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ACCREDITED

Testing Certification # 1367-01

TEST REPORT

06F221
04/16/2008

Applicant:

Commercial Wireless Systems International LLC
10798 NW 53rd Street
Sunrise, Fl 33351

Product:
Model - CP3000 and AR-3
Wireless Control Panel and Repeater

In Accordance with FCC Part 15.247

Test dates:
09/07/2006 - 02/20/2007

Receive Date:
08/30/2006

Prepared by: Steven E. Hoke - EMC Site Manager

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Test Procedures

Product description: The system utilizes FHSS type transmitters. The CWSI alarm panel and repeater are comprised of models CP3000 and AR-3 respectively. The model CP3000 is a Control panel with transceiver and the AR-3 consists of the identical transceiver as included in the CP3000 but does have any control circuitry. Each of these models has an identical PWB used for the transceiver.

Powerline conducted interference: The AC powerline conducted emissions were measured.

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 sent 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 had a direct connection to the measuring equipment.

Conducted output power: The conducted output power was measured with a direct connection between the EUT and the spectrum analyzer.

Operation with directional antenna gains greater than 6 dBi: Maximum permissible output power is (250) mW or (24) dBm. The isotropic gain of the highest gain antenna is (14.25) dBi. The derated output power limit is (9.75) dBm. The highest measured output power saw (8.5) dBm, therefor the EUT meets the requirements when used with the directional antenna having a gain of greater than (6) dBi.

Spurious emissions: All spurious emissions were measured 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.

Other conditions of operation per 15.247

15.247 (a) (1) - The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter.

Each transmitter hops over a pseudo-random list of 36 distinct hopping frequencies. Transmitters will remain in a frequency for 398 ms (hop period). Transmitters will hop into each frequency in the list (and remain at that frequency for the hop period) until each frequency has been "hopped into" once (hop cycle). Transmitters will start a new hop cycle once the previous one completes.

15.247 (g) - Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

The system does not make use of continuous data streams. All communication is achieved via short messages (less than 40 milliseconds) sent during a transmit opportunity within a hop. Messages can be transmitted or received on any hopping channel/frequency. Messages are not transmitted more than once within the same hop.

15.247 (h) - The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

The system does not implement any intelligence that permits it to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels. The system does not coordinate in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters.

Test Summary

Name of Test	Paragraph No.	Specification	Measurement	Result
Powerline Conducted Emissions	15.207(a)	Table 15.207(a)	8 dB margin	Complies
Channel Separation	15.247(a)(1)	Greater of 25 kHz or 20 dB bandwidth	> 750 kHz	Complies
Pseudo-random Hopping Algorithm	15.247(a)(1)	See Page 4	Not applicable	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	0.096 sec in 10 sec	Complies
20 dB Occupied Bandwidth	15.247(a)(1)	>250 kHz <500 kHz	270 - 297 kHz	Complies
Peak Output Power	15.247(b)	0.25 Watts	0.0071 Watts	Complies
Spurious Emissions (Conducted / Radiated)	15.247(d)	-20 dBc (peak) -30 dBc (avg)	- 39.9 dBc	Complies
Spurious Emissions (Radiated)	15.247(d)	54.0 dBuV/m per Table 15.209(a)	50.4 dBuV/m	Complies

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

Date: 02/20/2007

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 = (7.1) mW
See Page A15.

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

Direct measurement between EUT connector and input of spectrum analyzer.

Channel	dBm	Watts mW
low	8.3	6.8
Mid	8.5	7.1
high	8.1	6.5

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: 02/20/2007

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 had a margin of (8) dB.

RBW: (9) kHz
VBW: (10) kHz

See Pages A1 - A8.

Test: 20 dB Bandwidth

Date:02/20/2007

Requirement: The 20 dB bandwidth is required for other technical requirements.

Result: The 20 dB bandwidth was measured at the low, mid and high frequency of operation. The bandwidths are listed below:

Frequency (MHz)	Channel	Measured 20dB bandwidth
904.3	Low	280 kHz
915.3	Mid	297 kHz
926.3	High	270 kHz

See Page A9

Span:2 MHz

RBW: (10) 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: Carrier Frequency Separation per 15.247(a)(1)

Date: 02/20/2007

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 as (297) kHz. The separation was found to be (>750) kHz..

See Page A10

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: 02/20/2007

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 (270 - 297) kHz. We observed 25 hopping frequencies.

See Page A11.

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:02/20/2007

Requirement: The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period when the 20 dB bandwidth of the hopping channel is greater than 250 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 (96) 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 (270 - 297) kHz

See Pages A12 - A13.

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: 02/20/2007

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 (1.852) GHz at (-31.8) dBm. The highest inband level measured was (8.5) dBm at (904.3) MHz. The limit for out of band emissions is (-11.5) dBm. The worst case out of band emission measured was (20.3) dB below the limit.

See Page A14

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 Page A15.

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 = (7.1) mW

Antenna gain (numeric) = (26.6) dB

Distance = (20) cm

$S = (7.1 * 26.6) / (12.57 * 400)$

$S= (189) / (5{,}028)$

$S= (0.038)\ mW / cm^2$

Limit = (1.0) mW / cm^2

Antenna Specifications

This EUT uses various external design types. The specifications for each type are listed in pages A16 - A23. The highest isotropic gain of all the antennas is (14.25) dBi and is for the M2 Antenna systems model number 914A-ISP YAGI shown on page A16.

TEST TITLE:SPECTECH			PAGE 1
DATA FILE :222_L.D30			Freq.(MHz)
Amplitude Units : dBuV		Threshold -8 dB	0.1500

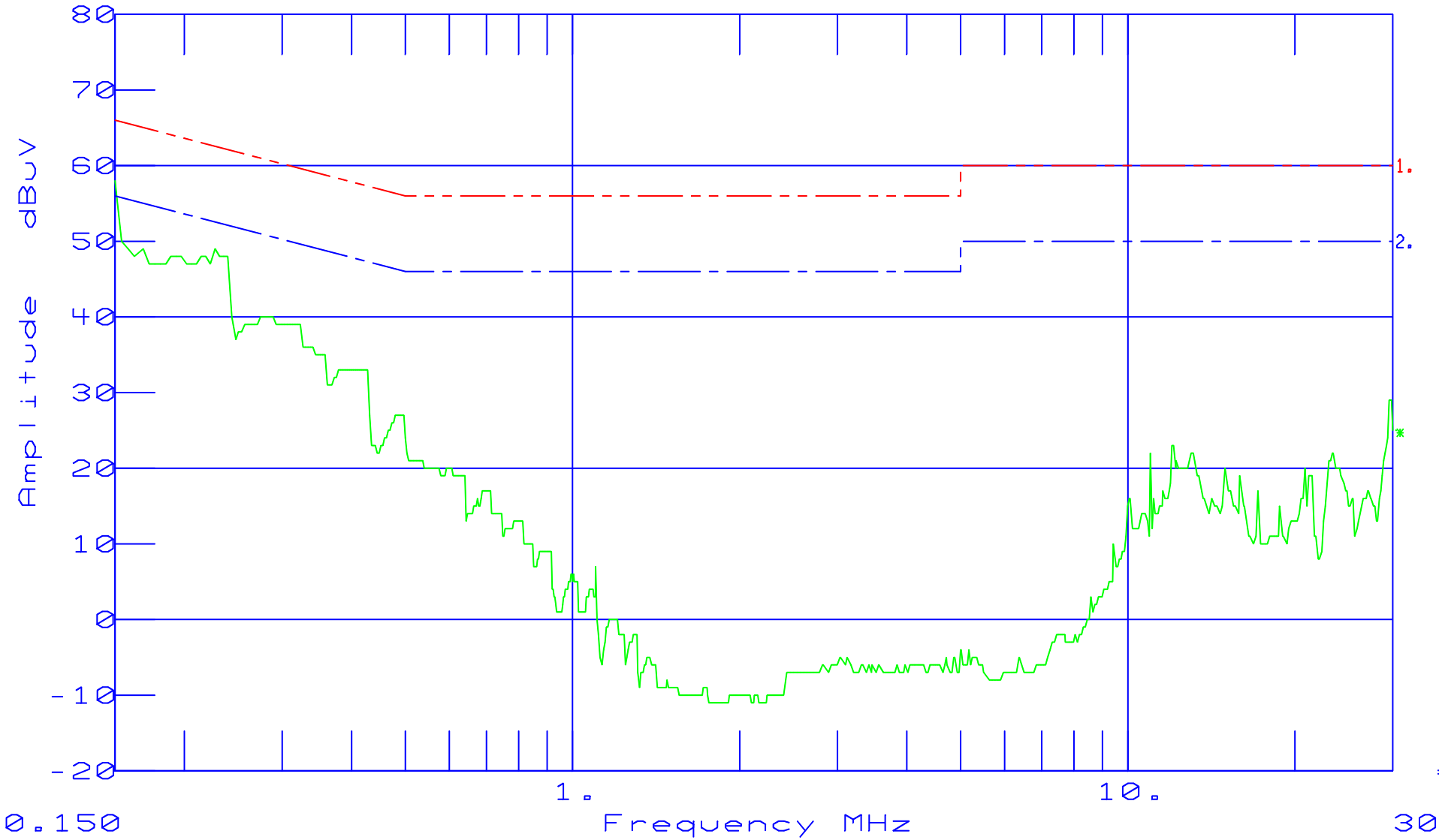
Freq(MHz)	Amp	C22BQP.S30 vs Spec(dB)	C22BAVG.S30 vs Spec(dB)
0.1500	58.0	-8.000 *	2.000 *
0.1542	50.0		-5.771 *
0.1583	49.0		-6.553 *
0.1625	48.0		-7.335 *
0.1686	49.0		-6.029 *
0.1728	47.0		-7.825 *
0.1769	47.0		-7.630 *
0.1811	47.0		-7.435 *
0.1852	47.0		-7.249 *
0.1890	48.0		-6.080 *
0.1932	48.0		-5.898 *
0.1973	48.0		-5.723 *
0.2019	47.0		-6.532 *
0.2061	47.0		-6.361 *
0.2102	47.0		-6.197 *
0.2143	48.0		-5.037 *
0.2185	48.0		-4.876 *
0.2227	47.0		-5.718 *
0.2272	49.0		-3.551 *
0.2314	48.0		-4.399 *
0.2355	48.0		-4.253 *
0.2394	48.0		-4.117 *

