NVLAP TESTING
NVLAP LAB CODE 600341-0

BACL Bay Area Compliance Labs Corp.

TEST REPORT

Applicant:	**Shenzhen CWELL Electronic Technology Co., Ltd.**
Address:	**8th Floor, Building 4, Block A, Hongchuang Technology Center, Xikeng Community, Fucheng Street, Longhua District, 518110, Shenzhen, China**
Product Name:	**4G Android PoC Radio**
FCC ID:	**2A8NJ-F41**
Standard(s):	**47 CFR Part 2, 47 CFR Part 22, Subpart H 47 CFR Part 24, Subpart E 47 CFR Part 27 ANSI C63.26-2015**
Report Number:	**2402T74162E-RF-00G**
Report Date:	**2024/11/25**

The above device has been tested and found compliant with the requirement of the relative standards by Bay Area Compliance Laboratories Corp. (Dongguan).

Reviewed By: **Gavin Xu**	**Approved By:** **Ivan Cao**
Title: **RF Supervisor**	Title: **EMC Manager**

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
1.0	2402T74162E-RF-00G	Original Report	2024/11/25

1. GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

EUT Name:	4G Android PoC Radio
EUT Model:	F41
Multiple Models:	F51, F81, T60
Operation Bands and modes:	GSM ,GPRS, EDGE: 850/1900 CDMA BC0/BC1: 850/1900 WCDMA: Band 2/4/5 LTE: Band 2/4/5/7/38/41
Modulation Type:	GMSK, 8PSK, BPSK, QPSK, 16QAM
Rated Input Voltage:	DC 3.8V from battery or DC 5.0V from adapter or DC 5.0V from Base
Serial Number:	Radiated Spurious Emissions: 2KWI-1 RF Conducted: 2KWI-4
EUT Received Date:	2024/5/9
EUT Received Status:	Good
Note: The multiple models are electrically identical with the test model. Please refer to the declaration letter for more detail, which was provided by manufacturer.	

1.2 Accessory Information

Accessory Description	Manufacturer	Model	Parameters
Adapter	Shenzhen Fanyajiahe Electronic Technology co.,Ltd	FYJH-F5200	Input: 100-240Vac 50/60Hz 0.3A Output: 5.0Vdc 2A
Base	Shenzhen CWELL Electronic Technology Co., Ltd.	Unknown	Input: 100-240Vac 50/60Hz Output: 5.0Vdc

1.3 Operation Voltage(V_{DC})▲:

Lowest:	3.5	Normal:	3.8	Highest:	4.35

1.4 Transmission Antenna Information▲

Manufacturer	Antenna Type	Antenna	Operation Bands	Antenna Frequency Range (MHz)	Antenna Gain (G_T) (dBi)	L_C (dB)
ShenZhen QiXinTongDa Technology Co.,Ltd.	FPC	Main	GSM850	824-849	-2.46	0.1
			PCS1900	1850-1910	1.07	0.2
			WCDMA B2	1850-1910	1.07	0.2
			WCDMA B4	1710-1755	0.34	0.2
			WCDMA B5	824-849	-2.46	0.1
			CDMA BC0	824-849	-2.46	0.1
			CDMA BC1	1850-1910	1.07	0.2
			LTE B2	1850-1910	1.07	0.2
			LTE B4	1710-1755	0.34	0.2
			LTE B5	824-849	-2.46	0.1
			LTE B7	2500-2570	-0.54	0.3
			LTE B38	2570-2620	-0.54	0.3
			LTE B41	2535-2655	-0.54	0.3

1.5 Equipment Modifications

No modifications are made to the EUT during all test items.

2. SUMMARY OF TEST RESULTS

Rules	Description of Test	Result
FCC§2.1046; § 22.913;§ 24.232; §27.50;	RF Output Power	Compliant
FCC§ 2.1047	Modulation Characteristics	Not Applicable
FCC§ 2.1049; § 22.905, §22.917; § 24.238; §27.53;	Occupied Bandwidth	Compliant
FCC§ 2.1051;§ 22.917; § 24.238; §27.53;	Spurious Emissions at Antenna Terminal	Compliant
FCC§ 22.917; § 24.238; §27.53;	Out of band emission, Band Edge	Compliant
FCC§ 2.1055;§ 22.355; § 24.235; §27.54;	Frequency stability vs. temperature Frequency stability vs. voltage	Compliant
FCC§ 2.1053§ 22.917; § 24.238; §27.53;	Radiated Spurious Emission	Compliant
Note 1: Per BLE report, Powered by Base was the worst for Radiated Spurious Emissions Below 1GHz, so only performed it.		

3. ESCRIPTION OF TEST CONFIGURATION

3.1 EUT Operation Condition:

The EUT was configured for testing according to ANSI C63.26-2015.
The test items were performed with the EUT operating at testing mode. The device operates on GSM Band 850/1900MHz,WCDMA Band 2/4/5, CDMA Band BC0/BC1, and LTE band2/4/5/7/38/41, test was performed with channels as below table:

Frequency Bands	Bandwidth (MHz)	Test Frequency(MHz)		
		Low	Middle	High
GSM 850	0.25	824.2	836.6	848.8
GSM 1900	0.25	1850.2	1880	1909.8
WCDMA Band 2	4.2	1852.4	1880	1907.6
WCDMA Band 4	4.2	1712.4	1732.6	1752.6
WCDMA Band 5	4.2	826.4	836.6	846.6
CDMA BC0	1.23	824.7	836.52	848.31
CDMA BC1	1.23	1851.25	1880	1908.75
LTE Band 2	1.4	1850.7	1880	1909.3
	3	1851.5	1880	1908.5
	5	1852.5	1880	1907.5
	10	1855	1880	1905
	15	1857.5	1880	1902.5
	20	1860	1880	1900
LTE Band 4	1.4	1710.7	1732.5	1754.3
	3	1711.5	1732.5	1753.5
	5	1712.5	1732.5	1752.5
	10	1715	1732.5	1750
	15	1717.5	1732.5	1747.5
	20	1720	1732.5	1745
LTE Band 5	1.4	824.7	836.5	848.3
	3	825.5	836.5	847.5
	5	826.5	836.5	846.5
	10	829	836.5	844
LTE Band 7	5	2502.5	2535	2567.5
	10	2505	2535	2565
	15	2507.5	2535	2562.5
	20	2510	2535	2560
LTE Band 38	5	2572.5	2595	2617.5
	10	2575	2595	2615
	15	2577.5	2595	2612.5
	20	2580	2595	2610
LTE Band 41	5	2537.5	2595	2652.5
	10	2540	2595	2650
	15	2542.5	2595	2647.5
	20	2545	2595	2645

3.2 Support Equipment List and Details

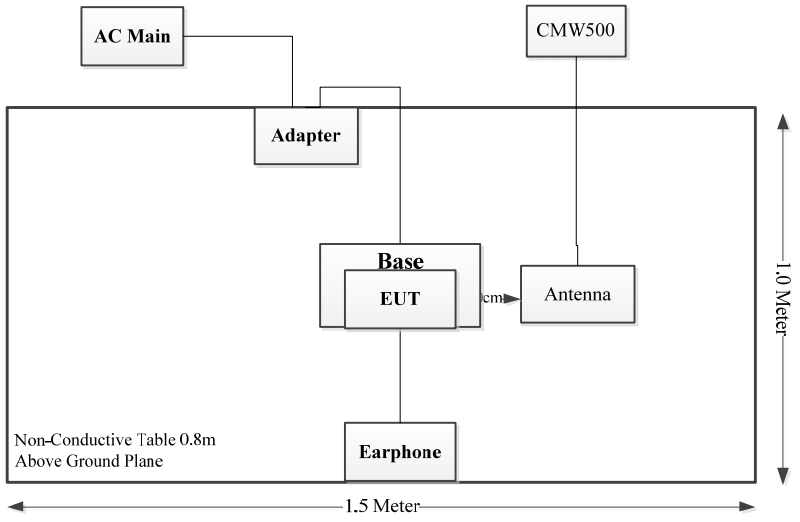
Manufacturer	Description	Model	Serial Number
R&S	Wideband Radio Communication Tester	CMW500	149216
Unknown	Antenna	Unknown	Unknown
CWELL	Earphone	Unknown	2KWE-7

3.3 Support Cable List and Details

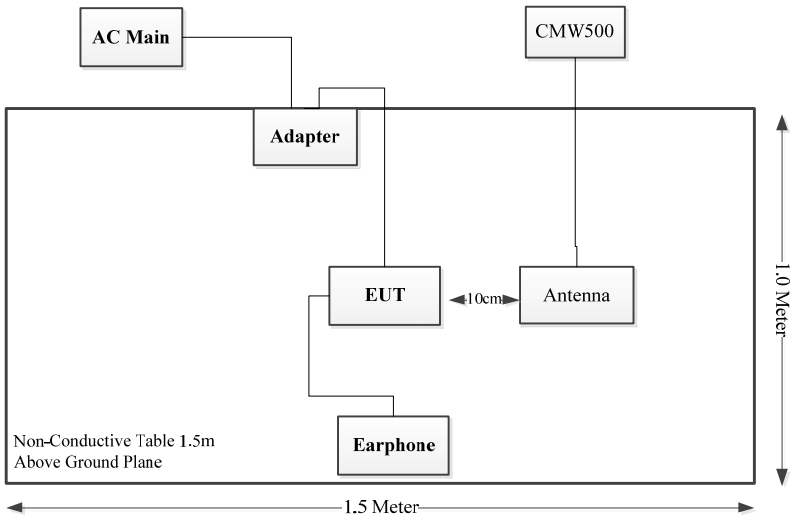
Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
USB Cable	no	no	1.0	Adapter	Base
USB Cable	no	no	1.0	Adapter	EUT
Earphone Cable	no	no	1.2	Earphone	EUT
Signal Cable	no	no	1.0	Antenna	CMW500

3.4 Block Diagram of Test Setup

Radiated Spurious Emission:
Below 1G:



Above 1G:


AC Main
CMW500
Adapter
EUT
10cm
Antenna
1.0 Meter
Non-Conductive Table 1.5m
Above Ground Plane
Earphone
1.5 Meter

3.5 Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.12, Pulong East 1st Road, Tangxia Town, Dongguan, Guangdong, China.

The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 829273, the FCC Designation No. : CN5044.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0022.

3.6 Measurement Uncertainty

Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±0.61dB
Power Spectral Density, conducted	±0.61 dB
Unwanted Emissions, radiated	30MHz~200MHz: 4.55 dB, 200MHz~1GHz: 5.92 dB, 1GHz~6GHz: 4.98 dB, 6GHz~18GHz: 5.89 dB, 18GHz~26.5GHz:5.47 dB, 26.5GHz~40GHz:5.63 dB
Unwanted Emissions, conducted	±2.47 dB
Temperature	±1℃
Humidity	±5%
DC and low frequency voltages	±0.4%
Duty Cycle	1%
RF Frequency	$\pm 0.082 \times 10^{-6}$

4. REQUIREMENTS AND TEST PROCEDURES

4.1 Applicable Standard For Part 22 Subpart H:

4.1.1 RF Output Power

FCC §22.913
(a)(5) The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7watts.

(d) *Power measurement.* Measurement of the ERP of Cellular base transmitters and repeaters must be made using an average power measurement technique. The peak-toaverage ratio (PAR) of the transmission must not exceed 13 dB. Power measurements for base transmitters and repeaters must be made in accordance with either of the following:
(1) A Commission-approved average power technique (*see* FCC Laboratory's Knowledge Database); or
(2) For purposes of this section, peak transmit power must be measured over an interval of continuous transmission using instrumentation calibrated in terms of an rmsequivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, *etc.*, so as to obtain a true peak measurement for the emission in question over the full bandwidth of the channel.

4.1.2 Spurious Emissions

FCC §22.917

(a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

(b) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a reference bandwidth as follows:
(1) In the spectrum below 1 GHz, instrumentation should employ a reference bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy, provided that the measured power is integrated over the full required reference bandwidth (i.e., 100 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.
(2) In the spectrum above 1 GHz, instrumentation should employ a reference bandwidth of 1 MHz

4.1.3 Frequency stability

FCC §22.355

Except as otherwise provided in this part, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table C-1 of this section.

Table C-1 - Frequency Tolerance for Transmitters in the Public Mobile Services

Frequency range (MHz)	Base, fixed (ppm)	Mobile >3 watts (ppm)	Mobile ≤3 watts (ppm)
25 to 50	20	20	50
50 to 450	5	5	50
450 to 512	2.5	5	5
821 to 896	1.5	**2.5**	**2.5**
928 to 929	5	n/a	n/a
929 to 960	1.5	n/a	n/a
2110 to 2220	10	n/a	n/a

4.2 Applicable Standard For Part 24 Subpart E:

4.2.1 RF Output Power

FCC §24.232
(c)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.

(d)Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (e) of this section. In both instances, equipment employed must be authorized in accordance with the provisions of § 24.51. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

4.2.2 Spurious Emissions

FCC §24.238

The rules in this section govern the spectral characteristics of emissions in the Broadband Personal Communications Service.

(a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

(b) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

(c) Alternative out of band emission limit. Licensees in this service may establish an alternative out of band emission limit to be used at specified band edge(s) in specified geographical areas, in lieu of that set forth in this section, pursuant to a private contractual arrangement of all affected licensees and applicants. In this event, each party to such contract shall maintain a copy of the contract in their station files and disclose it to prospective assignees or transferees and, upon request, to the FCC.

(d) Interference caused by out of band emissions. If any emission from a transmitter operating in this service results in interference to users of another radio service, the FCC may require a greater attenuation of that emission than specified in this section.

4.2.3 Frequency stability

FCC §24.235

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

4.3 Applicable Standard For Part 27:

4.3.1 RF Output Power

FCC §27.50

(a)(3) *Mobile and portable stations.*
(i) For mobile and portable stations transmitting in the 2305-2315 MHz band or the 2350-2360 MHz band, the average EIRP must not exceed 50 milliwatts within any 1 megahertz of authorized bandwidth, *except that* for mobile and portable stations compliant with 3GPP LTE standards or another advanced mobile broadband protocol that avoids concentrating energy at the edge of the operating band the average EIRP must not exceed 250 milliwatts within any 5 megahertz of authorized bandwidth but may exceed 50 milliwatts within any 1 megahertz of authorized bandwidth. For mobile and portable stations using time division duplexing (TDD) technology, the duty cycle must not exceed 38 percent in the 2305-2315 MHz and 2350-2360 MHz bands. Mobile and portable stations using FDD technology are restricted to transmitting in the 2305-2315 MHz band. Power averaging shall not include intervals in which the transmitter is off.
(ii) Mobile and portable stations are not permitted to transmit in the 2315-2320 MHz and 2345-2350 MHz bands.
(iii) *Automatic transmit power control.* Mobile and portable stations transmitting in the 2305-2315 MHz band or in the 2350-2360 MHz band must employ automatic transmit power control when operating so the stations operate with the minimum power necessary for successful communications.
(iv) *Prohibition on external vehicle-mounted antennas.* The use of external vehicle-mounted antennas for mobile and portable stations transmitting in the 2305-2315 MHz band or the 2350-2360 MHz band is prohibited.

(b)(10) Portable stations (hand-held devices) transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands are limited to 3 watts ERP.

(c)(10) Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP.

(d)(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. Fixed stations operating in the 1710-1755 MHz band are limited to a maximum antenna height of 10 meters above ground. Mobile and portable stations operating in these bands must employ a means for limiting power to the minimum necessary for successful communications.

