Testing Tomorrow's Technology

Application

For

Part 2, Subpart J, Paragraph 2.907 Equipment Authorization of Certification for an Intentional Radiator per Part 15, Subpart C, paragraphs 15.207, 15.209 and 15.247

And

Part 2, Subpart J, Section 2.902, Verification
Per
Part 15, Subpart B, for Unintentional Radiators, section 15.101, 15.107 and 15.109

For the

PakSense

Model: PSASII-01

FCC ID: WPEPSASII-01
IC ID:8031A-PSASII01

UST Project: 14-0123
Issue Date: September 10, 2014

Total Pages in This Report: 56

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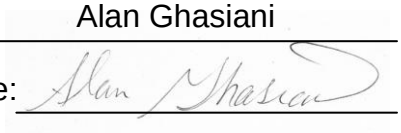
I certify that I am authorized to sign for the Test Agency and that all of the statements in this report and in the Exhibits attached hereto are true and correct to the best of my knowledge and belief:

US TECH (Agent Responsible For Test):

By: Alan Ghasiani

Name: 

Title: Compliance Engineer – President

Date September 10, 2014

NVLAP LAB CODE 200162-0

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MEASUREMENT TECHNICAL REPORT

COMPANY NAME: PakSense

MODEL: PSASII-01

FCC ID: WPEPSASII-01

IC ID: 8031A-PSASII01

DATE: September 10, 2014

This report concerns (check one): Original grant [X]
Class II change

Equipment type: 902-928 MHz Transmitter Module

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)? yes_____ No X

If yes, defer until: N/A
date

agrees to notify the Commission by N/A
date

of the intended date of announcement of the product so that the grant can be issued on that date.

Report prepared by:

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1 General Information

1.1 Purpose of this Report

This report is prepared as a means of conveying test results and information concerning the suitability of this exact product for public distribution according to the FCC Rules and Regulations Part 15, Section 247 and IC RSS 210 Issue 8.

1.2 Characterization of Test Sample

The sample used for testing was received by US Tech on September 4, 2014 in good operating condition.

1.3 Product Description

The Equipment under Test (EUT) is the PakSense Inc. AutoSense II Model PSASII-01. The EUT is a 900 MHz band radio transceiver used to communicate with other PakSense products such as the PakSense Ultra Wireless Label. The Autosense II unit is a product which can be sold with the following options:

1. Autosense II with 900 MHz Reader (CGTX) radio module and WiFi module (FCC ID: NCMOCG2101; IC: 2734A-CG2101)
2. Autosense II with 900 MHz Reader (CGTX) radio module and cellular module (FCC ID: NCMOMO6892; IC: 2734A-MO6892)
3. Autosense II with 900 MHz Reader (CGTX) radio module with both WiFi module and cellular module

The WiFi and cellular modules have been previously approved as denoted with the FCC ID and IC IDs above.

The EUT is declared to be a 902-928 MHz band radio, using FSK modulation with an output power setting of 2.6 dBm.

The EUT has been tested in the configuration which incorporates all three modules and had all three modules exercising during testing to ensure compliance as a co-located radios product.

1.4 Configuration of Tested System

The Test Sample was tested per *ANSI C63.4:2003, Methods of Measurement of Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (2003)* for FCC subpart A Digital equipment Verification requirements and per FCC KDB Publication number 558074 for Digital Transmission Systems Operating Under section 15.247. Also, FCC, KDB Publication No. 558074 was used as a test procedure guide.

A list of EUT and Peripherals is found in Table 1 below. A block diagram of the tested system is shown in Figure 1. Test configuration photographs are provided in separate Appendices.

1.5 Test Facility

Testing was performed at US Tech's measurement facility at 3505 Francis Circle, Alpharetta, GA 30004. This site has been fully described and registered with the FCC. Its designation number is 186022. Additionally this site has also been fully described and submitted to Industry Canada (IC), and has been approved under file number 9900A-1.

1.6 Related Submittals

1.6.1 The EUT is subject to the following FCC authorizations:

a) Certification under section 15.247 as a transmitter.
b) Verification under 15.101 as a digital device and receiver.

1.6.2 Verification of the Digital apparatus

The Verification requirement shares many common report elements with the Certification report. Therefore, though this report is mostly intended to provide data for the Certification process, the Verification authorization report (part 15.107 and 15.109) for the EUT is included herein.

Table 1. EUT and Peripherals

PERIPHERAL MANUFACTURER.	MODEL NUMBER	SERIAL NUMBER	FCC ID:	CABLES P/D
AutoSense II (EUT) PakSense	PSASII-01	Engineering Sample	Pending: WPEPSASII-01 (900 MHz band) NCMOCG2101 (WiFi) NCMOMO6892 (cellular)	1.5 m U P
Power adapter PakSense	KL-AD-120100	Production Sample	None	1.5 m U P
Ultra Wireless RF Label PakSense	Ultra Wireless Label	Engineering Sample	N/A	None
Antenna See antenna details	--	--	--	--

U= Unshielded
S= Shielded
P= Power
D= Data

2 Tests and Measurements

2.1 Test Equipment

The table below lists test equipment used to evaluate this product. Model numbers, serial numbers and their calibration status are indicated.

Table 2. Test Instruments

TEST INSTRUMENT	MODEL NUMBER	MANUFACTURER	SERIAL NUMBER	DATE OF LAST CALIBRATION
SPECTRUM ANALYZER	8566B	HEWLETT-PACKARD	24110A0019	2/3/2014
SPECTRUM ANALYZER	E4407B	Agilent	US41442935	11/8/2013
PREAMP	8449B	HEWLETT-PACKARD	3008A00480	2/06/2014
PREAMP	8447D	HEWLETT-PACKARD	299A07436	2/6/2014
LOOP ANTENNA	SAS-200/562	A. H. Systems	142	9/12/2013 2 yr cycle
BICONICAL ANTENNA	3110B	EMCO	9305-3600	2/11/2013 2 year cycle
LOG PERIODIC ANTENNA	3146	EMCO	3110-3236	7/1/2014 2 yr cycle
HORN ANTENNA	SAS-571	A. H. Systems	605	7/23/2013 2 yr cycle
HORN ANTENNA	3115	EMCO	9107-3723	7/8/2014 2 yr cycle
LISN	8028-50-TS24-BNC	Solar Electronics	955824 & 955825	3/20/2014

Note: The calibration interval of the above test instruments are 12 months unless stated otherwise and all calibrations are traceable to NIST/USA.

2.2 Modifications to EUT Hardware

No physical modifications were made by US Tech in order to bring the EUT into compliance with FCC Part 15, Subpart C Intentional Radiator Limits for the transmitter portion of the EUT or the Subpart B Unintentional Radiator Limits (Receiver and Digital Device) Requirements.

2.3 Number of Measurements for Intentional Radiators (15.31(m))

Measurements of intentional radiators or receivers shall be performed and reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in Table 3 below.

Table 3. Number of Test Frequencies for Intentional Radiators

Frequency Range over which the device operates	Number of Frequencies	Location in the Range of operation
1 MHz or less	1	Middle
1 to 10 MHz	2	1 near the top 1 near the bottom
Greater than 10 MHz	3	1 near top 1 near middle 1 near bottom

Because the EUT operates at 902 MHz to 928 MHz, 3 test frequencies were used.

2.4 Frequency Range of Radiated Measurements (Part 15.33)

2.4.1 Intentional Radiator

The spectrum shall be investigated for the intentional radiator from the lowest RF signal generated in the EUT, without going below 9 kHz to the 10^{th} harmonic of the highest fundamental frequency generated or 40 GHz, whichever is the lowest.

2.4.2 Unintentional Radiator

For the digital device, an unintentional radiator, the frequency range shall be 30 MHz to 1000 MHz, or to 5 times the highest internal clock frequency.

2.5 Measurement Detector Function and Bandwidth (CFR 15.35)

The radiated and conducted emissions limits shown herein are based on the following:

2.5.1 Detector Function and Associated Bandwidth

On frequencies below 1000 MHz, the limits herein are based upon measurement equipment employing a CISPR Quasi-peak detector function and related measurement bandwidths (i.e. 9 kHz from 150 kHz to 30 MHz and 120 kHz from 30 MHz to 1000 MHz). Alternatively, measurements may be made with equipment employing a peak detector function as long as the same bandwidths specified for the Quasi-peak device are used.

2.5.2 Corresponding Peak and Average Requirements

Above 1000 MHz, radiated limits are based on measuring instrumentation employing an average detector function. When average radiated emissions are specified there is also a corresponding Peak requirement, as measured using a peak detector, of 20 dB greater than the average limit. For all measurements above 1000 MHz the Resolution Bandwidth shall be at least 1 MHz.

2.5.3 Pulsed Transmitter Averaging

When the radiated emissions limit is expressed as an average value, and the transmitter is pulsed, the measured field strength shall be determined by applying a Duty Cycle Correction Factor based upon dividing the total ON time during the first 100 ms period by 100 ms (or by the period if less than 100 ms). The duty cycle may be expressed logarithmically in dB.

NOTE: If the transmitter was programmed to transmit at >98% duty cycle, then, wherever applicable (where the detection mode was AVG) the duty cycle factor calculated will be applied.

2.6 EUT Antenna Requirements (CFR 15.203)

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. Only the antenna(s) listed in Table 4 will be used with this module.

Table 4. Allowed Antenna(s)

REPORT REFERENCE	MANUFACTURER	TYPE OF ANTENNA	MODEL	GAIN dB_i	TYPE OF CONNECTOR
Antenna 1	Nearson	Dipole	S463AH-915	2.0	Reverse Sex SMA

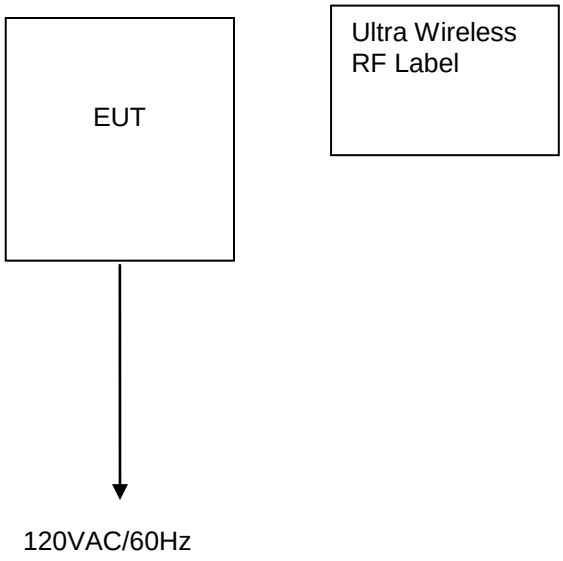


Figure 1. Test Configuration

2.7 Restricted Bands of Operation (Part 15.205)

Only spurious emissions can fall in the frequency bands of CFR 15.205. The field strength of these spurious cannot exceed the limits of 15.209. Radiated harmonics and other Spurious are examined for this requirement see paragraph 2.1

2.8 Transmitter Duty Cycle (CFR 35 (c))

The EUT sends two different types of transmissions. These are shown below, along with their pulse-width duration.

