Emissions
Test Report

Prepared in accordance with

CFR 47 part15.225

FCC ID: 2ASMPNB2IOT

On

SIT-03-0-X

Prepared for:

Lyft
185 Berry Street Suite 5000
San Francisco CA 94107
USA

Prepared by:

TUV Rheinland of North America, Inc.
1279 Quarry Lane, Ste. A
Pleasanton, CA 94566 U.S.A.

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Revisions

Revision No.	Date	Reason for Change	Author
0	03/12/2019	Original Document	D. Foster

Note: Latest revision report will replace all previous reports.

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ATTESTATION OF TEST RESULTS

Client:	Lyft 185 Berry Street Suite 5000 San Francisco CA 94107 USA	Cyril Meyer Tel: 502-432-4994 E-Mail: cmeyer@lyft.com	
Model Name:	SIT-03-0-X	***Serial Number:***	140-201
Model Numbers:	2.0	***Date(s) Tested:***	March 6-7, 2019
Test Location:	TUV Rheinland of North America 1279 Quarry Lane, Ste. A Pleasanton, CA 94566 U.S.A. Tel. (925) 249-9123		
Test Specifications:	Emissions:	CFR47 part15.225, CFR47 part 15.209	
	Immunity:	N/A	
Test Result:	**The above product was found to be Compliant to the above test standard(s)**		

Prepared by: Donn Foster	***Reviewed by: David Spencer***
May 8, 2019 *Date* *Name* *Signature*	May 8, 2019 *Date* *Name* *Signature*

Other aspects:	**None**

PLEASANTON

US1131	**Testing Cert #3331.02**	**INDUSTRY CANADA 2932M-1**	**1097 (A-0268)**

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1 General Information

1.1 Scope

This report is intended to document the status of conformance with the listed standards based on the results of testing performed on March 6-7-21, 2019 on the Ninebot Scooter model 2.0 by Lyft. This report only applies to the specific samples tested under the stated test conditions. It is the responsibility of the manufacturer to assure that additional production units of this model are manufactured with identical or EMI equivalent electrical and mechanical components. This report is further intended to document changes and modifications to the EUT throughout its life cycle. All documentation will be included as a supplement.

1.2 Purpose

Testing was performed to evaluate the EMC performance of the EUT (Equipment Under Test) in accordance with the applicable requirements, procedures, and criteria defined in the application of regulations and application of standards listed in this report.

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1.3 Summary of Test Results

Applicant	Lyft 185 Berry Street Suite 5000 San Francisco CA 94107 USA
Contact	Cyril Meyer
Tel.	502-432-4994
E-mail	cmeyer@lyft.com
Description	NFC reader
Model Name	SIT-03-0-X
Model Number	2.0
Serial Number	140-201
Input Power	36 VDC (batteries)
Test Date(s)	March 6-7-21, 2019

	Description	Severity Level or Limit	Criteria	Test Result
CFR47 part 15.225, Product Family Standard Emissions	Radio Equipment Operation within the band 13.110-14.010 MHz.	See called out basic standards below	See Below	Complies
CFR47 part 15.225, CFR47 part 15.209	Radiated Emissions	CLASS A 9KHZ- 26GHZ	Limit	Complies

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2 Laboratory Information

2.1 Accreditations & Endorsements

2.1.1 US Federal Communications Commission

TUV Rheinland of North America EMC test facilities located at 1279 Quarry Lane, Ste. A, Pleasanton, CA, 94566, and 5015 Brandin Ct. Fremont, CA, 94538 are recognized by the Commission for performing testing services for the general public on a fee basis. These laboratory test facilities have been fully described in reports submitted to and accepted by the FCC (Pleasanton Registration No. US1131, Fremont Registration No. US1131). The laboratory Scopes of Accreditation include Title 47 CFR Parts 15, 18 and 90. The accreditations are updated every three years.

2.1.2 A2LA

TUV Rheinland of North America EMC test facilities are accredited by the American Association for Laboratory Accreditation (A2LA). The laboratories have been assessed and accredited by A2LA in accordance with ISO Standard 17025:2005 (Testing Certificate #3331.02). The Scope of Laboratory Accreditation includes emission and immunity testing. The accreditations are updated annually.

2.1.3 Industry Canada

The Pleasanton 5-meter Semi-Anechoic Chamber, Registration No. 2932M-1, has been accepted by Industry Canada to perform testing to 3 and 5 meters based on the test procedures described in ANSI C63.4-2014. The Fremont 10-meter Semi-Anechoic Chamber, Registration No. 2932D-1, has been accepted by Industry Canada to perform testing to 3 and 10 meters based on the test procedures described in ANSI C63.4-2014.

2.1.4 Japan – VCCI

The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) is a group that consists of Information Technology Equipment (ITE) manufacturers and EMC test laboratories. The purpose of the Council is to take voluntary control measures against electromagnetic interference from Information Technology Equipment, and thereby contribute to the development of a socially beneficial and responsible state of affairs in the realm of Information Technology Equipment in Japan. TUV Rheinland of North America EMC test facilities located at 1279 Quarry Lane, Ste. A, Pleasanton, CA, 94566, and 5015 Brandin Ct. Fremont, CA, 94538, have been assessed and approved in accordance with the Regulations for Voluntary Control Measures.

VCCI Registration No. for Pleasanton: A-0268

VCCI Registration No. for Fremont: A-0268

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2.2 Test Facilities and EMC Software

Test facilities are located at 1279 Quarry Lane, Ste. A, Pleasanton, California 94566, U.S.A. and 5015 Brandin Ct, Fremont, CA 94538.

2.2.1 Emission Test Facility

The Semi-Anechoic Chambers and AC Line Conducted measurement facilities used to collect radiated and conducted emissions data have been constructed in accordance with ANSI C63.7:1992. The Fremont 10 meter semi-anechoic chamber has been measured in accordance with and verified to comply with the theoretical volumetric normalized site attenuation of ANSI C63.4:2009 and SVSWR requirements of CISPR 16-1-4 Consol. Ed. 3.0 (2010-04), at test distances of 3 and 10 meters. This site has been described in reports dated November 1st, 2006, submitted to the FCC, and accepted by letter dated November 28, 2006. The site is listed with the FCC and accredited by A2LA (Testing Certificate #3331.02). The Pleasanton 5 meter semi-anechoic chamber has been verified to comply with the theoretical volumetric normalized site attenuation of ANSI C63.4:2009 and SVSWR requirements of CISPR 16-1-4 Consol. Ed. 3.0 (2010-04) at a test distance of 3 meters. This site has been described in reports dated November 1st, 2006, submitted to the FCC, and accepted by letter dated November 28, 2006. The site is listed with the FCC and accredited by A2LA (Testing Certificate #3331.02).

2.2.2 Immunity Test Facility

ESD, EFT, Surge, PQF: These tests are performed in an environmentally controlled room with a 3.7 m x 3.7 m x 3.175 mm thick aluminum floor connected to PE ground. For ESD testing, tabletop equipment is placed on an insulated mat with a surface resistivity of 10^9 Ohms/square on a 1.6 m x 0.8 m x 0.8 m high non-conductive table with a 3.175 mm aluminum top (Horizontal Coupling Plane). The HCP is connected to the main ground plane via a low impedance ground strap through two 470 kΩ resistors. The Vertical Coupling Plane consists of an aluminum plate 50 cm x 50 cm x 3.175 mm thick. The VCP is connected to the main ground plane via a low impedance ground strap through two 470 kΩ resistors. For each of the other tests, the HCP is removed.

RF Field Immunity testing is performed in a 10m semi-anechoic chamber with absorber added to floor.

RF Conducted and Magnetic Field Immunity testing is performed on a 4.9 m x 3.7 m x 3.175 mm thick aluminum ground plane which is connected to one end of the anechoic chamber.

All test areas allow a minimum distance of 1 meter from the EUT to walls or conducting objects.

2.2.3 EMC Software - Fremont

Manufacturer	Name	Version	Test Type
EMISoft	Vasona	5.0	Radiated & Conducted Emissions
ETS-Lindgren	TILE	4.2.A	Radiated Emissions > 1 GHz
ETS-Lindgren	TILE	V.3.4.K.22	Radiated & Conducted Immunity
Haefely	WinFEAT	1.6.3	Surge

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Manufacturer	Name	Version	Test Type
Thermo Electron - Keytek	CEWare32	3.0	EFT/Surge/Voltage Dips & Interrupt
Voltech	IEC61000-3	1.15.07RC	Harmonic & Flicker

2.2.4 EMC Software - Pleasanton

Manufacturer	Name	Version	Test Type
ETS-Lindgren	TILE	3.4.K.14 @ 4.0.A.5	Radiated & Conducted Emissions
EMISoft	Vasona	5.0	Radiated & Conducted Emissions
Agilent	Agilent MXE	A.11.02	Radiated & Conducted Emissions
ETS-Lindgren	TILE	3.4.K.14	Radiated & Conducted Immunity
Thermo Electron - Keytek	CEWare32	4.00	EFT/Surge/Voltage Dips & Interrupt
Voltech	IEC61000-3	1.21.07RC2	Harmonic & Flicker

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2.3 Measurement Uncertainty

Two types of measurement uncertainty are expressed in this report, per *ISO Guide To The Expression Of Uncertainty In Measurement*, 1st Edition, 1995.

The Combined Standard Uncertainty is the standard uncertainty of the result of a measurement when that result is obtained from the values of a number of other quantities, equal to the positive square root of a sum of terms, the terms being the variances or co-variances of these other quantities weighted according to how the measurement result varies with changes in these quantities. The term standard uncertainty is the result of a measurement expressed as a standard deviation.

The Expanded Uncertainty defines an interval about the result of a measurement that may be expected to encompass a large fraction of the distribution of values that could reasonably be attributed to the measurand. The fraction may be viewed as the coverage probability or level of confidence of the interval.

2.3.1 Sample Calculation – radiated & conducted emissions

The field strength is calculated by subtracting the Amplifier Gain and adding the Cable Loss and Antenna Correction Factor to the measured reading. The basic equation is as follows:

Field Strength (dBμV/m) = RAW - AMP + CBL + ACF

Where: RAW = Measured level before correction (dBμV)

AMP = Amplifier Gain (dB)

CBL = Cable Loss (dB)

ACF = Antenna Correction Factor (dB/m)

$$\mu V/m = 10^{\frac{dB\mu V/m}{20}}$$

Sample radiated emissions calculation @ 30 MHz

Measurement +Antenna Factor–Amplifier Gain+Cable loss=Radiated Emissions (dBuV/m)

25 dBuV/m + 17.5 dB – 20 dB + 1.0 dB = 23.5 dBuV/m

For measurements made below 30MHz at 3 meters

The square of an inverse linear distance extrapolation factor was used. For 30m and 300m specifications 40 dB/decade was added to the limit to correct to 3m.

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2.3.2 Measurement Uncertainty Emissions

Per CISPR 16-4-2	U_{lab}	U_{cispr}
Radiated Disturbance @ 10 meters		
30 – 1,000 MHz	2.25 dB	4.51 dB
Radiated Disturbance @ 3 meters		
30 – 1,000 MHz	2.26 dB	4.52 dB
1 – 6 GHz	2.12 dB	4.25 dB
6 – 18 GHz	2.47 dB	4.93 dB
Conducted Disturbance @ Mains Terminals		
150 kHz – 30 MHz	1.09 dB	2.18 dB
Disturbance Power		

Voltech PM6000A

The estimated combined standard uncertainty for harmonic current and flicker measurements is ± 5.0%.	Per CISPR 16-4-2

2.3.3 Measurement Uncertainty Immunity

The estimated expanded uncertainty for ESD immunity measurements is ± 8.2%.	Per IEC 61000-4-2
The estimated expanded uncertainty for radiated immunity measurements is ± 4.10 dB.	Per IEC 61000-4-3
The estimated expanded uncertainty for EFT fast transient immunity measurements is ± 5.84%.	Per IEC 61000-4-4
The estimated expanded uncertainty for surge immunity measurements is ± 5.84 %.	Per IEC 61000-4-4
The estimated expanded uncertainty for conducted immunity measurements with CDN is ± 3.66 dB	Per IEC 61000-4-6
The estimated expanded uncertainty for power frequency magnetic field immunity is ± 11.6%.	Per IEC 61000-4-8
The estimated expanded uncertainty for voltage variation and interruption measurements is ± 3.48%.	Per IEC 61000-4-11

The expanded uncertainty at a level of 95% confidence is obtained by multiplying the combined standard uncertainty by a coverage factor of 2. Compliance criteria are not based on measurement uncertainty.

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2.4 Calibration Traceability

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Measurement method complies with ANSI/NCSL Z540-1-1994 and ISO Standard 17025:2005. Equipment calibration records are kept on file at the test facility.

2.5 Measurement Equipment Used

Equipment	Manufacturer	Model #	Serial/Inst #	Last Cal mm/dd/yy	Next Cal mm/dd/yy	Test
Bilog Antenna	Sunol Sciences	JB3	A102606	11/20/2017	11/20/2019	RE
Amplifier	Sonoma Instruments	310	165516	01/23/2019	01/23/2020	RE
Spectrum Analyzer	Agilent	PXA	US513358291	01/22/2019	01/22/2020	FS
AC programmable supply	California Instrument	1001P	L06329	NCR	NCR	FS
Temp chamber	Espec	BTZ-133	0613436	05/31/2018	05/31/2019	FS
Spectrum Analyzer	Agilent	N9038A	MY51210195	01/22/2019	01/22/2020	RE
Active loop antenna	Emco	6502	00062531	06/08/2018	06/08/2019	RE
Rigid Horn antenna	Sunol Sciences	DRH-118	A040806	05/16/2017	05/16/2019	RE
1-18GHz preamp	Miteq	TTA1800-30-HG	1842452	01/15/2019	01/15/2020	RE
18-40GHz active horn antenna	Com-Power	AHA-840	105005	05/26/2017	05/26/2019	RE

Note: CE=Conducted Emissions, CI=Conducted Immunity, DP=Disturbance Power, EFT=Electrical Fast Transients, ESD=Electrostatic Discharge, FLI=Flicker, FS=Frequency Stability, HAR=Harmonics, MF=Magnetic Field Immunity, NCR=No Calibration Required, RE=Radiated Emissions, RI=Radiated Immunity, SI=Surge Immunity, VDSI=Voltage Dips and Short Interruptions

3 Product Information

Product Description

See Section 5.3

Equipment Modifications

The tuning capacitors on each leg of the 13.56M oscillator were changed from 10pf to 27 pf to correct for frequency drift. This will be included in the production release as a BOM change.

Test Plan

The EUT product information, test configuration, mode of operation, test types, test procedures, test levels, pass/failure criteria, in this report were carried out per the product test plan located in Appendix A of this report.

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4 Radiated Emissions

This test measures the electromagnetic levels of spurious signals generated by the EUT on the AC power line that may affect the performance of other nearby electronic equipment.

