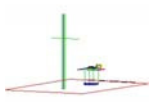
PCTEST ENGINEERING LABORATORY, INC.
7185 Oakland Mills Road, Columbia, MD 21046 USA
Tel. 410.290.6652 / Fax 410.290.6654
http://www.pctestlab.com



# 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:**
6/1 - 6/29/2016
**Test Site/Location:**
PCTEST Lab. Columbia, MD, USA
**Test Report Serial No.:**
1M1703230122-09.A3L

| | |
|---|---|
| **FCC ID:** | **A3LSMN935KOR** |
| **APPLICANT:** | **Samsung Electronics Co., Ltd.** |

| | |
|---|---|
| **Application Type:** | Certification |
| **Model(s):** | SM-N935S, SM-N935K, SM-N935L |
| **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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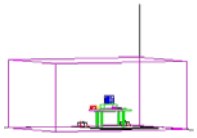
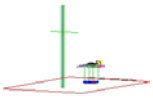


# MEASUREMENT REPORT
## FCC Part 15.249



## § 2.1033 General Information

| | |
|---|---|
| **APPLICANT:** | Samsung Electronics Co., Ltd. |
| **APPLICANT ADDRESS:** | 129, Samsung-ro,<br>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-N935S |
| **FCC ID:** | A3LSMN935KOR |
| **Test Device Serial No.:** | 066AA, 05A93, 0548E ☐ Production ☒ Pre-Production ☐ Engineering |
| **FCC CLASSIFICATION:** | Low Power Communications Device Transmitter (DXX) |
| **DATE(S) OF TEST:** | 6/2 - 6/28/2016 |
| **TEST REPORT S/N:** | 1M1703230122-09.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.

# 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 39º 10'23" N latitude and 76º 49'50" W longitude. The facility is 0.4 miles North of the FCC laboratory, and the ambient signal and ambient signal strength are approximately equal to those of the FCC laboratory. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2014 on January 22, 2015.

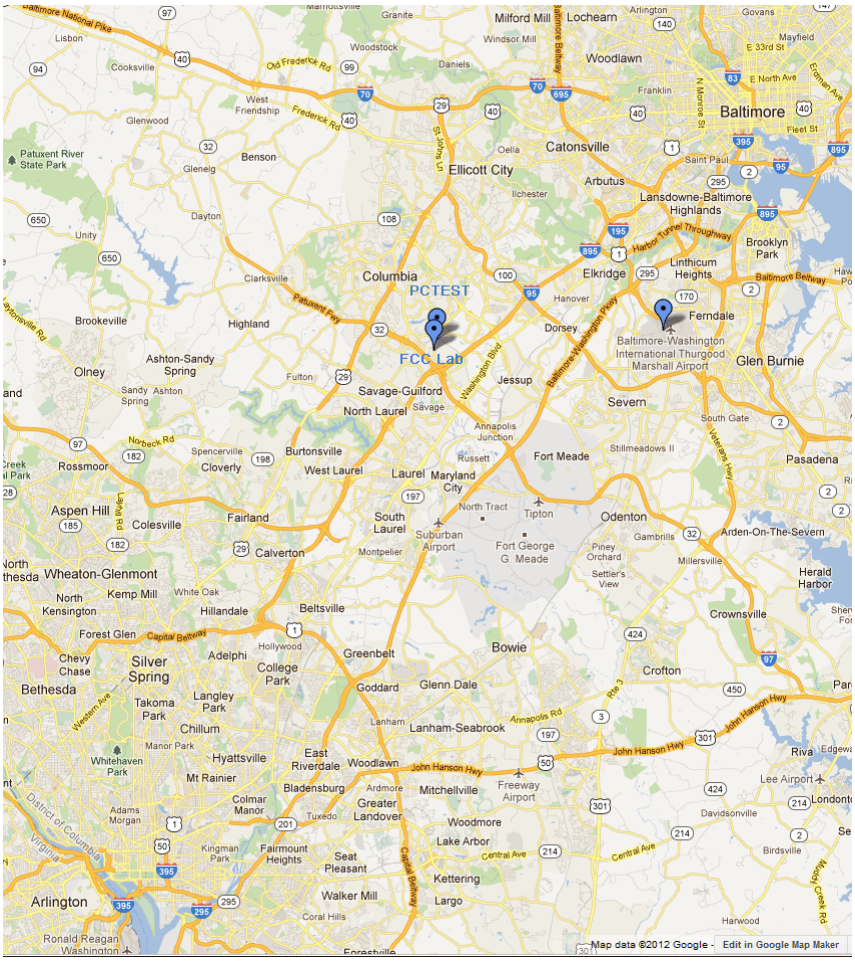



**Figure 1-1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area**

# 2.0 PRODUCT INFORMATION

## 2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMN935KOR**. 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:

1900 GPRS/EDGE, 850/1900 WCDMA/HSPA, Multi-band LTE, 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: A3LSMN935KOR 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.

# 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: A3LSMN935KOR.**

**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.

## 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 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).

# 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: A3LSMN935KOR** unit complies with the requirement of §15.203.

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

**Table 4-1. Frequency/ Channel Operations**

# 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 |

# 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.

# 7.0 TEST RESULTS

## 7.1 Summary

Company Name: Samsung Electronics Co., Ltd.

FCC ID: A3LSMN935KOR

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 1.1.5.
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.

