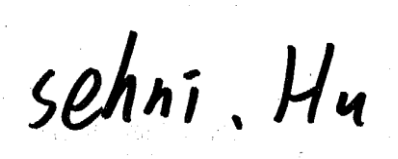
FCC RADIO TEST REPORT
FCC 47 CFR PART 15 SUBPART C

Test Standard	**FCC Part 15.249**
FCC ID	**2A2P5-ARFSA06**
Trade name	**Acer Gadget Inc.**
Product name	**24GHz Radar**
Model No.	**ARFSA06**
Test Result	**Pass**
Statements of Conformity	**Determination of compliance is based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.**

The test Result was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were given in ANSI C63.10: 2013 and compliance standards.

The test results of this report relate only to the tested sample (EUT) identified in this report.
The test Report of full or partial shall not copy. Without written approval of Compliance Certification Services Inc. (Wugu Laboratory)

Approved by:



Sehni Hu
Supervisor

Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	August 25, 2023	Initial Issue	ALL	Allison Chen
01	September 1, 2023	See the following Note Rev.(01)	4-5, 8, 11, 22-30	Allison Chen

Note:
Rev.(01)
1. Modify application and manufacturer information in section 1.1.
2. Modify frequency range in section 1.2, instrument calibration in section 1.6.
3. Modify spurious emission test mode below/above 1GHz in section 4.3.4.
4. Add tx justification in section 3.2.

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1. GENERAL INFORMATION

1.1 EUT INFORMATION

Applicant	Acer Gadget Inc. 24F., No. 112, Sec. 1, Xintai 5th Rd., Xizhi Dist., New Taipei City 221, Taiwan
Manufacturer	Acer Gadget Inc. 24F., No. 112, Sec. 1, Xintai 5th Rd., Xizhi Dist., New Taipei City 221, Taiwan
Equipment	24GHz Radar
Model Name	ARFSA06
Model Discrepancy	N/A
EUT Functions	24G Radar
Received Date	July 21, 2023
Date of Test	July 24 ~ August 18, 2023
Output Power	Peak : 102.53 dBuV/m Average : 98.31 dBuV/m
Power Operation	☐ AC ☒ DC Type : ☐ Battery ☒ DC Power Supply: 12VDC ☐ External DC adapter

Remark:
1. For more details, please refer to the User's manual of the EUT.
2. Disclaimer: Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.

1.2 EUT CHANNEL INFORMATION

Frequency Range	24.152 ~ 24.247 GHz
Centre frequency	24.199 GHz
Modulation Type	FMCW
Number of channel	1

1.3 ANTENNA INFORMATION

Antenna Type	☐ PCB ☐ PIFA ☐ Dipole ☐ Coils ☒ Patch
Antenna Gain	Gain: 11.5 dBi
Brand / Model	ALPHA / 1X2 Patch 24GHz
Antenna connector	N/A

1.4 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
AC Powerline Conducted Emission	± 2.213 dB
Channel Bandwidth	± 2.7 %
Radiated Emission_9kHz-30MHz	± 3.761 dB
Radiated Emission_30MHz-200MHz	± 3.473 dB
Radiated Emission_200MHz-1GHz	± 3.946 dB
Radiated Emission_1GHz-6GHz	± 4.797 dB
Radiated Emission_6GHz-18GHz	± 4.803 dB
Radiated Emission_18GHz-26GHz	± 3.459 dB
Radiated Emission_26GHz-40GHz	± 3.297 dB
Radiated Emission_40GHz-60GHz	± 2.317 dB
Radiated Emission_60GHz-90GHz	± 2.256 dB
Radiated Emission_90GHz-140GHz	± 2.278 dB

Remark:
1.This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2
2. ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report.

1.5 FACILITIES AND TEST LOCATION

All measurement facilities used to collect the measurement data are located at

AC Powerline Conducted Emission and Conducted:

☒ No.11, Wugong 6th Rd., Wugu Dist., New Taipei City, Taiwan.

Radiated emission:

☒ No.11, Wugong 6th Rd., Wugu Dist., New Taipei City, Taiwan.

☐ No. 12, Ln. 116, Wugong 3rd Rd., Wugu Dist., New Taipei City, Taiwan 24803 (Only 9kHz to 40GHz)

CAB identifier: TW1309

Test site	Test Engineer	Remark
AC Conduction Room	--	Not applicable, because EUT doesn't connect to AC Main Source direct.
Radiation	Tony Chao, Ray Li	--
RF Conducted	Allen Shen	--

Remark: The lab has been recognized as the FCC accredited lab. under the KDB 974614 D01 and is listed in the FCC pubic Access Link (PAL) database, FCC Registration No. :444940, the FCC Designation No.:TW1309.

1.6 INSTRUMENT CALIBRATION

RF Conducted Test Site					
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Cal Date**	**Cal Due**
Coaxial Cable	EMC	EMC104-35M-2000	230204	2023-03-13	2024-03-12
EXA Signal Analyzer	Keysight	N9010B	MY60242460	2023-02-02	2024-02-01
Horn Antenna	SCHWARZBECK	BBHA9170	1047	2022-12-30	2023-12-29
Software	N/A				

Remark:
1. Each piece of equipment is scheduled for calibration once a year.
2. N.C.R. = No Calibration Required.

3M 966 Chamber Test Site (966A)					
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Cal Date**	**Cal Due**
Pre-Amplifier	MITEQ	AMF-6F-18004000-37-8P	985646	2022-09-07	2023-09-06
Loop Antenna	COM-POWER	AL-130	121051	2023-05-23	2024-05-22
Preamplifier	EMEC	EM330	060609	2023-02-22	2024-02-21
Thermo-Hygro Meter	WISEWIND	1206	D07	2022-12-19	2023-12-18
Signal Analyzer	R&S	FSV 40	101073	2022-08-25	2023-08-24
PXA Signal Analyzer	Keysight Technologies	N9030B	MY62291089	2022-10-14	2023-10-13
Preamplifier	HP	8449B	3008A00965	2022-12-23	2023-12-22
Cable	Huber+Suhner	104PEA	20995+21000+182330	2023-02-22	2024-02-21
Signal Generator	Agilent	E8257C	US42340383	2023-06-17	2024-06-16
STANDARD GAIN HORN ANTENNA	CMI	RCHO08R	RCHO08R	2023-06-16	2024-06-15
STANDARD GAIN HORN ANTENNA	CMI	RCHO12R	RCHO12R	2023-06-16	2024-06-15
STANDARD GAIN HORN ANTENNA	CMI	RCHO19R	RCHO19R	2023-06-15	2024-06-14
SA EXTENSION MODULE	VDI	SAX WR8.0	SAX982	2023-06-14	2024-06-13
SA EXTENSION MODULE	VDI	SAX WR12	SAX983	2023-06-14	2024-06-13
SA EXTENSION MODULE	VDI	SAX WR19	SAX993	2023-06-14	2024-06-13
Bi-Log Antenna	Sunol Sciences	JB1	A052609	2023-02-09	2024-02-08
Horn Antenna	ETC	MCTD 1209	DRH13M02003	2023-01-12	2024-01-11
Horn Antenna	SCHWARZBECK	BBHA9170	1047	2022-12-30	2023-12-29
Pre-Amplifier	EMCI	EMC184045SE	980860	2022-12-07	2023-12-06
Cable	EMCI	EMC101G	211010+211011+211012	2022-12-22	2023-12-11
Turn Table	CCS	CC-T-1F	N/A	N.C.R	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R	N.C.R
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R	N.C.R
Software	e3 V9-210616c				

Remark:
1. Each piece of equipment is scheduled for calibration once a year.
2. N.C.R. = No Calibration Required.

