Product Safety Engineering, Inc
12955 Bellamy Brothers Blvd.
Dade City, FL 33525
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ACCREDITED

Testing Certification # 1367-01

TEST REPORT

07F102
08/02/2007

Applicant:

CowChips, LLC
24 Iron Ore Rd
Manalapan, NJ 07726

Product:
Model - Base Station, Repeater and Access Point
FHSS Transceiver

In Accordance with FCC Part 15.247

Test dates:
02/12/2007 - 02/17/2007

Receive Date:
02/12/2007

Prepared by: Steven E. Hoke - EMC Site Manager

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Test Procedures

Product description: The system utilizes FHSS type transmitters. The Cowchips HWII system is comprised of 4 different RF devices. The first device is the Cow Tag. It is a simple transceiver responsible for monitoring the activities of the cow. The other 3 devices are based on the same hardware platform with build and software variations. They are the Access Point, Base Station, and Repeater. They are collectively referred Common Module.

Powerline conducted interference: The AC powerline conducted emissions measurements were performed per ANSI C63.4:2003.

20 dB Bandwidth: The EUT had its hopping function disabled while modulated. The spectrum analyzer span was set to (2-3) times the (20) dB bandwidth. The spectrum analyzer was placed in peak hold mode and the upper and lower points of the waveform were measured at a level that was (20) dB down from the peak amplitude. This was repeated for a low, mid and high frequency channel.

Channel Separation: The EUT had its hopping function enabled. The span on the spectrum analyzer was set wide enough to capture at least (2) adjacnet channels. The channel separation was determined by measuring the peak frequency of (2) adjacent channels.

Description of frequency hopping system: The system utilizes 25 channels from 904.296 MHz to 926.250 MHz in the ISM band. The RF Unit hops though each of these channels at a rate of 375ms per channel, for a total hopping loop of 9.375 seconds. The system initiates data transmissions completely asynchronously from the hopping system which creates a random distribution of data for each channel. All messages are also acknowledged, which provides significant bandwidth throttling (i.e. messages can not be send continuously) which limits duty cycle per transmitter about 50%. Due to system limitations such as a maximum payload size of 32bytes, 5khz bit rate, and a fixed 7 bytes packet overhead, the longest time a RF transmitter can be active is 78ms. All channels are used all of the time. There are not any facilities to detect jammed or undesirable channels and remove them from the hopping system.

Receiver bandwidth: The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

Number of hopping frequencies: With the spectrum analyzer in peak hold, we stored an image of all the channels operating and then produced a plot of the analyzer. We manually counted each channel to determine the number.

Dwell time: The EUT had its hopping function enabled. The average time of occupancy was first determined by measuring the width of a single channel with the spectrum analyzer in a zero span mode and then with the analyzer in a peak hold mode, a (10) second sweep was then performed to determine how many single channels occupied a (10) second period of time.

RF Exposure Compliance Requirements: Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. Computations included in test report.

Peak output power: The EUT was directly connected to the input of a spectrum analyzer and peak measurements were made at the low, middle and high channels.

Conducted output power: The EUT was directly connected to the input of a spectrum analyzer and peak measurements were made at the low, middle and high channels.

Operation with directional antenna gains greater than 6 dBi: Not applicable with omni-directional antenna

Spurious emissions: All spurious emissions were measured at a (3) meter distance and up to the tenth harmonic per ANSI C63.4:2003.

Restricted Band Compliance: All emissions were measured per ANSI C63.4:2003 and compared to the restricted band list.

Test Summary

Name of Test	Paragraph No.	Specification	Measurement	Result
Powerline Conducted Emissions	15.207(a)	Table 15.207(a)	-10.7 dB QP	Complies
Channel Separation	15.247(a)(1)	Greater of 25 kHz or 20 dB bandwidth	926 kHz	Complies
Pseudo-random Hopping Algorithm	15.247(a)(1)			Complies
Hopping Frequencies	15.247(a)(1)(i)	at least 25	25	Complies
Dwell Time	15.247(a)(1)(ii)	<0.4 sec in 10 sec	42 mSec in 10 sec	Complies
20 dB Occupied Bandwidth	15.247(a)(1)	>250 kHz	380 kHz	Complies
Peak Output Power	15.247(b)	0.25 Watts	0.178 Watts	Complies
Spurious Emissions (Conducted)	15.247(C)	-20 dBc	-39.5 dBc	N/A
Spurious Emissions (Radiated)	15.247(C)	54.0 dBuV/m per Table 15.209(a)	52.3 dBuV/m	Complies

Test: Output Power per 15.247(b)(2)

Date: 02/12/2007

Requirement: The maximum peak conducted output power of the intentional radiator shall not exceed 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels

Result: Peak Output Power = (178) mW

See exhibit # 6.

RBW: (1) MHz
VBW: (3) MHz

Channel	Frequency MHz	RF Output dBm	RF Output Watts
low	904.3	21.4	0.138
Mid	915.24	22.0	0.159
high	926.3	22.5	0.178

Test Equipment:

Manufacturer	Model	Description	Serial Number	Cal Due
Hewlett Packard	8566B	Spectrum Analyzer	2421A00526	07/18/07

Test: Powerline conducted interference per 15.207

Date: 02/12/2007

Requirement: An intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table:

Freq (MHz)	Quasi-peak dBuV	Average dBuV
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

Result: The EUT complies as it was under both the quai-peak and average limits while using a quasi-peak detector. The worst case emission was (10.7) dB under the quasi-peak limit.

See exhibit 1

RBW: (9) kHz

VBW: (30) kHz

Test: 20 dB Bandwidth

Date:02/12/2007

Requirement: The 20 dB bandwidth is required to be greater than 250 kHz and less than 500 kHz.

Result: The 20 dB bandwidth was measured at the low, mid and high frequency of operation. The separation was found to be between (338 - 380) kHz.

See exhibit 2

Span:2 MHz

RBW: (30) kHz

VBW: (1) MHz

Channel: Low, mid and high

Test Equipment:

Manufacturer	Model	Description	Serial Number	Cal Due
Hewlett Packard	8566B	Spectrum Analyzer	2421A00526	07/18/07

Test: Channel Separation per 15.247(a)(1)

Date: 02/12/2007

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

Result: The 20 dB bandwidth was measured at the mid frequency of operation. The separation was found to be (926) kHz..

See Exhibit 3

RBW: (100) kHz

VBW: (1) MHz

Test Equipment:

Manufacturer	Model	Description	Serial Number	Cal Due
Hewlett Packard	8566B	Spectrum Analyzer	2421A00526	07/18/07

Test: Number of hopping frequencies per 15.247(a)(1)(i)

Date: 02/12/2007

Requirement: If the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies

Result: The 20 dB bandwidth was measured for low, middle and high frequency operation and the bandwidth was found to be between (338 - 380) kHz. The system employs (25) hopping frequencies.

