Product Safety Engineering, Inc
12955 Bellamy Brothers Blvd.
Dade City, FL 33525
352-588-2209

ACCREDITED

Testing Certification # 1367-01

TEST REPORT

14F100
03/37/2014

Applicant:

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

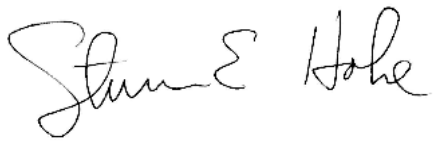
Product:
Model - 325/320
Wireless Smoke Detector

In Accordance with FCC Part 15.247

Test dates:
03/25/2014 - 03/27/2014

Receive Date:
03/20/2014

Prepared by: Steven E. Hoke - EMC Site Manager



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Test Procedures

Product description: The system utilizes FHSS type transmitters. The CWSI smoke detector is comprised of models 325 and 320. The model 320 is the same as model 325 with the exception that model 320 does not include a sounder. It is a simple transceiver responsible for monitoring the presence of smoke. The smoke detector is part of a larger system that includes a central processing device and various other devices including a pull station, heat detector, fire transmitter and repeater.

Powerline conducted interference: The AC powerline conducted emissions measurements were not applicable due to battery operation.

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 35 channels between902 MHz to 928 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 of13.125 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 has an integrated antenna that prohibited direct connection to the measuring equipment. We performed radiated field strength measurements as an alternative test procedure as defined in FCC DA 00-705.

Conducted output power: Not applicable for integrated antenna.

Operation with directional antenna gains greater than 6 dBi: Not applicable for integrated antenna.

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)	Not applicable	Complies
Channel Separation	15.247(a)(1)	Greater of 25 kHz or 20 dB bandwidth	703 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	36	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	380 - 420 kHz	Complies
Peak Output Power	15.247(b)	0.25 Watts	0.0012 Watts	Complies
Spurious Emissions (Conducted / Radiated)	15.247(d)	-20 dBc (peak) -30 dBc (avg)	NA	Complies
Spurious Emissions (Radiated)	15.247(d)	54.0 dBuV/m per Table 15.209(a)	53.3 dBuV/m	Complies

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

Date: 03/26/2014

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 = (1.2) mW
See exhibit # 6.

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

$P = (ED^2 / 30G)$

Measuring Antenna Correction Factor = 23.8 dB
Cable loss = 6.1 dB
Preamp Gain = 0

Channel	Level Received dBuV	ACF, Cable loss & Preamp Gain	Corrected Level dBuV/m	Level V/m	Distance	Antenna Gain (N)	Watts mW
low	65.3	29.9	95.2	0.058	3 m	1	1.0
Mid	64.2	29.9	94.1	0.051	3 m	1	0.8
high	66.1	30.0	96.1	0.064	3 m	1	1.2

Test Equipment:

Manufacturer	Model	Description	Serial Number	Cal Due	Cal Date
Hewlett Packard	8566B	Spectrum Analyzer	2532A02418	11/05/14	11/05/13
Hewlett Packard	8447D	Preamp 0.1 - 1,000 MHz	2944A06901	12/10/14	12/10/13
Hewlett Packard	8449B	Preamp 1 - 26.5 GHz	3008A00320	05/20/14	05/20/13
ETS Lindgren	3148	Log Periodic Antenna	75741	02/07/16	02/07/14
Electro-Mechanics	3115	Double Ridge Guide Ant	3810	07/16/15	07/16/13
EMCO	3104C	Biconical Antenna	75927	04/26/14	04/26/13

Test: Powerline conducted interference per 15.207

Date: NA

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 is battery powered and therefore exempt from this test.

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

See exhibit 1

Test: 20 dB Bandwidth

Date:03/26/2014

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	Low	420 kHz
915	Mid	412 kHz
926.1	High	380 kHz

See exhibit 2

Span:2 MHz

RBW: (10) kHz

VBW: (1) MHz

Channel: Low, mid and high

Test Equipment:

Manufacturer	Model	Description	Serial Number	Cal Due	Cal Date
Hewlett Packard	8566B	Spectrum Analyzer	2532A02418	11/05/14	11/05/13
Hewlett Packard	8447D	Preamp 0.1 - 1,000 MHz	2944A06901	12/10/14	12/10/13
Hewlett Packard	8449B	Preamp 1 - 26.5 GHz	3008A00320	05/20/14	05/20/13
ETS Lindgren	3148	Log Periodic Antenna	75741	02/07/16	02/07/14
Electro-Mechanics	3115	Double Ridge Guide Ant	3810	07/16/15	07/16/13
EMCO	3104C	Biconical Antenna	75927	04/26/14	04/26/13

Test: Carrier Frequency Separation per 15.247(a)(1)

Date: 03/26/2014

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 (703) kHz..

See Exhibit 3

RBW: (100) kHz

VBW: (100) kHz

Test Equipment:

Manufacturer	Model	Description	Serial Number	Cal Due	Cal Date
Hewlett Packard	8566B	Spectrum Analyzer	2532A02418	11/05/14	11/05/13
Hewlett Packard	8447D	Preamp 0.1 - 1,000 MHz	2944A06901	12/10/14	12/10/13
Hewlett Packard	8449B	Preamp 1 - 26.5 GHz	3008A00320	05/20/14	05/20/13
ETS Lindgren	3148	Log Periodic Antenna	75741	02/07/16	02/07/14
Electro-Mechanics	3115	Double Ridge Guide Ant	3810	07/16/15	07/16/13
EMCO	3104C	Biconical Antenna	75927	04/26/14	04/26/13

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

Date: 03/26/2014

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 (380- 420) kHz. We observed 36 hopping frequencies.

