



PCTEST ENGINEERING LABORATORY, INC.

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MEASUREMENT REPORT FCC Part 15B

Applicant Name:

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

Date of Testing:

11/23/2016-02/17/2017

Test Site/Location:

PCTEST Lab, Columbia, MD, USA

Test Report Serial No.:

0Y1611161812.A3L

FCC ID: A3LETWV530

APPLICANT: Samsung Electronics Co., Ltd.

Application Type: Certification

EUT Type: Indoor Access Point

Model: ET-WV530

FCC Rule Part(s): FCC Part 15 Subpart B

FCC Classification: Part 15 Class B Computing Device Peripheral (JBP)

Test Procedure: ANSI C63.4-2014

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and has been tested in accordance with the measurement procedures specified in ANSI C63.4-2014 (See Test Report). These measurements were performed with no deviation from the standards. Test results reported herein relate only to the item(s) tested.

I authorize and 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.

NVLAP accreditation does not constitute any product endorsement by NVLAP or any agency of the United States Government. This report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.


Randy Ortanez
President

NVLAP[®]
Lab Code 100431-0

FCC ID: A3LETWV530		FCC Pt. 15B MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 0Y1611161812.A3L	Test Dates: 11/23/2016-02/17/2017	EUT Type: Indoor Access Point		Page 1 of 18

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V 5.1

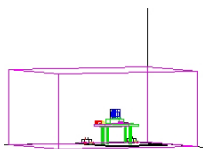
11/22/2016

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TABLE OF CONTENTS

FCC Class B MEASUREMENT REPORT	3
1.0 INTRODUCTION	4
1.1 Scope	4
1.2 PCTEST Test Location	4
2.0 PRODUCT INFORMATION.....	5
2.1 Equipment Description.....	5
2.2 Device Capabilities	5
2.3 Test Configuration	5
2.4 EMI Suppression Device(s)/Modifications	5
3.0 DESCRIPTION OF TESTS	6
3.1 Evaluation Procedure	6
3.2 AC Line Conducted Emissions	6
3.3 Radiated Emissions.....	7
3.4 Environmental Conditions.....	7
4.0 SAMPLE CALCULATIONS	8
4.1 Conducted Emission Measurement Sample Calculation	8
4.2 Radiated Emission Measurement Sample Calculation	8
5.0 Measurement Uncertainty	9
6.0 TEST EQUIPMENT CALIBRATION DATA	10
7.0 TEST DATA.....	11
7.1 Summary	11
7.2 Test Support Equipment.....	11
7.3 Radiated Measurement Data.....	12
7.4 Line Conducted Measurement Data	17
8.0 CONCLUSION.....	18

FCC ID: A3LETWV530		FCC Pt. 15B MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 0Y1611161812.A3L	Test Dates: 11/23/2016-02/17/2017	EUT Type: Indoor Access Point		Page 2 of 18



MEASUREMENT REPORT

FCC Part 15B – Unintentional Radiators



§ 2.1033 General Information

APPLICANT: Samsung Electronics Co., Ltd.

APPLICANT ADDRESS: 129, Samsung-ro,
Yeongtong-gu, Suwon-si

TEST SITE: PCTEST ENGINEERING LABORATORY, INC.

TEST SITE ADDRESS: 7185 Oakland Mills Road, Columbia, MD 21046 USA

FCC RULE PART(S): FCC Part 15 Subpart B

FCC ID: A3LETWV530

Test Device Serial No.: KNPX3S ☐ Production ☒ Pre-Production ☐ Engineering

FCC CLASSIFICATION: FCC Class B Digital Device (JBP)

DATE(S) OF TEST: 11/23/2016-02/17/2017

Test Methodology

Both conducted and radiated measurements were taken using the methods and procedures described in ANSI C63.4-2014. Radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Test Facility / NVLAP Accreditation

Conducted and radiated tests were performed at PCTEST Engineering Lab 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 by U.S. National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP) in EMC, Telecommunication, and FCC for satisfactory compliance with criteria established in Title 15, Part 285 Code of Federal Regulations. (NVLAP Lab code: 100431-0).
- 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.

