

# SPOT CHECK REPORT

## FCC PART 2 & 22 & 24 & 27

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**FCC ID:** XMR2020RM505QAE

**Application:** Quectel Wireless Solutions Company Limited

**Application Type:** Certification

**Product:** 5G Sub-6 GHz M.2 Module

**Model No.:** RM505Q-AE

**Brand Name:** Quectel

**FCC Rule Part(s):** Part 2, 22 (H), 24 (E), 27

**Test Procedure(s):** ANSI C63.26: 2015

**Test Date:** January 13, 2021 ~ February 06, 2021

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.

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## Revision History

Report No.	Version	Description	Issue Date	Note
2101RSU006-U7	Rev. 01	Initial Report	03-07-2021	Valid

Note: This application for certification is leveraging the data reuse procedures from KDB 484596 based on reference FCC ID: XMR2020RM502QAE to cover variant FCC ID: XMR2020RM505QAE.

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## 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

<input checked="" type="checkbox"/>	<b>Test Site - MRT Suzhou Laboratory</b>
	<b>Laboratory Location (Suzhou - Wuzhong)</b> D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China
	<b>Laboratory Location (Suzhou - SIP)</b> 4b Building, Liando U Valley, No.200 Xingpu Rd., Shengpu Town, Suzhou Industrial Park, China
	<b>Laboratory Accreditations</b>
	A2LA: 3628.01 <span style="float: right;">CNAS: L10551</span>
	FCC: CN1166 <span style="float: right;">ISED: CN0001</span>
	VCCI: R-20025, G-20034, C-20020, T-20020
<input type="checkbox"/>	<b>Test Site - MRT Shenzhen Laboratory</b>
	<b>Laboratory Location (Shenzhen)</b> 1G, Building A, Junxiangda Building, Zhongshanyuan Road West, Nanshan District, Shenzhen, China
	<b>Laboratory Accreditations</b>
	A2LA: 3628.02 <span style="float: right;">CNAS: L10551</span>
	FCC: CN1284 <span style="float: right;">ISED: CN0105</span>
<input type="checkbox"/>	<b>Test Site - MRT Taiwan Laboratory</b>
	<b>Laboratory Location (Taiwan)</b> No. 38, Fuxing 2 <sup>nd</sup> Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)
	<b>Laboratory Accreditations</b>
	TAF: L3261-190725
	FCC: 291082, TW3261 <span style="float: right;">ISED: TW3261</span>

## 2. PRODUCT INFORMATION

### 2.1. Equipment Description

Product Name:	5G Sub-6 GHz M.2 Module
Model No.:	RM505Q-AE
Brand Name:	Quectel
IMEI:	868692050005615
Operating Temperature:	-20 ~ 60 °C
Power Type:	3.135 ~ 4.4Vdc, typical 3.7Vdc
UMTS Specification	
Single Band:	Band 2, 4, 5
Modulation:	UL up to 16QAM, DL 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_66C
Modulation:	UL & DL up to 256QAM
5G NR Specification	
SA Band:	n2, n5, n7, n12, n25, n41, n66, n71, n77
SA UL MIMO Band:	n41
EN-DC Band:	DC_5A_n2A, DC_12A_n2, DC_13A_n2A, DC_2A_n5A DC_30A_n5A, DC_66A_n5A, DC_5A_n7A, DC_12A_n7A DC_2A_n12A, DC_12A_n25A, DC_2A_n41A, DC_25A_n41A DC_26A_n41A, DC_66A_n41A, DC_5A_n66A, DC_12A_n66A DC_13A_n66A, DC_14A_n66A, DC_71A_n66A, DC_2A_n71A DC_7A_n71A, DC_66A_n71A
HPUE Band:	n41, n77 (SA & UL MIMO)
SCS for NR cell:	FDD Band: 15kHz; TDD Band: 30kHz
Modulation:	UL & DL up to 256QAM

## 2.2. Product Specification Subjective to this Report

T <sub>x</sub> Frequency Range:	Band II: 1850 ~ 1910MHz, Band IV: 1710 ~ 1755MHz Band V: 824 ~ 849MHz
R <sub>x</sub> Frequency Range:	Band II: 1930 ~ 1990MHz, Band IV: 2110 ~ 2155MHz Band V: 869 ~ 894MHz

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.

