



FCC CFR 47 PART 15 SUBPART F §15.519

ISED RSS-220 ISSUE 1 AMENDMENT 1

CERTIFICATION TEST REPORT

FOR

SMART PHONE

MODEL NUMBER: A2398

REPORT NUMBER: 13190901-E21V1

ISSUE DATE: SEPTEMBER 25, 2020

FCC ID: BCG-E3540A

IC: 579C-E3540A

Prepared for

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Prepared by

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Revision History

Rev.	Issue Date	Revisions	Revised By
V1	09/25/2020	Initial Issue	Thu Chan

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: APPLE INC.
ONE APPLE PARK WAY
CUPERTINO, CA 95014, USA

EUT DESCRIPTION: SMART PHONE

MODEL: A2398

SERIAL NUMBERS: C7CD607108GF
C7CCT03MQ900

DATE TESTED: JULY 25th – SEPTEMBER 16th, 2020

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC §15 Subpart F	Complies
ISED RSS-220 Issue 1 Amendment 1	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.

This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of the U.S. government.

Approved & Released For
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Tested By:



THU CHAN
STAFF ENGINEER
UL Verification Services Inc.



GIA-PIAO CHIN
TEST ENGINEER
UL Verification Services Inc.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with CFR Title 47 Part 15 Subpart F, KDB 393764 D01 UWB FAQ v02, ISED RSS-220 Issue 1 Amendment 1 and ANSI C63.10-2013 and RSS GEN Issue 5.

3. FACILITIES AND ACCREDITATION

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

47173 Benicia Street ISED 2324A	47266 Benicia Street ISED 22541	47658 Kato Rd ISED 2324B
☐ 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 and covered under ISED Canada company numbers 2324A, 2324B and 22541 as listed in the table.

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

4. DECISION RULES AND MEASUREMENT UNCERTAINTY

4.1. METROLOGICAL TRACEABILITY

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, with a maximum time between calibrations of one year or the manufacturers' recommendation, whichever is less, and where applicable is traceable to recognized national standards.

4.2. DECISION RULES

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.)

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	U _{LAB}
Worst Case Conducted Disturbance, 9KHz to 0.15 MHz	3.39 dB
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.07 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%.

5. INTRODUCTION OF TEST DATA REUSE

5.1. DESCRIPTION OF EUT

The EUT is a smartphone with multimedia functions (music, application support, and video), cellular GSM, GPRS, EGPRS, UMTS, LTE, 5G, CDMA, IEEE 802.11a/b/g/n/ac/ax, Bluetooth, Ultra-Wideband, GPS, NFC and WPT. All models support at least one UICC based SIM. The second SIM is either an UICC based p-SIM (physical SIM) or e-SIM (electronic SIM). The device supports a built-in inductive charging transmitter and receiver. The rechargeable battery is not user accessible.

This test report addresses the UWB operational mode.

The EUT has a UWB transceiver with four integral antennas (UWB0, UWB1, ANT 2 = ANT6/UWB2 & ANT 3 = UWB3) and operates on 6.5 GHz (Channel 5) and 8 GHz (Channel 9). The antennas are not user accessible. UWB0 and UWB1 are disable on device. Six signal configurations (CONFIG 0,1,2,3,4 & 5) are available for each ANT/CH setting.

ANT	CH	CONFIG
2	5	0
2	5	1
2	5	2
2	5	3
2	5	4
2	5	5
2	9	0
2	9	1
2	9	2
2	9	3
2	9	4
2	9	5
3	5	0
3	5	1
3	5	2
3	5	3
3	5	4
3	5	5
3	9	0
3	9	1
3	9	2
3	9	3
3	9	4
3	9	5

5.2. INTRODUCTION

This application for certification is leveraging the data reuse procedures from KDB 484596 D01 based on reference FCC ID BCG-E3539A & IC: 579C-E3539A to cover variant model BCG-E3540A & IC: 579C-E3540A. The major difference between the parent/reference model and the variant model is the depopulation in the variant model of the mmWave transmitter. All other circuitry and features are identical. The data reuse test plan was approved via manufacturer KDB inquiry.

5.3. REFERENCE DETAIL

Reference application that contains the reused reference data which is attached to this report in the Appendix.

Equipment Class	Reference FCC ID & IC	Reference Report	Report Title / Section
UWB	BCG-E3539A 579C-E3539A	13179110-E21	FCC IC_UWB Report / All Sections

5.4. MAXIMUM OUTPUT POWER

Highest Average Powers based on ANT/CH.

ANT	CH	CONFIG	Average Power (dBm EIRP)
2	5	4	-42.73
2	9	3	-43.89
3	5	0	-42.26
3	9	2	-42.31

5.5. DESCRIPTION OF AVAILABLE ANTENNAS

Two integral antennas are employed and the antenna gains are listed as follow:

CH	Freq. Band (GHz)	Gain (dBi)	
		ANT 2 (ANT6/UWB2)	ANT 3 (UWB3)
5	6.5	-3.1	-4.4
9	8.0	-0.5	0.8

5.6. MODULATION

The UWB signal is BPSK pulsed modulated signal.

5.7. SOFTWARE AND FIRMWARE

The Software and Firmware version used at test is 18A33310I.

6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST			
Description	Manufacturer	Model	Serial Number
Laptop + Adapter	Apple	Mac Book Air	C02TK02YJ10C
Kanzi – USB Adapter	Apple	--	325D59
Laptop + Adapter	Apple	Mac Book Air	C02YL5TNJHC8
Kanzi – USB Adapter	Apple	--	316FAS

I/O CABLES

I/O CABLES					
Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
AC	1	AC	Un-shielded	2	N/A
USB	1	USB	Un-shielded	1	N/A

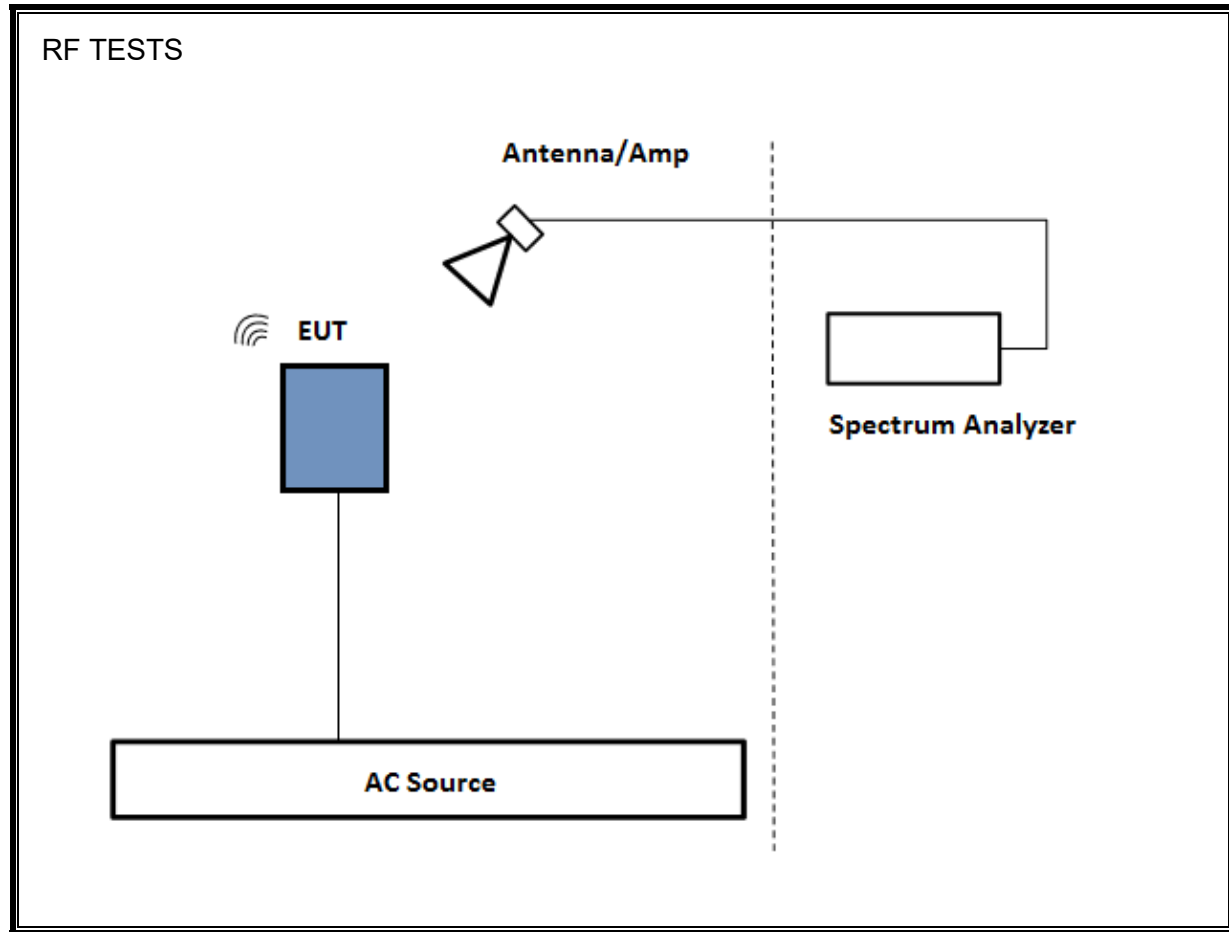
TEST SETUP

The EUT was examined at pre-scan test using a fundamental frequency in the portrait (z), landscape (y), and flatbed (x) position and the worst case orientation of individual ANT/CH/CONFIG setting was determined for final spurious emission measurement.

Measurements of spurious average emissions were made with the device operating at a higher power than production power to ensure compliance. Measurements of the in-band signal (peak and average emissions) were all made at the production power settings.

EUT was connected to AC power adapter in all test cases.

SETUP DIAGRAM FOR TESTS



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	Local ID	Cal Date	Cal Due
EMI Test Receiver	Rohde & Schwarz	ESW44	PRE0203383	2/18/2020	2/18/2021
Horn Antenna, 1-18 GHz	ETS Lindgren	3117	T119	4/21/2020	4/21/2021
Horn Antenna, 1-18 GHz	ETS Lindgren	3117	T345	5/19/2020	5/19/2021
Preamp, 1-18 GHz	Miteq	AFS42-00101800-25-S-42	PRE0183207	6/11/2020	6/11/2021
PXA Signal Analyzer	Agilent	N9030A	T342	1/24/2020	1/24/2021
Hybrid Antenna, 30-2000 MHz	SunAR	JB1	T243	4/15/2020	4/15/2021
Preamp, 0.1-1300 MHz	Sonoma Inst.	310	T173	7/22/2020	7/22/2021
Horn Antenna, 1-18 GHz	ETS Lindgren	3117	T711	2/12/2020	2/12/2021
Preamp, 1-18 GHz	Miteq	AFS42-00101800-25-S-42	PRE0183530	8/31/2019	8/31/2020
EMI Test Receiver	Rohde & Schwarz	ESW44	PRE0203384	2/18/2020	2/18/2021
Antenna, Active Loop 9kHz-30MHz	ETS Lindgren	6502	T1616	10/18/2019	10/18/2020
Spectrum Analyzer, 44GHz	Keysight	N9030A	T905	1/27/2020	1/27/2021
Preamplifier, 1-26.5GHz	Agilent	8449B	T404	4/8/2020	4/8/2021
Horn Antenna, 18-26.5GHz	ARA	MWH-1826/B	PRE0079280	4/17/2020	4/17/2021
Preamplifier, 26-40 GHz	Miteq	NSTTA2640-35-HG	T1864	4/8/2020	4/8/2021
Horn Antenna, 26-40 GHz	ARA	MWH-2640/B	PRE0182203	4/17/2020	4/17/2021
DC Power Supply	Hewlett Packard	E3610A	T502	NCR	--
DC Power Supply	All-Bright Technology Co.	8185D	PRE0129629	NCR	--
Multimeter	Fluke	77	T78	1/21/2020	1/21/2021
Low Pass Filter	Microtronics	LPM20143	PR0199966	11/23/2019	11/23/2020
High Pass Filter, CH5	Wainwright Inst. GMBH	WHW2-7100-10000-18000-40DC	--	NCR	--
High Pass Filter, CH9	Wainwright Inst. GMBH	WHW2-8165-11500-21000-40CD	--	NCR	--
EMI Test Receiver 9kHz-7GHz	Rohde & Schwarz	ESR	T1436	2/20/2020	2/20/2021
Power Cable, Line Conducted Emissions	UL	PR1	T861	10/27/2019	10/27/2020
LISN for Conducted Emissions CISPR-16	FISCHER CUSTOM COMMUNICATIONS	FCC-LISN-50/250-25-2-01	T1310	1/23/2020	1/23/2021
Radiated Software	UL	UL EMC	Ver 9.5, Mar 6, 2020		
AC Line Conducted Software	UL	UL EMC	Ver 9.5, Feb 21, 2020		

8. SPOT CHECK VERIFICATIONS

Spot check verifications have been performed on device model A2398 for in-band Peak Power and Maximum Average Emissions on all the configurations listed on Section 5.1 operating at the same production power settings as model A2176. For the verification of unwanted emissions from 9 kHz to 40 GHz, Config 3, Payload 125 of both CH5 and CH9 on Ant 2 were selected to test, using a higher power than production power to ensure compliance.

Tabulated data provides the test results of all available test configurations. The plots of Ant 2, CONFIG 0, Payload 125 power measurement on CH5 and CH9 are presented and same measurement settings apply to the rest of test configurations.

8.1. PEAK POWER AND MAXIMUM AVERAGE EMISSIONS

LIMITS

FCC

15.519 (e) There is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs, f_m . That limit is 0 dBm EIRP.

15.519 (c) The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

Frequency in MHz	EIRP in dBm
3100 - 10600	-41.3

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Annex, Section 4 (c) Peak measurements shall be made in addition to average measurements. Transmissions shall not exceed 0 dBm e.i.r.p. in any 50 MHz bandwidth when the average limit is -41.3 dBm/MHz.

Section 5.3.1 (d) Radiated emissions above 960 MHz from a device shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz.

Frequency	E.I.R.P. in a Resolution Bandwidth of 1 MHz
4.75 – 10.6 GHz	-41.3 dBm

TEST PROCEDURE

ANSI C63.10 Clause 10.3.

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Peak EIPR power is measured using RBW of 50 MHz.

The radiated emissions of 6 - 9 GHz frequency band are performed at 3-meter test distance.

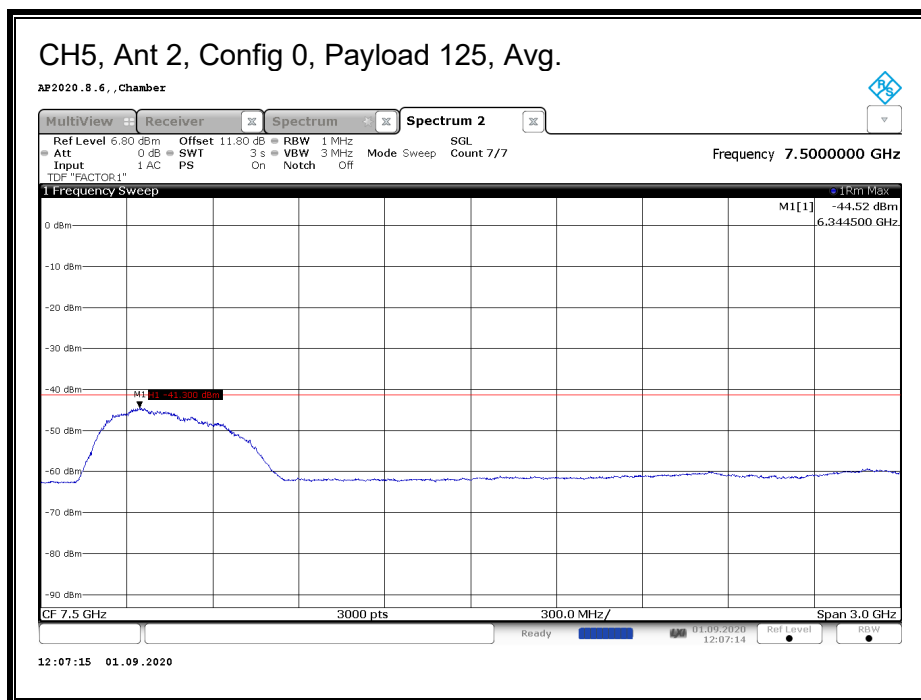
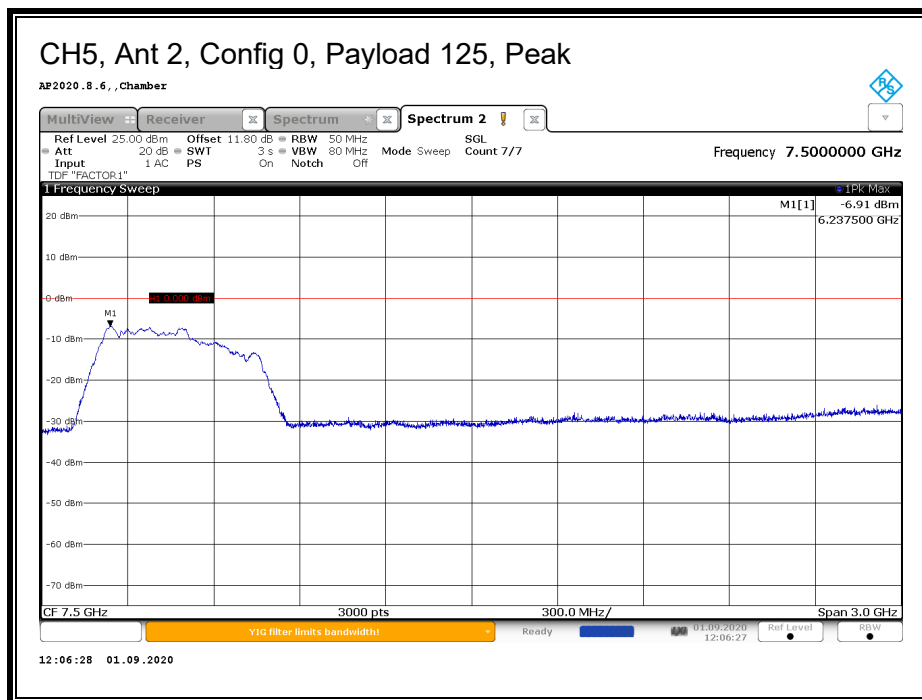
Tabulated data provides the test results of all available test configurations. The plots of Ant 2, CONFIG 0, Payload 125 power measurement on CH5 and CH9 are presented and same measurement settings apply to the rest of test configurations.

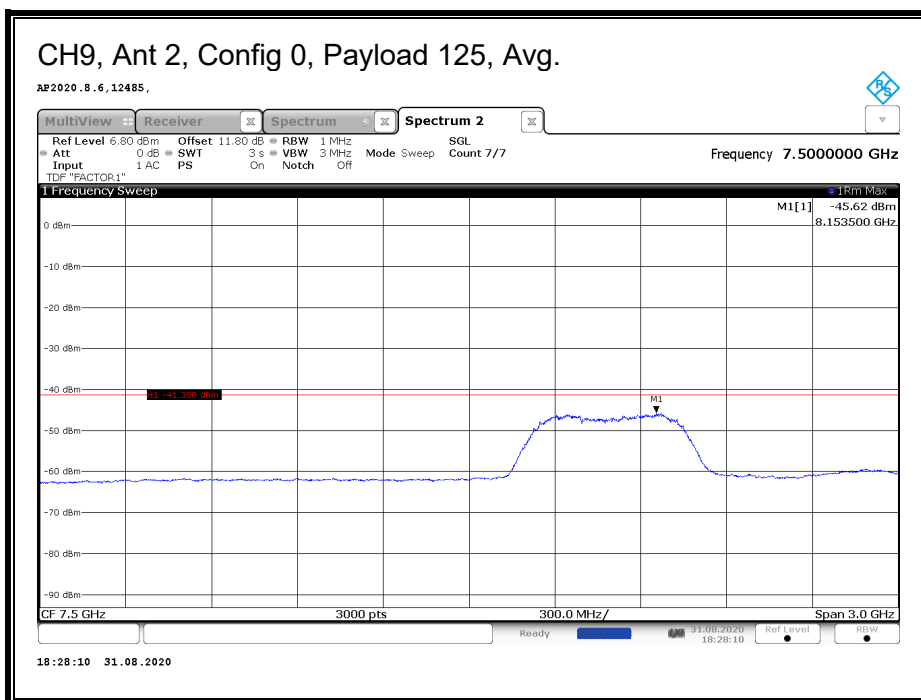
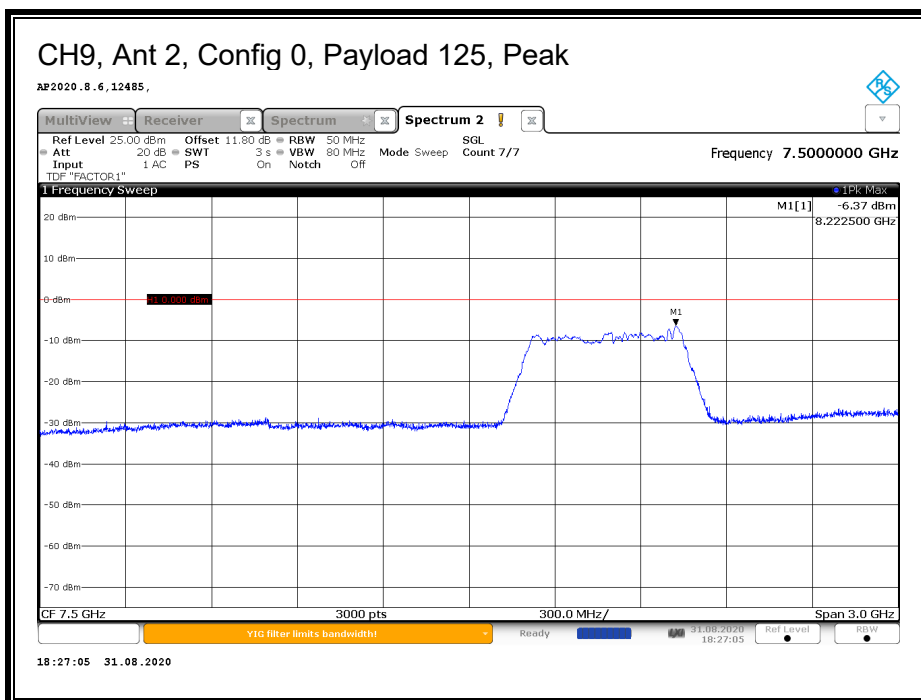
RESULTS

Tested By: 19419, 12501, 12485, 12472, 20737, 12471

ANT	CH	CONFIG	Payload	EUT Orientation	Meas. Ant. Polarity	Peak EIRP Power				Average EIRP Power			
						FM (GHz)	Peak Power (dBm/50MHz)	Peak Limit (0 dBm/50 MHz)	Margin (dB)	FM (GHz)	Avg Power (dBm/MHz)	Avg Limit (dBm/MHz)	Margin (dB)
2	5	0	125	Landscape	H	6.4855	-4.28	0	-4.28	6.3445	-43.14	-41.3	-1.84
2	5	1	125	Landscape	H	6.4875	-3.28	0	-3.28	6.3525	-43.12	-41.3	-1.82
2	5	2	125	Landscape	H	6.4865	-7.43	0	-7.43	6.3535	-43.28	-41.3	-1.98
2	5	3	125	Landscape	H	6.4905	-7.24	0	-7.24	6.3565	-43.28	-41.3	-1.98
2	5	4	0	Landscape	H	6.2355	-5.48	0	-5.48	6.4075	-42.73	-41.3	-1.43
2	5	5	0	Landscape	H	6.2465	-3.21	0	-3.21	6.3555	-42.9	-41.3	-1.60
2	9	0	125	Flatbed	V	8.2385	-4.44	0	-4.44	7.8215	-44.26	-41.3	-2.96
2	9	1	125	Flatbed	V	8.2395	-4.09	0	-4.09	7.8215	-44.35	-41.3	-3.05
2	9	2	125	Flatbed	V	7.9855	-8.36	0	-8.36	7.9855	-44.10	-41.3	-2.80
2	9	3	125	Flatbed	V	7.9975	-7.89	0	-7.89	7.8315	-43.89	-41.3	-2.59
2	9	4	0	Flatbed	V	8.2385	-4.64	0	-4.64	7.8205	-44.42	-41.3	-3.12
2	9	5	0	Flatbed	V	8.2395	-2.52	0	-2.52	8.1815	-44.32	-41.3	-3.02
3	5	0	125	Portrait	H	6.4895	-3.26	0	-3.26	6.5235	-42.26	-41.3	-0.96
3	5	1	125	Portrait	H	6.4905	-1.88	0	-1.88	6.5235	-42.58	-41.3	-1.28
3	5	2	125	Portrait	H	6.4905	-6.81	0	-6.81	6.4475	-42.64	-41.3	-1.34
3	5	3	125	Portrait	H	6.4905	-6.56	0	-6.56	6.5275	-42.28	-41.3	-0.98
3	5	4	0	Portrait	H	6.2385	-8.84	0	-8.84	6.4475	-42.34	-41.3	-1.04
3	5	5	0	Portrait	H	6.2435	-7.15	0	-7.15	6.4495	-42.98	-41.3	-1.68
3	9	0	125	Portrait	H	8.1005	-4.50	0	-4.50	8.1055	-42.36	-41.3	-1.06
3	9	1	125	Portrait	H	8.0985	-4.13	0	-4.13	8.0875	-42.88	-41.3	-1.58
3	9	2	125	Portrait	H	8.0975	-8.29	0	-8.29	8.1095	-42.31	-41.3	-1.01
3	9	3	125	Portrait	H	8.0955	-7.95	0	-7.95	8.1045	-42.32	-41.3	-1.02
3	9	4	0	Portrait	H	8.1995	-7.28	0	-7.28	8.1075	-42.41	-41.3	-1.11
3	9	5	0	Portrait	H	8.1995	-5.45	0	-5.45	8.1075	-42.67	-41.3	-1.37

RESULTS





8.2. EMISSIONS BELOW 960 MHz

LIMITS

FCC

§15.519 (c) The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in §15.209. The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

15.209 (a)

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
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

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Section 3.4 Radiated emissions at or below 960 MHz for all subclasses of UWB device shall not exceed the following limits. Measurements of radiated emissions at and below 960 MHz are to be made using a CISPR quasi-peak detector. CISPR measurement bandwidth specifications are to be used.

Frequency (MHz)	Field Strength (Microvolts/m)	Measurement Distance (Metres)	E.i.r.p. (dBmW)
0.009-0.490	2,400/F (F in kHz)	300	$10 \log (17.28 / F^2)$ (F in kHz)
0.490-1.705	24,000/F (F in kHz)	30	$10 \log (17.28 / F^2)$ (F in kHz)
1.705-30	30	30	-45.7
30-88	100	3	-55.2
88-216	150	3	-51.7
216-960	200	3	-49.2

Note: The emission limits for the bands 9-90 kHz and 110-490 kHz are based on measurements employing an average emissions detector.

TEST PROCEDURES

ANSI C63.10 Clause 10.2 and 10.3.

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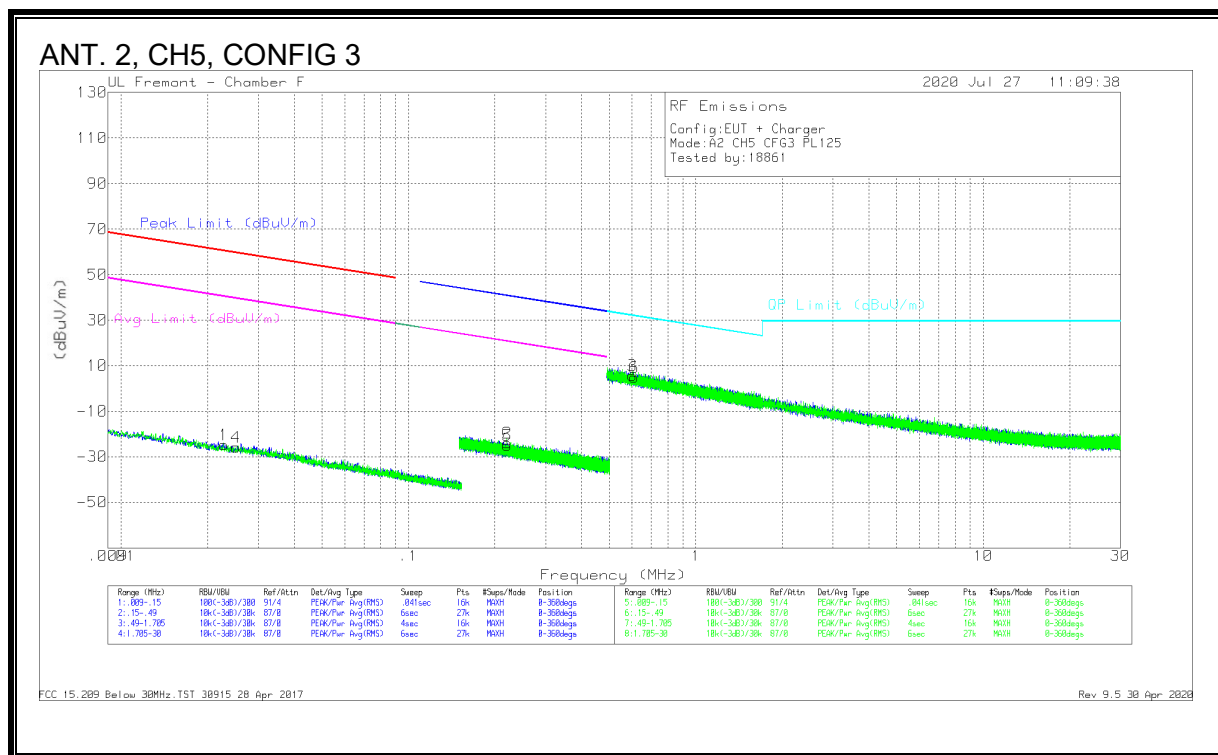
PROCEDURE FOR 9 kHz TO 960 MHz

Measurements are made with the antenna feeding a spectrum analyzer via a preamplifier and cables, at a maximum distance of 3m from the EUT.

A final test is made at any frequencies at which emissions are found. During this final scan, the antenna is kept no further from the EUT than the maximum distance calculated for each band that yields a minimum system noise floor.