FCC ID: A3LETWV530		FCC Pt. 15B MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 0Y1611161812.A3L	Test Dates: 11/23/2016-02/17/2017	EUT Type: Indoor Access Point		Page 3 of 18

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 Intern't'l (BWI) airport, the city of Baltimore and the Washington, DC area. (See 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 39° 10'23" N latitude and 76° 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.

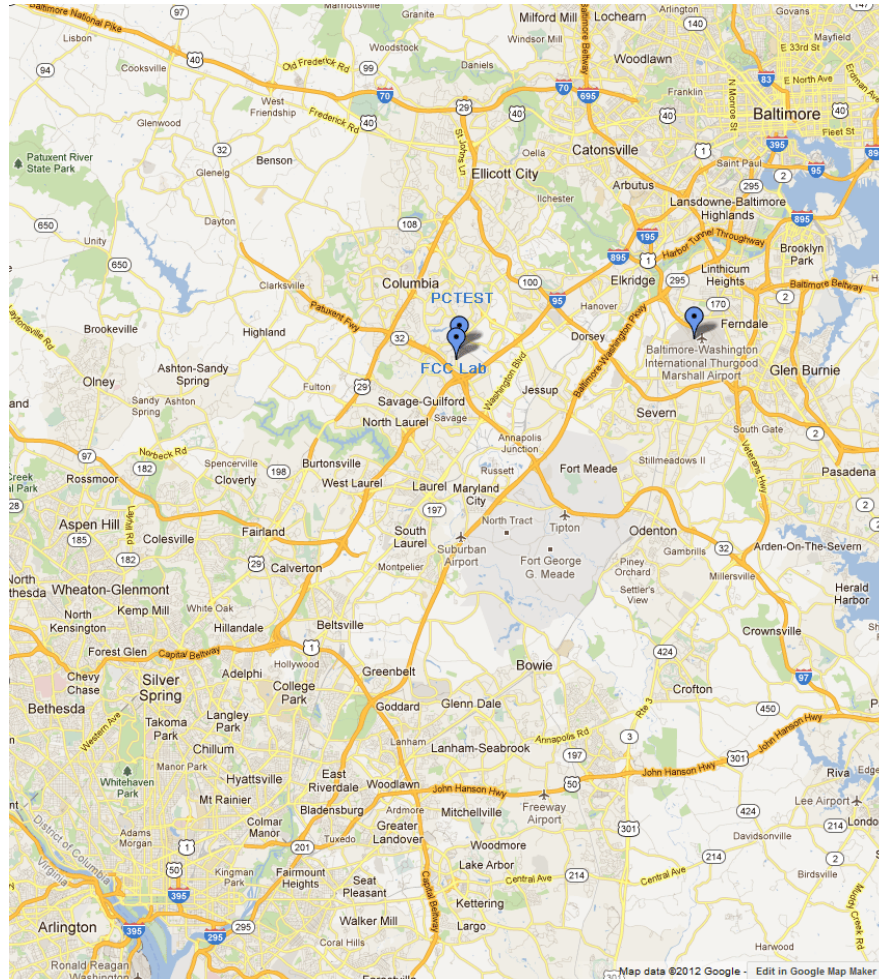


Figure 1-1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area

FCC ID: A3LETWV530	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 15B MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 0Y1611161812.A3L	Test Dates: 11/23/2016-02/17/2017	EUT Type: Indoor Access Point		Page 4 of 18

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Indoor Access Point FCC ID: A3LETWV530**. The test data contained in this report pertains only to the emissions due to the digital circuitry of the EUT.

2.2 Device Capabilities

This device contains the following capabilities:

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

2.3 Test Configuration

The EUT was tested with a laptop PC connected via USB interface port. The EUT was exercised during testing by means of software installed on the PC. Since the EUT is a peripheral device, the host PC was populated with another USB device and an additional peripheral device with a non-USB interface, as shown in Table 7-2, thus satisfying the minimum system requirement of two different I/O interfaces. All equipment is placed on the test table top and arranged in a typical configuration in accordance with ANSI C63.4-2014 and manipulated to obtain worst case emissions.

For more information please see Section 7.0 for test data and the test setup photos document for the test setup photographs.