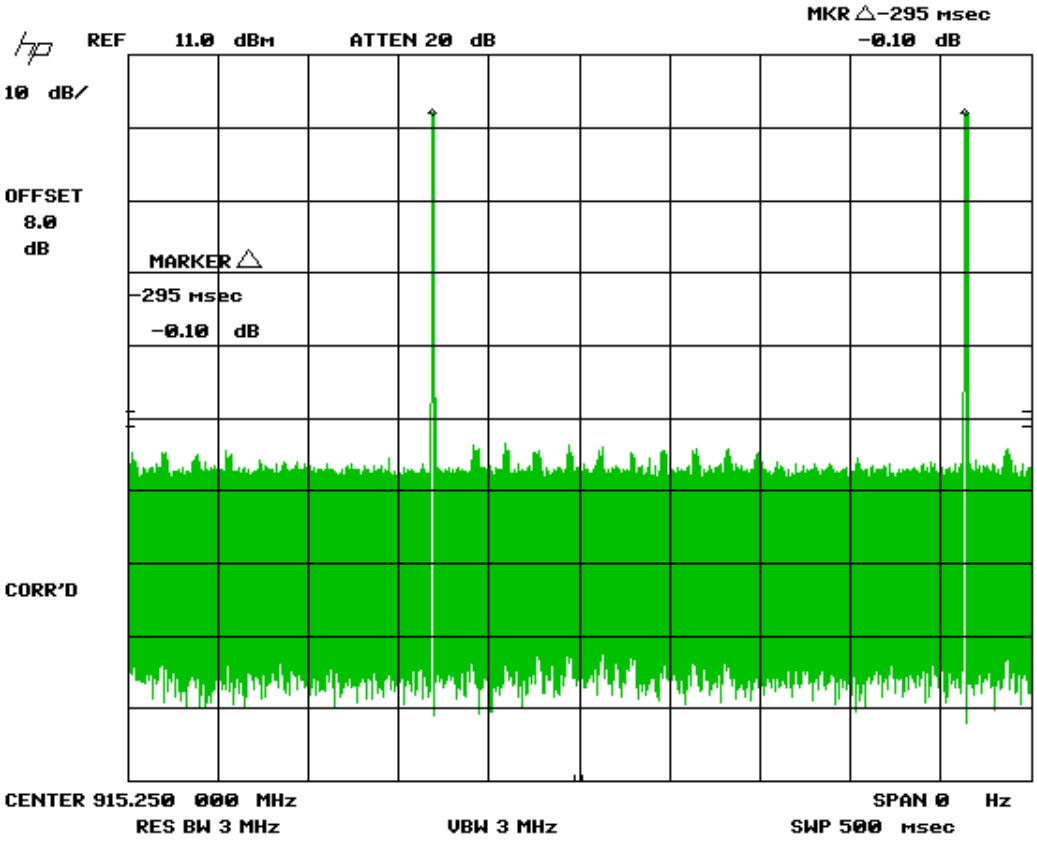


Figure 2. Duty Cycle 500 ms Sweep

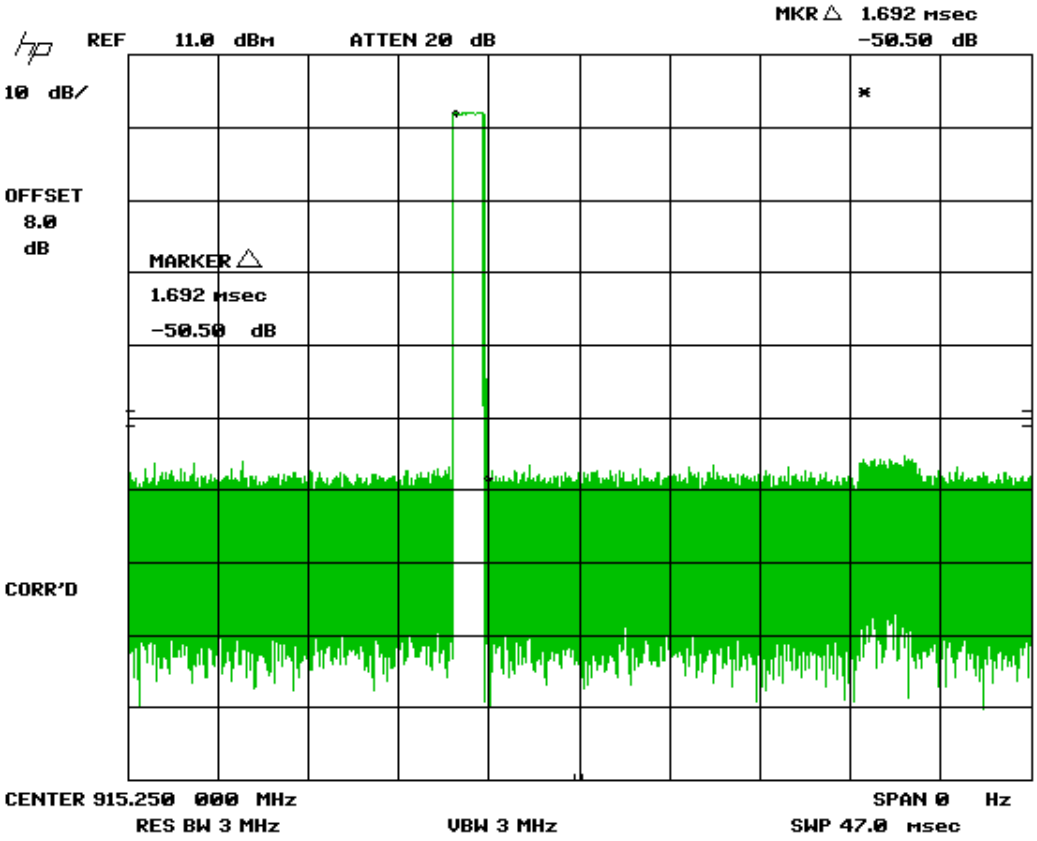


Figure 3. Transmitter Pulse Width, First Transmission

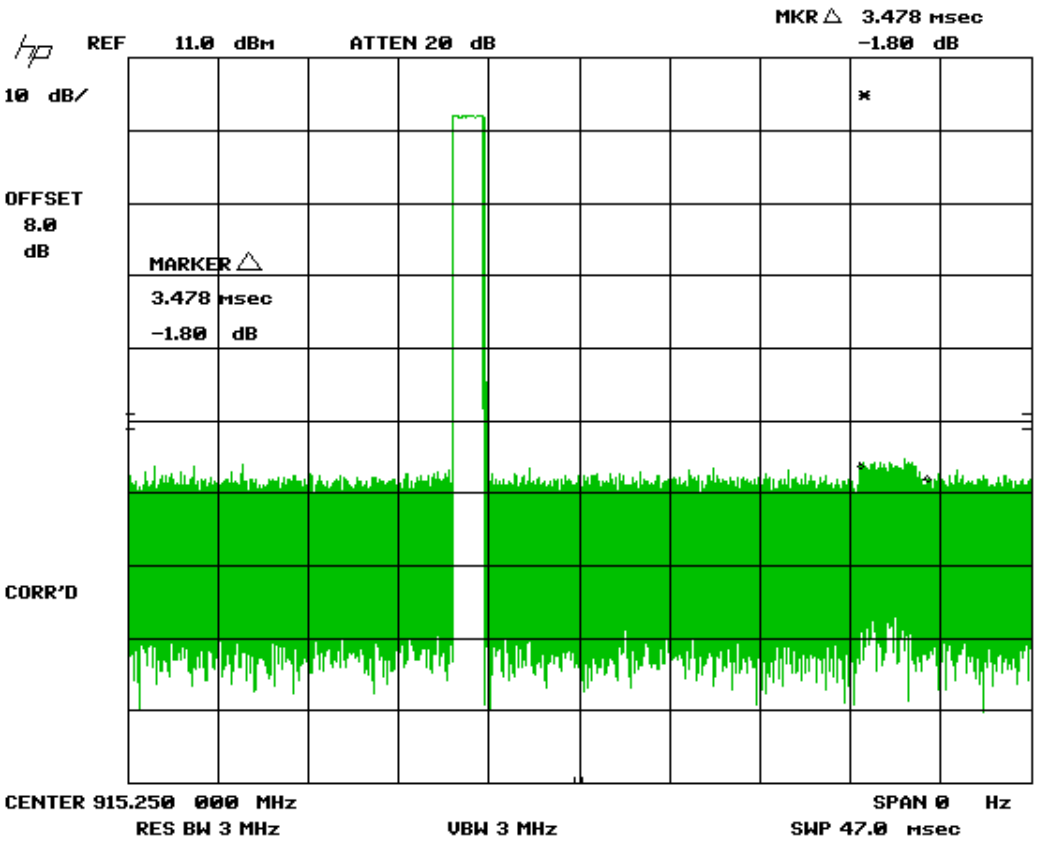


Figure 4. Transmitter Pulse Width, Second Transmission

Total Time On from Figure 2 = 1.69 ms (from first type of transmission)
+3.478 ms*10 (from second type of transmission)
36.47 ms (Total Time on in Figure 2)

(36.47 ms Total Time On)/(295 ms Total Pulse Train) = 0.124 Numeric Duty Cycle
Duty Cycle = 20 Log (0.34) = -18.13 dB

NOTE: The transmitter was programmed to transmit at >98% duty cycle, therefore wherever applicable (where the detection mode was AVG) the duty cycle factor calculated above will be applied.

2.9 Intentional Radiator, Power Line Conducted Emissions (CFR 15.207)

The EUT is rated for 12VDC input operation and receives its power from a switching power supply. The EUT is therefore considered to be indirectly connected to the AC mains. Power line conducted emissions testing was performed to ensure that with the EUT in operation (exercising all transmitter functions), the complete system continues to meet the applicable requirements for CFR 15.207. These measurements were completed and are displayed along with the 15.107 power line test data in the sections below.

2.10 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.247(d)) (IC RSS 210, A2.9 (a))

Conducted Radio measurements: the EUT was put into a continuous-transmit mode of operation and tested per FCC KDB Publication 558074 for conducted out of band emissions emanating from the antenna port over the frequency range of 30 MHz to 10 GHz. A conducted scan was performed on the EUT to identify and record spurious signals that were related to the transmitter. Antenna Conducted Emissions of a significant magnitude that fell within restricted bands were then measured as radiated emissions on the OATS. The conducted emissions graphs are found in figures below. The limit for antenna conducted power is 1 Watt (30 dBm) per 15.247 (b)(3).

