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Report On

Radio Testing of the
AnyDATA Corporation
ACT233F 4G Vehicle Tracker with Hotspot

FCC Part 15 Subpart C §15.231
ISED RSS-210 Issue 9 August 2016

Report No. SD72130442-0817A

January 2018



REPORT ON	Radio Testing of the AnyDATA Corporation 4G Vehicle Tracker with Hotspot
TEST REPORT NUMBER	SD72130442-0817A
REPORT DATE	January 2018
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APPROVED BY	 Ferdie S. Custodio Name Authorized Signatory Title: EMC/Senior Wireless Test Engineer
DATED	February 13, 2018



Revision History

SD72130442-0817A AnyDATA Corporation ACT233F 4G Vehicle Tracker with Hotspot					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
02/13/18	Initial Release				Ferdie S. Custodio

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SECTION 1

REPORT SUMMARY

Radio Testing of the
AnyDATA Corporation
ACT233F
4G Vehicle Tracker with Hotspot

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the AnyDATA Corporation 4G Vehicle Tracker with Hotspot to the requirements of FCC Part 15 Subpart C §15.231 and ISED RSS-210 Issue 9 August 2016.

Objective	To perform Radio Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	AnyDATA Corporation
Model Number(s)	ACT233F
FCC ID Number	P4M-ACT233F
IC Number	4594B-ACT233F
Serial Number(s)	20160908000172
Number of Samples Tested	1
Test Specification/Issue/Date	• FCC Part 15 Subpart C §15.231 (October 1, 2016). • RSS-210 - Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment (Issue 9, August 2016). • RSS-Gen - General Requirements and Information for the Certification of Radio Apparatus (Issue 4, November 2014).
Start of Test	August 28, 2017
Finish of Test	September 11, 2017
Name of Engineer(s)	Nikolay Shtin
Related Document(s)	None. Supporting documents for EUT certification are separate exhibits.



1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC Part 15 Subpart C §15.231 with cross-reference to the corresponding ISSED RSS standard is shown below.

Section	FCC Part 15	§15.231 Spec Clause	RSS	Test Description	Result	Comments/ Base Standard
2.1	§15.207 (a)		RSS-Gen 8.8	Conducted Emissions	N/A ¹	
2.2		§15.231(a)(2)	RSS-210 A1.1 (b)	Transmission Verification For Transmitter Activated Automatically	Compliant	
2.3		§15.231(a)(3)	RSS-210 A1.1 (c)	Polling Or Supervision Transmissions, Including Data, To Determine System Integrity Of Transmitters Used In Security Or Safety Applications	N/A ²	
2.4		§15.231(b)	RSS-210 A1.2	Field Strength Of Emissions	Compliant	
2.5		§15.231(c)	RSS-210 A1.3	Bandwidth Requirement	Compliant	
-		§15.231(d)	-	Frequency tolerance	N/A ³	
-		§15.231(e)	RSS-210 A1.4	Field Strength Of Emissions	N/A ⁴	
2.6			RSS-Gen 7.1	Receiver Spurious Emissions	Compliant	

N/A¹ Not applicable. EUT is battery powered device designed for vehicular use only.

N/A² Not applicable. EUT is not intended for applications using polling or supervision transmissions.

N/A³ Not applicable. EUT does not transmit in the 40.60 – 40.70 MHz band.

N/A⁴ Not applicable. Requirements of 15.231(b) were used.

1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) was an AnyDATA Corporation ACT233F 4G Vehicle Tracker with Hotspot as shown in the photograph below. The EUT connects to a vehicle's OBD-II port; it enables remote functions and vehicle tracking through a Smartphone app.



Equipment Under Test



1.3.2 EUT General Description

EUT Description	4G Vehicle Tracker with Hotspot
Model Number(s)	ACT233F
Rated Voltage	13.5 VDC Nominal voltage.
Mode Verified	Periodic operation transmitter above 70MHz (Part 15.231 Transmitter)
Capability	800/1900 CDMA2000 1xRTT and 1xEV-DO Release 0 Revision A, Band 4 and 13 LTE, 802.11 b/g/n WLAN, BT and Part 15.231 Transmitter
Primary Unit (EUT)	☒ Production ☐ Pre-Production ☐ Engineering
Antenna Type	Integral chip antenna
Antenna Gain	315MHz = -6dBi 434MHz = -8dBi 903MHz = -7dBi

1.3.3 Maximum Radiated Output Power

Transmitter Frequency (MHz)	Field Strength (dBμV/m @ 3 meters)	Part 15.231(b) limits in dBμV/m
314.95	71.1	75.6
315.00	70.2	75.6
433.589	73.0	80.8
433.920	71.8	80.8
434.251	71.0	80.8
902.375	76.5	81.9

1.4 EUT TEST CONFIGURATION

1.4.1 Test Configuration Description

Test Configuration	Description
Default	Radiated test setup. EUT transmitting continually through integral antenna with max power.

1.4.2 EUT Exercise Software

Before each test, the EUT is configured using XmtrCmd –Diag application provided by the client. The software allows running of preconfigured test profiles which includes the channel and modulation. Power setting is preconfigured within the test profiles.

1.4.3 Support Equipment and I/O cables

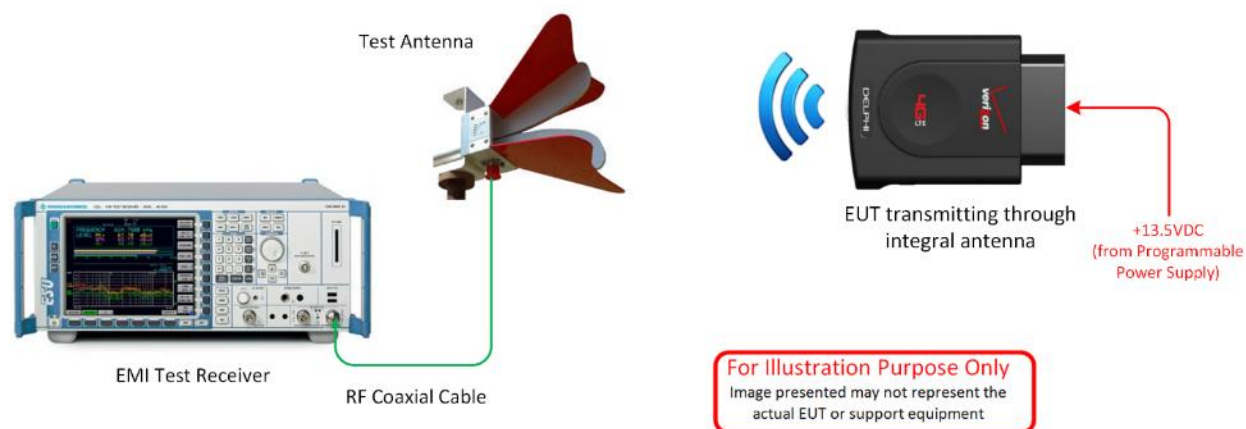
Manufacturer	Equipment/Cable	Description
Sony	Support Laptop	Model PCG-3131L SN27545537 3001106
Rongchun	USB cable	0.9m, high speed USB, Type A to Micro-B connector, style 2725, USB Revision 2.0
	Wiring harness with OBD-II connector (from EUT to Power supply)	Power cable with OBD-II connector

1.4.4 Worst Case Configuration

For radiated measurements X, Y and Z orientations were verified. Official measurements were performed using Y orientation (worst case).



1.4.5 Simplified Test Configuration Diagrams



1.5 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standards or test plan were made during testing.

1.6 MODIFICATION RECORD

Description of Modification	Modification Fitted By	Date Modification Fitted
Serial Number: N/A		
N/A	-	-

The table above details modifications made to the EUT during the test programme. The modifications incorporated during each test (if relevant) are recorded on the appropriate test pages.

1.7 TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

For conducted and radiated emissions the equipment under test (EUT) was configured to measure its highest possible emission level. This level was based on the maximized cable configuration from exploratory testing per ANSI C63.10-2013. The test modes were adapted according to the Operating Instructions provided by the manufacturer/client.

1.8 TEST FACILITY LOCATION

1.8.1 TÜV SÜD America Inc. (Mira Mesa)

10040 Mesa Rim Road, San Diego, CA 92121-2912 (32.901268,-117.177681). Phone: 858 678 1400 FAX: 858-546 0364



1.8.2 TÜV SÜD America Inc. (Rancho Bernardo)

16936 Via Del Campo, San Diego, CA 92127-1708 (33.018644,-117.092409). Phone: 858 942 5542 Fax: 858 546 0364.

1.9 TEST FACILITY REGISTRATION

1.9.1 FCC – Designation No.: US1146

TUV SUD America Inc. (San Diego), is an accredited test facility with the site description report on file and has met all the requirements specified in §2.948 of the FCC rules. The acceptance letter from the FCC is maintained in our files and the Designation is US1146.

1.9.2 Innovation, Science and Economic Development Canada (IC) Registration No.: 3067A-1 & 22806-1

The 10m Semi-anechoic chamber of TUV SUD America Inc. (San Diego Rancho Bernardo) has been registered by Certification and Engineering Bureau of Innovation, Science and Economic Development Canada for radio equipment testing with Registration No. 3067A-1.

The 3m Semi-anechoic chamber of TUV SUD America Inc. (San Diego Mira Mesa) has been registered by Certification and Engineering Bureau of Innovation, Science and Economic Development Canada for radio equipment testing with Registration No. 22806-1.

1.9.3 BSMI – Laboratory Code: SL2-IN-E-028R (US0102)

TUV Product Service Inc. (San Diego) is a recognized EMC testing laboratory by the BSMI under the MRA (Mutual Recognition Arrangement) with the United States. Accreditation includes CNS 13438 up to 6GHz.

1.9.4 NCC (National Communications Commission - US0102)

TUV SUD America Inc. (San Diego) is listed as a Foreign Recognized Telecommunication Equipment Testing Laboratory and is accredited to ISO/IEC 17025 (A2LA Certificate No.2955.13) which under APEC TEL MRA Phase 1 was designated as a Conformity Assessment Body competent to perform testing of equipment subject to the Technical Regulations covered under its scope of accreditation including RTTE01, PLMN01 and PLMN08 for TTE type of testing and LP002 for Low-Power RF Device type of testing.

1.9.5 VCCI – Registration No. A-0280 and A-0281

TUV SUD America Inc. (San Diego) is a VCCI registered measurement facility which includes radiated field strength measurement, radiated field strength measurement above 1GHz, mains port interference measurement and telecommunication port interference measurement.

1.9.6 RRA – Identification No. US0102

TUV SUD America Inc. (San Diego) is National Radio Research Agency (RRA) recognized laboratory under Phase I of the APEC Tel MRA.

1.9.7 OFCA – U.S. Identification No. US0102

TUV SUD America Inc. (San Diego) is recognized by Office of the Communications Authority (OFCA) under Appendix B, Phase I of the APEC Tel MRA.



SECTION 2

TEST DETAILS

Class II Permissive Change Verification of the
AnyDATA Corporation
ACT233F
4G Vehicle Tracker with Hotspot

2.1 CONDUCTED EMISSIONS

2.1.1 Specification Reference

Part 15 Subpart C §15.207(a)

2.1.2 Standard Applicable

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, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN).

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
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.*

2.1.3 Equipment Under Test and Modification State

Not applicable. EUT is for vehicle use only.



2.2 TRANSMISSION VERIFICATION FOR TRANSMITTER ACTIVATED AUTOMATICALLY

2.2.1 Specification Reference

Part 15 Subpart C §15.231(a)(2), RSS-210 Issue 9 A1.1 (b)

2.2.2 Standard Applicable

(2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.

2.2.3 Equipment Under Test and Modification State

Serial No: 20160908000172/ Default Test Configuration

2.2.4 Date of Test/Initial of test personnel who performed the test

September 11, 2017/NS

2.2.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

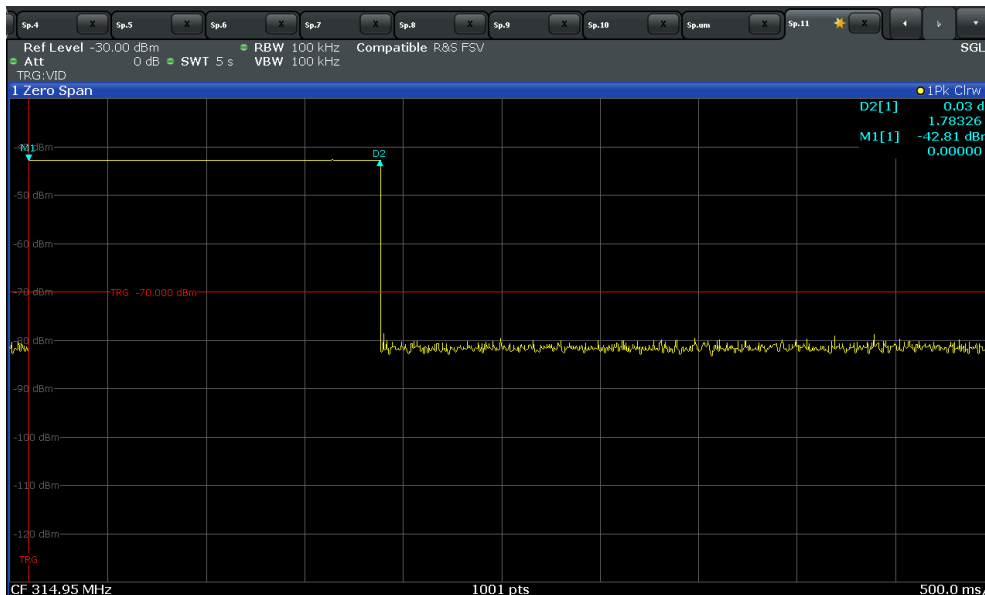
2.2.6 Environmental Conditions

Ambient Temperature	26.1°C
Relative Humidity	48.5%
ATM Pressure	100.1 kPa

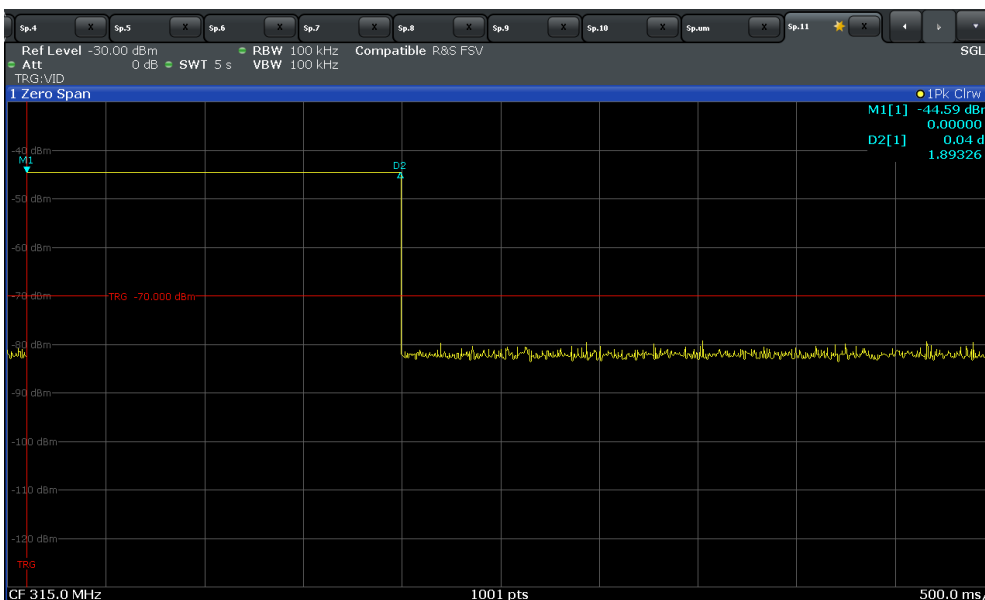
2.2.7 Additional Observations

- All channels/modulation configurations are presented.
- Span is set to zero Hz.
- Sweep time set to 5 seconds.
- EUT was observed for five (5) seconds.
- EUT verified to cease transmission within 5 seconds from automatic activation (simulated – activated through software).

