



FCC RADIO TEST REPORT

FCC ID : A4RGHH4K
Equipment : Wireless Device
Model Name : GHH4K
Applicant : Google LLC
1600 Amphitheatre Parkway,
Mountain View, CA, 94043 USA
Standard : FCC 47 CFR Part 15.255

The product was received on Mar. 10, 2025 and testing was performed from Mar. 29, 2025 to Apr. 11, 2025. We, Sporton International Inc. Wensan Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures ANSI C63.10-2020 and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval from Sporton International Inc. Wensan Laboratory, the test report shall not be reproduced except in full.

Louis Wu

Approved by: Louis Wu

Sporton International Inc. Wensan Laboratory

No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.)



Table of Contents

History of this test report.....	3
Summary of Test Result.....	4
1 General Description	5
1.1 Feature of Equipment Under Test.....	5
1.2 Modification of EUT	5
1.3 Testing Location	5
1.4 Applied Standards	6
2 Test Configuration of Equipment Under Test	7
2.1 Test Mode.....	7
2.2 Connection Diagram of Test System	8
2.3 Support Unit used in test configuration and system.....	8
2.4 Far Field Condition for Frequency above 18GHz.....	9
3 Radiated Test Items	10
3.1 Measuring Instruments.....	10
3.2 Test Setup	10
3.3 Test Result of Radiated Test.....	11
3.4 Emission Bandwidth	12
3.5 EIRP Power Measurement.....	15
3.6 Transmit Spurious Emission.....	17
3.7 Frequency Stability.....	29
4 AC conducted Emission Measurement	30
4.1 Limit of AC Conducted Emission.....	30
4.2 Measuring Instruments.....	30
4.3 Test Procedures	30
4.4 Test Setup	31
4.5 Test Result of AC Conducted Emission	31
5 List of Measuring Equipment.....	32
6 Measurement Uncertainty	34
Appendix A. AC Conducted Emission Test Result	
Appendix B. Setup Photographs	



History of this test report

Report No.	Version	Description	Issue Date
FR511001D	01	Initial issue of report	Apr. 28, 2025

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Limit	Result (PASS/FAIL)
3.4	§15.215(c) §15.255(e)(2)	Emission Bandwidth	Within 57 ~ 71 GHz	Pass
3.5	§15.255(c)(1)(i) §15.255(e)(1)	EIRP Power & Conducted Output Power	EIRP : - 43 dBm @ Peak Power - 40 dBm @ Average Power Conducted Power : - 500 mW @ Peak	Pass
3.6	§15.255(d)	Transmitter Spurious Emissions	Below 40GHz refer to 15.209 Above 40GHz: 90 pW/cm ² @ 3 m	Pass
3.7	§15.255(f)	Frequency Stability for Temperature & Voltage	Within 57 ~ 71 GHz	Pass
4	§15.207	AC Power Conducted Emission	§15.207	Pass

Conformity Assessment Condition:

1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacture who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account.
2. The measurement uncertainty please refer to each test result in the section "Measurement Uncertainty".

Disclaimer:

The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.

Reviewed by: Yun Huang

Report Producer: Lucy Wu



1 General Description

1.1 Feature of Equipment Under Test

Product Feature
General Specs Bluetooth, BLE, BLE ASK, BLE GFSK, Wi-Fi 2.4GHz 802.11b/g/n/ac/ax, Wi-Fi 5GHz 802.11a/n/ac/ax, NFC, UWB, 60GHz and GNSS.
Antenna Type 60GHz: Integrated Antenna

Antenna information
60.5 GHz Peak Gain (dBi) 4

Remark: The EUT's information above is declared by manufacturer. Please refer to Disclaimer in report summary.

EUT Information List	
S/N	Performed Test Item
51181WRCVW21B0	Radiated Spurious Emission
51181WRCVW219R	AC Conducted Emission

1.2 Modification of EUT

No modifications are made to the EUT during all test items.

1.3 Testing Location

Test Site	Sporton International Inc. Wensan Laboratory
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	Sporton Site No. 03CH11-HY, 03CH18-HY, CO07-HY

Note: The test site complies with ANSI C63.4 2014 requirement.

FCC designation No.: TW3786



1.4 Applied Standards

- ♦ FCC 47 CFR Part 2, 15.255
- ♦ KDB 364244 D01
- ♦ ANSI C63.10-2020

Remark: All test items were verified and recorded according to the standards and without any deviation during the test.

2 Test Configuration of Equipment Under Test

- a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, the measured emission level of the EUT was maximized by rotating the EUT on a turntable, adjusting the orientation of the EUT and EUT antenna in three orthogonal axis (X: flat, Y: portrait, Z: landscape), and adjusting the measurement antenna orientation, following C63.10 exploratory test procedures and find Z plane as worst plane.
- b. AC power line Conducted Emission was tested under maximum output power.

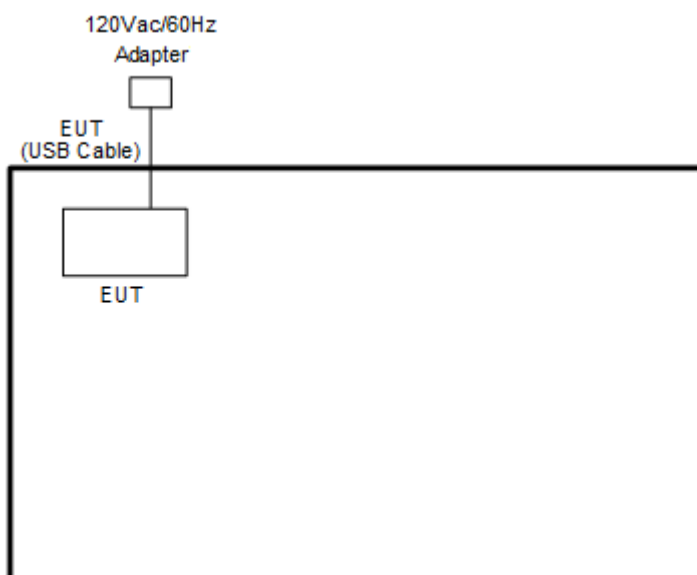
2.1 Test Mode

Frequency (GHz)	Modulation	Data Rate (Mbps)
60.5	2ASK	480

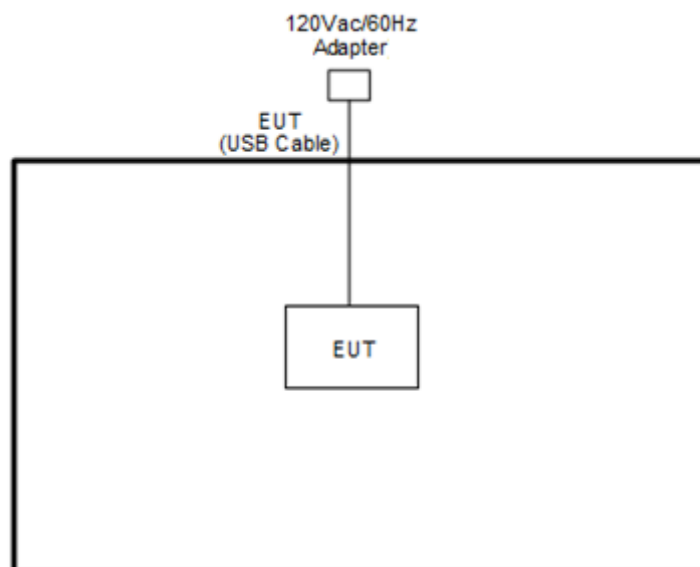
Test Cases	
AC Conducted Emission	Mode 1 : 60.5 GHz Tx + USB Cable (Charging with Adapter)

2.2 Connection Diagram of Test System

<AC Conducted Emission Mode>



<60GHz Tx Mode>



2.3 Support Unit used in test configuration and system

Item	Equipment	Brand Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Adapter	N/A	N/A	N/A	N/A	N/A

2.4 Far Field Condition for Frequency above 18GHz

Horn Antenna	Frequency (GHz)	Antenna Dimension A (mm)	Wavelength (λ) (m)	Far field R (m) $\geq 2A^2 / \lambda$	Measurement Distance (D) (m)
BBHA 9170	18	60	0.0167	0.43	1
	40	60	0.0075	0.96	
QWH-UPRR00	40	48	0.0075	0.61	0.87
	57	48	0.0053	0.87	
QWH-VPRR00	57	38	0.0053	0.54	0.62
	65	38	0.0046	0.62	
QWH-EPRR00	60	31	0.0050	0.38	0.6
	90	31	0.0033	0.60	
QWH-FPRR00	90	21	0.0033	0.26	0.43
	140	21	0.0021	0.42	
QWH-GPRR00	140	14	0.0021	0.18	0.27
	200	14	0.0015	0.26	

Note:

1. The measurement distance may be far than the measurement distance above.
2. $\lambda = [300/f \text{ MHz}]$, in m ; This table only keeps the rounding to four decimal places to reference.

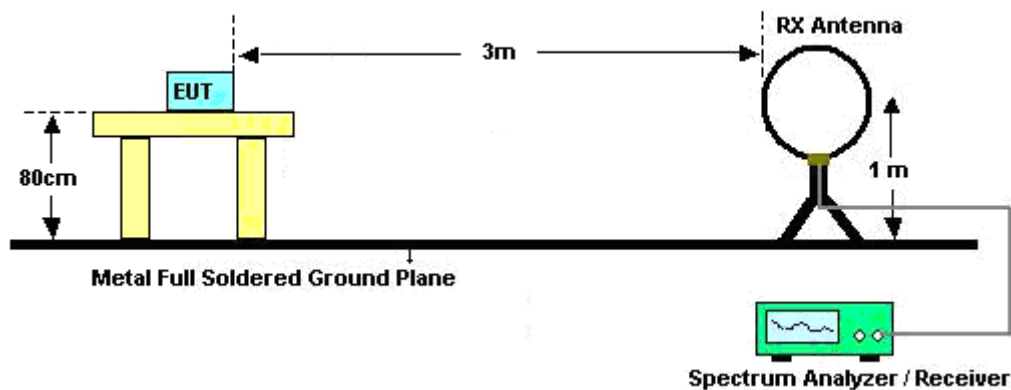
3 Radiated Test Items

3.1 Measuring Instruments

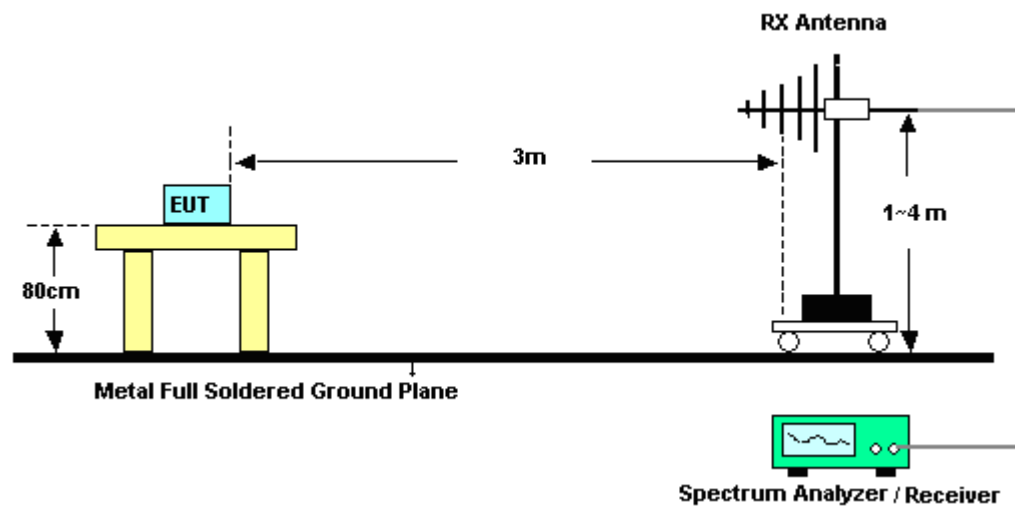
See list of measuring instruments of this test report.

