

Partial Test Report

Concerning:

Spurious Emissions

According:
CFR 47 Part 15.247
RSS-247 Issue 2

EUT Name: Ranger 4.4
Model No.: R44-N11

Prepared for:

Trapeze Software Group, Inc.
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Iowa 52402, U.S.A.

Prepared by:

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Revisions

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Note: Latest revision report will replace all previous reports.

Table of Contents

Manufacturer: Trapeze Software Group, Inc.
5265 Rockwell Drive NE, Cedar Rapids
Iowa 52402, U.S.A.
Requester / Applicant: Trapeze Software Group, Inc.
Name of Equipment: Ranger 4.4
Model No. R44-N11
Type of Equipment: Intentional Radiator
Application of Regulations: CFR 47 Part 15.247, RSS-247 Issue 2
Test Dates: July 17, 2017 to August 22, 2017

Guidance Documents:

Emissions: ANSI C63.10-2013

Test Methods:

Emissions: ANSI C63.10-2013

The electromagnetic compatibility test and documented data described in this report has been performed and recorded by TUV Rheinland, in accordance with the standards and procedures listed herein. As the responsible authorized agent of the EMC laboratory, I hereby declare that the equipment described above has been shown to be compliant with the EMC requirements of the stated regulations and standards based on these results. If any special accessories and/or modifications were required for compliance, they are listed in the Executive Summary of this report.

This report must not be used to claim product endorsement by A2LA or any agency of the U.S. Government. This report contains data that are not covered by A2LA accreditation. This report shall not be reproduced except in full, without the written authorization of TUV Rheinland of North America.

Bernd Jungbluth September 14, 2017

Report written Date

Douglas Antioco September 14, 2017

Test Engineer Date

Arndt Stoecker September 14, 2017

Operations Manager Date



Industry
Canada Industrie
Canada

Testing Cert #3331.02

US1131

2932M-1

Table of Contents

1	Executive Summary	7
1.1	Scope	7
1.2	Purpose	7
1.3	Summary of Test Results	8
	*This Partial Test report concerns only spurious emission measurements	8
1.4	Special Accessories	8
1.5	Equipment Modifications	8
2	Laboratory Information	9
2.1	Accreditations & Endorsements	9
2.1.1	US Federal Communications Commission	9
2.1.2	NIST / A2LA	9
2.1.3	Acceptance by Mutual Recognition Arrangement	9
2.2	Test Facilities	9
2.2.1	Emission Test Facility	9
2.3	Measurement Uncertainty	10
2.3.1	Sample Calculation – radiated & conducted emissions	10
2.3.2	Measurement Uncertainty	11
2.4	Calibration Traceability	11
3	Product Information	12
3.1	Product Description	12
3.2	Equipment Configuration	12
3.3	Operating Mode	12
3.4	Unique Antenna Connector	13
3.4.1	Results	13
4	Emissions	14
4.1	Transmitter Radiated Spurious Emissions	14
4.1.1	Test Methodology	14
4.1.2	Transmitter Spurious Emission Limit	16
4.1.3	Test Results	16
5	Test Equipment List	37
5.1	Equipment List	37
6	EMC Test Plan	38
6.1	Introduction	38
6.2	Customer	38
6.3	Equipment Under Test (EUT)	39
6.4	Testing Notes:	40

Index of Tables

Table 1: Summary of Test Results	8
Table 2: Customer Information	38
Table 3: EUT Specifications	39
Table 4: Antenna Information	39
Table 5: Support Equipment	39
Table 7: Description of Sample used for Testing	40
Table 8 Accessory Equipment.....	40

1 Executive Summary

1.1 Scope

This report is intended to document the status of conformance with the requirements of the CFR 47 Part 15.247 based on the results of testing performed on July 17, 2017 to August 22, 2017 on the Ranger 4.4 Model R44-N11 manufactured by Trapeze Software Group, Inc. This report only applies to the specific samples tested under the stated test conditions. It is the responsibility of the manufacturer to assure that additional production units of this model are manufactured with identical or EMI equivalent electrical and mechanical components. This report is further intended to document changes and modifications to the EUT throughout its life cycle. All documentation will be included as a supplement.

1.2 Purpose

Testing was performed to evaluate the EMC performance of the EUT in accordance with the applicable requirements, procedures, and criteria defined in the application of regulations and application of standards listed in this report. The 2400 MHz to 2483.5 MHz frequency band is covered in this document.

1.3 Summary of Test Results

Table 1: Summary of Test Results

Test	Test Method ANSI C63.4	Test Parameters (Measured)	Result
Spurious Emission in Transmit Mode	CFR47 15.209, RSS-GEN Sect.8.9	Class B	Compliant
Restricted Bands of Operation	CFR47 15.205, RSS GEN Sect.8.10	Class B	Not Tested*
AC Power Conducted Emission	CFR47 15.207, RSS-GEN Sect.8.8	Class B	Not Tested*
6dB and 99% Occupied Bandwidth	CFR47 15.247 (a2), RSS-247 Sect. 5.2.1	See plots	Not Tested*
Maximum Output Power	CFR47 15.247 (b), RSS-247 Sect. 5.4.4	See plots	Not Tested*
Peak Power Spectral Density	CFR47 15.247 (e), RSS-247 Sect. 5.2.2	See plots	Not Tested*
Out of Band Emission	CFR47 15.247 (d), RSS-247 Sect.5.5	See plots	Not Tested*

**This Partial Test report concerns only spurious emission measurements*

1.4 Special Accessories

No special accessories were necessary in order to achieve compliance.

1.5 Equipment Modifications

None

2 Laboratory Information

2.1 Accreditations & Endorsements

2.1.1 US Federal Communications Commission



TUV Rheinland of North America at 1279 Quarry Ln, Pleasanton, CA 94566 is recognized by the commission for performing testing services for the general public on a fee basis. These laboratory test facilities have been fully described in reports submitted to and accepted by the FCC (US1131). The laboratory scope of accreditation includes: Title 47 CFR Parts 15, 18, and 90. The accreditation is updated every 3 years.

2.1.2 NIST / A2LA



TUV Rheinland of North America is accredited by the National Voluntary Laboratory Accreditation Program, which is administered under the auspices of the National Institute of Standards and Technology. The laboratory has been assessed and accredited in accordance with ISO Guide 17025:1999 and ISO 9002 (Lab Code Testing Cert #3331.02). The scope of laboratory accreditation includes emission and immunity testing. The accreditation is updated annually.

2.1.3 Acceptance by Mutual Recognition Arrangement



The United States has an established agreement with specific countries under the Asia Pacific Laboratory Accreditation Corporation (APLAC) Mutual Recognition Arrangement. Under this agreement, all TUV Rheinland at 1279 Quarry Ln, Pleasanton, CA 94566 test results and test reports within the scope of the laboratory NIST / A2LA accreditation will be accepted by each member country.

2.2 Test Facilities

All of the test facilities are located at 1279 Quarry Lane, Pleasanton, California 94566, USA. The 2305 Mission College, Santa Clara, 95054, USA location is considered a Pleasanton annex.

2.2.1 Emission Test Facility

The Semi-Anechoic chamber and AC Line Conducted measurement facility used to collect the radiated and conducted data has been constructed in accordance with ANSI C63.7:1992. The site has been measured in accordance with and verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4-2014, at a test distance of 3 and 5 meters. The site is listed with the FCC and accredited by A2LA (Lab Code Testing Cert #3331.02). The 3/5-meter semi-anechoic chamber used to collect the radiated data has been verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4-2014, at a test distance of 3 meter and 5 meters. A report detailing this site can be obtained from TUV Rheinland of North America.

2.3 Measurement Uncertainty

Two types of measurement uncertainty are expressed in this report, per *ISO Guide To The Expression Of Uncertainty In Measurement*, 1st Edition, 1995.

The Combined Standard Uncertainty is the standard uncertainty of the result of a measurement when that result is obtained from the values of a number of other quantities; it is equal to the positive square root of the sum of the variances or co-variances of these other quantities, weighted according to how the measurement result varies with changes in these quantities. The term *standard uncertainty* is the result of a measurement expressed as a standard deviation.

2.3.1 Sample Calculation – radiated & conducted emissions

The field strength is calculated by subtracting the Amplifier Gain and adding the Cable Loss and Antenna Correction Factor to the measured reading. The basic equation is as follows:

$$\text{Field Strength (dB}\mu\text{V/m)} = \text{RAW} - \text{AMP} + \text{CBL} + \text{ACF}$$

Where: RAW = Measured level before correction (dB μ V)

AMP = Amplifier Gain (dB)

CBL = Cable Loss (dB)

ACF = Antenna Correction Factor (dB/m)

$$\mu\text{V/m} = 10^{\frac{\text{dB}\mu\text{V/m}}{20}}$$

Sample radiated emissions calculation @ 30 MHz

Measurement +Antenna Factor–Amplifier Gain+Cable loss=Radiated Emissions (dB μ V/m)

$$25 \text{ dB}\mu\text{V/m} + 17.5 \text{ dB} - 20 \text{ dB} + 1.0 \text{ dB} = 23.5 \text{ dB}\mu\text{V/m}$$

2.3.2 Measurement Uncertainty

Per CISPR 16-4-2	U_{lab}	U_{cisp}
Radiated Disturbance @ 10 meters		
30 – 1,000 MHz	2.25 dB	4.51 dB
Radiated Disturbance @ 3 meters		
30 – 1,000 MHz	2.26 dB	4.52 dB
1 – 6 GHz	2.12 dB	4.25 dB
6 – 18 GHz	2.47 dB	4.93 dB
Conducted Disturbance @ Mains Terminals		
150 kHz – 30 MHz	1.09 dB	2.18 dB
Disturbance Power		
30 MHz – 300 MHz	3.92 dB	4.3 dB

2.4 Calibration Traceability

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Measurement method complies with ANSI/NCSL Z540-1-1994 and ISO Standard 17025:2005. Equipment calibration records are kept on file at the test facility.

3 Product Information

3.1 Product Description

The Model R44-N11, Ranger 4.4, is a Rugged and Compact Vehicular Computer.

3.2 Equipment Configuration

A description of the equipment configuration is given in the Test Plan Section (Section 6). The EUT was tested as called for in the test standard and was configured and operated in a manner consistent with its intended use. The EUT was connected to rated power and allowed to reach intended operating conditions. The placement of the EUT system components was guided by the test standard and selected to represent typical installation conditions.

In the case of a EUT that can operate in more than one configuration, preliminary testing was performed to determine the configuration that produced maximum radiation.