See exhibit 4.

RBW: (100) kHz

VBW: (300) kHz

Test Equipment:

Manufacturer	Model	Description	Serial Number	Cal Due	Cal Date
Hewlett Packard	8566B	Spectrum Analyzer	2532A02418	11/05/14	11/05/13
Hewlett Packard	8447D	Preamp 0.1 - 1,000 MHz	2944A06901	12/10/14	12/10/13
Hewlett Packard	8449B	Preamp 1 - 26.5 GHz	3008A00320	05/20/14	05/20/13
ETS Lindgren	3148	Log Periodic Antenna	75741	02/07/16	02/07/14
Electro-Mechanics	3115	Double Ridge Guide Ant	3810	07/16/15	07/16/13
EMCO	3104C	Biconical Antenna	75927	04/26/14	04/26/13

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

Date:03/26/2014

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 (265 - 286) kHz

See exhibit 5.

Span: Zero

RBW: (300) kHz

VBW: (1) MHz

Test Equipment:

Manufacturer	Model	Description	Serial Number	Cal Due	Cal Date
Hewlett Packard	8566B	Spectrum Analyzer	2532A02418	11/05/14	11/05/13
Hewlett Packard	8447D	Preamp 0.1 - 1,000 MHz	2944A06901	12/10/14	12/10/13
Hewlett Packard	8449B	Preamp 1 - 26.5 GHz	3008A00320	05/20/14	05/20/13
ETS Lindgren	3148	Log Periodic Antenna	75741	02/07/16	02/07/14
Electro-Mechanics	3115	Double Ridge Guide Ant	3810	07/16/15	07/16/13
EMCO	3104C	Biconical Antenna	75927	04/26/14	04/26/13

Test: Spurious emissions per 15.247(d)

Date: 03/26/2014

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 (25) dB under the limit.

See exhibit 6

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	Cal Date
Hewlett Packard	8566B	Spectrum Analyzer	2532A02418	11/05/14	11/05/13
Hewlett Packard	8447D	Preamp 0.1 - 1,000 MHz	2944A06901	12/10/14	12/10/13
Hewlett Packard	8449B	Preamp 1 - 26.5 GHz	3008A00320	05/20/14	05/20/13
ETS Lindgren	3148	Log Periodic Antenna	75741	02/07/16	02/07/14
Electro-Mechanics	3115	Double Ridge Guide Ant	3810	07/16/15	07/16/13
EMCO	3104C	Biconical Antenna	75927	04/26/14	04/26/13

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 = (1.2) mW

Antenna gain (numeric) = 1.00 dB

Distance = 20 cm

S = (1.2 * 1.00) / (12.57 * 400)

S= 1.2) / (5,028)

S= (0.000239) mW / cm^2

Limit = (1.0) mW / cm^2

Antenna Specifications

This EUT incorporates an integrated antenna that is part of the PWB.

Spurious emissions below (30) MHz

Date: 04/04/2014

Magnetic field measurements were performed between (32) kHz and (30) MHz.

Results: All measurements were greater than (20) dB below the limit.

Test Equipment:

Manufacturer	Model	Description	Serial Number	Cal Due	Cal Date
Hewlett Packard	8566B	Spectrum Analyzer	2532A02418	11/05/14	11/05/13
Hewlett Packard	8447D	Preamp 0.1 - 1,000 MHz	2944A06901	12/10/14	12/10/13
Electro-Metrics	ALR-30M	Loop Antenna	824	02/07/15	02/07/14

