Measurement of RF Interference from an CW85 V4 NavTrack Transceiver

For : Conner-Winfield Corporation
: 2111 Comprehensive Drive
: Aurora, IL

P.O. No. : 090208
Date Tested : June 15, 2009 through June 17, 2009
Test Personnel : Mark E. Longinotti
Specification : FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Section 15.247 for Digital Modulation Intentional Radiators Operating within The band 2400-2483.5MHz

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NARTE®: ATL-0188-E
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REVISION HISTORY

Revision	Date	Description
—	June 24, 2009	Initial release

Measurement of RF Emissions from a NavTrack, Model No. CW85 V4 transceiver

1 INTRODUCTION

1.1 Scope of Tests

This document represents the results of the series of radio interference measurements performed on a Conner-Winfield Corporation NavTrack, Model No. CW85 V4, transceiver (hereinafter referred to as the test item). Serial No. 01 was used for all tests except for duty cycle correction factor measurements. Serial No. 02 was used for duty cycle correction factor measurements. The test item is a transceiver employing digital modulation. The transmitter was designed to transmit in the 2400-2483.5 MHz band using an external stub antenna. The highest gain stub antenna used was 5dBi therefore all radiated tests were performed with the 5dBi gain antenna. The test item was manufactured and submitted for testing by Conner-Winfield Corporation located in Aurora, IL.

1.2 Purpose

The test series was performed to determine if the test item meets the conducted and radiated RF emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Sections 15.207 and 15.247 for Intentional Radiators. Testing was performed in accordance with ANSI C63.4-2003.

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 National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP). NVLAP Lab Code: 100278-0.

1.5 Laboratory Conditions

The temperature at the time of the test was 24°C and the relative humidity was 38%.

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 2008
- 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 kHzto 40 GHz" Measurement of Digital Transmission Systems Operating under Section 15.247, dated March 23, 2005

3 TEST ITEM SET-UP AND OPERATION

3.1 General Description

The test item is a NavTrack, Model No. CW85 V4 transceiver. A block diagram of the test item setup is shown as Figure 1 and Figure 2.

3.1.1 Power Input

The test item obtained 3.7VDC from an internal lithium ion battery, P/N: MC-0233. The battery could be charged from the USB port of the test item. A travel charger with USB connector could be used to connect the USB port of the test item to the travel charger. The travel charger would provide 5VDC to the test item's USB port which could be used to charge the internal battery. The USB port was not used for any other function but to charge the internal battery.

3.1.2 Peripheral Equipment

For powerline conducted emissions tests, the internal battery of the test item was charged with 5VDC from the output of a Motorola travel charger, M/N: DCH3-05OUS-0304. The travel charged was connected to the test item via a 6 foot long USB cable.

3.1.3 Interconnect Cables

The following interconnect cables were submitted with the test item:

Item	Description
USB Cable	6 foot long USB cable was connected to the USB port of the test item for radiated emissions tests and powerline conducted emissions tests

3.1.4 Grounding

The test item was not grounded during testing.

3.2 Operational Mode

For all tests the test item and all peripheral equipment were placed on an 80cm high non-conductive stand. The test item and all peripheral equipment were energized. The test item was programmed to operate in one of the following modes:

- Transmit at 2413MHz (Channel 1)
- Transmit at 2438MHz (Channel 6)
- Transmit at 2462MHz (Channel 11)

3.3 Test Item Modifications

No modifications 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 C63.4-2003 for site attenuation.

4.2 Test Instrumentation

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

4.3 Calibration Traceability

Test equipment is maintained and calibrated on a regular basis. 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 Emission Measurements		
Combined Standard Uncertainty	1.07	-1.07
Expanded Uncertainty (95% confidence)	2.1	-2.1

Radiated Emission Measurements		
Combined Standard Uncertainty	2.26	-2.18
Expanded Uncertainty (95% confidence)	4.5	-4.4

5 TEST PROCEDURES

5.1 Powerline Conducted Emissions

5.1.1 Requirements

All radio frequency voltages on the power lines of an intentional radiator shall be below the values shown below when using a quasi-peak detector:

CONDUCTED LIMITS FOR AN INTENTIONAL RADIATOR

Frequency MHz	RFI Voltage dBuV(QP)	RFI Voltage dBuV(Average)

0.15-0.5	66 decreasing with logarithm of frequency to 56	56 decreasing with logarithm of frequency to 46
0.5 – 5.0	56	46
5.0 – 30.0	60	50

Note 1: The lower limit shall apply at the transition frequencies.
Note 2: If the levels measured using the QP detector meet both the QP and the Average limits, the test item is considered to have met both requirements and measurements do not need to be performed using the Average detector.

5.1.2 Procedures

The interference on each power lead of the Motorola travel charger, M/N: DCH3-05OUS-0304, was measured by connecting the measuring equipment to the appropriate meter terminal of the LISN. The meter terminal of the LISN not under test was terminated with 50 ohms. Measurements were first made over the entire frequency range from 150kHz through 30MHz with a peak detector and the results were automatically plotted. The data thus obtained was then searched by the computer for the highest levels. Quasi-peak measurements were automatically performed at the frequencies selected from the highest peak measurements, and the results printed.

5.1.3 Results

The plots of the peak preliminary conducted voltage levels on each power line are presented on pages 21 and 22. The conducted limits for a transmitter are shown as a reference. The final quasi-peak results are presented on pages 23 and 24.

As can be seen from the data, all emissions measured from the test item were within the specification limits. The emissions level closest to the limit (worst case) occurred at 502kHz. The emissions level at this frequency was 6.9dB within the limit. Photographs of the test configuration which yielded the highest or worst case, conducted emission levels are shown on Figure 3.

5.2 6dB Bandwidth

5.2.1 Requirements

The minimum 6dB bandwidth shall be at least 500kHz for all systems using digital modulation techniques.

5.2.2 Procedures

The output of the test item was connected to the spectrum analyzer through 40dB of attenuation. The test item was allowed to transmit continuously. The frequency was set separately to low, middle, and high channels. The resolution bandwidth (RBW) was set to 100kHz.

The 'Max-Hold' function was engaged. The analyzer was allowed to scan until the envelope of the transmitter bandwidth was defined. The analyzer's display was plotted using a 'screen dump' utility.

5.2.3 Results

The plots on pages 25 through 27 show that the minimum 6 dB bandwidth was 9.26MHz which is greater than minimum allowable 6dB bandwidth requirement of 500kHz for systems using digital modulation techniques. The

99% bandwidth was measured to be 12.5MHz.

5.3 Peak Output Power

5.3.1 Requirements

Per section 15.247(b)(3), for systems using digital modulation the maximum peak output conducted power shall not be greater than 1.0W (30dBm). Per section 15.247(b)(4), this limit is based on the use of antennas with directional gains that do not exceed 6dBi. Since the limit allows for a 6dBi antenna gain, the maximum EIRP can be increased by 6dB to 4 Watt (36dBm).