The final configuration was selected to produce the worst case radiation for emissions testing.

3.3 Operating Mode

A description of the operation mode is given in the Test Plan Section (Section 6).

The final operating mode was selected to produce the worst case radiation for emissions testing.

3.4 Unique Antenna Connector

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. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of CFR47 Parts 15.211, 15.213, 15.217, 15.219, or 15.221.

3.4.1 Results

The Ranger 4.4 employs a single integral antenna inaccessible to the end user. The antenna has a declared maximum gain of 3dBi.

Refer to Table 9 for additional antenna information.

4 Emissions

Testing was performed in accordance with CFR 47 Part 15.247. These test methods are listed under the laboratory's A2LA Scope of Accreditation. This test measures the levels emanating from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices. Procedures described in section 8 of the standard were used.

4.1 Transmitter Radiated Spurious Emissions

Transmitter spurious emissions are emissions outside the frequency range of the equipment when the equipment is in transmit mode; per requirement of CFR47 15.205, 15.209, 15.247, RSS-Gen.

4.1.1 Test Methodology

4.1.1.1 Preliminary Test

For 3.5-18GHz Measurements

A test program (Vasona) that controls instrumentation and data logging was used to automate the preliminary RF emission test procedure. The frequency range of interest was divided into sub-ranges to yield a frequency resolution of approximately 1 MHz and provide a reading at each frequency for no more than 12° of turntable rotation. For each frequency sub-range the turntable was rotated 360° while peak emission data was recorded and plotted over the frequency range of interest in horizontal and vertical antenna polarization's.

For All Other Ranges

A test program (EMC32) that controls instrumentation and data logging was used to automate the preliminary RF emissions test procedure. The frequency range of interest was divided into sub-ranges. For each sub-range peak emission data was recorded and plotted while the turntable was rotated 360° in 90° steps and the measurement antenna was rotated in horizontal and vertical antenna polarization.

Preliminary emission profile testing was performed inside a semi-anechoic chamber. The EUT was placed on a non-conductive table 80 cm above the floor for emissions less than 1 GHz and 150cm above the floor for emissions greater than 1 GHz. The EUT was positioned as shown in the setup photographs. The measurement antenna was placed at a distance of 3m.

4.1.1.2 Final Test

Final testing was performed on an NSA compliant test site.

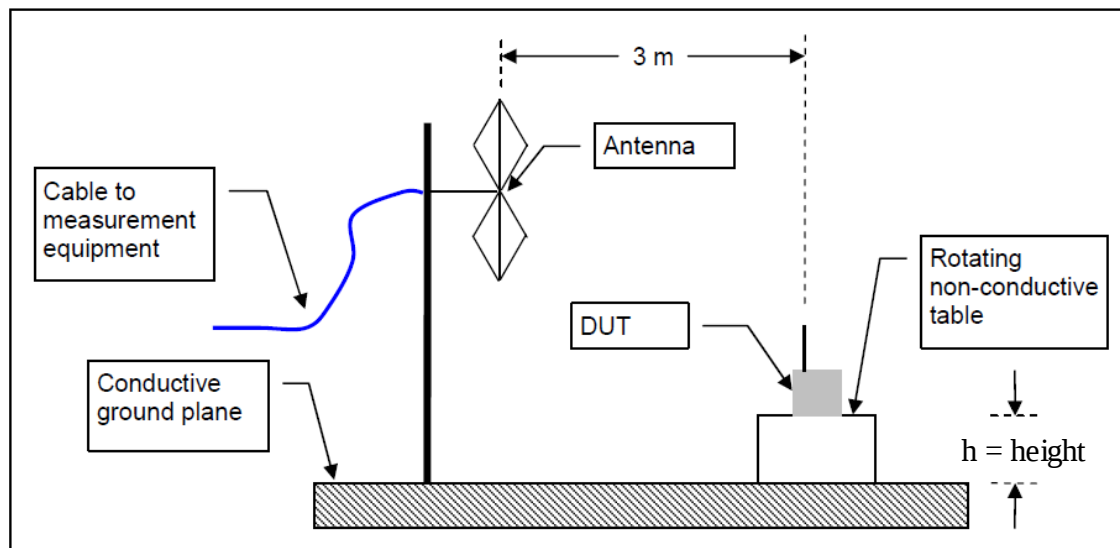
For each frequency measured, the peak emission was maximized by manipulating the receiving antenna from 1 to 4 meters above the ground plane and placing it at the position that produced the maximum signal strength reading. The turntable was then rotated through 360° while observing the peak signal and placing the EUT at the position that produced maximum radiation. Emissions within 6 dB of the limit were measured.

The final scans were performed on the worst EUT axis for three operating channels in the operating mode with the highest power.

4.1.1.3 Deviations

None.

Test Setup:



Where $h = 80\text{cm}$ for $<1\text{GHz}$ and 150cm for $>1\text{GHz}$

4.1.2 Transmitter Spurious Emission Limit

The spurious emissions of the transmitter shall not exceed the values in CFR47 Part 15.205, 15.209.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490.....	2400/F (kHz)	300
0.490-1.705.....	24000/F (kHz)	30
1.705-30.0.....	30	30
30-88.....	100 **	3
88-216.....	150 **	3
216-960.....	200 **	3
Above 960.....	500	3

All harmonics and spurious emission which are outside of the restricted band shall be 20dB below the in-band emission.

4.1.3 Test Results

The final measurement data was taken under the worst case operating modes, configurations, and/or cable positions. It also reflects the results including any modifications and/or special accessories listed in Sections 1.4 and test plan.

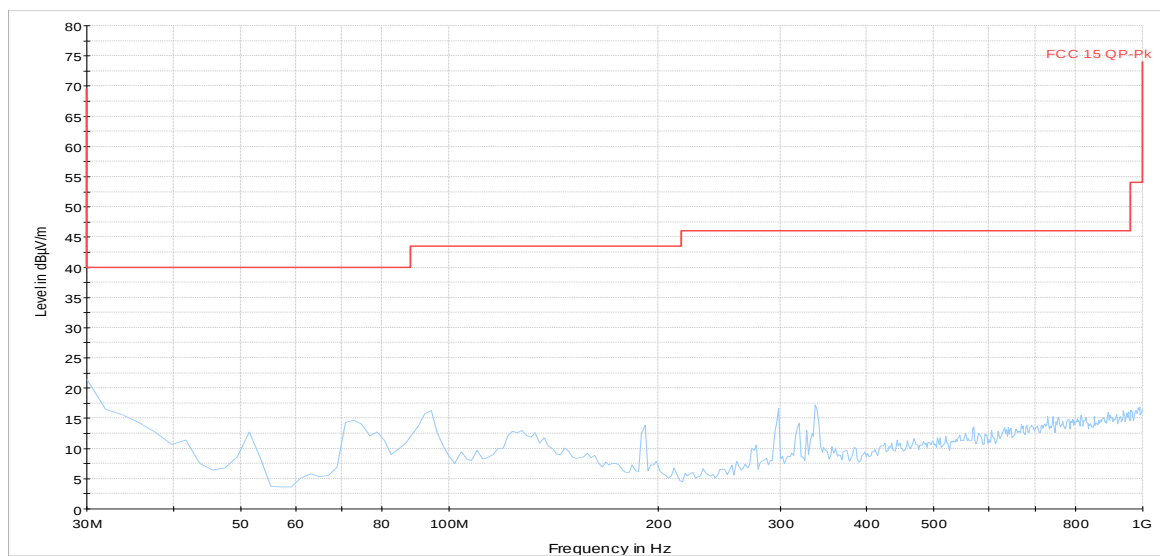
As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

802.11 b

Radiated Emissions – 802.11b CH1

EUT Name	Ranger 4.4	Date	07/17/2017-08/22/2017
EUT Model	R44-N11	Temp / Hum in	23°C / 38%rh
EUT Serial	356961070012789	Voltage Input	12 VDC
EUT Config.	1 MB/s	RBW/ VBW	<150kHz: 300Hz/1kHz
Standard	CFR 47 Part 15.209		150kHz – 30 MHz: 10kHz/30kHz
Dist/Ant Used	3m		>30Mhz: 1Mhz/3MHz
		Test Engineer	Douglas Antioco

