RF MEASUREMENT REPORT

FCC ID:	2AUBBFL30F
Applicant:	China Starwin Science & Technology Co., Ltd
Product:	Flat Panel Integrated Satellite Communication Terminal
Model No.:	FL30F-M
Trademark:	StarWin
FCC Classification:	Licensed Non-Broadcast Station Transmitter (TNB)
FCC Rule Part(s):	FCC CFR 47 Part 2, FCC CFR 47 Part 25
Test Procedure(s):	ANSI C63.26-2015, KDB 971168 D01v03r01
Test Date:	October 07, 2021 ~ February 25, 2022

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.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

Revision History

Report No.	Version	Description	Issue Date	Note
2112RSU001-U3	Rev. 01	Initial Report	03-02-2022	Valid

CONTENTS

Description Page

1. General Information 5

1.1. Applicant 5
1.2. Manufacturer 5
1.3. Testing Facility 5
1.4. Product Information 6
1.5. Product Specification Under Test 6
1.6. Working Frequencies 7

2. Test Configuration 8

2.1. Test Mode 8
2.2. Test System Connection Diagram 8
2.3. Test Software 9
2.4. Applied Standards 9
2.5. Test Environment Condition 9

3. Antenna Requirements 10

4. Measuring Instrument 11

5. Measurement Uncertainty 13

6. Test Result 14

6.1. Summary 14
6.2. Occupied Bandwidth 15
6.2.1. Test Limit 15
6.2.2. Test Procedure used 15
6.2.3. Test Setting 15
6.2.4. Test Setup 15
6.2.5. Test Result 15
6.3. Power Spectral Density & Output Power 16
6.3.1. Test Limit 16
6.3.2. Test Procedure used 16
6.3.3. Test Setting 17
6.3.4. Test Setup 18
6.3.5. Test Result 18
6.4. Off-axis EIRP Density 19
6.4.1. Test Limit 19
6.4.2. Test Procedure used 21
6.4.3. Test Setting 21

6.4.4. Test Setup 21
6.4.5. Test Result 21
6.5. Unwanted Emission at Antenna Terminal 22
6.5.1. Test Limit 22
6.5.2. Test Procedure used 22
6.5.3. Test Setting 22
6.5.4. Test Setup 23
6.5.5. Test Result 23
6.6. Frequency Tolerance 24
6.6.1. Test Limit 24
6.6.2. Test Procedure used 24
6.6.3. Test Setting 24
6.6.4. Test Setup 25
6.6.5. Test Result 25
6.7. Radiated Spurious Emission 26
6.7.1. Test Limit 26
6.7.2. Test Procedure used 26
6.7.3. Test Setting 26
6.7.4. Test Setup 27
6.7.5. Test Result 28

Appendix A – Test Result 29

A.1 Duty Cycle Test Result 30
A.2 Occupied Bandwidth Test Result 31
A.3 Power Spectral Density & Output Power Test Result 35
A.4 Off-axis EIRP Density Test Result 40
A.5 Unwanted Emission at Antenna Terminal Test Result 41
A.6 Frequency Tolerance Test Result 45
A.7 Radiated Spurious Emission Test Result 46

Appendix B – Test Setup Photograph 66

Appendix C – EUT Photograph 67

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: L3261-190725				
	FCC: 291082, TW3261		ISED: TW3261		

1.4. Product Information

Product Name	Flat Panel Integrated Satellite Communication Terminal
Model No.	FL30F-M
Hardware Version	XY-PB-FL30-202111
Software Version	XY-PB-FL30-V2.02
Wi-Fi Specification	802.11b/g/n
Bluetooth Version	V4.2 single mode, BLE only
Satellite Specification	Transmit: 14.00~14.50GHz Receive: 10.70~12.75GHz
Antenna Information	Refer to section 1.7
GNSS Specification	GPS, BDS
Operating Temperature	-25 ~ 50 °C
Power Type	By DC Adapter
Accessory	
DC Adapter	Model: GST160A24 Input: 100-240VAC, 50/60Hz, 2.0A Output: 24VDC, 6.67A, 160W MAX
Remark: The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer.	

1.5. Product Specification

Frequency Range	Transmit: 14.00 ~ 14.50 GHz Receive: 10.70 ~ 12.75 GHz
Test Frequency	Low channel: 14.00 GHz Mid channel: 14.25 GHz High channel: 14.50 GHz
Type of Modulation	8PSK, BPSK, QPSK
Data Rate	128kbps ~ 7500kbps
Antenna Type	Slotted Waveguide Array Antenna
Antenna Gain	33.11 dBi (in range of ±10 degree) 3.31 dBi (out range of ±10 degree)

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

1.6. Working Frequencies

Channel	Frequency
Low Channel	14000 MHz
…	…
Middle Channel	14250 MHz
…	…
High Channel	14500 MHz

2. Test Configuration

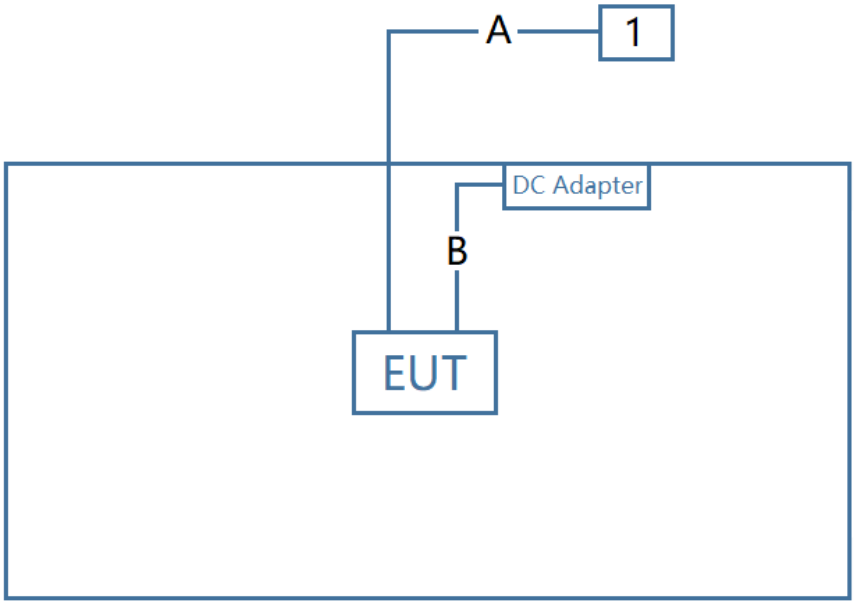
2.1. Test Mode

Mode 1: Transmit at Channel 14.00 GHz
Mode 2: Transmit at Channel 14.25 GHz
Mode 3: Transmit at Channel 14.50 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



Cable Type		Cable Description
A	LAN Cable	Shielded, > 10.0m
B	Power Cable	Non-Shielded, <3.0m

Product		Manufacturer	Model No.
1	Notebook	DELL	P62G

2.3. Test Software

The device connected with notebook, then set data rate and frequency in specified web pages.

Test Mode	Type of Modulation	Data Rate (kbps)	Channel No.	Test Frequency (MHz)	Power Parameter Value
Satellite	8PSK	128	Low	14000	-30.5
			Middle	14250	-30.5
			High	14500	-30.5
		7500	Low	14000	-10.0
			Middle	14250	-8.5
			High	14500	-8.0
	BPSK	128	Low	14000	-30.0
			Middle	14250	-30.5
			High	14500	-30.0
		7500	Low	14000	-9.5
			Middle	14250	-8.0
			High	14500	-7.5
	QPSK	128	Low	14000	-30.0
			Middle	14250	-29.5
			High	14500	-29.5
		7500	Low	14000	-9.5
			Middle	14250	-7.5
			High	14500	-7.5

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

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.

Conclusion:

The unit complies with the requirement of §25.209, and the details refer to the “Antenna Specification” file.

4. Measuring Instrument

Instrument Name	Manufacturer	Model No.	Asset No.	Cali. Interval	Cal. Due Date	Test Site
Signal Analyzer	Keysight	N9010B	MRTSUE06603	1 year	2022/10/31	SIP-AC2
Signal Analyzer	Keysight	N9020B	MRTSUE06604	1 year	2022/9/7	SIP-AC2
Thermohygrometer	testo	608-H1	MRTSUE06623	1 year	2022/11/28	SIP-AC2
Thermohygrometer	testo	608-H1	MRTSUE06624	1 year	2022/11/28	SIP-AC2
Anechoic Chamber	RIKEN	SIP-AC2	MRTSUE06781	1 year	2022/12/23	SIP-AC2
Signal Analyzer	Keysight	N9030B	MRTSUE06395	1 year	2022/8/8	SIP-AC2
Waveguide Harmonic Mixer	Keysight	M1970V	MRTSUE06271	/	/	SIP-AC2
Waveguide Harmonic Mixer	Keysight	M1970W	MRTSUE06272	/	/	SIP-AC2
mmWave Antenna	MI-WWAVE	261U-25/383	MRTSUE06273	/	/	SIP-AC2
mmWave Antenna	MI-WWAVE	261G/387	MRTSUE06274	/	/	SIP-AC2
mmWave Antenna	MI-WWAVE	261F/387	MRTSUE06275	/	/	SIP-AC2
mmWave Antenna	MI-WWAVE	261E-25/387	MRTSUE06276	/	/	SIP-AC2
mmWave Antenna	VDI	WR3/4	MRTSUE06277	/	/	SIP-AC2
mmWave Antenna	VDI	WR2/2	MRTSUE06278	/	/	SIP-AC2
mmWave Antenna	A-INFO	LB-15-25-A	MRTSUE06409	/	/	SIP-AC2
mmWave Antenna	A-INFO	LB-10-25-A	MRTSUE06410	/	/	SIP-AC2
mmWave Extension Module	Keysight	N9029AV03	MRTSUE06366	/	/	SIP-AC2
mmWave Extension Module	Keysight	N9029AV05	MRTSUE06367	/	/	SIP-AC2
mmWave Extension Module	Keysight	N9029AV06	MRTSUE06368	/	/	SIP-AC2
mmWave Extension Module	Keysight	N9029AV02	MRTSUE06369	/	/	SIP-AC2
mmWave Extension Module	Keysight	E8257DV15	MRTSUE06456	/	/	SIP-AC2
mmWave Extension Module	Keysight	E8257DV10	MRTSUE06458	/	/	SIP-AC2
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2022/12/29	WZ-AC1
Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06023	1 year	2022/9/16	WZ-AC1
Preamplifier	Agilent	83017A	MRTSUE06076	1 year	2022/11/12	WZ-AC1
TRILOG Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	1 year	2022/8/5	WZ-AC1
Anechoic Chamber	TDK	WZ-AC1	MRTSUE06212	1 year	2022/4/29	WZ-AC1
Thermohygrometer	testo	608-H1	MRTSUE06403	1 year	2022/6/28	WZ-AC1
Signal Analyzer	Keysight	N9010B	MRTSUE06607	1 year	2022/12/29	WZ-AC1
Thermohygrometer	testo	Testo 608-H1	MRTSUE11039	1 year	2022/11/11	WZ-AC1
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2022/10/28	WZ-AC1/WZ-AC2
Horn Antenna	ETS	3117	MRTSUE06257	1 year	2022/9/25	WZ-AC1/WZ-AC2
Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06597	1 year	2022/12/1	WZ-AC1/WZ-AC2

Instrument Name	Manufacturer	Model No.	Asset No.	Cali. Interval	Cal. Due Date	Test Site
Preamplifier	EMCI	EMC051845SE	MRTSUE06987	1 year	2022/9/9	WZ-AC1/WZ-AC2
Preamplifier	EMCI	EMC184045SE	MRTSUE06640	1 year	2022/1/14	WZ-AC1/WZ-AC2
				1 year	2023/1/13	WZ-AC1/WZ-AC2
TRILOG Antenna	Schwarzbeck	VULB 9162	MRTSUE06022	1 year	2022/5/24	WZ-AC2
EMI Test Receiver	Agilent	N9038A	MRTSUE06125	1 year	2022/6/24	WZ-AC2
Thermohygrometer	Mingle	ETH529	MRTSUE06170	1 year	2022/12/1	WZ-AC2
Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06171	1 year	2022/10/21	WZ-AC2
Preamplifier	Schwarzbeck	BBV 9718	MRTSUE06176	1 year	2022/11/12	WZ-AC2
Anechoic Chamber	RIKEN	WZ-AC2	MRTSUE06213	1 year	2022/4/29	WZ-AC2
Thermohygrometer	testo	Testo 608-H1	MRTSUE11038	1 year	2022/11/11	WZ-AC2
USB Power Sensor	Agilent	U2021XA	MRTSUE06030	1 year	2022/10/10	WZ-SR5
USB Power Sensor	Keysight	U2021XA	MRTSUE06582	1 year	2022/8/8	WZ-SR5
Signal Analyzer	Keysight	N9010B	MRTSUE06558	1 year	2022/6/24	WZ-SR5
Signal Analyzer	Agilent	N9020A	MRTSUE06106	1 year	2022/4/13	WZ-SR5
Thermohygrometer	testo	608-H1	MRTSUE06402	1 year	2022/6/28	WZ-SR5
Shielding Room	HUAMING	WZ-SR5	MRTSUE06442	/	/	WZ-SR5
Signal Analyzer	Keysight	N9010B	MRTSUE06457	1 year	2022/6/24	WZ-SR5

Software	Version	Function
EMI Software	V3	EMI Test Software

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 Disturbance
Measurement Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): Horizontal: 30MHz~300MHz: 5.04dB 300MHz~1GHz: 4.95dB 1GHz~75GHz: 6.40dB Vertical: 30MHz~300MHz: 5.24dB 300MHz~1GHz: 6.03dB 1GHz~75GHz: 6.40dB
Spurious Emissions, Conducted
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 0.78dB
Output Power
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 1.13dB
Power Spectrum Density
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 1.15dB
Occupied Bandwidth
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 0.28%

6. Test Result

6.1. Summary

FCC Section(s)	Test Description	Test Condition	Verdict
2.1049	Occupied Bandwidth	Conducted	Pass
2.1046(a), 25.204(a)	Power Spectral Density & Output Power		Pass
25.218	Off-axis EIRP density		Pass
2.1051, 25.202(f)	Unwanted Emission at Antenna Terminal.		Pass
2.1055, 25.202(d)	Frequency Tolerance		Pass
2.1053, 25.202(f)	Radiated Spurious Emission	Radiated	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

