

MEASUREMENT REPORT

FCC PART 96


FCC ID: XMR2020EM120RGL

Application: Quectel Wireless Solutions Company Limited

Application Type: Certification

Product: LTE-A Cat 12 M.2 Module


Model No.: EM120R-GL

Brand Name: 

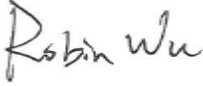
FCC Rule Part(s): Part 96

Test Procedure(s): ANSI C63.26-2015, KDB 971168 D01v03r01,
KDB 940660 D01v02

Test Date: June 19, 2020 ~ August 15, 2020

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
2006RSU085-U1	Rev. 01	Initial Report	08-20-2020	Valid

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General Information

Applicant:	Quectel Wireless Solutions Company Limited
Applicant Address:	Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233
Manufacturer:	Quectel Wireless Solutions Company Limited
Manufacturer Address:	Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233
Test Site:	MRT Technology (Suzhou) Co., Ltd
Test Site Address:	D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China

Test Facility / Accreditations

Measurements were performed at MRT Laboratory located in Tian'edang Rd., Suzhou, China.

- MRT facility is an FCC accredited testing laboratory (MRT Designation No. CN1166) on the FCC website.
- MRT facility is an ISED recognized testing laboratory (MRT Reg. No. CN0001) on the ISED website.
- MRT facility is a VCCI registered (R-20025, G-20034, C-20020, T-20020) test laboratory with the site description on file at VCCI Council.
- MRT Lab is accredited to ISO 17025 by the A2LA under the A2LA Program (Cert. No. 3628.01) and CNAS under the CNAS Program (Cert. No. L10551) in EMC, Safety, Radio, Telecommunications and SAR testing.

1. INTRODUCTION

1.1. Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Innovation, Science and Economic Development Canada and Certification and Engineering Bureau.


1.2. MRT Test Location

The map below shows the location of the MRT LABORATORY, its proximity to the Taihu Lake. These measurement tests were conducted at the MRT Technology (Suzhou) Co., Ltd. Facility located at D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2009 on September 30, 2013.



2. PRODUCT INFORMATION

2.1. Equipment Description

Product Name:	LTE-A Cat 12 M.2 Module
Model No.:	EM120R-GL
Brand Name:	
IMEI:	860459050000725
LTE Specification:	Band 2, 4, 5, 7, 12, 13, 14, 25, 26, 30, 38, 41, 48, 66
Intra-Band:	CA_41C
Category:	Category 12
Operating Temperature:	-25 ~ 75 °C
Power Type:	3.1 ~ 4.4Vdc, type 3.7Vdc

2.2. Product Specification Subjective to this Report

Frequency Range:	TDD Band 48: 3550 ~ 3700 MHz
Device Type:	End User Device
Type of Modulation:	QPSK, 16QAM, 64QAM, 256QAM (DL)

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

2.3. Description of Available Antennas

Technology	Frequency Range (MHz)	Antenna Type	Max Peak Gain (dBi)
LTE Band 2	1850 ~ 1910	Dipole Antenna	1.15
LTE Band 4	1710 ~ 1755		-0.50
LTE Band 5	824 ~ 849		1.85
LTE Band 7	2500 ~ 2570		1.32
LTE Band 12	699 ~ 716		-2.43
LTE Band 13	777 ~ 787		-0.10
LTE Band 14	788 ~ 798		2.40
LTE Band 25	1850 ~ 1915		1.15
LTE Band 26	814 ~ 849		1.85
LTE Band 30	2305 ~ 2315		-3.64
LTE Band 38	2570 ~ 2620		0.93
LTE Band 41	2496 ~ 2690		0.93
LTE Band 48	3550 ~ 3700		-3.37
LTE Band 66	1710 ~ 1780		-0.50

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

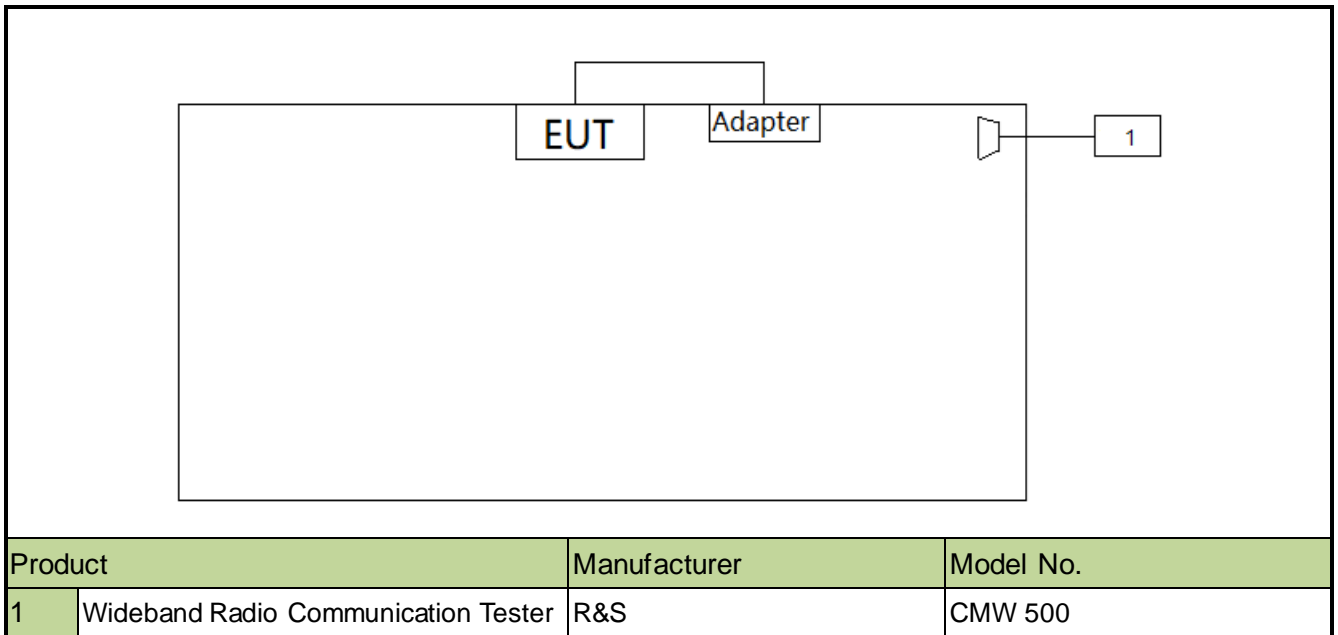
2.4. EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

2.5. Maximum Power, Frequency Tolerance, and Emission Designator

LTE Band 96		QPSK			16QAM			64QAM		
BW (MHz)	Freq. (MHz)	Designator	Tolerance (ppm)	Max Power Density (W/10MHz)	Designator	Tolerance (ppm)	Max Power Density (W/10MHz)	Designator	Tolerance (ppm)	Max Power Density (W/10MHz)
5	3552.5 ~ 3697.5	4M46G7D	-	0.2009	4M46W7D	-	0.1726	4M46W7D	-	0.1256
10	3555.0 ~ 3695.0	8M95G7D	-	0.1758	8M93W7D	-	0.1578	8M95W7D	-	0.1114
15	3557.5 ~ 3692.5	13M4G7D	-	0.1479	13M4W7D	-	0.1191	13M4W7D	-	0.0920
20	3560.0 ~ 3690.0	17M9G7D	0.0028	0.1059	17M9W7D	-	0.0841	17M9W7D	-	0.0697

2.6. Configuration of Tested System



2.7. Test Environment Condition

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

3. TEST EQUIPMENT CALIBRATION DATE

Radiated Emission - AC1

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2021/08/01
Wideband Radio Communication Tester	R&S	CMW 500	MRTSUE06243	1 year	2020/11/07
PXA Signal Analyzer	Keysight	9030B	MRTSUE06395	1 year	2020/09/03
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2020/11/10
Bilog Period Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	1 year	2021/03/31
Broad Band Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06023	1 year	2020/10/13
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06597	1 year	2021/02/23
Microwave System Amplifier	Agilent	83017A	MRTSUE06076	1 year	2020/11/15
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2021/06/11
Thermohygrometer	Testo	608-H1	MRTSUE06403	1 year	2021/08/08
Anechoic Chamber	TDK	Chamber-AC1	MRTSUE06212	1 year	2021/04/30

Radiated Emission - AC2

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Keysight	N9038A	MRTSUE06125	1 year	2021/08/01
Wideband Radio Communication Tester	R&S	CMW 500	MRTSUE06243	1 year	2020/11/07
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2020/11/10
Bilog Period Antenna	Schwarzbeck	VULB 9162	MRTSUE06022	1 year	2020/10/13
Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06171	1 year	2020/10/27
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06597	1 year	2021/02/23
Broadband Coaxial Preamplifier	Schwarzbeck	BBV 9718	MRTSUE06176	1 year	2020/11/15
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2021/06/11
Temperature/Humidity Meter	Minggao	ETH529	MRTSUE06170	1 year	2020/12/15
Anechoic Chamber	RIKEN	Chamber-AC2	MRTSUE06213	1 year	2021/04/30

