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Report On

Application for Grant of Equipment Authorization of the
AnyDATA

ACT233L 4G Vehicle Tracker with Hotspot

FCC Part 15 Subpart C §15.231

IC RSS-Gen and RSS-210 Issue 8 December 2010

Report No. SC1304495C

May 2013



REPORT ON Radio Testing of the
AnyDATA
4G Vehicle Tracker with Hotspot

TEST REPORT NUMBER SC1304495C

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DATED

May 20, 2013



Revision History

SC1304495C AnyDATA ACT233L 4G Vehicle Tracker with Hotspot					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
05/20/13	Initial Release				Ferdinand Custodio

CONTENTS

Section	Page No
1	REPORT SUMMARY..... 5
1.1	Introduction 6
1.2	Brief Summary Of Results 7
1.3	Product Information 8
1.4	EUT Test Configuration 10
1.5	Deviations From The Standard 12
1.6	Modification Record 12
1.7	Test Methodology 12
1.8	Test Facility 12
2	TEST DETAILS 13
2.1	Conducted Emissions 14
2.2	Transmission Verification For Transmitter Activated Automatically 15
2.3	Field Strength Of Emissions 17
2.4	Bandwidth Requirement 31
2.5	Receiver Spurious Emissions 37
3	TEST EQUIPMENT USED 38
3.1	Test Equipment Used 39
3.2	Measurement Uncertainty 40
4	DIAGRAM OF TEST SETUP 41
4.1	Test Setup Diagram 42
5	ACCREDITATION, DISCLAIMERS AND COPYRIGHT 44
5.1	Accreditation, Disclaimers and Copyright 45



SECTION 1

REPORT SUMMARY

Radio Testing of the
AnyDATA
4G Vehicle Tracker with Hotspot



1.1 INTRODUCTION

The information contained in this report is intended to show verification of the AnyDATA ACT233L 4G Vehicle Tracker with Hotspot to the requirements of the following:

- FCC Part 15 Subpart C §15.231
- IC RSS-Gen and RSS-210 Issue 8 December 2010.

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
Model Number(s)	ACT233L
FCC ID Number	P4M-ACT233
IC Number	4594B-ACT233
Serial Number(s)	20130418001831
Number of Samples Tested	1
Test Specification/Issue/Date	• FCC Part 15 Subpart C §15.231 (October 1, 2012). • RSS-210 - Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment (Issue 8, December 2010). • RSS-Gen - General Requirements and Information for the Certification of Radio Apparatus (Issue 3, December 2010).
Start of Test	May 03, 2013
Finish of Test	May 09, 2013
Name of Engineer(s)	Ferdinand Custodio
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 IC RSS standard is shown below.

Section	§15.247 Spec Clause	RSS	Test Description	Result	Comments/ Base Standard
2.1	§15.207 (a)	RSS-Gen 7.2.4	Conducted Emissions	Not Applicable	
2.2	§15.231(a)(2))	RSS-210 A1.1.1(b)	Transmission Verification For Transmitter Activated Automatically	Compliant	
2.3	§15.231(b)	RSS-210 A1.1.2	Field Strength Of Emissions	Compliant	
2.4	§15.231(c)	RSS-210 A1.1.3	Bandwidth Requirement	Compliant	
2.5		RSS-Gen 6.0	Receiver Spurious Emissions	Compliant	

1.3 PRODUCT INFORMATION

1.3.1 EUT General Description

The Equipment Under Test (EUT) was an AnyDATA ACT233L 4G Vehicle Tracker with Hotspot as shown in the photograph below. The EUT connects to a vehicle's OBD2 port; it enables remote functions and vehicle tracking through a Smartphone app.





1.3.2 EUT General Description

EUT Description	ACT233L 4G Vehicle Tracker with Hotspot
Model Number(s)	ACT233L
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	300MHz = -6dBi 319MHz = -6dBi 434MHz = -8dBi

1.3.3 Maximum Radiated Output Power

Transmitter Frequency (MHz)	Field Strength (dBμV/m @ 3 meters)		Part 15.231(b) limits in dBμV/m
	ASK modulation	FSK modulation	
300.00	63.3	62.1	74.68
309.50	68.4	66.7	75.29
319.00	70.3	70.8	75.86
433.92	66.5	66.2	80.80

1.4 EUT TEST CONFIGURATION

1.4.1 Test Configuration Description

Test Configuration	Description
Default	Radiated test setup. EUT transmitting through integral antenna.

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

1.4.4 Worst Case Configuration

Worst-case configuration used in this test report as per peak output power measurements:

Modulation	Frequency
ASK	319 MHz
FSK	319 MHz

EUT is a mobile device. For radiated measurements X, Y and Z orientations were verified. Worst case position is "X".



1.4.5 Simplified Test Configuration Diagram

Radiated Test Configuration



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 20130418001831		
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 C63.4-2009, 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 C63.4-2009. The test modes were adapted according to the Operating Instructions provided by the manufacturer/client.

1.8 TEST FACILITY

1.8.1 FCC – Registration No.: US5296

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 §2.498 of the FCC rules. The acceptance letter from the FCC is maintained in our files and the Registration is US5296.

1.8.2 Industry Canada (IC) Registration No.: 3067A

The 10m Semi-anechoic chamber of TUV SUD America Inc. (San Diego) has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No. 3067A.



SECTION 2

TEST DETAILS

Radio Testing of the
AnyDATA
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)

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: 20130418001831/ Default Test Configuration

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

May 08, 2013/FSC

2.2.5 Test Equipment Used

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

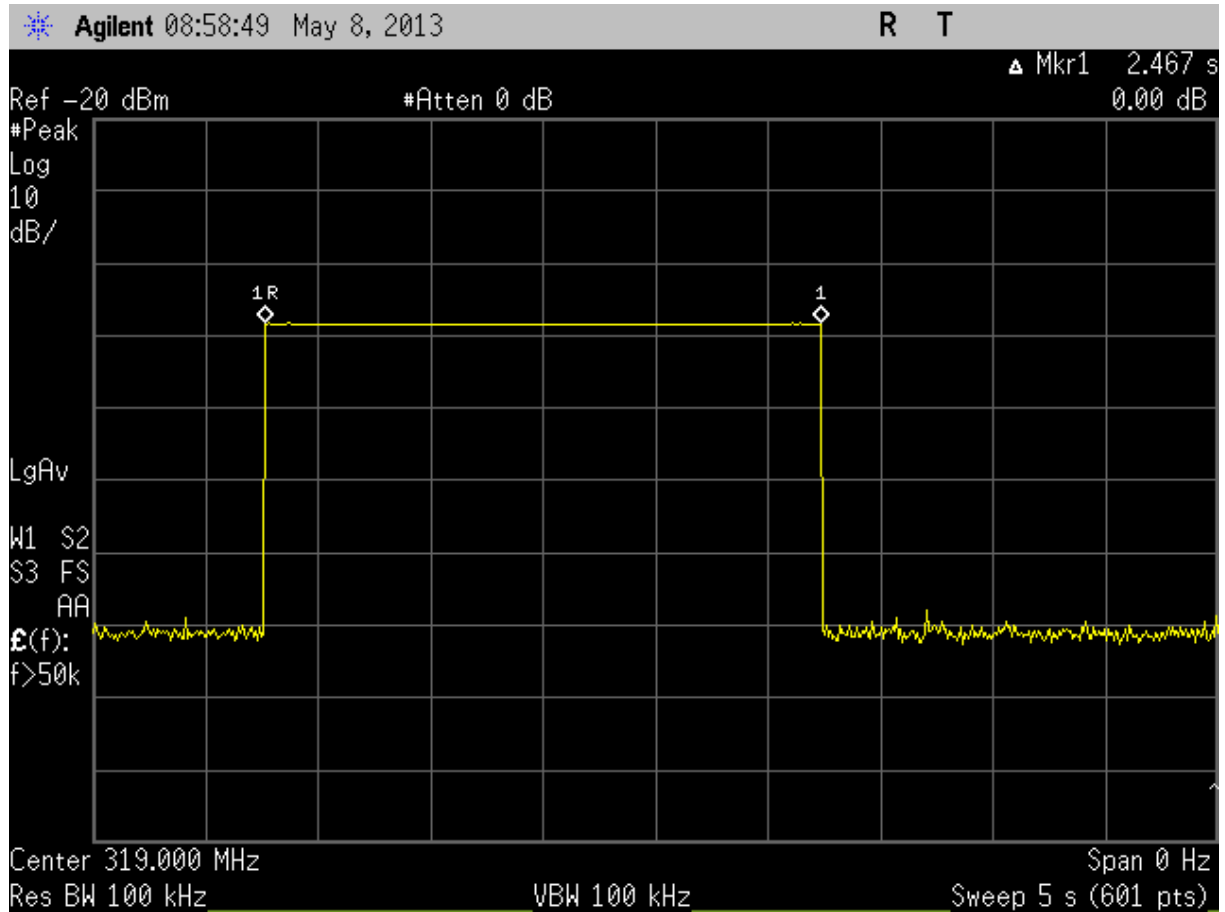
2.2.6 Environmental Conditions

Ambient Temperature	24.2°C
Relative Humidity	45.7%
ATM Pressure	99.5 kPa

2.2.7 Additional Observations

- Only worst case configuration presented, there are no differences in test results between different channels/modulation combinations.
- Span is set to zero.
- Sweep time set to 5 seconds.
- EUT is set to worst case transmit mode and was observed for five (5) seconds.
- EUT verified to cease transmission within 5 seconds of automatic activation (simulated – activated through software).

2.2.8 Test Result Plot



2.3 FIELD STRENGTH OF EMISSIONS

2.3.1 Specification Reference

Part 15 Subpart C §15.231(b)

2.3.2 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

2.3.3 Equipment Under Test and Modification State

Serial No: 20130418001831/ Default Test Configuration

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

May 08, 2013/FSC

2.3.5 Test Equipment Used

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

2.3.6 Environmental Conditions

Ambient Temperature	24.2°C
Relative Humidity	45.7%
ATM Pressure	99.5 kPa

2.3.7 Additional Observations

- This is a radiated test. The spectrum was searched from 30MHz to the 10th harmonic (5GHz), up to 18GHz presented.



- There are no emissions found that do not comply with the restricted bands defined in FCC Part 15 Subpart C, 15.205.
- Only the considered worst case configuration presented for radiated emissions above 1GHz. There are no significant differences in radiated emissions between all channels and modulation types.
- 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 2.3.8 for sample computation.

