Industrial Internet Innovation Center (Shanghai) Co.,Ltd.

RF TEST REPORT

PRODUCT	Handheld Wireless Terminal
BRAND	SUNMI
MODEL	T8F1B
APPLICANT	Shanghai Sunmi Technology Co.,Ltd.
FCC ID	2AH25T8F1B
IC	22621-T8F1B
ISSUE DATE	February 14, 2025
STANDARD(S)	FCC Part 2, FCC Part 22, FCC Part 24, FCC Part27, RSS-Gen Issue 5, RSS-132 Issue 4, RSS-133 Issue 7, RSS-139 Issue 4

Prepared by: ***Jia Rongwei*** **Reviewed by:** ***Yang Fan*** **Approved by:** ***Zhang Min***

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1. Summary of Test Report

1.1 Test Standard (s)

No.	Test Standard	Title	Version
1	FCC Part 2	FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS	--
2	FCC Part 22	PUBLIC MOBILE SERVICES	--
3	FCC Part 24	PERSONAL COMMUNICATIONS SERVICES	--
4	FCC Part 27	MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES	--
5	RSS-Gen Issue 5	General Requirements for Compliance of Radio Apparatus	2021-02
6	RSS-132 Issue 4	Cellular Systems Operating in the Bands 824-849 MHz and 869-894 MHz	2023-01
7	RSS-133 Issue 7	Personal Communications Service Equipment Operating in the Bands 1850-1915 MHz and 1930-1995 MHz	2024-07
8	RSS-139 Issue 4	Advanced Wireless Services (AWS) Equipment Operating in the Bands 1710-1780 MHz and 2110-2200 MHz	2022-09
Note: The standard of FCC Part 2 has not been accredited by A2LA.			

1.2 Reference Documents

No.	Test Standard	Title	Version
1	ANSI/TIA-603-E	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards	2016
2	ANSI C63.26	American National Standard of Procedures for Compliance Testing of Licensed Transmitters Used in Licensed Radio	2015
3	KDB 971168 D01 Power Meas License Digital Systems	Measurement Guidance for Certification of Licensed Digital Transmitters	v03r01
Note: The standard of KDB 971168 D01 Power Meas License Digital Systems has not been accredited by A2LA.			

1.3 Summary of Test Results

WCDMA II

Items	Test Name	Clause in FCC rules	Clause in IC rules	Verdict
1	Output Power/EIRP	2.1046/24.232(c)	RSS-133 5.5	Pass
2	Emission Limit	2.1053/24.238(a)	RSS-133 5.6	Pass
3	Frequency Stability	2.1055/24.235	RSS-133 5.4	Pass
4	Occupied Bandwidth	2.1049	RSS-GEN 6.7	Pass
5	Emission Bandwidth	2.1049	RSS-GEN 6.7	Pass
6	Band Edge Compliance	2.1051/24.238(a)	RSS-133 5.6	Pass
7	Conducted Spurious Emission	2.1051/24.238(a)	RSS-133 5.6	Pass

8	Peak to Average Power Ratio	24.232 (d)	RSS-133 5.5	Pass

WCDMA IV

Items	Test Name	Clause in FCC rules	Clause in IC rules	Verdict
1	Output Power/EIRP	2.1046/27.50(d)(4)	RSS-139 5.5	Pass
2	Emission Limit	2.1053/27.53(h)	RSS-139 5.6	Pass
3	Frequency Stability	2.1055/27.54	RSS-139 5.4	Pass
4	Occupied Bandwidth	2.1049	RSS-GEN 6.7	Pass
5	Emission Bandwidth	2.1049	RSS-GEN 6.7	Pass
6	Band Edge Compliance	2.1051/27.53(h)	RSS-139 5.6	Pass
7	Conducted Spurious Emission	2.1051/27.53(h)	RSS-139 5.6	Pass
8	Peak to Average Power Ratio	27.50(d)(5)	RSS-139 5.5	Pass

WCDMA V

Items	Test Name	Clause in FCC rules	Clause in IC rules	Verdict
1	Output Power/ERP	2.1046/22.913(a)	RSS-132 5.4	Pass
2	Emission Limit	2.1053/22.917(a)	RSS-132 5.5	Pass
3	Frequency Stability	2.1055/22.355	RSS-132 5.3	Pass
4	Occupied Bandwidth	2.1049	RSS-GEN 6.7	Pass
5	Emission Bandwidth	2.1049	RSS-GEN 6.7	Pass
6	Band Edge Compliance	2.1051/22.917(a)	RSS-132 5.5	Pass
7	Conducted Spurious Emission	2.1051/22.917(a)	RSS-132 5.5	Pass
8	Peak to Average Power Ratio	N/A	RSS-132 5.4	Pass

Note:

The T8F1B manufactured by Shanghai Sunmi Technology Co.,Ltd. is a new product for testing.

Industrial Internet Innovation Center (Shanghai) Co., Ltd. only performed test cases which identified with Pass/Fail/Inc result in section 1.3.

Industrial Internet Innovation Center (Shanghai) Co., Ltd. has verified that the compliance of the tested device specified in section 4 of this test report is successfully evaluated according to the procedure and test methods as defined in type certification requirement listed in section 1 of this test report.

1.4 Data Provided by Applicant

No.	Item(s)	Data
1	WCDMA Band 2 Antenna gain	2.19 dBi
2	WCDMA Band 4 Antenna gain	1.85 dBi
3	WCDMA Band 5 Antenna gain	-0.37 dBi
Note: The data of antenna gain is provided by Antenna specification may affect the validity of the test results in this report, and the impact and consequences of this shall be undertaken by the customer.		

2 General Information of The Laboratory

2.1 Testing Laboratory

Lab Name	Industrial Internet Innovation Center (Shanghai) Co.,Ltd.
Address	Building 4，No. 766，Jingang Road，Pudong，Shanghai，China
Telephone	021-68866880
FCC Registration No.	708870
FCC Designation No.	CN1364
IC Designation No.	10766A
CAB identifier	CN0067

2.2 Laboratory Environmental Requirements

Temperature	15℃~35℃
Relative Humidity	25%RH~75%RH
Atmospheric Pressure	86kPa~106kPa

2.3 Project Information

Project Manager	Gao Hongning
Test Date	November 30, 2024 to January 8, 2025

3 General Information of The Customer

3.1 Applicant

Company	Shanghai Sunmi Technology Co.,Ltd.
Address	Room 505, No.388 Song Hu Road, Yang Pu District, Shanghai, China
Telephone	8618501703215

3.2 Manufacturer

Company	Shanghai Sunmi Technology Co.,Ltd.
Address	Room 505, No.388 Song Hu Road, Yang Pu District, Shanghai, China
Telephone	8618501703215

4 General Information of The Product

4.1 Product Description for Equipment under Test (EUT)

Product	Handheld Wireless Terminal
Model	T8F1B
Date of Receipt	S10aa:November 29,2024 S14aa:December 2, 2024
EUT ID*	S10aa/S14aa
SN/IMEI	S10aa: 862072070026691'862072070026709 S14aa: 862072070026774'862072070026782
Supported Radio Technology and Bands	GSM 850/900/1800/1900 WCDMA Band I/II/IV/V/VI/VIII/XIX LTE Band 1/2/3/4/5/7/8/12/13/14/17/18/19/20/25/26/28/30/34/38/39/40/41/66/71 WLAN 802.11b/g/n WLAN 802.11a/n/ac BT 5.2 BR/EDR/BLE NFC GPS/GLONASS/BDS/Galileo
Hardware Version	V00
Software Version	1.00.00.20241113_186_userdebug
HVIN	T8F1B
FCC ID	2AH25T8F1B
IC	22621-T8F1B
NOTE1: EUT ID is the internal identification code of the laboratory. NOTE2: Samples in the test report are provided by the customer. The test results are only applicable to the samples received by the laboratory.	

4.2 Description for Auxiliary Equipment (AE)

AE ID*	Description	Model	SN/Remark
AE1	RF Cable	N/A	Cable Loss: 0.5 dB
CG01	Adapter	TPA-141A050200UU01	SHENZHEN TIANYIN ELECTRONICS CO., LTD. OUTPUT: 5V 2A
CH01	Adapter	UC13US	Jiangsu Chenyang Electron Co., Ltd. OUTPUT: 5V 2A
CI01	Adapter	TPA-10120150UU	SHENZHEN TIANYIN ELECTRONICS CO., LTD. OUTPUT: 9V 2A
UA10	AC Cable	SSM-A033A	Saibao (Jiangxi) Industry Co., LTD
BA10	Battery	GYPA	HUNAN GAOYUAN BATTERY CO.,LTD. 5000mAh 3.87V

NOTE1: AE ID is the internal identification code of the laboratory.

4.3 Additional Information

Type of modulation	QPSK/16QAM

Band Frequency Range:

Band	Frequency Range(MHz)
Band II	1850 -1910
Band IV	1710 -1755
Band V	824 – 849

Band List:

Band	Low Channel	Low Freq. (MHz)	Mid Channel	Mid Freq. (MHz)	High Channel	High Freq. (MHz)
Band II	9262	1852.4	9400	1880	9538	1907.6
Band IV	1312	1712.4	1413	1732.6	1513	1752.6
Band V	4132	826.4	4183	836.6	4233	846.6

Emissions Information:

Band	Frequency Min (MHz)	Frequency Max (MHz)	Modulation	Max OutPut Power (dBm)	Max OutPut Power EIRP (dBm)	Max OutPut Power EIRP (W)	Max OutPut Power ERP (W)	OBW (KHz)	Necessary Bandwidth & Emission Classification
WCDMA2	1852.4	1907.6	RMC	23.92	26.11	0.4083	0.2489	4160	4M16F9W
WCDMA4	1712.4	1752.6	RMC	23.98	25.83	0.3828	0.2333	4173	4M17F9W
WCDMA5	826.4	846.6	RMC	23.73	23.36	0.2168	0.1321	4172	4M17F9W

5 Test Configuration Information

5.1 Laboratory Environmental Conditions

5.1.1 Permanent Facilities

Relative Humidity	Min. = 45%, Max. = 55 %		
Atmospheric Pressure	101kPa		
Temperature	Normal	Minimum	Maximum
	25℃	-20℃	55℃
Working Voltage of EUT	Normal	Minimum	Maximum
	3.87V	3.45V	4.45V

5.2 Test Equipments Utilized

Conduction test system

No.	Name	Model	S/N	SW Version	HW Version	Manufacturer	Cal. Date	Cal. Interval
1	Software	Eagle V3.3	N/A	V3.3	N/A	3IN	N/A	N/A
2	Frequency spectrum analyzer	FSQ	101091	V4.75	V11.00	R&S	2024-07-25	1 Year
3	Frequency spectrum analyzer	FSW	101943	1.12	00	R&S	2024-08-21	1 Year
4	Wideband Radio Communication Tester	CMW 500	148874	V3.5.136	N/A	R&S	2024-07-26	1 Year
5	Temperature Chamber	B-TF-107C	201804107	N/A	N/A	BoYi	2024-06-07	1 Year
6	Programmable power supply	Keithley 2303	4039070	N/A	N/A	Keithley	2024-06-07	1 Year
7	RF Test Automation Box	RF 2021B	2001	V3.3	N/A	RANATEC	N/A	N/A

Radiated emission test system

No.	Name	Model	S/N	SW Version	HW Version	Manufacturer	Cal. Date	Cal. Interval
1	Universal Radio Communication Tester	CMU200	123126	V5.2.1	B12	R&S	2024-10-09	1 Year
2	Universal Radio Communication Tester	CMW500	104178	V3.7.20	1206.0600.00	R&S	2024-10-09	1 Year
3	EMI Test Receiver	ESU40	100307	V5.1-24-3	01	R&S	2023-12-19 2024-12-13	1 Year

4	TRILOG Broadband Antenna	VULB9163	01345	N/A	N/A	Schwarzbeck	2024-03-29	1 Year
5	Double- ridged Waveguide Antenna	ETS-3117	00135890	N/A	N/A	ETS	2024-03-16	1 Year
6	EMI Test Software	EMC32 V10.35.02	N/A	N/A	N/A	R&S	N/A	N/A
7	Preamplifier	SCU08F1	8320024	N/A	N/A	R&S	2024-10-09	1 Year
8	Preamplifier	SCU18	10155	N/A	N/A	R&S	2024-10-09	1 Year
9	Antenna	SWB-VUBA 9117	9117-266	N/A	N/A	Schwarzbeck	2024-08-31	1 Year
10	Antenna	BBHA9120D	02112	N/A	N/A	Schwarzbeck	2024-08-03	1 Year
11	Signal Generator	SMF100A	102314	3.20.390.24	05.10	R&S	2024-10-09	1 Year
12	Antenna Tower	TPMDC-LF	N/A	N/A	N/A	Top Precision	N/A	N/A
13	Antenna Tower	TPMDC-HF	N/A	N/A	N/A	Top Precision	N/A	N/A

Anechoic chamber

Fully anechoic chamber by ETS.

5.3 Measurement Uncertainty

Measurement uncertainty for all the testing in this report are within the limit specified in 3IN documents. The detailed measurement uncertainty is defined in 3IN documents.

Measurement Uncertainty of Radiation test

Frequency Range	Uncertainty(dB)
30MHz ≤ f ≤ 1GHz	±5.10
1GHz ≤ f ≤ 18GHz	±5.66
18GHz ≤ f ≤ 40GHz	±5.22

Measurement Uncertainty of Conduction test

No	Item	Extended uncertainty （k=2）	
1	Frequency Tolerance	23Hz	
2	RF Output Power	0.7dB	
3	conducted spurious	9kHz～3.6GHz	1.5dB
		3.6GHz～8.4GHz	2.8dB
		8.4GHz～12.75GHz	3.4dB
4	EVM	2.1%	
5	Occupied Bandwidth	Bandwidth 1.4MHz	0.03MHz
		Bandwidth 3MHz	0.03MHz
		Bandwidth 5MHz	0.03MHz
		Bandwidth 10MHz	0.05MHz
		Bandwidth 15MHz	0.06MHz

		Bandwidth 20MHz	0.08MHz
6	Emission intermodulation	Adjacent channel	1.4dB
		Alternate channel	1.4dB
7	Range of frequency	0.08MHz	

6 Test Results

6.1 Output Power

6.1.1 Measurement Limit

22.913(a) Mobile stations are limited to 7watts.
24.232(c) Mobile and portable stations are limited to 2 watts.
27.50d(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.
RSS-133 5.5 Subscriber equipment: 2 W /channel bandwidth e.i.r.p
RSS-139 5.5 Subscriber equipment: 30 dBm e.i.r.p./channel bandwidth
RSS-132 5.4 The transmitter output power shall be measured in terms of average power. The equivalent radiated power (e.r.p.) shall not exceed 7 watts for mobile equipment and 3 watts for portable equipment.