RESULTS

8.2.1. EMISSIONS, 9 kHz – 30 MHz



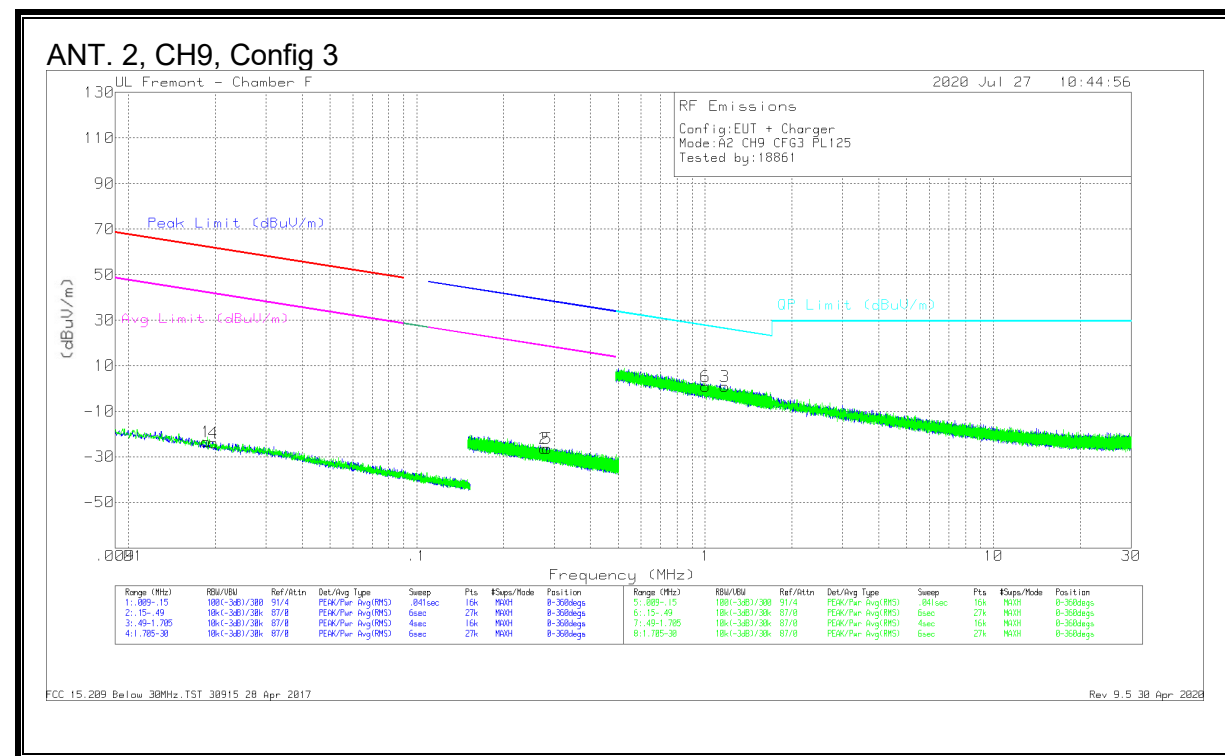
Trace Markers

Marker	Freq. (MHz)	Meter Reading (dBuV/m)	Det	Loop Antenna (dBm)	Cables (dB)	Dist Corr 300m	Corrected Reading (dBuV/m)	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	.02278	40.46	Pk	14.9	0	-80	-24.54	60.43	-85.07	40.43	-65.07	-	-	-	-	0-360
2	.22095	45.03	Pk	11	.1	-80	-23.87	-	-	40.73	-64.6	20.73	-44.6	-	-	0-360
4	.02512	39.43	Pk	14.7	0	-80	-25.57	59.58	-85.45	39.58	-65.45	-	-	-	-	0-360
5	.2211	43.99	Pk	11	.1	-80	-24.91	-	-	-	-	40.72	-65.63	20.72	-45.63	0-360

Pk - Peak detector

Marker	Frequency (MHz)	Meter Reading (dBuV/m)	Det	Loop Antenna (dBm)	Cables (dB)	Dist Corr (dB) 40Log	Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
3	.60187	34.59	Pk	11	.1	-40	5.69	32.02	-26.33	0-360
6	.61137	33.93	Pk	11	.1	-40	5.03	31.88	-26.85	0-360

Pk - Peak detector



Trace Markers

Marker	Freq. (MHz)	Meter Reading (dBuV/m)	Det	Loop Antenna (dBm)	Cables (dB)	Dist Corr 300m	Corrected Reading (dBuV/m)	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	.01859	40.95	Pk	15.6	0	-80	-23.45	62.2	-85.65	42.2	-85.65	-	-	38.76	-65.09	0-360
2	.27697	42.67	Pk	10.9	1	-80	-26.33	-	-	-	-	-	-	-	-	0-360
4	.01976	41.12	Pk	15.1	0	-80	-23.78	61.67	-85.45	41.67	-85.45	-	-	-	-	0-360
5	.28355	42.79	Pk	10.9	1	-80	-26.21	-	-	-	-	-	-	38.56	-64.77	0-360

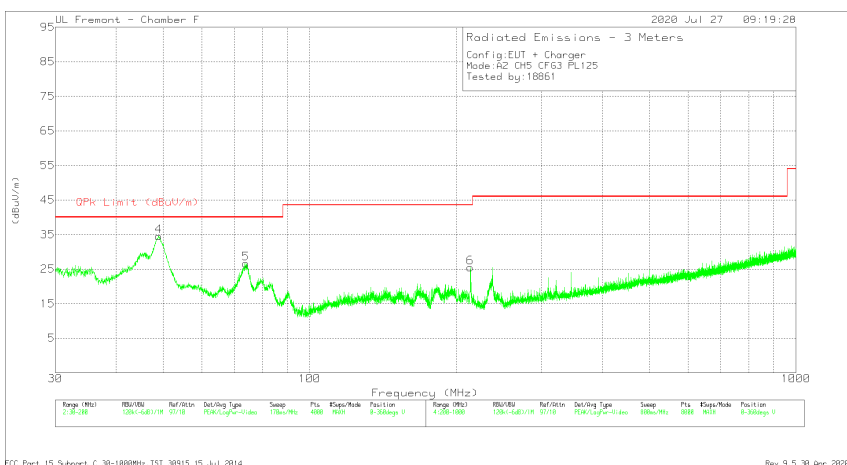
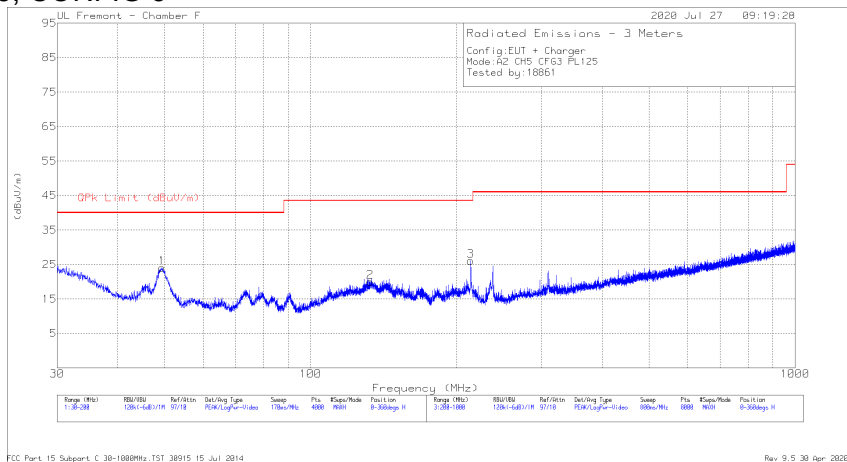
Pk - Peak detector

Marker	Frequency (MHz)	Meter Reading (dBuV/m)	Det	Loop Antenna (dBm)	Cables (dB)	Dist Corr (dB) 40Log	Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
3	1.16936	29.74	Pk	11.2	.1	-40	1.04	26.27	-25.23	0-360
6	1.00384	29.55	Pk	11.2	.1	-40	.85	27.59	-26.74	0-360

Pk - Peak detector

8.2.2. EMISSIONS, 30 – 960 MHz

ANT. 2, CH5, CONFIG 3



Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T243 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	49.385	41.21	Pk	14.6	-31.7	24.11	40	-15.89	0-360	401	H
2	132.7066	30.98	Pk	19.9	-30.9	19.98	43.52	-23.54	0-360	200	H
4	48.9174	51.44	Pk	14.8	-31.7	34.54	40	-5.46	0-360	100	V
5	73.9564	43.82	Pk	14.3	-31.5	26.62	40	-13.38	0-360	100	V
3	214.1018	39.35	Pk	17.1	-30.4	26.05	43.52	-17.47	0-360	201	H
6	214.1018	38.75	Pk	17.1	-30.4	25.45	43.52	-18.07	0-360	99	V

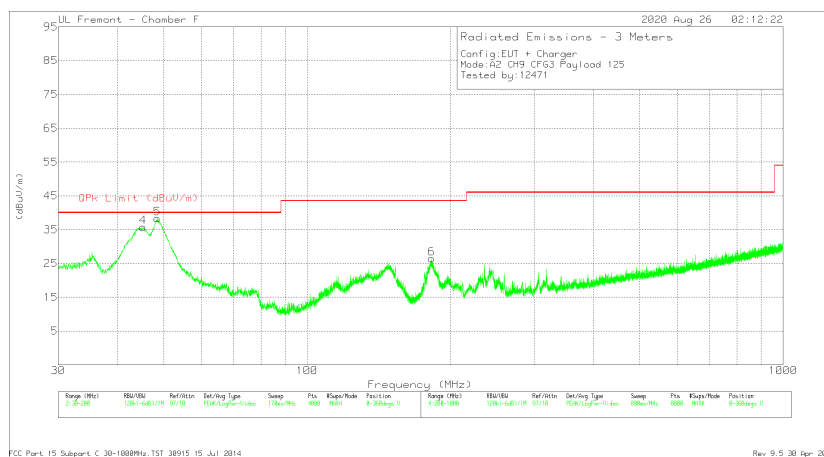
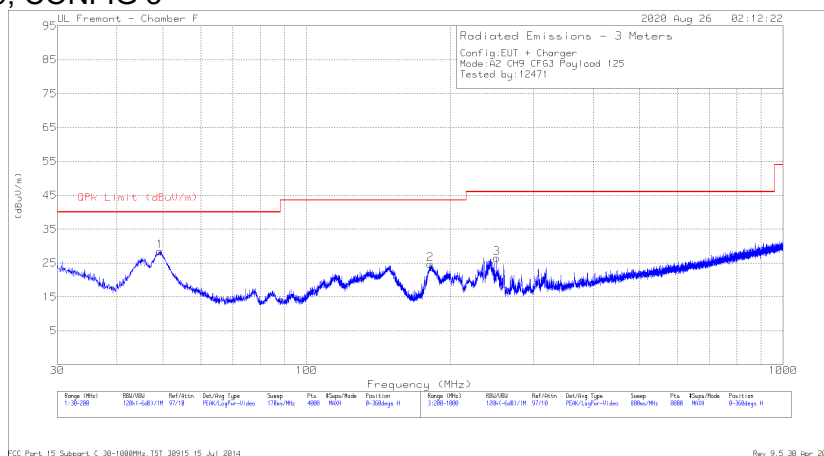
Pk - Peak detector

Radiated Emissions

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T243 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	48.8108	47.72	Qp	14.9	-31.7	30.92	40	-9.08	135	100	V

Qp - Quasi-Peak detector

ANT. 2, CH9, CONFIG 3



Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T243 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	49.215	45.52	Pk	14.7	-31.7	28.52	40	-11.48	0-360	401	H
2	181.8068	37.91	Pk	17.4	-30.6	24.71	43.52	-18.81	0-360	100	H
4	45.2189	50.72	Pk	16.7	-31.7	35.72	40	-4.28	0-360	100	V
5	48.4073	55.07	Pk	15	-31.7	38.37	40	-1.63	0-360	100	V
6	182.4444	39.72	Pk	17.4	-30.6	26.52	43.52	-17	0-360	100	V
3	250.6066	38.66	Pk	18	-30.2	26.46	46.02	-19.56	0-360	100	H

Pk - Peak detector

Radiated Emissions

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T243 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	45.348	47.54	Qp	16.6	-31.7	32.44	40	-7.56	51	101	V
5	48.5297	51.2	Qp	15	-31.7	34.5	40	-5.5	282	102	V

Qp - Quasi-Peak detector

8.3. AVERAGE EMISSIONS ABOVE 960 MHz

LIMITS

FCC

15.519 (c)

Frequency in MHz	EIRP in dBm
960-1610	-75.3
1610-1990	-63.3
1990-3100	-61.3
3100-10600	-41.3
Above 10600	-61.3

§15.519 (d) In addition to the radiated emission limits specified in the table in paragraph (c) of this section, UWB transmitters operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz:

Frequency in MHz	EIRP in dBm
1164-1240	-85.3
1559-1610	-85.3

RSS-220

Section 5.3.1 (d) Radiated emissions above 960 MHz from a device shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz.

Hand-held (Outdoor) Communication, Measurement, Location Sensing, and Tracking Devices	
Frequency	E.i.r.p. in a Resolution Bandwidth of 1 MHz
960-1 610 MHz	-75.3 dBm
1.61-4.75 GHz	-70.0 dBm
4.75-10.6 GHz	-41.3 dBm
Above 10.6 GHz	-61.3 dBm

Section 5.3.1 (e) In addition to the limits specified in paragraph (d) of this section, radiated emissions shall not exceed the following average limits when measured using a resolution bandwidth greater than or equal to 1 kHz. The measurements shall demonstrate compliance with the stated limits at whatever resolution bandwidth is used.

Frequency	E.i.r.p. in a Resolution Bandwidth of no less than 1 kHz
1 164-1 240 MHz	-85.3 dBm
1 559-1 610 MHz	-85.3 dBm

TEST PROCEDURES

ANSI C63.10 Clause 10.2 and 10.3.

RSS-220 Annex

PROCEDURE FOR 0.96 TO 6 GHz

Measurements are made with the antenna feeding a spectrum analyzer via a preamplifier and cables, at a maximum distance of 0.5m from the EUT.

A low pass filter with a cut off frequency of 6 GHz is used to suppress the fundamental and perform measurement for 0.96 - 6 GHz.

RESULTS FOR 6 GHz TO 9 GHz

The 6 - 9 GHz frequency band is covered in Section 8.2.

PROCEDURE FOR 9 GHz TO 18 GHz

Measurements are made with the antenna feeding a spectrum analyzer via a preamplifier and cables, at a maximum distance of 0.5m from the EUT.

A high pass filter with pass band frequency beyond 9 GHz is used to suppress the fundamental and perform measurement for 9 - 18 GHz.

PROCEDURE FOR 1.164 TO 1.240 GHz

Measurements are made with the antenna feeding a spectrum analyzer via a preamplifier and cables, at a maximum distance of 0.5m from the EUT.

RBW = 120 kHz & VBW = 360 kHz were used at pre-scan.

A low pass filter with a cut off frequency of 6 GHz is used to suppress the fundamental and perform measurement for 1.164 – 1.240 GHz.

PROCEDURE FOR 1.559 TO 1.610 GHz

Measurements are made with the antenna feeding a spectrum analyzer via a preamplifier and cables, at a maximum distance of 0.5m from the EUT.

RBW = 120 kHz & VBW = 360 kHz were used at pre-scan.

A low pass filter with a cut off frequency of 6 GHz is used to suppress the fundamental and perform measurement for 1.559 – 1.610 GHz.

PROCEDURE FOR 18 GHz TO 40 GHz

Measurements are made with the antenna feeding a spectrum analyzer via a preamplifier and cables, at a maximum distance of 0.5m from the EUT.

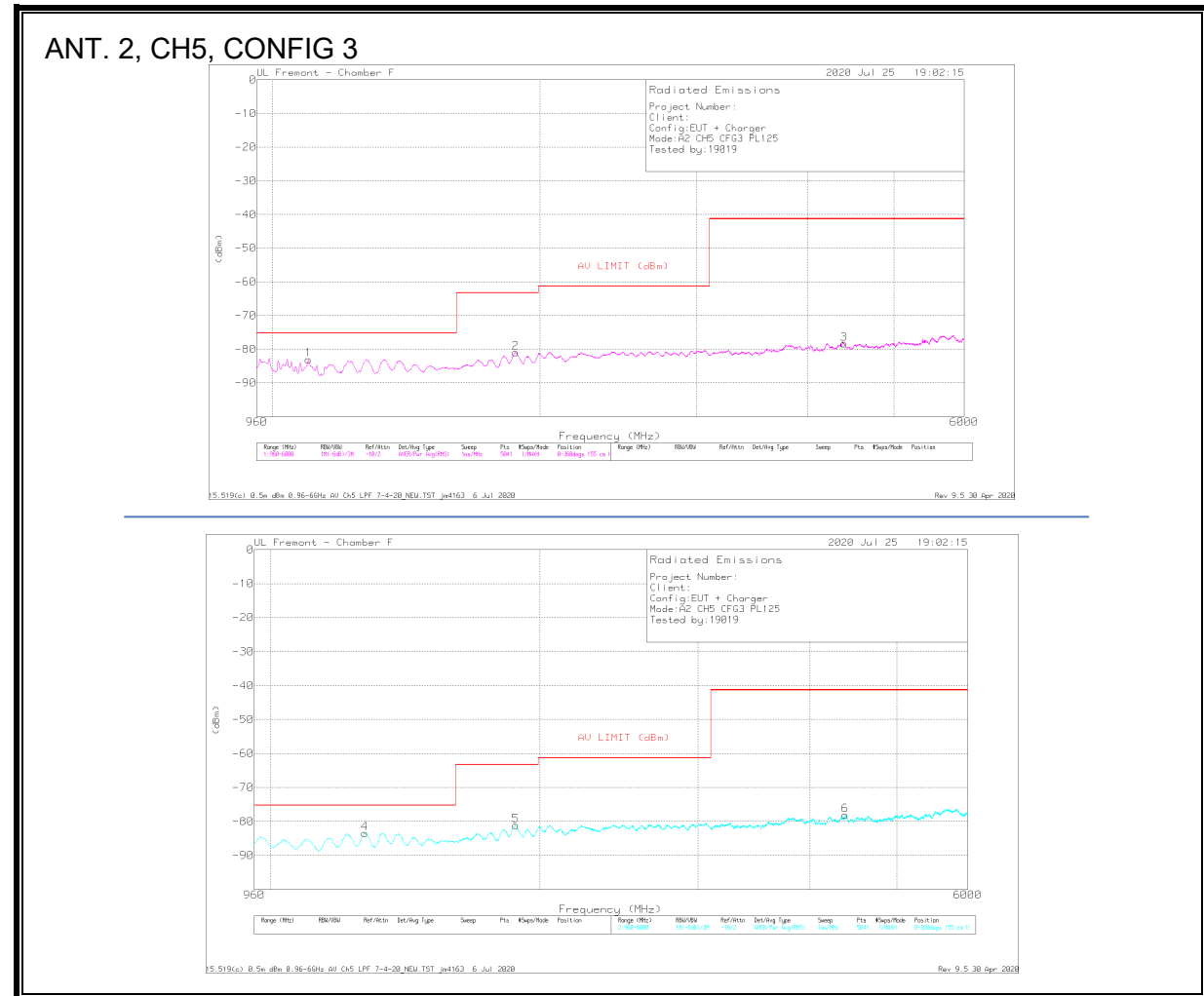
A final test is made at any frequencies at which emissions are found. During this final scan, the antenna is kept no further from the EUT than the maximum distance calculated for each band that yields a minimum system noise floor.

Distance Correction Factor from 3m to 0.5m = $20 \cdot \log(0.5\text{m}/3\text{m}) = -15.56 \text{ dB}$

RESULTS

8.3.1. AVERAGE EMISSIONS, 0.96 – 6 GHz

8.3.1.1. FCC15.519 (C)



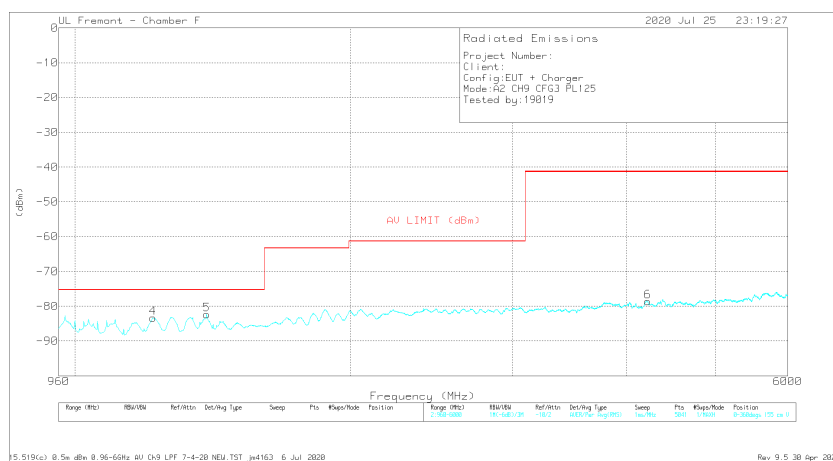
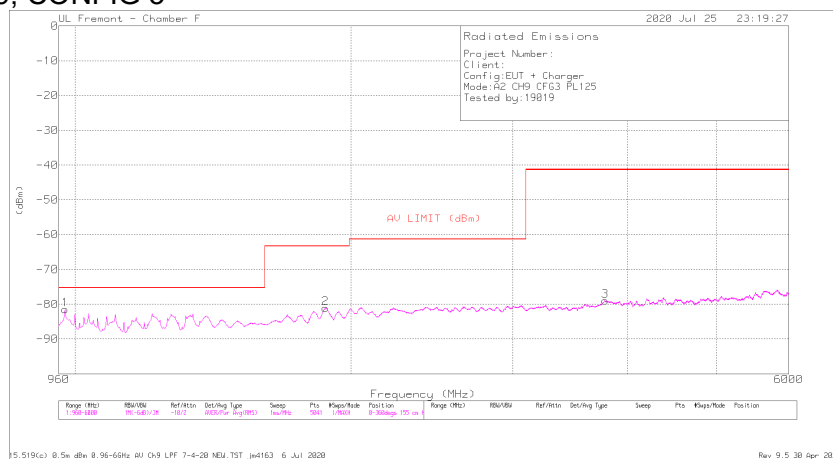
Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBm)	Det	AF T345 (dBm)	Amp/Cbl (dB)	Dist Correction (dB)	Conversion Factor (dB)	CH5_LPF (dB)	EIRP (dBm)	FCC15.519(c) EIRP RMS (dBm)	Margin (dB)	Azimuth (Degree)	Height (cm)	Polarity
1	1098	-61.43	RMS	27.5	-45.5	-15.6	11.8	.2	-83.03	-75.3	-7.73	360	155	H
2	1878	-63.17	RMS	30.7	-45	-15.6	11.8	.3	-80.97	-63.3	-17.67	53	155	H
3	4394	-65.17	RMS	33.9	-43.7	-15.6	11.8	.4	-78.37	-41.3	-37.07	360	155	H
4	1276	-63.51	RMS	29.1	-45.3	-15.6	11.8	.1	-83.41	-75.3	-8.11	360	155	V
5	1880	-63.18	RMS	30.6	-45	-15.6	11.8	.3	-81.08	-63.3	-17.78	360	155	V
6	4381	-65.3	RMS	33.9	-43.2	-15.6	11.8	.3	-78.1	-41.3	-36.8	360	155	V

RMS - RMS detection

*Note: Test was performed with a low-pass filter with cutoff frequency at 6 GHz to suppress CH5 fundamental signal.

ANT. 2, CH9, CONFIG 3



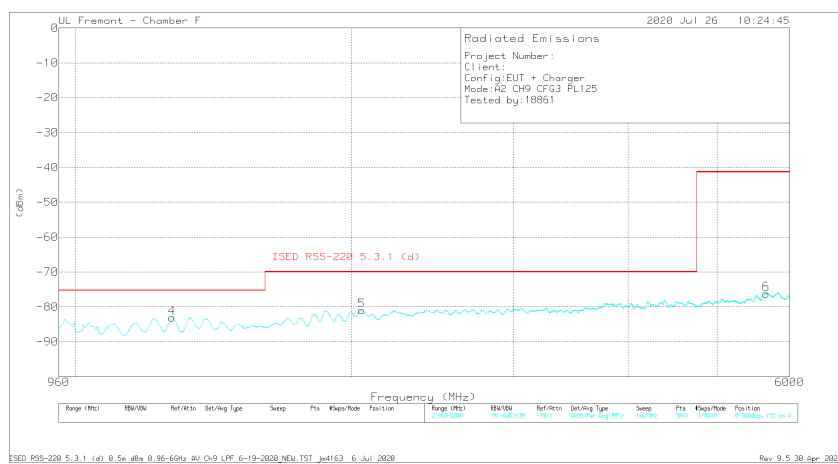
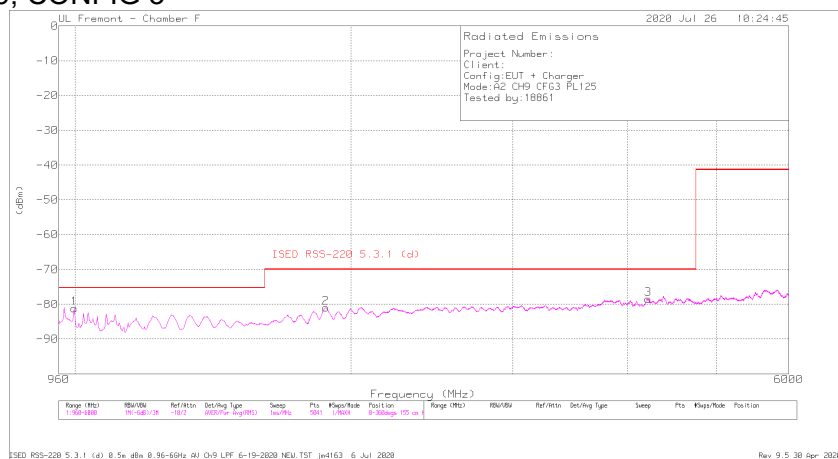
Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBm)	Det	AF T345 (dBm)	Amp/Cbl (dB)	Dist Correction (dB)	Conversion Factor (dB)	CH9_LFF (dB)	EIRP (dBm)	FCC15.519(c) EIRP RMS (dBm)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	976	-60.55	RMS	27.8	-45.1	-15.6	11.8	.2	-81.45	-75.3	-6.15	96	155	H
2	1876	-63.37	RMS	30.8	-45	-15.6	11.8	.3	-81.07	-63.3	-17.77	53	155	H
3	3784	-66.04	RMS	33.6	-43.2	-15.6	11.8	.5	-78.94	-41.3	-37.64	339	155	H
4	1217	-63.08	RMS	28.5	-45.2	-15.6	11.8	.2	-83.38	-75.3	-8.08	132	155	V
5	1393	-62.13	RMS	28.7	-45.2	-15.6	11.8	.1	-82.33	-75.3	-7.03	110	155	V
6	4222	-65.27	RMS	33.7	-43.8	-15.6	11.8	.6	-78.57	-41.3	-37.27	22	155	V

RMS - RMS detection

*Note: Test was performed with a low-pass filter with cutoff frequency at 6 GHz to suppress CH9 fundamental signal.

ANT. 2, CH9, CONFIG 3



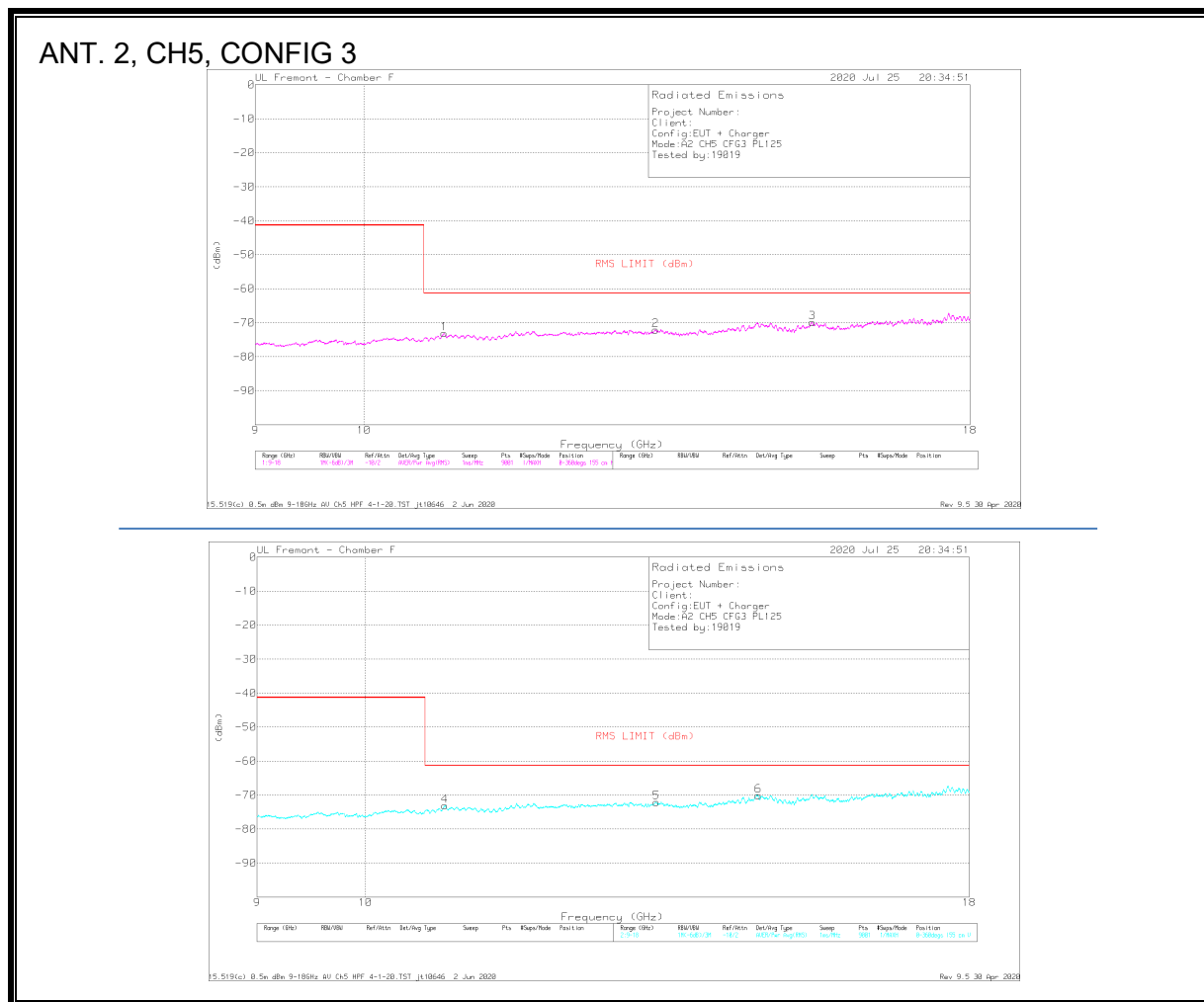
Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBm)	Det	AF T345 (dBm)	Amp/Cbl (dB)	Dist Correction (dB)	Conversion Factor (dB)	CH9_LPF (dB)	Corrected Reading (dBm)	ISED RSS-228 5.3.1 (d)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	998	-60.26	RMS	27.8	-45.1	-15.6	11.8	.2	-81.16	-75.3	-5.86	220	155	H
2	1877	-63.23	RMS	30.8	-45	-15.6	11.8	.3	-80.93	-70	-10.93	87	155	H
3	4216	-65.11	RMS	33.6	-43.8	-15.6	11.8	.6	-78.51	-70	-8.51	242	155	H
4	1276	-63.2	RMS	29.1	-45.3	-15.6	11.8	.1	-83.1	-75.3	-7.8	185	155	V
5	2053	-63.52	RMS	31.3	-45.4	-15.6	11.8	.4	-81.02	-70	-11.02	185	155	V
6	5659	-67.58	RMS	35	-41.7	-15.6	11.8	1.9	-76.18	-41.3	-34.88	360	155	V

RMS - RMS detection

*Note: Test was performed with a low-pass filter with cutoff frequency at 6 GHz to suppress CH9 fundamental signal.

8.3.2. AVERAGE EMISSIONS, 9 – 18 GHz



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T119 (dBm)	Amp/Cbl (dB)	Dist Correction (dB)	Conversion Factor (dB)	CH5_HP (dB)	EIRP (dBm)	FCC15.519(c) EIRP RMS (dBm)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	10.8095	-70.78	RMS	37.9	-37.1	-15.6	11.8	.6	-73.18	-61.3	-11.88	153	155	H
2	13.273	-70.97	RMS	39	-36.9	-15.6	11.8	.6	-72.07	-61.3	-10.77	1	155	H
3	15.449	-69.95	RMS	40.3	-37	-15.6	11.8	.6	-69.85	-61.3	-8.55	88	155	H
4	10.807	-70.79	RMS	37.9	-37	-15.6	11.8	.6	-73.09	-61.3	-11.79	207	155	V
5	13.277	-71.15	RMS	39	-36.8	-15.6	11.8	.6	-72.15	-61.3	-10.85	339	155	V
6	14.659	-70.77	RMS	40.2	-36.5	-15.6	11.8	.7	-70.17	-61.3	-8.87	207	155	V

RMS - RMS detection

*Note: Test was performed with a high-pass filter with pass-band frequency starting at 9 GHz to suppress CH5 fundamental signal.



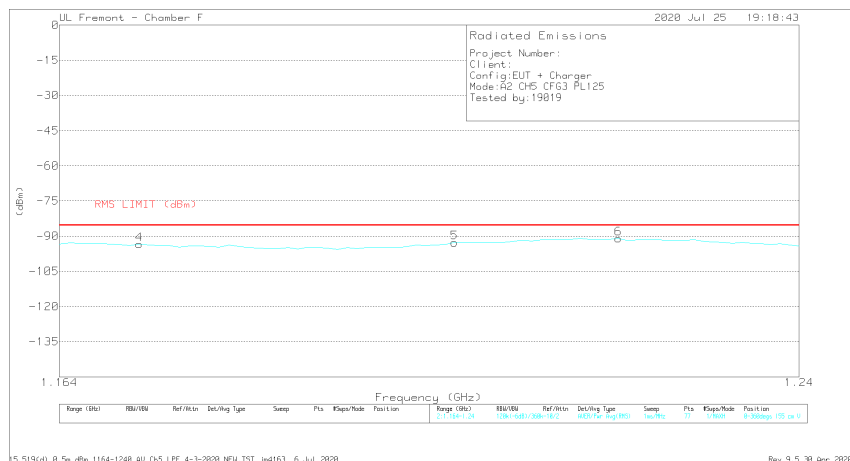
Marker	Frequency (GHz)	Measuring Reading (dBm)	Det	AF T119 (dBm)	Amp/Cbl (dB)	Dist Correction (dB)	Conversion Factor (dB)	C149_HPF (dB)	EIRP (dBm)	FCC15519(c) EIRP RMS (dBm)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	10.137	-69.25	RMS	37	-38.8	-15.6	11.8	0	-74.85	-41.3	-33.55	242	155	H
2	10.89	-69.62	RMS	37.8	-39	-15.6	11.8	0	-74.62	-61.3	-12.32	1	155	H
3	14.838	-70.52	RMS	40	-36.4	-15.6	11.8	8	-69.92	-61.3	-8.62	220	155	H
4	10.877	-69.68	RMS	37.8	-37.7	-15.6	11.8	0	-73.38	-61.3	-12.08	74	155	V
5	11.806	-71.39	RMS	38.9	-37.8	-15.6	11.8	6	-73.49	-61.3	-12.19	163	155	V
6	14.838	-70.77	RMS	40	-36.4	-15.6	11.8	8	-70.17	-61.3	-8.87	74	155	V

RMS - RMS detection

*Note: Test was performed with a high-pass filter with pass-band frequency starting at 9 GHz to suppress CH9 fundamental signal.

8.3.3. AVERAGE EMISSIONS, 1.164 – 1.240 GHz

ANT. 2, CH5, CONFIG 3



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T119 (dBm)	Amp/Cbl (dB)	Dist Correction (dB)	Conversion Factor (dB)	CH5 LP Filter	EIRP (dBm)	FCC E19(d) EIRP RMS (dBm)	Margin (dB)	Altitude (Dega)	Height (cm)	Polarity
1	1.168	-71.93	RMS	28.6	-45.4	-15.6	11.8	.1	-92.43	-85.3	-7.13	110	155	H
2	1.194	-74.22	RMS	29.3	-45.1	-15.6	11.8	.1	-93.72	-85.3	-8.42	110	155	H
3	1.216	-72.18	RMS	29.9	-45.2	-15.6	11.8	.2	-91.08	-85.3	-5.78	264	155	H
4	1.172	-72.93	RMS	28.8	-45.4	-15.6	11.8	.1	-93.43	-85.3	-8.13	251	155	V
5	1.204	-73.46	RMS	29.6	-45.2	-15.6	11.8	.1	-92.76	-85.3	-7.46	97	155	V
6	1.221	-71.93	RMS	29.9	-45.3	-15.6	11.8	.2	-90.93	-85.3	-5.63	141	155	V

RMS - RMS detection

*Note: Test was performed with a low-pass filter with cutoff frequency at 6 GHz to suppress CH5 fundamental signal.

