TEST REPORT

Report Number. : R13687586-E1

Applicant	:	Sonos 614 Chapala Street Santa Barbara, CA, 93101, U.S.A
Model	:	S36
FCC ID	:	SBVRM036
IC	:	5373A-RM036
EUT Description	:	Wireless Smart Speaker
Test Standard(s)	:	FCC 47 CFR PART 15 SUBPART C: 2022 ISED RSS-247 ISSUE 2: 2017 ISED RSS-GEN ISSUE 5 + A2: 2021

Date Of Issue:
2022-03-08

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

REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	2021-05-26	Initial Issue	Haley Ackun
V2	2021-11-17	Revised firmware information in Section 6.4	Brian T. Kiewra
V3	2022-02-02	Data reuse references added	Niklas Haydon
V4	2022-02-07	Editorial corrections	Niklas Haydon
V5	2022-03-08	Revised firmware information in Section 6.4	Lariah Ijames

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Sonos
614 Chapala Street
Santa Barbara, CA, 93101, U.S.A

EUT DESCRIPTION: Wireless Smart Speaker

MODEL: S36

SERIAL NUMBER: 00-0E-58-02-A8-F0:5

SAMPLE RECEIPT DATE: 2021-05-10

DATE TESTED: 2021-05-10 TO 2021-05-25

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C: 2021	Complies
ISED RSS-247 Issue 2: 2017	Complies
ISED RSS-GEN Issue 5 + A2: 2021	Complies

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

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

This document may not be altered or revised in any way unless done so by UL LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by a2La, NIST, or any agency of the U.S. government.

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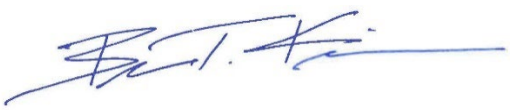
UL LLC. By:



Brian T. Kiewra
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2. TEST RESULTS SUMMARY

FCC Clause	ISED Clause	Requirement	Result	Comment
See Comment		Duty Cycle	Reporting purposes only	ANSI C63.10 Section 11.6.
-	RSS-GEN 6.7	99% OBW	Not performed	Refer to Section 7. Test Data Reuse
15.247 (a) (2)	RSS-247 5.2 (a)	6dB BW		
15.247 (b) (3)	RSS-247 5.4 (d)	Output Power		
See Comment		Average power		
15.247 (e)	RSS-247 5.2 (b)	PSD		
15.247 (d)	RSS-247 5.5	Conducted Spurious Emissions		
15.209, 15.205	RSS-GEN 8.9, 8.10	Radiated Emissions	Complies	None.
15.207	RSS-Gen 8.8	AC Mains Conducted Emissions	Complies	None.

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.

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3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15: 2022, ANSI C63.10-2013, KDB 558074 D01 15.247 Meas Guidance v05r02, KDB 414788 D01 Radiated Test Site v01r01, RSS-GEN Issue 5 + A2: 2021, and RSS-247 Issue 2: 2017.

4. FACILITIES AND ACCREDITATION

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

	Address	ISED CABID	ISED Company Number	FCC Registration
☐	Building: 12 Laboratory Dr RTP, NC 27709, U.S.A	US0067	2180C	703469
☒	Building: 2800 Perimeter Park Dr. Suite B Morrisville, NC 27560	US0067	2180C	703469

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5. DECISION RULES AND MEASUREMENT UNCERTAINTY

5.1. METROLOGICAL TRACEABILITY

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, with a maximum time between calibrations of one year or the manufacturers' recommendation, whichever is less, and where applicable is traceable to recognized national standards.

5.2. DECISION RULES

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4:2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

5.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Radio Frequency (Spectrum Analyzer)	141.2 Hz
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%
Time	3.39%

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

5.4. SAMPLE CALCULATION

RADIATED EMISSIONS

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

MAINS CONDUCTED EMISSIONS

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

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6. EQUIPMENT UNDER TEST

6.1. EUT DESCRIPTION

The EUT is a wireless smart speaker that supports BLE, 2.4 GHz WLAN, 5 GHz WLAN, and NFC. This report covers radiated emissions, ac line conducted emissions, and data reuse for BLE.

6.2. MAXIMUM OUTPUT POWER

Refer to Test Data Reuse Section.

6.3. DESCRIPTION OF AVAILABLE ANTENNAS

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

The radio utilizes an single band IFA antenna, with a maximum gain of 3.4 dBi.

6.4. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was Sonos S2 V13.2.

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.

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.

The fundamental of the EUT was investigated in two orthogonal orientations X and Z; it was determined that X orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in X orientation. Y orientation is not utilized in the field as declared by the client.

The EUT only supports 1 data rate, therefore all final testing was performed with the EUT at 1 Mbps.

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6.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Laptop	Lenovo	X220	R9LB8CG	QDS-BRCM1046
Laptop	Lenovo	T440p	PB0294NN	NA
AC Adapter	Lenovo	42T4438	NA	NA
AC Adapter	Lenovo	ADLX90NLC2A	NA	NA

I/O CABLES

I/O Cable List						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	1	1	Ethernet	Un-shielded	>3m	Ethernet connect to laptop and EUT.
2	2	1	I/O	Shielded	>3m	Connected to AC Mains

TEST SETUP

Test software exercised the radio card.

SETUP DIAGRAMS

Please refer to R13687586-EP1 for setup diagrams

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7. TEST DATA REUSE

7.1. INTRODUCTION

This application for certification is leveraging the data reuse procedures from KDB 484596 D01 based on reference FCC ID: SBVRM038 and IC: 5373A-RM038 to cover variant FCC ID: SBVRM036 and IC: 5373A-RM036. Antenna port conducted measurements are being leveraged.

7.2. DIFFERENCE IN MODEL NUMBER

The BLE device in the S36 is a fully integrated radio solution from Cypress (part number CY8C4248LQI-BL553) that operates in the 2GHz ISM band.

S36 references S38 (part number CY8C4247LQI-BL453) data as the BLE devices are similar. The two devices are from the same model Cypress PoSC 4200 BL. The only difference is S38 uses BLE Subsystem 4.1 with 128 kB of internal Flash. S36 is BLE Subsystem 4.2 and internal Flash of 256k. Physical radio and its function is the same between the two models.

7.3. SPOT CHECK VERIFICATION RESULTS

Spot check verification has been done on device model S36, FCC ID: SBVRM036 and IC: 5373A-RM036 for antenna port conducted power.

SBVRM036 SPOT CHECK RESULTS										
Technology	Mode	Test Item	Channel	Measured	Original model		Spot check model		Delta (dB)	
					S38		S36			
					SBVRM038 5373A-RM038		SBVRM036 5373A-RM036			
				Frequency	Ave	Peak	Ave	Peak	Ave	Peak
BLE	1Mbps	RBE	Low	2402	-1.52	-0.38	-1.62	-1.27	-0.10	-0.89
		RBE	High	2440	-1.50	-0.45	-1.72	-1.35	-0.22	-0.90
		RSE	Mid	2480	-1.49	-0.78	-1.92	-1.52	-0.03	-0.74

Comparison of the models, upper deviation is within 3dB range and all tests are under FCC/IC Technical Limits. The test report for FCC ID: SBVRM038 and IC: 5373A-RM038 is therefore being used to support the application for certification for FCC ID: SBVRM036 and IC: 5373A-RM036.

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8. MEASUREMENT METHOD

Duty Cycle: ANSI C63.10-2013 Section 11.6

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

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

General Radiated Spurious Emissions: ANSI C63.10 Sections 6.3-6.6

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

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9. TEST AND MEASUREMENT EQUIPMENT

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

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	2021-04-05	2022-04-05
HI0090	Environmental Meter	Fisher Scientific	15-077-963	2020-06-26	2021-06-26
LISN003	LISN, 50-ohm/50-uH, 250uH 2-conductor, 25A	Fischer Custom Com.	FCC-LISN-50/250-25-2-01	2020-08-18	2021-08-18
75141	EMI Test Receiver 9kHz-7GHz	Rohde & Schwarz	ESCI 7	2020-08-18	2021-08-18
ATA222	Transient Limiter, 0.009-100MHz	Electro-Metrics	EM-7600	2021-04-05	2022-04-05
PS214	AC Power Source	Elgar	CW2501M (s/n 1523A02396)	NA	NA
SOFTEMI	EMI Software	UL	Version 9.5 (2021-03-04)		
	Miscellaneous (if needed)				
LISN008	LISN, 50-ohm/50-uH, 2-conductor, 25A (For support gear only.)	Solar Electronics	8012-50-R-24-BNC	2020-08-08	2021-08-08

Test Equipment Used - Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
PWM002 (PRE0137344)	RF Power Meter	Keysight Technologies	N1911A	2020-07-31	2021-07-31
PWS001 (PRE0137347)	Peak and Avg Power Sensor, 50MHz to 18GHz	Keysight Technologies	N1921A	2020-05-27	2021-05-27
HI0090 (PRE0191271)	Environmental Meter	Fisher Scientific	15-077-963	2020-06-26	2021-06-26

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Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville - South Chamber)

Equip. ID	Description	Manufacturer/Brand	Model Number	Last Cal.	Next Cal.
	0.009-30MHz				
AT0079	Active Loop Antenna	ETS-Lindgren	6502	2020-08-20	2021-08-20
	30-1000 MHz				
AT0075	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2020-10-27	2021-10-27
	1-18 GHz				
AT0072	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2021-05-03	2022-05-03
	18-40 GHz				
AT0063	Horn Antenna, 18-26.5GHz	ARA	MWH-1826/B	2020-10-30	2021-10-30
	Gain-Loss Chains				
S-SAC01	Gain-loss string: 0.009-30MHz	Various	Various	2020-07-10	2021-07-10
S-SAC02	Gain-loss string: 25-1000MHz	Various	Various	2020-07-10	2021-07-10
S-SAC03	Gain-loss string: 1-18GHz	Various	Various	2020-07-06	2021-07-06
S-SAC04	Gain-loss string: 18-40GHz	Various	Various	2020-07-07	2021-07-07
	Receiver & Software				
197955	Spectrum Analyzer	Rohde & Schwarz	ESW44	2021-03-10	2022-03-10
SA0026	Spectrum Analyzer	Agilent	N9030A	2020-07-16	2021-07-16
SOFTEMI	EMI Software	UL	Version 9.5 (04 Mar 2021)		

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10. ANTENNA PORT TEST RESULTS

LIMITS

None; for reporting purposes only.

