TEST REPORT

Report Number. : 13211873-E7V2

Applicant	:	Samsung Electronics Co., Ltd. 129 Samsung-Ro, Yeongtong-Gu, Suwon-Si, Gyeonggi-Do, 16677, Korea
Model	:	SM-A715W
FCC ID	:	A3LSMA715W
EUT Description	:	GSM/WCDMA/LTE Phablet with BT/BLE, DTS/UNII a/b/g/n/ac, NFC, and ANT+
Test Standard(s)	:	FCC 47 CFR PART 15 SUBPART C

Date Of Issue:
March 04, 2020

Prepared by:
UL Verification Services Inc.
47173 Benicia Street
Fremont, CA 94538 U.S.A.
TEL: (510) 771-1000
FAX: (510) 661-0888

NVLAP Lab code: 200065-0

REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	2/25/2020	Initial Issue	
V2	3/4/2020	Updated Section 2.3.1 (plot label)	Dan Coronia

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	Samsung Electronics Co., Ltd. 129 Samsung-Ro, Yeongtong-Gu, Suwon-Si, Gyeonggi-Do, 16677, Korea
EUT DESCRIPTION:	GSM/WCDMA/LTE Phablet with BT/BLE, DTS/UNII a/b/g/n/ac, ANT+ NFC and WPT
MODEL:	SM-A715W
SERIAL NUMBER:	Radiated (Original): R38M808E5AH Radiated (Spot Check): R38M808E5AH
DATE TESTED:	November 26 – December 5, 2019 (Original) February 21, 2020 (Spot Check)

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 15 SUBPART C	Complies

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.

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Approved & Released For
UL Verification Services Inc. By:

Dan Coronia
Operations Leader
Consumer Technology Division
UL Verification Services Inc.

Prepared By:

Glenn Escano
Test Engineer
Consumer Technology Division
UL Verification Services Inc.

Reviewed By:

Steven Tran
Project Engineer
Consumer Technology Division
UL Verification Services Inc.

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2. INTRODUCTION OF TEST DATA REUSE

2.1. INTRODUCTION

According to the manufacturer, FCC ID: A3LSMA715F and FCC ID: A3LSMA715W non-licensed radios are electrically identical. The FCC ID: A3LSMA715F test data shall remain representative of FCC ID: A3LSMA715W.

The applicant takes full responsibility that the test data as referenced in this section represents compliance for this FCC ID.

2.2. DIFFERENCES

The FCC ID: A3LSMA715F, shares the same enclosure and circuit board as FCC ID: A3LSMA715W. The NFC antennas and surrounding circuitry and layout are identical between two models.

After confirming through preliminary radiated emissions that the performance of the FCC ID: A3LSMG715F remains representative of FCC ID: A3LSMA715W. The test data of FCC ID: A3LSMG715F being submitted for this application to cover NFC features.

2.3. SPOT CHECK VERIFICATION RESULTS SUMMARY

Spot check verification has been done on device A3LSMA715W for radiated fundamental. The data from the application has been verified through appropriate spot checks to demonstrate compliance for this device in accordance to FCC public KDB 484596 D01 as shown in the summary below.

A3LSMA715W SPOT CHECK RESULTS						
Technology	Mode	Test Item	Measured Frequency	Original Model	Spot check model	Delta (dB)
				SM-A715F	SM-A715W	
				A3LSMA715F	A3LSMA715W	
				Peak	Peak	Peak
NFC	Fundamental		13.56MHz	13.18	10.38	-2.8
	Spurious Emissions		0.85977 MHz	8.88	8.04	-0.84

Comparison of two models, higher deviation is within 3dB range and all test are under FCC Technical Limits.

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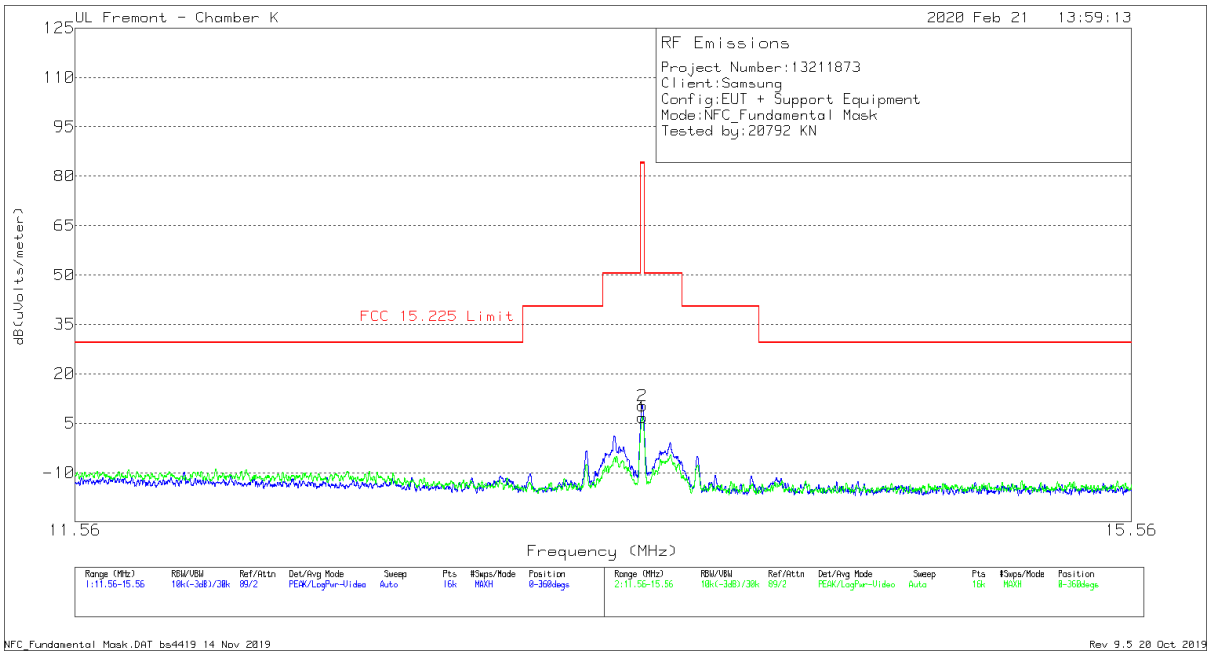
2.3.1. FUNDAMENTAL AND SPURIOUS EMISSIONS (0.09 - 30 MHz)

FUNDAMENTAL EMISSION MASK - TYPE A, 106Kbps (11.56 – 15.56 MHz)



ANTENNA- TWO ORIENTATIONS FACE ON/FACE OFF

NOTE: All data rate Field Strength was investigated and Type A, 106k found to have the highest Field Strength results and represents as the worst case data rate.

DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr 30m (dB) 40Log	Corrected Reading dB(uVolts/meter)	FCC 15.225 Limit	PK Margin (dB)	Azimuth (Degs)
2	13.5595	35.18	Pk	14.8	.4	-40	10.38	84	-73.62	0-360
1	13.5595	31.54	Pk	14.8	.4	-40	6.74	84	-77.26	0-360

Pk - Peak detector

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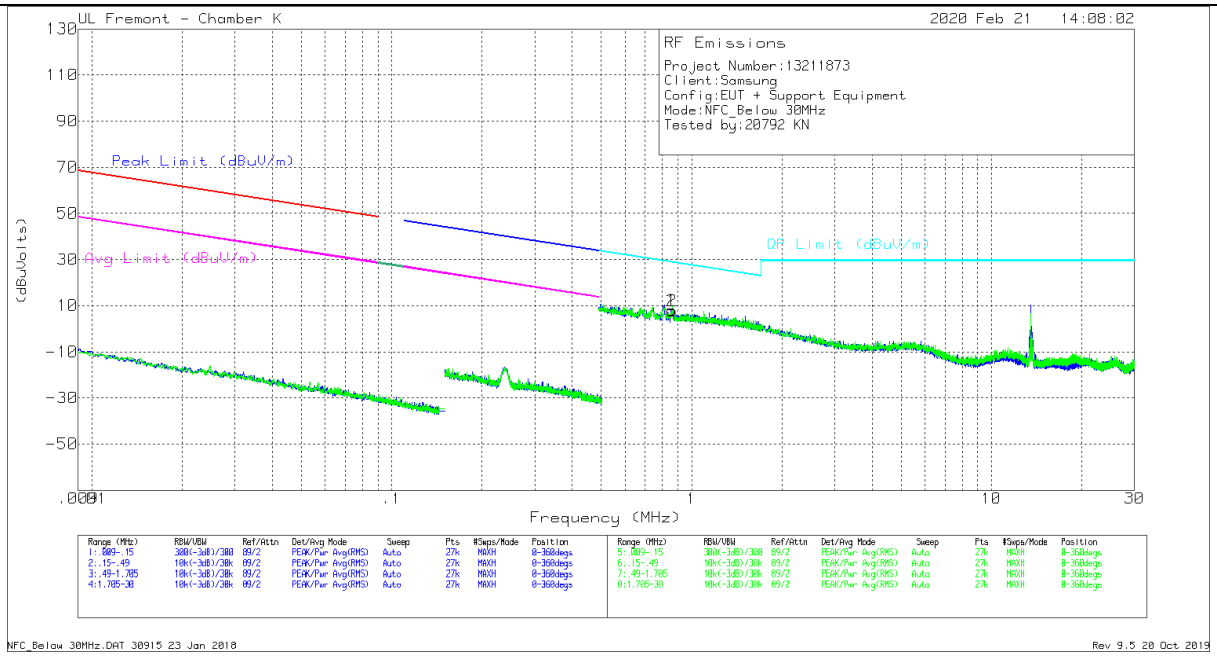
SPURIOUS EMISSIONS - TYPE A, 106kbps (0.09 – 30MHz)



