RF MEASUREMENT REPORT

FCC ID:	2AUBBV9OTM45
Applicant:	China Starwin Science & Technology Co., Ltd
Product:	mobile satellite communication terminal
Model No.:	V9 OTM45
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 ANSI C63.4-2014
Test Date:	October 13, 2021 ~ February 24, 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.

Revision History

Report No.	Version	Description	Issue Date	Note
2107RSU044-U3	Rev. 01	Initial Report	03-02-2022	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: L3261-190725				
	FCC: 291082, TW3261		ISED: TW3261		

1.4. Product Information

Product Name	mobile satellite communication terminal
Model No.	V9 OTM45
Hardware Version	XY-V9-OTM45-202111
Software Version	XY-V9-OTM45-V1.17B
Wi-Fi Specification	802.11b/g/n
Bluetooth Version	V4.2 single mode, BLE only
Satellite Specification	Transmit: 13.75~14.50GHz Receive: 10.70~12.75GHz
Antenna Information	Refer to section 1.5
GNSS Specification	GPS, BDS
Operating Temperature	-25 ~ 50 °C
Remark: 1, The product is made up of In-cabin Unit (Support Wi-Fi and Bluetooth) and Out-cabin Unit (Support Satellite). They cannot operate independently, and both operate together as a system, Out-cabin Unit is powered by In-cabin Unit. In-cabin Unit is responsible for interacting with the user, and Out-cabin Unit is to realize the functions of satellite signal sending and receiving, aligning the satellite 2, 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: 13.75 ~ 14.50 GHz Receive: 10.70 ~ 12.75 GHz
Test Frequency	Low channel: 13.75 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 Gain	33.21 dBi (in range of ±10 degree) 3.69 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	13750 MHz
…	…
Middle Channel	14250 MHz
…	…
High Channel	14500 MHz

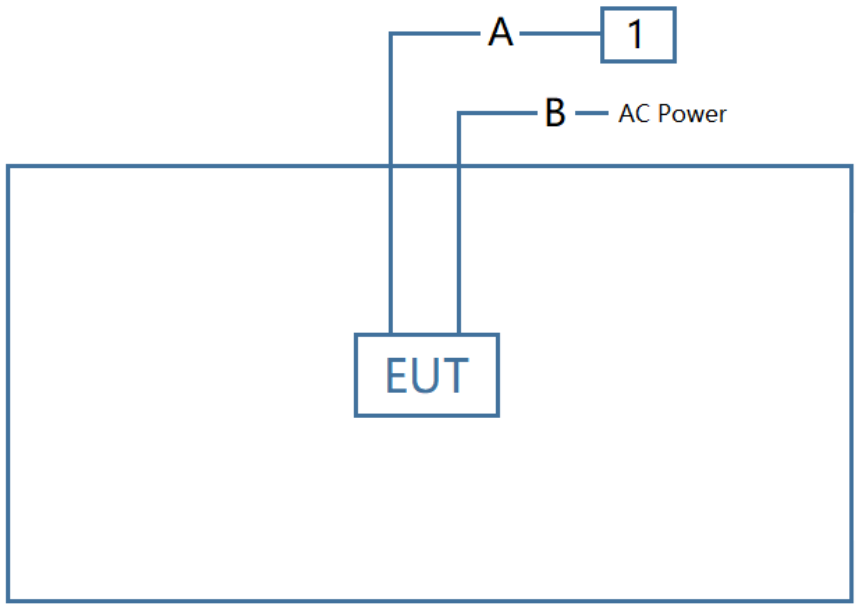
2. Test Configuration

2.1. Test Mode

Mode 1: Transmit at Channel 13.75 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		
					Ant 0	Ant 1	Ant 0 + 1
Satellite	8PSK	128	Low	13750	-34.0	-33.5	-35.0
			Middle	14250	-35.0	-35.0	-35.0
			High	14500	-34.5	-34.5	-35.0
		7500	Low	13750	-14.0	-14.5	-19.0
			Middle	14250	-9.5	-10.5	-15.5
			High	14500	-9.0	-9.5	-14.0
	BPSK	128	Low	13750	-33.5	-34.5	-35.0
			Middle	14250	-35.0	-35.0	-35.0
			High	14500	-34.0	-34.0	-35.0
		7500	Low	13750	-13.5	-14.5	-19.0
			Middle	14250	-10.0	-10.5	-15.5
			High	14500	-9.0	-9.0	-14.0
	QPSK	128	Low	13750	-33.5	-34.0	-35.0
			Middle	14250	-35.0	-35.0	-35.0
			High	14500	-34.5	-34.5	-35.0
		7500	Low	13750	-13.5	-14.5	-19.0
			Middle	14250	-10.0	-10.5	-15.5
			High	14500	-9.0	-9.5	-14.0

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.

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
Preamplifier	EMCI	EMC184045SE	MRTSUE06640	1 year	2022/1/14	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
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	Od-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

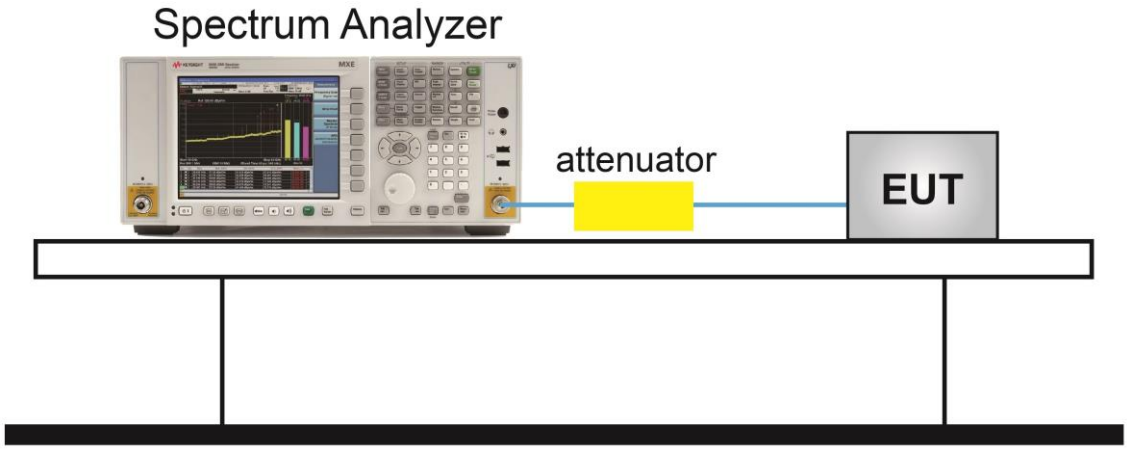
6.2.2.Test Procedure used

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.

Note: 0 dBw = 10*log(W) = 30 dBm, 40 dBW = 70 dBm.

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

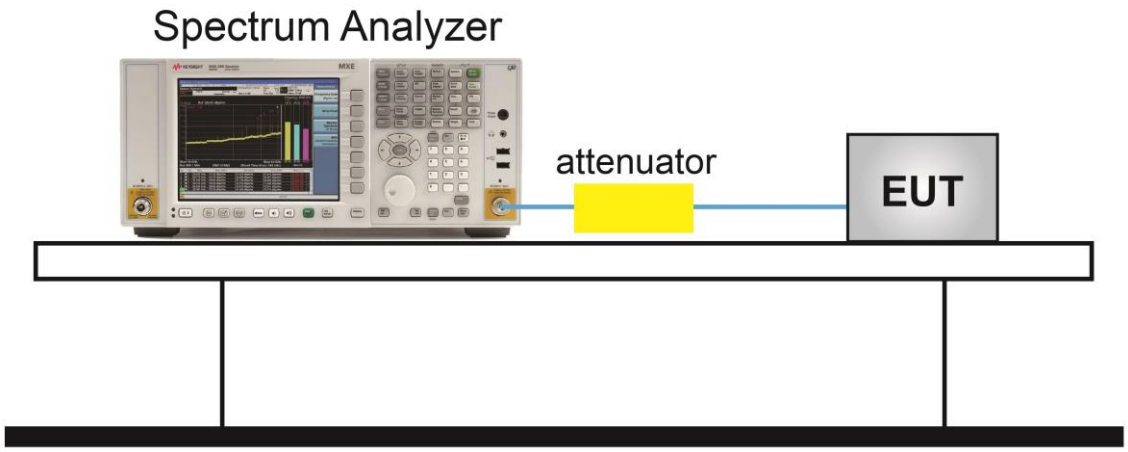
   (RBW shall set to the reference bandwidth specified by the applicable regulatory requirement, so set RBW = 3 kHz herein for measurement)
3. Set VBW ≥ 3 × RBW
4. Set number of measurement points in sweep ≥ 2 × span / RBW
5. Detector = power averaging (RMS)
6. Trace mode = Trace average
7. Trace was allowed 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

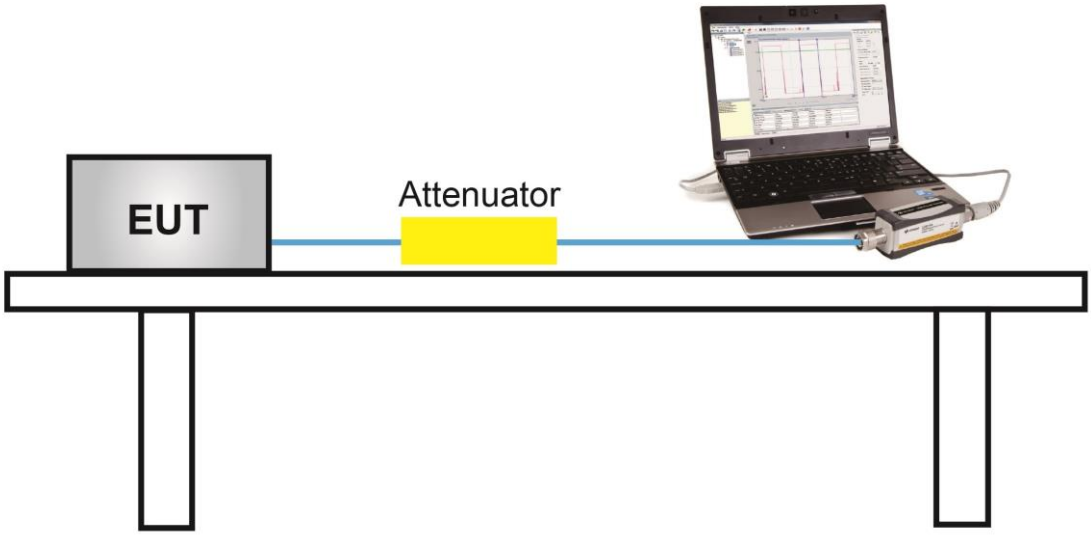
Measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since this measurement is made only during the ON time of the transmitter, no duty cycle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