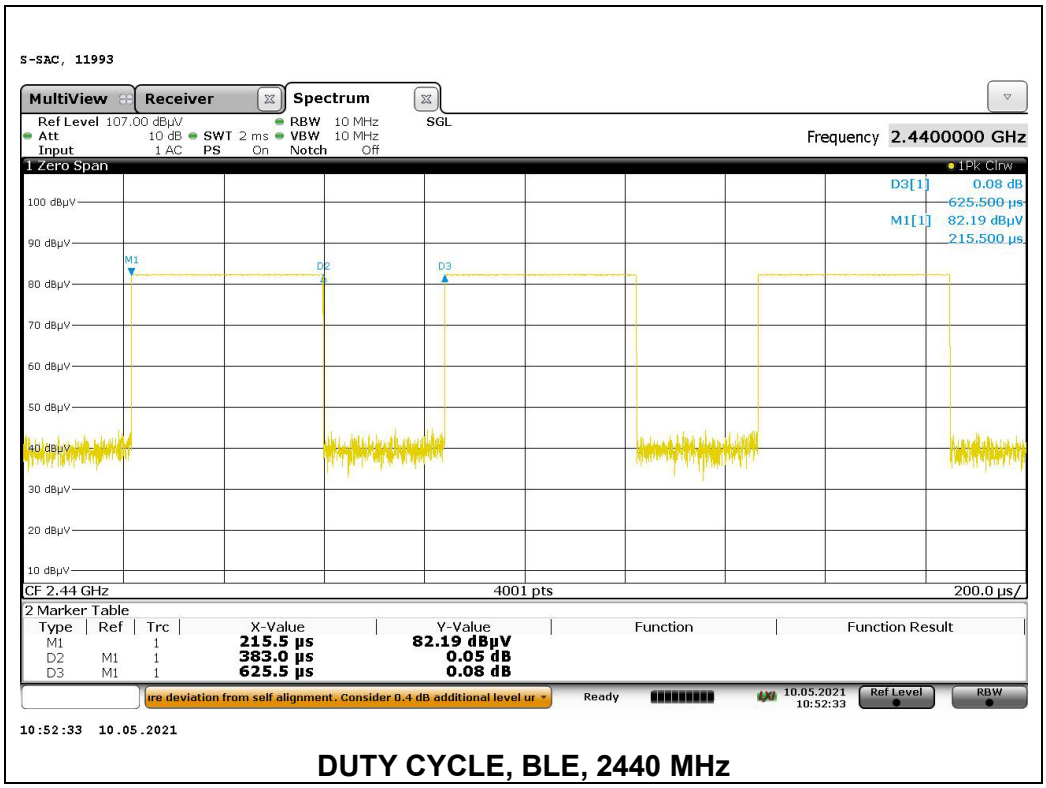
PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method.

ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
2.4GHz Band						
BLE	0.383	0.6255	0.612	61.23%	4.26	2.611

DUTY CYCLE PLOTS



DUTY CYCLE, BLE, 2440 MHz

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11. RADIATED TEST RESULTS

11.1. LIMITS AND PROCEDURE

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

RSS-GEN, Section 8.9 and 8.10.

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

TEST PROCEDURE

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

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements in the 30-1000MHz range, 9kHz for peak and/or quasi-peak detection measurements in the 0.15-30MHz range and 200Hz for peak and/or quasi-peak detection measurements in the 9 to 150kHz range. Peak detection is used unless otherwise noted as quasi-peak or average (9-90kHz and 110-490kHz).

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

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

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

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.

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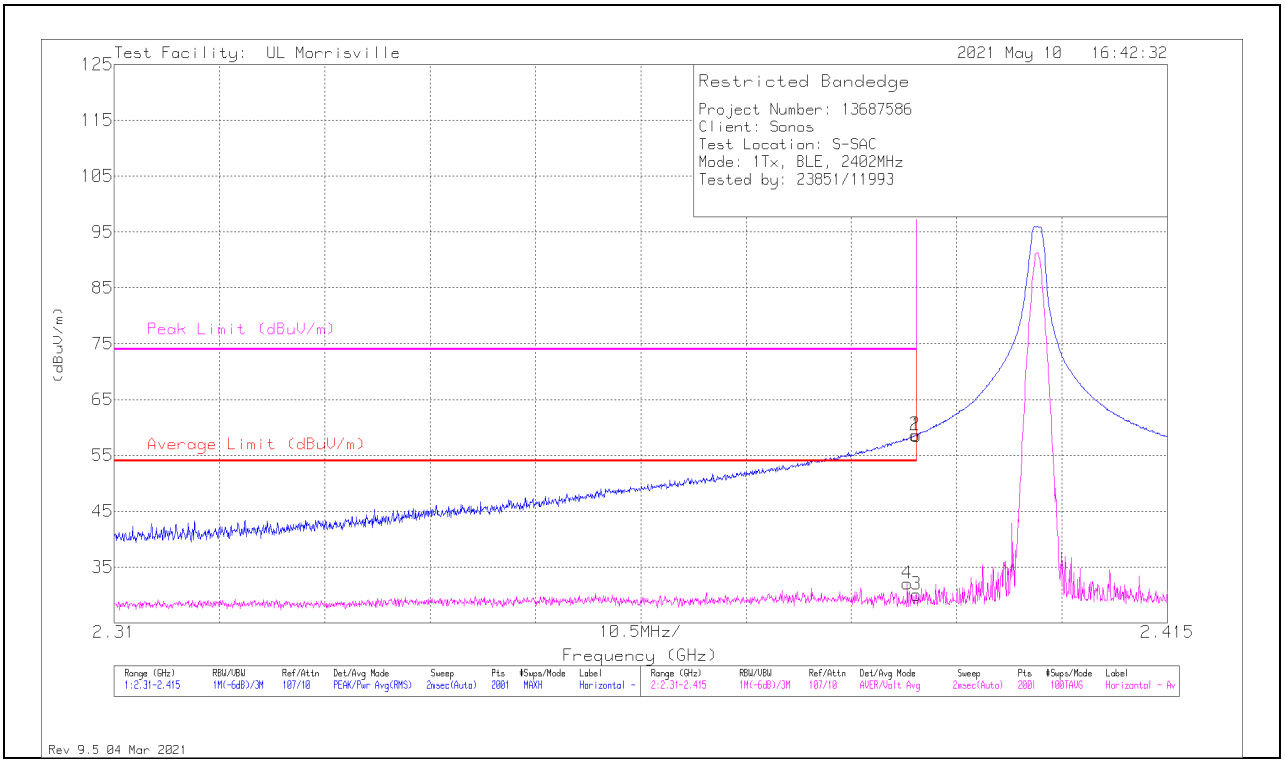
11.2. TRANSMITTER ABOVE 1 GHz

11.2.1. BLE (1Mbps)

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.38996	50.65	Pk	31.9	-24	0	58.55	-	-	74	-15.45	297	131	H
2	* ** 2.38985	50.75	Pk	31.9	-24	0	58.65	-	-	74	-15.35	297	131	H
3	* ** 2.38996	22.15	ADV	31.9	-24	4.26	34.31	54	-19.69	-	-	297	131	H
4	* ** 2.38907	24.13	ADV	31.9	-24	4.26	36.29	54	-17.71	-	-	297	131	H