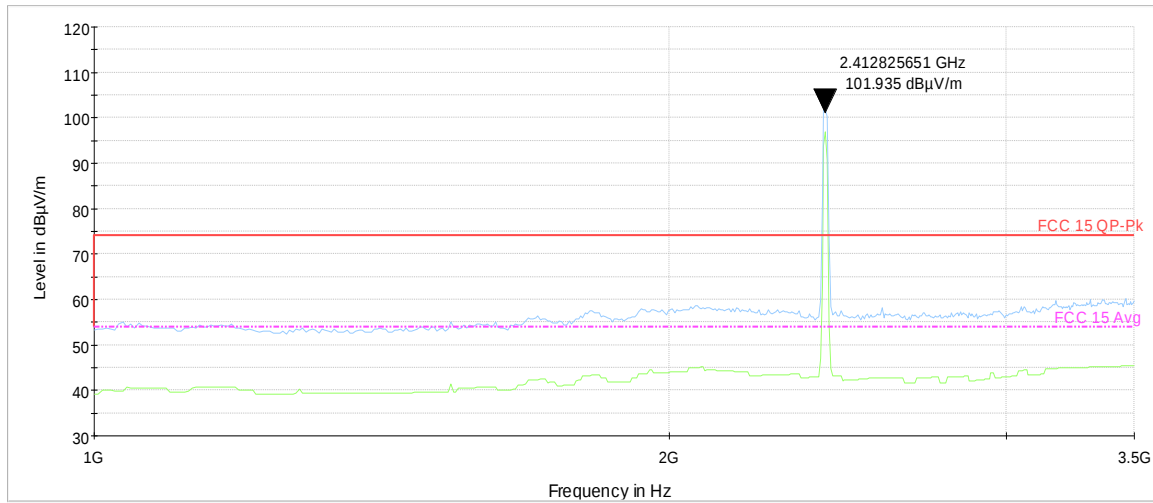
30 MHz – 1 GHz for CH1



Radiated Emissions – 802.11b CH1

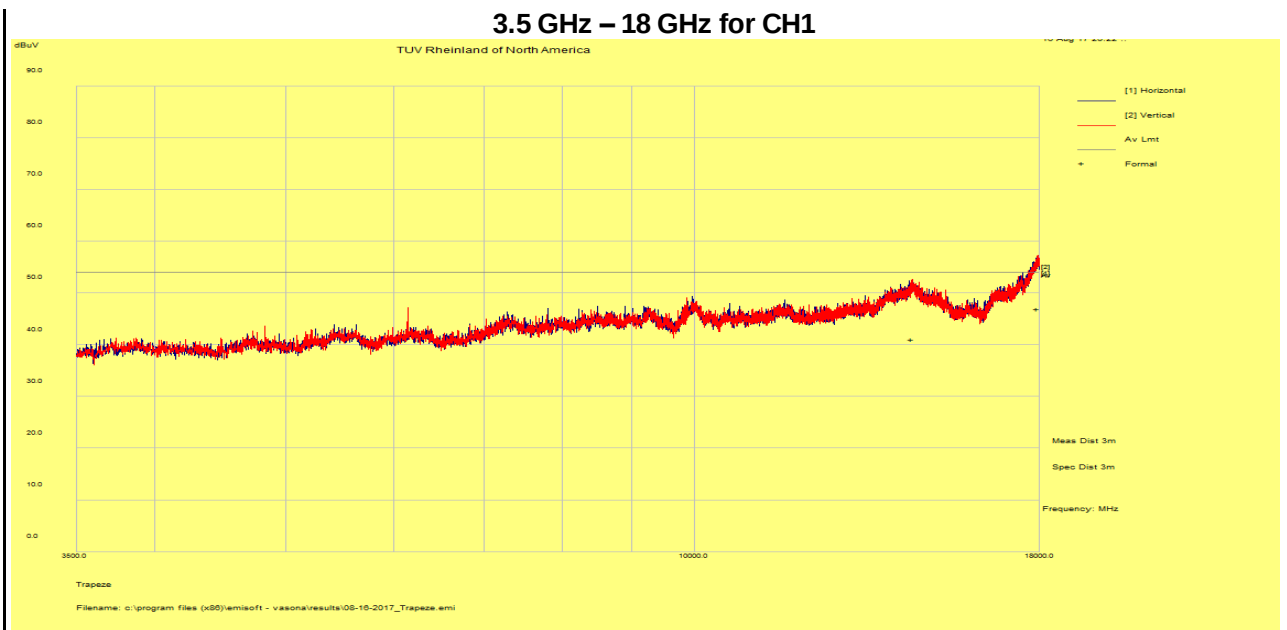
EUT Name	Ranger 4.4	Date	07/17/2017-08/22/2017
EUT Model	R44-N11	Temp / Hum in	23°C / 38%rh
EUT Serial	356961070012789	Voltage Input	12 VDC
EUT Config.	1 MB/s	RBW/ VBW	<150kHz: 300Hz/1kHz
Standard	CFR 47 Part 15.209		150kHz – 30 MHz: 10kHz/30kHz
Dist/Ant Used	3m		>30Mhz: 1Mhz/3MHz
		Test Engineer	Douglas Antioco

1 GHz – 3.5 GHz for CH1



— Preview Result 2-AVG
 — Preview Result 1-PK+
 ♦ Critical_Freqs AVG
 ♦ Critical_Freqs PK+
— FCC 15 QP-Pk
— FCC 15 Avg
♦ Final_Result PK+
♦ Final_Result AVG

Note: Peak above the limit is the uplink carrier frequency.

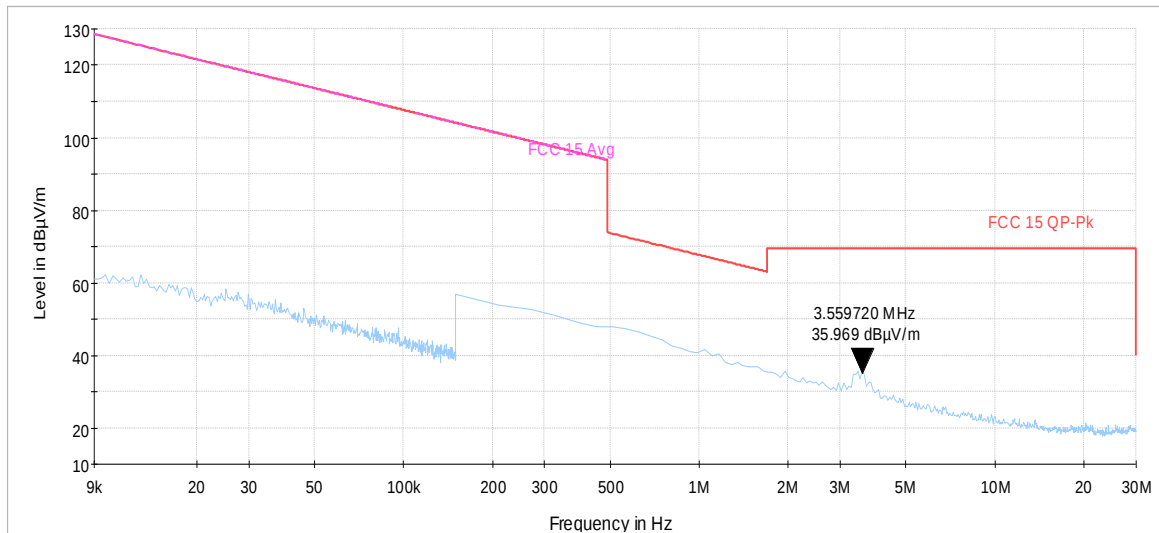


Frequency	Detector	Polarity	Raw	Corrected	Height	Azimuth	Limit	Margin	Result
MHz		H/V	dBuV/m	dBuV/m	cm	deg	dBuV/m	dB	
14490.66	Average Max	V	23.67	41.03	227	262	54.00	-12.97	Pass
17947.30	Average Max	V	24.89	46.94	221	104	54.00	-7.06	Pass

Emissions – 802.11b CH6

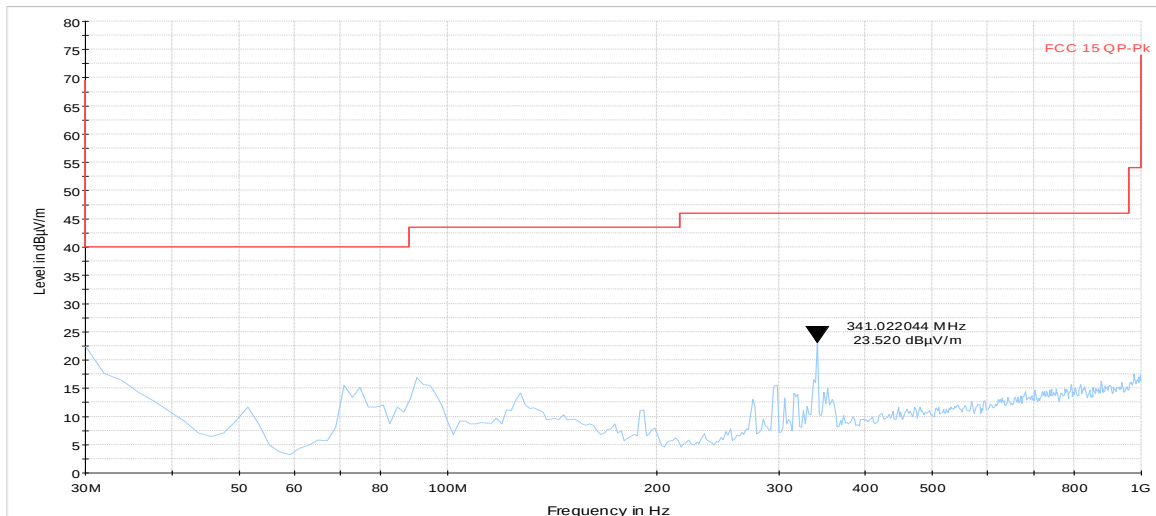
EUT Name	Ranger 4.4	Date	07/17/2017-08/22/2017
EUT Model	R44-N11	Temp / Hum in	23°C / 38%rh
EUT Serial	356961070012789	Voltage Input	12 VDC
EUT Config.	1 MB/s	RBW/ VBW	<150kHz: 300Hz/1kHz
Standard	CFR 47 Part 15.209		150kHz – 30 MHz: 10kHz/30kHz
Dist/Ant Used	3m		>30Mhz: 1Mhz/3MHz
Test Engineer		Douglas Antioco	

9 kHz – 30 MHz for CH6



Preview Result 2-AVG Preview Result 1-PK+ Critical_Freqs AVG Critical_Freqs PK+
FCC 15 QP-Pk FCC 15 Avg Final_Result QPK Final_Result AVG

30 MHz – 1 GHz for CH6

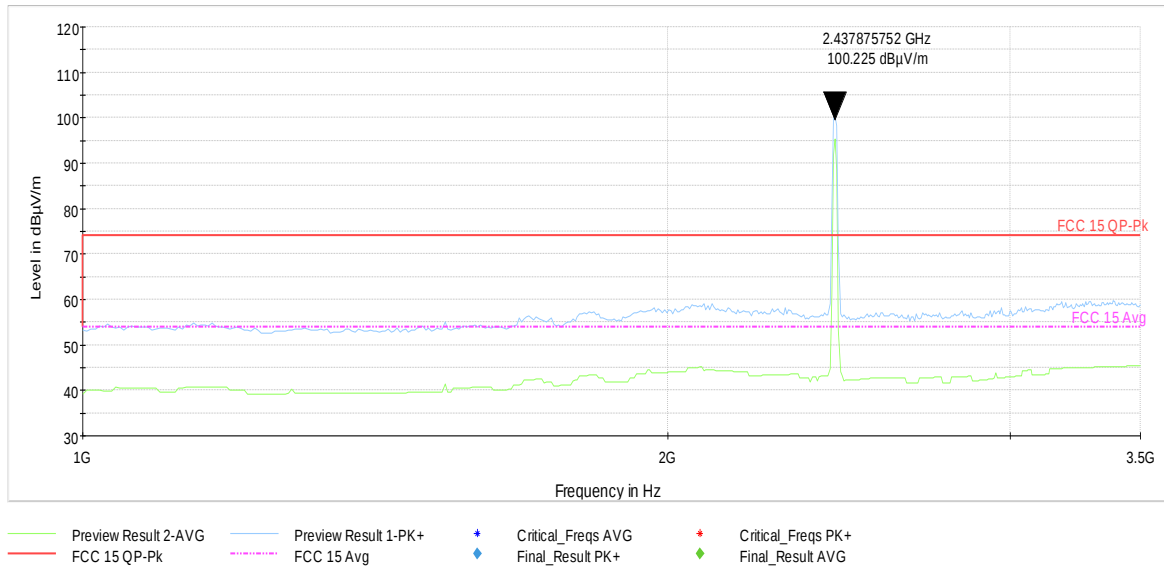


Preview Result 2-AVG Preview Result 1-PK+ Critical_Freqs AVG Critical_Freqs PK+
FCC 15 QP-Pk Final_Result QPK Final_Result AVG

