

MEASUREMENT REPORT

NFC

Applicant Name:

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

Date of Testing:

4/8/2022-7/15/2022

Test Report Issue Date:

07/15/2022

Test Site/Location:

Element Lab. Yongin-Si, Gyeonggi-do, South Korea

Test Report Serial No.:

1M2206140073-08.A3L

FCC ID:

A3LSMF721JPN

APPLICANT:

Samsung Electronics Co., Ltd.

Application Type:

Certification

Model:

SC-54C

Additional Model(s):

SCG17

EUT Type:

Portable Handset

Frequency:

13.56MHz

FCC Classification:

Low Power Communications Device Transmitter (DXX)

FCC Rule Part(s):

Part 15 Subpart C (15.225)

Test Procedure(s):

ANSI C63.10-2013

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

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.



Prepared by



Reviewed by

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1.0 INTRODUCTION

1.1 Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Innovation, Science and Economic Development Canada.

1.1 Element Test Location

These measurement tests were conducted at the Element Suwon Laboratory located at 13, Heungdeok 1-ro, Giheung-gu, Yongin-si, Gyeonggi-do, 16954, South Korea. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014.

1.2 Test Facility / Accreditations

Measurements were performed at Element Materials Technology Suwon, Ltd. located in Yongin-si, Gyeonggi-do, 16954, South Korea.

- Element Materials Technology Suwon, Ltd. is an ISO 17025-2017 accredited test facility under the American Association for Laboratory Accreditation(A2LA) with Certificate number 2041.04 for Specific Absorption Rate (SAR), and Electromagnetic Compatibility (EMC) & Telecommunications testing for FCC and Innovation, Science, and Economic Development Canada rules.
- Element Materials Technology Suwon, Ltd. facility is accredited, designated, and recognized in accordance with the provision of Radio Wave Act and International Standard ISO/IEC 17025:2017 under the National Radio Research Agency.
 - Designation Number / CABID: KR0169
 - Test Firm Registration Number of FCC: 417945
 - Test Firm Registration Number of ISED: 26168

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMF721JPN**. The test data contained in this report pertains only to the emissions due to the NFC transmitter of the EUT.

Test Device Serial No.: 0915M, 0940M

2.2 Device Capabilities

This device contains the following capabilities:

850/1900 GSM/GPRS/EDGE, 850 WCDMA/HSPA, Multi-band LTE, 802.11b/g/n/ax WLAN, 802.11a/n/ac/ax UNII (5GHz), Bluetooth (1x, EDR, LE), NFC, Wireless Power Transfer

2.3 Test Configuration

The EUT was set to continuously transmit at 13.56MHz. This was performed using manufacturer software loaded on the phone to allow for continuous transmission. This device was tested in accordance with the guidance of ANSI C63.10-2013. See Sections 3.2 and 3.3 of this test report for a description of the AC line conducted emissions and radiated emissions test setups, respectively.

This device supports two configurations: one is with screen open and one is with screen closed. Open, half opened and closed configurations are tested, and the worst case radiated emissions data is shown in this report.

2.4 Software and Firmware

The test was conducted with software/firmware version F721UOYN0AVCD installed on the EUT.

2.5 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 TEST

3.1 Evaluation Procedure

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

Deviation from measurement procedure.....None

3.2 AC Line Conducted Emissions

The line-conducted facility is located inside a 10'x16'x9' shielded enclosure. The shielded enclosure is manufactured by SY cooperation RF Enclosures. The line-conducted facility is located inside a 7m x 3.66m x 2.7m shielded enclosure. 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 ground plane. 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 7.6. The EMI Receiver mode of the R&S ESW was used to perform AC line conducted emissions testing. Automated test software was used to perform the AC line conducted emissions testing. Automated measurement software utilized is Rohde & Schwarz EMC32, Version 10.20.01.

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3.3 Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with Figure 5.7 of Clause 5 in ANSI C63.4-2014. Absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections for measurements above 1GHz. An 80cm tall test table made of Styrodur is placed on top of the turn table. For measurements above 1GHz, an additional Styrodur pedestal is placed on top of the test table to bring the total table height to 1.5m.

For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30MHz up to the upper frequency shown in 15.33 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 antenna of the EUT are **permanently attached**.
- This unit was tested with its standard battery.

Conclusion:

The EUT complies with the requirement of §15.203.

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5.0 MEASUREMENT UNCERTAINTY

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

Contribution	Expanded Uncertainty ($\pm$ dB)
Line Conducted Disturbance	1.60
Radiated Disturbance (<1GHz)	3.01

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6.0 TEST EQUIPMENT CALIBRATION DATA

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

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
COM-Power Corporation	AL-130R	Active Loop Antenna (9kHz-30MHz)	2020-10-29	Biennial	2022-10-28	10160045
Schwarzbeck	VULB9162	Broadband TRILOG Antenna (30MHz-1GHz)	2021-07-13	Biennial	2023-07-12	9162-217
Espec	SH-242	Temperature and Humidity Chamber	2021-09-15	Annual	2022-09-14	93011064
Rohde & Schwarz	ENV216	Two-Line V-Network	2022-05-09	Annual	2023-05-08	101319
TESTEK	-	LISN Extension Cord	2022-05-09	Annual	2023-05-08	N/A
Keysight Technologies	N9030B	PXA Signal Analyzer (2Hz-50GHz)	2021-07-06	Annual	2022-07-05	MY57143276
Rohde & Schwarz	ESW	EMI Test Receiver (2Hz-44GHz)	2021-07-06	Annual	2022-07-05	101761
Anritsu	S820E	Cable and Antenna Analyzer	2021-07-07	Annual	2022-07-06	1839097
Anritsu	TOSLKF50A-40	Calibration Kit	N/A	-	N/A	1825024

Table 6-1. Annual Test Equipment Calibration Schedule

Note:

1. 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.
2. Equipment with a calibration date of "N/A" shown in this list was not used to make direct calibrated measurements.

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7.0 TEST DATA

7.1 Summary

Company Name: Samsung Electronics Co., Ltd.
 FCC ID: A3LSMF721JPN
 FCC Classification: Low Power Communications Device Transmitter (DXX)
 Frequencies Examined: 13.56MHz

FCC Part Section(s)	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
2.1049	RSS-Gen [6.6]	Occupied Bandwidth	N/A	RADIATED	PASS	Section 7.2
15.225 (a)(b)(c)	RSS-210 [B.6]	In-Band Emissions	15,848µV/m @ 30m 13.553 – 13.567 MHz 334µV/m @ 30m 13.410 – 13.553 MHz 13.567 – 13.710 MHz 106µV/m @ 30m 13.110 – 13.410 MHz 13.710 – 14.010 MHz		PASS	Section 7.4
15.225 (d) 15.209	RSS-Gen [8.9]	Out-of-Band Emissions	Emissions outside of the specified band (13.110 – 14.010 MHz) must meet the radiated limits detailed in 15.209 (RSS-Gen [8.9])		PASS	Section 7.5
15.225 (e)	RSS-210 [B.6]	Frequency Stability Tolerance	± 0.01% of Operating Frequency	Temperature Chamber	PASS	Section 7.3
15.207	RSS-Gen [8.8]	AC Conducted Emissions 150kHz – 30MHz	< FCC 15.207 limits (RSS-Gen)	LINE CONDUCTED	PASS	Section 7.6

Table 7-1. Summary of Test Results

Note:

This unit was tested with its standard battery.

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7.2 Occupied Bandwidth Measurement

§2.1049; RSS-Gen (6.6)

Test Overview and Limit

The occupied bandwidth is measured with a spectrum analyzer connected to the receive antenna while the EUT is operating in transmission mode at the appropriate frequency.

Test Procedure Used

ANSI C63.10-2013 – Section 6.9.3

Test Settings

1. Spectrum analyzer frequency is set to the nominal EUT channel center frequency.
2. RBW = 1 – 5% OBW
3. VBW $\geq 3 \times$ RBW
4. Reference level set to keep signal from exceeding maximum input mixer level for linear operation.
5. Detector = Peak
6. Trace mode = max hold
7. Sweep = auto couple
8. The trace was allowed to stabilize
9. Using the 99% power bandwidth function of the instrument and report the measured bandwidth.

Test Notes

None.

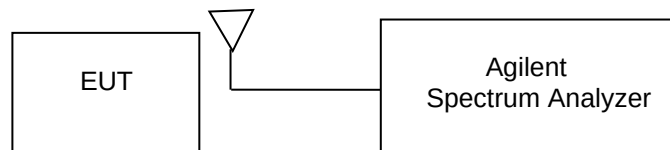


Figure 7-1. Test Instrument & Measurement Setup

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Frequency	Occupied Bandwidth
13.56MHz	584.31kHz

