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MEASUREMENT REPORT
FCC Part 15.239

Applicant Name:
Sirius XM Satellite Radio, Inc.
1500 Eckington Place, NE
Washington, DC 20002
United States

Date of Testing:
02/06 - 02/17/2017
Test Site/Location:
PCTEST Lab, Columbia, MD, USA
Test Report Serial No.:
1M1702060049-01-R1.RS2

FCC ID:	**RS2SXEZR1**
APPLICANT:	**Sirius XM Satellite Radio, Inc.**

Application Type:	Certification
Model(s):	SXEZR1
EUT Type:	Satellite Radio with FM Transmitter
FCC Classification:	Low Power Communication Device Transmitter (DXX)
FCC Rule Part(s):	Part 15.239
Test Procedure(s):	ANSI C63.10-2013

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10-2013. Test results reported herein relate only to the item(s) tested.

This revised Test Report (S/N: 1M1702060049-01-R1.RS2) supersedes and replaces the previously issued test report (S/N: 1M1702060049-01.RS2) on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Randy Ortanez
President

ACCREDITED
TESTING CERT#2041.01

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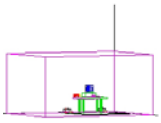
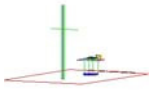


MEASUREMENT REPORT
FCC Part 15.239

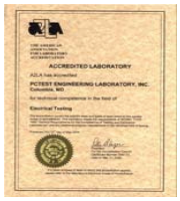


§ 2.1033 General Information

APPLICANT:	Sirius XM Satellite Radio, Inc.
APPLICANT ADDRESS:	1500 Eckington Place, NE
	Washington, DC 20002, United States
TEST SITE:	PCTEST ENGINEERING LABORATORY, INC.
TEST SITE ADDRESS:	7185 Oakland Mills Road, Columbia, MD 21046 USA
FCC RULE PART(S):	Part 15.239
BASE MODEL:	SXEZR1
FCC Classification:	Low Power Communication Device Transmitter (DXX)
FCC ID:	RS2SXEZR1
Test Device Serial No.:	2DZU0DHK ☐ Production ☒ Pre-Production ☐ Engineering
DATE(S) OF TEST:	02/06 - 02/17/2017
TEST REPORT S/N:	1M1702060049-01-R1.RS2

Test Facility / Accreditations

Measurements were performed at PCTEST Engineering Lab located in Columbia, MD 21046, U.S.A.



- PCTEST facility is an FCC registered (PCTEST Reg. No. 159966) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules and Industry Canada (2451B-1).
- PCTEST Lab is accredited to ISO 17025 by U.S. National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP Lab code: 100431-0) in EMC, FCC and Telecommunications.
- PCTEST Lab is accredited to ISO 17025-2005 by the American Association for Laboratory Accreditation (A2LA) in Specific Absorption Rate (SAR) testing, Hearing Aid Compatibility (HAC) testing, CTIA Test Plans, and wireless testing for FCC and Industry Canada Rules.
- PCTEST Lab is a recognized U.S. Conformity Assessment Body (CAB) in EMC and R&TTE (n.b. 0982) under the U.S.-EU Mutual Recognition Agreement (MRA).
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC Guide 65 by the American National Standards Institute (ANSI) in all scopes of FCC Rules and Industry Canada Standards (RSS).
- PCTEST facility is an IC registered (2451B-1) test laboratory with the site description on file at Industry Canada.
- PCTEST is a CTIA Authorized Test Laboratory (CATL) for AMPS, CDMA, and EvDO wireless devices and for Over-the-Air (OTA) Antenna Performance testing for AMPS, CDMA, GSM, GPRS, EGPRS, UMTS (W-CDMA), CDMA 1xEVDO, and CDMA 1xRTT.

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1.0 INTRODUCTION

1.1 Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Industry Canada Certification and Engineering Bureau.

1.2 PCTEST Test Location

The map below shows the location of the PCTEST LABORATORY, its proximity to the FCC Laboratory, the Columbia vicinity, the Baltimore-Washington Internt'l (BWI) airport, the city of Baltimore and the Washington, DC area. (S*ee Figure 1-1*).

These measurement tests were conducted at the PCTEST Engineering Laboratory, Inc. facility located at 7185 Oakland Mills Road, Columbia, MD 21046. The site coordinates are 39º 10'23" N latitude and 76º 49'50" W longitude. The facility is 0.4 miles North of the FCC laboratory, and the ambient signal and ambient signal strength are approximately equal to those of the FCC laboratory. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2014 on January 22, 2015.

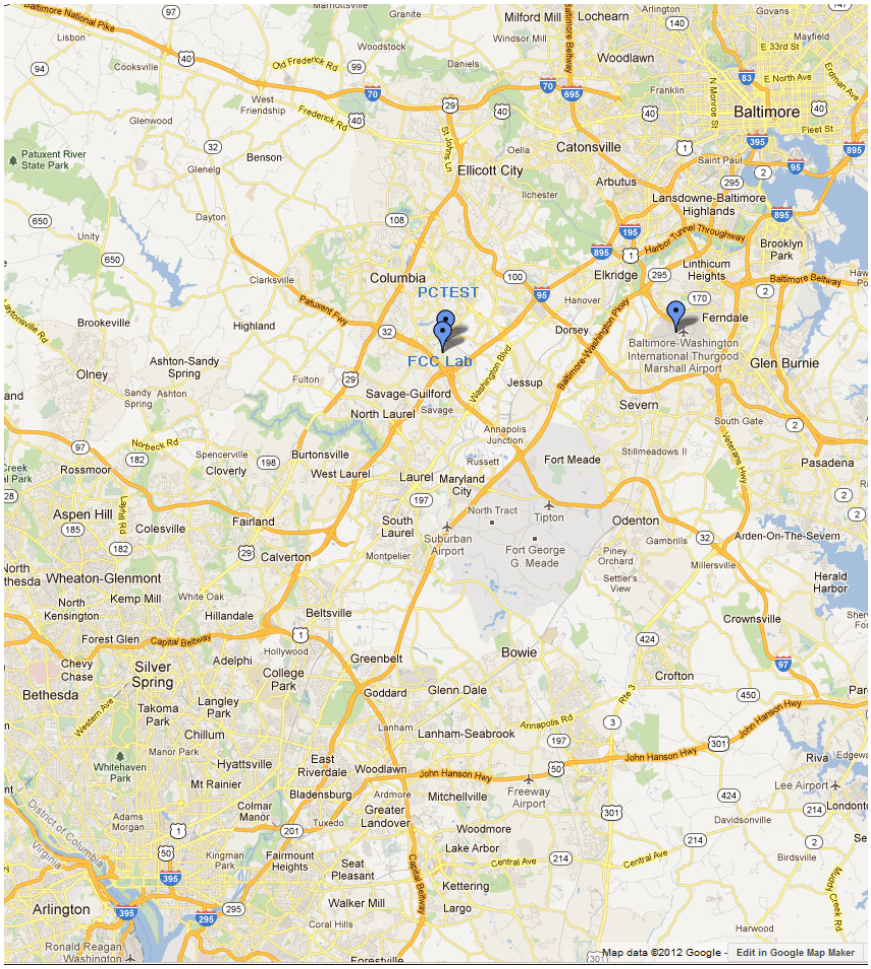

Figure 1-1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Sirius XM Satellite Radio with FM Transmitter FCC ID: RS2SXEZR1**. The test data contained in this report pertains only to the emissions due to the EUT's FM transmitter.

2.2 Device Capabilities

This device contains the following capabilities:

FM Transmitter

2.3 Test Configuration

The Sirius XM Satellite Radio with FM Transmitter FCC ID: RS2SXEZR1 was tested per the guidance of ANSI C63.10-2013. Below is a brief list of each configuration set-up.

Test Configuration #	Emissions Tested	Description
7	Intentional	Receiver (EUT) under test with FEA unit
8	Intentional	Receiver (EUT) under test with *Power*Connect Dock
5, 10	Intentional	Receiver (EUT) under test with *Power*Connect Dock, DC Power Source & Bias-Tee
9	Intentional	Receiver (EUT) under test with *Xpress* Car Dock and *SureConnect* Adapter
6	Intentional	Receiver (EUT) under test with *Xpress* Car Dock and FM Direct Adapter

Table 2-1. Test Configuration Description

2.4 EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

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3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

The measurement procedures described in the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2013), was used in the measurement of the **Sirius XM Satellite Radio with FM Transmitter FCC ID: RS2SXEZR1.**

Deviation from measurement procedure…….....None

3.2 Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with Clause 5, Figure 5.7 of ANSI C63.4-2009. For measurements above 1GHz absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, the absorbers are removed. An ETS Lindgren Model 2188 raised turntable is used for radiated measurement. It is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. A 78cm high PVC support structure is placed on top of the turntable. A 72.4cm high PVC support structure is placed on top of the turntable. A 3” (~7.6cm) sheet of high density polystyrene is used as the table top and is placed on top of the PVC supports to bring the total height of the table to 80cm.

For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30MHz up to the upper frequency shown in 15.33(b)(1) depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. For frequencies below 30MHz, a calibrated loop antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up was placed on top of the 0.8 meter high, 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, clock speed, mode of operation or video resolution, if applicable, turntable azimuth, and receive antenna height was noted for each frequency found.

Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, whichever produced the worst-case emissions.

3.3 Environmental Conditions

The temperature is controlled within range of 15°C to 35°C. The relative humidity is controlled within range of 10% to 75%. The atmospheric pressure is monitored within the range 86-106kPa (860-1060mbar).

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4.0 ANTENNA REQUIREMENTS

Excerpt from §15.203 of the FCC Rules/Regulations:
"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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 FM transmit antenna used with the Satellite Radio uses a unique coupling.

Conclusion:

The **Sirius XM Satellite Radio with FM Transmitter FCC ID: RS2SXEZR1** unit complies with the requirement of §15.203.

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5.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST).

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	RE1	Radiated Emissions Cable Set (UHF/EHF)	7/11/2016	Annual	7/11/2017	RE1
-	WL25-1	Conducted Cable Set (25GHz)	4/11/2016	Annual	4/11/2017	WL25-1
Agilent	N9020A	MXA Signal Analyzer	10/28/2016	Annual	10/28/2017	US46470561
Agilent	N9038A	MXE EMI Receiver	4/21/2016	Annual	4/21/2017	MY51210133
Anritsu	MA2411B	Pulse Power Sensor	10/14/2015	Biennial	10/14/2017	846215
Anritsu	ML2495A	Power Meter	10/16/2015	Biennial	10/16/2017	941001
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	7/30/2015	Biennial	7/30/2017	121034
Com-Power	PAM-103	Pre-Amplifier (1-1000MHz)	7/6/2016	Annual	7/6/2017	441119
Com-Power	PAM-118A	Pre-Amplifier	7/26/2016	Annual	7/26/2017	551080
EMCO	3160-09	Small Horn (18 - 26.5GHz)	8/23/2016	Biennial	8/23/2018	135427
Huber+Suhner	Sucoflex 102A	40GHz Radiated Cable	4/26/2016	Annual	4/26/2017	251425001
K & L	11SH10-3075/U18000	High Pass Filter	7/11/2016	Annual	7/11/2017	11SH10-3075/U18000-2
Pasternack	NMLC-1	Line Conducted Emissions Cable (NM)	10/14/2016	Annual	10/14/2017	NMLC-1
PCTEST	-	EMC Switch System	7/11/2016	Annual	7/11/2017	NM1
PCTEST	-	EMC Switch System	7/6/2016	Annual	7/6/2017	NM2
Rhode & Schwarz	TS-PR18	Pre-Amplifier	7/6/2016	Annual	7/6/2017	101622
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	5/16/2016	Annual	5/16/2017	100342
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	7/15/2016	Annual	7/15/2017	100348
Rohde & Schwarz	FSW67	Signal / Spectrum Analyzer	7/27/2016	Annual	7/27/2017	103200
Rohde & Schwarz	TS-PR26	18-26.5 GHz Pre-Amplifier	3/7/2016	Annual	3/7/2017	100040
Seekonk	NC-100	Torque Wrench 5/16", 8" lbs	3/2/2016	Biennial	3/2/2018	N/A
Solar Electronics	8012-50-R-24-BNC	Line Impedance Stabilization Network	7/30/2015	Biennial	7/30/2017	310233
Sunol	DRH-118	Horn Antenna (1-18GHz)	7/30/2015	Biennial	7/30/2017	A050307
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	3/14/2016	Biennial	3/14/2018	A051107

Table 5-1. Annual Test Equipment Calibration Schedule

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6.0 TEST RESULTS

6.1 Summary

Company Name: Sirius XM Satellite Radio, Inc.
FCC ID: RS2SXEZR1
FCC Classification: Low Power Communication Device Transmitter

Specification	Test Description	Test Limit	Test Condition	Test Result	Reference
TRANSMITTER MODE (TX)					
15.239(a), 15.215(c)	20dB Bandwidth	< 200kHz and whole band shall lie wholly within frequency range 88-108MHz	CONDUCTED	PASS	Section 6.2
2.1046, ANSI C63.10 Annex J	Conducted Power	-29.3dBm (per ANSI C63.10-2013)		PASS	Sections 6.3
15.239(b), 15.209	In-Band Emissions and Radiated Spurious Emissions Below 1GHz	< 250µV/m within permitted 200 kHz band Emissions outside of the specified band must meet the radiated limits detailed in 15.209	RADIATED	PASS	Sections 6.4
15.239(c), 15.209	Radiated Spurious Emission Above 1GHz	Emissions outside of the specified band must meet the radiated limits detailed in 15.209		PASS	Section 6.5

Table 6-1. Summary of Test Results

Notes:

1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
2) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables and attenuators.

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6.2 20dB Bandwidth Measurement

§15.239(a) §15.215(c)

Test Overview and Limit

The bandwidth at 20dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the receive antenna while the EUT is operating in transmission mode at the appropriate frequency.

Emissions from the intentional radiator shall be confined within a band 200 kHz wide centered on the operating frequency. The 200kHz band shall lie wholly within the frequency range of 88 – 108 MHz.

Test Procedure Used

ANSI C63.10-2013 – Clauses 6.9.1 and 8.7

Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 20dB bandwidth measurement. The "X" dB bandwidth parameter was set to X = 20. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. Center frequency set to nominal EUT channel center frequency
3. Span set between two times and five times the OBW
4. RBW = 1 – 5% OBW
5. VBW ≥ 3 x RBW
6. Detector = Peak
7. Trace mode = max hold
8. Sweep = auto couple
9. The trace was allowed to stabilize

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Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

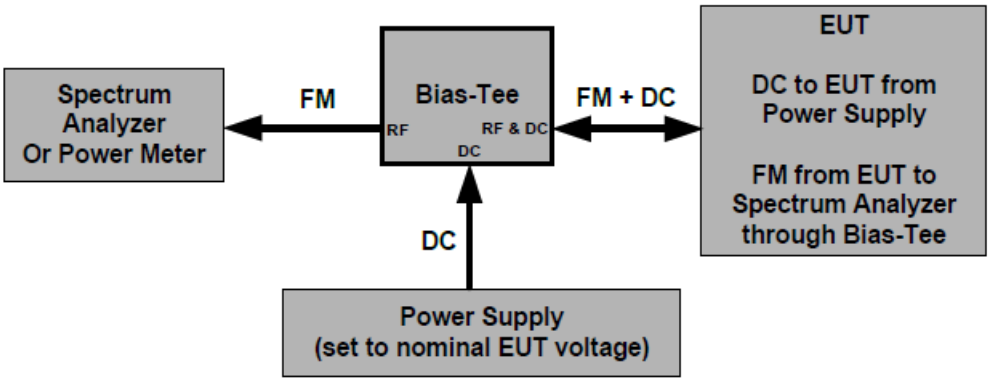

Figure 6-1. Test Instrument & Measurement Setup (Configuration #5)

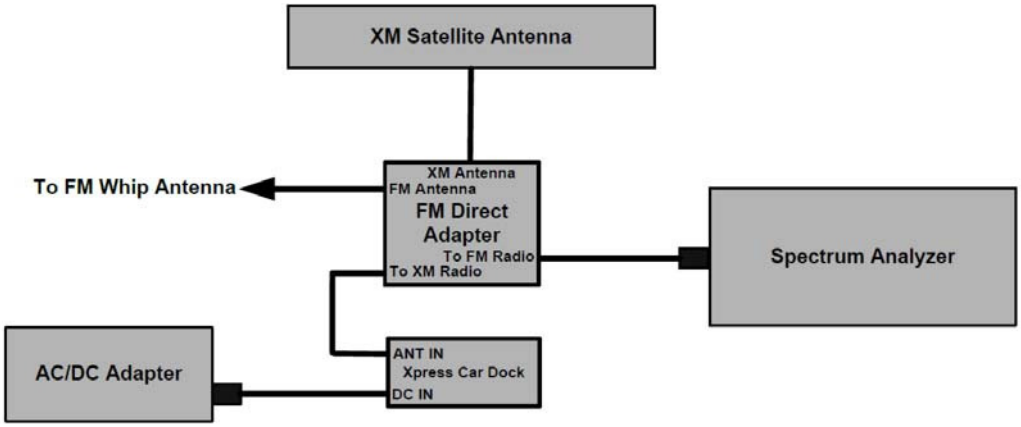

Figure 6-2. Test Instrument & Measurement Setup (Configuration #6)