ANTENNA- TWO ORIENTATIONS FACE ON/FACE OFF

DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr 30m (dB) 40Log	Corrected Reading (dBuVolts)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	.85857	33.74	Pk	14.2	.1	-40	8.04	28.94	-20.9	0-360
2	.8595	33.55	Pk	14.2	.1	-40	7.85	28.93	-21.08	0-360

Pk - Peak detector

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2.4. REFERENCE DETAIL

Reference application that contains the reused reference data

Equipment Class	Reference FCC ID	Type Grant/ Permissive Change	Reference Application	Folder Test/RF Exposure	Report Title/Section
DXX (NFC)	A3LSMA715F	Grant	13096868-E7	Test	FCC Report NFC / All sections

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3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2013, FCC CFR 47 Part 2, FCC CFR 47 Part 15, KDB 414788 D01 Radiated Test Site v01r01, and KDB 484596 D01 Referencing Test Data v01.

4. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, and 47658 Kato Road, Fremont, California, USA. Line conducted emissions are measured only at the 47173 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

47173 Benicia Street	47266 Benicia Street	47658 Kato Rd
☐ Chamber A	☐ Chamber D	☐ Chamber I
☐ Chamber B	☐ Chamber E	☒ Chamber J
☐ Chamber C	☐ Chamber F	☒ Chamber K
	☐ Chamber G	☐ Chamber L
	☐ Chamber H	☐ Chamber M

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers above are covered under Industry Canada company address and respective code: 2324A.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0

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5. CALIBRATION AND UNCERTAINTY

5.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

5.2. SAMPLE CALCULATION

RADIATED EMISSIONS

Where relevant, the following sample calculation is provided:
Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:
Final Voltage (dBuV) = Measured Voltage (dBuV) + Cable Loss (dB) + Limiter Factor (dB) + LISN Insertion Loss.
36.5 dBuV + 0 dB +10.1 dB+ 0 dB = 46.6 dBuV

5.3. MEASUREMENT UNCERTAINTY

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4:2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.).

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Worst Case Conducted Disturbance, 9KHz to 0.15 MHz	3.84 dB
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.65 dB
Worst Case Radiated Disturbance, 9KHz to 30 MHz	2.52 dB
Worst Case Radiated Disturbance, 30 to 1000 MHz	4.88 dB
Worst Case Radiated Disturbance, 1000 to 18000 MHz	4.24 dB
Worst Case Radiated Disturbance, 18000 to 26000 MHz	4.37 dB
Worst Case Radiated Disturbance, 26000 to 40000 MHz	5.17 dB

Uncertainty figures are valid to a confidence level of 95%.

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6. EQUIPMENT UNDER TEST

6.1. DESCRIPTION OF EUT

The EUT is a GSM/WCDMA/LTE Phablet with BT/BLE, DTS/UNII a/b/g/n/ac, NFC and ANT+. The test report addresses the NFC operational mode.

6.2. MAXIMUM FIELD STRENGTH

The testing was performed at 3 meters. The transmitter maximum E-field at 30 meter distance was 13.18 dBuV/m, which was converted from the 3 meter data.

6.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes the loop antenna.

6.4. SOFTWARE

The test utility software used during testing was N770F.001.

6.5. WORST-CASE CONFIGURATION AND MODE

The fundamental of the EUT was investigated under three orthogonal orientations X (Flatbed), Y (Landscape), and Z (Portrait). The Z (Portrait) orientation was determined to be the worst-case orientation.

In addition, Type A (CE – Card Emulator Mode), B and F were investigated to determine the worst case based on the highest power and spurious emissions. Type A, and data rate of 106kbps was determined to be the worst case and therefore Type A was selected for all final tests.

Although these tests were performed other than open field site, adequate comparison measurements were confirmed against 30 m open field site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788

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6.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
AC Adapter	Samsung	EP-TA800	R37M8PH3JN2SE3	N/A
Earphone	Samsung	N/A	N/A	N/A

I/O CABLES (CONDUCTED TEST)

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	Antenna	1	RF	Shielded	0.2	To PSA
2	USB	1	USB	Un-shielded	1	EUT to AC Mains

I/O CABLES (RADIATED AND CONDUCTED EMISSIONS)

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	USB	1	USB	Shielded	1	N/A
2	earphone	1	3.5mm	Un-shielded	1	N/A

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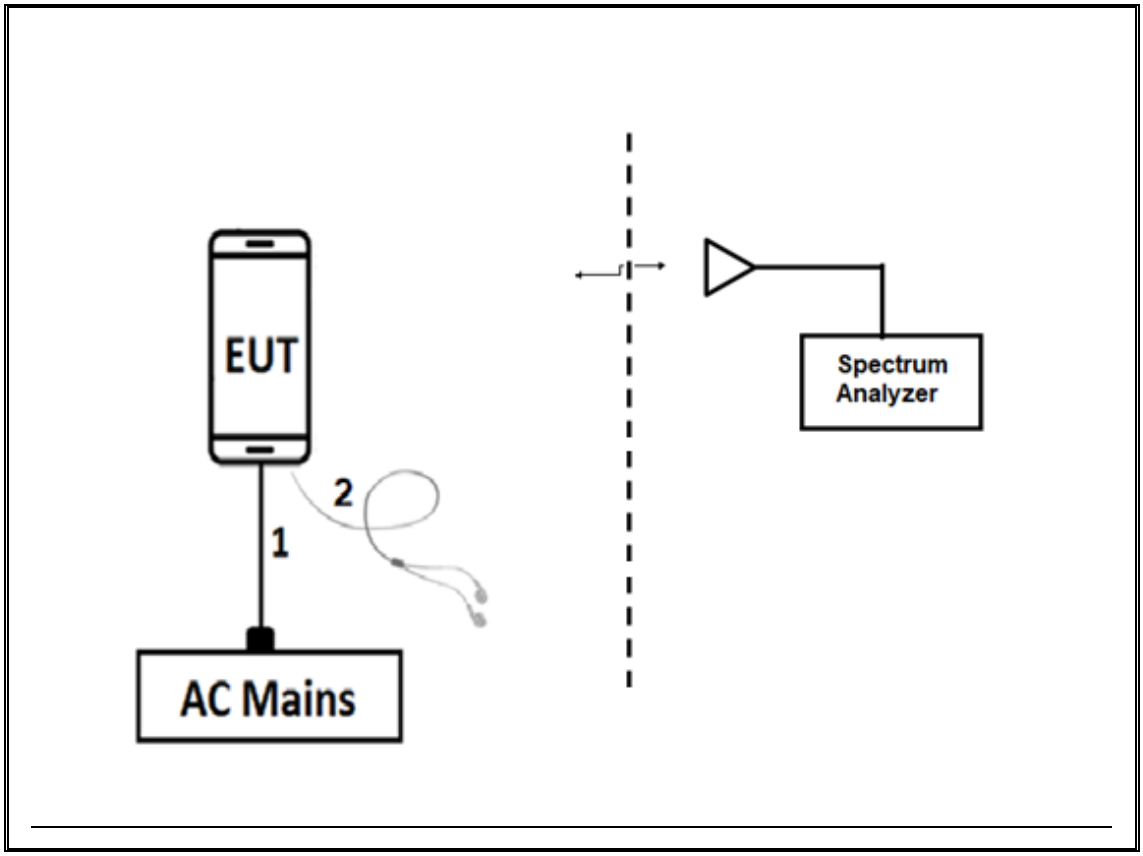
RADIATED AND AC LINE CONDUCTED EMISSIONS SETUP DIAGRAM



TEST SETUP

For radiated tests: EUT is connected to earphone. The test software exercises the radio.