## 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 [MHz] |
|---|---|---|---|
| 2441 | 39 | ANT+ (non-hop) | 1.0189 |

**Table 7-2. Occupied Bandwidth Measurement**


**Figure 7-1. Test Instrument & Measurement Setup**

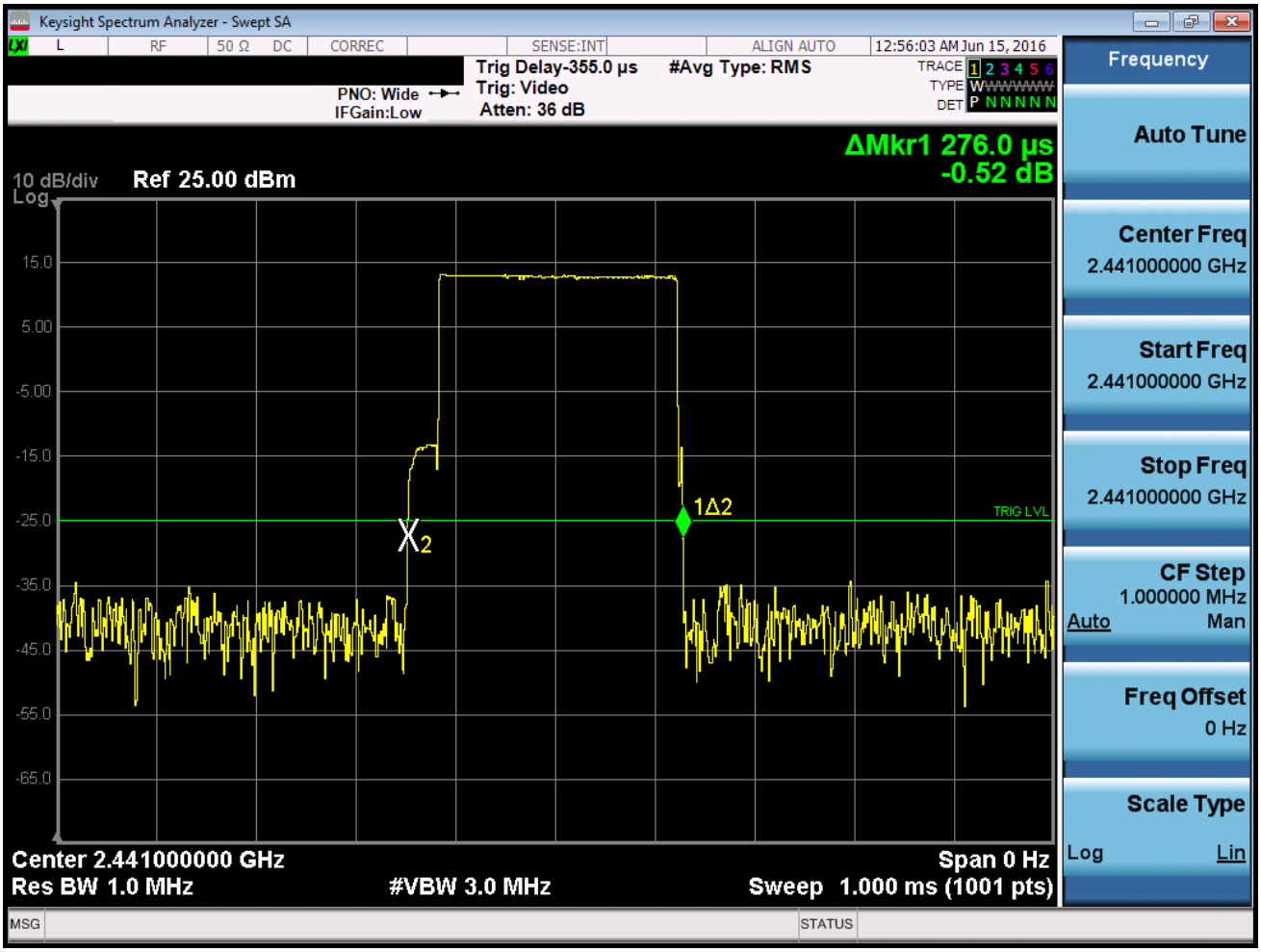

**Plot 7-1. Occupied Bandwidth Plot (ANT+ – Ch. 39)**

## 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 N/Aμs.

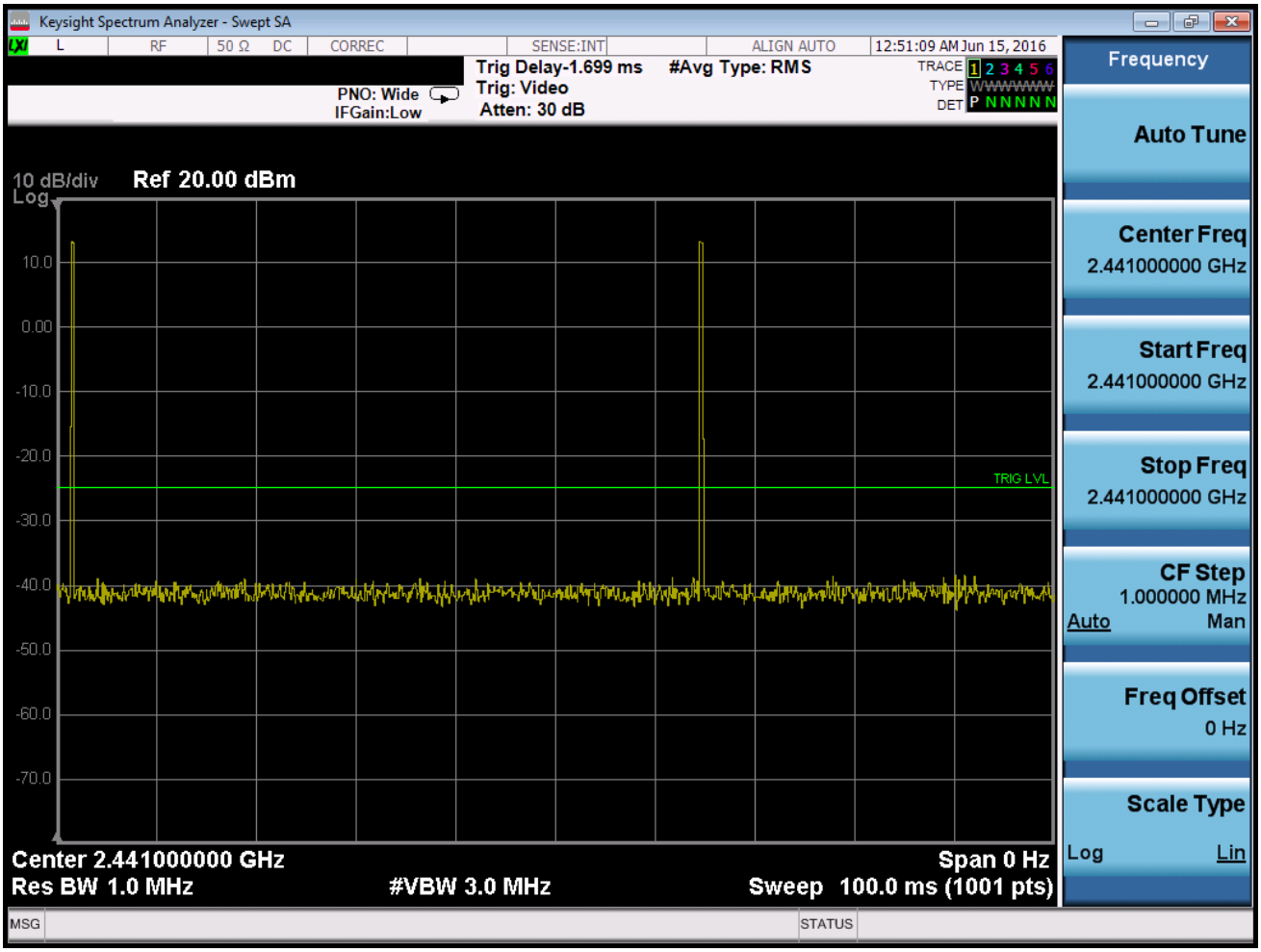



**Plot 7-2. Pulse Width Measurement**

## 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 N/Aμs, 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 (0.2760ms/100ms)) = -45.16dB

**DCCF = -45.16dB**

## 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/m] | Field Strength [dBμV/m] | Duty Cycle Correction [dB] | Corrected Field Strength [dBμV/m] | Limit [dBμV/m] | Margin [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2402.00 | Peak | H | 210 | 54 | -73.84 | 31.74 | 64.90 | -45.16 | 19.74 | 93.98 | -74.24 |
| 2402.00 | Peak | H | 210 | 54 | -73.84 | 31.74 | 64.90 | 0.00 | 64.90 | 113.98 | -49.08 |
| 2441.00 | Peak | H | 214 | 12 | -73.50 | 31.74 | 65.25 | -45.16 | 20.09 | 93.98 | -73.89 |
