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MEASUREMENT REPORT
FCC PART 15.249 ANT+

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

Date of Testing:
5/25-6/28/2016
Test Site/Location:
PCTEST Lab. Columbia, MD, USA
Test Report Serial No.:
0Y1606211101.A3L

FCC ID:	**A3LSMN930X**
APPLICANT:	**Samsung Electronics Co., Ltd.**

Application Type:	Certification
Model(s):	SM-N930X
EUT Type:	Portable Handset
Frequency Range:	2402 – 2480MHz
FCC Classification:	Low Power Communications Device Transmitter (DXX)
FCC Rule Part(s):	Part 15 Subpart C (15.249)
Test Procedure(s):	ANSI C63.10-2013, KDB 648474 D03 v01r04

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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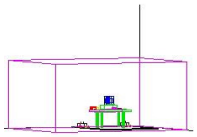
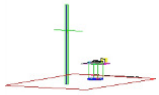


MEASUREMENT REPORT
FCC Part 15.249



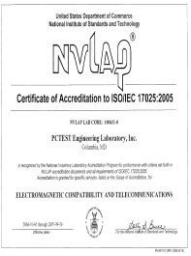
§ 2.1033 General Information

APPLICANT:	Samsung Electronics Co., Ltd.
APPLICANT ADDRESS:	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea
TEST SITE:	PCTEST ENGINEERING LABORATORY, INC.
TEST SITE ADDRESS:	7185 Oakland Mills Road, Columbia, MD 21046 USA
FCC RULE PART(S):	Part 15 Subpart C (15.249)
MODEL:	SM-N930X
FCC ID:	A3LSMN930X
Test Device Serial No.:	8424D, 05C28, 22758, 05C28 ☐ Production ☒ Pre-Production ☐ Engineering
FCC CLASSIFICATION:	Low Power Communications Device Transmitter (DXX)
DATE(S) OF TEST:	5/25-6/28/2016
TEST REPORT S/N:	0Y1606211101.A3L

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. (*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.

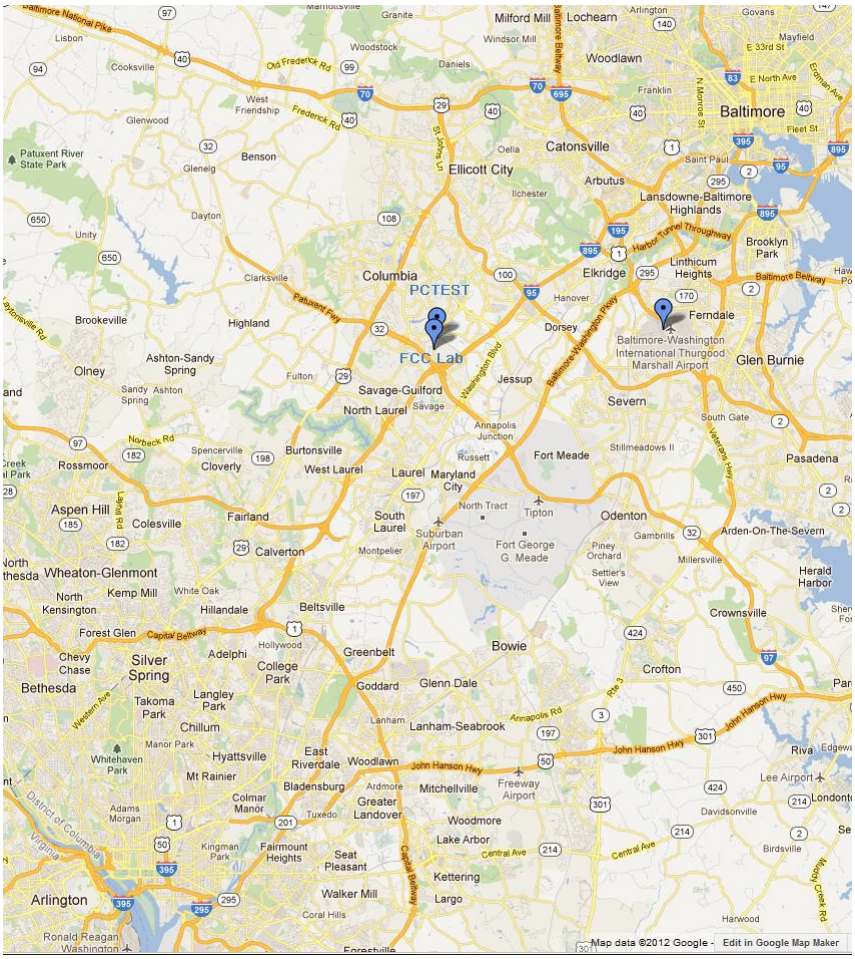

Figure 1-1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMN930X**. The test data contained in this report pertains only to the emissions due to the EUT's ANT+ transmitter.

2.2 Device Capabilities

This device contains the following capabilities:

802.11b/g/n WLAN, 802.11a/n/ac UNII, Bluetooth (1x, EDR, LE), NFC, ANT+

Note: This device is capable of operating in hopping and non-hopping mode. The EUT can hop between 79 different channels in the 2400 – 2483.5MHz band.

2.3 Test Configuration

The Samsung Portable Handset FCC ID: A3LSMN930X 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.

This device supports wireless charging capability and, thus, is subject to the test requirements of KDB 648474 D03 v01r04. Additional radiated spurious emission measurements were performed with the EUT lying flat on a certified wireless charging pad (WCP) while operating under normal conditions in a simulated call or data transmission configuration. The worst case radiated emissions data is shown in this report.

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 **Samsung Portable Handset FCC ID: A3LSMN930X.**

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. The EMI Receiver mode of the Agilent MXE was used to perform 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. 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 measurements above 1GHz, a high density expanded polystyrene block 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 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 antennas of the Samsung Portable Handset are **permanently attached.**
- There are no provisions for connection to an external antenna.

Conclusion:

The **Samsung Portable Handset FCC ID: A3LSMN930X** unit complies with the requirement of §15.203.

Ch.	Frequency (MHz)
00	2402
:	:
39	2441
:	:
78	2480

Table 4-1. Frequency/ Channel Operations

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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 (±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).

