TEST REPORT

Application No.:	KSCR2208001533AT
FCC ID:	2AXVM-TD1018
Applicant:	Hangzhou Microimage Software Co., Ltd.
Address of Applicant:	Room 313, Unit B, Building 2, 399 Danfeng Road, Xixing Subdistrict,Binjiang District, Hangzhou, Zhejiang
Manufacturer:	Hangzhou Microimage Software Co., Ltd.
Address of Manufacturer:	Room 313, Unit B, Building 2, 399 Danfeng Road, Xixing Subdistrict,Binjiang District, Hangzhou, Zhejiang
Factory:	Hangzhou Microimage Intelligent Technology Co., Ltd.
Address of Factory:	Floor 2, Building A1, 299 Qiushi Road, Tonglu Economic Development Zone, Tonglu County, Hangzhou City, Zhejiang Province
Equipment Under Test (EUT):	
EUT Name:	Thermal Presence Detector
Model No.:	HM-TD1018-1/QR，HM-TD1018-2/QR♣
♣	Please refer to section 2 of this report which indicates which model was actually tested and which were electrically identical.
Standard(s) :	47 CFR Part 15, Subpart C 15.255
Date of Receipt:	2022-08-29
Date of Test:	2022-08-29 to 2022-09-04
Date of Issue:	2022-09-05
Test Result:	**Pass***

* In the configuration tested, the EUT complied with the standards specified above.

Eric Lin
EMC Laboratory Manager

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Revision Record			
Version	**Description**	***Date***	***Remark***
00	Original	2022-09-05	/

Authorized for issue by:				
		Pawn. Liu		
		Pawn.Liu/Project Engineer		
		Eric Lin		
		Eric Lin / Reviewer		

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2 Test Summary

Radio Spectrum Technical Requirement				
Item	**Standard**	**Method**	**Requirement**	**Result**
Antenna Requirement	47 CFR Part 15, Subpart C 15.255	N/A	47 CFR Part 15, Subpart C 15.203	Pass

N/A: Not applicable

Radio Spectrum Matter Part				
Item	**Standard**	**Method**	**Requirement**	**Result**
Conducted Emissions at AC Power Line (150kHz-30MHz)	47 CFR Part 15, Subpart C 15.255	ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207	PASS
Transmitter power and power spectral density	47 CFR Part 15, Subpart C 15.255	ANSI C63.10, Sections 9.4, 9.5	47 CFR Part 15, Subpart C 15.255(c)(2), (d)(1)	PASS
Occupied bandwidth	47 CFR Part 15, Subpart C 15.255	ANSI C63.10 (2013) Section 9.3	47 CFR Part 15, Subpart C 15.215(c),15.255(c2)	PASS
Radiated spurious emissions below 40 GHz	47 CFR Part 15, Subpart C 15.255	ANSI C63.10 (2013) Section 9.13	47 CFR Part 15, Subpart C 15.255(d)(2)	PASS
Radiated emissions outside assigned band and above 40 GHz up to 200 GHz	47 CFR Part 15, Subpart C 15.255	ANSI C63.10 (2013) Section 9.9, 9.12	47 CFR Part 15, Subpart C 15. 255(d)(3)	PASS
Frequency stability	47 CFR Part 15, Subpart C 15.255	ANSI C63.10 (2013) Section 9.4	47 CFR Part 15, Subpart C 15. 255(f)	PASS

Declaration of EUT Family Grouping:
Note: There are series models mentioned in this report, and they are the Identical in electrical and electronic characters. Only the model HM-TD1018-1/QR was tested since their differences were the model number and Silk screen.

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4 General Information

4.1 Details of E.U.T.

Power supply: DC 12V
Test voltage: AC120V/60Hz
Frequency: 61GHz-61.5GHz
Modulation Type: FMCW
Antenna Type: Integrated Patch Antenna
Antenna Gain: 6dBi

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Adapter	HONOTO	ADS-12AM-12 12012EPCU	/
Notebook	ThinkPad	L14	/

4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	8.4×10^{-8}
2	Timeout	2s
3	Duty Cycle	0.37%
4	Occupied Bandwidth	3%
5	RF Conducted Power	0.6dB
6	RF Power Density	2.9dB
7	Conducted Spurious Emissions	0.75dB
8	RF Radiated Power	5.2dB (Below 1GHz)
		5.9dB (Above 1GHz)
9	Radiated Spurious Emission Test	4.2dB (Below 30MHz)
		4.5dB (30MHz-1GHz)
		5.1dB (1GHz-18GHz)
		5.4dB (Above 18GHz)
10	Temperature Test	1°C
11	Humidity Test	3%
12	Supply Voltages	1.5%
13	Time	3%

Note: The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

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4.4 Test Location

All tests were performed at:

Compliance Certification Services (Kunshan) Inc.

No.10 Weiye Rd, Innovation park, Eco&Tec, Development Zone, Kunshan City, Jiangsu, China.

Tel: +86 512 5735 5888 Fax: +86 512 5737 0818

No tests were sub-contracted.

Note:

1.SGS is not responsible for wrong test results due to incorrect information (e.g., max. internal working frequency, antenna gain, cable loss, etc) is provided by the applicant. (If applicable).

2.SGS is not responsible for the authenticity, integrity and the validity of the conclusion based on results of the data provided by applicant. (If applicable).

4.5 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• CNAS

Compliance Certification Services (Kunshan) Inc. is accredited by the China National Accreditation Service for Conformity Assessment (CNAS). Registration No. CNAS L4354

• A2LA

Compliance Certification Services (Kunshan) Inc. is accredited by the American Association for Laboratory Accreditation (A2LA). Certificate No. 2541.01.

• FCC

Compliance Certification Services (Kunshan) Inc. has been recognized as an accredited testing laboratory. Designation Number: CN1172.

• ISED

Compliance Certification Services (Kunshan) Inc. has been recognized by Innovation, Science and Economic Development Canada (ISED) as an accredited testing laboratory. Company Number: 2324E

• VCCI

The 3m and 10m Semi-anechoic chamber and Shielded Room of Compliance Certification Services (Kunshan) Inc. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-20134, R-11600, C-11707, T-11499, G-10216 respectively.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None

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5 Equipment List

Item	Equipment	Manufacturer	Model	Serial Number	Cal Date	Cal. Due Date
Conducted Emission at Mains Terminals (150kHz-30MHz)						
1	EMI Test Receive	R&S	ESCI	100781	01/30/2022	01/29/2023
2	LISN	R&S	ENV216	101604	10/12/2021	10/11/2022
3	LISN	Schwarzbeck	NNLK 8129	8129-143	10/12/2021	10/11/2022
4	Pulse Limiter	R&S	ESH3-Z2	100609	01/30/2022	01/29/2023
5	CE test Cable	Thermax	/	14	10/16/2021	10/15/2022
6	Test Software	Farad	EZ-EMC	CCS-03A1	N.C.R	N.C.R
RF Radiated Test						
1	Spectrum Analyzer	R&S	FSV40	101493	10/11/2021	10/10/2022
2	Signal Generator	Agilent	E8257C	MY43321570	10/18/2021	10/17/2022
3	Loop Antenna	Schwarzbeck	HXYZ9170	9170-108	02/21/2022	02/20/2023
4	Bilog Antenna	TESEQ	CBL 6112D	35403	06/21/2021	06/20/2023
5	Bilog Antenna	SCHWARZBECK	VULB9160	9160-3342	04/13/2021	04/12/2023
6	Horn-antenna(1-18GHz)	Schwarzbeck	BBHA9120D	267	10/26/2020	10/25/2022
7	Horn-antenna(1-18GHz)	ETS-LINDGREN	3117	00143290	02/22/2021	02/21/2023
8	Horn Antenna(18-40GHz)	Schwarzbeck	BBHA9170	BBHA9170171	02/21/2022	02/20/2023
9	Horn-antenna(40-60GHz)	REBES	SAZ-2410-19-S1	06299-01	N/A	N/A
10	Horn-antenna(50-75GHz)	REBES	SAZ-2410-15-S1	01731-01	N/A	N/A
11	Horn-antenna(75-110GHz)	REBES	SAZ-2410-10-S1	01773-09	N/A	N/A
12	Horn-antenna(110-170GHz)	REBES	SAZ-2410-06-S1	01776-05	N/A	N/A
13	Horn-antenna(140-220GHz)	REBES	SAZ-2410-05-S1	01759-04	N/A	N/A
14	Horn-antenna(220-325GHz)	REBES	SAR-2309-03-S2	06300-01	N/A	N/A
15	Extended waveguide(40-60GHz)	REBES	SWG-19025-FB	06303-01	N/A	N/A
16	Extended waveguide(50-75GHz)	REBES	SWG-15025-FB	01525-09	N/A	N/A
17	Extended waveguide(75-110GHz)	REBES	SWG-10025-FB	01509-01	N/A	N/A
18	Extended waveguide(110-170GHz)	REBES	SWG-06025-FB	06302-01	N/A	N/A
19	Extended waveguide(140-220GHz)	REBES	SWG-05025-FB	06304-01	N/A	N/A
20	Extended waveguide(220-325GHz)	REBES	SWG-03025-FB	06301-01	N/A	N/A
21	Harmonic mixer(110-170GHz)	REBES	STH-06SF-S1	06110-01	N/A	N/A
22	Harmonic mixer(40-60GHz)	REBES	STH-19SF-S1	06937-01	N/A	N/A
23	Harmonic mixer(140-220GHz)	REBES	STH-06SF-S1	0220-210-002-3D	N/A	N/A
24	Harmonic mixer(220-325GHz)	REBES	STH-19SF-S1	0325-210-002-2F	N/A	N/A
25	Waveguide Harmonic Mixer(50-75GHz)	KEYSIGHT	M1970V	MY51390966	N/A	N/A
26	Waveguide Harmonic Mixer(75-110GHz)	KEYSIGHT	M1970W	MY51430883	N/A	N/A
27	Waveguide Harmonic Mixer(50-75GHz) cable	Silverline	SLU18-SMSM-01.00M	99612	N/A	N/A
28	Waveguide Harmonic Mixer(75-110GHz) cable	Silverline	SLU18-SMSM-01.00M	94202	N/A	N/A
29	Waveguide Harmonic Mixer(40-60GHz) cable	Silverline	SLU18-SMSM-01.00M	94011	N/A	N/A
30	Waveguide Harmonic Mixer(110-170GHz) cable	Silverline	SLU18-SMSM-01.00M	96416	N/A	N/A
31	Waveguide Harmonic Mixer(140-220GHz) cable	Silverline	SLU18-SMSM-01.00M	99632	N/A	N/A
32	Waveguide Harmonic Mixer(220-325GHz) cable	Silverline	SLU18-SMSM-01.00M	94215	N/A	N/A

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33	Pre-Amplifier(30MHz~18GHz)	LNA	/	/	04/14/2022	04/13/2023
34	Amplifier(18~40GHz)	COM-POWER	PAM-840A	461332	10/18/2021	10/17/2022
35	Low Pass Filter	MICRO-TRONICS	VLFX-950	RV142900829	N.C.R	N.C.R
36	High Pass Filter	Mini-Circuits	VHF-1200	15542	N.C.R	N.C.R
37	RE test cable	/	RE01-RE04	/	04/14/2022	04/13/2023
38	PXA Spectrum Analyzer	KEYSIGHT	N9030B	KSEM021-1	01/30/2022	01/29/2023
39	Vector Signal Generator	R&S	SMW200A	110074	10/12/2021	10/12/2022
40	Software	Farad	EZ-EMC	CCS-03A1	N/A	N/A

Note: N.C.R means Not Calibration Requirements.

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6 Radio Spectrum Technical Requirement

6.1 Antenna Requirement

6.1.1 Test Requirement:

FCC 47 CFR Part 15C Section 15.203

6.1.2 Conclusion

Standard Requirement:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit permanently attached antenna or of an so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

EUT Antenna:

The antenna is Integrated Patch Antenna and no consideration of replacement.

Antenna location: Refer to EUT Photos.

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7 Radio Spectrum Matter Test Results

7.1 Conducted Emissions at AC Power Line (150kHz-30MHz)

Test Requirement 47 CFR Part 15, Subpart C 15.207

Test Method: ANSI C63.10 (2013) Section 6.2

Limit:

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.		

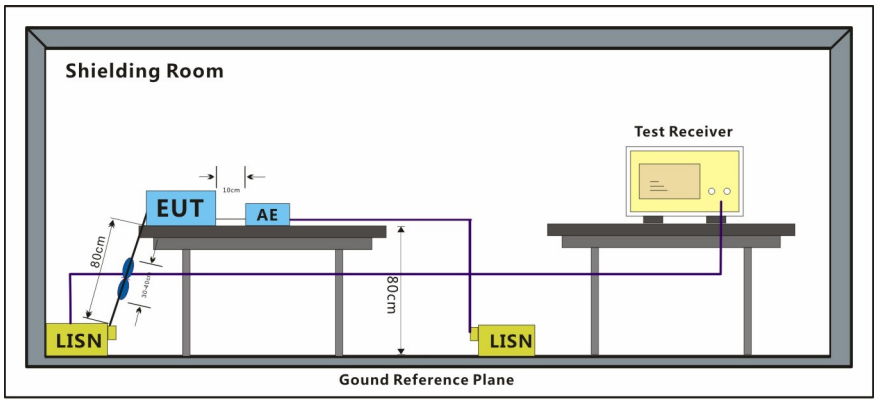
7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 22 °C Humidity: 50 % RH Atmospheric Pressure: 1002 mbar

Test Mode: a: TX mode _ Keep the EUT in continuously transmitting mode powered by AC adapter.

