TEST REPORT

Report Number : R14528846-E1

Applicant	:	Qolsys Inc. 1919 S. Bascom Ave. Suite 600 Campbell, CA 95008
Model	:	IQ4 NS
FCC ID	:	2AAJXQS-IQ4NS
IC ID	:	11205A-QSIQ4NS
EUT Description	:	Home Management System (No Screen)
Test Standard(s)	:	FCC 47 CFR PART 15 SUBPART C: 2022 ISED RSS-210 ISSUE 10+A1: 2020 ISED RSS-GEN ISSUE 5 + A2: 2021

Date Of Issue:
2023-01-10

Prepared by:
UL LLC
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Research Triangle Park, NC 27709 U.S.A.
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CERT #0751.06

REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	2023-01-10	Initial Issue	Brian Kiewra

UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL: (919) 549-1400

TABLE OF CONTENTS

UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL: (919) 549-1400

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Qolsys Inc.
1919 S. Bascom Ave. Suite 600
Campbell, CA 95008

EUT DESCRIPTION: Home Management System (No Screen)

MODEL: IQ4 NS

SERIAL NUMBER: QPK047X032237G00315, QPK047X032237G00301

SAMPLE RECEIPT DATE: 2022-11-29

DATE TESTED: 2022-12-06 to 2022-12-22

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C: 2022	Complies
ISED RSS-210 Issue 10+A1: 2020	Complies
ISED RSS-GEN Issue 5 + A2: 2021	Complies

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.

This document may not be altered or revised in any way unless done so by UL LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC 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 A2LA, or any agency of the U.S. government.

Approved & Released
For UL LLC By:

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Operations Manager
Consumer, Medical and IT Segment
UL LLC

Prepared By:

Brian Kiewra
Project Engineer
Consumer, Medical and IT Segment
UL LLC

2. TEST RESULTS SUMMARY

FCC Clause	ISED Clause	Requirement	Result	Comment
See Comment		Duty Cycle	Reporting purposes only	ANSI C63.10 Section 11.6.
-	RSS-GEN 6.7	99% OBW	Reporting purposes only	ANSI C63.10 Section 6.9.3.
15.249 (a)	RSS-210-B.10(a)	Fundamental Field Strength	Complies	None
15.205, 15.209, 15.249(a)	RSS-GEN 8.9, 8.10	Radiated Emissions	Complies	None.
15.207	RSS-GEN 8.8	AC Mains Conducted Emissions	Complies	None.

This report contains data provided by the applicant which can impact the validity of results. UL LLC is only responsible for the validity of results after the integration of the data provided by the customer.

3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15: 2022, ANSI C63.10-2013, KDB 414788 D01 Radiated Test Site v01r01, RSS-GEN Issue 5 + A2: 2021, and RSS-210 Issue 10 + A1: 2020.

4. FACILITIES AND ACCREDITATION

UL LLC is accredited by A2LA, certification # 0751.06, for all testing performed within the scope of this report. Testing was performed at the locations noted below.

	Address	ISED CABID	ISED Company Number	FCC Registration
☐	Building: 12 Laboratory Dr RTP, NC 27709, U.S.A	US0067	2180C	825374
☒	Building: 2800 Perimeter Park Dr. Suite B Morrisville, NC 27560, U.S.A		27265	

5. DECISION RULES AND MEASUREMENT UNCERTAINTY

5.1. 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.

5.2. 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.)

5.3. 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	1.22%
All emissions, radiated	6.01 dB
Conducted Emissions (0.150-30MHz) - LISN	3.40 dB
Temperature	0.57°C
Humidity	3.39%
DC Supply voltages	0.57%
Time	3.39%

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

5.4. SAMPLE CALCULATION

RADIATED EMISSIONS

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

MAINS CONDUCTED EMISSIONS

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

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6. EQUIPMENT UNDER TEST

6.1. EUT DESCRIPTION

The EUT is a Home Management System (No Screen) with a Z wave radio operating in the range of 908.6-921.4MHz.

6.2. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an ISM band loop antenna, with a maximum gain of 1.5 dBi.

6.3. SOFTWARE AND FIRMWARE

The EUT software installed during testing was msm8953_64-userdebug 9 PKQ1.190723.001

The test utility software used during testing was Android Debug Bridge v29.

6.4. WORST-CASE CONFIGURATION AND MODE

Radiated Emissions below 30 MHz and power line conducted emissions were performed with the EUT set to transmit at the channel with highest output fundamental field strength as worst-case scenario.

Radiated emissions and Equivalent Radiated Power below and above 1GHz were performed with the EUT set to transmit at 908.4 MHz, 908.42 MHz, 916 MHz, 919.8 MHz, and 921.4 MHz. The Power setting used for radiated spurious emissions and ERP was as below:

Channel (MHz)	Power Level
908.4 MHz	10
908.42 MHz	10
916 MHz	10
919.8 MHz	10
921.4 MHz	10

The fundamental of the EUT was investigated in three orthogonal orientations X,Y,Z, it was determined that X orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in X orientation.

6.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Laptop	HP	15-p100dx	5CD43938XL	N/A
Power Supply	SURE-POWER	SW-070100A	-	-

I/O CABLES

I/O Cable List						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	AC Power	1	Barrell	Shielded	<3m	Used to connect Host Device to AC Mains

TEST SETUP

The EUT was connected to a test laptop and configured to transmit continuously before the tests.

SETUP DIAGRAM

See R14528846-EP1 for Setup Diagrams

7. MEASUREMENT METHOD

Duty Cycle: ANSI C63.10-2013 Section 11.6

20dB Bandwidth: ANSI C63.10-2013 Section 6.9.2

Occupied Bandwidth: ANSI C63.10-2013 Subclause 6.9.3

General Radiated Spurious Emissions: ANSI C63.10-2013, Section 6.3, 6.5, 6.6

AC Power Line Conducted Emissions: ANSI C63.10-2013, Section 6.2.

8. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment Used - Wireless Conducted 2 Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
HI0090	Environmental Meter	Fisher Scientific	15-077-963	2022-07-20	2023-07-20
SA0025	Spectrum Analyzer	Keysight Technologies	N9030A	2022-05-02	2023-05-02
226559	SMA Coaxial 10dB Attenuator 25MHz-18GHz	CentricRF	C18S2-10	2022-05-03	2023-05-03
CBL101	Micro-Coax UTiFLEX Cable Assembly, Low Loss,40Ghz, 39.3", Connectors 2	Carlisle Interconnect Technologies	UFA147A-0-0180-200200	2022-01-24	2023-01-24
SOFTEMI	Antenna Port Software	UL	Version 2022.8.16		

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville – Chamber 4)

Equipment ID	Description	Manufacturer/Brand	Model Number	Last Cal.	Next Cal.
30-1000 MHz					
AT0081	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2021-12-08	2022-12-31
1-18 GHz					
AT0067	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2022-05-24	2023-05-24
Gain-Loss Chains					
C4-SAC02	Gain-loss string: 25-1000MHz	Various	Various	2022-05-20	2023-05-20
C4-SAC03	Gain-loss string: 1-18GHz	Various	Various	2022-05-20	2023-05-20
Receiver & Software					
206496	Spectrum Analyzer	Rohde & Schwarz	ESW44	2022-02-15	2023-02-15
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
Additional Equipment used					
21642	Environmental Meter	Fisher Scientific	15-077-963 (s/n 210701692)	2021-08-16	2023-08-16
BRF007	902-928MHz notch filter, 2W, F_{high} =1.5GHz	Micro-Tronics	BRC17691	2022-05-27	2023-05-27
HPF012	1GHz high-pass filter, 2W, F_{high} =18GHz	Micro-Tronics	HPM18129	2022-02-17	2023-02-17

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville – Chamber 2)

Equipment ID	Description	Manufacturer/Brand	Model Number	Last Cal.	Next Cal.
0.009-30MHz					
AT0059	Active Loop Antenna	ETS-Lindgren	6502	2022-09-29	2023-09-29
30-1000 MHz					
AT0074	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2022-09-07	2023-09-07
1-18 GHz					
206211	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2022-03-21	2023-03-21
Gain-Loss Chains					
C2-SAC01	Gain-loss string: 0.009-30MHz	Various	Various	2022-05-10	2023-05-10
C2-SAC02	Gain-loss string: 25-1000MHz	Various	Various	2022-05-10	2023-05-10
C2-SAC03	Gain-loss string: 1-18GHz	Various	Various	2022-05-10	2023-05-10
Receiver & Software					
197955	Spectrum Analyzer	Rohde & Schwarz	ESW44	2022-03-08	2023-03-08
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
Additional Equipment used					
200540	Environmental Meter	Fisher Scientific	15-077-963 (s/n 181474409)	2022-10-05	2023-10-05
HPF009	1GHz high-pass filter, 2W, F_{high} =10GHz	Micro-Tronics	HPM17672	2022-02-17	2023-02-17

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	2022-04-05	2023-04-05
HI0091	Environmental Meter	Fisher Scientific	15-077-963	2022-07-20	2023-07-20
LISN003	LISN, 50-ohm/50-uH, 250uH 2-conductor, 25A	Fischer Custom Com.	FCC-LISN-50/250-25-2-01	2022-08-01	2023-08-01
75141	EMI Test Receiver 9kHz-7GHz	Rohde & Schwarz	ESCI 7	2022-08-03	2023-08-03
ATA222	Transient Limiter, 0.009-100MHz	Electro-Metrics	EM-7600	2022-04-05	2023-04-05
PS215	AC Power Source	Elgar	CW2501M (s/n 1523A02397)	NA	NA
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
CDECABLE001	ANSI C63.4 1m extension cable.	UL	Per Annex B of ANSI C63.4	2022-09-12	2023-09-12

9. ANTENNA PORT TEST RESULTS

9.1. ON TIME AND DUTY CYCLE

LIMITS

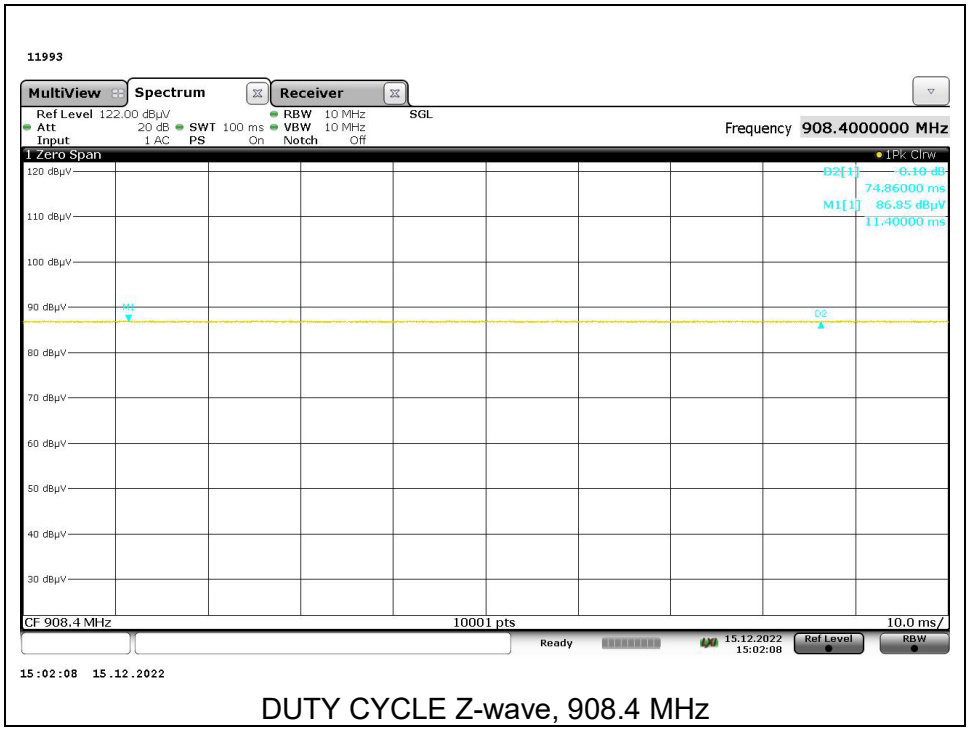
None; for reporting purposes only.

PROCEDURE

ANSI C63.10 Section 11.6
KDB 558074 Zero-Span Spectrum Analyzer Method.

ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
Z-wave- 908.4 MHz	100.000	100.000	1.000	100.00%	0.00	0.010



DUTY CYCLE Z-wave, 908.4 MHz

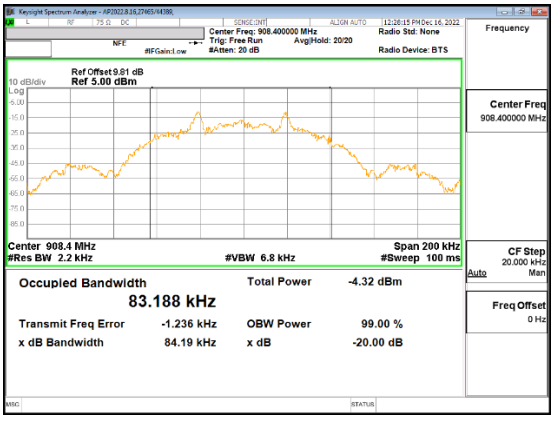
9.2. 99% AND 20dB BANDWIDTH

LIMITS

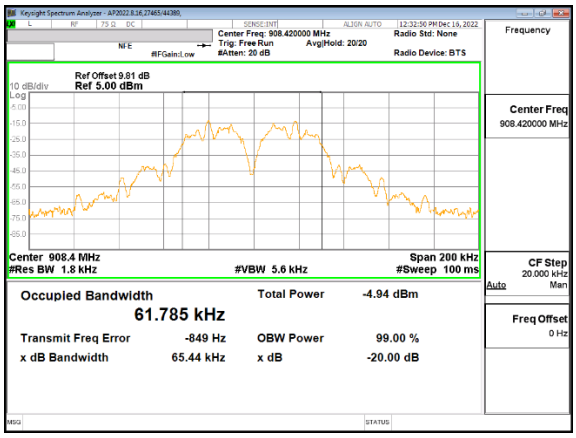
None; for reporting purposes only.

RESULTS

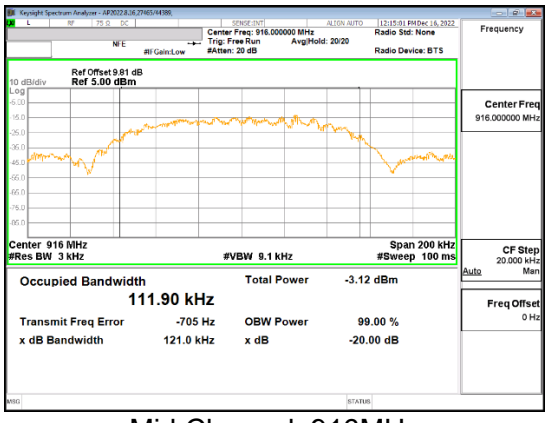
Channel	Frequency (MHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)
Low 1	908.4	84.19	83.188
Low 2	908.42	65.44	61.785
Mid	916	121.00	111.900
High 1	919.8	120.90	112.400
High 2	921.4	85.47	83.219



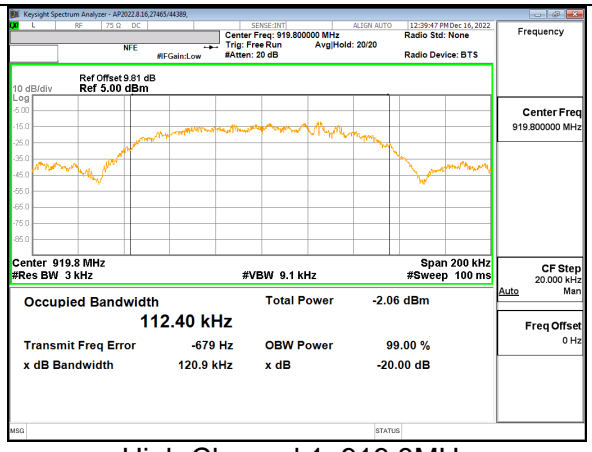
Low Channel 1: 908.4MHz



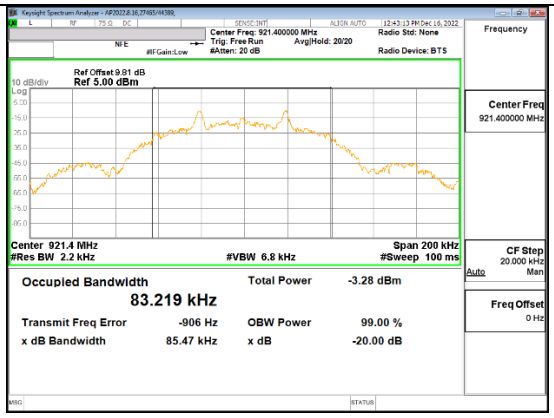
Low Channel 2: 908.42MHz



Mid Channel: 916MHz



High Channel 1: 919.8MHz



High Channel 2: 921.4MHz

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10. RADIATED TEST RESULTS

LIMITS

FCC §15.205 and §15.209

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
0.009-0.490	2400/F(kHz) @ 300 m	-
0.490-1.705	24000/F(kHz) @ 30 m	-
1.705 - 30	30 @ 30m	-
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

FCC 15.249(a), RSS-210 B.10(a)

Frequency Range (MHz)	Field Strength Limit of Fundamental (mV/m) at 3 m	Field Strength Limit of Harmonics (mV/m) at 3 m
902-928	50	.5

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.

(e) As shown in § 15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak field strength shall not exceed 2500 millivolts/meter at 3 meters along the antenna azimuth.

RSS-GEN, Section 8.9 and 8.10

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
0.009-0.490	2400/F(kHz) @ 300 m	-
0.490-1.705	24000/F(kHz) @ 30 m	-
1.705 - 30	30 @ 30m	-
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane for measurement below 1GHz; 1.5 m above the ground plane for measurement above 1GHz. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements in the 30-1000MHz range, 9kHz for peak and/or quasi-peak detection measurements in the 0.15-30MHz range and 200Hz for peak and/or quasi-peak detection measurements in the 9 to 150kHz range. Peak detection is used unless otherwise noted as quasi-peak.

For pre-scans above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements.
For final measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements and as applicable for linear voltage averaging measurements.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

3D antenna use - For below 30MHz testing, investigation was done on three antenna orientations (parallel, perpendicular, and ground-parallel).

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.

KDB 414788 Open Field Site(OFS) and Chamber Correlation Justification
OFS and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

10.1. FUNDAMENTAL AND SPURIOUS EMISSIONS

10.1.1. FUNDAMENTAL

Tested by: 28100/11993
Date Tested: 2022-12-15

LOW CHANNEL, 908.4 MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	AT0074 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
908.4	90.86	Qp	28	-25.4	93.46	94	-0.546	261	123	H
908.4	80.34	Qp	28	-25.4	82.94	94	-11.06	202	296	V

Qp - Quasi-Peak detector

LOW CHANNEL, 908.42 MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	AT0074 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
908.42	90.88	Qp	28	-25.4	93.48	94	-0.52	265	122	H
908.42	81.17	Qp	28	-25.4	83.77	94	-10.23	234	103	V

Qp - Quasi-Peak detector

MID CHANNEL, 916 MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	AT0074 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
916	86.96	Qp	28.1	-25.3	89.76	94	-4.24	61	118	H
916	73.69	Qp	28.1	-25.3	76.49	94	-17.51	43	203	V

Qp - Quasi-Peak detector

HIGH CHANNEL, 919.8 MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	AT0074 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
919.8	90.45	Qp	28.1	-25.2	93.35	94	-0.65	3	118	H
919.8	78.23	Qp	28.1	-25.2	81.13	94	-12.87	36	209	V

Qp - Quasi-Peak detector

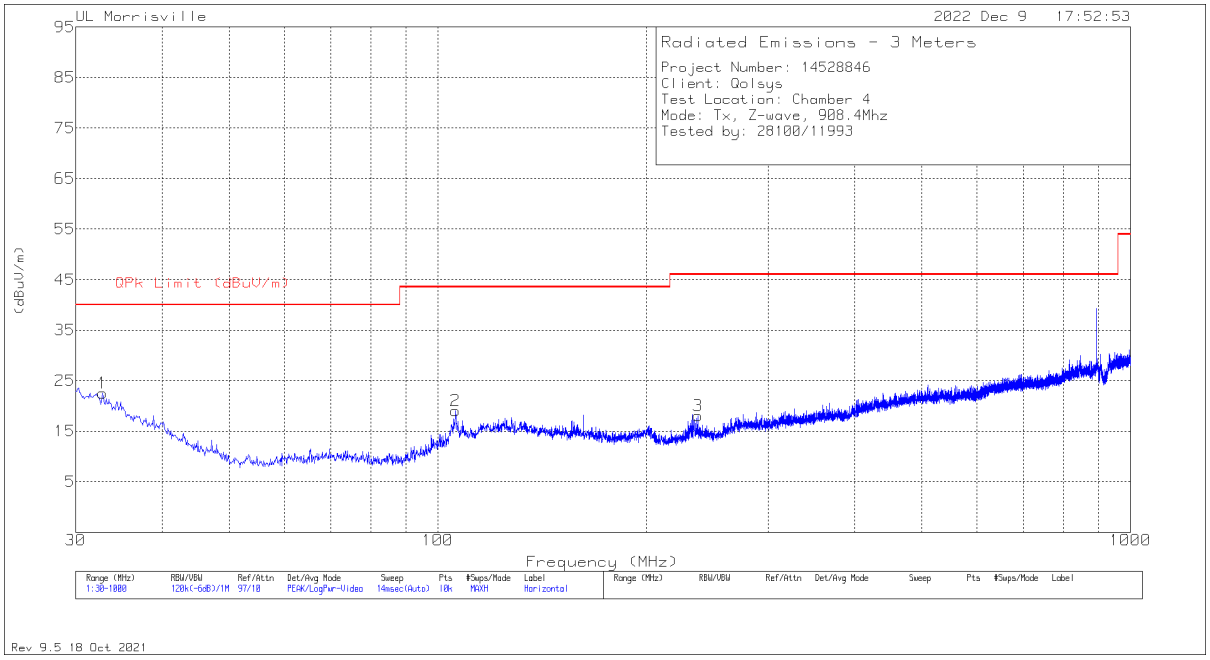
HIGH CHANNEL, 921.4MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	AT0074 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
921.378	88.9	Qp	28.2	-25	92.1	94	-1.9	262	125	H
921.3795	75.68	Qp	28.2	-25	78.88	94	-15.12	179	220	V

