RF MEASUREMENT REPORT

FCC ID:	2AUBBHSA-MAC
Applicant:	China StarWin Science & Technology Co., Ltd
Product:	Phased Array Satellite Communication Terminal
Model No.:	KaWin
Serial Model No.:	HSA-MAC, HT-ESA, ESA-MAC, HSA-PAC, HSA-FAC, ESA-IOT-Ka
Brand Name:	StarWin
FCC Classification:	Licensed Non-Broadcast Station Transmitter (TNB)
FCC Rule Part(s):	FCC CFR 47 Part 2, FCC CFR 47 Part 25
Result:	Complies
Received Date:	2023-04-21
Test Date:	2023-04-26 ~ 2023-12-28

Reviewed By: Jame Yuan

Approved By: Robin Wu

ACCREDITED
TESTING LABORATORY
CERTIFICATE #3628.01

The test results relate only to the samples tested.
This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.26-2015. Test results reported herein relate only to the item(s) tested.

Revision History

Report No.	Version	Description	Issue Date	Note
2302RSU008-U2	V01	Initial Report	2024-02-28	Valid

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1. General Information

1.1. Applicant

China StarWin Science & Technology Co.,Ltd

Floor 3th, Building B, No. 2 Keyuannan 2nd Road, High-tech Zone, Chengdu, China

1.2. Manufacturer

China StarWin Science & Technology Co.,Ltd

Floor 3th, Building B, No. 2 Keyuannan 2nd Road, High-tech Zone, Chengdu, China

1.3. Testing Facility

☒	**Test Site – MRT Suzhou Laboratory**				
	Laboratory Location (Suzhou - Wuzhong) D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China **Laboratory Location (Suzhou - SIP)** 4b Building, Liando U Valley, No.200 Xingpu Rd., Shengpu Town, Suzhou Industrial Park, China				
	Laboratory Accreditations				
	A2LA: 3628.01		CNAS: L10551		
	FCC: CN1166		ISED: CN0001		
	VCCI:	☐R-20025	☐G-20034	☐C-20020	☐T-20020
		☐R-20141	☐G-20134	☐C-20103	☐T-20104
☐	**Test Site – MRT Shenzhen Laboratory**				
	Laboratory Location (Shenzhen) 1G, Building A, Junxiangda Building, Zhongshanyuan Road West, Nanshan District, Shenzhen, China				
	Laboratory Accreditations				
	A2LA: 3628.02		CNAS: L10551		
	FCC: CN1284		ISED: CN0105		
☐	**Test Site – MRT Taiwan Laboratory**				
	Laboratory Location (Taiwan) No. 38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)				
	Laboratory Accreditations				
	TAF: 3261				
	FCC: 291082, TW3261		ISED: TW3261		

1.4. Product Information

Product Name	Phased Array Satellite Communication Terminal
Model No.	KaWin
Serial Model No.:	HSA-MAC, HT-ESA, ESA-MAC, HSA-PAC, HSA-FAC, ESA-IOT-Ka
EUT Identification No.	20230526Sample#07
Wi-Fi Specification	802.11b/g/n
Satellite Specification	Transmit: 29.25~30.00GHz Receive: 18.3~18.8GHz, 19.7 ~ 20.2GHz
GNSS Specification	GPS, BDS
Hardware Version	HSA-MAC, HT-ESA, HSA-PAC, HSA-FAC, ESA-IOT-Ka: ACU-2.0,ESA-DRV-V1.0, ZL60P-DRV-V5.1 ESA-MAC: ACU-2.0, ESA-DRV-V1.0
Software Version	KA_1.12B
Antenna Information	Refer to section 1.5
Working Voltage	By Adapter
Operating Temperature	-40 ~ 70 °C
Accessories	
Adapter	Model: HEP-480-36A Input: 100-240V ~ 50/60Hz 2.0A Output: 36V=13.3A Rated Power: 478.8W

Note:

1. The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer.
2. The differences between the models are the usage scenario, scanning mode and the bracket, which do not affect the RF.
3. We use HAS-MAC to perform tests.

1.5. Product Specification under Test

Frequency Range	Transmit: 29.25 ~ 30.00 GHz Receive: 18.3~18.8GHz, 19.7 ~ 20.2GHz
Test Frequency	Low channel: 29.25 GHz Mid channel: 29.65 GHz High channel: 30.00 GHz
Type of Modulation	8PSK
Data Rate	20Mbps
Antenna Type	Phased-array antenna
Antenna Gain	37.7dBi (in range of ±15 degree) 10.0dBi (out range of ±15 degree)
Authorized bandwidth	60 MHz
Stated EIRP	48 dBW

Note: For other features of this EUT, test report will be issued separately.

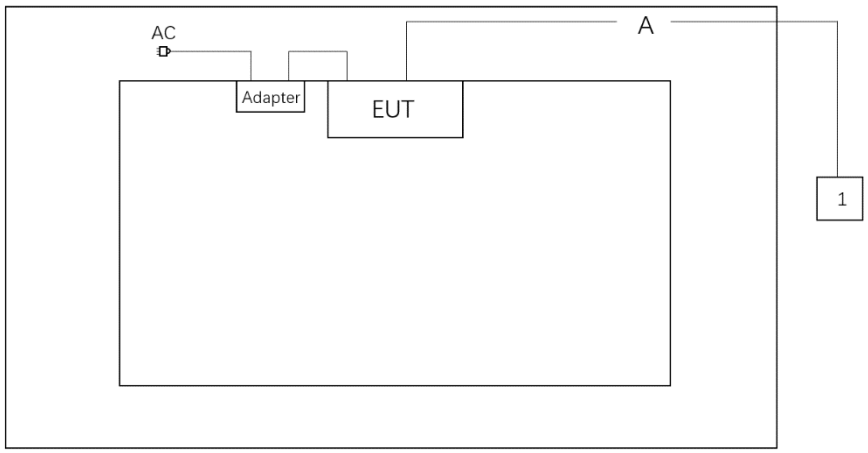
2. Test Configuration

2.1. Test Mode

Mode 1: Transmit by 8PSK at Channel 29.25 GHz
Mode 2: Transmit by 8PSK at Channel 29.65 GHz
Mode 3: Transmit by 8PSK at Channel 30.00 GHz

2.2. Test System Connection Diagram

The device was tested per the guidance ANSI C63.26: 2015 was used to reference the appropriate EUT setup for radiated emissions testing.

Connection Diagram – Radiated Emission testing


Cable Type		Cable Description
A	LAN Cable	Non shielded, > 10m

Product		Manufacturer	Model No.
1	Notebook	Lenovo	E431

2.3. Test Software

The device is connected to the notebook through a LAN cable, the frequency and rate set on the web page of the EUT IP address.

2.4. Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 25
- ANSI C63.26-2015
- KDB 971168 D01v03r01
- ANSI C63.4-2014

2.5. Test Environment Condition

Ambient Temp.	15 ~ 35 °C
Relative Humidity	20 ~ 75% RH

3. Antenna Requirements

Excerpt from §25.209 of the FCC Rules/Regulations:

Except as provided in paragraph (f) of the §25.209, the co-polarization gain of any earth station antenna operating in the FSS and transmitting to a GSO satellite, including earth stations providing feeder links for satellite services other than FSS, may not exceed the specified limits of §25.209 paragraph a(3) and a(6).

Conclusion:

The unit does not conform to the applicable standards of §25.209 paragraph a(3) and a(6) but complies with the requirement of §25.218 detailed in appendix A.4.