Test Notes

None

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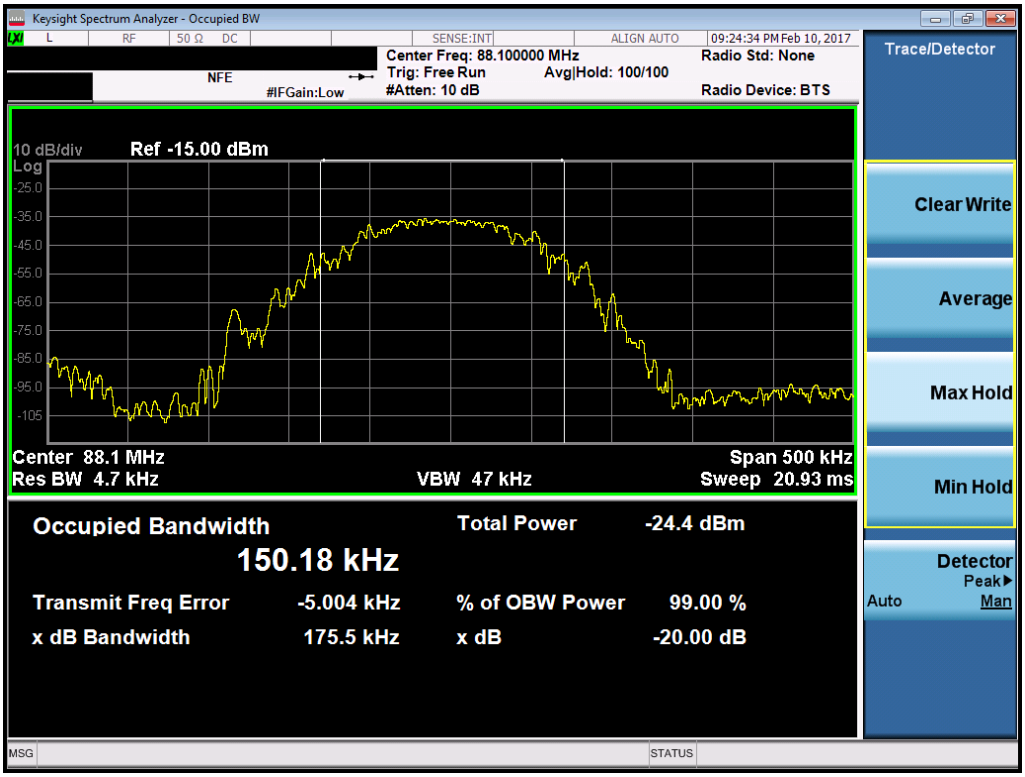
6.2.1 20dB Bandwidth Measurement – Configuration #5

Frequency [MHz]	Measured Bandwidth [kHz]	Maximum Bandwidth [kHz]	Pass / Fail
88.1	175.5	200.0	Pass
96.9	161.1	200.0	Pass
107.9	164.4	200.0	Pass

Table 6-2. Conducted Bandwidth Measurements



Plot 6-1. 20dB Bandwidth Plot (Low Channel – 88.1MHz)

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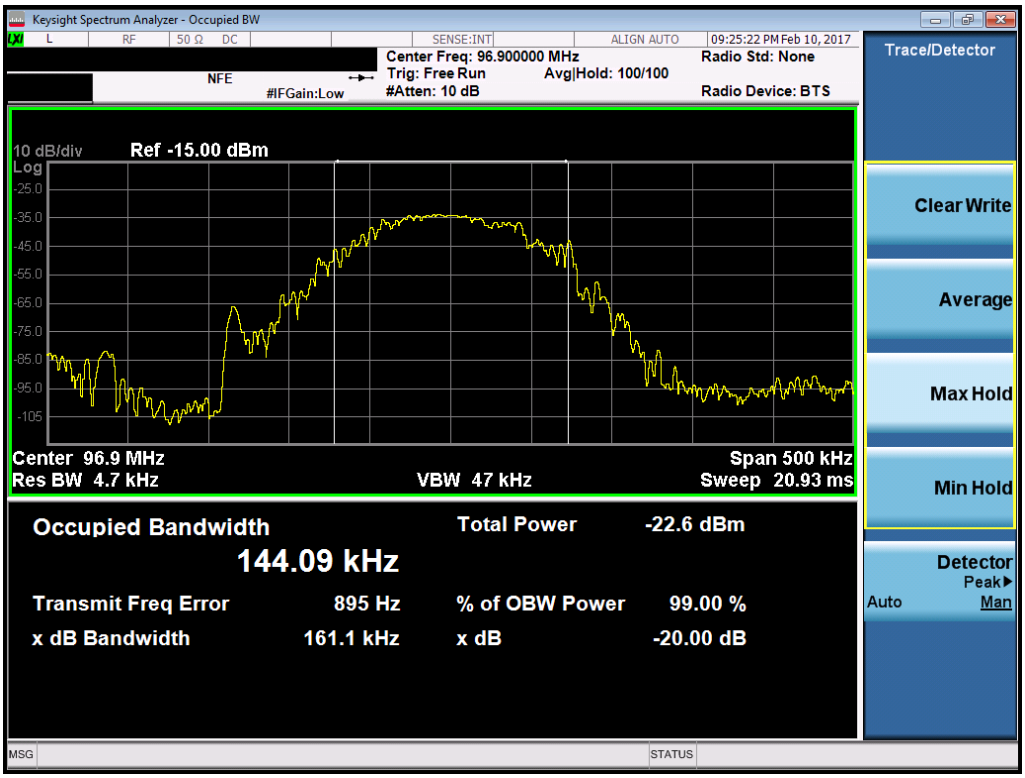
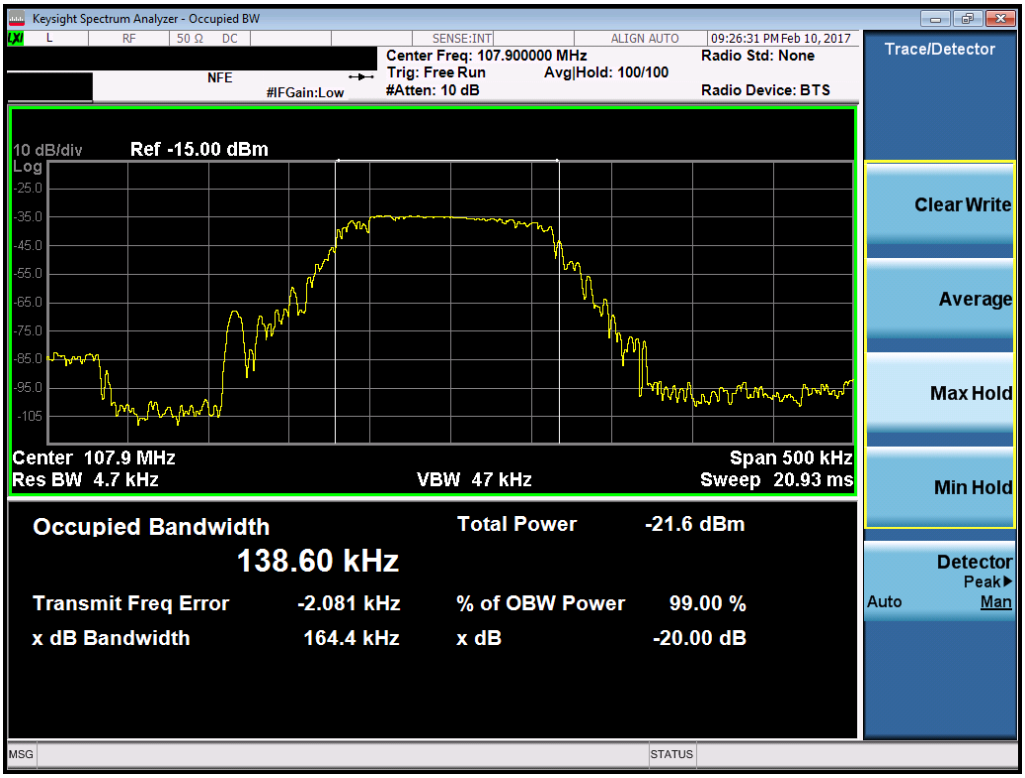


Plot 6-2. 20dB Bandwidth Plot (Mid Channel – 96.9MHz)



Plot 6-3. 20dB Bandwidth Plot (High Channel – 107.9MHz)

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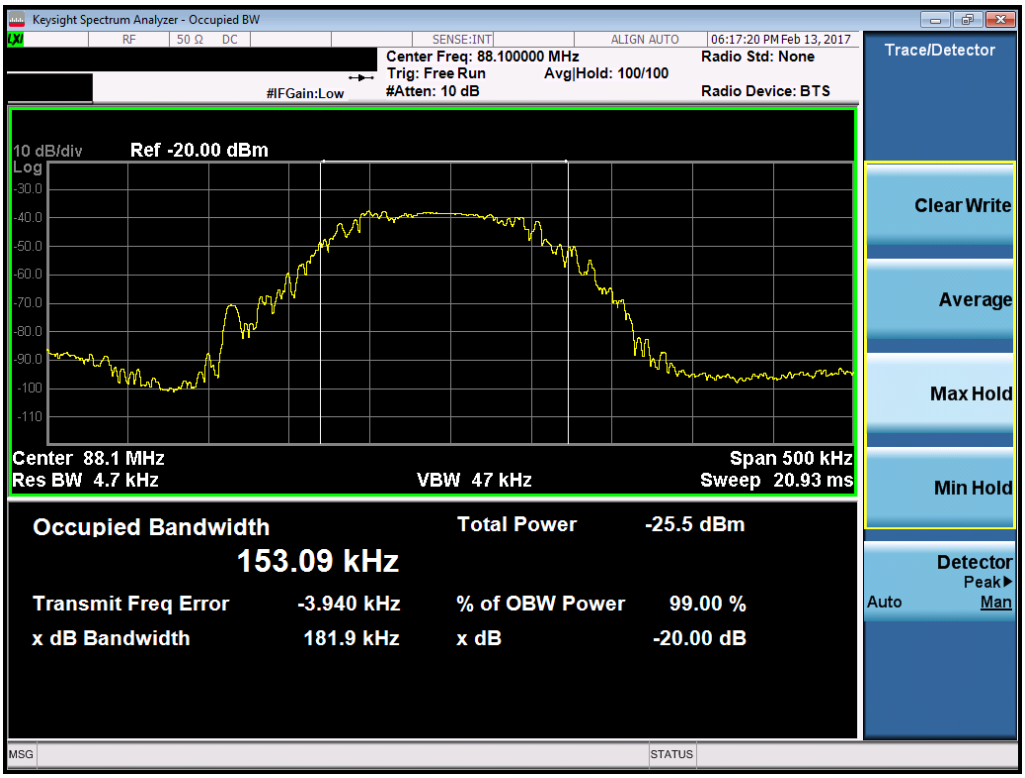
6.2.2 20dB Bandwidth Measurement – Configuration #6

Frequency [MHz]	Measured Bandwidth [kHz]	Maximum Bandwidth [kHz]	Pass / Fail
88.1	181.9	200.0	Pass
96.9	160.7	200.0	Pass
107.9	175.1	200.0	Pass

Table 6-3. Conducted Bandwidth Measurements



Plot 6-4. 20dB Bandwidth Plot (Low Channel – 88.1MHz)

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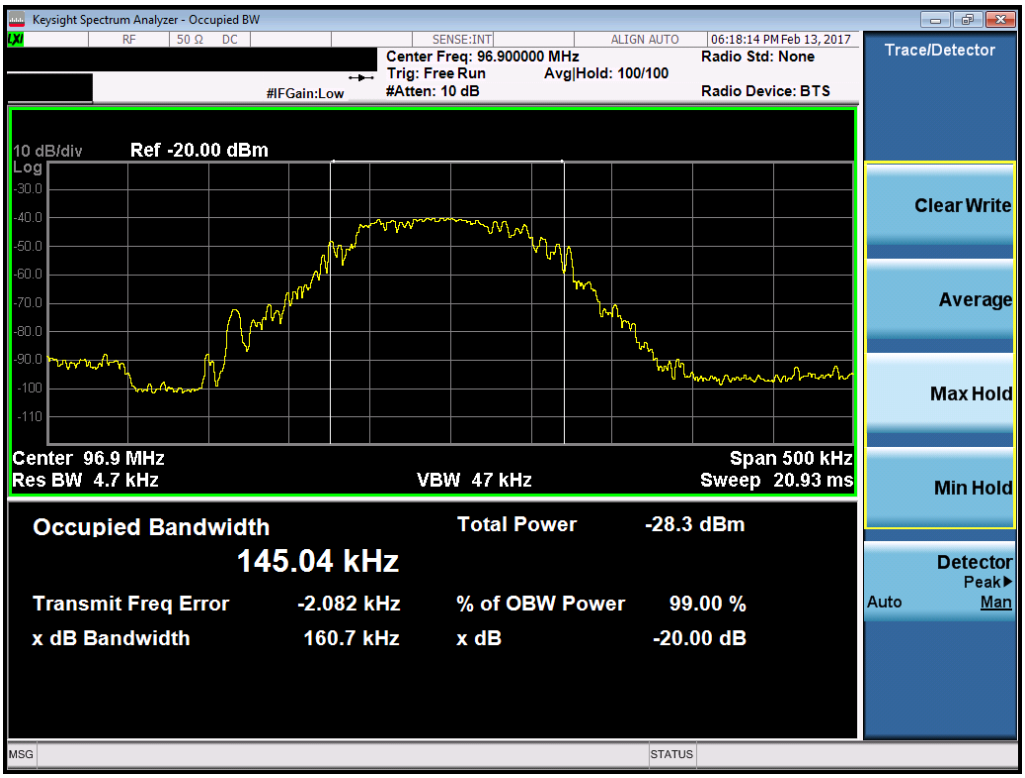
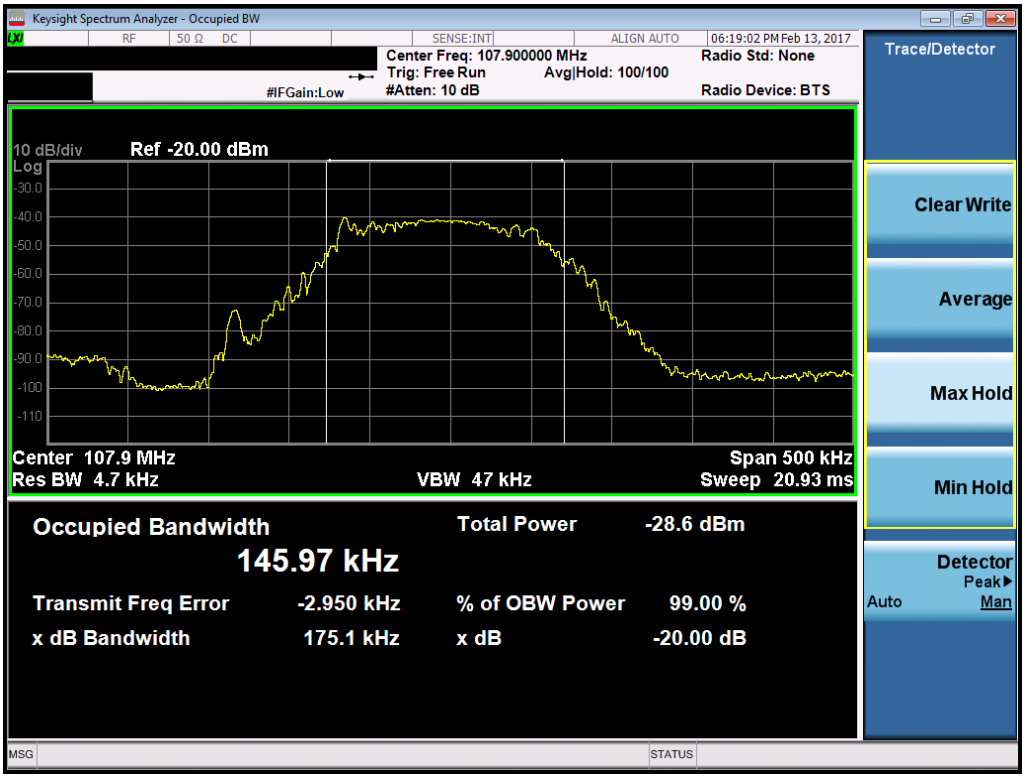


Plot 6-5. 20dB Bandwidth Plot (Mid Channel – 96.9MHz)



Plot 6-6. 20dB Bandwidth Plot (High Channel – 107.9MHz)

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6.3 Output Power Measurement - Configuration #10

§2.1046

Test Overview

The FM transmitter was set to maximum audio output and was tuned between 88.1MHz and 107.9MHz. Correction factor of 0.5 was used for the insertion loss of the Bias-T. All other amplitude corrections of cables and attenuators have been loaded into the spectrum analyzer.

Test Procedure Used

ANSI C63.10-2013 – Clauses 8.5 and Annex J

Test Setup

The EUT and measurement equipment were set up as shown in the diagrams below.

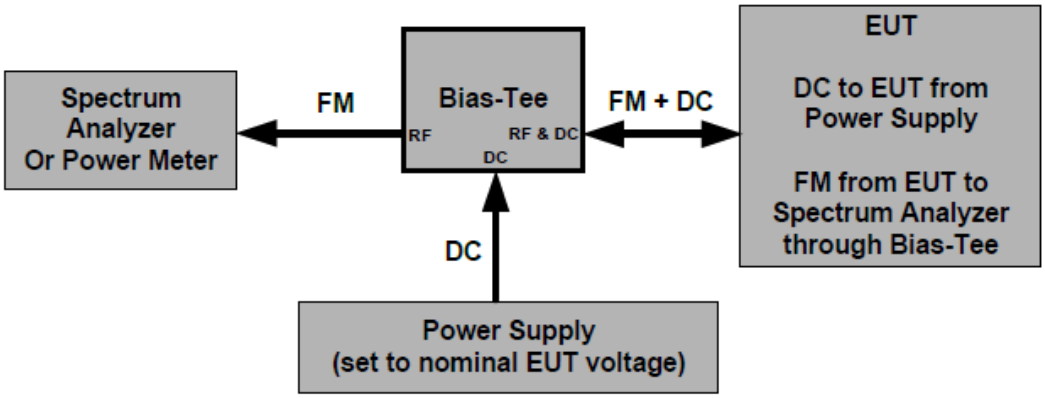

Figure 6-3. Test Instrument & Measurement Setup (Configuration #10)

Test Notes

Conducted power measurements were included to justify exclusion of in-situ measurements.