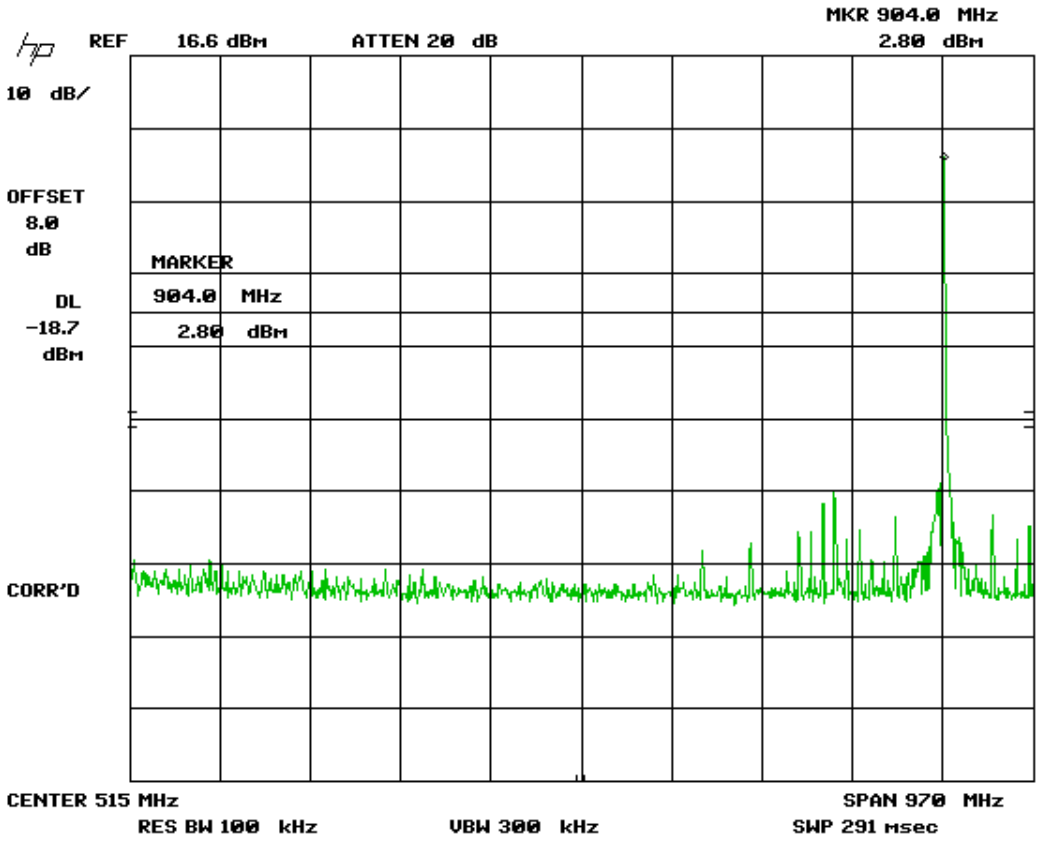


Figure 5. Antenna Conducted Emissions Low, Part 1

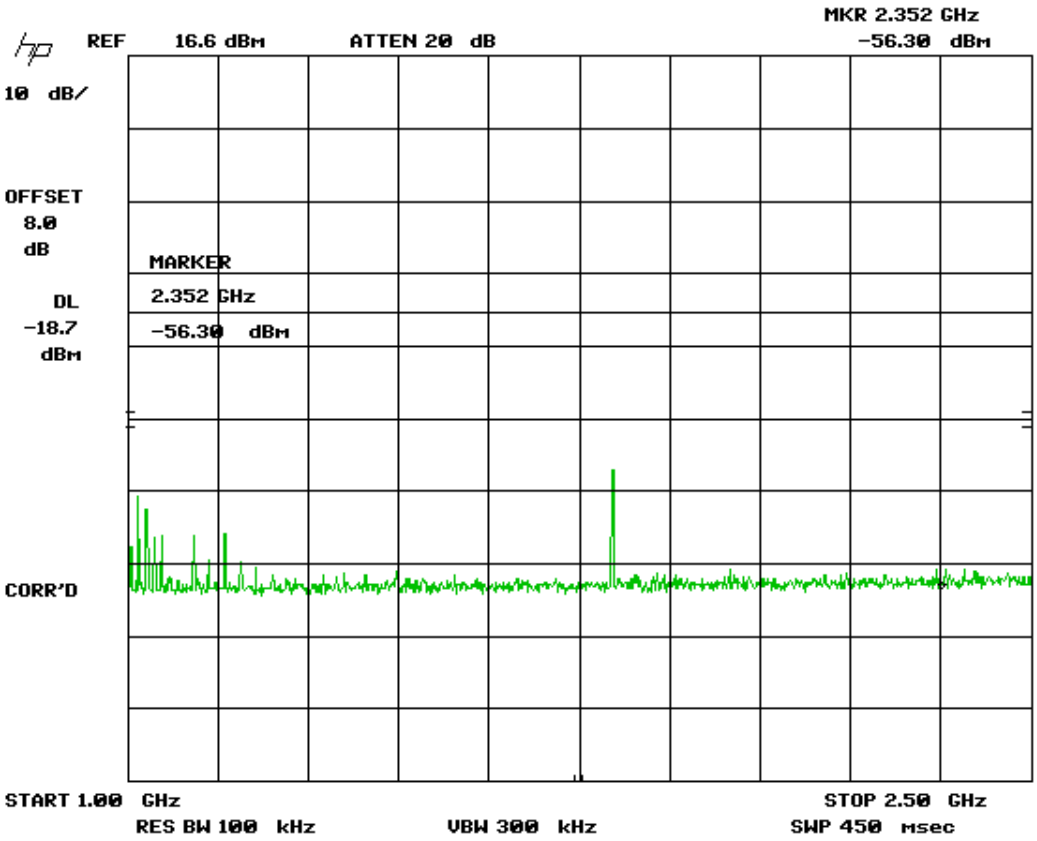


Figure 6. Antenna Conducted Emissions Low, Part 2

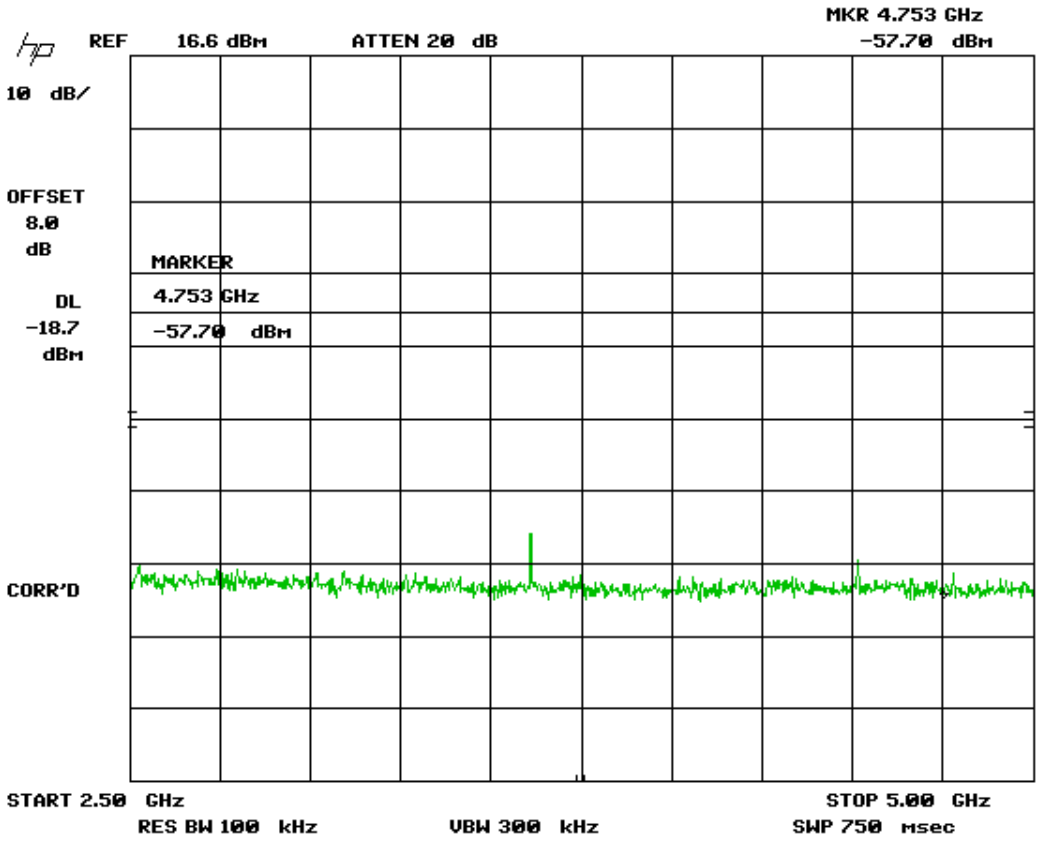


Figure 7. Antenna Conducted Emissions Low, Part 3

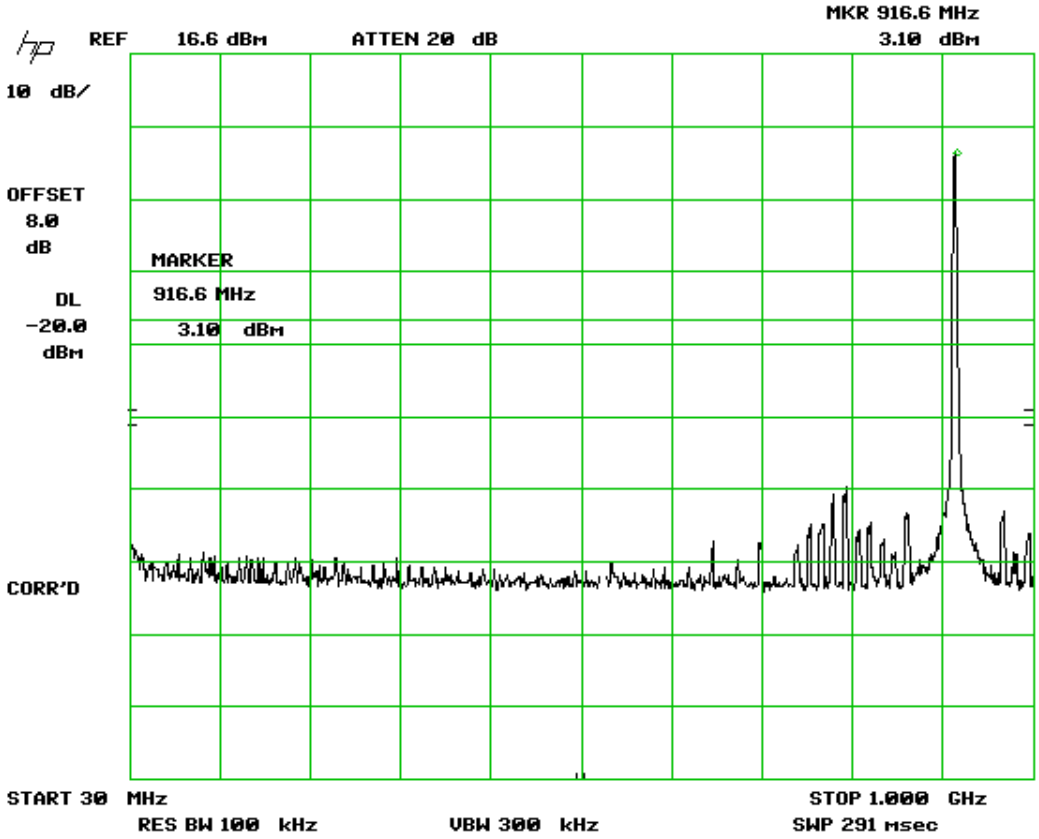


Figure 8. Antenna Conducted Emissions Mid, Part 1

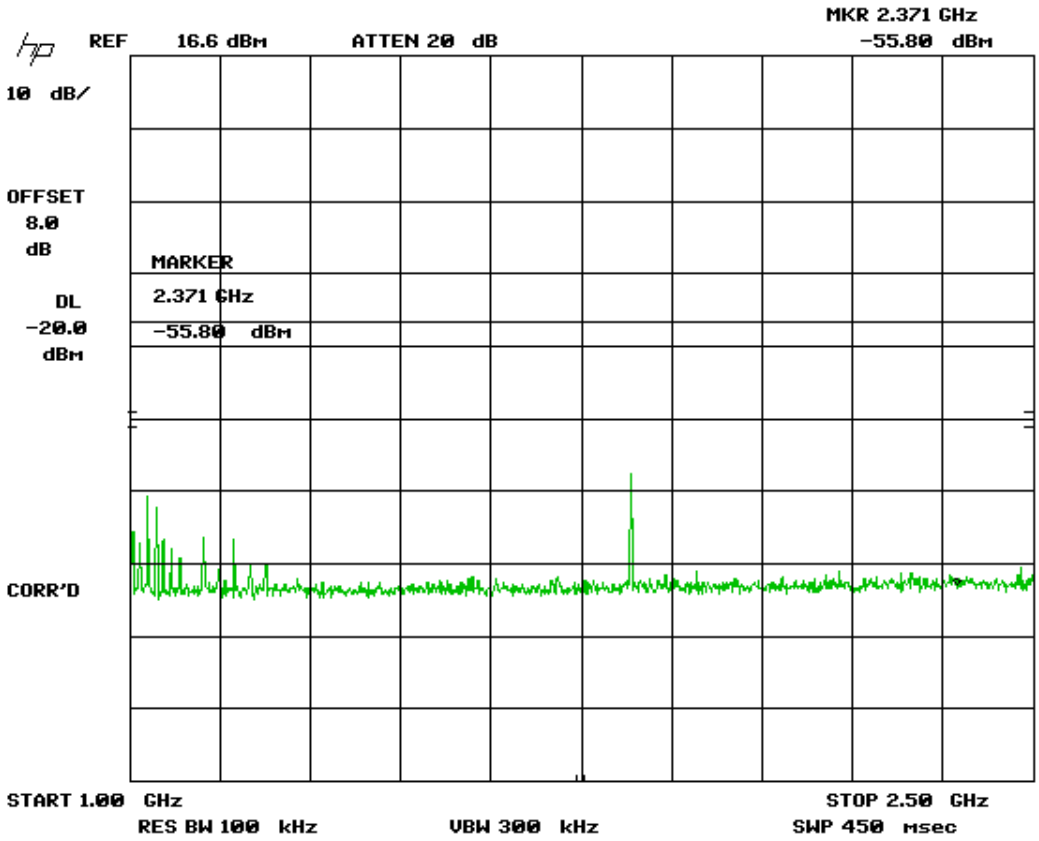


Figure 9. Antenna Conducted Emissions Mid, Part 2

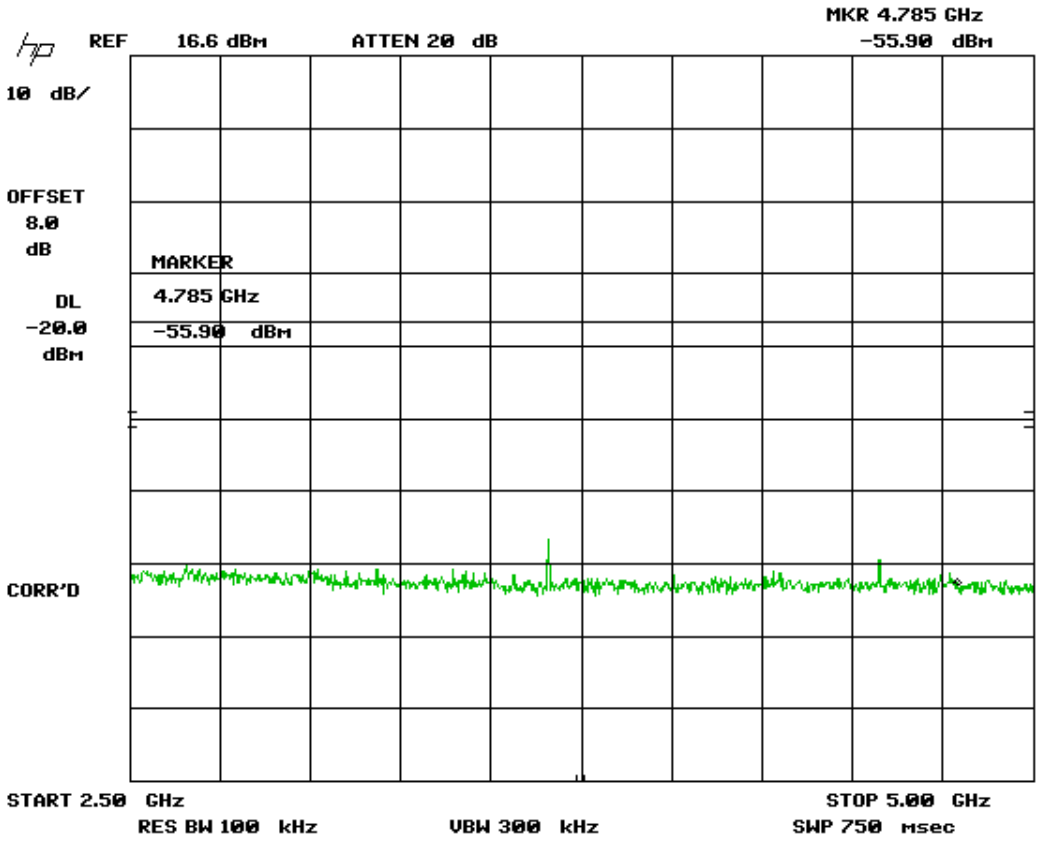


Figure 10. Antenna Conducted Emissions Mid, Part 3

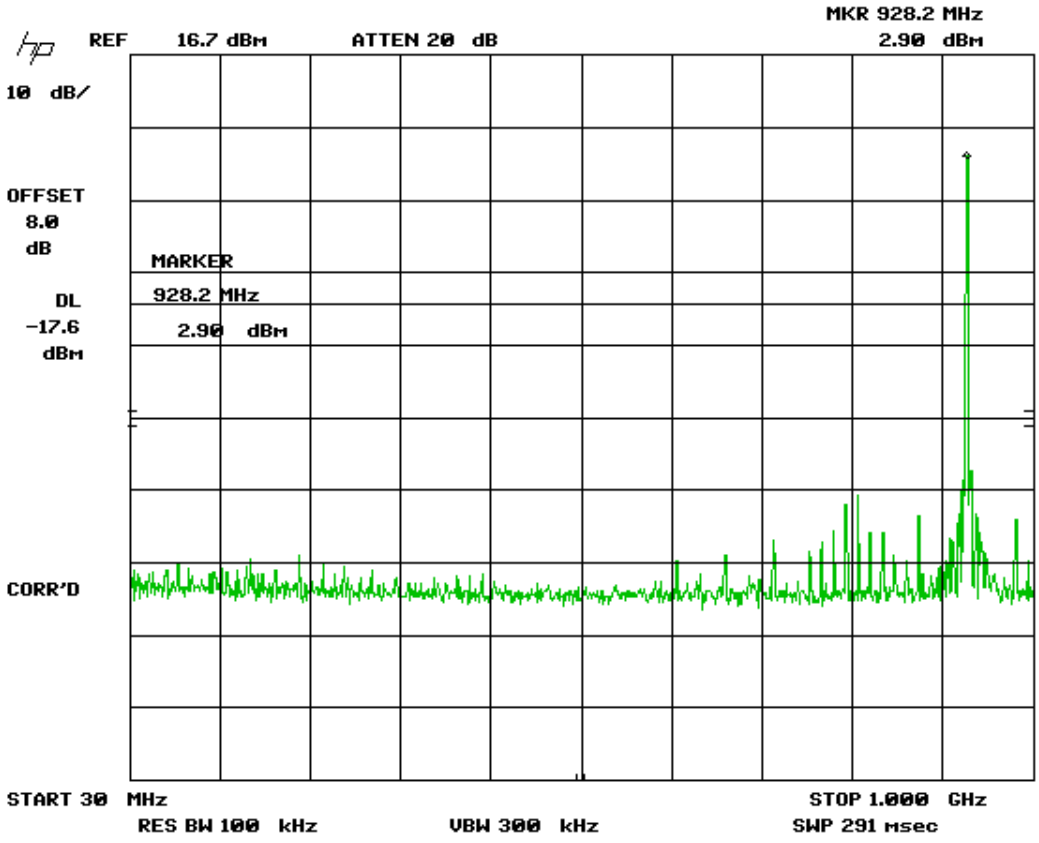


Figure 11. Antenna Conducted Emissions High, Part 1

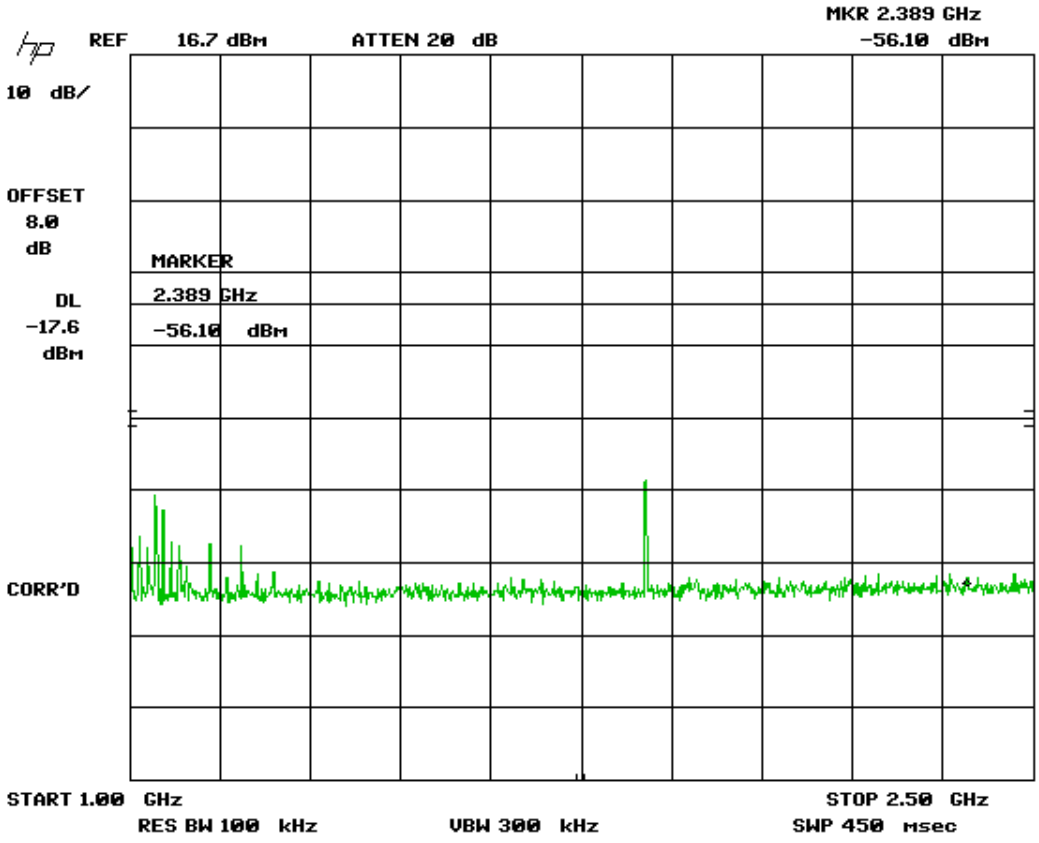


Figure 12. Antenna Conducted Emissions High, Part 2

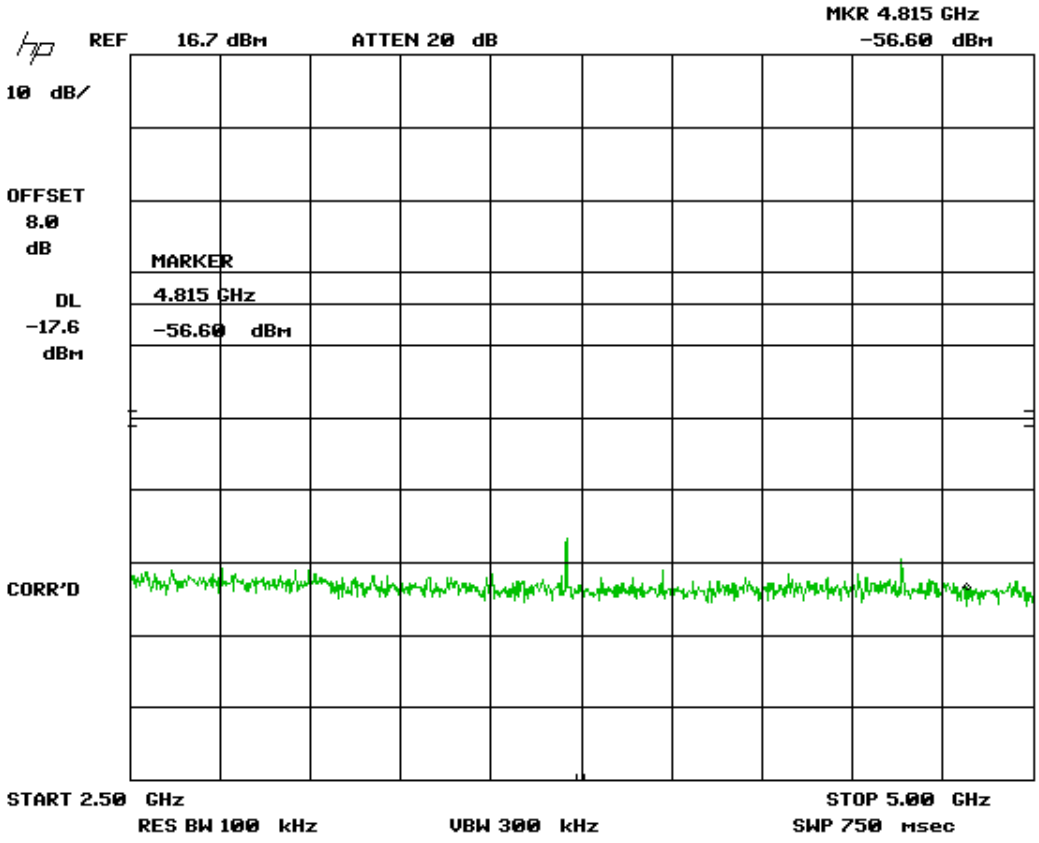


Figure 13. Antenna Conducted Emissions High, Part 3

2.11 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.247(d)) (IC RSS 210, A2.9 (a))

Radiated Radio measurements: the EUT was placed into a continuous transmit mode of operation and a preliminary scan was performed on the EUT to find signal frequencies that were caused by the transmitter part of the product. To obtain the worst case results, the EUT was placed on a table top of a non-conductive table, 80 cm above the ground floor. The EUT was positioned 3 meters away from the receiving antenna during testing (1 meter at frequencies above 6 GHz and if the emissions were less than 6 dB from the noise floor). The EUT was tested in X, Y and Z axes to determine the worst case orientation. Radiated measurements below 30 MHz were tested with a RBW = 9 kHz; emissions below 1 GHz were tested with a RBW = 120 kHz and radiated measurements above 1 GHz were measured using a RBW =1 MHz. VBW was set to three times the RBW value.

For radiated emissions, any emission that was greater than 20 dB from the applicable limit was not recorded below.

The test data is detailed below for this section. Several radiated emissions above 1 GHz were measured at a distance of 1 meter. The measured value at 1 meter was then extrapolated to the resultant at 3 meters using an inverse distance extrapolation factor of -20 dB/decade. There were no test failures.

Table 5. Peak Radiated Fundamental & Harmonic Emissions

Tested By: SS & CF	Test: FCC Part 15, Para 15.209,15.247(d)		Client: Paksense				
	Project: 14-0123		Model: PSASII-01				
Frequency (MHz)	**Test Data (dBuV)**	**AF+CL-PA (dB/m)**	**Corrected Results (dBuV/m)**	**Limits (dBuV/m)**	**Distance / Polarization**	**Margin (dB)**	**Detection Mode**
Low Channel - PEAK							
902.96	77.20	23.65	100.85		3 m. /HORZ		PK
1805.81	78.34	-9.20	69.14	74	3 m. /HORZ	4.9	PK
2708.99*	57.42	-4.68	52.74	74	3 m. /HORZ	21.3	PK
Mid Channel - PEAK							
915.05	73.27	25.07	98.34		3 m./ HORZ		PK
1830.70	71.55	-7.38	64.17	74	3 m./HORZ	9.8	PK
2744.90*	68.58	-11.61	56.97	74	3 m./HORZ	17.0	PK
5491.60	60.49	-4.55	55.94	74	3 m./HORZ	18.1	PK
High Channel – PEAK							
927.55	73.16	25.17	98.33		3m. /HORZ		PK
1855.7	71.62	-7.45	64.17	74	3 m./HORZ	9.8	PK
2780.90*	64.66	-11.26	53.40	74	1 m. /HORZ	20.6	PK
5566.70	58.60	-4.49	54.11	74	1 m./HORZ	19.9	PK

1. (*) Falls within the restricted bands of CFR 15.205. Limits based on CFR15.209 & 20 dB relaxation for peak measurements of CFR 15.35.
2. No other signals detected within 20 dB of specification limit. Harmonics investigated up to the 10th harmonic
3. (~)Measurements taken at 1 meter were extrapolated to 3 meter using a factor of (-9.5 dB).
4. The EUT was placed in three orthogonal positions and the transmitter was in constant broadcast mode, with a duty cycle of greater than 98%. The emissions were measured with the receive antenna in vertical and horizontal polarizations. The data listed in the above table was worst case.

