MEASUREMENT REPORT

FCC PART 90

FCC ID:	XMR2021RM502QGL
Application:	Quectel Wireless Solutions Company Limited
Application Type:	Certification
Product:	5G Sub-6 GHz M.2 Module
Model No.:	RM502Q-GL
Brand Name:	Quectel
FCC Rule Part(s):	Part 90 Subpart R
Test Procedure(s):	ANSI C63.26: 2015
Test Date:	January 23 ~ April 30, 2021

Reviewed By: Sunny Sun

Approved By: Robin Wu

Revision History

Report No.	Version	Description	Issue Date	Note
2101RSU049-U3	Rev. 01	Initial Report	05-19-2021	Valid

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Description Page

1. GENERAL INFORMATION

1.1. Applicant

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

1.2. Manufacturer

Quectel Wireless Solutions Company Limited
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 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	5G Sub-6 GHz M.2 Module
Model No.	RM502Q-GL
Brand Name	Quectel
IMEI	Conducted Measurement: 355878110939501 Radiated Measurement: 865776040001173
Operating Temperature	-30 ~ 70 °C
Power Type	3.135 ~ 4.4Vdc, typical 3.7Vdc
UMTS Specification	
Single Band	Band 2, 4, 5
Modulation	Uplink up to 16QAM, Downlink up to 64QAM
E-UTRA Specification	
Single Band	Band 2, 4, 5, 7, 12, 13, 14, 17, 25, 26, 30, 38, 41, 48, 66, 71
Intra-Band	CA_2C, CA_5B, CA_7C, CA_38C, CA_41C, CA_48C, CA_66C
HPUE Band	Band 41
Modulation	UL & DL up to 256QAM
5G NR Specification	
SA Band	n2, n7, n5, n12, n25, n41, n66, n71, n77
SA UL MIMO Band	n41, n77
EN-DC Band	DC_25A_n41A, DC_26A_n41A, DC_2A_n41A, DC_66A_n41A DC_4A_n41A, DC_2A_n77A, DC_7A_n77A, DC_12A_n77A, DC_41A_n77A, DC_66A_n77A
HPUE Band	n41, n77 (SA & UL MIMO)
SCS for NR cell	FDD Band: 15kHz; TDD Band: 30kHz
Modulation	UL & DL up to 256QAM

1.5. Radio Specification under Test

FDD T_X Frequency Range	Band 14: 788 ~ 798 MHz
FDD R_X Frequency Range	Band 14: 758 ~ 768 MHz

Note 1: For other features of this EUT, test report will be issued separately.

Note 2: 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.

1.6. Description of Available Antennas

Technology	Frequency Range (MHz)	Antenna Type	MaxPeak Gain (dBi)
LTE Band 2	1850 ~ 1910	Dipole	0.25
LTE Band 4	1710 ~ 1755		1.47
LTE Band 5	824 ~ 849		2.68
LTE Band 7	2500 ~ 2570		0.78
LTE Band 12	699 ~ 716		-0.20
LTE Band 13	777 ~ 787		1.54
LTE Band 14	788 ~ 798		2.42
LTE Band 17	704~ 716		-0.20
LTE Band 25	1850 ~ 1915		0.25
LTE Band 26	814~849		2.68
LTE Band 30	2305 ~ 2315		-3.06
LTE Band 38	2570 ~ 2620		0.78
LTE Band 41	2496 ~ 2690		0.78
LTE Band 48	3550 ~ 3700		-4.29
LTE Band 66	1710 ~ 1780		1.47
LTE Band 71	663 ~ 698		1.22

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

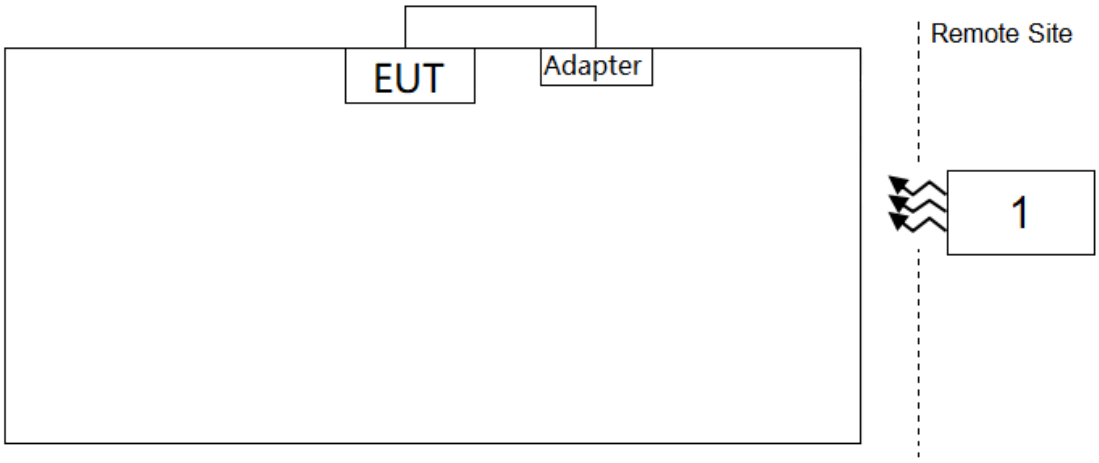
1.8. EMI Suppression Device(s)/Modifications

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

1.9. Maximum Power, Frequency Tolerance, and Emission Designator

LTE Band 14		QPSK			16QAM		
BW (MHz)	Feq. (MHz)	Designator	Tolerance (ppm)	Max Power (W)	Designator	Tolerance (ppm)	Max Power (W)
5	790.5 ~ 795.5	4M47G7D	-	0.1714	4M47W7D	-	0.1483
10	793	8M94G7D	-0.0465	0.1770	8M95W7D	-	0.1483
LTE Band 14		64QAM			256QAM		
BW (MHz)	Feq. (MHz)	Designator	Tolerance (ppm)	Max Power (W)	Designator	Tolerance (ppm)	Max Power (W)
5	790.5 ~ 795.5	4M47W7D	-	0.1276	4M48W7D	-	0.0634
10	793	8M96W7D	-	0.1340	8M93W7D	-	0.0685

1.10. Configuration of Tested System



Product		Manufacturer	Model No.
1	Wideband Radio Communication Tester	R&S	CMW 500

1.11. Test Environment Condition

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

2. TEST EQUIPMENT CALIBRATION DATE

Radiated Emission (WZ-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	2021/11/07
PXA Signal Analyzer	Keysight	9030B	MRTSUE06395	1 year	2021/09/03
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2021/11/10
Bilog Period Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	1 year	2022/03/30
Broad Band Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06023	1 year	2021/10/13
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06597	1 year	2022/02/22
Microwave System Amplifier	Agilent	83017A	MRTSUE06076	1 year	2021/11/15
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	2022/04/29

Radiated Emission (WZ-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	2021/11/07
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2021/11/10
Bilog Period Antenna	Schwarzbeck	VULB 9162	MRTSUE06022	1 year	2021/10/13
Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06171	1 year	2021/10/27
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06597	1 year	2022/02/22
Broad Band Coaxial Preamplifier	Schwarzbeck	BBV 9718	MRTSUE06176	1 year	2021/11/15
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2021/06/11
Temperature/Humidity Meter	Minggao	ETH529	MRTSUE06170	1 year	2021/12/14
Anechoic Chamber	RIKEN	Chamber-AC2	MRTSUE06213	1 year	2022/04/29

