

RF MEASUREMENT REPORT

FCC ID: XMR2023RG525FNA
Application: Quectel Wireless Solutions Co., Ltd
Product: 5G Sub-6 GHz LGA Module
Model No.: RG525F-NA
Brand Name: Quectel
FCC Rule Part(s): Part 90 Subpart S
Test Procedure(s): ANSI C63.26: 2015
Result: Complies
Received Date: 2022-11-14
Test Date: 2022-12-16 ~ 2023-02-03

Reviewed By:

Sunny Sun

Approved By:

Robin Wu



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
2211RSU034-U3	Rev. 01	Initial Report	2023-02-23	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. Radio Specification under Test	6
1.6. Description of Available Antennas.....	7
1.7. Test Methodology	7
2. Test Configuration	8
2.1. Test System Connection Diagram.....	8
2.2. Test Environment Condition	8
3. Measuring Instrument	9
4. Decision Rules and Measurement Uncertainty.....	11
4.1. Decision Rules	11
4.2. Measurement Uncertainty	11
5. Test Result	12
5.1. Summary.....	12
5.2. Occupied Bandwidth Measurement	13
5.2.1. Test Limit	13
5.2.2. Test Procedure	13
5.2.3. Test Setting	13
5.2.4. Test Setup	13
5.2.5. Test Result	13
5.3. Frequency Stability Measurement	14
5.3.1. Test Limit	14
5.3.2. Test Procedure	14
5.3.3. Test Setting	14
5.3.4. Test Setup	15
5.3.5. Test Result	15
5.4. Conducted Output Power Measurement	16
5.4.1. Test Limit	16
5.4.2. Test Procedure	16
5.4.3. Test Setting	16
5.4.4. Test Setup	16

5.4.5.	Test Result	16
5.5.	Band Edge Measurement	17
5.5.1.	Test Limit	17
5.5.2.	Test Procedure	17
5.5.3.	Test Setting	17
5.5.4.	Test Setup	18
5.5.5.	Test Result	18
5.6.	Conducted Spurious Emissions Measurement.....	19
5.6.1.	Test Limit	19
5.6.2.	Test Procedure	19
5.6.3.	Test Setting	19
5.6.4.	Test Setup	20
5.6.5.	Test Result	20
5.7.	Radiated Spurious Emissions Measurement.....	21
5.7.1.	Test Limit	21
5.7.2.	Test Procedure	21
5.7.3.	Test Setting	21
5.7.4.	Test Setup	22
5.7.5.	Test Result	23
Appendix A - Test Result		24
A.1	Occupied Bandwidth Test Result.....	24
A.2	Frequency Stability Test Result	29
A.3	Conducted Output Power Test Result	30
A.4	Band Edge Test Result	38
A.5	Conducted Spurious Emissions Test Result	42
A.6	Radiated Suprious Emissions Test Result	46
Appendix B - Test Setup Photograph		47
Appendix C - EUT Photograph		48

1. General Information

1.1. Applicant

Quectel Wireless Solutions Co., Ltd

Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233

1.2. Manufacturer

Quectel Wireless Solutions Co., Ltd

Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233

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
☐	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 2 nd 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	5G Sub-6 GHz LGA Module
Model No.	RG525F-NA
Brand Name	Quectel
IMEI	Conducted Measurement 1: 860465060012444 Conducted Measurement 2: 860465060013152 Radiated Measurement: 860465060012444
E-UTRA Band	Band 2, 4, 5, 7, 12, 13, 14, 17, 25, 26, 30, 38, 41, 42, 43, 48, 66, 71
5G NR Band	n2, n5, n7, n12, n13, n14, n25, n26, n30, n38, n41, n48, n66, n71, n77, n78
Operating Temperature	-30 ~ 75 °C
Power Type	3.3 ~ 4.4Vdc, typical 3.8Vdc
Remark: The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.	

1.5. Radio Specification under Test

FDD Tx Frequency Range	Band 26: 814 ~ 824 MHz
FDD Rx Frequency Range	Band 26: 859 ~ 869 MHz
Modulation	UL & DL up to 256QAM
Remark: - For other features of this EUT, test report will be issued separately. - LTE band 26 transmit frequency for part 90 rule is 814 ~ 824MHz and part 22 rule is 824 ~ 849MHz. ERP over 15MHz bandwidth complies the ERP limit line of part 22 rule, therefore ERP of the partial frequency spectrum which falls within part 22 also complies.	

1.6. Description of Available Antennas

Technology	Frequency Range (MHz)	Antenna Type	MaxPeak Gain (dBi)
LTE Band 2	1850 ~ 1910	Dipole	1.37
LTE Band 4	1710 ~ 1755		1.37
LTE Band 5	824 ~ 849		1.20
LTE Band 7	2500 ~ 2570		1.75
LTE Band 12	699 ~ 716		-2.60
LTE Band 13	777 ~ 787		-0.50
LTE Band 14	788 ~ 798		0.00
LTE Band 17	704~ 716		-1.50
LTE Band 25	1850 ~ 1915		1.37
LTE Band 26	814 ~ 849		1.20
LTE Band 30	2305 ~ 2315		1.10
LTE Band 38	2570 ~ 2620		1.60
LTE Band 41	2496 ~ 2690		1.80
LTE Band 42	3450 ~ 3550		0.95
LTE Band 43	3700 ~ 3800		0.60
LTE Band 48	3550 ~ 3700		0.60
LTE Band 66	1710 ~ 1780		1.37
LTE Band 71	663 ~ 698		-2.60

Note: All antenna information (Antenna type and Peak Gain) is provided by the manufacturer.

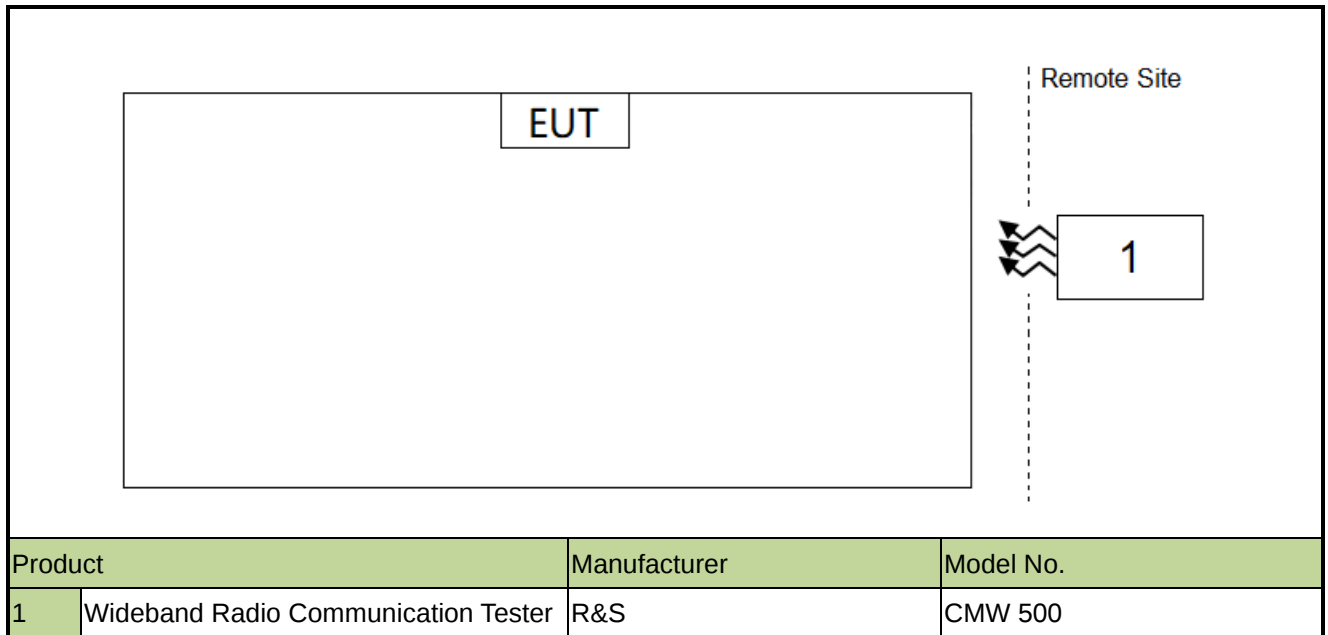
1.7. Test Methodology

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

- ANSI C63.26:2015
- FCC CFR 47 Part 90
- FCC KDB 971168 D01 v03r01: Power Meas License Digital Systems
- FCC KDB 971168 D02 v02r01: Misc Rev Approv License Devices
- FCC KDB 412172 D01 v01r01: Determining ERP and EIRP

2. Test Configuration

2.1. Test System Connection Diagram



2.2. Test Environment Condition

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

3. Measuring Instrument

Instrument	Manufacturer	Model No.	Asset No.	Cali. Interval	Cali. Due Date	Test Site
EMI Test Receiver	R&S	ESR3	MRTSUE06185	1 year	2022-12-28	SIP-AC2
EMI Test Receiver	R&S	ESR3	MRTSUE06185	1 year	2023-12-28	SIP-AC2
Preamplifier	EMCI	EMC184045SE	MRTSUE06602	1 year	2023-10-10	SIP-AC2
EMI Test Receiver	R&S	ESR3	MRTSUE06613	1 year	2023-06-01	SIP-AC2
Preamplifier	EMCI	EMC001330	MRTSUE06643	1 year	2023-01-13	SIP-AC2
Loop Antenna	Schwarzbeck	FMZB 1519 B	MRTSUE06937	1 year	2023-03-14	SIP-AC2
Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06598	1 year	2023-11-05	SIP-AC2
Preamplifier	EMCI	EMC051845SE	MRTSUE06601	1 year	2023-11-22	SIP-AC2
Thermohygrometer	testo	608-H1	MRTSUE06623	1 year	2023-11-27	SIP-AC2
Thermohygrometer	testo	608-H1	MRTSUE06624	1 year	2023-11-27	SIP-AC2
TRILOG Antenna	Schwarzbeck	VULB 9168	MRTSUE06647	1 year	2023-07-13	SIP-AC2
Anechoic Chamber	RIKEN	SIP-AC2	MRTSUE06781	1 year	2022-12-22	SIP-AC2
Anechoic Chamber	RIKEN	SIP-AC2	MRTSUE06781	1 year	2023-12-22	SIP-AC2
Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06648	1 year	2023-10-22	SIP-AC2
Test loop antenna	MRT	d-2m	MRTSUE11131	N/A	N/A	SIP-AC2
Signal Analyzer	Keysight	N9010B	MRTSUE07028	1 year	2023-11-25	SIP-AC2/SIP-TR 1/SIP-SR1
Signal Analyzer	Keysight	N9010B	MRTSUE06559	1 year	2023-06-01	SIP-AC2 SIP-SR1
Signal Analyzer	Keysight	N9010B	MRTSUE06603	1 year	2023-10-25	SIP-AC2 SIP-SR1
Signal Analyzer	Keysight	N9020B	MRTSUE06604	1 year	2023-11-07	SIP-AC2 SIP-SR1
Communication Tester	R&S	CMU 200	MRTSUE06009	1 year	2023-08-23	SIP-SR1
Communication Tester	R&S	CMW500	MRTSUE06243	1 year	2023-10-08	SIP-SR1
Signal Generator	Keysight	E8257D	MRTSUE06453	1 year	2023-06-01	SIP-SR1
Thermohygrometer	testo	622	MRTSUE06629	1 year	2024-01-03	SIP-SR1
5G Wireless Test Platform	Keysight	E7515B	MRTSUE06903	1 year	2023-10-25	SIP-SR1
Signal Generator	Keysight	E8257D	MRTSUE06904	1 year	2023-10-25	SIP-SR1
DC POWER MODULE	Keysight	N6743B	MRTSUE06905	N/A	N/A	SIP-SR1
DC POWER MODULE	Keysight	N6743B	MRTSUE06906	N/A	N/A	SIP-SR1
Low-Profile Modular Power System Mainframe	Keysight	N6700C	MRTSUE06907	N/A	N/A	SIP-SR1
FR1 Switching Unit	Keysight	C8880A	MRTSUE06908	N/A	N/A	SIP-SR1
Signal Analyzer	Keysight	N9021B	MRTSUE06915	1 year	2022-12-28	SIP-SR1