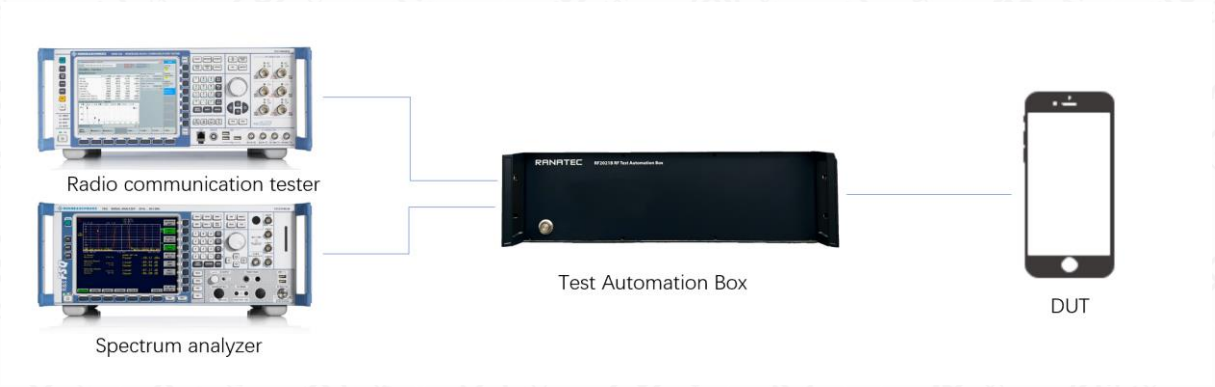
6.1.2 Method of Measurements

Method of measurements please refer to KDB971168 D01 v03 clause 5.
The EUT was set up for the max output power with pseudo random data modulation.
The power was measured with Rhode & Schwarz Spectrum Analyzer FSQ(peak).
These measurements were done at 3 frequencies, 1852.4 MHz, 1880.0MHz and 1907.6MHz for WCDMA Band II; 1732.6 MHz, 1712.4MHz and 1752.6MHz for WCDMA Band IV; 826.4MHz, 836.6MHz and 846.6MHz for WCDMA Band V. (bottom, middle and top of operational frequency range).
During the process of testing, the EUT was controlled Rhode & Schwarz Digital Radio.
Communication tester to ensure max power transmission and proper modulation.
This result contains peak output power and EIRP measurements for the EUT. In all cases, output power is within the specified limits.
EIRP= Conducted power+Gain, ERP = EIRP -2.15dBi.

6.1.3 Test procedures

The transmitter output port was connected to base station.
Set the EUT at maximum power through base station.
Select lowest, middle, and highest channels for each band and different modulation.
Measure maximum average power for other modulation signal.
The transmitter output power was connected to calibrated attenuator, the other end of which was connected to signal analyzer. Transmitter output power was read off the power in dBm. The power outputs at the transmitter antenna port was determined by adding the value of attenuator to the signal analyzer reading.

6.1.4 Test Setup



6.1.5 Output Power Measurement results

Mode	Test Mode	Tune up	Channel/Frequency(MHz)		
			9262/1852.4	9400/1880	9538/1907.6
WCDMA II	RMC	24.50	23.92	23.71	23.79
Mode	**Test Mode**	**Tune up**	**Channel/Frequency(MHz)**		
			1312/1712.4	**1413/1732.6**	**1513/1752.6**
WCDMA IV	RMC	24.50	23.39	23.98	23.58
Mode	**Test Mode**	**Tune up**	**Channel/Frequency(MHz)**		
			4132/826.4	**4183/836.6**	**4233/846.6**
WCDMA V	RMC	24.50	23.71	23.69	23.73

6.1.6 EIRP/ERP Results

WCDMA Band 2

Frequency (MHz)	EIRP (dBm)
1852.6	26.11
1880.0	25.90
1907.4	25.98

WCDMA Band 4

Frequency(MHz)	EIRP(dBm)
1712.4	25.24
1732.6	25.83
1752.6	25.43

WCDMA Band 5

Frequency(MHz)	EIRP (dBm)	ERP (dBm)
826.4	23.34	21.19
836.6	23.32	21.17
846.6	23.36	21.21

6.2 Peak-to-Average Power Ratio

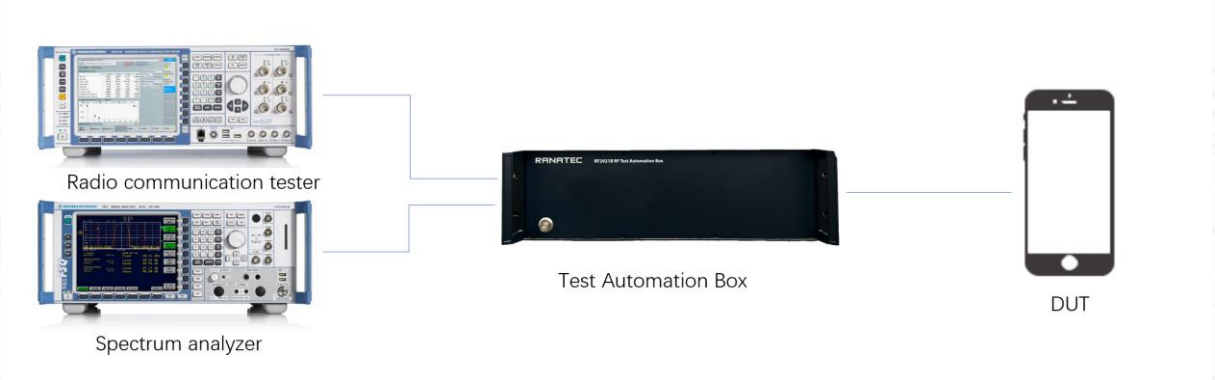
6.2.1 Measurement Limit

The peak-to-average ratio (PAR) of the transmission must not exceed 13 dB

6.2.2 Method of Measurement

The EUT was connected to the spectrum analyzer and system simulator via a power divider.
Select the spectrum analyzer CCDF function.
Set RBW ≥ signal's occupied bandwidth.
Set the number of counts to a value that stabilizes the measured CCDF cure;
Sweep time ≥ 1s.
Record the maximum PAPR level associated with a probability of 0.1%.

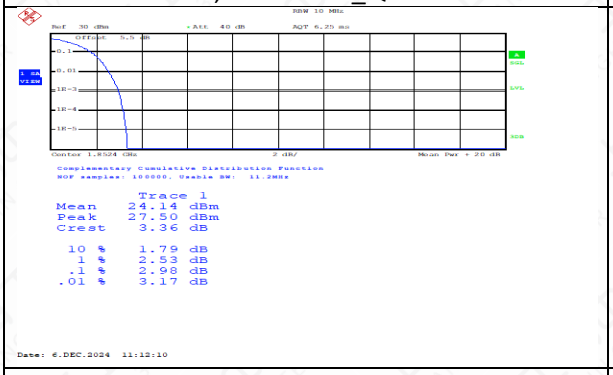
6.2.3 Test Setup



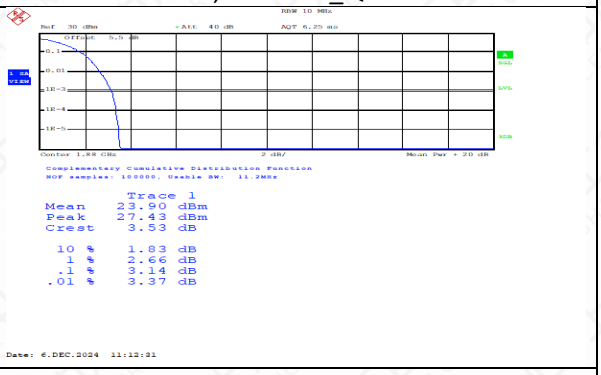
6.2.4 Measurement results

Band	Channel/fc	QPSK PAPR	16QAM PAPR	Limit
WCDMA II	9262	2.98	6.1	13
WCDMA II	9400	3.14	9.92	13
WCDMA II	9538	2.79	8.92	13
Band	**Channel/fc**	**QPSK PAPR**	**16QAM PAPR**	**Limit**
WCDMA IV	1312	3.04	6.26	13
WCDMA IV	1413	2.6	9.74	13
WCDMA IV	1513	2.98	8.58	13
Band	**Channel/fc**	**QPSK PAPR**	**16QAM PAPR**	**Limit**
WCDMA V	4132	3.11	6.12	13
WCDMA V	4183	2.85	11.5	13
WCDMA V	4233	2.85	11.5	13

B2,1852.4MHz_QPSK



B2,1880MHz_QPSK



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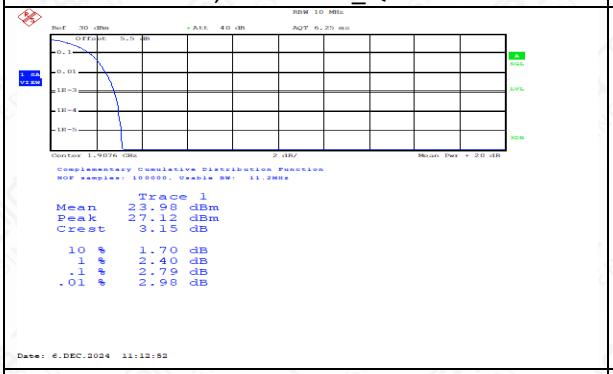

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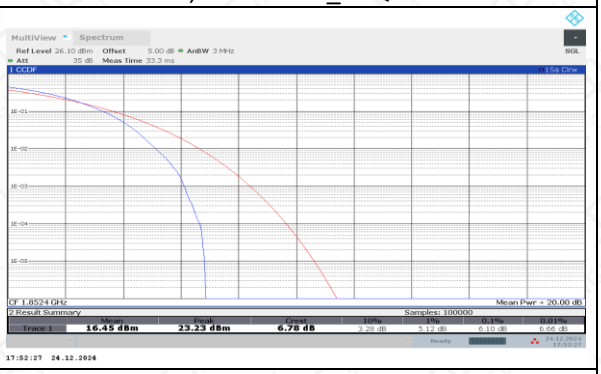

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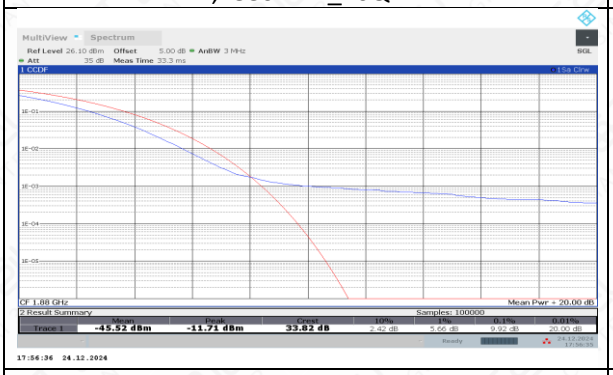
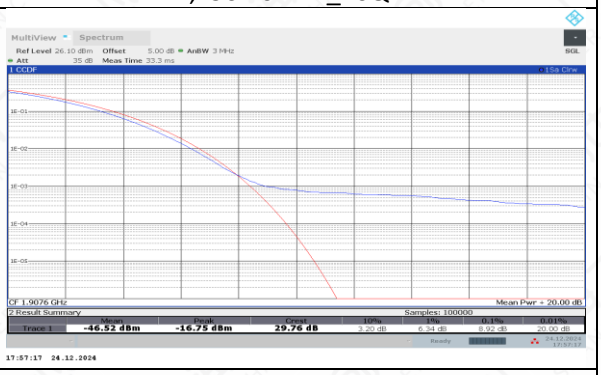
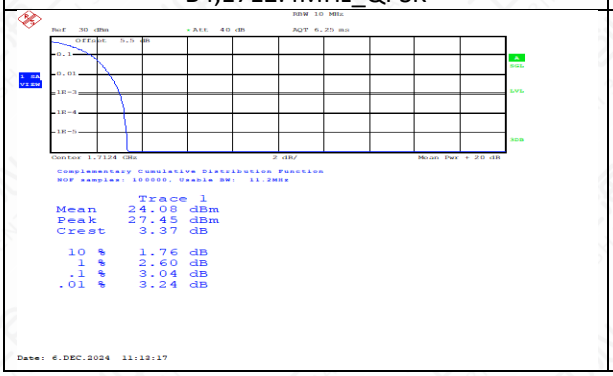