Frequency [MHz]	Mode	Conducted Power Test Results				
		Result [dBm]	Bias-T Loss [dB]	Corrected Result [dBm]	Limit [dBm]	Margin [dB]
88.1	Live	-34.748	0.50	-34.25	-29.30	-4.95
96.9	Live	-33.647	0.50	-33.15	-29.30	-3.85
107.9	Live	-34.733	0.50	-34.23	-29.30	-4.93

Table 6-4. Conducted Output Power Measurements

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6.4 In-Band Emissions and Radiated Spurious Emissions – Below 1GHz

§15.239(b) §15.209

Test Overview and Limit

All out of band radiated spurious emissions are measured with a spectrum analyzer connected to a receive antenna while the EUT is operating at maximum power and at the appropriate frequencies. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

All in band emissions must not exceed 250 microvolts/meter within the permitted 200kHz band per Section 15.239(b).

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in Table 6-5 per FCC Part 15.209.

Frequency	Field Strength [μV/m]	Measured Distance [Meters]
0.009 – 0.490 MHz	2400/F (kHz)	300
0.490 – 1.705 MHz	24000/F (kHz)	30
1.705 – 30.00 MHz	30	30
30.00 – 88.00 MHz	100	3
88.00 – 216.0 MHz	150	3
216.0 – 960.0 MHz	200	3
Above 960.0 MHz	500	3

Table 6-5. Radiated Limits

Test Procedures Used

ANSI C63.10-2013 - Clauses 6.5 and 8.6

Test Settings

Quasi-Peak Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 120kHz (for emissions from 30MHz – 1GHz)
3. Detector = quasi-peak
4. Sweep time = auto couple
5. Trace mode = max hold
6. Trace was allowed to stabilize

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Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

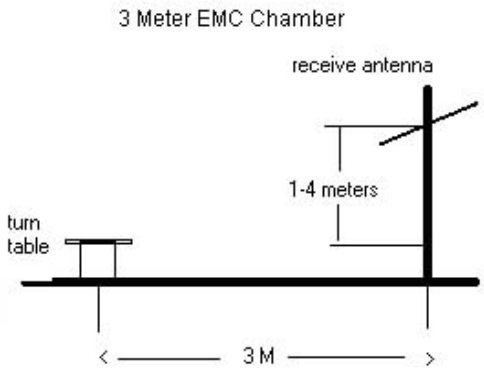

Figure 6-4. Test Instrument & Measurement Setup

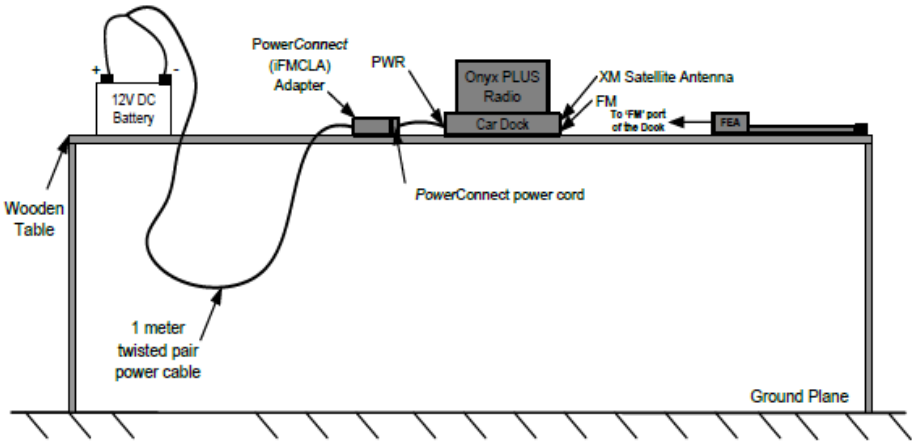

Figure 6-5. Test Instrument & Measurement Setup (Configuration #7)

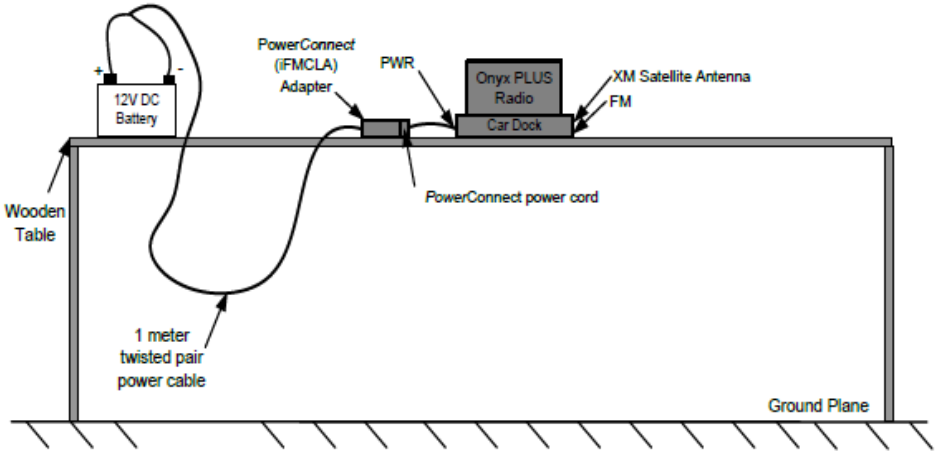

Figure 6-6. Test Instrument & Measurement Setup (Configuration #8)

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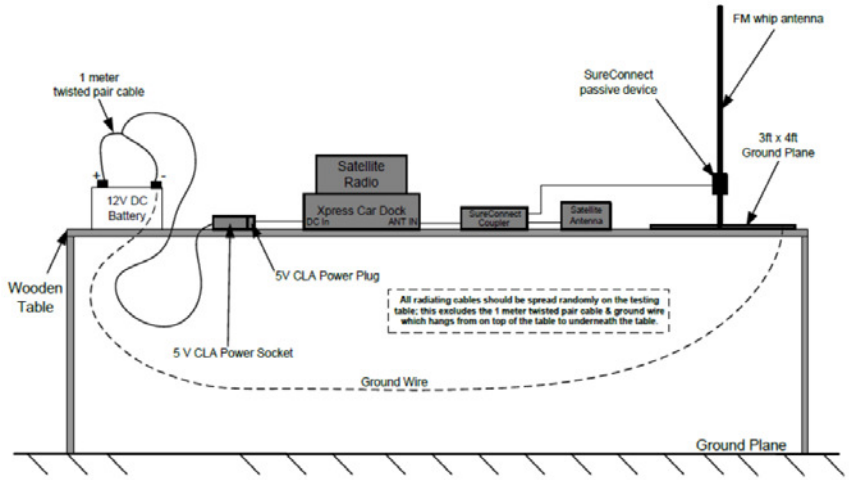

Figure 6-7. Test Instrument & Measurement Setup (Configuration #9)

Test Notes

1. All emissions lying in restricted bands specified in §15.205 are below the limit shown in Table 6-5.
2. The broadband receive antenna is manipulated through vertical and horizontal polarizations during the tests. The EUT is manipulated through three orthogonal planes.
3. This unit was tested while powered by a 12V DC battery.
4. The spectrum is investigated using a peak detector. Final in-band measurements are recorded using an RMS detector, and final spurious emission measurements are recorded using a peak detector. The worst-case emissions are reported however emissions whose levels were not within 20dB of the respective limits were not reported.
5. Emissions were measured at a 3 meter test distance.
6. No spurious emissions were detected within 20dB of the limit below 30MHz.
7. The results recorded using the broadband antenna is known to correlate with the results obtained by using a tuned dipole with an acceptable degree of accuracy. The VSWR for the measurement antenna was found to be less than 2:1.
8. The wide spectrum spurious emissions plots shown on the following pages are used only for the purpose of emission identification.

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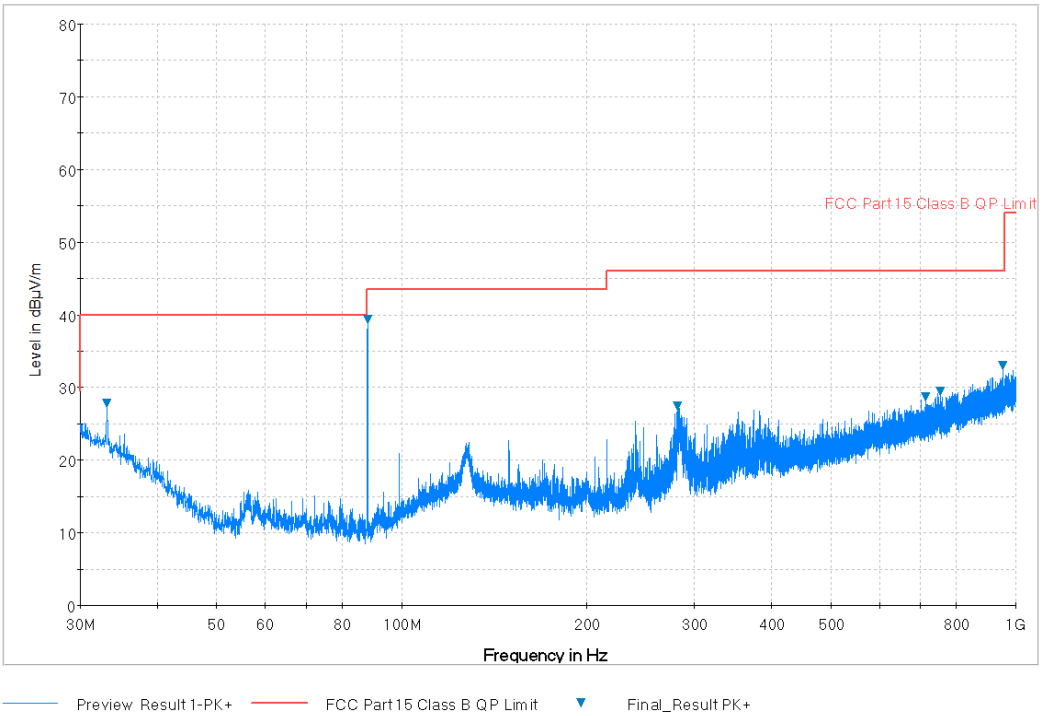
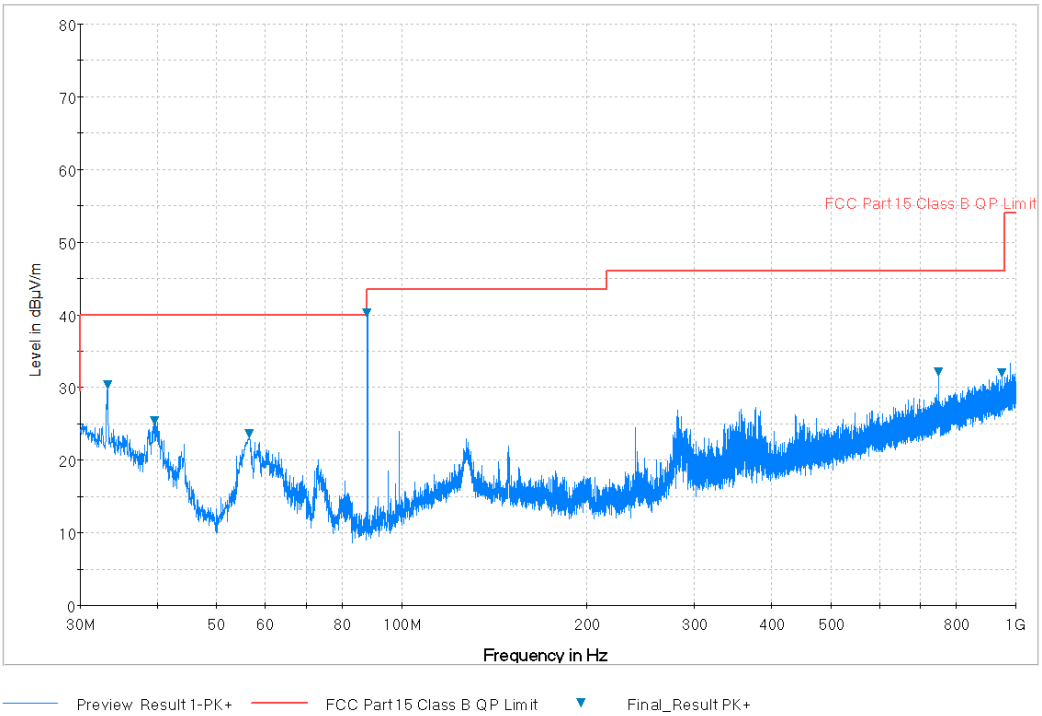
6.4.1 In-Band Emissions and Radiated Spurious Emissions – Configuration #7

§15.239(b) §15.209



Plot 6-7. Radiated Spurious Plot below 1GHz (Pol. H, Low Channel – 88.1MHz)



Plot 6-8. Radiated Spurious Plot below 1GHz (Pol. V, Low Channel – 88.1MHz)

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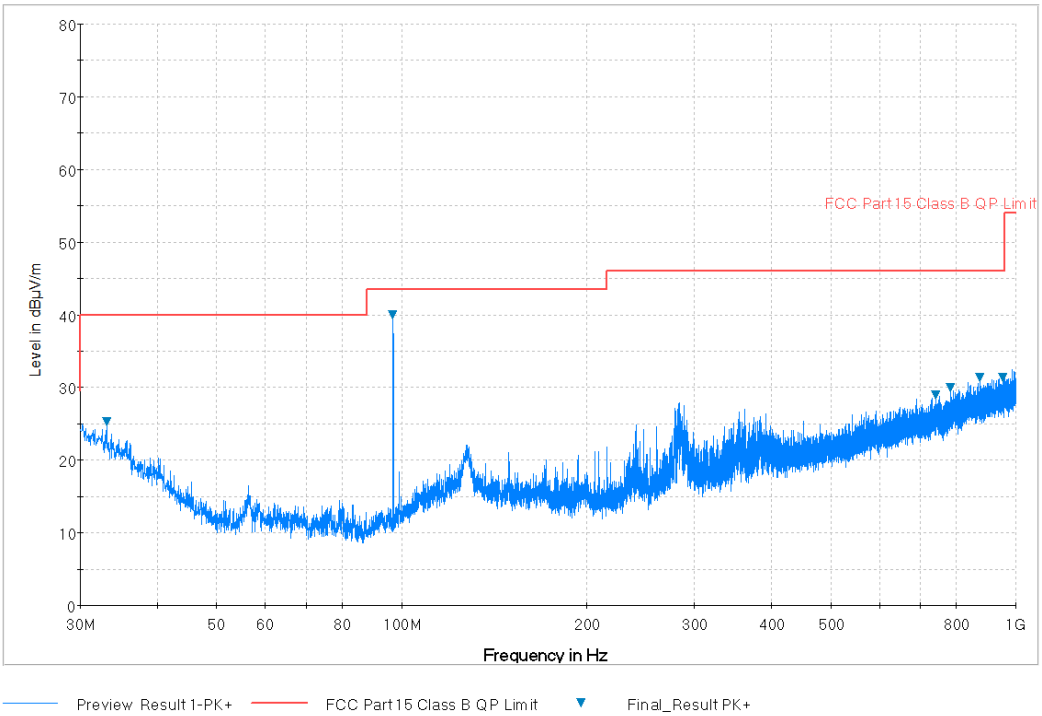
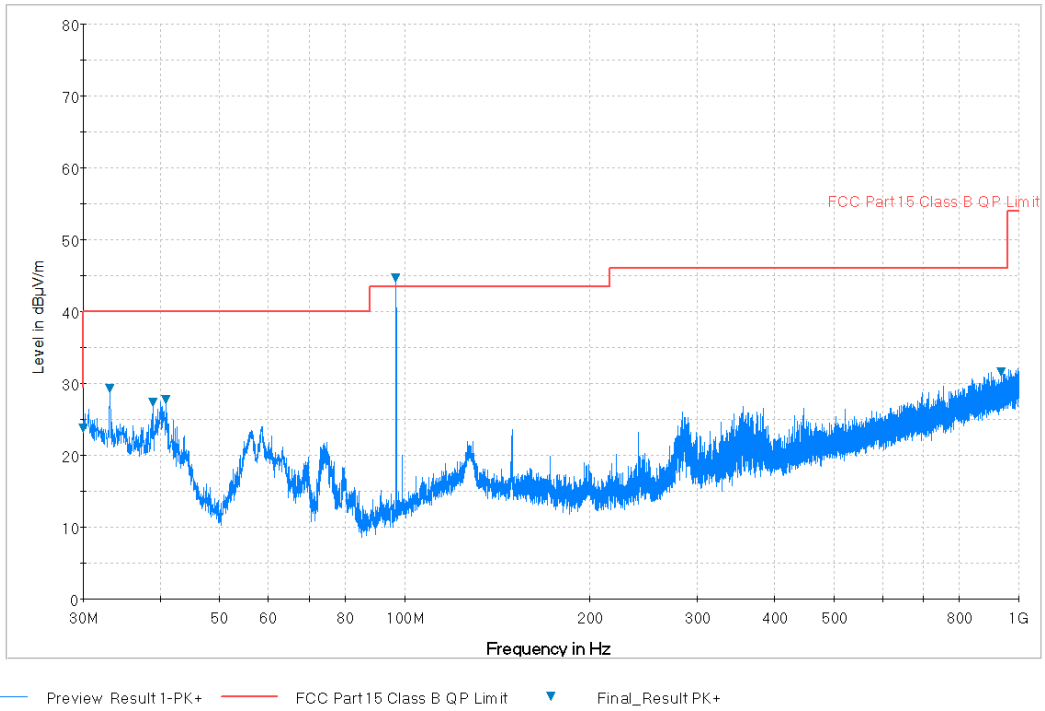