5.3.2 Procedures

The output of the test item was connected to a power meter. The maximum meter reading was recorded. The peak power output was calculated for the low, middle and high channels.

5.3.3 Results

The results are presented on pages 28. The maximum peak conducted output power from the transmitter was 0.0372W (15.70 dBm) which is below the 1 Watt limit.

5.4 Duty Cycle Factor Measurements

5.4.1 Procedures

The duty cycle factor is used to convert peak detected readings to average readings. This factor is computed from the time domain trace of the pulse modulation signal.

With the transmitter set up to transmit for maximum data rate, the time domain trace is displayed on the spectrum analyzer. This trace is obtained by tuning center frequency to the transmitter frequency and then setting a zero span width and a sweep time of 1msec. The amplitude settings are adjusted so that the on/off transitions clear the 4th division from the bottom of the display. The markers are set at the beginning and end of a pulse. The sweep time was then increased to 100msec to show the number of pulses in a 100msec period. The duty cycle is then computed as the On-time/ 100msec.

5.4.2 Results

The plots of the duty cycle are shown on data pages 29 and 30. The duty cycle correction factor was calculated to be 20log(0.545msec/100msec) = -45.3dB.

5.5 Spurious Emissions

5.5.1 Antenna Conducted

5.5.1.1 Requirements

Per section 15.247(c), the spurious emissions in any 100 kHz BW outside the frequency band must be at least 20dB below the highest 100 kHz BW level measured within the band.

5.5.1.2 Procedures

The output of the test item was connected to the spectrum analyzer through 40dB of attenuation. The resolution bandwidth (RBW) was set to 100kHz. The peak detector and 'Max-Hold' function were engaged. The emissions in the frequency range from 30MHz to 25GHz were observed and plotted separately with the test item transmitting at low, middle and high frequencies.

5.5.1.3 Results

The results of the antenna conducted emissions levels were plotted. These plots are presented on pages 31 through 45. These plots show that the spurious emissions were at least 20 dB below the level of the fundamental.

5.5.2 Radiated Spurious Emissions

Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must comply with the radiated emission limits specified in §15.209(a).

Paragraph 15.209(a) has the following radiated emission limits:

Frequency MHz	Field Strenght (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

5.5.3 Procedures

Radiated measurements were performed in a 32ft. x 20ft. x 14ft. high shielded enclosure. 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.

Preliminary radiated emissions tests were performed to determine the emission characteristics of the test item. For the preliminary test, a broadband measuring antenna was positioned at a 3 meter distance from the test item. The entire frequency range from 30MHz to 25GHz was investigated using a peak detector function.

The final open field emission tests were then manually performed over the frequency range of 30MHz to 25GHz.

1) For all emissions in the restricted bands, the following procedure was used:
   a) The field strengths of all emissions below 1 GHz were measured using a bi-log antenna. The bi-log antenna was positioned at a 3 meter distance from the test item. A peak detector with a resolution bandwidth of 100 kHz was used on the spectrum analyzer.
   b) The field strengths of all emissions above 1 GHz were measured using a double-ridged waveguide antenna. The waveguide antenna was positioned at a 3 meter distance from the test item. A peak detector with a resolution bandwidth of 1 MHz was used on the spectrum analyzer.
   c) To ensure that maximum or worst case emission levels were measured, the following steps were taken when taking all measurements:
      i) The test item was rotated so that all of its sides were exposed to the receiving antenna.
      ii) Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.
      iii) The measuring antenna was raised and lowered for each antenna polarization to maximize the readings.
      iv) For hand-held or body-worn devices, the test item was rotated through three orthogonal axes to determine which orientation produces the highest emission relative to the limit.
      v) In instances were it was necessary to use a shortened cable between the measuring antenna and the spectrum analyzer. The measuring antenna was not raised or lowered to ensure maximized readings, instead the test item was rotated through all axis to ensure the maximum readings were recorded for

the test item.

d) For all radiated emissions measurements below 1 GHz, if the peak reading is below the limits listed in 15.209(a), no further measurements are required. If however, the peak readings exceed the limits listed in 15.209(a), then the emissions are remeasured using a quasi-peak detector.

e) For all radiated emissions measurements above 1 GHz, the peak readings must comply with the 15.35(b) limits. 15.35(b) states that when average radiated emissions measurements are specified, there also is a limit on the peak level of the radiated emissions. The limit on the peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test. Therefore, all peak readings above 1 GHz must be no greater than 20 dB above the limits specified in 15.209(a).

f) Next, for all radiated emissions measurements above 1GHz, the resolution bandwidth was set to 1MHz. The analyzer was set to linear mode with a 10Hz video bandwidth in order to simulate an average detector. An average reading was taken. For pulsed emissions, then the reading obtained with the 10 Hz video bandwidth may be further adjusted by a “duty cycle correction factor”, derived from 20*log(dwell time/100msec). These readings must be no greater than the limits specified in 15.209(a).

5.5.4 Results

Preliminary radiated emissions plots with the test item transmitting at 2413MHz, 2437MHz, and 2462MHz are shown on pages 46 through 69. Final radiated emissions data are presented on data pages 70 through 75. As can be seen from the data, all emissions measured from the test item were within the specification limits. The emissions level closet to the limit (worst case) occurred at 14,472MHz. The emissions level at this frequency was 5.7dB within the limit. See data pages 70 through 75 for details. Photographs of the test configuration which yielded the highest, or worst case, radiated emission levels are shown on Figures 4 and 5.

5.6 Band Edge Compliance

5.6.1 Requirements

Per section 15.247(d), the emissions at the band-edges must be at least 20dB below the highest level measured within the band but attenuation below the general limits listed in 15.209(a) is not required. In addition, the radiated emissions which fall in the restricted band beginning at 2483.5 MHz must meet the general limits of 15.209(a).

5.6.2 Procedures

5.6.2.1 Low Band Edge

1) The output of the test item was connected to the spectrum analyzer through 40dB of attenuation.
2) The test item was set to transmit continuously at the channel closest to the low band-edge.
3) To determine the band edge compliance, the following spectrum analyzer settings were used:

   a. Center frequency = low band-edge frequency.
   b. Span = Wide enough to capture the peak level of the emission operating on the channel closest to the band-edge, as well as any modulation products which fall outside of the authorized band of operation.
   c. Resolution bandwidth (RBW) = 300kHz (at least 1% of the span).
   d. The 'Max-Hold' function was engaged. The analyzer was allowed to scan until the envelope of the transmitter bandwidth was defined.
   e. The marker was set on the peak of the in-band emissions. A display line was placed 20dB down from the peak of the in-band emissions. All emissions which fall outside of the authorized band of operation must be below the 20dB down display line. (All

emissions to the left of the center frequency (band-edge) must be below the display line.)

f. The analyzer's display was plotted using a 'screen dump' utility.

