

MEASUREMENT REPORT

FCC PART 22 & 24 & 27

FCC ID: 2A2TS2021IG830

Application: Honglink Wireless Solutions Co., Ltd.

Application Type: Certification

Product: LTE USB MODEM

Model No.: IG830

Brand Name: DJI

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

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

Test Date: June 03 ~ July 02, 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.

Revision History

Report No.	Version	Description	Issue Date	Note
2106RSU002-U1	Rev. 01	Initial Report	10-26-2021	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
1.8. Maximum Power, Frequency Tolerance, and Emission Designator	7
1.9. Configuration of Tested System	8
1.10. Test Environment Condition	8
2. TEST EQUIPMENT CALIBRATION DATE	9
3. MEASUREMENT UNCERTAINTY	11
4. TEST RESULT	12
4.1. Summary	12
4.2. Occupied Bandwidth Measurement	13
4.2.1. Test Limit	13
4.2.2. Test Procedure	13
4.2.3. Test Setting	13
4.2.4. Test Setup	13
4.2.5. Test Result	14
4.3. Frequency Stability Measurement	21
4.3.1. Test Limit	21
4.3.2. Test Procedure	21
4.3.3. Test Setting	21
4.3.4. Test Setup	22
4.3.5. Test Result	23
4.4. Equivalent Isotropically Radiated Power Measurement	28
4.4.1. Test Limit	28
4.4.2. Test Procedure	28
4.4.3. Test Setting	28
4.4.4. Test Setup	29
4.4.5. Test Result	30
4.5. Band Edge Measurement	35
4.5.1. Test Limit	35

4.5.2.	Test Procedure	35
4.5.3.	Test Setting.....	35
4.5.4.	Test Setup	36
4.5.5.	Test Result.....	37
4.6.	Peak to Average Ratio Measurement	42
4.6.1.	Test Limit	42
4.6.2.	Test Procedure	42
4.6.3.	Test Setting.....	42
4.6.4.	Test Setup	42
4.6.5.	Test Result.....	43
4.7.	Conducted Spurious Emission Measurement.....	52
4.7.1.	Test Limit	52
4.7.2.	Test Procedure	52
4.7.3.	Test Setting.....	52
4.7.4.	Test Setup	53
4.7.5.	Test Result.....	54
4.8.	Radiated Spurious Emission Measurement	63
4.8.1.	Test Limit	63
4.8.2.	Test Procedure	63
4.8.3.	Test Setting.....	63
4.8.4.	Test Setup	63
4.8.5.	Test Result.....	65
5.	CONCLUSION	70
	Appendix A - Test Setup Photograph	71
	Appendix B - EUT Photograph.....	72

1. GENERAL INFORMATION

1.1. Applicant

Honglink Wireless Solutions Co., Ltd.

Room 611-390, R&D Center Building, China (Hefei) International Intelligent Voice Industrial Park,
No.3333 Xiyu Road, High-tech Zone, Hefei

1.2. Manufacturer

Honglink Wireless Solutions Co., Ltd.

Room 611-390, R&D Center Building, China (Hefei) International Intelligent Voice Industrial Park,
No.3333 Xiyu Road, High-tech Zone, Hefei

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 FCC: CN1166 VCCI: ☐ R-20025 ☐ G-20034 ☐ C-20020 ☐ T-20020 ☐ R-20141 ☐ G-20134 ☐ C-20103 ☐ T-20104
	CNAS: L10551 ISED: CN0001
☐	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 FCC: CN1284
	CNAS: L10551 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	LTE USB MODEM
Model No.	IG830
Brand Name	DJI
IMEI	Conducted Measurement: 867914050003858 Radiated Measurement: 867914050004567
Operating Temperature	-20 ~ 55 °C
Supply Voltage	4.5 ~ 5.5Vdc, typical 5Vdc
GSM Band (s)	GSM 850, PCS 1900
UMTS Band	Band 2, 4, 5
E-UTRA Band	FDD Band: 2, 4, 5, 7, 12, 13, 25, 26, 66, 71 TDD Band: 38, 41
Antenna Information	Refer to section 1.6
Remark: The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer.	

1.5. Radio Specification under Test

GSM Specification	
T _x Frequency Range:	GSM 850: 824 ~ 849MHz, PCS 1900: 1850 ~ 1910MHz
R _x Frequency Range:	GSM850: 869 ~ 894MHz, GSM1900: 1930 ~ 1990MHz,
Modulation	GMSK, 8-PSK
Power Class	GSM900: 5, DCS1800: 3
Category	Multi-slot class 12
UMTS Specification	
T _x Frequency Range:	WCDMA Band II: 1850 ~ 1910MHz, WCDMA Band IV: 1710 ~ 1755MHz WCDMA Band V: 824 ~ 849MHz
R _x Frequency Range:	WCDMA Band II: 1930 ~ 1990MHz, WCDMA Band IV: 2110 ~ 2155MHz WCDMA Band V: 869 ~ 894MHz
Modulation	QPSK, 16QAM
Power Class	3
Category	HSDPA: 24; HSUPA: 6

1.6. Description of Available Antennas

Technology	Frequency Range (MHz)	Antenna Type	MaxPeak Gain (dBi)
Band 2 / PCS1900	1850 ~ 1910	PIFA	1.01
Band 4	1710 ~ 1755		1.36
Band 5 / GSM850	824 ~ 849		-0.11

1.7. Test Methodology

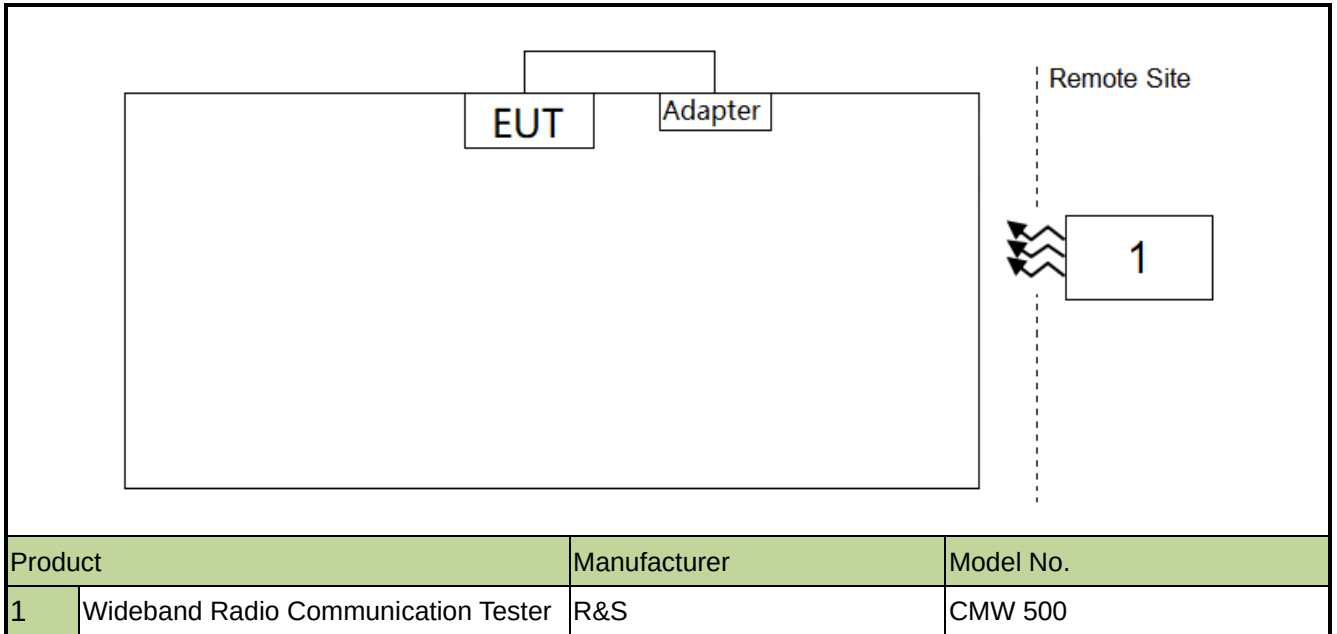
According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ANSI C63.26:2015
- FCC CFR 47 Part 2, 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

1.8. Maximum Power, Frequency Tolerance, and Emission Designator

System	Modulation	Maximum Power (W)	Frequency Tolerance (ppm)	Emission Designator
GSM 850_GPRS	GMSK	1.5996	0.0335	244KGXW
GSM 850_EGPRS	GMSK	0.4571	0.0275	244KG7W
PCS 1900_GPRS	8PSK	0.6067	0.0112	246KGXW
PCS 1900_EGPRS	8PSK	0.6397	0.0087	244KG7W
WCDMA Band II RMC 12.2Kbps	BPSK	0.1211	-0.0043	4M13F9W
WCDMA Band IV RMC 12.2Kbps	BPSK	0.1117	-0.0080	4M13F9W
WCDMA Band V RMC 12.2Kbps	BPSK	0.1368	0.0027	4M14F9W

1.9. Configuration of Tested System



1.10. 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	2022/01/04
Wideband Radio Communication Tester	R&S	CMW 500	MRTSUE06243	1 year	2021/10/20
PXA Signal Analyzer	Keysight	9030B	MRTSUE06395	1 year	2021/08/30
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2021/11/08
Bilog Period Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	1 year	2022/08/08
Broad Band Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06023	1 year	2021/09/27
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06597	1 year	2022/12/14
Microwave System Amplifier	Agilent	83017A	MRTSUE06076	1 year	2021/11/14
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2022/06/09
Thermohygrometer	Testo	608-H1	MRTSUE06403	1 year	2021/07/26
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	2022/06/24
Wideband Radio Communication Tester	R&S	CMW 500	MRTSUE06243	1 year	2021/10/20
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2021/11/08
Bilog Period Antenna	Schwarzbeck	VULB 9162	MRTSUE06022	1 year	2022/05/24
Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06171	1 year	2021/10/25
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06597	1 year	2022/12/14
Broad Band Coaxial Preamplifier	Schwarzbeck	BBV 9718	MRTSUE06176	1 year	2021/11/24
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2022/06/09
Temperature/Humidity Meter	Minggao	ETH529	MRTSUE06170	1 year	2021/12/08
Anechoic Chamber	RIKEN	Chamber-AC2	MRTSUE06213	1 year	2022/04/29

Conducted Test Equipment (WZ-SR6, WZ-TR3, SIP-SR1)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EXA Signal Analyzer	Agilent	N9020A	MRTSUE06106	1 year	2022/04/13
EXA Signal Analyzer	Keysight	N9010B	MRTSUE06457	1 year	2022/06/24
Signal Analyzer	R&S	FSV40	MRTSUE06218	1 year	2022/04/13
Wideband Radio Communication Tester	R&S	CMW 500	MRTSUE06243	1 year	2021/10/20
Power Meter	Agilent	U2021XA	MRTSUE06030	1 year	2021/10/22
DC Power Supply	GWINSTEK	DPS-3303C	MRTSUE06064	N/A	N/A
True RMS Clamp Meter	Fluke	319	MRTSUE06947	1 year	2022/05/05
Directional Coupler	Agilent	87301D	MRTSUE06082	1 year	2022/03/08
Dual Directional Coupler	Agilent	7778D	MRTSUE06083	1 year	2022/03/24
Attenuator	MVE	6dB	MRTSUE06534	N/A	N/A
Attenuator	MVE	10dB	MRTSUE06543	N/A	N/A
Temperature & Humidity Chamber	BAOYT	BYH-150CL	MRTSUE06051	1 year	2021/10/22
Thermohygrometer	testo	608-H1	MRTSUE06401	1 year	2021/07/26
Temperature Chamber	BAOYT	BYG-408CS	MRTSUE06847	1 year	2022/02/23

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 Emissions
Measurement Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 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% ($U=2U_c(y)$): 0.78dB
Output Power
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 1.13dB
Occupied Bandwidth
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 0.28%
Frequency Stability
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 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 4.2
2.1055, 22.355 24.235, 27.54	Frequency Stability	< 2.5 ppm		Pass	Section 4.3
22.913(a)(5)	Equivalent Radiated Power	< 7 Watts Max ERP		Pass	Section 4.4
27.50(d)(4)	Equivalent Isotropic Radiated Power	< 1 Watts Max EIRP		Pass	Section 4.4
24.232(c)	Equivalent Isotropic Radiated Power	< 2 Watts Max EIRP		Pass	Section 4.4
2.1051, 22.917(a) 24.238(a), 27.53(h)	Band Edge	< 43 + 10log ₁₀ (P _[Watts])		Pass	Section 4.5
2.1051, 22.917(a) 24.232(d), 27.53(h)	Peak to Average Ratio	< 13dB		Pass	Section 4.6
24.238(a), 27.50(d)(5)	Spurious Emission	< 43 + 10log ₁₀ (P _[Watts])		Pass	Section 4.7
2.1053, 22.917(a) 24.238(a), 27.53(h)	Spurious Emission	< 43 + 10log ₁₀ (P _[Watts])	Radiated	Pass	Section 4.8

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) 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.