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7. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Asset**	**Cal Due**
Antenna, Passive Loop 30Hz to 1MHz	ELETRO METRICS	EM-6871	PRE0179466	05/31/2020
Antenna, Passive Loop 100KHz to 30MHz	ELETRO METRICS	EM-6872	PRE0179468	05/31/2020
Antenna, Active Loop 9kHz to 30MHz	COM-POWER CORP.	AL-130R	PRE0165308	04/11/2020
Environmental Chamber	Thermotron Industries	SE-600-10-10	T80	05/07/2020
Antenna, Broadband Hybrid, 30MHz to 2GHz	Sunol Sciences	JB3	T899	08/23/2020
Amplifier, 9KHz to 1GHz, 32dB	SONOMA INSTRUMENT	310	PRE0180174	06/01/2020
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight Technologies	N9030A	T1450	01/23/2020
Spectrum Analyzer, PSA, 3Hz to 44GHz	Keysight	E4446A	T146	01/28/2020
EMI Test Receiver	Rohde&Schwarz	ESW44	PRE0179367	05/16/2020
AC Line Conducted				
EMI Receiver	Rohde & Schwarz	ESR	T1436	02/14/2020
LISN for Conducted Emissions CISPR-16	FCC INC.	FCC LISN 50/250	T1310	01/24/2020
UL AUTOMATION SOFTWARE				
Radiated Software	UL	UL EMC	Ver 9.5, June 15, 2019	
Antenna Port Software	UL	UL RF	Ver 11.13, Nov 13, 2019	
AC Line Conducted Software	UL	UL EMC	Ver 9.5, May 26, 2015	

NOTES:

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.

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SPOTCHECK TEST EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Asset**	**Cal Due**
Active Loop Antenna 9kHz -30MHz	COM-POWER	AL-130R	PRE0165308	04/11/2020
Amplifier, 1 to 18GHz	Amplical	AMP1G18-35	T1569	01/30/2021
EMI Test Receiver	Rohde & Schwarz	ESW44	PRE0179367	05/16/2020
UL AUTOMATION SOFTWARE				
Radiated Software	UL	UL EMC	Ver 9.5, June 15, 2019	

NOTES:

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.

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8. OCCUPIED BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 10kHz. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

Note: Because the measured signal is CW or CW-like adjusting the RBW per C63.10 would not be practical since measured bandwidth will always follow the RBW and the result will be approximately twice the RBW

RESULTS

99% and 20dB BW

Type A (Card Emulator Mode)

Mode Kbps	Frequency (MHz)	99% Bandwidth (KHz)	20dB Bandwidth (KHz)
424	13.56	21.7811	25.379
212	13.56	22.8184	24.636
106	13.56	25.8666	24.893

TYPE B

Mode Kbps	Frequency (MHz)	99% Bandwidth (KHz)	20dB Bandwidth (KHz)
424	13.56	21.6630	25.062
212	13.56	21.7790	25.927
106	13.56	22.0824	25.555

TYPE F

Mode Kbps	Frequency (MHz)	99% Bandwidth (KHz)	20dB Bandwidth (KHz)
424	13.56	21.6027	25.062
212	13.56	21.7290	25.397

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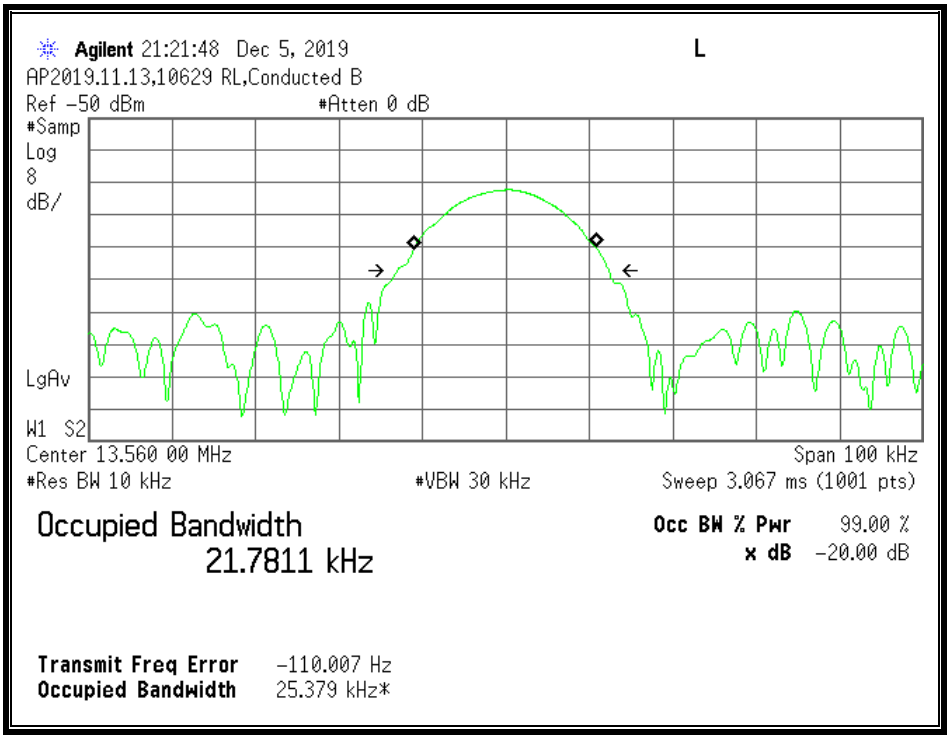
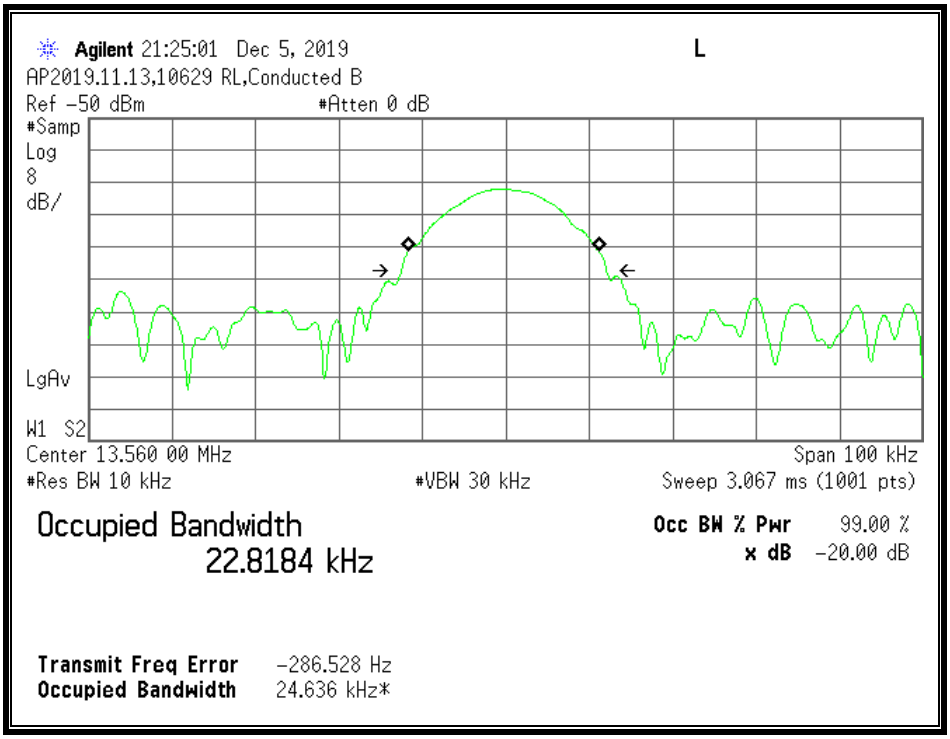
8.1. Type A