5.6.2.2 High Band Edge

1) The test item was set to transmit continuously at the channel closest to the high band-edge.
2) A double ridged waveguide was placed 3 meters away from the test item. The antenna was connected to the input of a spectrum analyzer.
3) The center frequency of the analyzer was set to the high band edge (2483.5MHz)
4) The resolution bandwidth was set to 1MHz.
5) To ensure that the maximum or worst case emission level was measured, the following steps were taken:
   a. The test item 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.
6) The highest measured peak reading was recorded.
7) The highest measured average reading was recorded.

5.6.3 Results

Pages 76 through 78 show the band-edge compliance results. As can be seen from these plots, the conducted emissions at the low end band edge are within the 20 dB down limits. The radiated emissions at the high end band edge are within the general limits.

5.7 Power Spectral Density

5.7.1 Requirement

Per section 15.247(d), the peak power spectral density from the intentional radiator shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

5.7.2 Procedures

1) The output of the test item was connected to the spectrum analyzer through 40dB of attenuation and the test item was set to transmit at a high channel.
2) To determine the power spectral density, the following spectrum analyzer settings were used for channel 1:
   a. Center frequency = transmit frequency
   b. Span = 7.5MHz
   c. Resolution bandwidth (RBW) = 3MHz
   d. Sweep time = auto
   e. The peak detector and 'Max-Hold' function was engaged. The analyzer was allowed to scan until the envelope of the transmitter bandwidth was defined.
   f. Channel 1 of the spectrum analyzer was placed in ‘View’ mode.
3) This reading corresponds to the peak output power.
4) The test item was then placed in the normal operation mode.
5) To determine the power spectral density, the following spectrum analyzer settings were used for

channel 2:

a. Center frequency = transmit frequency
b. Span = 7.5MHz
c. Resolution bandwidth (RBW) = 3kHz
d. Sweep time = span divided by RBW = 7.5MHz/3kHz = 2500 seconds
e. The peak detector and 'Max-Hold' function was engaged.
f. The display line represents the 8 dBm limit
g. The analyzer's display was plotted using a 'screen dump' utility.

5.7.3 Results

Page 79 shows the power spectral density results. As can be seen from this plot, the peak power density is less than 8dBm in a 3kHz band during any time interval of continuous transmission.

6 CONCLUSIONS

It was determined that the Conner-Winfield Corporation NavTrack, Model No. CW85 V4 digital modulation transceiver, did fully meet the conducted and radiated emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Sections 15.207 and 15.247 for Intentional Radiators Operating within the 2400-2483.5 MHz band when tested per ANSI C63.4-2003. Serial No. 01 was used for all tests except for duty cycle correction factor measurements. Serial No. 02 was used for duty cycle correction factor measurements.

7 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 test item at the test date. Any electrical or mechanical modification made to the test item subsequent to the specified test date will serve to invalidate the data and void this certification.

8 ENDORSEMENT DISCLAIMER

This report must not be used to claim product endorsement by NVLAP or any agency of the US Government.

9 EQUIPMENT LIST

Table 9-1 Equipment List

Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Due Date
APK4	PREAMPLIFIER OPT H02	HEWLETT PACKARD	8449B	3008A00329	1-26.5GHZ	4/6/2009	4/6/2010
APW1	PREAMPLIFIER	PLANAR ELECTRONICS	PE2-30-20G20R6G-3R0	PL2927/0646	20GHZ-26.5GHZ	4/3/2009	4/3/2010
APW2	PREAMPLIFIER	PLANAR ELECTRONICS	PE2-35-120-5R0-10	PL2925	1GHZ-20GHZ	12/16/2008	12/16/2009
CDX0	COMPUTER	ELITE	WORKSTATION	---	---	N/A	
MDA0	MULTIMETER (R. KING)	FLUKE CORPORATION	26	72120781	I;VDC;VAC;R	2/17/2009	2/17/2010
MPC2	DUAL POWER METER	HEWLETT PACKARD	EPM-442A	US37480150	0.1MHZ-50GHZ	1/8/2009	1/8/2010
MPCC	POWER SENSOR	HEWLETT PACKARD	8482A	2652A13499	0.1-4200MHZ	5/14/2009	5/14/2010
NHG1	STANDARD GAIN HORN ANTENNA	NARDA	638	---	18-26.5GHZ	NOTE 1	
NTA1	BILOG ANTENNA	CHASE EMC LTD.	BILOG CBL6112	2054	0.03-2GHZ	9/2/2008	9/2/2009
NWI1	RIDGED WAVE GUIDE	AEL	H1498	154	2-18GHZ	10/25/2008	10/25/2009
PLA5	462D/70A LISN	CEMEC, INC.	462D/70A	06	0.01-400MHZ	6/1/2009	6/1/2010
PLL8	50UH LISN 462D	ELITE ELECTRONIC ENG	462D/70A	009	0.01-400MHZ	4/8/2009	4/8/2010
RACA	RF PRESELECTOR	HEWLETT PACKARD	85685A	2926A00980	20HZ-2GHZ	2/20/2009	2/20/2010
RAEC	SPECTRUM ANALYZER	HEWLETT PACKARD	8566B	3014A06690	100HZ-22GHZ	2/20/2009	2/20/2010
RAF5	QUASIPEAK ADAPTOR	HEWLETT PACKARD	85650A	2043A00151	0.01-1000MHZ	2/20/2009	2/20/2010
RBB0	EMI TEST RECEIVER 20HZ TO 40 GHZ.	ROHDE & SCHWARZ	ESIB40	100250	20 HZ TO 40GHZ	3/11/2009	3/11/2010
SBA1	DC POWER SUPPLY	APLAB	ZS3205	99071032	0-32VDC;0-5A	NOTE 1	
T1E8	10DB 25W ATTENUATOR	WEINSCHEL	46-10-34	BH7996	DC-18GHZ	12/4/2008	12/4/2009
T2D7	20DB, 25W ATTENUATOR	WEINSCHEL	46-20-43	AY9246	DC-18GHZ	8/29/2008	8/29/2009
T2DI	20DB, 25W ATTENUATOR	WEINSCHEL	46-20-34	BN1041	DC-18GHZ	12/4/2008	12/4/2009
XLQJ	5W, 50 OHM TERMINATION	JFW INDUSTRIES	50T-052	56	DC-2GHZ	8/29/2008	8/29/2009
XOB1	ADAPTER	HEWLETT PACKARD	K281C	10422	18-26.5GHZ	NOTE 1	
XPR0	HIGH PASS FILTER	K&L MICROWAVE	11SH10-4800/X20000	001	4.8-20GHZ	7/30/2008	7/30/2009
XZG4	ATTENUATOR/SWITCH DRIVER	HEWLETT PACKARD	11713A	2223A01683	---	N/A	

Create your equipment list using the database on the mainframe. Create a test equipment list. The output of this list will have a "J" prefix, followed by the job and phase number. FTP this output file to your local computer. Open the file using Word; select and copy the text here using Edit, then Paste Special, and finally Unformatted Text. That way, the text will take on the attributes of the Equipment List Text Style contained in this paragraph. Delete this paragraph when finished.