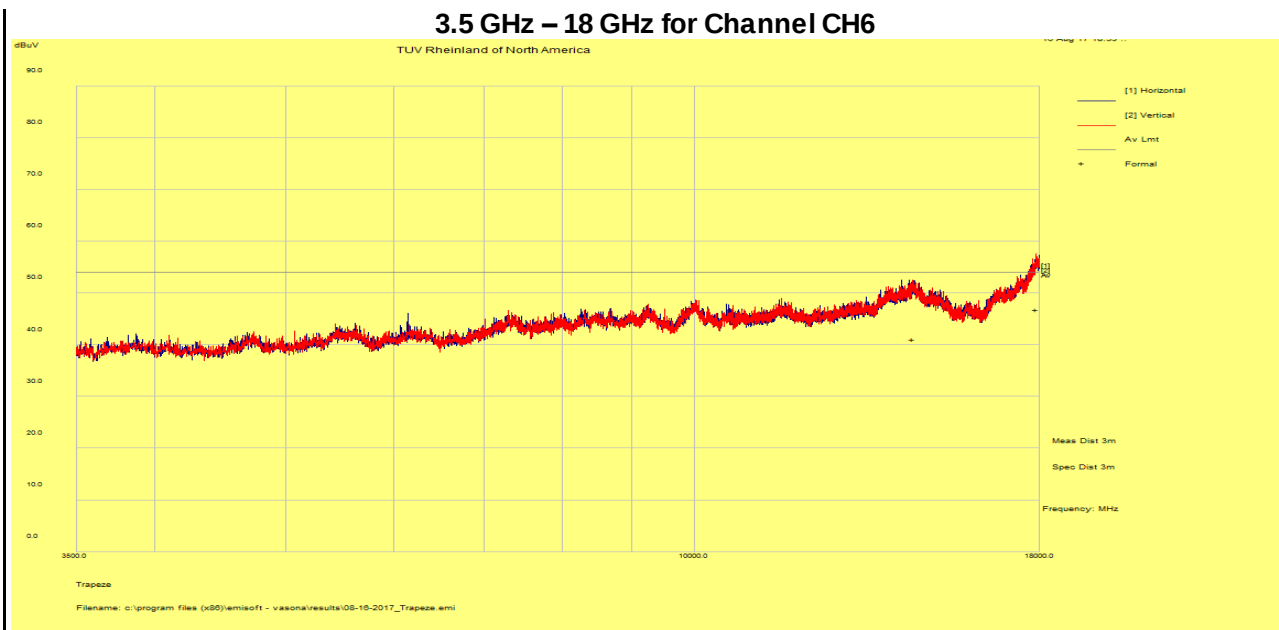
Radiated Emissions – 802.11b CH6

EUT Name	Ranger 4.4	Date	07/17/2017-08/22/2017
EUT Model	R44-N11	Temp / Hum in	23°C / 38%rh
EUT Serial	356961070012789	Voltage Input	12 VDC
EUT Config.	1 MB/s	RBW/ VBW	<150kHz: 300Hz/1kHz
Standard	CFR 47 Part 15.209		150kHz – 30 MHz: 10kHz/30kHz
Dist/Ant Used	3m		>30Mhz: 1Mhz/3MHz
		Test Engineer	Douglas Antioco

1 GHz – 3.5 GHz for CH6



Note: Peak above the limit is the uplink carrier frequency.



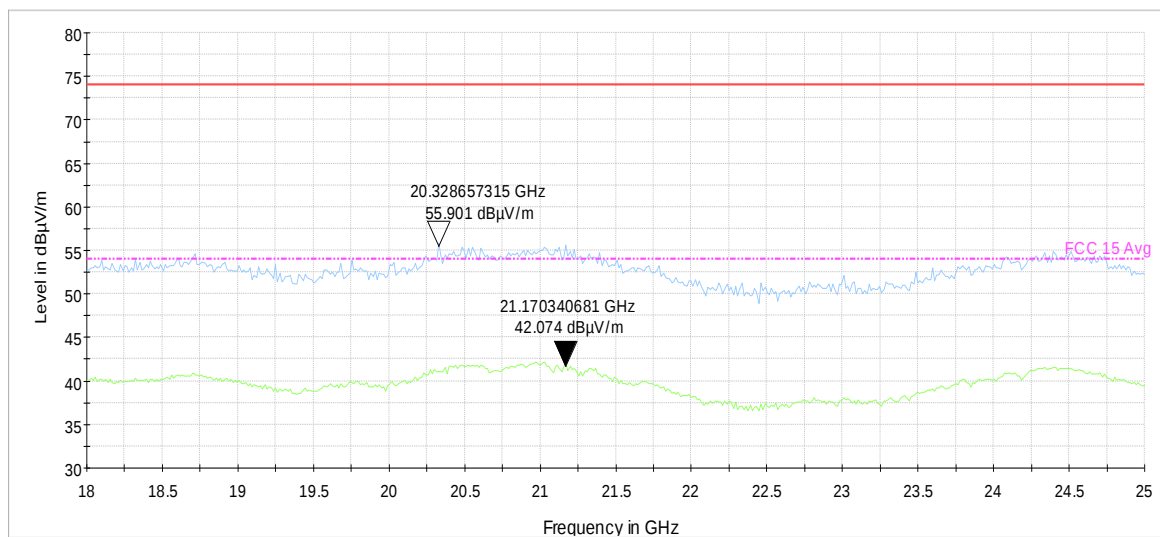
Note: EUT at 0 degree as worst case, not positioner utilized.

Frequency	Detector	Polarity	Raw	Corrected	Height	Azimuth	Limit	Margin	Result
MHz		H/V	dBuV/m	dBuV/m	cm	deg	dBuV/m	dB	
14509.92	Average Max	V	23.61	41.02	140	224	54.00	-7.63	Pass
17889.28	Average Max	V	24.91	46.80	157	248	54.00	-10.90	Pass

Radiated Emissions – 802.11b CH6

EUT Name	Ranger 4.4	Date	07/17/2017-08/22/2017
EUT Model	R44-N11	Temp / Hum in	23°C / 38%rh
EUT Serial	356961070012789	Voltage Input	12 VDC
EUT Config.	1 MB/s	RBW/ VBW	<150kHz: 300Hz/1kHz
Standard	CFR 47 Part 15.209		150kHz – 30 MHz: 10kHz/30kHz
Dist/Ant Used	3m		>30Mhz: 1Mhz/3MHz
		Test Engineer	Douglas Antioco

18 MHz – 25 GHz for CH6

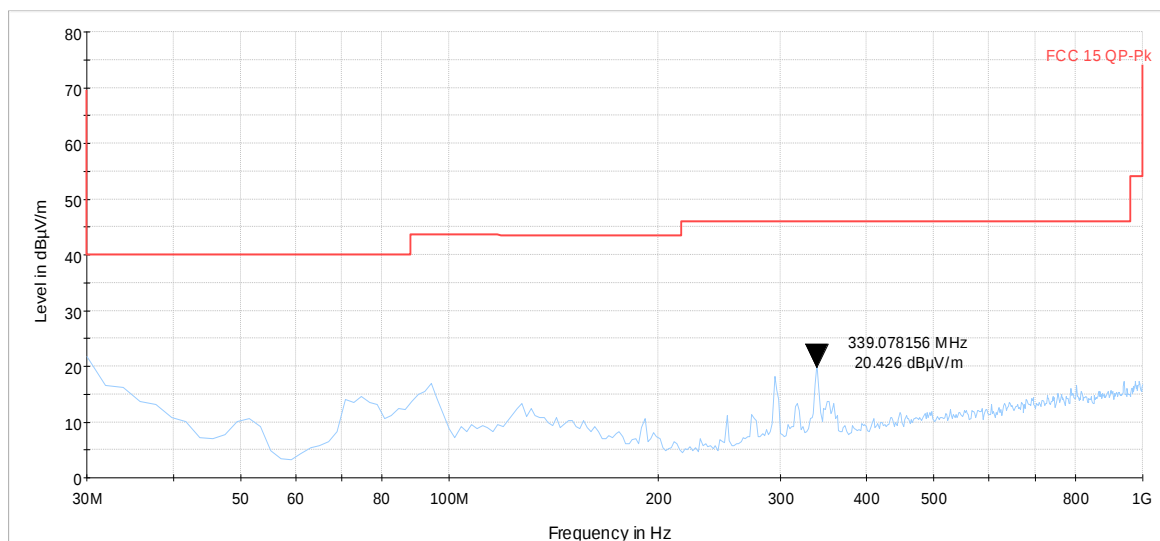


— Preview Result 2-AVG
 — Preview Result 1-PK+
 ♦ Critical_Freqs AVG
 * Critical_Freqs PK+
— FCC 15 QP-Pk
--- FCC 15 Avg
♦ Final_Result PK+
♦ Final_Result AVG

Radiated Emissions – 802.11b CH11

EUT Name	Ranger 4.4	Date	07/17/2017-08/22/2017
EUT Model	R44-N11	Temp / Hum in	23°C / 38%rh
EUT Serial	356961070012789	Voltage Input	12 VDC
EUT Config.	1 MB/s	RBW/ VBW	<150kHz: 300Hz/1kHz
Standard	CFR 47 Part 15.209		150kHz – 30 MHz: 10kHz/30kHz
Dist/Ant Used	3m		>30Mhz: 1Mhz/3MHz
		Test Engineer	Douglas Antioco