1.7 SUPPORT AND EUT ACCESSORIES EQUIPMENT

EUT Accessories Equipment					
No.	**Equipment**	**Brand**	**Model**	**Series No.**	**FCC ID**
	N/A				

Support Equipment					
No.	**Equipment**	**Brand**	**Model**	**Series No.**	**FCC ID**
1	NB(E)	Lenovo	T460	N/A	N/A

1.8 TEST METHODOLOGY AND APPLIED STANDARDS

The test methodology, setups and results comply with all requirements in accordance with ANSI C63.10:2013, FCC Part 15.249.

2. TEST SUMMARY

FCC Standard Section	Report Section	Test Item	Result
15.203	1.3	Antenna Requirement	Pass
15.207(a)	4.1	AC Conducted Emission	N/A
15.215	4.2	20dB Bandwidth and Occupied Bandwidth (99%)	Pass
15.249(a)	4.3	Filed strength of fundamental	Pass
15.249(a)	4.3	Radiation Spurious Emission	Pass

3. DESCRIPTION OF TEST MODES

3.1 THE WORST MODE OF MEASUREMENT

Radiated Emission Measurement Above 1G	
Test Condition	**Radiated Emission Above 1G**
Power supply Mode	**Mode 1: EUT power by Power supply**
Worst Mode	☒ **Mode 1** ☐ **Mode 2** ☐ **Mode 3** ☐ **Mode 4**
Worst Position	☐ **Placed in fixed position.** ☒ **Placed in fixed position at X-Plane (E2-Plane)** ☐ **Placed in fixed position at Y-Plane (E1-Plane)** ☐ **Placed in fixed position at Z-Plane (H-Plane)**

Radiated Emission Measurement Below 1G	
Test Condition	**Radiated Emission Below 1G**
Power supply Mode	**Mode 1: EUT power by Power supply**
Worst Mode	☒ **Mode 1** ☐ **Mode 2** ☐ **Mode 3** ☐ **Mode 4**

Remark:
1. The worst mode was record in this test report.
2. EUT pre-scanned in three axis ,X,Y, Z and two polarity, for radiated measurement. The worst case(X-Plane) were recorded in this report

3.2 TX JUSTIFICATION

1. Connect the prototype to the computer and start the PCAN software
2. At this time, it should be in the state of frequency scanning

The client's software is PCAN-View 4.2.1.533

4. TEST RESULT

4.1 AC POWER LINE CONDUCTED EMISSION

4.1.1 Test Limit

According to §15.207(a),

Frequency Range (MHz)	Limits(dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

* Decreases with the logarithm of the frequency.

4.1.2 Test Procedure

1. The EUT was placed on a non-conducted table, which is 0.8m above horizontal ground plane and 0.4m above vertical ground plane.

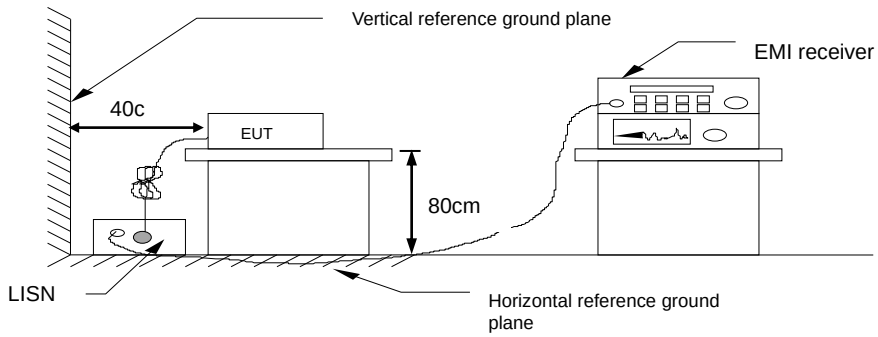
2. EUT connected to the line impedance stabilization network (LISN)

3. Receiver set RBW of 9kHz and Detector Peak, and note as quasi-peak and average.

4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.

5. Recorded Line for Neutral and Line.

4.1.3 Test Setup

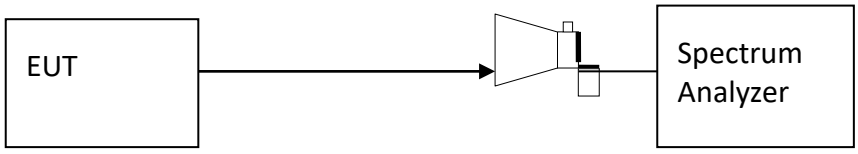


4.1.4 Test Result

Not applicable, because EUT doesn't connect to AC Main Source direct.

4.2 20dB BANDWIDTH AND OCCUPIED BANDWIDTH (99%)

TEST CONFIGURATION



TEST PROCEDURE

1. Place the EUT on the table and set it in the transmitting mode.
2. SA set RBW = 1% ~ 5% OBW, VBW = three times the RBW and Detector = Peak, to measurement 99% Bandwidth and 20dB Bandwidth
3. Measure and record the result of 20 dB Bandwidth and 99% Bandwidth. in the test report.

TEST RESULTS

Compliance.

Temperature:	26.3℃	**Tested by:**	Allen Shen
Humidity:	56% RH	**Test Date:**	July 24, 2023

Test Condition	Frequency(GHz)	Occupied Bandwidth 99% (MHz)	20 dB Bandwidth (MHz)
24G Radar	24.152 ~ 24.247	95.044	96.3769

Test Plot

20dB Bandwidth & BANDWIDTH (99%)

4.3 FIELD STRENGTH OF FUNDAMENTAL AND SPURIOUS EMISSION

4.3.1 Test Limit

According to §15.249(a)

(1) The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

* Field strength limits are specified at a distance of 3 meters

Fundamental Limit Conversion		
Average (mV/m) at 3M	Average (dBuV/m) at 3M	Peak (dBuV/m) at 3M
250	107.96	127.96

Harmonic Limit Conversion		
Average (uV/m) at 3M	Average (dBuV/m) at 3M	Peak (dBuV/m) at 3M
2500	67.96	87.96

(2) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209(follow the table), whichever is the lesser attenuation

Below 30 MHz

Frequency	Field Strength (μA/m)	Magnetic field strength (H-Field) (μA/m)	Measurement Distance (metres)
9-490 kHz	2,400/F (F in kHz)	2,400/F (F in kHz)	300
490-1,705 kHz	24,000/F (F in kHz)	24,000/F (F in kHz)	30
1.705-30 MHz	30	N/A	30

Above 30 MHz

Frequency (MHz)	Field Strength microvolts/m at 3 metres (watts, e.i.r.p.)	
	Transmitters	Receivers
30-88	100 (3 nW)	100 (3 nW)
88-216	150 (6.8 nW)	150 (6.8 nW)
216-960	200 (12 nW)	200 (12 nW)
Above 960	500 (75 nW)	500 (75 nW)

4.3.2 Test Procedure

1. The EUT is placed on a turntable, Above 1 GHz is 1.5m, below 1 GHz is 0.8m above ground plane. The EUT Configured un accordance with ANSI C63.10: 2013, and the EUT set in a continuous mode.

