TEST REPORT

Report Number. : R14753279-E2

Applicant	:	Starry Inc. 38 Chauncy St, Suite 200 Boston, MA, 02111, US
Model	:	S01711
FCC ID	:	2AGZ3S01711
EUT Description	:	Starry Comet37 2.0 (5Ghz Radio)
Test Standard(s)	:	FCC 47 CFR PART 15 SUBPART E

Date Of Issue:
2023-11-03

Prepared by:
UL LLC
12 Laboratory Dr.
Research Triangle Park, NC 27709 U.S.A.
TEL: (919) 549-1400

CERT #0751.06

REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	2023-08-09	Initial Issue	Noah Bennett
V2	2023-09-08	Added Sim Tx Scan	Noah Bennett
V3	2023-10-17	Updated Power Measurements. Removed VHT80 from report.	Noah Bennett
V4	2023-11-03	TCB Feedback 1: -Corrected calibration dates in section 8	Noah Bennett

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	**Starry Inc.** 38 Chauncy St, Suite 200 Boston, MA, 02111 US
EUT DESCRIPTION:	Starry Comet37 2.0 (5Ghz Radio)
MODEL:	S01711
SERIAL NUMBER:	2329000002
SAMPLE RECEIPT DATE:	2023-07-11
DATE TESTED:	2023-07-25 to 2023-10-06

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart E	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.

Approved & Released For
UL LLC. By:

Brian Kiewra
Project Engineer
Consumer Technology Division
UL LLC.

Prepared By:

Noah Bennett
Engineer
Consumer Technology Division
UL LLC.

2. TEST RESULT SUMMARY

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

1) Antenna gain and type (section 6.3)
2) Supported Modes, Data Rates, Channels, Worst Case Data Rate, and Power Settings (see section 6.5)

FCC Clause	Requirement	Result	Comment
See Comment	Duty Cycle	Reporting purposes only	Per ANSI C63.10, Section 12.2.
15.407 (e)	6 dB BW	Complies	None.
15.407 (a) (3), (i)	Output Power		None.
15.407 (a) (3), (i)	PSD		None.
15.209, 15.205, 15.407 (b) (4)	Radiated Emissions		None.
15.207	AC Mains Conducted Emissions		None.
15.407(h)	TPC and Dynamic Frequency Selection	N/A	Only applicable to UNII-2A and 2C. EUT only supports UNII-3 Band.

3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with;

- FCC 47 CFR Part 2
- FCC 47 CFR Part 15E
- FCC KDB 905462 D02 v02/D03 v01r02/D06 v02
- FCC KDB 789033 D02 v02r01,
- KDB 414788 D01 Radiated Test Site v01r01
- ANSI C63.10-2013,

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
☒	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)	141.2 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 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

6. EQUIPMENT UNDER TEST

6.1. EUT DESCRIPTION

The Starry Comet37 2.0 is a customer terminal transmitter / receiver radio for use on Starry's 37 - 40 GHz millimeter-wave (mmWave) network. The Comet37 2.0 utilizes the U-NII-3 5GHz band as a secondary link as well as BLE for provisioning and installation. The system is equipped with a GPS receiver to facilitate precise timing control.

6.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

5.8 GHz BAND (FCC)

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5.8 GHz band, 1TX			
5745-5825	802.11a	14.00	25.12
5745-5825	802.11n HT20	14.12	25.82
5755-5795	802.11n HT40	13.83	24.15

6.3. DESCRIPTION OF AVAILABLE ANTENNAS

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

Chain	Designation in Documentation	Type	Frequency Range (MHz)	Maximum Gain (dBi)
1	5.8 WLAN Antenna	Patch Antenna	5745-5775	4.29

6.4. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was 7/14/2023 Nightly Development.
The test utility software used during testing was fcc (Starry Python module) == 7.0.0.

6.5. WORST-CASE CONFIGURATION AND MODE

Radiated emissions below 1GHz, above 18GHz, and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario. This was found to be 11n HT20.

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

Per customer declaration, The EUT supports the following Channels, BWs, Data Rates, and Power settings:

Center Frequency (MHz)	Channel	Bandwidth	MCS
5745	149	20	0
5785	157		
5825	165		
5755	149	40	
5795	157		

Per customer declarations, the EUT is only meant to operate in 1 orientation. Therefore, all testing was performed in this orientation.

For 6dB BW, 11a and 11n HT20 covers 11n HT40, as they are narrower BWs, cover the same frequency block (5735 – 5835) and the limit does not have a maximum BW requirement.

Simultaneous transmission was investigated on the worst-case modes, data rates, and power settings. Below was the emission investigated:

1. BLE 1Mbps 2480MHz + 5.8 WLAN 11n HT20 5785MHz

6.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
NUC	Jetway	JBC313U591W-31ACB	19CF319X002872	N/A
GNSS Simulator	Racelogic	LabSat	--	
Starry Link	Starry	S00812	--	
Bias-T	Starry	850-00128	--	
Ethernet Switch	TP-Link	TL-SG108	22241J3004251	
Monitor	Viewsonic	VS15453	V1X203841229	
Keyboard	Dell	SK-8120	CN-04G481-71616-34R-099U-A00	

I/O CABLES

I/O Cable List						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	SMA	1	SMA	SMA	>3M	Provides GPS to EUT
2	RG-6	1	RG-6	RG-6	>3M	Provides power, ground & communication to EUT

TEST SETUP

The EUT is connected to a test stand during the tests, which includes a small form factor computer. Test software exercised the radio system.

SETUP DIAGRAMS

Please refer to R14753279-EP1 for setup diagrams and setup photos.

7. MEASUREMENT METHOD

On Time and Duty Cycle: KDB 789033 D02 v02r01, Section B.

6 dB Emission BW: KDB 789033 D02 v02r01, Section C.2

99% Occupied BW: KDB 789033 D02 v02r01, Section D.

Conducted Output Power: KDB 789033 D02 v02r01, Section E.3.b (Method PM-G) and KDB 789033 D02 v02r01, Section E.2.b (Method SA-1)

Power Spectral Density: KDB 789033 D02 v02r01, Section F

Unwanted emissions in restricted bands: KDB 789033 D02 v02r01, Sections G.3, G.4, G.5, and G.6.

Unwanted emissions in non-restricted bands: KDB 789033 D02 v02r01, Sections G.3, G.4, and G.5.

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

Radiated Spurious Emissions Below 30MHz: ANSI C63.10-2013 Section 6.3 to 6.6

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 2)

Equip. ID	Description	Manufacturer/Brand	Model Number	Last Cal.	Next Cal.
	0.009-30MHz				
135144	Active Loop Antenna	ETS-Lindgren	6502	2023-01-17	2024-01-17
	30-1000 MHz				
90627	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2022-09-07	2023-09-07
	1-18 GHz				
88761	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2022-09-13	2023-09-13
	18-40 GHz				
78835	Horn Antenna, 18-26.5GHz	ARA	MWH-1826/B	2022-12-15	2023-12-15
77783	Horn Antenna, 26-40GHz	ARA	MWH-2640/B	2022-12-15	2023-12-15
	Gain-Loss Chains				
91975	Gain-loss string: 0.009-30MHz	Various	Various	2023-06-06	2024-06-06
91978	Gain-loss string: 25-1000MHz	Various	Various	2023-06-06	2024-06-06
91977	Gain-loss string: 1-18GHz	Various	Various	2023-06-06	2024-06-06
136042	Gain-loss string: 18-40GHz	Various	Various	2023-06-06	2024-06-06
	Receiver & Software				
206496	Spectrum Analyzer	Rohde & Schwarz	ESW44	2023-03-24	2024-03-24
90416	Spectrum Analyzer	Keysight	N9030A	2023-06-09	2024-06-30
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
	Additional Equipment used				
200540	Environmental Meter	Fisher Scientific	15-077-963	2022-10-05	2023-10-05

NOTES:

* Testing is completed before equipment expiration date.

Test Equipment Used - Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	Common Equipment				
	Conducted Room 1				
SA0026	Spectrum Analyzer	Keysight Technologies	N9030A	2022-08-02	2023-08-02
90778	RF Power Meter	Keysight Technologies	N1911A	2022-09-10	2023-09-10
PWS001 (PRE0137347)	Peak and Avg Power Sensor, 50MHz to 18GHz	Keysight Technologies	N1921A	2022-07-07	2023-07-31
211056	Real-Time Peak Power Sensor 50MHz to 8GHz	Boonton	RTP5000	2023-08-01	2024-08-01
210642	Environmental Meter	Fisher Scientific	15-077-963	2021-08-16	2023-08-16
SOFTEMI	Antenna Port Software	UL	Version 2022.8.16	NA	NA
Power Software	Boonton Power Analyzer	Boonton	Version 3.0.13.0	NA	NA
	Cables/Attenuators				
CBL031	SMA Male to SMA Male Cable Using PE-P141 Coax - 12"	Pasternack	Sucoflex 104PEA	2023-06-27	2024-06-27
CBL032	SMA Male to SMA Male Cable Using PE-P141 Coax - 36"	Pasternack	Sucoflex 104PEA	2023-06-27	2024-06-27
226560	SMA Coaxial 10dB Attenuator 25MHz-18GHz	CentricRF	C18S2-10	2023-02-16	2024-02-16
226565	SMA Coaxial 10dB Attenuator 25MHz-18GHz	CentricRF	C18S2-10	2023-02-16	2024-02-16

NOTES:

* Testing is completed before equipment expiration date.

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	2023-04-04	2024-04-04
210642	Environmental Meter	Fisher Scientific	15-077-963	2021-08-16	2023-08-16
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
52859	Transient Limiter, 0.009-100MHz	Electro-Metrics	EM-7600	2023-04-04	2024-04-04
92852	AC Power Source	Elgar	CW2501M (s/n 1523A02397)	NA	NA
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
	Miscellaneous (if needed)				
LISN008	LISN, 50-ohm/50-uH, 2-conductor, 25A (For support gear only.)	Solar Electronics	8012-50-R-24-BNC	NA	NA

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville – Chamber 1)

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	1-18 GHz				
206211	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2023-04-06	2024-04-06
	Gain-Loss Chains				
91979	Gain-loss string: 1-18GHz	Various	Various	2023-05-16	2024-05-16
	Receiver & Software				
197954	Spectrum Analyzer	Rohde & Schwarz	ESW44	2023-02-02	2024-02-02
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
	Additional Equipment used				
200539	Environmental Meter	Fisher Scientific	15-077-963	2022-10-05	2023-10-05

NOTES:

* Testing is completed before equipment expiration date.

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)
802.11a 1TX	100.000	100.000	1.000	100.00	0.00	0.010
802.11n HT20 1TX	100.000	100.000	1.000	100.00	0.00	0.010
802.11n HT40 1TX	100.000	100.000	1.000	100.00	0.00	0.010

DUTY CYCLE 802.11a 1TX MODE

DUTY CYCLE 802.11n HT20 1TX MODE

DUTY CYCLE 802.11n HT40 1TX MODE

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9.2. 6 dB BANDWIDTH

LIMITS

FCC §15.407 (e)

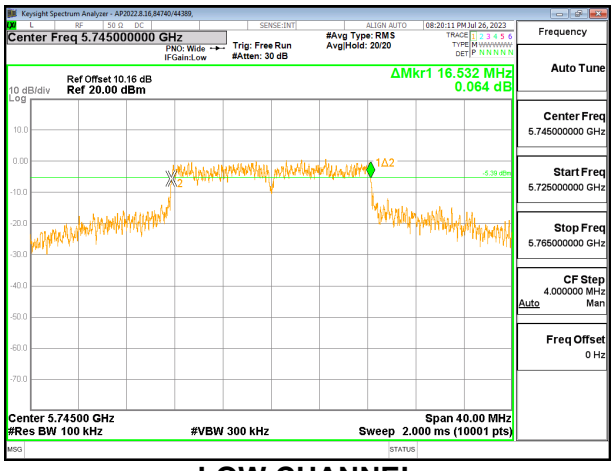
The minimum 6 dB bandwidth shall be at least 500 kHz.

RESULTS

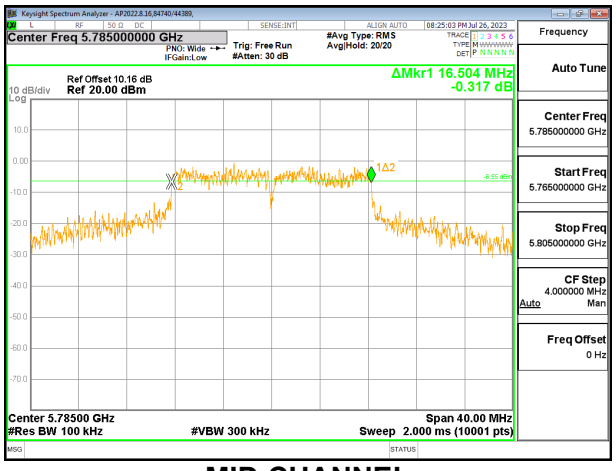
9.2.1. 802.11a MODE IN THE 5.8 GHz BAND

1TX Antenna 1 MODE

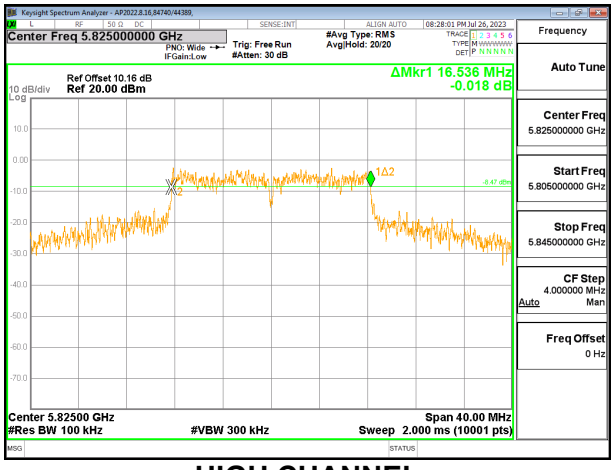
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	5745	16.532	0.5
Mid	5785	16.504	0.5
High	5825	16.536	0.5



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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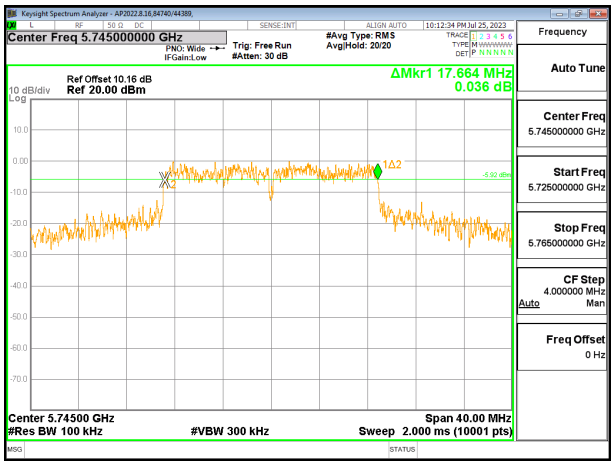
9.2.2. 802.11n HT20 MODE IN THE 5.8 GHz BAND

1TX Antenna 1 MODE

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	5745	17.664	0.5
Mid	5785	17.640	0.5
High	5825	17.736	0.5



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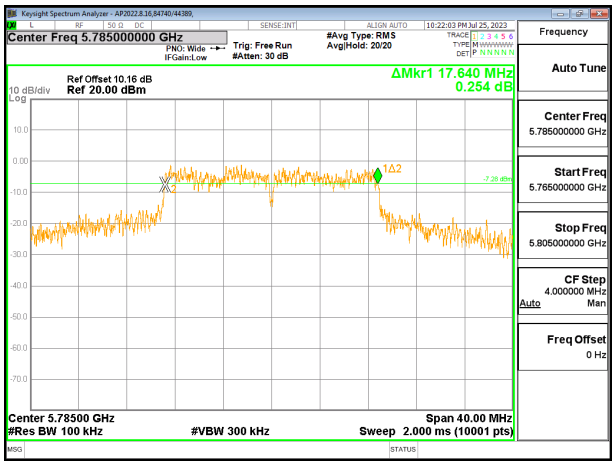

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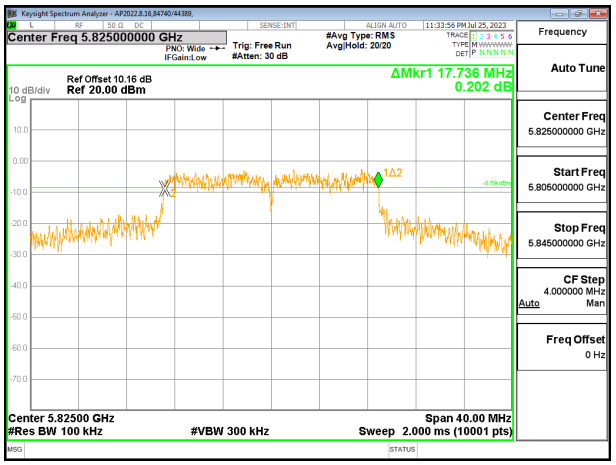

HIGH CHANNEL

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9.3. OUTPUT POWER AND PSD

LIMITS

FCC §15.407
Band 5.725-5.85 GHz

The maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information.

TEST PROCEDURE

The measurement method used for output power is KDB 789033 D02 v02r01, Section E.3.b (Method PM-G). The measurement method used for power spectral density is KDB 789033 D02 v02r01, Section F

The cable assembly insertion loss of 9.99 dB was entered as an offset in the power meter to allow for a peak reading of power. Total loss was calculated from a 9.75 dB attenuator, -0.17dB “Combined” EUT cable and 0.49 dB test cable. The power output was measured on the EUT antenna port an Internal U.FL port using a U.FL to 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.

The “Combined” EUT cable loss was found from a U.FL to U.FL cable, referred to as Cable A, that is installed in the end product, and a U.FL to SMA cable, referred to as Cable B, was included for testing purposes only. Per customer declaration, Cable B is not installed on the EUT, but Cable A is. So, “Combined” EUT loss is corrected by taking the loss of Cable A, 0.35dB, and subtracting the loss of Cable B, 0.60dB, resulting in -0.17dB, or the “Combined” EUT cable loss. This value was than used as part of the overall link budget of the setup.

DIRECTIONAL ANTENNA GAIN

For 1 TX:
There is only one transmitter output therefore the directional gain is equal to the antenna gain.