7.1.2 Test Setup Diagram



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7.1.3 Measurement Procedure and Data

1) The mains terminal disturbance voltage test was conducted in a shielded room.

2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50ohm/50μH + 5ohm linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.

3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane

4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.

5) In order to find the maximum emission, the relative positions of equipment and all the interface cables must be changed according to ANSI C63.10 on conducted measurement.

Remark:
LISN = Read Level + Cable Loss + LISN Factor

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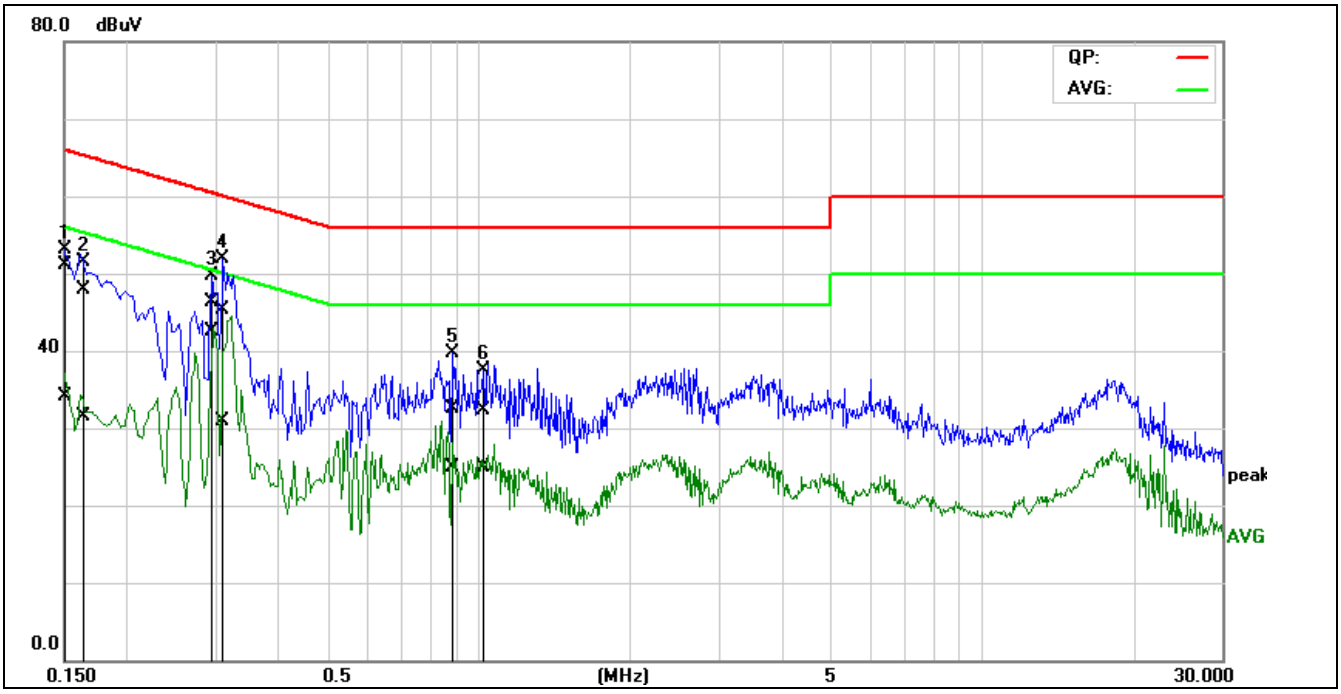
Mode: a; Line: Live Line



No.	Frequency	QuasiPeak reading	Average reading	Correction factor	QuasiPeak result	Average result	QuasiPeak limit	Average limit	QuasiPeak margin	Average margin	Remark
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
1	0.1500	31.52	14.65	19.50	51.02	34.15	66.00	56.00	-14.98	-21.85	Pass
2	0.1648	28.46	11.91	19.50	47.96	31.41	65.22	55.22	-17.26	-23.81	Pass
3*	0.2967	26.81	23.04	19.51	46.32	42.55	60.33	50.33	-14.01	-7.78	Pass
4	0.3100	25.88	11.47	19.51	45.39	30.98	59.97	49.97	-14.58	-18.99	Pass
5	0.8918	12.90	5.33	19.59	32.49	24.92	56.00	46.00	-23.51	-21.08	Pass
6	1.0054	12.77	5.24	19.60	32.37	24.84	56.00	46.00	-23.63	-21.16	Pass

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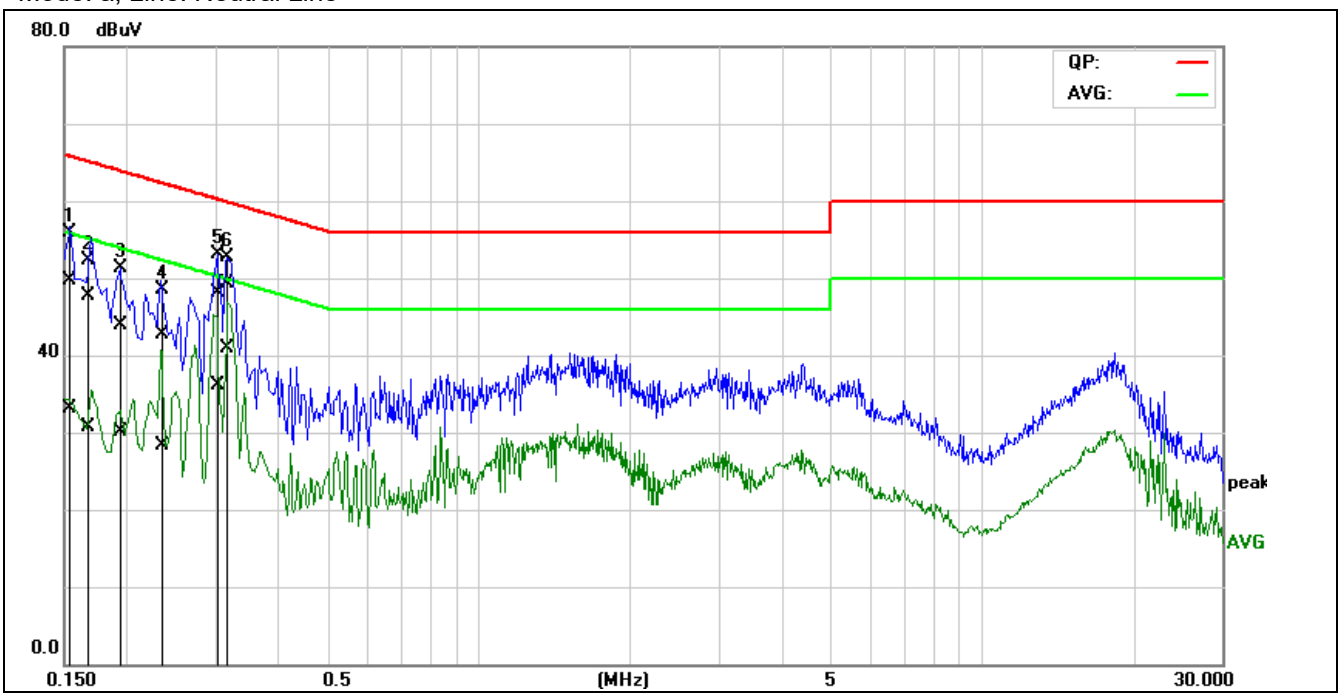
Mode: a; Line: Neutral Line



No.	Frequency	QuasiPeak reading	Average reading	Correction factor	QuasiPeak result	Average result	QuasiPeak limit	Average limit	QuasiPeak margin	Average margin	Remark
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
1	0.1509	30.30	13.55	19.48	49.78	33.03	65.95	55.95	-16.17	-22.92	Pass
2	0.1656	28.13	11.20	19.48	47.61	30.68	65.18	55.18	-17.57	-24.50	Pass
3	0.1936	24.32	10.66	19.49	43.81	30.15	63.88	53.88	-20.07	-23.73	Pass
4	0.2362	23.17	8.85	19.49	42.66	28.34	62.23	52.23	-19.57	-23.89	Pass
5	0.3037	28.54	16.54	19.50	48.04	36.04	60.14	50.14	-12.10	-14.10	Pass
6*	0.3143	29.90	21.46	19.50	49.40	40.96	59.86	49.86	-10.46	-8.90	Pass

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7.2 Occupied bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.215(c),15.255(c2)

Test Method: ANSI C63.10, Section 9.3

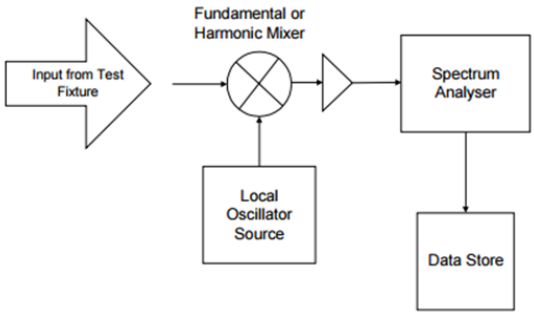
7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 22 °C Humidity: 50 % RH Atmospheric Pressure: 1002 mbar

Test Mode: a: TX mode _ Keep the EUT in continuously transmitting mode powered by AC adapter.

7.2.2 Test Setup Diagram



7.2.3 Measurement Procedure and Data

1) Place the EUT on the table and set it in the transmitting mode
2) SA set RBW=1%~5% OBW, VBW=RBW and Detector=Peak
3) Measure and record the result of 20dB and 99% bandwidth

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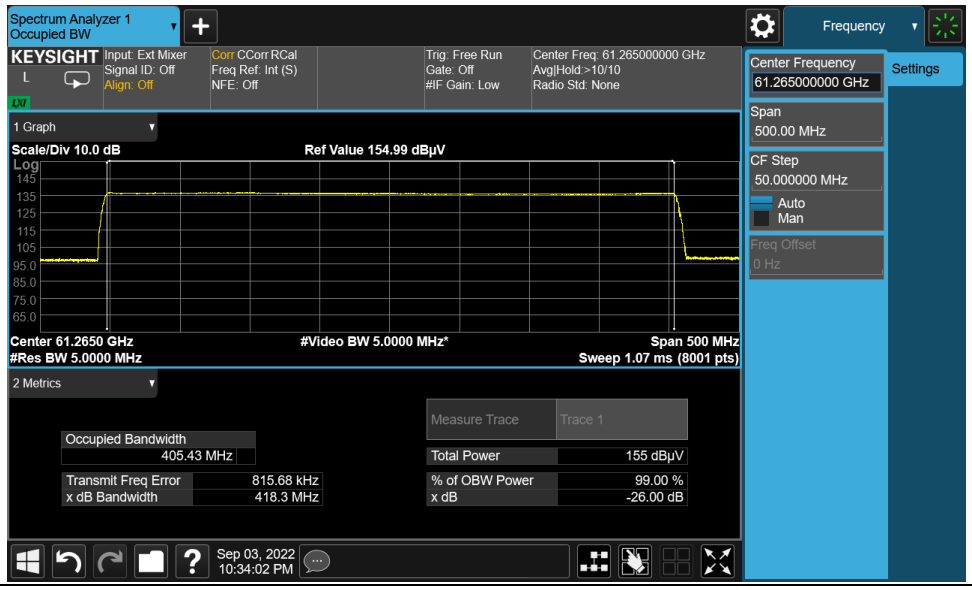
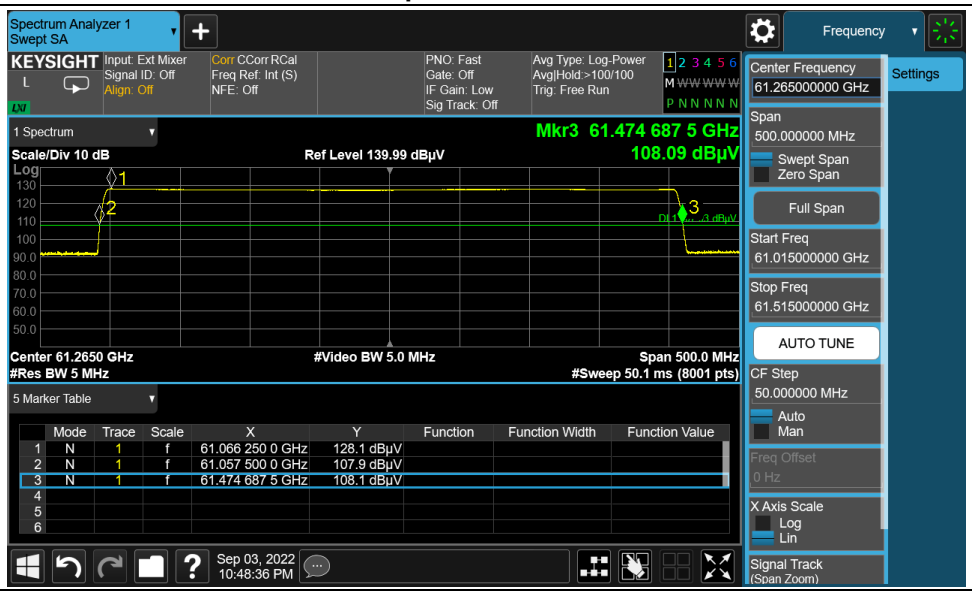
99% Occupied Channel