See exhibit 4.

RBW: (300) kHz

VBW: (1) MHz

Test Equipment:

Manufacturer	Model	Description	Serial Number	Cal Due
Hewlett Packard	8566B	Spectrum Analyzer	2421A00526	07/18/07

Test: Dwell time per 15.247(a)(1)(i)

Date:02/12/2007

Requirement: The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

Result: The analyzer was placed in a peak hold mode for greater than (10) seconds. The dwell time was measured and found to be (42.8) mSec which is less than the (400) mSec allowed..

Note: The 20 dB bandwidth was measured for low, middle and high frequency operation and the maximum bandwidth was found to be between (338 - 380) kHz

See exhibit 5.

Span: Zero

RBW: (300) kHz

VBW: (1) MHz

Test Equipment:

Manufacturer	Model	Description	Serial Number	Cal Due
Hewlett Packard	8566B	Spectrum Analyzer	2421A00526	07/18/07

Test: Spurious emissions per 15.247(d)

Date: 02/12/2007

Requirement: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

Result: The spurious emissions were measured up to the tenth harmonic. The highest spurious emission was found to be (1.830) Ghz at (39.5) dBc.

RBW: (1) MHz

VBW: (3) MHz

Channel: Low, mid and high.

Additional Requirement: Emissions which fall in the restricted bands, as defined by in 15.205(a), must also comply with the radiated emissions limits specified in 15.209.

Result: Emissions found in restricted bands did not exceed the limit as shown on exhibit 6.

Test Equipment:

Manufacturer	Model	Description	Serial Number	Cal Due
Hewlett Packard	8566B	Spectrum Analyzer	2421A00526	07/18/07
Hewlett Packard	8447D	Preamp 0.1 - 1,000 MHz	2944A06832	12/04/07
Hewlett Packard	8449B	Preamp 1 - 26.5 GHz	3008A00320	05/11/07
EMC Automation	HLP3003C	Hybrid Log Periodic	017501	05/02/07
Electro-Mechanics	3115	Double Ridge Guide Ant	3810	11/28/07

RF Exposure - Power Density Compliance Calculation

15.247(I) - Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.

Compliance is based upon section CFR 47 section 1.1310, Table (1) Limits for Maximum Permissible Exposure (MPE), (b) Limits for General Population/Uncontrolled Exposure. The stated limit is (1.0) mW/cm2 and compliance was calculated using the following formula:

$$S=(P\ G) / (4\ \pi\ r^2)$$

Where:

S = Power density in mW/cm2

P = Power in mW

G = Numerical antenna gain

r = Distance in cm

Maximum output power = (178) mW

Antenna gain (numeric) = 5.25 dB (worst case)

Distance = 20 cm

$S = (178 * 5.25) / (12.57 * 400)$

$S= (935) / (5,028)$

$S= (0.186)\ mW / cm^2$

Limit = (1.0) mW / cm^2

Antenna Specifications

This EUT uses one of two antennas described in exhibit 7.

Antenna 1 - Radial Larsen model FB35T900

Antenna 2 - Antenna Factor model ANT-916-CW-HWR-xxx

Product Safety Engineering

ANIDEA

Date :	08/24/07	Time :	14:12:04.20	EMC-30 SETTINGS	SPECS
Technician :	JACK GARNER	Test Equip. :	EMC-30	Detector QuasiPeak	1) CISPR 22 Quasi Peak
Test Method :	EN55022 CLASS B	Test Number :	1	Bandwidth CISPR	2) CISPR 22 AVG
Equipment :	COW TAG BS	Sensor Loc. :	LINE	Dump/Dwell N/A	3)
Mode of Op. :	NORMAL	Sensor Pol. :		RF Atten. 10 dB	4)
Serial No. :		Ext. Atten. :	0 dB	IF Atten. 10 dB	