Instrument	Manufacturer	Model No.	Asset No.	Cali. Interval	Cali. Due Date	Test Site
Signal Analyzer	Keysight	N9021B	MRTSUE06915	1 year	2023-12-28	SIP-SR1
Temperature Chamber	BAOYT	BYG-80CL	MRTSUE06932	1 year	2023-02-27	SIP-SR1
Shielding Room	MIX-BEP	SIP-SR1	MRTSUE06948	N/A	N/A	SIP-SR1
Signal Analyzer	Keysight	N9010B	MRTSUE06558	1 year	2023-06-01	SIP-TR1
Temperature Chamber	BAOYT	BYG-408CS	MRTSUE06847	1 year	2023-02-22	SIP-TR1
Communication Tester	R&S	CMW500	MRTSUE06881	1 year	2023-06-01	SIP-TR1
Thermohygrometer	testo	608-H1	MRTSUE11022	1 year	2023-11-01	SIP-TR1
Signal Analyzer	Keysight	N9030B	MRTSUE06395	1 year	2023-07-08	SIP-TR1
Signal Generator	R&S	SMU200A	MRTSUE06489	1 year	2023-02-22	SIP-TR1
USB Power Sensor	Keysight	U2021XA	MRTSUE06596	1 year	2023-08-23	SIP-TR1
Signal Generator	Keysight	N5182B	MRTSUE06605	1 year	2023-10-25	SIP-TR1
Signal Analyzer	Keysight	N9010B	MRTSUE07036	1 year	2023-03-31	SIP-TR1
USB Power Sensor	Agilent	U2021XA	MRTSUE06030	1 year	2023-10-08	SIP-TR1

Software	Version	Function
EMI Software	V3.0.0	EMI Test Software

4. Decision Rules and Measurement Uncertainty

4.1. Decision Rules

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4: 2012 Clause 8.2.
(Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

4.2. 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 Spurious Emissions
Measurement Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): Horizontal: 9kHz ~ 300MHz: 5.04dB 300MHz ~ 1GHz: 4.95dB 1GHz ~ 40GHz: 6.40dB Vertical: 9kHz ~ 300MHz: 5.24dB 300MHz ~ 1GHz: 6.03dB 1GHz ~ 40GHz: 6.40dB
Conducted Spurious Emissions
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
Occupied Bandwidth
Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 0.28%
Frequency Stability
Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 76.2Hz

5. Test Result

5.1. Summary

FCC Part Section(s)	Test Description	Test Condition	Verdict
2.1049	Occupied Bandwidth	Conducted	Pass
2.1055, 90.213	Frequency Stability		Pass
90.635	Conducted Output Power		Pass
2.1051, 90.691(a)	Band Edge		Pass
2.1051, 90.691(a)	Transmitter Spurious Emission		Pass
2.1053, 90.691(a)	Transmitter Spurious Emission	Radiated	Pass

Notes:

- 1) 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.
- 2) All supported modulation types were evaluated. The worst-case emission of modulation was selected. Therefore, the Frequency Stability, Channel Band Edge, Radiated & Conducted Spurious Emission were presented worst-case in the test report.

5.2. Occupied Bandwidth Measurement

5.2.1. Test Limit

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured.

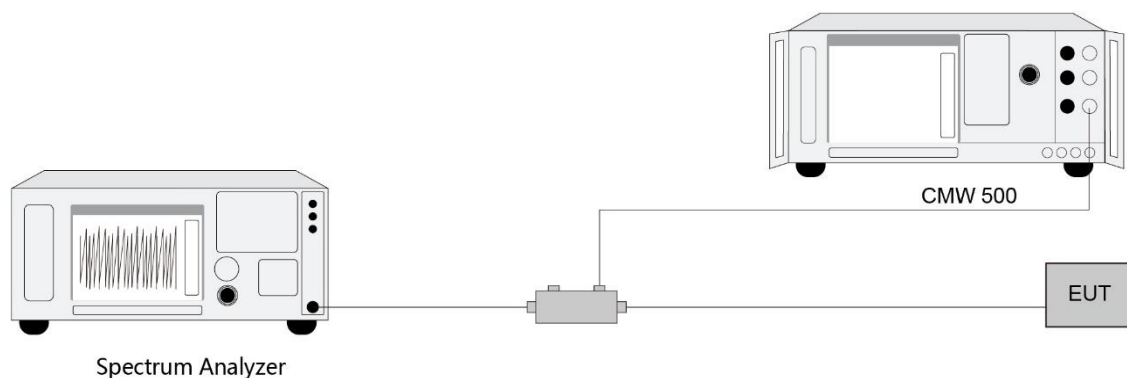
5.2.2. Test Procedure

ANSI C63.26-2015 - Section 5.4

5.2.3. Test Setting

1. Set center frequency to the nominal EUT channel center frequency
2. RBW = The nominal RBW shall be in the range of 1% to 5% of the anticipated OBW
3. $VBW \geq 3 \times RBW$
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. Allow the trace to stabilize
8. Use the 99% power bandwidth function of the instrument and report the measured bandwidth.

5.2.4. Test Setup



5.2.5. Test Result

Refer to Appendix A.1.

5.3. Frequency Stability Measurement

5.3.1. Test Limit

The frequency stability shall be measured by variation of ambient temperature and variation of primary supply voltage to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within $\pm 0.00025\%$ ($\pm 2.5\text{ppm}$) of the center frequency.

5.3.2. Test Procedure

ANSI C63.26-2015 - Section 5.6

5.3.3. Test Setting

Frequency Stability Under Temperature Variations:

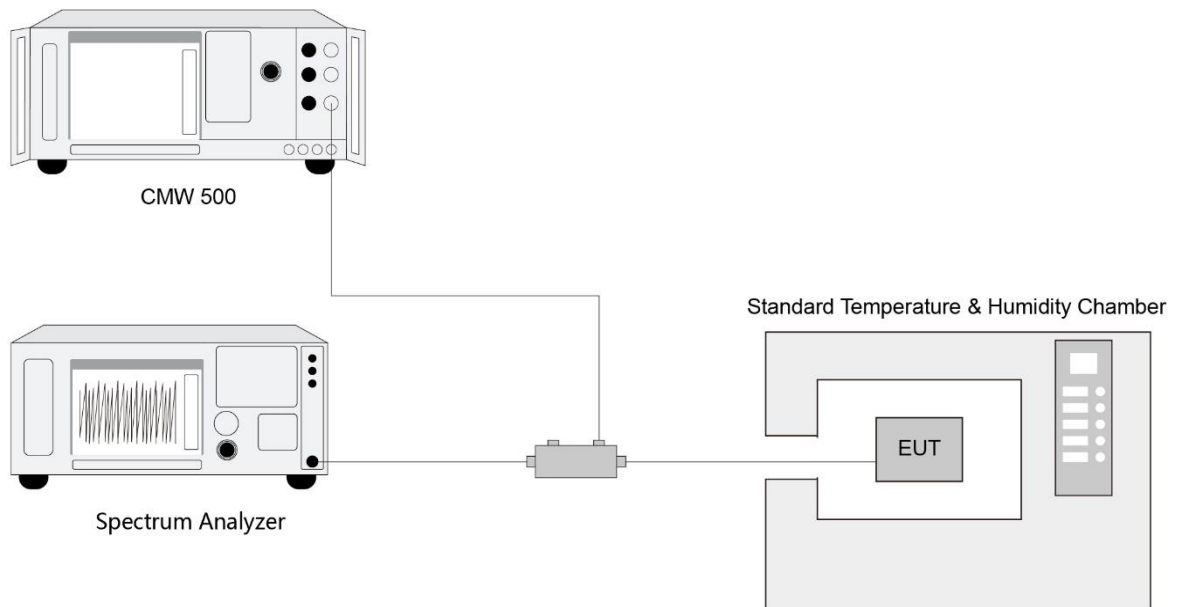
The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20°C operating frequency as reference frequency. Turn EUT off and set the chamber temperature to highest. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10°C decreased per stage until the lowest temperature reached.

Frequency Stability Under Voltage Variations:

Set chamber temperature to 20°C. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.

Reduce the input voltage to specify extreme voltage variation ($\pm 15\%$) and endpoint, record the maximum frequency change.

5.3.4. Test Setup



5.3.5. Test Result

Refer to Appendix A.2.

5.4. Conducted Output Power Measurement

5.4.1. Test Limit

The maximum output power of the transmitter for mobile stations is 100 watts (20dBw).

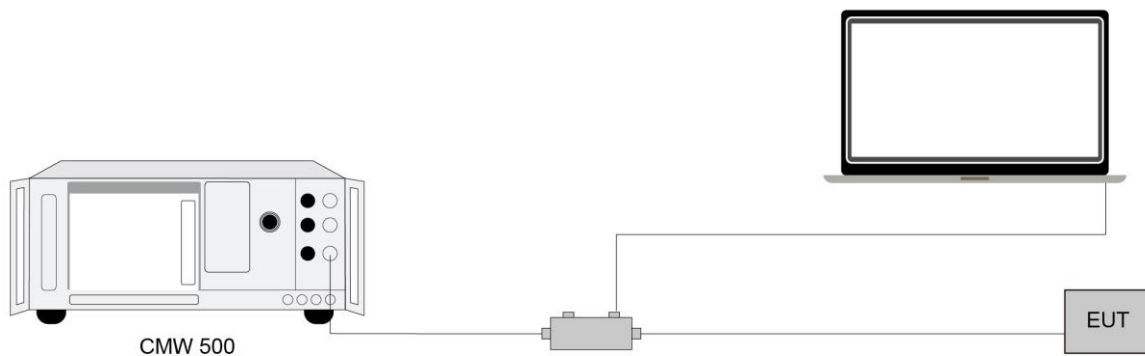
5.4.2. Test Procedure

ANSI C63.26-2015 - Section 5.2

5.4.3. Test Setting

Average power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter.

5.4.4. Test Setup



5.4.5. Test Result

Refer to Appendix A.3.