4. Measuring Instrument

Instrument Name	Manufacturer	Model No.	Asset No.	Cali. Interval	Cal. Due Date	Test Site
Anechoic Chamber	TDK	WZ-AC1	MRTSUE06212	1 year	2024-04-20	WZ-AC1
Thermohygrometer	testo	608-H1	MRTSUE06403	1 year	2024-05-31	WZ-AC1
Thermohygrometer	testo	608-H1	MRTSUE11039	1 year	2024-10-25	WZ-AC1
Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06597	1 year	2024-11-04	WZ-AC1
Signal Analyzer	Keysight	N9010B	MRTSUE06558	1 year	2024-05-23	WZ-AC1/WZ-AC2
TRILOG Antenna	Schwarzbeck	VULB 9162	MRTSUE06022	1 year	2024-05-15	WZ-AC2
EMI Test Receiver	Agilent	N9038A	MRTSUE06125	1 year	2024-05-23	WZ-AC2
Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06171	1 year	2024-10-11	WZ-AC2
Preamplifier	Schwarzbeck	BBV 9718	MRTSUE06176	1 year	2024-05-07	WZ-AC2
Anechoic Chamber	RIKEN	WZ-AC2	MRTSUE06213	1 year	2024-04-20	WZ-AC2
Thermohygrometer	testo	608-H1	MRTSUE11038	1 year	2024-10-25	WZ-AC2
Thermohygrometer	testo	608-H1	MRTSUE11263	1 year	2024-11-07	WZ-AC2
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2024-09-17	WZ-AC2
Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06597	1 year	2024-11-04	WZ-AC2
Preamplifier	EMCI	EMC184045SE	MRTSUE06640	1 year	2024-01-12	WZ-AC2
mmWave Antenna	MI-WWAVE	261U-25/383	MRTSUE06273	N/A	N/A	SIP-AC3
mmWave Antenna	A-INFO	LB-15-25-A	MRTSUE06409	N/A	N/A	SIP-AC3
Waveguide Harmonic Mixer	Keysight	M1970V	MRTSUE06271	3 years	2025-09-22	SIP-AC3
Signal Analyzer	Keysight	N9020B	MRTSUE06604	1 year	2024-10-23	SIP-AC3
Thermohygrometer	testo	608-H1	MRTSUE06619	1 year	2024-10-28	SIP-AC3
Thermohygrometer	testo	608-H1	MRTSUE06622	1 year	2024-11-03	SIP-AC3
Anechoic Chamber	RIKEN	SIP-AC3	MRTSUE06782	1 year	2024-12-21	SIP-AC3
Temperature Chamber	BAOYT	BYH-150CL	MRTSUE06051	1 year	2023-10-08	WZ-TR3
Thermohygrometer	testo	608-H1	MRTSUE06401	1 year	2023-06-06	WZ-TR3
Signal Analyzer	R&S	FSV40	MRTSUE06218	1 year	2023-09-06	WZ-TR3
Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06597	1 year	2023-11-05	WZ-TR3

Software	Version	Function
EMI Software	V3.0.0	EMI Test Software
Controller_MF 7802BS	1.02	RE Antenna & Turntable
Controller_MF 7802	2.03C	RE Antenna & Turntable
Controller_MF 7802	1.02	RE Antenna & Turntable

5. Measurement Uncertainty

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Radiated Emission Measurement
The maximum measurement uncertainty is evaluated as: Coaxial: 9kHz~30MHz: 2.61dB Coplanar: 9kHz~30MHz: 2.62dB Horizontal: 30MHz~200MHz: 3.79dB 200MHz~1GHz: 3.91dB 1GHz~40GHz: 4.99dB Vertical: 30MHz~200MHz: 4.06dB 200MHz~1GHz: 5.21dB 1GHz~40GHz: 4.90dB
Occupied Bandwidth
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 2.7%

6. Test Result

6.1. Summary

FCC Section(s)	Test Description	Test Condition	Verdict
2.1049	Occupied Bandwidth	Radiated	Pass
25.204(b)	Power Spectral Density		Pass
25.218	Off-axis EIRP density		Pass
2.1055, 25.202(d)	Frequency Tolerance		Pass
2.1053, 25.202(f)	Radiated Spurious Emission		Pass

Remark:

The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.

6.2. Occupied Bandwidth

6.2.1. Test Limit

N/A

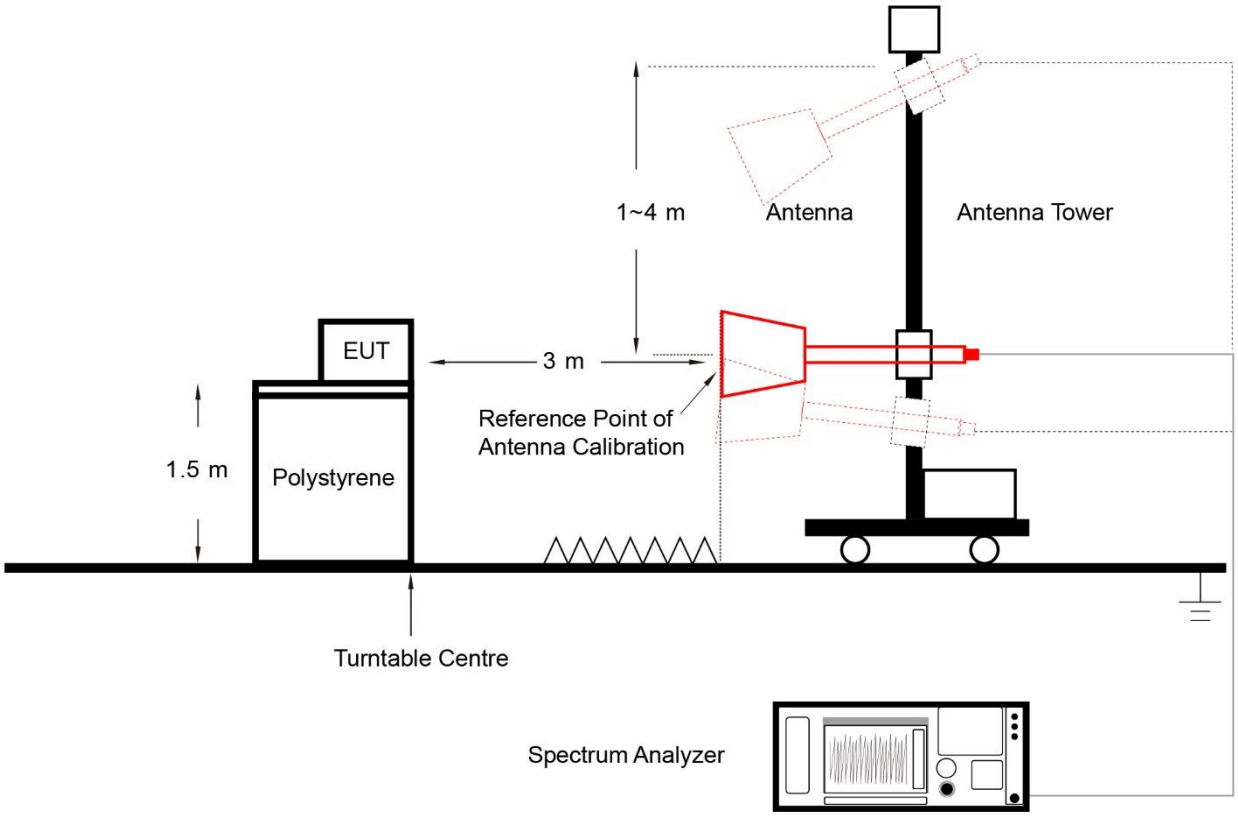
6.2.2. Test Procedure used

ANSI C63.26-2015 - Section 5.4.4

6.2.3. Test Setting

1. The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts (typically a span of 1.5 × OBW is sufficient)
2. Set RBW = 1% to 5% of the OBW
3. VBW ≥ 3 × RBW
4. Detector = Peak
5. Trace mode = Max hold
6. Sweep = Auto couple
7. Allow the trace was allowed to stabilize

6.2.4. Test Setup



6.2.5. Test Result

Refer to Appendix A.2.

6.3. Power Spectral Density

6.3.1. Test Limit

Part 25.203(c)(2)(ix)

Maximum equivalent isotropically radiated power (e.i.r.p.) density in the main beam in any 4kHz band, (dBW/4kHz) for frequency bands below 15GHz or in any 1MHz band (dBW/MHz) for frequency band above 15GHz.

Part 25.204(b)

In bands shared coequally with terrestrial radiocommunication services, the equivalent isotropically radiated power transmitted in any direction towards the horizon by an earth station operating in frequency bands above 15 GHz shall not exceed the following limits:

+ 64 dBW in any 1MHz band for $\theta \leq 0°$

+ 64 + 3θ dBW in any 1MHz band for $0° < \theta \leq 5°$

where θ is the angle of elevation of the horizon viewed from the center of radiation of the antenna of the earth station and measured in degrees as positive above the horizontal plane and negative below it.