Comment : 120 VAC / 60 HZ

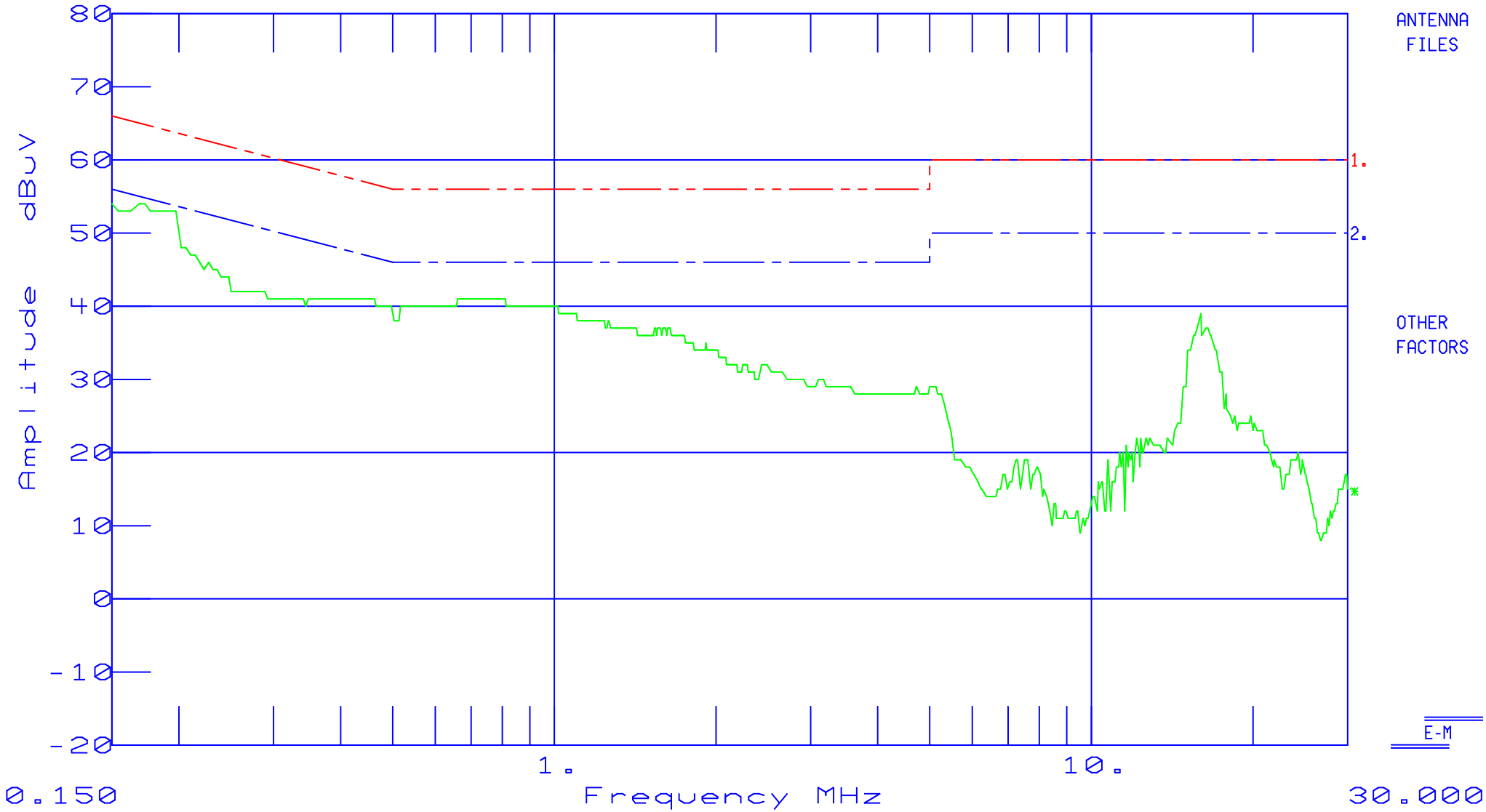


Exhibit 1b

TEST TITLE:ANIDEA
DATA FILE :AN_L.D30
Amplitude Units : dBuV
Threshold -3 dB
PAGE 1
Freq.(MHz)
0.1500

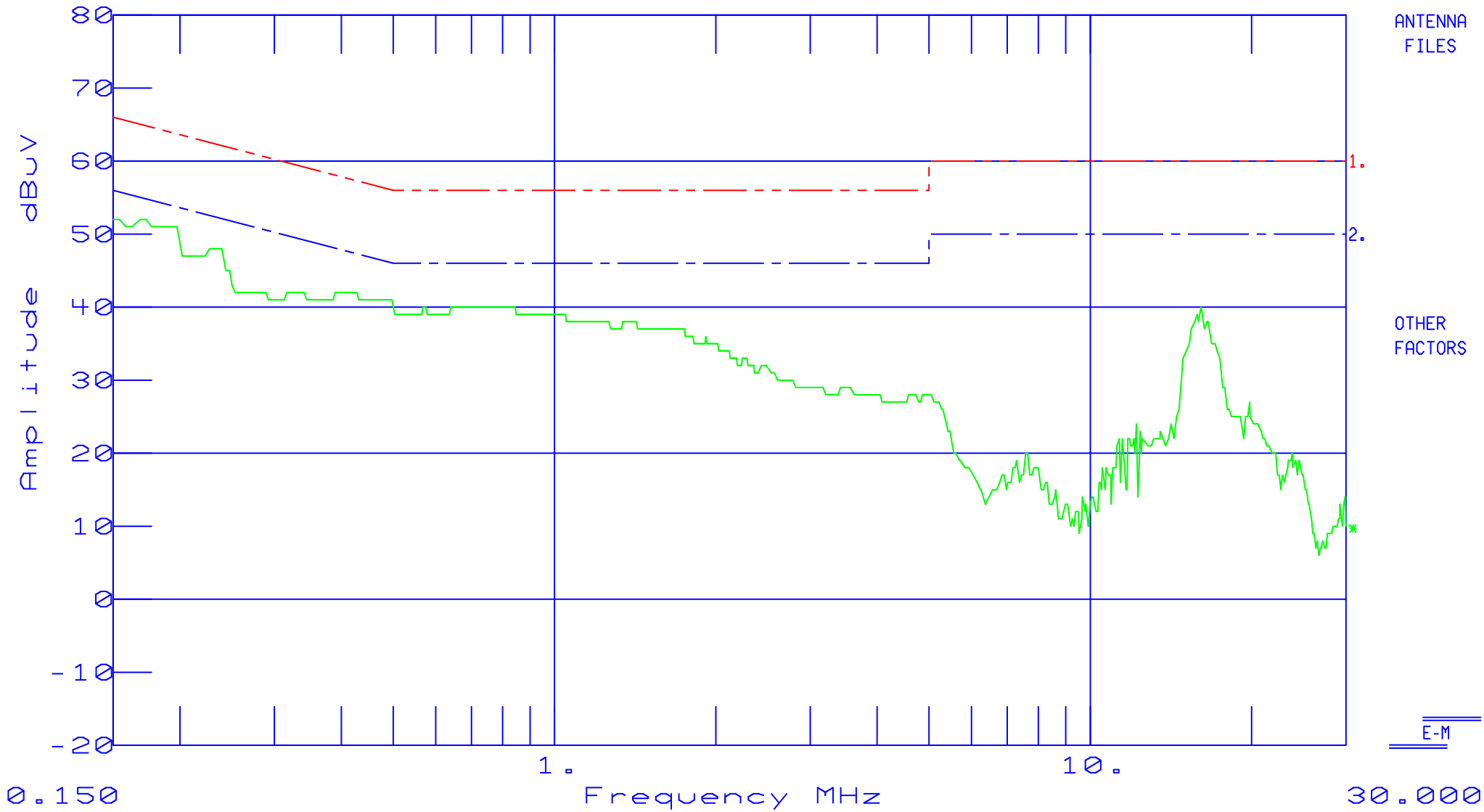
Freq(MHz)	Amp	C22BQP.S30 vs Spec(dB)	C22BAVG.S30 vs Spec(dB)
0.1500	54.0		-2.000 *
0.1542	53.0		-2.771 *
0.1583	53.0		-2.553 *
0.1625	53.0		-2.335 *
0.1686	54.0		-1.029 *
0.1728	54.0		-0.825 *
0.1769	53.0		-1.630 *
0.1811	53.0		-1.435 *
0.1852	53.0		-1.249 *
0.1890	53.0		-1.080 *
0.1932	53.0		-0.898 *
0.1973	53.0		-0.723 *