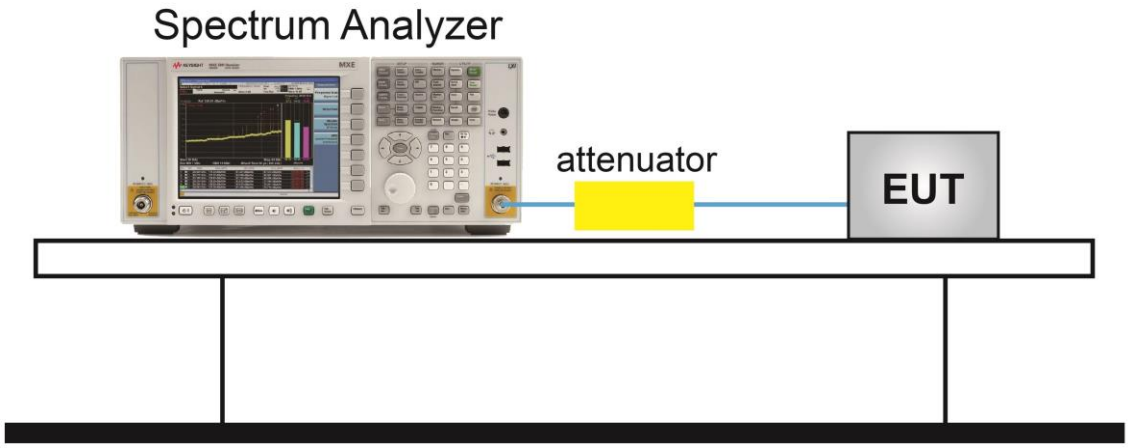
6.2.2.Test Procedure used

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 & Output Power

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(a)

In bands shared coequally with terrestrial radio communication services, the equivalent isotropically radiated power transmitted in any direction towards the horizon by an earth station, other than an ESV, operating in frequency bands between 1 and 15GHz, shall not exceed the following limits except as provided for in paragraph(c) of this section:

+ 40 dBW in any 4 kHz band for $\theta \leq 0°$

+ 40 + 3θ dBW in any 4 kHz 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)

ANSI C63.26-2015 - Section 5.2.4.2 (Output Power Measurement)

6.3.3.Test Setting

Power Spectral Density Measurement using spectrum analyzer

1. Set span to 2 to 3 times the OBW
2. Set RBW = 1% to 5% of the OBW

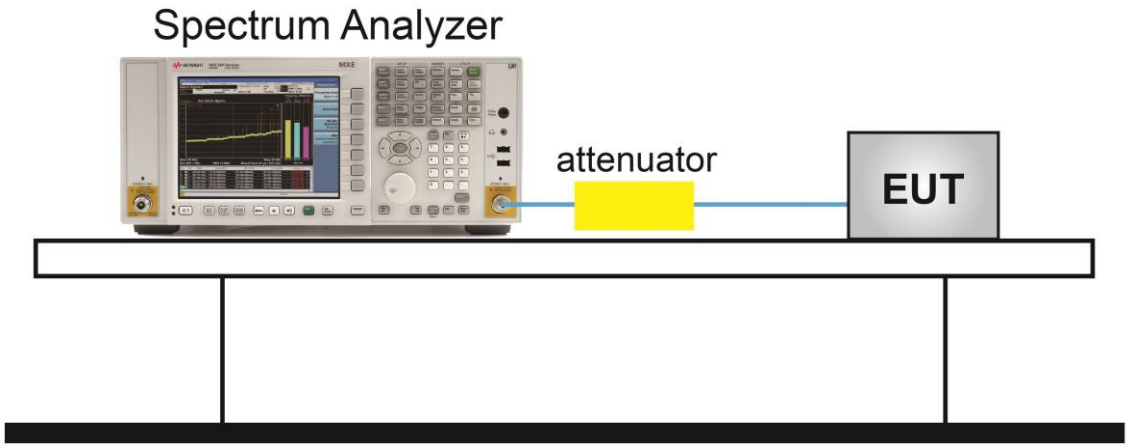
   (RBW shall set to the reference bandwidth specified by the applicable regulatory requirement, so set RBW = 3 kHz herein for measurement)
3. Set VBW ≥ 3 × RBW
4. Set number of measurement points in sweep ≥ 2 × span / RBW
5. Detector = power averaging (RMS)
6. Trace mode = Trace average
7. Trace was allowed to stabilize
8. 10*log(4kHz/3kHz) = 1.25dB was added to the reference offset to correct the result relative to any 4kHz band as per the requirement in 25.202(f).

Output Power Measurement using a gated RF average-reading power meter

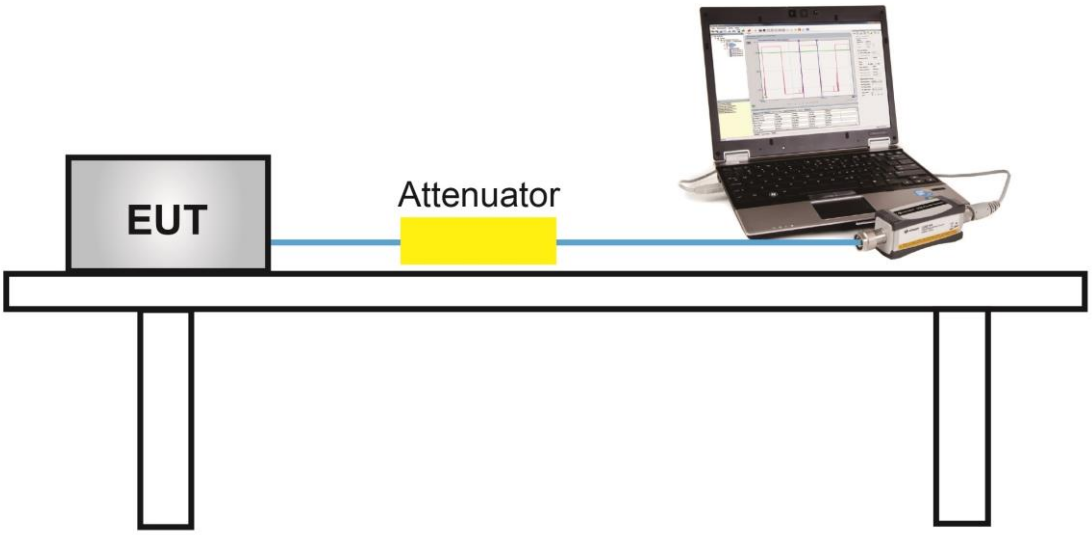
Measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since this measurement is made only during the ON time of the transmitter, no duty cycle correction is required.

6.3.4.Test Setup

Power Spectral Density Measurement



Output Power Measurement



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

(f) ***Digital earth station operation in the conventional Ku-band.***

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

15 - 25*log θ	dBW /4 kHz	for 1.5° ≤ θ ≤ 7°
-6	dBW /4 kHz	for 7° < θ ≤ 9.2°
18 - 25*log θ	dBW /4 kHz	for 9.2° < θ ≤ 19.1°
-14	dBW /4 kHz	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:

18 - 25*log θ	dBW /4 kHz	for 3° < θ ≤ 19.1°
-14	dBW /4 kHz	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:

5 - 25*log θ	dBW /4 kHz	for 1.5° < 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

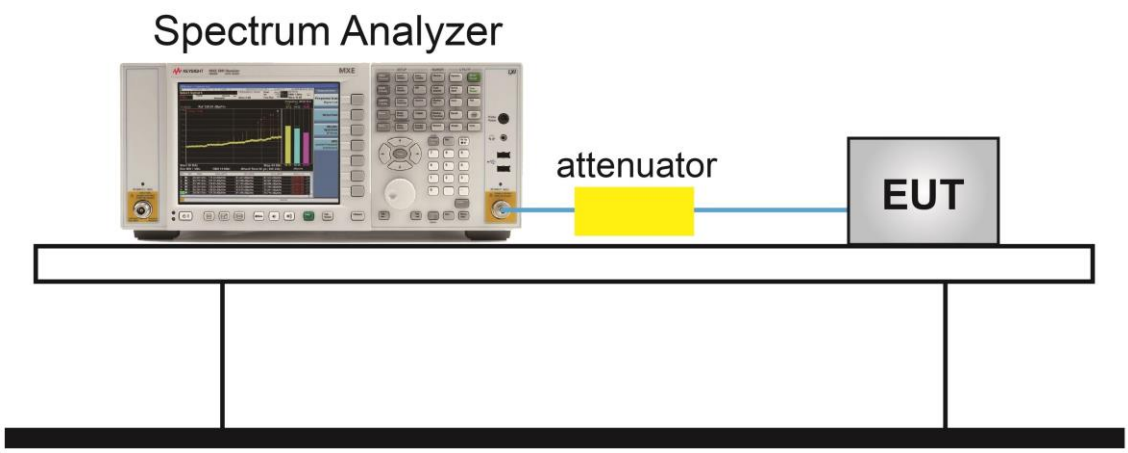
6.4.3.Test Setting

Power Spectral Density Measurement using spectrum analyzer

1. Set span to 2 to 3 times the OBW
2. Set RBW = 1% to 5% of the OBW

   (RBW shall set to the reference bandwidth specified by the applicable regulatory requirement, so set RBW = 3 kHz herein for measurement)
3. Set VBW ≥ 3 × RBW
4. Set number of measurement points in sweep ≥ 2 × span / RBW
5. Detector = power averaging (RMS)
6. Trace mode = Trace average
7. Trace was allowed to stabilize
8. 10*log(4kHz/3kHz) = 1.25dB was added to the reference offset to correct the result relative to any 4kHz band as per the requirement in 25.202(f).

6.4.4.Test Setup



6.4.5.Test Result

Refer to Appendix A.4.

6.5. Unwanted Emission at Antenna Terminal

6.5.1.Test Limit

Part 25.202(f)

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;

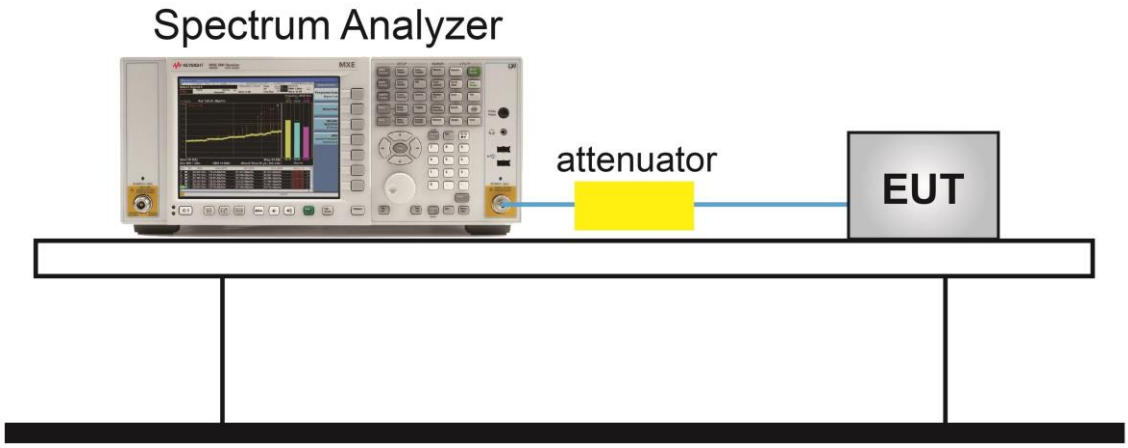
6.5.2.Test Procedure used

ANSI C63.26-2015 - Section 5.7

6.5.3.Test Setting

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 3kHz for in-band mask or 10kHz for below 30MHz or 100kHz for below 1GHz or 1MHz for above 1GHz, Set the RBW greater than 4kHz in order to increase the measurement speed
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
8. 10*log(4kHz/3kHz) = 1.25dB was added to the reference offset for in-band mask measurement to correct the result relative to any 4kHz band as per the requirement in 25.202(f)(1)&(2).

6.5.4.Test Setup



6.5.5.Test Result

Refer to Appendix A.5.

6.6. Frequency Tolerance

6.6.1.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.

6.6.2.Test Procedure used

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

6.6.3.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:

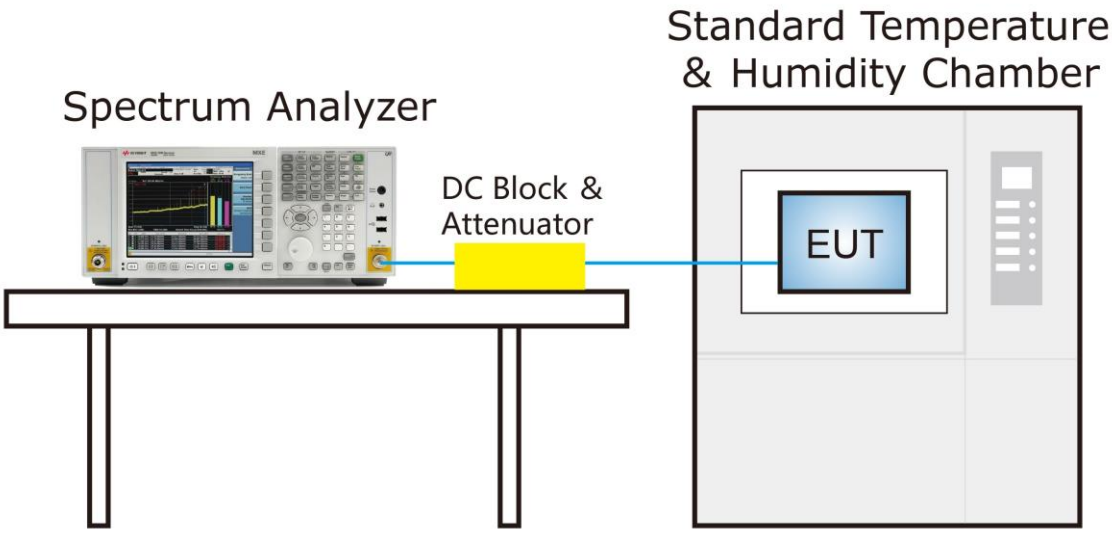
a) At 10°C intervals of temperatures between -30°C and +50°C at the manufacturer's rated supply voltage, and

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).

6.6.4.Test Setup



6.6.5.Test Result

Refer to Appendix A.6.

6.7. Radiated Spurious Emission

6.7.1.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:

(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.

