

TEST REPORT

Report Number: R15440806-E6

Applicant : RF IDEAS
425 N. Martingale Road
Suite 1680
Schaumburg, IL 60173, USA

Model : MD30L00

FCC ID : M9MMD30L00

IC : 6571A-MD30L00

EUT Description : Dual Band RFID Card Reader

Test Standard(s) : FCC 47 CFR PART 15 SUBPART C: 2024
ISED RSS-247 ISSUE 3: 2023
ISED RSS-GEN ISSUE 5 + A1 + A2: 2021

Date Of Issue:

2024-12-02

Prepared by:

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REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	2024-11-05	Initial Issue	Chandler Stanley
V2	2024-12-02	Added details about power setting to section 6.6.	Chandler Stanley

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: RF IDEAS
425 N. Martingale Road, Suite 1680
Schaumburg, IL 60173, USA

EUT DESCRIPTION: Dual Band RFID Card Reader

MODEL: MD30L00

SERIAL NUMBER: WLDA000175, WLDA000109, WLDA000118, WLDA000157,
WLDA000158, WLSA000026, WLSA000027, WLSA000029

SAMPLE RECEIPT DATE: 2024-08-30 and 2024-09-27

DATE TESTED: 2024-09-06 TO 2024-10-08

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	See Section 2
ISED RSS-247 Issue 3	See Section 2
ISED RSS-GEN Issue 5 + A1 + A2	See Section 2

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.

Approved & Released For
UL LLC. By:



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

Prepared By:



Chandler Stanley
Engineer
Consumer Medical and IT Segment
UL LLC.

2. TEST RESULTS SUMMARY

Below is a list of the data provided by the customer:

- 1) Antenna gain and type (see section 6.3)
- 2) Cable loss

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.
15.247 (a) (2)	RSS-247 5.2 (a)	6dB BW	Complies	None.
15.247 (b) (3)	RSS-247 5.4 (d)	Output Power	Complies	None.
See Comment		Average power	Reporting purposes only	Per ANSI C63.10, Section 11.9.2.3.2.
15.247 (e)	RSS-247 5.2 (b)	PSD	Complies	None.
15.247 (d)	RSS-247 5.5	Conducted Spurious Emissions	Complies	None.
15.209, 15.205	RSS-GEN 8.9, 8.10	Radiated Emissions	Complies	None.
15.207	RSS-Gen 8.8	AC Mains Conducted Emissions	Complies	None.

3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, ANSI C63.10-2020, KDB 558074 D01 15.247 Meas Guidance v05r02, KDB 414788 D01 Radiated Test Site v01r01, RSS-GEN Issue 5 + A1 + A2, and RSS-247 Issue 3.

4. FACILITIES AND ACCREDITATION

UL LLC is accredited by A2LA, Certificate Number #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
<input checked="" type="checkbox"/>	Building 2800 Suite Perimeter Park Dr. Suite B Morrisville, NC 27560, U.S.A	US0067	27265	825374

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	U _{Lab}
Radio Frequency (Spectrum Analyzer)	419.38 Hz
Occupied Channel Bandwidth	1.22%
RF output power, conducted	1.3 dB (PK) 0.45 dB (AV)
Power Spectral Density, conducted	2.47 dB
Unwanted Emissions, conducted	1.94 dB
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	1.70%

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)
 $36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} = 28.9 \text{ dBuV/m}$

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.
 $36.5 \text{ dBuV} + 0 \text{ dB} + 10.1 \text{ dB} + 0 \text{ dB} = 46.6 \text{ dBuV}$

6. EQUIPMENT UNDER TEST

6.1. EUT DESCRIPTION

The EUT is a dual band RFID card reader capable of reading both 125 kHz and 13.56 MHz credentials and Legic Secure Segment credentials via Bluetooth communication. This report covers the full emissions testing of the BLE radio.

6.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2402 - 2480	BLE	-3.33	0.46

6.3. DESCRIPTION OF AVAILABLE ANTENNAS

The antenna(s) gain and type, as provided by the manufacturer' are as follows:

The radio utilizes a chip antenna, with a maximum gain of 0.5 dBi.

6.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was:

For USB: FW: WN5020600UPX7L0

For Serial: FW: WN5020600SPX7L0

6.5. WORST-CASE CONFIGURATION AND MODE

Prior to final power measurements, 2402MHz was selected as the worst-case scenario. The average powers of all channels were within 0.5dB of each other so radiated emissions below 1GHz, above 18GHz, and power line conducted emission were performed with the EUT set to transmit at 2402 MHz as worst-case scenario.

Band edge and radiated emissions between 1GHz and 18GHz were performed with the EUT set to transmit on low, middle and high channels.

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

There are two variants that only differ between a USB or a USB and Serial interface. All radiated scans were performed on the sample with both the USB and Serial interface as worst case.

6.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	HP	Resolve 810	A000247	NA
Laptop Charger	HP	PPP009L-E	WCNXA0C1R6WIVK	NA
USB to RS232 Serial Adapter	Cables Unlimited	USB-2920	NA	NA

I/O CABLES

I/O Cable List						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Hardwired	1	USB/Serial	Unshielded	>3m	Cable Splits to USB and Serial and Connects to Laptop.

TEST SETUP

The EUT is connected to a test laptop during the tests. Test software exercised the radio card and the transmit power was set to 0dBm as instructed by the customer.

SETUP DIAGRAMS

Please refer to 15440806-EP3 for setup diagrams

7. MEASUREMENT METHOD

On Time and Duty Cycle: ANSI C63.10, Section 11.6 : Zero-Span Spectrum Analyzer Method.

6 dB BW: ANSI C63.10 Subclause -11.8.1

Occupied BW (99%): ANSI C63.10-2020 Section 6.9.3

Output Power: ANSI C63.10 Subclause -11.9.1.2 Method PKPM1 Peak-reading power meter
ANSI C63.10 Subclause -11.9.2.3.2 Method AVGPM-G (Measurement using a
gated RF average-reading power meter)

PSD: ANSI C63.10 Subclause -11.10.2 Method PKPSD (peak PSD)

Conducted emissions non-restricted frequency bands: ANSI C63.10 Subclause -11.11 and
6.10.4

Radiated emissions restricted frequency bands: ANSI C63.10 Subclause -11.12.1 and 6.10.5

General radiated emissions: ANSI C63.10 Subclause – 6.3-6.6

AC Power Line Conducted Emissions: ANSI C63.10-2020, 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 - Radiated Disturbance Emissions Test Equipment (Morrisville – Chamber 1)

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
0.009-30MHz					
65682	Active Loop Antenna	ETS-Lindgren	6502	2023-10-03	2024-10-03
	1-18 GHz				
135143	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2024-02-07	2026-02-07
	18-26.5 GHz				
204704	Horn Antenna, 18-26.5GHz	Com-Power	AH-826	2023-07-20	2025-07-20
	Gain-Loss Chains				
91974	Gain-loss string: 0.009-30MHz	Various	Various	2024-05-08	2025-05-08
91979	Gain-loss string: 1-18GHz	Various	Various	2024-05-08	2025-05-08
135999	Gain-loss string: 18-40GHz	Various	Various	2024-05-08	2025-05-08
	Receiver & Software				
197954	Spectrum Analyzer	Rohde & Schwarz	ESW44	2024-03-05	2025-03-05
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
	Additional Equipment used				
241205	Environmental Meter	Fisher Scientific	15-077-963	2023-09-05	2025-09-05

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

Equip. ID	Description	Manufacturer/Brand	Model Number	Last Cal.	Next Cal.
	30-1000 MHz				
90628	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2024-01-02	2026-01-02
	Gain-Loss Chains				
207639	Gain-loss string: 25-1000MHz	Various	Various	2024-05-22	2025-05-22
	Receiver & Software				
197955	Spectrum Analyzer	Rohde & Schwarz	ESW44	2024-04-16	2025-04-16
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
	Additional Equipment used				
241204	Environmental Meter	Fisher Scientific	15-077-963	2023-09-05	2025-09-05

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

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
248881	Environmental Meter	Control Company	06-662-4	2024-04-10	2026-04-10
80391	LISN, 50-ohm/50-uH, 250uH 2-conductor, 25A	Fischer Custom Com.	FCC-LISN-50/250-25-2-01	2024-08-01	2025-08-01
75141	EMI Test Receiver 9kHz-7GHz	Rohde & Schwarz	ESCI 7	2024-08-01	2025-08-01
52859	Transient Limiter, 0.009-100MHz	Electro-Metrics	EM-7600	2024-04-04	2025-04-04
PS216	AC Power Source	Elgar	CW2501M	NA	NA
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		

Test Equipment Used - Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	Common Equipment				
	Conducted Room 2				
90410	Spectrum Analyzer	Keysight Technologies	N9030A	2024-06-14	2025-06-14
248881	Environmental Meter	Control Company	06-662-4	2024-04-10	2026-04-10
SOFTEMI	Antenna Port Software	UL	Version 2024.2.23	NA	NA
Power Software	Boonton Power Analyzer	Boonton	Version 3.0.13.0	NA	NA
	Additional Equipment used				
211057	Real-Time Peak Power Sensor 50MHz to 8GHz	Boonton	RTP5000	2024-08-01	2025-08-01
CBL034	SMA Cable	Sucoflex	104PEA	2023-11-29	2024-11-29
226561	SMA Coaxial 10dB Attenuator 25MHz-18GHz	CentricRF	C18S2-10	2024-02-29	2025-02-28

9. ANTENNA PORT TEST RESULTS

9.1. ON TIME AND DUTY CYCLE

LIMITS

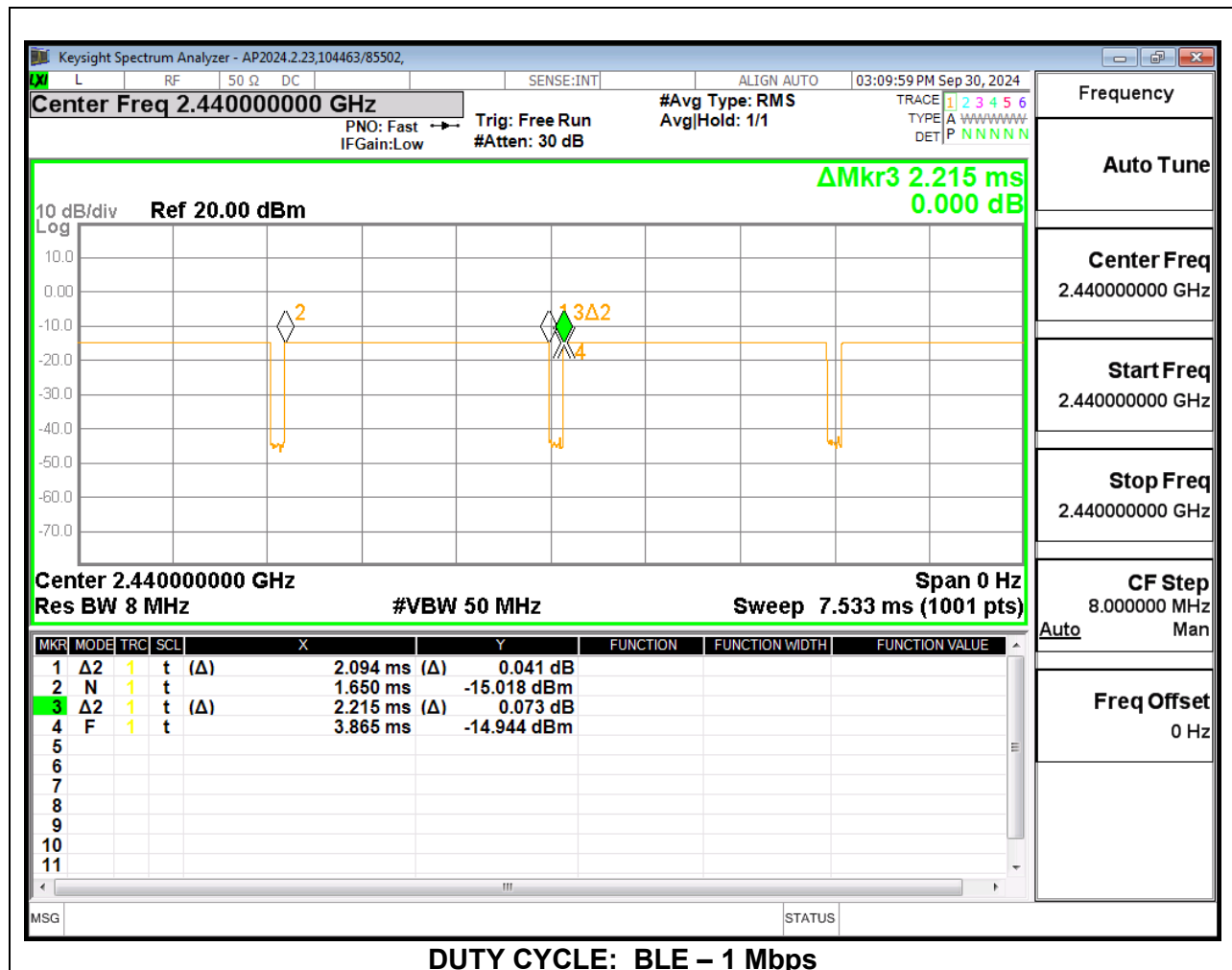
None; for reporting purposes only.