(h) The following power limits shall apply in the BRS and EBS:
(2)Mobile and other user stations. Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

4.3.2 Spurious Emissions

FCC §27.53

(a) For operations in the 2305-2320 MHz band and the 2345-2360 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power P (with averaging performed only during periods of transmission) within the licensed band(s) of operation, in watts, by the following amounts:
(4)For mobile and portable stations operating in the 2305-2315 MHz and 2350-2360 MHz bands:

(i) By a factor of not less than: 43 + 10 log (P) dB on all frequencies between 2305 and 2320 MHz and on all frequencies between 2345 and 2360 MHz that are outside the licensed band(s) of operation, not less than 55 + 10 log (P) dB on all frequencies between 2320 and 2324 MHz and on all frequencies between 2341 and 2345 MHz, not less than 61 + 10 log (P) dB on all frequencies between 2324 and 2328 MHz and on all frequencies between 2337 and 2341 MHz, and not less than 67 + 10 log (P) dB on all frequencies between 2328 and 2337 MHz;

(ii) By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2300 and 2305 MHz, 55 + 10 log (P) dB on all frequencies between 2296 and 2300 MHz, 61 + 10 log (P) dB on all frequencies between 2292 and 2296 MHz, 67 + 10 log (P) dB on all frequencies between 2288 and 2292 MHz, and 70 + 10 log (P) dB below 2288 MHz;

(iii) By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2360 and 2365 MHz, and not less than 70 + 10 log (P) dB above 2365 MHz.

(c)For operations in the 746-758 MHz band and the 776-788 MHz band, 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 any frequency outside the 746-758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(3) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations;

(4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations;

(5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed;

(6) Compliance with the provisions of paragraphs (c)(3) and (c)(4) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

(f) For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to – 70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and – 80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

(g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a 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, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

(h) AWS emission limits

(1) ***General protection levels.*** Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 $\log_{10}$ (P) dB.

(m)(4) For mobile digital stations, the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

4.3.3 Frequency stability

FCC §27.54

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

4.4 Test Method:

4.4.1 Transmitter output power, e.r.p. and e.i.r.p

According to CFR Part 2.1046, ANSI C63.26-2015 Section 5.2.5.5:

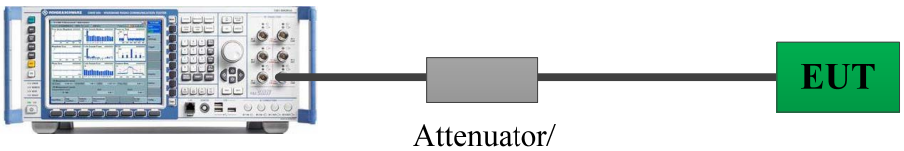
The relevant equation for determining the ERP or EIRP from the conducted RF output power measured using the guidance provided above is:

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

where:

ERP or EIRP = effective radiated power or equivalent isotropically radiated power, respectively (expressed in the same units as P_{Meas}, typically dBW or dBm);
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);
L_C = signal attenuation in the connecting cable between the transmitter and antenna, in dB.

Test Setup Block:



CMW500 Attenuator/ DC Block

Note: The Insertion loss of the RF cable and coaxial Attenuator was offset into the Reading of CMW500.

4.4.2 Occupied Bandwidth

According to ANSI C63.26-2015 Section 5.4.4

The OBW is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission.

The following procedure shall be used for measuring (99%) power bandwidth:

a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts (typically a span of 1.5 × OBW is sufficient).

b) The nominal IF filter 3 dB bandwidth (RBW) shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set ≥ 3 × RBW.

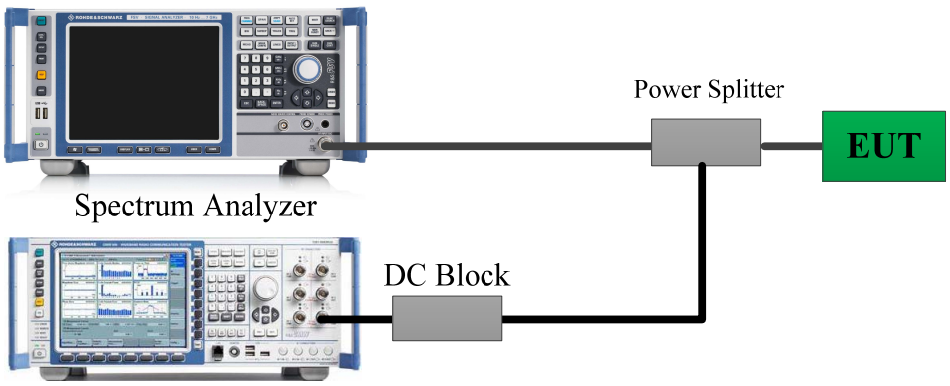
c) Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation. See guidance provided in 4.2.3. NOTE—Step a), step b), and step c) may require iteration to adjust within the specified tolerances.

d) Set the detection mode to peak, and the trace mode to max-hold.

e) If the instrument does not have a 99% OBW function, recover the trace data points and sum directly in linear power terms. Place the recovered amplitude data points, beginning at the lowest frequency, in a running sum until 0.5% of the total is reached. Record that frequency as the lower OBW frequency. Repeat the process until 99.5% of the total is reached and record that frequency as the upper OBW frequency. The 99% power OBW can be determined by computing the difference these two frequencies.

f) The OBW shall be reported and plot(s) of the measuring instrument display shall be provided with the test report. The frequency and amplitude axis and scale shall be clearly labeled. Tabular data can be reported in addition to the plot(s).

Test Setup Block:



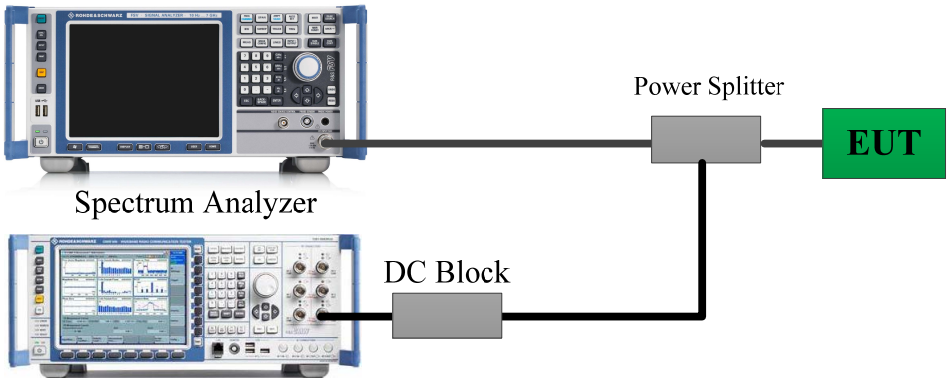
Note: The Insertion loss of the RF cable and Power Splitter was offset into the Reading of Spectrum Analyzer.

4.4.3 Transmitter unwanted emissions-at antenna terminals

According to ANSI C63.26-2015 Section 5.7.4:

the applicable rule part specifies the reference bandwidth for measuring unwanted emission levels (typically, 100 kHz if the authorized frequency band/block is at or below 1 GHz and 1 MHz if the authorized frequency band/block is above 1 GHz),8 effectively depicting the unwanted emission limit in terms of a power spectral density. In those cases where no reference bandwidth is explicitly specified, the values in the preceding sentence should be used.

Test Setup Block:



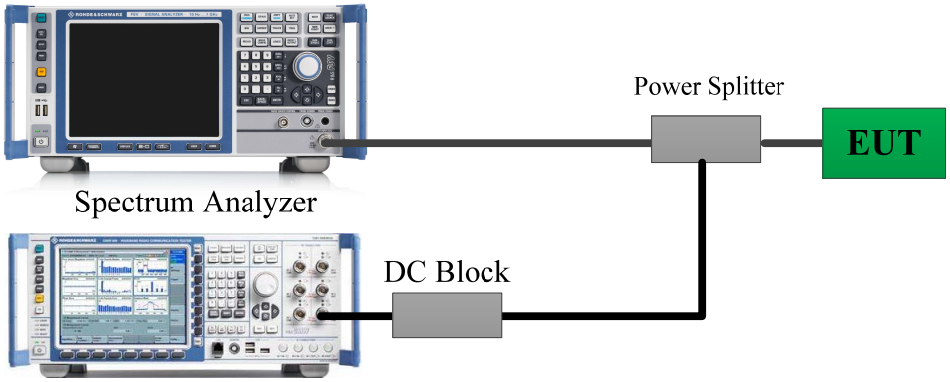
Note: The Insertion loss of the RF cable and Power Splitter was offset into the Reading of Spectrum Analyzer.

4.4.4 Transmitter unwanted emissions-Out of band emission

According to ANSI C63.26-2015 Section 5.7.3:

Typically, a measurement (resolution) bandwidth smaller than the reference bandwidth is allowed for measurements within a specified frequency range at the edge of the authorized frequency block/band (e.g., within the first Y MHz outside of the authorized frequency band/block, where the value of Y is specified in the relevant rule part). Some FCC out-of-band emission rules permit the use of a narrower RBW (typically limited to a minimum RBW of 1 % of the OBW) for measuring the out-of-band emissions without a requirement to integrate the result over the full reference bandwidth. Beyond the specified frequency range in which this relaxation of the uniform reference bandwidth is permitted, it typically is also acceptable to use a narrower RBW (again limited to a minimum of 1 % of OBW) to increase accuracy, but the measurement result must subsequently be integrated over the full reference bandwidth.

Test Setup Block:



Note: The Insertion loss of the RF cable and Power Splitter was offset into the Reading of Spectrum Analyzer.

4.4.5 Frequency stability

According to ANSI C63.26-2015 Section 5.6:

Frequency stability is a measure of the frequency drift due to temperature and supply voltage variations, with reference to the frequency measured at +20 °C and rated supply voltage.

The operating carrier frequency shall be set up in accordance with the manufacturer's published operation and instruction manual prior to the commencement of these tests. No adjustment of any frequency determining circuit element shall be made subsequent to this initial set-up. Frequency stability is tested:

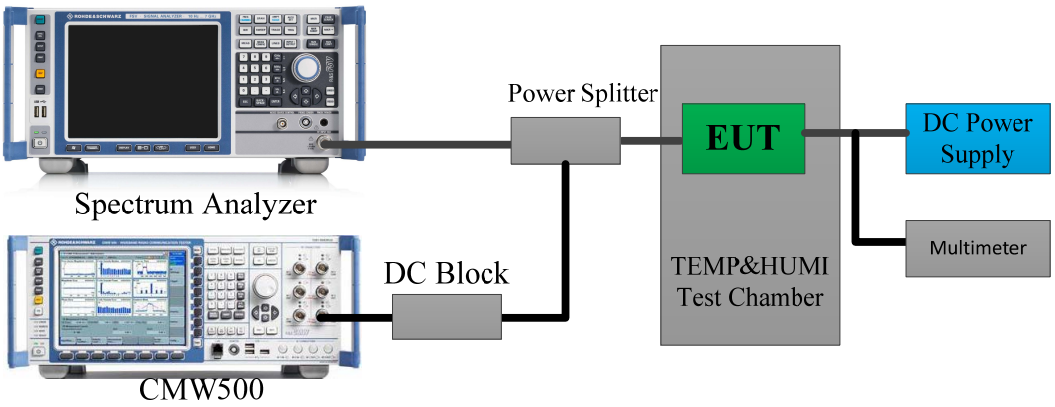
a) At 10 °C intervals of temperatures between −30 °C and +50 °C at the manufacturer's rated supply voltage, and

b) At +20 °C temperature and ±15% supply voltage variations. If a product is specified to operate over a range of input voltage then the −15% variation is applied to the lowermost voltage and the +15% is applied to the uppermost voltage.

During the test all necessary settings, adjustments and control of the EUT have to be performed without disturbing the test environment, i.e., without opening the environmental chamber. The frequency stabilities can be maintained to a lesser temperature range provided that the transmitter is automatically inhibited from operating outside the lesser temperature range. For handheld equipment that is only capable of operating from internal batteries and the supply voltage cannot be varied, the frequency stability tests shall be performed at the nominal battery voltage and the battery end point voltage specified by the manufacturer. An external supply voltage can be used and set at the internal battery nominal voltage, and again at the battery operating end point voltage which shall be specified by the equipment manufacturer.

If an unmodulated carrier is not available, the mean frequency of a modulated carrier can be obtained by using a frequency counter with gating time set to an appropriately large multiple of bit periods (gating time depending on the required accuracy). Full details on the choice of values shall be included in the test report.

Test Setup Block:



4.4.6 Transmitter unwanted emissions- Radiated Spurious emissions

According to ANSI C63.26-2015 Section 5.5.3:

Test setup:

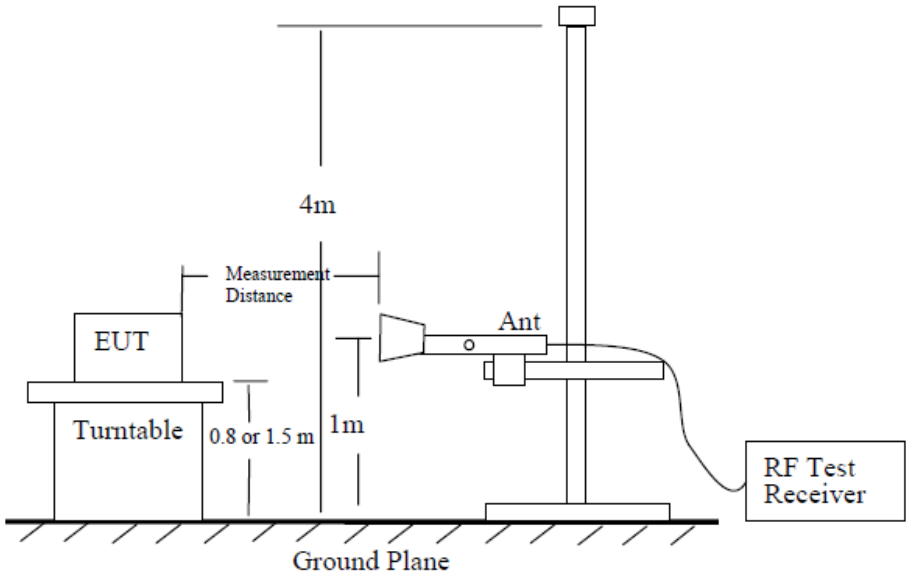


Figure 6—Test site-up for radiated ERP and/or EIRP measurements

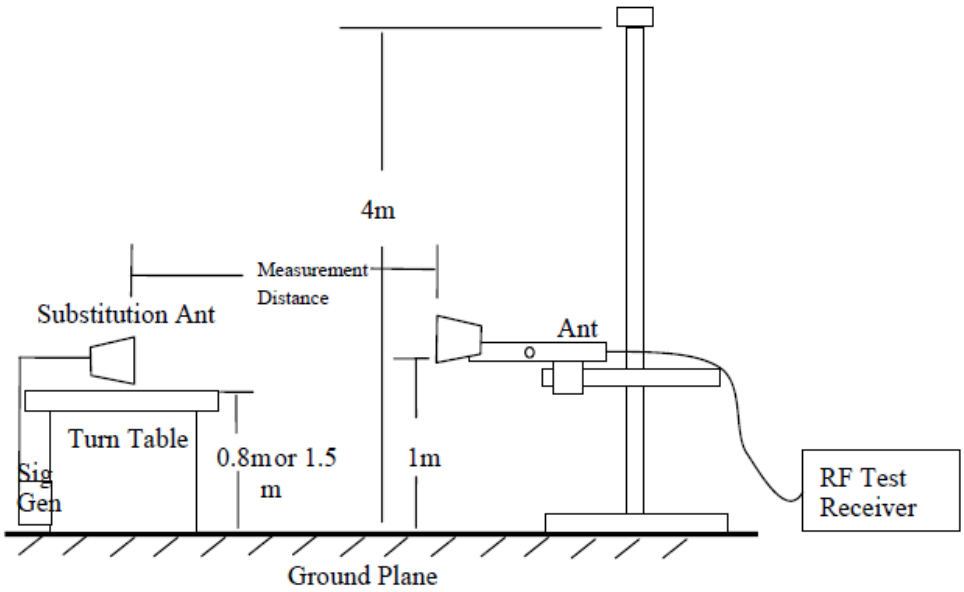


Figure 7—Substitution method set-up for radiated emission

Test Procedure:

a) Place the EUT in the center of the turntable. The EUT shall be configured to transmit into the standard non-radiating load (for measuring radiated spurious emissions), connected with cables of minimal length unless specified otherwise. If the EUT uses an adjustable antenna, the antenna shall be positioned to the length that produces the worst case emission at the fundamental operating frequency.

b) Each emission under consideration shall be evaluated:

1) Raise and lower the measurement antenna in accordance 5.5.2, as necessary to enable detection of the maximum emission amplitude relative to measurement antenna height.