POWERLINE CONDUCTED DATA

NA

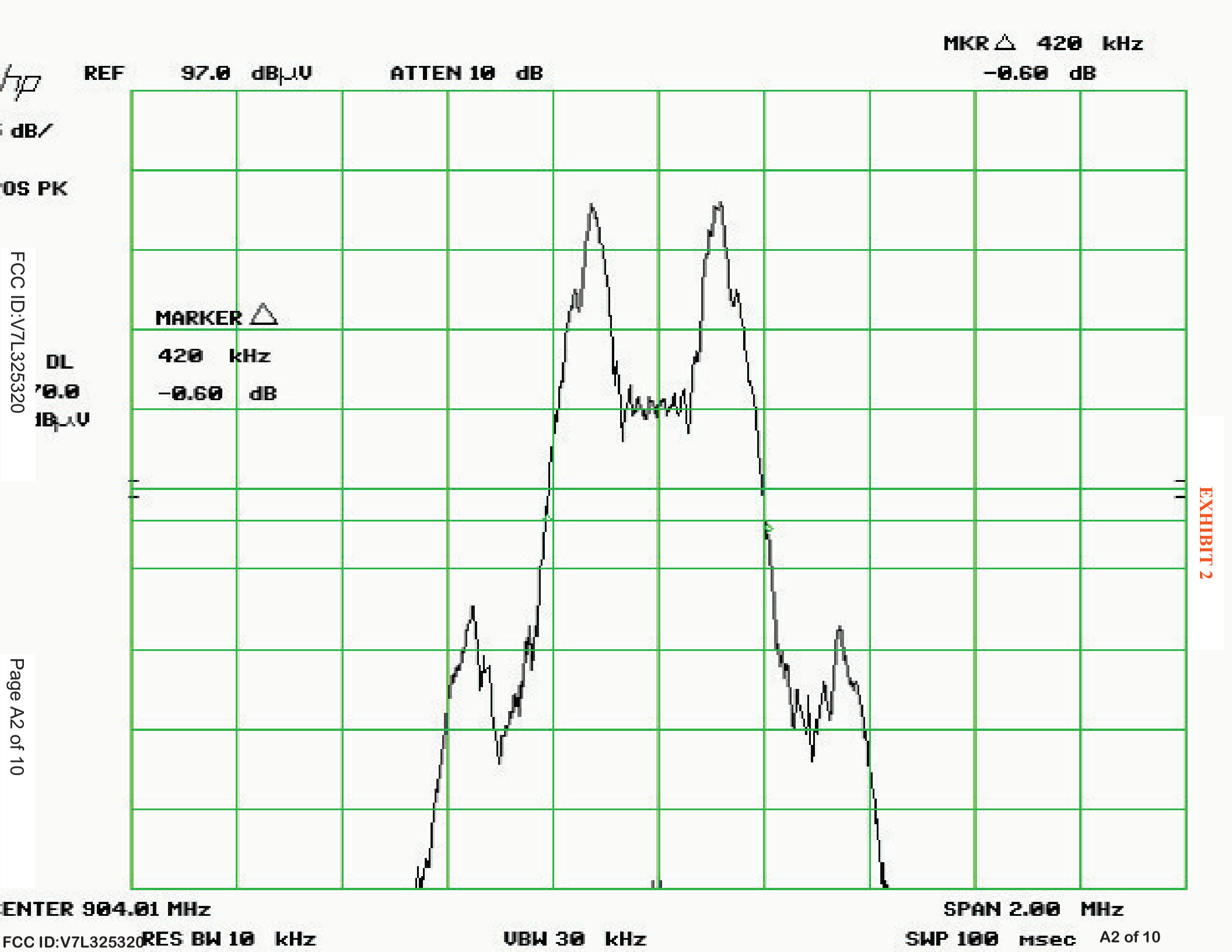

EXHIBIT 2

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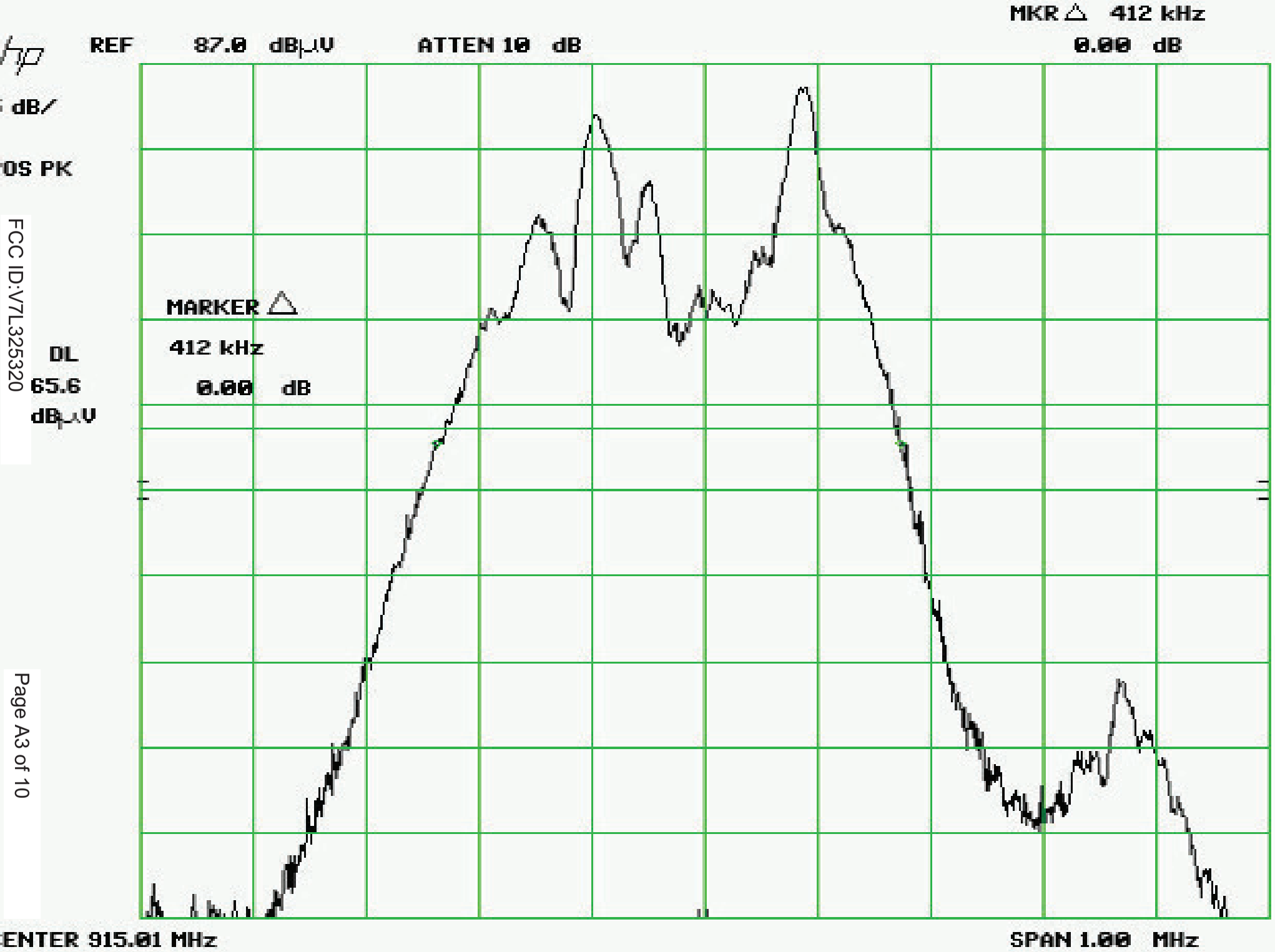

