



## Measurement of RF Interference from a Model FGR2 Frequency Hoping Spread Spectrum Transceiver

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For : Free Wave Technologies  
Boulder CO 80301

P.O. No. : 26871

Date Tested : December 3 through January 29, 2007

Test Personnel : Richard King

Specification : FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.247 for Frequency Hopping Spread Spectrum Intentional Radiators Operating within the 902-928MHz band.  
RSS 210 Issue 7 June 2007 - Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands)

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THIS REPORT SHALL NOT BE REPRODUCED, EXCEPT IN FULL, WITHOUT THE  
WRITTEN APPROVAL OF ELITE ELECTRONIC ENGINEERING INCORPORATED.

**REVISION HISTORY**

Revision	Date	Description
—	Feb. 4, 2008	Initial release

## Measurement of RF Emissions from a model FGR2 Transceiver

### **1.0 INTRODUCTION:**

**1.1 Description of Test Item** - This document represents the results of the series of radio interference measurements performed on a model Free Wave Technologies, Part No.FGR2, Serial No.960-0047 transmitter, (hereinafter referred to as the test item). The test item is a frequency hopping spread spectrum transmitter used for point to point communications. It transmits over 902 - 928 MHz and can use a Laird Technologies model FG9026 6dBc or a Radiall/Larsen Yagi model YA5900W 11dBi antenna. The test item was manufactured and submitted for testing by Free Wave Technologies located in Boulder , CO.

**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 15.247 for Intentional Radiators and RSS 210 Issue 7 June 2007 - Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands). 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 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 2007
- FCC Public Notice, DA 00-705, "Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems", Released March 30, 2000
- RSS 210 Issue 7 June 2007 - Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands)
- 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"

**1.5 Subcontractor 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.

**1.6 Laboratory Conditions** The temperature at the time of the test was 21.7°C and the relative humidity was 23%.

## **2.0 TEST ITEM SETUP AND OPERATION:**

The test item is a Free Wave Technologies, Part No.FGR2. A 6 dBi gain Omni-directional antenna and a 10 dBi gain Yagi antenna were supplied with the test item. The Yagi antenna was submitted with a 100 foot long cable which had 3.9 dB of loss in the 902 to 928MHz range. A block diagram of the test item setup is shown as Figure 1.

**2.1 Power Input** - The test item obtained 12VDC power through 2 leads from the secondary of a Tamuracorp Co. step-down transformer, Part No. 420AS12050. The primary of this transformer received 115V 60Hz power through lowpass powerline filters on the wall of the shielded enclosure. The 12VDC power from the secondary of the transformer was provided to the test item through a 2 wire, 6 foot long unshielded cord.

**2.2 Grounding** - Since only two wires were used to provide the input power, the test item was ungrounded during the tests. The third primary input terminal of the transformer was not used.

**2.3 Support Equipment** - The following support equipment was submitted with the test item:

Item	Description
Yagi antenna	Radiall / Larsen Yagi Directional antenna model YA5900W 9dBi -11dBi gain.
Omni Antenna	Laird Technologies model FG9026 Omni antenna.

**2.4 Interconnect Cables** - The following interconnect cables were submitted with the test item:

Item	Description
Serial cable	2 foot long serial cable connecting the test item to a laptop for programming the test item.
Coaxial cable	100 feet of Times Microwave LMR0-400 coaxial cable connecting the Yagi antenna to the test item.
Coaxial cable	20 feet of Times Microwave LMR0-240 coaxial cable connecting the Omni antenna to the test item.

**2.5 Operational Mode** - The test item and antenna were placed on a 80cm high non-

conductive stand. The test item was energized and through a series of commands communicated through a serial hyper terminal control. For some tests, the test item was transmitting at Channel 1 (902.2464MHz), Channel 59 (915.6096MHz) or Channel 112 (927.8208MHz). Other tests were performed with the test item transmitting in the frequency hopping mode. See the specific tests for transmitting details.

### **3.0 TEST EQUIPMENT:**

**3.1 Test Equipment List** - A list of the test equipment used can be found on Table I. All equipment was calibrated per the instruction manuals supplied by the manufacturer.

**3.2 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).

### **4.0 REQUIREMENTS, PROCEDURES AND RESULTS:**

#### **4.1 Powerline Conducted Emissions**

**4.1.1 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 of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56*	56 to 46*
0.5 - 5	56	46
5 - 30	60	50

**4.1.2 Procedures** - The interference on each power lead 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 ohm. Measurements were first made over the entire frequency range from 150 kHz through 30 MHz 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.

**4.1.3 Results** - The plots of the peak preliminary conducted voltage levels on each power line are presented on pages 16 and 17. The conducted limit for intentional

radiators is shown as a reference. The final quasi-peak results are presented on pages 18 and 19.

The emissions level closest to the limit (worst case) occurred at 154 kHz. The emissions level at this frequency was 12.5 dB within the average limit.

#### **4.2 Carrier Frequency Separation:**

**4.2.1 Requirements:** Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 20dB bandwidth of the hopping channel, whichever is greater.

**4.2.2 Procedures:** The output of the test item was connected to the spectrum analyzer through 40dB of attenuation. With the hopping function enabled, the test item was allowed to transmit continuously.

The resolution bandwidth (RBW) was set to  $\geq$  1% of the span. The peak detector and 'Max-Hold' function was engaged. The span was set wide enough to capture the peaks of at least two adjacent channels. When, the trace had stabilized after multiple scans. The marker-delta function was used to determine the separation between the peaks of the adjacent channels. The analyzer's display was plotted using a 'screen dump' utility.

**4.2.3 Results:** Page 20 shows the carrier frequency separation. As can be seen from this plot, the separation is 238.5kHz which is greater than the 20dB bandwidth (214.42kHz).

#### **4.3 Number of Hopping Frequencies**

**4.3.1 Requirements** - For frequency hopping systems operating in the 902-928MHz band. The frequency hopping system shall use at least 50 hopping frequencies if the 20dB bandwidth is less than 250kHz. If the 20dB bandwidth is greater than 250kHz the frequency hopping system shall use at least 25 hopping frequencies.

**4.3.2 Procedures** - The output of the test item was connected to the spectrum analyzer through 40dB of attenuation. With the hopping function enabled, the test item was allowed to transmit continuously.

The resolution bandwidth (RBW) was set to  $\geq$  1% of the span. The peak detector and 'Max-Hold' function was engaged. The span was set wide enough to capture the entire frequency band of operation.

The test item's signal was allowed to stabilize after multiple scans. The number of

hopping frequencies was counted. The analyzer's display was plotted using a 'screen dump' utility.

**4.3.3 Results** - Pages 21 through 23 show the number of hopping frequencies. As can be seen from these plots, the number of frequencies is 111 which is greater than the minimum required.

#### 4.4 Time of Occupancy

**4.4.1 Requirement** - For frequency hopping systems operating in the 902-928MHz band. The average time of occupancy shall not be greater than 0.4 seconds within a 20 second period if the 20dB bandwidth is less than 250kHz. If the 20dB bandwidth is greater than 250kHz, the average time of occupancy shall not be greater than 0.4 seconds within a 10 second period.

**4.4.2 Procedures** - The test item was setup inside the chamber. The output of the test item was connected to the spectrum analyzer. With the hopping function enabled, the test item was allowed to transmit continuously.

The peak detector and 'Max-Hold' function was engaged. With the span set to 0Hz, the sweep time was adjusted to capture a single event in order to measure the dwell time per hop. Then, the sweep time was expanded to capture the average time between hops. When the trace had stabilized after multiple scans, the time between hops was measured. The analyzer's display was plotted using a 'screen dump' utility.

The dwell time was calculated from the pulse width multiplied by the number of hops in 20 seconds.

**4.4.3 Results** - Pages 24 and 25 show the plots for the time of occupancy (dwell time). As can be seen from the plots, the time of occupancy can be determined by a pulse width of 14.8 ms multiplied by 8 pulses in a 20 second period. This calculated value is equal to 0.1184 seconds which is less than the 0.4 seconds maximum allowed.

#### 4.5 20dB Bandwidth

**4.5.1 Requirement** - For frequency hopping systems operating in the 902-928MHz band. The 20dB bandwidth shall not be greater than 500kHz.

**4.5.2 Procedures** - The test item was setup inside the chamber. The output of the test item was connected to the spectrum analyzer through a 40dB of attenuation. With the hopping function disabled, the test item was allowed to transmit continuously. The frequency

hopping channel was set separately to low, middle, and high hopping channels. The resolution bandwidth (RBW) was set to  $\geq$  1% of the 20 dB BW.

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.

**4.5.3 Results** - The plots on pages 26, 27 and 28 show that the maximum 20 dB bandwidth was 218.43 kHz. The 20 dB bandwidth was less than the 500 kHz maximum requirement. In addition the 99% bandwidth measurement was 236.3 kHz.

#### **4.6 Peak Output Power**

**4.6.1 Requirement** - For frequency hopping systems operating in the 902-928MHz band. The peak output power shall not be greater than 1 watt for systems employing at least 50 hopping channels. For systems employing less than 50 hopping channels the peak output power shall not be greater than 0.25 watts

The peak output power from an intentional radiator if the transmitting antenna(s) have a directional gain greater than 6dBi shall be reduced below by the amount in dB that the direction gain of the antenna exceeds 6dBi.

**4.6.2 Procedures** - The output of the test item was connected to the spectrum analyzer. The maximum meter reading was recorded. The peak power output was calculated for Channel 1 (902.2464MHz), Channel 59 (915.6096MHz) or Channel 112 (927.8208MHz).

**4.6.3 Results** - The results are presented on pages 29 through 31. The maximum antenna conducted output power measured from the transmitter was 29.6 dBm which meets the 30 dBm limit. The maximum EIRP measured from the transmitter was 35.6 dBm which meets the De Facto 36 dBm limit.

#### **4.7 Bandedge Compliance**

**4.7.1 Requirement** - The emissions at the band-edges must be at least 20dB below the highest level measured within the band. In addition, the radiated emissions which fall in the restricted band beginning at 2483.5 MHz, must meet the general limits of 15.209

**4.7.2 Procedures** - The test item was connected to the spectrum analyzer through 40 dB of attenuation. The frequency hopping channel was set separately to low and high hopping channels. The resolution bandwidth (RBW) was set to 1 kHz (greater than or equal to 1% of the span). 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. The measurement was repeated with the frequency hopping function enabled.

**4.7.3 Results** - Pages 33 through 36 show the band-edge compliance results. As can be seen from these plots, the emissions at the band-edges meet the requirements.

## 4.8 Duty Cycle

**4.8.1 Procedures** - The test item was connected to the spectrum analyzer through 40 dB of attenuation. 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 pulse density, 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 with 2msec/div. The markers are set at the beginning and end of a word period. If the word period exceeds 100 msec the word period is set to 100 msec.

**4.8.2 Results** - The plots of the duty cycle are shown on data page 25. The test item transmits a 14.8 msec pulse in 100 msec, the duty cycle factor was computed over a 100 msec interval. The duty cycle correction factor was calculated to be -16.6dB (-16.6dB =  $20 \log(14.8\text{msec}/100\text{msec})$ ).

## 4.9 Spurious Emissions

### 4.9.1 Antenna Conducted

**4.9.1.1 Requirement** – 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.

**4.9.1.2 Procedures** – The measuring equipment was connected to the test item's antenna port. The emissions in the frequency range from 30MHz to 10GHz were observed and plotted separately with the test item transmitting at Channel 1 (902.2464MHz), Channel 59 (915.6096MHz) or Channel 112 (927.8208MHz).

**4.9.1.3 Results** - The results of the antenna conducted emissions levels were plotted. These plots are presented on pages 37 through 42. These plots show that the spurious emissions were at least 20 dB below the level of the fundamental.

### 4.9.2 Radiated Spurious Emissions

**4.9.2.1 Requirement** – 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. In addition, the radiated emissions which fall in the restricted bands must meet the general limits of 15.209.

**4.9.2.2 Procedures** – The radiated tests were performed in a 32ft. x 20ft. x 18ft. hybrid absorber lined semi-anechoic 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. The floor of the chamber is used as the ground plane. The chamber complies with ANSI 63.4 and CISPR 16 requirements for site attenuation.

Preliminary radiated measurements are performed to determine the frequencies where the significant emissions might be found. With the test item at one set position and the measurement antenna at a set height (i.e. without maximizing), the radiated emissions were measured using peak detection with 100 kHz BW. This data was then automatically plotted up through 10 GHz.

Next, the harmonic or spurious emissions falling in the restricted bands were measured up through the 10th harmonic. For these measurements, the measurement bandwidths were set to 1 MHz. The analyzer was set to **linear mode** with 10 Hz VBW in order to simulate an average detector. A pre-amplifier was used to increase the receiver sensitivity. A high-pass filter was used to block the fundamental frequency and avoid saturation.

**4.9.2.3 Results** - Photographs of the test item set-up are presented as Figures 2 and 3. The preliminary radiated emissions plots from 30MHz to 10GHz for the omni antenna are presented on data pages 43 through 48. The preliminary radiated emissions plots from 30MHz to 10GHz for the Yagi antenna are presented on data pages 49 through 54. The final radiated emissions data for both the Omni and Yagi antennas are presented on data pages 55 through 66. As can be seen by the data, the test item did meet the emissions limits.

## **5.0 CONCLUSIONS:**

It was determined that the Free Wave Technologies Transceiver, Part No. FGR2, Serial No. 960-0047, did fully meet the conducted and radiated emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Section 15.205 et seq. for Intentional Radiators and and RSS 210 Issue 7 June 2007 - Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands), when tested per ANSI C63.4-2003.

**6.0 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.

**7.0 ENDORSEMENT DISCLAIMER:**

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



TABLE I: TEST EQUIPMENT LIST

ELITE ELECTRONIC ENG. INC.							Page: 1	
Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Cal Inv	Due Date
<b>Equipment Type: ACCESSORIES, MISCELLANEOUS</b>								
XLTX	5W, 50 OHM TERMINATION	JFW INDUSTRIES	50T-052	---	DC-2GHZ	11/19/07	12	11/19/08
XZG0	ATTENUATOR/SWITCH DRIVER	HEWLETT PACKARD	11713A	3439A02724	---	N/A		
<b>Equipment Type: AMPLIFIERS</b>								
APKO	PRE-AMPLIFIER	HEWLETT PACKARD	8449B	3008A00662	1-26.5GHZ	03/16/07	12	03/16/08
<b>Equipment Type: ANTENNAS</b>								
NDQ1	TUNED DIPOLE ANTENNA	EMCO	3121C-DB4	313	400-1000MHZ	03/28/07	12	03/28/08
NTAO	BILOG ANTENNA	CHASE EMC LTD.	BILOG CBL611	2057	0.03-2GHZ	06/20/07	12	06/20/08
<b>Equipment Type: ATTENUATORS</b>								
T1N3	10DB 20W ATTENUATOR	NARDA	766-10		DC-4GHZ	09/04/07	12	09/04/08
T2D5	20DB, 25W ATTENUATOR	WEINSCHEL	46-20-43	AY9244	DC-18GHZ	02/22/07	12	02/22/08
T2DG	20DB 25W ATTENUATOR	WEINSCHEL	46-20-34	BN1038	DC-18GHZ	03/01/07	12	03/01/08
<b>Equipment Type: CONTROLLERS</b>								
CMA0	MULTI-DEVICE CONTROLLER	EMCO	2090	9701-1213	---		N/A	
<b>Equipment Type: PROBES; CLAMP-ON &amp; LISNS</b>								
PLL2	50UH LISN 462D	ELITE	462D/70A	003	0.01-400MHZ	02/12/07	12	02/12/08
PLL5	50UH LISN 462D	ELITE	462D/70A	006	0.01-400MHZ	02/12/07	12	02/12/08
<b>Equipment Type: RECEIVERS</b>								
RAC1	SPECTRUM ANALYZER	HEWLETT PACKARD	85660B	3407A08369	100HZ-22GHZ	02/21/07	12	02/21/08
RAF3	QUASipeak ADAPTER	HEWLETT PACKARD	85650A	3303A01775	0.01-1000MHZ	02/21/07	12	02/21/08
RBB0	EMI TEST RECEIVER 20HZ TO	ROHDE & SCHWARZ	ESIB40	100250	20 HZ TO 40GHZ	11/05/07	12	11/05/08
<b>Equipment Type: SIGNAL GENERATORS</b>								
GBX1	SYNTHESIZED SWEEPER	HEWLETT PACKARD	83630A	3420A00857	10MHZ-26.5GHZ	02/23/07	12	02/23/08

Cal. Interval: Listed in Months 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 2