Conducted Test Equipment

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EXA Signal Analyzer	Agilent	N9020A	MRTSUE06106	1 year	2021/04/15
EXA Signal Analyzer	Keysight	N9010B	MRTSUE06452	1 year	2021/07/11
Signal Analyzer	R&S	FSV40	MRTSUE06218	1 year	2021/04/15
Wideband Radio Communication Tester	R&S	CMW 500	MRTSUE06243	1 year	2020/11/07
Power Meter	Agilent	U2021XA	MRTSUE06030	1 year	2020/11/18
USB wideband power sensor	Keysight	U2021XA	MRTSUE06446	1 year	2021/06/30
USB wideband power sensor	Keysight	U2021XA	MRTSUE06447	1 year	2021/06/30
Bluetooth Test Set	Anritsu	MT8852B-042	MRTSUE06389	1 year	2021/06/13
Audio Analyzer	Agilent	U8903B	MRTSUE06143	1 year	2021/06/13
Modulation Analyzer	HP	8901A	MRTSUE06098	1 year	2020/10/10
Wideband Radio Communication Tester	R&S	CMW 500	MRTSUE06243	1 year	2020/11/07
DC Power Supply	GWINSTEK	DPS-3303C	MRTSUE06064	N/A	N/A
Temperature & Humidity Chamber	BAOYT	BYH-150CL	MRTSUE06051	1 year	2020/11/07
Thermohygrometer	testo	608-H1	MRTSUE06401	1 year	2021/08/08

Software	Version	Function
EMI Software	V3	EMI Test Software

4. 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 Limit	Test Condition	Test Result	Reference
2.1049	Occupied Bandwidth	N/A	Conducted	Pass	Section 5.2
2.1055	Frequency Stability	Refer to section 5.3		Pass	Section 5.3
96.41(b)	Equivalent Isotropic Radiated Power	Refer to section 5.4		Pass	Section 5.4
2.1051 96.41(e)	Spurious Emissions; Band Edge Emissions	Refer to section 5.5, 5.6		Pass	Section 5.5, 5.6
2.1053, 96.41(e)	Spurious Emissions	Refer to section 5.7	Radiated	Pass	Section 5.7
96.47	End User Device Additional Requirements (CBSD Protocol)	Refer to section 5.8		Pass	Section 5.8

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) Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations the worst-case was found.
- 3) All supported modulation types were evaluated. The worst-case emission of modulation was selected. Therefore, the Frequency Stability, Band Edge, Radiated & Conducted Spurious Emission were presented in the test report.
- 4) This report is supplemented to MRT Original "2006RSU008-U1" Report, FCC ID: XMR2020EM160RGL updating product name and model number.

5.2. Occupied Bandwidth

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.

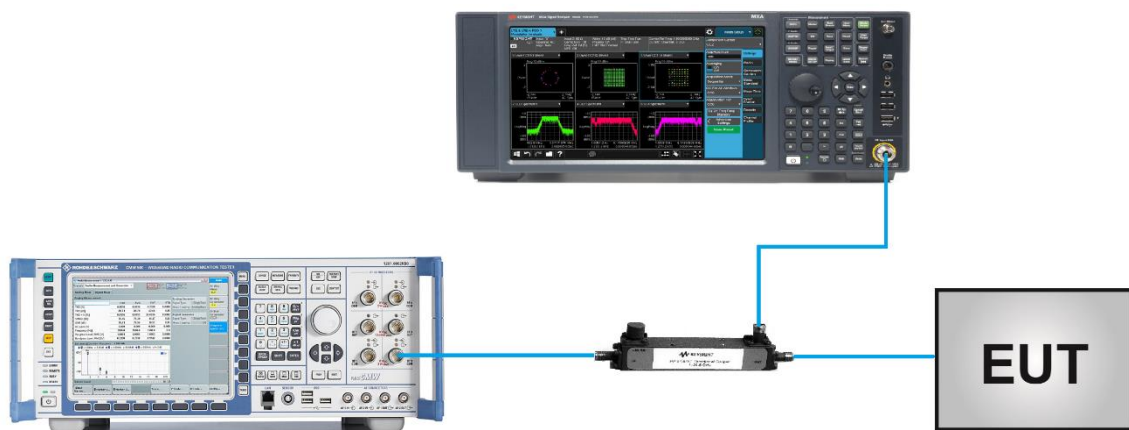
5.2.2. Test Procedure

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



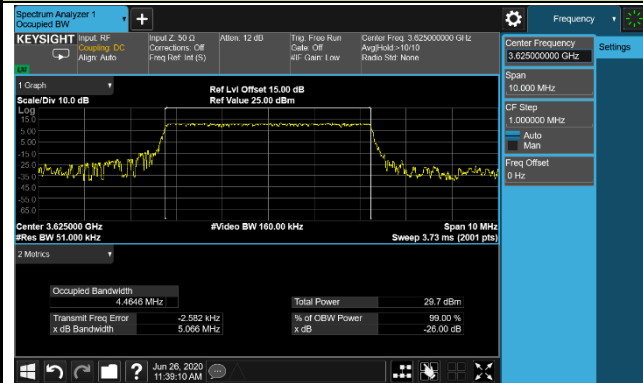
5.2.5. Test Result

Product	LTE-A Cat 12 M.2 Module	Test Engineer	Candy Luo
Test Date	2020/06/26	Test Site	TR3

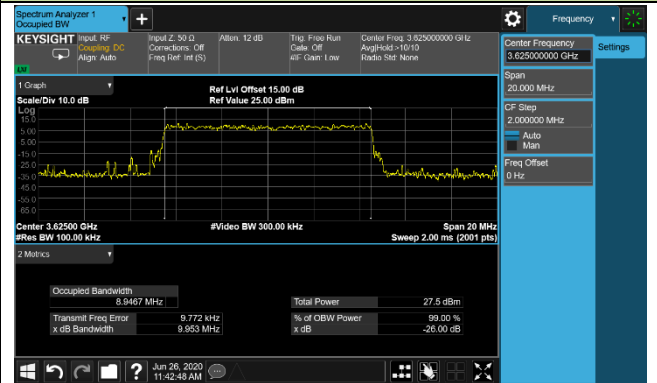
Modulation	Frequency (MHz)	Bandwidth (MHz)	99% Bandwidth (MHz)
QPSK	3625.0	5	4.46
		10	8.95
		15	13.39
		20	17.87
16QAM	3625.0	5	4.46
		10	8.93
		15	13.43
		20	17.88
64QAM	3625.0	5	4.46
		10	8.95
		15	13.43
		20	17.88