30 MHz – 1 GHz for CH11

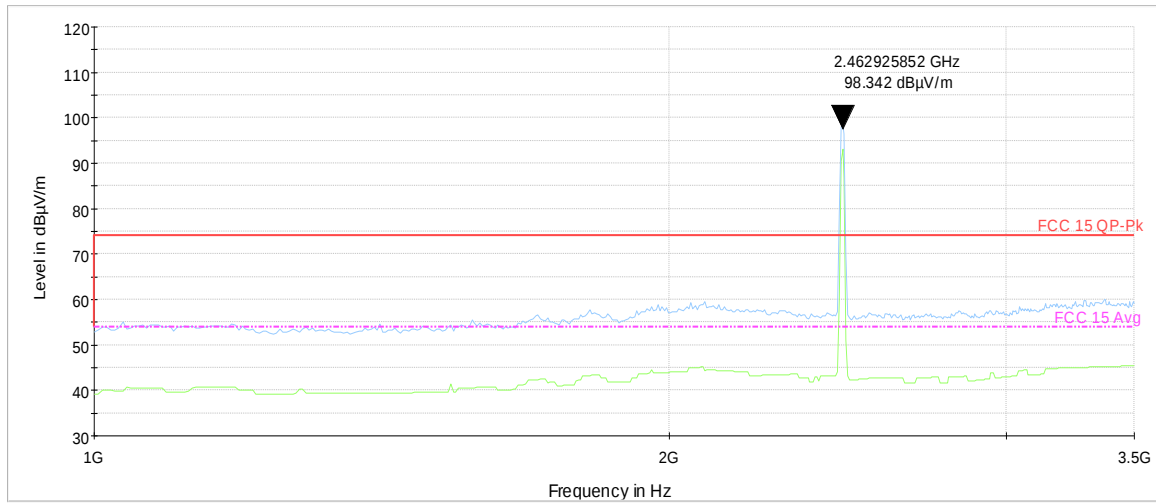


Preview Result 2-AVG Preview Result 1-PK+ Critical_Freqs AVG Critical_Freqs PK+
 FCC 15 QP-PK Final_Result QPK Final_Result AVG

Radiated Emissions – 802.11b CH11

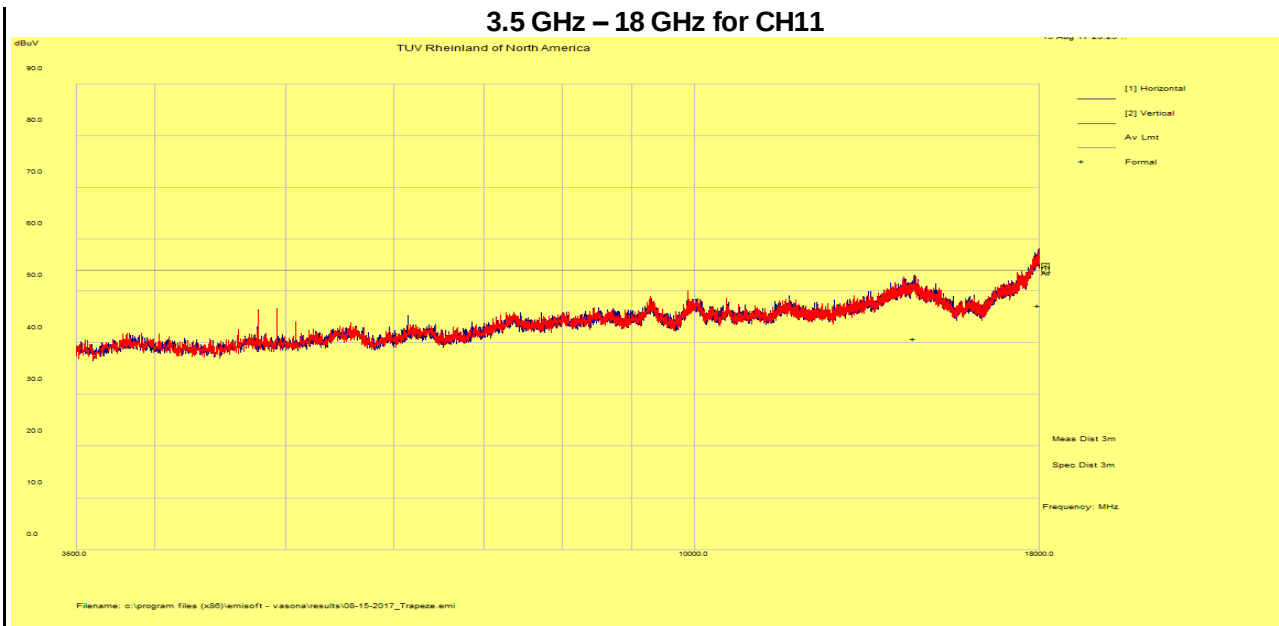
EUT Name	Ranger 4.4	Date	07/17/2017-08/22/2017
EUT Model	R44-N11	Temp / Hum in	23°C / 38%rh
EUT Serial	356961070012789	Voltage Input	12 VDC
EUT Config.	1 MB/s	RBW/ VBW	<150kHz: 300Hz/1kHz
Standard	CFR 47 Part 15.209		150kHz – 30 MHz: 10kHz/30kHz
Dist/Ant Used	3m		>30Mhz: 1Mhz/3MHz
		Test Engineer	Douglas Antioco

1 GHz – 3.5 GHz for CH11



— Preview Result 2-AVG
 — Preview Result 1-PK+
 ♦ Critical_Freqs AVG
 ♦ Critical_Freqs PK+
— FCC 15 QP-Pk
— FCC 15 Avg
♦ Final_Result PK+
♦ Final_Result AVG

Note: Peak above the limit is the uplink carrier frequency.



Note: EUT at 0 degree as worst case, not positioner utilized.

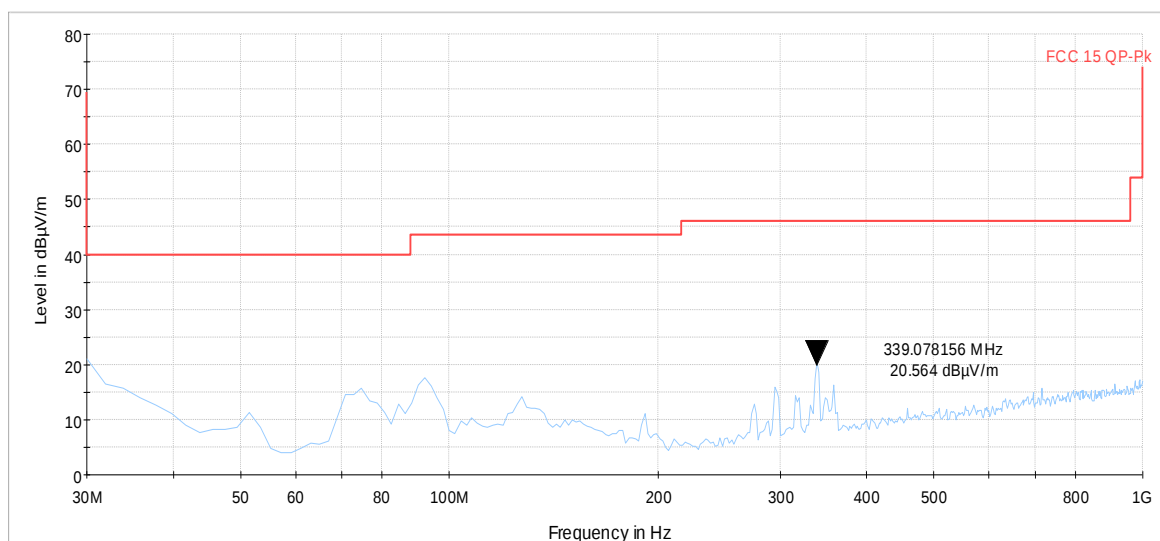
Frequency	Detector	Polarity	Raw	Corrected	Height	Azimuth	Limit	Margin	Result
MHz		H/V	dBuV/m	dBuV/m	cm	deg	dBuV/m	dB	
14545.57	Average Max	H	23.85	40.79	222	310	54.00	-13.21	Pass
17970.56	Average Max	V	25.03	47.19	165	32	54.00	-6.81	Pass

802.11 g

Radiated Emissions – 802.11g CH1

EUT Name	Ranger 4.4	Date	07/17/2017-08/22/2017
EUT Model	R44-N11	Temp / Hum in	23°C / 38%rh
EUT Serial	356961070012789	Voltage Input	12 VDC
EUT Config.	6 MB/s	RBW/ VBW	<150kHz: 300Hz/1kHz
Standard	CFR 47 Part 15.209		150kHz – 30 MHz: 10kHz/30kHz
Dist/Ant Used	3m		>30Mhz: 1Mhz/3MHz
		Test Engineer	Douglas Antioco

30 MHz – 1 GHz for CH1

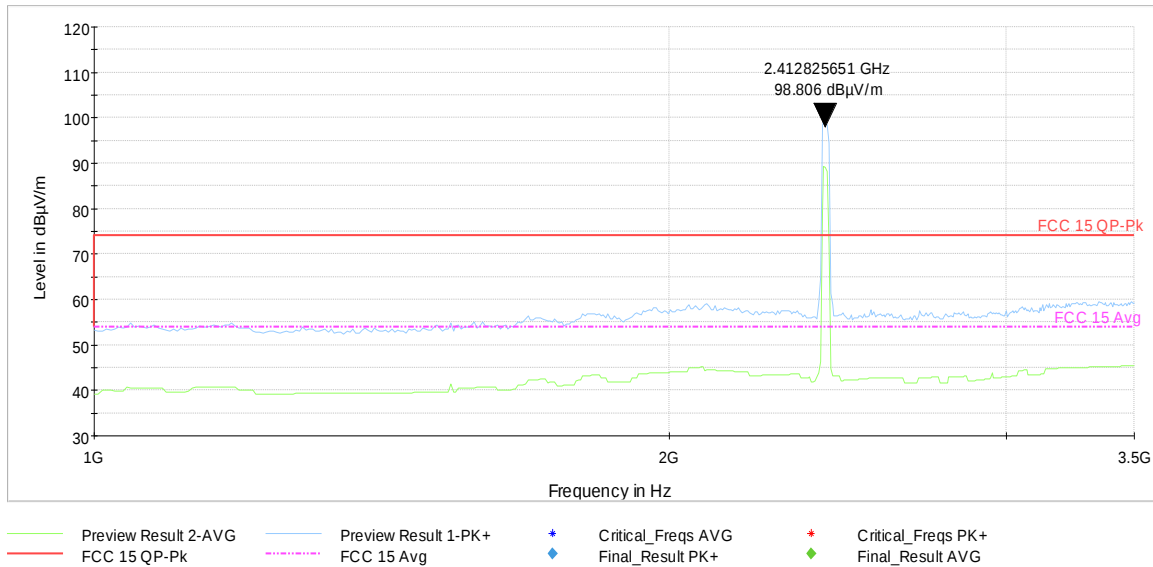


Preview Result 2-AVG
FCC 15 QP-Pk
Preview Result 1-PK+
Final_Result QPK
Critical_Freqs AVG
Final_Result AVG
Critical_Freqs PK+