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

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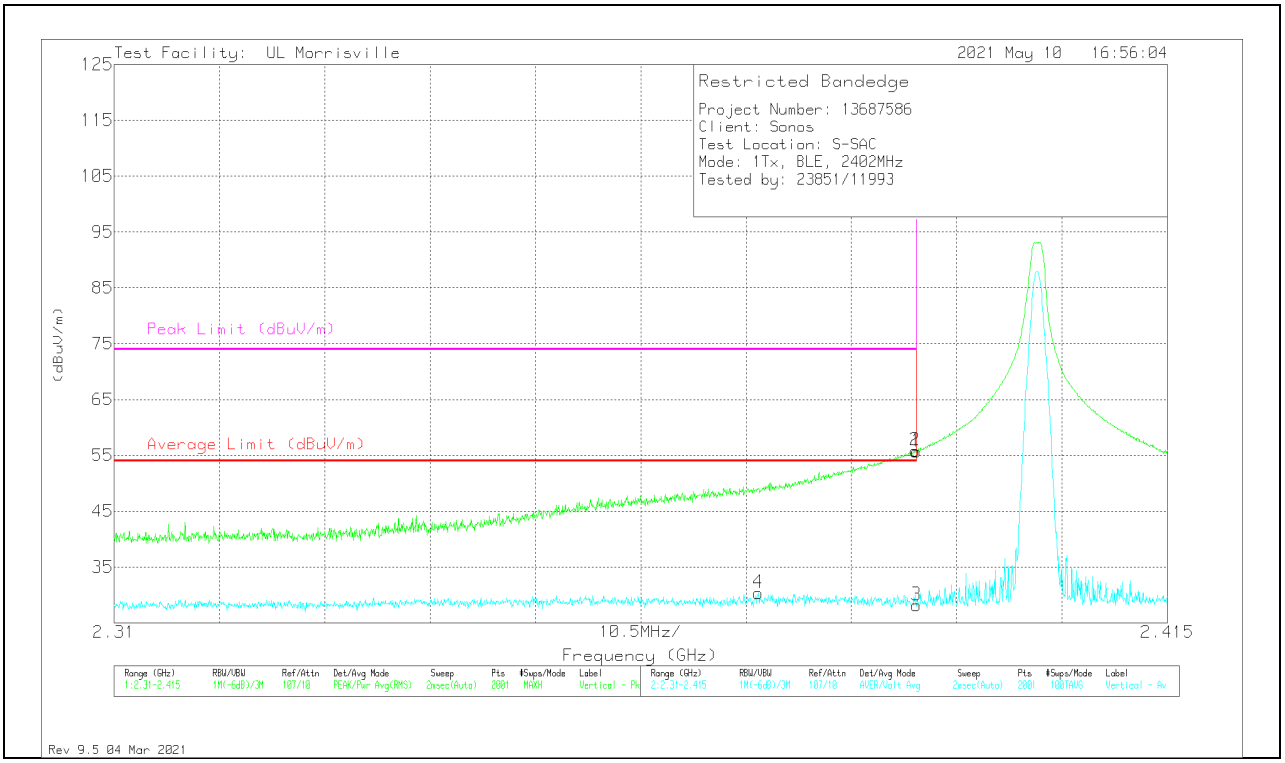
VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.38996	47.81	Pk	31.9	-24	0	55.71	-	-	74	-18.29	5	111	V
2	* ** 2.38985	47.96	Pk	31.9	-24	0	55.86	-	-	74	-18.14	5	111	V
3	* ** 2.38996	20.26	ADV	31.9	-24	4.26	32.42	54	-21.58	-	-	5	111	V
4	* ** 2.37421	21.98	ADV	32.3	-23.9	4.26	34.64	54	-19.36	-	-	5	111	V

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

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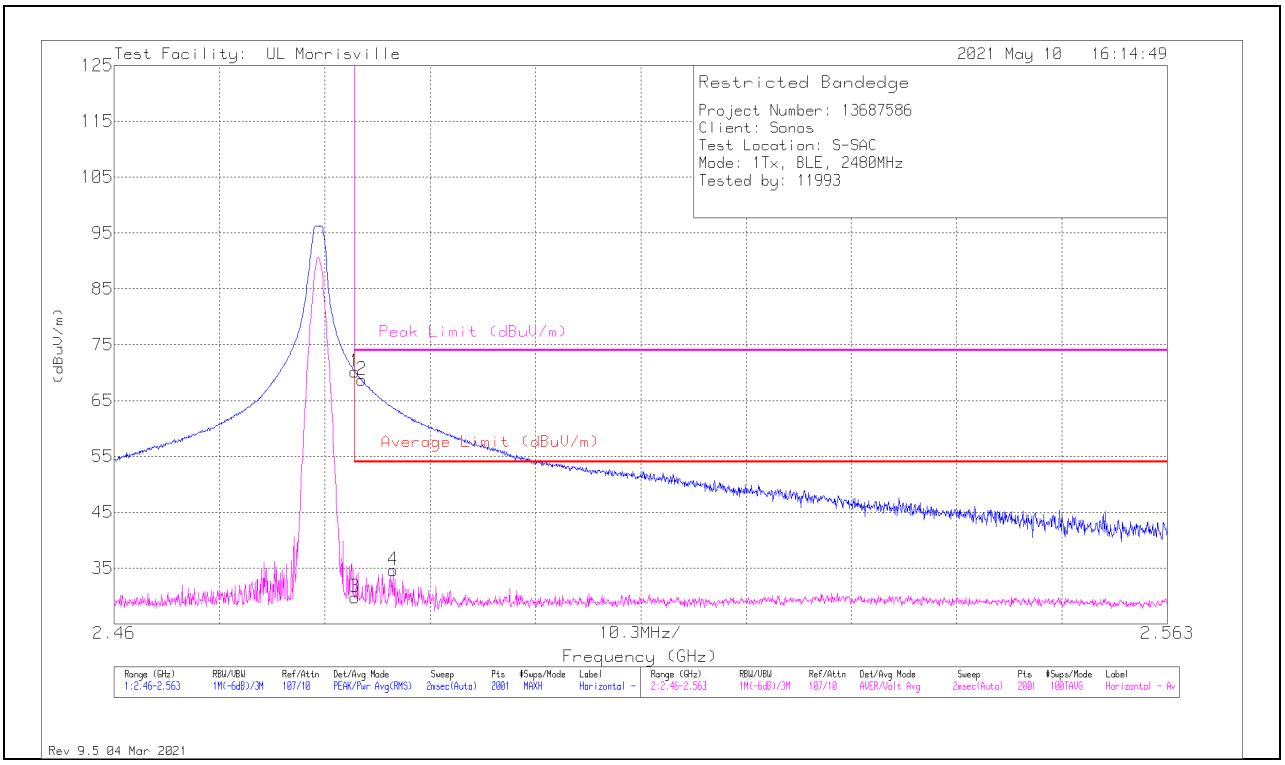
BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.48354	62.06	Pk	32.5	-24.4	0	70.16	-	-	74	-3.84	292	119	H
2	* ** 2.48421	60.62	Pk	32.5	-24.4	0	68.72	-	-	74	-5.28	292	119	H
3	* ** 2.48354	17.43	ADV	32.5	-24.4	4.26	29.79	54	-24.21	-	-	292	119	H
4	* ** 2.4873	22.35	ADV	32.5	-24.5	4.26	34.61	54	-19.39	-	-	292	119	H

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

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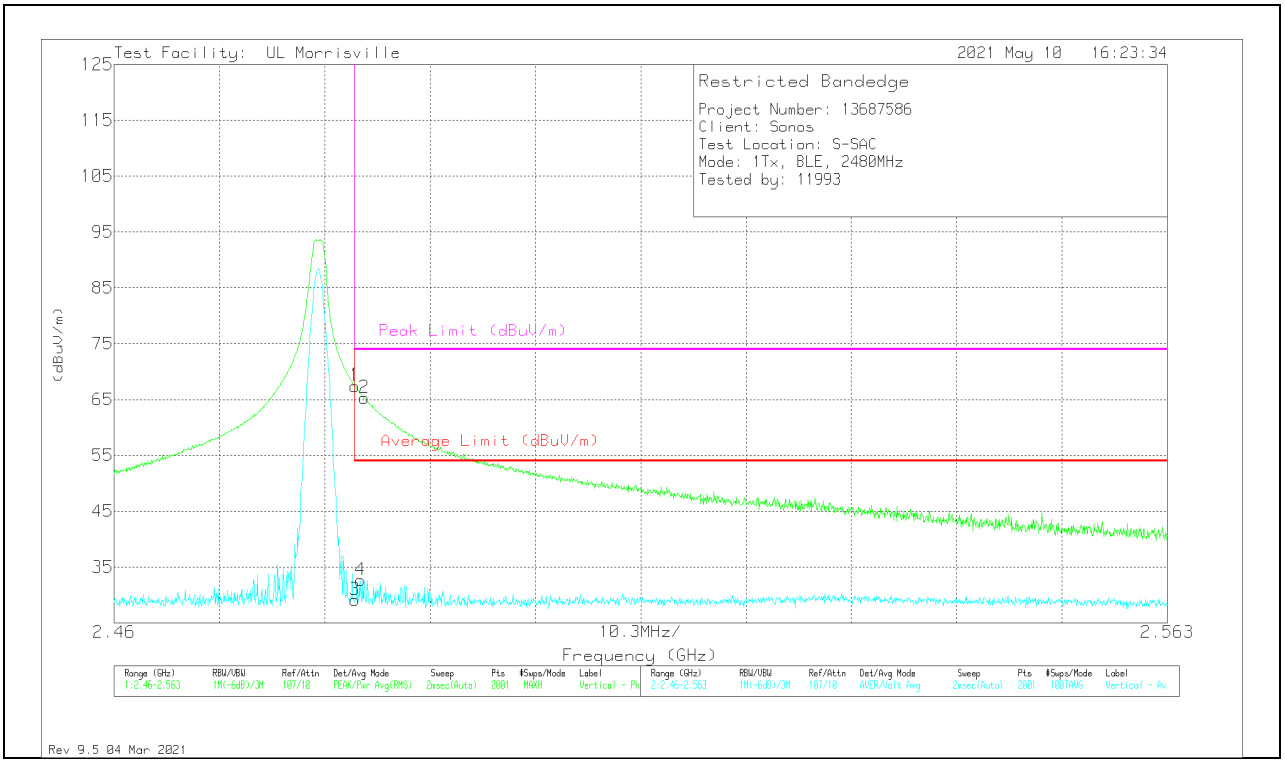
VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.48354	59.3	Pk	32.5	-24.4	0	67.4	-	-	74	-6.6	130	144	V
2	* ** 2.48446	57.2	Pk	32.5	-24.4	0	65.3	-	-	74	-8.7	130	144	V
3	* ** 2.48354	16.76	ADV	32.5	-24.4	4.26	29.12	54	-24.88	-	-	130	144	V
4	* ** 2.4841	20.27	ADV	32.5	-24.4	4.26	32.63	54	-21.37	-	-	130	144	V

