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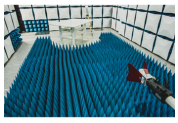

MEASUREMENT REPORT
FCC PART 15.249 ZWave

Applicant Name:
Samsung Electronics Co., Ltd.
129, Samsung-ro,
Yeongtong-gu, Suwon-si
Gyeonggi-do, 16677, Korea

Date of Testing:
11/6-11/14/2017
Test Site/Location:
PCTEST Lab. Columbia, MD, USA
Test Report Serial No.:
1M1711060288-01.A3L

FCC ID:	**A3LETWV531**
APPLICANT:	**Samsung Electronics Co., Ltd.**

Application Type:	Class II Permissive Change
Model(s):	ET-WV531
EUT Type:	Indoor Access Point
Frequency Range:	919.8 – 921.4MHz (Chile)
FCC Classification:	Low Power Transceiver, Rx Verified (DXT)
FCC Rule Part(s):	Part 15 Subpart C (15.249)
Test Procedure(s):	ANSI C63.10-2013
Class II Permissive Change:	Please see FCC change document

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.

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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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 Innovation, Science and Economic Development Canada.

1.2 PCTEST Test Location

These measurement tests were conducted at the PCTEST Engineering Laboratory, Inc. facility located at 7185 Oakland Mills Road, Columbia, MD 21046. 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 measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014.

1.3 Test Facility / Accreditations

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

- PCTEST is an ISO 17025-2005 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.01 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.

- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISED Standards (RSS).

- PCTEST facility is a registered (22831) test laboratory with the site description on file with ISED.

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Indoor Access Point FCC ID: A3LETWV531**. The test data contained in this report pertains only to the emissions due to the EUT's ZWave transmitter.

Test Device Serial No.: 26APR-1 and 26APR-6

2.2 Device Capabilities

This device contains the following capabilities:

802.11b/g/n WLAN, 802.11a/n/ac UNII, Bluetooth (LE), Zigbee, Zwave

Frequency (MHz)
919.8, 921.4

Table 2-1. Frequency Operations

2.3 Test Configuration

The EUT was tested per the guidance of ANSI C63.10-2013. ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing. See Sections 3.2 for AC line conducted emissions test setups, 3.3 for radiated emissions test setups, and 7.2 for antenna port conducted emissions test setups.

2.4 EMI Suppression Device(s)/Modifications

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

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3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

The measurement procedure described in the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices (ANSI C63.10-2013) was used in the measurement of the EUT**.**

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

3.2 AC Line Conducted Emissions

The line-conducted facility is located inside a 10'x16'x9' shielded enclosure. The shielded enclosure is manufactured by ETS Lindgren RF Enclosures. The shielding effectiveness of the shielded room is in accordance with MIL-Std-285 or NSA 65-5. A 1m x 1.5m wooden table 80cm high is placed 40cm away from the vertical wall and 80cm away from the sidewall of the shielded room. Two 10kHz-30MHz, 50Ω/50μH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room floor. Power to the LISNs is filtered by external high-current high-insertion loss power line filters. The external power line filter is an ETS Lindgren Model LPRX-4X30 (100dB Attenuation, 14kHz-18GHz) and the two EMI/RFI filters are ETS Lindgren Model LRW-2030-S1 (100dB Minimum Insertion Loss, 14kHz – 10GHz). These filters attenuate ambient signal noise from entering the measurement lines. These filters are also bonded to the shielded enclosure.

The EUT is powered from one LISN and the support equipment is powered from the second LISN. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and this supply line(s) will be connected to the second LISN. All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion) and draped over the back edge of the test table. All cables were at least 40cm above the horizontal reference groundplane. Power cables for support equipment were routed down to the second LISN while ensuring that that cables were not draped over the second LISN.

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 RF output of the LISN was connected to the spectrum analyzer and exploratory measurements were made to determine the frequencies producing the maximum emission from the EUT. The spectrum was scanned from 150kHz to 30MHz with a spectrum analyzer. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 10kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Once the worst case emissions have been identified, the one EUT cable configuration/arrangement and mode of operation that produced these emissions is used for final measurements on the same test site. The analyzer is set to CISPR quasi-peak and average detectors with a 9kHz resolution bandwidth for final measurements.

Line conducted emissions test results are shown in Section 7.7. Automated test software was used to perform the AC line conducted emissions testing.

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3.3 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 Figure 5.7 of Clause 5 in ANSI C63.4-2014. 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 above 1GHz. An 80cm tall test table made of Styrodur is placed on top of the turn table. For measurements above 1GHz, an additional Styrodur pedestal is placed on top of the test table to bring the total table height to 1.5m.

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 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, mode of operation, 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.

3.4 Environmental Conditions

The temperature is controlled within range of 15ºC to 35ºC. 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 antennas of the EUT are **permanently attached.**
- There are no provisions for connection to an external antenna.

Conclusion:

The EUT complies with the requirement of §15.203.

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5.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013. All measurement uncertainty values are shown with a coverage factor of k = 2 to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Contribution	Expanded Uncertainty (±dB)
Conducted Bench Top Measurements	1.13
Line Conducted Disturbance	3.09
Radiated Disturbance (<1GHz)	4.98
Radiated Disturbance (>1GHz)	5.07
Radiated Disturbance (>18GHz)	5.09

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6.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST). Measurements antennas used during testing were calibrated in accordance to the requirements of ANSI C63.5-2017.

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	RE1	Radiated Emissions Cable Set (UHF/EHF)	6/21/2017	Annual	6/21/2018	RE1
-	WL25-1	Conducted Cable Set (25GHz)	6/14/2017	Annual	6/14/2018	WL25-1
Agilent	N9020A	MXA Signal Analyzer	12/28/2016	Annual	12/28/2017	US46470561
Agilent	N9030A	PXA Signal Analyzer (44GHz)	3/27/2017	Annual	3/27/2018	MY52350166
Emco	3115	Horn Antenna (1-18GHz)	3/10/2016	Biennial	3/10/2018	9704-5182
ETS-Lindgren	3816/2NM	Line Impedance Stabilization Network	12/27/2016	Biennial	12/27/2018	114451
Pasternack	NMLC-1	Line Conducted Emissions Cable (NM)	5/31/2017	Annual	5/31/2018	NMLC-1
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	4/19/2017	Annual	4/19/2018	100342
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	7/3/2017	Annual	7/3/2018	102134
Rohde & Schwarz	TS-PR8	Preamplifier-Antenna SYS; 30MHz-8GHz	11/22/2016	Annual	11/22/2017	102324
Schwarzbeck	UHA 9105	Dipole Antenna	8/26/2016	Biennial	8/26/2018	2697
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	3/14/2016	Biennial	3/14/2018	A051107

Table 6-1. Annual Test Equipment Calibration Schedule

Note:

For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.

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7.0 TEST RESULTS

7.1 Summary

Company Name: Samsung Electronics Co., Ltd.

