



CERTIFICATION TEST REPORT

Report Number: R13104595-E1

Applicant : 3DGence Sp. Z o.o
Mickiewicza 29,
40-085 Katowice
Poland

Model : F380.13.024

FCC ID : 2AU79-SMM01

IC : 25678-SMM01

EUT Description : NFC reader rev. 1.1

Test Standard(s) : FCC 47 CFR PART 15 SUBPART C
ISED CANADA RSS-210 ISSUE 10

Date Of Issue:

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Prepared by:

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NVLAP Lab code: 200246-0

REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
1	2020-04-03	Initial Issue	Brian T. Kiewra

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: 3DGence Sp. Z o.o
Mickiewicza 29,
40-085 Katowice
Poland

EUT DESCRIPTION: NFC reader rev. 1.1

MODEL: F380.13.024

SERIAL NUMBER: Non-Serialized

SAMPLE RECEIVED: 2019-12-05

DATE TESTED: 2020-03-02 to 2020-03-03

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 15 SUBPART C	Compliant
ISED RSS-210 Issue 10, Annex B.6	Compliant
ISED RSS-GEN Issue 5	Compliant

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

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

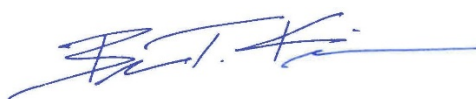
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Approved & Released
For UL LLC By:



Jeffrey Moser
Operations Leader
UL – Consumer Technology Division

Prepared By:



Brian T. Kiewra
Project Engineer
UL – Consumer Technology Division

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2013, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 5, and RSS-210 Issue 10 Annex B.6.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 12 Laboratory Drive, Research Triangle Park, NC 27709, USA and 2800 Perimeter Park Dr., Suite B, Morrisville, NC 27560, USA. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

12 Laboratory Dr.	2800 Perimeter Park Dr.
Site Code: 2180C	
☐ Chamber A RTP	☒ North Chamber
☐ Chamber C RTP	☐ South Chamber

UL LLC (RTP) is accredited by NVLAP, Laboratory Code 200246-0

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

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

4.2. SAMPLE CALCULATION

RADIATED EMISSIONS

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
 $36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} = 28.9 \text{ dBuV/m}$

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:

Final Voltage (dBuV) = Measured Voltage (dBuV) + Cable Loss (dB) + Limiter Factor (dB) + LISN Insertion Loss.
 $36.5 \text{ dBuV} + 0 \text{ dB} + 10.1 \text{ dB} + 0 \text{ dB} = 46.6 \text{ dBuV}$

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Radio Frequency (Spectrum Analyzer)	141.2 Hz
Occupied Channel Bandwidth	2.00%
All emissions, radiated	4.88 dB
Temperature	2.26°C
Humidity	6.79%
DC Supply voltages	1.70%
Time	3.39%

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT, model F380.13.024, is an NFC reader rev. 1.1.

5.1. MAXIMUM FIELD STRENGTH

The maximum E-field reading at 30m is 20.98 dBuV/m.

5.2. SOFTWARE AND FIRMWARE

The test utility software used during testing was WLM rev. 1.5-EMC. The EUT's firmware used during testing was PN532/C106 rev. 1.6.

5.3. WORST-CASE CONFIGURATION AND MODE

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

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

Manufacturer has declared worst-case data rate as 106kbps.

5.4. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Debug Device	3DGence	NA	NA	NA
Power Supply	Donguan MLF Tech Co., LTD	MLF-A00060501000FE0021	1711003780	NA
NFC Tag	3DGence	NA	NA	NA

I/O CABLES

I/O Cable List						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Mini plug	1	4 pin mini plug	4 wire	<1m	Used to provide DC power and configure radio.

SETUP DIAGRAM

Refer to R13104595-EP1 for setup diagrams.

6. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville - North Chamber)

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
0.009-30MHz (Loop Ant.)					
AT0079	Active Loop Antenna	ETS-Lindgren	6502	2019-08-08	2020-08-08
30-1000 MHz					
AT0073	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2019-008-08	2020-08-08
Receiver & Software					
SA0026	Spectrum Analyzer	Agilent	N9030A	2019-03-19	2020-03-19
SOFTEMI	EMI Software	UL	Version 9.5 (2019.06.12)		
Additional Equipment used					
s/n 181474341	Environmental Meter	Fisher Scientific	15-077-963	2018-07-27	2020-07-27
PS215	AC Power Source	Elgar	CW2501M (s/n 1523A02397)	NA	NA

Test Equipment Used - Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
Conducted Room 2					
T177 (PRE0079253)	Spectrum Analyzer	Agilent Technologies	E4446A	2019-04-22	2020-04-22
76023 (EC0225)	Temp/Humid Chamber	Cincinnati Sub-Zero	ZPH-8-3.5-SCT/AC	2019-06-14	2020-06-14
SN 181474341	Environmental Meter	Fisher Scientific	15-077-963	2018-07-27	2020-07-27
76021	DC Regulated Power Supply	CircuitSpecialists.Com	CSI3005X5	N/A	N/A
SOFTEMI	EMC Software	UL	Version 2019.11.13	NA	NA
Additional Equipment used					
MM0167	Multi-Meter	Agilent	U1232A	2019-08-23	2020-08-23

Test Equipment Used - Line-Conducted Emissions – Voltage (Morrisville – Conducted 1)

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
CBL087	Coax cable, RG223, N-male to BNC-male, 20-ft.	Pasternack	PE3W06143-240	2019-05-29	2020-05-29
s/n 181562858	Environmental Meter	Fisher Scientific	14-650-118	2018-09-04	2020-09-04
LISN003	LISN, 50-ohm/50-uH, 2-conductor, 25A	Fischer Custom Com.	FCC-LISN-50-25-2-01-550V	2019-08-19	2020-08-19
75141 (PRE0101521)	EMI Test Receiver 9kHz-7GHz	Rohde & Schwarz	ESCI 7	2019-08-20	2020-08-20
TL001	Transient Limiter, 0.009-30MHz	Com-Power	LIT-930A	2019-05-29	2020-05-29
PS215	AC Power Source	Elgar	CW2501M (s/n 1523A02397)	NA	NA
SOFTEMI	EMI Software	UL	Version 9.5 (2019.06.12)		
CDECABLE001	ANSI C63.4 1m extension cable.	UL	Per Annex B of ANSI C63.4	2019-07-10	2020-07-10

7. OCCUPIED BANDWIDTH

LIMITS

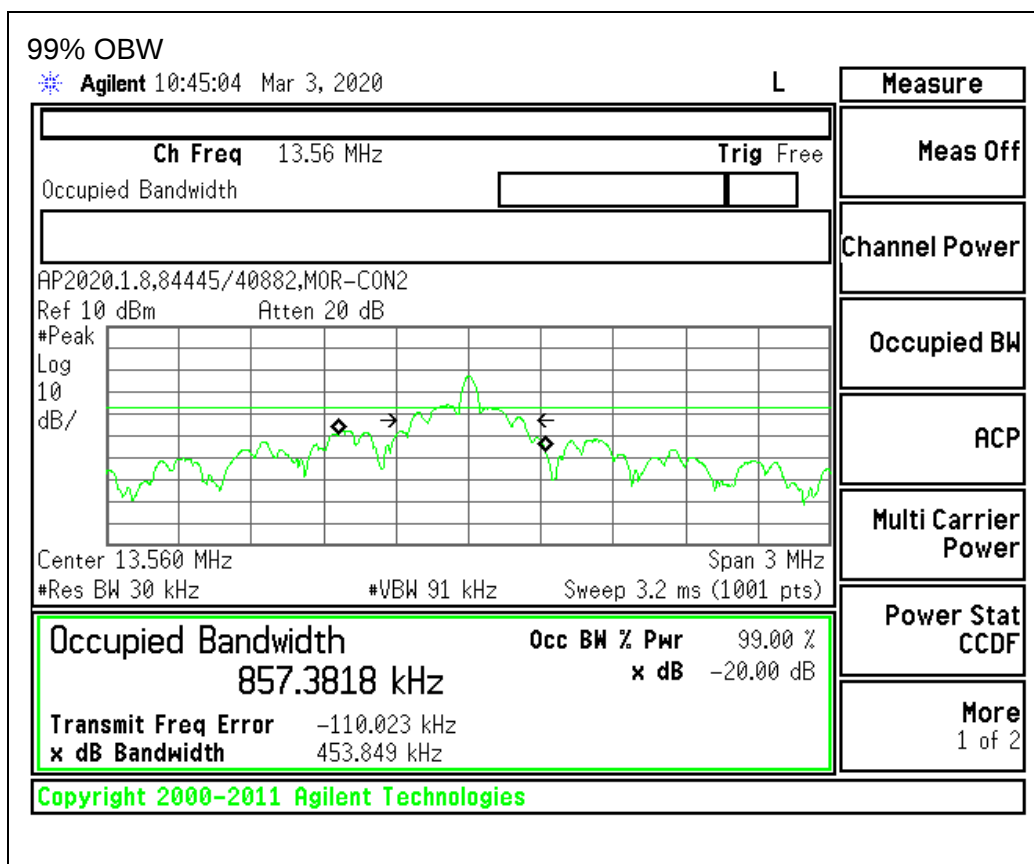
None; for reporting purposes only.