## 2.3. Description of Available Antennas

Technology	Frequency Range (MHz)	Antenna Type	Max Peak Gain (dBi)
WCDMA Band II	1850 ~ 1910	Dipole	0.25
WCDMA Band IV	1710 ~ 1755		1.47
WCDMA Band V	824 ~ 849		2.68

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

## 2.4. Test Methodology

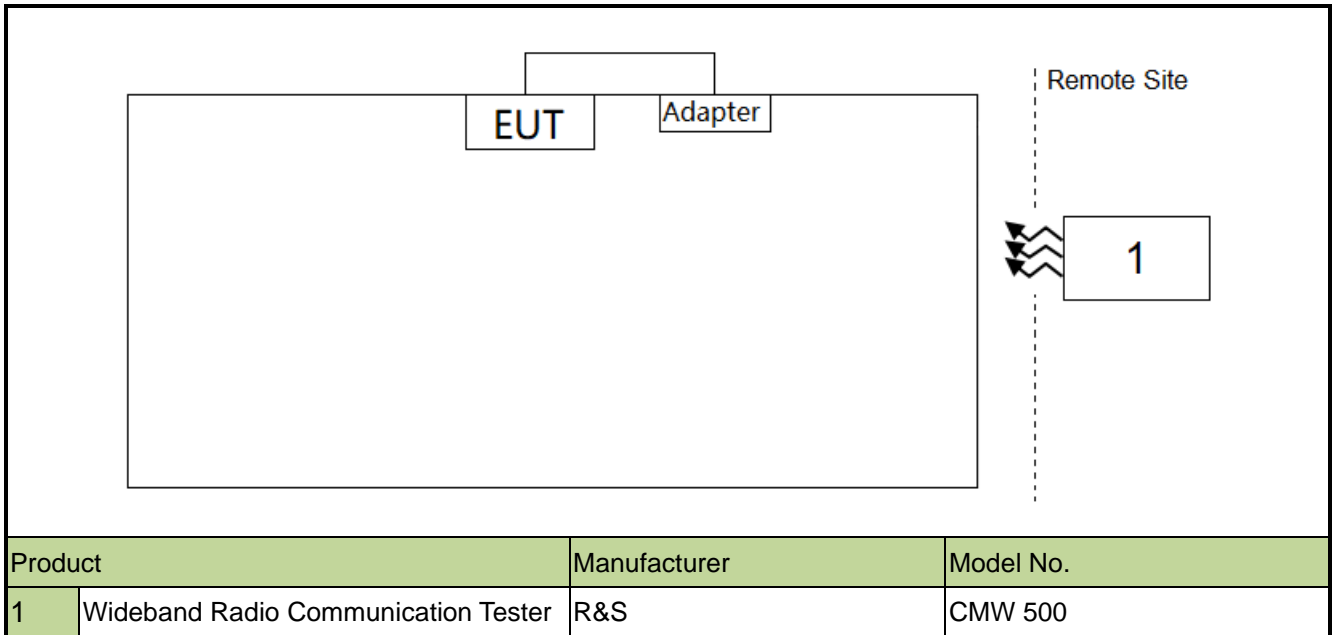
According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ANSI C63.26:2015
- FCC CFR 47 Part 22, Part 24, Part 27
- 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

## 2.5. EMI Suppression Device(s)/Modifications

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

## 2.6. Configuration of Tested System



## 2.7. Test Environment Condition

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

### 3. TEST EQUIPMENT CALIBRATION DATE

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	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	2021/11/07
UXM 5G Wireless Test Platform	Keysight	E7515B	MRTSUE06869	1 year	2021/05/25
Power Meter	Agilent	U2021XA	MRTSUE06030	1 year	2021/11/18
DC Power Supply	GWINSTEK	DPS-3303C	MRTSUE06064	N/A	N/A
True RMS Clamp Meter	Fluke	319	MRTSUE06080	1 year	2021/05/06
Directional Coupler	Agilent	87301D	MRTSUE06082	1 year	2021/03/25
Dual Directional Coupler	Agilent	7778D	MRTSUE06083	1 year	2021/03/25
Attenuator	MVE	6dB	MRTSUE06534	1 year	2021/12/12
Attenuator	MVE	10dB	MRTSUE06543	1 year	2021/12/12
Temperature & Humidity Chamber	BAOYT	BYH-150CL	MRTSUE06051	1 year	2021/11/07
Thermohygrometer	testo	608-H1	MRTSUE06401	1 year	2021/08/08



#### 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  $k = 2$ .

<b>Conducted Spurious Emissions</b>
Measuring Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ): 0.78dB
<b>Conducted Output Power</b>
Measuring Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ): 1.13dB