2.4 EMI Suppression Device(s)/Modifications

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

FCC ID: A3LETWV530		FCC Pt. 15B MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 0Y1611161812.A3L	Test Dates: 11/23/2016-02/17/2017	EUT Type: Indoor Access Point		Page 5 of 18

3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

The measurement procedure described in the American National Standard for Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSI C63.4-2014) 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 7.4. Automated test software was used to perform the AC line conducted emissions testing. Automated measurement software utilized is Rohde & Schwarz EMC32, Version 8.51.0.

FCC ID: A3LETWV530		FCC Pt. 15B MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 0Y1611161812.A3L	Test Dates: 11/23/2016-02/17/2017	EUT Type: Indoor Access Point		Page 6 of 18

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 Clause 5, Figure 5.7 of ANSI C63.4-2014. A 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. 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. 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, 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 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).

FCC ID: A3LETWV530		FCC Pt. 15B MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 0Y1611161812.A3L	Test Dates: 11/23/2016-02/17/2017	EUT Type: Indoor Access Point		Page 7 of 18

4.0 SAMPLE CALCULATIONS

4.1 Conducted Emission Measurement Sample Calculation

@ 20.3 MHz

Class B limit = 60.0 dB μ V (Quasi-peak limit)
Reading = - 57.8 dBm (calibrated quasi-peak level)
Convert to dB μ V = - 57.8 + 107 = 49.2 dB μ V

Margin = 49.2 - 60.0 = - 10.8 dB
= 10.8 dB below limit

4.2 Radiated Emission Measurement Sample Calculation

@ 66.7 MHz

Class B limit = 100 μ V/m = 40.0 dB μ V/m
Reading = - 76.0 dBm (calibrated level)
Convert to dB μ V = - 76.0 + 107 = 31.0 dB μ V
Antenna Factor + Cable Loss = 5.8 dB/m
Total = 36.8 dB μ V/m

Margin = 36.8 - 40.0 = - 3.2 dB
= 3.2 dB below limit

Note:

Level [dB μ V] = 20 log₁₀ (Level [μ V/m])
Level [dB μ V] = Level [dBm] + 107

FCC ID: A3LETWV530		FCC Pt. 15B MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 0Y1611161812.A3L	Test Dates: 11/23/2016-02/17/2017	EUT Type: Indoor Access Point		Page 8 of 18

5.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014. All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95% level of confidence. The measurement data shown herein 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 ($\pm$ dB)
Conducted Disturbance	3.09
Radiated Disturbance (<1GHz)	4.98
Radiated Disturbance (>1GHz)	5.07

FCC ID: A3LETWV530		FCC Pt. 15B MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 0Y1611161812.A3L	Test Dates: 11/23/2016-02/17/2017	EUT Type: Indoor Access Point		Page 9 of 18

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 C63.5-2006.

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
Agilent	N9038A	MXE EMI Receiver	4/21/2016	Annual	4/21/2017	MY51210133
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	7/30/2015	Biennial	7/30/2017	121034
Com-Power	PAM-103	Pre-Amplifier (1-1000MHz)	2/26/2016	Annual	2/26/2017	441119
Emco	3115	Horn Antenna (1-18GHz)	3/10/2016	Biennial	3/10/2018	9704-5182
ETS Lindgren	3160-09	18-26.5 GHz Standard Gain Horn	8/23/2016	Biennial	8/23/2018	135427
ETS Lindgren	3160-10	26.5-40 GHz Standard Gain Horn	8/23/2016	Biennial	8/23/2018	130993
Huber+Suhner	Sucoflex 102A	40GHz Radiated Cable	4/26/2016	Annual	4/26/2017	251425001
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	3/7/2016	Annual	3/7/2017	101622
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	7/15/2016	Annual	7/15/2017	100348
Rohde & Schwarz	TS-PR26	18-26.5 GHz Pre-Amplifier	3/7/2016	Annual	3/7/2017	100040
Rohde & Schwarz	TS-PR40	26.5-40 GHz Pre-Amplifier	3/7/2016	Annual	3/7/2017	100037
Rohde & Schwarz	FSW67	Signal / Spectrum Analyzer	7/27/2016	Annual	7/27/2017	103200
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	JB5	Bi-Log Antenna (30M - 5GHz)	3/14/2016	Biennial	3/14/2018	A051107