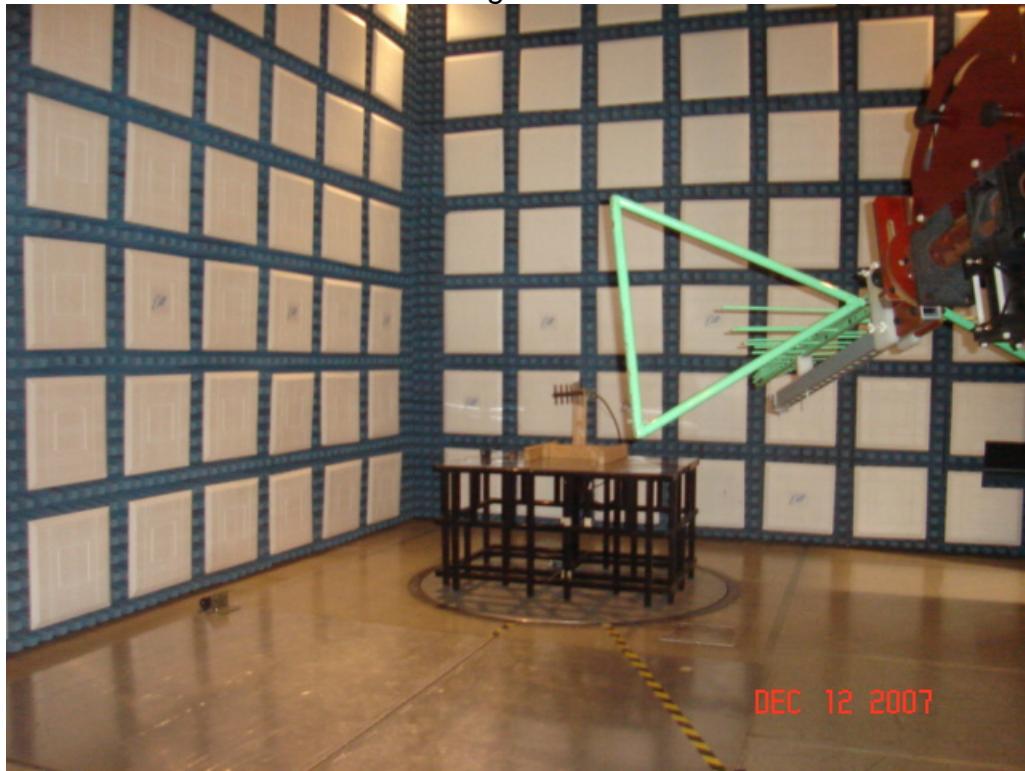


Test Setup for Radiated Emissions Omni Antenna – Horizontal Polarity



Test Setup for Radiated Emissions Omni Antenna – Vertical Polarity

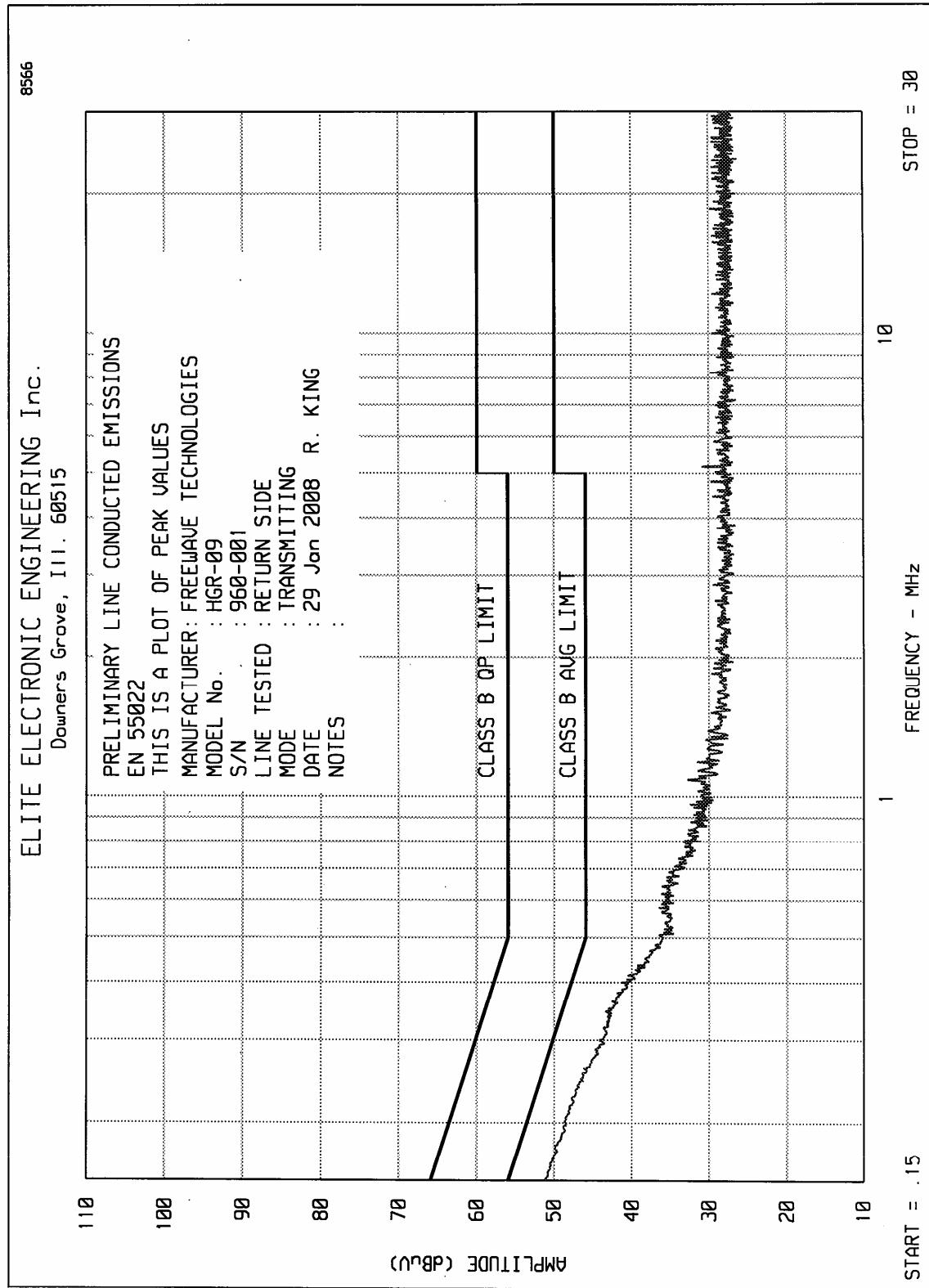
Figure 3

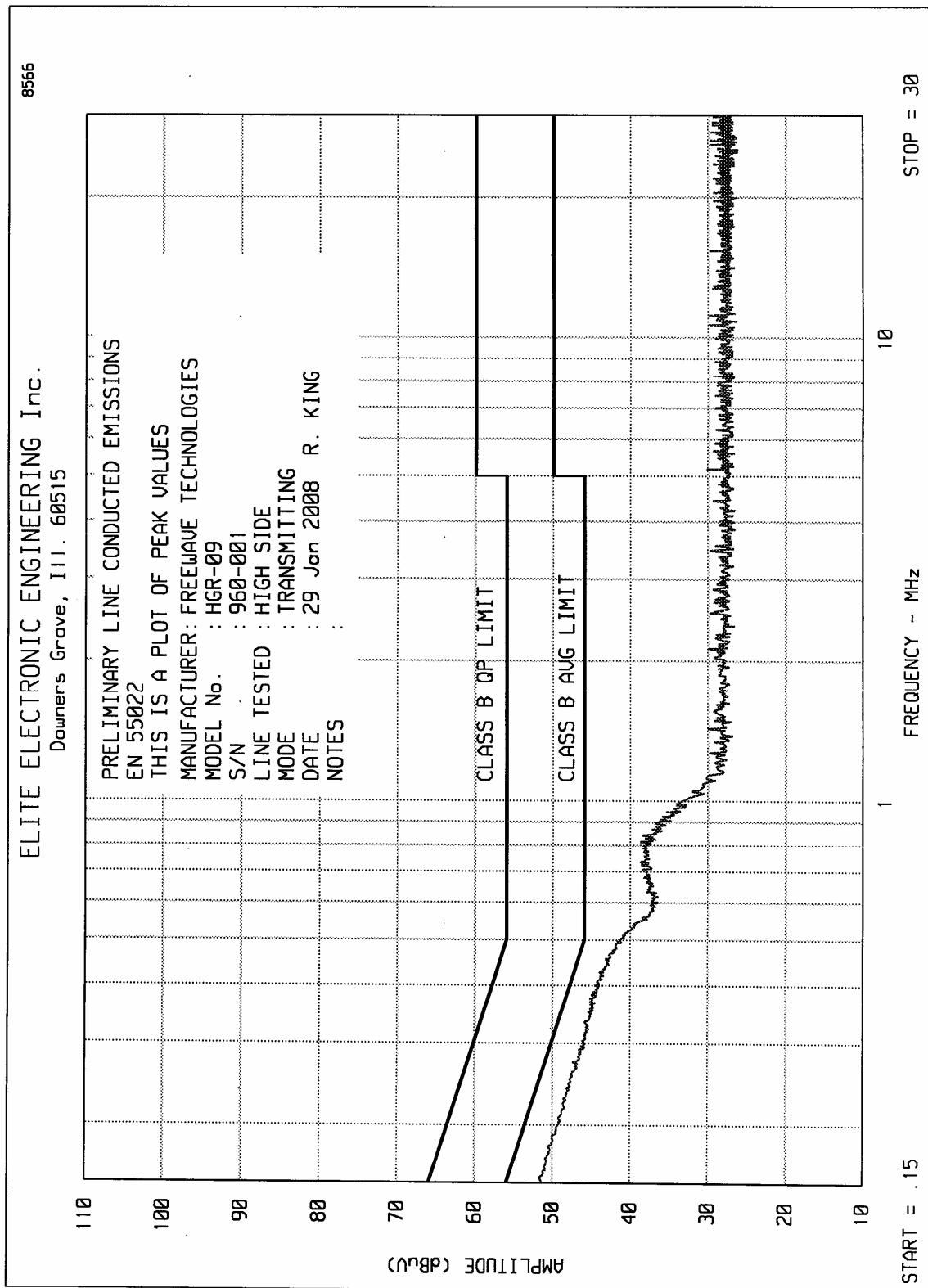


Test Setup for Radiated Emissions Yagi Antenna – Horizontal Polarization



Test Setup for Radiated Emissions Yagi Antenna – Vertical Polarization



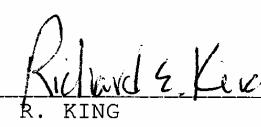


ETR No.  
ELITE ELECTRONIC ENGINEERING CO.

MANUFACTURER : FREEWAVE TECHNOLOGIES  
MODEL : HGR-09  
S/N : 960-001  
SPECIFICATION : EN 55022, CLASS B  
TEST : LINE CONDUCTED EMISSIONS  
LINE TESTED : HIGH SIDE  
MODE : TRANSMITTING  
DATE : 29 Jan 2008  
NOTES :  
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
.154	43.3	65.8		55.8	
.244	39.8	61.9		51.9	
.343	37.2	59.1		49.1	
.445	34.9	57.0		47.0	
.731	29.8	56.0		46.0	
.831	28.8	56.0		46.0	
2.531	25.8	56.0		46.0	
4.426	26.1	56.0		46.0	
6.543	25.3	60.0		50.0	
8.831	25.4	60.0		50.0	
12.762	25.4	60.0		50.0	
15.294	25.4	60.0		50.0	
18.473	25.3	60.0		50.0	
21.391	25.4	60.0		50.0	
24.425	25.3	60.0		50.0	
27.548	25.4	60.0		50.0	

CHECKED BY:

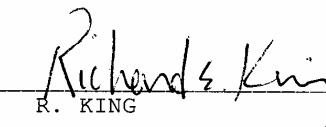
  
R. KING

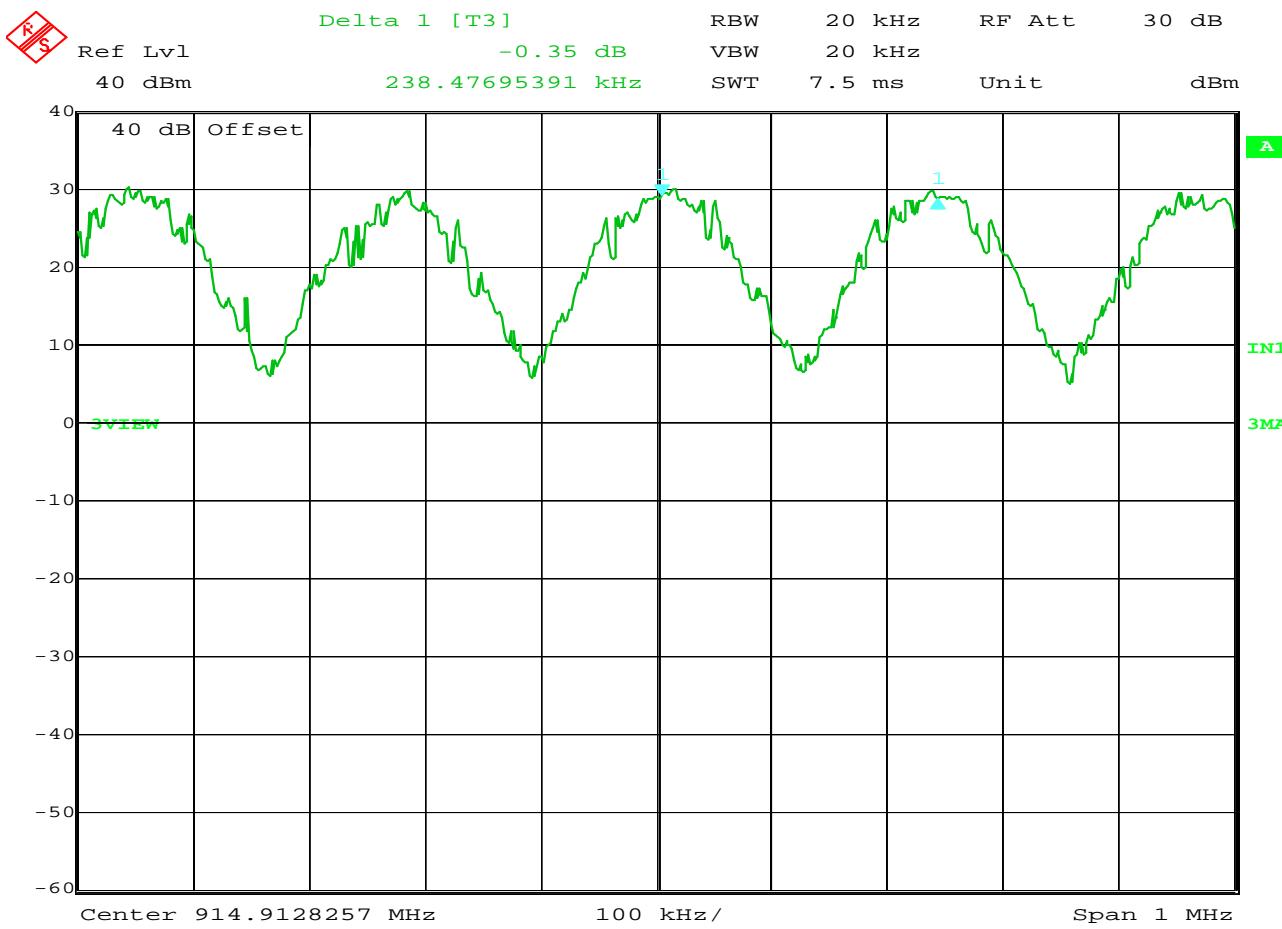
ETR NO.  
ELITE ELECTRONIC ENGINEERING CO.

MANUFACTURER : FREEWAVE TECHNOLOGIES  
MODEL : HGR-09  
S/N : 960-001  
SPECIFICATION : EN 55022, CLASS B  
TEST : LINE CONDUCTED EMISSIONS  
LINE TESTED : RETURN SIDE  
MODE : TRANSMITTING  
DATE : 29 Jan 2008  
NOTES :  
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
.152	42.4	65.9		55.9	
.247	37.8	61.9		51.9	
.347	34.0	59.0		49.0	
.444	29.2	57.0		47.0	
.637	27.4	56.0		46.0	
1.076	26.1	56.0		46.0	
2.858	25.9	56.0		46.0	
4.794	27.5	56.0		46.0	
6.955	25.6	60.0		50.0	
8.859	25.4	60.0		50.0	
12.433	25.4	60.0		50.0	
16.229	25.4	60.0		50.0	
17.696	25.4	60.0		50.0	
21.444	25.6	60.0		50.0	
24.440	25.4	60.0		50.0	
28.294	25.4	60.0		50.0	

CHECKED BY:

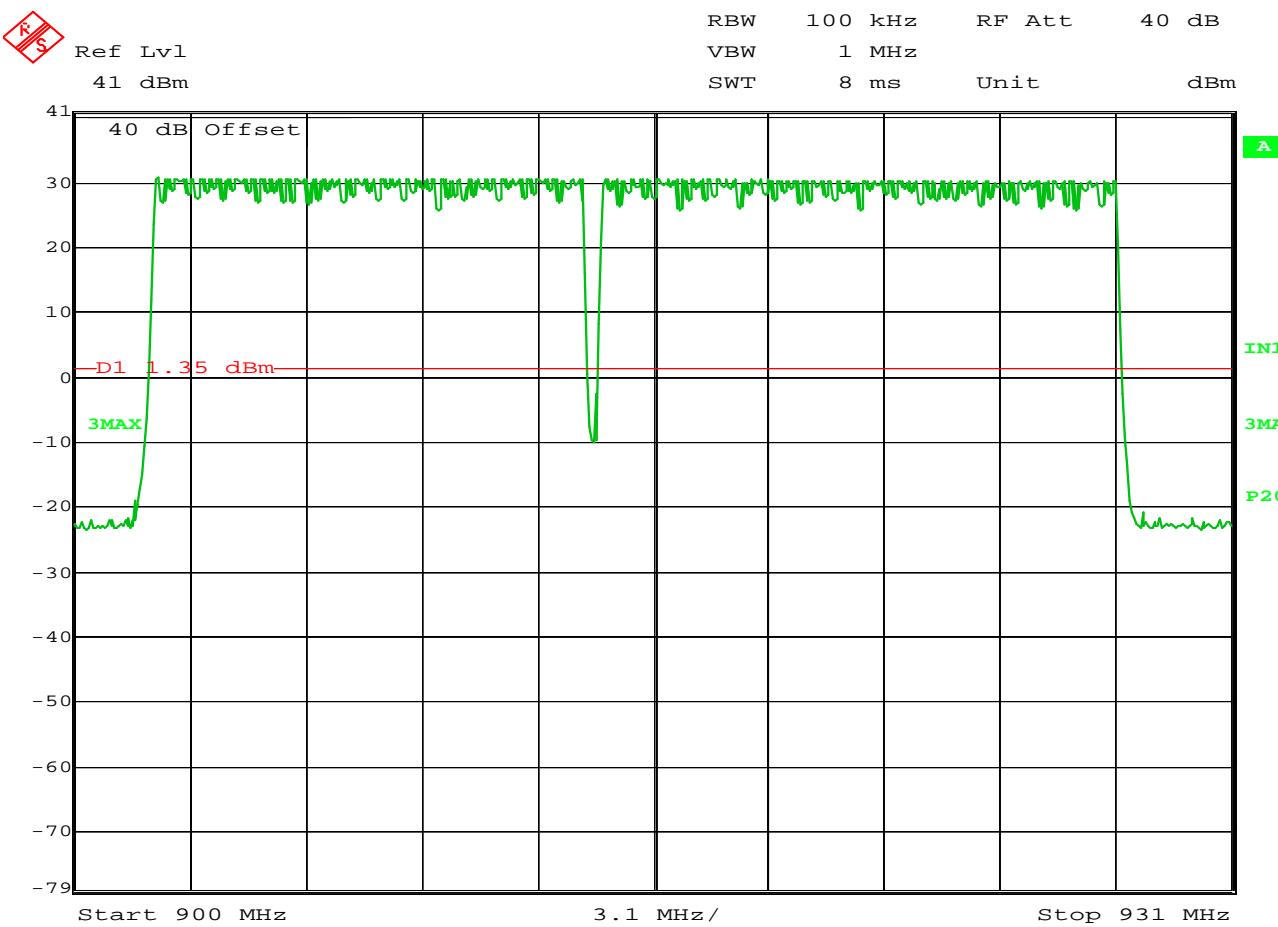
  
R. KING



Date: 3.JAN.2008 20:54:44

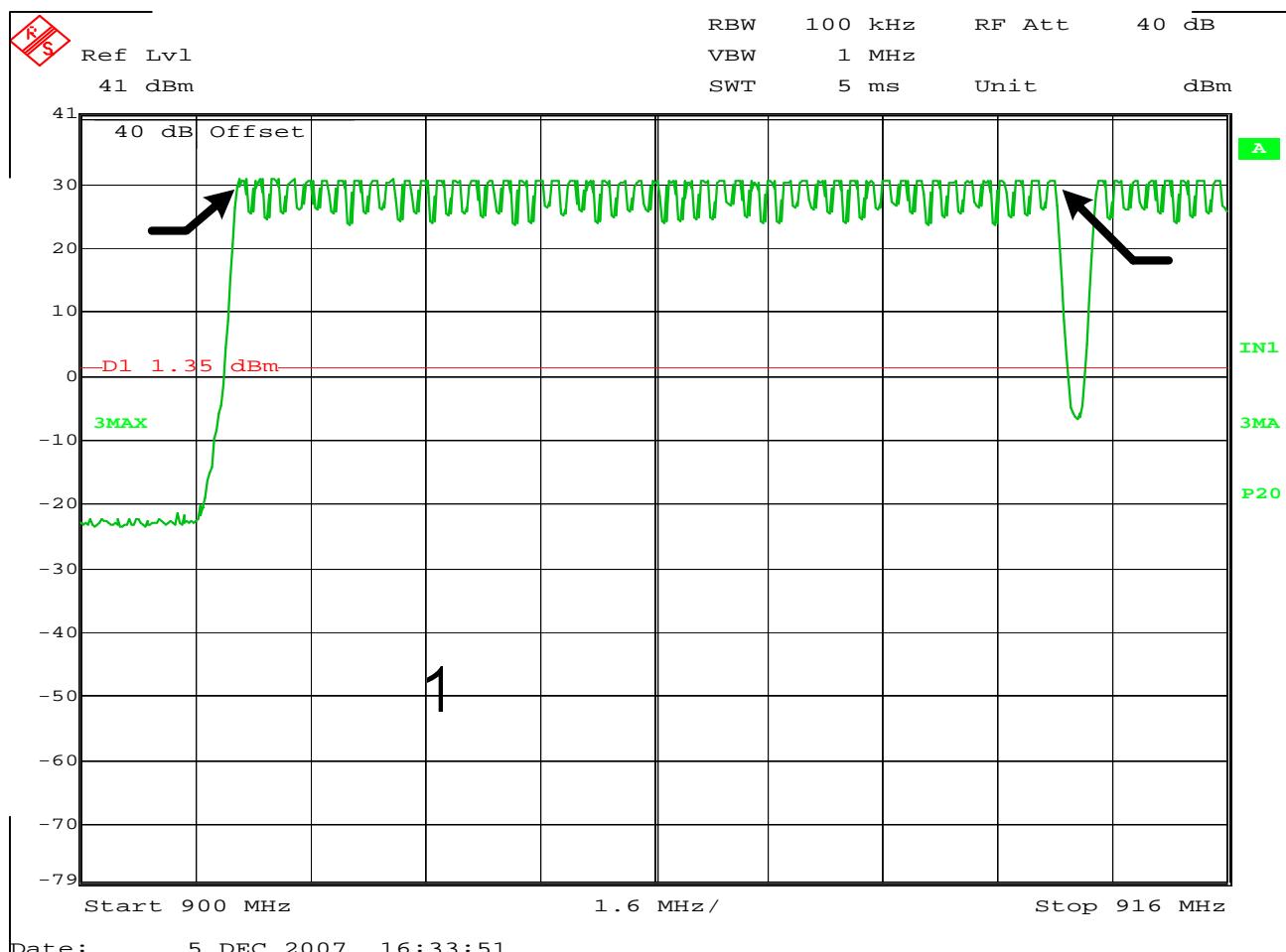
### FCC 15.247 Carrier Frequency Separation

MANUFACTURER : Free Wave Technologies  
TEST ITEM : Transceiver  
MODEL NUMBER : FGR2  
SERIAL NUMBER : 960-0047  
TEST MODE : Frequency Hopping  
NOTES :



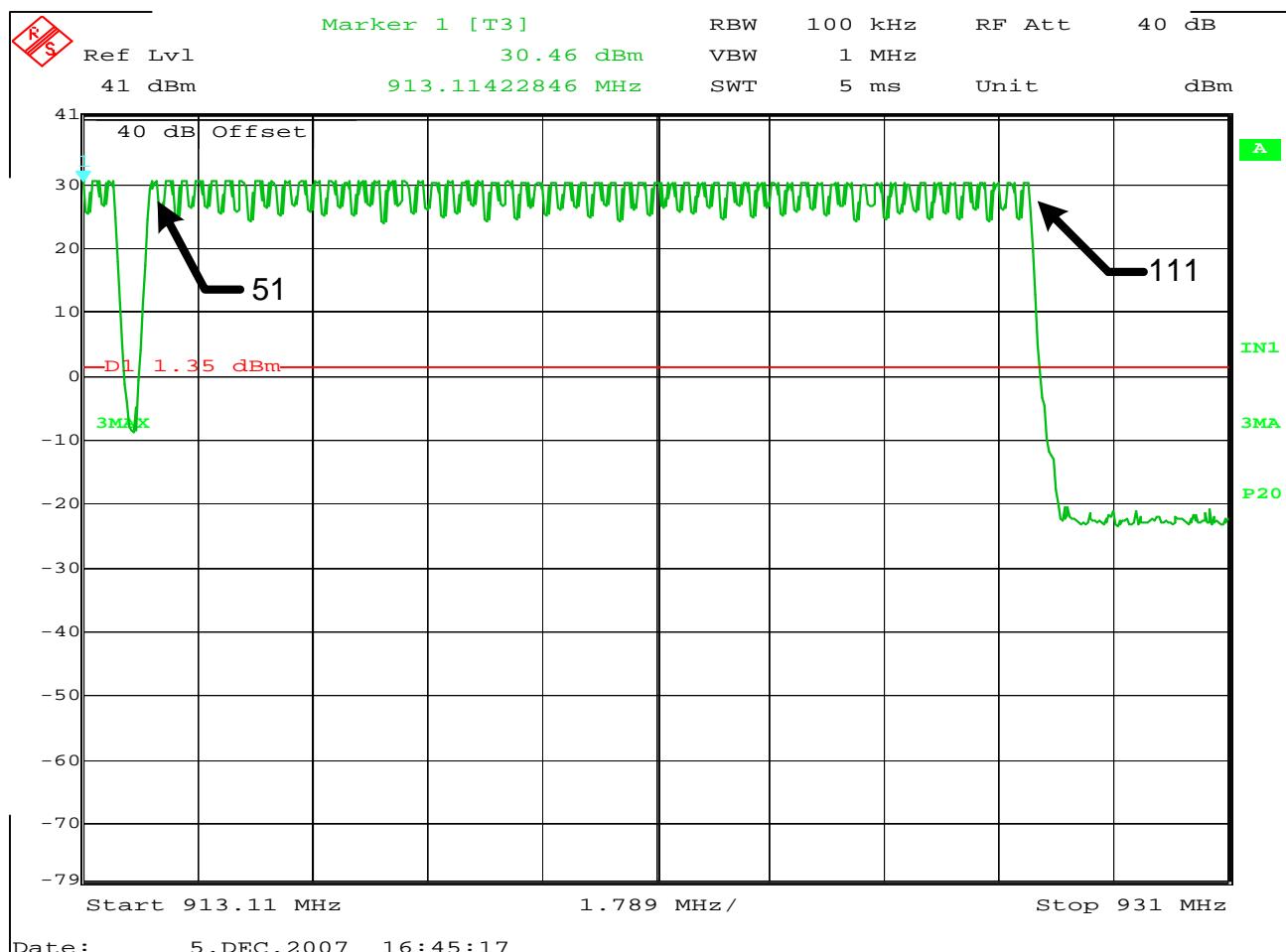
### FCC 15.247 Number of Hopping Frequencies

MANUFACTURER : Free Wave Technologies  
TEST ITEM : Transceiver  
MODEL NUMBER : FGR2  
SERIAL NUMBER : 960-0047  
TEST MODE : Frequency Hopping  
NOTES :