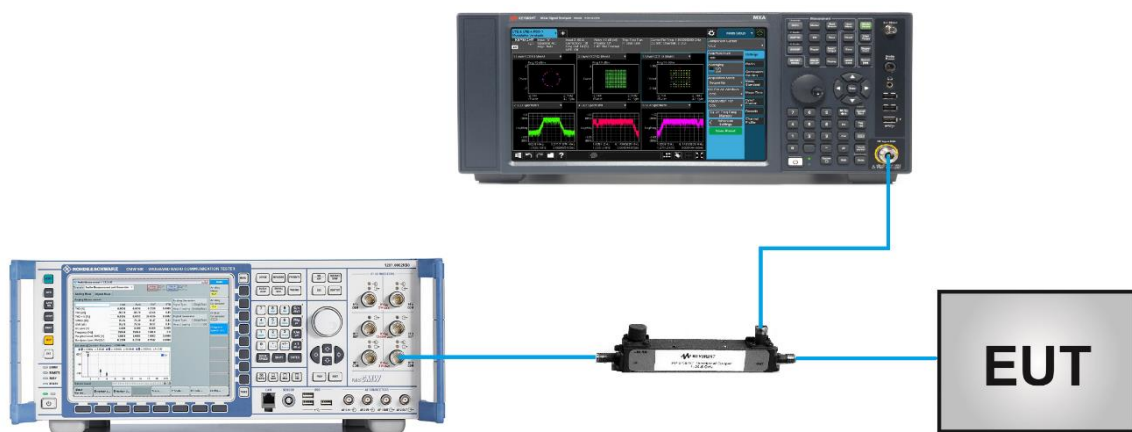
4.2.2. Test Procedure

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 $\geq 3 \times$ 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.

4.2.4. Test Setup



4.2.5. Test Result

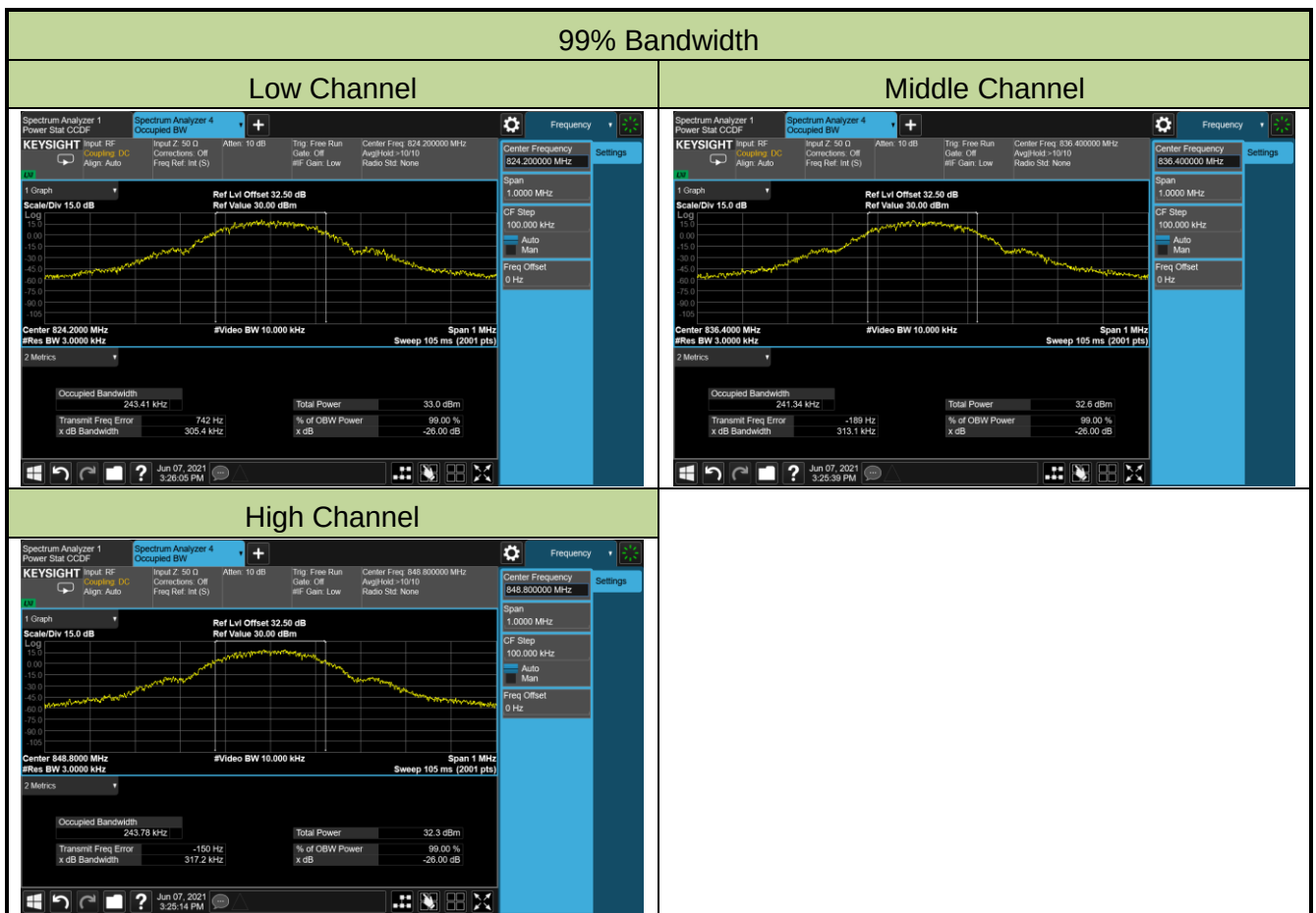
Product	LTE USB MODEM	Test Site	SIP-SR1
Test Engineer	Candy Luo	Test Date	2021/06/07
Test Band	GSM 850_GPRS		

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	824.2	0.239
Middle	836.4	0.244
High	848.8	0.244



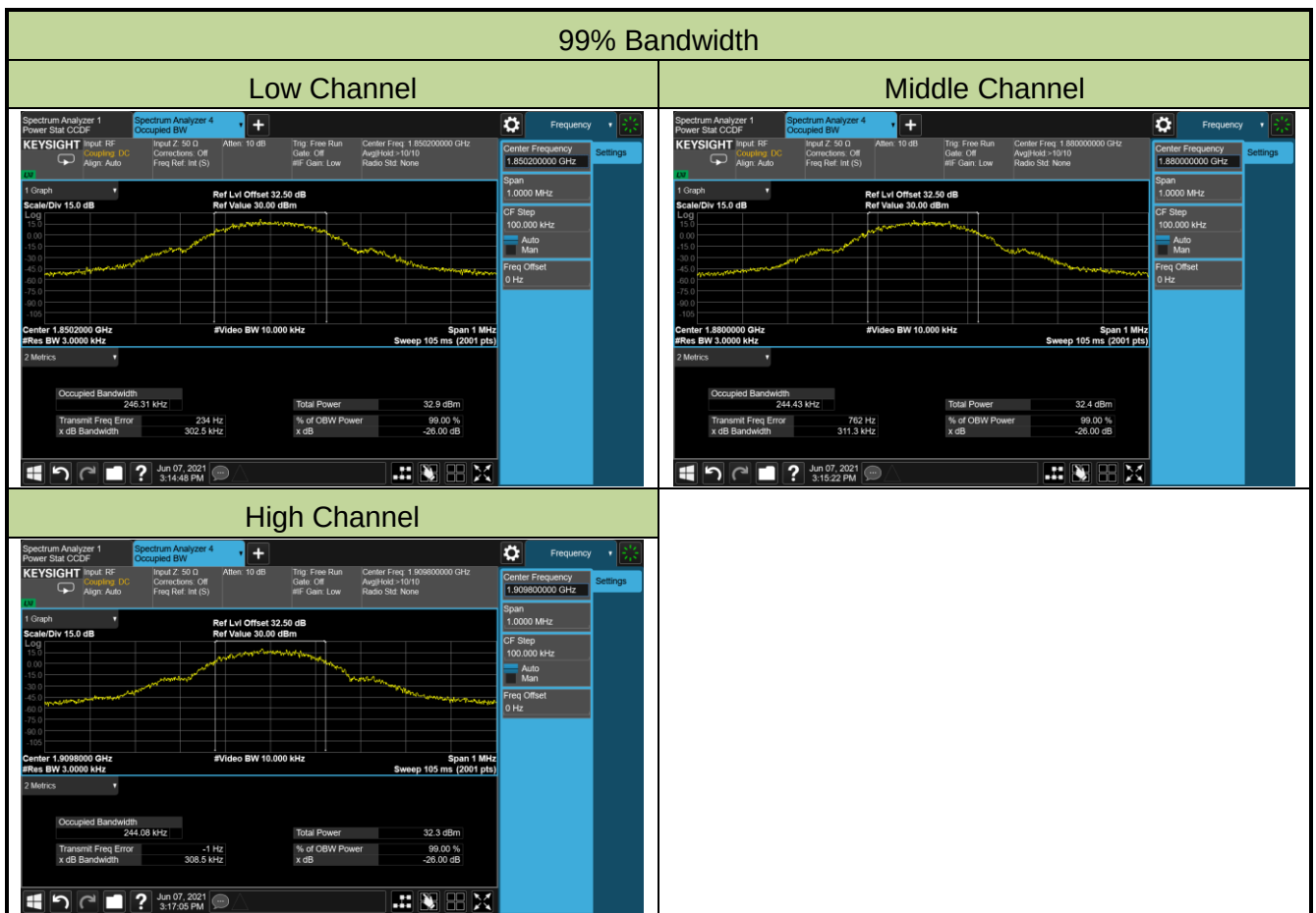
Product	LTE USB MODEM	Test Site	SIP-SR1
Test Engineer	Candy Luo	Test Date	2021/06/07
Test Band	GSM 850_EGPRS		

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	824.2	0.243
Middle	836.4	0.241
High	848.4	0.244