6.7.2.Test Procedure used

ANSI C63.26-2015 - Section 5.7

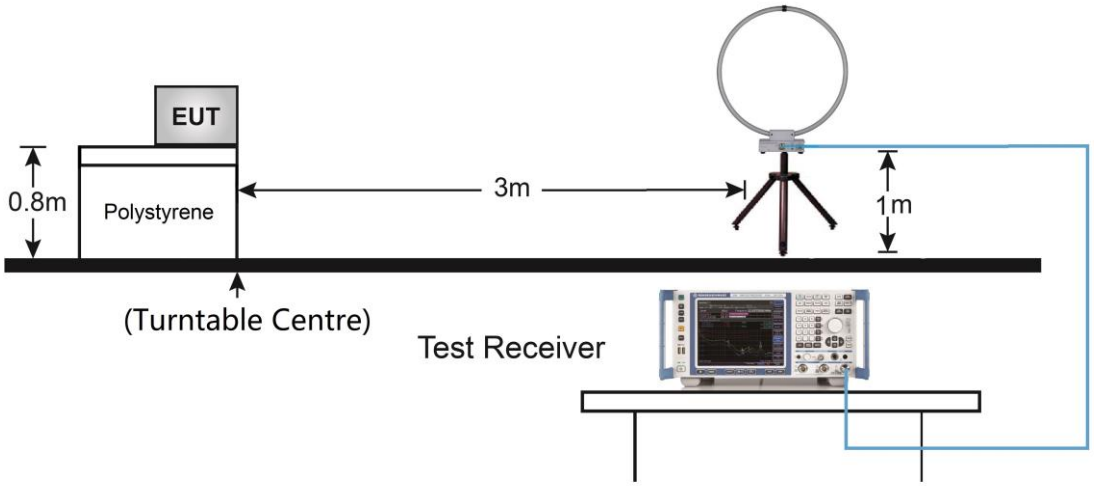
6.7.3.Test Setting

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 100kHz for below 1GHz or 1MHz for above 1GHz

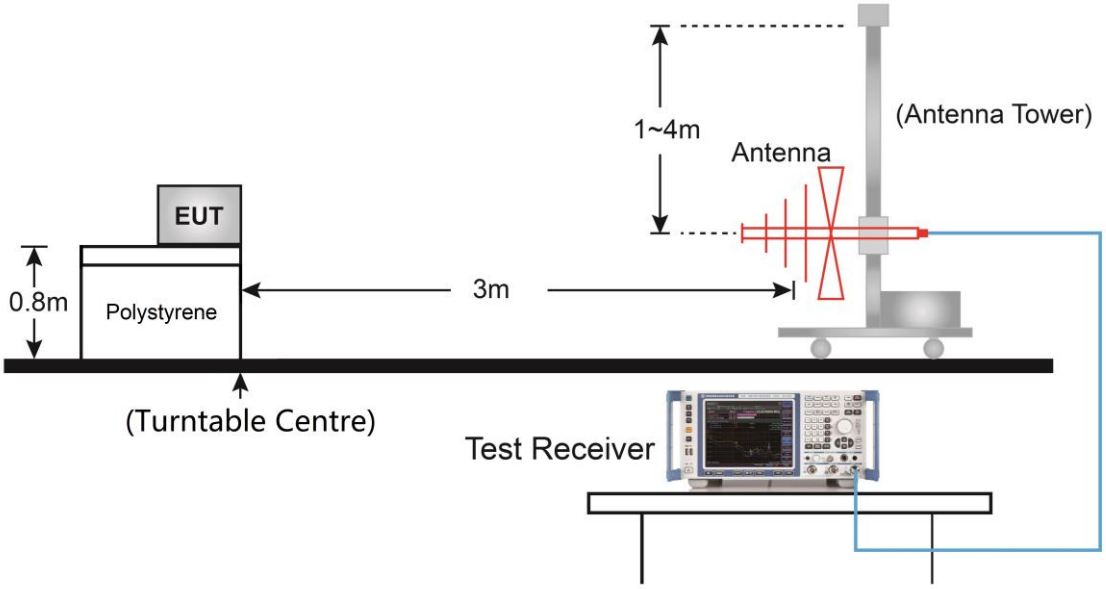
   Set the RBW greater than 4kHz in order to increase the measurement speed
3. VBW = 3 * RBW
4. Detector = power averaging (RMS)
5. Sweep time = Auto couple
6. Trace mode = Max hold
7. Trace was allowed to stabilize

6.7.4.Test Setup

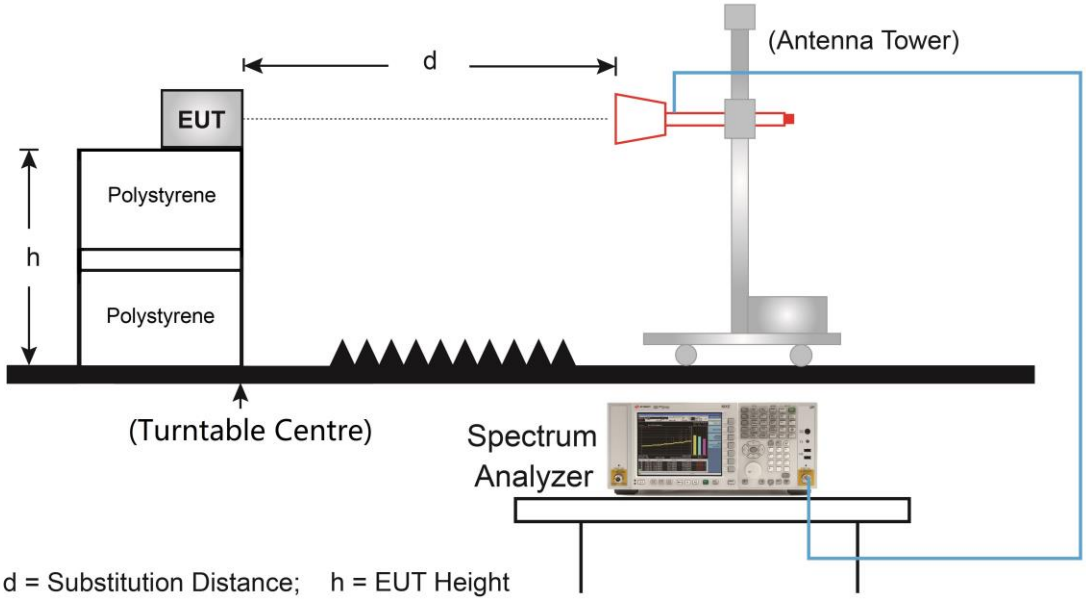
9kHz ~ 30MHz Test Setup



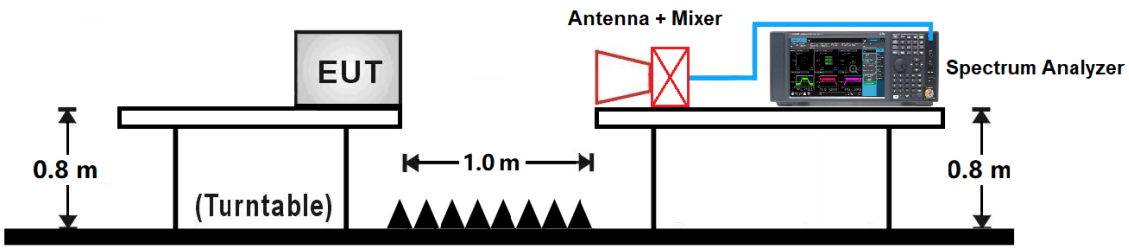
30MHz ~ 1GHz Test Setup



1GHz ~ 40GHz Test Setup



40GHz ~ 75GHz Test Setup



6.7.5.Test Result

Refer to Appendix A.7.

Appendix A – Test Result

A.1 Duty Cycle Test Result

Test Site	WZ-SR5	Test Engineer	Luis Yang
Test Date	2021/10/07		

Test Mode	Duty Cycle
8PSK	100%
BPSK	100%
QPSK	100%
8PSK - 14250 MHz	BPSK - 14250 MHz
QPSK - 14250 MHz	

A.2 Occupied Bandwidth Test Result

Test Site	WZ-SR5	Test Engineer	Luis Yang
Test Date	2021/10/07 ~ 2021/12/10		

Test Mode	Date Rate (kbps)	Test Channel	Test Frequency (MHz)	99% Bandwidth (MHz)
8PSK	128	Low	14000	0.143
	128	Mid	14250	0.143
	128	High	14500	0.143
	7500	Low	14000	8.164
	7500	Mid	14250	8.160
	7500	High	14500	8.202
BPSK	128	Low	14000	0.146
	128	Mid	14250	0.150
	128	High	14500	0.163
	7500	Low	14000	8.322
	7500	Mid	14250	8.443
	7500	High	14500	8.516
QPSK	128	Low	14000	0.142
	128	Mid	14250	0.142
	128	High	14500	0.142
	7500	Low	14000	8.158
	7500	Mid	14250	8.279
	7500	High	14500	8.216

