



TEST REPORT

Report Number: R14333406-E1

Applicant : KS Technologies, LLC
11580 Black Forest Road, Suite #60
Colorado Springs, CO 80908, USA

Model : KST7030

FCC ID : 2AA3A-KST7030

EUT Description : Affinity LoRa Concentrator Card

Test Standard(s) : FCC 47 CFR PART 15 SUBPART C (2022)

Date Of Issue:

2022-08-02

Prepared by:

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REPORT REVISION HISTORY

Ver.	Issue Date	Revisions	Revised By
v1	2022-07-15	Initial Issue	Niklas Haydon
v2	2022-07-25	Revised maximum output power, other editorial corrections	Niklas Haydon
v3	2020-08-02	Editorial corrections to the antenna section	Niklas Haydon

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: KS Technologies, LLC
11580 Black Forest Road, Suite #60
Colorado Springs, CO 80908, USA

EUT DESCRIPTION: Affinity LoRa Concentrator Card

MODEL: KST7030

SERIAL NUMBER: 9, 13

SAMPLE RECEIPT DATE: 2022-06-10

DATE TESTED: 2022-06-14 to 2022-06-30

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C (2022)	Compliant

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

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

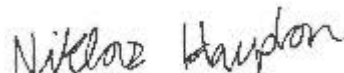
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Approved & Released
For UL LLC By:



Michael Antola
Staff Engineer
UL LLC

Prepared By:



Niklas Haydon
Operations Leader
UL LLC

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2 (2022), FCC CFR 47 Part 15 (2022), ANSI C63.10-2013, KDB 558074 D01 15.247 Meas Guidance v05r02, KDB 414788 D01 Radiated Test Site v01r01, RSS-GEN Issue 5 + A2, and RSS-247 Issue 2.

3. FACILITIES AND ACCREDITATION

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

	Address	ISED CABID	ISED Company Number	FCC Registration
<input type="checkbox"/>	Building: 12 Laboratory Dr RTP, NC 27709, U.S.A	US0067	2180C	825374
<input checked="" type="checkbox"/>	Building: 2800 Perimeter Park Dr. Suite B Morrisville, NC 27560, U.S.A		27265	

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

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

4.2. SAMPLE CALCULATION

RADIATED EMISSIONS

Where relevant, the following sample calculation is provided:

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

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

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:

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

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

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Radio Frequency (Spectrum Analyzer)	141.2 Hz
Occupied Channel Bandwidth	2.00%
RF output power, conducted	1.3 dB (PK), 0.45 dB (AV)
RF output power, radiated (SAC)	4.52 dB
Power Spectral Density, conducted	2.47 dB
Unwanted Emissions, conducted	2.50 dB
All emissions, radiated	4.88 dB
Temperature	2.26°C
Humidity	6.79%
DC Supply voltages	1.70%
Time	3.39%

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

5. EQUIPMENT UNDER TEST

5.1. EUT DESCRIPTION

The EUT is an Affinity LoRa® Concentrator Card. The module presents a bi-directional Radio Frequency (RF) interface to LoRaWAN compliant sensors and a digital interface to a Host Computer. The module can be inserted into a standard connector located on a generic gateway product to extend/add to its capabilities. The device firmware translates digital commands into RF Front-end Settings for lower-level radio functions. The RF Front End only supports ISM-band LoRa functionality.

5.2. MAXIMUM OUTPUT POWER

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

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
903.9-905.3	125kHz	16.92	49.20
923.3-927.5	500kHz	17.84	60.81

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

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

The radio utilizes two options for antennas:

Naming in Report	Antenna Part Number	Antenna Type	Antenna Gain	Total cables loss (u.fl to antenna)	Assembly Gain
Antenna #1	ANT-916-OC-LG	Dipole	2.2dBi	0.6dB	1.6dBi
Antenna #2	OMB.915.B08F21	Dipole	8dBi	1.25dB	6.75dBi

For antenna option #2, two different cable assemblies can be used (refer to the manufacturer's operational description). Both cable assemblies have the same loss and result in the same assembly gain.

5.4. SOFTWARE AND FIRMWARE

The test tools used to operate the EUT were as follows:

test_loragw_hal_tx version 2.0.0

test_loragw_hal_tx_helium version 2.0.0

5.5. WORST-CASE CONFIGURATION AND MODE

Radiated emissions below 30MHz and AC mains line conducted were performed with the EUT set to transmit at the channel with highest power spectral density as worst-case scenario.

Radiated emissions between 30MHz and 10GHz were performed with the EUT set to transmit at on low and high channels for 125kHz and 500kHz bandwidths as well as each antenna assembly.

Output power was performed for the levels set for antenna #1 and antenna #2. All other antenna port conducted testing was performed at the highest power level from antenna #1 or antenna #2.

The fundamental of the EUT was investigated in three orthogonal orientations X,Y,Z, it was determined that Y orientation was worst-case orientation for antenna #1 and antenna #2; therefore, all final radiated testing was performed with the EUT in Y orientation for antenna #1 and antenna #2.

The EUT was tested as a hybrid system while operating with a 125kHz bandwidth, and was tested as a DTS device while operating with a 500kHz bandwidth.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List			
Description	Manufacturer	Model	Serial Number
Computer	Raspberry Pi	4B	0000011029294653
Computer	Raspberry Pi	4B	0000011025465833
AC/DC adapter	RND	RPI-18PFCA-05	RND320T7715DV
AC/DC adapter	Raspberry Pi	KSA-15E-051300HU	N/A
Network Switch	Netonix	WS-8-150-AC	0639i210202008
Network Switch	Netgear	FS105	1D52913A0442A

I/O CABLES

I/O Cable List						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
None						

SETUP DIAGRAMS

Please refer to R14333406-EP1 for setup diagrams

6. MEASUREMENT METHOD

On Time and Duty Cycle: ANSI C63.10 Section 11.6

6 dB BW: ANSI C63.10 Subclause 11.8.1

Emissions BW (20dB): ANSI C63.10-2013 Section 6.9.2

Occupied BW (99%): ANSI C63.10-2013 Section 6.9.3

Carrier Frequency Separation: ANSI C63.10-2013 Section 7.8.2

Number of Hopping Frequencies: ANSI C63.10-2013 Section 7.8.3

Time of Occupancy (Dwell Time): ANSI C63.10-2013 Section 7.8.4

Output Power: ANSI C63.10 Subclause 11.9.2.3.2 (AVGPM-G)

PSD: ANSI C63.10 Subclause 11.10.5 (AVGPSD-2)

Out-of-Band Emissions in non-restricted band: ANSI C63.10-2013 Section 7.8.6, 7.8.8, 6.10.4, 11.11

Out-of-band emissions in restricted bands: ANSI C63.10-2013 Section 6.3-6.5, 6.10.5, 11.12.1

General Radiated Emissions: ANSI C63.10:2013 Sections 6.3 – 6.6

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

7. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment Used - Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
SA0026	Spectrum Analyzer	Keysight Technologies	N9030A	2021-07-26	2022-07-26
HI0090	Environmental Meter	Fisher Scientific	15-077-963	2021-07-12	2022-07-12
SOFTEMI	Antenna Port Software	UL	Version 2022.5.4	NA	NA
PWM003	RF Power Meter	Keysight Technologies	N1911A	2021-08-30	2022-08-30
PWS004	Peak and Avg Power Sensor, 50MHz to 6GHz	Keysight Technologies	E9323A	2021-08-19	2022-08-19
PWS005	Peak and Avg Power Sensor, 50MHz to 6GHz	Keysight Technologies	N1921A	2022-06-15	2023-06-15
PWS006	Peak and Avg Power Sensor, 50MHz to 6GHz	Keysight Technologies	N1921A	2021-12-17	2022-12-17

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

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
CBL087	Coax cable, RG223, N-male to BNC-male, 20-ft.	Pasternack	PE3W06143-240	2022-04-05	2023-04-05
HI0091	Environmental Meter	Fisher Scientific	15-077-963	2021-07-12	2022-07-12
LISN003	LISN, 50-ohm/50-uH, 250uH 2-conductor, 25A	Fischer Custom Com.	FCC-LISN-50/250-25-2-01	2021-08-16	2022-08-16
75141	EMI Test Receiver 9kHz-7GHz	Rohde & Schwarz	ESCI 7	2021-08-17	2022-08-17
ATA222	Transient Limiter, 0.009-100MHz	Electro-Metrics	EM-7600	2022-04-05	2023-04-05
PS215	AC Power Source	Elgar	CW2501M (s/n 1523A02397)	NA	NA
SOFTEMI	EMI Software	UL	Version 9.5 (04 Mar 2021)		
	Miscellaneous (if needed)				
CDECABLE001	ANSI C63.4 1m extension cable.	UL	Per Annex B of ANSI C63.4	2021-09-13	2022-09-13
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/Brand	Model Number	Last Cal.	Next Cal.
	0.009-30MHz				
AT0079	Active Loop Antenna	ETS-Lindgren	6502	2021-08-19	2022-08-19
	30-1000 MHz				
AT0066	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB1	2022-03-01	2023-03-01
	1-18 GHz				
AT0072	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2022-05-11	2023-05-11
	Gain-Loss Chains				
C1-SAC01	Gain-loss string: 0.009-30MHz	Various	Various	2022-05-05	2023-05-05
C1-SAC02	Gain-loss string: 25-1000MHz	Various	Various	2022-05-05	2023-05-05
C1-SAC03	Gain-loss string: 1-18GHz	Various	Various	2022-05-05	2023-05-05
	Receiver & Software				
197954	Spectrum Analyzer	Rohde & Schwarz	ESW44	2022-04-14	2023-04-14
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
	Additional Equipment used				
s/n 181474341	Environmental Meter	Fisher Scientific	15-077-963	2021-09-27	2022-09-27
HPF012	1GHz high-pass filter, 2W, F _{high} =18GHz	Micro-Tronics	HPM18129	2022-02-17	2023-02-17
BRF007	902-928MHz notch filter, 2W, F _{high} =1.5GHz	Micro-Tronics	BRC17691	2021-07-21	2022-07-21

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				
AT0081	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2021-12-08	2022-12-08
	1-18 GHz				
AT0069	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2021-06-29	2022-06-29
	Gain-Loss Chains				
C4-SAC02	Gain-loss string: 25-1000MHz	Various	Various	2022-05-20	2023-05-20
C4-SAC03	Gain-loss string: 1-18GHz	Various	Various	2022-05-20	2023-05-20
	Receiver & Software				
206496	Spectrum Analyzer	Rohde & Schwarz	ESW44	2022-02-15	2023-02-15
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
	Additional Equipment used				
s/n 210701942	Environmental Meter	Fisher Scientific	15-077-963	2021-8-16	2023-08-16
BRF007	902-928MHz notch filter, 2W, F _{high} = 1.5GHz	Micro-Tronics	BRC17691	2021-07-21	2022-07-21
HPF012	1GHz high-pass filter, 2W, F _{high} = 18GHz	Micro-Tronics	HPM18129	2022-02-17	2023-02-17

8. ANTENNA PORT TEST RESULTS

8.1. ON TIME AND DUTY CYCLE

LIMITS

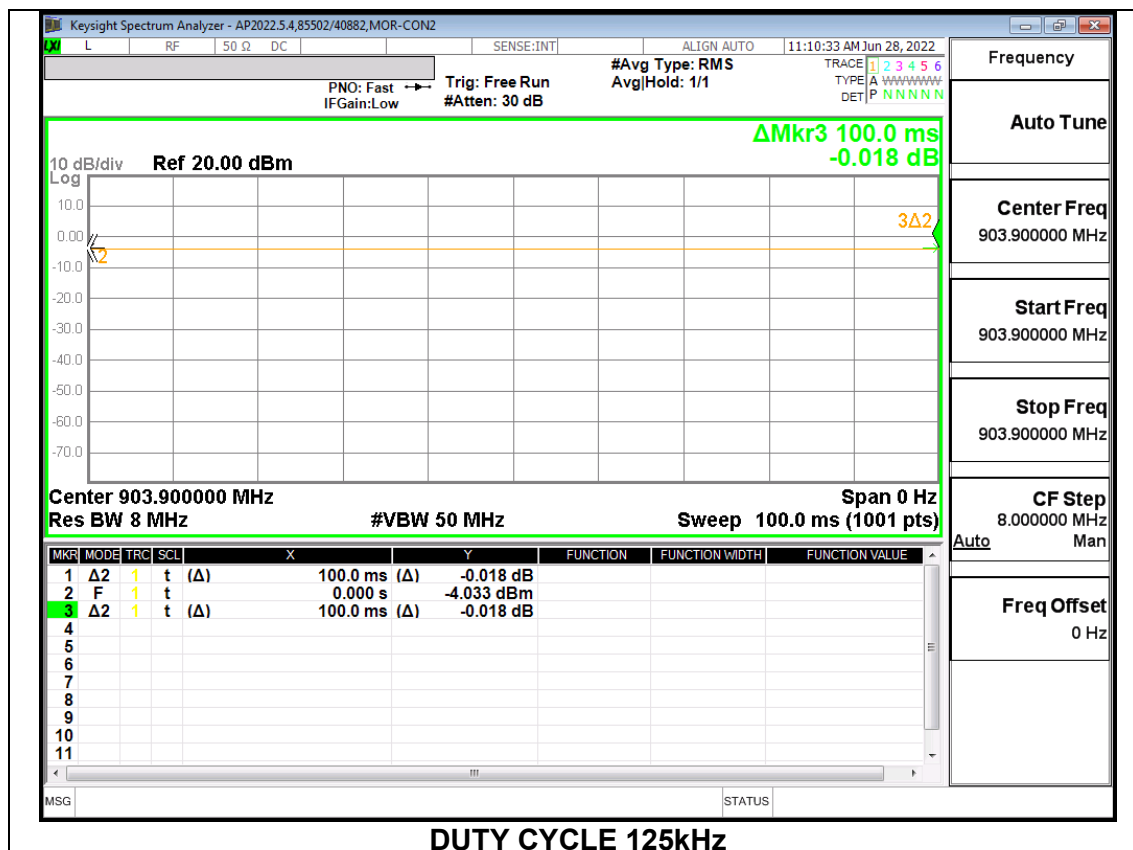
None; for reporting purposes only.

PROCEDURE

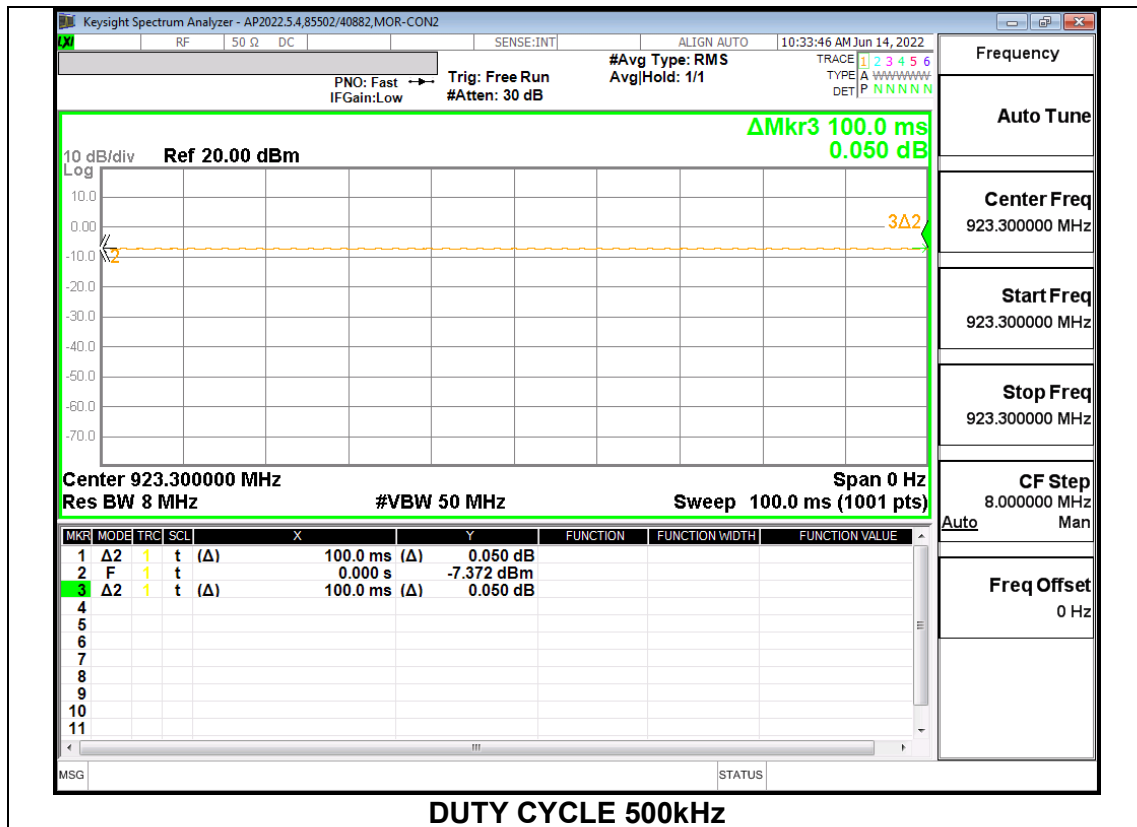
ANSI C63.10 Section 11.6 Zero-Span Spectrum Analyzer Method.

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
125kHz BW	100.0	100.0	1.000	100.00%	0.00	0.010
500kHz BW	100.0	100.0	1.000	100.00%	0.00	0.010

DUTY CYCLE PLOTS



DUTY CYCLE 125kHz



8.3.6 dB BANDWIDTH

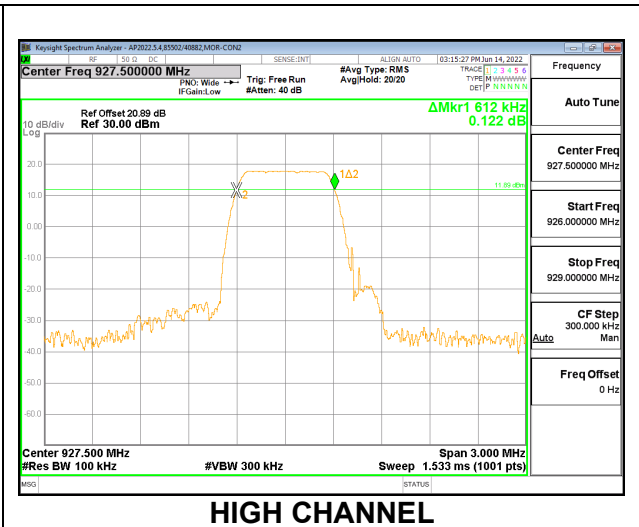
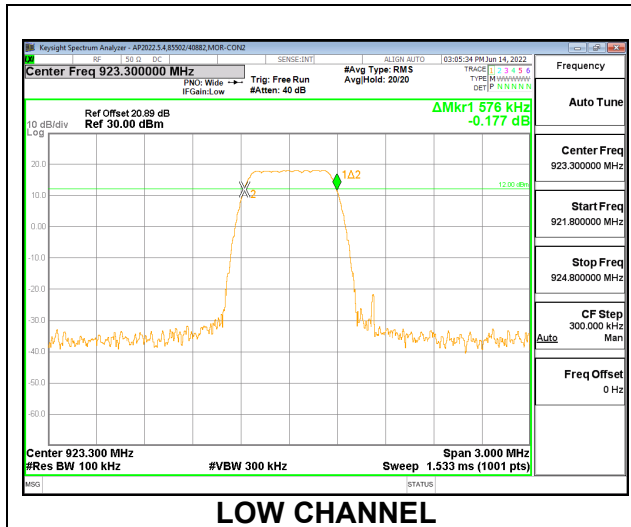
LIMITS

FCC §15.247 (a) (2)

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

8.3.1. 500kHz BANDWIDTH

Channel	Frequency (MHz)	6dB Bandwidth (MHz)
Low	923.3	0.576
High	927.5	0.612



8.4.20 dB BANDWIDTH

LIMITS

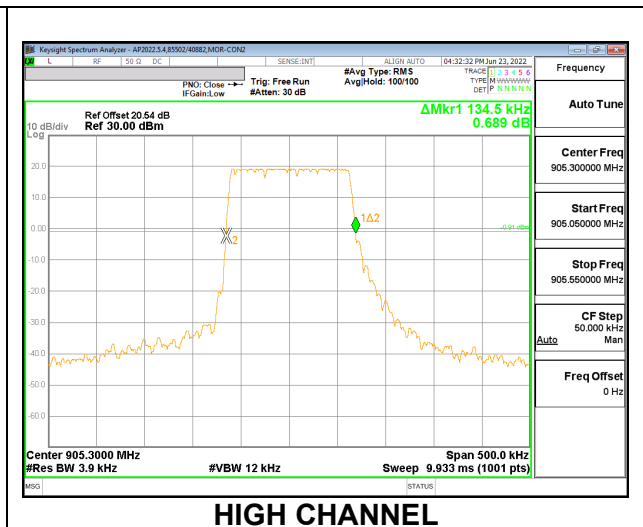
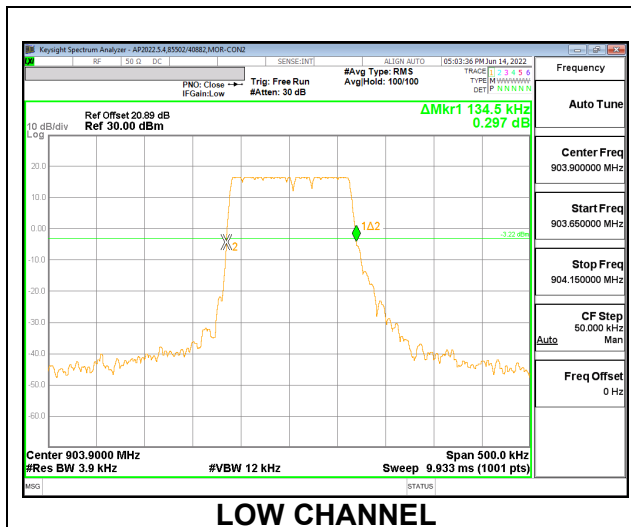
None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to between 1-5% of the 20 dB bandwidth. The VBW is set to \geq RBW. The sweep time is coupled.