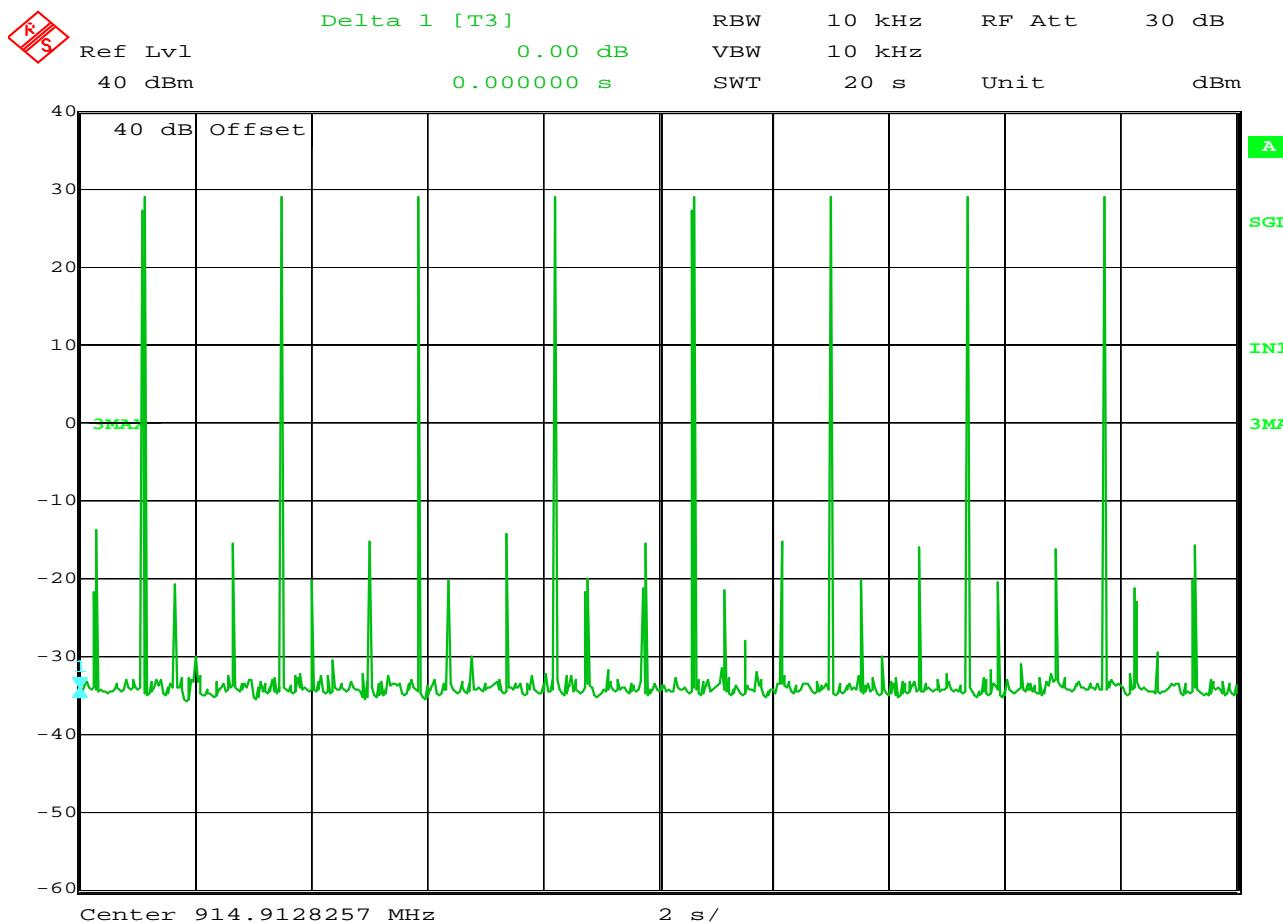
### FCC 15.247 Number of Hopping Frequencies

MANUFACTURER : Free Wave Technologies  
 TEST ITEM : Transceiver  
 MODEL NUMBER : FGR2  
 SERIAL NUMBER : 960-0047  
 TEST MODE : Frequency Hopping  
 NOTES :



### FCC 15.247 Number of Hopping Frequencies

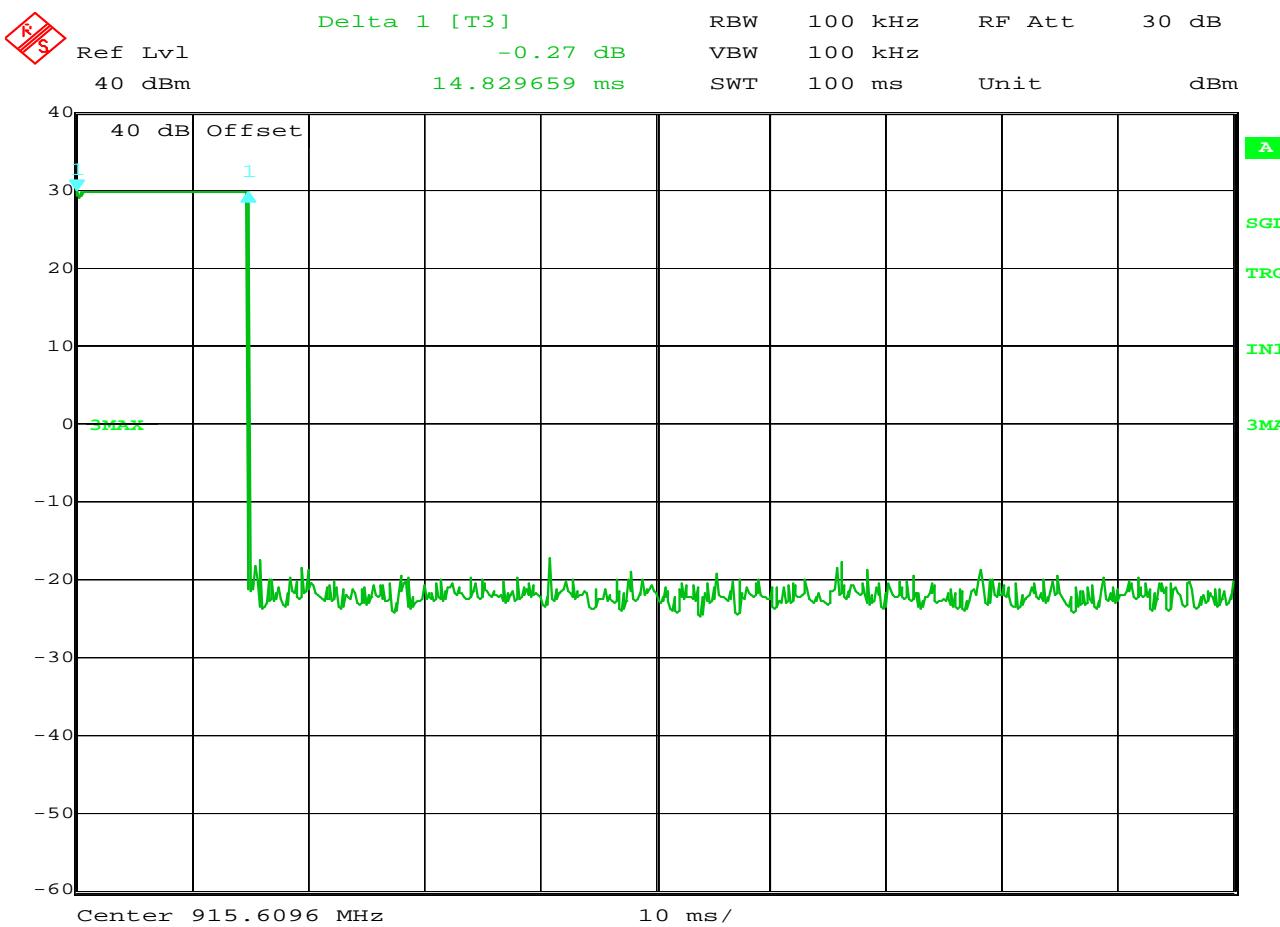
MANUFACTURER : Free Wave Technologies  
 TEST ITEM : Transceiver  
 MODEL NUMBER : FGR2  
 SERIAL NUMBER : 960-0047  
 TEST MODE : Frequency Hopping  
 NOTES :



Date: 3.JAN.2008 20:56:26

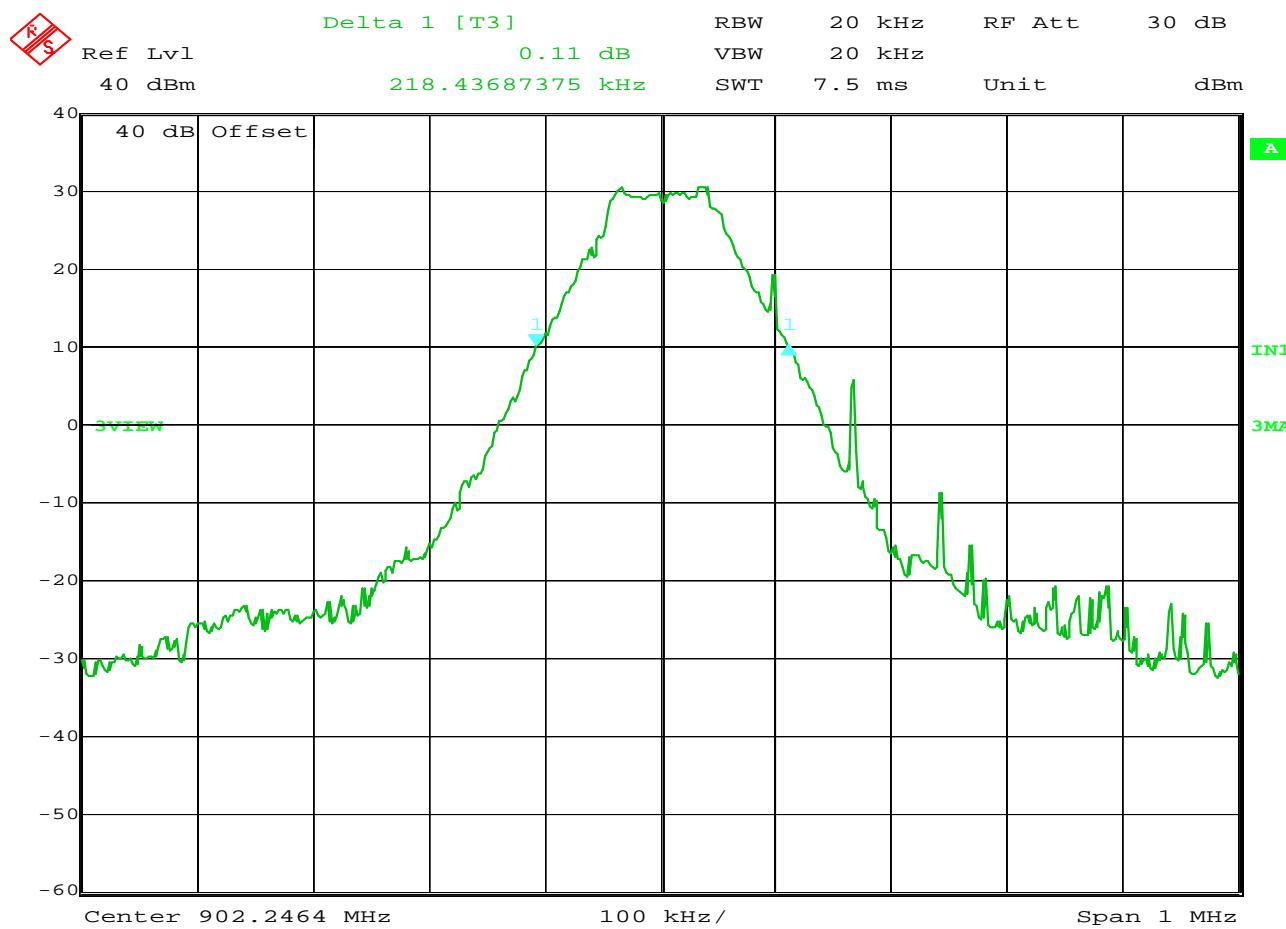
#### FCC 15.247 Dwell Time

MANUFACTURER : Free Wave Technologies  
TEST ITEM : Transceiver  
MODEL NUMBER : FGR2  
SERIAL NUMBER : 960-0047  
TEST MODE : Frequency Hopping enabled  
NOTES : 9 hits on a channel in 20 seconds



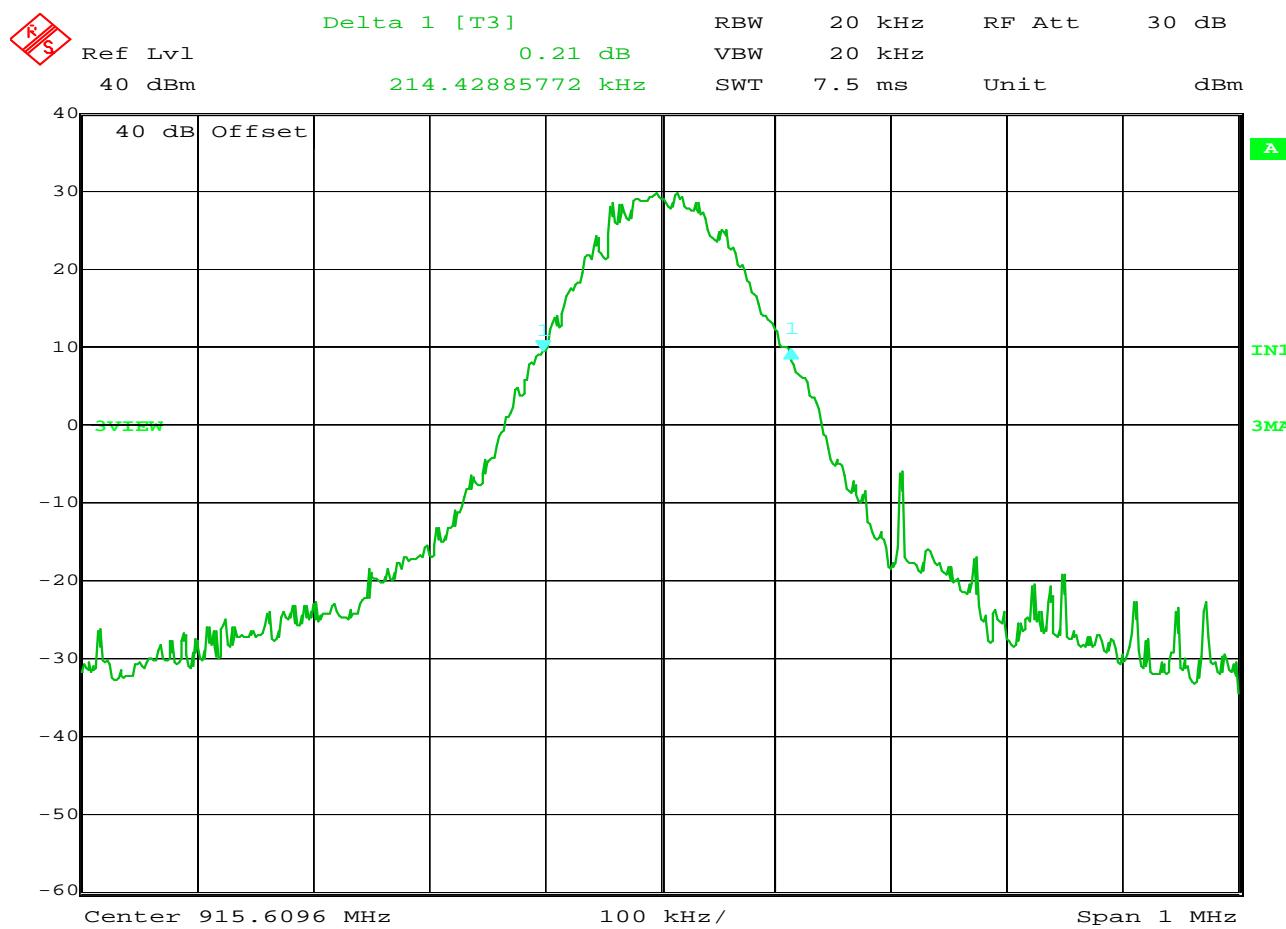
### FCC 15.247 Dwell Time

MANUFACTURER : Free Wave Technologies  
TEST ITEM : Transceiver  
MODEL NUMBER : FGR2  
SERIAL NUMBER : 960-0047  
TEST MODE : Frequency Hopping enabled  
NOTES : Pulse width



FCC 15.247 20 dB bandwidth

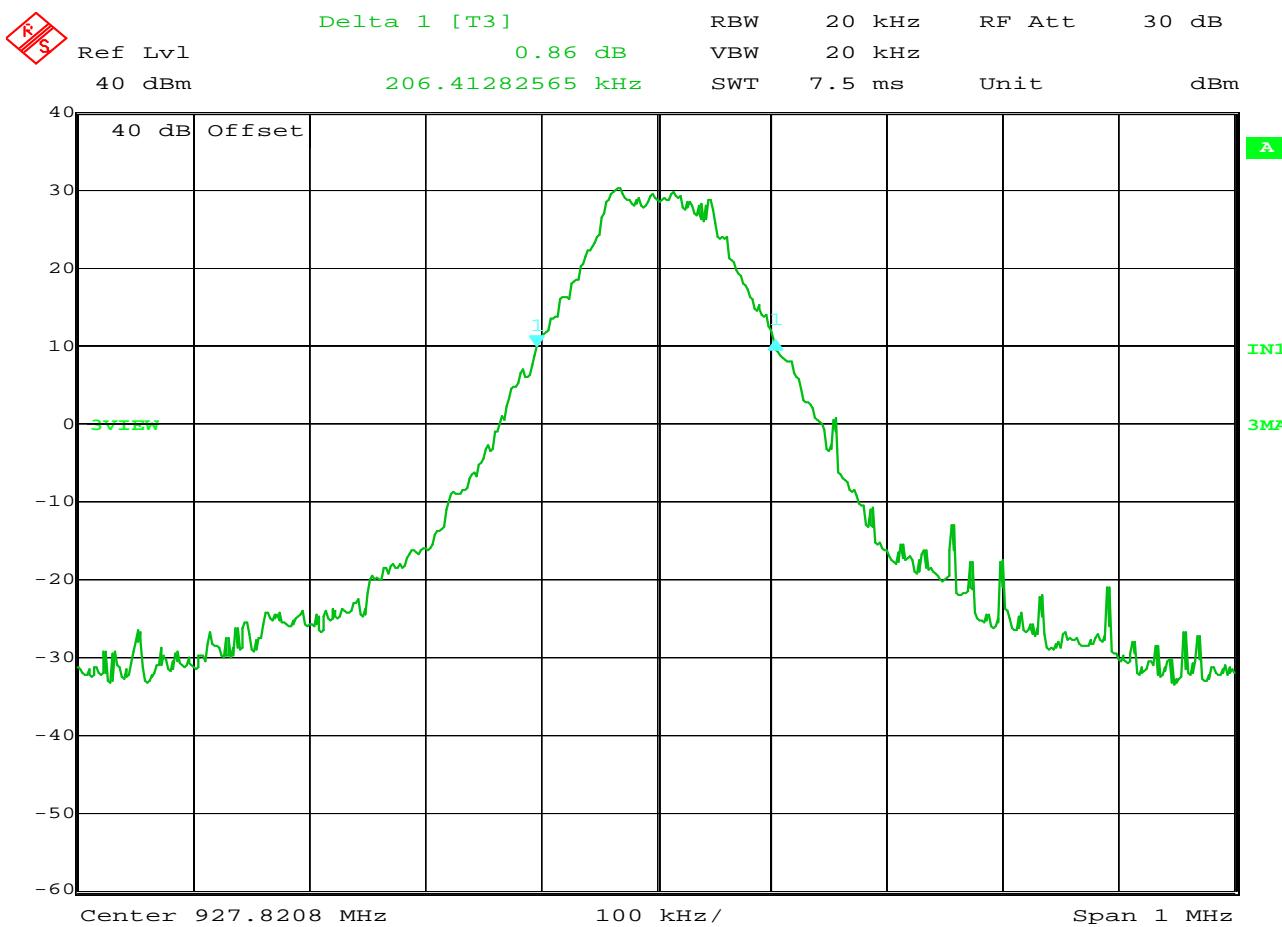
**MANUFACTURER** : Free Wave Technologies  
**TEST ITEM** : Transceiver  
**MODEL NUMBER** : FGR2  
**SERIAL NUMBER** : 960-0047  
**TEST MODE** : Tx @ 902.2464 MHz  
**NOTES** :



Date: 3.JAN.2008 20:42:13

FCC 15.247 20 dB bandwidth

MANUFACTURER : Free Wave Technologies  
TEST ITEM : Transceiver  
MODEL NUMBER : FGR2  
SERIAL NUMBER : 960-0047  
TEST MODE : Tx @ 915.6096 MHz  
NOTES :



### FCC 15.247 20 dB bandwidth

MANUFACTURER : Free Wave Technologies  
TEST ITEM : Transceiver  
MODEL NUMBER : FGR2  
SERIAL NUMBER : 960-0047  
TEST MODE : Tx @ 927.8208 MHz  
NOTES :



## Data Page

MANUFACTURER : Free Wave Technologies  
MODEL NO. : FGR2  
SERIAL NO. : 960-0047  
SPECIFICATION : FCC 15.247 Frequency Hopping Spread Spectrum  
TEST PERFORMED : RF Output Power - Conducted  
DATE : December 18, 2007  
NOTES :

UNIT	Rated Power (Watts)	Frequency (MHz)	Meter Reading (dBm)	Attenuation (dB)	Total (dBm)	Limit (dBm)	Total (Watts)	Limit (Watts)
FGR2	1	902.2464	-10.4	40.0	29.6	30.0	0.912	1.000
FGR2	1	915.6096	-10.4	40.0	29.6	30.0	0.912	1.000
FGR2	1	927.8208	-10.4	40.0	29.6	30.0	0.912	1.000

Checked BY : *Richard E. King*

Richard E. King

## Data Page

MANUFACTURER : Free Wave Technologies  
MODEL NO. : FGR2  
SERIAL NO. : 960-0047  
SPECIFICATION : FCC 15.247 Frequency Hopping Spread Spectrum  
TEST PERFORMED : RF Output Power – Omni Antenna  
DATE : December 18, 2007  
NOTES : Test Distance is 3 meters

EIRP = Sig. Gen. Reading + Antenna Gain – Cable Loss

Frequency MHz	Antenna Polarity	Meter Reading dBuV	Matched Signal Generator Reading dBm	Antenna Gain dB	Cable Loss dB	EIRP dBm	Limit dBm
902.2	H	92.4	23.8	0.0	1.6	22.2	36
902.2	V	104.8	36.2	0.0	1.6	34.6	36
915.6	H	90.3	21.2	0.0	1.6	19.6	36
915.6	V	104.1	35.0	0.0	1.6	33.4	36
927.8	H	91.5	22.1	0.0	1.6	20.5	36
927.8	V	103.4	34.4	0.0	1.6	32.8	36