RESULTS

9.3.1. 802.11a MODE IN THE 5.8 GHz BAND

1TX Antenna 1 MODE (FCC)

Test Engineer:	84740/44389 27465/44389
Test Date:	7/25/2023 -7/26/2023 10/6/2023

Antenna Gain and Limit

Channel	Frequency (MHz)	Directional Gain (dBi)	Power Limit (dBm)	PSD Limit (dBm/ 500KHz)
Low	5745	4.29	30.00	30.00
Mid	5785	4.29	30.00	30.00
High	5825	4.29	30.00	30.00

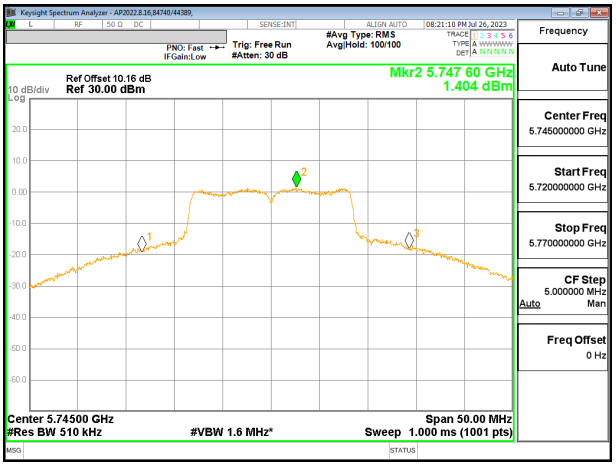
Duty Cycle CF (dB)	0.00	**Included in Calculations of Corr'd Power & PSD**

Output Power Results

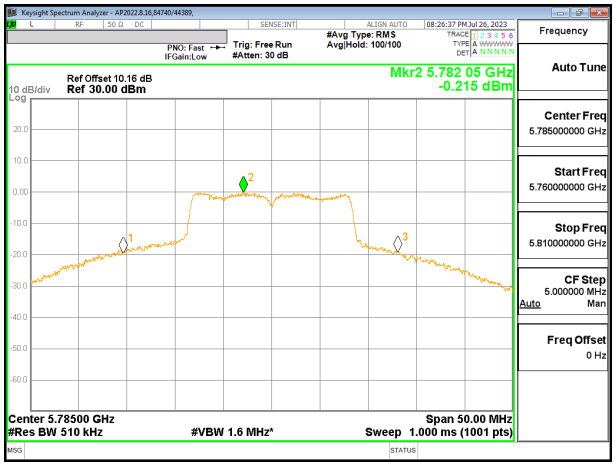
Channel	Frequency (MHz)	Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5745	14.00	14.00	30.00	-16.00
Mid	5785	12.23	12.23	30.00	-17.77
High	5825	11.81	11.81	30.00	-18.19

PSD Results

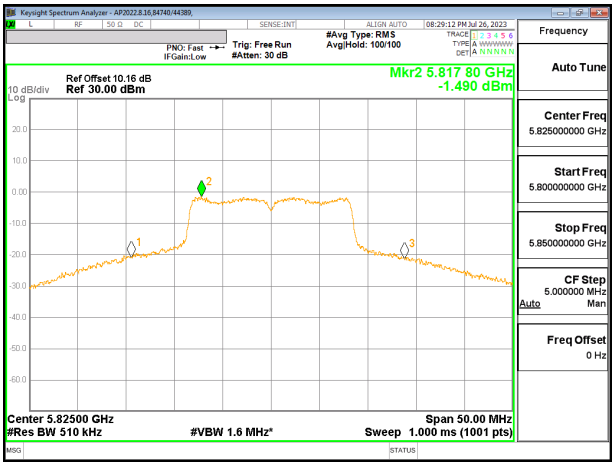
Channel	Frequency (MHz)	Meas PSD (dBm/ 500KHz)	Total Corr'd PSD (dBm/ 500KHz)	PSD Limit (dBm/ 500KHz)	PSD Margin (dB)
Low	5745	1.404	1.404	30.00	-28.60
Mid	5785	-0.215	-0.215	30.00	-30.22
High	5825	-1.490	-1.490	30.00	-31.49



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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9.3.2. 802.11n HT20 MODE IN THE 5.8 GHz BAND

1TX Antenna 1 MODE (FCC)

Test Engineer:	84740/44389 27465/44389
Test Date:	7/25/2023 -7/26/2023 10/6/2023

Antenna Gain and Limit

Channel	Frequency (MHz)	Directional Gain (dBi)	Power Limit (dBm)	PSD Limit (dBm/ 500KHz)
Low	5745	4.29	30.00	30.00
Mid	5785	4.29	30.00	30.00
High	5825	4.29	30.00	30.00

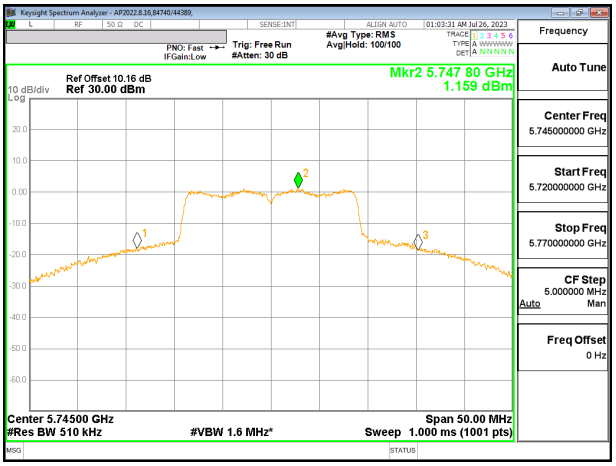
Duty Cycle CF (dB)	0.00	**Included in Calculations of Corr'd Power & PSD**

Output Power Results

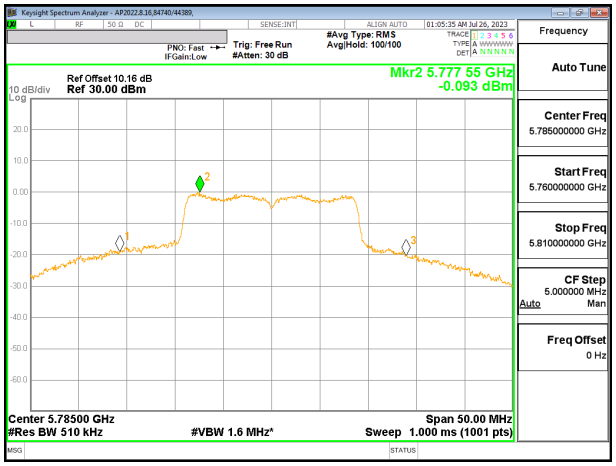
Channel	Frequency (MHz)	Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5745	14.12	14.12	30.00	-15.88
Mid	5785	12.31	12.31	30.00	-17.69
High	5825	11.84	11.84	30.00	-18.16

PSD Results

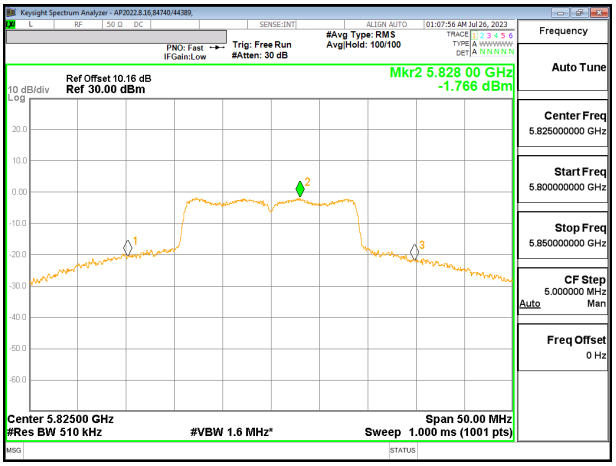
Channel	Frequency (MHz)	Meas PSD (dBm/ 500KHz)	Total Corr'd PSD (dBm/ 500KHz)	PSD Limit (dBm/ 500KHz)	PSD Margin (dB)
Low	5745	1.159	1.159	30.00	-28.84
Mid	5785	-0.093	-0.093	30.00	-30.09
High	5825	-1.766	-1.766	30.00	-31.77



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

CELL LEFT INTETIONALLY BLANK

9.3.3. 802.11n HT40 MODE IN THE 5.8 GHz BAND

1TX Antenna 1 MODE (FCC)

Test Engineer:	84740/44389 27465/44389
Test Date:	7/25/2023 -7/26/2023 10/6/2023

Antenna Gain and Limit

Channel	Frequency (MHz)	Directional Gain (dBi)	Power Limit (dBm)	PSD Limit (dBm/ 500KHz)
Low	5755	4.29	30.00	30.00
High	5795	4.29	30.00	30.00

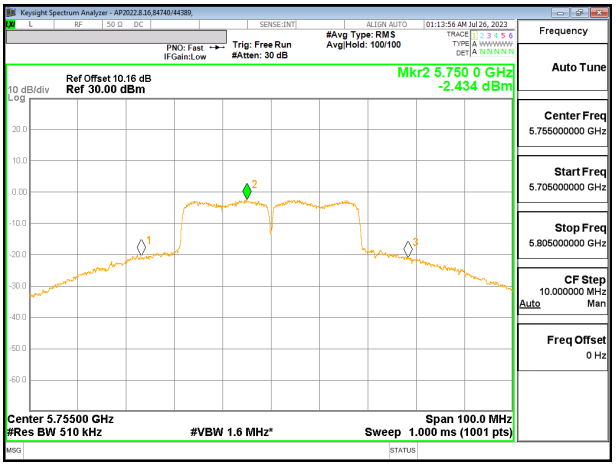
Duty Cycle CF (dB)	0.00	**Included in Calculations of Corr'd Power & PSD**

Output Power Results

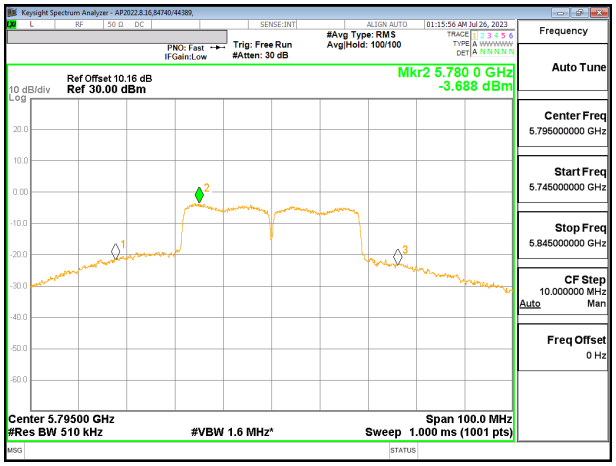
Channel	Frequency (MHz)	Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5755	13.83	13.830	30.00	-16.17
High	5795	12.13	12.130	30.00	-17.87

PSD Results

Channel	Frequency (MHz)	Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5755	-2.434	-2.434	30.00	-32.43
High	5795	-3.688	-3.688	30.00	-33.69



LOW CHANNEL



HIGH CHANNEL

10. RADIATED TEST RESULTS

LIMITS

FCC §15.205 and §15.209 -Restriced bands
FCC §15.407(b)(1-3) -Un-Restriced bands

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 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. A reduced VBW range was taken from 10Ghz to 18Ghz, with VBW of 30kHz.

The spectrum from 30 MHz to 1GHz and 18GHz to 40 GHz is investigated with the transmitter set to transmit at the channel with highest output power as worst-case scenario. 1GHz to 18GHz was set to the lowest, middle, and highest channels in the 5 GHz bands.

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.

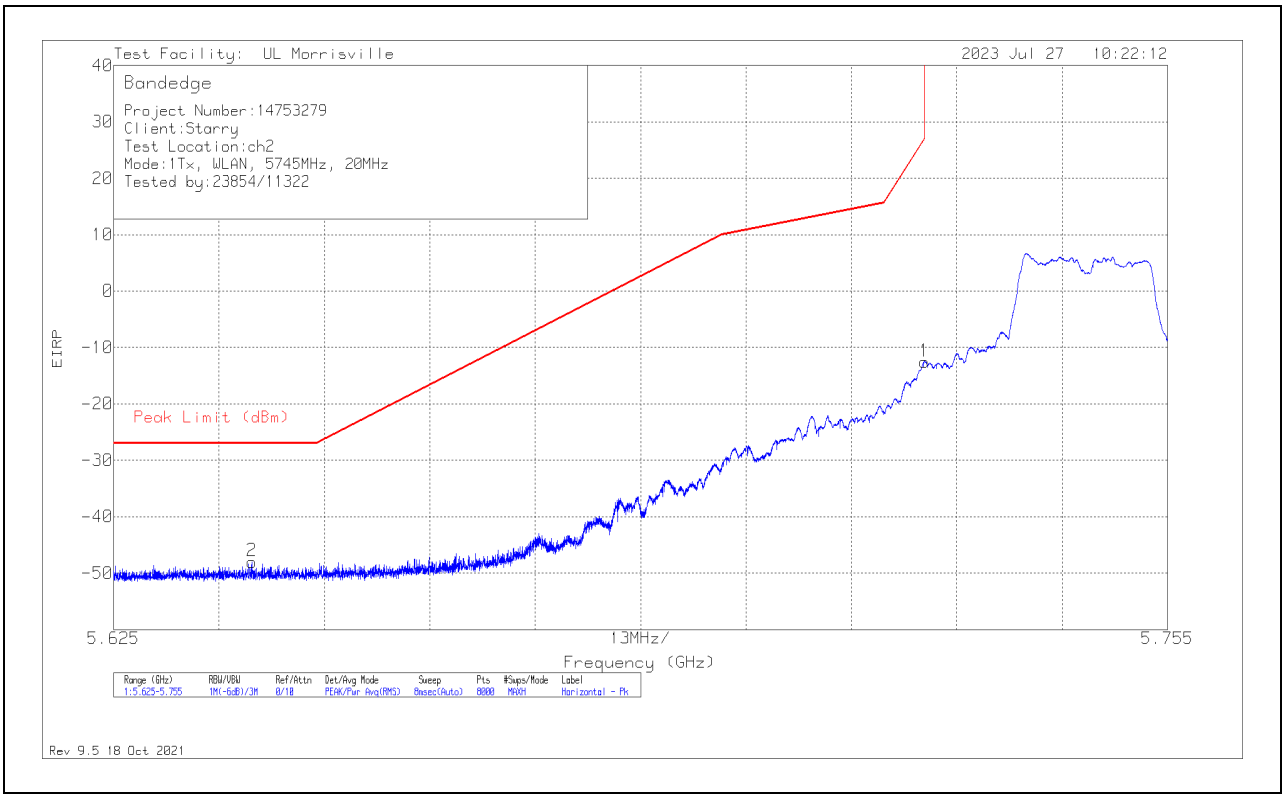
10.1. TRANSMITTER ABOVE 1 GHz

10.1.1. TX ABOVE 1 GHz 802.11a MODE IN THE 5.8 GHz BAND

1TX Antenna 1 MODE

BANDEDGE (LOW CHANNEL)

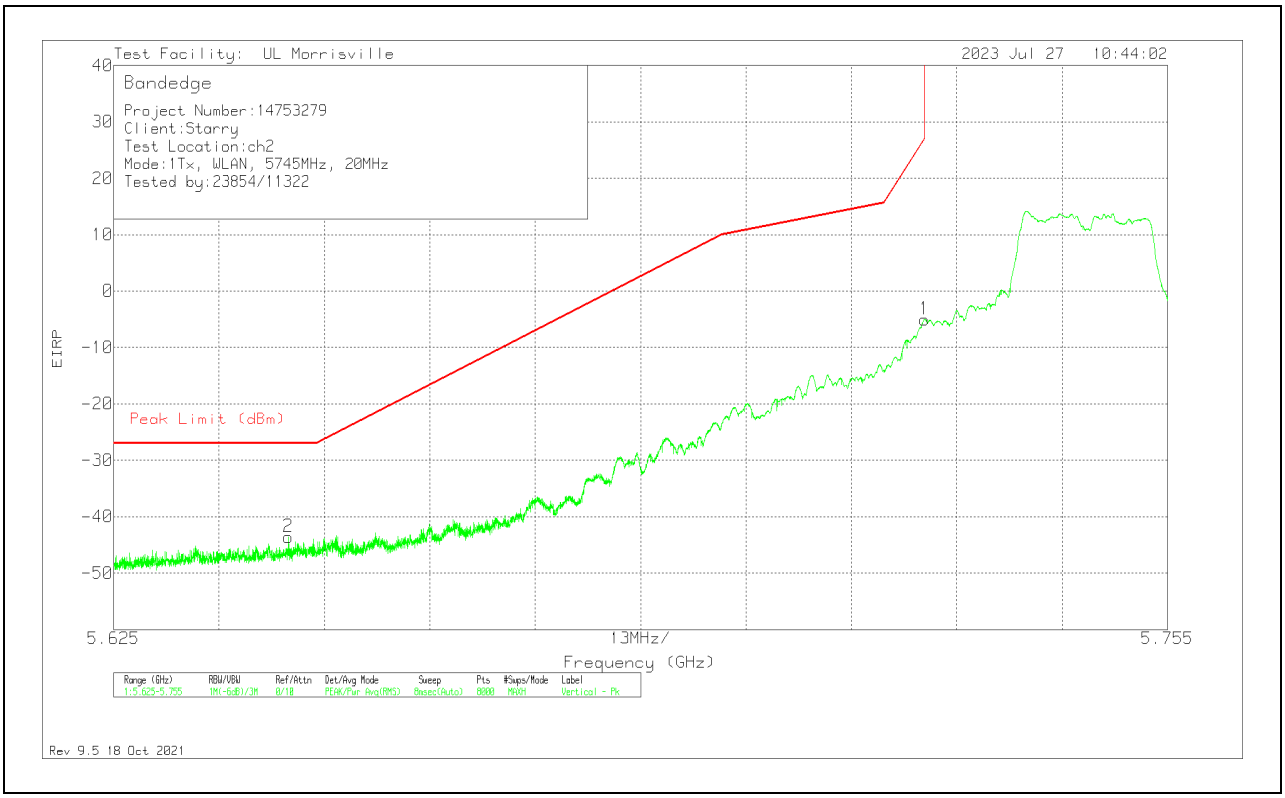
HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBm)	Det	88761 (dB/m)	Gain/Loss (dB)	Conversion Factor (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	5.64206	-71.46	Pk	34.6	-22.9	11.8	-47.96	-27	-20.96	356	132	H
1	5.725	-35.91	Pk	34.6	-23	11.8	-12.51	27	-39.51	356	132	H

Pk - Peak detector

VERTICAL RESULT

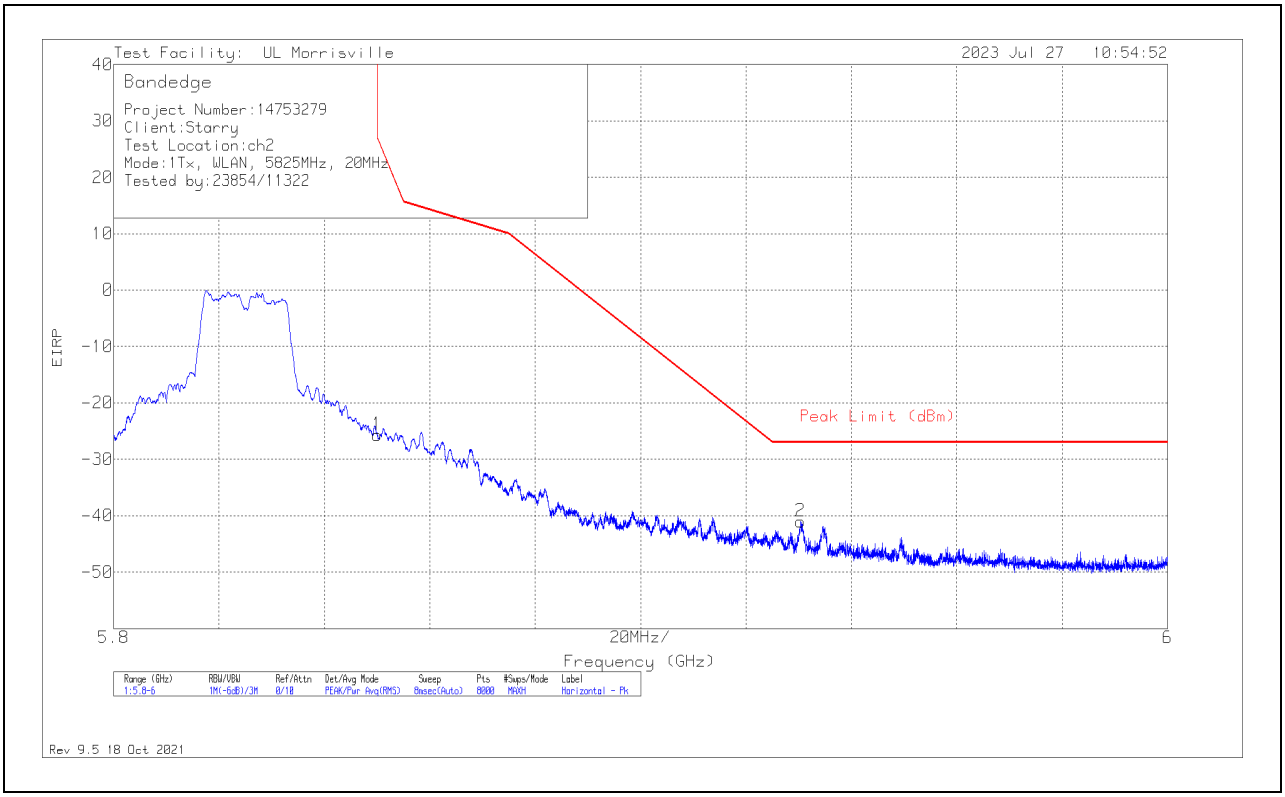


Marker	Frequency (GHz)	Meter Reading (dBm)	Det	88761 (dB/m)	Gain/Loss (dB)	Conversion Factor (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	5.64657	-67.04	Pk	34.6	-23	11.8	-43.64	-27	-16.64	48	140	V
1	5.725	-28.48	Pk	34.6	-23	11.8	-5.08	27	-32.08	48	140	V

Pk - Peak detector

BANDEDGE (HIGH CHANNEL)