8PSK (128kbps) - Occupied Bandwidth

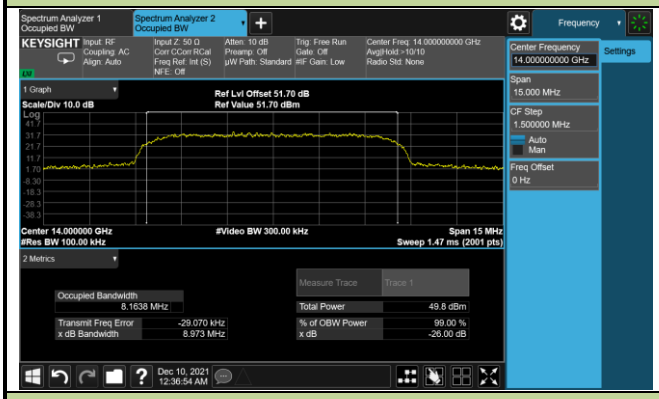
14000 MHz

14250 MHz

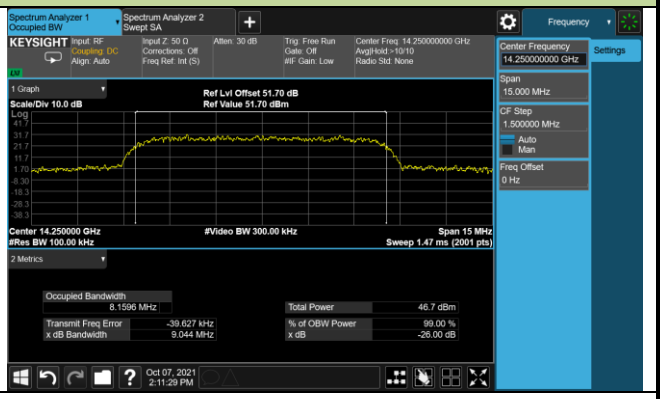
14500 MHz

8PSK (7500kbps) - Occupied Bandwidth

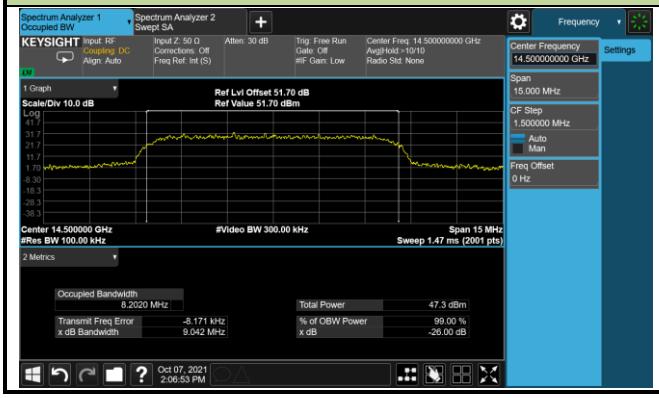
14000 MHz



14250 MHz



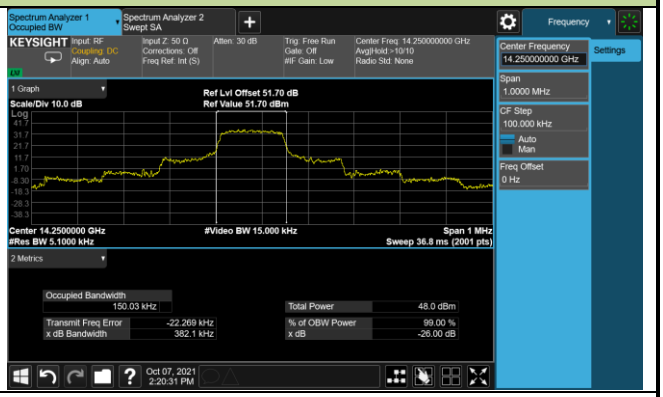
14500 MHz



BPSK (128kbps) - Occupied Bandwidth

14000 MHz

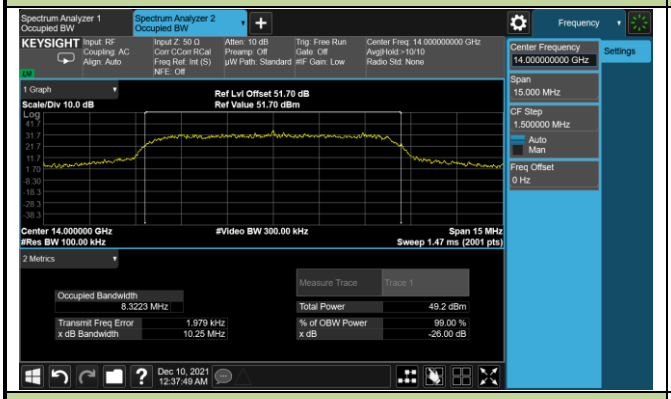
14250 MHz



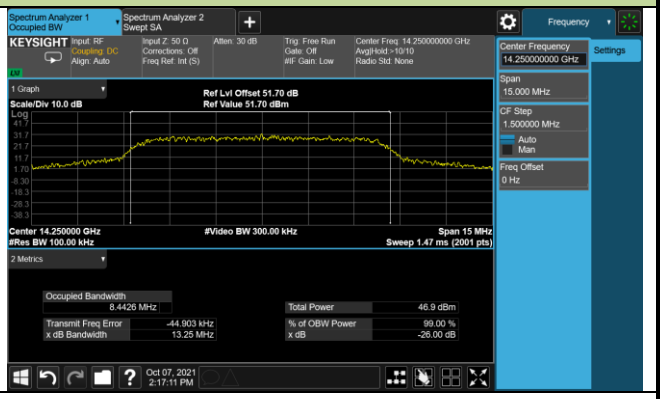
14500 MHz

BPSK (7500kbps) - Occupied Bandwidth

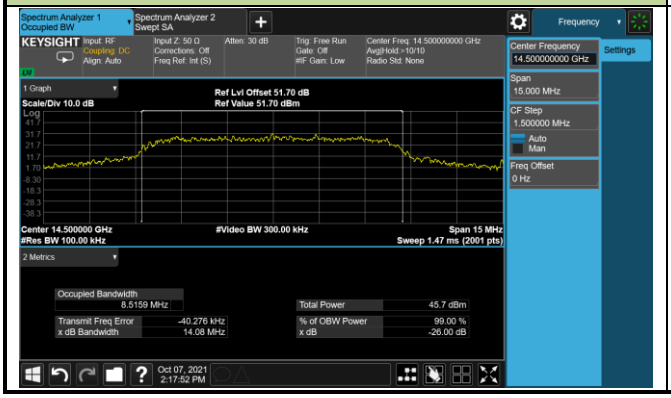
14000 MHz



14250 MHz

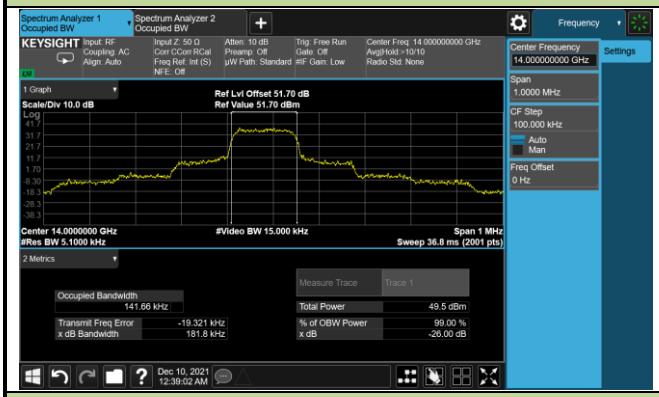


14500 MHz



QPSK (128kbps) - Occupied Bandwidth

14000 MHz

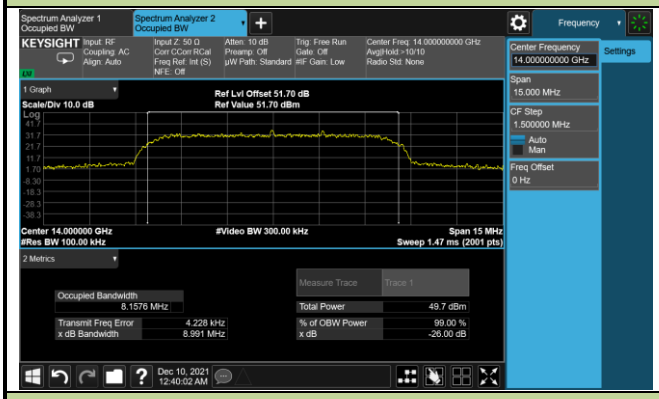


14250 MHz

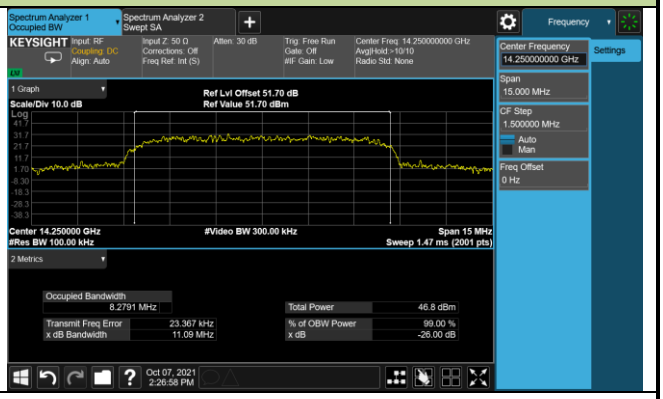
14500 MHz

QPSK (7500kbps) - Occupied Bandwidth

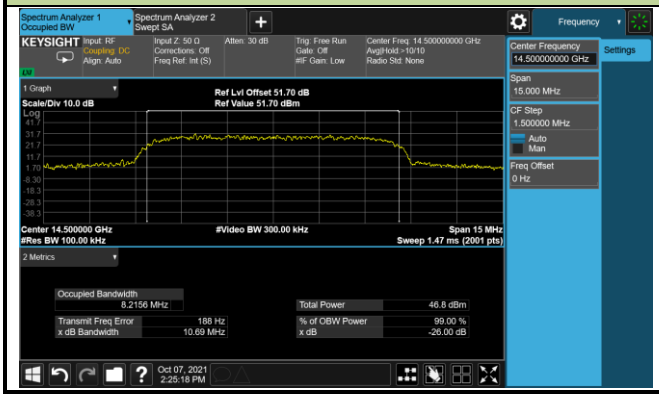
14000 MHz



14250 MHz



14500 MHz



A.3 Power Spectral Density & Output Power Test Result

Test Site	WZ-SR5	Test Engineer	Luis Yang
Test Date	2021/10/07 ~ 2022/02/23	Test Item	Power Spectral Density

Test Mode	Date Rate (kbps)	Test Channel	Test Freq. (MHz)	AVPSD (dBm/4kHz)	EIRP PSD (dBm/4kHz)	Limit (dBm/4kHz)	Result
8PSK	128	Low	14000	10.076	43.186	≤ 70	Pass
	128	Mid	14250	9.574	42.684	≤ 70	Pass
	128	High	14500	9.862	42.972	≤ 70	Pass
	7500	Low	14000	10.253	43.363	≤ 70	Pass
	7500	Mid	14250	10.011	43.121	≤ 70	Pass
	7500	High	14500	10.010	43.120	≤ 70	Pass
BPSK	128	Low	14000	10.320	43.430	≤ 70	Pass
	128	Mid	14250	9.519	42.629	≤ 70	Pass
	128	High	14500	10.034	43.144	≤ 70	Pass
	7500	Low	14000	10.732	43.842	≤ 70	Pass
	7500	Mid	14250	9.882	42.992	≤ 70	Pass
	7500	High	14500	10.208	43.318	≤ 70	Pass
QPSK	128	Low	14000	10.437	43.547	≤ 70	Pass
	128	Mid	14250	10.422	43.532	≤ 70	Pass
	128	High	14500	10.326	43.436	≤ 70	Pass
	7500	Low	14000	10.893	44.003	≤ 70	Pass
	7500	Mid	14250	10.772	43.882	≤ 70	Pass
	7500	High	14500	10.418	43.528	≤ 70	Pass

Note 1: EIRP PSD (dBm/4kHz) = AVPSD (dBm/4kHz) + Antenna Gain (dBi).

Note 2: 10*log(4kHz/3kHz) = 1.25dB was added to the spectrum analyzer reference offset to correct the result.

Test Site	WZ-SR5	Test Engineer	Luis Yang
Test Date	2021/10/07 ~ 2022/02/23	Test Item	Output Power

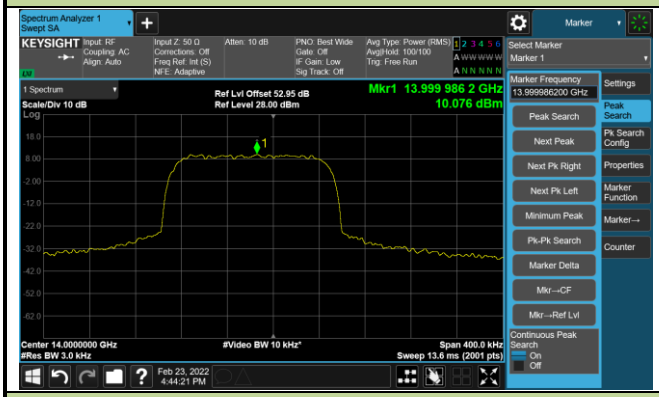
Test Mode	Date Rate (kbps)	Test Channel	Test Freq. (MHz)	AV Power (dBm)	E.I.R.P. (dBm)
8PSK	128	Low	14000	23.02	56.13
	128	Mid	14250	23.07	56.18
	128	High	14500	23.60	56.71
	7500	Low	14000	41.90	75.01
	7500	Mid	14250	42.08	75.19
	7500	High	14500	42.10	75.21
BPSK	128	Low	14000	23.83	56.94
	128	Mid	14250	22.85	55.96
	128	High	14500	23.59	56.7
	7500	Low	14000	41.91	75.02
	7500	Mid	14250	42.06	75.17
	7500	High	14500	42.05	75.16
QPSK	128	Low	14000	23.55	56.66
	128	Mid	14250	24.56	57.67
	128	High	14500	24.52	57.63
	7500	Low	14000	42.11	75.22
	7500	Mid	14250	42.06	75.17
	7500	High	14500	42.03	75.14

Note 1: E.I.R.P (dBm) = AV Power (dBm) + Antenna Gain (dBi).

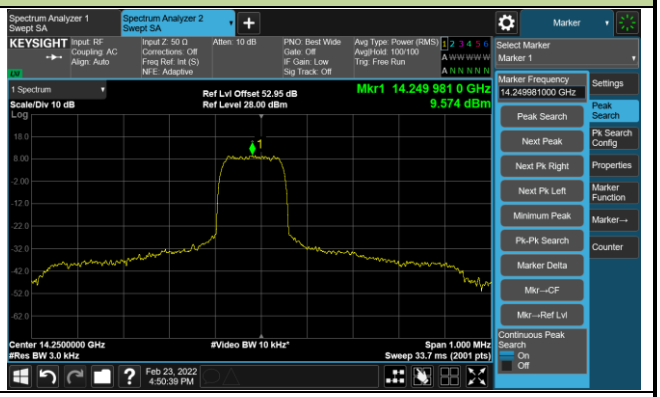
Note 2: Output power result is only for RF exposure evaluation.

