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Rev.: 01
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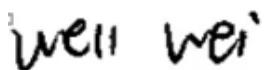
TEST REPORT

Application No.: SEWM2307000277RG
Applicant: Telly, Inc.
Address of Applicant: 2901 Florida Avenue Suite 840, Miami, Florida 33133, United States
Manufacturer: Telly, Inc.
Address of Manufacturer: 2901 Florida Avenue Suite 840, Miami, Florida 33133, United States
EUT Description: mmWave Radar
Model No.: A5L2
Trade Mark: TELLY
FCC ID: 2BBQXA5L2
Standards: FCC 47 CFR Part 15, Subpart C 15.255
Date of Receipt: 2023/06/05
Date of Test: 2023/06/07 to 2023/07/12
Date of Issue: 2023/07/26

Test Result :	PASS *
---------------	--------

* In the configuration tested, the EUT detailed in this report complied with the standards specified above.

Authorized Signature:



Well Wei
Wireless Laboratory Manager



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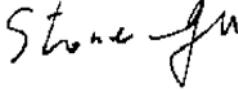
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1 Version

Revision Record

Version	Chapter	Date	Modifier	Remark
01		2023/07/26		Original

Prepared By	 (King-p Li) / Test Engineer
Checked By	 (Stone Gu) / Reviewer



SGS-CSTC Standards Technical Services (Suzhou) Co., Ltd.
Wireless Laboratory

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2 Test Summary

Test Item	FCC Rule No.	Test Method	Test Result	Result
Antenna Requirement	15.203	--	Clause 4.1	PASS
Transmitter power and power spectral density	15.255 (c)(3),(d)(1)	ANSI C63.10-2013 Section 9.5/9.6	Clause 4.2	PASS
Occupied bandwidth	15.215 (c), 15.255 (c3)	ANSI C63.10-2013 Section 9.3	Clause 4.3	PASS
Radiated spurious emissions below 40 GHz	15.255 (d)(2)	ANSI C63.10-2013 Section 9.13	Clause 4.4	PASS
Radiated emissions outside assigned band and above 40 GHz up to 200 GHz	15.255 (d)(3)	ANSI C63.10-2013 Section 9.9/9.12	Clause 4.5	PASS
Frequency stability	15.255 (f)	ANSI C63.10-2013 Section 9.14	Clause 4.6	PASS

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3 General Information

3.1 Details of Client

Applicant:	Telly, Inc.
Address of Applicant:	2901 Florida Avenue Suite 840, Miami, Florida 33133, United States
Manufacturer:	Telly, Inc.
Address of Manufacturer:	2901 Florida Avenue Suite 840, Miami, Florida 33133, United States

3.2 Test Location

Company:	SGS-CSTC Standards Technical Services (Suzhou) Co., Ltd.
Address:	South of No. 6 Plant, No. 1, Runsheng Road, Suzhou Industrial Park, Suzhou Area, China (Jiangsu) Pilot Free Trade Zone
Post code:	215000
Test engineer:	King-p Li

3.3 Test Facility

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

• **A2LA (Certificate No. 6336.01)**

SGS-CSTC STANDARDS TECHNICAL SERVICES (SUZHOU) CO., LTD. is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 6336.01.

• **Innovation, Science and Economic Development Canada**

SGS-CSTC STANDARDS TECHNICAL SERVICES (SUZHOU) CO., LTD. has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0120.

IC#: 27594.

• **FCC –Designation Number: CN1312**

SGS-CSTC STANDARDS TECHNICAL SERVICES (SUZHOU) CO., LTD. has been recognized as an accredited testing laboratory.

Designation Number: CN1312.

Test Firm Registration Number: 717327



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3.4 General Description of EUT

EUT Description:	mmWave Radar
Model No.:	A5L2
Trade Mark:	TELLY
Power supply:	DC 5V
Frequency Range:	60GHz-64GHz
Modulation Type:	FMCW
Antenna Type:	Antenna 1: Integrated Patch Antenna Antenna 2: Integrated Patch Antenna Antenna 3: Integrated Patch Antenna Not support MIMO Mode
Antenna Gain:	Antenna 1: 4.8dBi Antenna 2: 4.8dBi Antenna 3: 4.8dBi Not support MIMO Mode
	Note: The antenna gain are derived from the gain information report provided by the manufacturer.
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3.5 Test Environment

Environment Parameter	101.0 kPa Selected Values During Tests	
Relative Humidity	44-46 % RH Ambient	
Value	Temperature(°C)	Voltage(V)
NTNV	22-23	5
LTLV	-10	4.25
LTHV	-10	5.75
HTLV	50	4.25
HTHV	50	5.75

3.6 Description of Support Units

Description	Manufacturer	Model No.	Inventory No.
Computer	Lenovo	T14	SUWI-03-33-04
Adapter	Jiangsu Chenyang Electron CO.,Ltd.	MDY-09-EW	/
Serial port adapter plate	/	Test Plate 3	/
SecureCRT	VanDyke	V 6.2.0	/

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4 Test results and Measurement Data

4.1 Antenna Requirement

Standard requirement: 47 CFR Part 15C Section 15.203

15.203 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 a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

The antenna is Integrated Patch Antenna and no consideration of replacement. The best case gain of the antenna is 4.8dBi.

Note:

The antenna gain are derived from the gain information report provided by the manufacturer.

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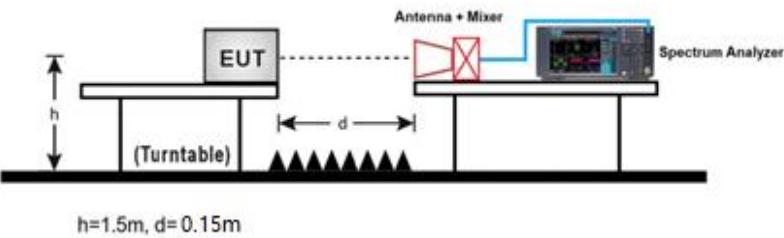
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4.2 Transmitter power and power spectral density

Test Requirement:	47 CFR Part 15C Section 15.255 (c)(3), (d)(1)										
Test Method:	ANSI C63.10-2013 Section 9.5, 9.6										
Test Setup:	 <p>$h=1.5m, d=0.15m$</p>										
Test Instruments:	Refer to section 6 for details										
Test Procedure:	<ol style="list-style-type: none"> 1. Place the EUT on the table and set it in the transmitting mode. 2. SA set RBW=10MHz , VBW=3*RBW , Detector=Peak Trace: Max Hold, Peak Search. 3. The EUT was turned from 0 degrees to 360 degrees to find the maximum reading. 										
Test Mode:	TX mode _ Keep the EUT in continuously transmitting mode powered by DC 5V										
Limit:	<table border="1"> <thead> <tr> <th rowspan="2">Assigned frequency range (MHz)</th> <th colspan="2">Maximum output power</th> </tr> <tr> <th>Peak Conducted Power (dBm)</th> <th>Peak EIRP (dBm)</th> </tr> </thead> <tbody> <tr> <td>57000 - 71000</td> <td>-10</td> <td>10</td> </tr> </tbody> </table>			Assigned frequency range (MHz)	Maximum output power		Peak Conducted Power (dBm)	Peak EIRP (dBm)	57000 - 71000	-10	10
Assigned frequency range (MHz)	Maximum output power										
	Peak Conducted Power (dBm)	Peak EIRP (dBm)									
57000 - 71000	-10	10									
Test Results:	Pass										
The detailed test data see: Appendix											



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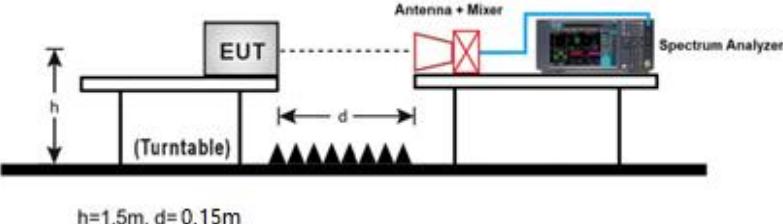
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4.3 Occupied Bandwidth

Test Requirement:	47 CFR Part 15C Section 15.215(c), 15.255 (c3)
Test Method:	ANSI C63.10-2013 Section 9.3
Test Setup:	 <p>$h=1.5m, d=0.15m$</p>
Instruments Used:	Refer to section 6 for details
Test Procedure:	<ol style="list-style-type: none"> 1. Place the EUT on the table and set it in the transmitting mode. 2. SA set RBW=1%~5% OBW, or a minimum of 1 MHz if this is not possible due to a large OBW, VBW=3*RBW and Detector=Peak. 3. Measure and record the result of 20dB and 99% bandwidth.
Test Mode:	TX mode _ Keep the EUT in continuously transmitting mode powered by DC 5V
Limit:	57-71GHz
Test Results:	Pass
The detailed test data see: Appendix	