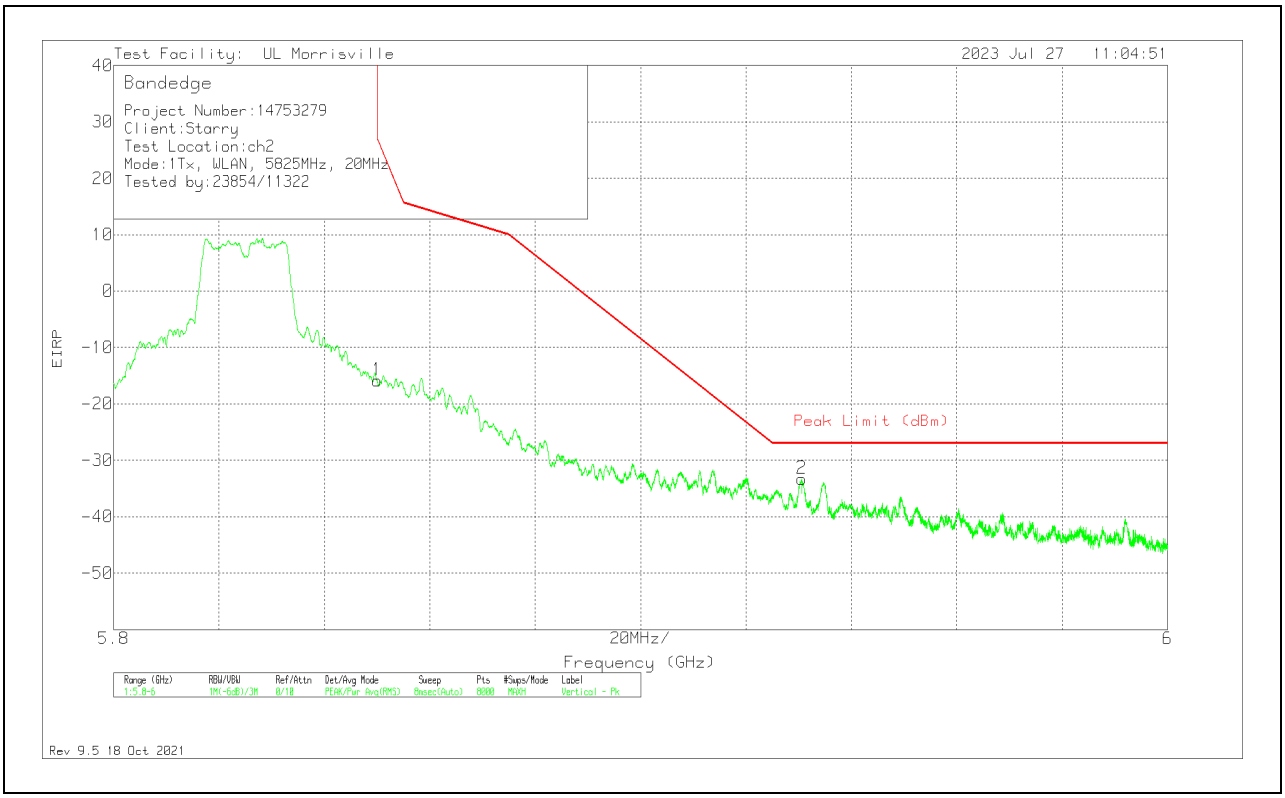
HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBm)	Det	88761 (dB/m)	Gain/Loss (dB)	Conversion Factor (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	5.85001	-49.35	Pk	34.8	-22.9	11.8	-25.65	26.99	-52.64	353	123	H
2	5.93039	-65.15	Pk	35	-22.7	11.8	-41.05	-27	-14.05	353	123	H

Pk - Peak detector

VERTICAL RESULT

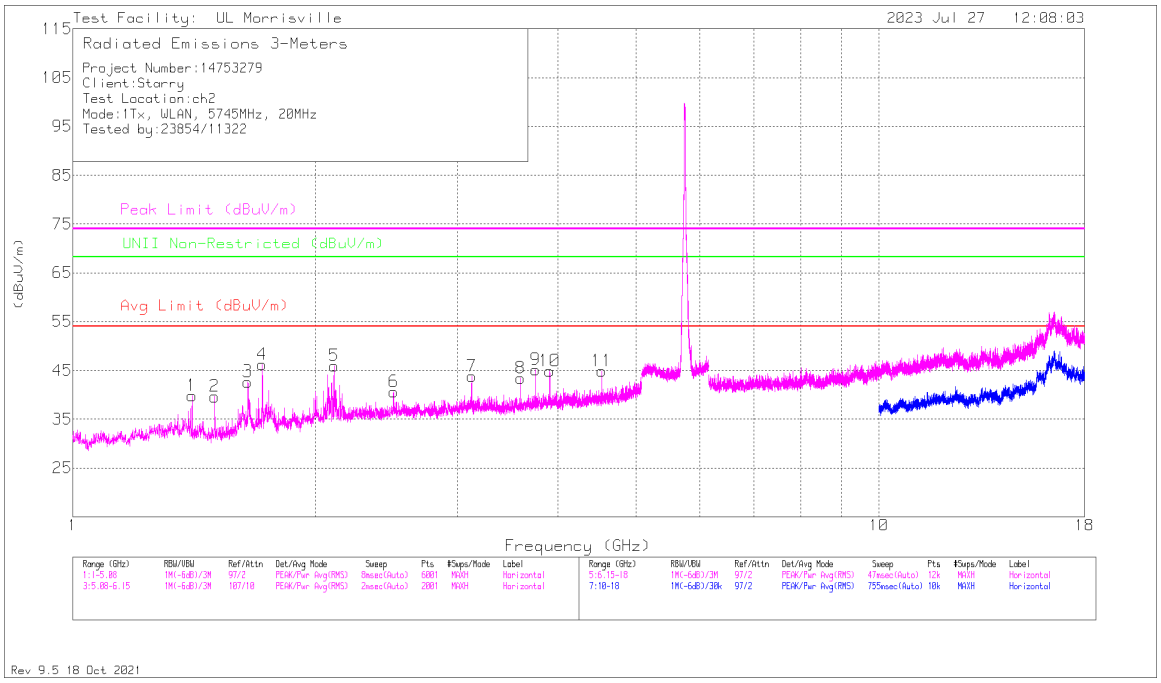


Marker	Frequency (GHz)	Meter Reading (dBm)	Det	88761 (dB/m)	Gain/Loss (dB)	Conversion Factor (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	5.85001	-39.58	Pk	34.8	-22.9	11.8	-15.88	26.99	-42.87	31	130	V
2	5.93057	-57.4	Pk	35	-22.7	11.8	-33.3	-27	-6.3	31	130	V

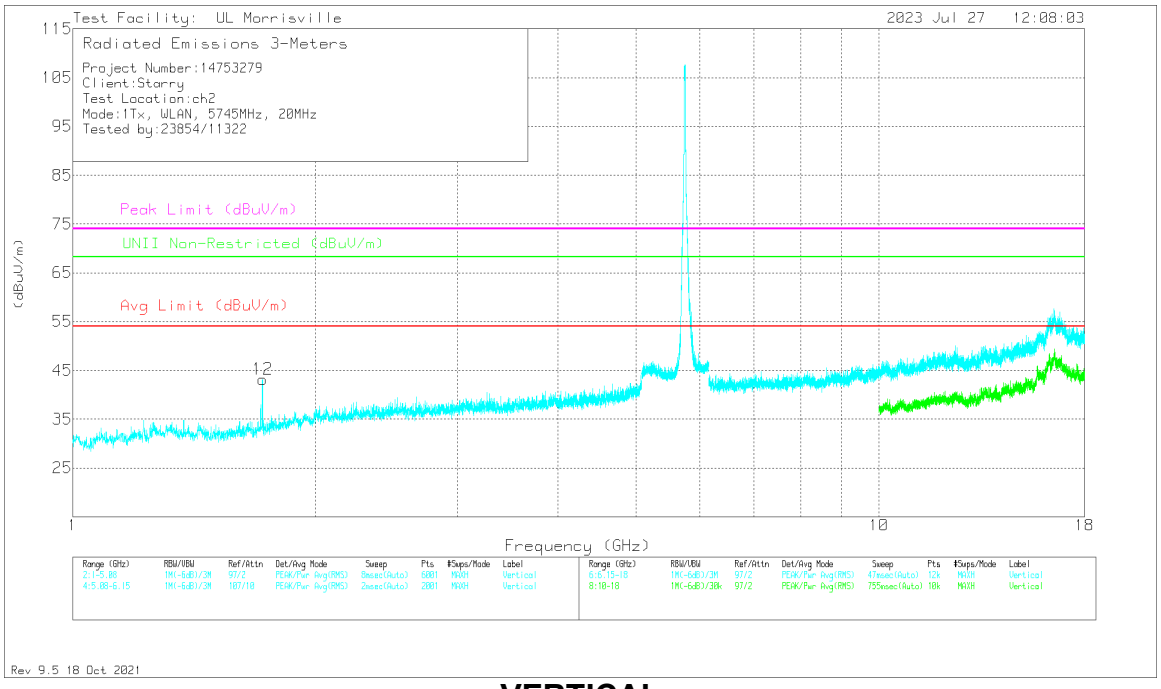
Pk - Peak detector

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



HORIZONTAL



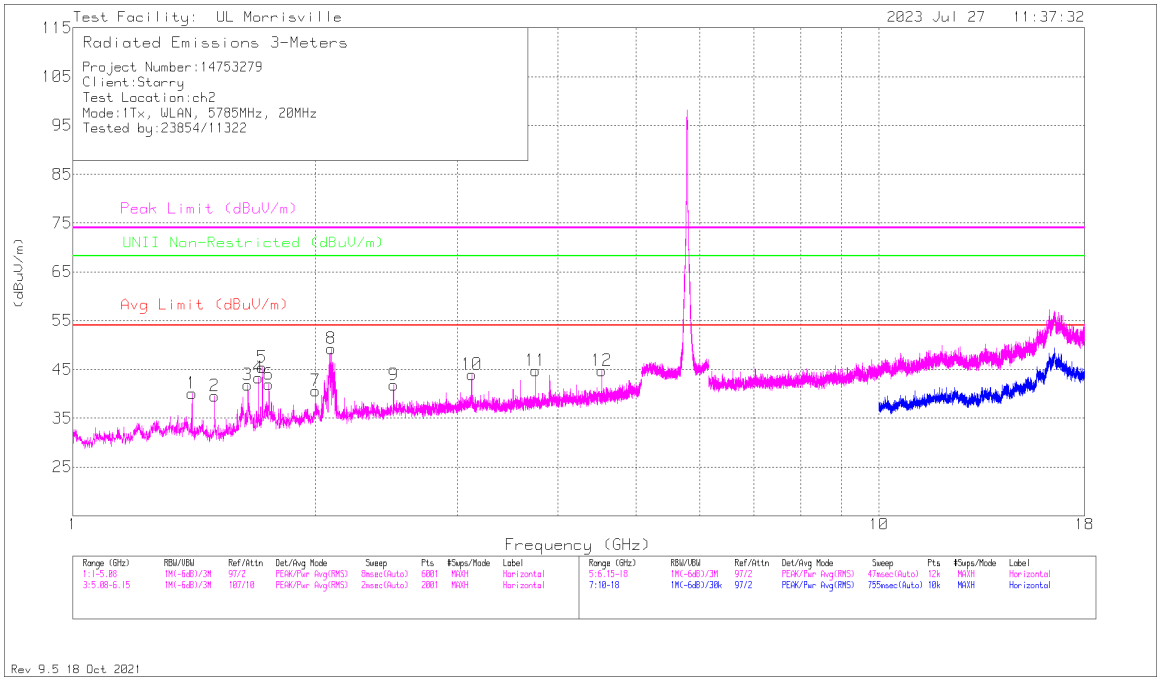
VERTICAL

RADIATED EMISSIONS

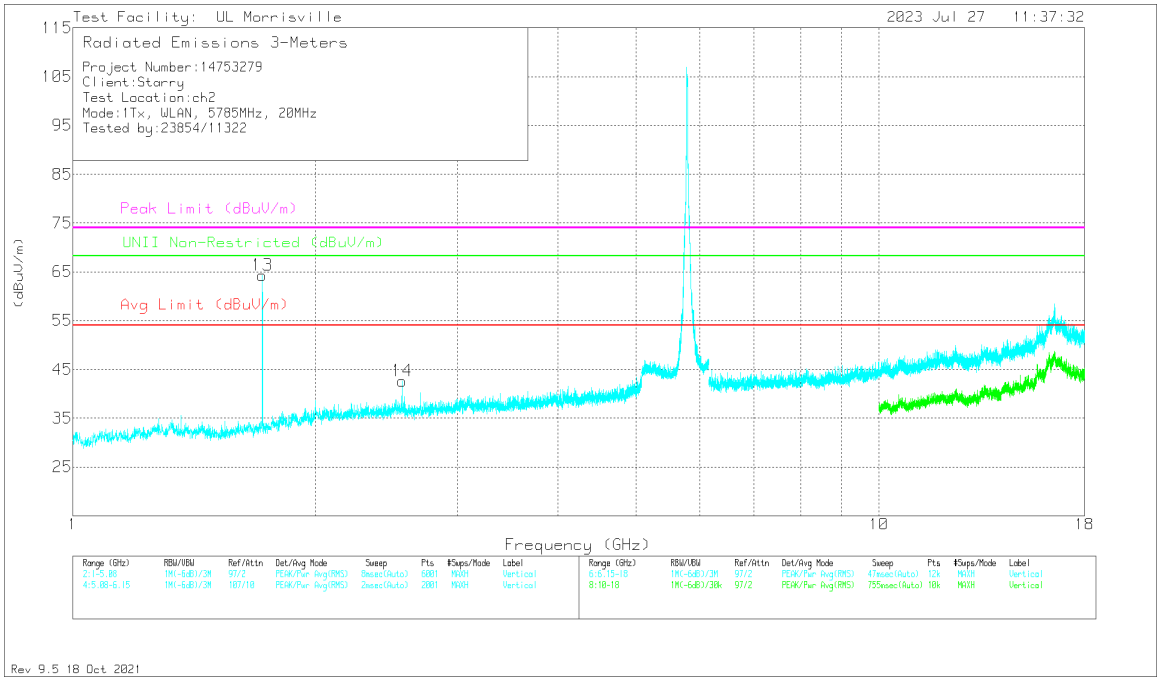
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	88761 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 1.40596	46.08	Pk	28.3	-34.6	39.78	54	-14.22	74	-34.22	-	-	0-360	101	H
2	* ** 1.4998	46.43	Pk	27.9	-34.7	39.63	54	-14.37	74	-34.37	-	-	0-360	101	H
4	** 1.71876	51.35	Pk	29.1	-34.3	46.15	-	-	-	-	68.2	-22.05	0-360	101	H
6	** 2.50008	41.95	Pk	32.4	-33.7	40.65	-	-	-	-	68.2	-27.55	0-360	199	H
8	* ** 3.5942	42.76	Pk	32.9	-32.2	43.46	54	-10.54	74	-30.54	-	-	0-360	199	H
9	* ** 3.74992	44.06	Pk	33.2	-32.1	45.16	54	-8.84	74	-28.84	-	-	0-360	199	H
10	* ** 3.90632	43.1	Pk	33.4	-31.6	44.9	54	-9.1	74	-29.1	-	-	0-360	199	H
11	* ** 4.53124	42.44	Pk	33.8	-31.4	44.84	54	-9.16	74	-29.16	-	-	0-360	101	H
12	* ** 1.71944	48.44	Pk	29.1	-34.4	43.14	54	-10.86	74	-30.86	-	-	0-360	199	V
3	1.6494	48.08	Pk	28.6	-34	42.68	-	-	-	-	68.2	-25.52	0-360	101	H
5	2.10908	48.64	Pk	31.6	-34.3	45.94	-	-	-	-	68.2	-22.26	0-360	101	H
7	3.125	43.77	Pk	33.1	-33	43.87	-	-	-	-	68.2	-24.33	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

MID CHANNEL RESULTS



HORIZONTAL



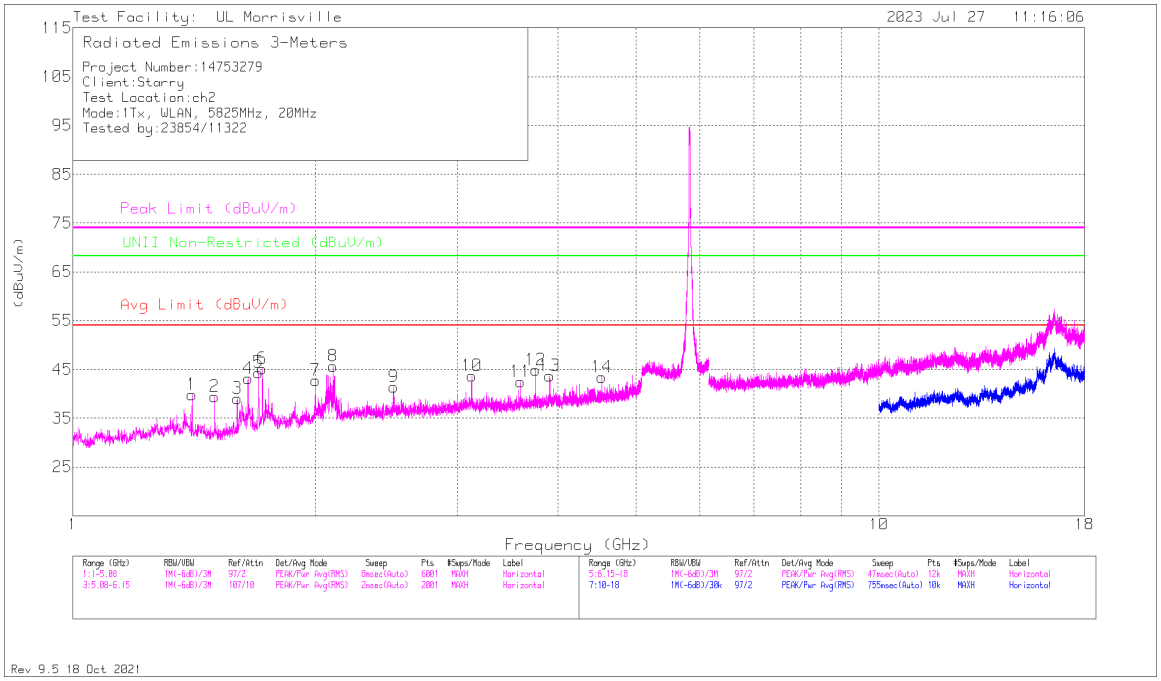
VERTICAL

RADIATED EMISSIONS

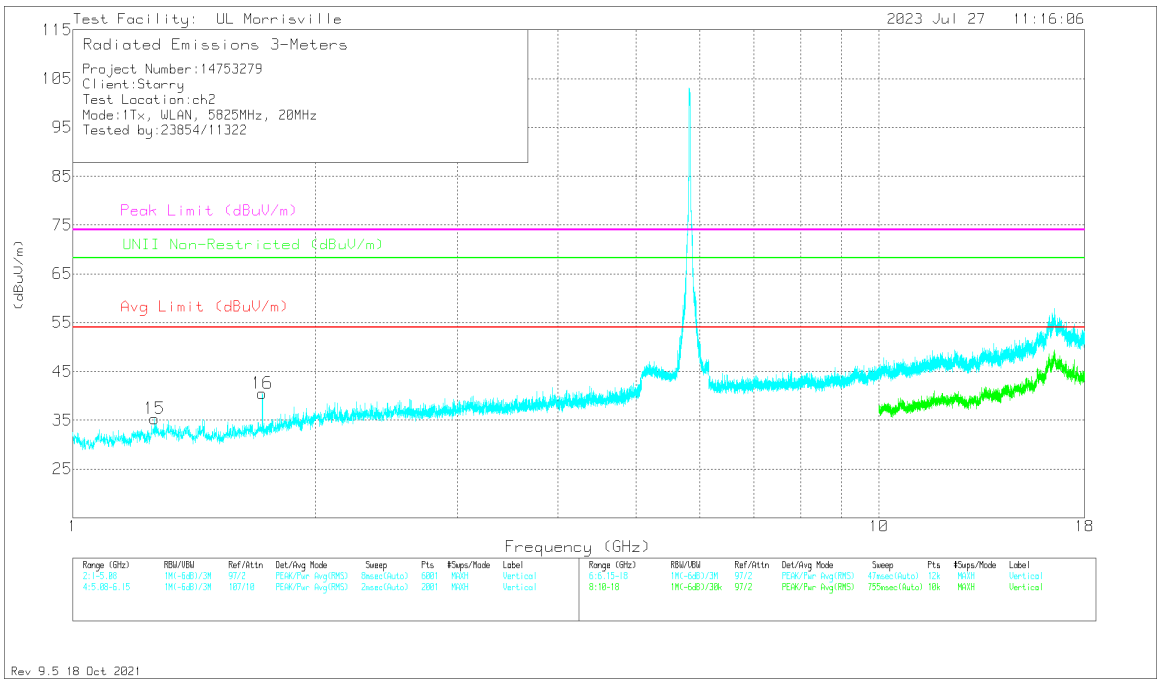
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	88761 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 1.40596	46.35	Pk	28.3	-34.6	40.05	54	-13.95	74	-33.95	-	-	0-360	200	H
2	* ** 1.4998	46.32	Pk	27.9	-34.7	39.52	54	-14.48	74	-34.48	-	-	0-360	101	H
4	* ** 1.69972	48.83	Pk	28.8	-34.3	43.33	54	-10.67	74	-30.67	-	-	0-360	101	H
5	** 1.71876	50.58	Pk	29.1	-34.3	45.38	-	-	-	-	68.2	-22.82	0-360	200	H
6	** 1.75072	46.98	Pk	29.4	-34.4	41.98	-	-	-	-	68.2	-26.22	0-360	101	H
9	** 2.50008	43.07	Pk	32.4	-33.7	41.77	-	-	-	-	68.2	-26.43	0-360	200	H
11	* ** 3.74992	43.6	Pk	33.2	-32.1	44.7	54	-9.3	74	-29.3	-	-	0-360	200	H
12	* ** 4.53192	42.39	Pk	33.8	-31.4	44.79	54	-9.21	74	-29.21	-	-	0-360	101	H
13	** 1.71874	51.87	Pk	29.1	-34.3	46.67	-	-	-	-	68.2	-21.53	90	395	V
14	** 2.5606	43.82	Pk	32.4	-33.6	42.62	-	-	-	-	68.2	-25.58	0-360	101	V
3	1.6494	47.21	Pk	28.6	-34	41.81	-	-	-	-	68.2	-26.39	0-360	101	H
7	2.00028	43.13	Pk	31.4	-33.9	40.63	-	-	-	-	68.2	-27.57	0-360	200	H
8	2.09344	51.94	Pk	31.7	-34.4	49.24	-	-	-	-	68.2	-18.96	0-360	101	H
10	3.125	43.79	Pk	33.1	-33	43.89	-	-	-	-	68.2	-24.31	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