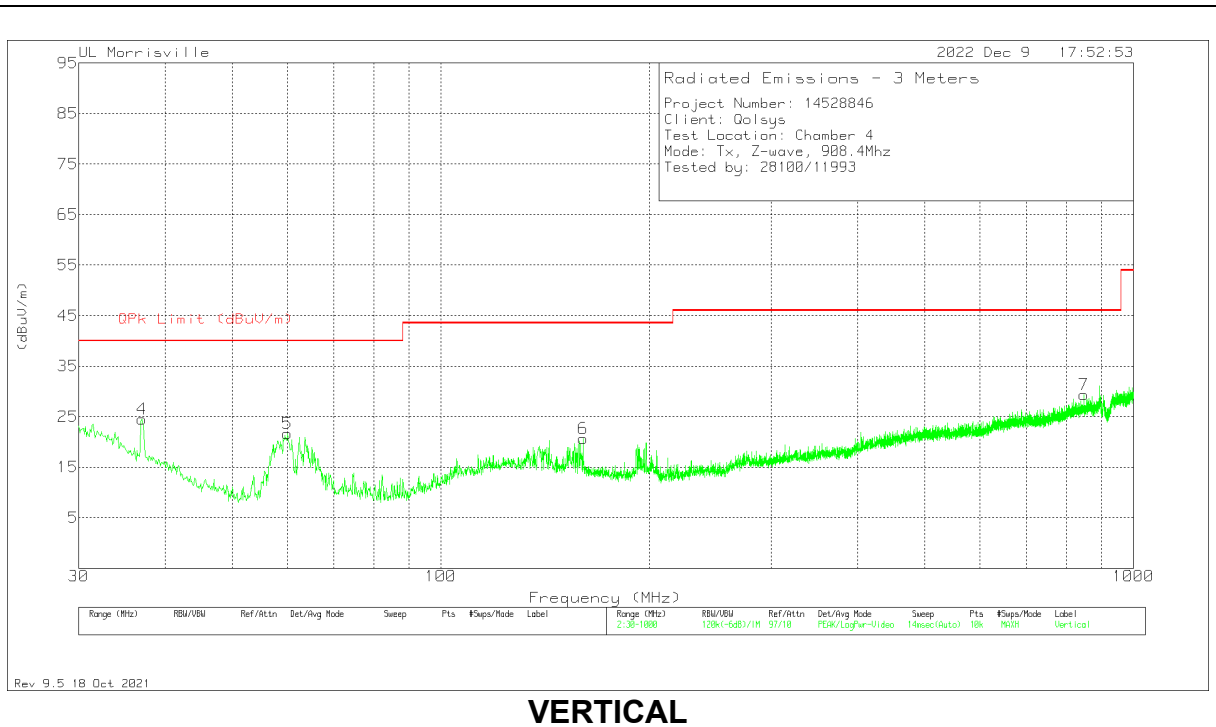
Qp - Quasi-Peak detector

10.1.2. HARMONICS AND SPURIOUS EMISSIONS BELOW 1 GHz

LOW CHANNEL, 908.4 MHz RESULTS



HORIZONTAL



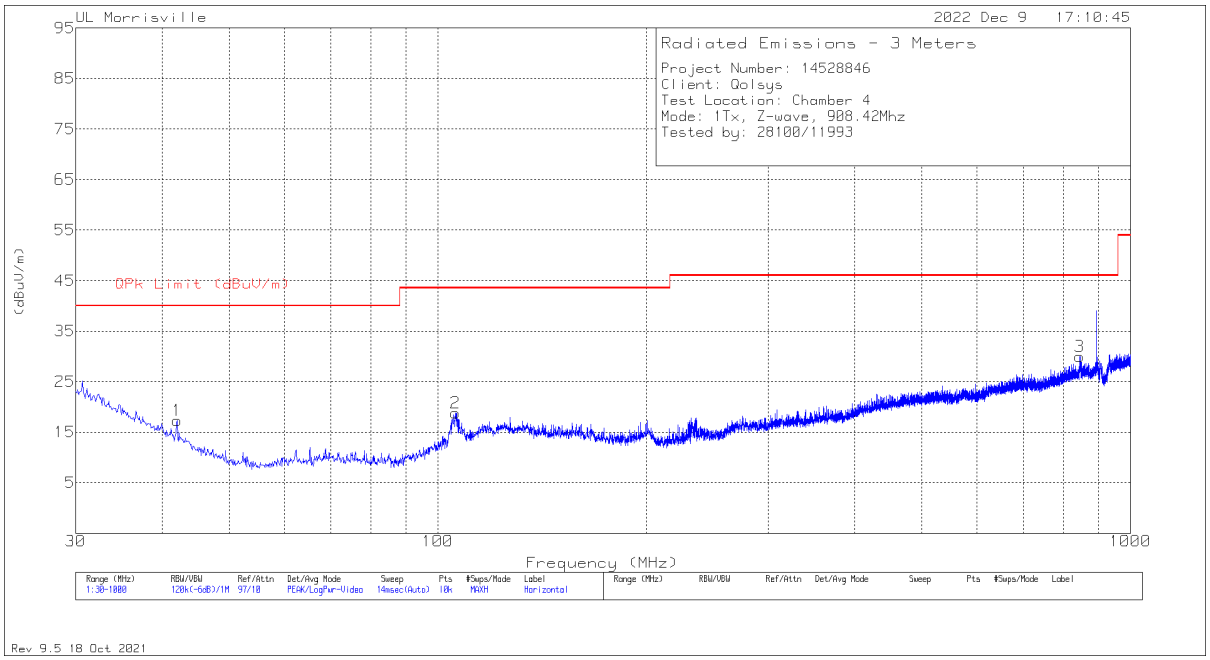
VERTICAL

RADIATED EMISSIONS

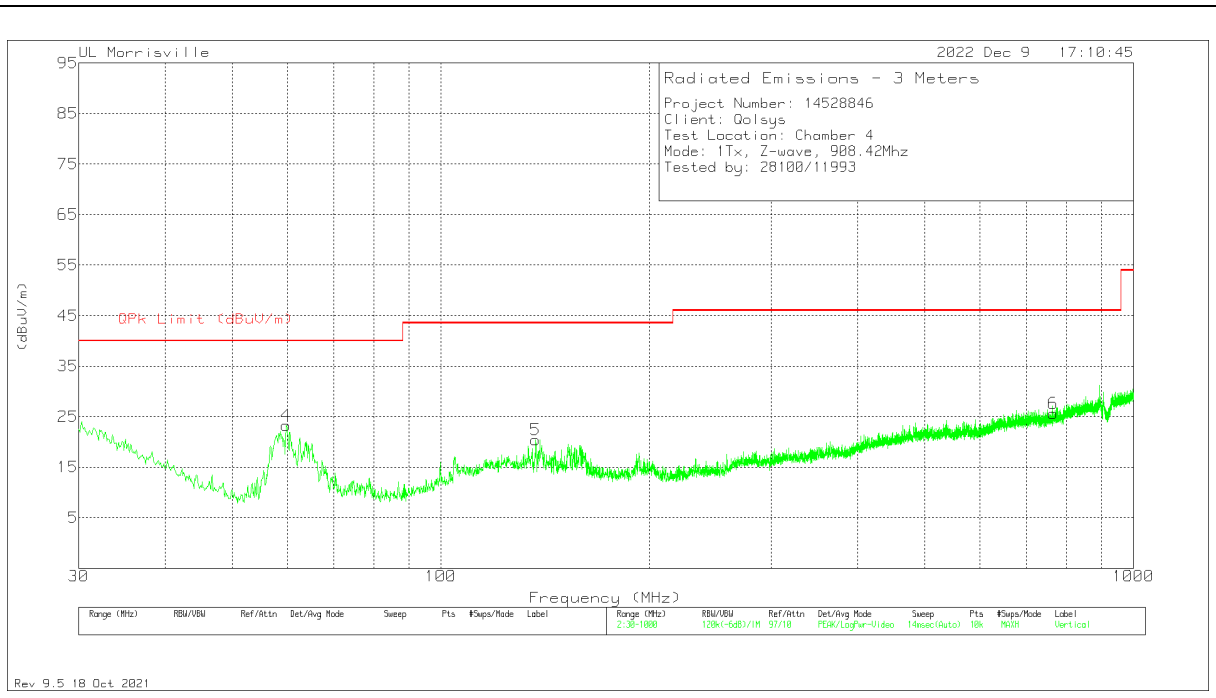
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0081 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	32.813	29.02	Pk	25.2	-31.7	22.52	40	-17.48	0-360	300	H
4	36.984	33.94	Pk	22.2	-31.6	24.54	40	-15.46	0-360	100	V
5	60.07	39.29	Pk	13.5	-31.1	21.69	40	-18.31	0-360	100	V
2	106.048	31.68	Pk	18	-30.6	19.08	43.52	-24.44	0-360	200	H
6	160.562	32.25	Pk	18.6	-30.2	20.65	43.52	-22.87	0-360	100	V
3	237.289	29.56	Pk	17.9	-29.4	18.06	46.02	-27.96	0-360	100	H
7	848.001	26.81	Pk	28.4	-25.9	29.31	46.02	-16.71	0-360	100	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector

LOW CHANNEL, 908.42 MHz RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0081 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	42.028	30.34	Pk	18.4	-31.4	17.34	40	-22.66	0-360	300	H
4	59.779	41.01	Pk	13.5	-31.2	23.31	40	-16.69	0-360	100	V
2	106.048	31.42	Pk	18	-30.6	18.82	43.52	-24.7	0-360	100	H
5	137.088	31.17	Pk	19.5	-30.3	20.37	43.52	-23.15	0-360	100	V
6	766.424	24.98	Pk	27.4	-26.7	25.68	46.02	-20.34	0-360	100	V
3	843.927	27.72	Pk	28.4	-26.1	30.02	46.02	-16	0-360	100	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector

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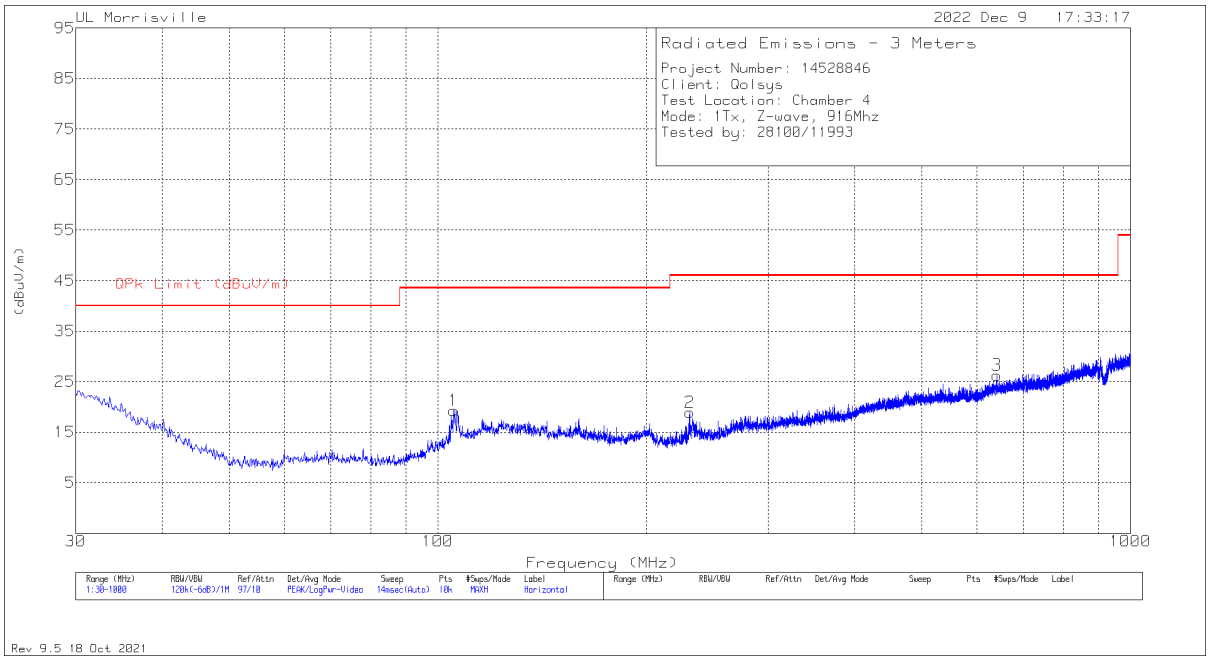
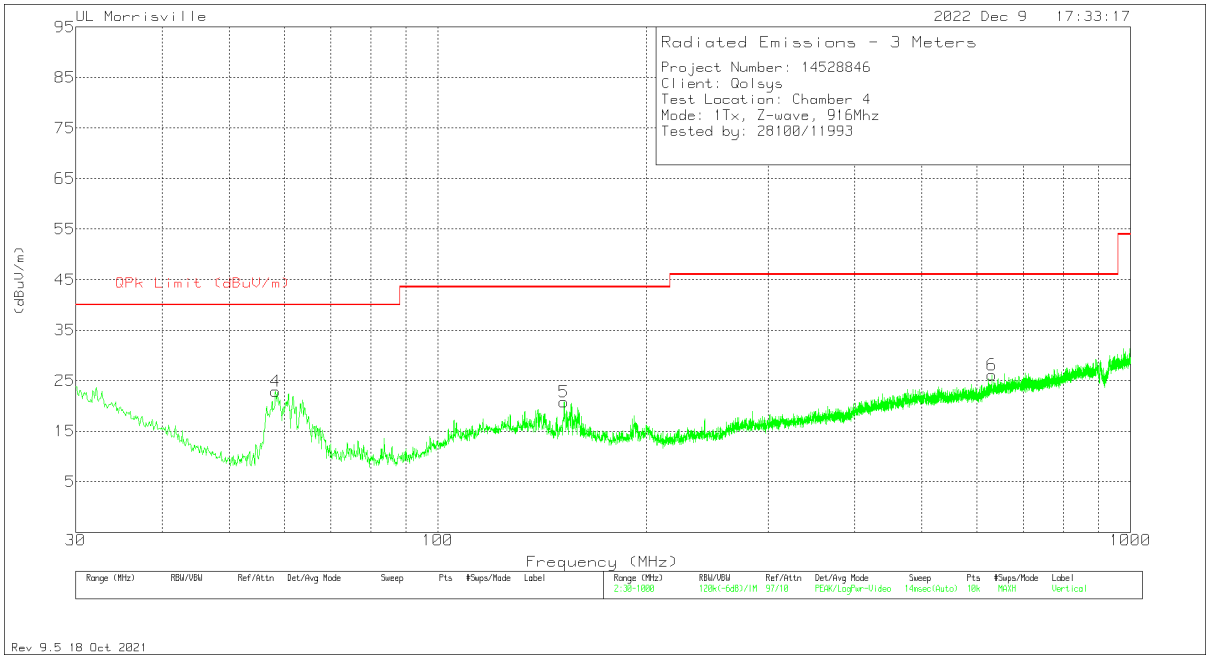
MID CHANNEL, 916 MHz RESULTS