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4.4 Radiated spurious emissions below 40 GHz

Test Requirement:	47 CFR Part 15C Section 15.225 (d)(2)																																					
Test Method:	ANSI C63.10-2013 Section 9.13																																					
Limit:	Below 30MHz: <table border="1"> <thead> <tr> <th>Frequency</th> <th>Field Strength (μV/m)</th> <th>Measurement Distance (metres)</th> </tr> </thead> <tbody> <tr> <td>9 - 490 kHz</td> <td>2,400/F (kHz)</td> <td>300</td> </tr> <tr> <td>490 - 1,705 kHz</td> <td>24,000/F (kHz)</td> <td>30</td> </tr> <tr> <td>1.705-30 MHz</td> <td>30</td> <td>30</td> </tr> </tbody> </table> <p>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.</p> <p>Above 30MHz:</p> <table border="1"> <thead> <tr> <th>Frequency (MHz)</th> <th>Field Strength (μV/m)</th> <th>Measurement Distance (metres)</th> </tr> </thead> <tbody> <tr> <td>30-88</td> <td>100**</td> <td>3</td> </tr> <tr> <td>88-216</td> <td>150**</td> <td>3</td> </tr> <tr> <td>216-960</td> <td>200**</td> <td>3</td> </tr> <tr> <td>Above 960</td> <td>500</td> <td>3</td> </tr> </tbody> </table> <p>** 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.</p>				Frequency	Field Strength (μ V/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	Frequency (MHz)	Field Strength (μ V/m)	Measurement Distance (metres)	30-88	100**	3	88-216	150**	3	216-960	200**	3	Above 960	500	3							
Frequency	Field Strength (μ V/m)	Measurement Distance (metres)																																				
9 - 490 kHz	2,400/F (kHz)	300																																				
490 - 1,705 kHz	24,000/F (kHz)	30																																				
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88-216	150**	3																																				
216-960	200**	3																																				
Above 960	500	3																																				
	<table border="1"> <thead> <tr> <th rowspan="2">Frequency (MHz)</th> <th colspan="3">Field strength at 3 m, dB(μV/m)*</th> </tr> <tr> <th colspan="3">Within restricted bands</th> </tr> </thead> <tbody> <tr> <th>Peak</th> <th>Quasi Peak</th> <th>Average</th> </tr> <tr> <td>0.009 - 0.090</td> <td>148.5 - 128.5</td> <td>NA</td> <td>128.5 - 108.5**</td> </tr> <tr> <td>0.090 - 0.110</td> <td>NA</td> <td>108.5 - 106.8**</td> <td>NA</td> </tr> <tr> <td>0.110 - 0.490</td> <td>126.8 - 113.8</td> <td>NA</td> <td>106.8 - 93.8**</td> </tr> <tr> <td>0.490 - 1.705</td> <td></td> <td>73.8 - 63.0**</td> <td rowspan="4">NA</td> </tr> <tr> <td>1.705 - 30.0*</td> <td></td> <td>69.5</td> </tr> <tr> <td>30 - 88</td> <td></td> <td>40.0</td> </tr> <tr> <td>88 - 216</td> <td></td> <td>43.5</td> </tr> </tbody> </table>			Frequency (MHz)	Field strength at 3 m, dB(μ V/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		73.8 - 63.0**	NA	1.705 - 30.0*		69.5	30 - 88		40.0	88 - 216		43.5
Frequency (MHz)	Field strength at 3 m, dB(μ V/m)*																																					
	Within restricted bands																																					
Peak	Quasi Peak	Average																																				
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1.705 - 30.0*		69.5																																				
30 - 88		40.0																																				
88 - 216		43.5																																				

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216 - 960		46.0	
Above 960		54.0	
1000 - 200000	74.0	N/A	54.0

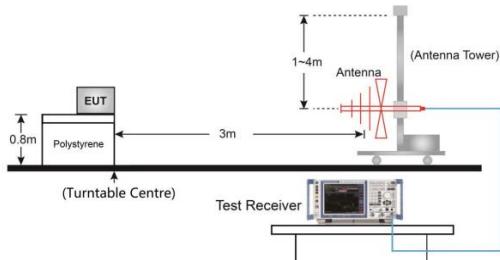
*- The limit for 3 m test distance was calculated using the inverse square distance extrapolation factor as follows:
 $\text{LimS2} = \text{LimS1} + 20 \log (\text{S1}/\text{S2})$,
 where S1 and S2 - standard defined and test distance respectively in meters.

**- 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

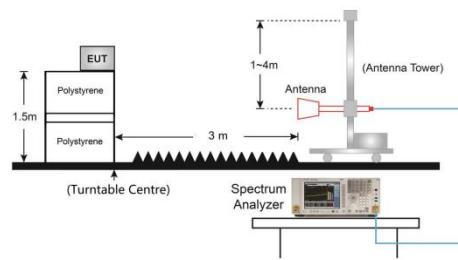
Test Setup:

Below 1GHz Test Setup:



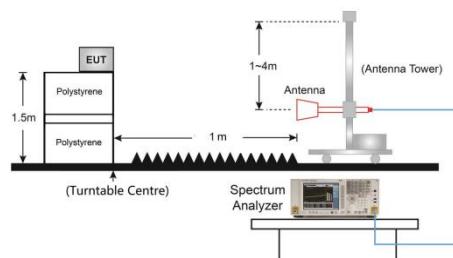
Below 1GHz

1GHz ~ 18 GHz Test Setup:



1GHz-18GHz

18GHz ~ 40GHz Test Setup:



18GHz-40GHz

Instruments Used:	Refer to section 6 for details
Test Procedure:	a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table

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	<p>was rotated 360 degrees to determine the position of the highest radiation.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to the same height (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.</p> <p>f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</p> <p>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.</p> <p>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.</p> <p>i. Repeat above procedures until all frequencies measured was complete.</p> <p>Remark 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamplifier Factor</p> <p>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.</p> <p>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.</p>
Final Test Mode:	TX mode _ Keep the EUT in continuously transmitting mode powered by DC 5V
Test Results:	Pass
The detailed test data see: Appendix	



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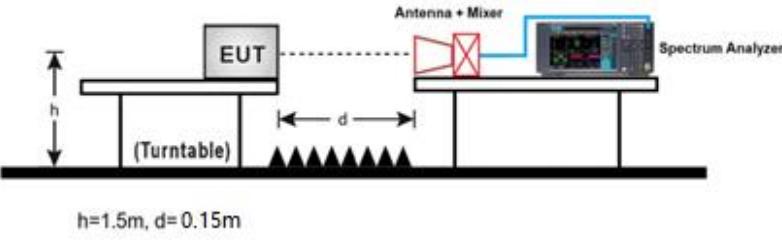
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4.5 Radiated emissions outside assigned band and above 40 GHz up to 200 GHz

Test Requirement:	47 CFR Part 15C Section 15.225 (d)(3)																			
Test Method:	ANSI C63.10-2013 Section 9.9,9.12																			
Limit:	Above 40GHz: <table border="1"> <thead> <tr> <th>Frequency (GHz)</th> <th>Power density at 3 m distance (pW/cm²)</th> <th>Distance (m)</th> <th>Field strength (dBuV/m)*, peak</th> <th>Field strength (dBuV/m)*, average</th> </tr> </thead> <tbody> <tr> <td>40 - 200</td> <td>90</td> <td>3.0</td> <td>105.31</td> <td>85.31</td> </tr> <tr> <td>40 - 200</td> <td>90</td> <td>0.15</td> <td>131.33**</td> <td>111.33**</td> </tr> </tbody> </table> <p>* - Field strength was calculated per equation (26) of ANSI C63.10-2013 section 9 as follows: $E = \sqrt{PD \times 377}$, where PD is the power density at the distance specified by the limit in W/m², E - field strength in V/m.</p> <p>** - The limit for other test distance was calculated using the inverse distance extrapolation factor as follows: $\text{LimS2} = \text{LimS1} + 20 \log(S1/S2)$, where S1 and S2 - standard defined and test distance respectively in meters.</p>					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**
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**																
Test Setup:	 <p>h=1.5m, d=0.15m</p>																			
Instruments Used:	Refer to section 6 for details																			
Test Procedure:	<ol style="list-style-type: none"> 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 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. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to the same height (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. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. If the emission level of the EUT in peak mode was 10dB lower than the limit 																			

