FCC RADIO TEST REPORT

FCC ID	:	**2AWL7-BS02WF**
Equipment	:	**Wireless Motion Sensor**
Brand Name	:	**BestShape**
Model Name	:	**BS02WF**
Applicant	:	**Wistron Medical Technology Corporation** **5F., No.5, Xin'anRd., East Dist., Hsinchu City 300, Taiwan (ROC)**
Manufacturer	:	**Wistron Corporation** **No.5, Hsin An Road, Hsinchu Science ParkHsinchu, Taiwan, R.O.C.**
Standard	:	**FCC 47 CFR Part 15.255**

The product was received on Apr. 14, 2023 and testing was performed from May 11, 2023 to Jun. 29, 2023. We, Sporton International Inc. Wensan Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures ANSI C63.10-2013 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.)

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Appendix A. AC Conducted Emission Test Result

Appendix B. Setup Photographs

History of this test report

Report No.	Version	Description	Issue Date
FR332423B	01	Initial issue of report	Aug. 23, 2023
FR332423B	02	1. Revise Section 1.1, 3.7.3 and 3.8.4 2. Add note for Transmit Spurious Emission 40GHz to 200GHz Data 3. This report is an updated version, replacing the report issued on Aug. 23, 2023.	Aug. 25, 2023

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Limit	Result (PASS/FAIL)
3.4	§15.255(c)(2)(iii)(A)	Duty Cycle	25.5 ms off time per 33 ms	Pass
3.5	§15.215(c) §15.255(c)(2)(iii)	Emission Bandwidth	20dB bandwidth Within 57 ~ 64GHz	Pass
3.6	§15.255(c)(2)(iii)(A)	Peak EIRP Power	< 14dBm	Pass
3.7	§15.255(d)	Transmitter Spurious Emissions	Below 40GHz refer to 15.209 Above 40GHz: 90 pW/cm² @ 3 m	Pass
3.8	§15.255(f)	Frequency Stability for Temperature & Voltage	Within 57 ~ 64GHz	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/manufacturer 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 Wi-Fi 2.4GHz 802.11b/g/n and 60GHz **Antenna Type** WLAN: PIFA Antenna 60GHz: Antenna-on-Package (AOP) Antenna

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

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
- ANSI C63.10-2013

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

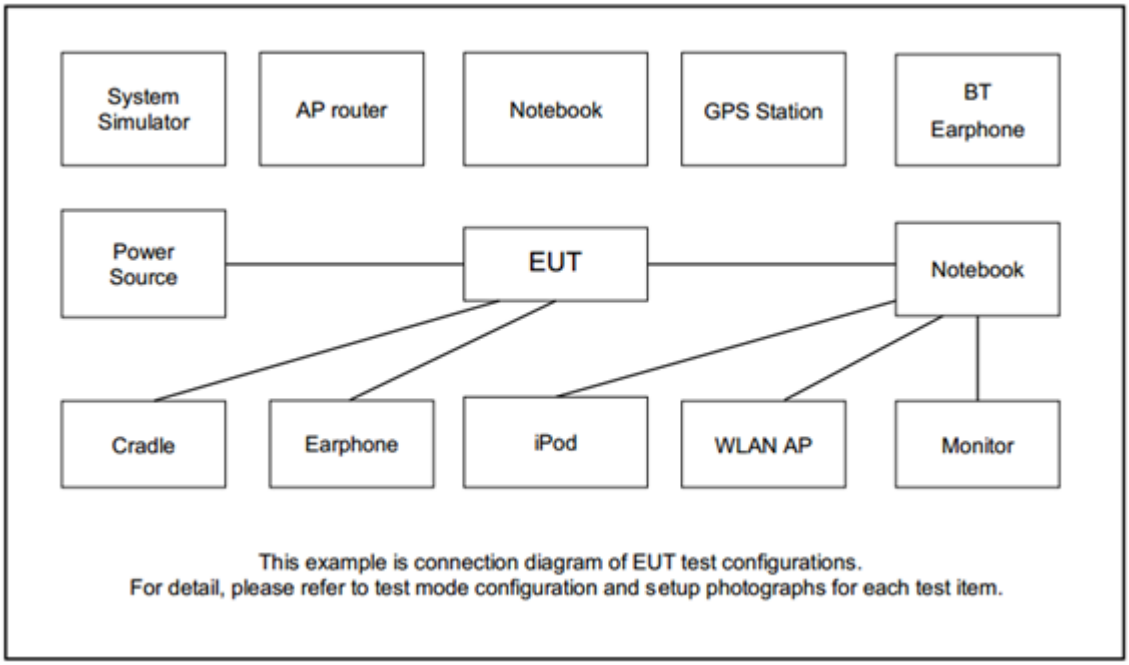
2.1 Test Mode

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 only the worst case emissions were reported in this report.

Frequency Band	Frequency (GHz)	Modulation
57G - 64GHz	60 - 64	FMCW

Test Cases	
AC Conducted Emission	Mode 1 : 60~64GHz Tx + Adapter

2.2 Connection Diagram of Test System



2.3 Support Unit used in test configuration and system

Item	Equipment	Brand Name	Model Name	FCC ID	Data Cable	Power Cord
1.	WLAN AP	ASUS	RT-AC52	MSQ-RTAC4A00	N/A	Unshielded, 1.8 m
2.	Notebook	Dell	P79G	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m

2.4 Far Field Condition for Frequency above 18GHz

Horn Antenna	Frequency (GHz)	Antenna Dimension A (mm)	Wavelength (λ) (m)	Far field R (m) >= $2A^2/\lambda$	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	0.6	
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: The measurement distance may be far than the measurement distance above.

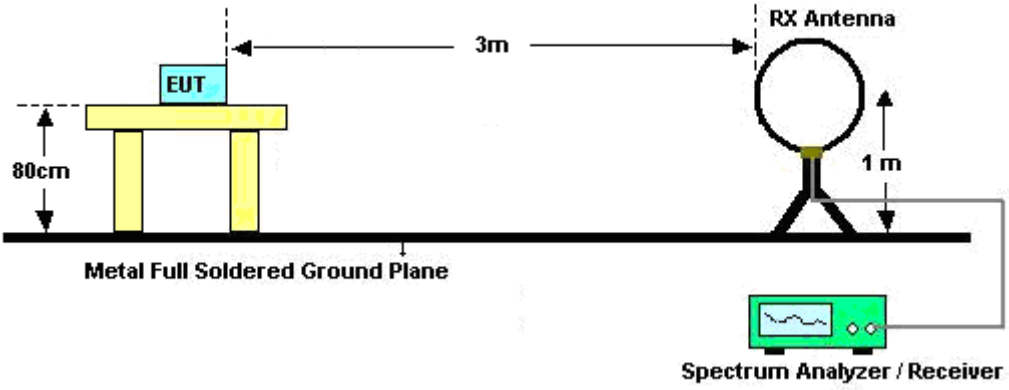
3 Radiated Test Items

3.1 Measuring Instruments

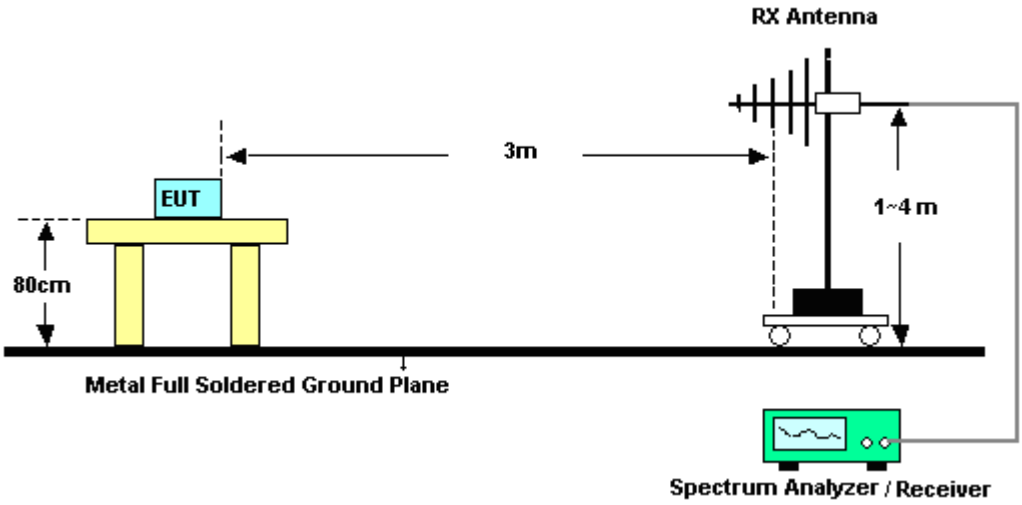
See list of measuring instruments of this test report.

3.2 Test Setup

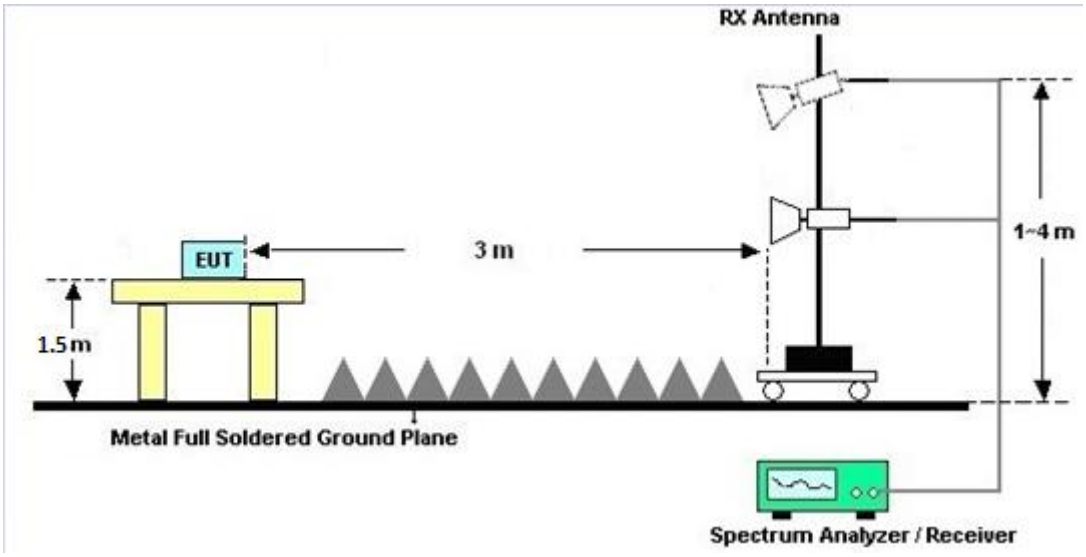
For radiated emissions from 9kHz to 30MHz



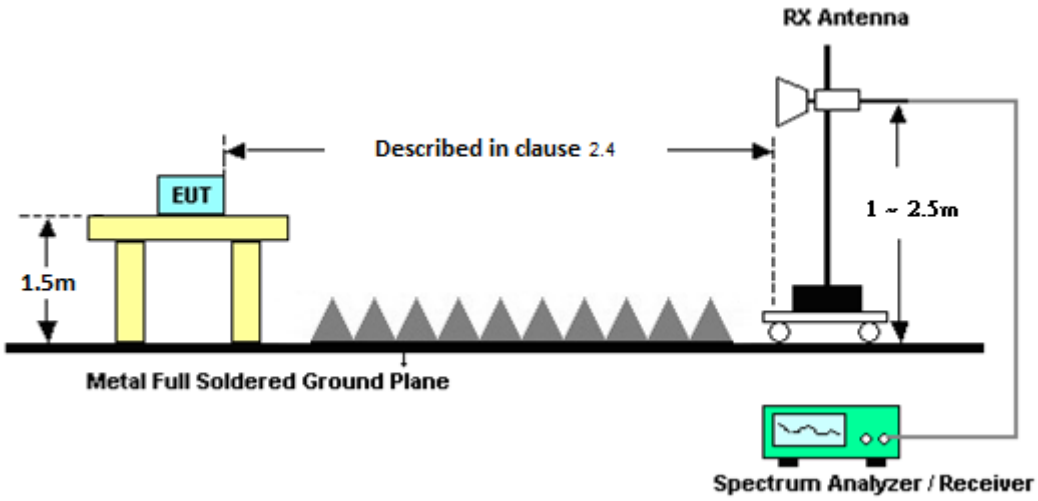
For radiated emissions from 30MHz to 1GHz



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 Duty Cycle

3.4.1 Limit of Duty Cycle Measurement

Per Part 15.255(c)(2)(iii) 57.0–64.0 GHz:

(A) The peak EIRP shall not exceed 14 dBm, and the sum of continuous transmitter off-times of at least two milliseconds shall equal at least 25.5 milliseconds within any contiguous interval of 33 milliseconds.