5.5. Band Edge Measurement

5.5.1. Test Limit

Out-of-band emission requirement shall apply only to the “outer” channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

- (1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $116 \log(f/6.1)$ decibels or $50 + 10 \log(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.
- (2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

5.5.2. Test Procedure

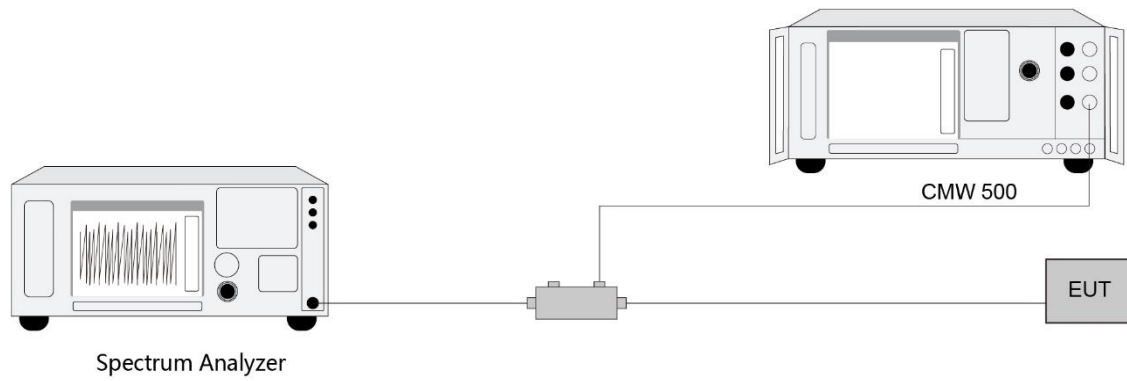
ANSI C63.26-2015 - Section 5.7

5.5.3. Test Setting

1. Set the analyzer frequency to low or high channel
2. $RBW \geq$ The nominal RBW shall be in the range of 1% of the anticipated OBW (in the 1MHz band immediately outside and adjacent to the band edge). For improvement of the accuracy in the measurement of the average power of a noise-like emission, a RBW narrower than the specified reference bandwidth can be used (generally limited to no less than 1% of the OBW), provided that a subsequent integration is performed over the full required measurement bandwidth. This integration should be performed using the spectrum analyzer's band power functions.
3. $VBW \geq 3 \cdot RBW$
4. Sweep time = auto
5. Detector = power averaging (rms)
6. Set sweep trigger to “free run.”
7. User gate triggered such that the analyzer only sweeps when the device is transmitting at full power
8. Trace average at least 100 traces in power averaging (rms) mode if sweep is set to auto-couple. To accurately determine the average power over the on and off time of the transmitter, it can be necessary to

increase the number of traces to be averaged above 100, or if using a manually configured sweep time, increase the sweep time.

5.5.4. Test Setup



5.5.5. Test Result

Refer to Appendix A.4.

5.6. Conducted Spurious Emissions Measurement

5.6.1. Test Limit

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst-case configuration. All modes of operation were investigated, and the worst-case configuration results are reported in this section.

For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $43 + 10\log_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

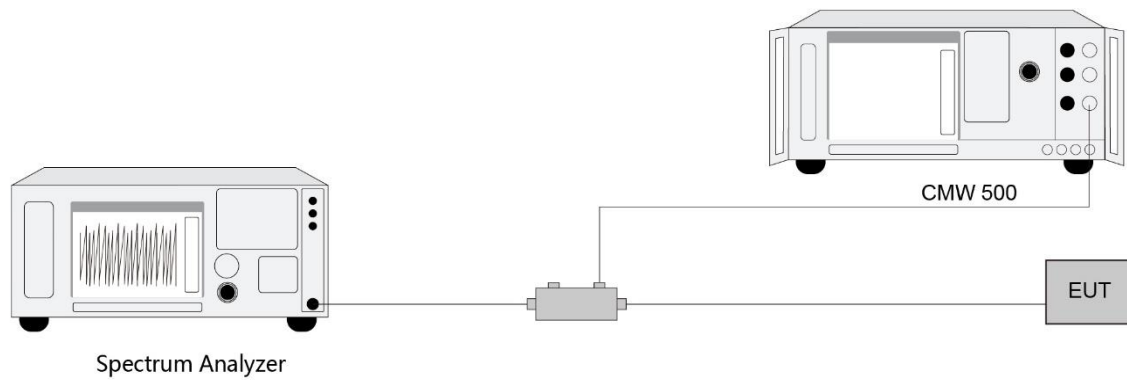
5.6.2. Test Procedure

ANSI C63.26-2015 - Section 5.7

5.6.3. Test Setting

1. Set the analyzer frequency to low, mid, high channel.
2. RBW = 1MHz
3. VBW $\geq 3 \times$ RBW
4. Sweep time = auto
5. Detector = power averaging (rms)
6. Set sweep trigger to "free run."
7. User gate triggered such that the analyzer only sweeps when the device is transmitting at full power.
8. Trace average at least 100 traces in power averaging (rms) mode if sweep is set to auto-couple. To accurately determine the average power over the on and off time of the transmitter, it can be necessary to increase the number of traces to be averaged above 100, or if using a manually configured sweep time, increase the sweep time.

5.6.4. Test Setup



5.6.5. Test Result

Refer to Appendix A.5.

5.7. Radiated Spurious Emissions Measurement

5.7.1. Test Limit

Out of band emissions: The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB. The emission limit equal to -13dBm.

E (dB μ V/m) = EIRP (dBm) - $20 \log D$ + 104.8; where D is the measurement distance in meters. The emission limit equal to 82.3dB μ V/m.

5.7.2. Test Procedure

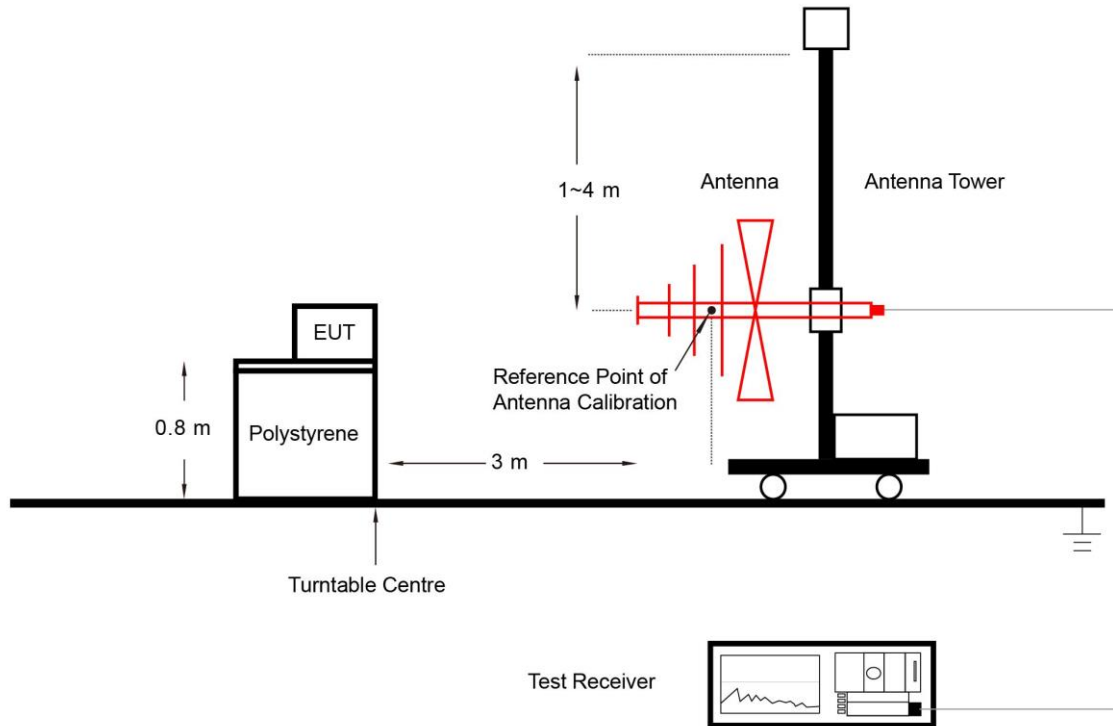
ANSI C63.26-2015 - Section 5.2.7 & 5.5

5.7.3. Test Setting

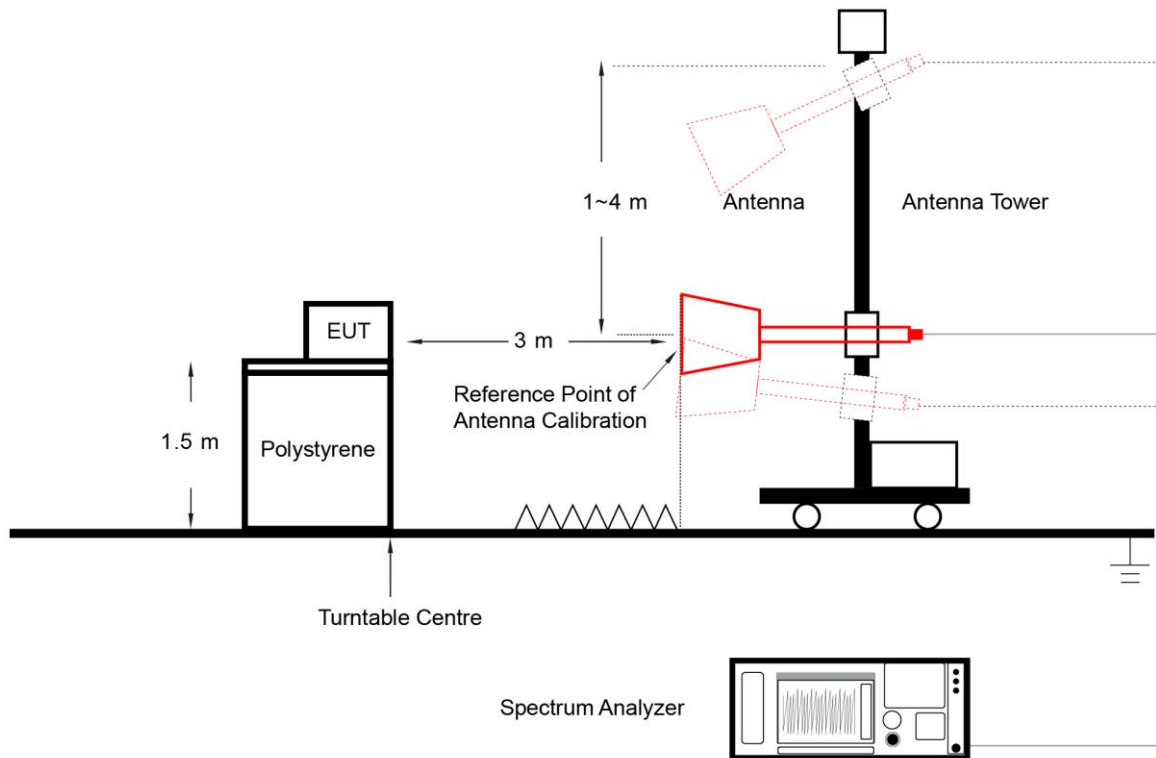
1. RBW = 1MHz
2. VBW $\geq 3 \times$ RBW
3. Sweep time $\geq 10 \times$ (number of points in sweep) $\times$ (transmission symbol period)
4. Detector = Peak
5. Trace mode = max hold
6. The trace was allowed to stabilize

5.7.4. Test Setup

Below 1GHz Test Setup:



Above 1GHz Test Setup:



5.7.5. Test Result

Refer to Appendix A.6.

