Measurement of RF Emissions from a Model XA0285 Transceiver

For	:	Twisthink, LLC 130 Central Avenue, Suite 400 Holland, MI 49423
P.O. No.	:	158
Date Tested	:	September 23, 2008
Test Personnel	:	Mark E. Longinotti
Specification	:	FCC Part 15, Subpart B, Class B Industry Canada RSS-310 Industry Canada RSS-GEN

Test Report By : MARK E. LONGINOTTI

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Approved By : Raymond J Klouda

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REVISION HISTORY

Revision	Date	Description
—	September 24, 2008	Initial release

Measurement of RF Emissions from a Model No. XA0285 Transceiver

1 INTRODUCTION

1.1 Scope of Tests

This report presents the results of the RF emissions measurements performed on a Transceiver, Model No. XA0285, Serial No. None Assigned, (hereinafter referred to as the test item). The test item was designed to transmit at approximately 908.42MHz and receive at approximately 908.42MHz using an internal antenna. The test item was manufactured and submitted for testing by Twisthink, LLC located in Holland, MI.

1.2 Purpose

The test was run to determine if the test item would meet the radiated emissions requirements for receivers in the frequency range of 30MHz to 1GHz with modifications made to the test item. The test series was performed to determine if the test item meets radiated RF emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart B, Section 15.109 and Industry Canada RSS-310 for Receivers. Testing was performed in accordance with ANSI C63.4-2003.

1.3 Deviations, Additions and Exclusions

For the purpose of the test, the only radiated emissions testing was performed in the frequency range of 30MHz to 1GHz with the test item set to receive at 908.42MHz. The upper test frequency of radiated emissions tests was limited to 1GHz. No other testing was performed.

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 23oC and the relative humidity was 42%.

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 B for Class B digital devices, dated 1 October 2007
- ANSI C63.4-2003, "American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz"
- Industry Canada RSS-310, Issue 1, September 2005, “Spectrum Management and Telecommunications Radio Standards Specification, Low-power License-exempt radio communication devices (All Frequency Bands): Category II Equipment”
- Industry Canada RSS-GEN, Issue 1, September 2005, “Spectrum Management and Telecommunications Radio Standards Specification, General Requirements and Information for the Certification of radio communication equipment”

3 TEST ITEM SETUP AND OPERATION

3.1 General Description

The test item is a Twisthink, LLC, Model No. XA0285. A block diagram of the test item setup is shown as Figure

1.

3.1.1 Power Input

The test item was powered by 5VDC from an external power supply, Manufacturer: CUI, Inc., M/N: EPS050100, P/N: EPS050100-P6P. The power supply was connected to the test item via a 1.75 meter long, 2 wire unshielded power cable. The power supply was powered with 115V, 60Hz.

3.1.2 Peripheral Equipment

The test item was submitted for testing with no peripheral equipment.

3.1.3 Signal Input/Output Leads

The following interconnect cables were submitted with the test item:

Item	Description
CAT 6 Cable	2.0 meter long CAT 5 Cable connected to the Ethernet port of the test item (unterminated)

3.1.4 Grounding

The test item was ungrounded during the test.

3.1.5 Frequency of Test Item

The test item was designed to transmit at approximately 908.42MHz and receive at approximately 908.42MHz. In accordance with 47 CFR 15.33 radiated emissions measurements should be made up to the 10th harmonic of the transmit frequency (9084.2MHz) for the transmitter and up to 5GHz for the receiver. However, for the purpose of this testing, the frequency range was limited to 30MHz to 1GHz.

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 was energized and set to receive continuously at 908.42MHz.

3.3 Test Item Modifications

The following modifications were performed to the test item:

- Inductor L2 was removed

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

No conducted emissions tests were performed on the test item per Twisthink, LLC personnel.

5.2 Radiated Measurements

5.2.1 Requirements

All emanations from a Receiver shall be below the levels shown on the following table.

RADIATION LIMITS FOR CLASS B DEVICE

Frequency MHz	Distance between Test Item 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.

5.2.2 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 C63.4-2003 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 requires long integration times, it is not practical to automatically sweep through the quasi-peak levels. Therefore, radiated emissions from the test item 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.

The broadband measuring antenna was positioned at a 3 meter distance from the test item. 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 test item with respect to the antenna. The maximum levels for each antenna polarization were plotted.