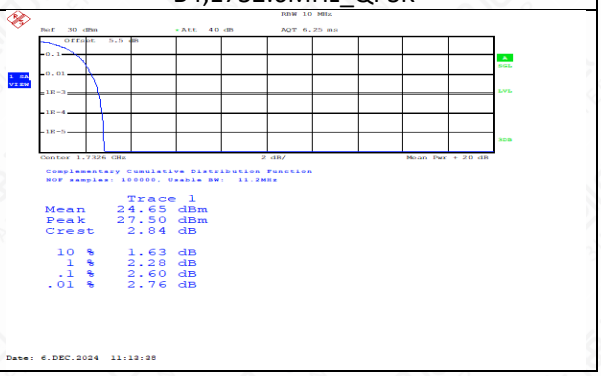
B2,1907.6MHz_16QAM



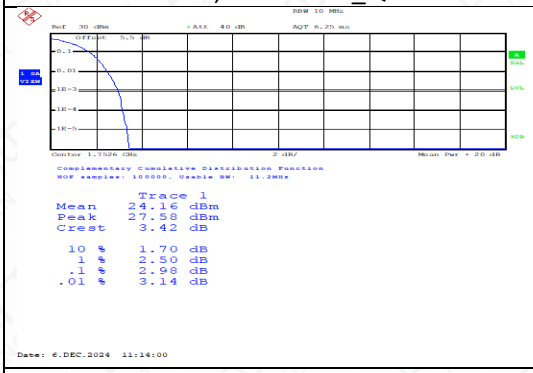
B4,1712.4MHz_QPSK



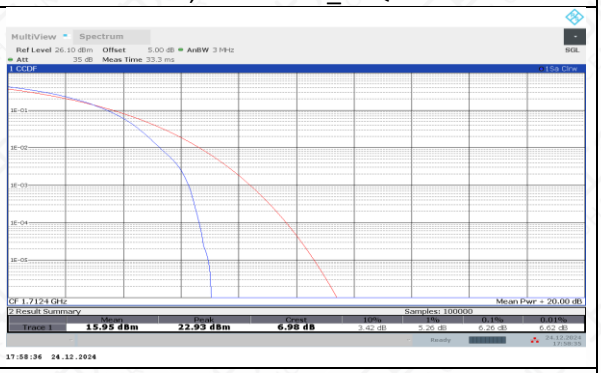
B4,1732.6MHz_QPSK



B4,1752.6MHz_QPSK



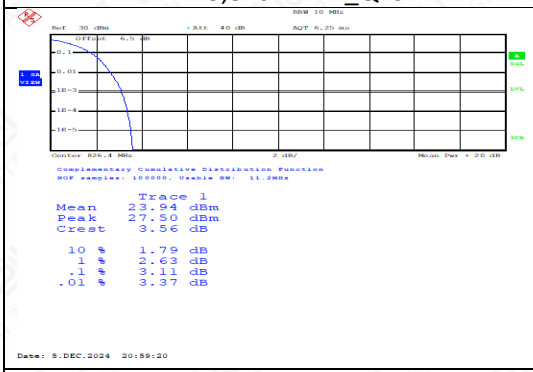
B4,1712.4MHz_16QAM



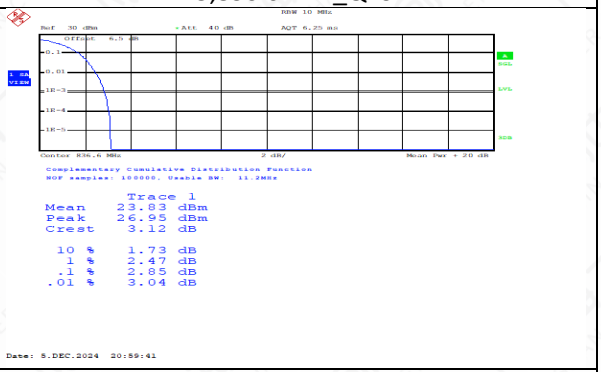
B4,1732.6MHz_16QAM

B4,1752.6MHz_16QAM

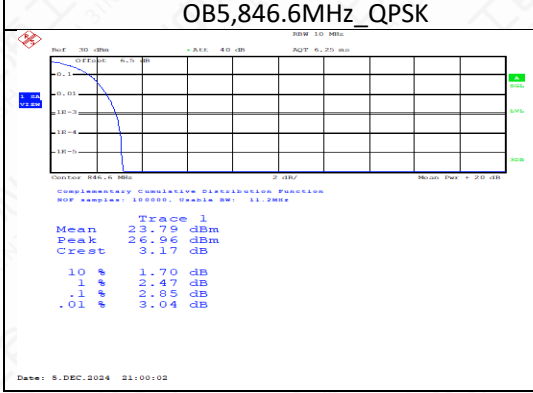
B5,826.4MHz_QPSK



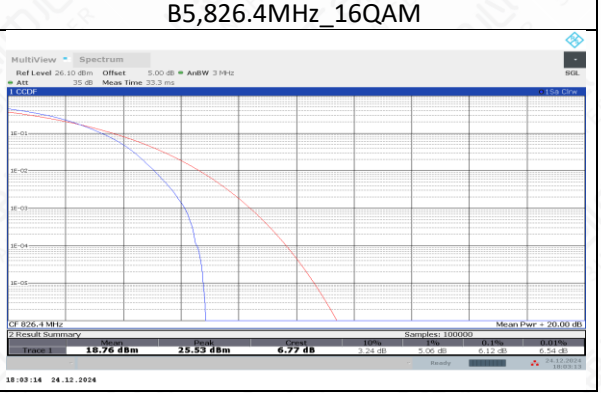
B5,836.6MHz_QPSK

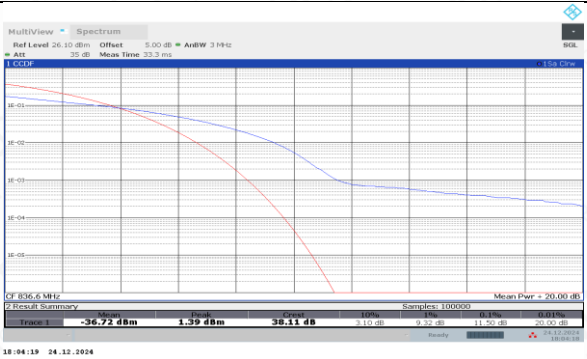
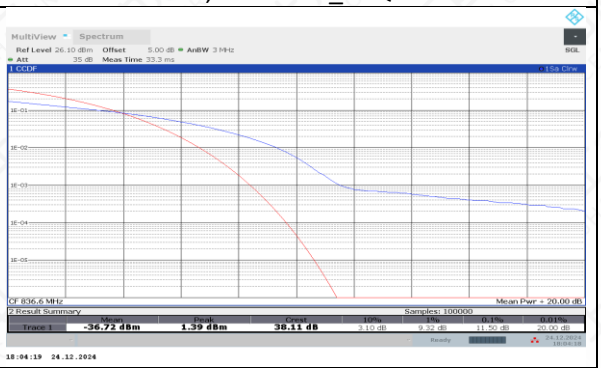


OB5,846.6MHz_QPSK



B5,826.4MHz_16QAM



B5,836.6MHz_16QAM	OB5,846.6MHz_16QAM
	

Note: Only the worst mode images are provided.

6.3 99% Occupied Bandwidth

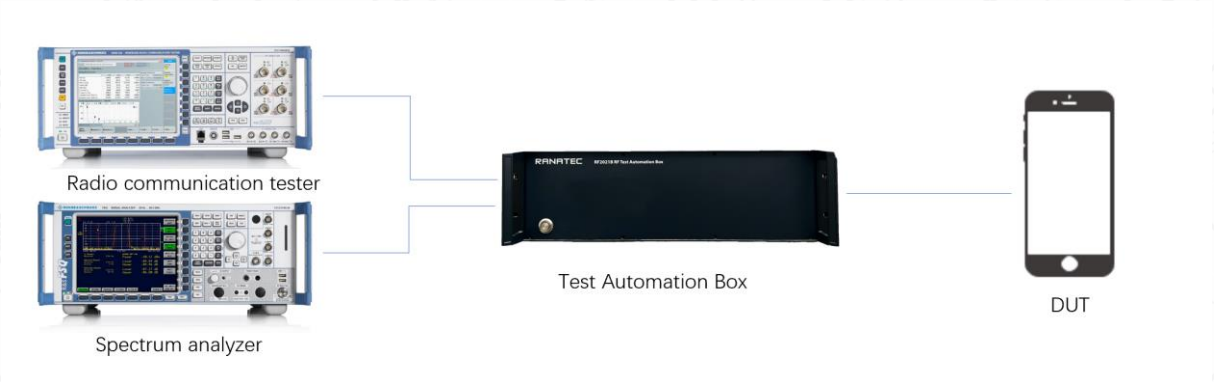
6.3.1 Summary

Similar to conducted emissions; occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of WCDMA BAND II , WCDMA BAND IV and WCDMA BAND V.

6.3.2 Method of Measurement

The EUT output RF connector was connected with a short cable to the signal analyzer.
RBW was set to about 1% of emission BW, VBW >= 3 times RBW,.
99% bandwidth were measured, the occupied bandwidth is delta frequency between the two points where the display line intersects the signal trace.

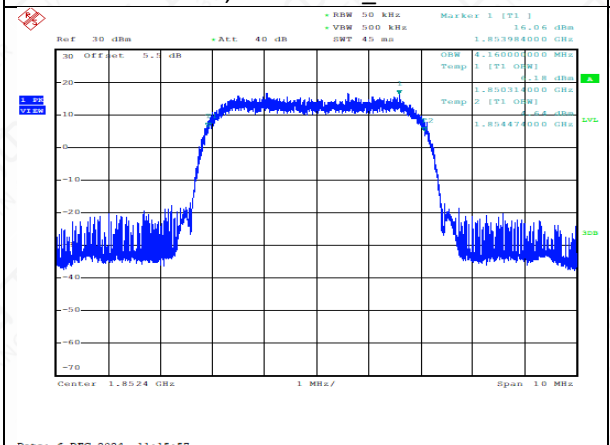
6.3.3 Test Setup



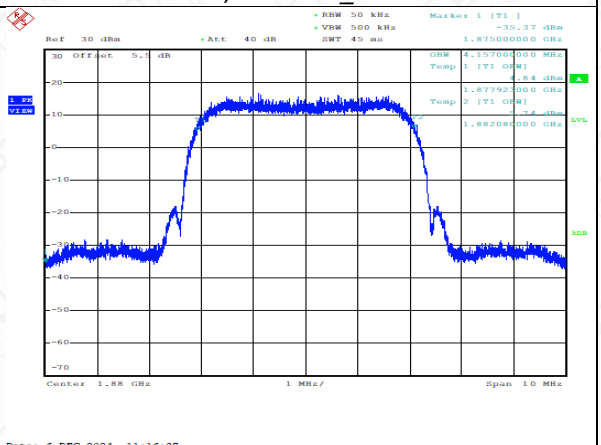
6.3.4 Measurement results

Band	Channel	99%Occupied Width
WCDMA II	9262	4160.00 kHz
WCDMA II	9400	4157.00 kHz
WCDMA II	9538	4149.00 kHz
Band	**Channel**	**99%Occupied Width**
WCDMA IV	1312	4155.00 kHz
WCDMA IV	1413	4173.00 kHz
WCDMA IV	1513	4173.00 kHz
Band	**Channel**	**99%Occupied Width**
WCDMA V	4132	4164.00 kHz
WCDMA V	4183	4162.00 kHz
WCDMA V	4233	4172.00 kHz