Appendix A - Test Result

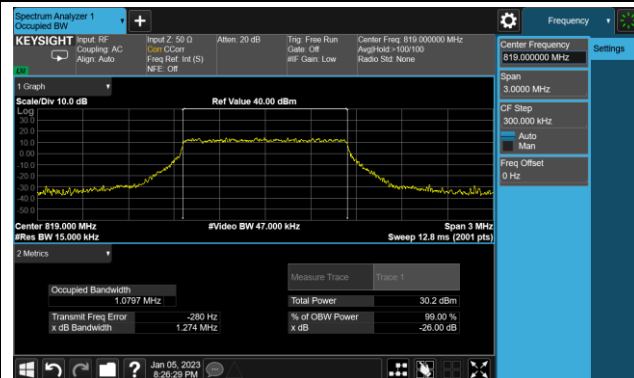
A.1 Occupied Bandwidth Test Result

Test Site	SIP-SR1	Test Engineer	Allen Zou
Test Date	2023-01-05	Test Band	LTE Band 26

Modulation	Frequency (MHz)	Bandwidth (MHz)	99% Bandwidth (MHz)
QPSK	819.0	1.4	1.0797
		3	2.6911
		5	4.4734
		10	8.9865
16QAM	819.0	1.4	1.0857
		3	2.6817
		5	4.4859
		10	8.9644
64QAM	819.0	1.4	1.0793
		3	2.6830
		5	4.4718
		10	8.9575
256QAM	819.0	1.4	1.0826
		3	2.6853
		5	4.4851
		10	8.9475
QPSK	821.5	15	13.390
16QAM			13.405
64QAM			13.416
256QAM			13.401