3.4.2 Measuring Instruments

See list of measuring equipment of this test report.

3.4.3 Test Procedures

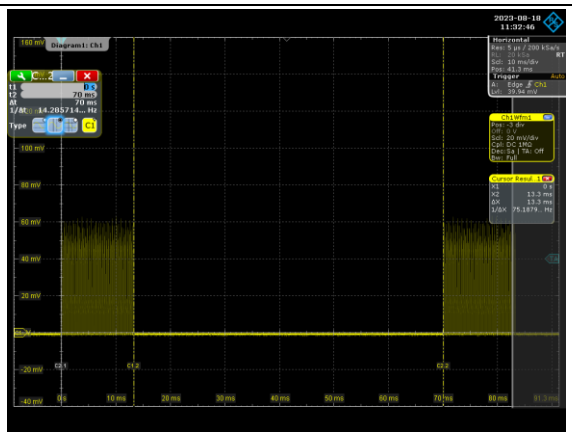
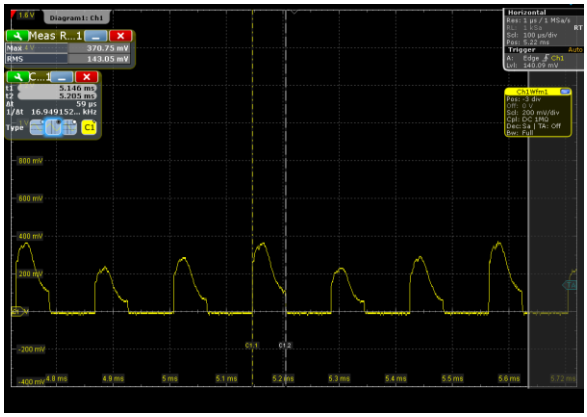
The testing follows ANSI C63.10-2013 Section 9.11

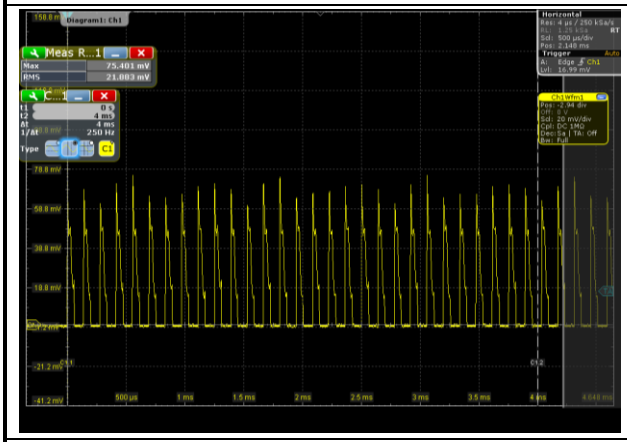
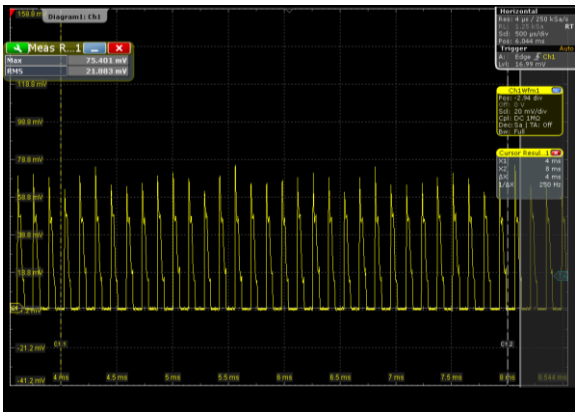
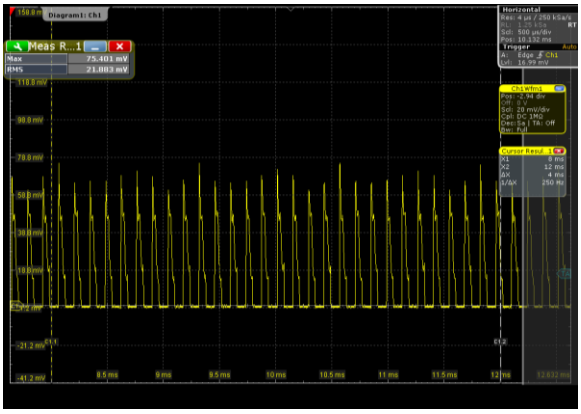
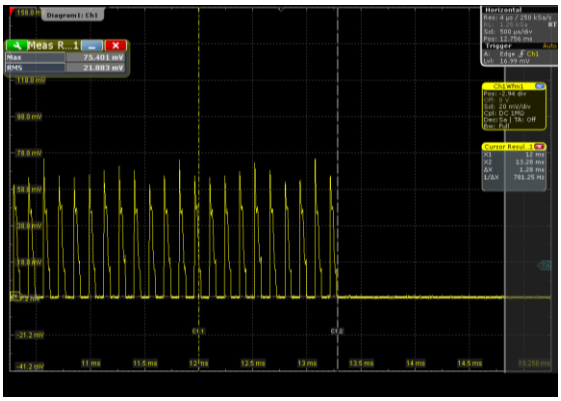
3.4.4 Test Results

Chirp Width	Chirp numbers per 33 ms	On Time per 33 ms	Off Time per 33 ms	limit	Result
59µs	96	5.664ms	27.336ms	> 25.5ms	Pass

Note: On time per 33ms = Chirp numbers (96) x Chirp Width (59µs)

3.4.5 Test Plot

Burst Period	Chirp Width
	

Chirp Numbers(0ms~4ms) : 29	Chirp Numbers(4ms~8ms) : 29
	
Chirp Numbers(8ms~12ms) : 29	**Chirp Numbers(12ms~13.28ms) : 9**
	

3.5 Emission Bandwidth

3.5.1 Limit of Emission Bandwidth Measurement

99% Occupied Bandwidth and 6dB Bandwidth are for reporting only.

Limit for 20 dB Bandwidth: Per Part 15.215(c), the device shall operate in the 57 - 64 GHz band.

The emission bandwidth (EBW) is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least the specified amount below the maximum level of the modulated carrier.

3.5.2 Measuring Instruments

See list of measuring equipment of this test report.

3.5.3 Test Procedures

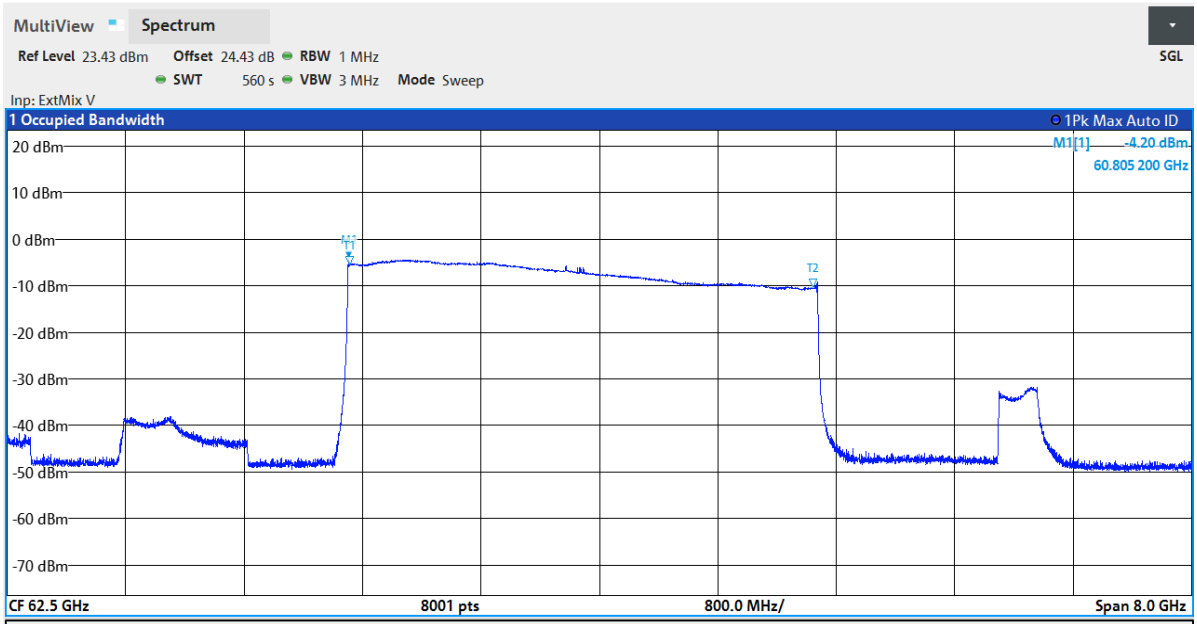
The testing follows ANSI C63.10-2013 Section 9.3.

3.5.4 Test Results

Temperature	20~25℃		**Relative Humidity**	50~60%
Test Engineer	Leo Li			
99% Occupied Bandwidth (GHz)			**Limit (GHz)**	
3.1329			Report Only	
6dB Bandwidth (GHz)			**Limit (GHz)**	
3.1736			Report Only	
20dB Bandwidth Measurement				
Bandwidth (GHz)	**Low Frequency (GHz)**	**High Frequency (GHz)**	**Limit**	**Result**
3.1946	60.7882	63.9829	Within 57 ~ 64GHz	Pass

3.5.5 Test Plots

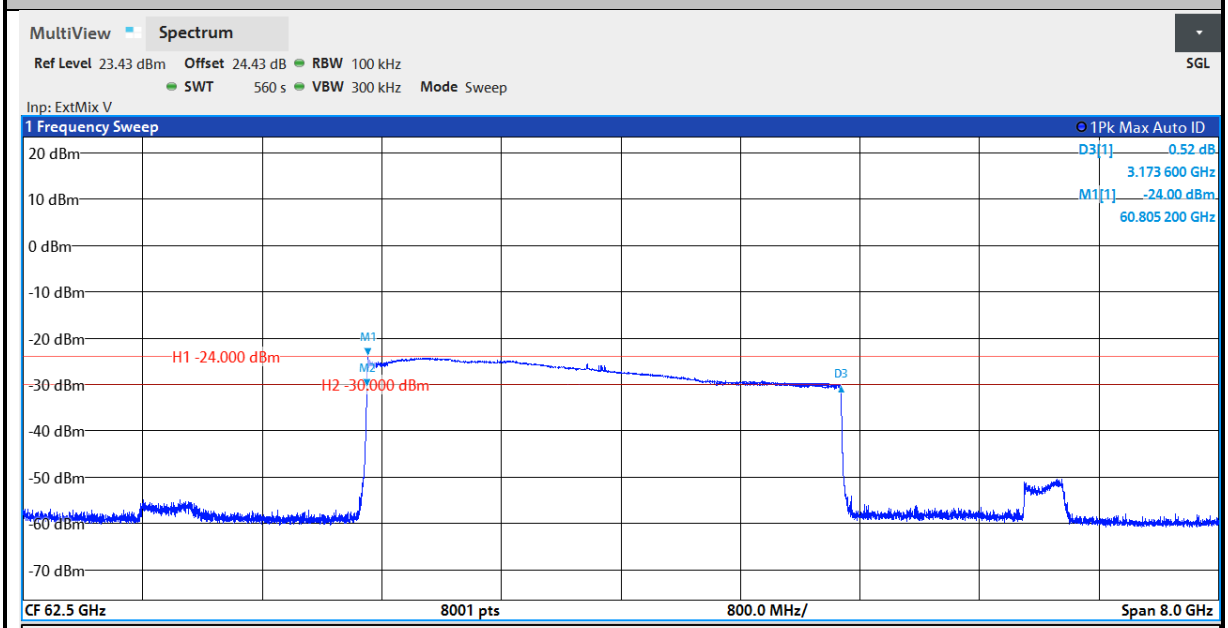
99% Occupied Bandwidth



2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	60.805 2 GHz	-4.20 dBm	Occ Bw	3.132 928 407 GHz
T1		1	60.810 064 GHz	-5.61 dBm	Occ Bw Centroid	62.376 528 431 GHz
T2		1	63.942 993 GHz	-10.48 dBm	Occ Bw Freq Offset	-123.471 569 442 MHz