PROCEDURE

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)
2.4GHz Band						
BLE	2.094	2.215	0.945	94.54	0.50	0.478



9.2. 99% BANDWIDTH

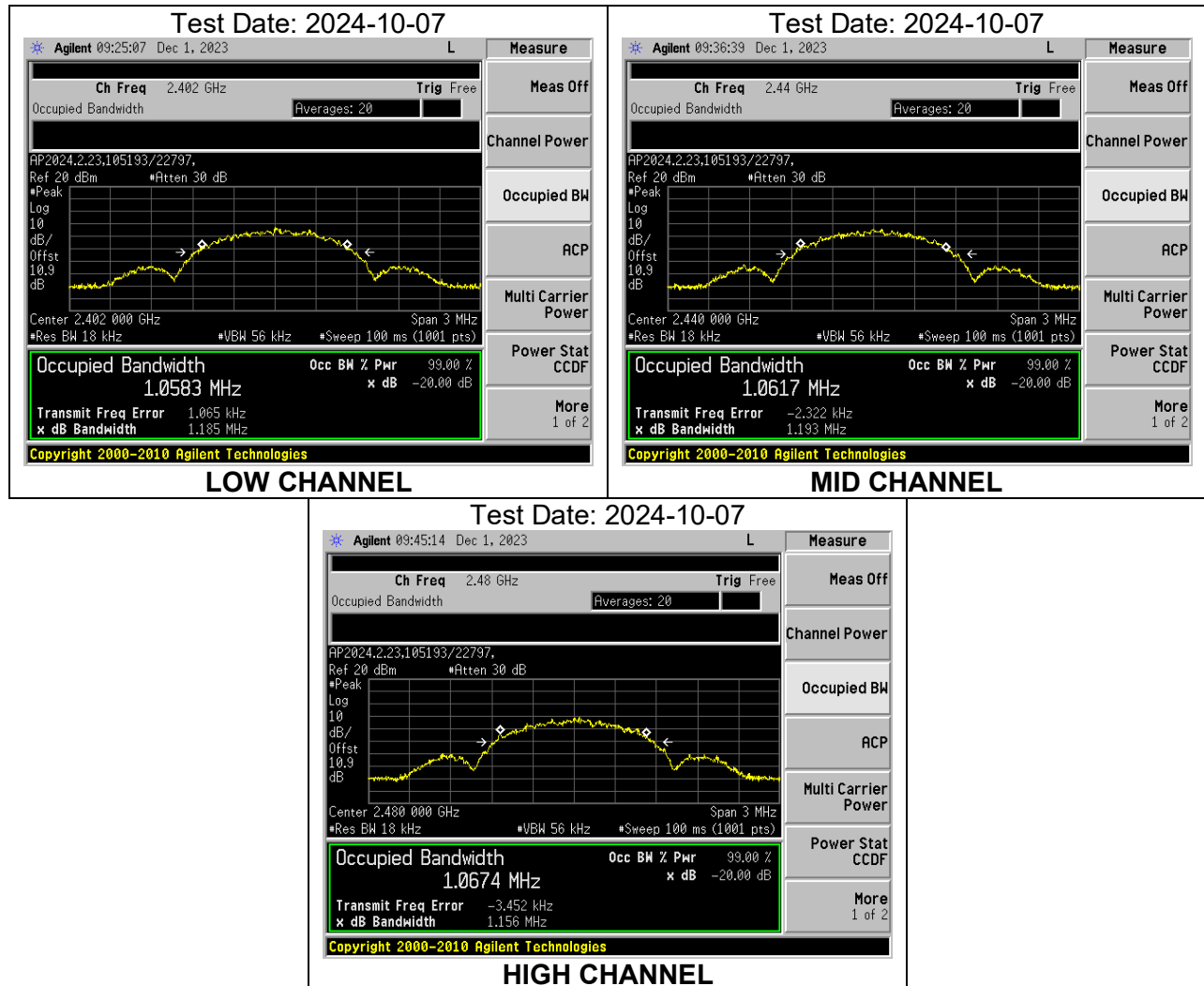
LIMITS

None; for reporting purposes only.

RESULTS

9.2.1. BLE (1Mbps)

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.0583
Middle	2440	1.0617
High	2480	1.0674



9.3. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

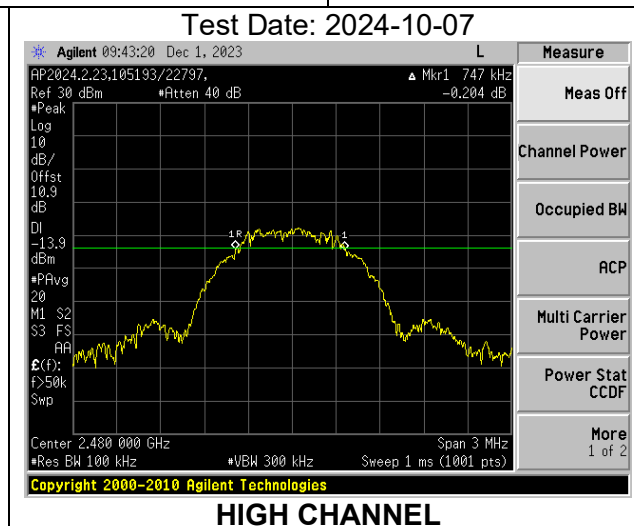
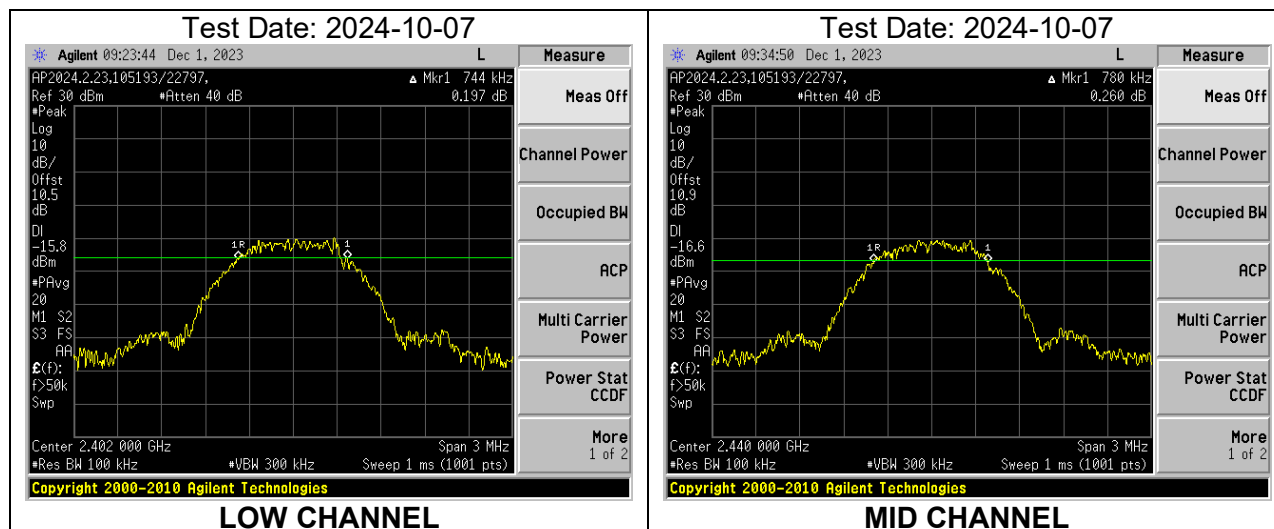
RSS-247 5.2 (a)

The minimum 6 dB bandwidth shall be at least 500 kHz.

RESULTS

9.3.1. BLE (1Mbps)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.7440	0.5
Middle	2440	0.7800	0.5
High	2480	0.7470	0.5



9.4. OUTPUT POWER

LIMITS

FCC §15.247 (b) (3)

RSS-247 5.4 (d)

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 10.86 dB (including 9.85 dB pad and 1.01 dB EUT cable) was entered as an offset in the power meter.

The power output was measured on the EUT antenna port using SMA cable with 10dB attenuator connected to a power meter via wideband power sensor. Peak output power was read directly from power meter.

RESULTS

9.4.1. BLE (1Mbps)

Tested By:	105193/22797
Date:	2024-10-07

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	-3.530	30	-33.530
Middle	2440	-3.420	30	-33.420
High	2480	-3.330	30	-33.330

9.5. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to an average gated power meter.

The cable assembly insertion loss of 10.86 dB (including 9.85 dB pad and 1.01 dB EUT cable) was entered as an offset in the average gated power meter.

The power output was measured on the EUT antenna port using SMA cable with 10dB attenuator connected to a power meter via wideband average power sensor. Gated average output power was read directly from power meter.

RESULTS

9.5.1. BLE (1Mbps)

Tested By:	105193/22797
Date:	2024-10-07

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	-4.003
Middle	2440	-3.885
High	2480	-3.765

9.6. POWER SPECTRAL DENSITY

LIMITS

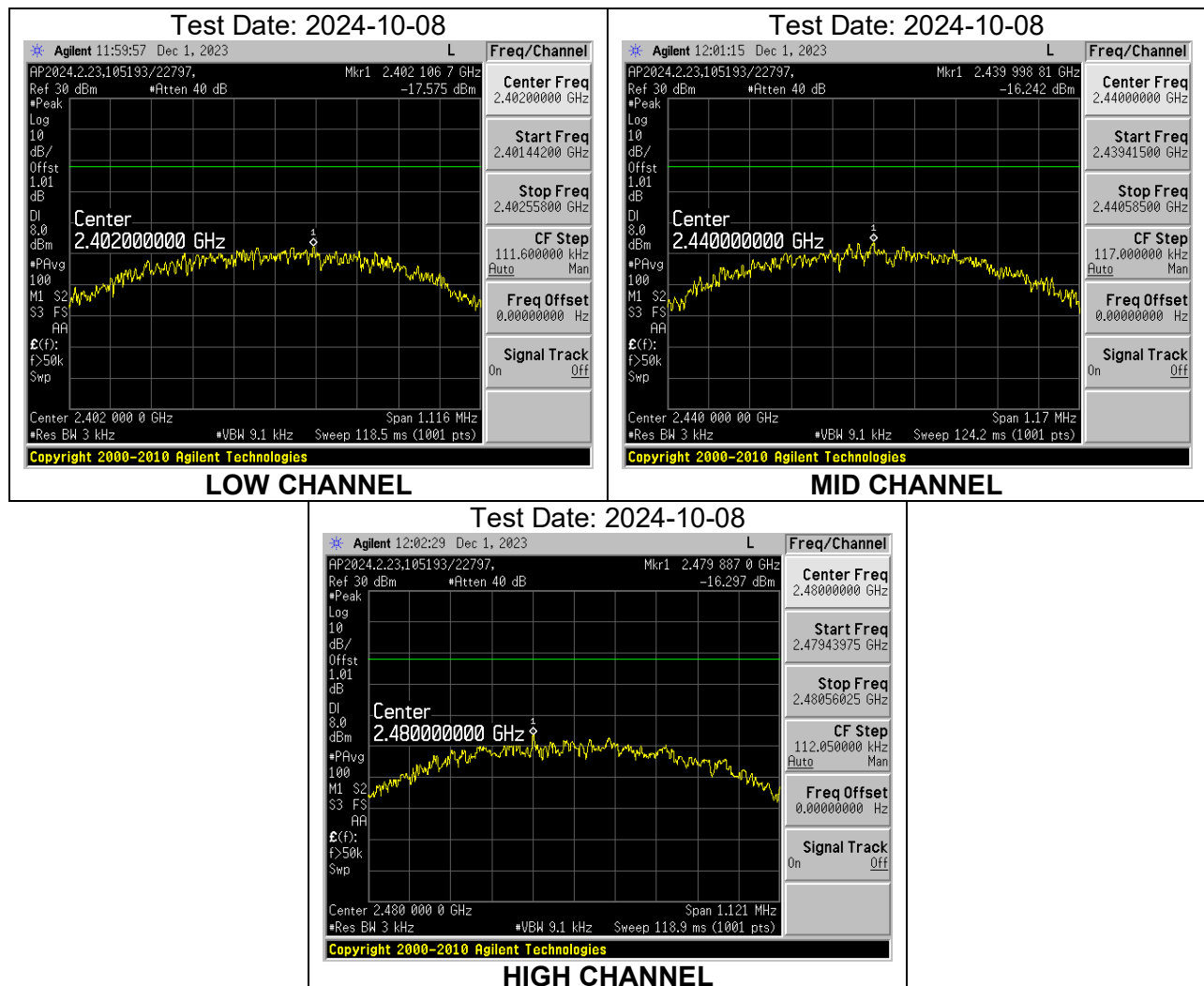
FCC §15.247 (e)
RSS-247 (5.2) (b)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