2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level. And EUT is set 3m away from the receiving antenna, which is scanned from 1m to 4m above the ground plane to find out the highest emissions. Measurement are made polarized in both the vertical and the horizontal positions with antenna.

3. The SA setting following：

(1) Below 1G：RBW = 100kHz, VBW ≥ 3 RBW, Sweep = Auto, Detector = Peak,

(2) Above 1G：

(2.1) For Peak measurement：RBW = 1MHz, VBW ≥ 3 RBW.

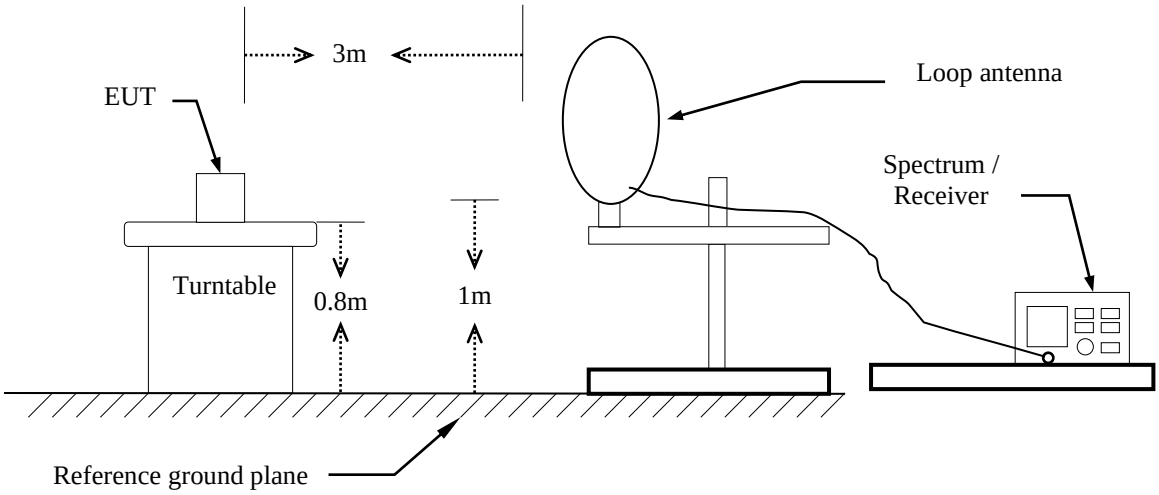
(2.2) For Average measurement：RBW = 1MHz, VBW = 1kHz.

Note:
(1) the measurement distance of the Fundamental frequency is 3m.
(2) No emission found between lowest internal used/generated frequency to 30MHz (9KHz~30MHz)

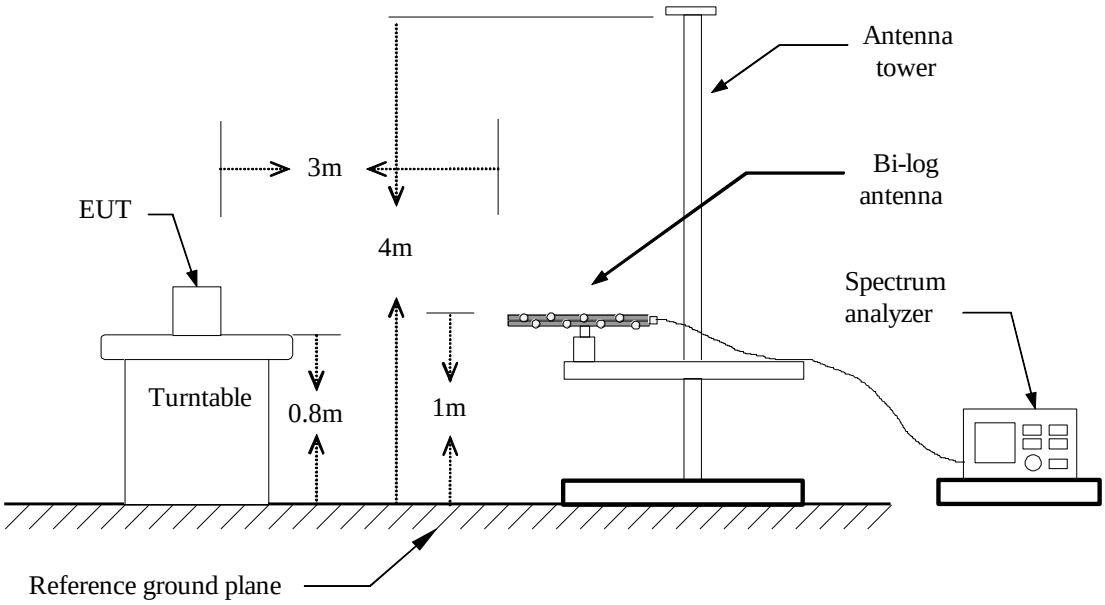
The measurement distance 30 MHz to 40 GHz is set 3m away from the receiving antenna.
The measurement distance above 40 GHz is set 1m away from the receiving antenna.