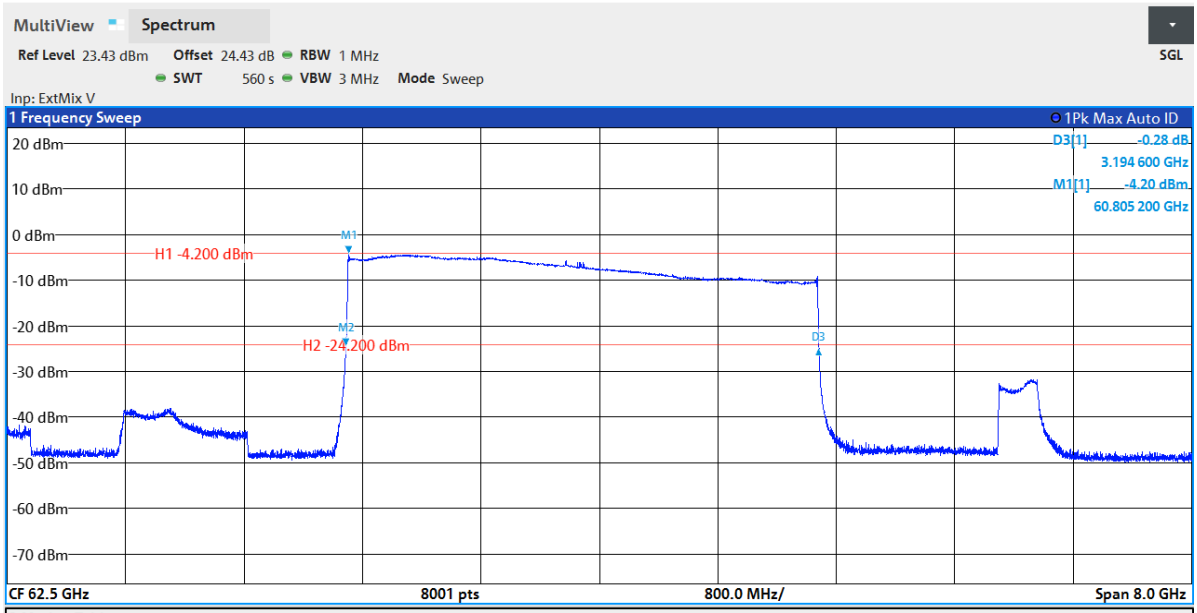
6dB bandwidth



2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	60.805 2 GHz	-24.00 dBm		
M2		1	60.800 2 GHz	-30.63 dBm		
D3	M2	1	3.173 6 GHz	0.52 dB		

20 dB Bandwidth



2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	60.805 2 GHz	-4.20 dBm		
M2		1	60.788 2 GHz	-24.48 dBm		
D3	M2	1	3.194 6 GHz	-0.28 dB		

3.6 EIRP Power Measurement

3.6.1 Limit of EIRP Power Measurement

Regulation	Product Type	Peak EIRP Power (dBm)
FCC 15.255(c)(2)(iii)(A)	Field disturbance sensors	14

3.6.2 Measuring Instruments

See list of measuring equipment of this test report.

3.6.3 Test Procedures

The testing follows ANSI C63.10-2013 Section 9.4, 9.5 and 9.11.

3.6.4 Test Results

Temperature	20~25℃	Relative Humidity	50~60%
Test Engineer	Leo Li		

EIRP Power Measurement								
Frequency (GHz)	Measure Dist. (m)	Measure Ant Gain (dBi)	DSO (mV)	Power measured (dBm)	Emeas (dBuV/m)	EIRP (dBm)	EIRP Limit (dBm) Peak	Result
63.17	0.63	22.4	63.172	-28.39	122.478	13.76	14	PASS

For radiated emissions, calculate the field strength (E) in dBµV/meter.

E = 126.8 – 20*log(λ) + P – G

where:

E : is the field strength of the emission at the measurement distance, in dBµV/m

P : is the power measured at the output of the test antenna, in dBm

λ: is the wavelength of the emission under investigation [300/fMHz], in m

G : is the gain of the test antenna, in dBi For radiated emissions, calculate the EIRP (dBm). If the measurement was performed in the far field, calculate the EIRP.

EIRP = E-meas +20*log(d-meas)-104.7

where:

EIRP : is the equivalent isotopically radiated power, in dBm

E-meas. : is the field strength of the emission at the measurement distance, in dBµV/m

d-meas. : is the measurement distance, in m

NOTE 1: The comparison method which replaces EUT with a signal generator is used to find the correct conversion factor between “DSO(mV)” & “Power Measured(dBm)”.

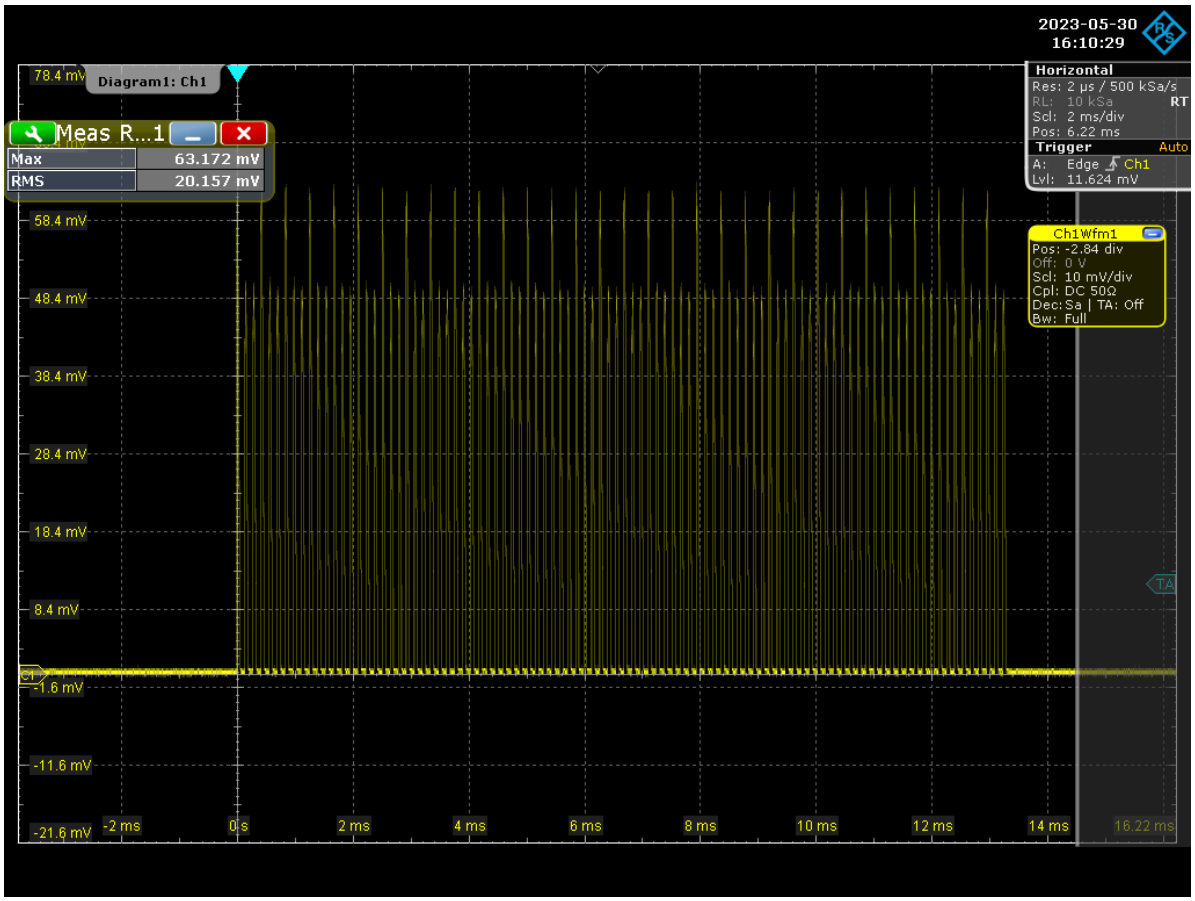
Calculation example:

E(dBuV/m) = 126.8 – 20*log(λ) + P – G, where f=63.17GHz, P= -28.39dBm, G= 22.4dBi, then E = 122.478 (dBuV/m)

EIRP (dBm) = E(dBuV/m) + 20*log (d) – 104.7 = 122.478 (dBuV/m) + 20*log(d=0.63) – 104.7 = 13.76dBm

3.6.5 Test Plots

DSO data



3.7 Transmit Spurious Emission

3.7.1 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.

3.7.2 Measuring Instruments

See list of measuring equipment of this test report.

3.7.3 Test Procedures

The testing follows ANSI C63.10-2013 Section 9.12 and 9.13.

For above 40GHz emission:

EIRP = Prx –Grx + Free space loss = Prx – Grx + 20*log(4π d/ λ) + Path Loss

Which

Prx = Read Level

Grx = Rx Antenna Gain

A distance factor is offset and formula is 20*log(D1/D2)

Which

D1 = Specification distance = 3m

D2 = Measurement distance

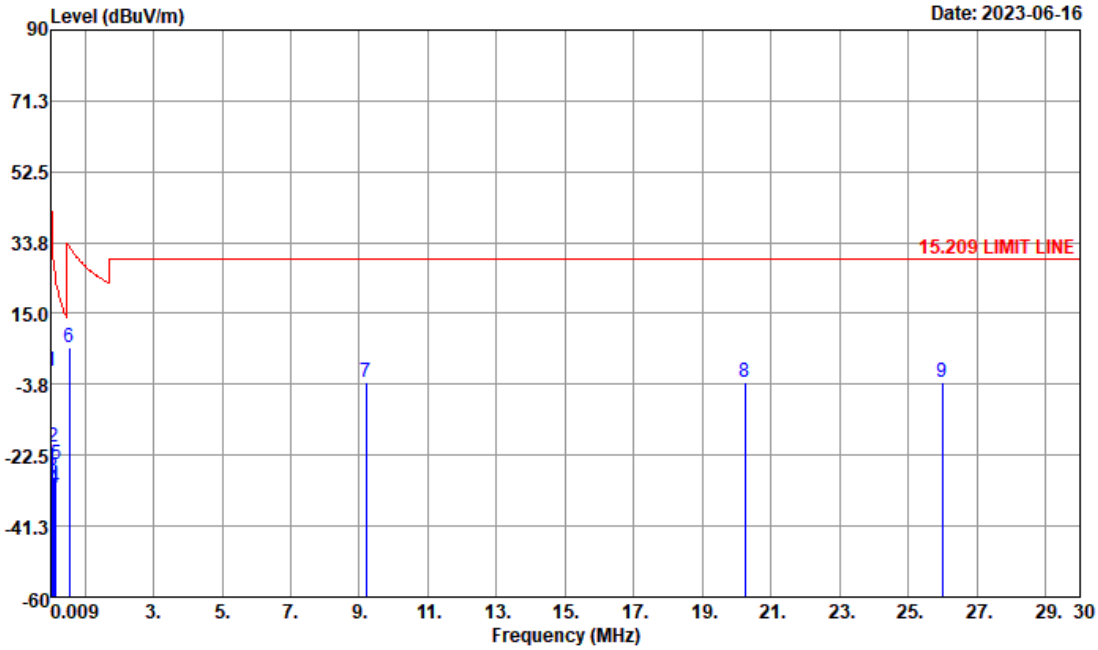
Power Density (W/m^2) = 10^[(EIRP-30)/10] / 4π d

Power Density (pW/cm^2) = Power Density (W/m^2) * 10^(-8)