6.3.2. Test Procedure used

ANSI C63.26-2015 - Section 5.2.4.5 & 5.2.4.4.1 (Power Spectral Density Measurement)

6.3.3. Test Setting

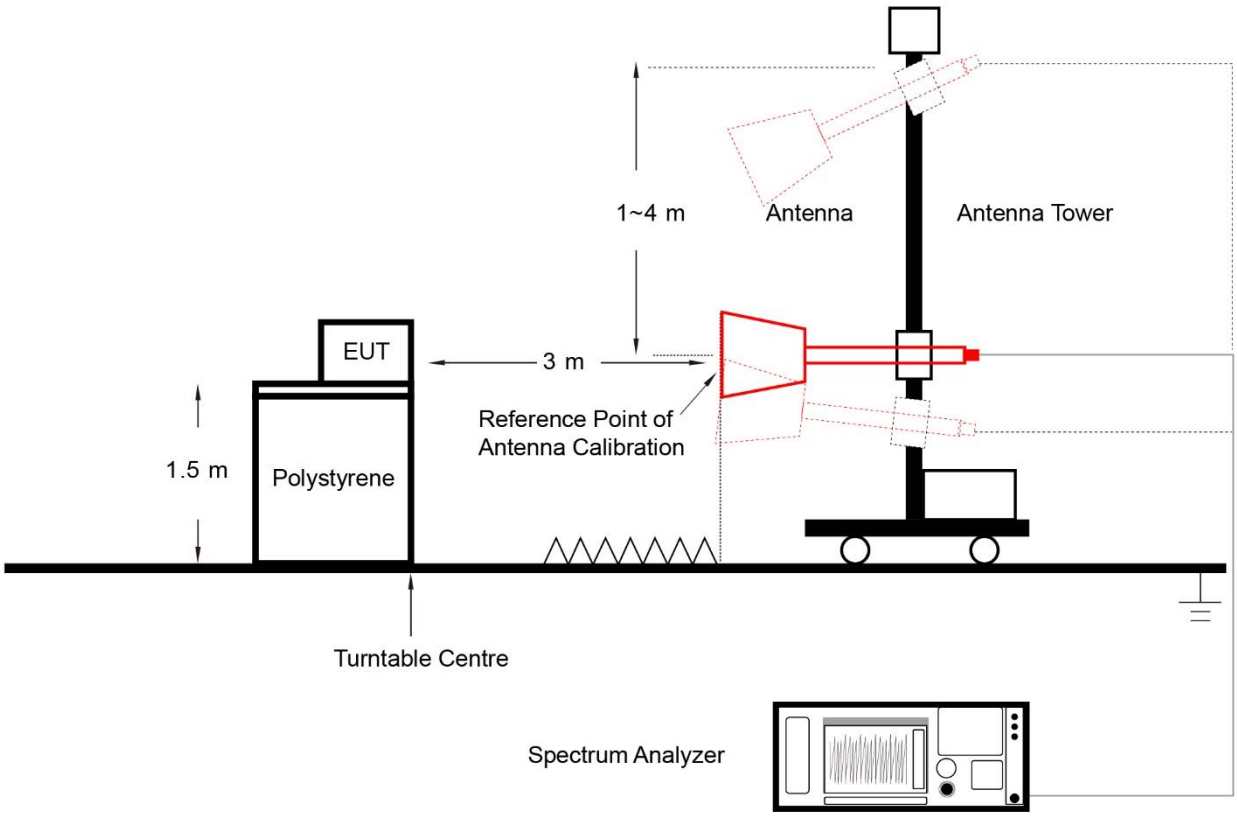
Power Spectral Density Measurement using spectrum analyzer

1. Set RBW = 1% to 5% of the OBW

   (RBW shall set to the reference bandwidth specified by the applicable regulatory requirement, so set RBW = 1MHz herein for measurement)

2. Set VBW ≥ 3 × RBW
3. Detector = power averaging (RMS)
4. Trace mode = Trace average
5. Trace was allowed to stabilize

6.3.4. Test Setup



6.3.5. Test Result

Refer to Appendix A.3.

6.4. Off-axis EIRP Density

6.4.1. Test Limit

Part 25.203(c)(2)(ix)

Maximum equivalent isotropically radiated power (e.i.r.p.) density in the main beam in any 4kHz band, (dBW/4kHz) for frequency bands below 15GHz or in any 1MHz band (dBW/MHz) for frequency band above 15GHz

Part 25.218

(i) *Digital earth station operation in the conventional or extended Ka-band.*

(1) For co-polarized transmissions in the plane tangent to the GSO arc:

32.5 - 25*log θ	dBW / MHz	for 2° ≤ θ ≤ 7°
11.5	dBW / MHz	for 7° < θ ≤ 9.2°
35.5 - 25*log θ	dBW / MHz	for 9.2° < θ ≤ 19.1°
3.5	dBW / MHz	for 19.1° < θ ≤ 180°

Where θ is the angle in degrees from a line from the earth station antenna to the assigned orbital location of the target satellite. The EIRP density levels specified for θ > 7° may be exceeded by up to 3 dB in up to 10% of the range of theta (θ) angles from ±7-180°, and by up to 6 dB in the region of main reflector spillover energy.

(2) For co-polarized transmissions in the plane perpendicular to the GSO arc:

35.5 - 25*log θ	dBW / MHz	for 3.5° < θ ≤ 7°
14.4	dBW / MHz	for 7° < θ ≤ 9.2°
38.5 - 25*log θ	dBW / MHz	for 9.2° < θ ≤ 19.1°
6.5	dBW / MHz	for 19.1° < θ ≤ 180°

Where θ is the angle in degrees from a line from the earth station antenna to the assigned orbital location of the target satellite. These EIRP density levels may be exceeded by up to 6 dB in the region of main reflector spillover energy and in up to 10% of the range of θ angles not included in that region, on each side of the line from the earth station to the target satellite.

(3) For cross-polarized transmissions in the plane tangent to the GSO arc and in the plane perpendicular to

the GSO arc:

22.5 - 25*log θ	dBW / MHz	for 2.0° < θ ≤ 7°

Where θ is the angle in degrees from a line from the earth station antenna to the assigned orbital location of the target satellite.

6.4.2. Test Procedure used

ANSI C63.26-2015 - Section 5.2.4.5 & 5.2.4.4.1

6.4.3. Test Setting

Power Spectral Density Measurement using spectrum analyzer

1. Set RBW = 1% to 5% of the OBW

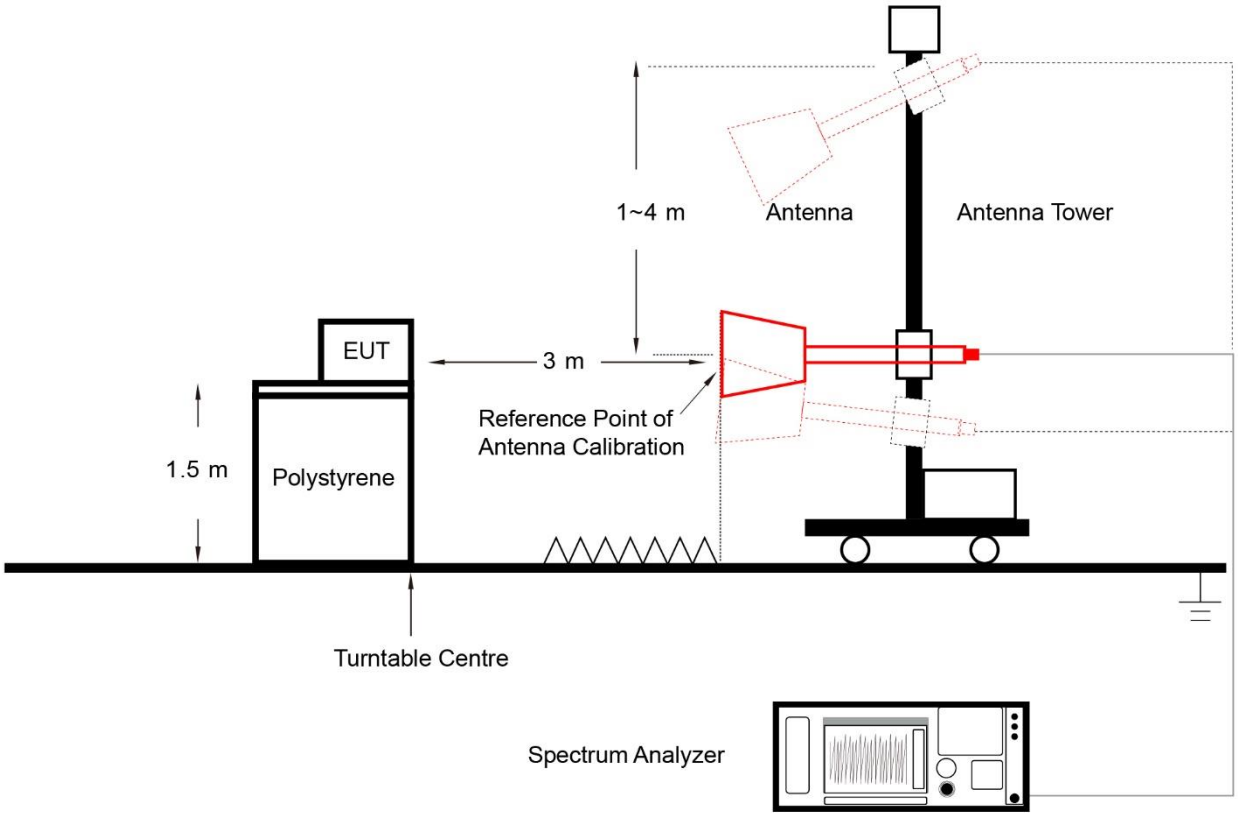
   (RBW shall set to the reference bandwidth specified by the applicable regulatory requirement, so set RBW = 1MHz herein for measurement)

2. Set VBW ≥ 3 × RBW
3. Detector = power averaging (RMS)
4. Trace mode = Trace average
5. Trace was allowed to stabilize

The off-axis EIRP density is calculated by the formula below:

$P_\theta = P_{normal} - (G_{normal} - G_\theta)$, where P_θ is the off-axis EIRP density of angle θ, P_{normal} is the EIRP density of normal phase with θ = 0, G_{normal} is the antenna gain of the normal phase, G_θ is the antenna gain of angle θ.