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

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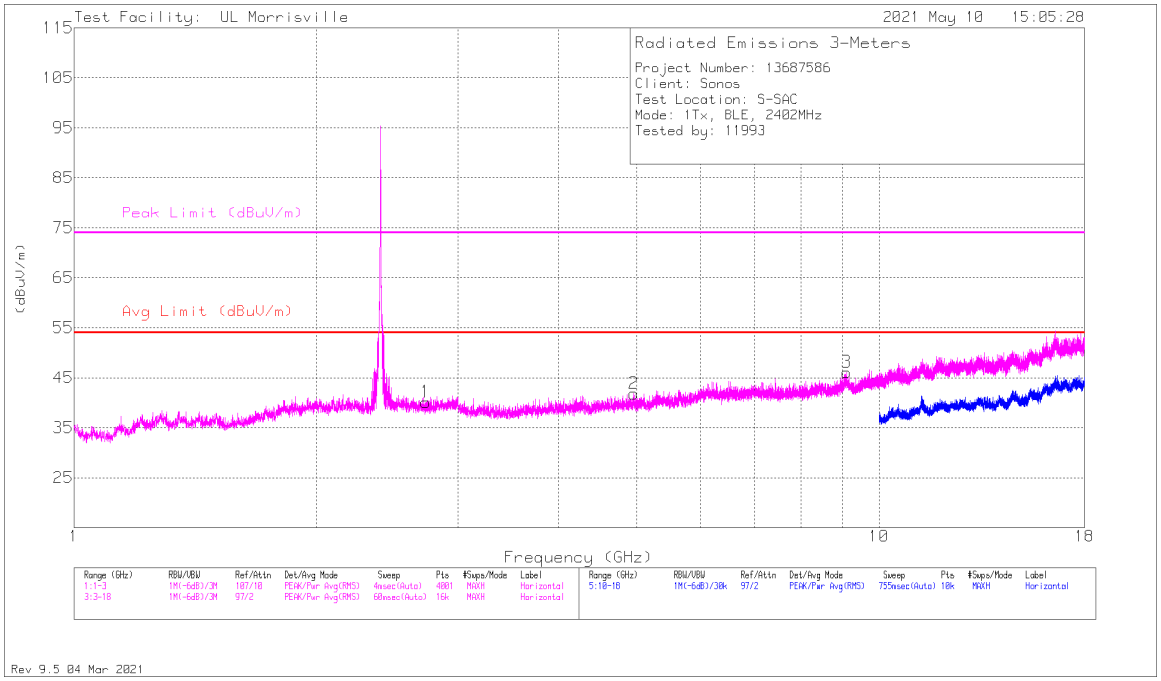
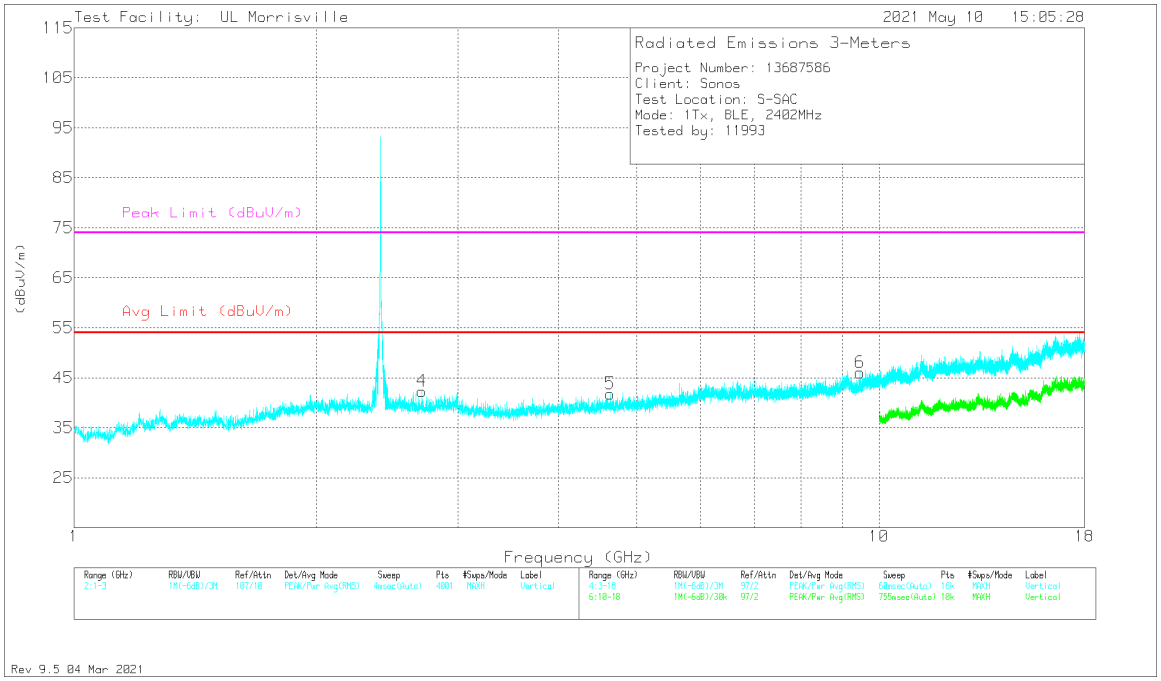
HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



HORIZONTAL



VERTICAL

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RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.7345	33.51	Pk	32.4	-25.8	40.11	54	-13.89	74	-33.89	0-360	200	H
4	* ** 2.7045	35.49	Pk	32.5	-25.7	42.29	54	-11.71	74	-31.71	0-360	200	V
2	* ** 4.95656	38.82	Pk	34	-31	41.82	54	-12.18	74	-32.18	0-360	199	H
3	* ** 9.12094	35.61	Pk	36.3	-25.8	46.11	54	-7.89	74	-27.89	0-360	101	H
5	* ** 4.635	39.38	Pk	34.1	-31.7	41.78	54	-12.22	74	-32.22	0-360	200	V
6	* ** 9.46969	35.93	Pk	36.6	-26.5	46.03	54	-7.97	74	-27.97	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

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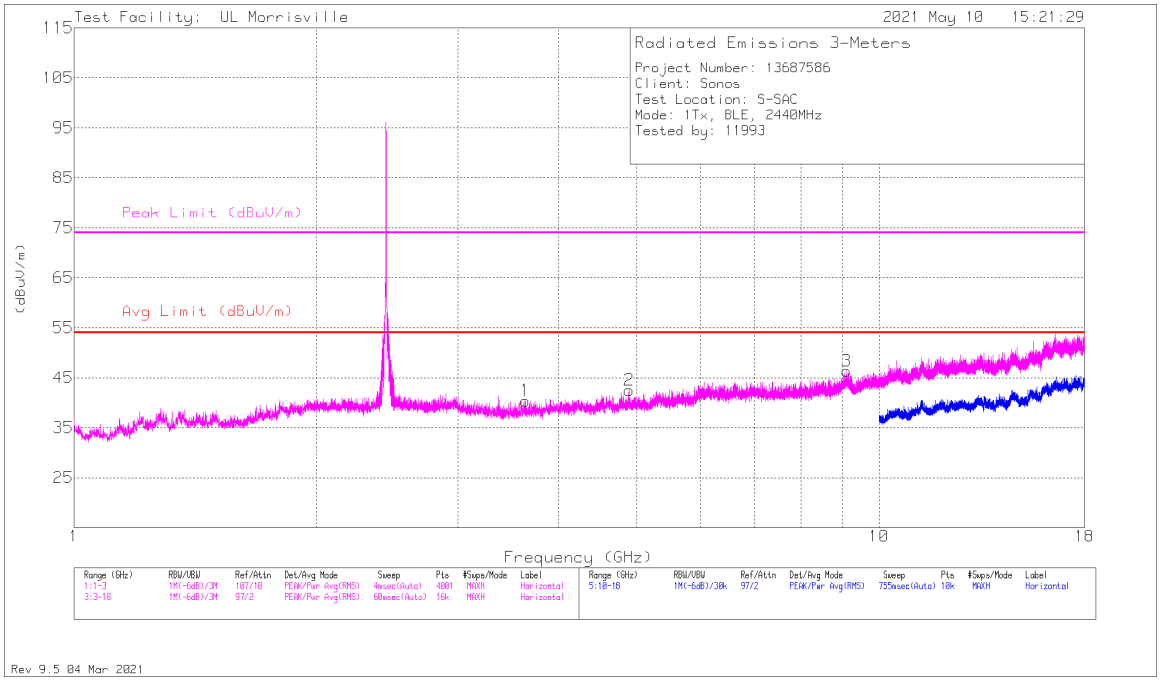
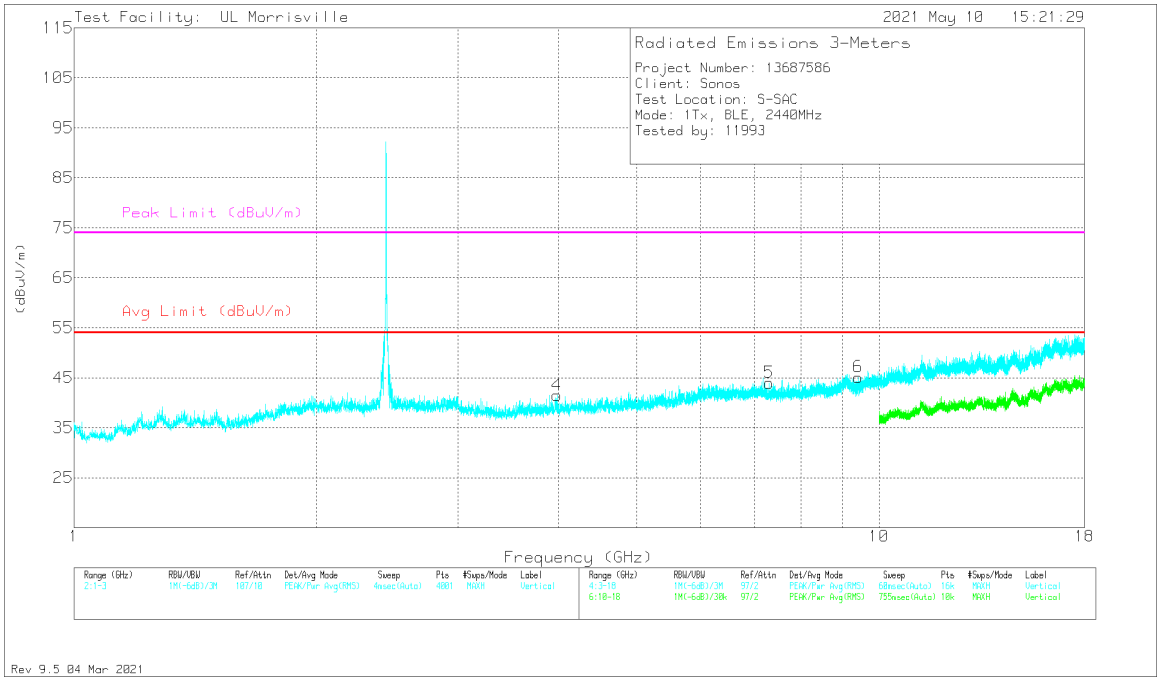
MID CHANNEL RESULTS