Plot 6-9. Radiated Spurious Plot below 1GHz (Pol. H, Mid Channel – 96.9MHz)



Plot 6-10. Radiated Spurious Plot below 1GHz (Pol. V, Mid Channel – 96.9MHz)

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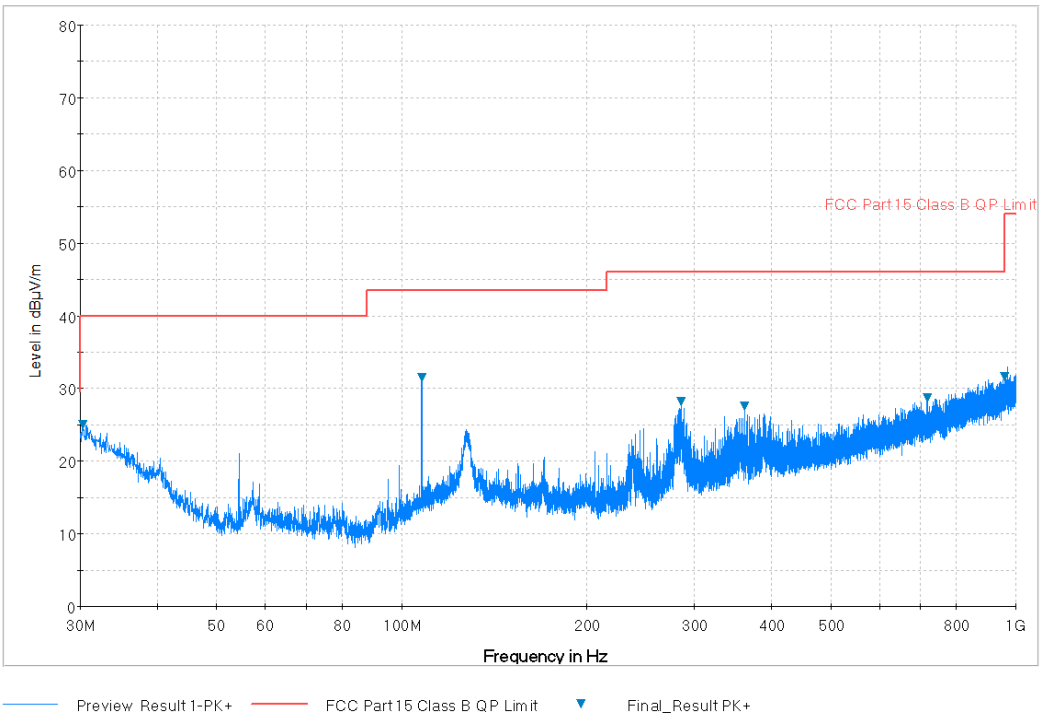
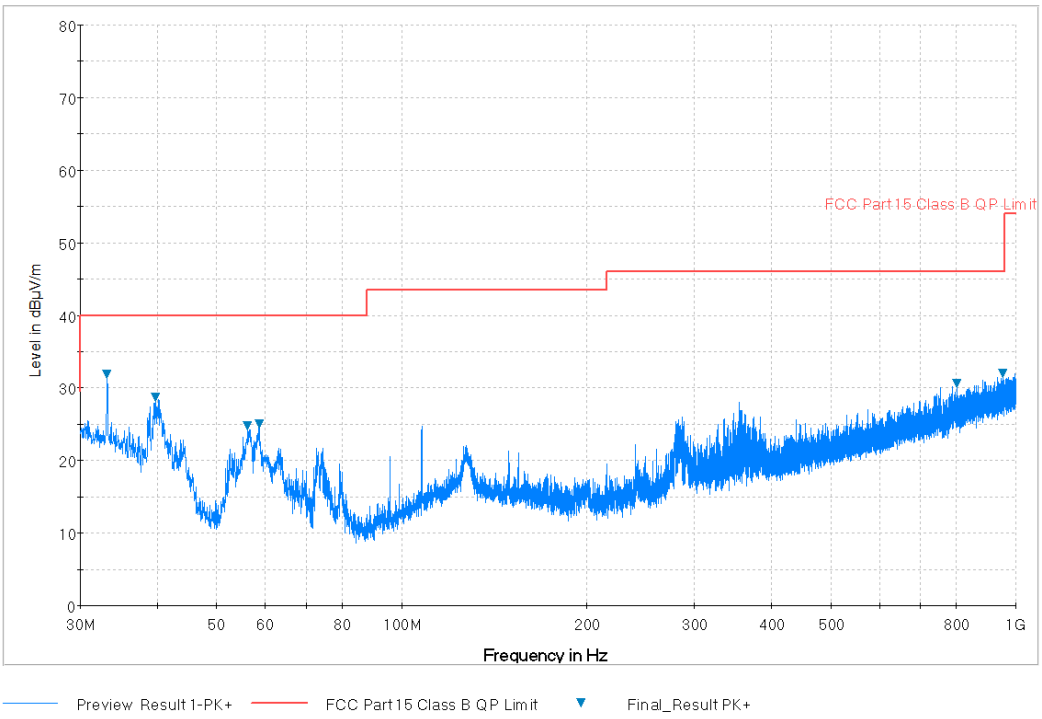


Plot 6-11. Radiated Spurious Plot below 1GHz (Pol. H, High Channel – 107.9MHz)



Plot 6-12. Radiated Spurious Plot below 1GHz (Pol. V, High Channel – 107.9MHz)

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In-Band Emissions and Radiated Spurious Emissions – Configuration #7

§15.239(b) §15.209

FREQ [MHz]	LEVEL [dBm]	Detector	Antenna Factor [dB/m]	Cable Loss [dB]	AFCL [dB/m]	POL [H/V]	Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
88.1	-48.75	Average	13.89	-35.41	-21.52	V	36.7	47.96	-11.23
88.1	-47.9	Peak	13.89	-35.41	-21.52	V	37.6	67.96	-30.38
176.2	-66.42	Peak	17.80	-35.03	-17.23	V	23.4	43.52	-20.17
264.3	-66.58	Peak	19.33	-34.44	-15.11	V	25.3	46.02	-20.71
352.4	-62.99	Peak	21.20	-34.05	-12.85	V	31.2	46.02	-14.86
440.5	-62.74	Peak	22.91	-33.76	-10.85	V	33.4	46.02	-12.61
96.9	-43.35	Average	15.68	-35.40	-19.72	V	43.9	47.96	-4.03
96.9	-42.19	Peak	15.68	-35.40	-19.72	V	45.1	67.96	-22.87
193.8	-70.62	Peak	18.31	-34.90	-16.59	V	19.8	43.52	-23.73
290.7	-63.19	Peak	19.93	-34.40	-14.47	V	29.3	46.02	-16.68
387.6	-66.84	Peak	21.85	-33.88	-12.03	V	28.1	46.02	-17.89
484.5	-73.73	Peak	23.88	-33.58	-9.70	V	23.6	46.02	-22.45
55.7	-70.75	Peak	14.10	-35.80	-21.70	V	14.6	40.00	-25.45
107.9	-60.87	Average	18.39	-35.40	-17.01	H	29.1	47.96	-18.84
107.9	-59.4	Peak	18.39	-35.40	-17.01	H	30.6	67.96	-37.37
215.8	-68.65	Peak	17.33	-34.70	-17.37	V	21.0	43.52	-22.54
323.7	-66.12	Peak	20.63	-34.30	-13.67	V	27.2	46.02	-18.81
431.6	-70.13	Peak	22.90	-33.73	-10.83	V	26.0	46.02	-19.98
539.5	-74.87	Peak	24.59	-33.29	-8.70	V	23.4	46.02	-22.59

Table 6-6. Radiated Spurious Emissions below 1GHz

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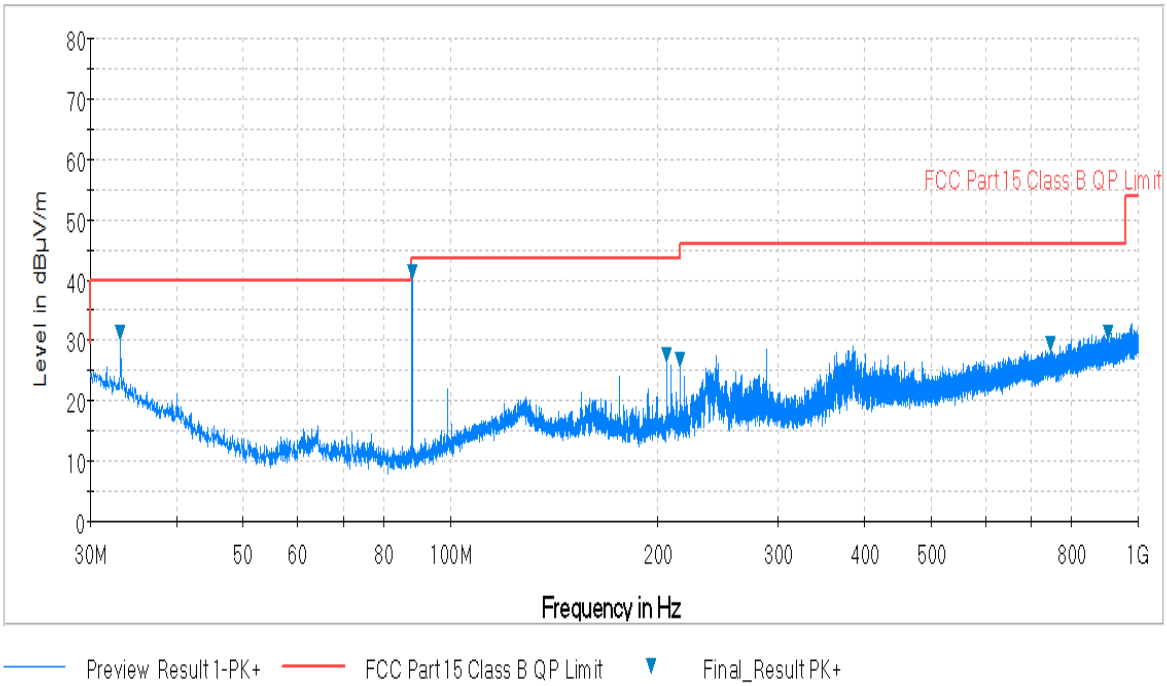
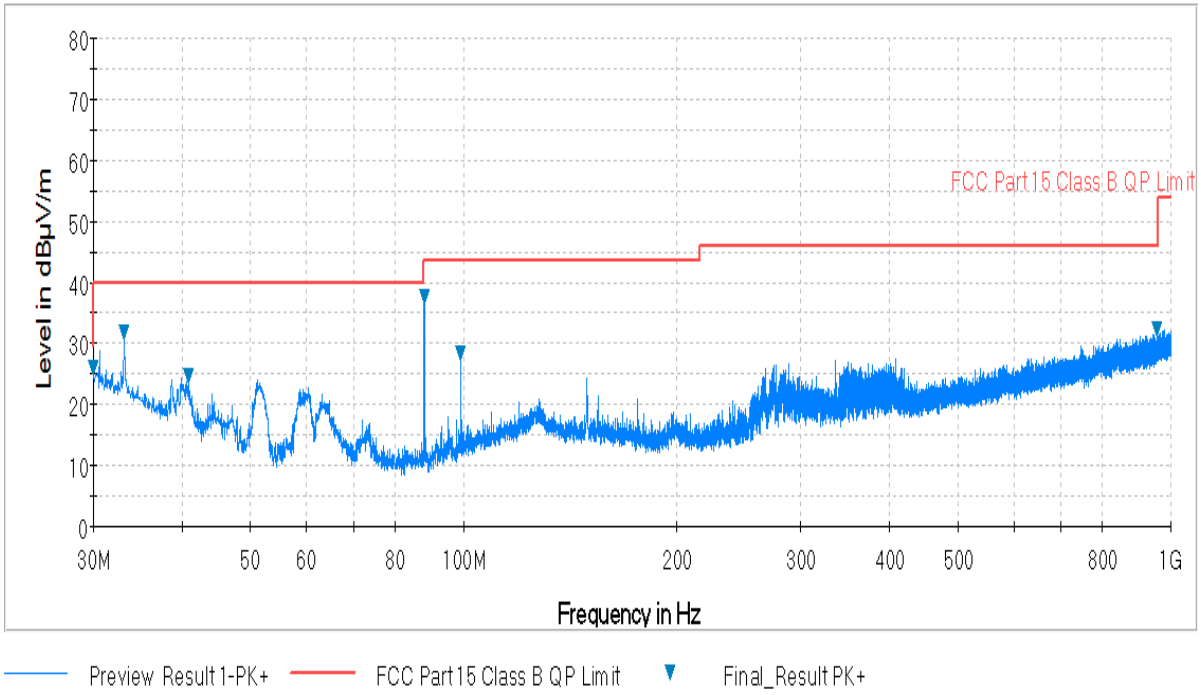
6.4.2 In-Band Emissions and Radiated Spurious Emissions – Configuration #8

§15.239(b) §15.209



Plot 6-13. Radiated Spurious Plot below 1GHz (Pol. H, Low Channel – 88.1MHz)



Plot 6-14. Radiated Spurious Plot below 1GHz (Pol. V, Low Channel – 88.1MHz)

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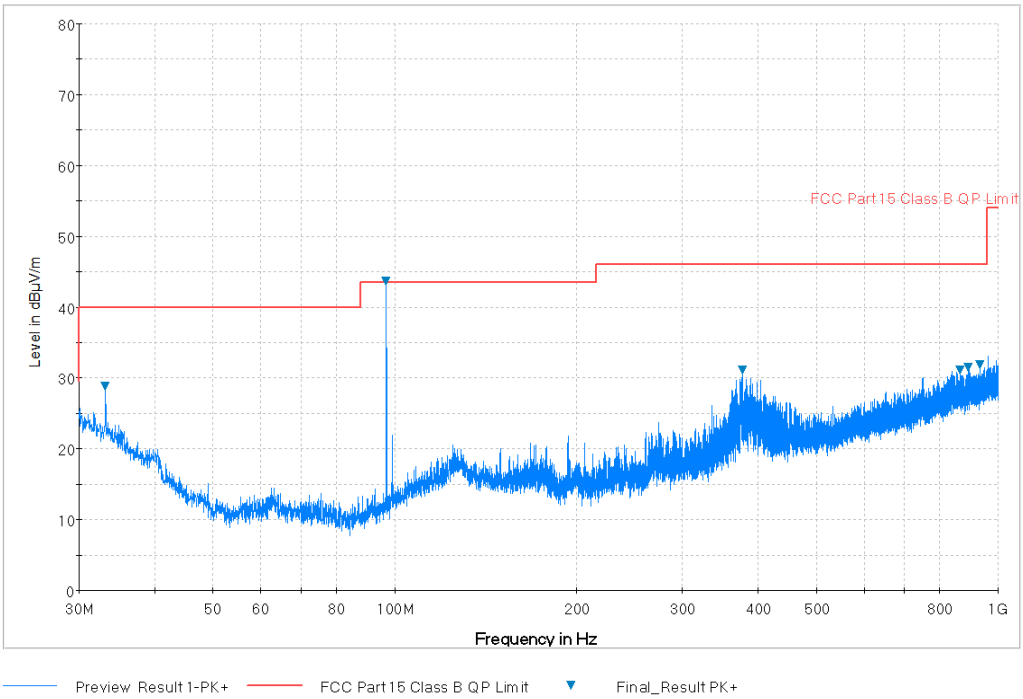
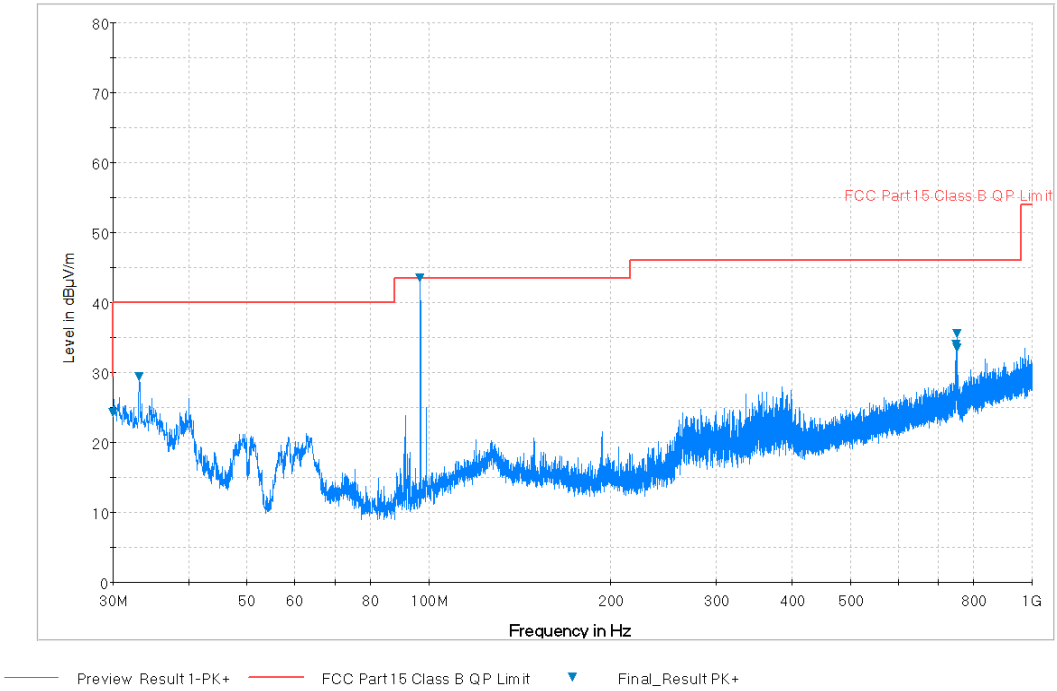