Checked BY : *Richard E. King*

Richard E. King

## Data Page

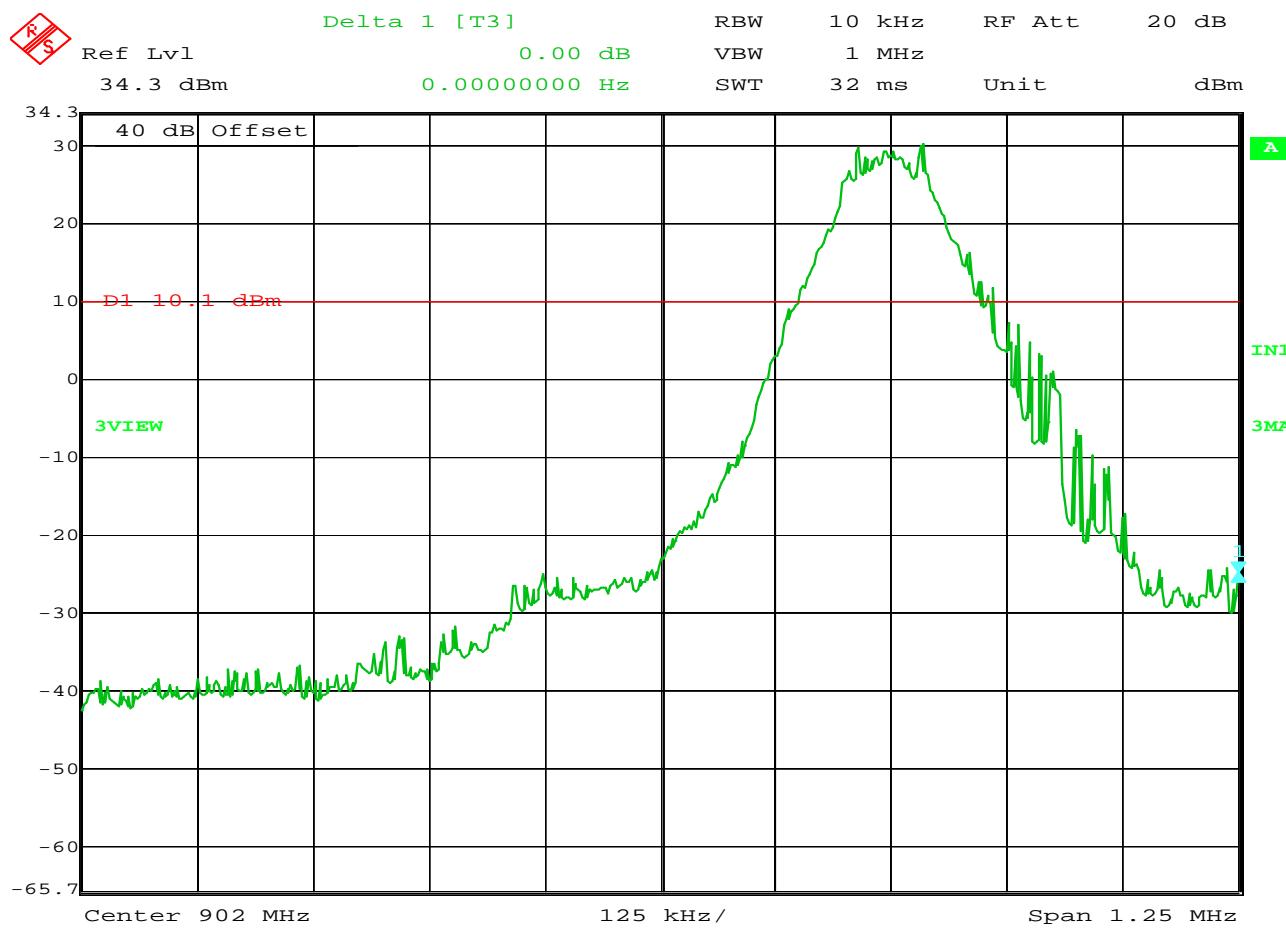
MANUFACTURER : Free Wave Technologies  
MODEL NO. : FGR2  
SERIAL NO. : 960-0047  
SPECIFICATION : FCC 15.247 Frequency Hopping Spread Spectrum  
TEST PERFORMED : RF Output Power – Yagi Antenna  
DATE : December 18, 2007  
NOTES : Test Distance is 3 meters

EIRP = Sig. Gen. Reading + Antenna Gain – Cable Loss

Frequency MHz	Antenna Polarity	Meter Reading dBuV	Matched Signal Generator Reading dBm	Antenna Gain dB	Cable Loss dB	EIRP dBm	Limit dBm
902.2	H	95.4	26.2	0.0	1.6	24.6	36
902.2	V	106.4	37.2	0.0	1.6	35.6	36
915.6	H	90.0	20.9	0.0	1.6	19.3	36
915.6	V	105.5	36.4	0.0	1.6	34.8	36
927.8	H	93.6	24.2	0.0	1.6	22.6	36
927.8	V	106.1	37.1	0.0	1.6	35.5	36

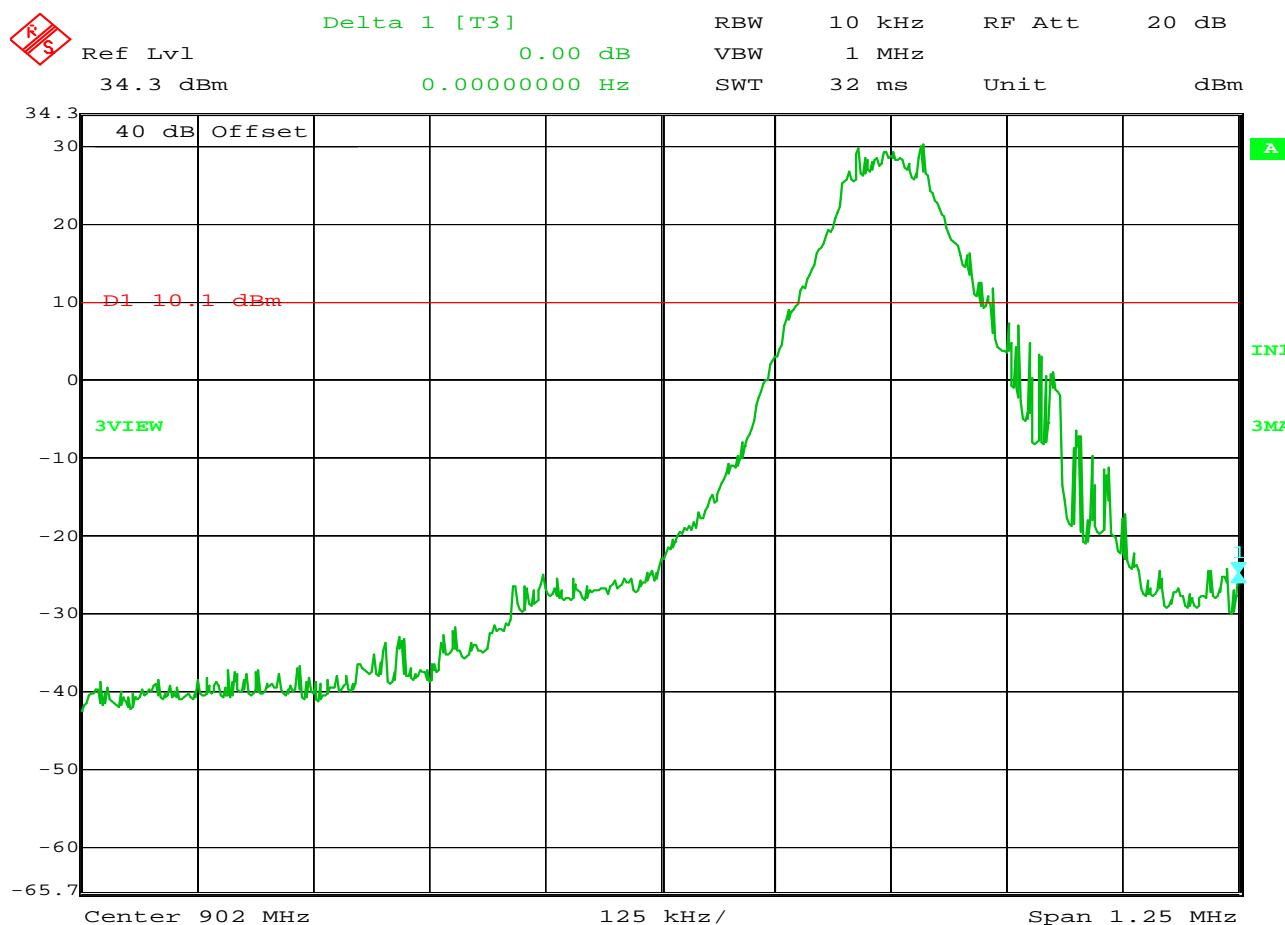
Checked BY : *Richard E. King*

Richard E. King



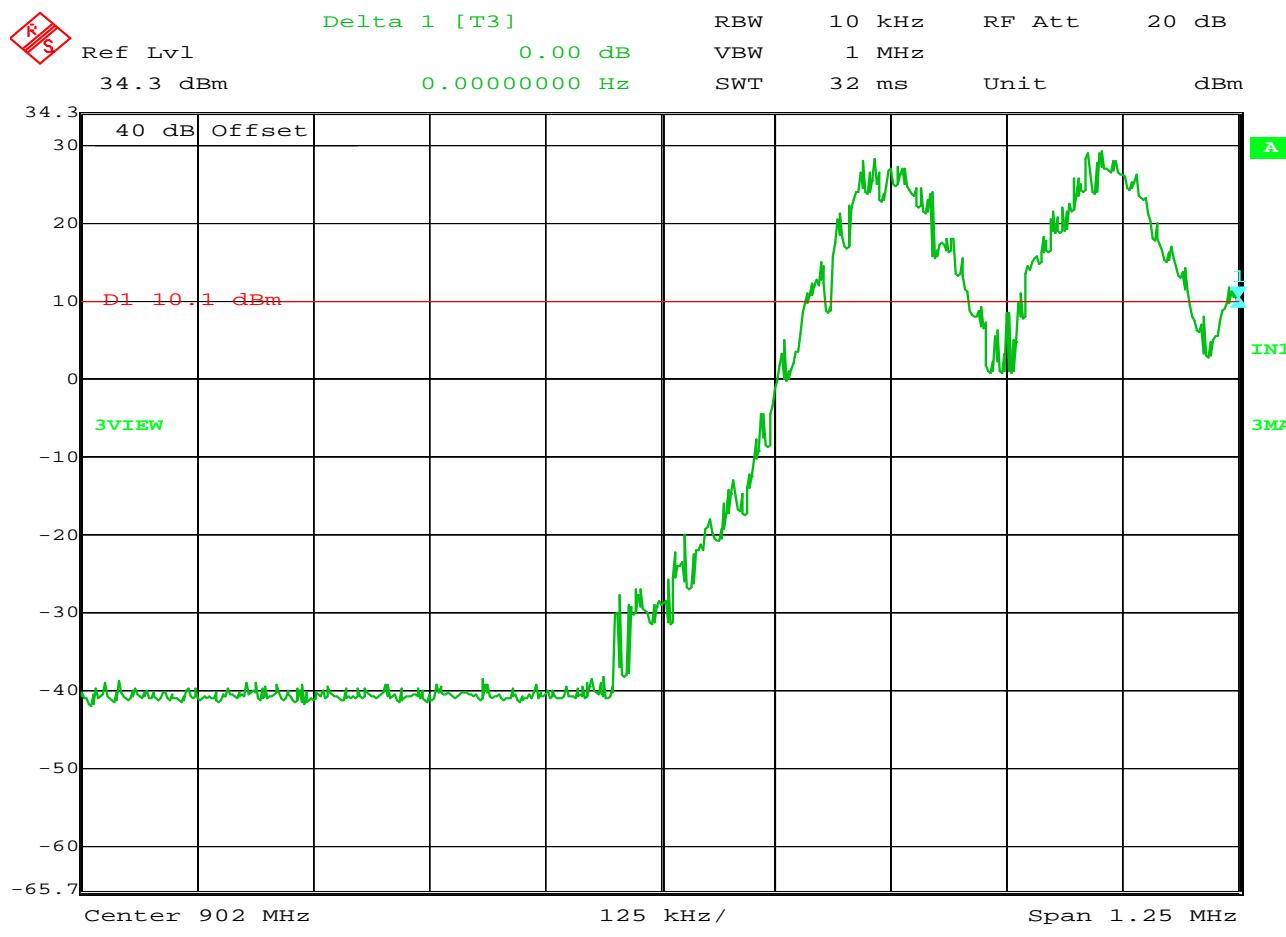
### FCC 15.247 Bandedge Compliance

MANUFACTURER : Free Wave Technologies  
TEST ITEM : Transceiver  
MODEL NUMBER : FGR2  
SERIAL NUMBER : 960-0047  
TEST MODE : Tx @ 902.2464 MHz  
NOTES :



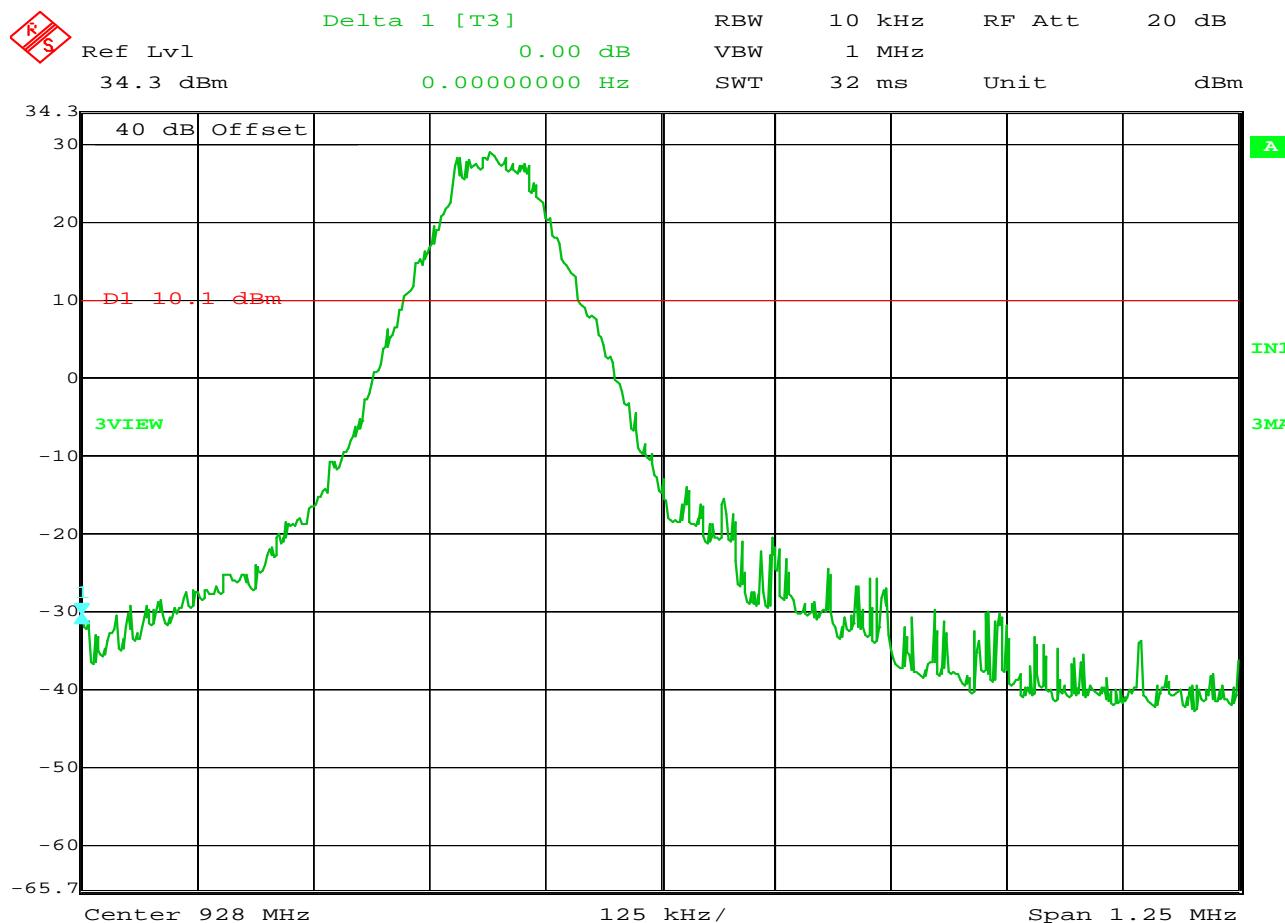
### FCC 15.247 Bandedge Compliance

MANUFACTURER : Free Wave Technologies  
TEST ITEM : Transceiver  
MODEL NUMBER : FGR2  
SERIAL NUMBER : 960-0047  
TEST MODE : Tx @ 902.2464 MHz  
NOTES :



### FCC 15.247 Bandedge Compliance

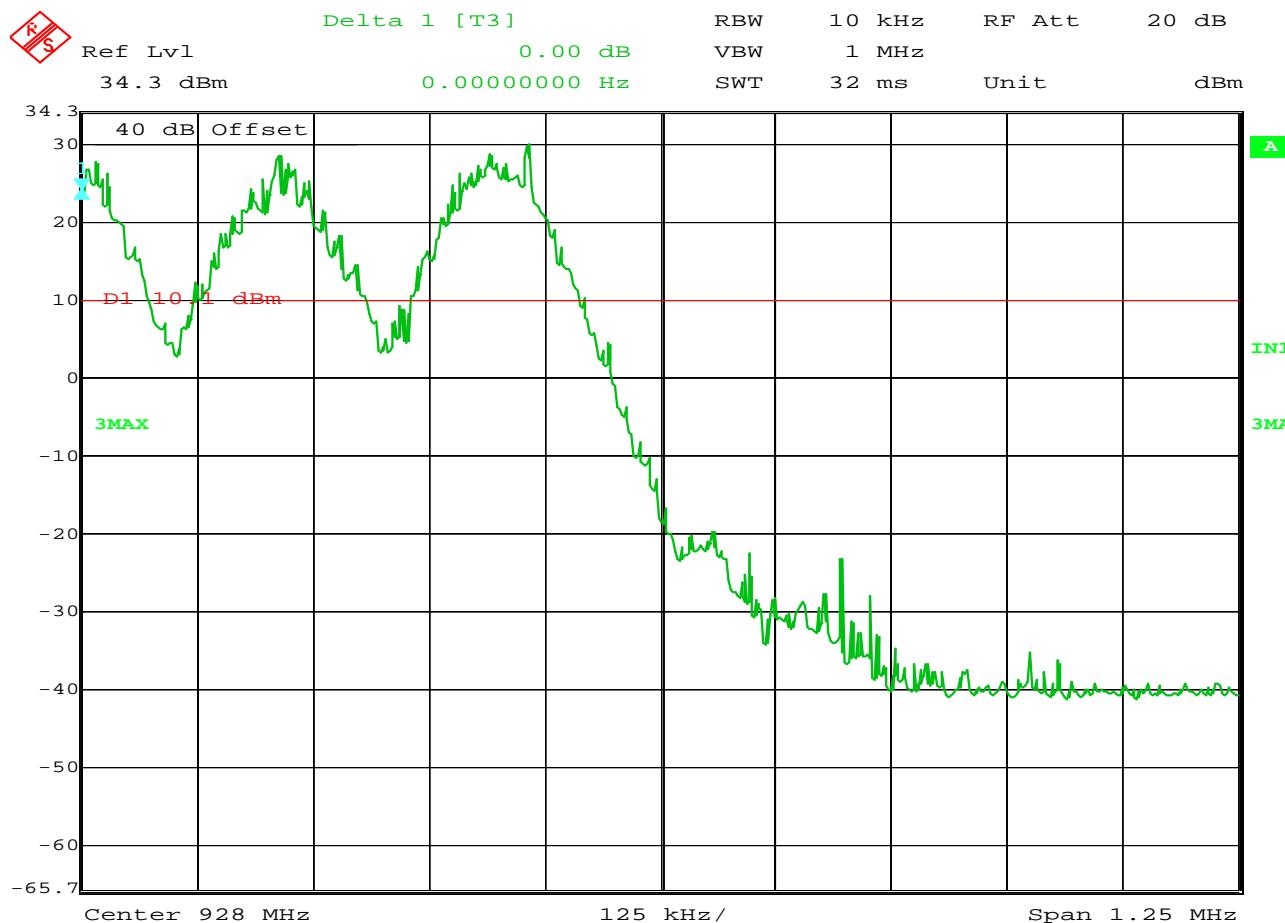
MANUFACTURER : Free Wave Technologies  
TEST ITEM : Transceiver  
MODEL NUMBER : FGR2  
SERIAL NUMBER : 960-0047  
TEST MODE : Tx @ 902.2464 MHz  
NOTES :