Product Safety Engineering

ANIDEA

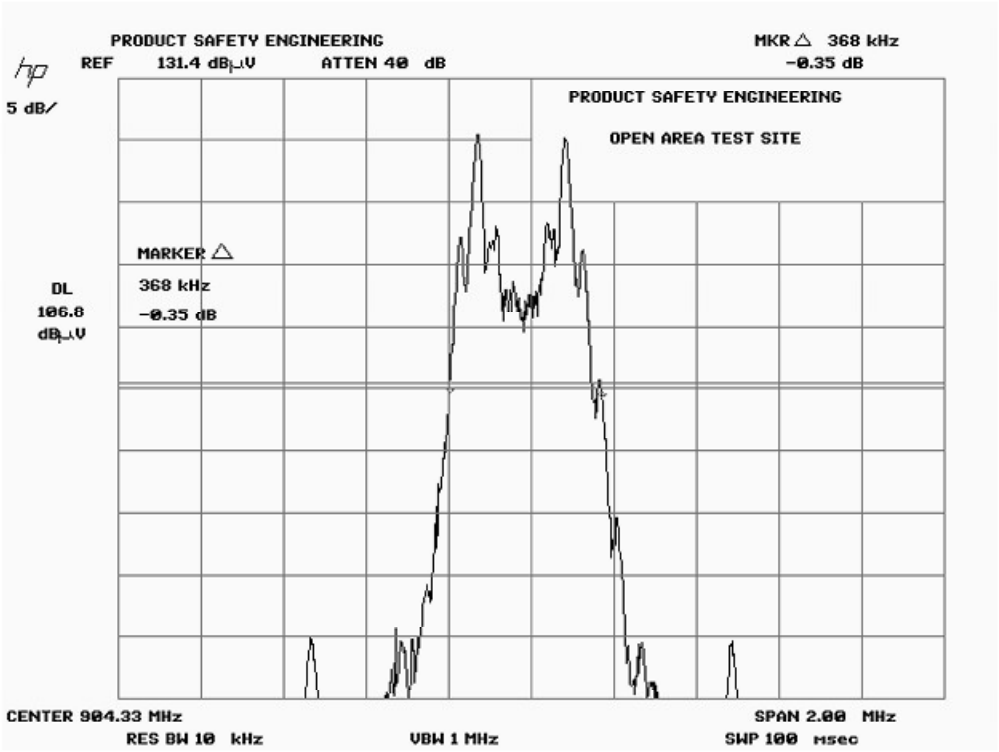
Date :	08/24/07	Time :	14:27:53.10	EMC-30 SETTINGS	SPECS
Technician :	JACK GARNER	Test Equip. :	EMC-30	Detector QuasiPeak	1) CISPR 22 Quasi Peak
Test Method :	EN55022 CLASS B	Test Number :	1	Bandwidth CISPR	2) CISPR 22 AVG
Equipment :	COW TAG BS	Sensor Loc. :	NEUTRAL	Dump/Dwell N/A	3)
Mode of Op. :	NORMAL	Sensor Pol. :		RF Atten. 10 dB	4)
Serial No. :		Ext. Atten. :	0 dB	IF Atten. 10 dB	