HORIZONTAL



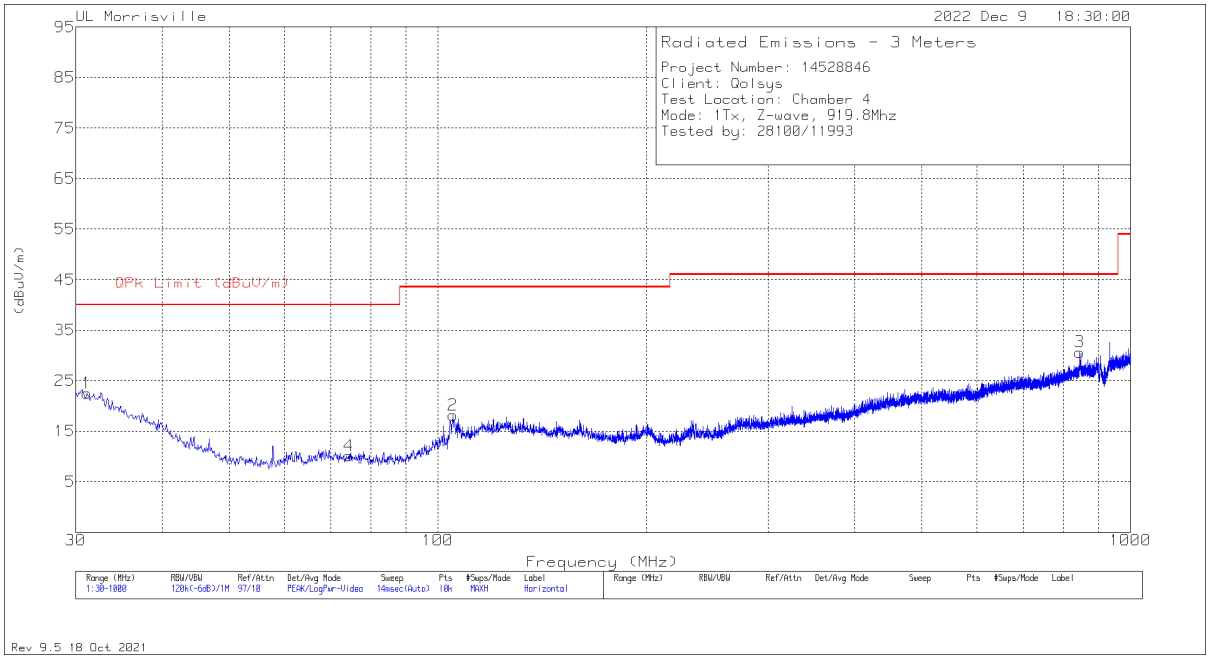
VERTICAL

RADIATED EMISSIONS

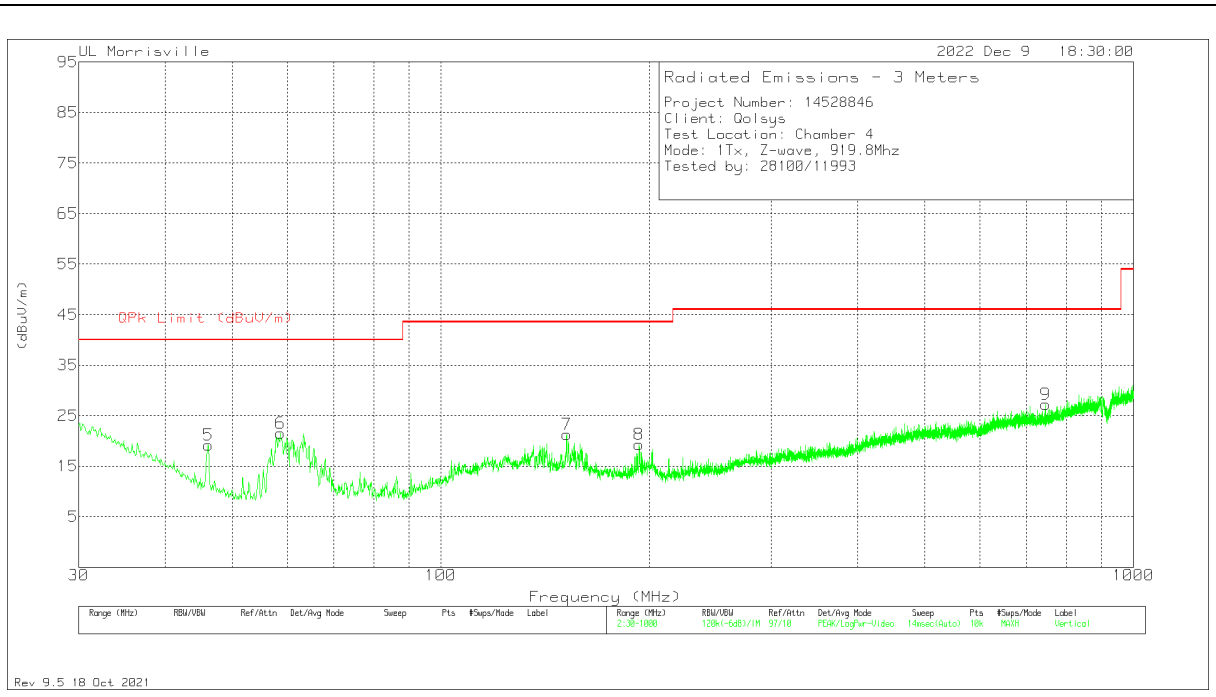
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0081 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	58.324	40.71	Pk	13.4	-31.2	22.91	40	-17.09	0-360	100	V
1	105.466	32.03	Pk	17.9	-30.6	19.33	43.52	-24.19	0-360	200	H
5	152.123	32.17	Pk	18.8	-30.2	20.77	43.52	-22.75	0-360	100	V
2	231.081	31	Pk	17.6	-29.7	18.9	46.02	-27.12	0-360	100	H
6	630.527	27.39	Pk	26.3	-27.6	26.09	46.02	-19.93	0-360	200	V
3	641.391	27.51	Pk	26.3	-27.5	26.31	46.02	-19.71	0-360	100	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector

HIGH CHANNEL, 919.8 MHz RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0081 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	31.164	28.12	Pk	26.2	-31.8	22.52	40	-17.48	0-360	300	H
5	46.199	35.1	Pk	15.7	-31.6	19.2	40	-20.8	0-360	200	V
6	58.615	39.32	Pk	13.4	-31.2	21.52	40	-18.48	0-360	100	V
4	74.426	26.84	Pk	14.3	-31	10.14	40	-29.86	0-360	200	H
2	105.078	31.09	Pk	17.8	-30.7	18.19	43.52	-25.33	0-360	100	H
7	151.929	32.68	Pk	18.8	-30.2	21.28	43.52	-22.24	0-360	100	V
8	193.251	31.39	Pk	17.7	-29.8	19.29	43.52	-24.23	0-360	100	V
9	746.636	26.73	Pk	27.3	-26.8	27.23	46.02	-18.79	0-360	100	V
3	843.927	28.36	Pk	28.4	-26.1	30.66	46.02	-15.36	0-360	100	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector

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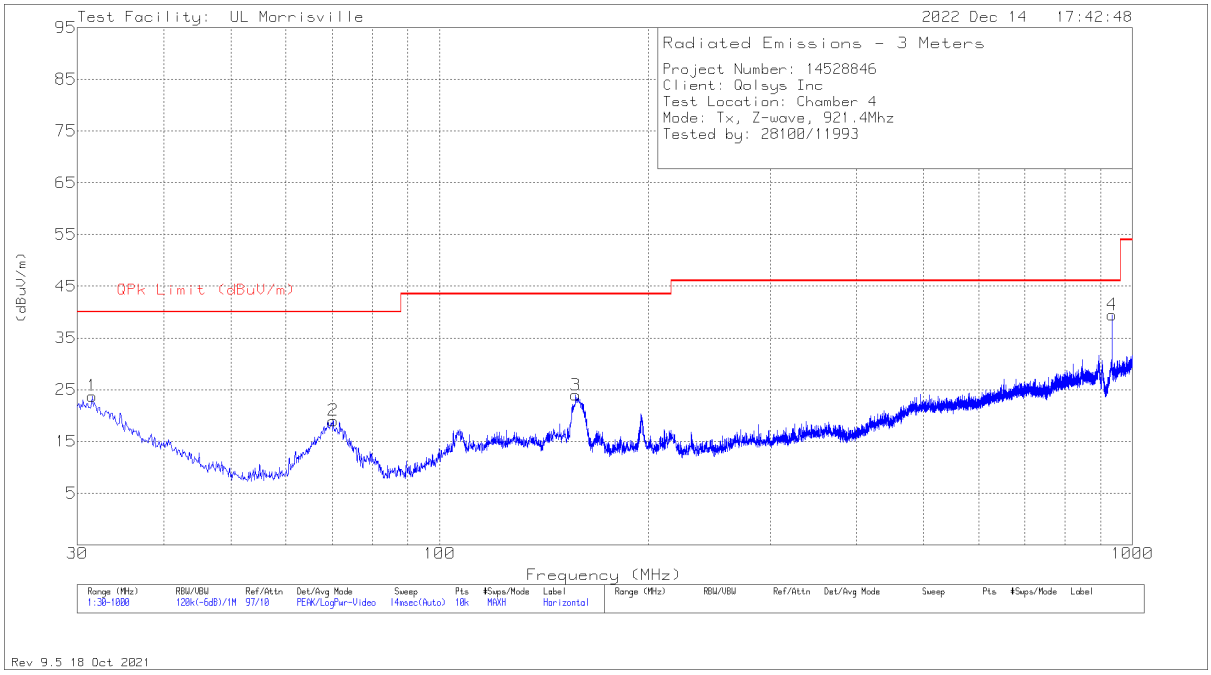
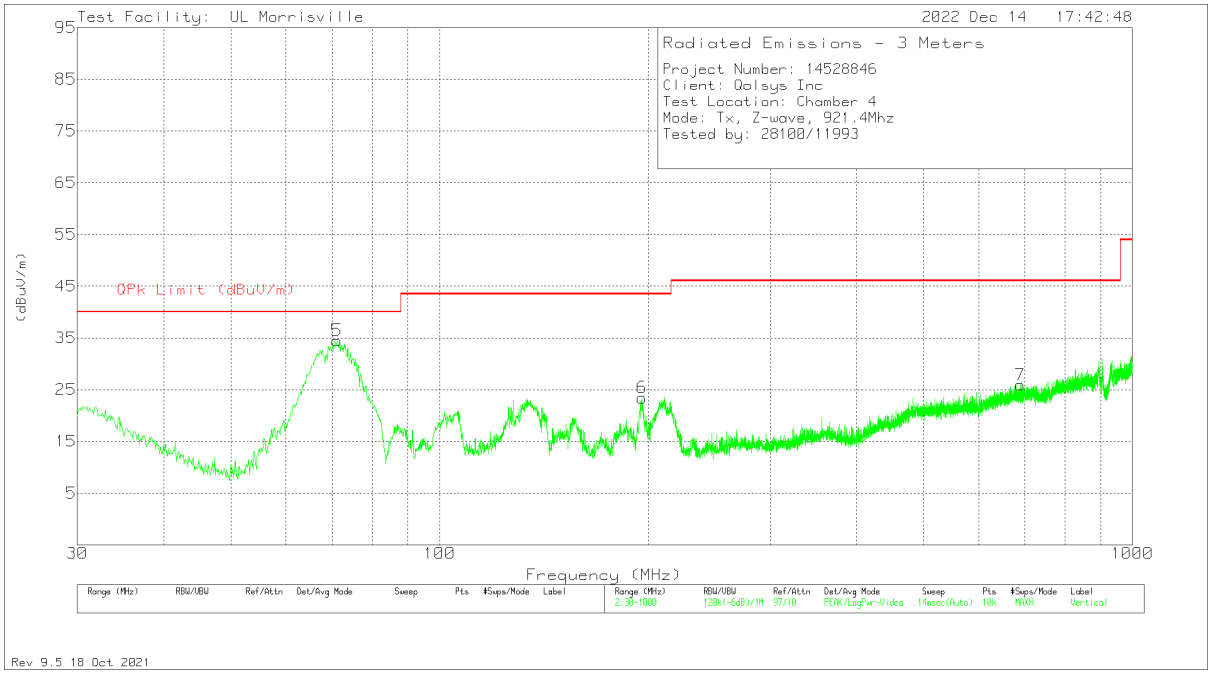
12 Laboratory Dr., RTP, NC 27709; USA TEL: (919) 549-1400