-20dB Occupied Channel Bandwidth



Centre Frequency (GHz)	-20dB OCW (MHz)	99% OCW (MHz)	F_L (GHz)	Limit (GHz)	F_H (GHz)	Limit (GHz)	Result
61.265	417.2	405.43	61.058	61	61.475	61.5	Pass

Remark:

F_L: Frequency Low Band Edge, F_H: Frequency High Band Edge

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7.3 Transmitter power and power spectral density

Test Requirement 47 CFR Part 15, Subpart C 15.255(c)(2), (d)(1)

Test Method: ANSI C63.10, Sections 9.4, 9.5

Limit:

Assigned frequency range (MHz)	Maximum output power	
	Average EIRP (dBm)	Peak EIRP (dBm)
61000 - 61500	40	43

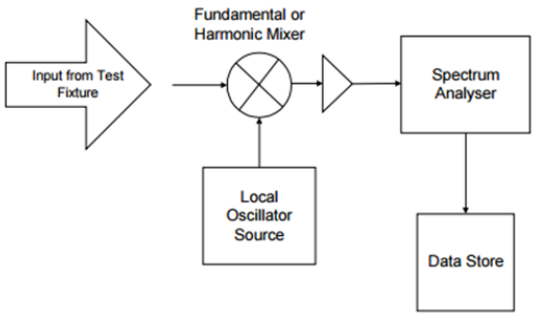
7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 22 °C Humidity: 50 % RH Atmospheric Pressure: 1002 mbar

Test Mode: a: TX mode _ Keep the EUT in continuously transmitting mode powered by AC adapter.

7.3.2 Test Setup Diagram



7.3.3 Measurement Procedure and Data

1) Place the EUT on the table and set it in the transmitting mode
2) SA set RBW=3MHz , VBW=3*RBW , Detector=Peak/Average, Trace: Mask Hold, Peak Search
3) The EUT was turned from 0 degrees to 360 degrees to find the maximum reading.

Remark 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

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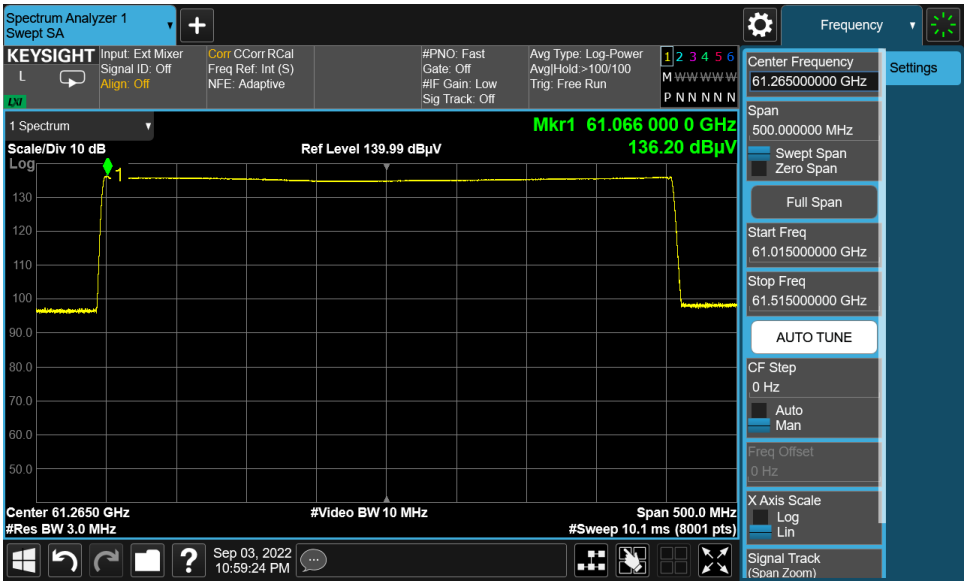
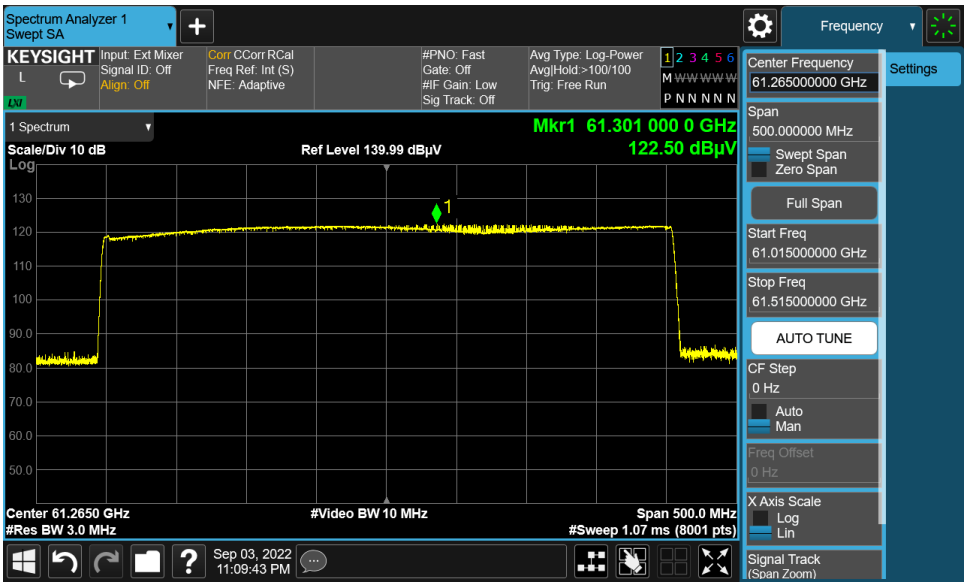
Peak Power- Horizontal



Peak Power- Vertical



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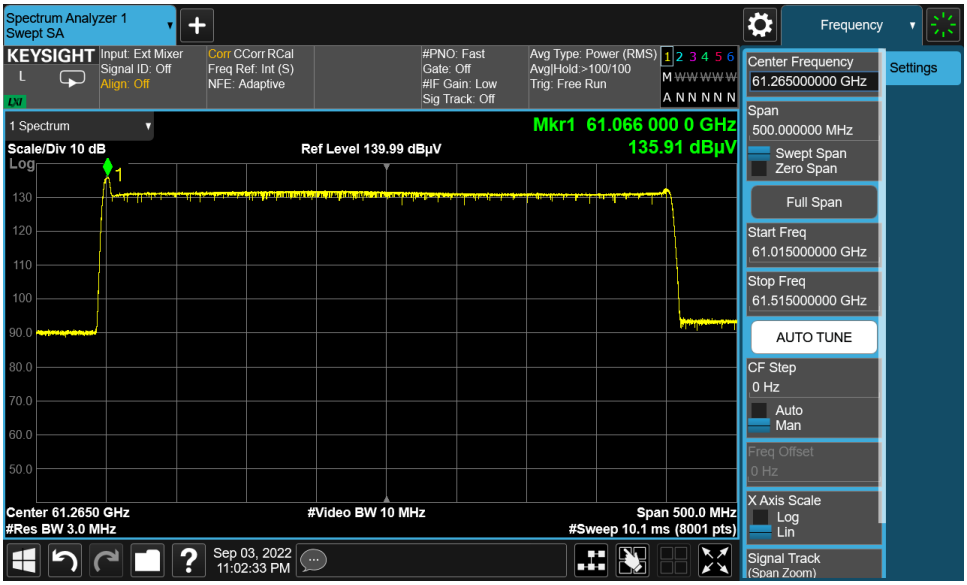
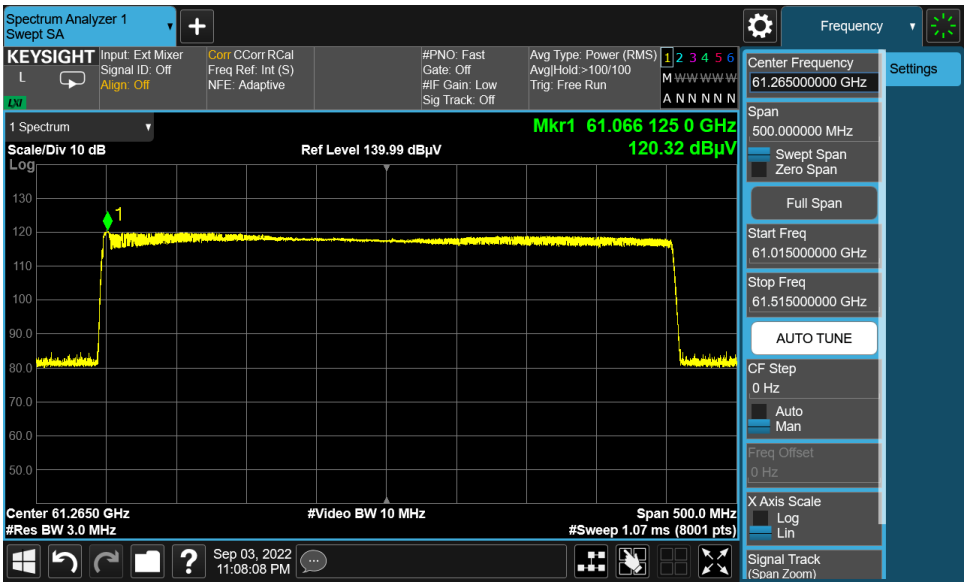
Average Power- Horizontal



Average Power- Vertical



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Frequency (GHz)	Distance (cm)	Polarity	dBuV/m @ 0.15m	E.I.R.P. Power (dBm)	E.I.R.P Limit (dBm)	Result	Remark
61.265	15	Horizontal	136.20	14.95	43	Pass	peak
		Vertical	122.50	1.25	43	Pass	peak
		Horizontal	135.91	14.66	40	Pass	Average
		Vertical	120.32	-0.93	40	Pass	Average

Remark:

E[dBμV/m] = EIRP[dBm] - 20 log(d[meters]) + 104.77, where E = field strength and d = distance at which field strength limit is specified in the rules

EIRP[dBm] = E[dBμV/m] + 20 log(d[meters]) - 104.77

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7.4 Emission within the 57-71Ghz, except 61.0-61.5GHz band

Test Requirement 47 CFR Part 15, Subpart C 15.255(c)(2)

Test Method: ANSI C63.10, Sections 9.10

Limit:

Frequency (GHz)	Average Power(dBm)	Peak Power(dBm)	Distance(m)	Field strength (dBuV/m)*, peak	Field strength (dBuV/m)*, average
57-61	10	13	0.15	134.25	131.25
61.5-71	10	13	0.15	134.25	131.25

E[dBμV/m] = EIRP[dBm] - 20 log(d[meters]) + 104.77, where E = field strength and d = distance at which field strength limit is specified in the rules

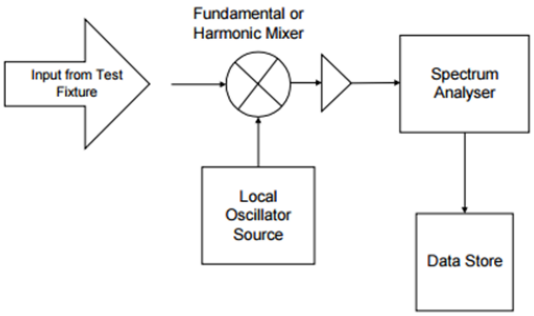
7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 22 °C Humidity: 50 % RH Atmospheric Pressure: 1002 mbar

Test Mode: a: TX mode _ Keep the EUT in continuously transmitting mode powered by AC adapter.

7.4.2 Test Setup Diagram



7.4.3 Measurement Procedure and Data

4) Place the EUT on the table and set it in the transmitting mode
5) SA set RBW=3MHz , VBW=3*RBW , Detector=Peak/Average, Trace: Mask Hold, Peak Search
6) The EUT was turned from 0 degrees to 360 degrees to find the maximum reading.