EXHIBIT 2

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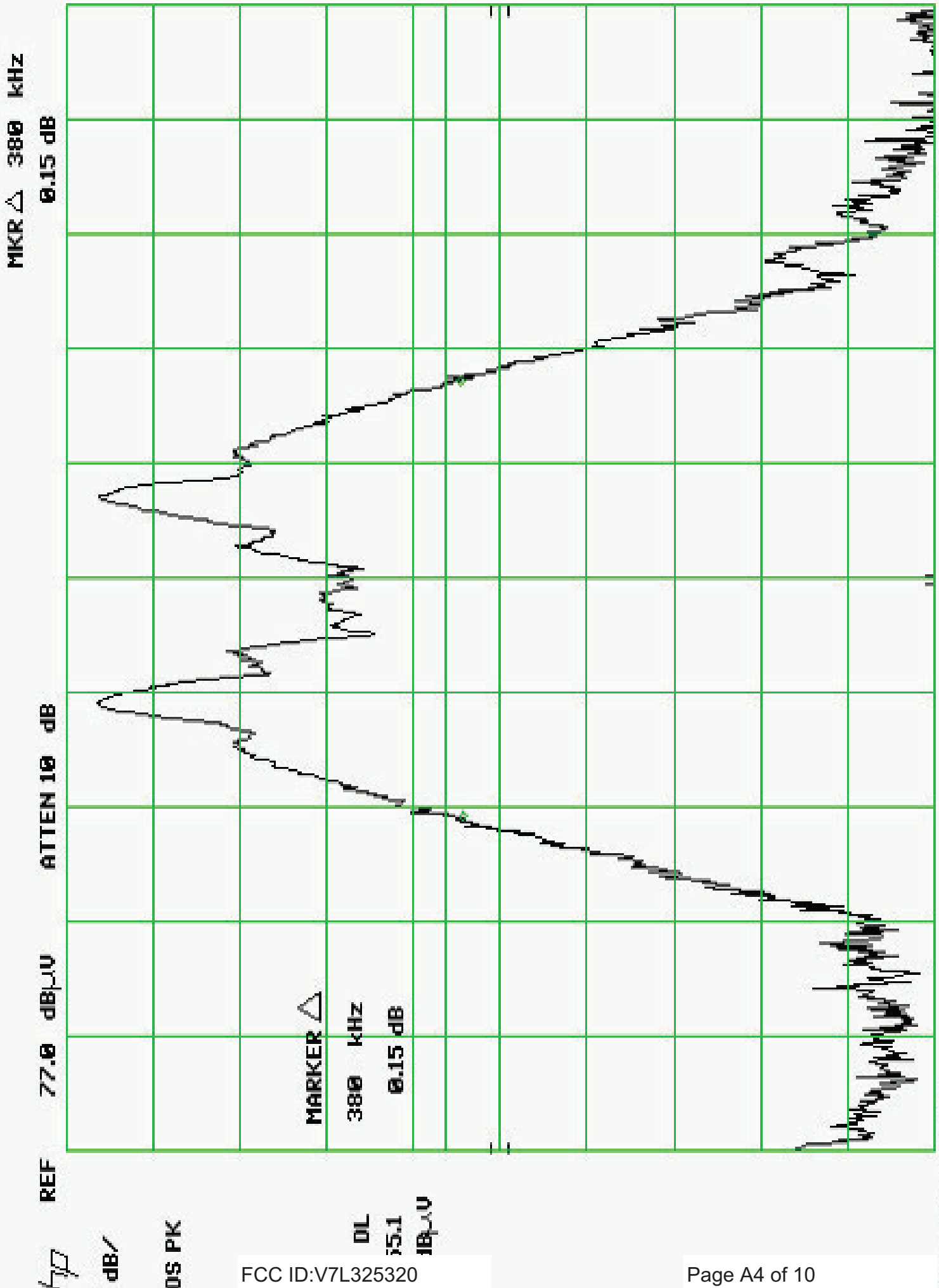

MKR Δ 380 kHz
0.15 dB
REF 77.0 dBμV
ATTEN 10 dB
MARKER Δ
380 kHz
0.15 dB
SPAN 1.00 MHz
SWP 100 msec
VBW 1 MHz
CENTER 926.16 MHz
RES BW 10 kHz
FCC ID:V7L325320
A4 of 10