Sample Calculation at 2744.90 MHz:

Magnitude of Measured Frequency	68.58	dBuV
+Antenna Factor + Cable Loss+ Amplifier Gain	-2.11	dB/m
1 meter to 3 meter extrapolation	-9.5	dB
Corrected Result	56.97	dBuV/m

Test Date: September 5 and 8, 2014
Tested By
Signature: Sina Sobhaniyan Name: Sina Sobhaniyan
Test Date: September 5 and 8, 2014
Tested By
Signature: Name: Carrie Fincannon

Table 6. Average Radiated Fundamental & Harmonic Emissions

Tested By: SS & CF	Test: FCC Part 15, Para 15.209, 15.247(d)			Client: Paksense			
	Project: 14-0123			Model: PSASII-01			
Frequency (MHz)	**Test Data (dBuV)**	**AF+CL-PA + DC (dB/m)**	**Corrected Results (dBuV/m)**	**Limits (dBuV/m)**	**Distance / Polarization**	**Margin (dB)**	**Detection Mode**
Low Channel – Average							
902.96	75.17	23.15	98.32		3 m. /HORZ		AVG
1805.81	63.59	-27.33	36.26	54	3 m. / HORZ	17.7	AVG
2708.99*	46.83	-22.81	24.02	54	3 m. / HORZ	30.0	AVG
Mid Channel – Average							
915.05	50.01	25.07	75.08		3 m. / HORZ		AVG
1830.7	59.56	-25.51	34.05	54	3 m. / HORZ	19.9	AVG
2744.9*	53.56	-29.74	23.82	54	1 m. / HORZ	30..2	AVG
5491.6	41.90	-22.68	19.22	54	1 m. / HORZ	34.8	AVG
High Channel – Average							
927.55	44.31	25.17	69.48		3 m. /HORZ		AVG
1855.70	59.28	-25.58	33.70	54	3 m./HORZ	20.3	AVG
2780.9*	55.56	-29.39	26.17	54	1 m./HORZ	27.8	AVG
5566.7	42.41	-22.62	19.79	54	1 m. /HORZ	34.2	AVG

1. (*) Falls within the restricted bands of CFR 15.205. Limits based on CFR15.209 & 20 dB relaxation for **peak** measurements of CFR 15.35.
2. No other signals detected within 20 dB of specification limit. Harmonics investigated up to the 10th harmonic
3. (~)Measurements taken at 1 meter were extrapolated to 3 meter using a factor of (-9.5 dB).
4. All measurements are corrected with a -18.13 dB duty. See section 2.8
5. The EUT was placed in three orthogonal positions and the transmitter was in constant broadcast mode, with a duty cycle of greater than 98%. The emissions were measured with the receive antenna in vertical and horizontal polarizations. The data listed in the above table was worst case.

Sample Calculation at 2744.9 MHz:

Magnitude of Measured Frequency	53.56	dBuV
+Antenna Factor + Cable Loss+ Amplifier Gain – Duty Cycle	-20.24	dB/m
1 meter to 3 meter extrapolation	-9.5	dB
Corrected Result	23.82	dBuV/m

Test Date: September 5 and 8, 2014
Tested By
Signature: Sina Sobhaniyan Name: Sina Sobhaniyan
Test Date: September 5 and 8, 2014
Tested By
Signature: _____ Name: Carrie Fincannon

2.12 Band Edge Measurements – (CFR 15.247 (d))

Band Edge measurements are made following the guidelines in FCC KDB Publication No. 558074 with the EUT initially operating on the Lowest Channel and then operating on the Highest Channel within its band of operation. Antenna port conducted measurements are performed to demonstrate compliance with the requirement of 15.247(d) that all emissions outside of the band edges be attenuated by at least 20 dB when compared to its highest in-band value (contained in a 100 kHz band).

To capture the band edge set the Spectrum Analyzer frequency span large enough (usually around 10 MHz) to capture the peak level of the emission operating on the channel closest to the band edge as well as any modulation products falling outside of the authorized band of operation. Conducted measurements are performed with RBW ≥1% of the frequency span. In all cases, the VBW is set ≥ RBW. See figure and calculations below for more detail.

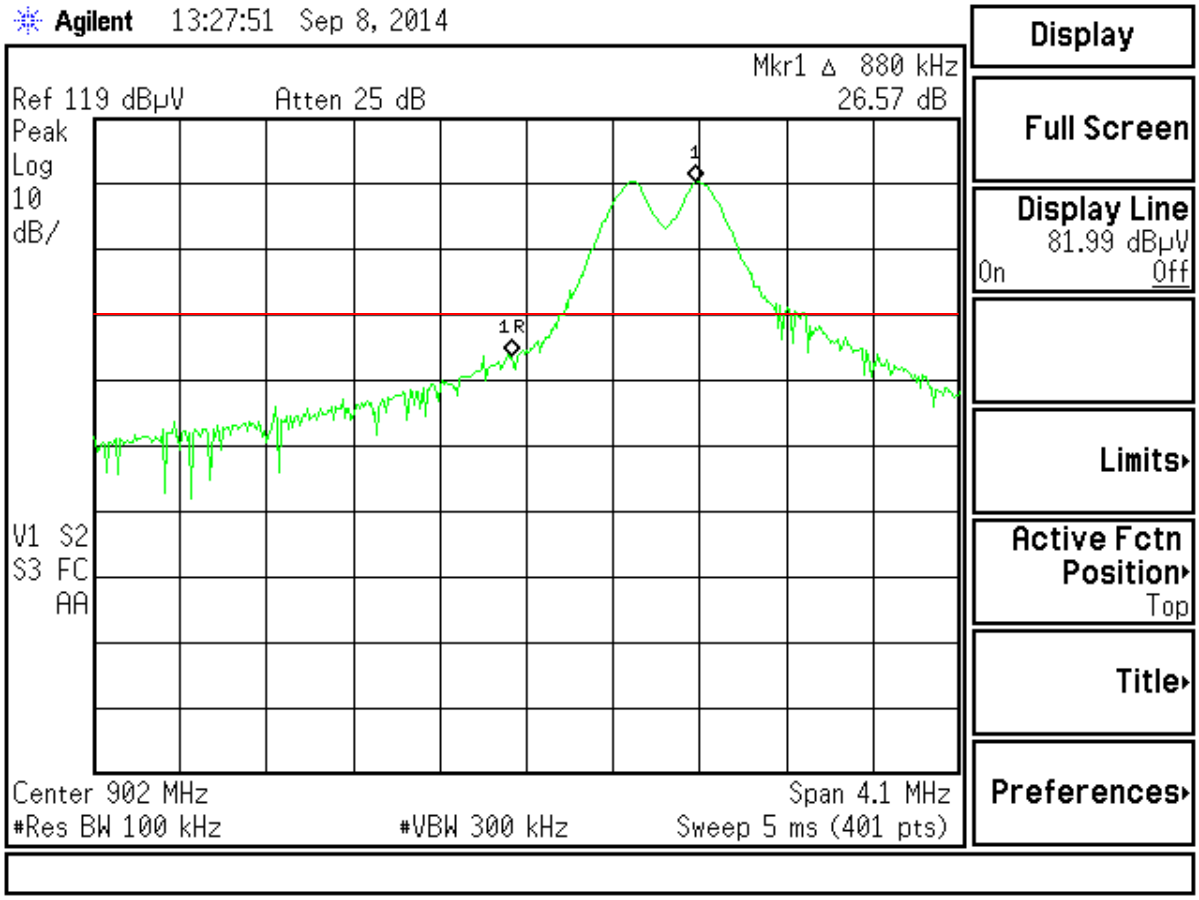


Figure 14. Band Edge Compliance, Low Channel Delta - Peak

(Lower band edge must be greater than 20 dB)