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.

2) To ensure that maximum or worst case, emission levels were 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.

    d) 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.

5.2.3 Results

The preliminary plots are presented on pages 12 and 13. The plots are presented for a reference only, and are not used to determine compliance. The final radiated levels are presented on page 14. 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 150MHz. The emissions level at this frequency was 2.0dB within the limit. See data page 14 for details. Photographs of the test configuration which yielded the highest or worst case, radiated emission levels are shown on Figure 2.

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 Test Item

The test item and all associated equipment were returned to Twisthink, LLC upon completion of the tests.

7 CONCLUSIONS

With inductor L2 removed, it was determined that the Twisthink, LLC Transceiver, Model No. XA0285, Serial No.

None Assigned, did fully meet the radiated interference requirements of Section 15.109 of the FCC Part 15, Subpart B and Industry Canada RSS-310for Receivers in the frequency range of 30MHz to 1GHz.

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 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.

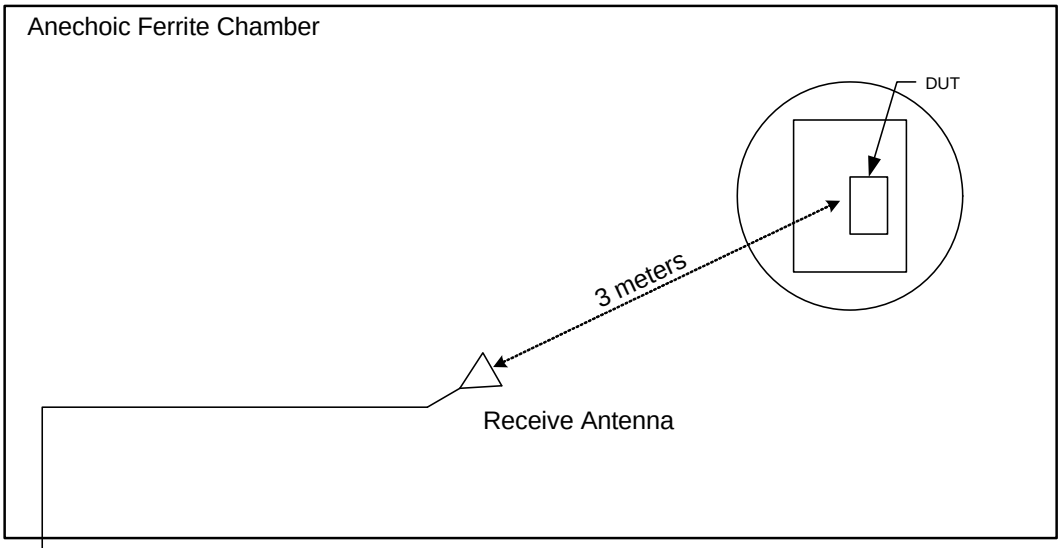
This report must not be used to claim product endorsement by NVLAP or any agency of the US Government.

9 EQUIPMENT LIST

Table 9-1 Equipment List

Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Due Date
CDS2	COMPUTER	GATEWAY	MFATXPNT NMZ 500L	0028483108	1.8GHZ	N/A	
CMA0	MULTI-DEVICE CONTROLLER	EMCO	2090	9701-1213	---	N/A	
NTA0	BILOG ANTENNA	CHASE EMC LTD.	BILOG CBL6112	2057	0.03-2GHZ	6/11/2008	6/11/2009
RAKG	RF SECTION	HEWLETT PACKARD	85462A	3549A00284	0.009-6500MHZ	11/21/2007	11/21/2008
RAKH	RF FILTER SECTION	HEWLETT PACKARD	85460A	3448A00324	---	11/21/2007	11/21/2008

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.