FCC ID: A3LETWV531

Method/System: Low Power Transceiver. Rx Verified (DXT)

Number of Channels: 2

FCC Part Section(s)	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
2.1049	RSS-Gen [6.6]	Occupied Bandwidth	N/A	CONDUCTED	PASS	Section 7.2
2.1046	N/A	Transmitter Output Power	<1 Watt		PASS	Section 7.3
15.249(a)(e)	RSS-210 [B.10]	Fundamental Field Strength Level	< 50 mV/m	RADIATED	PASS	Section 7.4
15.205, 15.209, 15.249(d)(e)	RSS-Gen [8.9]	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	< 15.209 limits or 50dB below the level of the fundamental (RSS-Gen [8.9])		PASS	Sections 7.5, 7.6
15.207	RSS-Gen [8.8]	AC Conducted Emissions 150kHz – 30MHz	< FCC 15.207 limits (RSS-Gen [8.8])	LINE CONDUCTED	PASS	Section 7.7

Table 7-1. Summary of Test Results

Notes:

1) All modes of operation were investigated. The test results shown in the following sections represent the worst case emissions.
2) 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, attenuators, and couplers.

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7.2 Occupied Bandwidth Measurement

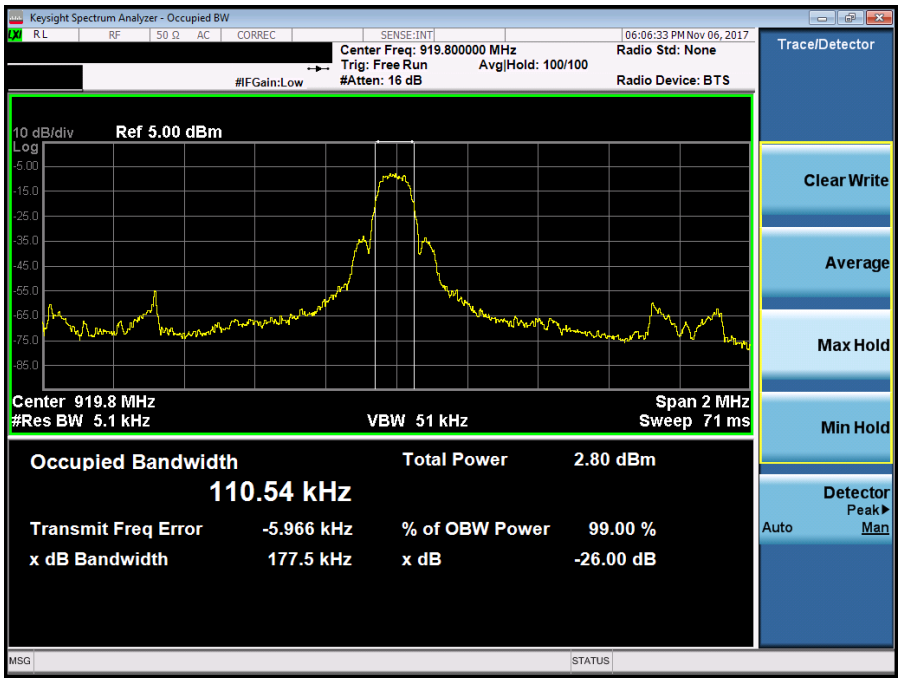
§2.1049; RSS-Gen (6.6)

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured. The spectrum analyzers' "occupied bandwidth" measurement function was used to record the occupied bandwidth.

Frequency [MHz]	Detector	Data Rate [kbps]	Measured Bandwidth [kHz]
919.8	Peak	100	110.5
921.4	Peak	100	93.3

Table 7-2. Occupied Bandwidth Measurement

Figure 7-1. Test Instrument & Measurement Setup



Plot 7-1. Occupied Bandwidth Plot (ZWave – 919.8MHz)

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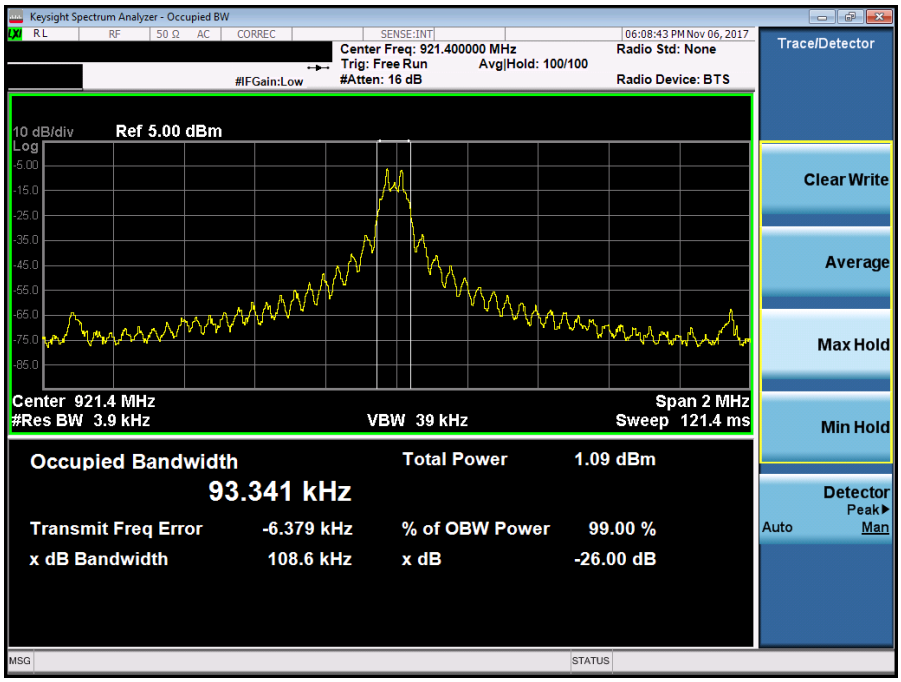

Plot 7-2. Occupied Bandwidth Plot (ZWave – 921.4MHz)

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7.3 Output Power Measurement

§2.1046

Test Overview and Limits

The transmitter antenna terminal of the EUT is connected to the input of a spectrum analyzer. Measurements are made while the EUT is operating at maximum power and at the appropriate frequencies.

The maximum permissible conducted output power is 1 Watt.

Test Procedure Used

ANSI C63.10-2013

Test Settings

1. RBW = 1MHz
2. VBW = 3MHz
3. Span ≥ 3 x RBW
4. Sweep = auto couple
5. Detector = Peak
6. Trace mode = max hold
7. The trace was allowed to stabilize