6.4.4. Test Setup



6.4.5. Test Result

Refer to Appendix A.4.

6.5. Frequency Tolerance

6.5.1. Test Limit

FCC Part 25.202(d)

The carrier frequency of each earth station transmitter authorized in these services shall be maintained within 0.001 percent of the reference frequency.

6.5.2. Test Procedure used

ANSI C63.26-2015 - Section 5.6.3 & 5.6.4 & 5.6.5

6.5.3. Test Setting

The EUT was set to transmit an unmodulated carrier. The EUT was connected to a spectrum analyzer via a cable and attenuator.

Adjust the temperature and supply voltage follow below:

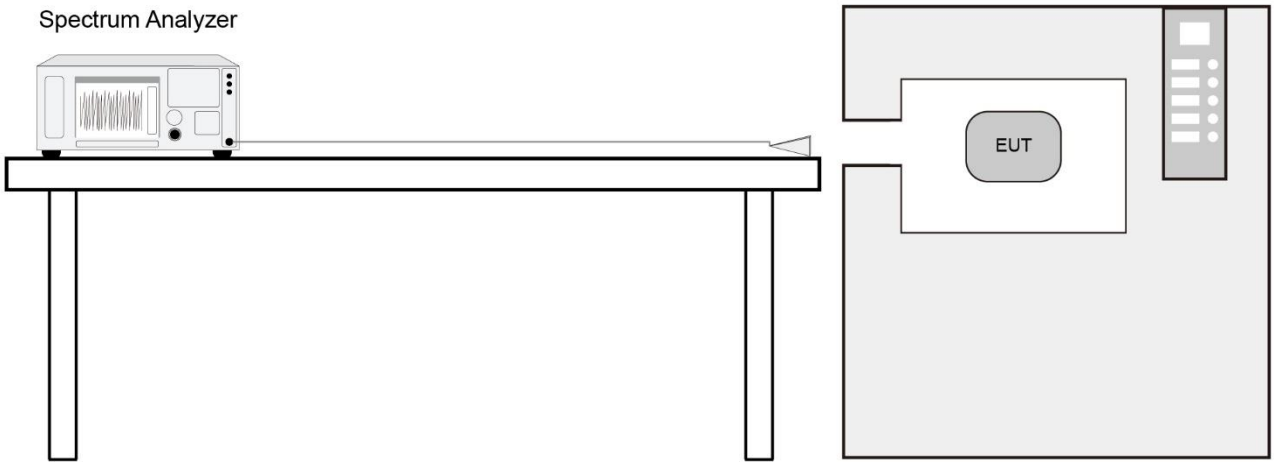
a) At 10°C intervals of temperatures between -30°C and +50°C at the manufacturer's rated supply voltage, and

b) At +20°C temperature and ±15% supply voltage variations. If a product is specified to operate over a range of input voltage then the -15% variation is applied to the lowermost voltage and the +15% is applied to the uppermost voltage.

Adjust the detector bandwidth and span settings to achieve a resolution capable of accurate frequency measurements over the applicable frequency stability limits. Mark the highest point and record it.

If an unmodulated carrier is not available, the mean frequency of a modulated carrier can be obtained by using a frequency counter with gating time set to an appropriately large multiple of bit periods (gating time depending on the required accuracy).

6.5.4. Test Setup



6.5.5. Test Result

Refer to Appendix A.5.

6.6. Radiated Spurious Emission

6.6.1. Test Limit

Part 25.202(f) Emission Limitations

The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the schedule:

(1) In any 4kHz band, the center frequency of which is removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: 25dB;

(2) In any 4kHz band, the center frequency of which is removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: 35dB;

(3) In any 4kHz band, the center frequency of which is removed from the assigned frequency by more than 250 percent of the authorized bandwidth: An amount equal to 43dB plus 10 times the logarithm (to the base 10) of the transmitter power in watts.

For Out-Of-Band Emission, The emission limit equal to 82.3dBμV/m.
E (dBμV/m) = EIRP (dBm) - 20 log D + 104.8; where D is the measurement distance in meters and EIRP is -13dBm.

6.6.2. Test Procedure used

ANSI C63.26-2015 - Section 5.7

6.6.3. Test Setting

Spurious Emission – In-Band Emission

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 5.1kHz for in-band mask
3. VBW ≥ 3 × RBW
4. Detect = power averaging (RMS)
5. Sweep time = Auto couple
6. Trace mode = Trace average

7. Trace was allowed to stabilize

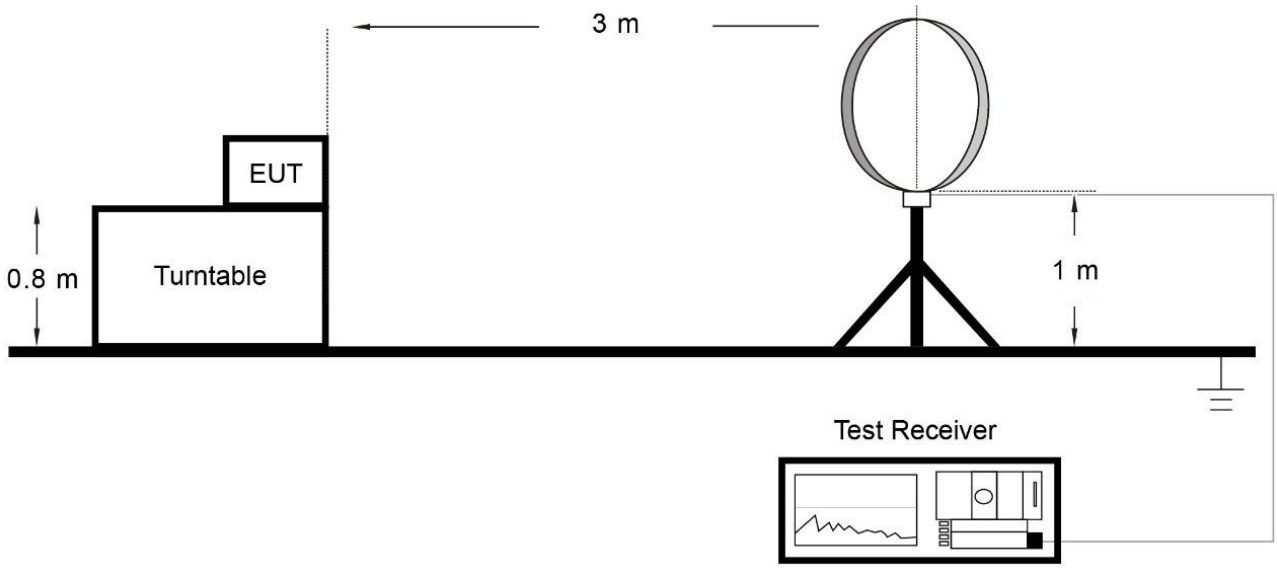
Spurious Emission – Out-of-Band Emission