Plot 6-15. Radiated Spurious Plot below 1GHz (Pol. H, Mid Channel – 96.9MHz)



Plot 6-16. Radiated Spurious Plot below 1GHz (Pol. V, Mid Channel – 96.9MHz)

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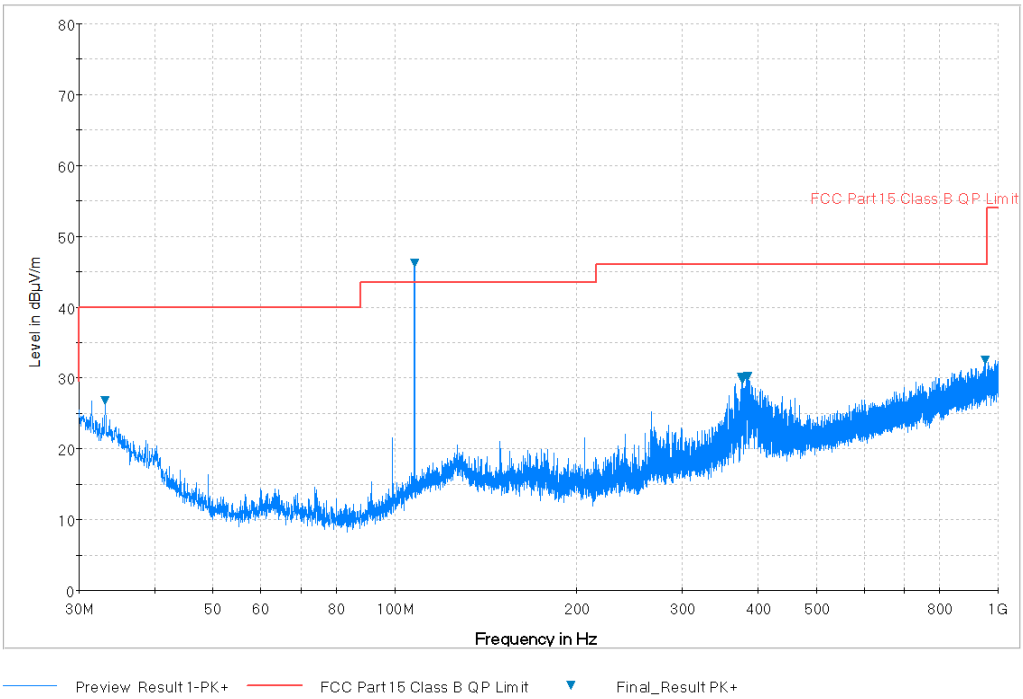
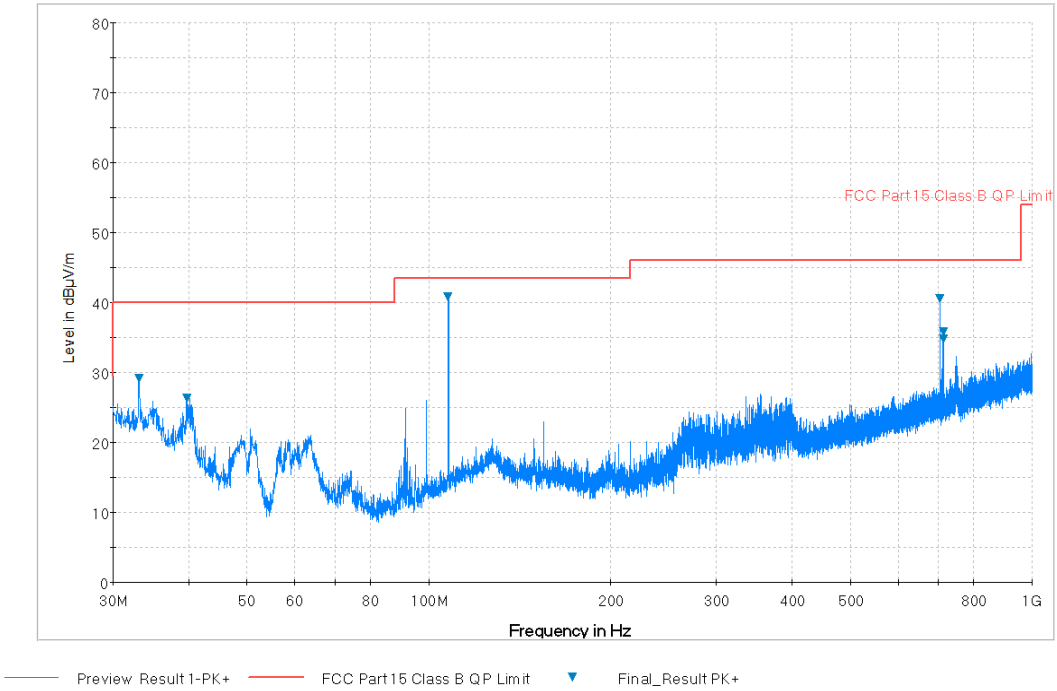


Plot 6-17. Radiated Spurious Plot below 1GHz (Pol. H, High Channel – 107.9MHz)



Plot 6-18. Radiated Spurious Plot below 1GHz (Pol. V, High Channel – 107.9MHz)

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In-Band Emissions and Radiated Spurious Emissions – Configuration #8

§15.239(b) §15.209

FREQ [MHz]	LEVEL [dBm]	Detector	Antenna Factor [dB/m]	Cable Loss [dB]	AFCL [dB/m]	POL [H/V]	Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
88.1	-46.2	Average	13.89	-35.41	-21.52	H	39.3	47.96	-8.68
88.1	-44.53	Peak	13.89	-35.41	-21.52	H	41.0	67.96	-27.01
176.2	-68.39	Peak	17.80	-35.03	-17.23	H	21.4	43.52	-22.14
264.3	-73.11	Peak	19.33	-34.44	-15.11	H	18.8	46.02	-27.24
352.4	-71.58	Peak	21.20	-34.05	-12.85	H	22.6	46.02	-23.45
440.5	-71.58	Peak	22.91	-33.76	-10.85	H	24.6	46.02	-21.45
528.6	-73.19	Peak	24.47	-33.32	-8.85	H	25.0	46.02	-21.06
96.9	-45.22	Average	15.68	-35.40	-19.72	V	42.1	47.96	-5.90
96.9	-43.8	Peak	15.68	-35.40	-19.72	V	43.5	67.96	-24.48
193.8	-67.32	Peak	18.31	-34.90	-16.59	V	23.1	43.52	-20.43
290.7	-69.55	Peak	19.93	-34.40	-14.47	V	23.0	46.02	-23.04
387.6	-70.75	Peak	21.85	-33.88	-12.03	V	24.2	46.02	-21.80
775.2	-75.11	Peak	27.31	-32.17	-4.86	V	27.0	46.02	-18.99
107.9	-46.33	Average	18.39	-35.40	-17.01	H	43.7	47.96	-4.30
107.9	-44.72	Peak	18.39	-35.40	-17.01	H	45.3	67.96	-22.69
215.8	-67.16	Peak	17.33	-34.70	-17.37	H	22.5	43.52	-21.05
323.7	-68.58	Peak	20.63	-34.30	-13.67	H	24.8	46.02	-21.27
431.6	-67.09	Peak	22.90	-33.73	-10.83	H	29.1	46.02	-16.94
755.3	-73.26	Peak	27.19	-32.30	-5.11	H	28.6	46.02	-17.39

Table 6-7. Radiated Spurious Emissions below 1GHz

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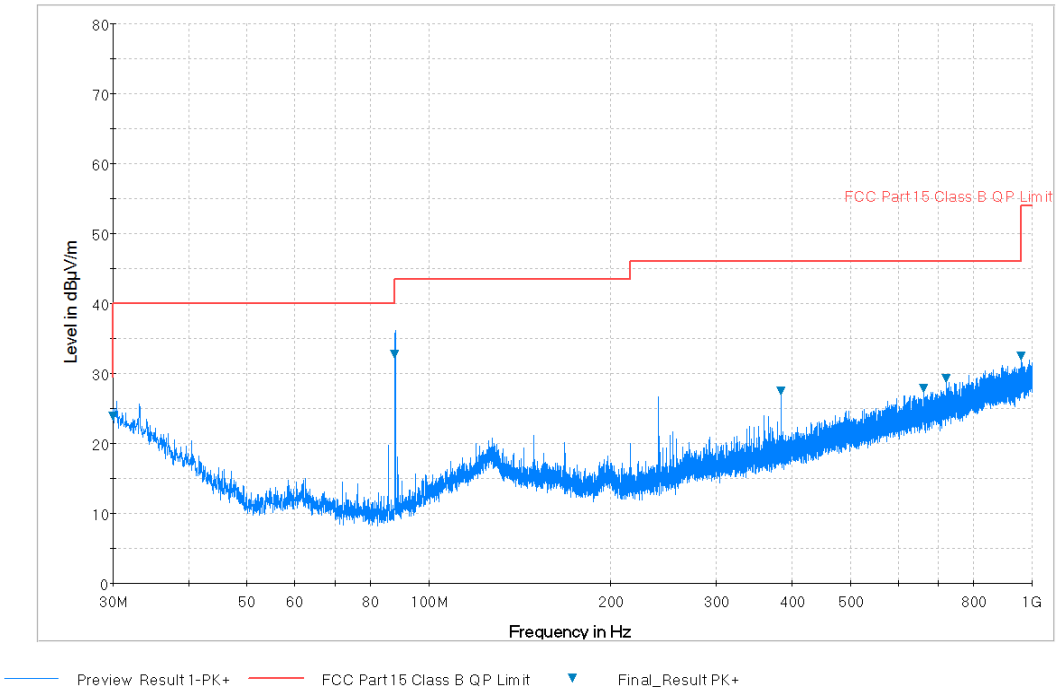
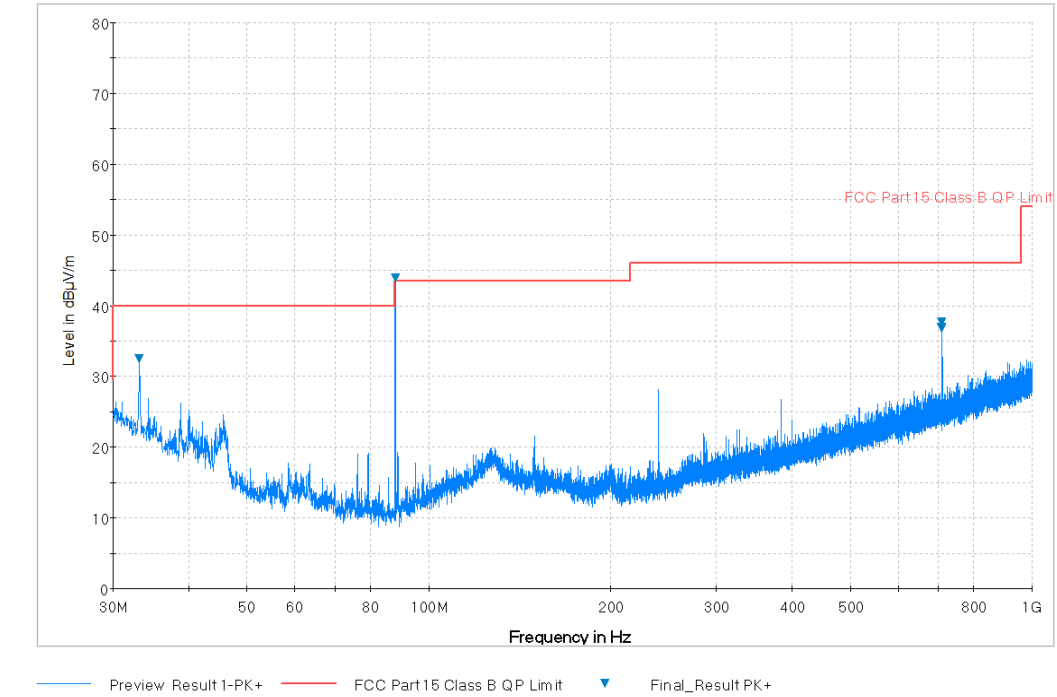
6.4.3 In-Band Emissions and Radiated Spurious Emissions – Configuration #9

§15.239(b) §15.209



Plot 6-19. Radiated Spurious Plot below 1GHz (Pol. H, Low Channel – 88.1MHz)



Plot 6-20. Radiated Spurious Plot below 1GHz (Pol. V, Low Channel – 88.1MHz)

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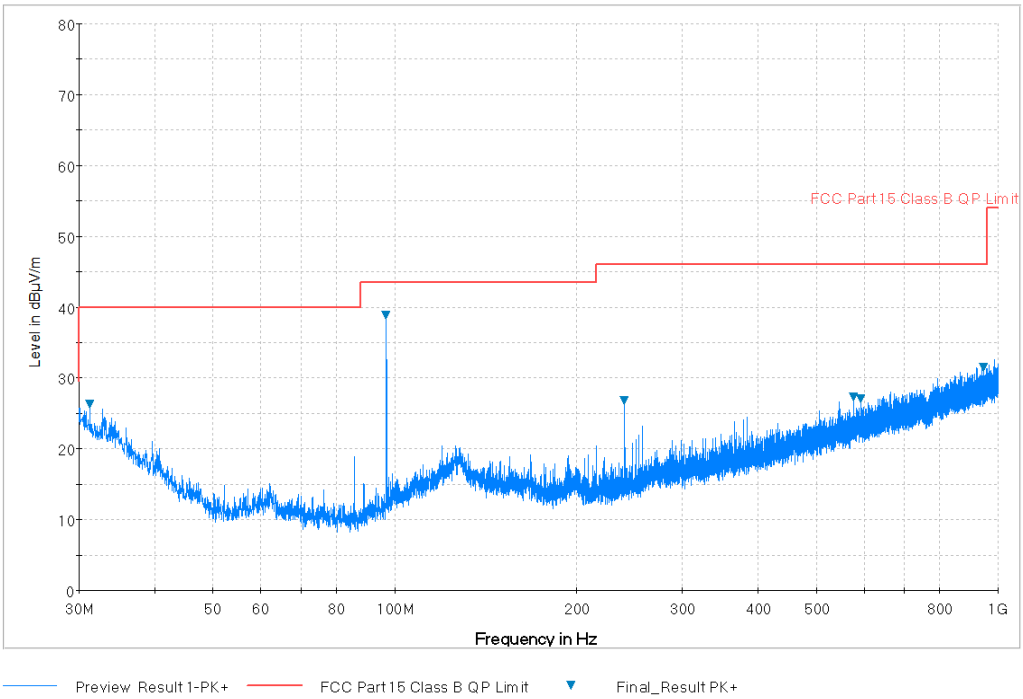
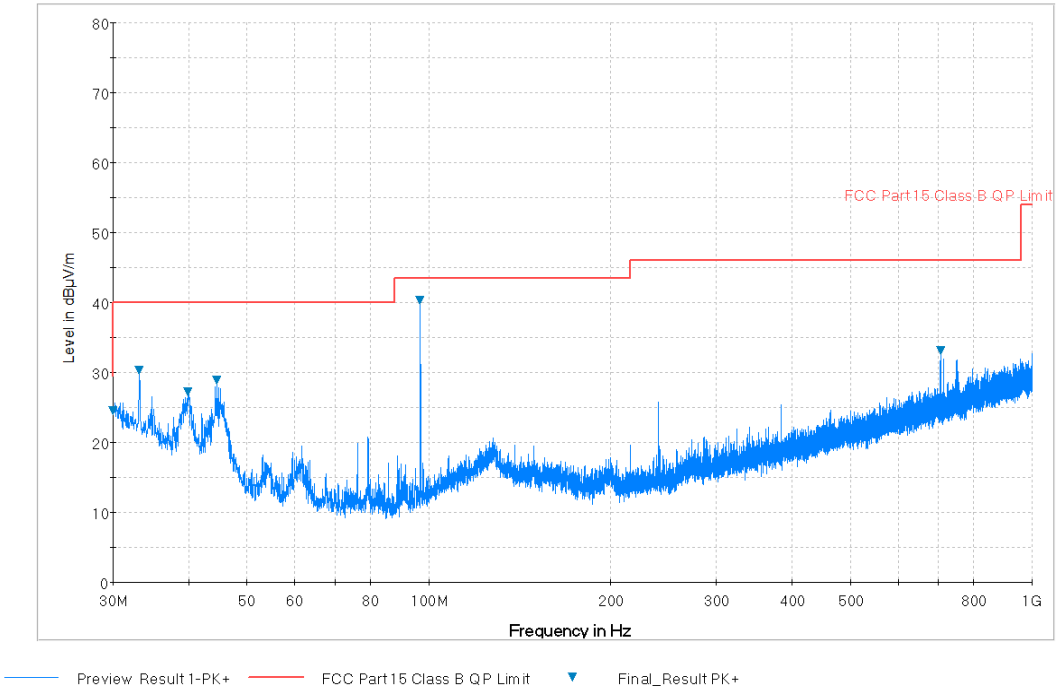


Plot 6-21. Radiated Spurious Plot below 1GHz (Pol. H, Mid Channel – 96.9MHz)



Plot 6-22. Radiated Spurious Plot below 1GHz (Pol. V, Mid Channel – 96.9MHz)