| 2441.00 | Peak | H | 214 | 12 | -73.50 | 31.74 | 65.25 | 0.00 | 65.25 | 113.98 | -48.73 |
| 2480.00 | Peak | H | 205 | 16 | -73.44 | 31.75 | 65.31 | -45.16 | 20.15 | 93.98 | -73.83 |
| 2480.00 | Peak | H | 205 | 16 | -73.44 | 31.75 | 65.31 | 0.00 | 65.31 | 113.98 | -48.67 |

**Table 7-3. Field Strength Measurements**

| Frequency [MHz] | Detector | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Analyzer Level [dBm] | AFCL [dB/m] | Field Strength [dBμV/m] | Duty Cycle Correction [dB] | Corrected Field Strength [dBμV/m] | Limit [dBμV/m] | Margin [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2402.00 | Peak | H | 216 | 54 | -74.97 | 31.74 | 63.77 | -45.16 | 18.61 | 93.98 | -75.37 |
| 2402.00 | Peak | H | 216 | 54 | -74.97 | 31.74 | 63.77 | 0.00 | 63.77 | 113.98 | -50.21 |
| 2441.00 | Peak | H | 156 | 24 | -74.45 | 31.74 | 64.29 | -45.16 | 19.13 | 93.98 | -74.85 |
| 2441.00 | Peak | H | 156 | 24 | -74.45 | 31.74 | 64.29 | 0.00 | 64.29 | 113.98 | -49.69 |
| 2480.00 | Peak | H | 142 | 278 | -73.93 | 31.75 | 64.82 | -45.16 | 19.66 | 93.98 | -74.32 |
| 2480.00 | Peak | H | 142 | 278 | -73.93 | 31.75 | 64.82 | 0.00 | 64.82 | 113.98 | -49.16 |