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 100kHz

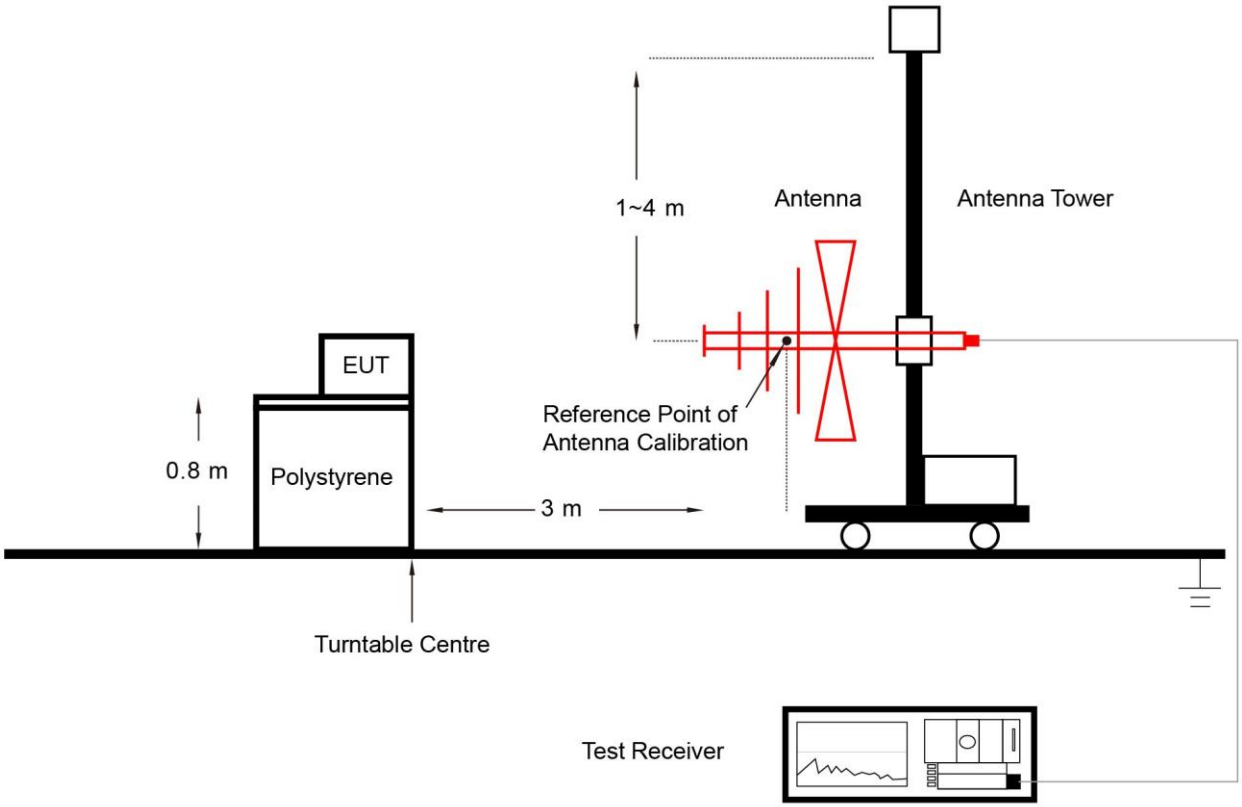
   Set the RBW greater than 4kHz in order to increase the measurement speed and higher RBW is more stringent.
3. VBW = 3 * RBW
4. Detector = Peak
5. Sweep time = Auto couple
6. Trace mode = Max hold
7. Trace was allowed to stabilize

6.6.4. Test Setup

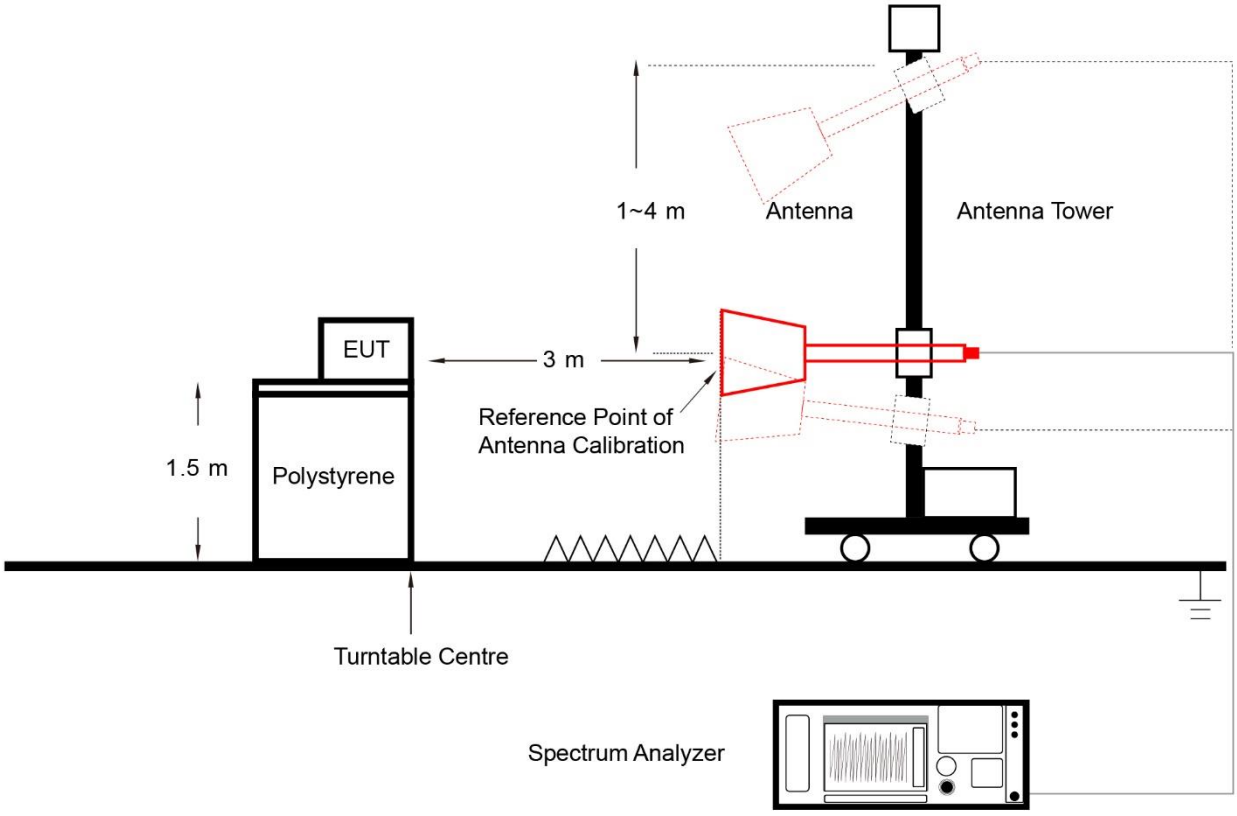
9kHz ~ 30MHz Test Setup



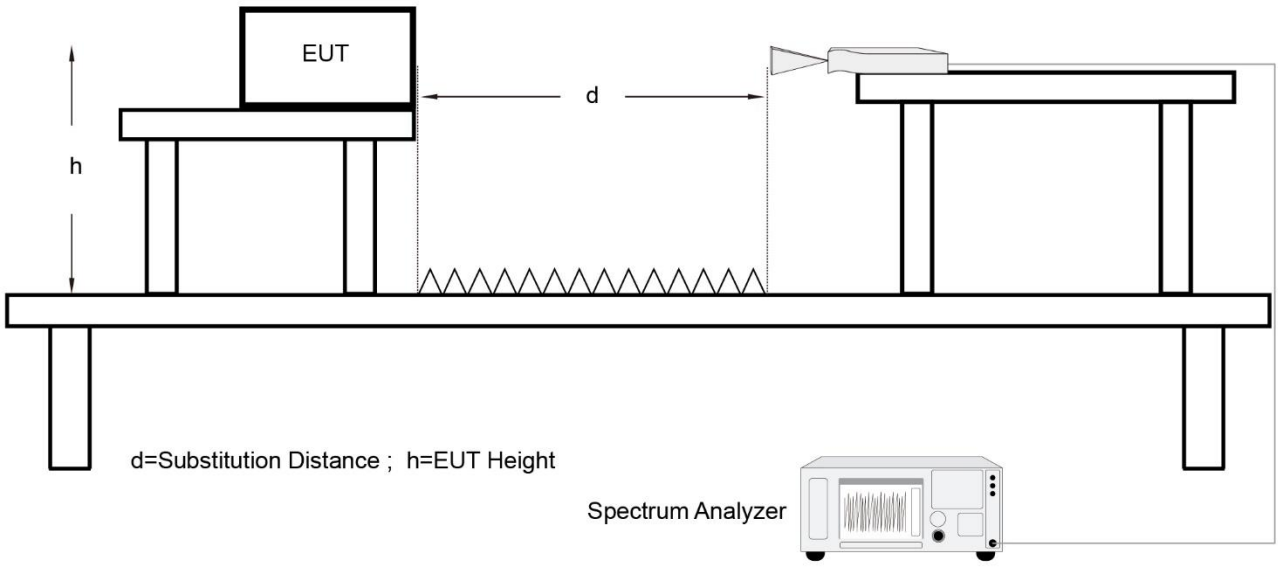
30MHz ~ 1GHz Test Setup



1GHz ~ 40GHz Test Setup



40GHz ~ 100GHz Test Setup



6.6.5. Test Result

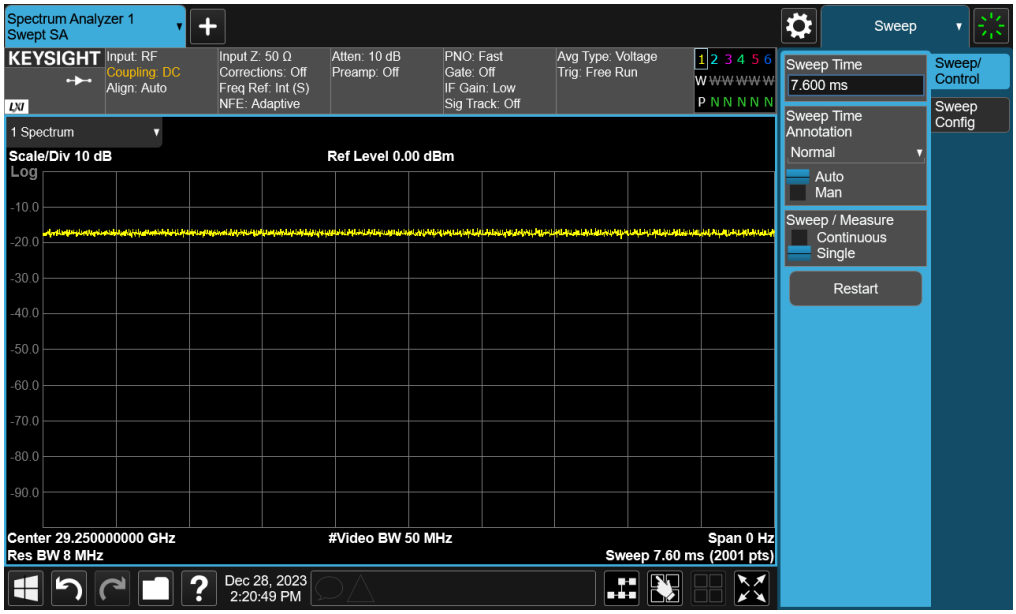
Refer to Appendix A.6.