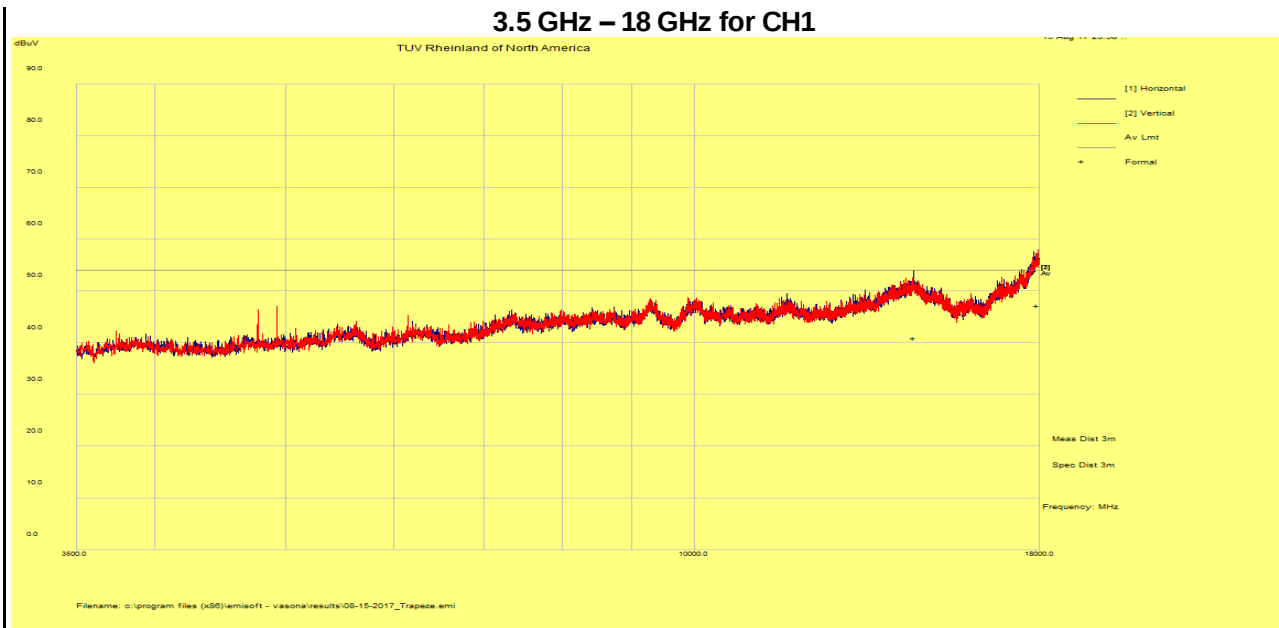
Radiated Emissions – 802.11g CH1

EUT Name	Ranger 4.4	Date	07/17/2017-08/22/2017
EUT Model	R44-N11	Temp / Hum in	23°C / 38%rh
EUT Serial	356961070012789	Voltage Input	12 VDC
EUT Config.	6 MB/s	RBW/ VBW	<150kHz: 300Hz/1kHz
Standard	CFR 47 Part 15.209		150kHz – 30 MHz: 10kHz/30kHz
Dist/Ant Used	3m		>30Mhz: 1Mhz/3MHz
		Test Engineer	Douglas Antioco

1 GHz – 3.5 GHz for CH1



Note: Peak above the limit is the uplink carrier frequency.



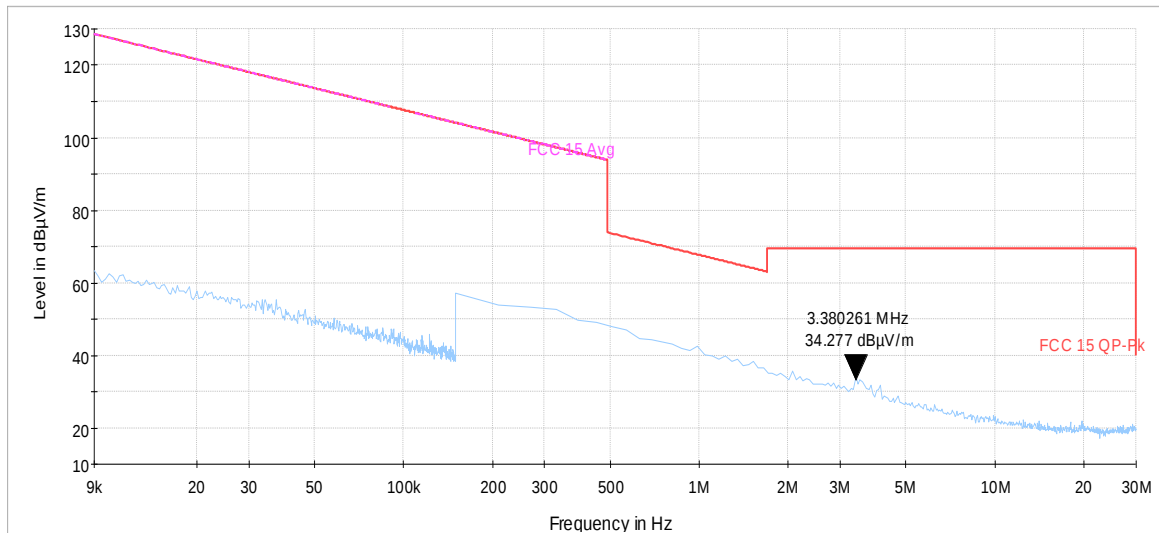
Note: EUT at 90 degree as worst case, not positioner utilized.

Frequency	Detector	Polarity	Raw	Corrected	Height	Azimuth	Limit	Margin	Result
MHz		H/V	dBuV/m	dBuV/m	cm	deg	dBuV/m	dB	
17930.33	Average Max	H	25.11	47.14	134	274	54.00	-6.86	Pass
14498.40	Average Max	V	23.75	41.25	176	124	54.00	-12.75	Pass

Radiated Emissions – 802.11g CH6

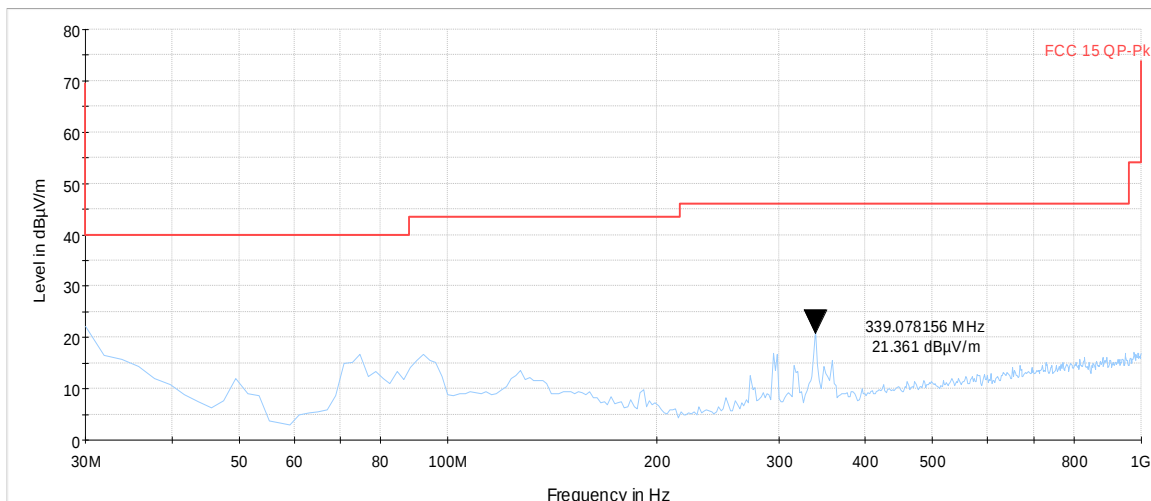
EUT Name	Ranger 4.4	Date	07/17/2017-08/22/2017
EUT Model	R44-N11	Temp / Hum in	23°C / 38%rh
EUT Serial	356961070012789	Voltage Input	12 VDC
EUT Config.	6 MB/s	RBW/ VBW	<150kHz: 300Hz/1kHz
Standard	CFR 47 Part 15.209		150kHz – 30 MHz: 10kHz/30kHz
Dist/Ant Used	3m		>30Mhz: 1Mhz/3MHz
		Test Engineer	Douglas Antioco

9 kHz – 30 MHz for CH6



Preview Result 2-AVG Preview Result 1-PK+ Critical_Freqs AVG Critical_Freqs PK+
FCC 15 QP-Pk FCC 15 Avg Final_Result QPK Final_Result AVG

30 MHz – 1 GHz for CH6

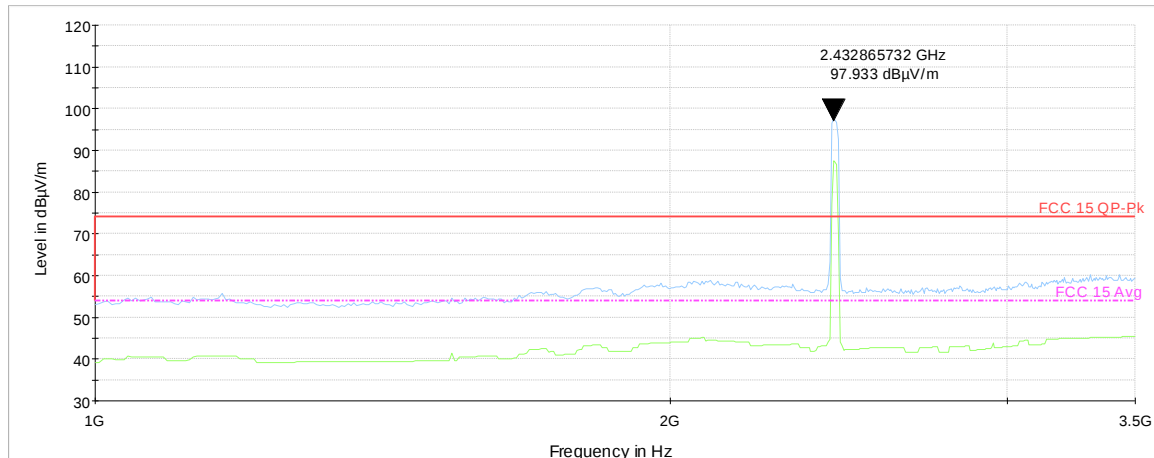


Preview Result 2-AVG Preview Result 1-PK+ Critical_Freqs AVG Critical_Freqs PK+
FCC 15 QP-Pk Final_Result QPK Final_Result AVG