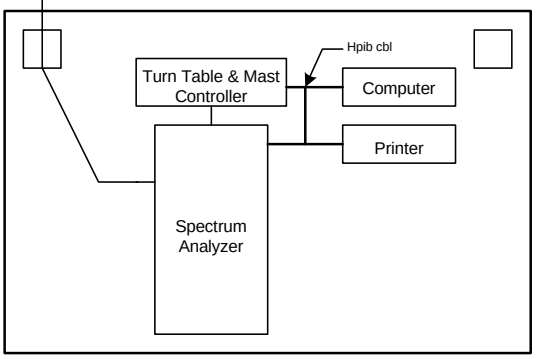
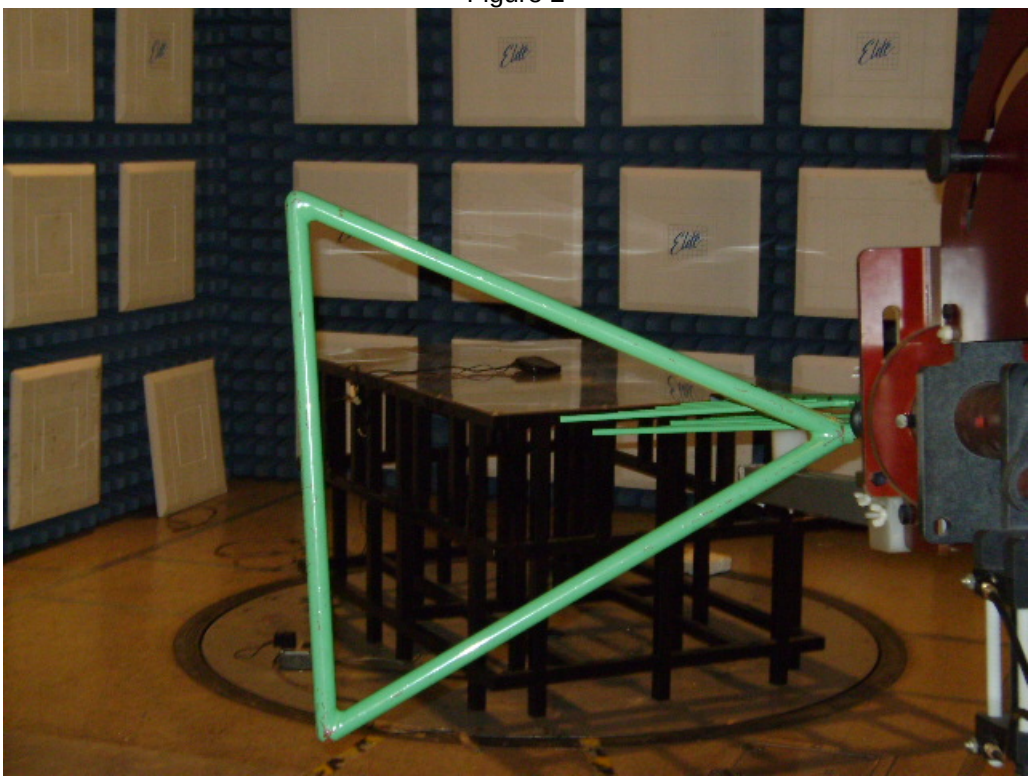
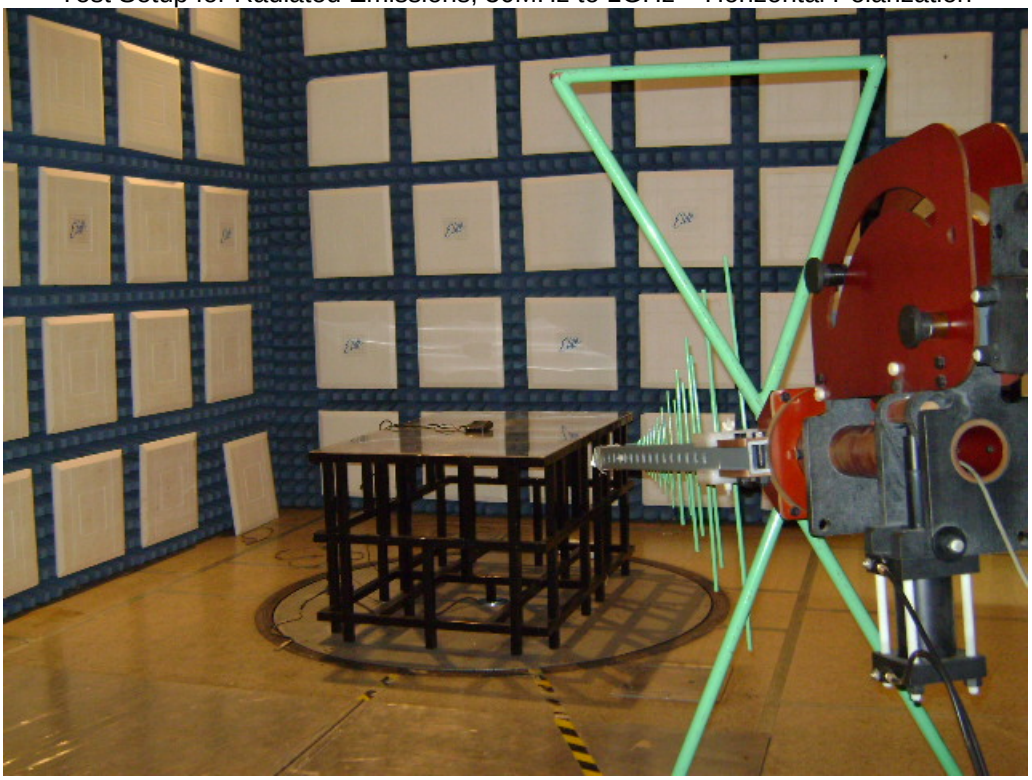