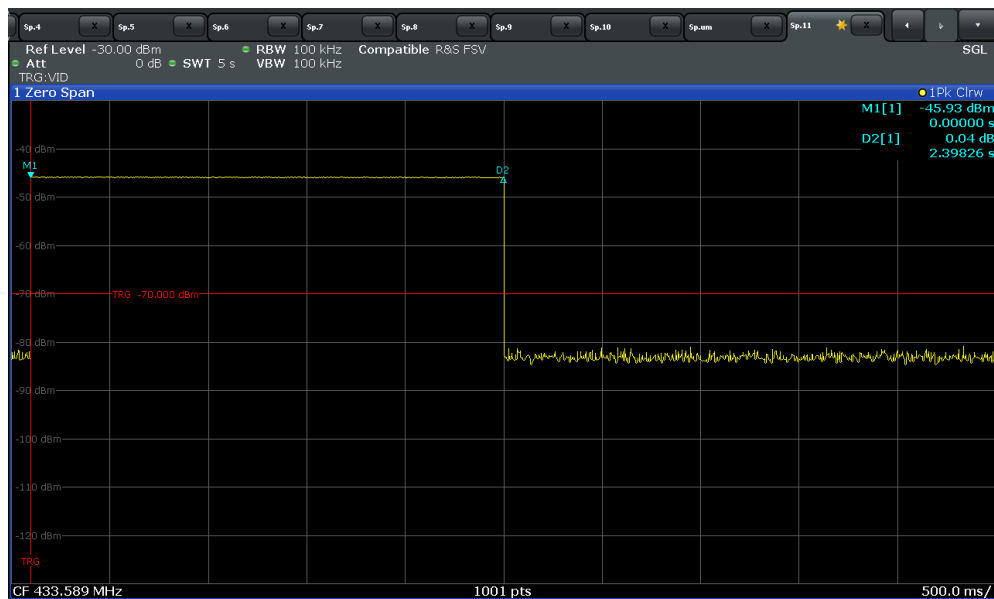
2.2.8 Test Result Plot



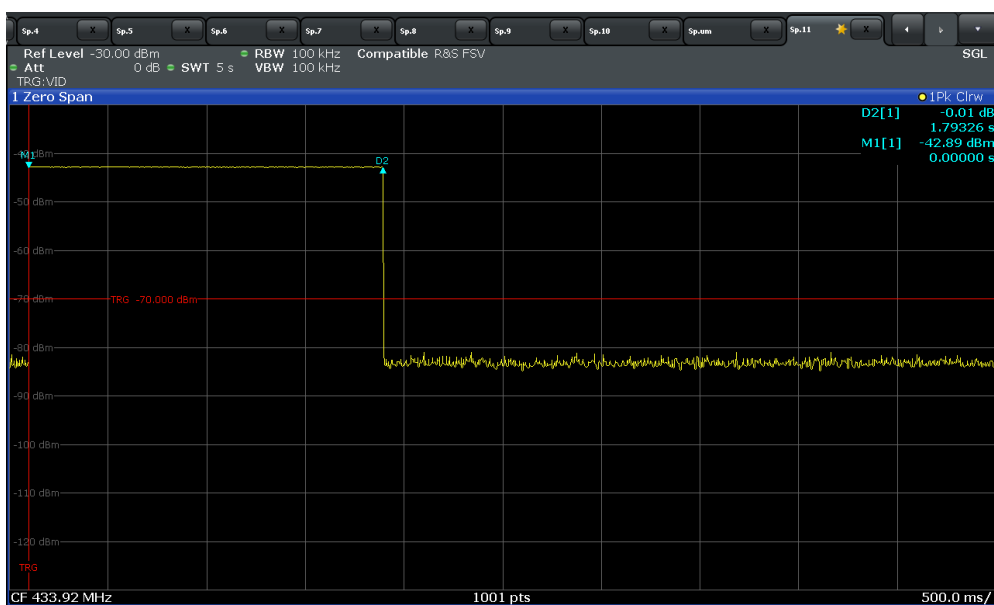
314.95 MHz ASK



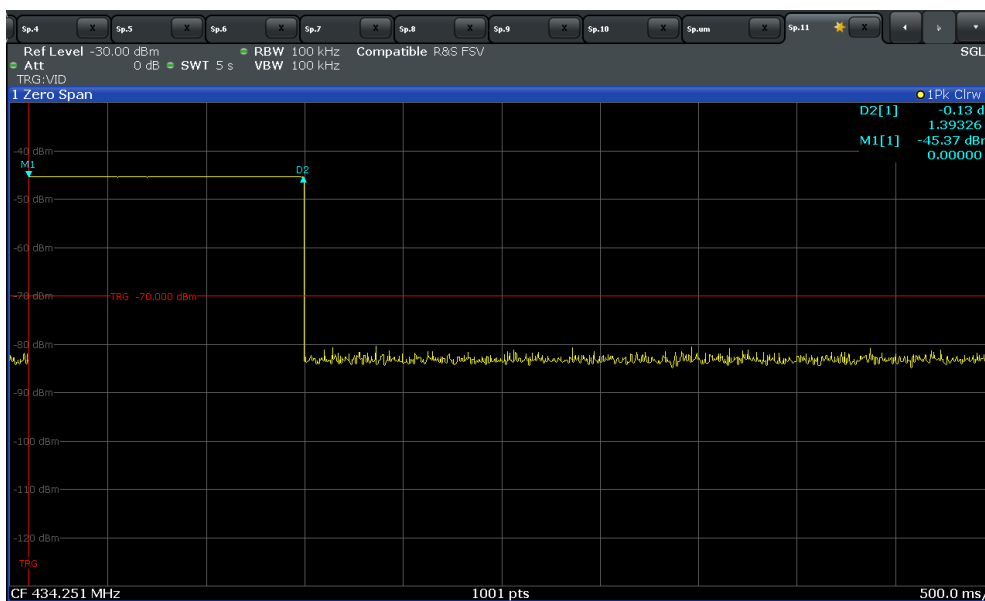
315.00 MHz ASK



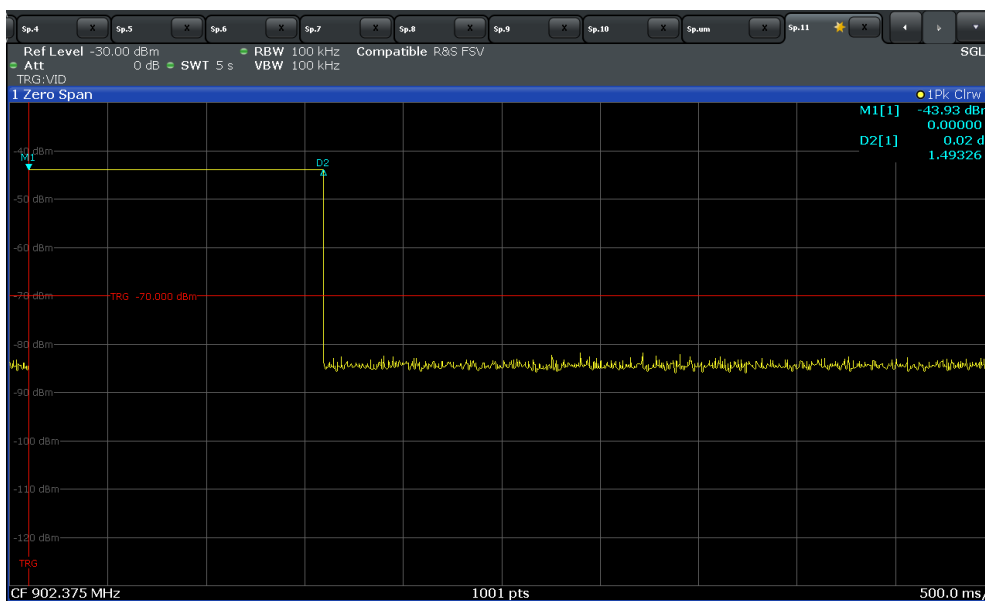
433.589 MHz FSK



433.920 MHz FSK



434.251 MHz FSK



902.375 MHz FSK



2.3 POLLING OR SUPERVISION TRANSMISSIONS, INCLUDING DATA, TO DETERMINE SYSTEM INTEGRITY OF TRANSMITTERS USED IN SECURITY OR SAFETY APPLICATIONS

2.3.1 Specification Reference

Part 15 Subpart C §15.231(a)(3), RSS-210 Issue A1.1 (c)

2.3.2 Standard Applicable

(3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.

2.3.3 Equipment Under Test and Modification State

Test not performed. EUT is not intended for applications using polling or supervision transmissions.



2.4 BANDWIDTH REQUIREMENT

2.4.1 Specification Reference

Part 15 Subpart C §15.231(c), RSS-210 Issue A1.3

2.4.2 Standard Applicable

(c) The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

2.4.3 Equipment Under Test and Modification State

Serial No: 20160908000172/ Default Test Configuration

2.4.4 Date of Test/Initial of test personnel who performed the test

September 09, 2017/ NS

2.4.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.4.6 Environmental Conditions

Ambient Temperature	26.1°C
Relative Humidity	48.5%
ATM Pressure	100.1 kPa

2.4.7 Additional Observations

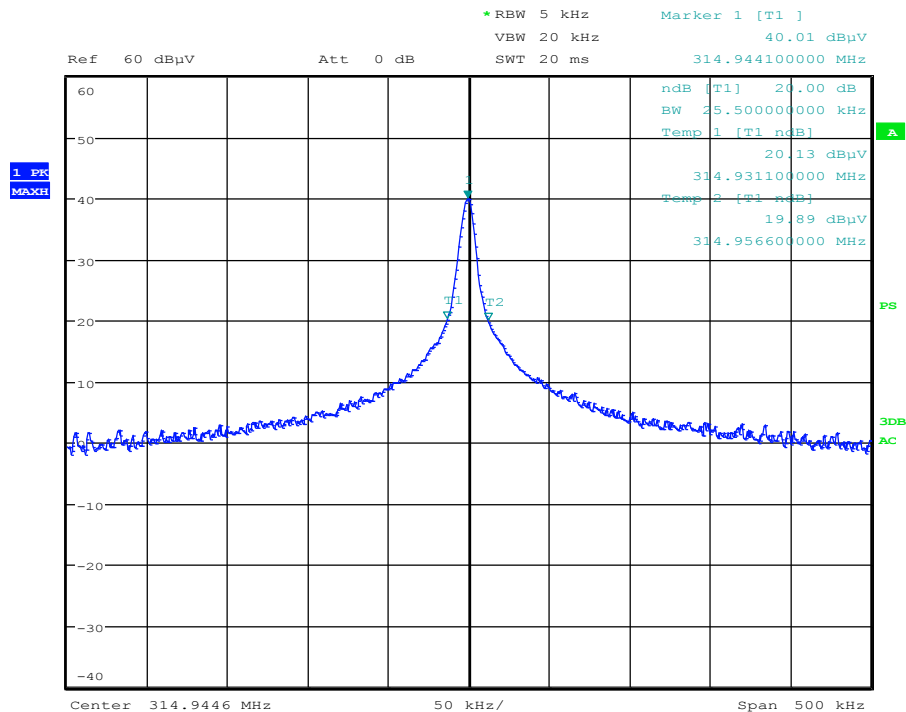
- This is a radiated test.
- Span is set to encompass the whole emission
- RBW is 1% of the span while VBW is greater than 3X RBW.
- Sweep is auto.
- Detector is peak.
- Max hold function activated.
- "x dB" function (20dB) under Occupied Bandwidth measurement of the spectrum analyzer was used for FCC Part 15.231 requirement.
- Occupied bandwidth % power set to 99% for ISSED RSS-210 requirement.

2.4.8 Test Results

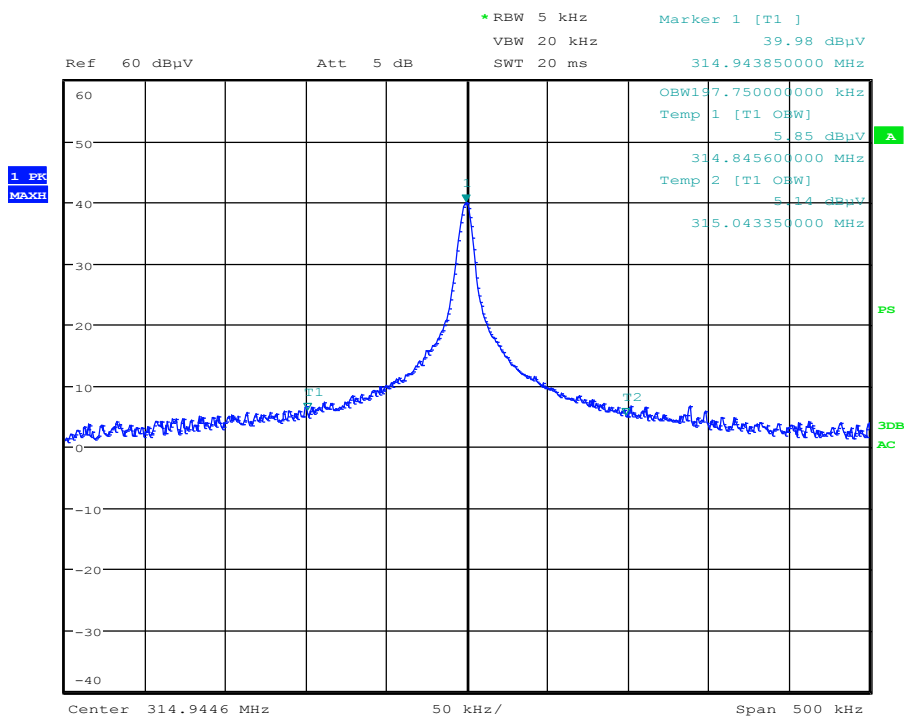
Transmitter Frequency (MHz)	Modulation	0.25% of the center frequency requirement	Measured 20-dB Bandwidth	99% Bandwidth
314.95	ASK	<787.375 kHz	25.50 kHz	157.75 kHz
315.00	ASK	<787.5 kHz	25.75 kHz	249.75 kHz
433.589	FSK	<1.0839 MHz	95.00 kHz	112.00 kHz
433.920	FSK	<1.0848 MHz	94.50 kHz	113.50 kHz
434.251	FSK	<1.0856 MHz	93.50 kHz	107.00 kHz
Transmitter Frequency (MHz)	Modulation	0.5% of the center frequency requirement	Measured 20-dB Bandwidth	99% Bandwidth
902.375	FSK	<4.5119 MHz	29.90 kHz	46.80 kHz