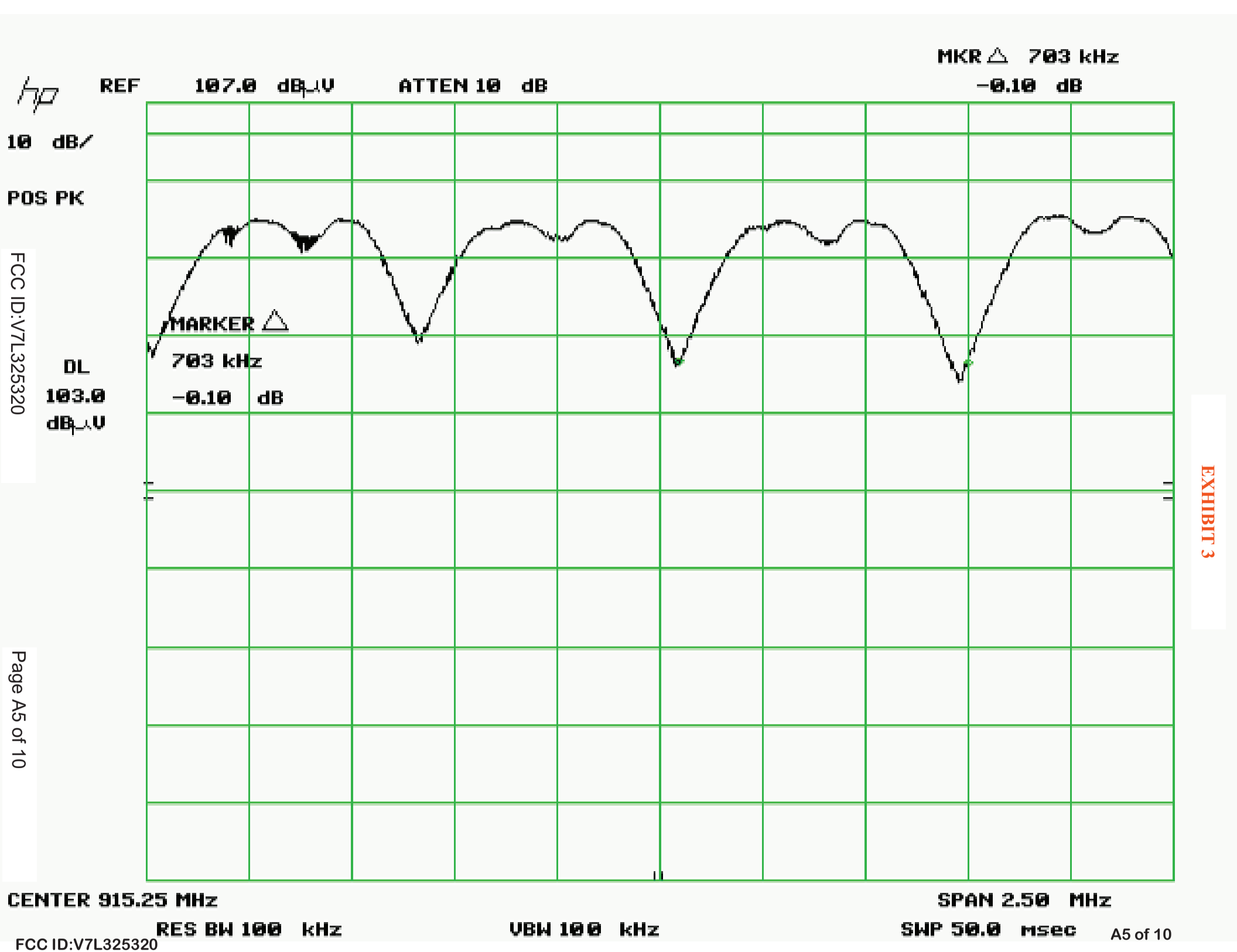
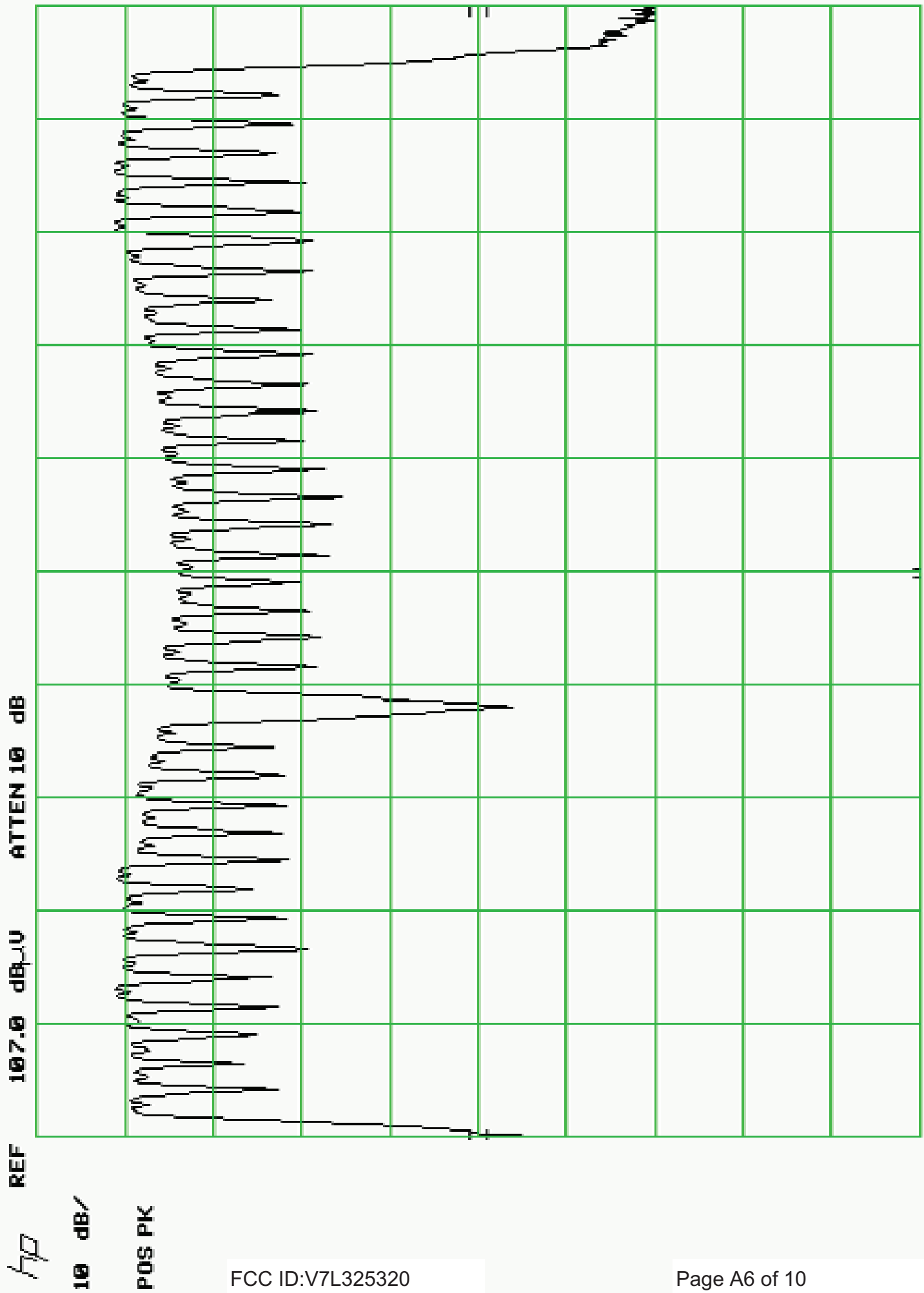