99% Bandwidth - QPSK

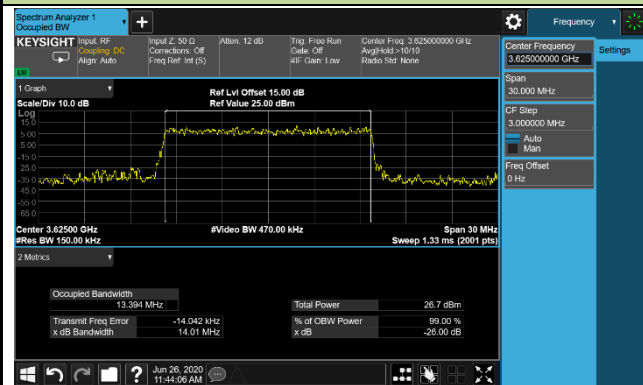
5MHz Channel Bandwidth



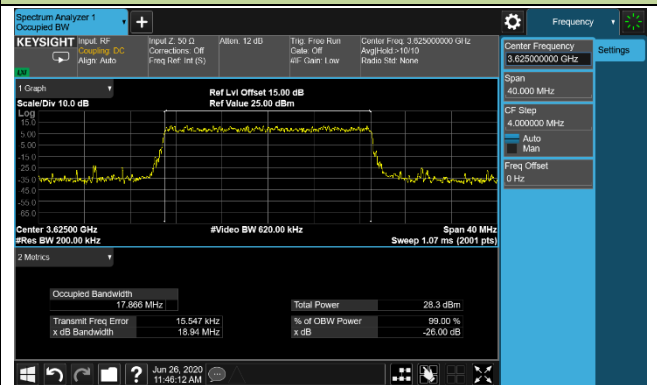
10MHz Channel Bandwidth



15MHz Channel Bandwidth

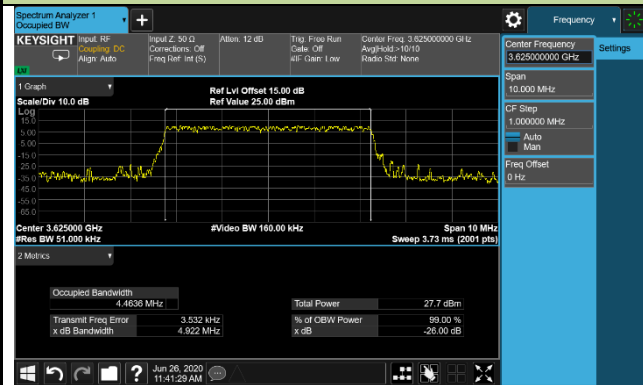


20MHz Channel Bandwidth

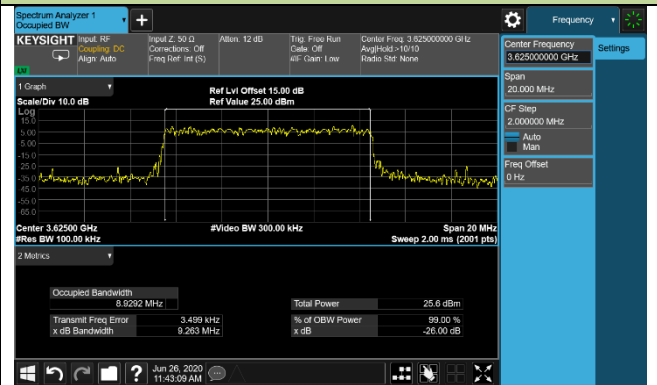


99% Bandwidth - 16QAM

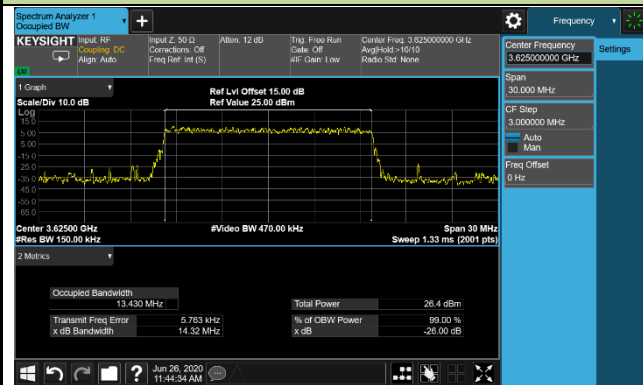
5MHz Channel Bandwidth



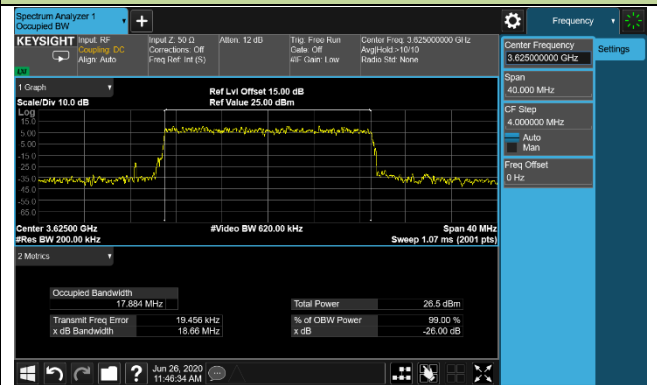
10MHz Channel Bandwidth



15MHz Channel Bandwidth

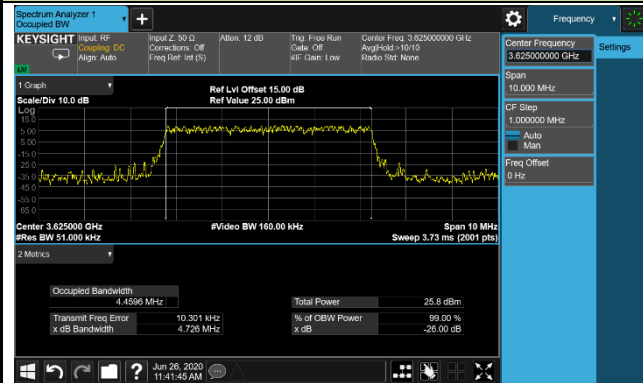


20MHz Channel Bandwidth

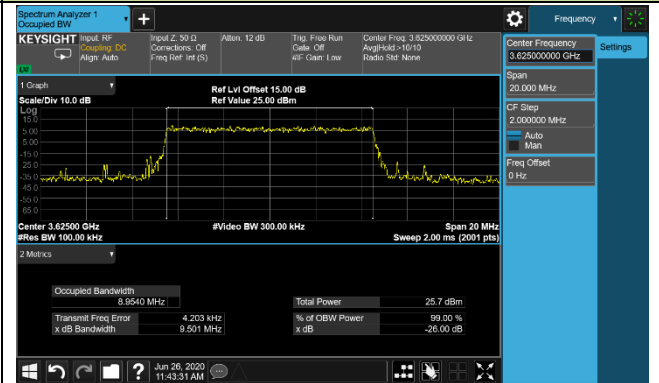


99% Bandwidth - 64QAM

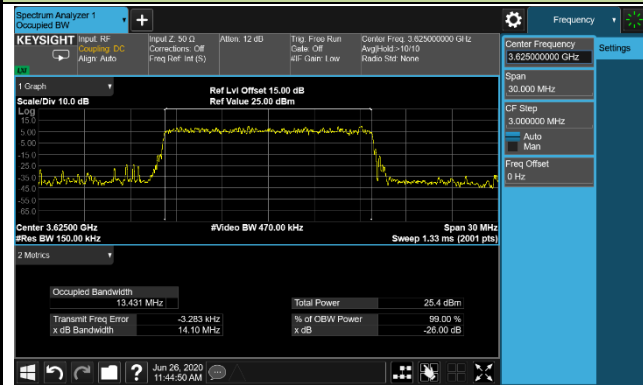
5MHz Channel Bandwidth



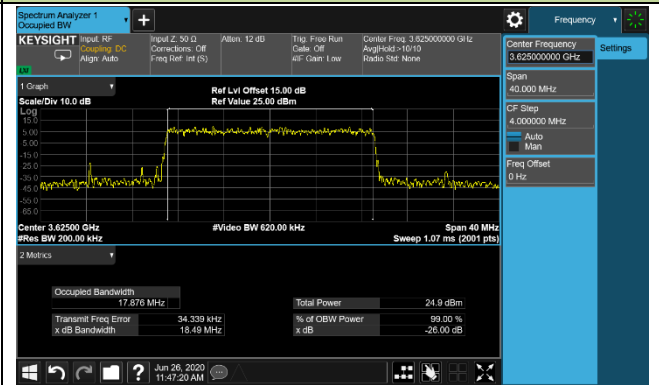
10MHz Channel Bandwidth



15MHz Channel Bandwidth



20MHz Channel Bandwidth



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 Procedures Used

ANSI C63.26-2015 - Section 5.6

5.3.3. Test Setting

Frequency Stability Under Temperature Variations:

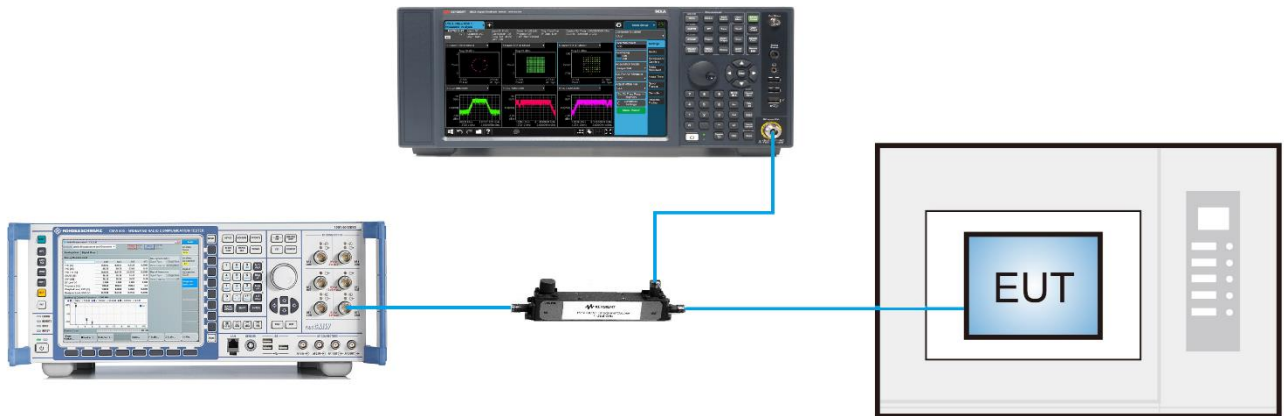
The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain 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

Product	LTE-A Cat 12 M.2 Module	Temperature	-30 ~ 50°C
Test Engineer	Candy Luo	Relative Humidity	53%
Test Site	TR3	Test Date	2020/06/19

Voltage (%)	Power (Vdc)	Temp. (°C)	Frequency Tolerance (ppm)
100%	3.7	- 30	0.0023
		- 20	0.0024
		- 10	0.0027
		0	0.0022
		+ 10	0.0028
		+ 20 (Ref)	0.0023
		+ 30	0.0021
		+ 40	0.0020
		+ 50	0.0023
115%	4.3	+ 20	0.0026
85%	3.2	+ 20	0.0018

5.4. Equivalent Isotropically Radiated Power Measurement

5.4.1. Test Limit

The maximum effective isotropic radiated power (EIRP) End User Device is 23dBm/10MHz

5.4.2. Test Procedures Used

ANSI C63.26-2015 - Section 5.2.4.4.2 & 5.2.5.5

5.4.3. Test Setting

When the fundamental condition for average power measurements cannot be realized (i.e., the EUT cannot be configured to transmit at full-power on a continuous basis (i.e., duty cycle < 98%) and the instrumentation cannot be configured to measure only during active full-power transmissions), then the following procedure can be used if the EUT duty cycle is constant (i.e., duty cycle variations are less than or equal to $\pm 2\%$).