ANT. 2, CH9, CONFIG 3



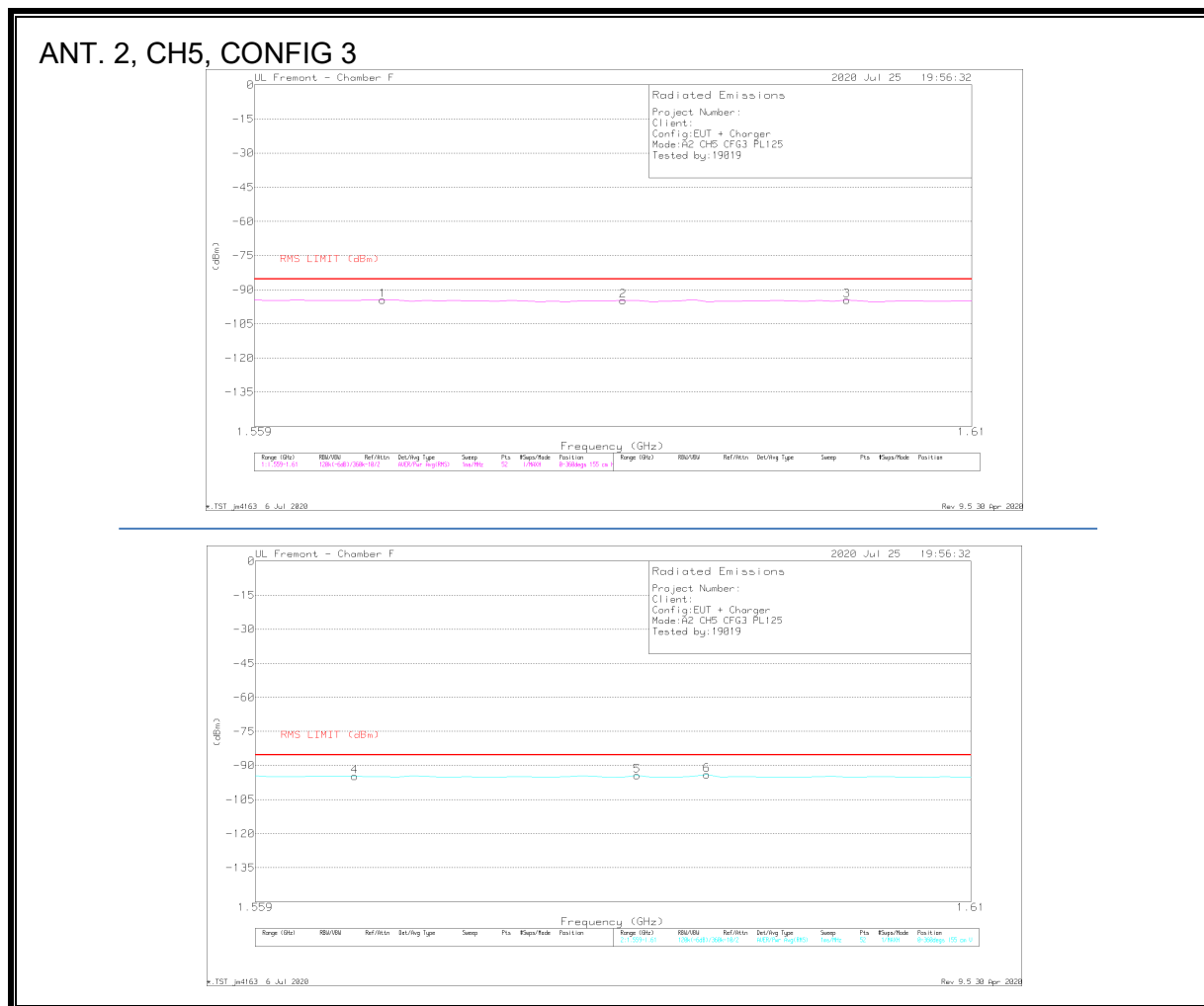
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T119 (dBm)	Amp/Cbl (dB)	Dist Correction (dB)	Conversion Factor (dB)	CH9 LP Filter	EIRP (dBm)	FCC15.519(d) ERP RMS (dBm)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.168	-72.75	RMS	28.6	-45.4	-15.6	11.8	.1	-93.25	-85.3	-7.95	44	155	H
2	1.19	-74.6	RMS	29.1	-45.2	-15.6	11.8	.1	-94.4	-85.3	-9.1	132	155	H
3	1.214	-71.73	RMS	29.8	-45.2	-15.6	11.8	.2	-90.73	-85.3	-5.43	88	155	H
4	1.174	-73.41	RMS	28.6	-45.4	-15.6	11.8	.1	-93.91	-85.3	-8.61	97	155	V
5	1.204	-73.68	RMS	29.6	-45.2	-15.6	11.8	.1	-92.98	-85.3	-7.68	119	155	V
6	1.221	-71.84	RMS	29.9	-45.3	-15.6	11.8	.2	-90.84	-85.3	-5.54	74	155	V

RMS - RMS detection

*Note: Test was performed with a low-pass filter with cutoff frequency at 6 GHz to suppress CH9 fundamental signal.

8.3.4. AVERAGE EMISSIONS, 1.559 – 1.610 GHz



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T119 (dBm)	Amp/Cbl (dB)	Dist Correction (dB)	Conversion Factor (dB)	CH5 LP Filter	EIRP (dBm)	FCC15.519(d) EIRP RMS (dBm)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.558	-73.67	RMS	27.9	-45.2	-15.6	11.8	.2	-94.57	-85.3	-9.27	30	155	H
2	1.585	-73.86	RMS	27.9	-45.2	-15.6	11.8	.2	-94.76	-85.3	-9.46	119	155	H
3	1.601	-73.63	RMS	28	-45.3	-15.6	11.8	.2	-94.53	-85.3	-9.23	162	155	H
4	1.566	-73.78	RMS	27.9	-45.2	-15.6	11.8	.2	-94.88	-85.3	-9.38	21	155	V
5	1.586	-73.49	RMS	28	-45.2	-15.6	11.8	.2	-94.29	-85.3	-8.99	220	155	V
6	1.591	-73.26	RMS	28	-45.3	-15.6	11.8	.3	-94.06	-85.3	-8.76	176	155	V

RMS - RMS detection

*Note: Test was performed with a low-pass filter with cutoff frequency at 6 GHz to suppress CH5 fundamental signal.

ANT. 2, CH9, CONFIG 3



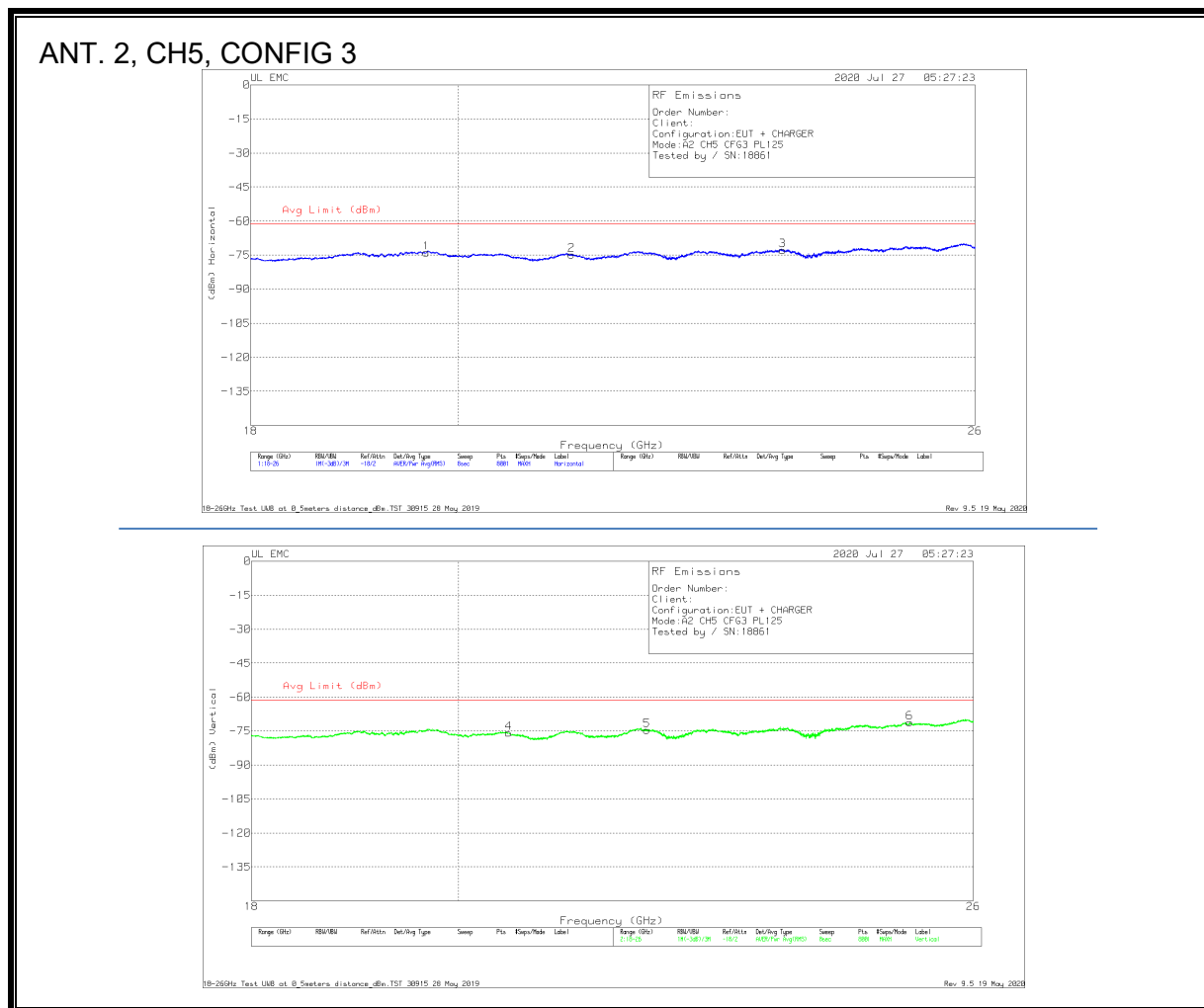
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T119 (dBm)	Amp/Cbl (dB)	Dist Correction (dB)	Conversion Factor (dB)	CH9 LP Filter	EIRP (dBm)	FCC15.519(d) ERP RMS (dBm)	Margin (dB)	Altitude (Meters)	Height (cm)	Polarity
1	1.566	-73.58	RMS	27.9	-45.2	-15.6	11.8	.2	-94.48	-85.3	-9.18	31	155	H
2	1.582	-73.68	RMS	27.9	-45.2	-15.6	11.8	.2	-94.58	-85.3	-9.28	339	155	H
3	1.596	-73.97	RMS	28	-45.2	-15.6	11.8	.3	-94.67	-85.3	-9.37	75	155	H
4	1.565	-73.7	RMS	27.9	-45.2	-15.6	11.8	.2	-94.6	-85.3	-9.3	88	155	V
5	1.583	-74.05	RMS	27.9	-45.2	-15.6	11.8	.2	-94.95	-85.3	-9.65	264	155	V
6	1.597	-74.11	RMS	28	-45.2	-15.6	11.8	.3	-94.81	-85.3	-9.51	1	155	V

RMS - RMS detection

*Note: Test was performed with a low-pass filter with cutoff frequency at 6 GHz to suppress CH9 fundamental signal.

8.3.5. AVERAGE EMISSIONS, 18 – 26 GHz

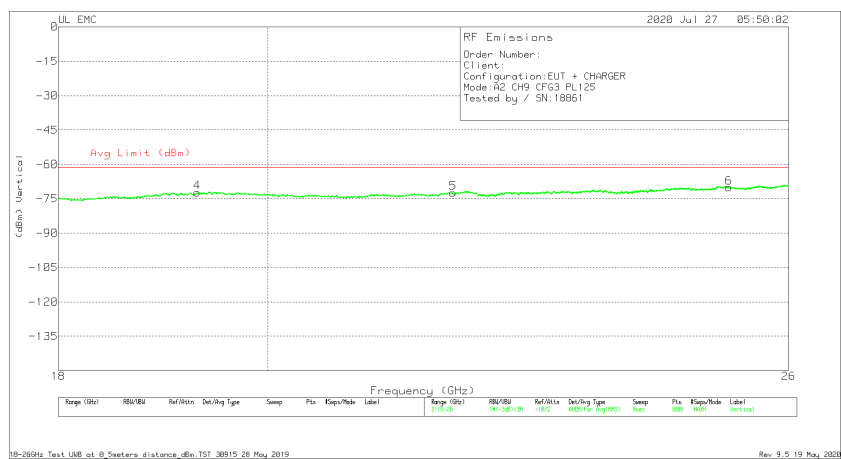
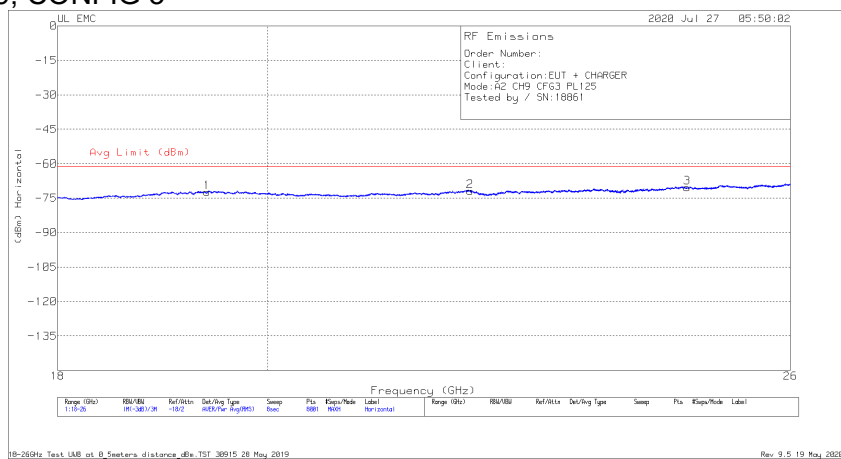


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	PRE0079280 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Conversion Factor (dB)	EIRP (dBm)	Avg Limit (dBm)	Margin (dB)
1	19.6785	-82.45	RMS	32.7	-20.3	-15.6	11.8	-73.85	-61.3	-12.55
2	21.182	-82.89	RMS	33	-21.1	-15.6	11.8	-74.79	-61.3	-13.49
3	23.579	-82.94	RMS	33.8	-19.9	-15.6	11.8	-72.84	-61.3	-11.54
4	20.519	-83.93	RMS	33.1	-21.2	-15.6	11.8	-75.83	-61.3	-14.53
5	22.017	-83.91	RMS	33.4	-20.3	-15.6	11.8	-74.61	-61.3	-13.31
6	25.169	-82.31	RMS	34.2	-19.3	-15.6	11.8	-71.21	-61.3	-9.91

RMS - RMS detection

ANT. 2, CH9, CONFIG 3

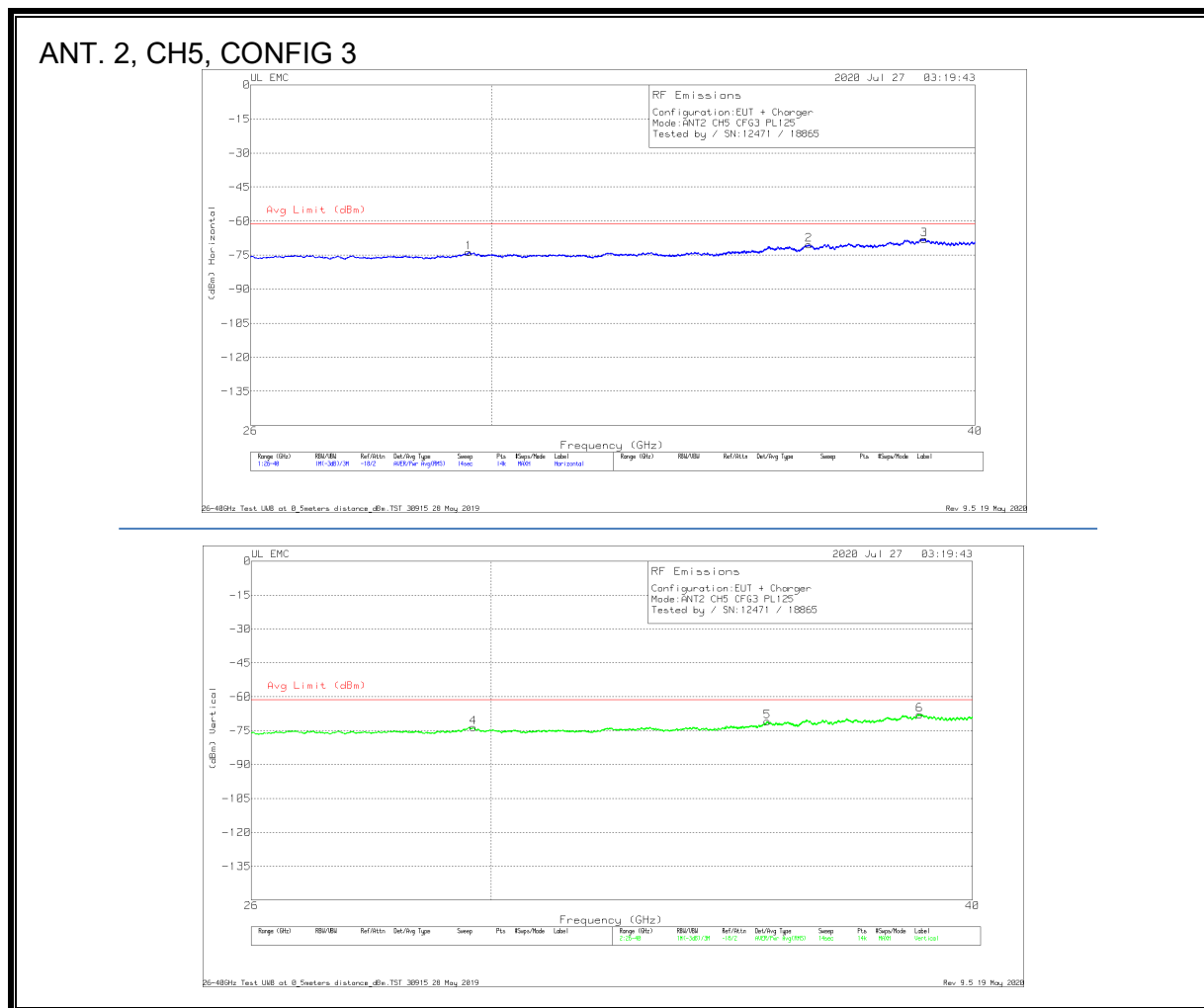


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	PRE0079280 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Conversion Factor (dB)	EIRP (dBm)	Avg Limit (dBm)	Margin (dB)
1	19.402	-82.14	RMS	32.6	-19	-15.6	11.8	-72.34	-61.3	-11.04
2	22.139	-81.29	RMS	33.4	-20.2	-15.6	11.8	-71.89	-61.3	-10.59
3	24.685	-81.65	RMS	34.1	-19	-15.6	11.8	-70.35	-61.3	-9.05
4	19.304	-82.04	RMS	32.7	-19.1	-15.6	11.8	-72.24	-61.3	-10.94
5	21.957	-81.4	RMS	33.4	-20.6	-15.6	11.8	-72.4	-61.3	-11.1
6	25.228	-80.76	RMS	34.2	-19.7	-15.6	11.8	-70.06	-61.3	-8.76

RMS - RMS detection

8.3.6. AVERAGE EMISSIONS, 26 – 40 GHz

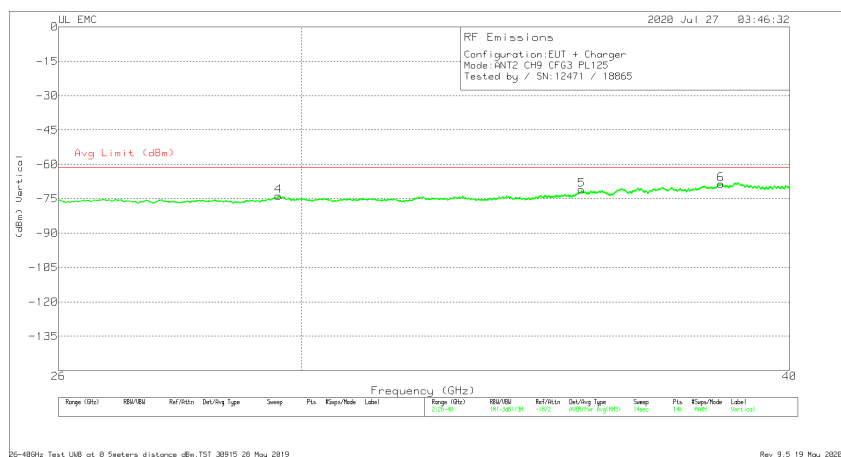
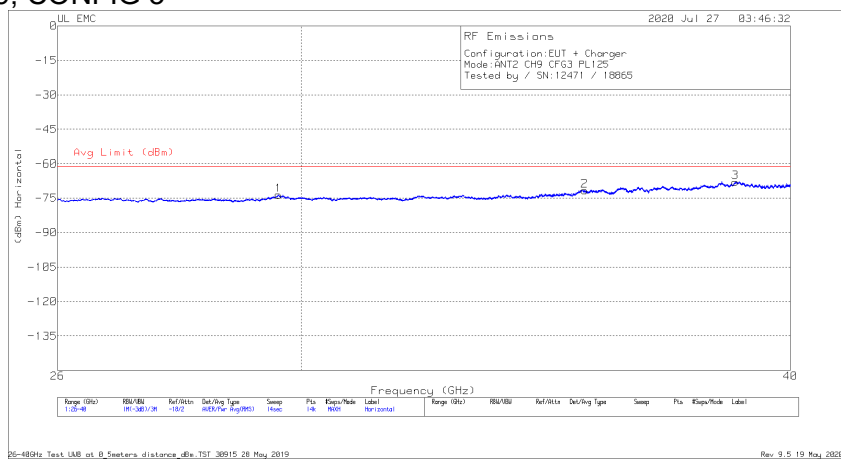


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	PRE0182203 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Conversion Factor (dB)	EIRP (dBm)	Avg Limit (dBm)	Margin (dB)
1	29.598	-80.02	RMS	37.2	-27.1	-15.6	11.8	-73.72	-61.3	-12.42
2	36.234	-78.19	RMS	37.6	-26	-15.6	11.8	-70.39	-61.3	-9.09
3	38.808	-77.46	RMS	38.3	-25	-15.6	11.8	-67.96	-61.3	-6.66
4	29.685	-79.9	RMS	37.5	-27.3	-15.6	11.8	-73.5	-61.3	-12.2
5	35.384	-78.56	RMS	37.7	-26.2	-15.6	11.8	-70.86	-61.3	-9.56
6	38.755	-77.3	RMS	38.2	-25	-15.6	11.8	-67.9	-61.3	-6.6

RMS - RMS detection

ANT. 2, CH9, CONFIG 3



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	PRE0182203 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Conversion Factor (dB)	EIRP (dBm)	Avg Limit (dBm)	Margin (dB)
1	29.602	-80.03	RMS	37.3	-27.1	-15.6	11.8	-73.63	-61.3	-12.33
2	35.444	-79.02	RMS	37.7	-26.5	-15.6	11.8	-71.62	-61.3	-10.32
3	38.723	-77.76	RMS	38.2	-24.6	-15.6	11.8	-67.96	-61.3	-6.66
4	29.598	-79.95	RMS	37.2	-27.1	-15.6	11.8	-73.65	-61.3	-12.35
5	35.381	-78.62	RMS	37.7	-26.3	-15.6	11.8	-71.02	-61.3	-9.72
6	38.412	-77.95	RMS	38.3	-25.1	-15.6	11.8	-68.55	-61.3	-7.25

RMS - RMS detection

9. SETUP PHOTOS

Please refer to 13179110-EP21V1 for setup photos.

Appendix A – Reference Test Report

Attached is the test report (13179110-E21) containing the reference data from the parent model as detailed in Section 5.3.

END OF REPORT



FCC CFR 47 PART 15 SUBPART F §15.519

ISED RSS-220 ISSUE 1 AMENDMENT 1

CERTIFICATION TEST REPORT

FOR

SMART PHONE

MODEL NUMBER: A2176

REPORT NUMBER: 13179110-E21V1

ISSUE DATE: SEPTEMBER 25, 2020

FCC ID: BCG-E3539A

IC: 579C-E3539A

Prepared for

**APPLE INC.
ONE APPLE PARK WAY
CUPERTINO, CA 95014, U.S.A.**

Prepared by

**UL VERIFICATION SERVICES INC.
47173 BENICIA STREET
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NVLAP LAB CODE 200065-0 (FREMONT)

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	09/25/2020	Initial Issue	Thu Chan

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: APPLE INC.
ONE APPLE PARK WAY
CUPERTINO, CA 95014, USA

EUT DESCRIPTION: SMART PHONE

MODEL: A2176

SERIAL NUMBERS: C7CD609T08HK
C7CCT01HQ91K
C7CD606R08GF

DATE TESTED: JUNE 24 – SEPTEMBER 13, 2020

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC §15 Subpart F	Complies
ISED RSS-220 Issue 1 Amendment 1	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.

This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of the U.S. government.

Approved & Released For
UL Verification Services Inc. By:

Tested By:



THU CHAN
STAFF ENGINEER
UL Verification Services Inc.



GIA-PIAO CHIN
TEST ENGINEER
UL Verification Services Inc.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with CFR Title 47 Part 15 Subpart F, KDB 393764 D01 UWB FAQ v02, ISED RSS-220 Issue 1 Amendment 1 and ANSI C63.10-2013 and RSS GEN Issue 5.

3. FACILITIES AND ACCREDITATION

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

47173 Benicia Street ISED 2324A	47266 Benicia Street ISED 22541	47658 Kato Rd ISED 2324B
☐ 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 and covered under ISED Canada company numbers 2324A, 2324B and 22541 as listed in the table.

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

4. DECISION RULES AND MEASUREMENT UNCERTAINTY

4.1. METROLOGICAL TRACEABILITY

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, with a maximum time between calibrations of one year or the manufacturers' recommendation, whichever is less, and where applicable is traceable to recognized national standards.

4.2. DECISION RULES

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.)

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	U _{LAB}
Worst Case Conducted Disturbance, 9KHz to 0.15 MHz	3.39 dB
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.07 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%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a smartphone with multimedia functions (music, application support, and video), cellular GSM, GPRS, EGPRS, UMTS, LTE, 5G, CDMA, IEEE 802.11a/b/g/n/ac/ax, Bluetooth, Ultra-Wideband, GPS, NFC and WPT. All models support at least one UICC based SIM. The second SIM is either an UICC based p-SIM (physical SIM) or e-SIM (electronic SIM). The device supports a built-in inductive charging transmitter and receiver. The rechargeable battery is not user accessible.

This test report addresses the UWB operational mode.

The EUT has a UWB transceiver with four integral antennas (UWB0, UWB1, ANT 2 = ANT6/UWB2 & ANT 3 = UWB3) and operates on 6.5 GHz (Channel 5) and 8 GHz (Channel 9). The antennas are not user accessible. UWB0 and UWB1 are disable on device. Six signal configurations (CONFIG 0,1,2,3,4 & 5) are available for each ANT/CH setting.

ANT	CH	CONFIG
2	5	0
2	5	1
2	5	2
2	5	3
2	5	4
2	5	5
2	9	0
2	9	1
2	9	2
2	9	3
2	9	4
2	9	5
3	5	0
3	5	1
3	5	2
3	5	3
3	5	4
3	5	5
3	9	0
3	9	1
3	9	2
3	9	3
3	9	4
3	9	5

5.2. MAXIMUM OUTPUT POWER

Highest Average Powers based on ANT/CH.

ANT	CH	CONFIG	Average Power (dBm EIRP)
2	5	4	-42.04
2	9	3	-42.00
3	5	1	-42.04
3	9	4	-42.12

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

Two integral antennas are employed and the antenna gains are listed as follow:

CH	Freq. Band (GHz)	Gain (dBi)	
		ANT 2 (ANT6/UWB2)	ANT 3 (UWB3)
5	6.5	-3.0	-4.6
9	8.0	-2.9	0.8

5.4. MODULATION

The UWB signal is BPSK pulsed modulated signal.

5.5. SOFTWARE AND FIRMWARE

The Software and Firmware version used at test is 18A33310I.

6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

SUPPORT EQUIPMENT LIST			
Description	Manufacturer	Model	Serial Number
Laptop + Adapter	Apple	Mac Book Air	C02TK02YJ10C
Kanzi – USB Adapter	Apple	--	325D59
Laptop + Adapter	Apple	Mac Book Air	C02YL5TNJHC8
Kanzi – USB Adapter	Apple	--	316FAS
Smart Phone	Apple	A2176	G6TD609K06PR

I/O CABLES

I/O CABLES					
Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
AC	1	AC	Un-shielded	2	N/A
USB	1	USB	Un-shielded	1	N/A

TEST SETUP

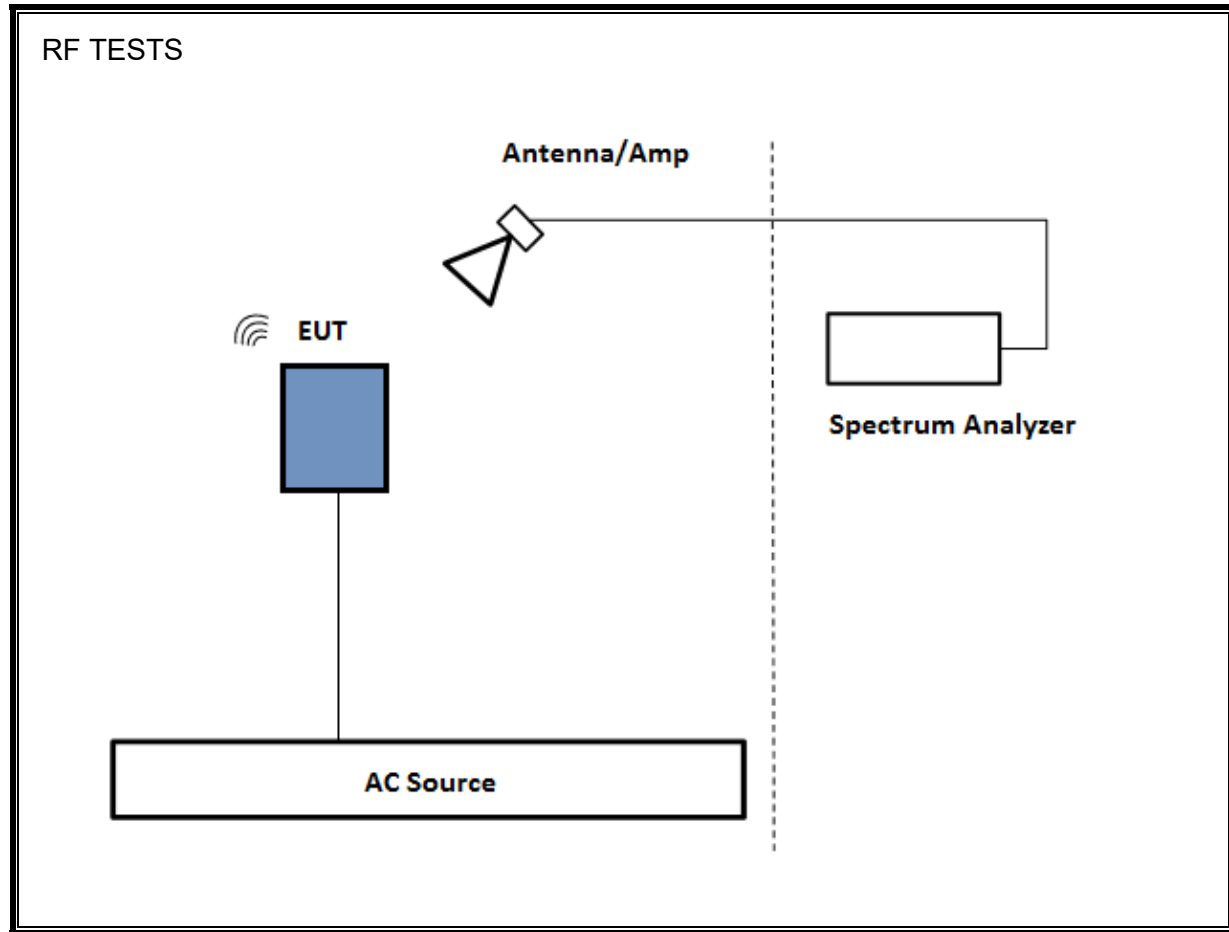
The EUT was examined at pre-scan test using a fundamental frequency in the portrait (z), landscape (y), and flatbed (x) position and the worst case orientation of individual ANT/CH/CONFIG setting was determined for final spurious emission measurement. Config 3, Payload 125 of both CH5 and CH9 on 2 antennas were selected to test for unwanted emissions as the worst case after pre-scan.

Measurements of spurious average emissions were made with the device operating at a higher power than production power to ensure compliance. Measurements of the in-band signal (peak and average emissions, 10 dBc bandwidth, 99% bandwidth) were all made at the production power settings.

EUT was connected to AC power adapter in all test cases.

For simultaneous transmission of multiple channels in the UWB, LTE, Sub-6 GHz 5G FR1 band, 2.4 GHz WiFi & 5 GHz WiFi bands, 28 GHz & 39 GHz 5G FR2 bands, no noticeable new emission was found.

SETUP DIAGRAM FOR TESTS



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	Local ID	Cal Date	Cal Due
EMI Test Receiver	Rohde & Schwarz	ESW44	PRE0203383	2/18/2020	2/18/2021
Horn Antenna, 1-18 GHz	ETS Lindgren	3117	T119	4/21/2020	4/21/2021
Horn Antenna, 1-18 GHz	ETS Lindgren	3117	T345	5/19/2020	5/19/2021
Preamp, 1-18 GHz	Miteq	AFS42-00101800-25-S-42	PRE0183207	6/11/2020	6/11/2021
PXA Signal Analyzer	Agilent	N9030A	T342	1/24/2020	1/24/2021
Hybrid Antenna, 30-2000 MHz	SunAR	JB1	T243	4/15/2020	4/15/2021
Preamp, 0.1-1300 MHz	Sonoma Inst.	310	T173	7/22/2020	7/22/2021
Horn Antenna, 1-18 GHz	ETS Lindgren	3117	T711	2/12/2020	2/12/2021
Preamp, 1-18 GHz	Miteq	AFS42-00101800-25-S-42	PRE0183530	8/31/2019	8/31/2020
EMI Test Receiver	Rohde & Schwarz	ESW44	PRE0203384	2/18/2020	2/18/2021
Antenna, Active Loop 9kHz-30MHz	ETS Lindgren	6502	T1616	10/18/2019	10/18/2020
Spectrum Analyzer, 44GHz	Keysight	N9030A	T905	1/27/2020	1/27/2021
Preamplifier, 1-26.5GHz	Agilent	8449B	T404	4/8/2020	4/8/2021
Horn Antenna, 18-26.5GHz	ARA	MWH-1826/B	PRE0079280	4/17/2020	4/17/2021
Preamplifier, 26-40 GHz	Miteq	NSTTA2640-35-HG	T1864	4/8/2020	4/8/2021
Horn Antenna, 26-40 GHz	ARA	MWH-2640/B	PRE0182203	4/17/2020	4/17/2021
DC Power Supply	Hewlett Packard	E3610A	T502	NCR	--
DC Power Supply	All-Bright Technology Co.	8185D	PRE0129629	NCR	--
Multimeter	Fluke	77	T78	1/21/2020	1/21/2021
Low Pass Filter	Microtronics	LPM20143	PR0199966	11/23/2019	11/23/2020
High Pass Filter, CH5	Wainwright Inst. GMBH	WHW2-7100-10000-18000-40DC	--	NCR	--
High Pass Filter, CH9	Wainwright Inst. GMBH	WHW2-8165-11500-21000-40CD	--	NCR	--
EMI Test Receiver 9kHz-7GHz	Rohde & Schwarz	ESR	T1436	2/20/2020	2/20/2021
Power Cable, Line Conducted Emissions	UL	PR1	T861	10/27/2019	10/27/2020
LISN for Conducted Emissions CISPR-16	FISCHER CUSTOM COMMUNICATIONS	FCC-LISN-50/250-25-2-01	T1310	1/23/2020	1/23/2021
Radiated Software	UL	UL EMC	Ver 9.5, Mar 6, 2020		
AC Line Conducted Software	UL	UL EMC	Ver 9.5, Feb 21, 2020		

8. APPLICABLE LIMITS AND TEST RESULTS

8.1. 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is in the range of 1% to 5% of the OBW bandwidth. The VBW is set to $\geq 3 \times \text{RBW}$. The sweep time is coupled.