RESULTS

9.6.1. BLE (1Mbps)

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-17.58	8	-25.58
Middle	2440	-16.24	8	-24.24
High	2480	-16.30	8	-24.30



9.7. CONDUCTED SPURIOUS EMISSIONS

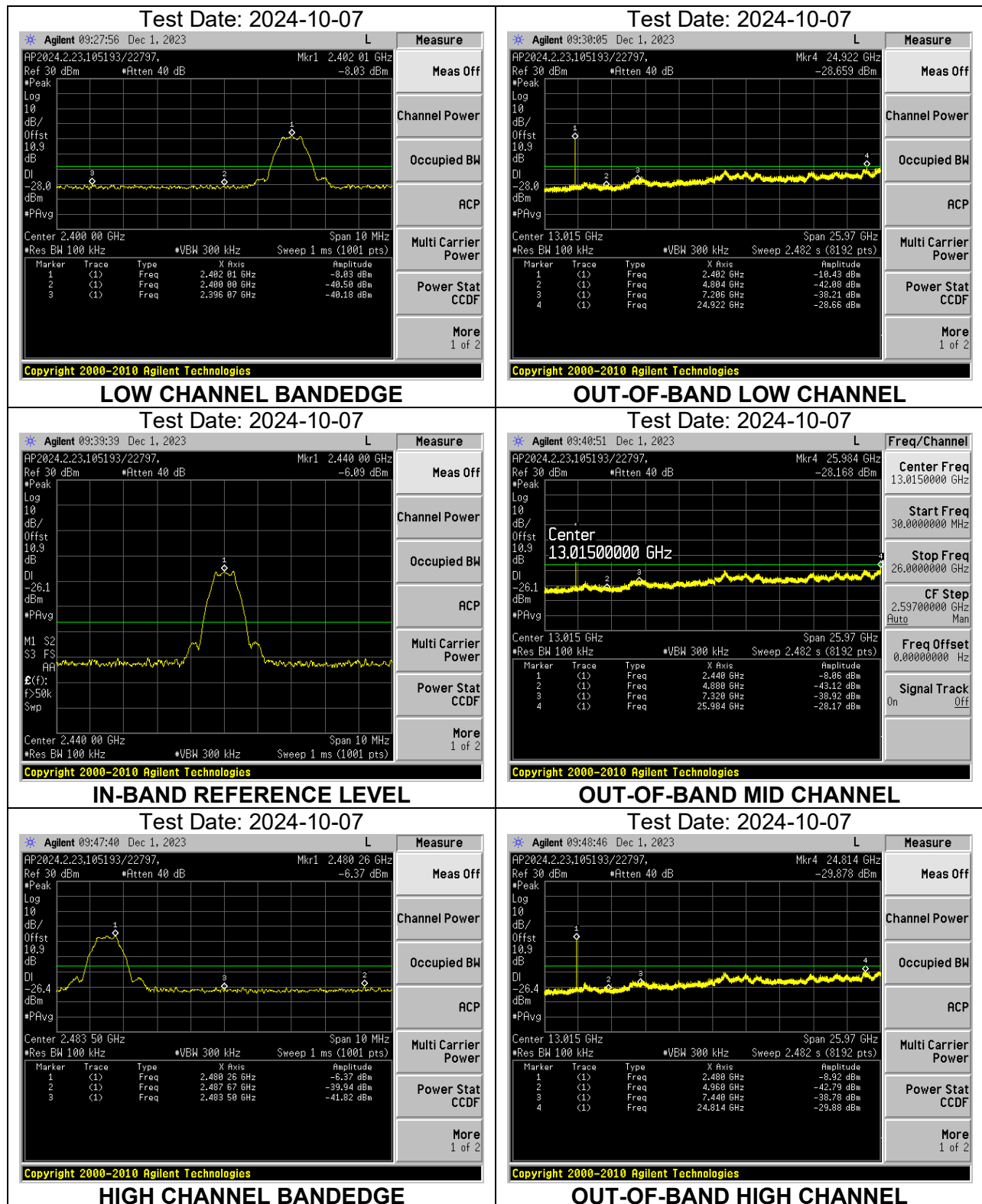
LIMITS

FCC §15.247 (d)
RSS-247 5.5

Output power was measured based on the use of a peak measurement, therefore the required attenuation is -20 dBc.

RESULTS

9.7.1. BLE (1Mbps)



10. RADIATED TEST RESULTS

10.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209
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

RSS-GEN, Section 8.9 and 8.10.

Frequency Range (MHz)	Field Strength Limit (uA/m) at 3 m	Field Strength Limit (dBuA/m) at 3 m
0.009-0.490	6.37/F(kHz) @ 300 m	-
0.490-1.705	63.7/F(kHz) @ 30 m	-
1.705 - 30	0.08 @ 30m	-
Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
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 or average (9-90kHz and 110-490kHz).

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 average measurements. Voltage Averaging was used.

The spectrum from 1 GHz to 18 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band. Below 1GHz and above 18GHz emissions, the channel with the highest power spectral density was tested.

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

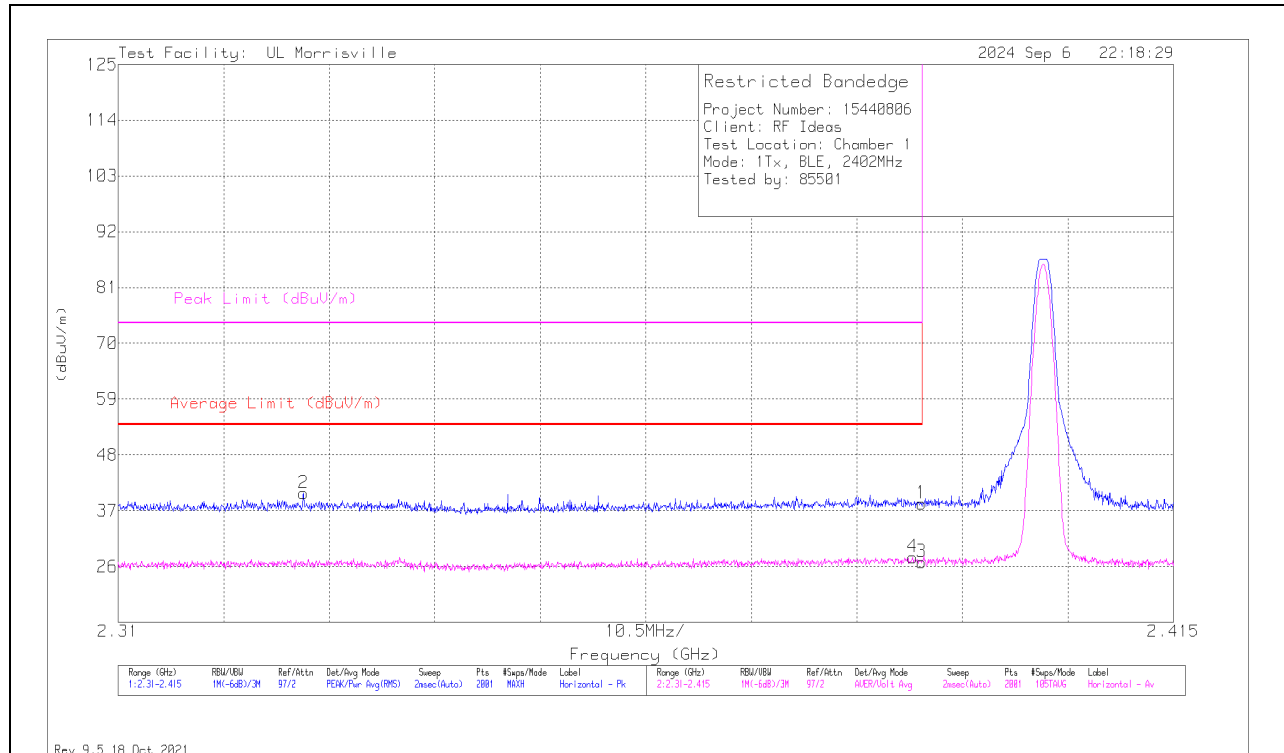
OFS and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

10.2. TRANSMITTER ABOVE 1 GHz

10.2.1. BLE (1Mbps)

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	135143 (dB/m)	Gain/Loss (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.38996	30.46	Pk	31.9	-24	0	38.36	-	-	74	-35.64	327	173	H
2	* ** 2.32843	32.9	Pk	31.7	-24.2	0	40.4	-	-	74	-33.6	327	173	H
3	* ** 2.38996	18.42	ADV	31.9	-24	.5	26.82	54	-27.18	-	-	327	173	H
4	* ** 2.38907	19.42	ADV	31.9	-24	.5	27.82	54	-26.18	-	-	327	173	H

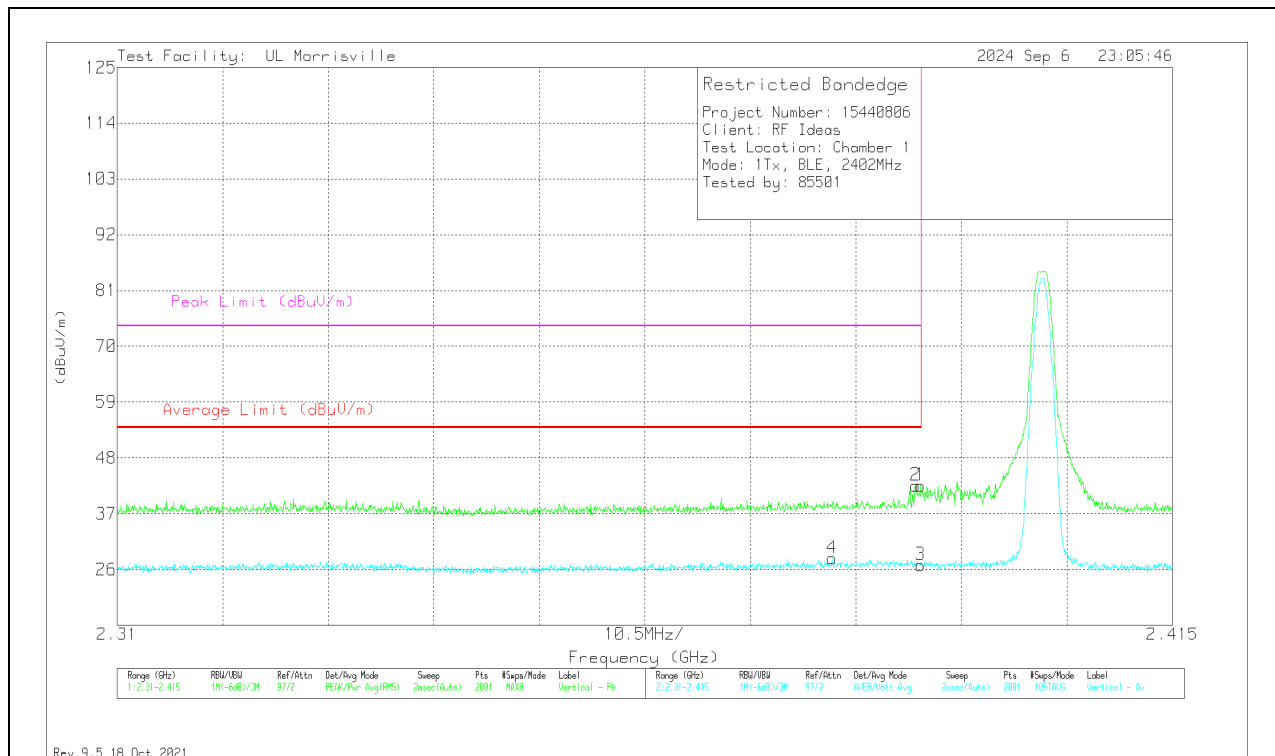
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