8PSK (128kbps) - Average PSD

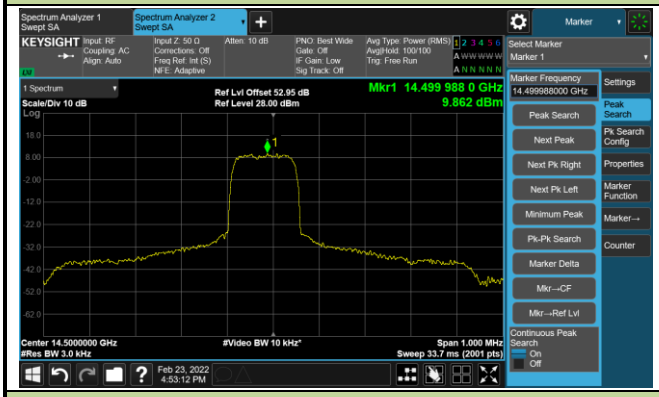
14000 MHz



14250 MHz

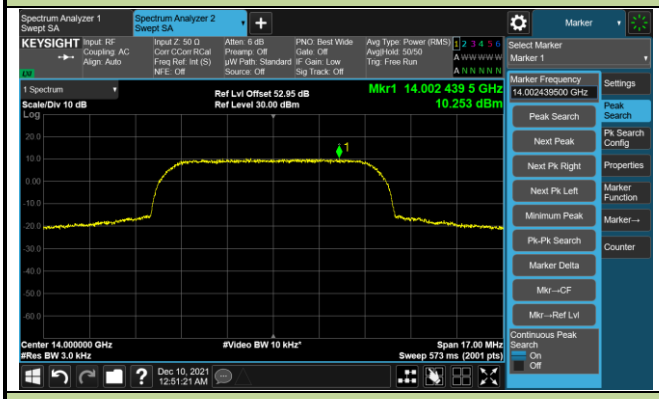


14500 MHz

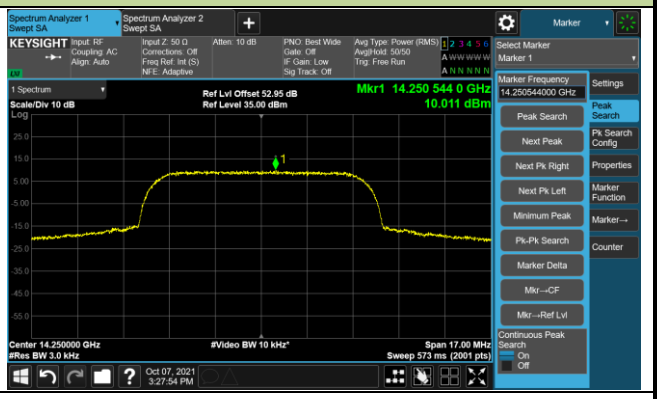


8PSK (7500kbps) - Average PSD

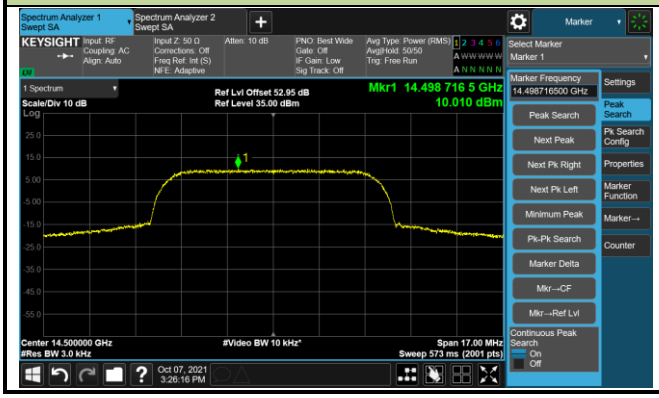
14000 MHz



14250 MHz

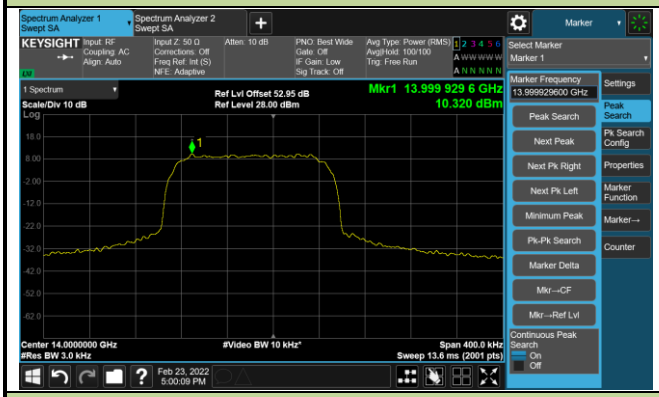


14500 MHz

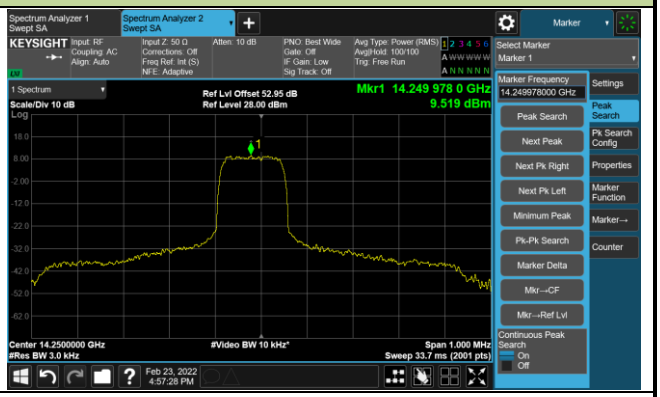


BPSK (128kbps) - Average PSD

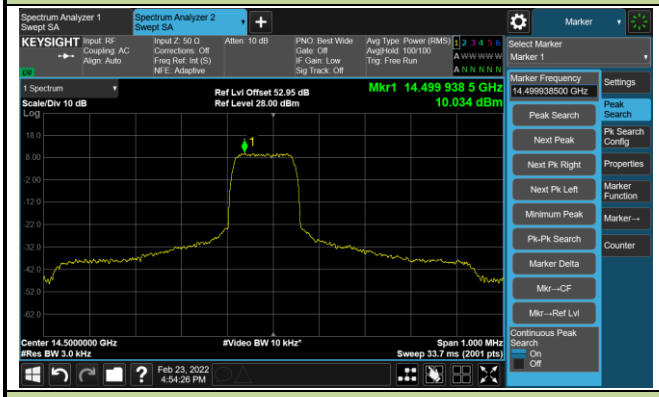
14000 MHz



14250 MHz

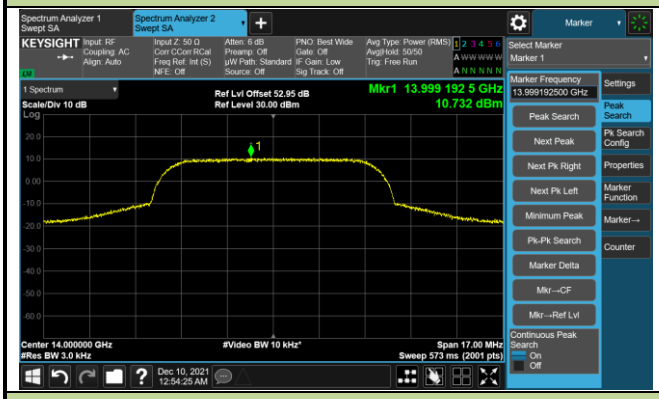


14500 MHz

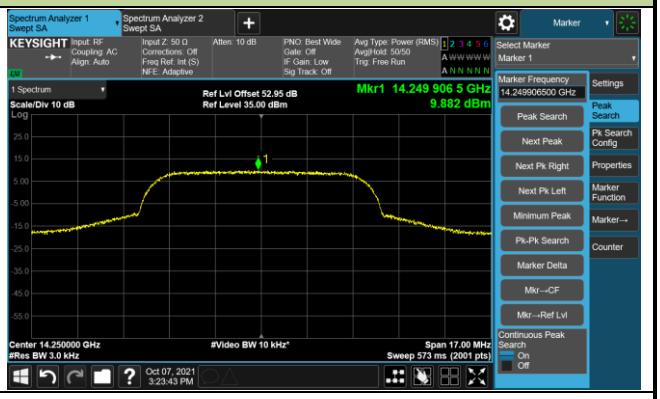


BPSK (7500kbps) - Average PSD

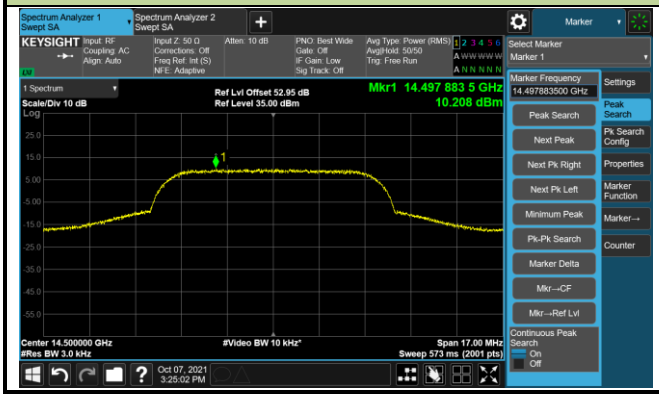
14000 MHz



14250 MHz

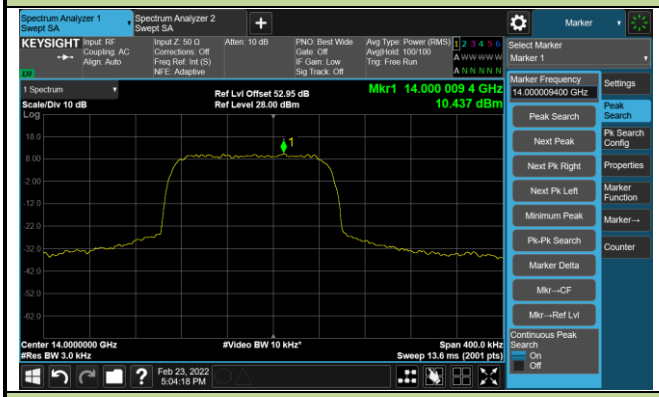


14500 MHz

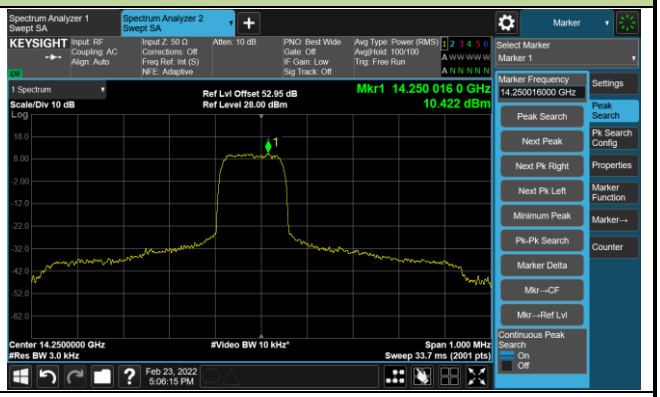


QPSK (128kbps) - Average PSD

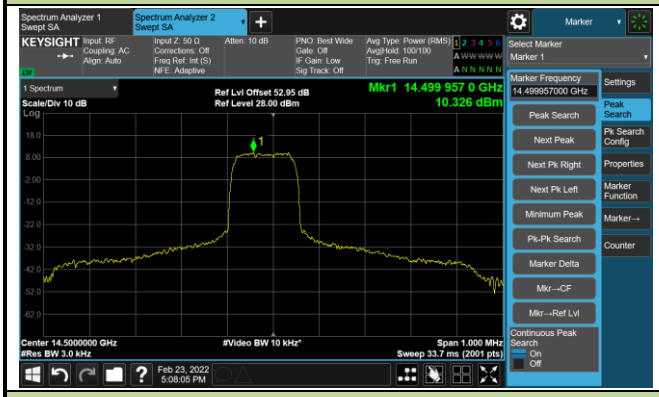
14000 MHz



14250 MHz

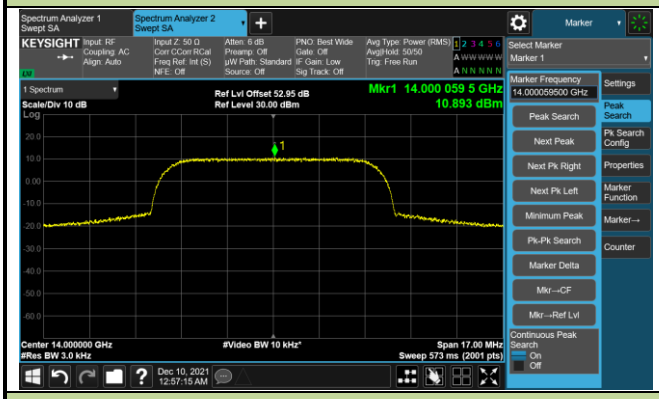


14500 MHz

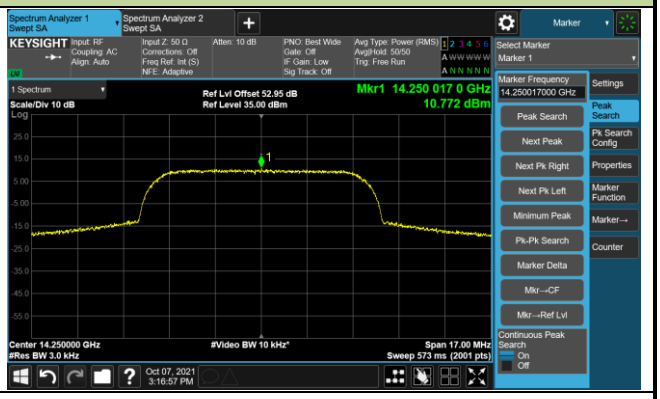


QPSK (7500kbps) - Average PSD

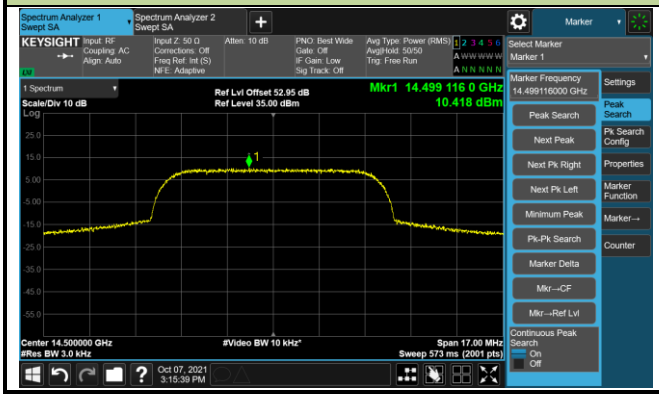
14000 MHz



14250 MHz



14500 MHz



A.4 Off-axis EIRP Density Test Result

Test Site	WZ-SR5	Test Engineer	Luis Yang
Test Date	2021/10/07 ~ 2022/02/23	Test Item	Off-axis EIRP Density

Test Mode	Test Freq. (MHz)	Max AVPSD (dBm/4kHz)	Angle (°)	Each Angle Antenna Gain (dBi)	EIRP PSD (dBm/4kHz)	Limit (dBm/4kHz)	Result
Conventional Ku-band							
QPSK	14000	10.893	2.0	26.557	37.450	37.474	Pass
QPSK	14250	10.772	-3.0	22.290	33.062	33.072	Pass
QPSK	14500	10.418	1.5	29.804	40.222	40.598	Pass

Note 1: EIRP PSD (dBm/4kHz) = Max AVPSD (dBm/4kHz) + Antenna Gain (dBi).

Note 2: 10*log(4kHz/3kHz) = 1.25dB was added to the spectrum analyzer reference offset to correct the result.

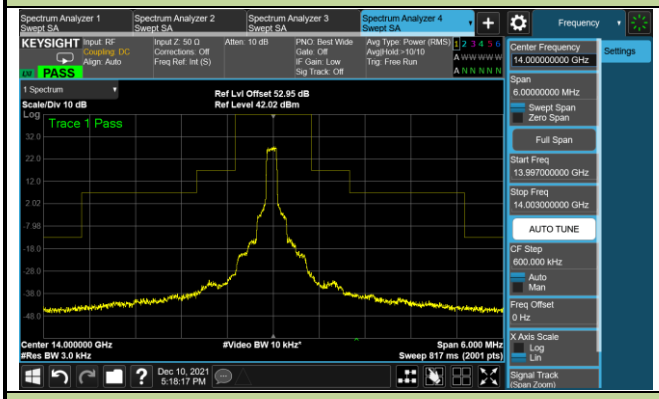
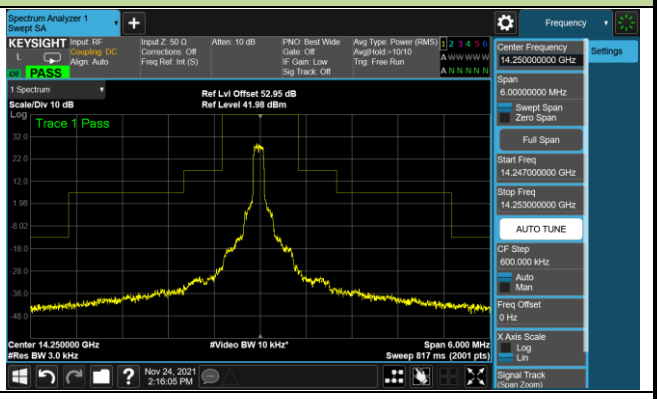
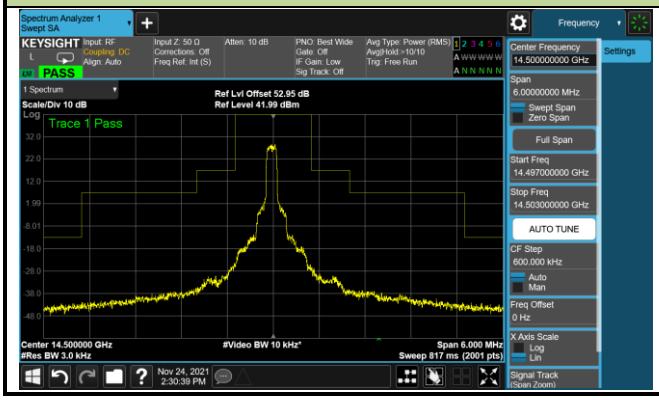
Note 3: Only exhibited worst case data in this report.

A.5 Unwanted Emission at Antenna Terminal Test Result

Test Site	WZ-SR5	Test Engineer	Luis Yang
Test Date	2021/11/24 ~ 2021/12/10	Test Item	In-band Mask

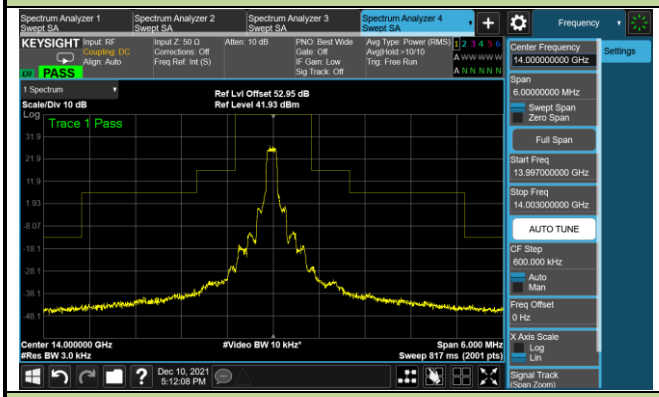
For Low Data Rate (128kbps):

Authorization Bandwidth = 1MHz

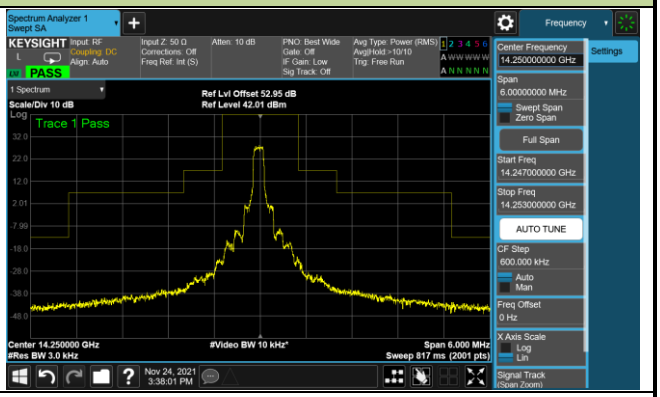
8PSK (128kbps) - In-band Mask	
14000 MHz	14250 MHz
	