- a) Set span to 2 x to 3 x the OBW.
- b) Set RBW = 1% to 5% of the OBW.
- c) Set VBW $\geq 3 \times$ RBW.
- d) Set number of measurement points in sweep $\geq 2 \times$ span / RBW.
- e) Sweep time:
 - 1) Set = auto-couple, or
 - 2) Set $\geq [10 \times (\text{number of points in sweep}) \times (\text{transmission symbol period})]$ for single sweep (automation-compatible) measurement.
- f) Detector = power averaging (rms).
- g) Set sweep trigger to "free run."
- h) 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.
- i) Using the marker function to identify the maximum PSD.
- j) Add $10 \log (1/\text{duty cycle})$ to the measured power level to compute the average power during continuous transmission. For example, add $[10 \log (1/0.25)] = 6 \text{ dB}$ if the duty cycle is a constant 25%.

The relevant equation for determining the maximum ERP or EIRP from the measured RF output

power is given in Equation (1) as follows:

$$\text{ERP or EIRP} = \text{PMeas} + \text{GT} \quad (1)$$

where

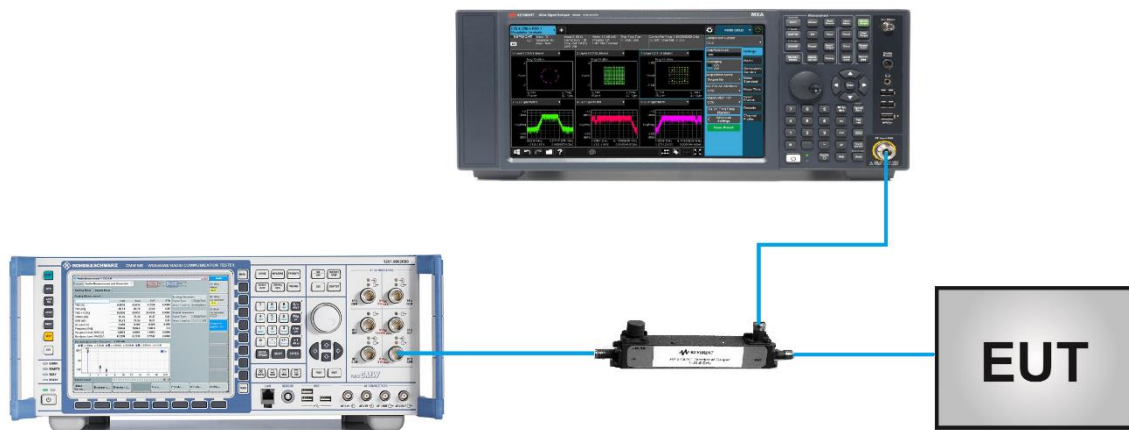
ERP or EIRP effective radiated power or equivalent isotropically radiated power, respectively (expressed in the same units as PMeas, e.g., dBm or dBW)

PMeas measured transmitter output power or PSD, in dBm or dBW

GT gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP)

For devices utilizing multiple antennas, see 6.4 for guidance with respect to determining the effective array transmit antenna gain term to be used in the above equation.

5.4.4. Test Setup



5.4.5. Test Result

Product	LTE-A Cat 12 M.2 Module	Test Engineer	Candy Luo
Test Date	2020/08/15	Test Site	TR3

Channel No.	Frequency (MHz)	Channel Bandwidth (MHz)	RB Size	RB Offset	Output Power (dBm/10MHz)	EIRP (dBm/10MHz)	Limit (dBm/10MHz)
QPSK							
55265	3552.50	5	25	0	23.03	19.66	< 23.00
55900	3625.00				22.97	19.60	< 23.00
56715	3697.50				22.31	18.94	< 23.00
55290	3555.00	10	50	0	22.45	19.08	< 23.00
55900	3625.00				22.60	19.23	< 23.00
56690	3695.00				22.85	19.48	< 23.00
55315	3557.50	15	75	0	21.39	18.02	< 23.00
55990	3625.00				21.70	18.33	< 23.00
56665	3692.50				21.28	17.91	< 23.00
55340	3560.00	20	100	0	20.25	16.88	< 23.00
55990	3625.00				20.20	16.83	< 23.00
56640	3690.00				19.98	16.61	< 23.00
16QAM							
55265	3552.50	5	25	0	21.84	18.47	< 23.00
55900	3625.00				22.37	19.00	< 23.00
56715	3697.50				21.83	18.46	< 23.00
55290	3555.00	10	50	0	21.98	18.61	< 23.00
55900	3625.00				21.80	18.43	< 23.00
56690	3695.00				21.56	18.19	< 23.00
55315	3557.50	15	75	0	20.76	17.39	< 23.00
55990	3625.00				20.73	17.36	< 23.00
56665	3692.50				20.27	16.90	< 23.00
55340	3560.00	20	100	0	19.18	15.81	< 23.00
55990	3625.00				19.25	15.88	< 23.00
56640	3690.00				19.22	15.85	< 23.00
Note: The EIRP (dBm/10MHz) = Output Power (dBm/10MHz) + Antenna Gain (dBi)							

Channel No.	Frequency (MHz)	Channel Bandwidth (MHz)	RB Size	RB Offset	Output Power (dBm/10MHz)	EIRP (dBm/10MHz)	Limit (dBm/10MHz)
64QAM							
55265	3552.50	5	25	0	20.42	17.05	< 23.00
55900	3625.00				20.99	17.62	< 23.00
56715	3697.50				19.80	16.43	< 23.00
55290	3555.00	10	50	0	20.47	17.10	< 23.00
55900	3625.00				20.43	17.06	< 23.00
56690	3695.00				19.15	15.78	< 23.00
55315	3557.50	15	75	0	19.48	16.11	< 23.00
55990	3625.00				19.64	16.27	< 23.00
56665	3692.50				18.36	14.99	< 23.00
55340	3560.00	20	100	0	18.43	15.06	< 23.00
55990	3625.00				18.29	14.92	< 23.00
56640	3690.00				17.32	13.95	< 23.00
Note: The EIRP (dBm/10MHz) = Output Power (dBm/10MHz) + Antenna Gain (dBi)							

5.5. Band Edge Measurement

5.5.1. Test Limit

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.

The conducted power of any emission outside the fundamental emission (whether in or outside of the authorized band) shall not exceed -13 dBm/MHz within 0-10 megahertz above the upper SAS-assigned channel edge and within 0-10 megahertz below the lower SAS-assigned channel edge. At all frequencies greater than 10 megahertz above the upper SAS assigned channel edge and less than 10 MHz below the lower SAS assigned channel edge, the conducted power of any emission shall not exceed -25 dBm/MHz.

The conducted power of any emissions below 3530 MHz or above 3720 MHz shall not exceed -40 dBm/MHz.

5.5.2. Test Procedure Used

ANSI C63.26-2015 - Section 5.7

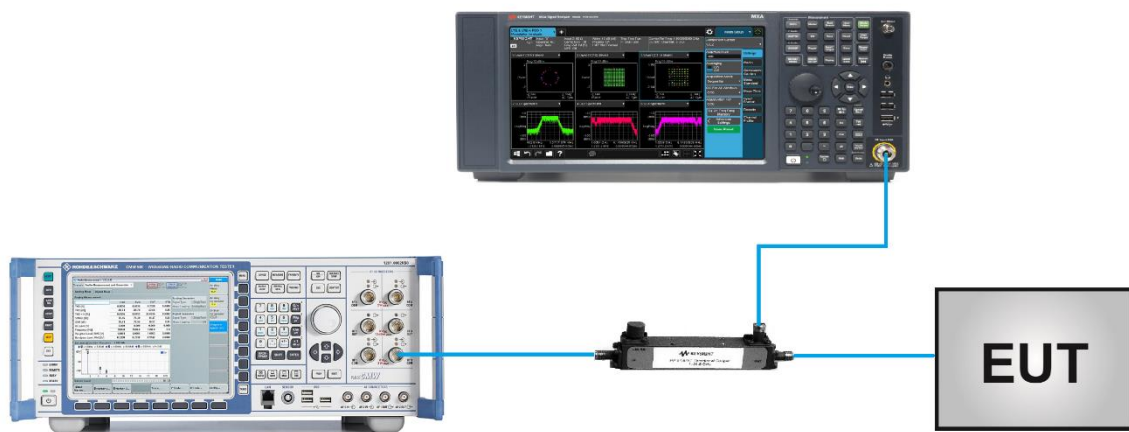
5.5.3. Test Setting

1. Set the analyzer frequency to low, middle, 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. $VBW \geq 3*RBW$
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