4.1 Overview of Test

Results	**Complies** (as tested per this report)			**Test Date(s)**		March 6-7, 2019	
Standard	CFR 47 part 15.225, CFR 47 part 15.209						
Model Number	2.0			**Serial #**	140-201		
Configuration	See test plan for details.						
Test Setup	Tested in the 5-meter chamber, placed on turntable: see test plan for details.						
EUT Powered By	36VDC						
Environmental Conditions	March 6, 2019	**Temp**	22º C	**Humidity**	44%	**Pressure**	1010 mbar
Frequency Range	9kHz - 26 GHz						
Perf. Criteria	Class A		**Perf. Verification**		Readings Under Limit		
Mod. to EUT	None		**Test Performed By**		Donn Foster		

4.1.1 Test Procedure

Radiated emissions tests were performed using the procedures of ANSI C63.10 including methods for signal maximizations and EUT configuration.

The frequency range from

9 kHz - 26 GHz was investigated for radiated emissions.

4.1.2 Deviations

There were no deviations from the test methodology listed in the test plan for the radiated emission test.

4.1.3 Final Test

All final radiated emissions measurements were below the specification limits.

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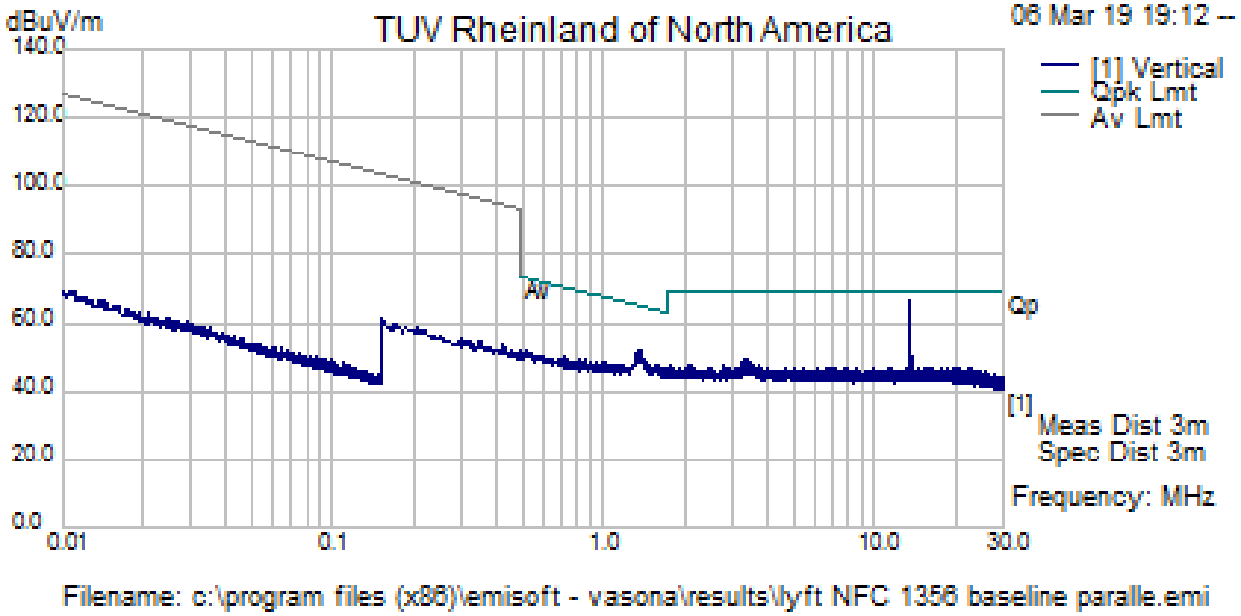
4.1.4 Plots

NOTES:

Radiated Emissions Pre-Scan
9k-30M Parallel Position 1



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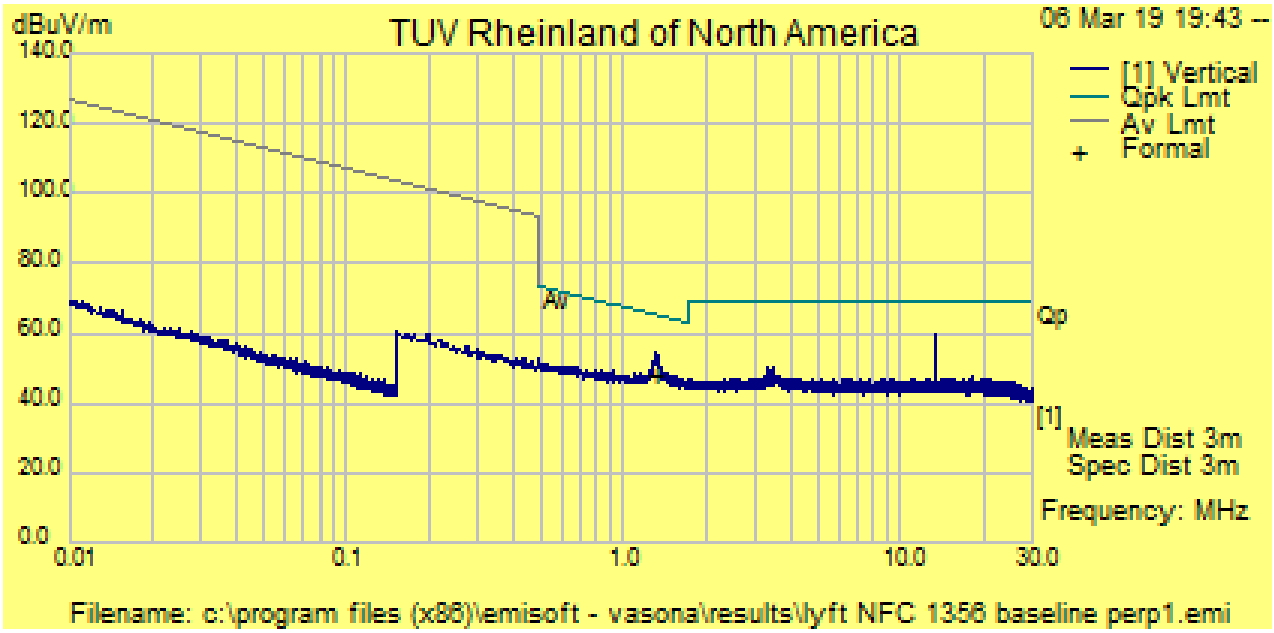
NOTES:

Radiated Emissions Full Scan
9k-30M Perpendicular Position 1



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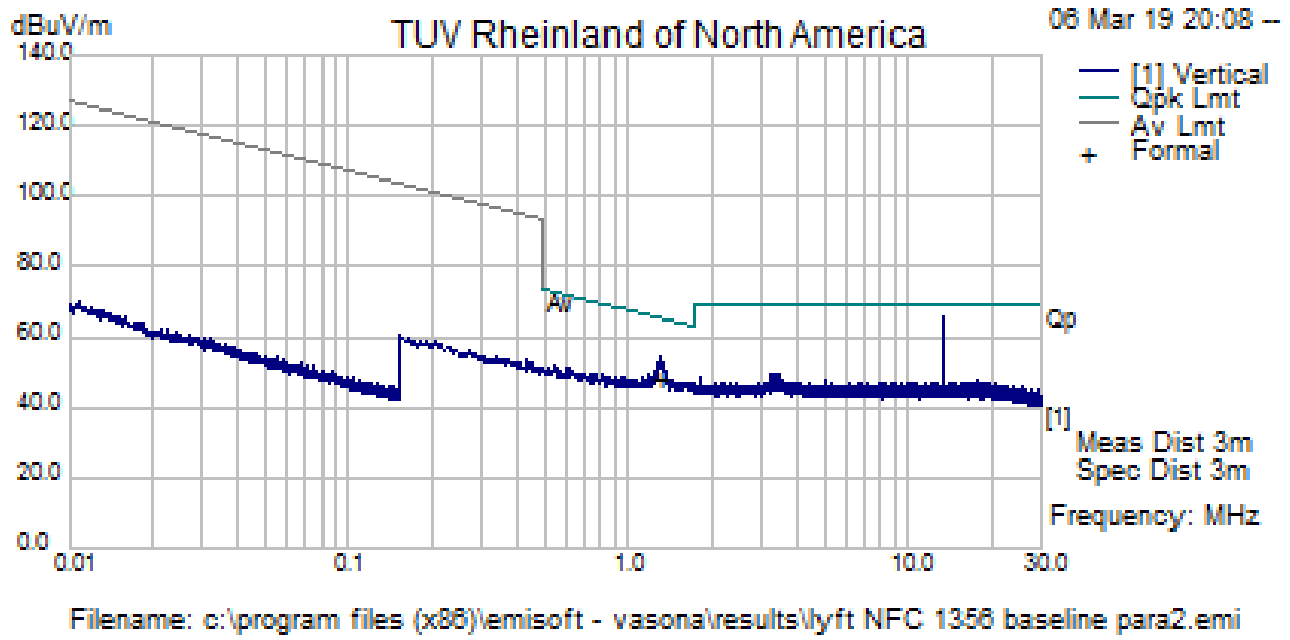
NOTES:

Radiated Emissions Full Scan
9k-30M Parallel Position 2



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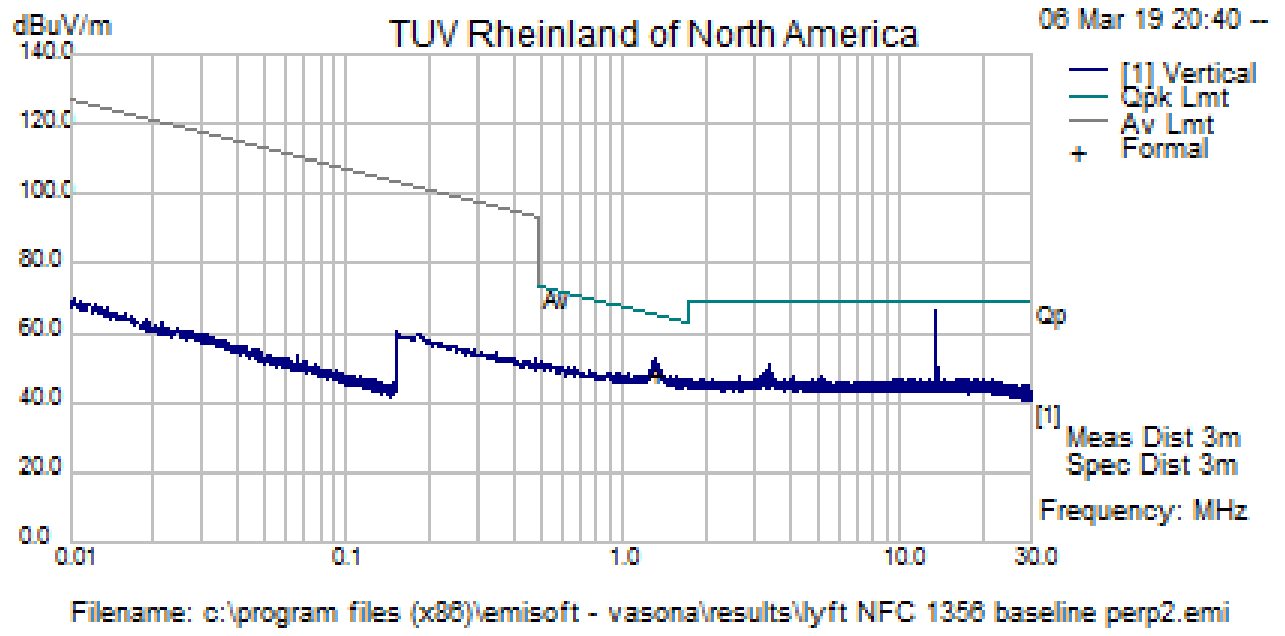
NOTES:

Radiated Emissions Full Scan
9k-30M Perpendicular Position 2



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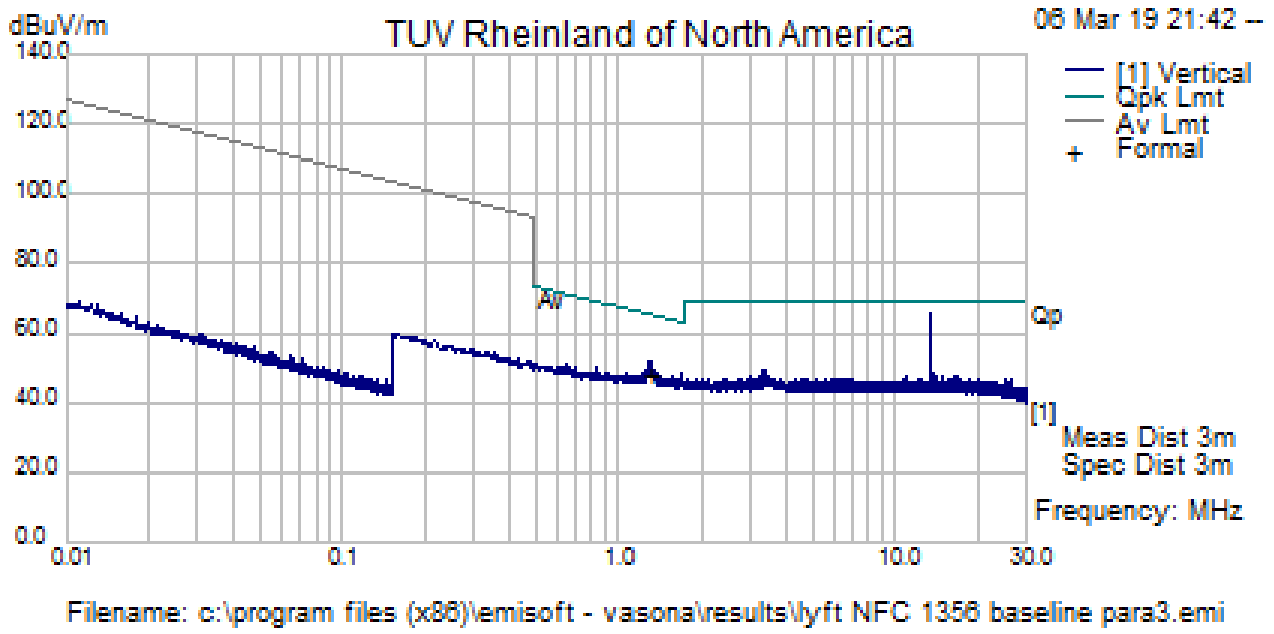
NOTES:

Radiated Emissions Full Scan
9k-30M Parallel Position 3



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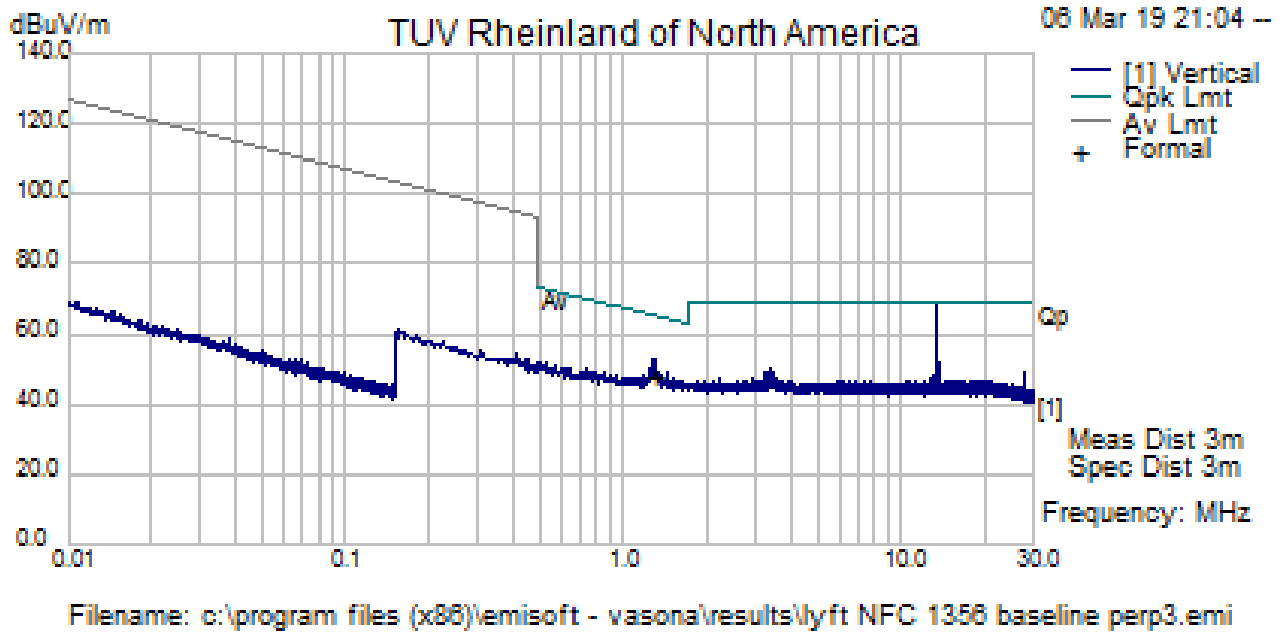
NOTES:

Radiated Emissions Full Scan
9k-30M Perpendicular Position 3



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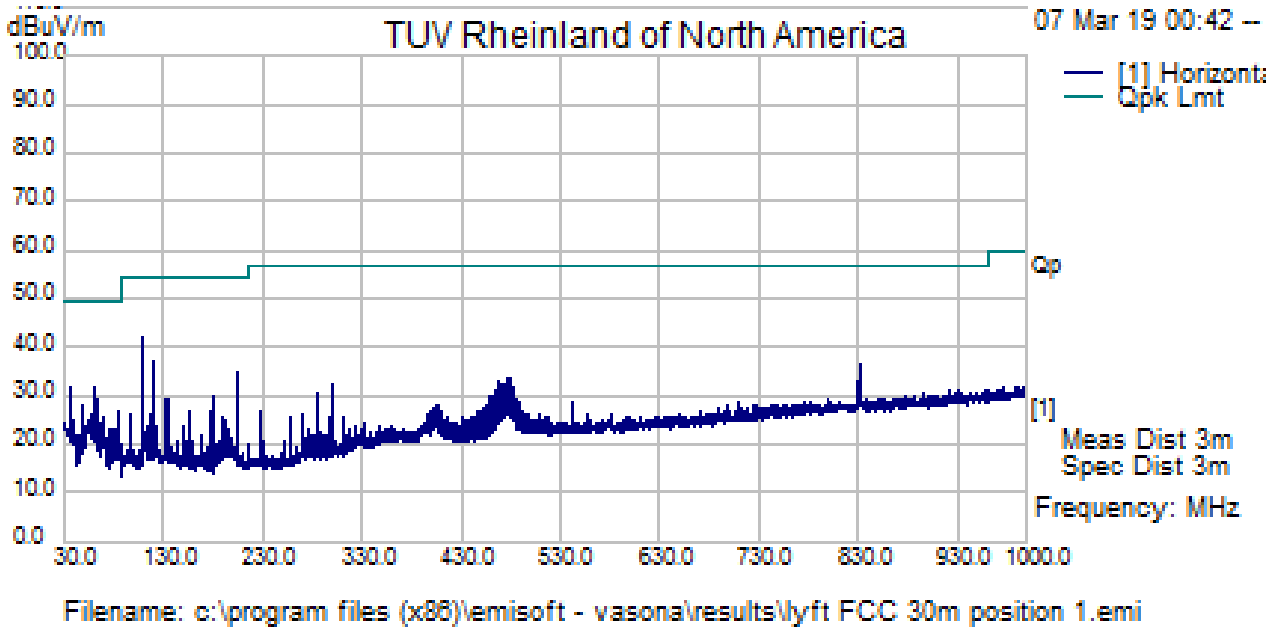
NOTES:

Radiated Emissions Full Scan
30-1000 MHz Position 1



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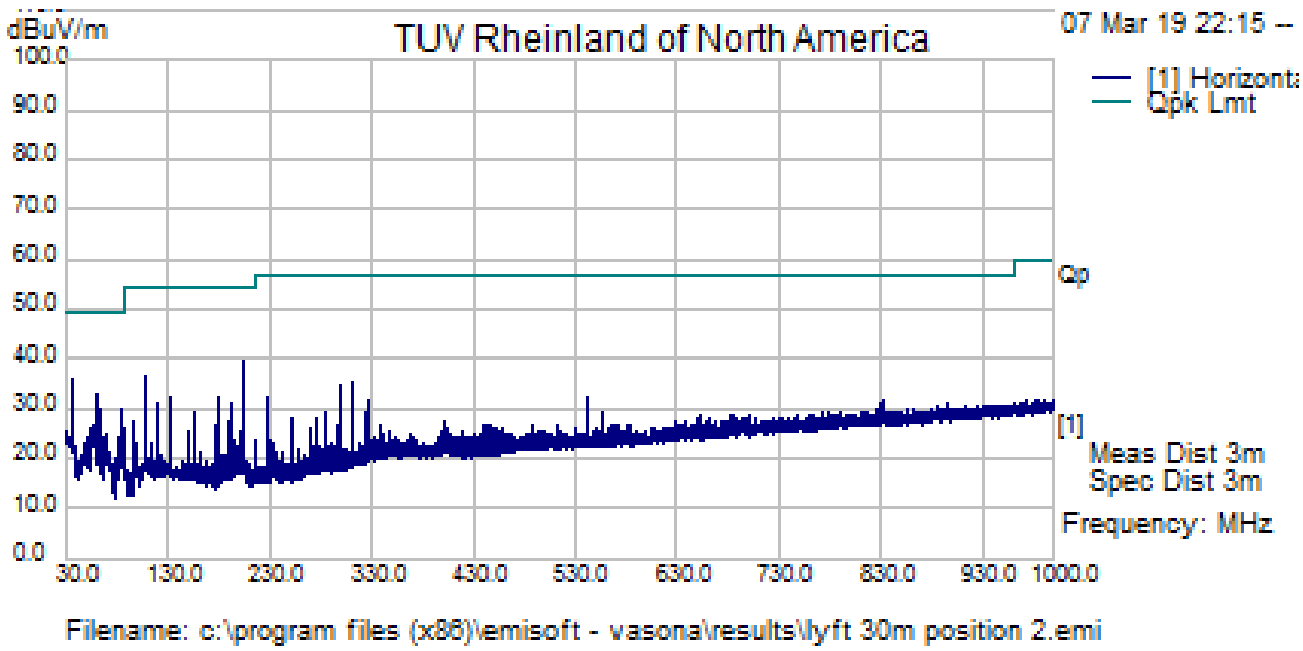
NOTES:

Radiated Emissions Full Scan
30-1000 MHz Position 2



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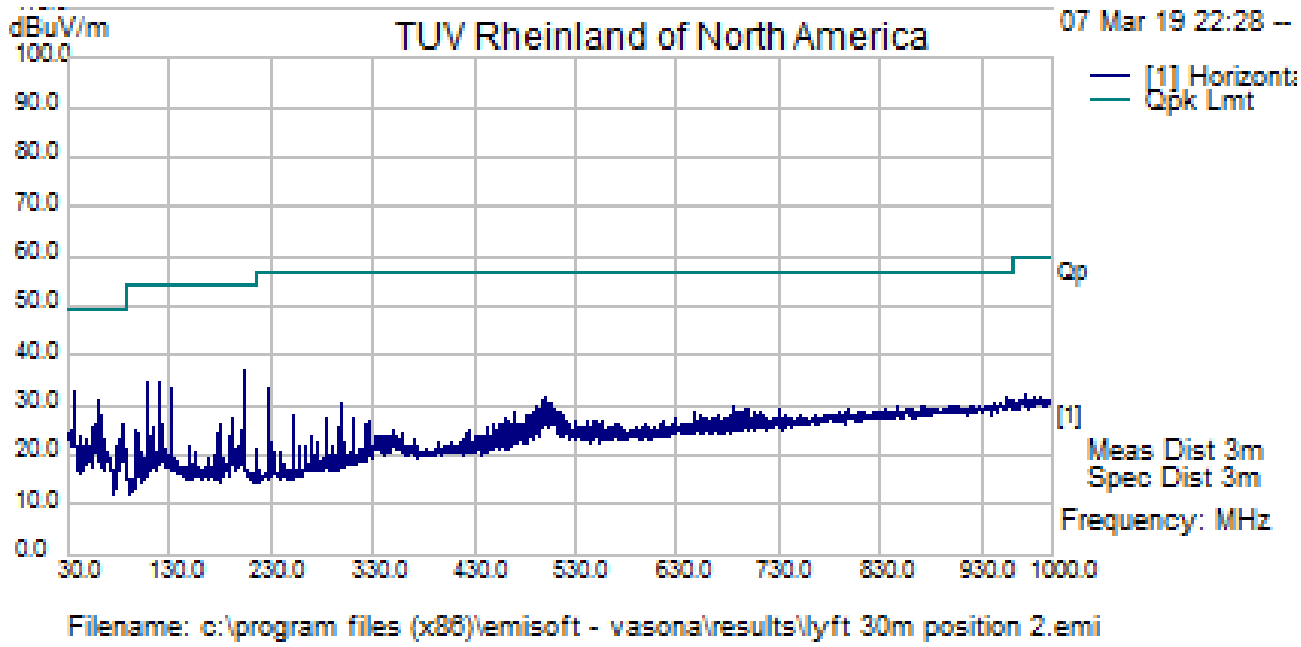
NOTES:

Radiated Emissions Full Scan
30-1000 MHz Position 3



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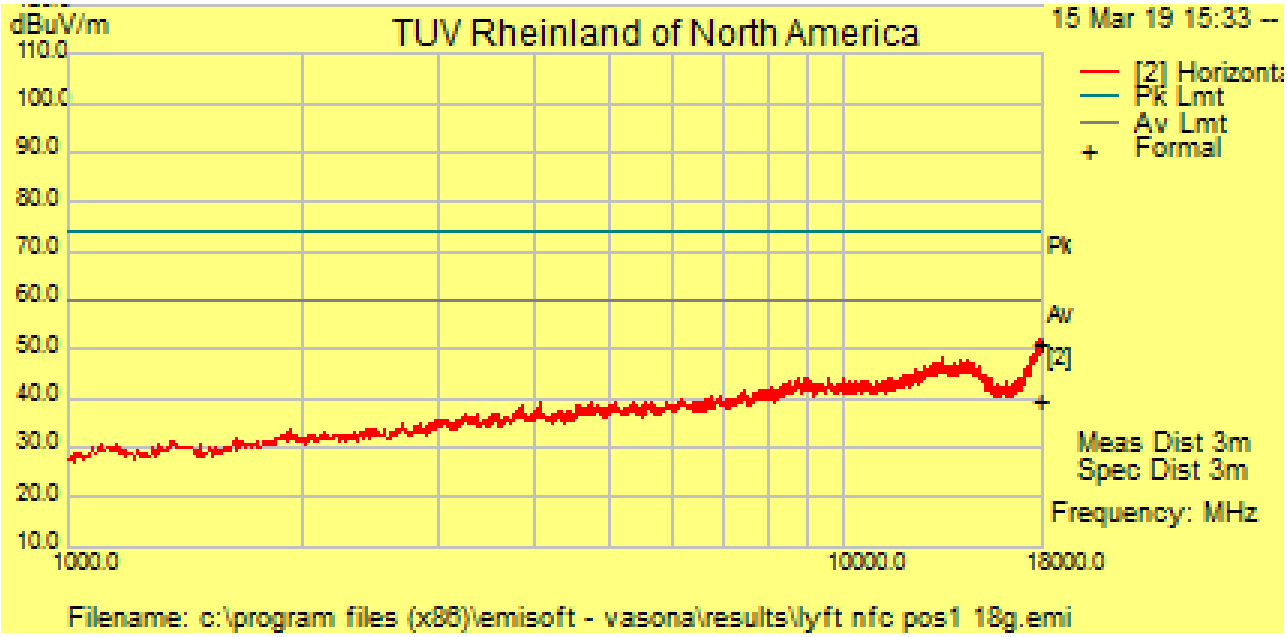
NOTES:

Radiated Emissions Full Scan
1-18 GHz Position 1



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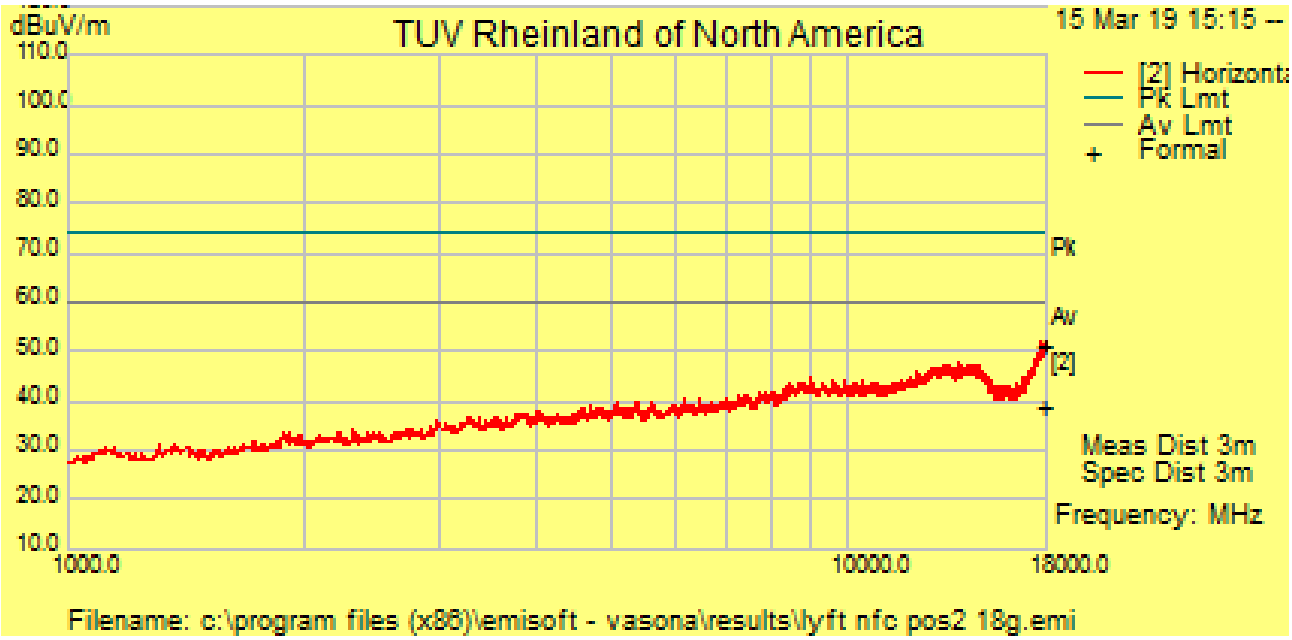
NOTES:

Radiated Emissions Full Scan
1-18 GHz Position 2



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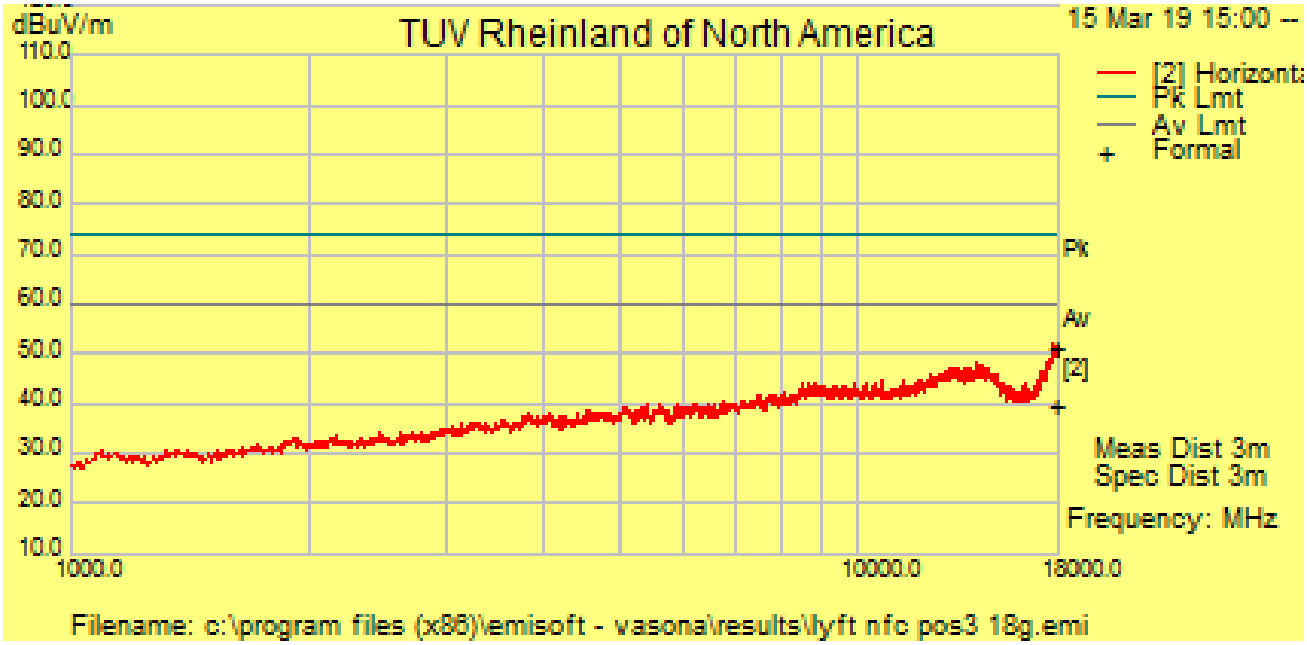
NOTES:

Radiated Emissions Full Scan
1-18 GHz Position 3



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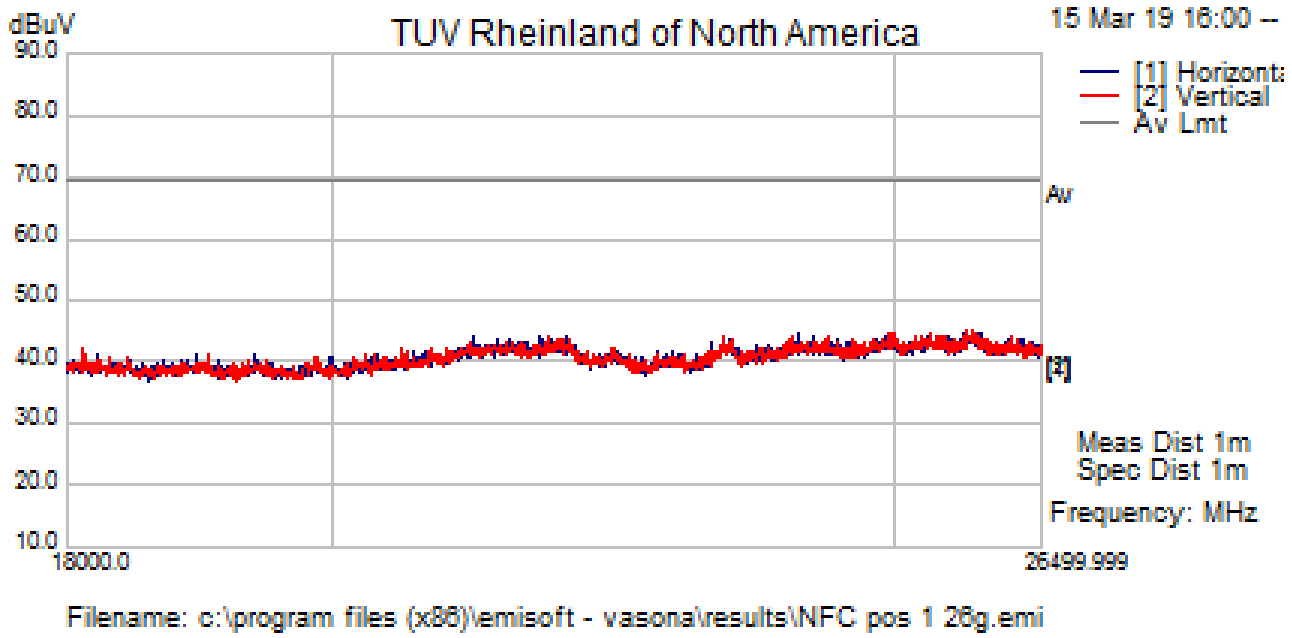
NOTES:

Radiated Emissions Full Scan
18-26 GHz Position 1



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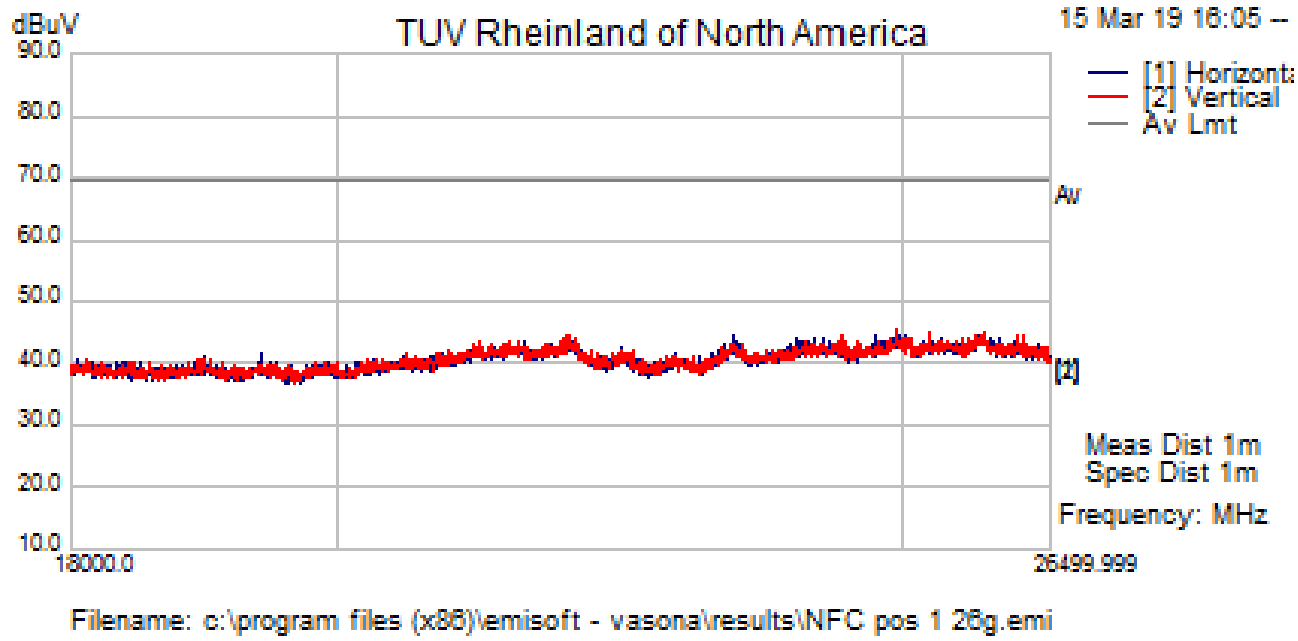
NOTES:

Radiated Emissions Full Scan
18-26 GHz Position 2



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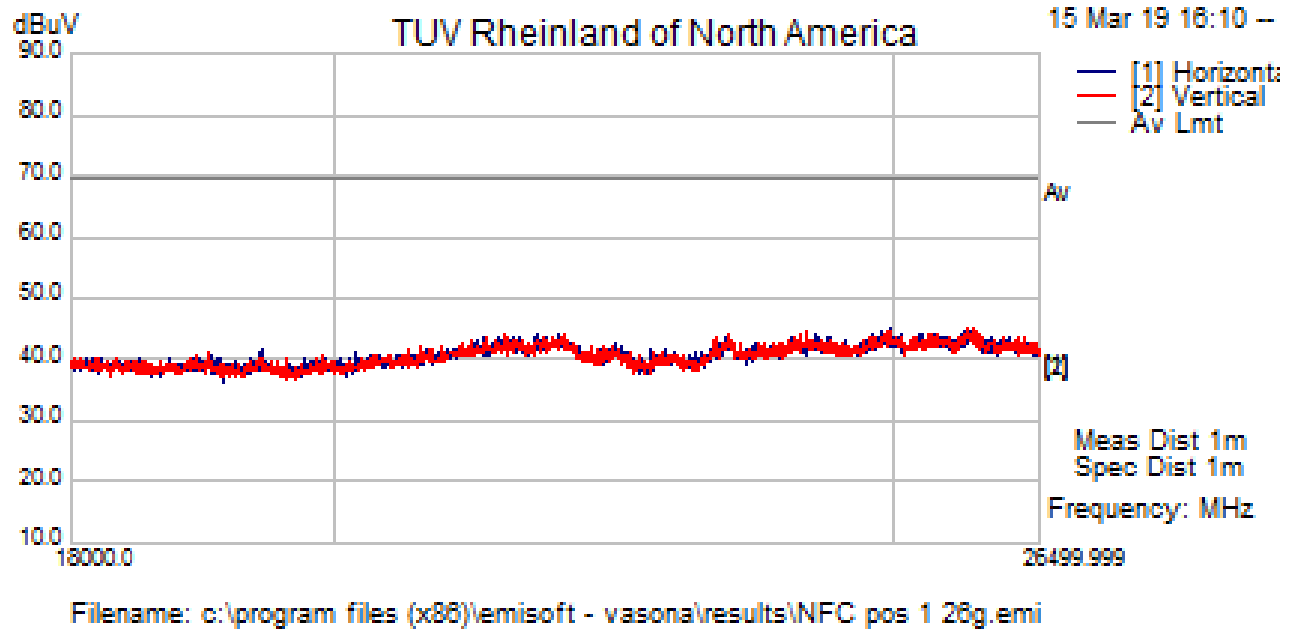
NOTES:

Radiated Emissions Full Scan
18-26 GHz Position 3



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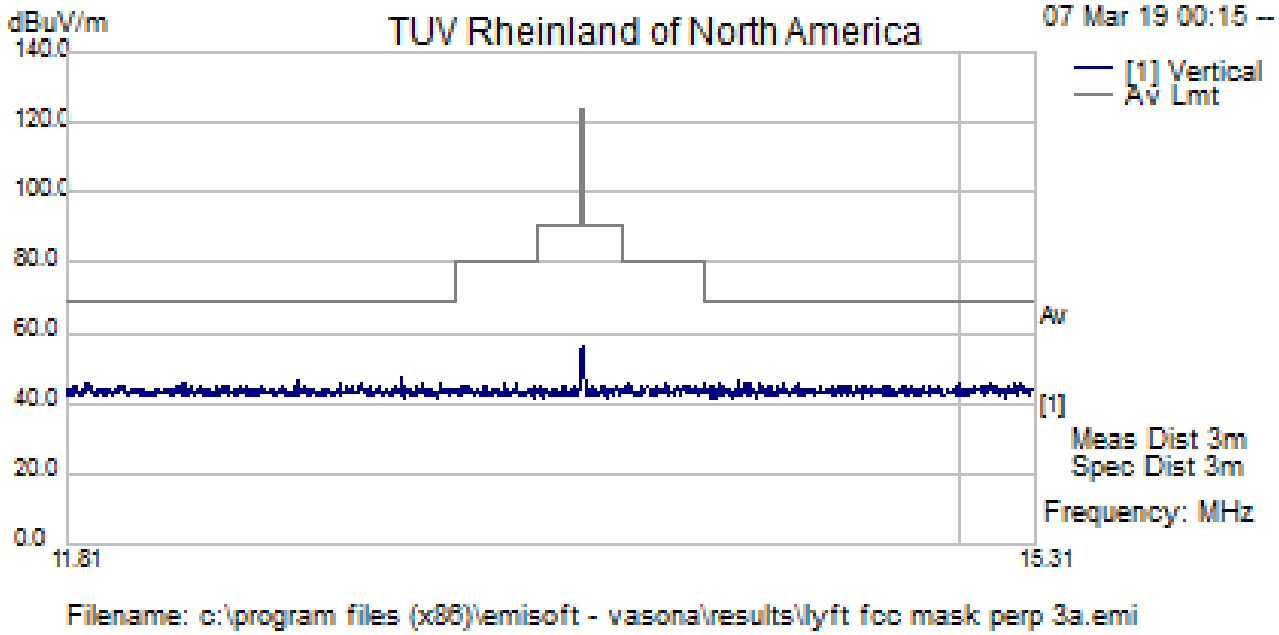
NOTES:

Radiated Emissions Full Scan
Transmitter Mask Parallel Position 1



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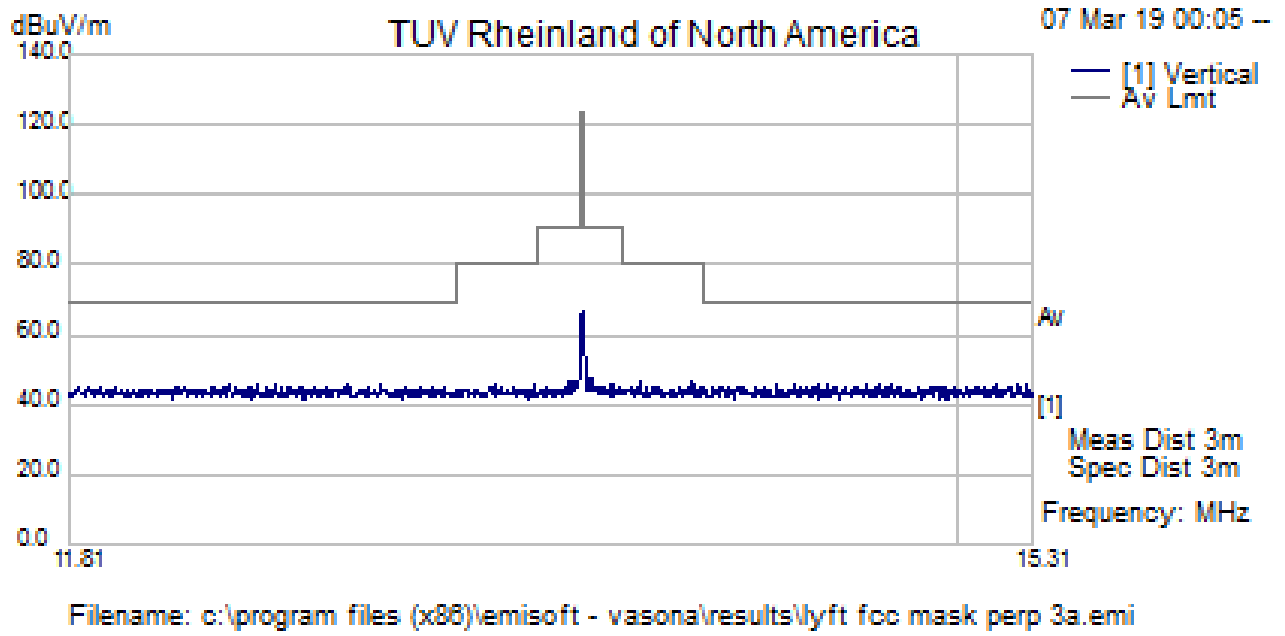
NOTES:

Radiated Emissions Full Scan
Transmitter Mask Perpendicular Position 1



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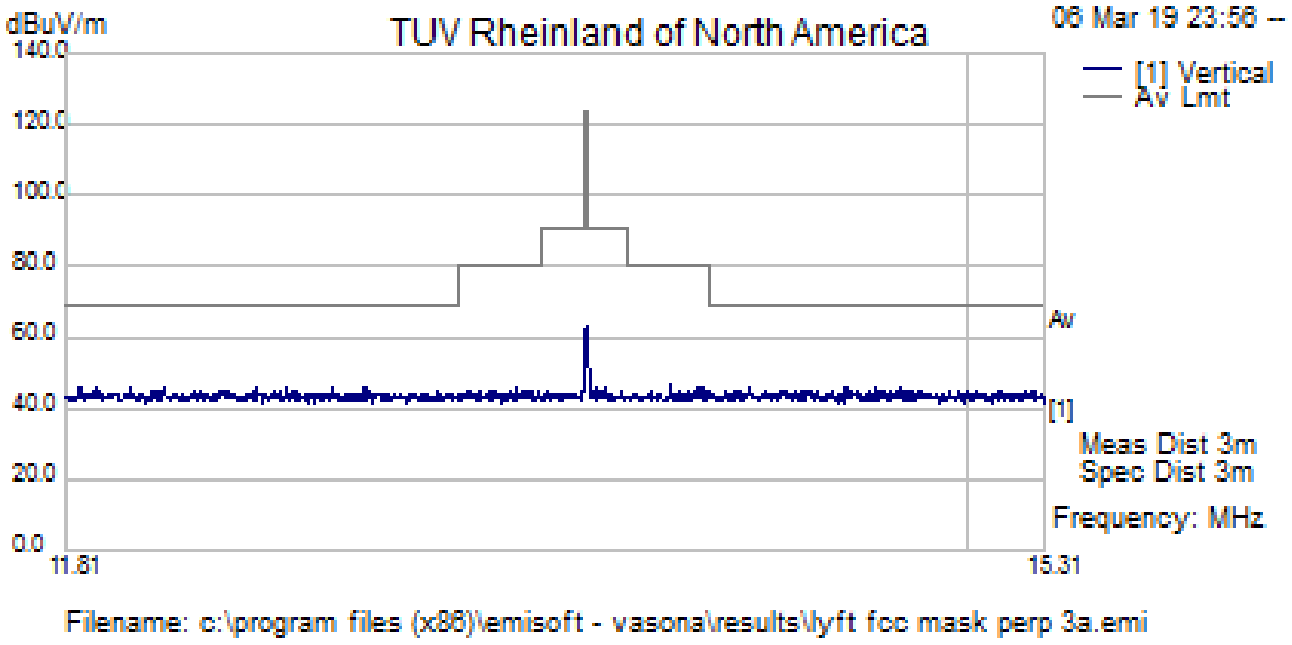
NOTES:

Radiated Emissions Full Scan
Transmitter Mask Parallel Position 2



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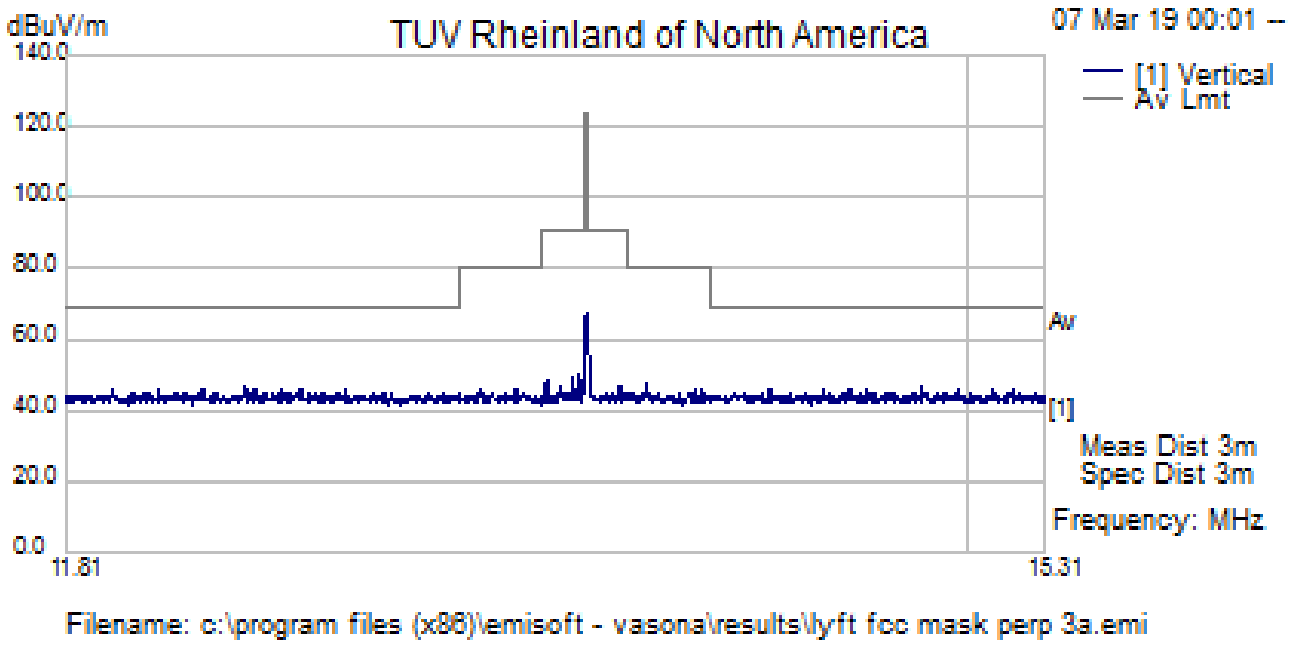
NOTES:

Radiated Emissions Full Scan
Transmitter Mask Perpendicular Position 2



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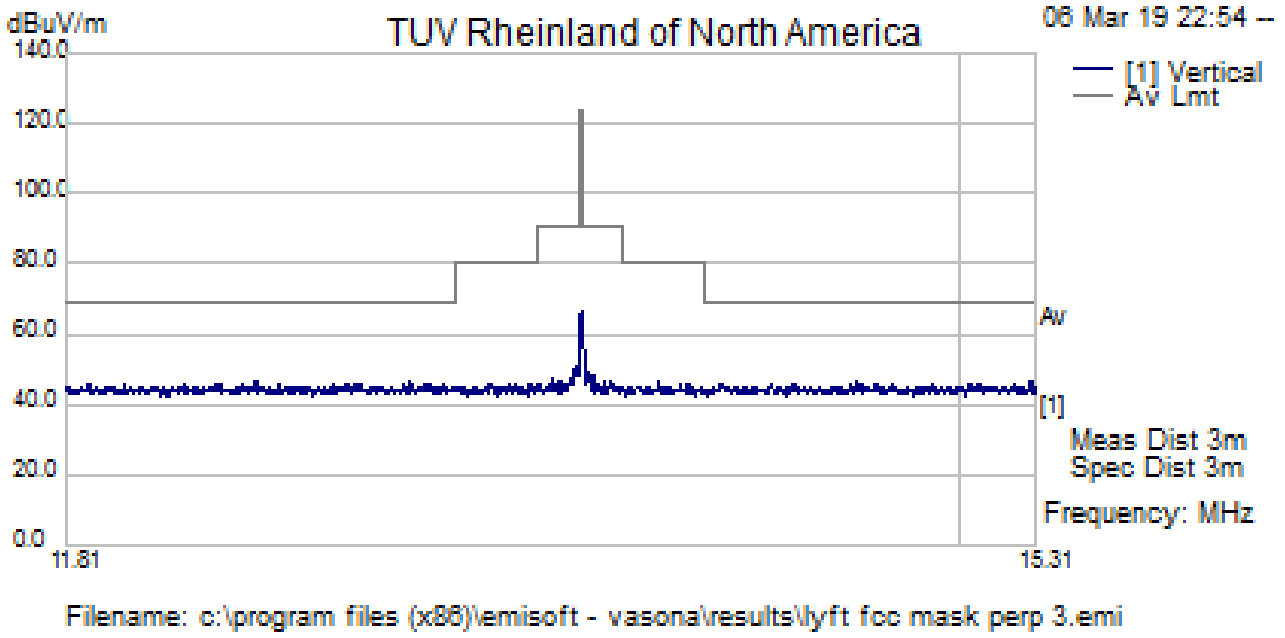
NOTES:

Radiated Emissions Full Scan
Transmitter Mask Parallel Position 3



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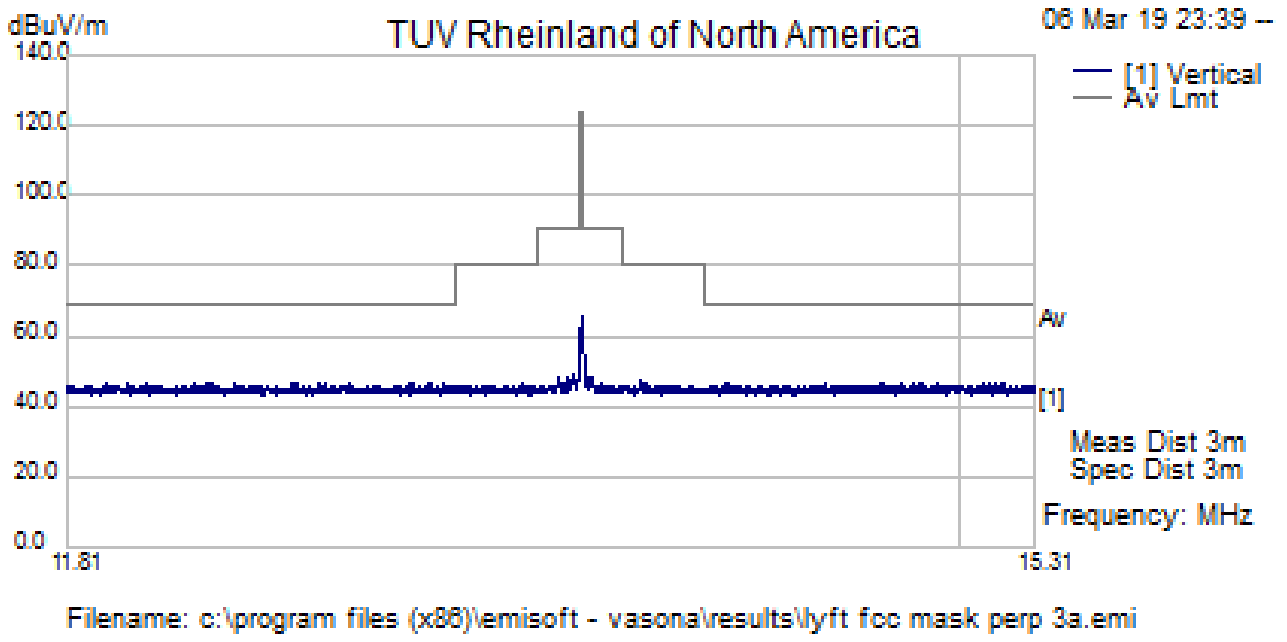
NOTES:

Radiated Emissions Full Scan
Transmitter Mask Perpendicular Position 3



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4.1.4.1 Final Tabulated Data – 9 kHz-30 MHz, 36VDC Parallel Position 1

Freq	Raw Reading	Cable Loss	AF	Corrected	Detector Type	Pol H/V	Ant Height	Azi	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m			Cm	Deg	dBuV/m	dB
13.56	46.48	2.44	10.80	59.73	Pk	V	125	0	69.50	-9.77
1.30	41.16	2.31	10.60	54.07	Pk	V	125	0	65.29	-11.22
3.45	37.47	2.37	10.65	50.49	Pk	V	125	0	69.50	-19.01
18.33	34.51	2.46	10.50	47.47	Pk	V	125	0	69.50	-22.03
0.44	40.10	2.25	10.29	52.64	Pk	V	125	0	75.24	-22.60
26.54	33.73	2.48	8.94	45.15	Pk	V	125	0	69.50	-24.35