**Table 7-4. Field Strength Measurements with WCP**

## 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.

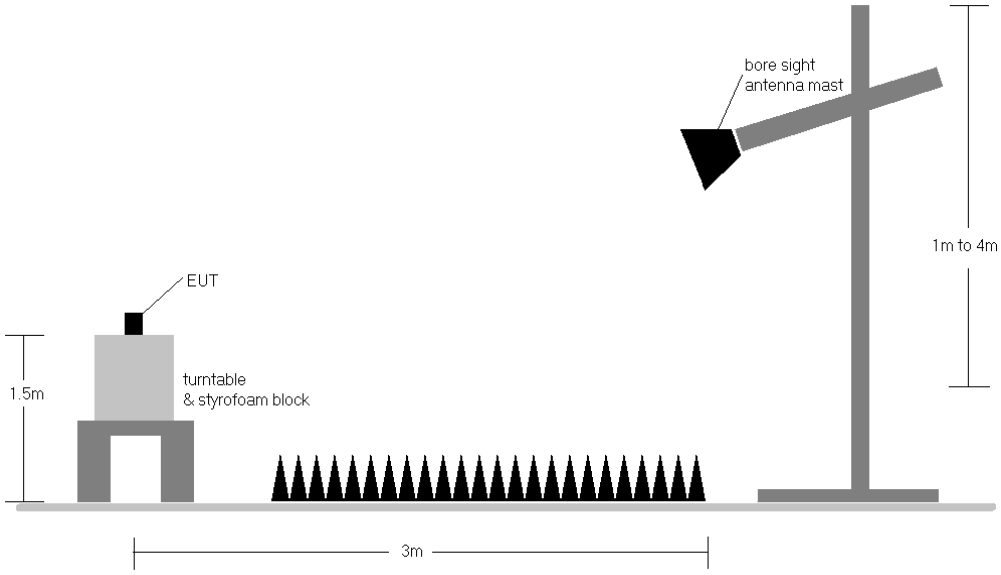



**Figure 7-2. Radiated Test Setup**

## 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.

## 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/m] | Field Strength [dBµV/m] | Duty Cycle Correction [dB] | Corrected Field Strength [dBµV/m] | Limit [dBµV/m] | Margin [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4804.00 | Peak | H | - | - | -98.65 | 40.43 | 48.78 | -45.16 | 3.62 | 53.98 | -50.36 |
| 4804.00 | Peak | H | - | - | -98.65 | 40.43 | 48.78 | 0.00 | 48.78 | 73.98 | -25.20 |
| 12010.00 | Peak | H | - | - | -97.56 | 51.20 | 60.63 | -45.16 | 15.47 | 53.98 | -38.50 |
| 12010.00 | Peak | H | - | - | -97.56 | 51.20 | 60.63 | 0.00 | 60.63 | 73.98 | -13.34 |

**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/m] | Field Strength [dBµV/m] | Duty Cycle Correction [dB] | Corrected Field Strength [dBµV/m] | Limit [dBµV/m] | Margin [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4882.00 | Peak | H | - | - | -97.62 | 39.94 | 49.32 | -45.16 | 4.16 | 53.98 | -49.82 |
| 4882.00 | Peak | H | - | - | -97.62 | 39.94 | 49.32 | 0.00 | 49.32 | 73.98 | -24.66 |
| 7323.00 | Peak | H | - | - | -98.36 | 43.81 | 52.44 | -45.16 | 7.28 | 53.98 | -46.70 |
| 7323.00 | Peak | H | - | - | -98.36 | 43.81 | 52.44 | 0.00 | 52.44 | 73.98 | -21.54 |
| 12205.00 | Peak | H | - | - | -96.40 | 51.21 | 61.81 | -45.16 | 16.65 | 53.98 | -37.33 |
| 12205.00 | Peak | H | - | - | -96.40 | 51.21 | 61.81 | 0.00 | 61.81 | 73.98 | -12.16 |

**Table 7-7. Radiated Measurements**

## 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/m] | Field Strength [dBµV/m] | Duty Cycle Correction [dB] | Corrected Field Strength [dBµV/m] | Limit [dBµV/m] | Margin [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4960.00 | Peak | H | - | - | -97.75 | 40.02 | 49.27 | -45.16 | 4.11 | 53.98 | -49.87 |
| 4960.00 | Peak | H | - | - | -97.75 | 40.02 | 49.27 | 0.00 | 49.27 | 73.98 | -24.71 |
| 7440.00 | Peak | H | - | - | -98.27 | 44.42 | 53.14 | -45.16 | 7.98 | 53.98 | -45.99 |
| 7440.00 | Peak | H | - | - | -98.27 | 44.42 | 53.14 | 0.00 | 53.14 | 73.98 | -20.83 |
| 12400.00 | Peak | H | - | - | -96.32 | 51.65 | 62.33 | -45.16 | 17.17 | 53.98 | -36.81 |
| 12400.00 | Peak | H | - | - | -96.32 | 51.65 | 62.33 | 0.00 | 62.33 | 73.98 | -11.65 |

**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/m] | Field Strength [dBµV/m] | Duty Cycle Correction [dB] | Corrected Field Strength [dBµV/m] | Limit [dBµV/m] | Margin [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4960.00 | Peak | H | - | - | -98.16 | 40.02 | 48.86 | -45.16 | 3.70 | 53.98 | -50.28 |
| 4960.00 | Peak | H | - | - | -98.16 | 40.02 | 48.86 | 0.00 | 48.86 | 73.98 | -25.12 |
| 7440.00 | Peak | H | - | - | -99.45 | 44.42 | 51.96 | -45.16 | 6.80 | 53.98 | -47.17 |
| 7440.00 | Peak | H | - | - | -99.45 | 44.42 | 51.96 | 0.00 | 51.96 | 73.98 | -22.01 |
| 12400.00 | Peak | H | - | - | -96.90 | 51.65 | 61.75 | -45.16 | 16.59 | 53.98 | -37.39 |
| 12400.00 | Peak | H | - | - | -96.90 | 51.65 | 61.75 | 0.00 | 61.75 | 73.98 | -12.23 |