8.4.1. 125kHz BANDWIDTH

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
Low	903.9	0.135
High	905.3	0.135



8.5. HOPPING FREQUENCY SEPARATION

LIMITS

FCC §15.247 (a) (1)

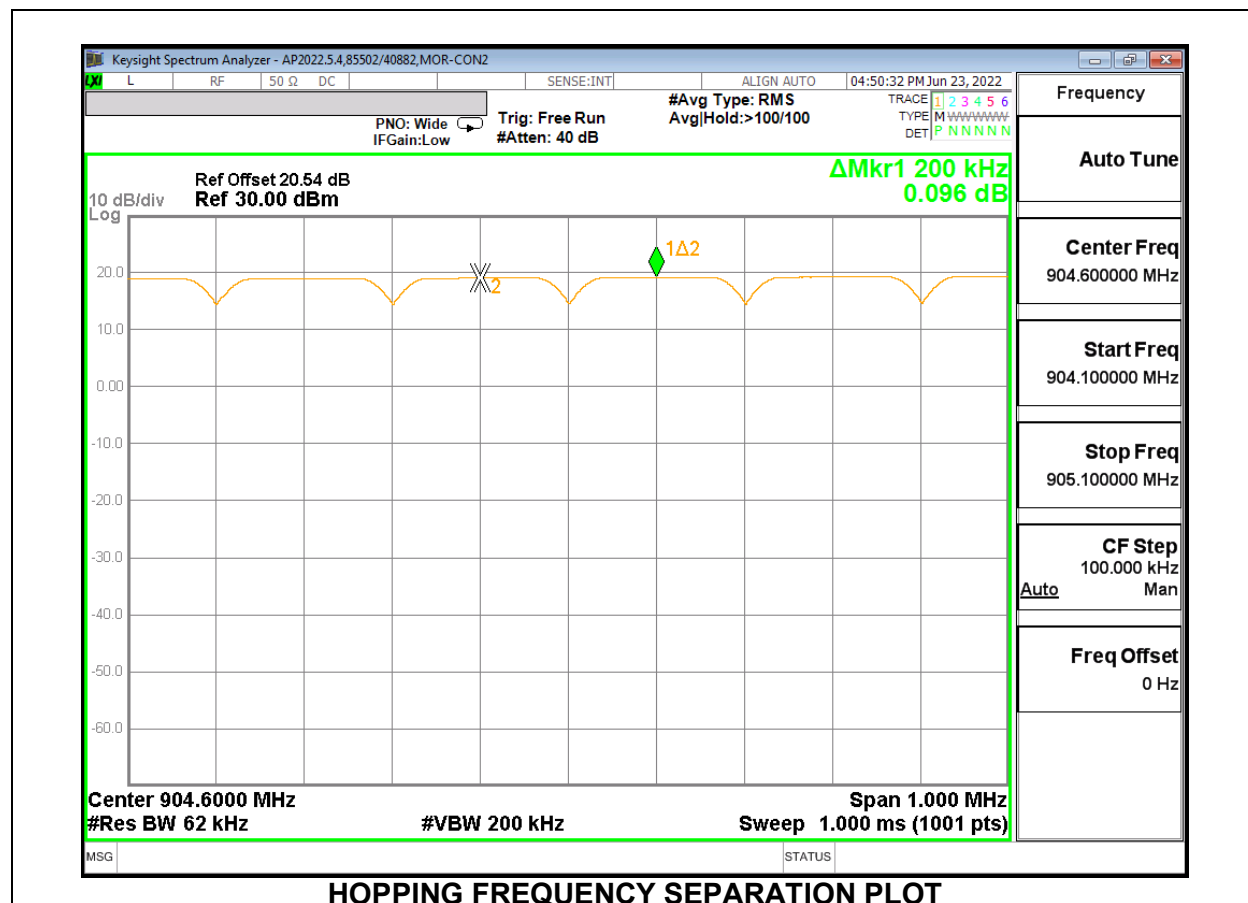
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to approximately 30% of the channel spacing and the VBW is set to $VBW \geq RBW$. The sweep time is coupled.

RESULTS

8.5.1. 125kHz BANDWIDTH



8.6. NUMBER OF HOPPING CHANNELS

LIMITS

For reporting purposes only (ref FCC §15.247 (f))

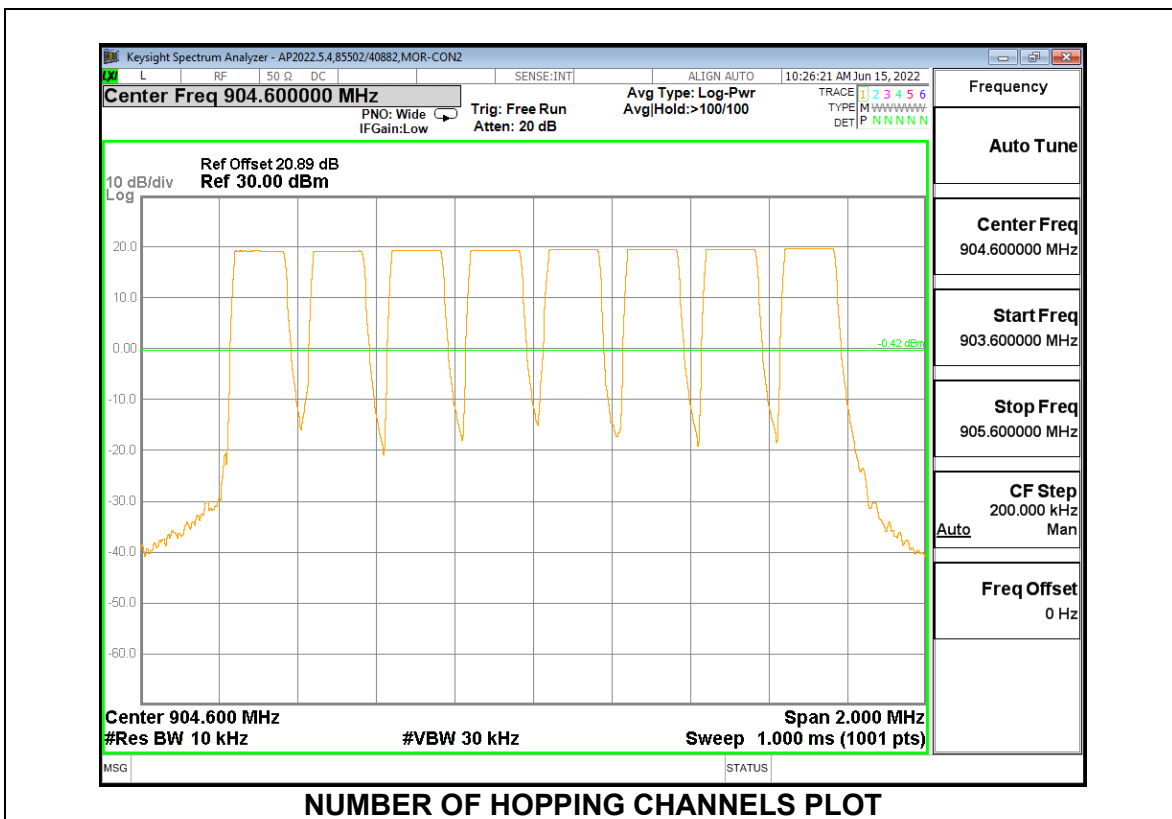
KDB 558074 D01 15.247 Meas Guidance v05r02 10. b) 4)

There is no minimum number of hopping channels associated with this type of hybrid system.

RESULTS

Normal Mode: 8 total channels observed.

8.6.1. 125kHz BANDWIDTH



8.7. AVERAGE TIME OF OCCUPANCY

LIMITS

FCC §15.247 (f)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

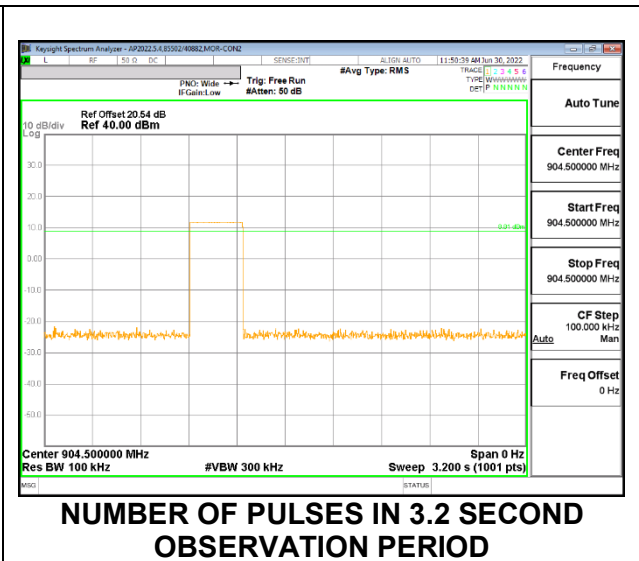
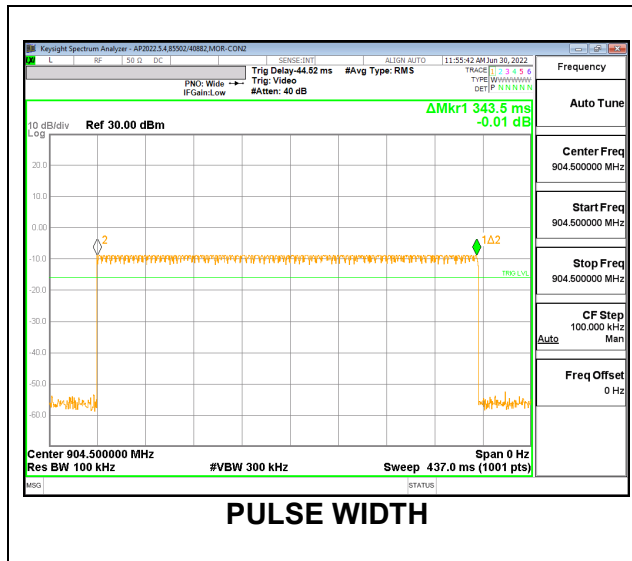
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.2 second scan, to enable resolution of each occurrence.

The average time of occupancy in the specified 3.2 second period (8 channels * 0.4 s) is equal to (# of pulses in 3.2 s) * pulse width.

8.7.1. 125kHz BANDWIDTH

Pulse Width (msec)	Number of Pulses in 3.2 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
343.5	1	0.3435	0.4	-0.0565



8.8. OUTPUT POWER

LIMITS

FCC §15.247 (b) (2)

TEST PROCEDURE

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

The cable assembly insertion loss of 20.89 dB was entered as an offset in the power meter.

RESULTS

8.8.1. 125kHz BANDWIDTH – ANTENNA #1

Tested By:	85502/40882
Date:	2022-06-24

Channel	Frequency (MHz)	AVG Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	903.9	16.67	30	-13.33
High	905.3	16.92	30	-13.08

8.8.2. 125kHz BANDWIDTH – ANTENNA #2

Tested By:	85502/40882
Date:	2022-06-24

Channel	Frequency (MHz)	AVG Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	903.9	16.12	30	-13.88
High	905.3	16.92	30	-13.08

8.8.3. 500kHz BANDWIDTH – ANTENNA #1

Tested By:	85502/40882
Date:	2022-06-24

Channel	Frequency (MHz)	AVG Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	923.3	15.10	30	-14.90
High	927.5	10.83	30	-19.17

8.8.4. 500kHz BANDWIDTH – ANTENNA #2

Tested By:	85502/40882
Date:	2022-06-24

Channel	Frequency (MHz)	AVG Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	923.3	17.10	30	-12.90
High	927.5	17.84	30	-12.16

8.9. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

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.

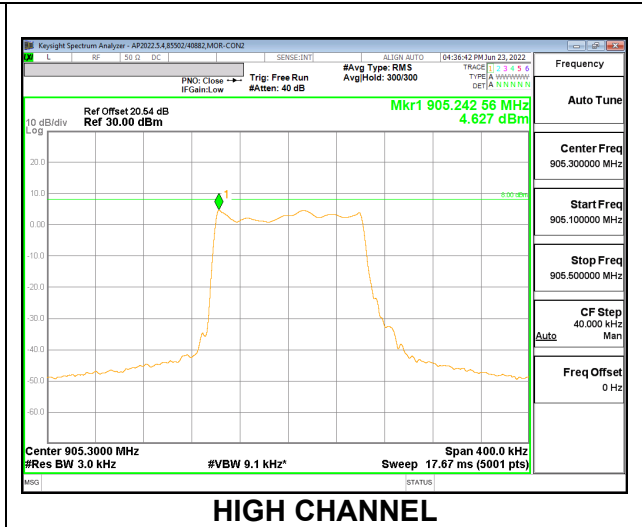
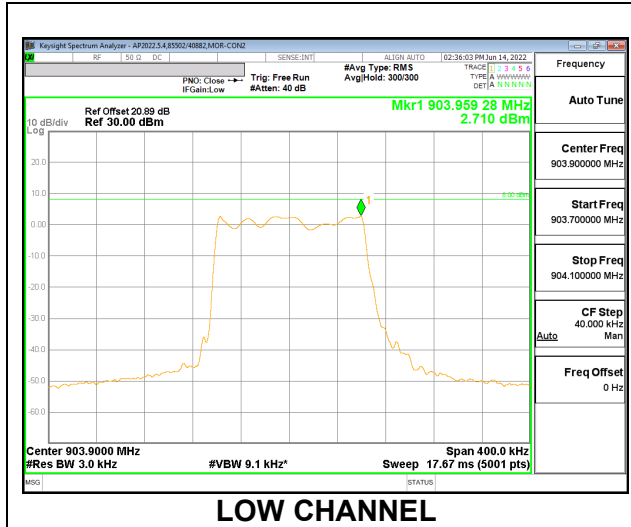
FCC §15.247 (f)

The power spectral density conducted from the intentional radiator to the antenna due to the digital modulation operation of the hybrid system, with the frequency hopping operation turned off, shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

8.9.1. 125kHz BANDWIDTH

Duty Cycle Correction	0
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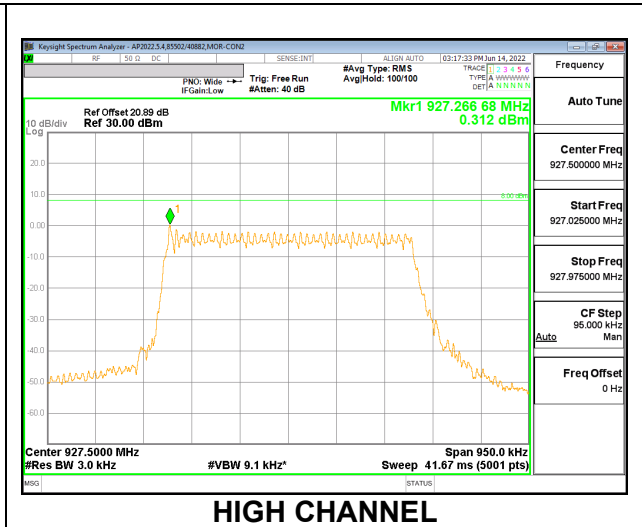
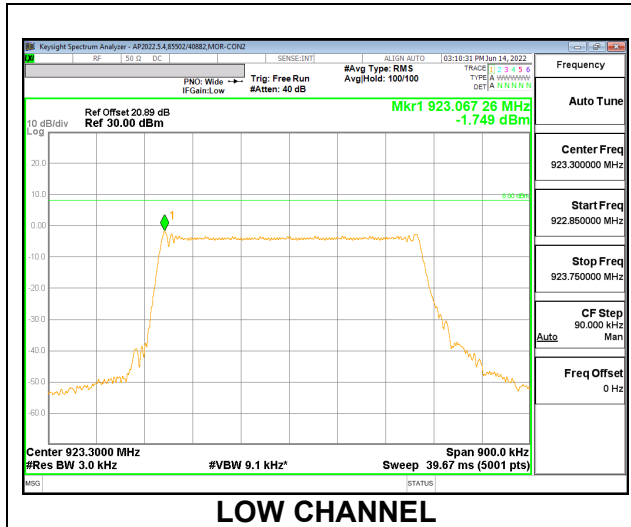
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Corr'd PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	903.9	2.710	2.710	8	-5.29
High	905.3	4.627	4.627	8	-3.37



8.9.2. 500kHz BANDWIDTH

Duty Cycle Correction	0
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Channel	Frequency (MHz)	PSD (dBm/3kHz)	Corr'd PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	923.3	-1.749	-1.749	8	-9.75
High	927.5	0.312	0.312	8	-7.69



8.10. CONDUCTED SPURIOUS EMISSIONS

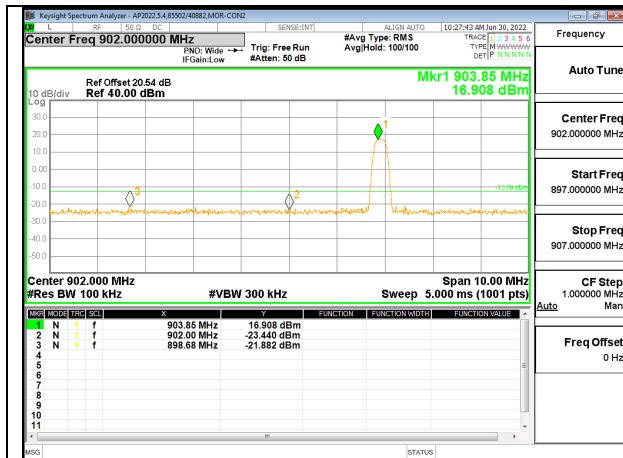
LIMITS

FCC §15.247 (d)

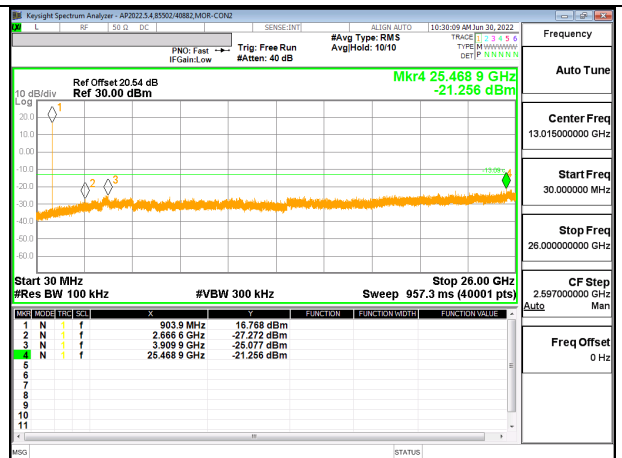
Output power was measured based on the use of an average measurement, therefore the required attenuation is 30 dB.