Radiated Emissions – 802.11g CH6

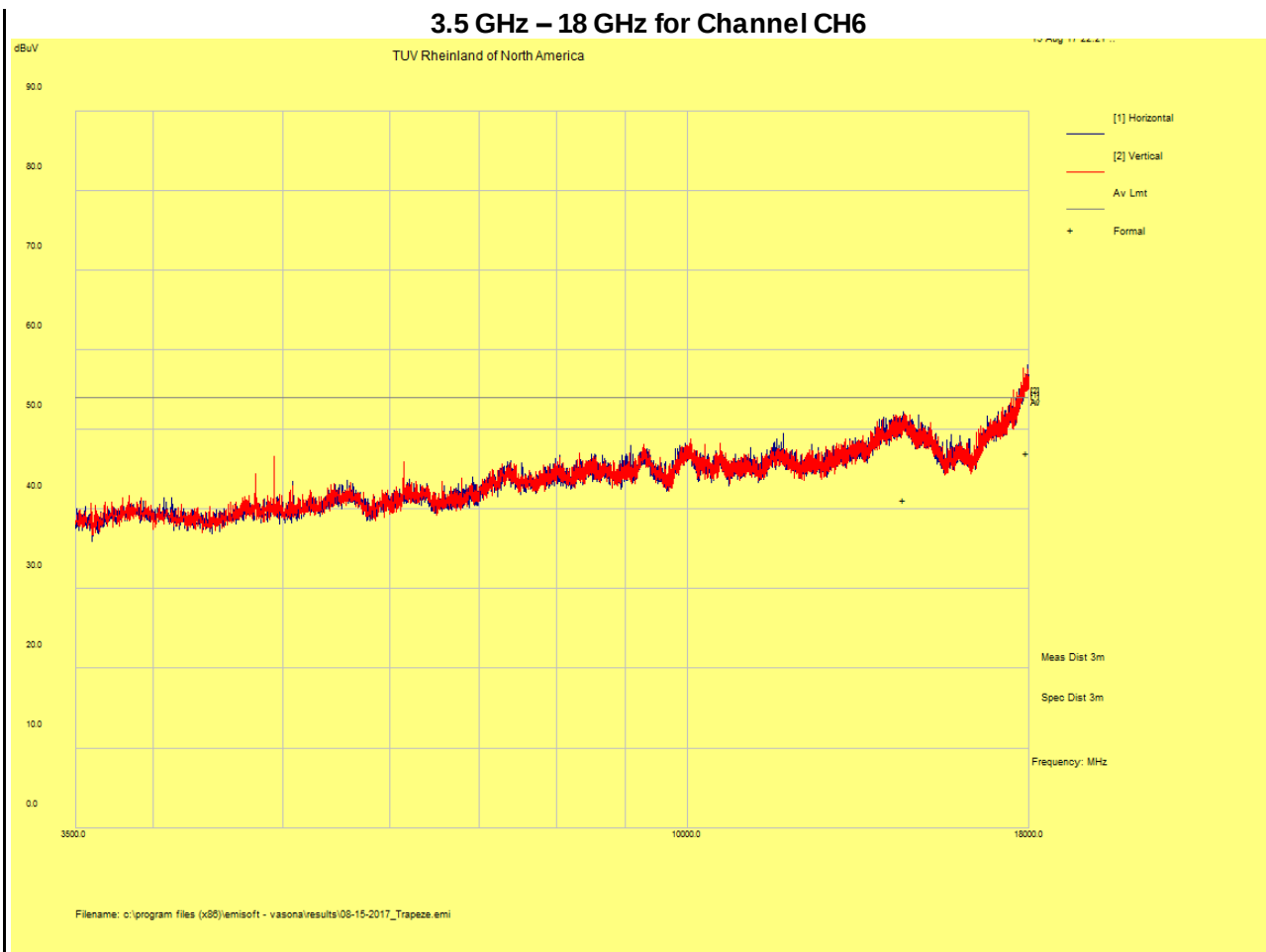
EUT Name	Ranger 4.4	Date	07/17/2017-08/22/2017
EUT Model	R44-N11	Temp / Hum in	23°C / 38%rh
EUT Serial	356961070012789	Voltage Input	12 VDC
EUT Config.	6 MB/s	RBW/ VBW	<150kHz: 300Hz/1kHz
Standard	CFR 47 Part 15.209		150kHz – 30 MHz: 10kHz/30kHz
Dist/Ant Used	3m		>30Mhz: 1Mhz/3MHz
		Test Engineer	Douglas Antioco

1 GHz – 3.5 GHz for CH6



— Preview Result 2-AVG
 — Preview Result 1-PK+
 ♦ Critical_Freqs AVG
 * Critical_Freqs PK+
— FCC 15 QP-Pk
— FCC 15 Avg
♦ Final_Result PK+
♦ Final_Result AVG

Note: Peak above the limit is the uplink carrier frequency.



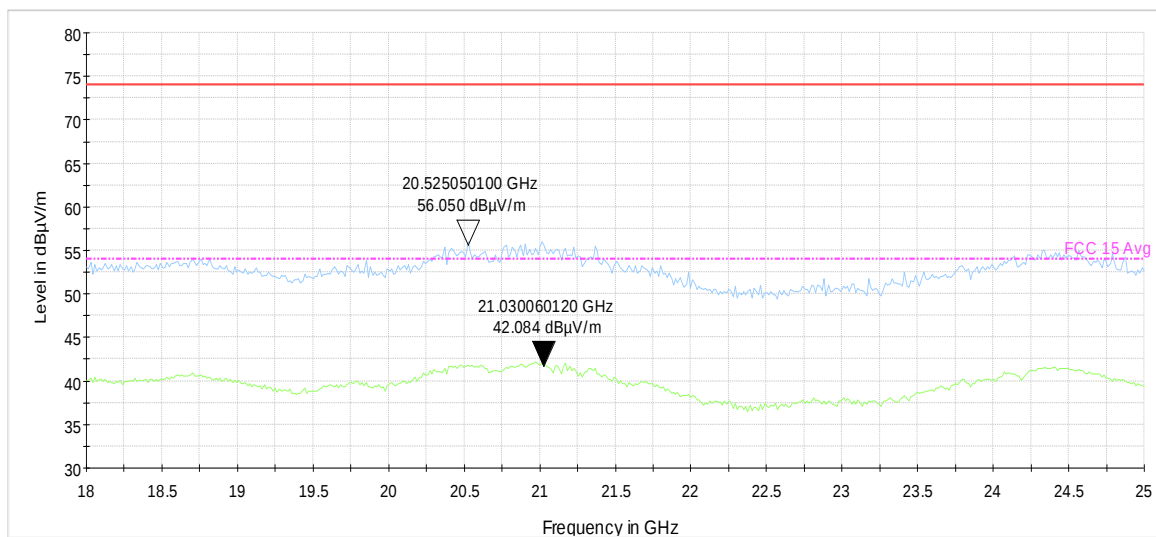
Note: EUT at 90 degree as worst case, not positioner utilized.

Frequency	Detector	Polarity	Raw	Corrected	Height	Azimuth	Limit	Margin	Result
MHz		H/V	dBuV/m	dBuV/m	cm	deg	dBuV/m	dB	
14499.31	Average Max	H	23.76	47.14	201	96	54.00	-12.74	Pass
17941.40	Average Max	H	25.10	41.25	160	248	54.00	-6.86	Pass

Radiated Emissions – 802.11g CH6

EUT Name	Ranger 4.4	Date	07/17/2017-08/22/2017
EUT Model	R44-N11	Temp / Hum in	23°C / 38%rh
EUT Serial	356961070012789	Voltage Input	12 VDC
EUT Config.	6 MB/s	RBW/ VBW	<150kHz: 300Hz/1kHz
Standard	CFR 47 Part 15.209		150kHz – 30 MHz: 10kHz/30kHz
Dist/Ant Used	3m		>30Mhz: 1Mhz/3MHz
		Test Engineer	Douglas Antioco

18 MHz – 25 GHz for CH6

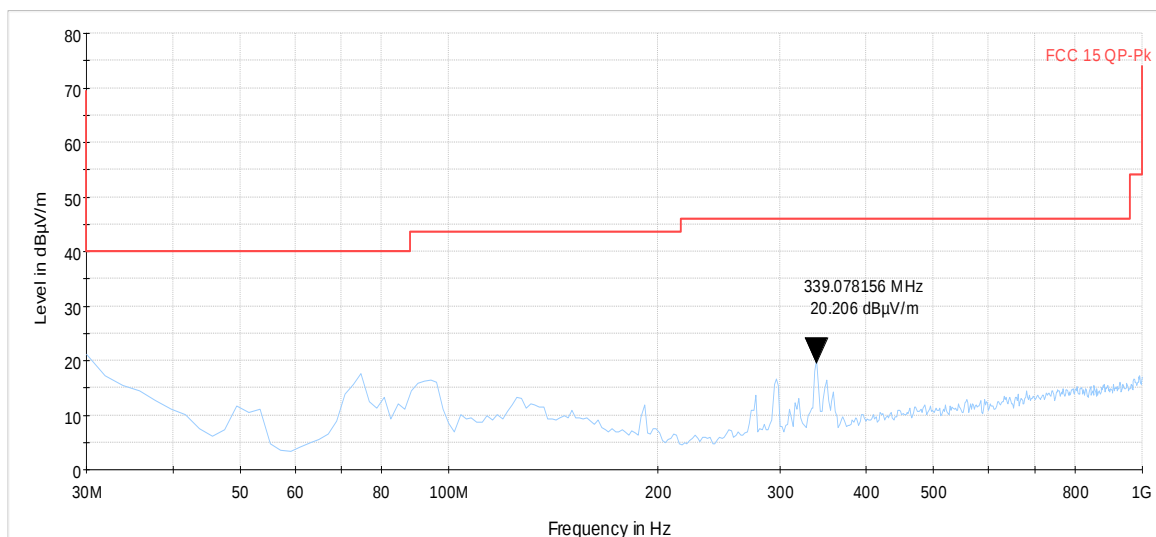


— Preview Result 2-AVG — Preview Result 1-PK+ * Critical_Freqs AVG * Critical_Freqs PK+
— FCC 15 QP-Pk --- FCC 15 Avg ◆ Final_Result PK+ ◆ Final_Result AVG