**Table 7-9. Radiated Measurements with WCP**

## 7.6 Radiated Restricted Band Edge Measurements

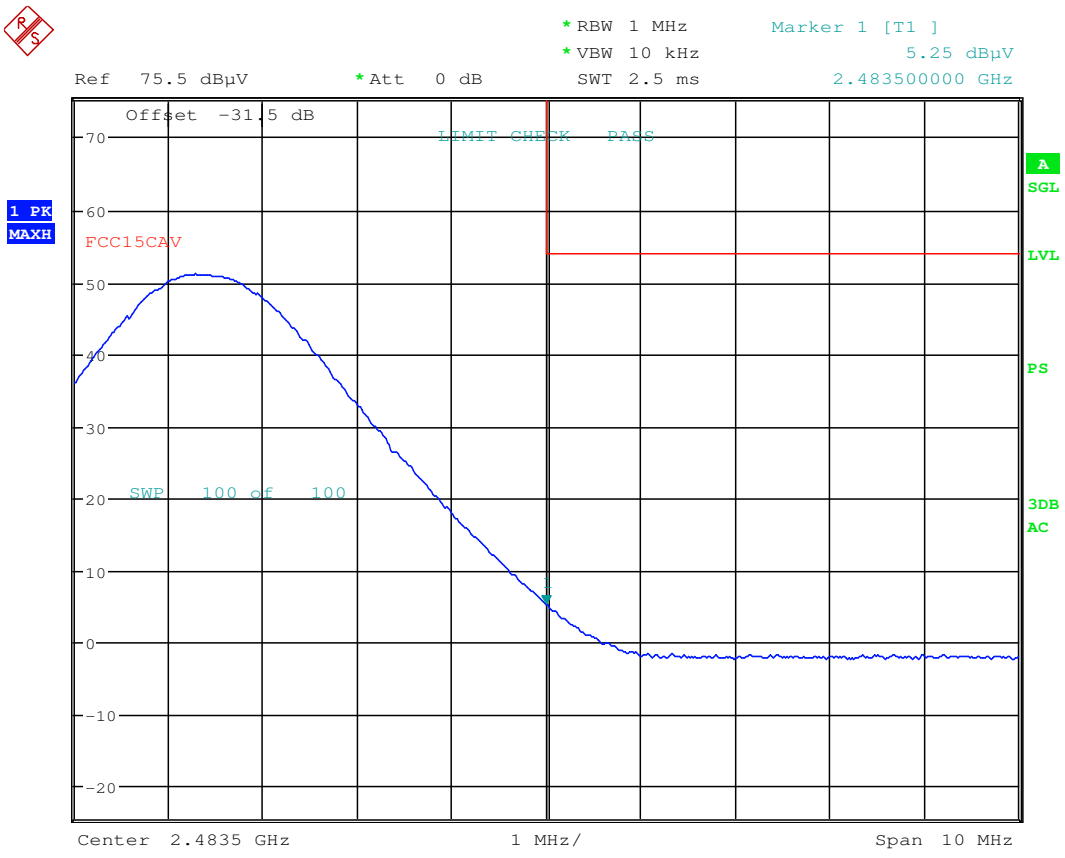
**§15.205 §15.209 §15.249 (d)**

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 |



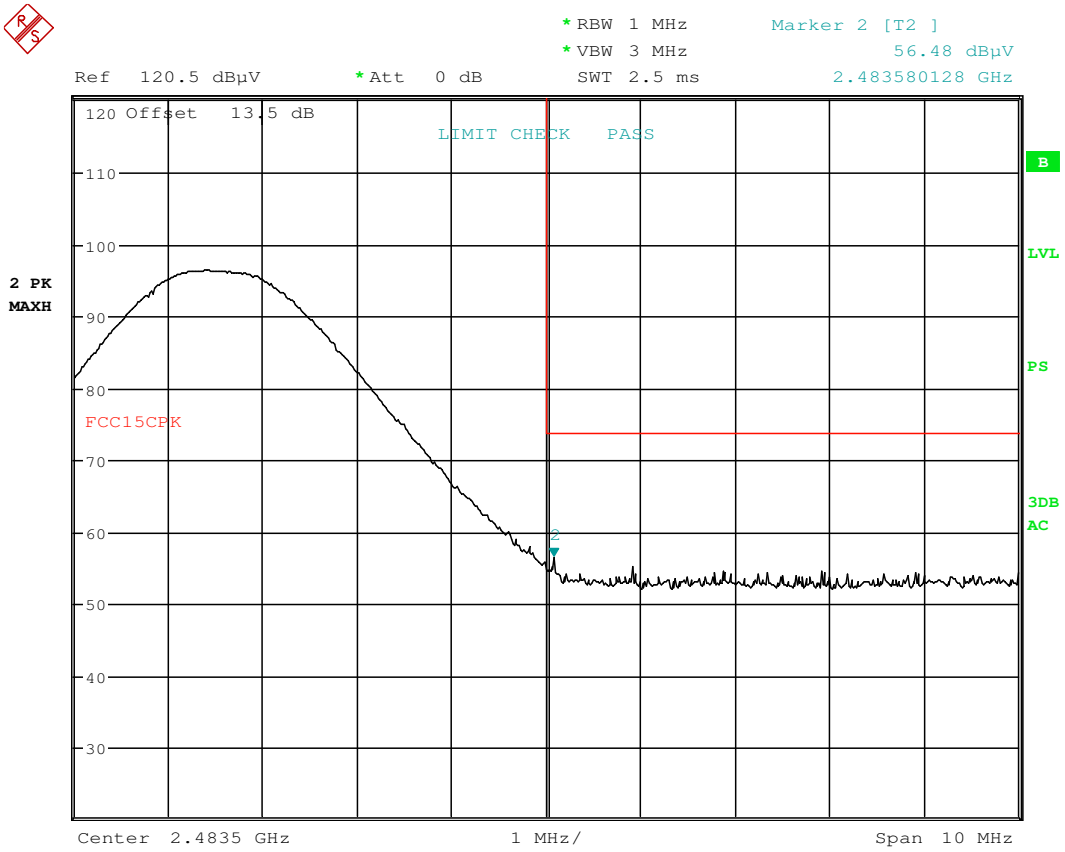