Conducted Test Equipment (WZ-SR6, WZ-TR3)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EXA Signal Analyzer	Agilent	N9020A	MRTSUE06106	1 year	2022/04/14
EXA Signal Analyzer	Keysight	N9010B	MRTSUE06452	1 year	2021/07/11
Signal Analyzer	R&S	FSV40	MRTSUE06218	1 year	2022/04/14
Wideband Radio Communication Tester	R&S	CMW 500	MRTSUE06243	1 year	2021/11/07
Power Meter	Agilent	U2021XA	MRTSUE06030	1 year	2021/11/17
DC Power Supply	GWINSTEK	DPS-3303C	MRTSUE06064	N/A	N/A
True RMS Clamp Meter	Fluke	319	MRTSUE06080	1 year	2022/05/05
Directional Coupler	Agilent	87301D	MRTSUE06082	1 year	2022/03/24
Dual Directional Coupler	Agilent	7778D	MRTSUE06083	1 year	2022/03/24
Attenuator	MVE	6dB	MRTSUE06534	1 year	2021/12/11
Attenuator	MVE	10dB	MRTSUE06543	1 year	2021/12/11
Temperature & Humidity Chamber	BAOYT	BYH-150CL	MRTSUE06051	1 year	2021/11/07
Thermohygrometer	testo	608-H1	MRTSUE06401	1 year	2021/08/08

Software	Version	Function
EMI Software	V3	EMI Test Software

3. 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 Emission
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 Emission
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

4. TEST RESULT

4.1. 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, 90.539(e)	Frequency Stability	<1.25 ppm		Pass	Section 5.3
90.542(a)(7)	Equivalent Radiated Power	<30 Watts Max ERP		Pass	Section 5.4
2.1051, 90.543(e)(2)(3)	Band Edge	Refer to section 5.5		Pass	Section 5.5
2.1051, 90.210(n)	Emission Mask	Mask B		Pass	Section 5.6
2.1051, 90.543(e)(3)	Spurious Emission	< 43 + 10log10 (P[Watts])		Pass	Section 5.7
2.1053, 90.543(e)(3), (f)	Spurious Emission	< 43 + 10log10 (P[Watts])	Radiated	Pass	Section5.8

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 ofthe 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.

4.2. Occupied Bandwidth Measurement

4.2.1.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.

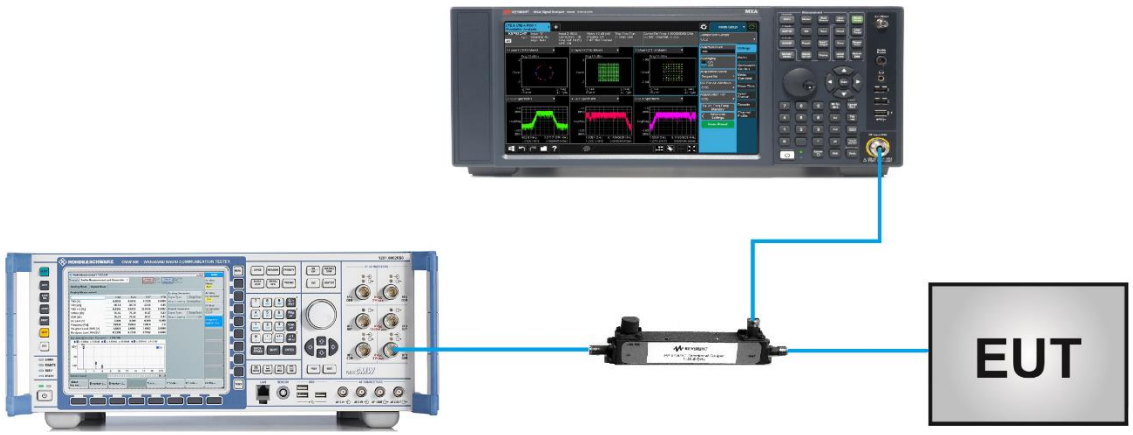
4.2.2.Test Procedure

ANSI C63.26-2015 - Section 5.4

4.2.3.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 ≥ 3 × 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.

4.2.4.Test Setup



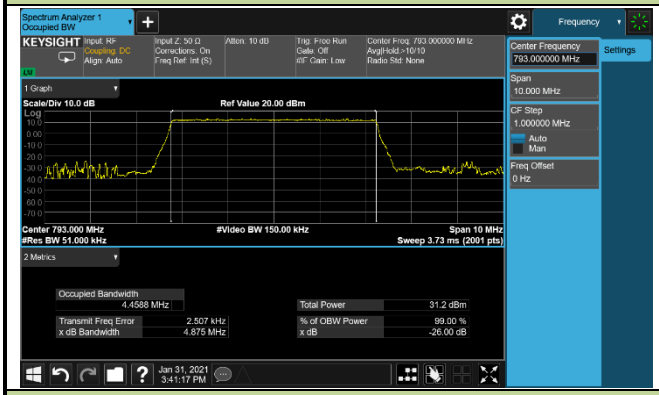
4.2.5.Test Result

Product	5G Sub-6 GHz M.2 Module	Test Site	SIP-SR5
Test Engineer	Candy Luo	Test Date	2021/01/31 ~ 2021/04/12
Test Band	LTE Band 14		

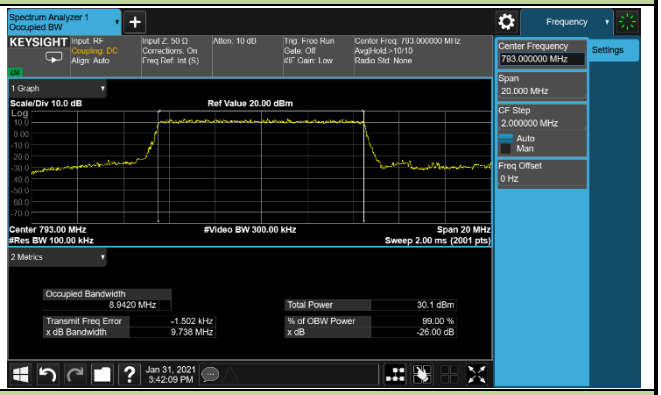
Modulation	Frequency (MHz)	Bandwidth (MHz)	99% Bandwidth (MHz)
QPSK	793.0	5	4.46
		10	8.94
16QAM	793.0	5	4.47
		10	8.95
64QAM	793.0	5	4.47
		10	8.96
256QAM	793.0	5	4.48
		10	8.93