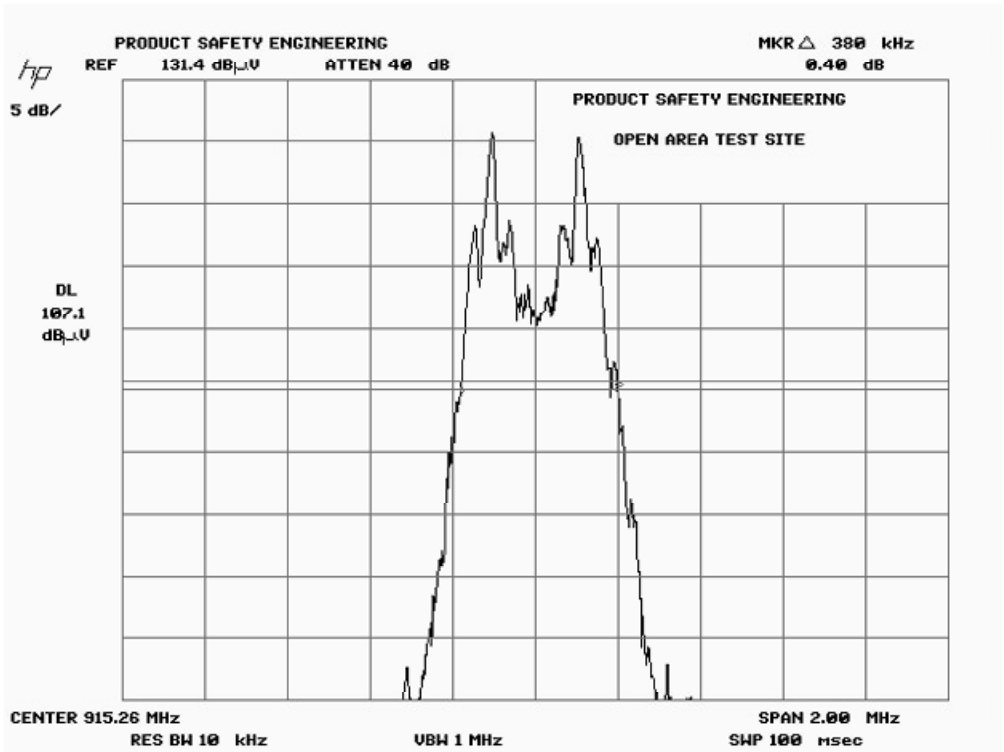
Comment : 120 VAC / 60 HZ

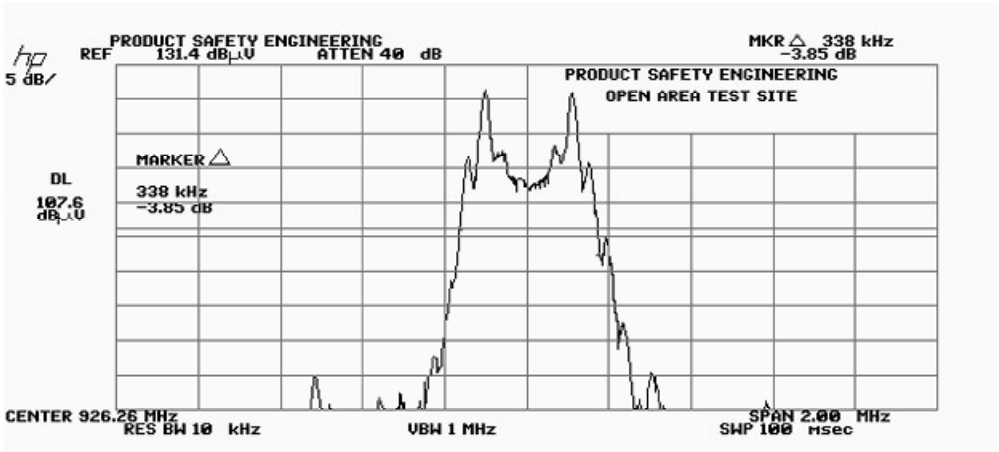


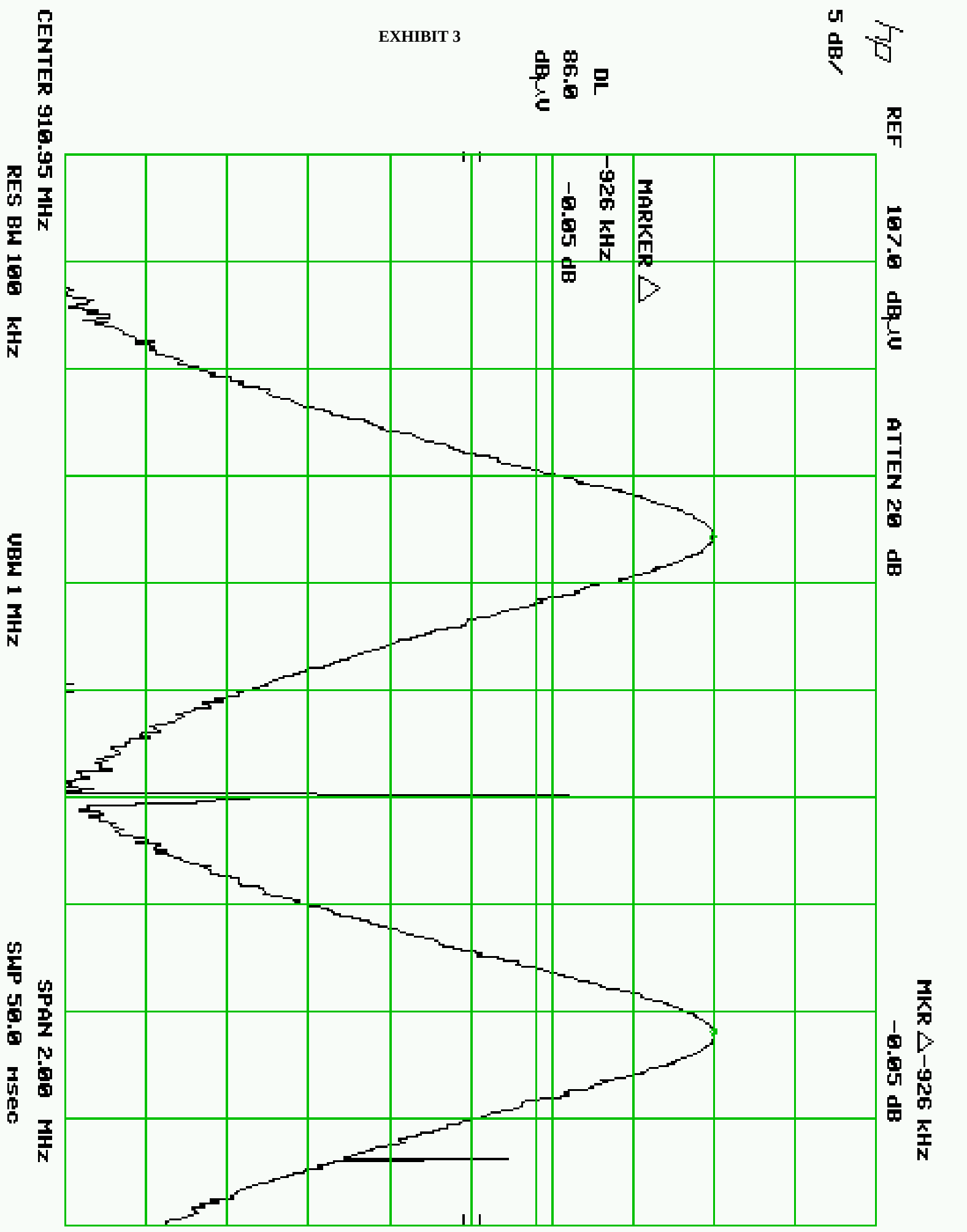
TEST TITLE:ANIDEA			PAGE 1
DATA FILE :AN_N.D30			Freq.(MHz)
Amplitude Units : dBuV		Threshold -3 dB	0.1500

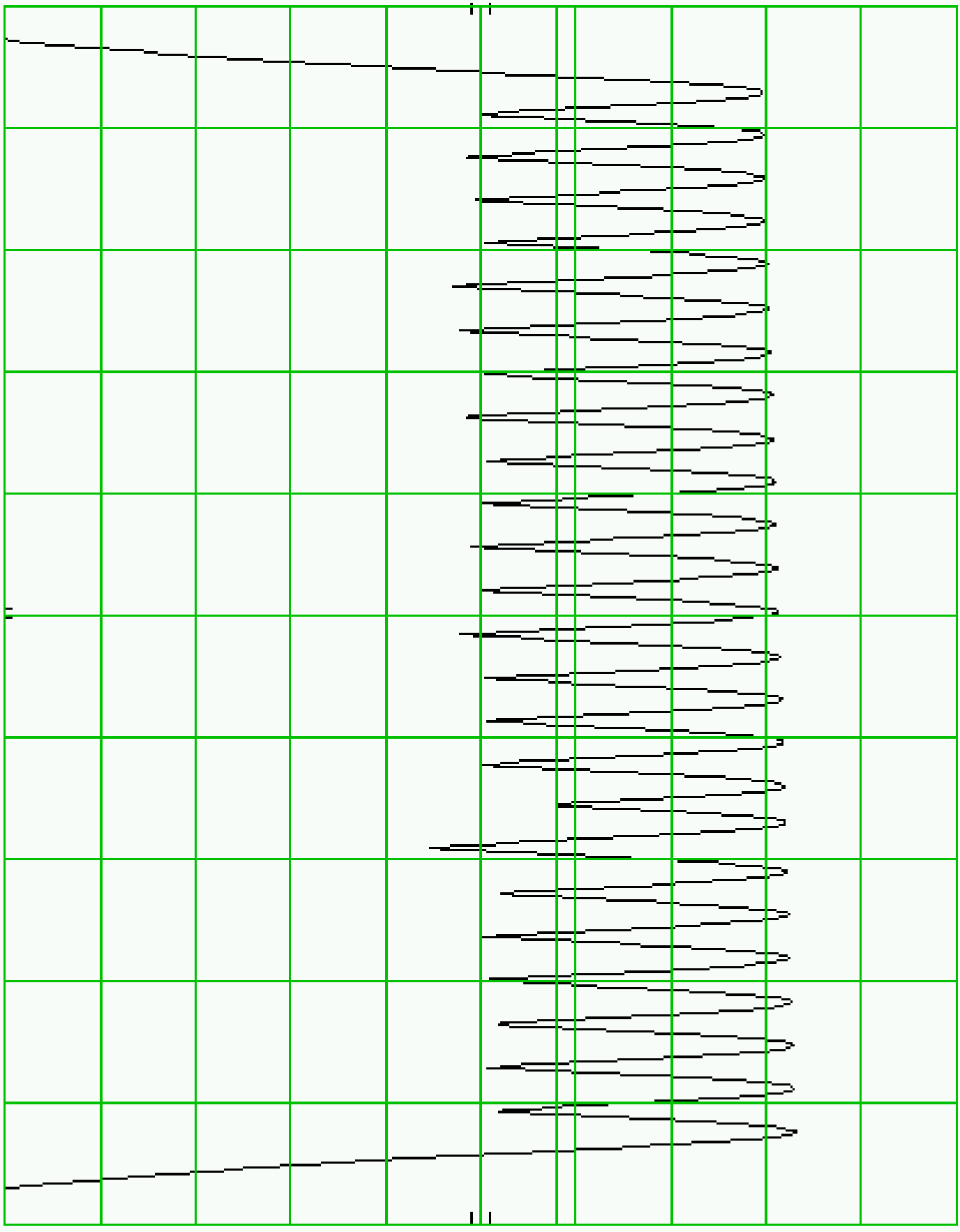
Freq(MHz)	Amp	C22BQP.S30 vs Spec(dB)	C22BAVG.S30 vs Spec(dB)
0.1728	52.0		-2.825 *
0.1932	51.0		-2.898 *
0.1973	51.0		-2.723 *