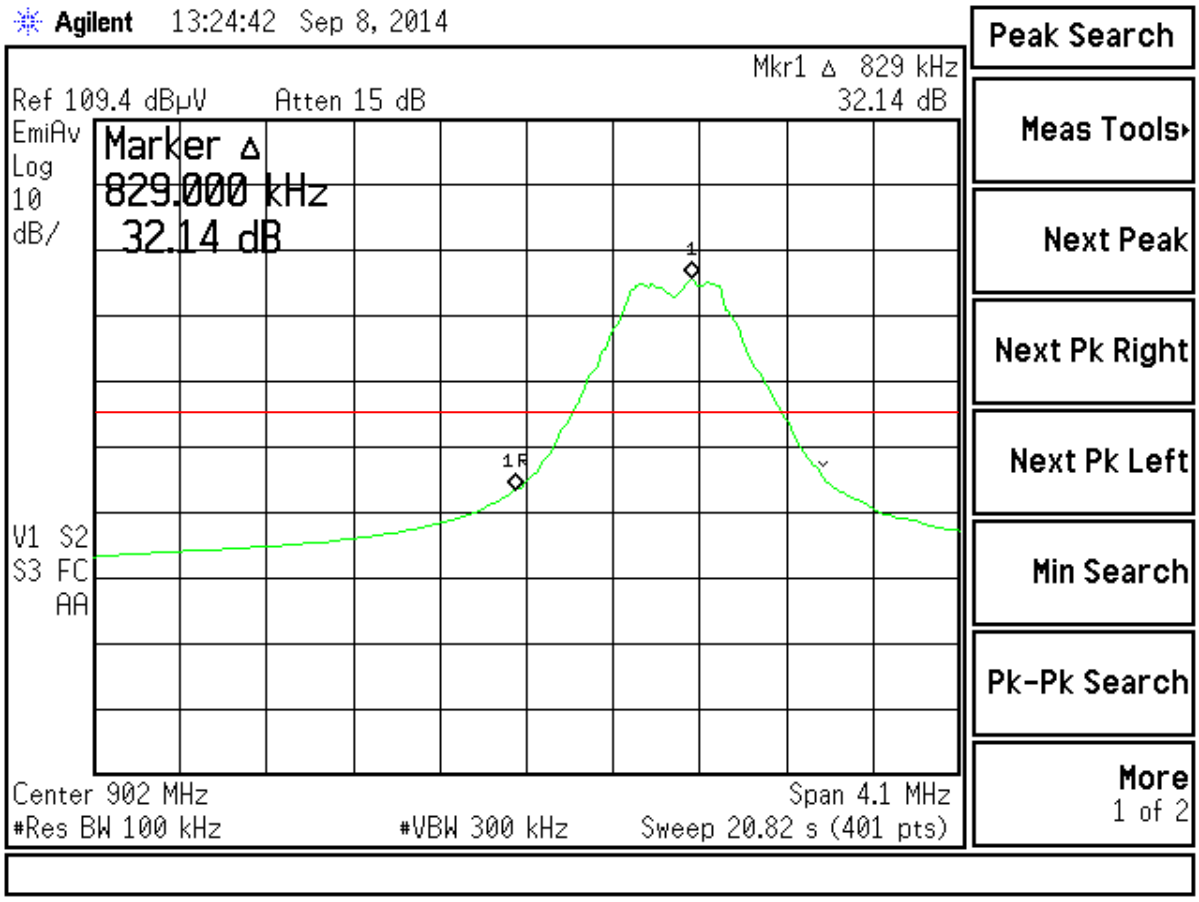


Figure 15. Band Edge Compliance, Low Channel Delta - Average

Calculation of worst case lower band edge measurement:

High Channel Corrected Measured Value from Table 6	100.85	dBuV
High Channel Band Edge Delta from Figure 33	-26.57	dB
Calculated Result	74.28	dBuV/m
Band Edge Limit= 20 dB from fundamental reading	80.85	dBuV/m
Calculated Result	-74.28	dBuV/m
Band Edge Margin	6.57	dBuV/m

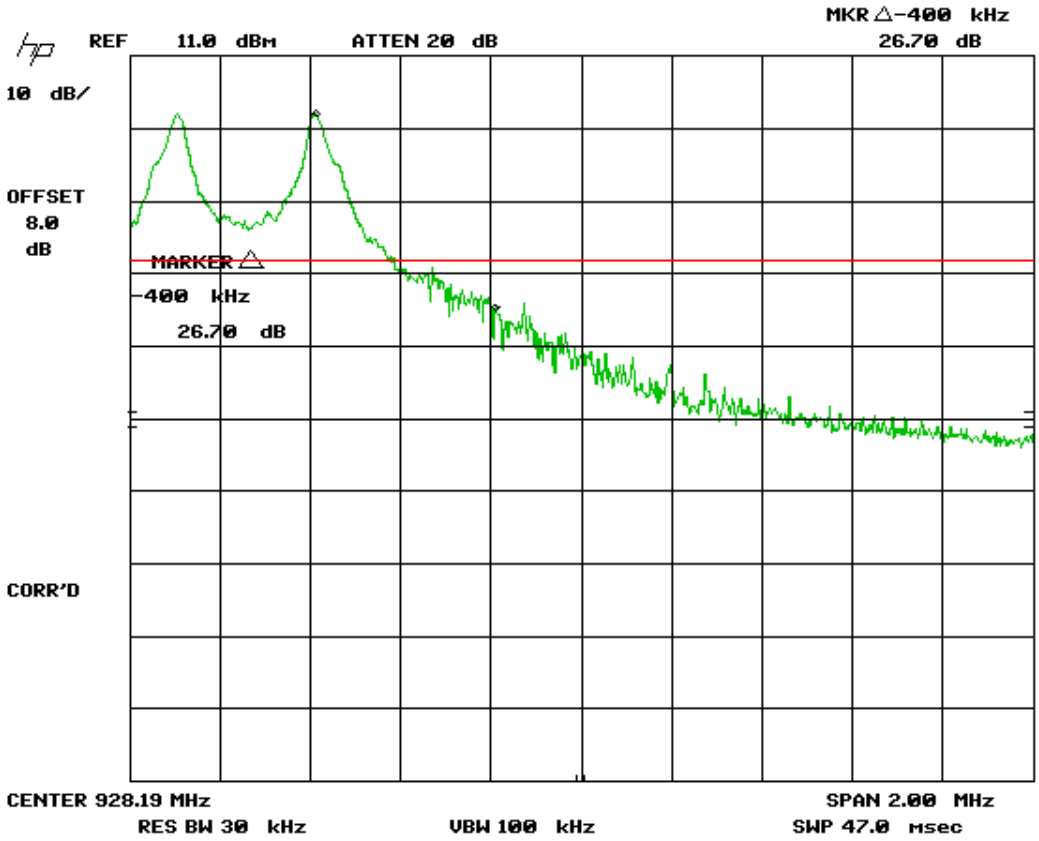


Figure 16. Band Edge Compliance, High Channel Delta – Peak

(Upper band edge must be greater than 20 dB)

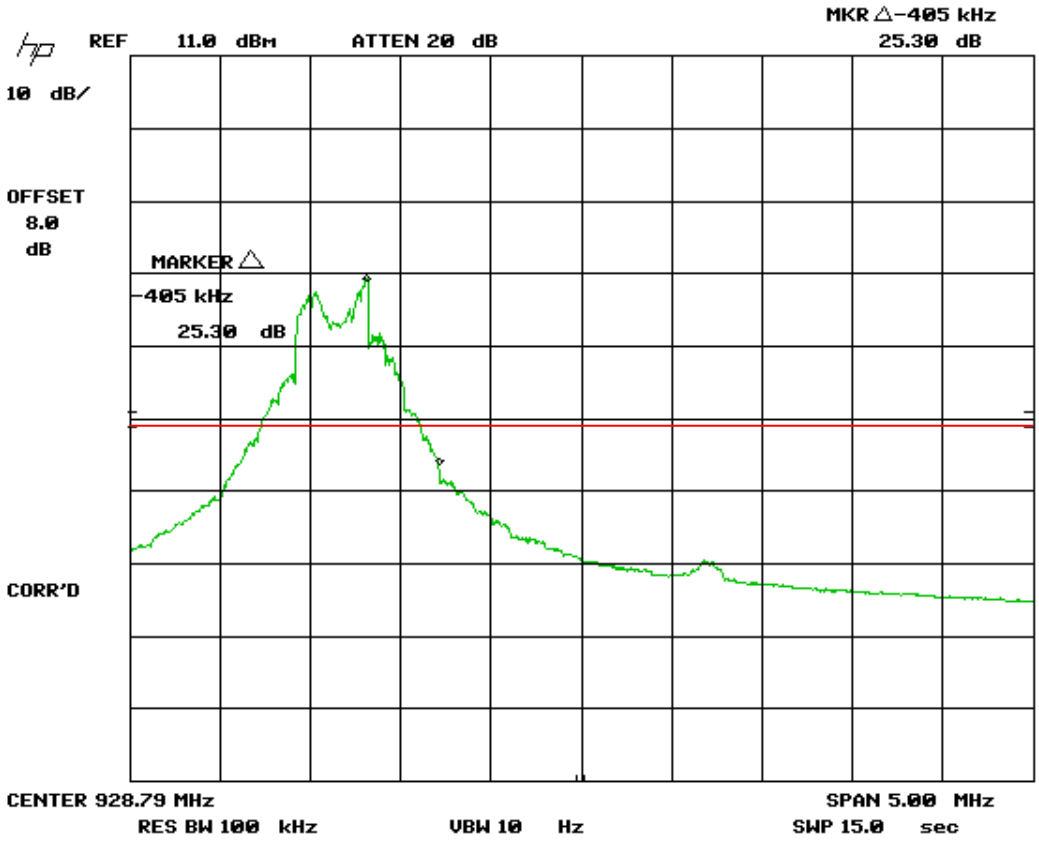


Figure 17. Band Edge Compliance, High Channel Delta – Average

Calculation of worst case upper band edge measurement:

High Channel Corrected Measured Value from Table 7	98.33	dBuV
High Channel Band Edge Delta from Figure 34	-26.70	dB
Calculated Result	71.63	dBuV/m
Band Edge Limit= 20 dB from fundamental reading	78.33	dBuV/m
Calculated Result	-71.63	dBuV/m
Band Edge Margin	6.70	dBuV/m

2.13 Six (6) dB Bandwidth per CFR 15.247(a)(2),

The EUT antenna port was connected to a spectrum analyzer having a 50 Ω input impedance. Measurements were performed similar to the method of FCC, KDB Publication No. 558074 for a bandwidth of 6 dB. The RBW was set to approximately 1/100 of the manufacturers claimed RBW and with the VBW ≥ RBW. The results of this test are given in the table below and Figures below.

Table 7. Six (6) dB Bandwidth

Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum FCC Bandwidth (MHz)
902.75	0.590	0.500
915.25	0.585	0.500
927.50	0.595	0.500