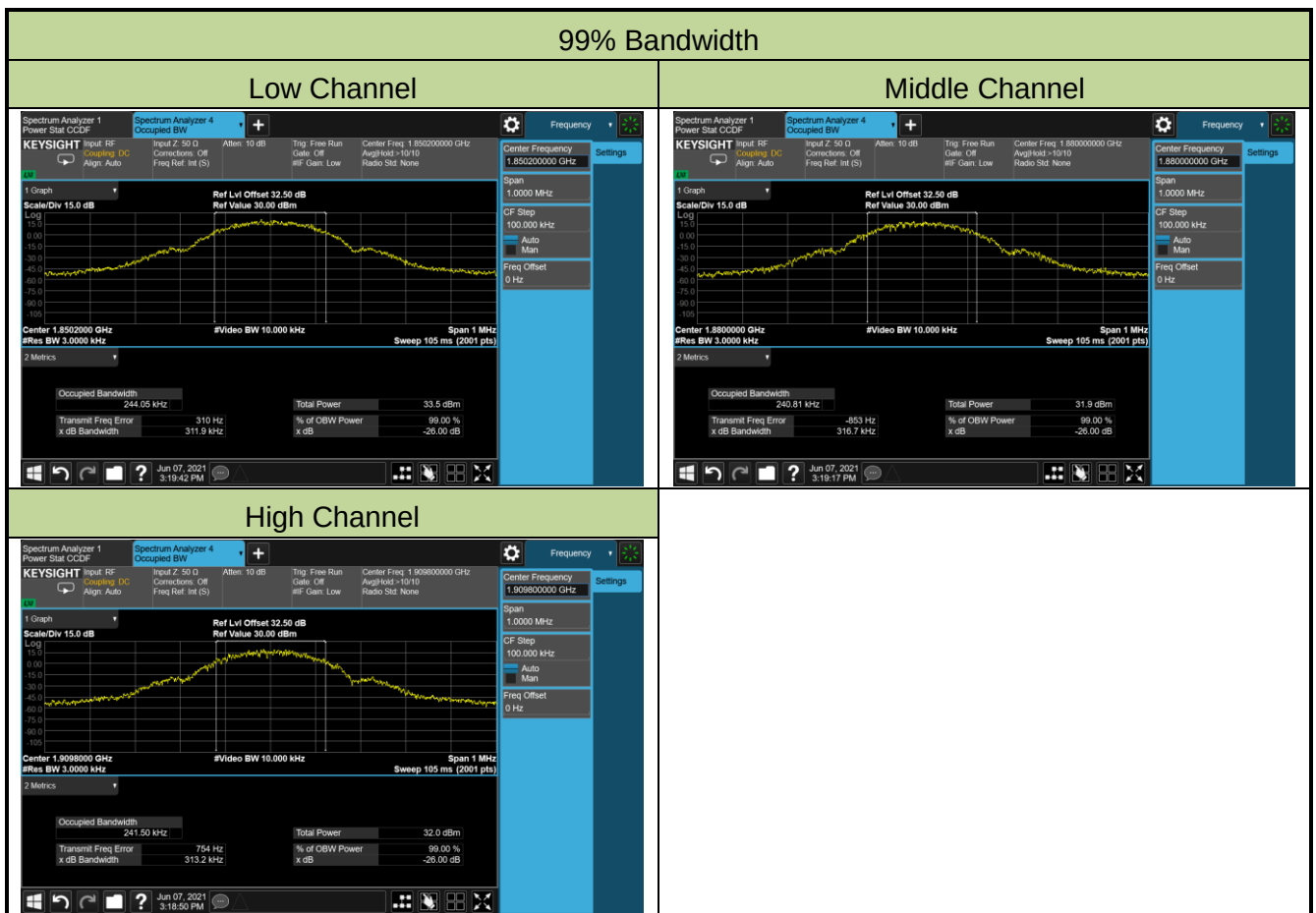
Product	LTE USB MODEM	Test Site	SIP-SR1
Test Engineer	Candy Luo	Test Date	2021/06/07
Test Band	PCS 1900_GPRS		

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	1850.2	0.246
Middle	1880.0	0.244
High	1909.8	0.244



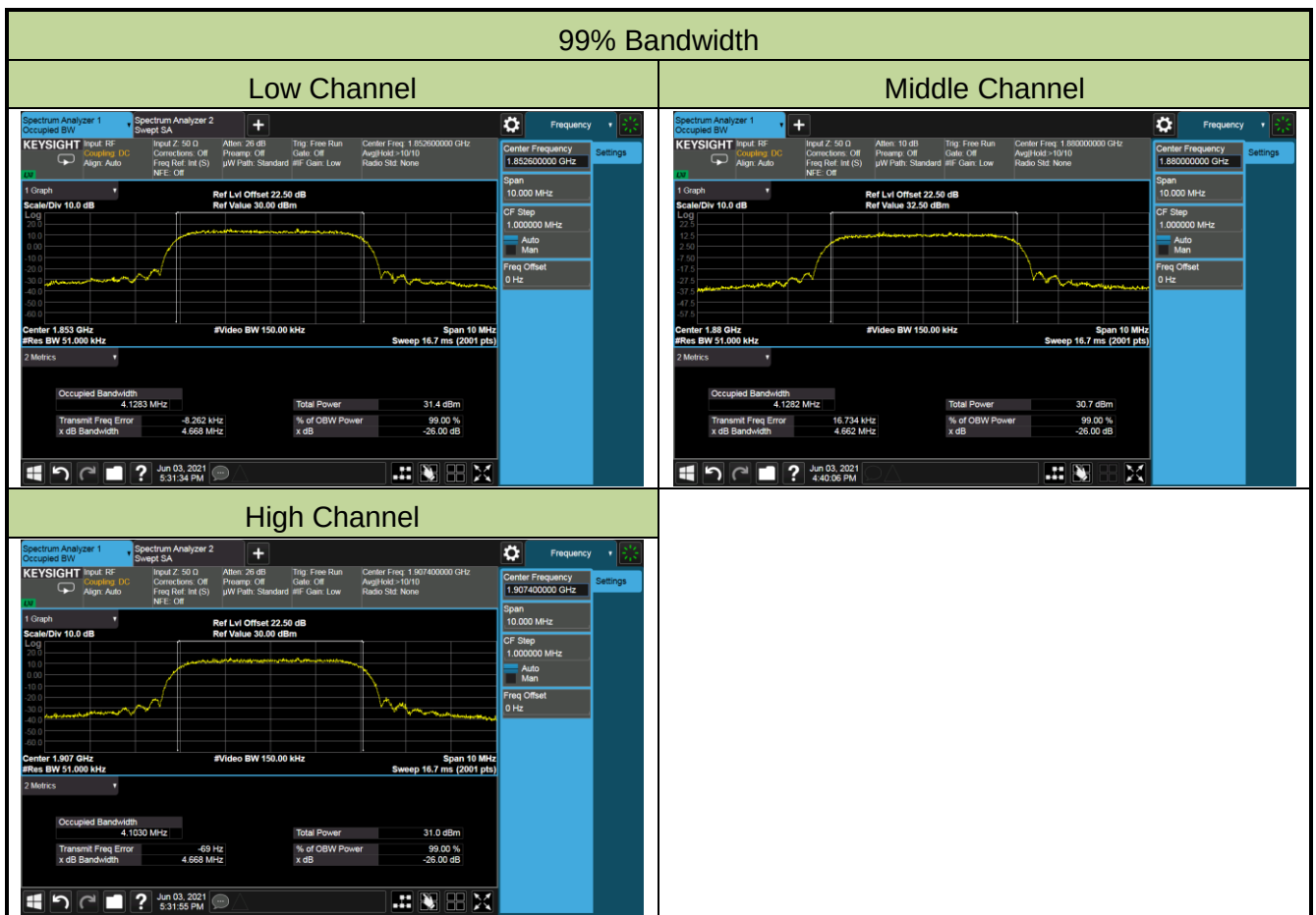
Product	LTE USB MODEM	Test Site	SIP-SR1
Test Engineer	Candy Luo	Test Date	2021/06/03
Test Band	PCS 1900_EGPRS		

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	1850.2	0.244
Middle	1880.0	0.240
High	1909.8	0.242



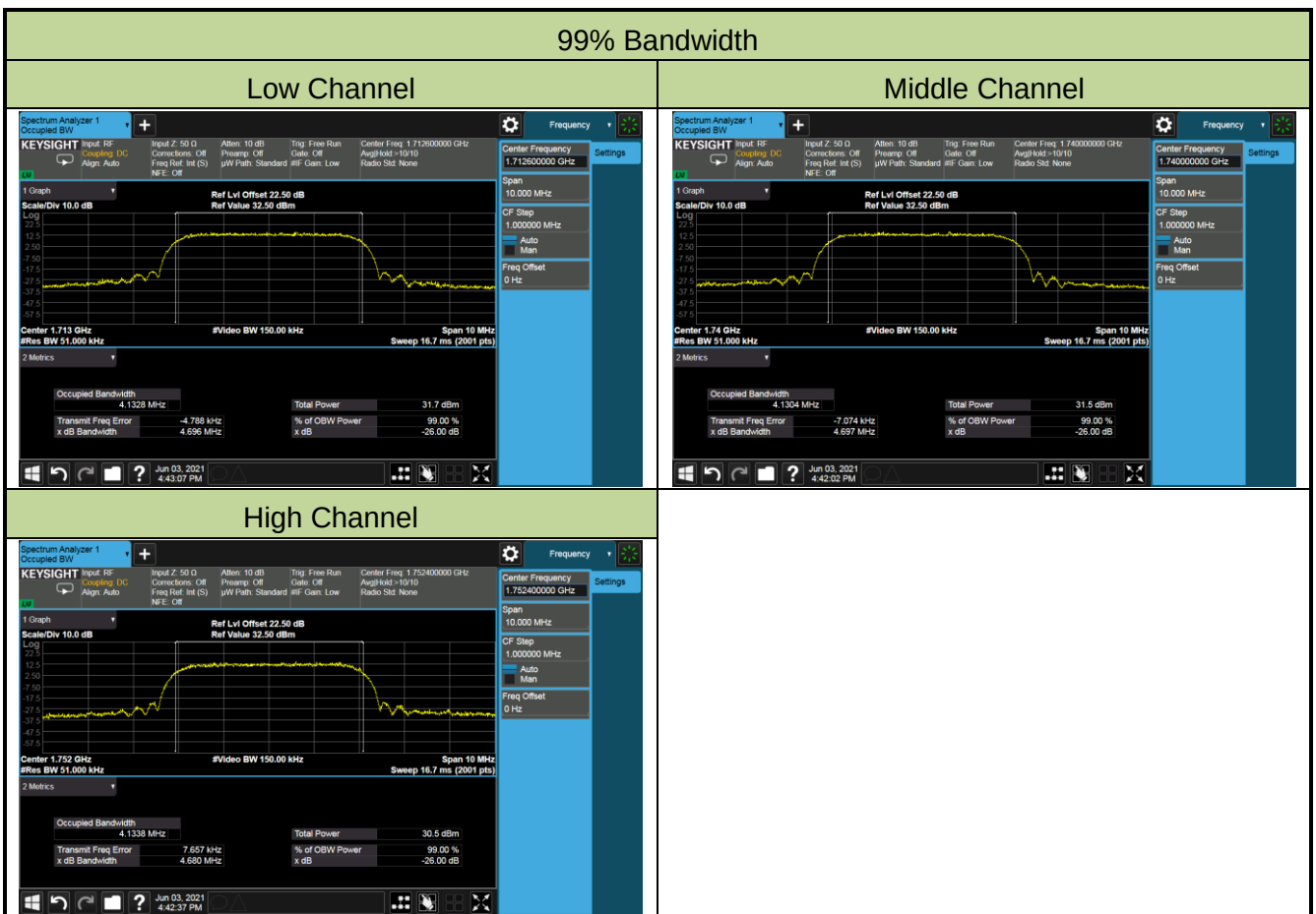
Product	LTE USB MODEM	Test Site	SIP-SR1
Test Engineer	Candy Luo	Test Date	2021/06/03
Test Band	WCDMA Band II		

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	1852.6	4.13
Middle	1880.0	4.13
High	1907.4	4.10