Table 6-1. Annual Test Equipment Calibration Schedule

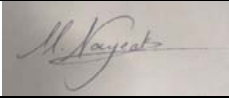
FCC ID: A3LETWV530		FCC Pt. 15B MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 0Y1611161812.A3L	Test Dates: 11/23/2016-02/17/2017	EUT Type: Indoor Access Point	Page 10 of 18	

7.0 TEST DATA

7.1 Summary

Test Date(s): 11/23/2016-02/17/2017

Test Engineer:



FCC Part 15 Section	Description	Result
15.107	Conducted Emissions	PASS
15.109	Radiated Emissions	PASS

Table 7-1. Summary of Test Results

7.2 Test Support Equipment

1	Samsung Data Link Cable	Model: N/A	S/N: N/A
2	Ethernet Cable	Model: N/A	S/N: N/A
3	Dell Notebook PC #1	Model: Vostro 3555 (DoC)	A/N: PCT80759
	w/ Dell AC Adapter	Model: PA-1600-06D2	S/N: CN-0928G4-71615-1CE-3447-A01
		0.85m Unshielded AC power cord	
		1.80m Unshielded DC power cord	
		with ferrite bead on notebook	
4	Dynex USB PC Camera	Model: DX-WC101 (DoC)	S/N: 122D05AC
		2.07m Shielded USB Cable	

Table 7-2. Test Support Equipment Used

Note: See test setup photographs for actual system test setup.

FCC ID: A3LETWV530		FCC Pt. 15B MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 0Y1611161812.A3L	Test Dates: 11/23/2016-02/17/2017	EUT Type: Indoor Access Point		Page 11 of 18

7.3 Radiated Measurement Data

§15.109

Test Procedures Used

ANSI C63.4-2014

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

Peak Field Strength Measurements Above 1GHz

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

FCC ID: A3LETWV530		FCC Pt. 15B MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 0Y1611161812.A3L	Test Dates: 11/23/2016-02/17/2017	EUT Type: Indoor Access Point		Page 12 of 18