HIGH CHANNEL RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	88761 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 1.40596	46.14	Pk	28.3	-34.6	39.84	54	-14.16	74	-34.16	-	-	0-360	101	H
2	* ** 1.4998	46.25	Pk	27.9	-34.7	39.45	54	-14.55	74	-34.55	-	-	0-360	101	H
3	* ** 1.59976	45.16	Pk	28.2	-34.3	39.06	54	-14.94	74	-34.94	-	-	0-360	101	H
5	* ** 1.69972	49.84	Pk	28.8	-34.3	44.34	54	-9.66	74	-29.66	-	-	0-360	199	H
6	** 1.71876	50.36	Pk	29.1	-34.3	45.16	-	-	-	-	68.2	-23.04	0-360	101	H
9	** 2.50008	42.7	Pk	32.4	-33.7	41.4	-	-	-	-	68.2	-26.8	0-360	199	H
11	* ** 3.5942	41.73	Pk	32.9	-32.2	42.43	54	-11.57	74	-31.57	-	-	0-360	199	H
12	* ** 3.7506	43.79	Pk	33.2	-32.1	44.89	54	-9.11	74	-29.11	-	-	0-360	199	H
13	* ** 3.90632	41.85	Pk	33.4	-31.6	43.65	54	-10.35	74	-30.35	-	-	0-360	199	H
14	* ** 4.53124	40.98	Pk	33.8	-31.4	43.38	54	-10.62	74	-30.62	-	-	0-360	101	H
15	* 1.26384	41.45	Pk	28.7	-34.9	35.25	54	-18.75	74	-38.75	-	-	0-360	199	V
16	** 1.71876	45.71	Pk	29.1	-34.3	40.51	-	-	-	-	68.2	-27.69	0-360	101	V
4	1.65008	48.53	Pk	28.6	-34	43.13	-	-	-	-	68.2	-25.07	0-360	101	H
7	1.9996	45.28	Pk	31.4	-33.9	42.78	-	-	-	-	68.2	-25.42	0-360	101	H
8	2.10228	48.47	Pk	31.6	-34.4	45.67	-	-	-	-	68.2	-22.53	0-360	199	H
10	3.125	43.58	Pk	33.1	-33	43.68	-	-	-	-	68.2	-24.52	0-360	101	H

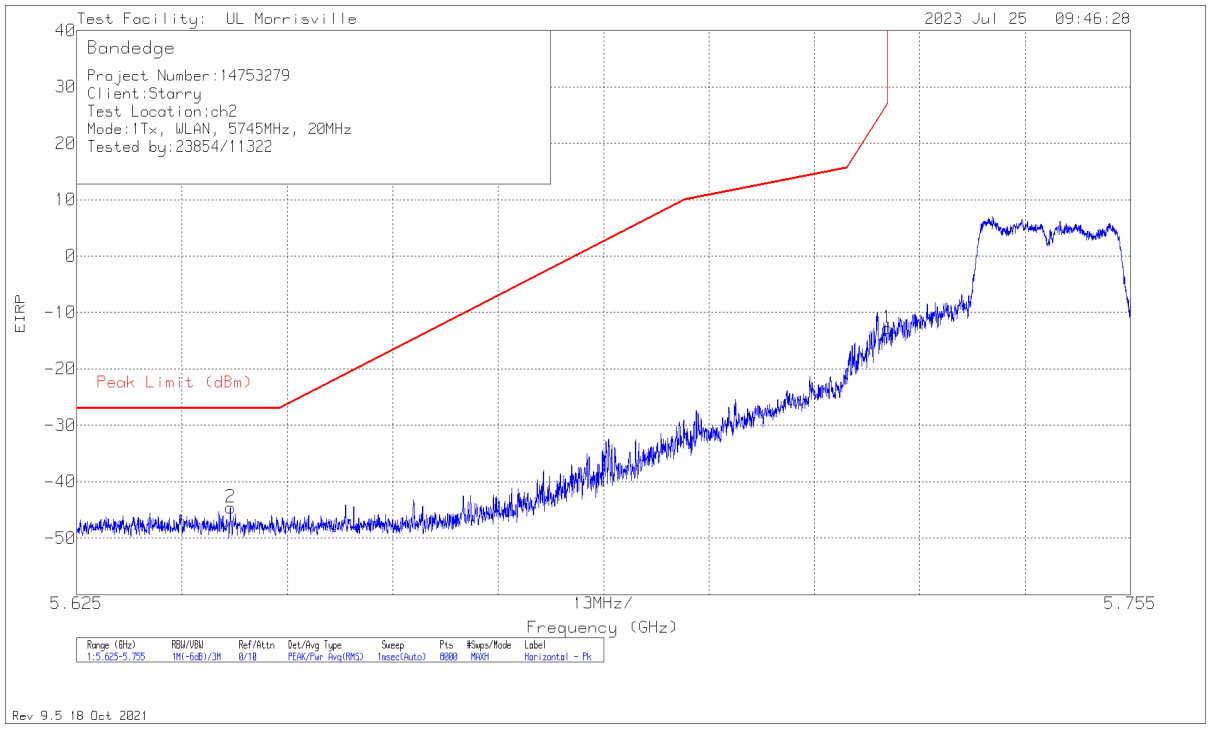
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector

10.1.2. TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 5.8 GHz BAND

1TX Antenna 1 MODE

BANDEDGE (LOW CHANNEL)

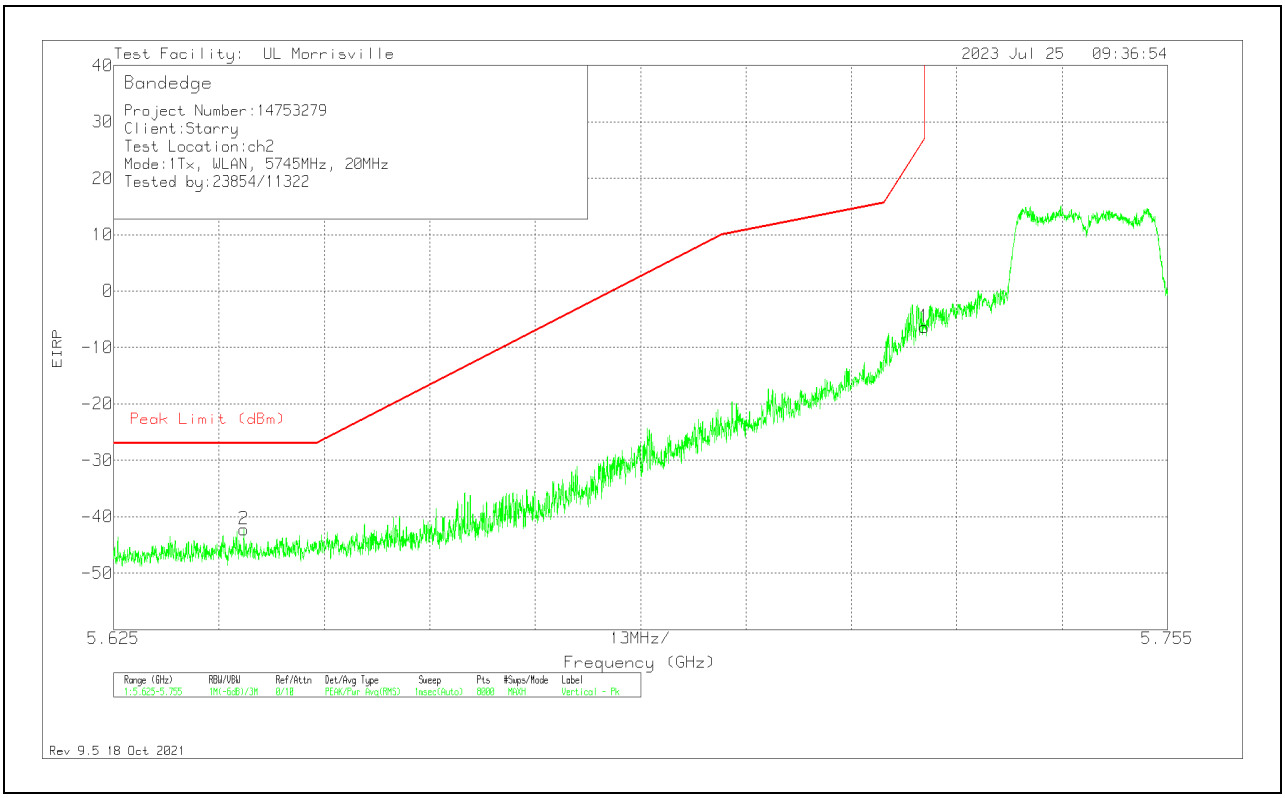
HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBm)	Det	88761 (dB/m)	Gain/Loss (dB)	Conversion Factor (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	5.64397	-67.99	Pk	34.6	-23	11.8	-44.59	-27	-17.59	356	124	H
1	5.725	-36.17	Pk	34.6	-23	11.8	-12.77	27	-39.77	356	124	H

Pk - Peak detector

VERTICAL RESULT

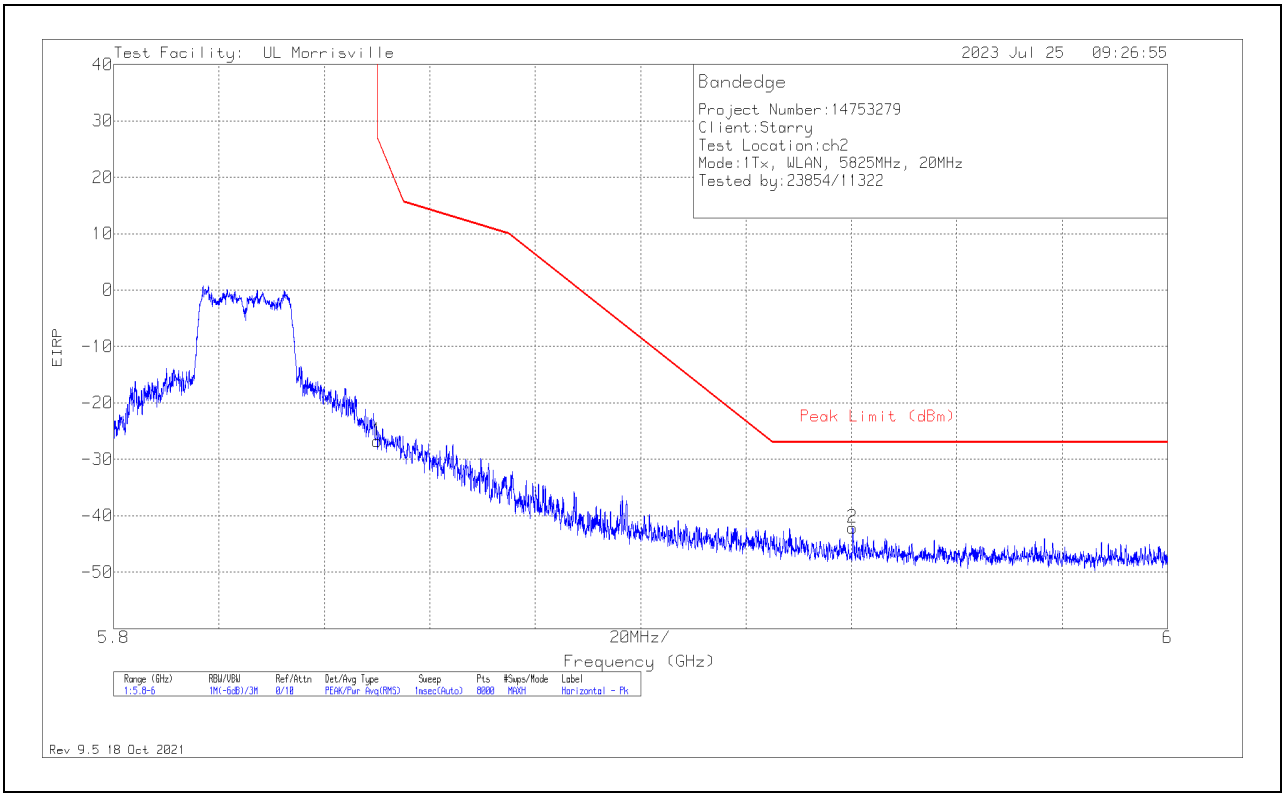


Marker	Frequency (GHz)	Meter Reading (dBm)	Det	88761 (dB/m)	Gain/Loss (dB)	Conversion Factor (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	5.64106	-65.8	Pk	34.6	-22.9	11.8	-42.3	-27	-15.3	29	137	V
1	5.725	-29.77	Pk	34.6	-23	11.8	-6.37	27	-33.37	29	137	V

Pk - Peak detector

BANDEDGE (HIGH CHANNEL)

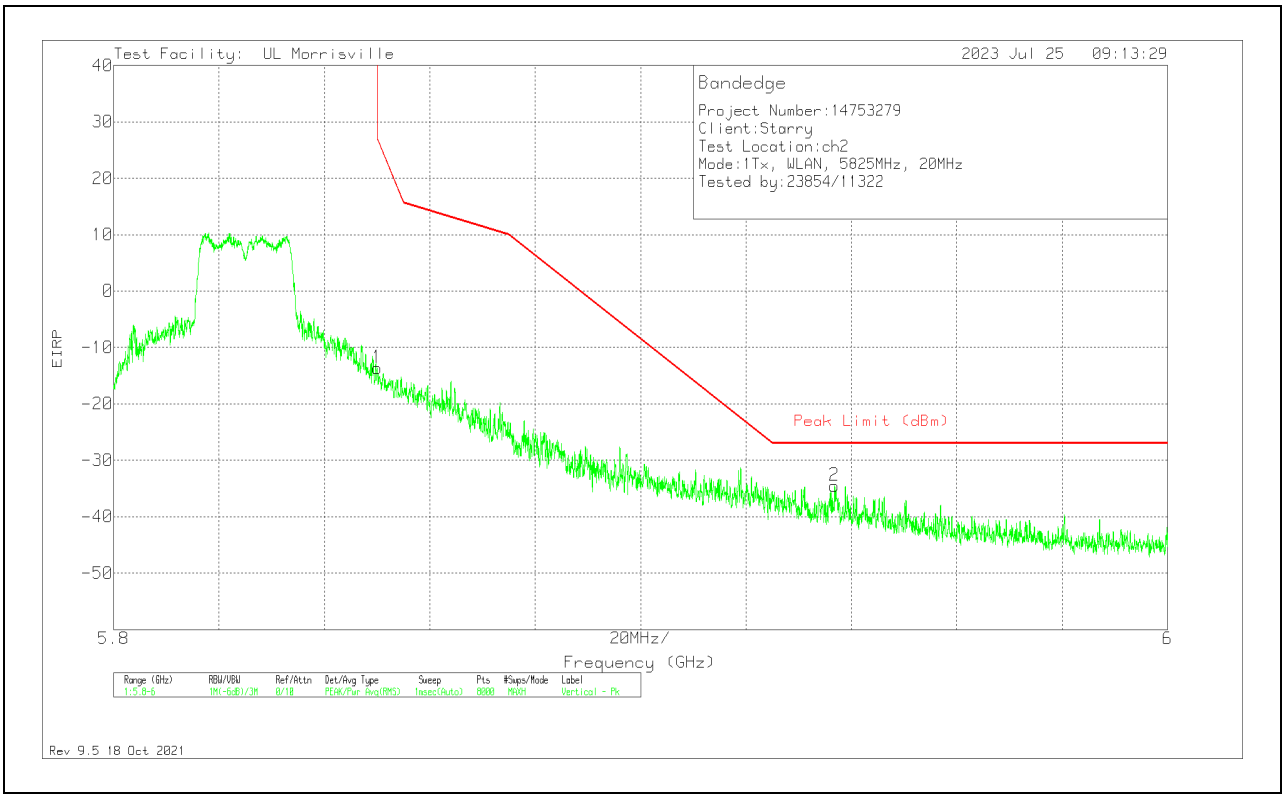
HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBm)	Det	88761 (dB/m)	Gain/Loss (dB)	Conversion Factor (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	5.85001	-50.42	Pk	34.8	-22.9	11.8	-26.72	26.99	-53.71	0	125	H
2	5.94027	-66.41	Pk	35	-22.5	11.8	-42.11	-27	-15.11	0	125	H

Pk - Peak detector

VERTICAL RESULT

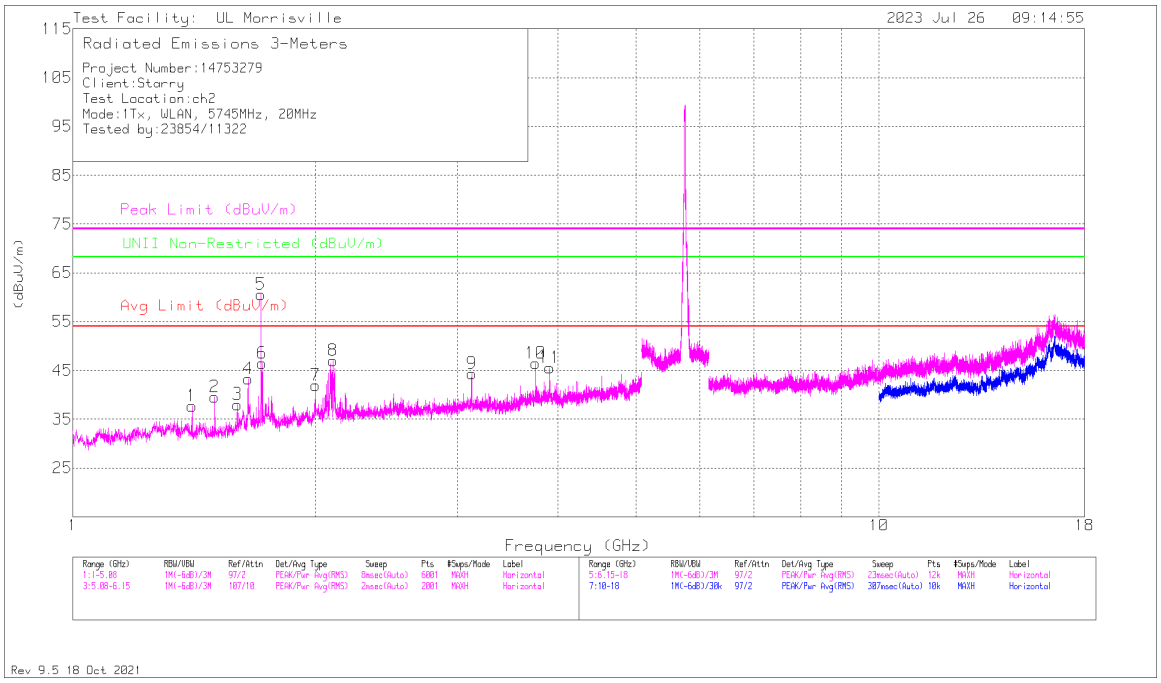


Marker	Frequency (GHz)	Meter Reading (dBm)	Det	88761 (dB/m)	Gain/Loss (dB)	Conversion Factor (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	5.85001	-37.36	Pk	34.8	-22.9	11.8	-13.66	26.99	-40.65	30	121	V
2	5.93682	-58.68	Pk	35	-22.6	11.8	-34.48	-27	-7.48	30	121	V