3.2 Test Setup

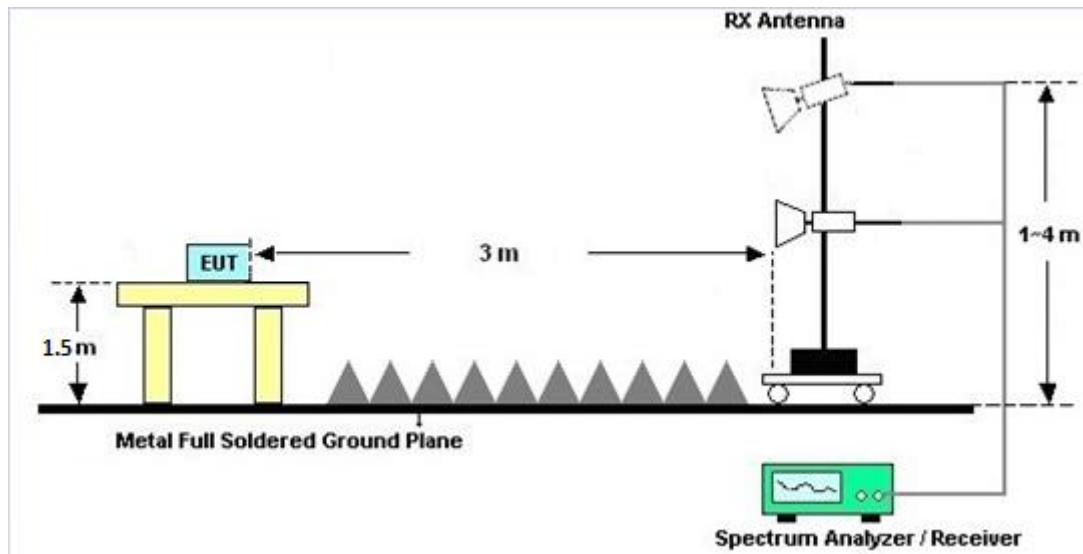
For radiated emissions from 9kHz to 30MHz



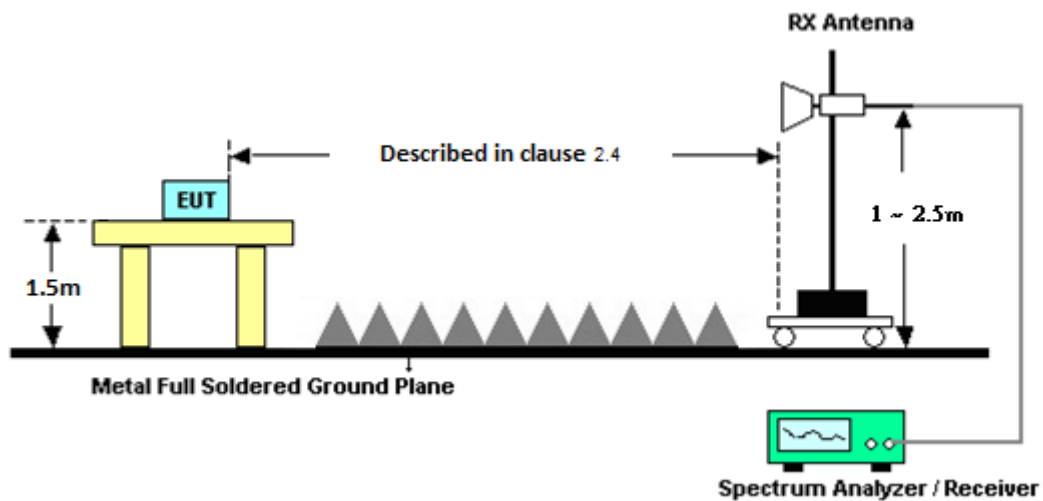
For radiated emissions from 30MHz to 1GHz



For radiated emissions 1GHz to 18GHz



For radiated emissions above 18GHz



3.3 Test Result of Radiated Test

Please refer to Clause 3.6.

3.4 Emission Bandwidth

3.4.1 Limit of Emission Bandwidth Measurement

99% Occupied Bandwidth & 6 dB Bandwidth is for reporting only.

3.4.2 Measuring Instruments

See list of measuring equipment of this test report.

3.4.3 Test Procedures

1. The testing follows ANSI C63.10-2020 Section 9.3 and 9.4.
2. Set the maximum power setting.
3. The EUT is placed on a turntable with 1.6 meter respectively above ground.
4. The EUT is set 0.62 meters away from the receiving antenna, which is mounted on the top of a variable height antenna tower.
5. Use 50-75 GHz receiver antenna, mixer and spectrum analyzer.
6. The EUT is arranged to its worst case and then tune the antenna tower and turntable (from 0 degree to 360 degrees) to find the maximum reading.
7. For 6dB Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set 100 kHz and Video bandwidth (VBW) is set 300 kHz.
8. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set 20 MHz and Video bandwidth (VBW) is set 80 MHz.
9. Measure and record the results in the test report.

**3.4.4 Test Results**

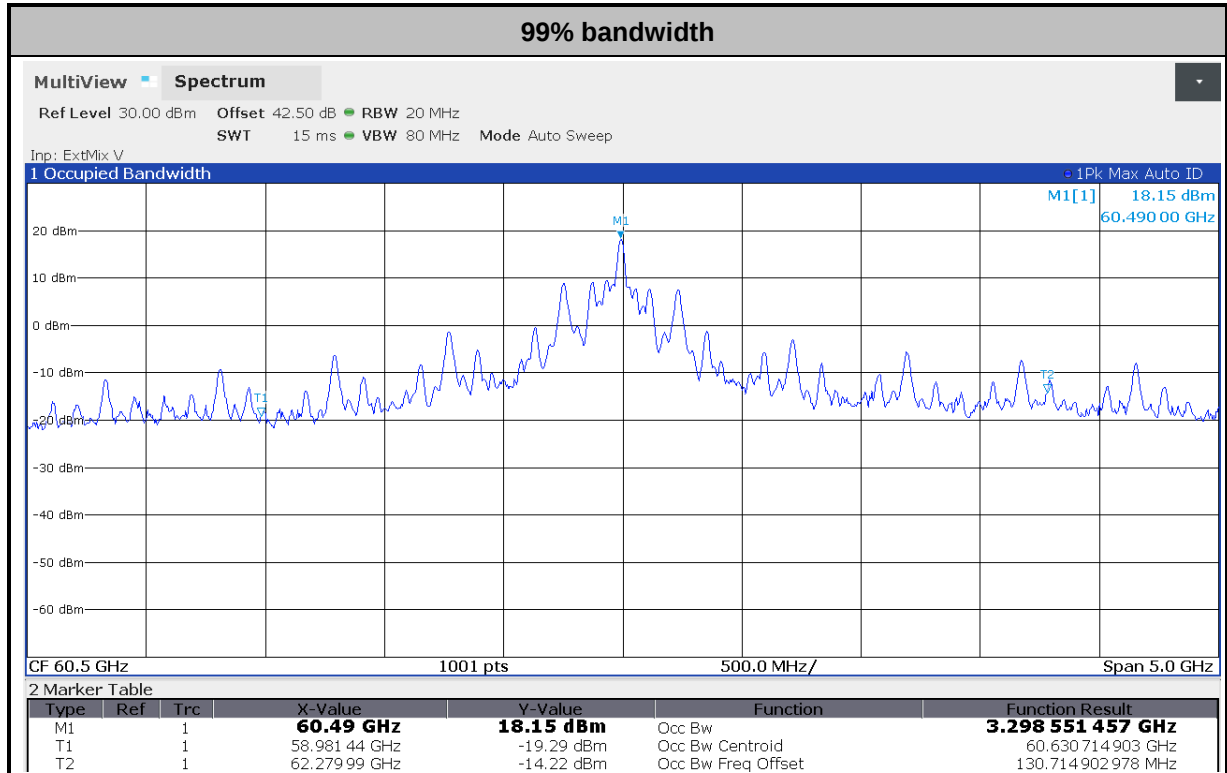
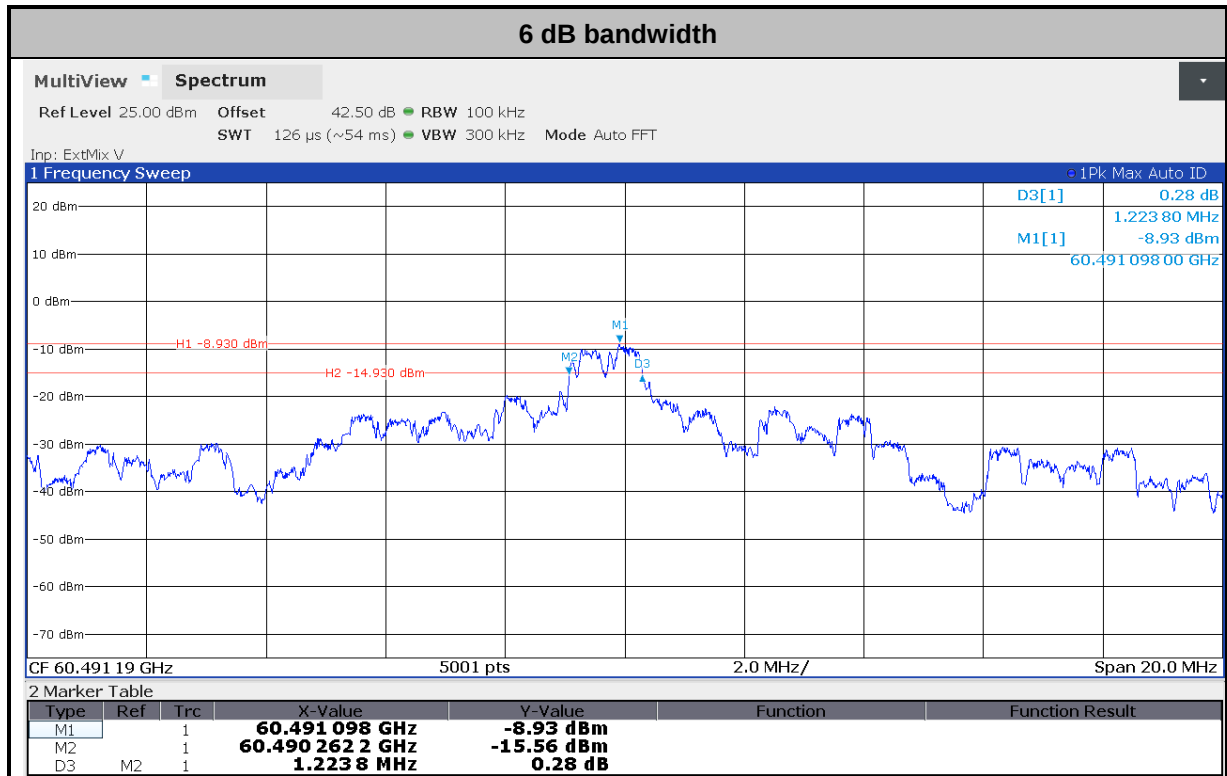
Temperature	20~25℃	Relative Humidity	50~60%
Test Engineer	Eric Jeng		

99% Occupied Bandwidth (GHz)	Limit (GHz)
3.299	Report Only

6 dB Bandwidth (GHz)	Limit (GHz)
0.0012	Report Only



3.4.5 Test Plots





3.5 EIRP Power Measurement

3.5.1 Limit of EIRP Power Measurement

Devices other than field disturbance sensors shall comply with one of the following power limits, as measured during the transmit interval: The average power of any emission shall not exceed 40 dBm and the peak power of any emission shall not exceed 43 dBm;

The peak transmitter conducted output power of devices other than field disturbance sensors/radars shall not exceed 500 mW.

3.5.2 Measuring Instruments

See list of measuring equipment of this test report.

3.5.3 Test Procedures

1. The testing follows ANSI C63.10-2020 Section 9.8.
2. Set the maximum power setting.
3. The EUT is placed on a turntable with 1.6 meter respectively above ground.
4. The EUT is set 0.62 meters away from the receiving antenna, which is mounted on the top of a variable height antenna tower.
5. Use 50-75 GHz receiver antenna, mixer and spectrum analyzer.
6. The EUT is arranged to its worst case and then tune the antenna tower and turntable (from 0 degree to 360 degrees) to find the maximum reading.
7. The spectrum analyzer's resolution bandwidth (RBW) is set 50 MHz and Video bandwidth (VBW) is set 80 MHz.
8. Use mark Peak function to check result.
9. Measure and record the results in the test report.