Remark 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

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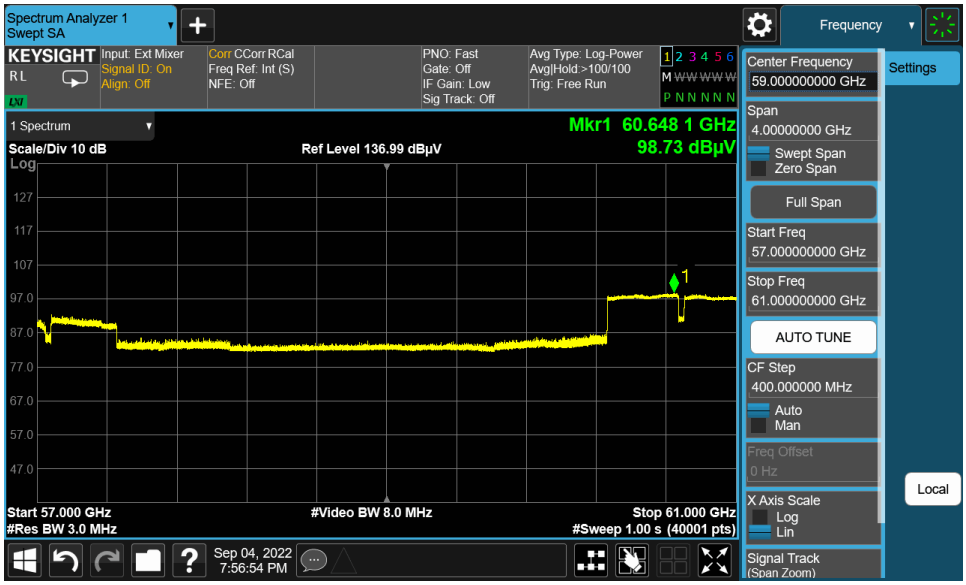
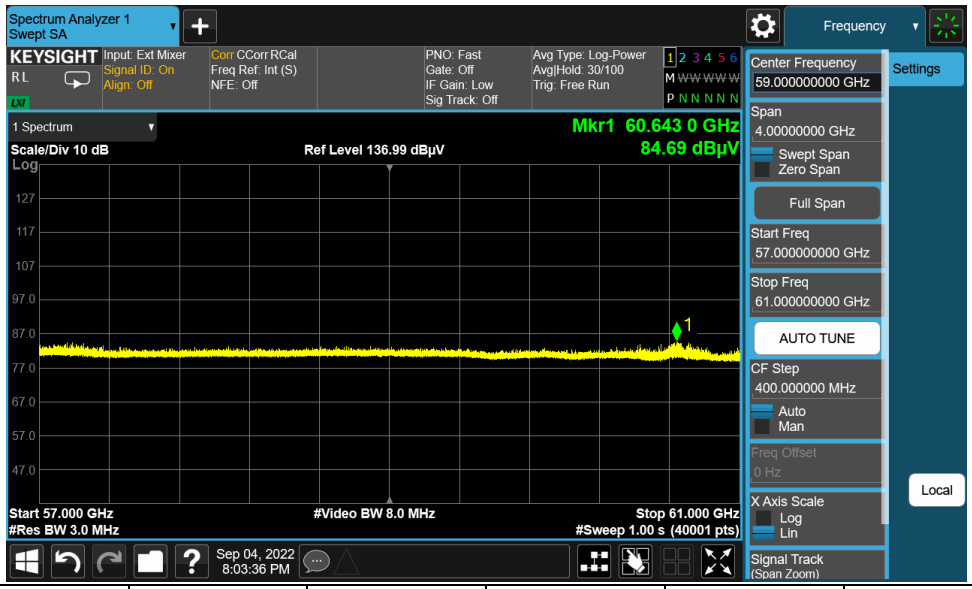
57-61GHz-Peak- Horizontal



57-61GHz-Peak - Vertical



Frequency (GHz)	Distance (M)	Peak Value (dBuv/m)	Peak Limit (dBuv/m)	Polarization	Result
60.6481	0.15	98.73	134.25	H	PASS
60.6430	0.15	84.69	134.25	V	PASS

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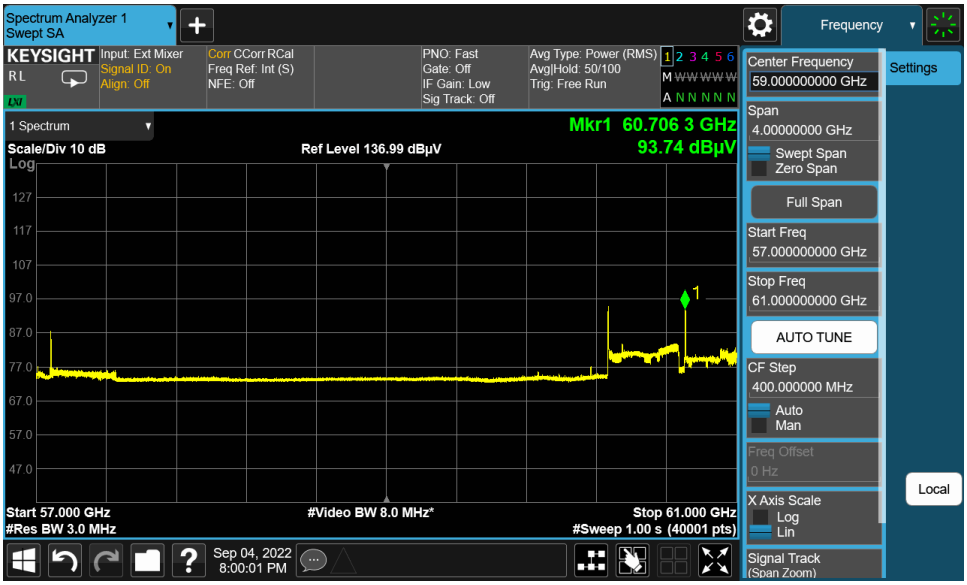
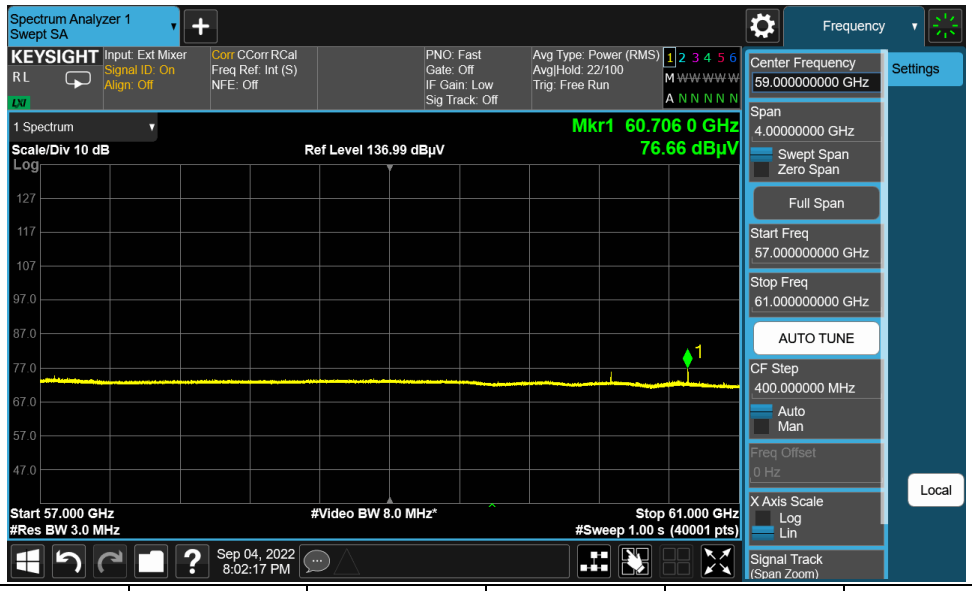
57-61GHz- Average-Horizontal



57-61GHz-Average-Vertical



Frequency (GHz)	Distance (M)	Average Value (dBuv/m)	Average Limit (dBuv/m)	Polarization	Result
60.7063	0.15	93.74	131.25	H	PASS
60.7060	0.15	76.66	131.25	V	PASS

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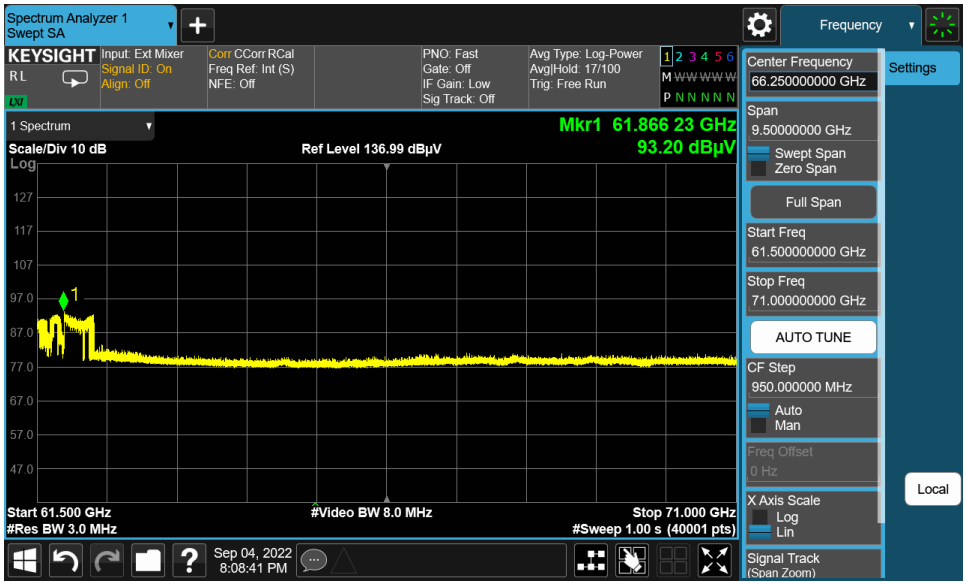
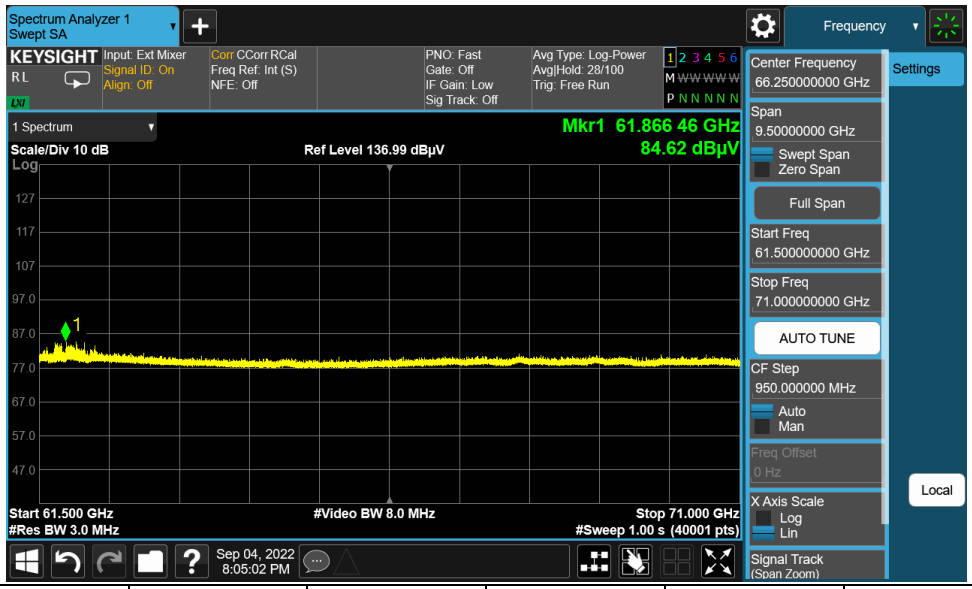
61.5-71GHz-Peak- Horizontal



61.5-71GHz-Peak - Vertical



Frequency (GHz)	Distance (M)	Peak Value (dBuv/m)	Peak Limit (dBuv/m)	Polarization	Result
61.86623	0.15	93.20	134.25	H	PASS
61.86646	0.15	84.62	134.25	V	PASS