Product Safety Engineering

SPECTECH

Date : 11/13/06	Time : 16:26:47.92	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 : CP-3000	Sensor Loc. :LINE	Dump/DwellN/A	3)
Mode of Op. :NORMAL	Sensor Pol. :	RF Atten. 10 dB	4)
Serial No. : NONE	Ext. Atten. :0 dB	IF Atten. 10 dB	

Comment : 120 VAC / 60 HZ



TEST TITLE:SPECTECH			PAGE 1
DATA FILE :222_LA.D30			Freq.(MHz)
Amplitude Units : dBuV		Threshold -32 dB	0.1500

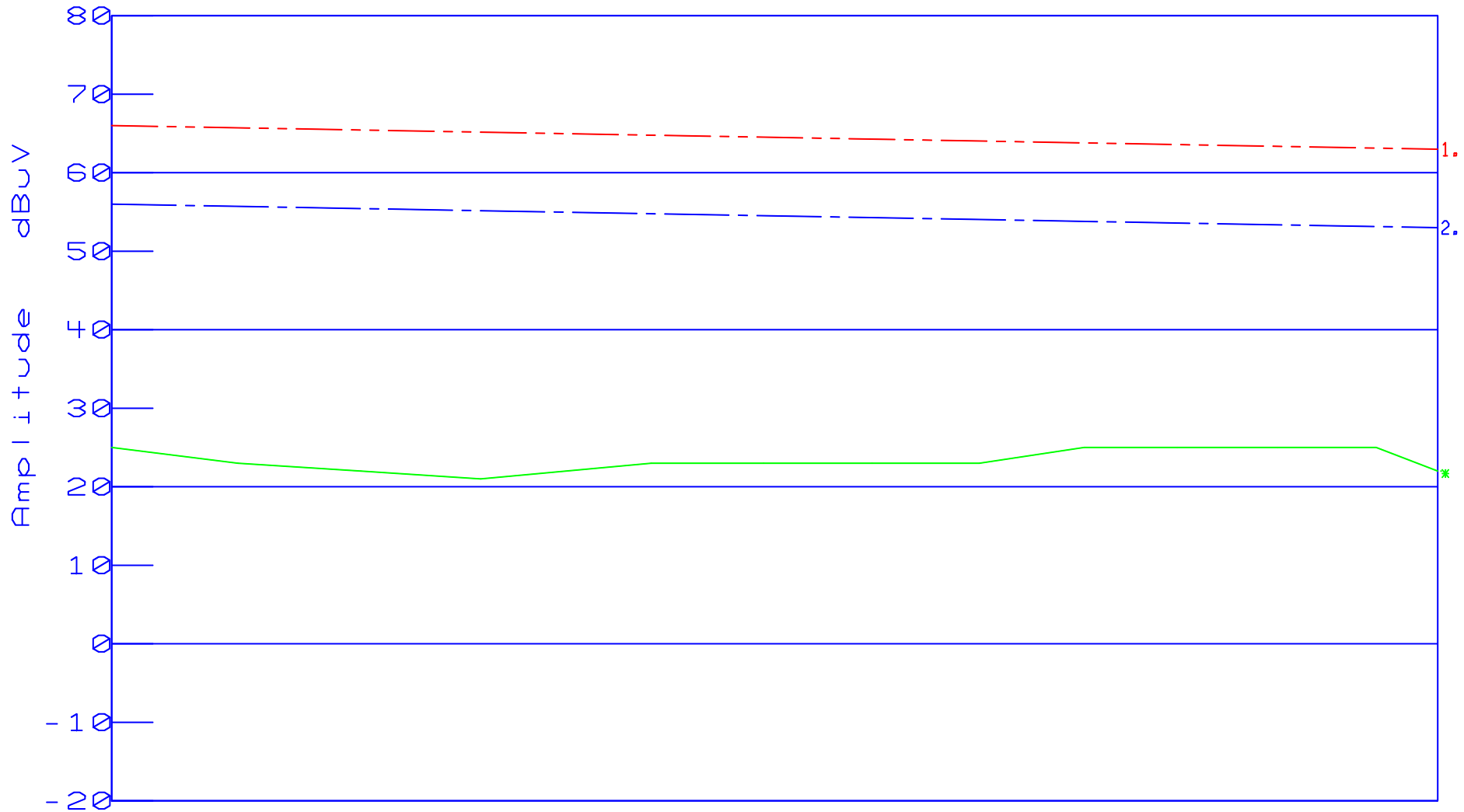
Freq(MHz)	Amp	C22BQP.S30 vs Spec(dB)	C22BAVG.S30 vs Spec(dB)
0.1500	25.0		-31.000 *
0.1728	23.0		-31.825 *
0.1769	23.0		-31.630 *
0.1811	23.0		-31.435 *
0.1852	25.0		-29.249 *
0.1890	25.0		-29.080 *
0.1932	25.0		-28.898 *
0.1973	25.0		-28.723 *
0.2000	22.0		-31.611 *

Product Safety Engineering

SPECTECH

Date :	11/14/06	Time :	09:02:22.80	EMC-30 SETTINGS	SPECS
Technician :	JACK GARNER	Test Equip. :	EMC-30	Detector Average	1) CISPR 22 Quasi Peak
Test Method :	EN55022 CLASS B	Test Number :	1	Bandwidth CISPR	2) CISPR 22 AVG
Equipment :	CP-3000	Sensor Loc. :	LINE	Dump/Dwell N/A	3)
Mode of Op. :	NORMAL	Sensor Pol. :		RF Atten. 10 dB	4)
Serial No. :	NONE	Ext. Atten. :	0 dB	IF Atten. 10 dB	

Comment : 120 VAC / 60 HZ



FCC ID:V7L3000AR3

E-M

TEST TITLE:SPECTECH			PAGE 1
DATA FILE :222_N.D30			Freq.(MHz)
Amplitude Units : dBuV		Threshold -12 dB	0.1500