3.5.4 Test Results

Temperature	20~25℃		Relative Humidity	50~60%	
Test Engineer	Eric Jeng				
EIRP Power					
Measurement	Measure Dist. (m)	Measure Ant Gain (dBi)	EIRP (dBm)	Limit (dBm)	Result
Peak EIRP	0.62	22.6	2.77	43	PASS

Note:

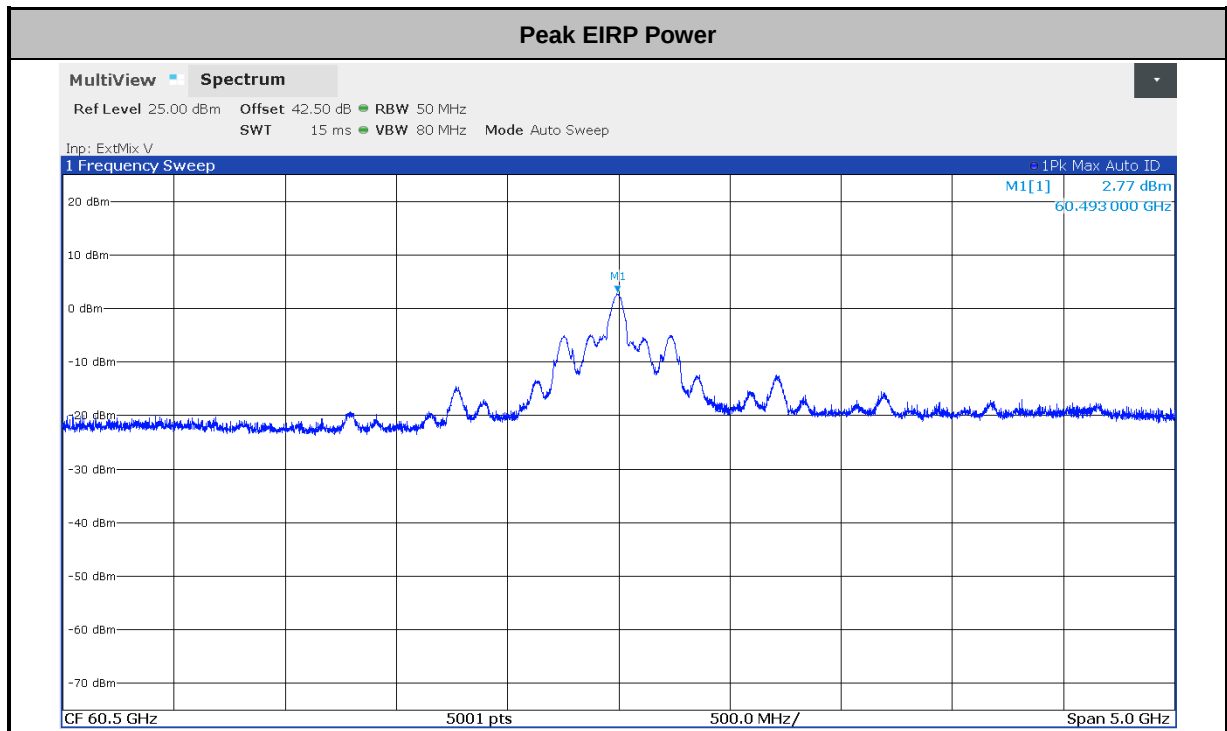
- Total path loss (dB) = Air loss - Measure Ant Gain (dBi) + Cable loss(dB)
Ex: Total path loss (dB) = 63.92 (dB) - 22.6 (dBi) + 1.18 (dB) = 42.50 (dB)
- No additional measurements for the Average EIRP as the Peak EIRP is less than 40 dBm.

Peak Conducted Power					
Peak EIRP (dBm)	Ant Gain (dBi)	Conducted Power (dBm)	Conducted Power (mW)	Limit (mW)	Result
2.77	4.00	-1.23	0.75	500	PASS

Note:

- Peak conducted power (dBm) = Peak EIRP Power - Ant Gain (dBi)

3.5.5 Test Plots



3.6 Transmit Spurious Emission

3.6.1 Limit of Radiated Spurious Emission

Frequency Range	Limit
Below 40GHz	Follow 15.209
Above 40GHz	90 pW/cm ² @ 3m (equivalent EIRP 102μW, -10dBm)
Note 1: For the applicable limit, see FCC 15.255 (d) Note 2: Spurious emissions shall not exceed the level of fundamental emission. Note 3: Per Part 15.215(c), the provisions in Part 15.35(b) and (c) that require emissions to be averaged over a 100 millisecond period and that limits the peak power to 20 dB above the average limit do not apply to devices operating under paragraphs Part 15.255(c)(2) and (3) of this section.	

3.6.2 Measuring Instruments

See list of measuring equipment of this test report.

3.6.3 Test Procedures

The testing follows ANSI C63.10-2020 Section 9.10 and 9.11 and ANSI C63.10-2020 clause 4.1.5.2.8 and Annex L.

For above 40GHz emission:

$$\text{EIRP} = \text{Prx} - \text{Grx} + \text{Free space loss} = \text{Prx} - \text{Grx} + 20 \cdot \log(4 \pi d / \lambda) + \text{Cable Loss}$$

Which

Prx = Read Level

Grx = Rx Antenna Gain

A distance factor is offset and formula is $20 \cdot \log(D1/D2)$

Which

D1 = Specification distance = 3m

D2 = Measurement distance

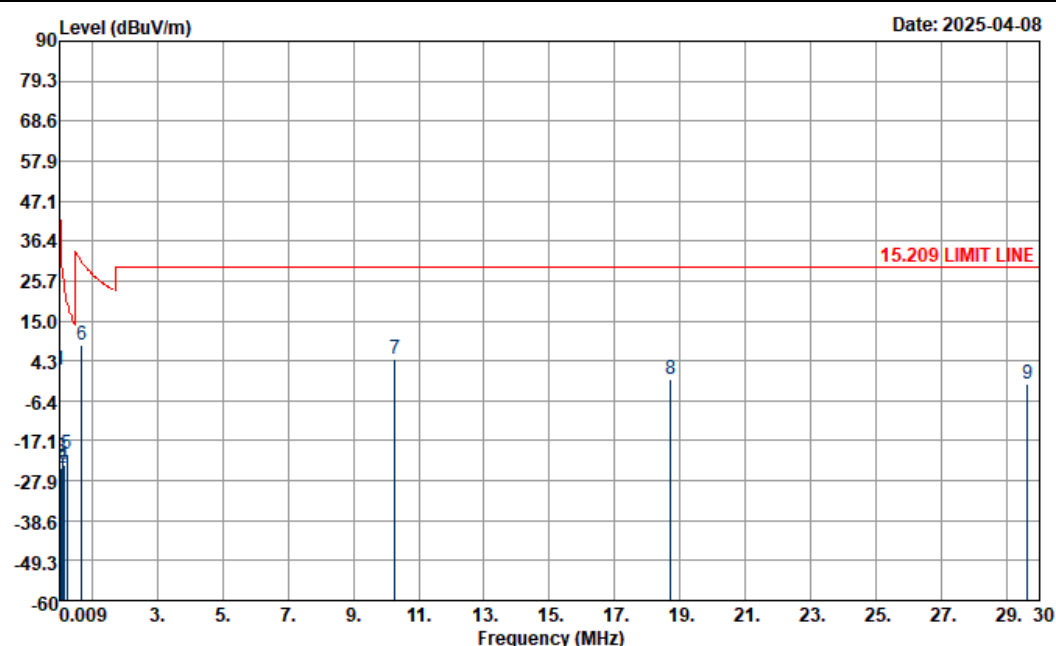
$$\text{Power Density (W/m}^2\text{)} = 10^{[(\text{EIRP}-30)/10]} / 4 \pi d$$

$$\text{Power Density (pW/cm}^2\text{)} = \text{Power Density (W/m}^2\text{)} * 10^{(-8)}$$

3.6.4 Test Result

<Below 30MHz>

Temperature	19.1 ~ 20.9℃	Relative Humidity	51.2 ~ 65.7%
Test Engineer	Daniel Lee, Fu Chen, Troye Hsieh	Test Distance	3m
Test Range	9KHz to 30MHz	Test Polarization	Horizontal
Remark	1. Level (dBμV/m) = Read Level (dBμV) + Antenna Factor (dB) + Cable Loss (dB) + Distance extrapolation factor (dB). 2. Distance extrapolation factor (dB) = 40 log (specific distance / test distance) 3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.		

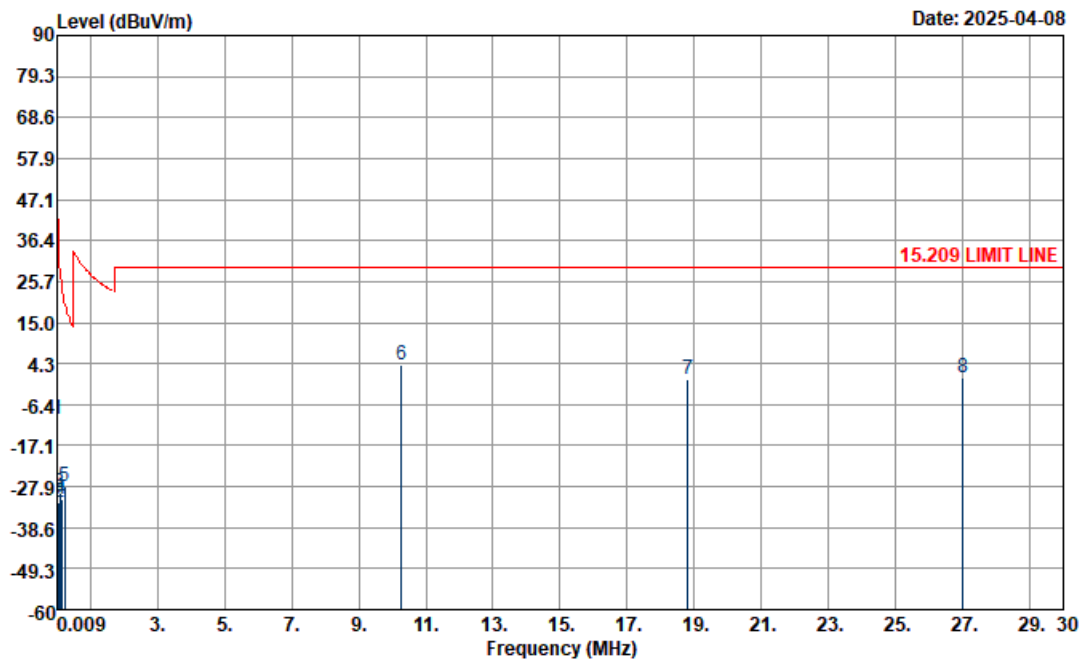


Site : 03CH11-HY
Condition : 15.209 LIMIT LINE 3m LOOP_100488_240829 HORIZONTAL

Mark	Frequency (MHz)	Level (dBμV/m)	Distance extrapolation Factor (dB)	Margin (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
1	0.01930	1.88	-80	-40.01	41.89	62.36	19.47	0.05	-	-	Average
2	0.06636	-24.64	-80	-55.81	31.17	37.12	18.17	0.07	-	-	Average
3	0.09640	-21.49	-80	-49.41	27.92	40.44	17.99	0.08	-	-	QP
4	0.14464	-23.54	-80	-47.94	24.40	38.15	18.23	0.08	-	-	Average
5	0.24146	-20.90	-80	-40.85	19.95	40.61	18.40	0.09	-	-	Average
6	0.68526	8.60	-40	-22.29	30.89	30.02	18.50	0.08	-	-	QP
7	10.27200	4.57	-40	-24.93	29.50	23.76	20.55	0.26	-	-	QP
8	18.70900	-0.87	-40	-30.37	29.50	17.17	21.74	0.22	-	-	QP
9	29.63500	-1.88	-40	-31.38	29.50	15.13	22.74	0.25	-	-	QP



Temperature	19.1 ~ 20.9℃	Relative Humidity	51.2 ~ 65.7%
Test Engineer	Daniel Lee, Fu Chen, Troye Hsieh	Test Distance	3m
Test Range	9KHz to 30MHz	Test Polarization	Vertical
Remark	1. Level (dBμV/m) = Read Level (dBμV) + Antenna Factor (dB) + Cable Loss (dB) + Distance extrapolation factor (dB). 2. Distance extrapolation factor (dB) = 40 log (specific distance / test distance) 3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.		