3.7.4 Test Result

<Below 30MHz>

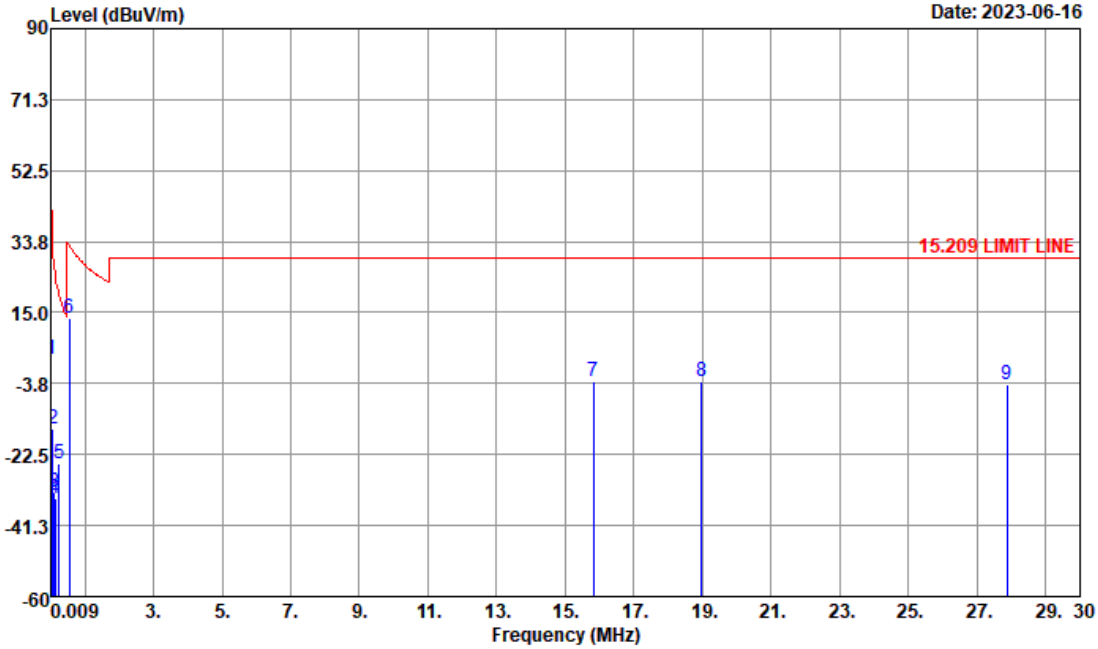
Temperature	20.3 ~ 21.3℃	**Relative Humidity**	56.5 ~ 66.3%
Test Engineer	Troye Hsieh and Yuan Lee	**Test Distance**	3m
Test Range	9KHz to 30MHz	**Test Polarization**	Horizontal
Remark	1. Level (dBμV/m) = Read Level (dBμV) + Antenna Factor (dB) + Cable Loss (dB) + Distance extrapolation factor (dB). 2. Distance extrapolation factor (dB) = 40 log (specific distance / test distance)		



Site : 03CH11-HY
Condition : 15.209 LIMIT LINE 3m LOOP_100488_220920 HORIZONTAL
: .
Detector : Peak
Project : 332423

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	0.01925	-0.22	-80	-42.14	41.92	59.93	19.83	0.02	-	-	Average
2	0.06663	-20.40	-80	-51.53	31.13	39.86	19.72	0.02	-	-	Average
3	0.09664	-28.23	-80	-56.13	27.90	32.10	19.65	0.02	-	-	QP
4	0.11516	-31.34	-80	-57.72	26.38	29.02	19.62	0.02	-	-	Average
5	0.15612	-25.02	-80	-48.76	23.74	35.33	19.62	0.03	-	-	Average
6	0.55008	6.05	-40	-26.75	32.80	26.46	19.55	0.04	-	-	QP
7	9.20000	-3.03	-40	-32.53	29.50	17.23	19.59	0.15	-	-	QP
8	20.2390	-3.13	-40	-32.63	29.50	16.67	20.02	0.18	-	-	QP
9	27.6050	-3.65	-40	-33.15	29.50	15.57	20.54	0.24	-	-	QP

Temperature	20.3 ~ 21.3℃	**Relative Humidity**	56.5 ~ 66.3%
Test Engineer	Troye Hsieh and Yuan Lee	**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)		

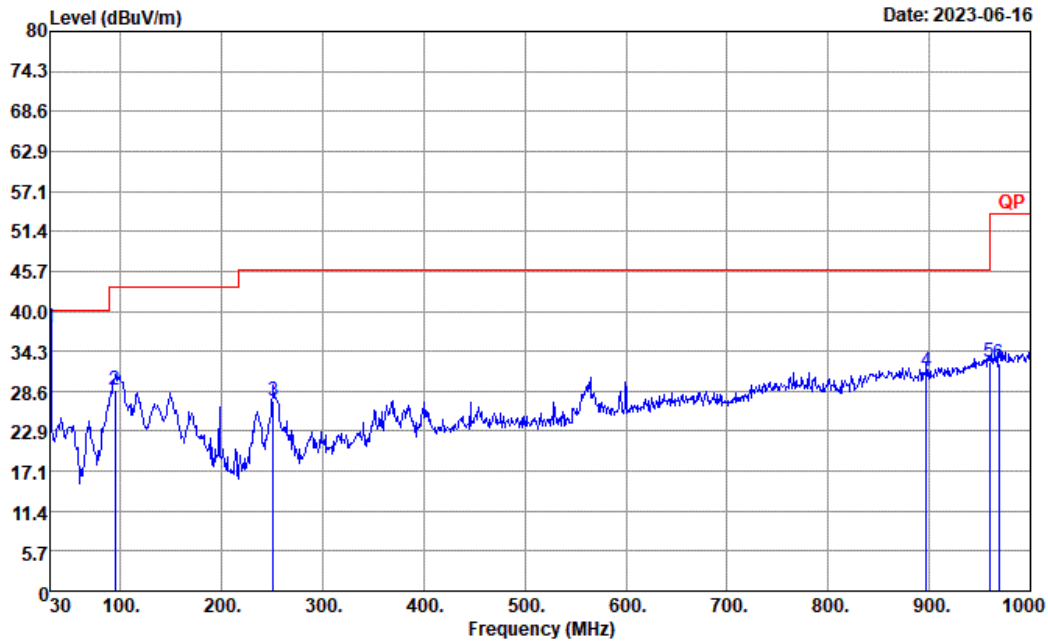


Site : 03CH11-HY
Condition : 15.209 LIMIT LINE 3m LOOP_100488_220920 VERTICAL
: .
Detector : Peak
Project : 332423

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	0.01925	2.49	-80	-39.43	41.92	62.64	19.83	0.02	-	-	Average
2	0.06669	-15.53	-80	-46.65	31.12	44.73	19.72	0.02	-	-	Average
3	0.10364	-32.48	-80	-59.77	27.29	27.88	19.62	0.02	-	-	QP
4	0.13496	-33.94	-80	-58.94	25.00	26.41	19.62	0.03	-	-	Average
5	0.24588	-24.87	-80	-44.66	19.79	35.51	19.58	0.04	-	-	Average
6	0.55008	13.61	-40	-19.19	32.80	34.02	19.55	0.04	-	-	QP
7	15.8320	-3.26	-40	-32.76	29.50	16.88	19.66	0.20	-	-	QP
8	18.9700	-3.22	-40	-32.72	29.50	16.72	19.88	0.18	-	-	QP
9	27.8650	-3.89	-40	-33.39	29.50	15.40	20.54	0.17	-	-	QP

<30MHz to 1GHz>

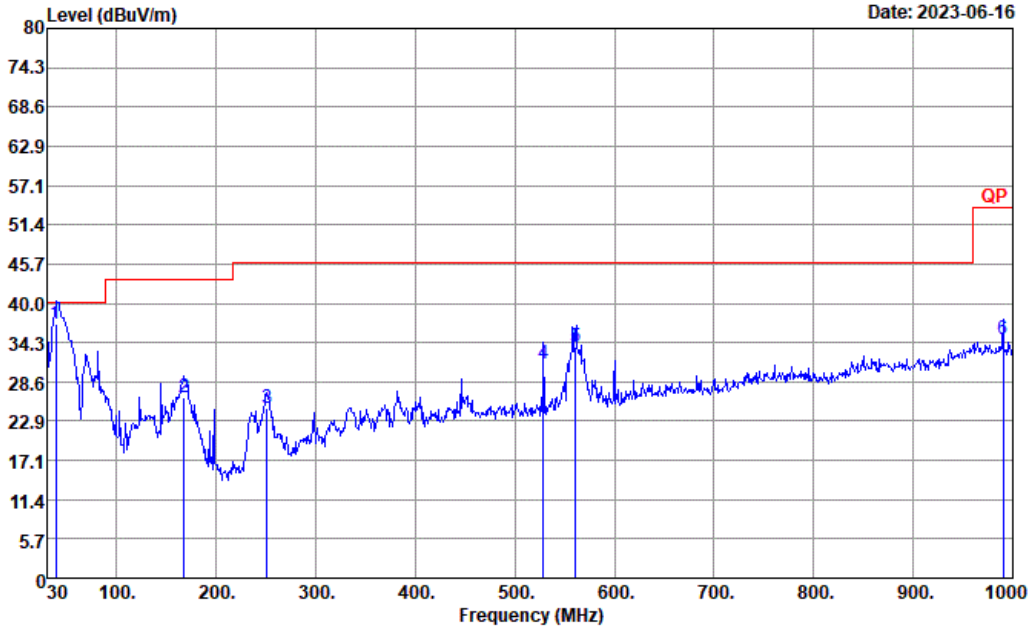
Temperature	20.3 ~ 21.3℃	**Relative Humidity**	56.5 ~ 66.3%
Test Engineer	Troye Hsieh and Yuan Lee	**Test Distance**	3m
Test Range	30MHz to 1GHz	**Test Polarization**	Horizontal
Remark	1. Level (dBμV/m) = Read Level (dBμV) + Antenna Factor (dB) + Path Loss(dB) - Preamp Factor (dB) 2. Path Loss(dB) = Cable loss(dB) + Filter loss(dB)		



Site : 03CH11-HY
Condition : QP 3m 2_BILOG_35414_221008 HORIZONTAL
: RBW:120.000KHz VBW:300.000KHz SWT:0.500sec
: .
Detector : Peak
Project : 332423

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	37.63	-2.37	40.0	45.02	23.92	0.84	32.15	100	319	QP
2	94.26	28.86	-14.64	43.5	44.32	15.10	1.57	32.13	200	305	QP
3	251.13	27.15	-18.85	46.0	38.52	18.20	2.46	32.03	100	357	QP
4	897.10	31.46	-14.54	46.0	29.83	28.50	4.39	31.26	150	190	QP
5	959.40	32.76	-13.24	46.0	28.11	30.66	4.69	30.70	200	84	QP
6	968.50	32.62	-21.38	54.0	27.98	30.53	4.72	30.61	200	0	QP

Temperature	20.3 ~ 21.3℃	**Relative Humidity**	56.5 ~ 66.3%
Test Engineer	Troye Hsieh and Yuan Lee	**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)		

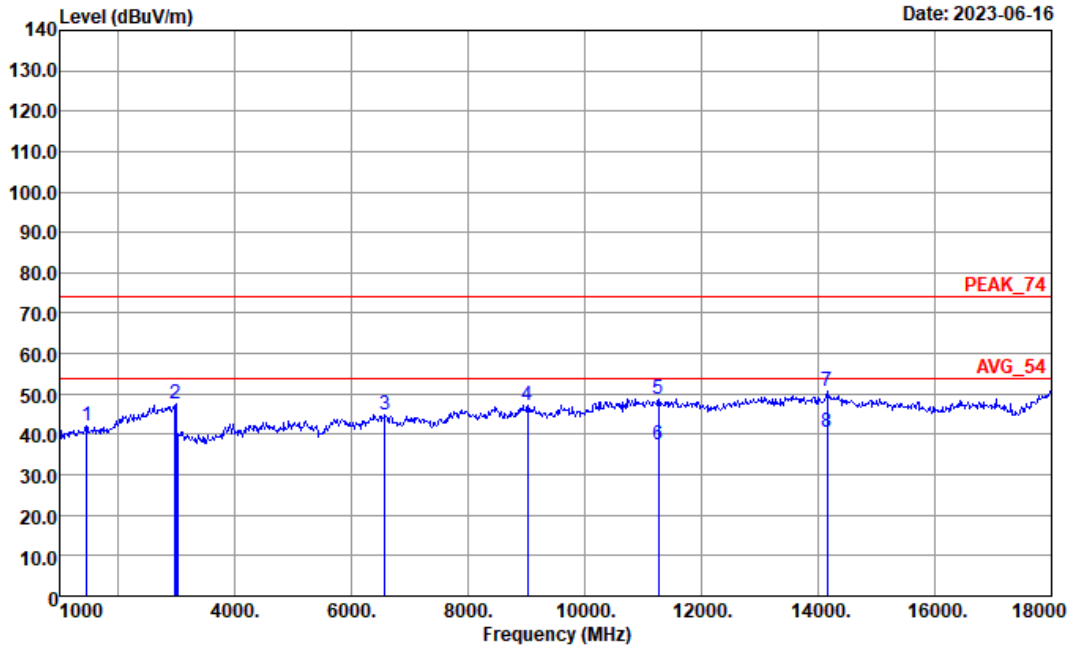


Site : 03CH11-HY
Condition : QP 3m 2_BILOG_35414_221008 VERTICAL
: RBW:120.000KHz VBW:300.000KHz SWT:0.500sec
: .
Detector : Peak
Project : 332423