(h) ***Digital earth station operation in the extended 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 ≤ *48*°
-24	dBW /4 kHz	for 48° < 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 ≤ *48*°
-24	dBW /4 kHz	for 48° < θ ≤ *85*°

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

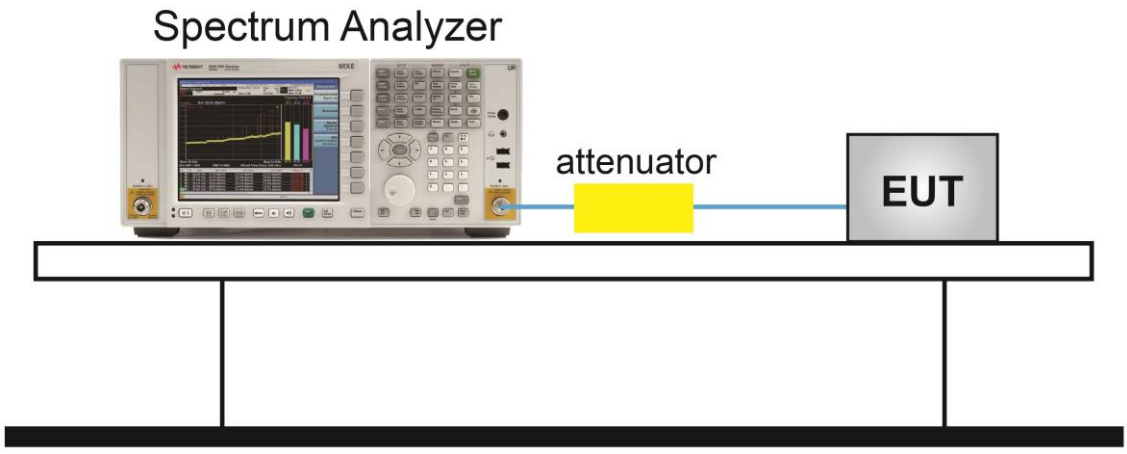
6.4.3.Test Setting

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;

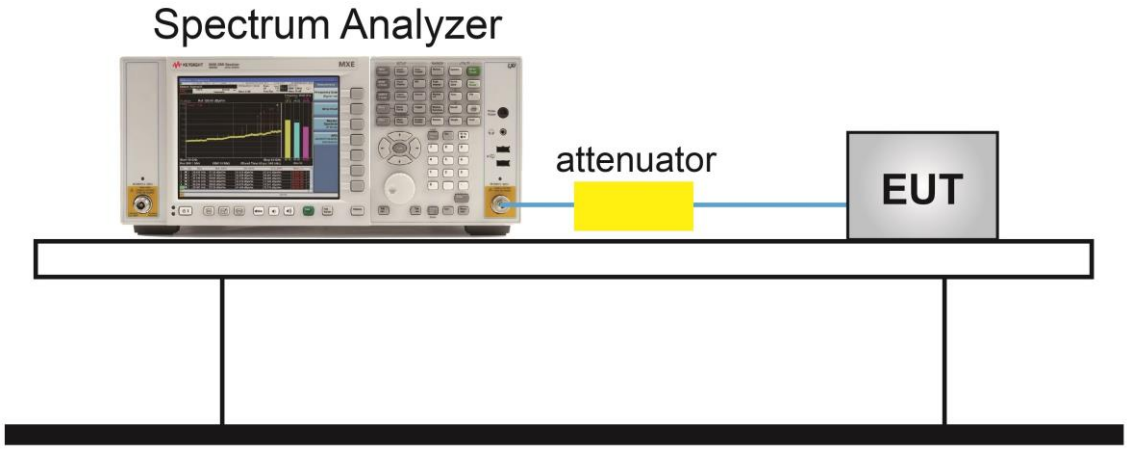
6.5.2.Test Procedure used

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:

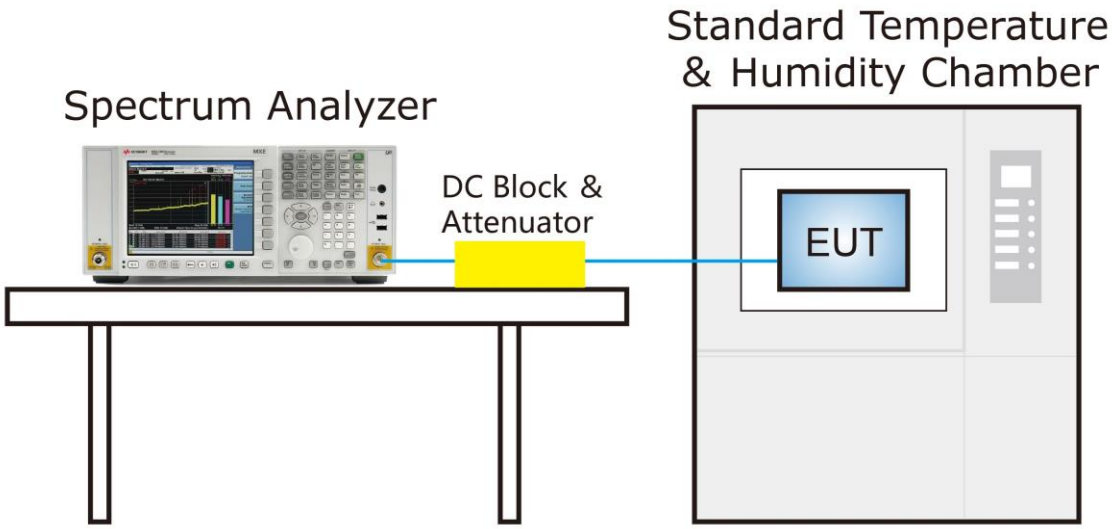
a) At 10°C intervals of temperatures between -30°C and +50°C at the manufacturer's rated supply voltage, and

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

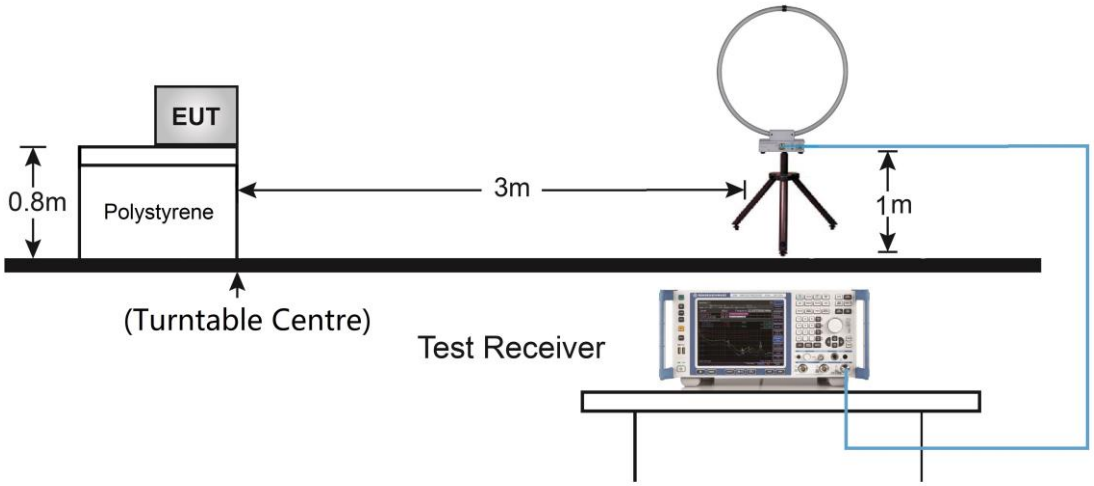
6.7.3.Test Setting

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

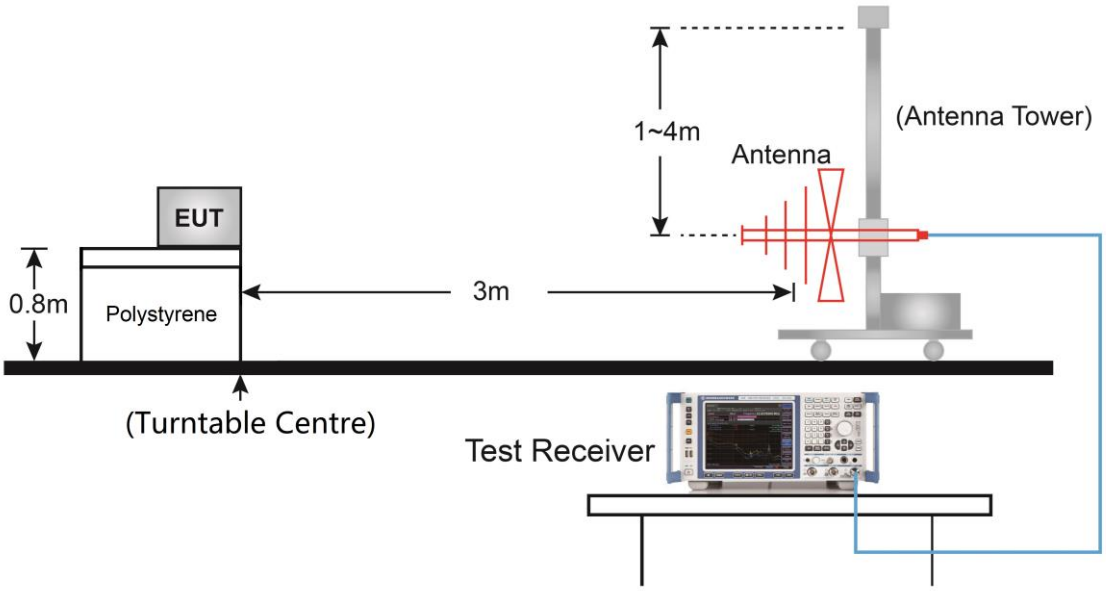
   Set the RBW greater than 4kHz in order to increase the measurement speed
3. VBW = 3 * RBW
4. Detector = power averaging (RMS)
5. Sweep time = Auto couple
6. Trace mode = Max hold
7. Trace was allowed to stabilize