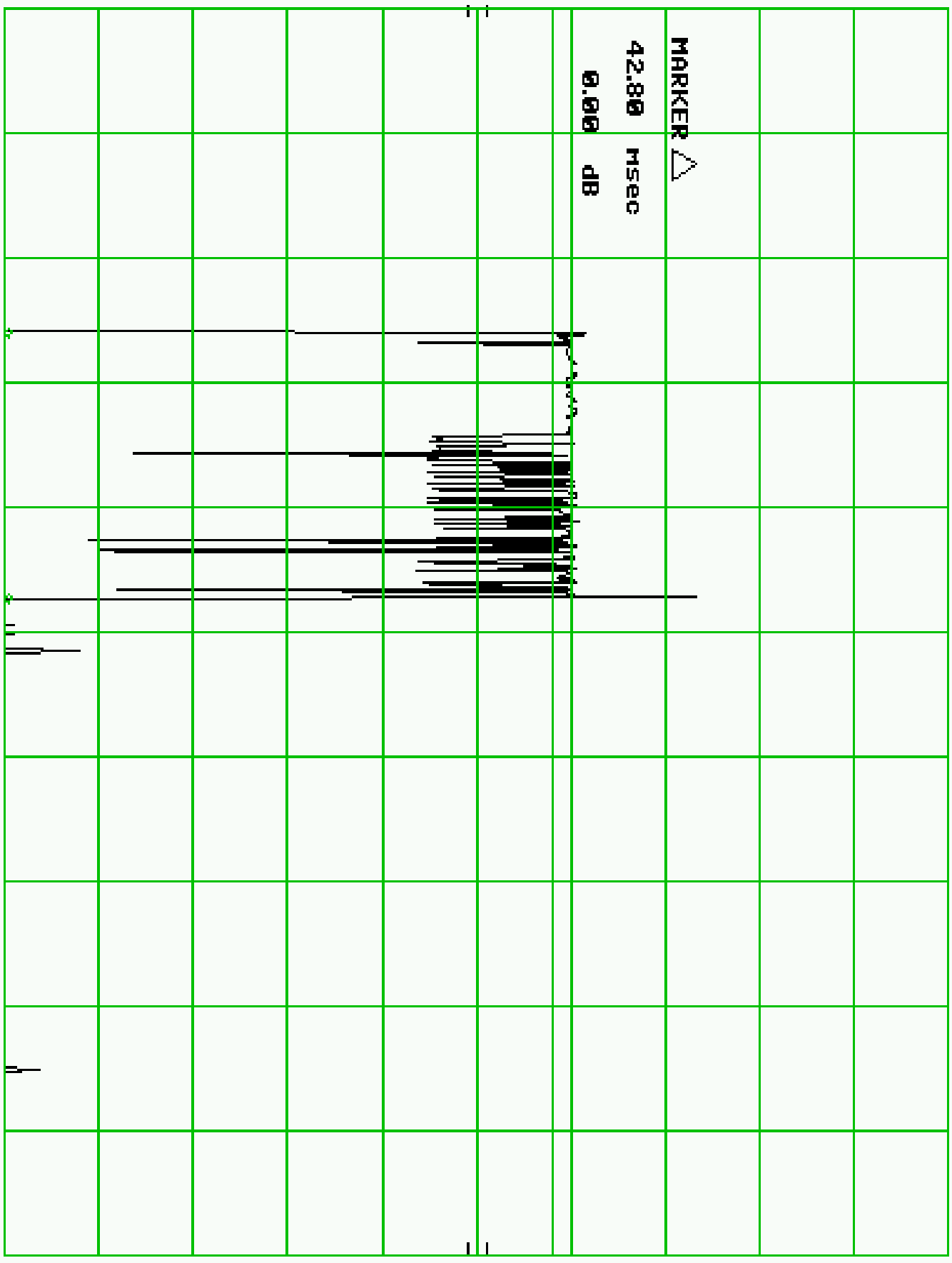

PRODUCT SAFETY ENGINEERING
MKR △ 368 kHz
REF 131.4 dBµV
ATTEN 40 dB
-0.35 dB
5 dB/
PRODUCT SAFETY ENGINEERING
OPEN AREA TEST SITE
MARKER △
368 kHz
-0.35 dB
DL
106.8
dBµV
CENTER 904.33 MHz
SPAN 2.00 MHz
RES BW 10 kHz
VBW 1 MHz
SWP 100 msec