**Plot 7-4. Radiated Restricted Upper Band Edge Measurement (Average)**

## 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




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

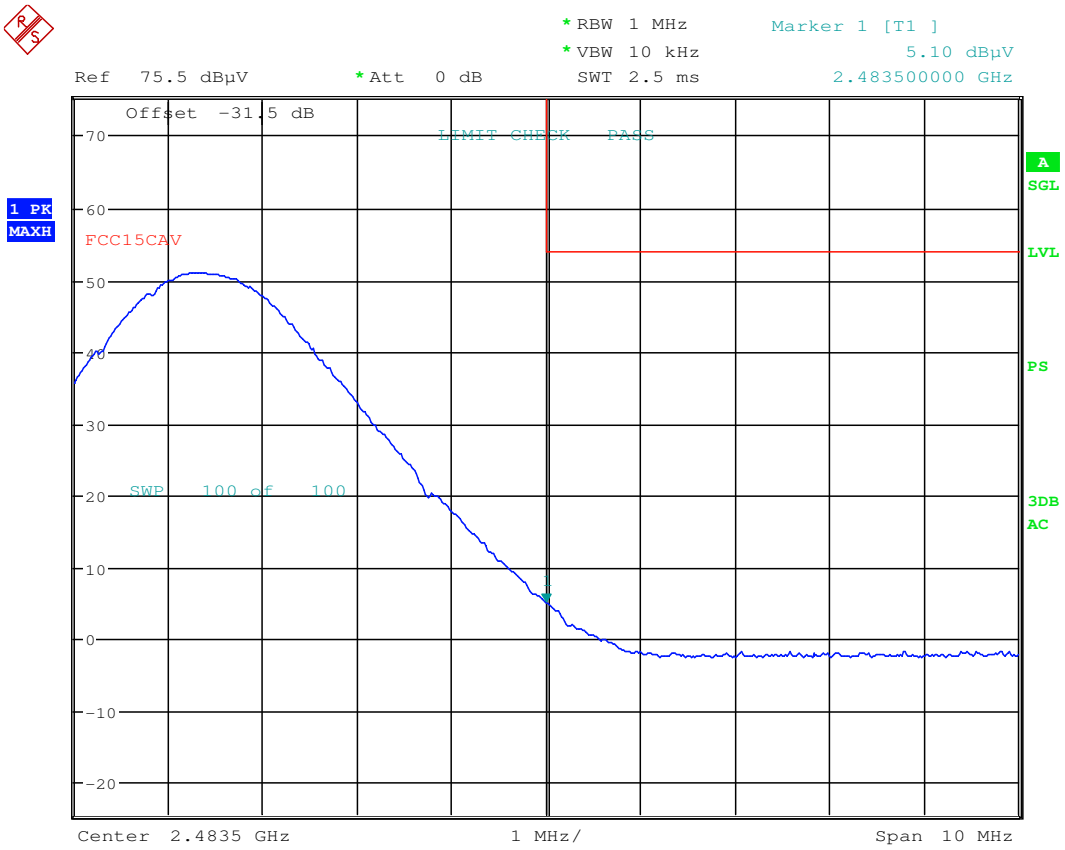
## Radiated Restricted Band Edge Measurements