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	RE1	Radiated Emissions Cable Set (UHF/EHF)	4/28/2015	Annual	7/28/2016	RE1
-	WL25-1	Conducted Cable Set (25GHz)	4/8/2015	Annual	7/8/2016	WL25-1
Agilent	8447D	Broadband Amplifier	6/12/2015	Annual	6/12/2016	1937A03348
Agilent	N9020A	MXA Signal Analyzer	11/5/2015	Annual	11/5/2016	US46470561
Agilent	N9038A	MXE EMI Receiver	4/21/2016	Annual	4/21/2017	MY51210133
Agilent	N9030A	PXA Signal Analyzer (44GHz)	3/1/2016	Annual	3/1/2017	MY52350166
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	7/30/2015	Biennial	7/30/2017	121034
Emco	3115	Horn Antenna (1-18GHz)	3/10/2016	Biennial	3/10/2018	9704-5182
Espec	ESX-2CA	Environmental Chamber	3/4/2016	Annual	3/4/2017	17620
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	4/26/2016	Biennial	4/26/2018	125518
ETS Lindgren	3160-09	18-26.5 GHz Standard Gain Horn	6/17/2014	Biennial	6/17/2016	135427
ETS-Lindgren	3816/2NM	Line Impedance Stabilization Network	11/11/2014	Biennial	11/11/2016	114451
Huber+Suhner	Sucoflex 102A	40GHz Radiated Cable	4/20/2015	Annual	7/20/2016	251425001
K & L	11SH10-3075/U18000	High Pass Filter	7/18/2015	Annual	7/18/2016	11SH10-3075/U18000-2
Pasternack	NMLC-1	Line Conducted Emissions Cable (NM)	4/28/2015	Annual	7/28/2016	NMLC-1
Rhode & Schwarz	TS-PR18	Pre-Amplifier	3/7/2016	Annual	3/7/2017	101622
Rohde & Schwarz	TS-PR18	1-18 GHz Pre-Amplifier	3/7/2016	Annual	3/7/2017	100071
Rohde & Schwarz	TS-PR26	18-26.5 GHz Pre-Amplifier	3/7/2016	Annual	3/7/2017	100040
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	3/12/2015	Annual	6/12/2016	100342
Rohde & Schwarz	TS-PR40	26.5-40 GHz Pre-Amplifier	3/7/2016	Annual	3/7/2017	100037
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	7/17/2015	Annual	7/17/2016	100348
Rohde & Schwarz	FSW67	Signal / Spectrum Analyzer	6/2/2015	Annual	6/2/2016	103200
Seekonk	NC-100	Torque Wrench 5/16", 8" lbs	3/2/2016	Biennial	3/2/2018	N/A
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: A3LSMN930X

Method/System: Frequency Hopping Spread Spectrum (FHSS)

Number of Channels: 79

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
TRANSMITTER MODE (Tx)					
2.1049	Occupied Bandwidth	N/A	CONDUCTED	PASS	Section 7.2
15.35(c)	Duty Cycle Calculation	N/A	RADIATED	N/A	Section 7.3
15.249(a)(e)	Fundamental Field Strength Level	< 50 mV/m		PASS	Section 7.4
15.249(a)(e)	Harmonic Field Strength Level	< 500 μV/m		PASS	Section 7.5
15.205, 15.209, 15.249(d)(e)	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	< 15.209 limits or 50dB below the level of the fundamental		PASS	Sections 7.5, 7.6
15.207	AC Conducted Emissions 150kHz – 30MHz	< FCC 15.207 limits	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) For radiated band edge, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST "Chamber Automation," Version 1.1.2.
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, attenuators, and couplers.

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7.2 Occupied Bandwidth Measurement

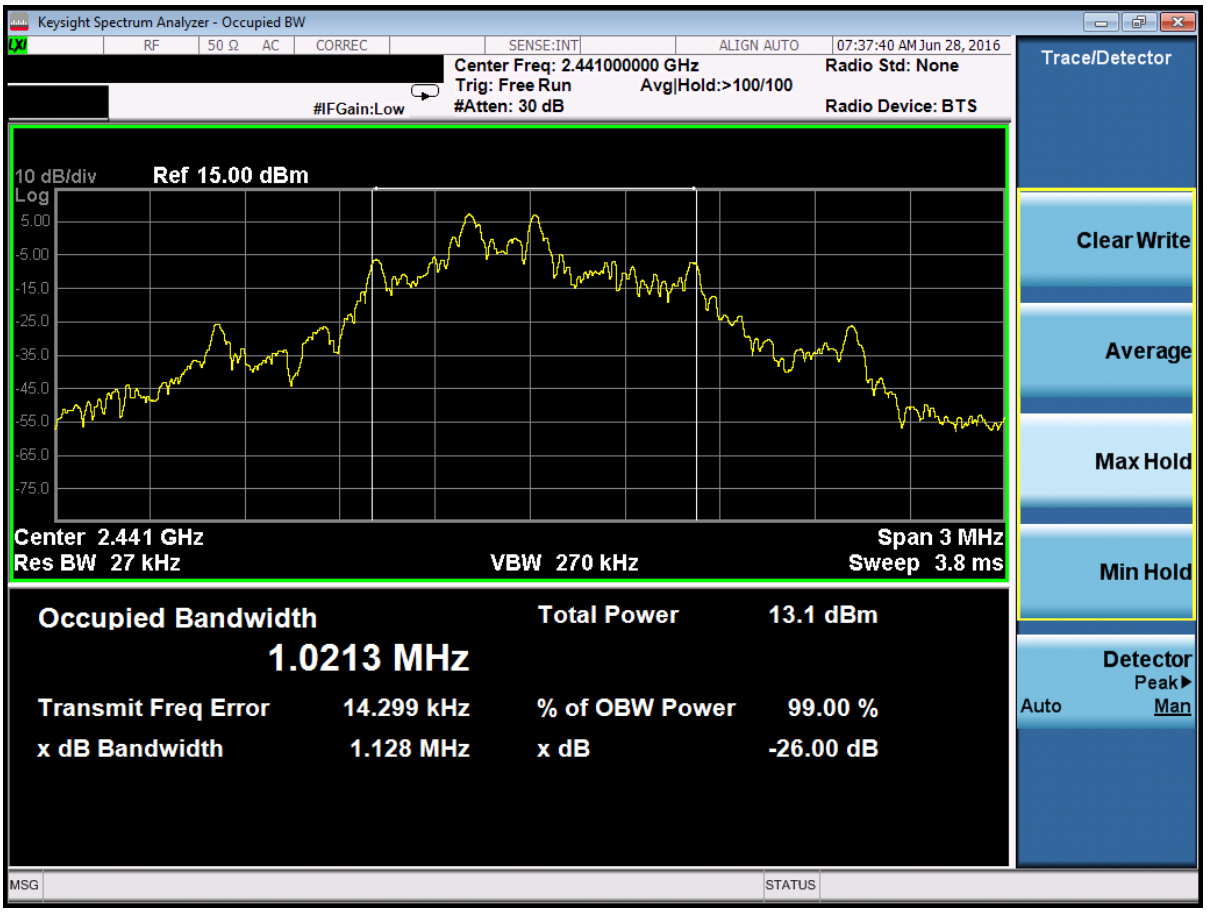
§2.1049

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]	Channel No.	Operating Mode	Measured Bandwidth [kHz]
2441	39	ANT+ (non-hop)	1021.3

Table 7-2. Occupied Bandwidth Measurement

Figure 7-1. Test Instrument & Measurement Setup



Plot 7-1. Occupied Bandwidth Plot (ANT+ – Ch. 39)