Table 7-2. Occupied Bandwidth Measurement

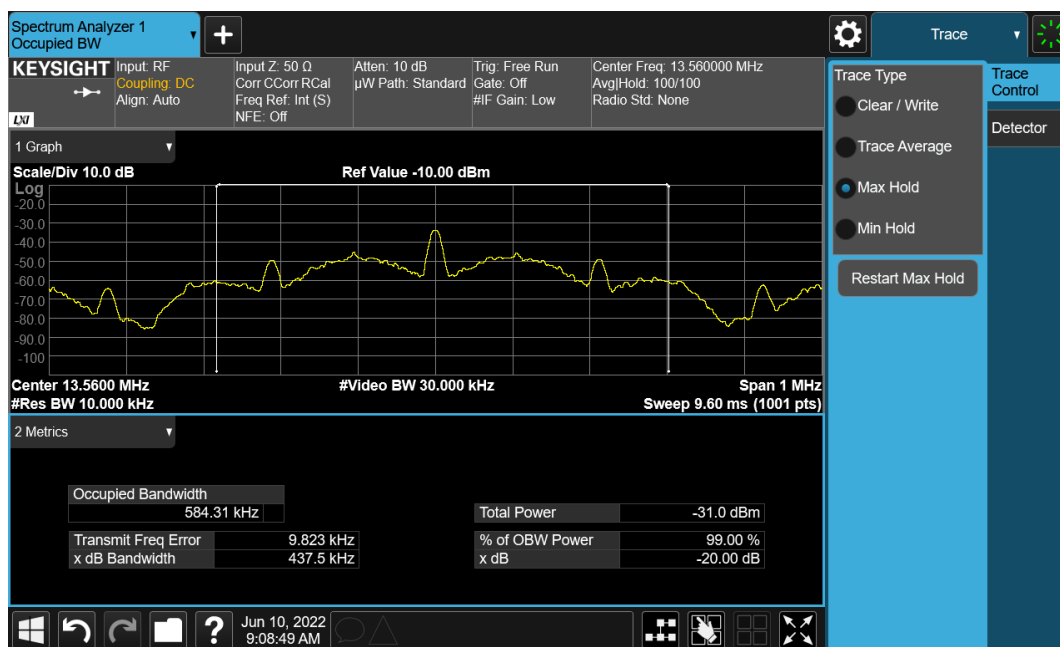


Figure 7-2. Occupied Bandwidth Plot

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7.3 Frequency Stability Test Data

§15.225; RSS-210 (B.6)

Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI C63.10-2013. The frequency stability of the transmitter is measured by:

- a.) **Temperature:** The temperature is varied from -20°C to +50°C in 10°C increments using an environmental chamber.
- b.) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

For Part 15.225, the frequency stability of the transmitter shall be maintained within $\pm 0.01\%$ of the center frequency.

Test Procedure Used

ANSI C63.10-2013 – Section 6.8

Test Settings

1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
2. The equipment is turned on in a “standby” condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10°C intervals ranging from -20°C to +50°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

Test Setup

The EUT was connected via an RF cable to a spectrum analyzer with the EUT placed inside an environmental chamber.

Test Notes

None.

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Frequency Stability Test Data

§15.225; RSS-210 (B.6)

OPERATING FREQUENCY: 13,560,000 Hz
 REFERENCE VOLTAGE: 4.25 VDC
 DEVIATION LIMIT: ± 0.01 % = 1356Hz

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.25	+ 20 (Ref)	13,560,016	16	0.0001154
100 %		- 30	13,560,077	77	0.0005678
100 %		- 20	13,560,114	114	0.0008407
100 %		- 10	13,560,116	116	0.0008555
100 %		0	13,560,112	112	0.0008260
100 %		+ 10	13,560,062	62	0.0004572
100 %		+ 20	13,560,038	38	0.0002802
100 %		+ 30	13,559,998	-2	-0.0000147
100 %		+ 40	13,559,973	-27	-0.0001991
100 %		+ 50	13,559,959	-41	-0.0003024
BATT. ENDPOINT	3.58	+ 20	13,559,990	-10	-0.0000737

Table 7-3. Frequency Stability Test Data

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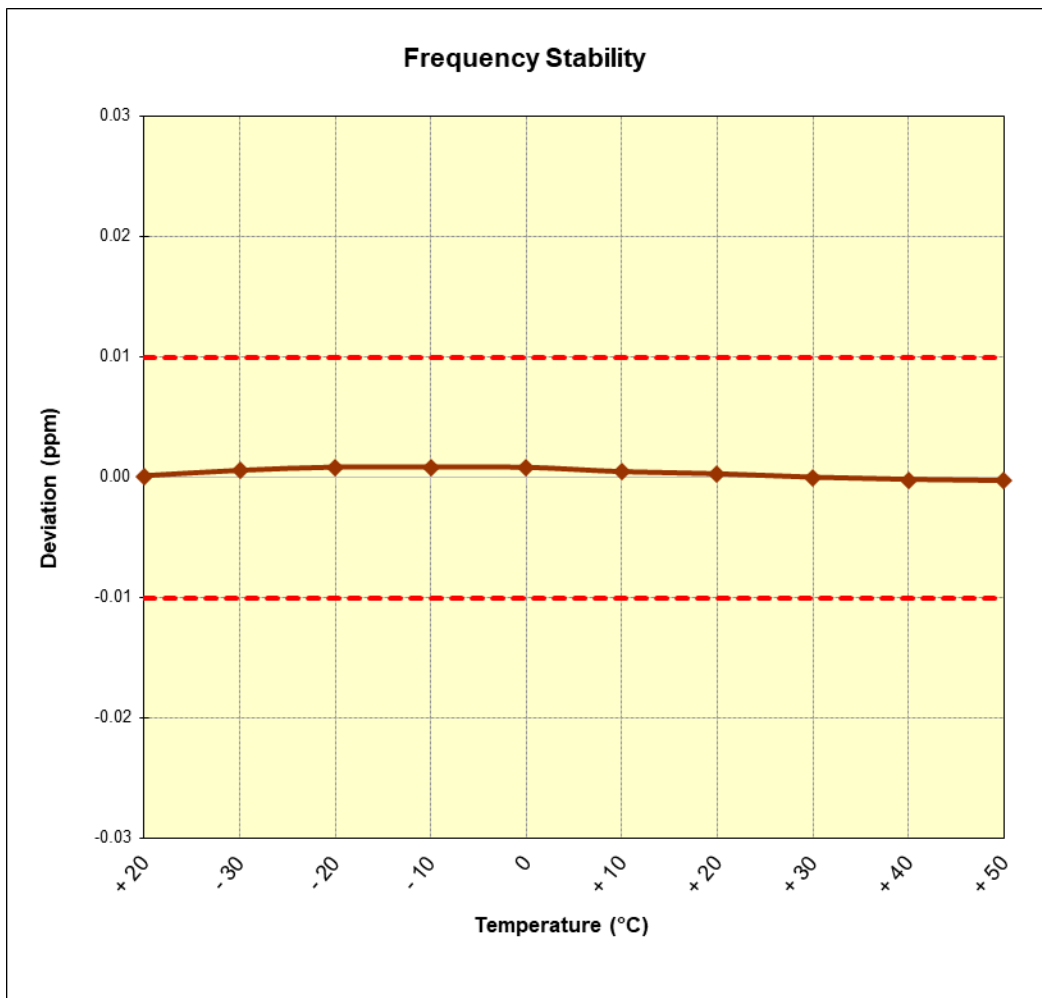


Figure 7-3. Frequency Stability Plot

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7.4 In-Band Radiated Spurious Emission Measurements

§15.225(a)(b)(c); RSS-210 (B.6)

Test Overview and Limit

The EUT was tested from 13.110 – 14.010 MHz. All in-band radiated spurious emissions are measured with a spectrum analyzer connected to a loop antenna while the EUT is operating at appropriate frequencies. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

All in-band emissions appearing in a restricted band as specified in Section 15.225 of the Title 47 CFR must not exceed the limits shown in Table 7-4.

Frequency [MHz]	Field Strength [μV/m]	Measured Distance [Meters]
13.553-13.567 MHz	15,848	30
13.410-13.553 MHz and 13.567-13.710 MHz	334	30
13.110-13.410 MHz and 13.710-14.010 MHz	106	30

Table 7-4. Radiated Limits

Test Procedures Used

ANSI C63.10-2013 – Section 6.4.7

Test Settings

1. RBW = 9kHz
2. VBW ≥ 3 x RBW
3. Detector = peak
4. Sweep time = auto couple
5. Trace mode = max hold
6. Trace was allowed to stabilize

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Test Setup

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

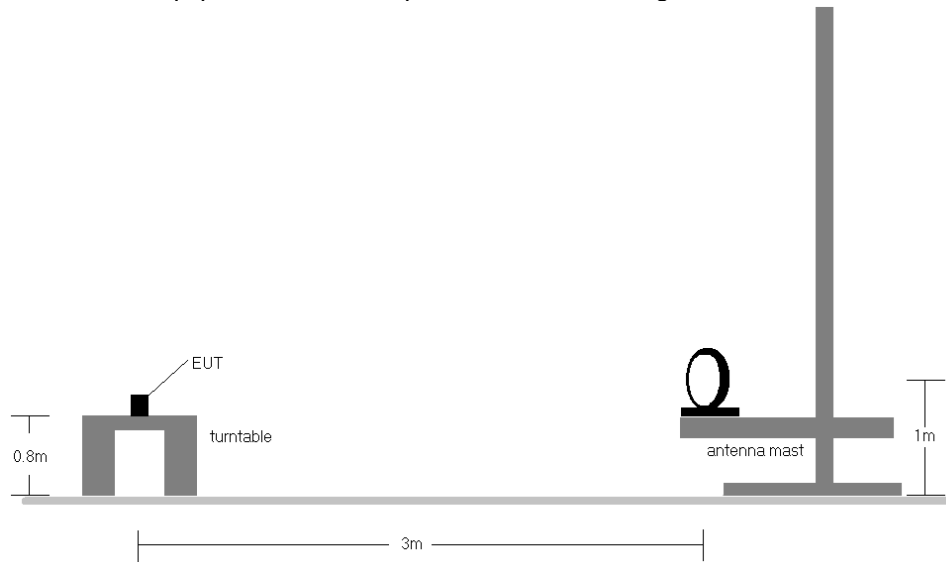


Figure 7-4. Radiated Test Setup

Test Notes:

1. All emissions lying in restricted bands specified in §15.225 and RSS-210 are below the limit shown in Table 7-4.
2. All measurements were performed using a loop antenna. The antenna was positioned in three orthogonal positions (X front, Y side, Z top) and the position with the highest emission level was recorded.
3. The EUT was positioned in three orthogonal planes to determine the orientation resulting in the worst case emissions.
4. Measurements were performed at 3m and the data was extrapolated to the specified measurement distance of 30m using the square of an inverse linear distance extrapolation factor (40 dB/decade) as specified in §15.31(f)(2). Extrapolation Factor = $20 \log_{10}(30/3)^2 = 40\text{dB}$.
5. The spectrum was investigated from 9kHz up to 30MHz using the loop antenna. Only the emissions shown in the table below were found to be significant.
6. The "-" shown in the following RSE tables are used to denote a noise floor measurement.