4.3.3 Test Setup

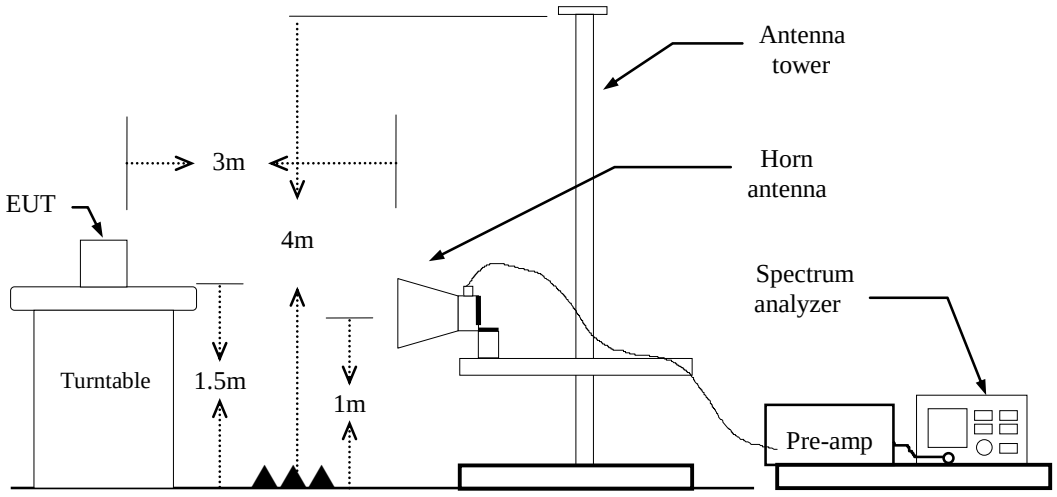
9kHz ~ 30MHz



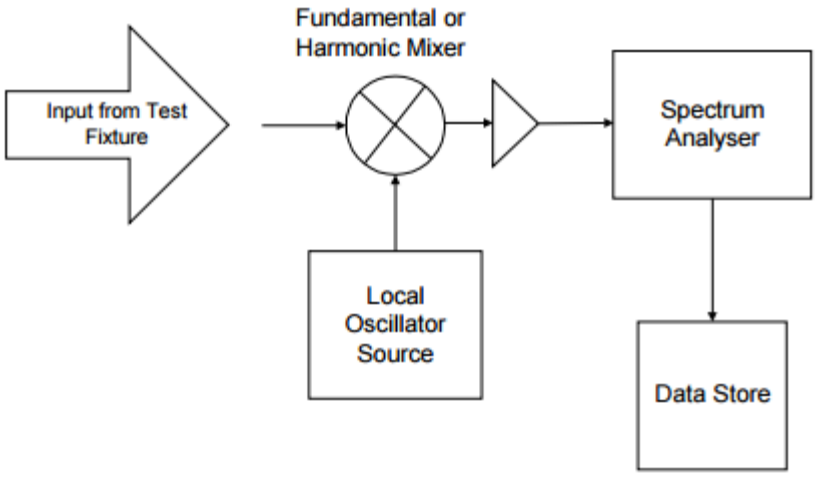
30MHz ~ 1GHz



Above 1 GHz



Above 40 GHz

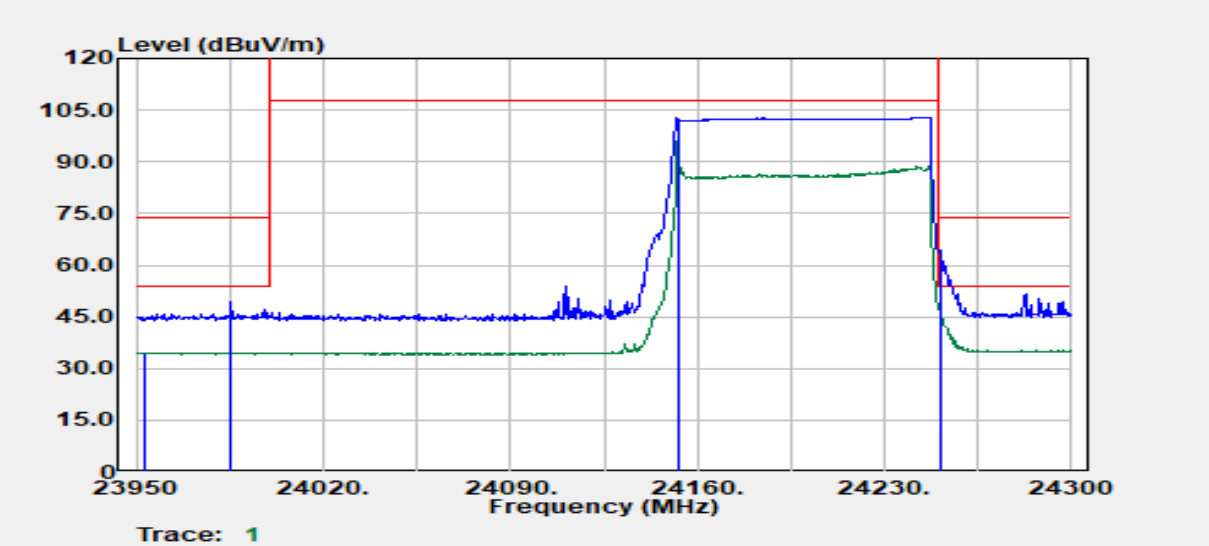


4.3.4 Test Result

Test Data

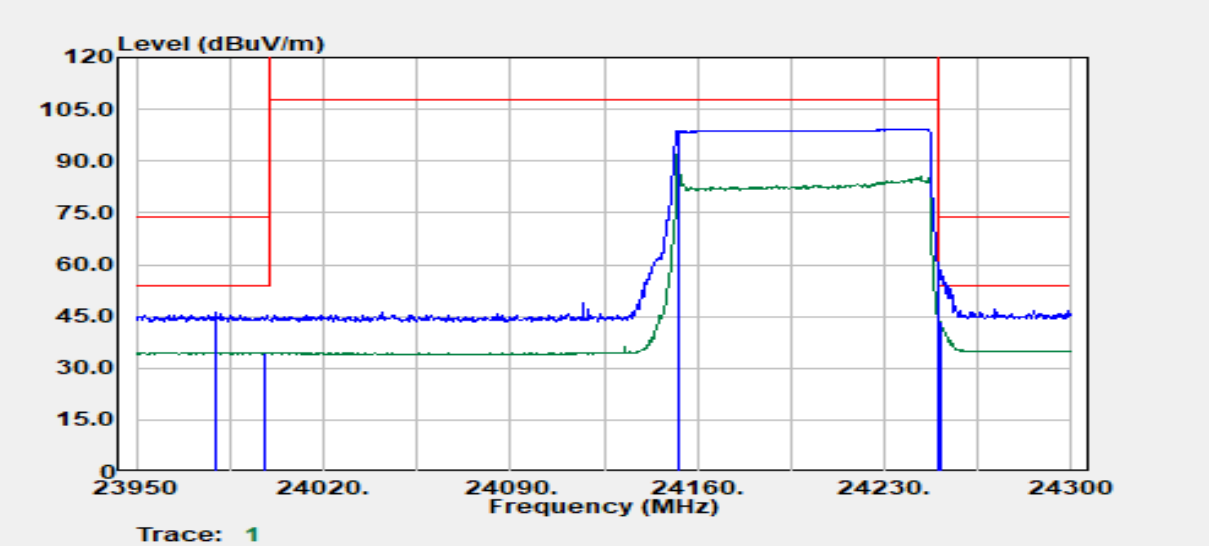
(1) Filed strength of fundamental :

Test Mode:	TX-24GHz	Temp/Hum	24.3(℃)/ 57%RH
Test Item	Fundamental	Test Date	July 25, 2023
Polarize	Vertical	Test Engineer	Tony Chao
Detector	Peak and Average		



Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Read Level (dBµV)	Factor (dB)	Actual FS (dBµV/m)	Limit (dBµV/m)	Margin (dB)
23953.50	Average	36.05	-1.47	34.58	54.00	-19.42
23985.35	Peak	51.01	-1.48	49.53	74.00	-24.47
24152.65	Peak	103.50	-0.98	102.53	127.96	-25.43
24152.65	Average	99.29	-0.98	98.31	107.96	-9.65
24250.65	Peak	64.73	-0.64	64.09	74.00	-9.91
24250.65	Average	48.06	-0.64	47.42	54.00	-6.58