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	<p>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.</p> <p>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.</p> <p>g. Repeat above procedures until all frequencies measured was complete.</p> <p>Remark 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor</p> <p>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.</p>
Final Test Mode:	RX mode _ Keep the EUT in continuously transmitting mode powered by DC 5V
Test Results:	Pass
The detailed test data see: Appendix	

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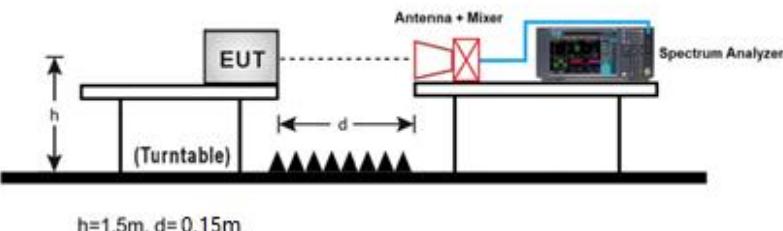
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4.6 Frequency Stability

Test Requirement:	47 CFR Part 15C Section 15.255 (f)				
Test Method:	ANSI C63.10-2013 Section 9.14				
Test Setup:	 <p>h=1.5m, d= 0.15m</p>				
Instruments Used:	Refer to section 6 for details				
Test Procedure:	<p>1. Temperature conditions:</p> <ol style="list-style-type: none"> The RF output port of the EUT was connected to Frequency Meter; Set the working Frequency in the middle channel; record the 20°C and norminal voltage frequency value as reference point; vary the temperature from -10°C to 50°C with step 10°C when reach a temperature point, keep the temperature banlance at least 1 hour to make the product working in this status; read the frequency at the relative temperature. <p>2. Voltage conditions:</p> <ol style="list-style-type: none"> record the 20°C and norminal voltage frequency value as reference point; vary the voltage from -15% norminal voltage to +15% voltage; read the frequency at the relative voltage. <p>Remark: Manufacturer declared that the minimum temperature for normal operation of this product is -10°C.</p>				
Test Mode:	TX mode _ Keep the EUT in continuously transmitting mode powered by DC 5V				
Limit:	<table border="1"> <thead> <tr> <th>Frequency (GHz)</th> <th>Limit</th> </tr> </thead> <tbody> <tr> <td>57 - 71</td> <td>The signal must be contained within assigned frequency band.</td> </tr> </tbody> </table>	Frequency (GHz)	Limit	57 - 71	The signal must be contained within assigned frequency band.
Frequency (GHz)	Limit				
57 - 71	The signal must be contained within assigned frequency band.				
Test Results:	Pass				
The detailed test data see: Appendix					



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5 Measurement Uncertainty (95% confidence levels, k=2)

No.	Item	Measurement Uncertainty
1	Total RF power	±0.54dB
2	Occupied Bandwidth	±1.0 %
3	Radio Frequency	±1.0 %
4	Radiated Emission	± 3.13dB (9k -30MHz)
		± 4.80dB (30M -1GHz)
		± 4.80dB (1GHz to 18GHz)
		± 4.80dB (Above 18GHz)

Remark:

The U_{lab} (lab Uncertainty) is less than $U_{cispri/ETSI}$ (CISPR/ETSI Uncertainty), so the test results

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.



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6 Equipment List

9*6*6 Test Equipment					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
Semi-Anechoic Chamber	Brilliant-emc	N/A	SUWI-04-02-01	2021/05/08	2024/05/07
Temperature and humidity meter	MingGao	TH101B	SUWI-01-01-05	2023/02/07	2024/02/06
Signal Analyzer	ROHDE&SCHWARZ	FSW43	SUWI-01-02-04	2023/05/11	2024/05/10
Signal Analyzer	KEYSIGHT	N9020A	SUWI-01-02-05	2022/11/23	2023/11/22
PXA Spectrum Analyzer	KEYSIGHT	N9030B	SUWI-01-62-01	2023/01/29	2024/01/28
Test receiver	ROHDE&SCHWARZ	ESR7	SUWI-01-10-01	2023/02/08	2024/02/07
DC Power Supply	HYELEC	HY3005B	SUWI-01-18-01	2023/02/06	2024/02/05
Receiving antenna	SCHWRZBECK MESS-ELEKTRONIK	VULB 9163	SUWI-01-11-01	2023/05/13	2024/05/12
Receiving antenna	SCHWRZBECK MESS-ELEKTRONIK	BBHA 9120D	SUWI-01-11-02	2023/05/13	2024/05/12
Receiving antenna	SCHWRZBECK MESS-ELEKTRONIK	BBHA 9170	SUWI-01-11-03	2023/05/12	2024/05/11
Active Loop Antenna	SCHWEZBECK MESS-ELEKTRONIK	FMZB 1519B	SUWI-01-21-01	2023/05/13	2024/05/12
Amplifier	Tonscend	TAP9K3G40	SUWI-01-14-01	2023/02/06	2024/02/05
Amplifier	Tonscend	TAP01018050	SUWI-01-14-02	2023/02/06	2024/02/05
Amplifier	Tonscend	TAP18040048	SUWI-01-14-03	2023/02/08	2024/02/07
Measurement Software	Tonscend	JS32-RE	SUWI-02-09-04	NCR	NCR
		V4.0.0.0			
Horn-antenna(40-60GHz)	REBES	SAZ-2410-19-S1	SUWI-03-49-01	NCR	NCR
Horn-antenna(50-75GHz)	REBES	SAZ-2410-15-S1	SUWI-03-49-02	NCR	NCR
Horn-antenna(75-110GHz)	REBES	SAZ-2410-10-S1	SUWI-03-49-03	NCR	NCR
Horn-antenna(110-170GHz)	REBES	SAZ-2410-06-S1	SUWI-03-49-04	NCR	NCR
Horn-antenna(140-220GHz)	REBES	SAZ-2410-05-S1	SUWI-03-49-05	NCR	NCR
Horn-antenna(220-325GHz)	REBES	SAR-2309-03-S2	SUWI-03-49-06	NCR	NCR
Extended waveguide(40-60GHz)	REBES	SWG-19025-FB	SUWI-03-50-01	NCR	NCR

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Extended waveguide(50-75GHz)	REBES	SWG-15025-FB	SUWI-03-50-02	NCR	NCR
Extended waveguide(75-110GHz)	REBES	SWG-10025-FB	SUWI-03-50-03	NCR	NCR
Extended waveguide(110-170GHz)	REBES	SWG-06025-FB	SUWI-03-51-01	NCR	NCR
Extended waveguide(140-220GHz)	REBES	SWG-05025-FB	SUWI-03-51-02	NCR	NCR
Extended waveguide(220-325GHz)	REBES	SWG-03025-FB	SUWI-03-51-03	NCR	NCR
Harmonic mixer(110-170GHz)	REBES	STH-06SF-S1	SUWI-03-52-01	NCR	NCR
Harmonic mixer(40-60GHz)	REBES	STH-19SF-S1	SUWI-03-52-02	NCR	NCR
Harmonic mixer(140-220GHz)	REBES	STH-06SF-S1	SUWI-03-52-03	NCR	NCR
Harmonic mixer(220-325GHz)	REBES	STH-19SF-S1	SUWI-03-52-04	NCR	NCR
Waveguide Harmonic Mixer(50-75GHz)	KEYSIGHT	M1970V	SUWI-03-53-01	NCR	NCR
Waveguide Harmonic Mixer(75-110GHz)	KEYSIGHT	M1970W	SUWI-03-53-02	NCR	NCR
Waveguide Harmonic Mixer(50-75GHz) cable	Silverline	SLU18-SMSM-01.00M	SUWI-03-54-01	NCR	NCR
Waveguide Harmonic Mixer(75-110GHz) cable	Silverline	SLU18-SMSM-01.00M	SUWI-03-54-02	NCR	NCR
Waveguide Harmonic Mixer(40-60GHz) cable	Silverline	SLU18-SMSM-01.00M	SUWI-03-54-03	NCR	NCR
Waveguide Harmonic Mixer(110-170GHz) cable	Silverline	SLU18-SMSM-01.00M	SUWI-03-54-04	NCR	NCR
Waveguide Harmonic Mixer(140-220GHz) cable	Silverline	SLU18-SMSM-01.00M	SUWI-03-54-05	NCR	NCR
Waveguide Harmonic Mixer(220-325GHz) cable	Silverline	SLU18-SMSM-01.00M	SUWI-03-54-06	NCR	NCR

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7 Photographs - Setup Photos

Refer to Appendix A.1 Radar Setup Photos.