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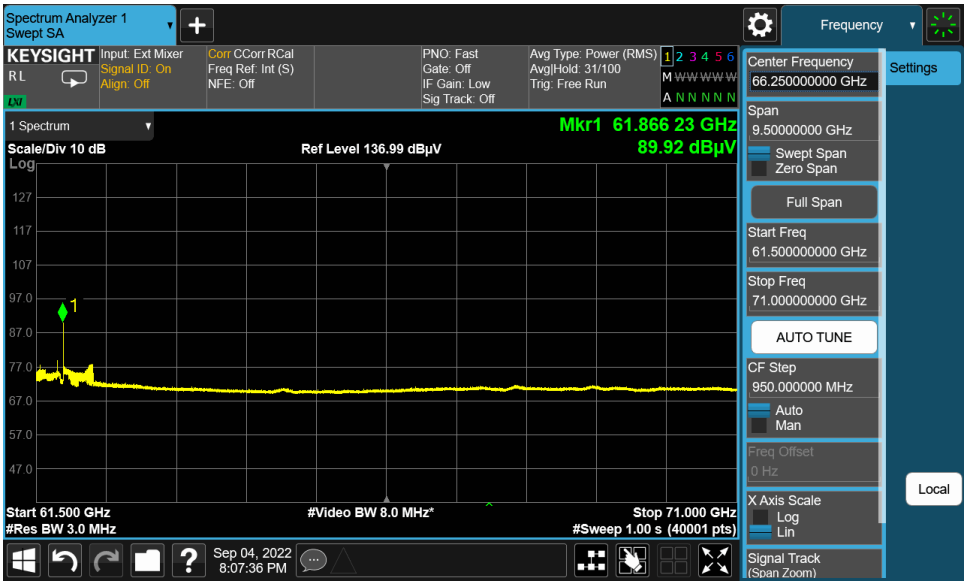
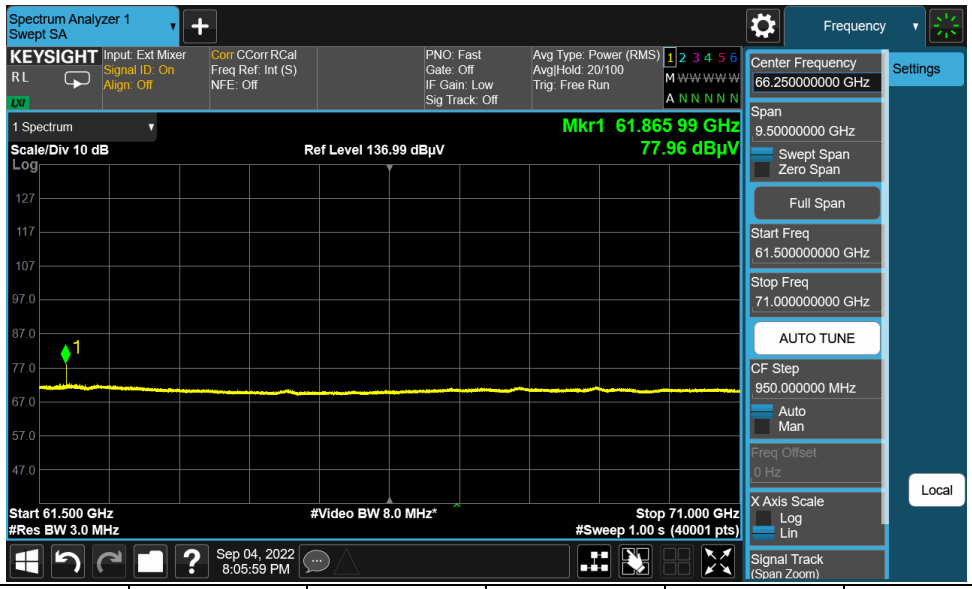
61.5-71GHz- Average-Horizontal



61.5-71GHz-Average-Vertical



Frequency (GHz)	Distance (M)	Average Value (dBuv/m)	Average Limit (dBuv/m)	Polarization	Result
61.86623	0.15	89.92	131.25	H	PASS
61.86599	0.15	77.96	131.25	V	PASS

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7.5 Out of band radiated emissions below 40 GHz

Test Requirement 47 CFR Part 15, Subpart C 15.255(d)(2)
Test Method: ANSI C63.10, Section 9.13
Limit:

Below 30MHz

Frequency	Field Strength (μV/m)	Measurement Distance (metres)
9 - 490 kHz	2,400/F (kHz)	300
490 - 1,705 kHz	24,000/F (kHz)	30
1.705-30 MHz	30	30
Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.		

Above 30MHz

Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (metres)
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241.

Frequency (MHz)	Field strength at 3 m, dB(uV/m)* Within restricted bands		
	Peak	Quasi Peak	Average
0.009 - 0.090	148.5 - 128.5	NA	128.5 - 108.5**
0.090 - 0.110	NA	108.5 - 106.8**	NA
0.110 - 0.490	126.8 - 113.8	NA	106.8 - 93.8**
0.490 - 1.705	NA	73.8 - 63.0**	NA
1.705 - 30.0*		69.5	
30 - 88		40.0	
88 - 216		43.5	
216 - 960		46.0	
Above 960		54.0	
1000 - 200000	74.0	N/A	54.0

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*- The limit for 3 m test distance was calculated using the inverse square distance extrapolation factor as follows:

$$Lim_{S2} = Lim_{S1} + 20 \log (S1/S2),$$

where S1 and S2 - standard defined and test distance respectively in meters.

**- The limit decreases linearly with the logarithm of frequency.

Note: The above field strength limits applied from the lowest radio frequency generated in the device, without going below 9 kHz up to the tenth harmonic of the highest fundamental frequency but not exceeding 40 GHz for intentional radiators operated below 10 GHz and up to the fifth harmonic of the highest fundamental frequency but not exceeding 200 GHz for intentional radiators operated above 30 GHz.

Frequency (MHz)	Field strength at 1 m, dB(uV/m)* Within restricted bands		
	Peak	Quasi Peak	Average
1000 - 200000	83.5	N/A	63.5

7.5.1 E.U.T. Operation

Operating Environment:

Temperature:	22	°C	Humidity:	50	% RH	Atmospheric Pressure:	1002	mbar

Test Mode: a: TX mode _ Keep the EUT in continuously transmitting mode powered by AC adapter.

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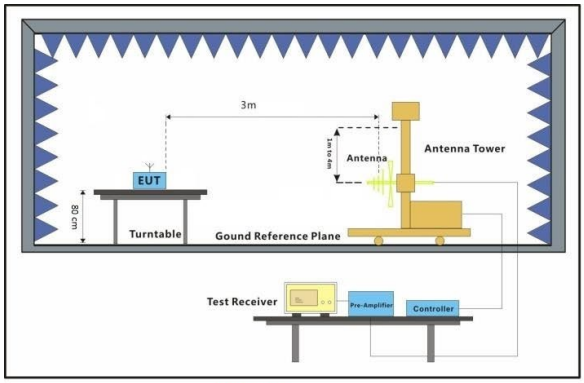
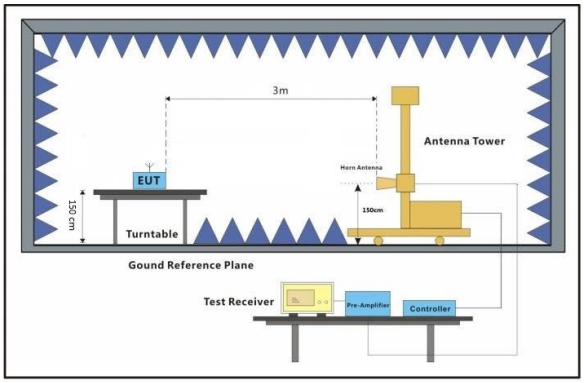
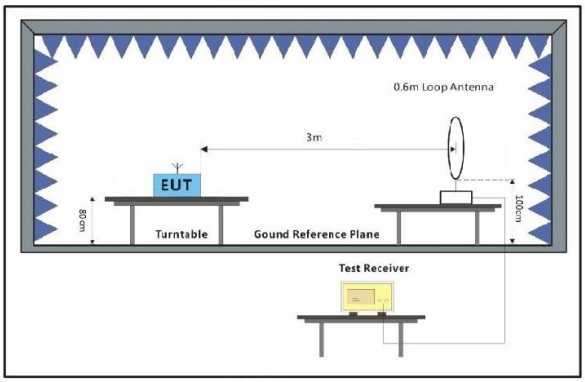
7.5.2 Test Setup Diagram



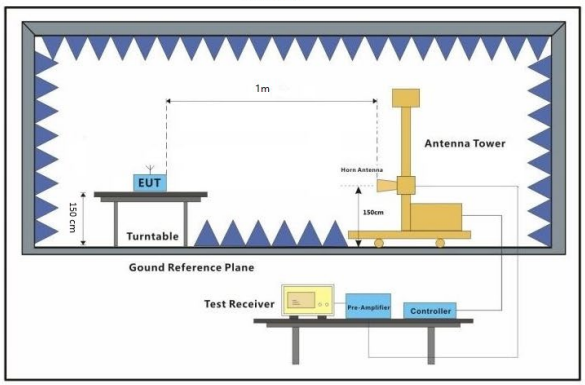
30MHz-1GHz



1GHz-18GHz



Below 30MHz



18GHz-40GHz

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7.5.3 Measurement Procedure and Data

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. For 1-18GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

c. For 18-40GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 1 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was t tuned to the same hight (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

i. Repeat above procedures until all frequencies measured was complete.

Remark 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

Remark 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

Remark 3: Scan from 9kHz to 40GHz, the disturbance below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

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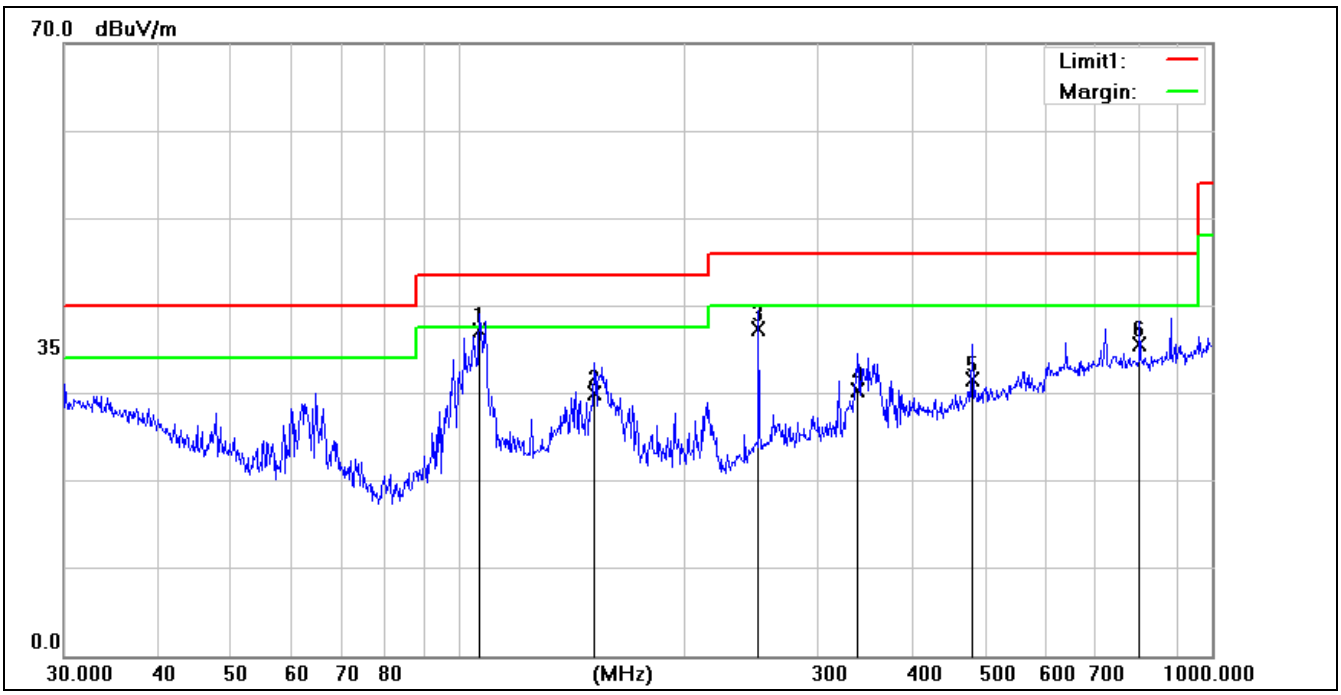
Radiation Spurious Emission
30MHz-1GHz Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(deg.)	
1	106.7587	19.09	18.06	37.15	43.50	-6.35	100	360	QP
2	151.5972	12.22	17.79	30.01	43.50	-13.49	100	360	QP
3	250.3012	17.52	19.79	37.31	46.00	-8.69	100	0	QP
4	338.4001	9.02	21.43	30.45	46.00	-15.55	100	23	QP
5	480.5276	6.36	25.20	31.56	46.00	-14.44	100	94	QP
6	801.7863	7.36	28.32	35.68	46.00	-10.32	100	7	QP