**§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 |



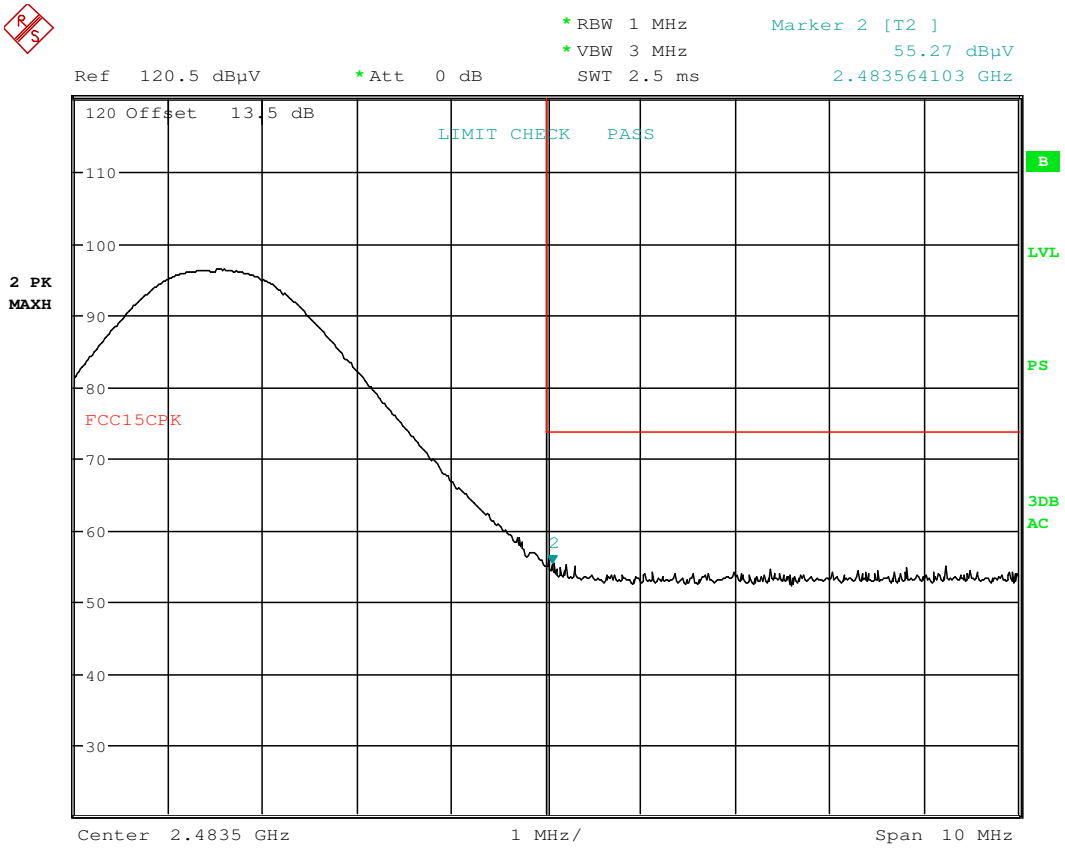

**Plot 7-6. Radiated Restricted Upper Band Edge Measurement with WCP (Average)**

## 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




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

## 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

## Test Setup

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

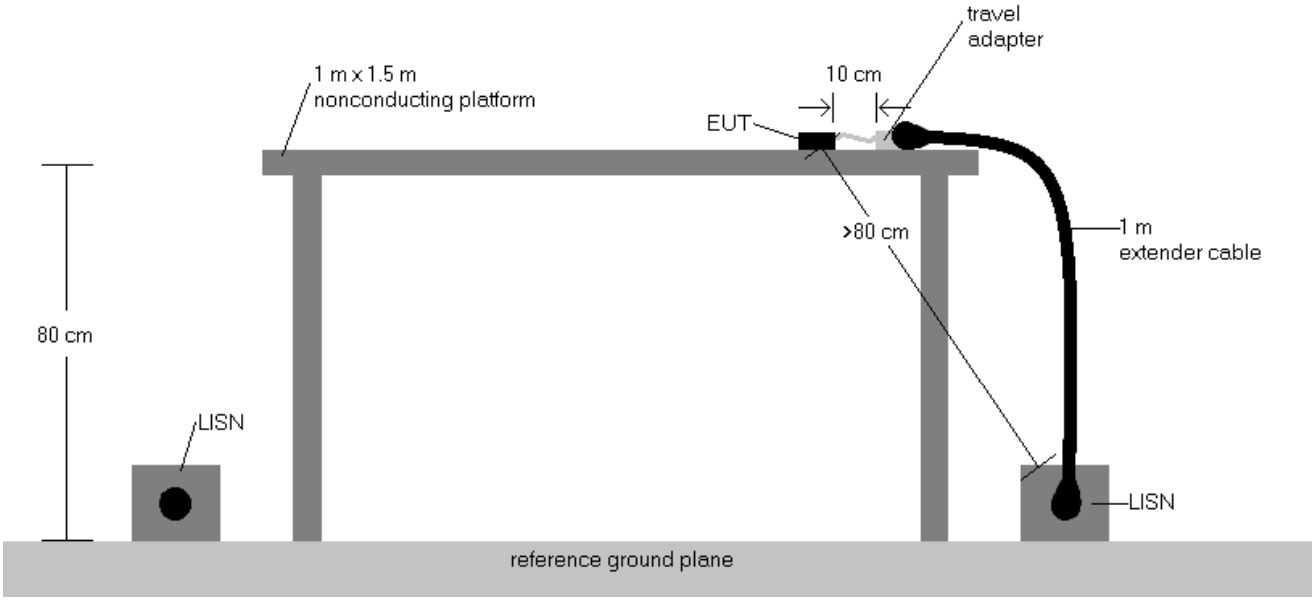


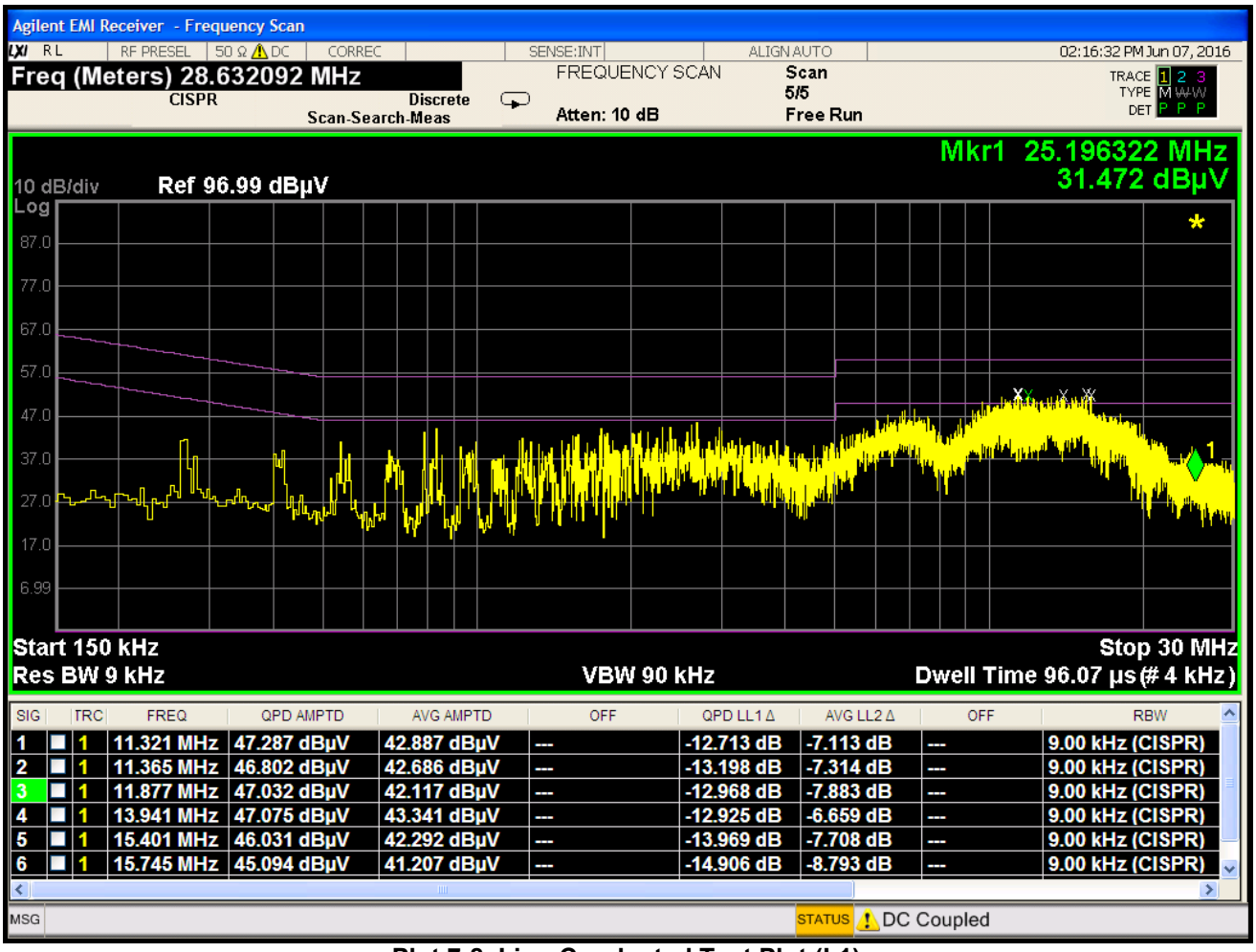