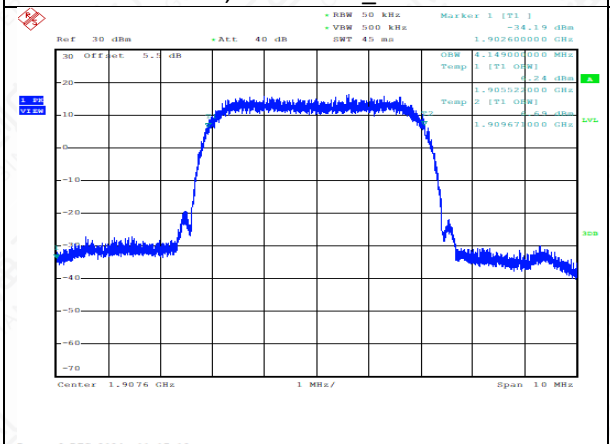
OB2,1852.4MHz_OBW



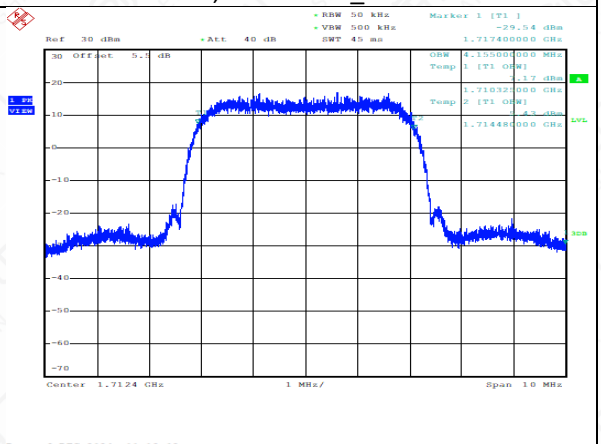
OB2,1880MHz_OBW



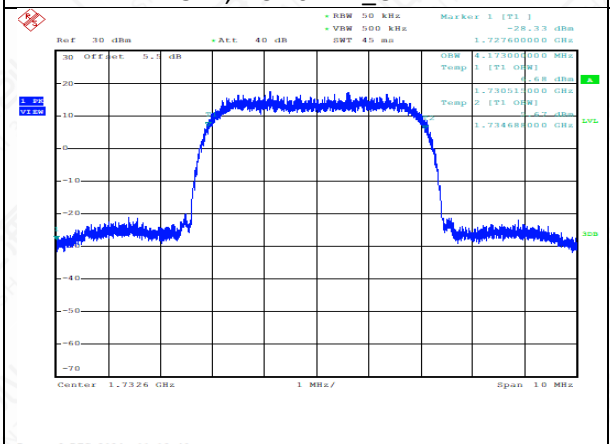
OB2,1907.6MHz_OBW



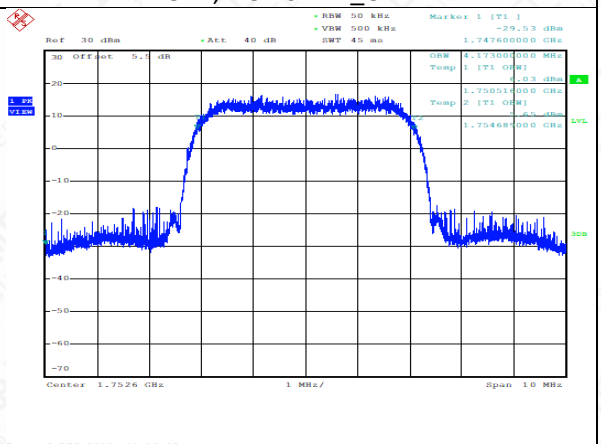
OB4,1712.4MHz_OBW

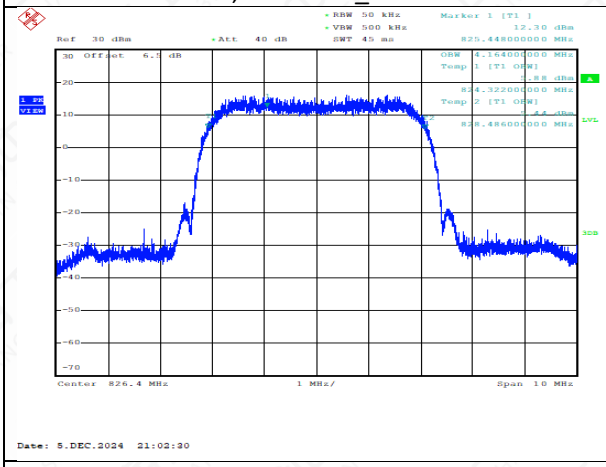
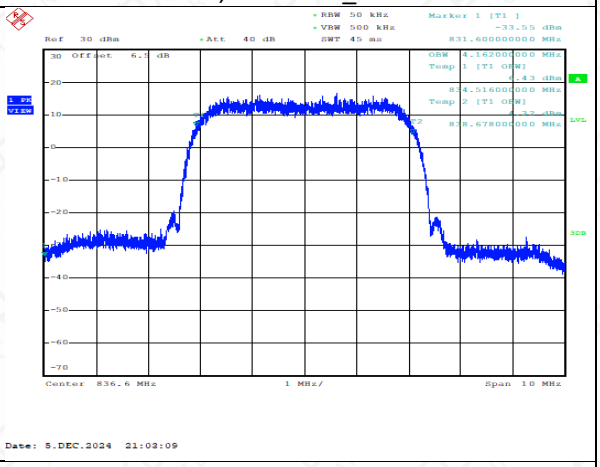
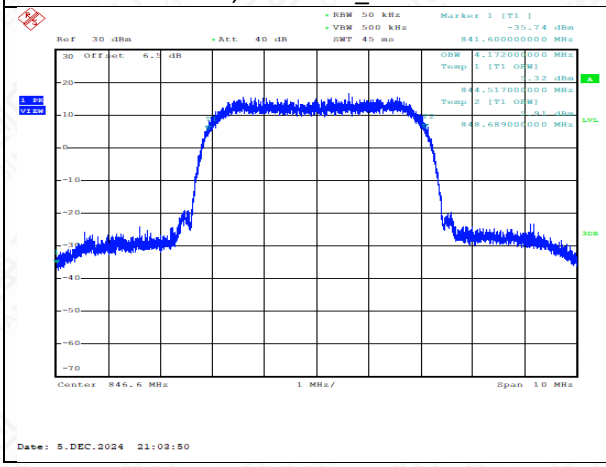


OB4,1732.6MHz_OBW



OB4,1752.6MHz_OBW



OB5,826.4MHz_OBW	OB5,836.6MHz_OBW
	
OB5,846.6MHz_OBW	/
	/

6.4 -26dB Emission Bandwidth

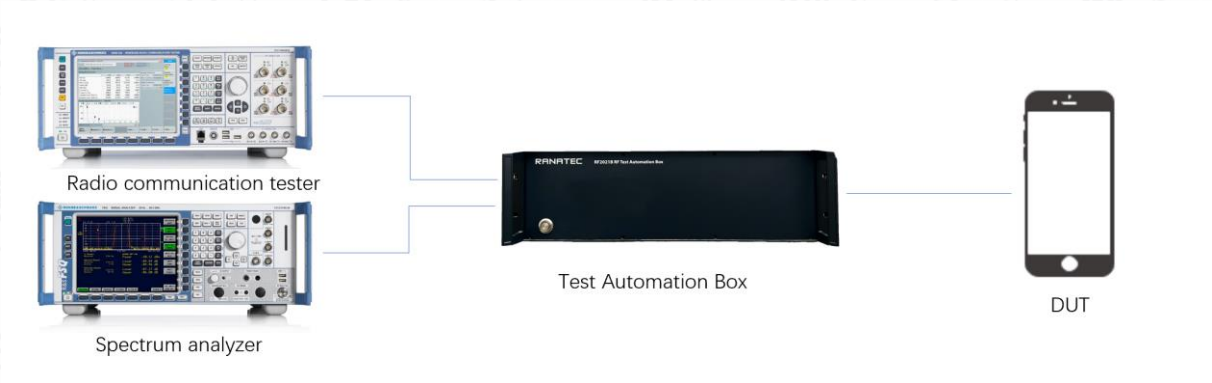
6.4.1 Summary

Similar to conducted emissions; occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of WCDMA BANDII, WCDMA BANDIV, WCDMA BANDV.

6.4.2 Method of Measurement

The EUT output RF connector was connected with a short cable to the signal analyzer.
RBW was set to about 1% of emission BW, VBW >= 3 times RBW,.
26dB bandwidth were measured, the occupied bandwidth is delta frequency between the two points where the display line intersects the signal trace.
For WCDMA: signal analyzer setting as: RBW=50KHz; VBW=200KHz; Span=10MHz.

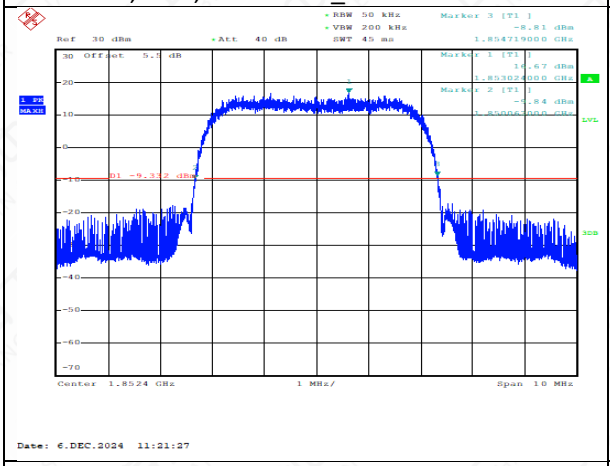
6.4.3 Test Setup



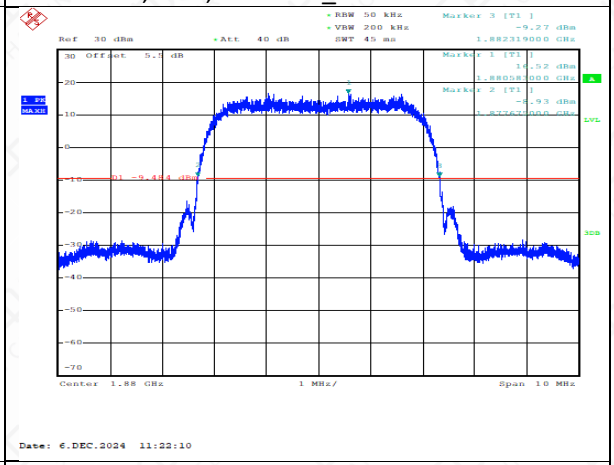
6.4.4 Measurement results

Band	Channel	26dBDown OccupiedWidth
WCDMA II	9262	4656.00 kHz
WCDMA II	9400	4644.00 kHz
WCDMA II	9538	4674.00 kHz
Band	**Channel**	**26dBDown OccupiedWidth**
WCDMA IV	1312	4662.00 kHz
WCDMA IV	1413	4687.00 kHz
WCDMA IV	1513	4677.00 kHz
Band	**Channel**	**26dBDown OccupiedWidth**
WCDMA V	4132	4661.00 kHz
WCDMA V	4183	4652.00 kHz
WCDMA V	4233	4686.00 kHz

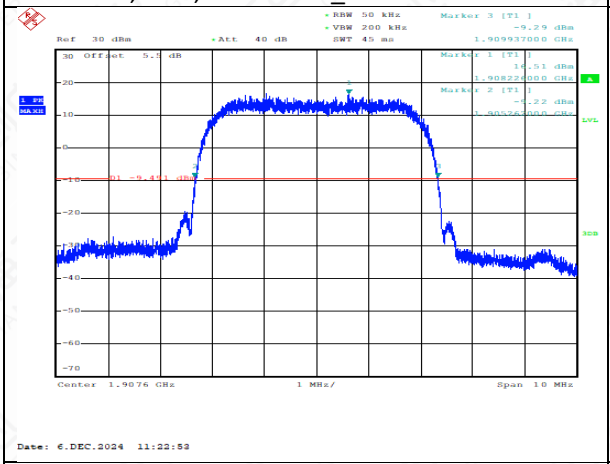
OB2,9262,1852.4MHz_26dBDownOBW



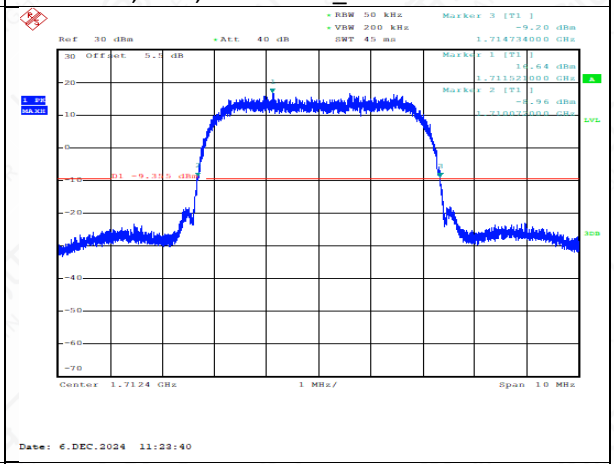
OB2,9400,1880MHz_26dBDownOBW



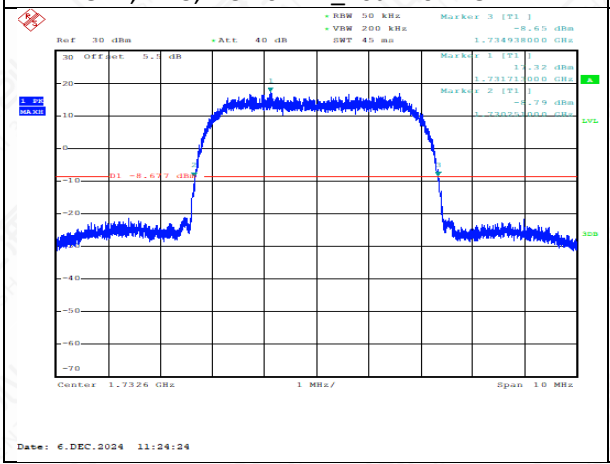
OB2,9538,1907.6MHz_26dBDownOBW



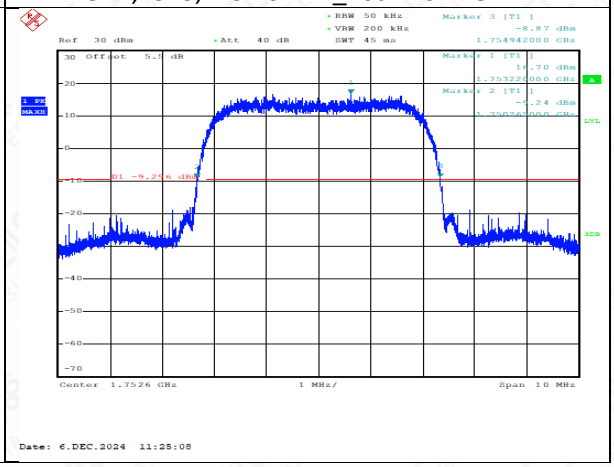
OB4,1312,1712.4MHz_26dBDownOBW

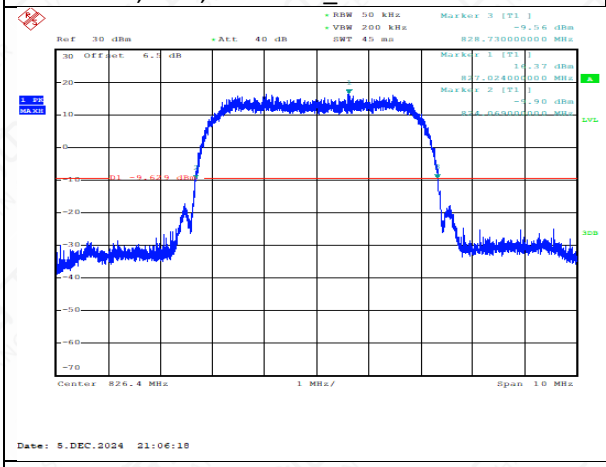
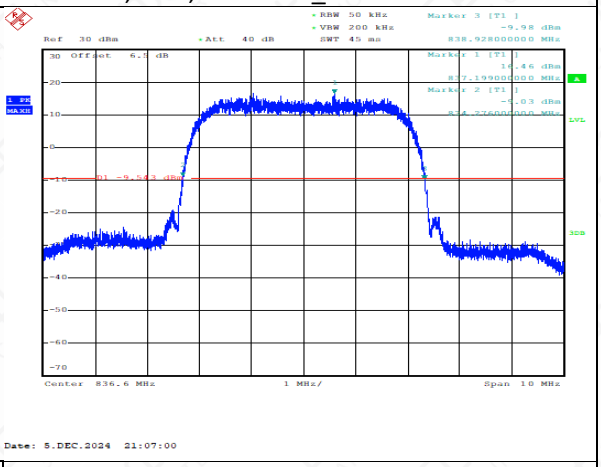
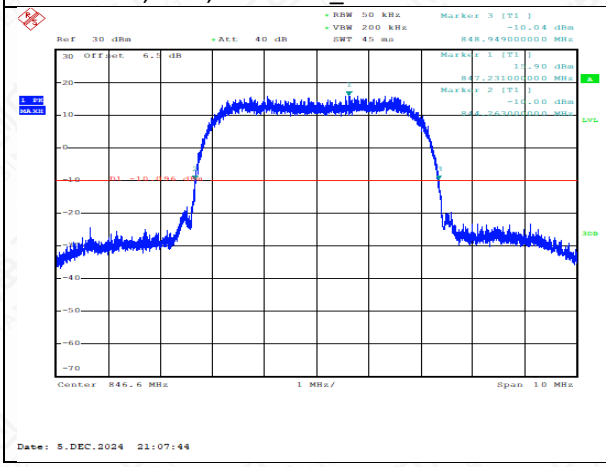


OB4,1413,1732.6MHz_26dBDownOBW



OB4,1513,1752.6MHz_26dBDownOBW



OB5,4132,826.4MHz_26dBDownOBW	OB5,4183,836.6MHz_26dBDownOBW
	
OB5,4233,846.6MHz_26dBDownOBW	/
	/

6.5 Band Edge at antenna terminals

6.5.1 Measurement Limit

22.917(a)

The rules in this section govern the spectral characteristics of emissions in the Cellular Radiotelephone 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.