14500 MHz	
	

BPSK (128kbps) - In-band Mask

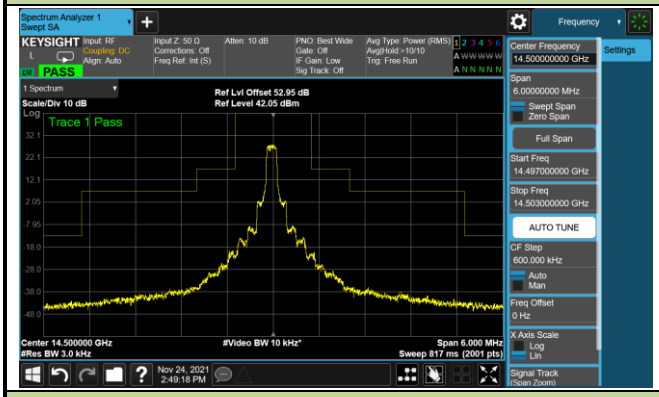
14000 MHz



14250 MHz

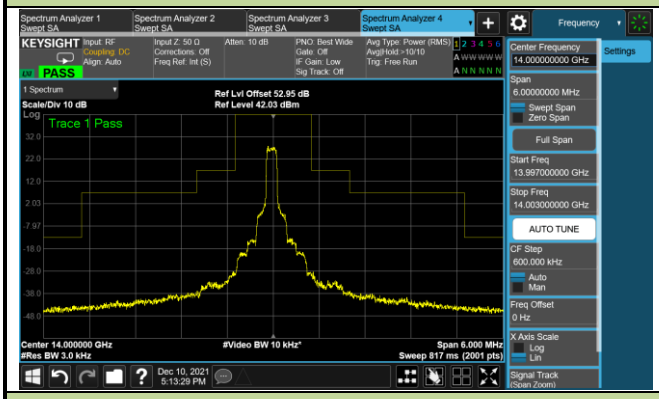


14500 MHz

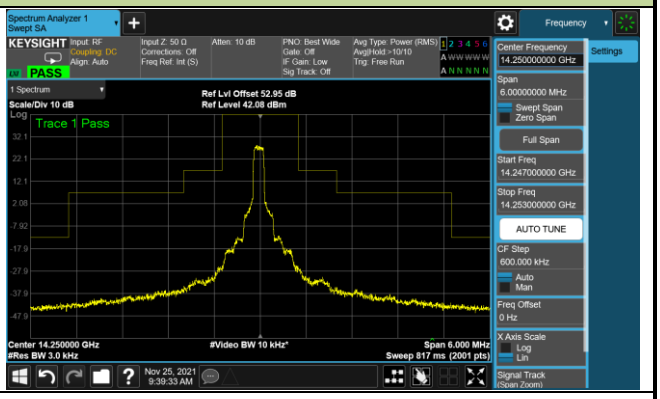


QPSK (128kbps) - In-band Mask

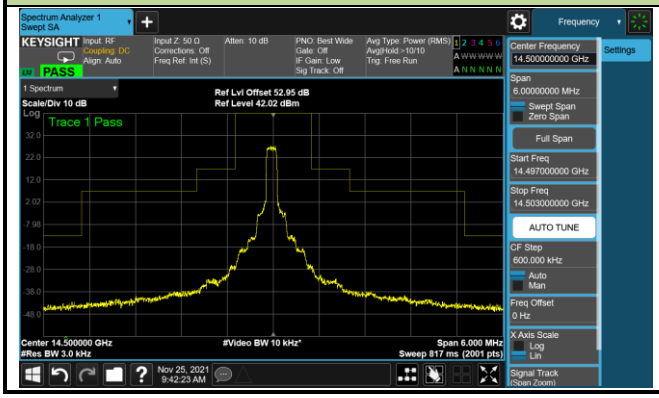
14000 MHz



14250 MHz

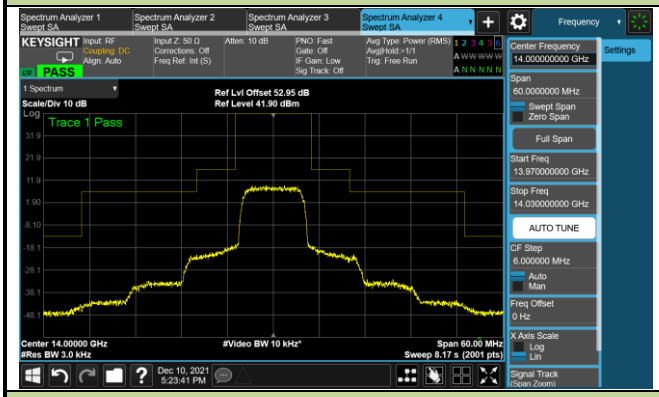
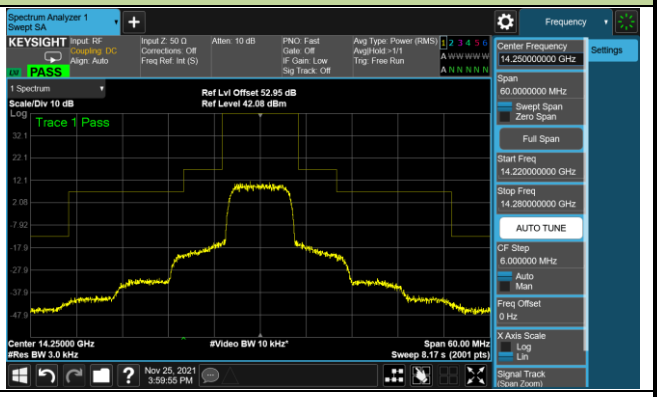
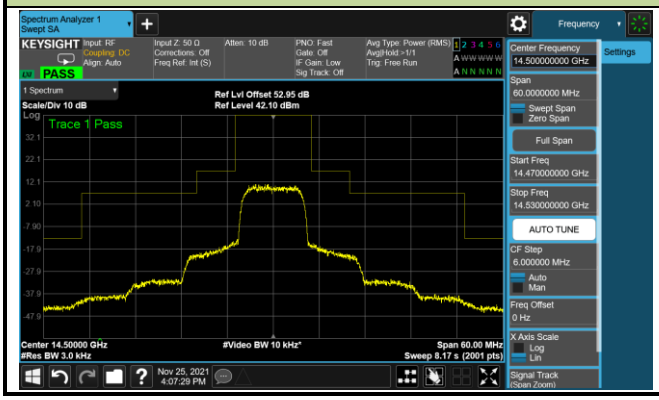


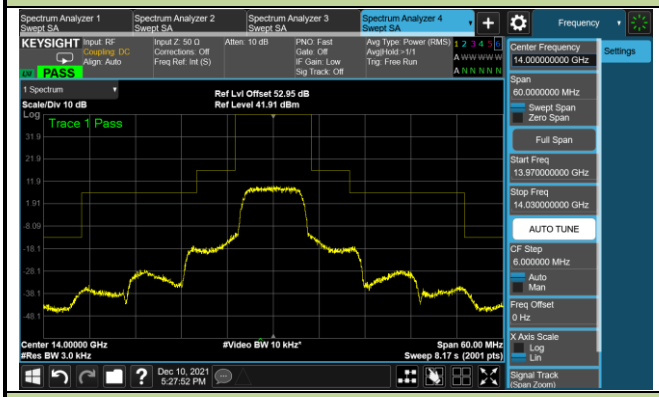
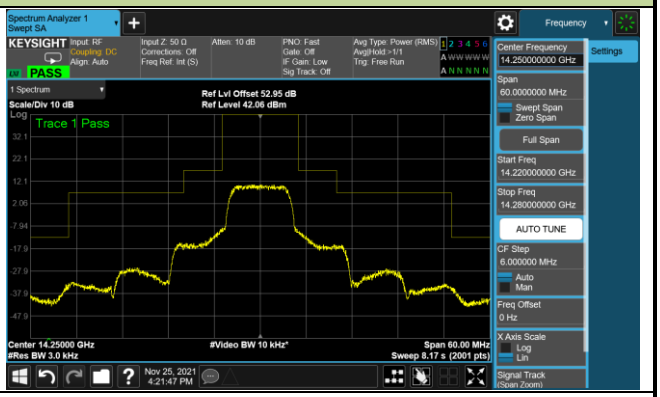
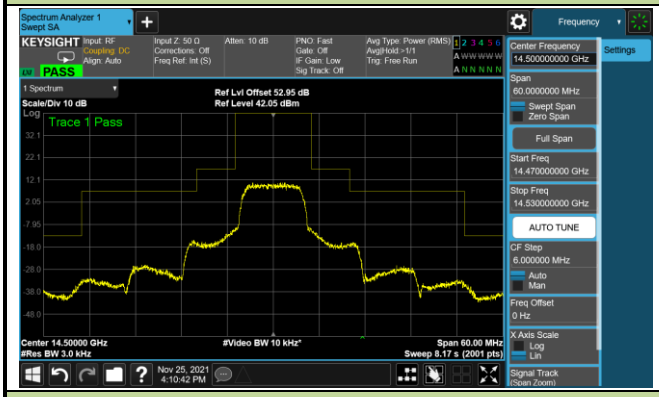
14500 MHz

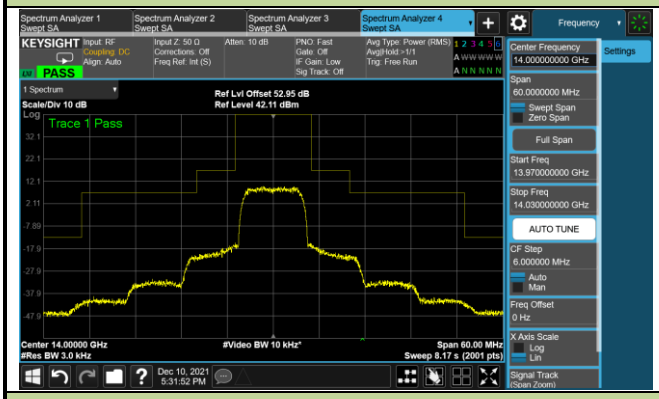
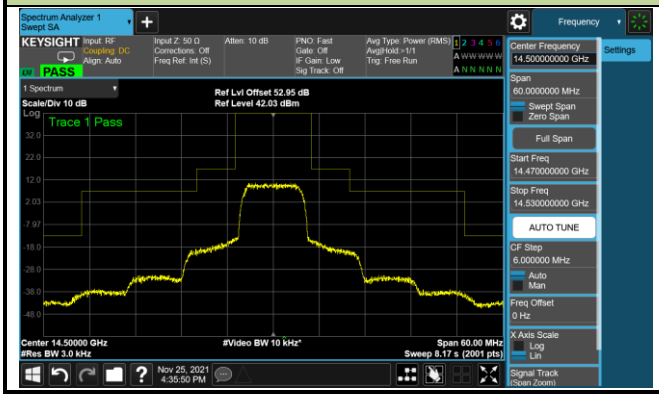


For High Data Rate (7500kbps):

Authorization Bandwidth = 10MHz

8PSK (7500kbps) - In-band Mask	
14000 MHz	14250 MHz
	
14500 MHz	
	

BPSK (7500kbps) - In-band Mask	
14000 MHz	14250 MHz
	
14500 MHz	
	

QPSK (7500kbps) - In-band Mask	
14000 MHz	14250 MHz
	
14500 MHz	
	

A.6 Frequency Tolerance Test Result

Test Site	WZ-TR3	Test Engineer	Luis Yang
Test Date	2021/10/14	Temperature	-30 ~ 50 °C

Test Freq. (MHz)	Voltage (V_{AC})	Temp. (°C)	Measured Freq. (MHz)	Freq. Tolerance (ppm)	Limit (ppm)	Result
14250	120	-30	14249.977436	-1.5834	≤ 10	Pass
		-20	14249.977397	-1.5862	≤ 10	Pass
		-10	14249.977342	-1.5900	≤ 10	Pass
		0	14249.977320	-1.5916	≤ 10	Pass
		+10	14249.977312	-1.5921	≤ 10	Pass
		+20	14249.977323	-1.5914	≤ 10	Pass
		+30	14249.977307	-1.5925	≤ 10	Pass
		+40	14249.977285	-1.5940	≤ 10	Pass
		+50	14249.977286	-1.5940	≤ 10	Pass
	102	+20	14249.977232	-1.5978	≤ 10	Pass
	138	+20	14249.977244	-1.5969	≤ 10	Pass

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

A.7 Radiated Spurious Emission Test Result

Test Site	WZ-AC1 & WZ-AC2	Test Engineer	Kin Xia & Tommy Tang
Test Date	2021/12/16 ~ 2022/01/27		
Test Mode	8PSK, 128kbps	Test Channel	14000MHz
Remark	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 9kHz to 30MHz and 40GHz to 75GHz, there is not show in the report.		

Frequency (MHz)	Reading Level (dBm)	Factor (dB)	Measure Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Polarization
4944.000	-52.3	14.2	-38.1	-13.0	-25.1	Peak	Horizontal
10596.500	-58.5	25.8	-32.7	-13.0	-19.7	Peak	Horizontal
25601.000	-44.3	5.0	-39.3	-13.0	-26.3	Peak	Horizontal
27999.000	-34.2	4.1	-30.1	-13.0	-17.1	Peak	Horizontal
10596.500	-57.3	25.2	-32.1	-13.0	-19.1	Peak	Vertical
18000.000	-72.5	35.5	-37.0	-13.0	-24.0	Peak	Vertical
25601.000	-42.6	5.1	-37.5	-13.0	-24.5	Peak	Vertical
27999.000	-34.3	4.3	-30.0	-13.0	-17.0	Peak	Vertical

Note 1: Measure Level (dBm) = Reading Level (dBm) + Substitution Factor (dB).

Note 2: Substitution Factor (dB) = Cable Loss (dB) + Space Attenuation (dB) + Antenna Gain (dBi) - Pre_Amplifier Gain (dB)

Note 3: Test Distance “d” = 3m.

Test Site	WZ-AC1 & WZ-AC2	Test Engineer	Kin Xia & Tommy Tang
Test Date	2021/12/16 ~ 2021/12/22		
Test Mode	8PSK, 128kbps	Test Channel	14250MHz
Remark	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 9kHz to 30MHz and 40GHz to 75GHz, there is not show in the report.		

Frequency (MHz)	Reading Level (dBm)	Factor (dB)	Measure Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Polarization
7417.500	-57.4	20.1	-37.3	-13.0	-24.3	Peak	Horizontal
9746.500	-56.7	24.7	-32.0	-13.0	-19.0	Peak	Horizontal
25601.000	-43.5	5.0	-38.5	-13.0	-25.5	Peak	Horizontal
28505.000	-40.6	4.7	-35.9	-13.0	-22.9	Peak	Horizontal
4944.000	-58.0	15.1	-42.9	-13.0	-29.9	Peak	Vertical
9746.500	-60.2	24.0	-36.2	-13.0	-23.2	Peak	Vertical
25601.000	-44.3	5.1	-39.2	-13.0	-26.2	Peak	Vertical
28505.000	-35.6	4.6	-31.0	-13.0	-18.0	Peak	Vertical

Note 1: Measure Level (dBm) = Reading Level (dBm) + Substitution Factor (dB).

Note 2: Substitution Factor (dB) = Cable Loss (dB) + Space Attenuation (dB) + Antenna Gain (dBi) - Pre_Amplifier Gain (dB)

Note 3: Test Distance “d” = 3m.

Test Site	WZ-AC1 & WZ-AC2	Test Engineer	Kin Xia & Tommy Tang
Test Date	2021/12/16 ~ 2021/12/22		
Test Mode	8PSK, 128kbps	Test Channel	14500MHz
Remark	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 9kHz to 30MHz and 40GHz to 75GHz, there is not show in the report.		

Frequency (MHz)	Reading Level (dBm)	Factor (dB)	Measure Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Polarization
4944.000	-49.8	14.2	-35.6	-13.0	-22.6	Peak	Horizontal
9746.500	-57.1	24.7	-32.4	-13.0	-19.4	Peak	Horizontal
25601.000	-45.4	5.0	-40.4	-13.0	-27.4	Peak	Horizontal
29000.000	-28.0	4.6	-23.4	-13.0	-10.4	Peak	Horizontal
4944.000	-59.4	15.1	-44.3	-13.0	-31.3	Peak	Vertical
9746.500	-60.7	24.0	-36.7	-13.0	-23.7	Peak	Vertical
25601.000	-44.2	5.1	-39.1	-13.0	-26.1	Peak	Vertical
29000.000	-28.1	4.6	-23.5	-13.0	-10.5	Peak	Vertical

Note 1: Measure Level (dBm) = Reading Level (dBm) + Substitution Factor (dB).