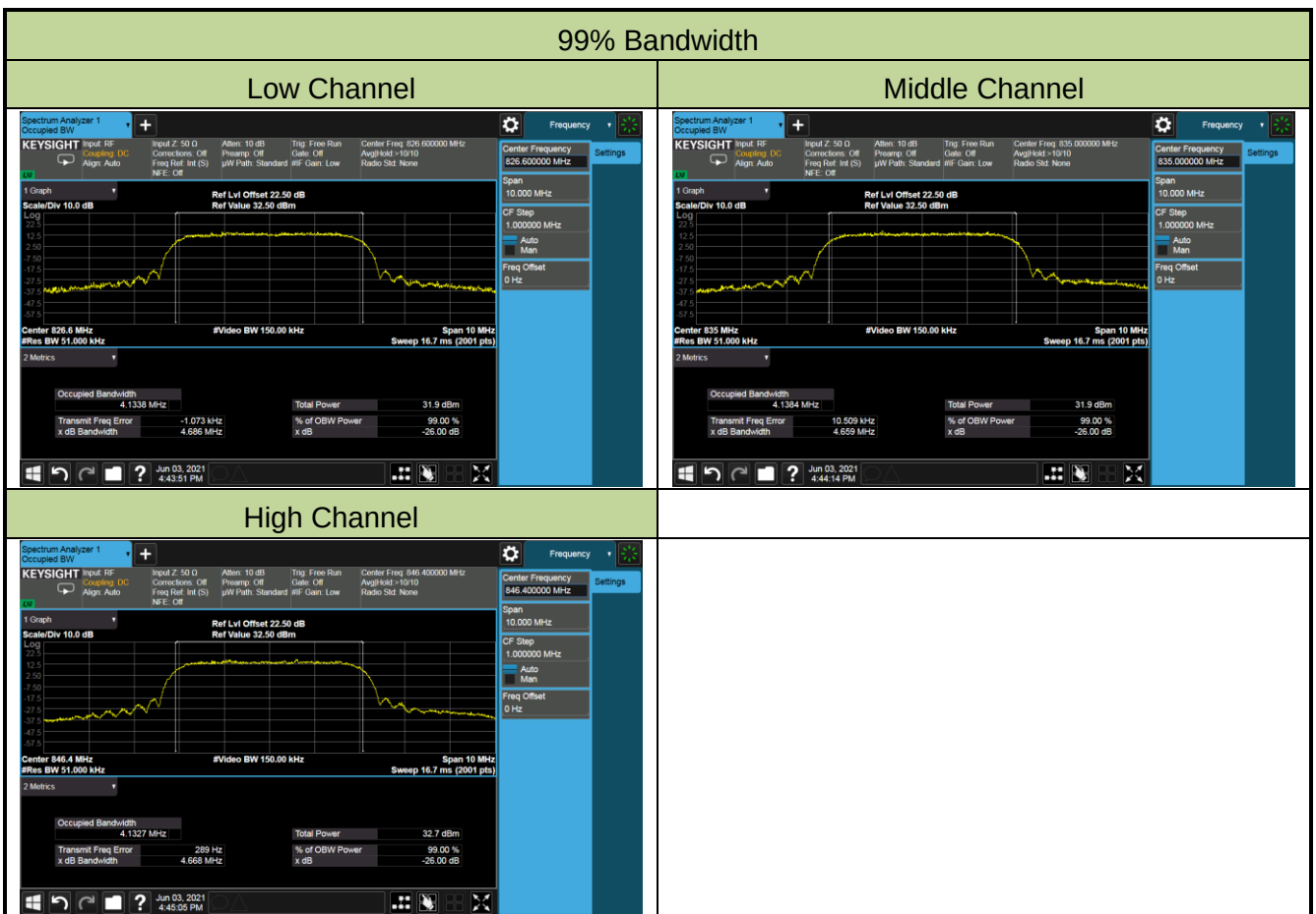
Product	LTE USB MODEM	Test Site	SIP-SR1
Test Engineer	Candy Luo	Test Date	2021/06/03
Test Band	WCDMA Band IV		

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	1712.6	4.13
Middle	1740.0	4.13
High	1752.4	4.13



Product	LTE USB MODEM	Test Site	SIP-SR1
Test Engineer	Candy Luo	Test Date	2021/06/03
Test Band	WCDMA Band V		

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	826.6	4.13
Middle	835.0	4.14
High	846.4	4.13



4.3. Frequency Stability Measurement

4.3.1. 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.

4.3.2. Test Procedure

ANSI C63.26-2015 - Section 5.6

4.3.3. Test Setting

Frequency Stability Under Temperature Variations:

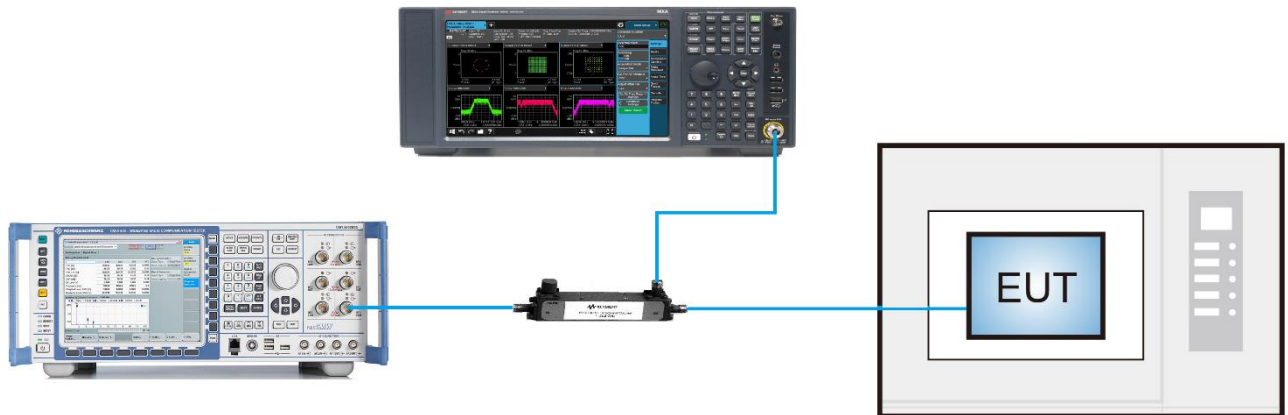
The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain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

4.3.4. Test Setup



4.3.5. Test Result

Product	LTE USB MODEM	Test Site	WZ-TR3
Test Engineer	Candy Luo	Test Date	2021/06/11
Test Band	GSM 850_GPRS		

Power (Vdc)	Temp. (°C)	Frequency Tolerance (ppm)
5.0	-30	0.1400
	-20	0.0156
	-10	0.0180
	0	0.0227
	+10	0.0238
	+20	0.0227
	+30	0.0265
	+40	0.0210
	+50	0.0223
5.75	+20	0.0215
4.25	+20	0.0335

Product	LTE USB MODEM	Test Site	SIP-SR1
Test Engineer	Candy Luo	Test Date	2021/06/11
Test Band	PCS 1900_GPRS		

Power (Vdc)	Temp. (°C)	Frequency Tolerance (ppm)
5.0	- 30	0.0048
	- 20	0.0047
	- 10	0.0088
	0	0.0057
	+ 10	0.0067
	+ 20	0.0059
	+ 30	0.0080
	+ 40	0.0099
	+ 50	0.0065
5.75	+ 20	0.0085
4.25	+ 20	0.0112

Product	LTE USB MODEM	Test Site	SIP-SR1
Test Engineer	Candy Luo	Test Date	2021/06/11
Test Band	WCDMA Band II		

Power (Vdc)	Temp. (°C)	Frequency Tolerance (ppm)
5.0	- 30	0.0016
	- 20	-0.0004
	- 10	-0.0005
	0	-0.0022
	+ 10	-0.0019
	+ 20	-0.0043
	+ 30	-0.0018
	+ 40	-0.0021
	+ 50	-0.0004
5.75	+ 20	-0.0032
4.25	+ 20	-0.0032

Product	LTE USB MODEM	Test Site	SIP-SR1
Test Engineer	Candy Luo	Test Date	2021/06/11
Test Band	WCDMA Band IV		

Power (Vdc)	Temp. (°C)	Frequency Tolerance (ppm)
5.0	- 30	0.0078
	- 20	0.0061
	- 10	0.0061
	0	0.0033
	+ 10	0.0007
	+ 20	-0.0080
	+ 30	-0.0039
	+ 40	-0.0041
	+ 50	-0.0039
5.75	+ 20	-0.0069
4.25	+ 20	-0.0064

Product	LTE USB MODEM	Test Site	SIP-SR1
Test Engineer	Candy Luo	Test Date	2021/06/11
Test Band	WCDMA Band V		

Power (Vdc)	Temp. (°C)	Frequency Tolerance (ppm)
5.0	- 30	0.0009
	- 20	-0.0005
	- 10	-0.0013
	0	-0.0016
	+ 10	-0.0018
	+ 20	-0.0027
	+ 30	-0.0007
	+ 40	-0.0008
	+ 50	-0.0001
5.75	+ 20	0.0027
4.25	+ 20	-0.0021

4.4. Equivalent Isotropically Radiated Power Measurement

4.4.1. Test Limit

PCS 1900, Band II

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 IV

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.

GSM 850, Band V:

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

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:

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

where

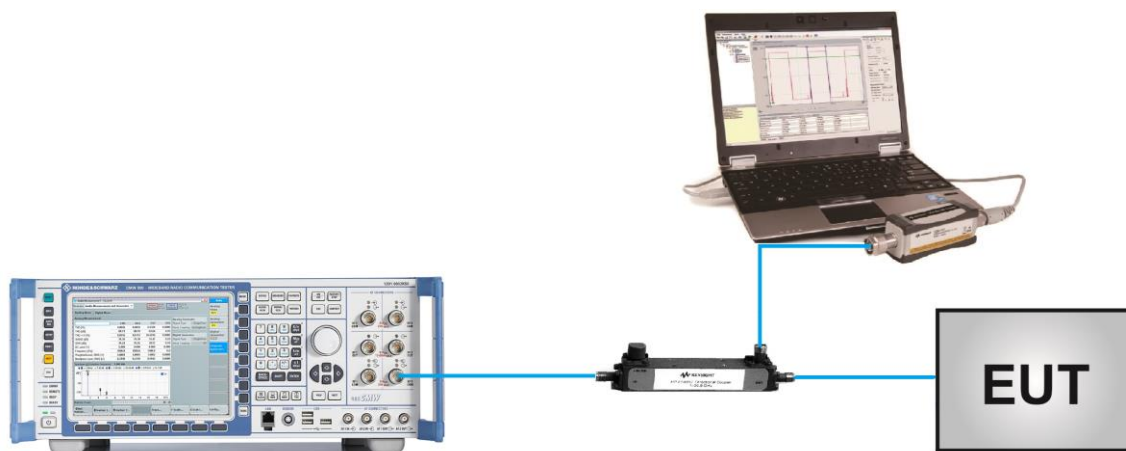
ERP or EIRP effective radiated power or equivalent isotropically radiated power, respectively (expressed in the same units as P_{Meas} , e.g., dBm or dBW)

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)

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

4.4.4. Test Setup



4.4.5. Test Result

Product	LTE USB MODEM	Test Site	SIP-SR1
Test Engineer	Candy Luo	Test Date	2021/06/07
Test Band	GSM 850		

Mode	Slot	Conducted Power (dBm)			Antenna Gain (dBi)	ERP (dBm)		
		GSM 850 Channel				GSM 850 Channel		
		128	189	251		128	189	251
GPRS	1	34.13	34.25	34.3	-0.11	31.87	31.99	32.04
	2	33.05	32.84	33.01	-0.11	30.79	30.58	30.75
	3	31.38	31.53	31.88	-0.11	29.12	29.27	29.62
	4	30.01	30.05	30.35	-0.11	27.75	27.79	28.09
EGPRS	1	28.53	28.68	28.86	-0.11	26.27	26.42	26.6
	2	28.5	28.42	28.65	-0.11	26.24	26.16	26.39
	3	28.34	28.31	28.37	-0.11	26.08	26.05	26.11
	4	28.11	28.34	28.24	-0.11	25.85	26.08	25.98
Limit	38.45dBm							

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

Product	LTE USB MODEM	Test Site	SIP-SR1
Test Engineer	Candy Luo	Test Date	2021/06/07
Test Band	PCS 1900		

Mode	Slot	Conducted Power (dBm)			Antenna Gain (dBi)	EIRP (dBm)		
		PCS 1900 Channel				PCS 1900 Channel		
		512	661	810		512	661	810
GPRS	1	26.82	26.31	26.12	1.01	27.83	27.32	27.13
	2	26.65	26.05	25.82	1.01	27.66	27.06	26.83
	3	25.93	25.37	25.23	1.01	26.94	26.38	26.24
	4	25.31	24.85	24.88	1.01	26.32	25.86	25.89
EGPRS	1	27.05	26.10	26.37	1.01	28.06	27.11	27.38
	2	26.11	25.97	26.14	1.01	27.12	26.98	27.15
	3	25.82	25.33	25.1	1.01	26.83	26.34	26.11
	4	25.27	24.69	24.37	1.01	26.28	25.7	25.38
Limit	33.01dBm							

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

Product	LTE USB MODEM	Test Site	SIP-SR1
Test Engineer	Candy Luo	Test Date	2021/06/10
Test Band	WCDMA Band II		

Mode	3GPP Subtest	Conducted Power (dBm)			Antenna Gain (dBi)	EIRP (dBm)		
		Band II Channel				Band II Channel		
		9263	9400	9537		9263	9400	9537
WCDMA R99	1	19.66	19.82	19.74	1.01	20.67	20.83	20.75
HSDPA	1	18.7	18.67	18.55	1.01	19.71	19.68	19.56
	2	18.62	18.69	18.64	1.01	19.63	19.7	19.65
	3	18.11	18.27	18.18	1.01	19.12	19.28	19.19
	4	18.08	18.28	18.19	1.01	19.09	19.29	19.2
HSUPA	1	18.89	19.07	18.93	1.01	19.9	20.08	19.94
	2	18.42	18.56	18.46	1.01	19.43	19.57	19.47
	3	18.93	19.06	18.86	1.01	19.94	20.07	19.87
	4	18.87	19.05	18.91	1.01	19.88	20.06	19.92
	5	18.87	18.97	18.78	1.01	19.88	19.98	19.79
Limit	33.01dBm							