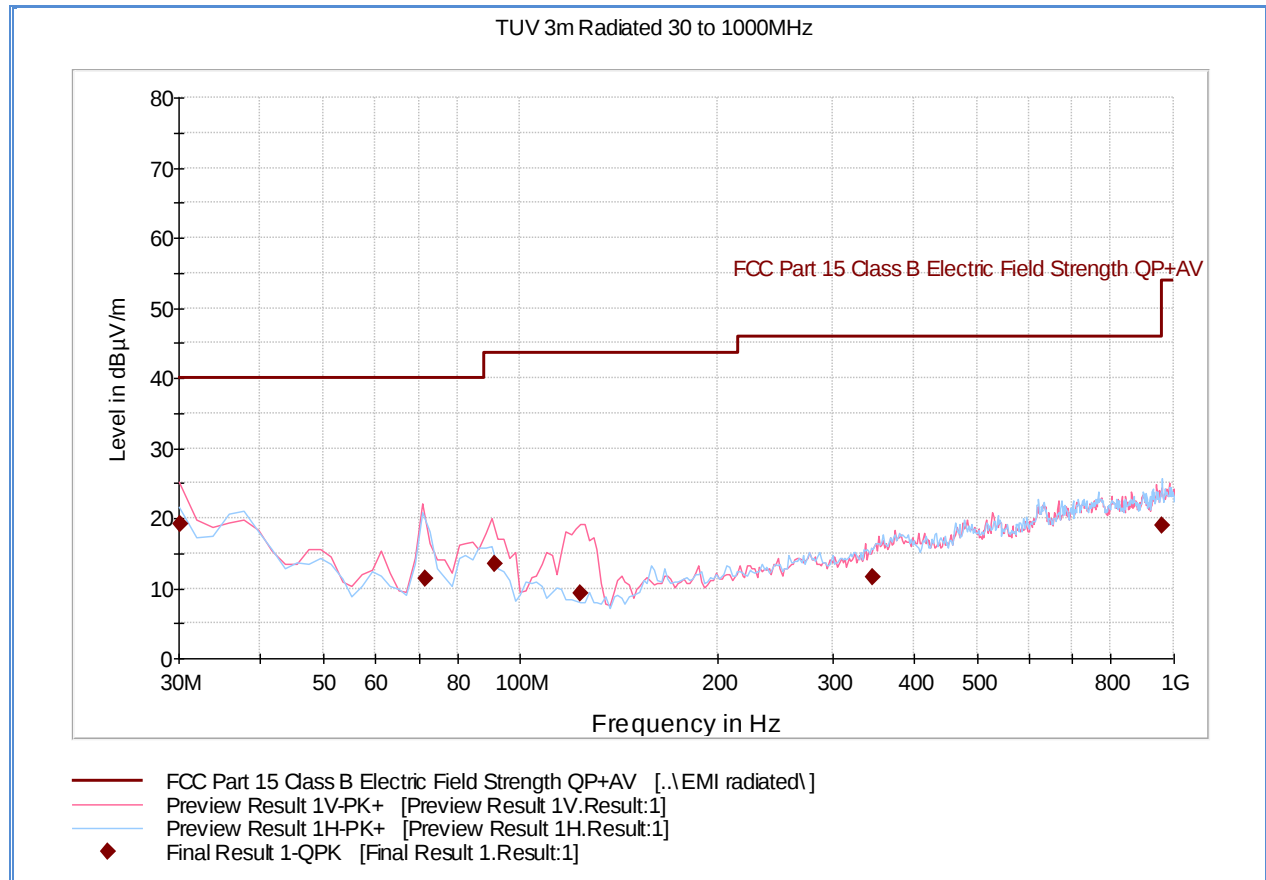
2.3.8 Sample Computation (Radiated Emission)

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

2.3.9 Test Results

See attached plots.

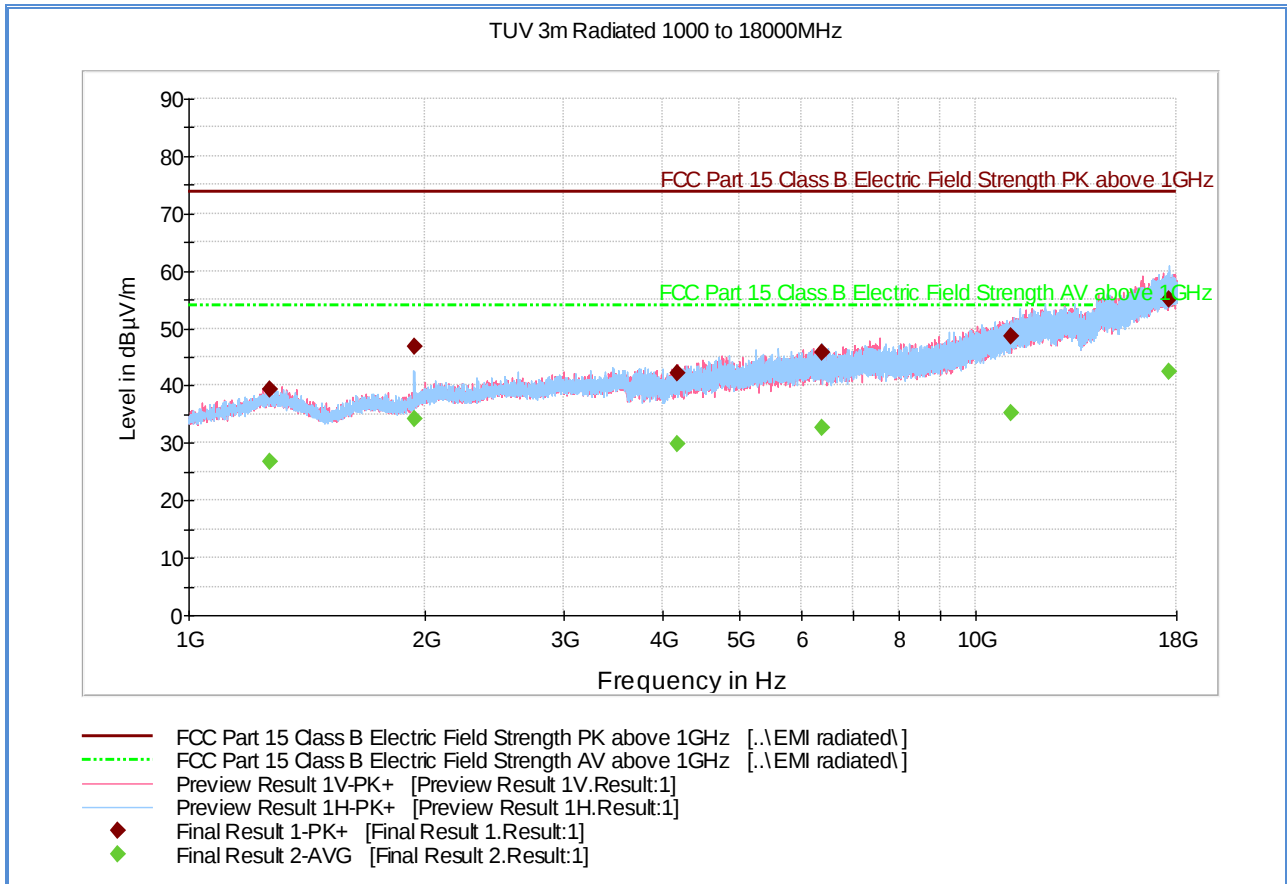
2.3.10 Test Results Below 1GHz (Receive Mode)



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)
30.200000	19.2	1000.0	120.000	350.0	V	221.0	-11.8	20.8	40.0
71.381643	11.4	1000.0	120.000	100.0	V	332.0	-21.7	28.6	40.0
91.540521	13.6	1000.0	120.000	110.0	V	244.0	-20.3	29.9	43.5
123.586613	9.3	1000.0	120.000	105.0	V	156.0	-20.3	34.2	43.5
346.077595	11.6	1000.0	120.000	309.0	V	173.0	-10.2	34.4	46.0
960.258357	18.9	1000.0	120.000	200.0	H	129.0	0.8	35.0	53.9

2.3.11 Test Results Above 1GHz (Receive Mode)



Peak Data

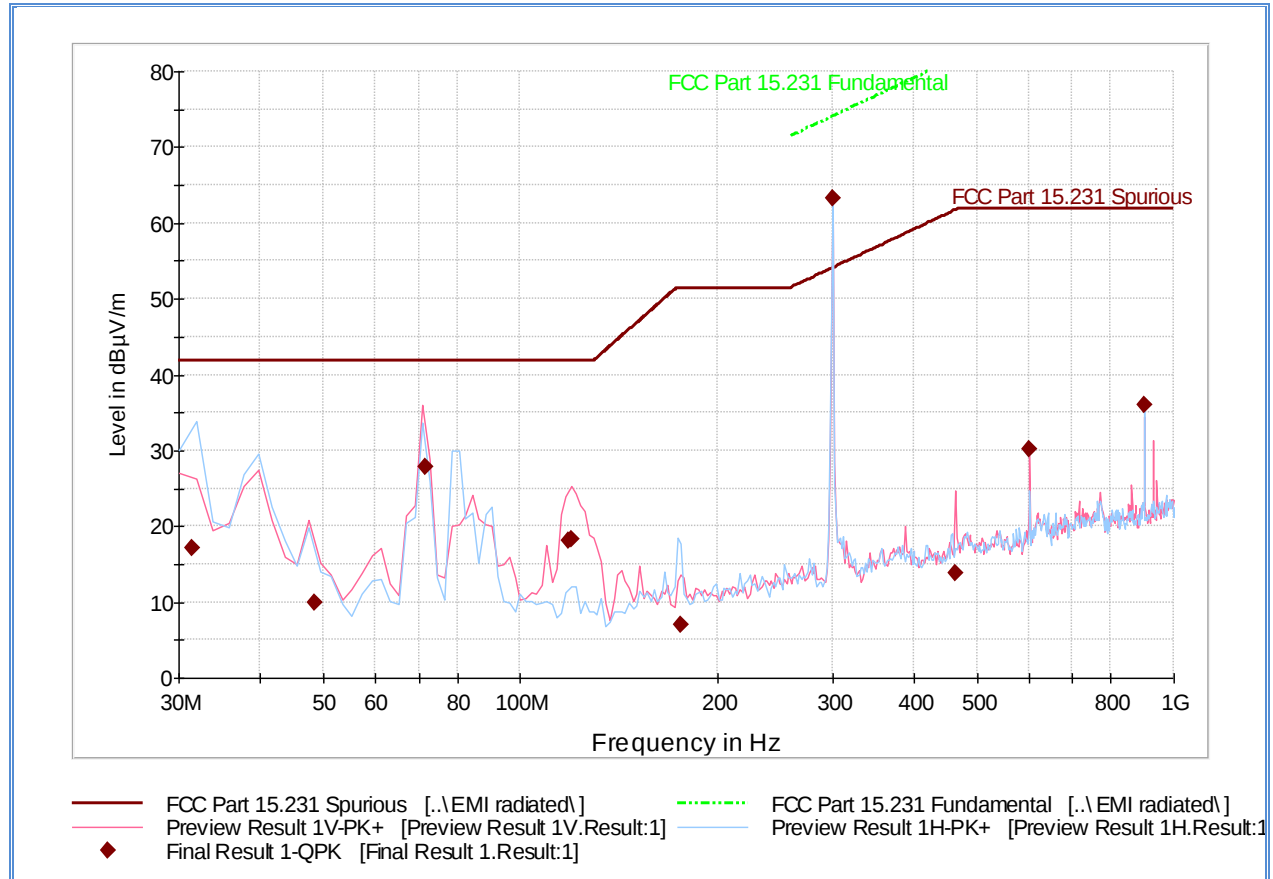
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1270.886667	39.3	1000.0	1000.000	400.4	V	15.0	-4.8	34.6	73.9
1932.746667	46.7	1000.0	1000.000	99.8	H	43.0	-2.0	27.2	73.9
4177.726667	42.3	1000.0	1000.000	307.2	V	15.0	3.7	31.6	73.9
6369.073333	45.8	1000.0	1000.000	209.5	H	302.0	8.4	28.1	73.9
11114.333333	48.5	1000.0	1000.000	400.4	H	331.0	14.6	25.4	73.9
17648.44000	55.0	1000.0	1000.000	296.3	H	10.0	22.1	18.9	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)
1270.886667	26.9	1000.0	1000.000	400.4	V	15.0	-4.8	27.0	53.9
1932.746667	34.3	1000.0	1000.000	99.8	H	43.0	-2.0	19.6	53.9
4177.726667	29.8	1000.0	1000.000	307.2	V	15.0	3.7	24.1	53.9
6369.073333	32.5	1000.0	1000.000	209.5	H	302.0	8.4	21.4	53.9
11114.333333	35.2	1000.0	1000.000	400.4	H	331.0	14.6	18.7	53.9
17648.44000	42.3	1000.0	1000.000	296.3	H	10.0	22.1	11.6	53.9

Test Notes: No significant emissions observed.