## 5. TEST RESULT

### 5.1. Summary

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
22.913(a)(5)	Equivalent Radiated Power (Band 5)	< 7 Watts Max ERP	Conducted	Pass	Section 5.2
27.50(d)(4)	Equivalent Isotropic Radiated Power (Band 4)	< 1 Watts Max EIRP		Pass	Section 5.2
24.232(c)	Equivalent Isotropic Radiated Power (Band 2)	< 2 Watts Max EIRP		Pass	Section 5.2
2.1051, 22.917(a) 24.238(a), 27.53(h)	Spurious Emission	< $43 + 10\log_{10}(P_{\text{Watts}})$		Pass	Section 5.3

**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) The difference compared with the original report is only different DL CA bands. Output power and conducted spurious emissions verification worst test refer to original MRT Repor No. "2010RSU005-U7".

## 5.2. Equivalent Isotropically Radiated Power Measurement

### 5.2.1. Test Limit

#### Band 2:

Mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

#### Band 4:

Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP.

#### Band 5:

The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

### 5.2.2. Test Procedures Used

ANSI C63.26-2015 - Section 5.2

### 5.2.3. 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:

$$\text{ERP or EIRP} = P_{\text{Meas}} + G_{\text{T}}$$

where

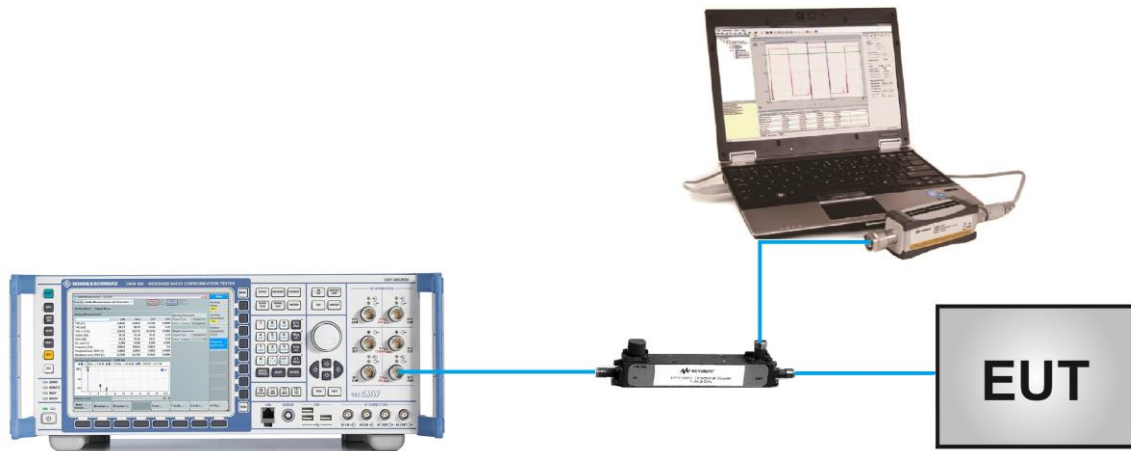
ERP or EIRP effective radiated power or equivalent isotropically radiated power, respectively (expressed in the same units as  $P_{\text{Meas}}$ , e.g., dBm or dBW)

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

$G_{\text{T}}$  gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP)

$$\text{ERP} = \text{EIRP} - 2.15$$

### 5.2.4. Test Setup



### 5.2.5. Test Result

Product	5G Sub-6 GHz M.2 Module	Test Site	WZ-SR6
Test Engineer	Larry Yan	Test Date	2021/02/08
Test Band	WCDMA Band II		

Mode	3GPP Subtest	Conducted Power (dBm)			Antenna Gain (dBi)	EIRP (dBm)		
		Band II Channel				Band II Channel		
		9262	9400	9538		9262	9400	9538
WCDMA R99	1	23.48	23.52	23.48	0.25	23.73	23.77	23.73
HSDPA	1	22.47	22.55	22.50	0.25	22.72	22.80	22.75
	2	22.48	22.50	22.49	0.25	22.73	22.75	22.74
	3	21.98	21.98	22.00	0.25	22.23	22.23	22.25
	4	21.94	21.97	21.96	0.25	22.19	22.22	22.21
HSUPA	1	21.96	21.99	21.96	0.25	22.21	22.24	22.21
	2	21.10	21.32	21.19	0.25	21.35	21.57	21.44
	3	22.05	22.05	22.08	0.25	22.30	22.30	22.33
	4	22.20	22.19	22.28	0.25	22.45	22.44	22.53
	5	22.49	22.52	22.47	0.25	22.74	22.77	22.72
Limit	33.01dBm							