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

Product	LTE USB MODEM	Test Site	SIP-SR1
Test Engineer	Candy Luo	Test Date	2021/06/10
Test Band	WCDMA Band IV		

Mode	3GPP Subtest	Conducted Power (dBm)			Antenna Gain (dBi)	EIRP (dBm)		
		Band IV Channel				Band IV Channel		
		1313	1450	1512		1313	1450	1512
WCDMA R99	1	19.02	19.09	19.12	1.36	20.38	20.45	20.48
HSDPA	1	18.06	18.14	18.09	1.36	19.42	19.50	19.45
	2	18.17	18.22	18.14	1.36	19.53	19.58	19.50
	3	17.64	17.69	17.6	1.36	19.00	19.05	18.96
	4	17.67	17.65	17.61	1.36	19.03	19.01	18.97
HSUPA	1	18.04	18.12	18	1.36	19.40	19.48	19.36
	2	18.1	18.2	18.14	1.36	19.46	19.56	19.50
	3	17.79	17.69	17.63	1.36	19.15	19.05	18.99
	4	18.23	18.26	18.2	1.36	19.59	19.62	19.56
	5	17.92	17.71	17.64	1.36	19.28	19.07	19.00
Limit	30.00dBm							

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

Product	LTE USB MODEM	Test Site	SIP-SR1
Test Engineer	Candy Luo	Test Date	2021/06/10
Test Band	WCDMA Band V		

Mode	3GPP Subtest	Conducted Power (dBm)			Antenna Gain (dBi)	ERP (dBm)		
		Band V Channel				Band V Channel		
		4133	4175	4232		4133	4175	4232
WCDMA R99	1	23.54	23.53	23.62	-0.11	21.28	21.27	21.36
HSDPA	1	22.38	22.43	22.40	-0.11	20.12	20.17	20.14
	2	22.44	22.46	22.45	-0.11	20.18	20.20	20.19
	3	22.00	21.89	21.94	-0.11	19.74	19.63	19.68
	4	22.04	22.05	22.02	-0.11	19.78	19.79	19.76
HSUPA	1	22.56	22.49	22.51	-0.11	20.30	20.23	20.25
	2	21.94	21.96	22.00	-0.11	19.68	19.70	19.74
	3	22.60	22.53	22.54	-0.11	20.34	20.27	20.28
	4	22.56	22.58	22.59	-0.11	20.30	20.32	20.33
	5	22.60	22.52	22.49	-0.11	20.34	20.26	20.23
Limit	38.45dBm							

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 824 ~ 849 MHz, 1850 ~ 1910 MHz, 1930 ~ 1990 MHz, 698 ~ 746 MHz and 1710 ~ 1755 MHz, the FCC limit is $43 + 10\log_{10}(P_{\text{[Watts]}})$ dB below the transmitter power P(Watts) in a 1 MHz bandwidth. However, in the 1MHz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

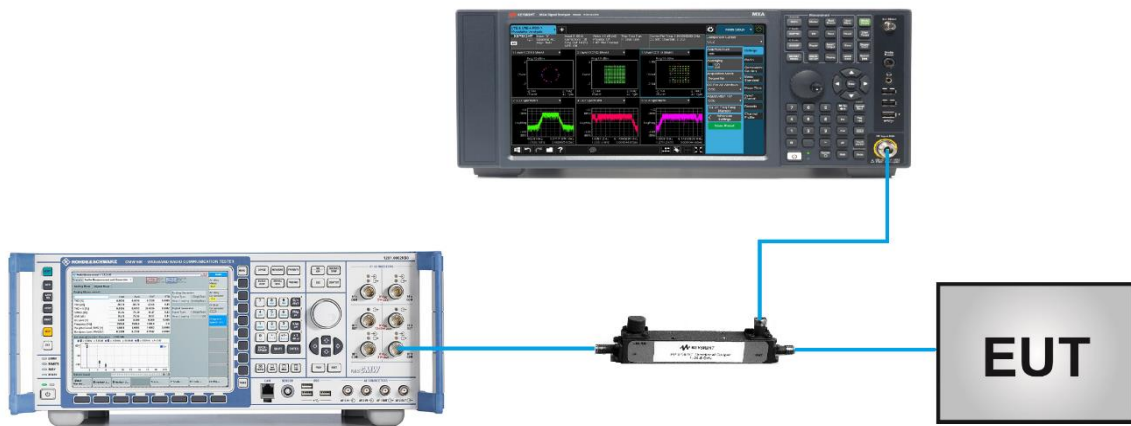
4.5.2. Test Procedure

ANSI C63.26-2015 - Section 5.7

4.5.3. Test Setting

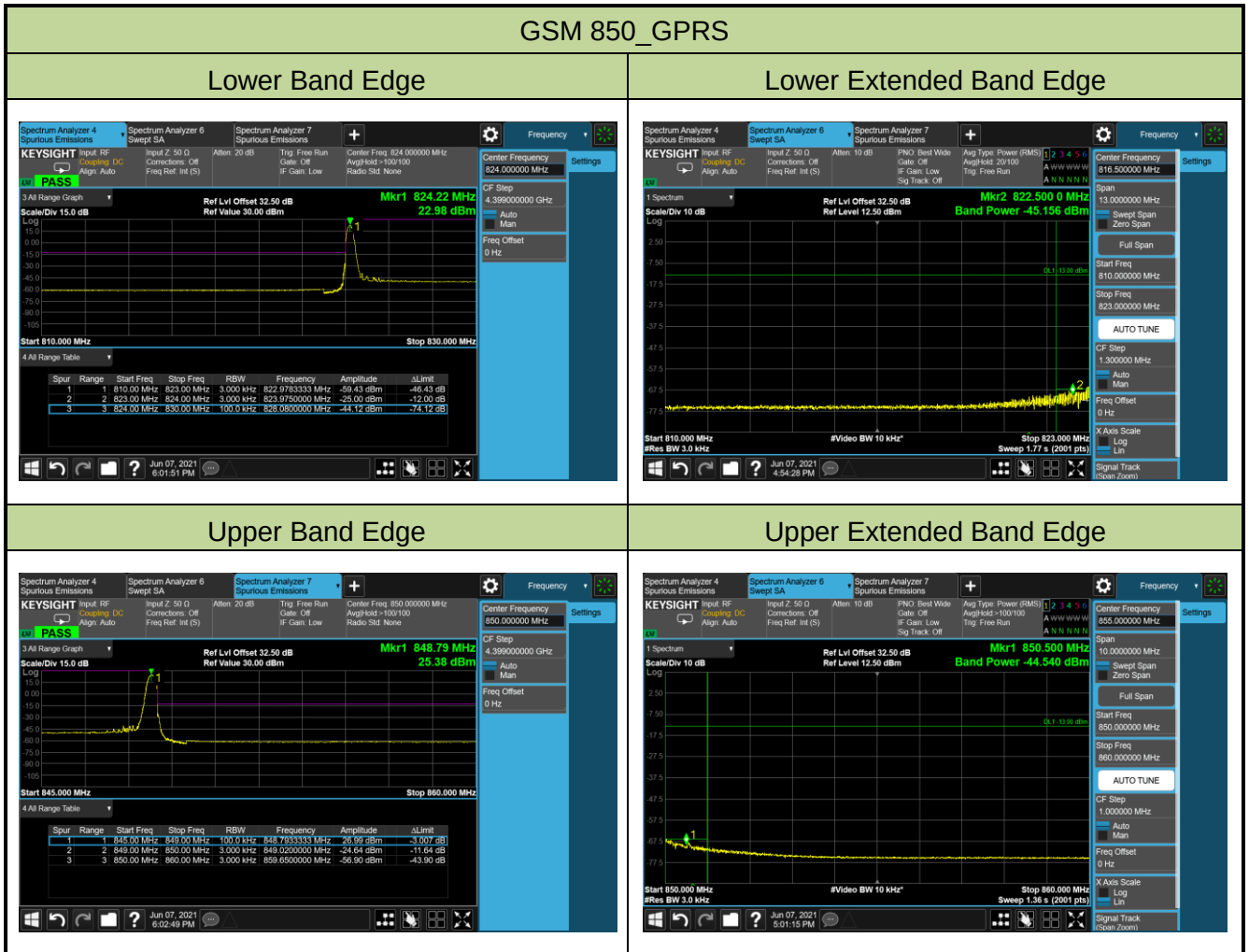
1. Set the analyzer frequency to low or high channel
2. $RBW \geq$ The nominal RBW shall be in the range of 1% of the anticipated OBW (in the 1MHz band immediately outside and adjacent to the band edge). For improvement of the accuracy in the measurement of the average power of a noise-like emission,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

4.5.4.Test Setup



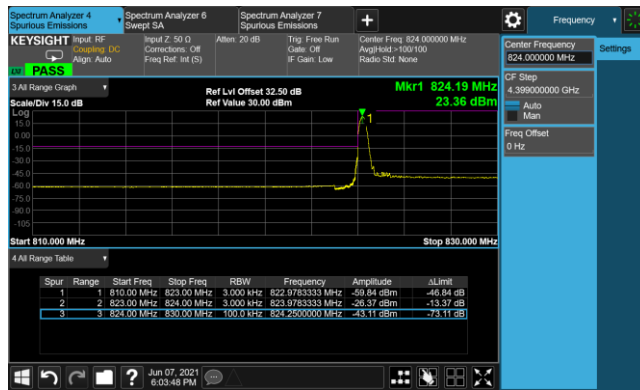
4.5.5. Test Result

Product	LTE USB MODEM	Test Site	SIP-SR1
Test Engineer	Candy Luo	Test Date	2021/06/07
Test Band	GSM 850		



GSM 850_EGPRS

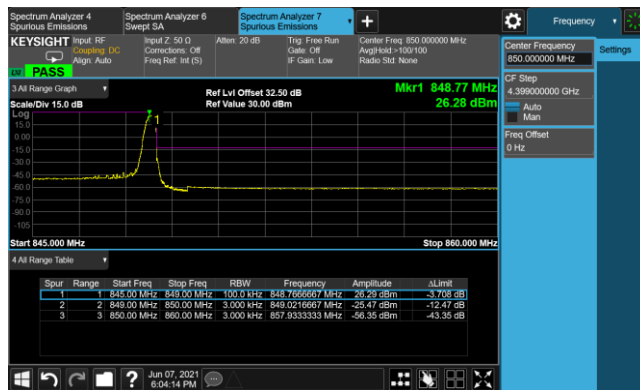
Lower Band Edge



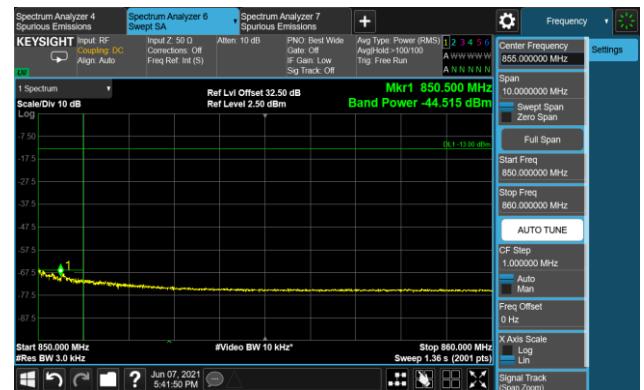
Lower Extended Band Edge



Upper Band Edge



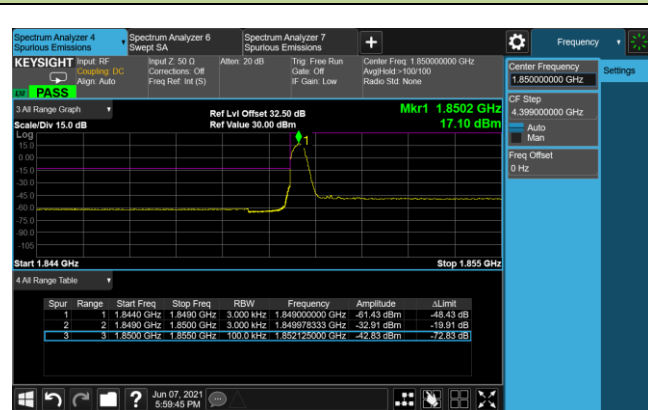
Upper Extended Band Edge



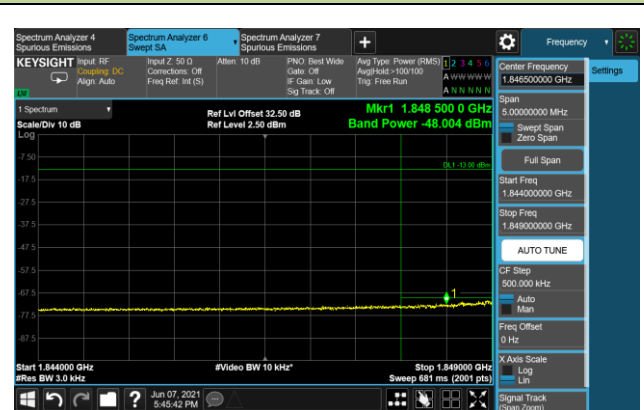
Product	LTE USB MODEM	Test Site	SIP-SR1
Test Engineer	Candy Luo	Test Date	2021/06/07
Test Band	PCS 1900		