6.7.4.Test Setup

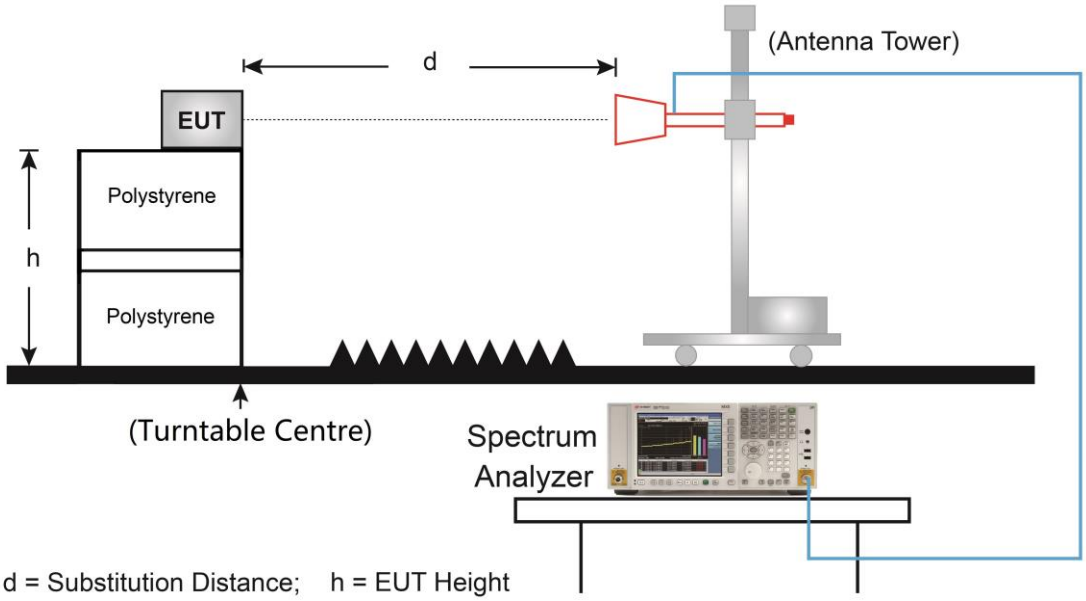
9kHz ~ 30MHz Test Setup



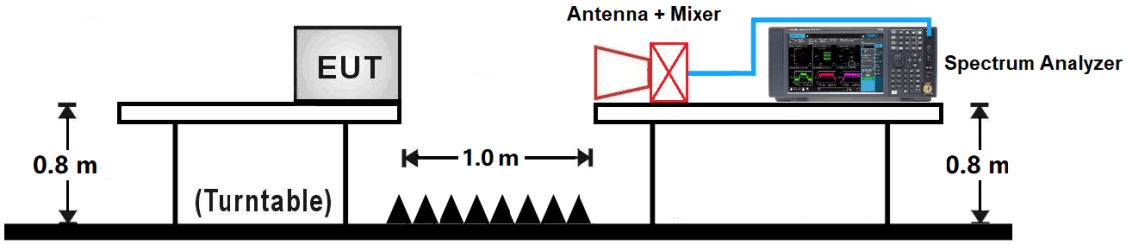
30MHz ~ 1GHz Test Setup



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	2021/10/29		

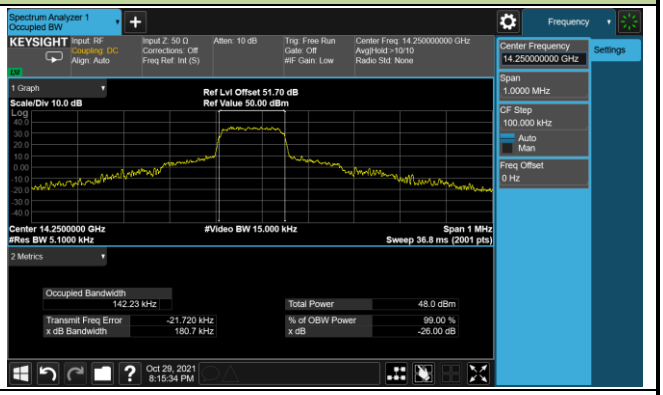
Test Mode	Duty Cycle
8PSK	100%
BPSK	100%
QPSK	100%
8PSK - 14250 MHz	BPSK - 14250 MHz
	
QPSK - 14250 MHz	
	

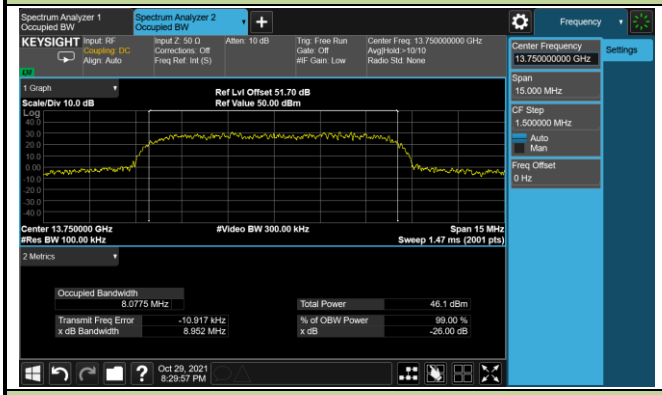
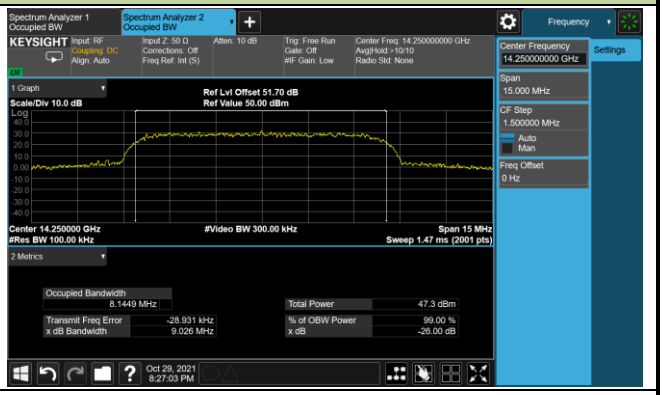
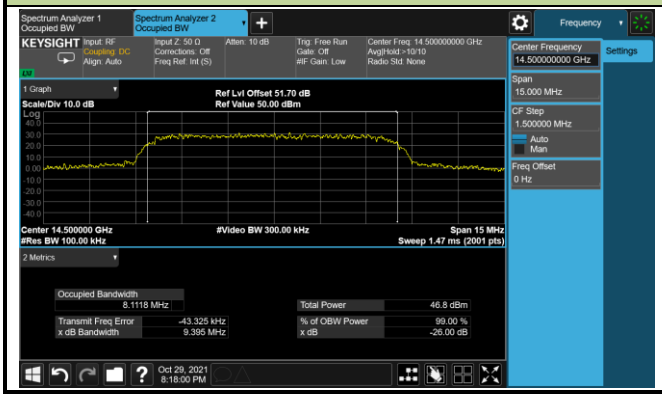
A.2 Occupied Bandwidth Test Result

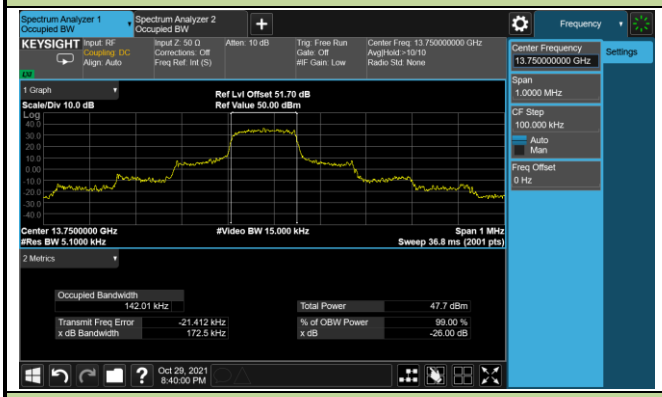
Test Site	WZ-SR5	Test Engineer	Luis Yang
Test Date	2021/10/29		