Test Setup

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

Figure 7-2. Test Instrument & Measurement Setup

Test Notes

None

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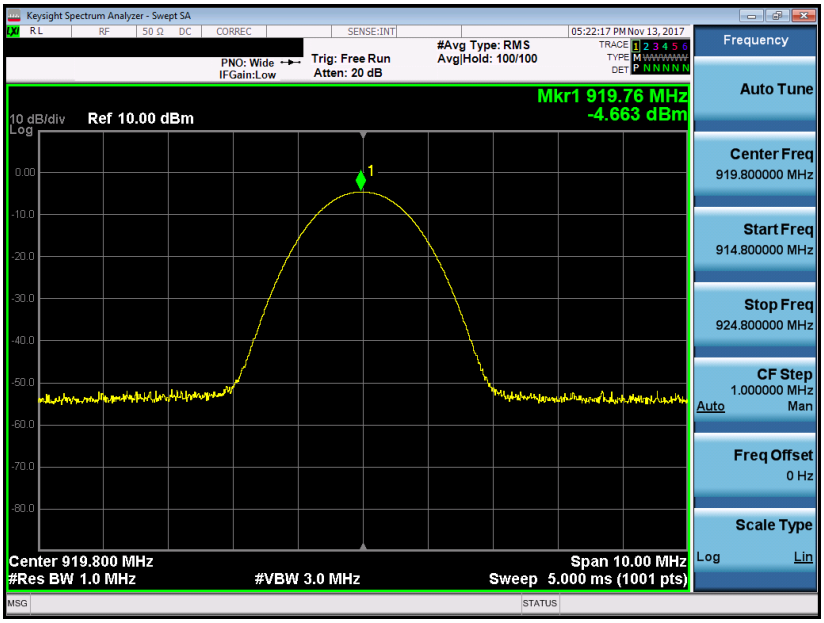
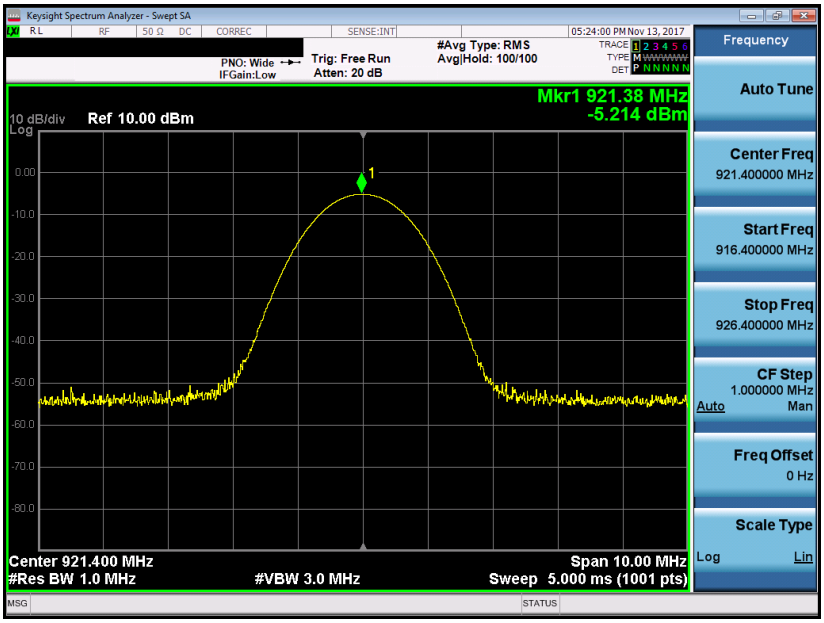
Frequency [MHz]	Detector	Peak Conducted Power	
		[dBm]	[mW]
919.8	Peak	-4.66	0.342
921.4	Peak	-5.21	0.301

Table 7-3. Conducted Output Power Measurements (Zwave)



Plot 7-3. Peak Conducted Power (ZWave – 919.8MHz)



Plot 7-4. Peak Conducted Power (ZWave – 921.4MHz)

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7.4 Fundamental Field Strength Level Measurement

§15.249(a)(e); RSS-210 (B.10)

Measurement is made while the EUT is operating in non-hopping transmission mode. The field strengths shown below were measured using a spectrum analyzer. Peak field strength measurements are performed in the analyzers' swept spectrum mode using a peak detector with RBW = 1MHz and VBW ≥ 3RBW.

The maximum permissible peak field strength level is 50mV/m (93.98dBμV/m).

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
919.80	Peak	H	189	141	-46.37	30.54	91.17	93.98	-2.81
921.40	Peak	H	190	140	-47.02	30.54	90.52	93.98	-3.46

Table 7-4. Field Strength Measurements

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7.5 Radiated Spurious Emission Measurements

§15.205 §15.209 §15.249 (d)(e); RSS-210 (B.10), RSS-Gen (8.9)

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 7-5. Radiated Limits

Test Setup

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

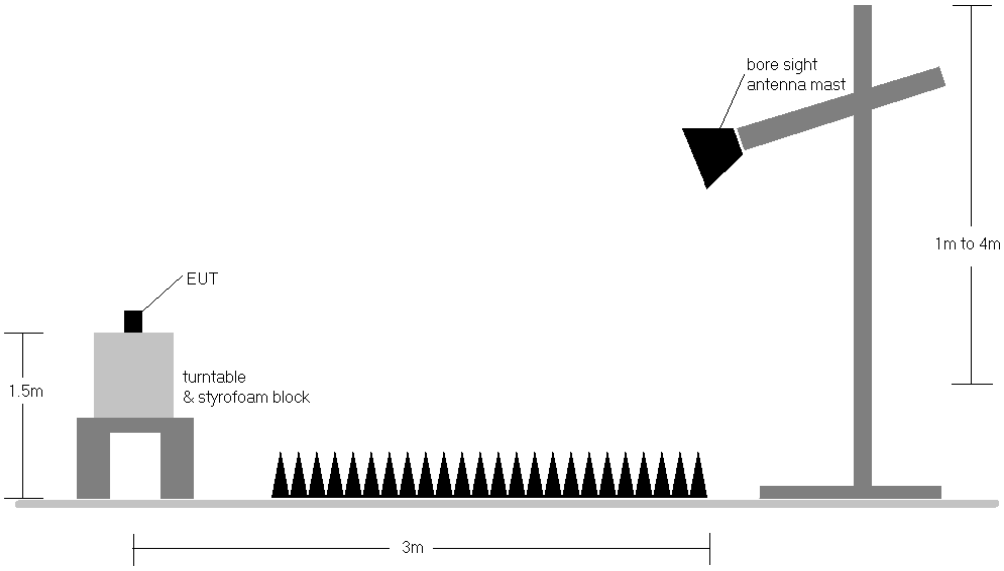

Figure 7-3. Radiated Test Setup

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Sample Calculation

- 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 $_{[dB\mu V/m]}$

Test Notes

1. The spectrum is measured from 9kHz to the 10th harmonic and the worst-case emissions are reported. There were no non-harmonic emissions detected whose levels were within 20dB of the applicable limits so only harmonic emissions data is shown in this section.
2. All emissions lying in restricted bands specified in §15.205 and Section 8.10 of RSS-Gen are below the limit shown in table 7-5. Per 15.249(d) and RSS-210 (B.10), the radiated emissions limits from 15.209 and RSS-Gen Section 8.10 were used since they were less than the limit of 50dB of attenuation from the measured fundamental field strength level.
3. Peak measurements > 1GHz using RBW = 1MHz and VBW = 3MHz.
4. The antenna is manipulated through typical positions, polarity and length during the tests. The EUT is manipulated through three orthogonal planes.
5. This unit was tested while powered by an DC power source.
6. The "-" shown in the following RSE tables are used to denote a noise floor measurement.