ADV - Linear Voltage Average

VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	135143 (dB/m)	Gain/Loss (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.38996	34.67	Pk	31.9	-24	0	42.57	-	-	74	-31.43	178	372	V
2	* ** 2.38943	34.66	Pk	31.9	-24	0	42.56	-	-	74	-31.44	178	372	V
3	* ** 2.38996	18.44	ADV	31.9	-24	.5	26.84	54	-27.16	-	-	178	372	V
4	* ** 2.38114	19.85	ADV	31.9	-24.1	.5	28.15	54	-25.85	-	-	178	372	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

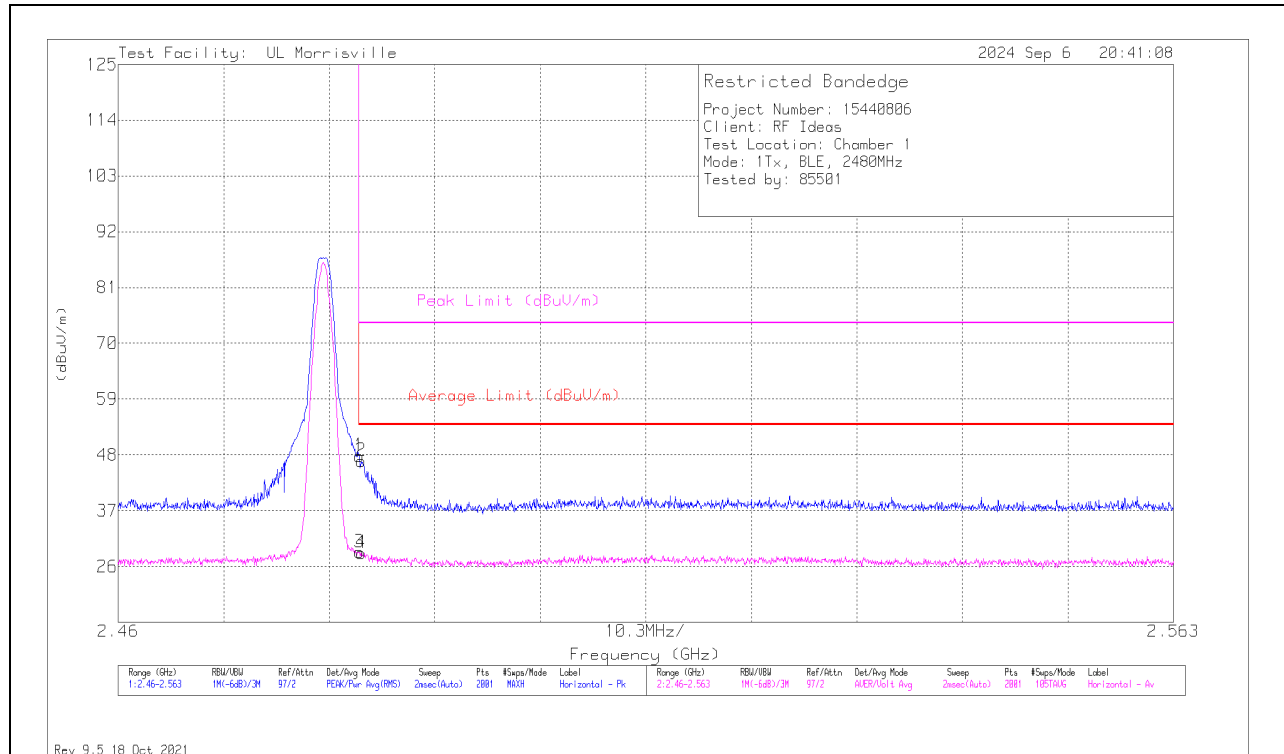
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

ADV - Linear Voltage Average

BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	135143 (dB/m)	Gain/Loss (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.48354	39.26	Pk	32.2	-23.7	0	47.76	-	-	74	-26.24	311	339	H
2	* ** 2.48374	38.25	Pk	32.2	-23.7	0	46.75	-	-	74	-27.25	311	339	H
3	* ** 2.48354	19.83	ADV	32.2	-23.7	.5	28.83	54	-25.17	-	-	311	339	H
4	* ** 2.48374	19.66	ADV	32.2	-23.7	.5	28.66	54	-25.34	-	-	311	339	H

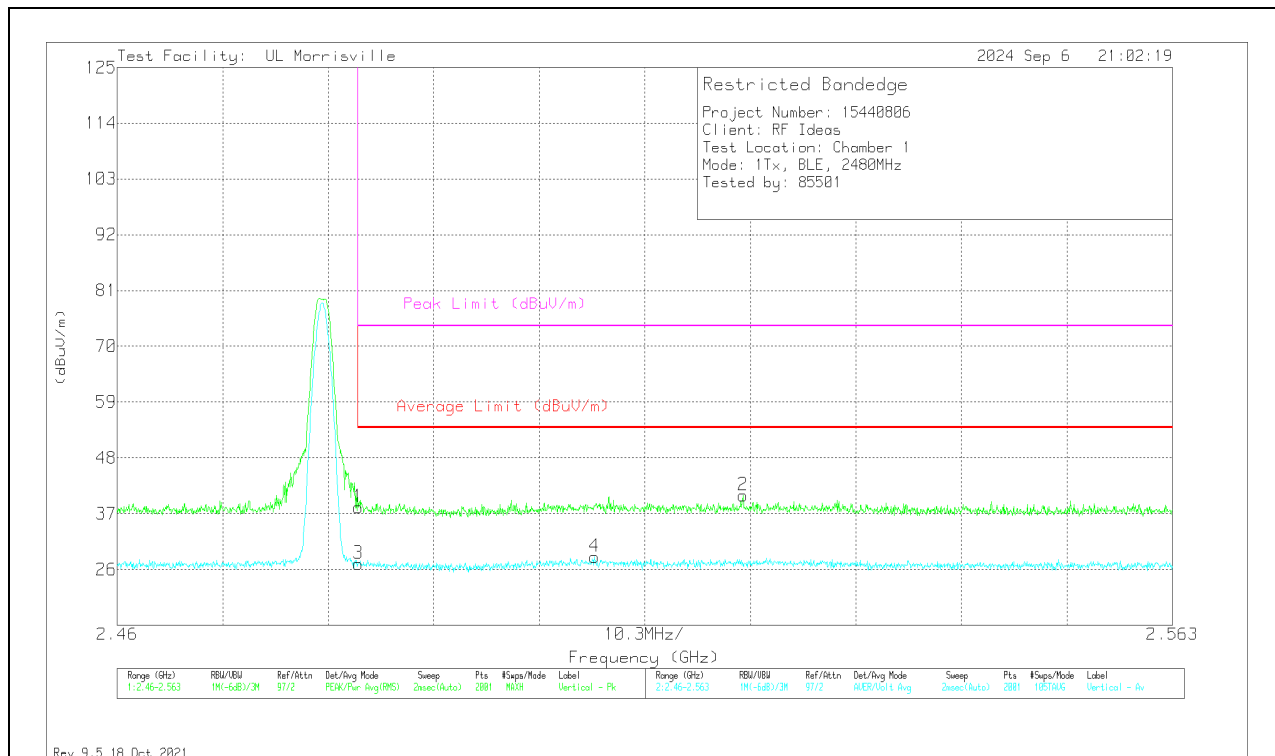
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

ADV - Linear Voltage Average

VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	135143 (dB/m)	Gain/Loss (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	*** 2.48354	29.71	Pk	32.2	-23.7	0	38.21	-	-	74	-35.79	300	193	V
2	** 2.52108	32.41	Pk	32.3	-24.1	0	40.61	-	-	74	-33.39	300	193	V
3	*** 2.48354	18.08	ADV	32.2	-23.7	.5	27.08	54	-26.92	-	-	300	193	V
4	** 2.50661	19.55	ADV	32.3	-23.9	.5	28.45	54	-25.55	-	-	300	193	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

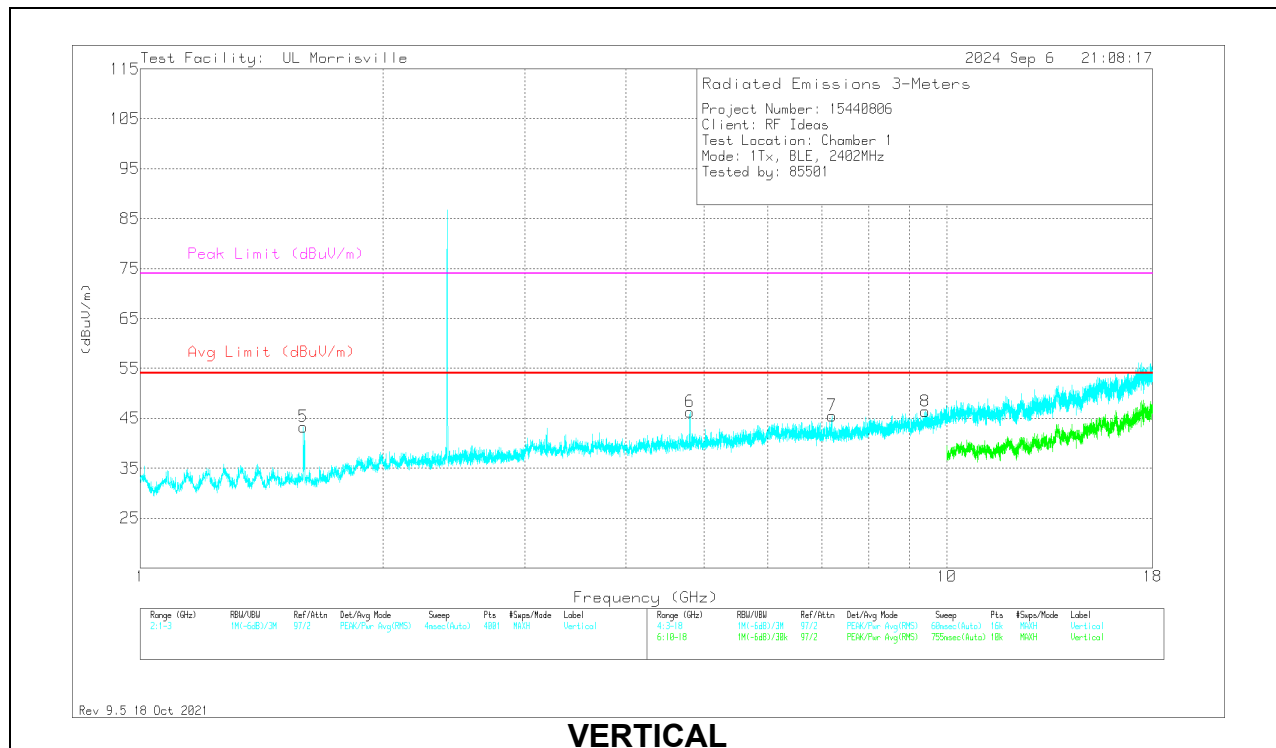
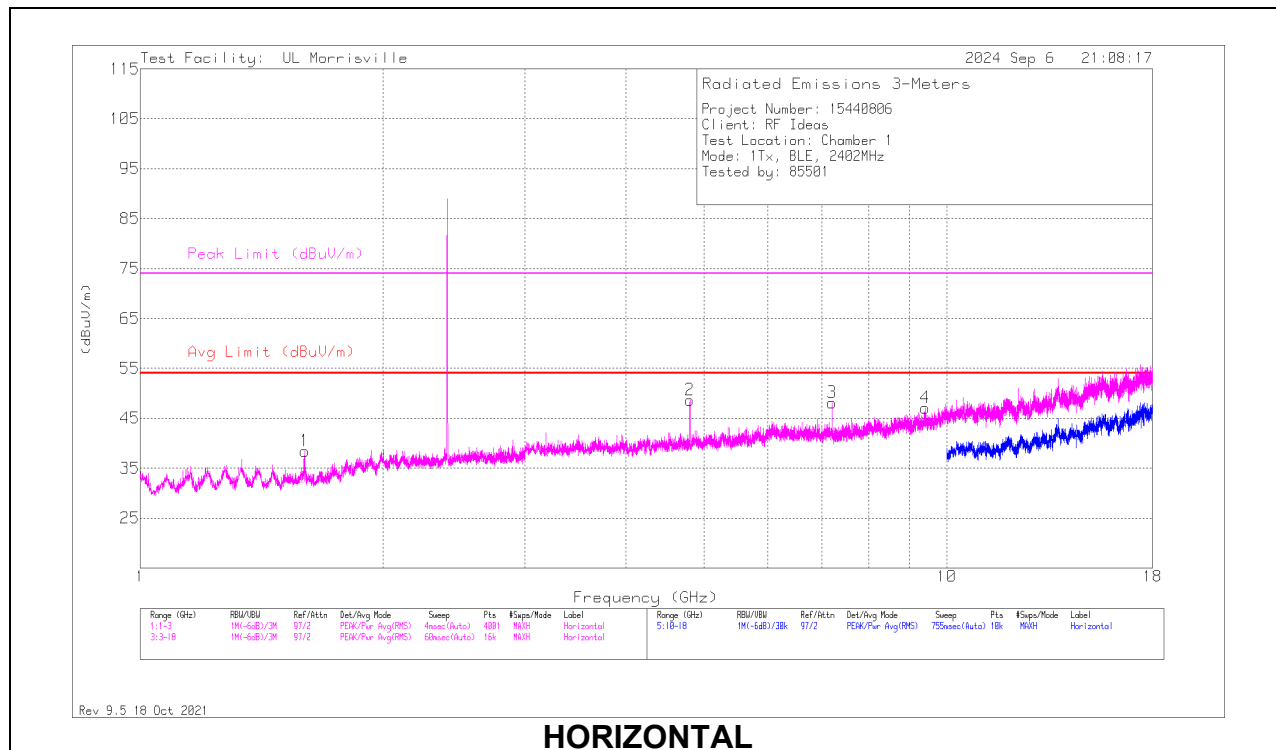
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