Test Date: September 9, 2014
Tested By
Signature: _____ Name: Carrie Fincannon

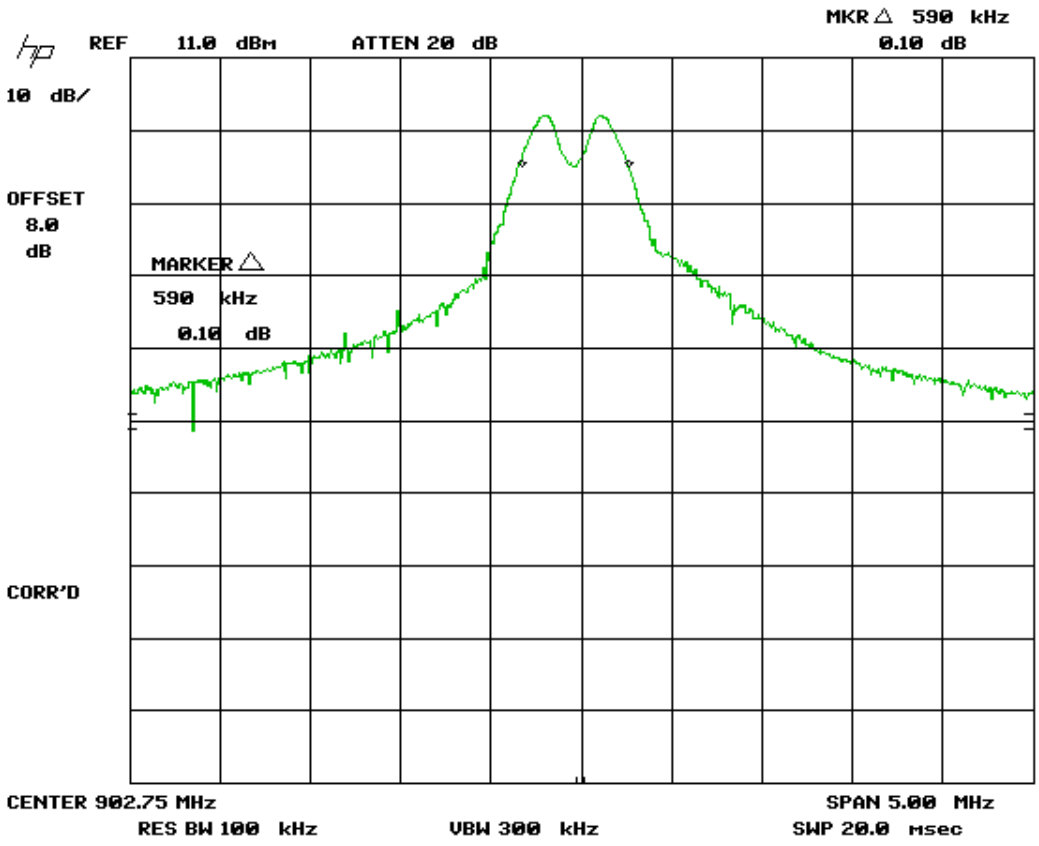


Figure 18. Six dB Bandwidth - 15.247 - Low Channel

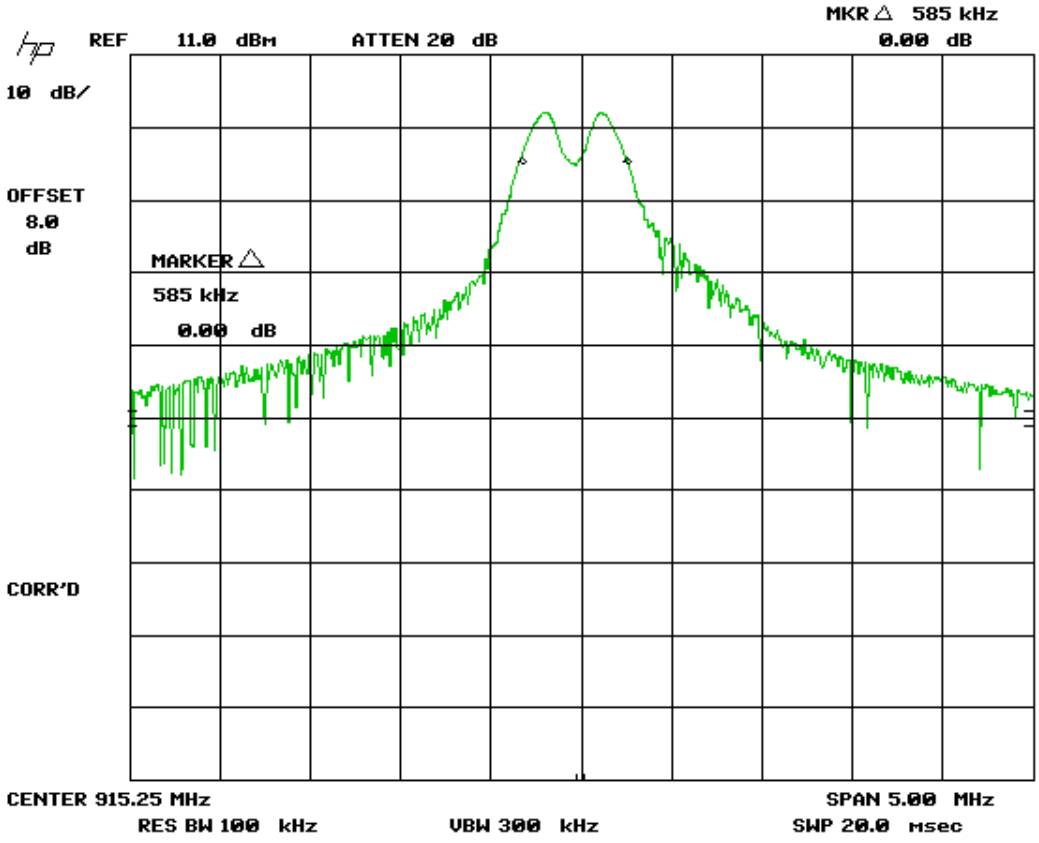


Figure 19. Six dB Bandwidth - 15.247 - Mid Channel

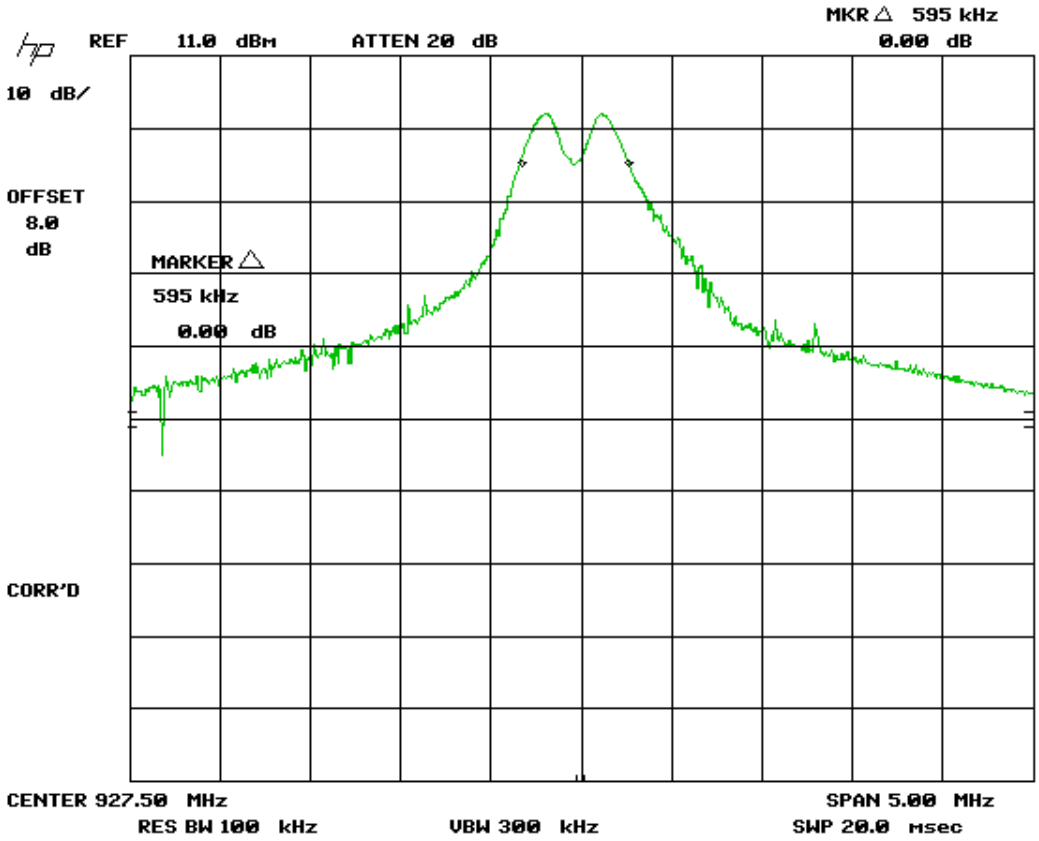


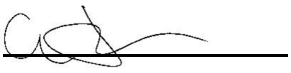
Figure 20. Six dB Bandwidth - 15.247 - High Channel

2.14 99% Occupied Bandwidth (IC RSS 210, A8.1)

These measurements were performed while the EUT was in a constant transmit mode. A method similar to the marker delta method was used to capture the points. The RBW was set to approximately 1/100 of the manufacturers claimed RBW and with the VBW ≥ RBW. The results of this test are given in Table 9 and Figures 21-23.

Table 8. 20 dB Bandwidth and 99% Occupied Bandwidth

Frequency (MHz)	20 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
902.75	1.045	1.045
915.25	1.115	1.115
927.50	1.500	1.500

Test Date: September 9, 2014
Tested By
Signature:  Name: Carrie Fincannon

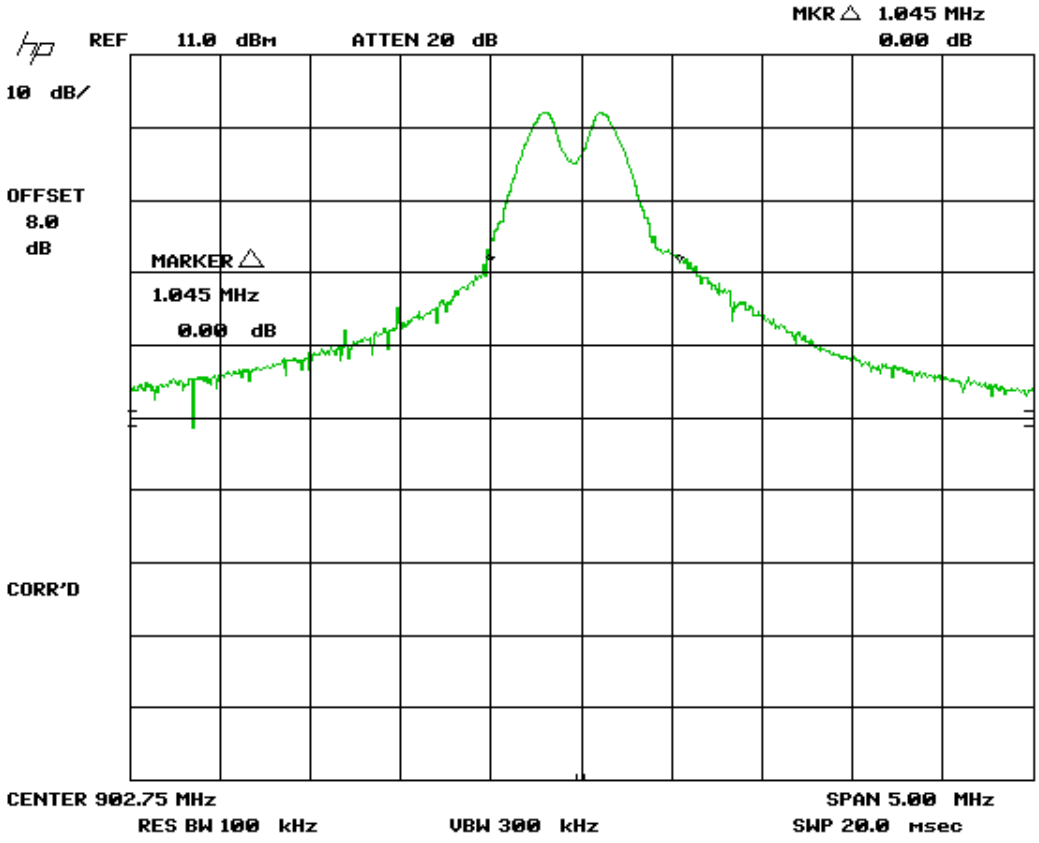


Figure 21. Twenty dB Bandwidth - IC RSS 210, A8.1– Low Channel

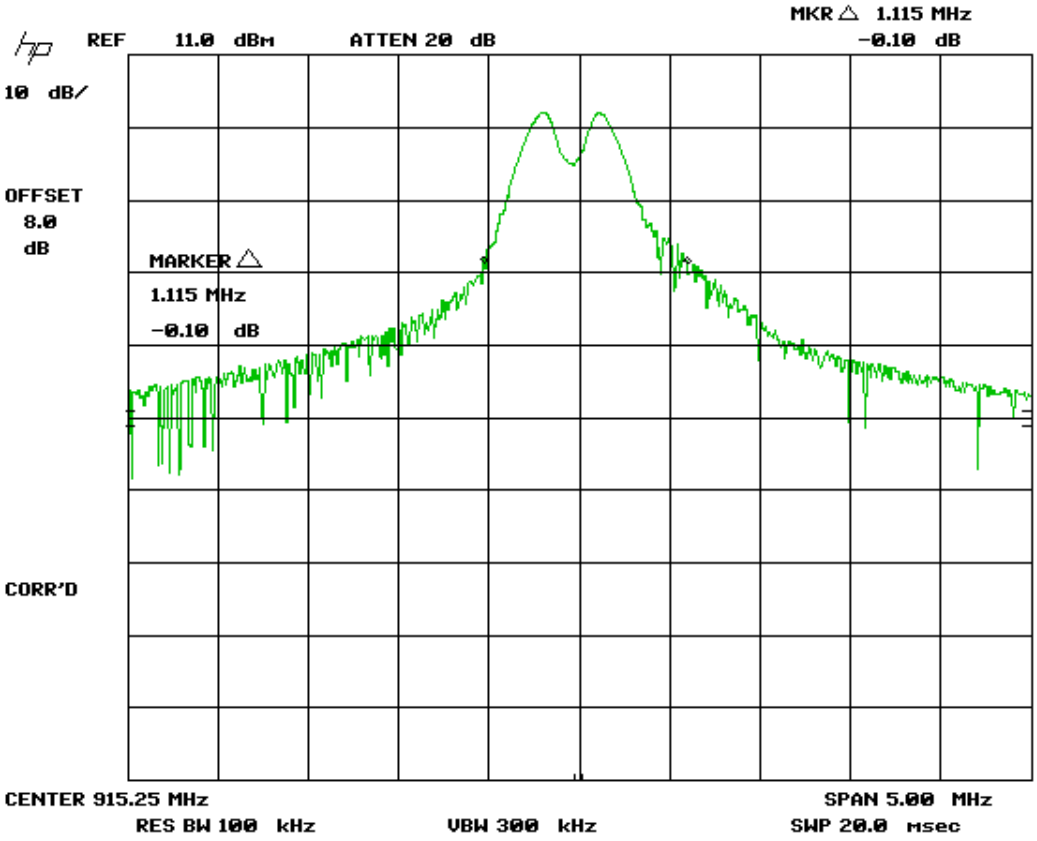


Figure 22. Twenty dB Bandwidth -IC RSS 210, A8.1 – Mid Channel

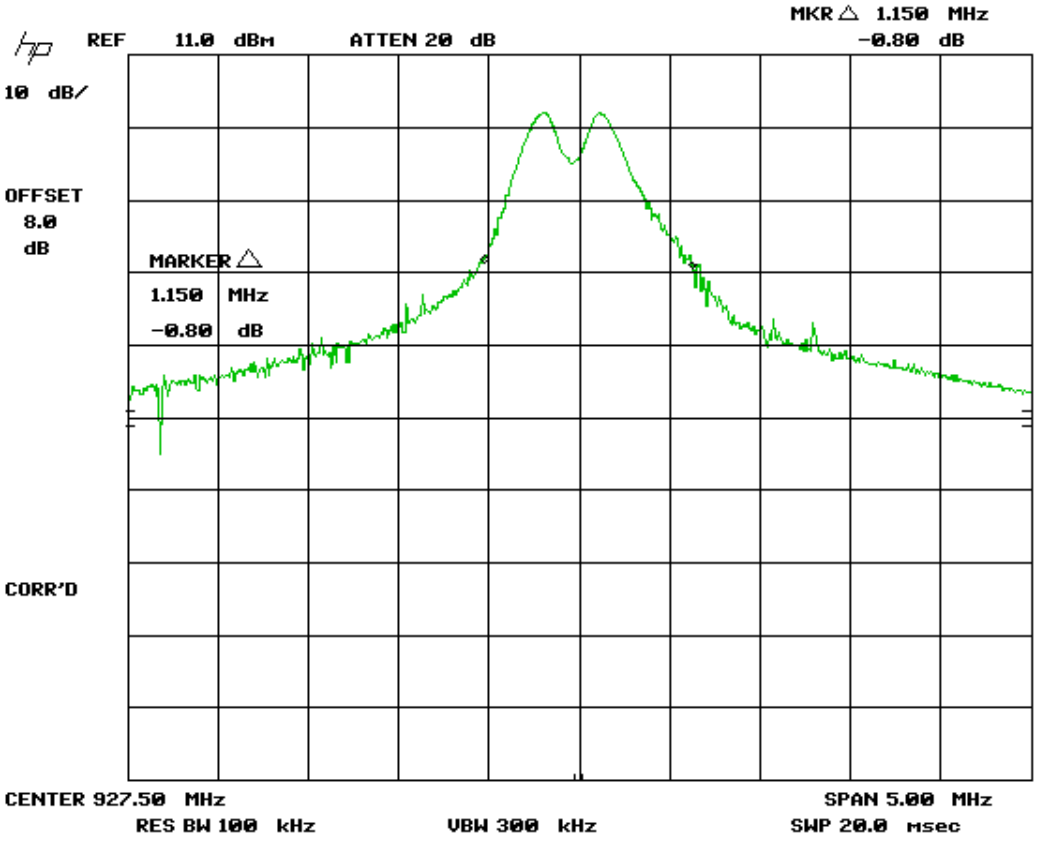


Figure 23. Twenty dB Bandwidth -IC RSS 210, A8.1 – High Channel

2.15 Maximum Peak Conducted Output Power (CFR 15.247 (b) (3))

For the PSASII-01, the transmitter was programmed to operate at a maximum output power across the bandwidth.