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Appendix



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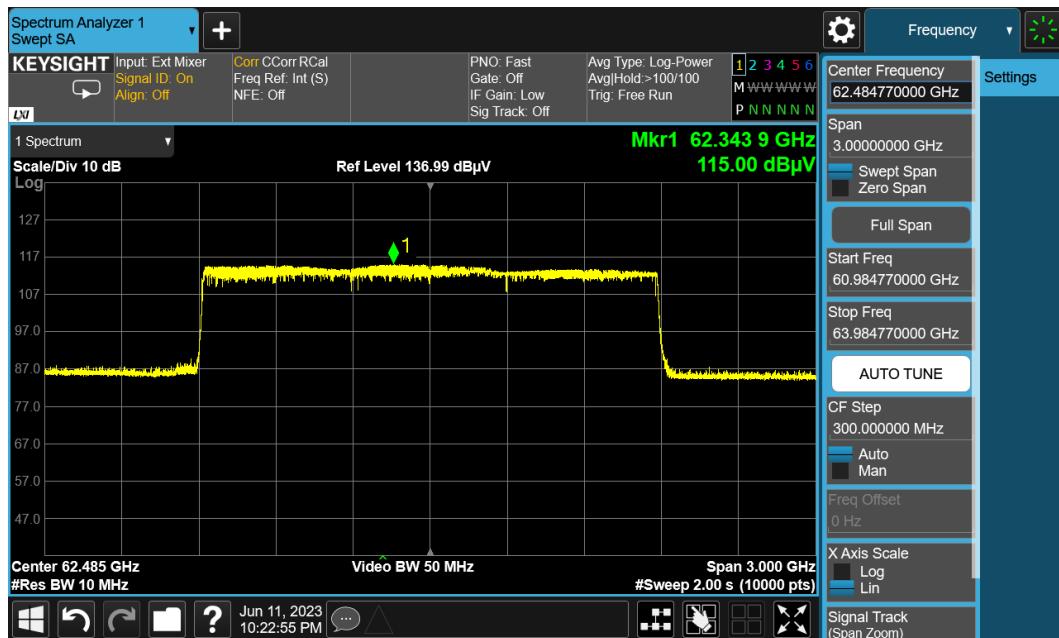
Transmitter power and power spectral density Test Result

Antenna 1

Peak Power- Horizontal



Peak Power- Vertical



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Antenna 2

Peak Power- Horizontal



Peak Power- Vertical



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Antenna 3

Peak Power- Horizontal



Peak Power- Vertical



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Antenna1

Frequency (GHz)	Distance (cm)	Polarity	dBuV/m @ 0.15m	Peak E.I.R.P.(dBm)	Peak E.I.R.P. Limit (dBm)	Gain (dBi)	Peak Conducted Power (dBm)	Peak Conducted Power Limit (dBm)	Result
62.485	15	Horizontal	107.55	-13.70	10	4.8	-18.50	-10	Pass
		Vertical	115.00	-6.25	10	4.8	-11.05	-10	Pass

Antenna2

Frequency (GHz)	Distance (cm)	Polarity	dBuV/m @ 0.15m	Peak E.I.R.P.(dBm)	Peak E.I.R.P. Limit (dBm)	Gain (dBi)	Peak Conducted Power (dBm)	Peak Conducted Power Limit (dBm)	Result
62.485	15	Horizontal	107.53	-13.72	10	4.8	-18.52	-10	Pass
		Vertical	114.28	-6.97	10	4.8	-11.77	-10	Pass

Antenna3

Frequency (GHz)	Distance (cm)	Polarity	dBuV/m @ 0.15m	Peak E.I.R.P.(dBm)	Peak E.I.R.P. Limit (dBm)	Gain (dBi)	Peak Conducted Power (dBm)	Peak Conducted Power Limit (dBm)	Result
62.485	15	Horizontal	105.91	-15.34	10	4.8	-20.14	-10	Pass
		Vertical	114.82	-6.43	10	4.8	-11.23	-10	Pass

Remark:

$E[\text{dB}\mu\text{V}/\text{m}] = \text{EIRP}[\text{dBm}] - 20 \log(\text{d}[\text{meters}]) + 104.77$, where E = field strength and d = distance at which field strength limit is specified in the rules

$\text{EIRP}[\text{dBm}] = E[\text{dB}\mu\text{V}/\text{m}] + 20 \log(\text{d}[\text{meters}]) - 104.77$

Peak Conducted Power (dBm)= Peak E.I.R.P.(dBm)- Gain(dBi)

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Occupied bandwidth Test Result

Antenna 1:



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Centre Frequency (GHz)	-20dB OCW (GHz)	99% OCW (GHz)	F _L (GHz)	Limit (GHz)	F _H (GHz)	Limit (GHz)	Result
62.485	1.787	1.751	61.591	57	63.378	71	Pass

Remark:

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

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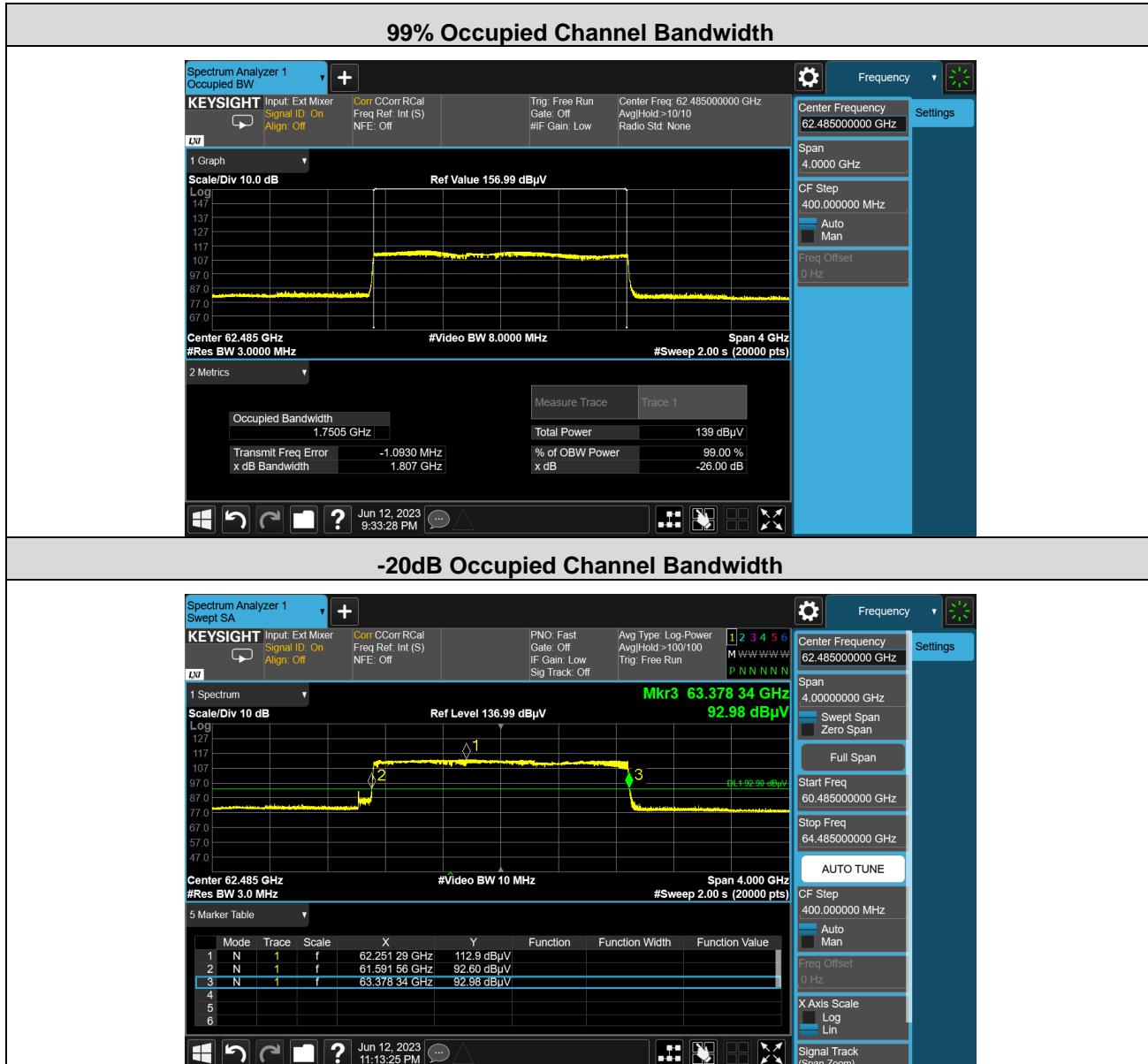
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Antenna 2:



Centre Frequency (GHz)	-20dB OCW (GHz)	99% OCW (GHz)	F _L (GHz)	Limit (GHz)	F _H (GHz)	Limit (GHz)	Result
62.485	1.786	1.751	61.592	57	63.378	71	Pass

Remark:

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



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Antenna 3:



Centre Frequency (GHz)	-20dB OCW (GHz)	99% OCW (GHz)	F _L (GHz)	Limit (GHz)	F _H (GHz)	Limit (GHz)	Result
62.485	1.781	1.751	61.594	57	63.375	71	Pass

Remark:

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



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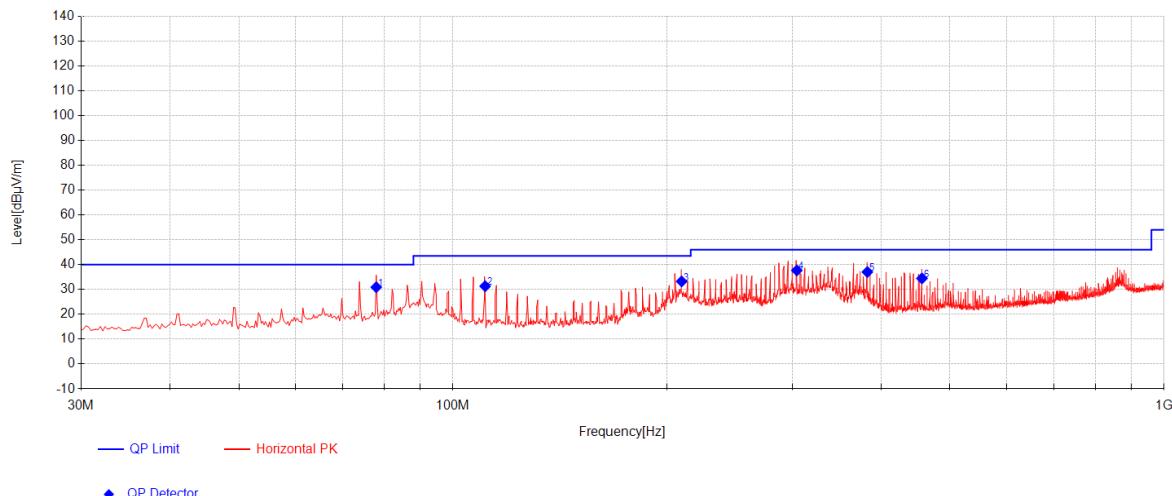
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Radiated spurious emissions below 40 GHz

Test Result

Below 1GHz

Horizontal



Final Data List										
NO.	Frequency [MHz]	Reading [dB μ V]	AF [dB/m]	Factor [dB]	QP Value [dB μ V/m]	QP Limit [dB μ V/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	78.015	49.02	15.58	-33.67	30.93	40.00	9.07	142	131	Horizontal
2	110.995	48.23	16.49	-33.39	31.33	43.50	12.17	153	131	Horizontal
3	209.6925	50.15	15.73	-32.62	33.26	43.50	10.24	261	145	Horizontal
4	304.51	51.18	18.63	-32.12	37.69	46.00	8.31	158	359	Horizontal
5	382.595	47.83	20.81	-31.60	37.04	46.00	8.96	196	237	Horizontal
6	456.5575	43.19	22.49	-31.21	34.46	46.00	11.54	142	254	Horizontal

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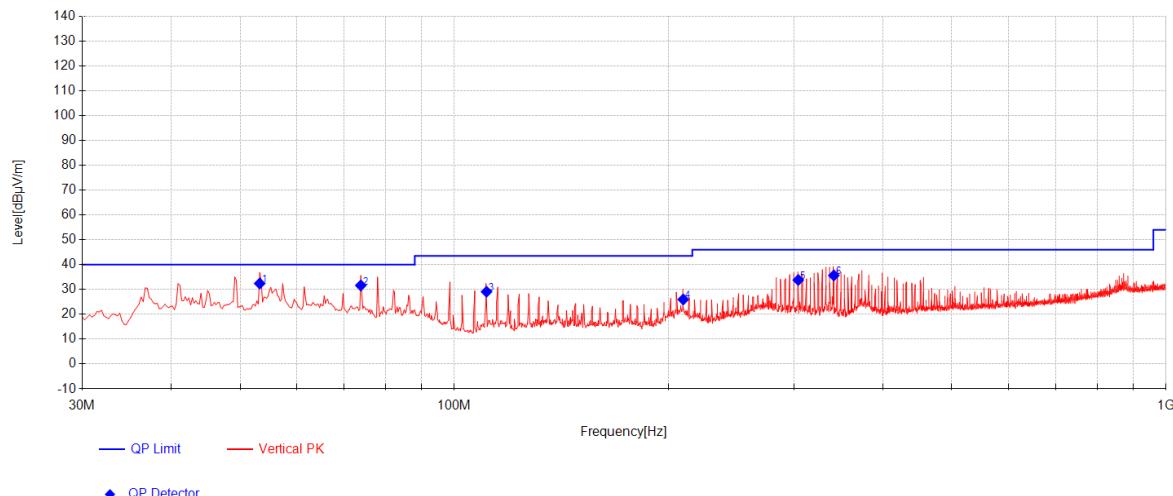
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Vertical



Final Data List										
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	53.28	47.29	19.07	-33.94	32.42	40.00	7.58	248	360	Vertical
2	73.8925	48.99	16.36	-33.71	31.64	40.00	8.36	122	236	Vertical
3	110.995	46.01	16.49	-33.39	29.11	43.50	14.39	136	356	Vertical
4	209.6925	42.89	15.73	-32.62	26.00	43.50	17.50	256	95	Vertical
5	304.2675	47.33	18.62	-32.12	33.83	46.00	12.17	142	155	Vertical
6	341.37	47.93	19.66	-31.93	35.66	46.00	10.34	199	136	Vertical



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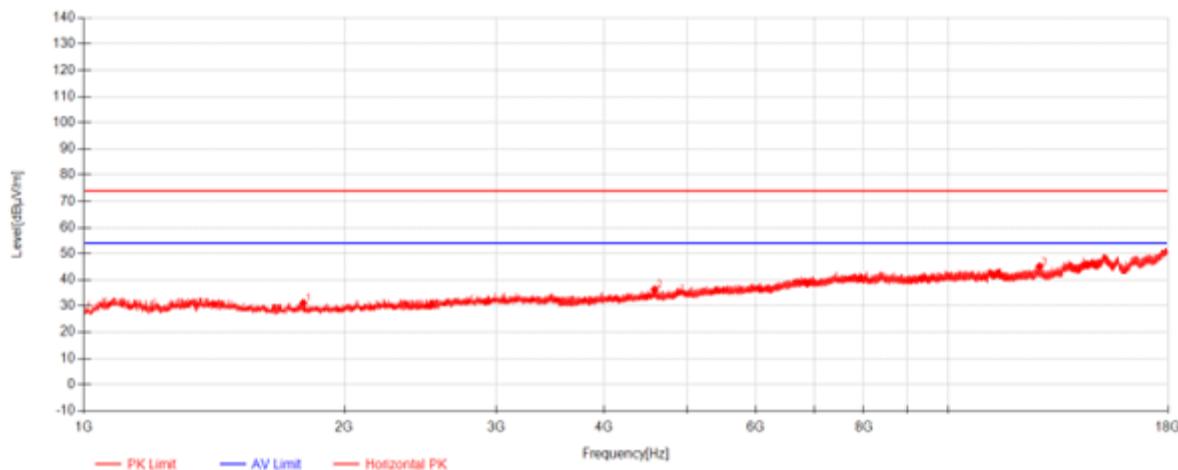
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1GHz-18GHz

Horizontal



Data List

NO.	Frequency [MHz]	Reading [dB μ V]	AF [dB/m]	Factor [dB]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1794	54.04	25.49	-48.43	31.11	74.00	42.89	265	357	Horizontal
2	4578	51.75	30.47	-45.97	36.25	74.00	37.75	226	86	Horizontal
3	12778.5	43.27	39.03	-37.21	45.09	74.00	28.91	142	71	Horizontal