2) Rotate the EUT through 360° to determine the maximum emission level relative to the axial position.

3) Return the turntable to the azimuth where the highest emission amplitude level was observed.

4) Vary the measurement antenna height again through 1 m to 4 m again to find the height associated with the maximum emission amplitude.

5) Record the measured emission amplitude level and frequency using the appropriate RBW.

c) Repeat step b) for each emission frequency with the measurement antenna oriented in both the horizontal and vertical polarizations to determine the orientation that gives the maximum emissions amplitude.

d) Set-up the substitution measurement with the reference point of the substitution antenna located as near as possible to where the center of the EUT radiating element was located during the initial EUT measurement.

e) Maintain the previous measurement instrument settings and test set-up, with the exception that the EUT is removed and replaced by the substitution antenna.

f) Connect a signal generator to the substitution antenna; locate the signal generator so as to minimize any potential influences on the measurement results. Set the signal generator to the frequency where emissions are detected, and set an output power level such that the radiated signal can be detected by the measurement instrument, with sufficient dynamic range relative to the noise floor.

g) For each emission that was detected and measured in the initial test [i.e., in step b) and step c)]:

1) Vary the measurement antenna height between 1 m to 4 m to maximize the received (measured) signal amplitude.

2) Adjust the signal generator output power level until the amplitude detected by the measurement instrument equals the amplitude level of the emission previously measured directly in step b) and step c).

3) Record the output power level of the signal generator when equivalence is achieved in step 2).

h) Repeat step e) through step g) with the measurement antenna oriented in the opposite polarization.

i) Calculate the emission power in dBm referenced to a half-wave dipole using the following equation:

$$Pe = Ps(dBm) - \text{cable loss (dB)} + \text{antenna gain (dBd)}$$

where

Pe = equivalent emission power in dBm
Ps = source (signal generator) power in dBm

NOTE—dBd refers to the measured antenna gain in decibels relative to a half-wave dipole.

j) Correct the antenna gain of the substitution antenna if necessary to reference the emission power to a half-wave dipole. When using measurement antennas with the gain specified in dBi, the equivalent dipole-referenced gain can be determined from: gain (dBd) = gain (dBi) − 2.15 dB. If necessary, the antenna gain can be calculated from calibrated antenna factor information

k) Provide the complete measurement results as a part of the test report.

5. Test DATA AND RESULTS

5.1 Antenna Port Test Data and Results for GSM 850 band:

Serial Number:	2KWI-4	Test Date:	2024/5/17
Test Site:	RF	Test Mode:	Transmitting
Tester:	Karl Liang	Test Result:	**Pass**

Environmental Conditions:					
Temperature: (℃)	24.9	Relative Humidity: (%)	49	ATM Pressure: (kPa)	100.6

Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSV40	101461	2023/11/27	2024/11/26
Micro-Coax	Coaxial Cable	UFB205A	323308-024	2024/1/2	2025/1/1
Minl-Clrcuits	Coaxial Power Splitters & Combiner	ZFRSC-183-S+	SF448201614	2024/2/25	2025/2/24
R&S	Wideband Radio Communication Tester	CMW500	144976	2023/10/18	2024/10/17
BACL	TEMP&HUMI Test Chamber	BTH-150-40	30173	2023/10/18	2024/10/17
All-sun	Clamp Meter	EM305A	8348897	2023/8/3	2024/8/2
TDK-Lambda	DC Power Supply	Z+60-14	F-08-EM038-1	N/A	N/A

** Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).*

Test Frequency For Each Mode:

Operation Modes	Lowest Frequency (MHz)	Middle Frequency (MHz)	Highest Frequency (MHz)
GSM	824.2	836.6	848.8
GPRS	824.2	836.6	848.8
EDGE	824.2	836.6	848.8

Test Data:

FCC§2.1046;§ 22.913 (a):RF Output Power					
Test Mode	Conducted Peak Output Power(dBm)			Maximum ERP (dBm)	ERP Limit (dBm)
	Lowest Channel	Middle Channel	Highest Channel		
GSM	32.54	32.53	32.07	27.83	38.45
GPRS 1 Slot	31.44	31.23	31.27	26.73	38.45
GPRS 2 Slots	30.41	30.18	30.09	25.7	38.45
GPRS 3 Slots	29.14	28.92	28.85	24.43	38.45
GPRS 4 Slots	27.87	27.64	27.76	23.16	38.45
EDGE 1 Slot	29.22	29.14	29.71	25	38.45
EDGE 2 Slots	28.13	27.88	28.55	23.84	38.45
EDGE 3 Slots	26.87	26.6	27.46	22.75	38.45
EDGE 4 Slots	25.74	25.38	26.37	21.66	38.45
Note: ERP= Conducted Power(dBm) - L_C(dB) + G_T(dBd) G_T(dBd)=G_T(dBi)-2.15					
				Result:	**Pass**

Peak-to-average Ratio(PAR)					
Test Mode	Peak-to-average Ratio(dB)			Limit (dB)	
	Lowest Channel	Middle Channel	Highest Channel		
GSM	0.38	0.41	0.38	13	
				Result:	**Pass**

FCC §2.1049, §22.917, §22.905:Occupied Bandwidth						
Operation Mode	99% Occupied Bandwidth (MHz)			26 dB Occupied Bandwidth (MHz)		
	Low Channel	Middle channel	High Channel	Low Channel	Middle Channel	High Channel
GSM	0.245	0.245	0.245	0.32	0.32	0.32
EDGE	0.247	0.249	0.245	0.307	0.31	0.304
Note: The test plots please refer to the Plots of Occupied Bandwidth						

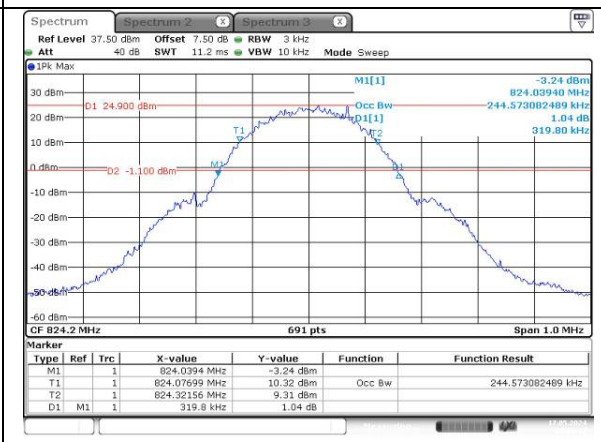
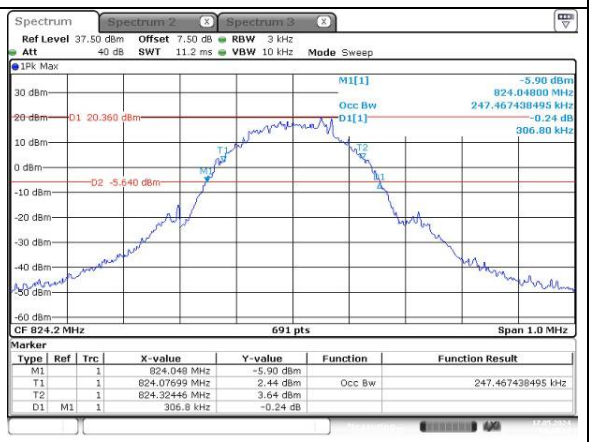
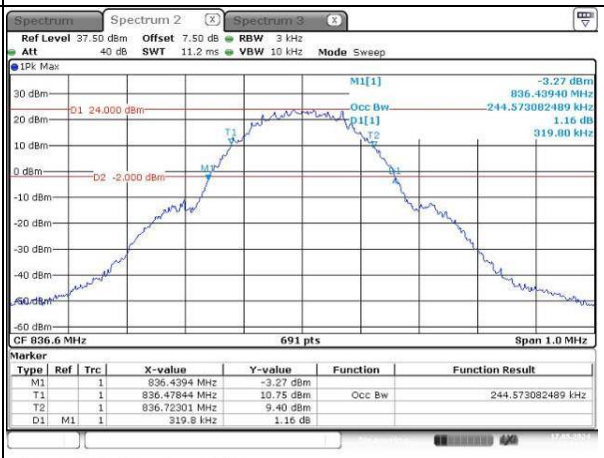
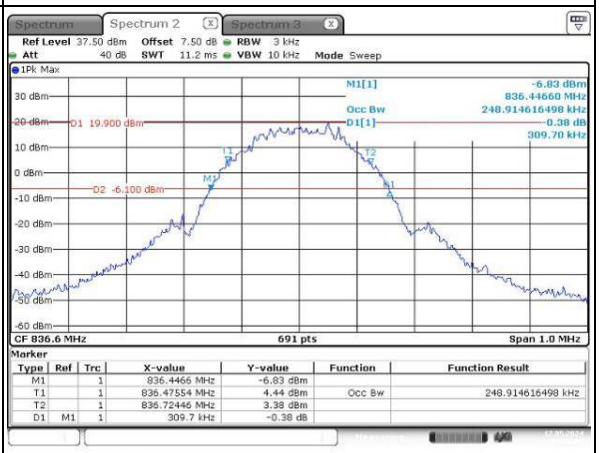
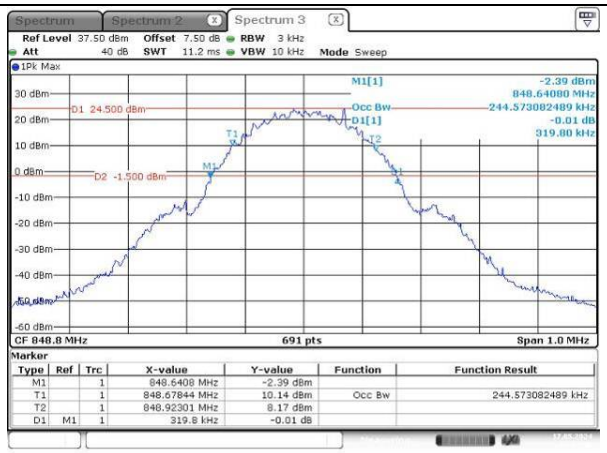
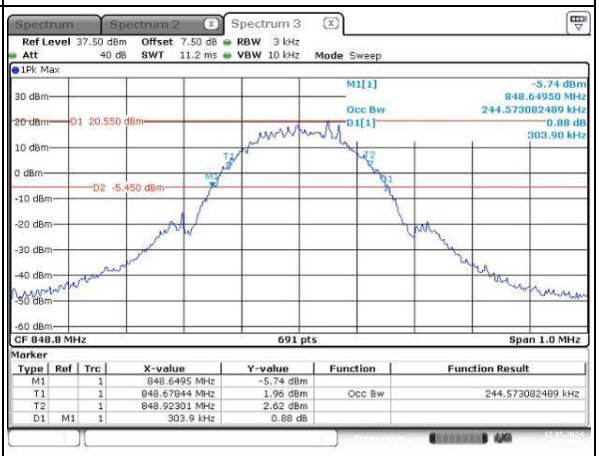
FCC §2.1051, §22.917(a):Spurious Emissions at Antenna Terminal	
Result:	**Pass, Please refer to the test plots of Spurious Emissions at Antenna Terminal.**

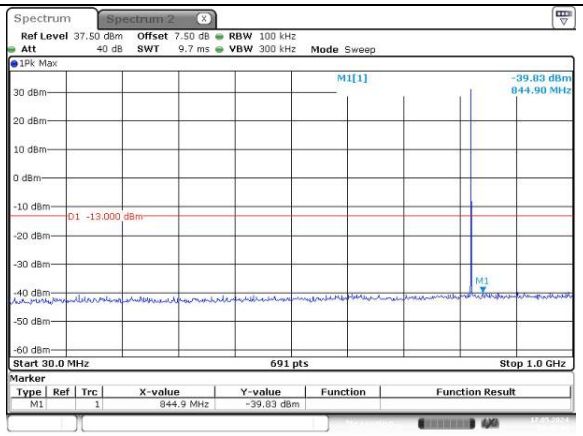
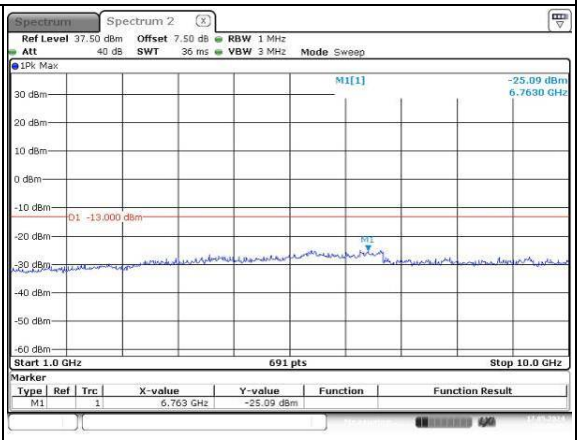
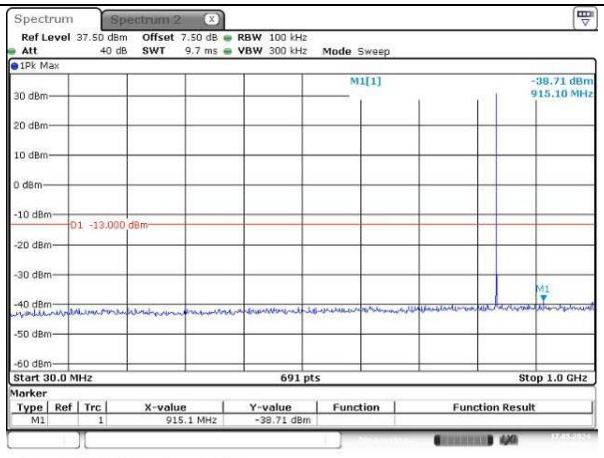
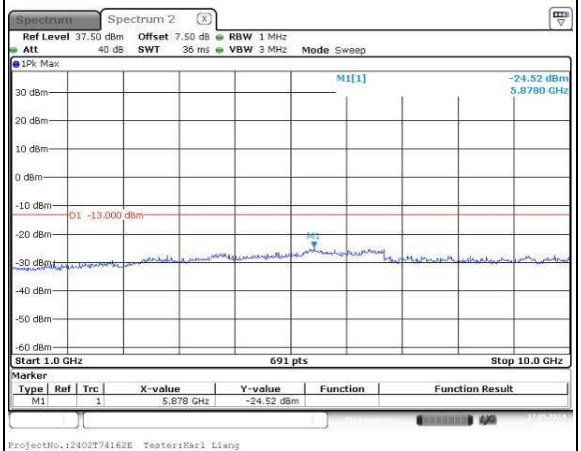
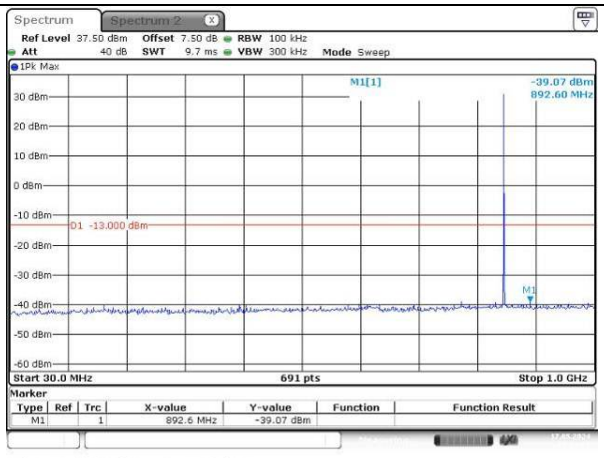
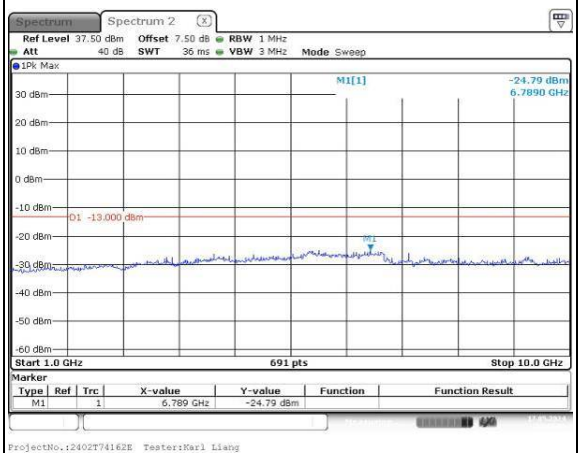
FCC §2.1051, §22.917(a):Out of band emission, Band Edge	
Result:	**Pass, Please refer to the test plots of Out of band emission, Band Edge.**