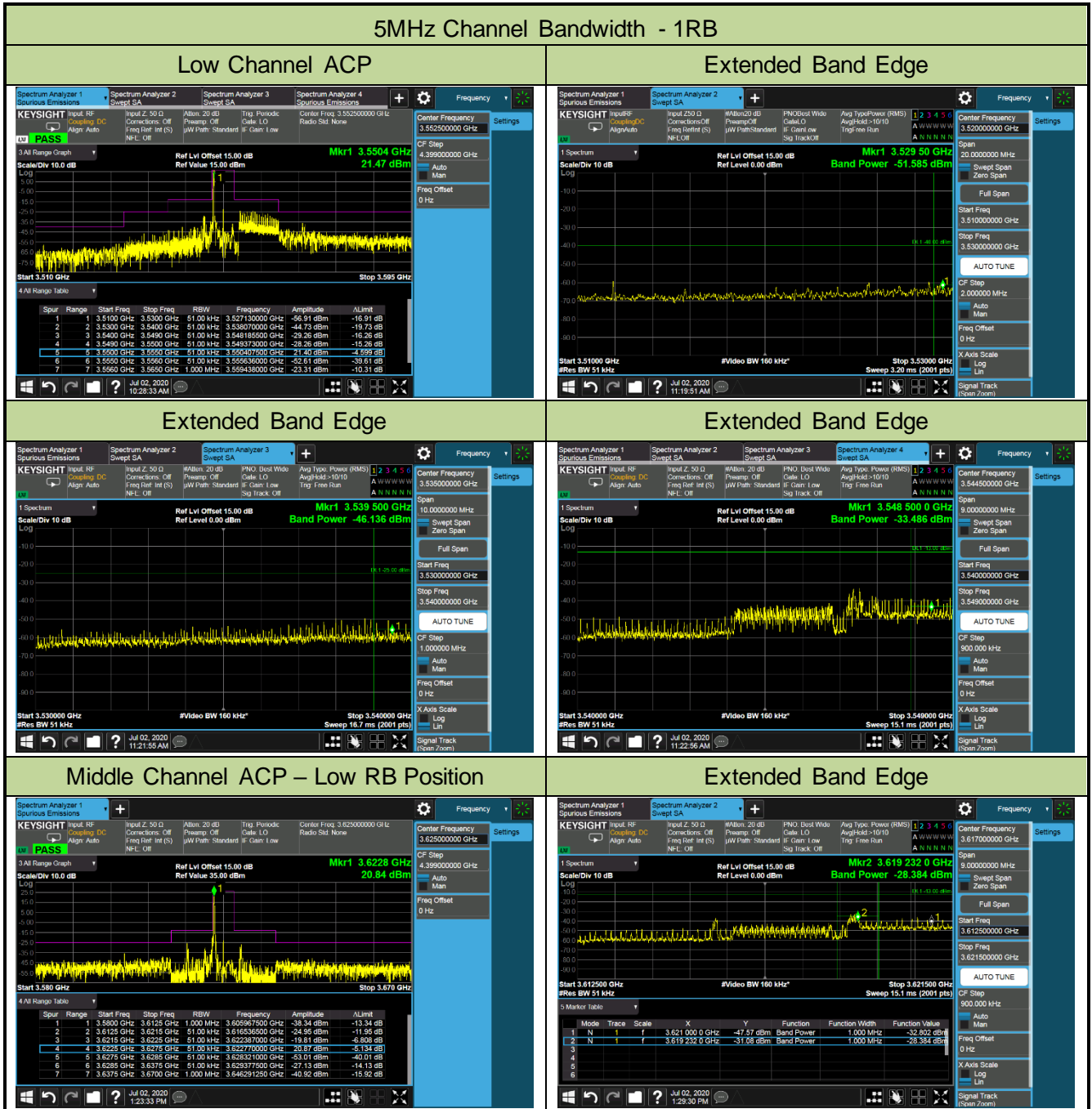
8. Trace average at least 100 traces in power averaging (rms) mode if sweep is set to auto-couple. To accurately determine the average power over the on and off time of the transmitter, it can be necessary to increase the number of traces to be averaged above 100, or if using a manually configured sweep time, increase the sweep time.
9. Used power integration when using a measurement bandwidth smaller than the specified bandwidth.

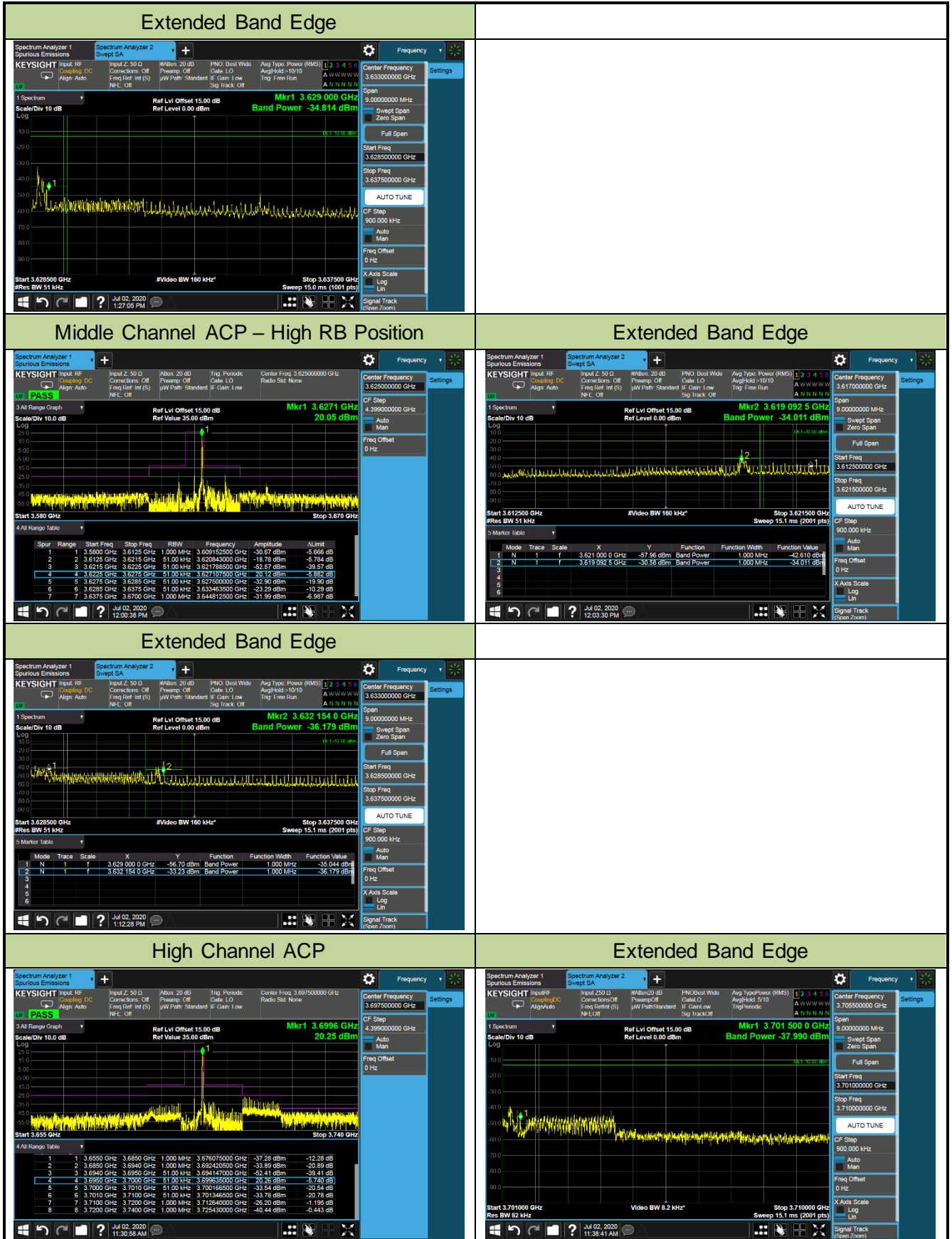
5.5.4. Test Setup



5.5.5. Test Result

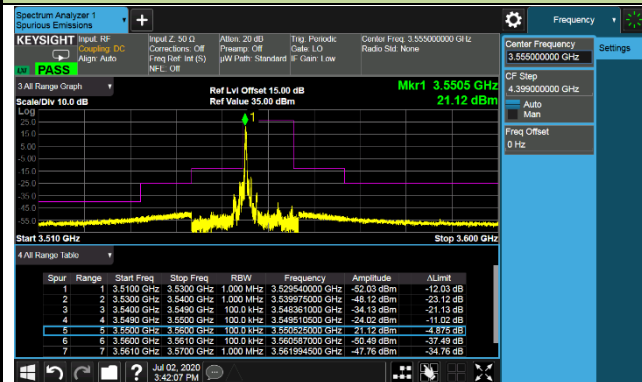
Product	LTE-A Cat 12 M.2 Module	Test Engineer	Candy Luo
Test Date	2020/07/02	Test Site	TR3