99% Bandwidth - QPSK

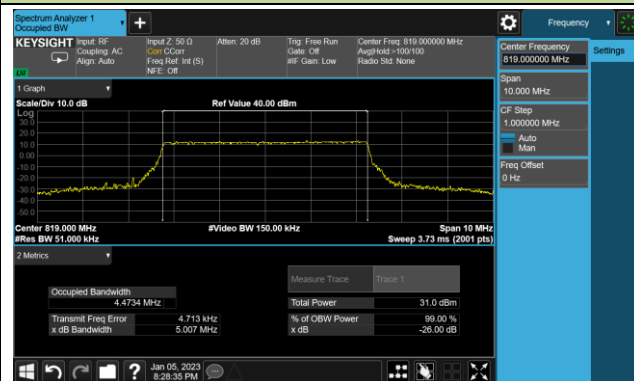
1.4MHz Channel Bandwidth



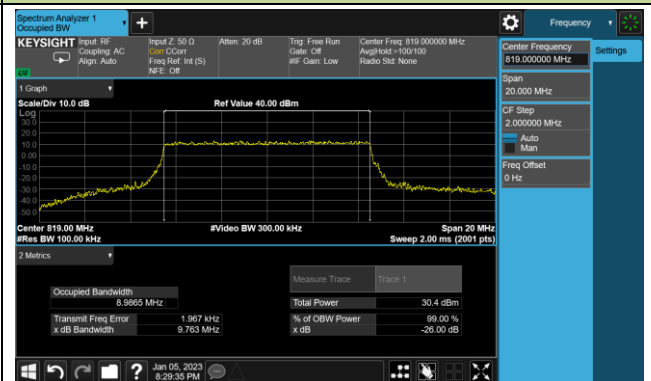
3MHz Channel Bandwidth



5MHz Channel Bandwidth



10MHz Channel Bandwidth

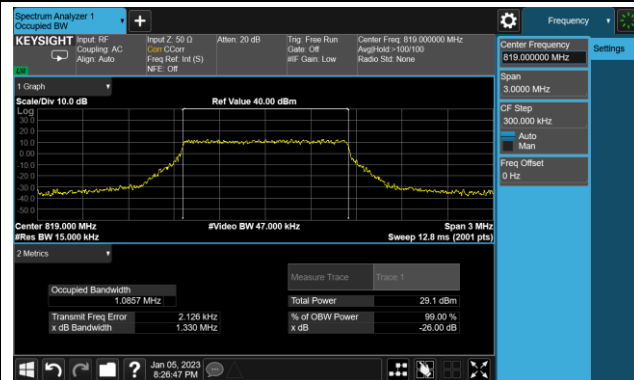


15MHz Channel Bandwidth

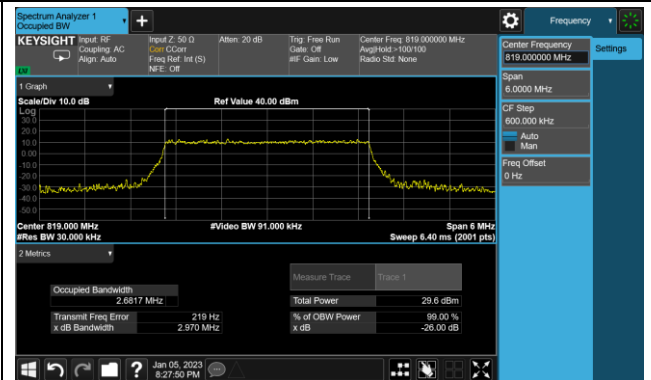


99% Bandwidth - 16QAM

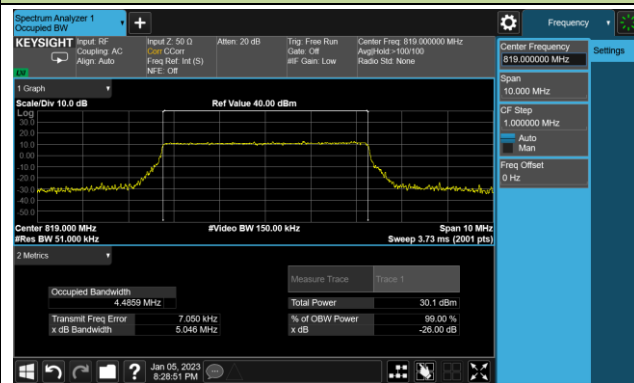
1.4MHz Channel Bandwidth



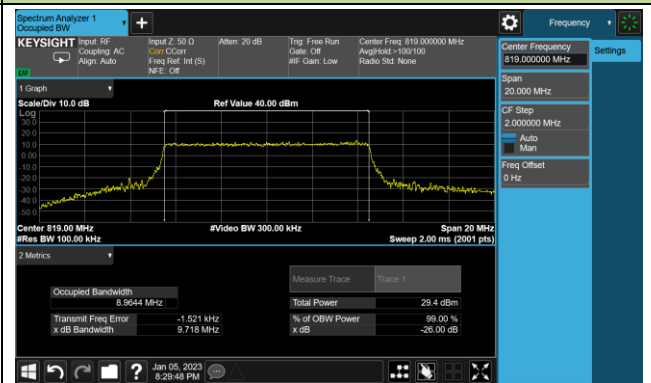
3MHz Channel Bandwidth



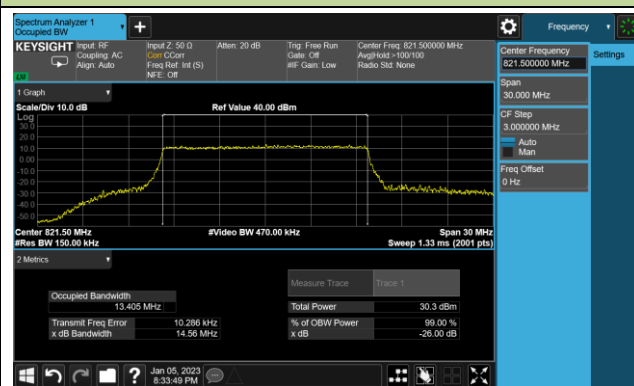
5MHz Channel Bandwidth



10MHz Channel Bandwidth

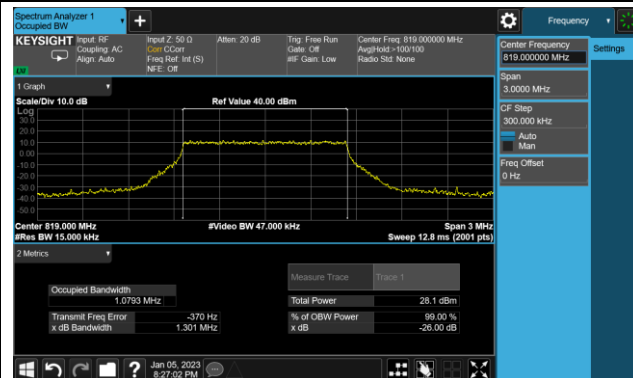


15MHz Channel Bandwidth

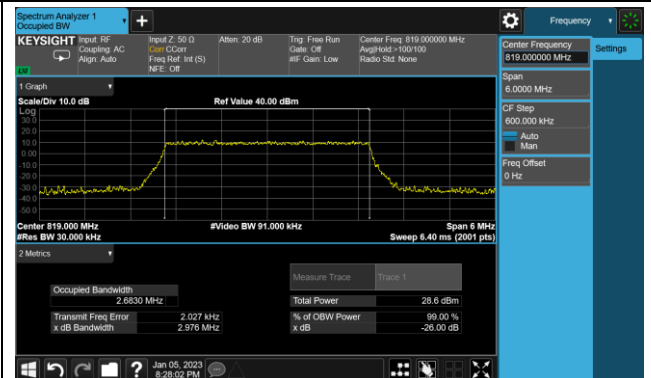


99% Bandwidth - 64QAM

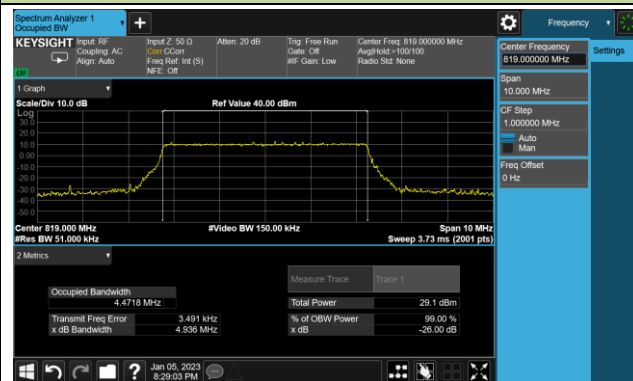
1.4MHz Channel Bandwidth



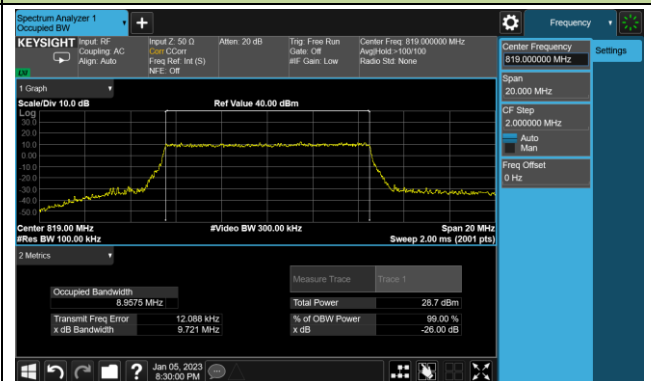
3MHz Channel Bandwidth



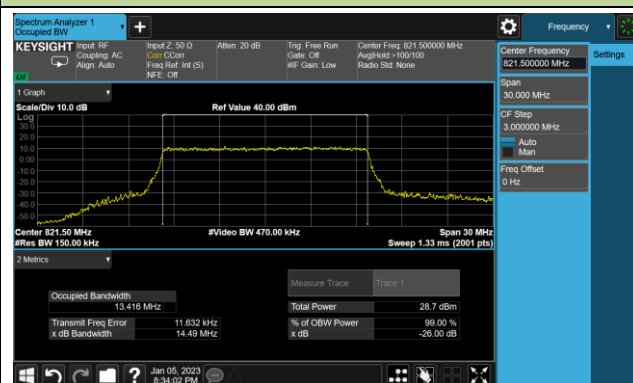
5MHz Channel Bandwidth



10MHz Channel Bandwidth

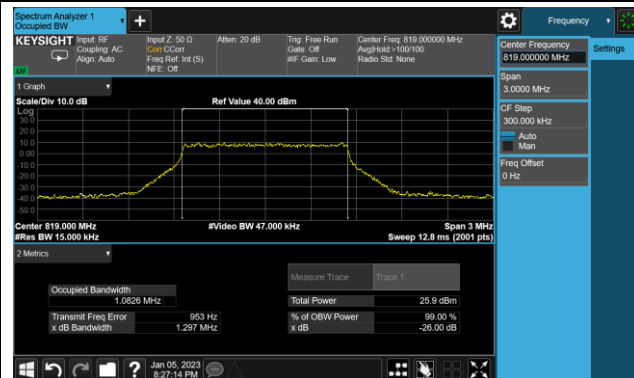


15MHz Channel Bandwidth

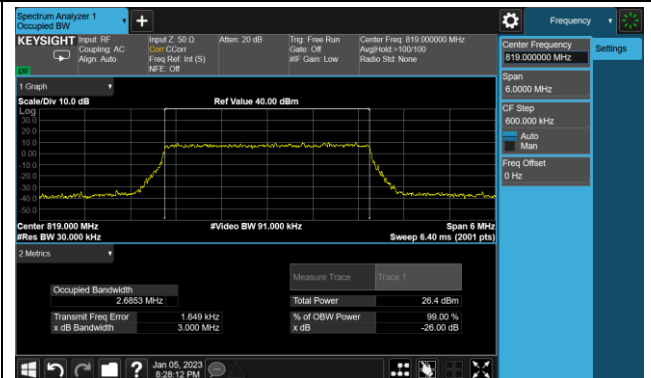


99% Bandwidth - 256QAM

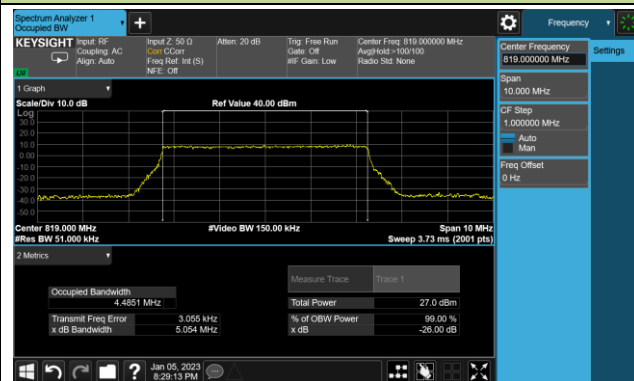
1.4MHz Channel Bandwidth



3MHz Channel Bandwidth



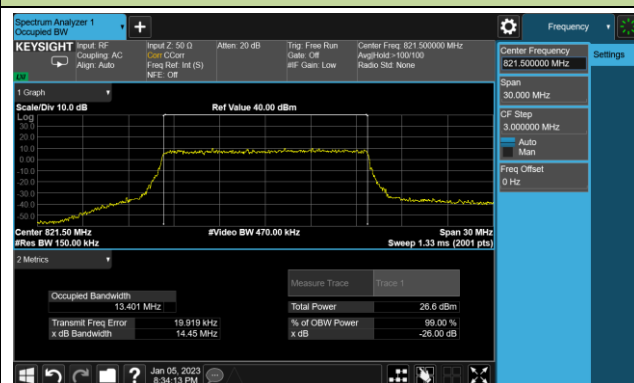
5MHz Channel Bandwidth



10MHz Channel Bandwidth



15MHz Channel Bandwidth



A.2 Frequency Stability Test Result

Test Site	SIP-TR1	Test Engineer	Allen Zou
Test Date	2023-02-03	Test Band	LTE Band 26

Power (Vdc)	Temp. (°C)	Frequency Tolerance (ppm)
3.8	- 30	0.0013
	- 20	0.0017
	- 10	0.0021
	0	0.0009
	+ 10	0.0012
	+ 20 (Ref)	0.0000
	+ 30	-0.0069
	+ 40	0.0011
	+ 50	0.0014
4.4	+ 20	0.0000
3.3	+ 20	0.0004

A.3 Conducted Output Power Test Result

Test Site	SIP-SR1	Test Engineer	Allen Zou
Test Date	2023-01-16	Test Band	LTE Band 26

Frequency (MHz)	Channel Bandwidth (MHz)	RB Size	RB Offset	Output Power (dBm)	Output Power (W)	Limit (W)
QPSK						
814.7	1.4	1	0	22.47	0.1766	< 100
819.0				22.45	0.1758	< 100
823.3				22.60	0.1820	< 100
814.7	1.4	1	2	2.53	0.0018	< 100
819.0				22.56	0.1803	< 100
823.3				22.62	0.1828	< 100
814.7	1.4	1	6	22.52	0.1786	< 100
819.0				22.59	0.1816	< 100
823.3				22.58	0.1811	< 100
814.7	1.4	6	0	21.61	0.1449	< 100
819.0				21.64	0.1459	< 100
823.3				21.59	0.1442	< 100
815.5	3	1	0	22.53	0.1791	< 100
819.0				22.57	0.1807	< 100
822.5				22.52	0.1786	< 100
815.5	3	1	7	22.63	0.1832	< 100
819.0				22.64	0.1837	< 100
822.5				22.63	0.1832	< 100
815.5	3	1	14	22.59	0.1816	< 100
819.0				22.55	0.1799	< 100
822.5				22.59	0.1816	< 100
815.5	3	15	0	21.66	0.1466	< 100
819.0				21.65	0.1462	< 100
822.5				21.69	0.1476	< 100

Frequency (MHz)	Channel Bandwidth (MHz)	RB Size	RB Offset	Output Power (dBm)	Output Power (W)	Limit (W)
QPSK						
816.5	5	1	0	22.58	0.1811	< 100
819.0				22.64	0.1837	< 100
821.5				22.65	0.1841	< 100
816.5	5	1	12	22.75	0.1884	< 100
819.0				22.75	0.1884	< 100
821.5				22.76	0.1888	< 100
816.5	5	1	24	22.66	0.1845	< 100
819.0				22.65	0.1841	< 100
821.5				22.66	0.1845	< 100
816.5	5	25	0	21.71	0.1483	< 100
819.0				21.71	0.1483	< 100
821.5				21.70	0.1479	< 100
819.0	10	1	0	22.63	0.1832	< 100
		1	24	22.66	0.1845	< 100
		1	49	22.63	0.1832	< 100
		50	0	21.74	0.1493	< 100
821.5	15	1	0	22.45	0.1758	< 100
		1	36	22.50	0.1778	< 100
		1	74	22.43	0.1750	< 100
		75	0	21.61	0.1449	< 100

Frequency (MHz)	Channel Bandwidth (MHz)	RB Size	RB Offset	Output Power (dBm)	Output Power (W)	Limit (W)
16QAM						
814.7	1.4	1	0	21.71	0.1483	< 100
819.0				21.65	0.1462	< 100
823.3				21.69	0.1476	< 100
814.7	1.4	1	2	21.78	0.1507	< 100
819.0				21.64	0.1459	< 100
823.3				21.76	0.1500	< 100
814.7	1.4	1	6	21.74	0.1493	< 100
819.0				21.72	0.1486	< 100
823.3				21.69	0.1476	< 100
814.7	1.4	6	0	20.65	0.1161	< 100
819.0				20.69	0.1172	< 100
823.3				20.63	0.1156	< 100
815.5	3	1	0	21.67	0.1469	< 100
819.0				21.74	0.1493	< 100
822.5				21.73	0.1489	< 100
815.5	3	1	7	21.78	0.1507	< 100
819.0				21.84	0.1528	< 100
822.5				21.87	0.1538	< 100
815.5	3	1	14	21.72	0.1486	< 100
819.0				21.78	0.1507	< 100
822.5				21.72	0.1486	< 100
815.5	3	15	0	20.69	0.1172	< 100
819.0				20.68	0.1169	< 100
822.5				20.65	0.1161	< 100

Frequency (MHz)	Channel Bandwidth (MHz)	RB Size	RB Offset	Output Power (dBm)	Output Power (W)	Limit (W)
16QAM						
816.5	5	1	0	21.73	0.1489	< 100
819.0				21.76	0.1500	< 100
821.5				21.77	0.1503	< 100
816.5	5	1	12	21.89	0.1545	< 100
819.0				21.86	0.1535	< 100
821.5				21.83	0.1524	< 100
816.5	5	1	24	21.85	0.1531	< 100
819.0				21.77	0.1503	< 100
821.5				21.84	0.1528	< 100
816.5	5	25	0	20.75	0.1189	< 100
819.0				20.74	0.1186	< 100
821.5				20.73	0.1183	< 100
819.0	10	1	0	21.83	0.1524	< 100
		1	24	21.87	0.1538	< 100
		1	49	21.82	0.1521	< 100
		50	0	20.75	0.1189	< 100
821.5	15	1	0	21.69	0.1476	< 100
		1	36	21.75	0.1496	< 100
		1	74	21.65	0.1462	< 100
		75	0	20.67	0.1167	< 100

Frequency (MHz)	Channel Bandwidth (MHz)	RB Size	RB Offset	Output Power (dBm)	Output Power (W)	Limit (W)
64QAM						
814.7	1.4	1	0	20.62	0.1153	< 100
819.0				20.69	0.1172	< 100
823.3				20.72	0.1180	< 100
814.7	1.4	1	2	20.79	0.1199	< 100
819.0				20.52	0.1127	< 100
823.3				20.78	0.1197	< 100
814.7	1.4	1	6	20.71	0.1178	< 100
819.0				20.87	0.1222	< 100
823.3				20.79	0.1199	< 100
814.7	1.4	6	0	19.65	0.0923	< 100
819.0				19.64	0.0920	< 100
823.3				19.68	0.0929	< 100
815.5	3	1	0	20.75	0.1189	< 100
819.0				20.72	0.1180	< 100
822.5				20.78	0.1197	< 100
815.5	3	1	7	20.89	0.1227	< 100
819.0				20.94	0.1242	< 100
822.5				20.78	0.1197	< 100
815.5	3	1	14	20.77	0.1194	< 100
819.0				20.65	0.1161	< 100
822.5				20.74	0.1186	< 100
815.5	3	15	0	19.68	0.0929	< 100
819.0				19.67	0.0927	< 100
822.5				19.69	0.0931	< 100