424Kbps



212Kbps



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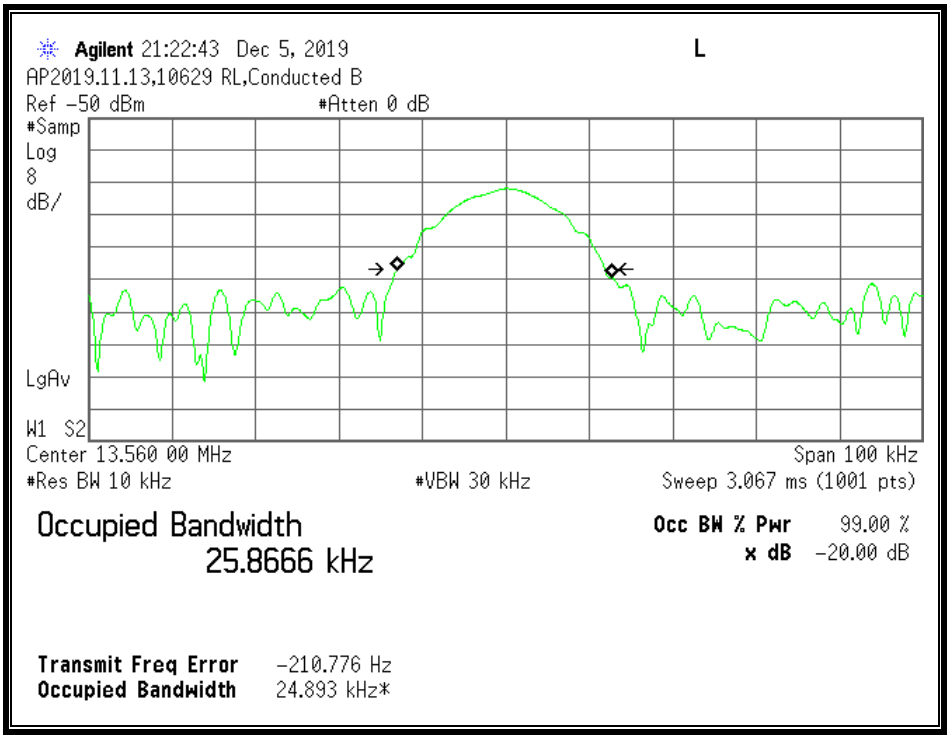
106Kbps



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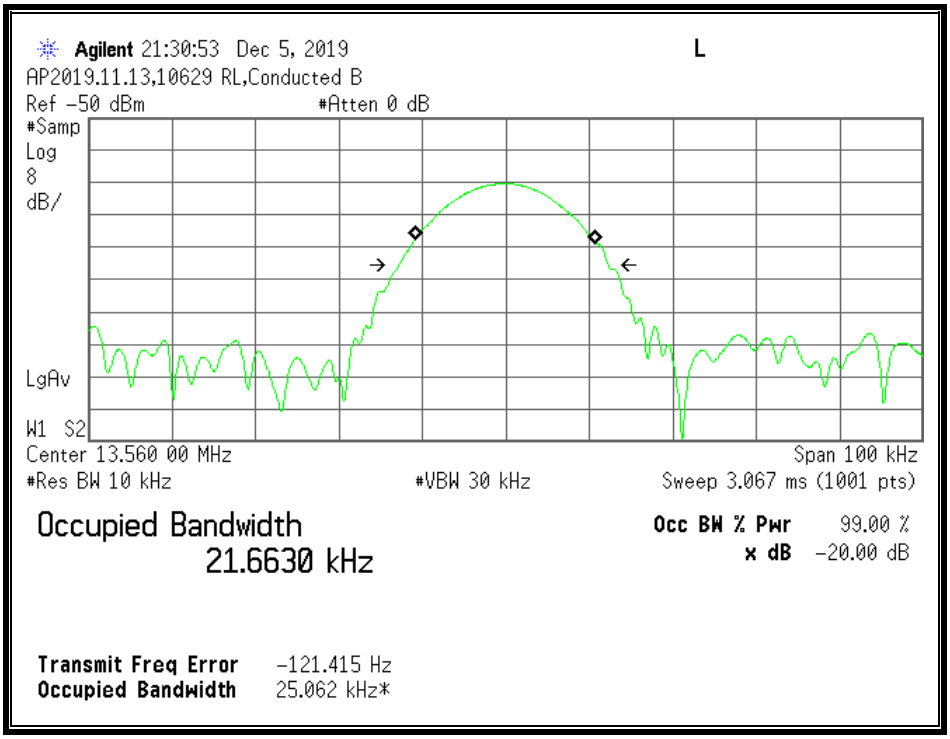
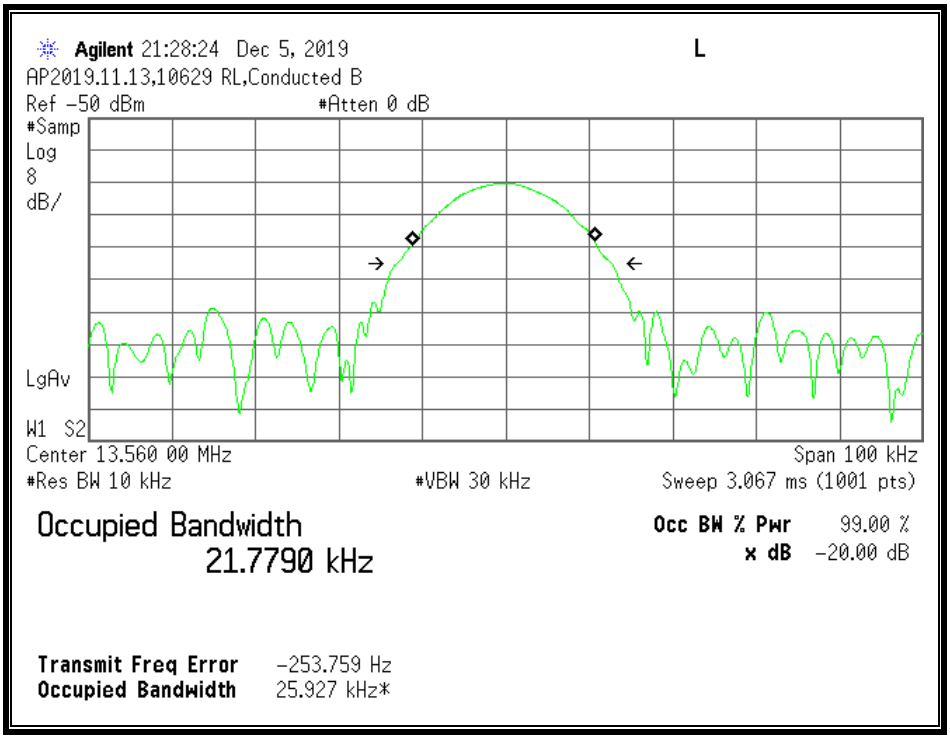
8.2. Type B

424Kbps



212Kbps



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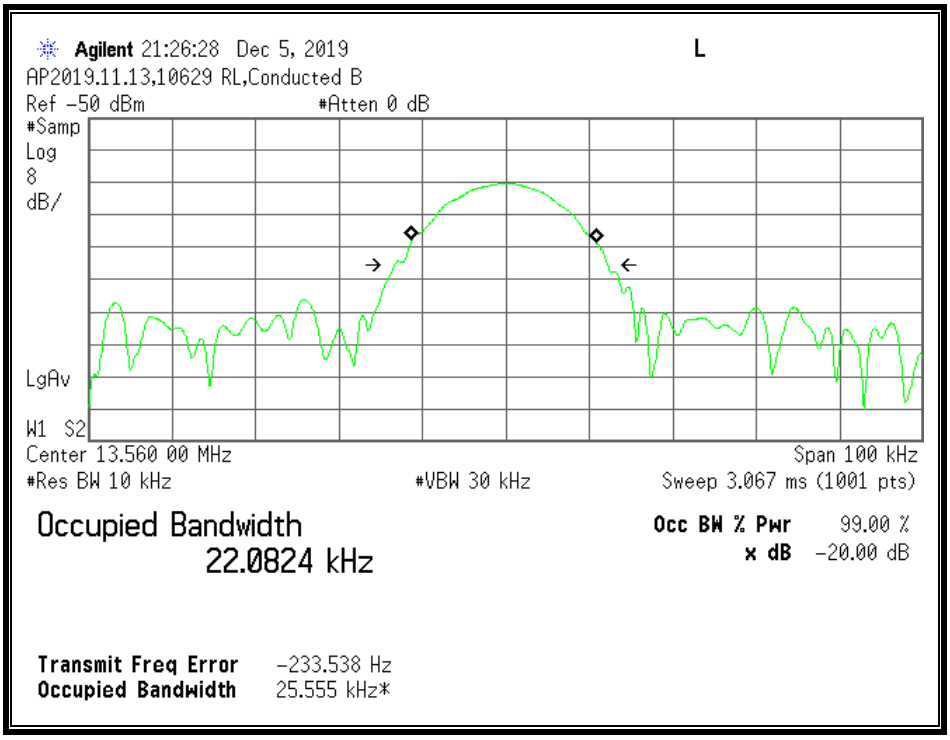
106Kbps