Test Setup

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

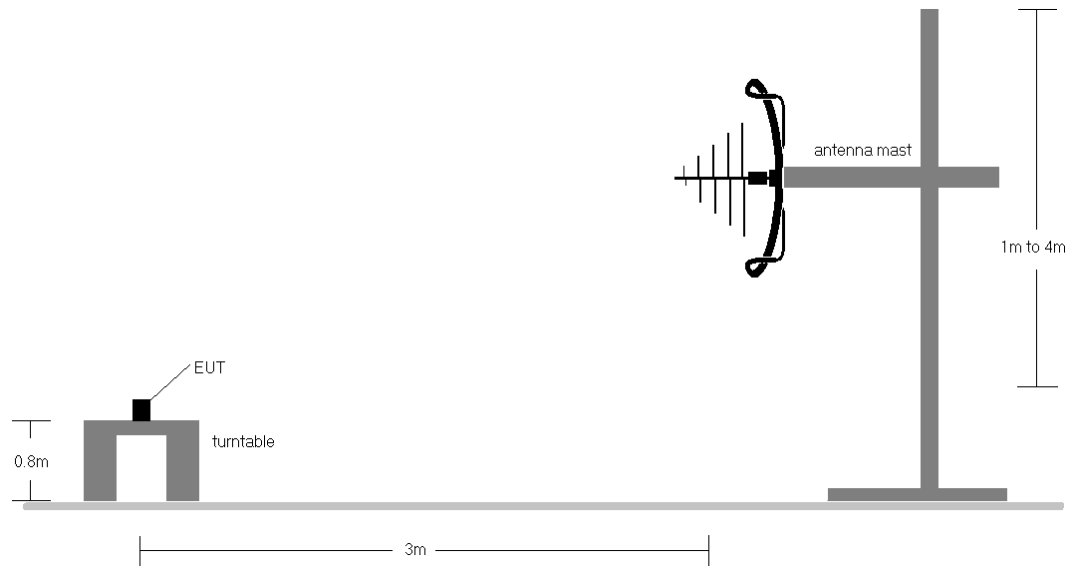


Figure 7-1. Radiated Test Setup

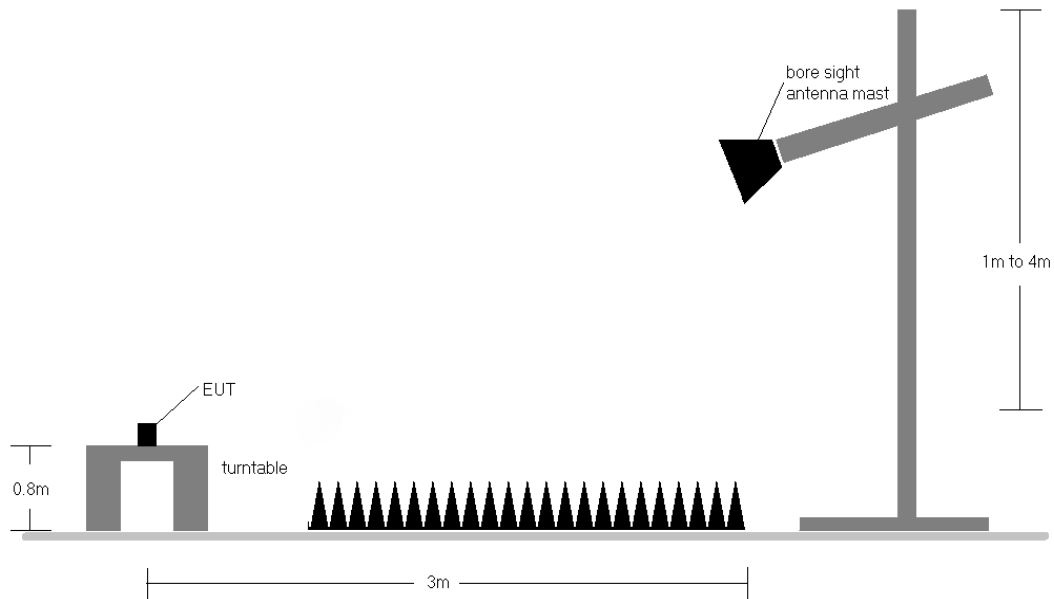


Figure 7-2. Radiated Test Setup Above 1 GHz

FCC ID: A3LETWV530	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 15B MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 0Y1611161812.A3L	Test Dates: 11/23/2016-02/17/2017	EUT Type: Indoor Access Point	Page 13 of 18

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]
59.35	Quasi-Peak	H	100	143	-57.33	-21.15	28.52	40.00	-11.48
750.22	Quasi-Peak	V	100	147	-62.99	-4.33	39.68	46.02	-6.35
272.31	Quasi-Peak	H	100	131	-64.99	-14.73	27.28	46.02	-18.74
328.95	Quasi-Peak	V	100	138	-54.30	-13.45	39.25	46.02	-6.77
360.00	Quasi-Peak	V	100	169	-57.90	-12.84	36.26	46.02	-9.76
499.95	Quasi-Peak	V	100	212	-60.69	-9.82	36.50	46.02	-9.52

Table 7-3. Radiated Measurements at 3-meters

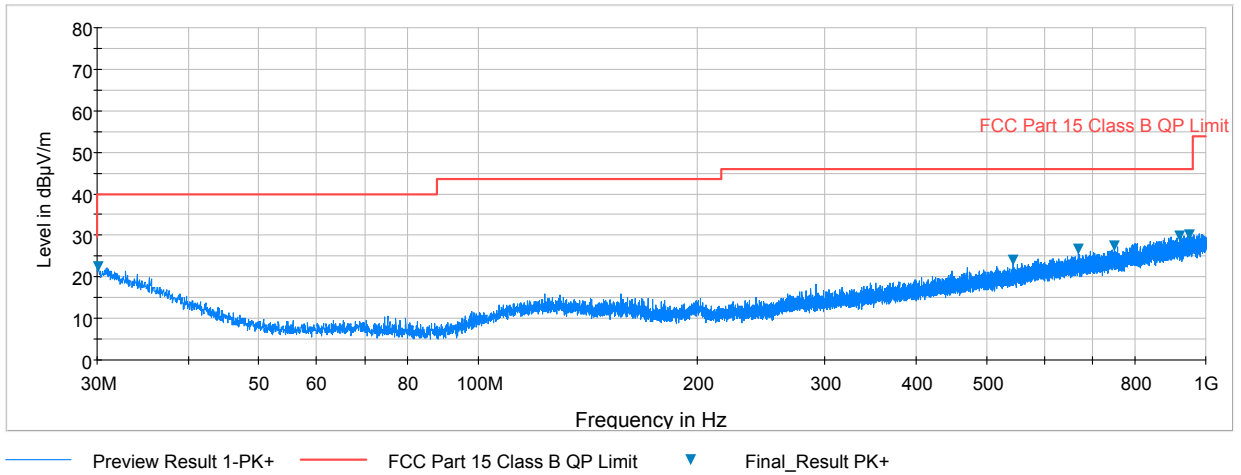
Notes:

1. All modes of operation were investigated and the worst-case emissions are reported.
2. Radiated emissions were measured from 30MHz – 30GHz to ensure that the provisions of 15.33(b)(1) are satisfied with respect to the upper frequency scanning range.
3. No emissions were found above 18GHz.
4. The radiated limits for unintentional radiators at a distance of 3 meters are used in the table above, as specified in 15.109(a).
5. All readings are calibrated by a signal generator with accuracy traceable to the National Institute of Standards and Technology (NIST).
6. AFCL (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB)
7. Level (dBμV/m) = Analyzer Reading (dBm) + AFCL (dB/m) + 107
8. Margin (dB) = Field strength (dBμV/m) – Limit (dBμV/m)
9. Measurements are made using a CISPR quasi-peak detector with a 120kHz resolution bandwidth. Above 1GHz, peak measurements are made using a peak detector with a resolution bandwidth of 1MHz and a video bandwidth of 3MHz and average measurements are made with a RMS detector using a resolution bandwidth of 1MHz and a video bandwidth of 3MHz.
10. Calibrated linearly polarized broadband and horn antennas were used for measurements below and above 1GHz, respectively. For measurements made below 1GHz, the results recorded using the broadband antenna are known to correlate with the results obtained by using a tuned dipole with an acceptable degree of accuracy. The VSWR for the measurement antennas was found to be less than 2:1.
11. Calibrated low-loss microwaves cables and broadband amplifiers are used.

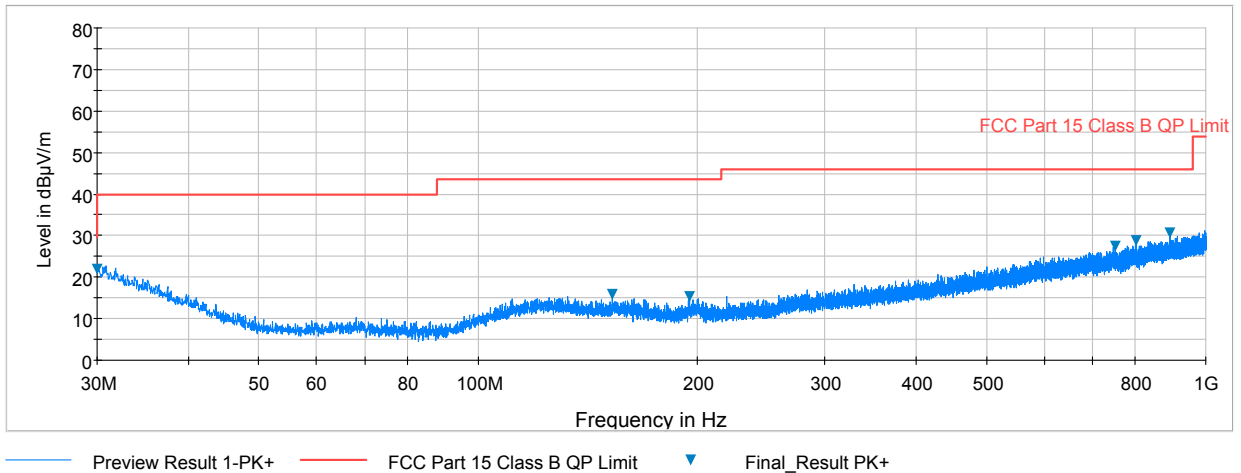
FCC ID: A3LETWV530		FCC Pt. 15B MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 0Y1611161812.A3L	Test Dates: 11/23/2016-02/17/2017	EUT Type: Indoor Access Point		Page 14 of 18