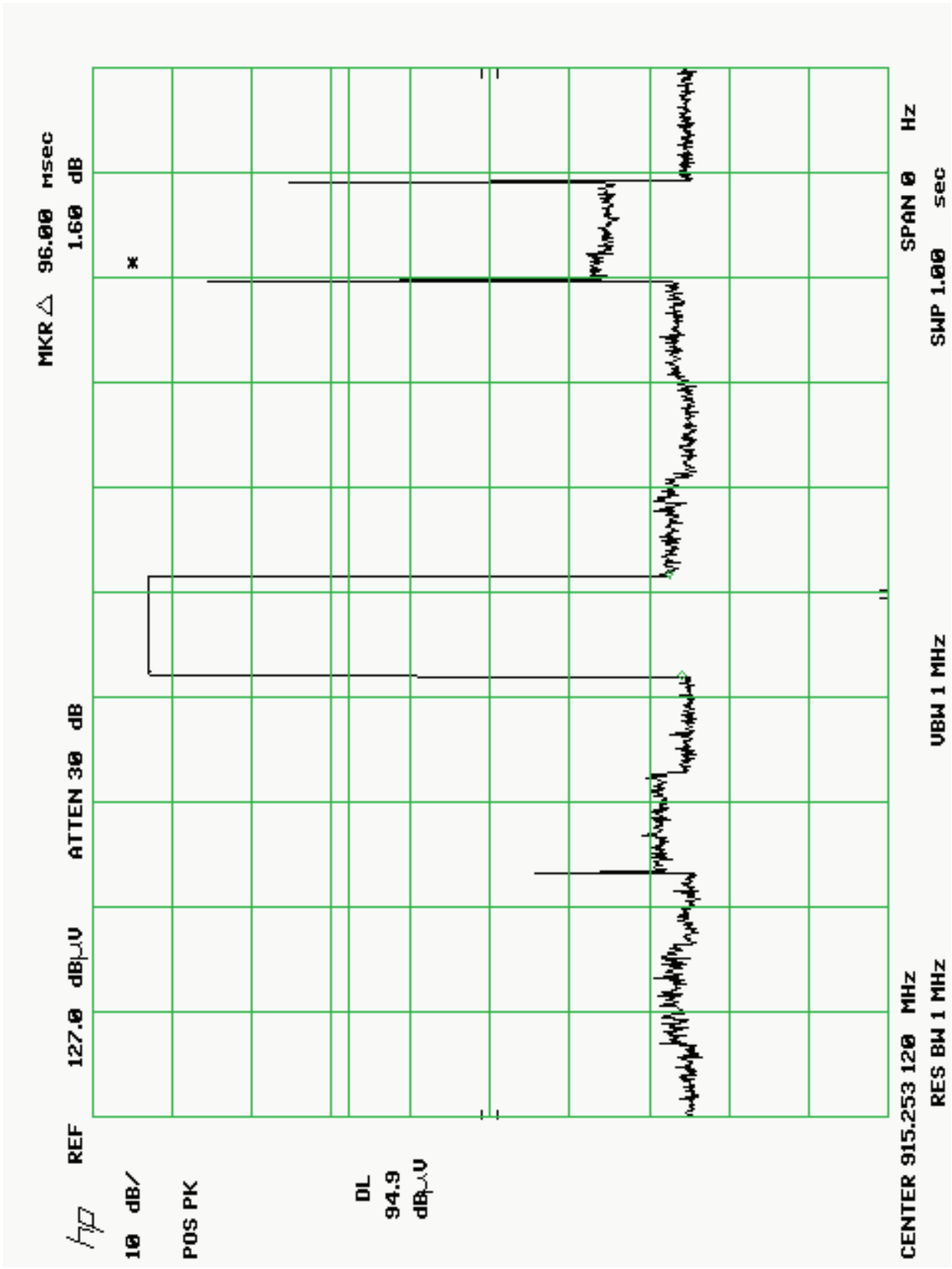
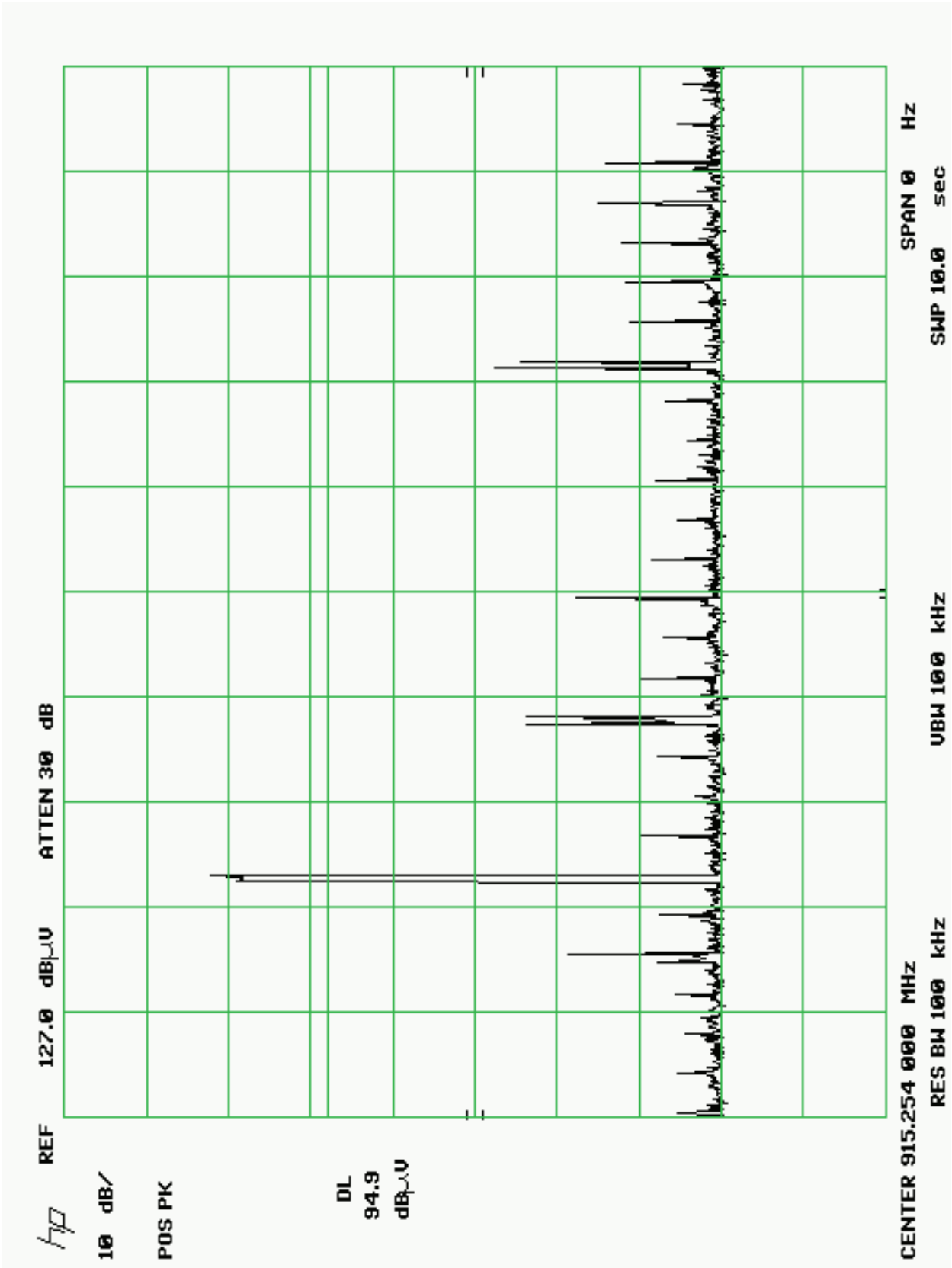