Appendix A - Test Result

A.1 Duty Cycle Test Result

Test Site	WZ-AC1	Test Engineer	Amy Zhang
Test Date	2023-12-28		

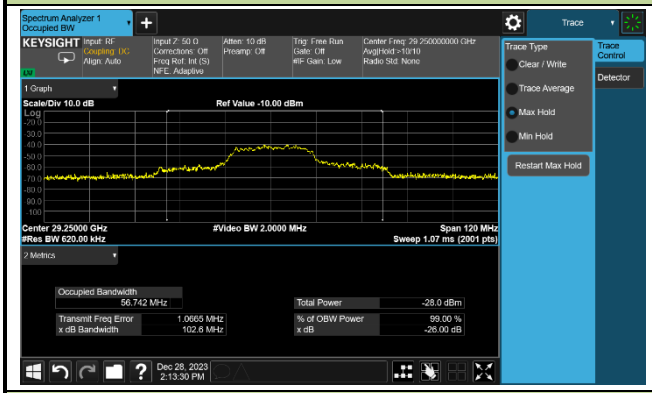
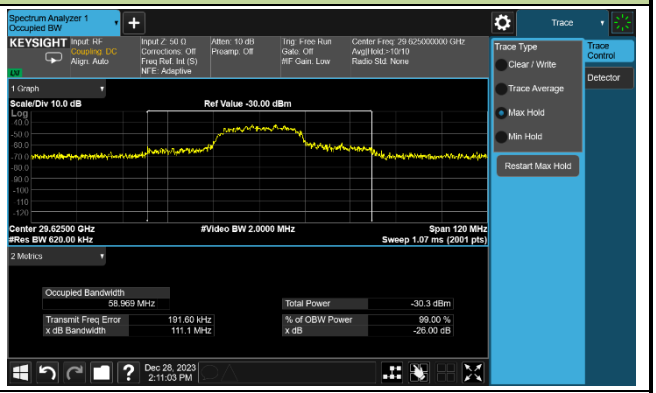
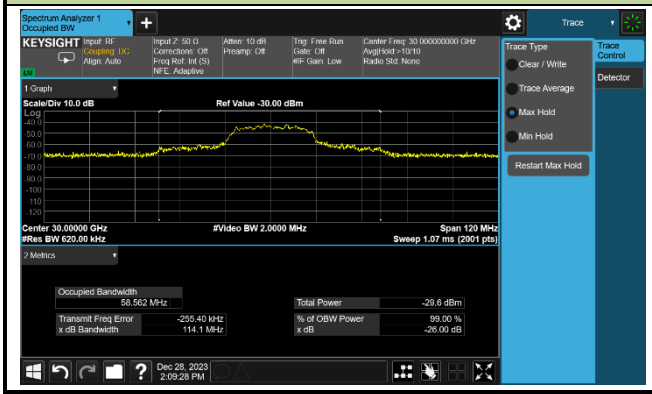
Test Mode	Duty Cycle
8PSK	100%
8PSK - 29250 MHz	



A.2 Occupied Bandwidth Test Result

Test Site	WZ-AC1	Test Engineer	Amy Zhang
Test Date	2023-12-28		

Test Mode	Date Rate (Mbps)	Test Channel	Test Frequency (MHz)	99% Bandwidth (MHz)
8PSK	20	Low	29250	56.742
	20	Mid	29625	58.969
	20	High	30000	58.562

Occupied Bandwidth	
29250 MHz	29625 MHz
	
30000 MHz	
	

A.3 Power Spectral Density Test Result

Test Site	WZ-AC1	Test Engineer	Amy Zhang
Test Date	2023-12-22		

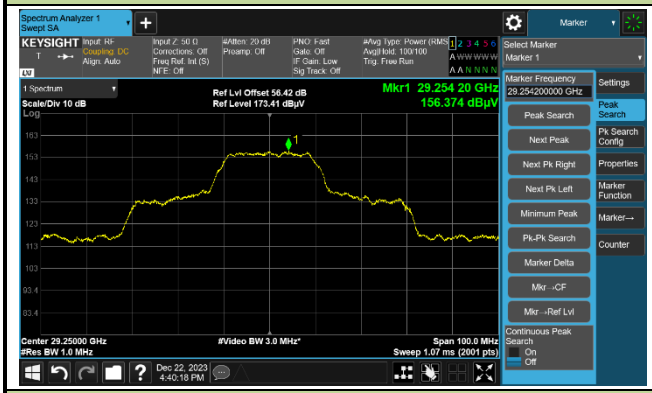
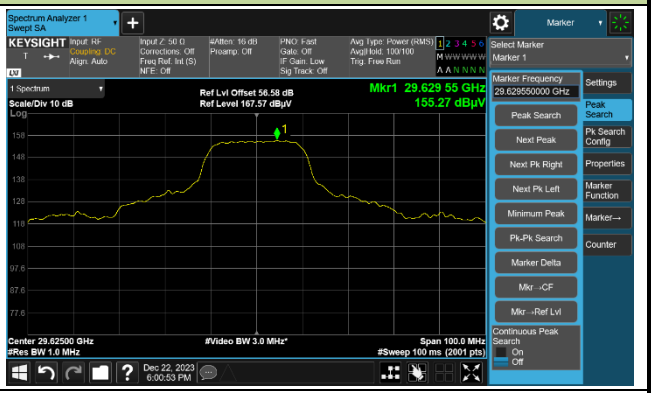
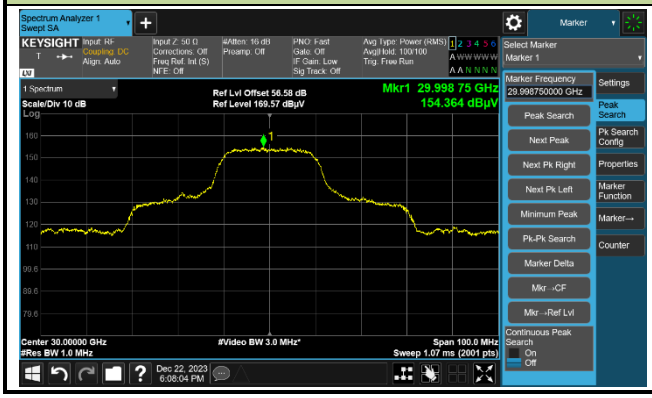
Test Mode	Date Rate (Mbps)	Test Channel	Test Freq. (MHz)	AVPSD (dBμV/m/MHz)	EIRP PSD (dBm/MHz)	EIRP PSD (dBW/MHz)	Limit (dBW/MHz)	Result
8PSK	20	Low	29250	156.374	61.174	31.174	≤ 64	Pass
	20	Mid	29625	155.270	60.070	30.070	≤ 64	Pass
	20	High	30000	154.364	59.164	29.164	≤ 64	Pass

Note 1: AVPSD (dBm/MHz) =AVPSD (dBμV/m/MHz) + Correction Factor @ 3m, Correction Factor @ 3m = 20log(D) - 104.7; where D is the measurement distance of 3m.

Note 2: EIRP PSD (dBW/MHz) = EIRP PSD (dBm/MHz) - 30.

Note 3: The max EIRP PSD is less than the limit for θ ≤ 0° which limit is lower, so the requirement is complied.

Note 4: The direction of the max EIRP is the direction to the target satellite.

Average PSD	
29250 MHz	29625 MHz
	
30000 MHz	
	

Note 1: The measured level was in dBμV/m, which had compensated cable loss (dB), antenna factor (dB/m) in SA's Ref offset, but showed dBμV in SA's screen.