Radiated Spurious Emissions Measurements (Below 1GHz)

§15.209



Plot 7-1. Radiated Spurious Plot below 1GHz (Pol. H)

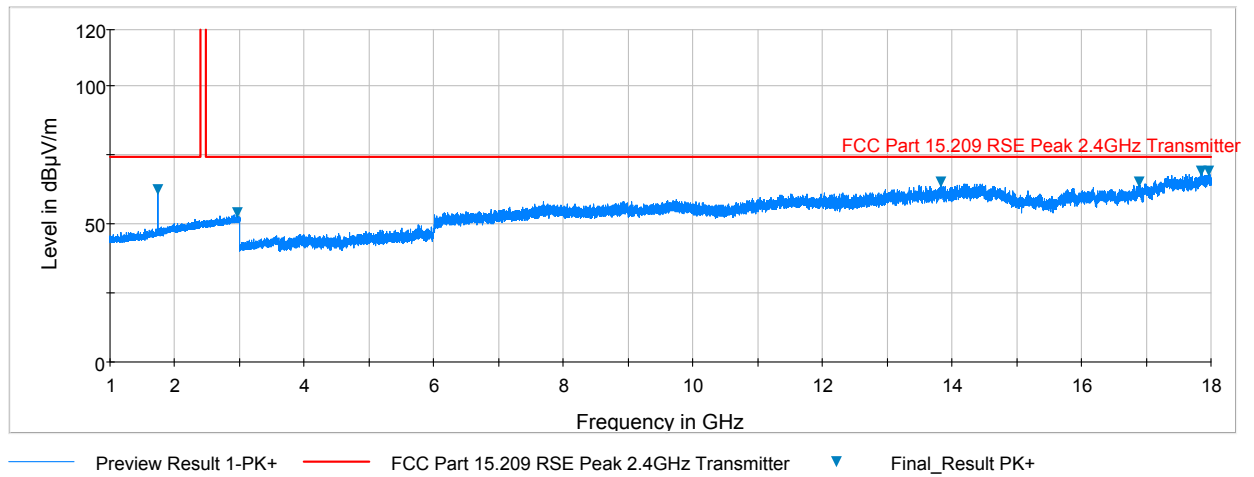


Plot 7-2. Radiated Spurious Plot below 1GHz (Pol. V)

FCC ID: A3LETWV530	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 15B MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 0Y1611161812.A3L	Test Dates: 11/23/2016-02/17/2017	EUT Type: Indoor Access Point	Page 15 of 18	

Radiated Spurious Emissions Measurements (Above 1GHz)