HORIZONTAL



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RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 3.6375	39.29	Pk	33	-31.9	40.39	54	-13.61	74	-33.61	0-360	101	H
2	* ** 4.89375	39.3	Pk	34.1	-30.9	42.5	54	-11.5	74	-31.5	0-360	101	H
3	* ** 9.11625	35.91	Pk	36.3	-25.9	46.31	54	-7.69	74	-27.69	0-360	200	H
4	* ** 3.97969	39.56	Pk	33.6	-31.7	41.46	54	-12.54	74	-32.54	0-360	101	V
5	* ** 7.29844	35.78	Pk	35.7	-27.5	43.98	54	-10.02	74	-30.02	0-360	101	V
6	* ** 9.42	35.01	Pk	36.6	-26.5	45.11	54	-8.89	74	-28.89	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

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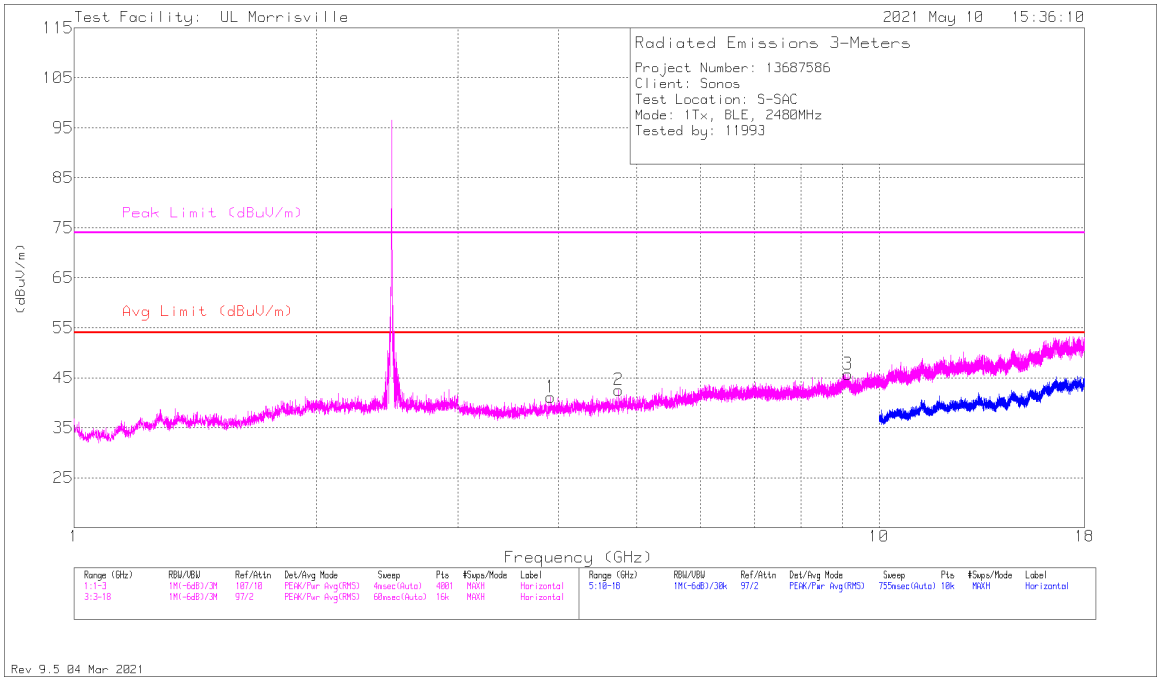
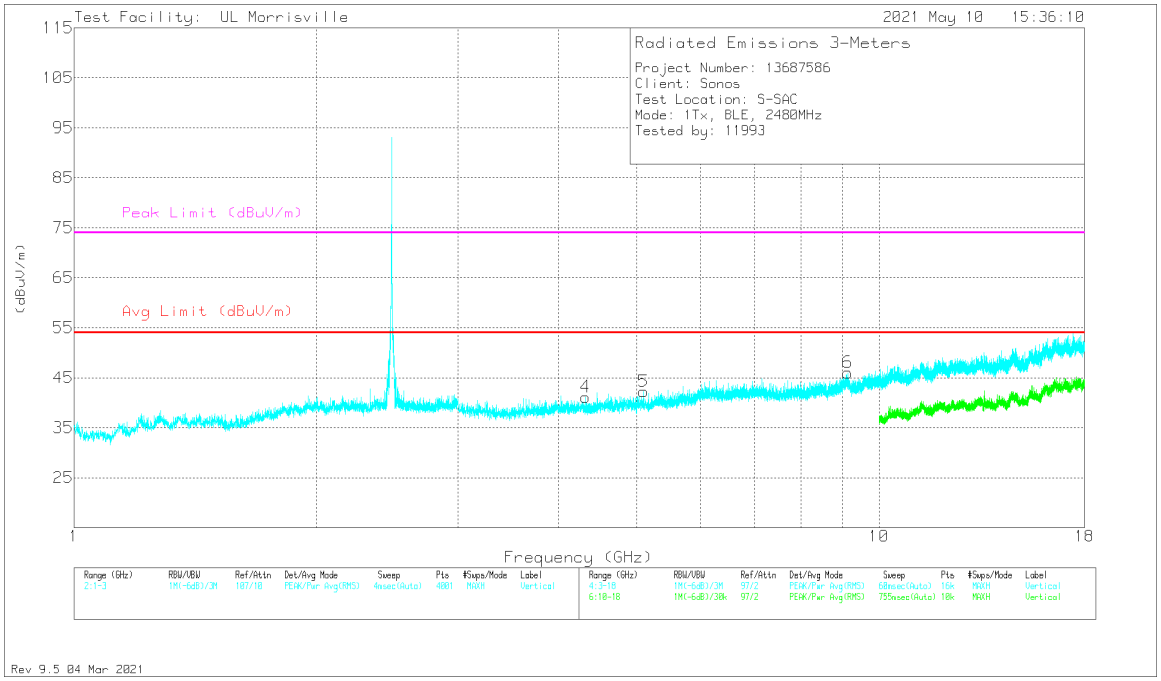
HIGH CHANNEL RESULTS



HORIZONTAL



VERTICAL

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RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 3.9075	39.63	Pk	33.5	-32	41.13	54	-12.87	74	-32.87	0-360	200	H
2	* ** 4.74844	39.96	Pk	34.1	-31.5	42.56	54	-11.44	74	-31.44	0-360	200	H
3	* ** 9.15469	35.53	Pk	36.3	-26.1	45.73	54	-8.27	74	-28.27	0-360	200	H
4	* ** 4.32	39.33	Pk	33.7	-31.9	41.13	54	-12.87	74	-32.87	0-360	101	V
5	* ** 5.09906	38.85	Pk	34.4	-31	42.25	54	-11.75	74	-31.75	0-360	200	V
6	* ** 9.1425	35.82	Pk	36.3	-26.1	46.02	54	-7.98	74	-27.98	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