RESULTS

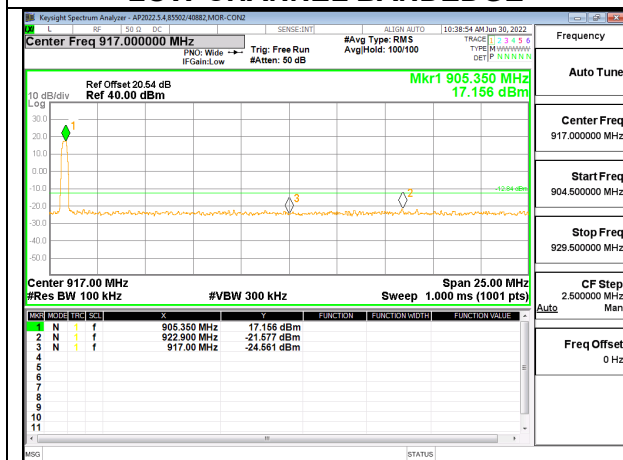
8.10.1. 125kHz BANDWIDTH



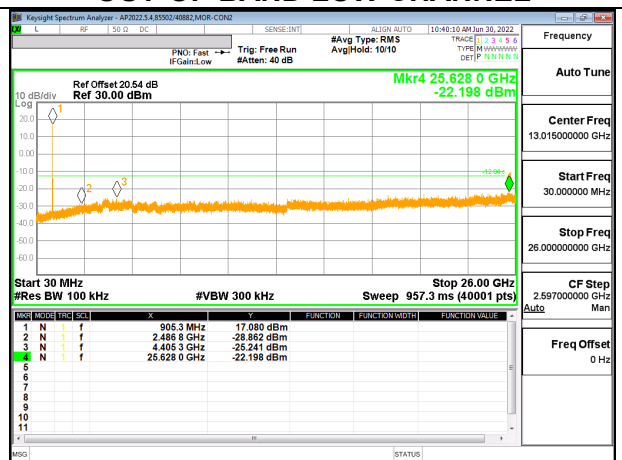
LOW CHANNEL BANDEDGE



OUT-OF-BAND LOW CHANNEL

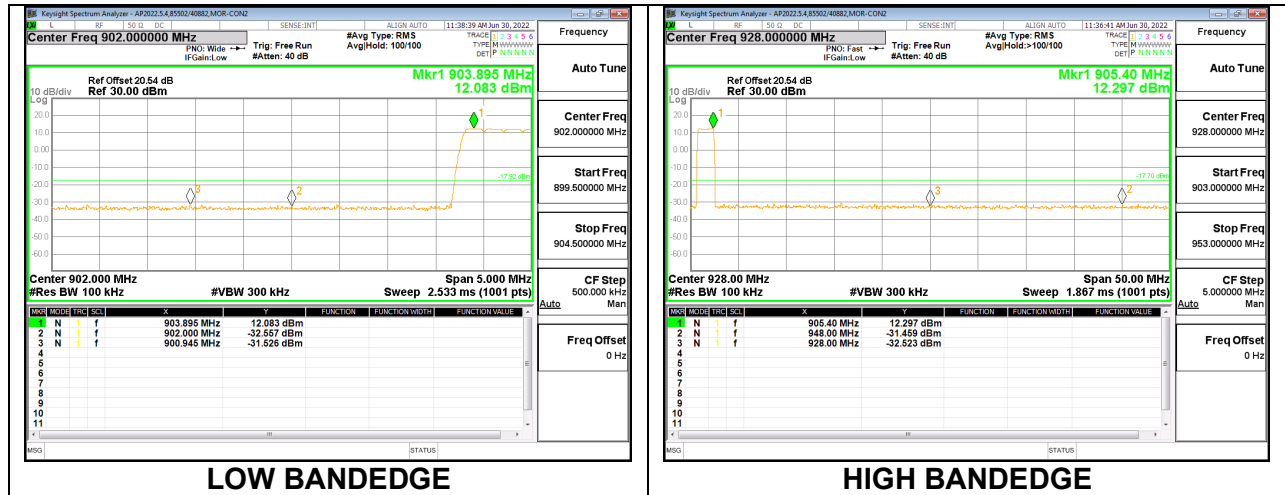


HIGH CHANNEL BANDEDGE

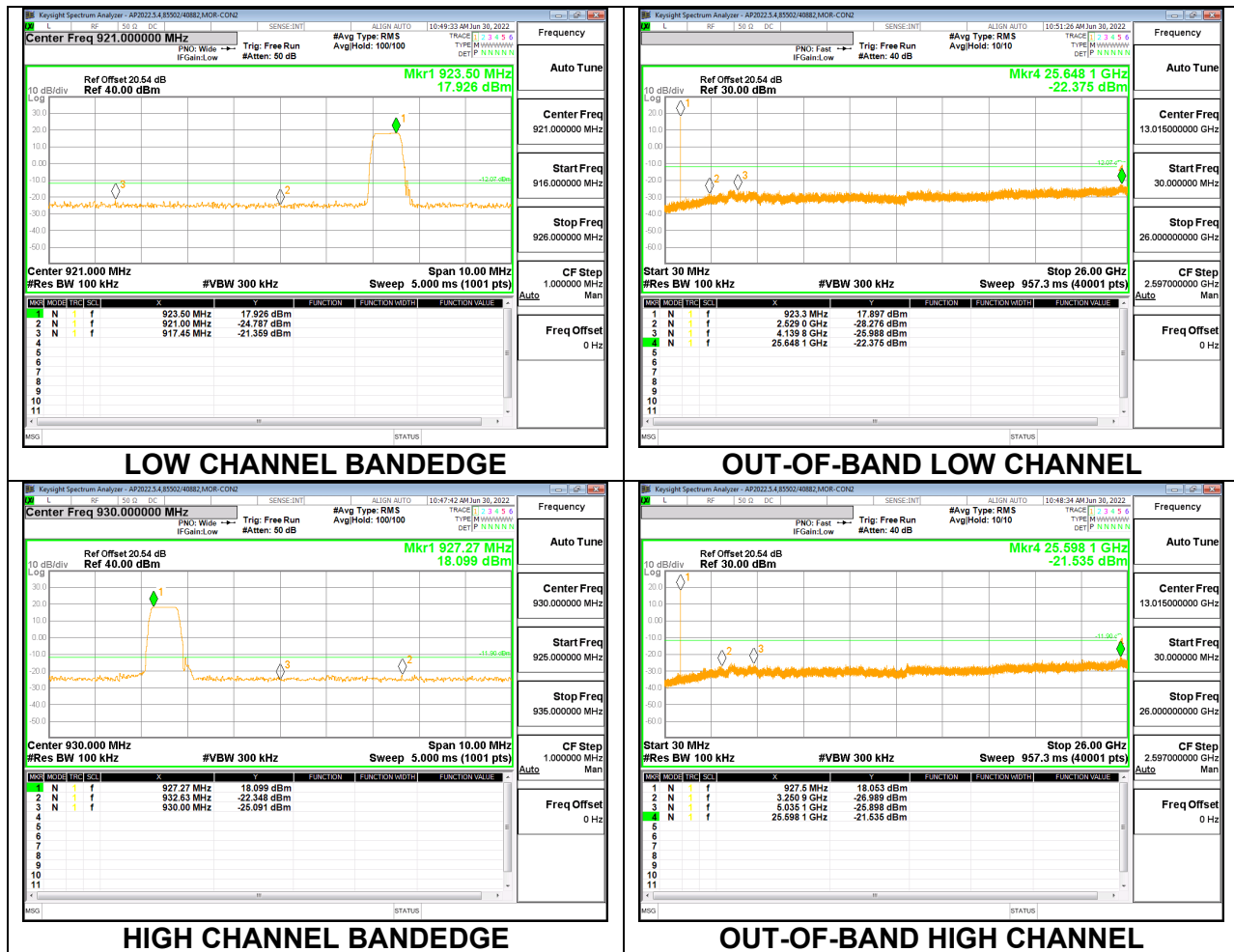


OUT-OF-BAND HIGH CHANNEL

8.10.2. 125kHz BANDWIDTH - HOPPING



8.10.3. 500kHz BANDWIDTH



9. RADIATED TEST RESULTS

LIMITS

FCC §15.205 and §15.209

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

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 120 kHz for peak and/or quasi-peak detection measurements in the 30-1000MHz range, 9kHz for peak and/or quasi-peak detection measurements in the 0.15-30MHz range, and 200Hz for peak and/or quasi-peak detection measurements in the 9 to 150kHz range. Peak detection is used unless otherwise noted as quasi-peak. For below 30MHz testing, investigation was done on three antenna orientations (parallel, perpendicular, and ground-parallel).

For pre-scans above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3MHz for peak measurements.

For final measurements above 1 GHz for 125kHz and 500kHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements. For average measurements above 1GHz for 125kHz, the resolution bandwidth is set to 1MHz and the video bandwidth is set to 1/T with peak detector. For average measurements above 1GHz for 500kHz, the resolution bandwidth is set to 1MHz and the video bandwidth is set to 3MHz with voltage averaging detector.

The spectrum from 30MHz to 10 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band. Below 30MHz, the channel with the highest output power 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.

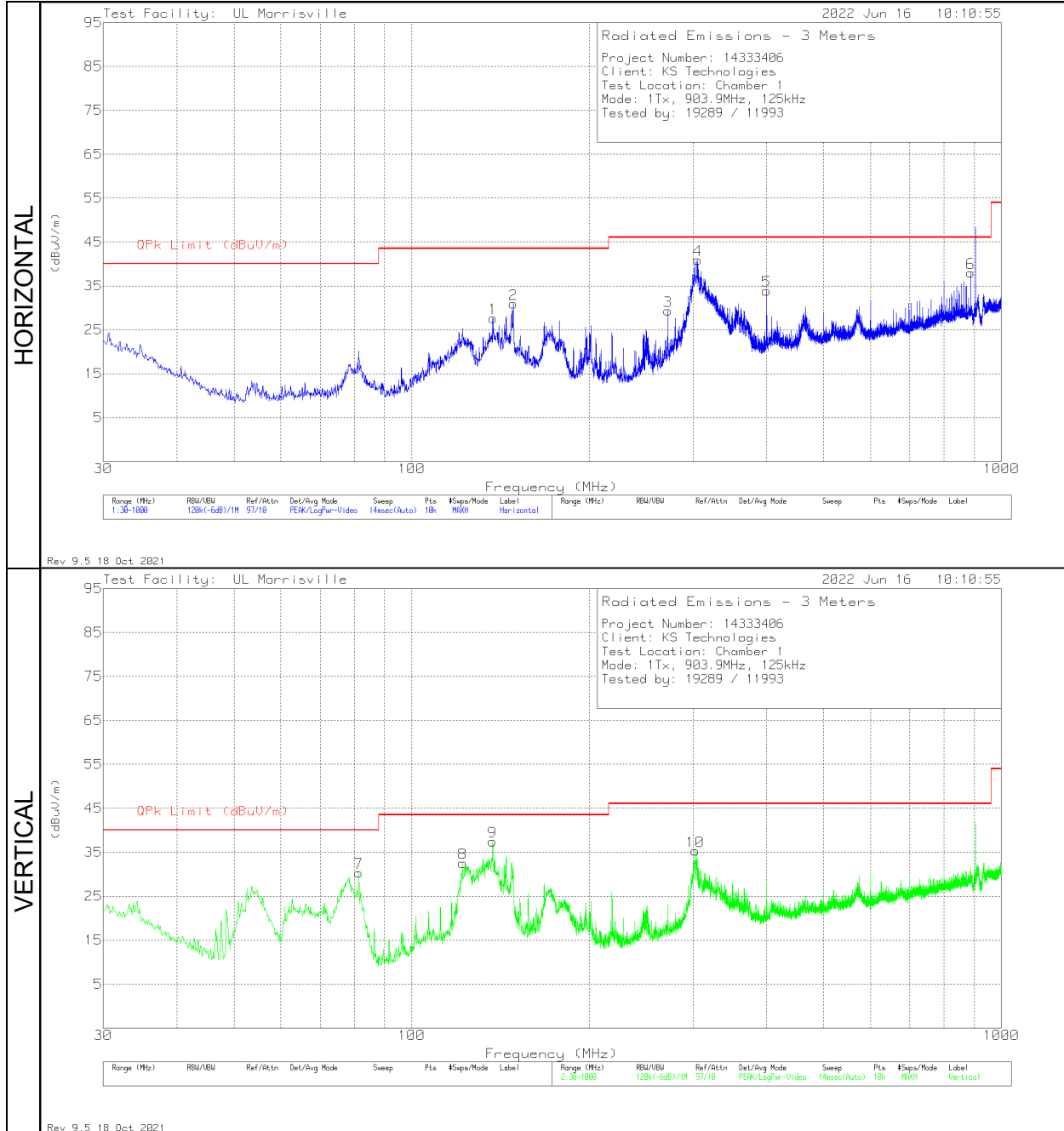
KDB 414788 OPEN FIELD SITE (OFS) AND CHAMBER CORRELATION JUSTIFICATION

Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. OFS and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

9.1. TRANSMITTER BELOW 1 GHz

9.1.1. 125kHz BANDWIDTH – ANTENNA #1

LOW CHANNEL



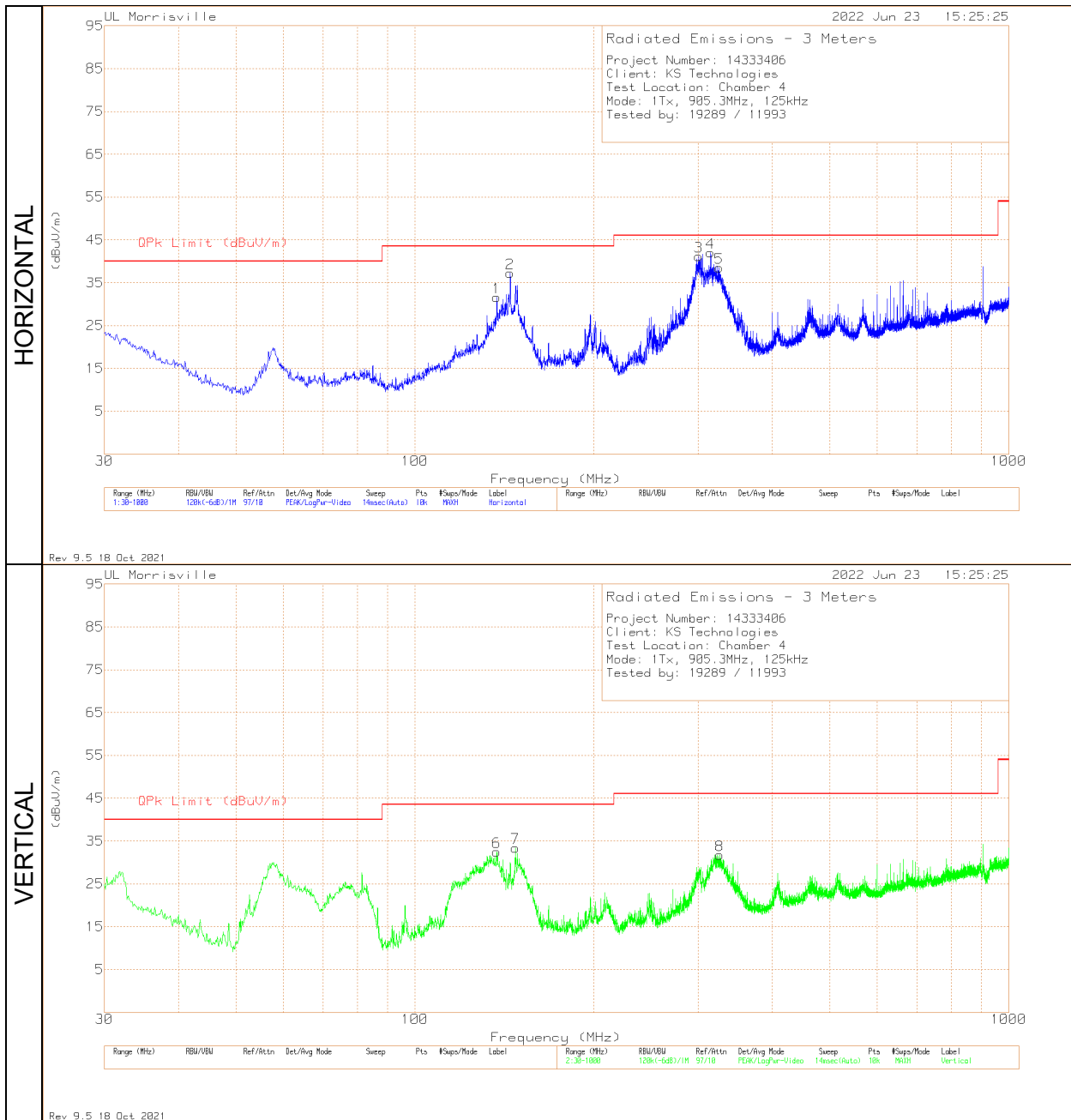
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0066 (dB/m)	Gain/Loss (dB)	Filter (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 137.379	37.87	Pk	19.2	-29.8	.4	27.67	43.52	-15.85	0-360	199	H
3	* ** 272.015	38.41	Pk	19	-28.5	.4	29.31	46.02	-16.71	0-360	100	H
5	* ** 400.055	39.19	Pk	21.3	-27.3	.7	33.89	46.02	-12.13	0-360	100	H
6	** 888.062	33	Pk	27.9	-24.1	1.2	38	46.02	-8.02	0-360	100	H
8	* ** 122.15	42.56	Pk	19.5	-29.9	.4	32.56	43.52	-10.96	0-360	99	V
9	* ** 137.282	47.66	Pk	19.2	-29.8	.4	37.46	43.52	-6.06	0-360	99	V
7	81.41	46.93	Pk	13.4	-30.3	.3	30.33	-	-	0-360	99	V
2	148.728	41.7	Pk	18.4	-29.6	.4	30.9	-	-	0-360	199	H
10	302.861	43.69	Pk	19.4	-28.3	.5	35.29	-	-	0-360	99	V
4	302.77	46.36	Pk	19.4	-28.3	.5	37.96	-	-	0-360	99	H

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

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

HIGH CHANNEL

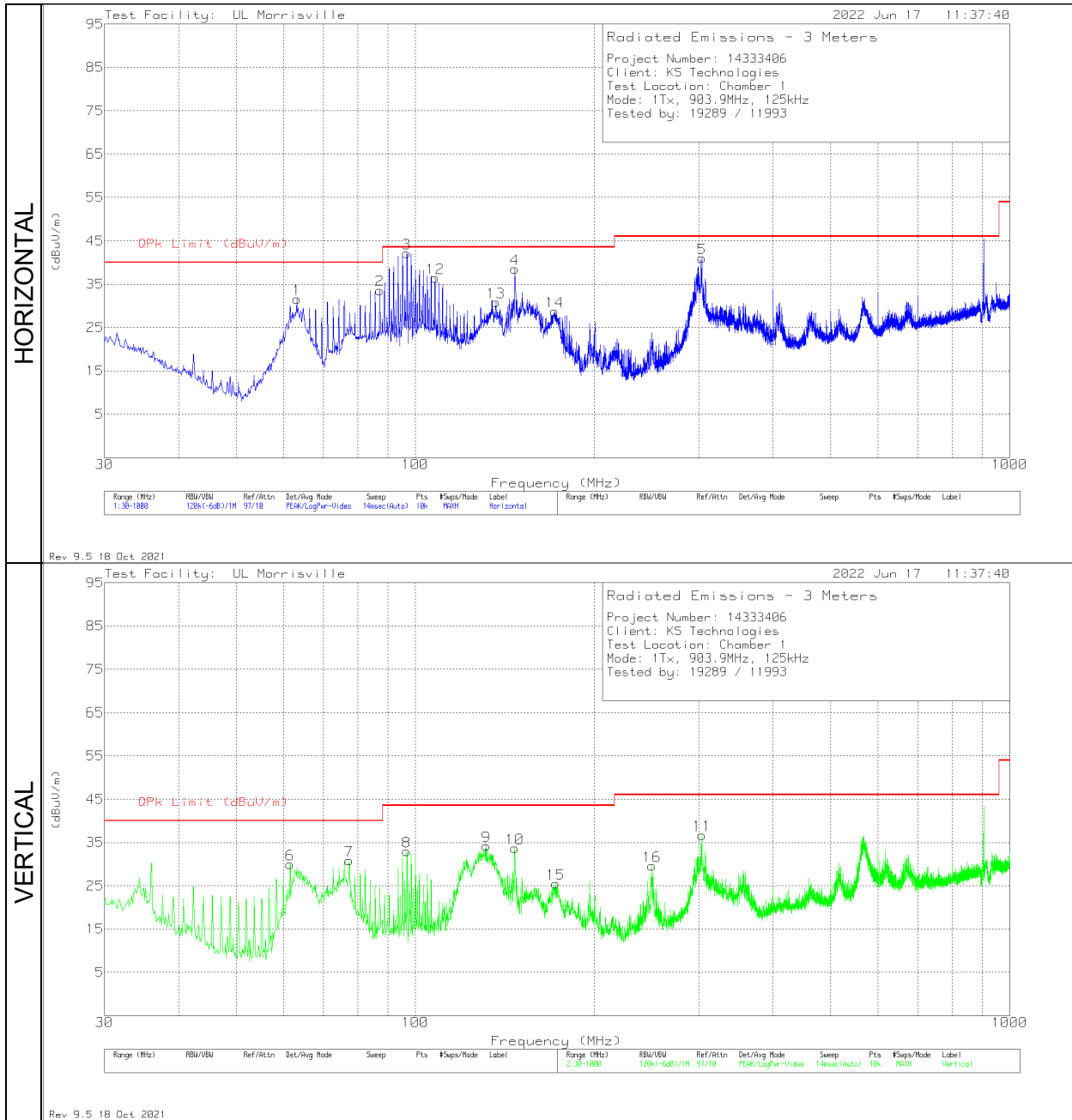


Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0081 (dB/m)	Gain/Loss (dB)	Filter (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 137.379	42.12	Pk	19.5	-30.4	.4	31.62	43.52	-11.9	0-360	100	H
5	* ** 325.074	46.73	Pk	20.4	-29	.4	38.53	46.02	-7.49	0-360	100	H
6	* ** 137.379	42.94	Pk	19.5	-30.4	.4	32.44	43.52	-11.08	0-360	100	V
8	* ** 326.141	39.81	Pk	20.4	-28.9	.4	31.71	46.02	-14.31	0-360	100	V
2	144.751	48.12	Pk	19	-30.3	.4	37.22	-	-	0-360	100	H
7	147.564	44.43	Pk	18.9	-30.3	.4	33.43	-	-	0-360	100	V
3	300.242	50.04	Pk	19.8	-29.2	.5	41.14	-	-	0-360	100	H
4	314.889	50.29	Pk	20.3	-29.1	.5	41.99	-	-	0-360	100	H