99% Bandwidth - QPSK

5MHz Channel Bandwidth

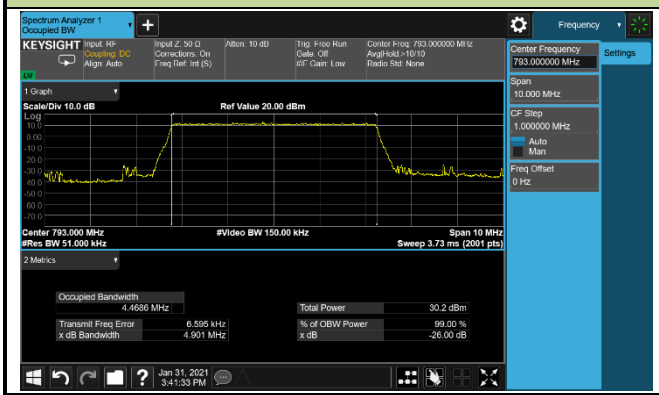


10MHz Channel Bandwidth

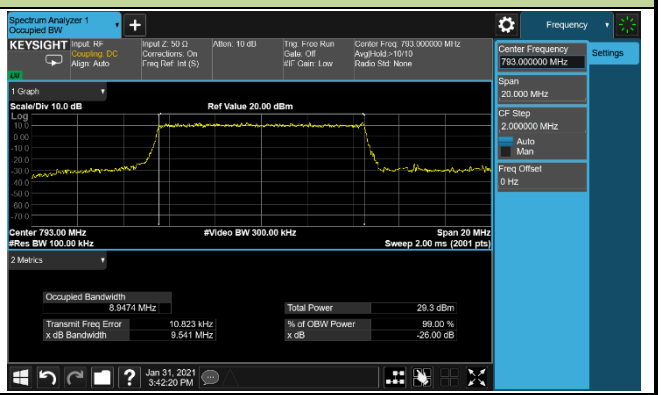


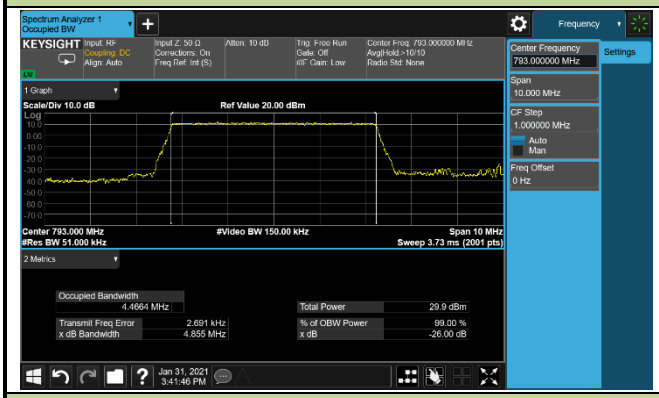
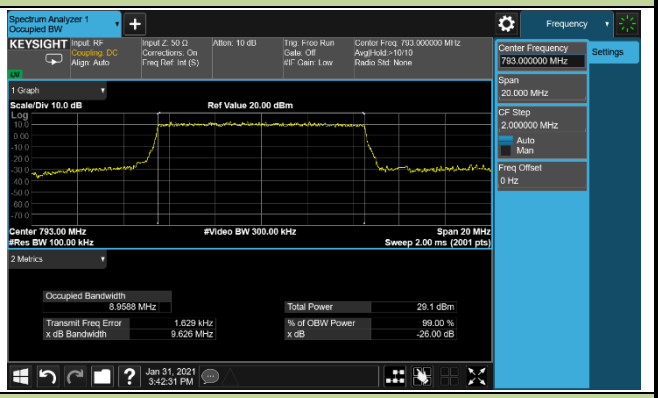
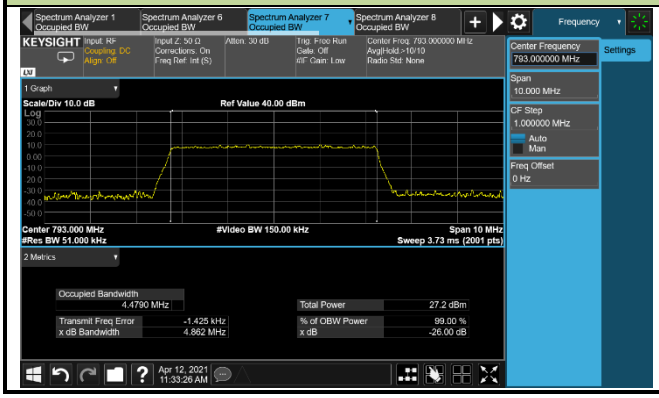
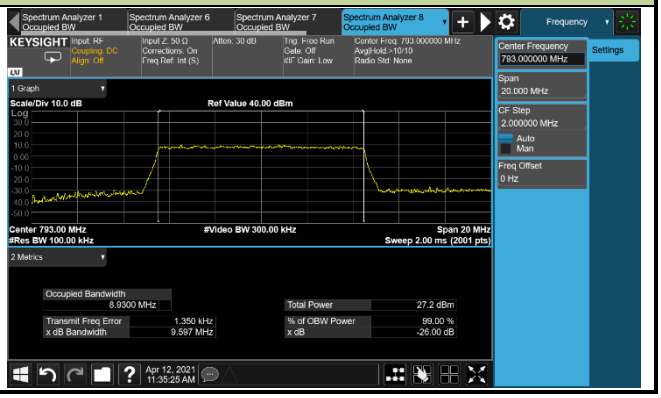
99% Bandwidth - 16QAM

5MHz Channel Bandwidth



10MHz Channel Bandwidth



99% Bandwidth - 64QAM	
5MHz Channel Bandwidth	10MHz Channel Bandwidth
	
99% Bandwidth - 256QAM	
5MHz Channel Bandwidth	10MHz Channel Bandwidth
	

4.3. Frequency Stability Measurement

4.3.1.Test Limit

The frequency stability of mobile, portable and control transmitters operating in the wideband segment must be 1.25 parts per million or better when AFC is locked to a base station, and 5 parts per million or better when AFC is not locked

4.3.2.Test Procedure

ANSI C63.26-2015 - Section 5.6

4.3.3.Test Setting

Frequency Stability Under Temperature Variations:

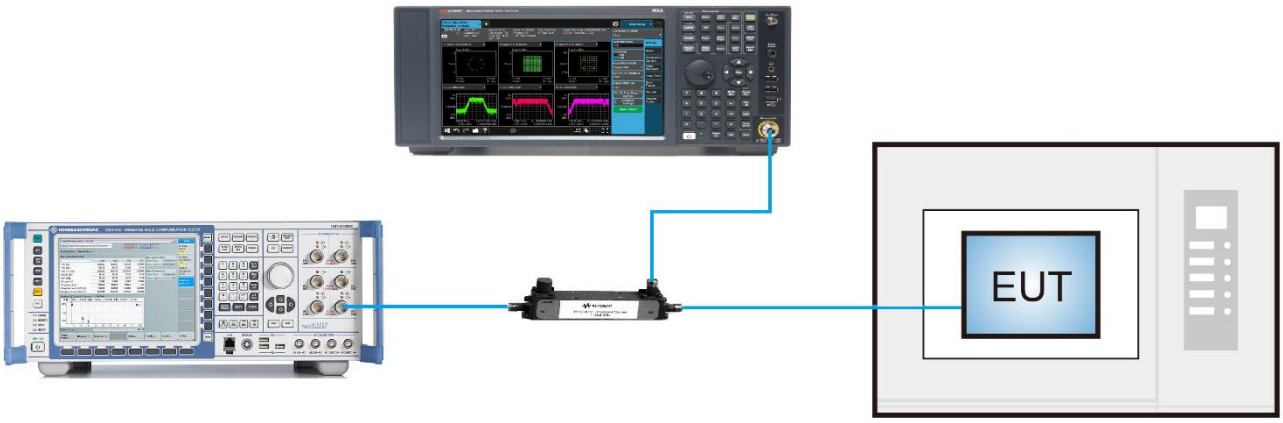
The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain 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 inputvoltage to specify extreme voltage variation (±15%) and end point, record the maximum frequency change.

4.3.4.Test Setup



4.3.5.Test Result

Product	5G Sub-6 GHz M.2 Module	Test Site	SIP-TR1
Test Engineer	Candy Luo	Test Date	2021/02/01
Test Band	LTE Band 14_QPSK		

Power (Vdc)	Temp. (°C)	Frequency Tolerance (ppm)
3.7	- 30	-0.0179
	- 20	0.0129
	- 10	0.0145
	0	-0.0030
	+ 10	-0.0078
	+ 20	0.0036
	+ 30	0.0068
	+ 40	0.0072
	+ 50	0.0149
4.4	+ 20	-0.0045
3.135	+ 20	-0.0465

4.4. Equivalent Isotropically Radiated Power Measurement

4.4.1.Test Limit

Control stations and mobile stations transmitting in the 758-768 MHz band and the788-798 MHz band are limited to 30 watts ERP.

4.4.2.Test Procedure

ANSI C63.26-2015 - Section 5.2

4.4.3.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.