EXHIBIT 3

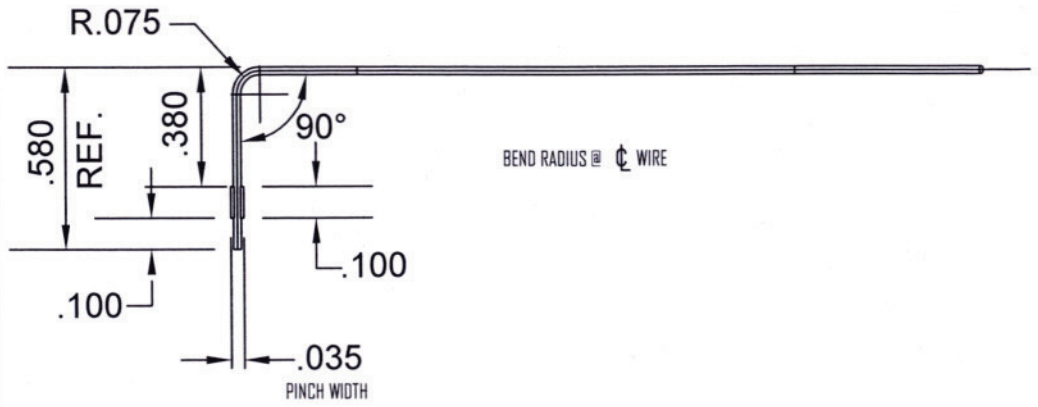
FCC ID:V7L325320

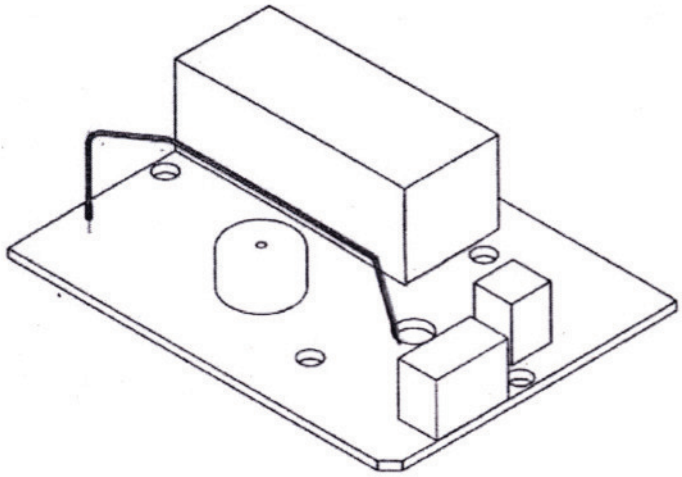

REF 107.0 dBµV
ATTEN 10 dB
10 dB/
POS PK
START 902.0 MHz
RES BW 100 kHz
VBW 300 kHz
STOP 928.0 MHz
SWP 200 msec
A6 of 10
FCC ID:V7L325320