PCS 1900_GPRS

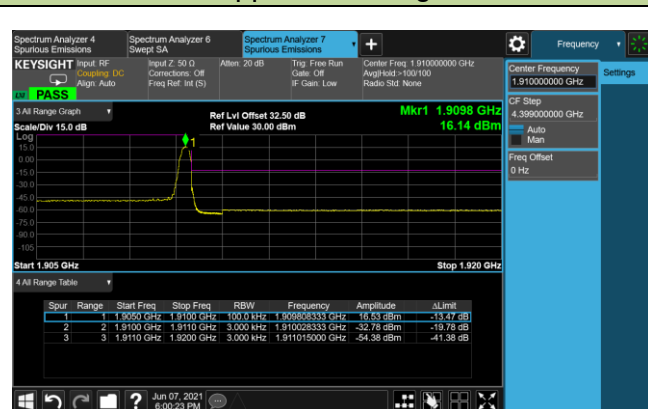
Lower Band Edge



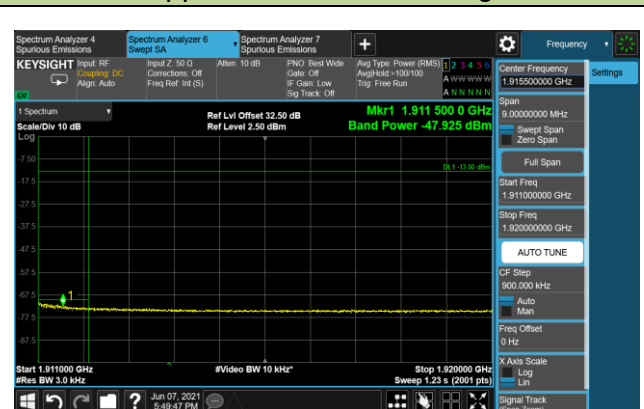
Lower Extended Band Edge



Upper Band Edge

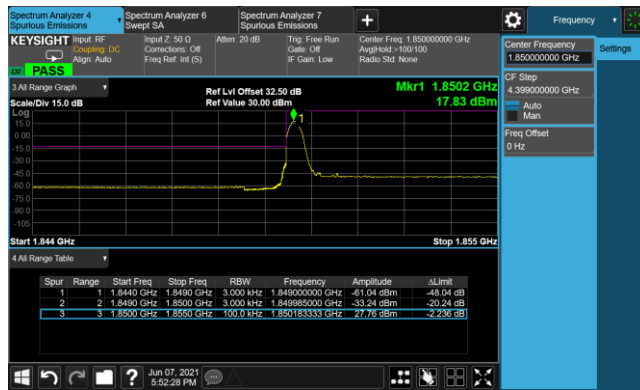


Upper Extended Band Edge

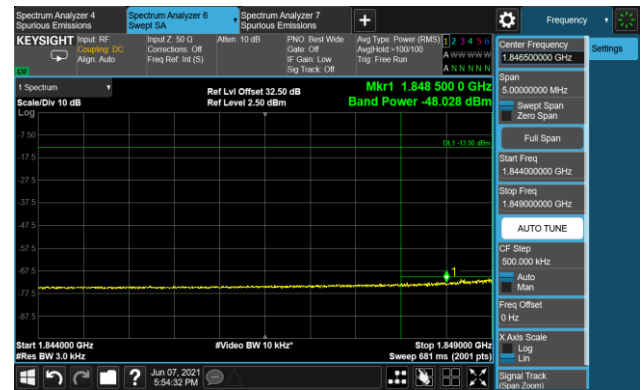


PCS 1900_EGPRS

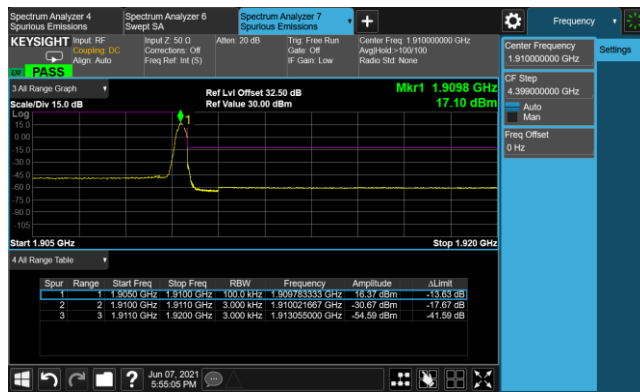
Lower Band Edge



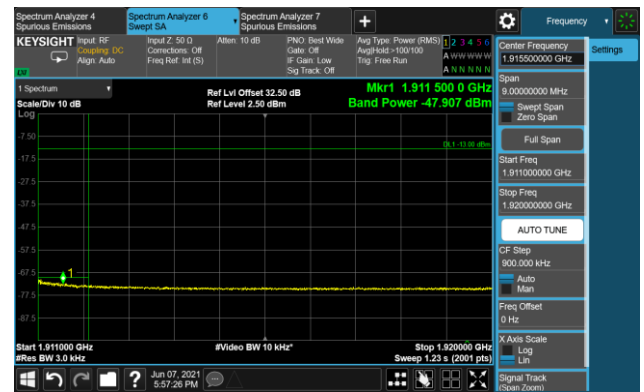
Lower Extended Band Edge



Upper Band Edge

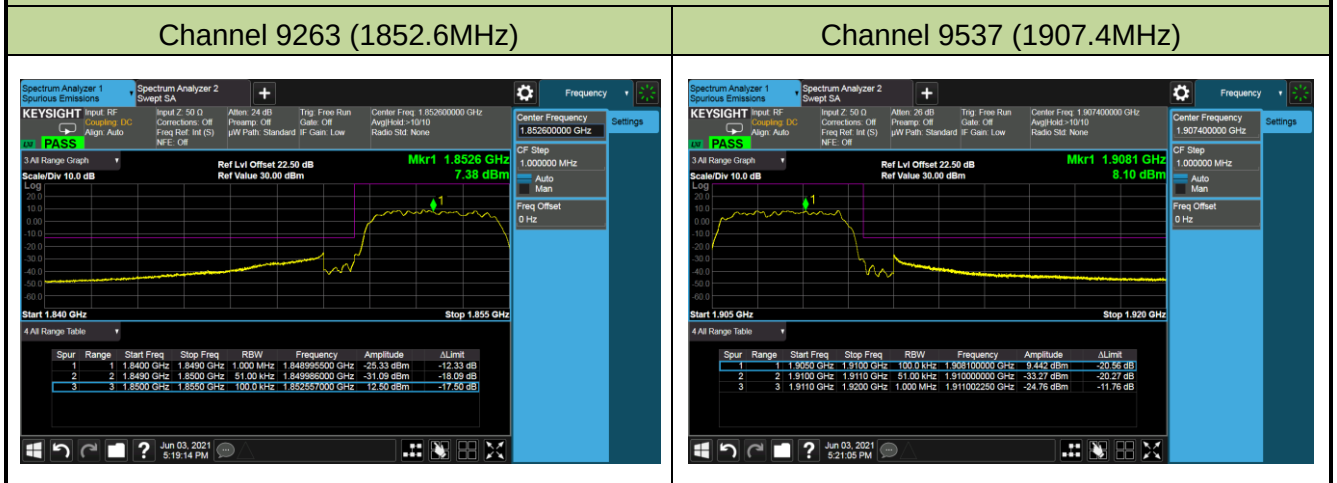


Upper Extended Band Edge

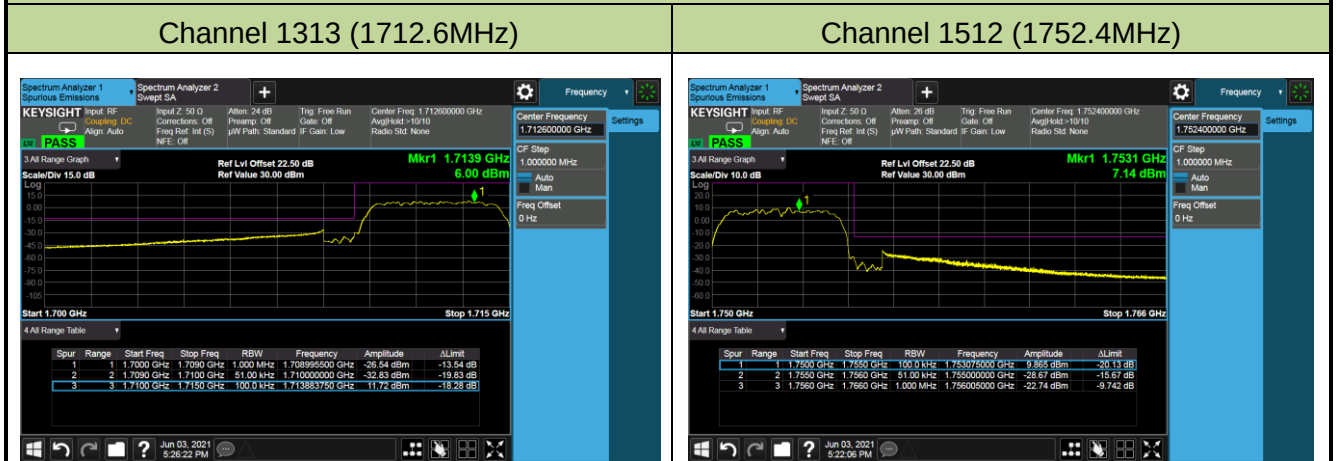


Product	LTE USB MODEM	Test Site	SIP-SR1
Test Engineer	Candy Luo	Test Date	2021/06/03
Test Band	WCDMA Band II, IV, V		

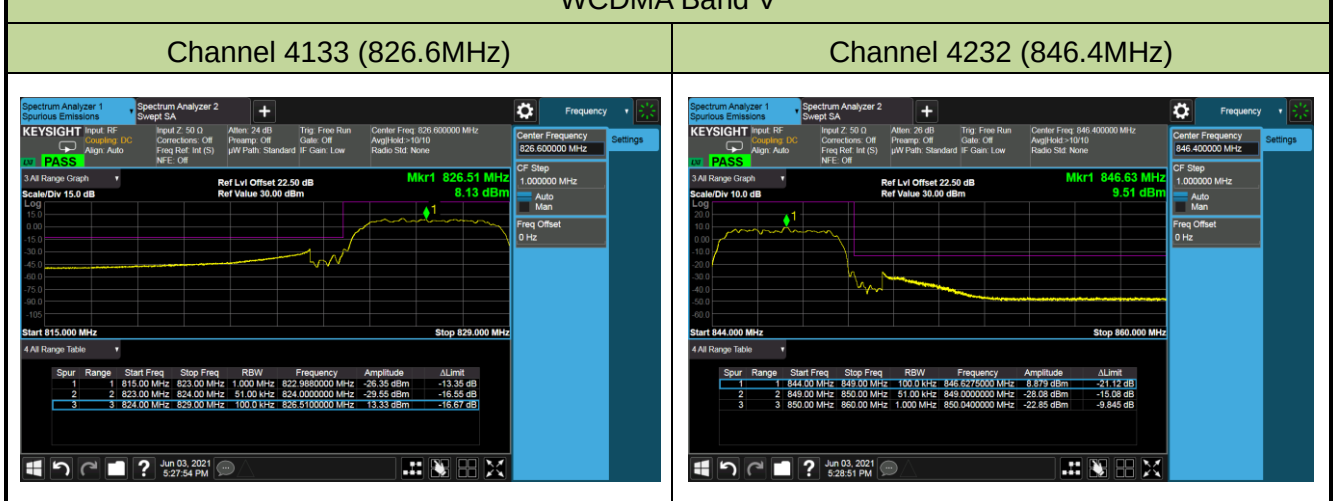
WCDMA Band II



WCDMA Band IV



WCDMA Band V



4.6. Peak to Average Ratio Measurement

4.6.1. Test Limit

A peak to average ratio measurement is performed at the conducted port of the EUT. The spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signal spends at or above the level defines the probability for that particular power level.

