg	ANT HT cm	ANT POL
33.35	-6.3	23.3	.5	0.0	0.0	17.4	40.0	45	120	H
65.08	.2	12.8	.5	0.0	0.0	13.5	40.0	135	200	H
84.67	-6.9	13.7	.5	0.0	0.0	7.3	40.0	-0	340	H
111.39	-7.2	17.9	.6	0.0	0.0	11.3	43.5	-0	340	V
122.45	-7.2	18.1	.6	0.0	0.0	11.5	43.5	225	200	H
148.50	6.8	16.6	.8	0.0	0.0	24.2	43.5	270	120	V
178.63	-7.3	15.3	.9	0.0	0.0	8.9	43.5	90	340	V
262.58	-6.5	18.4	1.0	0.0	0.0	13.0	46.0	225	120	V
359.81	-5.5	20.4	1.3	0.0	0.0	16.3	46.0	45	200	V
463.89	-6.0	22.9	1.5	0.0	0.0	18.4	46.0	-0	200	V
563.30	-6.5	24.7	1.5	0.0	0.0	19.7	46.0	225	120	H
666.22	-5.2	24.9	1.7	0.0	0.0	21.4	46.0	-0	120	V
796.02	-5.0	25.9	2.0	0.0	0.0	22.9	46.0	315	200	V
841.56	-5.0	26.0	2.0	0.0	0.0	23.0	46.0	135	340	V
932.24	-5.0	26.5	2.0	0.0	0.0	23.5	46.0	90	120	V

Checked BY Richard E. King :

Richard E. King

DATA SHEET HF TEST NO. 1

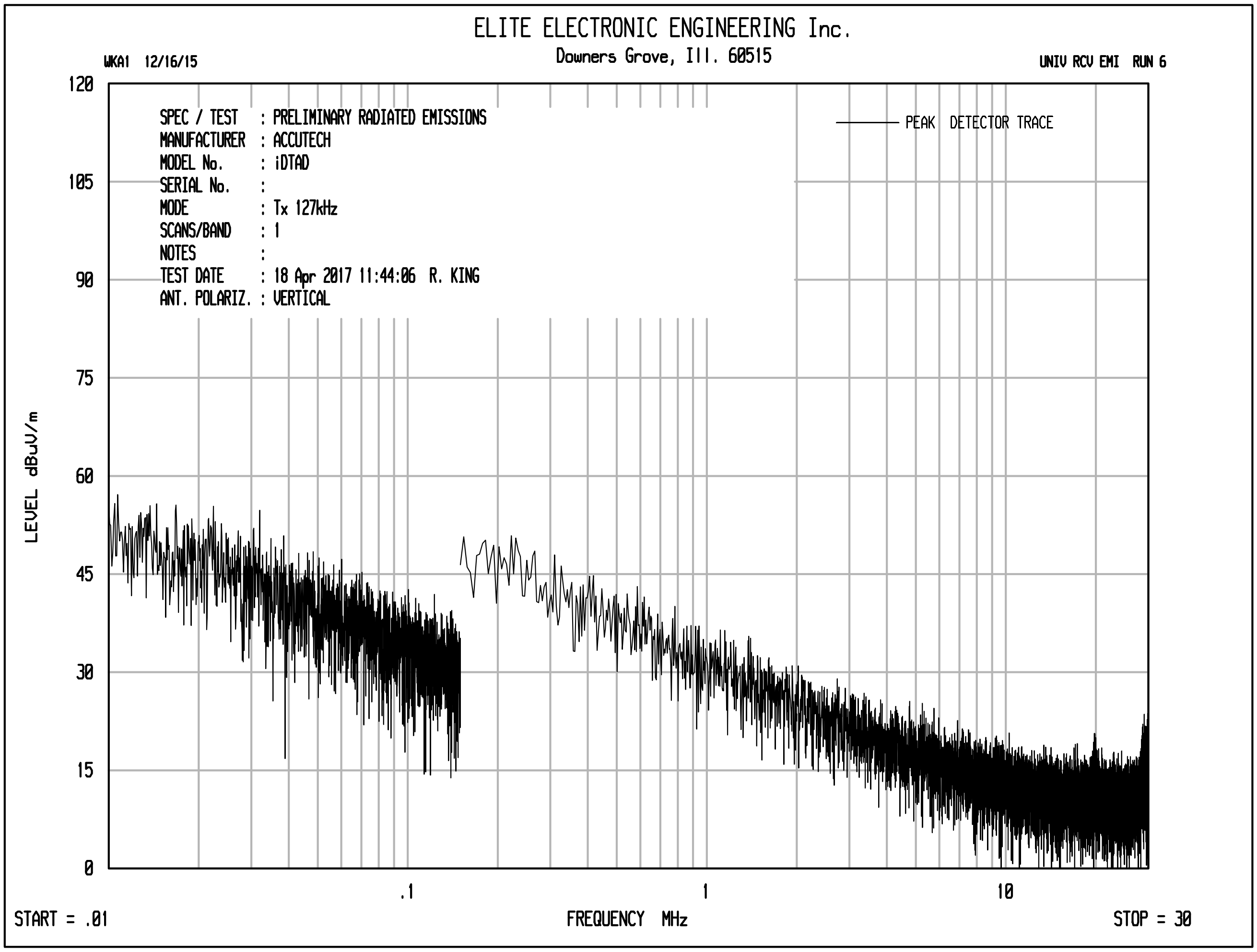
RADIATED AVG EMISSION MEASUREMENTS >=1000 MHz in a 3 m ANECHOIC ROOM