2.3.12 Test Results Below 1GHz (300MHz ASK)



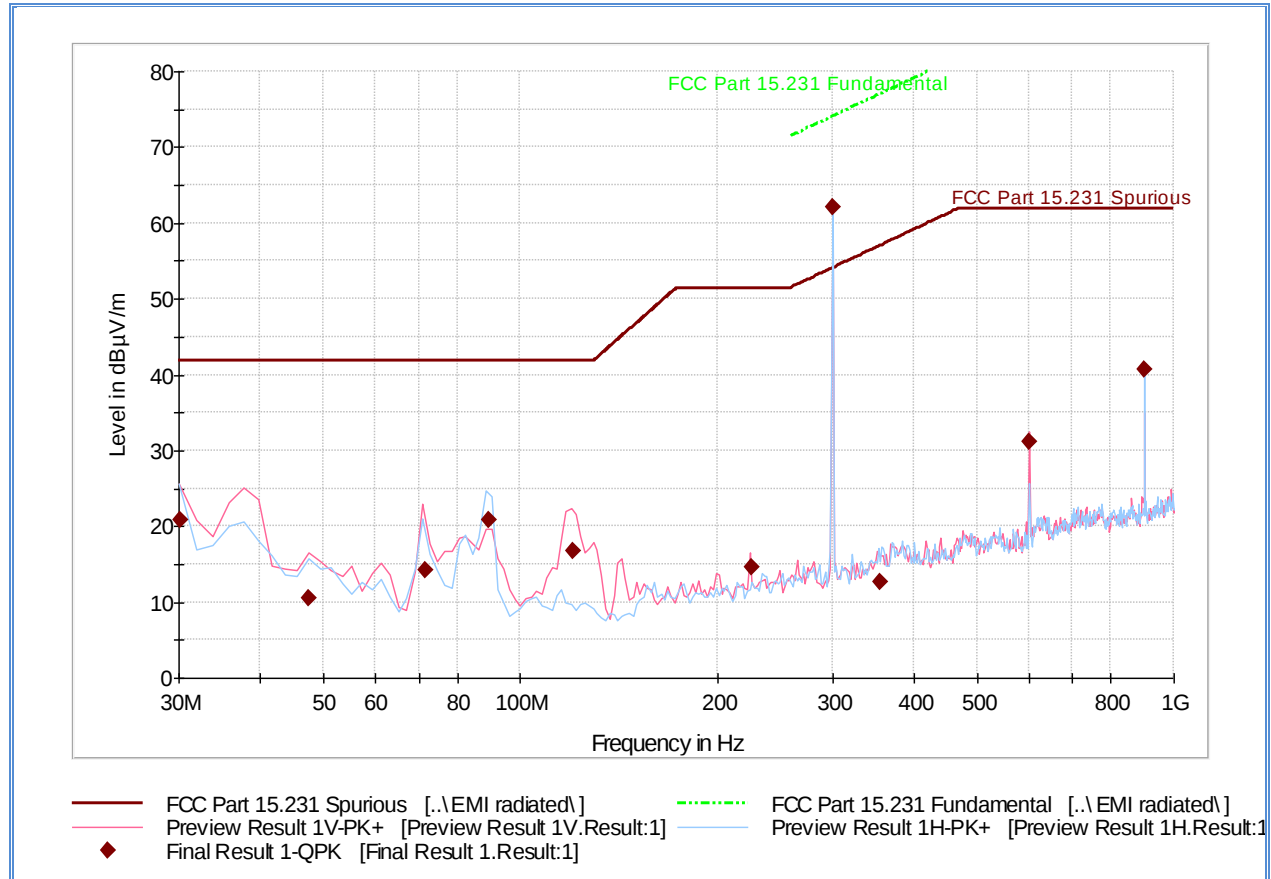
Limits used between 40.66-40.70MHz is the stringent 125µV/m, requirement is 225µV/m.

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)
31.480000	17.2	1000.0	120.000	311.0	H	198.0	-12.5	24.7	41.9
48.294990	10.0	1000.0	120.000	142.0	V	66.0	-19.5	31.9	41.9
71.581643	27.8	1000.0	120.000	100.0	V	242.0	-21.7	14.1	41.9
118.698838	18.1	1000.0	120.000	106.0	V	235.0	-20.2	23.9	41.9
119.946613	18.4	1000.0	120.000	100.0	V	216.0	-20.2	23.6	41.9
176.127695	6.9	1000.0	120.000	168.0	H	220.0	-16.9	44.5	51.5
300.000401	63.3	1000.0	120.000	100.0	V	266.0	-12.5	11.4	74.7
462.526974	13.7	1000.0	120.000	344.0	V	308.0	-7.4	47.9	61.6
600.023006	30.2	1000.0	120.000	100.0	V	88.0	-5.2	31.7	61.9
899.981723	36.0	1000.0	120.000	100.0	H	63.0	0.6	25.9	61.9

Test Notes: There are no emissions found that do not comply with the restricted bands defined in FCC Part 15 Subpart C, 15.205.

2.3.13 Test Results Below 1GHz (300MHz FSK)



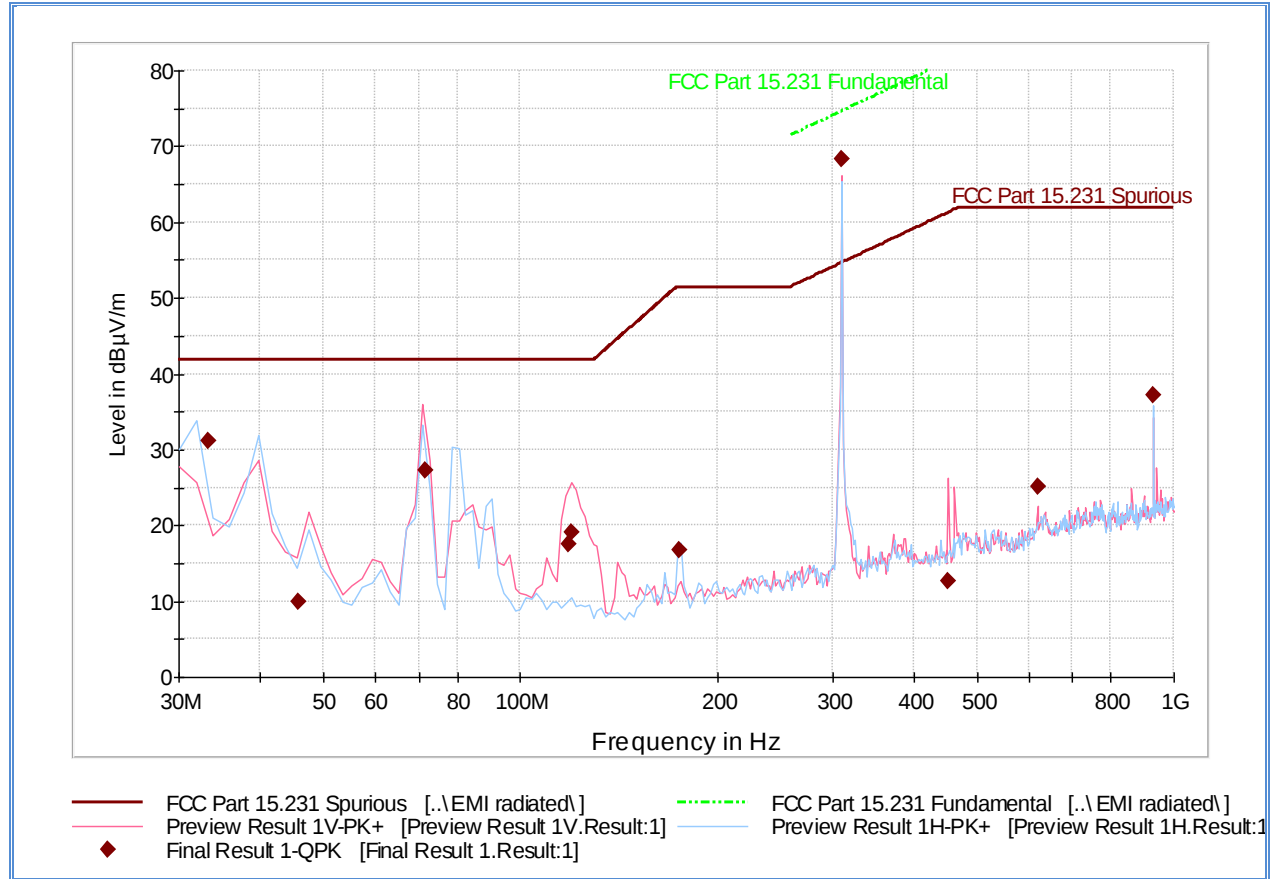
Limits used between 40.66-40.70MHz is the stringent 125µV/m, requirement is 225µV/m.

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)
30.120000	20.8	1000.0	120.000	109.0	V	29.0	-11.8	21.1	41.9
47.534990	10.5	1000.0	120.000	100.0	V	308.0	-19.3	31.4	41.9
71.501643	14.1	1000.0	120.000	100.0	V	223.0	-21.7	27.8	41.9
89.636633	20.8	1000.0	120.000	109.0	H	264.0	-20.5	21.1	41.9
120.066613	16.7	1000.0	120.000	100.0	V	206.0	-20.2	25.3	41.9
225.508778	14.5	1000.0	120.000	100.0	V	97.0	-14.5	36.9	51.5
300.080401	62.1	1000.0	120.000	100.0	H	222.0	-12.5	12.6	74.7
355.293146	12.7	1000.0	120.000	160.0	H	0.0	-9.5	44.3	57.0
600.143006	31.1	1000.0	120.000	100.0	V	261.0	-5.2	30.8	61.9
900.261723	40.7	1000.0	120.000	100.0	H	217.0	0.6	21.2	61.9

Test Notes: There are no emissions found that do not comply with the restricted bands defined in FCC Part 15 Subpart C, 15.205.

2.3.14 Test Results Below 1GHz (309.5MHz ASK)



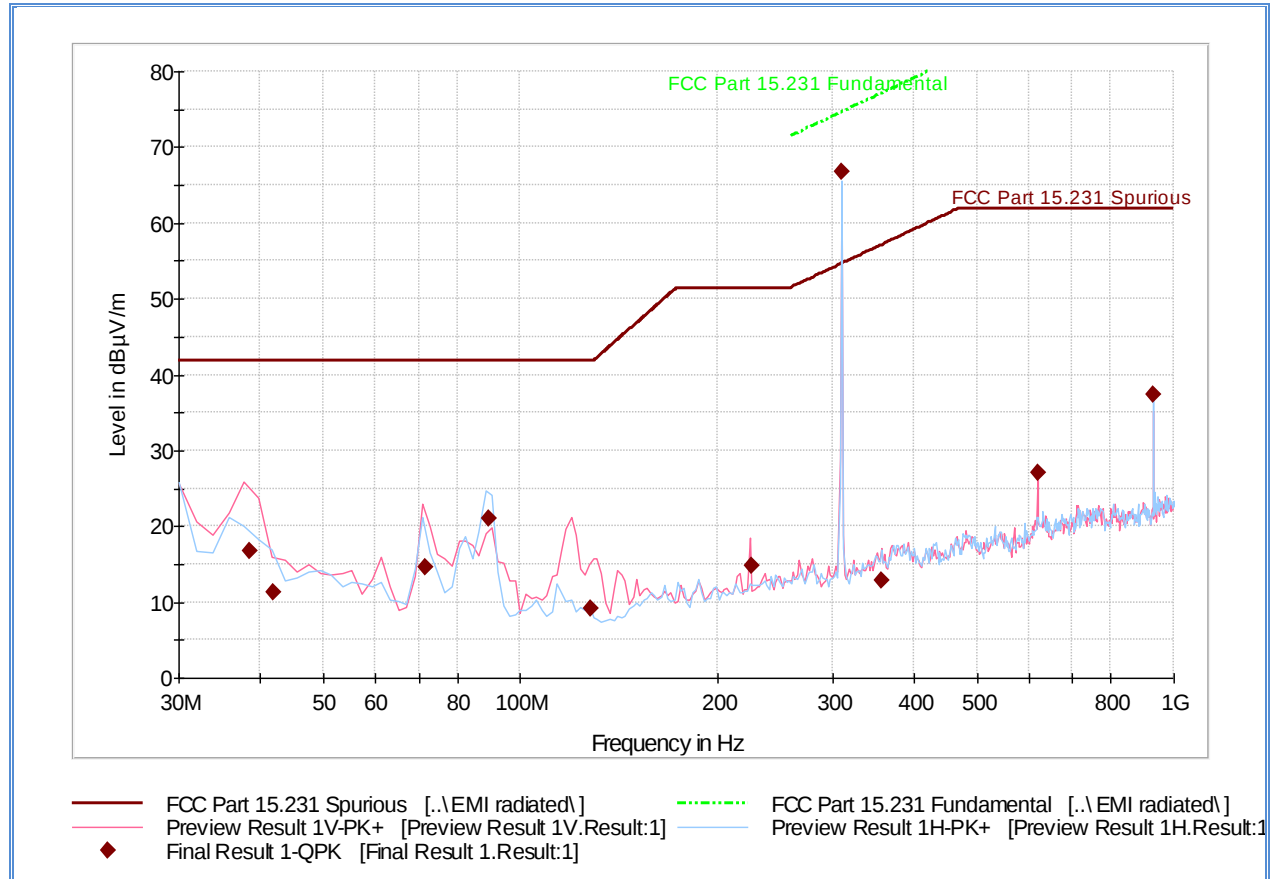
Limits used between 40.66-40.70MHz is the stringent 125µV/m, requirement is 225µV/m..