EUT **Complies**

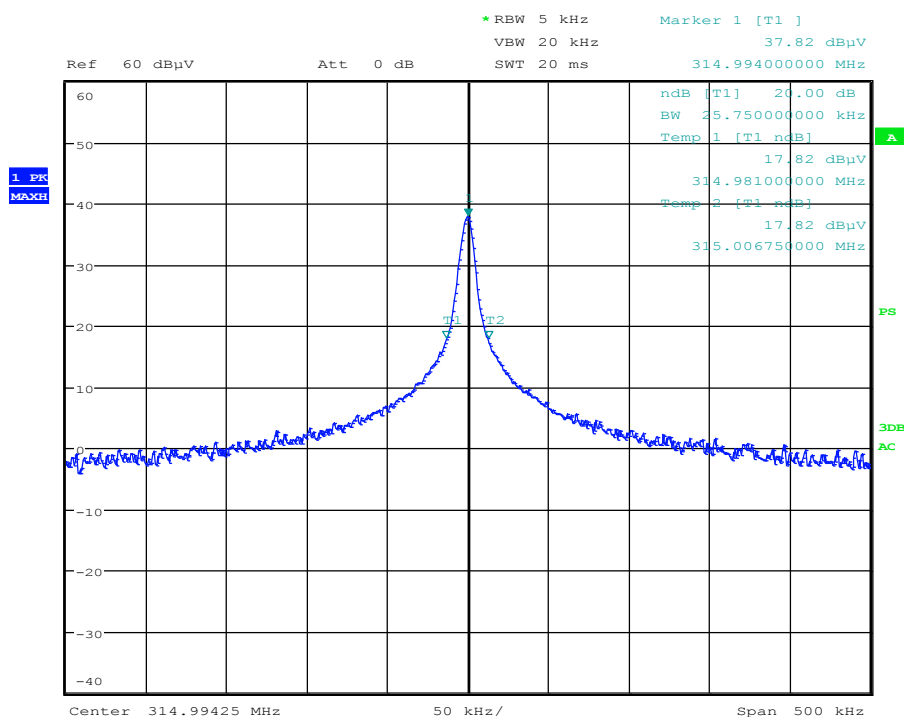
2.4.9 Test Results Plots



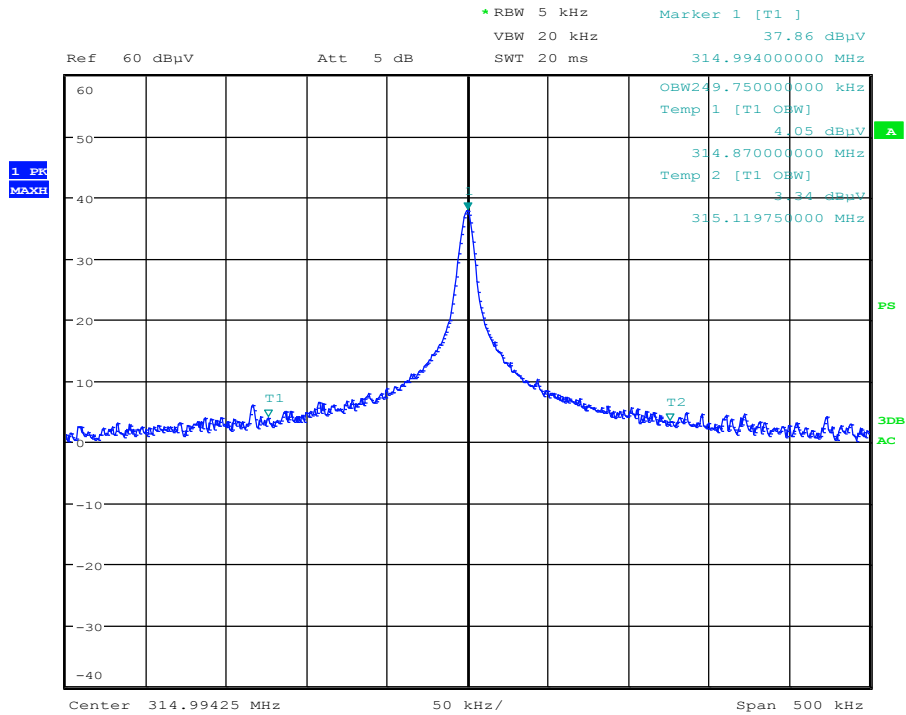
314.95MHz ASK (20-dB Bandwidth)



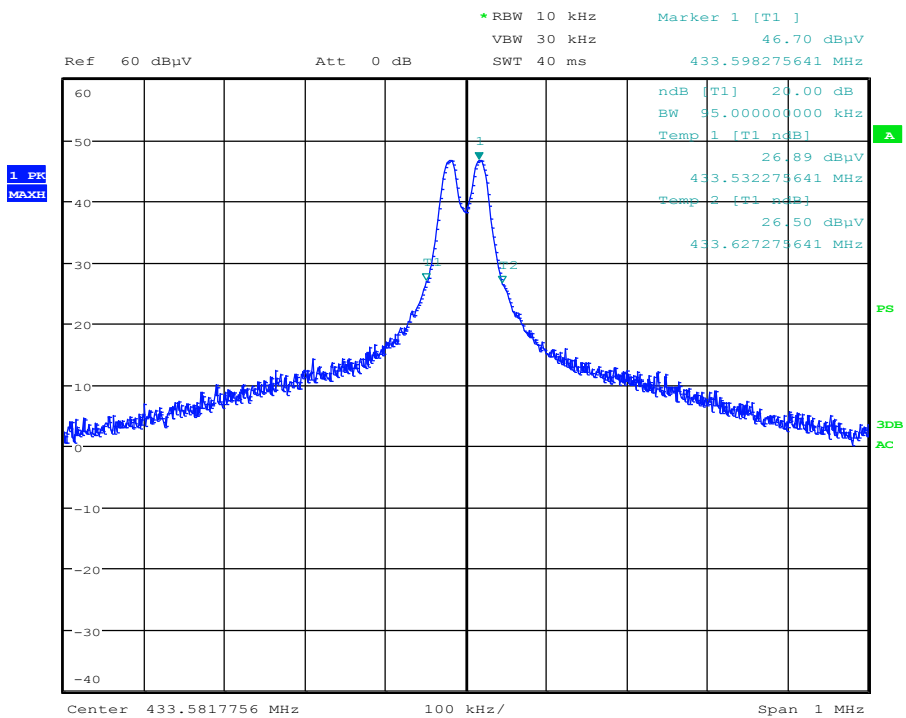
314.95MHz ASK (99% Occupied Bandwidth)



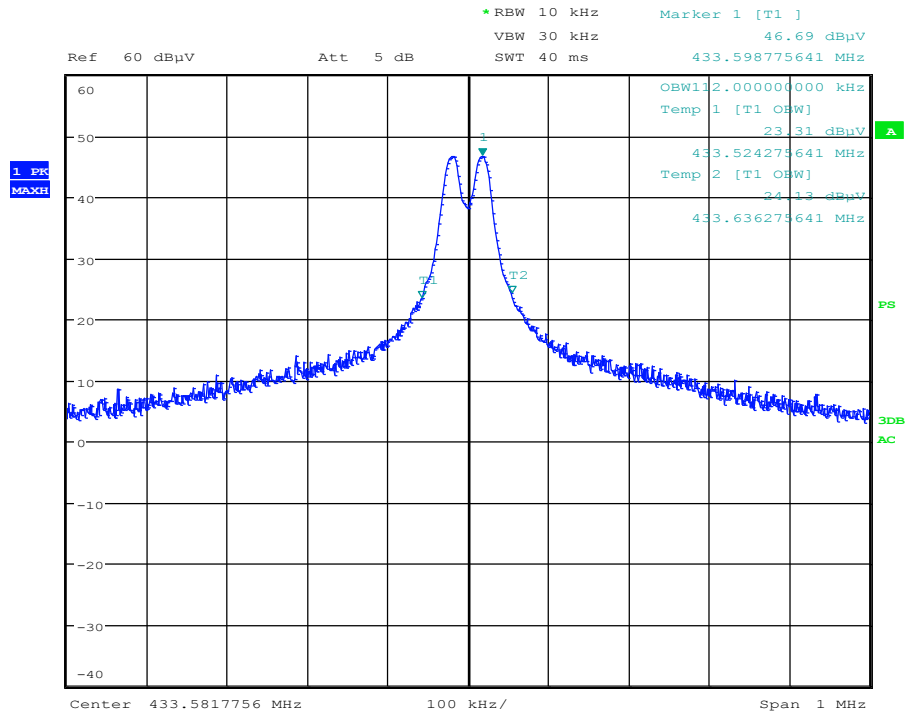
315.00MHz ASK (20-dB Bandwidth)



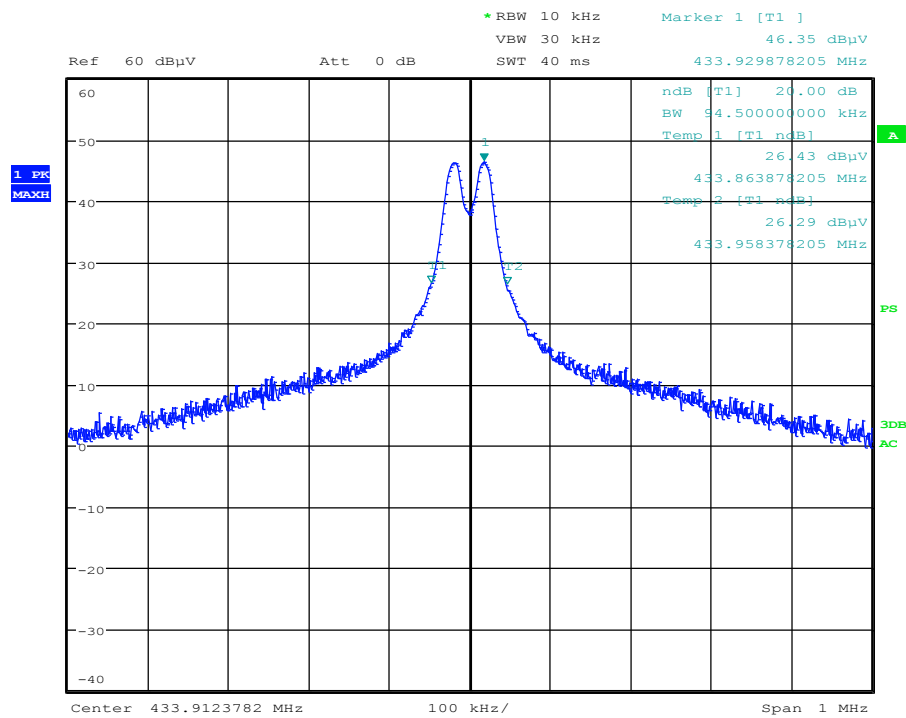
315.00MHz ASK (99% Occupied Bandwidth)



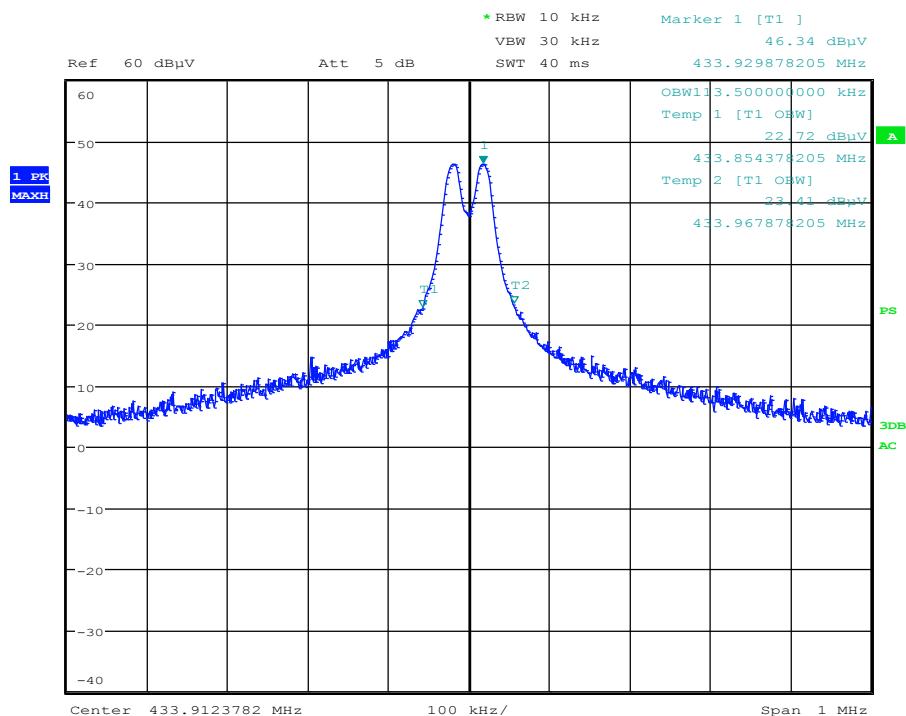
433.589MHz FSK (20-dB Bandwidth)



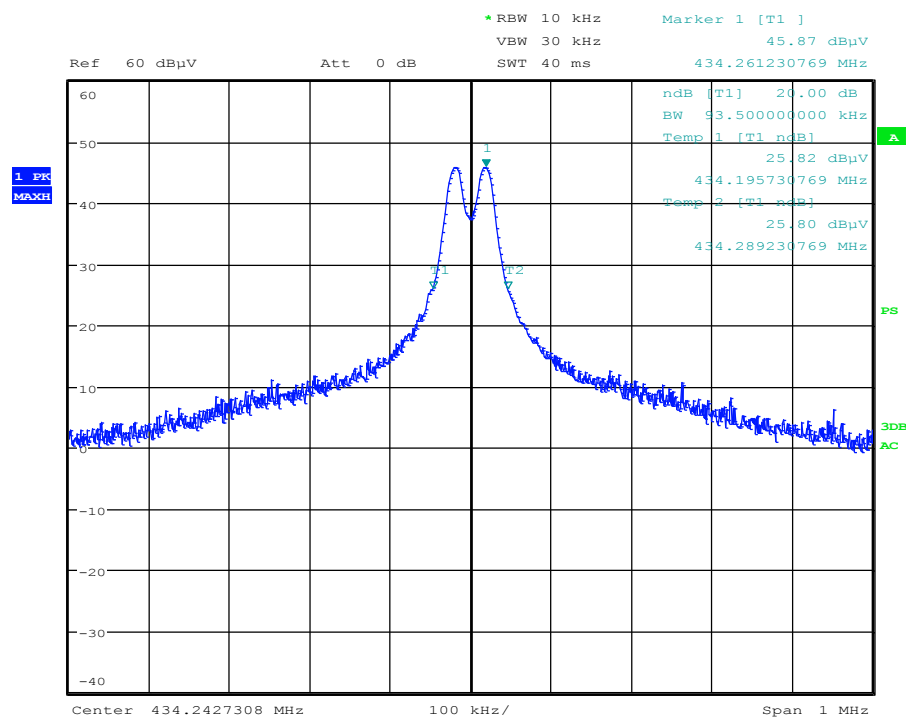
433.589MHz FSK (99% Occupied Bandwidth)