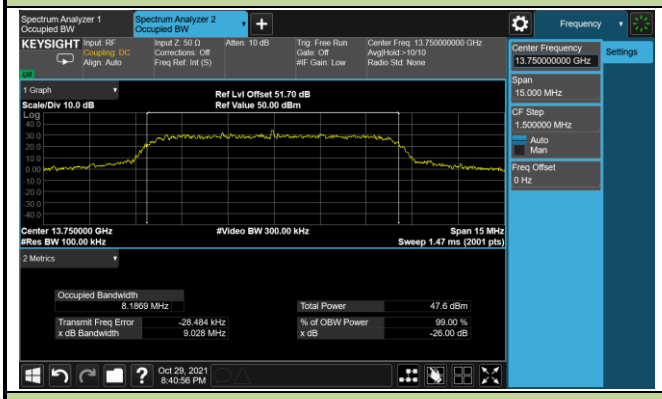
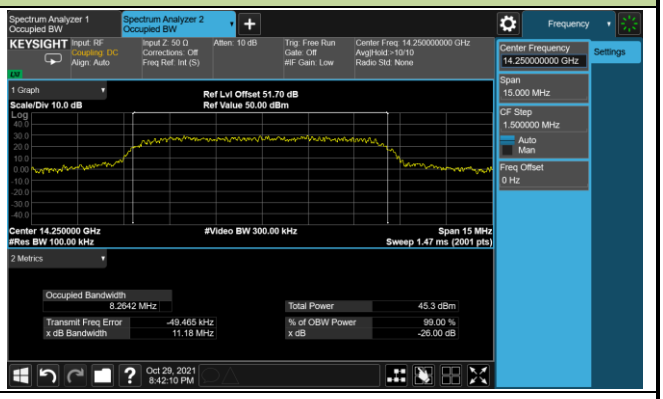
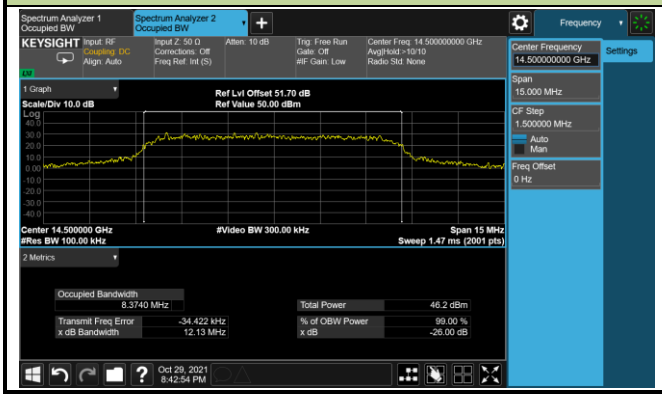
Test Mode	Date Rate (kbps)	Test Channel	Test Frequency (MHz)	99% Bandwidth (MHz)
Ant 0				
8PSK	128	Low	13750	0.141
	128	Mid	14250	0.142
	128	High	14500	0.143
	7500	Low	13750	8.078
	7500	Mid	14250	8.145
	7500	High	14500	8.112
BPSK	128	Low	13750	0.142
	128	Mid	14250	0.144
	128	High	14500	0.149
	7500	Low	13750	8.187
	7500	Mid	14250	8.264
	7500	High	14500	8.374
QPSK	128	Low	13750	0.141
	128	Mid	14250	0.142
	128	High	14500	0.142
	7500	Low	13750	8.127
	7500	Mid	14250	8.123
	7500	High	14500	8.213

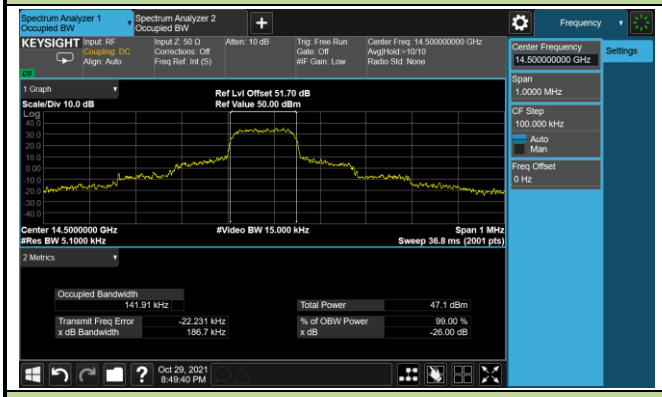
Test Mode	Date Rate (kbps)	Test Channel	Test Frequency (MHz)	99% Bandwidth (MHz)
Ant 1				
8PSK	128	Low	13750	0.139
	128	Mid	14250	0.140
	128	High	14500	0.139
	7500	Low	13750	8.069
	7500	Mid	14250	8.090
	7500	High	14500	8.127
BPSK	128	Low	13750	0.140
	128	Mid	14250	0.140
	128	High	14500	0.141
	7500	Low	13750	8.084
	7500	Mid	14250	8.139
	7500	High	14500	8.184
QPSK	128	Low	13750	0.140
	128	Mid	14250	0.140
	128	High	14500	0.141
	7500	Low	13750	8.113
	7500	Mid	14250	8.067
	7500	High	14500	8.052

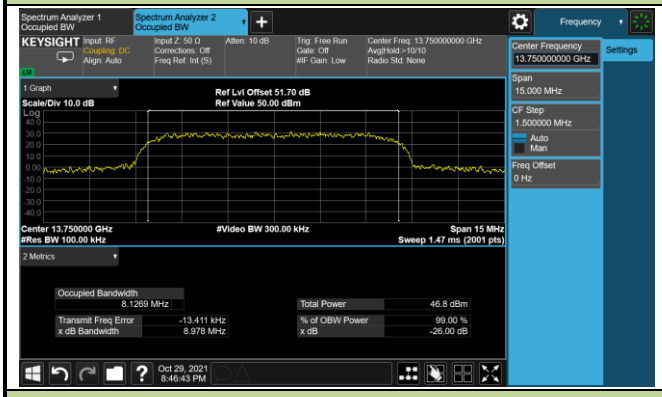
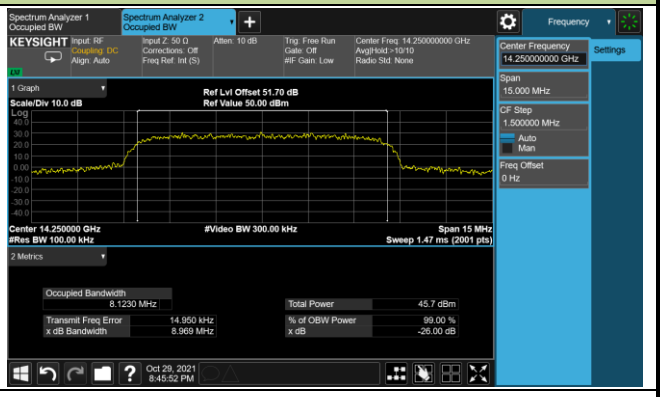
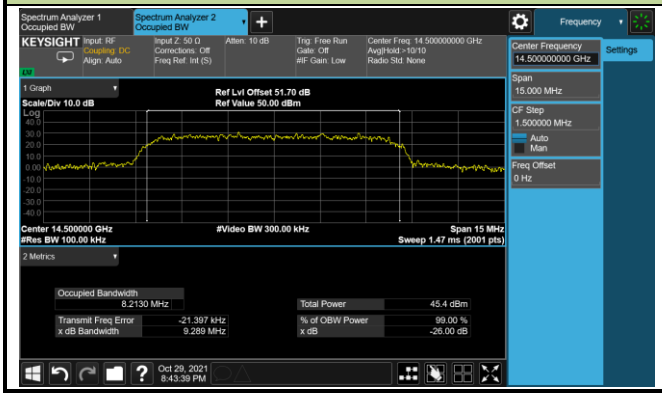
8PSK (128kbps) - Occupied Bandwidth - Ant 0	
13750 MHz	14250 MHz
	
14500 MHz	
	

8PSK (7500kbps) - Occupied Bandwidth - Ant 0	
13750 MHz	14250 MHz
	
14500 MHz	
	

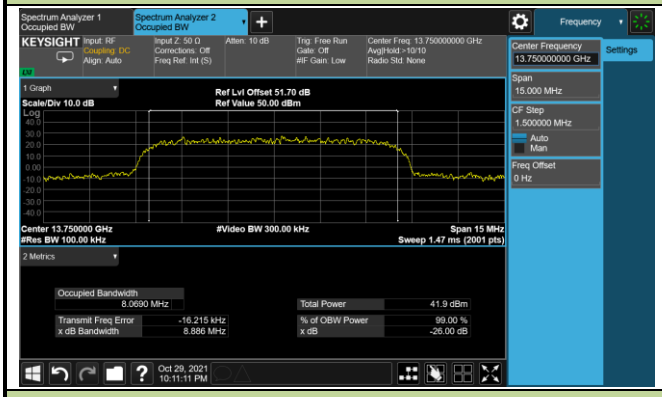
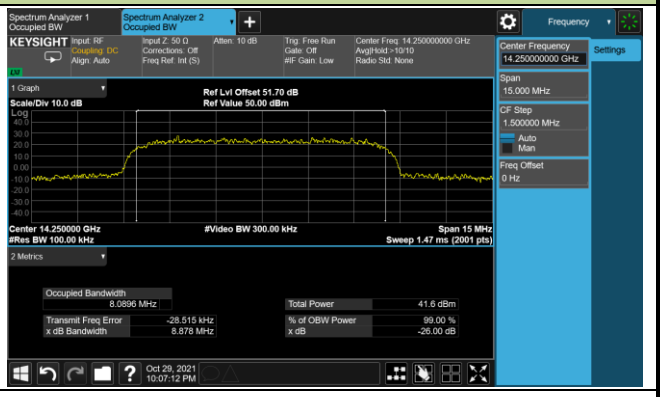
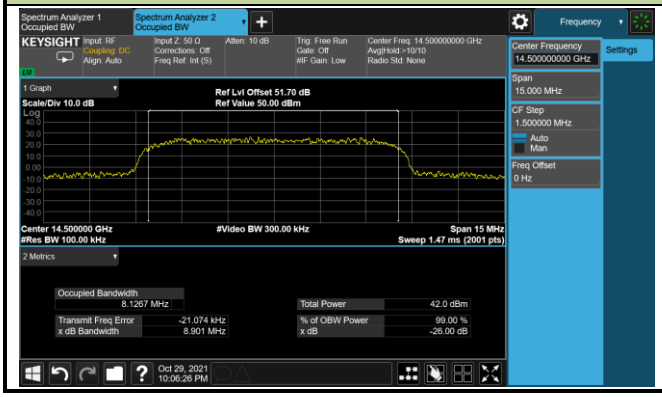
BPSK (128kbps) - Occupied Bandwidth - Ant 0	
13750 MHz	14250 MHz
	