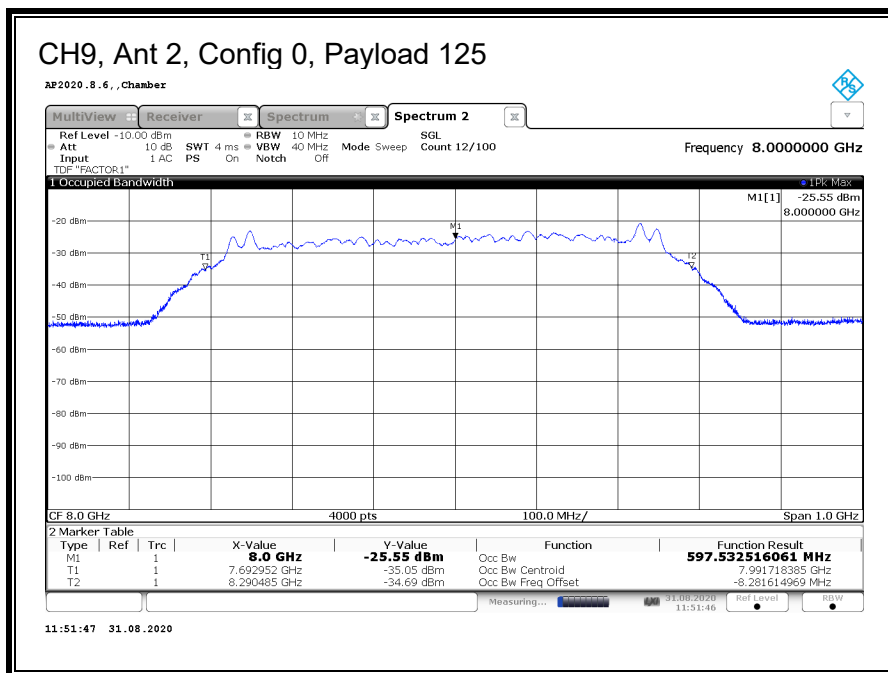
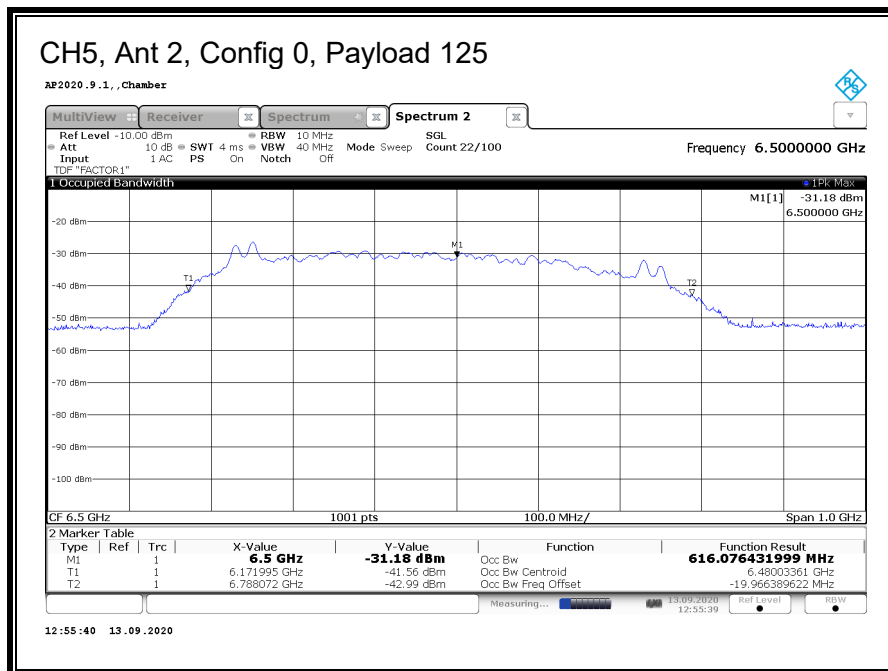
Tabulated data provides the test results of all available test configurations. The plots of Ant 2, CONFIG 0, Payload 125 bandwidth measurement on CH5 and CH9 are presented and same measurement settings apply to the rest of test configurations.

RESULTS

Tested By: 19419, 12501, 12485, 12472, 20737, 12471

ANT	CH	CONFIG	Payload	EUT	Meas. Ant	99% BW
				Orientation	Polarity	(MHz)
2	5	0	125	Flatbed	H	616.08
2	5	1	125	Flatbed	H	609.80
2	5	2	125	Flatbed	H	675.44
2	5	3	125	Flatbed	H	674.98
2	5	4	0	Flatbed	H	675.37
2	5	5	0	Flatbed	H	625.26
2	9	0	125	Flatbed	H	597.53
2	9	1	125	Flatbed	H	596.89
2	9	2	125	Flatbed	H	608.36
2	9	3	125	Flatbed	H	609.72
2	9	4	0	Flatbed	H	597.33
2	9	5	0	Flatbed	H	584.50
3	5	0	125	Portrait	H	572.98
3	5	1	125	Portrait	H	571.51
3	5	2	125	Portrait	H	582.57
3	5	3	125	Portrait	H	583.65
3	5	4	0	Portrait	H	579.21
3	5	5	0	Portrait	H	569.11
3	9	0	125	Portrait	H	560.57
3	9	1	125	Portrait	H	555.93
3	9	2	125	Portrait	H	574.92
3	9	3	125	Portrait	H	575.75
3	9	4	0	Portrait	H	577.04
3	9	5	0	Portrait	H	565.99

99% BW



8.2. OPERATING BANDWIDTH

LIMITS

FCC

§15.503 (a) *UWB bandwidth*. For the purpose of this subpart, the UWB bandwidth is the frequency band bounded by the points that are 10 dB below the highest radiated emission, as based on the complete transmission system including the antenna. The upper boundary is designated f_H and the lower boundary is designated f_L . The frequency at which the highest radiated emission occurs is designated f_M .

§15.503 (b) *Center frequency*. The center frequency, f_C , equals $(f_H + f_L)/2$.

§15.503 (c) *Fractional bandwidth*. The fractional bandwidth equals $2(f_H - f_L)/(f_H + f_L)$.

§15.503 (d) *Ultra-wideband (UWB) transmitter*. An intentional radiator that, at any point in time, has a fractional bandwidth equal to or greater than 0.20 or has a UWB bandwidth equal to or greater than 500 MHz, regardless of the fractional bandwidth.

§15.519 (b) The UWB bandwidth of a device operating under the provisions of this section must be contained between 3100 MHz and 10,600 MHz.

RSS-220

Section 2 A *UWB device* is an intentional radiator that has either a *-10 dB bandwidth* of at least 500 MHz or a *-10 dB fractional bandwidth* greater than 0.2.

Section 5.1 (a) The *-10 dB bandwidth* of the device shall be totally contained in the band 3.1-10.6 GHz.

“-10 dB bandwidth B_{-10} ” and “-10 dB fractional bandwidth μ_{-10} ” are defined as follows:

$$B_{-10} = f_H - f_L$$
$$\mu_{-10} = B_{-10}/f_C$$

where:

f_M is the frequency of maximum UWB transmission;

f_H is the highest frequency at which the power spectral density of the UWB transmission is -10 dB relative to f_M ;

f_L is the lowest frequency at which the power spectral density of the UWB transmission is -10 dB relative to f_M ; and

$f_C = (f_H + f_L)/2$ is the centre frequency of the -10 dB bandwidth.

TEST PROCEDURE

ANSI C63.10 Clause 10.1.

RSS-220 Section 2 of the Annex

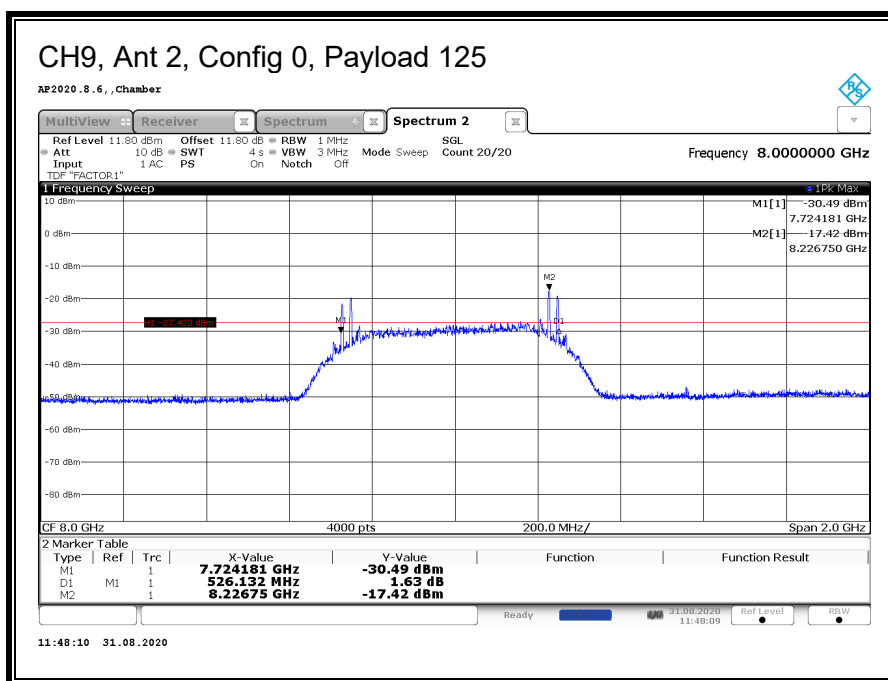
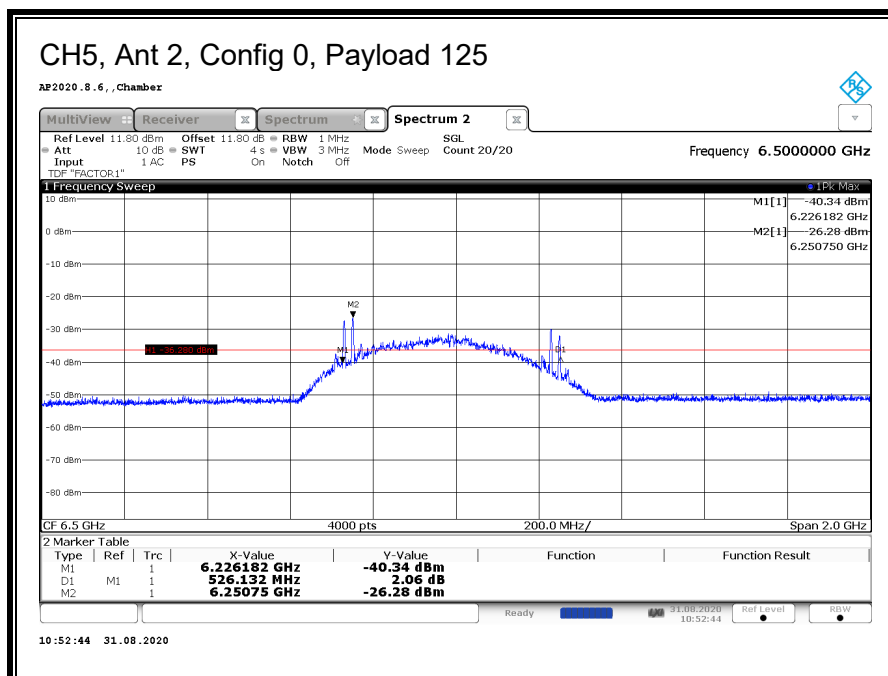
Tabulated data provides the test results of all available test configurations. The plots of Ant 2, CONFIG 0, Payload 125 bandwidth measurement on CH5 and CH9 are presented and same measurement settings apply to the rest of test configurations.

RESULTS

Tested By: 19419, 12501, 12485, 12472, 20737, 12471

ANT	CH	CONFIG	Payload	EUT Orientation	Meas. Ant Polarity	FM (GHz)	FL (GHz)	FH (GHz)	FC (GHz)	OBW (MHz)	Min. OBW (MHz)	OBW Margin (MHz)	OBW Pass/Fail
2	5	0	125	Flatbed	H	6.25	6.23	6.752	6.238	526.13	500	26.132	P
2	5	1	125	Flatbed	H	6.25	6.23	6.752	6.238	526.13	500	26.132	P
2	5	2	125	Flatbed	H	6.25	6.23	6.751	6.239	523.13	500	23.131	P
2	5	3	125	Flatbed	H	6.25	6.23	6.751	6.239	522.63	500	22.631	P
2	5	4	0	Flatbed	H	6.25	6.23	6.752	6.238	526.13	500	26.132	P
2	5	5	0	Flatbed	H	6.25	6.21	6.753	6.230	544.14	500	44.136	P
2	9	0	125	Flatbed	H	8.23	7.72	8.250	7.975	526.13	500	26.132	P
2	9	1	125	Flatbed	H	8.23	7.72	8.250	7.975	526.13	500	26.132	P
2	9	2	125	Flatbed	H	8.23	7.73	8.249	7.976	523.63	500	23.631	P
2	9	3	125	Flatbed	H	8.23	7.73	8.248	7.976	522.63	500	22.631	P
2	9	4	0	Flatbed	H	8.23	7.72	8.250	7.975	526.13	500	26.132	P
2	9	5	0	Flatbed	H	8.23	7.72	8.251	7.975	528.13	500	28.132	P
3	5	0	125	Portrait	H	6.25	6.23	6.752	6.239	525.13	500	25.131	P
3	5	1	125	Portrait	H	6.25	6.23	6.752	6.238	525.13	500	25.131	P
3	5	2	125	Portrait	H	6.25	6.23	6.751	6.239	523.13	500	23.131	P
3	5	3	125	Portrait	H	6.25	6.23	6.751	6.239	522.63	500	22.631	P
3	5	4	0	Portrait	H	6.25	6.23	6.752	6.238	525.13	500	25.131	P
3	5	5	0	Portrait	H	6.25	6.23	6.753	6.238	527.13	500	27.132	P
3	9	0	125	Portrait	H	7.72	7.75	8.274	7.736	526.12	500	26.120	P
3	9	1	125	Portrait	H	7.72	7.75	8.274	7.736	526.11	500	26.110	P
3	9	2	125	Portrait	H	7.73	7.75	8.272	7.737	523.61	500	23.610	P
3	9	3	125	Portrait	H	7.73	7.75	8.270	7.737	521.59	500	21.590	P
3	9	4	0	Portrait	H	7.72	7.75	8.274	7.736	525.61	500	25.610	P
3	9	5	0	Portrait	H	7.72	8.05	8.573	7.884	527.62	500	27.620	P

RESULTS



8.3. PEAK POWER AND MAXIMUM AVERAGE EMISSIONS

LIMITS

FCC

15.519 (e) There is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs, f_M . That limit is 0 dBm EIRP.

15.519 (c) The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

Frequency in MHz	EIRP in dBm
3100 - 10600	-41.3

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Annex, Section 4 (c) Peak measurements shall be made in addition to average measurements. Transmissions shall not exceed 0 dBm e.i.r.p. in any 50 MHz bandwidth when the average limit is -41.3 dBm/MHz.

Section 5.3.1 (d) Radiated emissions above 960 MHz from a device shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz.

Frequency	E.I.R.P. in a Resolution Bandwidth of 1 MHz
4.75 – 10.6 GHz	-41.3 dBm

TEST PROCEDURE

ANSI C63.10 Clause 10.3.

RSS-220 Annex

Peak EIPR power is measured using RBW of 50 MHz.

The radiated emissions of 6 - 9 GHz frequency band are performed at 3-meter test distance.

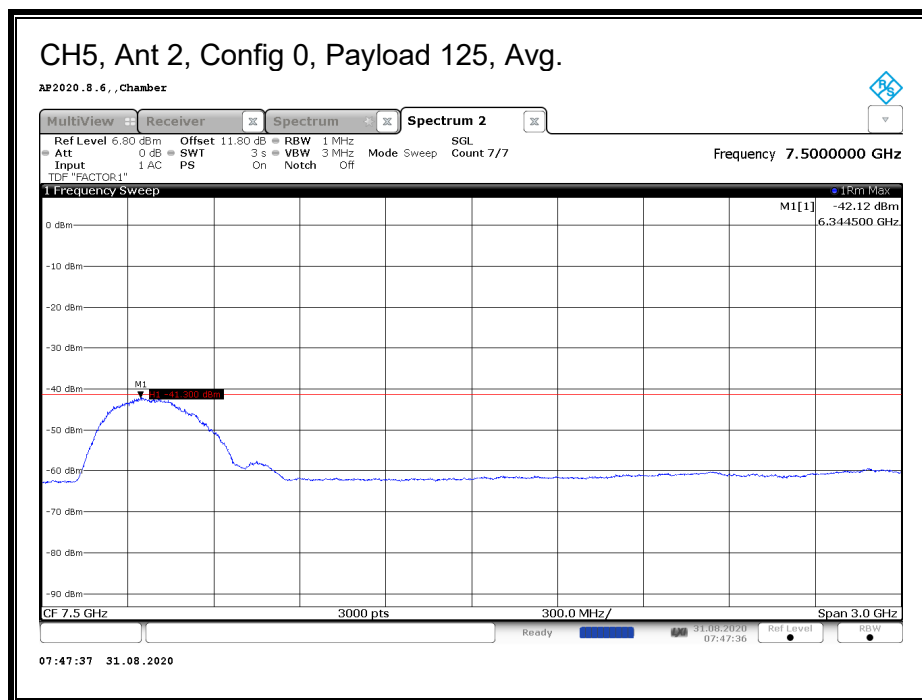
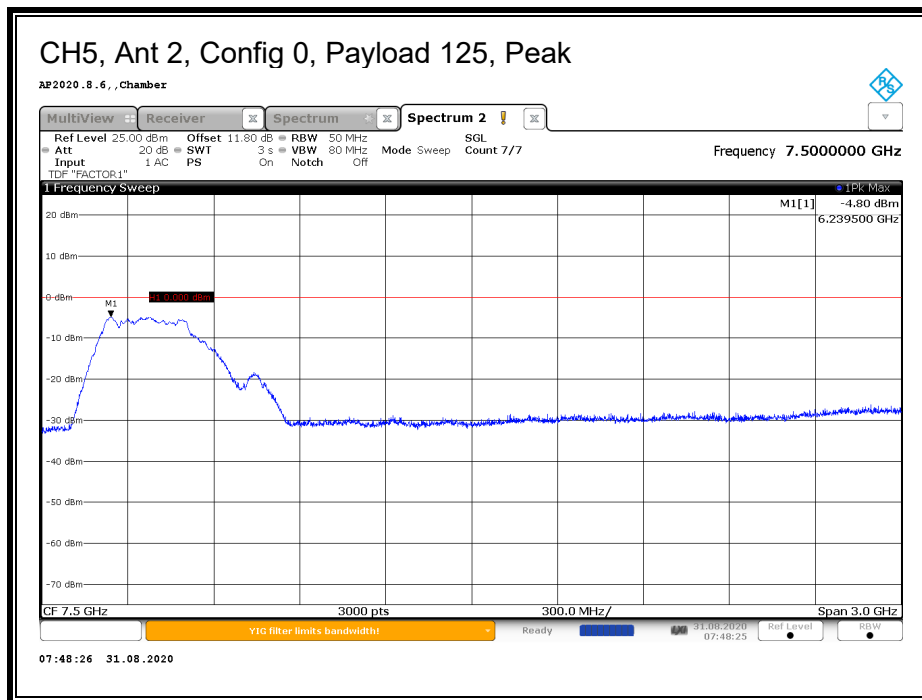
Tabulated data provides the test results of all available test configurations. The plots of Ant 2, CONFIG 0, Payload 125 power measurement on CH5 and CH9 are presented and same measurement settings apply to the rest of test configurations.

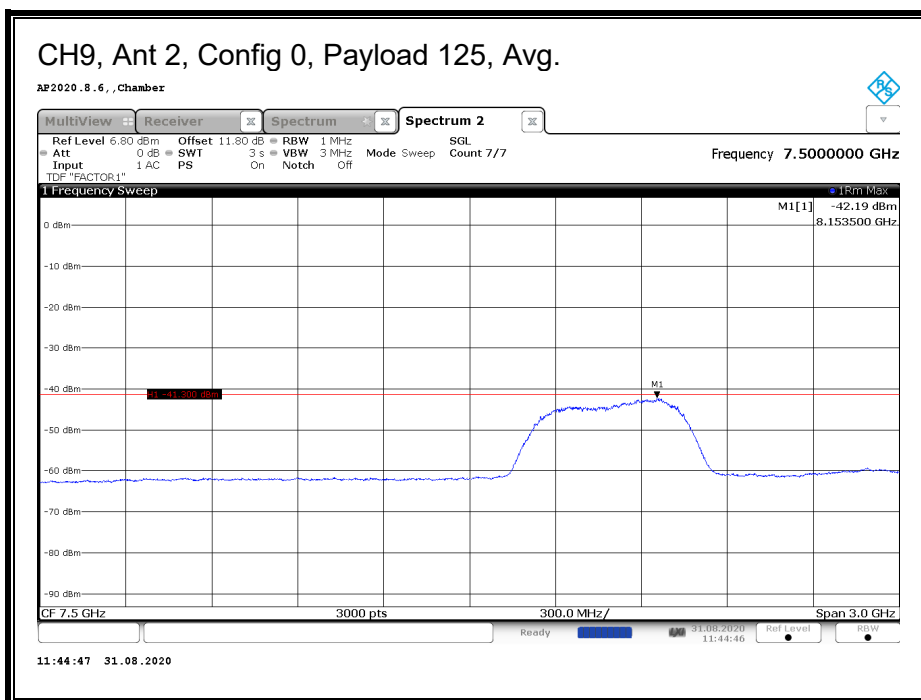
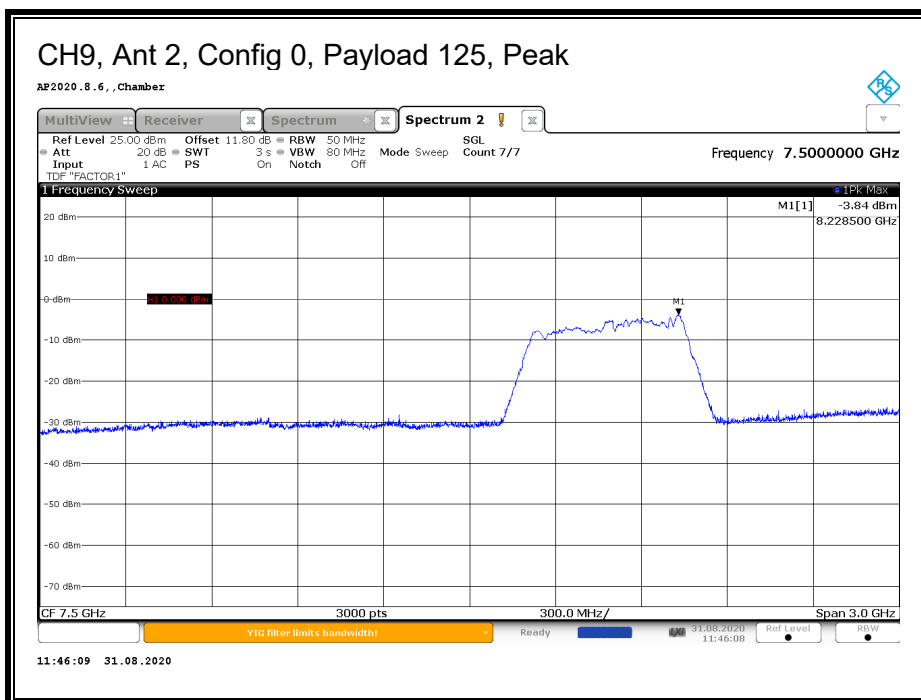
RESULTS

Tested By: 19419, 12501, 12485, 12472, 20737, 12471

ANT	CH	CONFIG	Payload	EUT Orientation	Meas. Ant. Polarity	Peak EIRP Power				Average EIRP Power			
						FM (GHz)	Peak Power (dBm/50MHz)	Peak Limit (0 dBm/50 MHz)	Margin (dB)	FM (GHz)	Avg Power (dBm/MHz)	Avg Limit (dBm/MHz)	Margin (dB)
2	5	0	125	Flatbed	H	6.2395	-4.80	0	-4.80	6.3445	-42.12	-41.3	-0.82
2	5	1	125	Flatbed	H	6.3735	-3.92	0	-3.92	6.3505	-42.26	-41.3	-0.96
2	5	2	125	Flatbed	H	6.4895	-8.83	0	-8.83	6.3495	-42.56	-41.3	-1.26
2	5	3	125	Flatbed	H	6.4905	-8.66	0	-8.66	6.3425	-42.34	-41.3	-1.04
2	5	4	0	Flatbed	H	6.2395	-4.34	0	-4.34	6.3495	-42.04	-41.3	-0.74
2	5	5	0	Flatbed	H	6.2405	-2.52	0	-2.52	6.3495	-42.33	-41.3	-1.03
2	9	0	125	Flatbed	H	8.2285	-3.84	0	-3.84	8.1535	-42.19	-41.3	-0.89
2	9	1	125	Flatbed	H	8.2305	-3.08	0	-3.08	8.1535	-42.37	-41.3	-1.07
2	9	2	125	Flatbed	H	8.2295	-7.89	0	-7.89	8.1635	-42.05	-41.3	-0.75
2	9	3	125	Flatbed	H	7.9895	-7.86	0	-7.86	8.1565	-42.00	-41.3	-0.70
2	9	4	0	Flatbed	H	8.2305	-3.30	0	-3.30	8.1665	-42.17	-41.3	-0.87
2	9	5	0	Flatbed	H	8.2315	-1.06	0	-1.06	8.1665	-42.14	-41.3	-0.84
3	5	0	125	Portrait	H	6.4865	-3.36	0	-3.36	6.4405	-42.05	-41.3	-0.75
3	5	1	125	Portrait	H	6.4875	-2.33	0	-2.33	6.4405	-42.04	-41.3	-0.74
3	5	2	125	Portrait	H	6.4885	-6.73	0	-6.73	6.4435	-42.29	-41.3	-0.99
3	5	3	125	Portrait	H	6.4905	-6.79	0	-6.79	6.4425	-42.24	-41.3	-0.94
3	5	4	0	Portrait	H	6.2395	-6.53	0	-6.53	6.4475	-42.49	-41.3	-1.19
3	5	5	0	Portrait	H	6.2405	-4.50	0	-4.50	6.4485	-42.68	-41.3	-1.38
3	9	0	125	Portrait	H	7.9975	-4.26	0	-4.26	8.0625	-42.31	-41.3	-1.01
3	9	1	125	Portrait	H	7.9975	-3.42	0	-3.42	8.0595	-42.56	-41.3	-1.26
3	9	2	125	Portrait	H	7.9895	-7.58	0	-7.58	8.0605	-42.50	-41.3	-1.20
3	9	3	125	Portrait	H	7.9885	-7.48	0	-7.48	8.0615	-42.35	-41.3	-1.05
3	9	4	0	Portrait	H	8.2325	-9.42	0	-9.42	8.0415	-42.12	-41.3	-0.82
3	9	5	0	Portrait	H	8.2315	-8.21	0	-8.21	8.0425	-42.54	-41.3	-1.24

RESULTS





8.4. CESSATION TIME

LIMITS

FCC

§15.519(a)(1) A UWB device operating under the provisions of this section shall transmit only when it is sending information to an associated receiver. The UWB intentional radiator shall cease transmission within 10 seconds unless it receives an acknowledgement from the associated receiver that its transmission is being received. An acknowledgment of reception must continue to be received by the UWB intentional radiator at least every 10 seconds or the UWB device must cease transmitting.

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Section 5.3.1 (b) The device is to transmit only when it is sending information to an associated receiver. The device shall cease transmission of information within 10 seconds unless it receives an acknowledgement from the associated receiver that its transmission is being received. An acknowledgment of reception must continue to be received by the UWB device at least every 10 seconds or the UWB device shall cease transmitting any information other than periodic signals used for the establishment or re-establishment of a communication link with an associated receiver.

TEST PROCEDURES

Transmissions are monitored for two cases:

1. The smart phone ends the UWB link.
2. The EUT ends the UWB link.

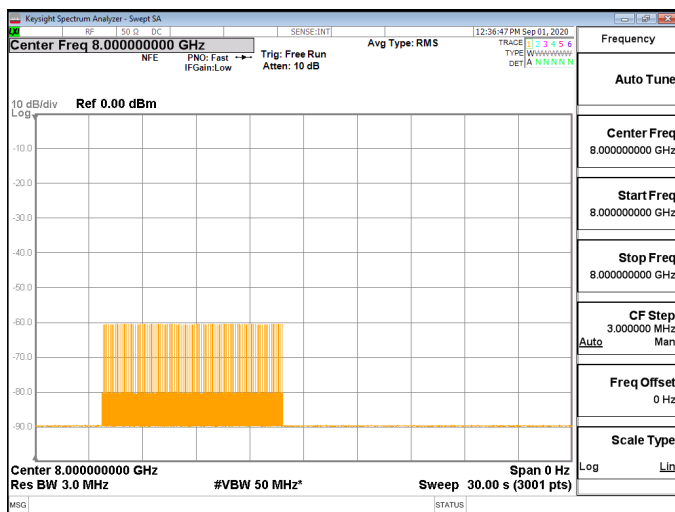
RESULTS

Tested By: 12501

Signal Levels on all Plots

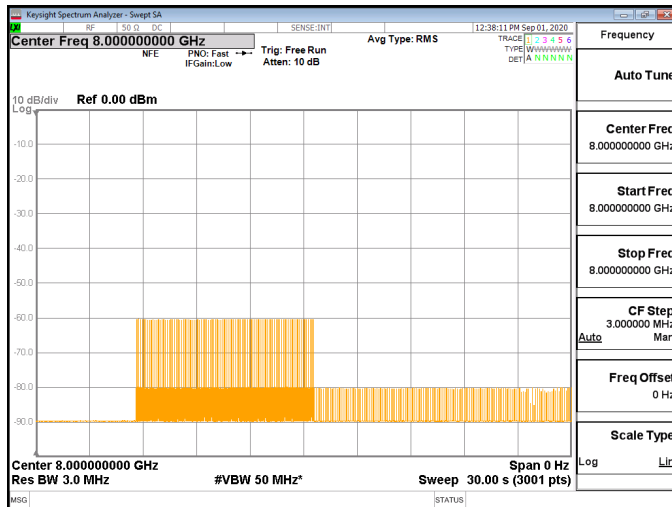
- EUT is High Amplitude
- Smart Phone is Low Amplitude

Case 1: Smart Phone ends the UWB link

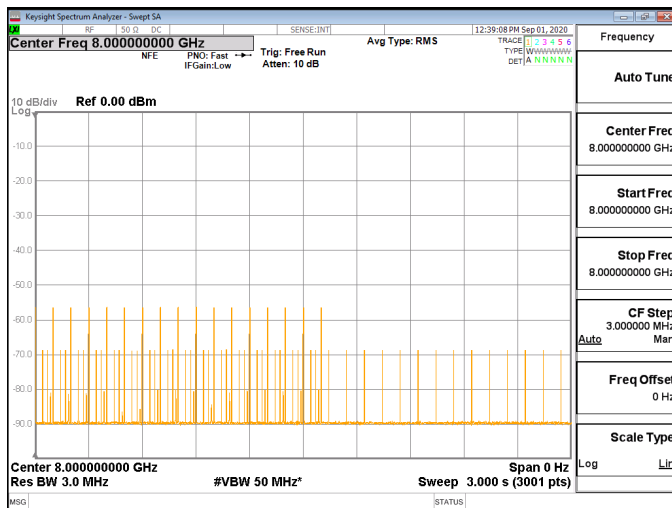


RESULT

- All devices, including the EUT, cease transmissions

Case 2: EUT ends the UWB linkRESULT

- EUT ends the link, Smart Phone stops Acknowledgements but continues Polling
- EUT ceases transmissions, does not respond to Polling Signals

Zoom-in Plot during On-Off TransitionRESULT

- Shows Link Traffic, Acknowledgements and Polling Signals while Link is established
- Shows Polling Signals after Link has ended

8.5. EMISSIONS BELOW 960 MHz

LIMITS

FCC

§15.519 (c) The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in §15.209. The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

15.209 (a)

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
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

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Section 3.4 Radiated emissions at or below 960 MHz for all subclasses of UWB device shall not exceed the following limits. Measurements of radiated emissions at and below 960 MHz are to be made using a CISPR quasi-peak detector. CISPR measurement bandwidth specifications are to be used.

Frequency (MHz)	Field Strength (Microvolts/m)	Measurement Distance (Metres)	E.i.r.p. (dBmW)
0.009-0.490	2,400/F (F in kHz)	300	$10 \log (17.28 / F^2)$ (F in kHz)
0.490-1.705	24,000/F (F in kHz)	30	$10 \log (17.28 / F^2)$ (F in kHz)
1.705-30	30	30	-45.7
30-88	100	3	-55.2
88-216	150	3	-51.7
216-960	200	3	-49.2

Note: The emission limits for the bands 9-90 kHz and 110-490 kHz are based on measurements employing an average emissions detector.

TEST PROCEDURE

ANSI C63.10 Clause 10.2 and 10.3.

RSS-220 Annex

PROCEDURE FOR 9 kHz TO 960 MHz

Measurements are made with the antenna feeding a spectrum analyzer via a preamplifier and cables, at a maximum distance of 3m from the EUT.