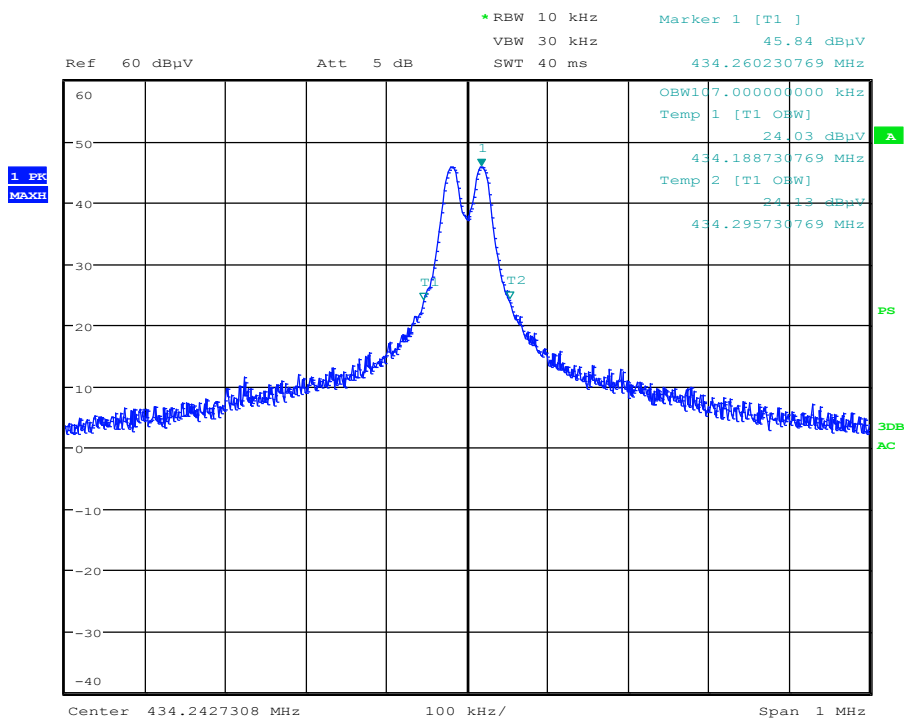
433.920MHz FSK (20-dB Bandwidth)



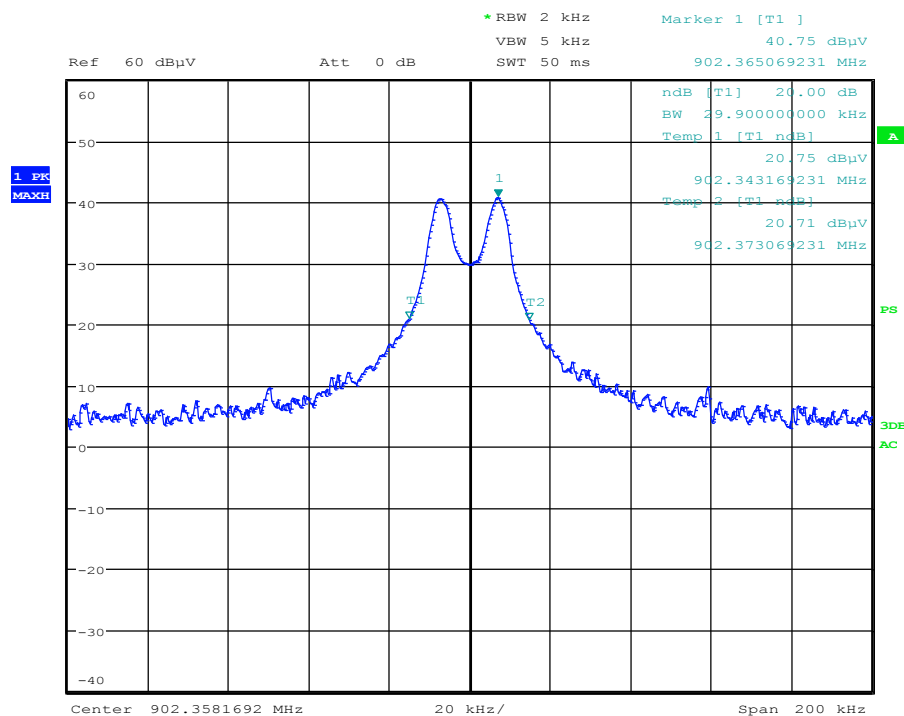
433.920MHz FSK (99% Occupied Bandwidth)



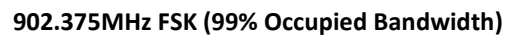
434.251MHz FSK (20-dB Bandwidth)



434.251MHz FSK (99% Occupied Bandwidth)



902.375MHz FSK (20-dB Bandwidth)



2.5 FIELD STRENGTH OF EMISSIONS

2.5.1 Specification Reference

Part 15 Subpart C §15.231(b), RSS-210 Issue 9 A1.2

2.5.2 Standard Applicable

(b) In addition to the provisions of § 15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	¹ 1,250 to 3,750	¹ 125 to 375
174-260	3,750	375
260-470	¹ 3,750 to 12,500	¹ 375 to 1,250
Above 470	12,500	1,250

¹Linear Interpolations

2.5.3 Equipment Under Test and Modification State

Serial No: 20160908000172 / Default Test Configuration

2.5.4 Date of Test/Initial of test personnel who performed the test

September 1 and September 7, 2017 /NS

2.5.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.5.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	23.9-24.3°C
Relative Humidity	44.1-48.6%
ATM Pressure	99.1-99.3 kPa

2.5.7 Additional Observations

- This is a radiated test. The spectrum was searched from 30MHz to the 10th harmonic of the highest fundamental frequency.
- Fundamental emissions were evaluated using Average/Peak detectors. Spurious emissions evaluation has been performed using Quasi-Peak detector.



- There are no emissions found that do not comply with the restricted bands defined in FCC Part 15 Subpart C, 15.205.
- Measurement was done using EMC32 automated software. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only. See Section 2.5.8 for sample computation.

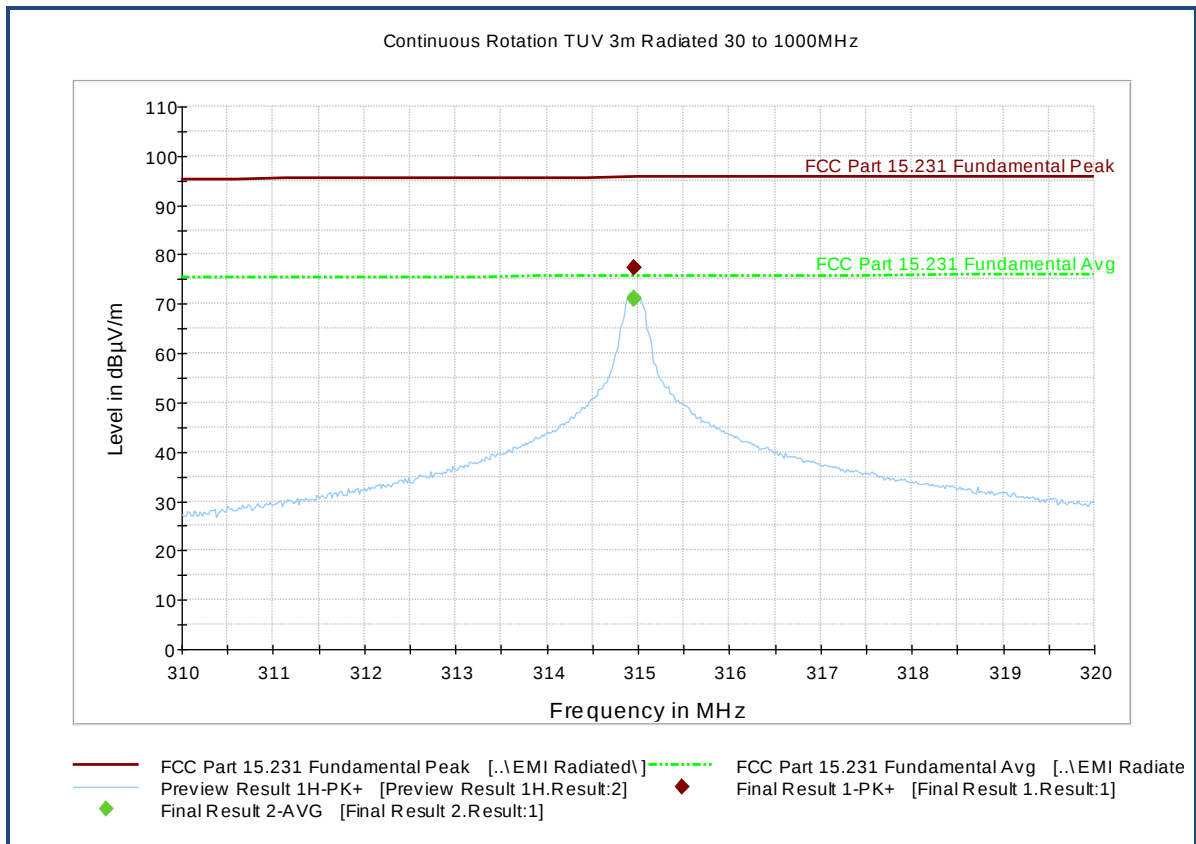
2.5.8 Sample Computation (Radiated Emission)

Measuring equipment raw measurement (db μ V) @ 30 MHz			24.4
Correction Factor (dB)	Asset# 1066 (cable)	0.3	-12.6
	Asset# 1172 (cable)	0.3	
	Asset# 1016 (preamplifier)	-30.7	
	Asset# 1175(cable)	0.3	
	Asset# 1002 (antenna)	17.2	
Reported QuasiPeak Final Measurement (db μ V/m) @ 30MHz			11.8

2.5.9 Test Results

See attached plots.

2.5.10 Fundamental Emissions (314.95 MHz ASK)



Quasi Peak Data

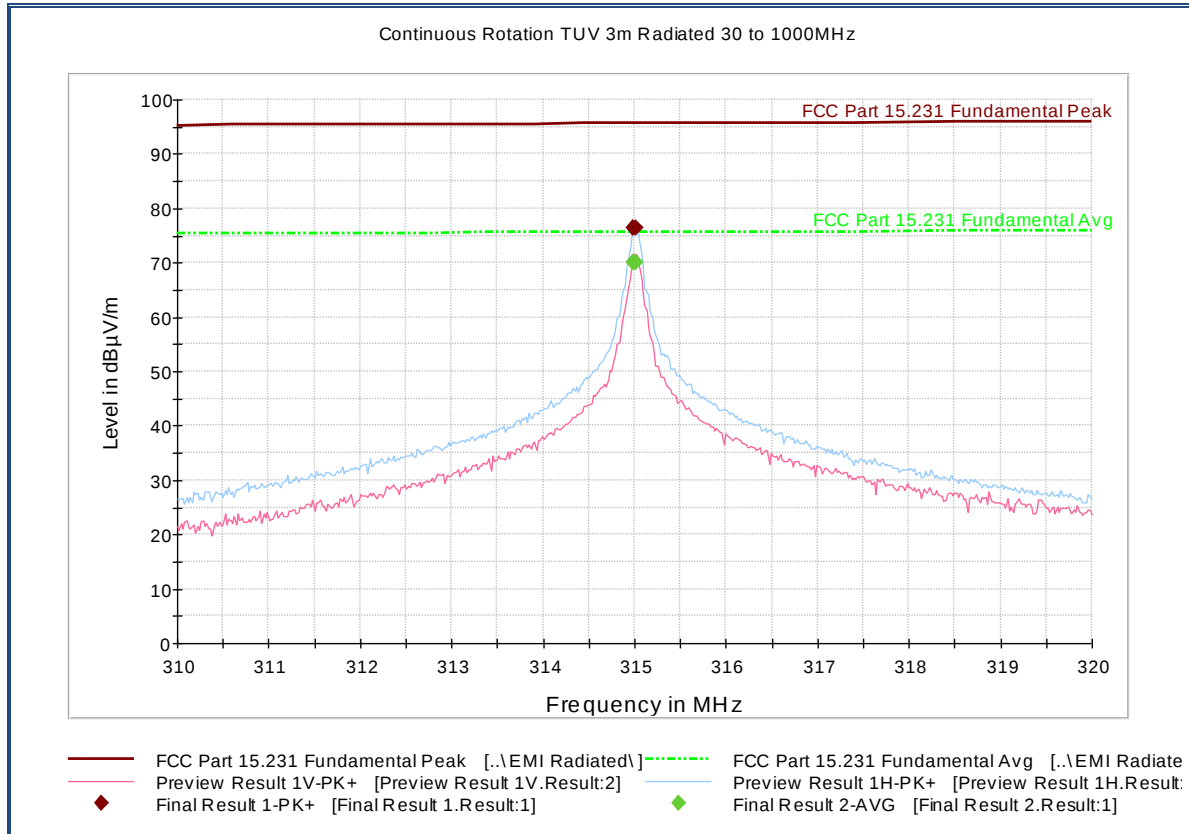
Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
314.949820	77.3	1000.0	120.000	100.0	H	107.0	-7.3	18.3	95.6
314.949980	77.2	1000.0	120.000	109.0	H	295.0	-7.3	18.4	95.6

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
314.949820	71.1	1000.0	120.000	100.0	H	107.0	-7.3	4.5	75.6
314.949980	71.0	1000.0	120.000	109.0	H	295.0	-7.3	4.6	75.6

Test Notes:

2.5.11 Fundamental Emissions (315.00 MHz ASK)



Quasi Peak Data

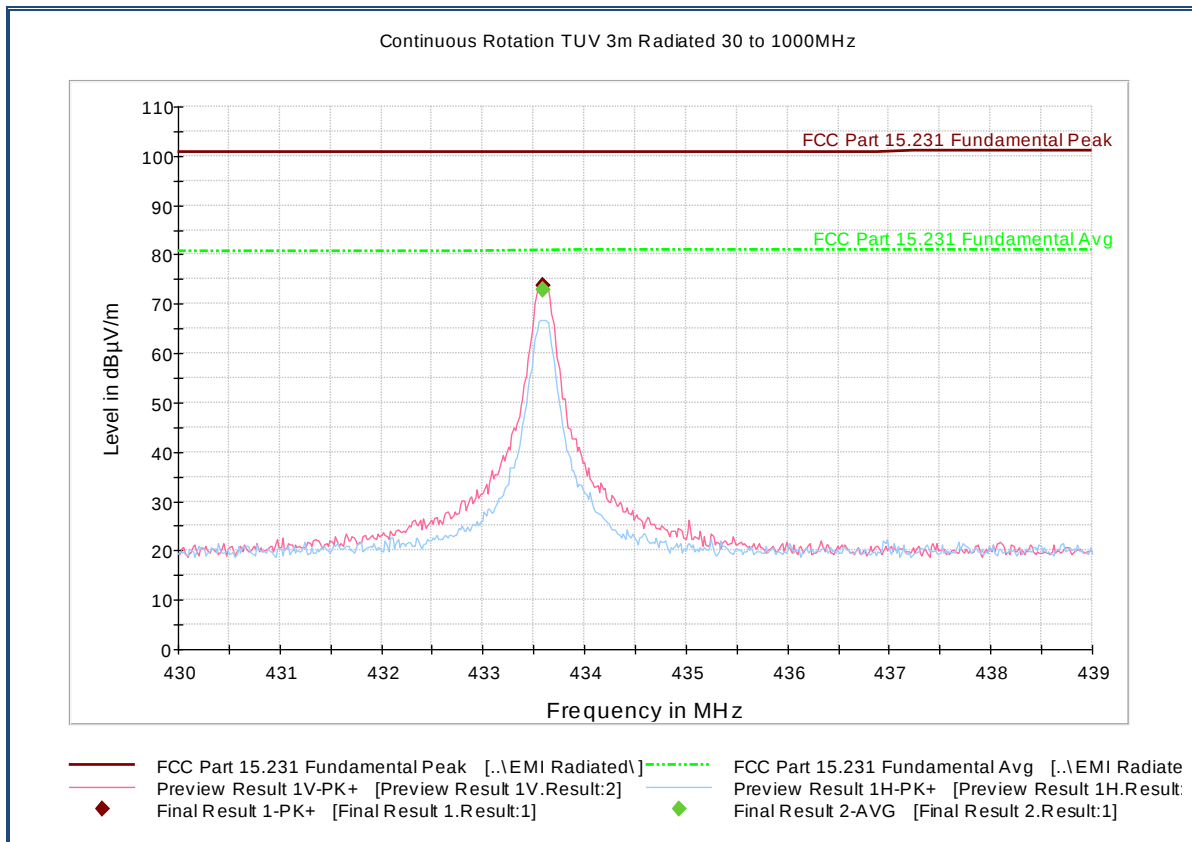
Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
314.989980	76.4	1000.0	120.000	100.0	H	266.0	-7.3	19.2	95.6
314.990060	76.4	1000.0	120.000	100.0	H	266.0	-7.3	19.2	95.6
315.010020	76.4	1000.0	120.000	100.0	H	266.0	-7.3	19.2	95.6