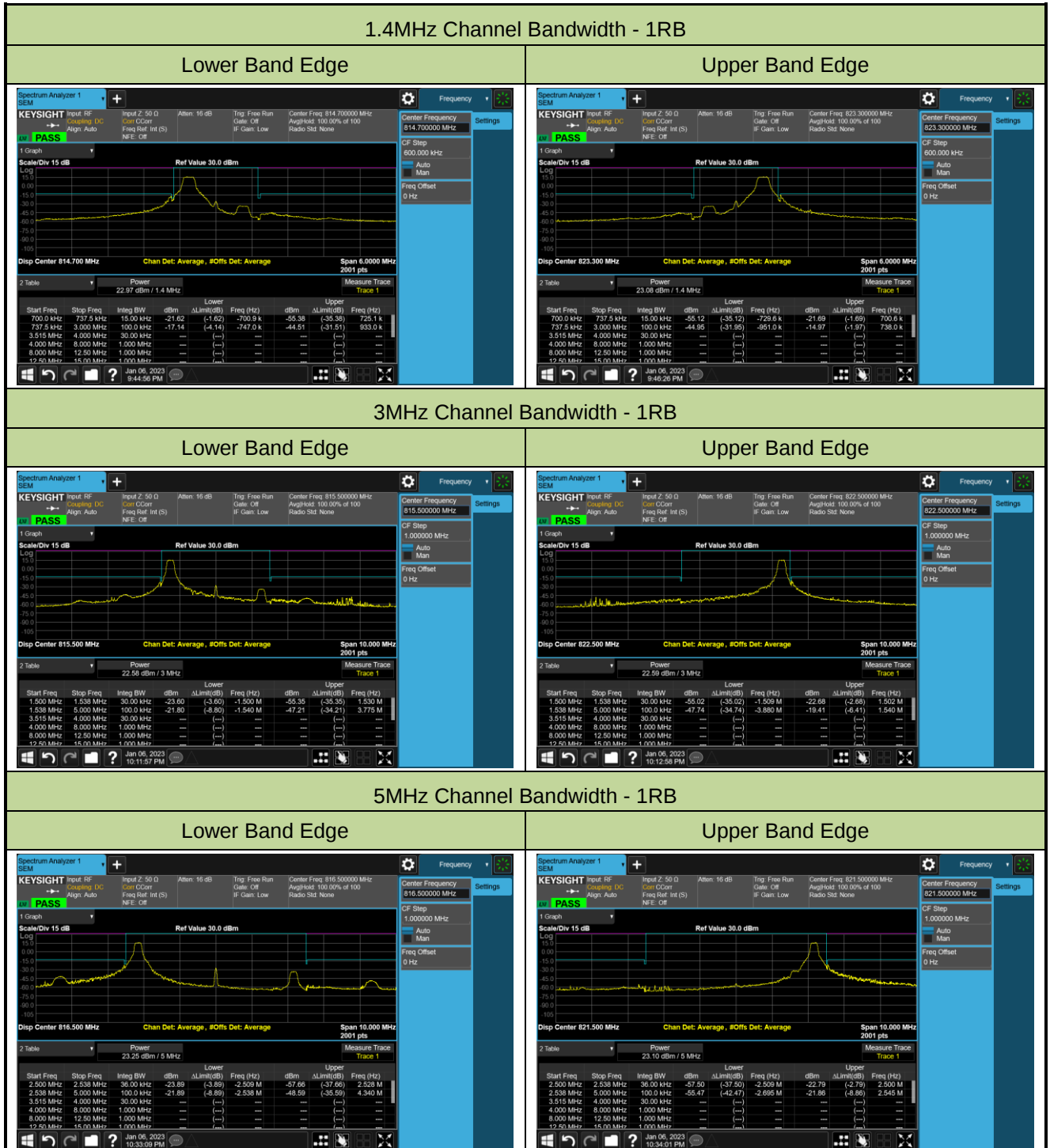
Frequency (MHz)	Channel Bandwidth (MHz)	RB Size	RB Offset	Output Power (dBm)	Output Power (W)	Limit (W)
64QAM						
816.5	5	1	0	20.82	0.1208	< 100
819.0				20.76	0.1191	< 100
821.5				20.79	0.1199	< 100
816.5	5	1	12	20.78	0.1197	< 100
819.0				20.87	0.1222	< 100
821.5				20.96	0.1247	< 100
816.5	5	1	24	20.82	0.1208	< 100
819.0				20.76	0.1191	< 100
821.5				20.87	0.1222	< 100
816.5	5	25	0	19.72	0.0938	< 100
819.0				19.73	0.0940	< 100
821.5				19.74	0.0942	< 100
819.0	10	1	0	20.80	0.1202	< 100
		1	24	20.84	0.1213	< 100
		1	49	20.79	0.1199	< 100
		50	0	19.74	0.0942	< 100
821.5	15	1	0	20.59	0.1146	< 100
		1	36	20.71	0.1178	< 100
		1	74	20.65	0.1161	< 100
		75	0	19.62	0.0916	< 100

Frequency (MHz)	Channel Bandwidth (MHz)	RB Size	RB Offset	Output Power (dBm)	Output Power (W)	Limit (W)
256QAM						
814.7	1.4	1	0	17.72	0.0592	< 100
819.0				17.64	0.0581	< 100
823.3				17.67	0.0585	< 100
814.7	1.4	1	2	17.77	0.0598	< 100
819.0				17.67	0.0585	< 100
823.3				17.68	0.0586	< 100
814.7	1.4	1	6	17.56	0.0570	< 100
819.0				17.67	0.0585	< 100
823.3				17.65	0.0582	< 100
814.7	1.4	6	0	17.55	0.0569	< 100
819.0				17.46	0.0557	< 100
823.3				17.54	0.0568	< 100
815.5	3	1	0	17.54	0.0568	< 100
819.0				17.59	0.0574	< 100
822.5				17.66	0.0583	< 100
815.5	3	1	7	17.81	0.0604	< 100
819.0				17.82	0.0605	< 100
822.5				17.82	0.0605	< 100
815.5	3	1	14	17.65	0.0582	< 100
819.0				17.73	0.0593	< 100
822.5				17.75	0.0596	< 100
815.5	3	15	0	17.66	0.0583	< 100
819.0				17.70	0.0589	< 100
822.5				17.66	0.0583	< 100

Frequency (MHz)	Channel Bandwidth (MHz)	RB Size	RB Offset	Output Power (dBm)	Output Power (W)	Limit (W)
256QAM						
816.5	5	1	0	17.77	0.0598	< 100
819.0				17.66	0.0583	< 100
821.5				17.74	0.0594	< 100
816.5	5	1	12	17.76	0.0597	< 100
819.0				17.86	0.0611	< 100
821.5				17.94	0.0622	< 100
816.5	5	1	24	17.80	0.0603	< 100
819.0				17.85	0.0610	< 100
821.5				17.86	0.0611	< 100
816.5	5	25	0	17.70	0.0589	< 100
819.0				17.69	0.0587	< 100
821.5				17.70	0.0589	< 100
819.0	10	1	0	17.73	0.0593	< 100
		1	24	17.84	0.0608	< 100
		1	49	17.79	0.0601	< 100
		50	0	17.72	0.0592	< 100
821.5	15	1	0	17.67	0.0585	< 100
		1	36	17.73	0.0593	< 100
		1	74	17.82	0.0605	< 100
		75	0	17.68	0.0586	< 100

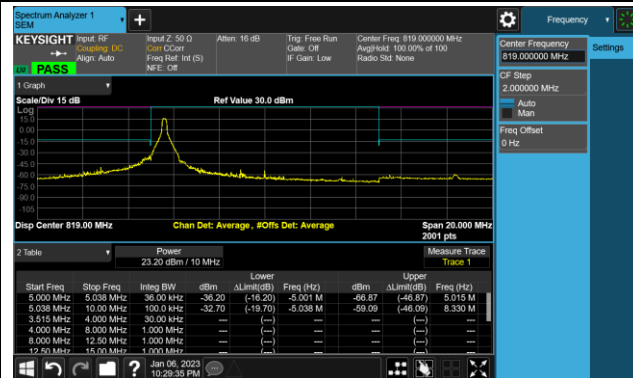
A.4 Band Edge Test Result

Test Site	SIP-SR1	Test Engineer	Allen Zou
Test Date	2023-01-06	Test Band	LTE Band 26