Date: 3.JAN.2008 21:22:31

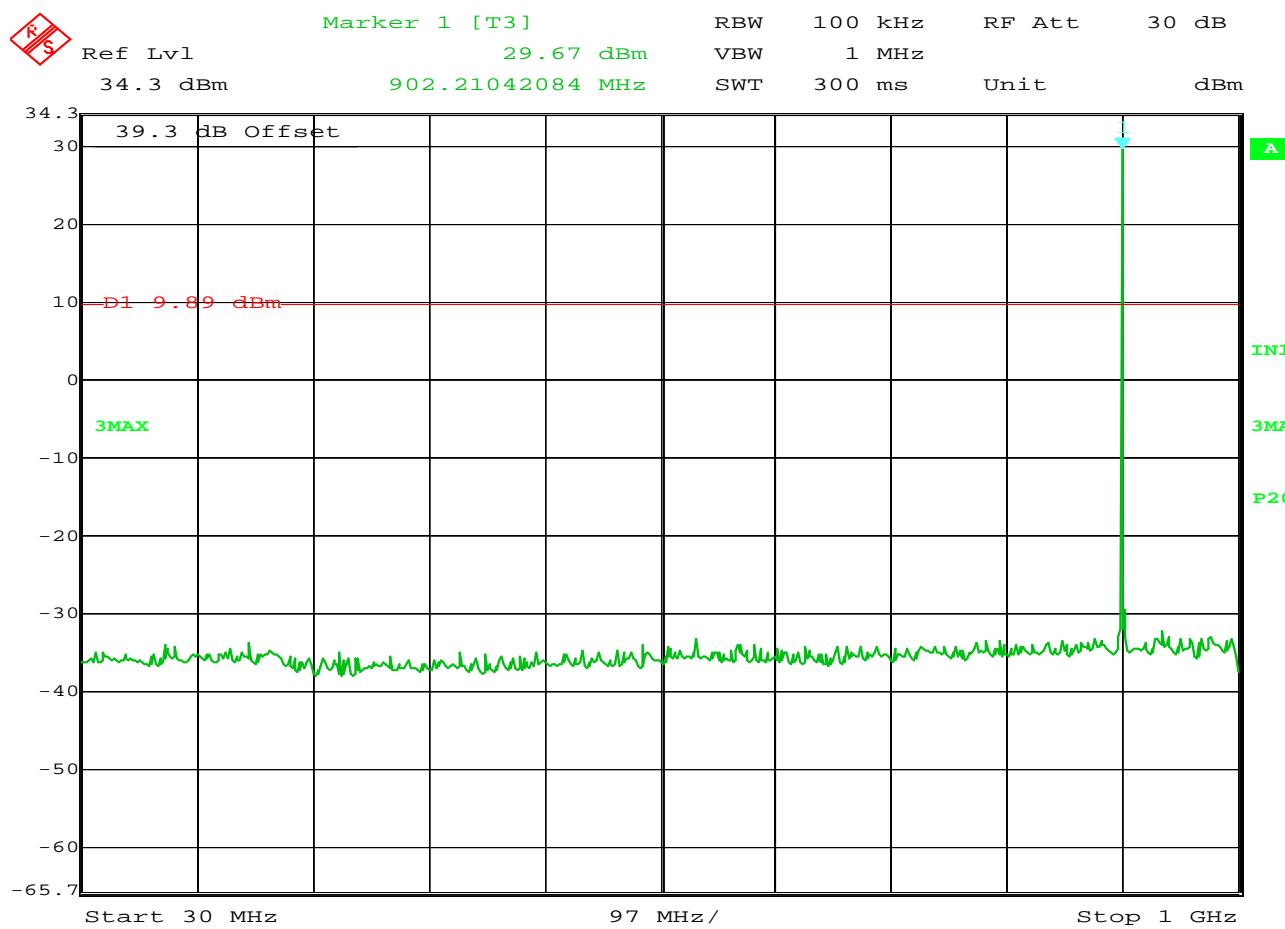
### FCC 15.247 Bandedge Compliance

MANUFACTURER : Free Wave Technologies  
TEST ITEM : Transceiver  
MODEL NUMBER : FGR2  
SERIAL NUMBER : 960-0047  
TEST MODE : Tx @ 927.8208 MHz  
NOTES :



### FCC 15.247 Bandedge Compliance

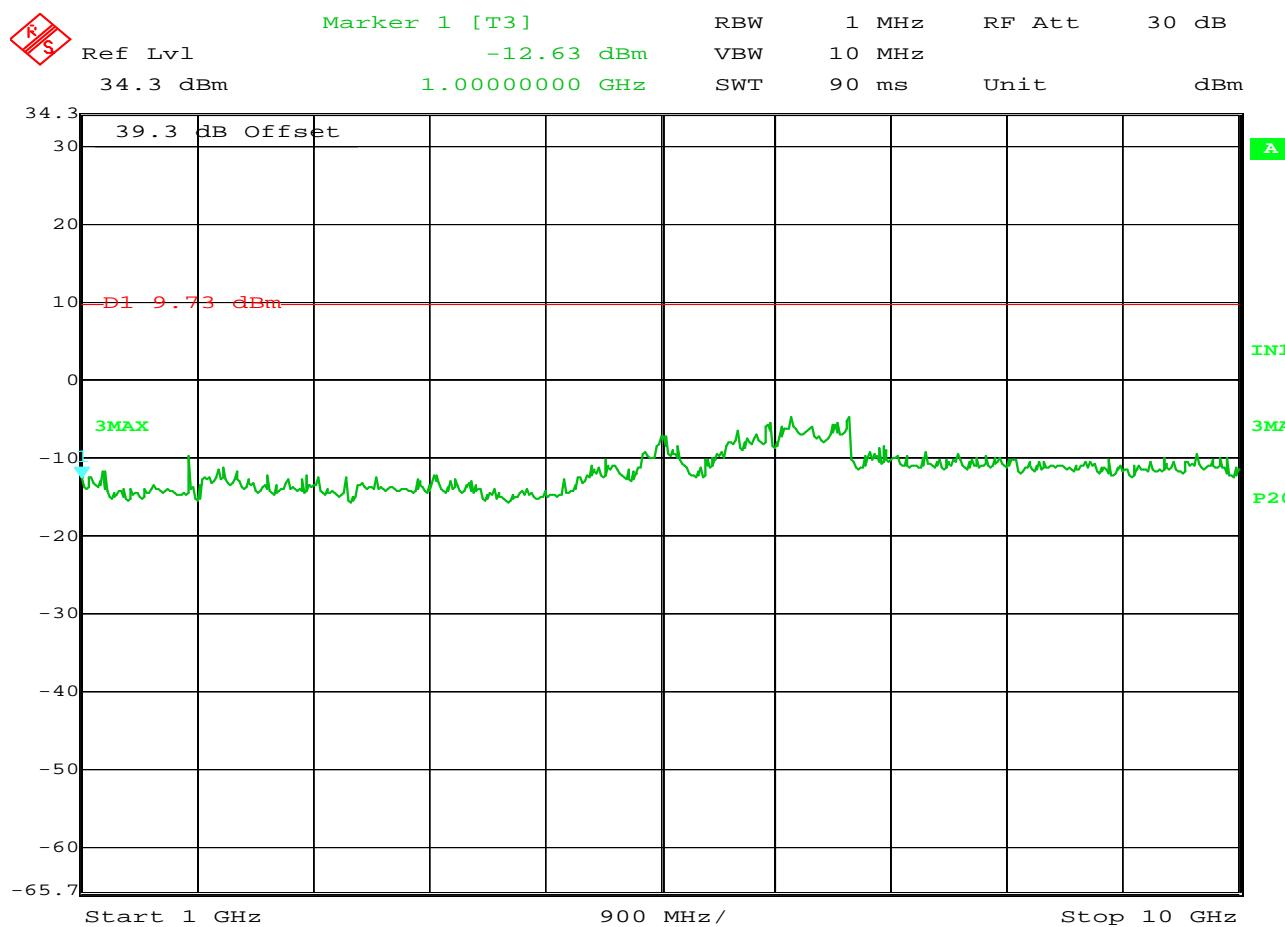
**MANUFACTURER** : Free Wave Technologies  
**TEST ITEM** : Transceiver  
**MODEL NUMBER** : FGR2  
**SERIAL NUMBER** : 960-0047  
**TEST MODE** : Tx @ 927.8208 MHz  
**NOTES** :



Date: 3.DEC.2007 21:39:11

### FCC 15.247 Antenna Conducted

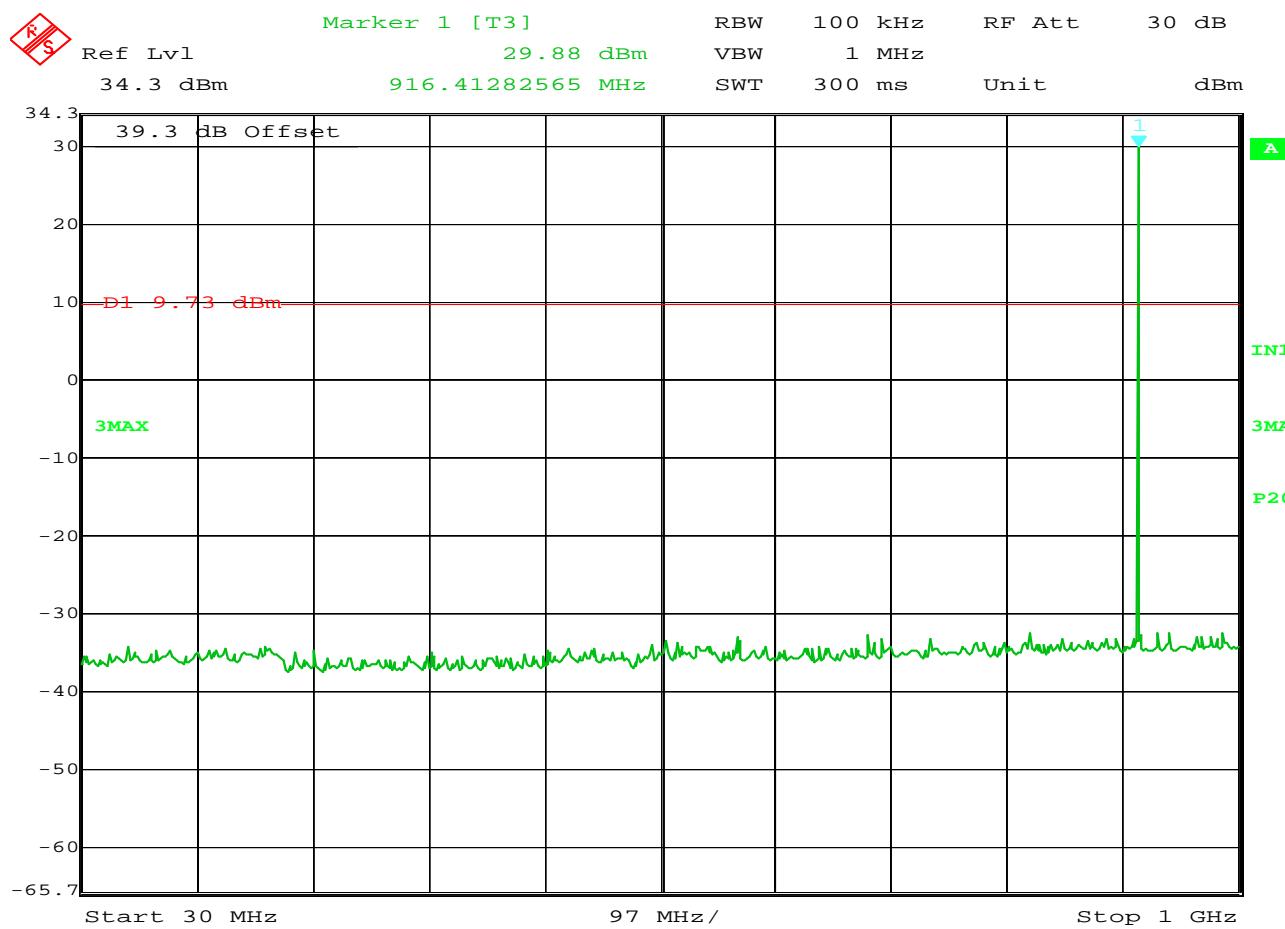
MANUFACTURER : Free Wave Technologies  
TEST ITEM : Transceiver  
MODEL NUMBER : FGR2  
SERIAL NUMBER : 960-0047  
TEST MODE : Tx @ 902.2464 MHz  
NOTES :



Date: 3.DEC.2007 22:24:09

### FCC 15.247 Antenna Conducted

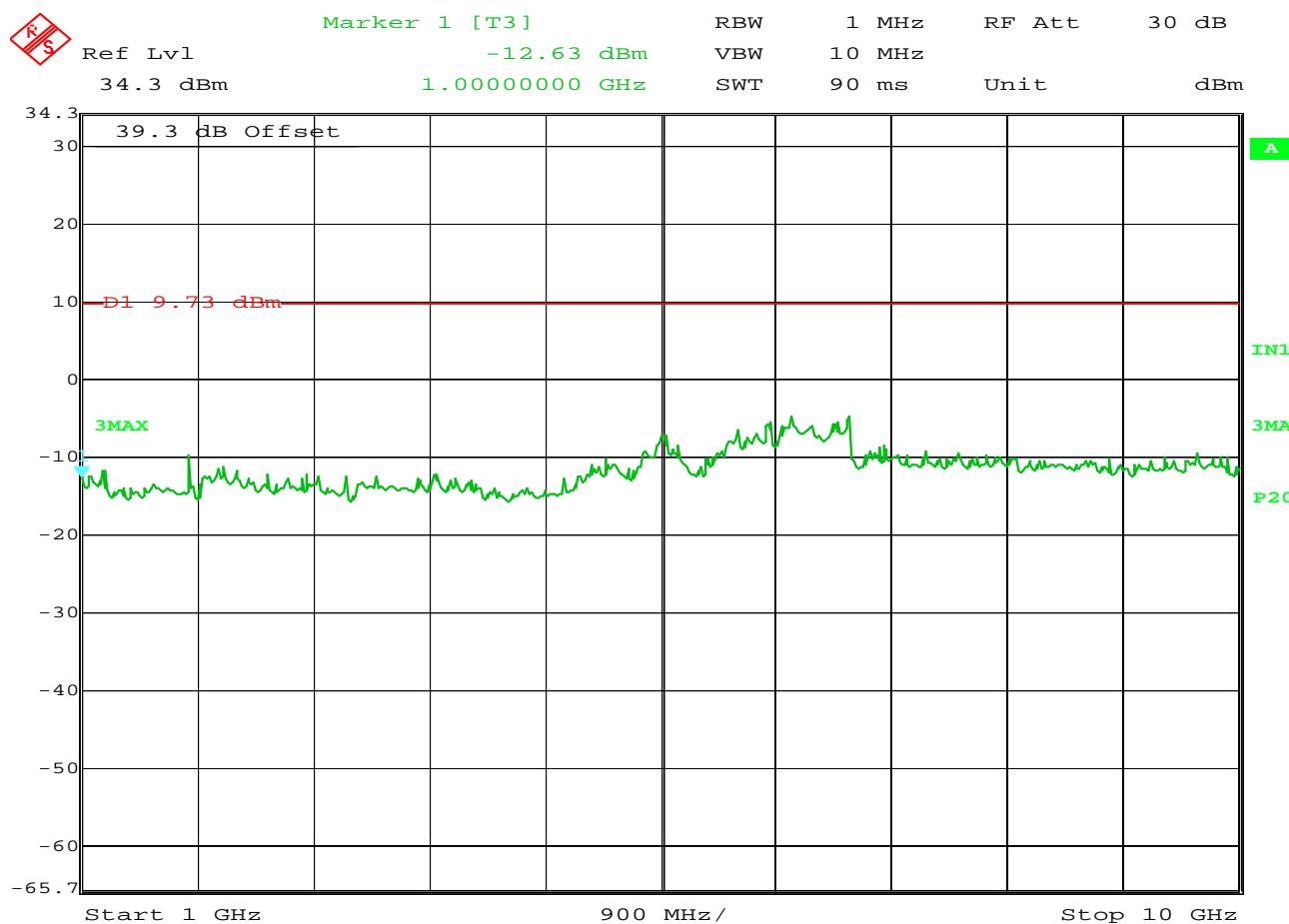
MANUFACTURER : Free Wave Technologies  
TEST ITEM : Transceiver  
MODEL NUMBER : FGR2  
SERIAL NUMBER : 960-0047  
TEST MODE : Tx @ 902.2464 MHz  
NOTES :



Date: 3.DEC.2007 22:20:57

### FCC 15.247 Antenna Conducted

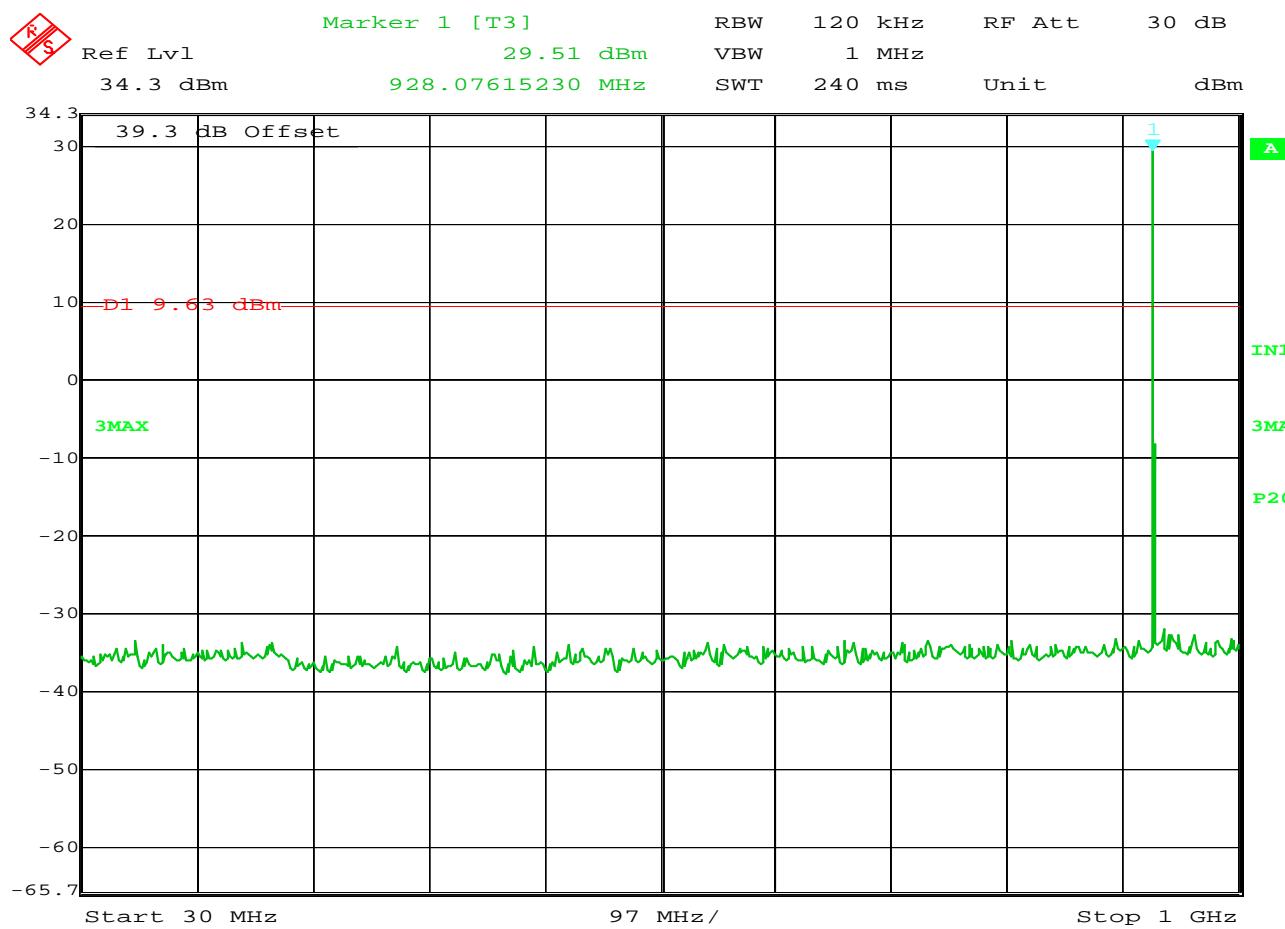
MANUFACTURER : Free Wave Technologies  
TEST ITEM : Transceiver  
MODEL NUMBER : FGR2  
SERIAL NUMBER : 960-0047  
TEST MODE : Tx @ 915.6096 MHz  
NOTES :



Date: 3.DEC.2007 22:24:09

### FCC 15.247 Antenna Conducted

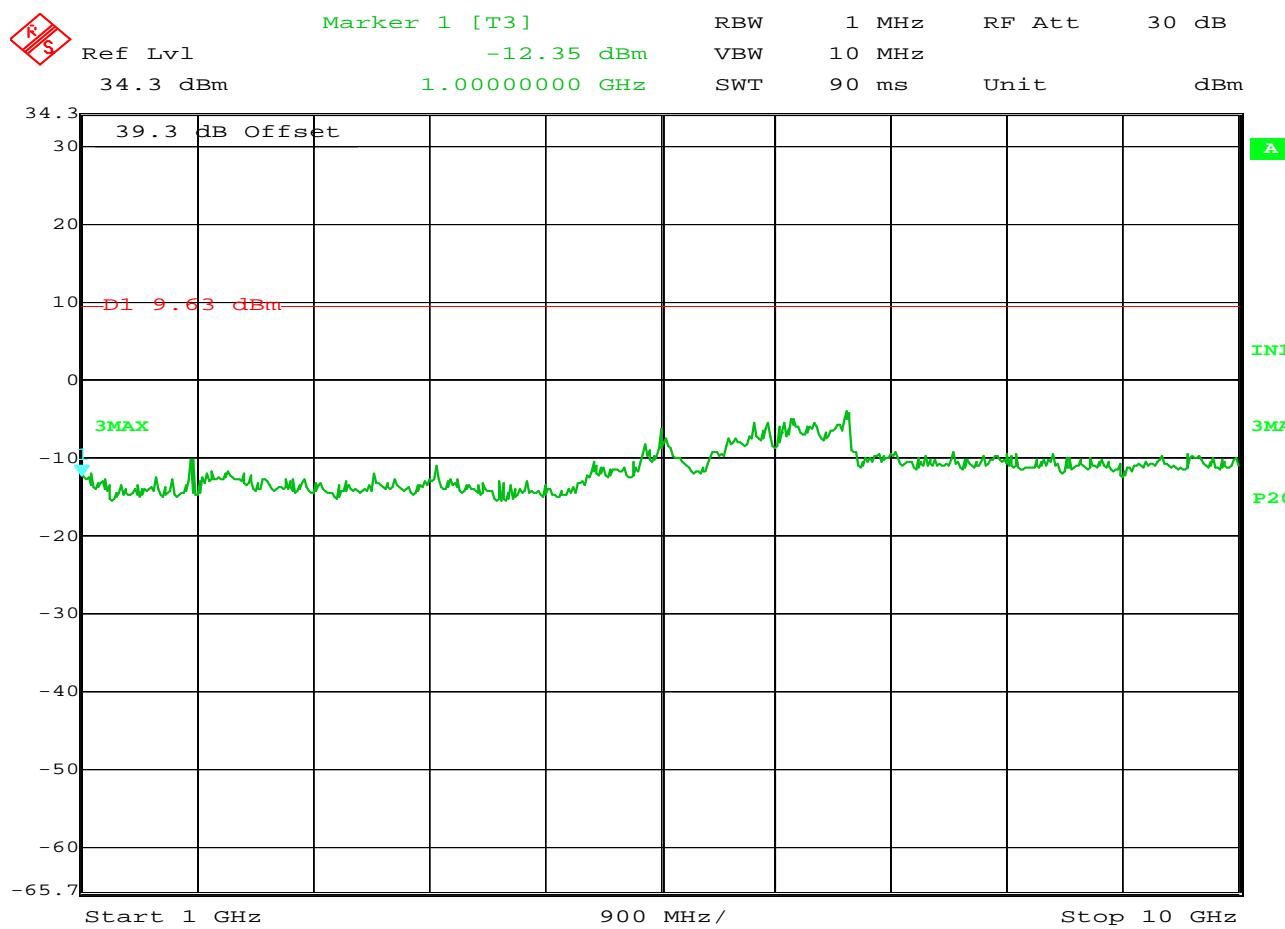
MANUFACTURER : Free Wave Technologies  
TEST ITEM : Transceiver  
MODEL NUMBER : FGR2  
SERIAL NUMBER : 960-0047  
TEST MODE : Tx @ 915.6096 MHz  
NOTES :