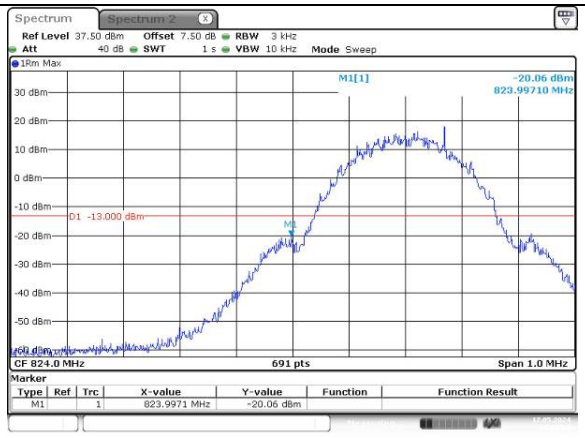
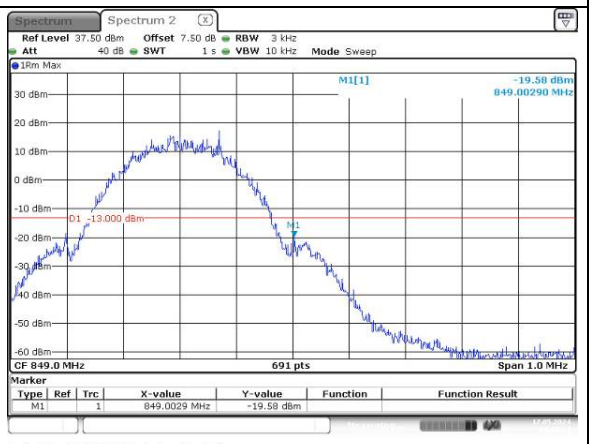
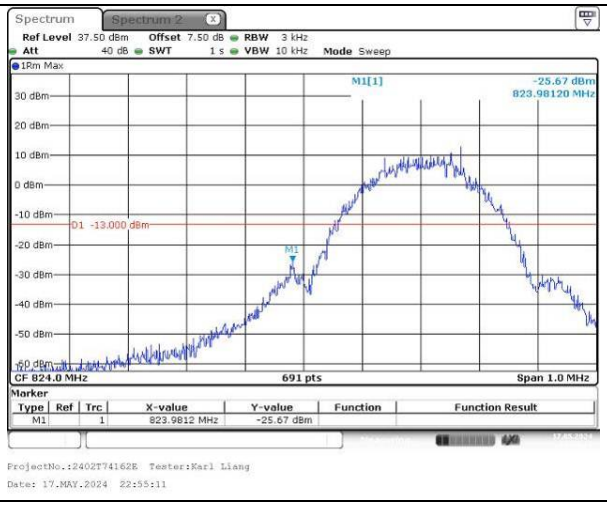
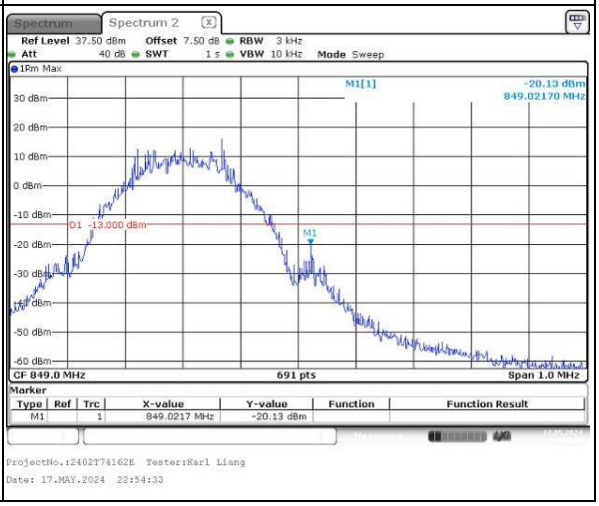
FCC §2.1055, §22.355: Frequency Stability					
Test Modulation:	GMSK		Test Channel:	836.6	MHz
Test Item	Temperature (℃)	Voltage (V_{DC})	Frequency Error		Limit
			(Hz)	(ppm)	(ppm)
Frequency Stability vs. Temperature	-30	3.8	-9.28	-0.0111	2.5
	-20	3.8	-8.05	-0.0096	2.5
	-10	3.8	4.4	0.0053	2.5
	0	3.8	6.51	0.0078	2.5
	10	3.8	1.59	0.0019	2.5
	20	3.8	-6.65	-0.0079	2.5
	30	3.8	1.72	0.0021	2.5
	40	3.8	1.62	0.0019	2.5
	50	3.8	-3.96	-0.0047	2.5
Frequency Stability vs. Voltage	20	3.5	-7.71	-0.0092	2.5
	20	4.35	1.36	0.0016	2.5
				Result:	**Pass**

Test Modulation:	8PSK		Test Channel:	836.6	MHz
Test Item	Temperature (℃)	Voltage (V_{DC})	Frequency Error		Limit
			(Hz)	(ppm)	(ppm)
Frequency Stability vs. Temperature	-30	3.8	-0.71	-0.0008	2.5
	-20	3.8	6.8	0.0081	2.5
	-10	3.8	8.25	0.0099	2.5
	0	3.8	-5	-0.0060	2.5
	10	3.8	1.43	0.0017	2.5
	20	3.8	4.52	0.0054	2.5
	30	3.8	4.32	0.0052	2.5
	40	3.8	9.16	0.0109	2.5
	50	3.8	9.73	0.0116	2.5
Frequency Stability vs. Voltage	20	3.5	5.67	0.0068	2.5
	20	4.35	-7.17	-0.0086	2.5
				Result:	**Pass**

Test Plots:

Occupied Bandwidth		
Channel	**GSM**	**EDGE**
Lowest		
Middle		
Highest		

Spurious Emissions at Antenna Terminal		
Channel	**GSM**	
Lowest		
Middle		
Highest		

Out of band emission, Band Edge		
Mode	Lowest	Highest
GSM		
EDGE		

5.2 Antenna Port Test Data and Results for GSM 1900 band:

Serial Number:	2KWI-4	Test Date:	2024/5/17
Test Site:	RF	Test Mode:	Transmitting
Tester:	Karl Liang	Test Result:	**Pass**

Environmental Conditions:					
Temperature: (℃)	24.9	Relative Humidity: (%)	49	ATM Pressure: (kPa)	100.6

Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSV40	101461	2023/11/27	2024/11/26
Micro-Coax	Coaxial Cable	UFB205A	323308-024	2024/1/2	2025/1/1
Minl-Clrcuits	Coaxial Power Splitters & Combiner	ZFRSC-183-S+	SF448201614	2024/2/25	2025/2/24
R&S	Wideband Radio Communication Tester	CMW500	144976	2023/10/18	2024/10/17
BACL	TEMP&HUMI Test Chamber	BTH-150-40	30173	2023/10/18	2024/10/17
All-sun	Clamp Meter	EM305A	8348897	2023/8/3	2024/8/2
TDK-Lambda	DC Power Supply	Z+60-14	F-08-EM038-1	N/A	N/A

** Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).*

Test Frequency For Each Mode:

Operation Modes	Lowest Frequency (MHz)	Middle Frequency (MHz)	Highest Frequency (MHz)
GSM	1850.2	1880	1909.8
GPRS	1850.2	1880	1909.8
EDGE	1850.2	1880	1909.8

Test Data:

FCC§2.1046;§ 24.232 (c):RF Output Power					
Test Mode	Conducted Peak Output Power(dBm)			Maximum EIRP (dBm)	EIRP Limit (dBm)
	Lowest Channel	Middle Channel	Highest Channel		
GSM	28.93	28.66	28.55	29.8	33
GPRS 1 Slot	27.41	27.55	27.52	28.42	33
GPRS 2 Slots	26.11	26.55	26.47	27.42	33
GPRS 3 Slots	25.04	25.52	25.24	26.39	33
GPRS 4 Slots	23.9	24.48	23.97	25.35	33
EDGE 1 Slot	26.67	26.44	26.23	27.54	33
EDGE 2 Slots	25.63	25.25	24.97	26.5	33
EDGE 3 Slots	24.52	24.08	23.67	25.39	33
EDGE 4 Slots	23.37	22.79	22.66	24.24	33
Note: EIRP=Conducted Power(dBm) - L_C(dB) + G_T(dBi)					
				Result:	**Pass**

Peak-to-average Ratio(PAR)					
Test Mode	Peak-to-average Ratio(dB)			Limit (dB)	
	Lowest Channel	Middle Channel	Highest Channel		
GSM	0.26	0.58	0.2	13	
				Result:	**Pass**

FCC §2.1049, §24.238:Occupied Bandwidth						
Operation Mode	99% Occupied Bandwidth (MHz)			26 dB Occupied Bandwidth (MHz)		
	Low Channel	Middle channel	High Channel	Low Channel	Middle Channel	High Channel
GSM	0.245	0.246	0.245	0.317	0.317	0.313
EDGE	0.252	0.25	0.249	0.318	0.32	0.32
Note: The test plots please refer to the Plots of Occupied Bandwidth						

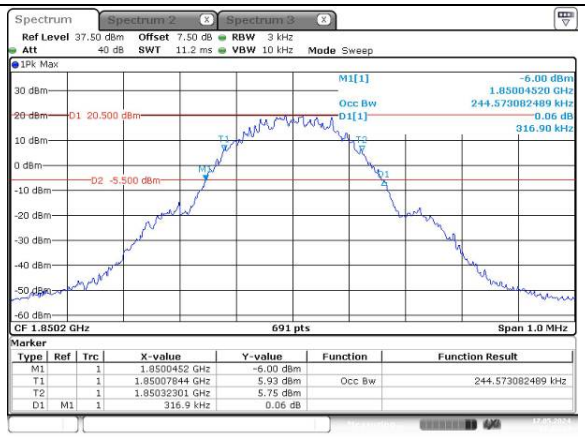
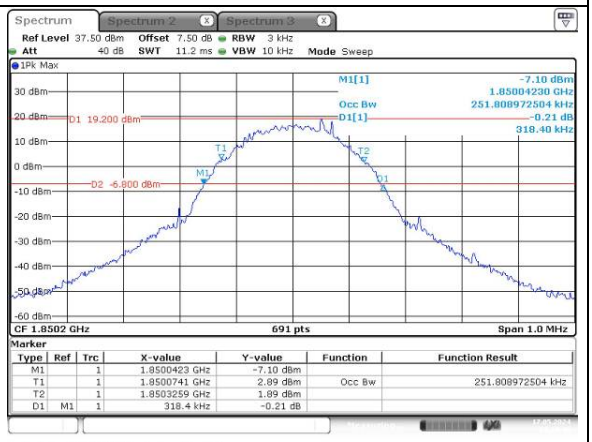
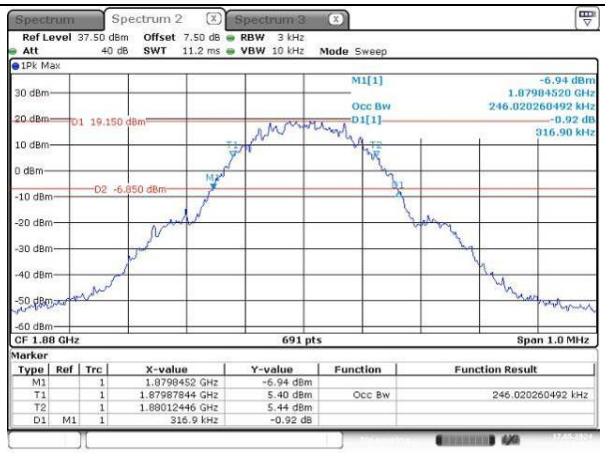
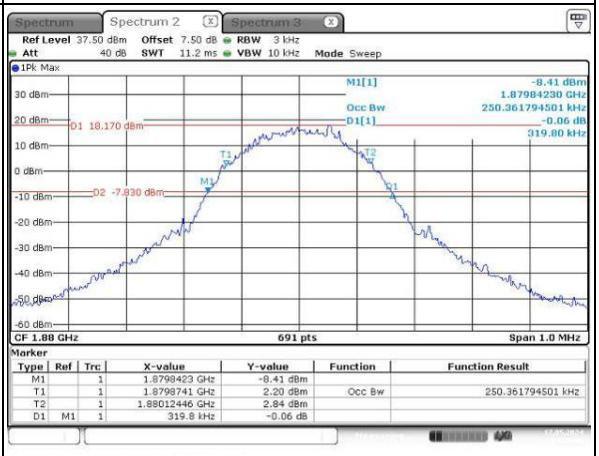
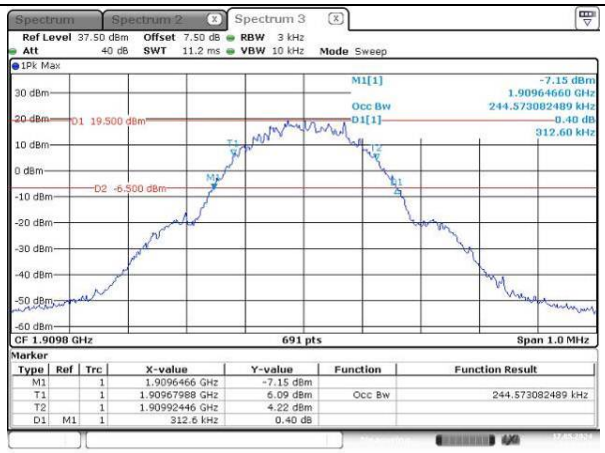
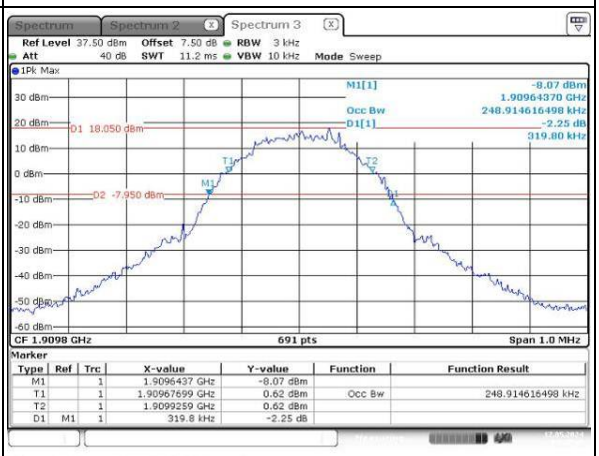
FCC §2.1051, § 24.238 (a):Spurious Emissions at Antenna Terminal	
Result:	**Pass, Please refer to the test plots of Spurious Emissions at Antenna Terminal.**