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	39.18	37.06	-2.94	40.0	48.54	19.66	1.07	32.21	100	55	QP
2	167.43	26.39	-17.11	43.5	40.88	15.55	2.04	32.08	100	360	QP
3	250.59	24.80	-21.20	46.0	36.24	18.13	2.46	32.03	100	352	QP
4	528.20	31.17	-14.83	46.0	36.03	23.65	3.53	32.04	100	360	QP
5	561.10	33.70	-12.30	46.0	36.22	25.84	3.62	31.98	100	300	QP
6	990.20	34.65	-19.35	540	30.16	30.11	4.77	30.39	100	127	QP

<1GHz to 18GHz>

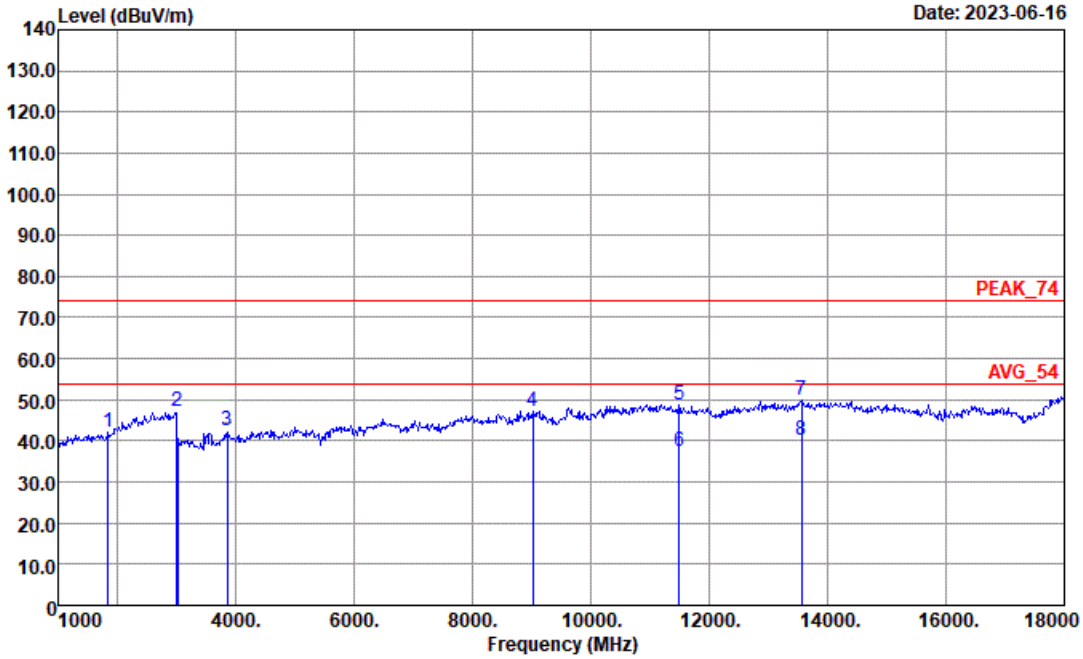
Temperature	20.3 ~ 21.3℃	**Relative Humidity**	56.5 ~ 66.3%
Test Engineer	Troye Hsieh and Yuan Lee	**Test Distance**	3m
Test Range	1GHz to 18GHz	**Test Polarization**	Horizontal
Remark	1. Level (dBμV/m) = Read Level (dBμV) + Antenna Factor (dB) + Path Loss(dB) - Preamp Factor (dB) 2. Path Loss(dB) = 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_220824 HORIZONTAL
: .
Project : 332423

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	1460	42.10	-31.90	74	45.86	25.74	5.52	35.02	-	-	Peak
2	2986	47.69	-26.31	74	44.37	29.46	7.95	34.09	-	-	Peak
3	6570	44.75	-29.25	74	54.11	35.62	13.68	58.66	-	-	Peak
4	9015	47.21	-26.79	74	51.28	37.93	16.23	58.23	-	-	Peak
5	11265	48.93	-25.07	74	52.69	39.17	18.22	61.15	100	76	Peak
6	11265	37.29	-16.71	54	41.05	39.17	18.22	61.15	100	76	Average
7	14160	50.68	-23.32	74	52.35	40.66	20.7	63.03	100	53	Peak
8	14160	40.55	-13.45	54	42.22	40.66	20.7	63.03	100	53	Average

Temperature	20.3 ~ 21.3℃	**Relative Humidity**	56.5 ~ 66.3%
Test Engineer	Troye Hsieh and Yuan Lee	**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.		

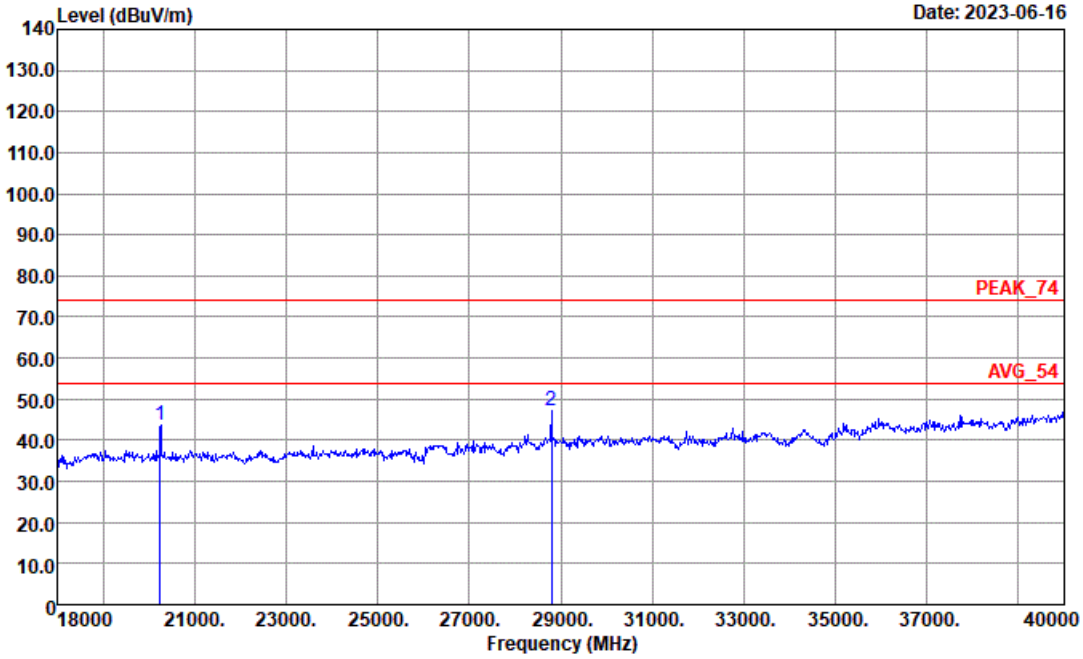


Site : 03CH11-HY
Condition : PEAK_74 3m 9120D_01620_220824 VERTICAL
: .
Project : 332423

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	1840	41.95	-32.05	74	44.76	25.44	6.26	34.51	-	-	Peak
2	3000	47.12	-26.88	74	43.64	29.60	7.97	34.09	-	-	Peak
3	3855	40.97	-26.03	74	57.12	31.01	10.81	57.97	-	-	Peak
4	9015	47.20	-26.80	74	51.27	37.93	16.23	58.23	-	-	Peak
5	11490	48.63	-25.37	74	52.32	39.21	18.36	61.26	100	183	Peak
6	11490	37.47	-16.53	54	41.16	39.21	18.36	61.26	100	183	Average
7	13560	49.72	-24.28	74	51.79	40.32	20.19	62.58	100	133	Peak
8	13560	40.00	-14.00	54	42.07	40.32	20.19	62.58	100	133	Average

<18GHz to 40GHz>

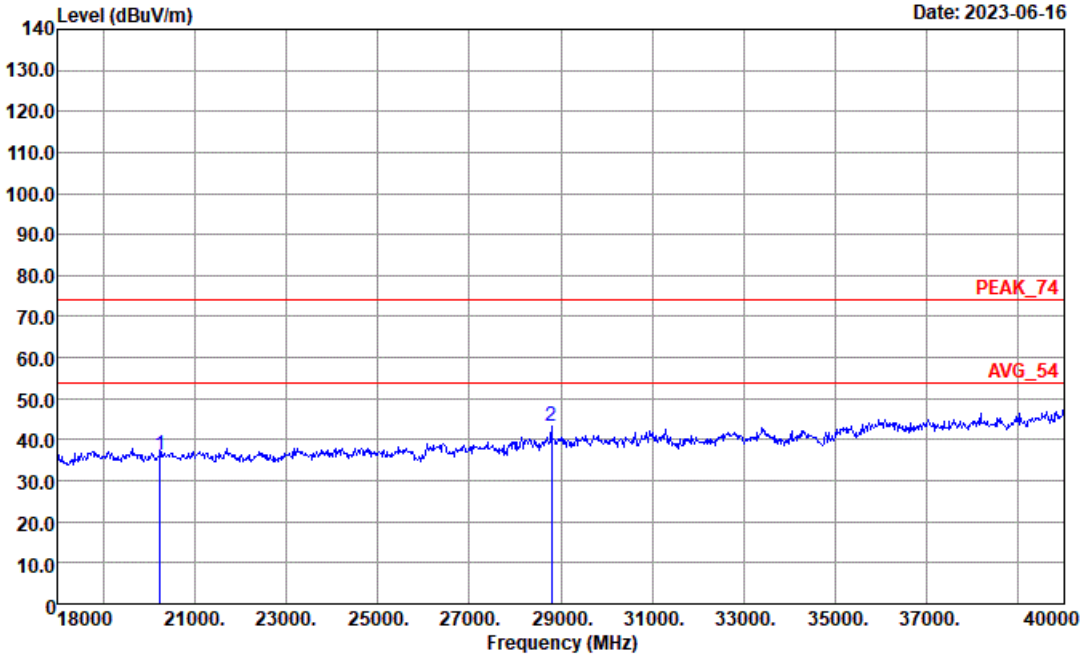
Temperature	20.3 ~ 21.3℃	**Relative Humidity**	56.5 ~ 66.3%
Test Engineer	Troye Hsieh and Yuan Lee	**Test Distance**	1m
Test Range	18GHz to 40GHz	**Test Polarization**	Horizontal
Remark	1. Level (dBμV/m) = Read Level (dBμV) + Antenna Factor (dB) + Path Loss(dB) - Preamp Factor (dB) 2. Path Loss(dB) = 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. 4. After verification, signals #1 and #2 do not match the FMCW signal characteristics as the fundamental.		



Site : 03CH16-HY
Condition : PEAK_74 1m SHF_00993_221124 HORIZONTAL
: .
Project : 332423

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	20251.8	43.81	-30.19	74	64.03	38.00	-3.32	54.90	-	-	Peak
2	28800.0	47.29	-26.71	74	62.91	40.82	-1.98	54.46	-	-	Peak

Temperature	20.3 ~ 21.3℃	**Relative Humidity**	56.5 ~ 66.3%
Test Engineer	Troye Hsieh and Yuan Lee	**Test Distance**	1m
Test Range	18GHz to 40GHz	**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) + 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. 4. After verification, signals #1 and #2 do not match the FMCW signal characteristics as the fundamental.		



Site : 03CH16-HY
Condition : PEAK_74 1m SHF_00993_221124 VERTICAL
: .
Project : 332423

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	20251.8	36.23	-37.77	74	56.45	38.00	-3.32	54.90	-	-	Peak
2	28800.0	43.16	-30.84	74	58.78	40.82	-1.98	54.46	-	-	Peak

<40GHz to 200GHz>

Temperature	20~25℃	Relative Humidity	50~60%
Test Engineer	Leo Li	Test Range	40GHz to 200GHz

Test Frequency (GHz)	Rx Antenna Gain (dBi)	Measurement Distance (m)	Read Worse Frequency (GHz)	Read Level (dBm)
40 - 57	22.64	0.87	42.0234	-75.24
EIRP (dBm)	**Specification Distance (m)**	**Power Density (pW/cm^2)**	**Limit (pW/cm^2)**	**Test Result**
-31.1	3	0.686353	90	PASS

Note: Path Loss = 0.43 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	22.4	0.6	86.6096	-84.15
EIRP (dBm)	**Specification Distance (m)**	**Power Density (pW/cm^2)**	**Limit (pW/cm^2)**	**Test Result**
-39.03	3	0.110547	90	PASS

Note: Path Loss = 0.43 dB; the calculate of λ using 90GHz as f.