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

9.1.2. 125kHz BANDWIDTH – ANTENNA #2

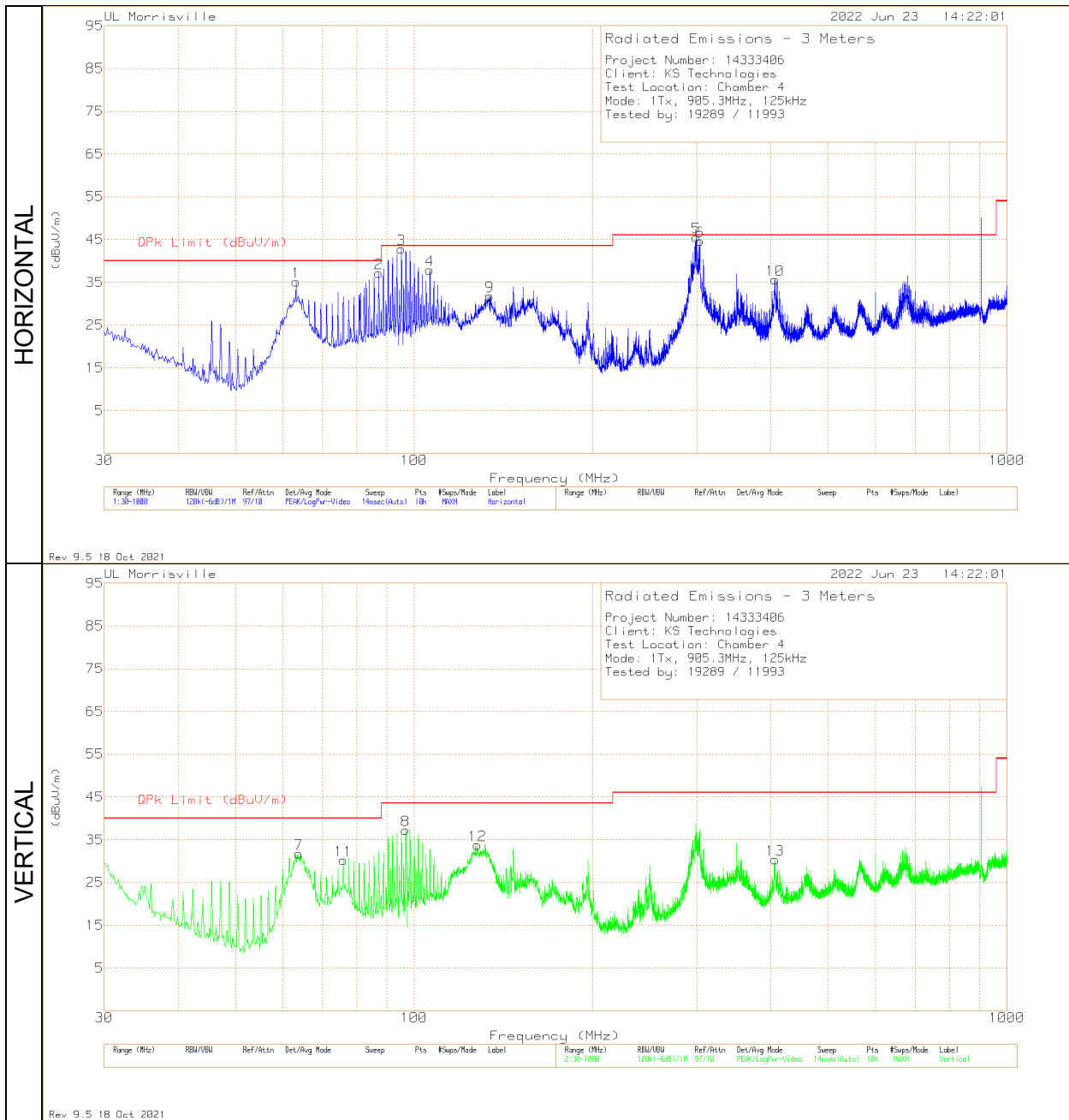
LOW CHANNEL



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0066 (dB/m)	Gain/Loss (dB)	Filter (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
13	* ** 136.797	41.05	Pk	19.2	-29.8	.4	30.85	43.52	-12.67	0-360	199	H
14	* ** 171.62	40.26	Pk	17.5	-29.3	.3	28.76	43.52	-14.76	0-360	199	H
9	* ** 131.753	44.34	Pk	19.5	-30	.4	34.24	43.52	-9.28	0-360	100	V
15	* ** 172.299	37.14	Pk	17.5	-29.4	.3	25.54	43.52	-17.98	0-360	100	V
16	* ** 249.996	40.36	Pk	17.3	-28.5	.4	29.56	46.02	-16.46	0-360	100	V
6	61.525	46.61	Pk	13.8	-30.6	.2	30.01	-	-	0-360	100	V
1	63.174	48.34	Pk	13.9	-30.8	.2	31.64	-	-	0-360	399	H
7	77.336	47.36	Pk	13.8	-30.6	.3	30.86	-	-	0-360	100	V
2	87.133	50.34	Pk	13.3	-30.2	.2	33.64	-	-	0-360	199	H
3	96.736	56.7	Pk	15.4	-30.2	.2	42.1	-	-	0-360	299	H
8	96.736	47.58	Pk	15.4	-30.2	.2	32.98	-	-	0-360	100	V
12	107.988	48.6	Pk	17.9	-30.3	.2	36.4	-	-	0-360	299	H
10	146.982	44.4	Pk	18.5	-29.6	.4	33.7	-	-	0-360	100	V
4	147.176	49.29	Pk	18.5	-29.6	.4	38.59	-	-	0-360	199	H
5	303.54	49.27	Pk	19.5	-28.3	.5	40.97	-	-	0-360	99	H
11	303.54	45.04	Pk	19.5	-28.3	.5	36.74	-	-	0-360	100	V

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

HIGH CHANNEL

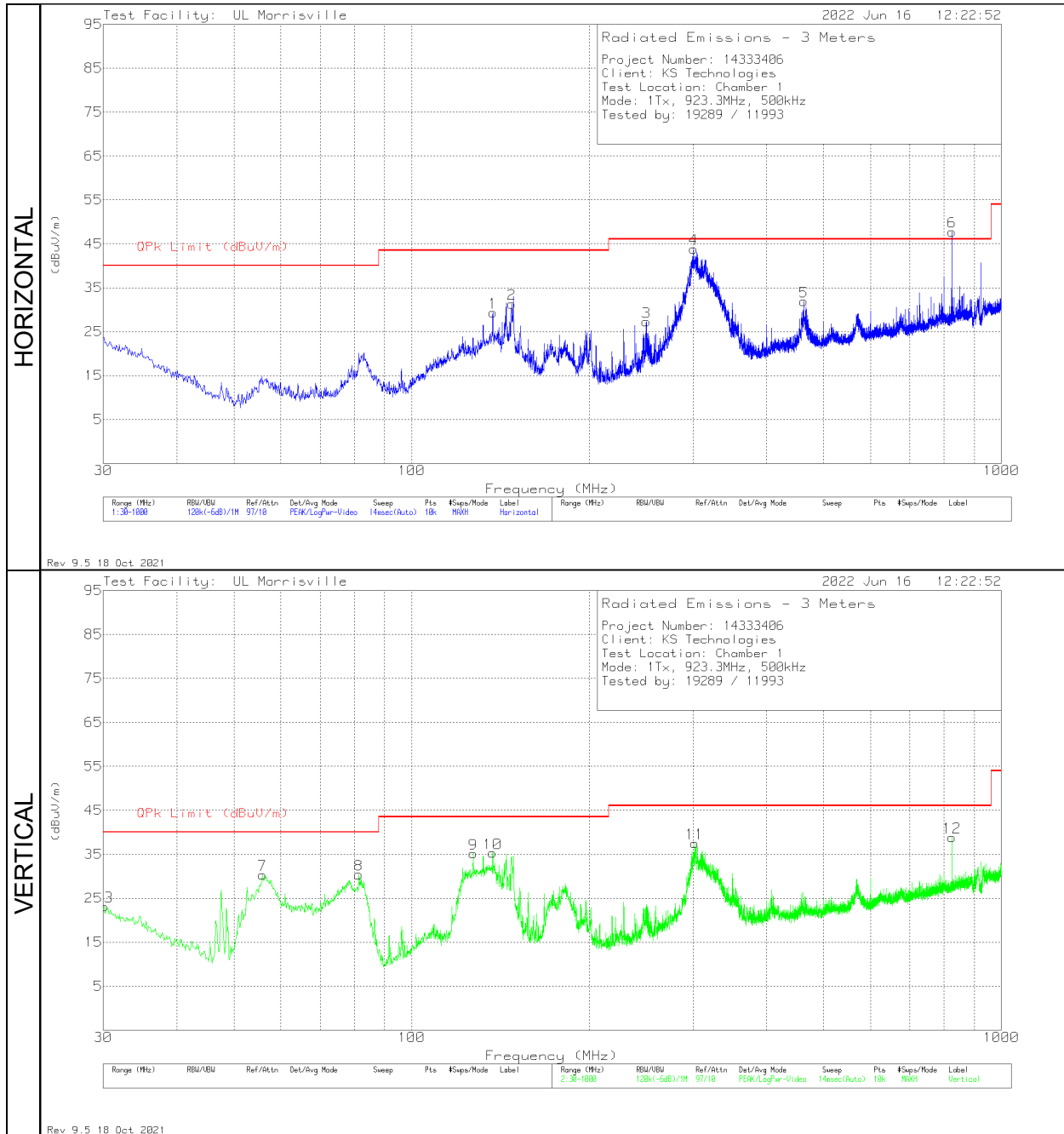


Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0081 (dB/m)	Gain/Loss (dB)	Filter (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
9	* ** 134.275	42.1	Pk	19.8	-30.5	.4	31.8	43.52	-11.72	0-360	100	H
10	* ** 406.36	41.06	Pk	22.3	-28.4	.7	35.66	46.02	-10.36	0-360	100	H
12	* ** 127.776	43.73	Pk	20.1	-30.5	.4	33.73	43.52	-9.79	0-360	100	V
13	* ** 406.457	35.87	Pk	22.3	-28.5	.7	30.37	46.02	-15.65	0-360	100	V
1	63.174	52.35	Pk	13.9	-31.3	.2	35.15	-	-	0-360	100	H
7	63.853	48.8	Pk	14	-31.3	.2	31.7	-	-	0-360	100	V
11	75.978	46.86	Pk	14.2	-31.1	.3	30.26	-	-	0-360	200	V
2	87.133	54.34	Pk	13.6	-31	.2	37.14	-	-	0-360	300	H
3	95.184	58.24	Pk	15.2	-30.8	.2	42.84	-	-	0-360	200	H
8	96.736	52.45	Pk	15.6	-31	.2	37.25	-	-	0-360	200	V
4	106.339	50.2	Pk	18.1	-30.6	.2	37.9	-	-	0-360	200	H
5	299.466	54.4	Pk	19.8	-29.2	.5	45.5	-	-	0-360	100	H
6	303.637	53.32	Pk	20	-29.2	.5	44.62	-	-	0-360	100	H

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

9.1.3. 500kHz BANDWIDTH – ANTENNA #1

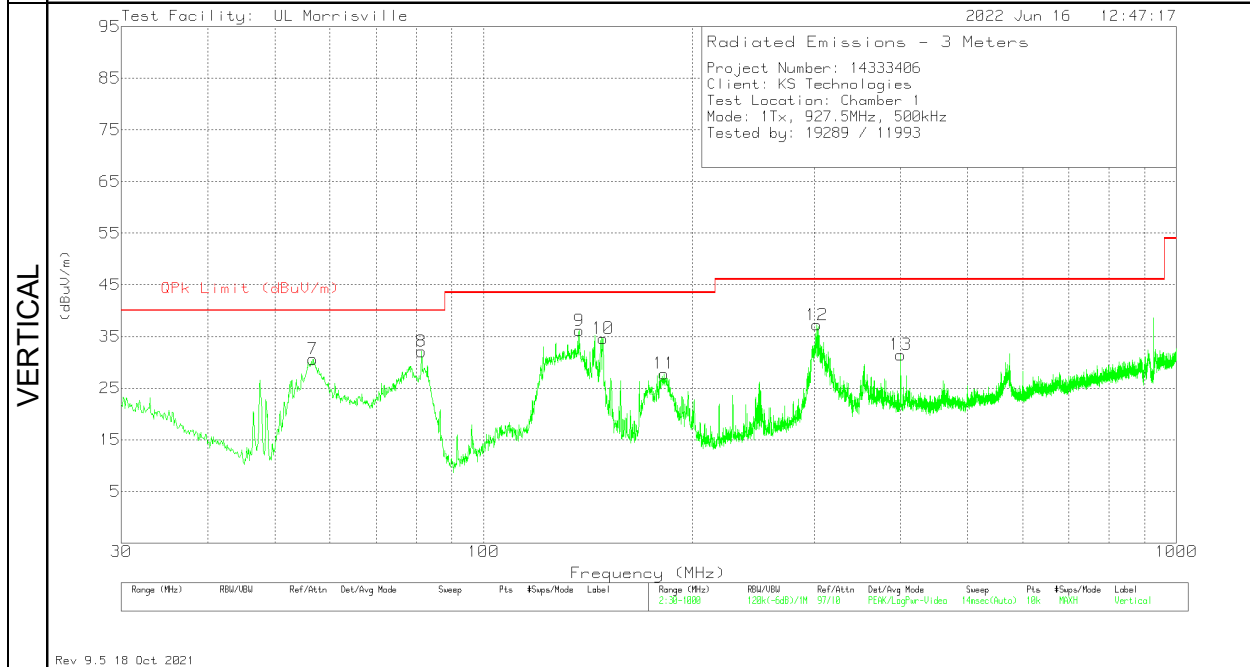
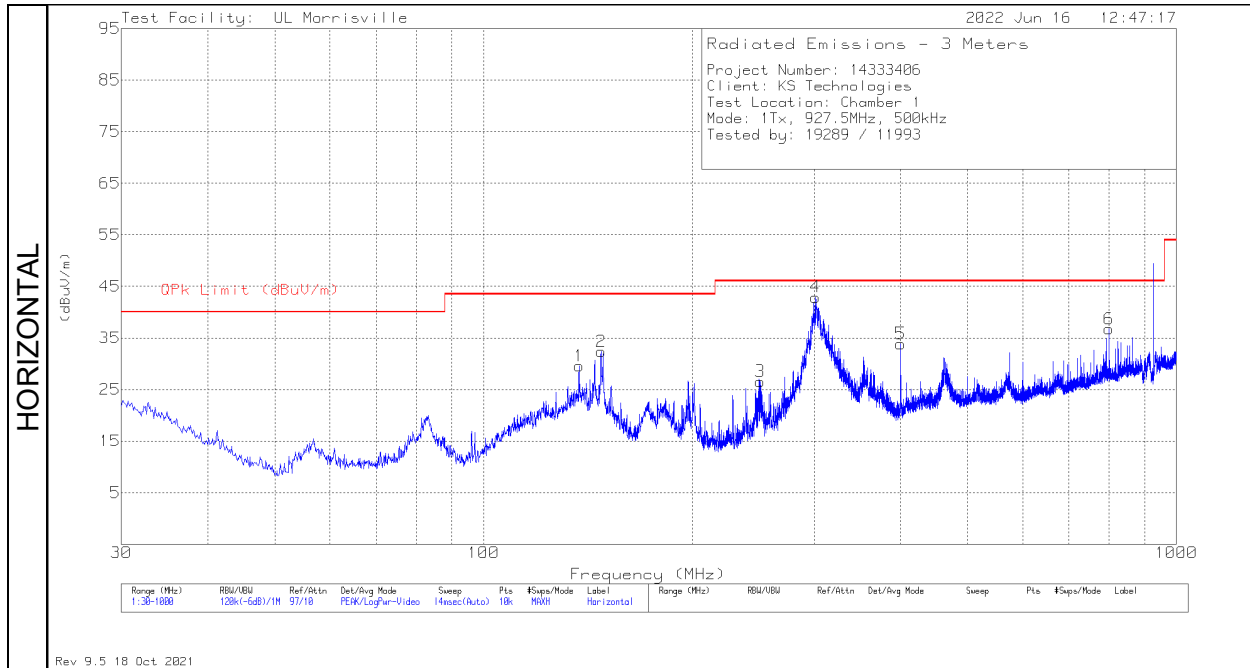
LOW CHANNEL



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0066 (dB/m)	Gain/Loss (dB)	Filter (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 137.379	39.57	Pk	19.2	-29.8	.4	29.37	43.52	-14.15	0-360	399	H
3	* ** 250.093	38.05	Pk	17.3	-28.5	.4	27.25	46.02	-18.77	0-360	99	H
9	* ** 127.194	45.18	Pk	19.6	-30	.4	35.18	43.52	-8.34	0-360	100	V
10	* ** 137.282	45.5	Pk	19.2	-29.8	.4	35.3	43.52	-8.22	0-360	100	V
13	30.097	27.43	Pk	26.7	-31.1	.1	23.13	-	-	0-360	300	V
7	55.899	47.94	Pk	13.1	-30.8	.1	30.34	-	-	0-360	100	V
8	81.41	46.99	Pk	13.4	-30.3	.3	30.39	-	-	0-360	100	V
2	147.855	41.94	Pk	18.5	-29.5	.4	31.34	-	-	0-360	199	H
4	301.018	52.45	Pk	19.3	-28.4	.5	43.85	-	-	0-360	99	H
11	301.988	46.02	Pk	19.4	-28.4	.5	37.52	-	-	0-360	100	V
5	462.814	35.39	Pk	23	-27.2	.7	31.89	-	-	0-360	99	H
12	824.818	35.36	Pk	27.5	-24.9	.9	38.86	-	-	0-360	199	V
6	824.915	44.28	Pk	27.5	-24.9	.9	47.78	-	-	0-360	99	H