Sample Calculation

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

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In-Band Radiated Spurious Emission Measurements

§15.225(a)(b)(c); RSS-210 (B.6)

Frequency: 13.56MHz

Measurement Distance: 3 Meters

Frequency [MHz]	Ant. Pol. [X/Y/Z]	Antenna Height [cm]	Turntable Azimuth [degree]	Level [dBm]	AFCL [dB/m]	3m Field Strength [dBμV/m]	30m Field Strength [dBμV/m]	Limit [μV/m]	Limit [dBμV/m]	Margin [dB]
13.136	Y	100	336	-88.00	15.10	34.10	-5.90	106.00	40.51	-46.41
13.225	Y	100	336	-92.10	15.09	29.99	-10.01	106.00	40.51	-50.52
13.553	Y	100	335	-83.70	15.06	38.36	-1.64	334.00	50.47	-52.11
13.560	Y	100	334	-68.30	15.06	53.76	13.76	15848.00	84.00	-70.24
13.568	Y	100	335	-83.20	15.06	38.86	-1.14	334.00	50.47	-51.61
13.885	Y	100	324	-93.30	15.03	28.73	-11.27	106.00	40.51	-51.77
13.984	Y	100	324	-89.00	15.03	33.03	-6.97	106.00	40.51	-47.48

Table 7-5. In-Band Radiated Measurements – OPEN

Frequency [MHz]	Ant. Pol. [X/Y/Z]	Antenna Height [cm]	Turntable Azimuth [degree]	Level [dBm]	AFCL [dB/m]	3m Field Strength [dBμV/m]	30m Field Strength [dBμV/m]	Limit [μV/m]	Limit [dBμV/m]	Margin [dB]
13.135	Y	100	22	-86.80	15.10	35.30	-4.70	106.00	40.51	-45.21
13.236	Y	100	25	-91.20	15.09	30.89	-9.11	106.00	40.51	-49.62
13.553	Y	100	41	-83.00	15.06	39.06	-0.94	334.00	50.47	-51.41
13.560	Y	100	42	-66.70	15.06	55.36	15.36	15848.00	84.00	-68.64
13.567	Y	100	34	-82.70	15.06	39.36	-0.64	334.00	50.47	-51.11
13.897	Y	100	30	-93.20	15.03	28.83	-11.17	106.00	40.51	-51.67
13.984	Y	100	28	-88.60	15.03	33.43	-6.57	106.00	40.51	-47.08

Table 7-6. In-Band Radiated Measurements – CLOSE

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Frequency [MHz]	Ant. Pol. [X/Y/Z]	Antenna Height [cm]	Turntable Azimuth [degree]	Level [dBm]	AFCL [dB/m]	3m Field Strength [dBμV/m]	30m Field Strength [dBμV/m]	Limit [μV/m]	Limit [dBμV/m]	Margin [dB]
13.136	Y	100	334	-86.00	15.10	36.10	-3.90	106.00	40.51	-44.41
13.224	Y	100	335	-91.20	15.09	30.89	-9.11	106.00	40.51	-49.62
13.553	Y	100	333	-82.70	15.06	39.36	-0.64	334.00	50.47	-51.11
13.560	Y	100	333	-66.50	15.06	55.56	15.56	15848.00	84.00	-68.44
13.567	Y	100	331	-82.50	15.06	39.56	-0.44	334.00	50.47	-50.91
13.897	Y	100	333	-93.00	15.03	29.03	-10.97	106.00	40.51	-51.47
13.986	Y	100	333	-89.00	15.03	33.03	-6.97	106.00	40.51	-47.48

Table 7-7. In-Band Radiated Measurements – HALF OPEN

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7.5 Radiated Spurious Emission Measurements, Out-of-Band

§15.209 §15.225(d); RSS-Gen (8.9)

Test Overview and Limit

The EUT was tested from 9kHz up to the 1GHz excluding the band 13.110 – 14.010 MHz.

All out-of-band emissions appearing in a restricted band as specified in Section 15.225 of the Title 47 CFR must not exceed the limits shown in Table 7- per Section 15.209.

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

Table 7-8. Radiated Limits – Out of band

Test Procedures Used

ANSI C63.10-2013 – Section 6.5.4

Test Settings

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 9kHz for emissions below 30MHz and 100kHz for emissions between 30MHz and 1GHz
3. VBW $\geq 3 \times$ RBW
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

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Test Setup

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

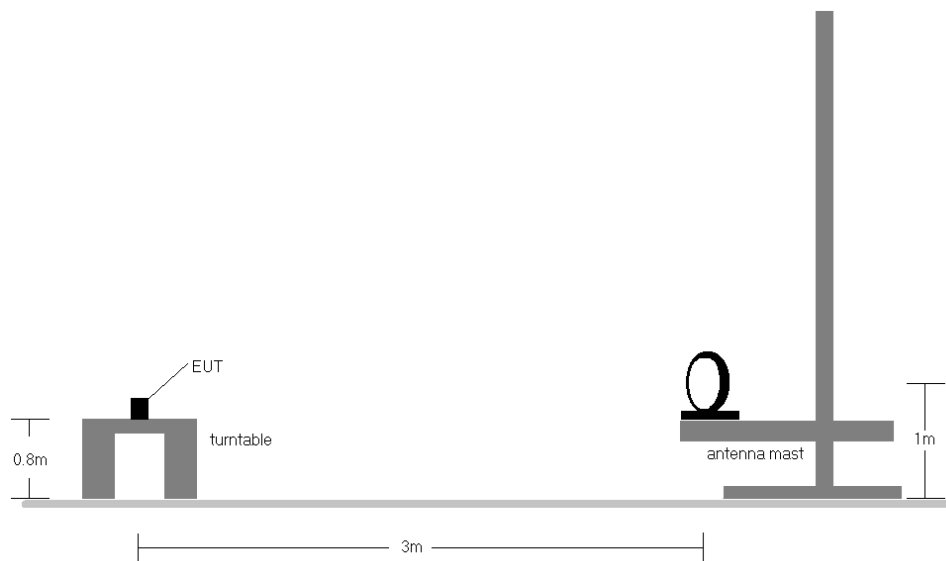


Figure 7-5. Radiated Test Setup < 30MHz

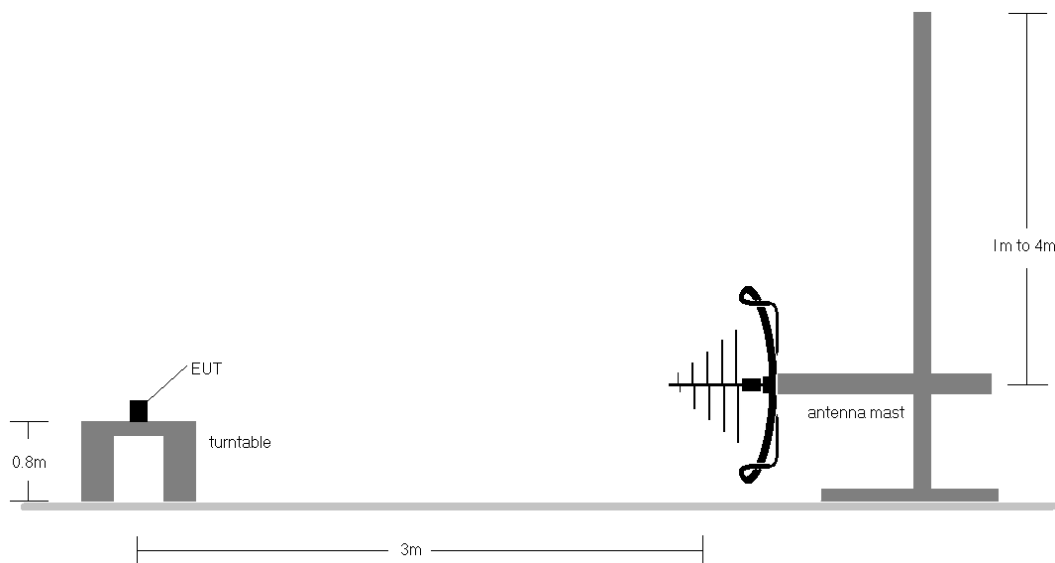


Figure 7-6. Radiated Test Setup > 30MHz

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Test Notes:

1. A loop antenna was used to investigate emissions below 30MHz.
2. Both Vertical and Horizontal polarities of the receive antenna were evaluated with the worst case emissions being reported. Below 30MHz the loop antenna was positioned in 3 orthogonal planes (X front, Y side, Z top) to determine the orientation resulting in the worst case emissions.
3. The EUT was positioned in three orthogonal planes to determine the orientation resulting in the worst case emissions.
4. The spectrum is measured from 9kHz to the 10th harmonic and the worst-case emissions are reported.
5. No spurious emissions levels were found to be greater than the level of the fundamental.
6. The "-" shown in the following RSE tables are used to denote a noise floor measurement.