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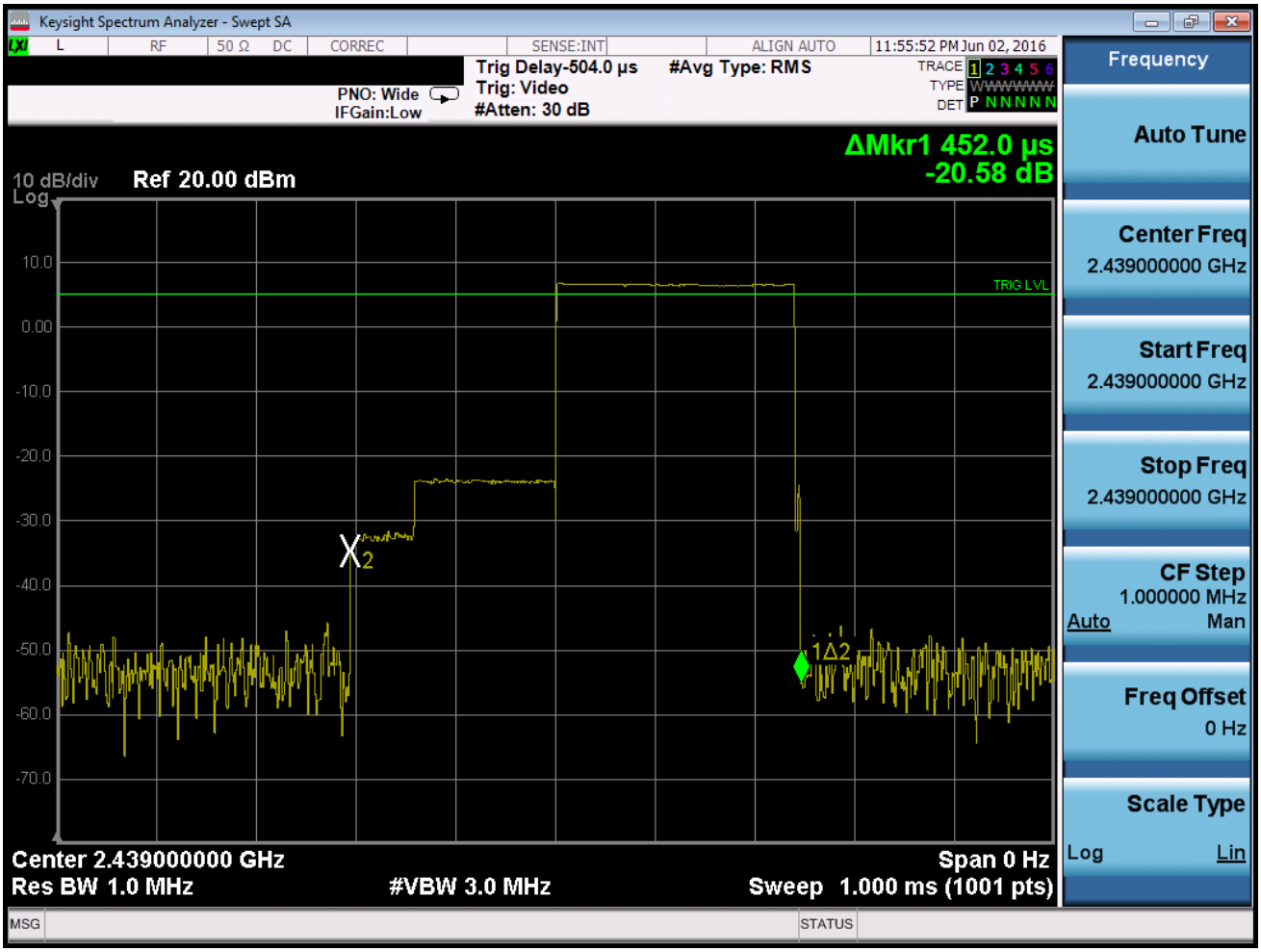
7.3 Duty Cycle Calculation

§15.35(c)

Per FCC Part 15.35(c), an average radiated field strength can be determined by applying a duty cycle correction factor to a measured peak radiated field strength level. The duty cycle correction factor is determined based on the worst case operation over a 100ms time period on any given channel. Two plots are included below to determine the appropriate duty cycle correction factor.

In Plot 7-2 below, it is shown that the pulse width for one transmission burst of the ANT+ transmitter while operating in non-hopping mode is 452.0µs.



Plot 7-2. Pulse Width Measurement

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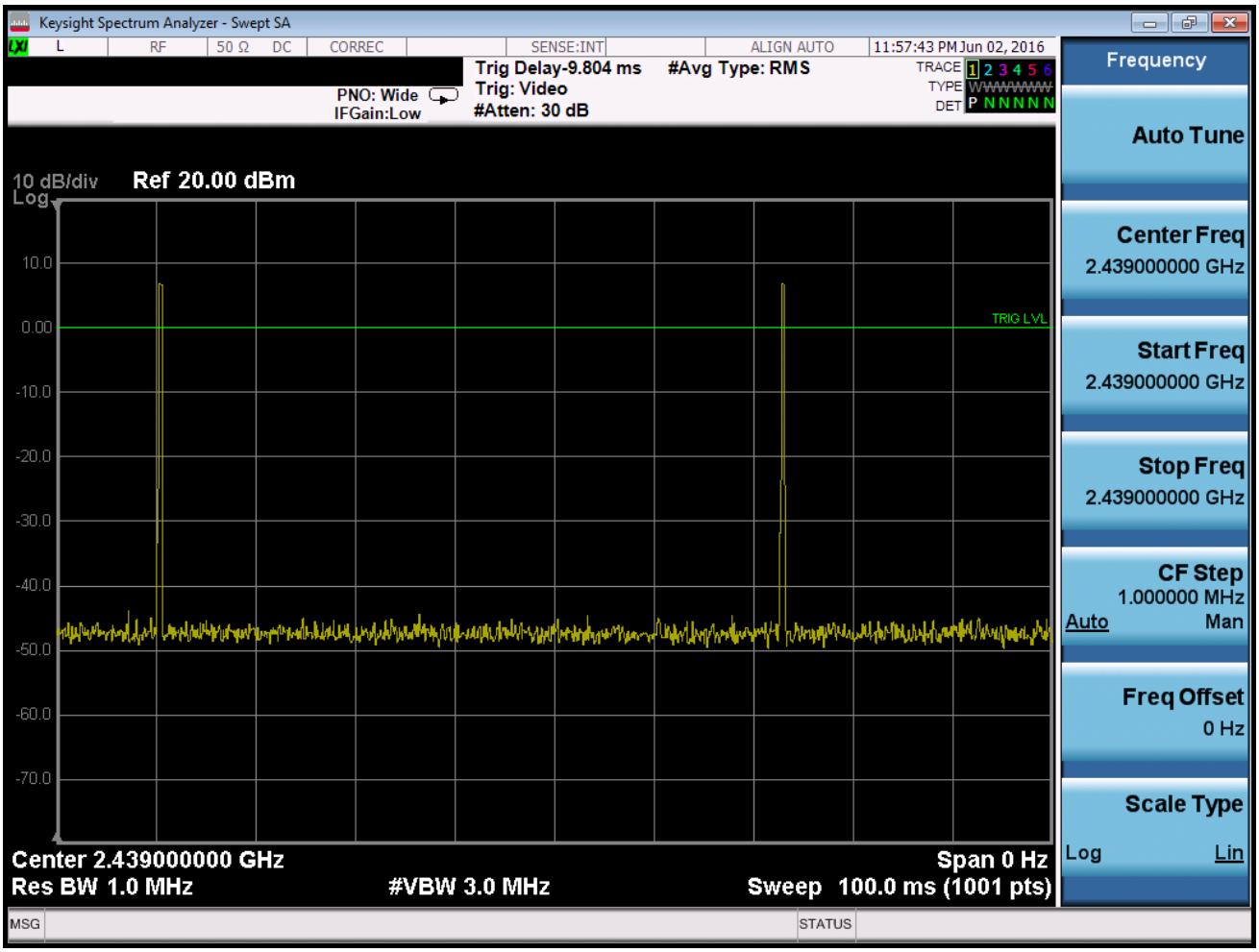
Duty Cycle Calculation
§15.35(c)

In Plot 7-3 below, a video trigger is used to determine the maximum number of times the transmitter operates at maximum power over a 100ms period.