Date: 3.DEC.2007 22:26:48

#### FCC 15.247 Antenna Conducted

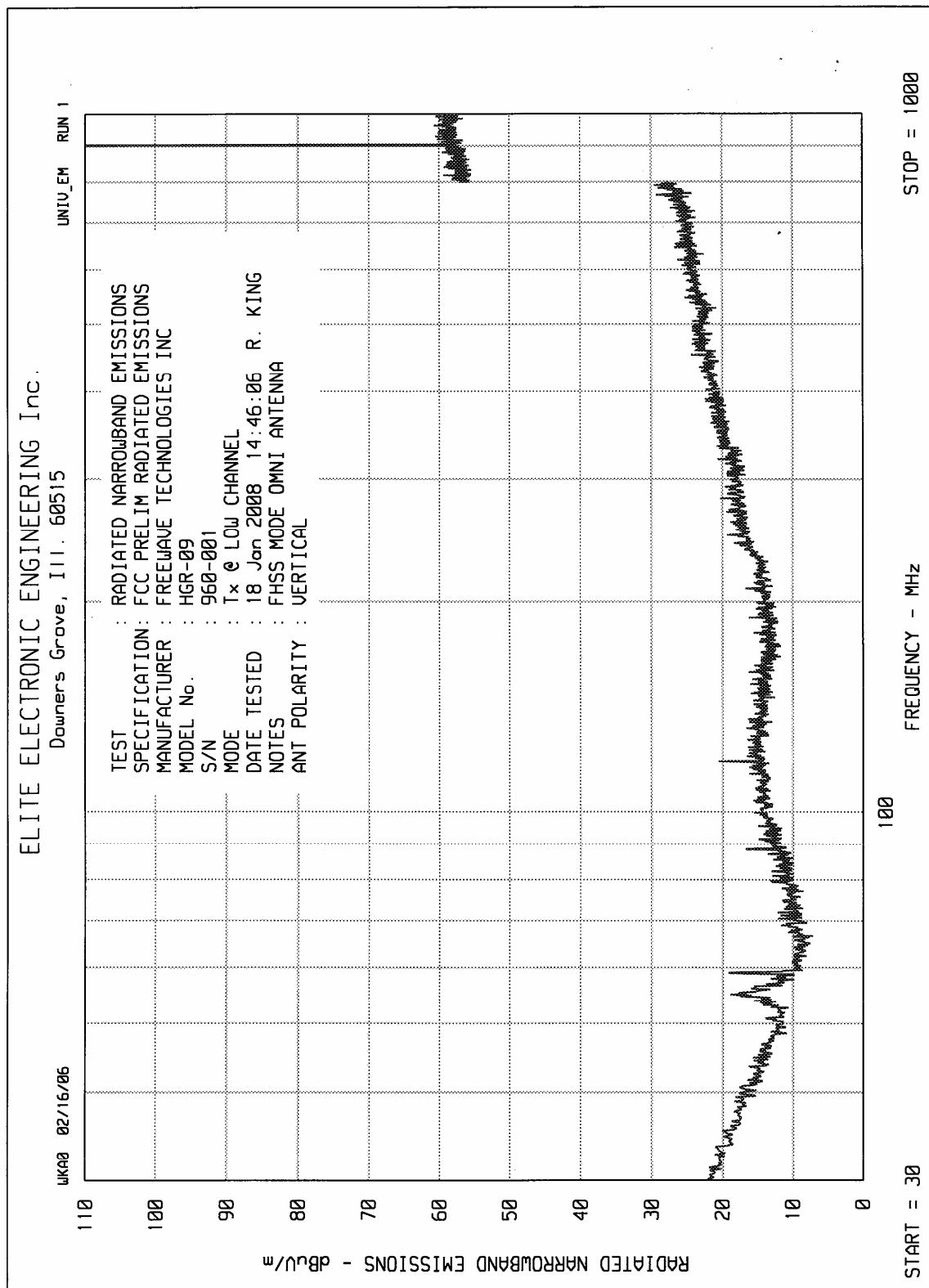
MANUFACTURER : Free Wave Technologies  
TEST ITEM : Transceiver  
MODEL NUMBER : FGR2  
SERIAL NUMBER : 960-0047  
TEST MODE : Tx @ 927.8208 MHz  
NOTES :

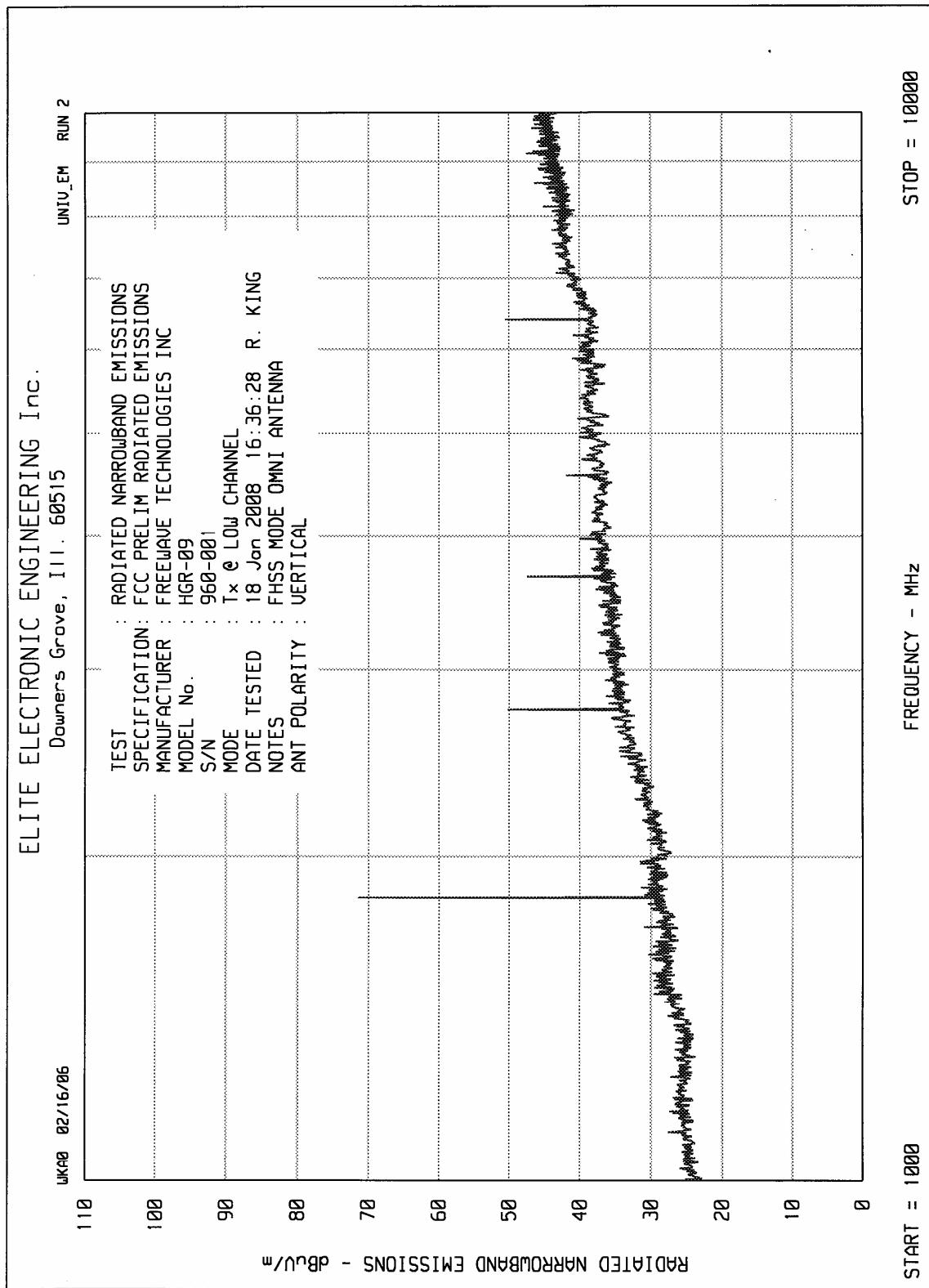


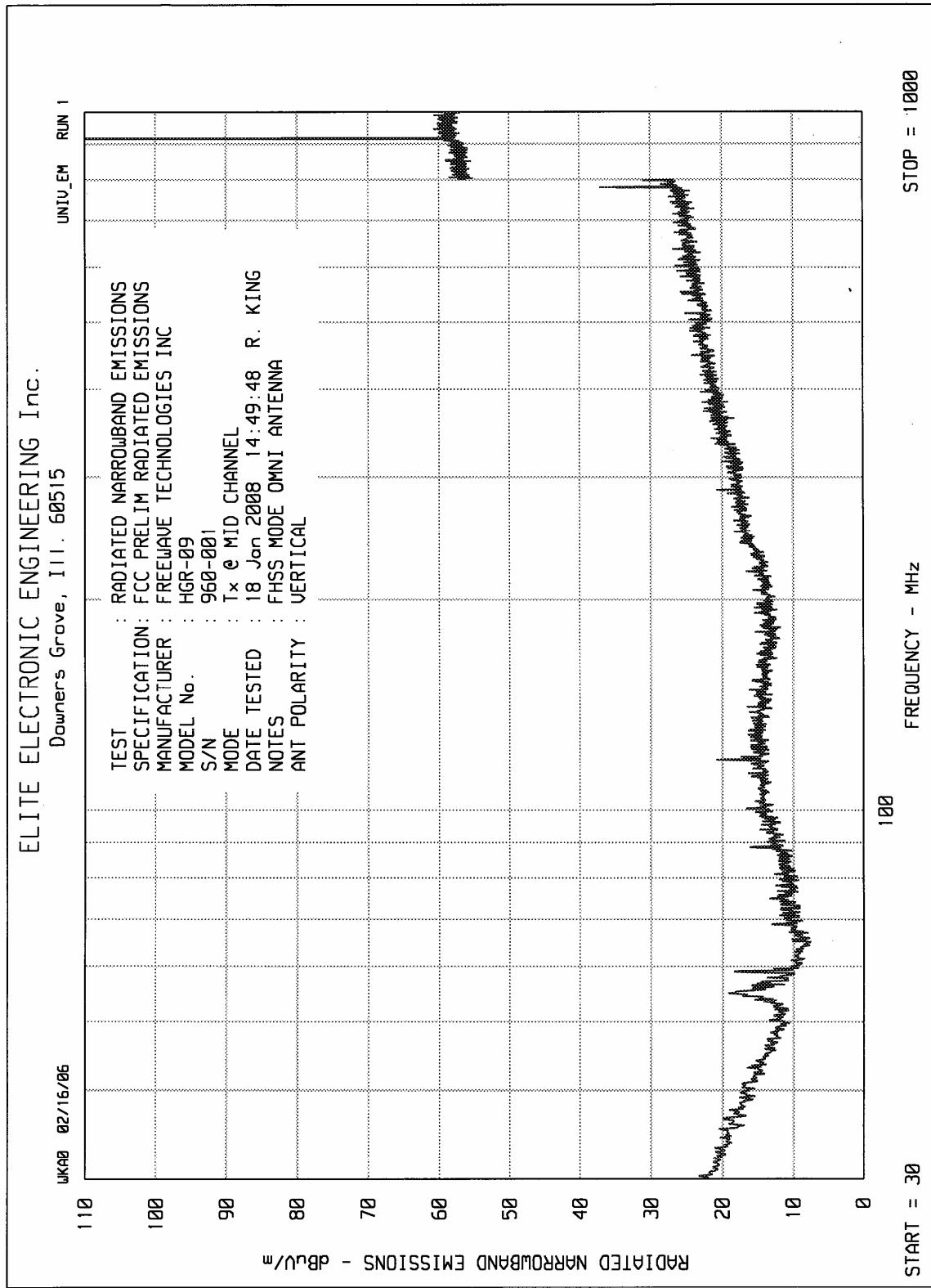
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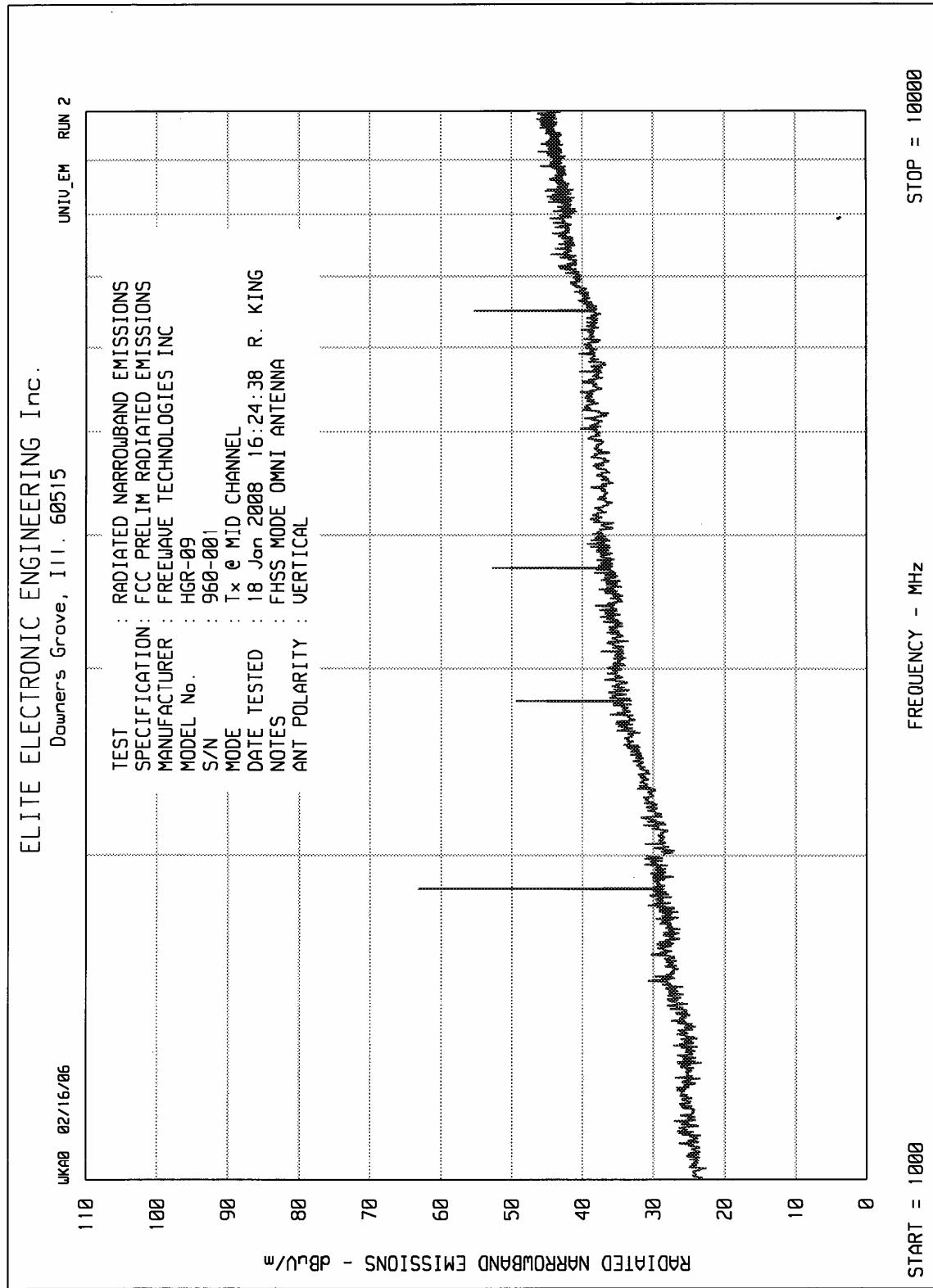
#### FCC 15.247 Antenna Conducted

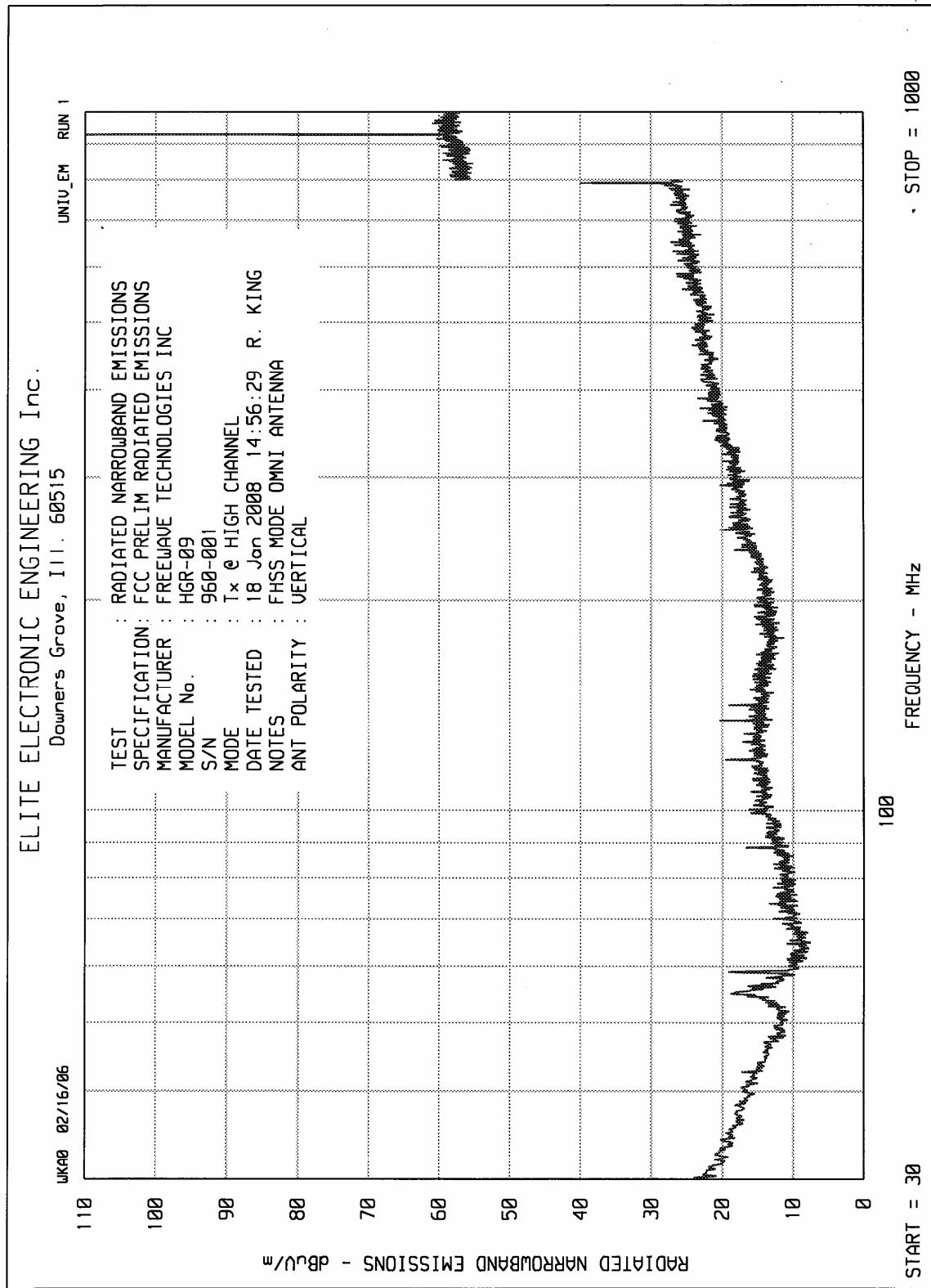
MANUFACTURER : Free Wave Technologies  
TEST ITEM : Transceiver  
MODEL NUMBER : FGR2  
SERIAL NUMBER : 960-0047  
TEST MODE : Tx @ 927.8208 MHz  
NOTES :