FIGURE 1 BLOCKDIAGRAM OF TEST SETUP

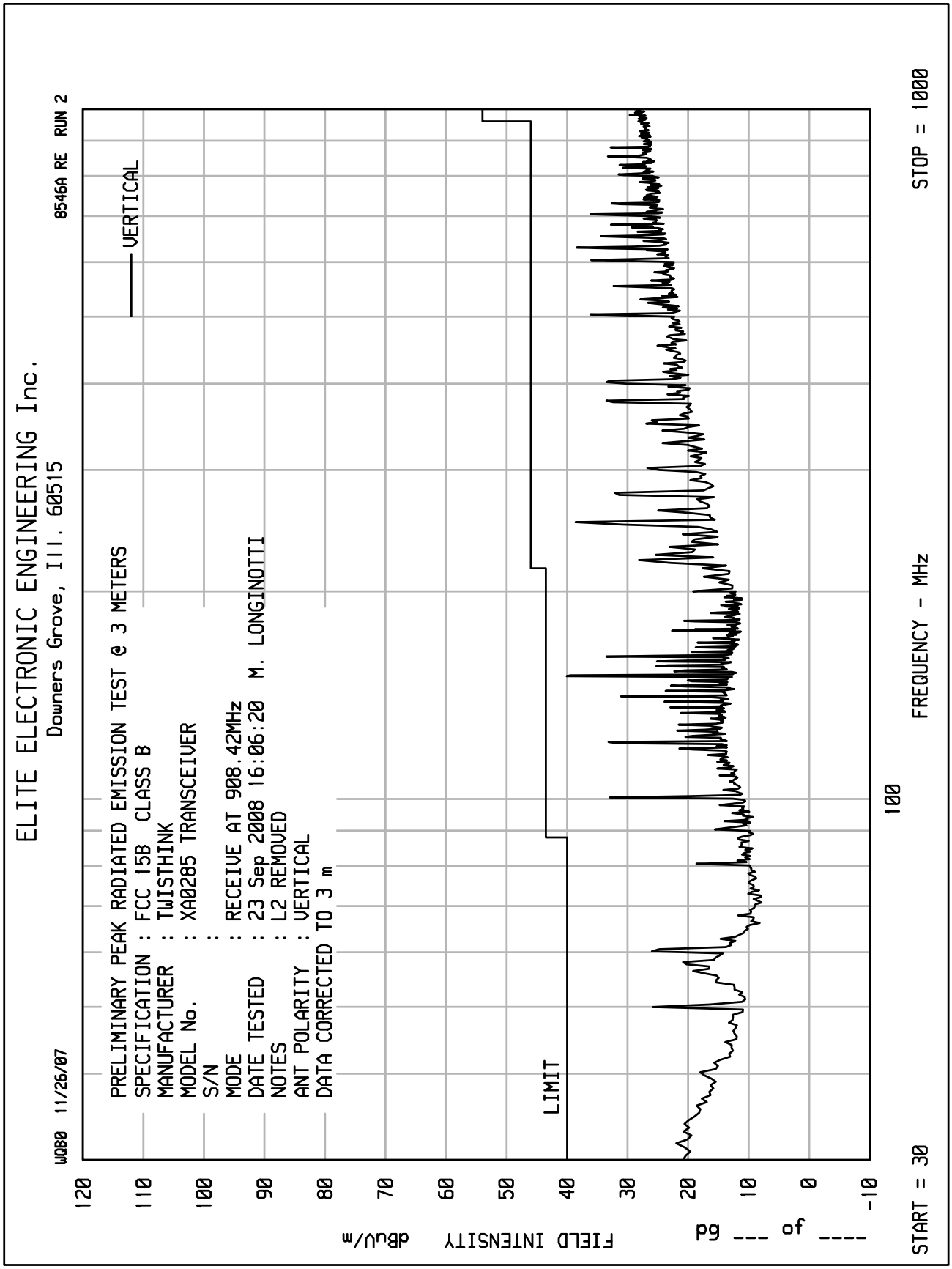
Figure 2

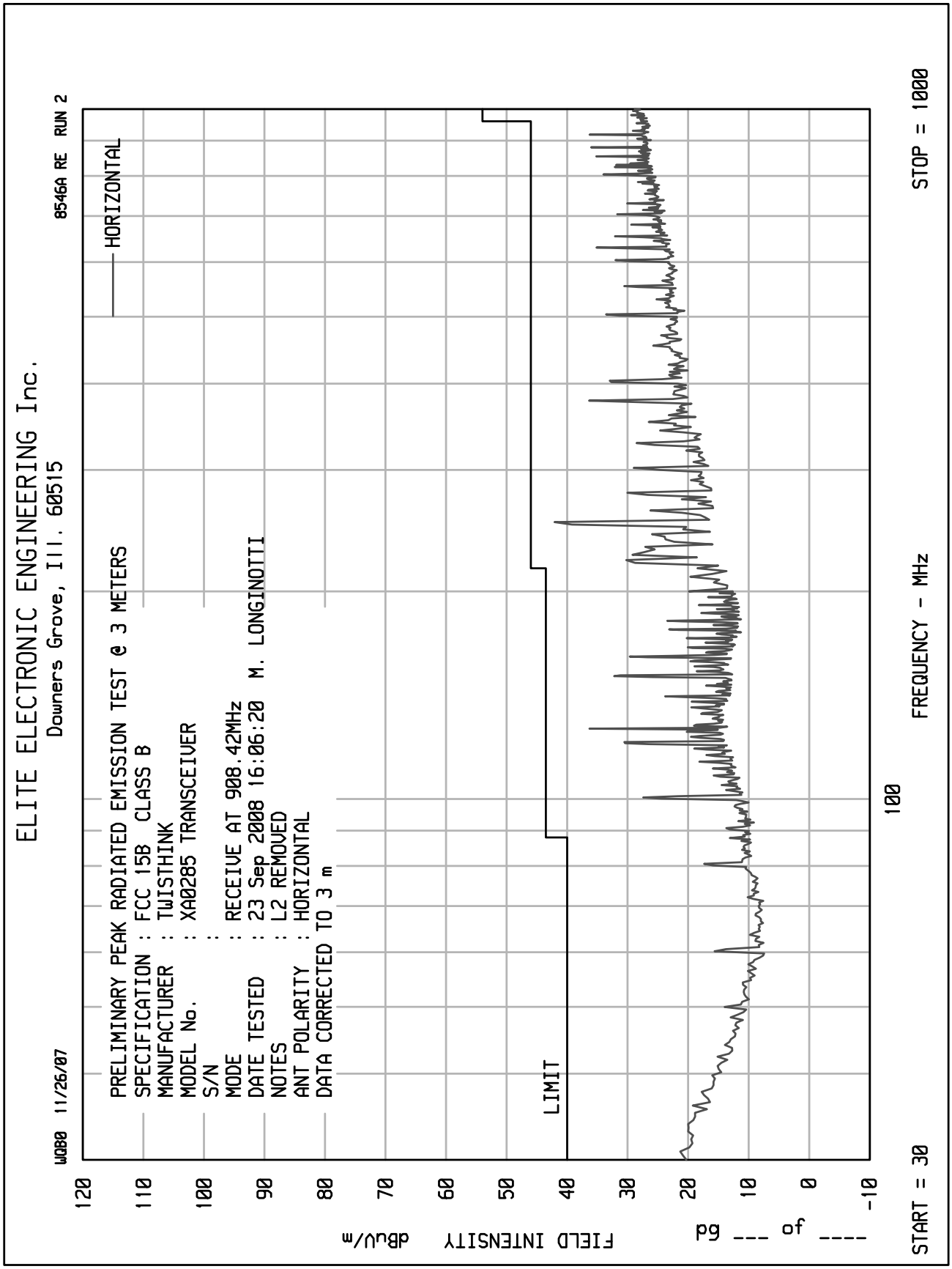


Test Setup for Radiated Emissions, 30MHz to 1GHz – Horizontal Polarization



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


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
8546A RE RUN 2
WQ80 11/26/07
PRELIMINARY PEAK RADIATED EMISSION TEST @ 3 METERS
SPECIFICATION : FCC 15B CLASS B
MANUFACTURER : TWISTHINK
MODEL No. : XA0285 TRANSCEIVER
S/N : :
MODE : RECEIVE AT 908.42MHz
DATE TESTED : 23 Sep 2008 16:06:20 M. LONGINOTTI
NOTES : L2 REMOVED
ANT POLARITY : VERTICAL
DATA CORRECTED TO 3 m
VERTICAL
LIMIT
FIELD INTENSITY dBuV/m
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
START = 30
100
STOP = 1000
FREQUENCY - MHz
pg --- of ---- 6d


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