Note: The EIRP (dBm) = Output Power (dBm) + Antenna Gain (dBi)

Product	5G Sub-6 GHz M.2 Module	Test Site	WZ-SR6
Test Engineer	Candy Luo	Test Date	2021/02/08
Test Band	WCDMA Band IV		

Mode	3GPP Subtest	Conducted Power (dBm)			Antenna Gain (dBi)	EIRP (dBm)		
		Band IV Channel				Band IV Channel		
		1312	1412	1513		1312	1412	1513
WCDMA R99	1	23.19	23.26	23.29	1.47	24.66	24.73	24.76
HSDPA	1	22.20	22.29	22.28	1.47	23.67	23.76	23.75
	2	22.23	22.28	22.29	1.47	23.70	23.75	23.76
	3	21.72	21.78	21.80	1.47	23.19	23.25	23.27
	4	21.65	21.78	21.77	1.47	23.12	23.25	23.24
HSUPA	1	21.69	21.81	21.79	1.47	23.16	23.28	23.26
	2	20.25	20.26	20.24	1.47	21.72	21.73	21.71
	3	21.74	21.86	21.90	1.47	23.21	23.33	23.37
	4	20.02	20.02	20.04	1.47	21.49	21.49	21.51
	5	22.20	22.26	22.21	1.47	23.67	23.73	23.68
Limit	30.00dBm							

Note: The EIRP (dBm) = Output Power (dBm) + Antenna Gain (dBi)

Product	5G Sub-6 GHz M.2 Module	Test Site	WZ-SR6
Test Engineer	Candy Luo	Test Date	2021/02/08
Test Band	WCDMA Band V		

Mode	3GPP Subtest	Conducted Power (dBm)			Antenna Gain (dBi)	ERP (dBm)		
		Band V Channel				Band V Channel		
		4132	4182	4233		4132	4182	4233
WCDMA R99	1	23.27	23.32	23.29	2.68	23.80	23.85	23.82
HSDPA	1	22.27	22.34	22.29	2.68	22.80	22.87	22.82
	2	22.28	22.33	22.30	2.68	22.81	22.86	22.83
	3	21.77	21.85	21.84	2.68	22.30	22.38	22.37
	4	21.76	21.83	21.77	2.68	22.29	22.36	22.30
HSUPA	1	21.80	21.88	21.76	2.68	22.33	22.41	22.29
	2	20.38	20.36	20.25	2.68	20.91	20.89	20.78
	3	21.26	21.30	21.32	2.68	21.79	21.83	21.85
	4	20.14	20.11	20.09	2.68	20.67	20.64	20.62
	5	22.27	22.35	22.30	2.68	22.80	22.88	22.83
Limit	38.45dBm							

Note: The ERP (dBm) = Output Power (dBm) + Antenna Gain (dBi) - 2.15

### **5.3. Conducted Spurious Emissions**

#### **5.3.1. 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 Low frequency generated in the equipment up to a frequency including its 10<sup>th</sup> 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 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.

#### **5.3.2. Test Procedure Used**

ANSI C63.26-2015 - Section 5.7

#### **5.3.3. Test Setting**

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



### 5.3.4. Test Setup



### 5.3.5. Test Result

Product	5G Sub-6 GHz M.2 Module	Test Site	WZ-SR6
Test Engineer	Eric Xu	Test Date	2021/01/19
Test Band	WCDMA Band II, IV, V		

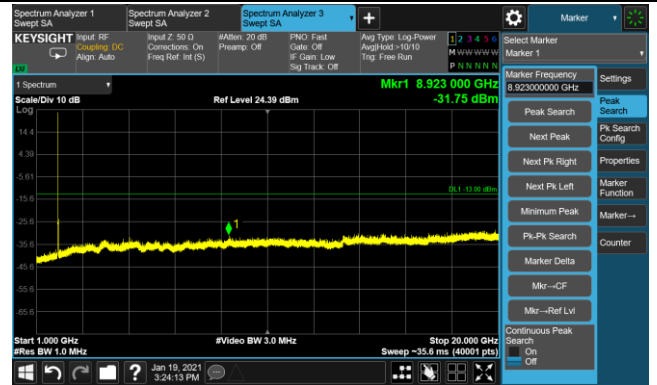
Mode	Frequency (MHz)	Frequency Range (MHz)	Max Spurious Emissions (dBm)	Limit (dBm)	Result
WCDMA Band II	1880.0	30 ~ 1000	-58.46	≤ -13.00	Pass
		1000 ~ 20000	-31.75	≤ -13.00	Pass
WCDMA Band IV	1732.4	30 ~ 1000	-59.34	≤ -13.00	Pass
		1000 ~ 20000	-31.47	≤ -13.00	Pass
WCDMA Band V	836.4	30 ~ 1000	-59.22	≤ -13.00	Pass
		1000 ~ 10000	-33.09	≤ -13.00	Pass