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

HIGH CHANNEL



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0066 (dB/m)	Gain/Loss (dB)	Filter (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	*** 137.379	39.78	Pk	19.2	-29.8	.4	29.58	43.52	-13.94	0-360	200	H
3	*** 250.966	37.45	Pk	17.3	-28.6	.4	26.55	46.02	-19.47	0-360	100	H
5	*** 400.055	39.15	Pk	21.3	-27.3	.7	33.85	46.02	-12.17	0-360	100	H
6	** 800.083	33.65	Pk	27.2	-25	.9	36.75	46.02	-9.27	0-360	100	H
9	*** 137.379	46.35	Pk	19.2	-29.8	.4	36.15	43.52	-7.37	0-360	100	V
13	*** 400.055	36.76	Pk	21.3	-27.3	.7	31.46	46.02	-14.56	0-360	100	V
7	56.675	48.02	Pk	13.2	-30.8	.2	30.62	-	-	0-360	100	V
8	81.41	48.7	Pk	13.4	-30.3	.3	32.1	-	-	0-360	100	V
2	147.855	42.97	Pk	18.5	-29.5	.4	32.37	-	-	0-360	200	H
10	148.825	45.39	Pk	18.4	-29.6	.4	34.59	-	-	0-360	100	V
11	182.29	39.6	Pk	17.2	-29.4	.4	27.8	-	-	0-360	100	V
4	301.697	51.41	Pk	19.4	-28.4	.5	42.91	-	-	0-360	100	H
12	302.958	45.63	Pk	19.4	-28.3	.5	37.23	-	-	0-360	100	V

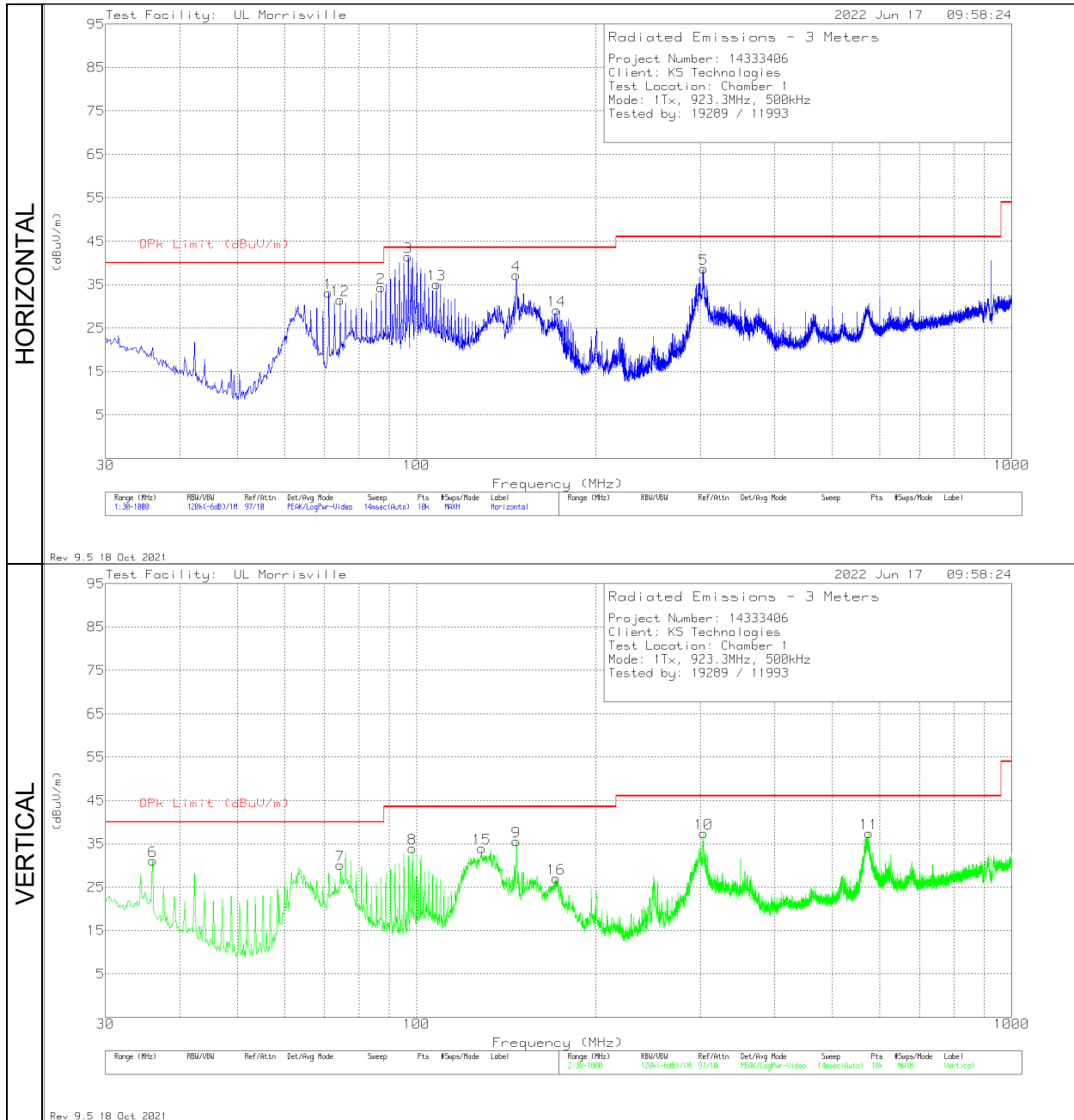
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

9.1.4. 500kHz BANDWIDTH – ANTENNA #2

LOW CHANNEL



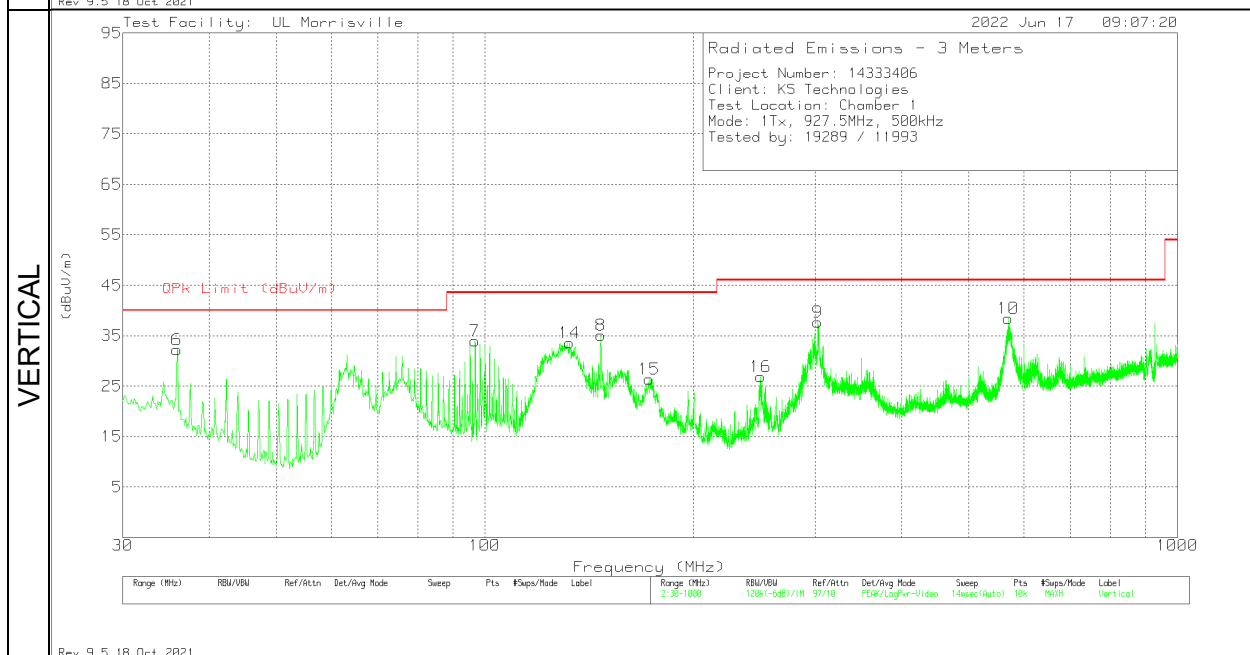
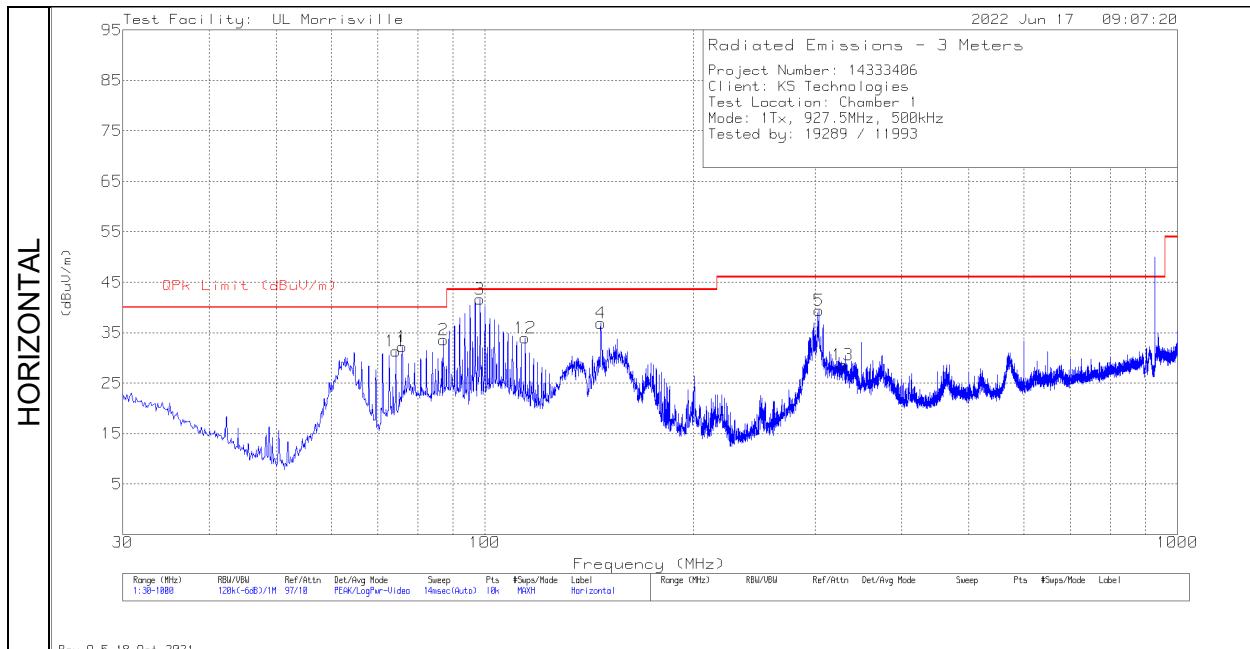
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0066 (dB/m)	Gain/Loss (dB)	Filter (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
12	*** 74.426	47.88	Pk	14.1	-30.7	.2	31.48	40	-8.52	0-360	199	H
14	*** 172.008	40.68	Pk	17.5	-29.4	.3	29.08	43.52	-14.44	0-360	100	H
7	*** 74.329	46.46	Pk	14.1	-30.7	.2	30.06	40	-9.94	0-360	99	V
15	*** 128.649	43.72	Pk	19.6	-29.8	.4	33.92	43.52	-9.6	0-360	99	V
16	*** 171.426	38.55	Pk	17.5	-29.3	.3	27.05	43.52	-16.47	0-360	199	V
6	36.014	39.51	Pk	22.9	-31.4	.1	31.11	-	-	0-360	99	V
1	71.128	49.13	Pk	14.3	-30.6	.2	33.03	-	-	0-360	399	H
2	87.133	50.97	Pk	13.3	-30.2	.2	34.27	-	-	0-360	299	H
3	96.736	55.97	Pk	15.4	-30.2	.2	41.37	-	-	0-360	299	H
8	98.385	48.23	Pk	15.8	-30.3	.2	33.93	-	-	0-360	300	V
13	107.988	47.23	Pk	17.9	-30.3	.2	35.03	-	-	0-360	299	H
4	147.079	47.92	Pk	18.5	-29.6	.4	37.22	-	-	0-360	199	H
9	147.176	46.31	Pk	18.5	-29.6	.4	35.61	-	-	0-360	199	V
5	303.443	47.07	Pk	19.4	-28.3	.5	38.67	-	-	0-360	100	H
10	303.7825	45.74	Pk	19.5	-28.3	.5	37.44	-	-	0-360	199	V
11	575.528	38.59	Pk	24.5	-26.5	.8	37.39	-	-	0-360	99	V

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

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

HIGH CHANNEL



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0066 (dB/m)	Gain/Loss (dB)	Filter (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
11	*** 74.329	47.69	Pk	14.1	-30.7	.2	31.29	40	-8.71	0-360	400	H
12	*** 114.39	44.67	Pk	18.8	-29.8	.3	33.97	43.52	-9.55	0-360	299	H
13	*** 328.372	36.57	Pk	19.7	-28.1	.4	28.57	46.02	-17.45	0-360	100	H
14	*** 132.529	43.71	Pk	19.5	-30	.4	33.61	43.52	-9.91	0-360	100	V
15	*** 172.784	38.12	Pk	17.4	-29.4	.3	26.42	43.52	-17.1	0-360	199	V
16	*** 249.996	37.72	Pk	17.3	-28.5	.4	26.92	46.02	-19.1	0-360	100	V
6	35.917	40.46	Pk	23	-31.4	.1	32.16	-	-	0-360	100	V
1	75.978	48.49	Pk	13.9	-30.5	.3	32.19	-	-	0-360	400	H
2	87.133	50.26	Pk	13.3	-30.2	.2	33.56	-	-	0-360	199	H
7	96.736	48.5	Pk	15.4	-30.2	.2	33.9	-	-	0-360	299	V
3	98.385	56	Pk	15.8	-30.3	.2	41.7	-	-	0-360	299	H
4	147.079	47.57	Pk	18.5	-29.6	.4	36.87	-	-	0-360	199	H
8	147.079	45.75	Pk	18.5	-29.6	.4	35.05	-	-	0-360	299	V
9	302.667	46.04	Pk	19.4	-28.3	.5	37.64	-	-	0-360	199	V
5	303.54	47.66	Pk	19.5	-28.3	.5	39.36	-	-	0-360	100	H
10	569.805	40.12	Pk	24.4	-26.9	.8	38.42	-	-	0-360	100	V

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

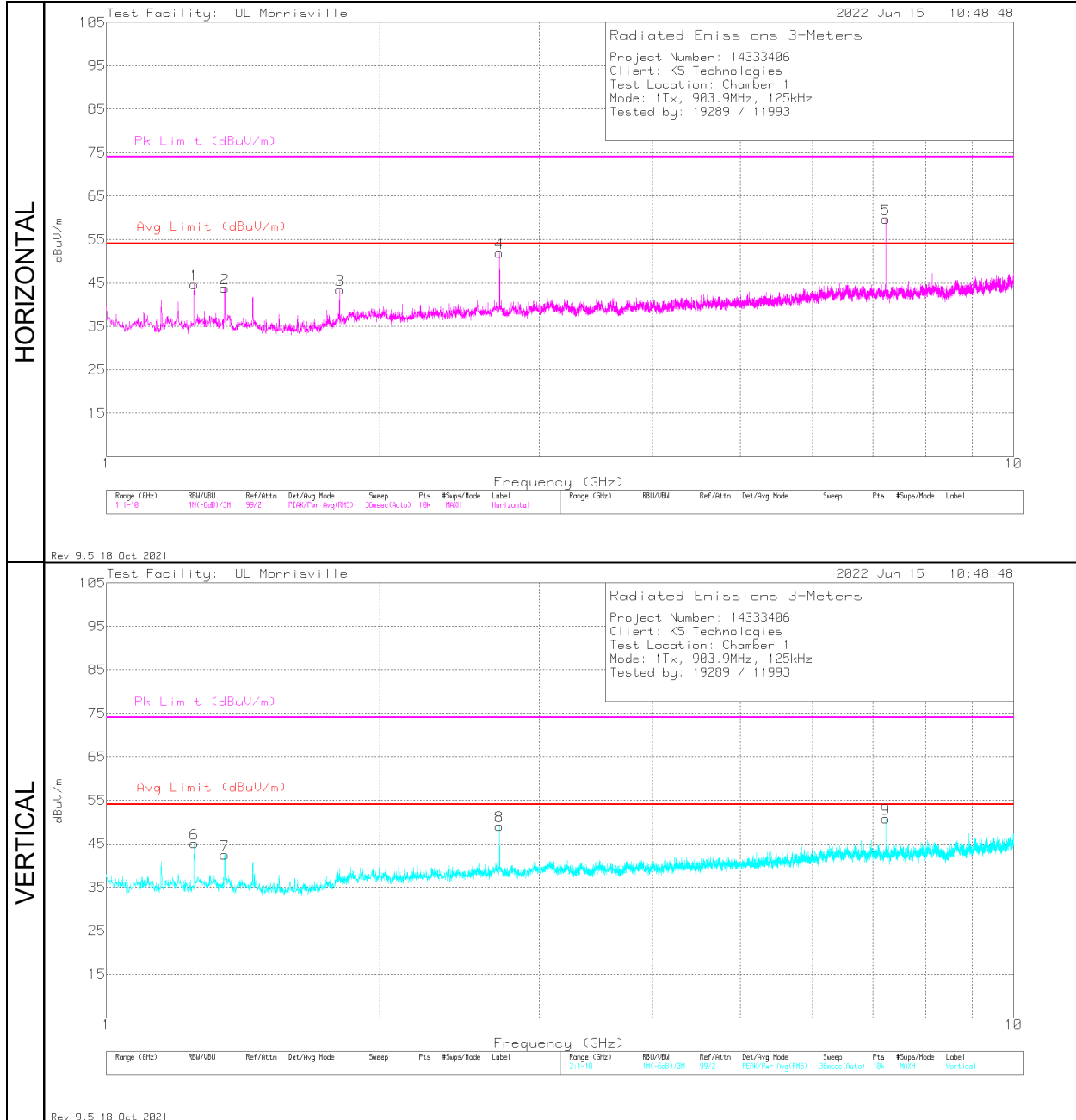
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

9.2. TRANSMITTER ABOVE 1GHZ

9.2.1. 125kHz BANDWIDTH – ANTENNA #1

LOW CHANNEL



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Gain/Loss (dB)	Filter (dB)	Corrected Reading dBuV/m	Avg Limit (dBuV/m)	Margin (dB)	Pk Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.2502	50.67	Pk	29.3	-36.2	.9	44.67	54	-9.33	74	-29.33	0-360	101	H
2	** 1.3501	49.09	Pk	29.6	-35.7	.8	43.79	54	-10.21	74	-30.21	0-360	101	H
3	** 1.8073	47.7	Pk	30.5	-35.1	.4	43.5	54	-10.5	74	-30.5	0-360	200	H
4	*** 2.71158	54.24	PK2	32.5	-33.6	.5	53.64	-	-	74	-20.36	138	101	H
	*** 2.7117	51.45	V1TV	32.5	-33.6	.5	50.85	54	-3.15	-	-	138	101	H
6	* 1.2493	51.12	Pk	29.2	-36.2	.9	45.02	54	-8.98	74	-28.98	0-360	200	V
7	*** 1.3501	47.79	Pk	29.6	-35.7	.8	42.49	54	-11.51	74	-31.51	0-360	101	V
8	*** 2.71157	52.15	PK2	32.5	-33.6	.5	51.55	-	-	74	-22.45	261	381	V
	*** 2.7117	48.79	V1TV	32.5	-33.6	.5	48.19	54	-5.81	-	-	261	381	V
5	7.2307	54.11	Pk	35.7	-30.7	.6	59.71	-	-	-	-	0-360	101	H
9	7.2316	45.05	Pk	35.7	-30.6	.6	50.75	-	-	-	-	0-360	400	V