HIGH CHANNEL, 921.4 MHz RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0066 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	31.552	28.89	Pk	26.1	-31.2	23.79	40	-16.21	0-360	299	H
2	70.255	35.53	Pk	14.3	-30.8	19.03	40	-20.97	0-360	299	H
5	70.9055	49.3	Qp	14.3	-30.8	32.8	40	-7.2	252	102	V
3	157.264	35.85	Pk	18.1	-30	23.95	43.52	-19.57	0-360	199	H
6	196.064	34.83	Pk	17.9	-29.3	23.43	43.52	-20.09	0-360	100	V
7	689.891	26.62	Pk	25.9	-26.6	25.92	46.02	-20.1	0-360	100	V
4	935.689	35.28	Pk	28.6	-24.4	39.48	46.02	-6.54	0-360	100	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector

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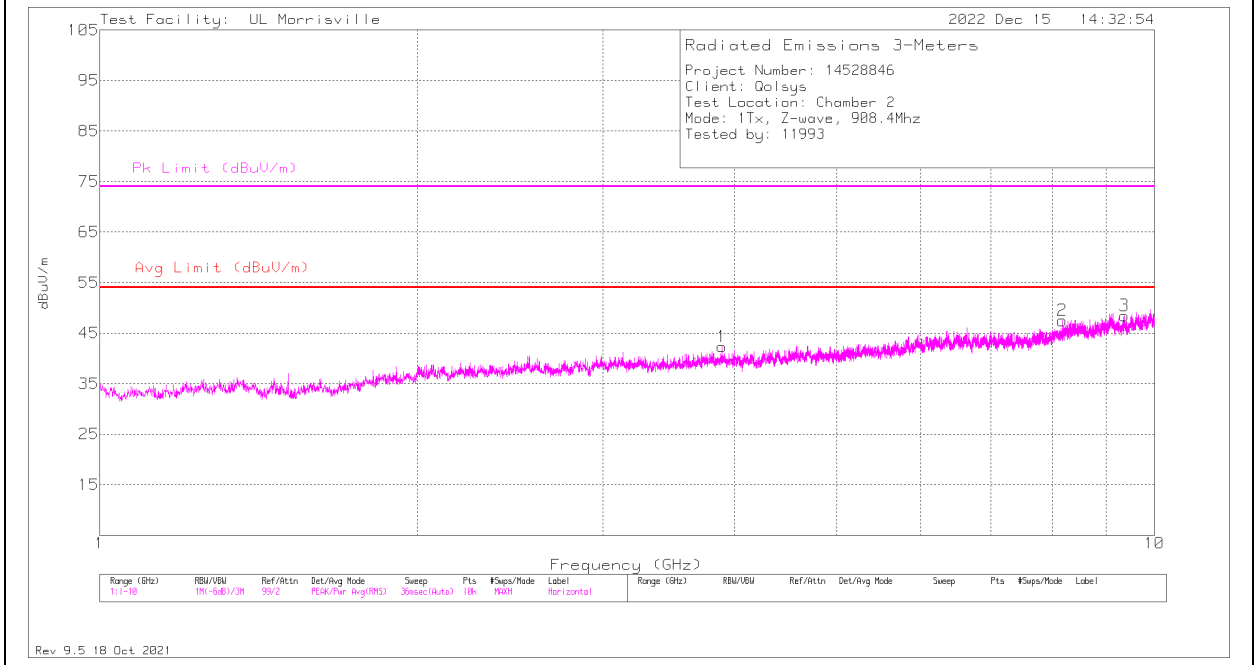
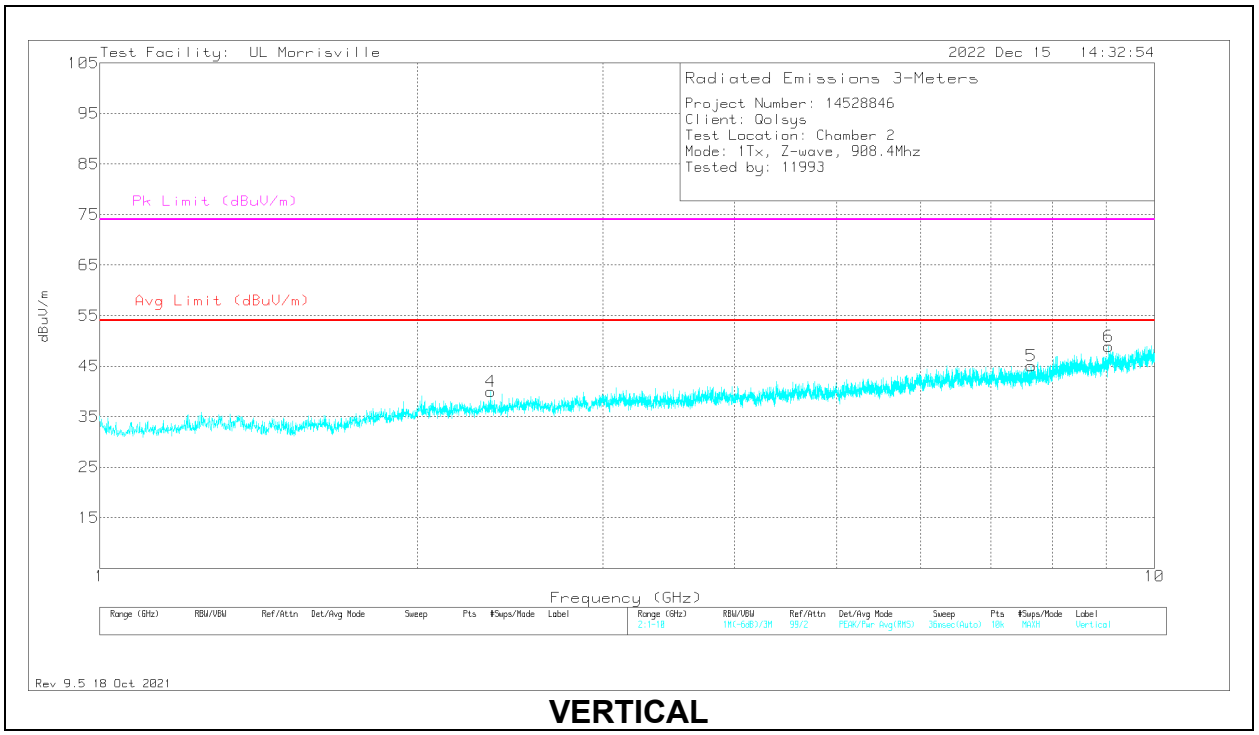
10.1.3. HARMONICS AND SPURIOUS EMISSIONS ABOVE 1 GHz

LOW CHANNEL, 908.4 MHz RESULTS



HORIZONTAL



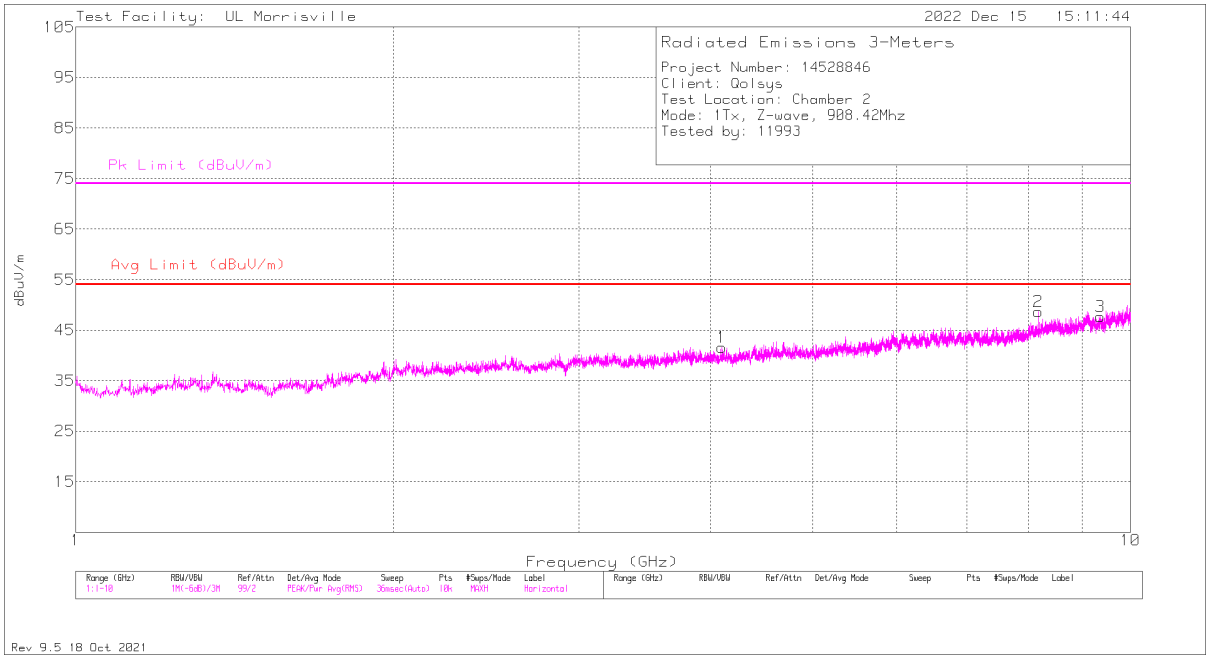
VERTICAL

RADIATED EMISSIONS

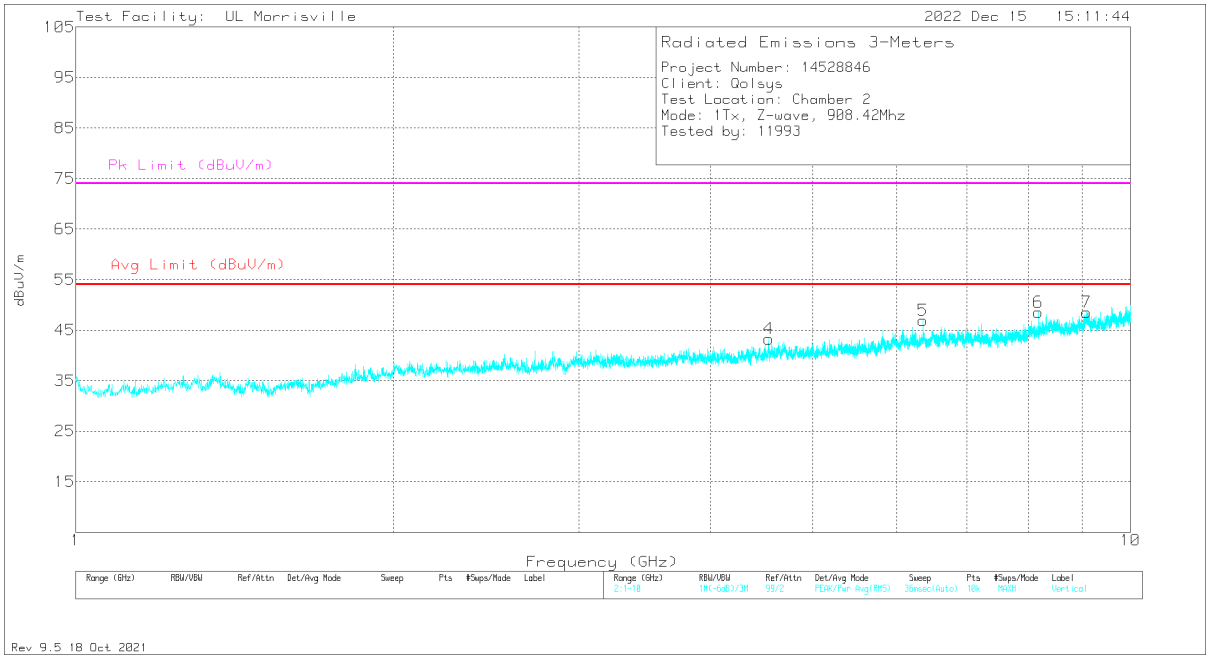
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	206211 (dB/m)	Gain/Loss (dB)	Filter (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Pk Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 3.8908	41.01	Pk	33.4	-32.5	.4	42.31	54	-11.69	74	-31.69	0-360	299	H
2	* ** 8.1757	38.79	Pk	35.7	-27.4	.4	47.49	54	-6.51	74	-26.51	0-360	100	H
3	* ** 9.35768	37.03	PK2	36.5	-25.9	.8	48.43	-	-	74	-25.57	112	338	H
	* ** 9.35718	24.87	ADV	36.5	-25.9	.8	36.27	54	-17.73	-	-	112	338	H
4	* ** 2.3473	41.64	Pk	31.9	-34	.4	39.94	54	-14.06	74	-34.06	0-360	200	V
5	* ** 7.642	36.58	Pk	35.7	-27.7	.5	45.08	54	-8.92	74	-28.92	0-360	200	V
6	* ** 9.0501	38.71	PK2	36.1	-26.3	.6	49.11	-	-	74	-24.89	265	204	V
	* ** 9.05009	25.91	ADV	36.1	-26.3	.6	36.31	54	-17.69	-	-	265	204	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector

LOW CHANNEL, 908.42 MHz RESULTS



HORIZONTAL



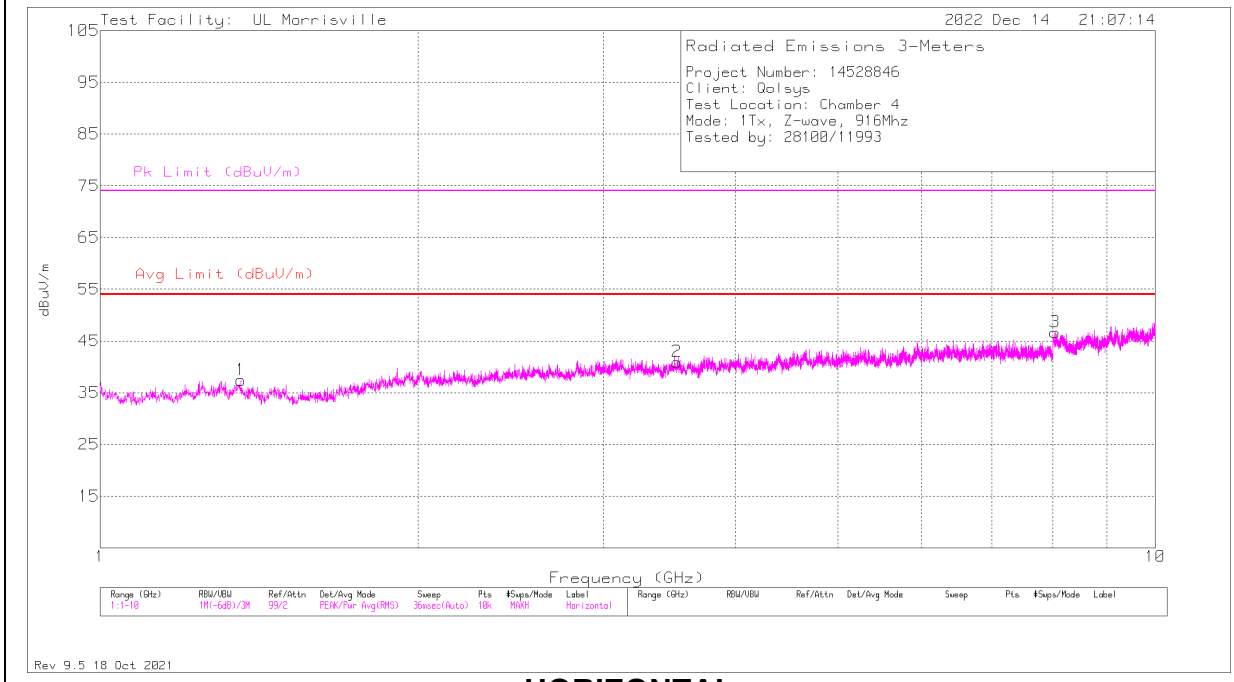
VERTICAL

RADIATED EMISSIONS

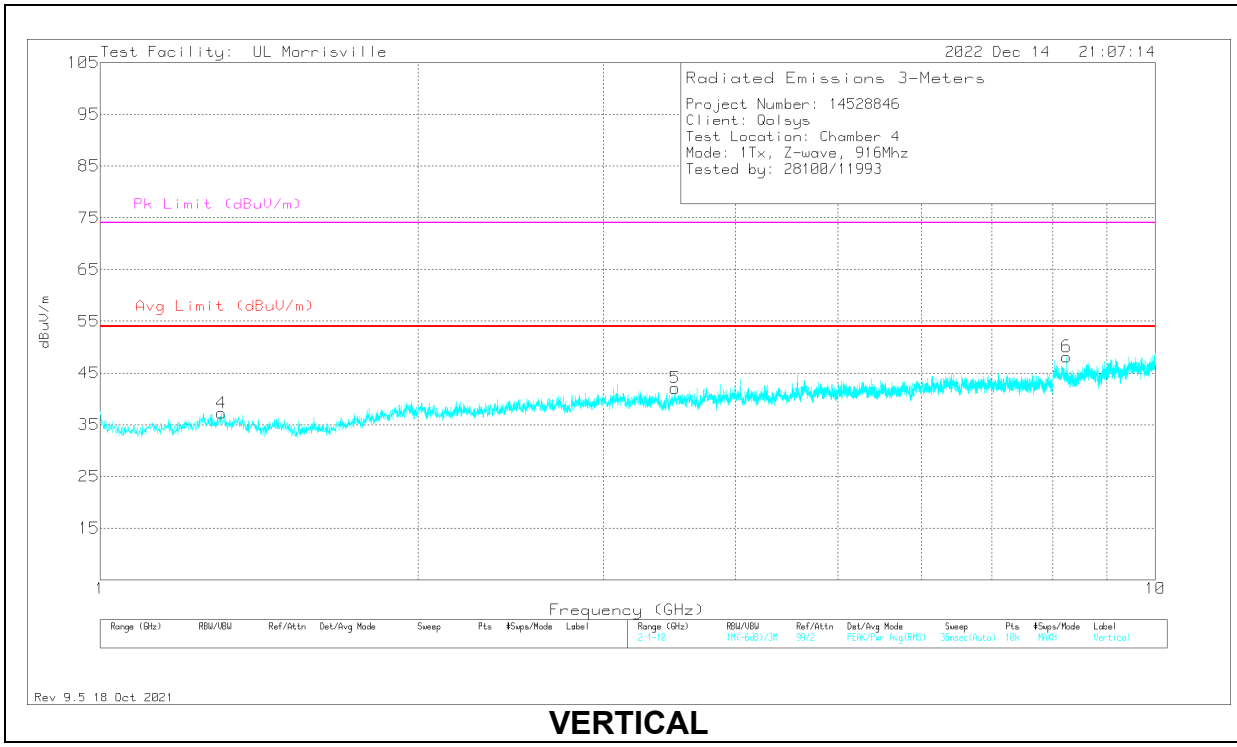
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	206211 (dB/m)	Gain/Loss (dB)	Filter (dB)	Corrected Reading dBuV/m	Avg Limit (dBuV/m)	Margin (dB)	Pk Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 4.1005	39.79	Pk	33.4	-32	.4	41.59	54	-12.41	74	-32.41	0-360	300	H
2	* ** 8.17582	41.98	PK2	35.7	-27.4	.4	50.68	-	-	74	-23.32	350	126	H
	* ** 8.17577	34.3	ADV	35.7	-27.4	.4	43	54	-11	-	-	350	126	H
3	* ** 9.3601	36.19	Pk	36.5	-25.8	.8	47.69	54	-6.31	74	-26.31	0-360	200	H
4	* ** 4.5424	40.47	Pk	34.1	-31.6	.3	43.27	54	-10.73	74	-30.73	0-360	100	V
6	* ** 8.17606	43.33	PK2	35.7	-27.5	.4	51.93	-	-	74	-22.07	92	102	V
	* ** 8.17576	36.92	ADV	35.7	-27.4	.4	45.62	54	-8.38	-	-	92	102	V
7	* ** 9.08137	39.32	PK2	36.1	-26.2	.7	49.92	-	-	74	-24.08	344	379	V
	* ** 9.08123	26.44	ADV	36.1	-26.2	.7	37.04	54	-16.96	-	-	344	379	V
5	6.3586	40.14	Pk	35.5	-29.5	.8	46.94	54	-7.06	74	-27.06	0-360	100	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
PK2 - Maximum Peak
ADV - Linear Voltage Average

MID CHANNEL, 916 MHz RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Gain/Loss (dB)	Filter (dB)	Corrected Reading dBuV/m	Avg Limit (dBuV/m)	Margin (dB)	Pk Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	1.3024	43.76	Pk	29.5	-37	1	37.26	54	-16.74	74	-36.74	0-360	101	V
1	1.36	43.95	Pk	29.6	-36.9	.8	37.45	54	-16.55	74	-36.55	0-360	101	H
5	3.5065	41.48	Pk	33	-32.8	.4	42.08	54	-11.92	74	-31.92	0-360	400	V
2	3.52	40.57	Pk	33.1	-33	.3	40.97	54	-13.03	74	-33.03	0-360	200	H
3	8.0353	40.5	Pk	35.8	-30	.4	46.7	54	-7.3	74	-27.3	0-360	299	H
6	8.24412	35.86	ADV	35.8	-30.1	.4	41.96	54	-12.04	-	-	256	129	V
	8.24422	43.73	PK2	35.8	-30.1	.4	49.83	-	-	74	-24.17	256	129	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
PK2 - Maximum Peak
ADV - Linear Voltage Average

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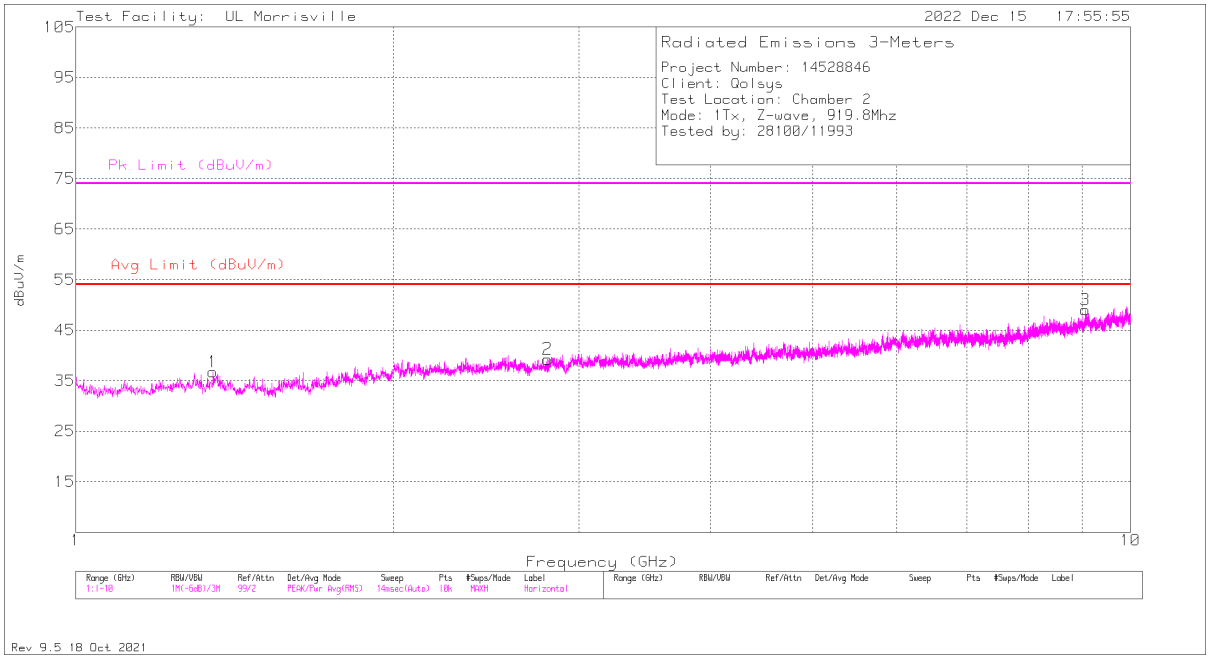
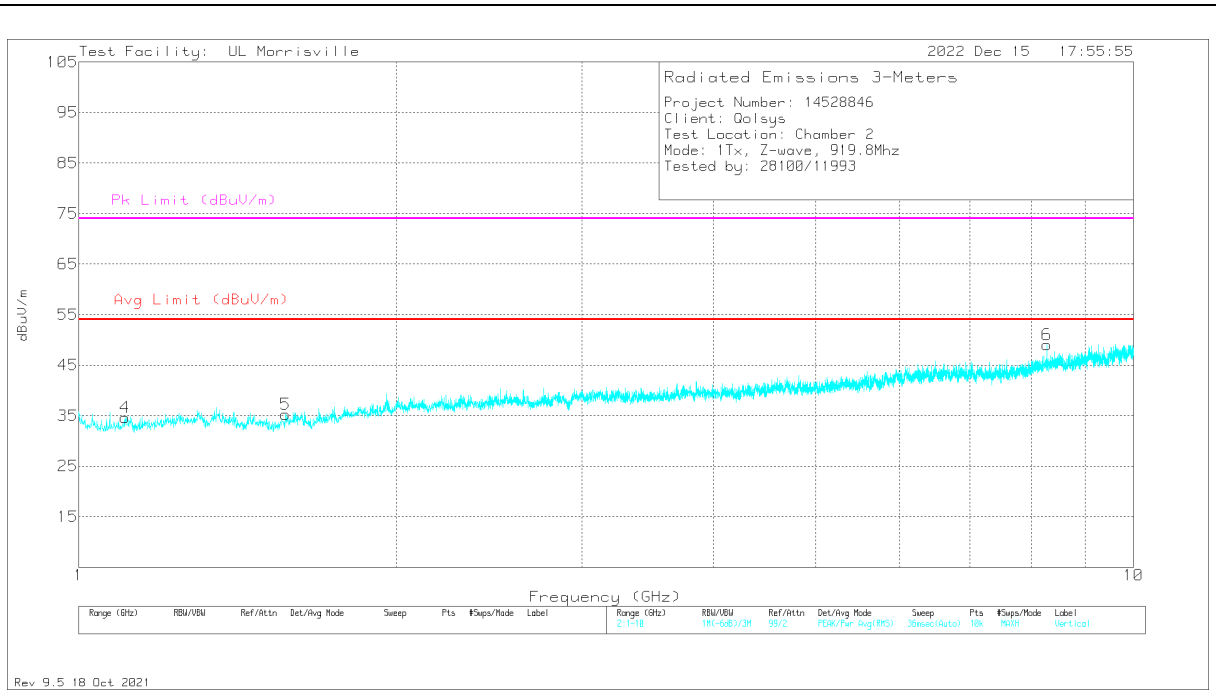
HIGH CHANNEL, 919.8 MHz RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	206211 (dB/m)	Gain/Loss (dB)	Filter (dB)	Corrected Reading dBuV/m	Avg Limit (dBuV/m)	Margin (dB)	Pk Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 1.3492	41.62	Pk	29.3	-35	.8	36.72	54	-17.28	74	-37.28	0-360	400	H
2	* ** 2.8	39.89	Pk	32.3	-33.5	.6	39.29	54	-14.71	74	-34.71	0-360	100	H
3	* ** 9.06442	38.43	PK2	36.1	-25.7	.7	49.53	-	-	74	-24.47	165	358	H
	* ** 9.06661	26.15	ADV	36.1	-25.8	.7	37.15	54	-16.85	-	-	165	358	H
4	* ** 1.1071	41.26	Pk	27.3	-35.1	1.2	34.66	54	-19.34	74	-39.34	0-360	200	V
5	* ** 1.5706	40.85	Pk	28.3	-34.5	.6	35.25	54	-18.75	74	-38.75	0-360	300	V
6	* ** 8.27849	39.58	PK2	35.8	-27.3	.5	48.58	-	-	74	-25.42	165	100	V
	* ** 8.27833	28.06	ADV	35.8	-27.3	.5	37.06	54	-16.94	-	-	165	100	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
PK2 - Maximum Peak
ADV - Linear Voltage Average