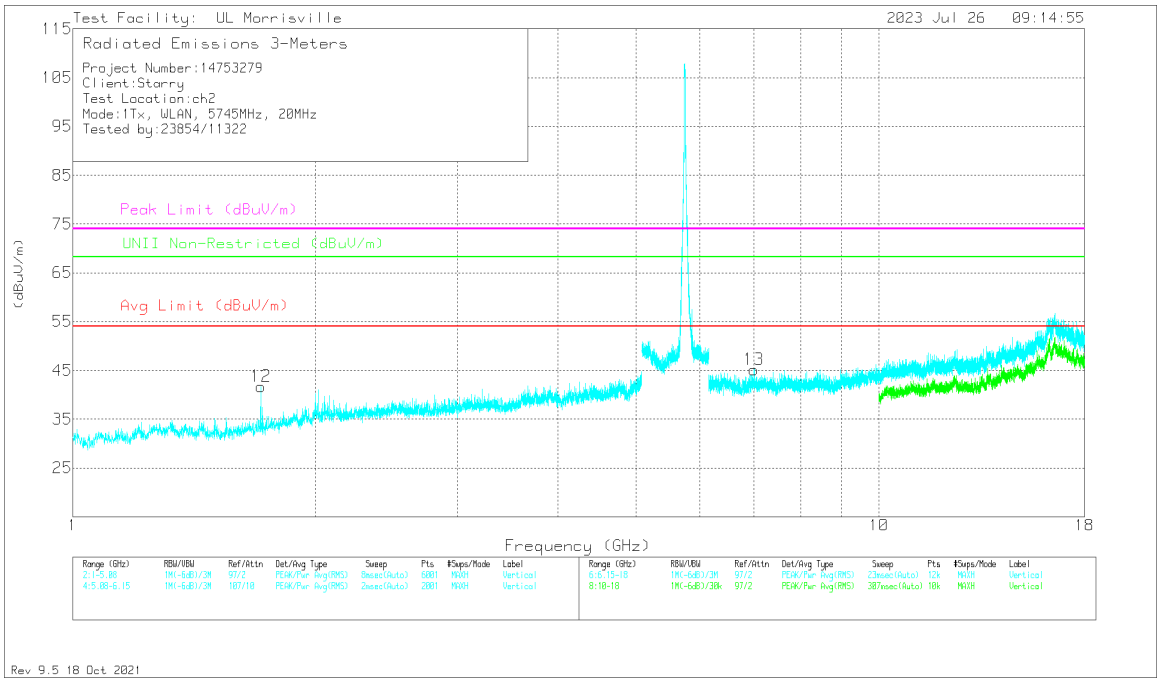
Pk - Peak detector

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



HORIZONTAL



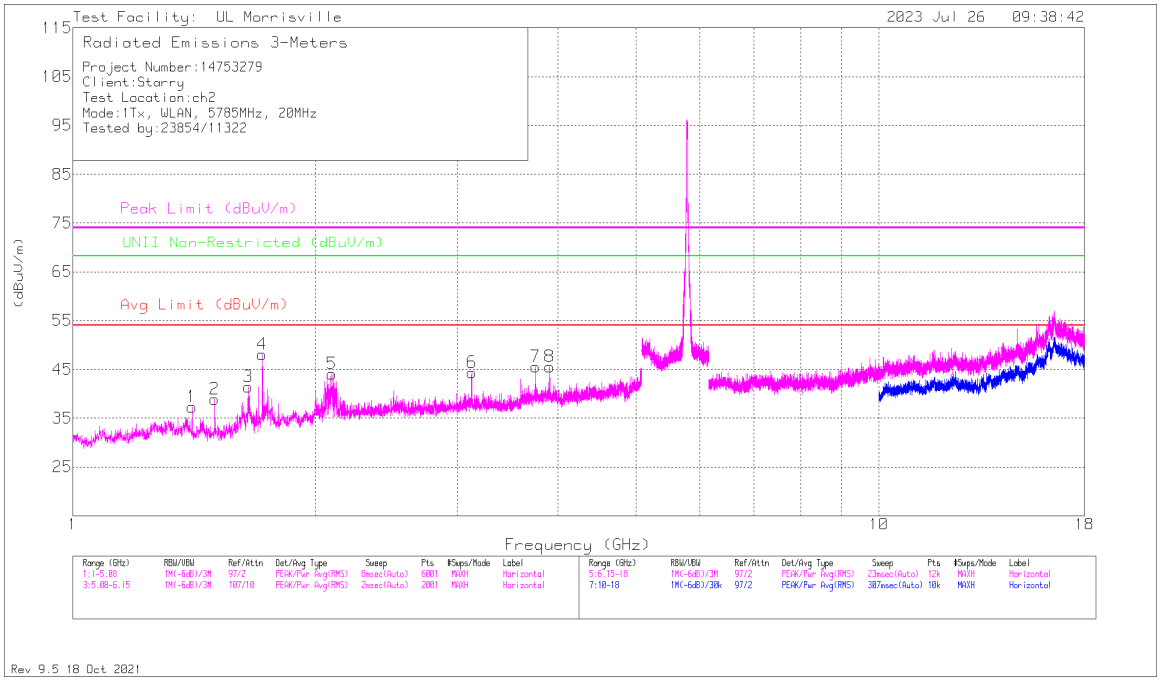
VERTICAL

RADIATED EMISSIONS

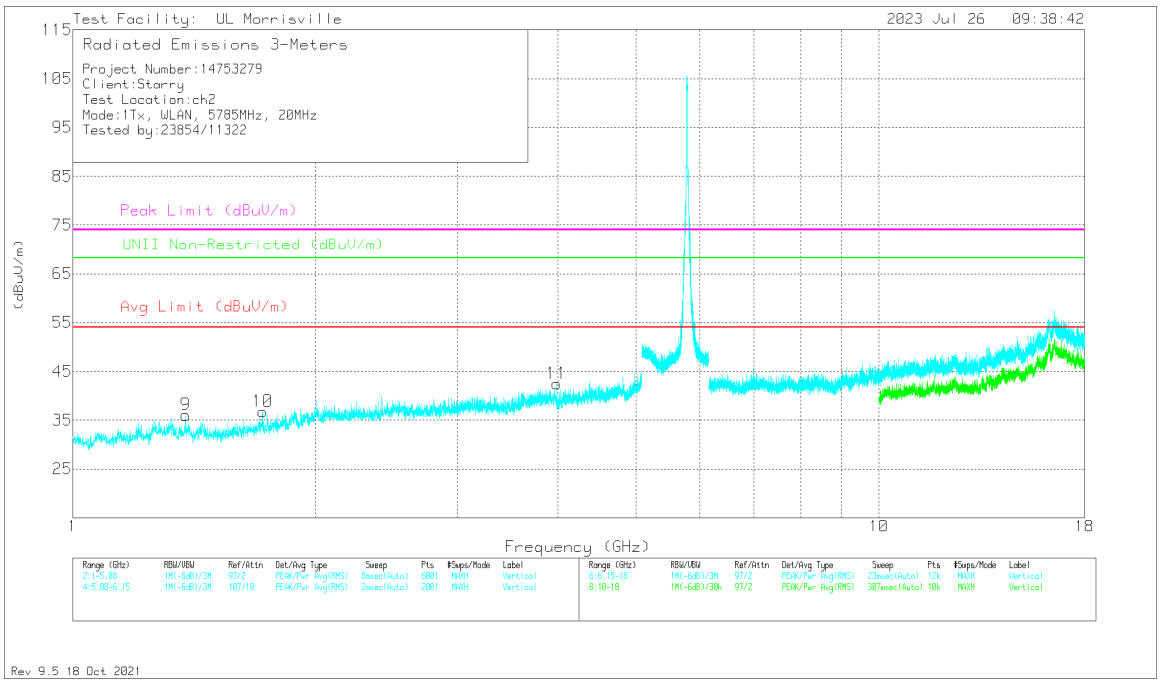
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	88761 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 1.40596	44.02	Pk	28.3	-34.6	37.72	54	-16.28	74	-36.28	-	-	0-360	101	H
2	* ** 1.4998	46.4	Pk	27.9	-34.7	39.6	54	-14.4	74	-34.4	-	-	0-360	101	H
3	* ** 1.59976	44.13	Pk	28.2	-34.3	38.03	54	-15.97	74	-35.97	-	-	0-360	101	H
5	** 1.71196	65.82	Pk	29	-34.3	60.52	-	-	-	-	68.2	-7.68	0-360	101	H
6	** 1.71876	51.63	Pk	29.1	-34.3	46.43	-	-	-	-	68.2	-21.77	0-360	101	H
10	* ** 3.74992	45.32	Pk	33.2	-32.1	46.42	54	-7.58	74	-27.58	-	-	0-360	199	H
11	* ** 3.90632	43.75	Pk	33.4	-31.6	45.55	54	-8.45	74	-28.45	-	-	0-360	199	H
12	** 1.7106	47.11	Pk	29	-34.4	41.71	-	-	-	-	68.2	-26.49	0-360	199	V
4	1.65076	48.57	Pk	28.6	-33.9	43.27	-	-	-	-	68.2	-24.93	0-360	101	H
7	2.00028	44.44	Pk	31.4	-33.9	41.94	-	-	-	-	68.2	-26.26	0-360	101	H
8	2.10432	49.83	Pk	31.6	-34.4	47.03	-	-	-	-	68.2	-21.17	0-360	101	H
9	3.125	44.3	Pk	33.1	-33	44.4	-	-	-	-	68.2	-23.8	0-360	101	H
13	7.00024	36.29	Pk	35.6	-26.7	45.19	-	-	-	-	68.2	-23.01	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

MID CHANNEL RESULTS



HORIZONTAL



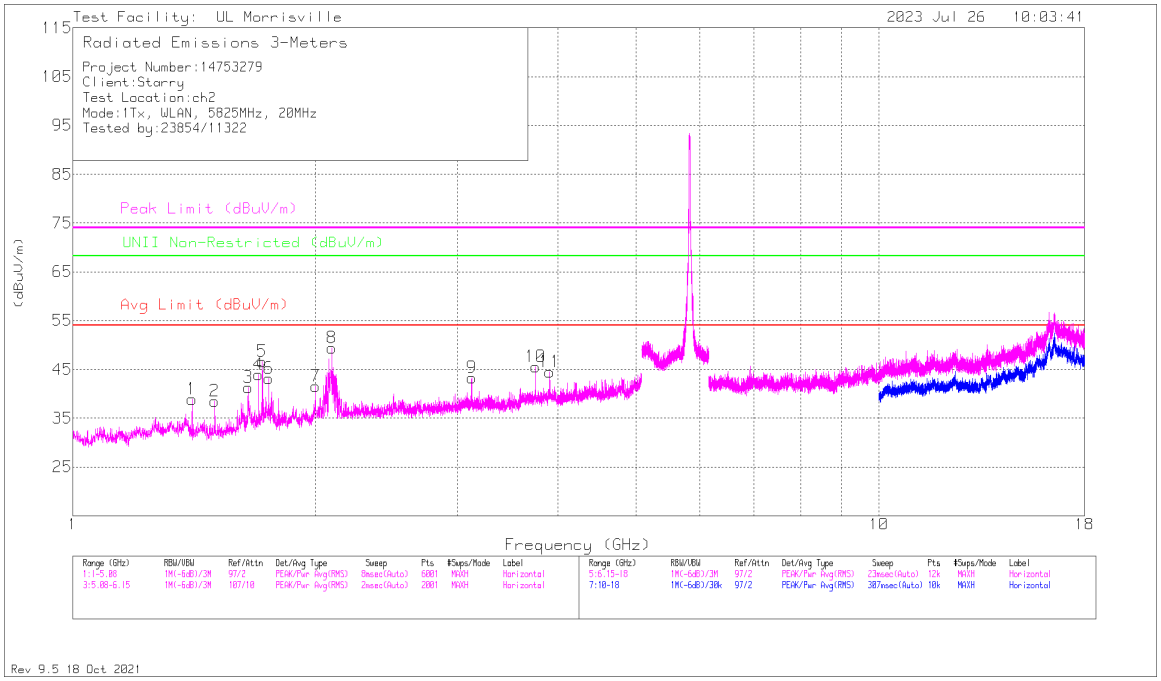
VERTICAL

RADIATED EMISSIONS

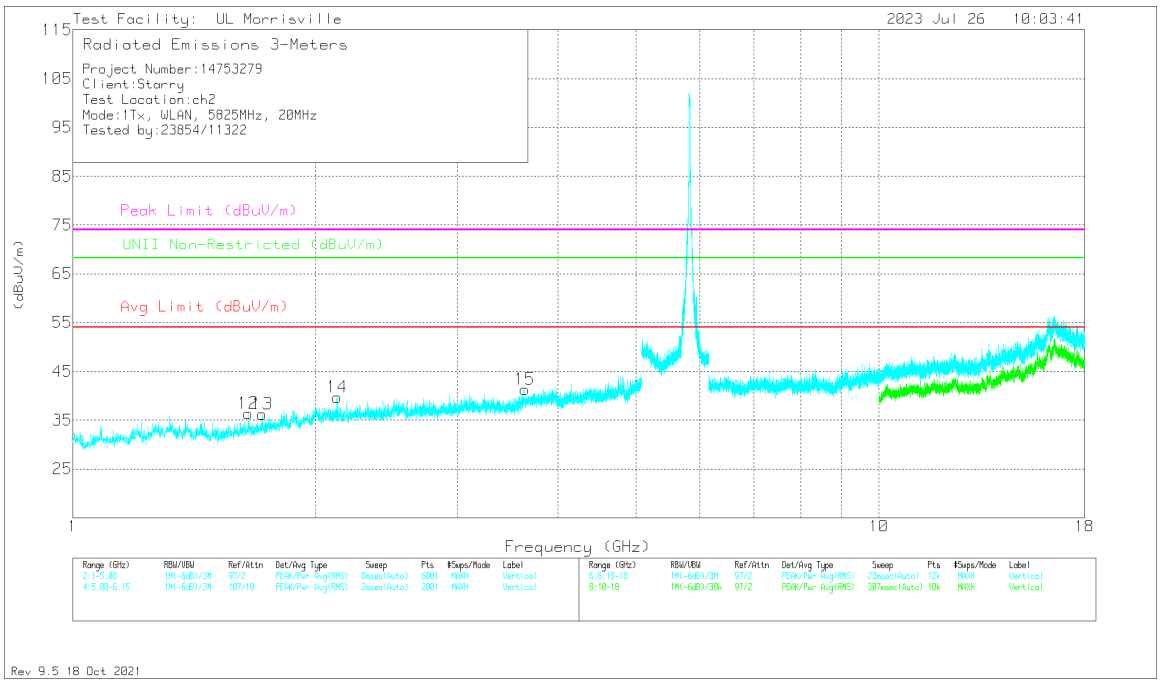
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	88761 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 1.40596	43.65	Pk	28.3	-34.6	37.35	54	-16.65	74	-36.65	-	-	0-360	101	H
2	* ** 1.4998	45.7	Pk	27.9	-34.7	38.9	54	-15.1	74	-35.1	-	-	0-360	199	H
4	** 1.71876	53.24	Pk	29.1	-34.3	48.04	-	-	-	-	68.2	-20.16	0-360	101	H
7	* ** 3.74992	44.38	Pk	33.2	-32.1	45.48	54	-8.52	74	-28.52	-	-	0-360	199	H
8	* ** 3.90632	43.76	Pk	33.4	-31.6	45.56	54	-8.44	74	-28.44	-	-	0-360	199	H
9	* ** 1.38012	42.14	Pk	28.3	-34.4	36.04	54	-17.96	74	-37.96	-	-	0-360	199	V
10	* ** 1.71944	42.11	Pk	29.1	-34.4	36.81	54	-17.19	74	-37.19	-	-	0-360	199	V
11	* ** 3.9852	40.69	Pk	33.3	-31.5	42.49	54	-11.51	74	-31.51	-	-	0-360	199	V
3	1.65076	46.67	Pk	28.6	-33.9	41.37	-	-	-	-	68.2	-26.83	0-360	101	H
5	2.09616	46.82	Pk	31.6	-34.4	44.02	-	-	-	-	68.2	-24.18	0-360	199	H
6	3.125	44.2	Pk	33.1	-33	44.3	-	-	-	-	68.2	-23.9	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

HIGH CHANNEL RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	88761 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 1.40596	45.23	Pk	28.3	-34.6	38.93	54	-15.07	74	-35.07	-	-	0-360	101	H
2	* ** 1.4998	45.28	Pk	27.9	-34.7	38.48	54	-15.52	74	-35.52	-	-	0-360	199	H
4	* ** 1.69972	49.42	Pk	28.8	-34.3	43.92	54	-10.08	74	-30.08	-	-	0-360	101	H
5	** 1.71876	51.78	Pk	29.1	-34.3	46.58	-	-	-	-	68.2	-21.62	0-360	101	H
6	** 1.75004	48.12	Pk	29.4	-34.4	43.12	-	-	-	-	68.2	-25.08	0-360	101	H
10	* ** 3.74992	44.43	Pk	33.2	-32.1	45.53	54	-8.47	74	-28.47	-	-	0-360	199	H
11	* ** 3.90632	42.72	Pk	33.4	-31.6	44.52	54	-9.48	74	-29.48	-	-	0-360	199	H
13	** 1.71876	41.47	Pk	29.1	-34.3	36.27	-	-	-	-	68.2	-31.93	0-360	199	V
14	** 2.12744	42.37	Pk	31.5	-34.2	39.67	-	-	-	-	68.2	-28.53	0-360	101	V
15	* ** 3.63568	40.05	Pk	32.9	-31.7	41.25	54	-12.75	74	-32.75	-	-	0-360	101	V
3	1.65008	46.71	Pk	28.6	-34	41.31	-	-	-	-	68.2	-26.89	0-360	101	H
12	1.65212	41.65	Pk	28.6	-33.9	36.35	-	-	-	-	68.2	-31.85	0-360	101	V
7	2.00028	44.02	Pk	31.4	-33.9	41.52	-	-	-	-	68.2	-26.68	0-360	101	H
8	2.09684	52.2	Pk	31.6	-34.4	49.4	-	-	-	-	68.2	-18.8	0-360	199	H
9	3.125	43.22	Pk	33.1	-33	43.32	-	-	-	-	68.2	-24.88	0-360	101	H

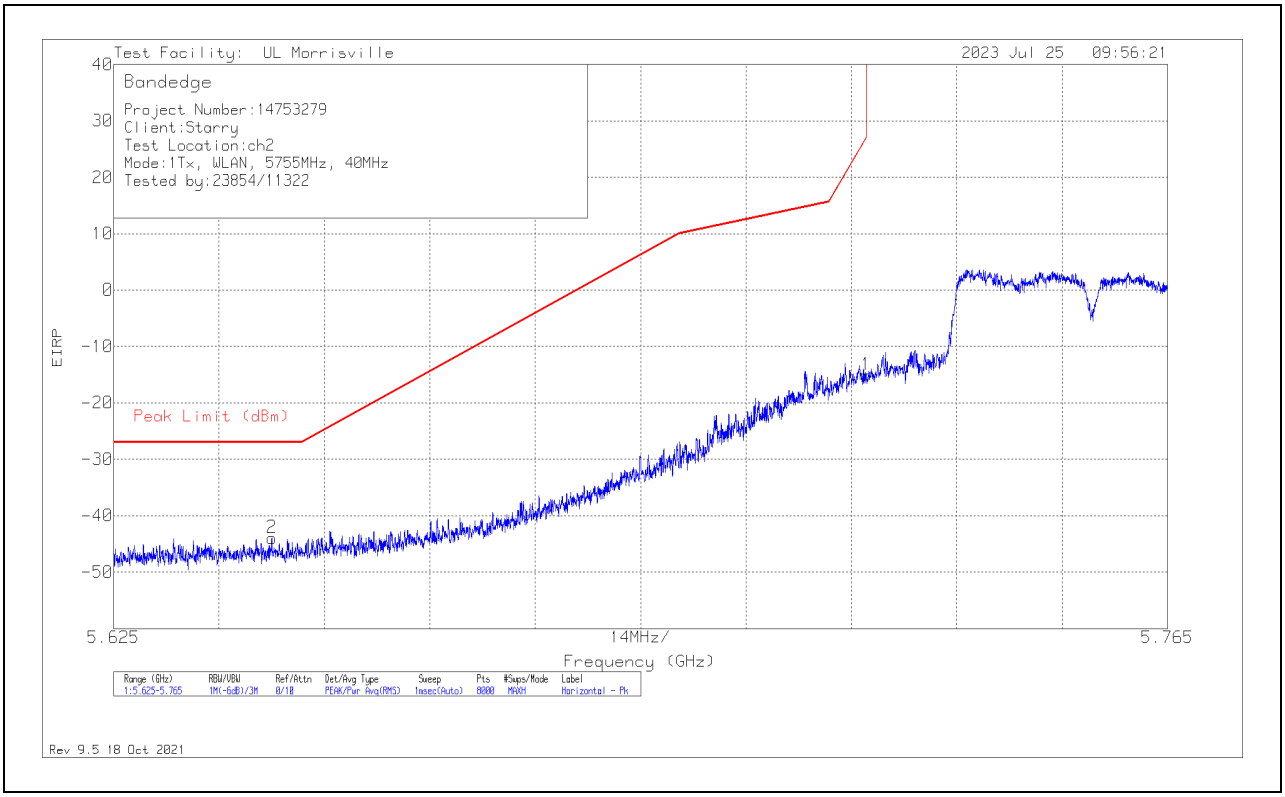
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector

10.1.3. TX ABOVE 1 GHz 802.11n HT40 MODE IN THE 5.8 GHz BAND

1TX Antenna 1 MODE

BANDEDGE (LOW CHANNEL)