Average Data

Frequency (MHz)	Average without DCF (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Average with DCF (dBµV/m)	Margin (dB)	Limit (dBµV/m)
314.989980	70.1	1000.0	120.000	100.0	H	266.0	-7.3	5.5	75.6
314.990060	70.1	1000.0	120.000	100.0	H	266.0	-7.3	5.5	75.6
315.010020	70.2	1000.0	120.000	100.0	H	266.0	-7.3	5.5	75.6

Test Notes:

2.5.12 Fundamental Emissions (433.589 MHz FSK)



Quasi Peak Data

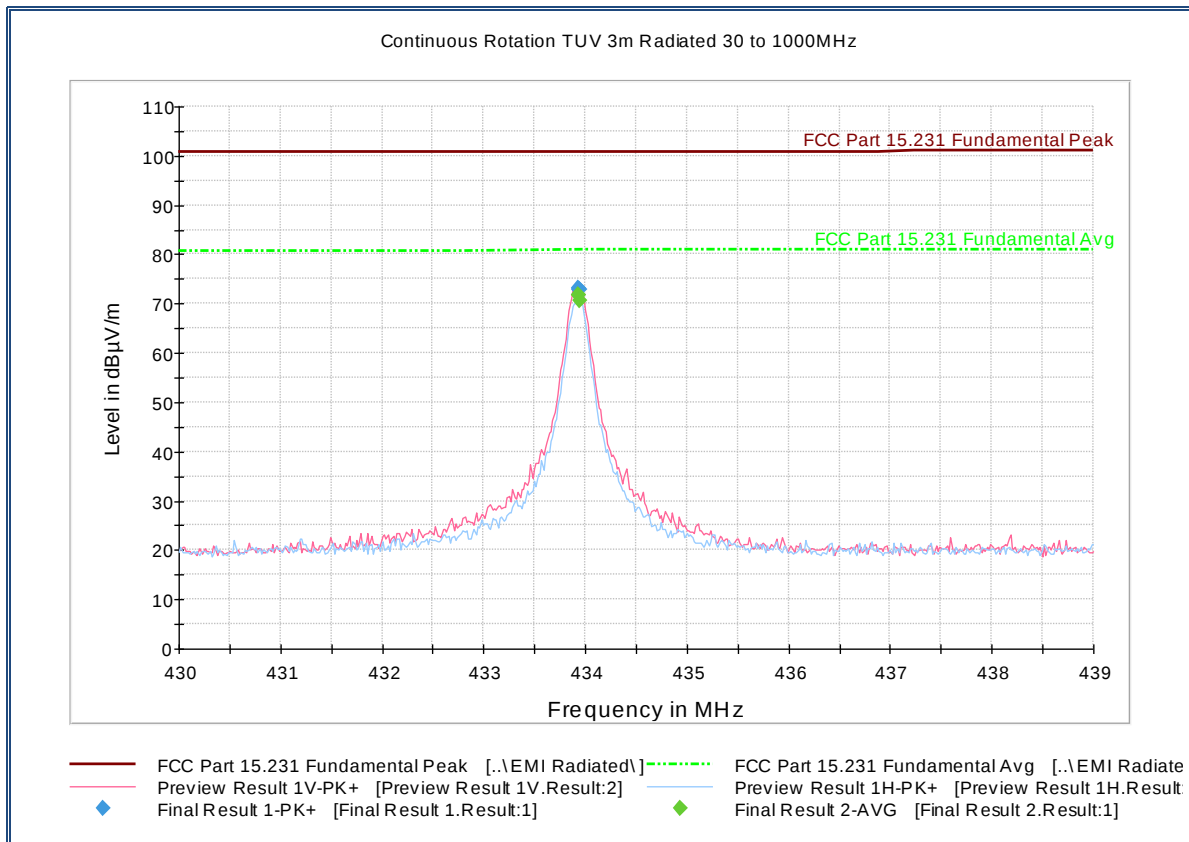
Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
433.585251	73.6	1000.0	120.000	114.0	V	98.0	-3.9	27.2	100.8
433.593106	73.6	1000.0	120.000	109.0	V	98.0	-3.9	27.2	100.8

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
433.585251	73.0	1000.0	120.000	114.0	V	98.0	-3.9	7.8	80.8
433.593106	73.0	1000.0	120.000	109.0	V	98.0	-3.9	7.8	80.8

Test Notes:

2.5.13 Fundamental Emissions (433.920 MHz FSK)



Quasi Peak Data

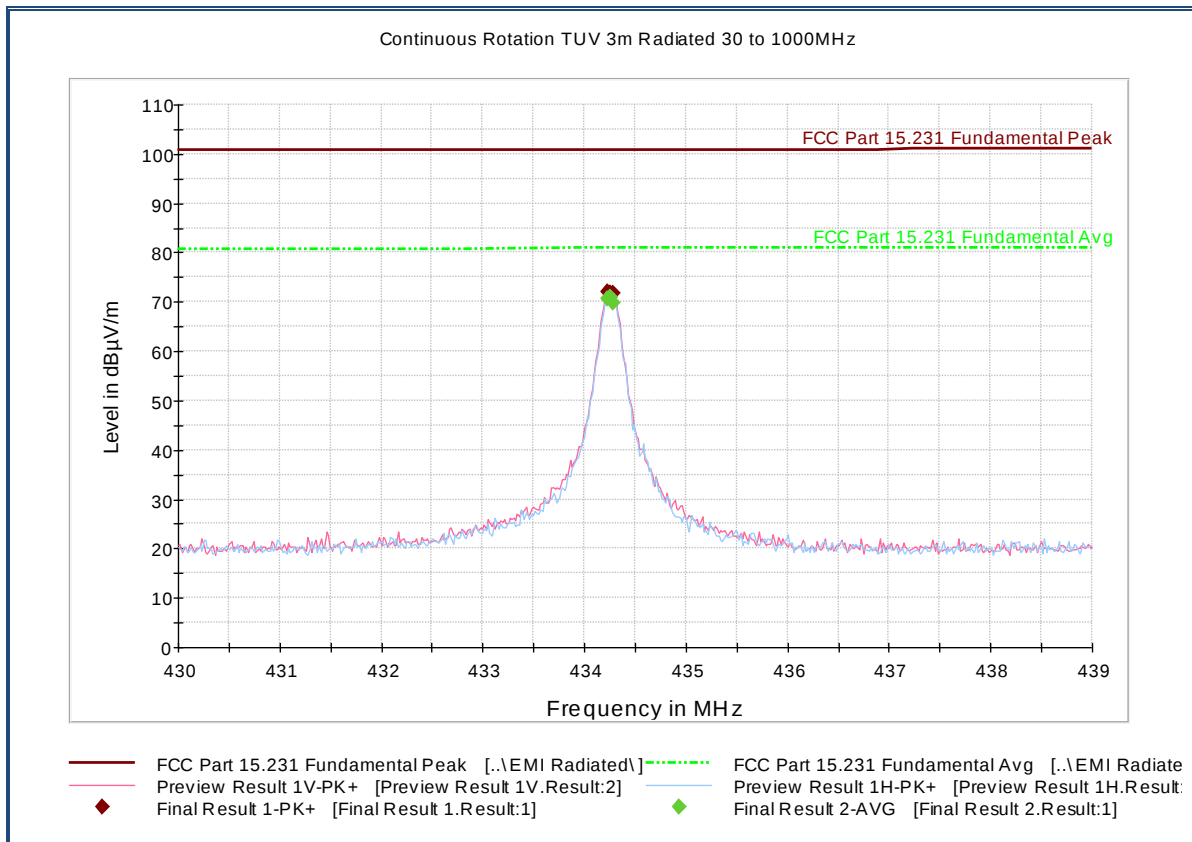
Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
433.931864	72.9	1000.0	120.000	109.0	V	96.0	-3.9	27.9	100.8
433.935792	73.0	1000.0	120.000	111.0	V	96.0	-3.9	27.8	100.8
433.949900	72.8	1000.0	120.000	109.0	V	96.0	-3.9	28.0	100.8

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
433.931864	71.8	1000.0	120.000	109.0	V	96.0	-3.9	9.0	80.8
433.935792	71.7	1000.0	120.000	111.0	V	96.0	-3.9	9.1	80.8
433.949900	70.7	1000.0	120.000	109.0	V	96.0	-3.9	10.1	80.8

Test Notes:

2.5.14 Fundamental Emissions (434.251 MHz FSK)



Quasi Peak Data

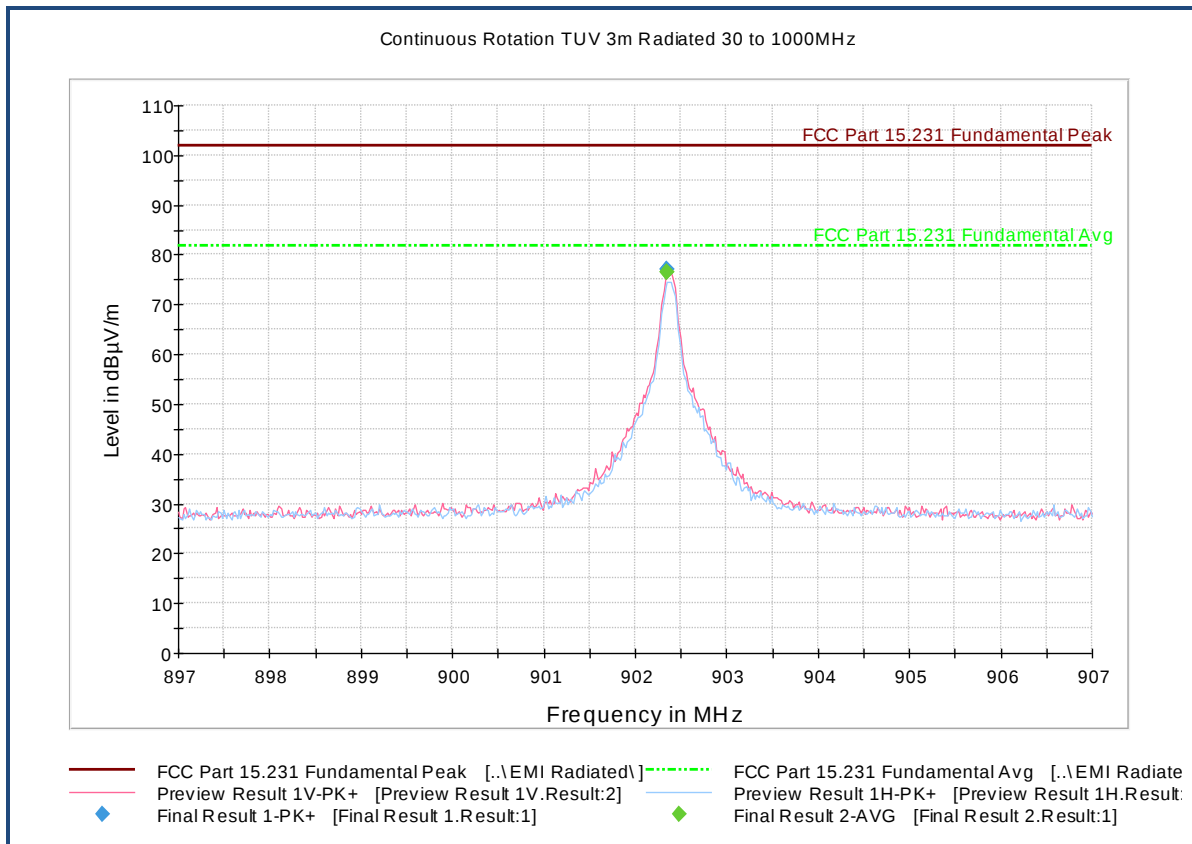
Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
434.234549	72.0	1000.0	120.000	116.0	V	208.0	-3.8	28.9	100.8
434.252585	71.7	1000.0	120.000	116.0	V	208.0	-3.8	29.1	100.8
434.260441	71.8	1000.0	120.000	116.0	V	208.0	-3.8	29.0	100.8

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
434.234549	70.7	1000.0	120.000	116.0	V	208.0	-3.8	10.1	80.8
434.252585	71.0	1000.0	120.000	116.0	V	208.0	-3.8	9.8	80.8
434.260441	70.9	1000.0	120.000	116.0	V	208.0	-3.8	9.9	80.8

Test Notes:

2.5.15 Fundamental Emissions (902.375 MHz FSK)



Quasi Peak Data

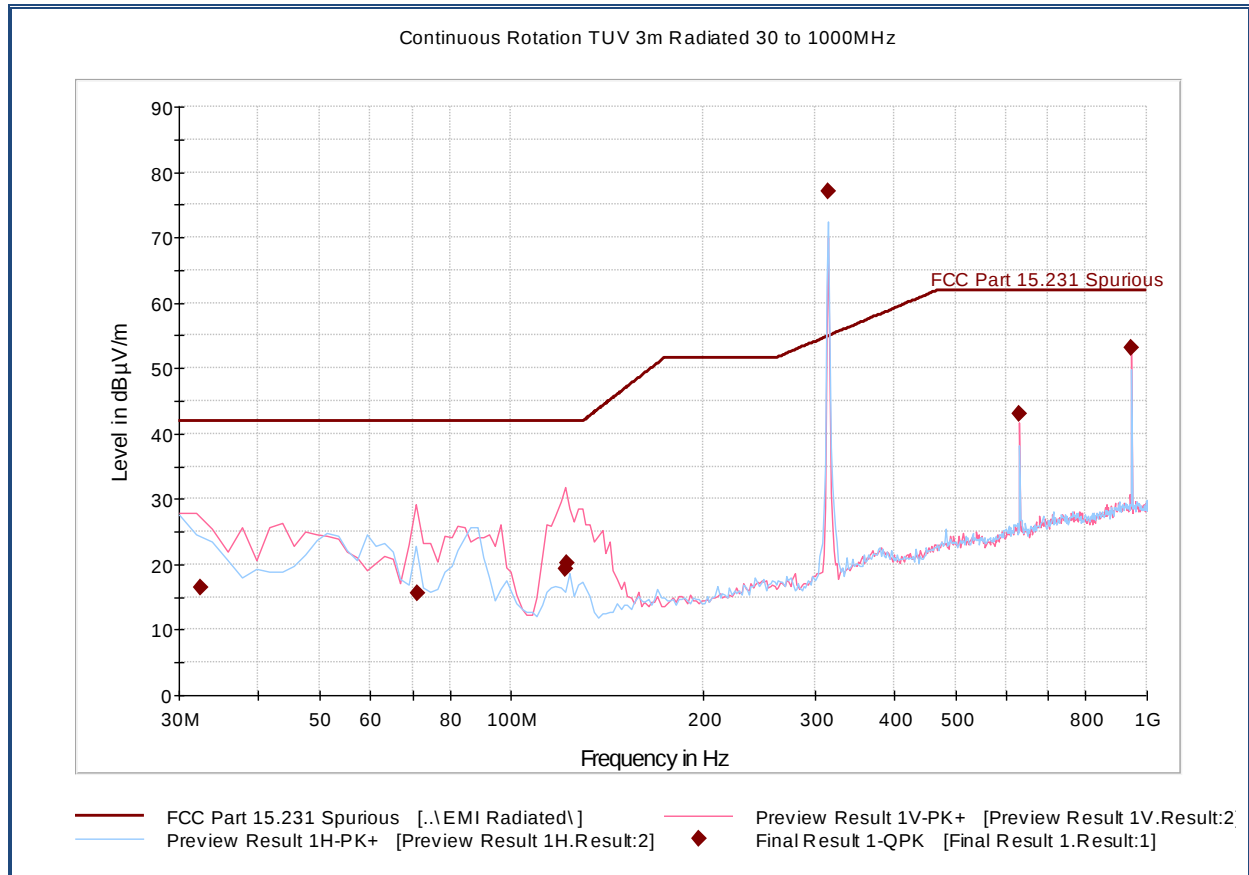
Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
902.350701	77.1	1000.0	120.000	110.0	V	234.0	5.9	24.8	101.9
902.350782	77.1	1000.0	120.000	109.0	V	234.0	5.9	24.8	101.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
902.350701	76.5	1000.0	120.000	110.0	V	234.0	5.9	5.4	81.9
902.350782	76.5	1000.0	120.000	109.0	V	234.0	5.9	5.4	81.9