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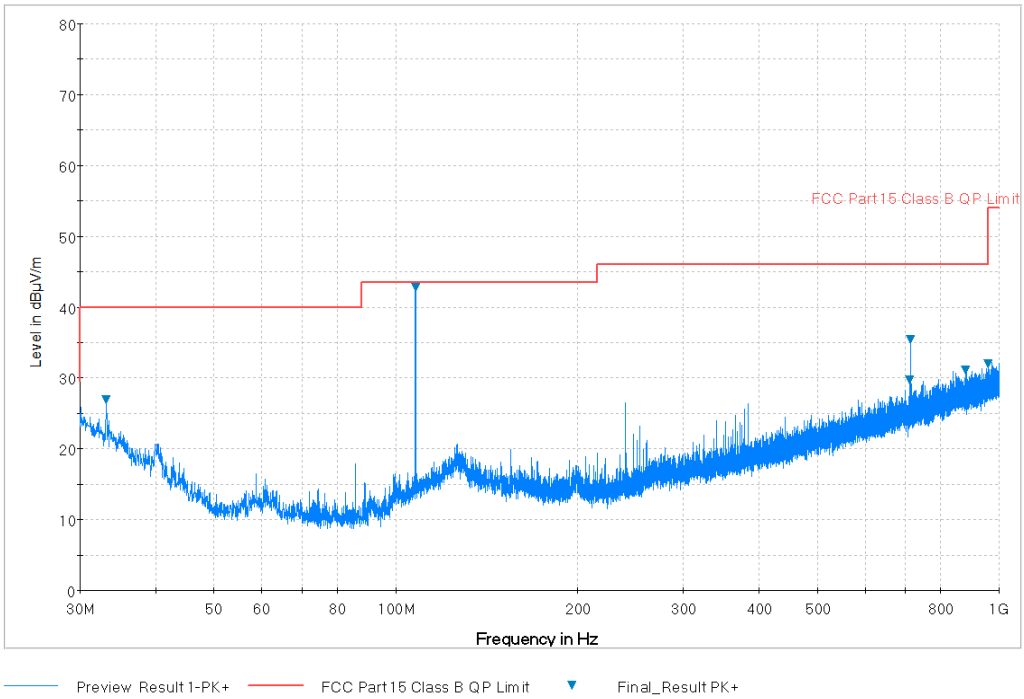
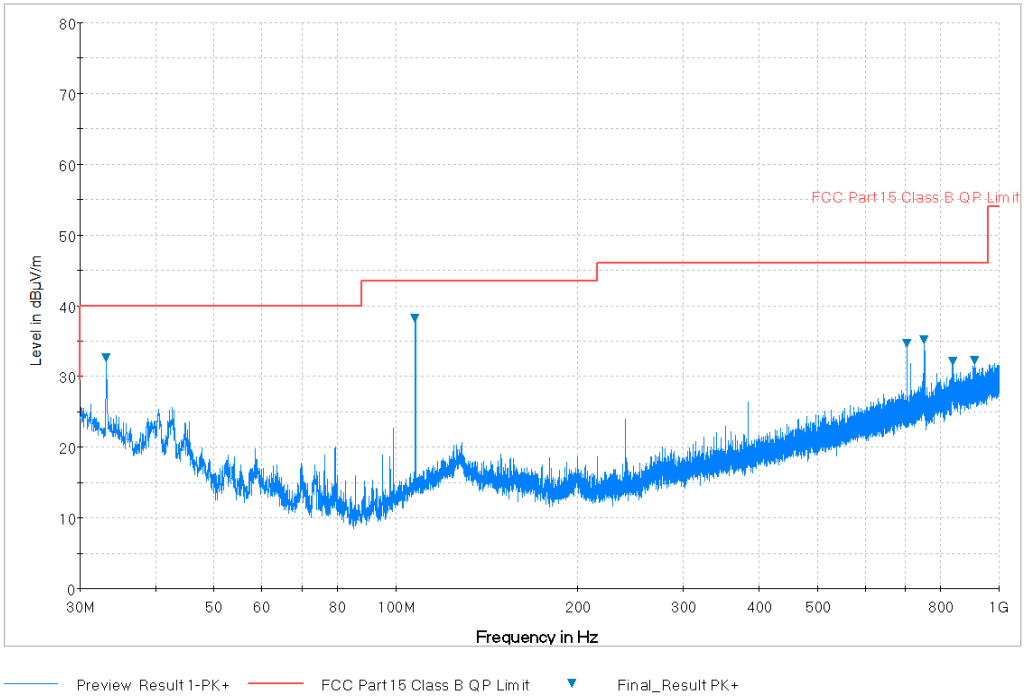


Plot 6-23. Radiated Spurious Plot below 1GHz (Pol. H, High Channel – 107.9MHz)



Plot 6-24. Radiated Spurious Plot below 1GHz (Pol. V, High Channel – 107.9MHz)

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In-Band Emissions and Radiated Spurious Emissions – Configuration #9

§15.239(b) §15.209

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FREQ [MHz]	LEVEL [dBm]	Detector	Antenna Factor [dB/m]	Cable Loss [dB]	AFCL [dB/m]	POL [H/V]	Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
88.1	-43.11	Average	13.89	-35.41	-21.52	V	42.4	47.96	-5.59
88.1	-42.07	Peak	13.89	-35.41	-21.52	V	43.4	67.96	-24.55
176.2	-72.96	Peak	17.80	-35.03	-17.22	V	16.8	43.52	-26.70
264.3	-71.5	Peak	19.33	-34.44	-15.11	V	20.4	46.02	-25.63
352.4	-69.76	Peak	21.20	-34.05	-12.86	V	24.4	46.02	-21.64
704.8	-73.27	Peak	26.70	-32.50	-5.80	V	27.9	46.02	-18.09
96.9	-48.34	Average	15.68	-35.40	-19.72	V	38.9	47.96	-9.02
96.9	-45.69	Peak	15.68	-35.40	-19.72	V	41.6	67.96	-26.37
193.8	-72.35	Peak	18.31	-34.90	-16.59	V	18.1	43.52	-25.46
290.7	-69.95	Peak	19.93	-34.40	-14.47	V	22.6	46.02	-23.44
387.6	-72.85	Peak	21.85	-33.88	-12.03	V	22.1	46.02	-23.90
775.2	-73.27	Peak	27.31	-32.17	-4.86	V	28.9	46.02	-17.15
107.9	-48.68	Average	18.39	-35.40	-17.01	H	41.3	47.96	-6.65
107.9	-46.76	Peak	18.39	-35.40	-17.01	H	43.2	67.96	-24.73
323.7	-68.66	Peak	20.63	-34.30	-13.67	H	24.7	46.02	-21.35
755.3	-72.61	Peak	27.19	-32.30	-5.11	H	29.3	46.02	-16.74
863.2	-72.79	Peak	28.56	-31.65	-3.09	H	31.1	46.02	-14.90
971.1	-74.21	Peak	29.38	-31.18	-1.80	H	31.0	53.98	-22.99

Table 6-8. Radiated Spurious Emissions below 1GHz

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6.5 Radiated Spurious Emissions – Above 1GHz

§15.239(c) §15.209

Test Overview and Limit

All out of band radiated spurious emissions are measured with a spectrum analyzer connected to a receive antenna while the EUT is operating at maximum power and at the appropriate frequencies. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in Table 6-9 per FCC Part 15.209.

Frequency	Field Strength [μV/m]	Measured Distance [Meters]
Above 960.0 MHz	500	3

Table 6-9. Radiated Limits

Test Procedures Used

ANSI C63.10-2013 – Clauses 6.6 and 8.6

Test Settings

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

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Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

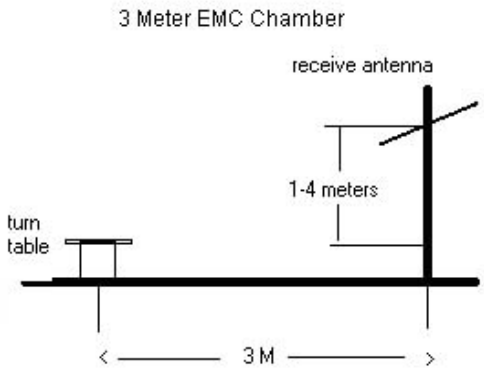

Figure 6-8. Test Instrument & Measurement Setup

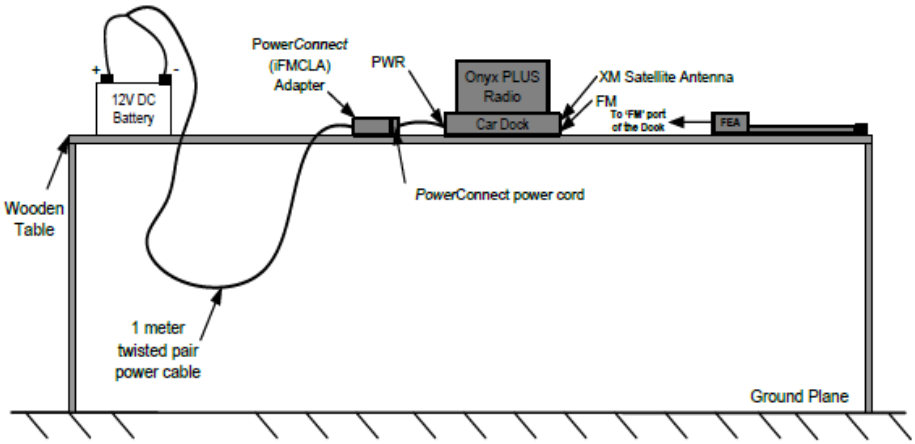

Figure 6-9. Test Instrument & Measurement Setup (Configuration #7)

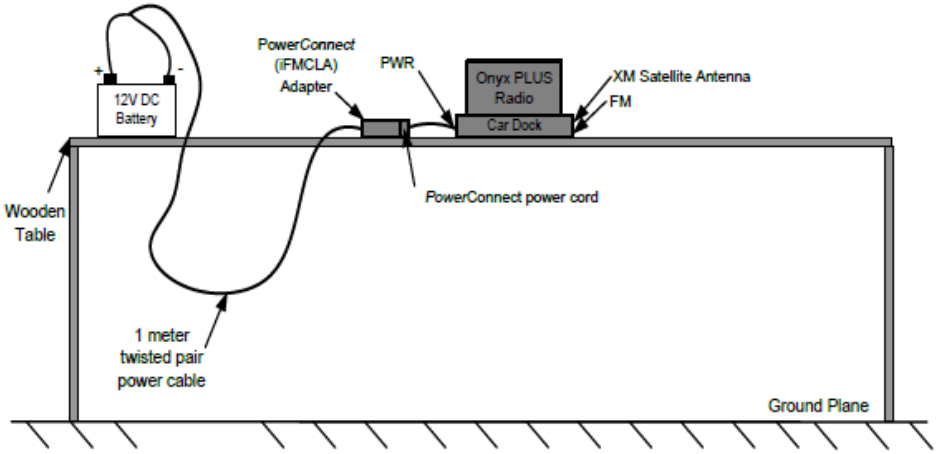

Figure 6-10. Test Instrument & Measurement Setup (Configuration #8)

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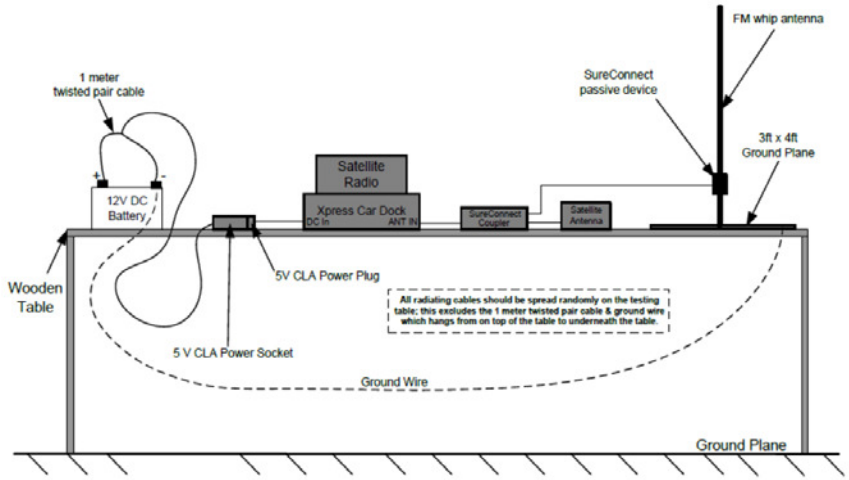

Figure 6-11. Test Instrument & Measurement Setup (Configuration #9)

Test Notes

1. All emissions lying in restricted bands specified in §15.205 are below the limit shown in Table 6-9.
2. The antenna is manipulated through typical positions, polarity and length during the tests.
3. This unit was tested while powered by a 12V DC battery.
4. The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter using CISPR quasi peak detector below 1GHz. Above 1 GHz, peak measurements were taken using linearly polarized horn antennas. The worst-case emissions are reported however emissions whose levels were not within 20dB of the respective limits were not reported.
5. Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.
6. The wide spectrum spurious emissions plots shown on the following pages are used only for the purpose of emission identification. Any emissions found to be within 20dB of the limit are fully investigated and the results are shown in this section.

Sample Calculations

Determining Spurious Emissions Levels

- Field Strength Level $_{[dB\mu V/m]}$ = Analyzer Level $_{[dBm]}$ + 107 + AFCL $_{[dB/m]}$
- AFCL $_{[dB/m]}$ = Antenna Factor $_{[dB/m]}$ + Cable Loss $_{[dB]}$
- Margin $_{[dB]}$ = Field Strength Level $_{[dB\mu V/m]}$ – Limit $_{[dB\mu V/m]}$

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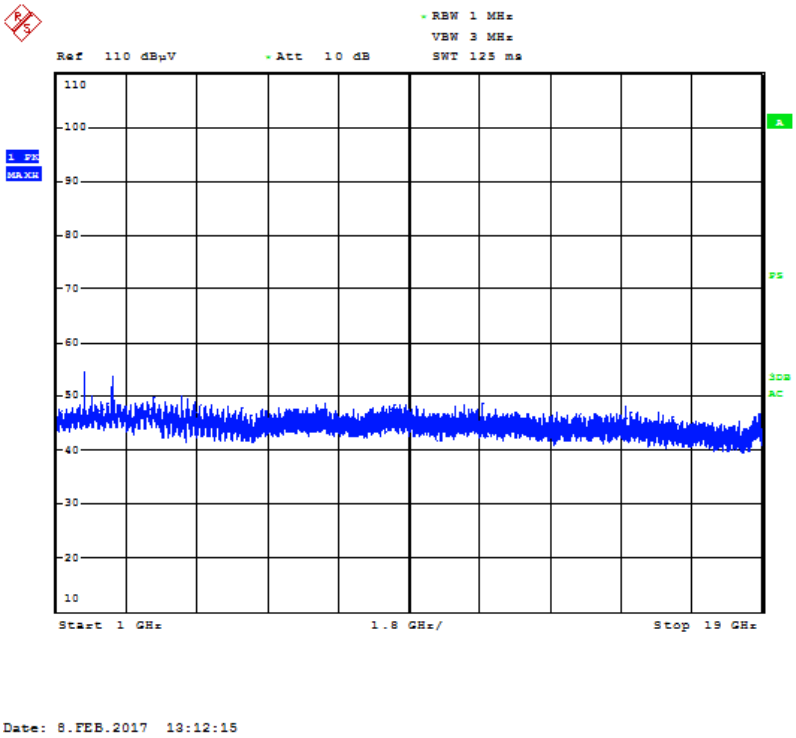
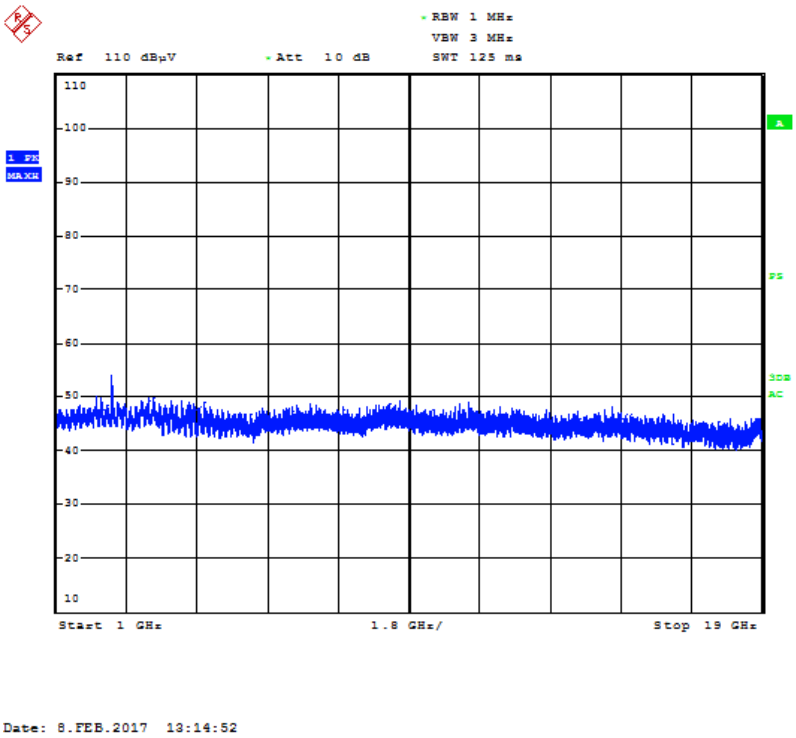
6.5.1 Radiated Spurious Emission Measurements – Configuration #7

§15.239(c) §15.209



Plot 6-25. Radiated Spurious Plot above 1GHz (Ant. Pol. H, Low Channel – 88.1MHz)



Plot 6-26. Radiated Spurious Plot above 1GHz (Ant. Pol. V, Low Channel – 88.1MHz)