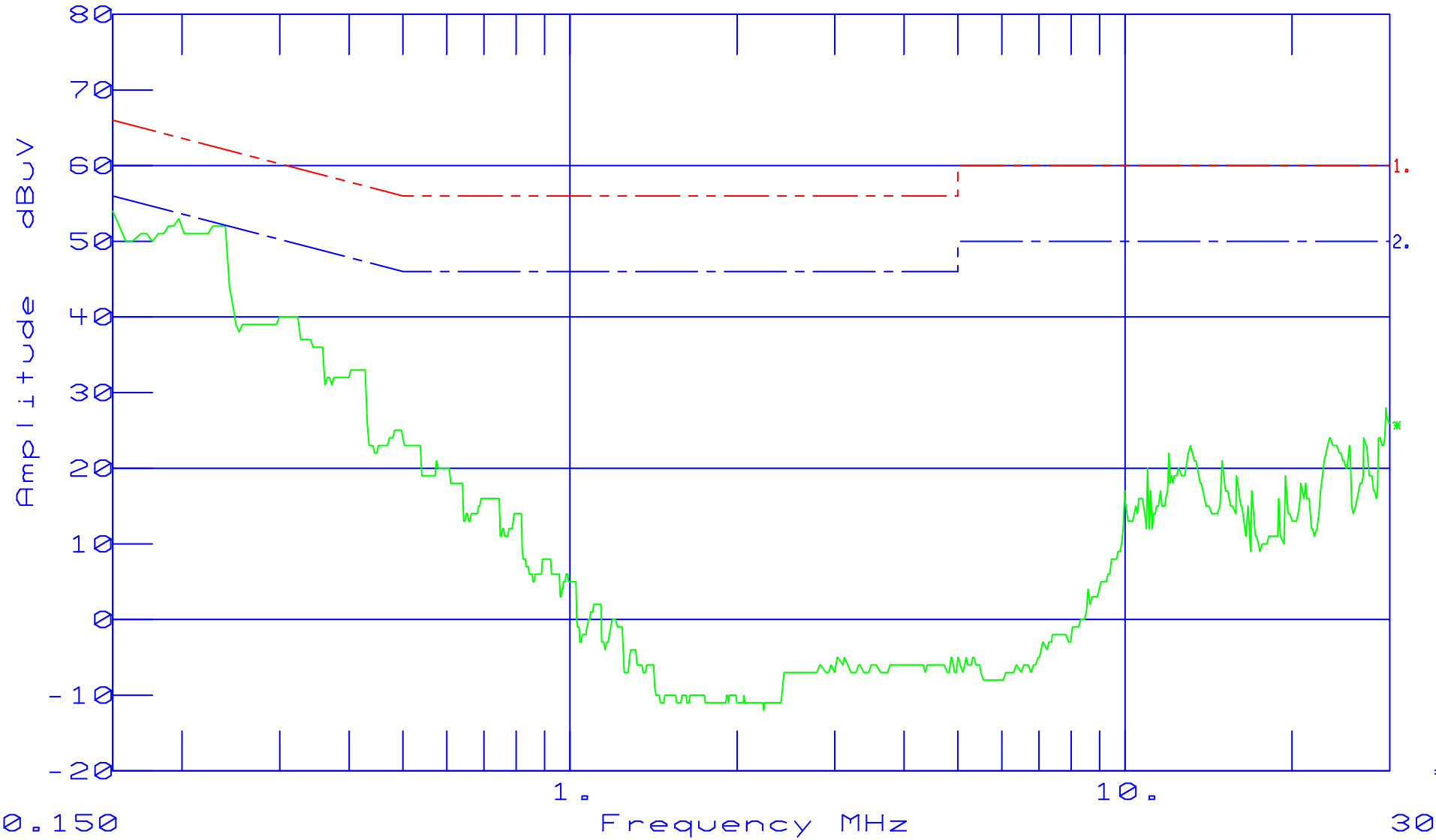
Freq(MHz)	Amp	C22BQP.S30 vs Spec(dB)	C22BAVG.S30 vs Spec(dB)
0.1500	54.0	-12.000 *	-2.000 *
0.1542	52.0		-3.771 *
0.1583	50.0		-5.553 *
0.1625	50.0		-5.335 *
0.1686	51.0		-4.029 *
0.1728	51.0		-3.825 *
0.1769	50.0		-4.630 *
0.1811	51.0		-3.435 *
0.1852	51.0		-3.249 *
0.1890	52.0		-2.080 *
0.1932	52.0	-11.898 *	-1.898 *
0.1973	53.0	-10.723 *	-0.723 *
0.2019	51.0		-2.532 *
0.2061	51.0		-2.361 *
0.2102	51.0		-2.197 *
0.2143	51.0		-2.037 *
0.2185	51.0	-11.876 *	-1.876 *
0.2227	51.0	-11.718 *	-1.718 *
0.2272	52.0	-10.551 *	-0.551 *
0.2314	52.0	-10.399 *	-0.399 *
0.2355	52.0	-10.253 *	-0.253 *
0.2394	52.0	-10.117 *	-0.117 *
0.2435	44.0		-7.976 *
0.2477	41.0		-10.834 *
0.2743	39.0		-11.987 *
0.2778	39.0		-11.881 *
0.2812	39.0		-11.780 *
0.2856	39.0		-11.651 *
0.2890	39.0		-11.553 *
0.2925	39.0		-11.453 *
0.2960	39.0		-11.354 *
0.2994	40.0		-10.259 *
0.3029	40.0		-10.163 *
0.3064	40.0		-10.068 *
0.3099	40.0		-9.973 *
0.3131	40.0		-9.888 *
0.3166	40.0		-9.796 *
0.3201	40.0		-9.704 *
0.3235	40.0		-9.616 *

Product Safety Engineering

SPECTECH

Date : 11/14/06	Time : 09:26:02.79	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 : CP-3000	Sensor Loc. :NEUTRAL	Dump/DwellN/A	3)
Mode of Op. :NORMAL	Sensor Pol. :	RF Atten. 10 dB	4)
Serial No. : NONE	Ext. Atten. :0 dB	IF Atten. 10 dB	

Comment : 120 VAC / 60 HZ



ANTENNA FILES

OTHER FACTORS

E-M

TEST TITLE:SPECTECH | PAGE 1
DATA FILE :222_NA.D30 | Freq.(MHz)
Amplitude Units : dBuV Threshold -31 dB | 0.1500

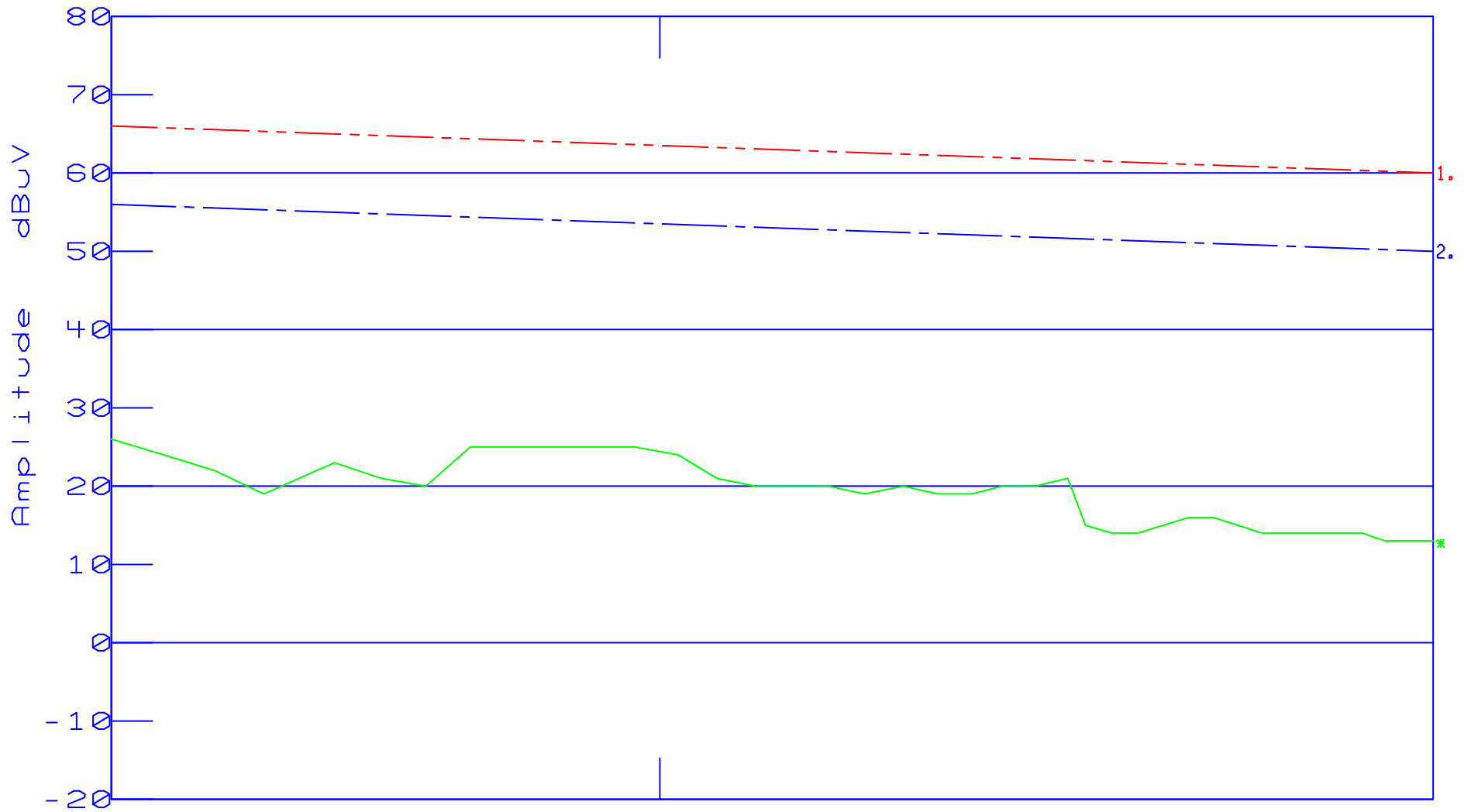
Freq(MHz)	Amp	C22BQP.S30 vs Spec(dB)	C22BAVG.S30 vs Spec(dB)
0.1500	26.0		-30.000 *
0.1811	25.0		-29.435 *
0.1852	25.0		-29.249 *
0.1890	25.0		-29.080 *
0.1932	25.0		-28.898 *
0.1973	25.0		-28.723 *
0.2019	24.0		-29.532 *
0.2477	21.0		-30.834 *