Note 2: This is the radiated measurement results, only the results of the maximum polarization direction.

A.4 Off-axis EIRP Density Test Result

Test Site	WZ-AC1	Test Engineer	Amy Zhang
Test Date	2023-12-22		

Test Mode	Test Freq. (MHz)	P_{normal} (dBW/MHz)	G_{normal} (dBi)	Max Measurement Angle (°)	G_θ (dBi)	P_θ (dBW/MHz)	Limit (dBW/MHz)	Result
8PSK	29250	31.174	37.420	6.2	14.290	8.044	≤12.7	Pass
		31.174	37.420	-8.0	12.920	6.674	≤11.5	
		31.174	37.420	-17.5	6.240	-0.006	≤4.4	
		31.174	37.420	-19.4	4.640	-1.606	≤3.5	
	29625	30.070	37.530	6.2	14.390	6.930	≤12.7	Pass
		30.070	37.530	-8.0	12.940	5.480	≤11.5	
		30.070	37.530	17.5	6.280	-1.180	≤4.4	
		30.070	37.530	-19.4	5.370	-2.090	≤3.5	
	30000	29.164	37.630	-6.1	14.620	6.154	≤12.9	Pass
		29.164	37.630	-8.0	12.960	4.494	≤11.5	
		29.164	37.630	-17.5	6.370	-2.096	≤4.4	
		29.164	37.630	-19.4	5.450	-3.016	≤3.5	

Note 1: $P_\theta = P_{normal} - (G_{normal} - G_\theta)$, where P_θ is the off-axis EIRP density of angle θ, P_{normal} is the EIRP density of normal phase with θ = 0, G_{normal} is the antenna gain of the normal phase, G_θ is the antenna gain of angle θ.

Note 2: Detailed antenna gain information refers to antenna description.

Note 3: The P_{normal} (dBW/MHz) is from Appendix A.3.

A.5 Frequency Tolerance Test Result

Test Site	WZ-TR3	Test Engineer	Amy Zhang
Test Date	2023-04-26	Temperature	-30 ~ 50 °C

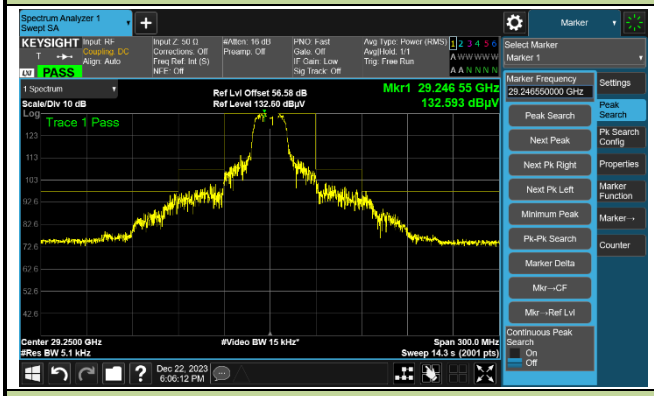
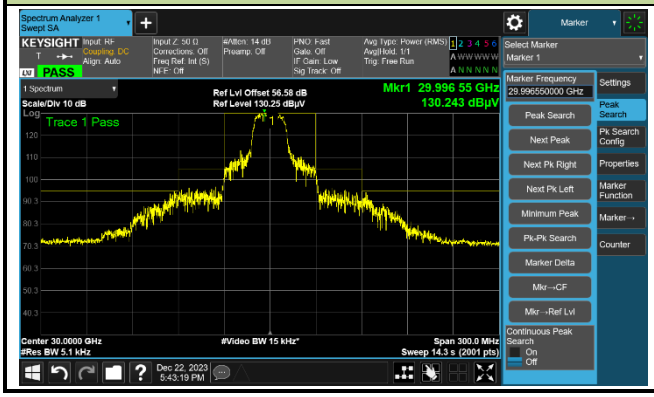
Test Freq. (MHz)	Voltage (V_{AC})	Temp. (°C)	Measured Freq. (MHz)	Freq. Tolerance (ppm)	Limit (ppm)	Result
29625	120	-30	29625.000600	0.02	≤ 10	Pass
		-20	29625.001099	0.04	≤ 10	Pass
		-10	29625.001599	0.05	≤ 10	Pass
		0	29625.002049	0.07	≤ 10	Pass
		+10	29625.003898	0.13	≤ 10	Pass
		+20	29625.004348	0.15	≤ 10	Pass
		+30	29625.005247	0.18	≤ 10	Pass
		+40	29625.006747	0.23	≤ 10	Pass
		+50	29625.010845	0.37	≤ 10	Pass
	102	+20	29625.011644	0.39	≤ 10	Pass
	138	+20	29625.012144	0.41	≤ 10	Pass

Note: Frequency Tolerance (ppm) = {[Measured Frequency (MHz) - Test Frequency (MHz)] / Test Frequency (MHz)} * 10^6.

A.6 Radiated Spurious Emission Test Result

Test Site	WZ-AC1	Test Engineer	Amy Zhang
Test Date	2023-12-22	Test Item	In-band Mask

Authorization Bandwidth = 60MHz

In-band Mask	
29250 MHz	29625 MHz
	
30000 MHz	
	

Note: The cable loss and measurement antenna factor has compensated to the spectrum analyzer's Ref Level Offset.

Test Site	WZ-AC2	Test Engineer	Amy Zhang
Test Date	2023-12-27	Test Channel	29250MHz
Test Mode	Out-of-Band Emission – 1G ~ 40G		
Remark	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-40GHz, there is not show in the report.		

Frequency (MHz)	Reading Level (dBμV)	Factor (dB/m)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
11642.0	20.9	17.9	38.8	82.3	-43.5	Peak	Horizontal
17974.5	21.2	28.2	49.4	82.3	-32.9	Peak	Horizontal
11999.0	25.6	17.0	42.6	82.3	-39.7	Peak	Horizontal
18000.0	21.7	28.0	49.7	82.3	-32.6	Peak	Horizontal
20486.0	48.2	-9.3	38.9	82.3	-43.4	Peak	Vertical
26580.0	60.7	-6.8	53.9	82.3	-28.4	Peak	Vertical
25964.0	56.8	-6.2	50.6	82.3	-31.7	Peak	Vertical
26613.0	57.1	-7.3	49.8	82.3	-32.5	Peak	Vertical

Note 1: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB/m).

Note 2: Average measurement was not performed when peak measure level was lower than the average limit.

Test Site	WZ-AC2	Test Engineer	Amy Zhang
Test Date	2023-12-27	Test Channel	29625MHz
Test Mode	Out-of-Band Emission – 1G ~ 40G		
Remark	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-40GHz, there is not show in the report.		

Frequency (MHz)	Reading Level (dBμV)	Factor (dB/m)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
11557.0	20.6	17.9	38.5	82.3	-43.8	Peak	Horizontal
17991.5	21.0	28.3	49.3	82.3	-33.0	Peak	Horizontal
11999.0	25.2	17.0	42.2	82.3	-40.1	Peak	Horizontal
17983.0	20.1	28.5	48.6	82.3	-33.7	Peak	Horizontal
26052.0	60.7	-6.7	54.0	82.3	-28.3	Peak	Vertical
31255.0	57.4	-5.7	51.7	82.3	-30.6	Peak	Vertical
26052.0	59.8	-6.7	53.1	82.3	-29.2	Peak	Vertical
26536.0	59.2	-6.6	52.6	82.3	-29.7	Peak	Vertical
Note 1: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB/m).							
Note 2: Average measurement was not performed when peak measure level was lower than the average limit.							

Test Site	WZ-AC2	Test Engineer	Amy Zhang
Test Date	2023-12-27	Test Channel	30000MHz
Test Mode	Out-of-Band Emission – 1G ~ 40G		
Remark	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-40GHz, there is not show in the report.		

Frequency (MHz)	Reading Level (dBμV)	Factor (dB/m)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
11565.5	20.9	17.8	38.7	82.3	-43.6	Peak	Horizontal
17991.5	21.1	28.3	49.4	82.3	-32.9	Peak	Horizontal
11999.0	25.1	17.0	42.1	82.3	-40.2	Peak	Horizontal
17983.0	21.6	28.5	50.1	82.3	-32.2	Peak	Horizontal
20508.0	48.4	-9.8	38.6	82.3	-43.7	Peak	Vertical
25997.0	64.8	-6.5	58.3	82.3	-24.0	Peak	Vertical
25898.0	58.9	-6.8	52.1	82.3	-30.2	Peak	Vertical
26558.0	58.0	-6.6	51.4	82.3	-30.9	Peak	Vertical

Note 1: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB/m).