14500 MHz	
	

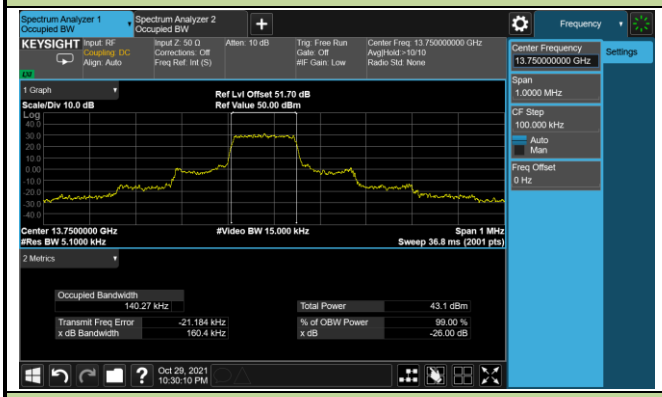
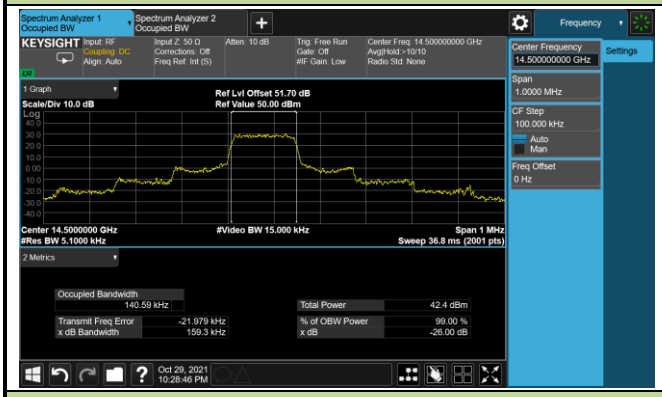
BPSK (7500kbps) - Occupied Bandwidth - Ant 0	
13750 MHz	14250 MHz
	
14500 MHz	
	

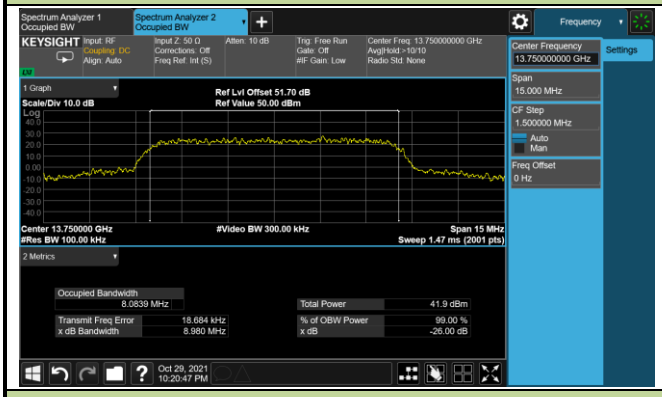
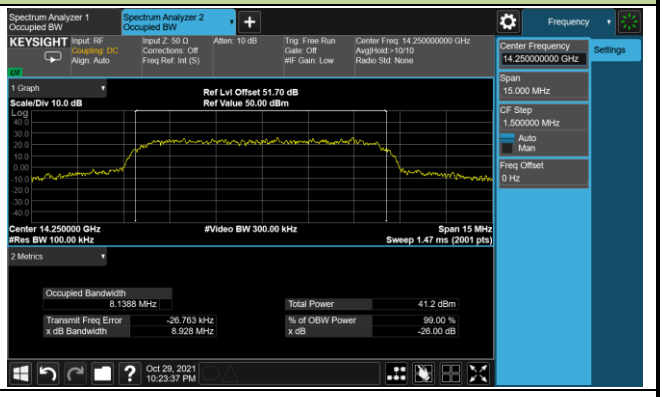
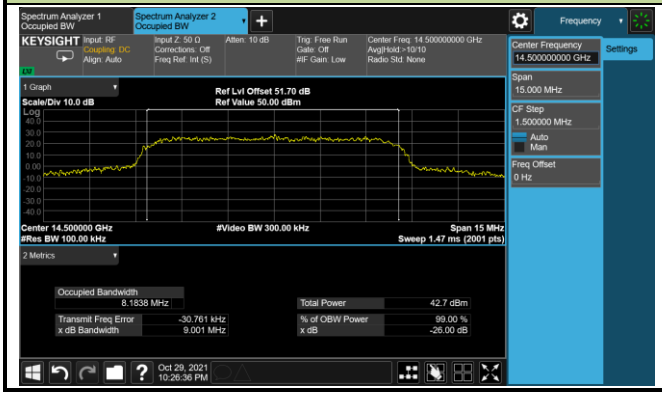
QPSK (128kbps) - Occupied Bandwidth - Ant 0	
13750 MHz	14250 MHz
	
14500 MHz	
	

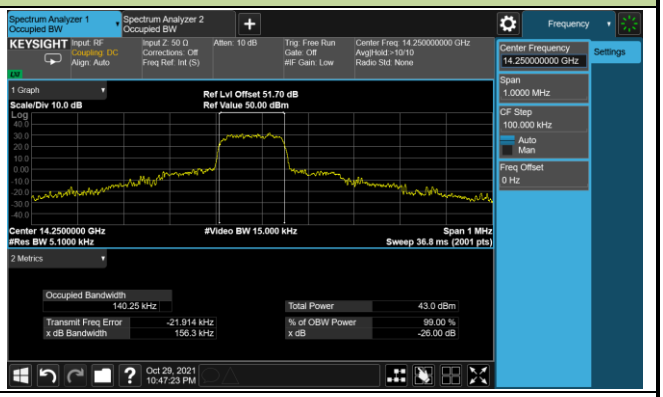
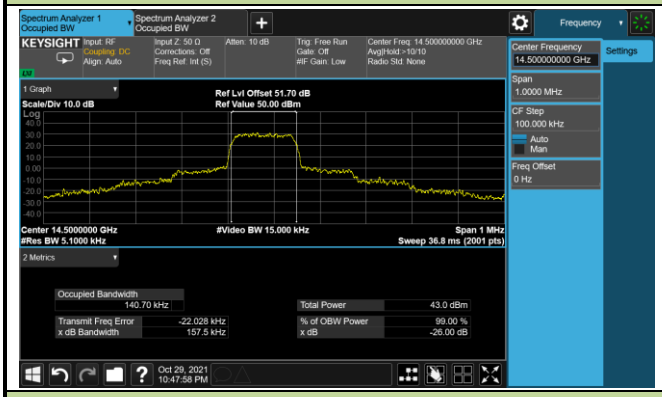
QPSK (7500kbps) - Occupied Bandwidth - Ant 0	
13750 MHz	14250 MHz
	
14500 MHz	
	

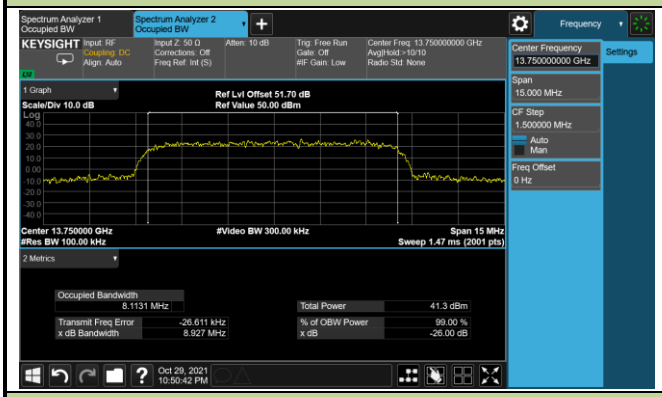
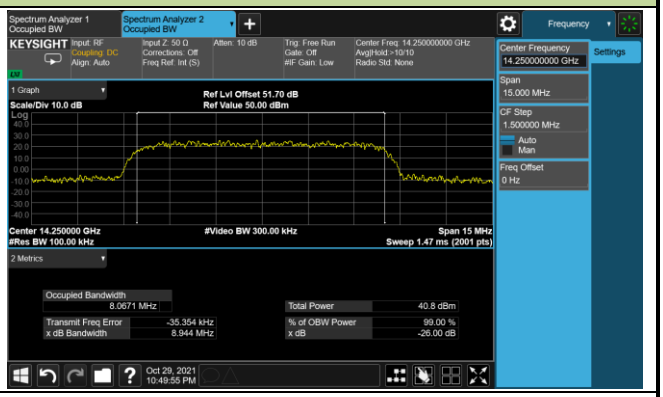
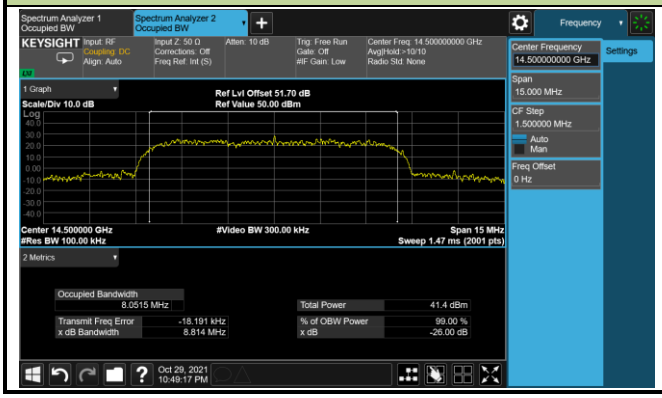
8PSK (128kbps) - Occupied Bandwidth - Ant 1	
13750 MHz	14250 MHz
	
14500 MHz	
	

8PSK (7500kbps) - Occupied Bandwidth - Ant 1	
13750 MHz	14250 MHz
	
14500 MHz	
	

BPSK (128kbps) - Occupied Bandwidth - Ant 1	
13750 MHz	14250 MHz
	
14500 MHz	
	

BPSK (7500kbps) - Occupied Bandwidth - Ant 1	
13750 MHz	14250 MHz
	
14500 MHz	
	

QPSK (128kbps) - Occupied Bandwidth - Ant 1	
13750 MHz	14250 MHz
	
14500 MHz	
	

QPSK (7500kbps) - Occupied Bandwidth - Ant 1	
13750 MHz	14250 MHz
	
14500 MHz	
	

A.3 Power Spectral Density & Output Power Test Result

Test Site	WZ-SR5	Test Engineer	Luis Yang
Test Date	2021/11/07 ~ 2022/02/24	Test Item	Power Spectral Density