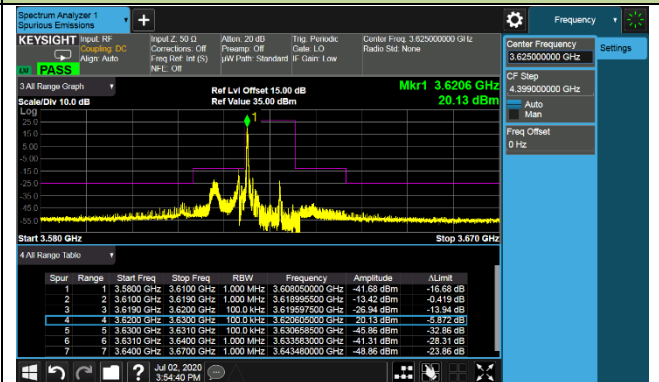


10MHz Channel Bandwidth – 1RB

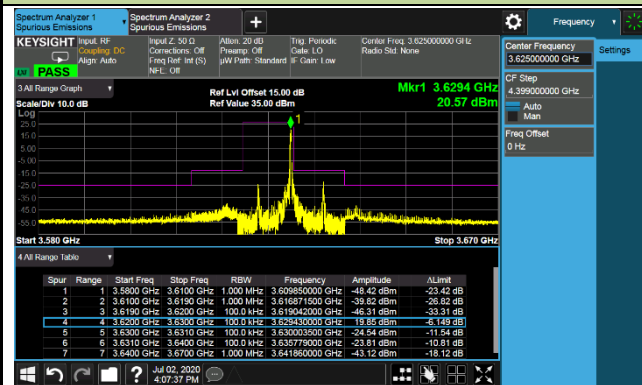
Low Channel ACP



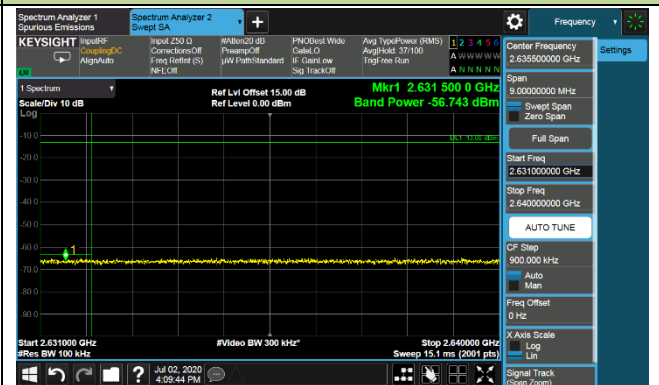
Middle Channel ACP – Low RB Position



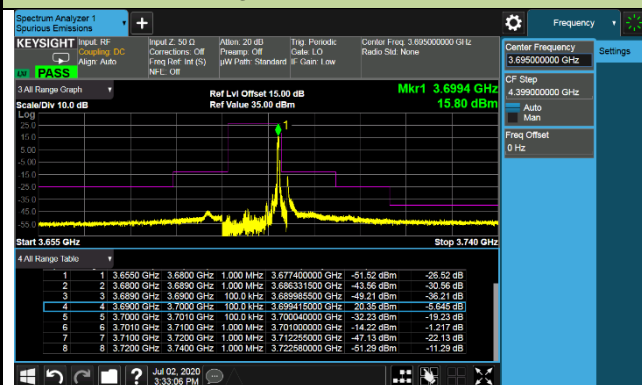
Middle Channel ACP – High RB Position



Extended Band Edge

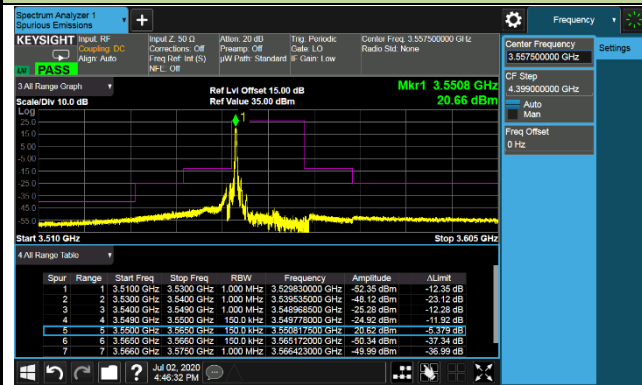


High Channel ACP

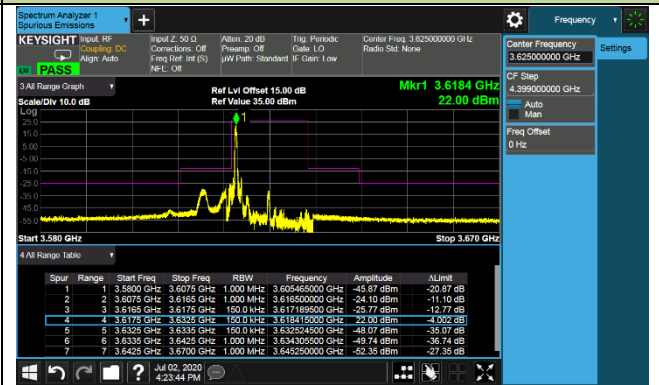


15MHz Channel Bandwidth – 1RB

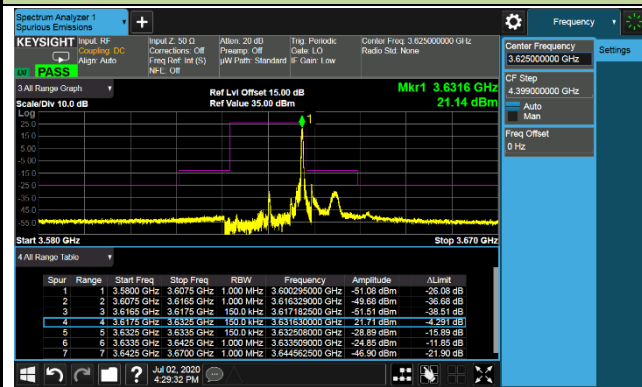
Low Channel ACP



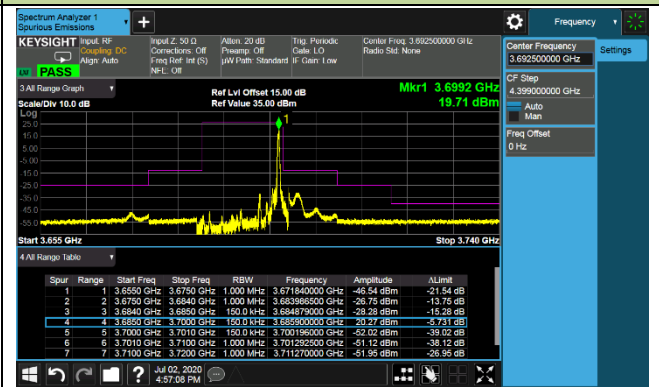
Middle Channel ACP – Low RB Position



Middle Channel ACP – High RB Position

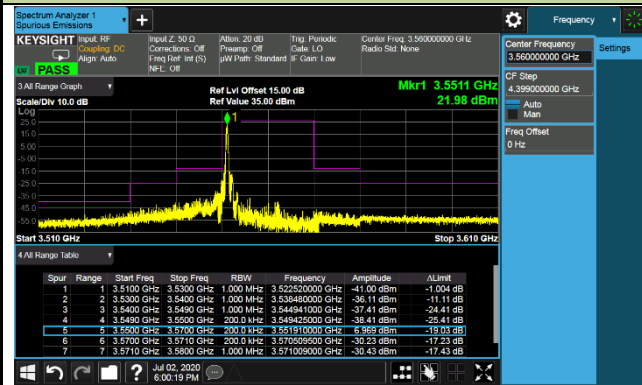


High Channel ACP

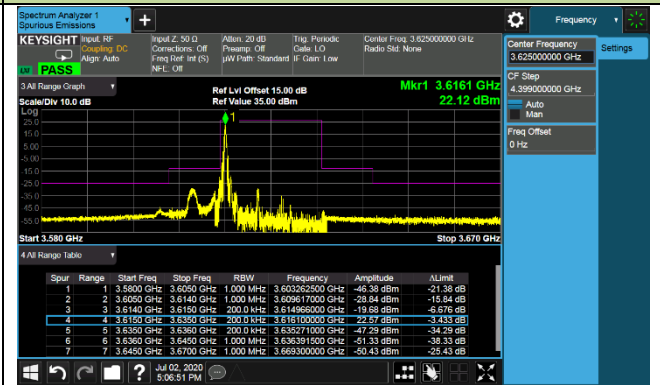


20MHz Channel Bandwidth – 1RB

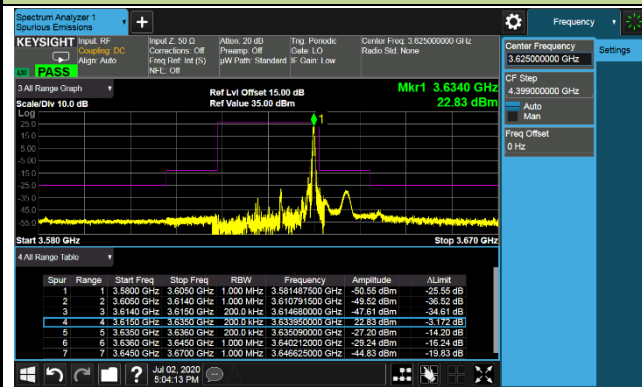
Low Channel ACP



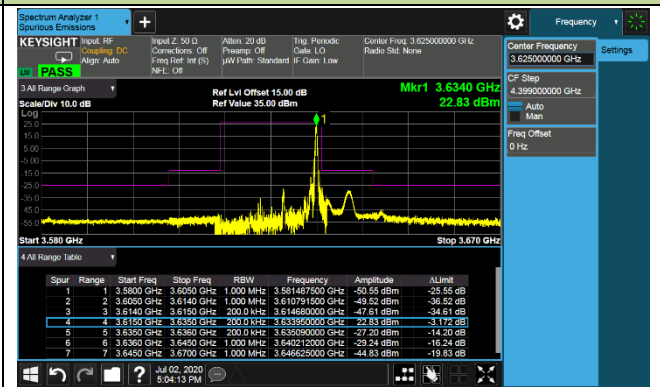
Middle Channel ACP – Low RB Position



Middle Channel ACP – High RB Position

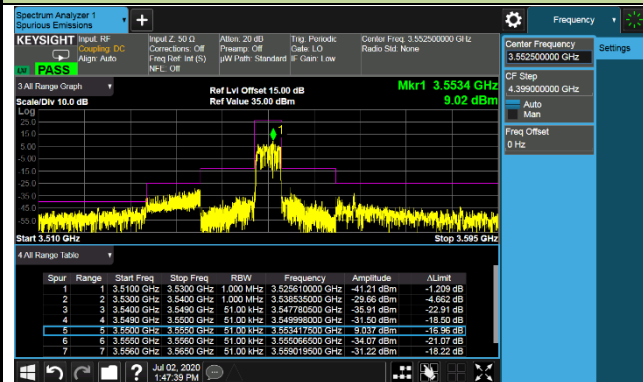


High Channel ACP

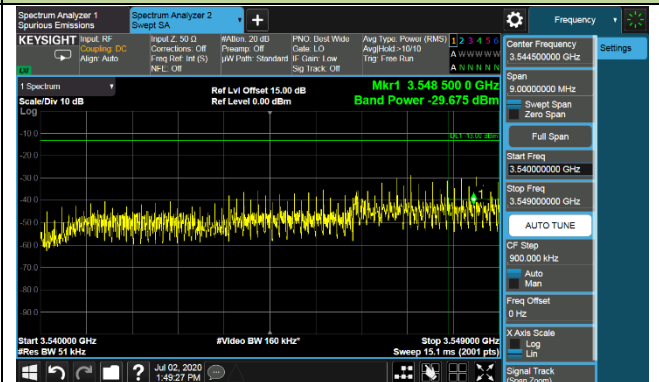


5MHz Channel Bandwidth – Full RB

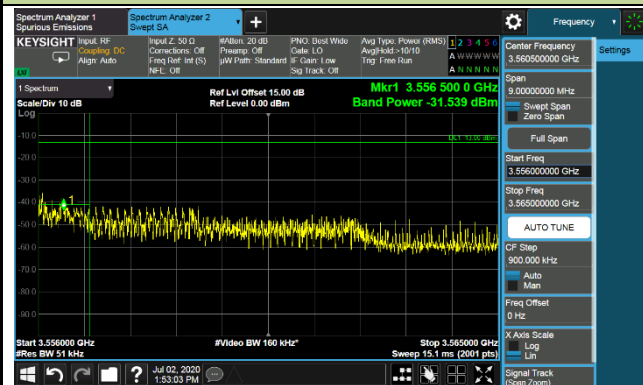