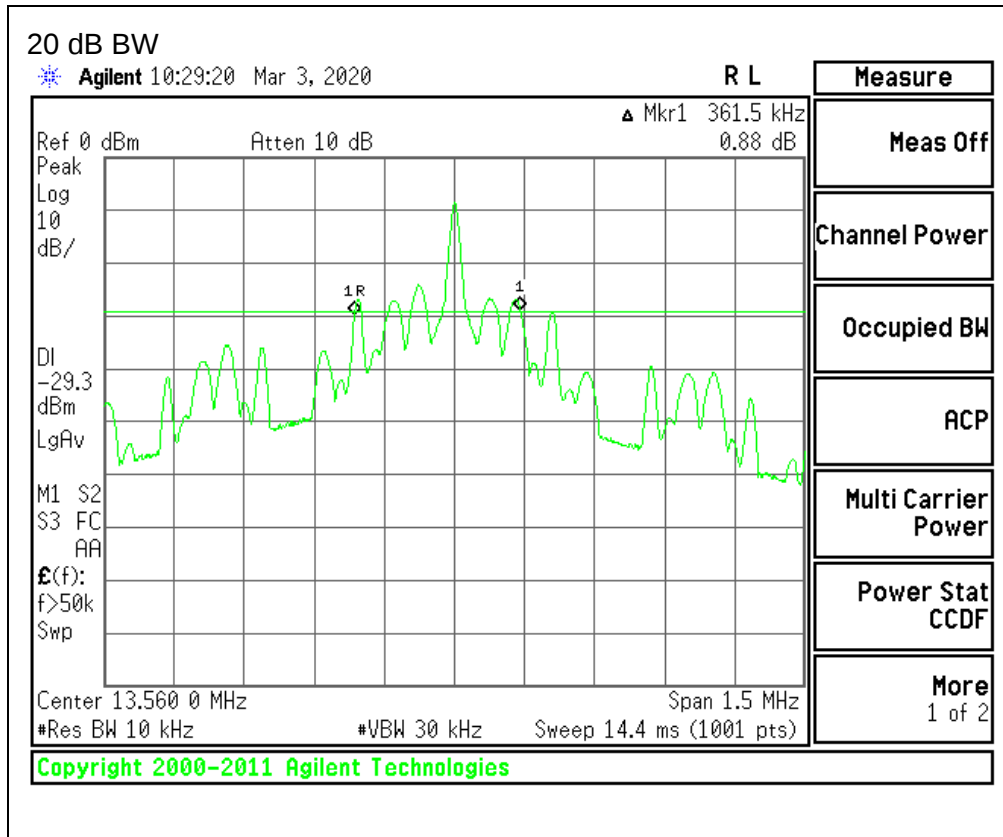
TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1 to 5% of the OBW. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

7.1. WITHOUT TAG

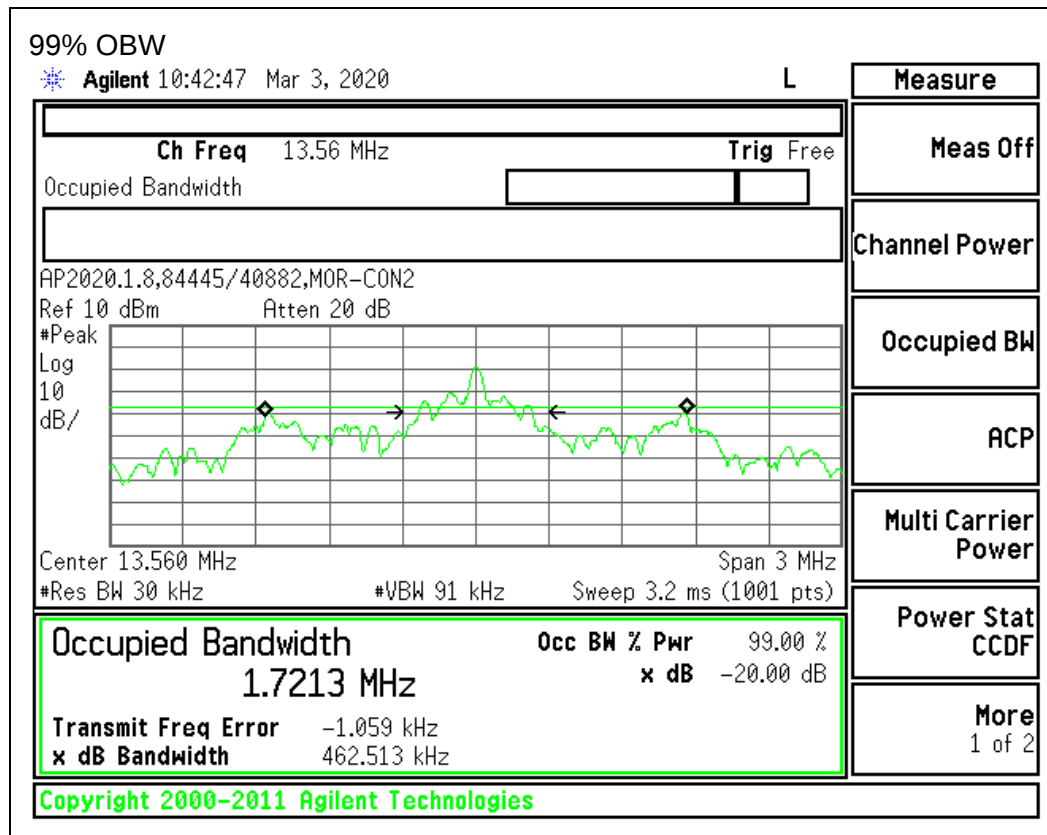
Frequency (MHz)	99% Bandwidth (MHz)	20dB Bandwidth (MHz)
13.56	0.85738	0.3615

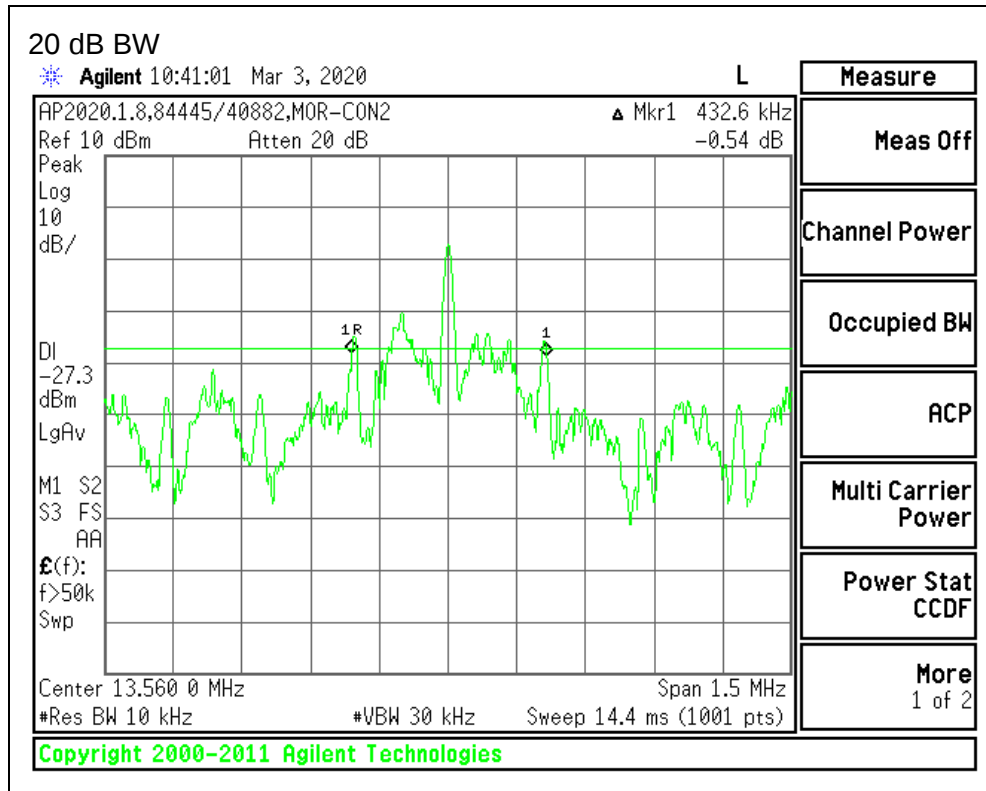




7.2. WITH TAG

Frequency (MHz)	99% Bandwidth (MHz)	20dB Bandwidth (MHz)
13.56	1.7213	0.4326





8. RADIATED EMISSION TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMIT

§15.225

IC RSS-210, Annex B.6

IC RSS-GEN, Section 8.9 (Transmitter)

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

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

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

(d) The field strength of any emissions appearing outside of the 13.110– 14.010 MHz and shall not exceed the general radiated emission limits in § 15.209 as follows:

§15.209 (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

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

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

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

Formula for converting the field strength from µV/m to dBµV/m is:

Limit (dBµV/m) = 20 log limit (µV/m)

In addition:

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

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

TEST PROCEDURE

ANSI C63.10, 2013

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

KDB 414788 Open Field Site(OFS) and Chamber Correlation Justification

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

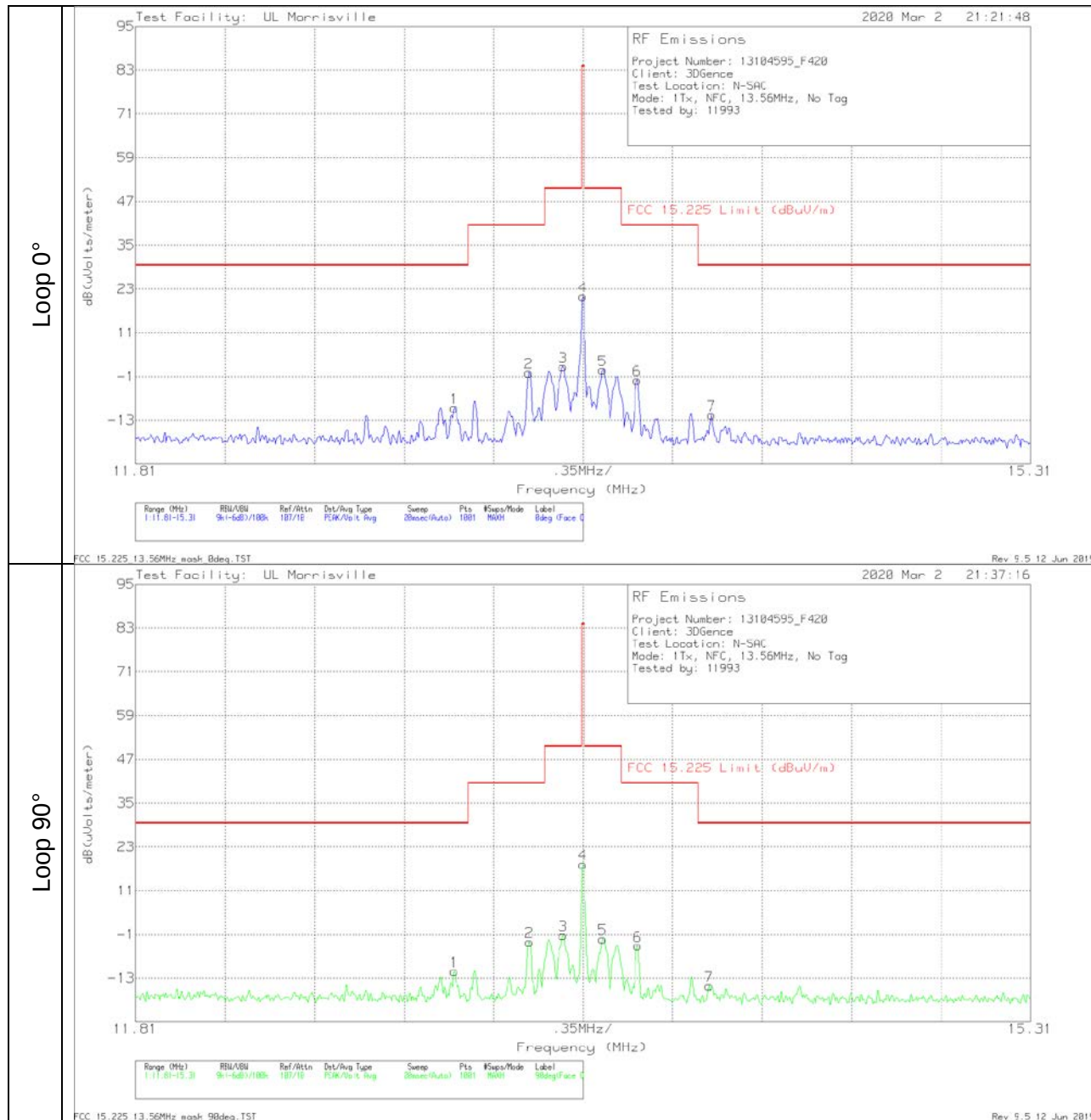
OFS and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

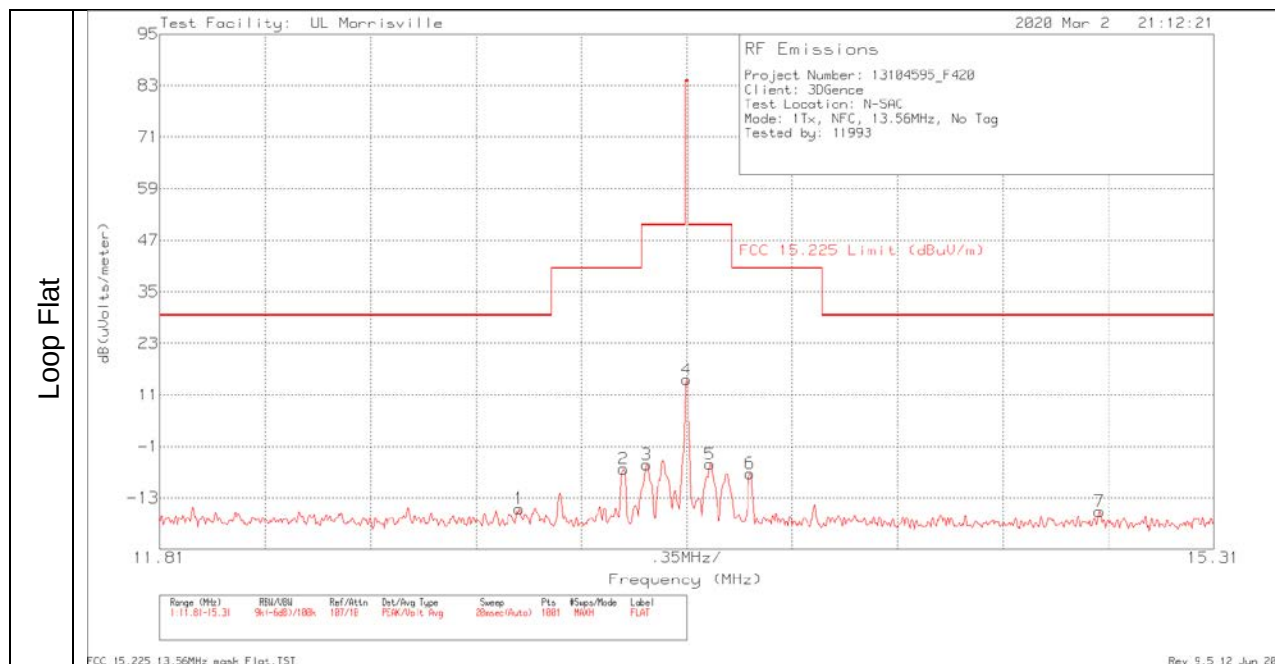
8.2. FUNDAMENTAL AND SPURIOUS EMISSIONS (0.15 - 30 MHz)

Note: All measurements were made at a test distance of 3 m. The measured data was extrapolated from the test distance (3m) to the specification distance (300 m from 9-490 kHz and 30 m from 490 kHz – 30 MHz) to clearly show the relative levels of fundamental and spurious emissions and demonstrate compliance with the requirement that the level of any spurious emissions be below the level of the intentionally transmitted signal. The extrapolation factor for the limits were 40*Log (test distance / specification distance).

8.2.1. WITHOUT TAG

FUNDAMENTAL



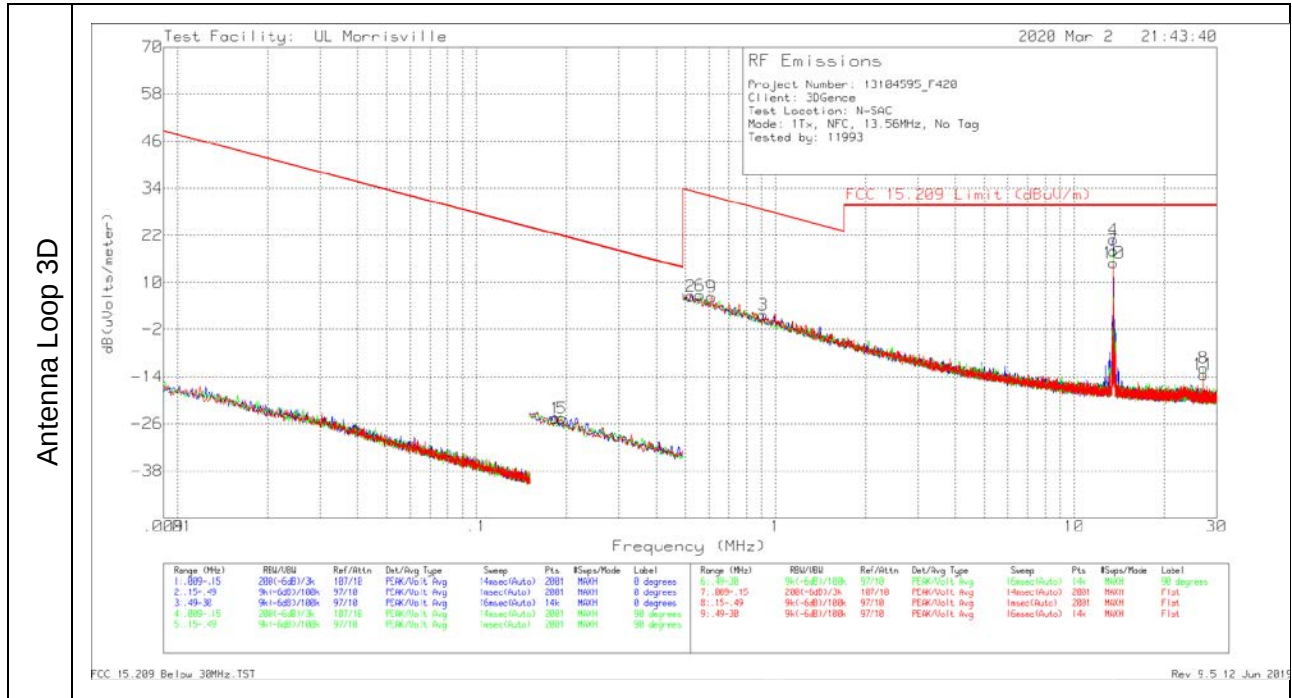


DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 AF (dB/m)	Cbl (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	FCC 15.225 Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
Loop 0°										
1	13.056	19.85	Pk	10	.6	-40	-9.55	29.5	-39.05	178
2	13.34825	29.45	Pk	10	.6	-40	.05	40.5	-40.45	178
3	13.483	31.08	Pk	10	.6	-40	1.68	50.5	-48.82	178
4	13.56	50.38	Pk	10	.6	-40	20.98	84	-63.02	178
5	13.637	30.34	Pk	9.9	.6	-40	.84	50.5	-49.66	178
6	13.77175	27.59	Pk	9.9	.6	-40	-1.91	40.5	-42.41	178
7	14.064	17.98	Pk	9.9	.6	-40	-11.52	29.5	-41.02	178
Loop 90°										
1	13.056	18.34	Pk	10	.6	-40	-11.06	29.5	-40.56	268
2	13.35	26.37	Pk	10	.6	-40	-3.03	40.5	-43.53	268
3	13.483	28.22	Pk	10	.6	-40	-1.18	50.5	-51.68	268
4	13.56	47.67	Pk	10	.6	-40	18.27	84	-65.73	268
5	13.637	27.32	Pk	9.9	.6	-40	-2.18	50.5	-52.68	268
6	13.7735	25.39	Pk	9.9	.6	-40	-4.11	40.5	-44.61	268
7	14.0535	14.4	Pk	9.9	.6	-40	-15.1	29.5	-44.6	268
Loop Flat										
1	13.0035	13.94	Pk	10	.6	-40	-15.46	29.5	-44.96	185
2	13.35	23.17	Pk	10	.6	-40	-6.23	40.5	-46.73	185
3	13.427	24.15	Pk	10	.6	-40	-5.25	50.5	-55.75	185
4	13.56	43.96	Pk	10	.6	-40	14.56	84	-69.44	185
5	13.637	24.34	Pk	9.9	.6	-40	-5.16	50.5	-55.66	185
6	13.77	22.23	Pk	9.9	.6	-40	-7.27	40.5	-47.77	185
7	14.93025	13.52	Pk	9.8	.6	-40	-16.08	29.5	-45.58	185