Plot 7-3. Worst Case 100ms Operation

Since it is determined that the transmitter burst appears a maximum of 2 times over a 100ms window with a pulse width of 452.0µs, then the appropriate duty cycle correction factor is determined from the following formula, based on 15.35(c):

DCCF = $20\log_{10}$ (number of hits x (worst case 100ms operation / 100ms))
= $20\log_{10}$ (2 x (0.4520ms/100ms)) = -40.87dB

DCCF = -40.87dB

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7.4 Fundamental Field Strength Level Measurement

§15.249(a)(e)

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 = 3MHz and VBW ≥ RBW. Average field strength data is determined by applying the duty cycle correction factor (DCCF) found in Section 7.3 to the measured peak field strength values.

The maximum permissible average field strength level is 50mV/m (93.98dBμV/m). The maximum permissible peak field strength level is 500mV/m (113.98 dBμV/m).

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB]	Field Strength [dBμV/m]	Duty Cycle Correction [dB]	Corrected Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
2402.00	Peak	H	150	41	-50.43	42.09	98.66	-40.87	57.79	93.98	-36.19
2402.00	Peak	H	150	41	-50.43	42.09	98.66	0.00	98.66	113.98	-15.32
2441.00	Peak	H	130	82	-52.38	42.11	96.73	-40.87	55.86	93.98	-38.12
2441.00	Peak	H	130	82	-52.38	42.11	96.73	0.00	96.73	113.98	-17.25
2480.00	Peak	H	135	25	-54.88	42.13	94.25	-40.87	53.38	93.98	-40.60
2480.00	Peak	H	135	25	-54.88	42.13	94.25	0.00	94.25	113.98	-19.73

Table 7-3. Field Strength Measurements

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB]	Field Strength [dBμV/m]	Duty Cycle Correction [dB]	Corrected Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
2402.00	Peak	H	150	41	-51.12	42.09	97.97	-40.87	57.10	93.98	-36.88
2402.00	Peak	H	150	41	-51.12	42.09	97.97	0.00	97.97	113.98	-16.01
2441.00	Peak	H	119	112	-50.96	42.11	98.15	-40.87	57.28	93.98	-36.70
2441.00	Peak	H	119	112	-50.96	42.11	98.15	0.00	98.15	113.98	-15.83
2480.00	Peak	H	135	25	-55.72	42.13	93.41	-40.87	52.54	93.98	-41.44
2480.00	Peak	H	135	25	-55.72	42.13	93.41	0.00	93.41	113.98	-20.57

Table 7-4. Field Strength Measurements with WCP

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7.5 Radiated Spurious Emission Measurements

§15.205 §15.209 §15.249 (d)(e)

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.

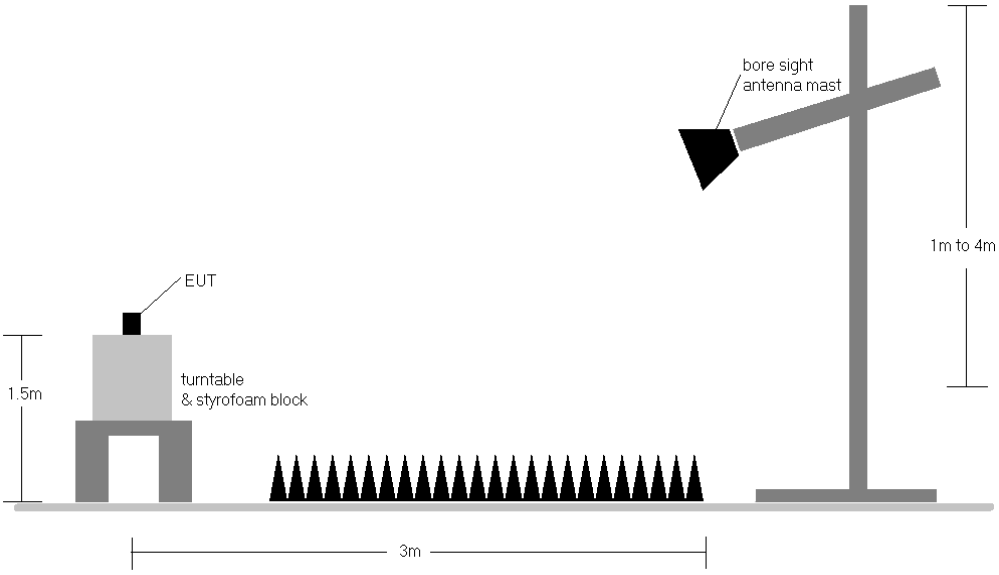

Figure 7-2. Radiated Test Setup

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Sample Calculation

- Avg. Field Strength Level $_{[dB\mu V/m]}$ = Analyzer Level $_{[dBm]}$ + 107 + AFCL $_{[dB/m]}$ + Duty Cycle Correction $_{[dB]}$
- Pk. 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 are below the limit shown in Table 7-5. Per 15.249(d), the radiated emissions limits from 15.209 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 with its standard battery.
6. The "-" shown in the following RSE tables are used to denote a noise floor measurement.

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Radiated Spurious Emission Measurements

§15.205 §15.209 §15.249 (d)(e)

Worst Case Mode: ANT+ (non-hopping)
Measurement Distance: 3 Meters
Operating Frequency: 2402MHz
Channel: 00

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB]	Field Strength [dBµV/m]	Duty Cycle Correction [dB]	Corrected Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4804.00	Peak	H	-	-	-98.62	40.43	48.81	-40.87	7.94	53.98	-46.04
4804.00	Peak	H	-	-	-98.62	40.43	48.81	0.00	48.81	73.98	-25.17
12010.00	Peak	H	-	-	-98.77	51.20	59.42	-40.87	18.55	53.98	-35.42
12010.00	Peak	H	-	-	-98.77	51.20	59.42	0.00	59.42	73.98	-14.55

Table 7-6. Radiated Measurements

Worst Case Mode: ANT+ (non-hopping)
Measurement Distance: 3 Meters
Operating Frequency: 2441MHz
Channel: 39

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB]	Field Strength [dBµV/m]	Duty Cycle Correction [dB]	Corrected Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4882.00	Peak	H	-	-	-97.27	39.94	49.67	-40.87	8.80	53.98	-45.18
4882.00	Peak	H	-	-	-97.27	39.94	49.67	0.00	49.67	73.98	-24.31
7323.00	Peak	H	-	-	-98.80	43.81	52.00	-40.87	11.13	53.98	-42.85
7323.00	Peak	H	-	-	-98.80	43.81	52.00	0.00	52.00	73.98	-21.98
12205.00	Peak	H	-	-	-98.27	51.21	59.94	-40.87	19.07	53.98	-34.91
12205.00	Peak	H	-	-	-98.27	51.21	59.94	0.00	59.94	73.98	-14.03