Test Mode	Date Rate (kbps)	Test Channel	Test Freq. (MHz)	Ant 0 AVPSD (dBm/4kHz)	EIRP PSD (dBm/4kHz)	Limit (dBm/4kHz)	Result
8PSK	128	Low	13750	7.147	40.357	≤ 70	Pass
	128	Mid	14250	5.183	38.393	≤ 70	Pass
	128	High	14500	3.617	36.827	≤ 70	Pass
	7500	Low	13750	7.245	40.455	≤ 70	Pass
	7500	Mid	14250	3.465	36.675	≤ 70	Pass
	7500	High	14500	3.618	36.828	≤ 70	Pass
BPSK	128	Low	13750	7.622	40.832	≤ 70	Pass
	128	Mid	14250	5.307	38.517	≤ 70	Pass
	128	High	14500	3.871	37.081	≤ 70	Pass
	7500	Low	13750	8.074	41.284	≤ 70	Pass
	7500	Mid	14250	3.405	36.615	≤ 70	Pass
	7500	High	14500	4.000	37.210	≤ 70	Pass
QPSK	128	Low	13750	7.669	40.879	≤ 70	Pass
	128	Mid	14250	5.594	38.804	≤ 70	Pass
	128	High	14500	3.627	36.837	≤ 70	Pass
	7500	Low	13750	7.919	41.129	≤ 70	Pass
	7500	Mid	14250	3.237	36.447	≤ 70	Pass
	7500	High	14500	3.975	37.185	≤ 70	Pass

Note 1: EIRP PSD (dBm/4kHz) = Ant 0 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 Mode	Date Rate (kbps)	Test Channel	Test Freq. (MHz)	Ant 1 AVPSD (dBm/4kHz)	EIRP PSD (dBm/4kHz)	Limit (dBm/4kHz)	Result
8PSK	128	Low	13750	6.373	39.583	≤ 70	Pass
	128	Mid	14250	5.511	38.721	≤ 70	Pass
	128	High	14500	2.676	35.886	≤ 70	Pass
	7500	Low	13750	6.436	39.646	≤ 70	Pass
	7500	Mid	14250	3.206	36.416	≤ 70	Pass
	7500	High	14500	2.966	36.176	≤ 70	Pass
BPSK	128	Low	13750	6.051	39.261	≤ 70	Pass
	128	Mid	14250	4.878	38.088	≤ 70	Pass
	128	High	14500	3.136	36.346	≤ 70	Pass
	7500	Low	13750	6.522	39.732	≤ 70	Pass
	7500	Mid	14250	2.846	36.056	≤ 70	Pass
	7500	High	14500	3.632	36.842	≤ 70	Pass
QPSK	128	Low	13750	6.382	39.592	≤ 70	Pass
	128	Mid	14250	4.872	38.082	≤ 70	Pass
	128	High	14500	2.919	36.129	≤ 70	Pass
	7500	Low	13750	6.730	39.940	≤ 70	Pass
	7500	Mid	14250	2.837	36.047	≤ 70	Pass
	7500	High	14500	3.228	36.438	≤ 70	Pass

Note 1: EIRP PSD (dBm/4kHz) = Ant 1 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 Mode	Date Rate (kbps)	Test Channel	Test Freq. (MHz)	Ant 0 AVPSD (dBm/4kHz)	Ant 1 AVPSD (dBm/4kHz)	EIRP PSD (dBm/4kHz)	Limit (dBm/4kHz)	Result
8PSK	128	Low	13750	6.656	5.590	42.376	≤ 70	Pass
	128	Mid	14250	5.658	5.429	41.765	≤ 70	Pass
	128	High	14500	3.522	2.075	39.079	≤ 70	Pass
	7500	Low	13750	3.135	2.728	39.157	≤ 70	Pass
	7500	Mid	14250	-1.052	-0.744	35.325	≤ 70	Pass
	7500	High	14500	0.283	-0.744	36.020	≤ 70	Pass
BPSK	128	Low	13750	6.396	5.342	42.121	≤ 70	Pass
	128	Mid	14250	5.796	5.184	41.721	≤ 70	Pass
	128	High	14500	3.288	1.859	38.852	≤ 70	Pass
	7500	Low	13750	2.956	2.980	39.188	≤ 70	Pass
	7500	Mid	14250	-1.097	-0.589	35.385	≤ 70	Pass
	7500	High	14500	0.242	-0.375	36.165	≤ 70	Pass
QPSK	128	Low	13750	6.176	5.584	42.110	≤ 70	Pass
	128	Mid	14250	5.707	5.578	41.863	≤ 70	Pass
	128	High	14500	3.346	2.127	38.999	≤ 70	Pass
	7500	Low	13750	3.469	2.733	39.337	≤ 70	Pass
	7500	Mid	14250	-0.902	-0.594	35.475	≤ 70	Pass
	7500	High	14500	0.181	-0.870	35.908	≤ 70	Pass

Note 1: EIRP PSD (dBm/4kHz) = 10*log {$10^{(\text{Ant 0 AVPSD}/10)}$ + $10^{(\text{Ant 1 AVPSD}/10)}$} (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	2021/10/13 ~ 2022/02/24	Test Item	Output Power

Test Mode	Date Rate (kbps)	Test Channel	Test Freq. (MHz)	Ant 0 AV Power (dBm)	E.I.R.P. (dBm)
8PSK	128	Low	13750	21.77	54.98
	128	Mid	14250	19.84	53.05
	128	High	14500	17.97	51.18
	7500	Low	13750	39.20	72.41
	7500	Mid	14250	39.00	72.21
	7500	High	14500	39.02	72.23
BPSK	128	Low	13750	22.33	55.54
	128	Mid	14250	19.87	53.08
	128	High	14500	18.38	51.59
	7500	Low	13750	39.10	72.31
	7500	Mid	14250	39.11	72.32
	7500	High	14500	38.95	72.16
QPSK	128	Low	13750	22.34	55.55
	128	Mid	14250	19.81	53.02
	128	High	14500	17.96	51.17
	7500	Low	13750	39.25	72.46
	7500	Mid	14250	39.12	72.33
	7500	High	14500	39.08	72.29

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

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

Test Mode	Date Rate (kbps)	Test Channel	Test Freq. (MHz)	Ant 1 AV Power (dBm)	E.I.R.P. (dBm)
8PSK	128	Low	13750	21.43	54.64
	128	Mid	14250	19.51	52.72
	128	High	14500	16.75	49.96
	7500	Low	13750	39.15	72.36
	7500	Mid	14250	39.03	72.24
	7500	High	14500	39.00	72.21
BPSK	128	Low	13750	20.23	53.44
	128	Mid	14250	19.49	52.70
	128	High	14500	17.28	50.49
	7500	Low	13750	39.08	72.29
	7500	Mid	14250	38.98	72.19
	7500	High	14500	39.20	72.41
QPSK	128	Low	13750	20.90	54.11
	128	Mid	14250	19.43	52.64
	128	High	14500	16.78	49.99
	7500	Low	13750	39.15	72.36
	7500	Mid	14250	39.08	72.29
	7500	High	14500	39.00	72.21

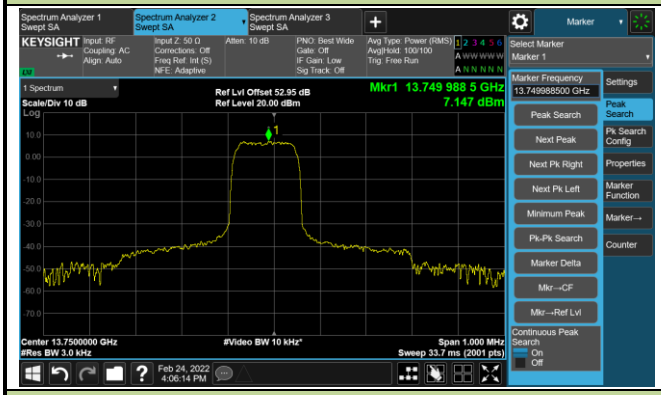
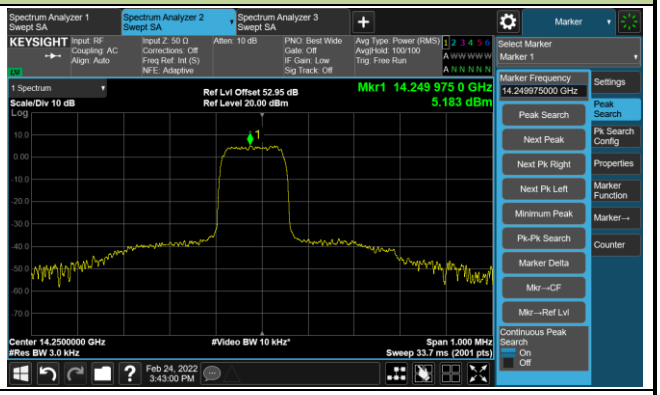
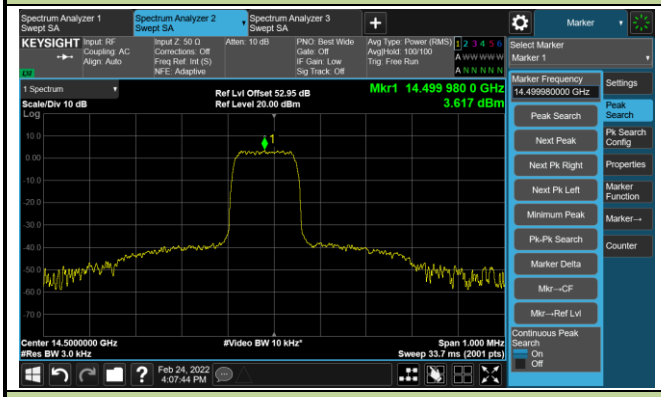
Note 1: E.I.R.P (dBm) = AV Power (dBm) + Antenna Gain (dBi).