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)
33.360000	31.1	1000.0	120.000	100.0	H	22.0	-13.6	10.9	41.9
45.814990	9.9	1000.0	120.000	115.0	V	66.0	-18.9	32.1	41.9
71.541643	27.2	1000.0	120.000	100.0	V	189.0	-21.7	14.7	41.9
118.498838	17.5	1000.0	120.000	100.0	V	222.0	-20.2	24.4	41.9
119.906613	19.1	1000.0	120.000	100.0	V	129.0	-20.2	22.8	41.9
175.231583	16.7	1000.0	120.000	196.0	H	242.0	-17.0	34.8	51.5
309.519840	68.4	1000.0	120.000	100.0	V	267.0	-12.2	6.9	75.3
451.183647	12.6	1000.0	120.000	100.0	V	14.0	-8.5	48.6	61.2
619.037996	25.1	1000.0	120.000	100.0	V	90.0	-3.0	36.8	61.9
928.540040	37.2	1000.0	120.000	100.0	H	242.0	-0.1	24.7	61.9

Test Notes: There are no emissions found that do not comply with the restricted bands defined in FCC Part 15 Subpart C, 15.205.

2.3.15 Test Results Below 1GHz (309.5MHz FSK)



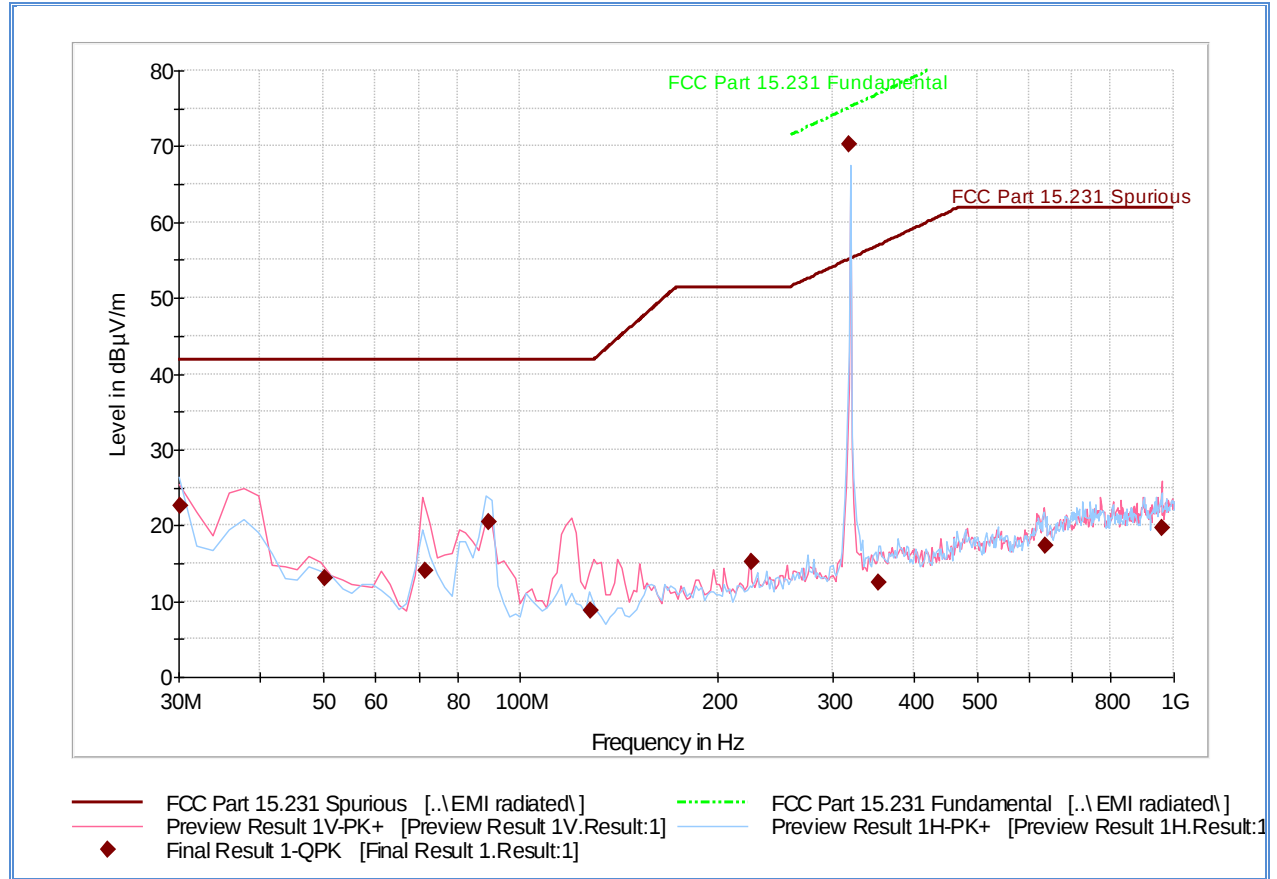
Limits used between 40.66-40.70MHz is the stringent 125µV/m, requirement is 225µV/m..

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)
38.535551	16.7	1000.0	120.000	100.0	V	289.0	-16.1	25.2	41.9
41.807214	11.2	1000.0	120.000	100.0	V	73.0	-17.5	30.7	41.9
71.581643	14.6	1000.0	120.000	100.0	V	260.0	-21.7	27.3	41.9
89.236633	21.0	1000.0	120.000	109.0	H	264.0	-20.5	21.0	41.9
128.018277	9.1	1000.0	120.000	100.0	V	265.0	-20.4	32.8	41.9
225.548778	14.7	1000.0	120.000	123.0	V	245.0	-14.5	36.8	51.5
309.599840	66.7	1000.0	120.000	100.0	H	79.0	-12.2	8.6	75.3
357.333146	12.8	1000.0	120.000	282.0	V	110.0	-9.7	44.3	57.1
618.877996	27.0	1000.0	120.000	100.0	V	255.0	-3.0	35.0	61.9
928.300040	37.4	1000.0	120.000	100.0	H	211.0	-0.1	24.5	61.9

Test Notes: There are no emissions found that do not comply with the restricted bands defined in FCC Part 15 Subpart C, 15.205.

2.3.16 Test Results Below 1GHz (319MHz ASK)



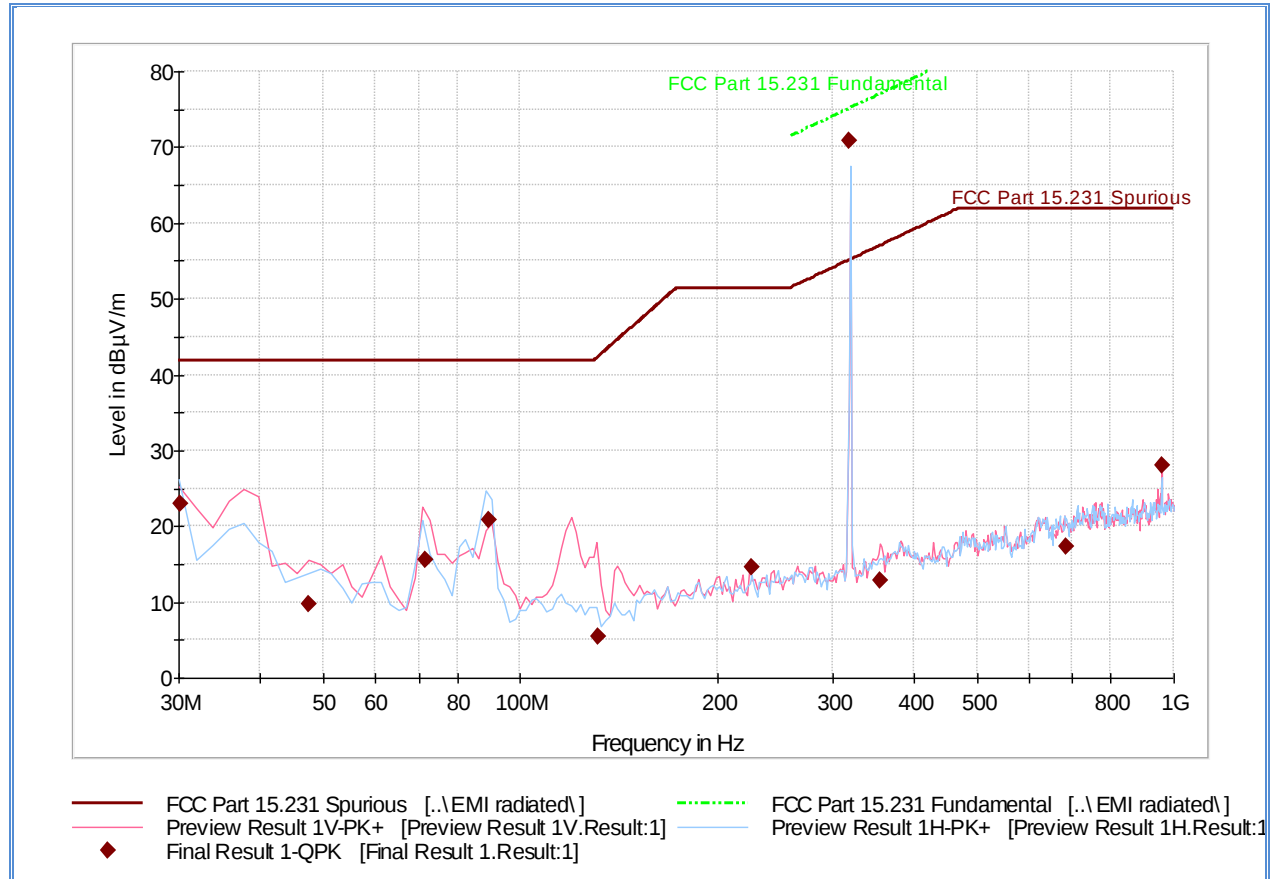
Limits used between 40.66-40.70MHz is the stringent 125µV/m, requirement is 225µV/m.

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)
30.200000	22.6	1000.0	120.000	109.0	H	132.0	-11.8	19.4	41.9
50.094990	13.0	1000.0	120.000	201.0	V	59.0	-19.9	28.9	41.9
71.581643	14.0	1000.0	120.000	100.0	V	261.0	-21.7	28.0	41.9
89.476633	20.5	1000.0	120.000	109.0	H	243.0	-20.5	21.5	41.9
127.978277	8.8	1000.0	120.000	353.0	V	249.0	-20.4	33.1	41.9
225.508778	15.2	1000.0	120.000	100.0	V	315.0	-14.5	36.2	51.5
318.999279	70.3	1000.0	120.000	100.0	H	228.0	-11.8	5.6	75.9
353.005371	12.4	1000.0	120.000	341.0	H	79.0	-9.5	44.5	56.9
634.885210	17.2	1000.0	120.000	278.0	V	167.0	-3.0	44.7	61.9
957.034469	19.7	1000.0	120.000	220.0	V	278.0	0.7	42.2	61.9

Test Notes: There are no emissions found that do not comply with the restricted bands defined in FCC Part 15 Subpart C, 15.205.