Site : 03CH11-HY

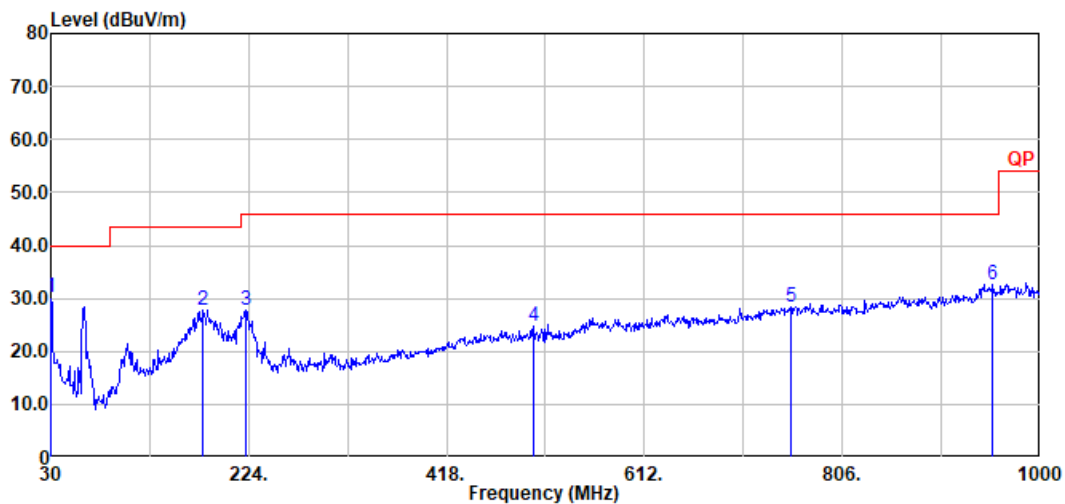
Condition : 15.209 LIMIT LINE 3m LOOP_100488_240829 VERTICAL

Mark	Frequency (MHz)	Level (dBμV/m)	Distance extrapolation Factor (dB)	Margin (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
1	0.01930	-10.21	-80	-52.10	41.89	50.27	19.47	0.05	-	-	Average
2	0.06639	-31.96	-80	-63.12	31.16	29.79	18.18	0.07	-	-	Average
3	0.09640	-29.67	-80	-57.59	27.92	32.26	17.99	0.08	-	-	QP
4	0.14464	-30.99	-80	-55.39	24.40	30.70	18.23	0.08	-	-	Average
5	0.24350	-27.67	-80	-47.54	19.87	33.84	18.40	0.09	-	-	Average
6	10.26400	3.87	-40	-25.63	29.50	23.06	20.55	0.26	-	-	QP
7	18.80800	0.11	-40	-29.39	29.50	18.14	21.76	0.21	-	-	QP
8	27.00000	0.56	-40	-28.94	29.50	17.64	22.70	0.22	-	-	QP



<30MHz to 1GHz>

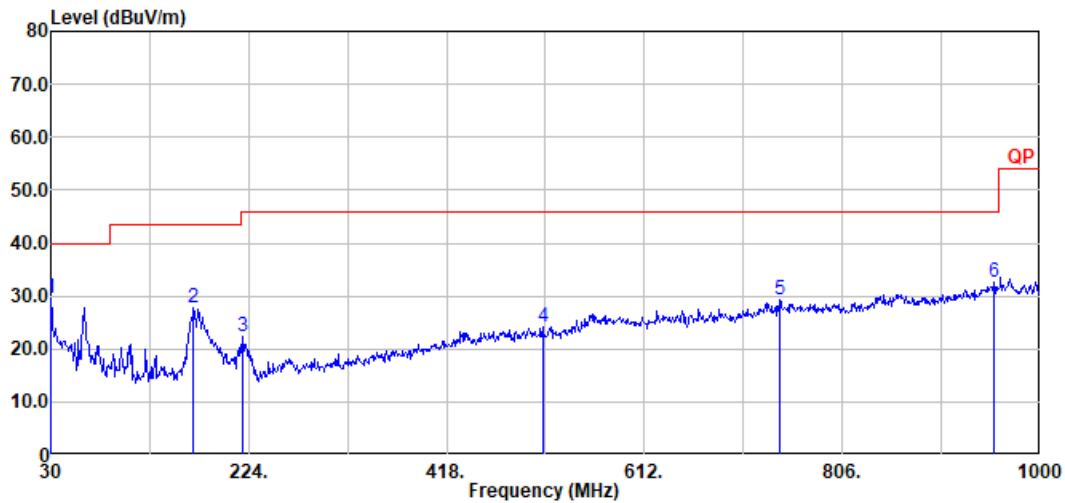
Temperature	19.1 ~ 20.9℃	Relative Humidity	51.2 ~ 65.7%
Test Engineer	Daniel Lee, Fu Chen, Troye Hsieh	Test Distance	3m
Test Range	30MHz to 1GHz	Test Polarization	Horizontal
Remark	1. Level (dBμV/m) = Read Level (dBμV) + Antenna Factor (dB) + Path Loss(dB) - Preamp Factor (dB) 2. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) 3. The emission position marked as "-" means no suspected emission found and emission level has at least 6dB margin against limit or emission is noise floor only.		



Mark	Frequency (MHz)	Level (dBμV/m)	Margin (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
1	30.00	30.05	-9.95	40.00	37.11	24.51	0.86	32.43	-	-	Peak
2	179.38	27.75	-15.75	43.50	42.67	15.32	1.98	32.22	-	-	Peak
3	221.09	27.66	-18.34	46.00	42.22	15.45	2.18	32.19	-	-	Peak
4	503.36	24.83	-21.17	46.00	29.56	24.22	3.25	32.20	-	-	Peak
5	755.56	28.32	-17.68	46.00	28.01	28.38	4.01	32.08	-	-	Peak
6	953.44	32.69	-13.31	46.00	27.94	31.08	4.53	30.86	-	-	Peak



Temperature	19.1 ~ 20.9℃	Relative Humidity	51.2 ~ 65.7%
Test Engineer	Daniel Lee, Fu Chen, Troye Hsieh	Test Distance	3m
Test Range	30MHz to 1GHz	Test Polarization	Vertical
Remark	1. Level (dBμV/m) = Read Level (dBμV) + Antenna Factor (dB) + Path Loss(dB) - Preamp Factor (dB) 2. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) 3. The emission position marked as "-" means no suspected emission found and emission level has at least 6dB margin against limit or emission is noise floor only.		



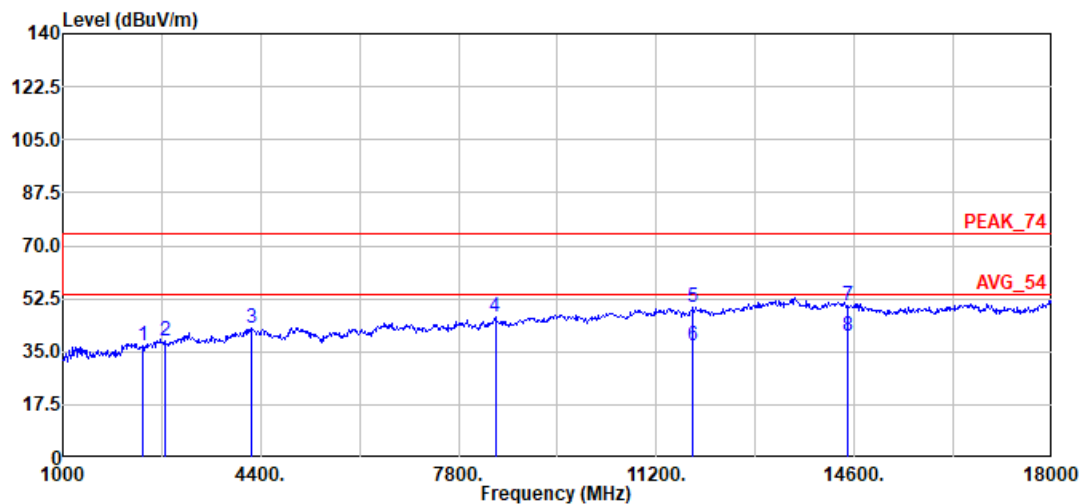
Site : 03CH11-HY
Condition: QP 3m BILOG_37059&01_241127 VERTICAL

Mark	Frequency (MHz)	Level (dBμV/m)	Margin (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
1	30.00	29.63	-10.37	40.00	36.69	24.51	0.86	32.43	-	-	Peak
2	169.68	27.68	-15.82	43.50	42.07	15.92	1.93	32.24	-	-	Peak
3	218.18	22.29	-23.71	46.00	37.10	15.22	2.16	32.19	-	-	Peak
4	512.09	24.00	-22.00	46.00	28.61	24.29	3.29	32.19	-	-	Peak
5	743.92	29.15	-16.85	46.00	28.93	28.36	3.97	32.11	-	-	Peak
6	954.41	32.71	-13.29	46.00	27.92	31.10	4.54	30.85	-	-	Peak



<1GHz to 18GHz>

Temperature	19.1 ~ 20.9℃	Relative Humidity	51.2 ~ 65.7%
Test Engineer	Daniel Lee, Fu Chen, Troye Hsieh	Test Distance	3m
Test Range	1GHz to 18GHz	Test Polarization	Horizontal
Remark	1. Level (dBμV/m) = Read Level (dBμV) + Antenna Factor (dB) + Path Loss(dB) - Preamp Factor (dB) 2. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) 3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.		



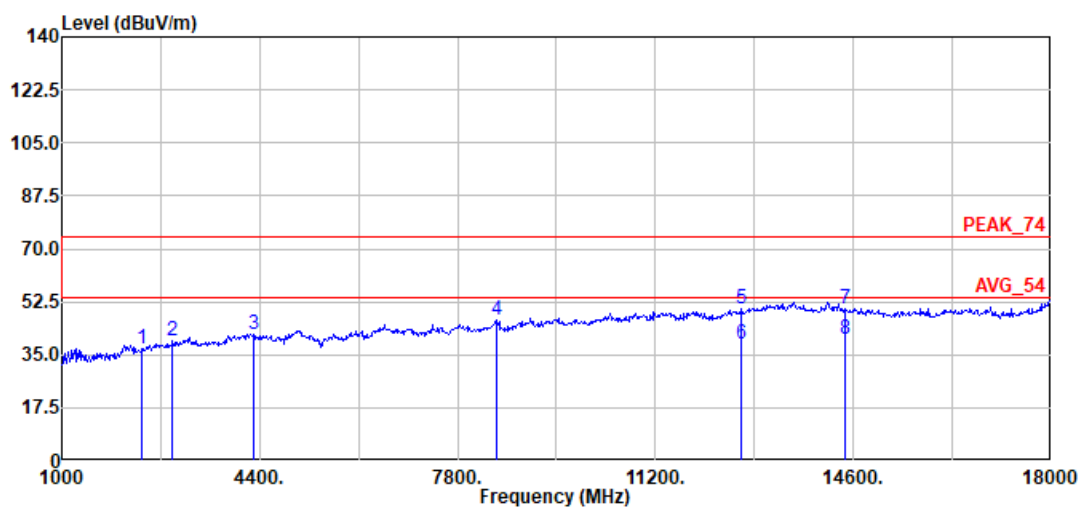
Site : 03CH11-HY

Condition: PEAK_74 3m 9120D_01620_240828 HORIZONTAL

Mark	Frequency (MHz)	Level (dBμV/m)	Margin (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
1	2377	36.83	-37.17	74	68.28	27.20	8.17	66.82	-	-	Peak
2	2751	38.63	-35.37	74	68.16	28.21	8.76	66.50	-	-	Peak
3	4230	42.70	-31.30	74	66.80	31.26	11.53	66.89	-	-	Peak
4	8429	46.47	-27.53	74	60.31	37.12	15.67	66.63	-	-	Peak
5	11829	49.56	-24.44	74	57.98	38.50	19.05	65.97	100	88	Peak
6	11829	36.89	-17.11	54	45.31	38.50	19.05	65.97	100	88	Average
7	14481	50.42	-23.58	74	54.24	40.32	21.78	65.92	100	63	Peak
8	14481	40.20	-13.80	54	44.02	40.32	21.78	65.92	100	63	Average



Temperature	19.1 ~ 20.9℃	Relative Humidity	51.2 ~ 65.7%
Test Engineer	Daniel Lee, Fu Chen, Troye Hsieh	Test Distance	3m
Test Range	1GHz to 18GHz	Test Polarization	Vertical
Remark	1. Level (dBμV/m) = Read Level (dBμV) + Antenna Factor (dB) + Path Loss(dB) - Preamp Factor (dB) 2. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) 3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.		