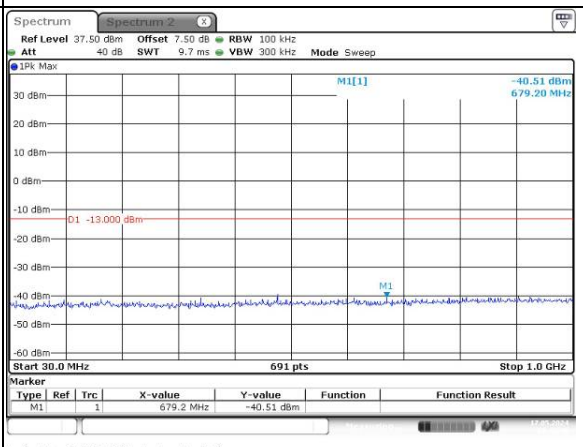
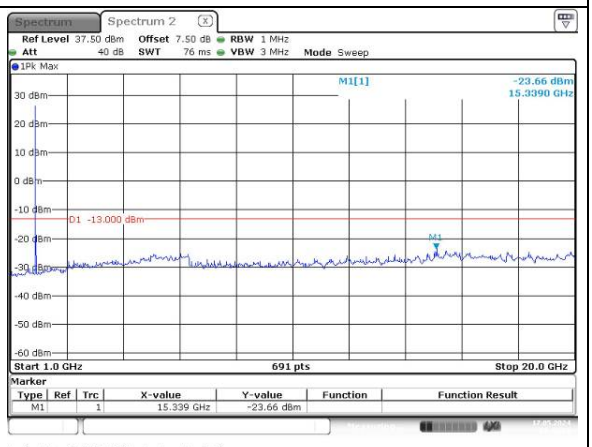
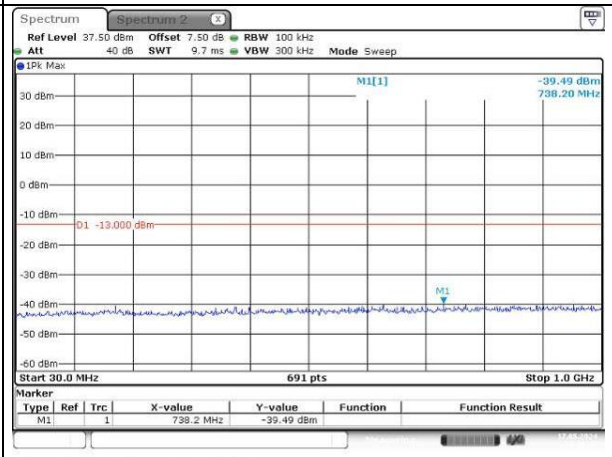
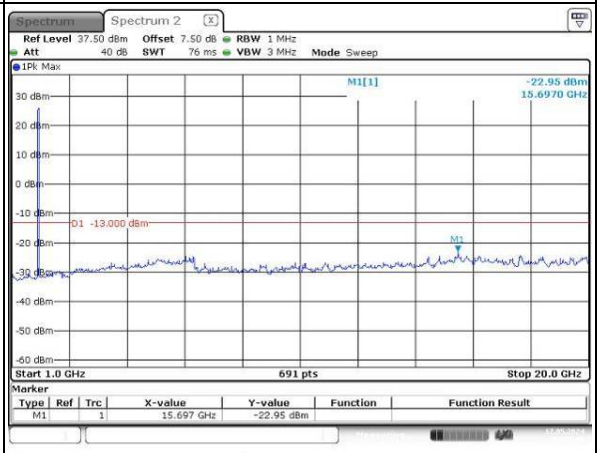
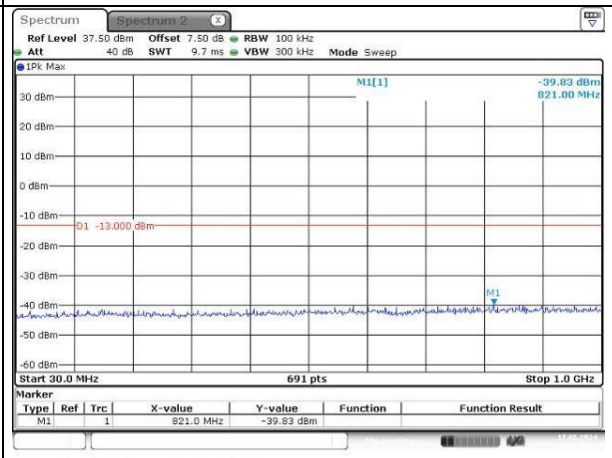
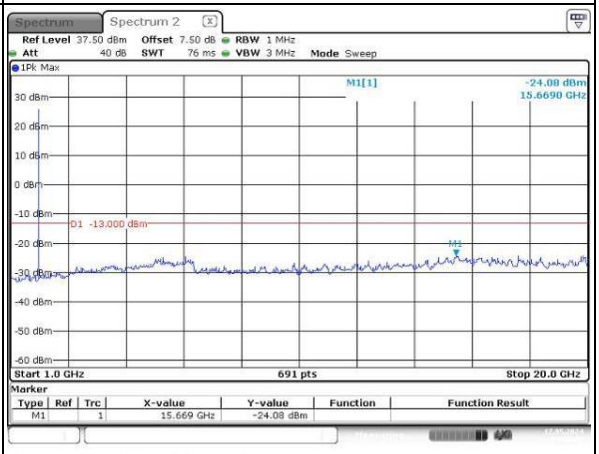
FCC §2.1051, § 24.238 (a):Out of band emission, Band Edge	
Result:	**Pass, Please refer to the test plots of Out of band emission, Band Edge.**

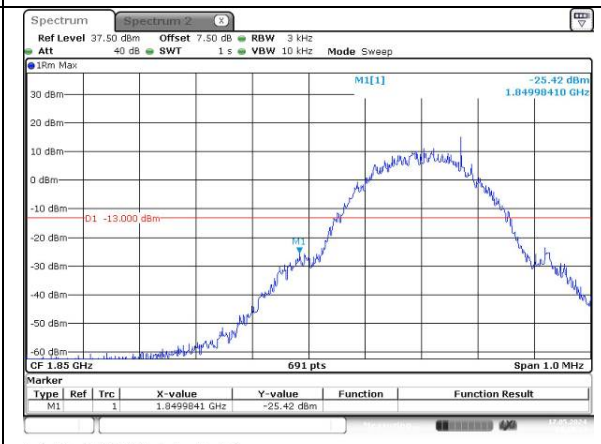
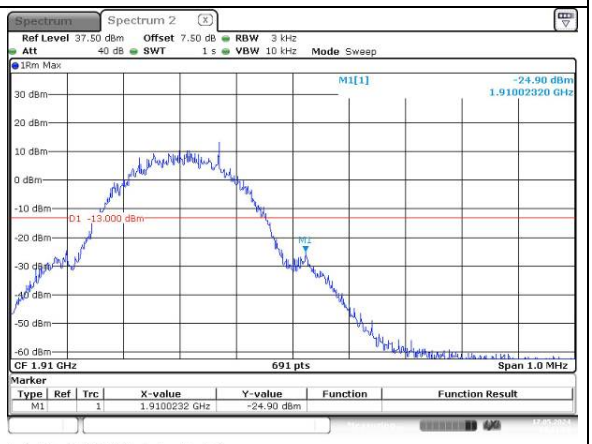
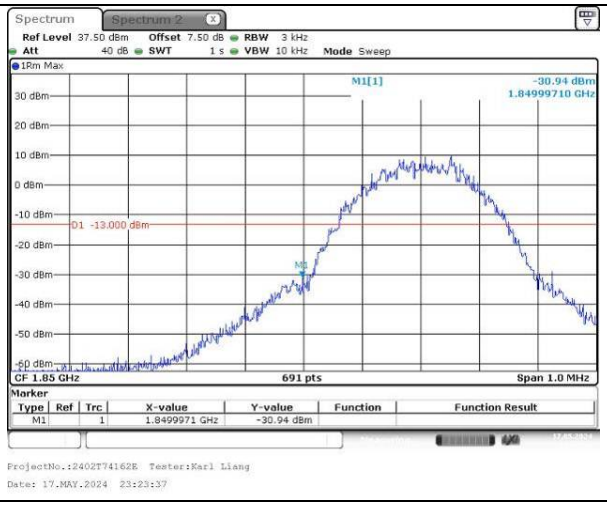
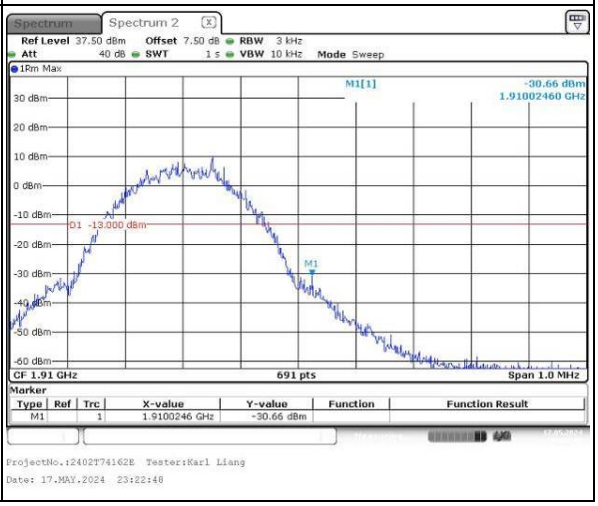
FCC §2.1055, §24.235: Frequency Stability						
Test Mode:	GMSK	Test Channel: Lowest for Lower Edge,Highest for Upper Edge				
Test Item	Temperature (℃)	Voltage (V_{DC})	Lower Edge (MHz)		Upper Edge (MHz)	
			Result	Limit	Result	Limit
Frequency Stability vs. Temperature	-30	3.8	1850.033	1850.000	1909.903	1910.000
	-20	3.8	1850.063	1850.000	1909.900	1910.000
	-10	3.8	1850.066	1850.000	1909.912	1910.000
	0	3.8	1850.063	1850.000	1909.918	1910.000
	10	3.8	1850.054	1850.000	1909.900	1910.000
	20	3.8	1850.078	1850.000	1909.924	1910.000
	30	3.8	1850.081	1850.000	1909.948	1910.000
	40	3.8	1850.096	1850.000	1909.927	1910.000
	50	3.8	1850.105	1850.000	1909.951	1910.000
Frequency Stability vs. Voltage	20	3.5	1850.102	1850.000	1909.948	1910.000
	20	4.35	1850.084	1850.000	1909.933	1910.000
					Result:	**Pass**

Test Mode:	8PSK	Test Channel: Lowest for Lower Edge,Highest for Upper Edge				
Test Item	Temperature (℃)	Voltage (V_{DC})	Lower Edge (MHz)		Upper Edge (MHz)	
			Result	Limit	Result	Limit
Frequency Stability vs. Temperature	-30	3.8	1850.062	1850.000	1909.908	1910.000
	-20	3.8	1850.056	1850.000	1909.920	1910.000
	-10	3.8	1850.047	1850.000	1909.920	1910.000
	0	3.8	1850.047	1850.000	1909.914	1910.000
	10	3.8	1850.053	1850.000	1909.911	1910.000
	20	3.8	1850.074	1850.000	1909.926	1910.000
	30	3.8	1850.086	1850.000	1909.944	1910.000
	40	3.8	1850.101	1850.000	1909.938	1910.000
	50	3.8	1850.086	1850.000	1909.938	1910.000
Frequency Stability vs. Voltage	20	3.5	1850.086	1850.000	1909.944	1910.000
	20	4.35	1850.077	1850.000	1909.953	1910.000
					Result:	**Pass**

Test Plots:

Occupied Bandwidth		
Channel	**GSM**	**EDGE**
Lowest		
Middle		
Highest		

Spurious Emissions at Antenna Terminal		
Channel	**GSM**	
Lowest		
Middle		
Highest		

Out of band emission, Band Edge		
Channel	Lowest	Highest
GSM		
EDGE		

5.3 Antenna Port Test Data and Results for WCDMA Band 2:

Serial Number:	2KWI-4	Test Date:	2024/5/17
Test Site:	RF	Test Mode:	Transmitting
Tester:	Karl Liang	Test Result:	**Pass**

Environmental Conditions:					
Temperature: (℃)	24.9	Relative Humidity: (%)	49	ATM Pressure: (kPa)	100.6

Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSV40	101461	2023/11/27	2024/11/26
Micro-Coax	Coaxial Cable	UFB205A	323308-024	2024/1/2	2025/1/1
Minl-Clrcuits	Coaxial Power Splitters & Combiner	ZFRSC-183-S+	SF448201614	2024/2/25	2025/2/24
R&S	Wideband Radio Communication Tester	CMW500	144976	2023/10/18	2024/10/17
BACL	TEMP&HUMI Test Chamber	BTH-150-40	30173	2023/10/18	2024/10/17
All-sun	Clamp Meter	EM305A	8348897	2023/8/3	2024/8/2
TDK-Lambda	DC Power Supply	Z+60-14	F-08-EM038-1	N/A	N/A

** Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).*

Test Frequency For Each Mode:

Operation Modes	Lowest Frequency (MHz)	Middle Frequency (MHz)	Highest Frequency (MHz)
WCDMA	1852.4	1880	1907.6

Test Data:

FCC§2.1046;§ 24.232
RF Output Power:

Test Mode	Conducted Average Output Power(dBm)			Maximum EIRP (dBm)	EIRP Limit (dBm)
	Lowest Channel	Middle Channel	Highest Channel		
WCDMA R99	23.22	23.35	23.31	24.22	33
HSDPA Subtest 1	21.47	21.39	21.43	22.34	33
HSDPA Subtest 2	21.43	21.45	21.47	22.34	33
HSDPA Subtest 3	21.52	21.45	21.51	22.39	33
HSDPA Subtest 4	21.39	21.55	21.37	22.42	33
HSUPA Subtest 1	21.38	21.29	21.45	22.32	33
HSUPA Subtest 2	21.46	21.42	21.32	22.33	33
HSUPA Subtest 3	21.28	21.43	21.43	22.3	33
HSUPA Subtest 4	21.35	21.43	21.35	22.3	33
HSUPA Subtest 5	21.39	21.39	21.33	22.26	33
DC-HSDPA Subtest 1	21.31	21.32	21.46	22.33	33
DC-HSDPA Subtest 2	21.42	21.29	21.34	22.29	33
DC-HSDPA Subtest 3	21.42	21.43	21.38	22.3	33
DC-HSDPA Subtest 4	21.41	21.31	21.4	22.28	33
HSPA+ Subtest 1	21.31	21.47	21.48	22.35	33
Note: EIRP=Conducted Power(dBm) - L_C(dB) + G_T(dBi)					
				Result:	**Pass**

Peak-to-average Ratio(PAR)

Test Mode	Peak-to-average Ratio(dB)			Limit (dB)
	Lowest Channel	Middle Channel	Highest Channel	
WCDMA R99	2.75	2.84	2.61	13
HSDPA	5.36	4.43	4.58	13
HSUPA	5.19	5.42	5.01	13
				Result: **Pass**