ADV - Linear Voltage Average

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	135143 (dB/m)	Gain/Loss (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	*** 1.599	34.75	Pk	28.1	-24.4	0	38.45	54	-15.55	74	-35.55	0-360	101	H
5	*** 1.593	39.47	Pk	28.1	-24.3	0	43.27	54	-10.73	74	-30.73	0-360	101	V
2	*** 4.80359	62.08	PK2	33.9	-45.6	0	50.38	-	-	74	-23.62	2	116	H
	*** 4.80421	55.47	ADV	33.9	-45.6	.5	44.27	54	-9.73	-	-	2	116	H
4	*** 9.41063	51.04	Pk	36.3	-40.3	0	47.04	54	-6.96	74	-26.96	0-360	200	H
6	*** 4.80375	58.01	Pk	33.9	-45.6	0	46.31	54	-7.69	74	-27.69	0-360	200	V
8	*** 9.41344	50.05	Pk	36.3	-40	0	46.35	54	-7.65	74	-27.65	0-360	200	V
7	7.20469	52.23	Pk	35.4	-42.1	0	45.53	-	-	-	-	0-360	101	V
3	7.20563	54.87	Pk	35.4	-42.2	0	48.07	-	-	-	-	0-360	101	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

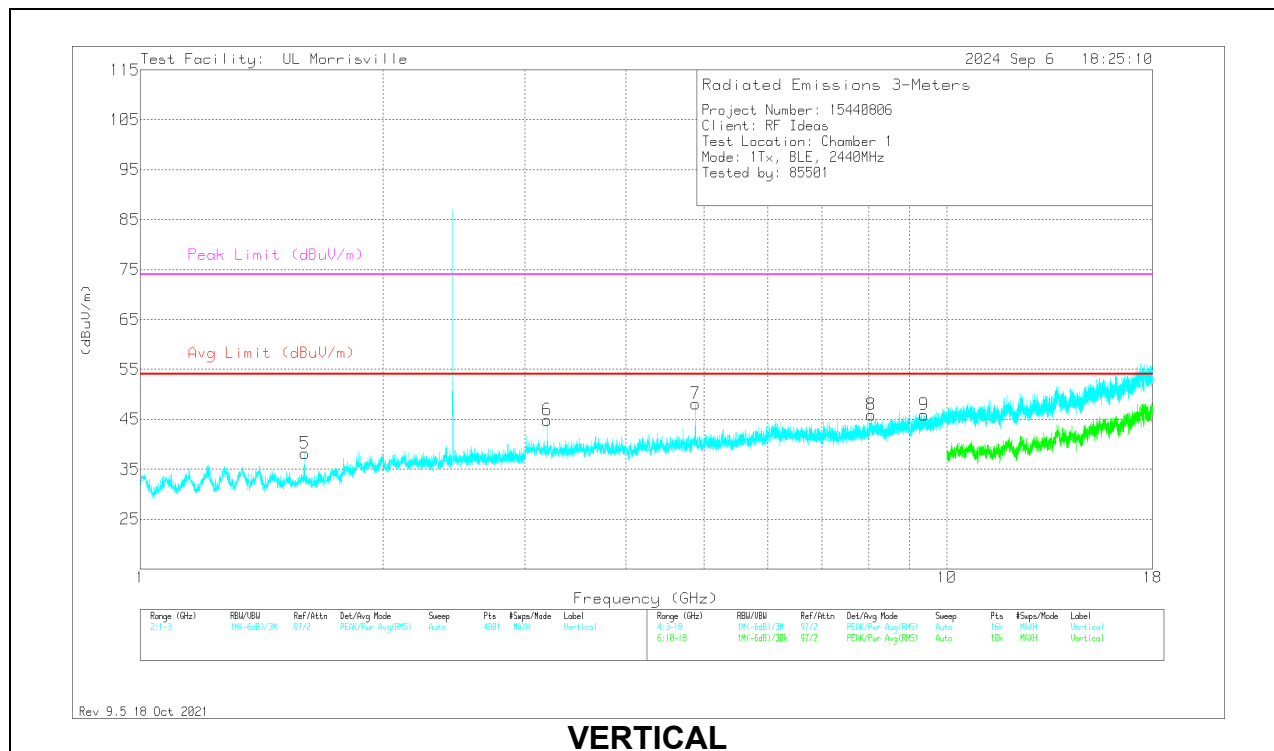
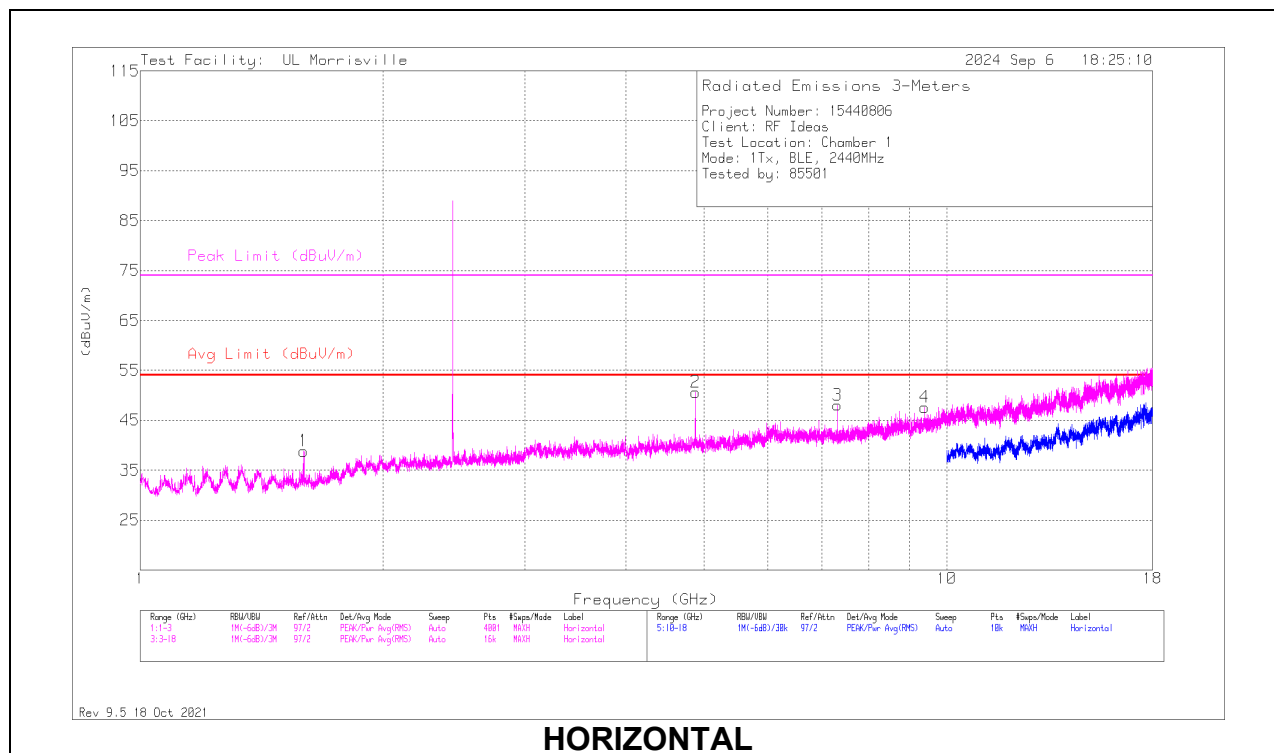
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

PK2 - KDB558074 Method: Maximum Peak

ADV - Linear Voltage Average

MID CHANNEL RESULTS



RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	135143 (dB/m)	Gain/Loss (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 1.5955	35.01	Pk	28.1	-24.3	0	38.81	54	-15.19	74	-35.19	0-360	199	H
5	* ** 1.6	34.44	Pk	28.1	-24.4	0	38.14	54	-15.86	74	-35.86	0-360	200	V
2	* ** 4.87948	63.99	PK2	34	-44.7	0	53.29	-	-	74	-20.71	2	102	H
	*** 4.88008	57.51	ADV	34	-44.7	.5	47.31	54	-6.69	-	-	2	102	H
3	* ** 7.32064	57.08	PK2	35.4	-41.7	0	50.78	-	-	74	-23.22	2	117	H
	*** 7.32061	47.91	ADV	35.4	-41.7	.5	42.11	54	-11.89	-	-	2	117	H
4	* ** 9.39656	51.45	Pk	36.3	-40.2	0	47.55	54	-6.45	74	-26.45	0-360	101	H
7	* ** 4.88044	60.33	PK2	34	-44.7	0	49.63	-	-	74	-24.37	15	110	V
	*** 4.88019	52.35	ADV	34	-44.7	.5	42.15	54	-11.85	-	-	15	110	V
8	* ** 8.06625	51.34	Pk	35.9	-41.3	0	45.94	54	-8.06	74	-28.06	0-360	200	V
9	* ** 9.37406	49.93	Pk	36.2	-40.2	0	45.93	54	-8.07	74	-28.07	0-360	101	V
6	3.19688	56.62	Pk	32.6	-44.4	0	44.82	-	-	-	-	0-360	200	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