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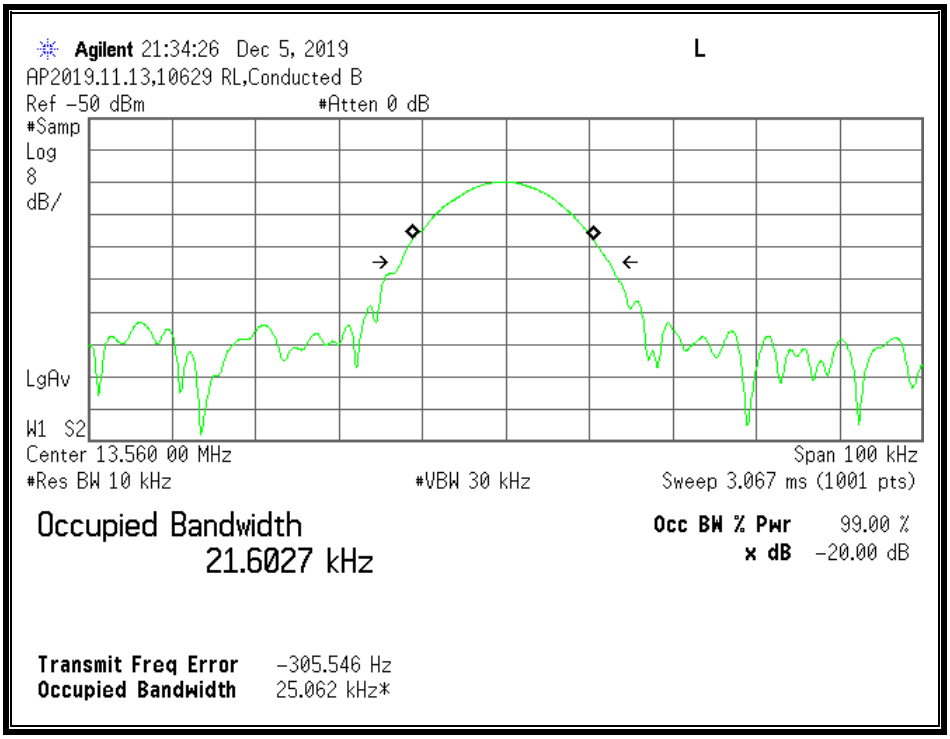
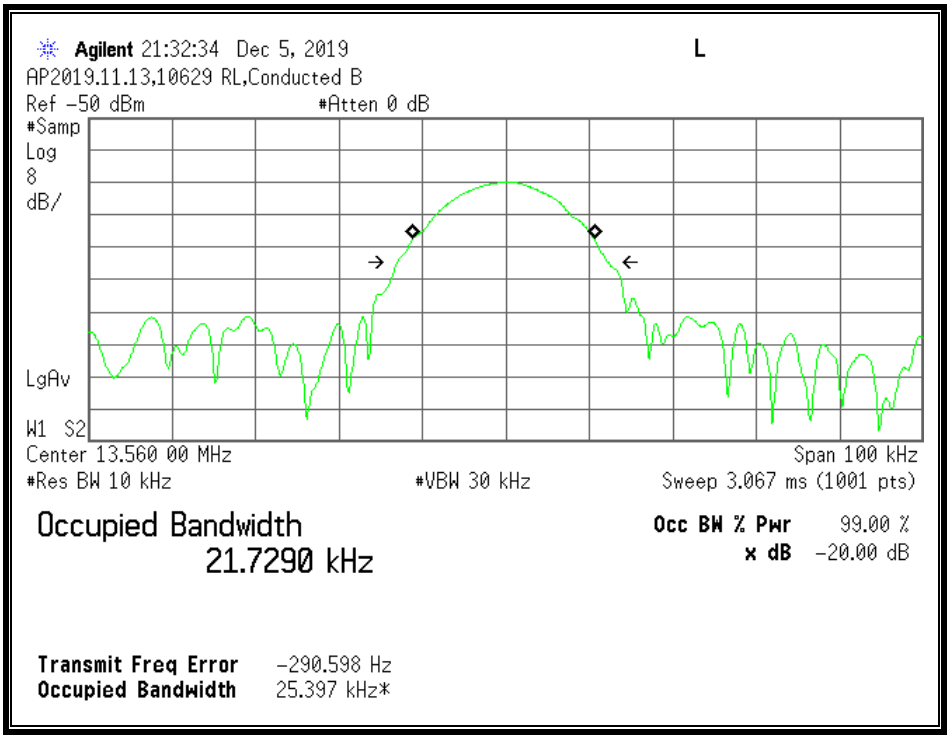
8.3. Type F

424Kbps



212Kbps



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9. RADIATED EMISSION TEST RESULTS

9.1. LIMITS AND PROCEDURE

LIMIT

§15.225

(a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/ meter at 30 meters.

(b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

(c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

(d) The field strength of any emissions appearing outside of the 13.110– 14.010 MHz and shall not exceed the general radiated emission limits in § 15.209 as follows:
§15.209 (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Limits for radiated disturbance of an intentional radiator		
Frequency range (MHz)	Limits (µV/m)	Measurement Distance (m)
0.009 – 0.490	2400 / F (kHz)	300
0.490 – 1.705	24000 / F (kHz)	30
1.705 – 30.0	30	30
30 – 88	100**	3
88 - 216	150**	3
216 – 960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g. §§ 15.231 and 15.241.
§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

Formula for converting the filed strength from uV/m to dBuV/m is:
Limit (dBuV/m) = 20 log limit (uV/m)

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In addition:

§15.209 (d) The emission limits shown the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emissions limits in these three bands are based on measurements employing an average detector.

§15.209 (d) The provisions in §§ 15.225, measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this part.

TEST PROCEDURE

ANSI C63.10, 2013

The EUT is an intentional radiator that incorporates a digital device, the highest fundamental frequency generated or used in the device is 13.56 MHz; therefore, the frequency range was investigated from 0.15 MHz to the 10th harmonic of the highest fundamental frequency, or 1000 MHz, whichever is greater.

2D antenna use - For below 30MHz testing, investigation was done on three antenna orientations (parallel, perpendicular, and ground-parallel), parallel and perpendicular are the worst orientations, therefore testing was performed on these two orientations only.

KDB 414788 OFS and Chamber Correlation Justification

Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.

OFS and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

RESULTS

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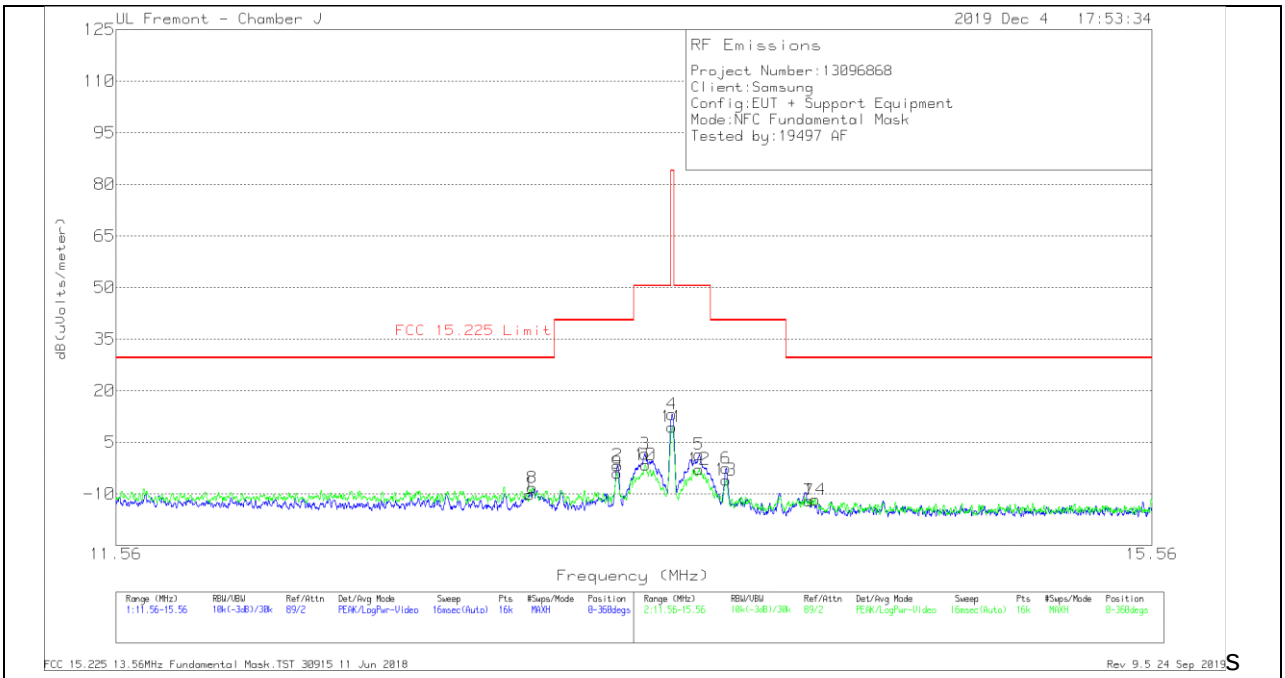
9.2. FUNDAMENTAL AND SPURIOUS EMISSIONS (0.15 - 30 MHz)