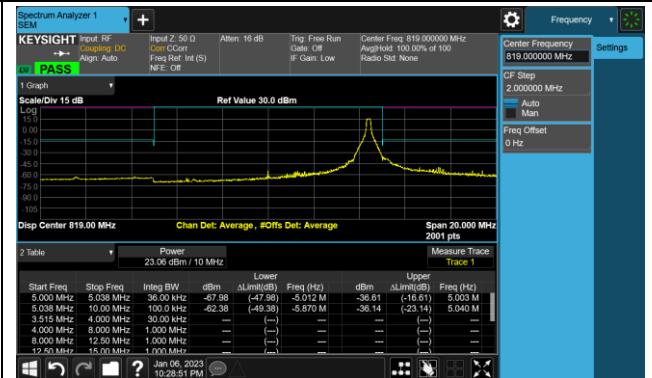


10MHz Channel Bandwidth - 1RB

Lower Band Edge

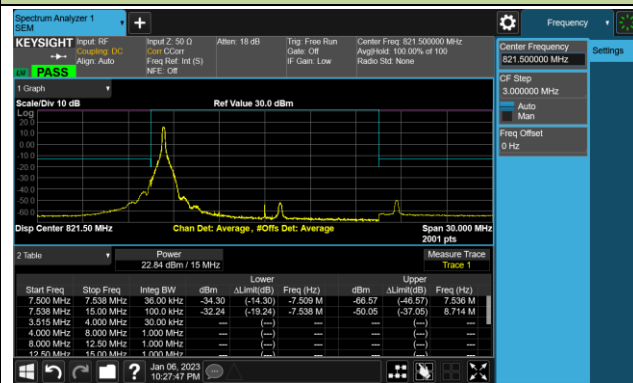


Upper Band Edge

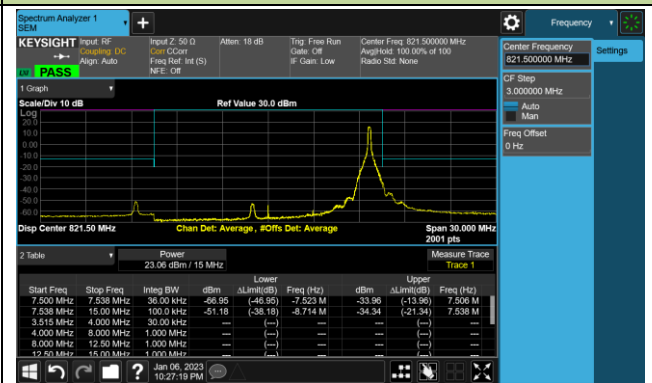


15MHz Channel Bandwidth - 1RB

Lower Band Edge

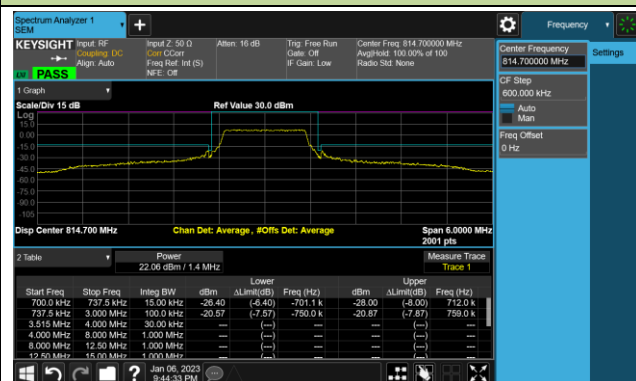


Upper Band Edge

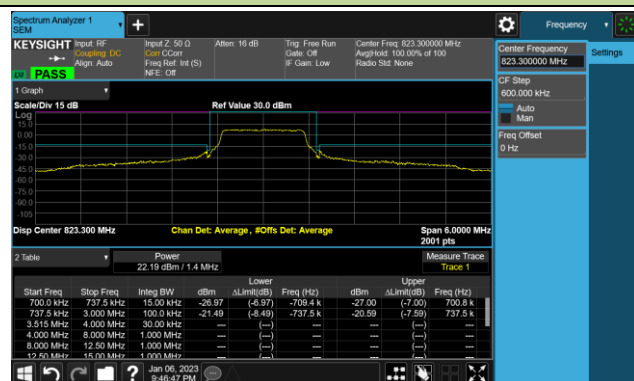


1.4MHz Channel Bandwidth - Full RB

Lower Band Edge

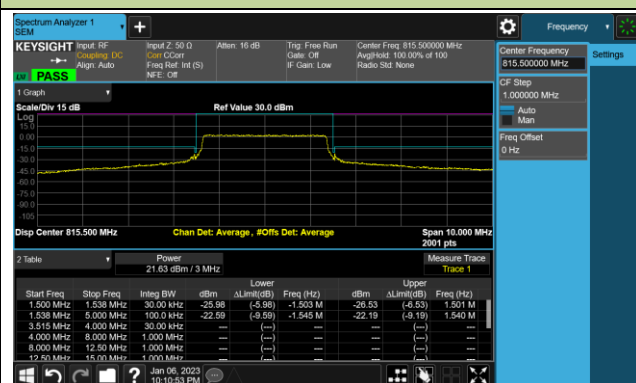


Upper Band Edge

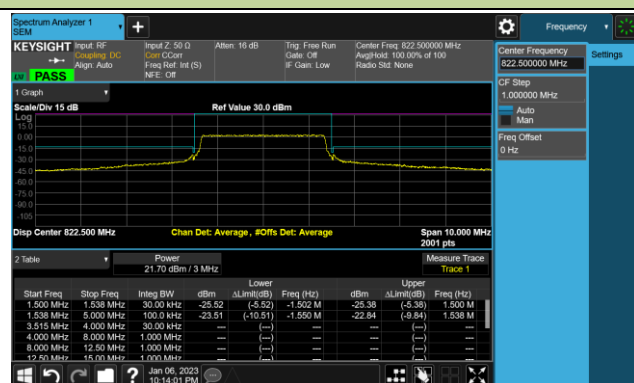


3MHz Channel Bandwidth - Full RB

Lower Band Edge

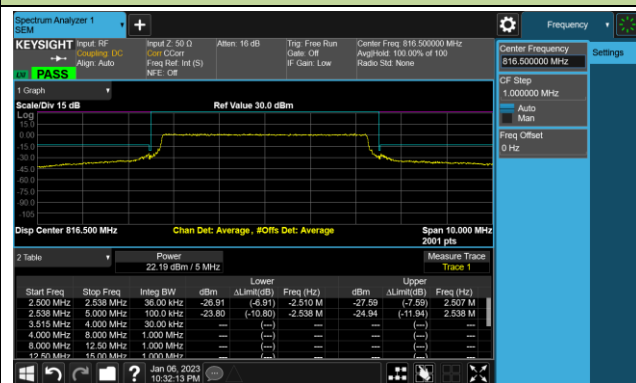


Upper Band Edge

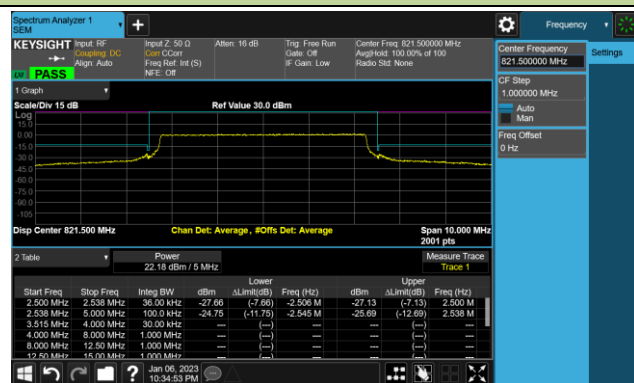


5MHz Channel Bandwidth - Full RB

Lower Band Edge

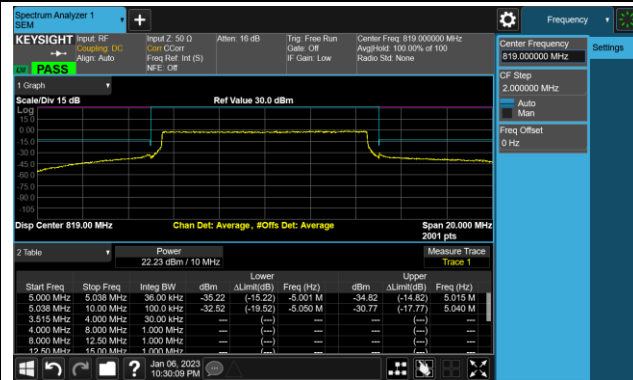


Upper Band Edge

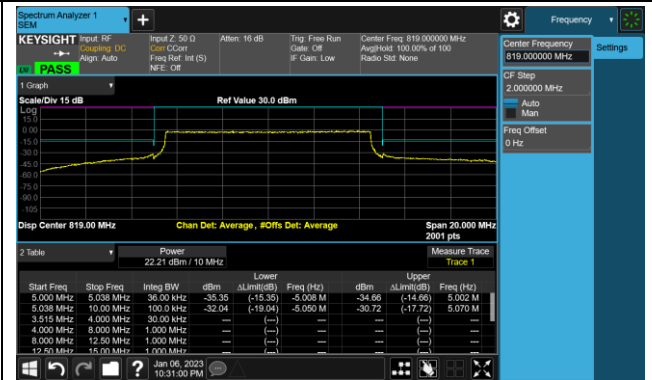


10MHz Channel Bandwidth - Full RB

Lower Band Edge

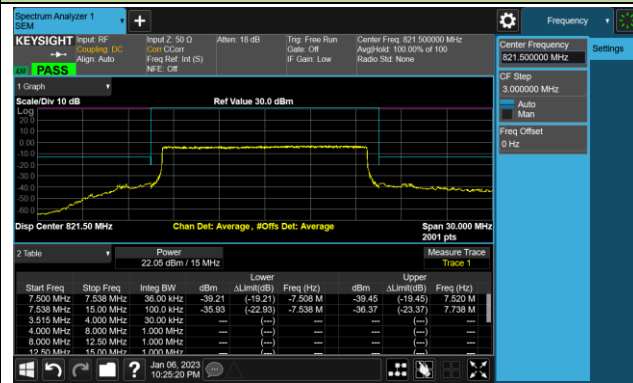


Upper Band Edge

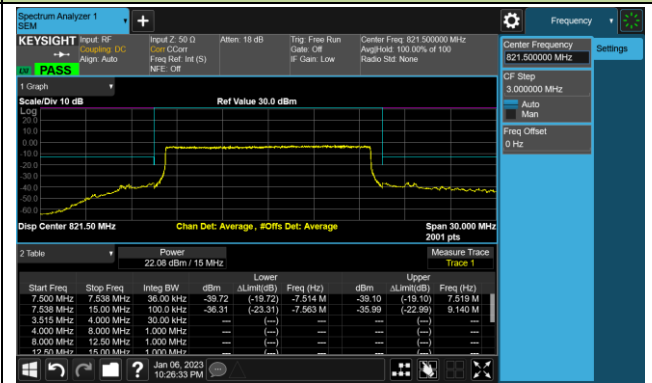


15MHz Channel Bandwidth - Full RB

Lower Band Edge



Upper Band Edge



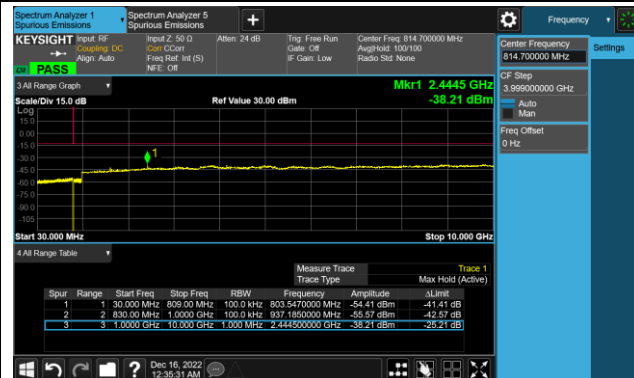
A.5 Conducted Spurious Emissions Test Result

Test Site	SIP-SR1	Test Engineer	Allen Zou
Test Date	2022-12-16	Test Band	LTE Band 26, 1RB, QPSK

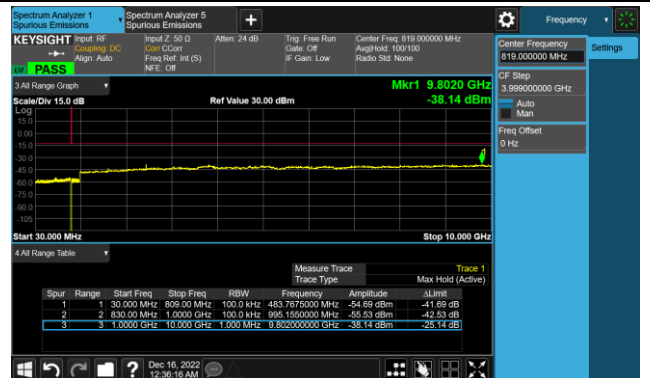
Frequency (MHz)	Channel Bandwidth (MHz)	Frequency Range (MHz)	Max Spurious Emissions (dBm)	Limit (dBm)	Result
814.7	1.4	30 ~ 10000	-38.21	≤ -13.00	Pass
819.0	1.4	30 ~ 10000	-38.14	≤ -13.00	Pass
823.3	1.4	30 ~ 10000	-36.18	≤ -13.00	Pass
815.5	3	30 ~ 10000	-38.09	≤ -13.00	Pass
819.0	3	30 ~ 10000	-38.22	≤ -13.00	Pass
822.5	3	30 ~ 10000	-36.50	≤ -13.00	Pass
816.5	5	30 ~ 10000	-37.21	≤ -13.00	Pass
819.0	5	30 ~ 10000	-37.40	≤ -13.00	Pass
821.5	5	30 ~ 10000	-37.25	≤ -13.00	Pass
819.0	10	30 ~ 10000	-37.56	≤ -13.00	Pass
821.5	15	30 ~ 10000	-37.08	≤ -13.00	Pass