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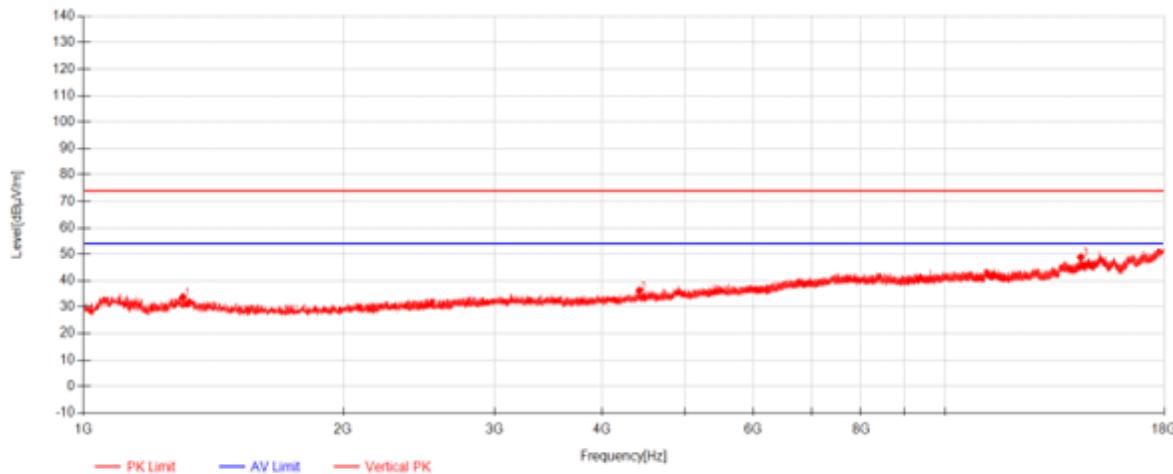
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Vertical



Data List

NO.	Frequency [MHz]	Reading [dB μ V]	AF [dB/m]	Factor [dB]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1304	57.79	25.15	-49.23	33.71	74.00	40.29	205	160	Vertical
2	4420	52.25	30.11	-46.21	36.15	74.00	37.85	142	346	Vertical
3	14400	43.25	41.06	-35.52	48.79	74.00	25.21	296	360	Vertical

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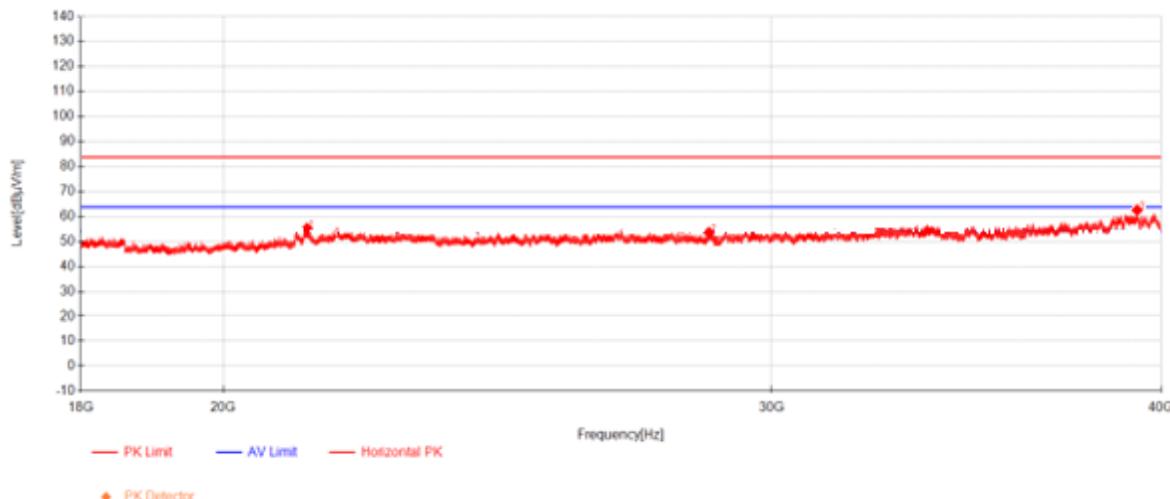
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18GHz-40GHz

Horizontal



Data List										
NO.	Frequency [MHz]	Reading [dB μ V]	AF [dB/m]	Factor [dB]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	21277.45	53.23	37.81	-35.96	55.08	83.50	28.42	102	260	Horizontal
2	28635.9	50.86	39.41	-36.82	53.45	83.50	30.05	265	170	Horizontal
3	39294.9	51.81	43.04	-32.41	62.44	83.50	21.06	284	80	Horizontal



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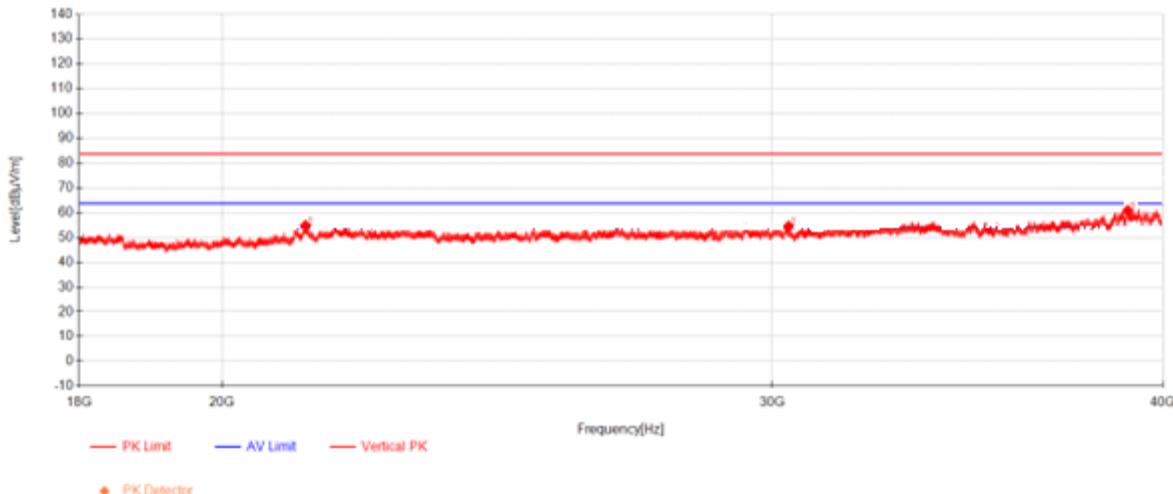
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Vertical



Data List

NO.	Frequency [MHz]	Reading [dB μ V]	AF [dB/m]	Factor [dB]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	21267	52.74	37.81	-35.86	54.68	83.50	28.82	205	310	Vertical
2	30354.65	52.38	39.44	-37.46	54.36	83.50	29.14	284	110	Vertical
3	38974.25	50.29	43.19	-32.75	60.73	83.50	22.77	177	20	Vertical

Remark: Three antennas cannot transmit simultaneously. We have tested the transmission of the three antennas and only the worst-case data is shown in the report.



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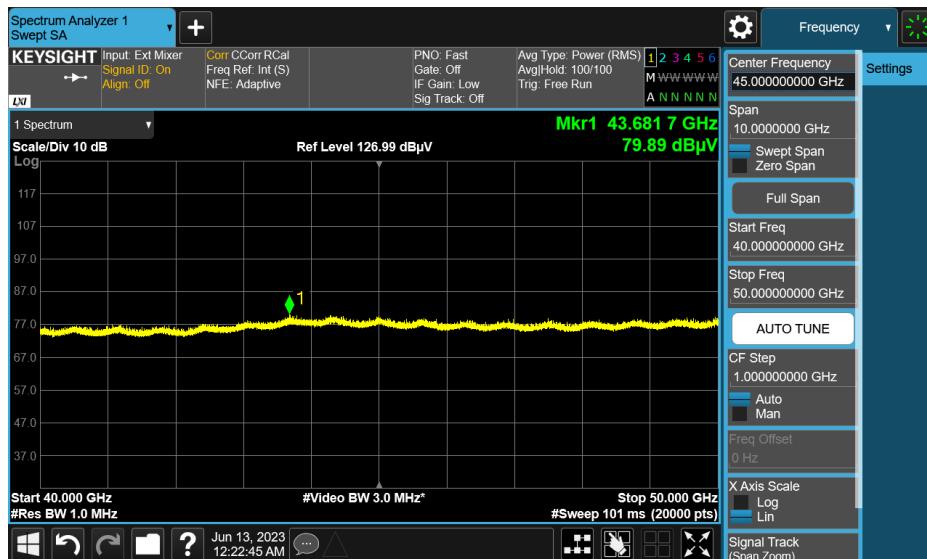
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Radiated emissions outside assigned band and above 40 GHz up to 200 GHz

Test Result

40-50GHz Horizontal



40-50GHz Vertical



Frequency (GHz)	Distance (M)	Peak Value (dBuv/m)	AV Limit (dBuv/m)	Polarization	Result
43.6817	0.15	79.89	111.33	H	PASS
44.2942	0.15	79.72	111.33	V	PASS