2.3.17 Test Results Below 1GHz (319MHz FSK)



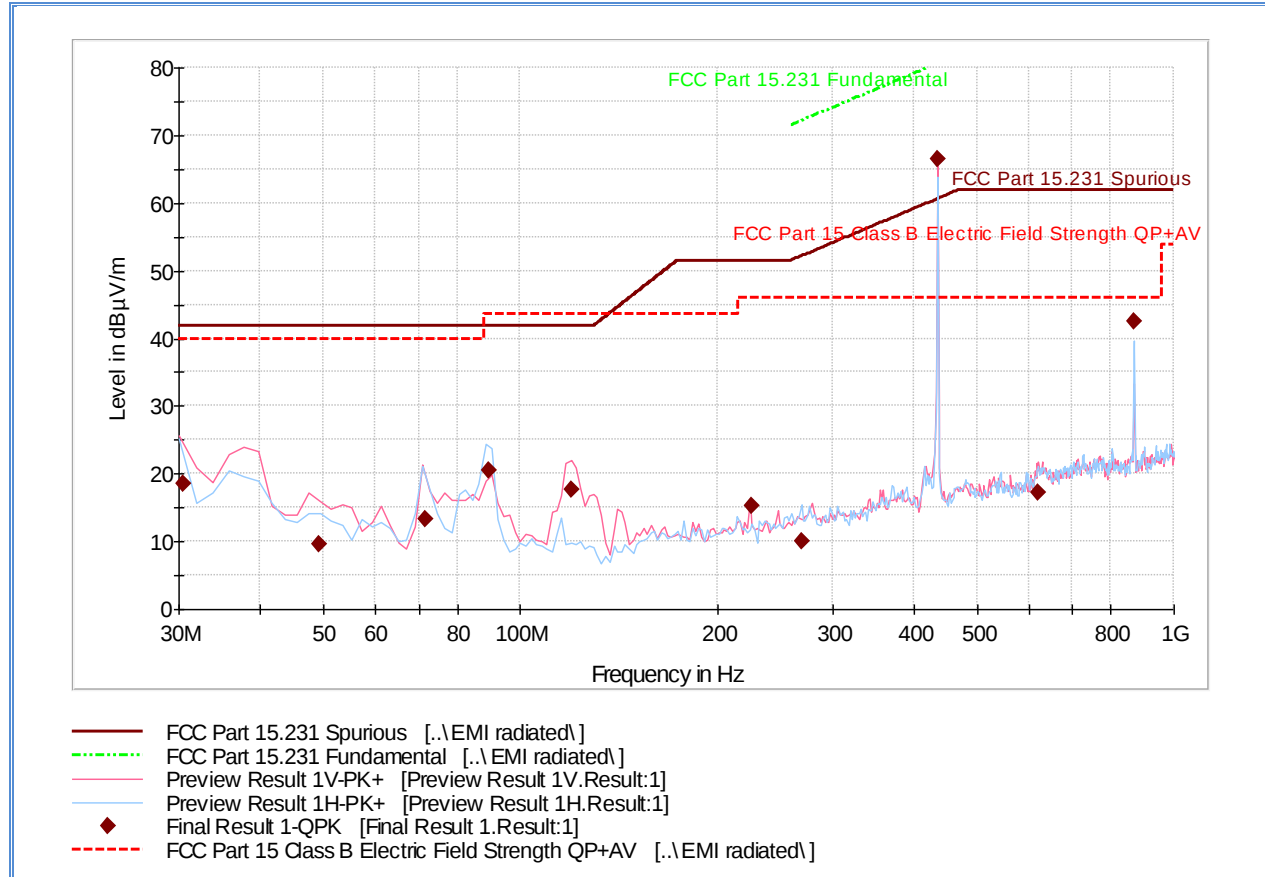
Limits used between 40.66-40.70MHz is the stringent 125µV/m, requirement is 225µV/m..

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)
30.200000	22.9	1000.0	120.000	123.0	H	154.0	-11.8	19.0	41.9
47.494990	9.6	1000.0	120.000	163.0	V	47.0	-19.3	32.3	41.9
71.541643	15.5	1000.0	120.000	100.0	V	261.0	-21.7	26.4	41.9
89.276633	20.8	1000.0	120.000	100.0	H	235.0	-20.5	21.1	41.9
131.602164	5.4	1000.0	120.000	100.0	V	117.0	-20.3	36.9	42.3
225.548778	14.6	1000.0	120.000	100.0	V	257.0	-14.5	36.8	51.5
319.079279	70.8	1000.0	120.000	100.0	H	228.0	-11.8	5.1	75.9
355.069259	12.8	1000.0	120.000	253.0	V	9.0	-9.5	44.2	57.0
682.498517	17.4	1000.0	120.000	216.0	V	352.0	-2.7	44.5	61.9
957.234469	28.1	1000.0	120.000	100.0	V	272.0	0.7	33.8	61.9

Test Notes: There are no emissions found that do not comply with the restricted bands defined in FCC Part 15 Subpart C, 15.205.

2.3.18 Test Results Below 1GHz (433.92MHz ASK)



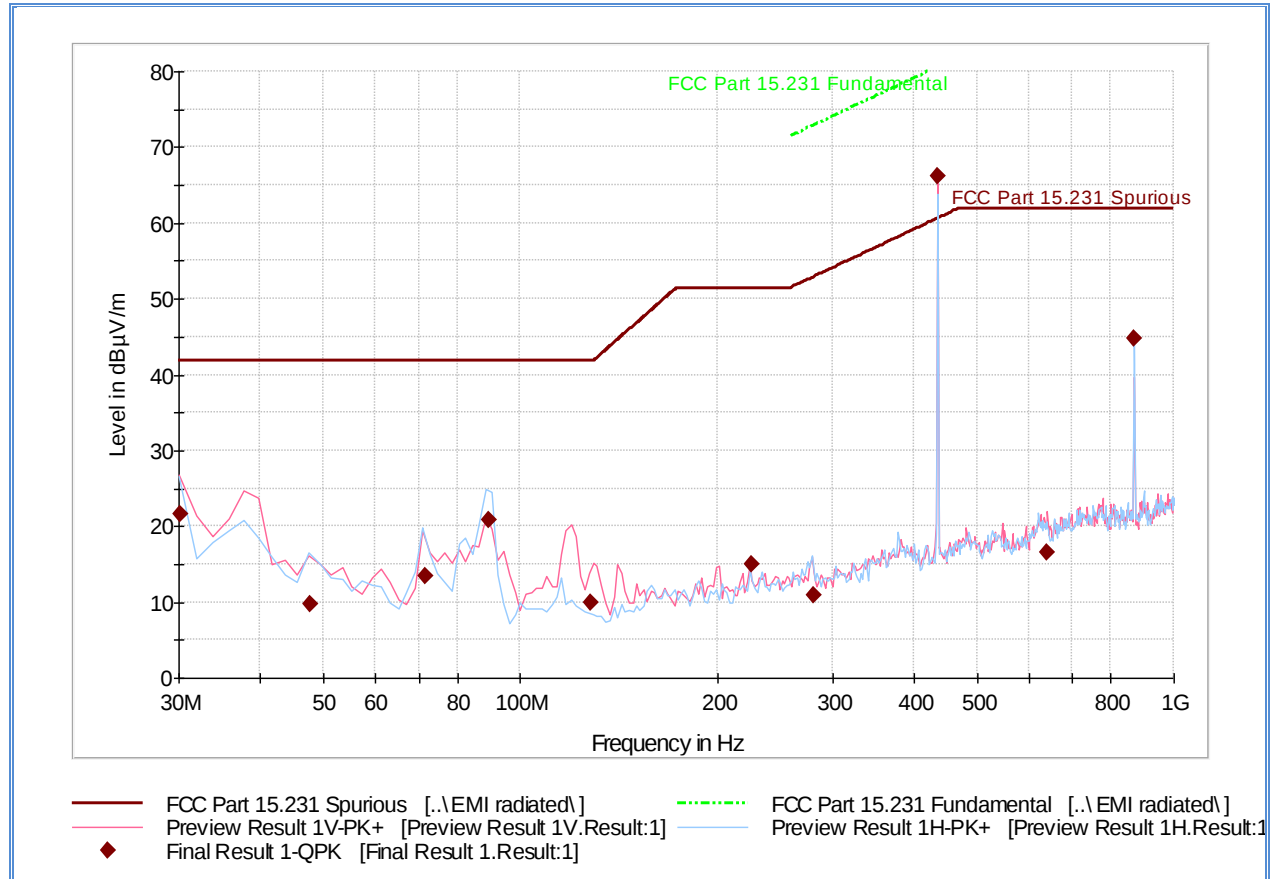
Limits used between 40.66-40.70MHz is the stringent 125µV/m, requirement is 225µV/m.

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)
30.480000	18.6	1000.0	120.000	100.0	V	308.0	-12.0	23.4	41.9
49.294990	9.7	1000.0	120.000	197.0	V	271.0	-19.7	32.3	41.9
71.461643	13.4	1000.0	120.000	100.0	V	260.0	-21.7	28.6	41.9
89.436633	20.4	1000.0	120.000	100.0	H	220.0	-20.5	21.5	41.9
119.706613	17.7	1000.0	120.000	128.0	V	85.0	-20.2	24.2	41.9
225.508778	15.3	1000.0	120.000	100.0	V	244.0	-14.5	36.2	51.5
269.538196	10.0	1000.0	120.000	154.0	H	3.0	-12.7	42.1	52.1
433.928657	66.5	1000.0	120.000	118.0	V	282.0	-8.6	14.3	80.8
619.861884	17.3	1000.0	120.000	304.0	V	278.0	-2.9	44.7	61.9
867.855631	42.6	1000.0	120.000	100.0	H	44.0	-0.7	19.3	61.9

Test Notes: There are no emissions found that do not comply with the restricted bands defined in FCC Part 15 Subpart C, 15.205.

2.3.19 Test Results Below 1GHz (433.92MHz FSK)



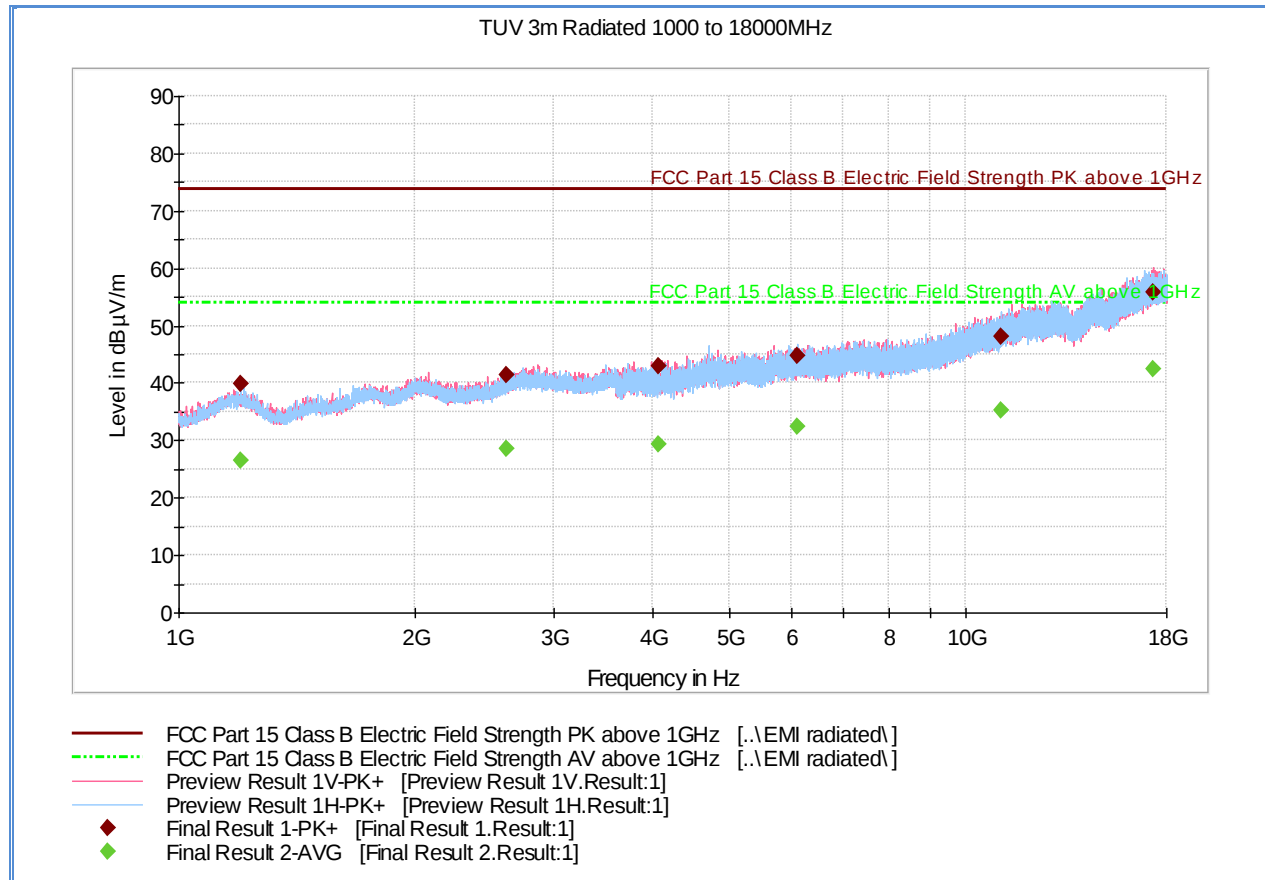
Limits used between 40.66-40.70MHz is the stringent 125µV/m, requirement is 225µV/m.