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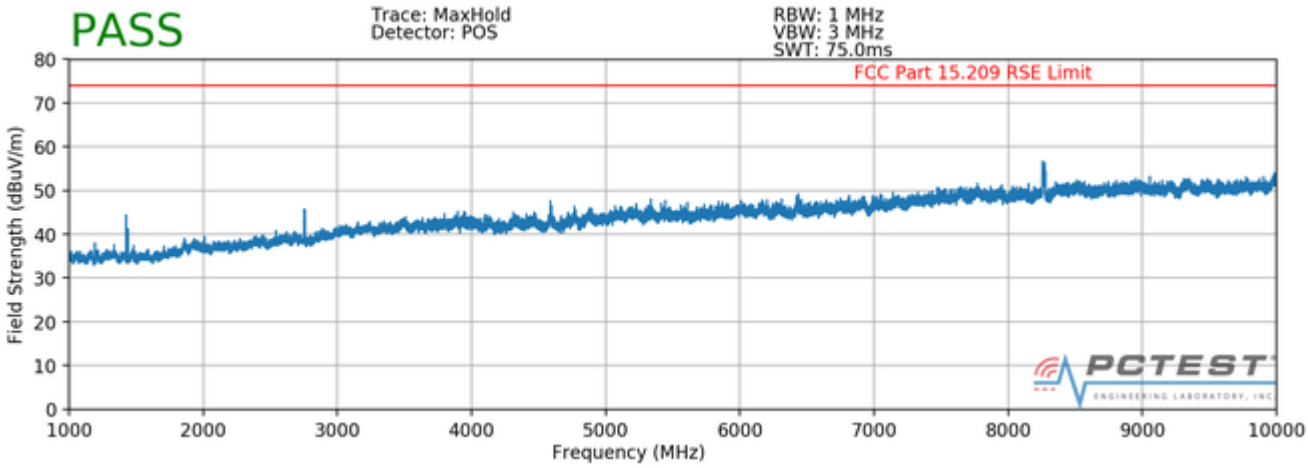
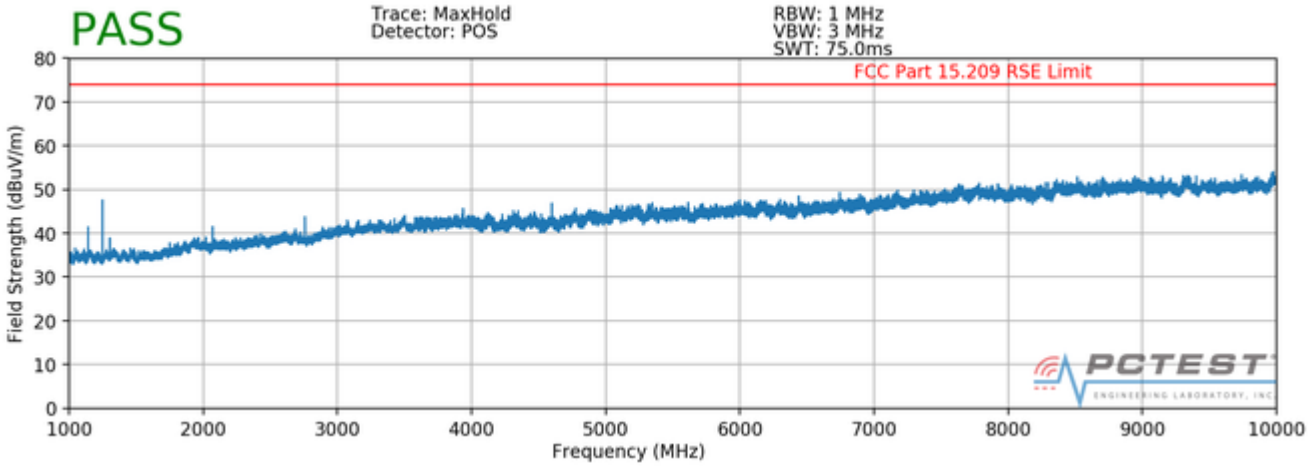
Radiated Spurious Emission Measurements

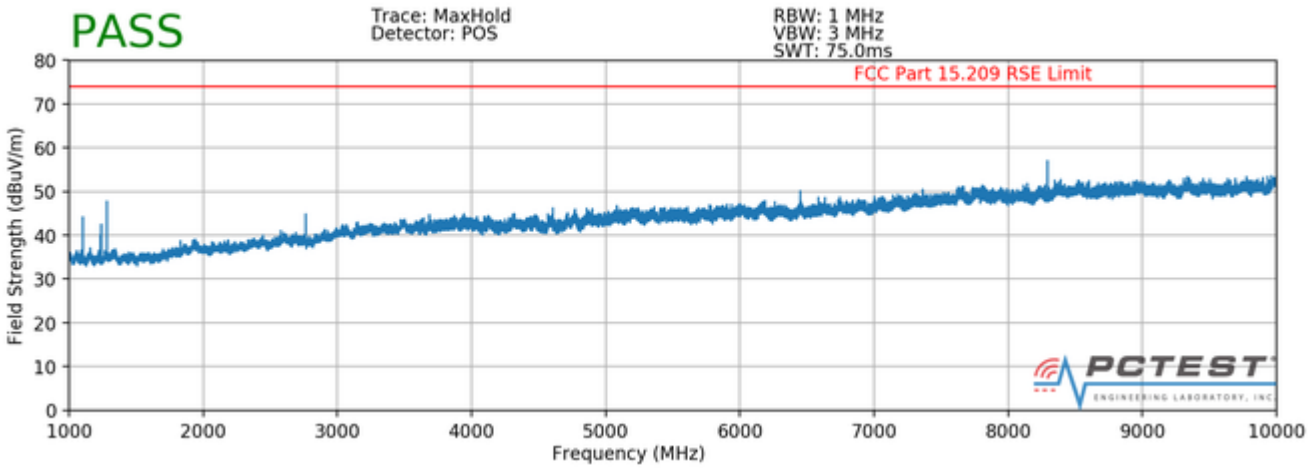
§15.247(d) §15.205 & §15.209



Plot 7-5. Radiated Spurious Plot above 1GHz (Zwave – 919.8MHz, Ant. Pol. H)



Plot 7-6. Radiated Spurious Plot above 1GHz (Zwave – 919.8MHz, Ant. Pol. V)



Plot 7-7. Radiated Spurious Plot above 1GHz (Zwave – 921.4MHz, Ant. Pol. H)

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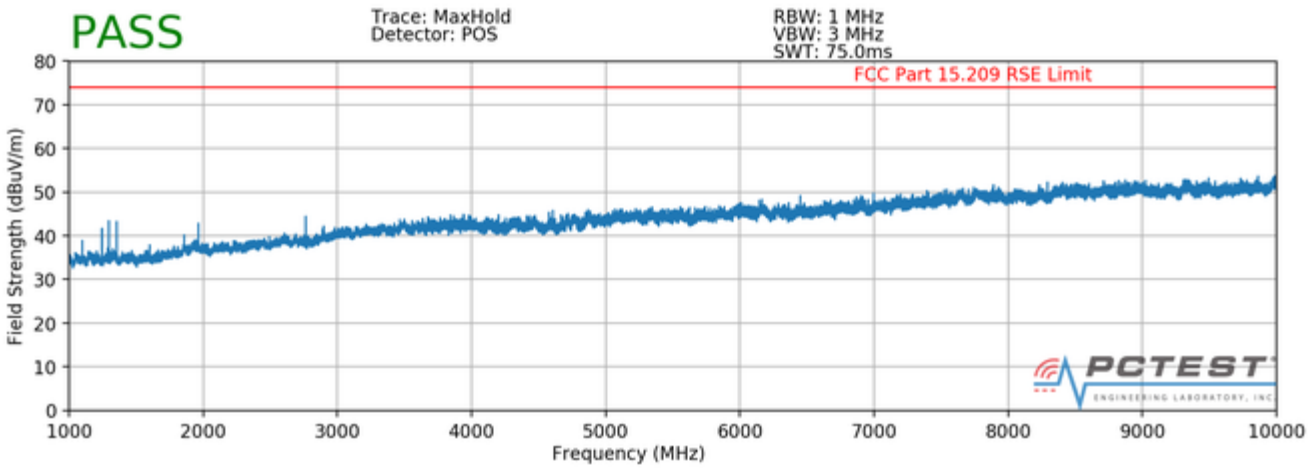