Table 7-7. Radiated Measurements

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Radiated Spurious Emission Measurements

§15.205 §15.209 §15.249 (d)(e)

Worst Case Mode: ANT+ (non-hopping)
Measurement Distance: 3 Meters
Operating Frequency: 2480MHz
Channel: 78

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB]	Field Strength [dBµV/m]	Duty Cycle Correction [dB]	Corrected Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4960.00	Peak	H	-	-	-98.32	40.02	48.70	-40.87	7.83	53.98	-46.15
4960.00	Peak	H	-	-	-98.32	40.02	48.70	0.00	48.70	73.98	-25.28
7440.00	Peak	H	-	-	-98.43	44.42	52.98	-40.87	12.11	53.98	-41.86
7440.00	Peak	H	-	-	-98.43	44.42	52.98	0.00	52.98	73.98	-20.99
12400.00	Peak	H	-	-	-97.99	51.65	60.66	-40.87	19.79	53.98	-34.19
12400.00	Peak	H	-	-	-97.99	51.65	60.66	0.00	60.66	73.98	-13.32

Table 7-8. Radiated Measurements

Worst Case Mode: ANT+ (non-hopping)
Measurement Distance: 3 Meters
Operating Frequency: 2480MHz
Channel: 78

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB]	Field Strength [dBµV/m]	Duty Cycle Correction [dB]	Corrected Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4960.00	Peak	H	-	-	-98.03	40.02	48.99	-40.87	8.12	53.98	-45.86
4960.00	Peak	H	-	-	-98.03	40.02	48.99	0.00	48.99	73.98	-24.99
7440.00	Peak	H	-	-	-99.47	44.42	51.94	-40.87	11.07	53.98	-42.90
7440.00	Peak	H	-	-	-99.47	44.42	51.94	0.00	51.94	73.98	-22.03
12400.00	Peak	H	-	-	-98.27	51.65	60.38	-40.87	19.51	53.98	-34.47
12400.00	Peak	H	-	-	-98.27	51.65	60.38	0.00	60.38	73.98	-13.60

Table 7-9. Radiated Measurements with WCP

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7.6 Radiated Restricted Band Edge Measurements

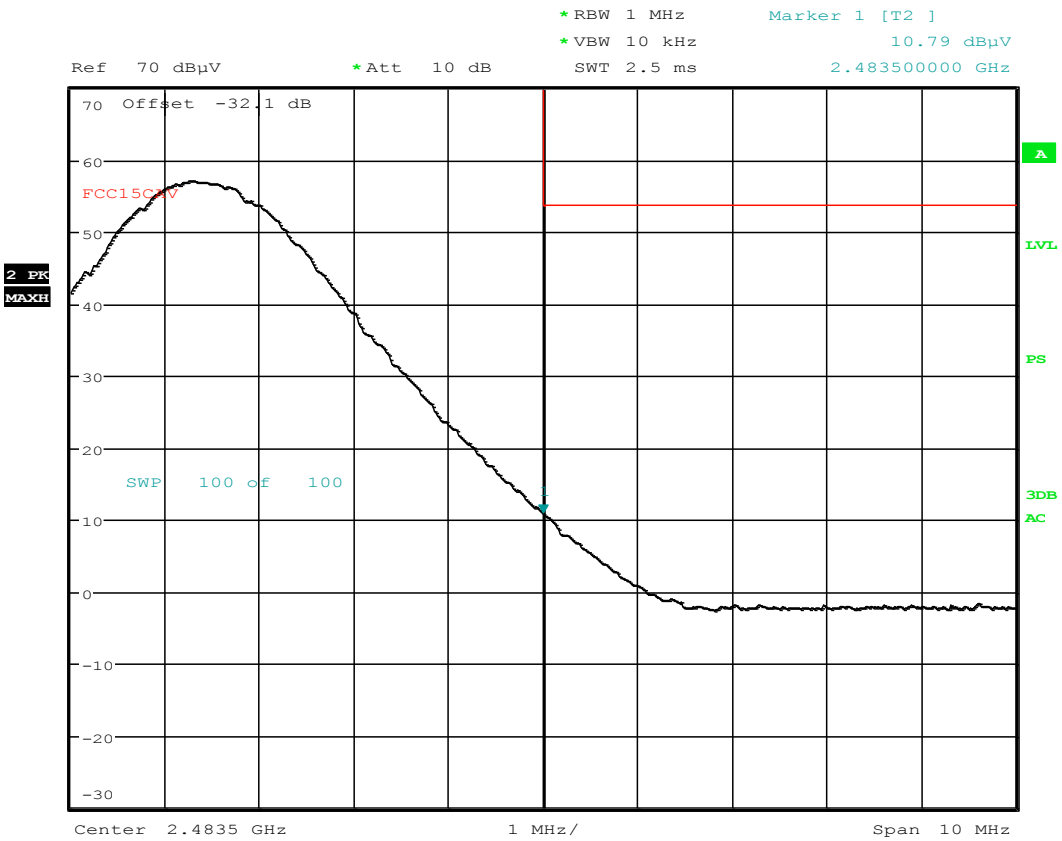
§15.205 §15.209 §15.249 (d)

The radiated restricted band edge measurements are measured with an EMI test receiver connected to the receive antenna while the EUT is transmitting. Two different amplitude offsets were used depending on whether peak or average measurements were measured. The average measurements use a duty cycle correction factor (DCCF).

The amplitude offset shown in the following plots for average measurements was calculated using the formula:

Offset (dB) = (Antenna Factor + Cable Loss) – Preamplifier Gain + DCCF

Worst Case Mode:	ANT+ (non-hopping)
Measurement Distance:	3 Meters
Operating Frequency:	2480MHz
Back Cover	Standard
Channel:	78



Date: 3.JUN.2016 22:18:32

Plot 7-4. Radiated Restricted Upper Band Edge Measurement (Average)