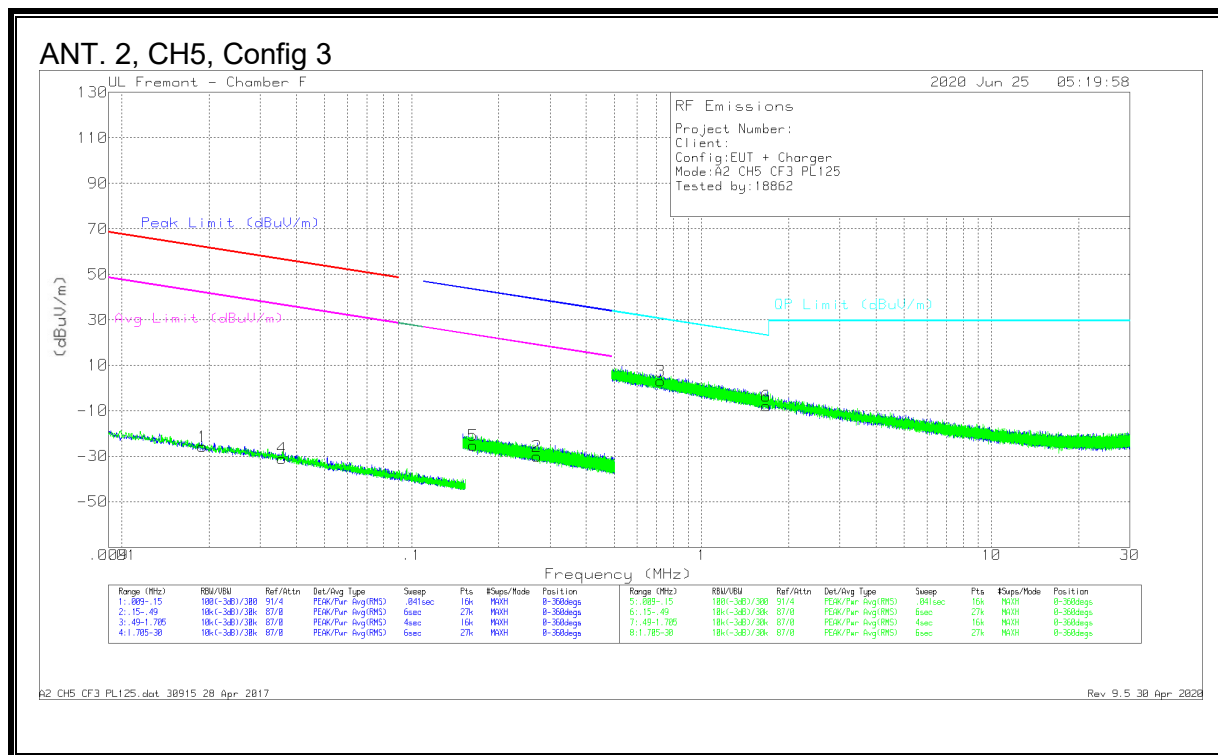
A final test is made at any frequencies at which emissions are found. During this final scan, the antenna is kept no further from the EUT than the maximum distance calculated for each band that yields a minimum system noise floor.

RESULTS

Emissions Summary

Ant	CH	Config	Payload	Power Setting	Frequency Range	
					9 kHz - 30 MHz	30 - 960 MHz
2	5	3	125	Max	PASS	PASS
2	9	3	125	Max	PASS	PASS
3	5	3	125	Max	PASS	PASS
3	9	3	125	Max	PASS	PASS

8.5.1. EMISSIONS, 9 kHz – 30 MHz



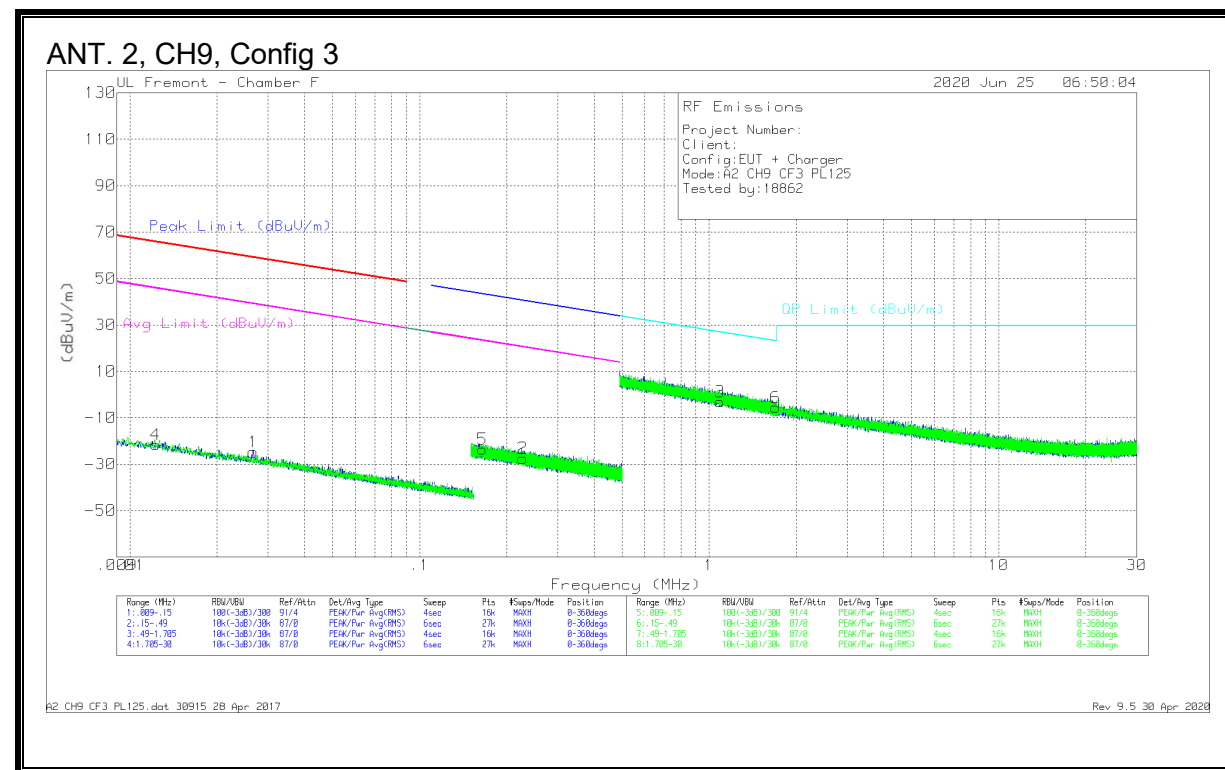
Trace Markers

Marker	Freq. (MHz)	Meter Reading (dBuV/m)	Det	Loop Antenna (dBm)	Cables (dB)	Dist Corr 300m	Corrected Reading (dBuV/m)	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	.01899	38.82	Pk	15.3	0	-80	-25.88	62.01	-87.89	42.01	-67.89	-	-	-	-	0-360
2	.27035	38.95	Pk	10.9	.1	-80	-30.05	-	-	-	-	38.97	-69.02	18.97	-49.02	0-360
4	.03571	35.53	Pk	13.5	0	-80	-30.97	56.53	-87.5	36.53	-67.5	-	-	-	-	0-360
5	.16299	43.65	Pk	11	.1	-80	-25.25	-	-	-	-	43.38	-68.63	23.38	-48.63	0-360

Pk - Peak detector

Marker	Frequency (MHz)	Meter Reading (dBuV/m)	Det	Loop Antenna (dBm)	Cables (dB)	Dist Corr 40Log	Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
3	.72271	32.11	Pk	10.8	.1	-40	3.01	30.43	-27.42	0-360
6	1.6718	21	Pk	11	.1	-40	-7.9	23.17	-31.07	0-360

Pk - Peak detector



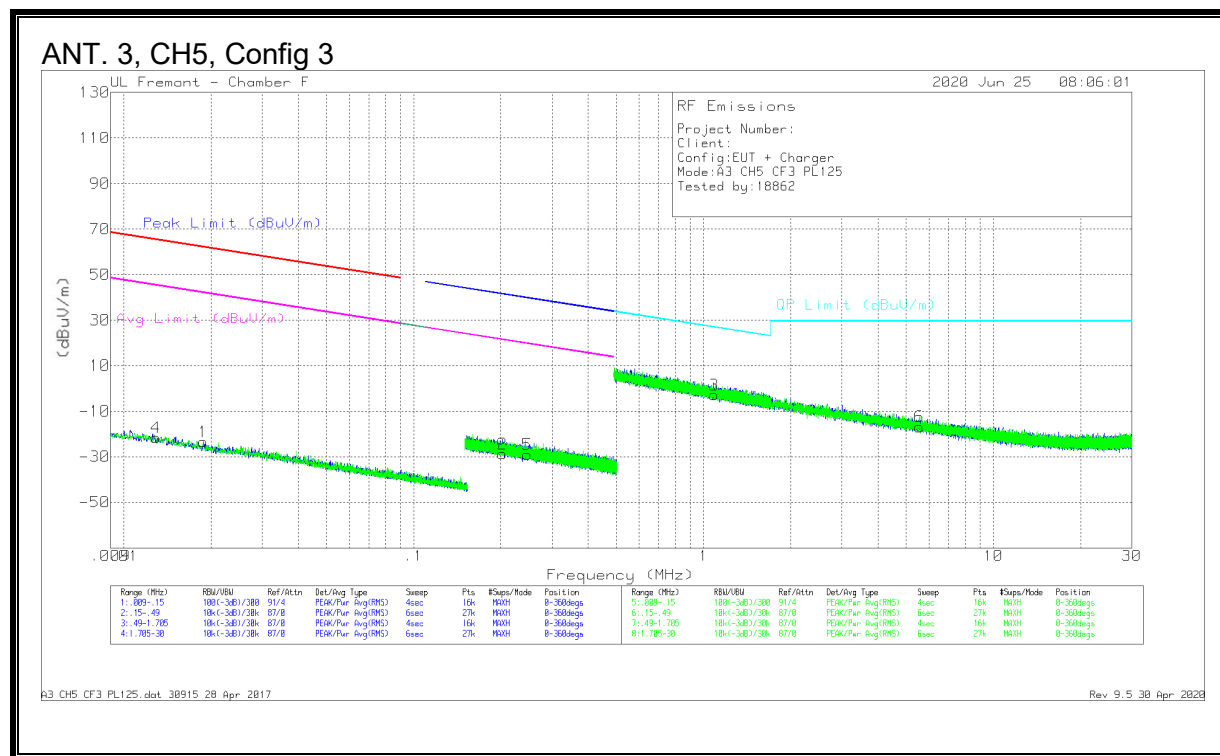
Trace Markers

Marker	Freq. (MHz)	Meter Reading (dBuV/m)	Det	Loop Antenna (dBm)	Cables (dB)	Dist Corr 300m	Corrected Reading (dBuV/m)	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	.02861	40.97	Pk	14.3	0	-80	-24.73	59.08	-83.81	39.08	-83.81	-	-	-	-	0-360
2	.22729	41.56	Pk	10.9	-1	-80	-27.44	-	-	40.48	-67.92	-	-	20.48	-47.92	0-360
4	.01225	40.48	Pk	18	0	-80	-21.52	65.82	-87.34	45.82	-67.34	-	-	-	-	0-360
5	.16456	45.35	Pk	11	-1	-80	-23.55	-	-	-	-	43.29	-66.84	23.29	-46.84	0-360

Pk - Peak detector

Marker	Frequency (MHz)	Meter Reading (dBuV/m)	Det	Loop Antenna (dBm)	Cables (dB)	Dist Corr (dB) 40Log	Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
3	1.08865	25.93	Pk	10.9	.1	-40	-3.07	26.89	-29.96	0-360
6	1.69612	23.38	Pk	11	.1	-40	-5.52	23.05	-28.57	0-360

Pk - Peak detector



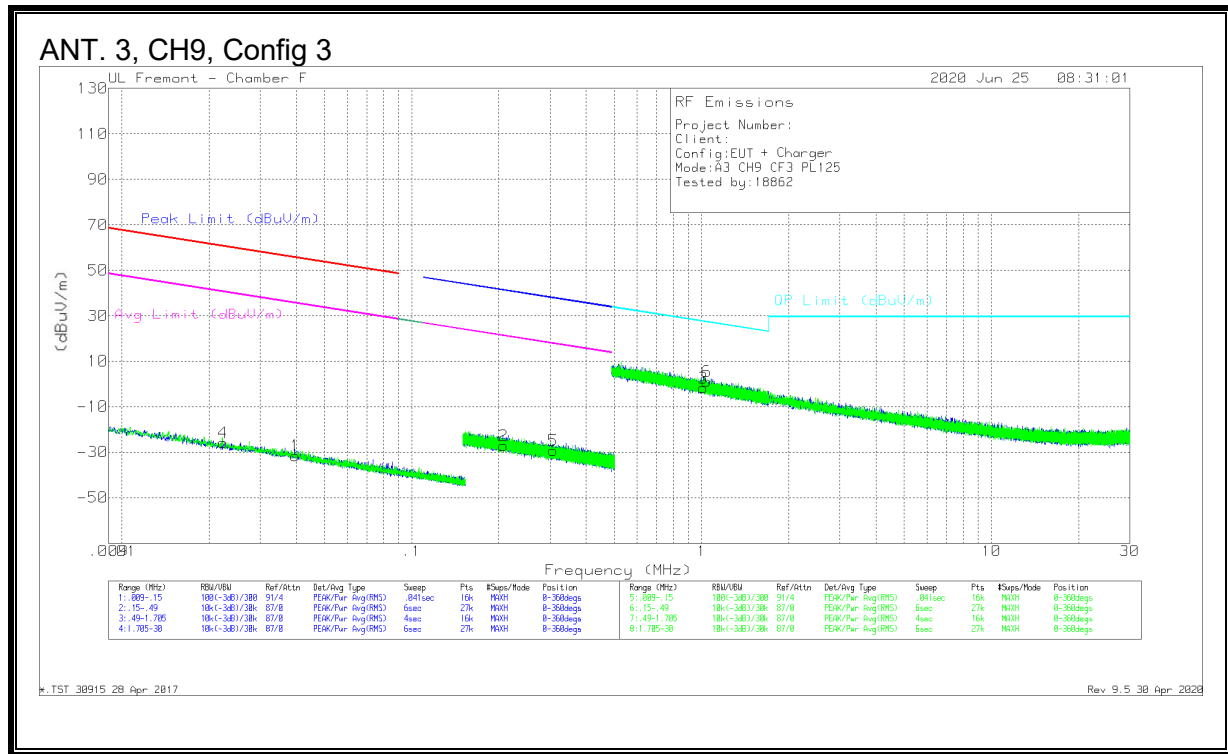
Trace Markers

Marker	Freq. (MHz)	Meter Reading (dBUV/m)	Det	Loop Antenna (dBm)	Cables (dB)	Dist Corr 300m	Corrected Reading (dBUV/m)	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	01881	44.34	Pk	15.4	0	-80	-23.26	62.1	-85.36	42.1	-65.36	-	-	21.49	-50.09	0-360
2	20246	40.4	Pk	10.9	-1	-80	-29.6	65.36	-86.93	45.36	-66.93	-	-	-	-	0-360
4	01292	40.73	Pk	17.7	0	-80	-21.57	-	-	-	-	-	-	-	-	0-360
5	24669	39.93	Pk	10.9	-1	-80	-29.07	-	-	-	-	39.77	-68.84	19.77	-48.84	0-360

Pk - Peak detector

Marker	Frequency (MHz)	Meter Reading (dBUV/m)	Det	Loop Antenna (dBm)	Cables (dB)	Dist Corr (dB) 40Log	Corrected Reading (dBUV/m)	QP Limit (dBUV/m)	Margin (dB)	Azimuth (Degs)
3	1.08865	26.06	Pk	10.9	.1	-40	-2.94	26.89	-29.83	0-360
6	5.55116	12.18	Pk	10.7	.3	-40	-16.82	29.5	-46.32	0-360

Pk - Peak detector



Trace Markers

Marker	Freq. (MHz)	Meter Reading (dBuV/m)	Det	Loop Antenna (dBm)	Cables (dB)	Dist Corr 300m	Corrected Reading (dBuV/m)	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	.0397	35.39	Pk	13.1	0	-80	-31.51	55.61	-87.12	35.61	-67.12	-	-	-	-	0-360
2	.2074	41.97	Pk	10.9	.1	-80	-27.03	-	-	-	-	41.28	-68.31	21.28	-48.31	0-360
4	.02237	39.5	Pk	14.7	0	-80	-25.8	60.59	-86.39	40.59	-66.39	-	-	-	-	0-360
5	.30792	39.87	Pk	10.9	.1	-80	-29.13	-	-	-	-	37.84	-66.97	17.84	-46.97	0-360

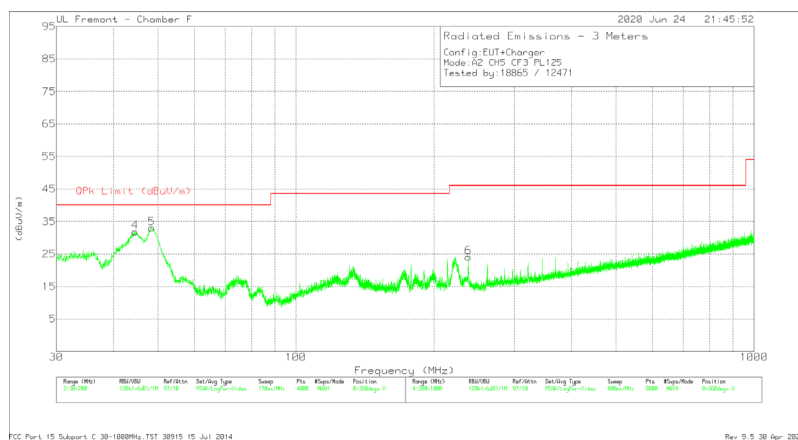
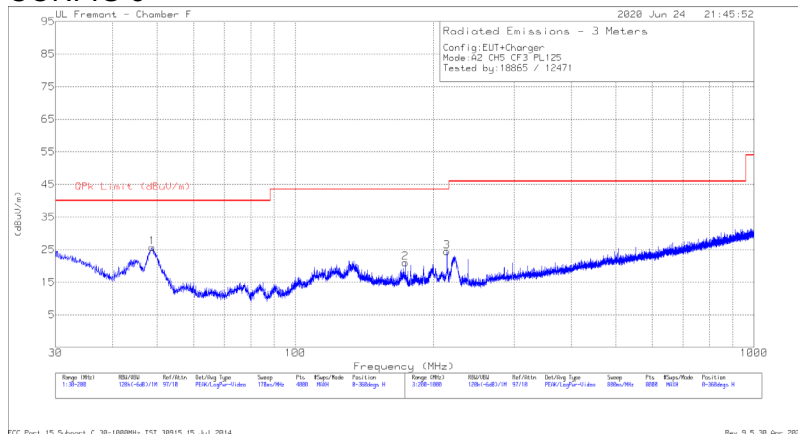
Pk - Peak detector

Marker	Frequency (MHz)	Meter Reading (dBuV/m)	Det	Loop Antenna (dBm)	Cables (dB)	Dist Corr (dB) 40Log	Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
3	1.01273	27.14	Pk	10.9	.1	-40	-1.86	27.51	-29.37	0-360
6	1.04244	30.15	Pk	10.9	.1	-40	1.15	27.26	-26.11	0-360

Pk - Peak detector

8.5.2. EMISSIONS, 30 – 960 MHz

ANT. 2, CH5, CONFIG 3

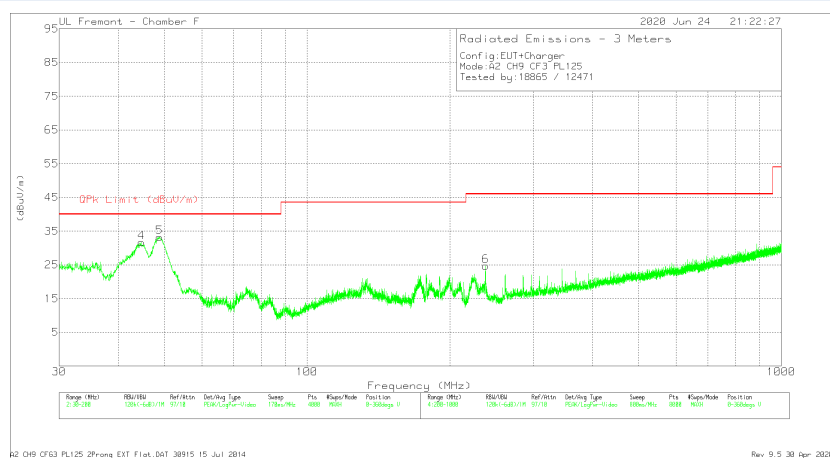
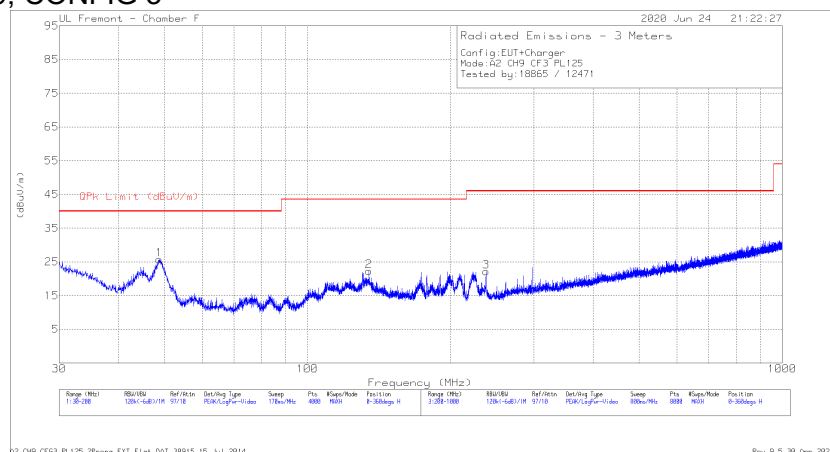


Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T243 (dB/m)	Amp Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	48.7474	42.46	Pk	14.9	-31.7	25.66	40	-14.34	0-360	401	H
2	173.6022	34.09	Pk	17.5	-30.6	20.99	43.52	-22.53	0-360	201	H
4	44.5813	46.4	Pk	17.1	-31.7	31.8	40	-8.2	0-360	100	V
5	48.4073	49.7	Pk	15	-31.7	33	40	-7	0-360	100	V
3	214.1018	37.7	Pk	17.1	-30.4	24.4	43.52	-19.12	0-360	100	H
6	237.8049	36.2	Pk	18	-30.2	24	46.02	-22.02	0-360	201	V

Pk - Peak detector

ANT. 2, CH9, CONFIG 3

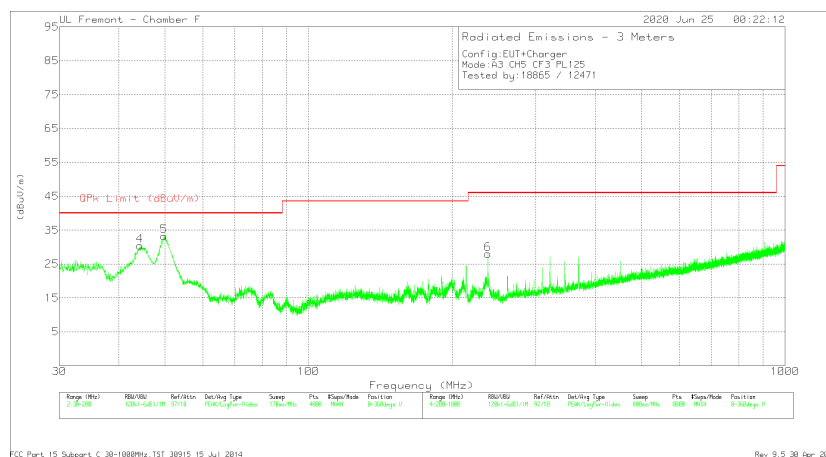
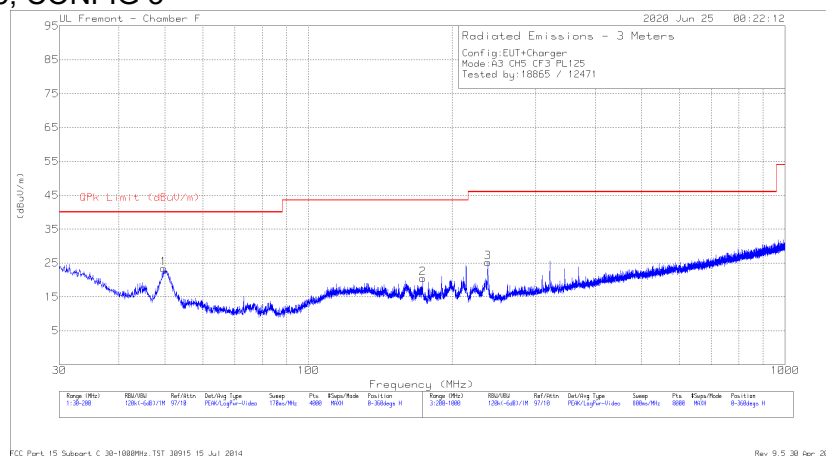


Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T243 (dB/m)	Amp Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	48.7048	42.51	Pk	14.9	-31.7	25.71	40	-14.29	0-360	401	H
2	134.7046	33.51	Pk	19.7	-30.9	22.31	43.52	-21.21	0-360	201	H
4	44.7513	46.5	Pk	16.9	-31.7	31.7	40	-8.3	0-360	100	V
5	48.7899	50.03	Pk	14.9	-31.7	33.23	40	-6.77	0-360	100	V
3	237.8049	34.32	Pk	18	-30.2	22.12	46.02	-23.9	0-360	100	H
6	237.8049	36.85	Pk	18	-30.2	24.65	46.02	-21.37	0-360	201	V

Pk - Peak detector

ANT. 3, CH5, CONFIG 3

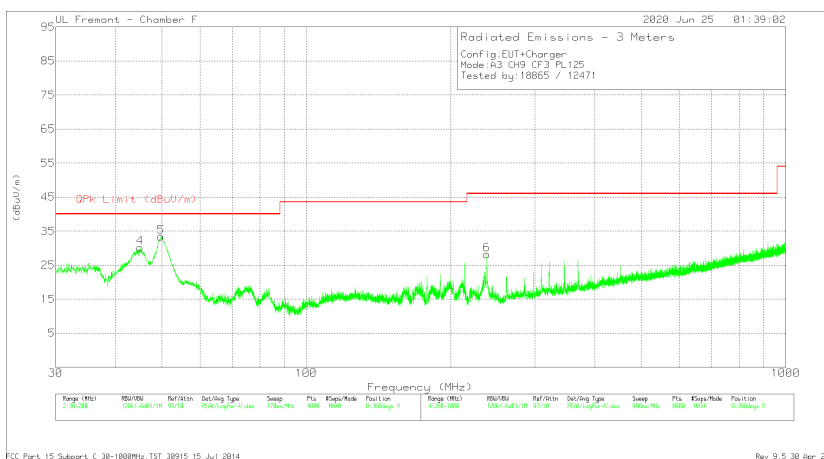
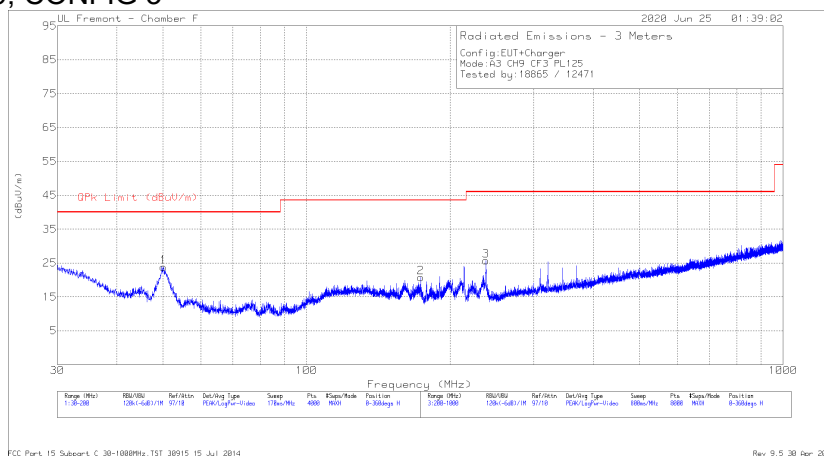


Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T243 (dB/m)	Amp Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	49.6826	40.6	Pk	14.5	-31.7	23.4	40	-16.6	0-360	400	H
2	173.6447	33.58	Pk	17.5	-30.6	20.48	43.52	-23.04	0-360	201	H
4	44.2412	44.79	Pk	17.3	-31.7	30.39	40	-9.61	0-360	100	V
5	49.8101	50.44	Pk	14.5	-31.7	33.24	40	-6.76	0-360	100	V
3	237.9049	37.46	Pk	18	-30.2	25.26	46.02	-20.76	0-360	99	H
6	237.9049	40.22	Pk	18	-30.2	28.02	46.02	-18	0-360	201	V

Pk - Peak detector

ANT. 3, CH9, CONFIG 3



Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T243 (dB/m)	Amp Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	50.1077	41.16	Pk	14.4	-31.7	23.86	40	-16.14	0-360	401	H
2	173.6447	33.82	Pk	17.5	-30.6	20.72	43.52	-22.8	0-360	200	H
4	45.0064	45.1	Pk	16.8	-31.7	30.2	40	-9.8	0-360	100	V
5	49.8101	50.51	Pk	14.5	-31.7	33.31	40	-6.69	0-360	100	V
3	237.9049	37.87	Pk	18	-30.2	25.67	46.02	-20.35	0-360	99	H
6	237.9049	40.38	Pk	18	-30.2	28.18	46.02	-17.84	0-360	200	V

Pk - Peak detector

8.6. AVERAGE EMISSIONS ABOVE 960 MHz

LIMITS

FCC

15.519 (c)

Frequency in MHz	EIRP in dBm
960-1610	-75.3
1610-1990	-63.3
1990-3100	-61.3
3100-10600	-41.3
Above 10600	-61.3

§15.519 (d) In addition to the radiated emission limits specified in the table in paragraph (c) of this section, UWB transmitters operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz:

Frequency in MHz	EIRP in dBm
1164-1240	-85.3
1559-1610	-85.3

RSS-220

Section 5.3.1 (d) Radiated emissions above 960 MHz from a device shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz.

Hand-held (Outdoor) Communication, Measurement, Location Sensing, and Tracking Devices	
Frequency	E.i.r.p. in a Resolution Bandwidth of 1 MHz
960-1 610 MHz	-75.3 dBm
1.61-4.75 GHz	-70.0 dBm
4.75-10.6 GHz	-41.3 dBm
Above 10.6 GHz	-61.3 dBm

Section 5.3.1 (e) In addition to the limits specified in paragraph (d) of this section, radiated emissions shall not exceed the following average limits when measured using a resolution bandwidth greater than or equal to 1 kHz. The measurements shall demonstrate compliance with the stated limits at whatever resolution bandwidth is used.

Frequency	E.i.r.p. in a Resolution Bandwidth of no less than 1 kHz
1 164-1 240 MHz	-85.3 dBm
1 559-1 610 MHz	-85.3 dBm

TEST PROCEDURE

ANSI C63.10 Clause 10.2 and 10.3.

RSS-220 Annex

PROCEDURE FOR 0.96 TO 6 GHz

Measurements are made with the antenna feeding a spectrum analyzer via a preamplifier and cables, at a maximum distance of 0.5m from the EUT.

A low pass filter with a cut off frequency of 6 GHz is used to suppress the fundamental and perform measurement for 0.96 - 6 GHz.

RESULTS FOR 6 GHz TO 9 GHz

The 6 - 9 GHz frequency band is covered in Section 8.2.

PROCEDURE FOR 9 GHz TO 18 GHz

Measurements are made with the antenna feeding a spectrum analyzer via a preamplifier and cables, at a maximum distance of 0.5m from the EUT.

A high pass filter with pass band frequency beyond 9 GHz is used to suppress the fundamental and perform measurement for 9 - 18 GHz.

PROCEDURE FOR 1.164 TO 1.240 GHz

Measurements are made with the antenna feeding a spectrum analyzer via a preamplifier and cables, at a maximum distance of 0.5m from the EUT.

RBW = 120 kHz & VBW = 360 kHz were used at pre-scan.

A low pass filter with a cut off frequency of 6 GHz is used to suppress the fundamental and perform measurement for 1.164 – 1.240 GHz.

PROCEDURE FOR 1.559 TO 1.610 GHz

Measurements are made with the antenna feeding a spectrum analyzer via a preamplifier and cables, at a maximum distance of 0.5m from the EUT.

RBW = 120 kHz & VBW = 360 kHz were used at pre-scan.

A low pass filter with a cut off frequency of 6 GHz is used to suppress the fundamental and perform measurement for 1.559 – 1.610 GHz.

PROCEDURE FOR 18 GHz TO 40 GHz

Measurements are made with the antenna feeding a spectrum analyzer via a preamplifier and cables, at a maximum distance of 0.5m from the EUT.

A final test is made at any frequencies at which emissions are found. During this final scan, the antenna is kept no further from the EUT than the maximum distance calculated for each band that yields a minimum system noise floor.