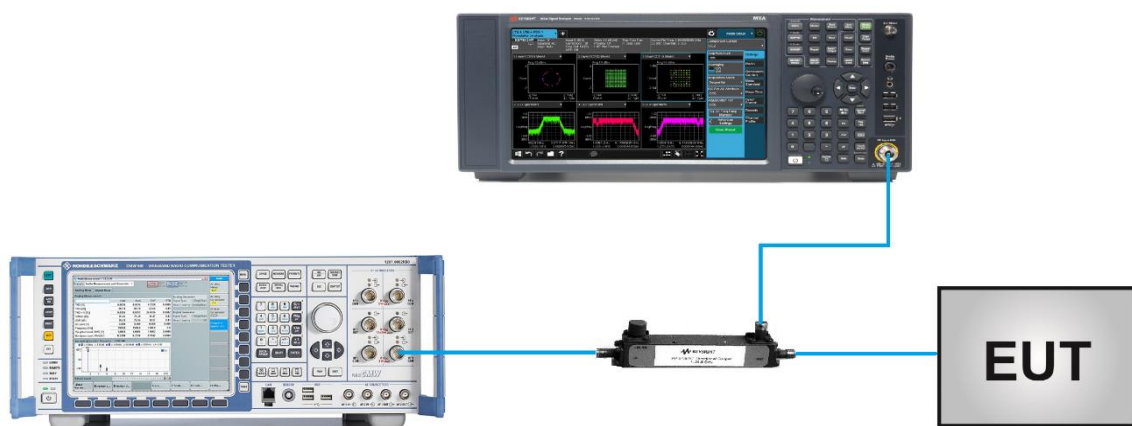
4.6.2. Test Procedure

ANSI C63.26-2015 - Section 5.2.3.4 (CCDF).

4.6.3. Test Setting

1. Set the resolution / measurement bandwidth $\geq$ signal's occupied bandwidth
2. Set the number of counts to a value that stabilizes the measured CCDF curve
3. Record the maximum PARR level associated with a probability of 0.1%

4.6.4. Test Setup



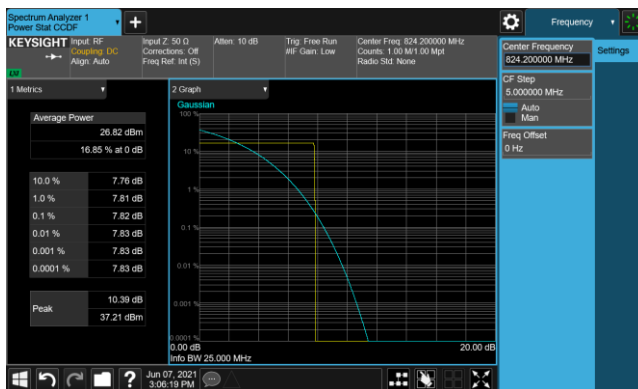
4.6.5. Test Result

Product	LTE USB MODEM	Test Site	SIP-SR1
Test Engineer	Candy Luo	Test Date	2021/06/07
Test Band	GSM 850, PCS 1900		

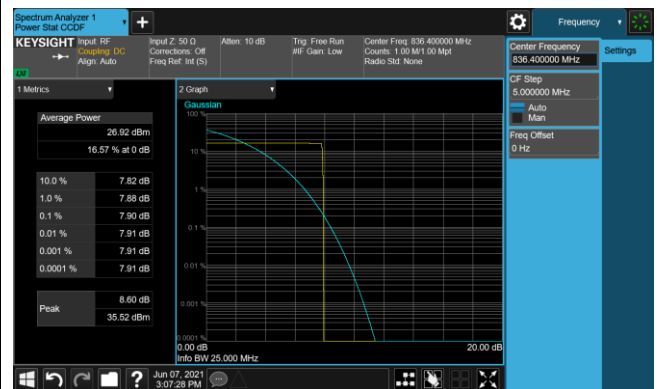
Channel No.	Frequency (MHz)	Channel Bandwidth (KHz)	Peak to Average Ratio (dB)	Limit (dB)	Result
GSM 850_GPRS					
128	824.2	200	7.82	≤ 13.00	Pass
189	836.4	200	7.90	≤ 13.00	Pass
251	848.8	200	7.64	≤ 13.00	Pass
GSM 850_EGPRS					
128	824.2	200	7.98	≤ 13.00	Pass
189	836.4	200	7.66	≤ 13.00	Pass
251	848.8	200	7.65	≤ 13.00	Pass
PCS 1900_GPRS					
512	1850.2	200	7.79	≤ 13.00	Pass
661	1880.0	200	7.73	≤ 13.00	Pass
810	1909.8	200	7.97	≤ 13.00	Pass
PCS 1900_EGPRS					
512	1850.2	200	7.81	≤ 13.00	Pass
661	1880.0	200	7.78	≤ 13.00	Pass
810	1909.8	200	7.64	≤ 13.00	Pass

GSM 850_GPRS

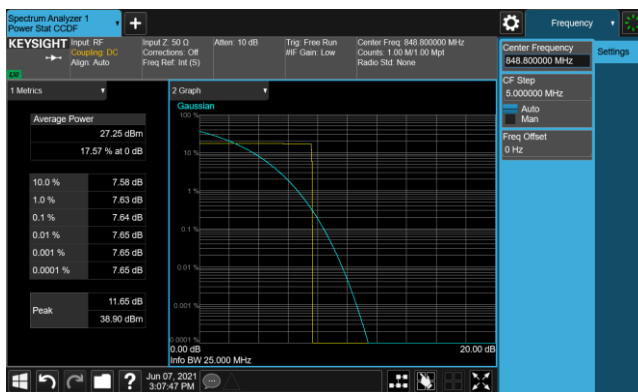
Channel 128 (824.2MHz)



Channel 189 (836.4MHz)

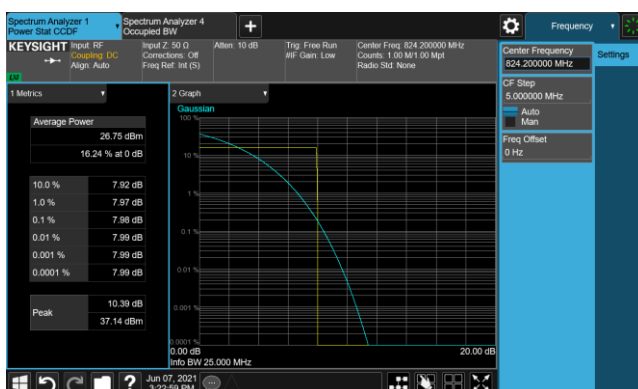


Channel 254 (848.8MHz)

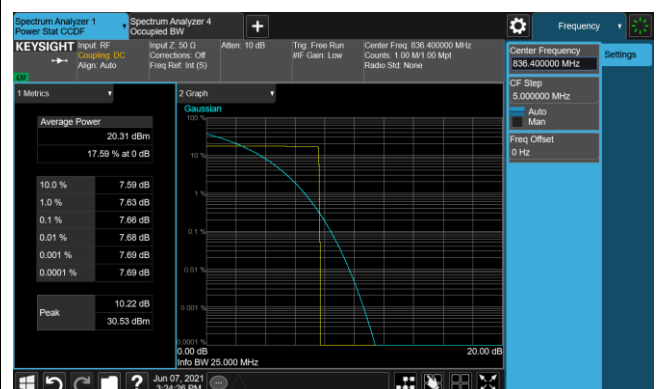


GSM 850_EGPRS

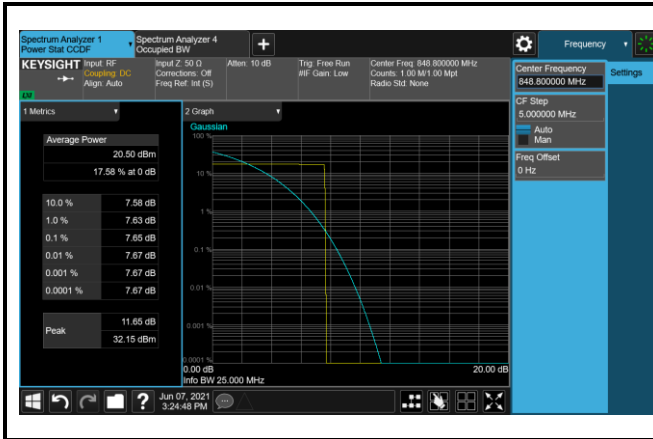
Channel 128 (824.2MHz)



Channel 189 (836.4MHz)

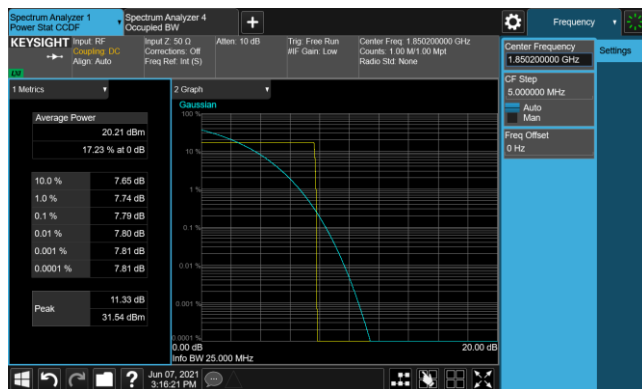


Channel 254 (848.8MHz)

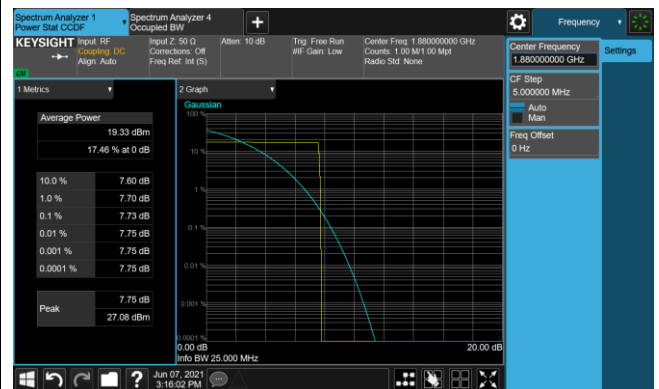


PCS 1900_GPRS

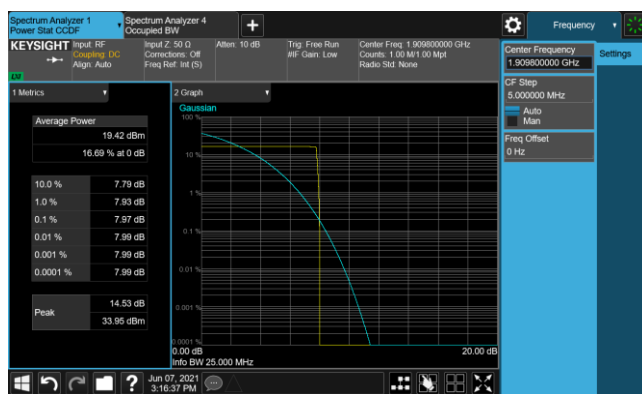
Channel 512 (1850.2MHz)



Channel 661 (1880.0MHz)

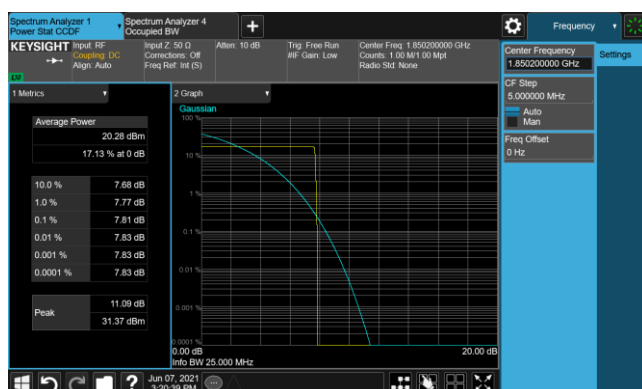


Channel 810 (1909.8MHz)