Note: The transmitter was not measured against this limit

4.1.4.2 Final Tabulated Data – 9 kHz-30 MHz, 36VDC Perpendicular Position 1

Freq	Raw Reading	Cable Loss	AF	Corrected	Detector Type	Pol H/V	Ant Height	Azi	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m			Cm	Deg	dBuV/m	dB
13.56	53.47	2.44	10.80	66.71	Pk	V	125	0	69.50	-2.79
1.34	39.30	2.31	10.60	52.22	Pk	V	125	0	65.07	-12.86
13.59	36.48	2.45	10.80	49.73	Pk	V	125	0	69.50	-19.77
3.33	36.56	2.37	10.64	49.56	Pk	V	125	0	69.50	-19.94
13.62	35.56	2.45	10.80	48.81	Pk	V	125	0	69.50	-20.69
20.38	34.06	2.47	10.36	46.89	Pk	V	125	0	69.50	-22.61

Note: The transmitter was not measured against this limit

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4.1.4.3 Final Tabulated Data – 9 kHz-30 MHz, 36VDC Parallel Position 2

Freq	Raw Reading	Cable Loss	AF	Corrected	Detector Type	Pol H/V	Ant Height	Azi	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m			Cm	Deg	dBuV/m	dB
13.56	52.24	2.44	10.80	65.48	Pk	V	125	0	69.50	-4.02
1.31	41.40	2.31	10.60	54.31	Pk	V	125	0	65.23	-10.92
13.54	37.07	2.44	10.80	50.32	Pk	V	125	0	69.50	-19.18
3.22	36.69	2.36	10.62	49.68	Pk	V	125	0	69.50	-19.82
0.55	38.97	2.26	10.40	51.63	Pk	V	125	0	72.81	-21.18
13.58	34.05	2.45	10.80	47.30	Pk	V	125	0	69.50	-22.21

Note: The transmitter was not measured against this limit

4.1.4.4 Final Tabulated Data – 9 kHz-30 MHz, 36VDC Perpendicular Position 2

Freq	Raw Reading	Cable Loss	AF	Corrected	Detector Type	Pol H/V	Ant Height	Azi	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m			Cm	Deg	dBuV/m	dB
13.56	53.13	2.44	10.80	66.37	Pk	V	125	0	69.50	-3.13
1.29	39.45	2.31	10.60	52.36	Pk	V	125	0	65.40	-13.04
3.35	37.60	2.37	10.64	50.61	Pk	V	125	0	69.50	-18.89
13.59	37.18	2.45	10.80	50.43	Pk	V	125	0	69.50	-19.07
13.48	36.71	2.44	10.80	49.96	Pk	V	125	0	69.50	-19.55
3.40	35.86	2.37	10.64	48.87	Pk	V	125	0	69.50	-20.63

Note: The transmitter was not measured against this limit

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4.1.4.5 Final Tabulated Data – 9 kHz-30 MHz, 36VDC Parallel Position 3

Freq	Raw Reading	Cable Loss	AF	Corrected	Detector Type	Pol H/V	Ant Height	Azi	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m			Cm	Deg	dBuV/m	dB
13.56	52.04	2.44	10.80	65.29	Pk	V	125	0	69.50	-4.22
1.29	39.04	2.31	10.60	51.96	Pk	V	125	0	65.41	-13.46
3.34	36.58	2.37	10.64	49.58	Pk	V	125	0	69.50	-19.92
13.59	35.43	2.45	10.80	48.68	Pk	V	125	0	69.50	-20.82
26.70	35.40	2.48	8.89	46.77	Pk	V	125	0	69.50	-22.73
0.34	42.38	2.24	10.20	54.81	Pk	V	125	0	78.82	-24.01

Note: The transmitter was not measured against this limit

4.1.4.6 Final Tabulated Data – 9 kHz-30 MHz, 36VDC Perpendicular Position 3

Freq	Raw Reading	Cable Loss	AF	Corrected	Detector Type	Pol H/V	Ant Height	Azi	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m			Cm	Deg	dBuV/m	dB
13.56	55.90	2.44	10.80	69.14	Pk	V	125	0	69.50	-0.36
1.29	40.11	2.31	10.60	53.02	Pk	V	125	0	65.41	-12.39
1.43	36.46	2.32	10.60	49.38	Pk	V	125	0	64.50	-15.13
13.59	38.56	2.45	10.80	51.81	Pk	V	125	0	69.50	-17.69
13.48	37.60	2.44	10.80	50.84	Pk	V	125	0	69.50	-18.66
3.35	37.03	2.37	10.64	50.03	Pk	V	125	0	69.50	-19.47

Note: The transmitter was not measured against this limit

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4.1.4.7 Final Tabulated Data – 30 - 1000 MHz, 36VDC Position 1

Freq	Raw Reading	Cable Loss	AF	Corrected	Detector Type	Pol H/V	Ant Height	Azi	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m			Cm	Deg	dBuV/m	dB
107.90	54.73	2.91	-15.87	41.77	Pk	V	100	88	54.00	-12.23
120.03	48.73	2.98	-14.34	37.38	Pk	V	100	151	54.00	-16.62
36.06	40.41	2.52	-11.06	31.87	Pk	V	100	273	49.60	-17.73
60.01	49.76	2.68	-20.69	31.75	Pk	V	100	272	49.60	-17.85
203.39	47.66	3.30	-16.11	34.85	Pk	V	200	360	54.00	-19.15
63.04	47.08	2.70	-20.49	29.29	Pk	V	100	29	49.60	-20.31

4.1.4.8 Final Tabulated Data – 30 - 1000 MHz, 36VDC Position 2

Freq	Raw Reading	Cable Loss	AF	Corrected	Detector Type	Pol H/V	Ant Height	Azi	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m			Cm	Deg	dBuV/m	dB
36.14	44.37	2.52	-11.12	35.77	Pk	V	100	284	49.60	-13.83
203.39	52.30	3.30	-16.11	39.50	Pk	V	100	91	54.00	-14.50
60.01	50.67	2.68	-20.69	32.66	Pk	V	100	26	49.60	-16.94
107.98	49.31	2.91	-15.85	36.36	Pk	V	100	24	54.00	-17.64
203.99	48.46	3.30	-16.35	35.42	Pk	V	100	44	54.00	-18.58
63.04	47.31	2.70	-20.49	29.52	Pk	V	100	260	49.60	-20.08

4.1.4.9 Final Tabulated Data – 30 - 1000 MHz, 36VDC Position 3

Freq	Raw Reading	Cable Loss	AF	Corrected	Detector Type	Pol H/V	Ant Height	Azi	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m			Cm	Deg	dBuV/m	dB
203.3875	50.12	3.3	-16.11	37.31	Peak [Scan]	V	200	185	54	-16.69
36.0625	41.15	2.52	-11.06	32.61	Peak [Scan]	V	100	140	49.6	-16.99

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60.3125	48.85	2.68	-20.66	30.87	Peak [Scan]	V	100	356	49.6	-18.73
108.2063	47.84	2.91	-15.81	34.94	Peak [Scan]	V	100	338	54	-19.06
119.725	46.12	2.98	-14.34	34.76	Peak [Scan]	V	100	360	54	-19.24
131.85	44.96	3.04	-14.33	33.67	Peak [Scan]	V	100	60	54	-20.33

4.1.4.10 Final Tabulated Data – 1-18 GHz, 36VDC Position 1

Freq	Raw Reading	Cable Loss	AF	Corrected	Detector Type	Pol H/V	Ant Height	Azi	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m			Cm	Deg	dBuV/m	dB
17773.54	52.8	6.75	-8.47	51.08	Peak Max	V	185	112	74	-22.92
17773.54	40.92	6.75	-8.47	39.2	Average Max	V	185	112	60	-20.8

4.1.4.11 Final Tabulated Data – 1-18 GHz, 36VDC Position 2

Freq	Raw Reading	Cable Loss	AF	Corrected	Detector Type	Pol H/V	Ant Height	Azi	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m			Cm	Deg	dBuV/m	dB
17711.91	53.17	6.78	-9.08	50.87	Peak Max	H	201	182	74	-23.14
17711.91	41.4	6.78	-9.08	39.1	Average Max	H	201	182	60	-20.9

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4.1.4.12 Final Tabulated Data – 1-18 GHz, 36VDC Position 3

Freq	Raw Reading	Cable Loss	AF	Corrected	Detector Type	Pol H/V	Ant Height	Azi	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m			Cm	Deg	dBuV/m	dB
17730.11	53.18	6.74	-8.9	51.02	Peak Max	V	111	76	74	-22.98
17730.11	41.48	6.74	-8.9	39.32	Average Max	V	111	76	60	-20.68

4.1.4.13 Final Tabulated Data – 18-26 GHz, 36VDC Position 1

Freq	Raw Reading	Cable Loss	AF	Corrected	Detector Type	Pol H/V	Ant Height	Azi	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m			Cm	Deg	dBuV/m	dB
25735	40.17	8.13	-3.33	44.98	Peak [Scan]	V	150	314	69.5	-24.52
21724.06	36.77	7.75	-0.3	44.23	Peak [Scan]	H	150	87	69.5	-25.27

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4.1.4.14 Final Tabulated Data – 18-26 GHz, 36VDC Position 2

Freq	Raw Reading	Cable Loss	AF	Corrected	Detector Type	Pol H/V	Ant Height	Azi	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m			Cm	Deg	dBuV/m	dB
24938.12	40.68	8.17	-3.45	45.4	Peak [Scan]	V	150	172	69.5	-24.1
21894.06	37.61	7.69	-0.5	44.8	Peak [Scan]	V	150	82	69.5	-24.7

4.1.4.15 Final Tabulated Data – 18-26 GHz, 36VDC Position 3

Freq	Raw Reading	Cable Loss	AF	Corrected	Detector Type	Pol H/V	Ant Height	Azi	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m			Cm	Deg	dBuV/m	dB
25814.69	40.38	8.12	-3.32	45.17	Peak [Scan]	V	150	235	69.5	-24.33

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4.1.4.16 Final Tabulated Data – 11.8-15.3 MHz, 36VDC Parallel Position 1

Freq	Raw Reading	Cable Loss	AF	Corrected	Detector Type	Pol H/V	Ant Height	Azi	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m			Cm	Deg	dBuV/m	dB
12.92	34.57	2.44	10.80	47.81	Pk	V	125	0	69.50	-21.69
12.92	34.15	2.44	10.80	47.39	Pk	V	125	0	69.50	-22.11
14.14	32.98	2.45	10.80	46.22	Pk	V	125	0	69.50	-23.28
14.35	29.71	2.45	10.80	42.96	Pk	V	125	0	69.50	-26.54
15.13	30.80	2.45	10.79	44.04	Pk	V	125	0	69.50	-25.46
15.15	31.63	2.45	10.78	44.87	Pk	V	125	0	69.50	-24.63

4.1.4.17 Final Tabulated Data – 11.8-15.3 MHz, 36VDC Perpendicular Position 1

Freq	Raw Reading	Cable Loss	AF	Corrected	Detector Type	Pol H/V	Ant Height	Azi	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m			Cm	Deg	dBuV/m	dB
12.46	31.20	2.44	10.80	44.44	Pk	V	125	0	69.50	-25.06
12.52	29.94	2.44	10.80	43.18	Pk	V	125	0	69.50	-26.32
13.58	35.30	2.45	10.80	48.55	Pk	V	125	0	90.50	-41.95
13.97	33.38	2.45	10.80	46.63	Pk	V	125	0	80.50	-33.87
14.76	31.32	2.45	10.80	44.57	Pk	V	125	0	69.50	-24.93
15.14	30.91	2.45	10.79	44.15	Pk	V	125	0	69.50	-25.35

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4.1.4.18 Final Tabulated Data – 11.8-15.3 MHz, 36VDC Parallel Position 2

Freq	Raw Reading	Cable Loss	AF	Corrected	Detector Type	Pol H/V	Ant Height	Azi	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m			Cm	Deg	dBuV/m	dB
12.04	30.20	2.44	10.80	43.44	Pk	V	125	0	69.50	-26.06
12.09	30.44	2.44	10.80	43.68	Pk	V	125	0	69.50	-25.82
13.02	30.18	2.44	10.80	43.42	Pk	V	125	0	69.50	-26.08
13.86	33.25	2.45	10.80	46.50	Pk	V	125	0	80.50	-34.00
14.56	31.14	2.45	10.80	44.39	Pk	V	125	0	69.50	-25.11
14.74	29.66	2.45	10.80	42.91	Pk	V	125	0	69.50	-26.59

4.1.4.19 Final Tabulated Data – 11.8-15.3 MHz, 36VDC Perpendicular Position 2

Freq	Raw Reading	Cable Loss	AF	Corrected	Detector Type	Pol H/V	Ant Height	Azi	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m			Cm	Deg	dBuV/m	dB
12.11	29.30	2.44	10.80	42.54	Pk	V	125	360	69.50	-26.96
12.41	29.76	2.44	10.80	43.00	Pk	V	125	360	69.50	-26.50
13.42	35.09	2.44	10.80	48.33	Pk	V	125	0	90.50	-42.17
13.54	36.49	2.44	10.80	49.74	Pk	V	125	0	90.50	-40.76
13.77	34.38	2.45	10.80	47.62	Pk	V	125	0	80.50	-32.88
14.37	30.74	2.45	10.80	43.99	Pk	V	125	360	69.50	-25.51

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4.1.4.20 Final Tabulated Data – 11.8-15.3 MHz, 36VDC Parallel Position 3

Freq	Raw Reading	Cable Loss	AF	Corrected	Detector Type	Pol H/V	Ant Height	Azi	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m			Cm	Deg	dBuV/m	dB
13.56	53.42	2.44	10.80	66.67	Pk	V	125	0	124.00	-57.33
13.59	36.29	2.45	10.80	49.54	Pk	V	125	0	90.50	-40.96
15.29	33.49	2.45	10.77	46.71	Pk	V	125	0	69.50	-22.79

4.1.4.21 Final Tabulated Data – 11.8-15.3 MHz, 36VDC Perpendicular Position 3

Freq	Raw Reading	Cable Loss	AF	Corrected	Detector Type	Pol H/V	Ant Height	Azi	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m			Cm	Deg	dBuV/m	dB
13.57	37.29	2.45	10.80	50.54	Pk	V	125	0	90.50	-39.96
13.78	33.89	2.45	10.80	47.13	Pk	V	125	0	80.50	-33.37