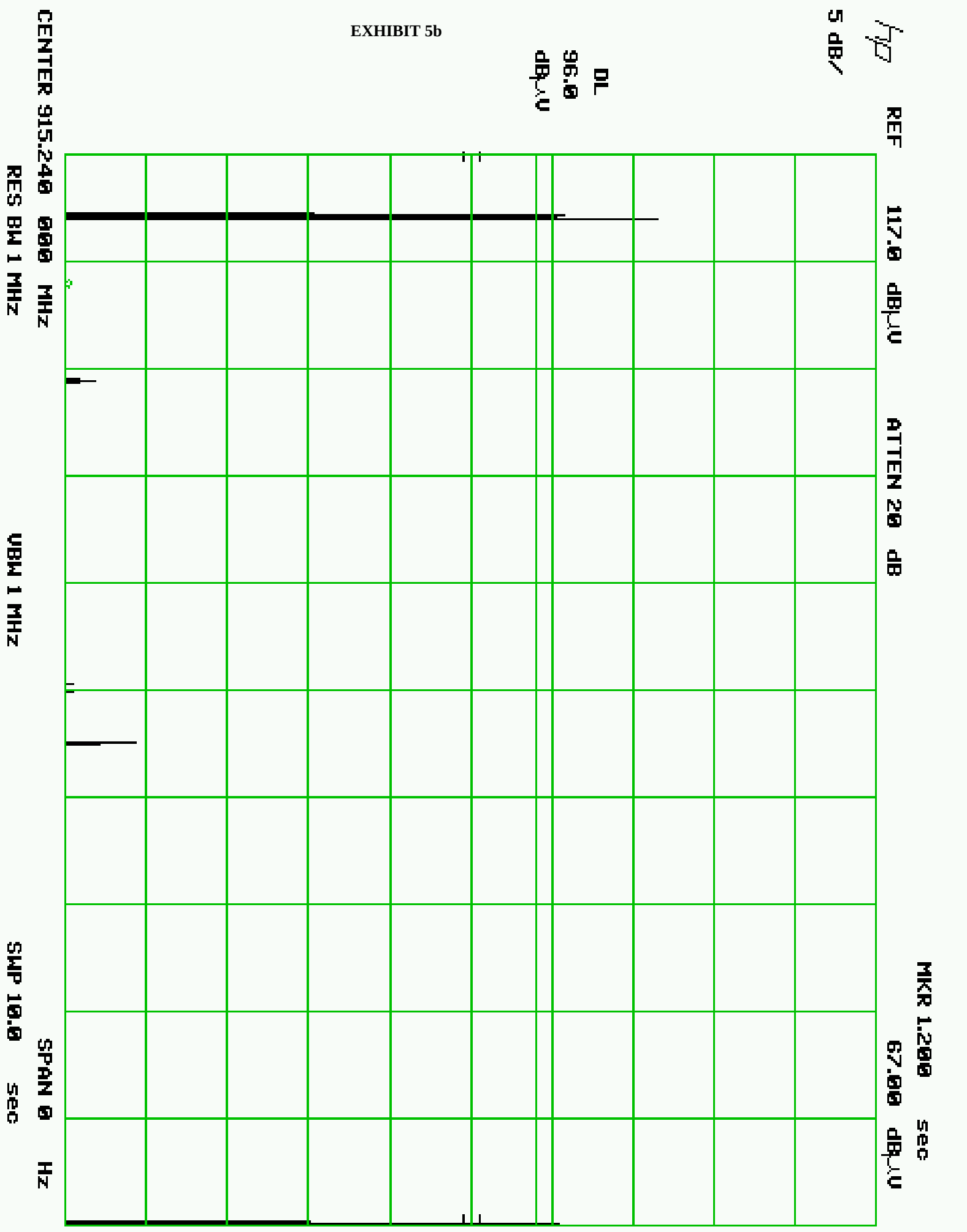

PRODUCT SAFETY ENGINEERING
MKR △ 380 kHz
REF 131.4 dBµV
ATTEN 40 dB
0.40 dB
5 dB/
PRODUCT SAFETY ENGINEERING
OPEN AREA TEST SITE
DL
107.1
dBµV
CENTER 915.26 MHz
SPAN 2.00 MHz
RES BW 10 kHz
VBW 1 MHz
SWP 100 msec


PRODUCT SAFETY ENGINEERING
MKR △ 338 kHz
REF 131.4 dBµV
ATTEN 40 dB
-3.85 dB
5 dB/
PRODUCT SAFETY ENGINEERING
OPEN AREA TEST SITE
MARKER △
338 kHz
-3.85 dB
DL
107.6
dBµV
CENTER 926.26 MHz
SPAN 2.00 MHz
RES BW 10 kHz
VBW 1 MHz
SWP 100 msec


CENTER 910.95 MHz
RES BW 100 kHz
VBW 1 MHz
SPAN 2.000 MHz
SWP 50.0 msec
REF 107.0 dBµV
ATTEN 20 dB
5 dB/
DL
86.0
dBµV
MARKER △
-926 kHz
-0.05 dB
MKR △-926 kHz
-0.05 dB


START 902.3 MHz
RES BW 300 kHz
VBW 1 MHz
STOP 928.1 MHz
SWP 50.0 msec
REF 107.0 dBµV
ATTEN 20 dB
5 dB/
DL
86.0
dBµV


REF 117.0 dBµV
ATTEN 20 dB
5 dB/
DL
96.0
dBµV
MARKER △
42.80 msec
0.00 dB
CENTER 915.240 000 MHz
RES BW 1 MHz
VBW 1 MHz
SWP 200 msec
SPAN 0 Hz
MKR △ 42.80 msec
0.00 dB


CENTER 915.240 000 MHz
RES BW 1 MHz
VBW 1 MHz
SWP 10.0 sec
SPAN 0 Hz
5 dB/
REF 117.0 dBµV
ATTEN 20 dB
DL
96.0 dBµV
MKR 1.200 sec
67.00 dBµV

Freq (MHz)	**904.3**	1808.6	2712.9	3617.2	4521.5	5425.8	6330.1	7234.4	8138.7	9043
Harmonic	1	2	3	4	5	6	7	8	9	10
Measured Power (dBm)	20.3	-34.8	-63.3	-49.5	-43.5	-74.3	-46.5	-38.1	-62.1	-70.9
Cable Loss	1.1	1.1	2.9	2.7	2.2	2.3	3.6	4.1	2.8	2.7
Power (dBm) Output	21.4	-33.7	-60.4	-46.8	-41.3	-72	-42.9	-34	-59.3	-68.2
Power (milliWatts)	138.04	4.3E-04	9.1E-07	2.1E-05	7.4E-05	6.3E-08	5.1E-05	4.0E-04	1.2E-06	1.5E-07
dBuV/m @ 3 meters	124.1	60.4	31.9	43.1	49.5	18.7	46.5	54.9	30.9	22.1
Restricted Bands (Y/N)		**N**	**Y**	**Y**	**Y**	**Y**	**N**	**N**	**Y**	**Y**
Limit dBuV/m		54	54	54	54	54	54	54	54	54
Margin (dB)		N/A	-22.1	-10.9	-4.5	-35.3	N/A	N/A	-23.1	-31.9

Freq (MHz)	**915.24**	1830.48	2745.72	3660.96	4576.2	5491.44	6406.68	7321.92	8237.16	9152.4
Harmonic	1	2	3	4	5	6	7	8	9	10
Measured Power (dBm)	20.9	-18.6	-63.5	-50.1	-40.7	-55.7	-37.6	-37.1	-62.5	-70.8
Cable Loss	1.1	1.1	2.9	2.7	2.2	2.3	3.6	4.1	2.8	2.7
Power (dBm) Output	22	-17.5	-60.6	-47.4	-38.5	-53.4	-34	-33	-59.7	-68.1
Power (milliWatts)	158.49	1.8E-02	8.7E-07	1.8E-05	1.4E-04	4.6E-06	4.0E-04	5.0E-04	1.1E-06	1.5E-07
dBuV/m @ 3 meters	124.7	76.6	31.7	42.5	52.3	37.3	55.4	55.9	30.5	22.2
Restricted Bands (Y/N)		**N**	**Y**	**Y**	**Y**	**Y**	**N**	**N**	**Y**	**Y**
Limit dBuV/m		54	54	54	54	54	54	54	54	54
Margin (dB)		N/A	-22.3	-11.5	-1.7	-16.7	N/A	N/A	-23.5	-31.8