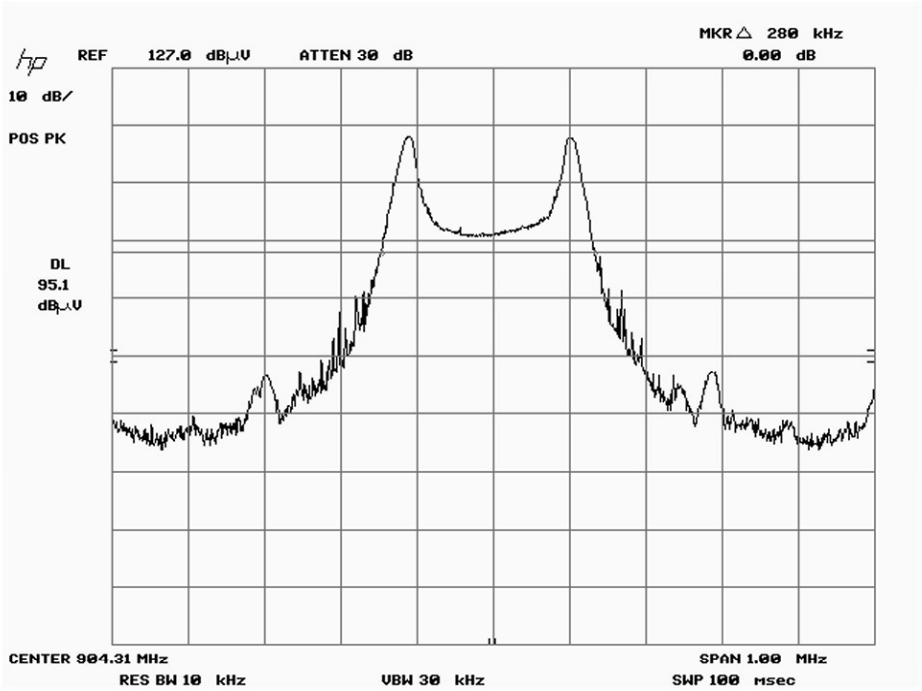
Product Safety Engineering

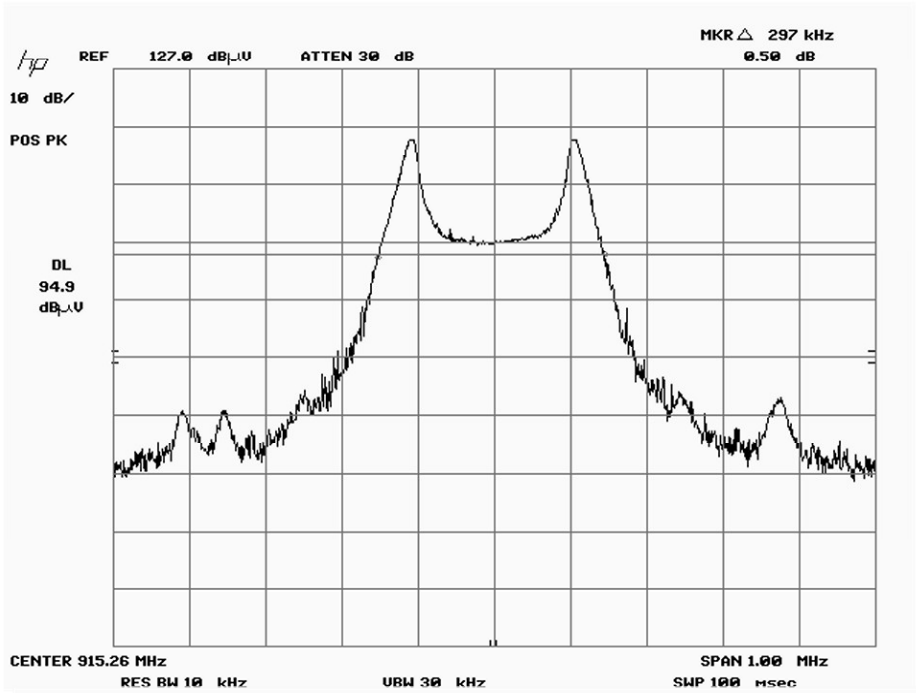
SPECTECH

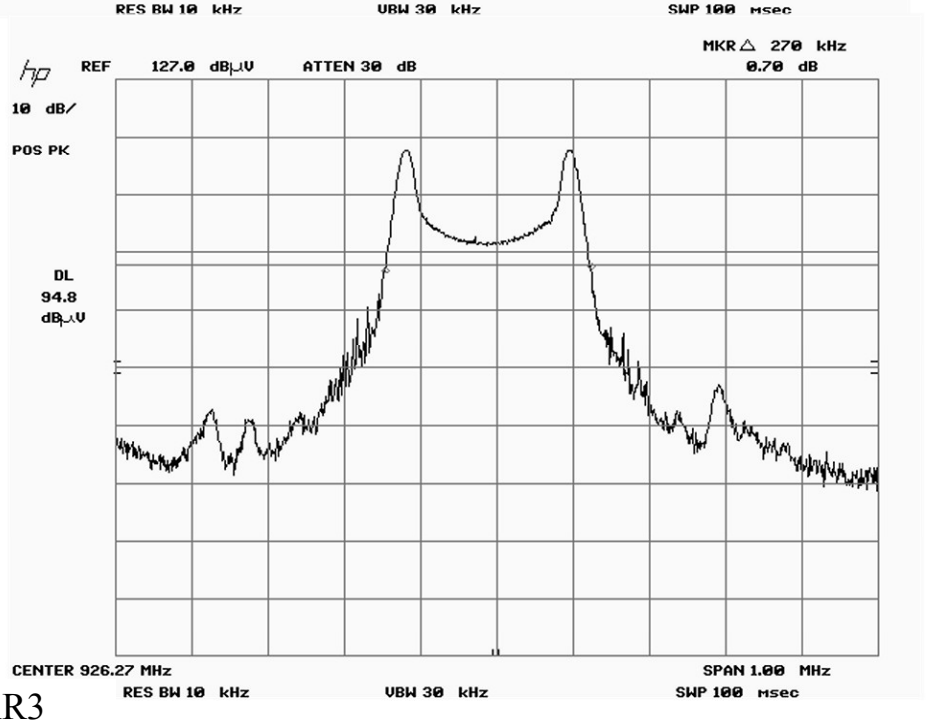
Date :	11/14/06	Time :	10:03:21.72	EMC-30 SETTINGS	SPECS
Technician :	JACK GARNER	Test Equip. :	EMC-30	Detector Average	1) CISPR 22 Quasi Peak
Test Method :	EN55022 CLASS B	Test Number :	1	Bandwidth CISPR	2) CISPR 22 AVG
Equipment :	CP-3000	Sensor Loc. :	NEUTRAL	Dump/Dwell IN/A	3)
Mode of Op. :	NORMAL	Sensor Pol. :		RF Atten. 10 dB	4)
Serial No. :	NONE	Ext. Atten. :	0 dB	IF Atten. 10 dB	