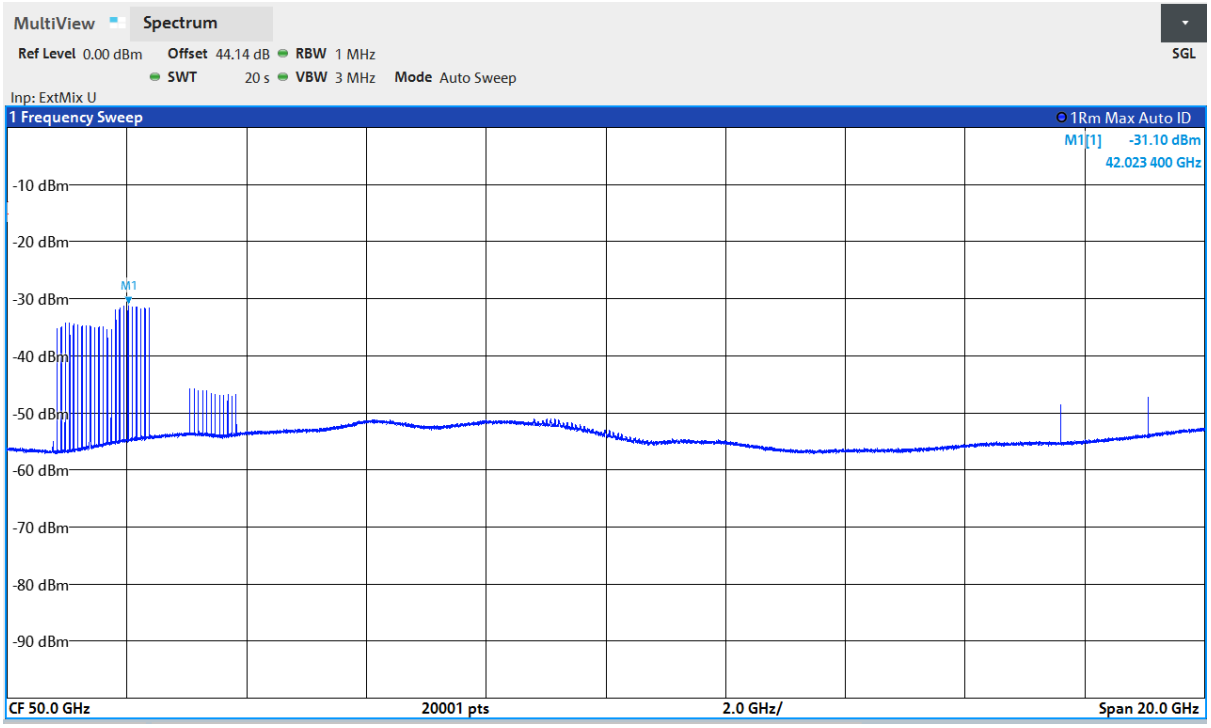
Test Frequency (GHz)	Rx Antenna Gain (dBi)	Measurement Distance (m)	Read Worse Frequency (GHz)	Read Level (dBm)
90 - 140	22.4	0.43	90.2875	-71.15
EIRP (dBm)	**Specification Distance (m)**	**Power Density (pW/cm^2)**	**Limit (pW/cm^2)**	**Test Result**
-25.09	3	2.738720	90	PASS

Note: Path Loss = 0.43 dB; the calculate of λ using 140GHz as f.

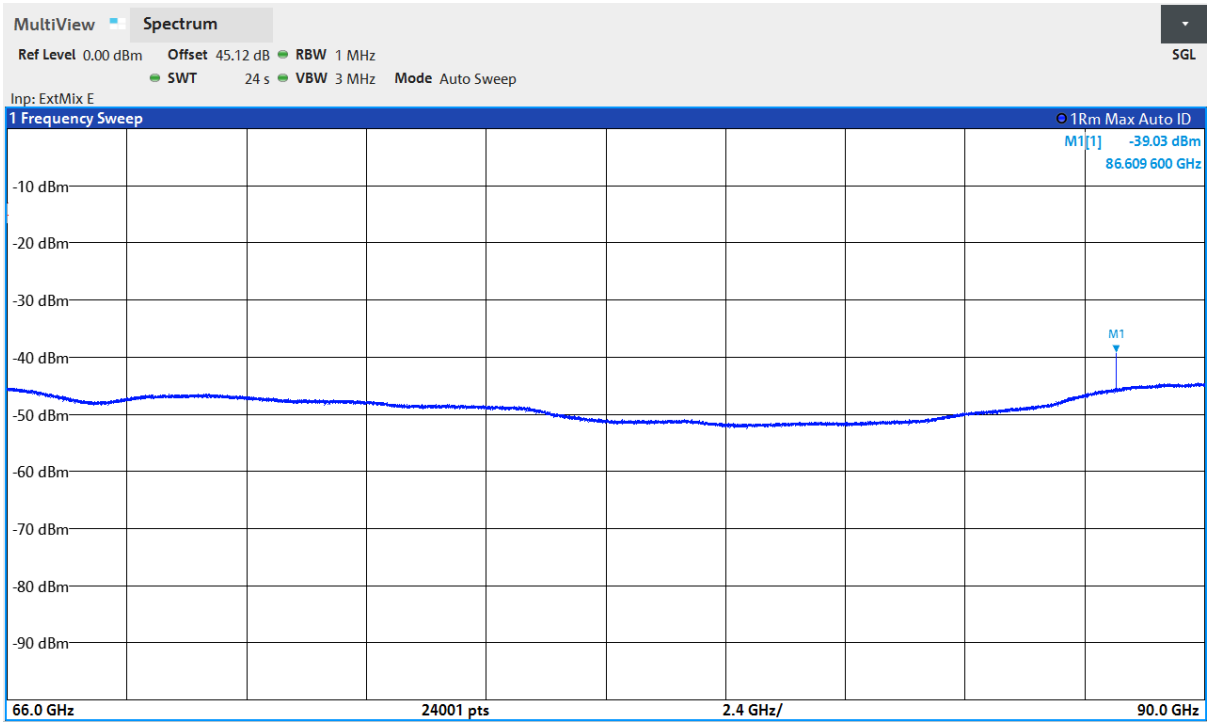
Test Frequency (GHz)	Rx Antenna Gain (dBi)	Measurement Distance (m)	Read Worse Frequency (GHz)	Read Level (dBm)
140 - 200	22.8	0.27	140.1935	-74.86
EIRP (dBm)	**Specification Distance (m)**	**Power Density (pW/cm^2)**	**Limit (pW/cm^2)**	**Test Result**
-30.14	3	0.856146	90	PASS

Note: Path Loss = 0.43 dB; the calculate of λ using 200GHz as f.

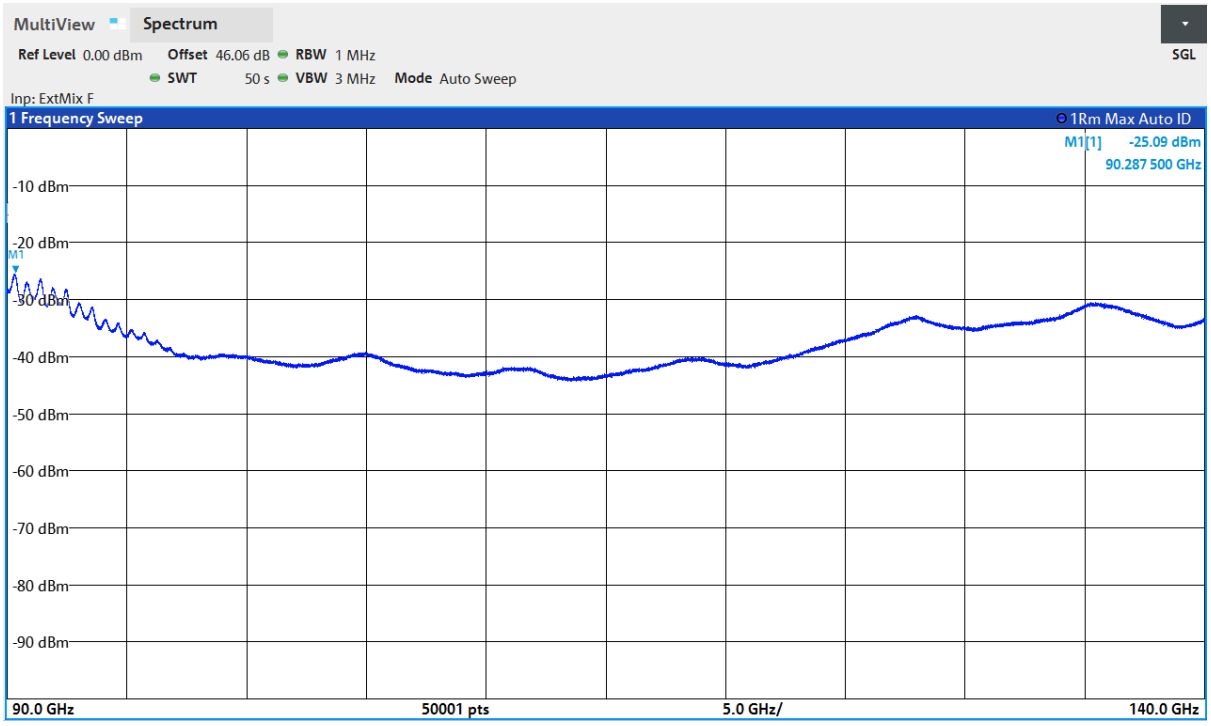
40GHz ~ 57GHz



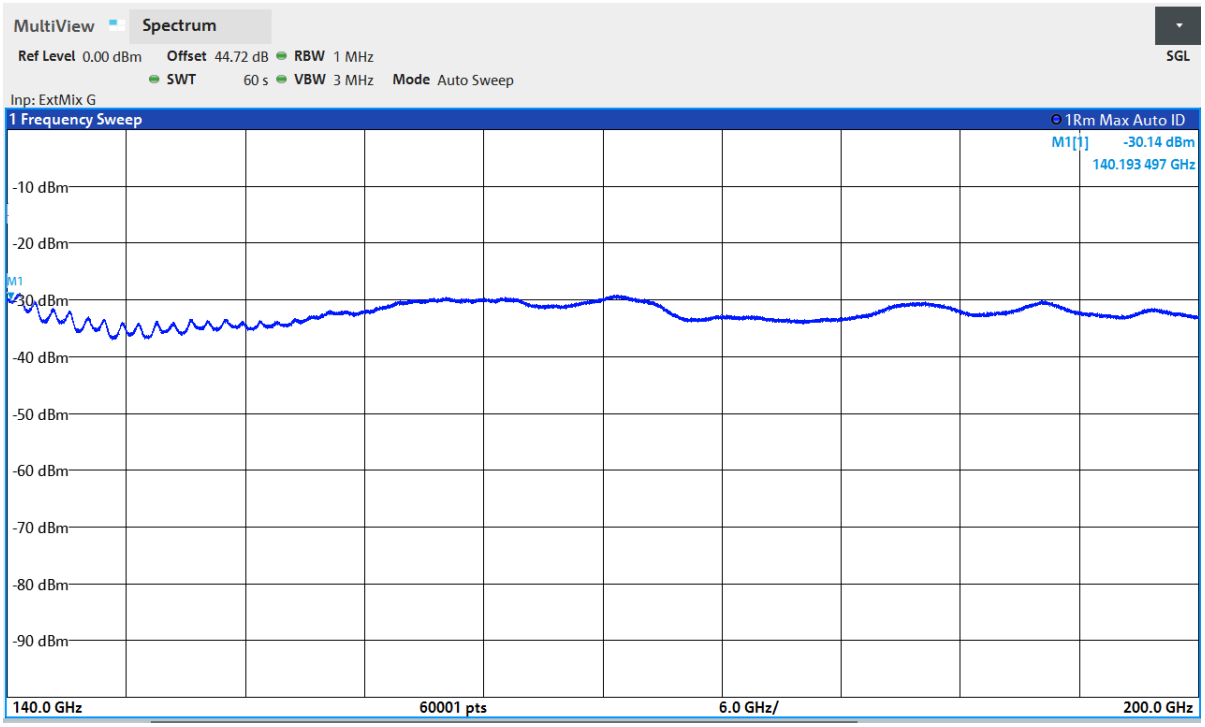
71GHz ~ 90GHz



90GHz ~ 140GHz



140GHz ~ 200GHz



3.8 Frequency Stability

3.8.1 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, 57GHz – 64GHz.