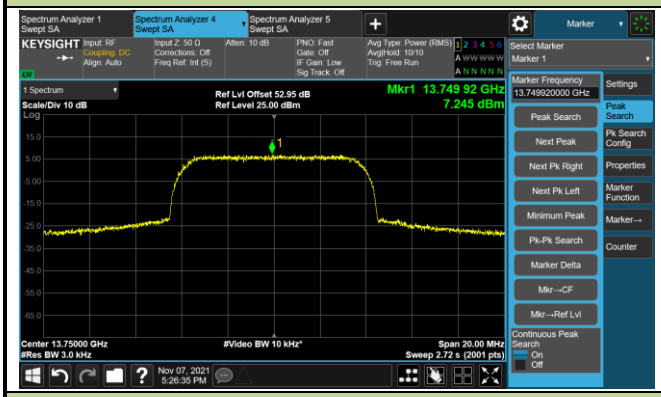
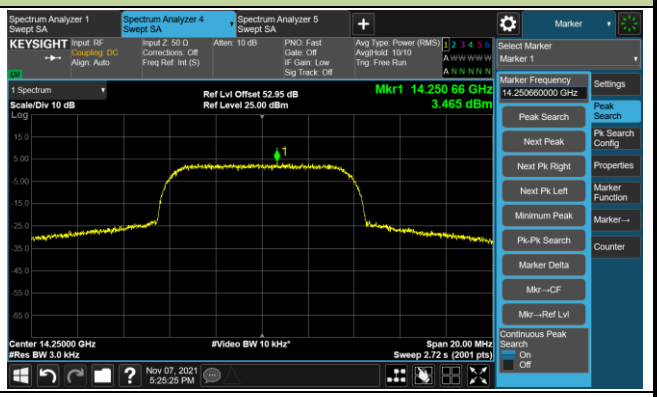
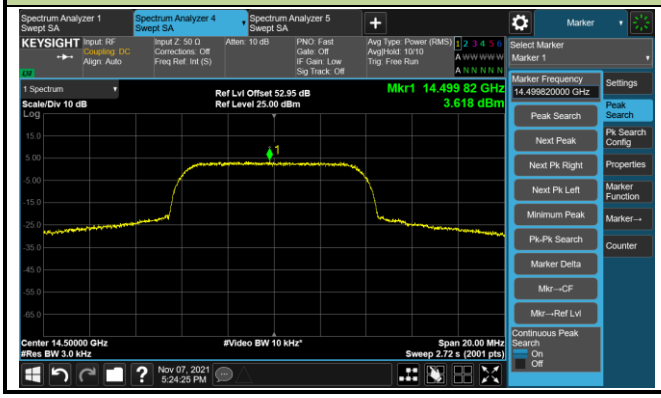
Note 2: Output power result is only for RF exposure evaluation.

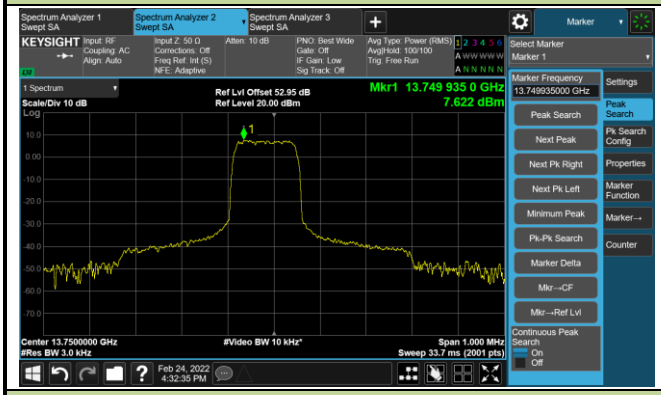
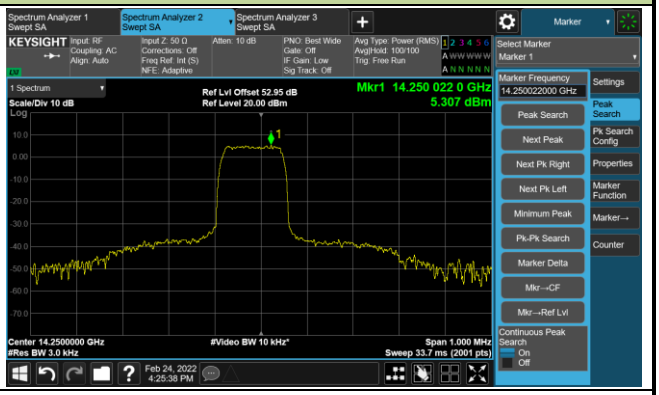
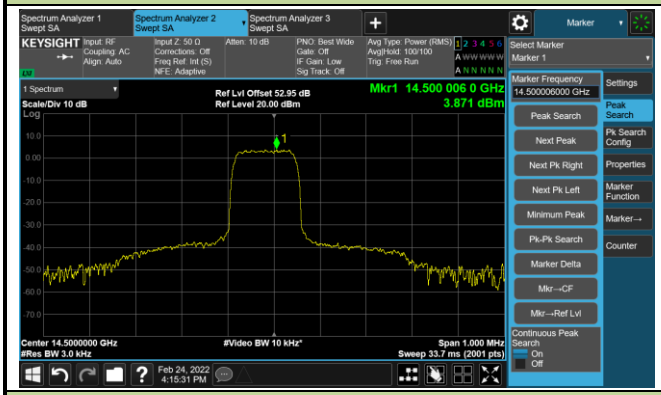
Test Mode	Date Rate (kbps)	Test Channel	Test Freq. (MHz)	Ant 0 AV Power (dBm)	Ant 1 AV Power (dBm)	E.I.R.P. (dBm)
8PSK	128	Low	13750	20.73	19.98	56.59
	128	Mid	14250	19.83	19.42	55.85
	128	High	14500	17.43	16.11	53.04
	7500	Low	13750	35.88	36.02	72.17
	7500	Mid	14250	36.29	35.96	72.35
	7500	High	14500	36.60	35.23	72.19
BPSK	128	Low	13750	20.47	19.92	56.42
	128	Mid	14250	19.63	19.47	55.77
	128	High	14500	17.45	16.25	53.11
	7500	Low	13750	35.95	36.08	72.24
	7500	Mid	14250	36.28	35.95	72.34
	7500	High	14500	36.43	35.91	72.40
QPSK	128	Low	13750	20.52	19.74	56.37
	128	Mid	14250	19.62	19.11	55.59
	128	High	14500	17.32	16.28	53.05
	7500	Low	13750	35.83	36.00	72.14
	7500	Mid	14250	36.24	35.86	72.27
	7500	High	14500	36.30	35.86	72.31

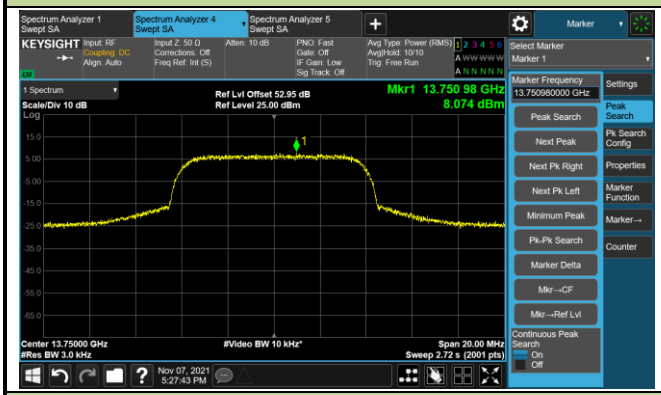
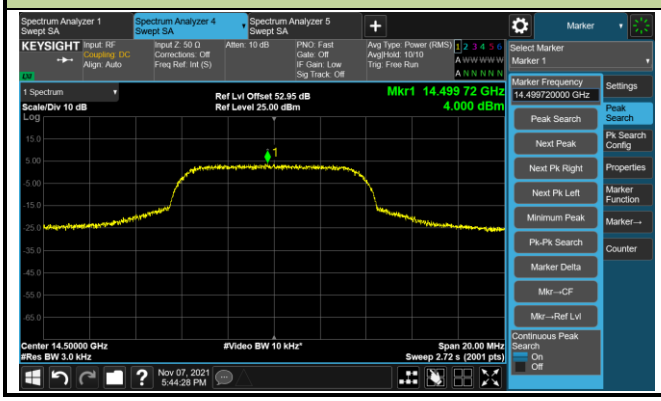
Note 1: E.I.R.P (dBm) = 10*log $\{10^{(\text{Ant 0 AV Power}/10)} + 10^{(\text{Ant 1 AV Power}/10)}\}$ (dBm) + Antenna Gain (dBi).