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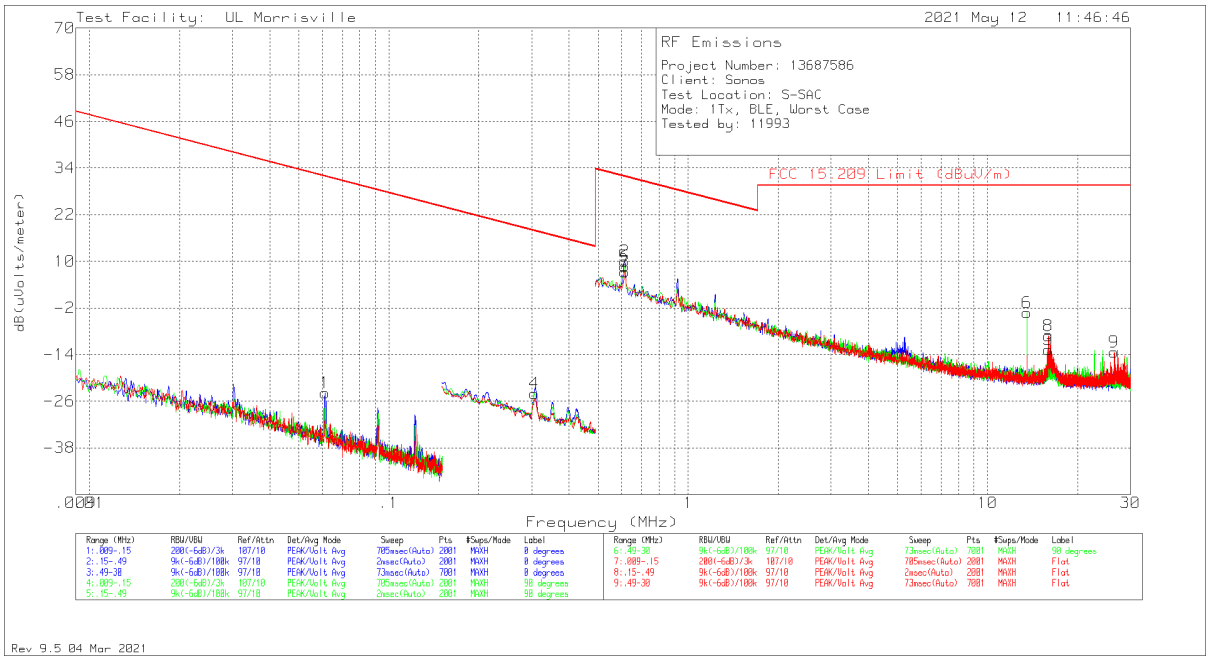
11.3. WORST CASE BELOW 30MHZ

Note for below 30 MHz scans: All measurements were made at a test distance of 3 m. The measured data was extrapolated from the test distance (3m) to the specification distance (300 m from 9-490 kHz and 30 m from 490 kHz – 30 MHz) to clearly show the relative levels of fundamental and spurious emissions and demonstrate compliance with the requirement that the level of any spurious emissions be below the level of the intentionally transmitted signal. The extrapolation factor for the limits were 40*Log (test distance / specification distance).

SPURIOUS EMISSIONS BELOW 30 MHz (WORST-CASE CONFIGURATION-E FIELD)



ANTENNA- THREE ORIENTATIONS

Below 30MHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 (dB/m)	Cbl (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	FCC 15.209 Qp/Av Limit (dBuV/m)	FCC 15.209 Pk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Antenna Face
1	.06111	44.58	Pk	11.5	.1	-80	-23.82	31.88	51.88	-55.7	0-360	On
2	.61226	39.04	Pk	10.8	.2	-40	10.04	31.87	-	-21.83	0-360	On
3	15.94586	16.13	Pk	10.3	.8	-40	-12.77	29.54	-	-42.31	0-360	On
4	.30598	45.17	Pk	10.7	.1	-80	-24.03	17.89	37.89	-41.92	0-360	Off
5	.61226	37.73	Pk	10.8	.2	-40	8.73	31.87	-	-23.14	0-360	Off
6	13.5596	25.68	Pk	10.4	.7	-40	-3.22	29.54	-	-32.76	0-360	Off
7	.61226	36.34	Pk	10.8	.2	-40	7.34	31.87	-	-24.53	0-360	Flat
8	15.98802	19.69	Pk	10.3	.8	-40	-9.21	29.54	-	-38.75	0-360	Flat
9	26.49007	16.97	Pk	8.7	1	-40	-13.33	29.54	-	-42.87	0-360	Flat

Pk - Peak detector

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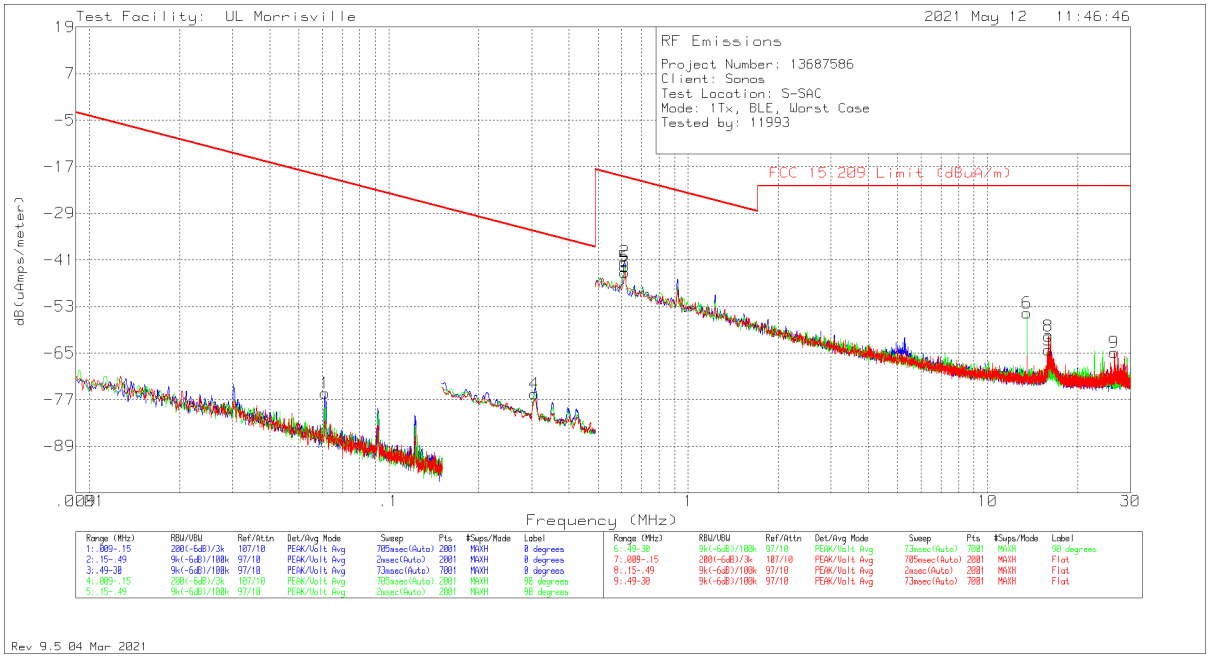
SPURIOUS EMISSIONS BELOW 30 MHz (WORST-CASE CONFIGURATION-H FIELD)



ANTENNA- THREE ORIENTATIONS

Below 30MHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 (dB/m)	Cbl (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uAmps/meter)	RSS-GEN Qp/Av Limit (dBuA/m)	RSS-GEN Pk Limit (dBuA/m)	Margin (dB)	Azimuth (Degs)	Antenna Face
1	.06111	44.58	Pk	-40	.1	-80	-75.32	-19.62	0.38	-55.7	0-360	On
2	.61226	39.04	Pk	-40.7	.2	-40	-41.46	-19.63	-	-21.83	0-360	On
3	15.94586	16.13	Pk	-41.2	.8	-40	-64.27	-21.96	-	-42.31	0-360	On
4	.30598	45.17	Pk	-40.8	.1	-80	-75.53	-33.61	-13.61	-41.92	0-360	Off
5	.61226	37.73	Pk	-40.7	.2	-40	-42.77	-19.63	-	-23.14	0-360	Off
6	13.5596	25.68	Pk	-41.1	.7	-40	-54.72	-21.96	-	-32.76	0-360	Off
7	.61226	36.34	Pk	-40.7	.2	-40	-44.16	-19.63	-	-24.53	0-360	Flat
8	15.98802	19.69	Pk	-41.2	.8	-40	-60.71	-21.96	-	-38.75	0-360	Flat
9	26.49007	16.97	Pk	-42.8	1	-40	-64.83	-21.96	-	-42.87	0-360	Flat