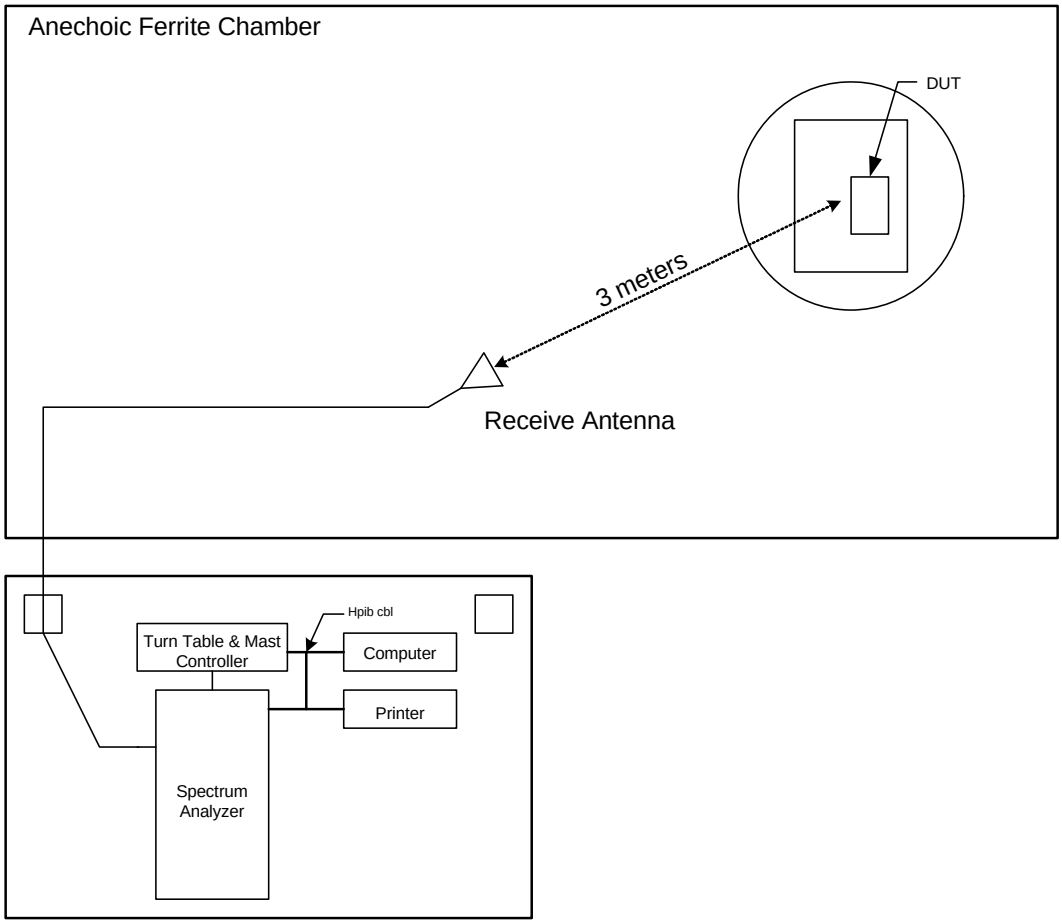


FIGURE 1 BLOCKDIAGRAM OF TEST SETUP

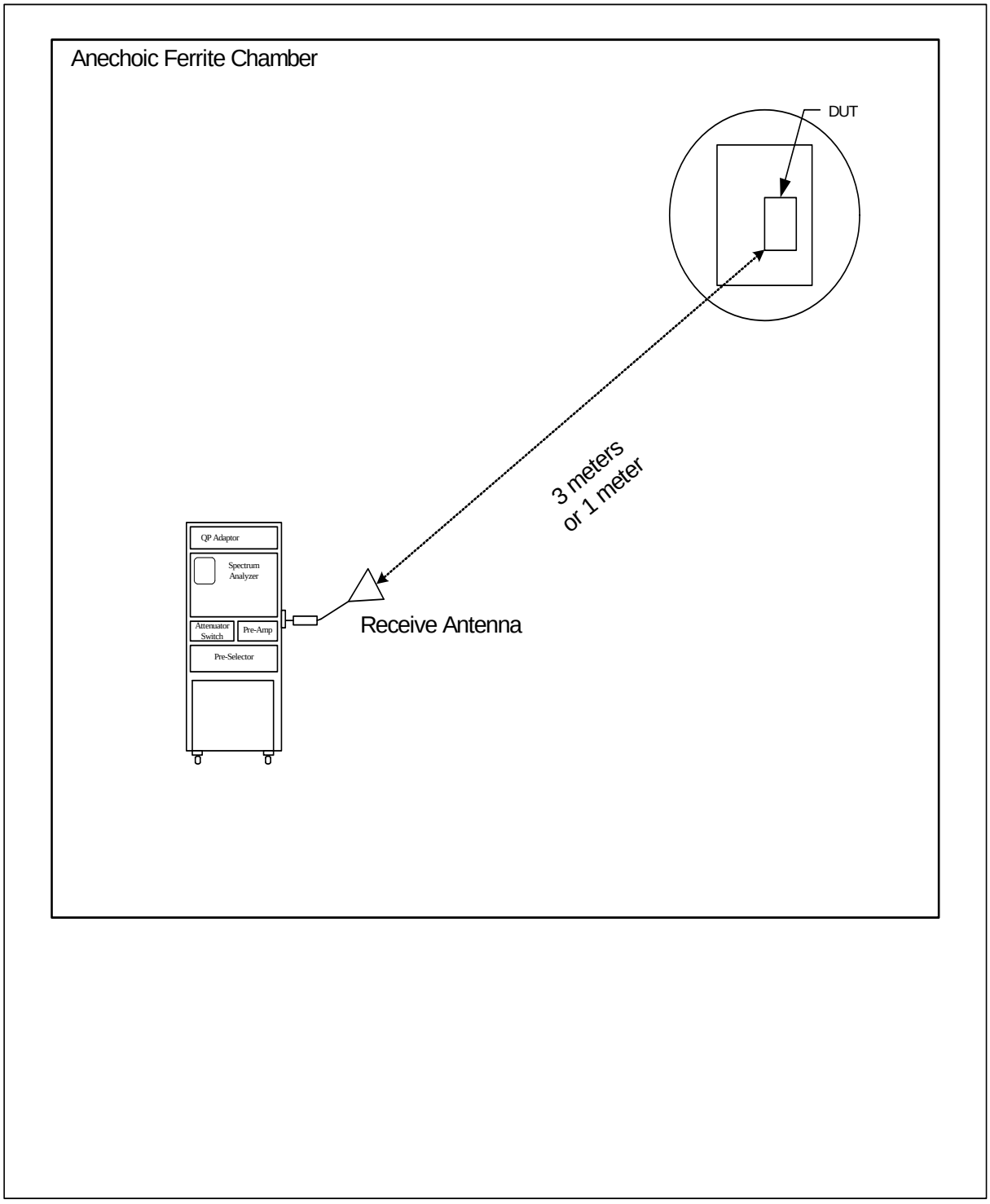


Figure 2: BLOCK DIAGRAM OF TEST SETUP FOR RADIATED EMISSIONS ABOVE 18GHZ

Figure 3