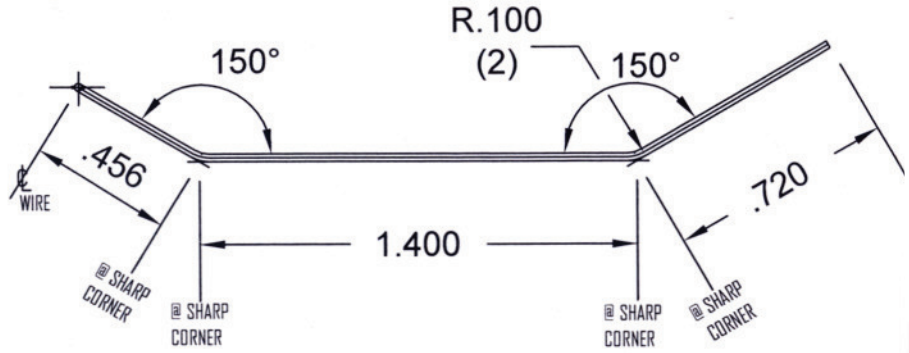

REF 127.0 dBµV
ATTEN 30 dB
MKR Δ 96.00 msec
1.60 dB
10 dB/
POS PK
DL
94.9
dBµV
CENTER 915.253 120 MHz
RES BW 1 MHz
VBW 1 MHz
SWP 1.00 sec
SPAN 0 Hz


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

Client	**CWSI**										
Date	**26-Mar-14**										
Test	**Spurious Radiated Emissions**										
904 MHz											
Freq. MHz	Measured @ 3 m dBuV	AVG/QP Detector	ACF dB/m	CL dB	System Gain dB	Adj AVERAGE dBuV/m	Average Limit dBuV/m	Delta dB	Restricted Band Yes/No	POL H/V	Comments
904	**65.3**	QP	23.8	6.1	0	95.2	95.2	0		Horz	No PreAmp
1808	**46.7**	AVG	27.4	0	25.3	48.8	75.2	-26.4		Horz	Preamp
2712	**47.9**	AVG	29.1	0	24.1	52.9	**54**	**-1.1**	**YES**	Vert	Preamp
3616	**31.6**	AVG	31.7	0	20.5	42.8	54	-11.2	**YES**	Vert	Preamp
4520	**28**	AVG	32.3	0	18.4	41.9	54	-12.1	**YES**	Vert	Preamp
*** system gain = CL - Preamp gain**											
915											
Freq. MHz	Measured @ 3 m dBuV		ACF dB/m	CL dB	System Gain dB	Adj AVERAGE dBuV/m	Average Limit dBuV/m	Delta dB	Restricted Band Yes/No	POL H/V	Comments
915	**64.2**	QP	23.8	6.1	0	94.1	94.1	0		Horz	No PreAmp
1830	**46.5**	AVG	27.4	0	25.3	48.6	74.1	-25.5		vert	Preamp
2745	**48.3**	AVG	29.1	0	24.1	53.3	**54**	**-0.7**	**YES**	vert	Preamp
3660	**28.5**	AVG	32.1	0	20.5	40.1	54	-13.9	**YES**	Vert	Preamp
4575	**28**	AVG	32.4	0	18.4	42	54	-12	**YES**	vert	Preamp
*** system gain = CL - Preamp gain**											
926.1											
Freq. MHz	Measured @ 3 m dBuV		ACF dB/m	CL dB	System Gain dB	Adj AVERAGE dBuV/m	Average Limit dBuV/m	Delta dB	Restricted Band Yes/No	POL H/V	Comments
926.1	**66.1**	QP	23.9	6.1	0	96.1	96.1	0		Horz	No PreAmp
1852.2	**48.9**	AVG	27.5	0	25.3	51.1	76.1	-25		Horz	Preamp
2778.3	**48.1**	AVG	29.2	0	24.2	53.1	**54**	**-0.9**	**YES**	Vert	Preamp
3704.4	**28**	AVG	32.2	0	20.5	39.7	54	-14.3	**YES**	Horz	Preamp
4630.85	**28**	AVG	32.5	0	18.4	42.1	54	-11.9	**YES**	Vert	Preamp
*** system gain = CL - Preamp gain**											
*** All Harmonic Frequencies greater than 4.5 GHz are More than 10 dB under Limit**											







22 ga Spring Steel, tin plated
Plating for radiation
Max dia after plating .030"

CWSI LLC		UNLESS OTHERWISE SPECIFIED:		NAME	DATE	CWSI P/N: AN-0700
10798 NW 53 STREET SUNRISE, FL33351		DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ±	DRAWN	KEN	08/06/09	TITLE:
(954) 749-4204		ANGULAR: MACH ± BEND ± TWO PLACE DECIMAL ± THREE PLACE DECIMAL ±	CHECKED			CWSI - Heat-Smoke Antenna
			ENG APPR.	MARTY	08/06/09	
			MFG APPR.			
		INTERPRET GEOMETRIC TOLERANCING PER:	Q.A.			
		MATERIAL Spring Steel	COMMENTS:			SIZE A / DWG. NO. Heat-Smoke Antenna / REV
NEXT ASSY	USED ON	FINISH Tin Plate				SCALE: 2:1 / WEIGHT: / SHEET 1 OF 1
APPLICATION		DO NOT SCALE DRAWING				

5 4 3 2 1