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4.2 Photos

Figure 1 Radiated Emissions Test Setup 9 kHz- 30 MHz - Front

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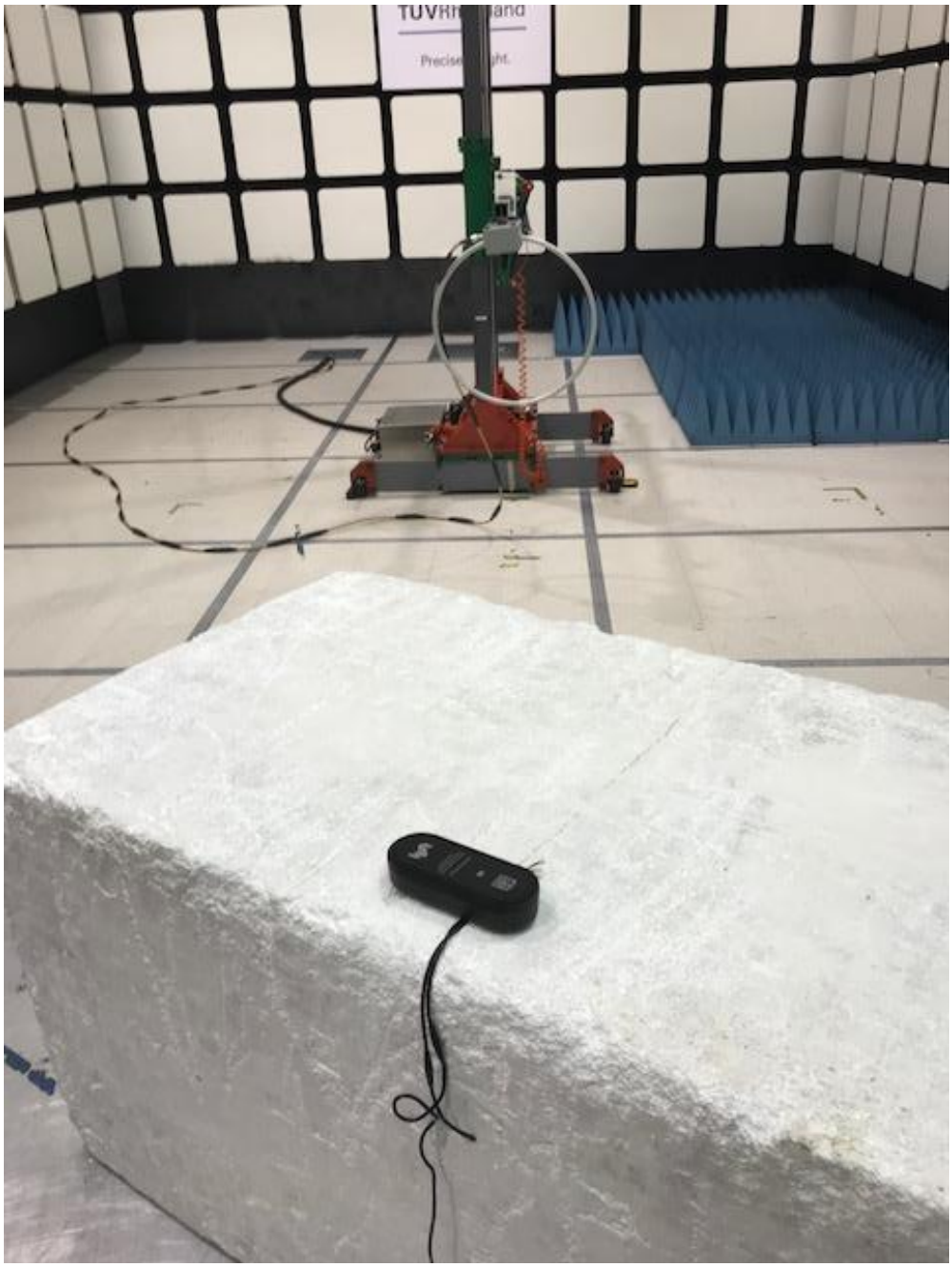

Figure 2 - Radiated Emissions Test Setup 9 kHz-30 MHz - Back

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Figure 3 - Radiated Emissions Test Setup 30 - 1000 MHz - Front

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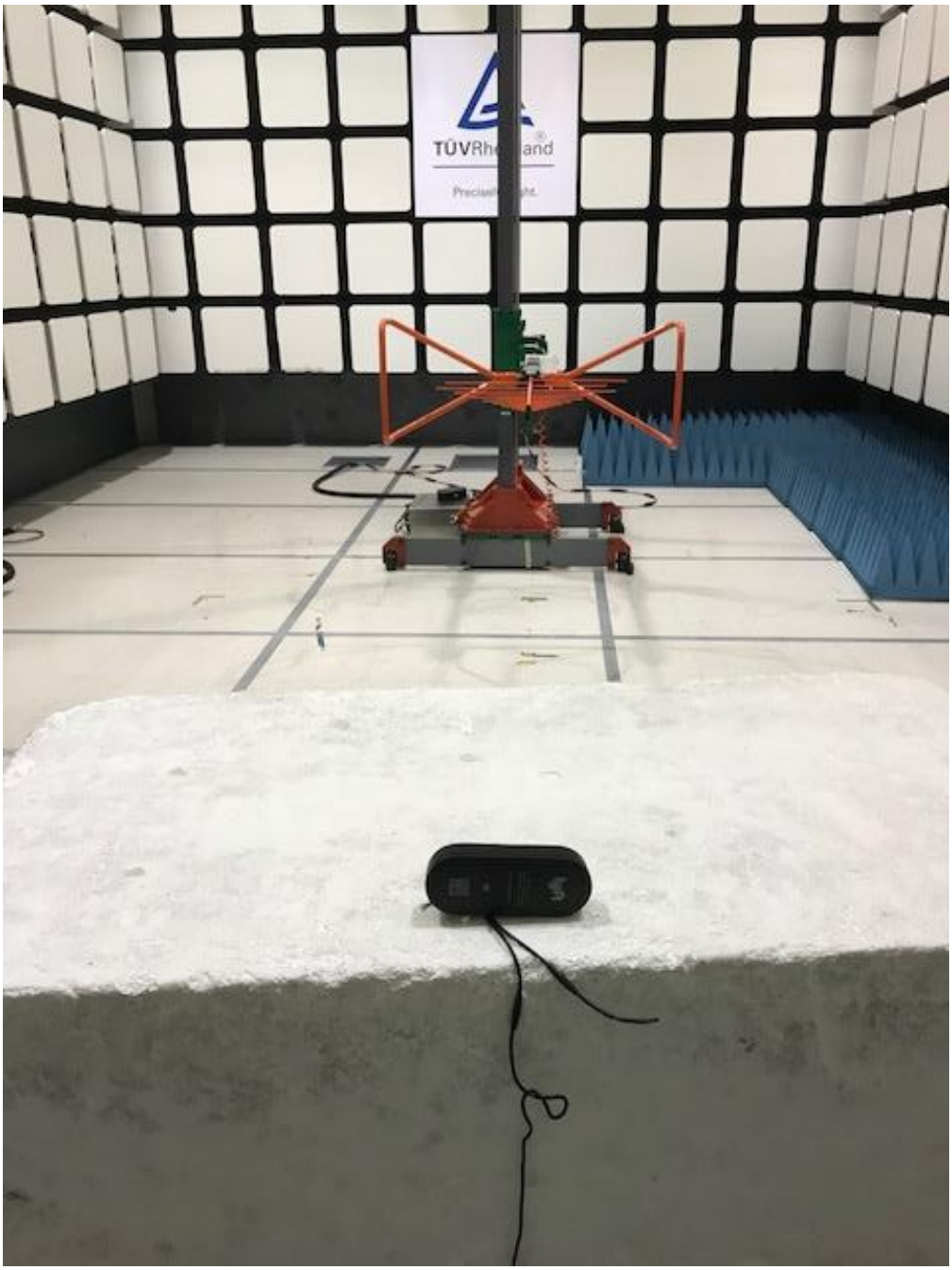

Figure 4 - Radiated Emissions Test Setup 30 - 1000 MHz - Back

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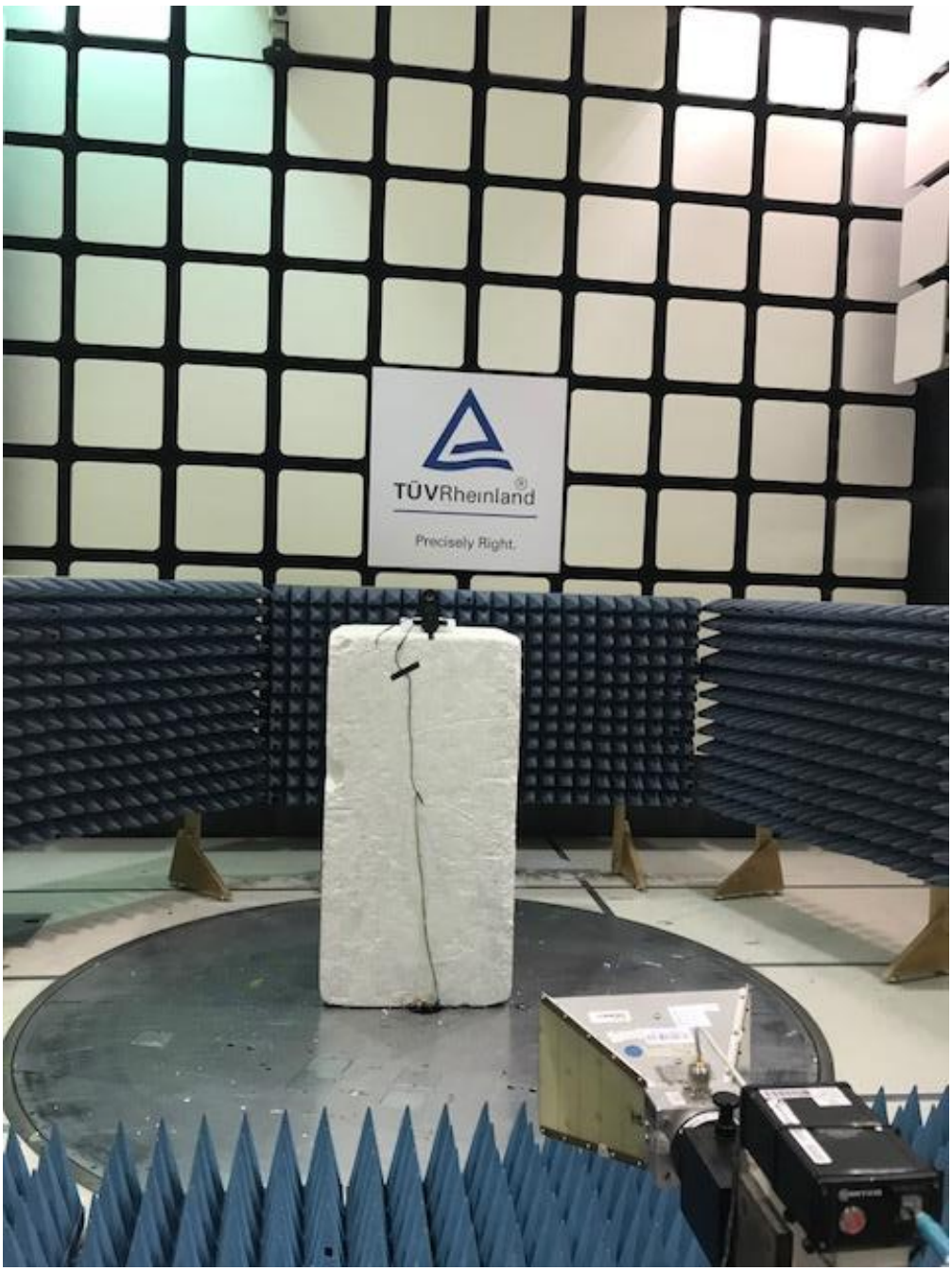

Figure 5 - Radiated Emissions Test Setup – 1-18 GHz Front

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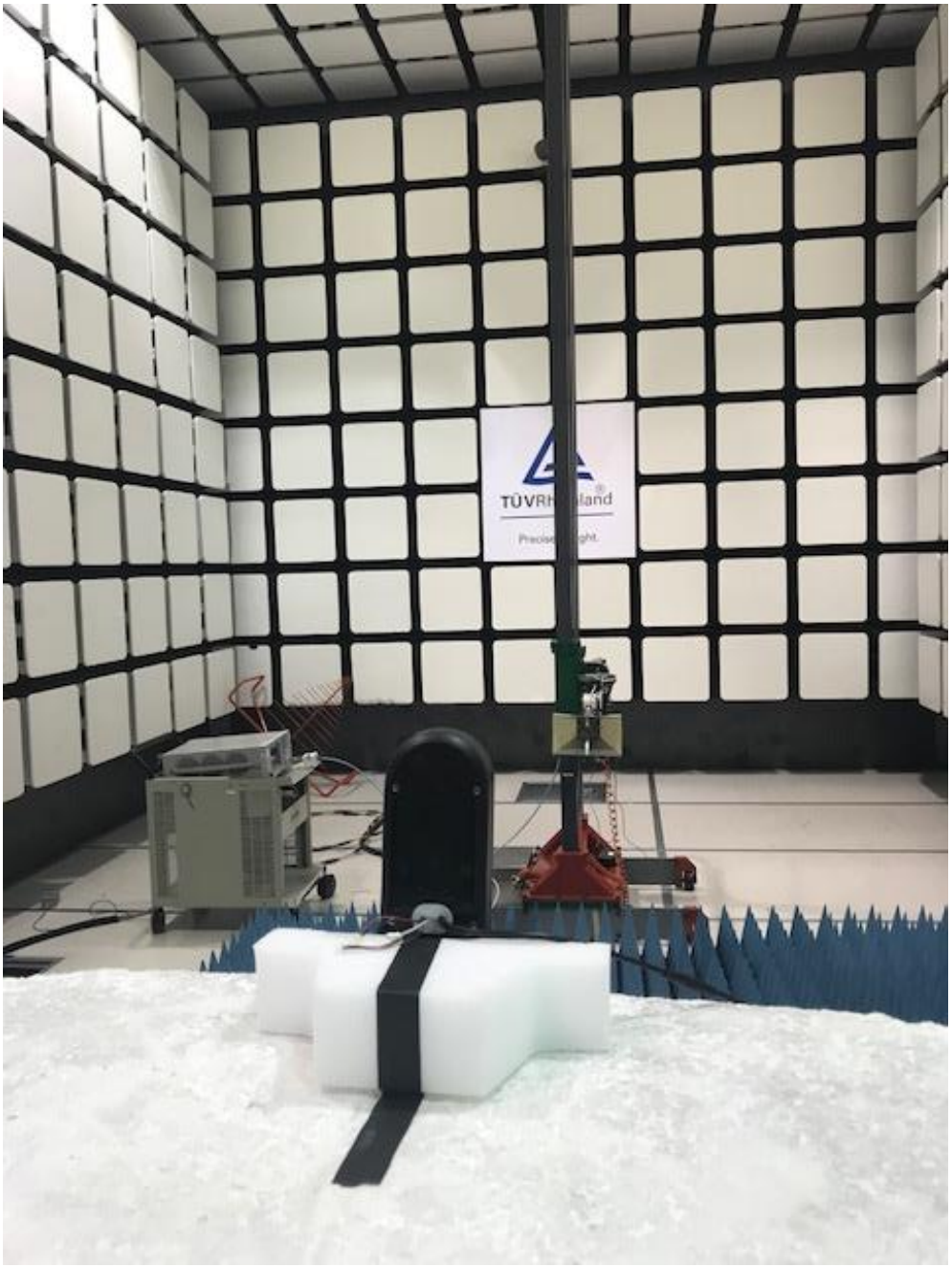

Figure 6 - Radiated Emissions Test Setup – 1-18 GHz Rear

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Figure 7 - Radiated Emissions Test Setup – 18-26 GHz Front

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Figure 8 - Radiated Emissions Test Setup – 18-26 GHz Rear

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4.3 Frequency Stability

Testing was performed in accordance ANSI C63.10: 2013 subsections 6.8.1 and 6.8.2. The requirements of ANSI section 5.6 could not be met since the NFC reader runs only at 13.56 MHz.