Pk - Peak detector

SPURIOUS EMISSIONS



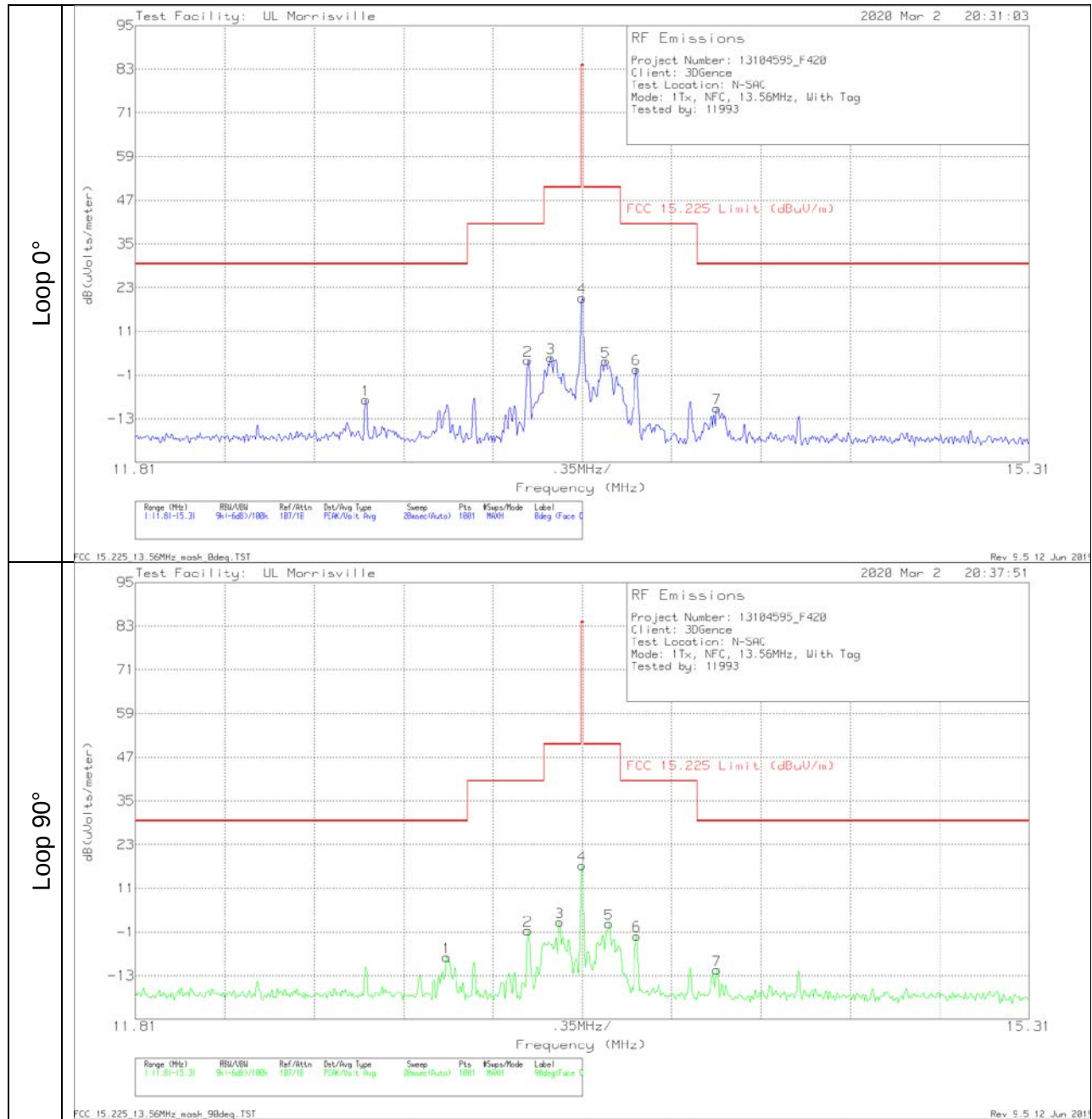
DATA

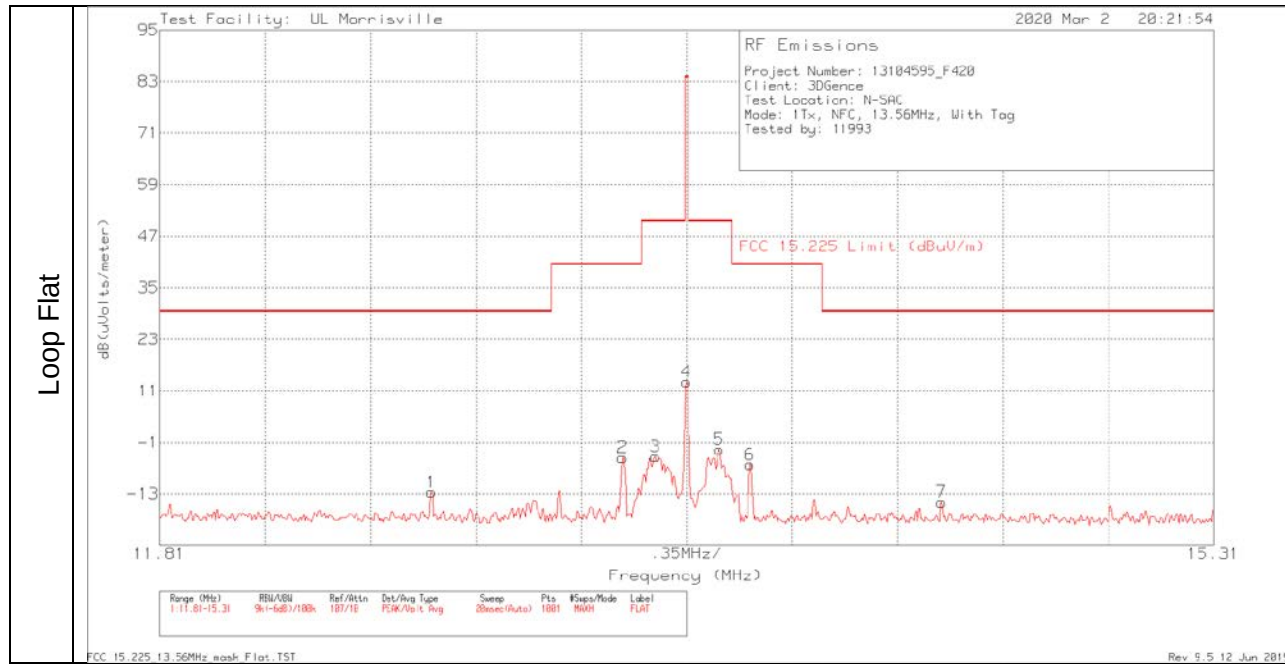
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 AF (dB/m)	Cbl (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	FCC 15.209 QP/AV Limit (dBuV/m)	FCC 15.209 PK Limit (dBuV/m)	Worst-Case Margin (dB)	Azimuth (Degs)
1	.18417	44.23	Pk	11	.1	-80	-24.67	22.3	42.3	-61.21	0-360
5	.19335	44.23	Pk	11	.1	-80	-24.67	21.88	41.88	-62.02	0-360
2	.52162	35.42	Pk	11	.1	-40	6.52	33.26	-	-60.84	0-360
6	.56167	35.61	Pk	11	.1	-40	6.71	32.61	-	-26.77	0-360
9	.61226	35.16	Pk	11	.1	-40	6.26	31.87	-	-26.24	0-360
3	.9116	30.66	Pk	11	.1	-40	1.76	28.41	-	-26.35	0-360
4	13.5596	50.26	Pk	10	.6	-40	20.86	29.54	-	-37.53	0-360
7	13.5596	47.49	Pk	10	.6	-40	18.09	29.54	-	-29.35	0-360
10	13.5596	44.36	Pk	10	.6	-40	14.96	29.54	-	-28.05	0-360
8	27.12247	18.71	Pk	8.5	.9	-40	-11.89	29.54	-	-9.34	0-360
11	27.12247	17.17	Pk	8.5	.9	-40	-13.43	29.54	-	-12.3	0-360