Pk - Peak detector

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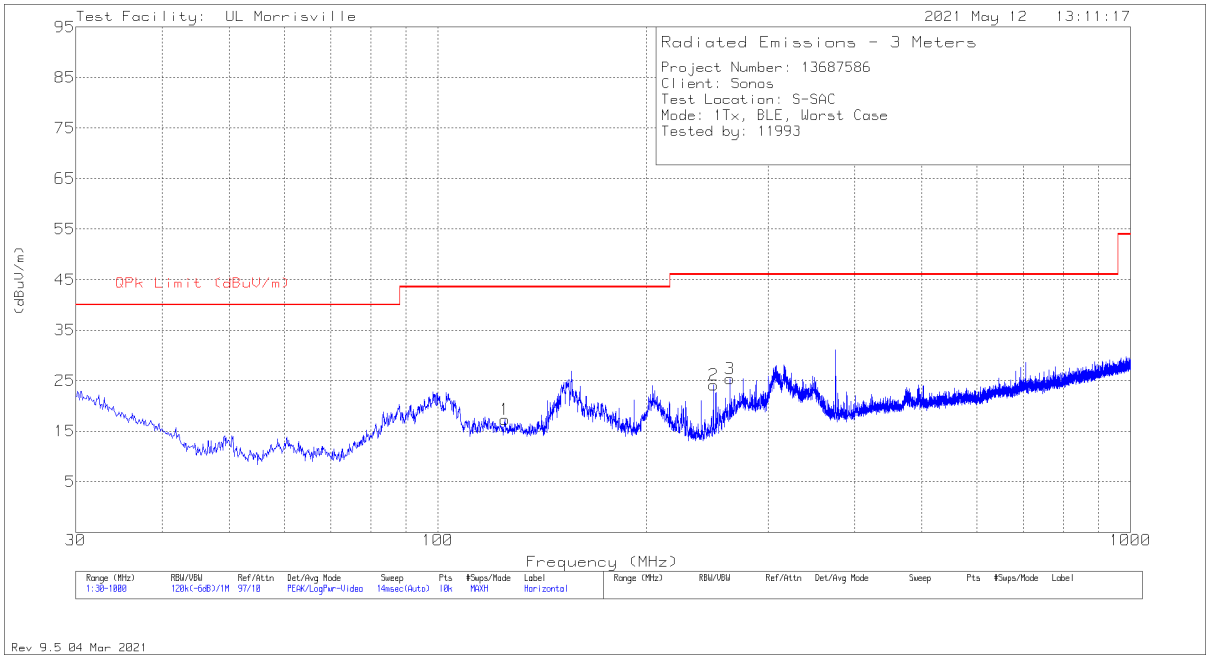
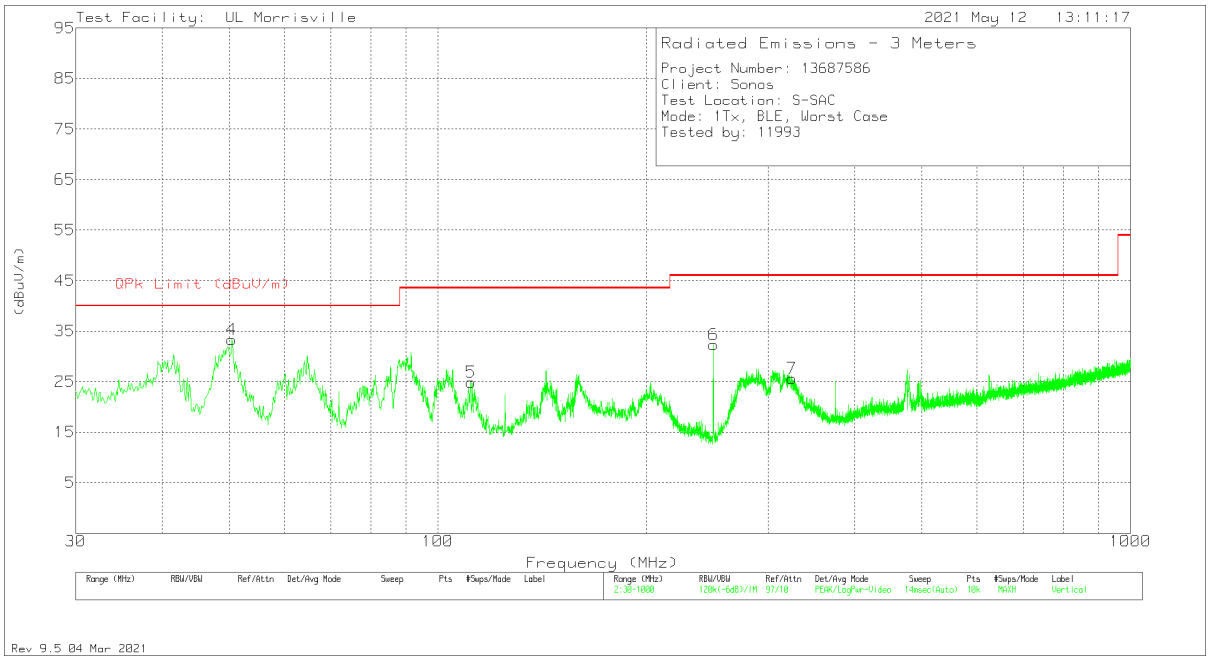
11.4. WORST CASE BELOW 1 GHZ

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



HORIZONTAL



VERTICAL

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Below 1GHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0075 AF (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 124.963	27.54	Pk	20.1	-30.3	17.34	43.52	-26.18	0-360	199	H
2	* ** 249.996	35.68	Pk	17.6	-29.1	24.18	46.02	-21.84	0-360	199	H
3	* ** 263.964	35.92	Pk	18.6	-29.1	25.42	46.02	-20.6	0-360	101	H
5	* ** 111.577	36.25	Pk	19.1	-30.5	24.85	43.52	-18.67	0-360	101	V
6	* ** 249.996	43.8	Pk	17.6	-29.1	32.3	46.02	-13.72	0-360	101	V
7	* ** 324.88	34.26	Pk	20.1	-28.7	25.66	46.02	-20.36	0-360	199	V
4	50.37	50.47	Pk	14.1	-31.2	33.37	-	-	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

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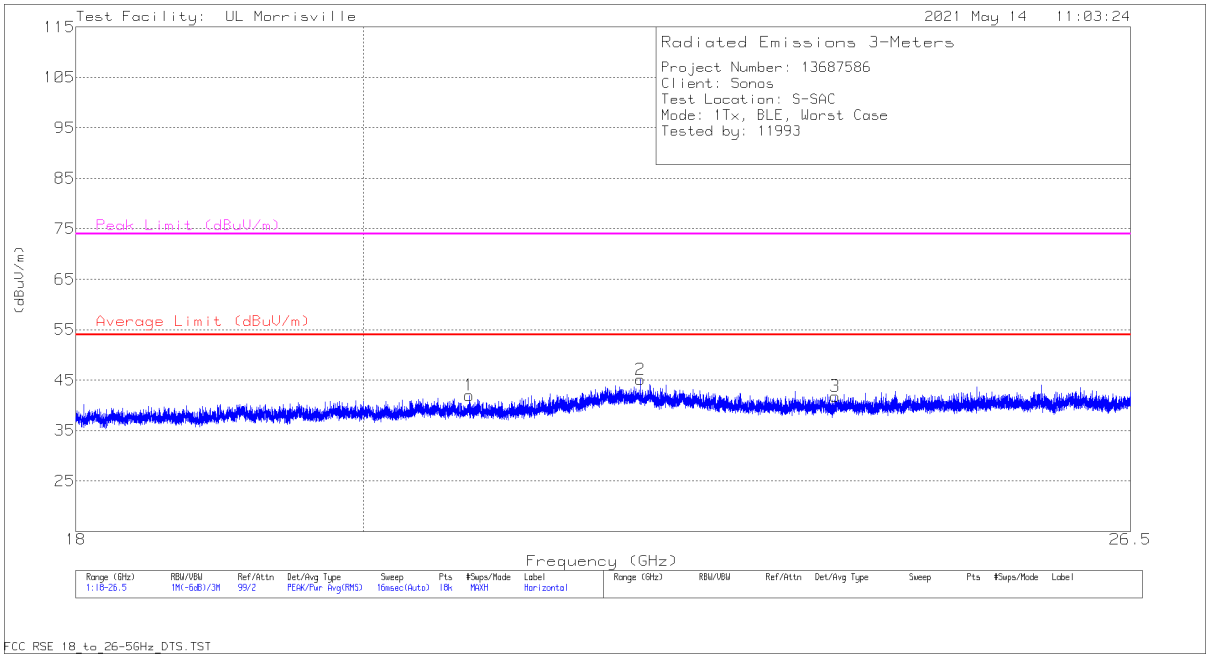
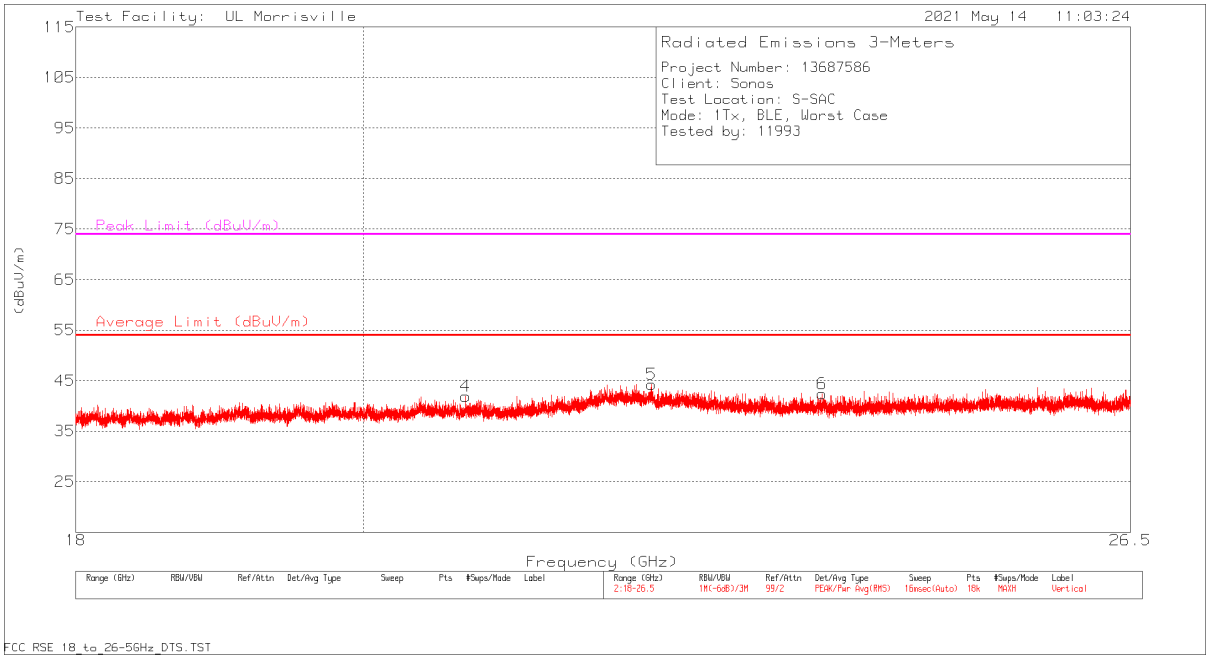
11.5. WORST CASE 18-26 GHZ