3.8.2 Measuring Instruments

See list of measuring equipment of this test report.

3.8.3 Test Procedures

The testing follows ANSI C63.10-2013 Section 9.14.

3.8.4 Test Result

Test Engineer	Leo Li				
Test Temperature (°C)	Voltage (Volt)	Low Frequency (GHz)	High Frequency (GHz)	Limit	Result
40	120	60.8050	63.8534	Within 57 ~ 64GHz	pass
30	120	60.8051	63.8535		
20	120	60.8088	63.9490		
10	120	60.8053	63.9539		
0	120	60.8055	63.9540		
20	102	60.8055	63.9536		
20	138	60.8054	63.8543		

Note: The device will shut down if the environment temperature is higher than 40°C or lower than 0°C, and there is no signal generated within the temperature range of FCC regulations.

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 (dBμV)	
	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.

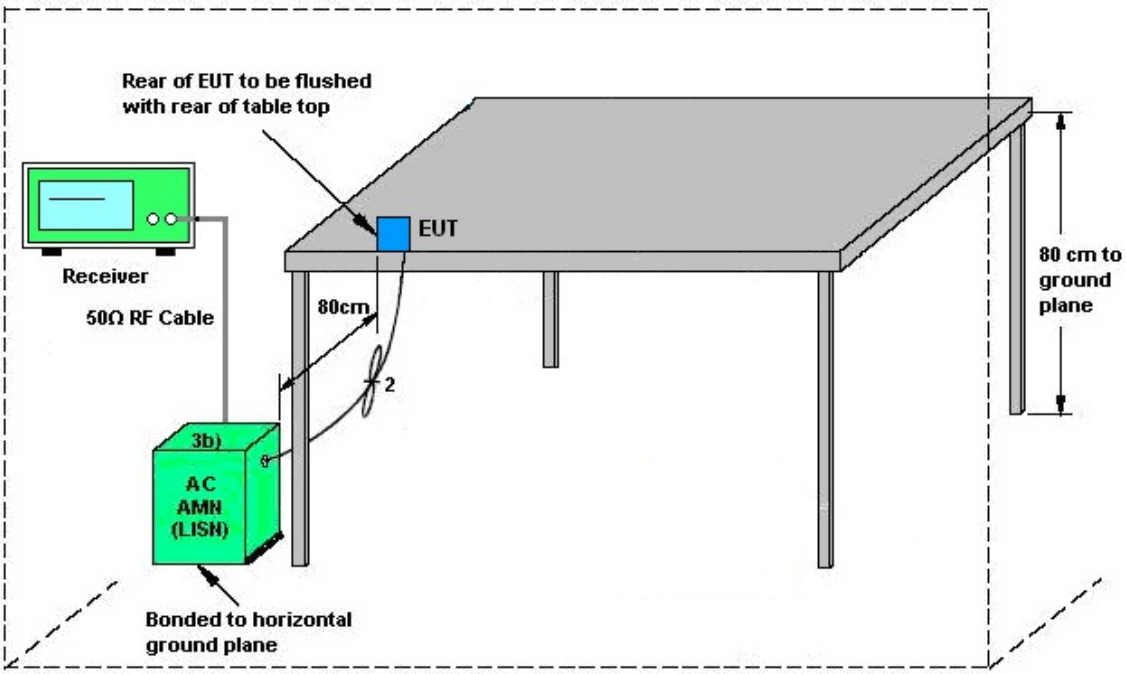
4.2 Measuring Instruments

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



AMN = Artificial mains network (LISN)
AE = Associated equipment
EUT = Equipment under test
ISN = Impedance stabilization network

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
LOOP Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Sep. 20, 2022	Jun. 16, 2023	Sep. 19, 2023	Radiation (03CH11-HY)
Bilog Antenna	TESEQ	CBL 6111D & N-6-06	35414 & AT-N0602	30MHz~1GHz	Oct. 08, 2022	Jun. 16, 2023	Oct. 07, 2023	Radiation (03CH11-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-01620	1GHz~18GHz	Aug. 24, 2022	Jun. 16, 2023	Aug. 23, 2023	Radiation (03CH11-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA9170	00993	18GHz~40GHz	Nov. 24, 2022	Jun. 16, 2023	Nov. 23, 2023	Radiation (03CH11-HY)
Amplifier	SONOMA	310N	187312	9kHz~1GHz	Dec. 09, 2022	Jun. 16, 2023	Dec. 08, 2023	Radiation (03CH11-HY)
Preamplifier	Keysight	83017A	MY53270080	1GHz~26.5GHz	Nov. 09, 2022	Jun. 16, 2023	Nov. 08, 2023	Radiation (03CH11-HY)
Preamplifier	Jet-Power	JPA0118-55-303	1710001800055007	1GHz~18GHz	Jun. 14, 2023	Jun. 16, 2023	Jun. 13, 2024	Radiation (03CH11-HY)
Preamplifier	EMEC	EM18G40G	060801	18GHz~40GHz	Jun. 28, 2022	Jun. 16, 2023	Jun. 27, 2023	Radiation (03CH11-HY)
Spectrum Analyzer	Keysight	N9010A	MY54200486	10Hz~44GHz	Oct. 07, 2022	Jun. 16, 2023	Oct. 06, 2023	Radiation (03CH11-HY)
EMI Test Receiver	Keysight	N9038A(MXE)	MY54130085	20MHz~8.4GHz	Oct. 18, 2022	Jun. 16, 2023	Oct. 17, 2023	Radiation (03CH11-HY)
Controller	EMEC	EM 1000	N/A	Control Turn table & Ant Mast	N/A	Jun. 16, 2023	N/A	Radiation (03CH11-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1~4m	N/A	Jun. 16, 2023	N/A	Radiation (03CH11-HY)
Turn Table	EMEC	TT 2000	N/A	0~360 Degree	N/A	Jun. 16, 2023	N/A	Radiation (03CH11-HY)
Software	Audix	E3 6.2009-8-24	RK-001053	N/A	N/A	Jun. 16, 2023	N/A	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY2859/2	30MHz~40GHz	Mar. 07, 2023	Jun. 16, 2023	Mar. 06, 2024	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	801595/2	30MHz~40GHz	Mar. 07, 2023	Jun. 16, 2023	Mar. 06, 2024	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	803951/2	9K~30M	Mar. 07, 2023	Jun. 16, 2023	Mar. 06, 2024	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	803951/2	30M~40G	Mar. 07, 2023	Jun. 16, 2023	Mar. 06, 2024	Radiation (03CH11-HY)
Filter	Wainwright	WLK4-1000-1530-8000-40SS	SN11	1.53G Low Pass	Sep. 12, 2022	Jun. 16, 2023	Sep. 11, 2023	Radiation (03CH11-HY)
Filter	Wainwright	WHKX12-2700-3000-18000-60SS	SN3	3GHz High Pass Filter	Sep. 12, 2022	Jun. 16, 2023	Sep. 11, 2023	Radiation (03CH11-HY)
Filter	Wainwright	WHKX12-900-1000-15000-60SS	SN12	1GHz High Pass Filter	Sep. 12, 2022	Jun. 16, 2023	Sep. 11, 2023	Radiation (03CH11-HY)
Hygrometer	TECPEL	DTM-303B	TP140325	N/A	Sep. 07, 2022	Jun. 16, 2023	Sep. 06, 2023	Radiation (03CH11-HY)

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	Rohde & Schwarz	FSV3044	101009	9kHz to 44GHz	Nov. 22, 2022	May 11, 2023~ Jun. 29, 2023	Nov. 21, 2023	Radiation (03CH18-HY)
Harmonic Mixer	Rohde & Schwarz	RPG FS-Z60	100986	40GHz to 60GHz	Apr. 09, 2021	May 11, 2023~ Jun. 29, 2023	Apr. 08, 2024	Radiation (03CH18-HY)
Harmonic Mixer	Rohde & Schwarz	RPG FS-Z75	101557	50 GHz to 75 GHz	Apr. 06, 2021	May 11, 2023~ Jun. 29, 2023	Apr. 05, 2024	Radiation (03CH18-HY)
Harmonic Mixer	Rohde & Schwarz	FSZ-90	101811	60GHz to 90GHz	Nov. 16, 2021	May 11, 2023~ Jun. 29, 2023	Nov. 15, 2024	Radiation (03CH18-HY)
Harmonic Mixer	Rohde & Schwarz	RPG FS-Z140	101128	90GHz to 140GHz	Oct. 26, 2020	May 11, 2023~ Jun. 29, 2023	Oct. 25, 2023	Radiation (03CH18-HY)
Harmonic Mixer	Rohde & Schwarz	RPG FS-Z220	101014	140GHz to 220GHz	Dec. 06, 2021	May 11, 2023~ Jun. 29, 2023	Dec. 05, 2024	Radiation (03CH18-HY)
Antenna	Quinstar	QWH-UPRR00	QWH-UPRR 00-01	40-60 GHz	Jul. 06, 2021	May 11, 2023~ Jun. 29, 2023	Jul. 05, 2024	Radiation (03CH18-HY)
Antenna	Quinstar	QWH-VPRR00	1371800009	50-75 GHz	Jul. 06, 2021	May 11, 2023~ Jun. 29, 2023	Jul. 05, 2024	Radiation (03CH18-HY)
Antenna	Quinstar	QWH-VPRR00	1371800008	50-75 GHz	Jul. 06, 2021	May 11, 2023~ Jun. 29, 2023	Jul. 05, 2024	Radiation (03CH18-HY)
Antenna	Quinstar	QWH-EPRR00	1372000000	60-90 GHz	Jul. 06, 2021	May 11, 2023~ Jun. 29, 2023	Jul. 05, 2024	Radiation (03CH18-HY)
Antenna	Quinstar	QWH-FPRR00	1011500008	90-140 GHz	Jul. 06, 2021	May 11, 2023~ Jun. 29, 2023	Jul. 05, 2024	Radiation (03CH18-HY)
Antenna	Quinstar	QWH-GPRR0 0	QWH-GPR R00-01	140-220 GHz	Jul. 06, 2021	May 11, 2023~ Jun. 29, 2023	Jul. 05, 2024	Radiation (03CH18-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	801589/2	N/A	Nov. 29, 2022	May 11, 2023~ Jun. 29, 2023	Nov. 28, 2023	Radiation (03CH18-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	801607/2	N/A	Nov. 29, 2022	May 11, 2023~ Jun. 29, 2023	Nov. 28, 2023	Radiation (03CH18-HY)
Amplifier	Quinstars	QLW-5075453 0-I2	953600006	50 ~ 75 GHz	Jul. 06, 2021	May 11, 2023~ Jun. 29, 2023	Jul. 05, 2024	Radiation (03CH18-HY)
Detector	Quinstars	QEA-FBFBVP	2672009	50 ~ 75 GHz	Jul. 06, 2021	May 11, 2023~ Jun. 29, 2023	Jul. 05, 2024	Radiation (03CH18-HY)
Oscilloscope	Rohde & Schwarz	RTO 1002	400025	600MHz, 10GSa/sec	Sep. 20, 2022	May 11, 2023~ Jun. 29, 2023	Sep. 19, 2023	Radiation (03CH18-HY)
Power Meter	Agilent	E4416A	GB4331230 6	N/A	Apr. 14, 2023	May 11, 2023~ Jun. 29, 2023	Apr. 13, 2024	Radiation (03CH18-HY)
Power Sensor	Keysight	V8486A	MY6017000 2	50 ~ 75 GHz	Jul. 06, 2021	May 11, 2023~ Jun. 29, 2023	Jul. 05, 2024	Radiation (03CH18-HY)
Signal Generator	Anritsu	MG3694C	163401	8MHz~40GHz	Feb. 08, 2023	May 11, 2023~ Jun. 29, 2023	Feb. 07, 2024	Radiation (03CH18-HY)
Active Frequency Multiplier	Eravant	SFA-50375341 6-15KF-E1	03099-01	50 ~ 75 GHz	Jul. 06, 2021	May 11, 2023~ Jun. 29, 2023	Jul. 05, 2024	Radiation (03CH18-HY)
Attenuator	SAGE	STA-30-15-M2	18953-02	50 ~ 75 GHz	Jul. 06, 2021	May 11, 2023~ Jun. 29, 2023	Jul. 05, 2024	Radiation (03CH18-HY)
Thermal Chamber	ESPEC	SU-641	92013721	-30℃ ~70℃	Oct. 17, 2022	May 11, 2023~ Jun. 29, 2023	Oct. 16, 2023	Radiation (03CH18-HY)
AC Power Source	AC POWER	AFC-500W	F104070011	50Hz~60Hz	Sep. 16, 2022	May 11, 2023~ Jun. 29, 2023	Sep. 15, 2023	Radiation (03CH18-HY)