Sample Calculation

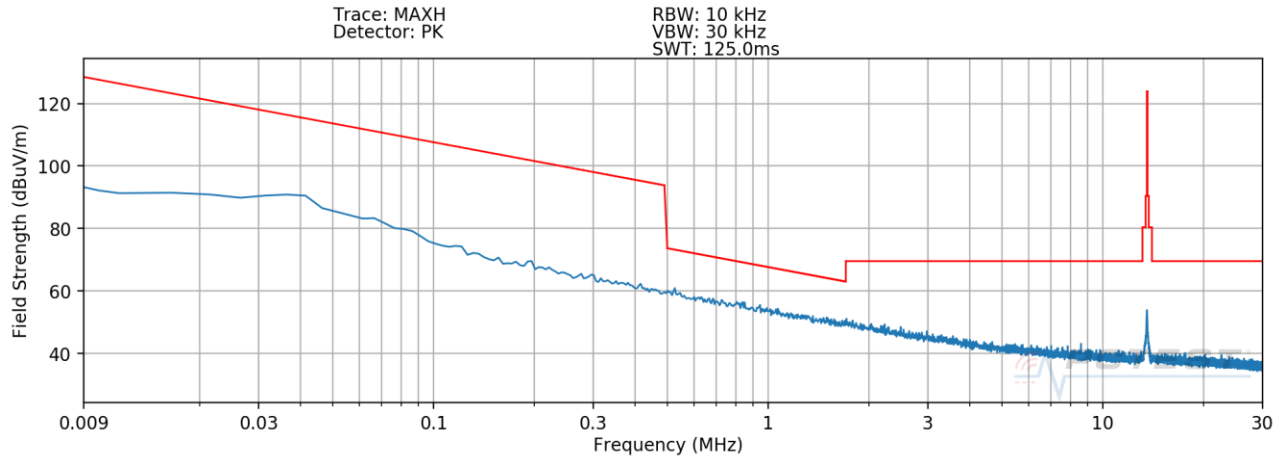
- Field Strength Level $_{[dB\mu V/m]} = \text{Analyzer Level}_{[dBm]} + 107 + \text{AFCL}_{[dB/m]}$
- $\text{AFCL}_{[dB/m]} = \text{Antenna Factor}_{[dB/m]} + \text{Cable Loss}_{[dB]}$
- $\text{Margin}_{[dB]} = \text{Field Strength Level}_{[dB\mu V/m]} - \text{Limit}_{[dB\mu V/m]}$

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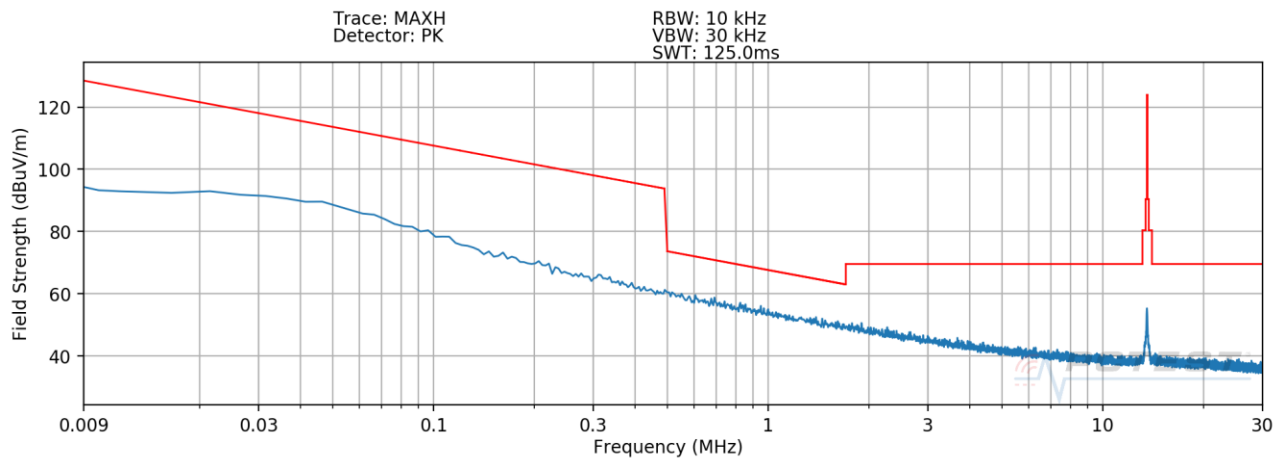
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Radiated Spurious Emission Measurements, Out-of-Band

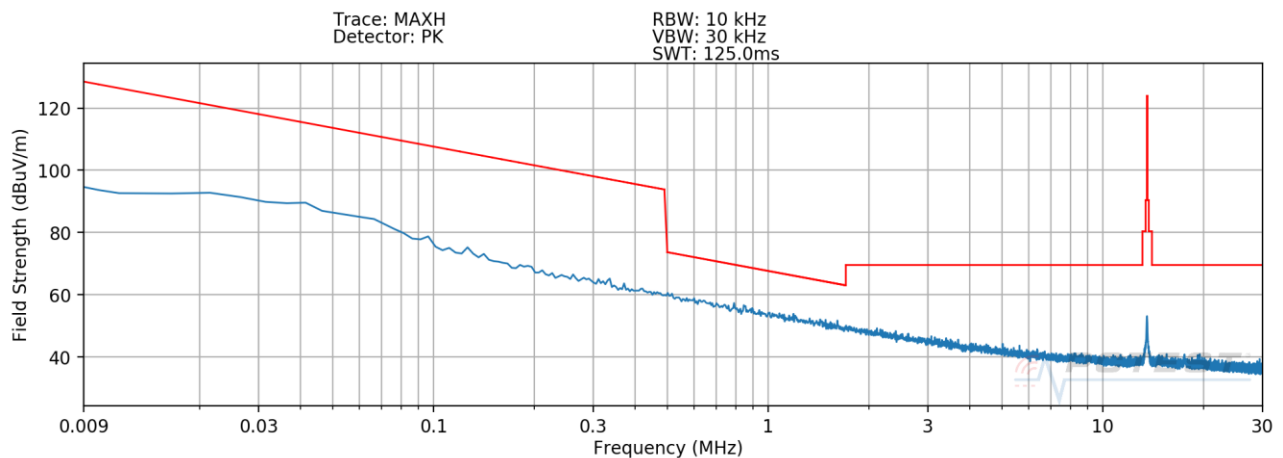
§15.209 §15.225(d); RSS-Gen (8.9)



Plot 7-1. Radiated Spurious Plot 9kHz – 30MHz (Pol. X) – OPEN



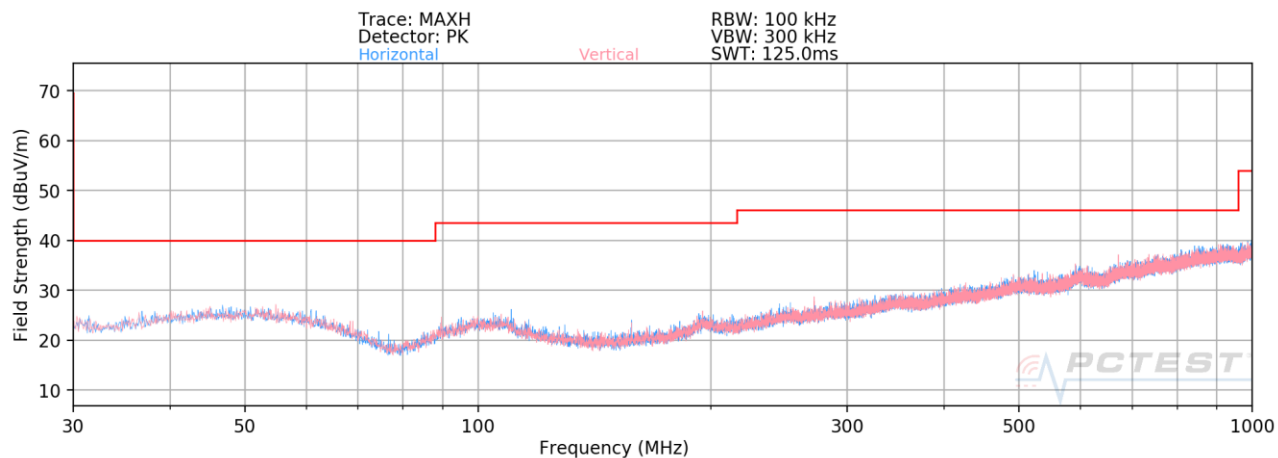
Plot 7-2. Radiated Spurious Plot 9kHz – 30MHz (Pol. Y) – OPEN



Plot 7-3. Radiated Spurious Plot 9kHz – 30MHz (Pol. Z) – OPEN

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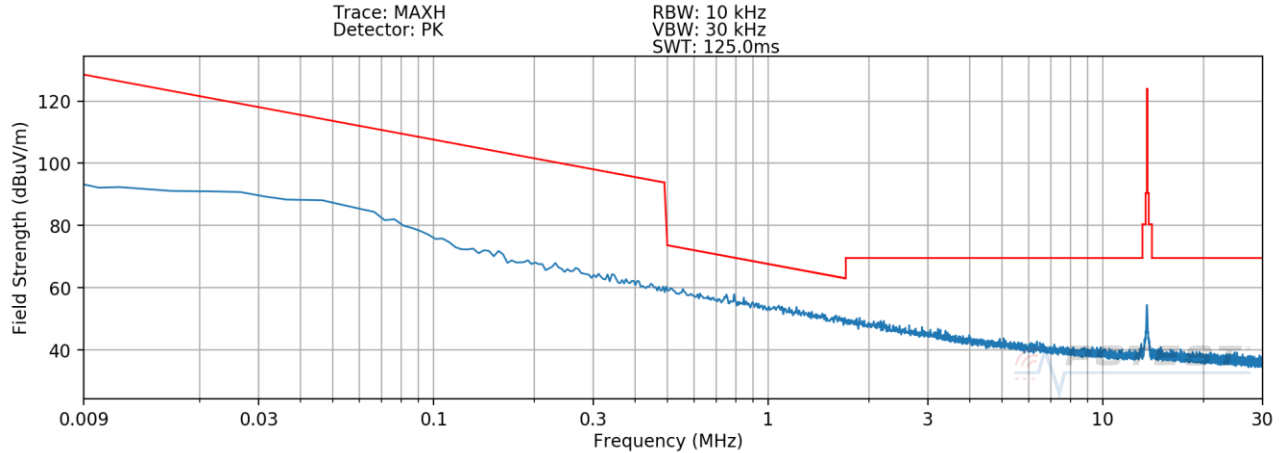