Pk - Peak detector

8.2.2. WITH TAG

FUNDAMENTAL



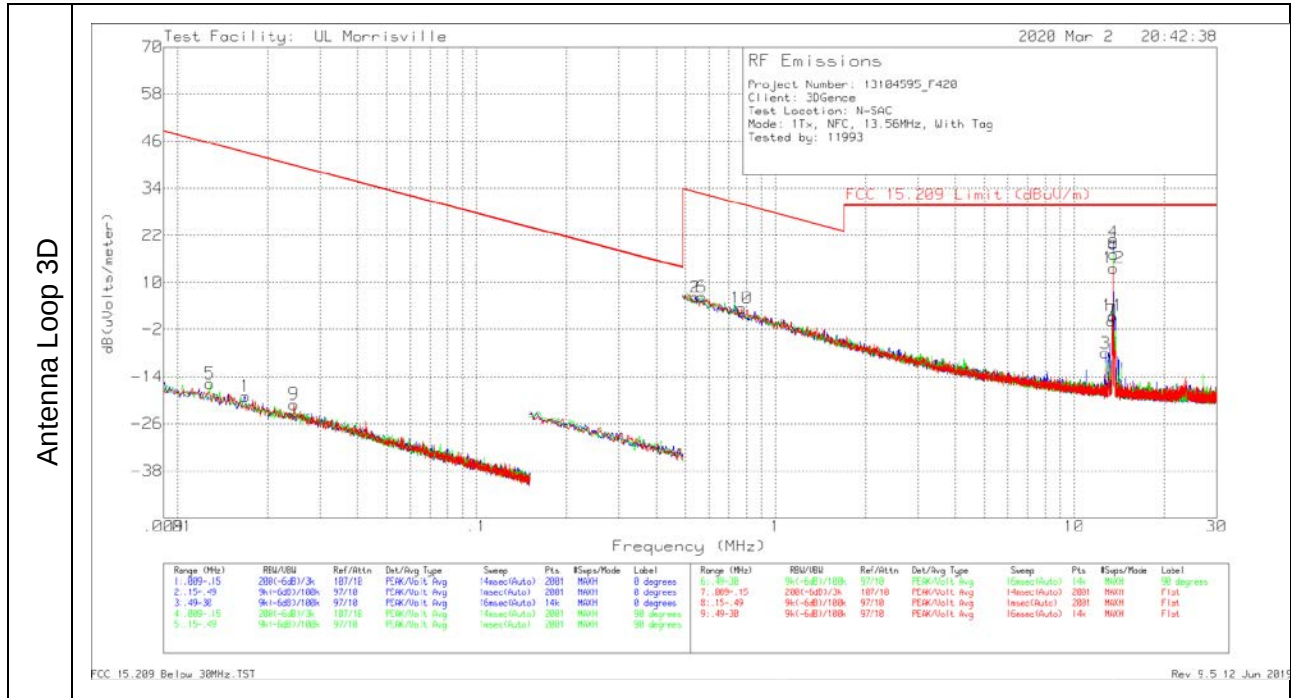


DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 AF (dB/m)	Cbl (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	FCC 15.225 Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
Loop 0°										
1	12.713	21.65	Pk	10	.6	-40	-7.75	29.5	-37.25	175
2	13.3465	32.39	Pk	10	.6	-40	2.99	40.5	-37.51	175
3	13.4375	33.19	Pk	10	.6	-40	3.79	50.5	-46.71	175
4	13.56	49.58	Pk	10	.6	-40	20.18	84	-63.82	175
5	13.651	32.25	Pk	9.9	.6	-40	2.75	50.5	-47.75	175
6	13.77175	30.12	Pk	9.9	.6	-40	.62	40.5	-39.88	175
7	14.0885	19.39	Pk	9.9	.6	-40	-10.11	29.5	-39.61	175
Loop 90°										
1	13.02975	21.48	Pk	10	.6	-40	-7.92	29.5	-37.42	268
2	13.3465	28.74	Pk	10	.6	-40	-.66	40.5	-41.16	268
3	13.4725	31.12	Pk	10	.6	-40	1.72	50.5	-48.78	268
4	13.56	46.67	Pk	10	.6	-40	17.27	84	-66.73	268
5	13.665	30.74	Pk	9.9	.6	-40	1.24	50.5	-49.26	268
6	13.7735	27.48	Pk	9.9	.6	-40	-2.02	40.5	-42.52	268
7	14.0885	18.04	Pk	9.9	.6	-40	-11.46	29.5	-40.96	268
Loop Flat										
1	12.713	16.84	Pk	10	.6	-40	-12.56	29.5	-42.06	185
2	13.3465	24.9	Pk	10	.6	-40	-4.5	40.5	-45	185
3	13.455	25.13	Pk	10	.6	-40	-4.27	50.5	-54.77	185
4	13.56	42.51	Pk	10	.6	-40	13.11	84	-70.89	185
5	13.6685	26.88	Pk	9.9	.6	-40	-2.62	50.5	-53.12	185
6	13.77	23.37	Pk	9.9	.6	-40	-6.13	40.5	-46.63	185
7	14.407	14.62	Pk	9.9	.6	-40	-14.88	29.5	-44.38	185

Pk - Peak detector

SPURIOUS EMISSIONS



DATA

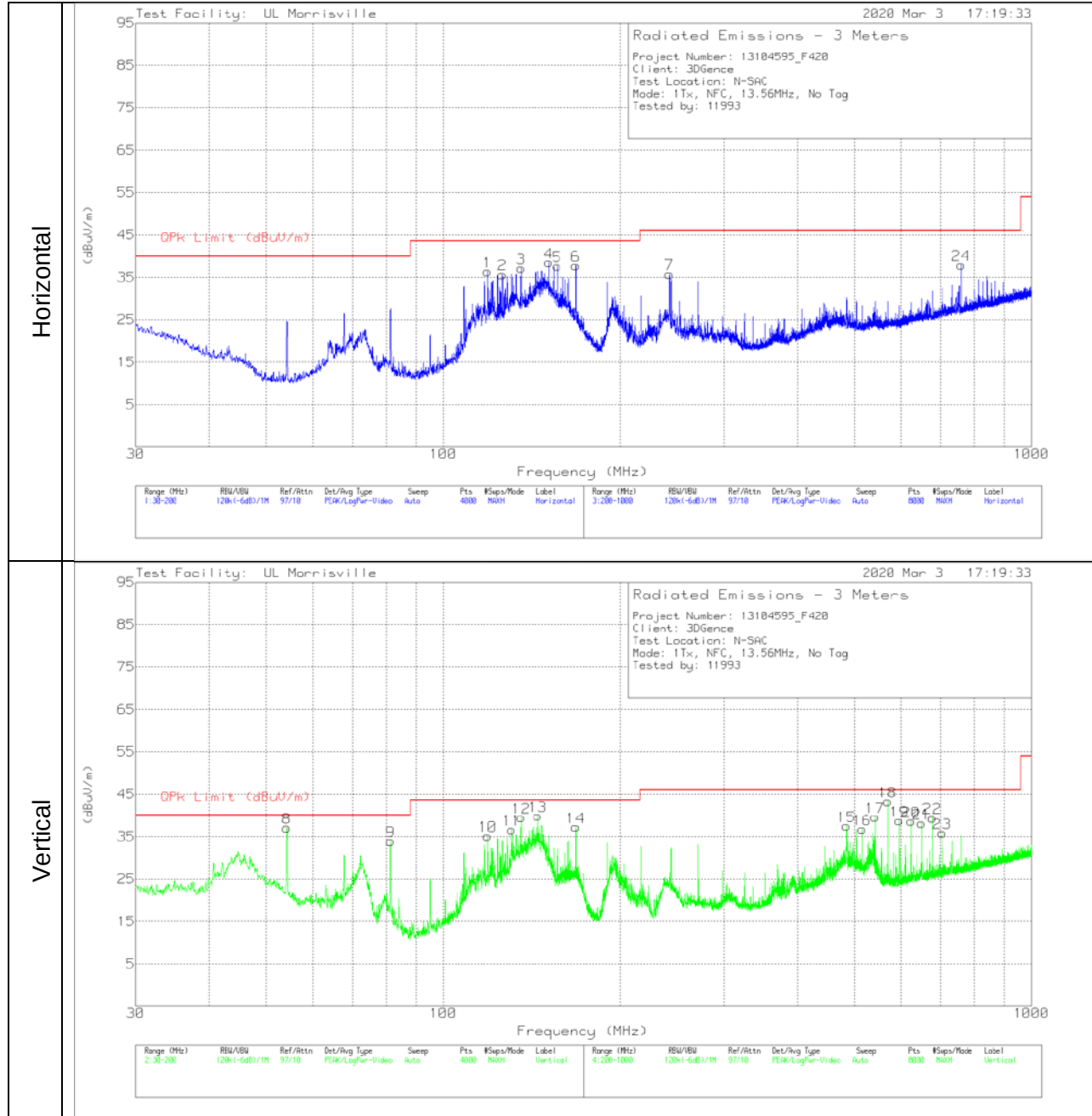
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 AF (dB/m)	Cbl (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	FCC 15.209 QP/AV Limit (dBuV/m)	FCC 15.209 PK Limit (dBuV/m)	Worst-Case Margin (dB)	Azimuth (Degs)
5	.01283	47.13	Pk	17	.1	-80	-15.77	45.44	65.44	-61.21	0-360
1	.01688	45.64	Pk	15.3	.1	-80	-18.96	43.06	63.03	-62.02	0-360
9	.02455	45.26	Pk	13.6	.1	-80	-21.04	39.8	59.8	-60.84	0-360
2	.54059	35.08	Pk	11	.1	-40	6.18	32.95	-	-26.77	0-360
6	.568	35.18	Pk	11	.1	-40	6.28	32.52	-	-26.24	0-360
10	.77247	32.4	Pk	11	.1	-40	3.5	29.85	-	-26.35	0-360
3	12.71218	21.41	Pk	10	.6	-40	-7.99	29.54	-	-37.53	0-360
7	13.3488	29.59	Pk	10	.6	-40	.19	29.54	-	-29.35	0-360
11	13.4542	30.89	Pk	10	.6	-40	1.49	29.54	-	-28.05	0-360
4	13.5596	49.6	Pk	10	.6	-40	20.2	29.54	-	-9.34	0-360
8	13.5596	46.64	Pk	10	.6	-40	17.24	29.54	-	-12.3	0-360
12	13.5596	43.03	Pk	10	.6	-40	13.63	29.54	-	-15.91	0-360