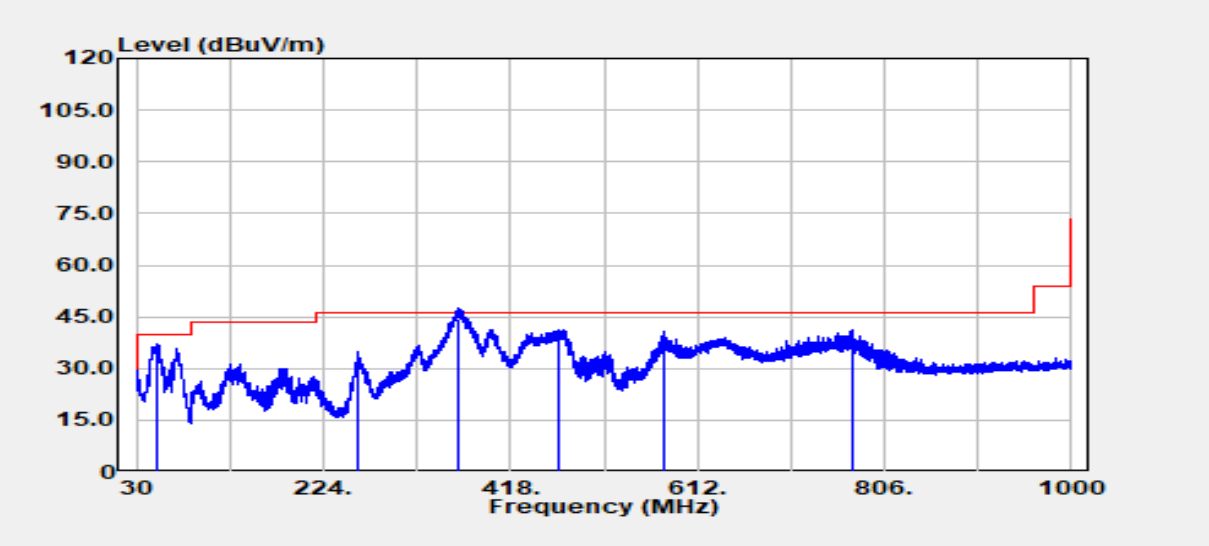
Test Mode:	TX-24GHz	Temp/Hum	24.3(℃)/ 57%RH
Test Item	Fundamental	Test Date	July 25, 2023
Polarize	Horizontal	Test Engineer	Tony Chao
Detector	Peak and Average		



Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Read Level (dBµV)	Factor (dB)	Actual FS (dBµV/m)	Limit (dBµV/m)	Margin (dB)
23979.40	Peak	47.67	-1.48	46.19	74.00	-27.81
23997.60	Average	35.99	-1.48	34.51	54.00	-19.49
24152.65	Peak	99.71	-0.98	98.73	127.96	-29.23
24152.65	Average	95.82	-0.98	94.84	107.96	-13.12
24250.30	Peak	60.49	-0.64	59.85	74.00	-14.15
24250.65	Average	44.27	-0.64	43.63	54.00	-10.37

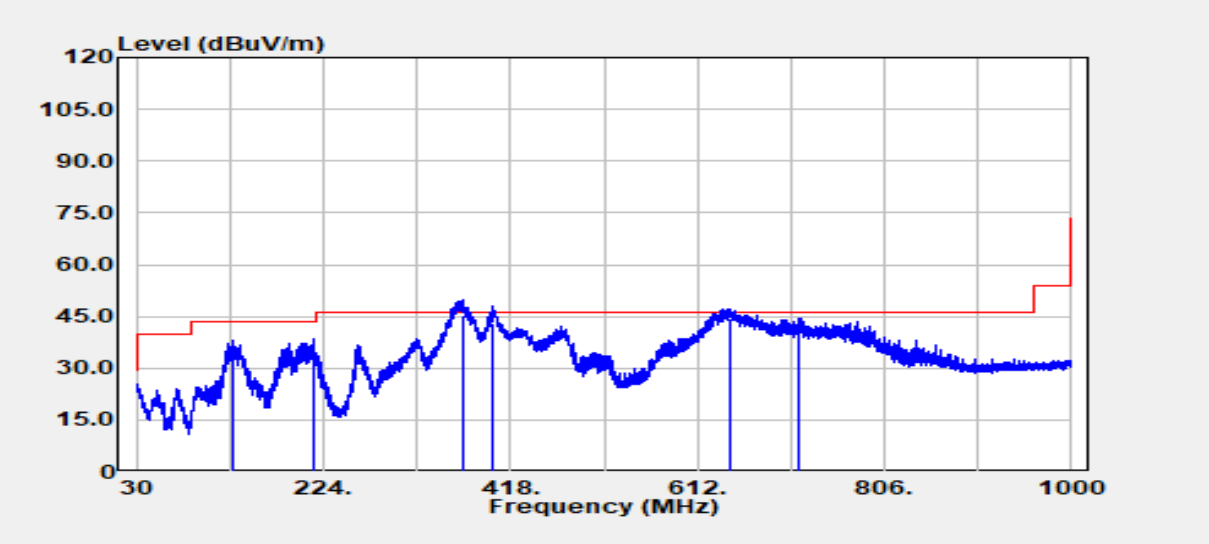
(2) Below 1G :

Test Mode:	TX_24GHz	Temp/Hum	24.6(℃)/ 59%RH
Test Item	30MHz-1GHz	Test Date	August 18, 2023
Polarize	Vertical	Test Engineer	Tony Chao
Detector	Peak and Quasi-peak		



Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Read Level (dBµV)	Factor (dB)	Actual FS (dBµV/m)	Limit (dBµV/m)	Margin (dB)
52.43	Peak	53.38	-16.17	37.22	40.00	-2.78
259.65	Peak	44.81	-10.06	34.75	46.00	-11.25
363.92	QP	51.20	-7.03	44.17	46.00	-1.83
468.08	Peak	45.29	-3.95	41.33	46.00	-4.67
578.41	Peak	42.80	-2.11	40.68	46.00	-5.32
771.69	Peak	39.94	1.10	41.04	46.00	-4.96