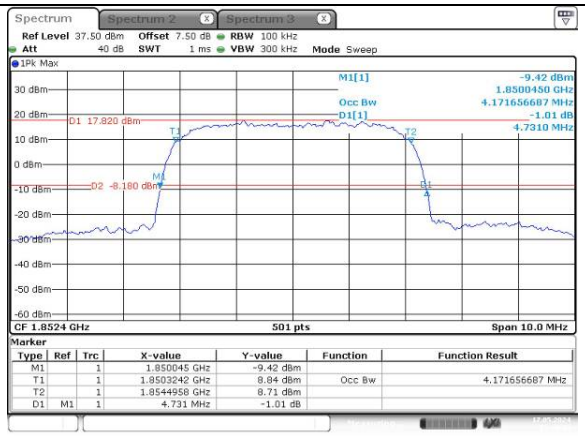
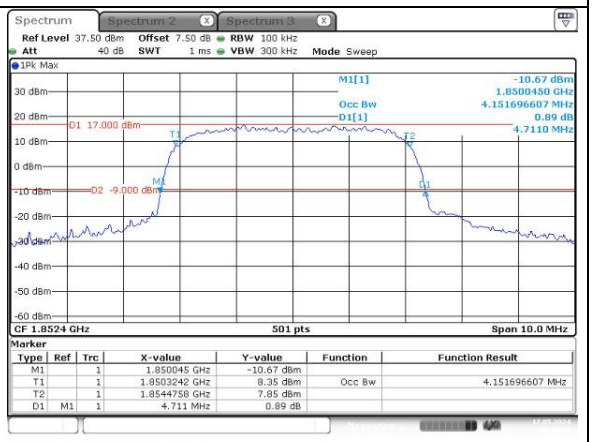
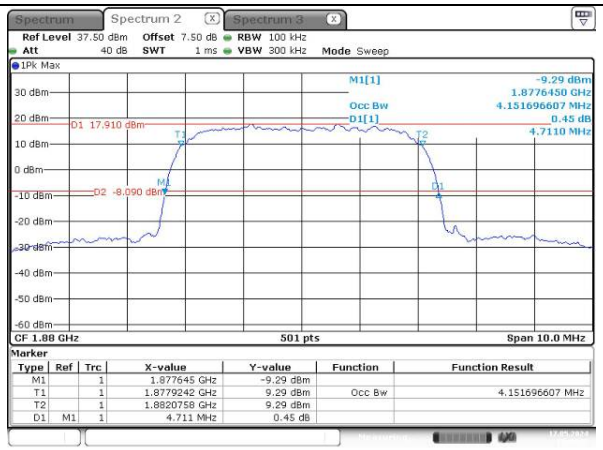
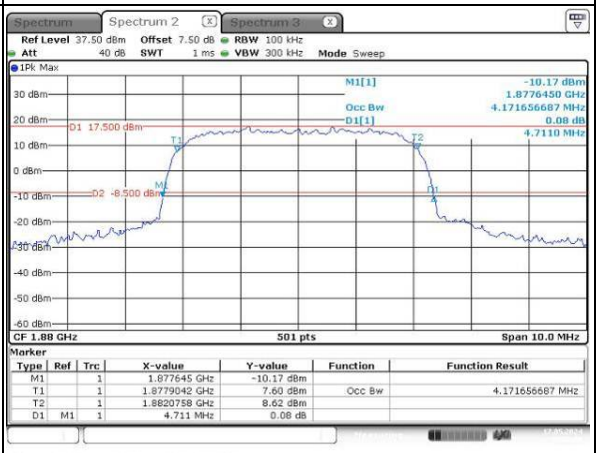
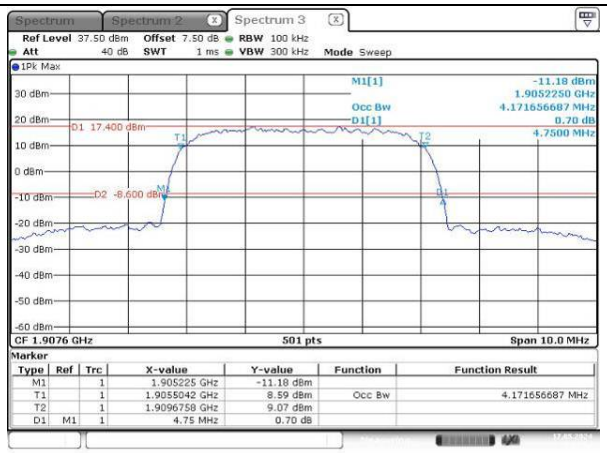
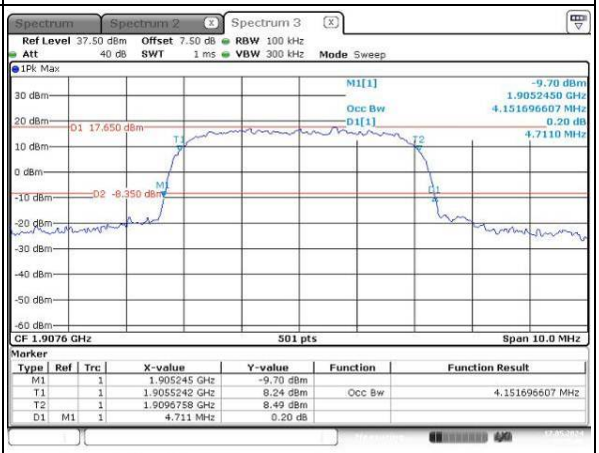
FCC §2.1049, §24.238:Occupied Bandwidth						
Operation Mode	99% Occupied Bandwidth (MHz)			26 dB Occupied Bandwidth (MHz)		
	Low Channel	Middle channel	High Channel	Low Channel	Middle Channel	High Channel
WCDMA R99	4.172	4.152	4.172	4.731	4.711	4.75
HSDPA	4.152	4.172	4.152	4.711	4.711	4.711
HSUPA	4.132	4.152	4.152	4.731	4.711	4.711
Note: The test plots please refer to the Plots of Occupied Bandwidth						

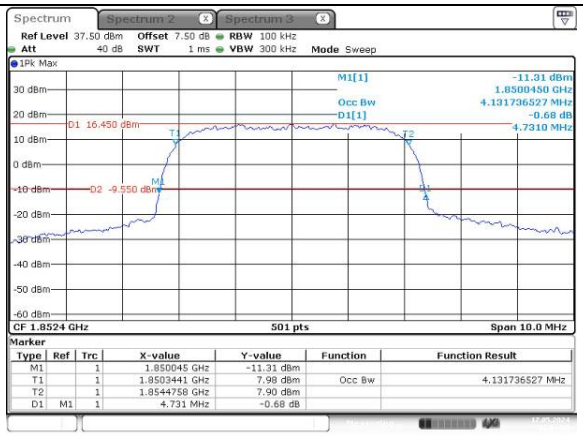
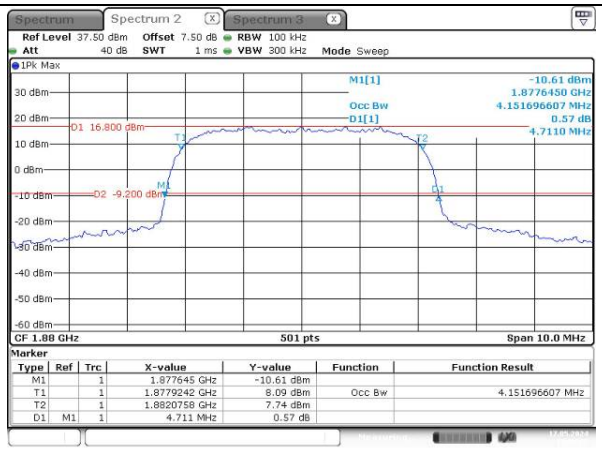
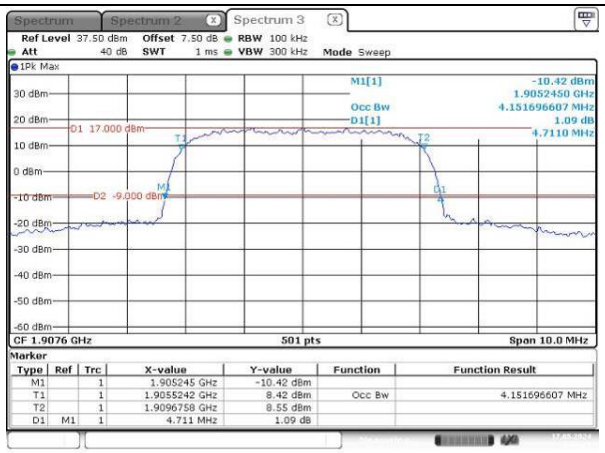
FCC §2.1051, § 24.238 (a):Spurious Emissions at Antenna Terminal	
Result:	**Pass, Please refer to the test plots of Spurious Emissions at Antenna Terminal.**

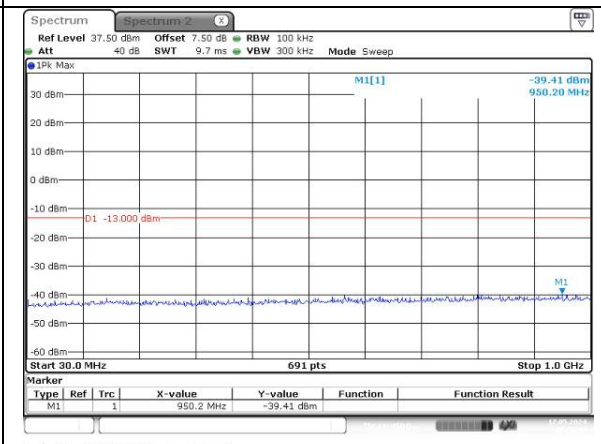
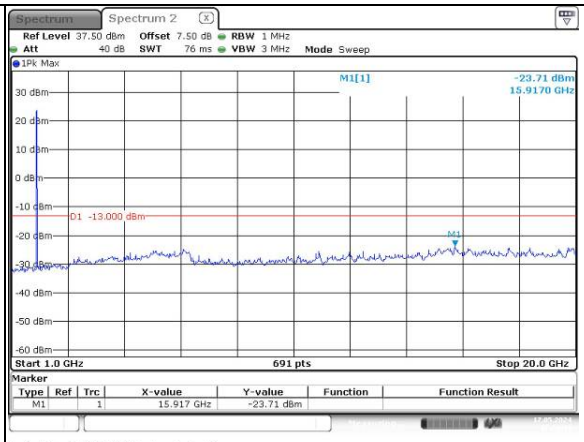
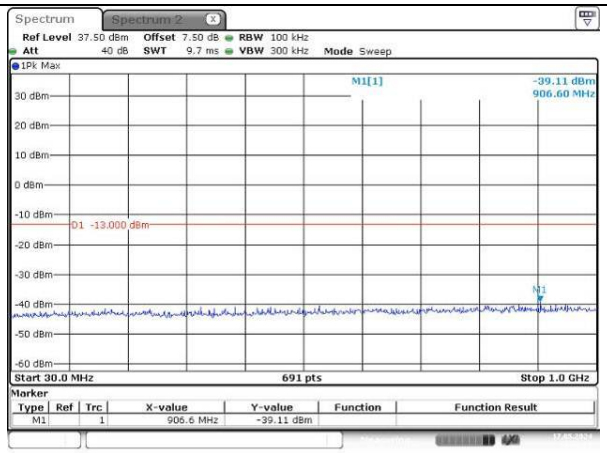
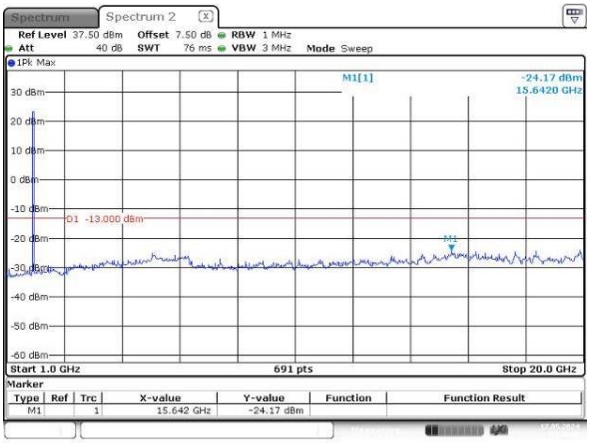
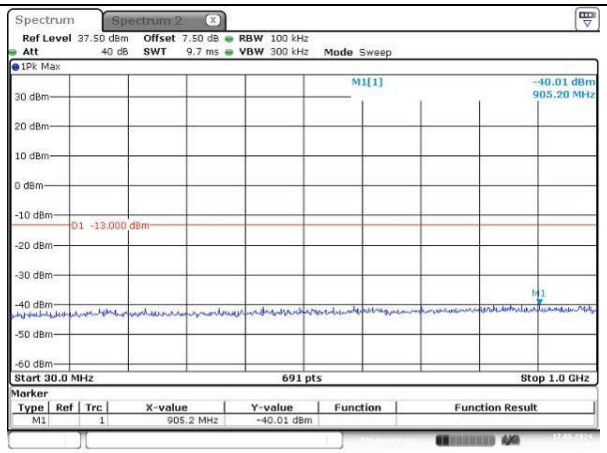
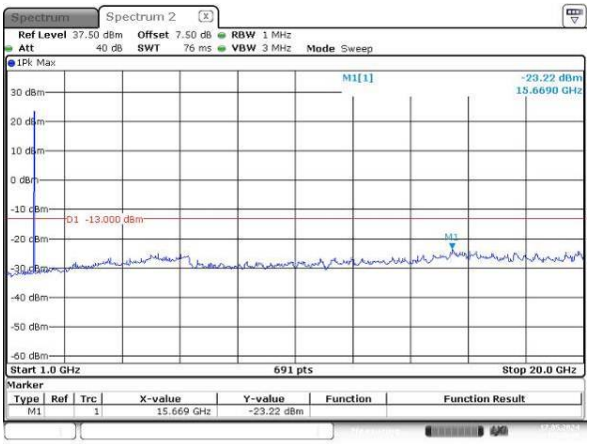
FCC §2.1051, § 24.238 (a):Out of band emission, Band Edge	
Result:	**Pass, Please refer to the test plots of Out of band emission, Band Edge.**

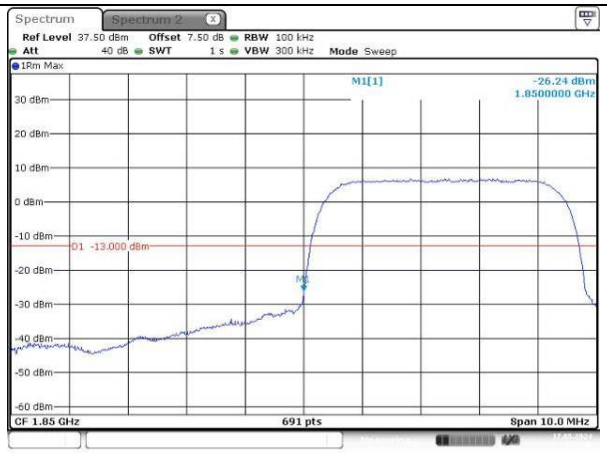
FCC §2.1055, §24.235: Frequency Stability						
Test Mode:	WCDMA R99	Test Channel: Lowest for Lower Edge,Highest for Upper Edge				
Test Item	Temperature (℃)	Voltage (VDC)	Lower Edge (MHz)		Upper Edge (MHz)	
			Result	Limit	Result	Limit
Frequency Stability vs. Temperature	-30	3.8	1850.294	1850.000	1909.670	1910.000
	-20	3.8	1850.303	1850.000	1909.670	1910.000
	-10	3.8	1850.306	1850.000	1909.661	1910.000
	0	3.8	1850.297	1850.000	1909.667	1910.000
	10	3.8	1850.297	1850.000	1909.664	1910.000
	20	3.8	1850.324	1850.000	1909.676	1910.000
	30	3.8	1850.330	1850.000	1909.682	1910.000
	40	3.8	1850.348	1850.000	1909.694	1910.000
	50	3.8	1850.333	1850.000	1909.688	1910.000
Frequency Stability vs. Voltage	20	3.5	1850.333	1850.000	1909.694	1910.000
	20	4.35	1850.345	1850.000	1909.694	1910.000
					Result:	**Pass**