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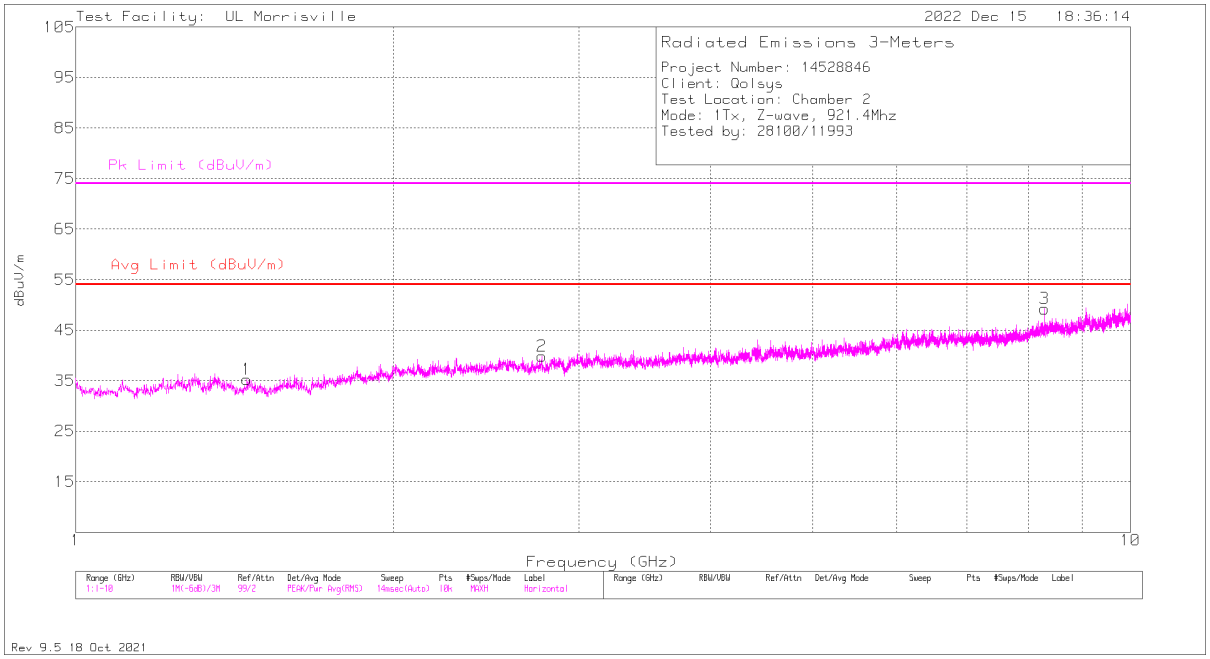
HIGH CHANNEL, 921.4 MHz RESULTS



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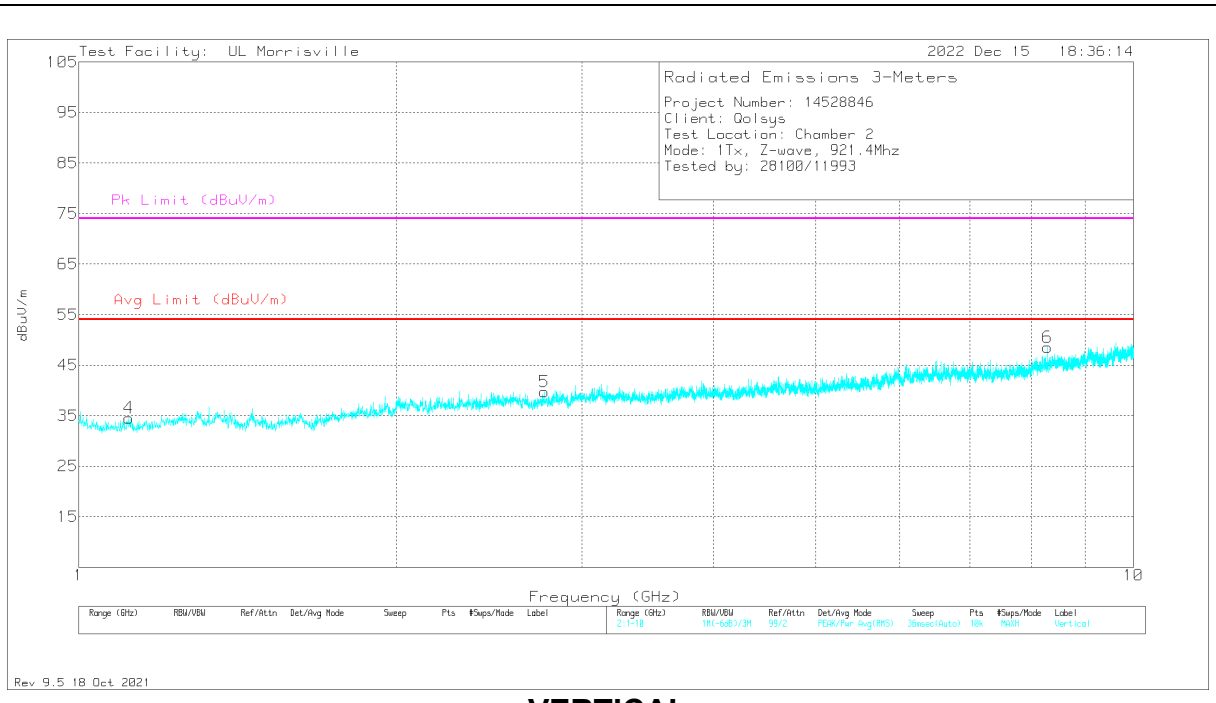

VERTICAL

RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	206211 (dB/m)	Gain/Loss (dB)	Filter (dB)	Corrected Reading dBuV/m	Avg Limit (dBuV/m)	Margin (dB)	Pk Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 1.4527	40.92	Pk	28.1	-34.6	.8	35.22	54	-18.78	74	-38.78	0-360	299	H
2	* ** 2.7676	40.82	Pk	32.2	-33.7	.5	39.82	54	-14.18	74	-34.18	0-360	299	H
3	* ** 8.29225	41.93	PK2	35.8	-27.4	.5	50.83	-	-	74	-23.17	354	102	H
	* ** 8.29263	34.92	ADV	35.8	-27.4	.5	43.82	54	-10.18	-	-	354	102	H
4	* ** 1.1161	41.07	Pk	27.3	-35	1.2	34.57	54	-19.43	74	-39.43	0-360	100	V
5	* ** 2.764	40.88	Pk	32.2	-33.7	.4	39.78	54	-14.22	74	-34.22	0-360	300	V
6	* ** 8.29288	42.2	PK2	35.8	-27.4	.5	51.1	-	-	74	-22.9	96	100	V
	* ** 8.29261	34.52	ADV	35.8	-27.4	.5	43.42	54	-10.58	-	-	96	100	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
PK2 - Maximum Peak
ADV - Linear Voltage Average

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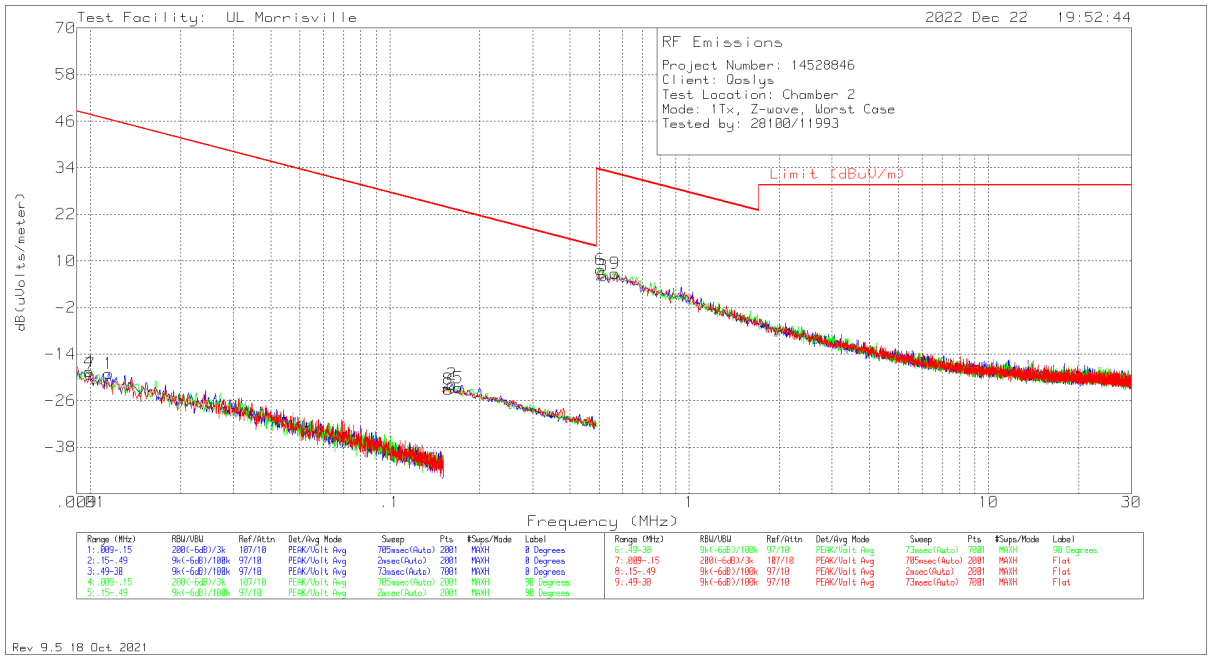
10.1.4. SPURIOUS EMISSIONS BELOW 30 MHz