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	May 11, 2023	N/A	Conduction (CO07-HY)
Software	Rohde & Schwarz	EMC32 V10.30	N/A	N/A	N/A	May 11, 2023	N/A	Conduction (CO07-HY)
Pulse Limiter	SCHWARZBECK	VTSD 9561-F N	9561-F N00373	9kHz-200MHz	Nov. 01, 2022	May 11, 2023	Oct. 31, 2023	Conduction (CO07-HY)
RF Cable	HUBER + SUHNER	RG 214/U	1358175	9kHz~30MHz	Mar. 15, 2023	May 11, 2023	Mar. 14, 2024	Conduction (CO07-HY)
Two-Line V-Network	TESEQ	NNB 51	45051	N/A	Mar. 05, 2023	May 11, 2023	Mar. 04, 2024	Conduction (CO07-HY)
Four-Line V-Network	TESEQ	NNB 52	36122	N/A	Mar. 13, 2023	May 11, 2023	Mar. 12, 2024	Conduction (CO07-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102317	9kHz~3.6GHz	Oct. 06, 2022	May 11, 2023	Oct. 05, 2023	Conduction (CO07-HY)

6 Measurement Uncertainty

Test Item	Uncertainty
AC Power Conducted Emission Measurement (150 kHz ~ 30 MHz)	±3.46dB
Radiated Emission Measurement (9 kHz ~ 30 MHz)	±3.9dB
Radiated Emission Measurement (30 MHz ~ 1000 MHz)	±6.3dB
Radiated Emission Measurement (1 GHz ~ 6 GHz)	±4.4dB
Radiated Emission Measurement (6 GHz ~ 18 GHz)	±4.8dB
Radiated Emission Measurement (18 GHz ~ 40 GHz)	±5.3dB
Radiated Emission Measurement (40 GHz ~ 140 GHz)	±5.64dB
Radiated Emission Measurement (140 GHz ~ 200 GHz)	±6.62dB
99% Occupied Bandwidth	±1.324 MHz
6dB Bandwidth	±0.676 MHz
Frequency Stability	±0.671 MHz
Temperature	±0.58 ℃

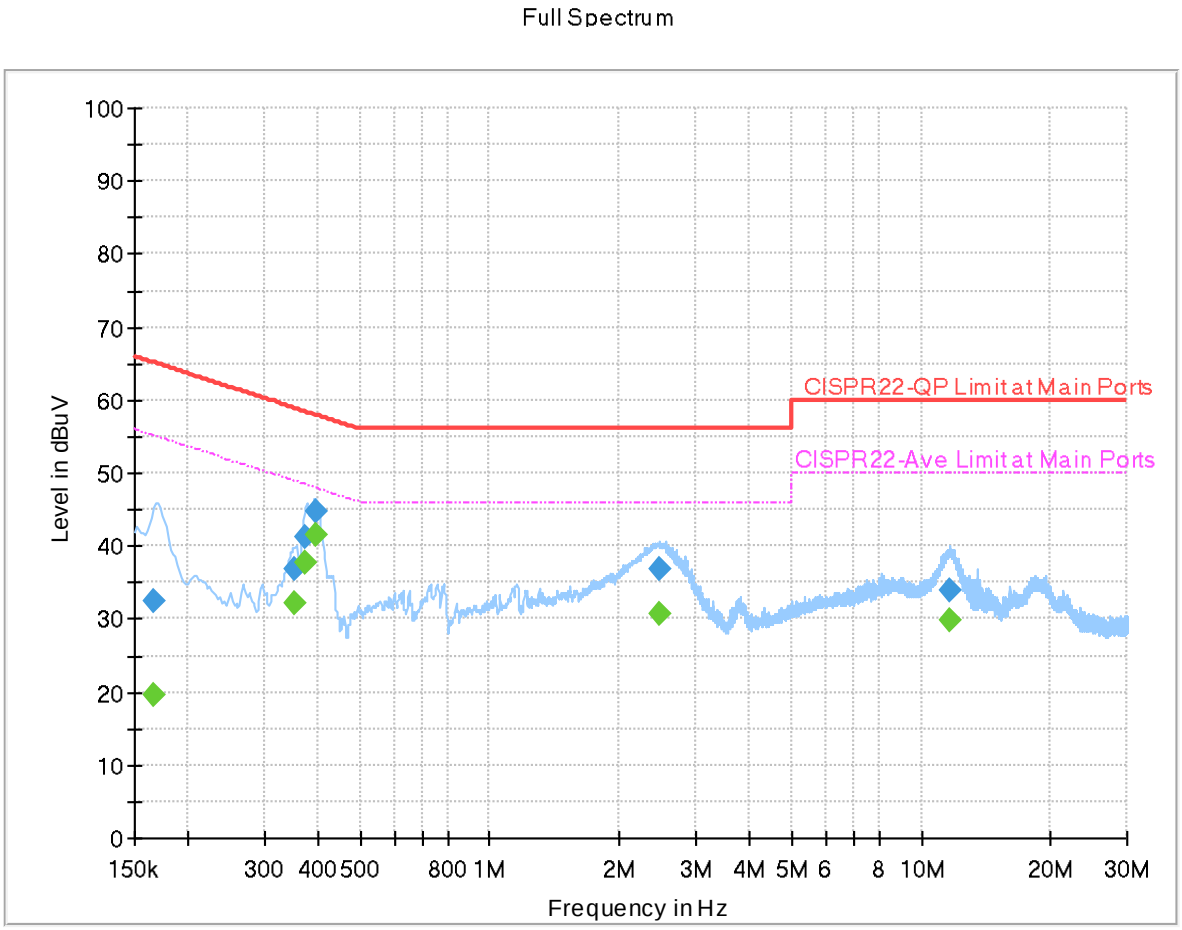
Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))

Appendix A. AC Conducted Emission Test Results

Test Engineer :	Louis Chung	**Temperature :**	23.4~24.6℃
		Relative Humidity :	58.5~63.7%

EUT Information

Report NO :	332423
Test Mode :	Mode 1
Test Voltage :	120Vac/60Hz
Phase :	Line

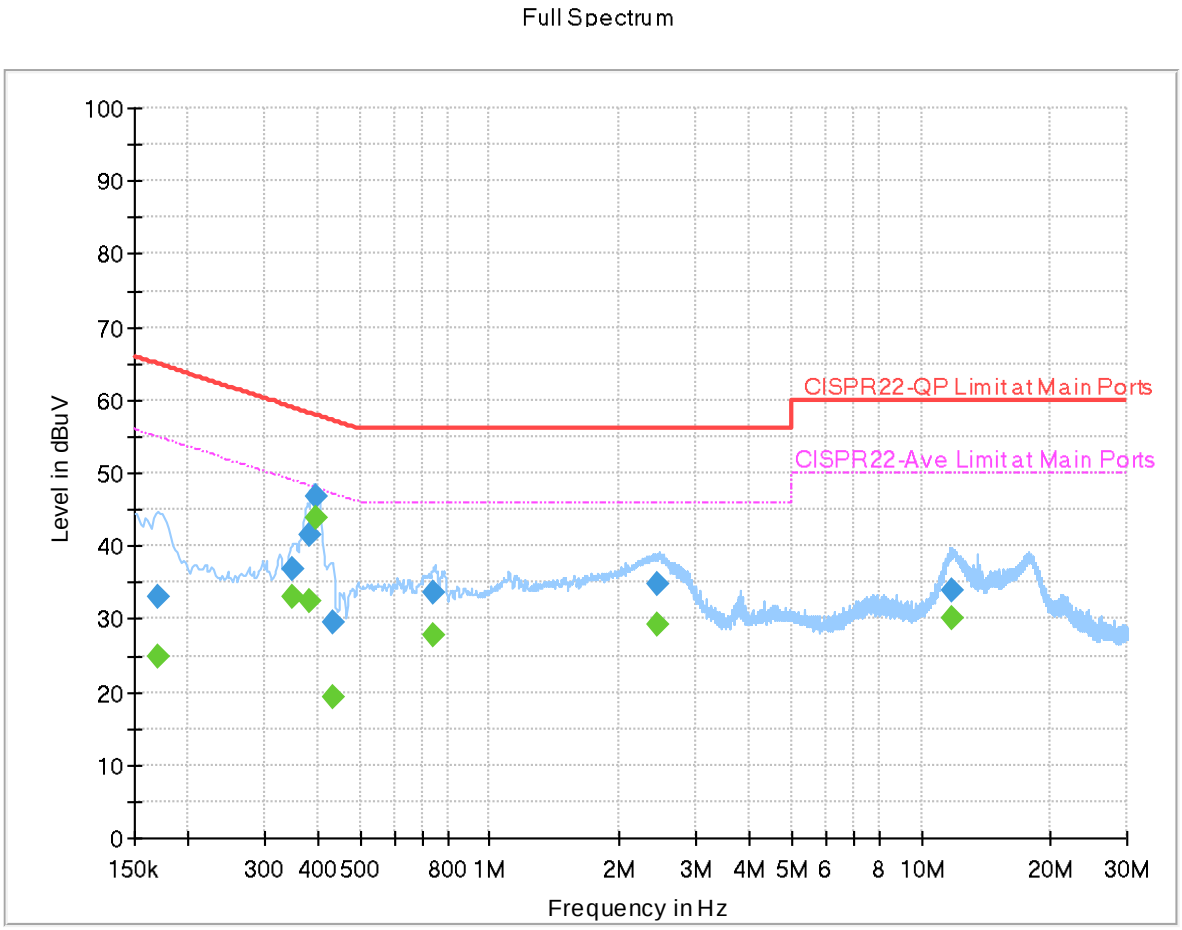


Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.165750	---	19.61	55.17	35.56	L1	OFF	19.9
0.165750	32.42	---	65.17	32.75	L1	OFF	19.9
0.352500	---	32.12	48.90	16.78	L1	OFF	20.0
0.352500	36.89	---	58.90	22.01	L1	OFF	20.0
0.372750	---	37.62	48.44	10.82	L1	OFF	20.0
0.372750	41.26	---	58.44	17.18	L1	OFF	20.0
0.393630	---	41.55	47.99	6.44	L1	OFF	20.0
0.393630	44.64	---	57.99	13.35	L1	OFF	20.0
2.475600	---	30.69	46.00	15.31	L1	OFF	20.0
2.475600	36.91	---	56.00	19.09	L1	OFF	20.0
11.716710	---	29.75	50.00	20.25	L1	OFF	20.1
11.716710	33.94	---	60.00	26.06	L1	OFF	20.1

EUT Information

Report NO :	332423
Test Mode :	Mode 1
Test Voltage :	120Vac/60Hz
Phase :	Neutral



Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.170160	---	24.88	54.95	30.07	N	OFF	20.0
0.170160	33.11	---	64.95	31.84	N	OFF	20.0
0.348000	---	32.94	49.01	16.07	N	OFF	20.0
0.348000	36.88	---	59.01	22.13	N	OFF	20.0
0.384000	---	32.56	48.19	15.63	N	OFF	20.0
0.384000	41.43	---	58.19	16.76	N	OFF	20.0
0.395160	---	43.93	47.96	4.03	N	OFF	20.0
0.395160	46.66	---	57.96	11.30	N	OFF	20.0
0.433500	---	19.18	47.19	28.01	N	OFF	20.0
0.433500	29.49	---	57.19	27.70	N	OFF	20.0
0.742740	---	27.84	46.00	18.16	N	OFF	20.0
0.742740	33.59	---	56.00	22.41	N	OFF	20.0
2.449500	---	29.28	46.00	16.72	N	OFF	20.0
2.449500	34.87	---	56.00	21.13	N	OFF	20.0
11.772600	---	30.04	50.00	19.96	N	OFF	20.1
11.772600	34.05	---	60.00	25.95	N	OFF	20.1