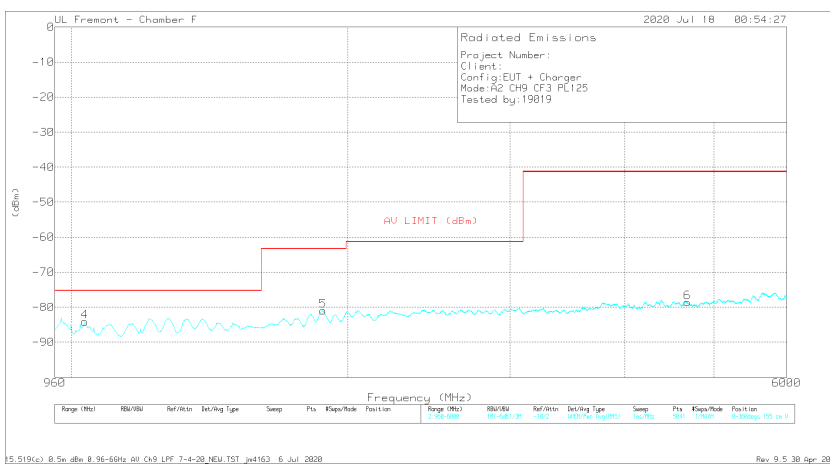
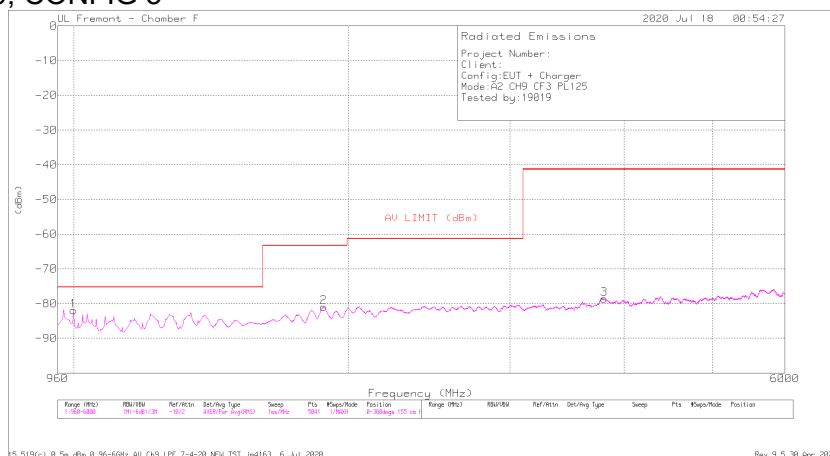
Distance Correction Factor from 3m to 0.5m = $20 \cdot \log(0.5\text{m}/3\text{m}) = -15.56 \text{ dB}$

RESULTS

Average Emissions Summary

Ant	CH	Config	Payload	Power Setting	Frequency Range				
					1164 - 1240 MHz	1559 - 1610 MHz	0.96 - 18 GHz	18 - 26 GHz	26 - 40 GHz
2	5	3	125	Max	PASS	PASS	PASS	PASS	PASS
2	9	3	125	Max	PASS	PASS	PASS	PASS	PASS
3	5	3	125	Max	PASS	PASS	PASS	PASS	PASS
3	9	3	125	Max	PASS	PASS	PASS	PASS	PASS

ANT. 2, CH9, CONFIG 3



Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBm)	Det	AF T345 (dBm)	Amp/Cbl (dB)	Dist Correction (dB)	Conversion Factor (dB)	CH9_LFF (dB)	EIRP (dBm)	FCC15.519(c) EIRP RMS (dBm)	Margin (dB)	Altitude (Degs)	Height (cm)	Polarity
1	999	-61.07	RMS	27.8	-45.1	-15.6	11.8	.2	-81.97	-75.3	-6.67	110	155	H
2	1878	-63.17	RMS	30.7	-45	-15.6	11.8	.3	-80.97	-63.3	-17.67	132	155	H
3	3807	-65.67	RMS	33.6	-43.4	-15.6	11.8	.7	-78.57	-41.3	-37.27	242	155	H
4	1035	-62.35	RMS	27	-45.2	-15.6	11.8	.2	-84.15	-75.3	-8.85	119	155	V
5	1879	-63.14	RMS	30.7	-45	-15.6	11.8	.3	-80.94	-63.3	-17.64	163	155	V
6	4683	-65.37	RMS	34.1	-44.1	-15.6	11.8	.6	-78.57	-41.3	-37.27	360	155	V

RMS - RMS detection

*Note: Test was performed with a low-pass filter with cutoff frequency at 6 GHz to suppress CH9 fundamental signal.

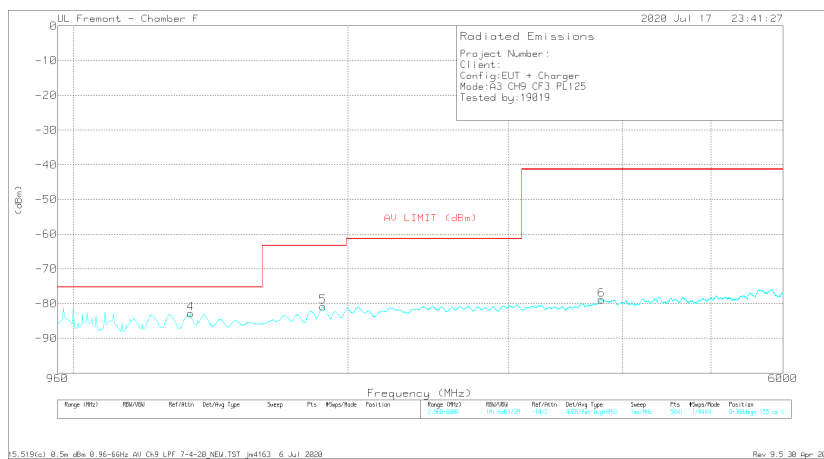
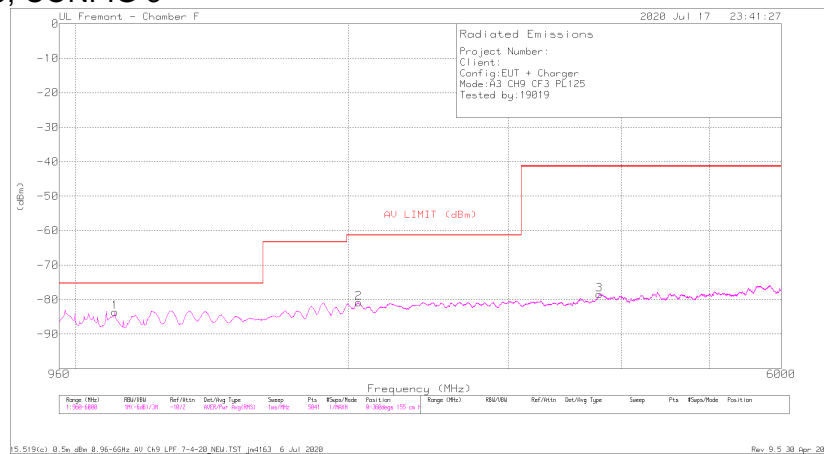


Marker	Frequency (MHz)	Measuring Meter Reading (dBm)	Det	A= 1345 (dBm)	Amp/Cbi (dB)	Dist Correction (dB)	Conversion Factor (dB)	CH5_LPF (dB)	ERP (dBm)	FC15.519(C) ERP RMS (dBm)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1062	-61.32	RMS	27.4	-45.4	-15.6	11.8	2	-82.92	-75.3	-7.62	176	155	H
2	2479	-64.72	RMS	32.4	-45	-15.6	11.8	2	-80.92	-61.3	-19.62	154	155	H
3	4384	-65	RMS	32.4	-45	-15.6	11.8	3	-77.9	-41.3	-36.6	242	155	H
4	1083	-61.77	RMS	27.4	-45.4	-15.6	11.8	2	-83.37	-75.3	-8.07	226	155	V
5	1877	-63.29	RMS	30.8	-45	-15.6	11.8	3	-80.99	-63.3	-17.69	251	155	V
6	5520	-67.55	RMS	34.7	-41.7	-15.6	11.8	1.8	-76.55	-41.3	-35.25	273	155	V

RMS - RMS detection

*Note: Test was performed with a low-pass filter with cutoff frequency at 6 GHz to suppress CH5 fundamental signal.

ANT. 3, CH9, CONFIG 3



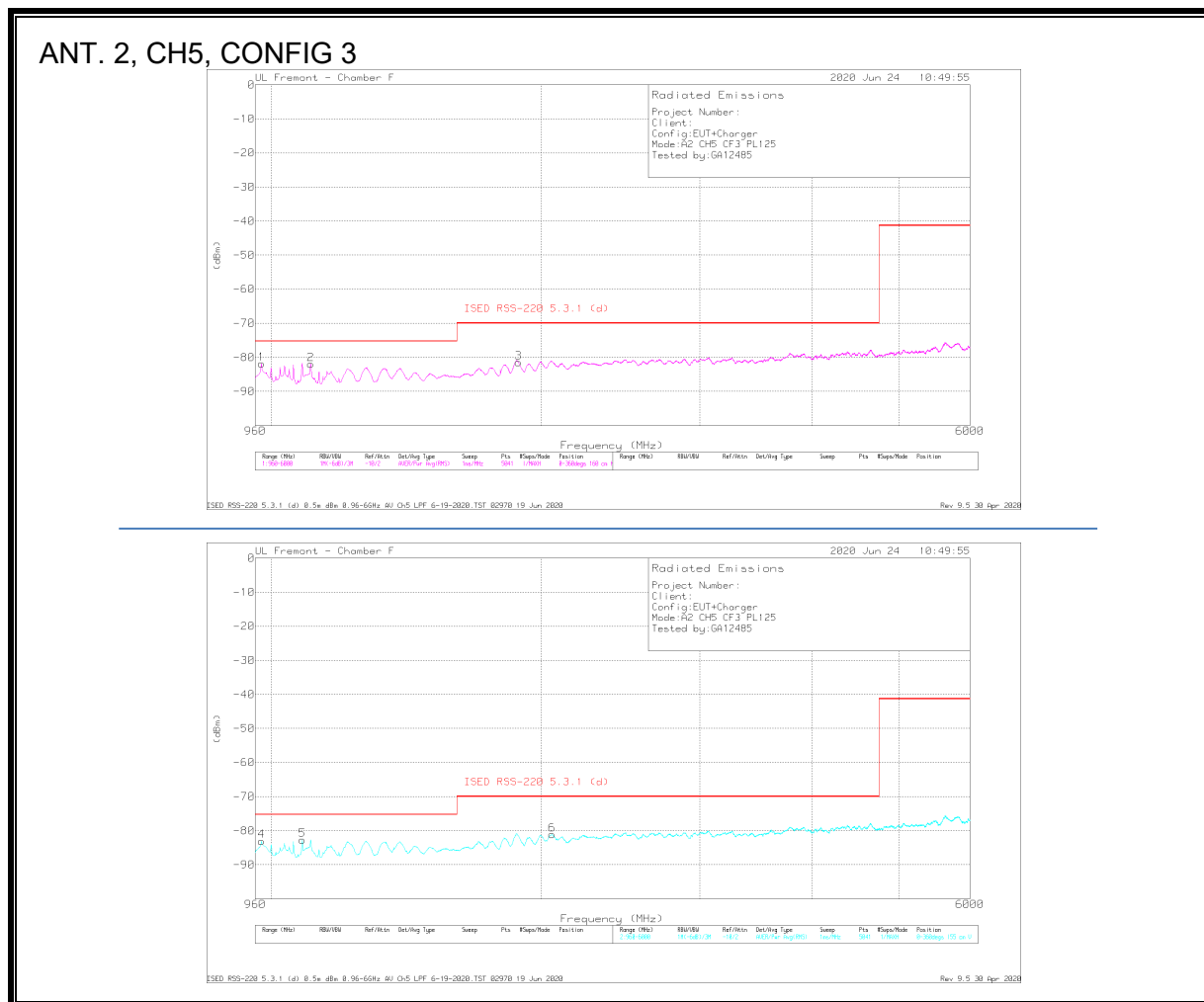
Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBm)	Det	AF T345 (dBm)	Amp/Cbl (dB)	Dist Correction (dB)	Conversion Factor (dB)	CH9_LPF (dB)	EIRP (dBm)	FCC15.519(c) EIRP RMS (dBm)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1106	-62.08	RMS	27.5	-45.4	-15.6	11.8	.2	-83.58	-75.3	-8.28	154	155	H
2	2052	-63.36	RMS	31.3	-45.4	-15.6	11.8	.4	-80.86	-61.3	-19.56	88	155	H
3	3782	-65.63	RMS	33.6	-43.1	-15.6	11.8	.5	-78.43	-41.3	-37.13	1	155	H
4	1344	-63.09	RMS	29.1	-45.1	-15.6	11.8	.1	-82.79	-75.3	-7.49	185	155	V
5	1877	-63.09	RMS	30.8	-45	-15.6	11.8	.3	-80.79	-63.3	-17.49	207	155	V
6	3792	-65.65	RMS	33.6	-43.4	-15.6	11.8	.6	-78.65	-41.3	-37.55	359	155	V

RMS - RMS detection

*Note: Test was performed with a low-pass filter with cutoff frequency at 6 GHz to suppress CH9 fundamental signal.

8.6.1.2. RSS-220 5.3.1 (d)



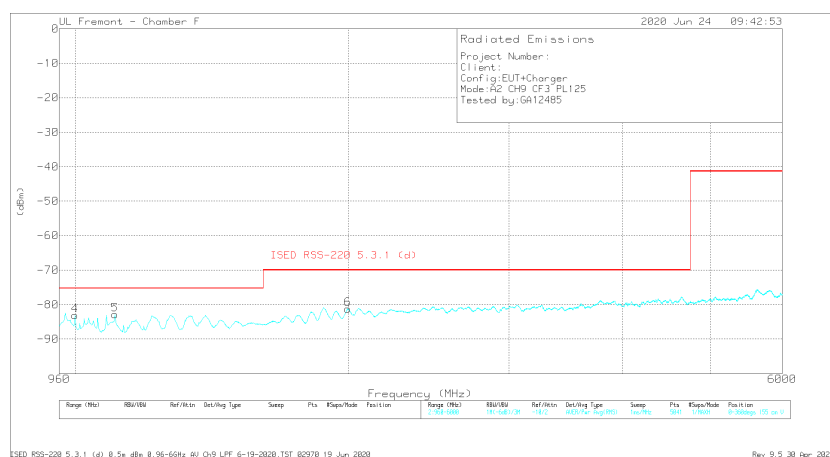
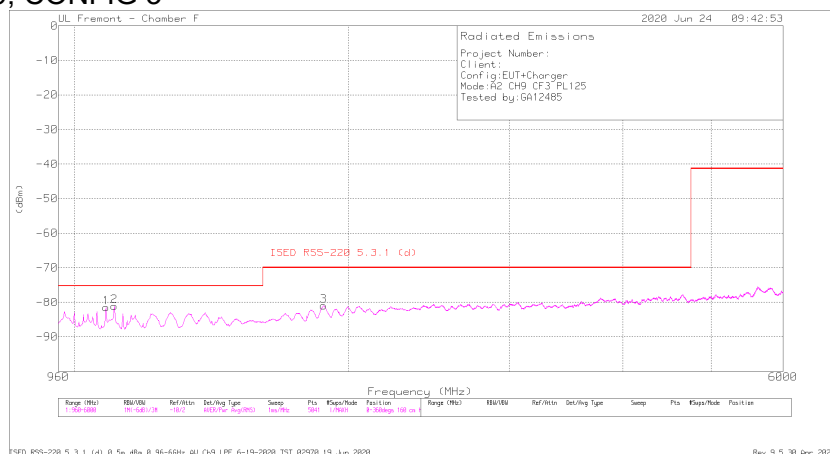
Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBm)	Det	AF T345 (dBm)	Amp/Cbi (dB)	Dist Correction (dB)	Conversion Factor (dB)	CH5_LPF (dB)	Corrected Reading (dBm)	ISED RSS-220 5.3.1 (d)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	976	-60.99	RMS	27.8	-45.1	-15.6	11.8	.2	-81.99	-75.3	-6.59	228	160	H
2	1107	-60.34	RMS	27.5	-45.5	-15.6	11.8	.2	-81.94	-75.3	-6.64	228	160	H
3	1885	-63.43	RMS	30.7	-45.1	-15.6	11.8	.2	-81.43	-70	-11.43	360	160	H
4	976	-62.13	RMS	27.8	-45.1	-15.6	11.8	.2	-83.03	-75.3	-7.73	220	155	V
5	1083	-61.11	RMS	27.4	-45.4	-15.6	11.8	.2	-82.71	-75.3	-7.41	220	155	V
6	2055	-63.48	RMS	31.3	-45.4	-15.6	11.8	.3	-81.08	-70	-11.08	22	155	V

RMS - RMS detection

*Note: Test was performed with a low-pass filter with cutoff frequency at 6 GHz to suppress CH5 fundamental signal.

ANT. 2, CH9, CONFIG 3



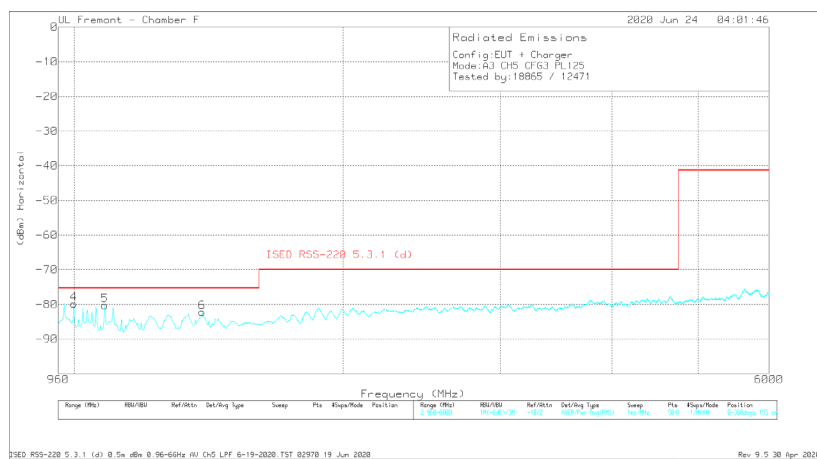
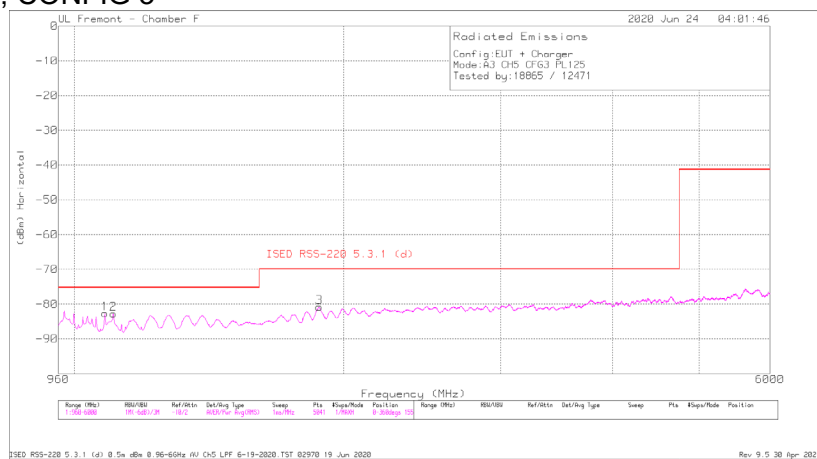
Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBm)	Det	AF T345 (dBm)	Amp/Cbl (dB)	Dist Correction (dB)	Conversion Factor (dB)	CH9_LPF (dB)	Corrected Reading (dBm)	ISED RSS-228 5.3.1 (d)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1083	-59.84	RMS	27.4	-45.4	-15.6	11.8	.2	-81.44	-75.3	-6.14	163	160	H
2	1106	-59.55	RMS	27.5	-45.4	-15.6	11.8	.2	-81.05	-75.3	-5.75	163	160	H
3	1878	-63.19	RMS	30.7	-45	-15.6	11.8	.3	-80.99	-70	-10.99	53	160	H
4	999	-62.14	RMS	27.8	-45.1	-15.6	11.8	.2	-83.04	-75.3	-7.74	154	155	V
5	1106	-61.39	RMS	27.5	-45.4	-15.6	11.8	.2	-82.89	-75.3	-7.59	154	155	V
6	1996	-63.63	RMS	31.3	-45.4	-15.6	11.8	.3	-81.23	-70	-11.23	330	155	V

RMS - RMS detection

*Note: Test was performed with a low-pass filter with cutoff frequency at 6 GHz to suppress CH9 fundamental signal.

ANT. 3, CH5, CONFIG 3

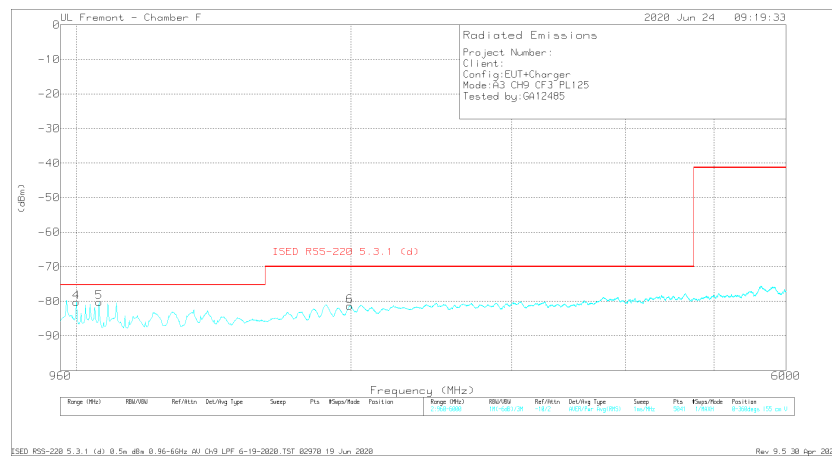
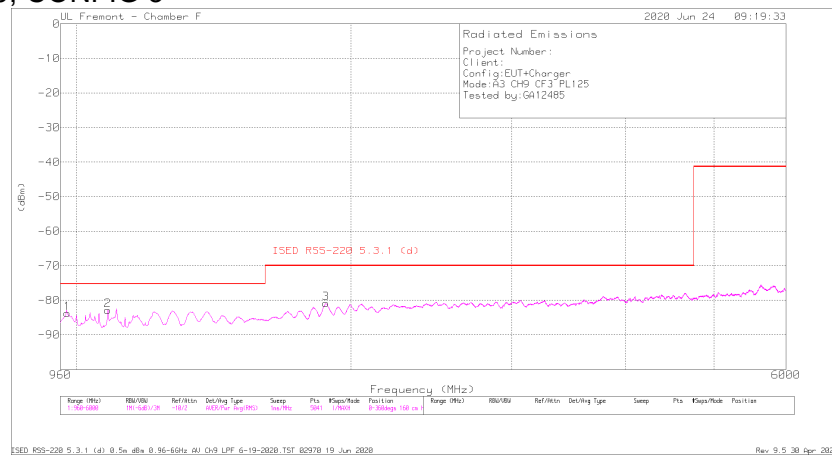


Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBm)	Det	AF T345 (dBm)	Amp/Cbl (dB)	Dist Correction (dB)	Conversion Factor (dB)	CH5_LFF (dB)	Corrected Reading (dBm)	ISED RSS-220 5.3.1 (d)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1082	-61.02	RMS	27.4	-45.4	-15.6	11.8	.2	-82.62	-75.3	-7.32	250	155	H
2	1106	-61.24	RMS	27.5	-45.4	-15.6	11.8	.2	-82.74	-75.3	-7.44	250	155	H
3	1879	-63.02	RMS	30.7	-45	-15.6	11.8	.3	-80.82	-70	-10.82	272	155	H
4	999	-58.92	RMS	27.8	-45.1	-15.6	11.8	.2	-79.82	-75.3	-4.52	264	155	V
5	1082	-58.65	RMS	27.4	-45.4	-15.6	11.8	.2	-80.25	-75.3	-4.95	220	155	V
6	1391	-62.11	RMS	28.7	-45.2	-15.6	11.8	.2	-82.21	-75.3	-6.91	198	155	V

RMS - RMS detection

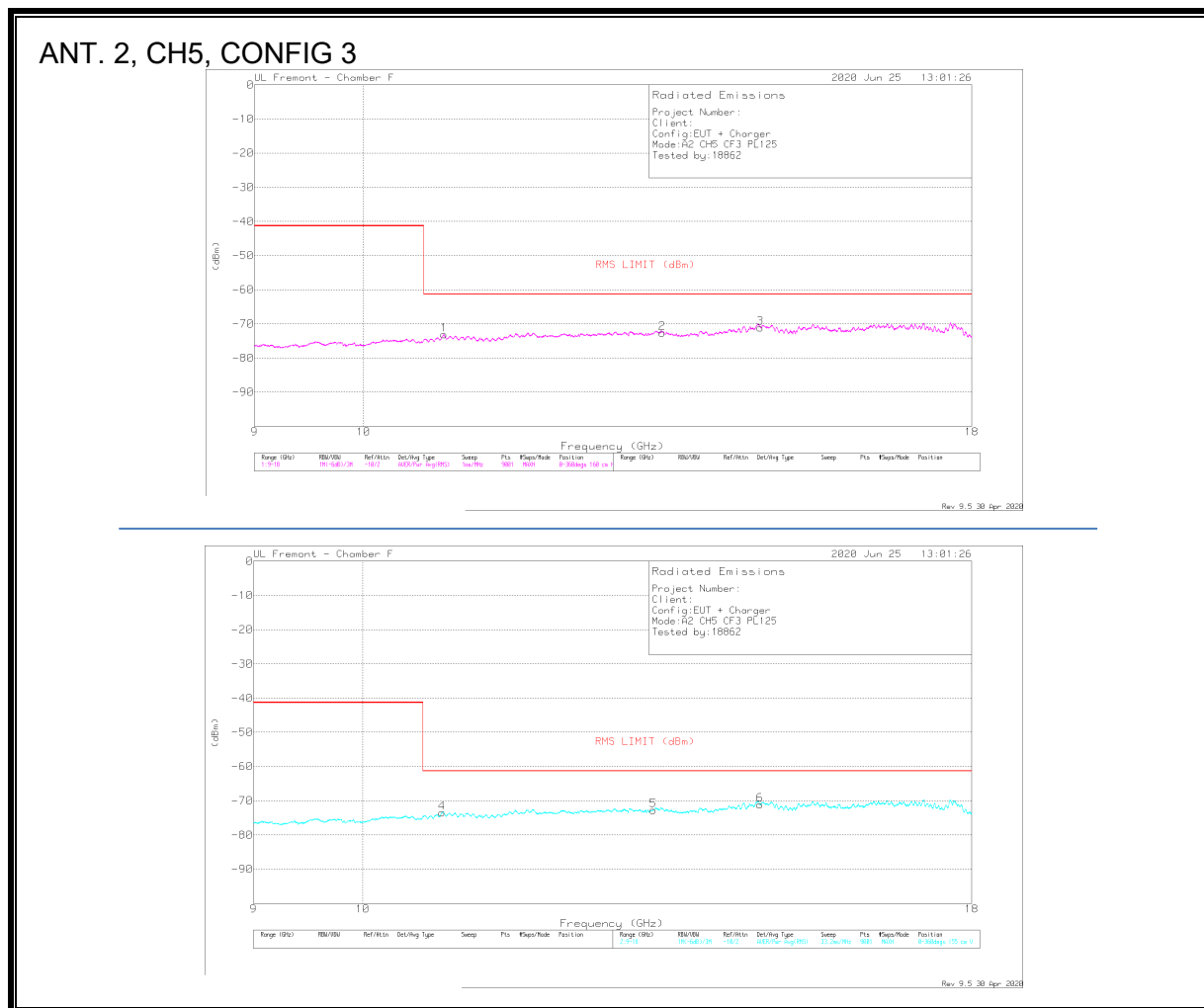
*Note: Test was performed with a low-pass filter with cutoff frequency at 6 GHz to suppress CH5 fundamental signal.



Marker	Frequency (MHz)	Meter Reading (dBm)	Det	AF T345 (dBm)	Amp/Cbl (dB)	Dist Correction (dB)	Conversion Factor (dB)	CH9_LPF (dB)	Corrected Reading (dBm)	ISED RSS-220 5.3.1 (dB)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	977	-62.84	RMS	27.8	-45.1	-15.6	11.8	-2	-83.74	-75.3	-8.44	251	160	H
2	1082	-61.25	RMS	27.4	-45.4	-15.6	11.8	-2	-82.85	-75.3	-7.55	185	160	H
3	1878	-63.09	RMS	30.7	-45	-15.6	11.8	-3	-80.89	-70	-10.89	163	160	H
4	999	-59.37	RMS	27.8	-45.1	-15.6	11.8	-2	-80.27	-75.3	-4.97	220	155	V
5	1059	-57.97	RMS	26.8	-45.4	-15.6	11.8	-2	-80.17	-75.3	-4.87	220	155	V
6	1994	-63.79	RMS	31.3	-45.4	-15.6	11.8	-3	-81.39	-70	-11.39	176	155	V

*Note: Test was performed with a low-pass filter with cutoff frequency at 6 GHz to suppress CH9 fundamental signal.

8.6.2. AVERAGE EMISSIONS, 9 – 18 GHz



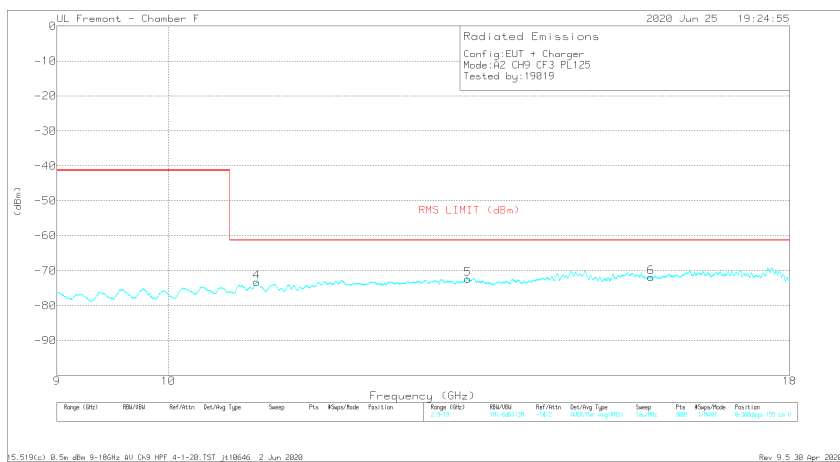
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T119 (dBm)	Amp/Cbl (dB)	Dist Correction (dB)	Conversion Factor (dB)	CH5_HPF (dB)	EIRP (dBm)	FCC15.119(c) EIRP RMS (dBm)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	10.81	-70.78	RMS	37.9	-37.1	-15.6	11.8	.6	-73.18	-61.3	-11.88	295	160	H
2	13.348	-71.94	RMS	39.1	-36.5	-15.6	11.8	.5	-72.64	-61.3	-11.34	317	160	H
3	14.674	-70.82	RMS	40.2	-37.3	-15.6	11.8	.6	-71.12	-61.3	-9.82	207	160	H
4	10.797	-70.78	RMS	37.8	-37.3	-15.6	11.8	.6	-73.48	-61.3	-12.18	88	155	V
5	13.238	-70.89	RMS	39	-37.5	-15.6	11.8	.4	-72.79	-61.3	-11.49	220	155	V
6	14.674	-70.85	RMS	40.2	-37.3	-15.6	11.8	.6	-71.15	-61.3	-9.85	109	155	V

RMS - RMS detection

*Note: Test was performed with a high-pass filter with pass-band frequency starting at 9 GHz to suppress CH5 fundamental signal.

ANT. 2, CH9, CONFIG 3



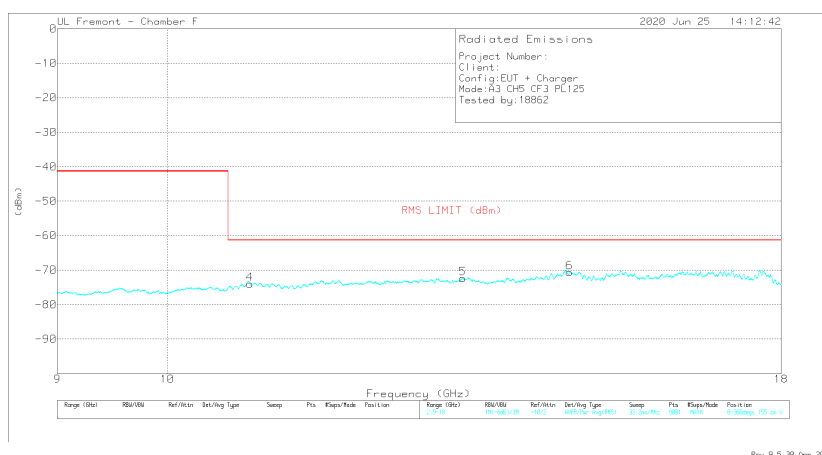
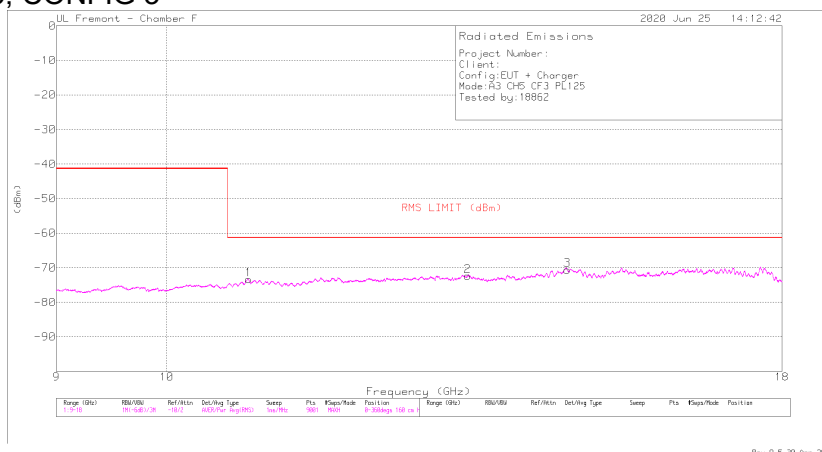
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T119 (dBm)	Amp/Cbl (dB)	Dist Correction (dB)	Conversion Factor (dB)	CH9_HPF (dB)	Corrected Reading (dBm)	FCC15.519(c) ERP RMS (dBm)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	10.873	-69.6	RMS	37.8	-37.7	-15.6	11.8	0	-73.3	-61.3	-12	317	155	H
2	12.662	-71.11	RMS	39.1	-37.6	-15.6	11.8	-3	-73.11	-61.3	-11.81	295	155	H
3	14.824	-70.75	RMS	40.1	-36.6	-15.6	11.8	-5	-70.55	-61.3	-9.25	75	155	H
4	10.874	-69.58	RMS	37.8	-37.7	-15.6	11.8	0	-73.28	-61.3	-11.98	286	155	V
5	13.278	-71.16	RMS	39	-36.8	-15.6	11.8	-4	-72.36	-61.3	-11.06	286	155	V
6	15.787	-71.73	RMS	40.3	-37.2	-15.6	11.8	-6	-71.83	-61.3	-10.53	286	155	V

RMS - RMS detection

*Note: Test was performed with a high-pass filter with pass-band frequency starting at 9 GHz to suppress CH9 fundamental signal.