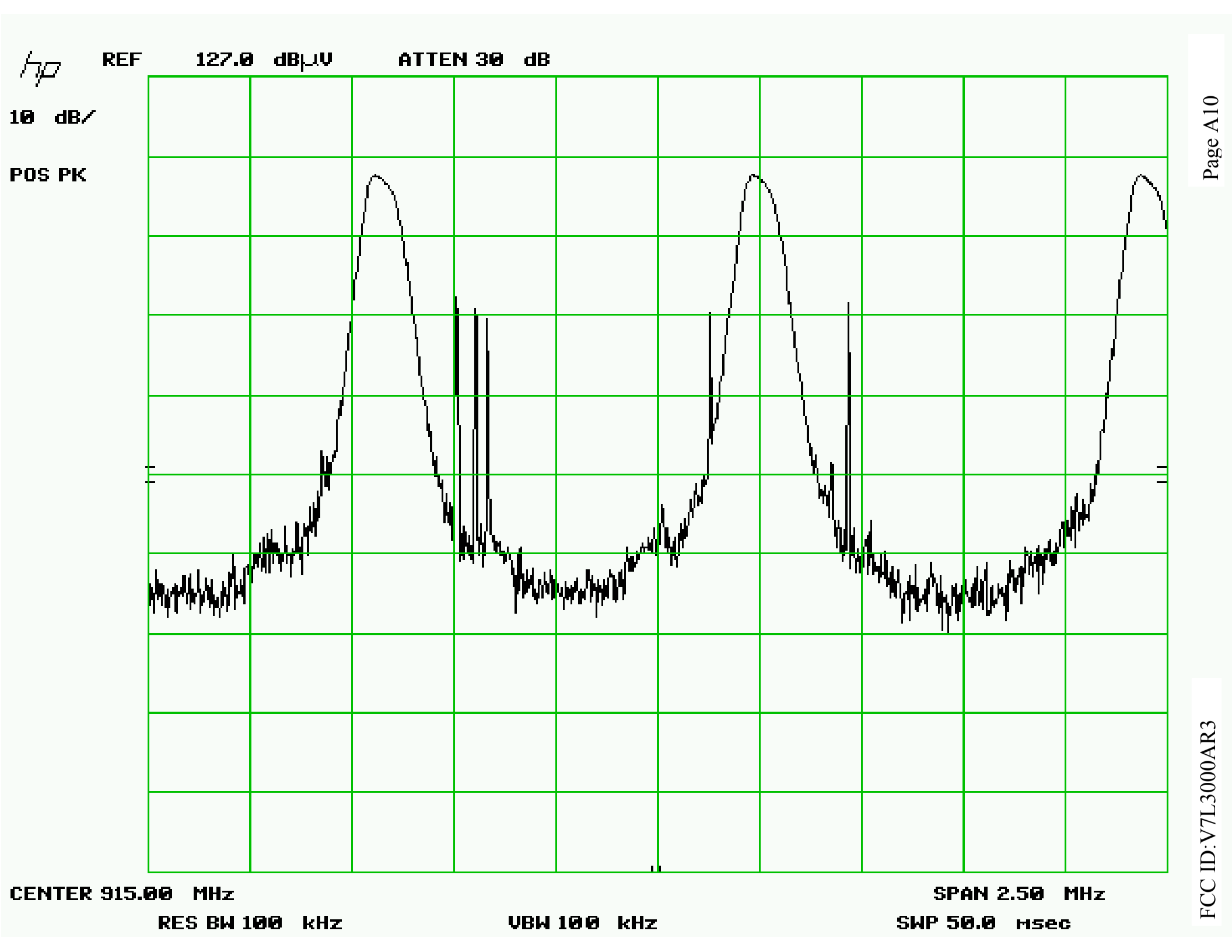
Comment : 120 VAC / 60 HZ

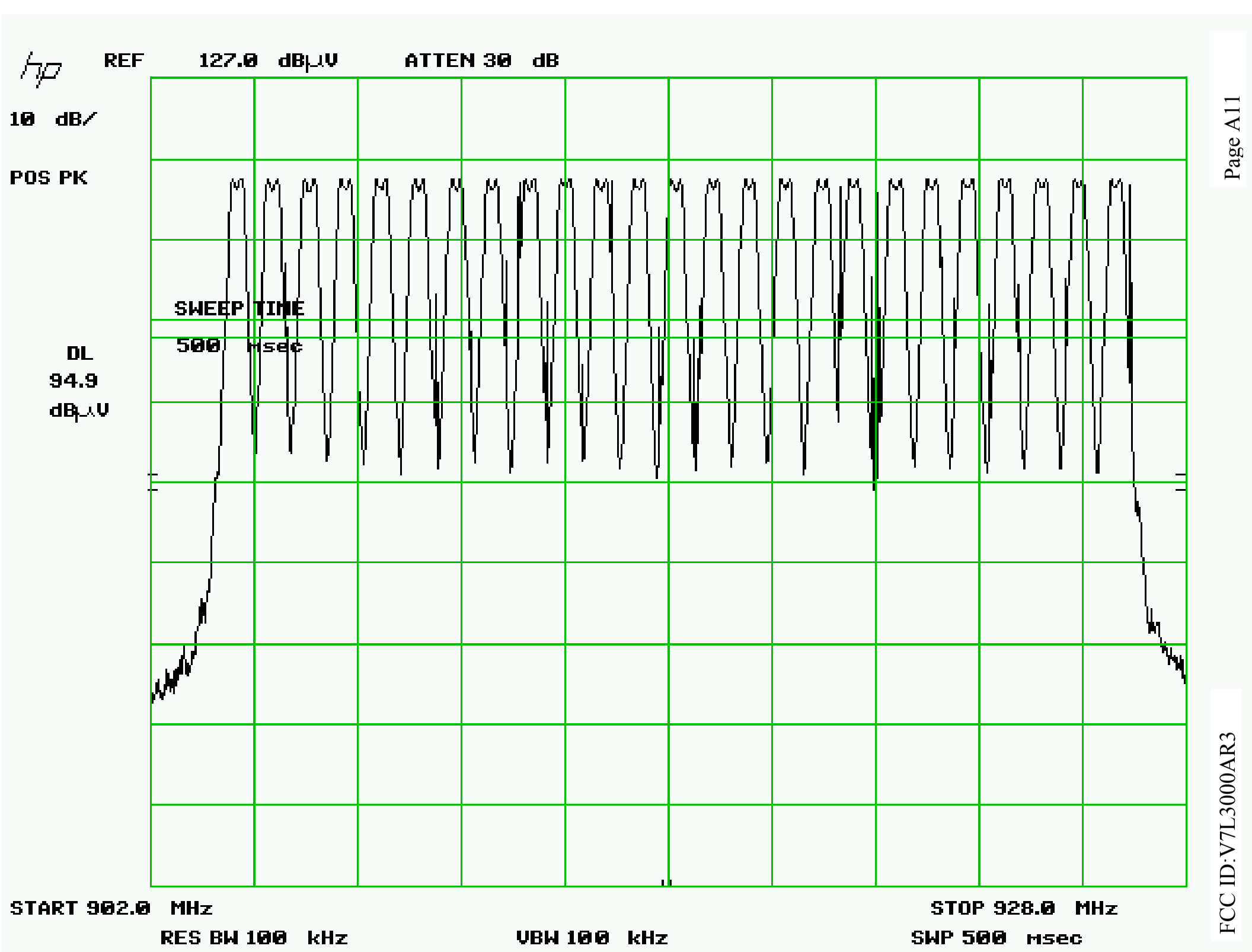


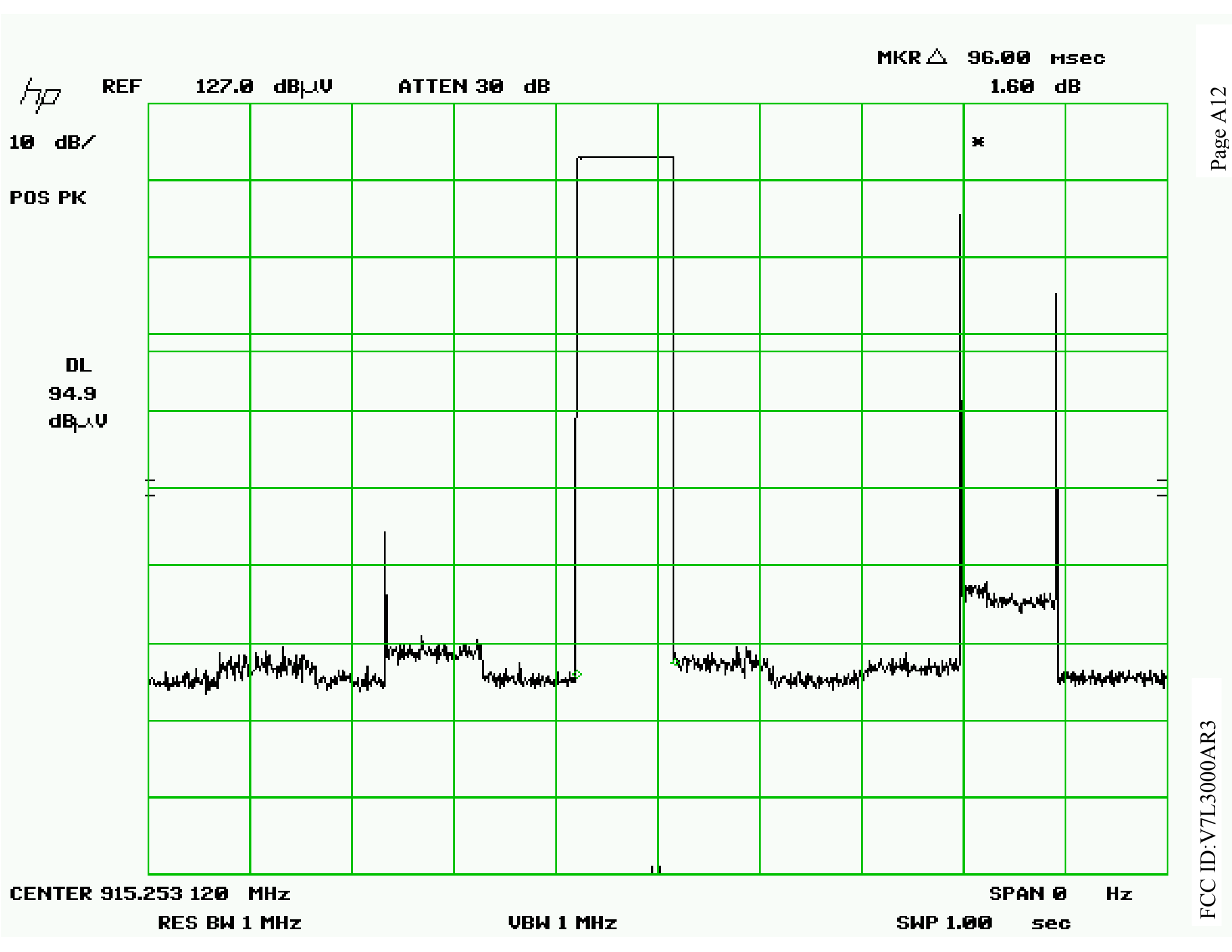

MKR△ 280 kHz
0.00 dB
REF 127.0 dBµV
ATTEN 30 dB
10 dB/
POS PK
DL
95.1
dBµV
CENTER 904.31 MHz
SPAN 1.00 MHz
RES BW 10 kHz
VBW 30 kHz
SWP 100 msec