Plot 7-4. Radiated Spurious Plot 30MHz – 1GHz – OPEN

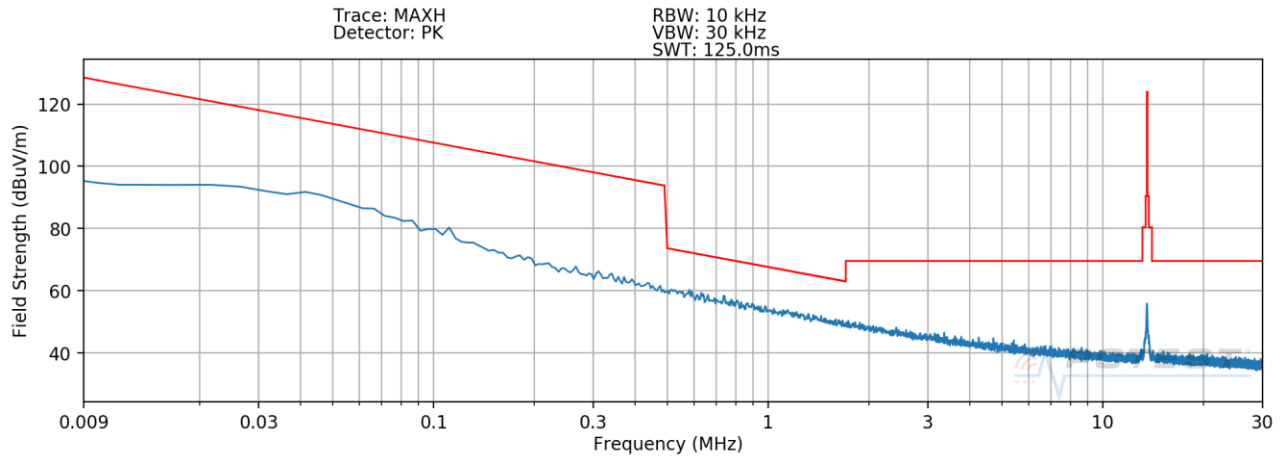
FCC ID: A3LSMF721JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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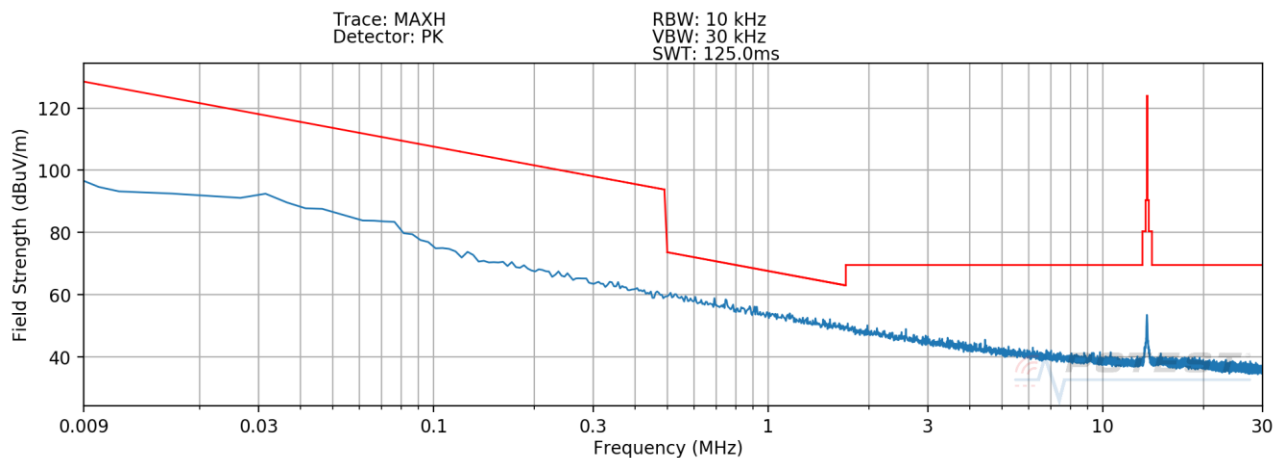
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Plot 7-5. Radiated Spurious Plot 9kHz – 30MHz (Pol. X) – CLOSE

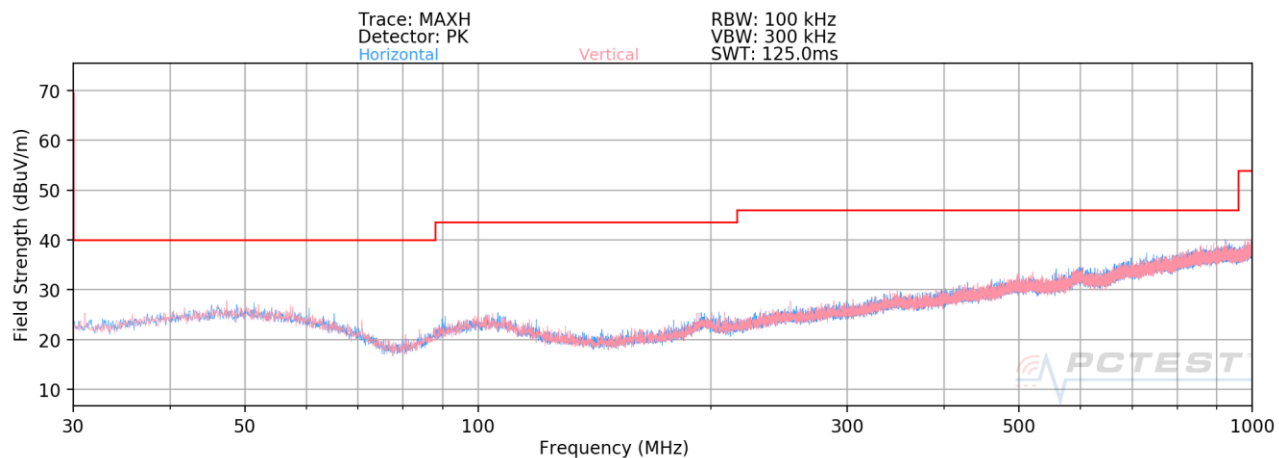


Plot 7-6. Radiated Spurious Plot 9kHz – 30MHz (Pol. Y) – CLOSE



Plot 7-7. Radiated Spurious Plot 9kHz – 30MHz (Pol. Z) – CLOSE

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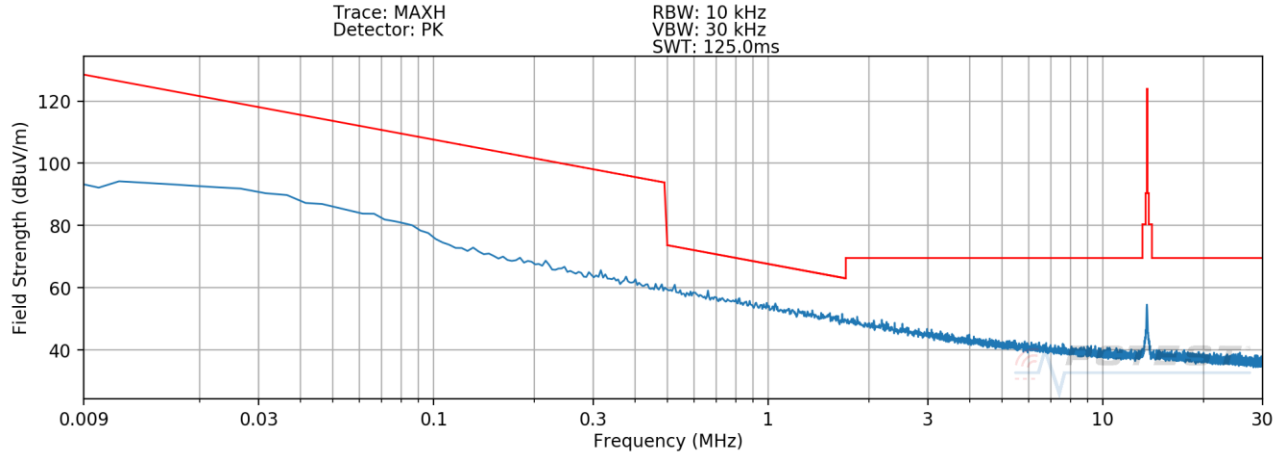