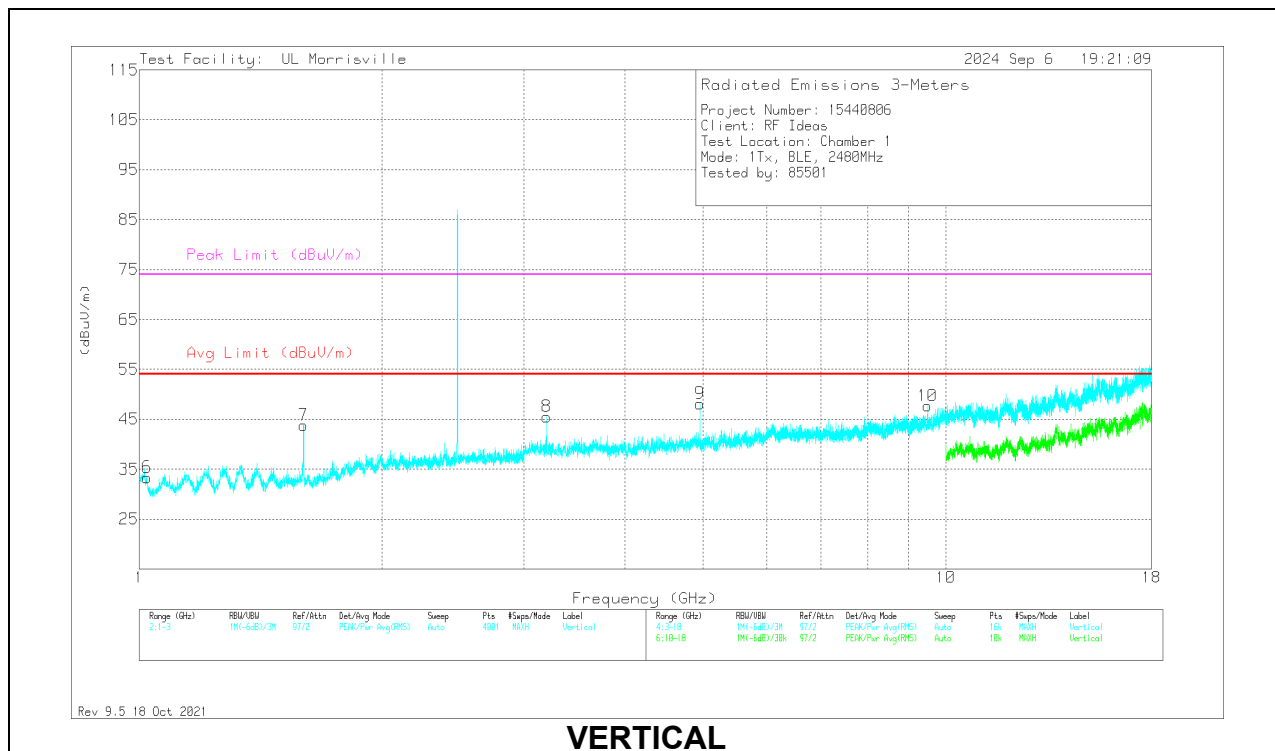
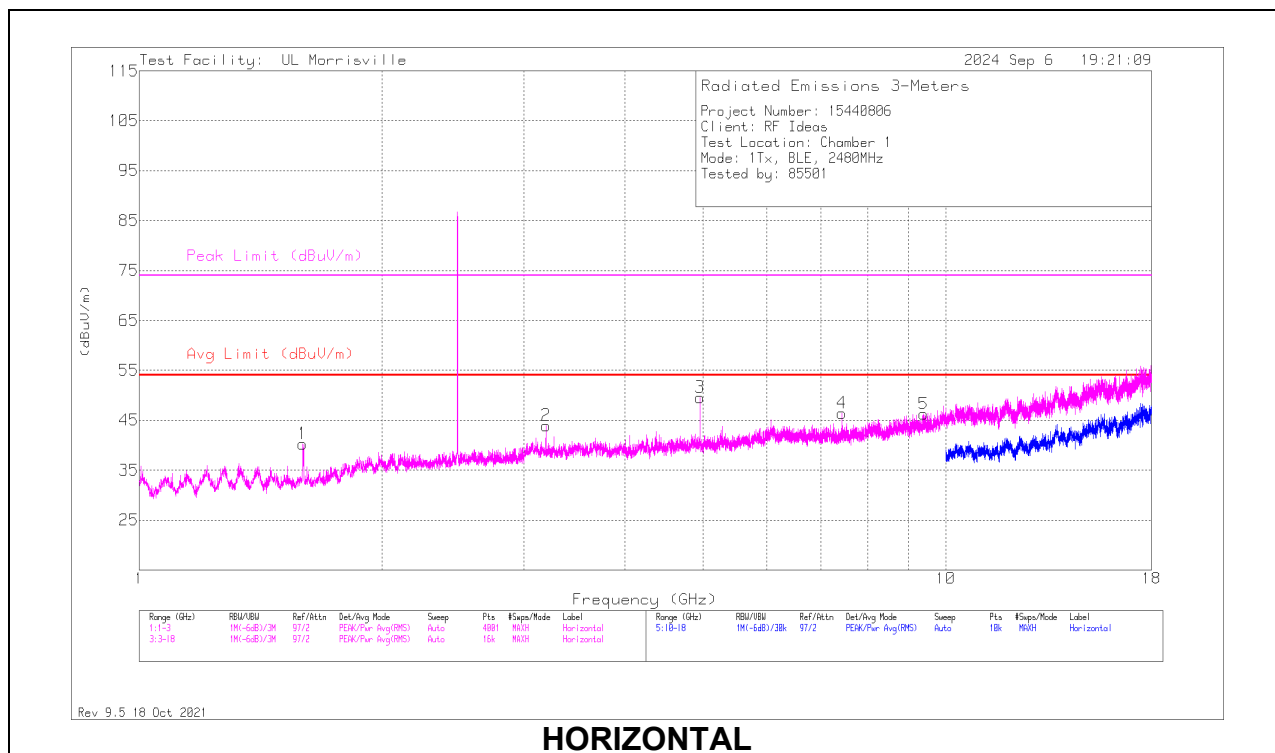
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

PK2 - KDB558074 Method: Maximum Peak

ADV - Linear Voltage Average

HIGH CHANNEL RESULTS



RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	135143 (dB/m)	Gain/Loss (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	*** 1.5955	36.42	Pk	28.1	-24.3	0	40.22	54	-13.78	74	-33.78	0-360	101	H
6	*** 1.0215	32.67	Pk	27.7	-27.1	0	33.27	54	-20.73	74	-40.73	0-360	101	V
7	*** 1.5985	40.09	Pk	28.1	-24.4	0	43.79	54	-10.21	74	-30.21	0-360	200	V
3	*** 4.95945	63.22	PK2	34.2	-44.8	0	52.62	-	-	74	-21.38	0	109	H
	*** 4.95977	56.84	ADV	34.2	-44.8	.5	46.74	54	-7.26	-	-	0	109	H
4	*** 7.43906	52.05	Pk	35.4	-41	0	46.45	54	-7.55	74	-27.55	0-360	101	H
5	*** 9.39375	49.92	Pk	36.3	-40	0	46.22	54	-7.78	74	-27.78	0-360	199	H
9	*** 4.9596	59.8	PK2	34.2	-44.8	0	49.2	-	-	74	-24.8	26	132	V
	*** 4.95996	52.26	ADV	34.2	-44.8	.5	42.16	54	-11.84	-	-	26	132	V
10	*** 9.49594	51.66	Pk	36.4	-40.4	0	47.66	54	-6.34	74	-26.34	0-360	200	V
2	3.19688	55.75	Pk	32.6	-44.4	0	43.95	-	-	-	-	0-360	101	H
8	3.19969	57.28	Pk	32.6	-44.4	0	45.48	-	-	-	-	0-360	101	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

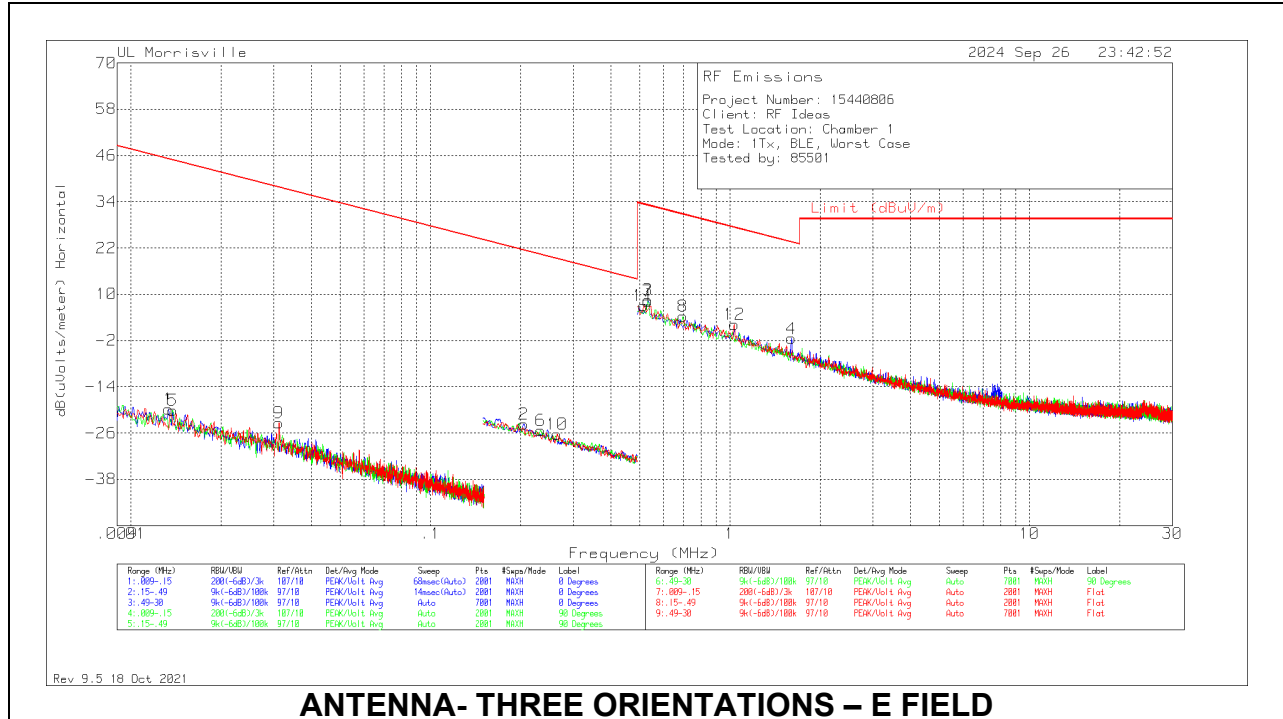
PK2 - KDB558074 Method: Maximum Peak

ADV - Linear Voltage Average

10.3. WORST CASE BELOW 30MHZ

SPURIOUS EMISSIONS BELOW 30 MHz (WORST-CASE CONFIGURATION)

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).

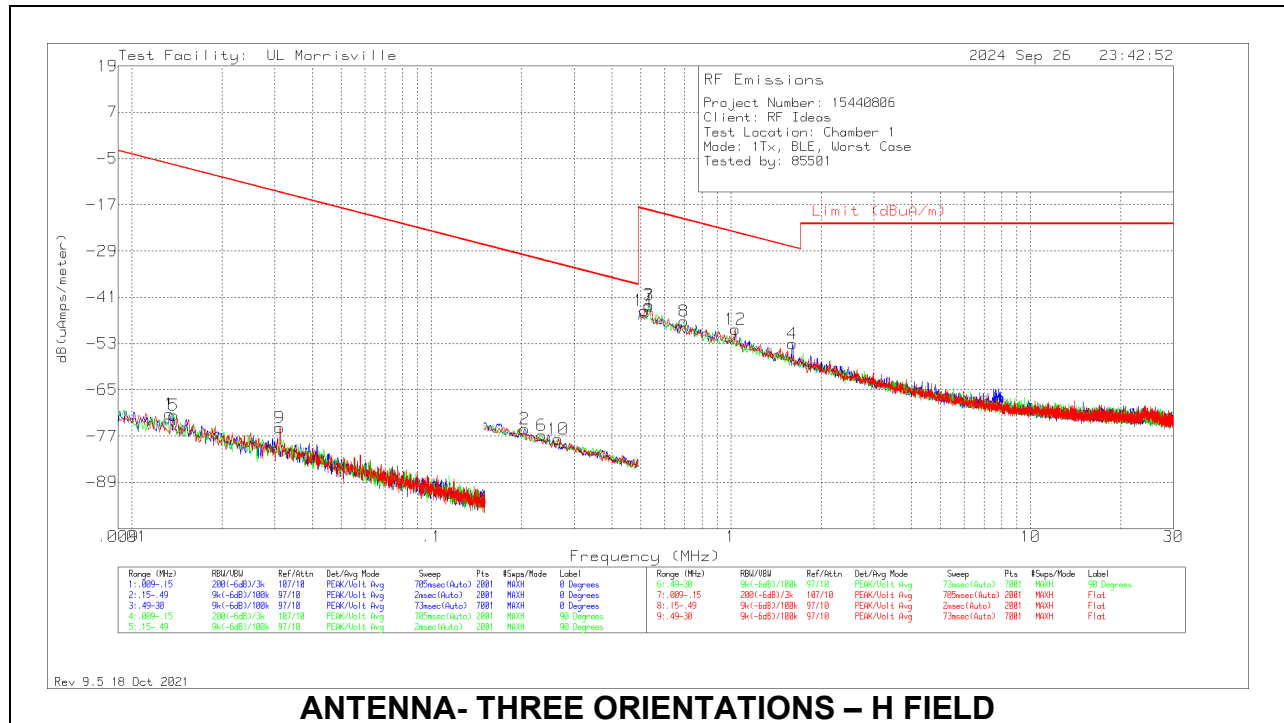


ANTENNA- THREE ORIENTATIONS – E FIELD

Below 30MHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	65682 (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
1	.01333	42.84	Pk	17.3	.1	-80	-19.76	45.11	65.11	-64.87	0-360	0 degs
5	.01383	42.79	Pk	17	.1	-80	-20.11	44.79	64.79	-64.9	0-360	90 degs
9	.03122	43.64	Pk	12.9	.1	-80	-23.36	37.72	57.72	-61.08	0-360	Flat
2	.205	46.07	Pk	10.1	.1	-80	-23.73	21.37	41.37	-45.1	0-360	0 degs
6	.23313	44.49	Pk	10.1	.1	-80	-25.31	20.25	40.25	-45.56	0-360	90 degs
10	.26509	43.46	Pk	10.1	.1	-80	-26.34	19.14	39.14	-45.48	0-360	Flat
11	.5153	36.82	Pk	10.2	.1	-40	7.12	33.36	-	-26.24	0-360	Flat
3	.53216	38.21	Pk	10.2	.1	-40	8.51	33.08	-	-24.57	0-360	0 degs
7	.53216	37.92	Pk	10.2	.1	-40	8.22	33.08	-	-24.86	0-360	90 degs
8	.69658	33.94	Pk	10.2	.1	-40	4.24	30.74	-	-26.5	0-360	90 degs
12	1.03386	31.66	Pk	10.4	.1	-40	2.16	27.32	-	-25.16	0-360	Flat
4	1.60302	27.91	Pk	10.4	.2	-40	-1.49	23.51	-	-25	0-360	0 degs