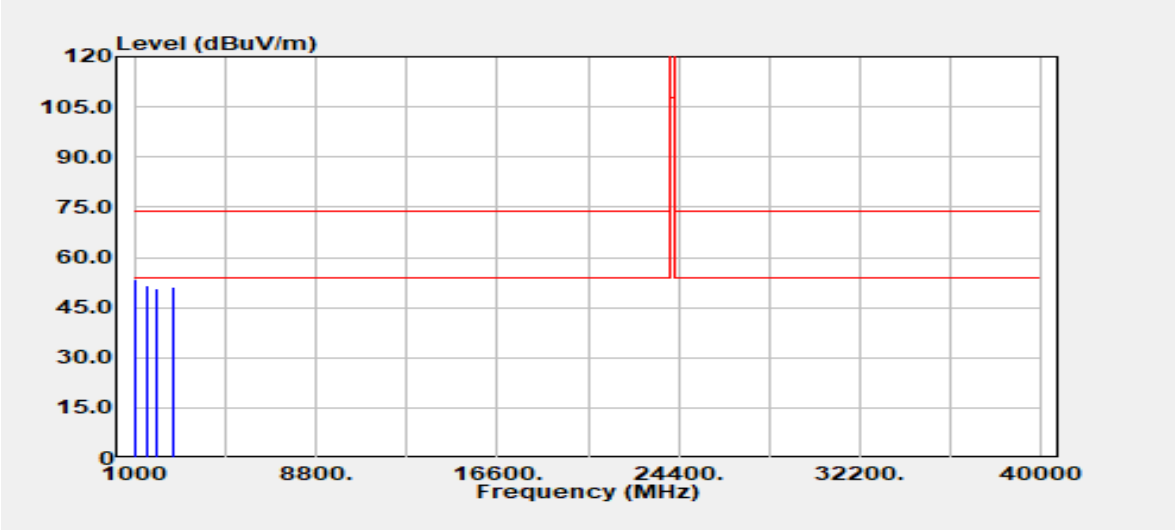
Test Mode:	TX_24GHz	Temp/Hum	24.6(℃)/ 59%RH
Test Item	30MHz-1GHz	Test Date	August 18, 2023
Polarize	Horizontal	Test Engineer	Tony Chao
Detector	Peak and Quasi-peak		



Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Read Level (dBµV)	Factor (dB)	Actual FS (dBµV/m)	Limit (dBµV/m)	Margin (dB)
129.06	Peak	47.18	-9.35	37.84	43.50	-5.66
213.69	Peak	50.30	-11.93	38.37	43.50	-5.13
369.26	QP	52.10	-6.88	45.22	46.00	-0.78
398.84	QP	48.80	-5.75	43.05	46.00	-2.95
644.74	QP	44.90	-0.64	44.26	46.00	-1.74
718.22	Peak	44.11	0.23	44.34	46.00	-1.66

(3) Above 1G :

Test Mode:	TX_24GHz	Temp/Hum	24.3(℃)/ 57%RH
Test Item	1GHz-40GHz	Test Date	July 25, 2023
Polarize	Vertical	Test Engineer	Ray Li
Detector	Peak		

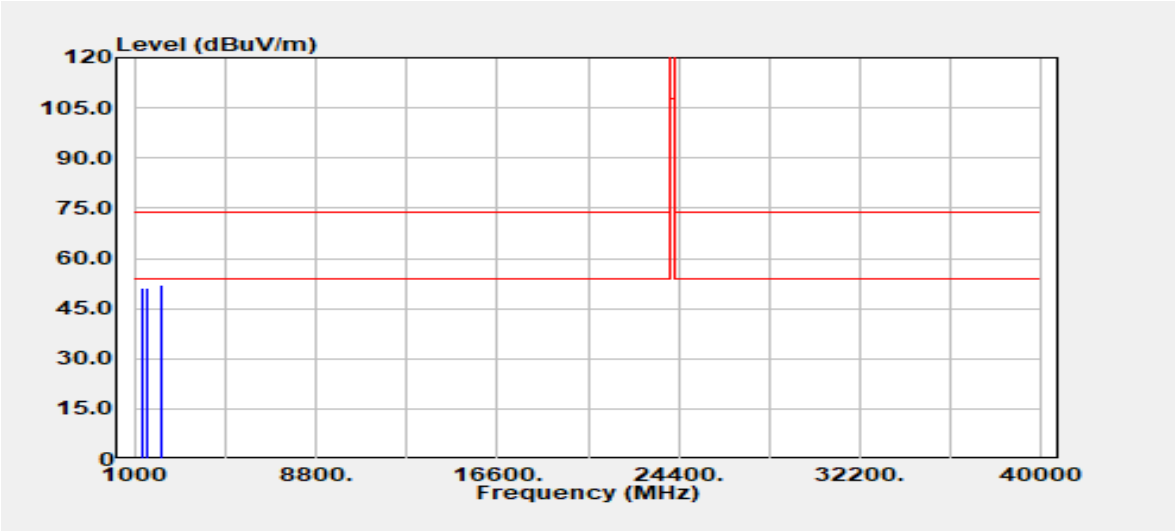


Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Read Level (dBµV)	Factor (dB)	Actual FS (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1063.000	Peak	62.92	-9.31	53.61	74.00	-20.39
1598.000	Peak	58.86	-7.42	51.44	74.00	-22.56
1996.000	Peak	55.64	-4.98	50.66	74.00	-23.34
2656.000	Peak	54.24	-2.92	51.32	74.00	-22.68
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode:	TX_24GHz	Temp/Hum	24.3(℃)/ 57%RH
Test Item	1GHz-40GHz	Test Date	July 25, 2023
Polarize	Horizontal	Test Engineer	Ray Li
Detector	Peak		



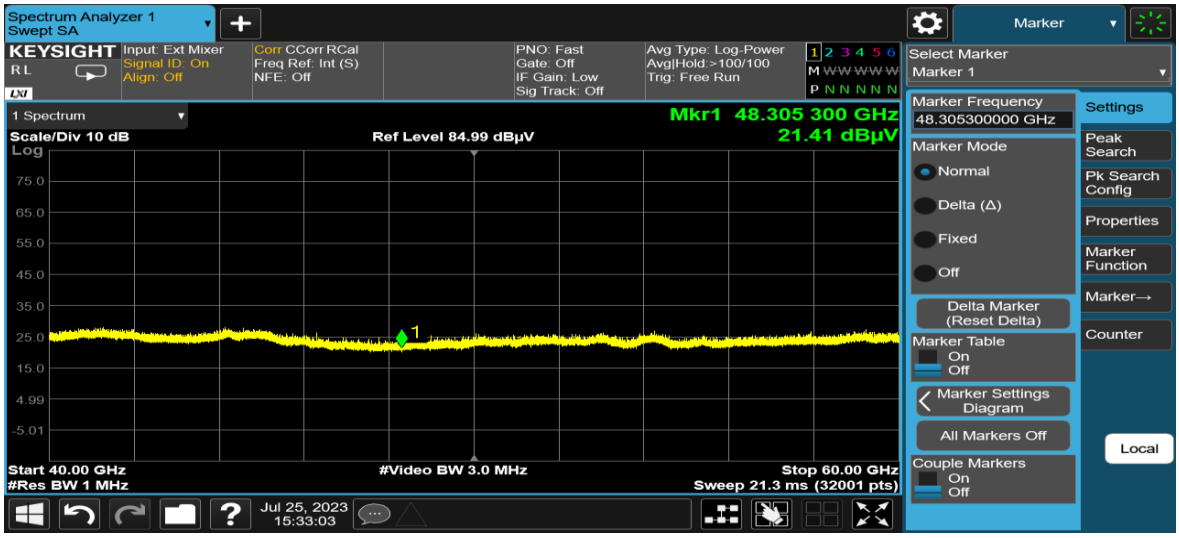
Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Read Level (dBµV)	Factor (dB)	Actual FS (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1308.000	Peak	59.00	-7.89	51.11	74.00	-22.89
1500.000	Peak	59.22	-7.97	51.25	74.00	-22.75
2128.000	Peak	55.40	-3.49	51.91	74.00	-22.09
N/A						