1.4MHz Channel Bandwidth

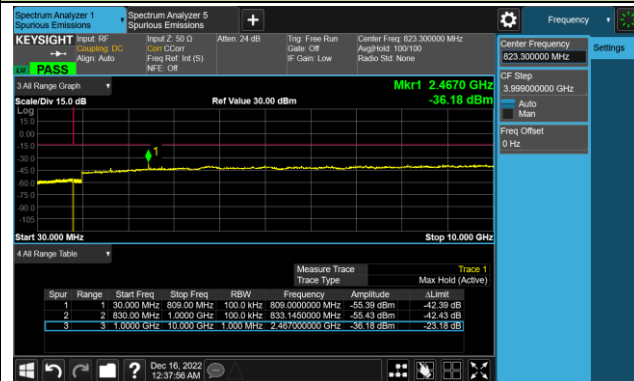
Low Channel



Middle Channel

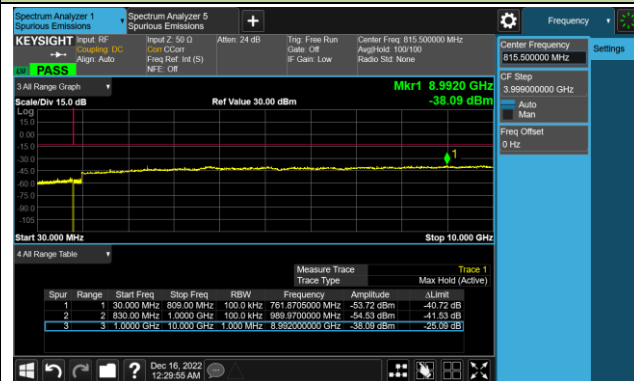


High Channel

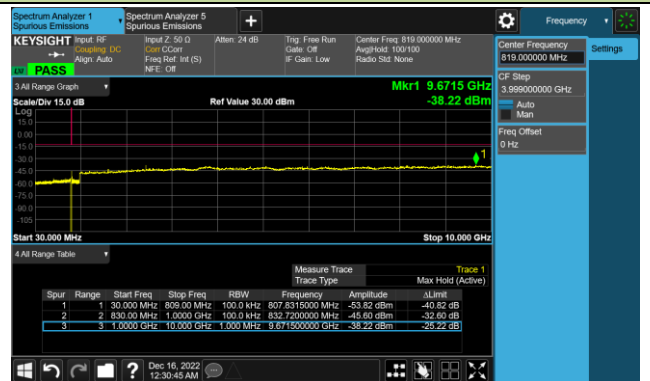


3MHz Channel Bandwidth

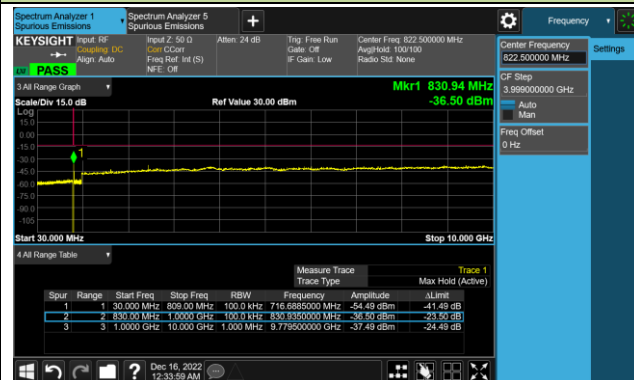
Low Channel



Middle Channel

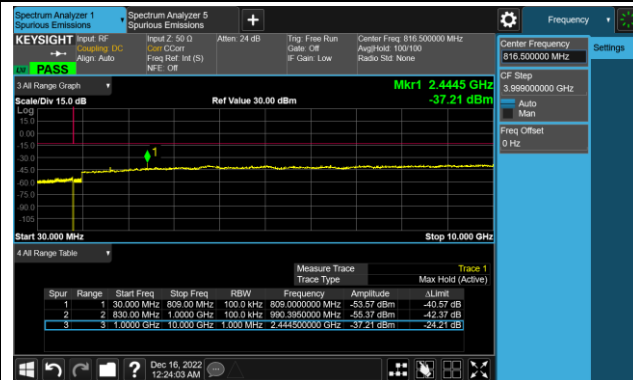


High Channel

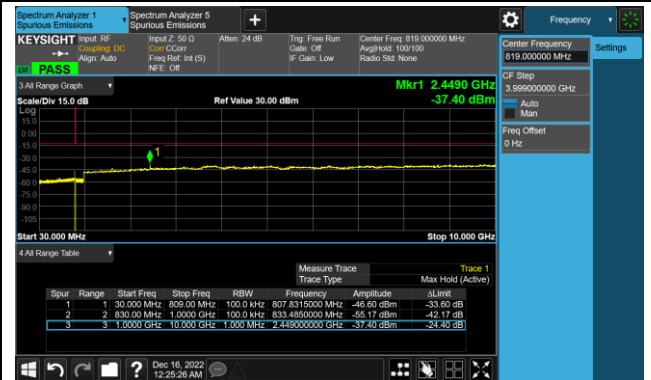


5MHz Channel Bandwidth

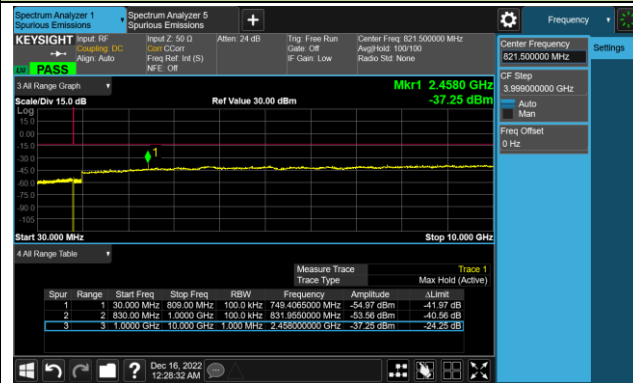
Low Channel



Middle Channel

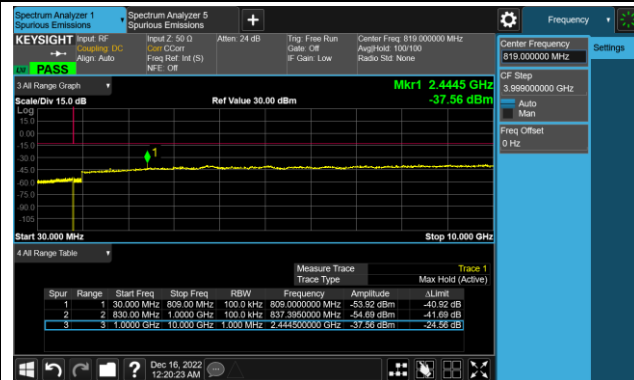


High Channel



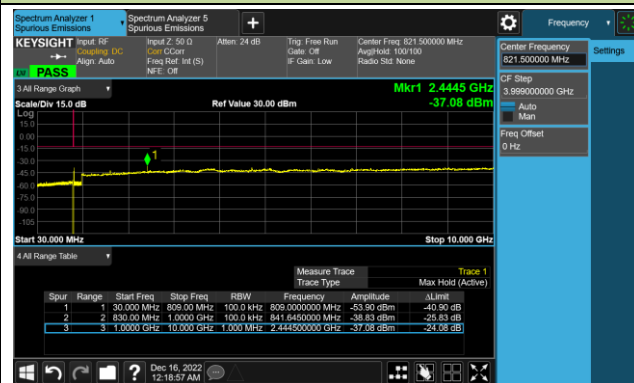
10MHz Channel Bandwidth

Middle Channel



15MHz Channel Bandwidth

Middle Channel



A.6 Radiated Suprious Emissions Test Result

Test Site	SIP-AC2	Test Engineer	Barry Wu & Mero Zhou
Test Date	2022-12-22~2022-12-23	Test Band	LTE Band 26, 1RB, QPSK

Frequency (MHz)	Reading Level (dBμV)	Factor (dB/m)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
Low Channel							
52.8	13.7	18.4	32.1	82.3	-50.2	Peak	Horizontal
695.9	15.7	27.1	42.8	82.3	-39.5	Peak	Horizontal
44.1	14.6	18.1	32.7	82.3	-49.6	Peak	Vertical
608.6	16.1	26.3	42.4	82.3	-39.9	Peak	Vertical
1628.0	51.6	-16.0	35.6	82.3	-46.7	Peak	Horizontal
1768.0	52.9	-14.2	38.7	82.3	-43.6	Peak	Horizontal
1628.0	54.9	-16.0	38.9	82.3	-43.4	Peak	Vertical
2464.0	57.0	-12.2	44.8	82.3	-37.5	Peak	Vertical
Middle Channel							
55.7	13.6	18.3	31.9	82.3	-50.4	Peak	Horizontal
662.0	15.4	26.3	41.7	82.3	-40.6	Peak	Horizontal
44.6	15.3	18.2	33.5	82.3	-48.8	Peak	Vertical
605.2	15.4	26.2	41.6	82.3	-40.7	Peak	Vertical
1636.0	50.1	-15.9	34.2	82.3	-48.1	Peak	Horizontal
4044.0	46.6	-4.8	41.8	82.3	-40.5	Peak	Horizontal
1636.0	54.9	-15.9	39.0	82.3	-43.3	Peak	Vertical
2464.0	57.4	-12.2	45.2	82.3	-37.1	Peak	Vertical
High Channel							
39.7	13.0	17.7	30.7	82.3	-51.6	Peak	Horizontal
639.6	14.9	26.4	41.3	82.3	-41.0	Peak	Horizontal
54.7	14.3	18.3	32.6	82.3	-49.7	Peak	Vertical
701.2	16.0	27.3	43.3	82.3	-39.0	Peak	Vertical
1864.0	46.9	-11.4	35.5	82.3	-46.8	Peak	Horizontal
5148.0	46.6	-3.5	43.1	82.3	-39.2	Peak	Horizontal
1644.0	56.1	-15.7	40.4	82.3	-41.9	Peak	Vertical
2464.0	51.4	-12.2	39.2	82.3	-43.1	Peak	Vertical

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

Appendix B - Test Setup Photograph

Refer to “2211RSU034-UT” file.

Appendix C - EUT Photograph

Refer to “2211RSU034-UE” file.