Pk - Peak detector



ANTENNA- THREE ORIENTATIONS – H FIELD

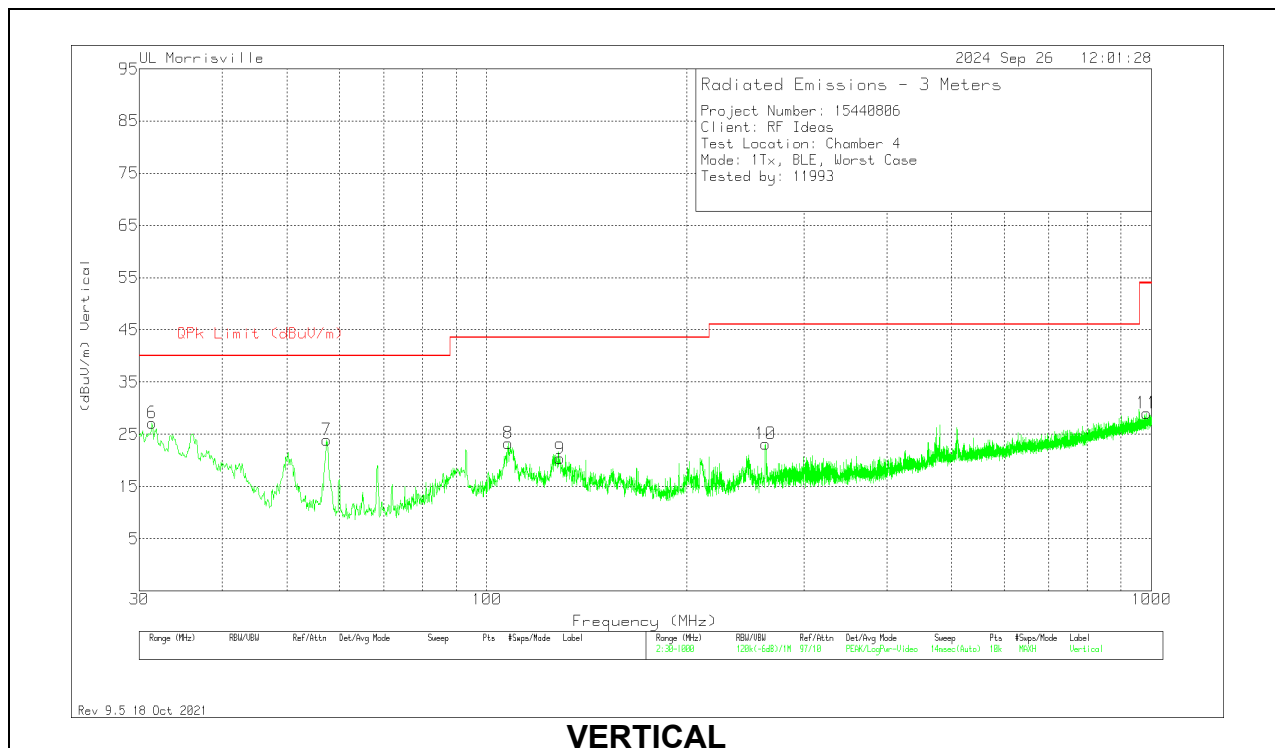
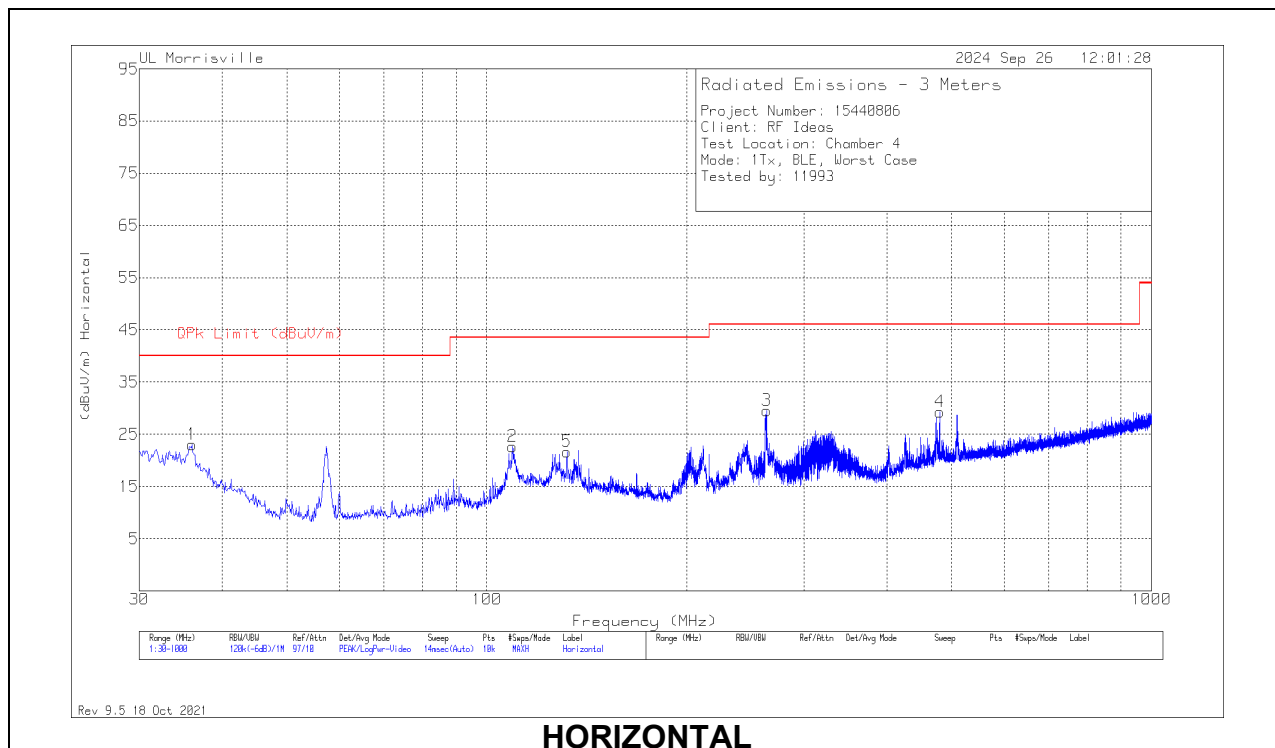
Below 30MHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	65682 (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)	Loop Angle
1	.01333	42.84	Pk	-34.2	.1	-80	-71.26	-6.39	13.61	-64.87	0-360	0 degs
5	.01383	42.79	Pk	-34.5	.1	-80	-71.61	-6.71	13.29	-64.9	0-360	90 degs
9	.03122	43.64	Pk	-38.6	.1	-80	-74.86	-13.78	6.22	-61.08	0-360	Flat
2	.205	46.07	Pk	-41.4	.1	-80	-75.23	-30.13	-10.13	-45.1	0-360	0 degs
6	.23313	44.49	Pk	-41.4	.1	-80	-76.81	-31.25	-11.25	-45.56	0-360	90 degs
10	.26509	43.46	Pk	-41.4	.1	-80	-77.84	-32.36	-12.36	-45.48	0-360	Flat
11	.5153	36.82	Pk	-41.3	.1	-40	-44.38	-18.14	-	-26.24	0-360	Flat
3	.53216	38.21	Pk	-41.3	.1	-40	-42.99	-18.42	-	-24.57	0-360	0 degs
7	.53216	37.92	Pk	-41.3	.1	-40	-43.28	-18.42	-	-24.86	0-360	90 degs
8	.69658	33.94	Pk	-41.3	.1	-40	-47.26	-20.76	-	-26.5	0-360	90 degs
12	1.03386	31.66	Pk	-41.1	.1	-40	-49.34	-24.18	-	-25.16	0-360	Flat
4	1.60302	27.91	Pk	-41.1	.2	-40	-52.99	-27.99	-	-25	0-360	0 degs

Pk - Peak detector

10.4. WORST CASE BELOW 1 GHZ

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION)