Remark:

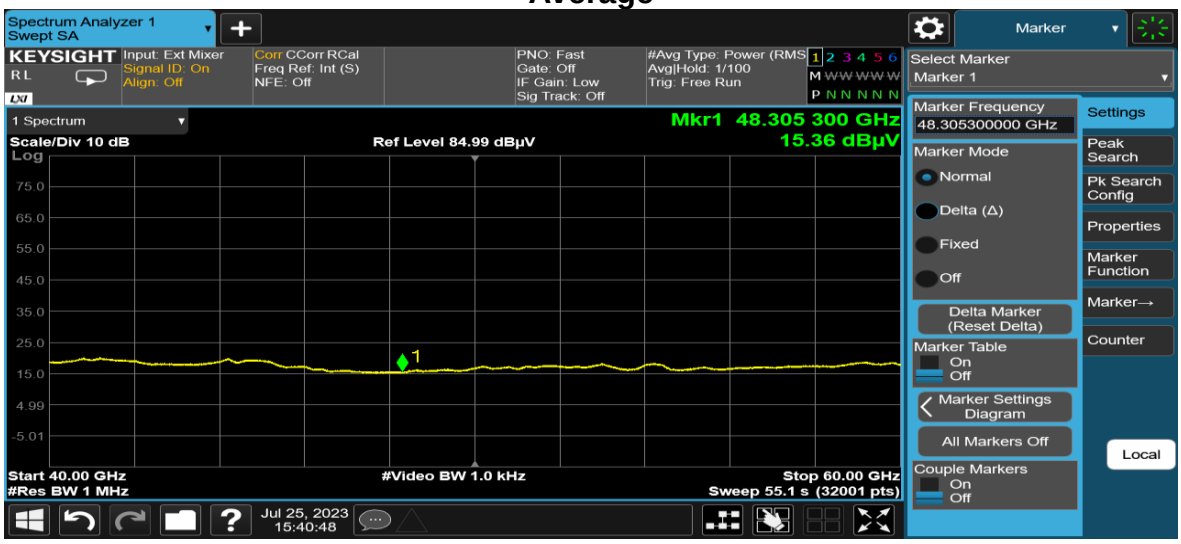
1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode:	TX_24GHz	Temp/Hum	24.3(℃)/ 57%RH
Test Item	40GHz-60GHz	Test Date	July 25, 2023
Polarize	Vertical/Horizontal	Test Engineer	Tony Chao
Detector	Peak		

Peak



Average



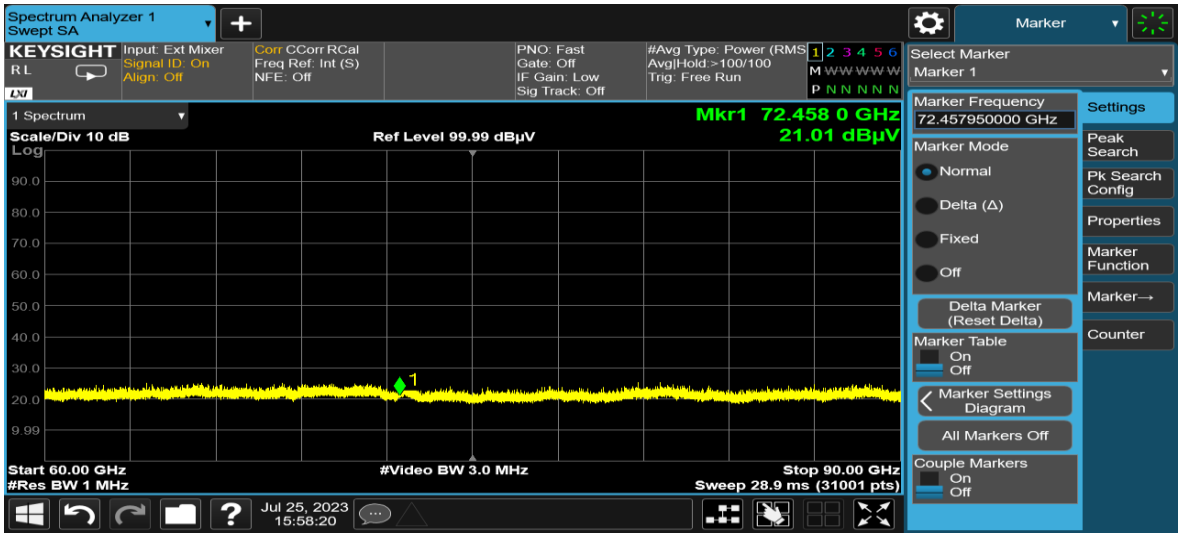
Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Level= SA Reading + Antenna Factor + Cable Loss - Distance factor [20*log(3/1) ex: 9.54dB]

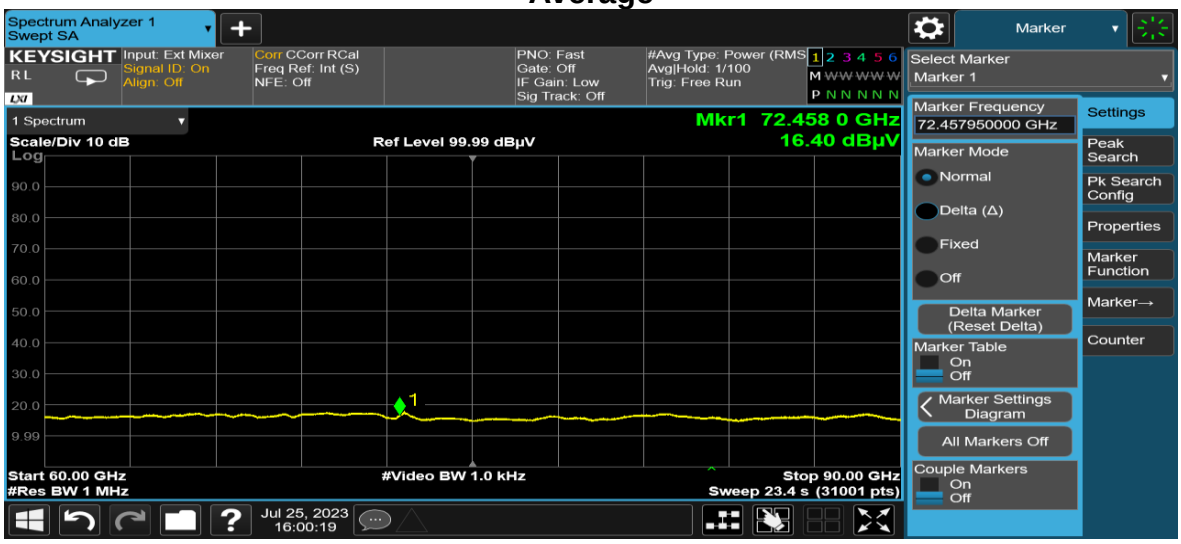
Unwanted Emission 40GHz~60GHz									
Frequency (GHz)	**SA Reading (dBuV)**	**Antenna Factor**	**Cable Loss**	**Distance (m)**	**Level (dBuV/m)**	**Limit (dBm)**	**Margin (dB)**	**Remark**	**Result**
48.3053	21.2	42.51	6.41	1	60.57	87.96	-27.39	Peak	Pass
48.3053	15.36	42.51	6.41	1	54.73	67.96	-13.23	AVG	Pass