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)
30.160000	21.5	1000.0	120.000	100.0	V	295.0	-11.8	20.4	41.9
47.574990	9.8	1000.0	120.000	100.0	H	88.0	-19.3	32.2	41.9
71.381643	13.5	1000.0	120.000	100.0	H	45.0	-21.7	28.5	41.9
89.276633	20.9	1000.0	120.000	100.0	H	264.0	-20.5	21.1	41.9
127.978277	10.0	1000.0	120.000	109.0	V	289.0	-20.4	32.0	41.9
225.508778	15.0	1000.0	120.000	136.0	V	320.0	-14.5	36.5	51.5
280.297635	10.9	1000.0	120.000	187.0	H	338.0	-12.2	42.0	52.8
434.008657	66.2	1000.0	120.000	123.0	V	282.0	-8.6	14.6	80.8
638.860762	16.6	1000.0	120.000	306.0	V	212.0	-3.3	45.3	61.9
867.719519	44.7	1000.0	120.000	100.0	H	223.0	-0.7	17.2	61.9

Test Notes: There are no emissions found that do not comply with the restricted bands defined in FCC Part 15 Subpart C, 15.205.

2.3.20 Test Results Above 1GHz (Worst case configuration ASK)



Peak Data

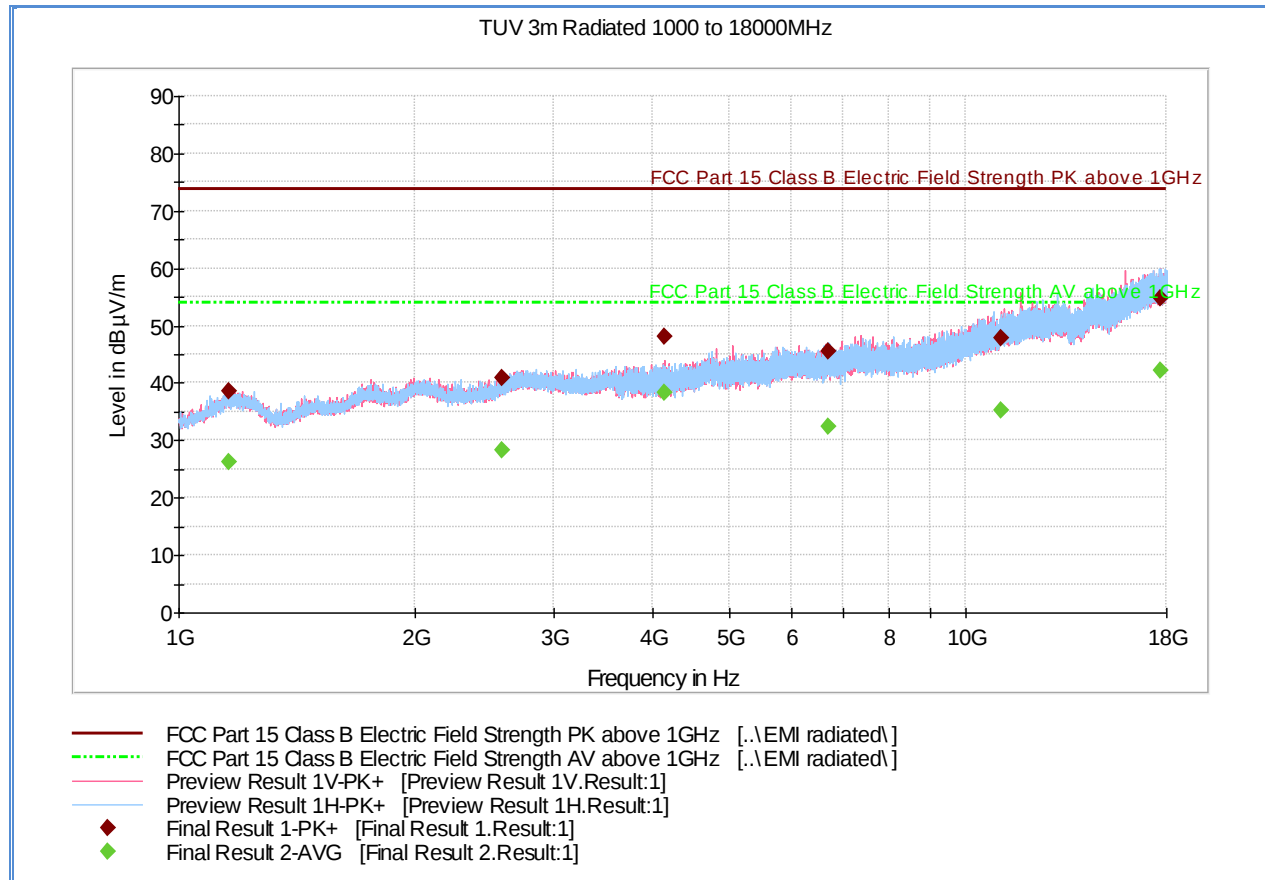
Frequency (MHz)	MaxPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1198.993333	39.8	1000.0	1000.000	247.4	H	101.0	-5.1	34.1	73.9
2613.886667	41.5	1000.0	1000.000	121.8	H	10.0	0.4	32.4	73.9
4080.693333	42.8	1000.0	1000.000	136.8	V	86.0	3.7	31.1	73.9
6124.466667	44.8	1000.0	1000.000	183.6	H	133.0	8.2	29.1	73.9
11085.913333	48.1	1000.0	1000.000	369.2	H	67.0	14.6	25.8	73.9
17287.226667	55.8	1000.0	1000.000	203.5	V	208.0	21.8	18.1	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)
1198.993333	26.6	1000.0	1000.000	247.4	H	101.0	-5.1	27.3	53.9
2613.886667	28.7	1000.0	1000.000	121.8	H	10.0	0.4	25.2	53.9
4080.693333	29.4	1000.0	1000.000	136.8	V	86.0	3.7	24.5	53.9
6124.466667	32.4	1000.0	1000.000	183.6	H	133.0	8.2	21.5	53.9
11085.913333	35.3	1000.0	1000.000	369.2	H	67.0	14.6	18.6	53.9
17287.226667	42.5	1000.0	1000.000	203.5	V	208.0	21.8	11.4	53.9

Test Notes: Measurement was performed with a 900MHz High Pass filter. No spurious emissions observed above 1GHz.

2.3.21 Test Results Above 1GHz (Worst case configuration 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)
1158.166667	38.7	1000.0	1000.000	101.8	H	293.0	-5.3	35.2	73.9
2578.986667	40.8	1000.0	1000.000	298.3	V	142.0	0.2	33.1	73.9
4148.093333	48.1	1000.0	1000.000	134.8	V	176.0	3.7	25.8	73.9
6683.153333	45.5	1000.0	1000.000	400.1	H	263.0	8.4	28.4	73.9
11099.153333	47.8	1000.0	1000.000	227.5	V	86.0	14.6	26.1	73.9
17681.233333	54.9	1000.0	1000.000	400.1	V	189.0	22.1	19.0	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)
1158.166667	26.2	1000.0	1000.000	101.8	H	293.0	-5.3	27.7	53.9
2578.986667	28.2	1000.0	1000.000	298.3	V	142.0	0.2	25.7	53.9
4148.093333	38.4	1000.0	1000.000	134.8	V	176.0	3.7	15.5	53.9
6683.153333	32.4	1000.0	1000.000	400.1	H	263.0	8.4	21.5	53.9
11099.153333	35.2	1000.0	1000.000	227.5	V	86.0	14.6	18.7	53.9
17681.233333	42.1	1000.0	1000.000	400.1	V	189.0	22.1	11.8	53.9

Test Notes: Measurement was performed with a 900MHz High Pass filter. No spurious emissions observed above 1GHz.



2.4 BANDWIDTH REQUIREMENT

2.4.1 Specification Reference

Part 15 Subpart C §15.231(c)

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: 20130418001831/ Default Test Configuration

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

May 09, 2013/FSC

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	24.2°C
Relative Humidity	44.1%
ATM Pressure	99.4 kPa

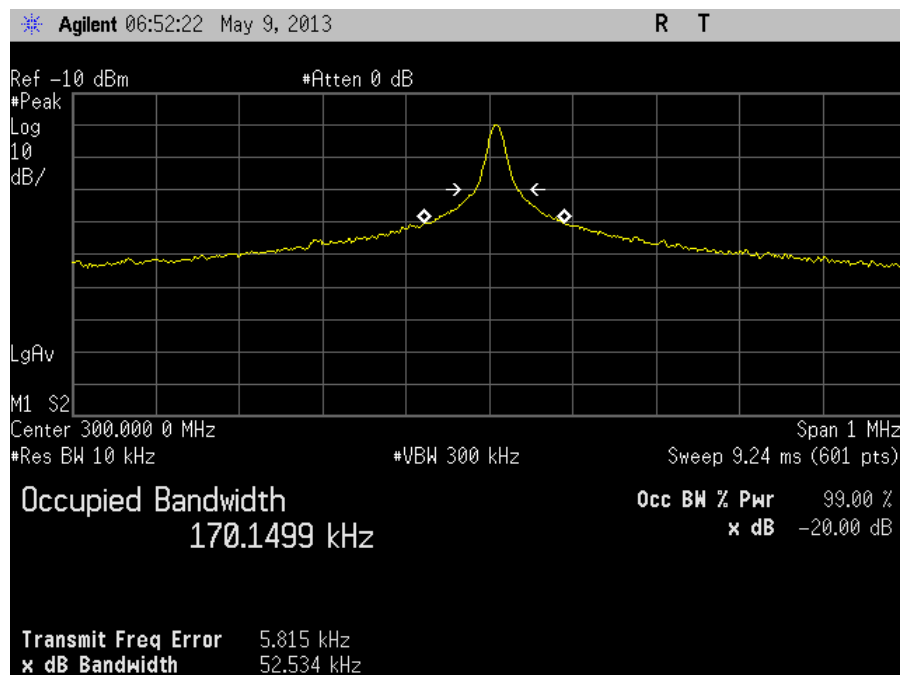
2.4.7 Additional Observations

- 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 requirement.
- Occupied bandwidth % power set to 99% for IC requirement.