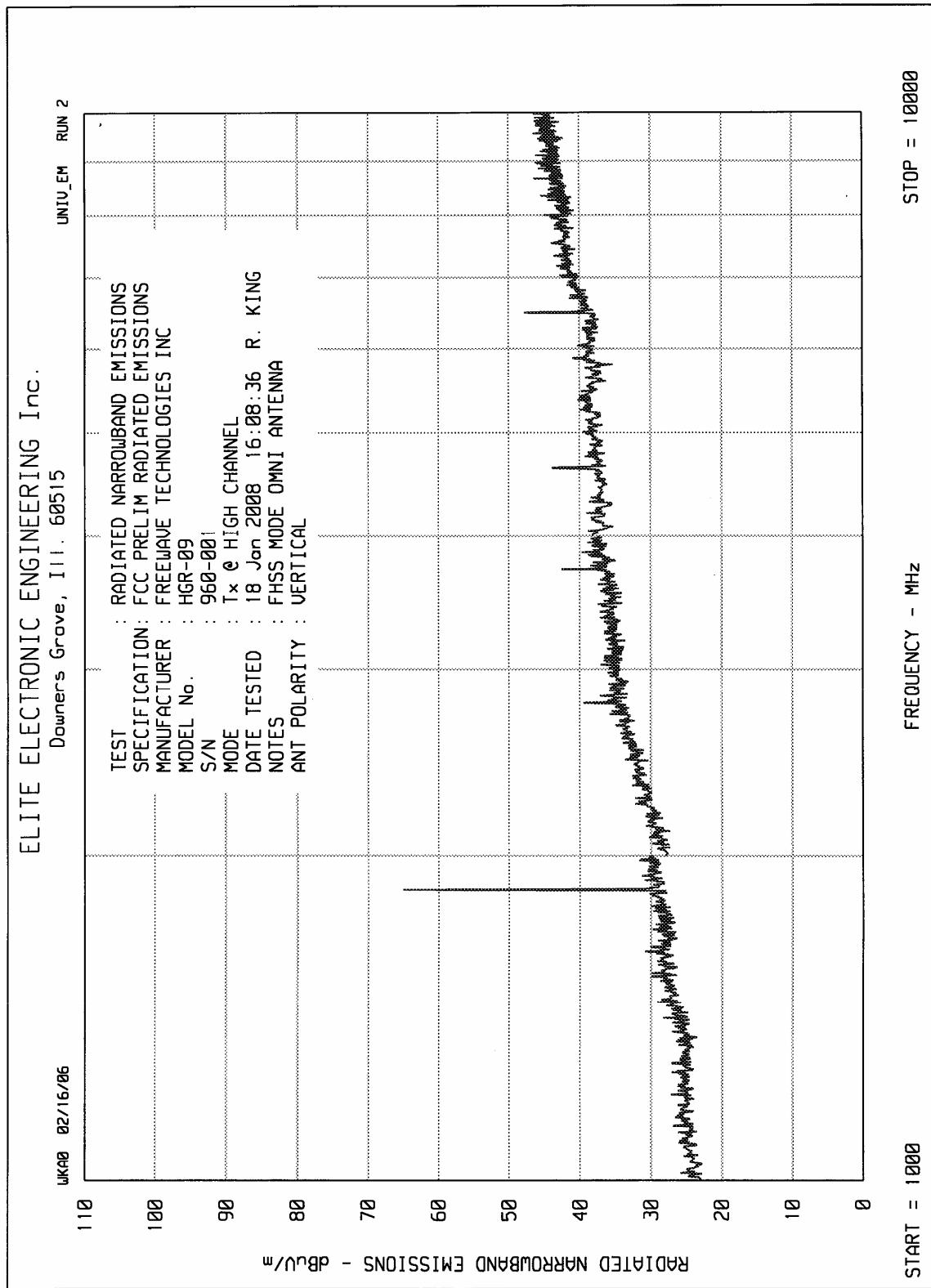


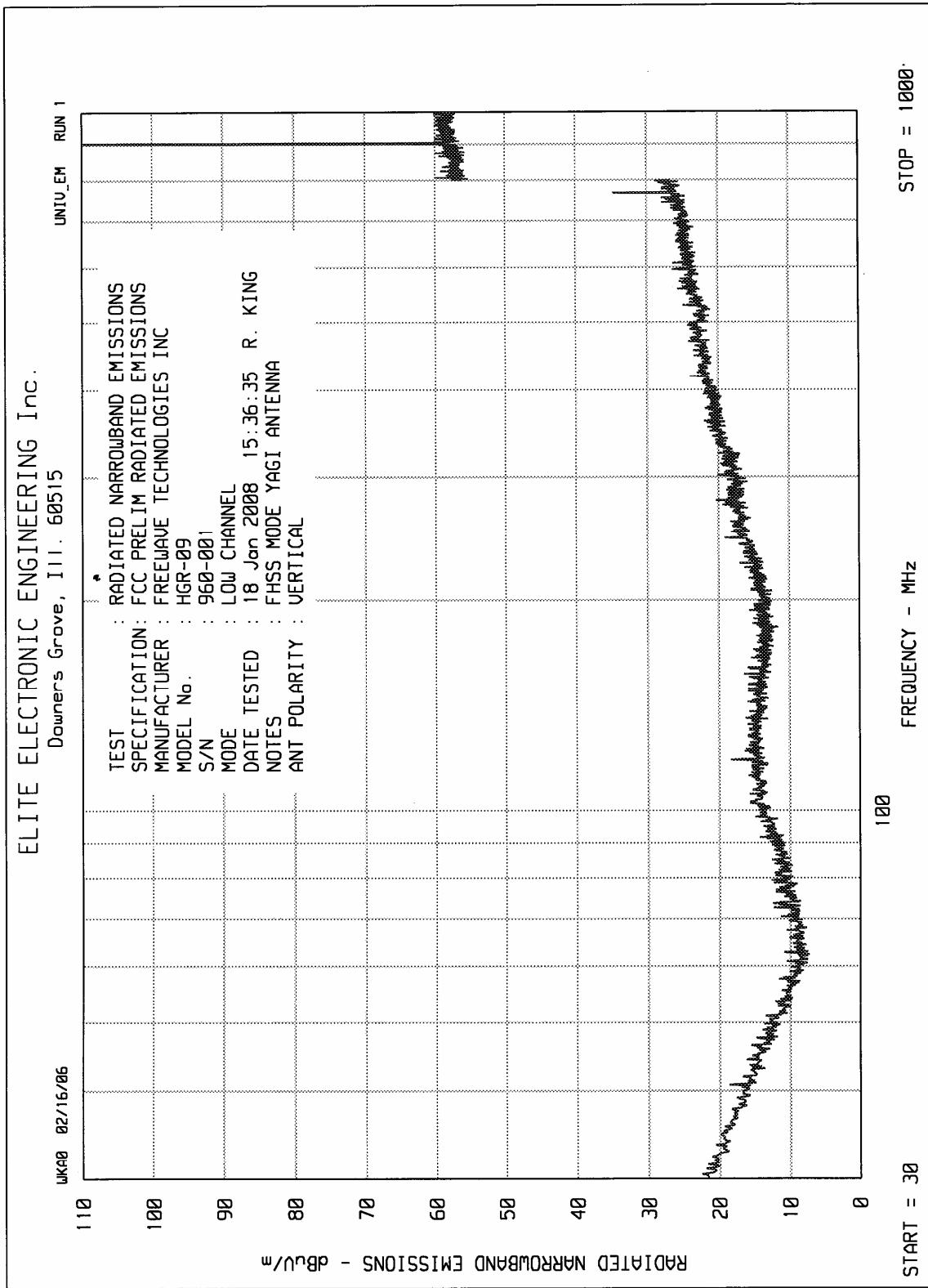


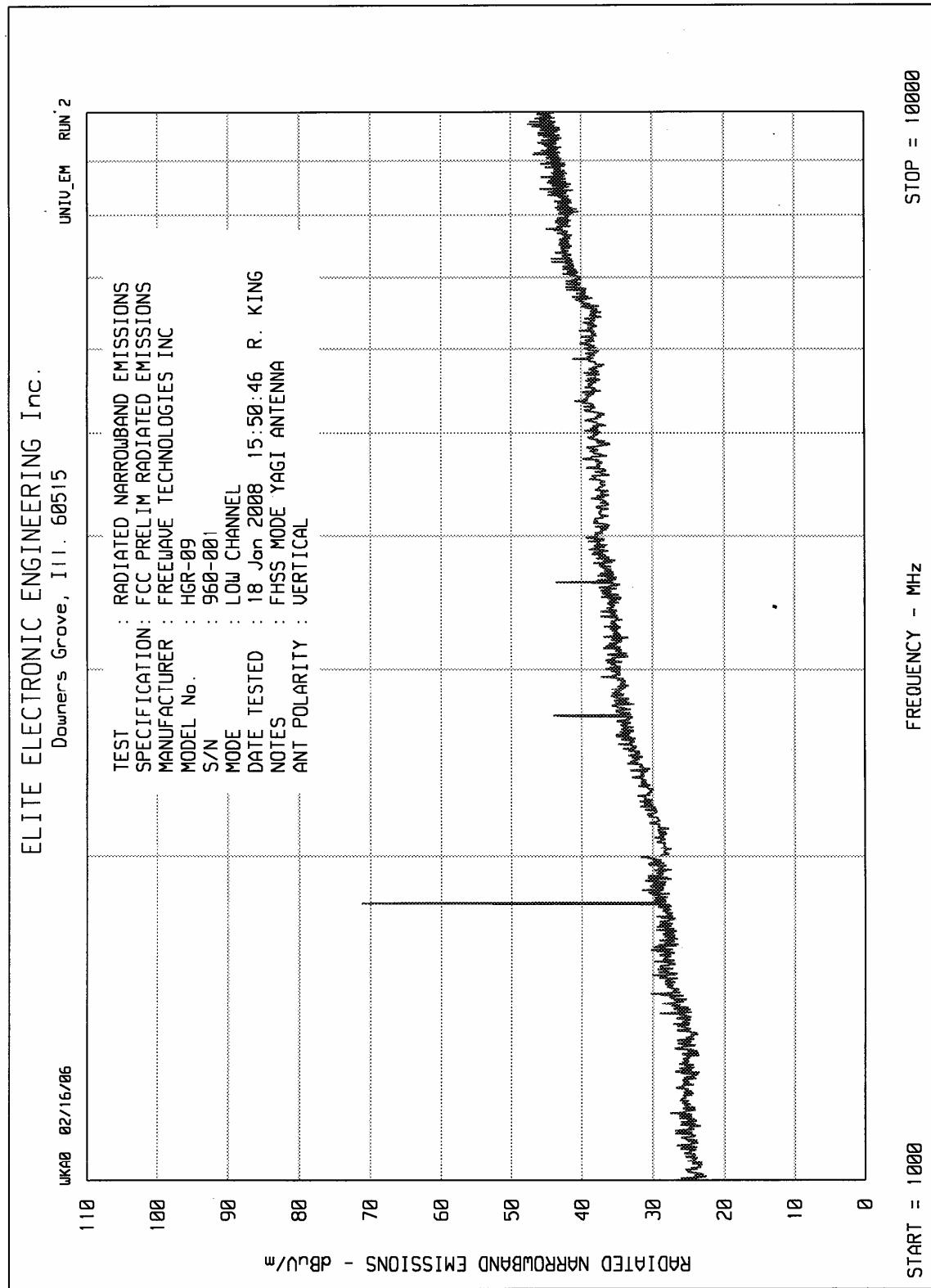


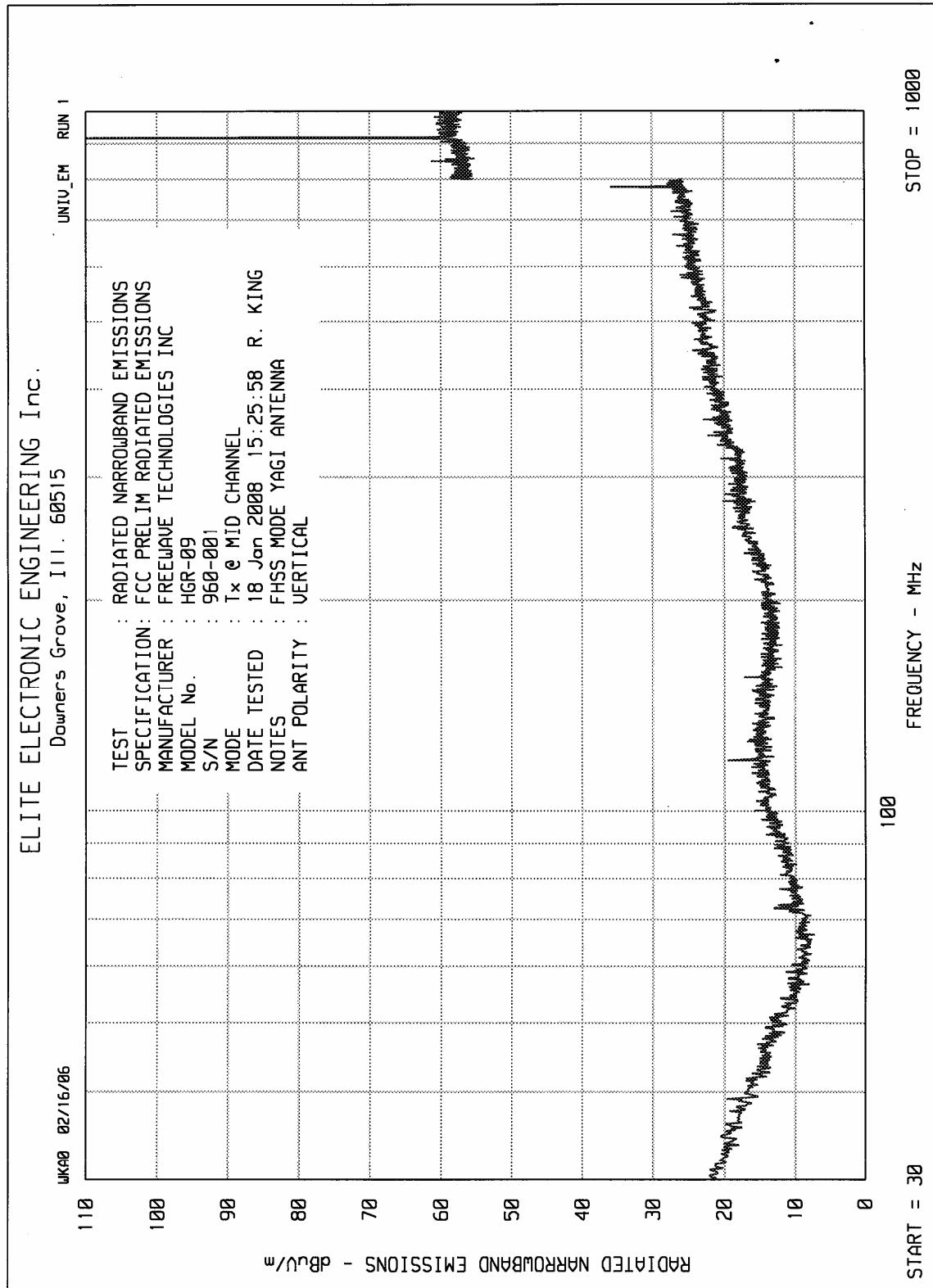


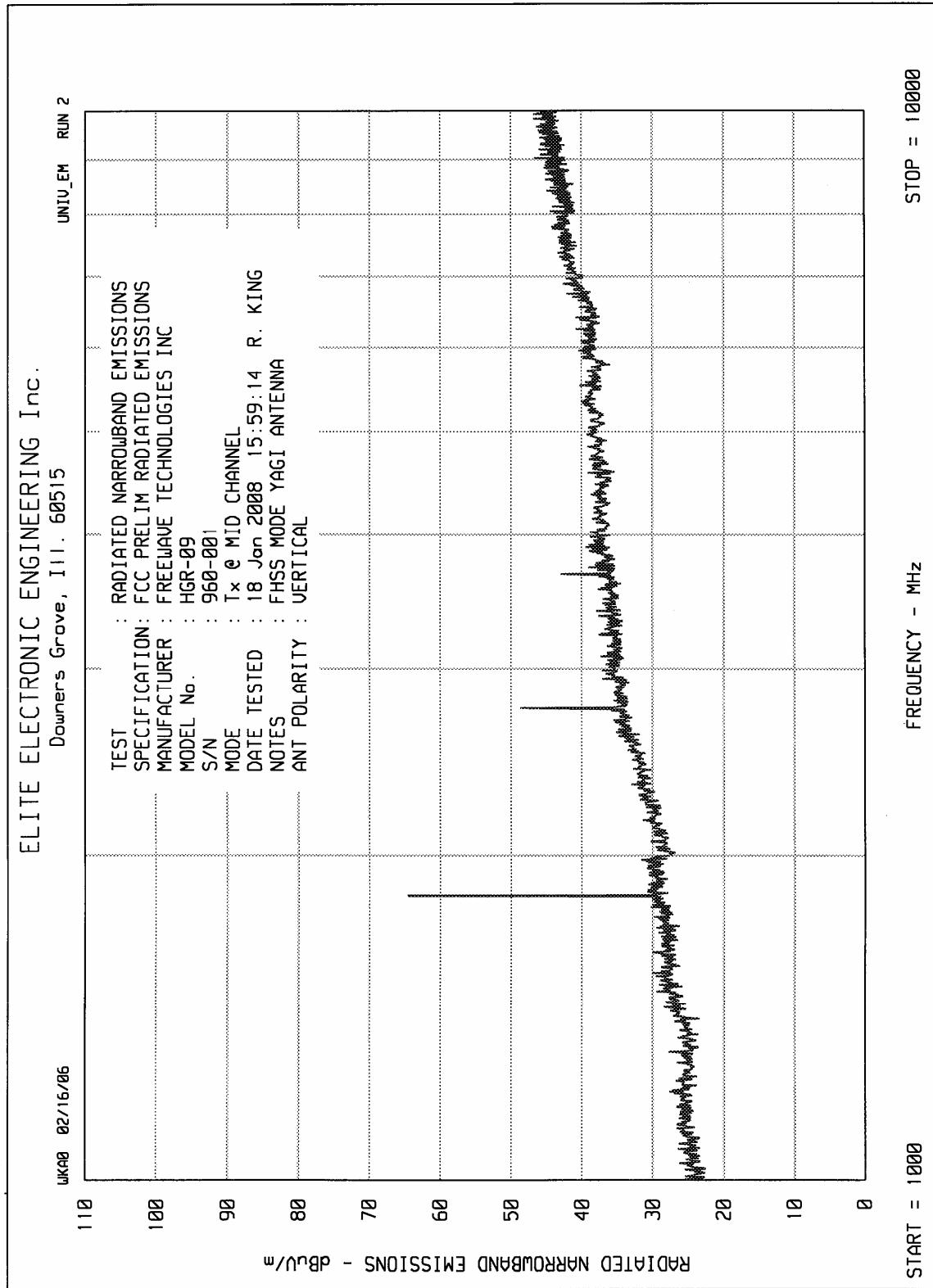


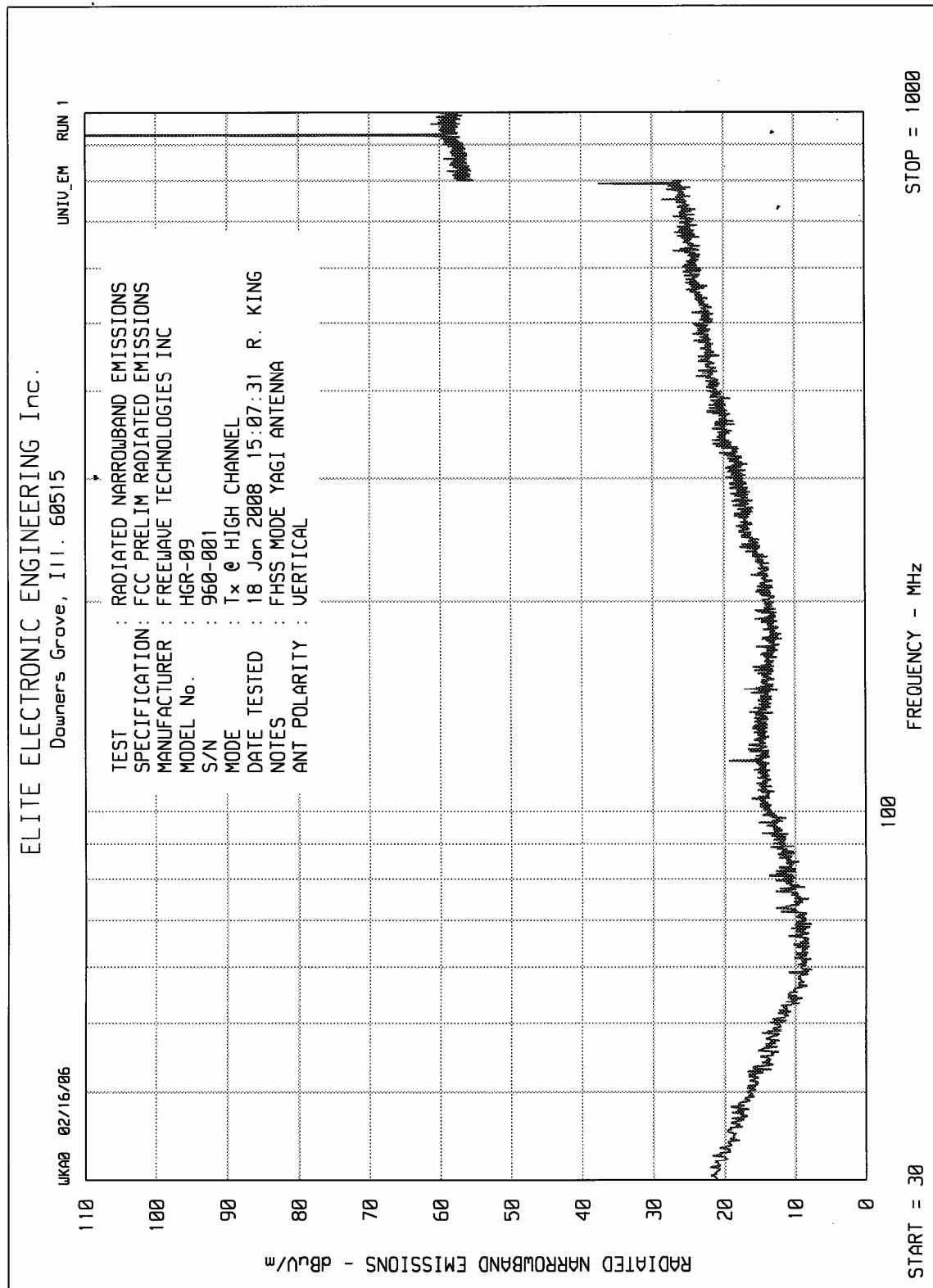


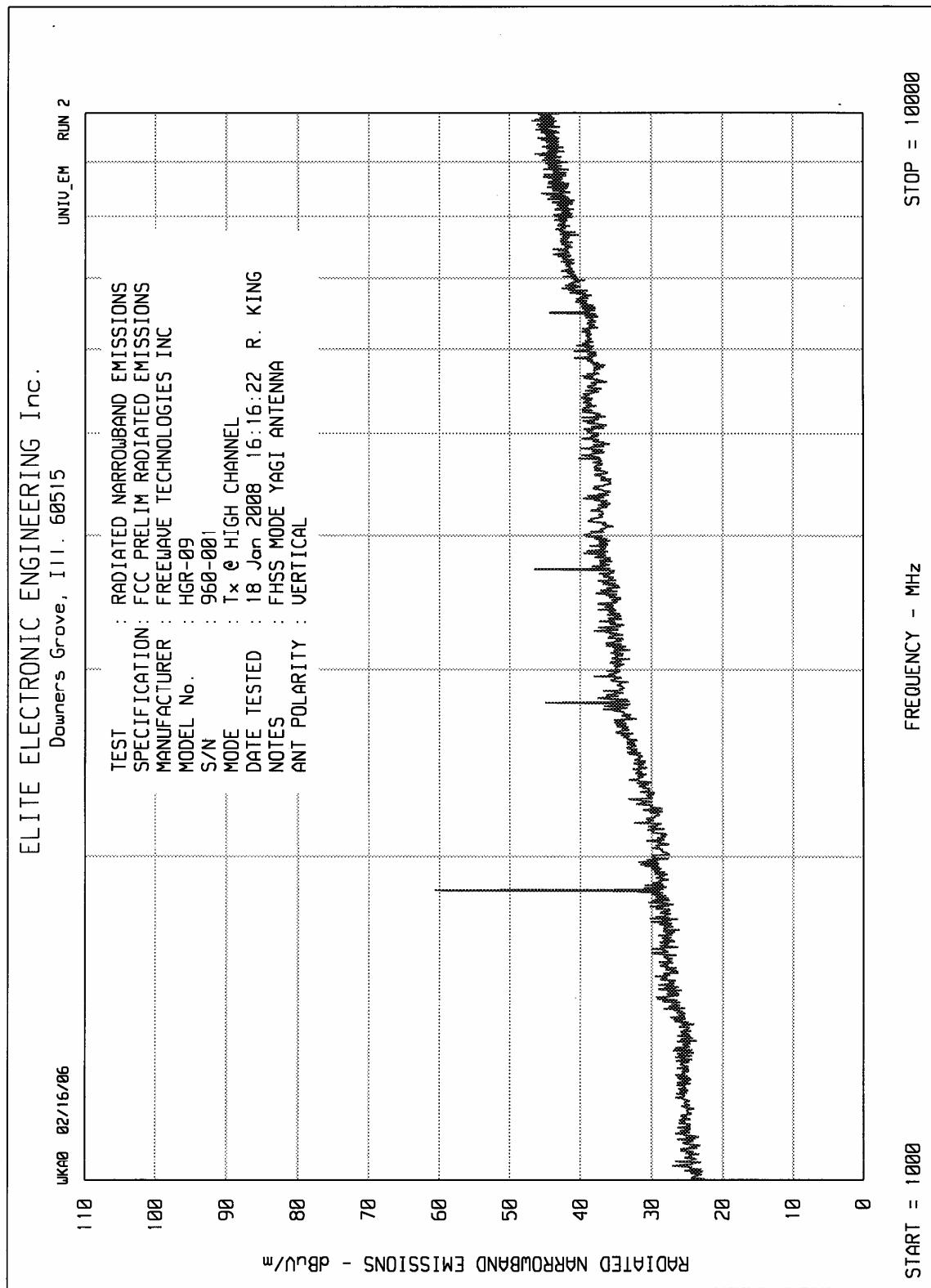














## DATA PAGE

MANUFACTURER Free Wave Technologies  
MODEL NUMBER FGR2  
SERIAL NO. 960-0047  
SPECIFICATION 15.247 RADIATED SPURIOUS EMISSIONS  
MODE Tx @ Channel 1 (902.2464MHz)  
DATE 1/15/2008  
NOTES TEST DISTANCE IS 3 METERS  
ANTENNA Omni Antenna