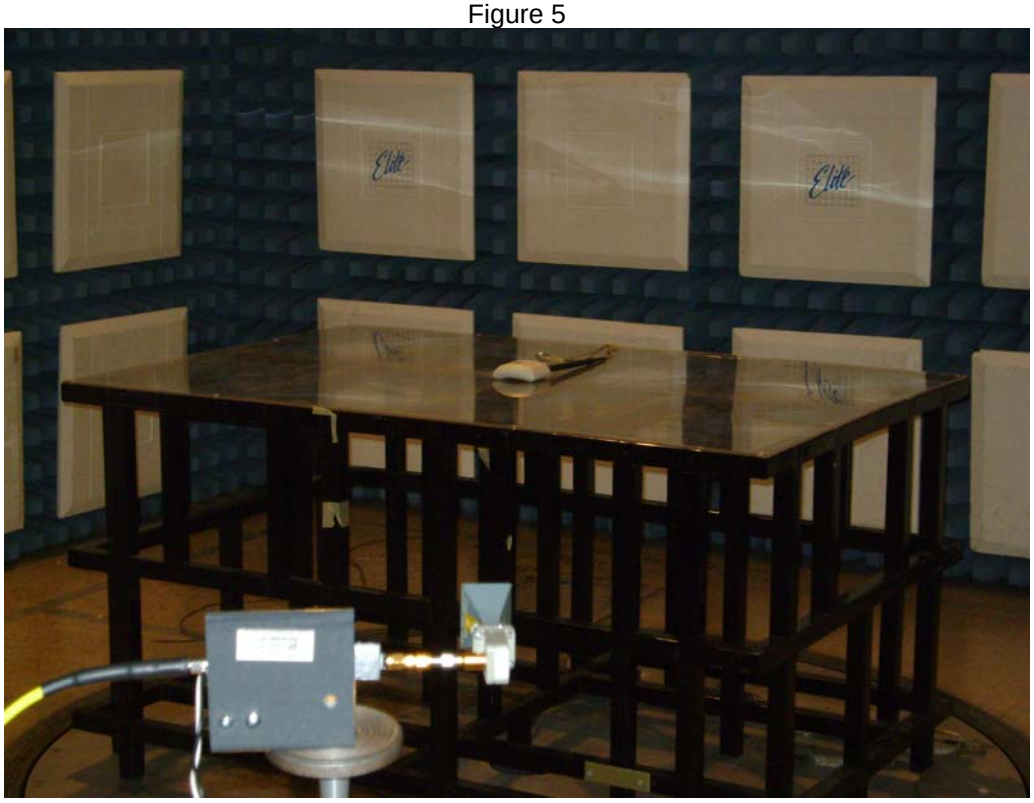
Test Setup for Conducted Emissions

Figure 4

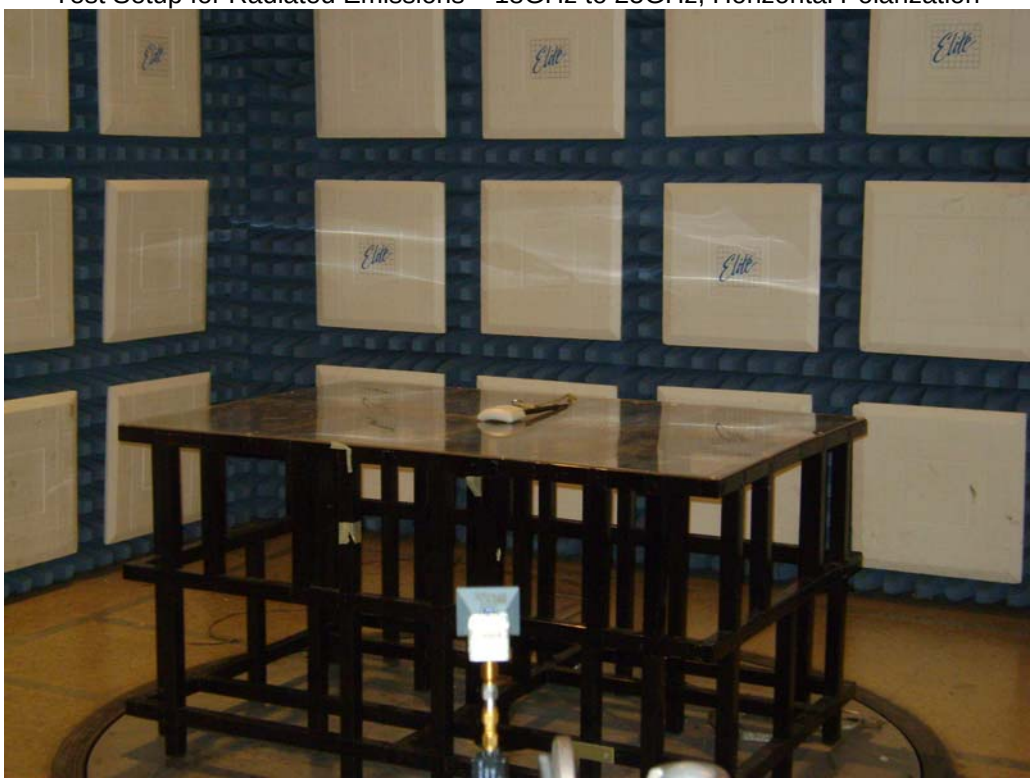
Test Setup for Radiated Emissions – 2GHz to 18GHz, Horizontal Polarization