ANT. 3, CH5, CONFIG 3



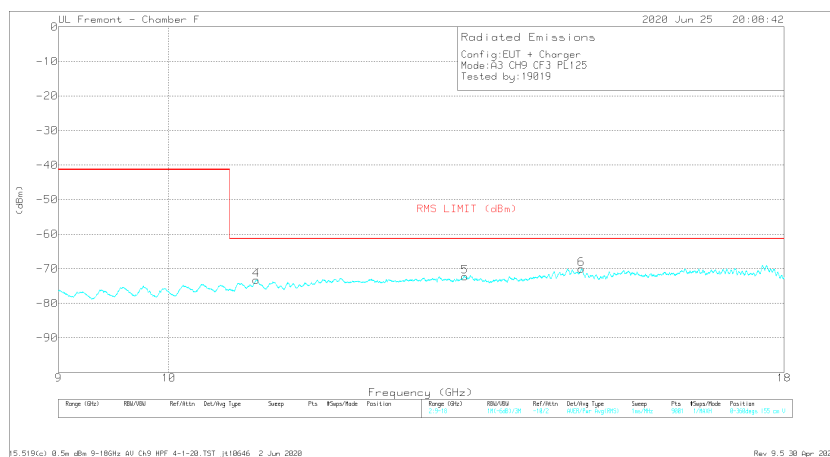
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T119 (dBm)	Amp/Cbl (dB)	Dist Correction (dB)	Conversion Factor (dB)	CH5_HPF (dB)	EIRP (dBm)	FCC15.519(c) EIRP RMS (dBm)	Margin (dB)	Altitude (m)	Height (cm)	Polarity
1	10.814	-70.78	RMS	37.8	-37.2	-15.6	11.8	.6	-73.38	-61.3	-12.08	339	160	H
2	13.331	-71.37	RMS	39.1	-36.8	-15.6	11.8	.5	-72.37	-61.3	-11.07	295	160	H
3	14.662	-71.07	RMS	40.2	-36.6	-15.6	11.8	.7	-70.57	-61.3	-9.27	360	160	H
4	10.823	-70.95	RMS	37.8	-37.7	-15.6	11.8	.6	-74.05	-61.3	-12.75	330	155	V
5	13.271	-71.17	RMS	39	-36.9	-15.6	11.8	.5	-72.37	-61.3	-11.07	178	155	V
6	14.698	-71.02	RMS	40.2	-36.6	-15.6	11.8	.6	-70.62	-61.3	-9.32	242	155	V

RMS - RMS detection

*Note: Test was performed with a high-pass filter with pass-band frequency starting at 9 GHz to suppress CH5 fundamental signal.

ANT. 3, CH9, CONFIG 3



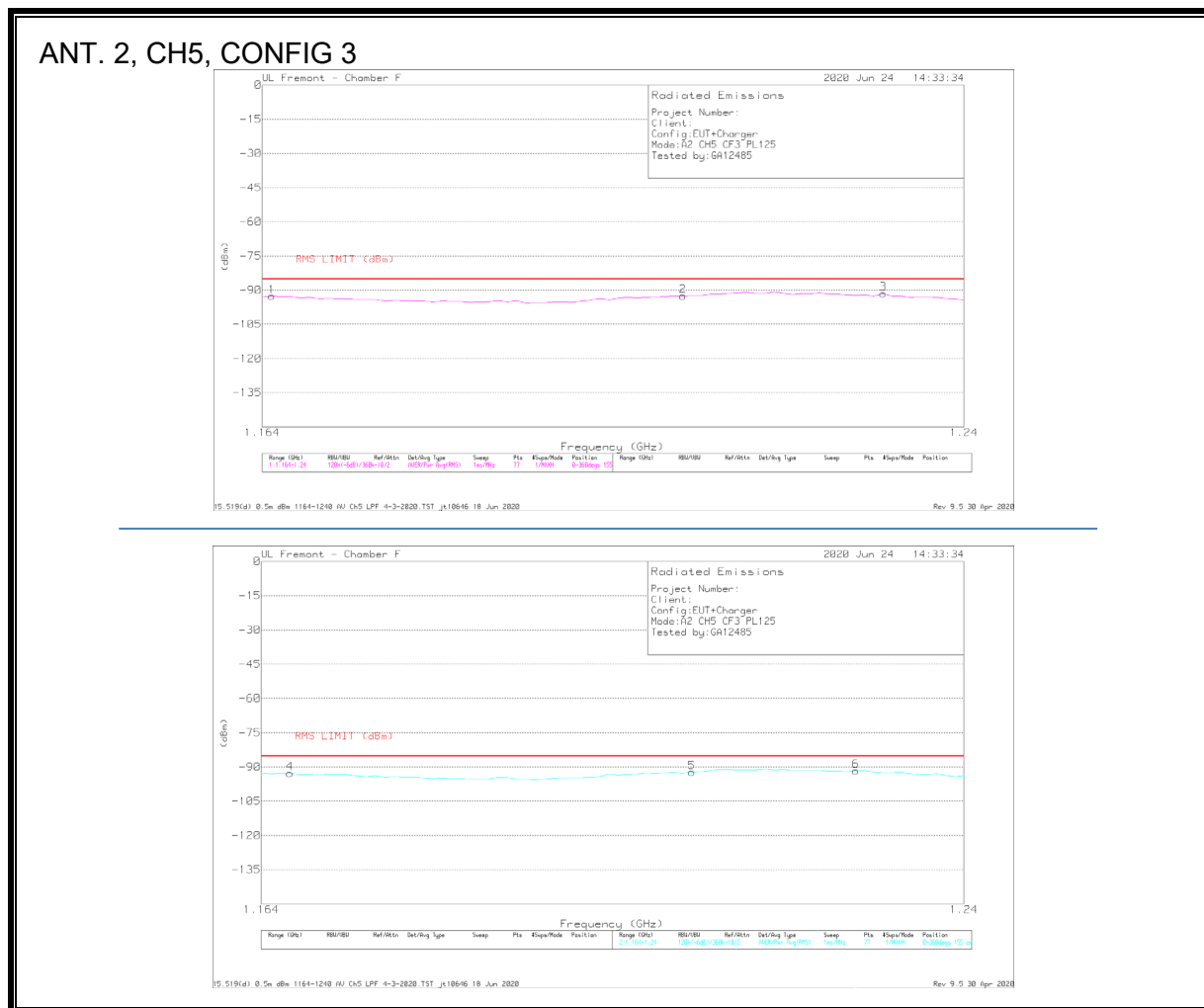
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T119 (dBm)	Amp/Cbl (dB)	Dist Correction (dB)	Conversion Factor (dB)	CH9_HP (dB)	EIRP (dBm)	FCC15.519(c) ERP RMS (dBm)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	10.875	-69.48	RMS	37.8	-37.7	-15.6	11.8	0	-73.18	-61.3	-11.88	185	155	H
2	13.247	-71.11	RMS	39.1	-37.3	-15.6	11.8	.4	-72.71	-61.3	-11.41	31	155	H
3	14.835	-70.53	RMS	40	-36.4	-15.6	11.8	.7	-70.03	-61.3	-8.73	119	155	H
4	10.873	-69.51	RMS	37.8	-37.7	-15.6	11.8	0	-73.21	-61.3	-11.91	264	155	V
5	13.269	-71.04	RMS	39.1	-36.9	-15.6	11.8	.4	-72.24	-61.3	-10.94	21	155	V
6	14.831	-70.66	RMS	40.1	-36.4	-15.6	11.8	.7	-70.06	-61.3	-8.76	175	155	V

RMS - RMS detection

*Note: Test was performed with a high-pass filter with pass-band frequency starting at 9 GHz to suppress CH9 fundamental signal.

8.6.3. AVERAGE EMISSIONS, 1.164 – 1.240 GHz

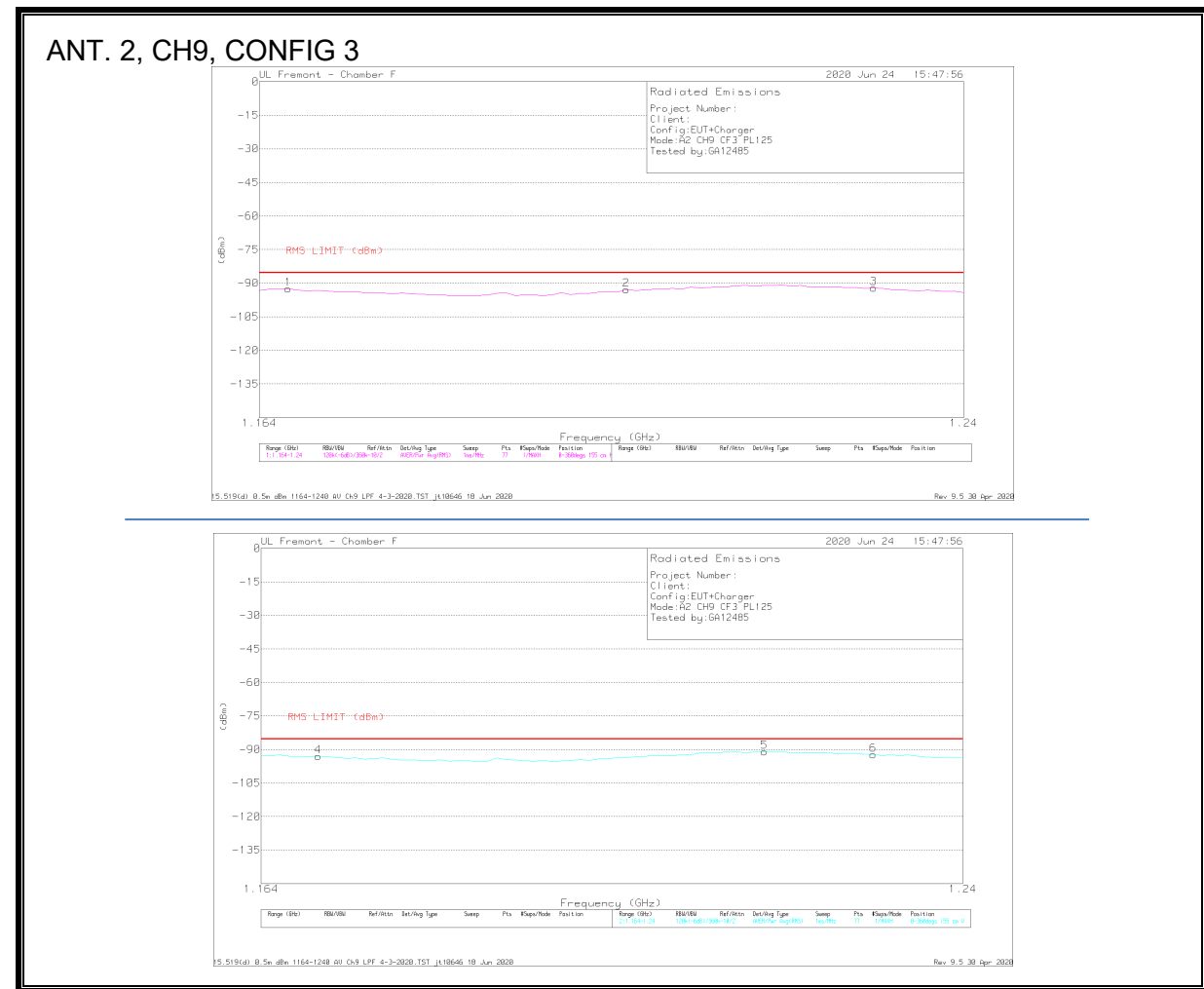


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T119 (dBm)	Amp/Cbi (dB)	Dist Correction (dB)	Conversion Factor (dB)	CH5 LP Filter	EIRP (dBm)	FCC15.519(d) EIRP RMS (dBm)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.165	-72.15	RMS	28.5	-45.4	-15.6	11.8	.2	-92.65	-85.3	-7.35	229	155	H
2	1.209	-73.23	RMS	29.6	-45.3	-15.6	11.8	.2	-92.53	-85.3	-7.23	97	155	H
3	1.231	-72.28	RMS	29.8	-45.4	-15.6	11.8	.2	-91.48	-85.3	-6.18	74	155	H
4	1.167	-72.34	RMS	28.6	-45.4	-15.6	11.8	.2	-92.74	-85.3	-7.44	1	155	V
5	1.21	-72.99	RMS	29.6	-45.3	-15.6	11.8	.2	-92.29	-85.3	-6.99	88	155	V
6	1.228	-72.45	RMS	29.8	-45.4	-15.6	11.8	.2	-91.65	-85.3	-6.35	242	155	V

RMS - RMS detection

*Note: Test was performed with a low-pass filter with cutoff frequency at 6 GHz to suppress CH5 fundamental signal.



Trace Markers

Marker	Frequency (GHz)	Measuring Reading (dBm)	Det	AF 1119 (dBm)	Amp/Cbl (dB)	Dist Correction (dB)	Conversion Factor (dB)	CH9 LP Filter	ERP (dBm)	FC15.519(d) ERP RMS (dBm)	Margin (dB)	Azimuth (Dega)	Height (cm)	Polarity
1	1.167	-72.15	RMS	28.6	-45.4	-15.6	11.8	2	-92.55	-85.3	-7.25	229	155	H
2	2.203	-73.73	RMS	29.6	-45.2	-15.6	11.8	2	-92.93	-85.3	-7.63	141	155	H
3	1.23	-72.88	RMS	29.8	-45.4	-15.6	11.8	2	-92.08	-85.3	-6.78	119	155	H
4	1.17	-72.67	RMS	28.6	-45.4	-15.6	11.8	2	-93.07	-85.3	-7.77	66	155	V
5	1.218	-72.11	RMS	29.9	-45.2	-15.6	11.8	2	-91.01	-85.3	-5.71	44	155	V
6	1.23	-73.09	RMS	29.8	-45.4	-15.6	11.8	2	-92.29	-85.3	-6.99	110	155	V

RMS - RMS detection

*Note: Test was performed with a low-pass filter with cutoff frequency at 6 GHz to suppress CH9 fundamental signal.

ANT. 3, CH5, CONFIG 3



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T119 (dBm)	Amp/Cbl (dB)	Dist Correction (dB)	Conversion Factor (dB)	CH5 LP Filter	EIRP (dBm)	FCC15.519(d) EIRP RMS (dBm)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.169	-72.05	RMS	28.6	-45.4	-15.6	11.8	.2	-92.45	-85.3	-7.15	185	155	H
2	1.205	-73.45	RMS	29.6	-45.2	-15.6	11.8	.2	-92.65	-85.3	-7.35	339	155	H
3	1.23	-72.78	RMS	29.8	-45.4	-15.6	11.8	.2	-91.98	-85.3	-6.68	317	155	H
4	1.166	-71.57	RMS	28.5	-45.4	-15.6	11.8	.2	-92.07	-85.3	-6.77	242	155	V
5	1.21	-72.76	RMS	29.6	-45.3	-15.6	11.8	.2	-92.06	-85.3	-6.76	65	155	V
6	1.23	-72.93	RMS	29.8	-45.4	-15.6	11.8	.2	-92.13	-85.3	-6.83	286	155	V

RMS - RMS detection

*Note: Test was performed with a low-pass filter with cutoff frequency at 6 GHz to suppress CH5 fundamental signal.

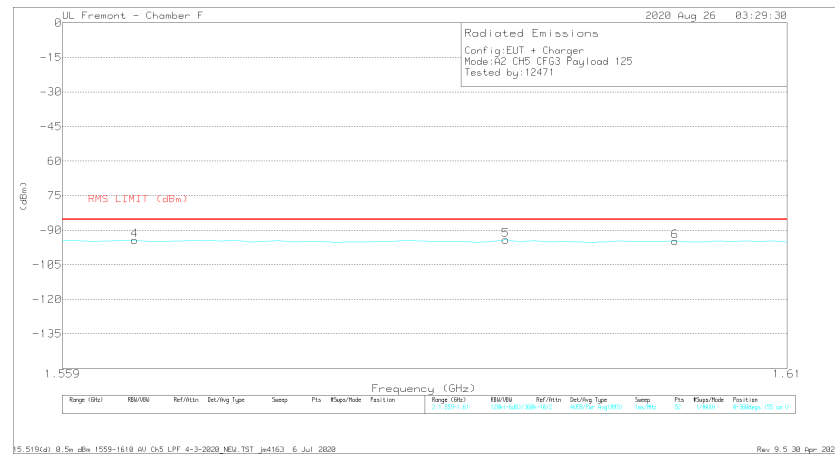


Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T119 (dBm)	Amp/Cbl (dB)	Dist Correction (dB)	Conversion Factor (dB)	CH9 LP Filter	EIRP (dBm)	FCCL5.5519 (dBm)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.177	-73.45	RMS	28.7	-45.4	-15.6	11.8	2	-93.75	-85.3	-8.45	330	155	H
2	1.189	-75.07	RMS	29.1	-45.2	-15.6	11.8	2	-94.77	-85.3	-9.47	198	155	H
3	1.212	-72.03	RMS	29.7	-45.2	-15.6	11.8	2	-91.13	-85.3	-5.83	176	155	H
4	1.179	-74.04	RMS	28.8	-45.4	-15.6	11.8	2	-94.24	-85.3	-8.94	339	155	V
5	1.204	-73.8	RMS	29.6	-45.2	-15.6	11.8	2	-93	-85.3	-7.7	75	155	V
6	1.22	-71.81	RMS	29.9	-45.3	-15.6	11.8	2	-90.81	-85.3	-5.51	295	155	V

*Note: Test was performed with a low-pass filter with cutoff frequency at 6 GHz to suppress CH9 fundamental signal.

8.6.4. AVERAGE EMISSIONS, 1.559 – 1.610 GHz

ANT. 2, CH5, CONFIG 3



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T119 (dBm)	Amp/Cbl (dB)	Dist Correction (dB)	Conversion Factor (dB)	CH5 LP Filter	EIRP (dBm)	FCC15.519(d) EIRP RMS (dBm)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.564	-73.46	RMS	27.9	-45.2	-15.6	11.8	.2	-94.36	-85.3	-9.06	96	155	H
2	1.583	-73.9	RMS	27.9	-45.2	-15.6	11.8	.2	-94.8	-85.3	-9.5	207	155	H
3	1.595	-74.03	RMS	28	-45.2	-15.6	11.8	.3	-94.73	-85.3	-9.43	339	155	H
4	1.564	-73.46	RMS	27.9	-45.2	-15.6	11.8	.2	-94.36	-85.3	-9.06	119	155	V
5	1.59	-73.33	RMS	28	-45.3	-15.6	11.8	.3	-94.13	-85.3	-8.83	229	155	V
6	1.602	-73.8	RMS	28	-45.3	-15.6	11.8	.2	-94.7	-85.3	-9.4	229	155	V

RMS - RMS detection

*Note: Test was performed with a low-pass filter with cutoff frequency at 6 GHz to suppress CH5 fundamental signal.

ANT. 2, CH9, CONFIG 3



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T119 (dBm)	Amp/Cbl (dB)	Dist Correction (dB)	Conversion Factor (dB)	CH9 LP Filter	EIRP (dBm)	FCC15.519(d) EIRP RMS (dBm)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.572	-73.5	RMS	28	-45.2	-15.6	11.8	.2	-94.3	-85.3	-9	330	155	H
2	1.588	-73.42	RMS	28	-45.3	-15.6	11.8	.3	-94.22	-85.3	-8.92	131	155	H
3	1.595	-73.83	RMS	28	-45.2	-15.6	11.8	.3	-94.53	-85.3	-9.23	330	155	H
4	1.57	-73.42	RMS	28	-45.2	-15.6	11.8	.2	-94.22	-85.3	-8.92	207	155	V
5	1.587	-73.78	RMS	28	-45.3	-15.6	11.8	.3	-94.58	-85.3	-9.28	273	155	V
6	1.604	-74.2	RMS	28	-45.3	-15.6	11.8	.3	-95	-85.3	-9.7	75	155	V

RMS - RMS detection

*Note: Test was performed with a low-pass filter with cutoff frequency at 6 GHz to suppress CH9 fundamental signal.

ANT. 3, CH5, CONFIG 3



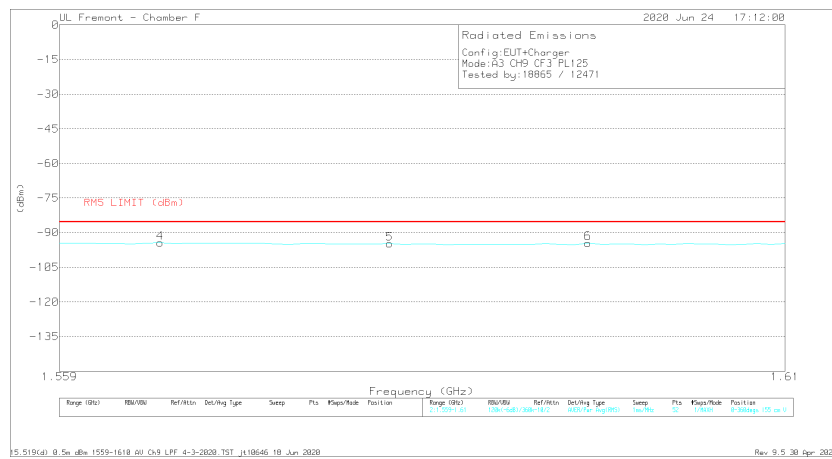
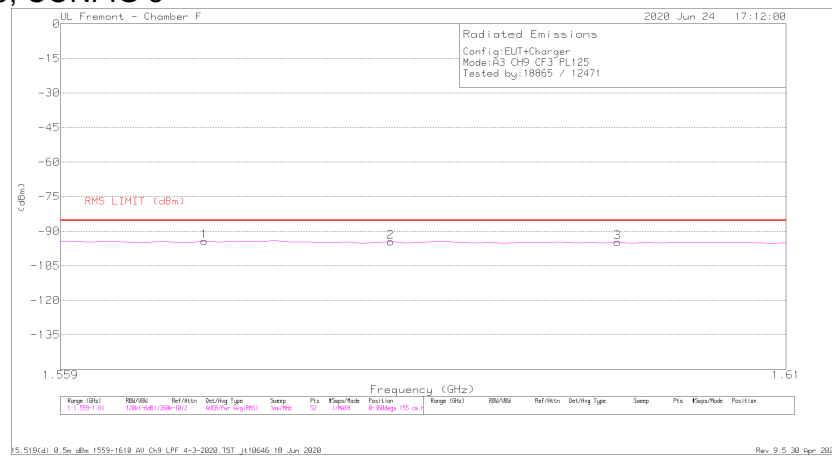
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T119 (dBm)	Amp/Cb1 (dB)	Dist Correction (dB)	Conversion Factor (dB)	CH5 LP Filter	EIRP (dBm)	FCC15.519(d) EIRP RMS (dBm)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.567	-73.29	RMS	27.9	-45.2	-15.6	11.8	.2	-94.19	-85.3	-8.89	97	155	H
2	1.583	-73.6	RMS	27.9	-45.2	-15.6	11.8	.2	-94.5	-85.3	-9.2	163	155	H
3	1.6	-73.63	RMS	28	-45.3	-15.6	11.8	.3	-94.43	-85.3	-9.13	207	155	H
4	1.561	-73.59	RMS	27.9	-45.2	-15.6	11.8	.2	-94.49	-85.3	-9.19	131	155	V
5	1.576	-73.71	RMS	28	-45.2	-15.6	11.8	.2	-94.51	-85.3	-9.21	154	155	V
6	1.594	-73.66	RMS	28	-45.2	-15.6	11.8	.3	-94.36	-85.3	-9.06	198	155	V

RMS - RMS detection

*Note: Test was performed with a low-pass filter with cutoff frequency at 6 GHz to suppress CH5 fundamental signal.

ANT. 3, CH9, CONFIG 3



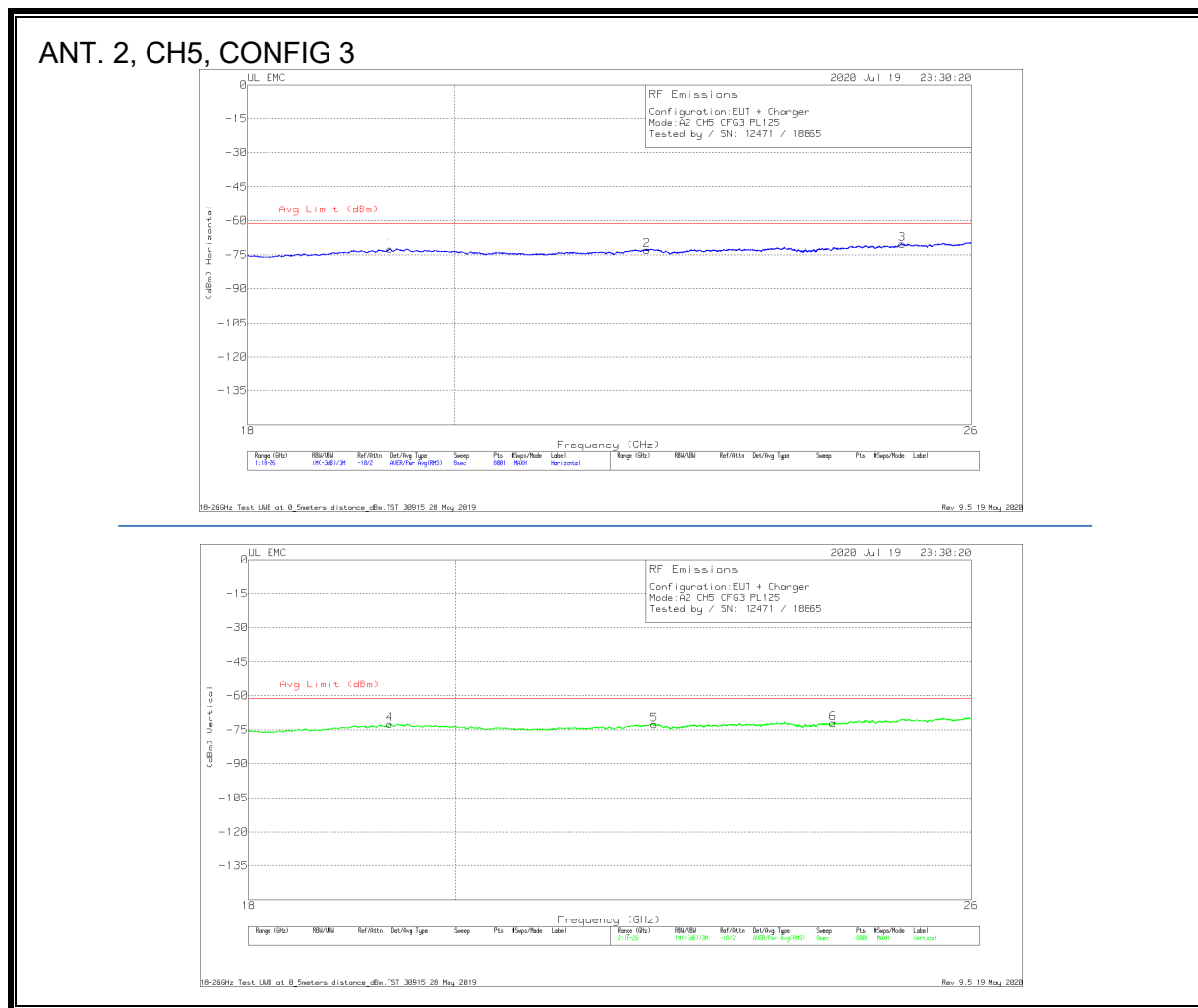
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T119 (dBm)	Amp/Cbl (dB)	Dist Correction (dB)	Conversion Factor (dB)	CH9 LP Filter	EIRP (dBm)	FCC15.519(d) ERP RMS (dBm)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.569	-73.46	RMS	27.9	-45.2	-15.6	11.8	.2	-94.36	-85.3	-9.06	359	155	H
2	1.582	-73.69	RMS	27.9	-45.2	-15.6	11.8	.3	-94.49	-85.3	-9.19	207	155	H
3	1.598	-73.97	RMS	28	-45.2	-15.6	11.8	.3	-94.67	-85.3	-9.37	273	155	H
4	1.566	-73.45	RMS	27.9	-45.2	-15.6	11.8	.2	-94.35	-85.3	-9.05	110	155	V
5	1.582	-73.86	RMS	27.9	-45.2	-15.6	11.8	.3	-94.66	-85.3	-9.36	329	155	V
6	1.596	-73.75	RMS	28	-45.2	-15.6	11.8	.3	-94.45	-85.3	-9.15	286	155	V

RMS - RMS detection

*Note: Test was performed with a low-pass filter with cutoff frequency at 6 GHz to suppress CH9 fundamental signal.

8.6.5. AVERAGE EMISSIONS, 18 – 26 GHz

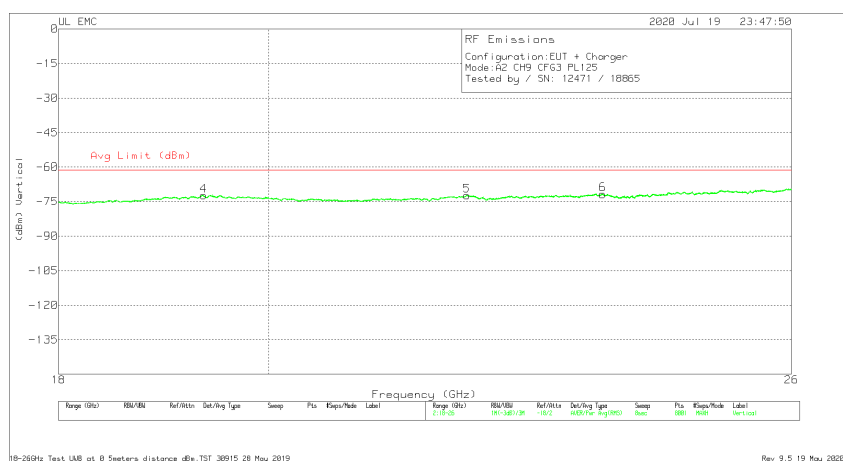
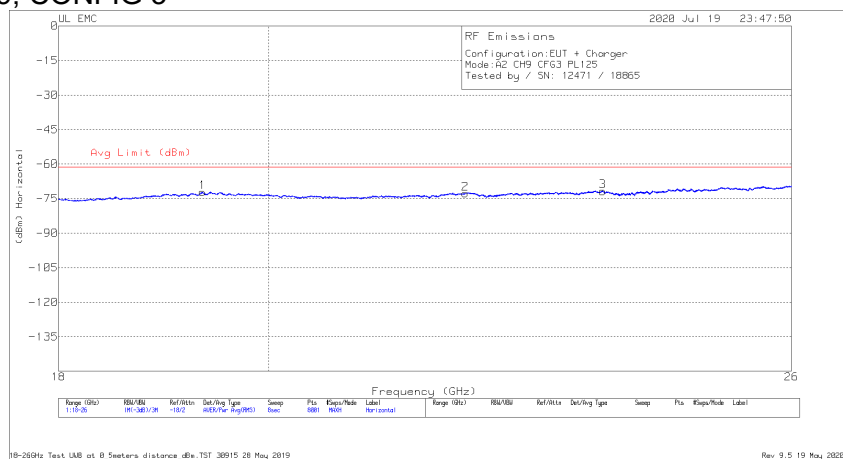


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	PRE0079280 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Conversion Factor (dB)	EIRP (dBm)	Avg Limit (dBm)	Margin (dB)
1	19.351	-82.49	RMS	32.6	-18.7	-15.6	11.8	-72.39	-61.3	-11.09
2	22.052	-82.06	RMS	33.4	-20.3	-15.6	11.8	-72.76	-61.3	-11.46
3	25.103	-81.58	RMS	34.3	-19.1	-15.6	11.8	-70.18	-61.3	-8.88
4	19.34	-82.64	RMS	32.6	-18.6	-15.6	11.8	-72.44	-61.3	-11.14
5	22.127	-81.95	RMS	33.4	-20.2	-15.6	11.8	-72.55	-61.3	-11.25
6	24.238	-82.82	RMS	33.8	-19.2	-15.6	11.8	-72.02	-61.3	-10.72

RMS - RMS detection

ANT. 2, CH9, CONFIG 3

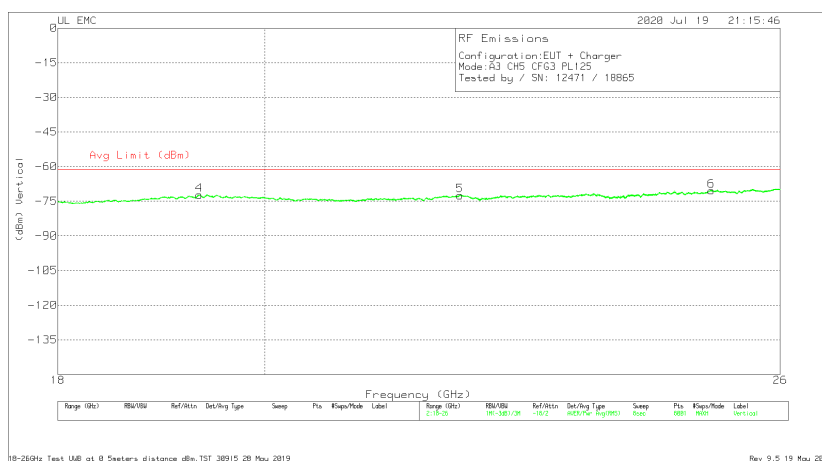
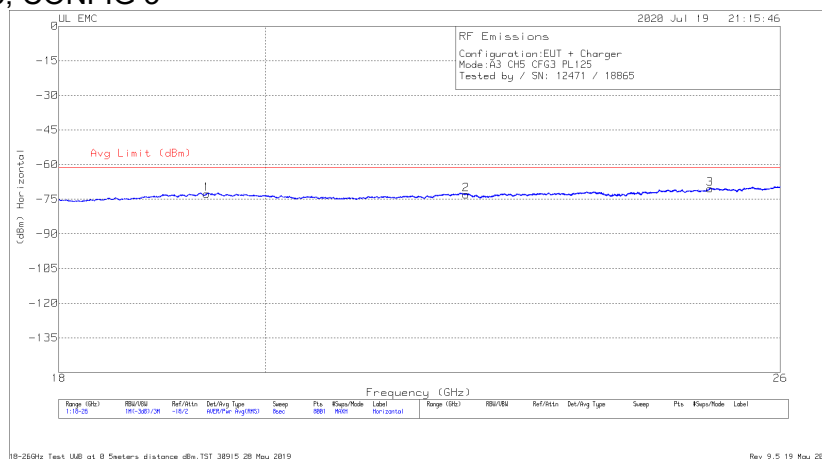


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	PRE0079280 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Conversion Factor (dB)	EIRP (dBm)	Avg Limit (dBm)	Margin (dB)
1	19.348	-82.24	RMS	32.6	-18.7	-15.6	11.8	-72.14	-61.3	-10.84
2	22.074	-82.24	RMS	33.4	-20.1	-15.6	11.8	-72.74	-61.3	-11.44
3	23.65	-82.19	RMS	33.8	-19.6	-15.6	11.8	-71.79	-61.3	-10.49
4	19.359	-82.31	RMS	32.6	-18.8	-15.6	11.8	-72.31	-61.3	-11.01
5	22.094	-81.99	RMS	33.4	-19.9	-15.6	11.8	-72.29	-61.3	-10.99
6	23.65	-82.19	RMS	33.8	-19.6	-15.6	11.8	-71.79	-61.3	-10.49