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

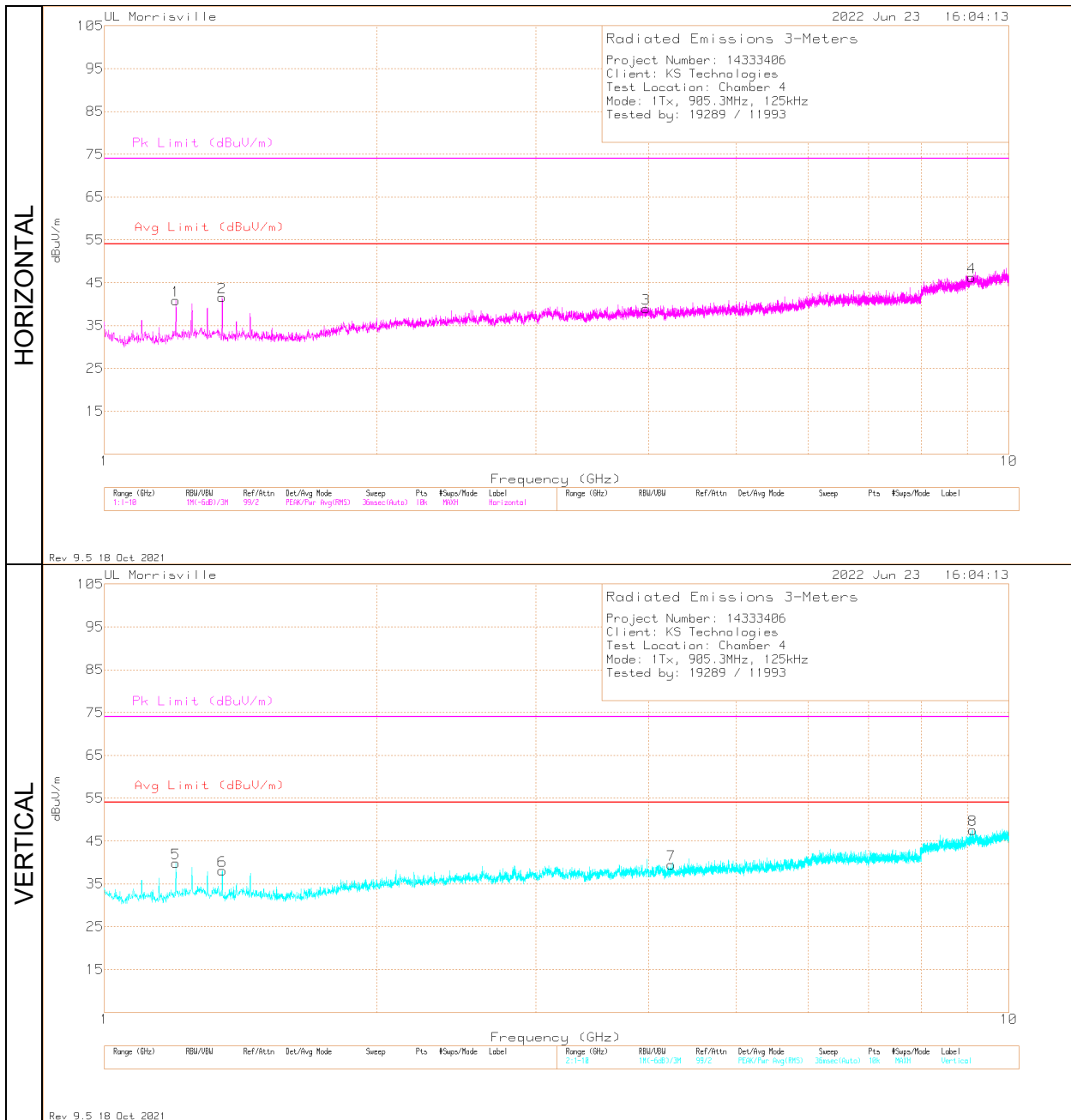
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

PK2 - Maximum Peak

V1TV - VB=1/Ton, Linear Voltage Average where: Ton is packet duration

HIGH CHANNEL

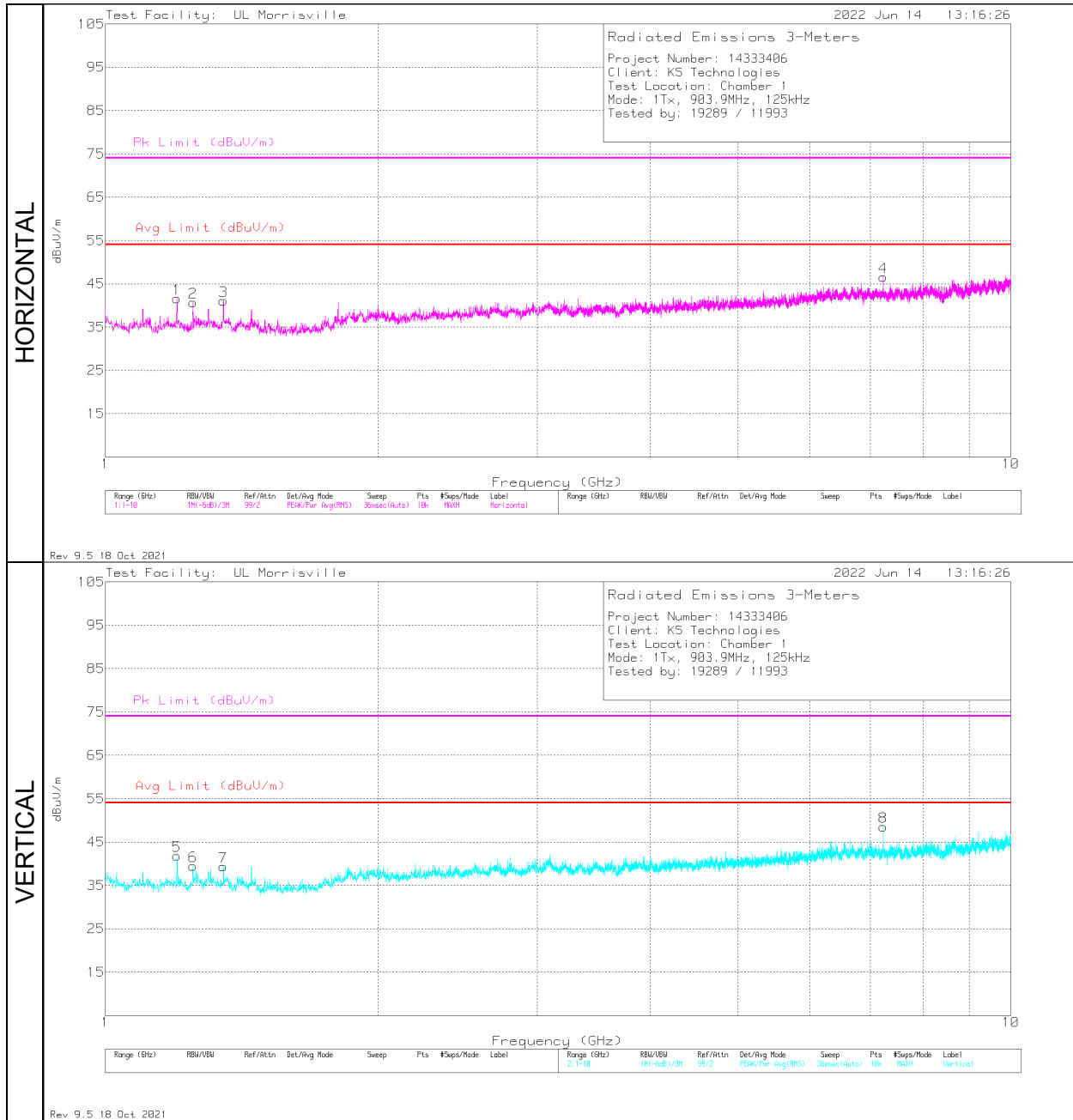


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 (dB/m)	Gain/Loss (dB)	Filter (dB)	Corrected Reading dBuV/m	Avg Limit (dBuV/m)	Margin (dB)	Pk Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarit y
1	* ** 1.1998	47.51	Pk	28.2	-35.9	1.1	40.91	54	-13.09	74	-33.09	0-360	100	H
2	* ** 1.3492	48.21	Pk	28.7	-36.1	.8	41.61	54	-12.39	74	-32.39	0-360	100	H
3	* ** 3.9727	38.67	Pk	33.5	-33.6	.4	38.97	54	-15.03	74	-35.03	0-360	100	H
4	* ** 9.0964	36.11	Pk	36.2	-26.7	.7	46.31	54	-7.69	74	-27.69	0-360	200	H
5	* ** 1.1998	46.42	Pk	28.2	-35.9	1.1	39.82	54	-14.18	74	-34.18	0-360	300	V
6	* ** 1.3501	44.67	Pk	28.7	-36.1	.8	38.07	54	-15.93	74	-35.93	0-360	400	V
7	* ** 4.2337	38.22	Pk	33.3	-32.5	.4	39.42	54	-14.58	74	-34.58	0-360	200	V
8	* ** 9.1234	37.28	Pk	36.3	-26.6	.6	47.58	54	-6.42	74	-26.42	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

9.2.2. 125kHz BANDWIDTH – ANTENNA #2

LOW CHANNEL



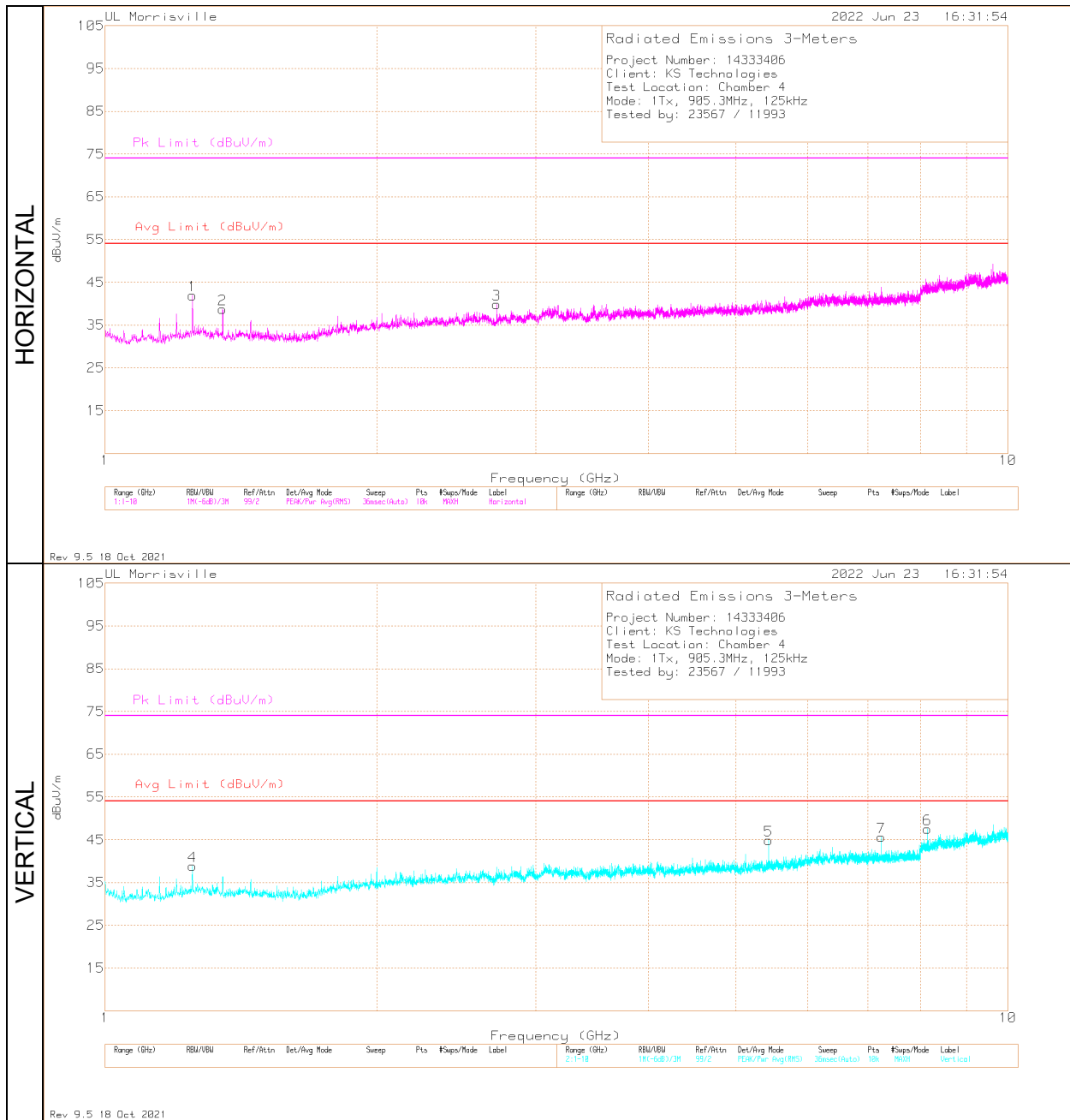
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Gain/Loss (dB)	Filter (dB)	Corrected Reading dBuV/m	Avg Limit (dBuV/m)	Margin (dB)	Pk Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 1.1998	47.67	Pk	28.7	-35.9	1.1	41.57	54	-12.43	74	-32.43	0-360	200	H
5	* ** 1.1998	47.96	Pk	28.7	-35.9	1.1	41.86	54	-12.14	74	-32.14	0-360	200	V
7	* ** 1.3492	44.63	Pk	29.6	-35.7	.8	39.33	54	-14.67	74	-34.67	0-360	300	V
3	* ** 1.3501	46.34	Pk	29.6	-35.7	.8	41.04	54	-12.96	74	-32.96	0-360	200	H
2	* 1.2493	46.86	Pk	29.2	-36.2	.9	40.76	54	-13.24	74	-33.24	0-360	299	H
6	* 1.2493	45.53	Pk	29.2	-36.2	.9	39.43	54	-14.57	74	-34.57	0-360	300	V
4	7.2307	40.98	Pk	35.7	-30.7	.6	46.58	-	-	-	-	0-360	400	H
8	7.2316	42.8	Pk	35.7	-30.6	.6	48.5	-	-	-	-	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

HIGH CHANNEL

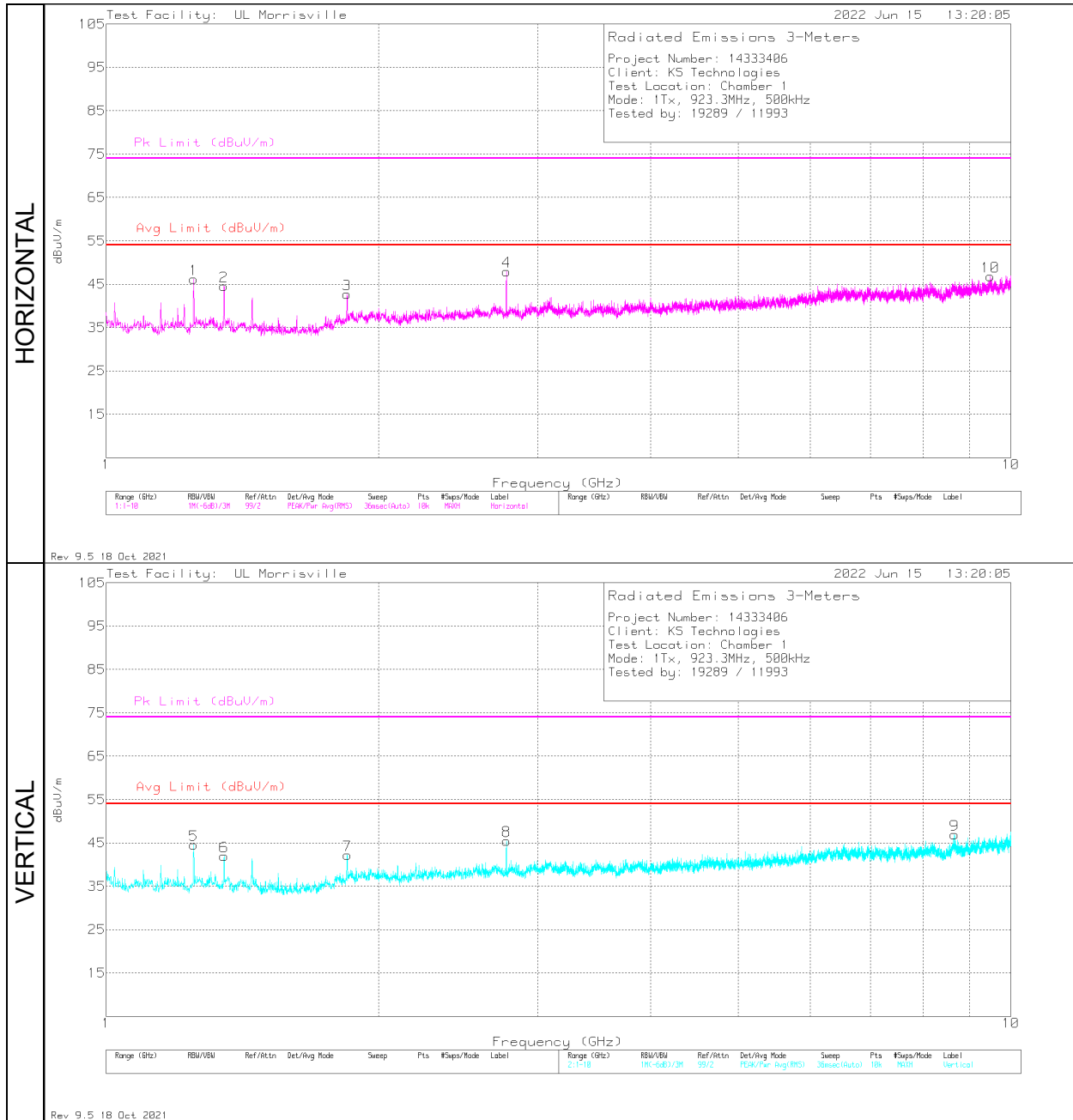


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 (dB/m)	Gain/Loss (dB)	Filter (dB)	Corrected Reading dBuV/m	Avg Limit (dBuV/m)	Margin (dB)	Pk Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarit y
1	* 1.2502	48.03	Pk	29.1	-36.1	.9	41.93	54	-12.07	74	-32.07	0-360	100	H
2	** 1.3492	45.31	Pk	28.7	-36.1	.8	38.71	54	-15.29	74	-35.29	0-360	100	H
3	** 2.7163	43.54	Pk	31.9	-36.1	.5	39.84	54	-14.16	74	-34.16	0-360	100	H
4	* 1.2493	44.91	Pk	29.1	-36.1	.9	38.81	54	-15.19	74	-35.19	0-360	400	V
5	** 5.4316	42.26	Pk	34.4	-32.1	.3	44.86	54	-9.14	74	-29.14	0-360	300	V
6	** 8.1487	39.41	Pk	35.7	-28.1	.5	47.51	54	-6.49	74	-26.49	0-360	300	V
7	7.2424	38.22	Pk	35.5	-28.7	.6	45.62	-	-	-	-	0-360	300	V

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

9.2.3. 500kHz BANDWIDTH – ANTENNA #1

LOW CHANNEL



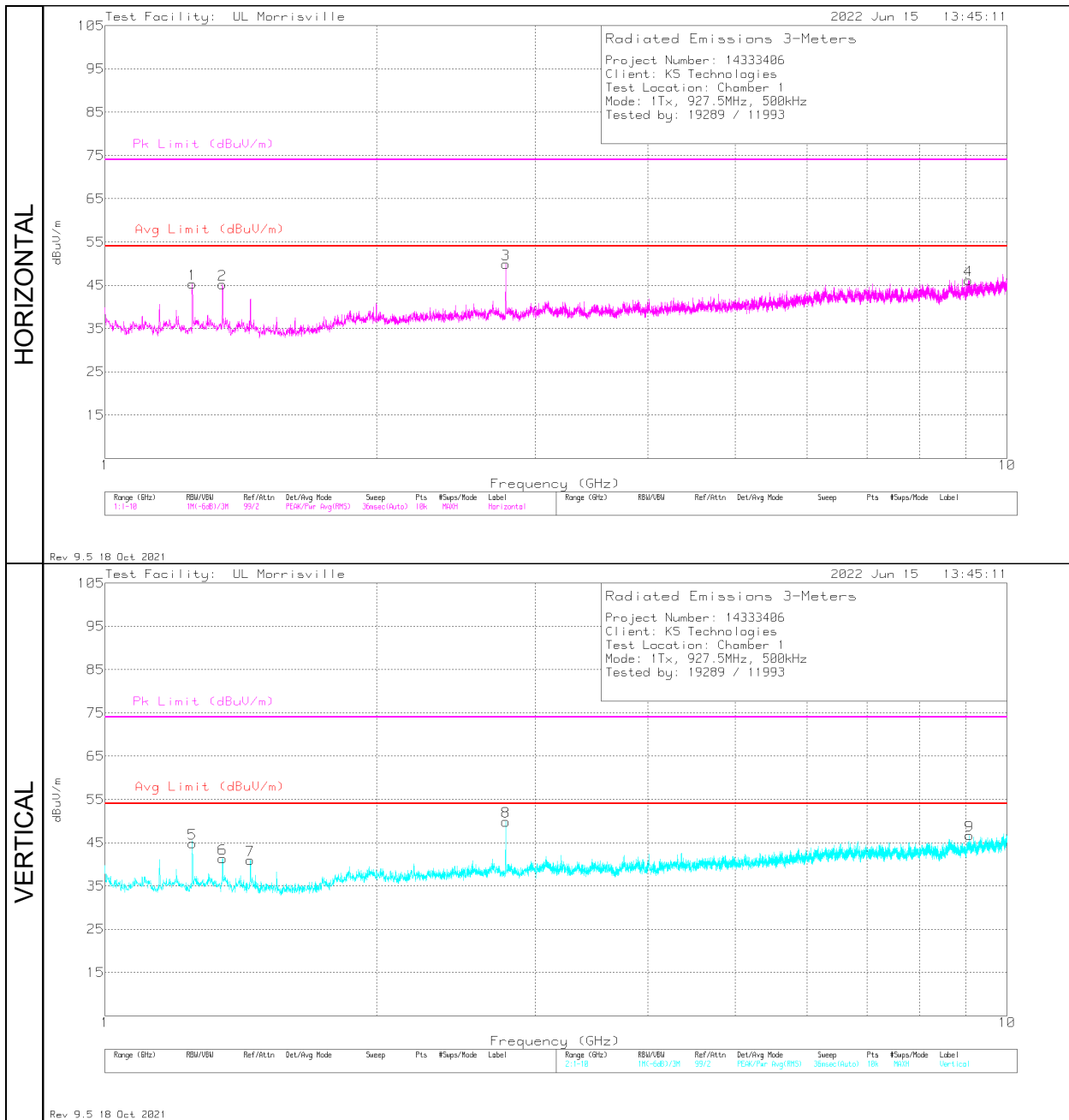
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Gain/Loss (dB)	Filter (dB)	Corrected Reading dBuV/m	Avg Limit (dBuV/m)	Margin (dB)	Pk Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.2493	52.32	Pk	29.2	-36.2	.9	46.22	54	-7.78	74	-27.78	0-360	101	H
2	** 1.3492	49.85	Pk	29.6	-35.7	.8	44.55	54	-9.45	74	-29.45	0-360	101	H
3	** 1.846	46.32	Pk	31	-35	.4	42.72	-	-	-	-	0-360	199	H
4	** 2.7703	49.18	Pk	32.5	-34.2	.5	47.98	54	-6.02	74	-26.02	0-360	101	H
10	** 9.4915	37.84	Pk	36.7	-28.6	.9	46.84	54	-7.16	74	-27.16	0-360	199	H
5	* 1.2493	50.7	Pk	29.2	-36.2	.9	44.6	54	-9.4	74	-29.4	0-360	101	V
6	** 1.3501	47.21	Pk	29.6	-35.7	.8	41.91	54	-12.09	74	-32.09	0-360	101	V
7	** 1.8469	45.89	Pk	31	-35.1	.4	42.19	-	-	-	-	0-360	400	V
8	** 2.7703	46.7	Pk	32.5	-34.2	.5	45.5	54	-8.5	74	-28.5	0-360	400	V
9	8.6671	39.52	Pk	35.9	-29	.5	46.92	-	-	-	-	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