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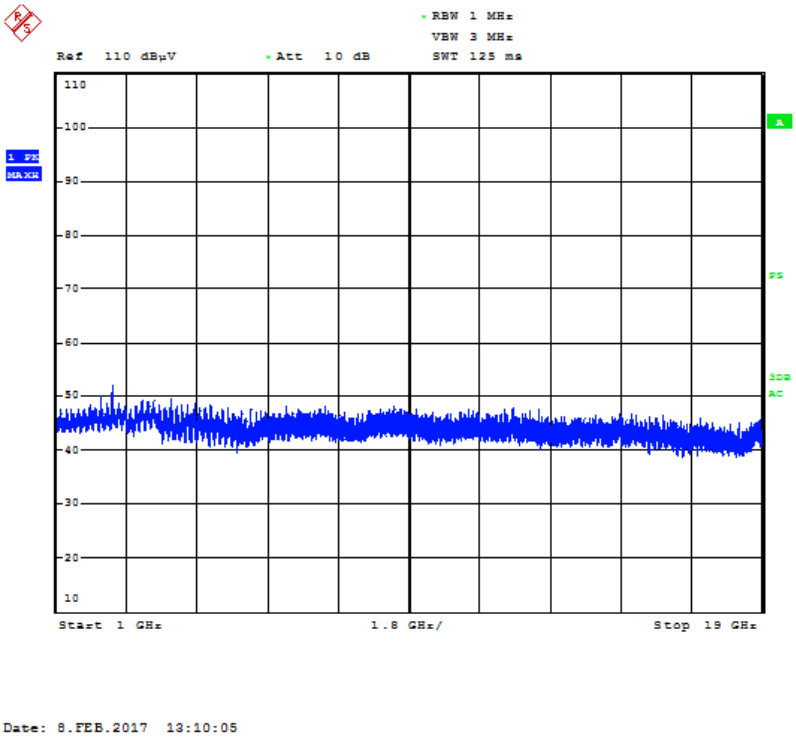
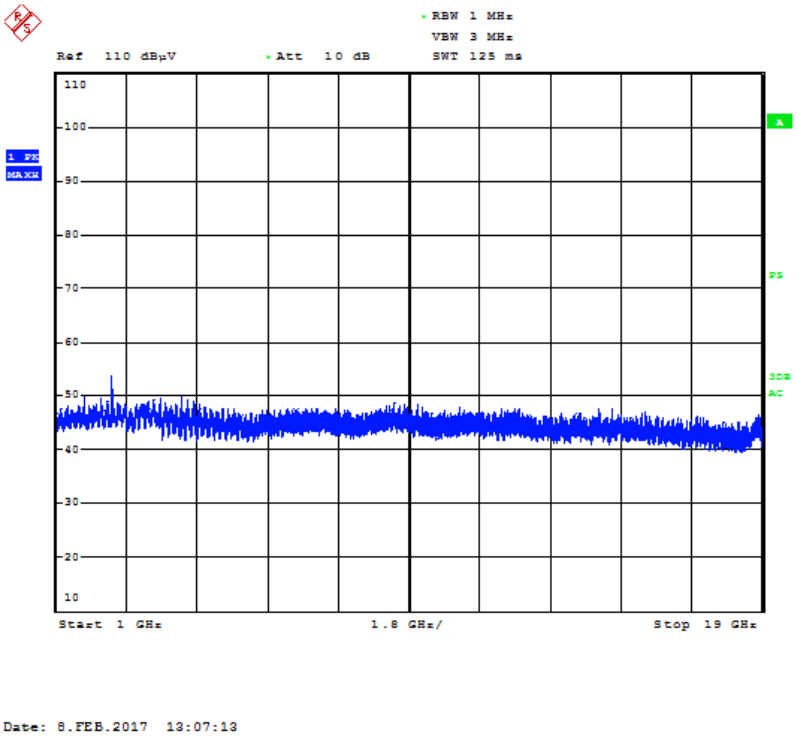


Plot 6-27. Radiated Spurious Plot above 1GHz (Ant. Pol. H, Mid Channel – 96.9MHz)



Plot 6-28. Radiated Spurious Plot above 1GHz (Ant. Pol. V, Mid Channel – 96.9MHz)

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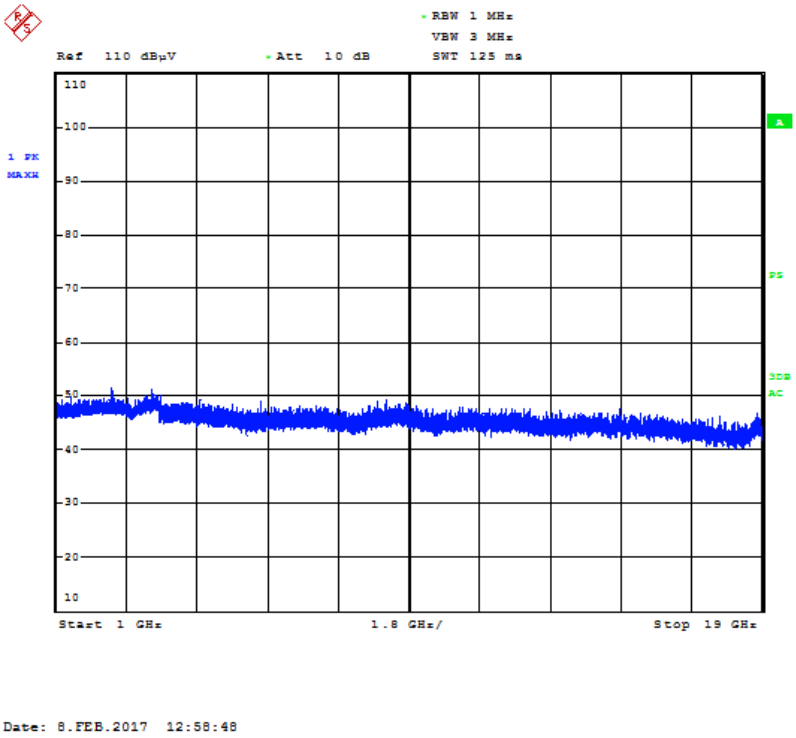
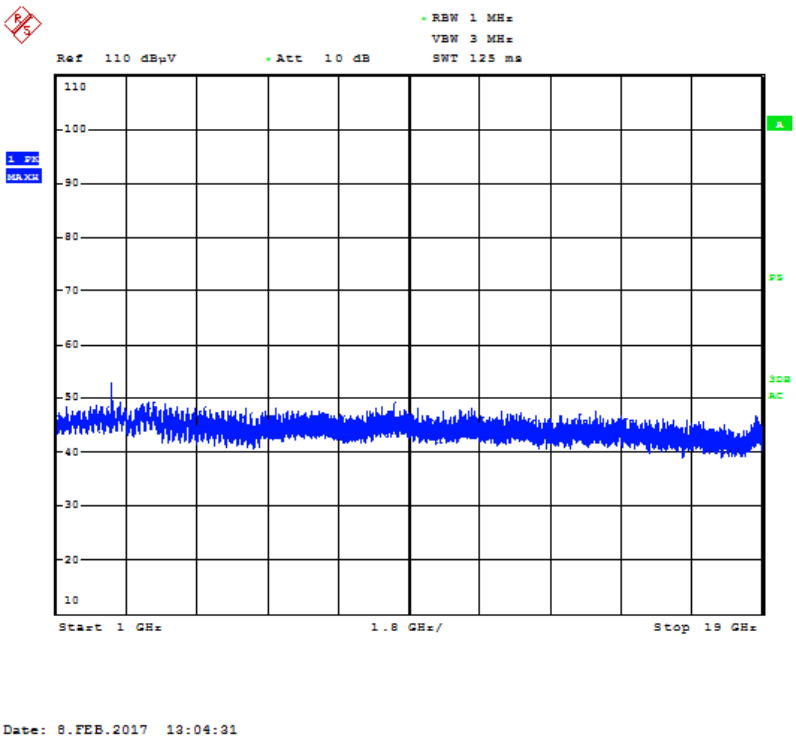


Plot 6-29. Radiated Spurious Plot above 1GHz (Ant. Pol. H, High Channel – 107.9MHz)



Plot 6-30. Radiated Spurious Plot above 1GHz (Ant. Pol. V, High Channel – 107.9MHz)

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Radiated Spurious Emission Measurements
§15.247(d) §15.209

Distance of Measurements: 3 Meters

Operating Frequency: 88.1MHz, 96.9MHz, 107.9MHz

FREQ [MHz]	LEVEL [dBm]	Detector	Antenna Factor [dB/m]	Cable Loss [dB]	AFCL [dB/m]	POL [H/V]	Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
88.1									
3789.4	-68.35	Average	32.46	-29.12	3.34	V	41.99	53.979	-11.99
3789.4	-57.27	Peak	32.46	-29.12	3.34	V	53.07	73.979	-20.91
96.9									
3856.6	-70.49	Average	32.53	-29.10	3.43	V	39.94	53.979	-14.04
3856.6	-57.44	Peak	32.53	-29.10	3.43	V	52.99	73.979	-20.99
107.9									
3194.8	-69.27	Average	30.85	-29.75	1.10	V	38.83	53.979	-15.15
3194.8	-57.55	Peak	30.85	-29.75	1.10	V	50.55	73.979	-23.43

Table 6-10. Radiated Measurements above 1GHz

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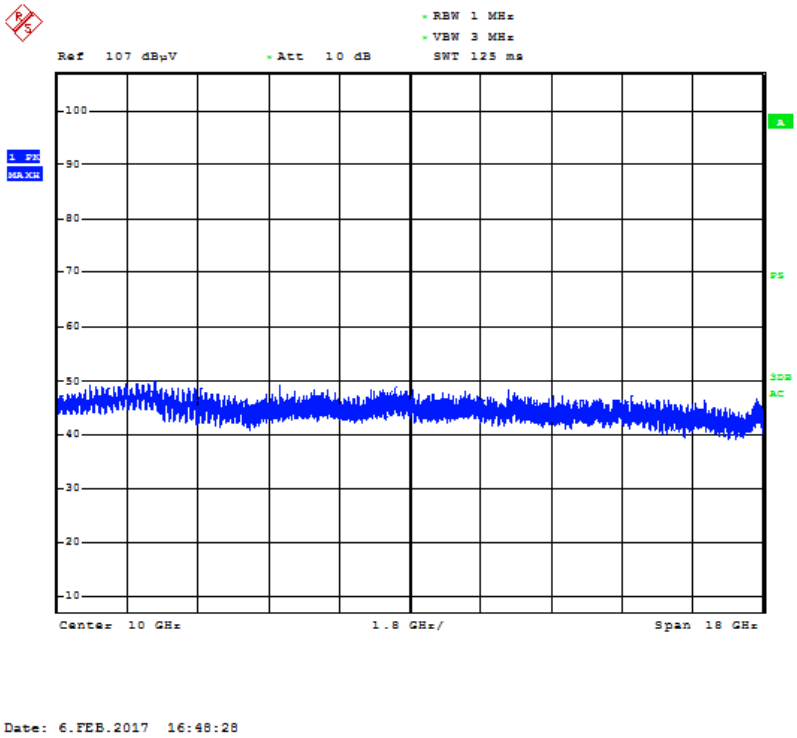
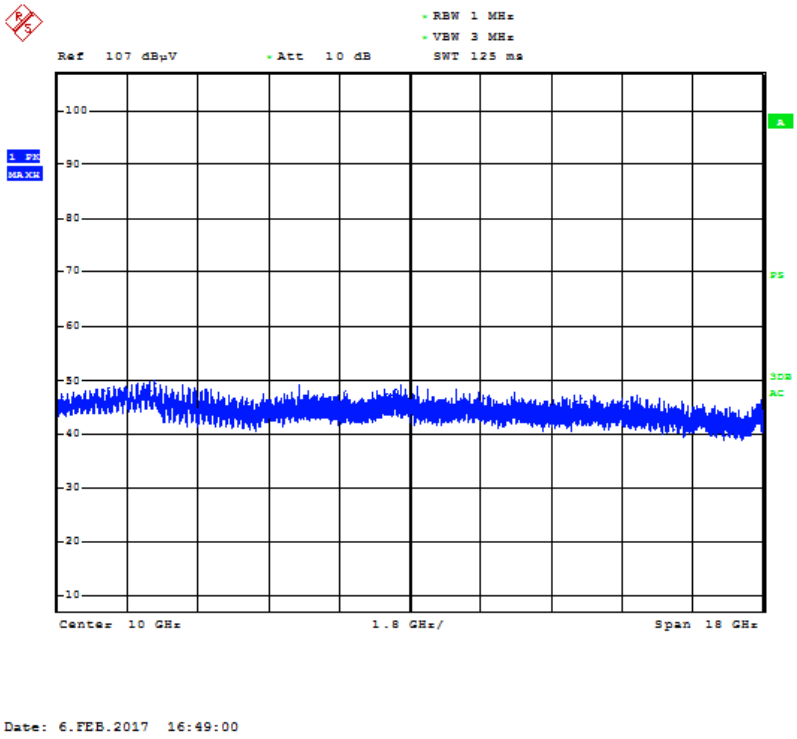
6.5.2 Radiated Spurious Emission Measurements – Configuration #8

§15.239(c) §15.209



Plot 6-31. Radiated Spurious Plot above 1GHz (Ant. Pol. H, Low Channel – 88.1MHz)



Plot 6-32. Radiated Spurious Plot above 1GHz (Ant. Pol. V, Low Channel – 88.1MHz)

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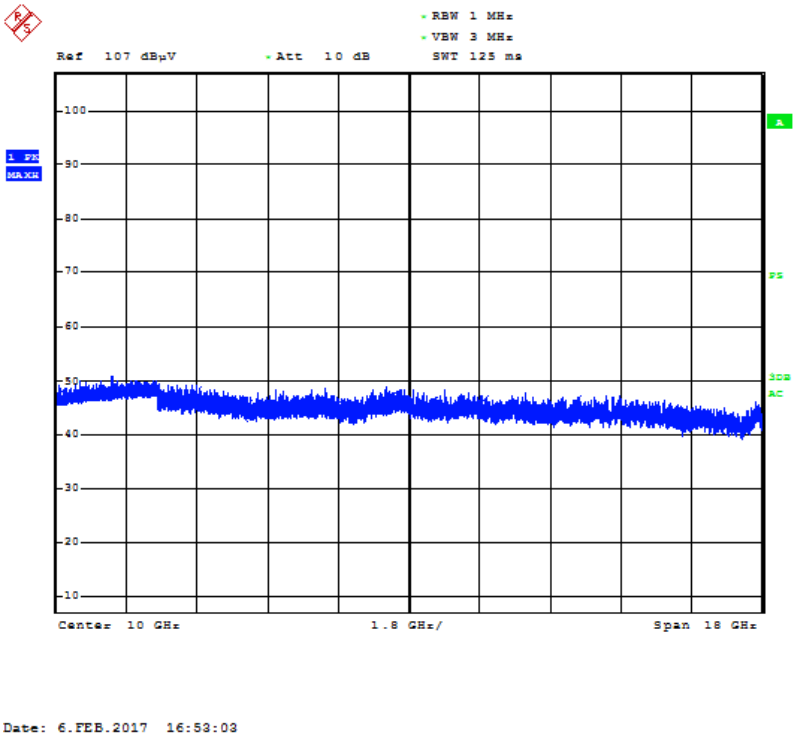
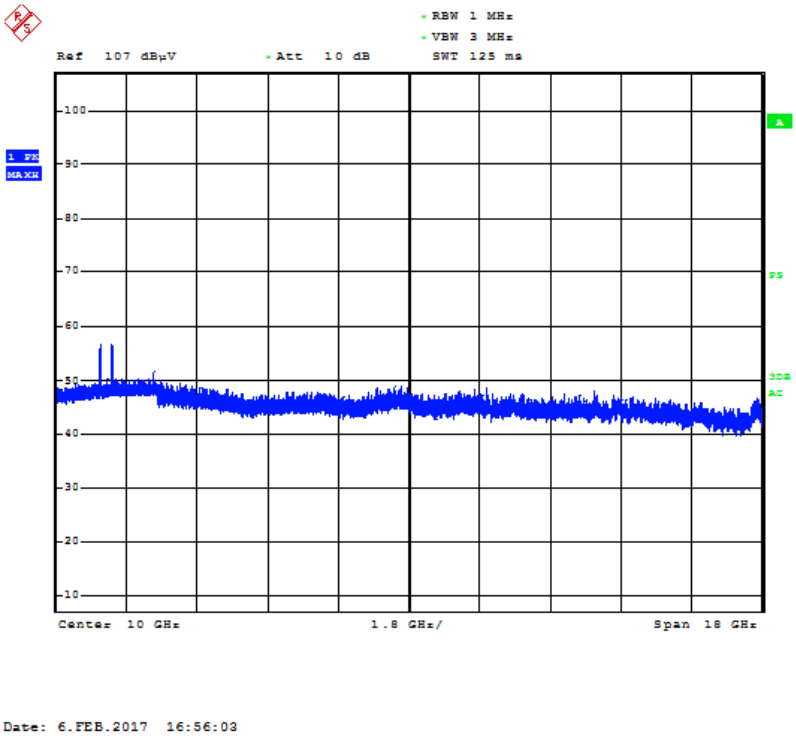


Plot 6-33. Radiated Spurious Plot above 1GHz (Ant. Pol. H, Mid Channel – 96.9MHz)



Plot 6-34. Radiated Spurious Plot above 1GHz (Ant. Pol. V, Mid Channel – 96.9MHz)