Pk - Peak detector

8.3. TX SPURIOUS EMISSION 30 TO 1000 MHz

8.3.1. WITHOUT TAG

SPURIOUS EMISSION



DATA

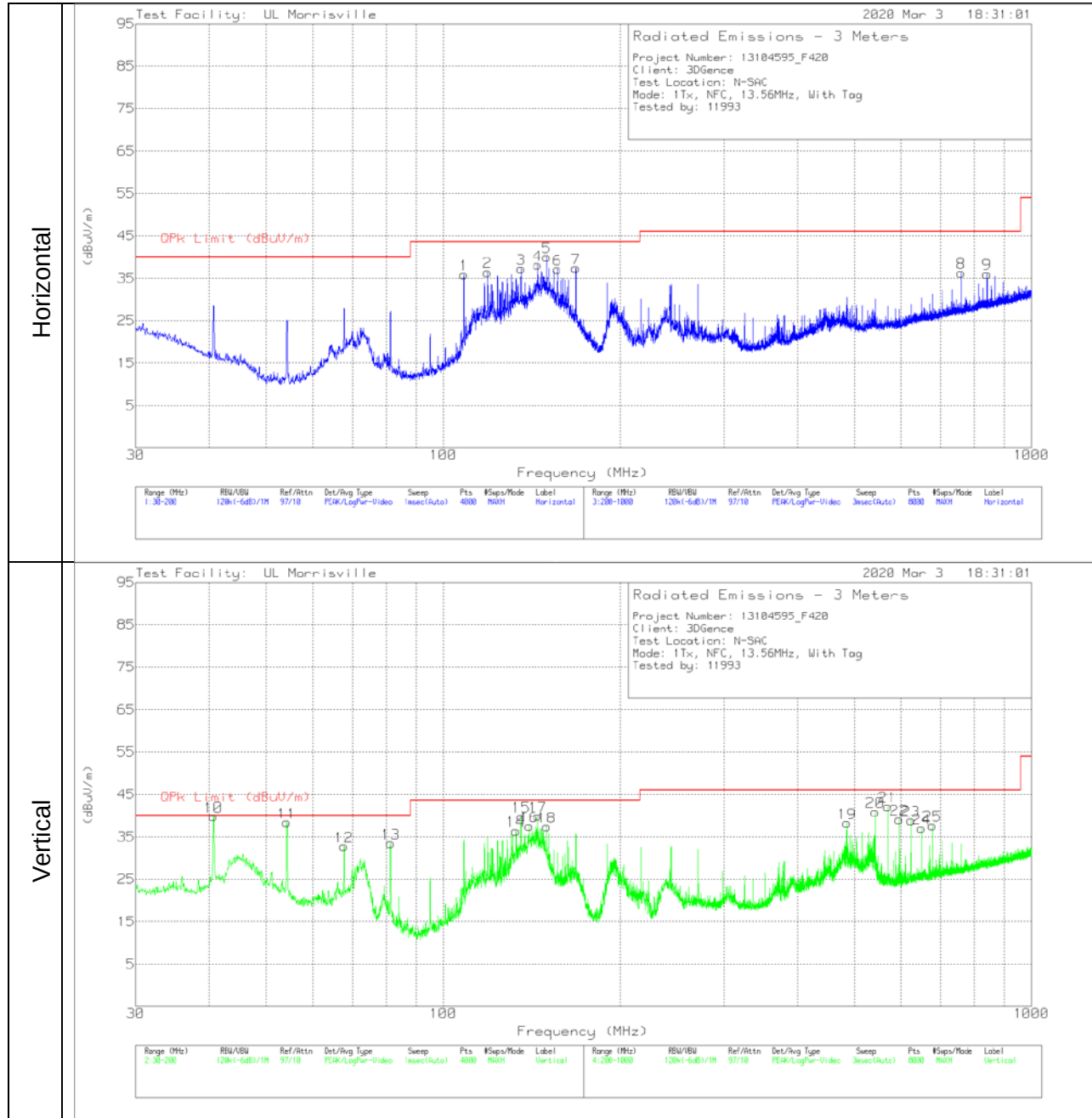
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0073 AF (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	119.018	47.37	Pk	19.8	-30.8	36.37	43.52	-7.15	0-360	299	H
2	125.9898	46.5	Pk	19.9	-30.7	35.7	43.52	-7.82	0-360	199	H
3	135.5973	48.4	Pk	19.4	-30.6	37.2	43.52	-6.32	0-360	199	H
4	151.197	46.64	Qp	18.5	-30.5	34.64	43.52	-8.88	31	255	H
5	156.3451	46.88	Qp	18.4	-30.4	34.88	43.52	-8.64	213	170	H
6	168.02	48.61	Qp	18.1	-30.3	36.41	43.52	-7.11	27	180	H
7	242.5055	47.9	Pk	17.7	-29.8	35.8	46.02	-10.22	0-360	102	H
24	759.3727	38.75	Pk	26.8	-27.6	37.95	46.02	-8.07	0-360	102	H
8	54.2491	53.56	Qp	13.3	-31.4	35.46	40	-4.54	306	104	V
9	81.3533	51.56	Pk	13.5	-31.1	33.96	40	-6.04	0-360	102	V
10	119.018	46.18	Pk	19.8	-30.8	35.18	43.52	-8.34	0-360	102	V
11	130.666	47.68	Pk	19.7	-30.7	36.68	43.52	-6.84	0-360	102	V
12	135.5973	49.29	Qp	19.4	-30.6	38.09	43.52	-5.43	340	146	V
13	144.7108	46.11	Qp	18.9	-30.6	34.41	43.52	-9.11	4	102	V
14	167.9907	49.44	Pk	18.1	-30.3	37.24	43.52	-6.28	0-360	102	V
15	485.2371	42.09	Pk	23.8	-28.4	37.49	46.02	-8.53	0-360	102	V
16	515.241	41.49	Pk	23.7	-28.4	36.79	46.02	-9.23	0-360	102	V
17	542.3445	43.78	Pk	24.2	-28.3	39.68	46.02	-6.34	0-360	102	V
18	569.525	46.63	Qp	24.5	-28.2	42.93	46.02	-3.09	40	102	V
19	596.6516	42.67	Pk	24.3	-28.2	38.77	46.02	-7.25	0-360	102	V
20	623.7551	41.34	Pk	25.4	-28.1	38.64	46.02	-7.38	0-360	102	V
21	650.8586	40.33	Pk	25.8	-28	38.13	46.02	-7.89	0-360	102	V
22	677.9621	41.56	Pk	25.8	-27.9	39.46	46.02	-6.56	0-360	102	V
23	705.1657	37.35	Pk	26.3	-27.8	35.85	46.02	-10.17	0-360	102	V

Pk - Peak detector

Qp - Quasi-Peak detector

8.3.2. WITH TAG

SPURIOUS EMISSION



DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0073 AF (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	108.4753	48.22	Pk	18.5	-30.8	35.92	43.52	-7.6	0-360	299	H
2	119.018	47.45	Pk	19.8	-30.8	36.45	43.52	-7.07	0-360	199	H
3	135.5973	48.49	Pk	19.4	-30.6	37.29	43.52	-6.23	0-360	199	H
4	144.6745	47.15	Qp	18.9	-30.6	35.45	43.52	-8.07	215	201	H
5	149.9338	42.9	Qp	18.6	-30.5	31	43.52	-12.52	20	223	H
6	156.3427	49.14	Pk	18.4	-30.4	37.14	43.52	-6.38	0-360	199	H
7	168.0231	48.19	Qp	18.1	-30.3	35.99	43.52	-7.53	28	202	H
8	759.3727	37.1	Pk	26.8	-27.6	36.3	46.02	-9.72	0-360	102	H
9	840.0832	35.27	Pk	27.8	-27	36.07	46.02	-9.95	0-360	102	H
10	40.6794	51.29	Qp	19.3	-31.6	38.99	40	-1.01	140	102	V
11	54.2356	55.19	Qp	13.3	-31.4	37.09	40	-2.91	295	106	V
12	67.7923	49.95	Pk	14.1	-31.3	32.75	40	-7.25	0-360	102	V
13	81.3533	51.05	Pk	13.5	-31.1	33.45	40	-6.55	0-360	102	V
14	133.0042	47.54	Pk	19.6	-30.7	36.44	43.52	-7.08	0-360	102	V
15	135.605	49.9	Qp	19.4	-30.6	38.7	43.52	-4.82	342	111	V
16	140.0185	48.79	Pk	19.2	-30.5	37.49	43.52	-6.03	0-360	102	V
17	144.687	47.95	Qp	18.9	-30.6	36.25	43.52	-7.27	351	117	V
18	149.9454	39.51	Qp	18.6	-30.5	27.61	43.52	-15.91	333	117	V
19	486.0372	42.88	Pk	23.8	-28.4	38.28	46.02	-7.74	0-360	102	V
20	542.4071	44.03	Qp	24.2	-28.3	39.93	46.02	-6.09	62	102	V
21	569.5226	44.75	Qp	24.5	-28.2	41.05	46.02	-4.97	36	107	V
22	596.6516	43	Pk	24.3	-28.2	39.1	46.02	-6.92	0-360	102	V
23	623.7551	41.56	Pk	25.4	-28.1	38.86	46.02	-7.16	0-360	102	V
24	650.8586	39.19	Pk	25.8	-28	36.99	46.02	-9.03	0-360	102	V
25	677.9621	39.79	Pk	25.8	-27.9	37.69	46.02	-8.33	0-360	102	V

Pk - Peak detector

Qp - Quasi-Peak detector

9. FREQUENCY STABILITY

LIMIT

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

IC RSS-210, Annex B.6

Carrier frequency stability shall be maintained to $\pm 0.01\%$ (± 100 ppm).

TEST PROCEDURE

ANSI 63.10:2013 Clause 6.8.1 and 6.8.2

TEST INFORMATION

Date: 2020-03-03

Tester: 40882

9.1. WITHOUT TAG

Reference Frequency: EUT Channel 13.56 MHz @ 20°C Limit: ± 100 ppm = 1.356 kHz										
Power Supply	Envir. Temp	Frequency Deviation Measured with Time Elapse								
VDC	(°C)	Startup (MHz)	Delta (ppm)	@ 2 mins (MHz)	Delta (ppm)	@ 5 mins (MHz)	Delta (ppm)	@ 10 mins (MHz)	Delta (ppm)	Limit (ppm)
5.00	50	13.5598480	10.546	13.5598470	10.619	13.5598470	10.619	13.5598470	10.619	± 100
5.00	40	13.5598920	7.301	13.5598890	7.522	13.5598890	7.522	13.5598890	7.522	± 100
5.00	30	13.5599410	3.687	13.5599410	3.687	13.5599400	3.761	13.5599400	3.761	± 100
5.00	20	13.5599910	0.000	13.5599910	0.000	13.5599910	0.000	13.5599910	0.000	± 100
5.00	10	13.5600330	-3.097	13.5600340	-3.171	13.5600340	-3.171	13.5600330	-3.097	± 100
5.00	0	13.5600620	-5.236	13.5600610	-5.162	13.5600610	-5.162	13.5600610	-5.162	± 100
5.00	-10	13.5600690	-5.752	13.5600690	-5.752	13.5600690	-5.752	13.5600690	-5.752	± 100
5.00	-20	13.5600530	-4.572	13.5600520	-4.499	13.5600510	-4.425	13.5600500	-4.351	± 100
4.25	20	13.5599610	2.212	13.5599610	2.212	13.5599610	2.212	13.5599610	2.212	± 100
5.75	20	13.5599610	2.212	13.5599610	2.212	13.5599610	2.212	13.5599610	2.212	± 100