The relevant equation for determining the maximum ERP or EIRP from the measured RF output power is given in Equation (1) as follows:

ERP or EIRP = P_{Meas} + G_T

where

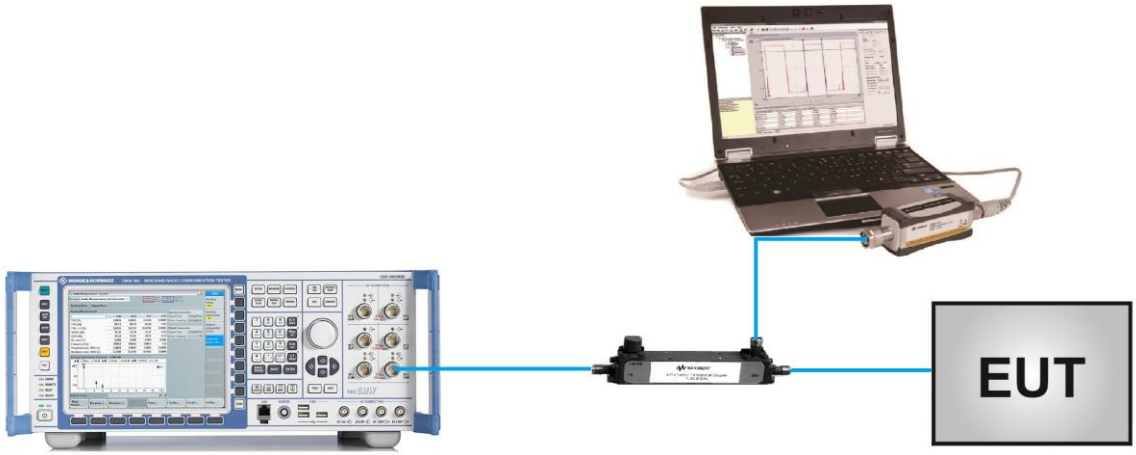
ERP or EIRP effective radiated power or equivalent isotropically radiated power, respectively (expressed in the same units as P_{Meas}, e.g., dBm or dBW)

P_{Meas} measured transmitter output power or PSD, in dBm or dBW

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

ERP = EIRP -2.15

4.4.4.Test Setup



4.4.5.Test Result

Product	5G Sub-6 GHz M.2 Module	Test Site	SIP-SR5
Test Engineer	Candy Luo	Test Date	2021/02/20
Test Band	LTE Band 14		

Channel No.	Frequency (MHz)	Channel Bandwidth (MHz)	RB Size	RB Offset	Output Power (dBm)	ERP (dBm)	Limit (dBm)
QPSK							
5305	760.5	5	1	0	22.32	22.59	< 44.77
5330	763.0				22.20	22.47	< 44.77
5355	765.5				22.19	22.46	< 44.77
5305	760.5	5	1	12	22.26	22.53	< 44.77
5330	763.0				22.29	22.56	< 44.77
5355	765.5				22.34	22.61	< 44.77
5305	760.5	5	1	24	22.26	22.53	< 44.77
5330	763.0				22.23	22.50	< 44.77
5355	765.5				22.17	22.44	< 44.77
5305	760.5	5	25	0	21.34	21.61	< 44.77
5330	763.0				21.16	21.43	< 44.77
5355	765.5				21.22	21.49	< 44.77
5330	763.0	10	1	0	22.48	22.75	< 44.77
5330	763.0			24	22.19	22.46	< 44.77
5330	763.0			49	22.24	22.51	< 44.77
5330	763.0	10	50	0	21.29	21.56	< 44.77
Note: The ERP (dBm) = Output Power (dBm) + Antenna Gain (dBi) - 2.15							

Channel No.	Frequency (MHz)	Channel Bandwidth (MHz)	RB Size	RB Offset	Output Power (dBm)	ERP (dBm)	Limit (dBm)
16QAM							
5305	760.5	5	1	0	21.54	21.81	< 44.77
5330	763.0				21.40	21.67	< 44.77
5355	765.5				21.36	21.63	< 44.77
5305	760.5	5	1	12	21.35	21.62	< 44.77
5330	763.0				21.71	21.98	< 44.77
5355	765.5				21.42	21.69	< 44.77
5305	760.5	5	1	24	21.36	21.63	< 44.77
5330	763.0				21.29	21.56	< 44.77
5355	765.5				21.55	21.82	< 44.77
5305	760.5	5	25	0	20.35	20.62	< 44.77
5330	763.0				20.30	20.57	< 44.77
5355	765.5				20.24	20.51	< 44.77
5330	763.0	10	1	0	21.71	21.98	< 44.77
5330	763.0			24	21.52	21.79	< 44.77
5330	763.0			49	21.56	21.83	< 44.77
5330	763.0	10	50	0	20.25	20.52	< 44.77
Note: The ERP (dBm) = Output Power (dBm) + Antenna Gain (dBi) - 2.15							

Channel No.	Frequency (MHz)	Channel Bandwidth (MHz)	RB Size	RB Offset	Output Power (dBm)	ERP (dBm)	Limit (dBm)
64QAM							
5305	760.5	5	1	0	20.85	21.12	< 44.77
5330	763.0				20.79	21.06	< 44.77
5355	765.5				20.91	21.18	< 44.77
5305	760.5	5	1	12	21.06	21.33	< 44.77
5330	763.0				20.99	21.26	< 44.77
5355	765.5				20.89	21.16	< 44.77
5305	760.5	5	1	24	21.06	21.33	< 44.77
5330	763.0				20.97	21.24	< 44.77
5355	765.5				20.93	21.20	< 44.77
5305	760.5	5	25	0	19.76	20.03	< 44.77
5330	763.0				19.68	19.95	< 44.77
5355	765.5				19.63	19.90	< 44.77
5330	763.0	10	1	0	21.13	21.40	< 44.77
5330	763.0			24	21.07	21.34	< 44.77
5330	763.0			49	21.27	21.54	< 44.77
5330	763.0	10	50	0	19.71	19.98	< 44.77
Note: The ERP (dBm) = Output Power (dBm) + Antenna Gain (dBi) - 2.15							

Channel No.	Frequency (MHz)	Channel Bandwidth (MHz)	RB Size	RB Offset	Output Power (dBm)	ERP (dBm)	Limit (dBm)
256QAM							
5305	760.5	5	1	0	17.91	18.18	< 44.77
5330	763.0				17.87	18.14	< 44.77
5355	765.5				17.75	18.02	< 44.77
5305	760.5	5	1	12	17.92	18.19	< 44.77
5330	763.0				18.02	18.29	< 44.77
5355	765.5				17.84	18.11	< 44.77
5305	760.5	5	1	24	17.80	18.07	< 44.77
5330	763.0				17.86	18.13	< 44.77
5355	765.5				17.75	18.02	< 44.77
5305	760.5	5	25	0	17.82	18.09	< 44.77
5330	763.0				17.67	17.94	< 44.77
5355	765.5				17.67	17.94	< 44.77
5330	763.0	10	1	0	17.88	18.15	< 44.77
5330	763.0			24	17.90	18.17	< 44.77
5330	763.0			49	18.36	18.63	< 44.77
5330	763.0	10	50	0	17.73	18.00	< 44.77
Note: The ERP (dBm) = Output Power (dBm) + Antenna Gain (dBi) - 2.15							

4.5. Band Edge Measurement

4.5.1.Test Limit

For operations in the 758-768 MHz and the 788-798 MHz bands, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations;

(2) On any frequency between 775-788 MHz, above 805 MHz, and below 758 MHz, byat least 43 + 10 log (P) dB.