Note 2: Substitution Factor (dB) = Cable Loss (dB) + Space Attenuation (dB) + Antenna Gain (dBi) - Pre_Amplifier Gain (dB)

Note 3: Test Distance “d” = 3m.

Test Site	WZ-AC1 & WZ-AC2	Test Engineer	Kin Xia & Tommy Tang
Test Date	2021/12/16 ~ 2022/01/27		
Test Mode	BPSK, 128kbps	Test Channel	14000MHz
Remark	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 9kHz to 30MHz and 40GHz to 75GHz, there is not show in the report.		

Frequency (MHz)	Reading Level (dBm)	Factor (dB)	Measure Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Polarization
4944.000	-48.2	14.2	-34.0	-13.0	-21.0	Peak	Horizontal
10596.500	-58.6	25.8	-32.8	-13.0	-19.8	Peak	Horizontal
25601.000	-43.8	5.0	-38.8	-13.0	-25.8	Peak	Horizontal
27999.000	-36.3	4.1	-32.2	-13.0	-19.2	Peak	Horizontal
10596.500	-57.6	25.2	-32.4	-13.0	-19.4	Peak	Vertical
17991.500	-73.1	35.0	-38.1	-13.0	-25.1	Peak	Vertical
25601.000	-45.3	5.1	-40.2	-13.0	-27.2	Peak	Vertical
27999.000	-33.4	4.3	-29.1	-13.0	-16.1	Peak	Vertical

Note 1: Measure Level (dBm) = Reading Level (dBm) + Substitution Factor (dB).

Note 2: Substitution Factor (dB) = Cable Loss (dB) + Space Attenuation (dB) + Antenna Gain (dBi) - Pre_Amplifier Gain (dB)

Note 3: Test Distance “d” = 3m.

Test Site	WZ-AC1 & WZ-AC2	Test Engineer	Kin Xia & Tommy Tang
Test Date	2021/12/16 ~ 2021/12/22		
Test Mode	BPSK, 128kbps	Test Channel	14250MHz
Remark	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 9kHz to 30MHz and 40GHz to 75GHz, there is not show in the report.		

Frequency (MHz)	Reading Level (dBm)	Factor (dB)	Measure Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Polarization
4944.000	-51.7	14.2	-37.5	-13.0	-24.5	Peak	Horizontal
9746.500	-58.0	24.7	-33.3	-13.0	-20.3	Peak	Horizontal
25601.000	-44.9	5.0	-39.9	-13.0	-26.9	Peak	Horizontal
28505.000	-40.2	4.7	-35.5	-13.0	-22.5	Peak	Horizontal
4944.000	-55.8	15.1	-40.7	-13.0	-27.7	Peak	Vertical
9746.500	-60.7	24.0	-36.7	-13.0	-23.7	Peak	Vertical
25601.000	-44.5	5.1	-39.4	-13.0	-26.4	Peak	Vertical
28505.000	-35.9	4.6	-31.3	-13.0	-18.3	Peak	Vertical

Note 1: Measure Level (dBm) = Reading Level (dBm) + Substitution Factor (dB).

Note 2: Substitution Factor (dB) = Cable Loss (dB) + Space Attenuation (dB) + Antenna Gain (dBi) - Pre_Amplifier Gain (dB)

Note 3: Test Distance “d” = 3m.

Test Site	WZ-AC1 & WZ-AC2	Test Engineer	Kin Xia & Tommy Tang
Test Date	2021/12/16 ~ 2021/12/22		
Test Mode	BPSK, 128kbps	Test Channel	14500MHz
Remark	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 9kHz to 30MHz and 40GHz to 75GHz, there is not show in the report.		

Frequency (MHz)	Reading Level (dBm)	Factor (dB)	Measure Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Polarization
4944.000	-50.5	14.2	-36.3	-13.0	-23.3	Peak	Horizontal
9746.500	-57.2	24.7	-32.5	-13.0	-19.5	Peak	Horizontal
25601.000	-45.4	5.0	-40.4	-13.0	-27.4	Peak	Horizontal
29000.000	-29.7	4.6	-25.1	-13.0	-12.1	Peak	Horizontal
4944.000	-55.4	15.1	-40.3	-13.0	-27.3	Peak	Vertical
9746.500	-60.8	24.0	-36.8	-13.0	-23.8	Peak	Vertical
25601.000	-45.3	5.1	-40.2	-13.0	-27.2	Peak	Vertical
29000.000	-29.0	4.6	-24.4	-13.0	-11.4	Peak	Vertical

Note 1: Measure Level (dBm) = Reading Level (dBm) + Substitution Factor (dB).

Note 2: Substitution Factor (dB) = Cable Loss (dB) + Space Attenuation (dB) + Antenna Gain (dBi) - Pre_Amplifier Gain (dB)

Note 3: Test Distance “d” = 3m.

Test Site	WZ-AC1 & WZ-AC2	Test Engineer	Kin Xia & Tommy Tang
Test Date	2021/12/16 ~ 2022/01/27		
Test Mode	QPSK, 128kbps	Test Channel	14000MHz
Remark	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 9kHz to 30MHz and 40GHz to 75GHz, there is not show in the report.		

Frequency (MHz)	Reading Level (dBm)	Factor (dB)	Measure Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Polarization
10596.500	-58.6	25.8	-32.8	-13.0	-19.8	Peak	Horizontal
17983.000	-73.4	34.1	-39.3	-13.0	-26.3	Peak	Horizontal
25601.000	-46.6	5.0	-41.6	-13.0	-28.6	Peak	Horizontal
27999.000	-34.8	4.1	-30.7	-13.0	-17.7	Peak	Horizontal
10596.500	-57.9	25.2	-32.7	-13.0	-19.7	Peak	Vertical
18000.000	-73.4	35.5	-37.9	-13.0	-24.9	Peak	Vertical
25601.000	-44.1	5.1	-39.0	-13.0	-26.0	Peak	Vertical
27999.000	-34.6	4.3	-30.3	-13.0	-17.3	Peak	Vertical

Note 1: Measure Level (dBm) = Reading Level (dBm) + Substitution Factor (dB).

Note 2: Substitution Factor (dB) = Cable Loss (dB) + Space Attenuation (dB) + Antenna Gain (dBi) - Pre_Amplifier Gain (dB)

Note 3: Test Distance “d” = 3m.

Test Site	WZ-AC1 & WZ-AC2	Test Engineer	Kin Xia & Tommy Tang
Test Date	2021/12/16 ~ 2021/12/22		
Test Mode	QPSK, 128kbps	Test Channel	14250MHz
Remark	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 9kHz to 30MHz and 40GHz to 75GHz, there is not show in the report.		

Frequency (MHz)	Reading Level (dBm)	Factor (dB)	Measure Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Polarization
7417.500	-57.8	20.1	-37.7	-13.0	-24.7	Peak	Horizontal
9746.500	-57.5	24.7	-32.8	-13.0	-19.8	Peak	Horizontal
25601.000	-44.6	5.0	-39.6	-13.0	-26.6	Peak	Horizontal
28505.000	-41.9	4.7	-37.2	-13.0	-24.2	Peak	Horizontal
4944.000	-58.8	15.1	-43.7	-13.0	-30.7	Peak	Vertical
9746.500	-60.4	24.0	-36.4	-13.0	-23.4	Peak	Vertical
25601.000	-45.4	5.1	-40.3	-13.0	-27.3	Peak	Vertical
28505.000	-37.1	4.6	-32.5	-13.0	-19.5	Peak	Vertical

Note 1: Measure Level (dBm) = Reading Level (dBm) + Substitution Factor (dB).

Note 2: Substitution Factor (dB) = Cable Loss (dB) + Space Attenuation (dB) + Antenna Gain (dBi) - Pre_Amplifier Gain (dB)

Note 3: Test Distance “d” = 3m.

Test Site	WZ-AC1 & WZ-AC2	Test Engineer	Kin Xia & Tommy Tang
Test Date	2021/12/16 ~ 2021/12/22		
Test Mode	QPSK, 128kbps	Test Channel	14500MHz
Remark	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 9kHz to 30MHz and 40GHz to 75GHz, there is not show in the report.		

Frequency (MHz)	Reading Level (dBm)	Factor (dB)	Measure Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Polarization
4944.000	-51.3	14.2	-37.1	-13.0	-24.1	Peak	Horizontal
9746.500	-55.8	24.7	-31.1	-13.0	-18.1	Peak	Horizontal
25601.000	-44.4	5.0	-39.4	-13.0	-26.4	Peak	Horizontal
29000.000	-30.1	4.6	-25.5	-13.0	-12.5	Peak	Horizontal
4944.000	-52.2	15.1	-37.1	-13.0	-24.1	Peak	Vertical
7417.500	-60.6	20.1	-40.5	-13.0	-27.5	Peak	Vertical
25601.000	-46.4	5.1	-41.3	-13.0	-28.3	Peak	Vertical
29000.000	-29.8	4.6	-25.2	-13.0	-12.2	Peak	Vertical

Note 1: Measure Level (dBm) = Reading Level (dBm) + Substitution Factor (dB).

Note 2: Substitution Factor (dB) = Cable Loss (dB) + Space Attenuation (dB) + Antenna Gain (dBi) - Pre_Amplifier Gain (dB)

Note 3: Test Distance “d” = 3m.

Test Site	WZ-AC1 & WZ-AC2	Test Engineer	Kin Xia & Tommy Tang
Test Date	2021/12/16 ~ 2022/01/27		
Test Mode	8PSK, 7500kbps	Test Channel	14000MHz
Remark	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 9kHz to 30MHz and 40GHz to 75GHz, there is not show in the report.		

Frequency (MHz)	Reading Level (dBm)	Factor (dB)	Measure Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Polarization
4944.000	-48.3	14.2	-34.1	-13.0	-21.1	Peak	Horizontal
10596.500	-58.5	25.8	-32.7	-13.0	-19.7	Peak	Horizontal
25601.000	-44.4	5.0	-39.4	-13.0	-26.4	Peak	Horizontal
27999.000	-41.8	4.1	-37.7	-13.0	-24.7	Peak	Horizontal
10596.500	-57.9	25.2	-32.7	-13.0	-19.7	Peak	Vertical
17991.500	-73.3	35.0	-38.3	-13.0	-25.3	Peak	Vertical
25601.000	-43.7	5.1	-38.6	-13.0	-25.6	Peak	Vertical
27999.000	-39.3	4.3	-35.0	-13.0	-22.0	Peak	Vertical

Note 1: Measure Level (dBm) = Reading Level (dBm) + Substitution Factor (dB).

Note 2: Substitution Factor (dB) = Cable Loss (dB) + Space Attenuation (dB) + Antenna Gain (dBi) - Pre_Amplifier Gain (dB)

Note 3: Test Distance “d” = 3m.

Test Site	WZ-AC1 & WZ-AC2	Test Engineer	Kin Xia & Tommy Tang
Test Date	2021/12/16 ~ 2021/12/22		
Test Mode	8PSK, 7500kbps	Test Channel	14250MHz
Remark	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 9kHz to 30MHz and 40GHz to 75GHz, there is not show in the report.		

Frequency (MHz)	Reading Level (dBm)	Factor (dB)	Measure Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Polarization
7417.500	-64.4	20.1	-44.3	-13.0	-31.3	Peak	Horizontal
9746.500	-57.3	24.7	-32.6	-13.0	-19.6	Peak	Horizontal
25601.000	-43.9	5.0	-38.9	-13.0	-25.9	Peak	Horizontal
28494.000	-44.4	4.5	-39.9	-13.0	-26.9	Peak	Horizontal
4944.000	-56.5	15.1	-41.4	-13.0	-28.4	Peak	Vertical
9746.500	-60.8	24.0	-36.8	-13.0	-23.8	Peak	Vertical
25601.000	-44.6	5.1	-39.5	-13.0	-26.5	Peak	Vertical
28494.000	-41.0	4.4	-36.6	-13.0	-23.6	Peak	Vertical

Note 1: Measure Level (dBm) = Reading Level (dBm) + Substitution Factor (dB).

Note 2: Substitution Factor (dB) = Cable Loss (dB) + Space Attenuation (dB) + Antenna Gain (dBi) - Pre_Amplifier Gain (dB)

Note 3: Test Distance “d” = 3m.

Test Site	WZ-AC1 & WZ-AC2	Test Engineer	Kin Xia & Tommy Tang
Test Date	2021/12/16 ~ 2021/12/22		
Test Mode	8PSK, 7500kbps	Test Channel	14500MHz
Remark	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 9kHz to 30MHz and 40GHz to 75GHz, there is not show in the report.		

Frequency (MHz)	Reading Level (dBm)	Factor (dB)	Measure Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Polarization
4944.000	-52.4	14.2	-38.2	-13.0	-25.2	Peak	Horizontal
9746.500	-57.2	24.7	-32.5	-13.0	-19.5	Peak	Horizontal
25601.000	-43.8	5.0	-38.8	-13.0	-25.8	Peak	Horizontal
29000.000	-32.2	4.6	-27.6	-13.0	-14.6	Peak	Horizontal
7205.000	-63.8	20.2	-43.6	-13.0	-30.6	Peak	Vertical
9746.500	-60.4	24.0	-36.4	-13.0	-23.4	Peak	Vertical
25601.000	-45.5	5.1	-40.4	-13.0	-27.4	Peak	Vertical
29000.000	-33.3	4.6	-28.7	-13.0	-15.7	Peak	Vertical

Note 1: Measure Level (dBm) = Reading Level (dBm) + Substitution Factor (dB).

Note 2: Substitution Factor (dB) = Cable Loss (dB) + Space Attenuation (dB) + Antenna Gain (dBi) - Pre_Amplifier Gain (dB)

Note 3: Test Distance “d” = 3m.

Test Site	WZ-AC1 & WZ-AC2	Test Engineer	Kin Xia & Tommy Tang
Test Date	2021/12/16 ~ 2022/01/27		
Test Mode	BPSK, 7500kbps	Test Channel	14000MHz
Remark	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 9kHz to 30MHz and 40GHz to 75GHz, there is not show in the report.		

Frequency (MHz)	Reading Level (dBm)	Factor (dB)	Measure Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Polarization
4944.000	-48.6	14.2	-34.4	-13.0	-21.4	Peak	Horizontal
10596.500	-58.5	25.8	-32.7	-13.0	-19.7	Peak	Horizontal
25601.000	-45.3	5.0	-40.3	-13.0	-27.3	Peak	Horizontal
27999.000	-39.4	4.1	-35.3	-13.0	-22.3	Peak	Horizontal
10596.500	-58.0	25.2	-32.8	-13.0	-19.8	Peak	Vertical
18000.000	-73.3	35.5	-37.8	-13.0	-24.8	Peak	Vertical
25601.000	-47.1	5.1	-42.0	-13.0	-29.0	Peak	Vertical
27999.000	-35.2	4.3	-30.9	-13.0	-17.9	Peak	Vertical

Note 1: Measure Level (dBm) = Reading Level (dBm) + Substitution Factor (dB).

Note 2: Substitution Factor (dB) = Cable Loss (dB) + Space Attenuation (dB) + Antenna Gain (dBi) - Pre_Amplifier Gain (dB)

Note 3: Test Distance “d” = 3m.