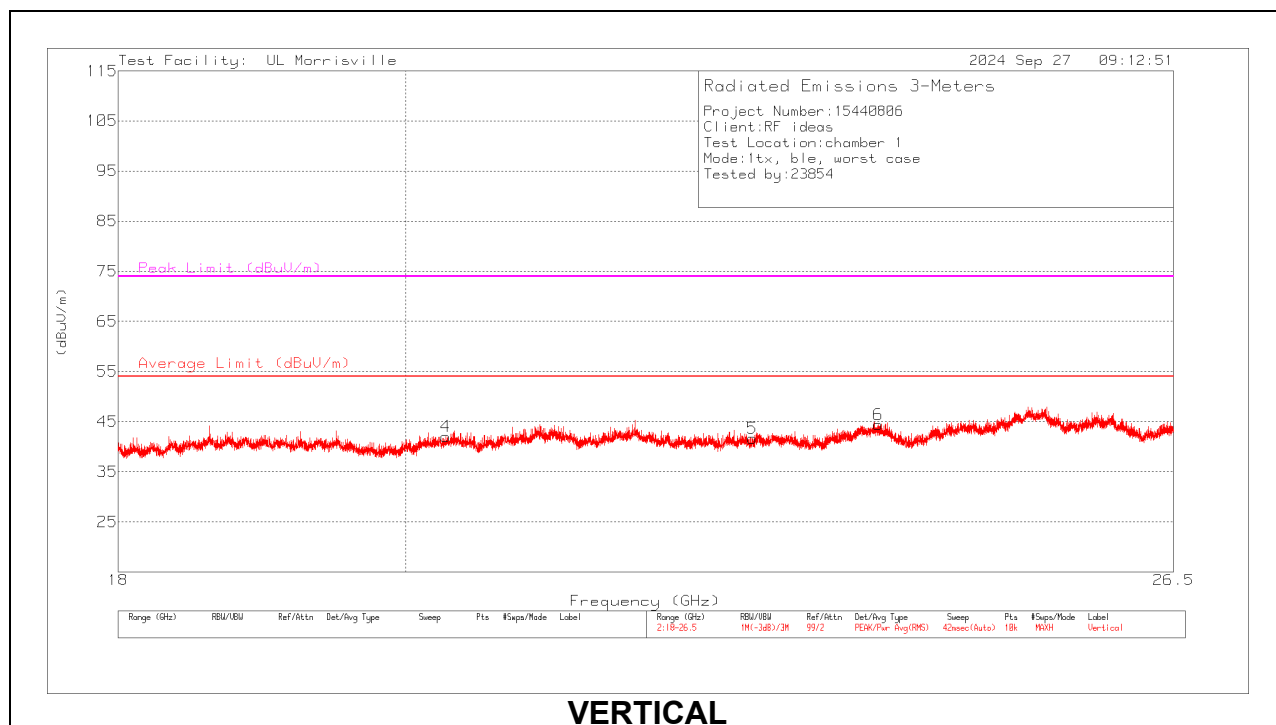
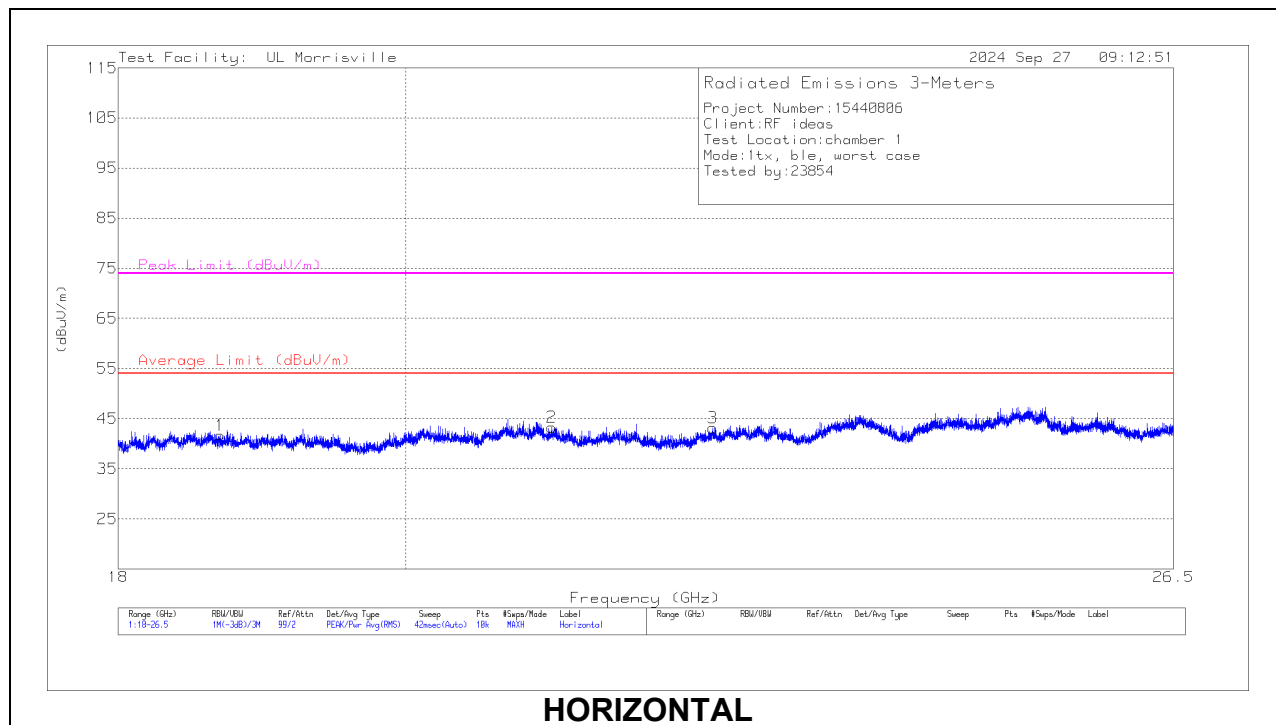
Below 1GHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	90628 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* ** 109.249	35.35	Pk	18.7	-31.4	22.65	43.52	-20.87	0-360	200	H
3	* ** 263.576	41.01	Pk	18.8	-30.3	29.51	46.02	-16.51	0-360	100	H
5	* ** 131.947	32.91	Pk	19.9	-31.2	21.61	43.52	-21.91	0-360	100	H
9	* ** 128.94	31.54	Pk	20	-31.2	20.34	43.52	-23.18	0-360	100	V
10	* ** 262.703	35	Pk	18.6	-30.4	23.2	46.02	-22.82	0-360	100	V
11	* ** 982.54	26.16	Pk	29.1	-26.2	29.06	53.97	-24.91	0-360	100	V
6	31.358	33.38	Pk	25.9	-32.1	27.18	-	-	0-360	100	V
1	36.014	32.27	Pk	22.9	-32.1	23.07	-	-	0-360	100	H
7	57.451	42.03	Pk	13.6	-31.7	23.93	-	-	0-360	100	V
8	107.6	36.33	Pk	18.4	-31.4	23.33	-	-	0-360	100	V
4	479.983	35.03	Pk	23.8	-29.5	29.33	-	-	0-360	100	H

Pk - Peak detector

10.5. WORST CASE 18-26 GHZ

SPURIOUS EMISSIONS 18-26 GHz (WORST-CASE CONFIGURATION)



18 – 26GHz Data

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	204704 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 18.68758	48.71	Pk	33.1	-40.1	41.71	54	-12.29	74	-32.29	0-360	300	H
2	* ** 21.10049	49.55	Pk	33.7	-40	43.25	54	-10.75	74	-30.75	0-360	199	H
3	* ** 22.38301	49.24	Pk	34.1	-40.2	43.14	54	-10.86	74	-30.86	0-360	149	H
4	* ** 20.29562	48.54	Pk	33.6	-40.1	42.04	54	-11.96	74	-31.96	0-360	101	V
5	* ** 22.70768	47.75	Pk	34.1	-40.2	41.65	54	-12.35	74	-32.35	0-360	300	V
6	* ** 23.78027	49.94	Pk	34.4	-39.9	44.44	54	-9.56	74	-29.56	0-360	151	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

11. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §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 (MHz)	Limits (dB μ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

Notes:
1. The lower limit shall apply at the transition frequencies
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

TEST PROCEDURE

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

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

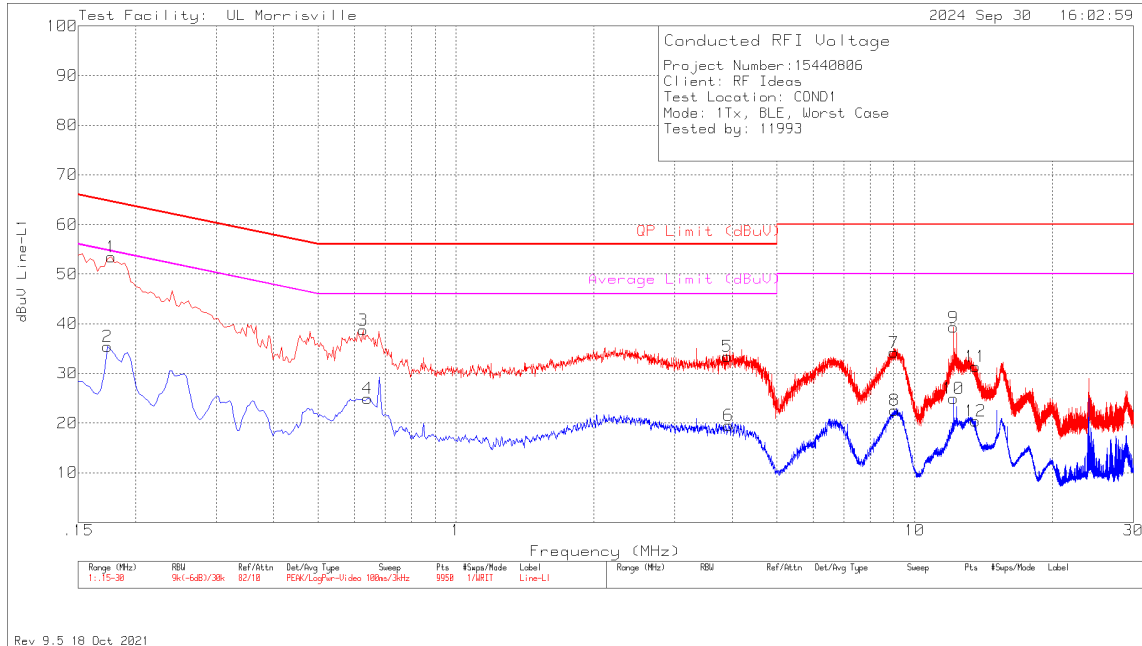
Line conducted data is recorded for both NEUTRAL and HOT lines.

RESULTS

No non-compliance noted:

Conducted Emissions Graph

Line 1



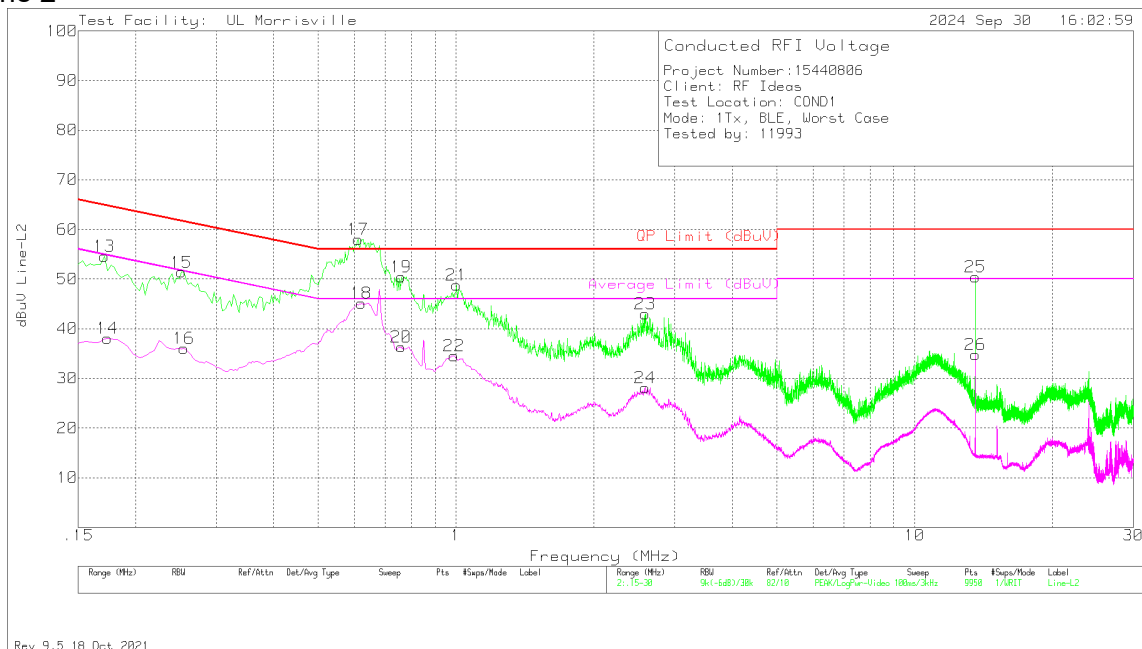
Conducted Emissions Data Points

Range 1: Line-L1 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VDF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit (dBuV)	Margin (dB)	Average Limit (dBuV)	Margin (dB)
2	.174	25.47	Av	.2	9.8	35.47	-	-	54.77	-19.3
1	.177	43.48	Pk	.2	9.8	53.48	64.63	-11.15	-	-
3	.627	28.96	Pk	0	9.8	38.76	56	-17.24	-	-
4	.642	15.19	Av	0	9.8	24.99	-	-	46	-21.01
5	3.903	23.47	Pk	0	9.9	33.37	56	-22.63	-	-
6	3.927	9.65	Av	0	9.9	19.55	-	-	46	-26.45
7	9.015	24.12	Pk	.1	10	34.22	60	-25.78	-	-
8	9.039	12.49	Av	.1	10	22.59	-	-	50	-27.41
9	12.162	29.17	Pk	.1	10	39.27	60	-20.73	-	-
10	12.162	14.89	Av	.1	10	24.99	-	-	50	-25.01
12	13.56	10.27	Av	.1	10	20.37	-	-	50	-29.63
11	13.584	21.3	Pk	.1	10	31.4	60	-28.6	-	-

Pk - Peak detector
Av - Average detection

Conducted Emissions Graph

Line 2



Conducted Emissions Data Points

Range 2: Line-L2 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VDF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit (dBuV)	Margin (dB)	Average Limit (dBuV)	Margin (dB)
13	.171	44.6	Pk	.2	9.8	54.6	64.91	-10.31	-	-
14	.174	28.11	Av	.2	9.8	38.11	-	-	54.77	-16.66
15	.252	41.48	Pk	.1	9.8	51.38	61.69	-10.31	-	-
16	.255	26.17	Av	.1	9.8	36.07	-	-	51.59	-15.52
17	.6287	41.39	Qp	0	9.8	51.19	56	-4.81	-	-
18	.62852	34.64	Ca	0	9.8	44.44	-	-	46	-1.56
19	.76678	32.53	Qp	0	9.8	42.33	56	-13.67	-	-
20	.759	26.56	Av	0	9.8	36.36	-	-	46	-9.64
22	.99	24.7	Av	0	9.8	34.5	-	-	46	-11.5
21	1.002	38.98	Pk	0	9.8	48.78	56	-7.22	-	-
23	2.586	33.18	Pk	0	9.8	42.98	56	-13.02	-	-
24	2.586	18.32	Av	0	9.8	28.12	-	-	46	-17.88
25	13.563	40.31	Pk	.1	10	50.41	60	-9.59	-	-
26	13.563	24.66	Av	.1	10	34.76	-	-	50	-15.24

Pk - Peak detector

Av - Average detection

Qp - Quasi-Peak detector

Ca - CISPR average detection

12. SETUP PHOTOS

Please refer to R15440806-EP3 for setup photos

END OF TEST REPORT