TYPE A - 106Kbps (CE Mode)

FUNDAMENTAL EMISSION MASK - (11.56 – 15.56 MHz)



ANTENNA- TWO ORIENTATIONS FACE ON/FACE OFF

NOTE: All data rate Field Strength was investigated and Type A, 106k found to have the highest Field Strength results and represents as the worst case data rate.

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr 30m (dB) 40Log	Corrected Reading dB(uVolts/meter)	FCC 15.225 Limit	PK Margin (dB)	Azimuth (Degs)
1	13.01713	14.58	Pk	14.9	.4	-40	-10.12	29.54	-39.66	0-360
2	13.34888	23.08	Pk	14.8	.4	-40	-1.72	40.51	-42.23	0-360
3	13.45325	26.46	Pk	14.8	.4	-40	1.66	50.5	-48.84	0-360
4	*13.55913	37.98	Pk	14.8	.4	-40	13.18	84	-70.82	0-360
5	13.66513	26.25	Pk	14.8	.4	-40	1.45	50.5	-49.05	0-360
6	13.771	22.4	Pk	14.7	.4	-40	-2.5	40.51	-43.01	0-360
7	14.10238	12.92	Pk	14.7	.4	-40	-11.98	29.54	-41.52	0-360
8	13.0275	16.51	Pk	14.9	.4	-40	-8.19	29.54	-37.73	0-360
9	13.34813	20.88	Pk	14.8	.4	-40	-3.92	40.51	-44.43	0-360
10	13.45538	23.24	Pk	14.8	.4	-40	-1.56	50.5	-52.06	0-360
11	*13.55938	34.28	Pk	14.8	.4	-40	9.48	84	-74.52	0-360
12	13.66563	21.98	Pk	14.8	.4	-40	-2.82	50.5	-53.32	0-360
13	13.77163	18.97	Pk	14.7	.4	-40	-5.93	40.51	-46.44	0-360
14	14.12875	13.18	Pk	14.7	.4	-40	-11.72	29.54	-41.26	0-360

* - Indicates fundamental frequency
Pk - Peak detector

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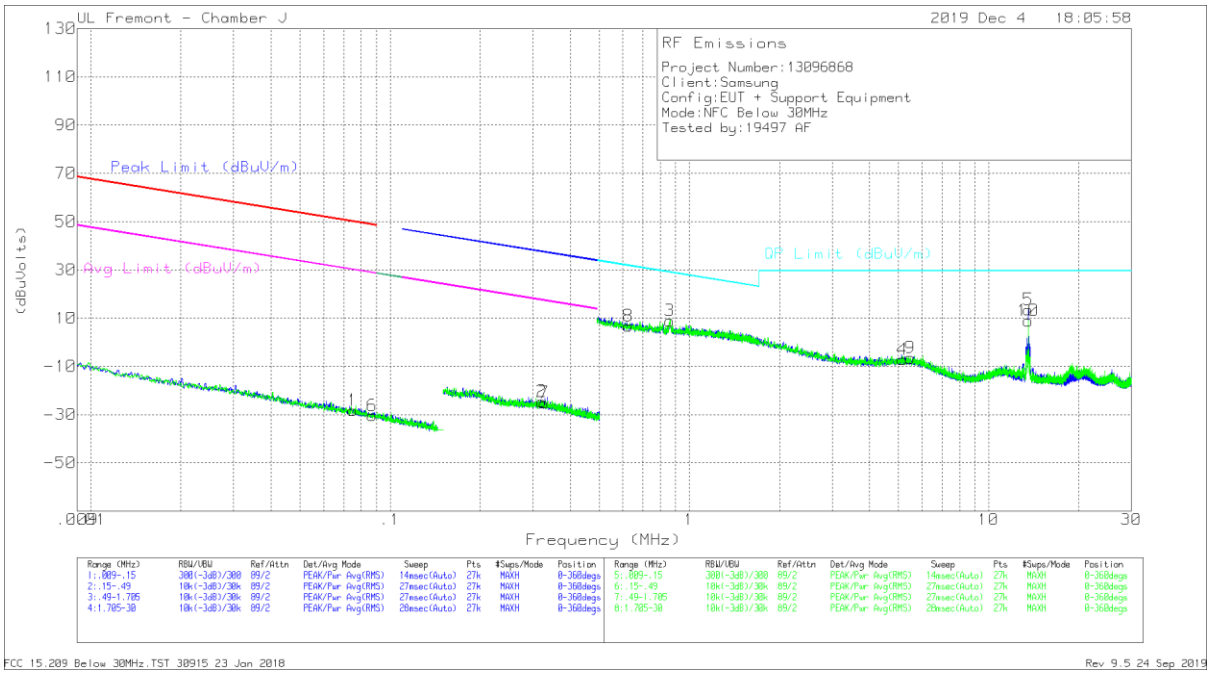
SPURIOUS EMISSIONS (0.09 – 30MHz)



ANTENNA- TWO ORIENTATIONS FACE ON/FACE OFF

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr 300m	Corrected Reading (dBuVolts)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	.07505	37.44	Pk	14.3	0	-80	-28.26	50.08	-78.34	30.08	-58.34	-	-	-	-	0-360
2	.32139	41.44	Pk	13.9	.1	-80	-24.56	-	-	-	-	37.47	-62.03	17.47	-42.03	0-360
6	.08712	35.18	Pk	14.4	0	-80	-30.42	48.78	-79.2	28.78	-59.2	-	-	-	-	0-360
7	.32705	40.88	Pk	13.9	.1	-80	-25.12	-	-	-	-	37.32	-62.44	17.32	-42.44	0-360

Pk - Peak detector

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr 30m (dB) 40Log	Corrected Reading (dBuVolts)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
3	.85977	34.58	Pk	14.2	.1	-40	8.88	28.93	-20.05	0-360
4	5.15292	17.67	Pk	14.9	.2	-40	-7.23	29.5	-36.73	0-360
5	13.55788	38.24	Pk	14.8	.4	-40	13.44	29.5	-16.06	0-360
8	.62579	32.49	Pk	14.1	.1	-40	6.69	31.68	-24.99	0-360
9	5.47466	18.31	Pk	14.9	.3	-40	-6.49	29.5	-35.99	0-360
10	13.5584	33.7	Pk	14.8	.4	-40	8.9	29.5	-20.6	0-360