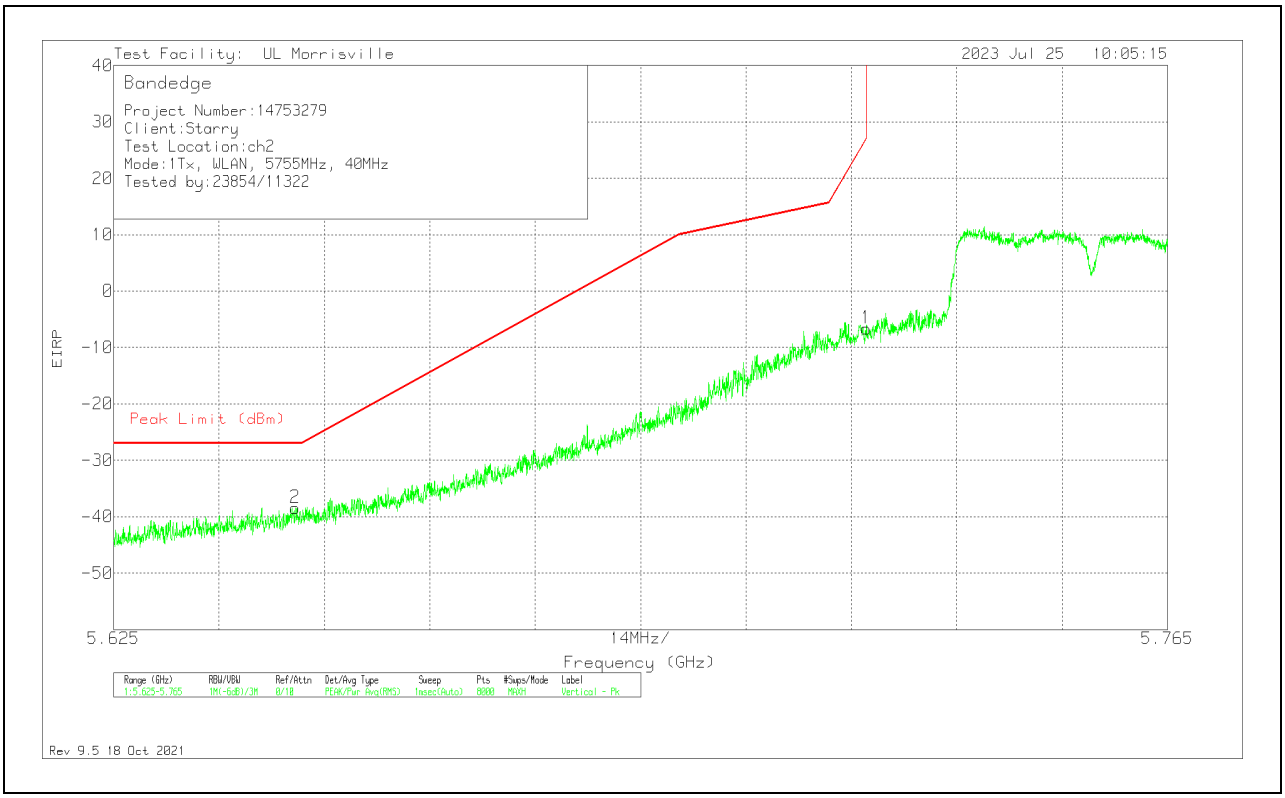
HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBm)	Det	88761 (dB/m)	Gain/Loss (dB)	Conversion Factor (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	5.646	-67.38	Pk	34.6	-23	11.8	-43.98	-27	-16.98	355	121	H
1	5.72499	-38.47	Pk	34.6	-23	11.8	-15.07	26.97	-42.04	355	121	H

Pk - Peak detector

VERTICAL RESULT

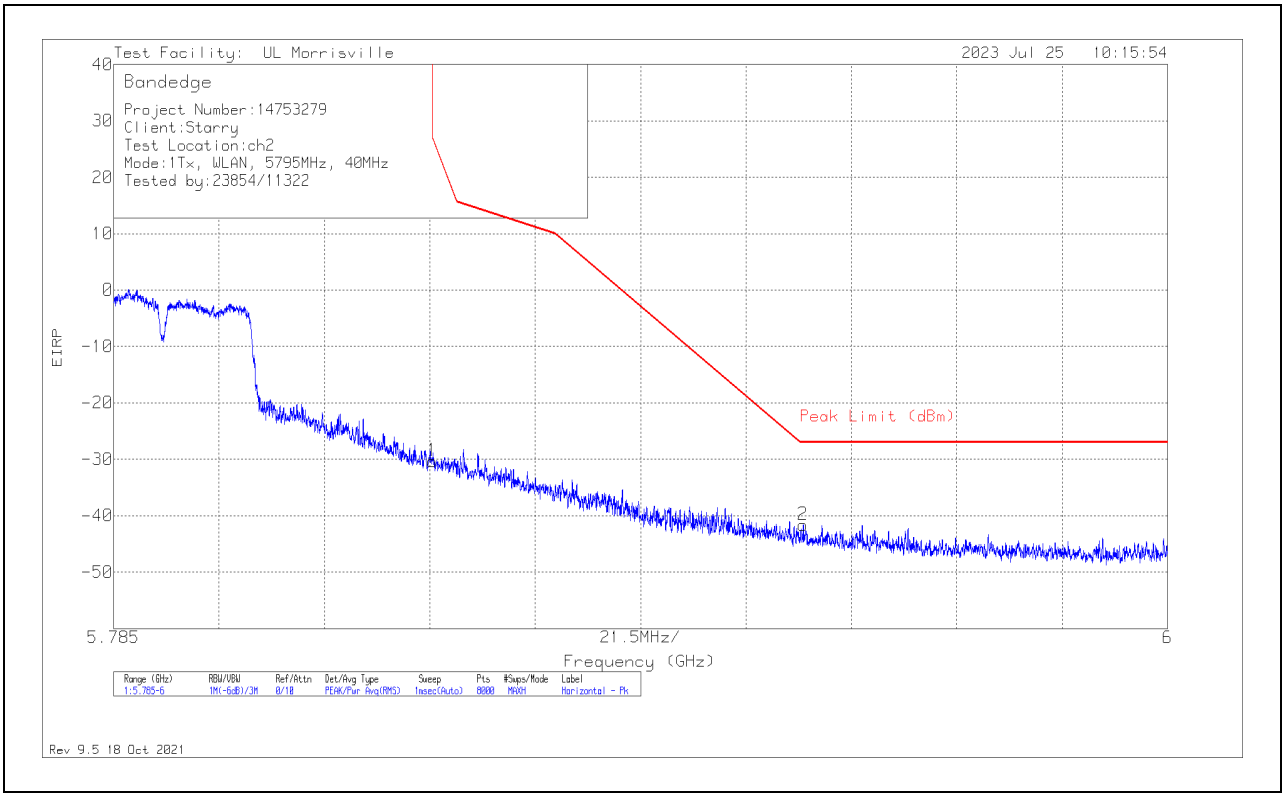


Marker	Frequency (GHz)	Meter Reading (dBm)	Det	88761 (dB/m)	Gain/Loss (dB)	Conversion Factor (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	5.64912	-61.84	Pk	34.6	-23	11.8	-38.44	-27	-11.44	41	120	V
1	5.72499	-30.01	Pk	34.6	-23	11.8	-6.61	26.97	-33.58	41	120	V

Pk - Peak detector

BANDEDGE (HIGH CHANNEL)

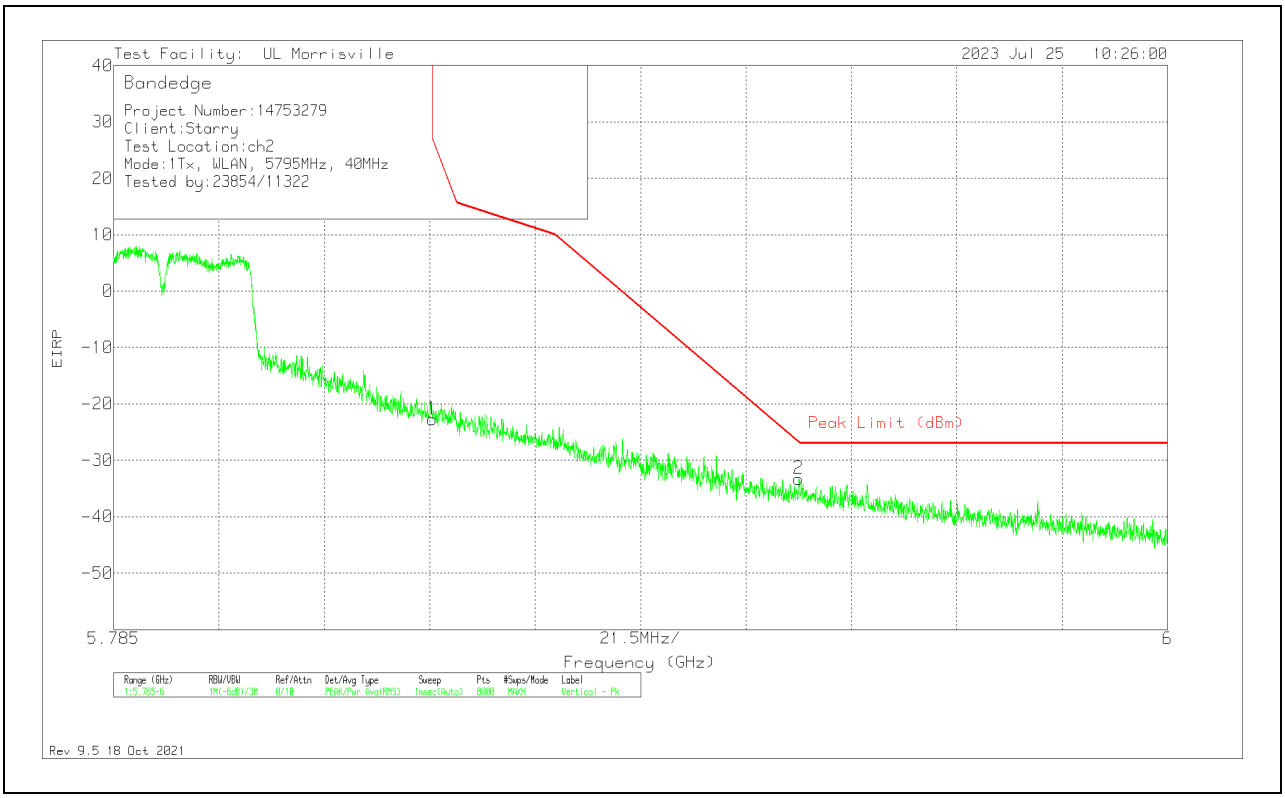
HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBm)	Det	88761 (dB/m)	Gain/Loss (dB)	Conversion Factor (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	5.85002	-54.03	Pk	34.8	-22.9	11.8	-30.33	26.96	-57.29	358	140	H
2	5.92568	-65.85	Pk	35	-22.6	11.8	-41.65	-27	-14.65	358	140	H

Pk - Peak detector

VERTICAL RESULT

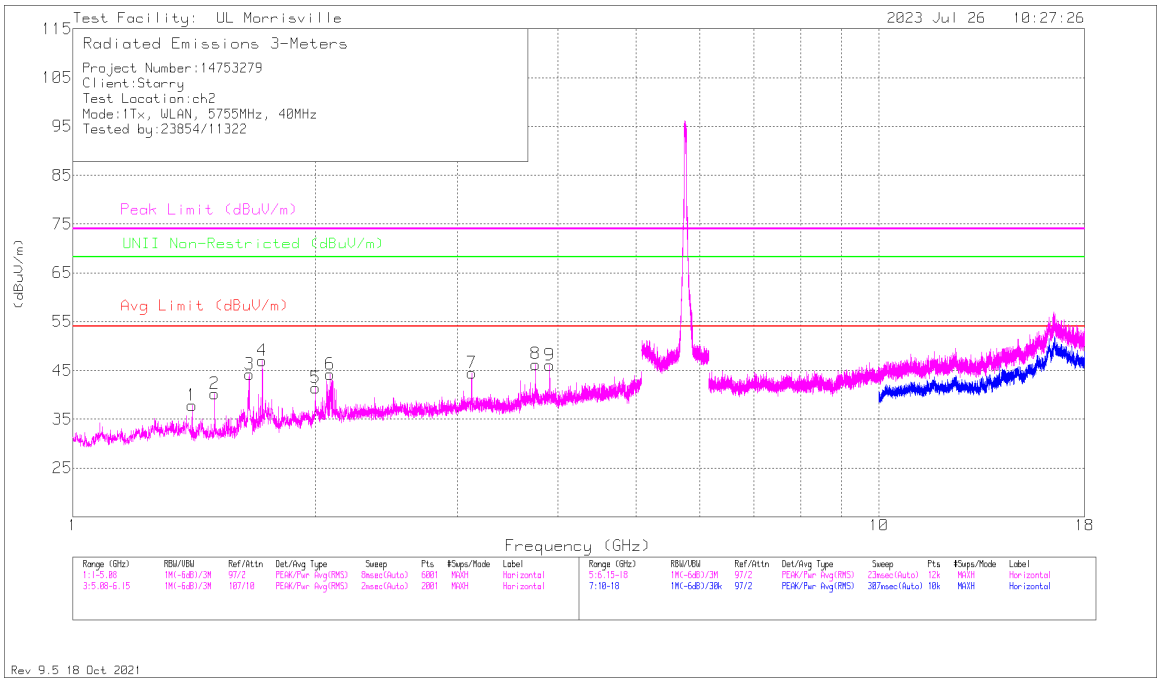


Marker	Frequency (GHz)	Meter Reading (dBm)	Det	88761 (dB/m)	Gain/Loss (dB)	Conversion Factor (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	5.85002	-46.45	Pk	34.8	-22.9	11.8	-22.75	26.96	-49.71	26	114	V
2	5.92477	-57.34	Pk	34.9	-22.6	11.8	-33.24	-26.83	-6.41	26	114	V

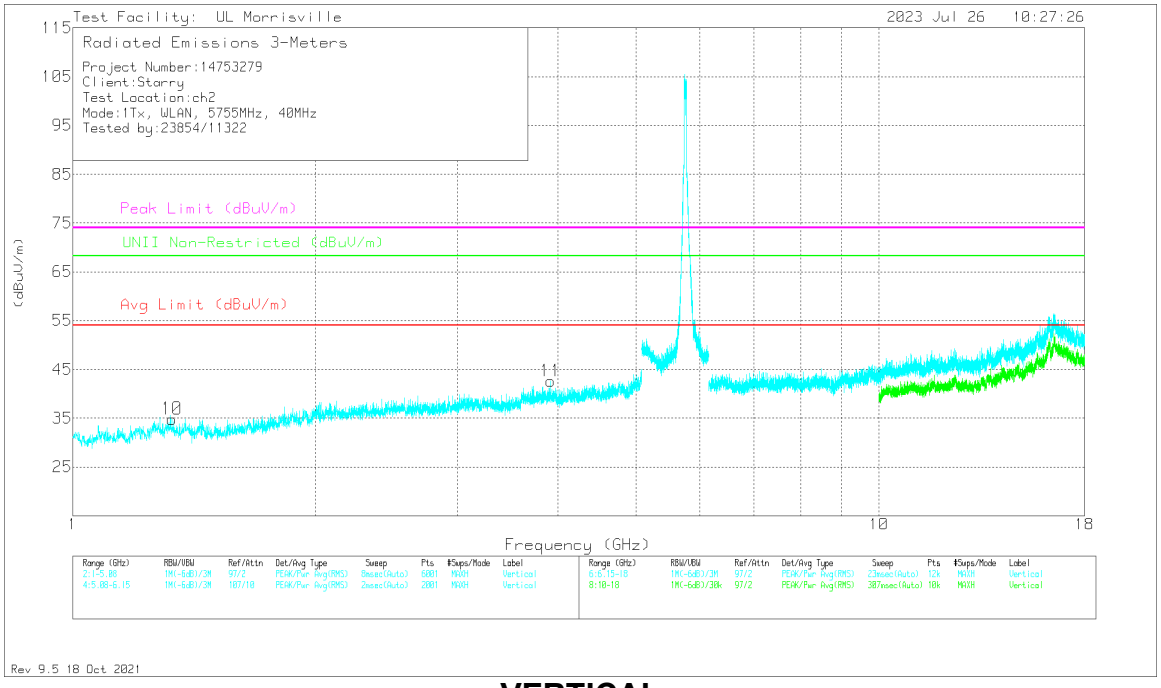
Pk - Peak detector

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



HORIZONTAL



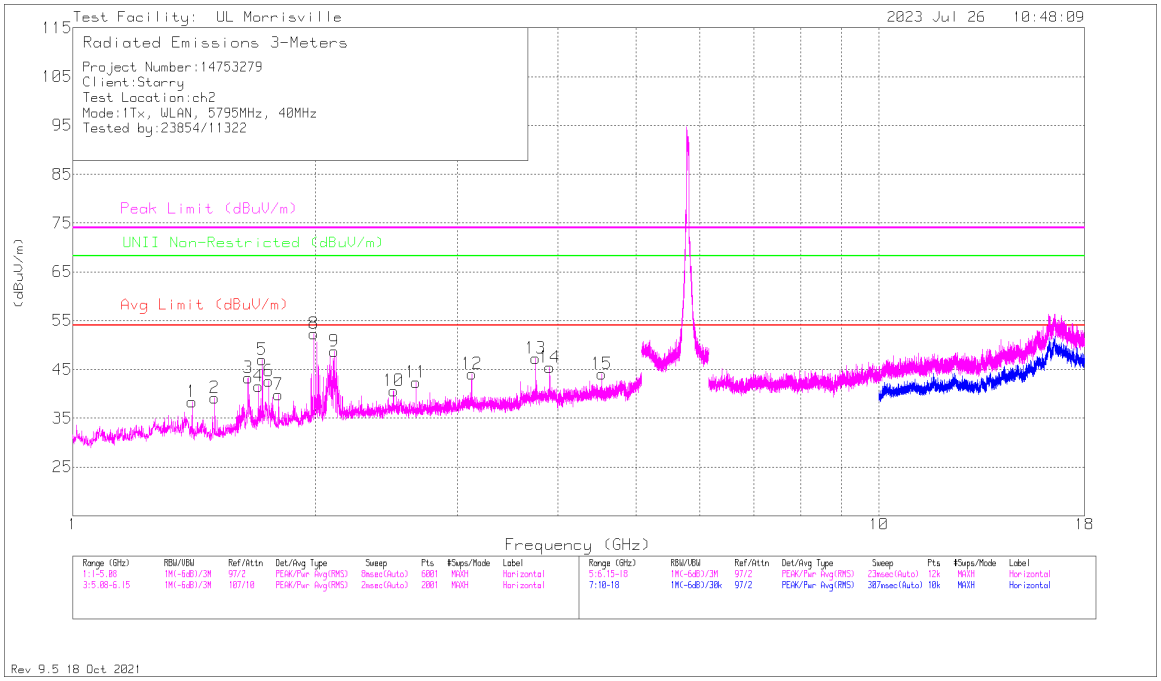
VERTICAL

RADIATED EMISSIONS

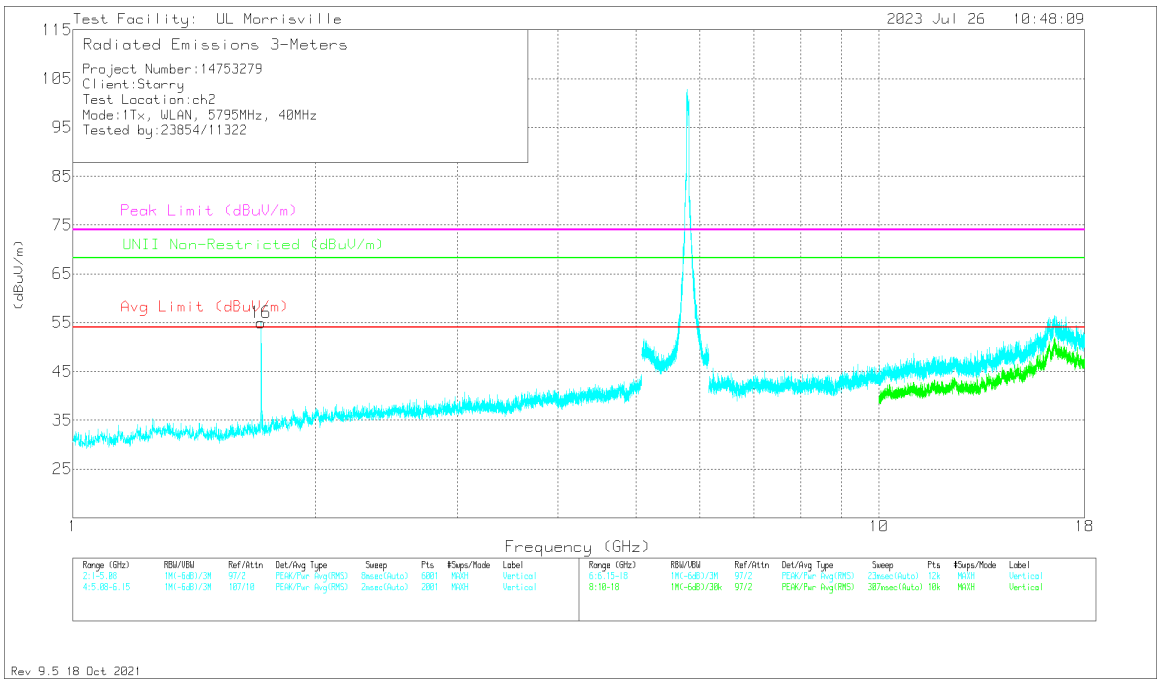
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	88761 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 1.40596	44.11	Pk	28.3	-34.6	37.81	54	-16.19	74	-36.19	-	-	0-360	101	H
2	* ** 1.4998	47.06	Pk	27.9	-34.7	40.26	54	-13.74	74	-33.74	-	-	0-360	101	H
4	** 1.71876	52.23	Pk	29.1	-34.3	47.03	-	-	-	-	68.2	-21.17	0-360	101	H
8	* ** 3.74992	45.17	Pk	33.2	-32.1	46.27	54	-7.73	74	-27.73	-	-	0-360	200	H
9	* ** 3.90632	44.21	Pk	33.4	-31.6	46.01	54	-7.99	74	-27.99	-	-	0-360	200	H
10	* ** 1.32708	40.74	Pk	28.8	-34.7	34.84	54	-19.16	74	-39.16	-	-	0-360	200	V
11	* ** 3.91448	40.79	Pk	33.4	-31.6	42.59	54	-11.41	74	-31.41	-	-	0-360	200	V
3	1.65552	49.6	Pk	28.5	-33.9	44.2	-	-	-	-	68.2	-24	0-360	200	H
5	2.00096	43.87	Pk	31.4	-33.9	41.37	-	-	-	-	68.2	-26.83	0-360	101	H
6	2.08392	46.75	Pk	31.7	-34.3	44.15	-	-	-	-	68.2	-24.05	0-360	101	H
7	3.125	44.4	Pk	33.1	-33	44.5	-	-	-	-	68.2	-23.7	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