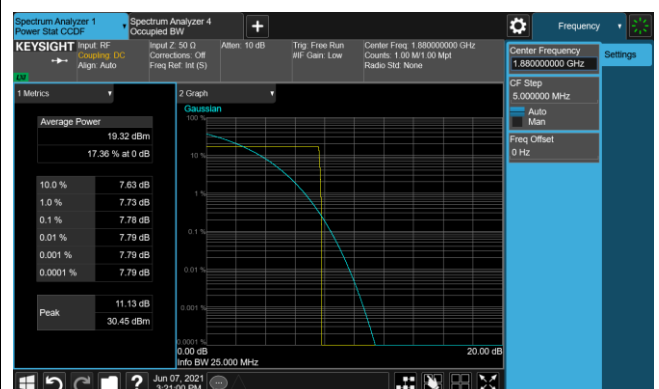


PCS 1900_EGPRS

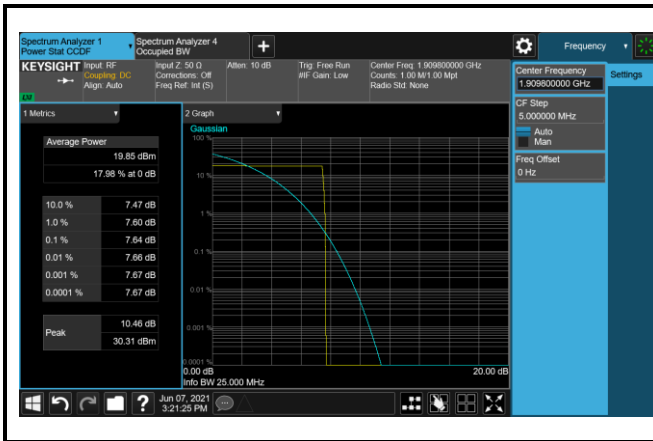
Channel 512 (1850.2MHz)



Channel 661 (1880.0MHz)



Channel 810 (1909.8MHz)

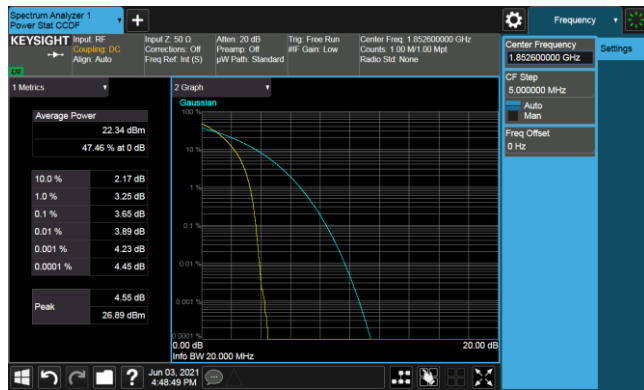


Product	LTE USB MODEM	Test Site	SIP-SR1
Test Engineer	Candy Luo	Test Date	2021/06/03
Test Band	WCDMA Band II, IV, V		

Channel No.	Frequency (MHz)	Channel Bandwidth (MHz)	Peak to Average Ratio (dB)	Limit (dB)	Result
Band II					
9263	1852.6	5	3.65	≤ 13.00	Pass
9400	1880.0	5	3.67	≤ 13.00	Pass
9537	1907.4	5	3.64	≤ 13.00	Pass
Band IV					
1313	1712.6	5	3.88	≤ 13.00	Pass
1450	1740.0	5	3.81	≤ 13.00	Pass
1512	1752.4	5	3.80	≤ 13.00	Pass
Band V					
4133	826.6	5	3.83	≤ 13.00	Pass
4175	835.0	5	3.88	≤ 13.00	Pass
4232	846.4	5	3.89	≤ 13.00	Pass

WCDMA Band II

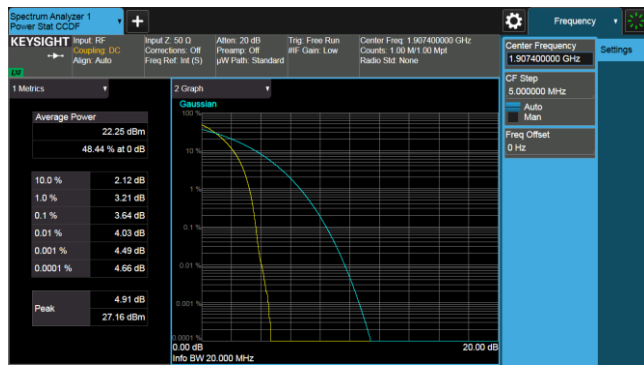
Channel 9263 (1852.6MHz)



Channel 9400 (1880.0MHz)

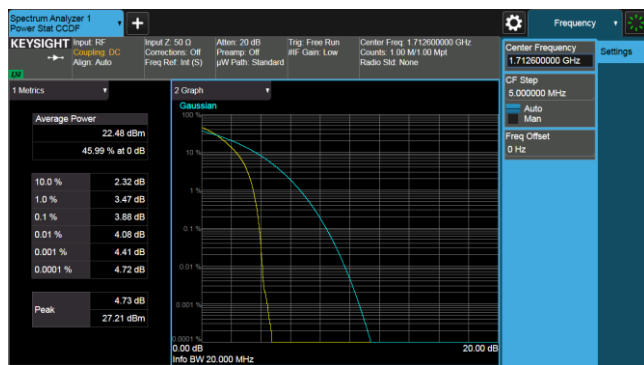


Channel 9537 (1907.4MHz)

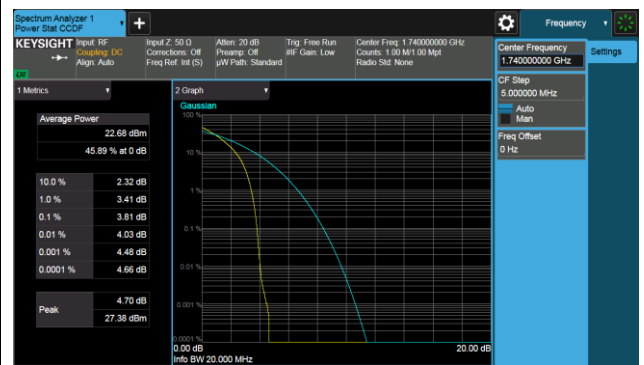


WCDMA Band IV

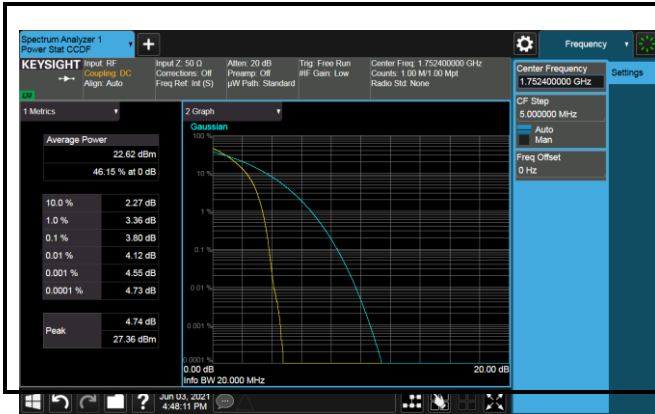
Channel 1313 (1712.6MHz)



Channel 1450 (1740.0MHz)

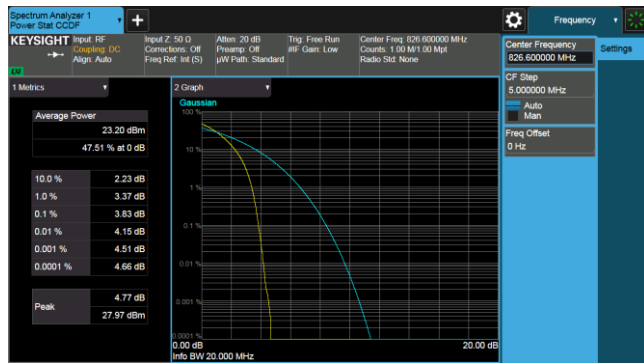


Channel 1512 (1752.4MHz)

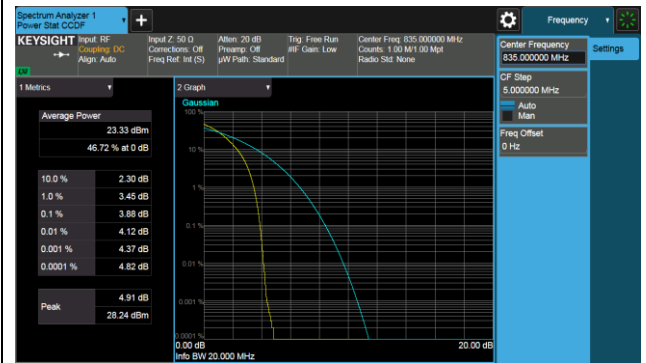


WCDMA Band V

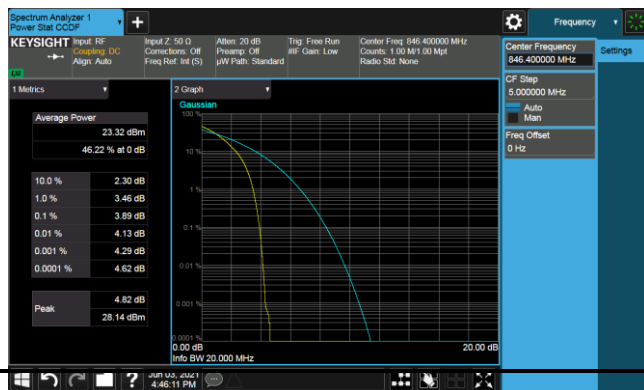
Channel 4133 (826.6MHz)



Channel 4175 (835.0MHz)



Channel 4232 (846.4MHz)



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 Low 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 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.

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 $\geq 3 \times$ 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.

4.7.4.Test Setup



4.7.5.Test Result

Product	LTE USB MODEM	Test Site	SIP-SR1
Test Engineer	Candy Luo	Test Date	2021/06/07
Test Band	GSM 850, PCS 1900		

Mode	Frequency (MHz)	Frequency Range (MHz)	Max Spurious Emissions (dBm)	Limit (dBm)	Result
GSM 850 GPRS	824.2	30 ~ 1000	-50.45	≤ -13.00	Pass
		1000 ~ 20000	-30.88	≤ -13.00	Pass
	836.4	30 ~ 1000	-50.29	≤ -13.00	Pass
		1000 ~ 20000	-28.65	≤ -13.00	Pass
	848.8	30 ~ 1000	-48.15	≤ -13.00	Pass
		1000 ~ 20000	-28.55	≤ -13.00	Pass
GSM 850 EGPRS	824.2	30 ~ 1000	-49.51	≤ -13.00	Pass
		1000 ~ 20000	-32.88	≤ -13.00	Pass
	836.4	30 ~ 1000	-50.95	≤ -13.00	Pass
		1000 ~ 20000	-34.11	≤ -13.00	Pass
	848.8	30 ~ 1000	-49.14	≤ -13.00	Pass
		1000 ~ 20000	-34.24	≤ -13.00	Pass
PCS 1900 GPRS	1850.2	30 ~ 1000	-47.58	≤ -13.00	Pass
		1000 ~ 10000	-32.88	≤ -13.00	Pass
	1880.0	30 ~ 1000	-47.95	≤ -13.00	Pass
		1000 ~ 10000	-33.23	≤ -13.00	Pass
	1909.8	30 ~ 1000	-48.08	≤ -13.00	Pass
		1000 ~ 10000	-32.96	≤ -13.00	Pass
PCS 1900 EGPRS	1850.2	30 ~ 1000	-48.76	≤ -13.00	Pass
		1000 ~ 10000	-32.08	≤ -13.00	Pass
	1880.0	30 ~ 1000	-47.75	≤ -13.00	Pass
		1000 ~ 10000	-32.52	≤ -13.00	Pass
	1909.8	30 ~ 1000	-48.21	≤ -13.00	Pass
		1000 ~ 10000	-32.78	≤ -13.00	Pass