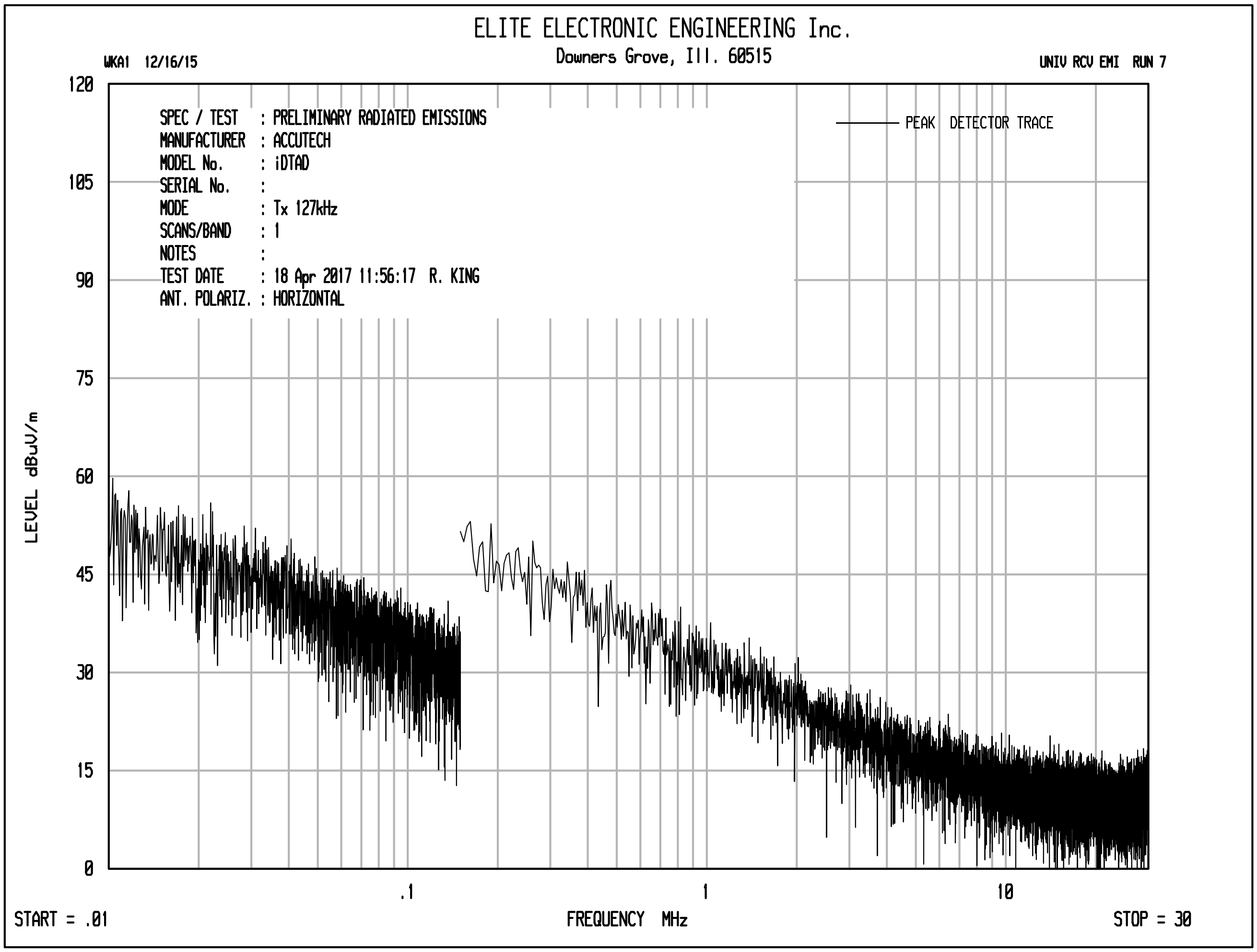
SPECIFICATION : FCC 15A
MANUFACTURER : ACCUTECH
MODEL NO. : iDTAD
SERIAL NO. : NONE
TEST MODE : Rx AT 418MHz
NOTES : .
TEST DATE : 18 Apr 2017 09:15:14
TEST DISTANCE : 3 m
ANTENNA : ANT54C