Test Setup for Radiated Emissions – 2GHz to 18GHz, Vertical Polarization

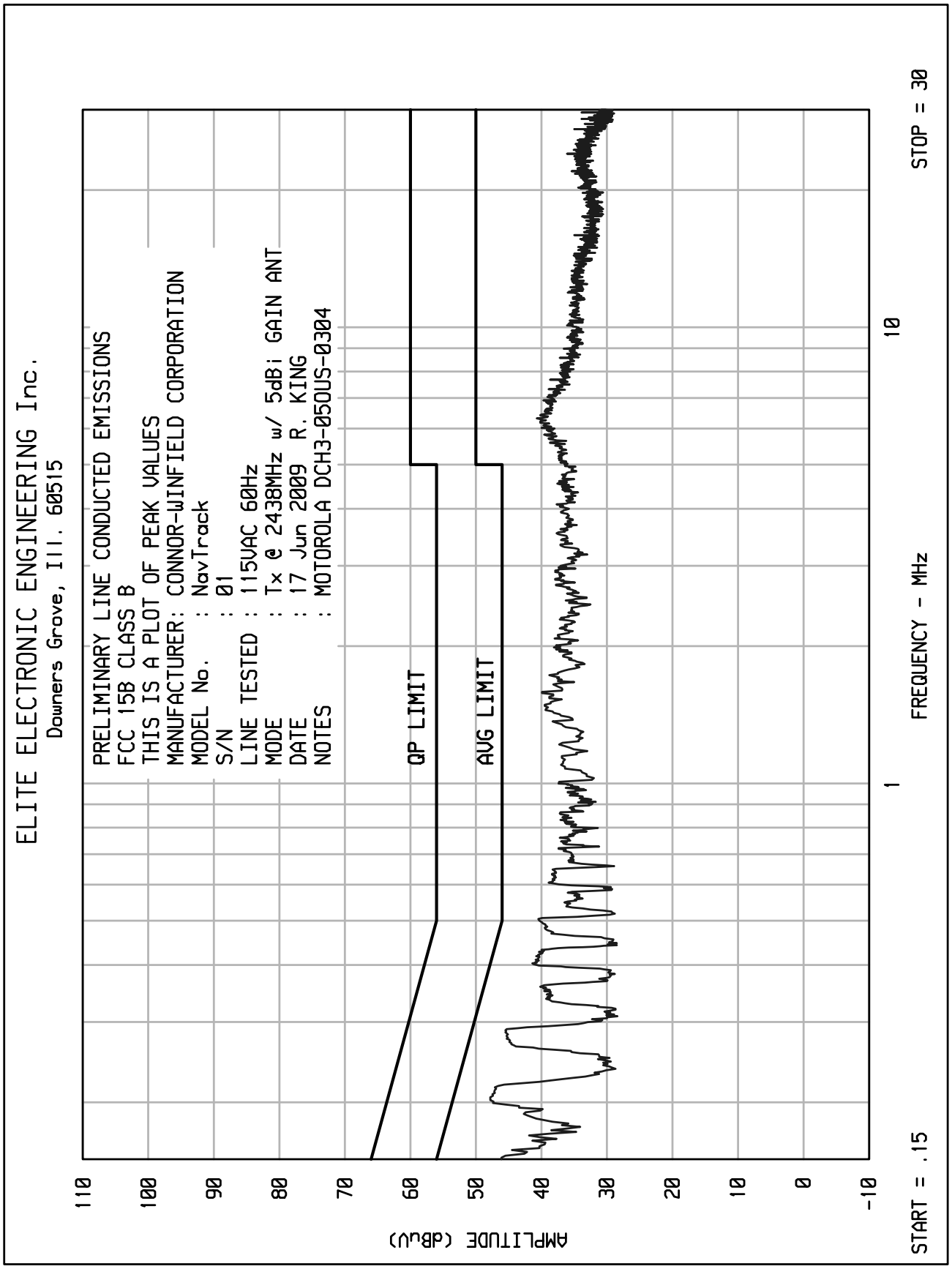
Figure 5

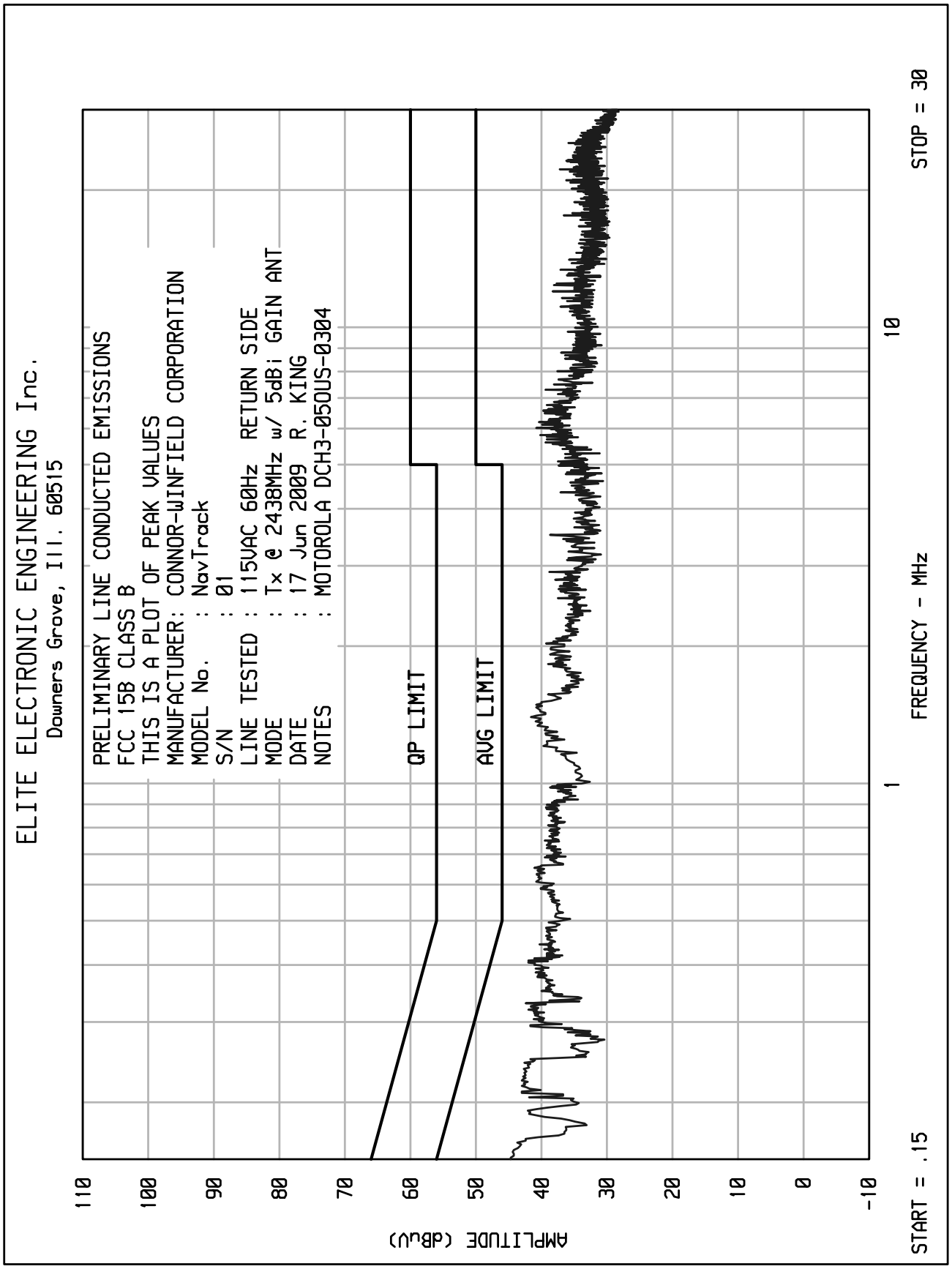


Test Setup for Radiated Emissions – 18GHz to 25GHz, Horizontal Polarization



Test Setup for Radiated Emissions – 18GHz to 25GHz, Vertical Polarization


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
PRELIMINARY LINE CONDUCTED EMISSIONS
FCC 15B CLASS B
THIS IS A PLOT OF PEAK VALUES
MANUFACTURER: CONNOR-WINFIELD CORPORATION
MODEL No. : NavTrack
S/N : 01
LINE TESTED : 115VAC 60Hz
MODE : Tx @ 2438MHz w/ 5dBi GAIN ANT
DATE : 17 Jun 2009 R. KING
NOTES : MOTOROLA DCH3-050US-0304
QP LIMIT
AVG LIMIT
AMPLITUDE (dBuV)
110
100
90
80
70
60
50
40
30
20
10
0
-10
START = .15
1
10
STOP = 30
FREQUENCY - MHz