24.238(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.

27.53(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 log10 (P) dB.

(2) Additional protection levels. Notwithstanding the foregoing paragraph (h)(1) of this section:

(i) Operations in the 2180–2200 MHz band are subject to the out-of-band emission requirements set forth in § 27.1134 for the protection of federal government operations operating in the 2200–2290 MHz band.

(ii) For operations in the 2000–2020 MHz band, the power of any emissions below 2000 MHz shall be attenuated below the transmitter power (P) in watts by at least 70 + 10 log10(P) dB.

(iii) For operations in the 1915–1920 MHz band, the power of any emission between 1930–1995 MHz shall be attenuated below the transmitter power (P) in watts by at least 70 + 10 log10(P) dB.

(iv) For operations in the 1995–2000 MHz band, the power of any emission between 2005–2020 MHz shall be attenuated below the transmitter power (P) in watts by at least 70 + 10 log10(P) dB.

RSS-133 5.6

Unwanted emissions shall be measured in terms of average values while the transmitter is operating at the manufacturer's rated power and modulated as specified in RSS-Gen.

Equipment shall meet the unwanted emission limits, specified in table 3, outside each frequency block group. For each channel bandwidth supported by the equipment under test, the unwanted emissions shall be measured and reported for two channel frequencies: one located as close as possible to the low end and one located as close as possible to the high end of the equipment’s operating frequency range.

For the unwanted emission limits, in the 1 MHz bands immediately outside and adjacent to the frequency block group, the power shall be measured with a resolution bandwidth of at least 1% of the occupied bandwidth (OBW). Beyond these 1 MHz bands, a resolution bandwidth of 1 MHz shall be used. A narrower resolution bandwidth may be used, provided that the measured power is integrated over the full required measurement bandwidth of 1 MHz, or 1% of the OBW, as applicable.

For all equipment, the TRP or total conducted power (sum of conducted power across all antenna connectors), where applicable, of the unwanted emissions outside the frequency block or frequency block group shall not exceed the limits shown in the table.

Offset frequency from the edge of the frequency block group (MHz)	Unwanted emission limit
≤ 1	-13 dBm/(1% of OBW)
> 1	-13 dBm/MHz

RSS-139 5.6

Unwanted emissions shall be measured in terms of average values.

For all equipment, the TRP or total conducted power (sum of conducted power across all antenna connectors) of the unwanted emissions outside the frequency block or frequency block group shall not exceed the limits shown in table.

Offset frequency from the edge of the frequency block group (MHz)	Unwanted emission limit
1 MHz	-13 dBm/(1% of OB*)
>1 MHz	-13 dBm/MHz

RSS-132 5.5

Equipment shall meet the unwanted emission limits specified below:

i. In the first 1.0 MHz band immediately outside and adjacent to each of the sub-bands specified in Section 5.1, the power of emissions per any 1% of the occupied bandwidth shall be attenuated below the transmitter output power P (dBW) by at least 43 + 10 log(p) dB.

ii. After the first 1.0 MHz immediately outside and adjacent to each of the sub-bands, the power of emissions in any 100 kHz bandwidth shall be attenuated below the transmitter output power P (dBW) by at least 43 + 10 log(p) dB. If the measurement is performed using 1% of the occupied bandwidth, power integration over 100 kHz is required.

p is the output power specified in watts.

6.5.2 Method of Measurement

The RF output of the transceiver was connected to a signal analyzer through appropriate attenuation. In the 1MHz 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.

The RF fundamental frequency should be excluded against the limit line in the operating frequency band

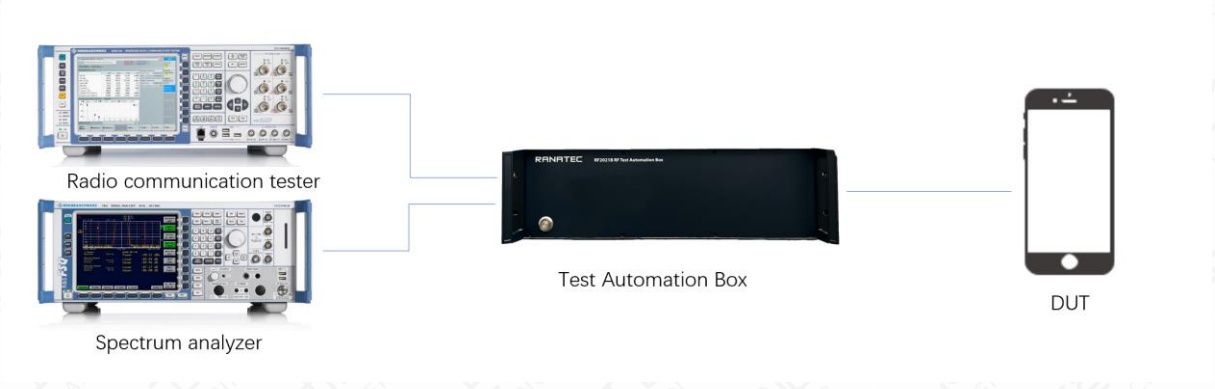
The limit line is derived from 43+10log(P) dB below the transmitter power P(Watts)

=P(W)-[43+10log(P)](dB)

=[30+10log(P)](dBm)-[43+10log(P)](dB)

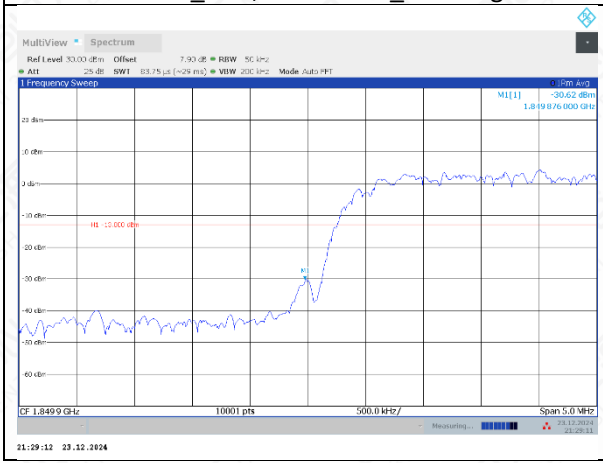
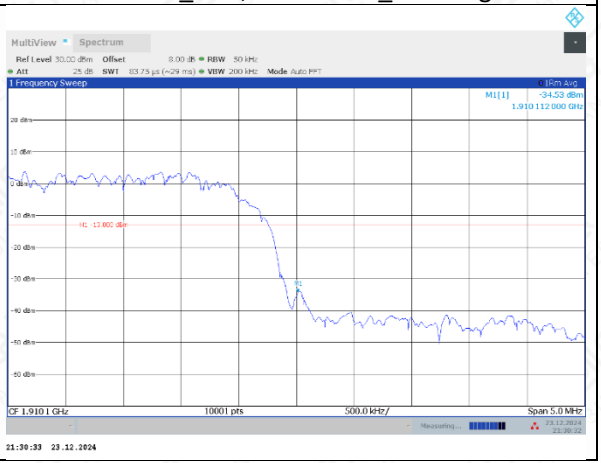
=-13dBm

6.5.3 Test Setup

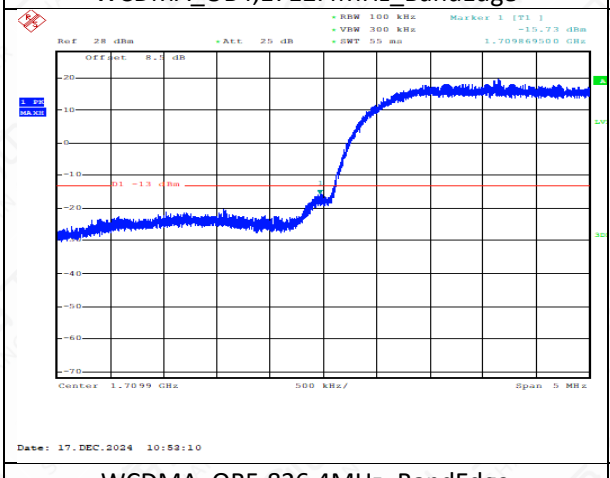


6.5.4 Measurement Results

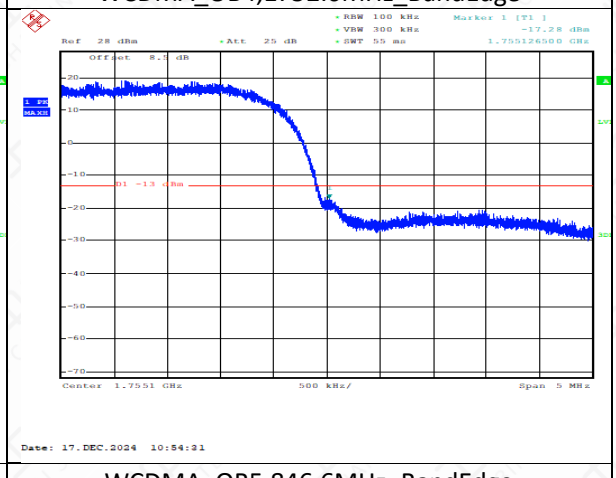
Band	Channel	Result	Limit(dBm)	TestVerdict
OB2	9262	-31.35	-13	Pass
OB2	9538	-36.72	-13	Pass
OB4	1312	-15.73	-13	Pass
OB4	1513	-17.28	-13	Pass
OB5	4132	-15.07	-13	Pass
OB5	4233	-17.23	-13	Pass

WCDMA_OB2,1852.4MHz_BandEdge	WCDMA_OB2,1907.6MHz_BandEdge
	

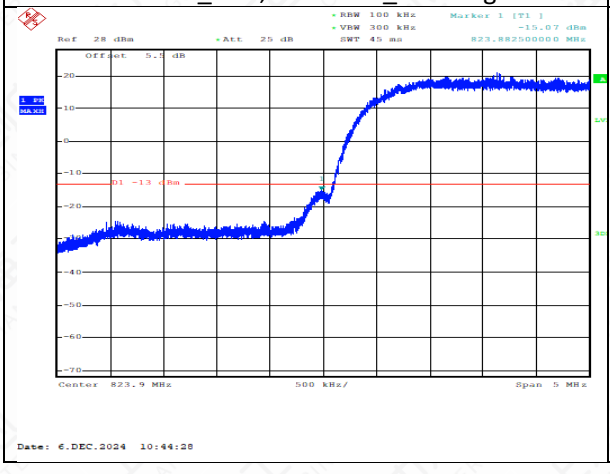
WCDMA_OB4,1712.4MHz_BandEdge



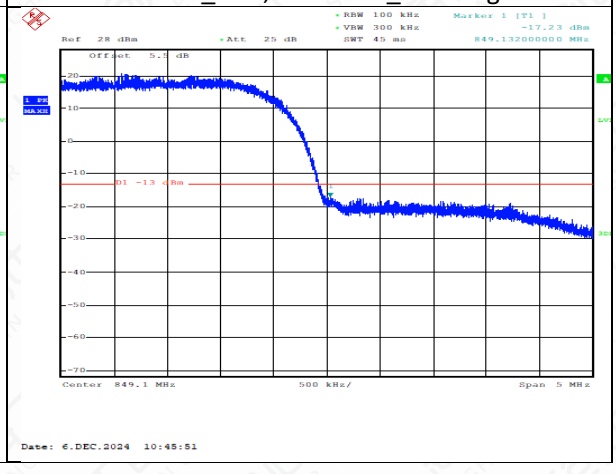
WCDMA_OB4,1752.6MHz_BandEdge



WCDMA_OB5,826.4MHz_BandEdge



WCDMA_OB5,846.6MHz_BandEdge



6.6 Frequency Stability

6.6.1 Summary

According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. As this transceiver is considered "Hand carried, battery powered equipment" Section 2.1055(d) (2) applies. This requires that the lower voltage for frequency stability testing be specified by the manufacturer. This transceiver is specified to operate with an input voltage of between 6.0VDC and 8.8VDC, with a nominal voltage of 7.7VDC. Operation above or below these voltage limits is prohibited by transceiver software in order to prevent improper operation as well as to protect components from overstress. For the purposes of measuring frequency stability these voltage limits are to be used.

6.6.2 Method of Measurement

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the EUT in a “call mode”. This is accomplished with the use of R&S CMW500 DIGITAL RADIO COMMUNICATION TESTER.

1. Measure the carrier frequency at room temperature.
2. Subject the EUT to overnight soak at -30℃.
3. With the EUT, powered via nominal voltage, connected to the CMW500 and in a simulated call on mid channel of WCDMA BANDII, WCDMA BANDIV and WCDMA BANDV, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
4. Repeat the above measurements at 10℃ increments from -30℃ to +50℃. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.
5. Re-measure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments re-measuring carrier frequency at each voltage. Pause at nominal voltage for 1 1/2 hours unpowered, to allow any self-heating to stabilize, before continuing.
6. Subject the EUT to overnight soak at +50℃.
7. With the EUT, powered via nominal voltage, connected to the CMU200 and in a simulated call on the centre channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
8. Repeat the above measurements at 10 C increments from +50℃ to -30℃. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
9. At all temperature levels hold the temperature to +/- 0.5℃ during the measurement procedure.