Plot 7-8. Radiated Spurious Plot above 1GHz (Zwave – 921.4MHz, Ant. Pol. V)

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Radiated Spurious Emission Measurements
§15.205 §15.209 §15.249 (d)(e)

Worst Case Mode: ZWave
Measurement Distance: 3 Meters
Operating Frequency: 919.8MHz

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
1839.60	Avg	H	-	-	-75.07	-4.55	27.38	53.98	-26.60
1839.60	Peak	H	-	-	-62.43	-4.55	40.02	73.98	-33.96
2759.40	Avg	H	400	110	-62.97	-2.28	41.75	53.98	-12.23
2759.40	Peak	H	400	110	-58.83	-2.28	45.89	73.98	-28.09
3679.20	Avg	H	358	176	-71.51	2.79	38.28	53.98	-15.70
3679.20	Peak	H	358	176	-63.64	2.79	46.15	73.98	-27.83
4599.00	Avg	H	282	99	-68.37	3.20	41.83	53.98	-12.15
4599.00	Peak	H	282	99	-60.51	3.20	49.69	73.98	-24.29
5518.80	Avg	H	-	-	-77.63	5.20	34.57	53.98	-19.41
5518.80	Peak	H	-	-	-64.52	5.20	47.68	73.98	-26.30
6438.60	Avg	H	153	9	-69.83	6.67	43.84	53.98	-10.14
6438.60	Peak	H	153	9	-63.20	6.67	50.47	73.98	-23.51
7358.40	Avg	H	-	-	-77.26	9.25	38.99	53.98	-14.99
7358.40	Peak	H	-	-	-66.18	9.25	50.07	73.98	-23.91
8278.20	Avg	H	312	95	-73.59	10.41	43.82	53.98	-10.16
8278.20	Peak	H	312	95	-65.47	10.41	51.94	73.98	-22.04
9198.00	Avg	H	113	125	-73.85	12.87	46.02	53.98	-7.96
9198.00	Peak	H	113	125	-65.46	12.87	54.41	73.98	-19.57

Table 7-6. Radiated Measurements

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Worst Case Mode: ZWave
Measurement Distance: 3 Meters
Operating Frequency: 921.4MHz

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
1842.80	Avg	H	-	-	-76.81	-4.14	26.05	53.98	-27.93
1842.80	Peak	H	-	-	-65.54	-4.14	37.32	73.98	-36.66
2764.20	Avg	H	145	110	-62.69	-2.51	41.80	53.98	-12.18
2764.20	Peak	H	145	110	-58.51	-2.51	45.98	73.98	-28.00
3685.60	Avg	H	146	174	-70.36	2.46	39.10	53.98	-14.88
3685.60	Peak	H	146	174	-62.58	2.46	46.88	73.98	-27.10
4607.00	Avg	H	378	192	-69.09	2.96	40.87	53.98	-13.11
4607.00	Peak	H	378	192	-62.23	2.96	47.73	73.98	-26.25
5528.40	Avg	H	-	-	-77.62	5.22	34.60	53.98	-19.38
5528.40	Peak	H	-	-	-64.66	5.22	47.56	73.98	-26.42
6449.80	Avg	H	159	33	-76.31	6.91	37.60	53.98	-16.38
6449.80	Peak	H	159	33	-64.81	6.91	49.10	73.98	-24.88
7371.20	Avg	H	-	-	-78.33	9.28	37.95	53.98	-16.03
7371.20	Peak	H	-	-	-66.75	9.28	49.53	73.98	-24.45
8292.60	Avg	H	143	255	-70.63	10.15	46.52	53.98	-7.46
8292.60	Peak	H	143	255	-63.42	10.15	53.73	73.98	-20.25
9214.00	Avg	H	-	-	-78.91	12.49	40.58	53.98	-13.40
9214.00	Peak	H	-	-	-67.28	12.49	52.21	73.98	-21.77

Table 7-7. Radiated Measurements

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7.6 Radiated Spurious Emissions Measurements – Below 1GHz

§15.209;RSS-210 (B.10), RSS-Gen (8.9)

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 its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates and modes were investigated for radiated spurious emissions. 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 7-8 per Section 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 7-8. Radiated Limits

Test Procedures Used

ANSI C63.10-2013

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 diagrams below.