WORST-CASE CONFIGURATION

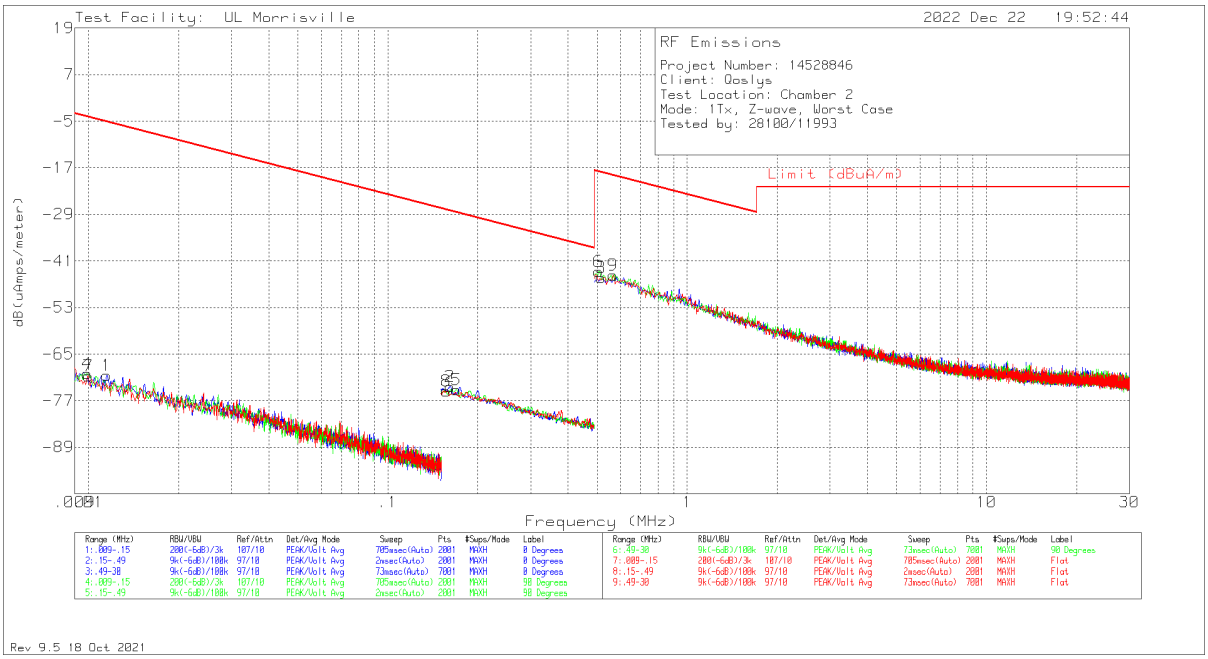
Note for below 30 MHz scans: All measurements were made at a test distance of 3 m. The measured data was extrapolated from the test distance (3m) to the specification distance (300 m from 9-490 kHz and 30 m from 490 kHz – 30 MHz) to clearly show the relative levels of fundamental and spurious emissions 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). Emissions were applied to the QP/AV limits as worst case.



E-Field

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0059 (dBuV/m)	Gain/Loss (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	QP/AV Limit (dBuV/m)	PK Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Loop Angle
4	.00989	41.92	Pk	19.4	.1	-80	-18.58	47.7	67.7	-66.28	0-360	90 degs
7	.00999	41.48	Pk	19.3	.1	-80	-19.12	47.61	67.61	-66.73	0-360	Flat
1	.01149	42.35	Pk	18.6	.1	-80	-18.95	46.4	66.4	-65.35	0-360	0 degs
8	.15697	46.29	Pk	10.6	.1	-80	-23.01	23.69	43.69	-46.7	0-360	Flat
2	.16139	47.46	Pk	10.6	.1	-80	-21.84	23.45	43.45	-45.29	0-360	0 degs
5	.16972	46.61	Pk	10.6	.1	-80	-22.69	23.01	43.01	-45.7	0-360	90 degs
6	.50686	37.2	Pk	10.5	.1	-40	7.8	33.51	-	-25.71	0-360	90 degs
3	.5153	35.5	Pk	10.5	.1	-40	6.1	33.36	-	-27.26	0-360	0 degs
9	.56589	36.13	Pk	10.6	.1	-40	6.83	32.55	-	-25.72	0-360	Flat

Pk - Peak detector



H-Field

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0059 (dBuV/m)	Gain/Loss (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uAmps/meter)	QP/AV Limit (dBuA/m)	PK Limit (dBuA/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Loop Angle
4	.00989	41.92	Pk	-32.1	.1	-80	-70.08	-3.8	16.2	-66.28	0-360	401	90 degs
7	.00999	41.48	Pk	-32.2	.1	-80	-70.62	-3.89	16.11	-66.73	0-360	401	Flat
1	.01149	42.35	Pk	-32.9	.1	-80	-70.45	-5.1	14.9	-65.35	0-360	401	0 degs
8	.15697	46.29	Pk	-40.9	.1	-80	-74.51	-27.81	-7.81	-46.7	0-360	401	Flat
2	.16139	47.46	Pk	-40.9	.1	-80	-73.34	-28.05	-8.05	-45.29	0-360	401	0 degs
5	.16972	46.61	Pk	-40.9	.1	-80	-74.19	-28.49	-8.49	-45.7	0-360	401	90 degs
6	.50686	37.2	Pk	-41	.1	-40	-43.7	-17.99	-	-25.71	0-360	401	90 degs
3	.5153	35.5	Pk	-41	.1	-40	-45.4	-18.14	-	-27.26	0-360	401	0 degs
9	.56589	36.13	Pk	-40.9	.1	-40	-44.67	-18.95	-	-25.72	0-360	401	Flat

Pk - Peak detector

11. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)
RSS-Gen 8.8

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.

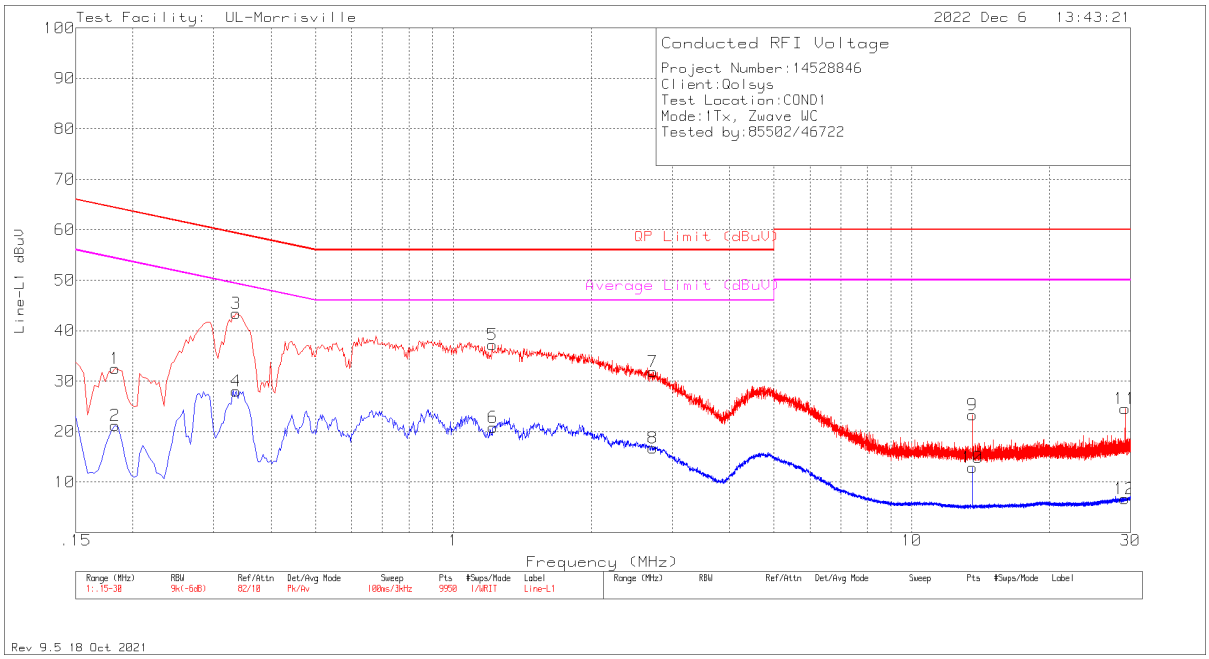
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both lines.

RESULTS

11.1.1. AC Power Line

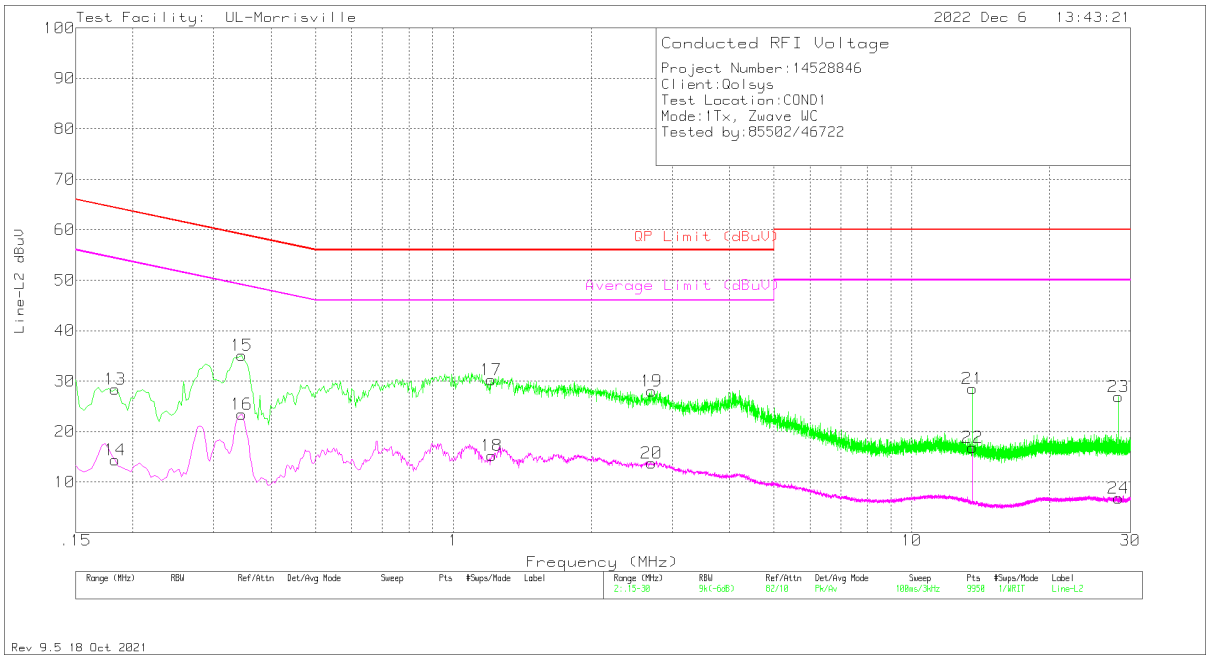
LINE 1 RESULTS



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	.183	22.46	Pk	.2	9.8	32.46	64.35	-31.89	-	-
2	.183	11.21	Av	.2	9.8	21.21	-	-	54.35	-33.14
3	.336	33.49	Pk	.1	9.8	43.39	59.3	-15.91	-	-
4	.336	18.14	Av	.1	9.8	28.04	-	-	49.3	-21.26
5	1.215	27.39	Pk	0	9.8	37.19	56	-18.81	-	-
6	1.221	11.04	Av	0	9.8	20.84	-	-	46	-25.16
7	2.724	22.12	Pk	0	9.8	31.92	56	-24.08	-	-
8	2.727	6.98	Av	0	9.8	16.78	-	-	46	-29.22
9	13.56	13.25	Pk	.1	10	23.35	60	-36.65	-	-
10	13.56	2.75	Av	.1	10	12.85	-	-	50	-37.15
11	29.205	13.99	Pk	.3	10.2	24.49	60	-35.51	-	-
12	29.202	-3.81	Av	.3	10.2	6.69	-	-	50	-43.31

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	.183	18.43	Pk	.2	9.8	28.43	64.35	-35.92	-	-
14	.183	4.33	Av	.2	9.8	14.33	-	-	54.35	-40.02
15	.345	25.24	Pk	.1	9.8	35.14	59.08	-23.94	-	-
16	.345	13.57	Av	.1	9.8	23.47	-	-	49.08	-25.61
17	1.209	20.43	Pk	0	9.8	30.23	56	-25.77	-	-
18	1.212	5.41	Av	0	9.8	15.21	-	-	46	-30.79
19	2.706	18.19	Pk	0	9.8	27.99	56	-28.01	-	-
20	2.706	3.92	Av	0	9.8	13.72	-	-	46	-32.28
21	13.5615	18.41	Pk	.1	10	28.51	60	-31.49	-	-
22	13.56	6.77	Av	.1	10	16.87	-	-	50	-33.13
23	28.284	16.43	Pk	.3	10.2	26.93	60	-33.07	-	-
24	28.275	-3.73	Av	.3	10.2	6.77	-	-	50	-43.23

Pk - Peak detector
Av - Average detection

12. SETUP PHOTOS

See R14528846-EP1 for Setup Photos.

END OF TEST REPORT

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