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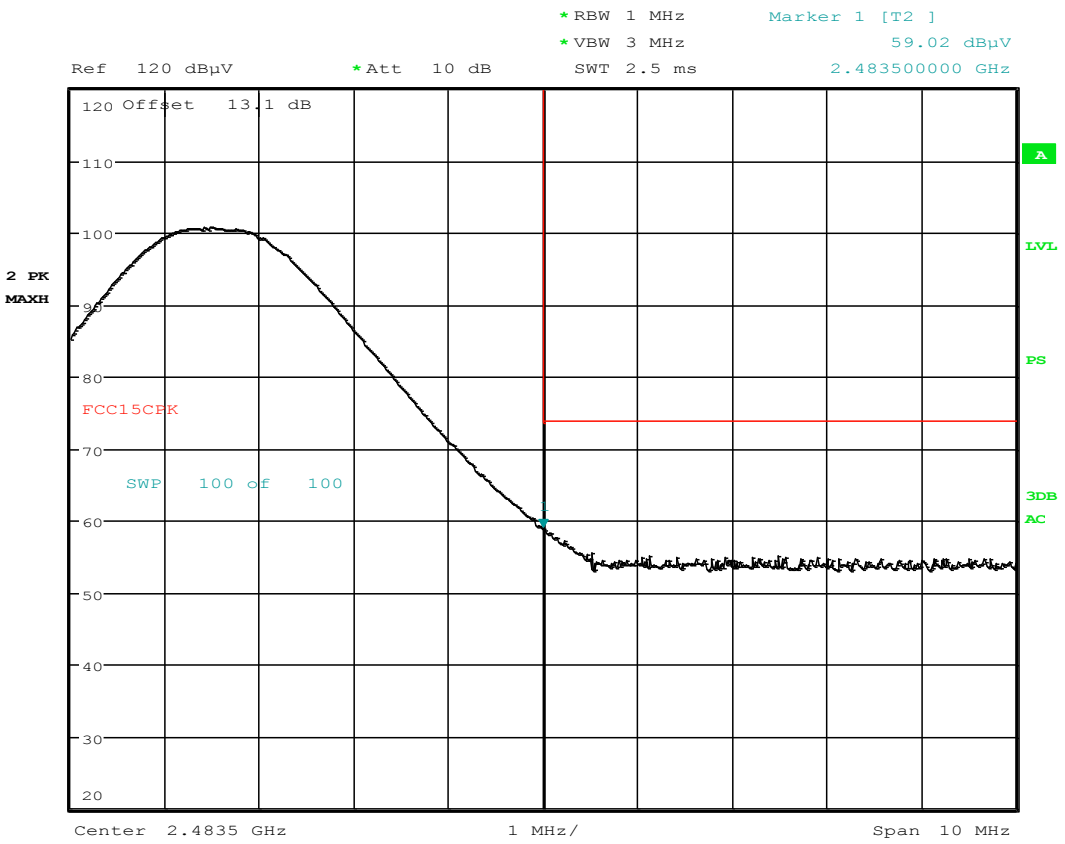
Radiated Restricted Band Edge Measurements

§15.205 §15.209 §15.249 (d)

The amplitude offset shown in the following plots for peak measurements was calculated using the formula:

Offset (dB) = (Antenna Factor + Cable Loss) – Preamplifier Gain



Date: 3.JUN.2016 22:12:00

Plot 7-5. Radiated Restricted Upper Band Edge Measurement (Peak)

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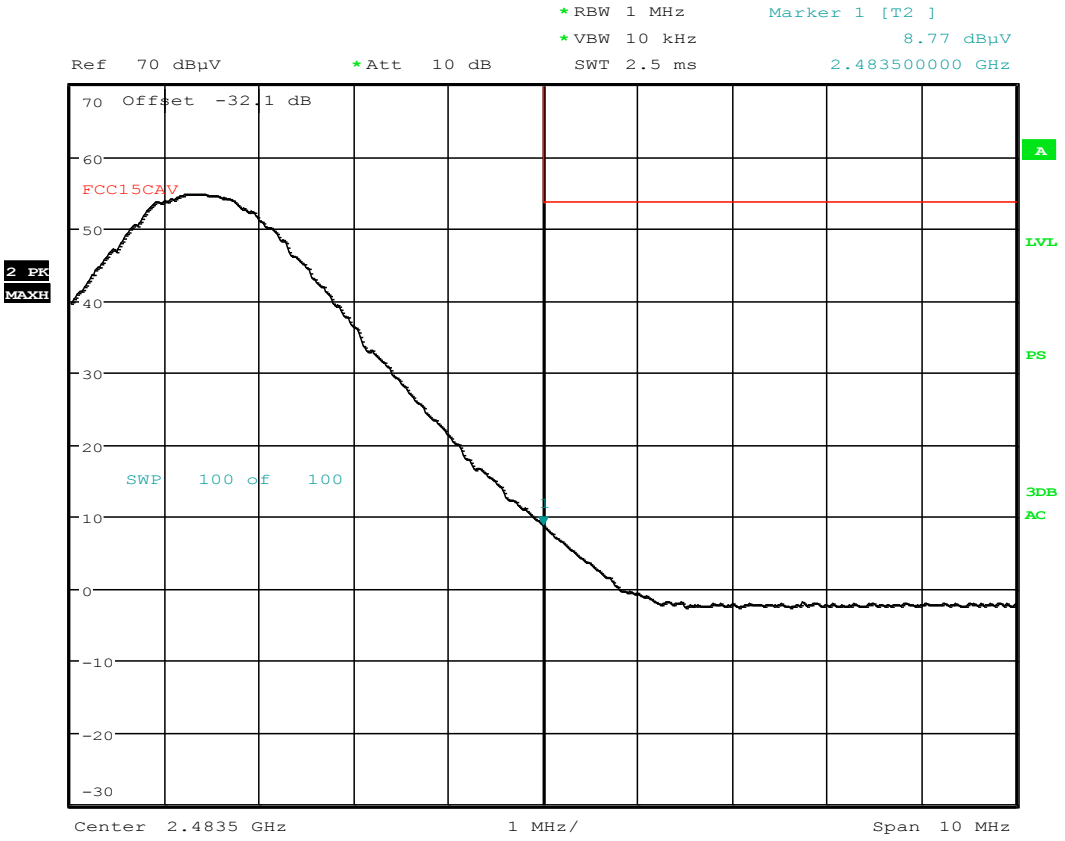
Radiated Restricted Band Edge Measurements

§15.205 §15.209 §15.249 (d)

The amplitude offset shown in the following plots for average measurements was calculated using the formula:

Offset (dB) = (Antenna Factor + Cable Loss) – Preamplifier Gain + DCCF

Worst Case Mode:	ANT+ (non-hopping)
Measurement Distance:	3 Meters
Operating Frequency:	2480MHz
Back Cover	Standard
Channel:	78



Date: 3.JUN.2016 22:20:02

Plot 7-6. Radiated Restricted Upper Band Edge Measurement with WCP (Average)

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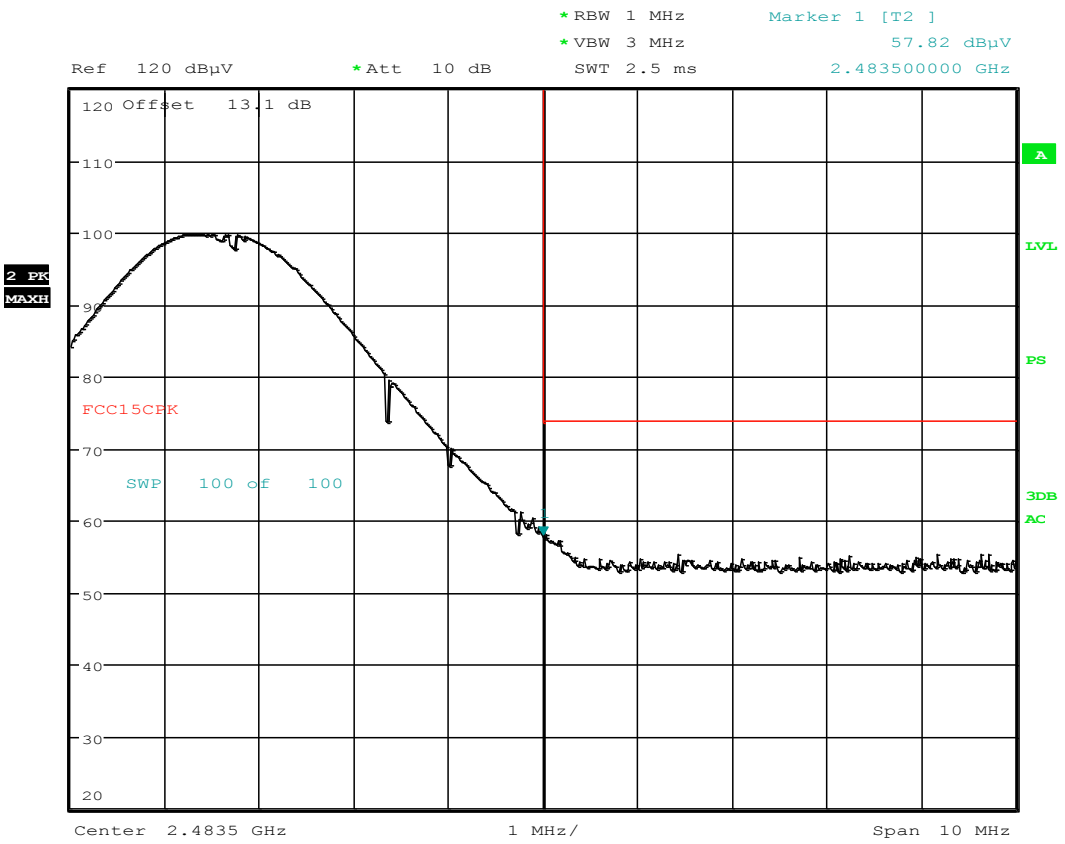
Radiated Restricted Band Edge Measurements