Low Channel ACP



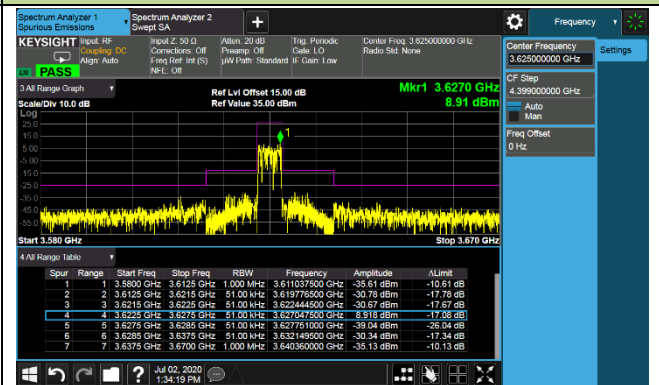
Extended Band Edge



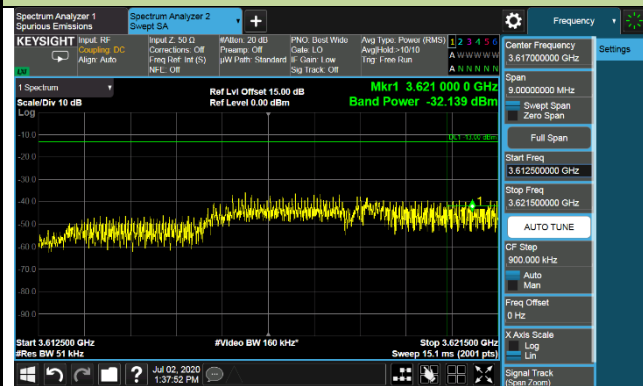
Extended Band Edge



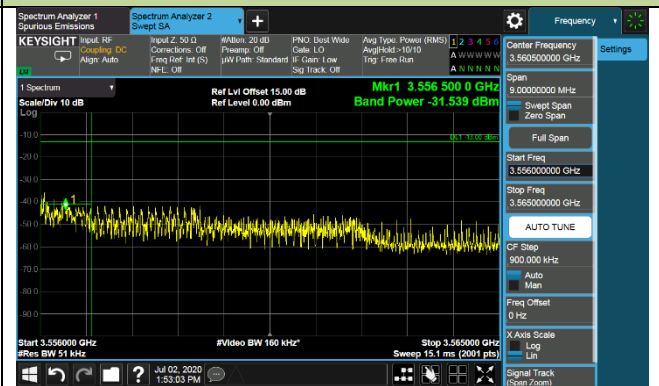
Middle Channel ACP



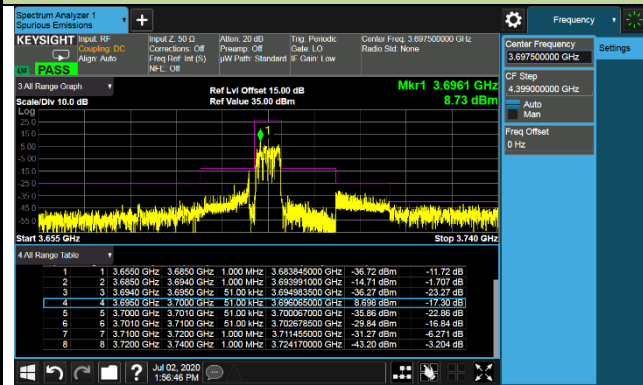
Extended Band Edge



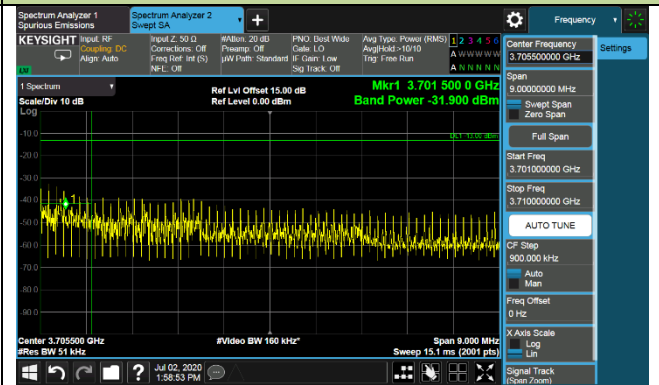
Extended Band Edge



High Channel ACP

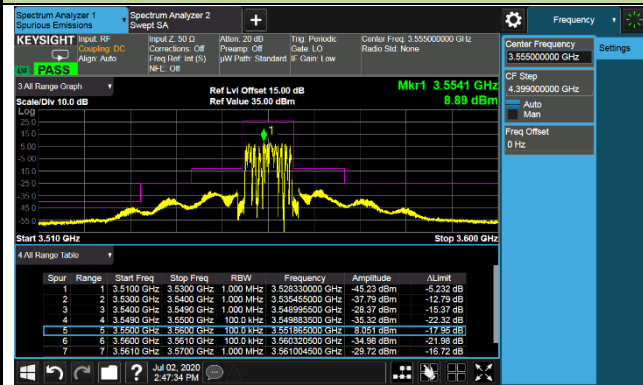


Extended Band Edge

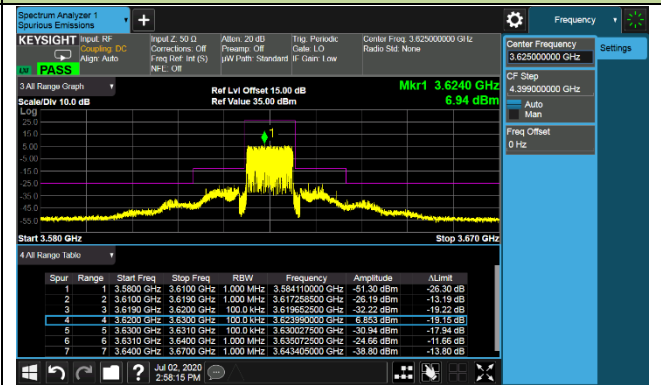


10MHz Channel Bandwidth – Full RB

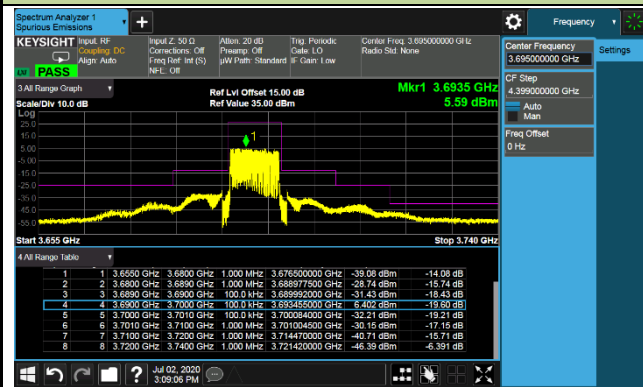
Low Channel ACP



Middle Channel ACP



High Channel ACP

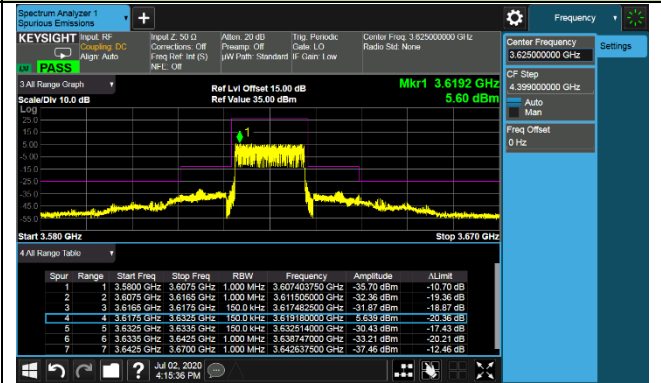


15MHz Channel Bandwidth – Full RB

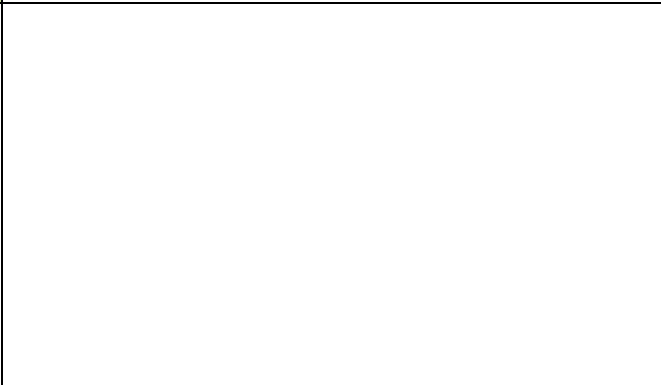
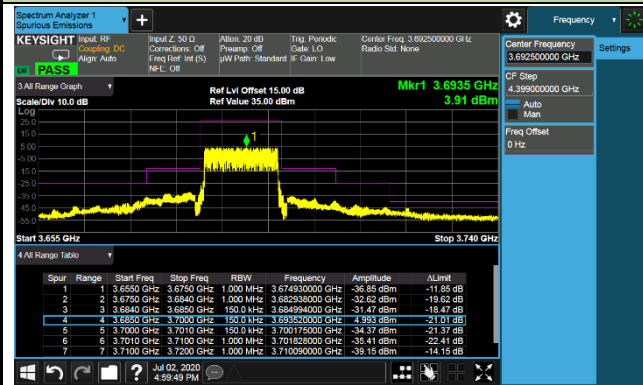
Low Channel ACP



Middle Channel ACP

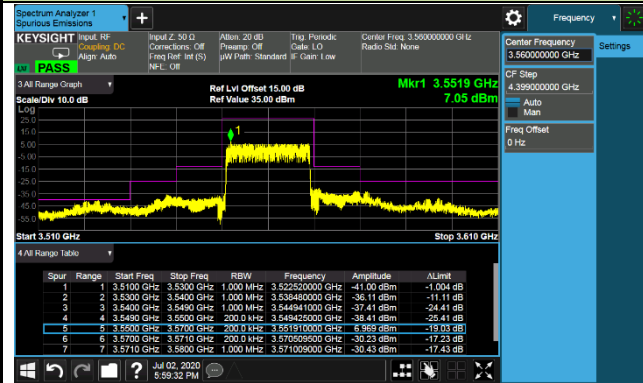


High Channel ACP

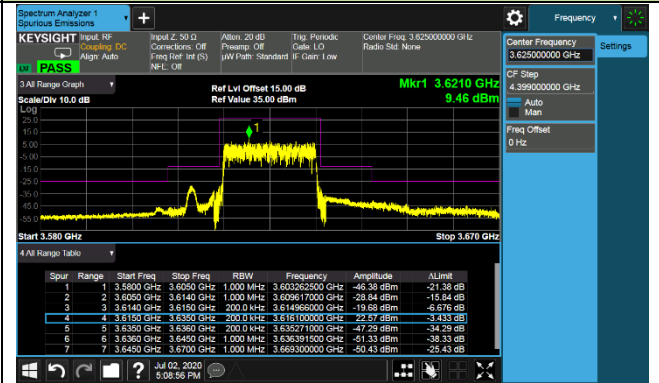


20MHz Channel Bandwidth – Full RB

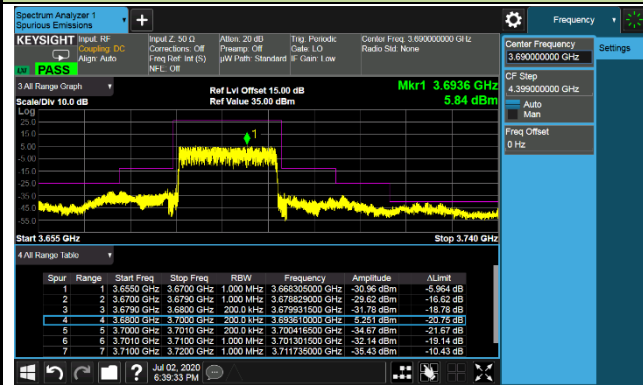
Low Channel ACP



Middle Channel ACP



High Channel ACP



5.6. Conducted Spurious Emissions