Pk - Peak detector

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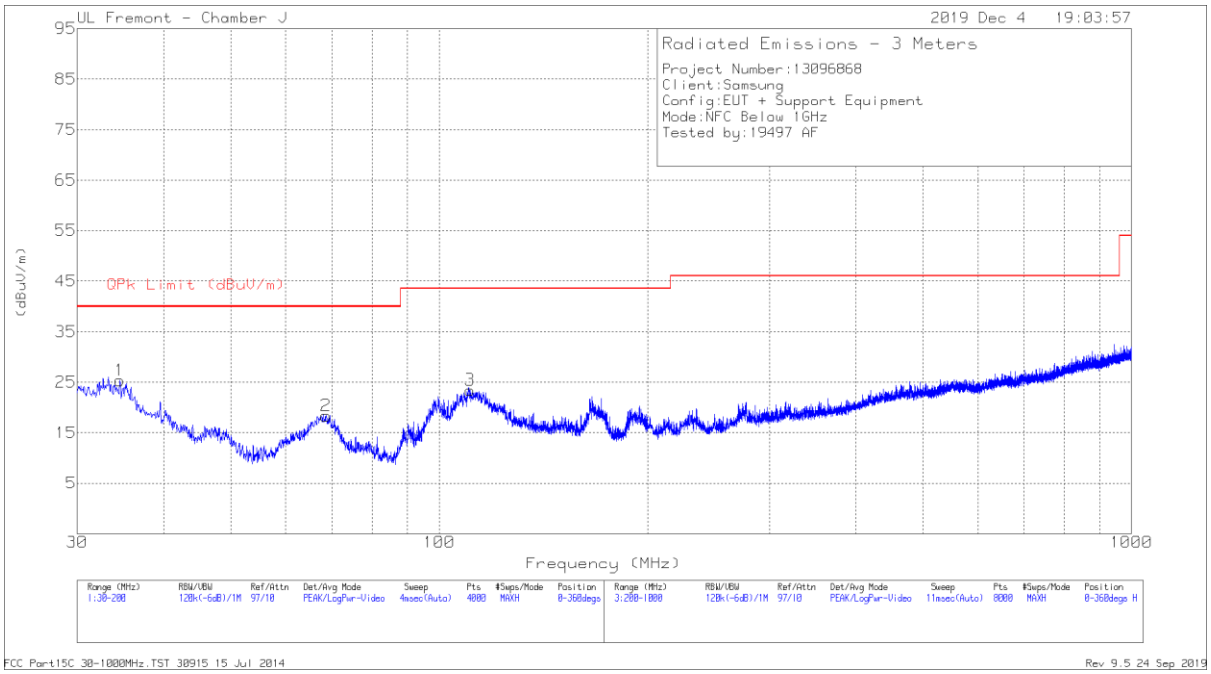
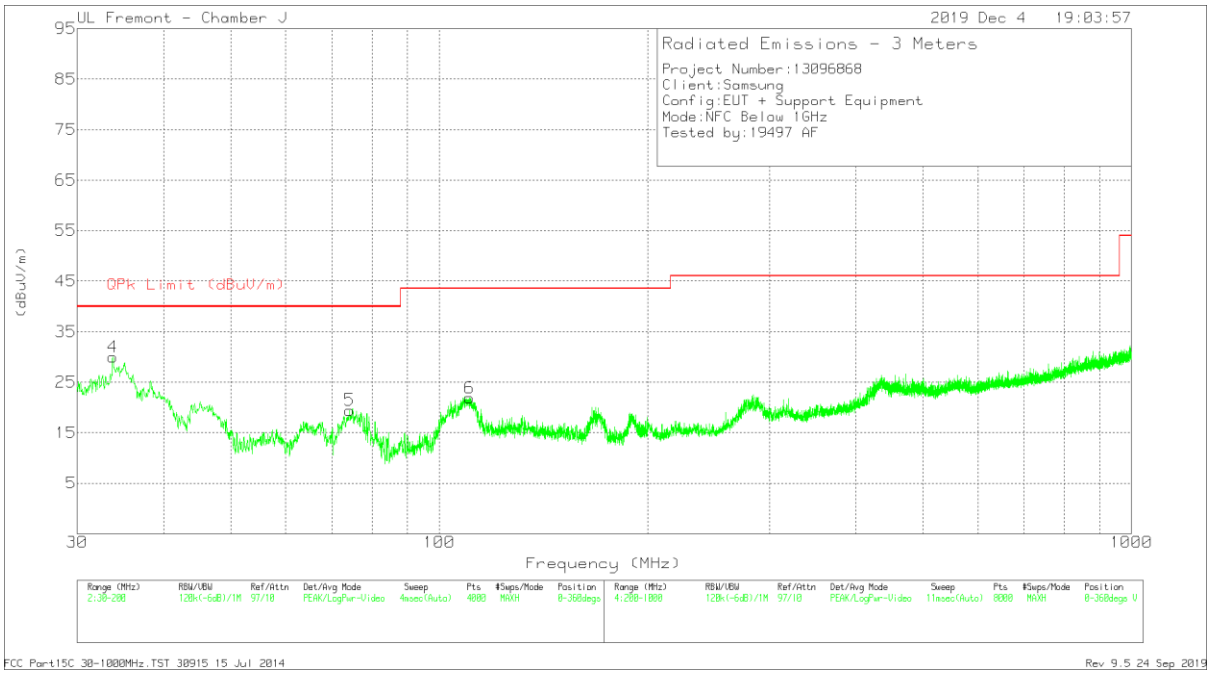
9.3. TX SPURIOUS EMISSION 30 TO 1000 MHz

TYPE A - 106Kbps (CE Mode)



HORIZONTAL



VERTICAL

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Below 1GHz DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T899 (dB/m)	Amp Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	34.5912	32.64	Pk	24.2	-31.5	25.34	40	-14.66	0-360	398	H
2	68.6425	35.46	Pk	14.1	-31.2	18.36	40	-21.64	0-360	299	H
3	*110.8134	35.73	Pk	18.6	-30.9	23.43	43.52	-20.09	0-360	299	H
4	33.795	40.7	Pk	24.7	-31.6	33.8	40	-6.2	180	101	V
	33.795	33.86	Qp	24.7	-31.6	26.96	40	-13.04	180	101	V
5	*74.254	36.83	Pk	13.8	-31.2	19.43	40	-20.57	0-360	101	V
6	*110.5583	34.26	Pk	18.5	-30.9	21.86	43.52	-21.66	0-360	101	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
Qp - Quasi-Peak detector

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10. FREQUENCY STABILITY

LIMIT

§15.225 (e) The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency, over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

TEST PROCEDURE

ANSI C63.10-2013 Clause 6.8

RESULTS

ID:	45256 JB	Date:	12/04/2019

No non-compliance noted.

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10.1. TYPE A - 106Kbps (CE Mode)

106Kbps

Reference Frequency: EUT Channel 13.56 MHz @ 20ºC Limit: ± 100 ppm = 1.356 kHz										
Power Supply	Envir. Temp	Frequency Deviation Measureed with Time Elapse								
(Vdc)	(ºC)	Startup (MHz)	Delta (ppm)	@ 2 mins (MHz)	Delta (ppm)	@ 5 mins (MHz)	Delta (ppm)	@ 10 mins (MHz)	Delta (ppm)	Limit (ppm)
3.80	50	13.5596957	1.895	13.5596941	2.013	13.5596916	2.198	13.5596916	2.198	± 100
3.80	40	13.5597232	-0.133	13.5597126	0.649	13.5597046	1.239	13.5596962	1.858	± 100
3.80	30	13.5597748	-3.938	13.5597606	-2.891	13.5597468	-1.873	13.5597344	-0.959	± 100
3.80	***20***	***13.5597214***	***0.000***	***13.5597214***	***0.000***	***13.5597211***	***0.022***	***13.5597204***	***0.074***	***± 100***
3.80	10	13.5597883	-4.934	13.5597861	-4.771	13.5597840	-4.617	13.5597813	-4.417	± 100
3.80	0	13.5597811	-4.403	13.5597825	-4.506	13.5597850	-4.690	13.5597866	-4.808	± 100
3.80	-10	13.5597728	-3.791	13.5597750	-3.953	13.5597764	-4.056	13.5597800	-4.322	± 100
3.23	20	13.5597203	0.081	13.5597201	0.096	13.5597196	0.133	13.5597199	0.111	± 100
4.37	20	13.5597199	0.111	13.5597201	0.096	13.5597201	0.096	13.5597232	-0.133	± 100

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11. AC MAINS LINE CONDUCTED EMISSIONS

LIMITS

§15.207

(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Frequency range (MHz)	Limits (dBµV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
Notes: 1. The lower limit shall apply at the transition frequencies 2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

RESULTS

No non-compliance noted:

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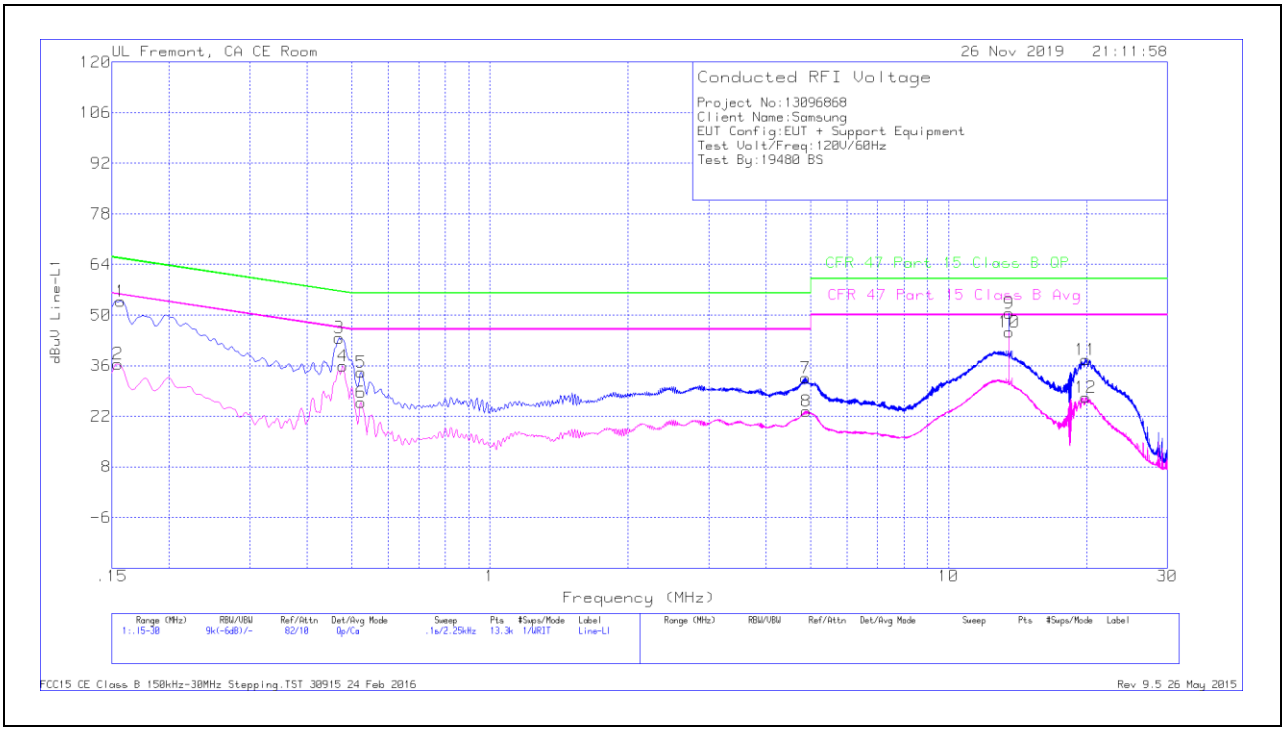
11.1. TYPE A - 106Kbps (CE Mode)

NORMAL OPERATION with ANTENNA

LINE 1 RESULTS



Trace Markers

Range 1: Line-L1 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L1	LC Cables C1&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR) Margin (dB)
1	.15675	43.68	Qp	.1	0	10.1	53.88	65.63	-11.75	-	-
2	.1545	26.32	Ca	.1	0	10.1	36.52	-	-	55.75	-19.23
3	.4695	33.56	Qp	0	0	10.1	43.66	56.52	-12.86	-	-
4	.4785	25.89	Ca	0	0	10.1	35.99	-	-	46.37	-10.38
5	.5235	24.08	Qp	0	0	10.1	34.18	56	-21.82	-	-
6	.5235	15.77	Ca	0	0	10.1	25.87	-	-	46	-20.13
7	4.88175	22.38	Qp	0	.1	10.1	32.58	56	-23.42	-	-
8	4.902	13.27	Ca	0	.1	10.1	23.47	-	-	46	-22.53
9	13.56	39.95	Qp	.1	.2	10.2	50.45	60	-9.55	-	-
10	13.56	34.82	Ca	.1	.2	10.2	45.32	-	-	50	-4.68
11	19.914	26.96	Qp	.1	.3	10.3	37.66	60	-22.34	-	-
12	19.90725	16.56	Ca	.1	.3	10.3	27.26	-	-	50	-22.74

Qp - Quasi-Peak detector
Ca - CISPR average detection
Note: Markers 9 and 10 are the 13.56MHz NFC Fundamental

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47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 771-1000 FAX:(510) 661-0888
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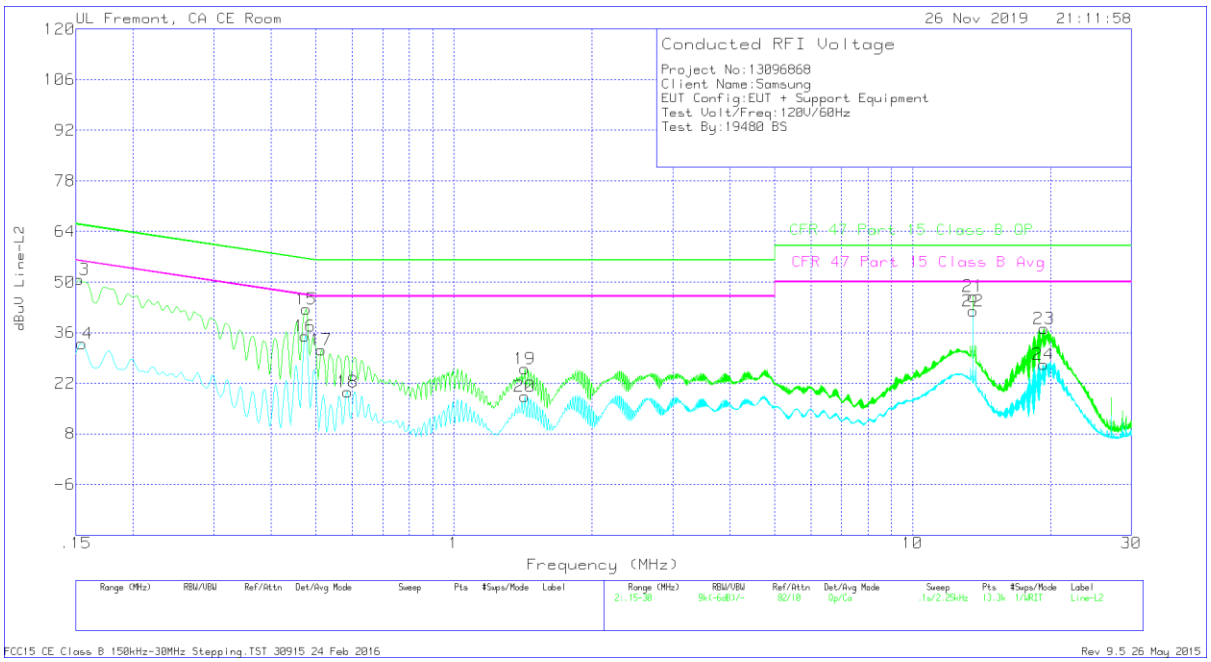
LINE 2 RESULTS



Trace Markers

Range 2: Line-L2 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L2	LC Cables C2&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR) Margin (dB)
13	.15225	40.49	Qp	.1	0	10.1	50.69	65.88	-15.19	-	-
14	.1545	22.76	Ca	.1	0	10.1	32.96	-	-	55.75	-22.79
15	.47625	32.44	Qp	0	0	10.1	42.54	56.4	-13.86	-	-
16	.474	24.94	Ca	0	0	10.1	35.04	-	-	46.44	-11.4
17	.5145	21.19	Qp	0	0	10.1	31.29	56	-24.71	-	-
18	.5865	9.56	Ca	0	0	10.1	19.66	-	-	46	-26.34
19	1.428	15.75	Qp	0	.1	10.1	25.95	56	-30.05	-	-
20	1.428	8.17	Ca	0	.1	10.1	18.37	-	-	46	-27.63
21	13.56	35.58	Qp	.1	.2	10.2	46.08	60	-13.92	-	-
22	13.56	31.58	Ca	.1	.2	10.2	42.08	-	-	50	-7.92
23	19.347	26.44	Qp	.1	.3	10.3	37.14	60	-22.86	-	-
24	19.2795	16.45	Ca	.1	.3	10.3	27.15	-	-	50	-22.85

Qp - Quasi-Peak detector
Ca - CISPR average detection
Note: Markers 21 and 22 are the 13.56MHz NFC Fundamental

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