6.6.3 Test Setup

6.6.4 Measurement Results

Band	Channel	Temperature	Voltage	Frequency Error(Hz)	Frequency Error(ppm)	Result
OB2	9262	Normal	Low	-20.37	-0.011	Pass
OB2	9262	Normal	Normal	3.355	0.002	Pass
OB2	9262	Normal	High	1.502	0.001	Pass
OB2	9262	50	Normal	-1.502	-0.001	Pass
OB2	9262	40	Normal	8.748	0.005	Pass
OB2	9262	30	Normal	-10.114	-0.005	Pass
OB2	9262	20	Normal	-4.306	-0.002	Pass
OB2	9262	10	Normal	3.812	0.002	Pass
OB2	9262	0	Normal	12.803	0.007	Pass
OB2	9262	-10	Normal	8.254	0.004	Pass
OB2	9262	-20	Normal	2.339	0.001	Pass
OB2	9262	-30	Normal	-1.159	-0.001	Pass
Band	**Channel**	**Temperature**	**Voltage**	**Frequency Error(Hz)**	**Frequency Error(ppm)**	**Result**
OB2	9400	Normal	Low	-4.985	-0.003	Pass
OB2	9400	Normal	Normal	-3.827	-0.002	Pass
OB2	9400	Normal	High	-1.144	-0.001	Pass
OB2	9400	50	Normal	-3.383	-0.002	Pass
OB2	9400	40	Normal	-4.799	-0.003	Pass
OB2	9400	30	Normal	-1.18	-0.001	Pass
OB2	9400	20	Normal	-11.351	-0.006	Pass
OB2	9400	10	Normal	-1.681	-0.001	Pass
OB2	9400	0	Normal	-5.929	-0.003	Pass
OB2	9400	-10	Normal	-5.207	-0.003	Pass
OB2	9400	-20	Normal	-3.219	-0.002	Pass
OB2	9400	-30	Normal	3.784	-0.002	Pass
Band	**Channel**	**Temperature**	**Voltage**	**Frequency Error(Hz)**	**Frequency Error(ppm)**	**Result**

OB2	9538	Normal	Low	-4.978	-0.003	Pass
OB2	9538	Normal	Normal	-6.065	-0.003	Pass
OB2	9538	Normal	High	-2.403	-0.001	Pass
OB2	9538	50	Normal	-3.262	-0.002	Pass
OB2	9538	40	Normal	-8.454	-0.004	Pass
OB2	9538	30	Normal	-8.39	-0.004	Pass
OB2	9538	20	Normal	-1.595	-0.001	Pass
OB2	9538	10	Normal	-3.641	-0.002	Pass
OB2	9538	0	Normal	-0.372	0	Pass
OB2	9538	-10	Normal	1.788	0.001	Pass
OB2	9538	-20	Normal	4.835	0.003	Pass
OB2	9538	-30	Normal	1.745	0.001	Pass
Band	**Channel**	**Temperature**	**Voltage**	**Frequency Error(Hz)**	**Frequency Error(ppm)**	**Result**
OB4	1312	Normal	Low	-0.386	0	Pass
OB4	1312	Normal	Normal	0.243	0	Pass
OB4	1312	Normal	High	0.365	0	Pass
OB4	1312	50	Normal	-4.249	-0.002	Pass
OB4	1312	40	Normal	2.747	0.002	Pass
OB4	1312	30	Normal	2.439	0.001	Pass
OB4	1312	20	Normal	-0.508	0	Pass
OB4	1312	10	Normal	-7.067	-0.004	Pass
OB4	1312	0	Normal	0.486	0	Pass
OB4	1312	-10	Normal	-7.467	-0.004	Pass
OB4	1312	-20	Normal	-5.028	-0.003	Pass
OB4	1312	-30	Normal	-6.859	-0.004	Pass
Band	**Channel**	**Temperature**	**Voltage**	**Frequency Error(Hz)**	**Frequency Error(ppm)**	**Result**
OB4	1413	Normal	Low	-6.173	-0.004	Pass
OB4	1413	Normal	Normal	-7.532	-0.004	Pass
OB4	1413	Normal	High	-3.004	-0.002	Pass
OB4	1413	50	Normal	-5.801	-0.003	Pass
OB4	1413	40	Normal	-7.074	-0.004	Pass
OB4	1413	30	Normal	-5.322	-0.003	Pass
OB4	1413	20	Normal	-2.968	-0.002	Pass
OB4	1413	10	Normal	-1.559	-0.001	Pass
OB4	1413	0	Normal	-2.074	-0.001	Pass
OB4	1413	-10	Normal	-2.704	-0.002	Pass
OB4	1413	-20	Normal	-2.003	-0.001	Pass
OB4	1413	-30	Normal	-1.023	-0.001	Pass

Band	Channel	Temperature	Voltage	Frequency Error(Hz)	Frequency Error(ppm)	Result
OB4	1513	Normal	Low	-7.546	-0.004	Pass
OB4	1513	Normal	Normal	-5.772	-0.003	Pass
OB4	1513	Normal	High	-10.357	-0.006	Pass
OB4	1513	50	Normal	-3.133	-0.002	Pass
OB4	1513	40	Normal	-3.49	-0.002	Pass
OB4	1513	30	Normal	-9.842	-0.006	Pass
OB4	1513	20	Normal	-5.221	-0.003	Pass
OB4	1513	10	Normal	-6.888	-0.004	Pass
OB4	1513	0	Normal	-3.068	-0.002	Pass
OB4	1513	-10	Normal	-4.427	-0.003	Pass
OB4	1513	-20	Normal	-2.224	-0.001	Pass
OB4	1513	-30	Normal	-2.332	-0.001	Pass
Band	**Channel**	**Temperature**	**Voltage**	**Frequency Error(Hz)**	**Frequency Error(ppm)**	**Result**
OB5	4132	Normal	Low	-2.618	-0.003	Pass
OB5	4132	Normal	Normal	-3.519	-0.004	Pass
OB5	4132	Normal	High	-3.719	-0.005	Pass
OB5	4132	50	Normal	-0.98	-0.001	Pass
OB5	4132	40	Normal	-3.612	-0.004	Pass
OB5	4132	30	Normal	-3.555	-0.004	Pass
OB5	4132	20	Normal	-3.633	-0.004	Pass
OB5	4132	10	Normal	-3.998	-0.005	Pass
OB5	4132	0	Normal	-3.254	-0.004	Pass
OB5	4132	-10	Normal	-4.041	-0.005	Pass
OB5	4132	-20	Normal	-2.854	-0.003	Pass
OB5	4132	-30	Normal	-3.984	-0.005	Pass
Band	**Channel**	**Temperature**	**Voltage**	**Frequency Error(Hz)**	**Frequency Error(ppm)**	**Result**
OB5	4183	Normal	Low	-3.469	-0.004	Pass
OB5	4183	Normal	Normal	-6.952	-0.008	Pass
OB5	4183	Normal	High	-0.708	-0.001	Pass
OB5	4183	50	Normal	-4.184	-0.005	Pass
OB5	4183	40	Normal	-5.379	-0.006	Pass
OB5	4183	30	Normal	-3.09	-0.004	Pass
OB5	4183	20	Normal	-2.031	-0.002	Pass
OB5	4183	10	Normal	-4.799	-0.006	Pass
OB5	4183	0	Normal	-5.6	-0.007	Pass
OB5	4183	-10	Normal	-0.093	0	Pass
OB5	4183	-20	Normal	-3.512	-0.004	Pass

OB5	4183	-30	Normal	-2.618	-0.003	Pass
Band	**Channel**	**Temperature**	**Voltage**	**Frequency Error(Hz)**	**Frequency Error(ppm)**	**Result**
OB5	4233	Normal	Low	-4.663	-0.006	Pass
OB5	4233	Normal	Normal	-3.726	-0.004	Pass
OB5	4233	Normal	High	-6.58	-0.008	Pass
OB5	4233	50	Normal	-4.492	-0.005	Pass
OB5	4233	40	Normal	-3.784	-0.004	Pass
OB5	4233	30	Normal	-5	-0.006	Pass
OB5	4233	20	Normal	-4.964	-0.006	Pass
OB5	4233	10	Normal	-3.884	-0.005	Pass
OB5	4233	0	Normal	-3.798	-0.004	Pass
OB5	4233	-10	Normal	-3.397	-0.004	Pass
OB5	4233	-20	Normal	-4.47	-0.005	Pass
OB5	4233	-30	Normal	-6.723	-0.008	Pass

6.7 Conducted Spurious Emission

6.7.1 Measurement Limit

22.917(a)

The rules in this section govern the spectral characteristics of emissions in the Cellular Radiotelephone 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.

24.238(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.

27.53(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 log10 (P) dB.

(2) Additional protection levels. Notwithstanding the foregoing paragraph (h)(1) of this section:

(i) Operations in the 2180–2200 MHz band are subject to the out-of-band emission requirements set forth in § 27.1134 for the protection of federal government operations operating in the 2200–2290 MHz band.

(ii) For operations in the 2000–2020 MHz band, the power of any emissions below 2000 MHz shall be attenuated below the transmitter power (P) in watts by at least 70 + 10 log10(P) dB.

(iii) For operations in the 1915–1920 MHz band, the power of any emission between 1930–1995 MHz shall be attenuated below the transmitter power (P) in watts by at least 70 + 10 log10(P) dB.

(iv) For operations in the 1995–2000 MHz band, the power of any emission between 2005–2020 MHz shall be attenuated below the transmitter power (P) in watts by at least 70 + 10 log10(P) dB.

RSS-133 5.6

Unwanted emissions shall be measured in terms of average values while the transmitter is operating at the manufacturer's rated power and modulated as specified in RSS-Gen.

Equipment shall meet the unwanted emission limits, specified in table 3, outside each frequency block group. For each channel bandwidth supported by the equipment under test, the unwanted emissions shall be measured and reported for two channel frequencies: one located as close as possible to the low end and one located as close as possible to the high end of the equipment’s operating frequency range.

For the unwanted emission limits, in the 1 MHz bands immediately outside and adjacent to the frequency block group, the power shall be measured with a resolution bandwidth of at least 1% of the occupied bandwidth (OBW). Beyond these 1 MHz bands, a resolution bandwidth of 1 MHz shall be used. A narrower resolution bandwidth may be used, provided that the measured power is integrated over the full required measurement bandwidth of 1 MHz, or 1% of the OBW, as applicable.

For all equipment, the TRP or total conducted power (sum of conducted power across all antenna connectors), where applicable, of the unwanted emissions outside the frequency block or frequency block group shall not exceed the limits shown in the table.

Offset frequency from the edge of the frequency block group (MHz)	Unwanted emission limit
≤ 1	-13 dBm/(1% of OBW)
> 1	-13 dBm/MHz

RSS-139 5.6

Unwanted emissions shall be measured in terms of average values.

For all equipment, the TRP or total conducted power (sum of conducted power across all antenna connectors) of the unwanted emissions outside the frequency block or frequency block group shall not exceed the limits shown in table.

Offset frequency from the edge of the frequency block group (MHz)	Unwanted emission limit
1 MHz	-13 dBm/(1% of OB*)
>1 MHz	-13 dBm/MHz

RSS-132 5.5

Equipment shall meet the unwanted emission limits specified below:

i. In the first 1.0 MHz band immediately outside and adjacent to each of the sub-bands specified in Section 5.1, the power of emissions per any 1% of the occupied bandwidth shall be attenuated below the transmitter output power P (dBW) by at least 43 + 10 log(p) dB.

ii. After the first 1.0 MHz immediately outside and adjacent to each of the sub-bands, the power of emissions in any 100 kHz bandwidth shall be attenuated below the transmitter output power P (dBW) by at least 43 + 10 log(p) dB. If the measurement is performed using 1% of the occupied bandwidth, power integration over 100 kHz is required.

p is the output power specified in watts.

6.7.2 Method of Measurement

The following steps outline the procedure used to measure the conducted emissions from the EUT.

1. Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency. For the equipment of WCDMA Band II and WCDMA BANDIV, these equate to a frequency range of 30 MHz to 19.1 GHz, data taken from 30 MHz to 20 GHz. For WCDMA Band V, data taken from 30 MHz to 10GHz.

2. The sweep time is set automatically by instrument itself. That should be the optimal sweep time for the span and the RBW. If the sweep time is too short, that is sweep is too fast, the sweep result is not accurate; If the sweep time is too long, that is sweep is too low, some frequency components may be lost. The instrument will give a optimal sweep time according the selected span and RBW.

3. The procedure to get the conducted spurious emission is as follows:

The trace mode is set to MaxHold to get the highest signal at each frequency;

Wait 25 seconds;

Get the result.

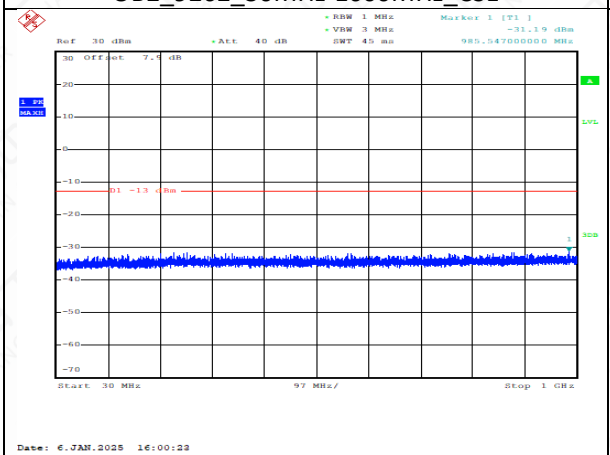
4. Determine EUT transmit frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

6.7.3 Test Setup

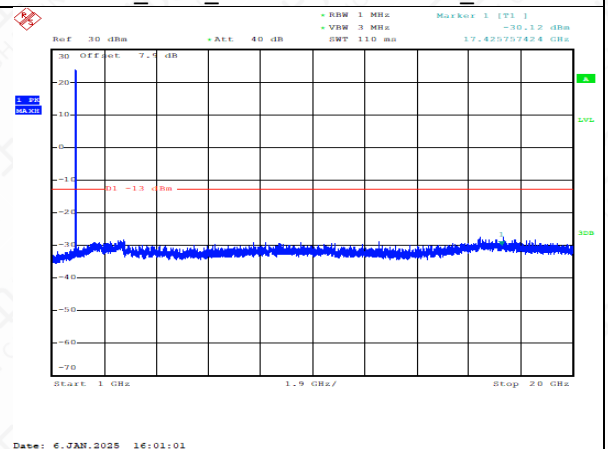
6.7.4 Measurement Results

Band	Channel/fc (MHz)	TestRange (MHz)	TestResult(dBm)	Limit(dBm)	TestVerdict
OB2	9262	30MHz-1000MHz	-31.19	-13	Pass
OB2	9262	1000MHz-20000MHz	-27.63	-13	Pass
OB2	9400	30MHz-1000MHz	-31.62	-13	Pass
OB2	9400	1000MHz-20000MHz	-27.50	-13	Pass
OB2	9538	30MHz-1000MHz	-31.12	-13	Pass
OB2	9538	1000MHz-20000MHz	-27.64	-13	Pass
OB4	1312	30MHz-1000MHz	-31.42	-13	Pass
OB4	1312	1000MHz-20000MHz	-27.86	-13	Pass
OB4	1413	30MHz-1000MHz	-31.20	-13	Pass
OB4	1413	1000MHz-20000MHz	-27.21	-13	Pass
OB4	1513	30MHz-1000MHz	-31.02	-13	Pass
OB4	1513	1000MHz-20000MHz	-27.65	-13	Pass
OB5	4132	30MHz-1000MHz	-33.31	-13	Pass
OB5	4132	1000MHz-20000MHz	-29.54	-13	Pass
OB5	4183	30MHz-1000MHz	-32.89	-13	Pass
OB5	4183	1000MHz-20000MHz	-29.44	-13	Pass
OB5	4233	30MHz-1000MHz	-33.68	-13	Pass
OB5	4233	1000MHz-20000MHz	-29.37	-13	Pass