Peak power within the band 902 MHz to 9285 MHz was measured per FCC KDB Publication 558074 as an Antenna Conducted test with a spectrum analyzer by connecting the spectrum analyzer directly, via a short RF cable, and attenuators to the antenna output terminals on the EUT. The spectrum analyzer was set for an impedance of 50 Ω with the RBW set greater than the 6 dB bandwidth of the EUT, and the VBW ≥ RBW. Peak antenna conducted output power is tabulated in the table below.

Table 9. Peak Antenna Conducted Output Power per Part 15.247 (b) (3)

Frequency of Fundamental (MHz)	Raw Test Data dBm	Converted Data (mW)	FCC Limit (mW Maximum)
902.75	3.50	2.24	1000
915.25	3.40	2.19	1000
927.50	3.40	2.19	1000

Test Date: September 9, 2014
Tested By
Signature: _____ Name: Carrie Fincannon

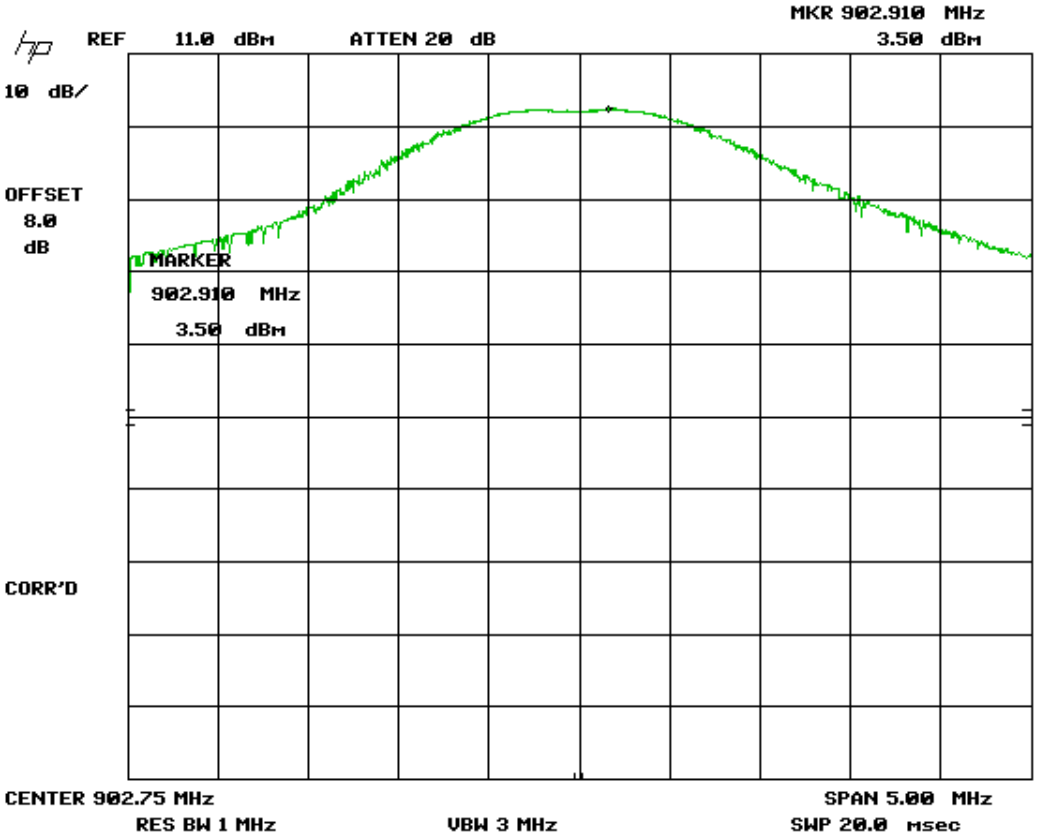


Figure 24. Peak Antenna Conducted Output Power, Low Channel

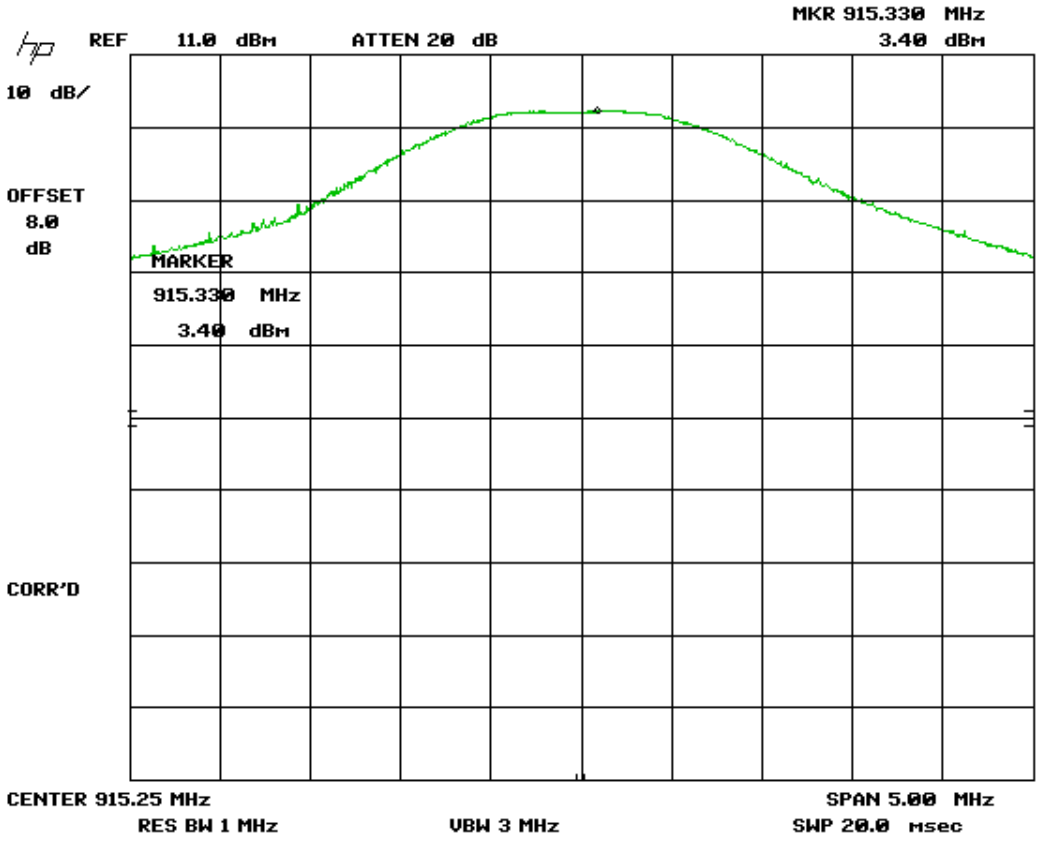


Figure 25. Peak Antenna Conducted Output Power, Mid Channel

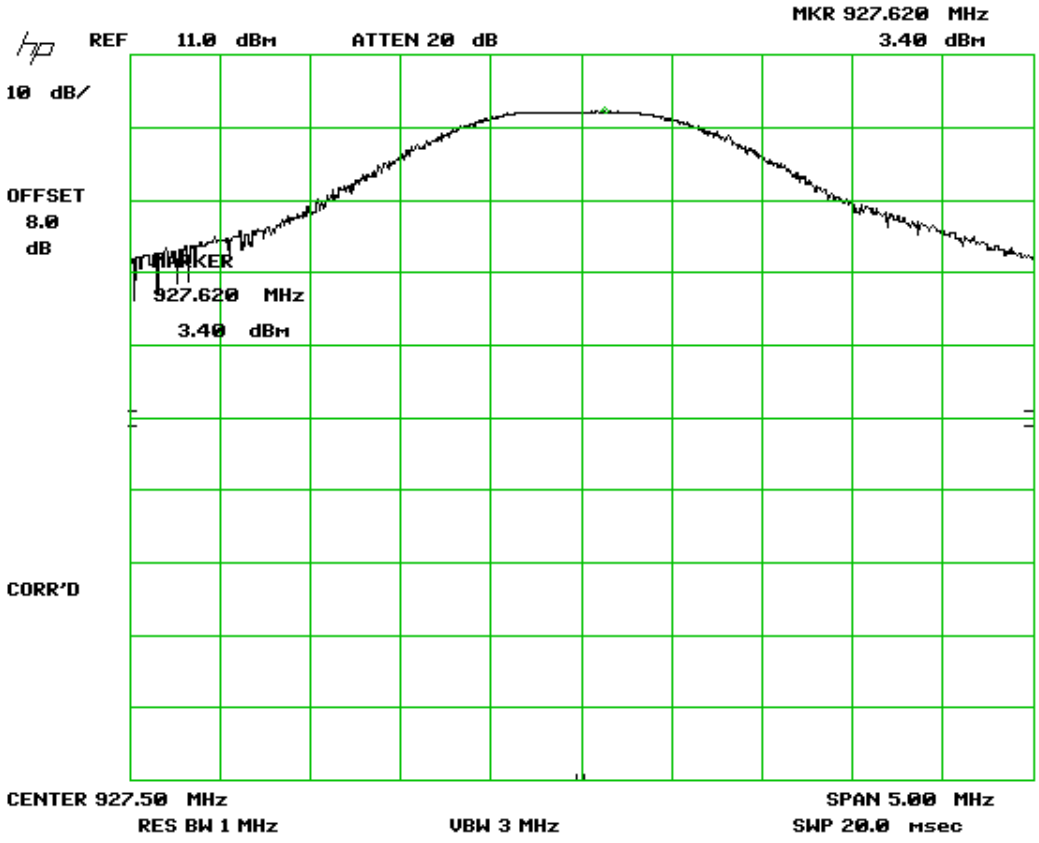


Figure 26. Peak Antenna Conducted Output Power, High Channel

2.16 Power Spectral Density (CFR 15.247(e)) (IC RSS 210 A8.5)

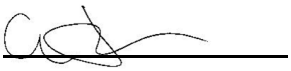
The transmitter was placed into a continuous mode of operation at all applicable frequencies. The measurements were performed per the procedures of FCC KDB Procedure 558074. The RBW was set to 3 kHz and the Video Bandwidth was set to ≥ RBW. The trace capture time was set to "Span/3 kHz".

In accordance with 15.247 (e), the power spectral density shall be no greater than +8 dBm per any 3 kHz band.

The following results show that all are less than +8 dBm per 3 kHz band.

Table 10. Power Spectral Density for Low, Mid and High Bands

Frequency (MHz)	Test Data (dBm/3 KHz)	Results (dBm/3 kHz)	FCC Limit (dBm/3 kHz)
902.75	2.70	2.70	+8.0
915.25	1.80	1.80	+8.0
927.50	1.50	1.50	+8.0