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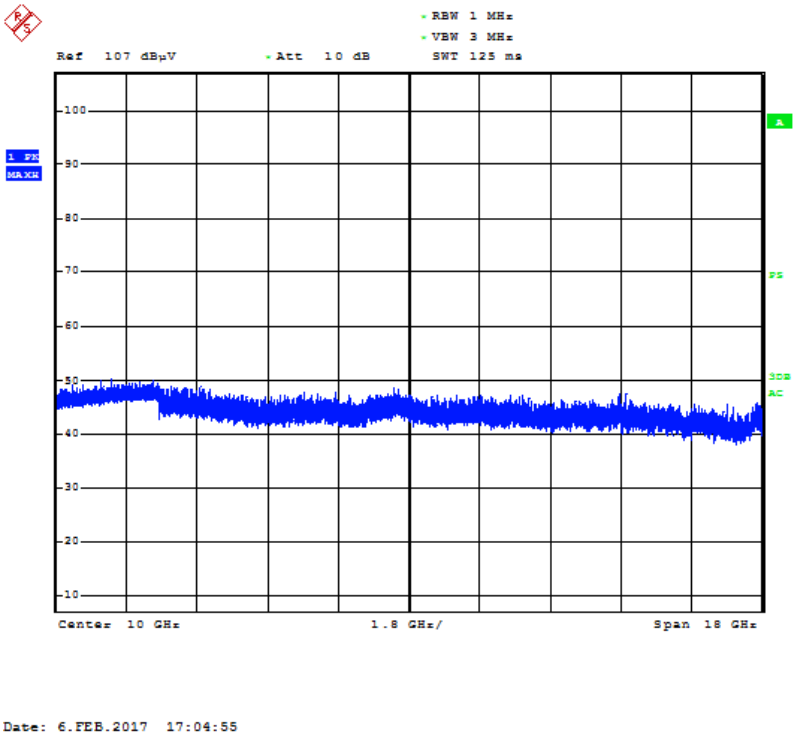
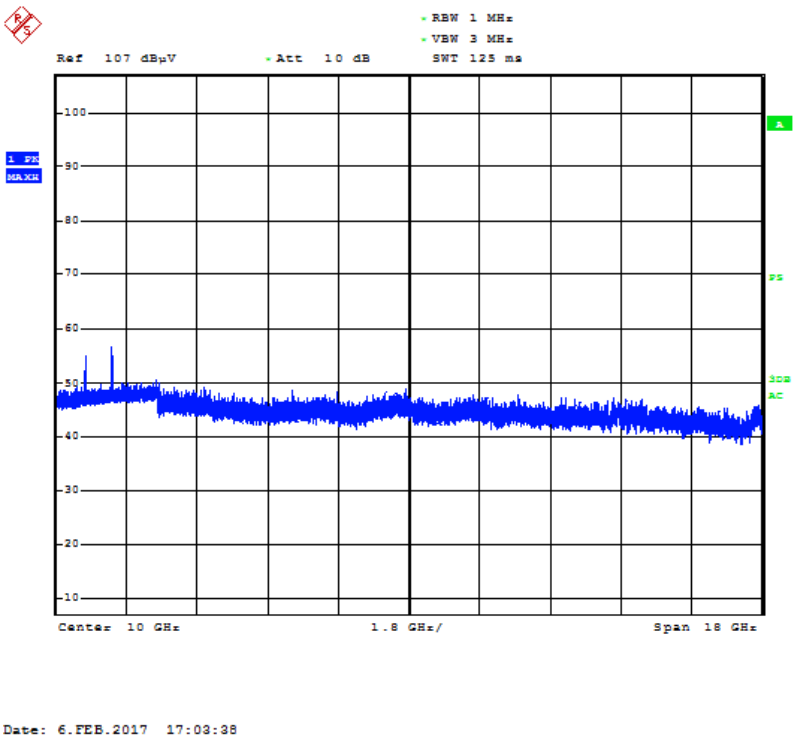


Plot 6-35. Radiated Spurious Plot above 1GHz (Ant. Pol. H, High Channel – 107.9MHz)



Plot 6-36. Radiated Spurious Plot above 1GHz (Ant. Pol. V, High Channel – 107.9MHz)

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Radiated Spurious Emission Measurements

§15.239(c) §15.209

Distance of Measurements: 3 Meters

Operating Frequency: 88.1MHz, 96.9MHz, 107.9MHz

FREQ [MHz]	LEVEL [dBm]	Detector	Antenna Factor [dB/m]	Cable Loss [dB]	AFCL [dB/m]	POL [H/V]	Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
88.1									
3.521	-69.05	Average	31.18	-29.54	1.64	V	39.59	53.979	-14.39
3.521	-56.74	Peak	31.18	-29.54	1.64	V	51.90	73.979	-22.08
96.9									
3.671	-69.09	Average	31.84	-29.47	2.37	V	40.28	53.979	-13.70
3.671	-58.57	Peak	31.84	-29.47	2.37	V	50.80	73.979	-23.18
107.9									
3.904	-69.55	Average	32.55	-29.10	3.45	V	40.90	53.979	-13.08
3.904	-58.9	Peak	32.55	-29.10	3.45	V	51.55	73.979	-22.43

Table 6-11. Radiated Measurements above 1GHz

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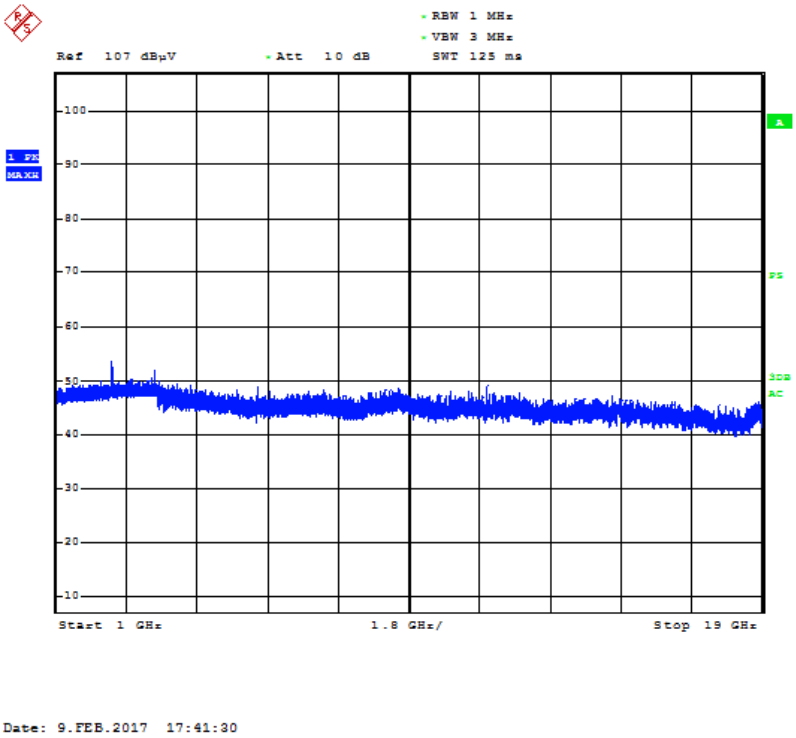
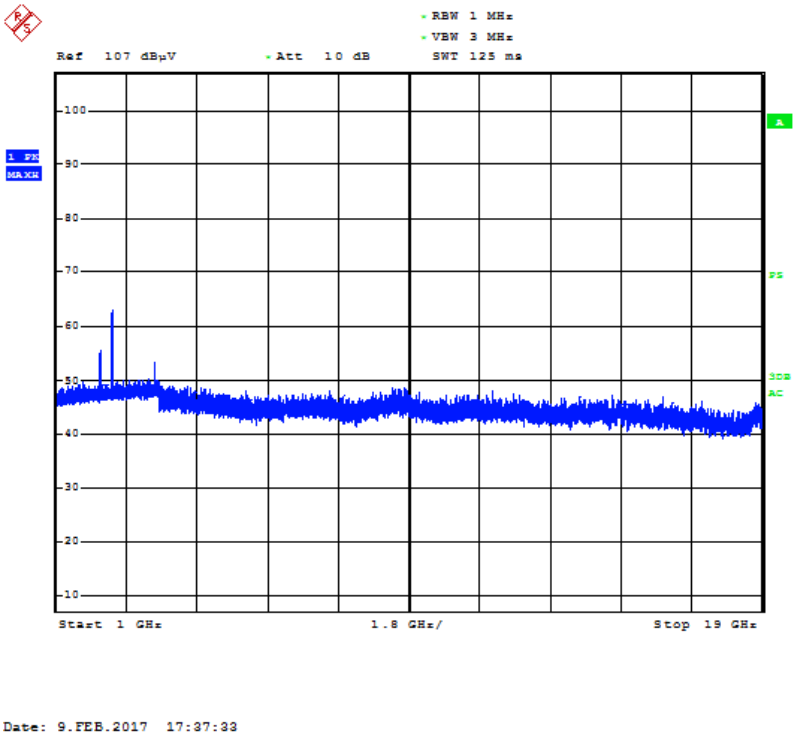
6.5.3 Radiated Spurious Emission Measurements – Configuration #9

§15.239(c) §15.209



Plot 6-37. Radiated Spurious Plot above 1GHz (Ant. Pol. H, Low Channel – 88.1MHz)



Plot 6-38. Radiated Spurious Plot above 1GHz (Ant. Pol. V, Low Channel – 88.1MHz)

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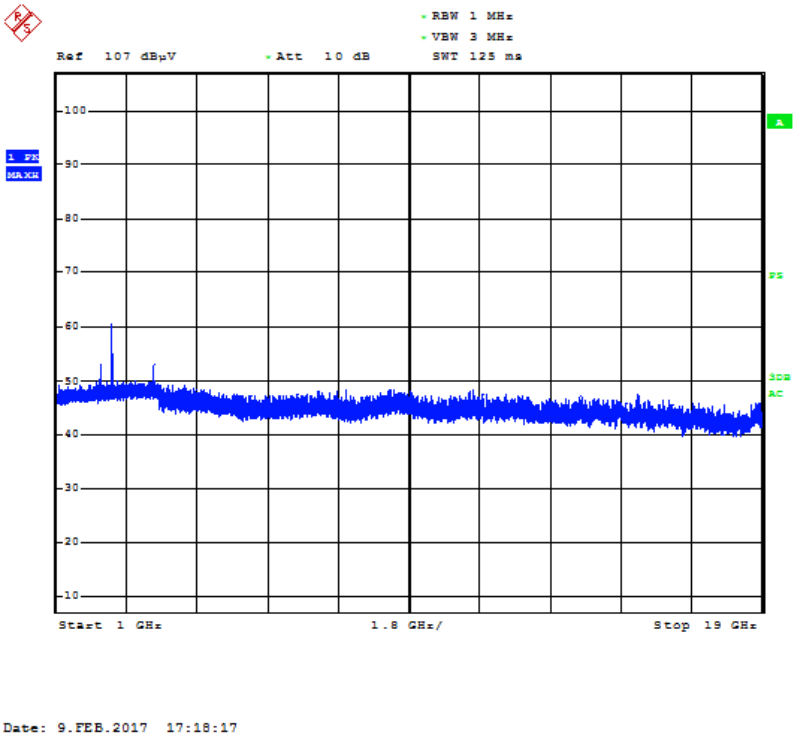
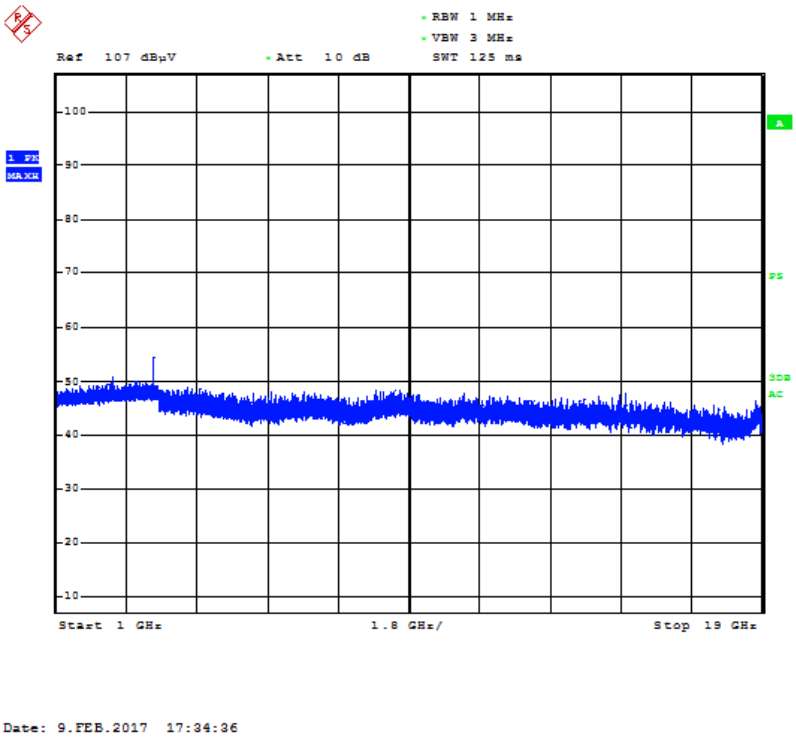


Plot 6-39. Radiated Spurious Plot above 1GHz (Ant. Pol. H, Mid Channel – 96.9MHz)



Plot 6-40. Radiated Spurious Plot above 1GHz (Ant. Pol. V, Mid Channel – 96.9MHz)

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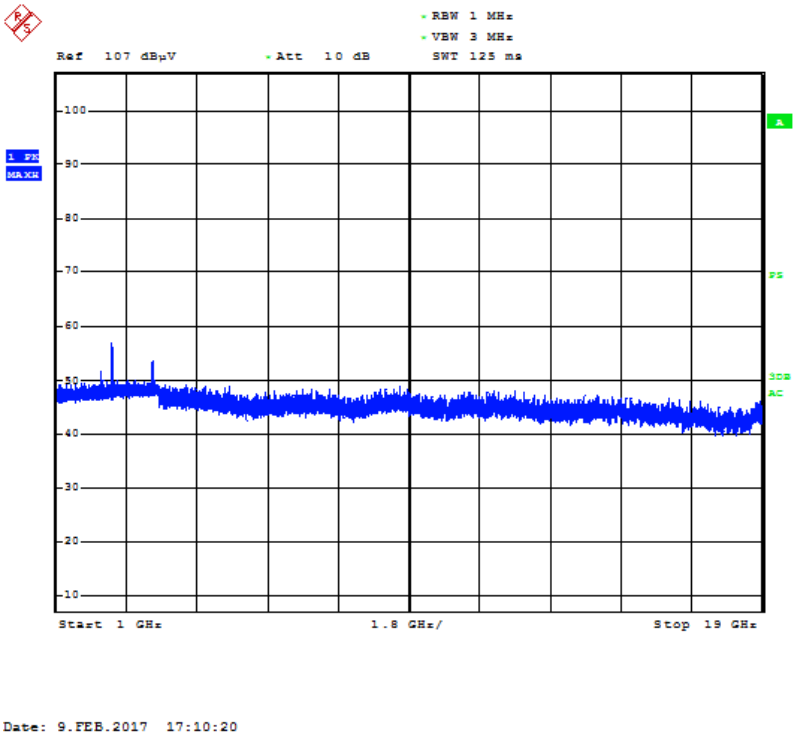
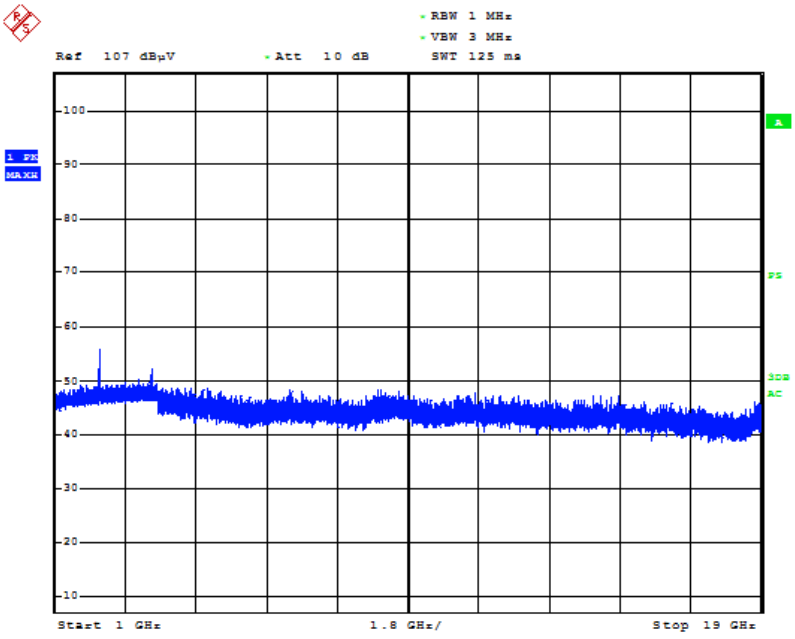


Date: 9.FEB.2017 17:10:20

Plot 6-41. Radiated Spurious Plot above 1GHz (Ant. Pol. H, High Channel – 107.9MHz)



Date: 9.FEB.2017 17:15:08

Plot 6-42. Radiated Spurious Plot above 1GHz (Ant. Pol. V, High Channel – 107.9MHz)

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Radiated Spurious Emission Measurements
§15.239(c) §15.209

Distance of Measurements: 3 Meters

Operating Frequency: 88.1MHz, 96.9MHz, 107.9MHz

FREQ [MHz]	LEVEL [dBm]	Detector	Antenna Factor [dB/m]	Cable Loss [dB]	AFCL [dB/m]	POL [H/V]	Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
88.1									
1980.8	-67.8	Average	27.72	-34.57	-6.85	V	32.35	53.979	-21.63
1980.8	-52.93	Peak	27.72	-34.57	-6.85	V	47.22	73.979	-26.76
96.9									
3450.2	-67.31	Average	31.06	-34.10	-3.04	V	36.65	53.979	-17.33
3450.2	-57.8	Peak	31.06	-34.10	-3.04	V	46.16	73.979	-27.82
107.9									
3448.5	-58.98	Average	31.06	-34.11	-3.05	V	44.97	53.979	-9.01
3448.5	-53.7	Peak	31.06	-34.11	-3.05	V	50.25	73.979	-23.73

Table 6-12. Radiated Measurements above 1GHz

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7.0 CONCLUSION

The data collected relate only the item(s) tested and show that the **Sirius XM Satellite Radio with FM Transmitter FCC ID: RS2SXEZR1** is in compliance with Part 15C of the FCC Rules.

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