HIGH CHANNEL

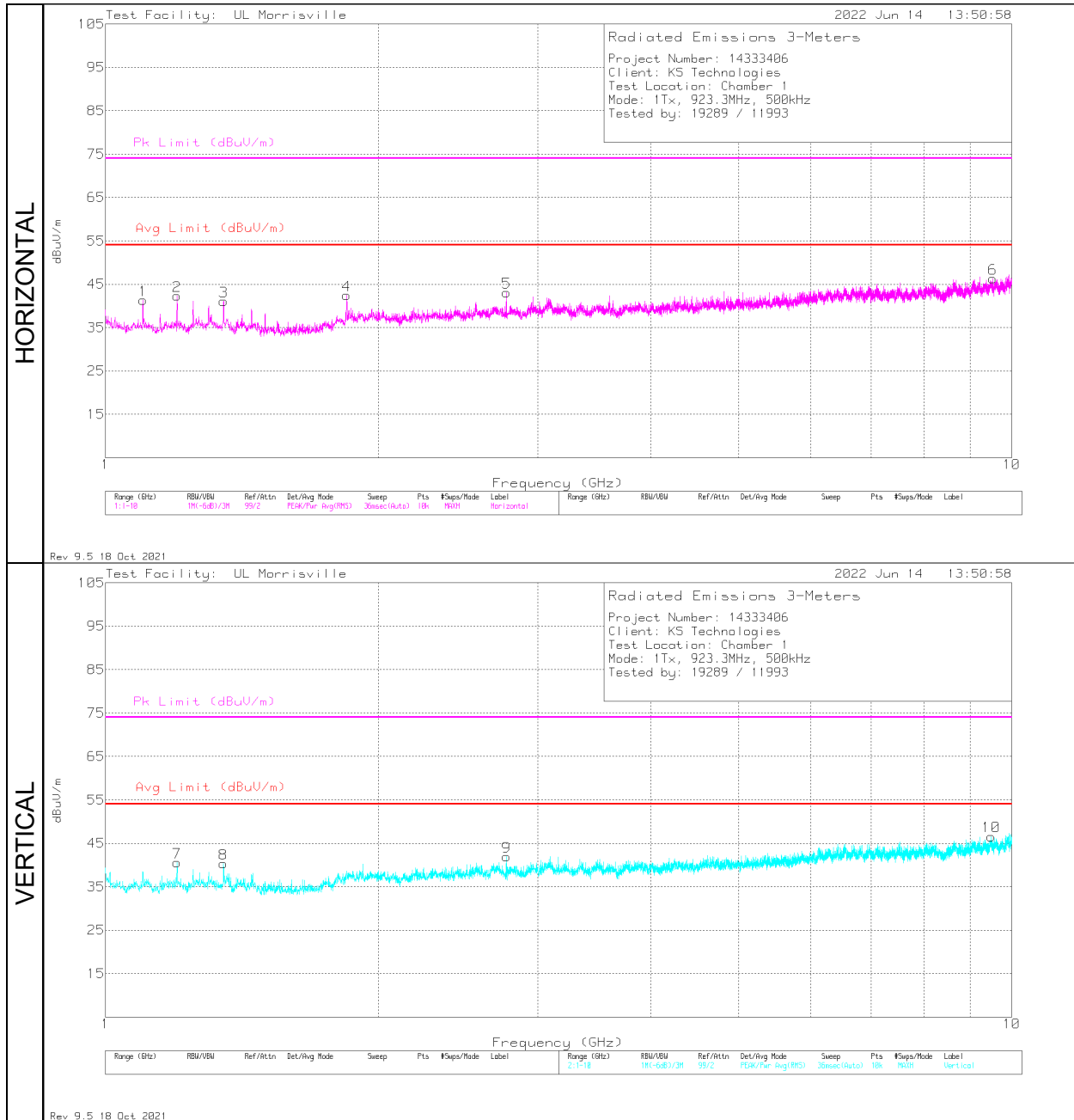


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Gain/Loss (dB)	Filter (dB)	Corrected Reading dBuV/m	Avg Limit (dBuV/m)	Margin (dB)	Pk Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.2493	51.47	Pk	29.2	-36.2	.9	45.37	54	-8.63	74	-28.63	0-360	101	H
2	** 1.3492	50.51	Pk	29.6	-35.7	.8	45.21	54	-8.79	74	-28.79	0-360	101	H
3	** 2.78174	52.85	PK2	32.5	-33.9	.5	51.95	-	-	74	-22.05	191	107	H
3	** 2.78228	46.28	ADV	32.5	-34	.5	45.28	54	-8.72	-	-	191	107	H
4	** 9.0586	38.34	Pk	36.2	-28.9	.6	46.24	54	-7.76	74	-27.76	0-360	299	H
5	* 1.2493	50.97	Pk	29.2	-36.2	.9	44.87	54	-9.13	74	-29.13	0-360	101	V
6	** 1.3501	46.59	Pk	29.6	-35.7	.8	41.29	54	-12.71	74	-32.71	0-360	200	V
7	** 1.4491	46.84	Pk	28.6	-35.3	.8	40.94	54	-13.06	74	-33.06	0-360	400	V
8	** 2.78194	46.51	PK2	32.5	-33.9	.5	45.61	-	-	74	-28.39	309	116	V
8	** 2.78228	37.29	ADV	32.5	-34	.5	36.29	54	-17.71	-	-	309	116	V
9	** 9.0838	38.29	Pk	36.3	-28.6	.7	46.69	54	-7.31	74	-27.31	0-360	400	V

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

9.2.4. 500kHz BANDWIDTH – ANTENNA #2

LOW CHANNEL



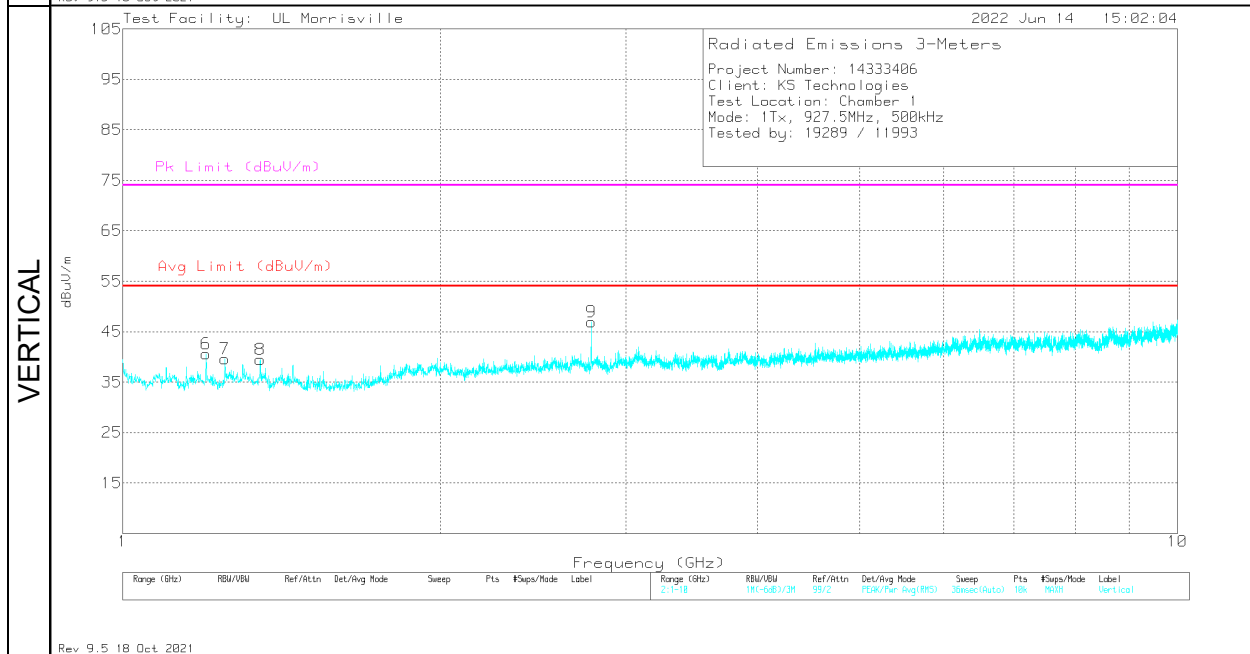
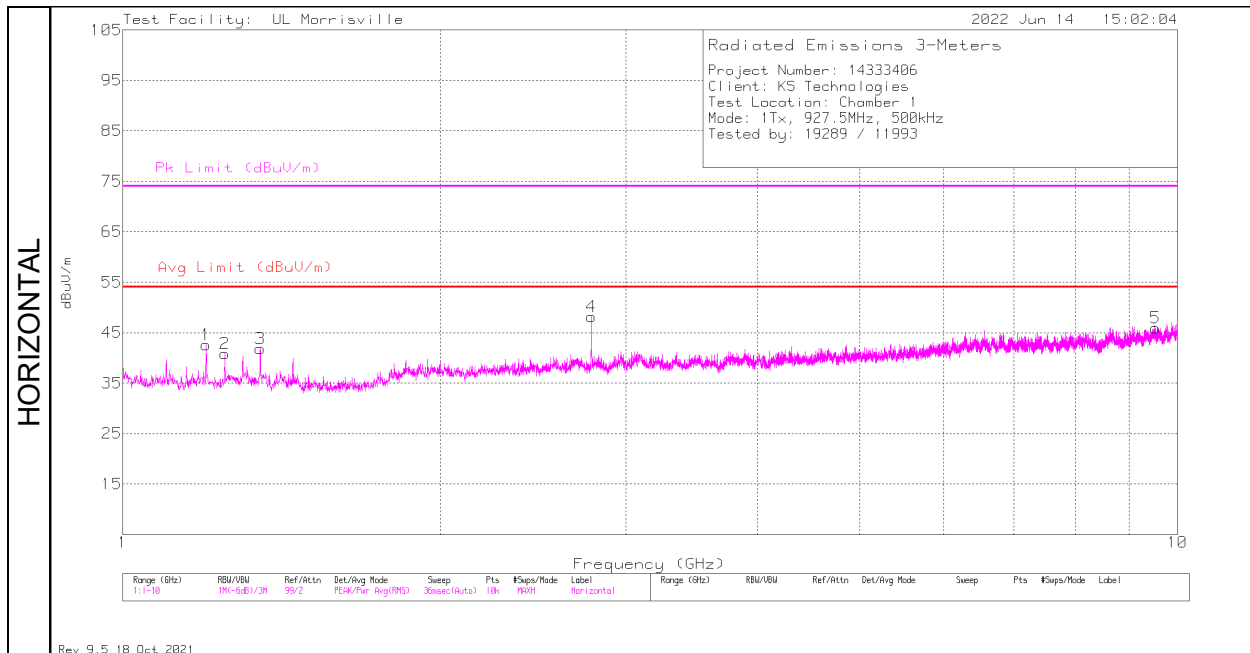
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Gain/Loss (dB)	Filter (dB)	Corrected Reading dBuV/m	Avg Limit (dBuV/m)	Margin (dB)	Pk Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 1.0999	47.93	Pk	28.1	-35.9	1.2	41.33	54	-12.67	74	-32.67	0-360	199	H
2	* ** 1.1989	48.44	Pk	28.7	-35.9	1.1	42.34	54	-11.66	74	-31.66	0-360	101	H
7	* ** 1.1998	46.64	Pk	28.7	-35.9	1.1	40.54	54	-13.46	74	-33.46	0-360	300	V
8	* ** 1.3492	45.63	Pk	29.6	-35.7	.8	40.33	54	-13.67	74	-33.67	0-360	300	V
3	* ** 1.3501	46.41	Pk	29.6	-35.7	.8	41.11	54	-12.89	74	-32.89	0-360	199	H
5	* ** 2.7703	44.34	Pk	32.5	-34.2	.5	43.14	54	-10.86	74	-30.86	0-360	199	H
9	* ** 2.7703	43.11	Pk	32.5	-34.2	.5	41.91	54	-12.09	74	-32.09	0-360	101	V
10	* ** 9.4897	37.72	Pk	36.7	-28.7	.9	46.62	54	-7.38	74	-27.38	0-360	101	V
4	** 1.846	46.1	Pk	31	-35	.4	42.5	-	-	-	-	0-360	199	H
6	9.5329	37.11	Pk	36.8	-28.3	.7	46.31	-	-	-	-	0-360	300	H

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

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

HIGH CHANNEL



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Gain/Loss (dB)	Filter (dB)	Corrected Reading dBuV/m	Avg Limit (dBuV/m)	Margin (dB)	Pk Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 1.1998	48.73	Pk	28.7	-35.9	1.1	42.63	54	-11.37	74	-31.37	0-360	101	H
2	* 1.2493	46.99	Pk	29.2	-36.2	.9	40.89	54	-13.11	74	-33.11	0-360	199	H
3	* ** 1.3501	47.12	Pk	29.6	-35.7	.8	41.82	54	-12.18	74	-32.18	0-360	101	H
4	* ** 2.78226	50.44	PK2	32.5	-34	.5	49.44	-	-	74	-24.56	197	244	H
4	* ** 2.78244	43.79	ADV	32.5	-34	.5	42.79	54	-11.21	-	-	197	244	H
6	* ** 1.1998	46.71	Pk	28.7	-35.9	1.1	40.61	54	-13.39	74	-33.39	0-360	200	V
7	* 1.2502	45.59	Pk	29.3	-36.2	.9	39.59	54	-14.41	74	-34.41	0-360	300	V
8	* ** 1.3501	44.79	Pk	29.6	-35.7	.8	39.49	54	-14.51	74	-34.51	0-360	400	V
9	* ** 2.782	47.83	Pk	32.5	-33.9	.5	46.93	54	-7.07	74	-27.07	0-360	101	V
5	9.5347	36.98	Pk	36.8	-28.6	.7	45.88	-	-	-	-	0-360	400	H

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

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

PK2 - Maximum Peak

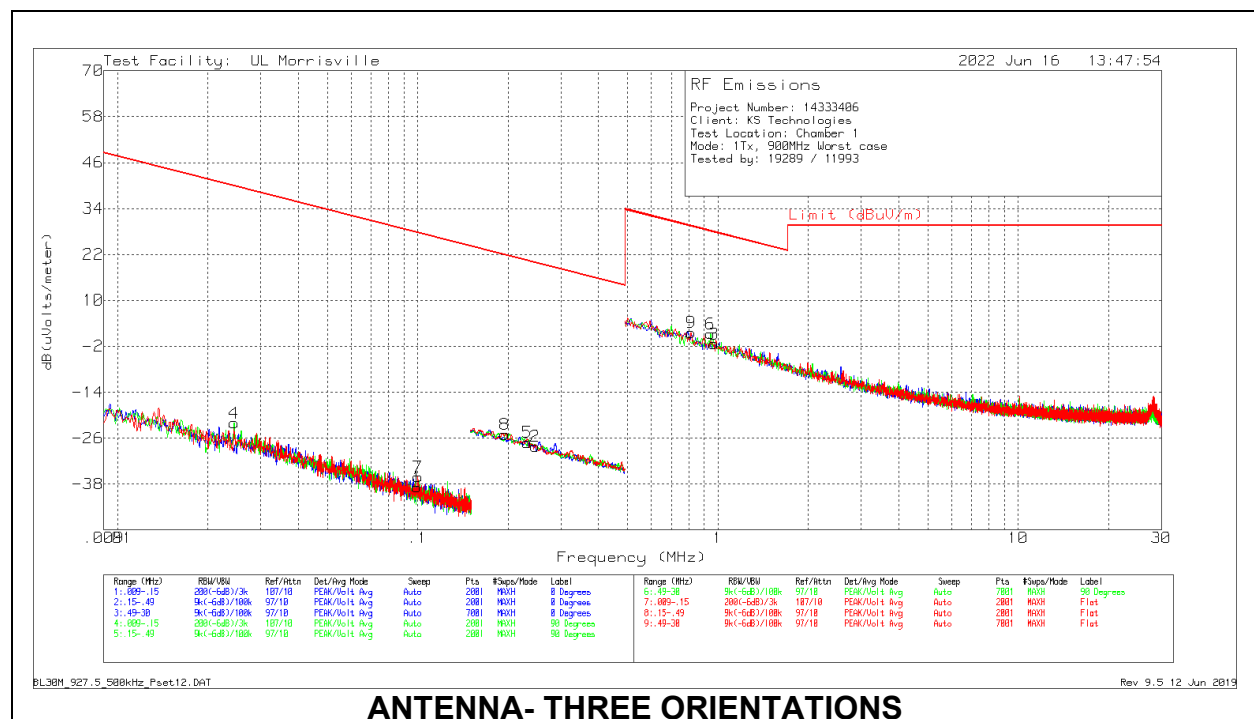
ADV - Linear Voltage Average

9.3. 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).