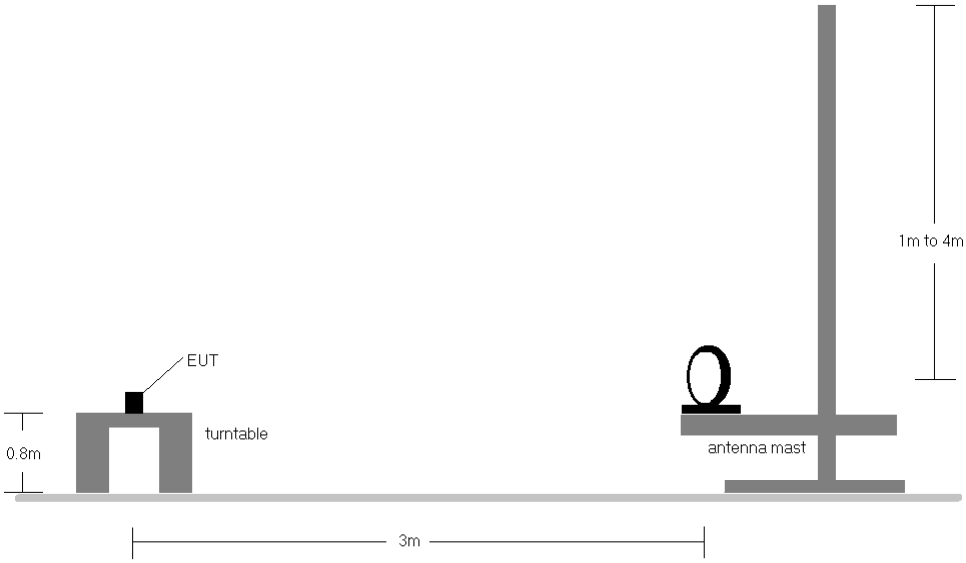

Figure 7-4. Radiated Test Setup < 30Mhz

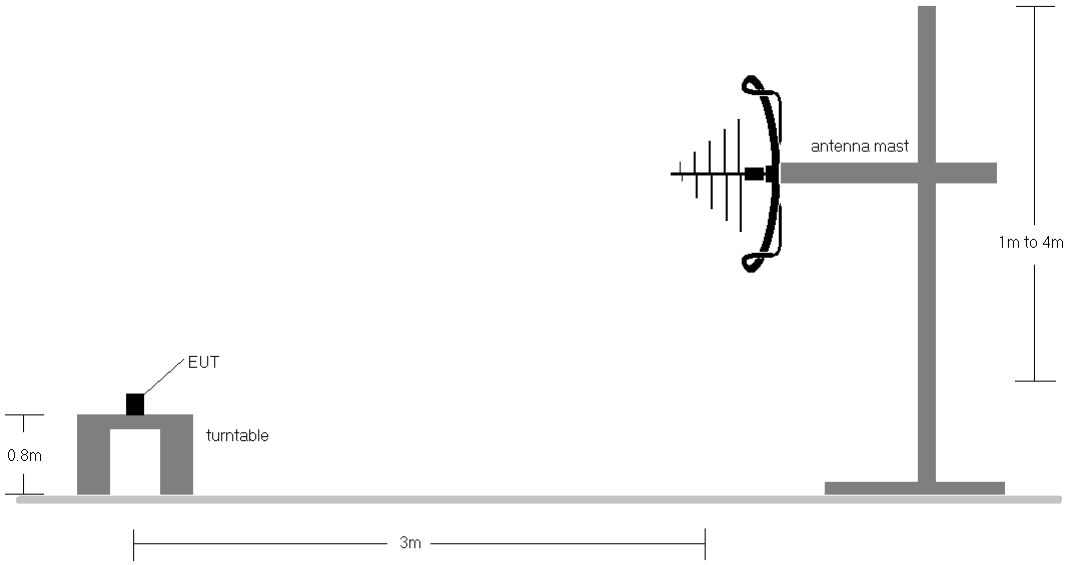

Figure 7-5. Radiated Test Setup < 1GHz

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Test Notes

1. The broadband receive antenna is manipulated through vertical and horizontal polarizations during the tests. The EUT is manipulated through three orthogonal planes.
2. This unit was tested while powered by an DC power source.
3. The spectrum is investigated using a peak detector and final measurements are recorded using CISPR quasi peak detector. The worst-case emissions are reported however emissions whose levels were not within 20dB of the respective limits were not reported.
4. Emissions were measured at a 3 meter test distance.
5. Emissions are investigated while operating on the center channel of the mode, band, and modulation that produced the worst case results during the transmitter spurious emissions testing.
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. There were no emissions detected in the 30MHz – 1GHz frequency range, as shown in the subsequent plots.

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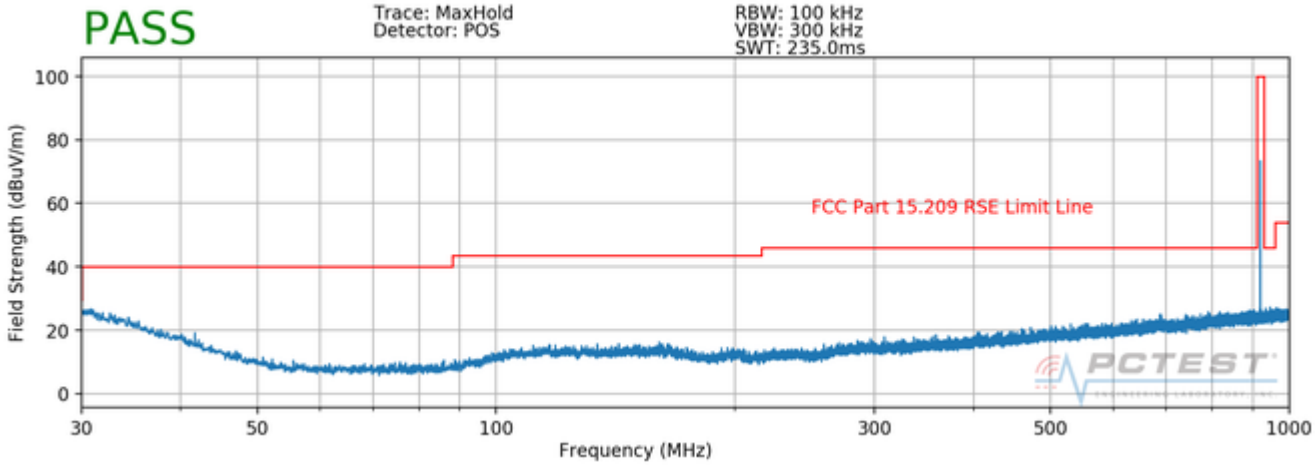
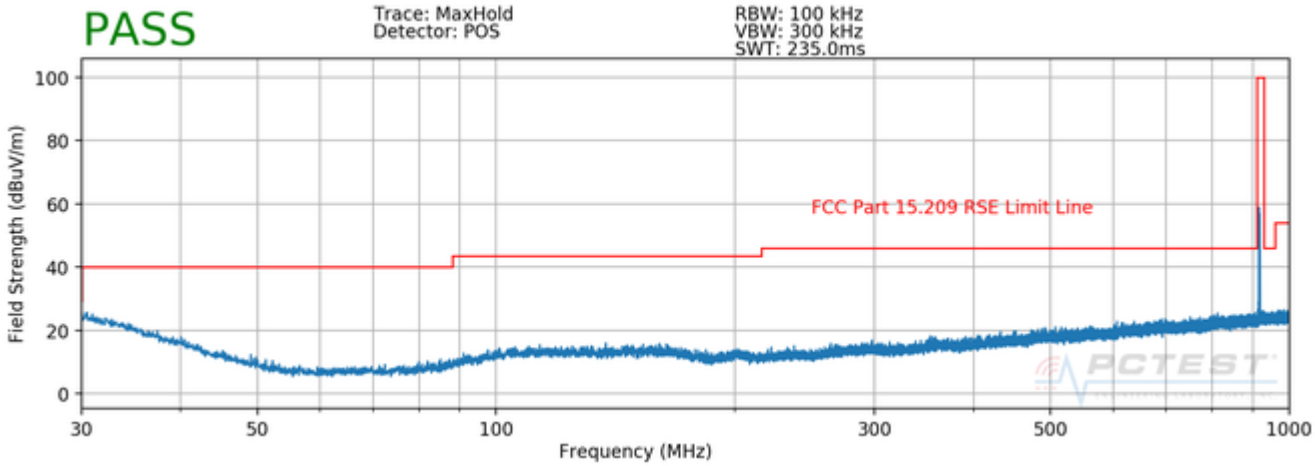
Radiated Spurious Emissions Measurements (Below 1GHz)