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
PRELIMINARY LINE CONDUCTED EMISSIONS
FCC 15B CLASS B
THIS IS A PLOT OF PEAK VALUES
MANUFACTURER: CONNOR-WINFIELD CORPORATION
MODEL No. : NavTrack
S/N : 01
LINE TESTED : 115VAC 60Hz RETURN SIDE
MODE : Tx @ 2438MHz w/ 5dBi GAIN ANT
DATE : 17 Jun 2009 R. KING
NOTES : MOTOROLA DCH3-050US-0304
QP LIMIT
AVG LIMIT
AMPLITUDE (dBuV)
110
100
90
80
70
60
50
40
30
20
10
0
-10
START = .15
1
10
STOP = 30
FREQUENCY - MHz

ELITE ELECTRONIC ENGINEERING CO.

MANUFACTURER : CONNOR-WINFIELD CORPORATION
MODEL : NavTrack
S/N : 01
SPECIFICATION : FCC 15B CLASS B
TEST : LINE CONDUCTED EMISSIONS
LINE TESTED : 115VAC 60Hz
MODE : Tx @ 2438MHz w/ 5dBi GAIN ANT
DATE : 17 Jun 2009
NOTES : MOTOROLA DCH3-05OUS-0304
RECEIVER : HP 8566 w/ HP85650A QP ADAPTOR
VALUES MEASURED WITH QP DETECTOR USING 9kHz BANDWIDTH

FREQUENCY MHz	METER RDG. dBuV	QP LIMIT dBuV	AVG RDG dBuV	AVG LIMIT dBuV	NOTES
.199	43.2	63.7		53.7	
.288	42.7	60.6		50.6	
.359	37.3	58.7		48.7	
.405	38.0	57.8		47.8	
.502	39.1	56.0		46.0	
.644	34.5	56.0		46.0	
.872	32.6	56.0		46.0	
1.002	34.9	56.0		46.0	
1.500	35.3	56.0		46.0	
1.572	34.8	56.0		46.0	
1.716	34.9	56.0		46.0	
2.792	33.7	56.0		46.0	
3.406	32.3	56.0		46.0	
3.502	31.4	56.0		46.0	
4.076	30.2	56.0		46.0	
5.570	33.2	60.0		50.0	
5.781	33.6	60.0		50.0	
6.280	34.7	60.0		50.0	
6.647	32.6	60.0		50.0	
7.629	30.4	60.0		50.0	
9.046	29.3	60.0		50.0	
11.867	29.1	60.0		50.0	
15.924	27.8	60.0		50.0	
17.940	27.6	60.0		50.0	
20.773	28.2	60.0		50.0	
24.732	28.7	60.0		50.0	
27.184	27.6	60.0		50.0	

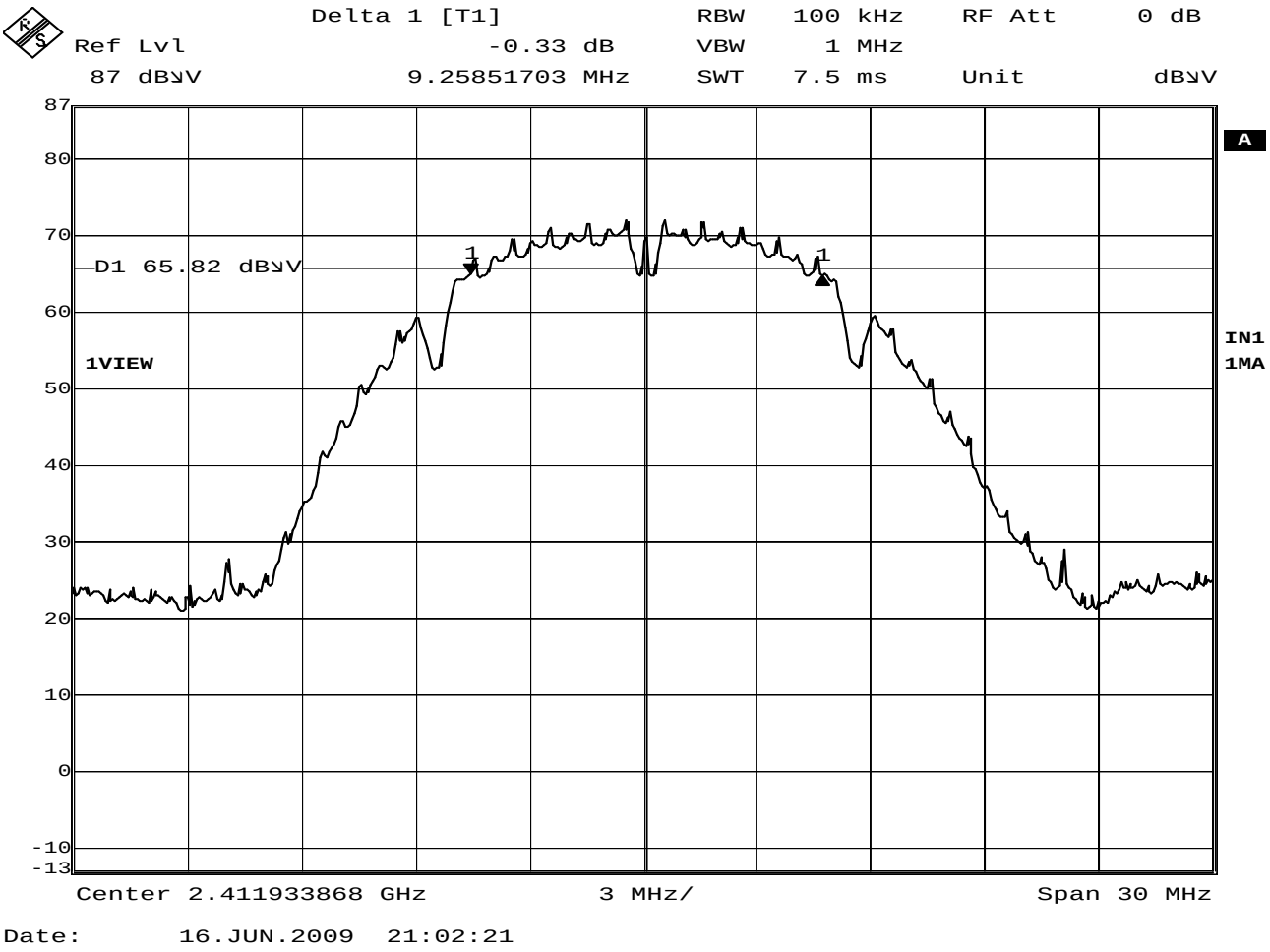
CHECKED BY: MARK E. LONGINOTTI
For R. KING

ELITE ELECTRONIC ENGINEERING CO.