§15.205 §15.209 §15.249 (d)

The amplitude offset shown in the following plots for peak measurements was calculated using the formula:

Offset (dB) = (Antenna Factor + Cable Loss) – Preamplifier Gain



Date: 3.JUN.2016 22:14:56

Plot 7-7. Radiated Restricted Upper Band Edge Measurement with WCP (Peak)

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7.7 Line Conducted Measurement Data

§15.207

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.

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 7-10. 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

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 = quasi-peak
4. Sweep time = auto couple
5. Trace mode = max hold
6. 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.

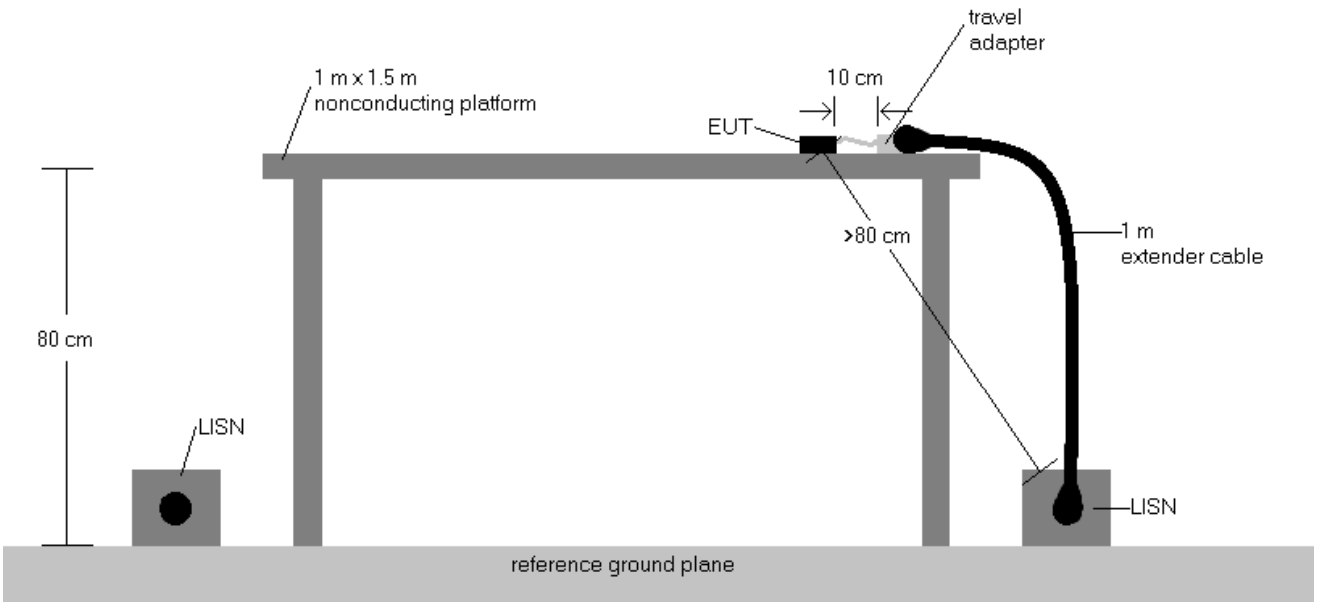

Figure 7-3. Test Instrument & Measurement Setup

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.
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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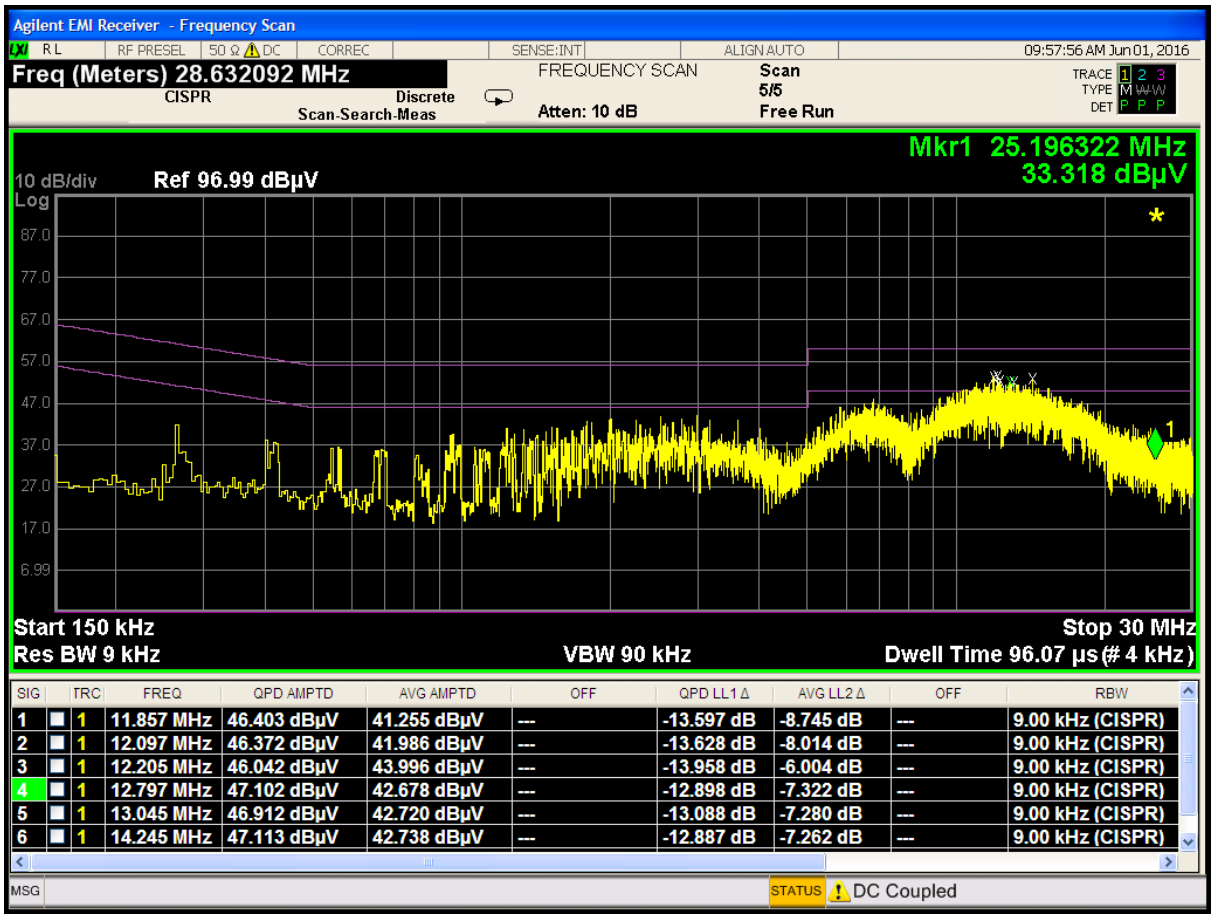
Line Conducted Measurement Data