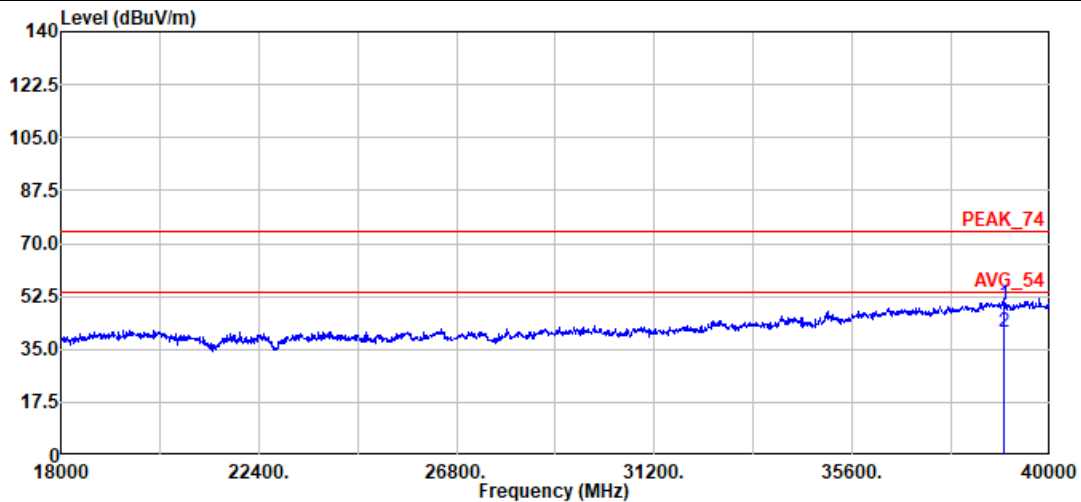
Site : 03CH11-HY
Condition: PEAK_74 3m 9120D_01620_240828 VERTICAL

Mark	Frequency (MHz)	Level (dBμV/m)	Margin (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
1	2377	36.79	-37.21	74	68.24	27.20	8.17	66.82	-	-	Peak
2	2904	39.45	-34.55	74	67.94	28.84	8.99	66.32	-	-	Peak
3	4298	41.93	-32.07	74	65.68	31.49	11.68	66.92	-	-	Peak
4	8463	46.30	-27.70	74	60.04	37.25	15.67	66.66	-	-	Peak
5	12662	50.35	-23.65	74	56.89	39.32	20.43	66.29	100	55	Peak
6	12662	38.65	-15.35	54	45.19	39.32	20.43	66.29	100	55	Average
7	14464	50.23	-23.77	74	54.14	40.26	21.77	65.94	100	39	Peak
8	14464	40.22	-13.78	54	44.13	40.26	21.77	65.94	100	39	Average



<18GHz to 40GHz>

Temperature	19.1 ~ 20.9℃	Relative Humidity	51.2 ~ 65.7%
Test Engineer	Daniel Lee, Fu Chen, Troye Hsieh	Test Distance	1m
Test Range	18GHz to 40GHz	Test Polarization	Horizontal
Remark	1. Level (dBμV/m) = Read Level (dBμV) + Antenna Factor (dB) + Path Loss(dB) - Preamp Factor (dB) 2. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) + Distance extrapolation factor (dB). 3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.		



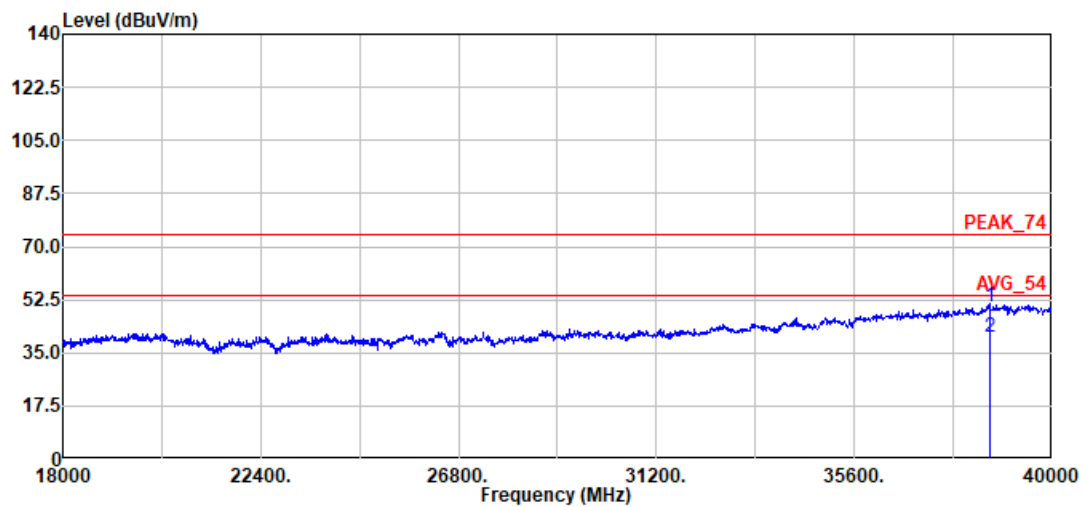
Site : 03CH11-HY

Condition: PEAK_74 1m SHF_1223_240624 HORIZONTAL

Mark	Frequency (MHz)	Level (dBμV/m)	Margin (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
1	38971.80	49.48	-24.52	74	39.75	44.27	27.71	62.25	100	75	Peak
2	38971.80	40.50	-13.50	54	30.77	44.27	27.71	62.25	100	75	Average



Temperature	19.1 ~ 20.9℃	Relative Humidity	51.2 ~ 65.7%
Test Engineer	Daniel Lee, Fu Chen, Troye Hsieh	Test Distance	1m
Test Range	18GHz to 40GHz	Test Polarization	Vertical
Remark	- Level (dBμV/m) = Read Level (dBμV) + Antenna Factor (dB) + Path Loss(dB) - Preamp Factor (dB) - Path Loss(dB) = Cable loss(dB) + Filter loss(dB) + Distance extrapolation factor (dB). - The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.		



Site : 03CH11-HY
Condition: PEAK_74 1m SHF_1223_240624 VERTICAL

Mark	Frequency (MHz)	Level (dB μ V/m)	Margin (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
1	38629.70	50.14	-23.86	74	40.52	43.66	27.59	61.63	100	26	Peak
2	38629.70	40.23	-13.77	54	30.61	43.66	27.59	61.63	100	26	Average



<40GHz to 200GHz>

Temperature	20~25°C	Relative Humidity	50~60%
Test Engineer	Eric Jeng	Test Range	40GHz to 200GHz

Test Frequency (GHz)	Rx Antenna Gain (dBi)	Measurement Distance (m)	Read Worse Frequency (GHz)	Read Level (dBm)
40 - 57	22.70	0.87	40.3325	-84.09
EIRP (dBm)	Specification Distance (m)	Power Density (pW/cm ²)	Limit (pW/cm ²)	Test Result
-39.95	3	0.089443	90	PASS

Note: Path Loss = 1.18 dB; the calculate of λ using 57GHz as f.

Test Frequency (GHz)	Rx Antenna Gain (dBi)	Measurement Distance (m)	Read Worse Frequency (GHz)	Read Level (dBm)
71 - 90	23.10	0.6	89.9715	-82.84
EIRP (dBm)	Specification Distance (m)	Power Density (pW/cm ²)	Limit (pW/cm ²)	Test Result
-37.72	3	0.149468	90	PASS