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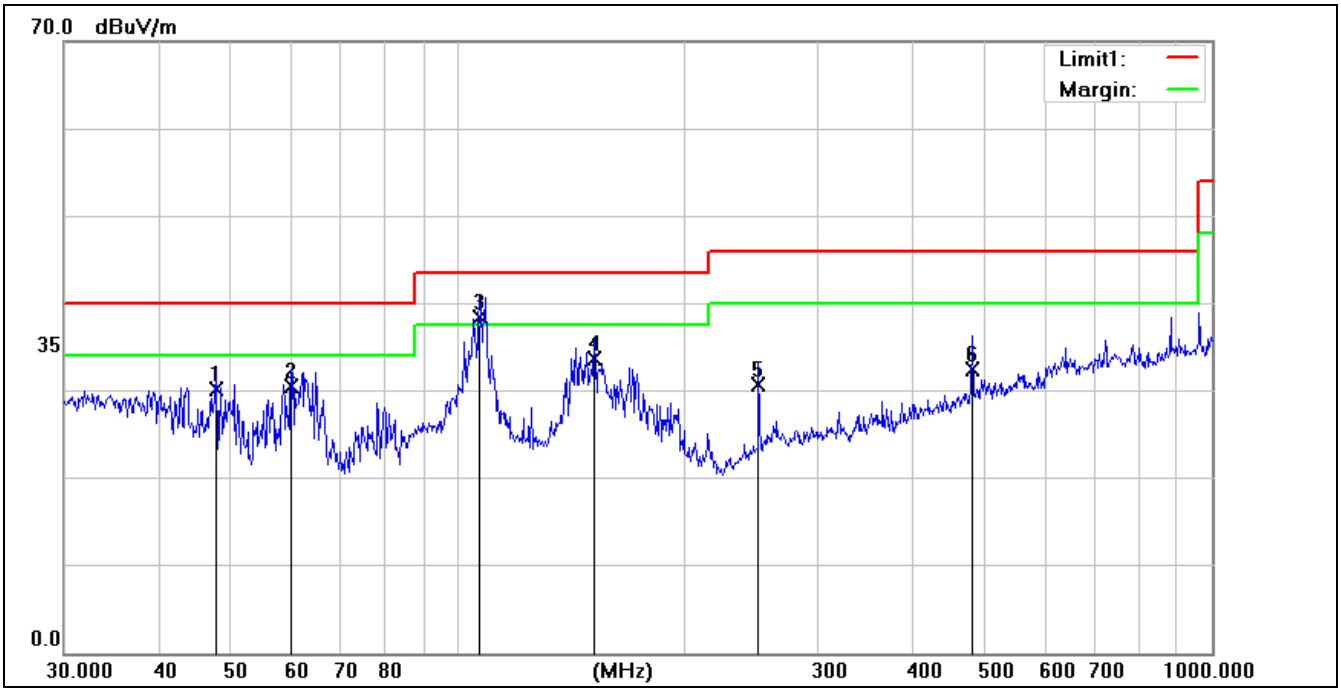
30MHz-1GHz Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(deg.)	
1	47.8260	11.45	18.66	30.11	40.00	-9.89	100	26	QP
2	60.0690	15.64	14.92	30.56	40.00	-9.44	100	360	QP
3	106.7587	20.38	18.06	38.44	43.50	-5.06	100	215	QP
4	151.5971	15.82	17.79	33.61	43.50	-9.89	100	120	QP
5	250.3011	10.85	19.79	30.64	46.00	-15.36	100	0	QP
6	480.5276	7.28	25.20	32.48	46.00	-13.52	100	2	QP

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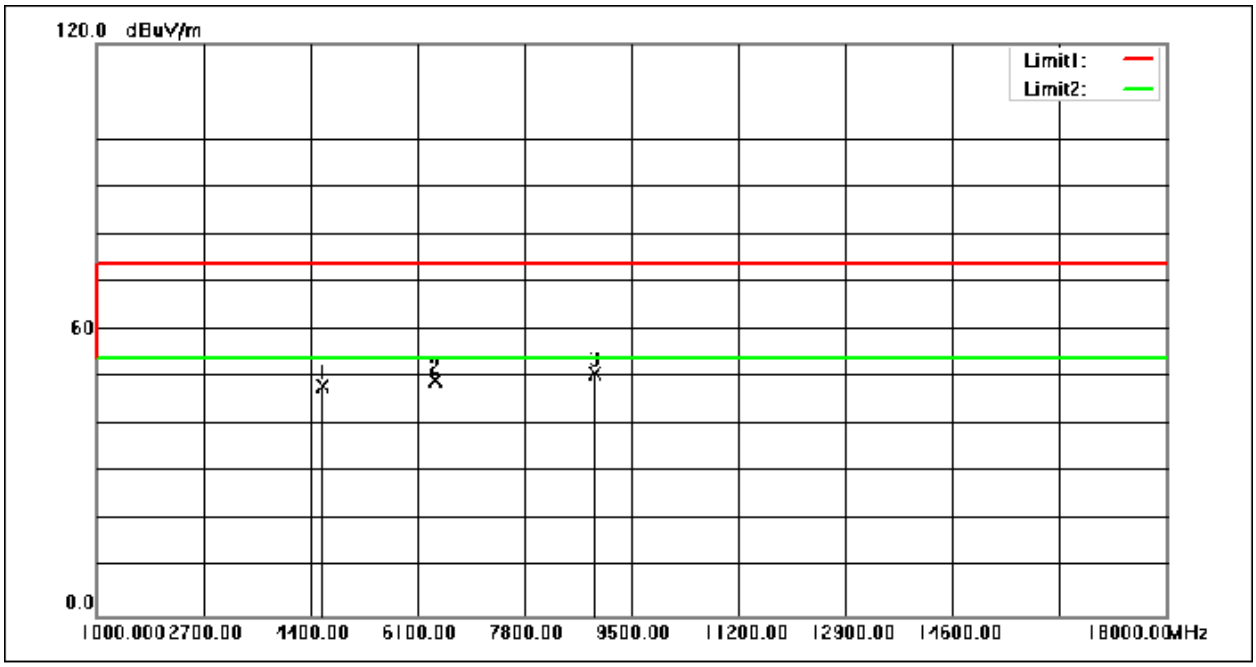
1-18GHz Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4585.000	56.70	-8.56	48.14	74.00	-25.86	peak
2	6389.000	54.66	-5.41	49.25	74.00	-24.75	peak
3	8925.000	52.95	-2.16	50.79	74.00	-23.21	peak

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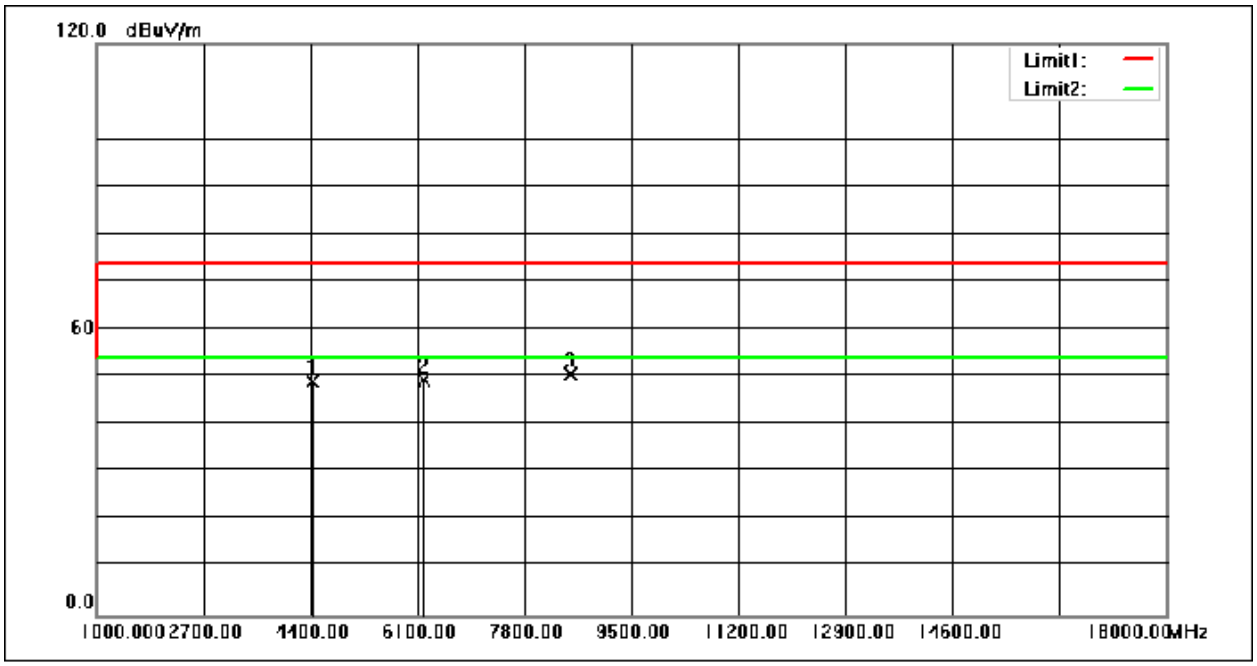
1-18GHz Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4426.000	57.88	-8.90	48.98	74.00	-25.02	peak
2	6197.000	54.42	-5.15	49.27	74.00	-24.73	peak
3	8541.000	54.65	-4.14	50.51	74.00	-23.49	peak

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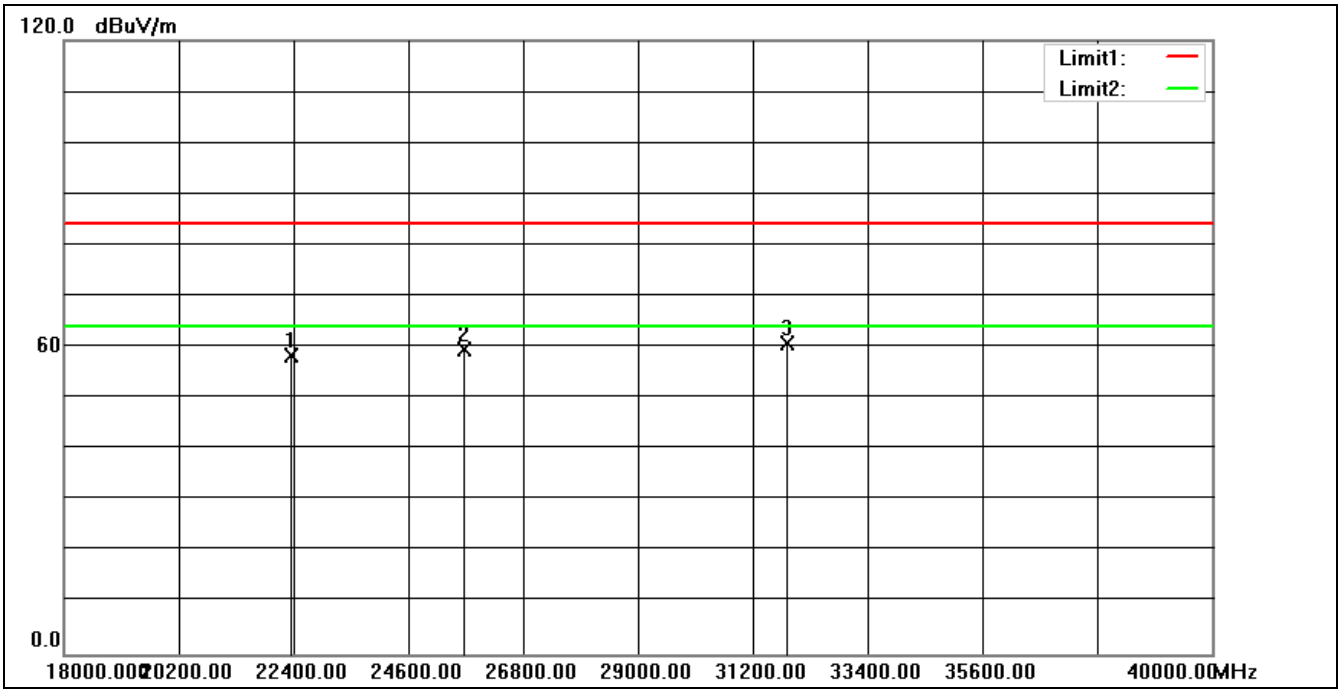
18-40GHz Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	22348.000	45.44	12.79	58.23	83.50	-25.27	peak
2	25682.000	45.12	14.32	59.44	83.50	-24.06	peak
3	31856.000	45.98	14.80	60.78	83.50	-22.72	peak

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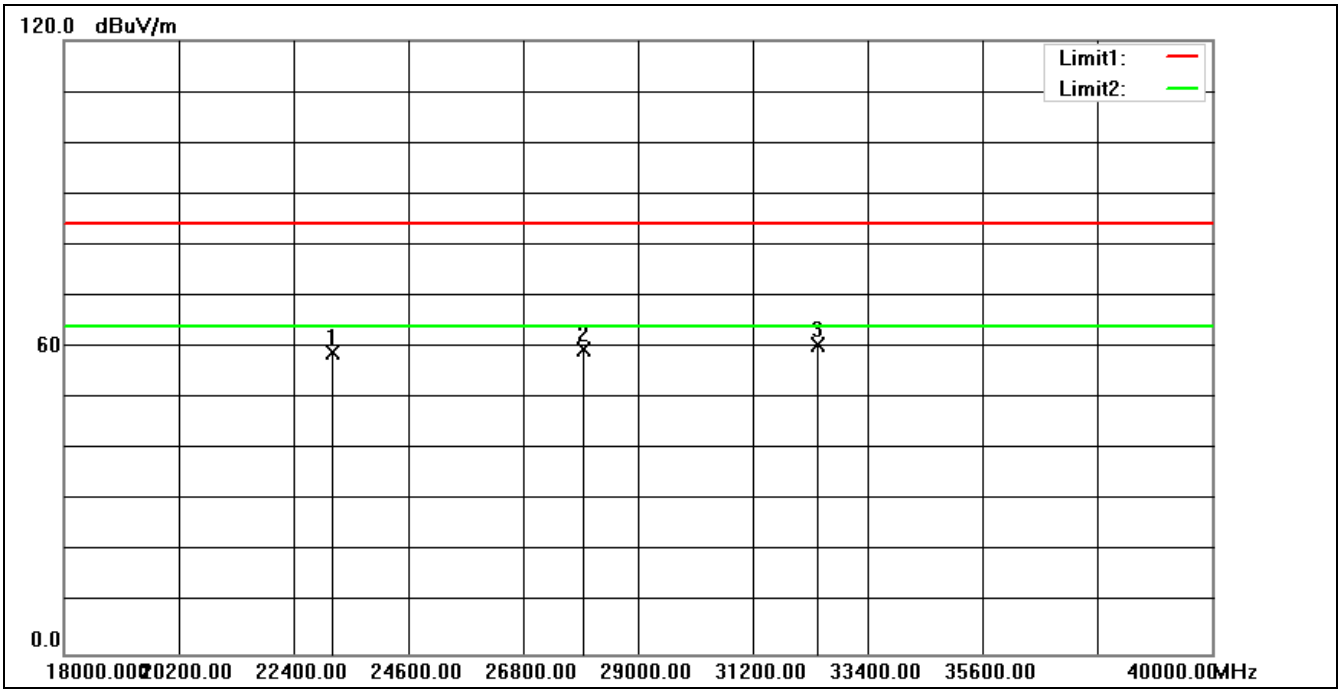
18-40GHz Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	23152.000	46.39	12.47	58.86	83.50	-24.64	peak
2	27964.000	46.28	13.23	59.51	83.50	-23.99	peak
3	32440.000	44.28	16.06	60.34	83.50	-23.16	peak

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7.6 Out of band radiated emissions above 40 GHz

Test Requirement 47 CFR Part 15, Subpart C 15.255(d)(3)
Test Method: ANSI C63.10, Section 9.9, 9.12
Limit:

Above 40GHz

Frequency (GHz)	Power density at 3 m distance (pW/cm^2)	Distance (m)	Field strength (dBuV/m)*, peak	Field strength (dBuV/m)*, average
40 - 200	90	3.0	105.31	85.31
40 - 200	90	0.15	131.33**	111.33**

* - Field strength was calculated per equation (26) of ANSI C63.10-2013 section 9 as follows: E=sqrt(PD×377), where PD is the power density at the distance specified by the limit in W/m^2, E- field strength in V/m.