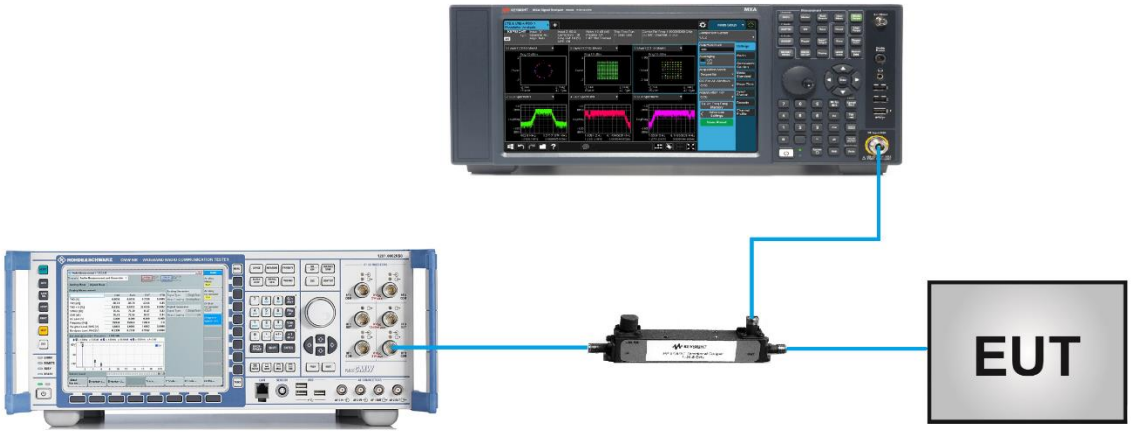
4.5.2.Test Procedure

ANSI C63.26-2015 - Section5.7

4.5.3.Test Setting

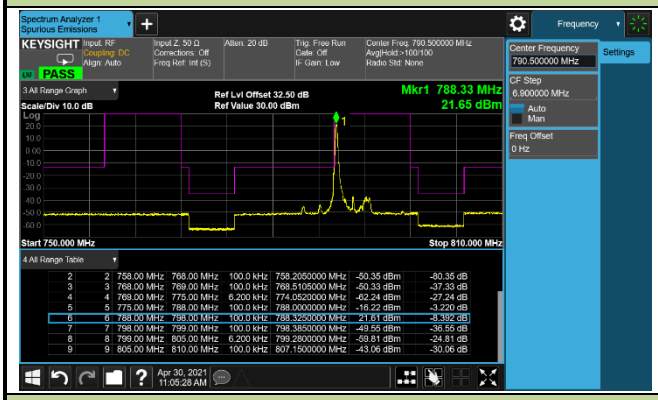
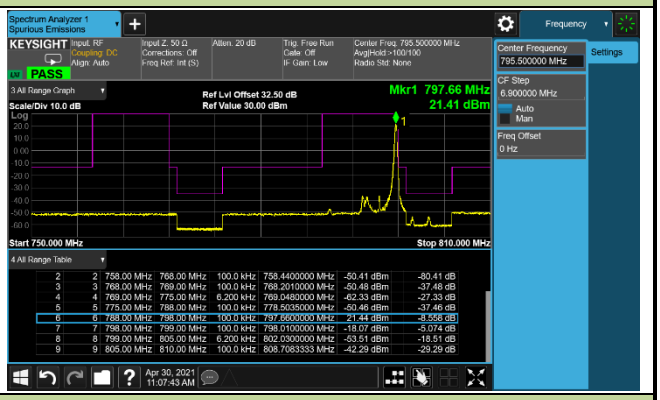
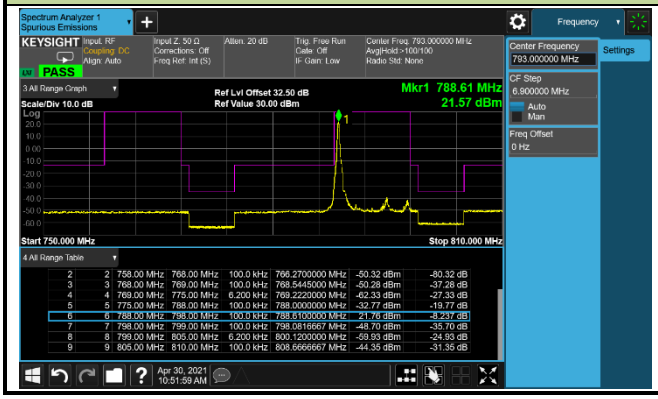
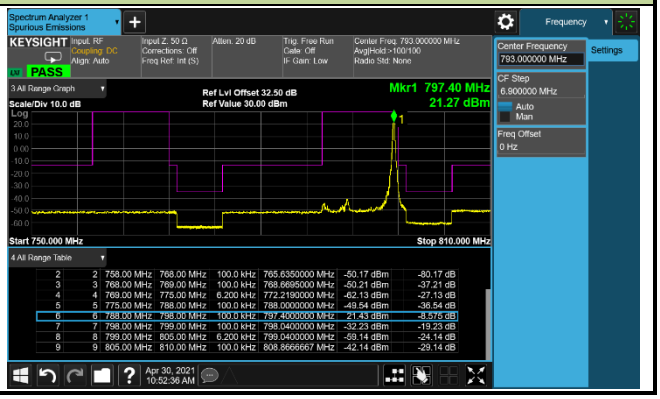
1. Set the analyzer frequency to low or high channel
2. RBW ≥ The nominal RBW shall be in the range of 1% of the anticipated OBW (in the 1MHz band immediately outside and adjacent to the band edge). For improvement of the accuracy in the measurement of the average power of a noise-like emission, a RBW 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 ≥ 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.

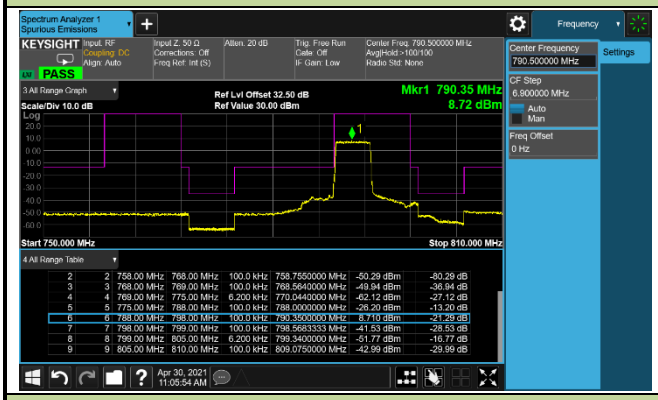
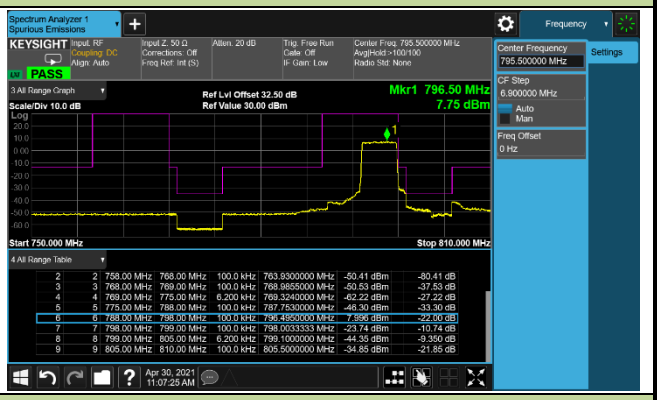
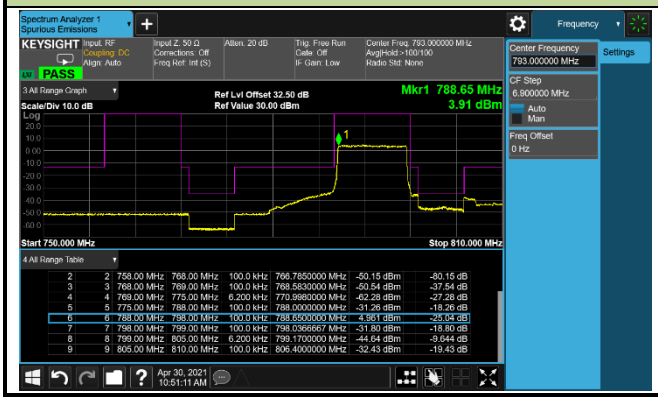
4.5.4.Test Setup



4.5.5.Test Result

Product	5G Sub-6 GHz M.2 Module	Test Site	SIP-SR5
Test Engineer	Candy Luo	Test Date	2021/04/30
Test Band	LTE Band 14_QPSK		

5MHz Channel Bandwidth 1RB	
Lower ACP	Upper ACP
	
10MHz Channel Bandwidth 1RB	
Lower ACP	Upper ACP
	

5MHz Channel Bandwidth Full RB	
Lower ACP	Upper ACP
	
10MHz Channel Bandwidth Full RB	
Middle ACP	
	

4.6. Emisson Mask Measurement

4.6.1.Test Limit

Emission Mask B.For transmitters that are equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

(1) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: At least 25 dB.

(2) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB.

(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.