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.

The conducted power of any emissions below 3530MHz or above 3720MHz shall not exceed -40dBm/MHz.

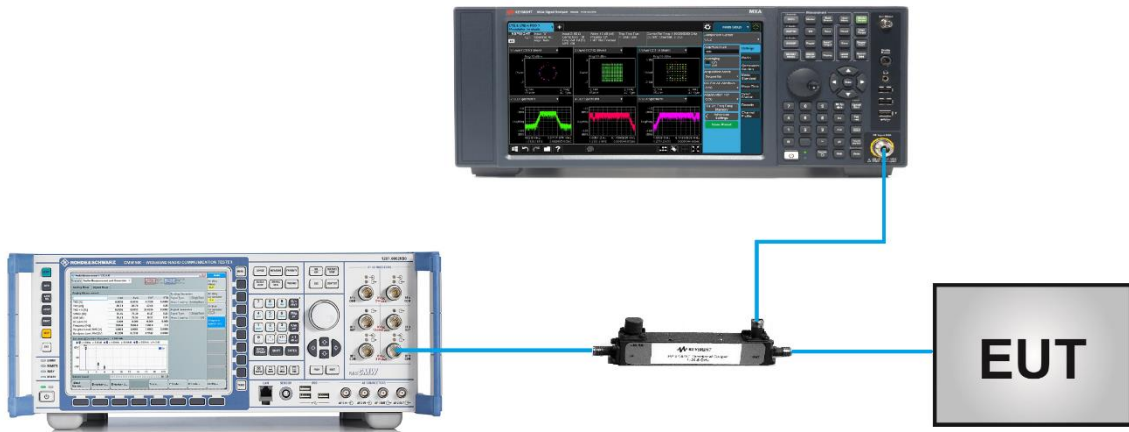
5.6.2. Test Procedure Used

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*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

Product	LTE-A Cat 12 M.2 Module	Test Engineer	Candy Luo
Test Date	2020/07/13	Test Site	TR3

Channel	Frequency (MHz)	Channel Bandwidth (MHz)	Frequency Range (MHz)	Max Spurious Emissions (dBm/MHz)	Limit (dBm/MHz)	Result
QPSK						
55265	3552.5	5	30 ~ 40000	-47.21	≤ -40.00	Pass
55900	3625.0	5	30 ~ 40000	-53.51	≤ -40.00	Pass
56715	3697.5	5	30 ~ 40000	-51.72	≤ -40.00	Pass
55290	3555.0	10	30 ~ 40000	-52.77	≤ -40.00	Pass
55900	3625.0	10	30 ~ 40000	-50.71	≤ -40.00	Pass
56690	3695.0	10	30 ~ 40000	-53.84	≤ -40.00	Pass
55315	3557.5	15	30 ~ 40000	-50.67	≤ -40.00	Pass
55900	3625.0	15	30 ~ 40000	-53.02	≤ -40.00	Pass
56665	3692.5	15	30 ~ 40000	-49.28	≤ -40.00	Pass
55340	3550.0	20	30 ~ 40000	-51.61	≤ -40.00	Pass
55900	3625.0	20	30 ~ 40000	-52.39	≤ -40.00	Pass
56640	3690.0	20	30 ~ 40000	-49.22	≤ -40.00	Pass