FREQ. (MHz)	ANT POL	MTR RDG dBuV	CABLE LOSS dB	ANT FAC dB	PRE AMP dB	DUTY CYCLE dB	PEAK TOTAL dBuV/m	PEAK TOTAL uV/m	PEAK LIMIT uV
			AMBIENT						
2706.74	H	26.9	3.7	29.7	0.0	0.0	60.4	1045.0	5000.0
2706.74	V	27.6	3.7	29.7	0.0	0.0	61.1	1132.7	5000.0
3608.99	H	28.5	4.4	32.3	0.0	0.0	65.2	1813.0	5000.0
3608.99	V	29.6	4.4	32.3	0.0	0.0	66.3	2057.7	5000.0
4511.23	H	21.3	4.8	33.0	0.0	0.0	59.1	898.0	5000.0
4511.23	V	27.6	4.8	33.0	0.0	0.0	65.4	1854.7	5000.0
5413.48	H	21.4	5.2	34.7	0.0	0.0	61.3	1163.6	5000.0
5413.48	V	27.5	5.2	34.7	0.0	0.0	67.4	2348.6	5000.0
8120.22	H	28.3	*	37.7	0.0	0.0	73.1	4513.5	5000.0
8120.22	V	28.3	*	37.7	0.0	0.0	73.1	4513.5	5000.0
9022.46	H	27.4	*	38.1	0.0	0.0	73.0	4476.3	5000.0
9022.46	V	27.4	*	38.1	0.0	0.0	73.0	4476.3	5000.0

Checked By: *Richard E. King*

Richard King



## DATA PAGE

MANUFACTURER Free Wave Technologies  
MODEL NUMBER FGR2  
SERIAL NO. 960-0047  
SPECIFICATION 15.247 RADIATED SPURIOUS EMISSIONS  
MODE Tx @ Channel 1 (902.2464MHz)  
DATE 1/15/2008  
NOTES TEST DISTANCE IS 3 METERS  
ANTENNA Omni Antenna

FREQ. (MHz)	ANT POL	MTR dBuV	AMBIENT	CABLE LOSS dB	ANT FAC dB	PRE AMP dB	DUTY CYCLE dB	Avg TOTAL dBuV/m	Avg TOTAL uV/m	Avg Limit uV
2706.74	H	12.2		3.7	30.2	0.0	-16.6	29.5	30.0	500.0
2706.74	V	12.9		3.7	30.2	0.0	-16.6	30.2	32.5	500.0
3608.99	H	14.2		4.4	33.9	0.0	-16.6	35.8	61.8	500.0
3608.99	V	18.8		4.4	33.9	0.0	-16.6	40.4	105.0	500.0
4511.23	H	11.3		4.8	33.9	0.0	-16.6	33.4	47.0	500.0
4511.23	V	17.2		4.8	33.9	0.0	-16.6	39.3	92.6	500.0
5413.48	H	17.2		5.2	36.3	0.0	-16.6	42.1	127.3	500.0
5413.48	V	17.4		5.2	36.3	0.0	-16.6	42.3	129.7	500.0
8120.22	H	15.9	*	7.1	38.0	0.0	-16.6	44.3	164.1	500.0
8120.22	V	15.9	*	7.1	38.0	0.0	-16.6	44.3	164.3	500.0
9022.46	H	15.0	*	7.5	38.5	0.0	-16.6	44.4	166.1	500.0
9022.46	V	15.0	*	7.5	38.5	0.0	-16.6	44.3	164.7	500.0

Checked By: *Richard E. King*

Richard King



## DATA PAGE

MANUFACTURER Free Wave Technologies  
MODEL NUMBER FGR2  
SERIAL NO. 960-0047  
SPECIFICATION 15.247 RADIATED SPURIOUS EMISSIONS  
MODE Tx @ Channel 1 (902.2464MHz)  
DATE 1/15/2008  
NOTES TEST DISTANCE IS 3 METERS  
ANTENNA YAGI Antenna

FREQ. (MHz)	ANT POL	MTR RDG dBuV	AMBIENT	CABLE LOSS dB	ANT FAC dB	PRE AMP dB	DUTY CYCLE dB	PEAK TOTAL dBuV/m	PEAK TOTAL uV/m	PEAK LIMIT uV
2706.7	H	21.8		3.7	29.7	0.0	0.0	55.3	580.9	5000.0
2706.7	V	26.7		3.7	29.7	0.0	0.0	60.2	1021.2	5000.0
3609.0	H	27.0		4.4	32.3	0.0	0.0	63.7	1525.4	5000.0
3609.0	V	24.9		4.4	32.3	0.0	0.0	61.6	1197.8	5000.0
4511.2	H	30.6		4.8	33.0	0.0	0.0	68.4	2619.8	5000.0
4511.2	V	30.4		4.8	33.0	0.0	0.0	68.2	2560.1	5000.0
5413.5	H	23.5	*	5.2	34.7	0.0	0.0	63.4	1481.8	5000.0
5413.5	V	22.9	*	5.2	34.7	0.0	0.0	62.8	1382.9	5000.0
8120.2	H	24.0	*	7.1	37.7	0.0	0.0	68.8	2751.2	5000.0
8120.2	V	24.0	*	7.1	37.7	0.0	0.0	68.8	2751.2	5000.0
9022.5	H	23.0	*	7.5	38.1	0.0	0.0	68.6	2697.2	5000.0
9022.5	V	23.0	*	7.5	38.1	0.0	0.0	68.6	2697.2	5000.0

Checked By: *Richard E. King*

Richard King



## DATA PAGE

MANUFACTURER Free Wave Technologies  
MODEL NUMBER FGR2  
SERIAL NO. 960-0047  
SPECIFICATION 15.247 RADIATED SPURIOUS EMISSIONS  
MODE Tx @ Channel 1 (902.2464MHz)  
DATE 1/15/2008  
NOTES TEST DISTANCE IS 3 METERS  
ANTENNA YAGI Antenna

FREQ. (MHz)	ANT POL	MTR dBuV	AMBIENT	CABLE LOSS dB	ANT FAC dB	PRE AMP dB	DUTY CYCLE dB	Avg TOTAL dBuV/m	Avg TOTAL uV/m	Avg Limit uV
2706.7	H	16.7		3.7	29.7	0.00	-16.6	33.6	47.8	500.0
2706.7	V	21.6		3.7	29.7	0.00	-16.6	38.5	84.0	500.0
3609.0	H	22.4		4.4	32.3	0.00	-16.6	42.5	132.9	500.0
3609.0	V	19.5		4.4	32.3	0.00	-16.6	39.6	95.1	500.0
4511.2	H	23.6		4.8	33.0	0.00	-16.6	44.8	173.1	500.0
4511.2	V	23.8		4.8	33.0	0.00	-16.6	45.0	177.1	500.0
5413.5	H	18.1	*	5.2	34.7	0.00	-16.6	41.4	117.7	500.0
5413.5	V	18.9	*	5.2	34.7	0.00	-16.6	42.2	129.1	500.0
8120.2	H	18.0	*	7.1	37.7	0.00	-16.6	46.2	203.9	500.0
8120.2	V	18.0	*	7.1	37.7	0.00	-16.6	46.2	203.9	500.0
9022.5	H	17.1	*	7.5	38.1	0.00	-16.6	46.1	202.3	500.0
9022.5	V	17.1	*	7.5	38.1	0.00	-16.6	46.1	202.3	500.0

Checked By: *Richard E. King*

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## DATA PAGE

MANUFACTURER Free Wave Technologies  
MODEL NUMBER FGR2  
SERIAL NO. 960-0047  
SPECIFICATION 15.247 RADIATED SPURIOUS EMISSIONS  
MODE Tx @ Channel 59 (915.6096MHz)  
DATE 1/15/2008  
NOTES TEST DISTANCE IS 3 METERS  
ANTENNA OMNI Antenna

FREQ. (MHz)	ANT POL	MTR dBuV	RDG dB	CABLE LOSS dB	ANT FAC dB	PRE AMP dB	DUTY CYCLE dB	PEAK TOTAL dBuV/m	PEAK TOTAL uV/m	PEAK LIMIT uV
AMBIENT										
2746.83	H	26.4		3.8	29.8	0.0	0.0	60.0	1003.0	5000.0
2746.83	V	27.4		3.8	29.8	0.0	0.0	61.0	1125.4	5000.0
3662.44	H	24.9		4.4	32.4	0.0	0.0	61.7	1221.0	5000.0
3662.44	V	24.7		4.4	32.4	0.0	0.0	61.5	1193.2	5000.0
4578.05	H	25.7		4.8	33.2	0.0	0.0	63.7	1528.0	5000.0
4578.05	V	24.6		4.8	33.2	0.0	0.0	62.6	1346.3	5000.0
7324.88	H	28.3	*	6.7	37.3	0.0	0.0	72.3	4125.0	5000.0
7324.88	V	28.8	*	6.7	37.3	0.0	0.0	72.8	4369.4	5000.0
8240.49	H	28.4	*	7.1	37.8	0.0	0.0	73.4	4662.8	5000.0
8240.49	V	27.7	*	7.1	37.8	0.0	0.0	72.7	4301.7	5000.0
9156.10	H	26.8	*	7.5	38.1	0.0	0.0	72.4	4147.1	5000.0
9156.10	V	26.9	*	7.5	38.1	0.0	0.0	72.5	4195.1	5000.0

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## DATA PAGE

MANUFACTURER Free Wave Technologies  
MODEL NUMBER FGR2  
SERIAL NO. 960-0047  
SPECIFICATION 15.247 RADIATED SPURIOUS EMISSIONS  
MODE Tx @ Channel 59 (915.6096MHz)  
DATE 1/15/2008  
NOTES TEST DISTANCE IS 3 METERS  
ANTENNA Omni Antenna

FREQ. (MHz)	ANT POL	MTR dBuV	AMBIENT	CABLE LOSS dB	ANT FAC dB	PRE AMP dB	DUTY CYCLE dB	Avg TOTAL dBuV/m	Avg TOTAL uV/m	Avg Limit uV
2746.83	H	10.4		3.8	29.8	0.0	-16.6	27.4	23.5	500.0
2746.83	V	16.1		3.8	29.8	0.0	-16.6	33.1	45.3	500.0
3662.44	H	12.0		4.4	32.4	0.0	-16.6	32.2	40.9	500.0
3662.44	V	11.7		4.4	32.4	0.0	-16.6	31.9	39.5	500.0
4578.05	H	11.9		4.8	33.2	0.0	-16.6	33.3	46.1	500.0
4578.05	V	12.5		4.8	33.2	0.0	-16.6	33.9	49.4	500.0
7324.88	H	16.5	*	6.7	37.3	0.0	-16.6	43.9	157.4	500.0
7324.88	V	16.6	*	6.7	37.3	0.0	-16.6	44.0	159.4	500.0
8240.49	H	15.9	*	7.1	37.8	0.0	-16.6	44.3	163.9	500.0
8240.49	V	15.9	*	7.1	37.8	0.0	-16.6	44.3	164.3	500.0
9156.10	H	14.8	*	7.5	38.1	0.0	-16.6	43.7	153.4	500.0
9156.10	V	14.7	*	7.5	38.1	0.0	-16.6	43.7	152.3	500.0

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MANUFACTURER Free Wave Technologies  
MODEL NUMBER FGR2  
SERIAL NO. 960-0047  
SPECIFICATION 15.247 RADIATED SPURIOUS EMISSIONS  
MODE Tx @ Channel 59 (915.6096MHz)  
DATE 1/15/2008  
NOTES TEST DISTANCE IS 3 METERS  
ANTENNA YAGI Antenna

FREQ. (MHz)	ANT POL	MTR RDG dBuV	CABLE LOSS dB	ANT FAC dB	PRE AMP dB	DUTY CYCLE dB	PEAK TOTAL dBuV/m	PEAK TOTAL uV/m	PEAK LIMIT uV
			AMBIENT						
2746.8	H	22.1		3.8	29.8	0.0	0.0	55.7	611.4
2746.8	V	27.8		3.8	29.8	0.0	0.0	61.4	1178.5
3662.4	H	26.0		4.4	32.4	0.0	0.0	62.8	1385.8
3662.4	V	25.5		4.4	32.4	0.0	0.0	62.3	1308.3
4578.0	H	23.8		4.8	33.2	0.0	0.0	61.8	1227.8
4578.0	V	24.1		4.8	33.2	0.0	0.0	62.1	1271.0
7324.9	H	24.0	*	6.7	37.3	0.0	0.0	68.0	2514.3
7324.9	V	24.0	*	6.7	37.3	0.0	0.0	68.0	2514.3
8240.5	H	23.0	*	7.1	37.8	0.0	0.0	68.0	2504.1
8240.5	V	23.0	*	7.1	37.8	0.0	0.0	68.0	2504.1
9156.1	H	22.0	*	7.5	38.1	0.0	0.0	67.6	2386.4
9156.1	V	22.0	*	7.5	38.1	0.0	0.0	67.6	2386.4

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MANUFACTURER Free Wave Technologies  
MODEL NUMBER FGR2  
SERIAL NO. 960-0047  
SPECIFICATION 15.247 RADIATED SPURIOUS EMISSIONS  
MODE Tx @ Channel 59 (915.6096MHz)  
DATE 1/15/2008  
NOTES TEST DISTANCE IS 3 METERS  
ANTENNA YAGI Antenna

FREQ. (MHz)	ANT POL	MTR dBuV	AMBIENT	CABLE LOSS dB	ANT FAC dB	PRE AMP dB	DUTY CYCLE dB	Avg TOTAL dBuV/m	Avg TOTAL uV/m	Avg Limit uV
2746.8	H	17.2		3.8	29.8	0.0	-16.6	34.2	51.4	500.0
2746.8	V	22.4		3.8	29.8	0.0	-16.6	39.4	93.6	500.0
3662.4	H	20.8		4.4	32.4	0.0	-16.6	41.0	112.6	500.0
3662.4	V	20.1		4.4	32.4	0.0	-16.6	40.3	103.9	500.0
4578.1	H	18.2		4.8	33.2	0.0	-16.6	39.6	95.3	500.0
4578.1	V	18.8		4.8	33.2	0.0	-16.6	40.2	102.1	500.0
7324.9	H	18.8	*	6.7	37.3	0.0	-16.6	46.2	204.4	500.0
7324.9	V	18.5	*	6.7	37.3	0.0	-16.6	45.9	197.4	500.0
8240.5	H	17.9	*	7.1	37.8	0.0	-16.6	46.3	205.9	500.0
8240.5	V	17.5	*	7.1	37.8	0.0	-16.6	45.9	196.6	500.0
9156.1	H	17.0	*	7.5	38.1	0.0	-16.6	46.0	198.5	500.0
9156.1	V	17.0	*	7.5	38.1	0.0	-16.6	46.0	198.5	500.0

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## DATA PAGE

MANUFACTURER Free Wave Technologies  
MODEL NUMBER FGR2  
SERIAL NO. 960-0047  
SPECIFICATION 15.247 RADIATED SPURIOUS EMISSIONS  
MODE Tx @ Channel 112 (927.8208MHz)  
DATE 1/15/2008  
NOTES TEST DISTANCE IS 3 METERS  
ANTENNA OMNI Antenna

FREQ. (MHz)	ANT POL	MTR dBuV	RDG dBuV	CABLE LOSS dB	ANT FAC dB	PRE AMP dB	DUTY CYCLE dB	PEAK TOTAL dBuV/m	PEAK TOTAL uV/m	PEAK LIMIT uV
AMBIENT										
2783.5	H	18.4		3.8	29.9	0.0	0.0	52.2	405.3	5000.0
2783.5	V	19.3		3.8	29.9	0.0	0.0	53.1	449.6	5000.0
3711.3	H	20.3		4.4	32.6	0.0	0.0	57.3	731.5	5000.0
3711.3	V	21.8		4.4	32.6	0.0	0.0	58.8	869.4	5000.0
4639.1	H	19.9		4.9	33.3	0.0	0.0	58.1	801.5	5000.0
4639.1	V	22.8		4.9	33.3	0.0	0.0	61.0	1119.2	5000.0
7422.6	H	28.3	*	6.7	37.5	0.0	0.0	72.5	4224.7	5000.0
7422.6	V	27.7	*	6.7	37.5	0.0	0.0	71.9	3942.7	5000.0
8350.4	H	27.1	*	7.2	38.0	0.0	0.0	72.2	4091.4	5000.0
8350.4	V	27.8	*	7.2	38.0	0.0	0.0	72.9	4434.8	5000.0

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MANUFACTURER Free Wave Technologies  
MODEL NUMBER FGR2  
SERIAL NO. 960-0047  
SPECIFICATION 15.247 RADIATED SPURIOUS EMISSIONS  
MODE Tx @ Channel 112 (927.8208MHz)  
DATE 1/15/2008  
NOTES TEST DISTANCE IS 3 METERS  
ANTENNA OMNI Antenna

FREQ. (MHz)	ANT POL	MTR RDG dBuV	AMBIENT	CABLE LOSS dB	ANT FAC dB	PRE AMP dB	DUTY CYCLE dB	Avg TOTAL dBuV/m	Avg TOTAL uV/m	Avg LIMIT uV
2783.5	H	9.3		3.8	29.9	0.0	-16.6	26.5	21.0	500.0
2783.5	V	11.7		3.8	29.9	0.0	-16.6	28.9	27.7	500.0
3711.3	H	13.9		4.4	32.6	0.0	-16.6	34.3	51.8	500.0
3711.3	V	16.4		4.4	32.6	0.0	-16.6	36.8	69.1	500.0
4639.1	H	14.3		4.9	33.3	0.0	-16.6	35.9	62.2	500.0
4639.1	V	9.2		4.9	33.3	0.0	-16.6	30.8	34.6	500.0
7422.6	H	16.0	*	6.7	37.5	0.0	-16.6	43.6	150.9	500.0
7422.6	V	16.0	*	6.7	37.5	0.0	-16.6	43.6	150.9	500.0
8350.4	H	15.0	*	7.2	38.0	0.0	-16.6	43.6	151.0	500.0
8350.4	V	15.1	*	7.2	38.0	0.0	-16.6	43.6	151.8	500.0

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MODEL NUMBER FGR2  
SERIAL NO. 960-0047  
SPECIFICATION 15.247 RADIATED SPURIOUS EMISSIONS  
MODE Tx @ Channel 112 (927.8208MHz)  
DATE 1/15/2008  
NOTES TEST DISTANCE IS 3 METERS  
ANTENNA YAGI Antenna

FREQ. (MHz)	ANT POL	MTR dBuV	RDG dBuV	CABLE LOSS dB	ANT FAC dB	PRE AMP dB	DUTY CYCLE dB	PEAK TOTAL dBuV/m	PEAK TOTAL uV/m	PEAK LIMIT uV
				AMBIENT						
2783.5	H	22.5		3.8	29.9	0.0	0.0	56.3	649.8	5000.0
2783.5	V	27.8		3.8	29.9	0.0	0.0	61.6	1196.2	5000.0
3711.3	H	21.2		4.4	32.6	0.0	0.0	58.2	811.4	5000.0
3711.3	V	23.2		4.4	32.6	0.0	0.0	60.2	1021.4	5000.0
4639.1	H	20.6		4.9	33.3	0.0	0.0	58.8	868.8	5000.0
4639.1	V	25.1		4.9	33.3	0.0	0.0	63.3	1458.6	5000.0
7422.6	H	23.0	*	6.7	37.5	0.0	0.0	67.2	2295.1	5000.0
7422.6	V	23.0	*	6.7	37.5	0.0	0.0	67.2	2295.1	5000.0
8350.4	H	23.0	*	7.2	38.0	0.0	0.0	68.1	2551.9	5000.0
8350.4	V	23.0	*	7.2	38.0	0.0	0.0	68.1	2551.9	5000.0

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MODEL NUMBER FGR2  
SERIAL NO. 960-0047  
SPECIFICATION 15.247 RADIATED SPURIOUS EMISSIONS  
MODE Tx @ Channel 112 (927.8208MHz)  
DATE 1/15/2008  
NOTES TEST DISTANCE IS 3 METERS  
ANTENNA YAGI Antenna

FREQ. (MHz)	ANT POL	MTR dBuV	AMBIENT	CABLE LOSS dB	ANT FAC dB	PRE AMP dB	DUTY CYCLE dB	Avg TOTAL dBuV/m	Avg TOTAL uV/m	Avg Limit uV
2783.5	H	17.7		3.8	29.9	0.0	-16.6	34.9	55.3	500.0
2783.5	V	21.2		3.8	29.9	0.0	-16.6	38.4	82.8	500.0
3711.3	H	16.7		4.4	32.6	0.0	-16.6	37.1	71.5	500.0
3711.3	V	18.7		4.4	32.6	0.0	-16.6	39.1	90.0	500.0
4639.1	H	16.7		4.9	33.3	0.0	-16.6	38.3	82.0	500.0
4639.1	V	20.2		4.9	33.3	0.0	-16.6	41.8	122.7	500.0
7422.6	H	18.0	*	6.7	37.5	0.0	-16.6	45.6	190.9	500.0
7422.6	V	18.0	*	6.7	37.5	0.0	-16.6	45.6	190.9	500.0
8350.4	H	17.8	*	7.2	38.0	0.0	-16.6	46.3	207.4	500.0
8350.4	V	18.0	*	7.2	38.0	0.0	-16.6	46.5	212.3	500.0

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