RMS - RMS detection

ANT. 3, CH5, CONFIG 3

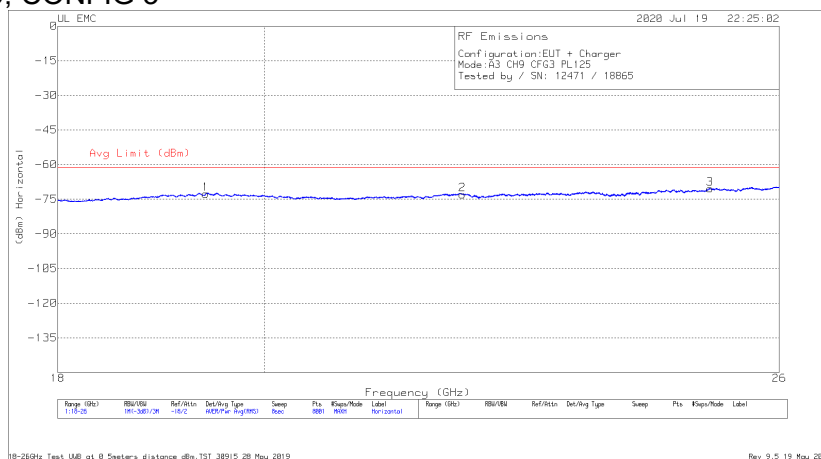


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	PRE0079280 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Conversion Factor (dB)	EIRP (dBm)	Avg Limit (dBm)	Margin (dB)
1	19.41	-82.7	RMS	32.6	-18.8	-15.6	11.8	-72.7	-61.3	-11.4
2	22.153	-82.31	RMS	33.4	-20.2	-15.6	11.8	-72.91	-61.3	-11.61
3	25.085	-81.73	RMS	34.3	-19.2	-15.6	11.8	-70.43	-61.3	-9.13
4	19.344	-82.45	RMS	32.6	-18.6	-15.6	11.8	-72.25	-61.3	-10.95
5	22.089	-82.16	RMS	33.4	-19.9	-15.6	11.8	-72.46	-61.3	-11.16
6	25.105	-81.81	RMS	34.3	-19.1	-15.6	11.8	-70.41	-61.3	-9.11

RMS - RMS detection

ANT. 3, CH9, CONFIG 3

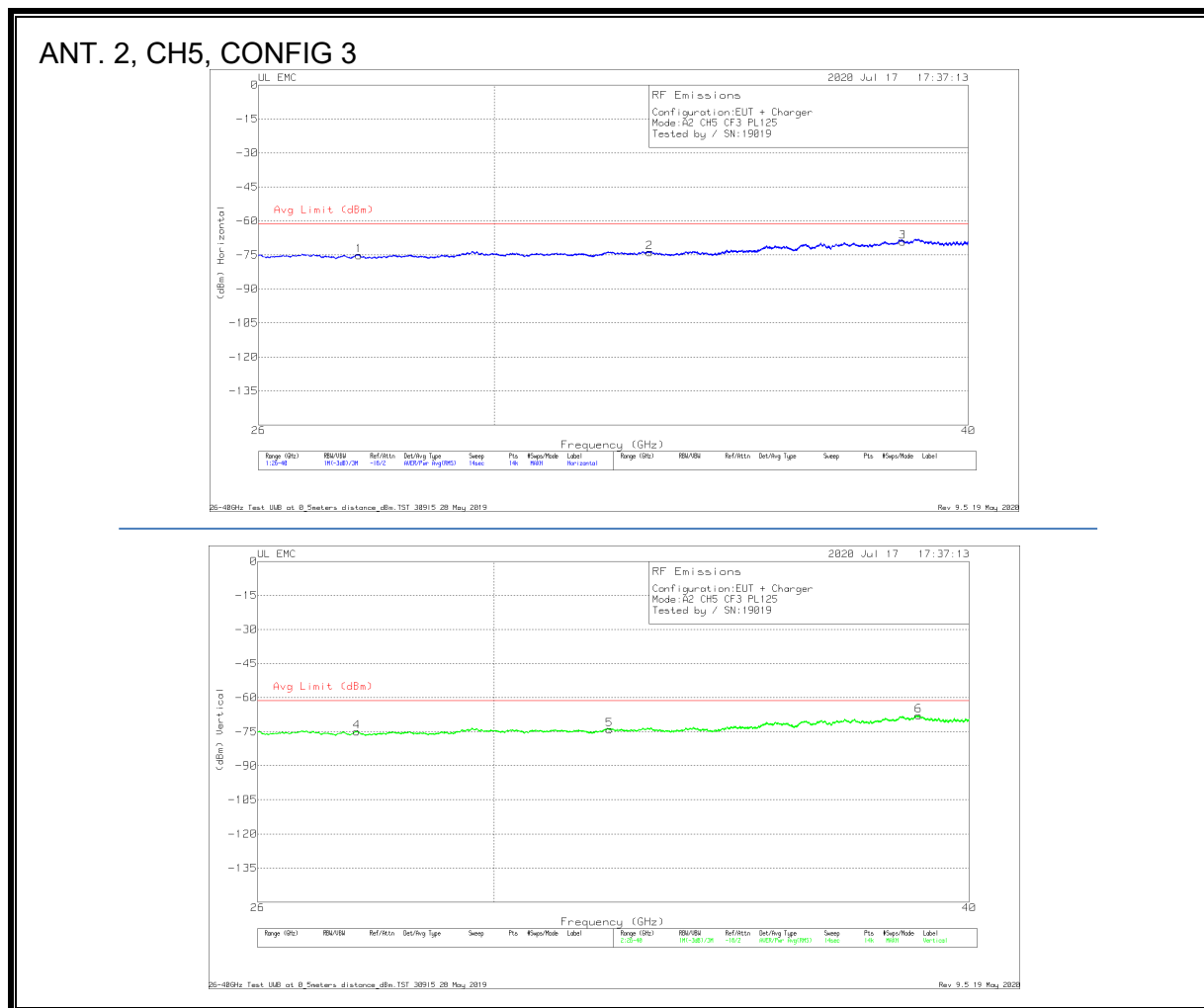


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	PRE0079280 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Conversion Factor (dB)	Corrected Reading (dBm)	Avg Limit (dBm)	Margin (dB)
1	19.41	-82.7	RMS	32.6	-18.8	-15.6	11.8	-72.7	-61.3	-11.4
2	22.124	-82.49	RMS	33.4	-20.1	-15.6	11.8	-72.99	-61.3	-11.69
3	25.098	-81.83	RMS	34.3	-19.1	-15.6	11.8	-70.43	-61.3	-9.13
4	19.354	-82.43	RMS	32.6	-18.7	-15.6	11.8	-72.33	-61.3	-11.03
5	22.165	-82.44	RMS	33.4	-20	-15.6	11.8	-72.84	-61.3	-11.54
6	25.151	-81.83	RMS	34.2	-19.5	-15.6	11.8	-70.93	-61.3	-9.63

RMS - RMS detection

8.6.6. AVERAGE EMISSIONS, 26 – 40 GHz

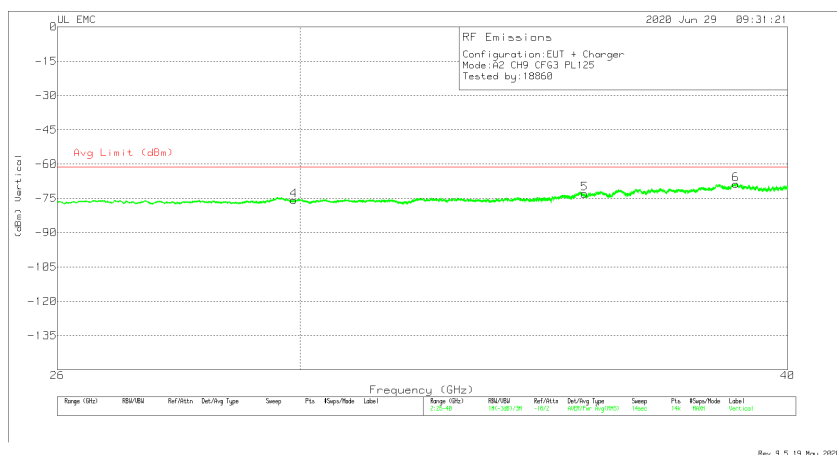
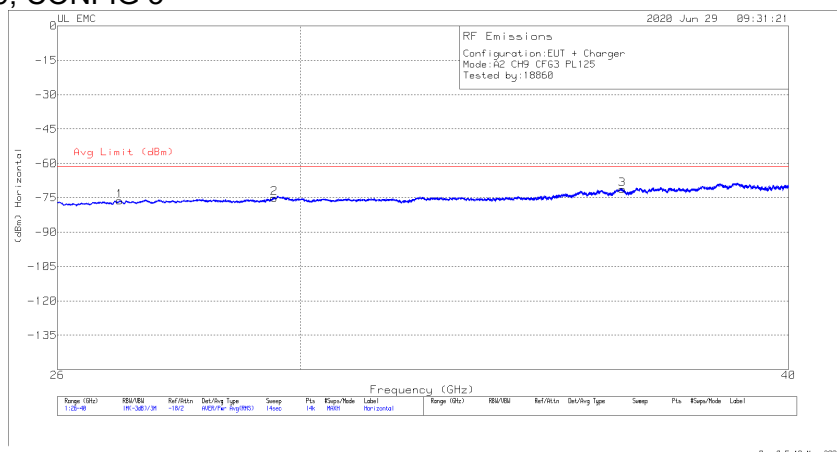


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	PRE0182203 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Conversion Factor (dB)	EIRP (dBm)	Avg Limit (dBm)	Margin (dB)
1	27.634	-78.14	RMS	35.8	-29	-15.6	11.8	-75.14	-61.3	-13.84
2	32.965	-79.18	RMS	36.9	-27.8	-15.6	11.8	-73.88	-61.3	-12.58
3	38.439	-78.56	RMS	38.2	-25	-15.6	11.8	-69.16	-61.3	-7.86
4	27.608	-77.67	RMS	35.8	-29.3	-15.6	11.8	-74.97	-61.3	-13.67
5	32.173	-79.13	RMS	37	-28.1	-15.6	11.8	-74.03	-61.3	-12.73
6	38.796	-77.26	RMS	38.3	-25.1	-15.6	11.8	-67.86	-61.3	-6.56

RMS - RMS detection

ANT. 2, CH9, CONFIG 3

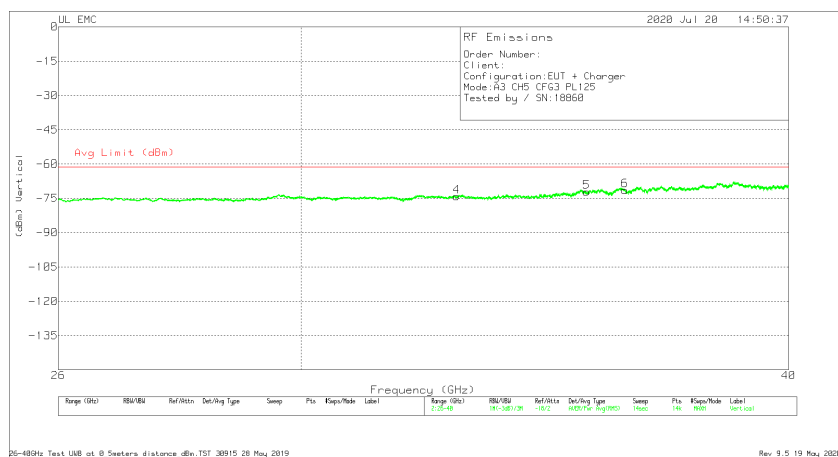
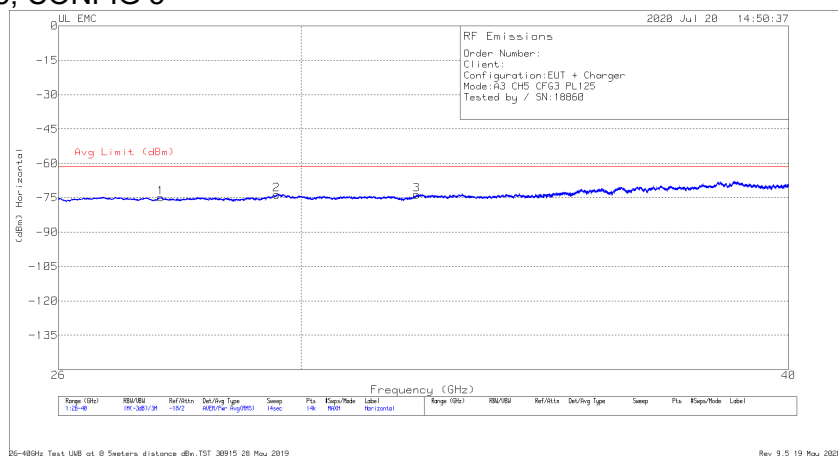


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	PRE0182203 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Conversion Factor (dB)	EIRP (dBm)	Avg Limit (dBm)	Margin (dB)
1	26.968	-78.09	RMS	35.8	-30.2	-15.6	11.8	-76.29	-61.3	-14.99
2	29.546	-80.75	RMS	37	-27.5	-15.6	11.8	-75.05	-61.3	-13.75
3	36.263	-78.9	RMS	37.6	-26.1	-15.6	11.8	-71.2	-61.3	-9.9
4	29.893	-80.87	RMS	36.6	-27.7	-15.6	11.8	-75.77	-61.3	-14.47
5	35.48	-80.42	RMS	37.6	-26.3	-15.6	11.8	-72.92	-61.3	-11.62
6	38.791	-78.09	RMS	38.3	-25.2	-15.6	11.8	-68.79	-61.3	-7.49

RMS - RMS detection

ANT. 3, CH5, CONFIG 3

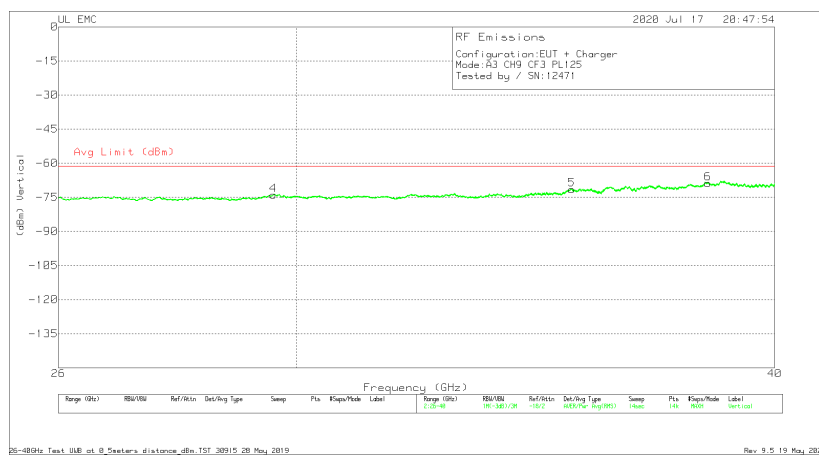
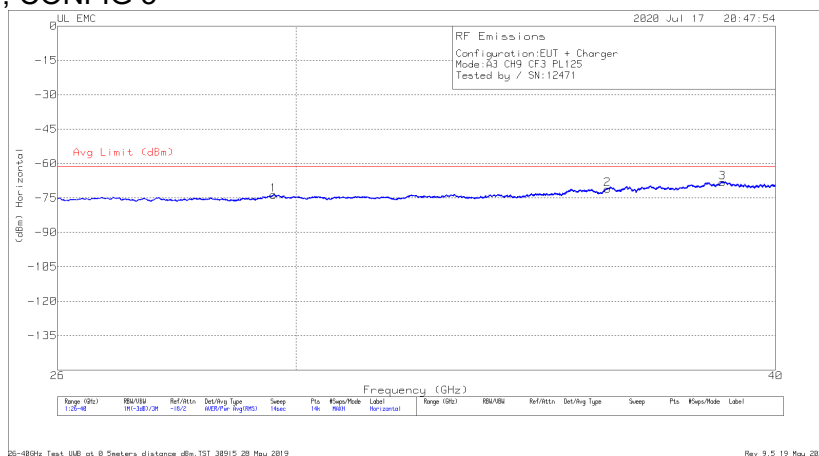


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	PRE0182203 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Conversion Factor (dB)	EIRP (dBm)	Avg Limit (dBm)	Margin (dB)
1	27.614	-77.74	RMS	35.8	-29.2	-15.6	11.8	-74.94	-61.3	-13.64
2	29.571	-79.39	RMS	37.1	-27.5	-15.6	11.8	-73.59	-61.3	-12.29
3	32.115	-78.82	RMS	37	-28	-15.6	11.8	-73.62	-61.3	-12.32
4	32.883	-79.36	RMS	36.8	-27.8	-15.6	11.8	-74.16	-61.3	-12.86
5	35.502	-79.55	RMS	37.6	-26.4	-15.6	11.8	-72.15	-61.3	-10.85
6	36.316	-79.29	RMS	37.6	-25.9	-15.6	11.8	-71.39	-61.3	-10.09

RMS - RMS detection

ANT. 3, CH9, CONFIG 3



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	PRE0182203 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Conversion Factor (dB)	EIRP (dBm)	Avg Limit (dBm)	Margin (dB)
1	29.598	-79.9	RMS	37.2	-27.1	-15.6	11.8	-73.6	-61.3	-12.3
2	36.166	-78.48	RMS	37.6	-26.4	-15.6	11.8	-71.08	-61.3	-9.78
3	38.748	-77.58	RMS	38.2	-25	-15.6	11.8	-68.18	-61.3	-6.88
4	29.589	-80.18	RMS	37.2	-27.2	-15.6	11.8	-73.98	-61.3	-12.68
5	35.406	-79.01	RMS	37.8	-26.5	-15.6	11.8	-71.51	-61.3	-10.21
6	38.427	-78.46	RMS	38.3	-24.9	-15.6	11.8	-68.86	-61.3	-7.56

RMS - RMS detection

8.7. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 [*]	56 to 46 [*]
0.5-5	56	46
5-30	60	50

^{*} Decreases with the logarithm of the frequency.

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.

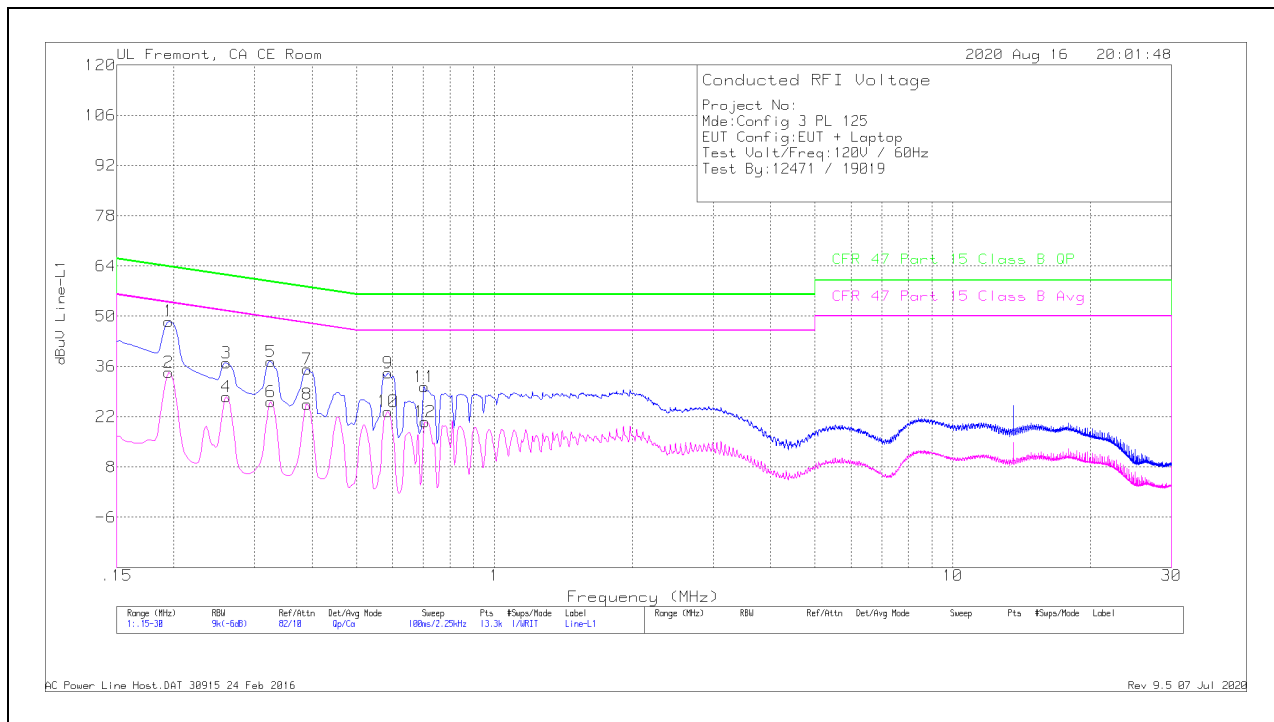
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

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

RESULTS

8.7.1. AC Power Line Host With Laptop

LINE 1 RESULTS



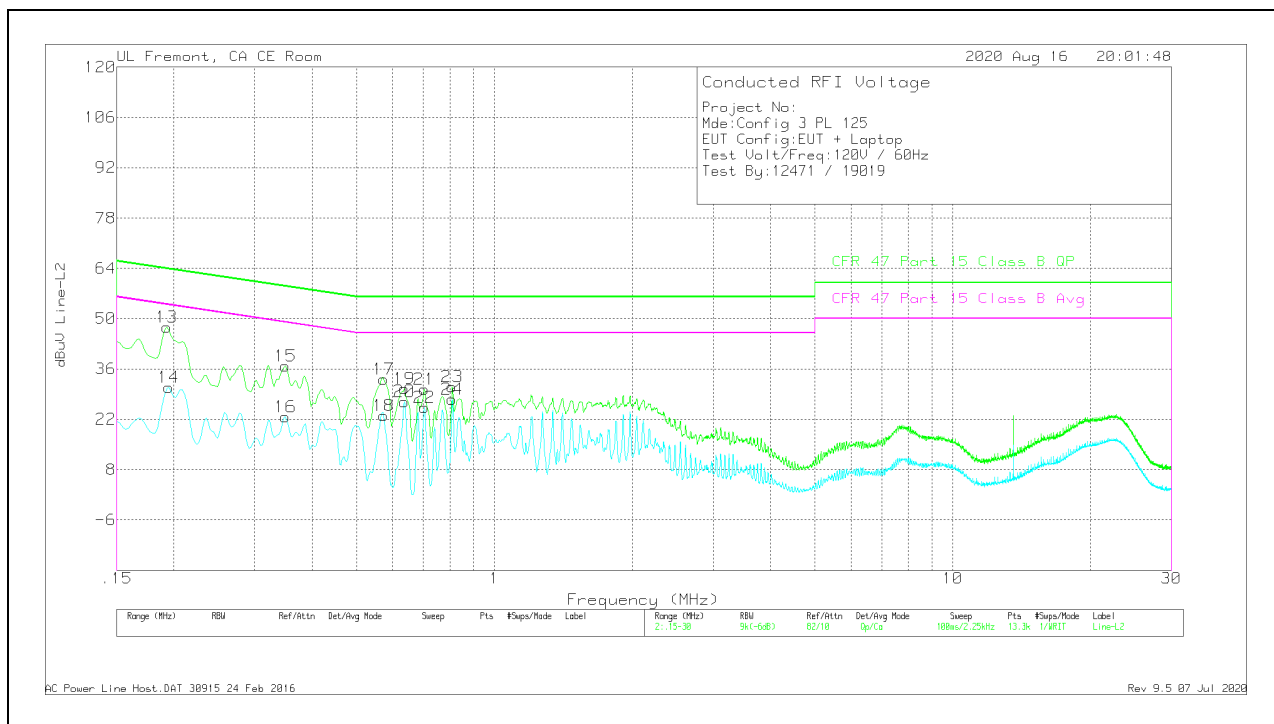
Range 1: Line-L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE018644 6 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)M argin (dB)
1	.195	38.6	Qp	0	0	10	48.6	63.82	-15.22	-	-
2	.195	24.4	Ca	0	0	10	34.4	-	-	53.82	-19.42
3	.26025	27.02	Qp	0	0	10	37.02	61.42	-24.4	-	-
4	.26025	17.62	Ca	0	0	10	27.62	-	-	51.42	-23.8
5	.3255	27.35	Qp	0	0	10	37.35	59.57	-22.22	-	-
6	.3255	16.2	Ca	0	0	10	26.2	-	-	49.57	-23.37
7	.39075	25.23	Qp	0	0	10	35.23	58.05	-22.82	-	-
8	.39075	15.51	Ca	0	0	10	25.51	-	-	48.05	-22.54
9	.5865	24.14	Qp	0	0	10	34.14	56	-21.86	-	-
10	.5865	13.47	Ca	0	0	10	23.47	-	-	46	-22.53
11	.7035	20.33	Qp	0	0	10	30.33	56	-25.67	-	-
12	.70575	10.62	Ca	0	0	10	20.62	-	-	46	-25.38

Qp - Quasi-Peak detector

Ca - CISPR average detection

LINE 2 RESULTS



Range 2: Line-L2 .15 - 30MHz

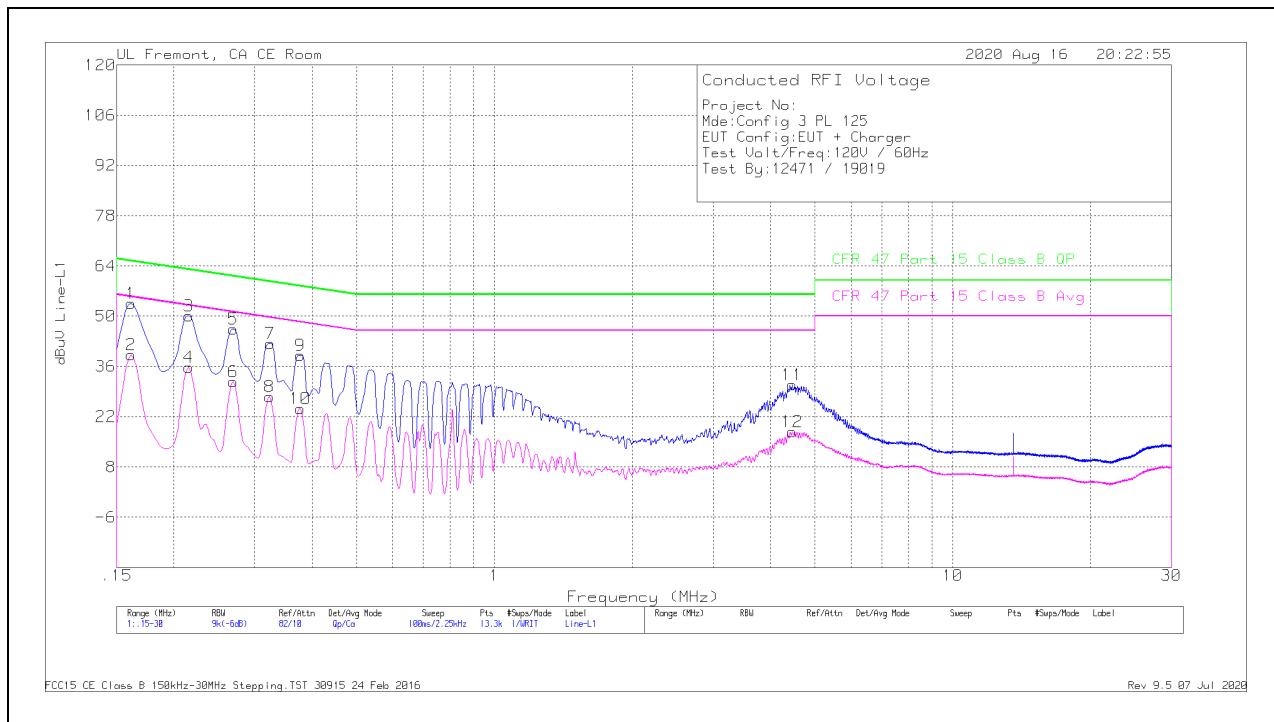
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE018644 6 LISN L2	LC Cables C2&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR)M argin (dB)
13	.19275	37.7	Qp	0	0	10	47.7	63.92	-16.22	-	-
14	.195	20.93	Ca	0	0	10	30.93	-	-	53.82	-22.89
15	.35025	26.74	Qp	0	0	10	36.74	58.96	-22.22	-	-
16	.35025	12.67	Ca	0	0	10	22.67	-	-	48.96	-26.29
17	.573	23.2	Qp	0	0	10	33.2	56	-22.8	-	-
18	.573	13.1	Ca	0	0	10	23.1	-	-	46	-22.9
19	.636	20.61	Qp	0	0	10	30.61	56	-25.39	-	-
20	.636	16.96	Ca	0	0	10	26.96	-	-	46	-19.04
21	.7035	20.29	Qp	0	0	10	30.29	56	-25.71	-	-
22	.7035	15.25	Ca	0	0	10	25.25	-	-	46	-20.75
23	.80925	20.99	Qp	0	0	10	30.99	56	-25.01	-	-
24	.80925	17.62	Ca	0	0	10	27.62	-	-	46	-18.38

Qp - Quasi-Peak detector

Ca - CISPR average detection

8.7.2. AC Power Line With AC/DC Adapter

LINE 1 RESULTS



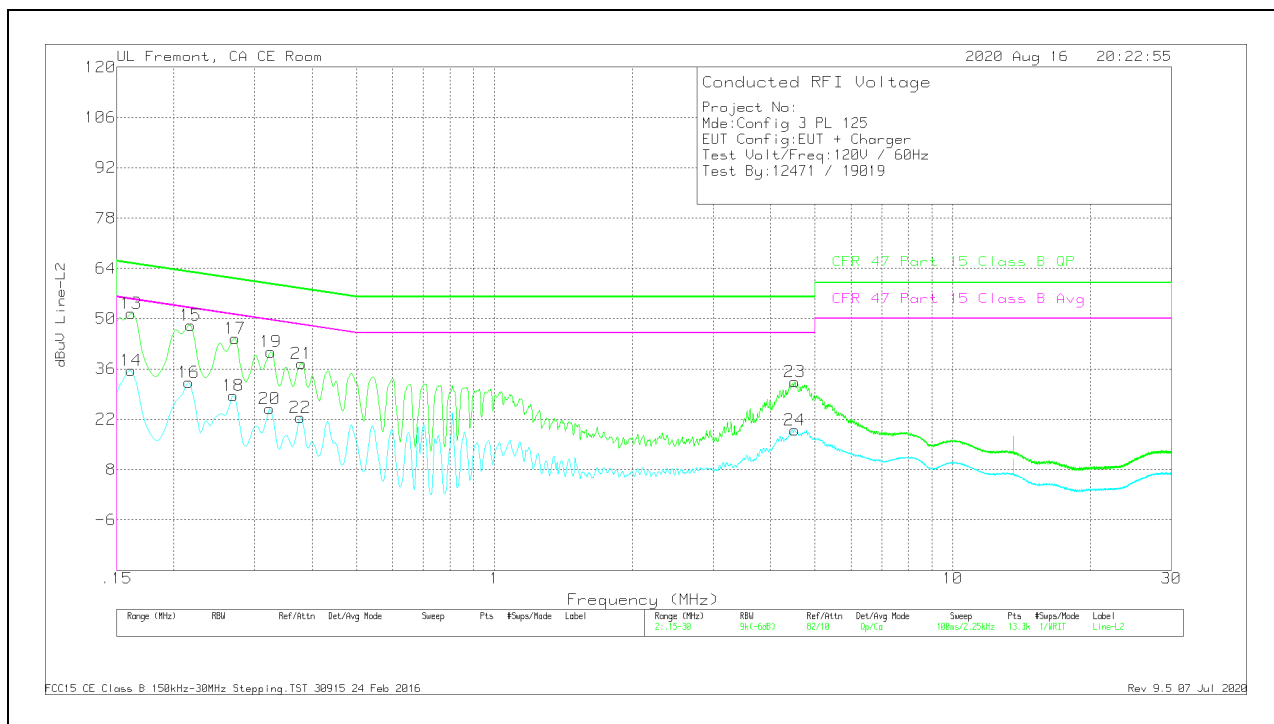
Range 1: Line-L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE018644 6 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)M argin (dB)
1	.16125	43.61	Qp	0	0	10	53.61	65.4	-11.79	-	-
2	.16125	29.28	Ca	0	0	10	39.28	-	-	55.4	-16.12
3	.21525	40.09	Qp	0	0	10	50.09	63	-12.91	-	-
4	.21525	25.77	Ca	0	0	10	35.77	-	-	53	-17.23
5	.26925	36.37	Qp	0	0	10	46.37	61.14	-14.77	-	-
6	.26925	21.74	Ca	0	0	10	31.74	-	-	51.14	-19.4
7	.32438	32.48	Qp	0	0	10	42.48	59.59	-17.11	-	-
8	.32325	17.64	Ca	0	0	10	27.64	-	-	49.62	-21.98
9	.37725	29.14	Qp	0	0	10	39.14	58.34	-19.2	-	-
10	.37725	14.3	Ca	0	0	10	24.3	-	-	48.34	-24.04
11	4.46775	20.63	Qp	0	.1	10.1	30.83	56	-25.17	-	-
12	4.46663	7.66	Ca	0	.1	10.1	17.86	-	-	46	-28.14

Qp - Quasi-Peak detector

Ca - CISPR average detection

LINE 2 RESULTS



Range 2: Line-L2 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE018644 6 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)M argin (dB)
13	.16125	41.55	Qp	0	0	10	51.55	65.4	-13.85	-	-
14	.16125	25.66	Ca	0	0	10	35.66	-	-	55.4	-19.74
15	.2175	38.2	Qp	0	0	10	48.2	62.91	-14.71	-	-
16	.21525	22.23	Ca	0	0	10	32.23	-	-	53	-20.77
17	.2715	34.57	Qp	0	0	10	44.57	61.07	-16.5	-	-
18	.26925	18.54	Ca	0	0	10	28.54	-	-	51.14	-22.6
19	.3255	30.75	Qp	0	0	10	40.75	59.57	-18.82	-	-
20	.32325	14.95	Ca	0	0	10	24.95	-	-	49.62	-24.67
21	.3795	27.55	Qp	0	0	10	37.55	58.29	-20.74	-	-
22	.37725	12.44	Ca	0	0	10	22.44	-	-	48.34	-25.9
23	4.5285	22.27	Qp	0	.1	10.1	32.47	56	-23.53	-	-
24	4.52063	8.89	Ca	0	.1	10.1	19.09	-	-	46	-26.91

Qp - Quasi-Peak detector

Ca - CISPR average detection

9. SETUP PHOTOS

Please refer to 13179110-EP2V1 for setup photos.

END OF REPORT