9.2. WITH TAG

Date: 2020-03-03
Tester: 40882

Reference Frequency: EUT Channel 13.56 MHz @ 20°C Limit: ± 100 ppm = 1.356 kHz										
Power Supply	Envir. Temp	Frequency Deviation Measured with Time Elapse								
VDC	(°C)	Startup (MHz)	Delta (ppm)	@ 2 mins (MHz)	Delta (ppm)	@ 5 mins (MHz)	Delta (ppm)	@ 10 mins (MHz)	Delta (ppm)	Limit (ppm)
5.00	50	13.5598510	10.324	13.5598510	10.324	13.5598510	10.324	13.5598500	10.398	± 100
5.00	40	13.5599340	4.204	13.5599290	4.572	13.5599240	4.941	13.5599220	5.088	± 100
5.00	30	13.5599410	3.687	13.5599420	3.614	13.5599400	3.761	13.5599400	3.761	± 100
5.00	20	13.5599910	0.000	13.5599900	0.074	13.5599910	0.000	13.5599900	0.074	± 100
5.00	10	13.5600330	-3.097	13.5600330	-3.097	13.6003200	-2974.115	13.5600320	-3.024	± 100
5.00	0	13.5600630	-5.310	13.5600620	-5.236	13.5600620	-5.236	13.5600620	-5.236	± 100
5.00	-10	13.5600700	-5.826	13.5600700	-5.826	13.5600700	-5.826	13.5600700	-5.826	± 100
5.00	-20	13.5600530	-4.572	13.5600530	-4.572	13.5600520	-4.499	13.5600520	-4.499	± 100
4.25	20	13.5599400	3.761	13.5599400	3.761	13.5599520	2.876	13.5599520	2.876	± 100
5.75	20	13.5599500	3.024	13.5599500	3.024	13.5599500	3.024	13.5599500	3.024	± 100

10. AC MAINS LINE CONDUCTED EMISSIONS

LIMITS

§15.207

IC RSS-GEN, Section 8.8

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

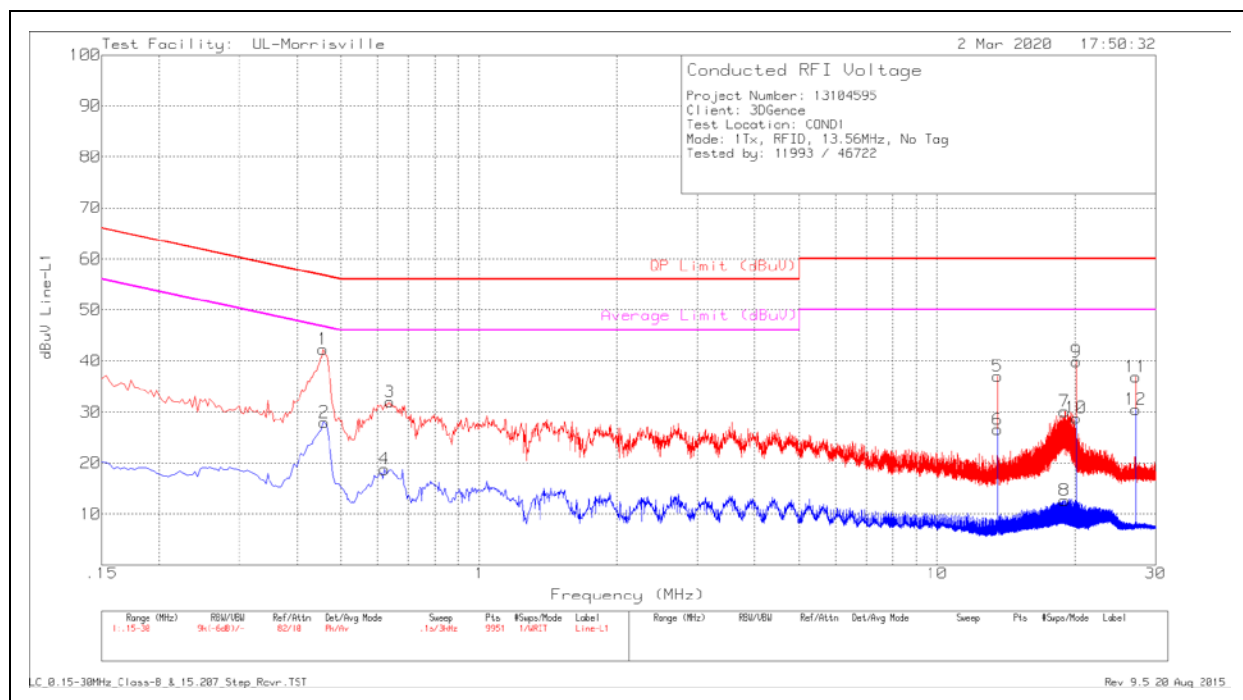
Frequency range	Limits (dB μ V)	
(MHz)	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
Notes: 1. The lower limit shall apply at the transition frequencies 2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

TEST PROCEDURE

ANSI C63.10:2013

10.1. WITHOUT TAG

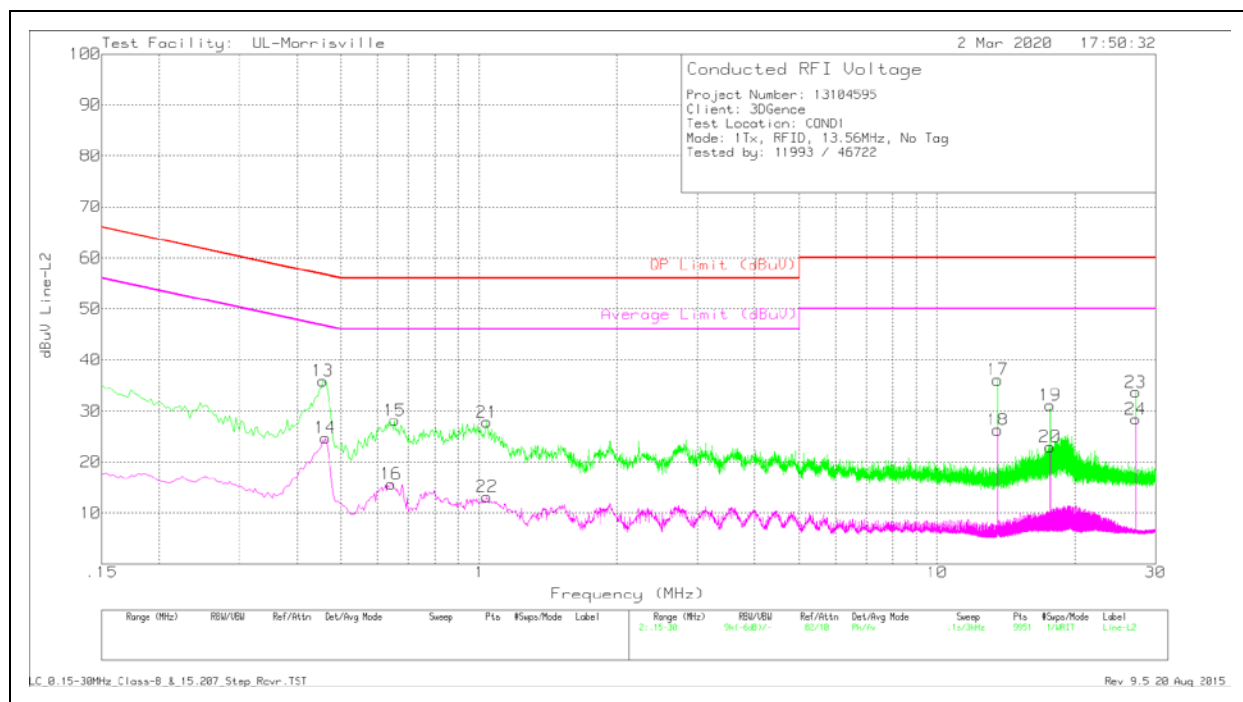
LINE 1 RESULTS



Range 1: Line-L1 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit (dBuV)	Margin (dB)	Average Limit (dBuV)	Margin (dB)
1	.456	32.18	Pk	.1	10	42.28	56.77	-14.49	-	-
2	.459	17.87	Av	.1	10	27.97	-	-	46.71	-18.74
3	.639	21.87	Pk	.1	10	31.97	56	-24.03	-	-
4	.621	8.68	Av	.1	10	18.78	-	-	46	-27.22
5	13.563	26.5	Pk	.1	10.4	37	60	-23	-	-
6	13.56	16.06	Av	.1	10.4	26.56	-	-	50	-23.44
7	18.972	19.44	Pk	.1	10.6	30.14	60	-29.86	-	-
8	18.969	2	Av	.1	10.6	12.7	-	-	50	-37.3
9	20.109	29.08	Pk	.2	10.6	39.88	60	-20.12	-	-
10	20.109	18.05	Av	.2	10.6	28.85	-	-	50	-21.15
11	27.12	25.92	Pk	.3	10.7	36.92	60	-23.08	-	-
12	27.123	19.5	Av	.3	10.7	30.5	-	-	50	-19.5