Plot 7-8. Radiated Spurious Plot 30MHz – 1GHz – CLOSE

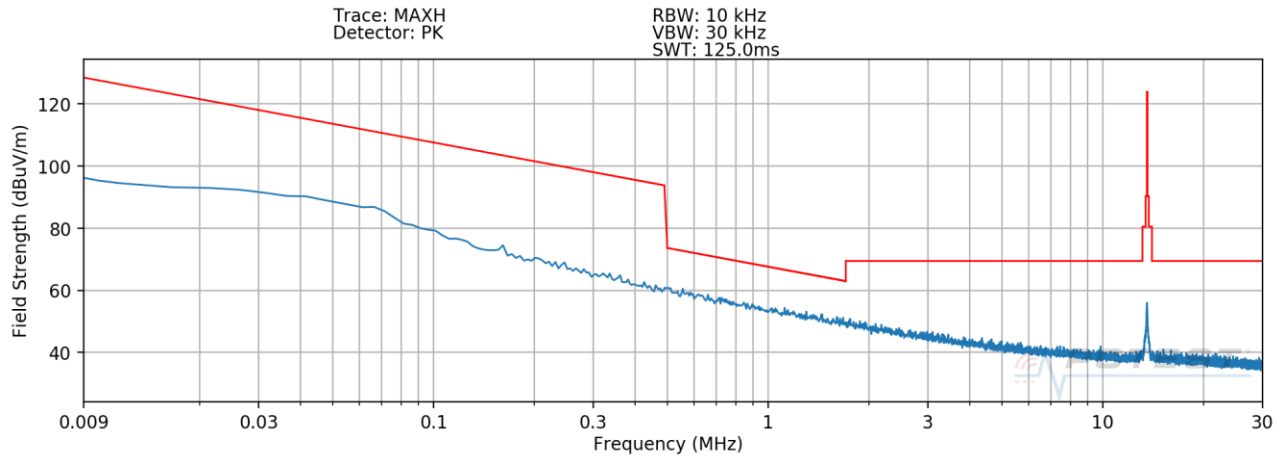
FCC ID: A3LSMF721JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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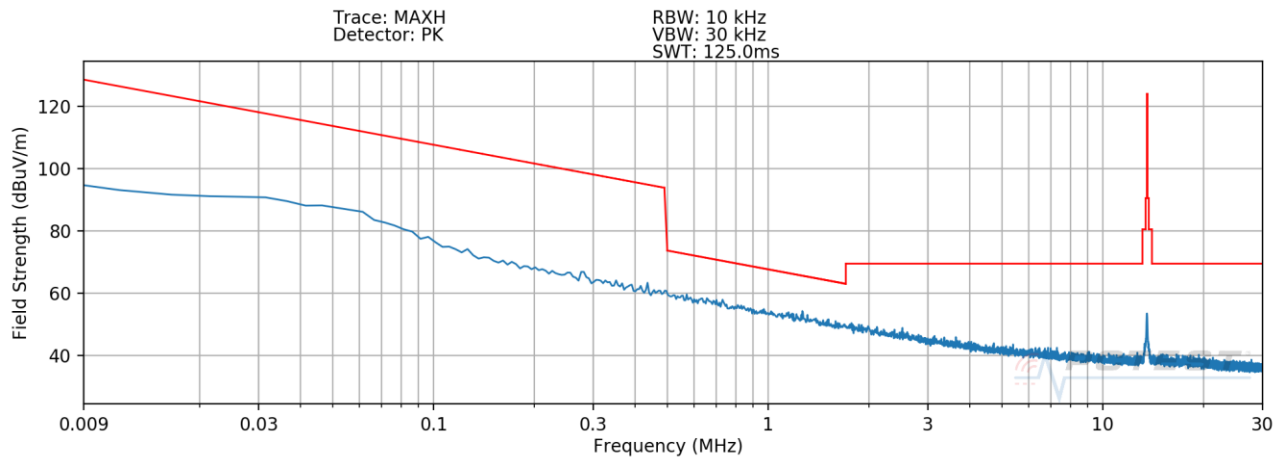
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Plot 7-9. Radiated Spurious Plot 9kHz – 30MHz (Pol. X) – HALF OPEN

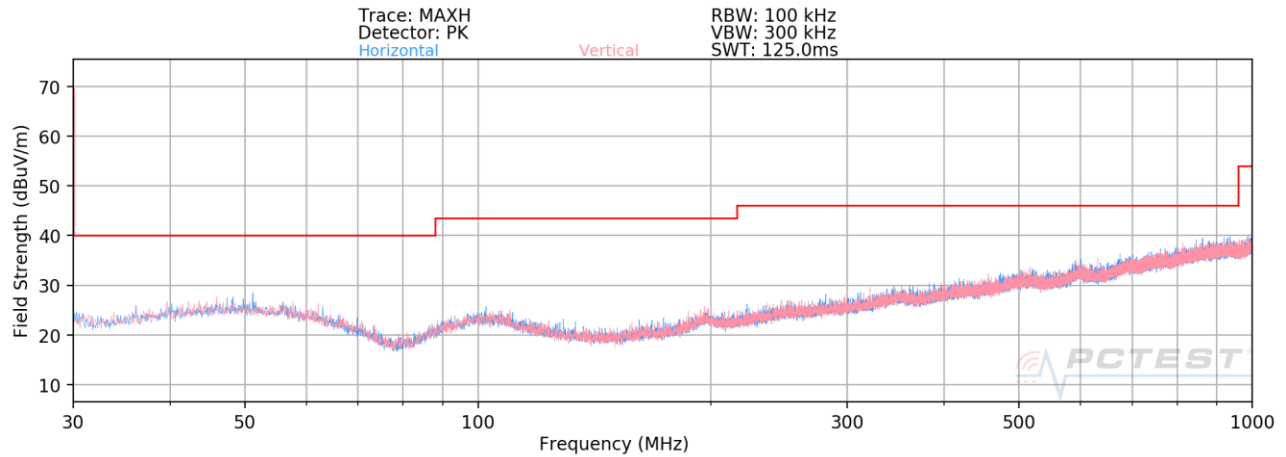


Plot 7-10. Radiated Spurious Plot 9kHz – 30MHz (Pol. Y) – HALF OPEN



Plot 7-11. Radiated Spurious Plot 9kHz – 30MHz (Pol. Z) – HALF OPEN

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Plot 7-12. Radiated Spurious Plot 30MHz – 1GHz – HALF OPEN

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Radiated Spurious Emission Measurements, Out-of-Band

§15.209 §15.225(d); RSS-Gen (8.9)

Tx Frequency 13.56MHz

Measurement Distance: 3 Meters

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level [dBm]	AFCL [dB/m]	3m Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
27.12	Y	-	-	-101.10	12.16	18.06	69.54	-51.48
40.68	V	-	-	-102.68	13.62	17.94	40.00	-22.06
54.24	V	-	-	-102.77	14.38	18.61	40.00	-21.39
67.80	V	-	-	-101.32	11.00	16.68	40.00	-23.32
81.36	V	101	62	-101.31	7.82	13.51	40.00	-26.49
94.92	V	101	64	-101.37	11.59	17.22	43.52	-26.30
108.48	V	104	34	-97.88	12.60	21.72	43.52	-21.80

Table 7-9. Radiated Measurements – OPEN

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level [dBm]	AFCL [dB/m]	3m Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
27.12	Y	-	-	-100.70	12.16	18.46	69.54	-51.08
40.68	V	-	-	-102.20	13.62	18.42	40.00	-21.58
54.24	V	-	-	-104.05	14.38	17.33	40.00	-22.67
67.80	V	-	-	-100.08	11.00	17.92	40.00	-22.08
81.36	V	109	196	-102.62	7.82	12.20	40.00	-27.80
94.92	V	102	184	-102.49	11.59	16.10	43.52	-27.42
108.48	V	100	214	-92.79	12.60	26.81	43.52	-16.71

Table 7-10. Radiated Measurements – CLOSE

FCC ID: A3LSMF721JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level [dBm]	AFCL [dB/m]	3m Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
27.12	Y	-	-	-101.10	12.16	18.06	69.54	-51.48
40.68	V	-	-	-102.67	13.62	17.95	40.00	-22.05
54.24	V	-	-	-104.23	14.38	17.15	40.00	-22.85
67.80	V	-	-	-101.65	11.00	16.35	40.00	-23.65
81.36	V	101	106	-101.30	7.82	13.52	40.00	-26.48
94.92	V	103	119	-102.32	11.59	16.27	43.52	-27.25
108.48	V	100	124	-93.35	12.60	26.25	43.52	-17.27

Table 7-11. Radiated Measurements – HALF OPEN

FCC ID: A3LSMF721JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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7.6 Line Conducted Measurement Data

§15.207; RSS-Gen (8.8)

Test Overview and Limit

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

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

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

Table 7-12. 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.