Test Plots:

Occupied Bandwidth		
Channel	WCDMA R99	HSDPA
Lowest		
Middle		
Highest		

Occupied Bandwidth	
Channel	HSUPA
Lowest	
Middle	
Highest	

Spurious Emissions at Antenna Terminal		
Channel	WCDMA R99	
Lowest		
Middle		
Highest		

Out of band emission, Band Edge		
Mode	**Lowest**	**Highest**
R99		
HSUPA		
HSDPA		

5.4 Antenna Port Test Data and Results for WCDMA Band 4:

Serial Number:	2KWI-4	Test Date:	2024/5/17
Test Site:	RF	Test Mode:	Transmitting
Tester:	Karl Liang	Test Result:	**Pass**

Environmental Conditions:					
Temperature: (℃)	24.9	Relative Humidity: (%)	49	ATM Pressure: (kPa)	100.6

Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSV40	101461	2023/11/27	2024/11/26
Micro-Coax	Coaxial Cable	UFB205A	323308-024	2024/1/2	2025/1/1
Minl-Clrcuits	Coaxial Power Splitters & Combiner	ZFRSC-183-S+	SF448201614	2024/2/25	2025/2/24
R&S	Wideband Radio Communication Tester	CMW500	144976	2023/10/18	2024/10/17
BACL	TEMP&HUMI Test Chamber	BTH-150-40	30173	2023/10/18	2024/10/17
All-sun	Clamp Meter	EM305A	8348897	2023/8/3	2024/8/2
TDK-Lambda	DC Power Supply	Z+60-14	F-08-EM038-1	N/A	N/A

** Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).*

Test Frequency For Each Mode:

Operation Modes	Lowest Frequency (MHz)	Middle Frequency (MHz)	Highest Frequency (MHz)
WCDMA	1712.4	1732.6	1752.6

Test Data:

FCC§2.1046;§27.50(d)(4)
RF Output Power:

Test Mode	Conducted Average Output Power(dBm)			Maximum EIRP (dBm)	EIRP Limit (dBm)
	Lowest Channel	Middle Channel	Highest Channel		
WCDMA R99	23.14	23.01	23.04	23.28	30
HSDPA Subtest 1	21.34	21.33	21.27	21.48	30
HSDPA Subtest 2	21.43	21.27	21.31	21.57	30
HSDPA Subtest 3	21.31	21.42	21.43	21.57	30
HSDPA Subtest 4	21.32	21.32	21.37	21.51	30
HSUPA Subtest 1	21.26	21.24	21.26	21.4	30
HSUPA Subtest 2	21.21	21.26	21.25	21.4	30
HSUPA Subtest 3	21.3	21.18	21.34	21.48	30
HSUPA Subtest 4	21.21	21.25	21.17	21.39	30
HSUPA Subtest 5	21.18	21.28	21.32	21.46	30
DC-HSDPA Subtest 1	21.33	21.34	21.23	21.48	30
DC-HSDPA Subtest 2	21.33	21.17	21.23	21.47	30
DC-HSDPA Subtest 3	21.22	21.21	21.28	21.42	30
DC-HSDPA Subtest 4	21.33	21.25	21.18	21.47	30
HSPA+ Subtest 1	21.22	21.36	21.33	21.5	30
Note: EIRP=Conducted Power(dBm) - L_C(dB) + G_T(dBi)					
				Result:	**Pass**

Peak-to-average Ratio(PAR)

Test Mode	Peak-to-average Ratio(dB)			Limit (dB)
	Lowest Channel	Middle Channel	Highest Channel	
WCDMA R99	3.19	3.16	3.19	13
HSDPA	3.51	3.39	3.42	13
HSUPA	6.00	5.59	5.77	13
				Result: **Pass**

FCC §2.1049, §27.53:Occupied Bandwidth						
Opration Mode	99% Occupied Bandwidth (MHz)			26 dB Occupied Bandwidth (MHz)		
	Low Channel	Middle channel	High Channel	Low Channel	Middle Channel	High Channel
WCDMA R99	4.172	4.152	4.152	4.711	4.711	4.711
HSDPA	4.172	4.152	4.172	4.731	4.711	4.711
HSUPA	4.132	4.152	4.152	4.731	4.711	4.711
Note: The test plots please refer to the Plots of Occupied Bandwidth						

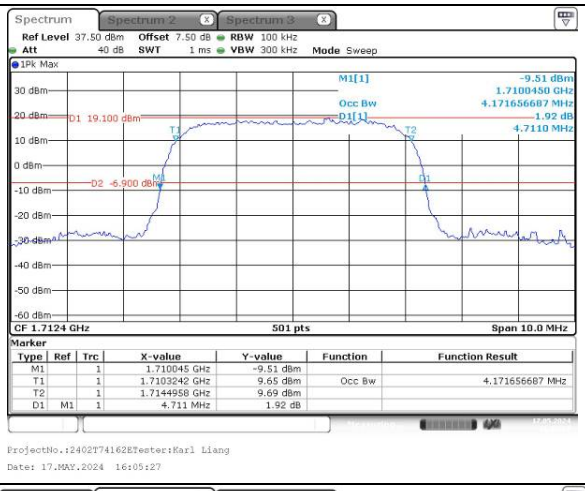
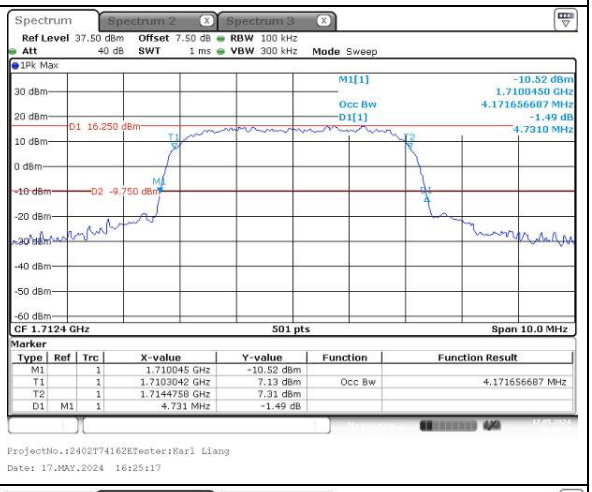
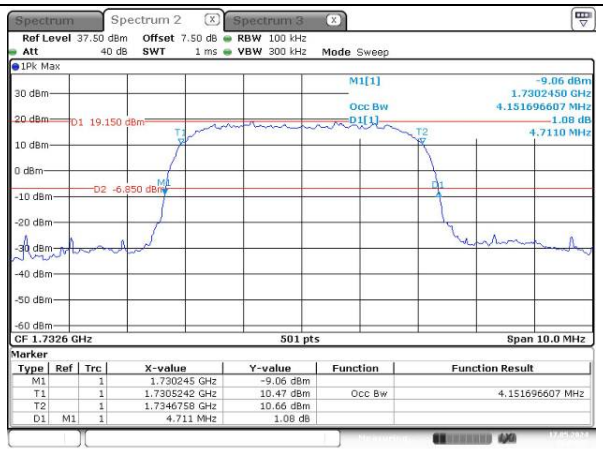
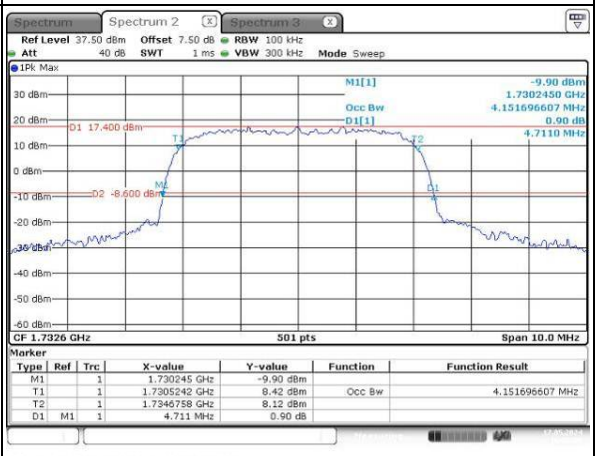
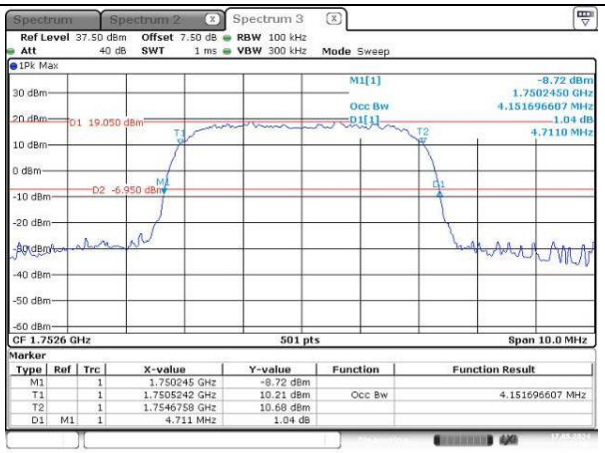
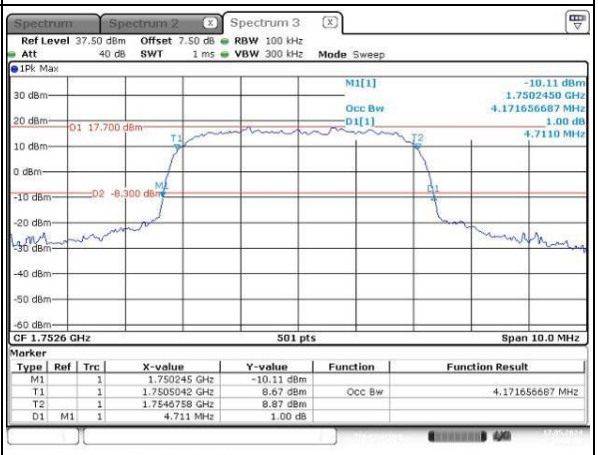
FCC §2.1051, § 27.53:Spurious Emissions at Antenna Terminal	
Result:	**Pass, Please refer to the test plots of Spurious Emissions at Antenna Terminal.**

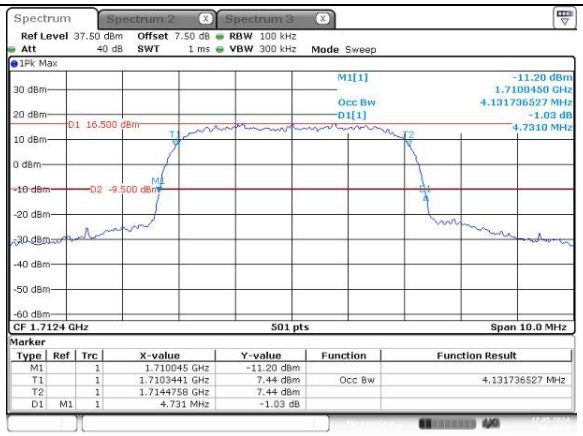
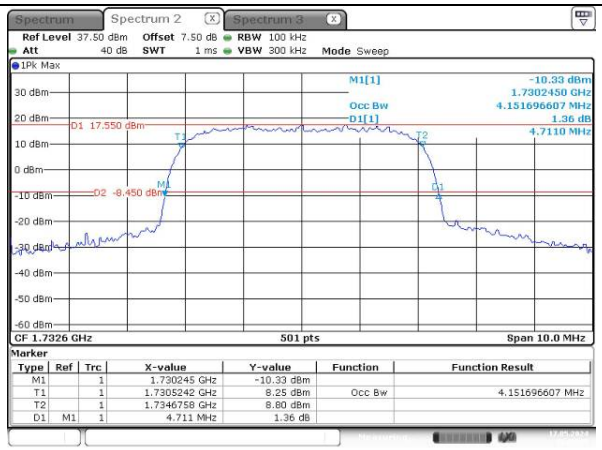
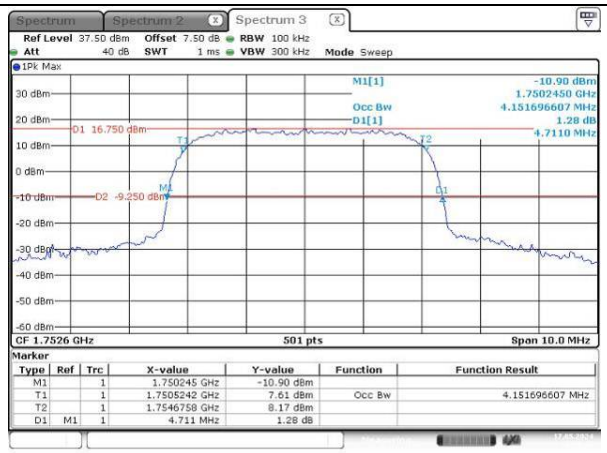
FCC §2.1051, § 27.53:Out of band emission, Band Edge	
Result:	**Pass, Please refer to the test plots of Out of band emission, Band Edge.**