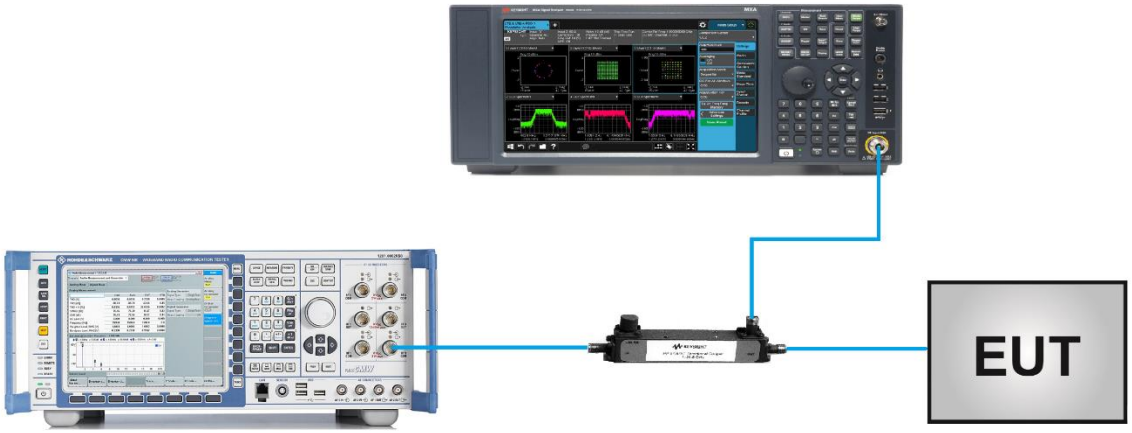
4.6.2.Test Procedure

ANSI C63.26-2015 - Section5.7

4.6.3.Test Setting

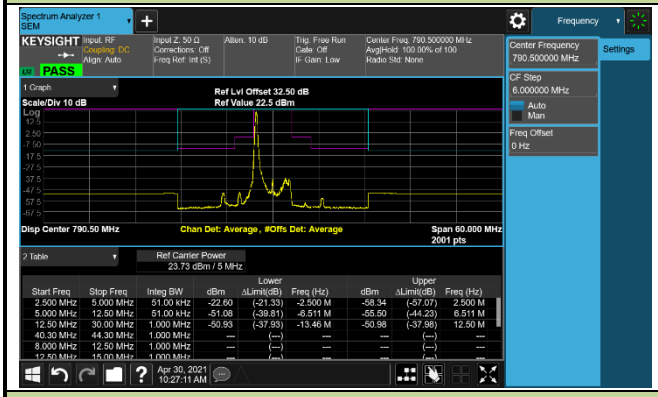
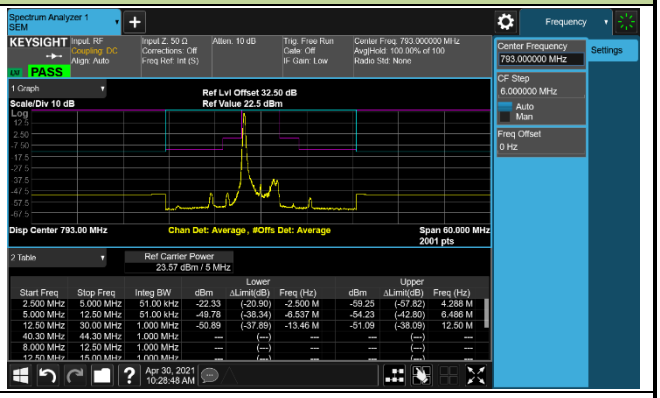
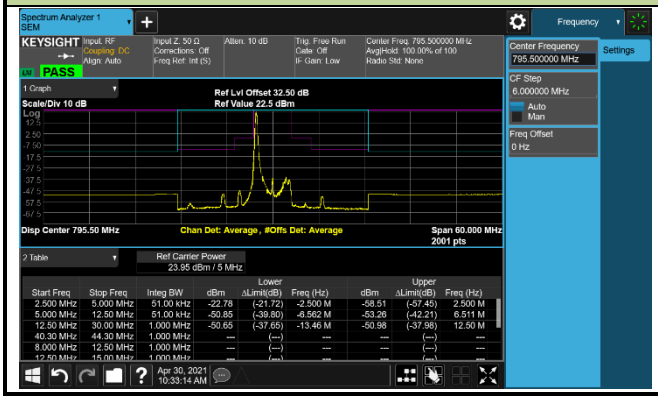
1. Set the analyzer frequency to low or high channel
2. RBW ≥ The nominal RBW shall be in the range of 1% of the anticipated OBW (in the 1MHz band immediately outside and adjacent to the band edge). For improvement of the accuracy in the measurement of the average power of a noise-like emission, a RBW 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 ≥ 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.

4.6.4.Test Setup



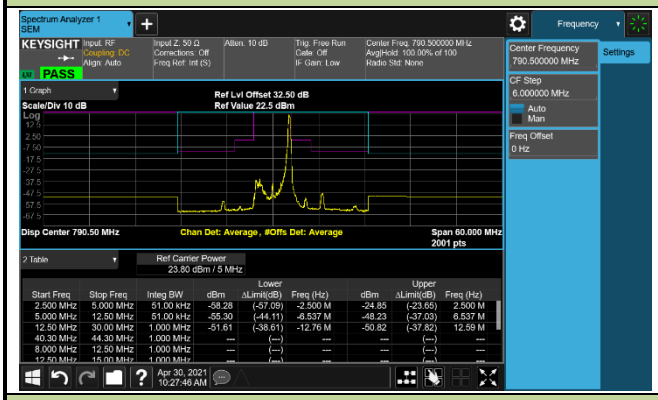
4.6.5.Test Result

Product	5G Sub-6 GHz M.2 Module	Test Site	SIP-SR5
Test Engineer	Candy Luo	Test Date	2021/04/30
Test Band	LTE Band 14		