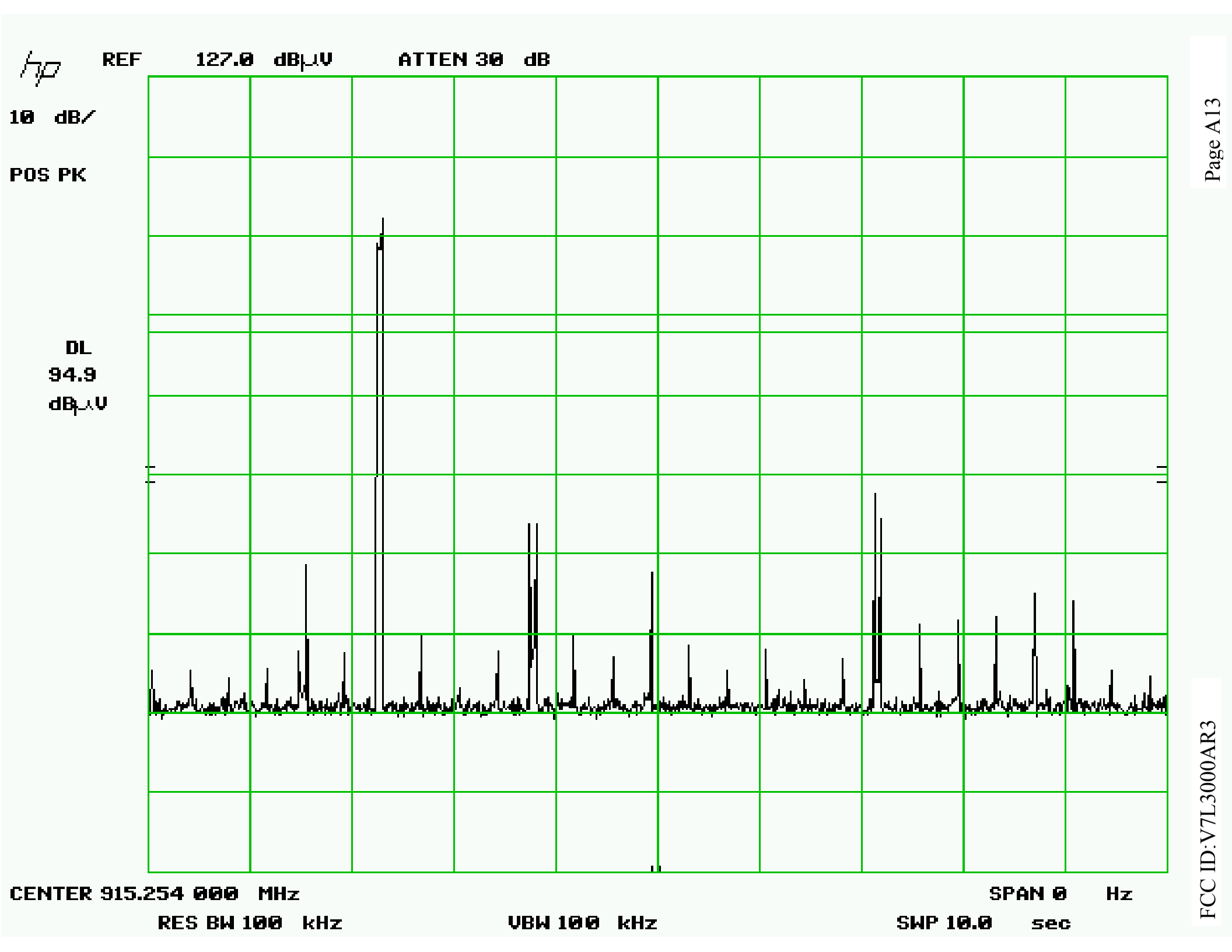

MKR△ 297 kHz
0.50 dB
REF 127.0 dBµV
ATTEN 30 dB
10 dB/
POS PK
DL
94.9
dBµV
CENTER 915.26 MHz
SPAN 1.00 MHz
RES BW 10 kHz
VBW 30 kHz
SWP 100 msec


MKR△ 270 kHz
0.70 dB
REF 127.0 dBµV
ATTEN 30 dB
10 dB/
POS PK
DL
94.8
dBµV
CENTER 926.27 MHz
SPAN 1.00 MHz
RES BW 10 kHz
VBW 30 kHz
SWP 100 msec








REF 127.0 dBµV
ATTEN 30 dB
10 dB/
POS PK
DL
94.9
dBµV
CENTER 915.254 000 MHz
SPAN 0 Hz
RES BW 100 kHz
VBW 100 kHz
SWP 10.0 sec

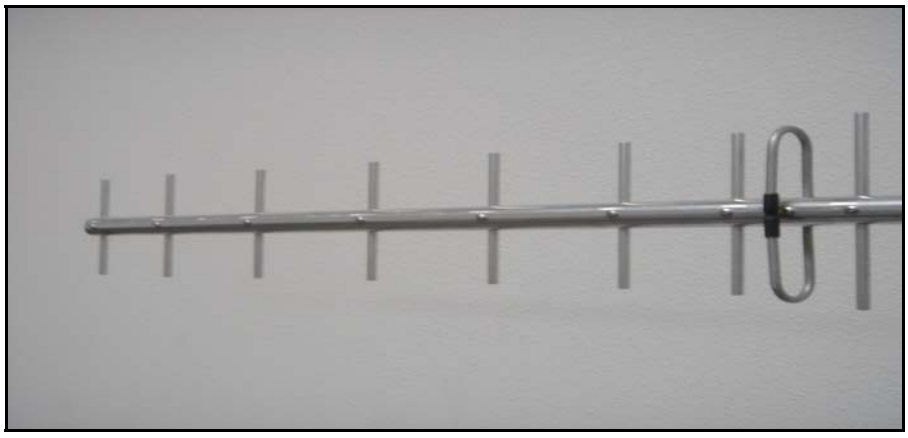
Low Freq (MHz)	904.3	1808.6	2712.9	3617.2	4521.5	5425.8	6330.1	7234.4	8138.7	9043.0
Harmonic	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
Distance (meters)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
dBuV/m	112.0	69.6	50.4	34.3	38.1	40.3	31.7	31.7	31.7	31.7
Restricted Band	N	N	Y	Y	Y	Y	N	Y	Y	Y
Restricted Band Margin			3.6	19.7	15.9	13.7		22.3	22.3	22.3
Mid Freq (MHz)	915.3	1830.6	2745.9	3661.2	4576.5	5491.8	6407.1	7322.4	8237.7	9153.0
Harmonic	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
Distance (meters)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
dBuV/m	112.2	69.6	49.8	33.7	36.4	40.4	41.6	32.3	31.7	31.7
Restricted Band	N	N	Y	Y	Y	N	N	Y	Y	Y
Restricted Band Margin			4.2	20.3	17.6			21.7	22.3	22.3
High Freq. (MHz)	926.3	1852.6	2778.9	3705.2	4631.5	5557.8	6484.1	7410.4	8336.7	9263.0
Harmonic	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
Distance (meters)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
dBuV/m	111.8	71.9	48.8	28.7	49.7	44.7	42.4	31.7	31.7	31.7
Restricted Band	N	N	Y	Y	Y	N	N	Y	Y	N
Restricted Band Margin			5.2	25.3	4.3			22.3	22.3	

Conducted OUtput Power

Freq (MHz)	Level (dBm) (direct)	
915.3	8.3	
1830.5	-34.1	
2745.8	-43.3	
3661.0	-69.4	
4576.3	-65.6	
5491.5	-63.4	
6406.8	-72.0	
7322.1	-72.0	
8237.3	-72.0	
9152.6	-72.0	
904.3	8.5	
1808.6	-34.1	
2712.9	-43.9	
3617.2	-70.0	
4521.5	-67.3	
5425.8	-63.3	
6330.1	-62.1	
7234.4	-71.4	
8138.7	-72.0	
9043.0	-72.0	
926.2	8.1	
1852.4	-31.8	
2778.7	-38.1	
3704.9	-75.0	
4631.1	-54.0	
5557.3	-59.0	
6483.5	-61.3	
7409.8	-72.0	
8336.0	-72.0	
9262.2	-72.0	

914A-ISP YAGI (900-930MHz)

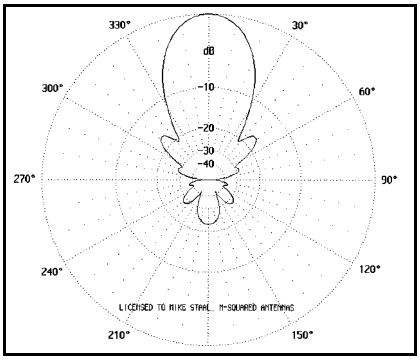
12-6-05



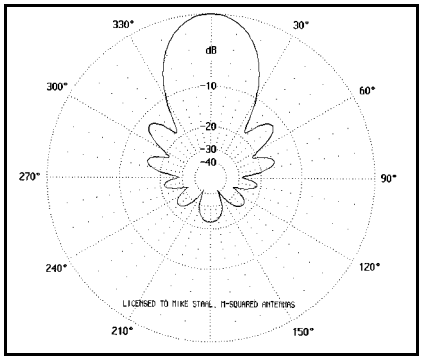
SPECIFICATIONS

MODEL	914A-ISP
FREQUENCY RANGE	900-930 MHz
USABLE RANGE	880-940 MHz
GAIN	14.25 dBi
FRONT TO BACK	25 dB
VSWR	1.2:1 TYPICAL
POLARITY	VERT / HORZ
STACKING DISTANCE	28”
FEED IMPEDANCE	50 OHMS
FEED CONNECTOR	N-FEMALE
POWER HANDLING	500 WATTS
BOOM LENGTH	36”
BOOM DIA.	1”
MAST SIZE	1 1/4” TO 2”
WIND AREA	(.4) SQ FT.
WIND RATING	100 MPH
WEIGHT	3 LBS.