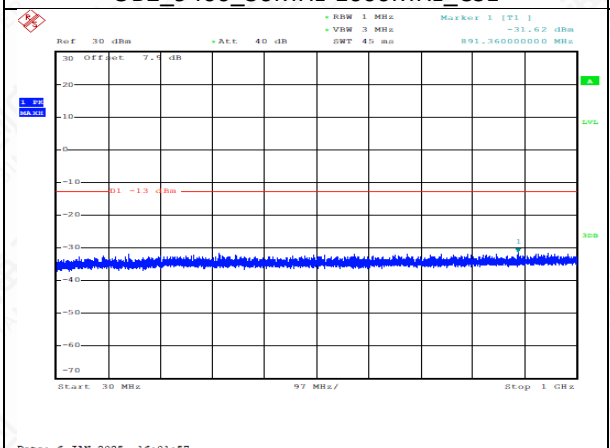
OB2_9262_30MHz-1000MHz_CSE



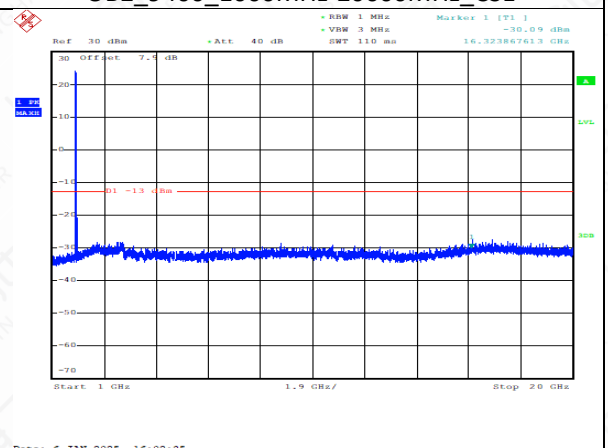
OB2_9262_1000MHz-20000MHz_CSE



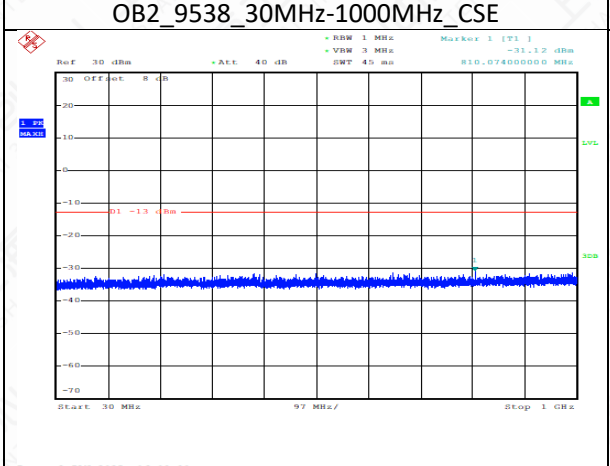
OB2_9400_30MHz-1000MHz_CSE



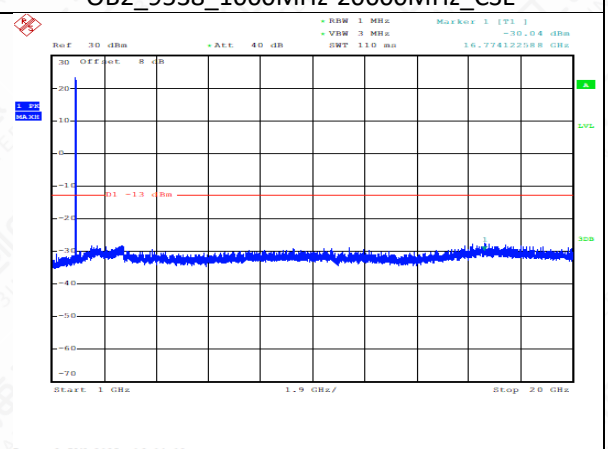
OB2_9400_1000MHz-20000MHz_CSE



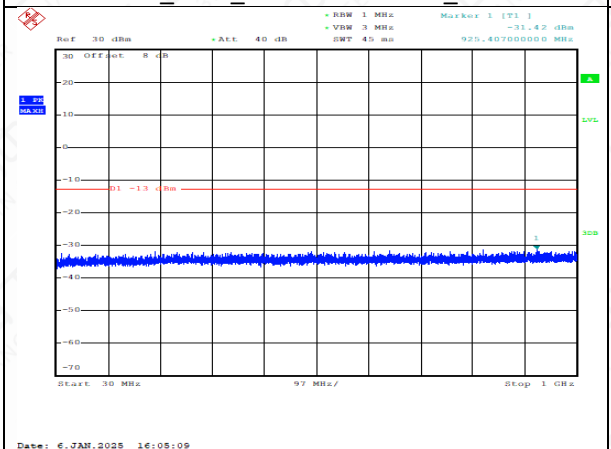
OB2_9538_30MHz-1000MHz_CSE



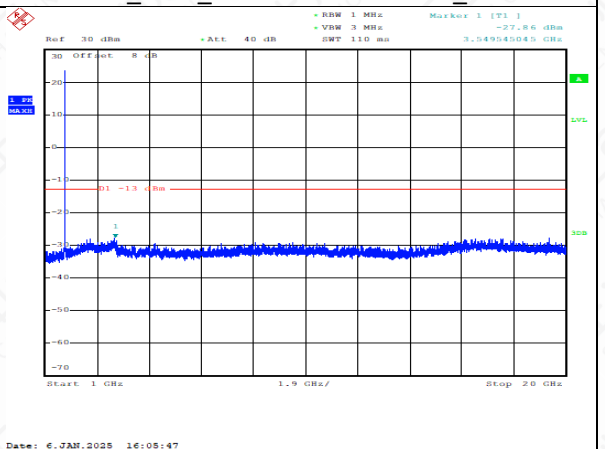
OB2_9538_1000MHz-20000MHz_CSE



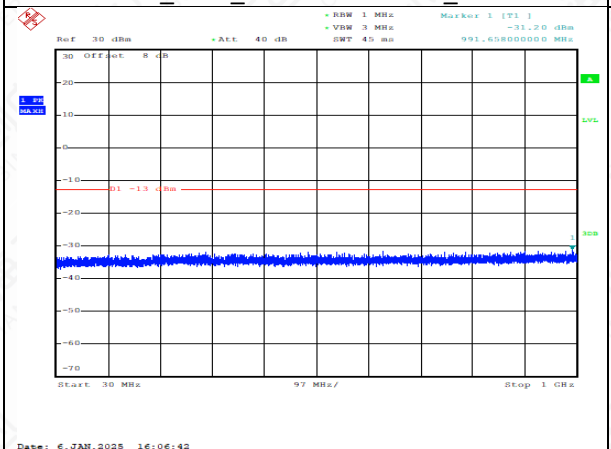
OB4_1312_30MHz-1000MHz_CSE



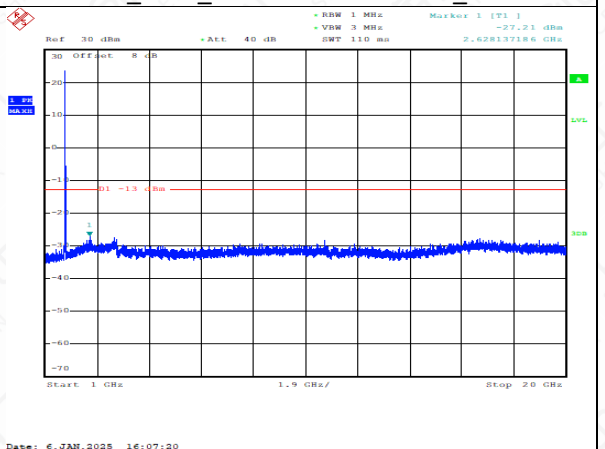
OB4_1312_1000MHz-20000MHz_CSE



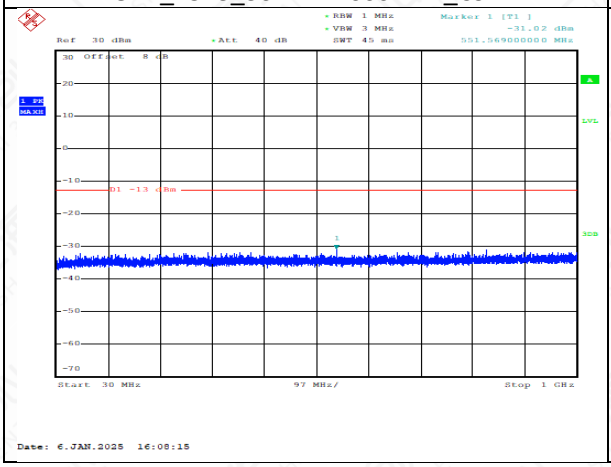
OB4_1413_30MHz-1000MHz_CSE



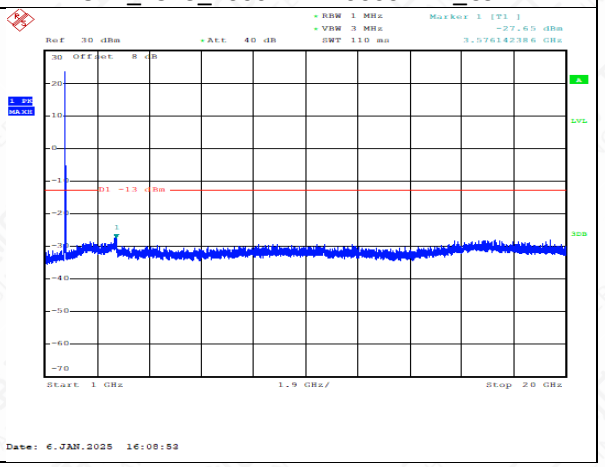
OB4_1413_1000MHz-20000MHz_CSE



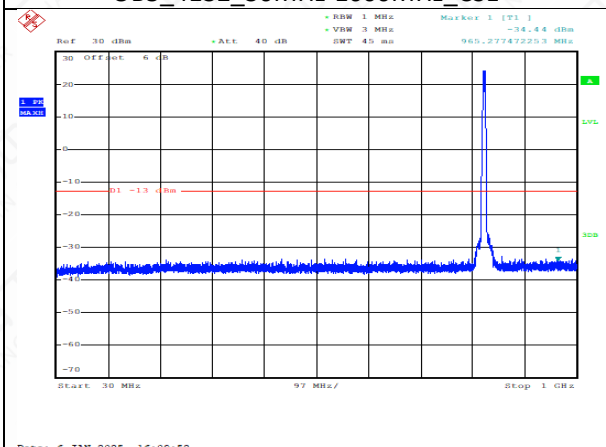
OB4_1513_30MHz-1000MHz_CSE



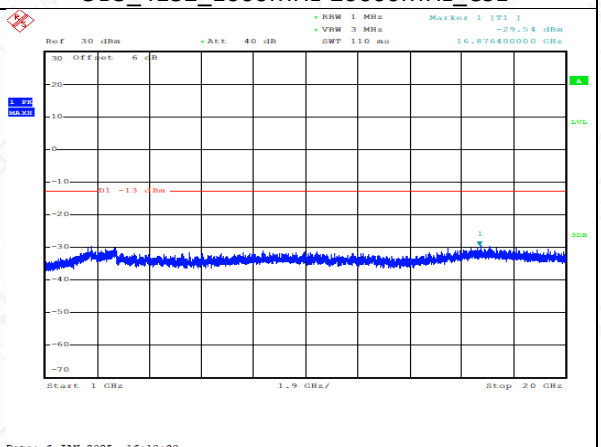
OB4_1513_1000MHz-20000MHz_CSE



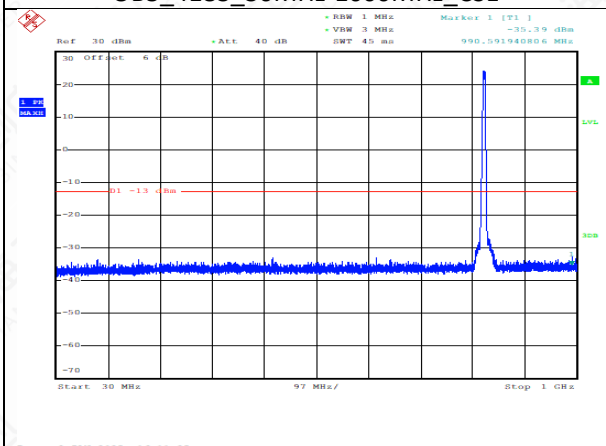
OB5_4132_30MHz-1000MHz_CSE



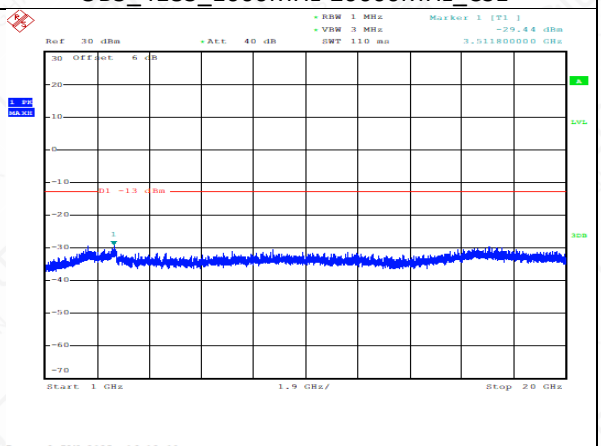
OB5_4132_1000MHz-20000MHz_CSE



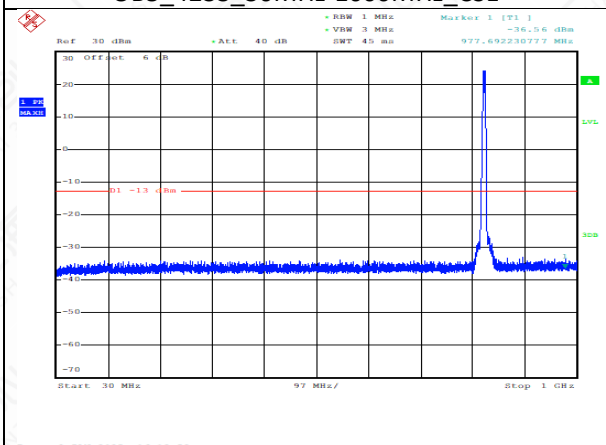
OB5_4183_30MHz-1000MHz_CSE



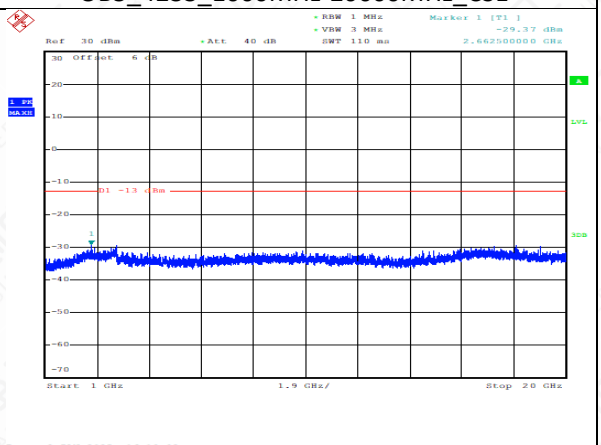
OB5_4183_1000MHz-20000MHz_CSE



OB5_4233_30MHz-1000MHz_CSE



OB5_4233_1000MHz-20000MHz_CSE



6.8 Emission Limit

6.8.1 Measurement Limit

22.917(a)

The rules in this section govern the spectral characteristics of emissions in the Cellular Radiotelephone 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.