HIGH CHANNEL RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

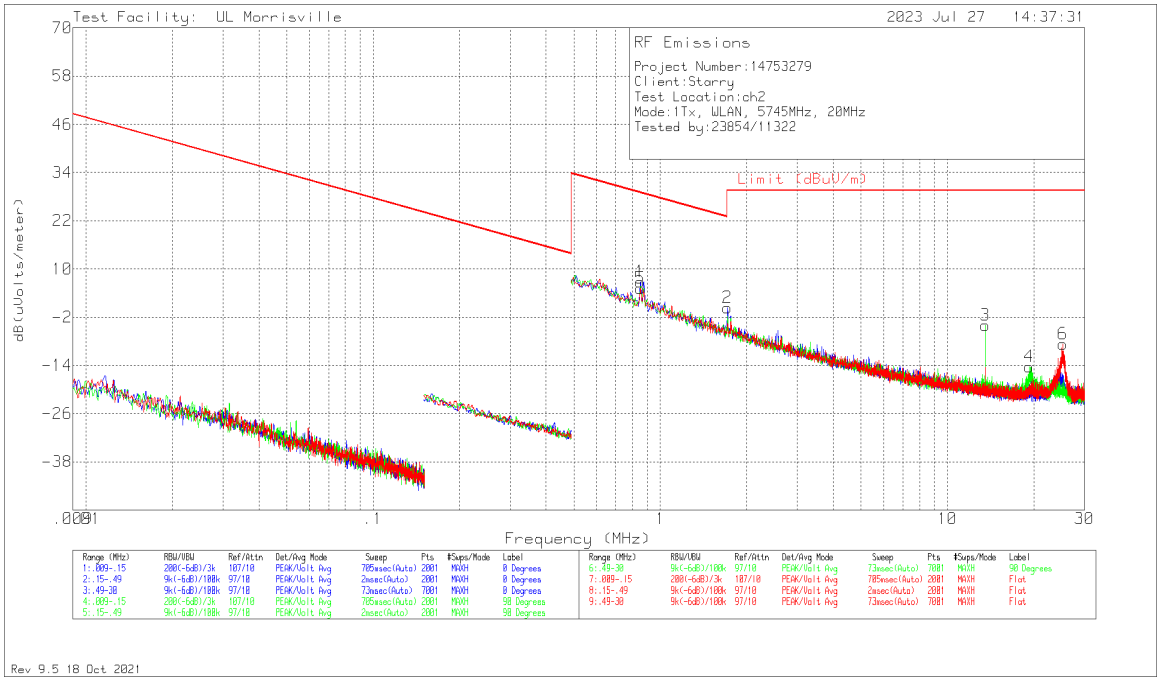
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	88761 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 1.40596	44.7	Pk	28.3	-34.6	38.4	54	-15.6	74	-35.6	-	-	0-360	101	H
2	* ** 1.4998	45.91	Pk	27.9	-34.7	39.11	54	-14.89	74	-34.89	-	-	0-360	101	H
4	* ** 1.69972	47.08	Pk	28.8	-34.3	41.58	54	-12.42	74	-32.42	-	-	0-360	200	H
5	** 1.71876	52.16	Pk	29.1	-34.3	46.96	-	-	-	-	68.2	-21.24	0-360	200	H
6	** 1.75004	47.6	Pk	29.4	-34.4	42.6	-	-	-	-	68.2	-25.6	0-360	200	H
9	** 2.11112	51.41	Pk	31.6	-34.3	48.71	-	-	-	-	68.2	-19.49	0-360	101	H
10	** 2.50008	41.87	Pk	32.4	-33.7	40.57	-	-	-	-	68.2	-27.63	0-360	200	H
11	* ** 2.66668	43.96	Pk	32.2	-33.8	42.36	54	-11.64	74	-31.64	-	-	0-360	101	H
13	* ** 3.74992	46.2	Pk	33.2	-32.1	47.3	54	-6.7	74	-26.7	-	-	0-360	200	H
14	* ** 3.90632	43.59	Pk	33.4	-31.6	45.39	54	-8.61	74	-28.61	-	-	0-360	200	H
15	* ** 4.53124	41.67	Pk	33.8	-31.4	44.07	54	-9.93	74	-29.93	-	-	0-360	101	H
16	** 1.71264	60.3	Pk	29	-34.3	55	-	-	-	-	68.2	-13.2	0-360	101	V
3	1.65008	48.74	Pk	28.6	-34	43.34	-	-	-	-	68.2	-24.86	0-360	200	H
7	1.80036	44.51	Pk	29.9	-34.6	39.81	-	-	-	-	68.2	-28.39	0-360	200	H
8	1.99144	55.01	Pk	31.2	-33.9	52.31	-	-	-	-	68.2	-15.89	0-360	101	H
12	3.125	43.97	Pk	33.1	-33	44.07	-	-	-	-	68.2	-24.13	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

10.2. WORST CASE BELOW 30MHZ

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).

SPURIOUS EMISSIONS BELOW 30 MHz (WORST-CASE CONFIGURATION)



ANTENNA- THREE ORIENTATIONS

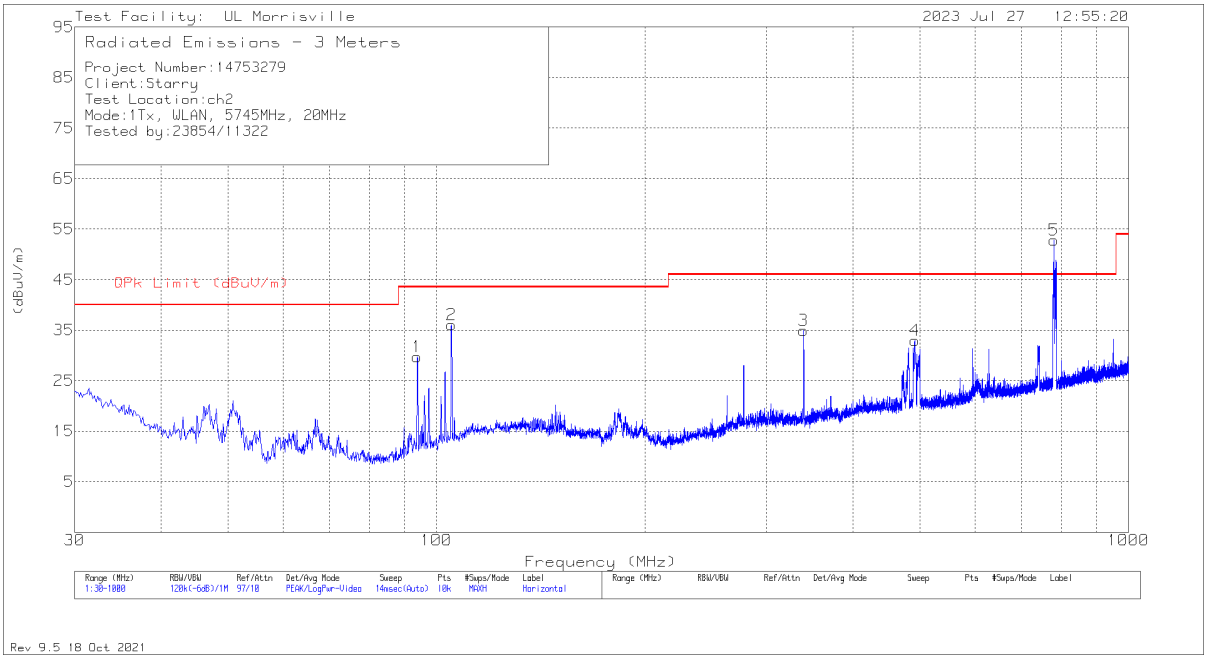
Below 30MHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	135144 (dB/m)	Gain/Loss (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Loop Angle
1	.85258	34.44	Pk	12.2	.2	-40	6.84	28.99	-22.15	0-360	0 degs
5	.85258	32.78	Pk	12.2	.2	-40	5.18	28.99	-23.81	0-360	Flat
2	1.71264	27.81	Pk	12.3	.2	-40	.31	29.54	-29.23	0-360	0 degs
3	13.5596	24.8	Pk	10.6	.6	-40	-4	29.54	-33.54	0-360	90 degs
4	19.2259	14.95	Pk	9.9	.8	-40	-14.35	29.54	-43.89	0-360	90 degs
6	25.16625	21.47	Pk	8.9	.9	-40	-8.73	29.54	-38.27	0-360	Flat

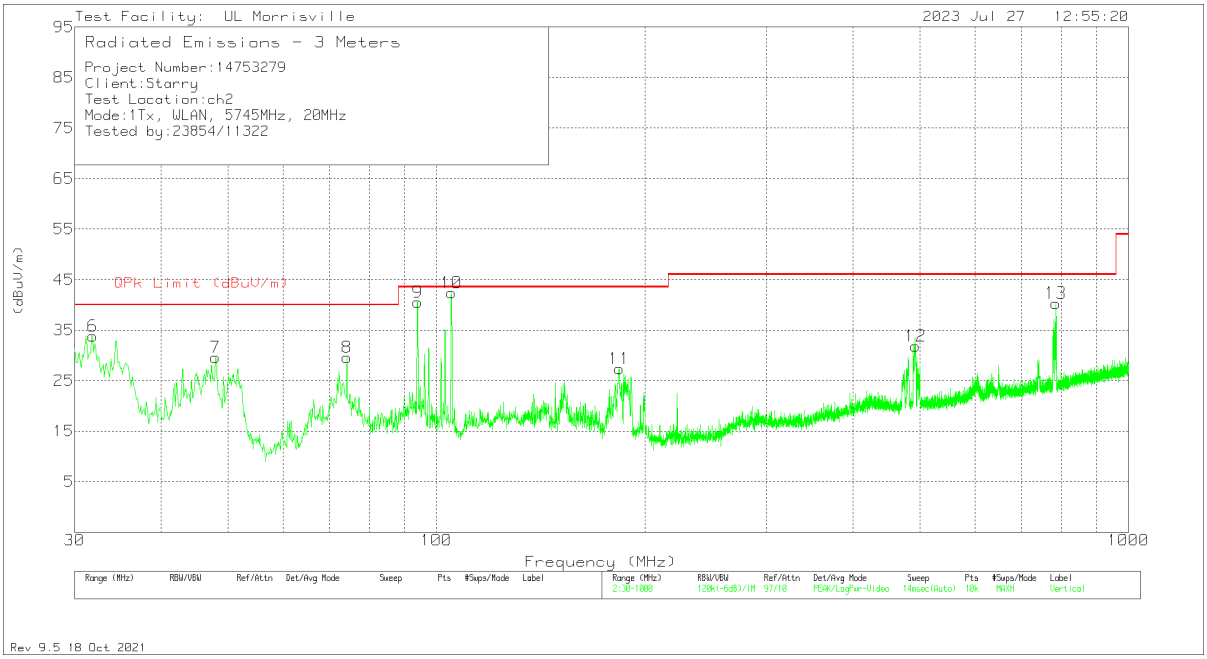
Pk – Peak Detector

10.3. WORST CASE BELOW 1 GHZ

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



HORIZONTAL



VERTICAL

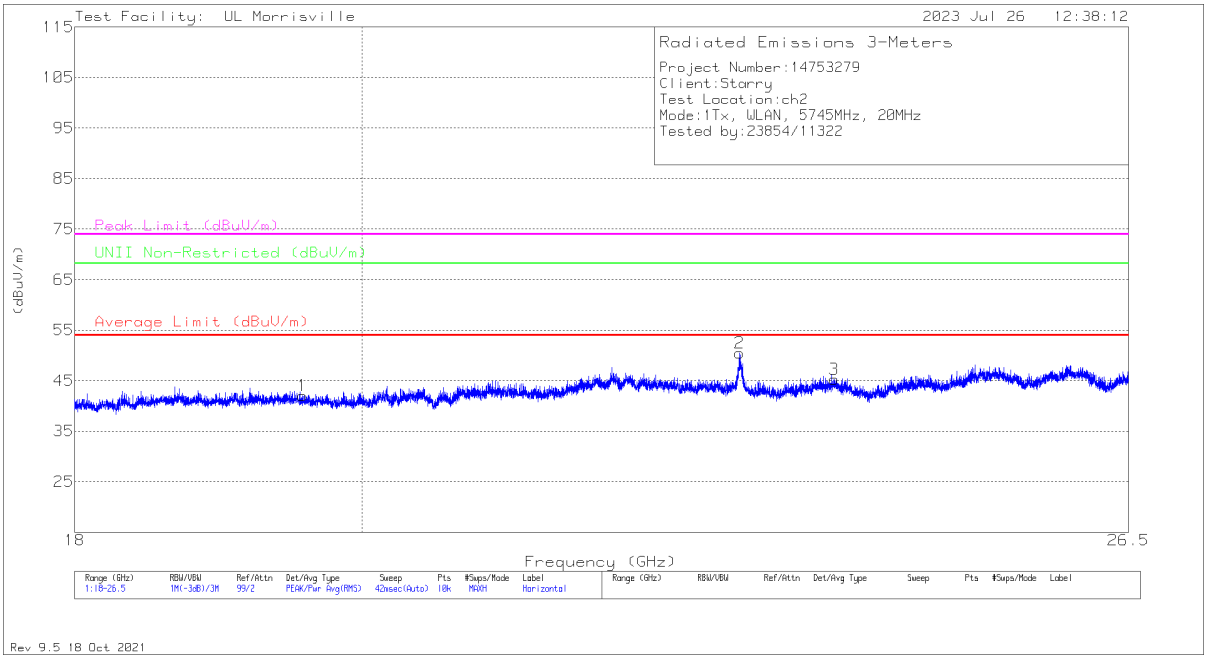
Below 1GHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	90627 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
6	31.843	39.4	Pk	26	-31.6	33.8	40	-6.2	0-360	101	V
7	47.945	46.25	Pk	14.8	-31.5	29.55	40	-10.45	0-360	101	V
8	74.232	46.42	Pk	14.3	-31.1	29.62	40	-10.38	0-360	101	V
1	93.826	45.98	Pk	14.9	-31.1	29.78	43.52	-13.74	0-360	399	H
9	93.9081	52.87	Qp	14.9	-31.1	36.67	43.52	-6.85	31	126	V
2	105.078	49.11	Pk	17.8	-30.8	36.11	43.52	-7.41	0-360	399	H
10	105.1168	44.69	Qp	17.8	-30.8	31.69	43.52	-11.83	346	112	V
11	183.648	40	Pk	17.5	-30.1	27.4	43.52	-16.12	0-360	101	V
3	339.236	44.19	Pk	20	-29.2	34.99	46.02	-11.03	0-360	99	H
4	490.944	37.39	Pk	23.9	-28.3	32.99	46.02	-13.03	0-360	99	H
12	491.914	36.46	Pk	23.9	-28.5	31.86	46.02	-14.16	0-360	101	V
5	780.0311	18.9	Qp	26.8	-27.3	18.4	46.02	-27.62	289	241	H
13	785.7632	19.04	Qp	26.7	-27.4	18.34	46.02	-27.68	181	122	V

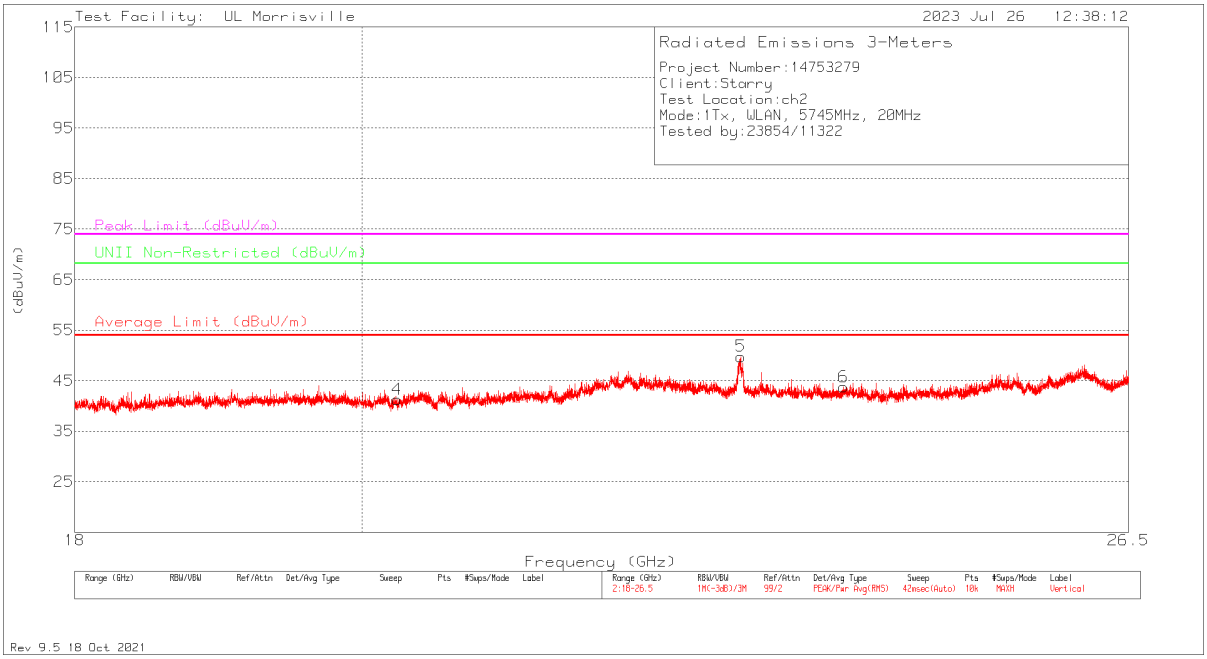
Pk - Peak detector
Qp - Quasi-Peak detector

10.4. WORST CASE 18-26 GHZ

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



HORIZONTAL



VERTICAL

18 – 26GHz Data

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	78835 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 19.56979	46.94	Pk	33	-37.9	42.04	54	-11.96	74	-31.96	-	-	0-360	200	H
2	* ** 22.97731	55.92	PK-U	34.7	-37.3	53.32	-	-	74	-20.68	-	-	36	143	H
	* ** 22.97731	42.38	ADV	34.7	-37.3	39.78	54	-14.22	-	-	-	-	36	143	H
3	* ** 23.78707	48.18	Pk	34.1	-37	45.28	54	-8.72	74	-28.72	-	-	0-360	101	H
4	* ** 20.25992	46	Pk	33.1	-37.8	41.3	54	-12.7	74	-32.7	-	-	0-360	250	V
5	* ** 22.98572	56.71	PK-U	34.6	-37.4	53.91	-	-	74	-20.09	-	-	62	290	V
	* ** 22.98396	42.86	ADV	34.6	-37.4	40.06	54	-13.94	-	-	-	-	62	290	V
6	* ** 23.86781	46.9	Pk	34.2	-37.3	43.8	54	-10.2	74	-30.2	-	-	0-360	250	V