Test Notes:

2.5.16 Spurious Emissions Below 1 GHz (314.95 MHz ASK)

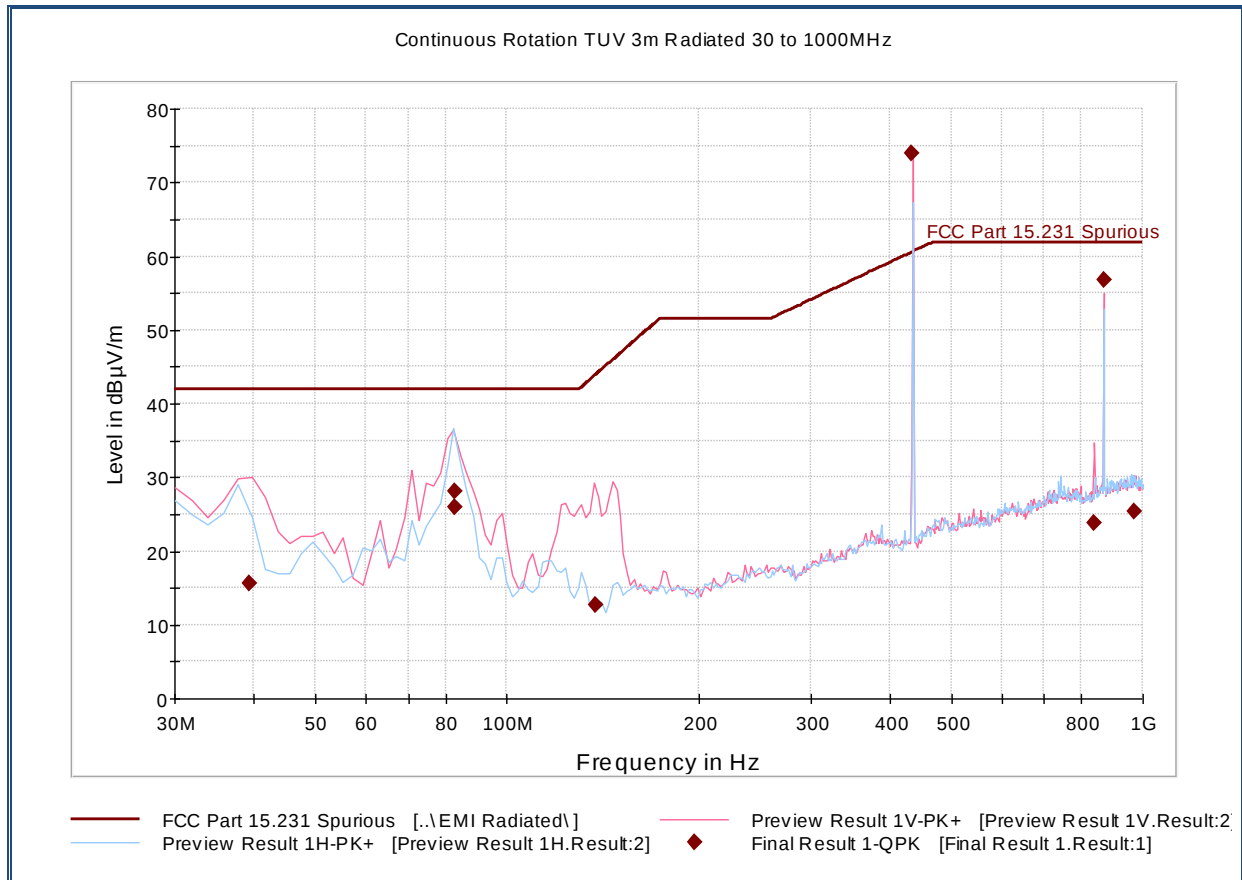


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
32.440000	16.5	1000.0	120.000	100.0	V	100.0	-7.7	25.4	41.9
71.061643	15.6	1000.0	120.000	200.0	V	100.0	-16.9	26.3	41.9
121.826613	19.3	1000.0	120.000	100.0	V	350.0	-15.9	22.6	41.9
122.162725	20.1	1000.0	120.000	100.0	V	-1.0	-15.9	21.8	41.9
314.951503	77.0	1000.0	120.000	100.0	H	101.0	-7.3	Fundamental	
629.901323	43.1	1000.0	120.000	100.0	V	106.0	1.5	18.8	61.9
944.851142	53.1	1000.0	120.000	100.0	V	224.0	6.1	8.9	61.9

Test Notes:

2.5.17 Spurious Emissions Below 1 GHz (433.589 MHz FSK)

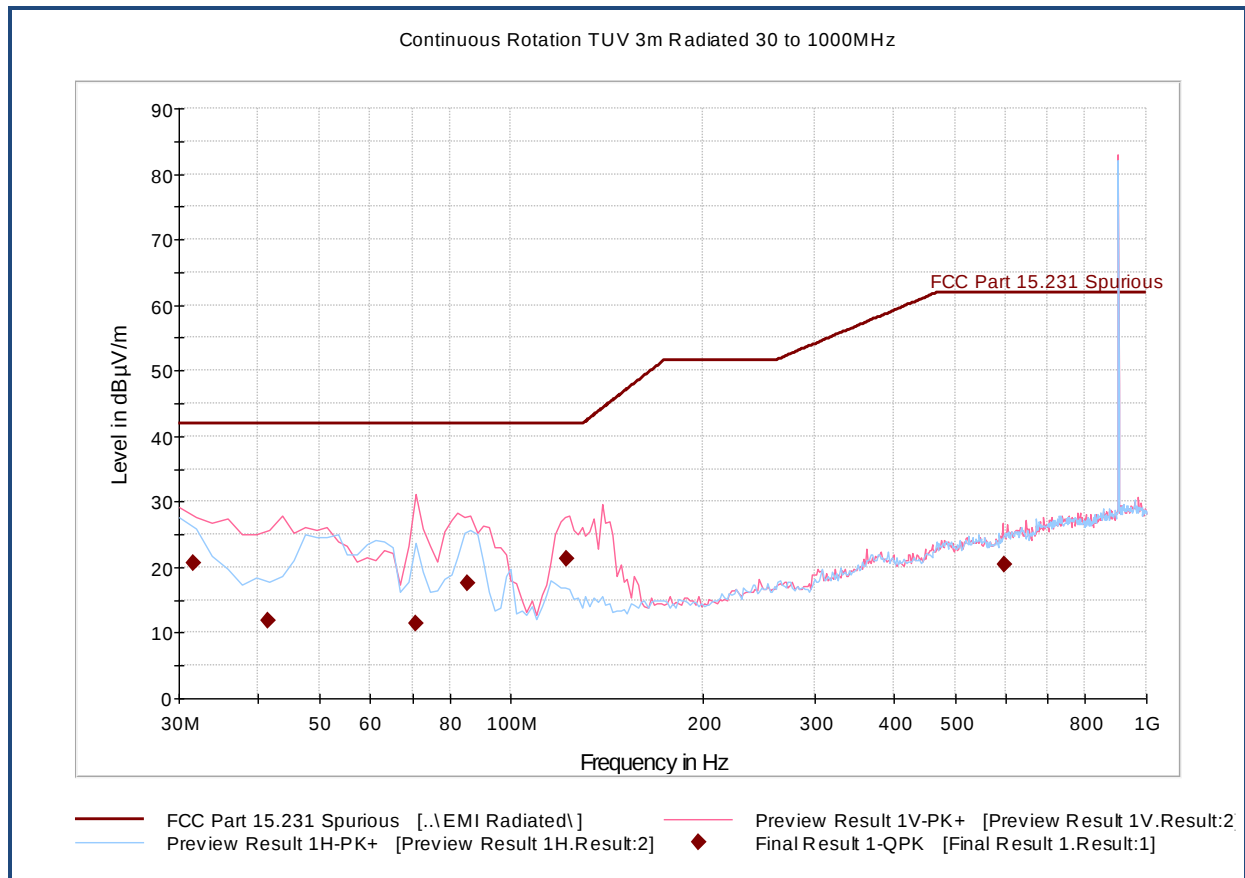


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
39.279439	15.6	1000.0	120.000	100.0	V	343.0	-12.1	26.4	41.9
82.884970	25.9	1000.0	120.000	400.0	H	-12.0	-17.0	16.0	41.9
82.932745	28.2	1000.0	120.000	184.0	V	342.0	-16.9	13.8	41.9
137.833828	12.8	1000.0	120.000	105.0	V	246.0	-15.2	31.1	43.8
433.568657	73.9	1000.0	120.000	109.0	V	100.0	-3.9	Fundamental	
839.777315	23.8	1000.0	120.000	343.0	V	-2.0	4.6	38.1	61.9
867.215631	56.8	1000.0	120.000	115.0	V	261.0	5.1	5.2	61.9
968.073908	25.3	1000.0	120.000	259.0	V	332.0	6.3	36.6	61.9

Test Notes:

2.5.18 Spurious Emissions Below 1 GHz (902.375 MHz FSK)

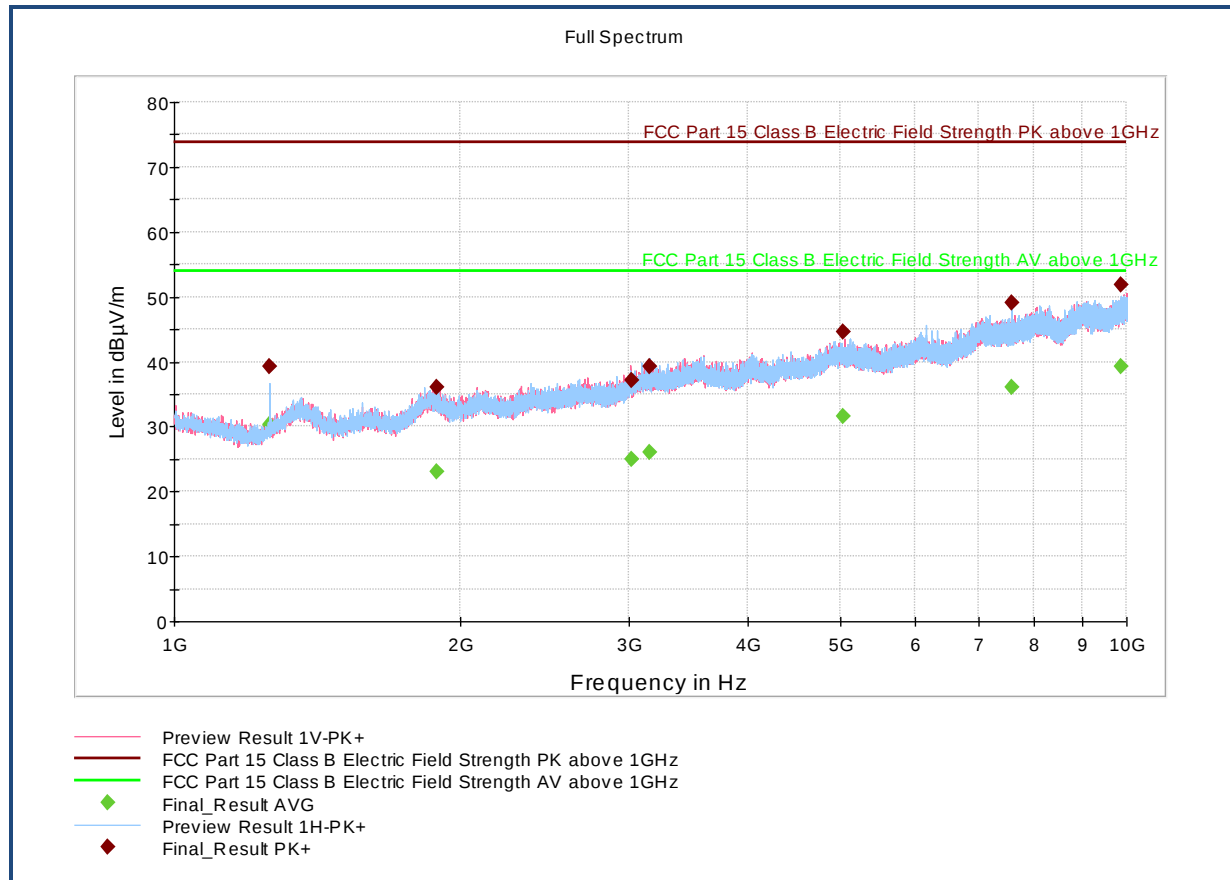


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
31.600000	20.6	1000.0	120.000	100.0	V	-1.0	-7.1	21.4	41.9
41.527214	11.9	1000.0	120.000	134.0	V	307.0	-12.8	30.0	41.9
70.621643	11.5	1000.0	120.000	100.0	V	166.0	-17.0	30.4	41.9
85.212745	17.6	1000.0	120.000	122.0	V	-12.0	-16.8	24.4	41.9
121.986613	21.3	1000.0	120.000	100.0	V	262.0	-15.9	20.7	41.9
596.127455	20.3	1000.0	120.000	350.0	V	258.0	0.8	41.6	61.9

Test Notes:

2.5.19 Test Results Above 1 GHz (314.95 MHz ASK)



Peak Data

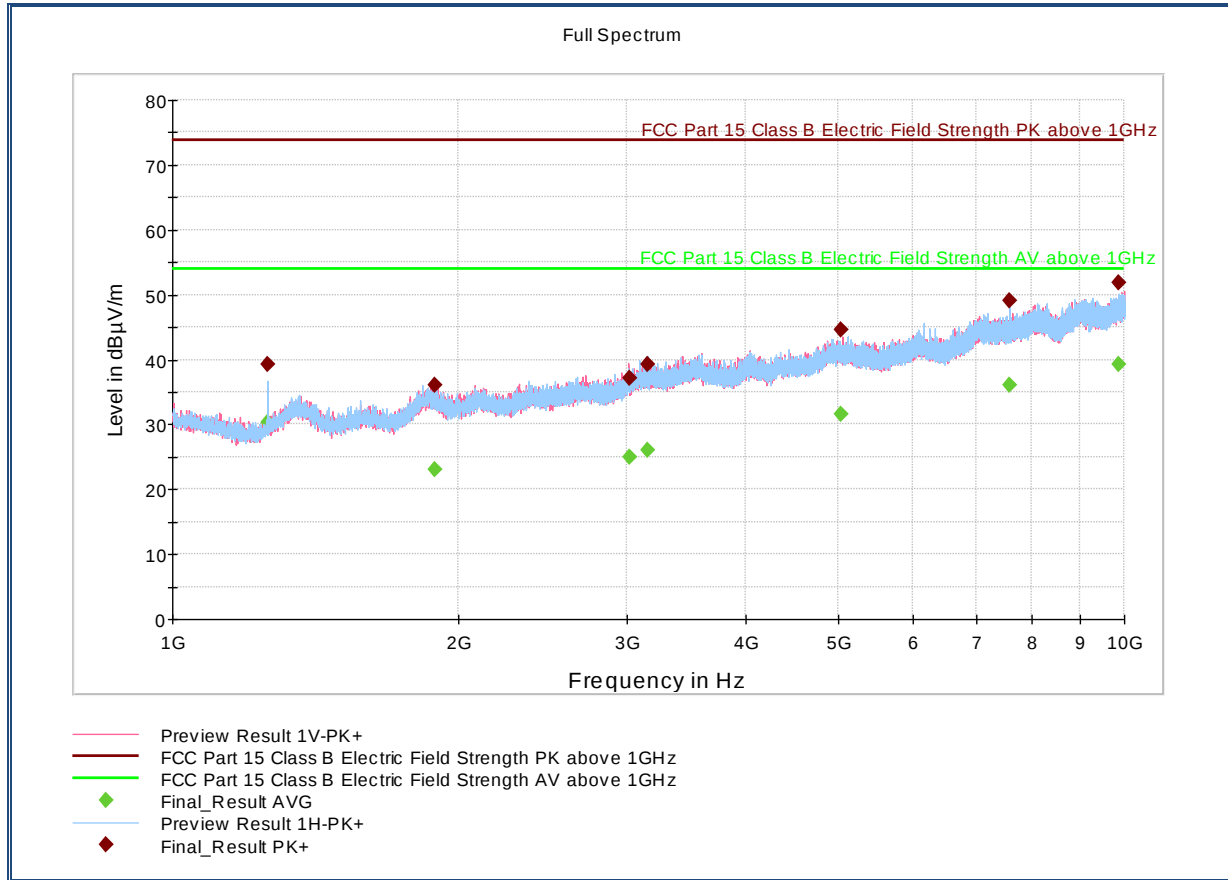
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1259.796667	39.24	1000.0	1000.000	196.7	H	70.0	-3.2	34.66	73.90
1885.428001	36.10	1000.0	1000.000	142.1	V	325.0	-0.1	37.80	73.90
3018.609167	37.22	1000.0	1000.000	268.4	V	328.0	3.9	36.68	73.90
3162.051000	39.19	1000.0	1000.000	107.2	H	210.0	4.8	34.71	73.90
5044.094334	44.59	1000.0	1000.000	122.5	V	336.0	10.9	29.31	73.90
7577.791500	49.08	1000.0	1000.000	150.2	H	271.0	17.3	24.82	73.90
9862.219500	51.92	1000.0	1000.000	350.2	H	236.0	21.3	21.98	73.90

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth h (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1259.796667	30.20	1000.0	1000.000	196.7	H	70.0	-3.2	23.70	53.90
1885.428001	23.09	1000.0	1000.000	142.1	V	325.0	-0.1	30.81	53.90
3018.609167	24.99	1000.0	1000.000	268.4	V	328.0	3.9	28.91	53.90
3162.051000	26.08	1000.0	1000.000	107.2	H	210.0	4.8	27.82	53.90
5044.094334	31.54	1000.0	1000.000	122.5	V	336.0	10.9	22.36	53.90
7577.791500	35.95	1000.0	1000.000	150.2	H	271.0	17.3	17.95	53.90
9862.219500	39.29	1000.0	1000.000	350.2	H	236.0	21.3	14.61	53.90

Test Notes:

2.5.20 Test Results Above 1 GHz (433.589 MHz FSK)



Peak Data

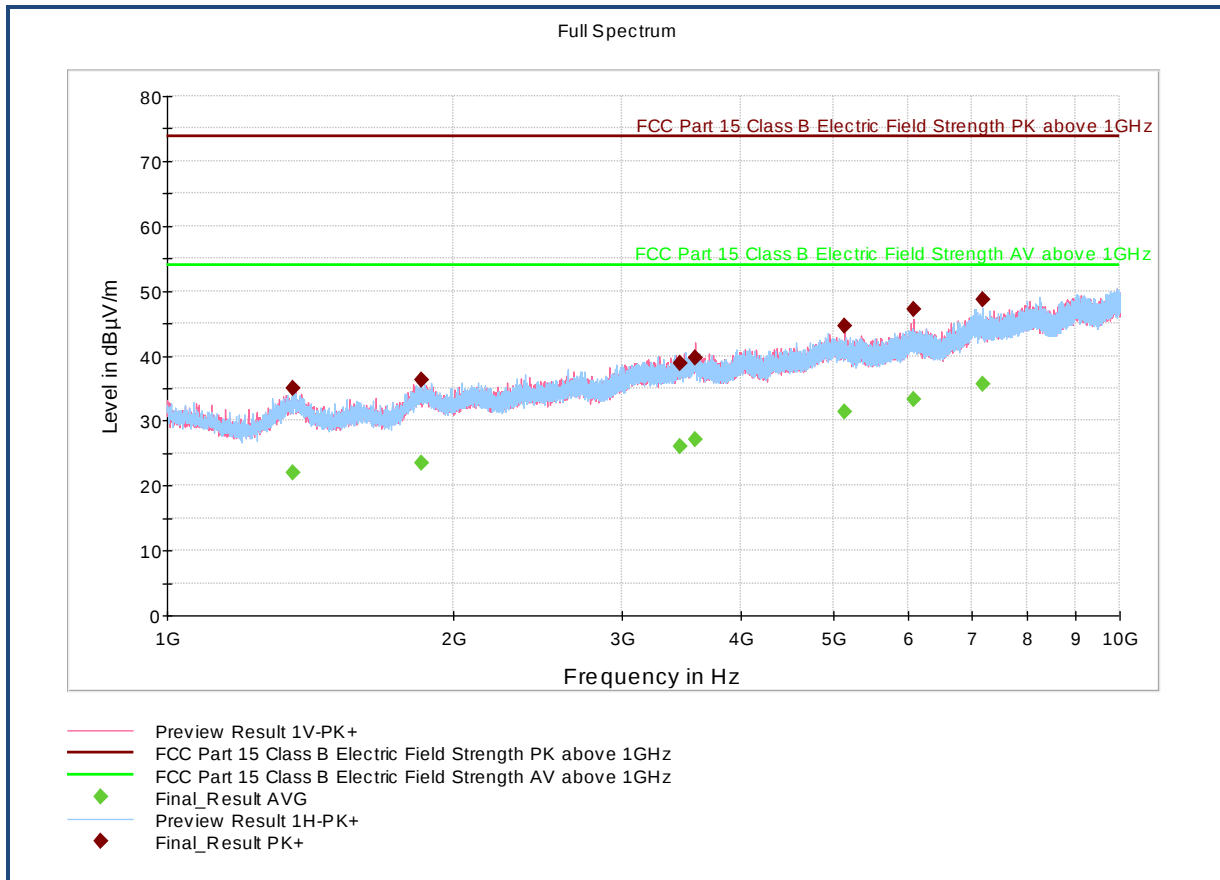
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1300.737000	41.08	1000.0	1000.000	99.7	H	207.0	-3.3	32.82	73.90
1842.457167	36.16	1000.0	1000.000	336.0	V	152.0	-0.5	37.74	73.90
2179.994167	34.87	1000.0	1000.000	322.6	V	328.0	0.1	39.03	73.90
3437.528667	38.69	1000.0	1000.000	99.8	H	196.0	5.4	35.21	73.90
5098.772666	44.38	1000.0	1000.000	295.4	V	312.0	11.2	29.52	73.90
7911.640834	49.55	1000.0	1000.000	149.9	V	325.0	18.0	24.35	73.90
9564.812500	52.39	1000.0	1000.000	99.7	V	94.0	20.2	21.51	73.90

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth h (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1300.737000	36.98	1000.0	1000.000	99.7	H	207.0	-3.3	16.92	53.90
1842.457167	23.47	1000.0	1000.000	336.0	V	152.0	-0.5	30.43	53.90
2179.994167	22.23	1000.0	1000.000	322.6	V	328.0	0.1	31.67	53.90
3437.528667	26.03	1000.0	1000.000	99.8	H	196.0	5.4	27.87	53.90
5098.772666	31.28	1000.0	1000.000	295.4	V	312.0	11.2	22.62	53.90
7911.640834	36.72	1000.0	1000.000	149.9	V	325.0	18.0	17.18	53.90
9564.812500	38.16	1000.0	1000.000	99.7	V	94.0	20.2	15.74	53.90

Test Notes:

2.5.21 Test Results Above 1 GHz (902.375 MHz FSK)



Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1355.734333	34.95	1000.0	1000.000	152.2	H	104.0	-3.3	38.95	73.90
1848.779666	36.27	1000.0	1000.000	150.7	H	172.0	-0.3	37.63	73.90
3454.640500	38.83	1000.0	1000.000	191.6	V	151.0	5.4	35.07	73.90
3590.014000	39.74	1000.0	1000.000	99.9	V	347.0	6.0	34.16	73.90
5144.538667	44.64	1000.0	1000.000	276.1	V	247.0	11.4	29.26	73.90
6080.903500	47.18	1000.0	1000.000	181.1	V	45.0	14.0	26.72	73.90
7189.243667	48.58	1000.0	1000.000	345.4	H	213.0	16.8	25.32	73.90

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth h (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1355.734333	22.08	1000.0	1000.000	152.2	H	104.0	-3.3	31.82	53.90
1848.779666	23.55	1000.0	1000.000	150.7	H	172.0	-0.3	30.35	53.90
3454.640500	26.08	1000.0	1000.000	191.6	V	151.0	5.4	27.82	53.90
3590.014000	27.07	1000.0	1000.000	99.9	V	347.0	6.0	26.83	53.90
5144.538667	31.45	1000.0	1000.000	276.1	V	247.0	11.4	22.45	53.90
6080.903500	33.35	1000.0	1000.000	181.1	V	45.0	14.0	20.55	53.90
7189.243667	35.53	1000.0	1000.000	345.4	H	213.0	16.8	18.37	53.90

Test Notes:

2.6 RECEIVER SPURIOUS EMISSIONS

2.6.1 Specification Reference

RSS-Gen 7.1

2.6.2 Standard Applicable

Spurious emissions from receivers shall not exceed the radiated limits shown in Table 2 below:

Table 2: Radiated Limits of Receiver Spurious Emissions

Frequency (MHz)	Field Strength (microvolts/m at 3 metres)*
30-88	100
88-216	150
216-960	200
Above 960	500

*Measurements for compliance with limits in the above table may be performed at distances other than 3 metres, in accordance with Section 6.5 of RSS-Gen.

2.6.3 Equipment Under Test and Modification State

Serial No: 20160908000172 / Default Test Configuration

2.6.4 Date of Test/Initial of test personnel who performed the test

August 28, 2017/NS

2.6.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.6.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	26.6°C
Relative Humidity	51.5%
ATM Pressure	98.6 kPa

2.6.7 Additional Observations

- This is a radiated test. The spectrum was searched from 30MHz to 18GHz.
- EUT in RX (Receive) mode configuration.

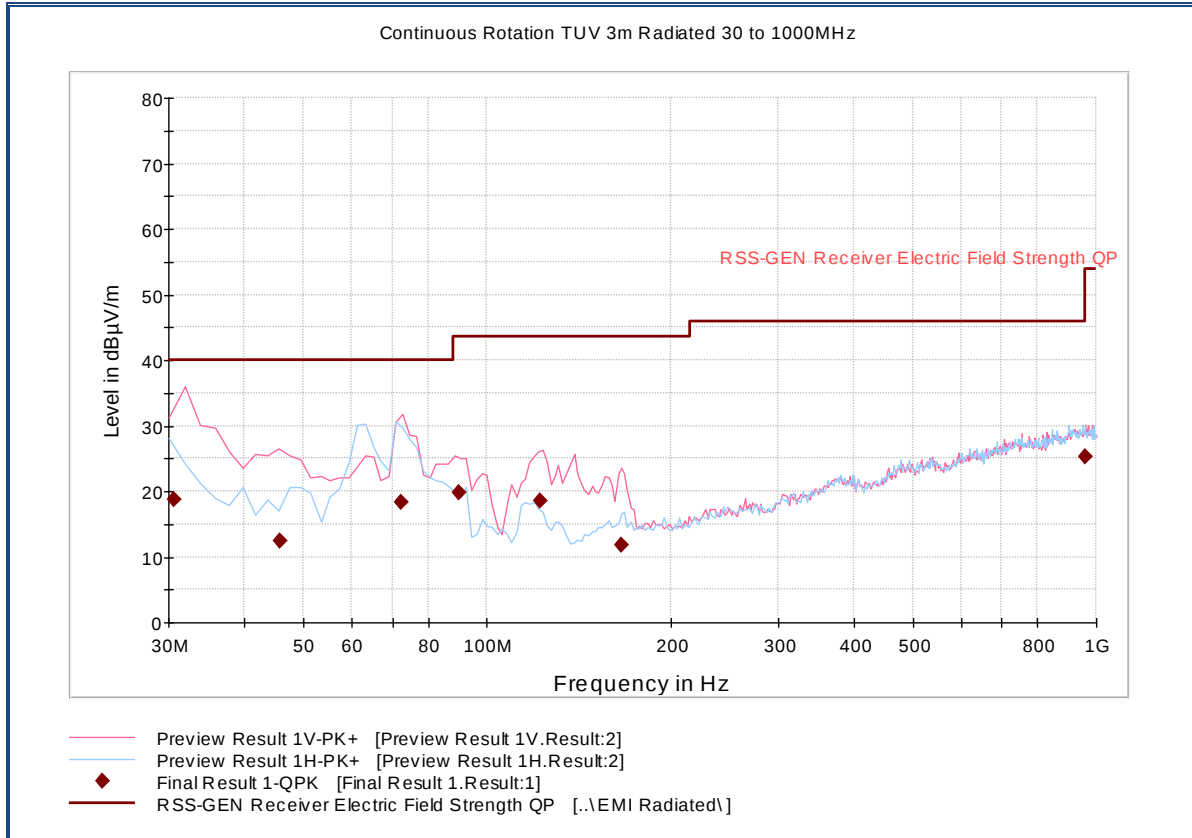


- Measurement was done using EMC32 V8.53 automated software. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only. See Section 2.6.8 for sample computation.