5MHz Channel Bandwidth 1RB@0	
Low Channel	Middle Channel
	
High Channel	
	

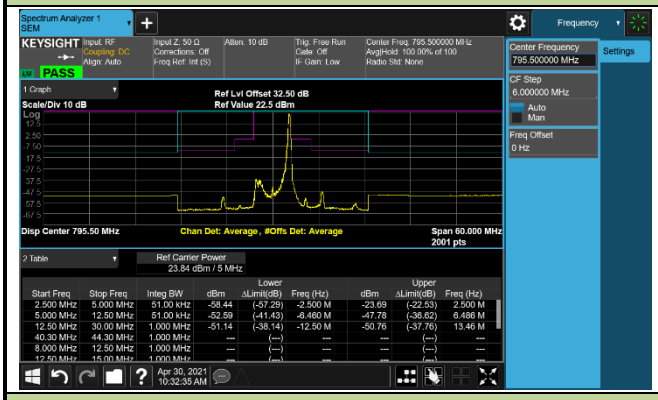
5MHz Channel Bandwidth 1RB@24

Low Channel



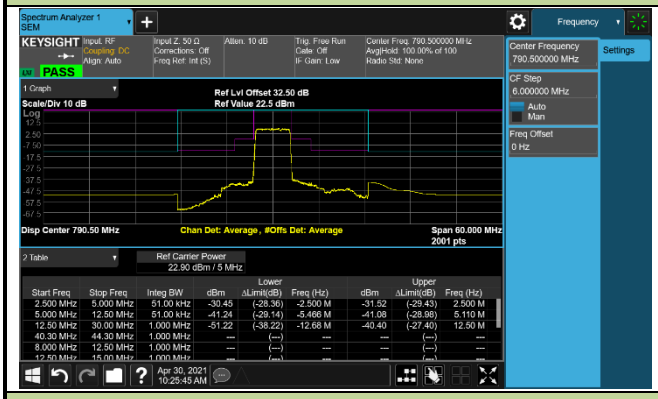
Middle Channel

High Channel

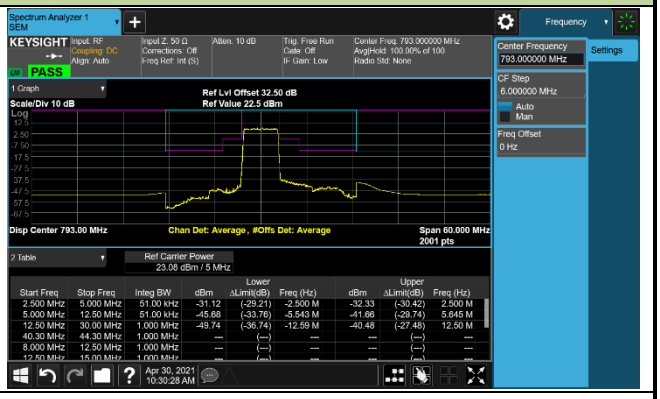


5MHz Channel Bandwidth Full RB

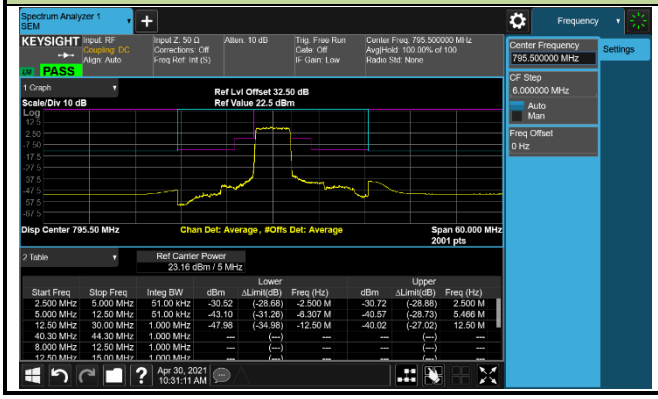
Low Channel

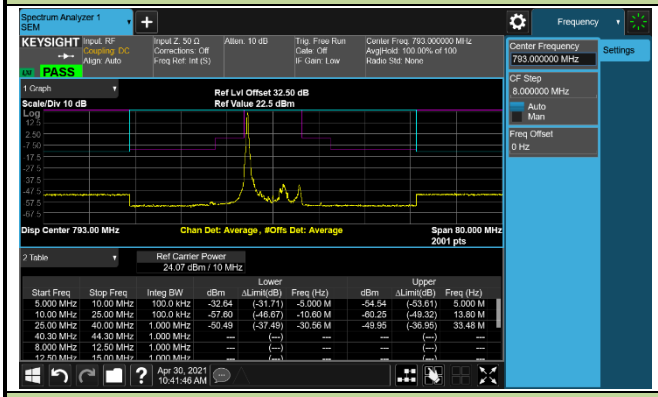
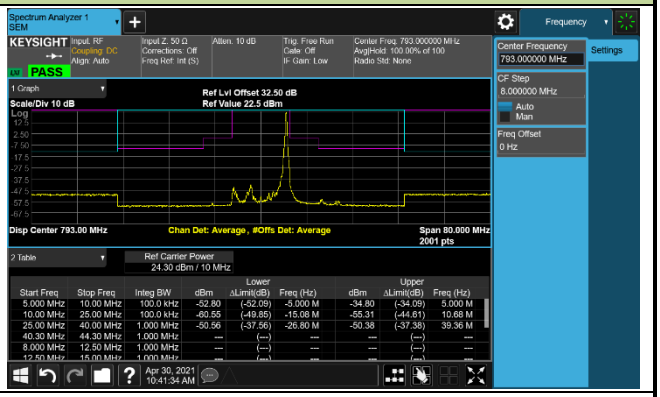
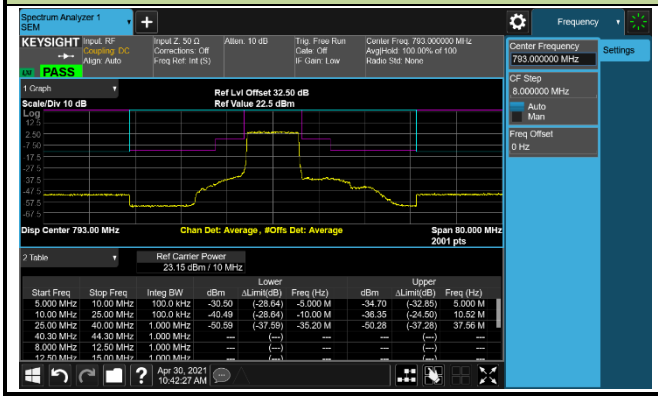


Middle Channel



High Channel



10MHz Channel Bandwidth 1RB@0	10MHz Channel Bandwidth 1RB@49
	
10MHz Channel Bandwidth Full RB	
	

4.7. Conducted Spurious Emission Measurement

4.7.1.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.
On any frequency between 775-788 MHz, above 805 MHz, and below 758 MHz, by at least 43 + 10 log (P) dB.

4.7.2.Test Procedure

ANSI C63.26-2015 - Section 5.7

4.7.3.Test Setting

1. Set the analyzer frequency to low, mid, high channel.
2. RBW = 1MHz
3. VBW ≥ 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.

4.7.4.Test Setup

4.7.5.Test Result

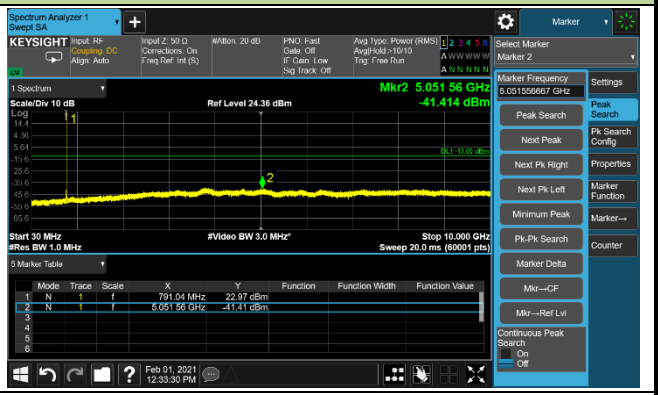
Product	5G Sub-6 GHz M.2 Module	Test Site	SIP-SR5
Test Engineer	Candy Luo	Test Date	2021/02/01
Test Band	LTE Band 14_QPSK		

Channel	Frequency (MHz)	Channel Bandwidth (MHz)	Frequency Range (MHz)	Max Spurious Emissions (dBm)	Limit (dBm)	Result
5305	760.5	5	30 ~ 10000	-43.58	≤ -13.00	Pass
5330	763.0	5	30 ~ 10000	-41.41	≤ -13.00	Pass
5355	765.5	5	30 ~ 10000	-41.76	≤ -13.00	Pass
5330	763.0	10	30 ~ 10000	-40.84	≤ -13.00	Pass

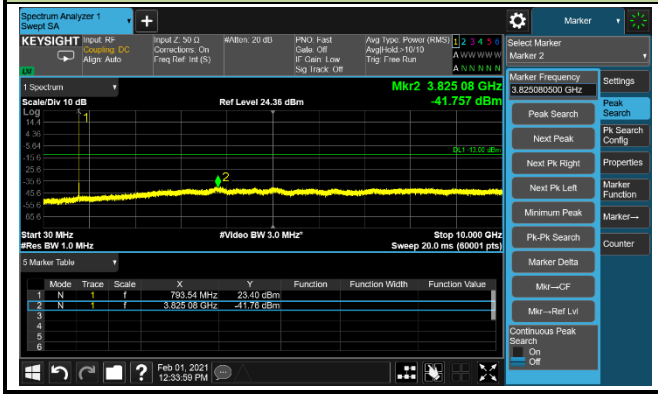
5MHz Channel Bandwidth

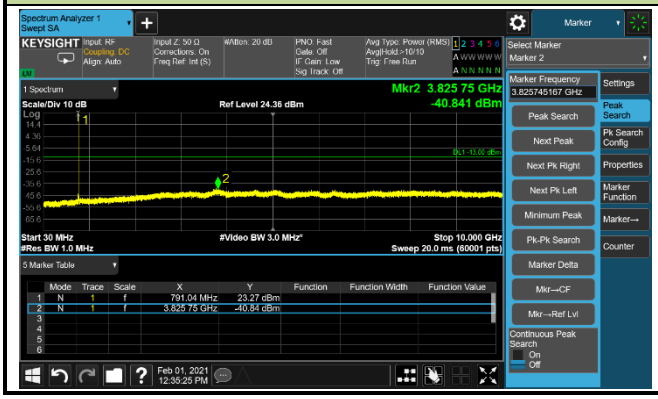
Low Channel

Middle Channel



High Channel



10MHz Channel Bandwidth	
Middle Channel	
	

4.8. Radiated Spurious Emission Measurement

4.8.1.Test Limit

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

For operations in the 758 ~ 775 MHz and 788 ~ 805 MHz bands, all emissions including harmonics in the band 1559 ~ 1610 MHz shall be limited to -70 dBW/MHz(-40dBm/MHz) equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW (-50dBm) EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, atransmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

E (dBμV/m) = EIRP (dBm) - 20 log D + 104.8; where D is the measurement distance in meters. The emission limit equal to 82.3dBμV/m or 55.3dBμV/m.