FREQUENCY MHz	AVG READING dBuV	ANT FAC dB	CBL FAC dB	DIST FAC dB	TOTAL dBuV/m	AVG LIMIT dBuV/m	PASS/ FAIL	AZ deg	ANT HT cm	POLAR
1107.49	-3.1	27.2	2.1	0.0	26.2	54.0		315	120	H
1251.25	-2.7	28.8	2.3	0.0	28.4	54.0		180	200	H
1399.56	-2.7	29.0	2.5	0.0	28.8	54.0		270	200	V
1408.04	-2.4	28.9	2.5	0.0	29.0	54.0		0	200	V
1603.36	-3.0	28.5	2.7	0.0	28.2	54.0		315	340	V
1731.24	-2.9	29.7	2.8	0.0	29.6	54.0		135	200	V
1887.06	-3.2	31.5	2.9	0.0	31.1	54.0		270	120	H
1971.87	-4.5	31.7	3.0	0.0	30.2	54.0		270	120	V

Checked BY RICHARD E. KING :

Richard E. King


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 12/16/15
UNIV RCV EMI RUN 6
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : ACCUTECH
MODEL No. : iDTAD
SERIAL No. :
MODE : Tx 127kHz
SCANS/BAND : 1
NOTES :
TEST DATE : 18 Apr 2017 11:44:06 R. KING
ANT. POLARIZ. : VERTICAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
.1
1
10
START = .01
FREQUENCY MHz
STOP = 30


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 12/16/15
UNIV RCV EMI RUN 7
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : ACCUTECH
MODEL No. : iDTAD
SERIAL No. :
MODE : Tx 127kHz
SCANS/BAND : 1
NOTES :
TEST DATE : 18 Apr 2017 11:56:17 R. KING
ANT. POLARIZ. : HORIZONTAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
.1
1
10
START = .01
FREQUENCY MHz
STOP = 30

MANUFACTURER : Accutech
MODEL NUMBER : iDTAD
TEST MODE : Transmit at 127kHz
TEST PERFORMED : FCC15C, section 15.209 Radiated Emissions
TEST DATE : April 18, 2017
TEST DISTANCE : 3 meters
NOTES : Readings below 150kHz: Peak reading with 200Hz bandwidth
: Readings above 150kHz: Quasi-peak readings with 9kHz bandwidth

Freq. (MHz)	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB)	Pre Amp (dB)	Dist. Corr. (dB)	Total (dBuV/m)	Total (uV/m)	Limit (uV/m)	Specified Test Distance (meters)	Margin (dB)
0.127	H	32.0	*	0.0	11.0	0.0	-80.0	-36.9	0.0	18.9	300.0	-62.5
0.127	V	32.8	*	0.0	11.0	0.0	-80.0	-36.1	0.0	18.9	300.0	-61.6
0.254	H	36.5	*	0.0	11.0	0.0	-80.0	-32.5	0.0	9.4	300.0	-52.0
0.254	V	36.3	*	0.0	11.0	0.0	-80.0	-32.7	0.0	9.4	300.0	-52.2
0.381	H	32.8	*	0.0	11.0	0.0	-80.0	-36.2	0.0	6.3	300.0	-52.2
0.381	V	32.8	*	0.0	11.0	0.0	-80.0	-36.3	0.0	6.3	300.0	-52.3
0.508	H	30.2	*	0.0	11.0	0.0	-40.0	1.1	1.1	47.2	30.0	-32.3
0.508	V	30.1	*	0.0	11.0	0.0	-40.0	1.0	1.1	47.2	30.0	-32.5
0.635	H	27.9	*	0.0	11.0	0.0	-40.0	-1.1	0.9	37.8	30.0	-32.7
0.635	V	27.8	*	0.0	11.0	0.0	-40.0	-1.2	0.9	37.8	30.0	-32.7
0.762	H	26.0	*	0.0	11.0	0.0	-40.0	-3.0	0.7	31.5	30.0	-33.0
0.762	V	26.0	*	0.0	11.0	0.0	-40.0	-3.0	0.7	31.5	30.0	-33.0
0.889	H	24.5	*	0.0	11.0	0.0	-40.0	-4.5	0.6	27.0	30.0	-33.1
0.889	V	24.5	*	0.0	11.0	0.0	-40.0	-4.5	0.6	27.0	30.0	-33.1
1.016	H	23.2	*	0.0	11.0	0.0	-40.0	-5.8	0.5	23.6	30.0	-33.2
1.016	V	23.3	*	0.0	11.0	0.0	-40.0	-5.7	0.5	23.6	30.0	-33.2
1.143	H	21.9	*	0.0	11.0	0.0	-40.0	-7.1	0.4	21.0	30.0	-33.5
1.143	V	22.0	*	0.0	11.0	0.0	-40.0	-7.0	0.4	21.0	30.0	-33.4

Checked BY RICHARD E. KING :

Richard E. King