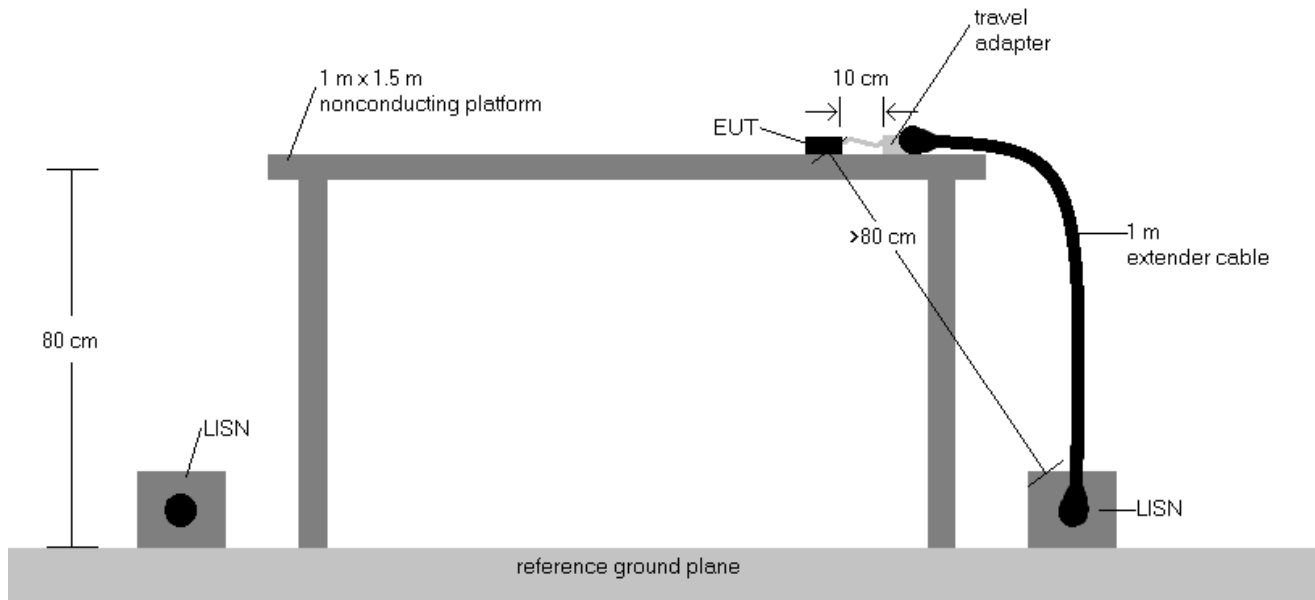


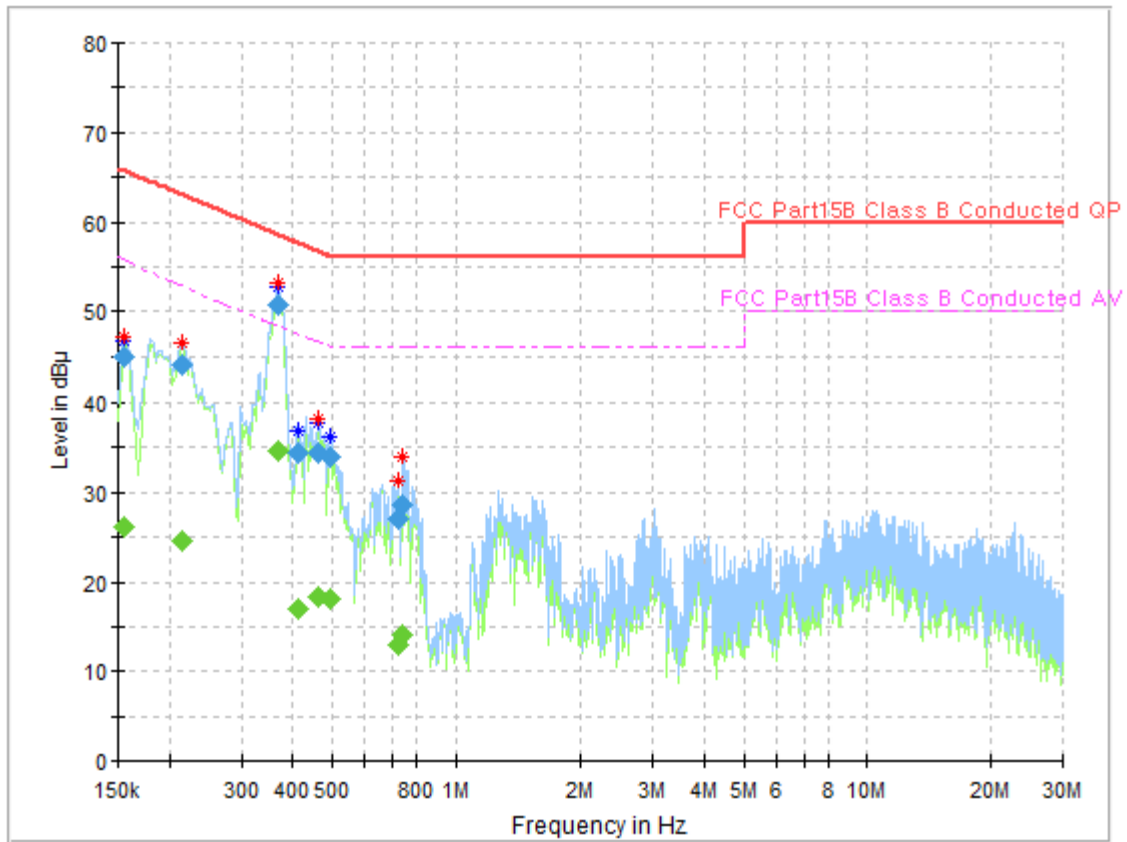
Figure 7-7. Test Instrument & Measurement Setup

Test Notes

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

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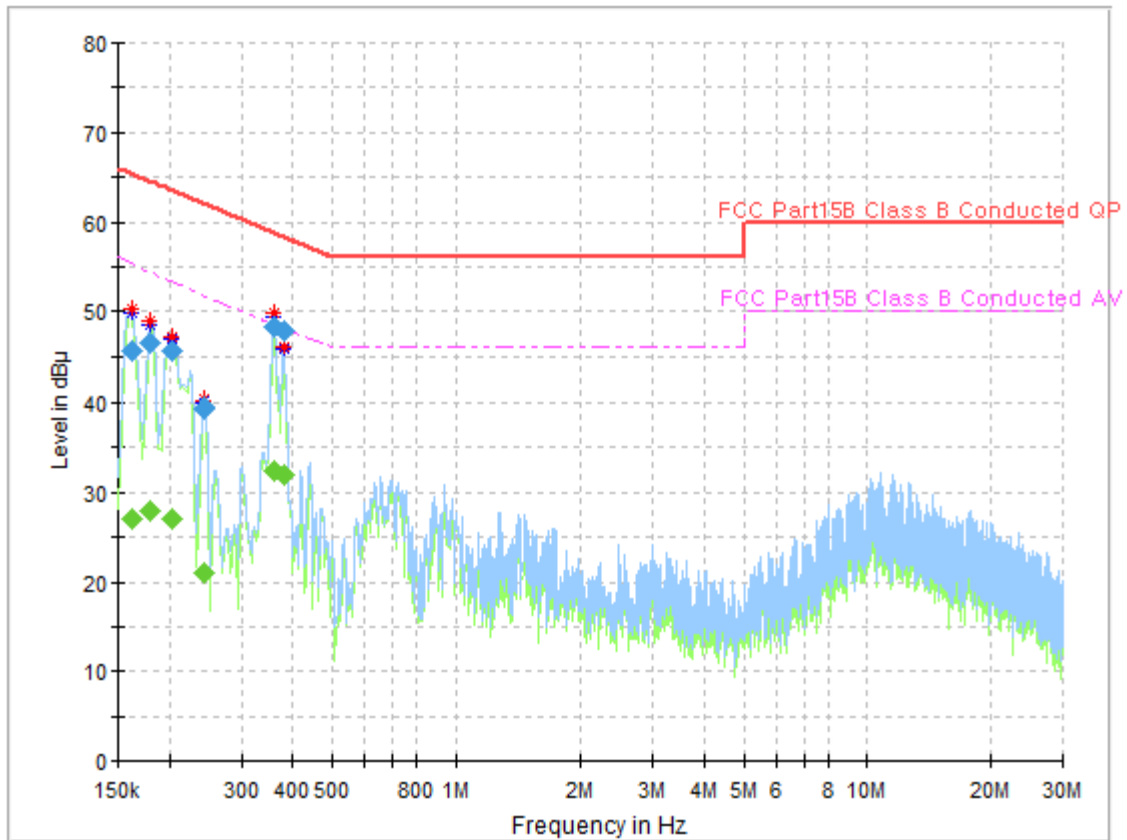


Plot 7-13. Line-Conducted Test Plot (L1)

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.155970	---	26.12	55.64	29.52	1000.0	9.000	L1	9.8
0.155970	44.82	---	65.68	20.86	1000.0	9.000	L1	9.8
0.215670	---	24.62	52.77	28.15	1000.0	9.000	L1	9.8
0.215670	44.03	---	62.98	18.95	1000.0	9.000	L1	9.8
0.367905	---	34.63	48.36	13.73	1000.0	9.000	L1	9.8
0.367905	50.77	---	58.55	7.77	1000.0	9.000	L1	9.8
0.412680	---	17.06	47.47	30.41	1000.0	9.000	L1	9.9
0.412680	34.46	---	57.59	23.14	1000.0	9.000	L1	9.9
0.463425	---	18.35	46.57	28.22	1000.0	9.000	L1	9.9
0.463425	34.39	---	56.63	22.24	1000.0	9.000	L1	9.9
0.496260	---	18.05	46.06	28.01	1000.0	9.000	L1	9.9
0.496260	33.93	---	56.06	22.14	1000.0	9.000	L1	9.9
0.723120	---	12.94	46.00	33.06	1000.0	9.000	L1	9.9
0.723120	27.13	---	56.00	28.87	1000.0	9.000	L1	9.9
0.744015	---	14.02	46.00	31.98	1000.0	9.000	L1	9.9
0.744015	28.69	---	56.00	27.31	1000.0	9.000	L1	9.9

Table 7-12. Line-Conducted Test Data (L1)