Radiated Emissions – 802.11g CH11

EUT Name	Ranger 4.4	Date	07/17/2017-08/22/2017
EUT Model	R44-N11	Temp / Hum in	23°C / 38%rh
EUT Serial	356961070012789	Voltage Input	12 VDC
EUT Config.	6 MB/s	RBW/ VBW	<150kHz: 300Hz/1kHz
Standard	CFR 47 Part 15.209		150kHz – 30 MHz: 10kHz/30kHz
Dist/Ant Used	3m		>30Mhz: 1Mhz/3MHz
		Test Engineer	Douglas Antioco

30 MHz – 1 GHz for CH11

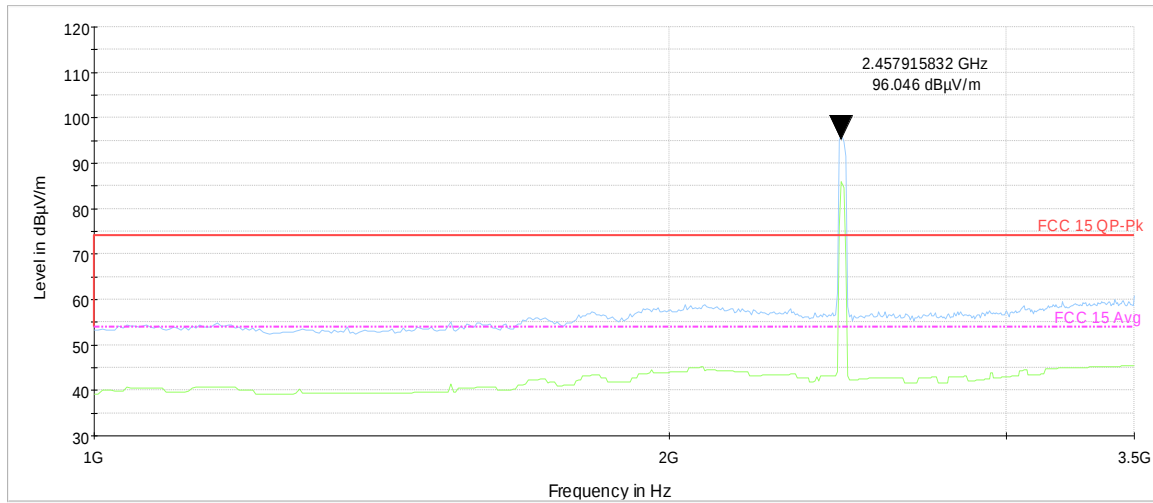


— Preview Result 2-AVG
 — Preview Result 1-PK+
 * Critical_Freqs AVG
 * Critical_Freqs PK+
— FCC 15 QP-Pk
 ◆ Final_Result QPK
 ◆ Final_Result AVG

Radiated Emissions – 802.11g CH11

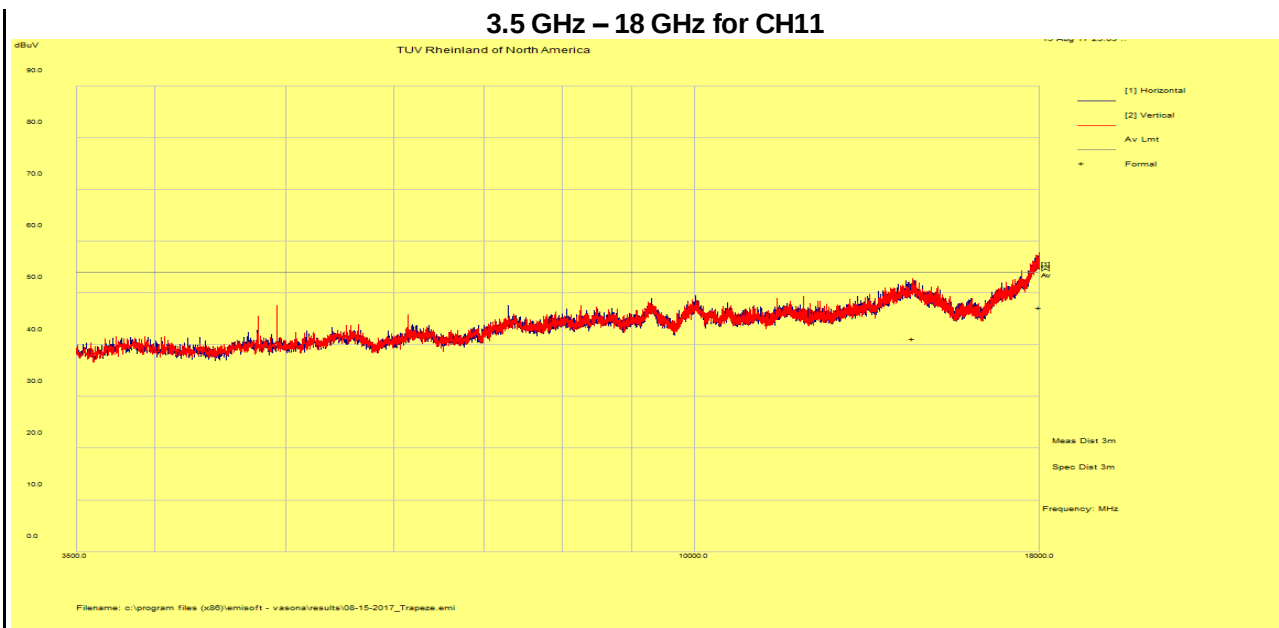
EUT Name	Ranger 4.4	Date	07/17/2017-08/22/2017
EUT Model	R44-N11	Temp / Hum in	23°C / 38%rh
EUT Serial	356961070012789	Voltage Input	12 VDC
EUT Config.	6 MB/s	RBW/ VBW	<150kHz: 300Hz/1kHz
Standard	CFR 47 Part 15.209		150kHz – 30 MHz: 10kHz/30kHz
Dist/Ant Used	3m		>30Mhz: 1Mhz/3MHz
		Test Engineer	Douglas Antioco

1 GHz – 3.5 GHz for CH11



— Preview Result 2-AVG
 — Preview Result 1-PK+
 * Critical_Freqs AVG
 * Critical_Freqs PK+
— FCC 15 QP-Pk
— FCC 15 Avg
♦ Final_Result PK+
♦ Final_Result AVG

Note: Peak above the limit is the uplink carrier frequency.



Note: EUT at 90 degree as worst case, not positioner utilized.

Frequency	Detector	Polarity	Raw	Corrected	Height	Azimuth	Limit	Margin	Result
MHz		H/V	dBuV/m	dBuV/m	cm	deg	dBuV/m	dB	
14499.31	Average Max	H	23.75	41.17	160	360	54.00	-12.83	Pass
17941.40	Average Max	H	24.91	47.24	116	96	54.00	-6.77	Pass

5 Test Equipment List

5.1 Equipment List

Equipment	Manufacturer	Model #	Serial/Inst #	Last Cal mm/dd/yyyy	Next Cal mm/dd/yyyy
Test Software	Rohde & Schwarz	EMC32 v.10.20.01	N/A	N/A	
Test Software (3.5-18GHz)	EMlsoft	Version 5.0	N/A	N/A	
Signalling antenna	Commscope	CELLMAX-D-CPUSE	L011504152918	N/A	
Maturo Control Unit	Maturo	SCU	246/20571216	N/A	
Maturo EUT Positioner	Maturo	TD1.5-10kg	087/20571216	N/A	
3.5 GHz High Pass Filter	Hewlett Packard	84300-80038	820004	N/A (See Note)	
1.6GHz Low Pass Filter	K & L Microwave, Inc	8L120-X1600-0/09135-0249	UA691-35	N/A (See Note)	
DC Block	Mini-Circuits	UNAT-1+	VUU83701027	N/A (See Note)	
Amplifier	Sonoma	310N	185516	01/02/2017	01/02/2018
Amplifier	Rohde & Schwarz	TS-PR18	100019/3545.7008.03	01/12/2017	01/12/2018
Active Loop Antenna	EMCO	6502	00062531	05/17/2017	05/17/2019
Bilog Antenna	Sunol Sciences	JB3	A061907	08/04/2016	08/04/2018
Horn Antenna (1-18GHz)	EMCO	3115	9710-5301	10/08/2015	10/08/2017
Horn Antenna (18-26GHz)	Com-Power	AHA-840	105005	05/26/2017	05/26/2019
EMI Receiver	Rohde & Schwarz	ESIB40	100180	01/12/2017	01/12/2018
Spectrum Analyzer	Rohde & Schwarz	FSL 6	100169	01/13/2017	01/13/2018
Thermometer	VWR	61161-378	160702310	08/15/2015	08/15/2018

Note: Equipment is characterized before use.

6 EMC Test Plan

6.1 Introduction

This section provides a description of the Equipment Under Test (EUT), configurations, operating conditions, and performance acceptance criteria. It is an overview of information provided by the manufacturer so that the test laboratory may perform the requested testing.

6.2 Customer

Table 2: Customer Information

Company Name	Trapeze Software Group, Inc.
Address	5265 Rockwell Drive NE, Cedar Rapids
City, State, Zip	Iowa 52402, U.S.A.
Country	USA

6.3 Equipment Under Test (EUT)

Table 3: EUT Specifications

EUT Specification	
Voltage Input	12 VDC
Number of Antenna Feeds:	Transmit: 1 Receive: 1
Hardware Version	4.4
RF Software Version	1.04P
Radio Evaluated	802.11 b/g/n
Transmit Frequency Band	2400-2484.5MHz
Max. Power Output for Technology	14.62 dBm, 29mW (Declared by Manufacturer)
Antenna Gain	3 dBi
Antenna Type	Flex circuit PCB antenna
Modulation Type	DSSS, OFDM
Type of Equipment	☒ Table Top ☐ Wall-mount ☐ Floor standing cabinet ☐ Other:

Table 4: Antenna Information

Number	Antenna Type	Description	Max Gain (dBi)
1	Internal	Flex circuit PCB antenna	3

Table 5: Support Equipment

Equipment	Manufacturer	Model	Serial	Used for
AC to DC Converter	V-Infinity	ETSA1205 00UD	-	To provide power to EUT
Note: None.				

Table 6: Description of Sample used for Testing

Device	Serial/IMEI	Configuration	Used For
R44-N11	356961070012789	Radiated Sample	Radiated Emissions

Table 7 Accessory Equipment

Equipment	Manufacturer	Model	Serial Number
N/A	N/A	N/A	N/A

6.4 Testing Notes:

The EUT's 802.11 b and g radios were stimulated for continuous transmission on all applicable channels via software installed on the EUT by the manufacturer for testing purposes only. This software is not available to the end user. 802.11n mode was not evaluated since the modulation is the same as 802.11g mode with equal or lower power settings.

END OF REPORT