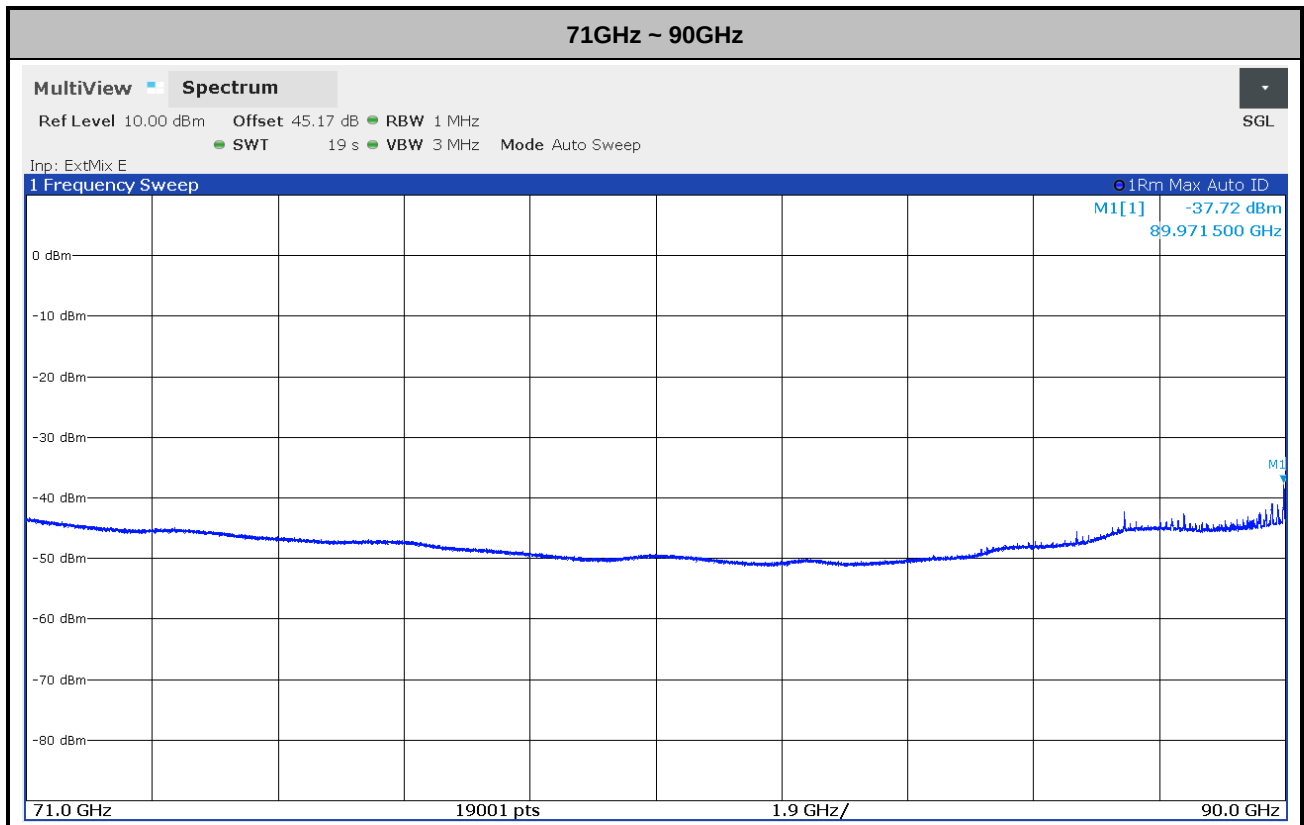
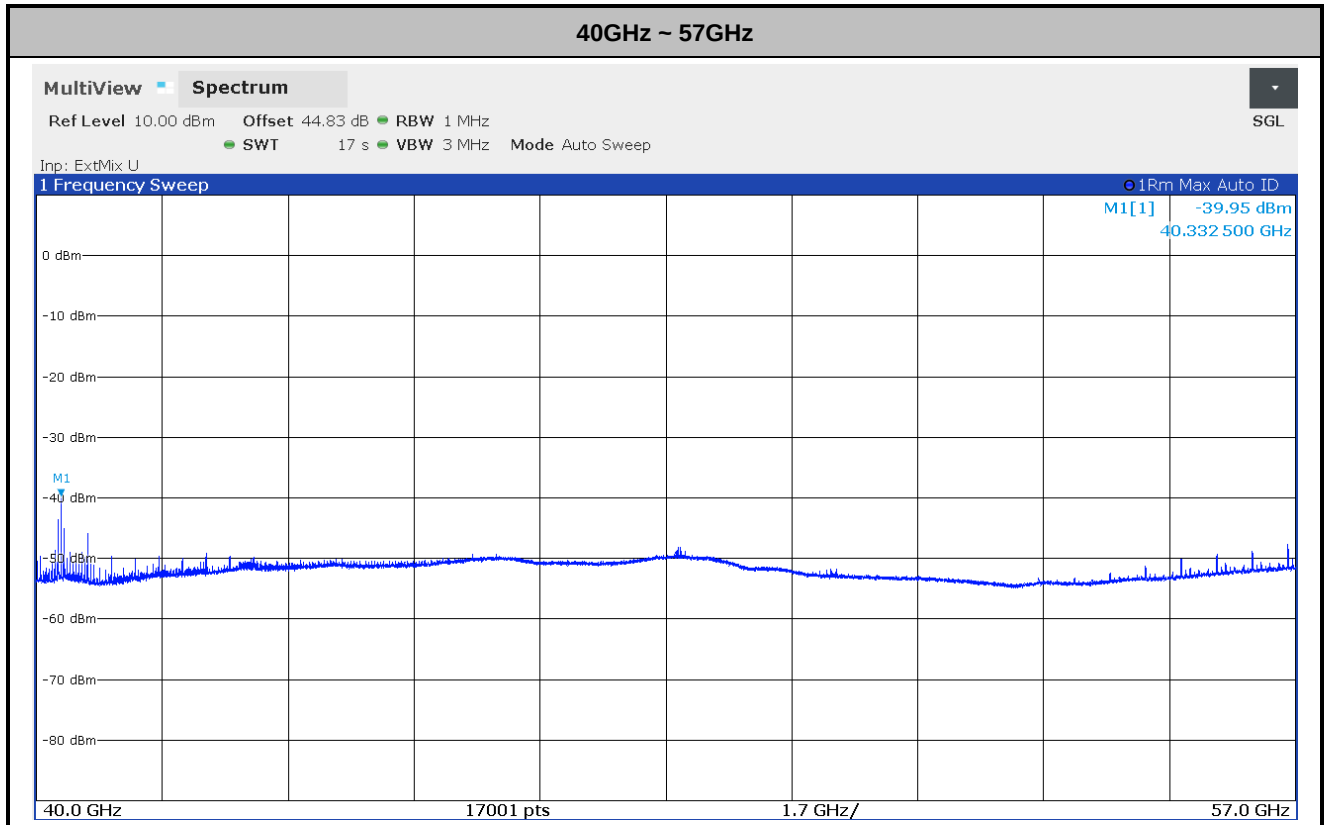
Note: Path Loss = 1.18 dB; the calculate of λ using 90GHz as f.

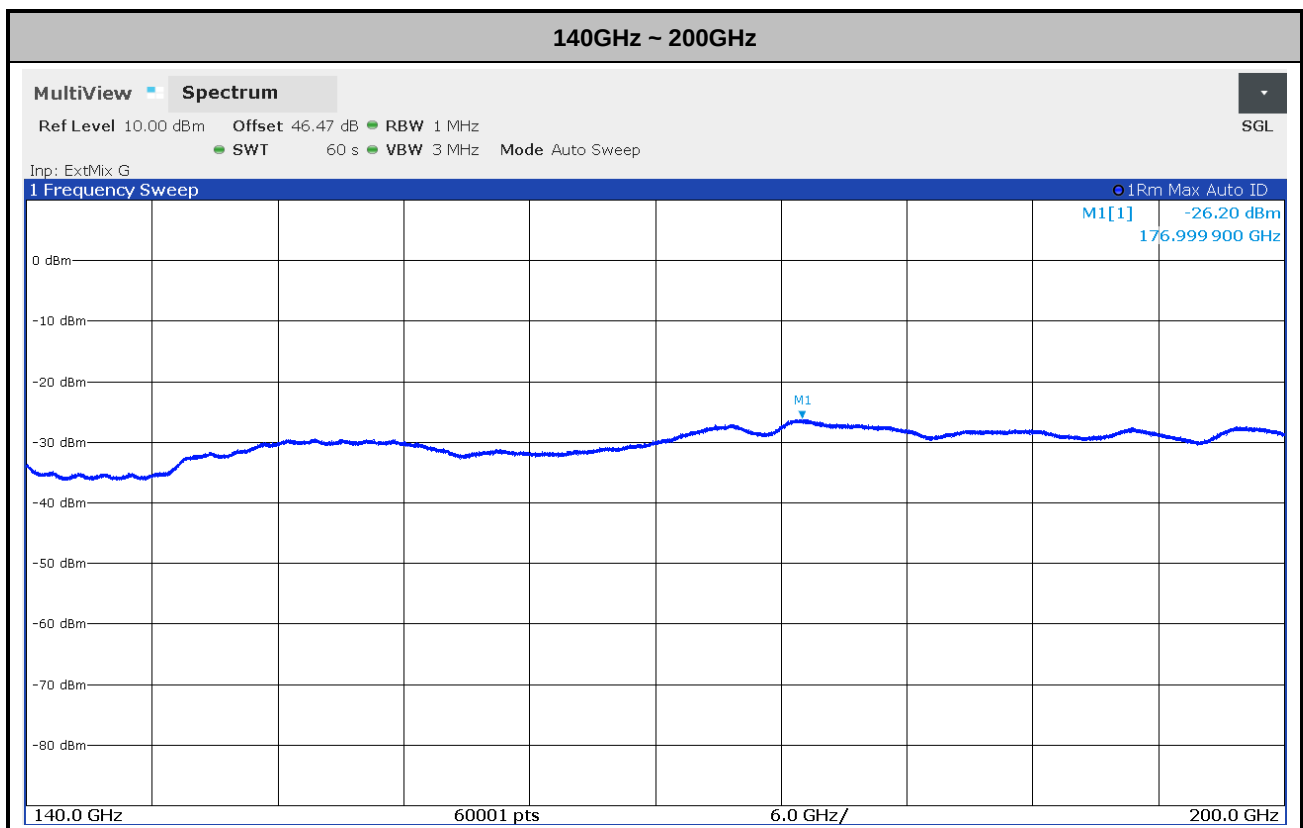
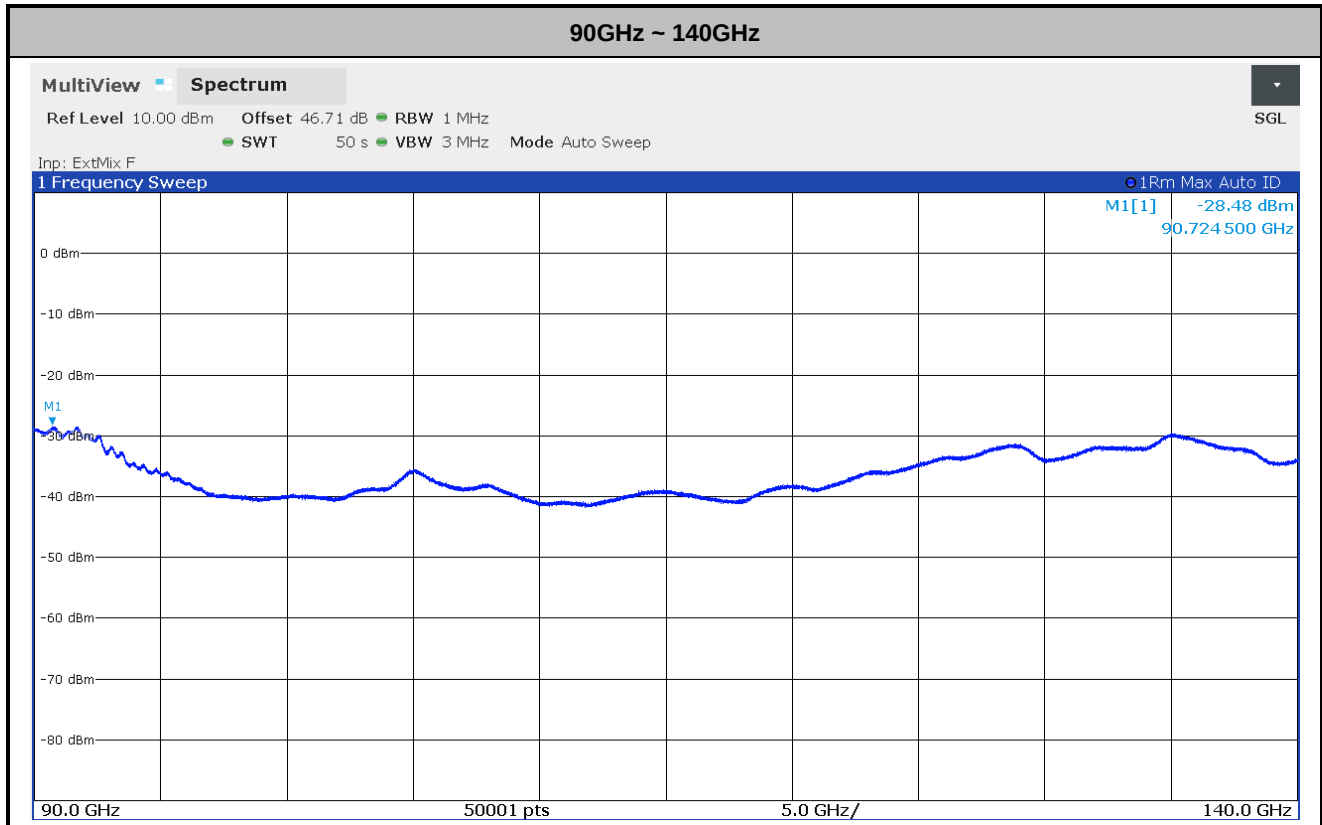
Test Frequency (GHz)	Rx Antenna Gain (dBi)	Measurement Distance (m)	Read Worse Frequency (GHz)	Read Level (dBm)
90 - 140	22.50	0.43	90.7245	-74.54
EIRP (dBm)	Specification Distance (m)	Power Density (pW/cm ²)	Limit (pW/cm ²)	Test Result
-28.48	3	1.254722	90	PASS

Note: Path Loss = 1.18 dB; the calculate of λ using 140GHz as f.

Test Frequency (GHz)	Rx Antenna Gain (dBi)	Measurement Distance (m)	Read Worse Frequency (GHz)	Read Level (dBm)
140 - 200	21.80	0.27	176.9999	-70.92
EIRP (dBm)	Specification Distance (m)	Power Density (pW/cm ²)	Limit (pW/cm ²)	Test Result
-26.20	3	2.121034	90	PASS

Note: Path Loss = 1.18 dB; the calculate of λ using 200GHz as f.







3.7 Frequency Stability

3.7.1 Description of Frequency Stability Measurement

The frequency stability shall be measured by variation of ambient temperature and variation of primary supply voltage to ensure that the fundamental emission stays within the authorized frequency range, 57 GHz – 71 GHz.

3.7.2 Measuring Instruments

See list of measuring equipment of this test report.

3.7.3 Test Procedures

The testing follows ANSI C63.10-2020 Section 9.5.