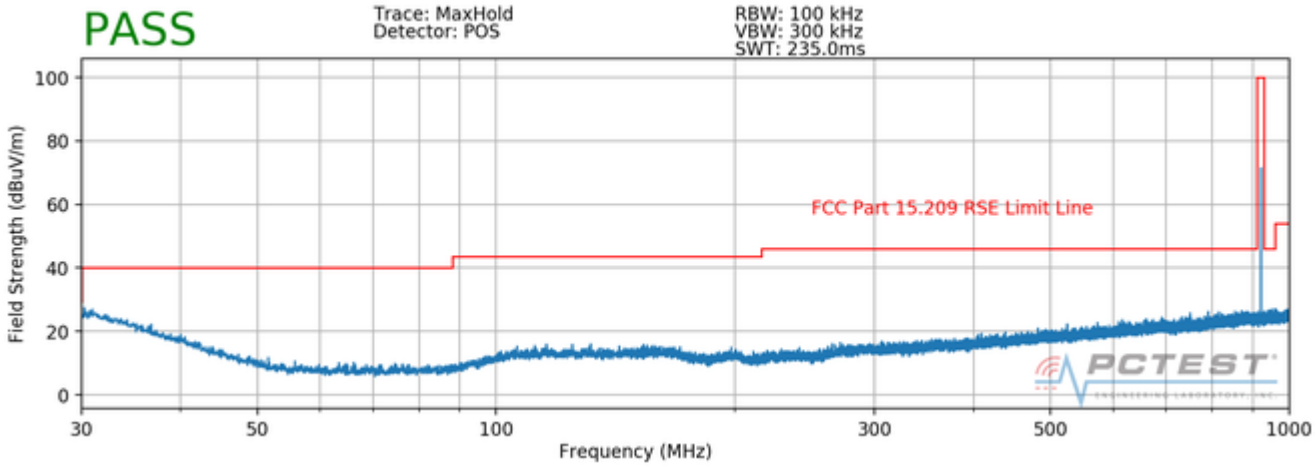
§15.209



Plot 7-9. Radiated Spurious Plot below 1GHz (Zwave – 919.8MHz, Ant. Pol. H)



Plot 7-10. Radiated Spurious Plot below 1GHz (Zwave – 919.8MHz, Ant. Pol. V)



Plot 7-11. Radiated Spurious Plot below 1GHz (Zwave – 921.4MHz, Ant. Pol. H)

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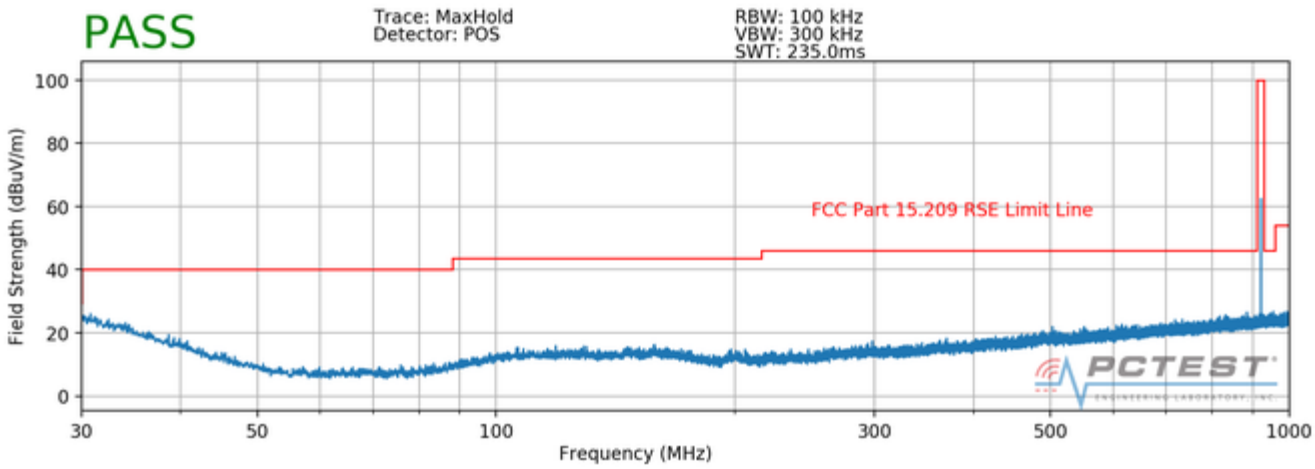

Plot 7-12. Radiated Spurious Plot below 1GHz (Zwave – 921.4MHz, Ant. Pol. V)

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7.7 Line Conducted Measurement Data

§15.207; RSS-Gen (8.8)

Test Overview and Limit

All AC line conducted spurious emissions are measured with a receiver connected to a grounded LISN while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates and modes were investigated for conducted spurious emissions. Only the conducted emissions of the configuration that produced the worst case emissions are reported in this section.

All conducted emissions must not exceed the limits shown in the table below, per §15.207 and RSS-Gen (8.8).

Frequency of emission (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30	60	50

Table 7-9. Conducted Limits

*Decreases with the logarithm of the frequency.

Test Procedures Used

ANSI C63.10-2013, Section 6.2

Test Settings

Quasi-Peak Field Strength Measurements

7. Analyzer center frequency was set to the frequency of the spurious emission of interest
8. RBW = 9kHz (for emissions from 150kHz – 30MHz)
9. Detector = quasi-peak
10. Sweep time = auto couple
11. Trace mode = max hold
12. Trace was allowed to stabilize

Average Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the spurious emission of interest
2. RBW = 9kHz (for emissions from 150kHz – 30MHz)
3. Detector = RMS
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.