§15.209

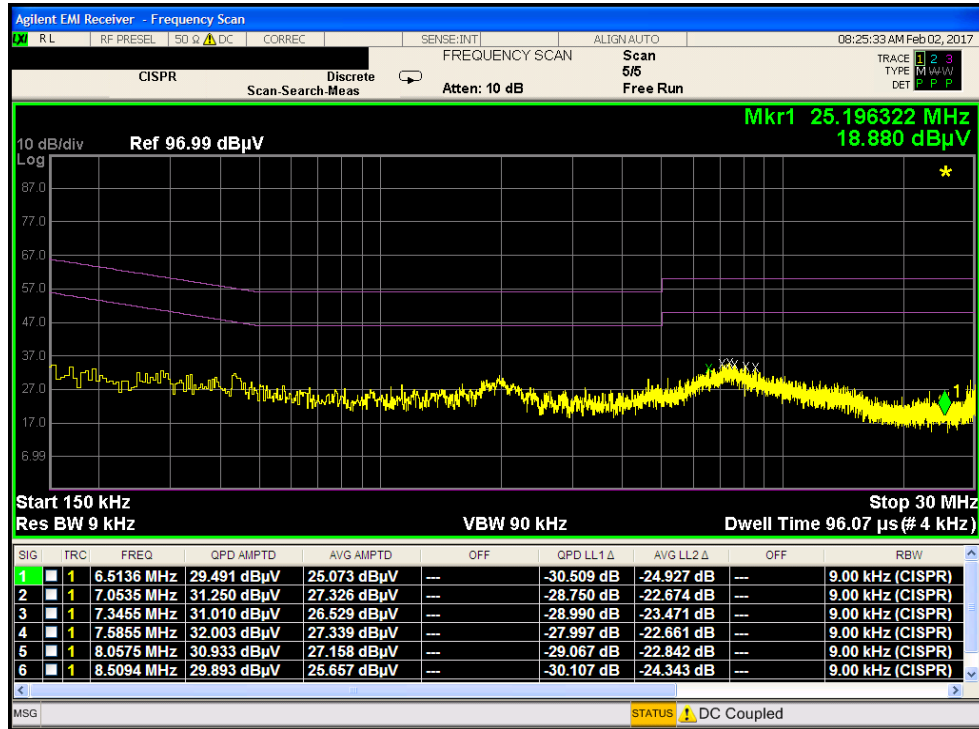


Plot 7-3. Radiated Spurious Plot above 1GHz (Pol. H)

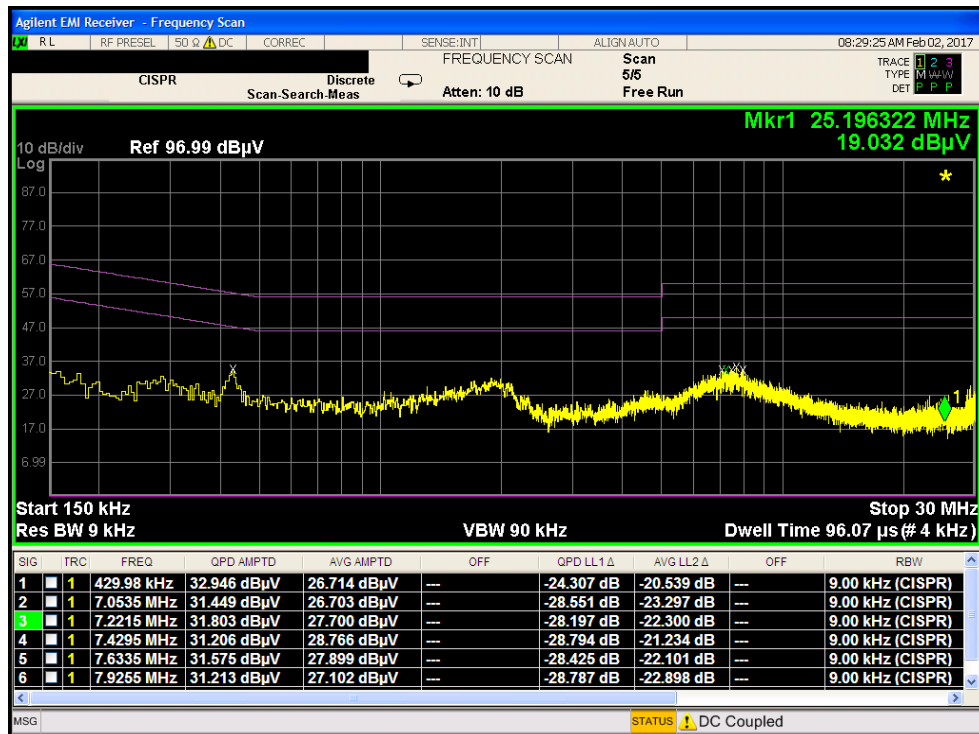
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Test Report S/N: 0Y1611161812.A3L	Test Dates: 11/23/2016-02/17/2017	EUT Type: Indoor Access Point	Page 16 of 18	

7.4 Line Conducted Measurement Data

\$15.107



Plot 7-4. Line Conducted Plot (L1)



Plot 7-5. Line Conducted Plot (N)

FCC ID: A3LETWV530	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 15B MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 0Y1611161812.A3L	Test Dates: 11/23/2016-02/17/2017	EUT Type: Indoor Access Point		Page 17 of 18

CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Indoor Access Point FCC ID: A3LETWV530** has been tested to comply with the requirements specified in §15.107 and §15.109 of the FCC Rules.

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Test Report S/N: 0Y1611161812.A3L	Test Dates: 11/23/2016-02/17/2017	EUT Type: Indoor Access Point		Page 18 of 18