4.8.2.Test Procedure

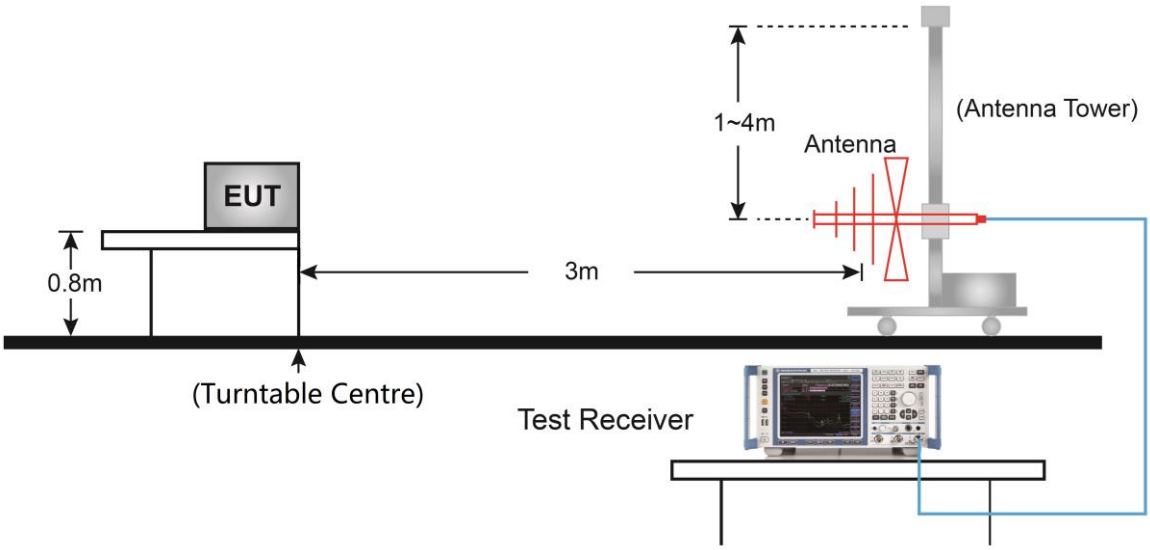
ANSI C63.26-2015 - Section 5.2.7 & 5.5

4.8.3.Test Setting

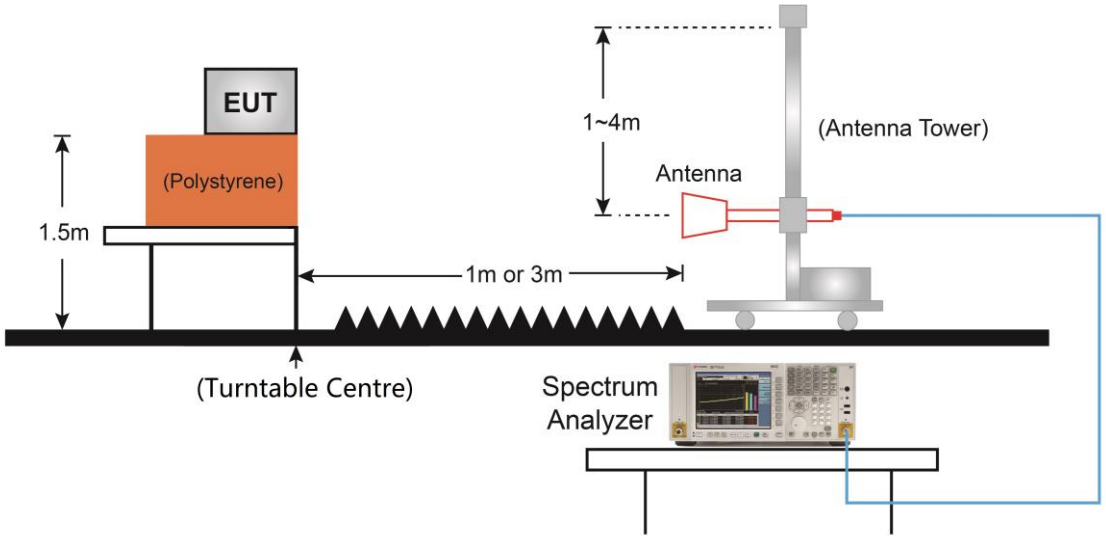
1. RBW = 1MHz
2. VBW ≥ 3*RBW
3. Sweep time ≥ 10 × (number of points in sweep) × (transmission symbol period)
4. Detector = Peak
5. Trace mode = max hold
6. The trace was allowed to stabilize

4.8.4.Test Setup

Below 1GHz Test Setup:



Above 1GHz Test Setup:



4.8.5.Test Result

Product	5G Sub-6 GHz M.2 Module	Test Site	WZ-AC1
Test Engineer	Buter Shi	Test Date	2021/02/06
Test Band	LTE Band 14_5MHz_1RB_QPSK		

Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level(dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
Low Channel							
313.2	40.0	19.1	59.1	82.3	-23.2	Peak	Horizontal
362.2	35.8	20.1	55.9	82.3	-26.4	Peak	Horizontal
312.3	32.0	19.1	51.1	82.3	-31.2	Peak	Vertical
364.7	31.3	20.2	51.6	82.3	-30.7	Peak	Vertical
1561.0	42.6	-5.7	36.9	55.3	-18.4	Peak	Horizontal
11650.5	36.9	14.9	51.8	82.3	-30.5	Peak	Horizontal
1595.0	42.1	-5.6	36.5	55.3	-18.8	Peak	Vertical
10885.5	37.2	15.7	52.9	82.3	-29.4	Peak	Vertical
Middle Channel							
313.2	39.6	19.1	58.7	82.3	-23.6	Peak	Horizontal
362.2	35.6	20.1	55.7	82.3	-26.6	Peak	Horizontal
311.8	31.7	19.0	50.7	82.3	-31.6	Peak	Vertical
364.2	30.9	20.2	51.1	82.3	-31.2	Peak	Vertical
1610.0	42.2	-5.6	36.6	55.3	-18.7	Peak	Horizontal
10953.5	36.1	15.9	52.0	82.3	-30.3	Peak	Horizontal
1595.0	42.5	-5.6	36.9	55.3	-18.4	Peak	Vertical
11455.0	36.8	15.3	52.1	82.3	-30.2	Peak	Vertical
High Channel							
314.2	40.1	19.1	59.2	82.3	-23.1	Peak	Horizontal
362.7	37.1	20.2	57.2	82.3	-25.1	Peak	Horizontal
313.2	32.5	19.1	51.6	82.3	-30.7	Peak	Vertical
367.1	31.8	20.3	52.2	82.3	-30.1	Peak	Vertical
1603.5	42.5	-5.6	36.9	55.3	-18.4	Peak	Horizontal
10953.5	37.2	15.9	53.1	82.3	-29.2	Peak	Horizontal
1610.0	41.6	-5.6	36.0	55.3	-19.3	Peak	Vertical
11888.5	38.0	15.1	53.1	82.3	-29.2	Peak	Vertical
Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB).							

5. CONCLUSION

The data collected relate only the item(s) tested and show that unitis compliance with FCC Rules.

The End

Appendix A - Test Setup Photograph

Refer to “2101RSU049-UT” file.

Appendix B - EUT Photograph

Refer to “2101RSU049-UE” file.