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

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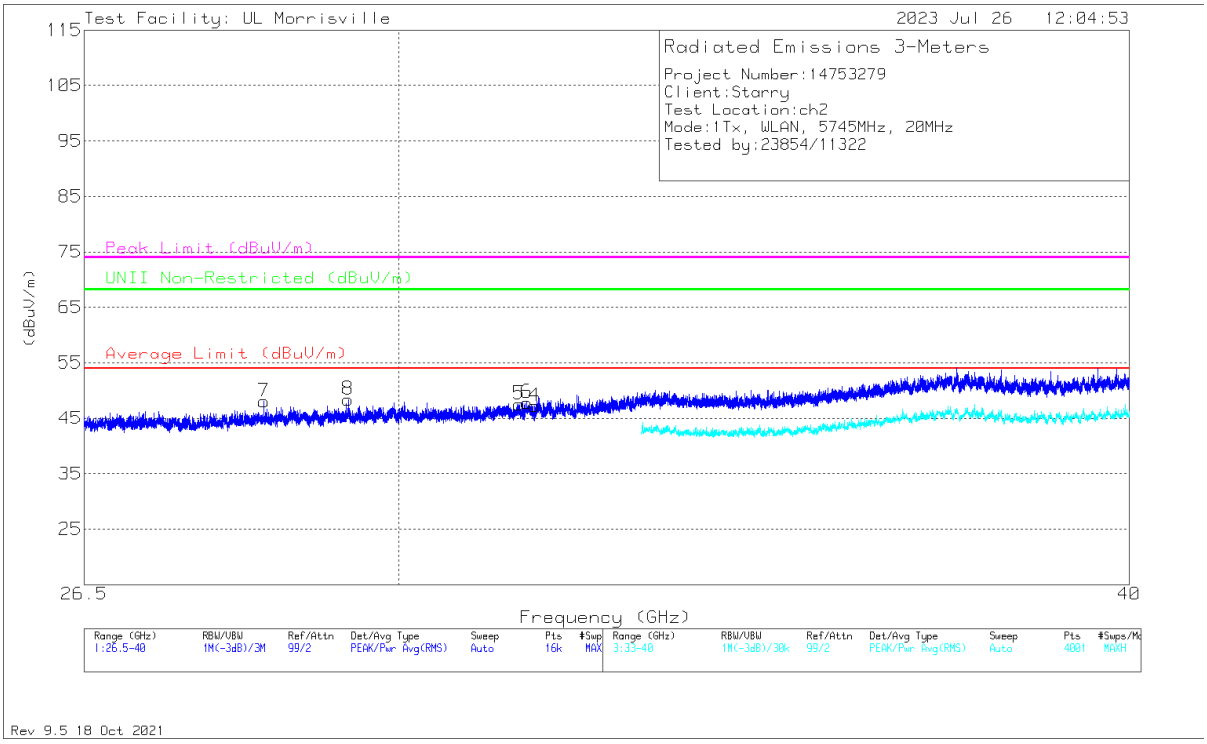
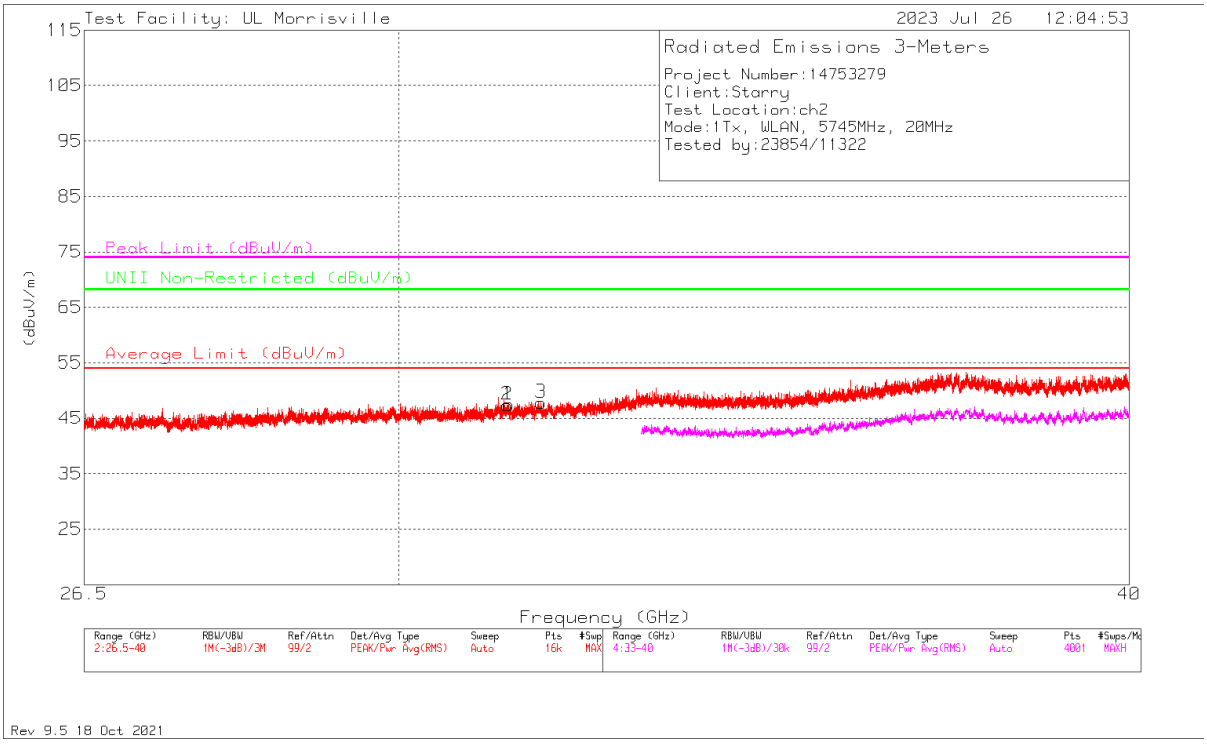
10.5. WORST CASE 26-40 GHZ

SPURIOUS EMISSIONS 26-40 GHz (WORST-CASE CONFIGURATION)



HORIZONTAL



VERTICAL

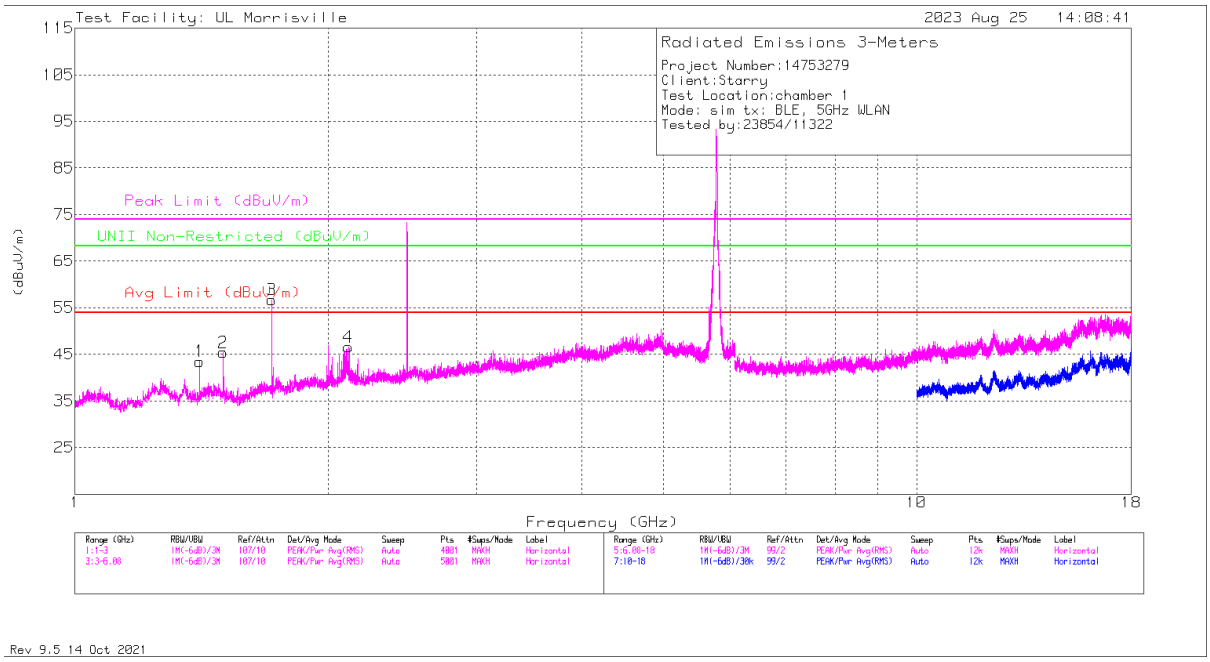
26 – 40GHz Data

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	77783 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	* ** 31.64402	44.9	Pk	36.9	-34.6	47.2	54	-6.8	74	-26.8	-	-	0-360	250	H
5	* ** 31.45335	44.7	Pk	36.9	-34.1	47.5	54	-6.5	74	-26.5	-	-	0-360	150	H
6	* ** 31.54784	44.88	Pk	36.9	-34	47.78	54	-6.22	74	-26.22	-	-	0-360	250	H
1	* ** 31.32257	44.65	Pk	36.9	-34.1	47.45	54	-6.55	74	-26.55	-	-	0-360	150	V
2	* ** 31.30992	44.49	Pk	36.9	-34	47.39	54	-6.61	74	-26.61	-	-	0-360	150	V
3	* ** 31.72586	45.09	Pk	37	-34.3	47.79	54	-6.21	74	-26.21	-	-	0-360	299	V
7	28.44641	46.24	Pk	36.4	-34.6	48.04	-	-	-	-	68.2	-20.16	0-360	299	H
8	29.40485	45.86	Pk	36.3	-33.8	48.36	-	-	-	-	68.2	-19.84	0-360	299	H

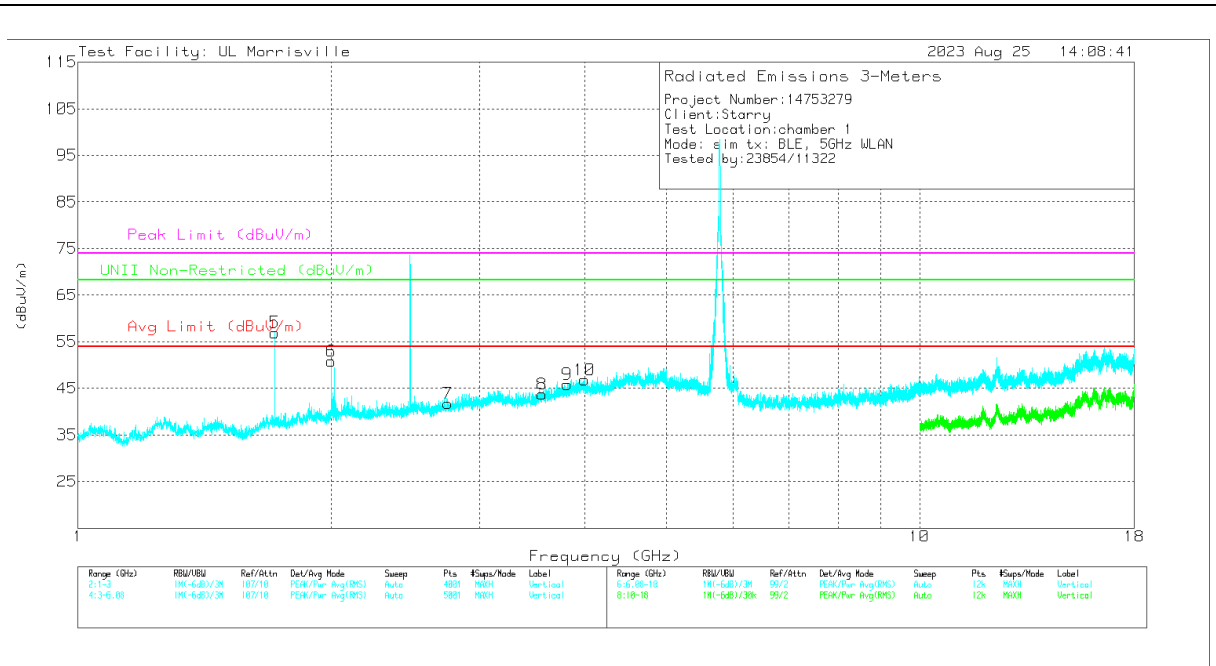
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector

10.6. SIMULTANEOUS TRANSMISSION

10.6.1. BLE 1Mbps 2480MHz + 5.8 WLAN 11n HT20 5785MHz



HORIZONTAL



VERTICAL

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	206211 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	UNII Non-Restricted (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.4065	38.49	Pk	28.4	-23.4	43.49	54	-10.51	74	-30.51	68.2	-24.71	0-360	101	H
2	* 1.5	40.37	Pk	27.9	-22.9	45.37	54	-8.63	74	-28.63	68.2	-22.83	0-360	200	H
3	1.713	50.6	Pk	29.3	-23.2	56.7	-	-	-	-	68.2	-11.5	0-360	200	H
4	2.1135	38.26	Pk	31.6	-23.3	46.56	-	-	-	-	68.2	-21.64	0-360	101	H
5	1.7125	50.74	Pk	29.3	-23.1	56.94	-	-	-	-	68.2	-11.26	0-360	200	V
7	* 2.751	32.44	Pk	32.1	-22.8	41.74	54	-12.26	74	-32.26	68.2	-26.46	0-360	200	V
8	* 3.56056	30.33	Pk	32.8	-19.4	43.73	54	-10.27	74	-30.27	68.2	-24.47	0-360	200	V
9	* 3.81435	31.76	Pk	33.4	-19.3	45.86	54	-8.14	74	-28.14	68.2	-22.34	0-360	101	V
10	* 3.99915	32.52	Pk	33.4	-19.1	46.82	54	-7.18	74	-27.18	68.2	-21.38	0-360	200	V
6	2	43.08	Pk	31.1	-23.4	50.78	-	-	-	-	68.2	-17.42	0-360	200	V

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

11. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

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

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

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

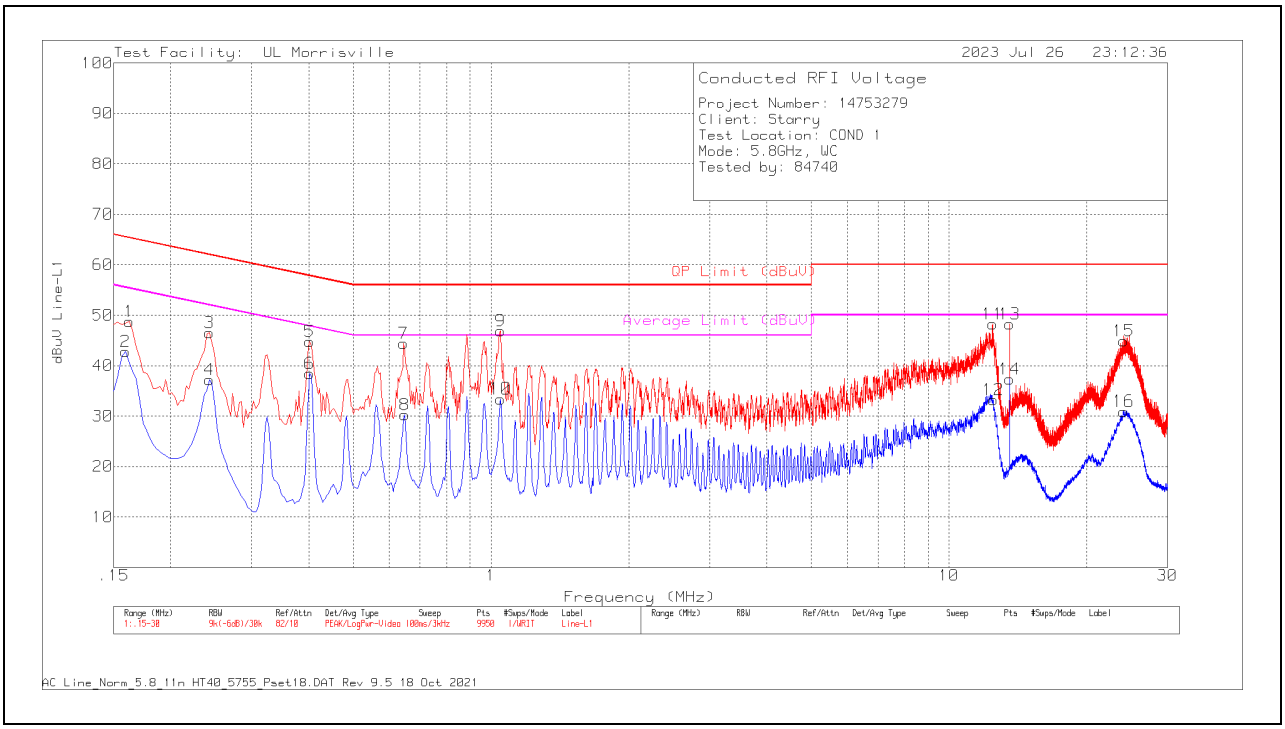
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

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

RESULTS

11.1.1. AC Power Line Host

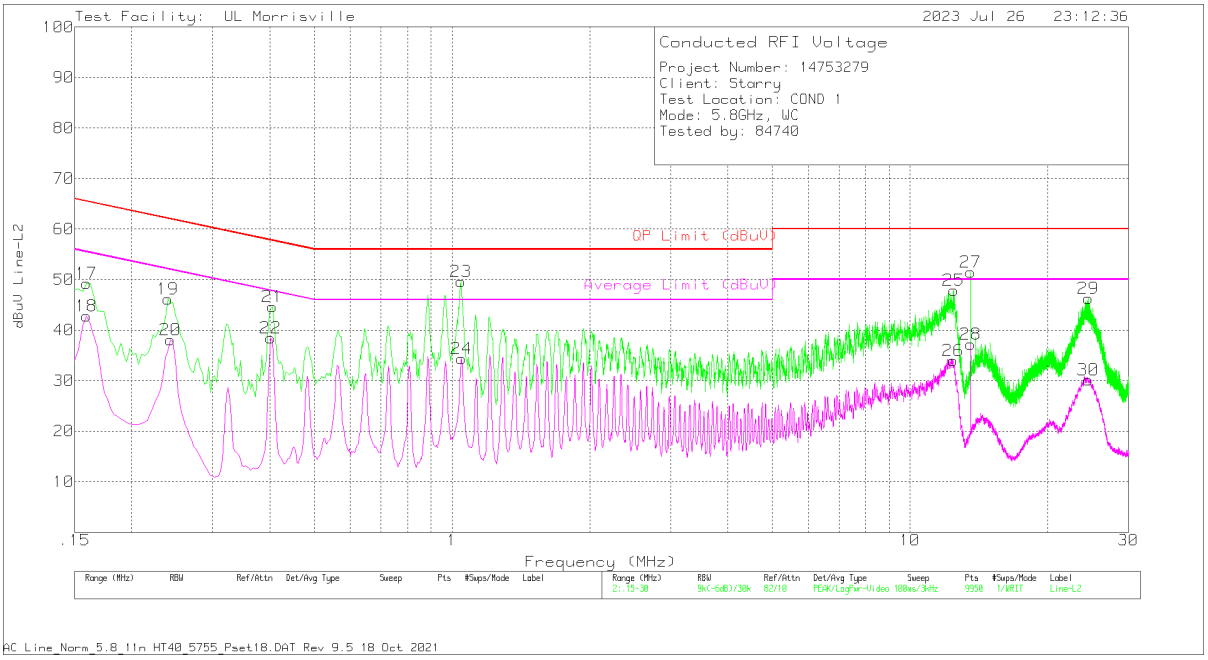
LINE 1 RESULTS



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)
2	.159	32.8	Av	.2	9.8	42.8	-	-	55.52	-12.72
1	.162	38.79	Pk	.2	9.8	48.79	65.36	-16.57	-	-
3	.243	36.67	Pk	.1	9.8	46.57	61.99	-15.42	-	-
4	.243	27.31	Av	.1	9.8	37.21	-	-	51.99	-14.78
5	.402	35.02	Pk	0	9.8	44.82	57.81	-12.99	-	-
6	.402	28.69	Av	0	9.8	38.49	-	-	47.81	-9.32
7	.645	34.56	Pk	0	9.8	44.36	56	-11.64	-	-
8	.648	20.43	Av	0	9.8	30.23	-	-	46	-15.77
9	1.05	37.15	Pk	0	9.8	46.95	56	-9.05	-	-
10	1.05	23.62	Av	0	9.8	33.42	-	-	46	-12.58
11	12.456	38.15	Pk	.1	10	48.25	60	-11.75	-	-
12	12.483	23.15	Av	.1	10	33.25	-	-	50	-16.75
13	13.56	38.17	Pk	.1	10	48.27	60	-11.73	-	-
14	13.56	27.2	Av	.1	10	37.3	-	-	50	-12.7
15	24.078	34.54	Pk	.2	10.2	44.94	60	-15.06	-	-
16	24.087	20.54	Av	.2	10.2	30.94	-	-	50	-19.06

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)
17	.159	39.28	Pk	.2	9.8	49.28	65.52	-16.24	-	-
18	.159	32.81	Av	.2	9.8	42.81	-	-	55.52	-12.71
19	.24	36.22	Pk	.1	9.8	46.12	62.1	-15.98	-	-
20	.243	28.16	Av	.1	9.8	38.06	-	-	51.99	-13.93
22	.402	28.62	Av	0	9.8	38.42	-	-	47.81	-9.39
21	.405	34.85	Pk	0	9.8	44.65	57.75	-13.1	-	-
23	1.047	39.86	Pk	0	9.8	49.66	56	-6.34	-	-
24	1.05	24.51	Av	0	9.8	34.31	-	-	46	-11.69
26	12.411	23.93	Av	.1	10	34.03	-	-	50	-15.97
25	12.444	37.84	Pk	.1	10	47.94	60	-12.06	-	-
27	13.56	41.34	Pk	.1	10	51.44	60	-8.56	-	-
28	13.56	27.15	Av	.1	10	37.25	-	-	50	-12.75
30	24.486	19.71	Av	.2	10.2	30.11	-	-	50	-19.89
29	24.492	35.91	Pk	.2	10.2	46.31	60	-13.69	-	-

Pk - Peak detector
Av - Average detection

12. SETUP PHOTOS

Please refer to R14753279-EP1 for setup diagrams and setup photos.

END OF TEST REPORT