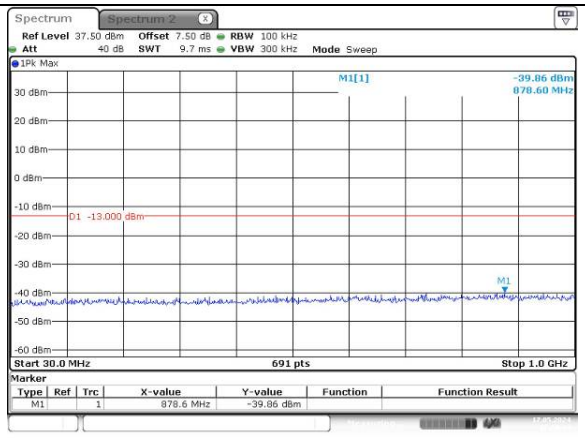
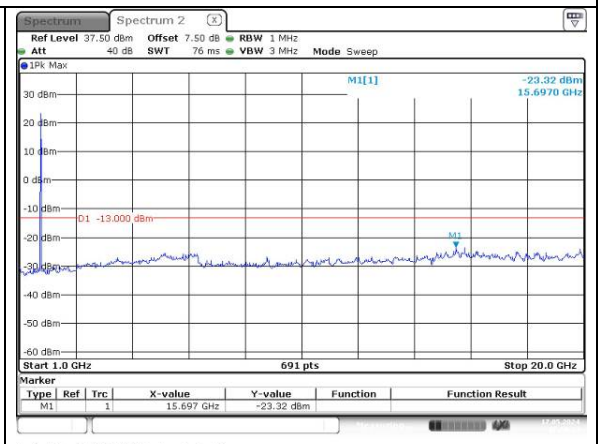
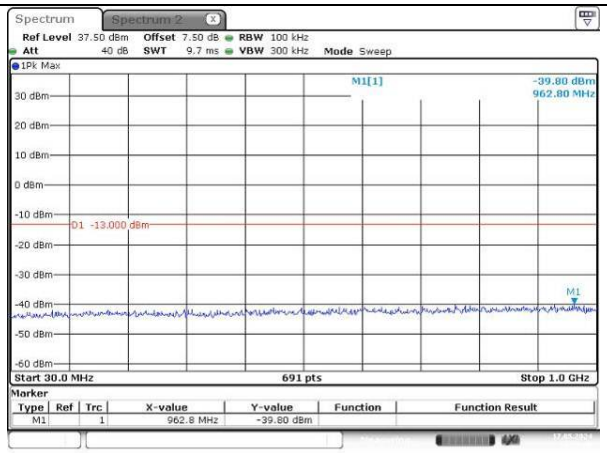
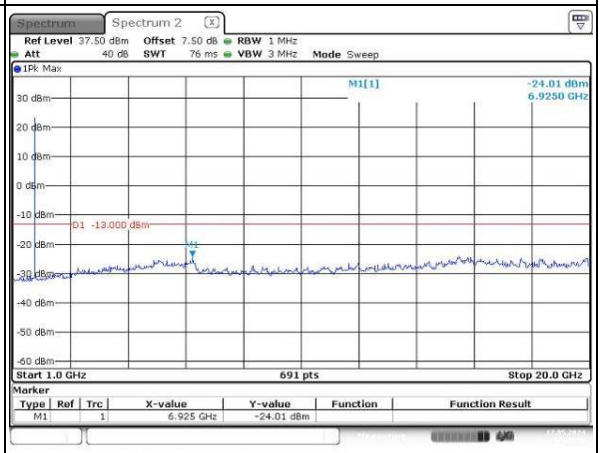
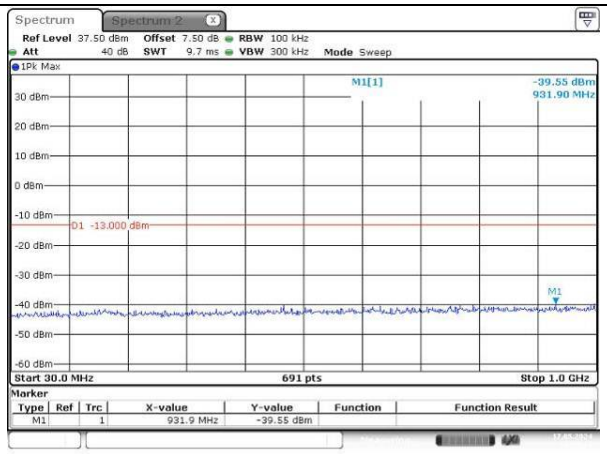
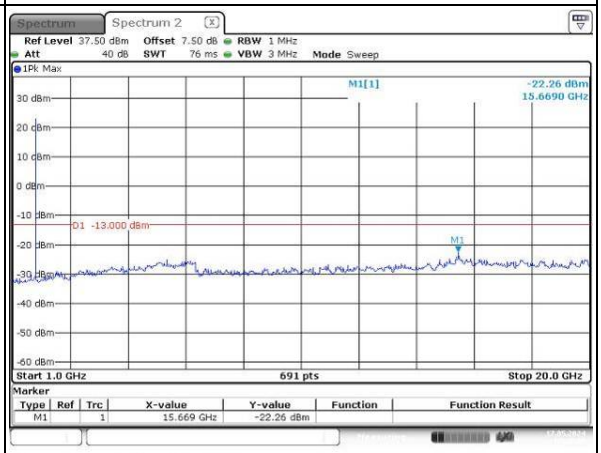
FCC §2.1055, §27.54: Frequency Stability

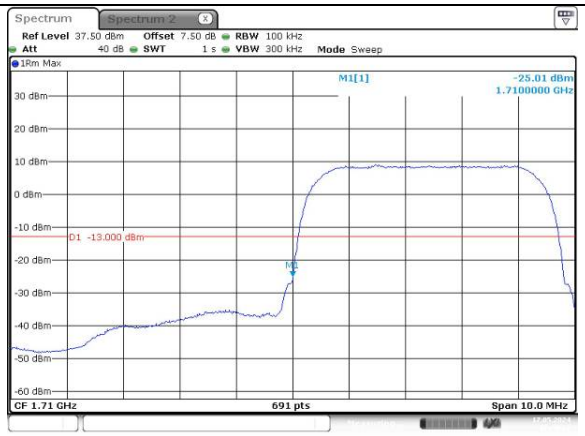
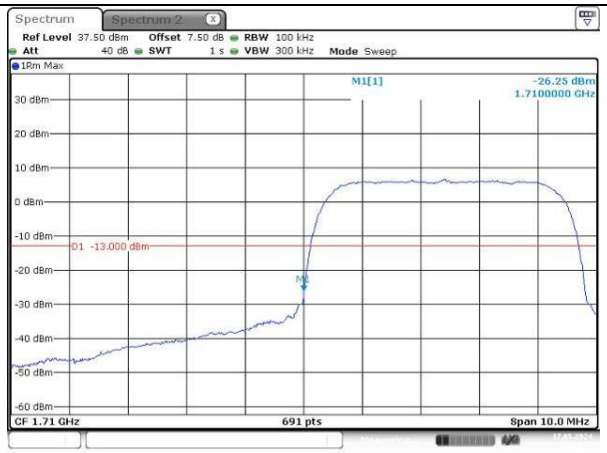
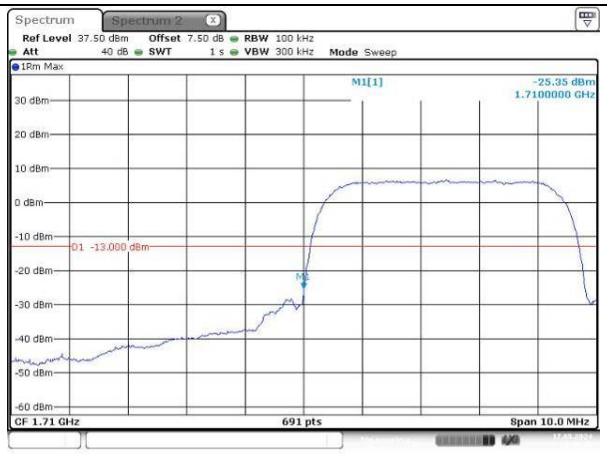
Test Mode:	WCDMA R99	Test Channel: Lowest for Lower Edge,Highest for Upper Edge				
Test Item	Temperature (℃)	Voltage (VDC)	Lower Edge (MHz)		Upper Edge (MHz)	
			Result	Limit	Result	Limit
Frequency Stability vs. Temperature	-30	3.8	1710.297	1710.000	1754.652	1755.000
	-20	3.8	1710.309	1710.000	1754.655	1755.000
	-10	3.8	1710.303	1710.000	1754.661	1755.000
	0	3.8	1710.309	1710.000	1754.664	1755.000
	10	3.8	1710.303	1710.000	1754.670	1755.000
	20	3.8	1710.324	1710.000	1754.676	1755.000
	30	3.8	1710.336	1710.000	1754.694	1755.000
	40	3.8	1710.333	1710.000	1754.697	1755.000
	50	3.8	1710.348	1710.000	1754.679	1755.000
Frequency Stability vs. Voltage	20	3.5	1710.336	1710.000	1754.697	1755.000
	20	4.35	1710.327	1710.000	1754.700	1755.000
					Result:	**Pass**

Test Plots:

Occupied Bandwidth		
Channel	WCDMA R99	HSDPA
Lowest		
Middle		
Highest		

Occupied Bandwidth	
Channel	HSUPA
Lowest	
Middle	
Highest	

Spurious Emissions at Antenna Terminal		
Channel	WCDMA R99	
Lowest		
Middle		
Highest		

Out of band emission, Band Edge		
Mode	**Lowest**	**Highest**
R99		
HSUPA		
HSDPA		

5.5 Antenna Port Test Data and Results for WCDMA Band 5:

Serial Number:	2KWI-4	Test Date:	2024/5/17
Test Site:	RF	Test Mode:	Transmitting
Tester:	Karl Liang	Test Result:	**Pass**

Environmental Conditions:					
Temperature: (℃)	24.9	Relative Humidity: (%)	49	ATM Pressure: (kPa)	100.6

Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSV40	101461	2023/11/27	2024/11/26
Micro-Coax	Coaxial Cable	UFB205A	323308-024	2024/1/2	2025/1/1
Minl-Clrcuits	Coaxial Power Splitters & Combiner	ZFRSC-183-S+	SF448201614	2024/2/25	2025/2/24
R&S	Wideband Radio Communication Tester	CMW500	144976	2023/10/18	2024/10/17
BACL	TEMP&HUMI Test Chamber	BTH-150-40	30173	2023/10/18	2024/10/17
All-sun	Clamp Meter	EM305A	8348897	2023/8/3	2024/8/2
TDK-Lambda	DC Power Supply	Z+60-14	F-08-EM038-1	N/A	N/A

** Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).*

Test Frequency:

Operation Modes	Lowest Frequency (MHz)	Middle Frequency (MHz)	Highest Frequency (MHz)
WCDMA	826.4	836.6	846.6

Test Data:

FCC§2.1046;§ 22.913 (a)
RF Output Power:

Test Mode	Conducted Average Output Power(dBm)			Maximum ERP (dBm)	ERP Limit (dBm)
	Lowest Channel	Middle Channel	Highest Channel		
WCDMA R99	23.31	23.07	23.16	18.6	38.45
HSDPA Subtest 1	21.29	21.27	21.37	16.66	38.45
HSDPA Subtest 2	21.38	21.25	21.26	16.67	38.45
HSDPA Subtest 3	21.24	21.35	21.38	16.67	38.45
HSDPA Subtest 4	21.19	21.34	21.27	16.63	38.45
HSUPA Subtest 1	21.17	21.13	21.13	16.46	38.45
HSUPA Subtest 2	21.13	21.1	21.25	16.54	38.45
HSUPA Subtest 3	21.14	21.14	21.16	16.45	38.45
HSUPA Subtest 4	21.23	21.09	21.17	16.52	38.45
HSUPA Subtest 5	21.19	21.23	21.24	16.53	38.45
DC-HSDPA Subtest 1	21.24	21.26	21.22	16.55	38.45
DC-HSDPA Subtest 2	21.15	21.13	21.13	16.44	38.45
DC-HSDPA Subtest 3	21.12	21.18	21.23	16.52	38.45
DC-HSDPA Subtest 4	21.23	21.17	21.26	16.55	38.45
HSPA+ Subtest 1	21.11	21.14	21.25	16.54	38.45

Note:
ERP= Conducted Power(dBm) - L_C(dB) + G_T(dBd)
G_T(dBd)=G_T(dBi)-2.15

Result:	**Pass**

Peak-to-average Ratio(PAR)

Test Mode	Peak-to-average Ratio(dB)			Limit (dB)
	Lowest Channel	Middle Channel	Highest Channel	
WCDMA R99	3.04	2.93	3.10	13
HSDPA	3.28	4.38	4.90	13
HSUPA	5.71	5.33	4.93	13

Result:	**Pass**

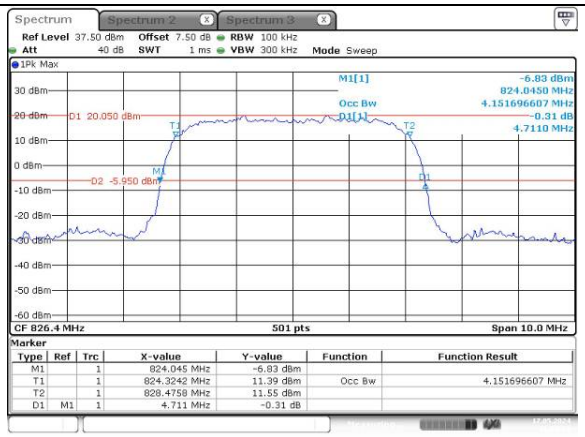
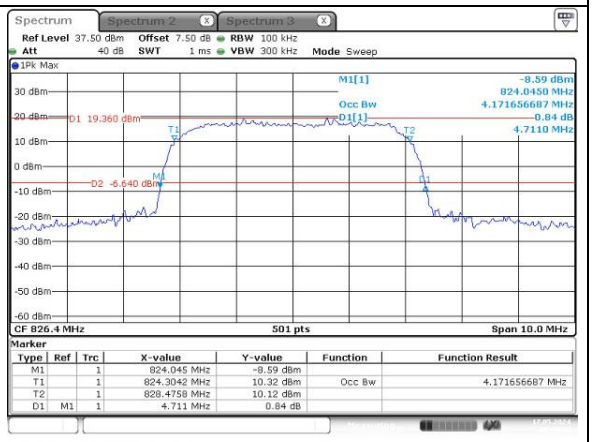
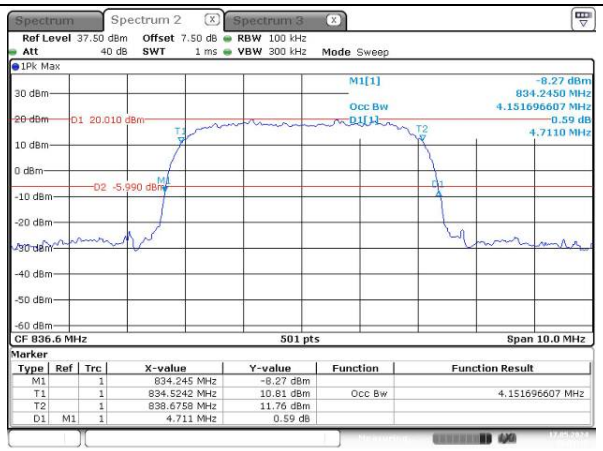
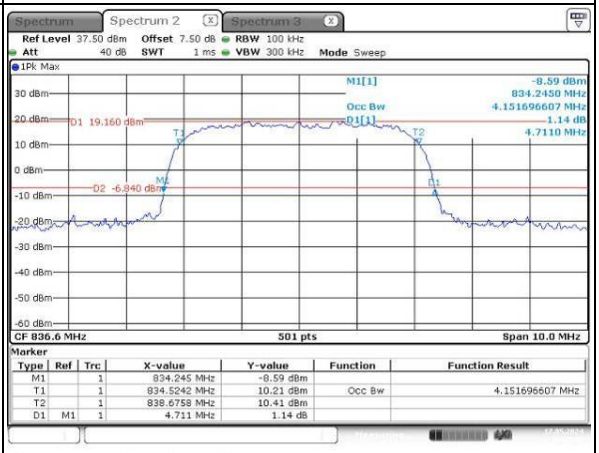
FCC §2.1049, §22.917, §22.905:Occupied Bandwidth						
Operation Mode	99% Occupied Bandwidth (MHz)			26 dB Occupied Bandwidth (MHz)		
	Low Channel	Middle channel	High Channel	Low Channel	Middle Channel	High Channel
WCDMA R99	4.152	4.152	4.152	4.711	4.711	4.711
HSDPA	4.172	4.152	4.172	4.711	4.711	4.711
HSUPA	4.152	4.152	4.152	4.731	4.711	4.731
Note: The test plots please refer to the Plots of Occupied Bandwidth						

FCC §2.1051, §22.917(a):Spurious Emissions at Antenna Terminal	
Result:	**Pass, Please refer to the test plots of Spurious Emissions at Antenna Terminal.**

FCC §2.1051, §22.917(a):Out of band emission, Band Edge	
Result:	**Pass, Please refer to the test plots of Out of band emission, Band Edge.**

FCC §2.1055, §22.355: Frequency Stability					
Test Modulation:	WCDMA R99		Test Channel:	836.6MHz	
Test Item	Temperature (℃)	Voltage (VDC)	Frequency Error		Limit
			(Hz)	(ppm)	(ppm)
Frequency Stability vs. Temperature	-30	3.8	9.73	0.0116	2.5
	-20	3.8	-9.56	-0.0114	2.5
	-10	3.8	-5.2	-0.0062	2.5
	0	3.8	6.03	0.0072	2.5
	10	3.8	-6.81	-0.0081	2.5
	20	3.8	-9.31	-0.0111	2.5
	30	3.8	-7.64	-0.0091	2.5
	40	3.8	-8.34	-0.0100	2.5
	50	3.8	-3.28	-0.0039	2.5
Frequency Stability vs. Voltage	20	3.5	-0.52	-0.0006	2.5
	20	4.35	8.43	0.0101	2.5
				Result:	**Pass**

Test Plots:

Occupied Bandwidth		
Channel	WCDMA R99	HSDPA
Lowest		
Middle		
Highest