3.7.4 Test Result

Test Engineer	Eric Jeng				
Test Temperature (°C)	Voltage (Volt)	Low Frequency (GHz)	High Frequency (GHz)	Limit	Result
50	3.88	58.9466	62.1749	Within 57 ~ 71 GHz	pass
40	3.88	58.9366	62.1748		
30	3.88	58.8913	62.1748		
20	3.88	58.9814	62.2800		
10	3.88	58.8869	62.1748		
0	3.88	58.8984	62.1748		
-10	3.88	58.9497	62.1748		
-20	3.88	58.9466	62.1749		
20	3.60	58.8752	62.1749		
20	4.48	58.8832	62.1748		

Note:

1. Normal Voltage = 3.88 Vdc. ; Low Voltage = 3.60 Vdc. ; Maximum Voltage = 4.48 Vdc.
2. The frequency fundamental emissions stay within the operation band.

4 AC conducted Emission Measurement

4.1 Limit of AC Conducted Emission

For equipment 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.

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	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.

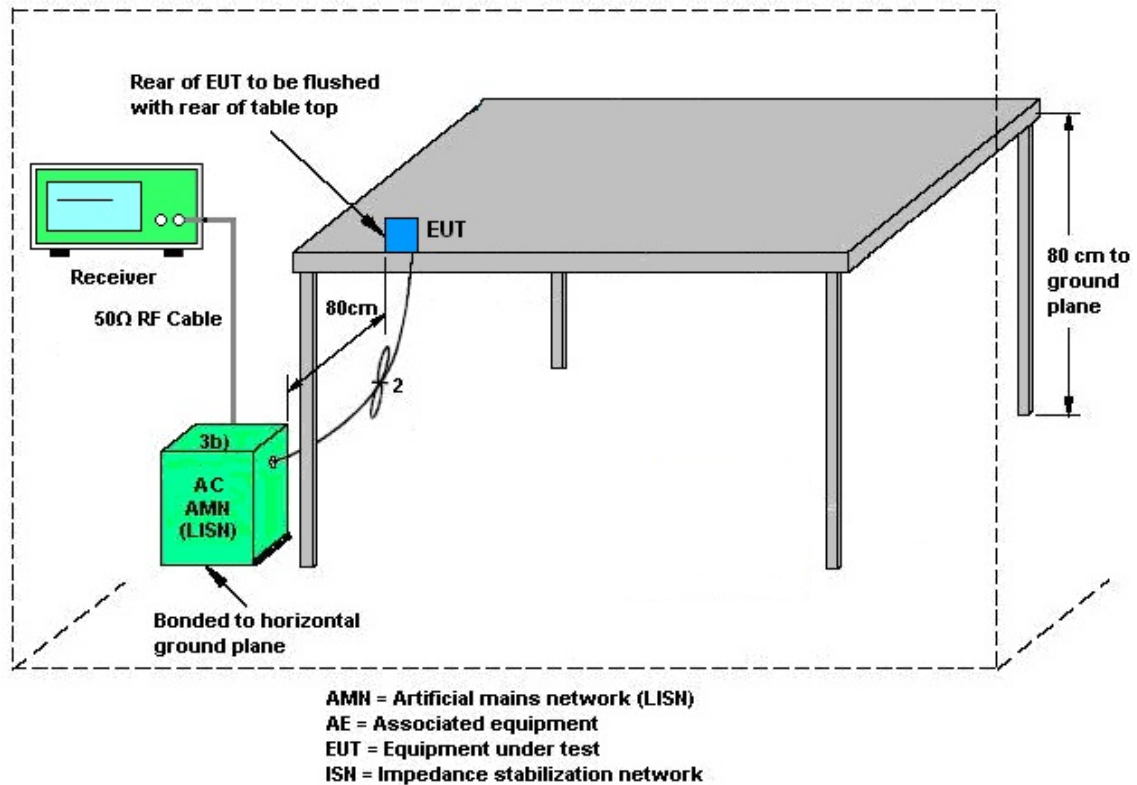
4.2 Measuring Instruments

See list of measuring equipment of this test report.

4.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

4.4 Test Setup



4.5 Test Result of AC Conducted Emission

Please refer to Appendix A.



5 List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
AC Power Source	ACPOWER	AFC-11003G	F317040033	N/A	N/A	Mar. 29, 2025	N/A	Conduction (CO07-HY)
Software	Rohde & Schwarz	EMC32 V10.30	N/A	N/A	N/A	Mar. 29, 2025	N/A	Conduction (CO07-HY)
Pulse Limiter	SCHWARZBECK	VTSD 9561-FN	9561-FN00373	9kHz-200MHz	Oct. 23, 2024	Mar. 29, 2025	Oct. 22, 2025	Conduction (CO07-HY)
RF Cable	HUBER + SUHNER	RG 214/U	1358175	9kHz~30MHz	Mar. 03, 2025	Mar. 29, 2025	Mar. 02, 2026	Conduction (CO07-HY)
Two-Line V-Network	TESEQ	NNB 51	45051	N/A	Mar. 24, 2025	Mar. 29, 2025	Mar. 23, 2026	Conduction (CO07-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102317	9kHz~3.6GHz	Sep. 23, 2024	Mar. 29, 2025	Sep. 22, 2025	Conduction (CO07-HY)
Bilog Antenna	TESEQ	CBL 6111D & 00800N1D01N-06	37059 & 01	30MHz~1GHz	Nov. 27, 2024	Apr. 07, 2025~ Apr. 08, 2025	Nov. 26, 2025	Radiation (03CH11-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Aug. 29, 2024	Apr. 07, 2025~ Apr. 08, 2025	Aug. 28, 2025	Radiation (03CH11-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-01620	1GHz~18GHz	Aug. 28, 2024	Apr. 07, 2025~ Apr. 08, 2025	Aug. 27, 2025	Radiation (03CH11-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	1223	18GHz~40GHz	Jun. 24, 2024	Apr. 07, 2025~ Apr. 08, 2025	Jun. 23, 2025	Radiation (03CH11-HY)
Amplifier	SONOMA	310N	187312	9kHz~1GHz	Dec. 07, 2024	Apr. 07, 2025~ Apr. 08, 2025	Dec. 06, 2025	Radiation (03CH11-HY)
Preamplifier	E-INSTRUMENT TECH LTD.	ERA-100M-18G-56-01-A70	EC1900249	1GHz~18GHz	Jan. 21, 2025	Apr. 07, 2025~ Apr. 08, 2025	Jan. 20, 2026	Radiation (03CH11-HY)
Preamplifier	EMEC	EM18G40G	060873	18GHz~40GHz	Sep. 02, 2024	Apr. 07, 2025~ Apr. 08, 2025	Sep. 01, 2025	Radiation (03CH11-HY)
Spectrum Analyzer	Keysight	N9010A	MY54200486	10Hz~44GHz	Oct. 14, 2024	Apr. 07, 2025~ Apr. 08, 2025	Oct. 13, 2025	Radiation (03CH11-HY)
EMI Test Receiver	Keysight	N9038A(MXE)	MY55420170	20MHz~8.4GHz	Jul. 19, 2024	Apr. 07, 2025~ Apr. 08, 2025	Jul. 18, 2025	Radiation (03CH11-HY)
Controller	EMEC	EM 1000	N/A	Control Turn table & Ant Mast	N/A	Apr. 07, 2025~ Apr. 08, 2025	N/A	Radiation (03CH11-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1~4m	N/A	Apr. 07, 2025~ Apr. 08, 2025	N/A	Radiation (03CH11-HY)
Turn Table	EMEC	TT 2000	N/A	0~360 Degree	N/A	Apr. 07, 2025~ Apr. 08, 2025	N/A	Radiation (03CH11-HY)
Software	Audix	E3 6.2009-8-24	RK-001053	N/A	N/A	Apr. 07, 2025~ Apr. 08, 2025	N/A	Radiation (03CH11-HY)
Hygrometer	TECPEL	DTM-303B	TP200880	N/A	Aug. 29, 2024	Apr. 07, 2025~ Apr. 08, 2025	Aug. 28, 2025	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	804013/2	30M~40G	Mar. 05, 2025	Apr. 07, 2025~ Apr. 08, 2025	Mar. 04, 2026	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY2859/2	30MHz~40GHz	Mar. 05, 2025	Apr. 07, 2025~ Apr. 08, 2025	Mar. 04, 2026	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	803951/2	9K~30M	Mar. 05, 2025	Apr. 07, 2025~ Apr. 08, 2025	Mar. 04, 2026	Radiation (03CH11-HY)



Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
RF Cable	HUBER + SUHNER	SUCOFLEX 102	803951/2	30M~40G	Mar. 05, 2025	Apr. 07, 2025~ Apr. 08, 2025	Mar. 04, 2026	Radiation (03CH11-HY)
Filter	Wainwright	WLK4-1000-15 30-8000-40SS	SN11	1.53GHz Low Pass Filter	Sep. 10, 2024	Apr. 07, 2025~ Apr. 08, 2025	Sep. 09, 2025	Radiation (03CH11-HY)
Spectrum Analyzer	Rohde & Schwarz	FSW43	101456	2Hz to 43.5GHz	Feb. 20, 2025	Apr. 08, 2025~ Apr. 11, 2025	Feb. 19, 2026	Radiation (03CH18-HY)
Harmonic Mixer	Rohde & Schwarz	RPG FS-Z75	102042	50 GHz to 75 GHz	Jun. 27, 2024	Apr. 08, 2025~ Apr. 11, 2025	Jun. 26, 2025	Radiation (03CH18-HY)
Harmonic Mixer*	Rohde & Schwarz	RPG FS-Z60	101033	40GHz to 60GHz	Jun. 27, 2024	Apr. 08, 2025~ Apr. 11, 2025	Jun. 26, 2025	Radiation (03CH18-HY)
Harmonic Mixer*	Rohde & Schwarz	FSZ-90	101867	60GHz to 90GHz	Jun. 27, 2024	Apr. 08, 2025~ Apr. 11, 2025	Jun. 26, 2025	Radiation (03CH18-HY)
Harmonic Mixer*	Rohde & Schwarz	RPG FS-Z140	101130	90GHz to 140GHz	Jun. 27, 2024	Apr. 08, 2025~ Apr. 11, 2025	Jun. 26, 2025	Radiation (03CH18-HY)
Harmonic Mixer	Rohde & Schwarz	RPG FS-Z220	101042	140GHz to 220GHz	Jun. 27, 2024	Apr. 08, 2025~ Apr. 11, 2025	Jun. 26, 2025	Radiation (03CH18-HY)
Antenna	Quinstar	QWH-VPRR00	1371800008	50-75 GHz	Jun. 27, 2024	Apr. 08, 2025~ Apr. 11, 2025	Jun. 26, 2025	Radiation (03CH18-HY)
Antenna	Quinstar	QWH-UPRR00	1410300003	40-60 GHz	Jun. 27, 2024	Apr. 08, 2025~ Apr. 11, 2025	Jun. 26, 2025	Radiation (03CH18-HY)
Antenna	Quinstar	QWH-EPRR00	1372000000	60-90 GHz	Jun. 27, 2024	Apr. 08, 2025~ Apr. 11, 2025	Jun. 26, 2025	Radiation (03CH18-HY)
Antenna	Quinstar	QWH-FPRR00	1011500008	90-140 GHz	Jun. 27, 2024	Apr. 08, 2025~ Apr. 11, 2025	Jun. 26, 2025	Radiation (03CH18-HY)
Antenna	Quinstar	QWH-GPRR0 0	QWH-GPR R00-01	140-220 GHz	Jun. 27, 2024	Apr. 08, 2025~ Apr. 11, 2025	Jun. 26, 2025	Radiation (03CH18-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	801607/2	N/A	Dec. 25, 2024	Apr. 08, 2025~ Apr. 11, 2025	Dec. 24, 2025	Radiation (03CH18-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	519231/2	N/A	Dec. 25, 2024	Apr. 08, 2025~ Apr. 11, 2025	Dec. 24, 2025	Radiation (03CH18-HY)
Detector	Quinstars	QEA-FBFBVP	2672009	50 ~ 75 GHz	Jul. 09, 2024	Apr. 08, 2025~ Apr. 11, 2025	Jul. 08, 2025	Radiation (03CH18-HY)
Oscilloscope	Rohde & Schwarz	RTO 1002	400025	600MHz, 10GSa/sec	Sep. 25, 2024	Apr. 08, 2025~ Apr. 11, 2025	Sep. 24, 2025	Radiation (03CH18-HY)
Thermal Chamber	ESPEC	SU-641	92013721	-30℃ ~70℃	Oct. 08, 2024	Apr. 08, 2025~ Apr. 11, 2025	Oct. 07, 2025	Radiation (03CH18-HY)
AC Power Source	AC POWER	AFC-500W	F104070011	50Hz~60Hz	N/A	Apr. 08, 2025~ Apr. 11, 2025	N/A	Radiation (03CH18-HY)

Note: (*) Equipment manufacturer's Calibration Certificate.