9.3.1. ANTENNA #1

SPURIOUS EMISSIONS BELOW 30 MHz (E-FIELD)



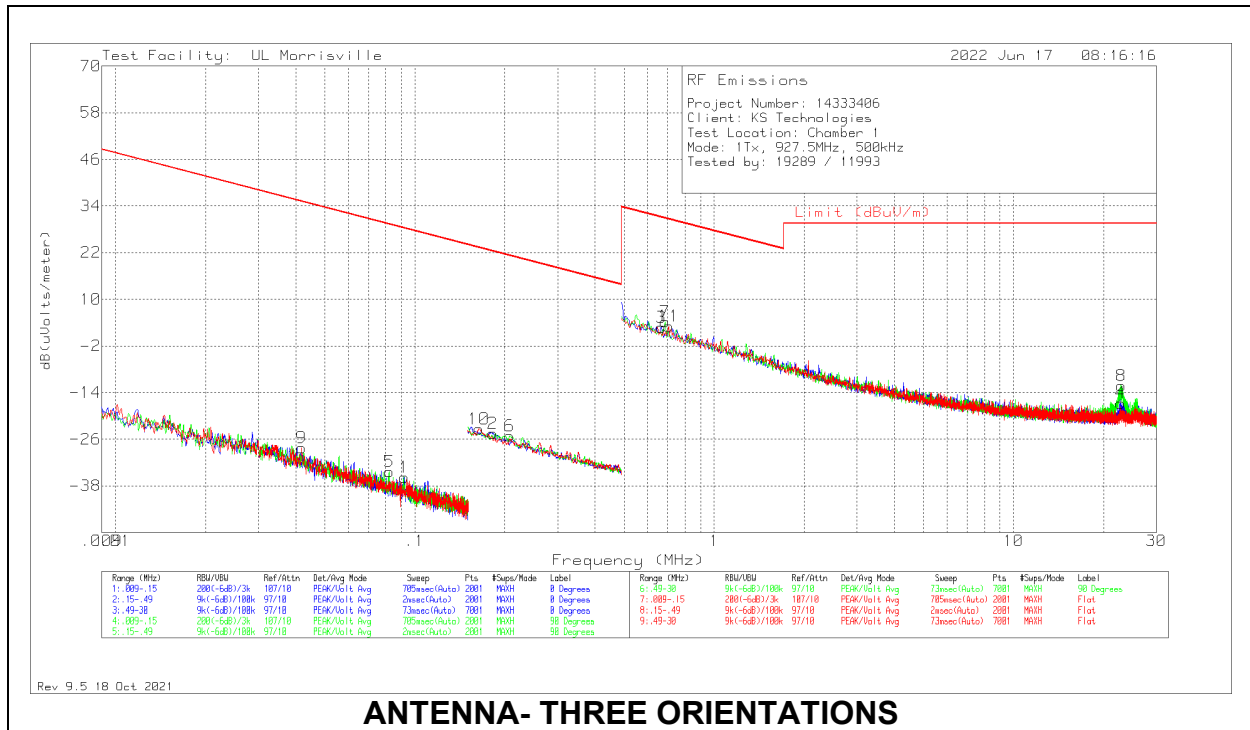
ANTENNA- THREE ORIENTATIONS

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0059 (dB/m)	Gain/Loss (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	Avg/QP Limit (dBuV/m)	PK Limit (dBuV/m)	Worst Margin (dB)	Azimuth (Degs)	Loop Angle
1	.09945	30.77	Pk	10.3	.1	-80	-38.83	27.65	47.65	-66.48	0-360	0 degs
2	.24656	41.69	Pk	10.1	.1	-80	-28.11	19.77	39.77	-47.88	0-360	0 degs
3	.97062	28.11	Pk	10.3	.2	-40	-1.39	27.86	-	-29.25	0-360	0 degs
4	.02448	44.14	Pk	13.7	.1	-80	-22.06	39.83	59.83	-61.89	0-360	90 degs
5	.23194	42.69	Pk	10.1	.1	-80	-27.11	20.3	40.3	-47.41	0-360	90 degs
6	.94533	30.75	Pk	10.3	.2	-40	1.25	28.09	-	-26.84	0-360	90 degs
7	.10024	33.45	Pk	10.3	.1	-80	-36.15	27.58	47.58	-63.73	0-360	Flat
8	.19505	44.69	Pk	10.2	.1	-80	-25.01	21.8	41.8	-46.81	0-360	Flat
9	.81463	31.18	Pk	10.2	.2	-40	1.58	29.38	-	-27.8	0-360	Flat

Pk - Peak detector

9.3.2. ANTENNA #2

SPURIOUS EMISSIONS BELOW 30 MHz (E-FIELD)



ANTENNA- THREE ORIENTATIONS

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0059 (dB/m)	Gain/Loss (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	Avg/QP Limit (dBuV/m)	PK Limit (dBuV/m)	Worst Margin (dB)	Azimuth (Degs)	Loop Angle
1	.09221	33.54	Pk	10.6	.1	-80	-35.76	28.31	48.31	-64.07	0-360	0 degs
2	.18239	45.23	Pk	10.2	.1	-80	-24.47	22.38	42.38	-46.85	0-360	0 degs
3	.66707	32.42	Pk	10.2	.2	-40	2.82	31.12	-	-28.3	0-360	0 degs
4	22.80529	12.72	Pk	9.6	1	-40	-16.68	29.54	-	-46.22	0-360	0 degs
5	.08206	35	Pk	10.6	.1	-80	-34.3	29.32	49.32	-63.62	0-360	90 degs
6	.20729	44.5	Pk	10.2	.1	-80	-25.2	21.27	41.27	-46.47	0-360	90 degs
7	.68394	33.81	Pk	10.2	.2	-40	4.21	30.9	-	-26.69	0-360	90 degs
8	22.85588	17.13	Pk	9.6	1	-40	-12.27	29.54	-	-41.81	0-360	90 degs
9	.04187	39.76	Pk	11.9	.1	-80	-28.24	35.17	45.17	-63.41	0-360	Flat
10	.16403	46.37	Pk	10.2	.1	-80	-23.33	23.31	43.31	-46.64	0-360	Flat
11	.70502	32.71	Pk	10.2	.2	-40	3.11	30.64	-	-27.53	0-360	Flat

Pk - Peak detector

10. AC MAINS LINE CONDUCTED EMISSIONS

LIMITS

§15.207

(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

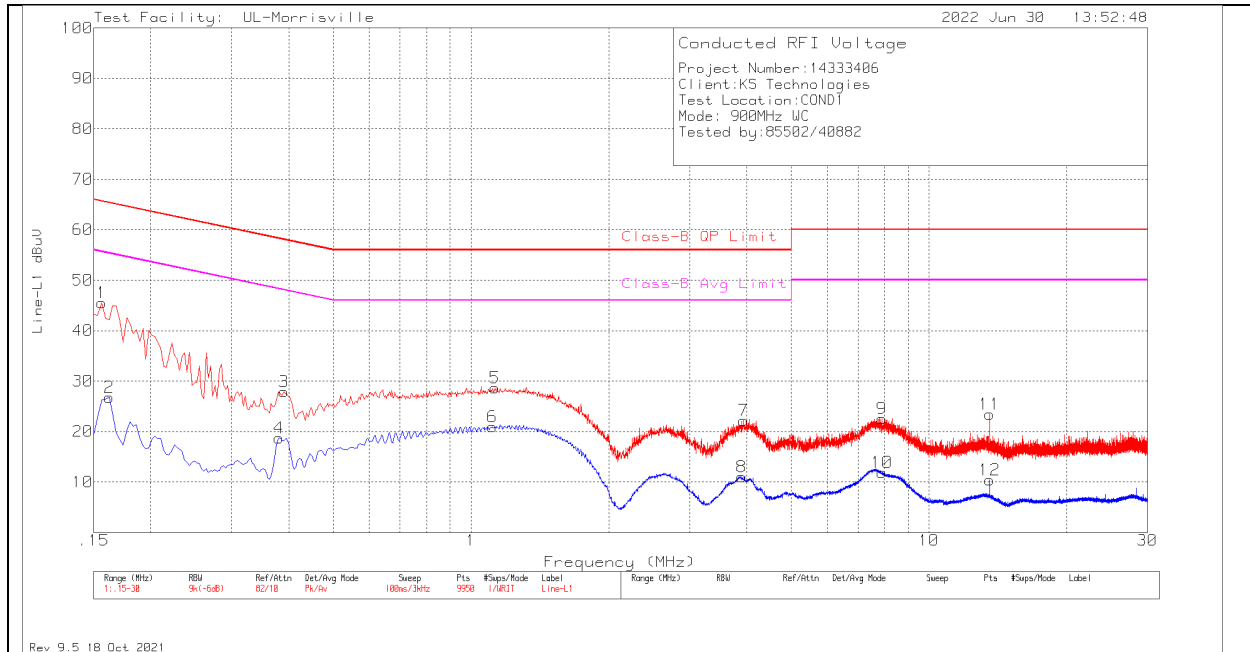
The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

The receiver is set to a resolution bandwidth of 9 kHz above 150kHz and 200Hz below 150kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both lines.

10.1.1. ANTENNA #1

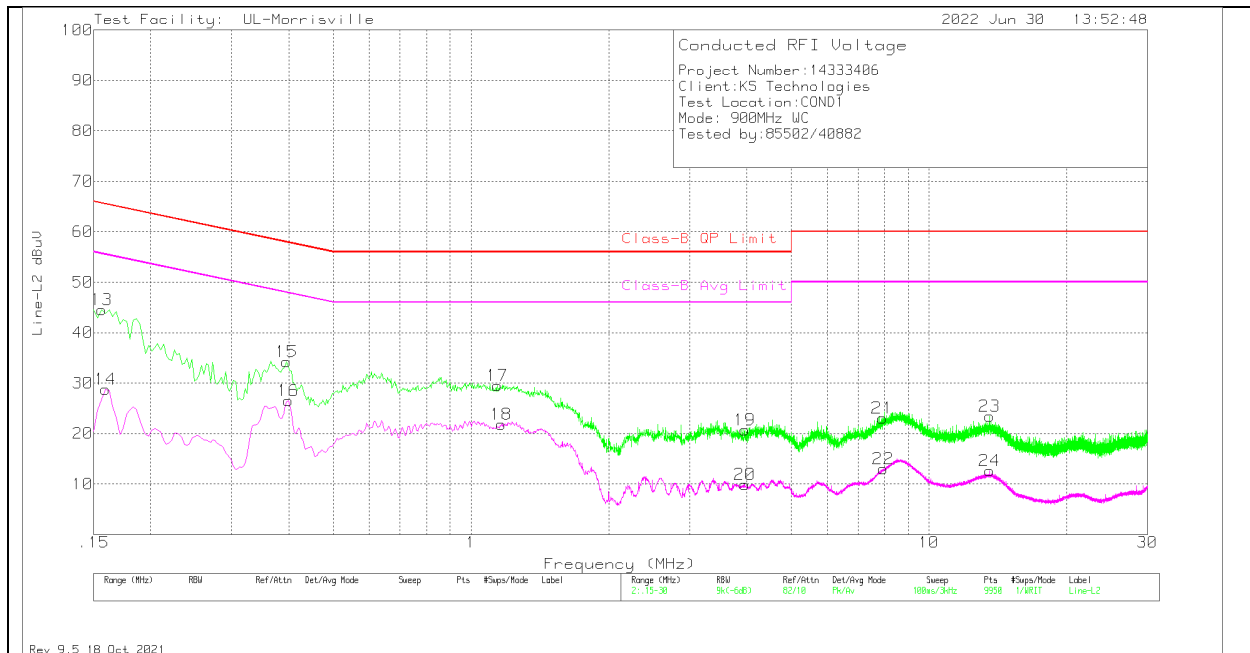
LINE 1 RESULTS



Range 1: Line-L1 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	Class-B QP Limit	Margin (dB)	Class-B Avg Limit	Margin (dB)
1	.156	35.57	Pk	.2	9.8	45.57	65.67	-20.1	-	-
2	.162	16.76	Av	.2	9.8	26.76	-	-	55.36	-28.6
3	.39	18.01	Pk	.1	9.8	27.91	58.06	-30.15	-	-
4	.381	8.78	Av	.1	9.8	18.68	-	-	48.26	-29.58
5	1.128	18.84	Pk	0	9.8	28.64	56	-27.36	-	-
6	1.113	11.15	Av	0	9.8	20.95	-	-	46	-25.05
7	3.936	12.27	Pk	0	9.9	22.17	56	-33.83	-	-
8	3.903	1.08	Av	0	9.9	10.98	-	-	46	-35.02
9	7.902	12.48	Pk	.1	10	22.58	60	-37.42	-	-
10	7.893	1.81	Av	.1	10	11.91	-	-	50	-38.09
11	13.56	13.3	Pk	.1	10	23.4	60	-36.6	-	-
12	13.56	.24	Av	.1	10	10.34	-	-	50	-39.66

Pk - Peak detector
 Av - Average detection

LINE 2 RESULT

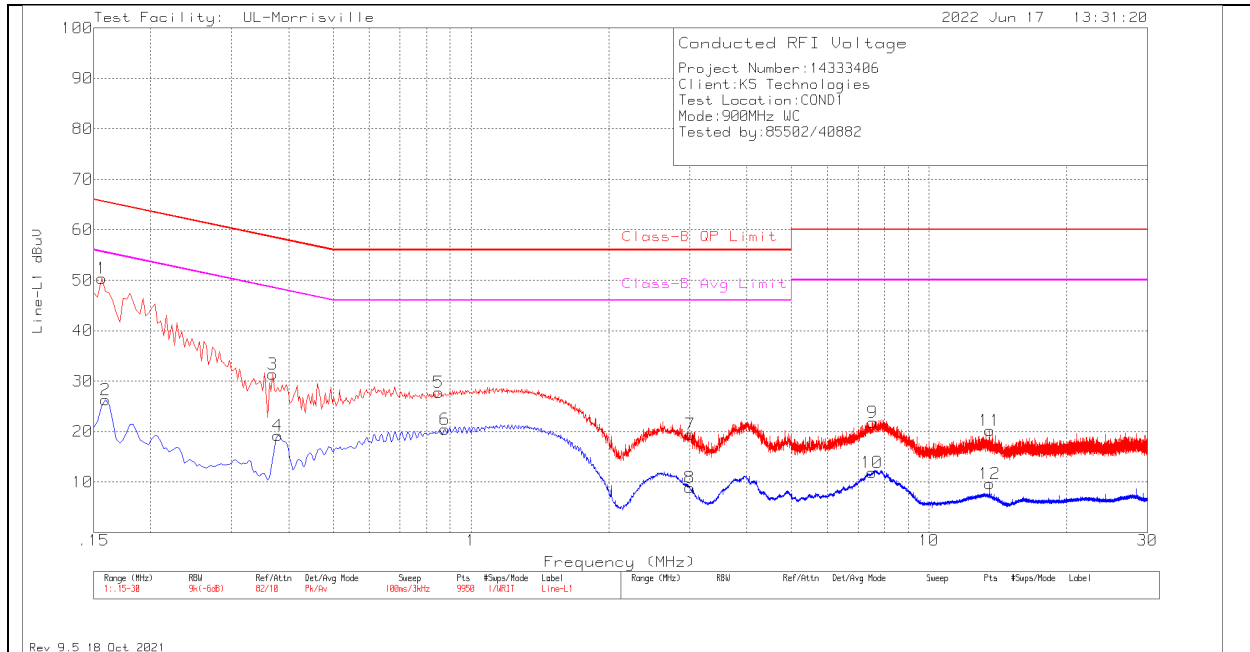


Range 2: Line-L2 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	Class-B QP Limit	Margin (dB)	Class-B Avg Limit	Margin (dB)
13	.156	34.58	Pk	.2	9.8	44.58	65.67	-21.09	-	-
14	.159	18.77	Av	.2	9.8	28.77	-	-	55.52	-26.75
15	.396	24.31	Pk	.1	9.8	34.21	57.94	-23.73	-	-
16	.399	16.6	Av	.1	9.8	26.5	-	-	47.87	-21.37
17	1.143	19.68	Pk	0	9.8	29.48	56	-26.52	-	-
18	1.164	12	Av	0	9.8	21.8	-	-	46	-24.2
19	3.963	10.77	Pk	0	9.9	20.67	56	-35.33	-	-
20	3.963	.01	Av	0	9.9	9.91	-	-	46	-36.09
21	7.908	13	Pk	.1	10	23.1	60	-36.9	-	-
22	7.953	2.9	Av	.1	10	13	-	-	50	-37
23	13.557	13.28	Pk	.1	10	23.38	60	-36.62	-	-
24	13.563	2.55	Av	.1	10	12.65	-	-	50	-37.35

Pk - Peak detector
 Av - Average detection

10.1.1. ANTENNA #2

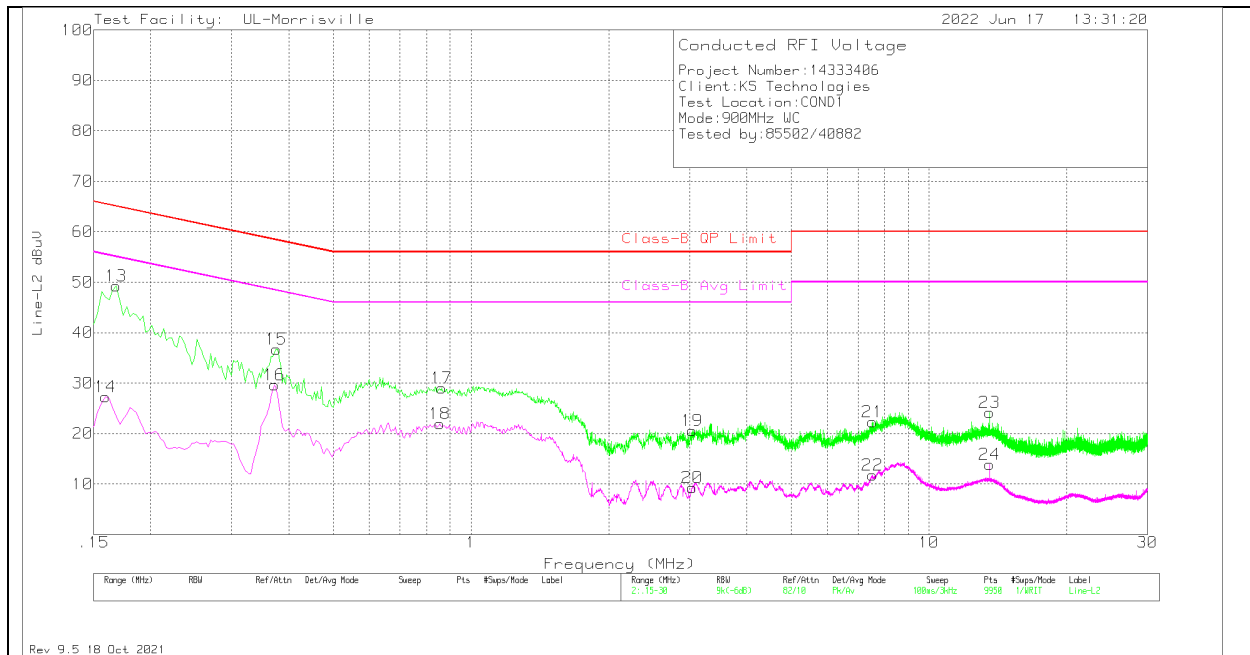
LINE 1 RESULTS



Range 1: Line-L1 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	Class-B QP Limit	Margin (dB)	Class-B Avg Limit	Margin (dB)
1	.156	40.35	Pk	.2	9.8	50.35	65.67	-15.32	-	-
2	.159	16.26	Av	.2	9.8	26.26	-	-	55.52	-29.26
3	.369	21.49	Pk	.1	9.8	31.39	58.52	-27.13	-	-
4	.378	9.29	Av	.1	9.8	19.19	-	-	48.32	-29.13
5	.849	17.99	Pk	0	9.8	27.79	56	-28.21	-	-
6	.876	10.66	Av	0	9.8	20.46	-	-	46	-25.54
7	3.015	9.64	Pk	0	9.8	19.44	56	-36.56	-	-
8	3.006	-88	Av	0	9.8	8.92	-	-	46	-37.08
9	7.542	11.7	Pk	.1	10	21.8	60	-38.2	-	-
10	7.509	1.81	Av	.1	10	11.91	-	-	50	-38.09
11	13.56	10.1	Pk	.1	10	20.2	60	-39.8	-	-
12	13.56	-49	Av	.1	10	9.61	-	-	50	-40.39

Pk - Peak detector
 Av - Average detection

LINE 2 RESULT



Range 2: Line-L2 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	Class-B QP Limit	Margin (dB)	Class-B Avg Limit	Margin (dB)
13	.168	39.29	Pk	.2	9.8	49.29	65.06	-15.77	-	-
14	.159	17.25	Av	.2	9.8	27.25	-	-	55.52	-28.27
15	.3765	26.77	Pk	.1	9.8	36.67	58.36	-21.69	-	-
16	.372	19.68	Av	.1	9.8	29.58	-	-	48.46	-18.88
17	.864	19.16	Pk	0	9.8	28.96	56	-27.04	-	-
18	.855	12.09	Av	0	9.8	21.89	-	-	46	-24.11
19	3.045	10.74	Pk	0	9.8	20.54	56	-35.46	-	-
20	3.039	-47	Av	0	9.8	9.33	-	-	46	-36.67
21	7.536	12.26	Pk	.1	10	22.36	60	-37.64	-	-
22	7.527	1.71	Av	.1	10	11.81	-	-	50	-38.19
23	13.56	14.07	Pk	.1	10	24.17	60	-35.83	-	-
24	13.56	3.82	Av	.1	10	13.92	-	-	50	-36.08

Pk - Peak detector
 Av - Average detection

11. SETUP PHOTOS

Please refer to R14333406-EP1 for setup diagrams.

END OF TEST REPORT