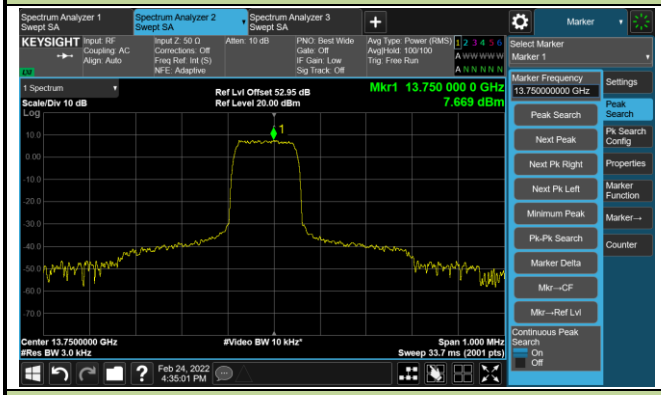
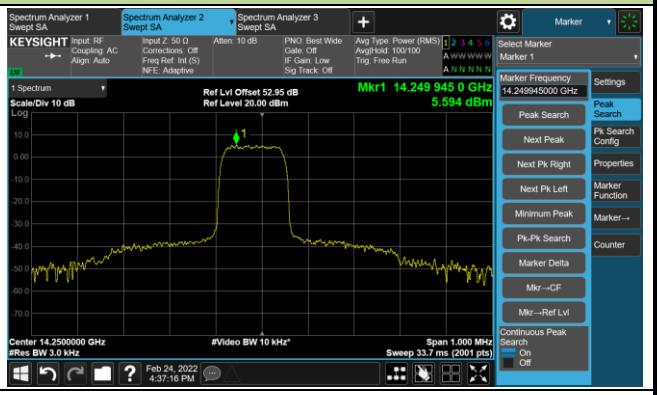
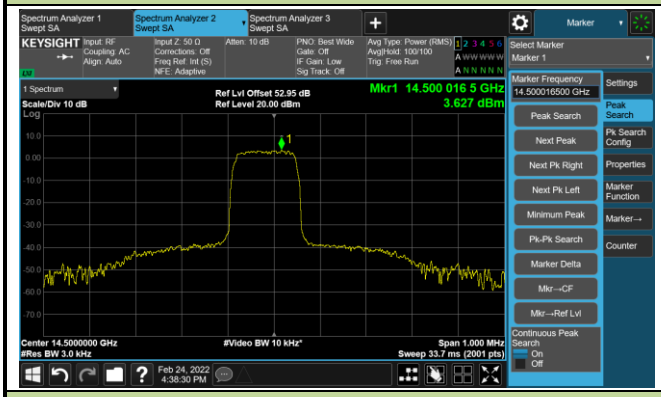
Note 2: Output power result is only for RF exposure evaluation.

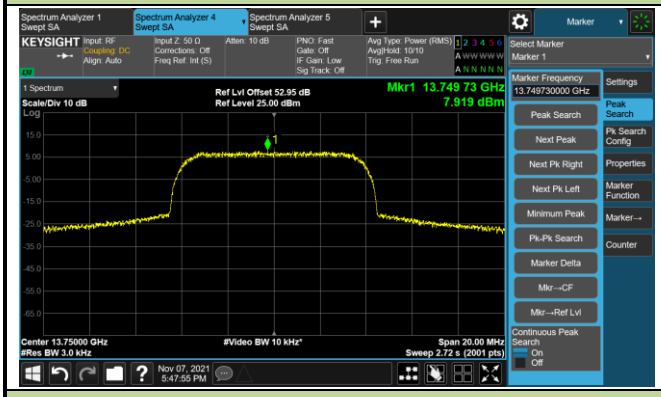
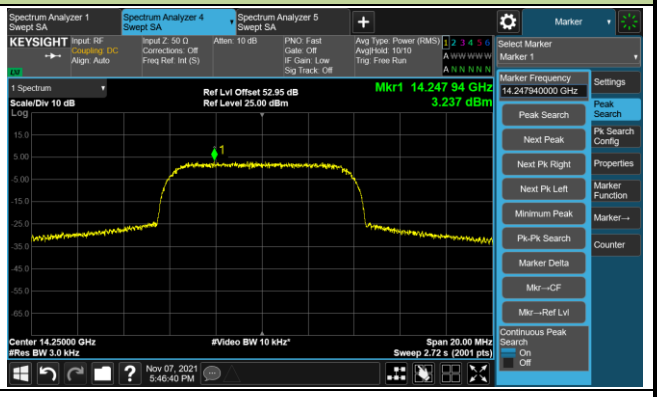
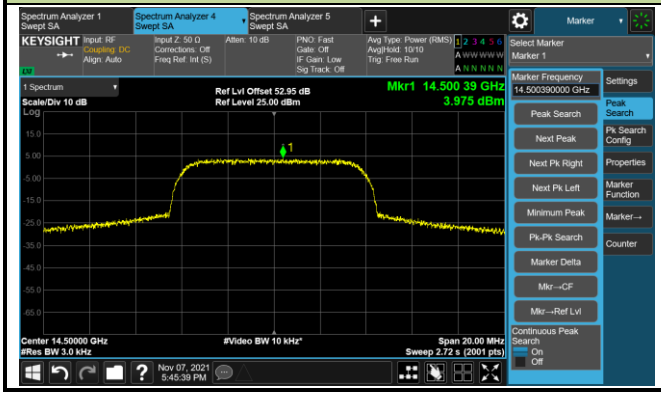
8PSK (128kbps) - Average PSD - Ant 0	
13750 MHz	14250 MHz
	
14500 MHz	
	

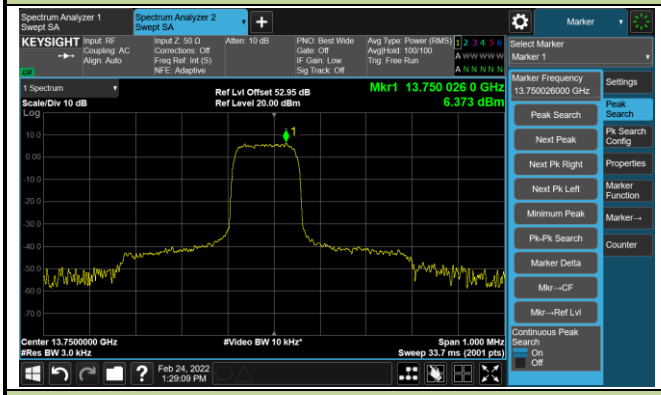
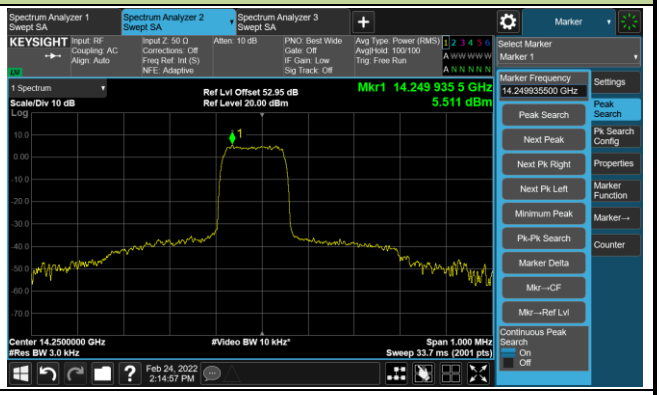
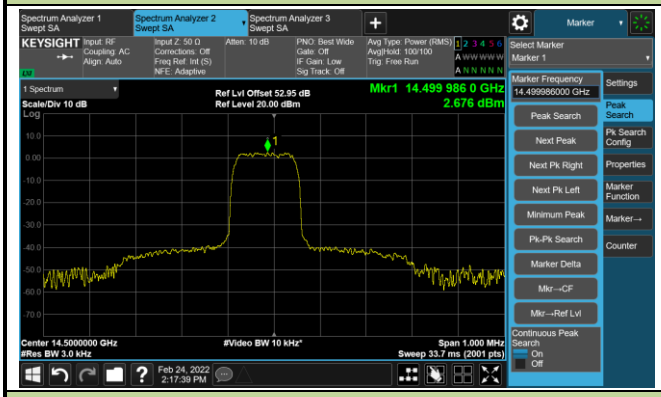
8PSK (7500kbps) - Average PSD - Ant 0	
13750 MHz	14250 MHz
	
14500 MHz	
	

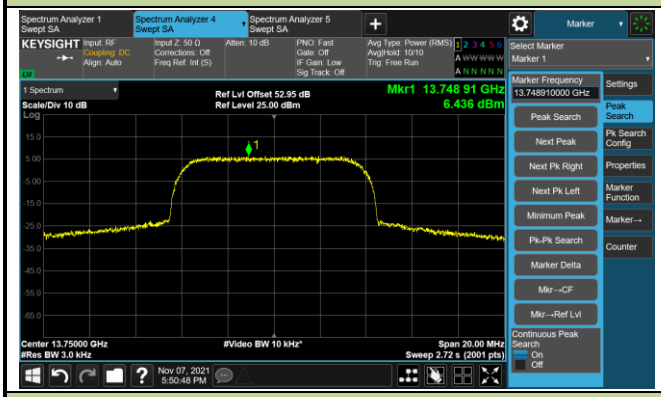
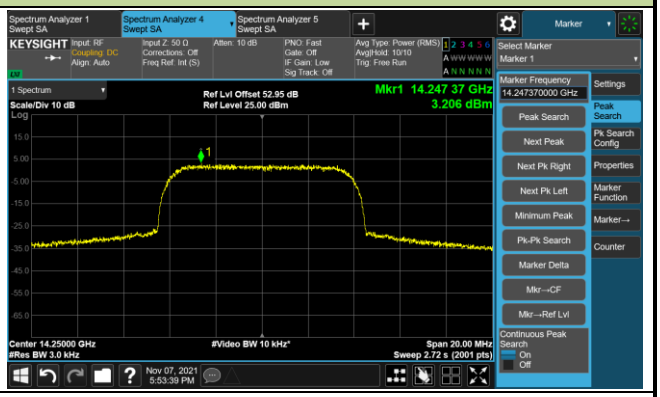
BPSK (128kbps) - Average PSD - Ant 0	
13750 MHz	14250 MHz
	
14500 MHz	
	

BPSK (7500kbps) - Average PSD - Ant 0	
13750 MHz	14250 MHz
	
14500 MHz	
	

QPSK (128kbps) - Average PSD - Ant 0	
13750 MHz	14250 MHz
	
14500 MHz	
	

QPSK (7500kbps) - Average PSD - Ant 0	
13750 MHz	14250 MHz
	
14500 MHz	
	

8PSK (128kbps) - Average PSD - Ant 1	
13750 MHz	14250 MHz
	
14500 MHz	
	

8PSK (7500kbps) - Average PSD - Ant 1	
13750 MHz	14250 MHz
	
14500 MHz