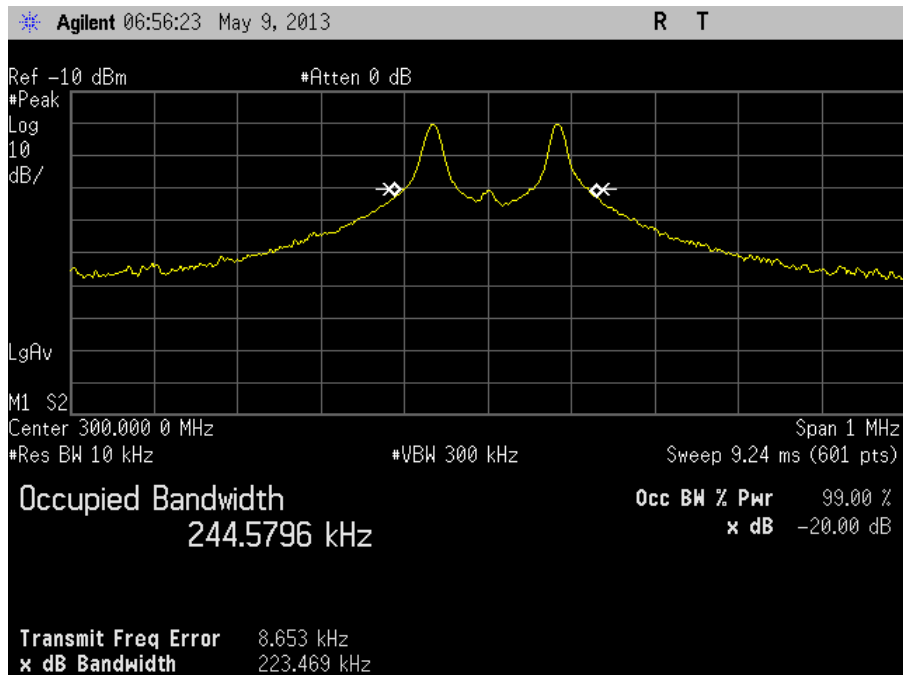
2.4.8 Test Results

Transmitter Frequency (MHz)	Modulation	0.25% of the center frequency requirement	Measured 20dB Bandwidth (MHz)	99% Bandwidth (MHz)
300.00	ASK	<750 kHz	52.534 kHz	170.15 kHz
300.00	FSK	<750 kHz	223.469 kHz	244.58 kHz
309.50	ASK	<773.75 kHz	55.250 kHz	262.53 kHz
309.50	FSK	<773.75 kHz	231.751 kHz	268.21 kHz
319.00	ASK	<797.5 kHz	53.000 kHz	164.47 kHz
319.00	FSK	<797.5 kHz	228.507 kHz	250.00 kHz
433.92	ASK	<1.0848 MHz	54.465 kHz	218.30 kHz
433.92	FSK	<1.0848 MHz	219.693 kHz	246.35 kHz