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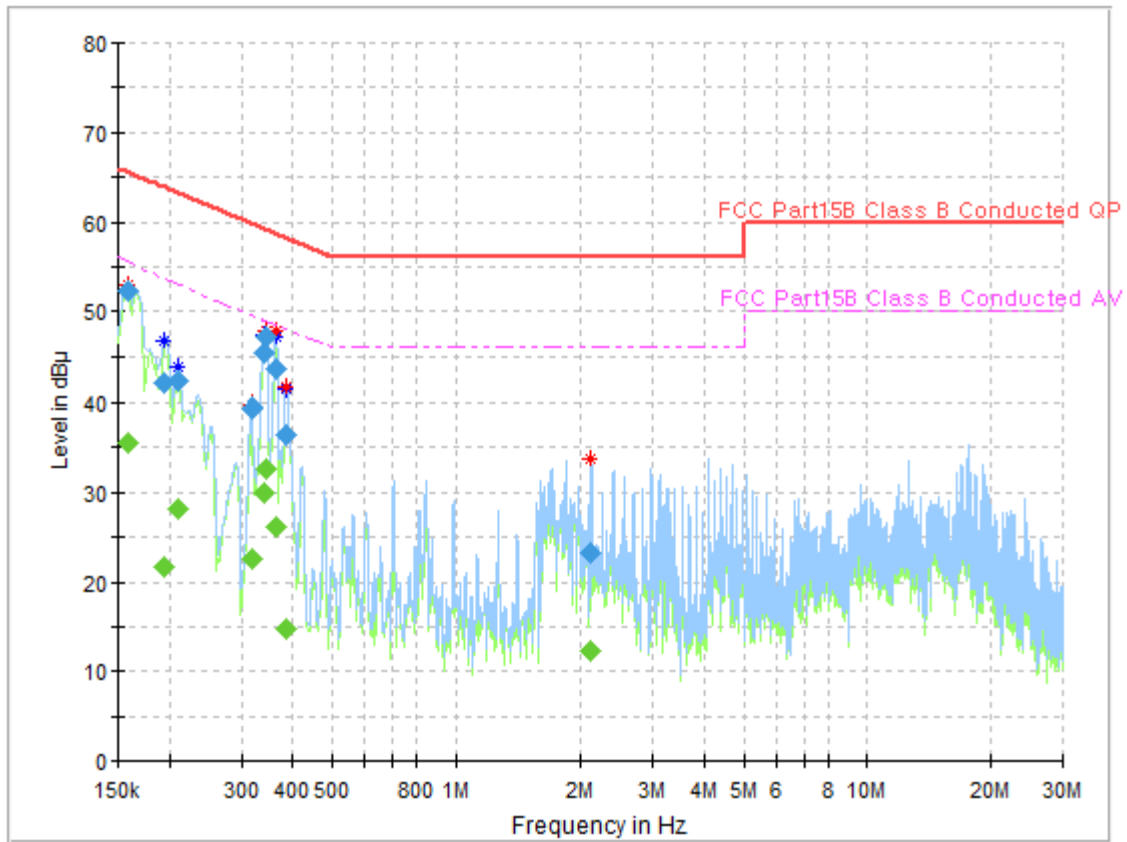
Plot 7-14. Line-Conducted Test Plot (N)

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.161940	---	26.99	55.30	28.32	1000.0	9.000	N	9.9
0.161940	45.62	---	65.36	19.74	1000.0	9.000	N	9.9
0.179850	---	27.94	54.36	26.43	1000.0	9.000	N	10.0
0.179850	46.38	---	64.49	18.11	1000.0	9.000	N	10.0
0.203730	---	27.01	53.27	26.26	1000.0	9.000	N	9.9
0.203730	45.54	---	63.46	17.92	1000.0	9.000	N	9.9
0.242535	---	21.09	51.77	30.69	1000.0	9.000	N	9.7
0.242535	39.26	---	62.01	22.75	1000.0	9.000	N	9.7
0.358950	---	32.44	48.56	16.12	1000.0	9.000	N	9.8
0.358950	48.31	---	58.75	10.44	1000.0	9.000	N	9.8
0.379845	---	31.95	48.11	16.16	1000.0	9.000	N	9.9
0.379845	47.80	---	58.28	10.48	1000.0	9.000	N	9.9

Table 7-13. Line-Conducted Test Data (N)

FCC ID: A3LSMF721JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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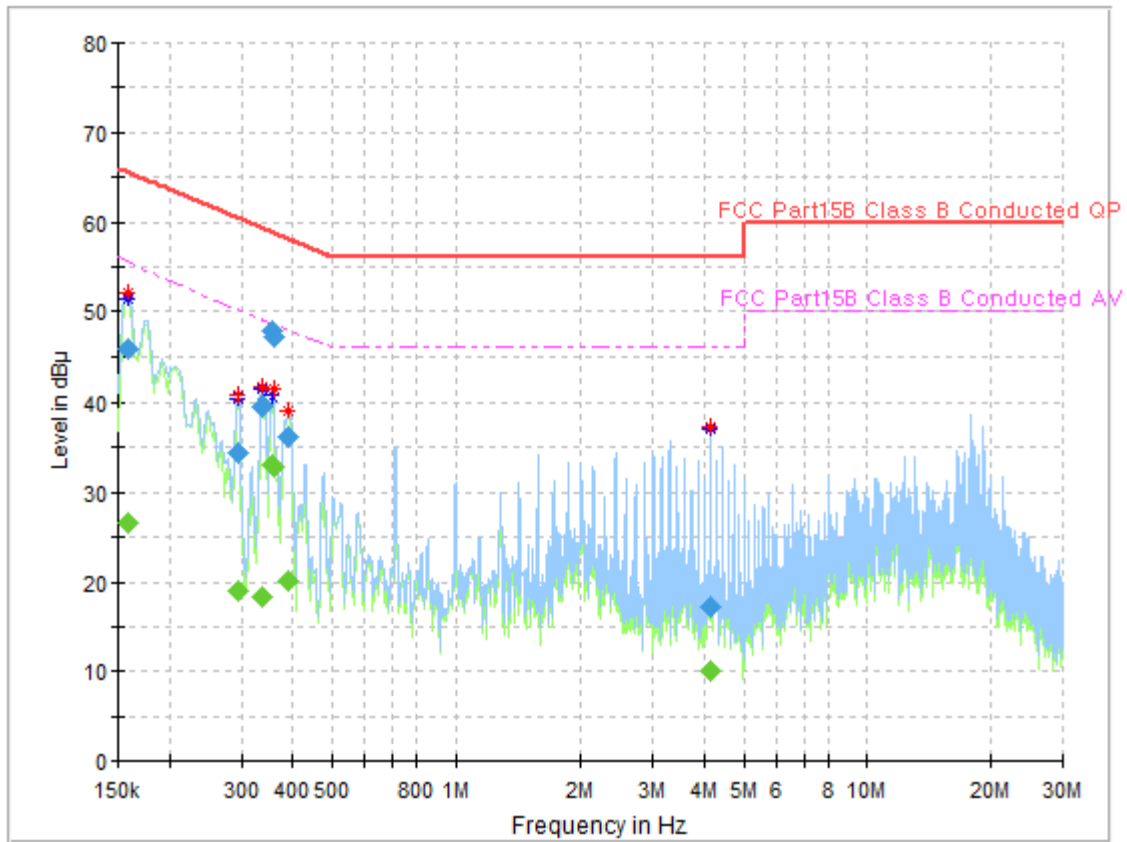
Plot 7-15. Line-Conducted Test Plot (L1) with WCP

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.158955	---	35.45	55.47	20.02	1000.0	9.000	L1	9.9
0.158955	52.38	---	65.52	13.14	1000.0	9.000	L1	9.9
0.194775	---	21.75	53.66	31.91	1000.0	9.000	L1	9.9
0.194775	42.01	---	63.83	21.83	1000.0	9.000	L1	9.9
0.209700	---	28.13	53.02	24.89	1000.0	9.000	L1	9.8
0.209700	42.24	---	63.22	20.98	1000.0	9.000	L1	9.8
0.317160	---	22.61	49.55	26.94	1000.0	9.000	L1	9.8
0.317160	39.29	---	59.78	20.49	1000.0	9.000	L1	9.8
0.341040	---	29.95	48.97	19.02	1000.0	9.000	L1	9.8
0.341040	45.46	---	59.18	13.72	1000.0	9.000	L1	9.8
0.344025	---	32.74	48.90	16.16	1000.0	9.000	L1	9.8
0.344025	47.14	---	59.11	11.96	1000.0	9.000	L1	9.8
0.364920	---	26.19	48.43	22.24	1000.0	9.000	L1	9.8
0.364920	43.59	---	58.62	15.03	1000.0	9.000	L1	9.8
0.385815	---	14.77	47.99	33.22	1000.0	9.000	L1	9.9
0.385815	36.48	---	58.15	21.67	1000.0	9.000	L1	9.9
2.120100	---	12.35	46.00	33.65	1000.0	9.000	L1	9.8
2.120100	23.13	---	56.00	32.87	1000.0	9.000	L1	9.8

Table 7-14. Line-Conducted Test Data (L1) with WCP

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Plot 7-16. Line-Conducted Test Plot (N) with WCP

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.158955	---	26.52	55.47	28.95	1000.0	9.000	N	9.9
0.158955	45.92	---	65.52	19.60	1000.0	9.000	N	9.9
0.293280	---	18.90	50.19	31.29	1000.0	9.000	N	9.7
0.293280	34.43	---	60.43	26.01	1000.0	9.000	N	9.7
0.338055	---	18.39	49.04	30.64	1000.0	9.000	N	9.8
0.338055	39.47	---	59.25	19.78	1000.0	9.000	N	9.8
0.355965	---	33.12	48.63	15.51	1000.0	9.000	N	9.8
0.355965	47.92	---	58.82	10.90	1000.0	9.000	N	9.8
0.358950	---	32.83	48.56	15.73	1000.0	9.000	N	9.8
0.358950	47.19	---	58.75	11.56	1000.0	9.000	N	9.8
0.391785	---	20.10	47.87	27.77	1000.0	9.000	N	9.9
0.391785	36.09	---	58.03	21.93	1000.0	9.000	N	9.9
4.149900	---	9.96	46.00	36.04	1000.0	9.000	N	9.9
4.149900	17.29	---	56.00	38.71	1000.0	9.000	N	9.9

Table 7-15. Line-Conducted Test Data (N) with WCP

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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: A3LSMF721JPN** has been tested to show compliance with Part 15 Subpart C (15.225) of the FCC Rules.

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