914A-ISP E-PLANE



914A-ISP H-PLANE



FEATURES

The **914A-ISP** Wireless internet antenna, has been designed to give you optimum performance for the smallest package size. **The new 5/16” element design decreases the effects of rain and light snow deterioration often seen in similar antennas.**

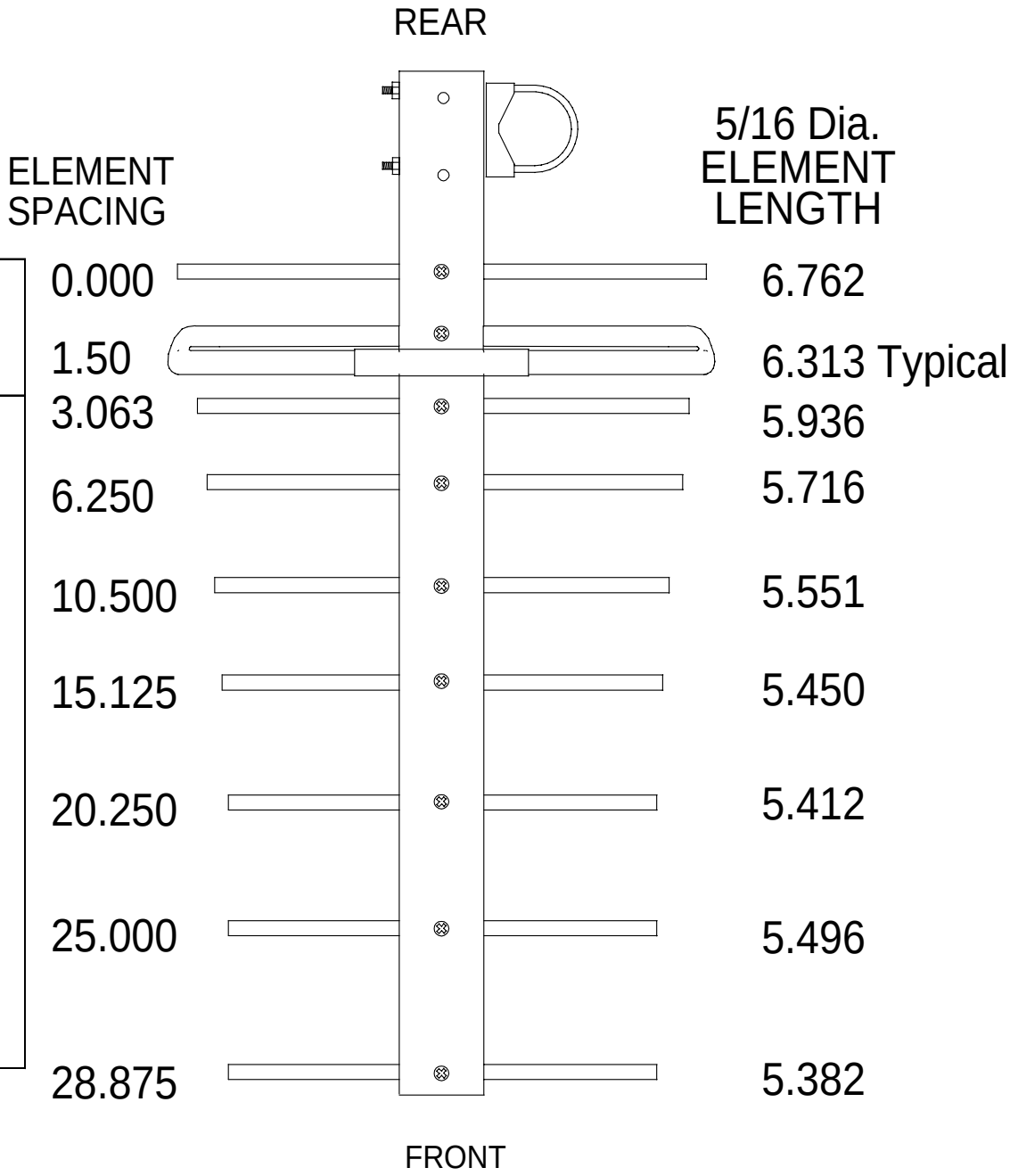
The heart of the **914A-ISP**, the folded dipole, provides a virtual flat match for over 30 MHz. The gain has been designed to roll-off quickly above range limits to prevent receiver overload from high power services above 930 MHz. The heavy duty two piece boom and 5/16” elements, give the ISP service confidence for superior performance and longevity.

The **914A-ISP** is a DC grounded antenna designed to work with many radios including the Wave Rider. The 3003 and 3004 Wave Rider radios have internal DC circuit protection built in. The 3000 model will work with the 917-ISP, but will default to the outside antenna once it sees a short.

Call about special bulk pricing !

4402 N. Selland Ave, Fresno, CA 93722 (559) 432-8873 FAX: 432-3059
www.m2inc.com Email: wyatt@m2inc.com

914A-ISP
(HI-PERFORMANCE 900-930 MHZ YAGI)
DIMENSION SHEET

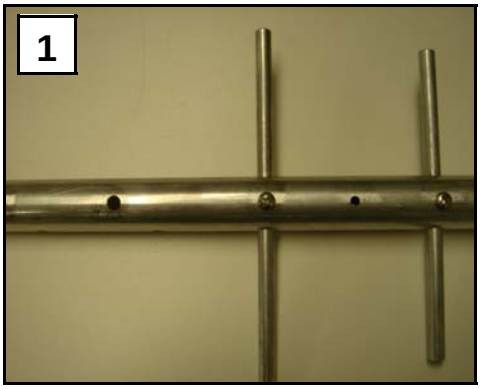


DECIMAL TO FRACTION CONVERSION
.062 = 1/16
.125 = 1/8
.188 = 3/16
.250 = 1/4
.313 = 5/16
.375 = 3/8
.437 = 7/16
.500 = 1/2
.562 = 9/16
.625 = 5/8
.688 = 11/16
.750 = 3/4
.813 = 13/16
.875 = 7/8
.937 = 15/16

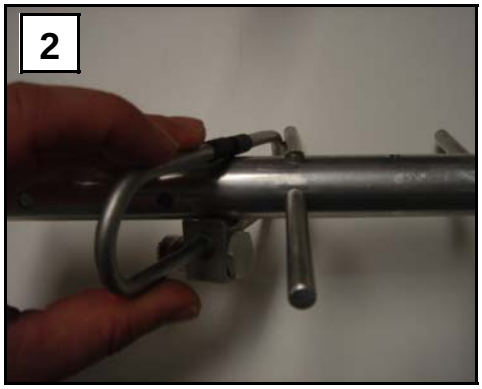
914AISPDIM
W.LYZENGA
12-07-05

GETTING STARTED

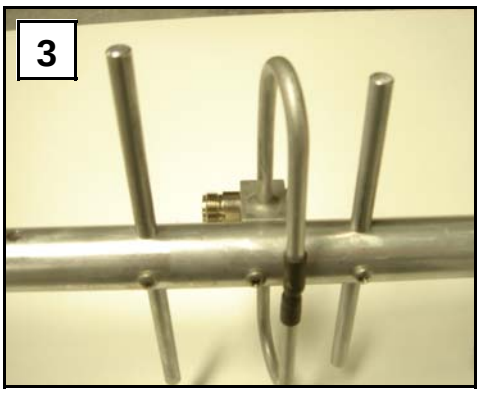
Tools handy for assembly process: Phillips head screwdriver, 11/32” spin-tite or socket, 7/16” end wrench or socket. The elements of the antenna are pre-assembled from the factory.



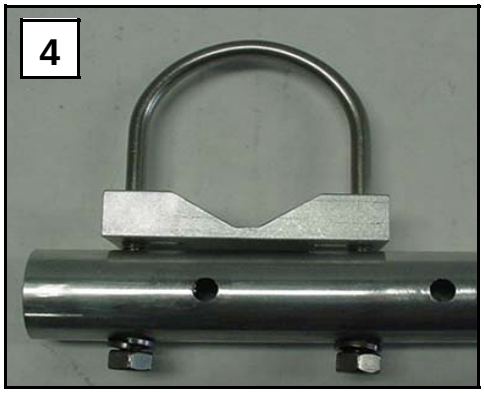
Step 1:
The assembly will be started at the rear of the boom section.



Step 2:
Attach the folded dipole to the rear boom section by sliding the unit back and forth until it is in place.



Step 3:
It may be necessary to remove the first element to slide the dipole in place. Attach the dipole with an 8-32 x 1 1/4” screw.



Step 5:
Attach the mounting U-bolt and Cradle in the correct polarity holes. Use the two 1/4-20 hex nuts and lock washers. It is highly recommended to use a lubricant like WD-40 on the threads of the U-bolt. Stainless material will seize if not lubricated.