4.3.1 Overview of Test

Results	**Complies** (as tested per this report)			**Test Date(s)**		March 21, 2019	
Standard	CFR 47 part 15.225						
Model Number	2.0			**Serial #**	140-201		
Configuration	See test plan for details.						
Test Setup	Tested in lab 6 temperature chamber						
EUT Powered By	36VDC						
Environmental Conditions	March 21, 2019	**Temp**	22º C	**Humidity**	44%	**Pressure**	1010 mbar
Frequency Range	13.56 MHz						
Perf. Criteria	Less than .01% frequency error			**Perf. Verification**	Meets limit		
Mod. to EUT	None			**Test Performed By**	Donn Foster		

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4.3.2 Measured frequency in Hz.

Temp	0min	2min	5min	10min
50	13560050	13560050	13560050	13559850
40	13560050	13560050	13559850	13560050
30	13560050	13560050	13560050	13560050
20(normal)	13560050	13560050	13560050	13560050
10	13560250	13560250	13560050	13560250
0	13560250	13560250	13560250	13560250
-10	13560050	13560050	13560250	13560050
-20	13560397	13560397	13560397	13560050

4.3.3 Percent of Frequency error (<,01%)

Temp	0min %	2min %	5min %	10min %
50	.0003	.0003	.0003	.0003
40	.0003	.0003	-.0009	.0003
30	.0003	.0003	.0003	.0003
20(normal)	.0003	.0003	.0003	.0003
10	.001	.001	.0003	.001
0	.001	.001	.001	.001
-10	.0003	.0003	.001	.001
-20	.002	.002	.002	.0003

4.3.4 Percent of error over voltage extremes

85%	100%	115%
.0001	.00007	.0001

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4.3.5 Photos

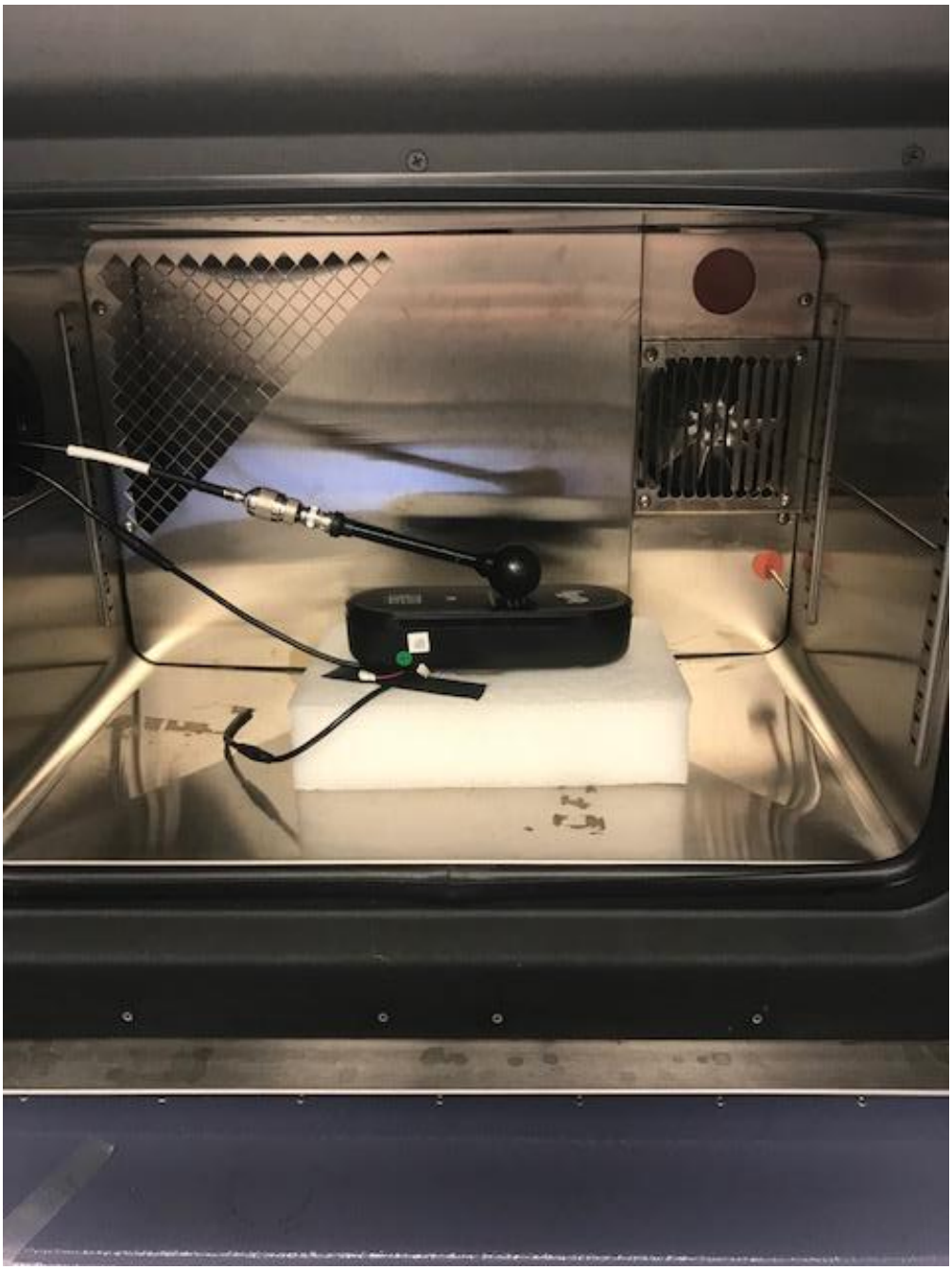

Figure 9 – Frequency Stability test setup

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Appendix A

5 Test Plan

This test report is intended to follow this test plan outlined here in unless otherwise stated in this here report. The following test plan will give details on product information, standards to be used, test set ups and refer to TUV test procedures. The test procedures will give the steps to be taken when performing the stated test. The product information below came via client, product manual, product itself and or the internet.

5.1 General Information

Client	Lyft
Address	185 Berry Street Suite 5000
	San Francisco CA 94107 USA
Contact Person	Cyril Meyer
Telephone	Tel: 502-432-4994
e-mail	E-Mail: cmeyer@lyft.com

5.2 EUT Designation

Model Name	SIT-03-0-X
Model Number(s)	2.0

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5.3 Equipment Under Test (EUT) Description

The control module SIT-03-0-X is part of the Ninebot 2.0 Scooter. The NFC radio is used to register rental payment for the scooter.

5.4 Product Environment(s)

☐	**Domestic/Residential**	☐	**Hospital**
☒	**Light Industrial/Commercial**	☐	**Small Clinic**
☐	**Industrial**	☐	**Doctor's office**
☐	**Telecommunications Center**	☐	**Other than Telecommunications Center**
☐	**Other**		

*Check all that apply

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5.5 Applicable Documents

Standards	Description
CFR 47 part 15.225, Product Family Standard Emissions	Radio Equipment Operation within the band 13.110-14.010 MHz.
CFR 47 part 15.225, CFR 47 part 15.209	Radiated Emissions
CFR 47 part 15.225	Frequency Stability

5.6 EUT specifications

Dimensions	17.5x6.5x4cm
AC Input	N/A
Environment	Outdoor
Operating Temperature Range:	-10c - 40c
Multiple Feeds:	No
Product Marketing Name (PMN)	SIT-03-0-X
Hardware Version Identification Number (HVIN)	2.0
Firmware Version Identification Number (FVIN)	fcc_test_nb2_v1.0.0 (IoT)
NFC Radio	
Operating Mode	RFID reader
Transmitter Frequency Band	13.56 MHz
Operating Bandwidth	500kHz
Max. Radiated Voltage Output	18 dbm
Power Setting @ Operating Channel	Max
Antenna Type	Integrated Coil antenna
Modulation Type	ASK
Data Rate	106 kbps, 212 kbps, 424 kbps, 848 kbps

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5.7 EUT Electrical Power Information

Name	# of Phases	Type	Input Voltage		AC Voltage Frequency		
			Min	Max			
Ninebot control unit	1 ☐ 3 ☐ None ☒	AC ☐ DC ☐ Host ☐ Batteries ☒	36	36	n/a		
Notes							

5.8 EUT Clock/Oscillator Frequencies

Reference Designation	Speed (MHz)	Type
RFID transmit frequency	13.56	☐ Oscillator ☒ Transmitter
LTE B4	1900	☐ Oscillator ☒ Transmitter
		☐ Oscillator ☐ Microprocessor

5.8.1 Radiated Emissions, Upper Frequency

☐	**Less than 108 MHz**	**Scan to 1 GHz**
☐	**Less than 500 MHz**	**Scan to 2 GHz**
☐	**Less than 1000 MHz**	**Scan to 5 GHz**
☒	**Greater than 1000 MHz**	**Scan to 10th Harmonic or 40 GHz (whichever is lower)**

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5.9 Electrical Support Equipment

Reference Designation	Manufacturer	Model	Serial Number	BSMI #

5.10 Non - Electrical Support Equipment

Reference Designation	Manufacturer	Model	Serial Number or Description (e.g., Type of Gas or Liquid)

5.11 EUT Equipment/Cabling Information

EUT Port	Connected To	Cable Type				
		Length (Meters)	Shielded Yes / No		Bead Yes / No	
DC power	Batteries	2m	☐	☒	☐	☒
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐

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5.12 EUT Test Program

fcc_test_nb2_v1.0.0 (IoT)

5.13 EUT Modes of Operation

The system is transmitting continuously at 13.56 MHz.

5.14 Monitoring of EUT during Testing

The testing is for Emissions only no monitoring is required

5.15 EUT Configuration

5.15.1 Description

Configuration	Description
Mode 1	Reader running continuously
Notes	

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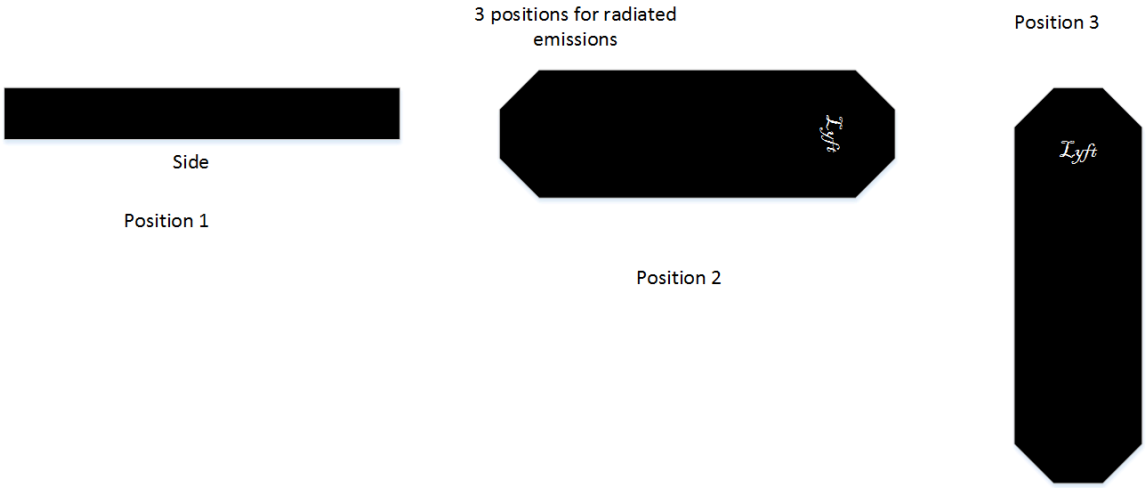
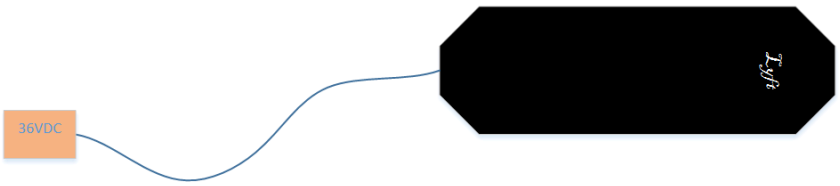
5.15.2 Block Diagram





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5.16 Emissions

5.16.1 Radiated Emissions

5.16.1.1 Preliminary Radiated Emissions Test Setup

Standard	CFR 47 part 15.225, CFR47 part 15.209			**Procedure**	ANSI C63.10
Limit	Class A	**Emissions Verification**		Emissions Under Limit	
Frequency Range	9 kHz-26 GHz				
Scan #1	Final Scan 9 kHz-30 MHz	**Antenna Distance**	3m	**Detector**	Quasi Peak
Scan #2	Final Scan 30-1000 MHz	**Antenna Distance**	3m	**Detector**	Quasi Peak
Scan #3	Final Scan 1-18 GHz	**Antenna Distance**	3m	**Detector**	Average
Scan #4	Final Scan 18-26 GHz	**Antenna Distance**	1m	**Detector**	Average
Scan #5	Final Scan 13.56 MHz	**Antenna Distance**	3m	**Detector**	Quasi Peak
Configuration	See Section 5.15				
Notes	EUT tested in 3 positions				

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5.16.1.2 Final Radiated Emissions Test Setup

Standard	CFR 47 part 15.225, CFR47 part 15.209			**Procedure**	ANSI C63.10
Limit	Class A	**Emissions Verification**		Emissions Under Limit	
Frequency Range	9 kHz-26 GHz				
Scan #1	Final Scan 9 kHz-30 MHz	**Antenna Distance**	3m	**Detector**	Quasi Peak
Scan #2	Final Scan 30-1000 MHz	**Antenna Distance**	3m	**Detector**	Quasi Peak
Scan #3	Final Scan 1-18 GHz	**Antenna Distance**	3m	**Detector**	Average
Scan #4	Final Scan 18-26 GHz	**Antenna Distance**	1m	**Detector**	Average
Scan #5	Final Scan 13.56 MHz	**Antenna Distance**	3m	**Detector**	Quasi Peak
Configuration	See Section 5.15				
Notes	EUT tested in 3 positions				

End of Report

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