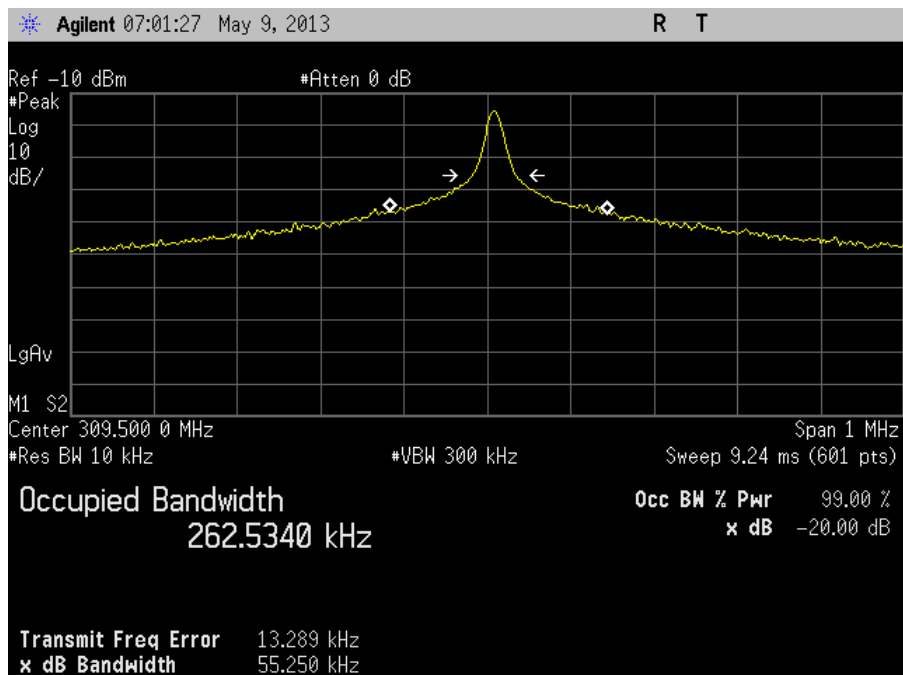
2.4.9 Test Results Plots



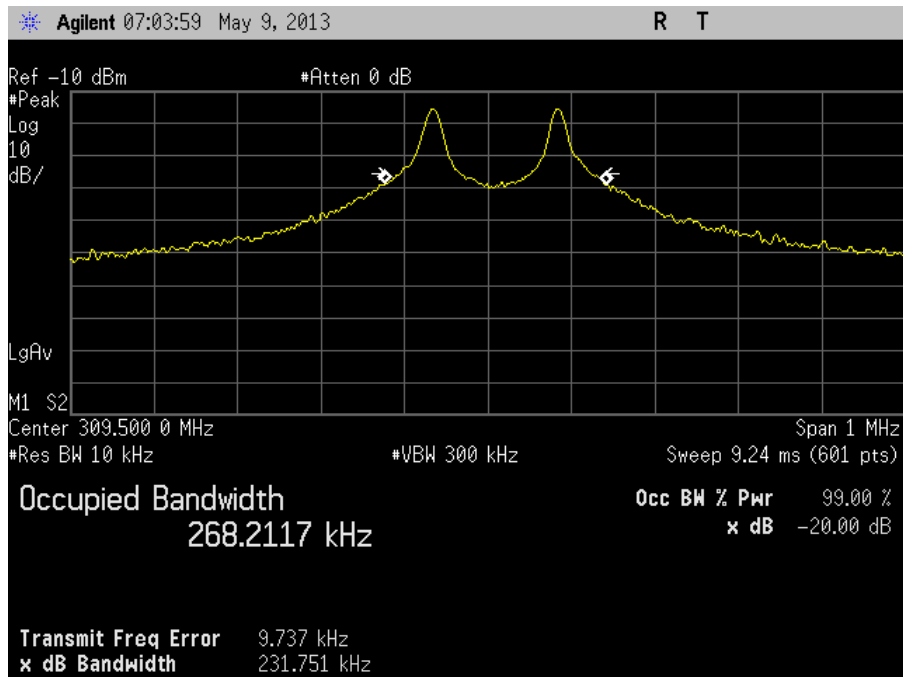
300MHz ASK



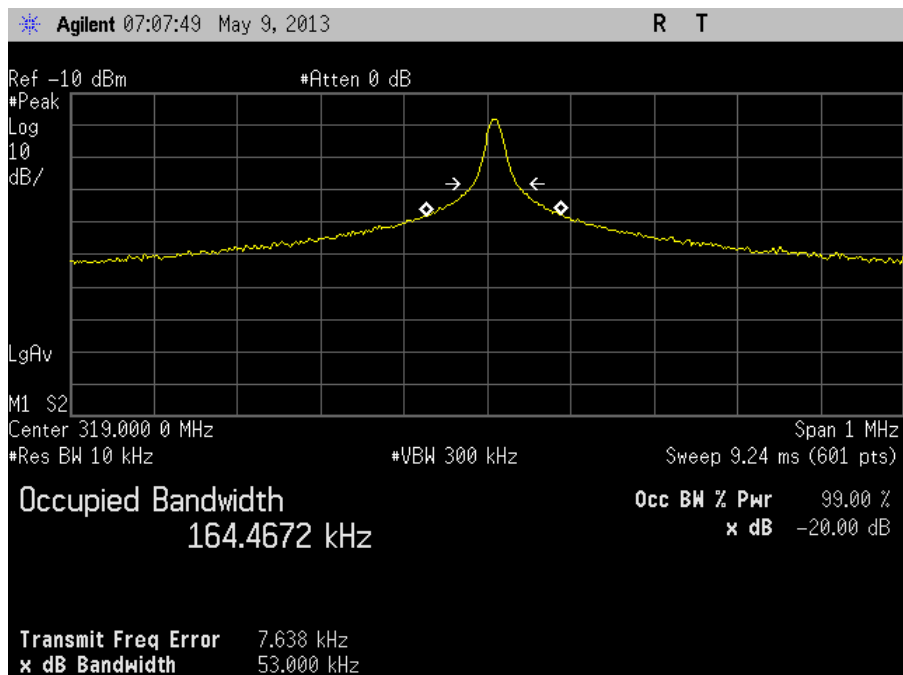
300MHz FSK



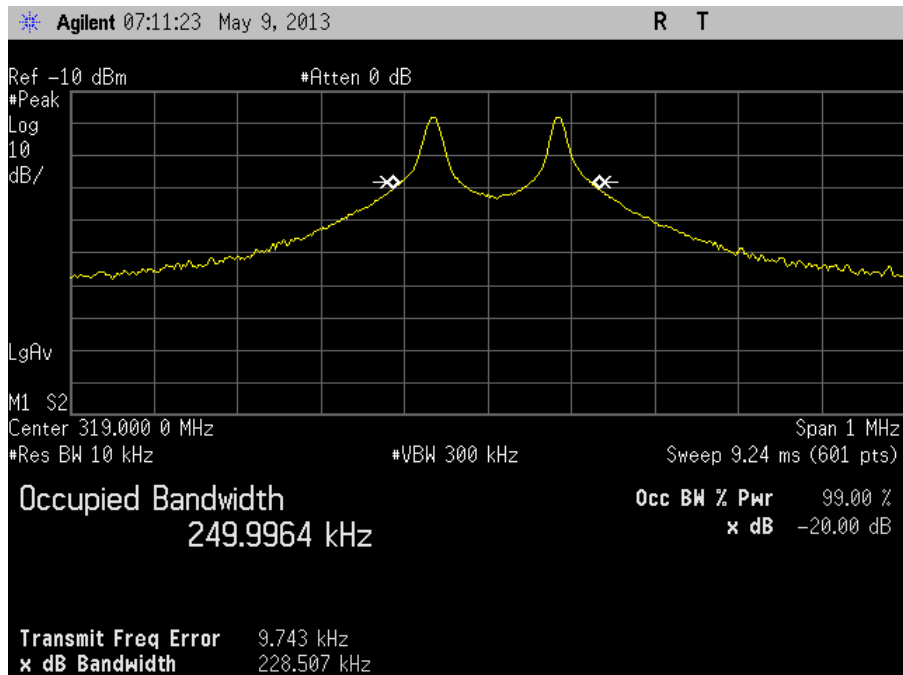
309.50MHz ASK



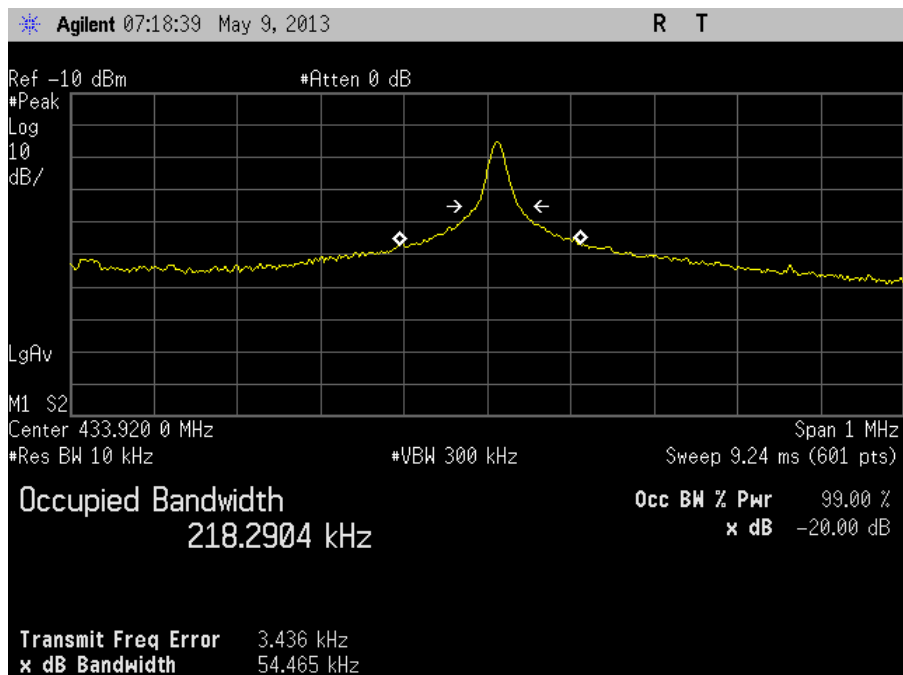
309.50MHz FSK



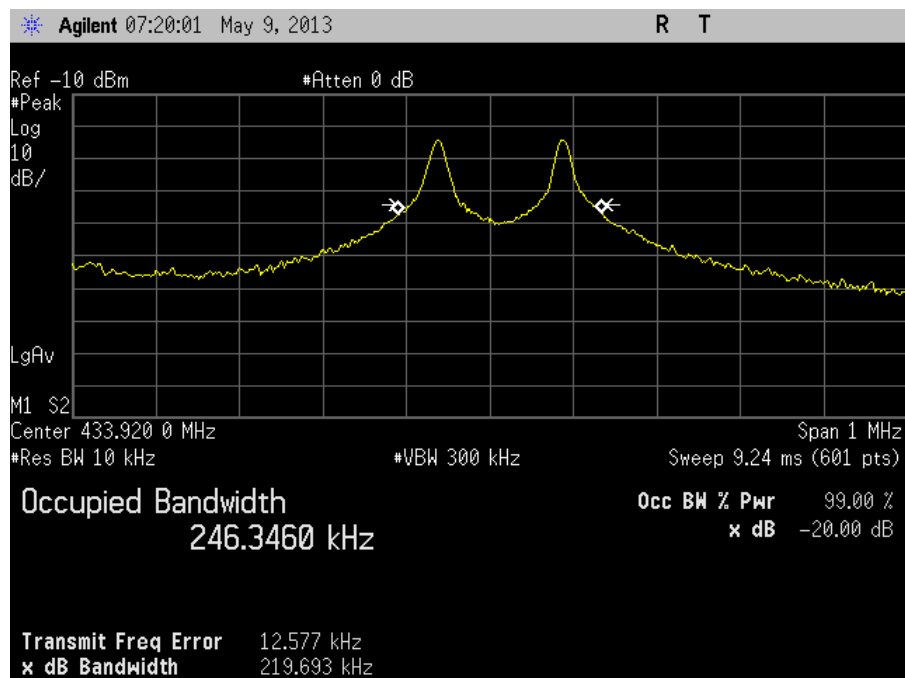
319MHz ASK



319MHz FSK



433.92MHz ASK



433.92MHz FSK

2.5 RECEIVER SPURIOUS EMISSIONS

2.5.1 Specification Reference

RSS-Gen 6.0

2.5.2 Standard Applicable

Receivers shall comply with the limits of spurious emissions set out in this section, measured over the frequency range determined in accordance with Section 4.10 of RSS-Gen.

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 7.2.7 of RSS-Gen.

2.5.3 Equipment Under Test and Modification State

Serial No: 20130418001831/ Default Test Configuration

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

May 08, 2013/FSC

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

Ambient Temperature 24.2°C
Relative Humidity 45.7%
ATM Pressure 99.5 kPa

2.5.7 Additional Observations

- This is a radiated test. The spectrum was searched from 30MHz to the 3rd harmonic (up to 18GHz performed).
- Results identical to Section 2.3.10 and 2.3.11 of this test report.
- EUT in RX (Receive) mode configuration.



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						
1033	Bilog Antenna	3142C	00044556	EMCO	05/23/12	05/23/13
7575	Double-ridged waveguide horn antenna	3117	00155511	EMCO	03/25/13	03/25/14
8628	Pre-amplifier	QLJ 01182835-JO	8986002	QuinStar Technologies Inc.	09/21/12	09/21/13
1153	High-frequency cable	SucoFlex 100 SX	N/A	Suhner	09/21/12	09/21/13
1040	EMI Test Receiver	ESIB40	100292	Rhode & Schwarz	08/10/12	08/10/13
1049	EMI Test Receiver	ESU	100133	Rhode & Schwarz	06/13/12	06/13/13
1016	Pre-amplifier	PAM-0202	187	PAM	09/24/12	09/24/13
Miscellaneous						
	Test Software	EMC32	V8.53	Rhode & Schwarz	N/A	
1003	Signal Generator	SMR-40	1104.0002.40	Rhode & Schwarz	11/12/12	11/12/13
6452	Multimeter	3478A	2911A52177	Hewlett Packard	07/16/12	07/16/13
7560	Barometer/Temperature /Humidity Transmitter	iBTHX-W	1240476	Omega	11/19/12	11/19/13
7539	DC Power Supply	6434B	1140A01866	Hewlett Packard	Verified by 6452	

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	3.89	2.25	5.04
6	EUT Setup	Rectangular	1.00	0.58	0.33
Combined Uncertainty (u_c):					2.41
Coverage Factor (k):					2
Expanded Uncertainty:					4.82

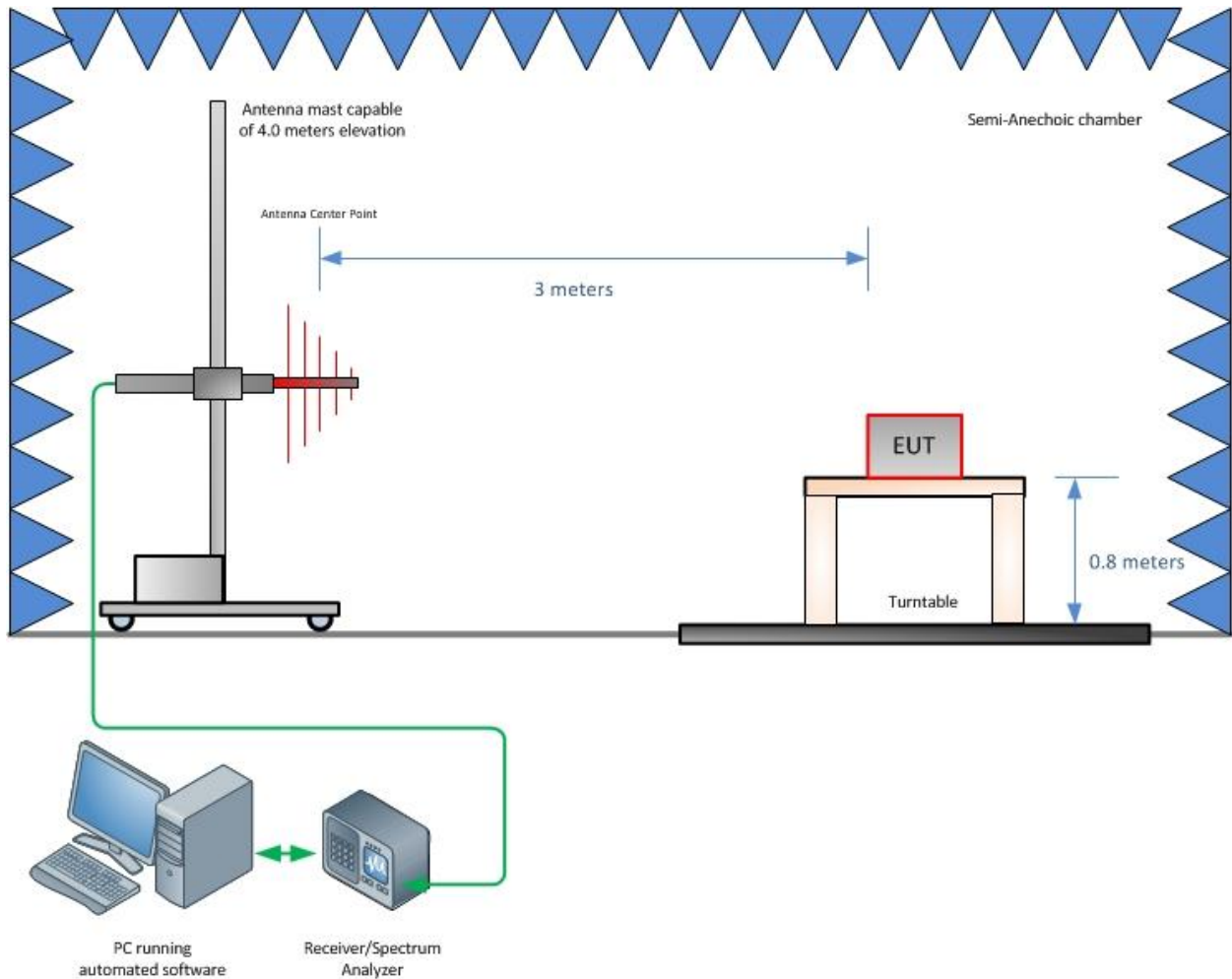
3.2.2 Radiated Emission Measurements (Above 1GHz)

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	3.89	2.25	5.04
6	EUT Setup	Rectangular	1.00	0.58	0.33
Combined Uncertainty (u_c):					2.40
Coverage Factor (k):					2
Expanded Uncertainty:					4.81

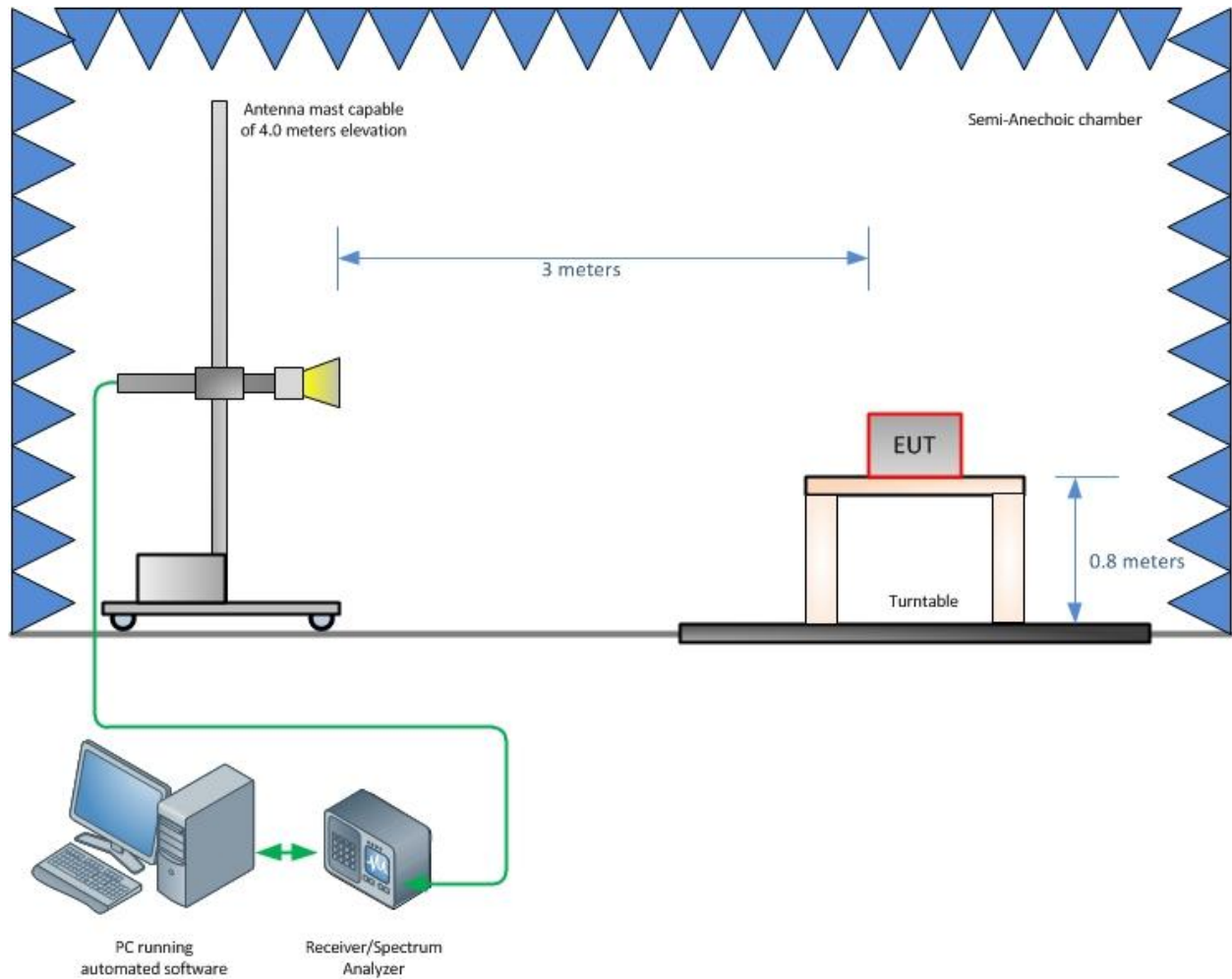
SECTION 4

DIAGRAM OF TEST SETUP

4.1 TEST SETUP DIAGRAM



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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