**- The limit for other test distance was calculated using the inverse distance extrapolation factor as follows: LimS2 = LimS1 + 20 log (S1/S2), where S1 and S2 - standard defined and test distance respectively in meters.

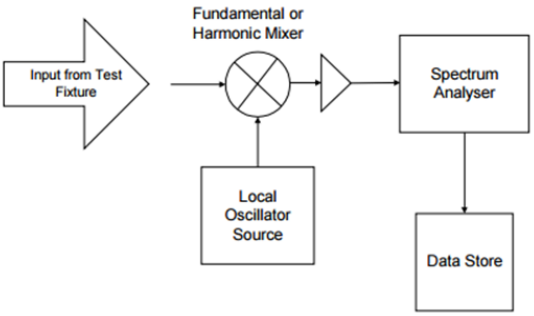
7.6.1 E.U.T. Operation

Operating Environment:

Temperature: 22 °C Humidity: 50 % RH Atmospheric Pressure: 1002 mbar

Test mode: a: TX mode _ Keep the EUT in continuously transmitting mode powered by AC adapter.

7.6.2 Test Setup Diagram



Above 40GHz

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7.6.3 Measurement Procedure and Data

a. For above 40GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 0.15 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation

b. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

c. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to the same hight (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

d. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

e. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

f. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

g. Repeat above procedures until all frequencies measured was complete.

Remark 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

Remark 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

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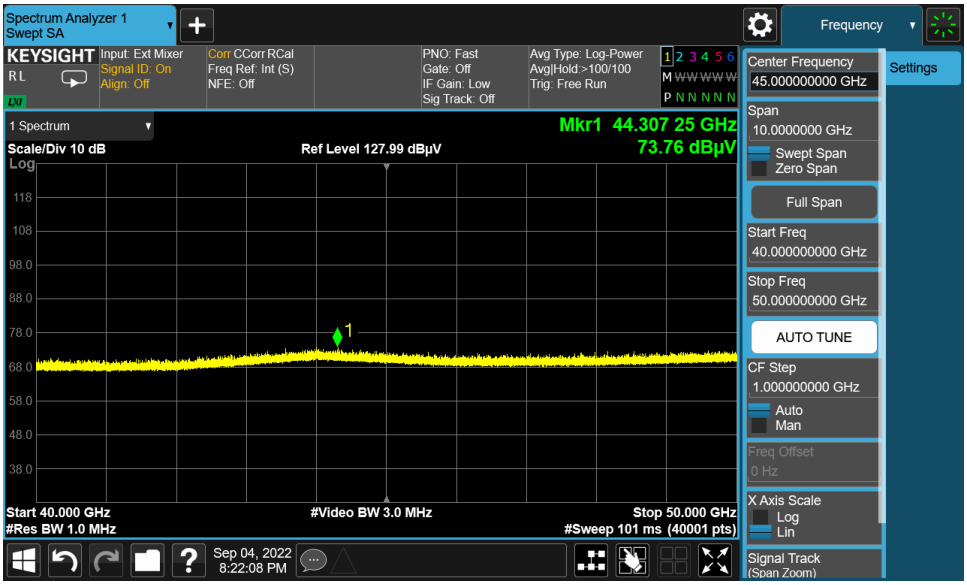
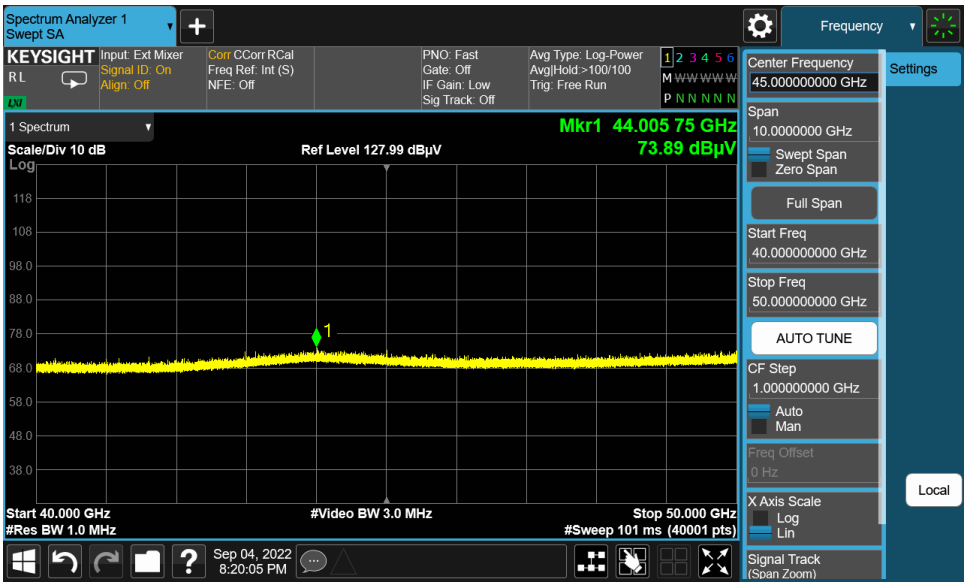
40-50GHz Horizontal



40-50GHz Vertical



Frequency (GHz)	Distance (M)	Peak Value (dBuv/m)	AV Limit (dBuv/m)	Polarization	Result
44.30725	0.15	73.76	111.33	V	PASS
44.00575	0.15	73.89	111.33	H	PASS

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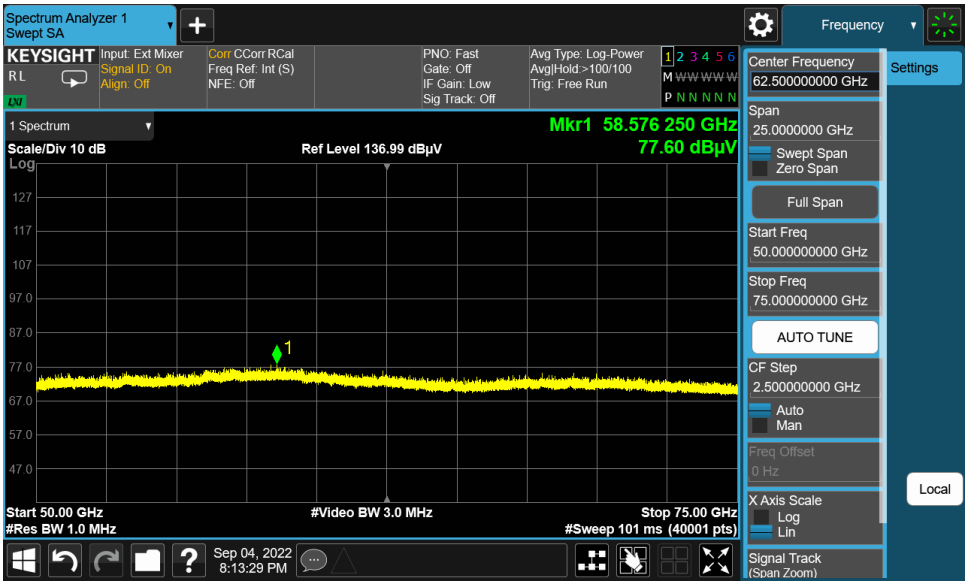
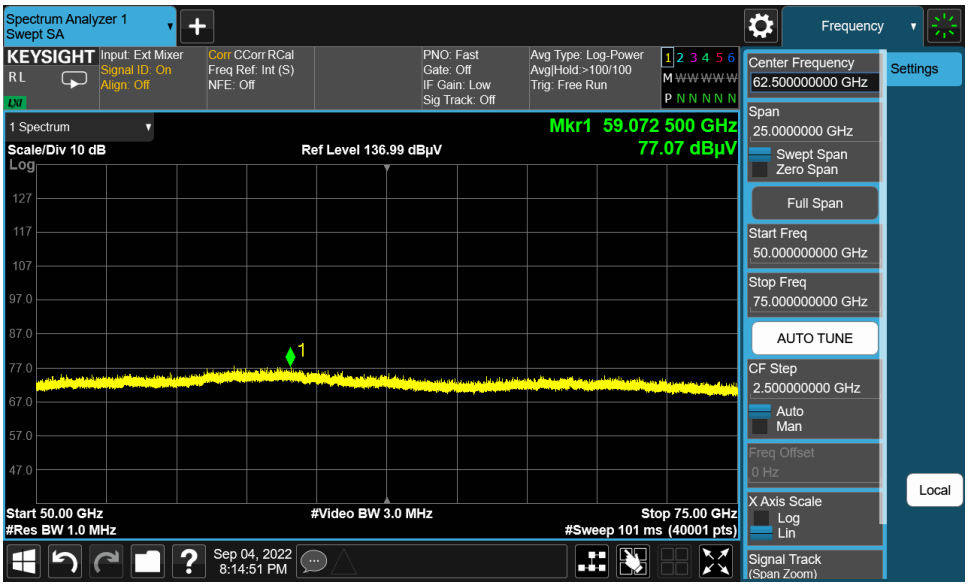
50-75GHz Horizontal



50-75GHz Vertical



Frequency (GHz)	Distance (M)	Peak Value (dBuv/m)	AV Limit (dBuv/m)	Polarization	Result
58.57925	0.15	77.60	111.33	H	PASS
59.07250	0.15	77.07	111.33	V	PASS

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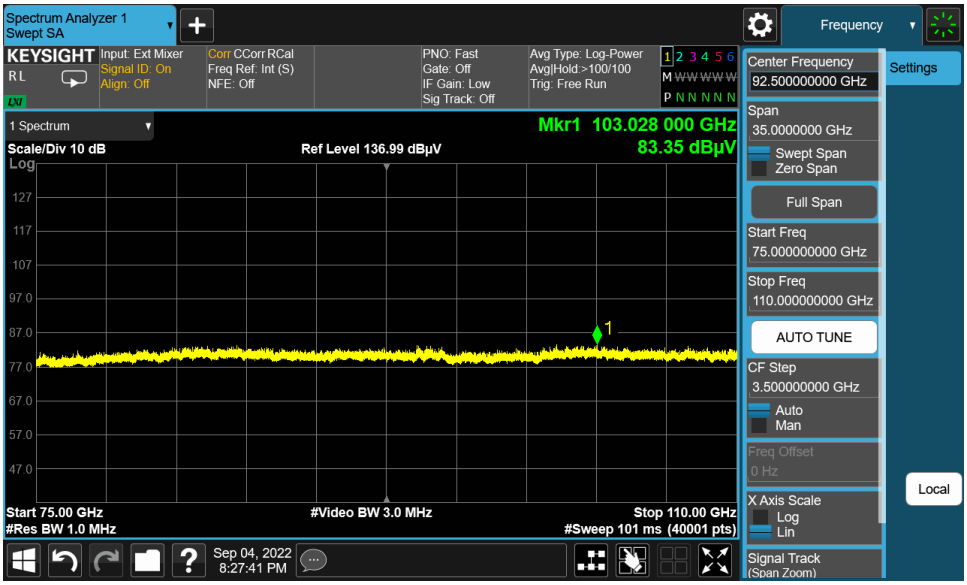
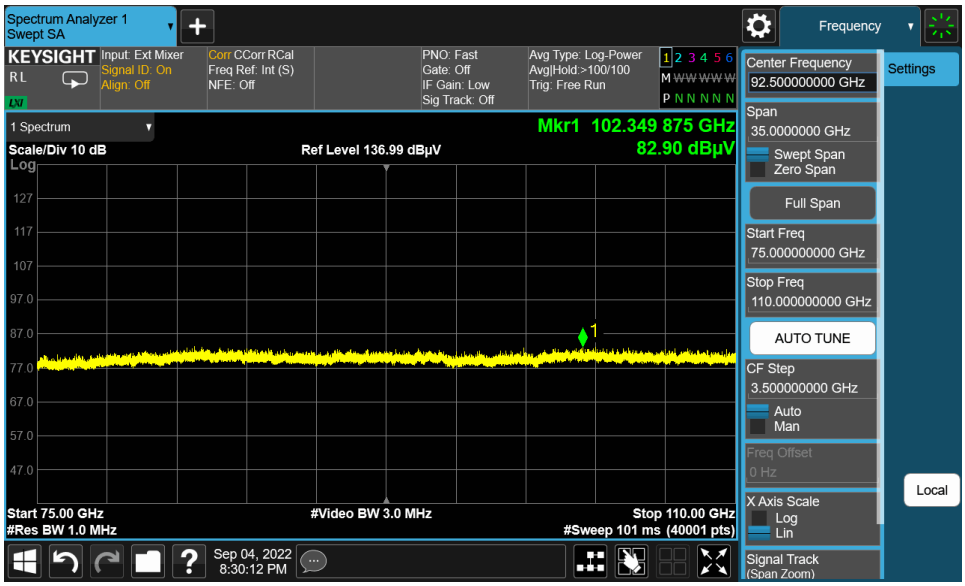
75-110GHz Horizontal