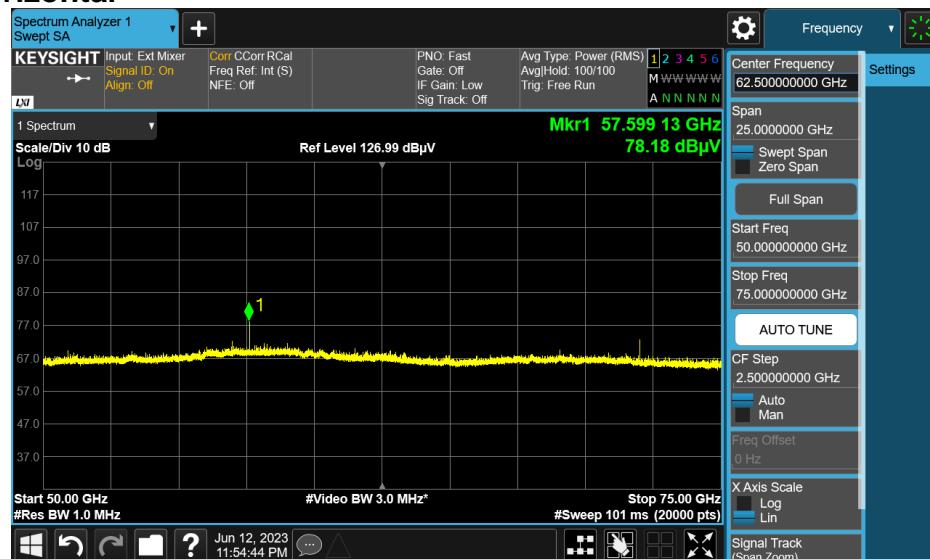
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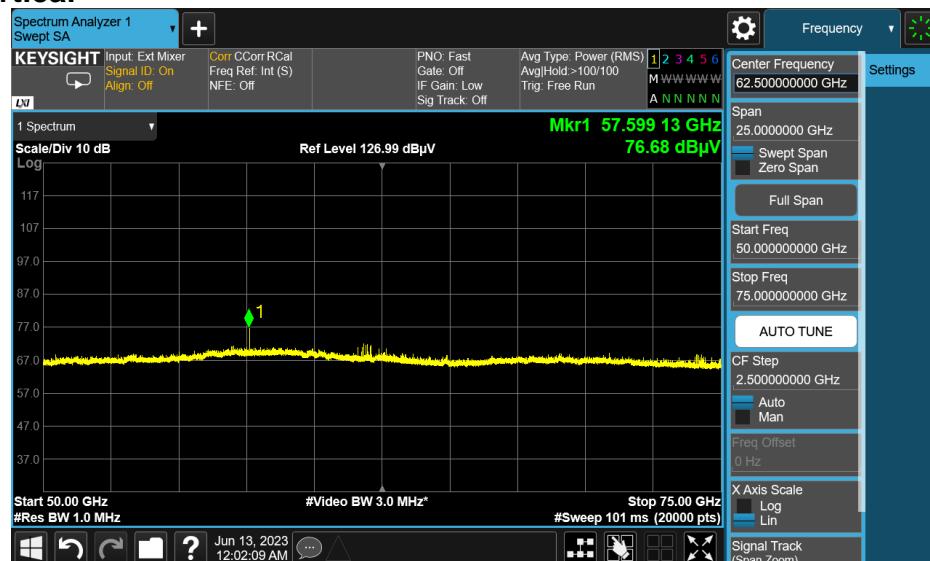
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50-75GHz Horizontal



50-75GHz Vertical



Frequency (GHz)	Distance (M)	Peak Value (dBμV/m)	AV Limit (dBμV/m)	Polarization	Result
57.59913	0.15	78.18	111.33	H	PASS
57.59913	0.15	76.68	111.33	V	PASS

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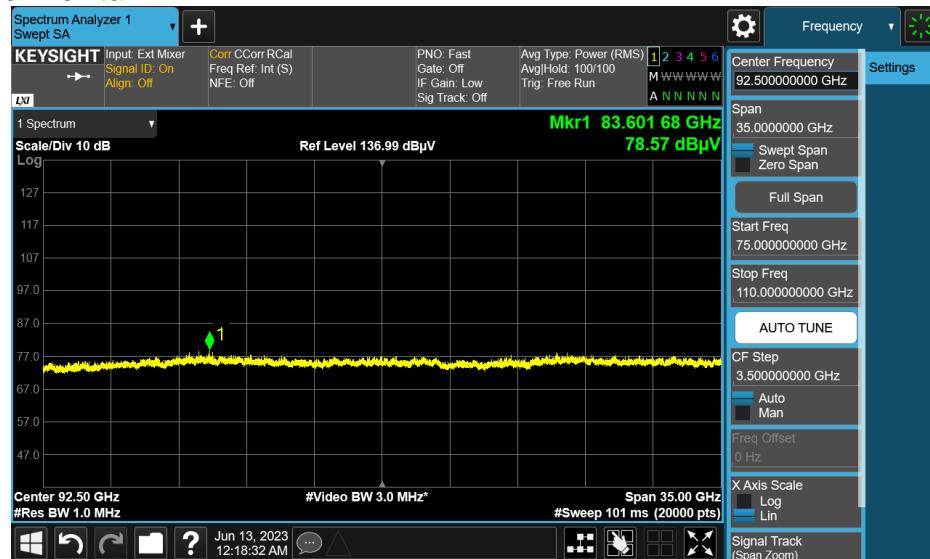
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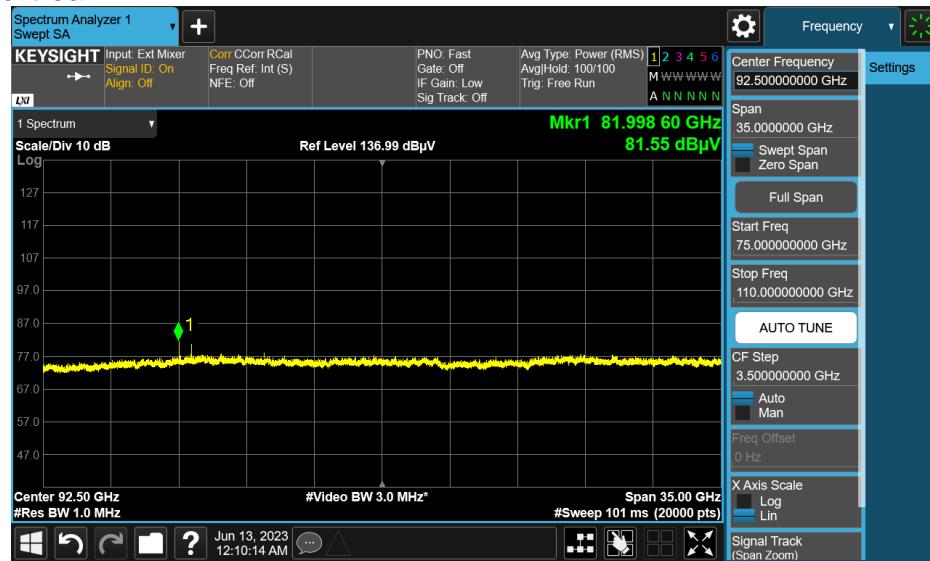
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75-110GHz Horizontal



75-110GHz Vertical



Frequency (GHz)	Distance (M)	Peak Value (dBuV/m)	AV Limit (dBuV/m)	Polarization	Result
83.60168	0.15	78.57	111.33	H	PASS
81.99860	0.15	81.55	111.33	V	PASS



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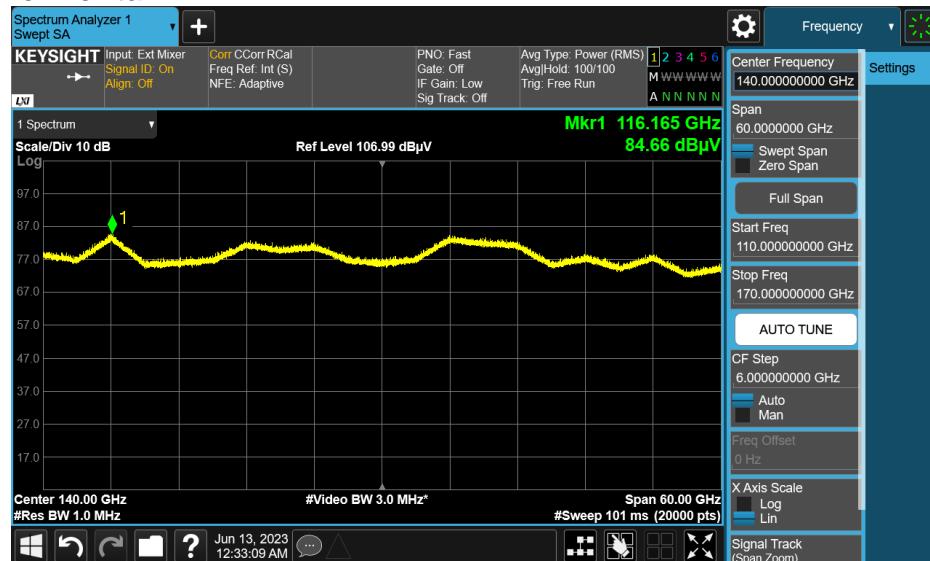
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110-170GHz Horizontal