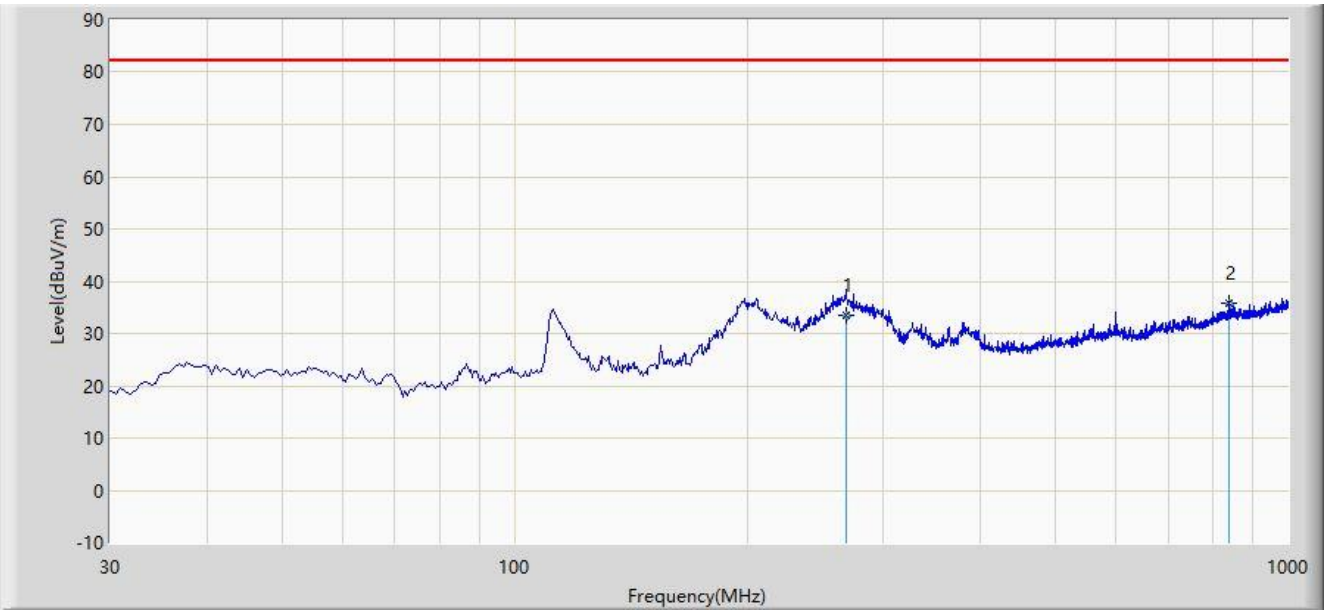
Note 2: Average measurement was not performed when peak measure level was lower than the average limit.

Test Site	SIP-AC3	Test Engineer	Amy Zhang
Test Date	2023-12-27	Test Mode	Out-of-Band Emission - 40G ~ 100G
Remark	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 40-100GHz, there is not show in the report.		

Channel	Frequency (MHz)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
29250	49119.5	69.310	82.3	-12.990	Peak	Horizontal
	49241.5	68.560	82.3	-13.740	Peak	Vertical
	58492.4	80.605	82.3	-1.695	Average	Horizontal
	58489.4	78.678	82.3	-3.622	Average	Vertical
	87739.2	74.420	82.3	-7.880	Average	Horizontal
	87739.2	76.455	82.3	-5.845	Average	Vertical
29625	49220.0	68.090	82.3	-14.210	Peak	Horizontal
	49117.5	68.100	82.3	-14.200	Peak	Vertical
	59239.4	75.008	82.3	-7.292	Average	Horizontal
	59239.4	79.016	82.3	-3.284	Average	Vertical
	88876.5	79.210	82.3	-3.090	Peak	Horizontal
	88876.0	76.580	82.3	-5.720	Peak	Vertical
30000	49224.5	68.370	82.3	-13.930	Peak	Horizontal
	48562.0	68.040	82.3	-14.260	Peak	Vertical
	59989.4	78.033	82.3	-4.267	Average	Horizontal
	59989.4	77.811	82.3	-4.489	Average	Vertical
	83241.0	72.120	82.3	-10.180	Peak	Horizontal
	89997.5	72.490	82.3	-9.810	Peak	Vertical
Note: The Vertical and Horizontal polarization were evaluated, only the worst case test results are shown in the table.						

Radiated Spurious Emission For below 1GHz:

Site: WZ-AC2	Test Date: 2023-12-27
Limit: FCC Part 25_RE	Engineer: Bob Zhang
Probe: VULB9162_30-7000MHz	Polarity: Horizontal
EUT: Phased Array Satellite Communication Terminal	Power: AC 120V/60Hz
Test Mode: Transmit by 8PSK at 29250MHz	



No	Mark	Frequency (MHz)	Measure Level (dBμV/m)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV/m)	Factor (dB/m)	Type
1		268.200	33.468	13.220	-48.832	82.300	20.248	QP
2	*	840.000	35.741	4.690	-46.559	82.300	31.051	QP

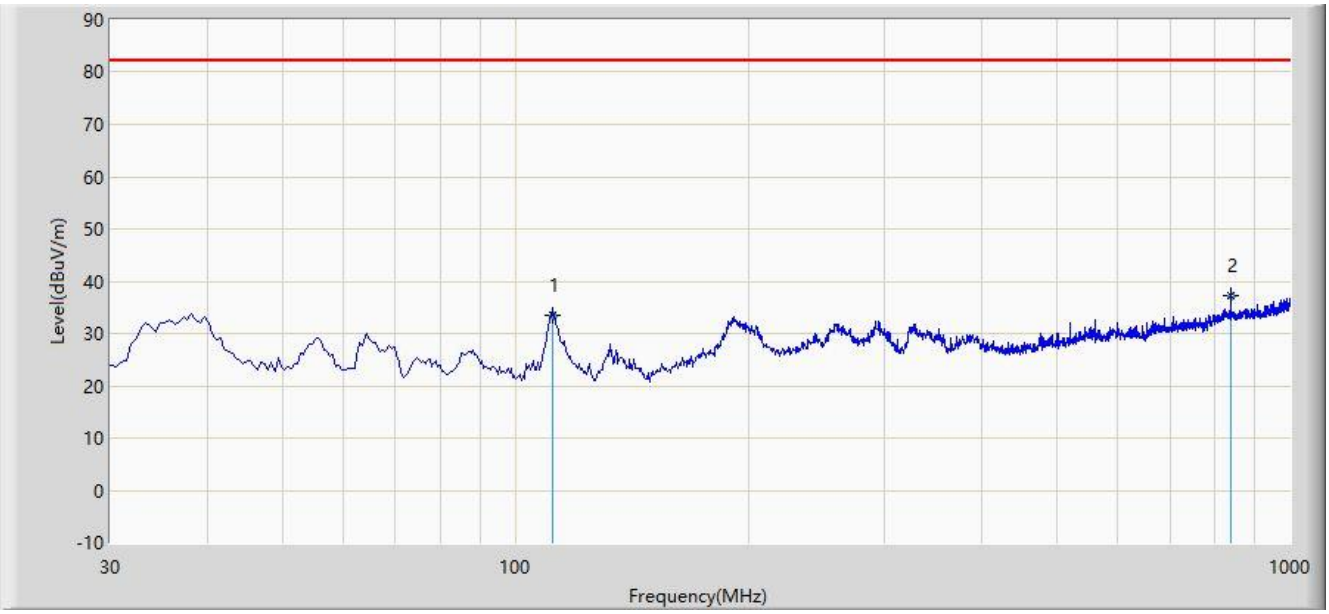
Note 1: " * ", means this data is the worst emission level.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB/m).

Note 3: Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).

Note 4: The amplitude of radiated emission (frequency range from 9kHz to 30MHz) is that proximity to ambient noise, which also are attenuated more than 20 dB below the permissible value. Therefore, the data is not presented in the report.

Site: WZ-AC2	Test Date: 2023-12-27
Limit: FCC Part 25_RE	Engineer: Bob Zhang
Probe: VULB9162_30-7000MHz	Polarity: Vertical
EUT: Phased Array Satellite Communication Terminal	Power: AC 120V/60Hz
Test Mode: Transmit by 8PSK at 29250MHz	



No	Mark	Frequency (MHz)	Measure Level (dBμV/m)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV/m)	Factor (dB/m)	Type
1		111.760	33.403	15.530	-48.897	82.300	17.873	QP
2	*	840.000	37.151	6.100	-45.149	82.300	31.051	QP

Note 1: " * ", means this data is the worst emission level.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB/m).

Note 3: Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).

Note 4: The amplitude of radiated emission (frequency range from 9kHz to 30MHz) is that proximity to ambient noise, which also are attenuated more than 20 dB below the permissible value. Therefore, the data is not presented in the report.

Appendix B - Test Setup Photograph

Refer to “2302RSU008-UT” file.

Appendix C - EUT Photograph

Refer to “2302RSU008-UE” file.

The End