8546A RE RUN 2
WQBB 11/26/07
PRELIMINARY PEAK RADIATED EMISSION TEST @ 3 METERS
SPECIFICATION : FCC 15B CLASS B
MANUFACTURER : TWISTHINK
MODEL No. : XA0285 TRANSCEIVER
S/N : :
MODE : RECEIVE AT 908.42MHz
DATE TESTED : 23 Sep 2008 16:06:20 M. LONGINOTTI
NOTES : L2 REMOVED
ANT POLARITY : HORIZONTAL
DATA CORRECTED TO 3 m
HORIZONTAL
LIMIT
FIELD INTENSITY dBuV/m
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
START = 30
100
FREQUENCY - MHz
STOP = 1000
pg --- of ---- fd

ETR No. 8546A
DATA SHEET TEST NO. 2

RADIATED QP EMISSION MEASUREMENTS in a 3 m SEMI-ANECHOIC ROOM
SPECIFICATION : FCC 15B CLASS B
MANUFACTURER : TWISTHINK
MODEL NO. : XA0285 TRANSCEIVER
SERIAL NO. :
TEST MODE : RECEIVE AT 908.42MHz
NOTES : L2 REMOVED
TEST DATE : 23 Sep 2008 16:06:20
TEST DISTANCE : 3 m (DATA EXTRAPOLATED TO 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	POLAR
49.99	15.4	9.1	.6	0.0	0.0	25.1	40.0	270	120	V
60.00	19.5	5.2	.7	0.0	0.0	25.4	40.0	315	120	V
80.00	8.6	8.6	.9	0.0	0.0	18.0	40.0	315	340	V
119.97	19.6	12.5	1.0	0.0	0.0	33.1	43.5	180	120	V
127.50	5.2	13.0	1.0	0.0	0.0	19.1	43.5	225	200	H
150.00	28.6	11.9	1.0	0.0	0.0	41.5	43.5	270	120	V
180.00	15.1	10.1	1.0	0.0	0.0	26.2	43.5	225	200	H
250.00	27.9	13.3	1.3	0.0	0.0	42.5	46.0	225	120	H
275.00	17.7	13.6	1.4	0.0	0.0	32.7	46.0	180	200	V
375.00	18.9	16.0	1.5	0.0	0.0	36.4	46.0	270	120	H
500.01	16.0	18.4	1.8	0.0	0.0	36.2	46.0	180	200	V
625.00	16.6	20.0	2.1	0.0	0.0	38.7	46.0	180	120	V
700.01	13.9	20.4	2.3	0.0	0.0	36.6	46.0	180	120	V
875.01	11.3	22.6	2.5	0.0	0.0	36.4	46.0	135	120	H
926.23	-6.6	22.7	2.5	0.0	0.0	18.6	46.0	315	200	H

tested by: MARK E. LONGINOTTI
M. LONGINOTTI