75-110GHz Vertical



Frequency (GHz)	Distance (M)	Peak Value (dBuv/m)	AV Limit (dBuv/m)	Polarization	Result
103.0280	0.15	83.35	111.33	H	PASS
102.3499	0.15	82.90	111.33	V	PASS

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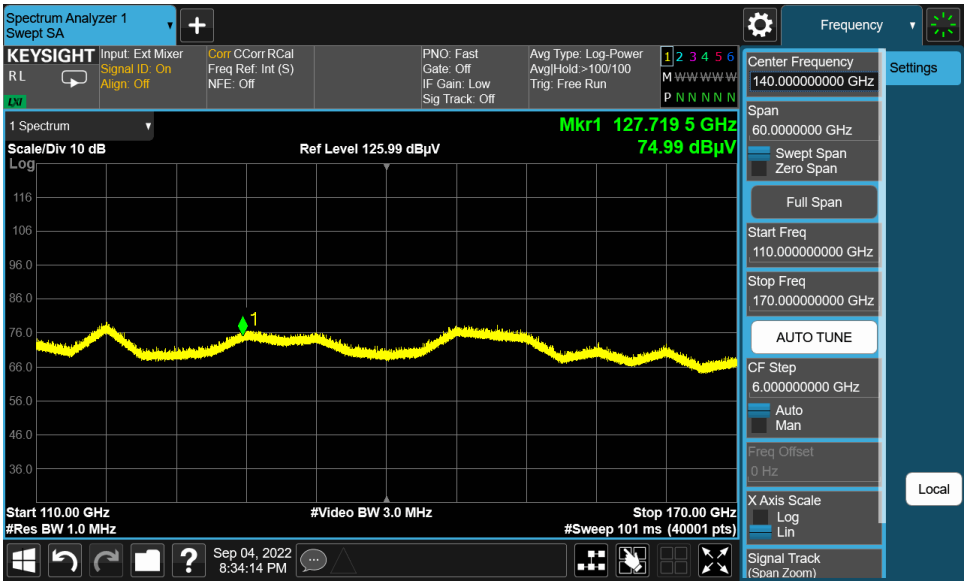
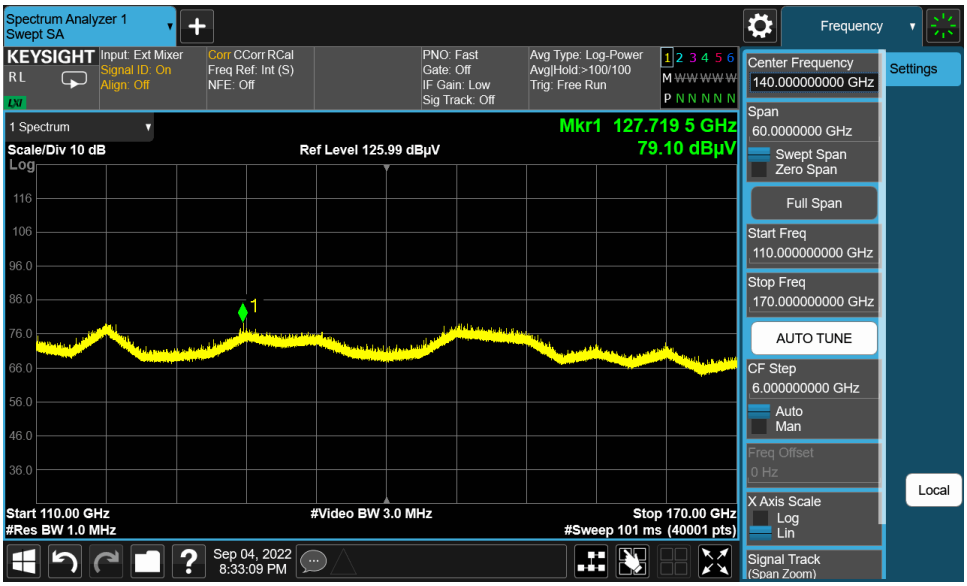
110-170GHz Horizontal



110-170GHz Vertical



Frequency (GHz)	Distance (M)	Peak Value (dBuv/m)	AV Limit (dBuv/m)	Polarization	Result
127.7195	0.15	74.99	111.33	H	PASS
127.7195	0.15	79.10	111.33	V	PASS

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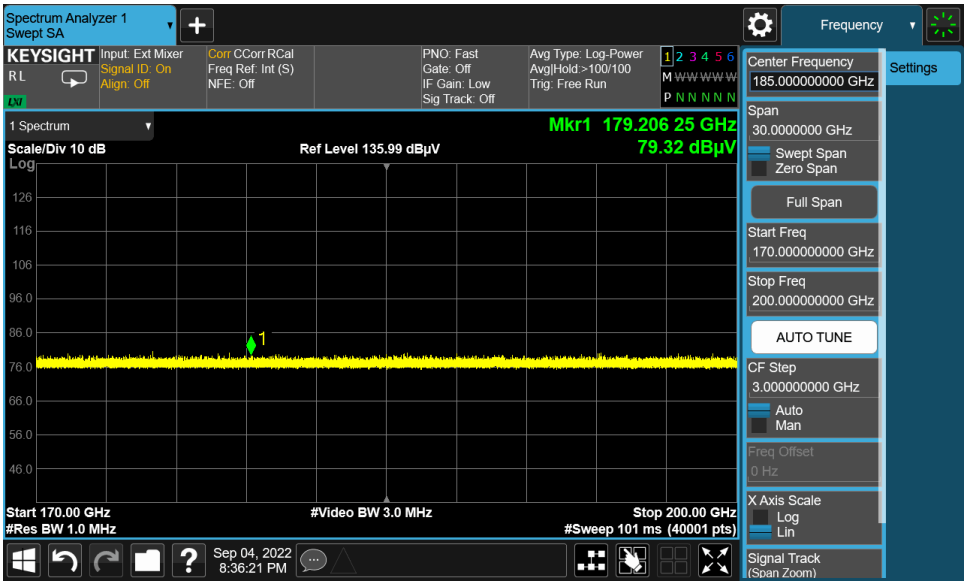
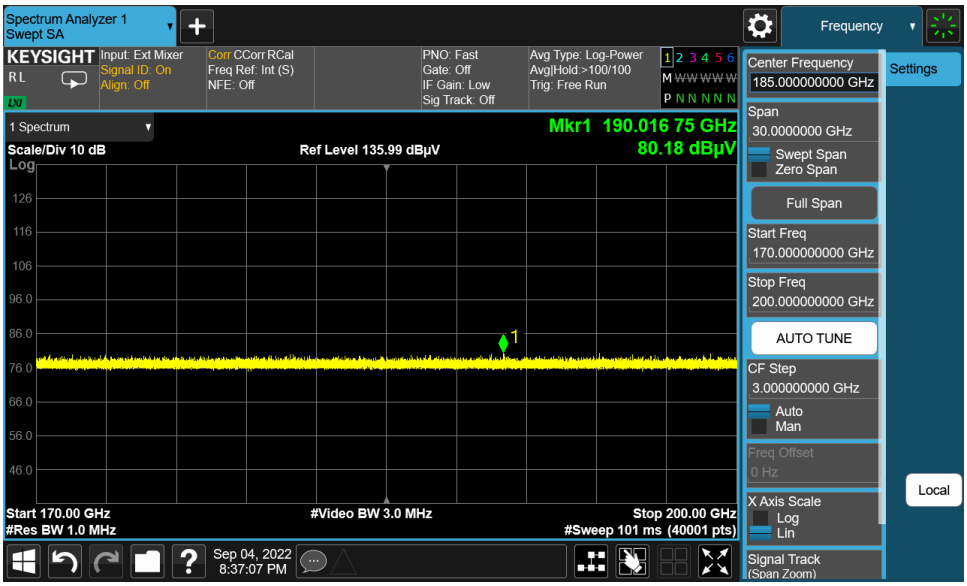
170-200GHz Horizontal



170-200GHz Vertical



Frequency (GHz)	Distance (M)	Peak Value (dBuv/m)	AV Limit (dBuv/m)	Polarization	Result
179.20625	0.15	79.32	111.33	H	PASS
190.01675	0.15	80.18	111.33	V	PASS

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7.7 Frequency stability

Test Requirement 47 CFR Part 15, Subpart C 15. 255(f)

Test Method: ANSI C63.10, Section 9.14

Limit:

Frequency (GHz)	Limit
57 - 71	The signal must be contained within assigned frequency band

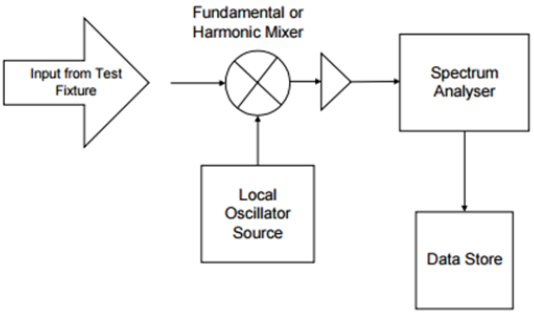
7.7.1 E.U.T. Operation

Operating Environment:

Temperature: 22 °C Humidity: 50 % RH Atmospheric Pressure: 1002 mbar

Test mode: a: TX mode _ Keep the EUT in continuously transmitting mode powered by AC adapter.

7.7.2 Test Setup Diagram



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7.7.3 Measurement Procedure and Data

1. Temperature conditions:
   a) The RF output port of the EUT was connected to Frequency Meter;
   b) Set the working Frequency in the middle channel;
   c) record the 20°C and norminal voltage frequency value as reference point;
   d) vary the temperature from -20°C to 45°C with step 10°C
   e) when reach a temperature point, keep the temperature banlance at least 1 hour to make the product working in this status;
   f) read the frequency at the relative temperature.
2. Voltage conditions:
   a) record the 20°C and norminal voltage frequency value as reference point;
   b) vary the voltage from -15% norminal voltage to +15% voltage;

read the frequency at the relative voltage.

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Frequency Stability vs temperature:

1. Test for 61GHz to 61.5GHz (Channel=61.265GHz)

Frequency (GHz)	Temperature (°C)	Voltage (V ac)	F_L (GHz)	Limit (GHz)	F_H (GHz)	Limit (GHz)	Result
61 – 61.5	45	120	61.049	61	61.472	61.5	Pass
	40	120	61.055	61	61.468	61.5	Pass
	30	120	61.051	61	61.477	61.5	Pass
	20	120	61.058	61	61.470	61.5	Pass
	10	120	61.047	61	61.473	61.5	Pass
	0	120	61.050	61	61.469	61.5	Pass
	-10	120	61.061	61	61.471	61.5	Pass
	-20	120	61.048	61	61.466	61.5	Pass

Frequency Stability vs voltage:

1. Test for 61GHz to 61.5GHz (Channel=61.265GHz)

Frequency (GHz)	Voltage (V ac)	Temperature (°C)	F_L (GHz)	Limit (GHz)	F_H (GHz)	Limit (GHz)	Result
61 – 61.5	108	20	61.052	61	61.479	61.5	Pass
	120	20	61.051	61	61.473	61.5	Pass
	132	20	61.089	61	61.468	61.5	Pass

Remark:

F_L: Frequency Low Band Edge, F_H: Frequency High Band Edge

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8 Test Setup Photo

Refer to Appendix - Test Setup Photo for KSCR2208001533AT

9 EUT Constructional Details (EUT Photos)

Refer to Appendix - Photographs of EUT Constructional Details for KSCR2208001533AT

- End of the Report -

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