**Figure 7-3. Test Instrument & Measurement Setup**

## 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.

# Line Conducted Measurement Data

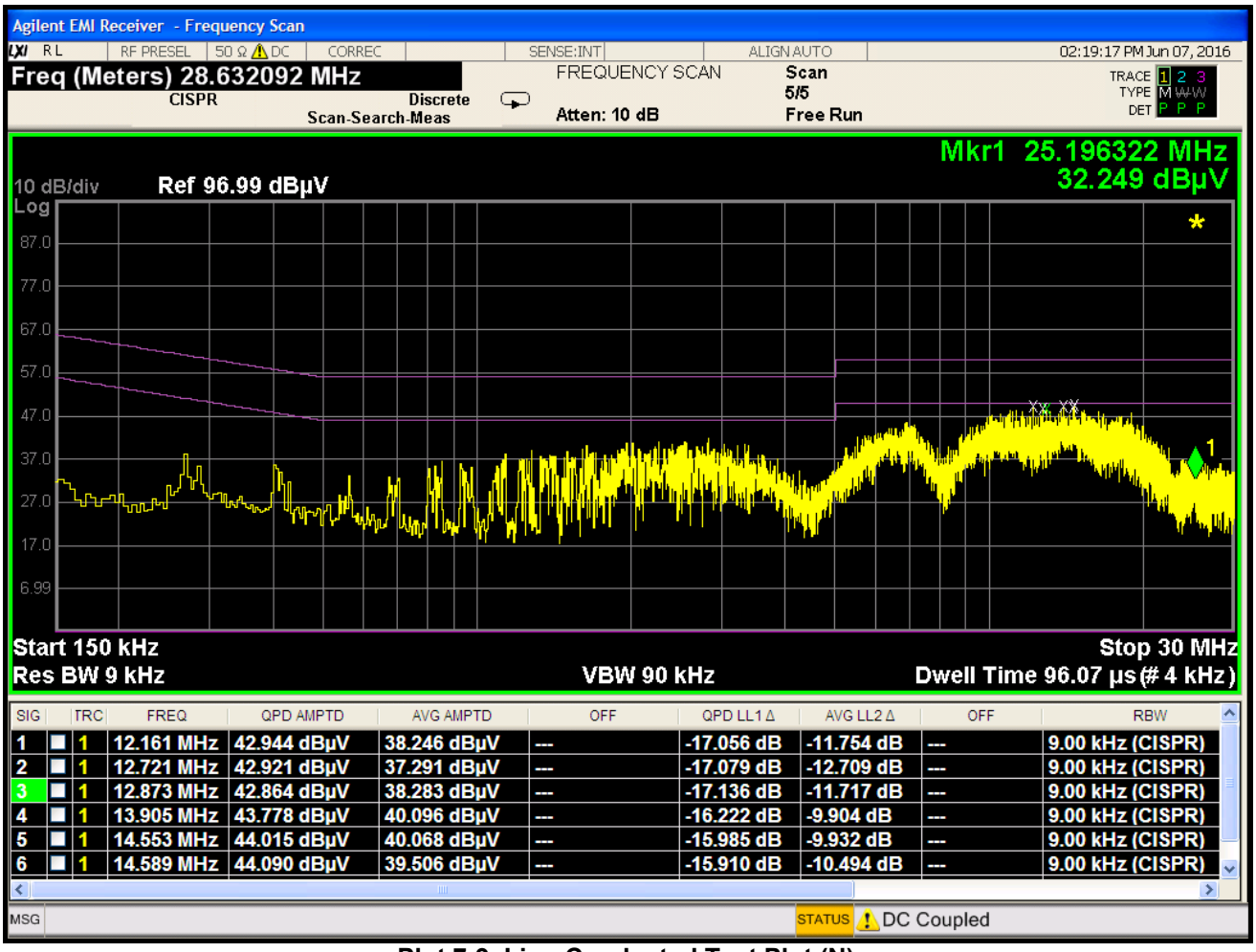
**§15.207**




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

# Line Conducted Measurement Data

**§15.207**




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

# 8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Portable Handset FCC ID: A3LSMN935KOR** is in compliance with Part 15 Subpart C (15.249) of the FCC Rules.