Pk - Peak detector
Av - Average detection

LINE 2 RESULTS

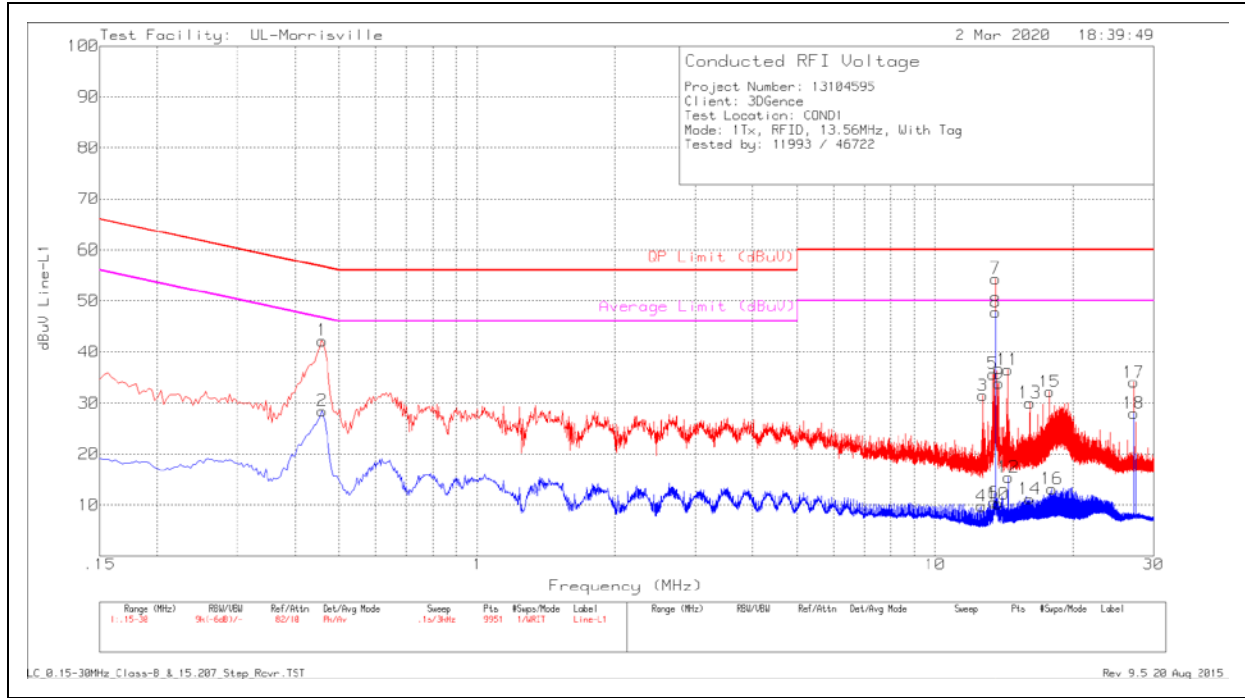


Range 2: Line-L2 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit (dBuV)	Margin (dB)	Average Limit (dBuV)	Margin (dB)
13	.456	25.81	Pk	.1	10	35.91	56.77	-20.86	-	-
14	.462	14.63	Av	.1	10	24.73	-	-	46.66	-21.93
15	.654	18.19	Pk	0	10	28.19	56	-27.81	-	-
16	.642	5.68	Av	0	10	15.68	-	-	46	-30.32
17	13.56	25.61	Pk	.1	10.4	36.11	60	-23.89	-	-
18	13.56	15.78	Av	.1	10.4	26.28	-	-	50	-23.72
19	17.643	20.55	Pk	.1	10.5	31.15	60	-28.85	-	-
20	17.643	12.36	Av	.1	10.5	22.96	-	-	50	-27.04
21	1.041	17.8	Pk	0	10	27.8	56	-28.2	-	-
22	1.041	3.16	Av	0	10	13.16	-	-	46	-32.84
23	27.12	22.78	Pk	.2	10.7	33.68	60	-26.32	-	-
24	27.12	17.53	Av	.2	10.7	28.43	-	-	50	-21.57

Pk - Peak detector
Av - Average detection

10.2. WITH TAG

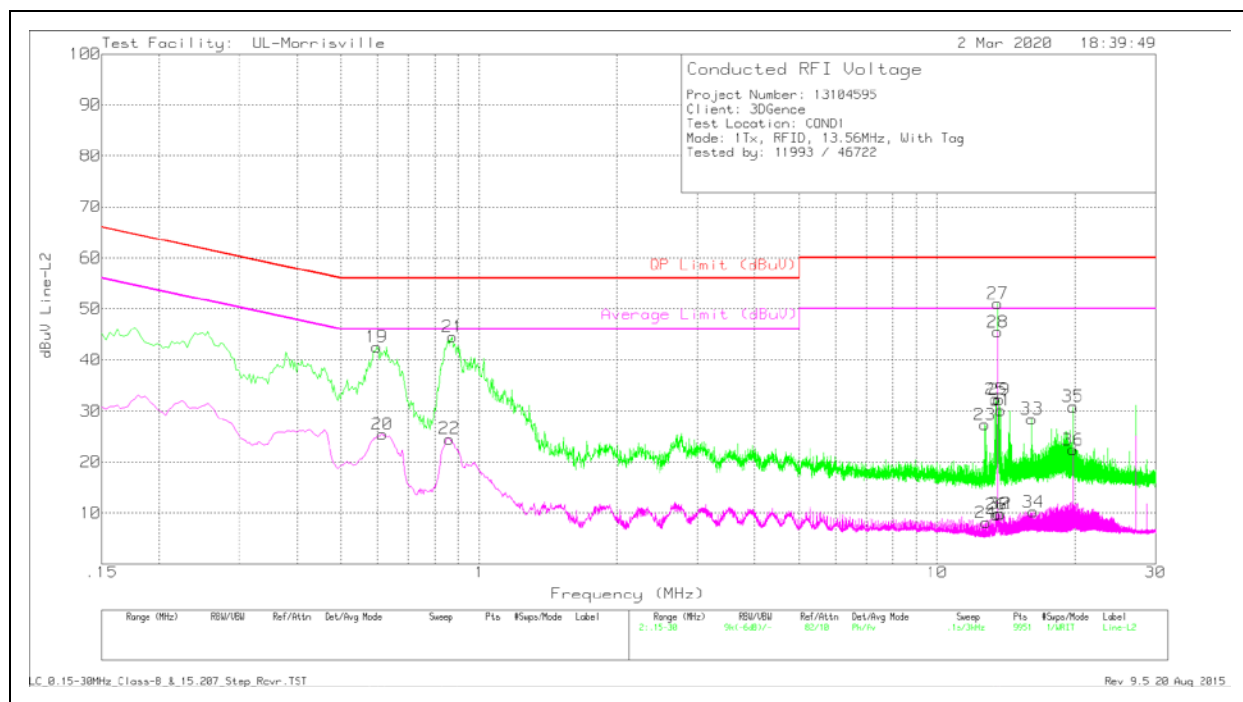
LINE 1 RESULTS



Range 1: Line-L1 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit (dBuV)	Margin (dB)	Average Limit (dBuV)	Margin (dB)
1	.459	32.14	Pk	.1	10	42.24	56.71	-14.47	-	-
2	.459	18.38	Av	.1	10	28.48	-	-	46.71	-18.23
3	12.711	20.99	Pk	.1	10.4	31.49	60	-28.51	-	-
4	12.63	-72	Av	.1	10.4	9.78	-	-	50	-40.22
5	13.35	25.23	Pk	.1	10.4	35.73	60	-24.27	-	-
6	13.425	0	Av	.1	10.4	10.5	-	-	50	-39.5
7	13.5602	42.33	Qp	.1	10.4	52.83	60	-7.17	-	-
	13.5602	37.08	Av	.1	10.4	47.58	-	-	50	-2.42
8	13.56	42.22	Qp	.1	10.4	52.72	60	-7.28	-	-
	13.56	37.1	Av	.1	10.4	47.6	-	-	50	-2.4
9	13.773	23.33	Pk	.1	10.4	33.83	60	-26.17	-	-
10	13.719	-26	Av	.1	10.4	10.24	-	-	50	-39.76
11	14.409	26.02	Pk	.1	10.4	36.52	60	-23.48	-	-
12	14.43	4.93	Av	.1	10.4	15.43	-	-	50	-34.57
13	16.104	19.45	Pk	.1	10.5	30.05	60	-29.95	-	-
14	16.098	.58	Av	.1	10.5	11.18	-	-	50	-38.82
15	17.799	21.65	Pk	.1	10.5	32.25	60	-27.75	-	-
16	17.979	2.59	Av	.1	10.5	13.19	-	-	50	-36.81
17	27.12	23.08	Pk	.3	10.7	34.08	60	-25.92	-	-
18	27.12	16.99	Av	.3	10.7	27.99	-	-	50	-22.01

Pk - Peak detector
Av - Average detection
Qp - Quasi-Peak detector

LINE 2 RESULTS



Range 2: Line-L2 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit (dBuV)	Margin (dB)	Average Limit (dBuV)	Margin (dB)
19	.597	32.58	Pk	0	10	42.58	56	-13.42	-	-
20	.615	15.49	Av	0	10	25.49	-	-	46	-20.51
21	.876	34.55	Pk	0	10	44.55	56	-11.45	-	-
22	.861	14.54	Av	0	10	24.54	-	-	46	-21.46
23	12.711	16.82	Pk	.1	10.4	27.32	60	-32.68	-	-
24	12.78	-2.37	Av	.1	10.4	8.13	-	-	50	-41.87
25	13.452	21.85	Pk	.1	10.4	32.35	60	-27.65	-	-
26	13.476	-81	Av	.1	10.4	9.69	-	-	50	-40.31
27	13.56	40.57	Pk	.1	10.4	51.07	60	-8.93	-	-
28	13.56	38.38	Qp	.1	10.4	48.88	60	-11.12	-	-
	13.56	32.15	Av	.1	10.4	42.65	-	-	50	-7.35
29	13.668	21.69	Pk	.1	10.4	32.19	60	-27.81	-	-
30	13.668	-.69	Av	.1	10.4	9.81	-	-	50	-40.19
31	13.77	19.6	Pk	.1	10.4	30.1	60	-29.9	-	-
32	13.77	-.69	Av	.1	10.4	9.81	-	-	50	-40.19
33	16.101	17.86	Pk	.1	10.5	28.46	60	-31.54	-	-
34	16.245	-.37	Av	.1	10.5	10.23	-	-	50	-39.77
35	19.8	20.12	Pk	.1	10.6	30.82	60	-29.18	-	-
36	19.8	11.66	Av	.1	10.6	22.36	-	-	50	-27.64

Pk - Peak detector

Av - Average detection

Qp - Quasi-Peak detector

11. SETUP PHOTOS

Refer to R13104595-EP1 for setup photos.

END OF TEST REPORT