2.6.8 Sample Computation (Radiated Emission)

Measuring equipment raw measurement (db μ V) @ 30 MHz			24.4
Correction Factor (dB)	Asset# 1066 (cable)	0.3	-12.6
	Asset# 1172 (cable)	0.3	
	Asset# 1016 (preamplifier)	-30.7	
	Asset# 1175(cable)	0.3	
	Asset# 1002 (antenna)	17.2	
Reported QuasiPeak Final Measurement (db μ V/m) @ 30MHz			11.8

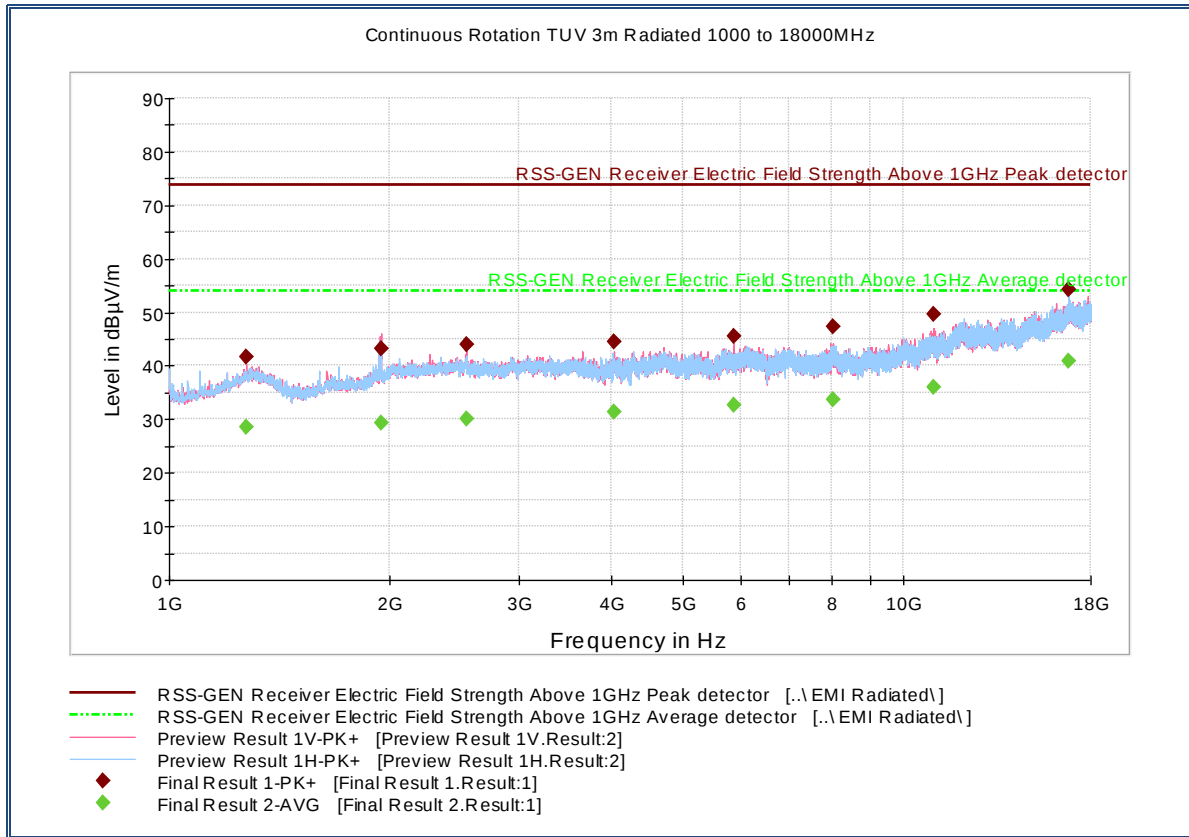
2.6.9 Test Results Below 1GHz (Receive Mode)



Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.600000	18.8	1000.0	120.000	250.0	V	200.0	-6.4	21.2	40.0
45.711102	12.4	1000.0	120.000	100.0	V	312.0	-13.7	27.6	40.0
72.245531	18.2	1000.0	120.000	100.0	V	-11.0	-16.9	21.8	40.0
89.732745	19.7	1000.0	120.000	100.0	V	150.0	-16.0	23.8	43.5
122.466613	18.6	1000.0	120.000	100.0	V	22.0	-15.9	24.9	43.5
165.912144	11.9	1000.0	120.000	109.0	V	30.0	-12.5	31.6	43.5
960.378357	25.2	1000.0	120.000	144.0	V	272.0	6.4	28.7	53.9

2.6.10 Test Results Above 1GHz (Receive Mode)



Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1273.50000	41.6	1000.0	1000.000	386.0	V	270.0	-5.5	32.3	73.9
1943.70000	43.1	1000.0	1000.000	406.7	V	-19.0	-2.2	30.8	73.9
2545.73333	43.9	1000.0	1000.000	161.4	V	316.0	-0.4	30.0	73.9
4038.46666	44.6	1000.0	1000.000	200.5	V	236.0	3.2	29.3	73.9
5884.50000	45.4	1000.0	1000.000	189.3	V	233.0	5.7	28.5	73.9
8026.23333	47.4	1000.0	1000.000	392.0	V	194.0	8.2	26.5	73.9
10996.9333	49.6	1000.0	1000.000	339.0	V	143.0	13.7	24.3	73.9
16769.2000	54.1	1000.0	1000.000	404.0	H	251.0	22.8	19.8	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1273.50000	28.6	1000.0	1000.000	386.0	V	270.0	-5.5	25.3	53.9
1943.70000	29.4	1000.0	1000.000	406.7	V	-19.0	-2.2	24.5	53.9
2545.73333	30.2	1000.0	1000.000	161.4	V	316.0	-0.4	23.7	53.9
4038.46666	31.5	1000.0	1000.000	200.5	V	236.0	3.2	22.4	53.9
5884.50000	32.7	1000.0	1000.000	189.3	V	233.0	5.7	21.2	53.9
8026.23333	33.7	1000.0	1000.000	392.0	V	194.0	8.2	20.2	53.9
10996.9333	35.9	1000.0	1000.000	339.0	V	143.0	13.7	18.0	53.9
16769.2000	40.9	1000.0	1000.000	404.0	H	251.0	22.8	13.0	53.9



SECTION 3

TEST EQUIPMENT USED



3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

ID Number (SDGE/SDRB)	Test Equipment	Type	Serial Number	Manufacturer	Cal Date	Cal Due Date
Radiated Test Setup						
7611	Signal/Spectrum Analyzer	FSW26	102017	Rhode & Schwarz	04/25/17	04/25/18
1033	Bilog Antenna	3142C	00044556	EMCO	10/11/16	10/11/18
1016	Pre-amplifier	PAM-0202	187	PAM	10/17/16	10/17/17
7575	Double-ridged waveguide horn antenna	3117	155511	EMCO	06/01/17	06/01/18
1040	EMI Test Receiver	ESIB40	100292	Rhode & Schwarz	10/07/16	10/07/17
1049	EMI Test Receiver	ESU	100133	Rhode & Schwarz	07/13/17	07/13/18
8628	Pre-amplifier	QLJ 01182835-JO	8986002	QuinStar Technologies Inc.	02/09/17	02/09/18
8922	High-frequency cable	R90-088-200	N/A	Teledyne	02/10/17	02/10/18
1026	High-frequency cable	3M-7/C2	N/A	MicroCoax	04/26/17	04/26/18
8849	High-frequency cable (1-18 GHz)	SAC-26G-6.1	363	A.H.Systems	04/23/17	04/23/18
8771	6dB attenuator	606-06-1F4/DR	N/A	MECA	10/11/17	10/11/18
Miscellaneous						
6708	Multimeter	34401A	US36086974	Hewlett Packard	07/05/17	07/05/18
7554	Barometer/Temperature/Humidity Transmitter	iBTHX-W	15250268	Omega	01/17/17	01/17/18
9076	DC Power Supply	18020M	P802039	Protek	Verified by 6708	
	Test Software	EMC32	V8.53	Rhode & Schwarz	N/A	

3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:

3.2.1 Radiated Emission Measurements (Below 1GHz)

Contribution		Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.45	0.26	0.07
2	Cables	Rectangular	0.50	0.29	0.08
3	Preamp	Rectangular	0.50	0.29	0.08
4	Antenna	Rectangular	0.75	0.43	0.19
5	Site	Rectangular	3.52	1.44	2.07
6	EUT Setup	Rectangular	1.00	0.58	0.33
Combined Uncertainty (u_c):					1.68
Coverage Factor (k):					2
Expanded Uncertainty:					3.36

3.2.2 Radiated Emission Measurements (Above 1GHz)

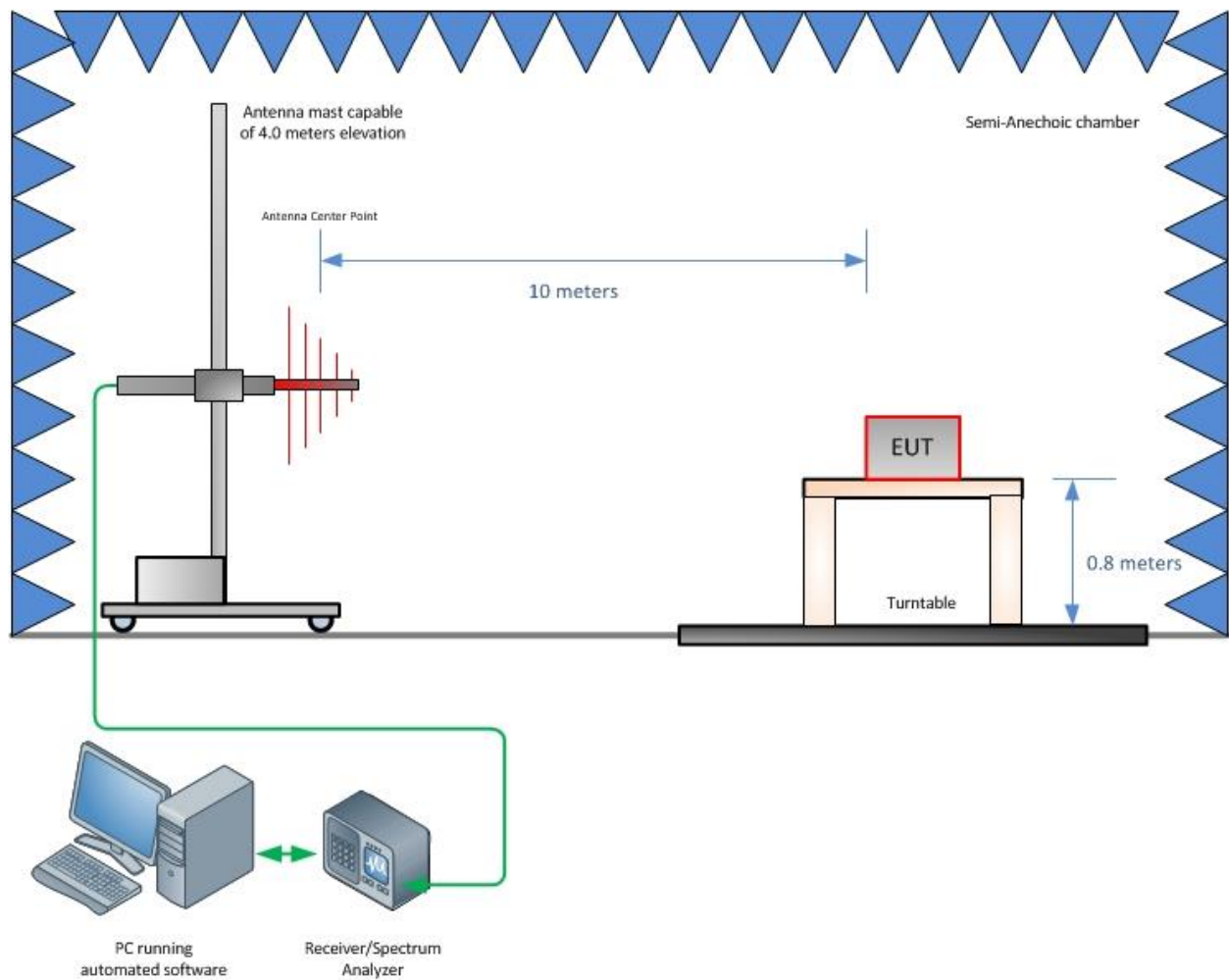
Contribution		Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.57	0.33	0.11
2	Cables	Rectangular	0.70	0.40	0.16
3	Preamp	Rectangular	0.50	0.29	0.08
4	Antenna	Rectangular	0.37	0.21	0.05
5	Site	Rectangular	3.00	1.22	1.50
6	EUT Setup	Rectangular	1.00	0.58	0.33
Combined Uncertainty (u_c):					1.49
Coverage Factor (k):					2
Expanded Uncertainty:					2.99



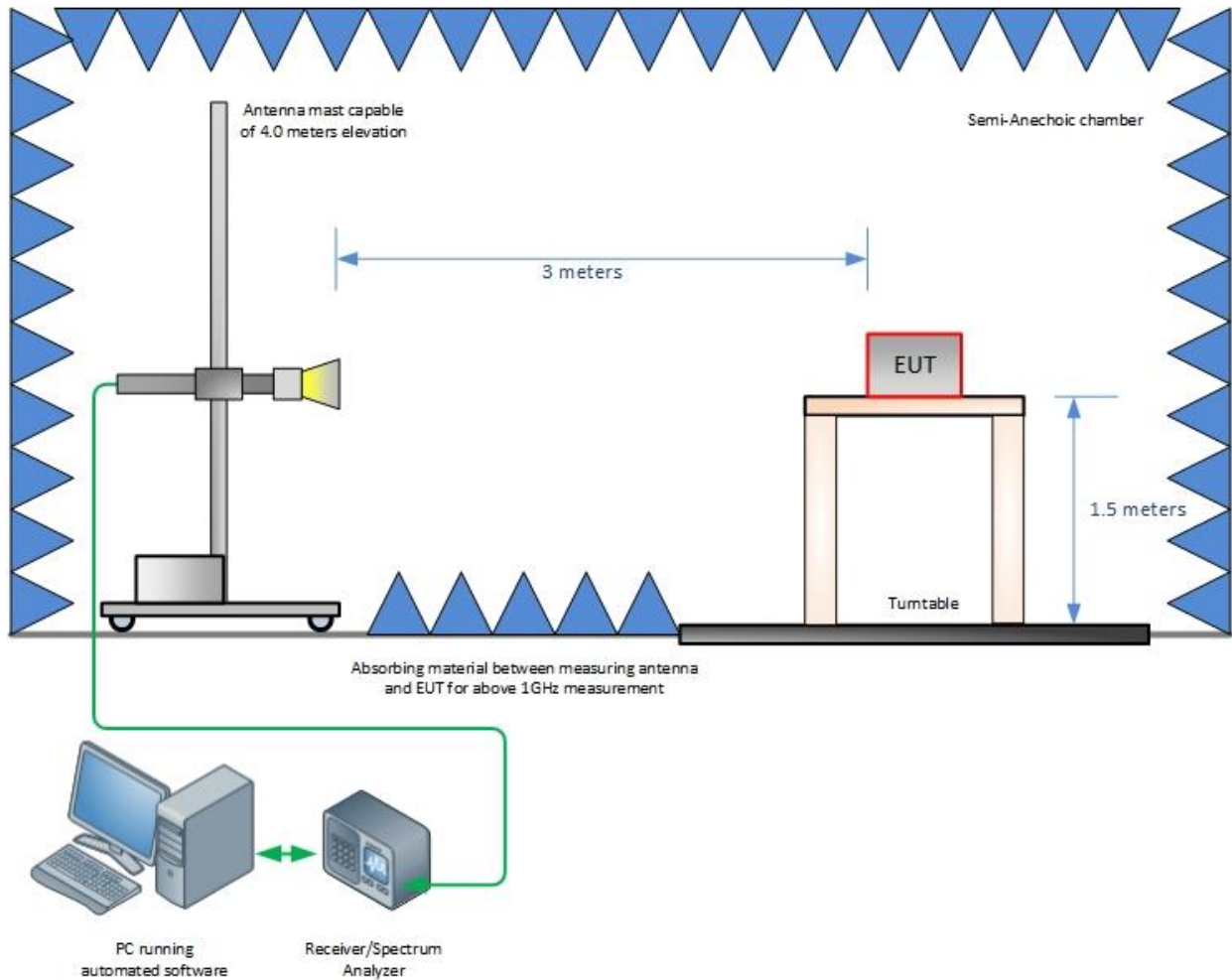
SECTION 4

DIAGRAM OF TEST SETUP

4.1 RADIATED EMISSION TEST SETUP (BELOW 1GHZ)



Radiated Emission Test Setup (Below 1GHz)



Radiated Emission Test Setup (Above 1GHz)



SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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