24.238(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.

27.53(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 log10 (P) dB.

(2) Additional protection levels. Notwithstanding the foregoing paragraph (h)(1) of this section:

(i) Operations in the 2180–2200 MHz band are subject to the out-of-band emission requirements set forth in § 27.1134 for the protection of federal government operations operating in the 2200–2290 MHz band.

(ii) For operations in the 2000–2020 MHz band, the power of any emissions below 2000 MHz shall be attenuated below the transmitter power (P) in watts by at least 70 + 10 log10(P) dB.

(iii) For operations in the 1915–1920 MHz band, the power of any emission between 1930–1995 MHz shall be attenuated below the transmitter power (P) in watts by at least 70 + 10 log10(P) dB.

(iv) For operations in the 1995–2000 MHz band, the power of any emission between 2005–2020 MHz shall be attenuated below the transmitter power (P) in watts by at least 70 + 10 log10(P) dB.

RSS-133 5.6

Unwanted emissions shall be measured in terms of average values while the transmitter is operating at the manufacturer's rated power and modulated as specified in RSS-Gen.

Equipment shall meet the unwanted emission limits, specified in table 3, outside each frequency block group. For each channel bandwidth supported by the equipment under test, the unwanted emissions shall be measured and reported for two channel frequencies: one located as close as possible to the low end and one located as close as possible to the high end of the equipment’s operating frequency range.

For the unwanted emission limits, in the 1 MHz bands immediately outside and adjacent to the frequency block group, the power shall be measured with a resolution bandwidth of at least 1% of the occupied bandwidth (OBW). Beyond these 1 MHz bands, a resolution bandwidth of 1 MHz shall be used. A narrower resolution bandwidth may be used, provided that the measured power is integrated over the full required measurement bandwidth of 1 MHz, or 1% of the OBW, as applicable.

For all equipment, the TRP or total conducted power (sum of conducted power across all antenna connectors), where applicable, of the unwanted emissions outside the frequency block or frequency block group shall not exceed the limits shown in the table.

Offset frequency from the edge of the frequency block group (MHz)	Unwanted emission limit
≤ 1	-13 dBm/(1% of OBW)
> 1	-13 dBm/MHz

RSS-139 5.6

Unwanted emissions shall be measured in terms of average values.

For all equipment, the TRP or total conducted power (sum of conducted power across all antenna connectors) of the unwanted emissions outside the frequency block or frequency block group shall not exceed the limits shown in table.

Offset frequency from the edge of the frequency block group (MHz)	Unwanted emission limit
1 MHz	-13 dBm/(1% of OB*)
>1 MHz	-13 dBm/MHz

RSS-132 5.5

Equipment shall meet the unwanted emission limits specified below:

i. In the first 1.0 MHz band immediately outside and adjacent to each of the sub-bands specified in Section 5.1, the power of emissions per any 1% of the occupied bandwidth shall be attenuated below the transmitter output power P (dBW) by at least 43 + 10 log(p) dB.

ii. After the first 1.0 MHz immediately outside and adjacent to each of the sub-bands, the power of emissions in any 100 kHz bandwidth shall be attenuated below the transmitter output power P (dBW) by at least 43 + 10 log(p) dB. If the measurement is performed using 1% of the occupied bandwidth, power integration over 100 kHz is required.

p is the output power specified in watts.

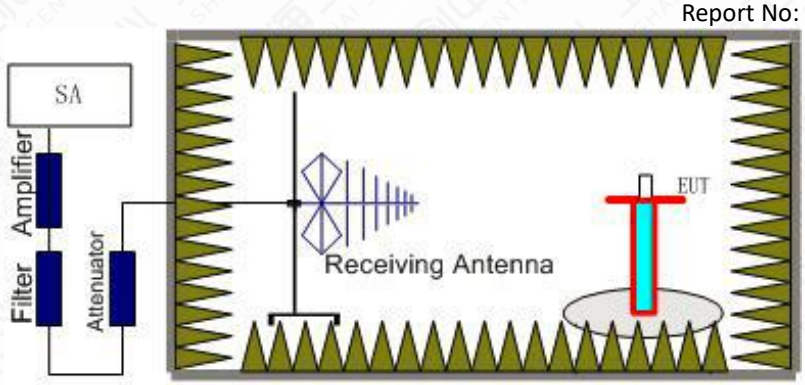
6.8.2 Method of Measurement

The measurements procedures in TIA-603E-2016 are used.

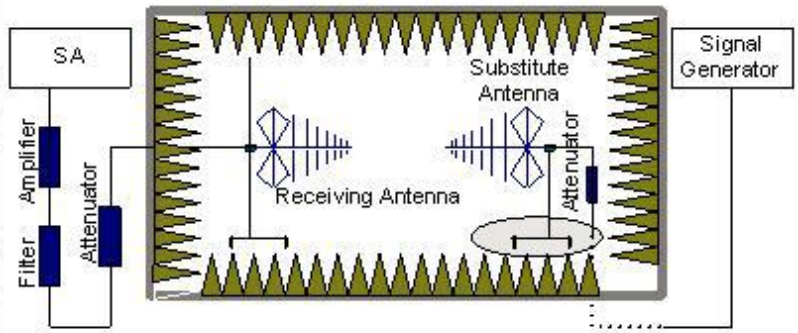
The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment. The resolution bandwidth is set as outlined in Part 24.238 and Part 24.917. The spectrum is scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of WCDMA Band V.

The procedure of radiated spurious emissions is as follows

1. EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.5m. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all non-harmonic and harmonics of the transmit frequency through the 10thharmonic were measured with peak detector.



2. The EUT is then put into continuously transmitting mode at its maximum power level during the test. And the maximum value of the receiver should be recorded as (Pr).
3. The EUT shall be replaced by a substitution antenna. The test setup refers to figure below.



In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (PMea) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (Pr). The power of signal source (PMea) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
4. The Path loss (Ppl) between the Signal Source with the Substitution Antenna and the Substitution Antenna Gain (Ga) should be recorded after test.
A amplifier should be connected in for the test.
The Path loss (Ppl) is the summation of the cable loss .
The measurement results are obtained as described below:
Power(EIRP)=PMea- Ppl+ Ga
5. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
6. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.15dBi

6.8.3 Measurement Results

Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the WCDMA Band V (826.4MHz, 836.6MHz and 846.6MHz) . It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the WCDMA Band V into any of the other

blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.

Frequency	Channel	Frequency Range	Result
WCDMA Band II	Low	30MHz~20GHz	Pass
	Middle	30MHz~20GHz	Pass
	High	30MHz~20GHz	Pass
WCDMA Band IV	Low	30MHz~20GHz	Pass
	Middle	30MHz~20GHz	Pass
	High	30MHz~20GHz	Pass
WCDMA Band V	Low	30MHz~20GHz	Pass
	Middle	30MHz~20GHz	Pass
	High	30MHz~20GHz	Pass

RSE-W2-L

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Test Result (dBm)	Limit(dBm)	Margin(dBm)	Polarization
3736.0	-60.51	6.6	7.9	-59.21	-13	46.21	H
5098.0	-59.08	7.9	9.6	-57.38	-13	44.38	H
7057.2	-60.76	9.4	11.1	-59.06	-13	46.06	H
9267.6	-57.76	10.7	12.7	-55.76	-13	42.76	H
12251.6	-53.71	12.7	12.3	-54.11	-13	41.11	H
15909.4	-47.29	15.0	12.3	-49.99	-13	36.99	H

RSE-W2-M

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Test Result (dBm)	Limit(dBm)	Margin(dBm)	Polarization
3509.2	-61.87	6.4	7.8	-60.47	-13	47.47	H
4452.8	-61.94	7.3	8.7	-60.54	-13	47.54	H
5644.4	-59.15	8.3	10.2	-57.25	-13	44.25	V
7520.0	-58.83	9.7	11.6	-56.93	-13	43.93	V
11624.4	-53.67	12.2	12.3	-53.57	-13	40.57	V
16779.9	-45.46	15.8	12.3	-48.96	-13	35.96	H

RSE-W2-H

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Test Result (dBm)	Limit(dBm)	Margin(dBm)	Polarization
3542.8	-55.26	6.4	7.8	-53.86	-13	40.86	V
5079.6	-60.65	7.9	9.6	-58.95	-13	45.95	H
7631.2	-59.29	9.7	11.8	-57.19	-13	44.19	V
9682.4	-56.48	10.9	12.7	-54.68	-13	41.68	H
13354.8	-52.53	13.7	12.3	-53.93	-13	40.93	H
16681.2	-45.89	15.1	12.3	-48.69	-13	35.69	H

RSE-W4-L

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Test Result (dBm)	Limit(dBm)	Margin(dBm)	Polarization
5138.4	-59.11	7.9	9.4	-57.61	-13	44.61	H
7484.8	-60.18	9.7	11.6	-58.28	-13	45.28	V
10434.8	-56.21	11.6	12.3	-55.51	-13	42.51	V
12936.9	-53.02	13.0	12.3	-53.72	-13	40.72	H
15703.6	-48.07	14.5	12.3	-50.27	-13	37.27	H
17852.0	-46.32	16.2	12.3	-50.22	-13	37.22	V

RSE-W4-M

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Test Result (dBm)	Limit(dBm)	Margin(dBm)	Polarization
3510.4	-57.48	6.4	7.8	-56.08	-13	43.08	V
6342.4	-60.62	8.8	10.3	-59.12	-13	46.12	H
8661.2	-59.99	10.3	12.7	-57.59	-13	44.59	H
11233.8	-55.93	12.1	12.3	-55.73	-13	42.73	H
14347.0	-53.88	13.6	12.3	-55.18	-13	42.18	V
16799.8	-45.74	15.8	12.3	-49.24	-13	36.24	H

RSE-W4-H

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Test Result (dBm)	Limit(dBm)	Margin(dBm)	Polarization
4780.8	-60.42	7.6	9.0	-59.02	-13	46.02	H
7476.8	-60.29	9.7	11.6	-58.39	-13	45.39	H
9639.2	-58.94	10.8	12.7	-57.04	-13	44.04	H
11636.6	-54.43	12.2	12.3	-54.33	-13	41.33	V
14295.6	-54.13	13.6	12.3	-55.43	-13	42.43	V
16965.8	-44.85	16.0	12.3	-48.55	-13	35.55	H

RSE-W5-L

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Test Result (dBm)	Limit(dBm)	Margin(dBm)	Polarization
1651.1	-61.03	4.5	4.7	-60.83	-13	47.83	V
2674.2	-55.77	5.5	6.1	-55.17	-13	42.17	H
3306.4	-62.36	6.2	6.9	-61.66	-13	48.66	H
4414.8	-60.53	7.3	8.7	-59.13	-13	46.13	H
5869.2	-62.1	8.4	10.2	-60.3	-13	47.30	H
7859.2	-60.84	9.9	11.8	-58.94	-13	45.94	H

RSE-W5-M

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Test Result (dBm)	Limit(dBm)	Margin(dBm)	Polarization
1671.8	-61.08	4.5	4.7	-60.88	-13	47.88	V
2874.2	-53.54	5.8	6.1	-53.24	-13	40.24	H
4189.6	-62.07	7.0	8.9	-60.17	-13	47.17	V
5088.4	-61.31	7.9	9.6	-59.61	-13	46.61	H
6122.8	-61.02	8.7	10.2	-59.52	-13	46.52	H
7619.2	-61.03	9.7	11.6	-59.13	-13	46.13	H

RSE-W5-H

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Test Result (dBm)	Limit(dBm)	Margin(dBm)	Polarization
1691.8	-60.3	4.5	4.7	-60.1	-13	47.10	V
2788.8	-54.47	5.7	6.1	-54.07	-13	41.07	H
3575.6	-59.07	6.5	7.8	-57.77	-13	44.77	H
4892.8	-61.63	7.7	9.6	-59.73	-13	46.73	H
6024.4	-60.98	8.6	10.2	-59.38	-13	46.38	H
8268.4	-60.35	10.1	12.4	-58.05	-13	45.05	H

Annex A: Revised History

Version	Revised Content
V0	Initial

Annex B: Accreditation Certificate

Accredited Laboratory

A2LA has accredited

INDUSTRIAL INTERNET INNOVATION CENTER (SHANGHAI) CO., LTD.

Shanghai, People's Republic of China

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated April 2017*).

Presented this 20th day of September 2023.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3682.01
Valid to February 28, 2025

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

END OF REPORT