6 Measurement Uncertainty

Test Item	Uncertainty
AC Power Conducted Emission Measurement (150 kHz ~ 30 MHz)	±3.7dB
Radiated Emission Measurement (9 kHz ~ 30 MHz)	±3.3dB
Radiated Emission Measurement (30 MHz ~ 1000 MHz)	±6.4dB
Radiated Emission Measurement (1 GHz ~ 6 GHz)	±5.1dB
Radiated Emission Measurement (6 GHz ~ 18 GHz)	±5.3dB
Radiated Emission Measurement (18 GHz ~ 40 GHz)	±5.3dB
Radiated Emission Measurement (40 GHz ~ 140 GHz)	±5.59dB
Radiated Emission Measurement (140 GHz ~ 200 GHz)	±6.57dB
99% Occupied Bandwidth	±1.324 MHz
6dB Bandwidth	±0.676 MHz
Frequency Stability	±0.671 MHz
Temperature	±0.58 °C

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)



Appendix A. AC Conducted Emission Test Results

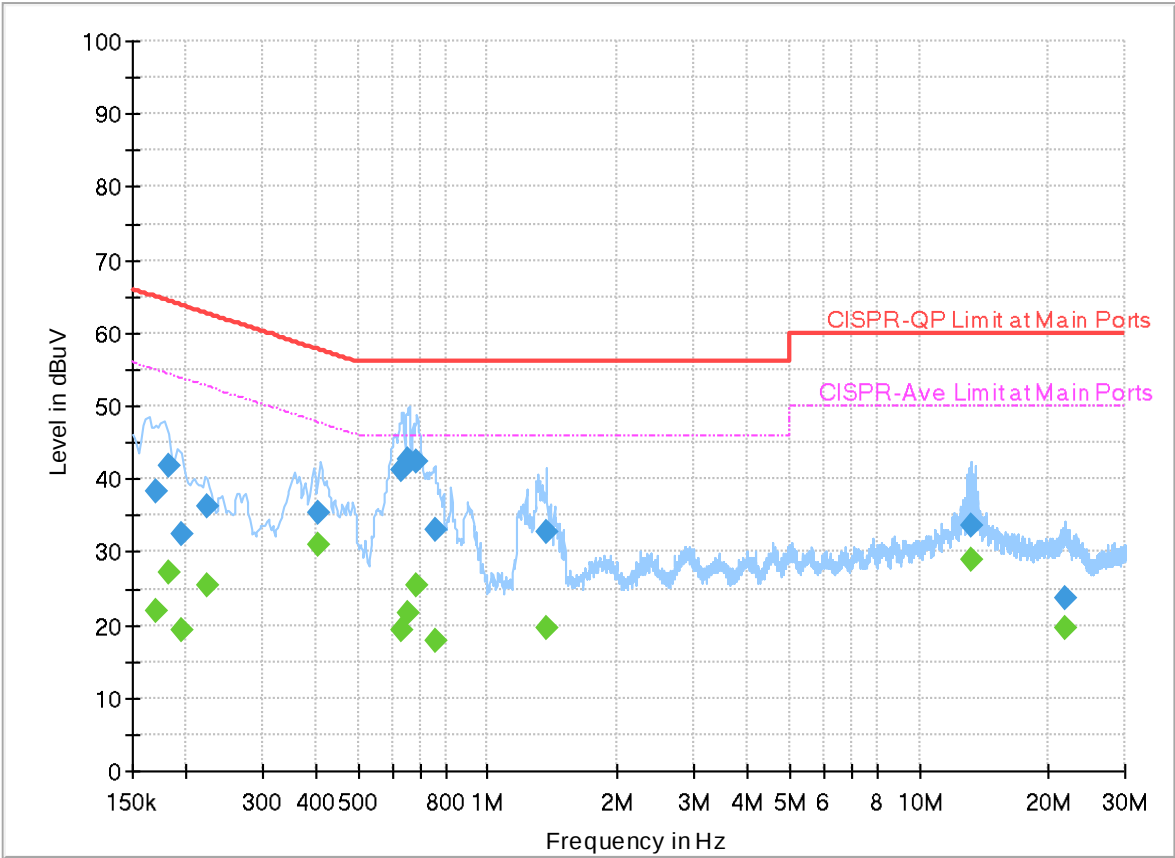
Test Engineer :	Louis Chung	Temperature :	21.5~23.6°C
		Relative Humidity :	48.2~53.6%

EUT Information

Report NO :
Test Mode :
Test Voltage :
Phase :

511001
Mode 1
120Vac/60Hz
Line

Full Spectrum



Final_Result

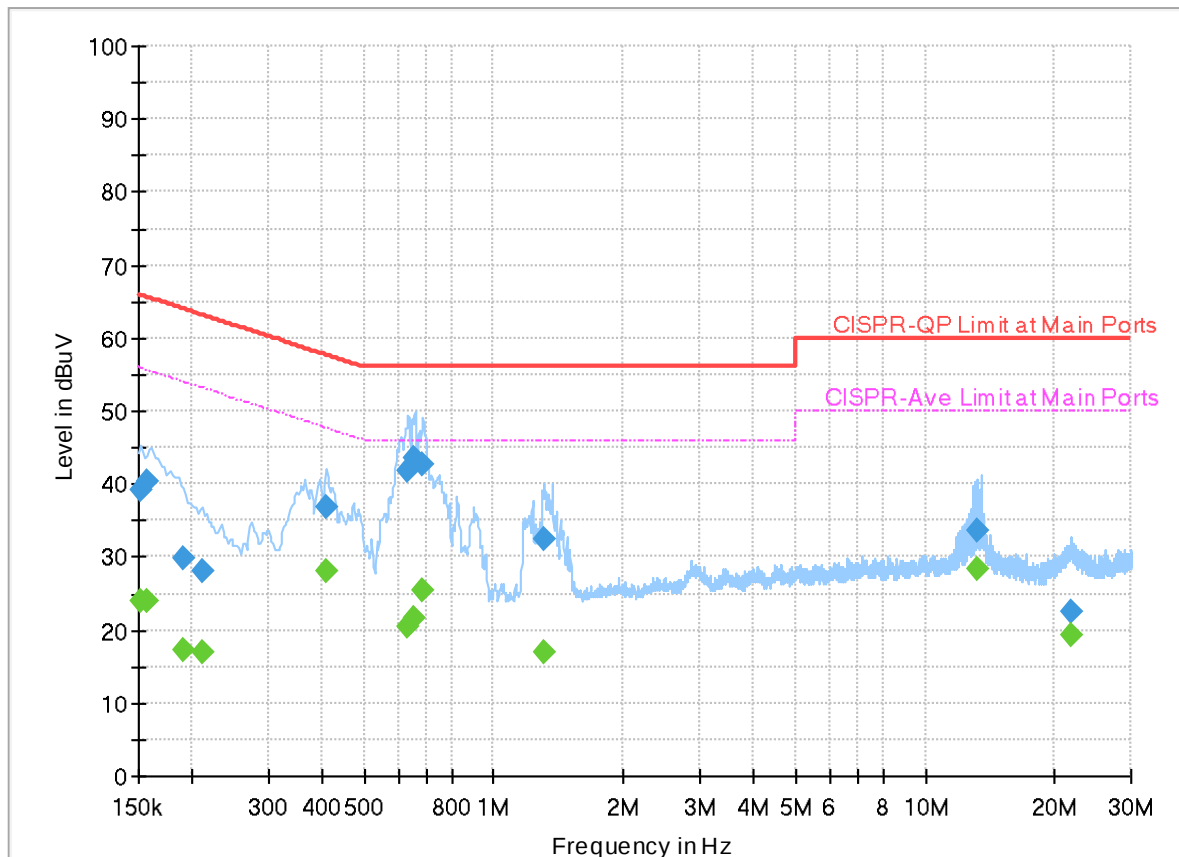
Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	PE	Corr. (dB)
0.169260	---	21.79	55.00	33.21	L1	FLO	20.0
0.169260	38.35	---	65.00	26.65	L1	FLO	20.0
0.181500	---	27.17	54.42	27.25	L1	FLO	20.0
0.181500	41.93	---	64.42	22.49	L1	FLO	20.0
0.194280	---	19.43	53.85	34.42	L1	FLO	20.0
0.194280	32.46	---	63.85	31.39	L1	FLO	20.0
0.223260	---	25.37	52.70	27.33	L1	FLO	20.0
0.223260	36.28	---	62.70	26.42	L1	FLO	20.0
0.406500	---	30.96	47.72	16.76	L1	FLO	20.0
0.406500	35.25	---	57.72	22.47	L1	FLO	20.0
0.627450	---	19.44	46.00	26.56	L1	FLO	20.0
0.627450	41.17	---	56.00	14.83	L1	FLO	20.0
0.652290	---	21.60	46.00	24.40	L1	FLO	20.0
0.652290	42.83	---	56.00	13.17	L1	FLO	20.0
0.681000	---	25.52	46.00	20.48	L1	FLO	20.0
0.681000	42.42	---	56.00	13.58	L1	FLO	20.0
0.752190	---	17.97	46.00	28.03	L1	FLO	20.0
0.752190	33.11	---	56.00	22.89	L1	FLO	20.0
1.362750	---	19.56	46.00	26.44	L1	FLO	20.0

1.362750	32.72	---	56.00	23.28	L1	FLO	20.0
13.271910	---	28.99	50.00	21.01	L1	FLO	20.5
13.271910	33.60	---	60.00	26.40	L1	FLO	20.5
21.898410	---	19.48	50.00	30.52	L1	FLO	20.9
21.898410	23.68	---	60.00	36.32	L1	FLO	20.9

EUT Information

Report NO : 511001
Test Mode : Mode 1
Test Voltage : 120Vac/60Hz
Phase : Neutral

Full Spectrum



Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	PE	Corr. (dB)
0.152228	---	23.85	55.88	32.03	N	FLO	20.0
0.152228	39.05	---	65.88	26.83	N	FLO	20.0
0.156750	---	24.11	55.63	31.52	N	FLO	20.0
0.156750	40.27	---	65.63	25.36	N	FLO	20.0
0.190500	---	17.25	54.02	36.77	N	FLO	20.0
0.190500	29.76	---	64.02	34.26	N	FLO	20.0
0.212280	---	17.02	53.12	36.10	N	FLO	20.0
0.212280	28.21	---	63.12	34.91	N	FLO	20.0
0.409650	---	27.93	47.66	19.73	N	FLO	20.0
0.409650	36.97	---	57.66	20.69	N	FLO	20.0
0.632310	---	20.38	46.00	25.62	N	FLO	20.0
0.632310	41.95	---	56.00	14.05	N	FLO	20.0
0.655530	---	21.55	46.00	24.45	N	FLO	20.0
0.655530	43.50	---	56.00	12.50	N	FLO	20.0
0.681000	---	25.41	46.00	20.59	N	FLO	20.0
0.681000	42.78	---	56.00	13.22	N	FLO	20.0
1.308750	---	17.01	46.00	28.99	N	FLO	20.0
1.308750	32.53	---	56.00	23.47	N	FLO	20.0
13.257240	---	28.32	50.00	21.68	N	FLO	20.5

13.257240	33.51	---	60.00	26.49	N	FLO	20.5
21.876000	---	19.16	50.00	30.84	N	FLO	20.9
21.876000	22.53	---	60.00	37.47	N	FLO	20.9

————THE END————