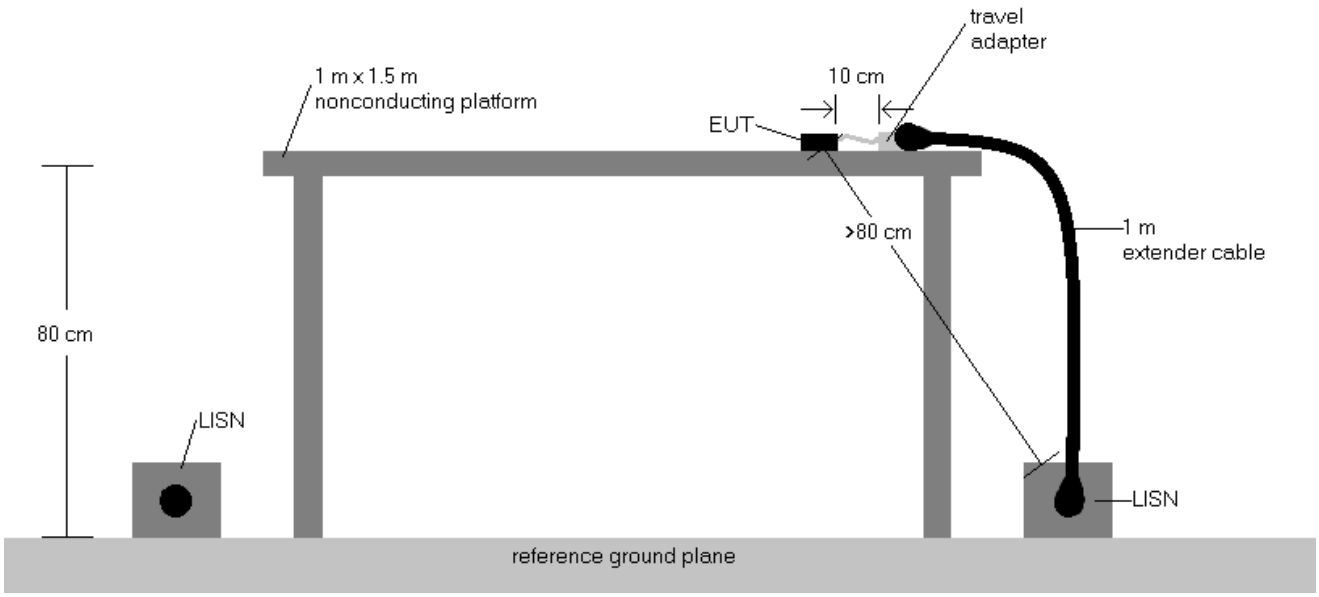

Figure 7-6. Test Instrument & Measurement Setup

Test Notes

1. All modes of operation were investigated and the worst-case emissions are reported using mid channel. The emissions found were not affected by the choice of channel used during testing.
2. The limit for an intentional radiator from 150kHz to 30MHz are specified in 15.207 and RSS-Gen (8.8).
3. Corr. (dB) = Cable loss (dB) + LISN insertion factor (dB)
4. QP/AV Level (dBμV) = QP/AV Analyzer/Receiver Level (dBμV) + Corr. (dB)
5. Margin (dB) = QP/AV Limit (dBμV) - QP/AV Level (dBμV)
6. Traces shown in plot are made using a peak detector.
7. Deviations to the Specifications: None.

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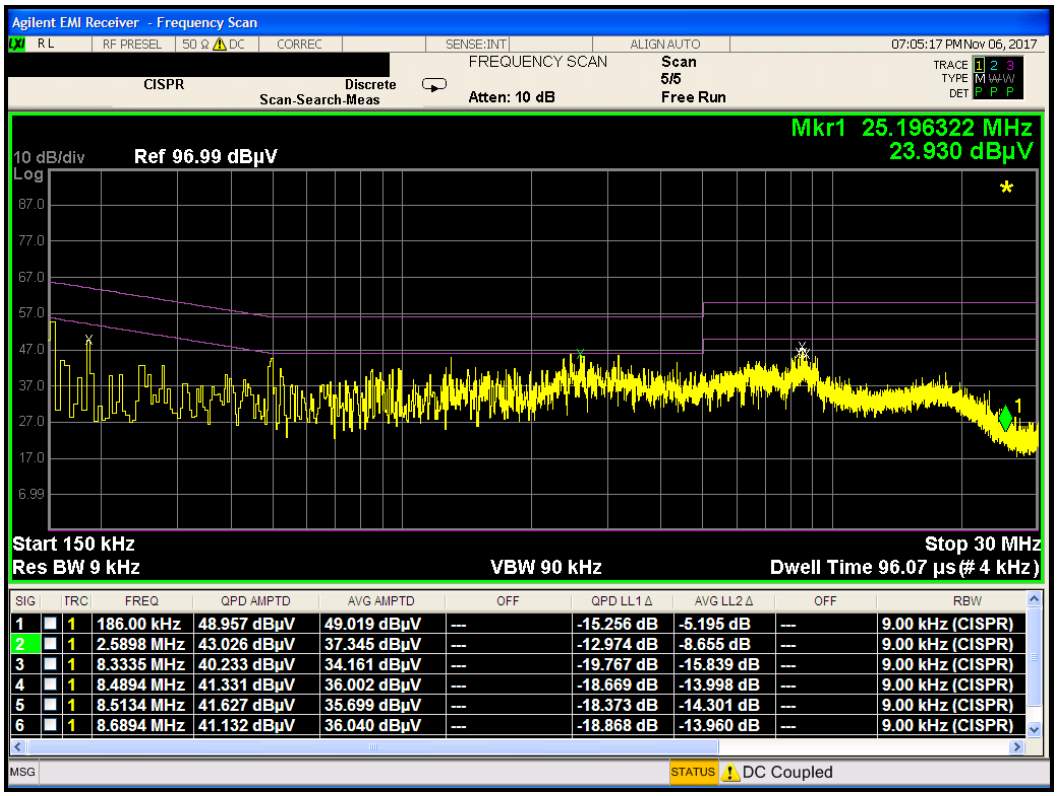
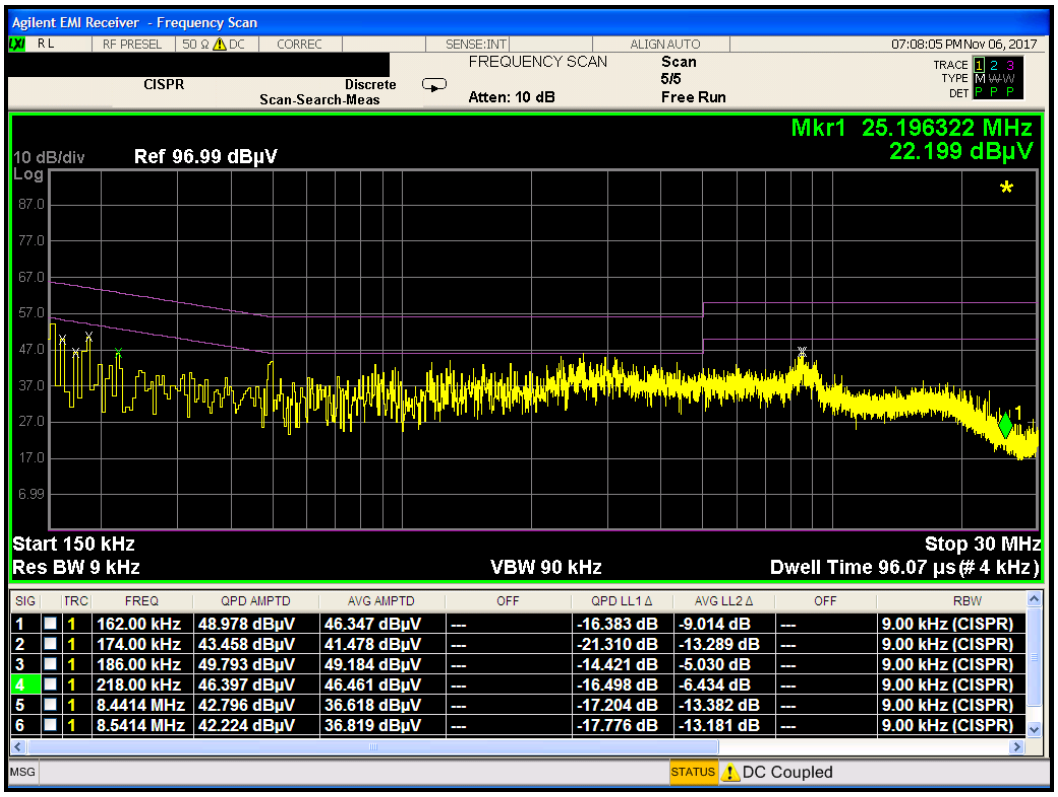


Plot 7-13. Line-Conducted Test Plot (L1 Z-Wave)



Plot 7-14. Line-Conducted Test Plot (N Z-Wave)

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8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Indoor Access Point FCC ID: A3LETWV531** is compliant with Part 15 Subpart C (15.249) of the FCC Rules.

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