914A-ISP PARTS LIST

12-06-05

DESCRIPTION..... QTY

BOOM, 1.0” X .058 X 36.00 ALUM 1
ELEMENTS, 5/16” (INSTALLED).....8
FOLDED DIPOLE ASSEMBLY 1
U-BOLT, 2”, SS & UNI-SADDLE 1
ASSEMBLY MANUAL.....1

IN HARDWARE BAGS:

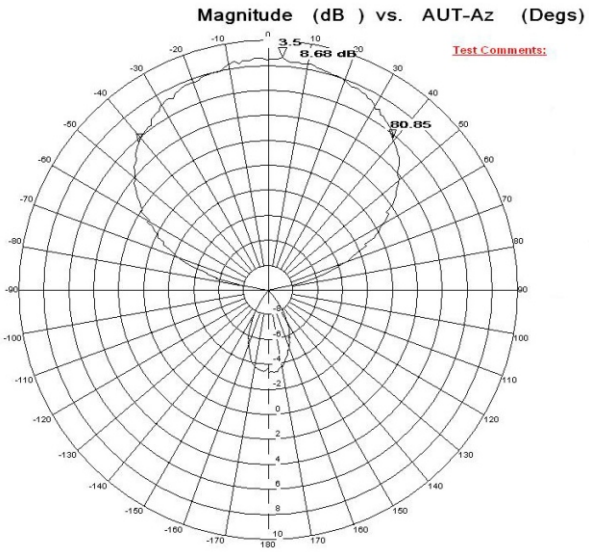
NUT, 1/4-20, SS.....2
LOCKWASHER, 1/4” SPLIT RING SS 2
SCREW, 8-32 X 1-1/4”, SS.....1

M^2 ANTENNA SYSTEMS, INC.
4402 N. SELLAND AVE.
FRESNO, CA 93722
(559) 432-8873 FAX: 432-3059
www.m2inc.com Email: sales@m2inc.com

For applications where maximum gain is required, AWI Yagis deliver the signal.

Yagis offer high performance and precise radiation patterns. They are excellent for cellular, ISM, data and other point to point applications. This series is available for 850 and 930 cellular bands in 4, 8 and 14 element versions. Gains range from 9dBi to over 15dBi.
Designed and fabricated in The USA to exacting standards.

COM-8804Y FOR MEDIUM GAIN REQUIREMENTS IN THE GSM, DATA AND ISM 900 BANDS WORLDWIDE



This design was optimized for wide bandwidth and robust construction in a low-cost package. The elevation pattern (not shown) provides a small amount of downtilt for maximizing coverage. Downtilt is aprox 5deg towards driver side of feed dipole. (Image is upside down) The azimuth pattern demontrates excellent beamwidth compared to patch antennas of the same gain. Versions available at 850 or 900 with 4, 8 and 14 elements.

SPECIFICATIONS

Frequency Band:	880-960MHz
Elements:	4
Gain:	8.5dBi Average
Beam Width @ Half Power AZ	80deg average
Beam Width @ Half Power EL	50deg average
Front To Back Ratio:	14dB Average
SWR Max/ Min:	1.9:1/1.1:1
SWR Average Across Band:	1.45:1
Power Max:	100 Watts
Connector: (options avail)	TNC Female
Length:	14”
Weight:	0.9 Lb (in box)
Materials:	Aluminum
Finish:	ElectrostaticPowder
Color: (options avail)	Light Gray
Wind Survival:	100 MPH
Mounting:	0.75-1.5” pipe

COMTELCO

Technical Specification **P915-SMA-2**

902-928MHz Unity Gain **PORTABLE ANTENNA**

FEATURES:

¼ wave loaded design

High durability and efficiency

Textured finish with strain-relief base

Straight connector

ELECTRICAL SPECIFICATIONS:

FREQUENCY:	*902-928MHz*
VSWR:	*<1.9:1*
GAIN:	*Unity*
POWER RATING:	*50 watts*
IMPEDANCE:	*50 ohms*
POLARIZATION:	*Vertical*

MECHANICAL SPECIFICATIONS:

OPERATING TEMPERATURE:	*-20℃ to +65℃*
ANTENNA LENGTH:	*2.1"*
CONNECTOR:	*SMA Plug (male)*
MATERIAL:	
WHIP:	*Polyurethane (black)*
CONNECTOR:	*Brass with black chrome plating)*

CENTURION™

Specifications

EXE

Two-Way Radio Antenna

Part Number (P/N):
EXE806 EXE821
EXE902 EXES806
+ Connector Option

Features:

- Injection molded ½ wave coaxial dipole antenna
- High durability, high efficiency
- Textured finish with strain-relief base
- Available in various standard connectors
- An original 'Tuf Duck' antenna

Specifications:

All Centurion products are designed for maximum efficiency and are customizable and scalable to meet your frequency and application requirements.

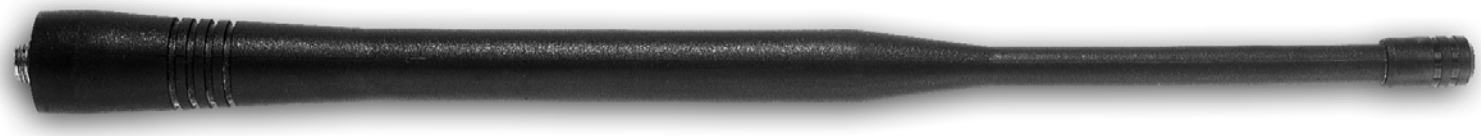
Frequency Range	Trunking/ Cellular
Polarization	Vertical
Nominal Impedance	50 ohms
VSWR	1.5:1 max at resonance
Power Rating	50 watts
Temperature Range	-40°C to +85°C
Drop Test	1M

The EXE model antenna is available in the following frequencies and connectors. Order by antenna model, frequency and connector. For example: EXE806SF. Length of each antenna will vary according to the connector chosen.

Part Number	Frequency Band	Connectors	Average Length
EXE806	806-866 MHz	BN, MD & SM	8.0" – 8.9"
EXE821	821-902 MHz	BN, MD & SM	8.0"
EXE902	902-960 MHz	BN, MD & SM	8.3"

Shortened ½ wave dipole EXES

EXES806	806–866 MHz	BN, MD & SM	7.6"



EXE

CENTURION

3425 N.44th Street, LINCOLN, NE 68504 USA
PHONE: 402.467.4491 • **FAX**: 402.467.4528
TECHNICAL SUPPORT: 888.454.6914
www.centurion.com • sales@centurion.com

P/N	S161AM−915

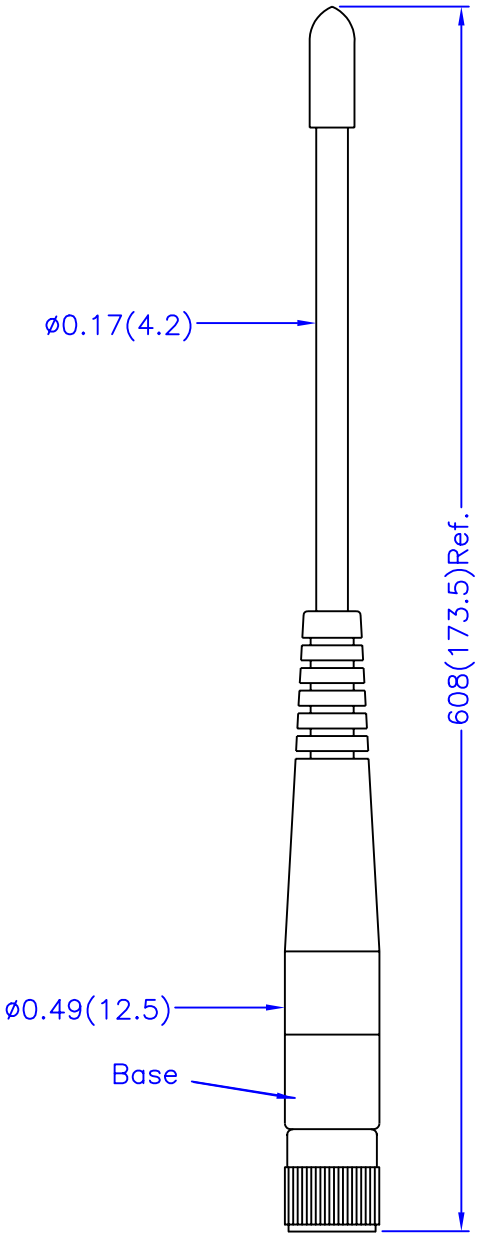
Alternative Connectors

.SMA Reverse Polarity Plug(female)

P/N: S161AH−915

.SMA Reverse Thread Plug(male)

P/N: S161AT−915



Electrical Properties:

Frequency Range:	902~928 MHz
Impedance:	50Ω nominal
VSWR:	<2.0:1
Gain:	2.5 dBi
Radiation:	Omni
Polarization:	Vertical
Wave:	½wave loaded

Mechanical Properties:

Connector:	SMA Plug
Material:	
Whip:	Wire (Black)
Base:	Polyacetal(Black)
Connector:	Brass with nickel plating(Black)
Operation Temp.:	−20°C to +65°C
Storage Temp.:	−30°C to +75°C

TOLERANCE		TITLE	900MHz ISM Band Antenna−161 Model	DATE	SHEET
.X					1 OF 1
.XX		UNIT	DWG. NO. S161AM−915		A4
.XXX		in.(mm)			
ANGLE		SCALE	NEARSON		
		1 : 1			