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



HORIZONTAL



VERTICAL

18-26 GHz DATA

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Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0063 AF (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 20.79618	46.87	Pk	34	-38.9	41.97	54	-12.03	74	-32.03	0-360	149	H
2	* ** 22.14067	47.7	Pk	36.7	-39.3	45.1	54	-8.9	74	-28.9	0-360	101	H
3	* ** 23.7789	45.64	Pk	34.8	-38.6	41.84	54	-12.16	74	-32.16	0-360	249	H
4	* ** 20.76785	47.2	Pk	34	-39.3	41.9	54	-12.1	74	-32.1	0-360	101	V
5	* ** 22.23087	46.52	Pk	36.6	-38.9	44.22	54	-9.78	74	-29.78	0-360	250	V
6	* ** 23.6665	46	Pk	34.9	-38.5	42.4	54	-11.6	74	-31.6	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

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12. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 8.8

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

* Decreases with the logarithm of the frequency.

RESULTS

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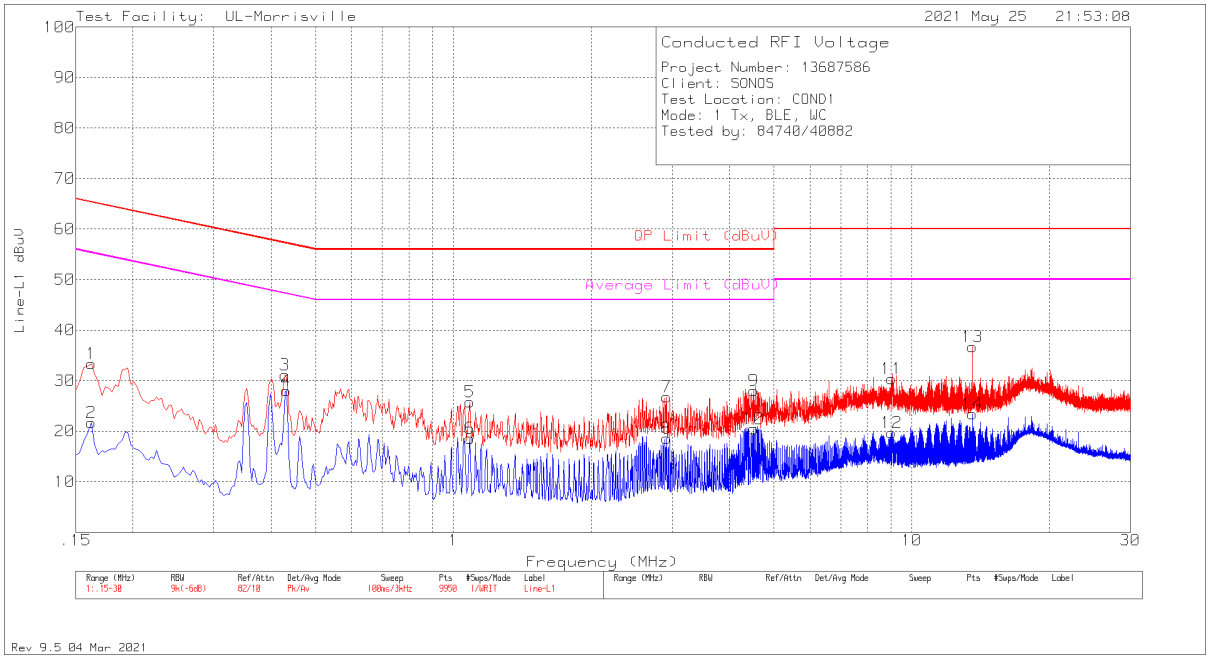
12.1.1. AC Power Line

LINE 1 RESULTS



Range 1: Line-L1 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit (dBuV)	Margin (dB)	Average Limit (dBuV)	Margin (dB)
1	.162	23.34	Pk	.2	9.8	33.34	65.36	-32.02	-	-
2	.162	11.66	Av	.2	9.8	21.66	-	-	55.36	-33.7
3	.429	21.17	Pk	.1	9.8	31.07	57.27	-26.2	-	-
4	.432	18.09	Av	.1	9.8	27.99	-	-	47.21	-19.22
5	1.086	16	Pk	0	9.8	25.8	56	-30.2	-	-
6	1.086	8.81	Av	0	9.8	18.61	-	-	46	-27.39
7	2.916	17.03	Pk	0	9.8	26.83	56	-29.17	-	-
8	2.916	8.78	Av	0	9.8	18.58	-	-	46	-27.42
10	4.515	10.52	Av	0	9.9	20.42	-	-	46	-25.58
9	4.518	18.13	Pk	0	9.9	28.03	56	-27.97	-	-
11	9.051	20.26	Pk	.1	10	30.36	60	-29.64	-	-
12	9.051	9.57	Av	.1	10	19.67	-	-	50	-30.33
13	13.563	26.49	Pk	.1	10.1	36.69	60	-23.31	-	-
14	13.563	13.25	Av	.1	10.1	23.45	-	-	50	-26.55

Pk - Peak detector
Av - Average detection

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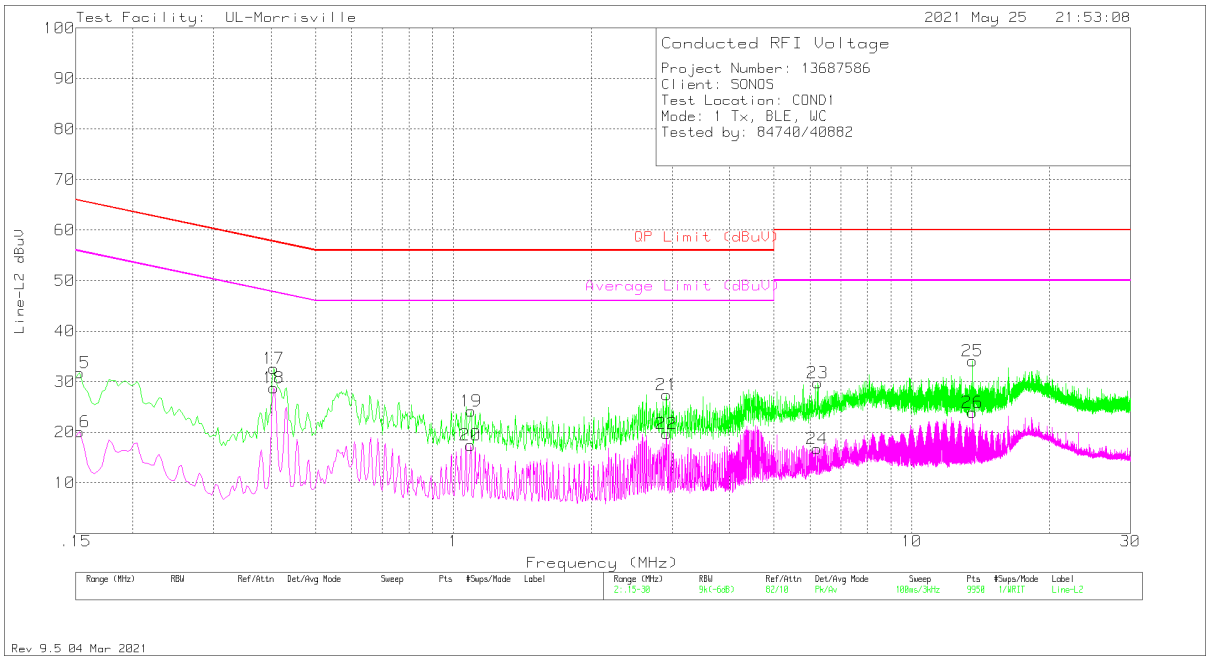
LINE 2 RESULTS



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)
15	.153	21.76	Pk	.2	9.8	31.76	65.84	-34.08	-	-
16	.153	10.05	Av	.2	9.8	20.05	-	-	55.84	-35.79
17	.405	22.72	Pk	.1	9.8	32.62	57.75	-25.13	-	-
18	.405	18.86	Av	.1	9.8	28.76	-	-	47.75	-18.99
20	1.089	7.61	Av	0	9.8	17.41	-	-	46	-28.59
19	1.092	14.4	Pk	0	9.8	24.2	56	-31.8	-	-
21	2.916	17.6	Pk	0	9.8	27.4	56	-28.6	-	-
22	2.916	9.95	Av	0	9.8	19.75	-	-	46	-26.25
24	6.213	6.63	Av	.1	10	16.73	-	-	50	-33.27
23	6.237	19.71	Pk	.1	10	29.81	60	-30.19	-	-
25	13.56	23.92	Pk	.1	10.1	34.12	60	-25.88	-	-
26	13.563	13.67	Av	.1	10.1	23.87	-	-	50	-26.13

Pk - Peak detector
Av - Average detection

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13. SETUP PHOTOS

Please refer to R13687586-EP1 for setup photos

END OF TEST REPORT

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