110-170GHz Vertical



Frequency (GHz)	Distance (M)	Peak Value (dB μ V/m)	AV Limit (dB μ V/m)	Polarization	Result
116.165	0.15	84.66	111.33	H	PASS
116.291	0.15	84.44	111.33	V	PASS



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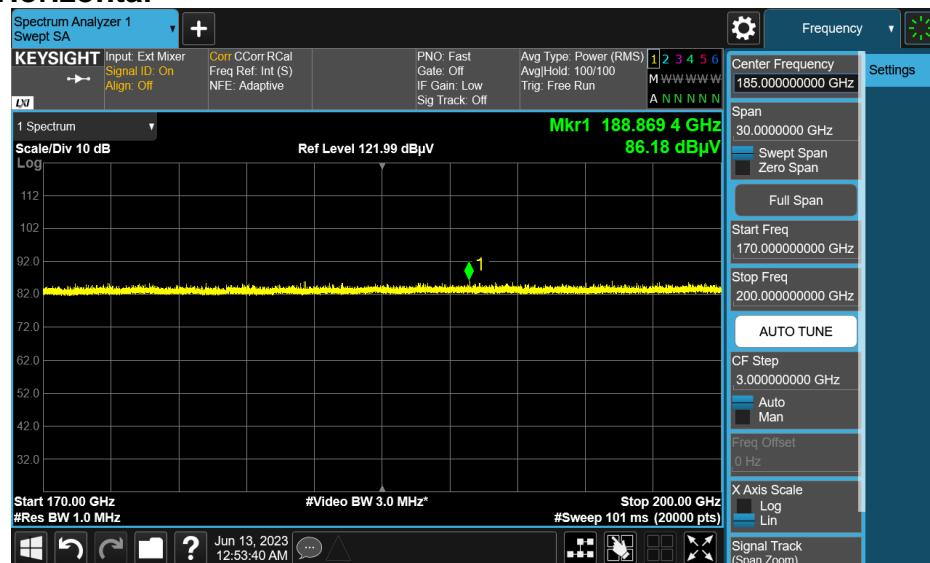
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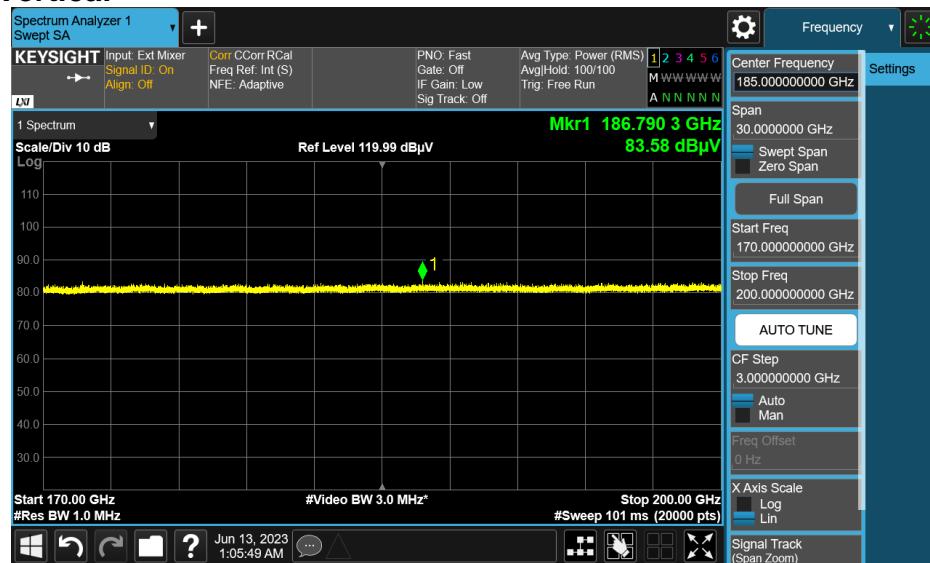
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170-200GHz Horizontal



170-200GHz Vertical



Frequency (GHz)	Distance (M)	Peak Value (dBuv/m)	AV Limit (dBuv/m)	Polarization	Result
188.8694	0.15	86.18	111.33	H	PASS
186.7903	0.15	83.58	111.33	V	PASS

Remark: Three antennas cannot transmit simultaneously. We have tested the transmission of the three antennas and only the worst-case data is shown in the report.



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Frequency stability Test Result

Antenna 1:

Frequency Stability vs temperature:

1. Test for 57GHz to 71GHz (Channel=62.485GHz)

Frequency (GHz)	Temperature (°C)	Voltage (V DC)	F _L (GHz)	Limit (GHz)	F _H (GHz)	Limit (GHz)	Result
57-71	50	5	61.6075	57	63.3623	71	Pass
	40	5	61.6072	57	63.3627	71	Pass
	30	5	61.6073	57	63.3625	71	Pass
	20	5	61.6076	57	63.3629	71	Pass
	10	5	61.6077	57	63.3622	71	Pass
	0	5	61.6072	57	63.3628	71	Pass
	-10	5	61.6077	57	63.3629	71	Pass

Frequency Stability vs voltage:

1. Test for 57GHz to 71GHz (Channel=62.485GHz)

Frequency (GHz)	Voltage (V DC)	Temperature (°C)	F _L (GHz)	Limit (GHz)	F _H (GHz)	Limit (GHz)	Result
57-71	4.25	20	61.6081	57	63.3631	71	Pass
	5	20	61.6079	57	61.3628	71	Pass
	5.75	20	61.6083	57	61.3633	71	Pass

Remark:

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

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Antenna 2:

Frequency Stability vs temperature:

1. Test for 57GHz to 71GHz (Channel=62.485GHz)

Frequency (GHz)	Temperature (°C)	Voltage (V DC)	F_L (GHz)	Limit (GHz)	F_H (GHz)	Limit (GHz)	Result
57-71	50	5	61.6089	57	63.3793	71	Pass
	40	5	61.6085	57	63.3786	71	Pass
	30	5	61.6083	57	63.3792	71	Pass
	20	5	61.6086	57	63.3787	71	Pass
	10	5	61.6081	57	63.3793	71	Pass
	0	5	61.6090	57	63.3795	71	Pass
	-10	5	61.6088	57	63.3789	71	Pass

Frequency Stability vs voltage:

1. Test for 57GHz to 71GHz (Channel=62.485GHz)

Frequency (GHz)	Voltage (V DC)	Temperature (°C)	F_L (GHz)	Limit (GHz)	F_H (GHz)	Limit (GHz)	Result
57-71	4.25	20	61.6093	57	63.3795	71	Pass
	5	20	61.6089	57	61.3791	71	Pass
	5.75	20	61.6095	57	61.3793	71	Pass

Remark:

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

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Antenna 3:

Frequency Stability vs temperature:

1. Test for 57GHz to 71GHz (Channel=62.485GHz)

Frequency (GHz)	Temperature (°C)	Voltage (V DC)	F _L (GHz)	Limit (GHz)	F _H (GHz)	Limit (GHz)	Result
57-71	50	5	61.6103	57	63.3869	71	Pass
	40	5	61.6105	57	63.3876	71	Pass
	30	5	61.6107	57	63.3878	71	Pass
	20	5	61.6110	57	63.3872	71	Pass
	10	5	61.6109	57	63.3873	71	Pass
	0	5	61.6106	57	63.3867	71	Pass
	-10	5	61.6112	57	63.3879	71	Pass

Frequency Stability vs voltage:

1. Test for 57GHz to 71GHz (Channel=62.485GHz)

Frequency (GHz)	Voltage (V DC)	Temperature (°C)	F _L (GHz)	Limit (GHz)	F _H (GHz)	Limit (GHz)	Result
57-71	4.25	20	61.6112	57	63.3882	71	Pass
	5	20	61.6109	57	63.3878	71	Pass
	5.75	20	61.6114	57	63.3880	71	Pass

Remark:

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

---End of Report---



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