Test Site	WZ-AC1 & WZ-AC2	Test Engineer	Kin Xia & Tommy Tang
Test Date	2021/12/16 ~ 2021/12/22		
Test Mode	BPSK, 7500kbps	Test Channel	14250MHz
Remark	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 9kHz to 30MHz and 40GHz to 75GHz, there is not show in the report.		

Frequency (MHz)	Reading Level (dBm)	Factor (dB)	Measure Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Polarization
7417.500	-61.0	20.1	-40.9	-13.0	-27.9	Peak	Horizontal
9746.500	-57.7	24.7	-33.0	-13.0	-20.0	Peak	Horizontal
25601.000	-45.6	5.0	-40.6	-13.0	-27.6	Peak	Horizontal
28505.000	-42.8	4.7	-38.1	-13.0	-25.1	Peak	Horizontal
4944.000	-57.2	15.1	-42.1	-13.0	-29.1	Peak	Vertical
9746.500	-61.4	24.0	-37.4	-13.0	-24.4	Peak	Vertical
25601.000	-45.5	5.1	-40.4	-13.0	-27.4	Peak	Vertical
28505.000	-36.7	4.6	-32.1	-13.0	-19.1	Peak	Vertical

Note 1: Measure Level (dBm) = Reading Level (dBm) + Substitution Factor (dB).

Note 2: Substitution Factor (dB) = Cable Loss (dB) + Space Attenuation (dB) + Antenna Gain (dBi) - Pre_Amplifier Gain (dB)

Note 3: Test Distance “d” = 3m.

Test Site	WZ-AC1 & WZ-AC2	Test Engineer	Kin Xia & Tommy Tang
Test Date	2021/12/16 ~ 2021/12/22		
Test Mode	BPSK, 7500kbps	Test Channel	14500MHz
Remark	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 9kHz to 30MHz and 40GHz to 75GHz, there is not show in the report.		

Frequency (MHz)	Reading Level (dBm)	Factor (dB)	Measure Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Polarization
4944.000	-51.9	14.2	-37.7	-13.0	-24.7	Peak	Horizontal
9746.500	-57.6	24.7	-32.9	-13.0	-19.9	Peak	Horizontal
25601.000	-46.2	5.0	-41.2	-13.0	-28.2	Peak	Horizontal
29000.000	-29.2	4.6	-24.6	-13.0	-11.6	Peak	Horizontal
4944.000	-53.4	15.1	-38.3	-13.0	-25.3	Peak	Vertical
9746.500	-60.7	24.0	-36.7	-13.0	-23.7	Peak	Vertical
25601.000	-45.2	5.1	-40.1	-13.0	-27.1	Peak	Vertical
29000.000	-30.7	4.6	-26.1	-13.0	-13.1	Peak	Vertical

Note 1: Measure Level (dBm) = Reading Level (dBm) + Substitution Factor (dB).

Note 2: Substitution Factor (dB) = Cable Loss (dB) + Space Attenuation (dB) + Antenna Gain (dBi) - Pre_Amplifier Gain (dB)

Note 3: Test Distance “d” = 3m.

Test Site	WZ-AC1 & WZ-AC2	Test Engineer	Kin Xia & Tommy Tang
Test Date	2021/12/16 ~ 2022/01/27		
Test Mode	QPSK, 7500kbps	Test Channel	14000MHz
Remark	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 9kHz to 30MHz and 40GHz to 75GHz, there is not show in the report.		

Frequency (MHz)	Reading Level (dBm)	Factor (dB)	Measure Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Polarization
4944.000	-48.7	14.2	-34.5	-13.0	-21.5	Peak	Horizontal
10596.500	-59.0	25.8	-33.2	-13.0	-20.2	Peak	Horizontal
25601.000	-44.9	5.0	-39.9	-13.0	-26.9	Peak	Horizontal
27999.000	-42.2	4.1	-38.1	-13.0	-25.1	Peak	Horizontal
10596.500	-57.7	25.2	-32.5	-13.0	-19.5	Peak	Vertical
17983.000	-72.5	34.6	-37.9	-13.0	-24.9	Peak	Vertical
25601.000	-44.5	5.1	-39.4	-13.0	-26.4	Peak	Vertical
27999.000	-39.1	4.3	-34.8	-13.0	-21.8	Peak	Vertical

Note 1: Measure Level (dBm) = Reading Level (dBm) + Substitution Factor (dB).

Note 2: Substitution Factor (dB) = Cable Loss (dB) + Space Attenuation (dB) + Antenna Gain (dBi) - Pre_Amplifier Gain (dB)

Note 3: Test Distance “d” = 3m.

Test Site	WZ-AC1 & WZ-AC2	Test Engineer	Kin Xia & Tommy Tang
Test Date	2021/12/16 ~ 2021/12/22		
Test Mode	QPSK, 7500kbps	Test Channel	14250MHz
Remark	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 9kHz to 30MHz and 40GHz to 75GHz, there is not show in the report.		

Frequency (MHz)	Reading Level (dBm)	Factor (dB)	Measure Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Polarization
4944.000	-51.0	14.2	-36.8	-13.0	-23.8	Peak	Horizontal
9746.500	-55.3	24.7	-30.6	-13.0	-17.6	Peak	Horizontal
25601.000	-46.7	5.0	-41.7	-13.0	-28.7	Peak	Horizontal
28494.000	-44.5	4.5	-40.0	-13.0	-27.0	Peak	Horizontal
4944.000	-55.1	14.2	-40.9	-13.0	-27.9	Peak	Vertical
9746.500	-54.7	24.7	-30.0	-13.0	-17.0	Peak	Vertical
25601.000	-46.2	5.1	-41.1	-13.0	-28.1	Peak	Vertical
28505.000	-39.0	4.6	-34.4	-13.0	-21.4	Peak	Vertical

Note 1: Measure Level (dBm) = Reading Level (dBm) + Substitution Factor (dB).

Note 2: Substitution Factor (dB) = Cable Loss (dB) + Space Attenuation (dB) + Antenna Gain (dBi) - Pre_Amplifier Gain (dB)

Note 3: Test Distance “d” = 3m.

Test Site	WZ-AC1 & WZ-AC2	Test Engineer	Kin Xia & Tommy Tang
Test Date	2021/12/16 ~ 2021/12/22		
Test Mode	QPSK, 7500kbps	Test Channel	14500MHz
Remark	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 9kHz to 30MHz and 40GHz to 75GHz, there is not show in the report.		

Frequency (MHz)	Reading Level (dBm)	Factor (dB)	Measure Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Polarization
7417.500	-55.7	20.1	-35.6	-13.0	-22.6	Peak	Horizontal
9746.500	-55.5	24.7	-30.8	-13.0	-17.8	Peak	Horizontal
25601.000	-46.7	5.0	-41.7	-13.0	-28.7	Peak	Horizontal
29000.000	-33.2	4.6	-28.6	-13.0	-15.6	Peak	Horizontal
4944.000	-54.1	15.1	-39.0	-13.0	-26.0	Peak	Vertical
9746.500	-58.2	24.0	-34.2	-13.0	-21.2	Peak	Vertical
25601.000	-46.2	5.1	-41.1	-13.0	-28.1	Peak	Vertical
29000.000	-33.4	4.6	-28.8	-13.0	-15.8	Peak	Vertical

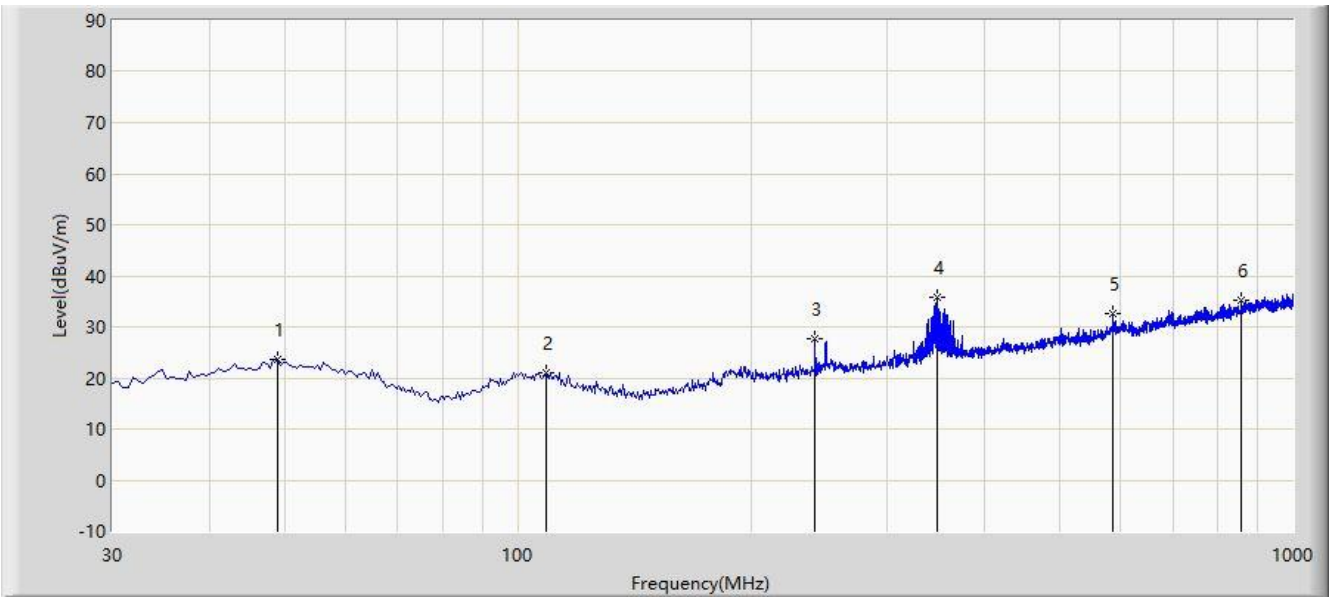
Note 1: Measure Level (dBm) = Reading Level (dBm) + Substitution Factor (dB).

Note 2: Substitution Factor (dB) = Cable Loss (dB) + Space Attenuation (dB) + Antenna Gain (dBi) - Pre_Amplifier Gain (dB)

Note 3: Test Distance “d” = 3m.

Radiated Spurious Emission For below 1GHz:

Site: WZ-AC2	Time: 2021/12/22 - 15:55
Limit: FCC Part 25_RE	Engineer: Tommy Tang
Probe: WZ-AC2_VULB9162_0.03-7GHz	Polarity: Horizontal
EUT: Flat Panel Integrated Satellite Communication Terminal	Power: AC 120V/60Hz
Test Mode: Transmit by QPSK 7500kbps at Channel 14000MHz	

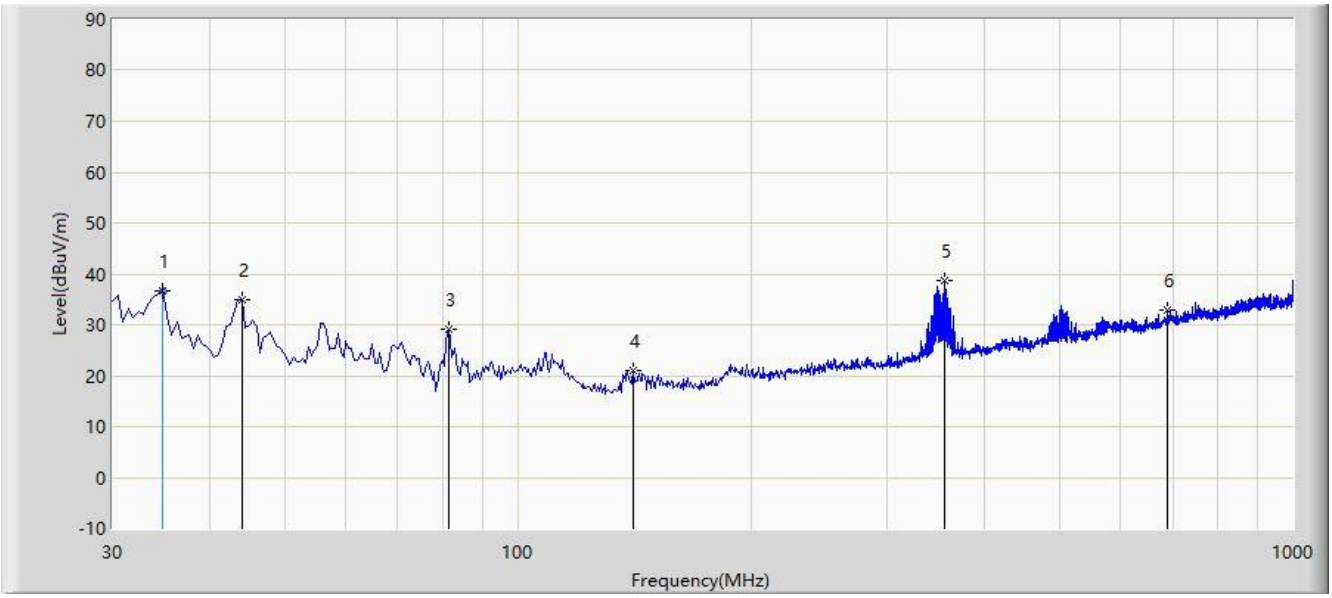


No	Flag	Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Measure Level (dBm)	Limit (dBm)	Margin (dB)	Type
1			48.915	3.059	20.708	23.767	-71.433	-13.000	-58.433	PK
2			109.055	2.624	18.316	20.940	-74.260	-13.000	-61.260	PK
3			241.945	7.73	19.835	27.565	-67.635	-13.000	-54.635	PK
4		*	347.675	13.022	22.795	35.817	-59.383	-13.000	-46.383	PK
5			586.78	5.086	27.397	32.483	-62.717	-13.000	-49.717	PK
6			858.38	3.746	31.358	35.104	-60.096	-13.000	-47.096	PK

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

Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: WZ-AC2	Time: 2021/12/22 - 15:47
Limit: FCC Part 25_RE	Engineer: Tommy Tang
Probe: WZ-AC2_VULB9162_0.03-7GHz	Polarity: Vertical
EUT: Flat Panel Integrated Satellite Communication Terminal	Power: AC 120V/60Hz
Test Mode: Transmit by QPSK 7500kbps at Channel 14000MHz	



No	Flag	Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Measure Level (dBm)	Limit (dBm)	Margin (dB)	Type
1			34.85	18.6	18.087	36.687	-58.513	-13.000	-45.513	QP
2			44.065	14.451	20.498	34.949	-60.251	-13.000	-47.251	PK
3			81.41	14.634	14.368	29.002	-66.198	-13.000	-53.198	PK
4			141.065	5.717	15.19	20.907	-74.293	-13.000	-61.293	PK
5		*	355.92	16.281	22.285	38.566	-56.634	-13.000	-43.634	PK
6			688.63	3.895	28.881	32.776	-62.424	-13.000	-49.424	PK

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

Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m)

Appendix B – Test Setup Photograph

Refer to “2112RSU001-UT” file.

Appendix C – EUT Photograph

Refer to “2112RSU001-UE” file.

The End