Test Mode:	TX_24GHz	Temp/Hum	24.3(℃)/ 57%RH
Test Item	60GHz-90GHz	Test Date	July 25, 2023
Polarize	Vertical/Horizontal	Test Engineer	Tony Chao
Detector	Peak		

Peak



Average



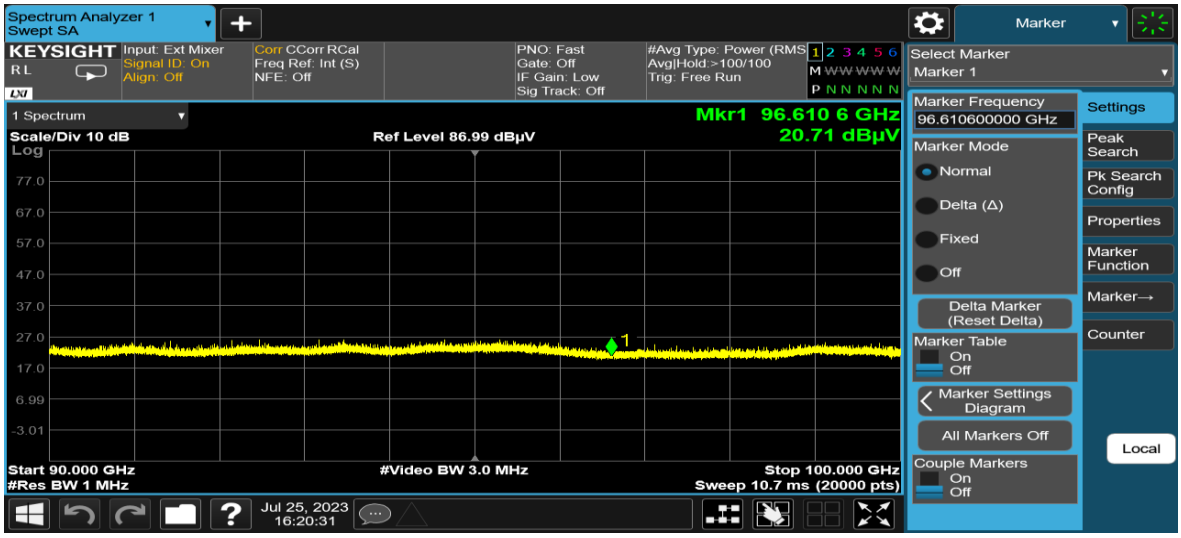
Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Level= SA Reading + Antenna Factor + Cable Loss - Distance factor [20*log(3/1) ex: 9.54dB]

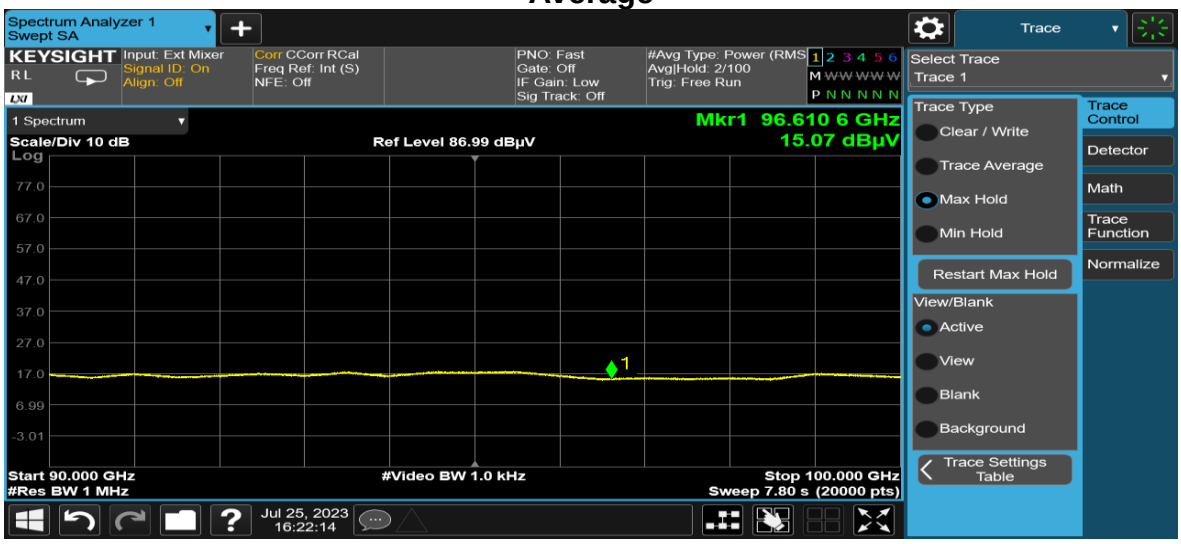
Unwanted Emission 60GHz~90GHz									
Frequency (GHz)	**SA Reading (dBuV)**	**Antenna Factor**	**Cable Loss**	**Distance (m)**	**Level (dBuV/m)**	**Limit (dBm)**	**Margin (dB)**	**Remark**	**Result**
72.45795	21.01	46.00	6.41	1	63.88	87.96	-24.08	Peak	Pass
72.45795	16.4	46.00	6.41	1	59.27	67.96	-8.69	AVG	Pass

Test Mode:	TX_24GHz	Temp/Hum	24.3(℃)/ 57%RH
Test Item	90GHz-100GHz	Test Date	July 25, 2023
Polarize	Vertical/Horizontal	Test Engineer	Tony Chao
Detector	Peak		

Peak



Average



Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Level= SA Reading + Antenna Factor + Cable Loss - Distance factor [20*log(3/1) ex: 9.54dB]

Unwanted Emission 90GHz~100GHz									
Frequency (GHz)	**SA Reading (dBuV)**	**Antenna Factor**	**Cable Loss**	**Distance (m)**	**Level (dBuV/m)**	**Limit (dBm)**	**Margin (dB)**	**Remark**	**Result**
96.6106	20.71	49.60	7.29	1	68.06	87.96	-19.90	Peak	Pass
96.6106	15.07	49.60	7.29	1	62.42	67.96	-5.54	AVG	Pass

- End of Test Report -