MANUFACTURER : CONNOR-WINFIELD CORPORATION
MODEL : NavTrack
S/N : 01
SPECIFICATION : FCC 15B CLASS B
TEST : LINE CONDUCTED EMISSIONS
LINE TESTED : 115VAC 60Hz RETURN SIDE
MODE : Tx @ 2438MHz w/ 5dBi GAIN ANT
DATE : 17 Jun 2009
NOTES : MOTOROLA DCH3-05OUS-0304
RECEIVER : HP 8566 w/ HP85650A QP ADAPTOR
VALUES MEASURED WITH QP DETECTOR USING 9kHz BANDWIDTH

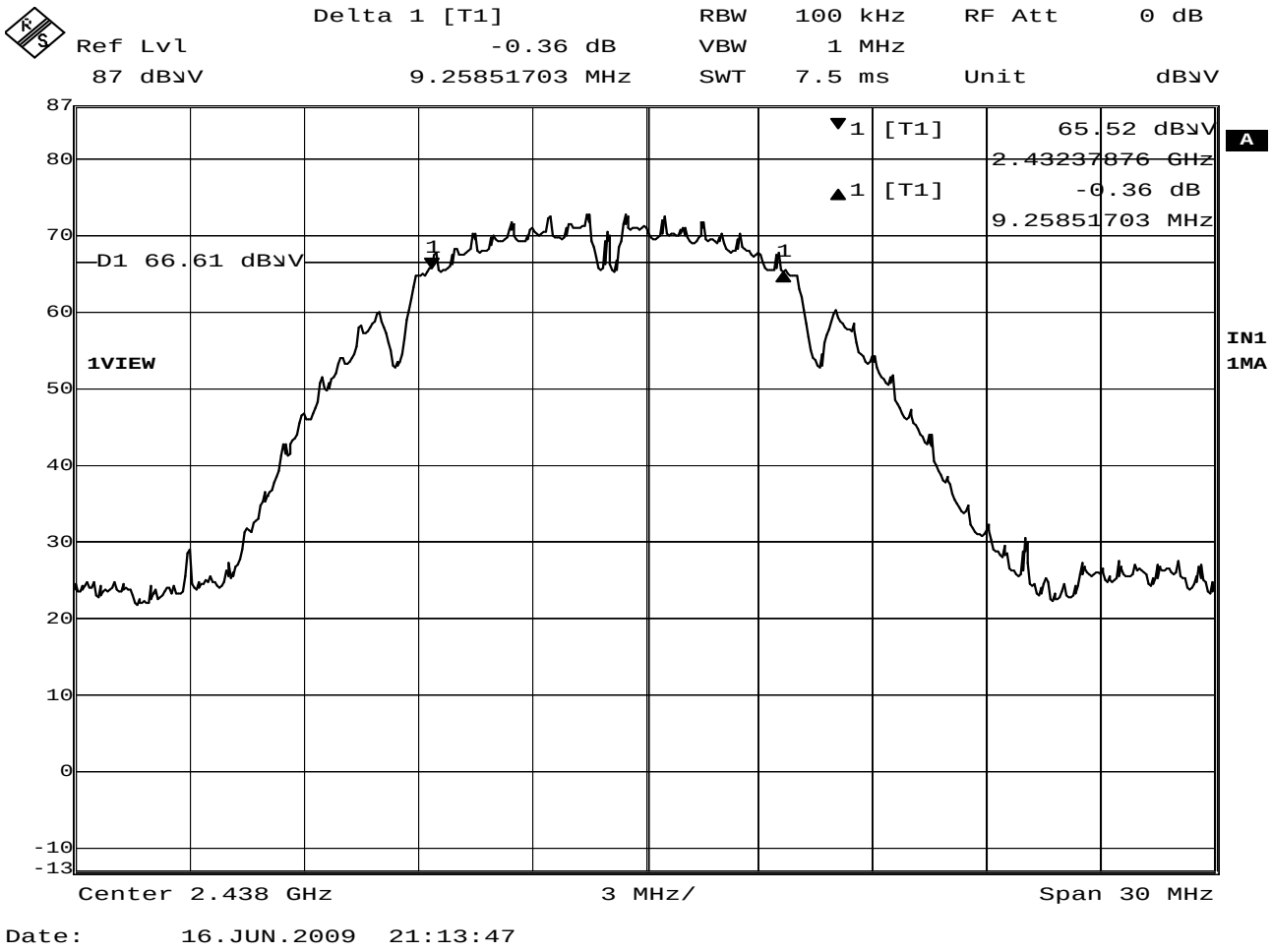
FREQUENCY MHz	METER RDG. dBuV	QP LIMIT dBuV	AVG RDG dBuV	AVG LIMIT dBuV	NOTES
.158	40.0	65.6		55.6	
.338	34.6	59.2		49.2	
.414	35.0	57.6		47.6	
.599	33.1	56.0		46.0	
.634	33.4	56.0		46.0	
.642	34.1	56.0		46.0	
.805	30.5	56.0		46.0	
.889	31.4	56.0		46.0	
1.396	32.9	56.0		46.0	
2.018	30.8	56.0		46.0	
2.901	28.9	56.0		46.0	
3.525	28.5	56.0		46.0	
4.967	28.7	56.0		46.0	
5.786	30.5	60.0		50.0	
5.980	31.5	60.0		50.0	
6.393	30.9	60.0		50.0	
7.504	29.1	60.0		50.0	
8.755	28.1	60.0		50.0	
11.074	28.4	60.0		50.0	
11.963	28.2	60.0		50.0	
12.324	28.3	60.0		50.0	
13.317	27.9	60.0		50.0	
15.157	27.1	60.0		50.0	
18.772	27.1	60.0		50.0	
22.164	27.6	60.0		50.0	
24.056	28.1	60.0		50.0	
26.672	27.3	60.0		50.0	

CHECKED BY: MARK E. LONGINOTTI
For R. KING



FCC 15.247 6dB Bandwidth

MANUFACTURER	: Connor-Winfield Corporation
PART NUMBER	: NavTrack
SERIAL NUMBER	: 01
TEST MODE	: Transmit @ 2413MHz (Ch. 1)
TEST PARAMETER	: 6dB bandwidth = 9.26MHz in a 100kHz bandwidth
NOTES	: Measurements taken at the antenna port
EQUIPMENT USED	: RBB0,T2D7, T2DI



FCC 15.247 6dB Bandwidth

MANUFACTURER	: Connor-Winfield Corporation
PART NUMBER	: NavTrack
SERIAL NUMBER	: 01
TEST MODE	: Transmit @ 2438MHz (Ch. 6)
TEST PARAMETER	: 6dB bandwidth = 9.26MHz in a 100kHz bandwidth
NOTES	: Measurements taken at the antenna port
EQUIPMENT USED	: RBB0,T2D7, T2DI