WCDMA Band II

Middle Channel 30 ~ 1000MHz

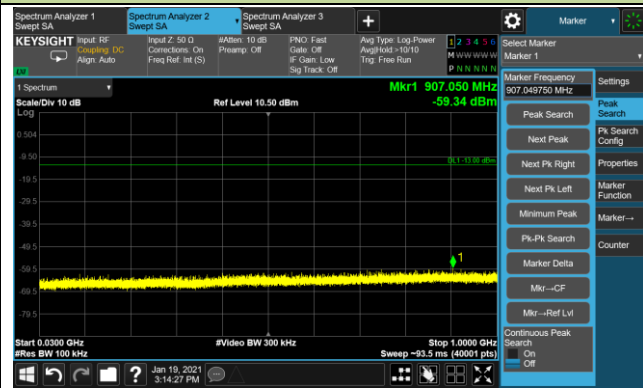


Middle Channel 1000 ~ 20000MHz

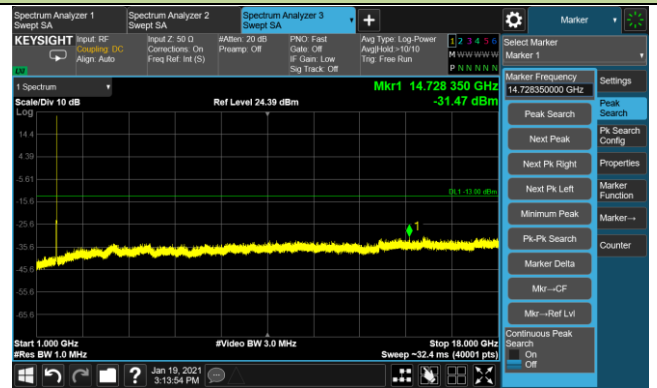


WCDMA Band IV

Middle Channel 30 ~ 1000MHz

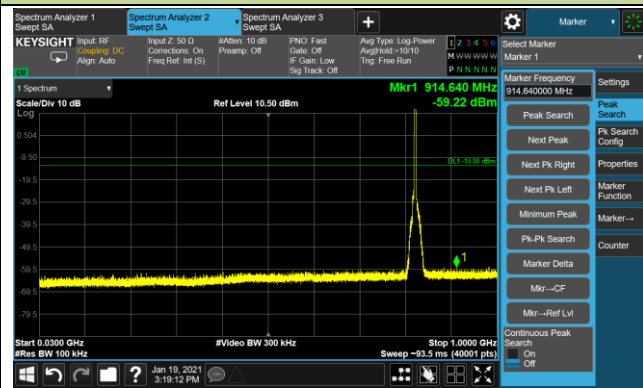


Middle Channel 1000 ~ 20000MHz

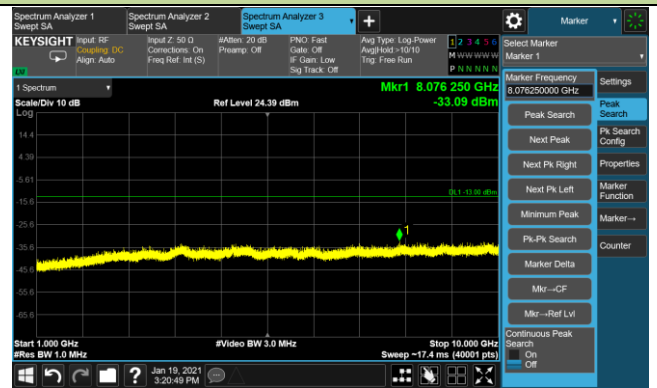


WCDMA Band V

Middle Channel 30 ~ 1000MHz



Middle Channel 1000 ~ 10000MHz



## 6. CONCLUSION

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

## **Appendix A - Test Setup Photograph**

Refer to "2101RSU006-UT" file.

## **Appendix B - EUT Photograph**

Refer to "2101RSU006-UE" file.

## Appendix C - Reference Test Report