Test Date: September 9, 2014
Tested By
Signature:  Name: Carrie Fincannon

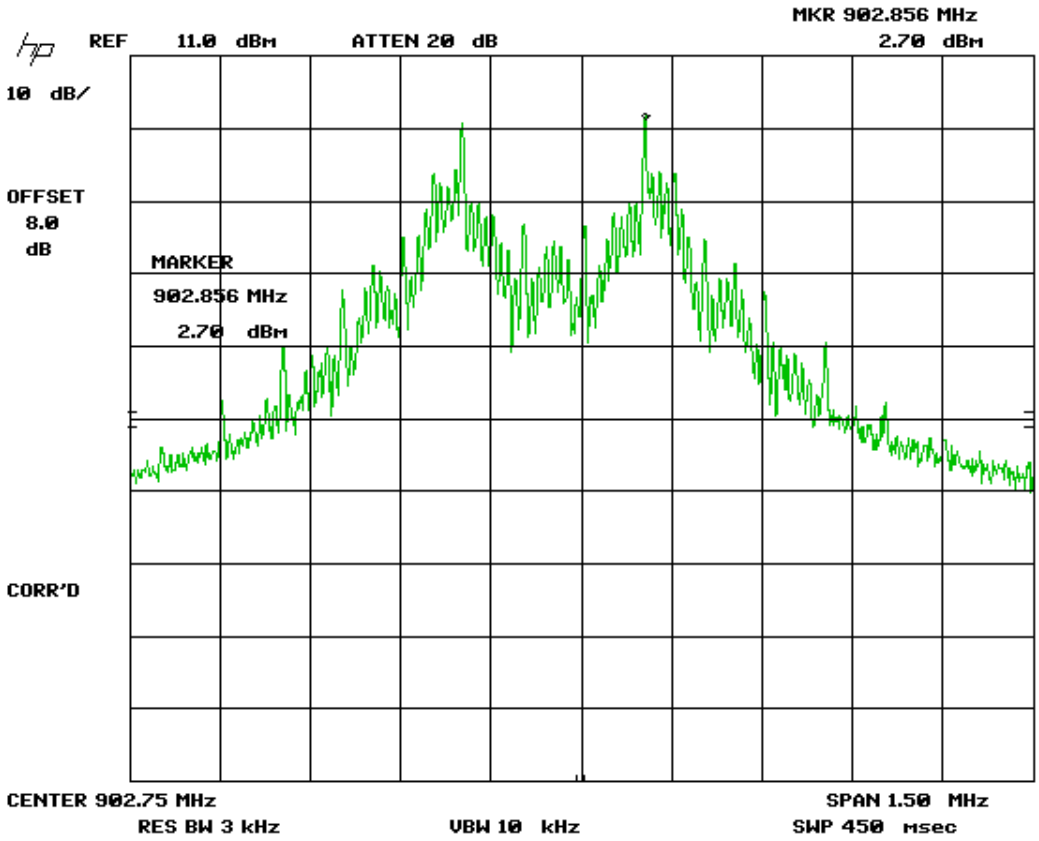


Figure 27. Peak Power Spectral Density, Low Channel

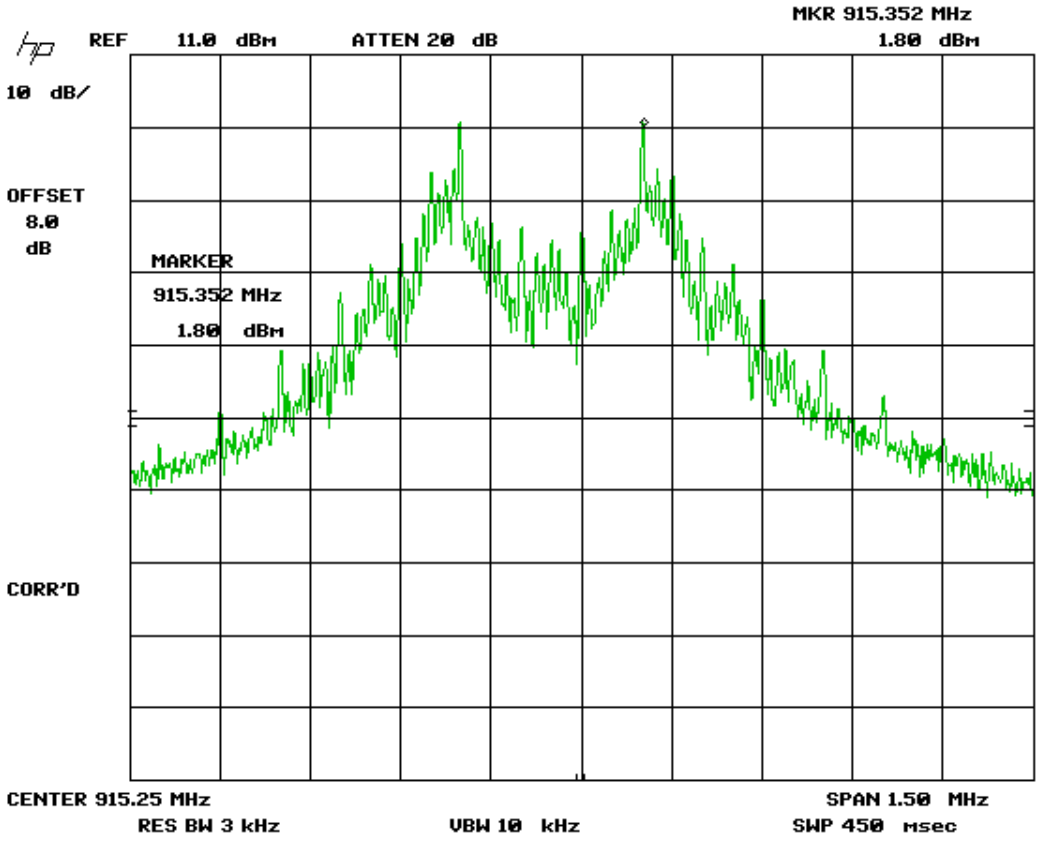


Figure 28. Peak Power Spectral Density, Mid Channel

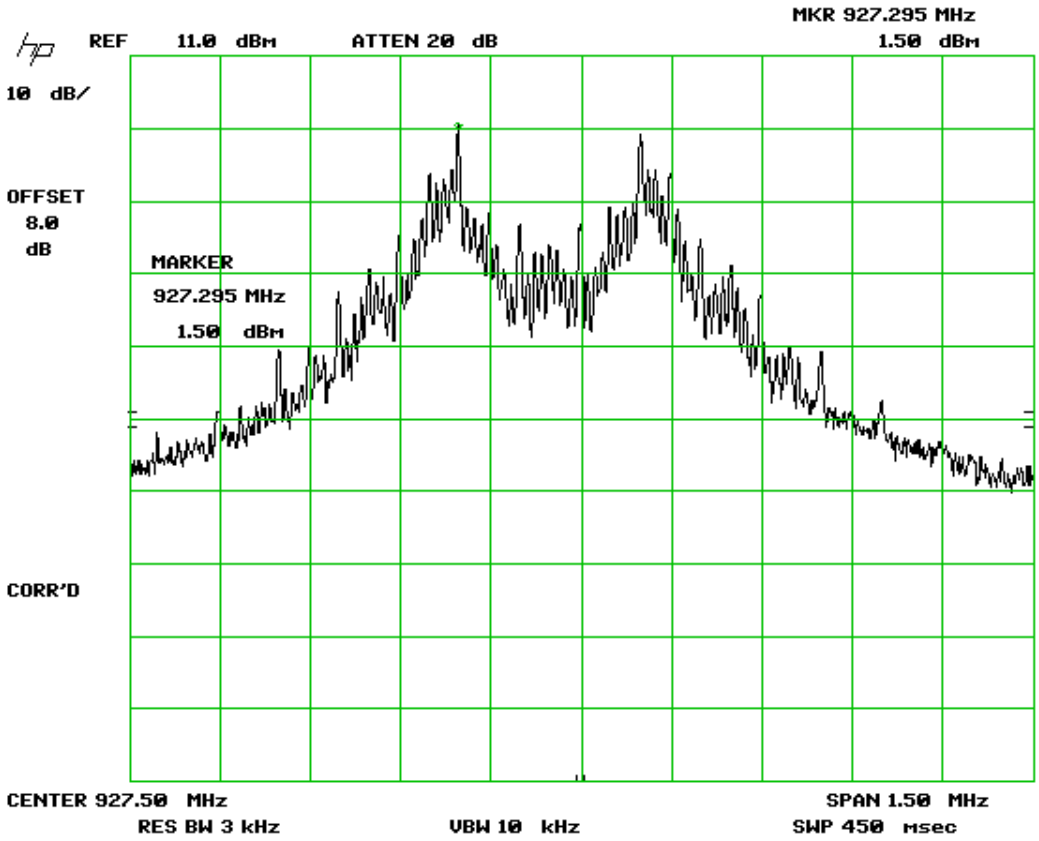


Figure 29. Peak Power Spectral Density, High Channel

2.17 Unintentional Radiator, Powerline Emissions (CFR 15.107)

The power line conducted voltage emission measurements have been carried out in accordance with CFR 15.107, per ANSI C63.4:2003, Paragraph 7, with a spectrum analyzer connected to a LISN and the EUT placed into a continuous mode of transmission.

The worst-case results for conducted emissions were determined to be produced when the EUT was operating under continuous transmission. The worst case measurement occurred on the phase line at 18.25 MHz. The emission level was 5.0 dB from the applicable limit. All other emissions were at least 5.8 dB from the limit. Those results are given in the table following.

NOTE: The test data provided in this section is to support the Verification and co-location requirement for the digital apparatus and the radios within.

Table 11. Transmitter Power Line Conducted Emissions Test Data, Part 15.107

CONDUCTED EMISSIONS 150 kHz to 30 MHz						
Tested By: SS	Specification Requirement: FCC Part 15.107 Class B		Project No.: 14-0123	Manufacturer: Paksense Model: PSASII-01		
Frequency (MHz)	**Test Data (dBuV)**	**LISN+CL (dB)**	**Corrected Results (dBuV)**	**Avg Limits (dBuV)**	**Margin (dB)**	**Detector**
120 VAC, 60 Hz, Phase Line						
0.4046	39.65	0.55	40.20	47.8	7.6	**PK**
0.6950	33.10	0.42	33.52	46.0	12.5	**PK**
4.5400	36.25	0.39	36.64	46.0	9.4	**PK**
7.9250	39.06	0.44	39.50	50.0	10.5	**PK**
18.2500	44.42	0.59	45.01	50.0	5.0	**QP**
23.1290	41.09	0.66	41.75	50.0	8.2	**QP**
120 VAC, 60 Hz, Neutral Line						
0.4003	40.75	0.55	41.30	47.9	6.6	**QP**
0.5025	38.00	0.47	38.47	46.0	7.5	**PK**
4.5000	37.57	0.39	37.96	46.0	8.0	**PK**
7.9250	39.73	0.44	40.17	50.0	9.8	**PK**
18.2500	43.64	0.58	44.22	50.0	5.8	**QP**
20.2500	41.75	0.61	42.36	50.0	7.6	**QP**

SAMPLE CALCULATION at 0.4046 MHz:

Magnitude of Measured Frequency	39.65	dBuV
+ Cable Loss+ LISN Loss	0.55	dB
=Corrected Result	40.20	dBuV
Limit	47.80	dBuV
-Corrected Result	40.20	dBuV
Margin	7.60	dB

Test Date: September 5, 2014
Tested By
Signature: Sina Sobhaniyan Name: Sina Sobhaniyan

2.18 Unintentional Radiator, Radiated Emissions (CFR 15.109)

Radiated emissions disturbance Measurements were performed with an instrument having both peak and quasi-peak detectors over the frequency range of 30 MHz to 12.5 GHz. Measurements of the radiated emissions were made with the receiver antenna at a distance of 3 m from the boundary of the test unit.

The end product device is a considered a Class A device therefore all measurements performed at a test distance of 3 m such as described above were extrapolated to 10 meters using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements)

For measurements from 30 MHz to 12.5 GHz, the test antenna was varied from 1 m to 4 m in height while watching the analyzers' display for the maximum magnitude of the signal at the test frequency. The antenna polarization (horizontal or vertical) and test sample azimuth were varied during the measurements to find the maximum field strength readings to record.

The worst-case radiated emission in the range of 30 MHz to 5 GHz was 4.5 dB below the limit at 798.08 MHz. This signal is found in Table 13. All other radiated emissions were 8.5 dB or more below the limit.

As stated in the previous sections of this test report the EUT incorporated three radios. All three radios were active and broadcasting during this evaluation to show compliance with radio co-location requirements. Each radio of the three radios operates in different frequency bands and does not qualify for simultaneous transmission. During the testing no additional emissions were seen, all emissions recorded meet the applicable Part 15 requirements.

NOTE: The test data provided in this section is to support the Verification and co-location requirement for the digital apparatus and the radios within.

Table 12 . Unintentional Radiator, Peak Radiated Emissions (CFR 15.109), 30 MHz to 1000 MHz

30 MHz to 1000 MHz							
Test By:	**Test:** Part 15.109, Class B Verification			**Client:** Paksense, Inc.			
SJM	**Project:** 14-0122			**Model:** PSASII-01			
Frequency (MHz)	**Test Data (dBuV)**	**Correction Factors (dB/m)**	**Results (dBuV/m)**	**Quasi Peak Limits (dBuV/m)**	**Antenna Distance/ Polarization**	**Margin (dB)**	**Detector PK or QP**
78.5600	48.70	-17.34	31.36	40.0	3m./VERT	8.6	PK
82.7000	49.90	-17.03	32.87	40.0	3m./HORZ	7.1	PK
82.3800	49.40	-17.03	32.37	40.0	3m./HORZ	7.6	PK
83.0160	50.80	-16.63	34.17	40.0	3m./VERT	5.8	PK
143.6300	47.10	-12.01	35.09	43.5	3m./HORZ	8.4	PK
123.1700	52.10	-13.16	38.94	43.5	3m./VERT	4.6	PK
130.4900	45.10	-12.71	32.39	43.5	3m./HORZ	11.1	PK

Tested from 30 MHz to 1 GHz

SAMPLE CALCULATION:
RESULTS at 78.5600 MHz, 48.70 dBuV + (-17.34) dB = 31.36 dBuV/m

Test Date: September 4, 2014

Tested by
Signature: Stephen Miller Name: Stephen Miller

Table 13 . Unintentional Radiator, Peak Radiated Emissions (CFR 15.109), 1 GHz to 5 GHz

Peak Radiated Emissions, Digital Device and Receiver							
Test By: SS	**Test:** Radiated Emissions- 1 GHz to 5 GHz			**Client:** Paksense			
	Project: 14-0123	**Requirement** 15.109, Class: B		**Model:** PSASII-01			
Frequency (MHz)	**Test Data (dBuV)**	**AF+CL-PA (dB)**	**Results (dBuV/m)**	**AVG Limits (dBuV/m)**	**Distance / Polarity (meters)**	**Margin (dB)**	**Detector PK / QP**
All emissions seen are more than 20 dB below the applicable limit.							

Tested from 1 GHz to 5 GHz

SAMPLE CALCULATION: N/A

Test Date: September 5, 2014
Tested By
Signature: Sina Sobhaniyan Name: Sina Sobhaniyan

2.19 Measurement Uncertainty

The measurement uncertainties given were calculated using the method detailed in CISPR 16-4. A coverage factor of k=2 was used to give a level of confidence of approximately 95%.

2.19.1 Conducted Emissions Measurement Uncertainty

Measurement Uncertainty (within a 95% confidence level) for this test is ±2.8 dB.

The data listed in this test report does have sufficient margin to negate the effects of uncertainty. Therefore, the EUT unconditionally meets this requirement.

2.19.2 Radiated Emissions Measurement Uncertainty

For a measurement distance of 3 m the measurement uncertainty (with a 95% confidence level) for this test using a Biconical Antenna (30 MHz to 200 MHz) is ±5.33 dB. This value includes all elements of measurement.

The measurement uncertainty (with a 95% confidence level) for this test using a Log Periodic Antenna (200 MHz to 1000 MHz) is ±5.12 dB.

The measurement uncertainty (with a 95% confidence level) for this test using a Horn Antenna is ±5.15 dB.

The data listed in this test report does not have sufficient margin to negate the effects of uncertainty. Therefore, the EUT conditionally meets this requirement.