Freq (MHz)	926.3	1852.6	2778.9	3705.2	4631.5	5557.8	6484.1	7410.4	8336.7	9263
Harmonic	1	2	3	4	5	6	7	8	9	10
Measured Power (dBm)	21.4	-21.1	-58.9	-48.1	-51.7	-57.7	-57.1	-45.9	-57.5	-79.6
Cable Loss	1.1	1.1	2.9	2.7	2.2	2.3	3.6	4.1	2.8	2.7
Power (dBm) Output	22.5	-20	-56	-45.4	-49.5	-55.4	-53.5	-41.8	-54.7	-76.9
Power (milliWatts)	177.83	1.0E-02	2.5E-06	2.9E-05	1.1E-05	2.9E-06	4.5E-06	6.6E-05	3.4E-06	2.0E-08
dBuV/m @ 3 meters	125.2	74.1	36.3	44.5	41.3	35.3	35.9	47.1	35.5	13.4
Restricted Bands (Y/N)		**N**	**Y**	**Y**	**Y**	**Y**	**N**	**N**	**Y**	**Y**
Limit dBuV/m		54	54	54	54	54	54	54	54	54
Margin (dB)		N/A	-17.7	-9.5	-12.7	-18.7	N/A	N/A	-18.5	-40.6

Antenna Specifications

Radial Larsen
http://www.radialllarsen.com/docfiles/ASB7/Pages/129.pdf

Field tunable omni base antenna with attached ground plane, 740 - 960 MHz. Includes mounting bracket and hardware.

MODEL	FREQUENCY
FB3740	740 - 806 MHz
FB3800	806 - 866 MHz
FB3825	824 - 896 MHz
FB3900	890 - 960 MHz

SPECIFICATIONS	
GAIN	3.2 dBd / 5.4 dBi
TYPE	5/8 over 1/4 wave
VSWR	1.5:1 or less
COLOR	Black
WHIP	.100, open coil
POWER RATING	150 Watts
MAX HEIGHT	16"
FEED CONNECTION	N Female
WIND LOAD	100 mph

Omni base antenna with attached ground plane, 740 - 960 MHz. No mounting hardware.

MODEL	FREQUENCY
FB3740WA	740 - 806 MHz
FB3800WA	806 - 866 MHz
FB3825WA	824 - 896 MHz
FB3900WA	890 - 960 MHz

SPECIFICATIONS	
GAIN	3.2 dBd / 5.4 dBi
TYPE	5/8 over 1/4 wave
VSWR	1.5:1 or less (TX)
COLOR	Black
WHIP	.100, open coil
POWER RATING	150 Watts
MAX HEIGHT	16"
FEED CONNECTION	N Female
WIND LOAD	100 mph

High gain omni base antenna with attached ground plane for SMR, cellular or data applications. Includes mounting bracket and hardware.

MODEL	FREQUENCY
FB35T800	806 - 866 MHz
FB35T825	824 - 896 MHz
FB35T900	902 - 928 MHz

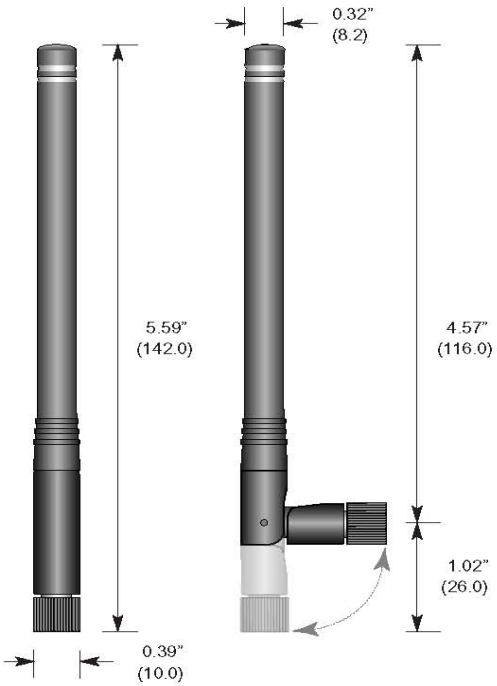
SPECIFICATIONS	
GAIN	5 dBd / 7.2 dBi
TYPE	5/8 over 5/8 over 1/4 wave
VSWR	1.5:1 or less (TX)
COLOR	Black
WHIP	.100, twin open coil
POWER RATING	150 Watts
MAX HEIGHT	32"
FEED CONNECTION	N Female
WIND LOAD	100 mph

BASE STATION ANTENNAS

Linx Technologies
http://www.antennafactor.com/documents/ANT-916-CW-HWR-xxx_Data_Sheet.pdf

ANTENNA FACTOR ANT-916-CW-HWR-xxx DATA SHEET

Product Dimensions



Description

HWR Series 1/2-wave center-fed dipole antennas deliver outstanding performance in a rugged and cosmetically attractive package. The articulating base allows the antenna to tilt 90 degrees and rotate 360 degrees. The antenna's internal counterpoise eliminates external ground plane dependence and maximizes performance. HWR Series antennas attach via a standard SMA or Part 15 compliant RP-SMA connector. Custom colors and connectors are available for volume OEM customers.

Features

- Low cost
- Internal counterpoise
- Tilts and rotates
- Excellent performance
- Omni-directional pattern
- Outstanding VSWR
- Flexible main shaft
- Rugged & damage-resistant
- Standard SMA or Part 15 compliant RP-SMA connector
- Custom terminations for volume OEMs
- Available in black or custom colors

Electrical Specifications

Center Freq.	916MHz
Bandwidth	30MHz
Wavelength	1/2-wave
VSWR	<2.0 typ. at center
Impedance	50 ohms
Gain	2dBi
Connector	RP-SMA or SMA

Electrical specifications and plots measured on 4.00" x 4.00" reference ground plane

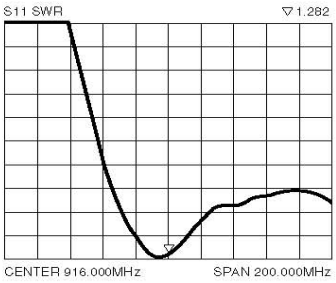
Ordering Information

- ANT-916-CW-HWR-RPS (with RP-SMA connector)
- ANT-916-CW-HWR-SMA (with SMA connector)

Polar Plots and VSWR Graph

Azimuth

Elevation



Typical VSWR

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