§15.207



SIG		TRC	FREQ	QPD AMPTD	AVG AMPTD	OFF	QPD LL1 Δ	AVG LL2 Δ	OFF	RBW
1	■	1	11.857 MHz	46.403 dBµV	41.255 dBµV	---	-13.597 dB	-8.745 dB	---	9.00 kHz (CISPR)
2	■	1	12.097 MHz	46.372 dBµV	41.986 dBµV	---	-13.628 dB	-8.014 dB	---	9.00 kHz (CISPR)
3	■	1	12.205 MHz	46.042 dBµV	43.996 dBµV	---	-13.958 dB	-6.004 dB	---	9.00 kHz (CISPR)
4	■	1	12.797 MHz	47.102 dBµV	42.678 dBµV	---	-12.898 dB	-7.322 dB	---	9.00 kHz (CISPR)
5	■	1	13.045 MHz	46.912 dBµV	42.720 dBµV	---	-13.088 dB	-7.280 dB	---	9.00 kHz (CISPR)
6	■	1	14.245 MHz	47.113 dBµV	42.738 dBµV	---	-12.887 dB	-7.262 dB	---	9.00 kHz (CISPR)

Plot 7-8. Line-Conducted Test Plot (L1)

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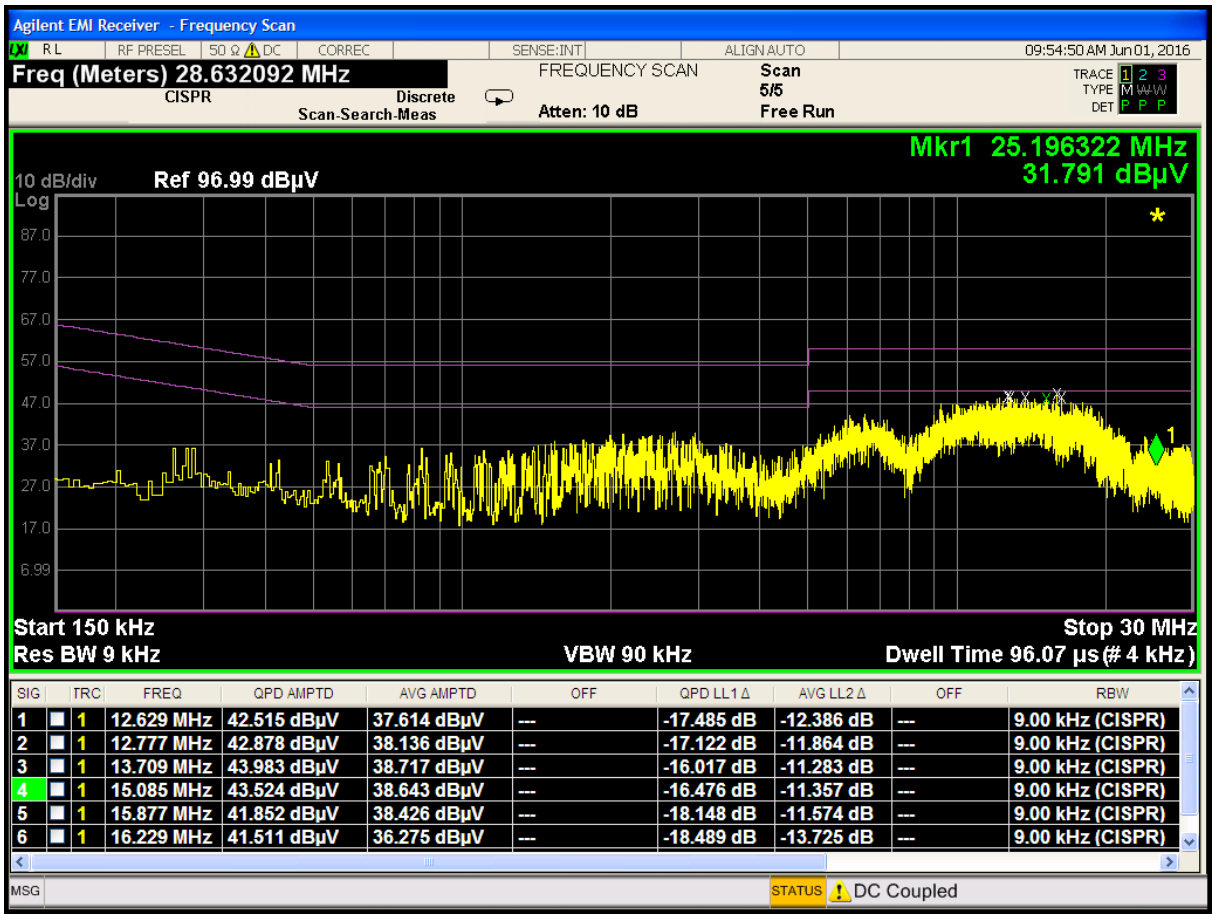
Line Conducted Measurement Data

§15.207



SIG		TRC	FREQ	QPD AMPTD	AVG AMPTD	OFF	QPD LL1 Δ	AVG LL2 Δ	OFF	RBW
1	■	1	12.629 MHz	42.515 dBµV	37.614 dBµV	---	-17.485 dB	-12.386 dB	---	9.00 kHz (CISPR)
2	■	1	12.777 MHz	42.878 dBµV	38.136 dBµV	---	-17.122 dB	-11.864 dB	---	9.00 kHz (CISPR)
3	■	1	13.709 MHz	43.983 dBµV	38.717 dBµV	---	-16.017 dB	-11.283 dB	---	9.00 kHz (CISPR)
4	■	1	15.085 MHz	43.524 dBµV	38.643 dBµV	---	-16.476 dB	-11.357 dB	---	9.00 kHz (CISPR)
5	■	1	15.877 MHz	41.852 dBµV	38.426 dBµV	---	-18.148 dB	-11.574 dB	---	9.00 kHz (CISPR)
6	■	1	16.229 MHz	41.511 dBµV	36.275 dBµV	---	-18.489 dB	-13.725 dB	---	9.00 kHz (CISPR)

Plot 7-9. Line-Conducted Test Plot (N)

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8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Portable Handset FCC ID: A3LSMN930X** is in compliance with Part 15 Subpart C (15.249) of the FCC Rules.

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