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

RF TEST REPORT

PRODUCT	Smart POS system
BRAND	SUNMI
MODEL	T6F10
APPLICANT	Shanghai Sunmi Technology Co.,Ltd.
FCC ID	2AH25T6F10LA
ISSUE DATE	February 26, 2024
STANDARD(S)	FCC Part 2, FCC Part 22H, FCC Part 24E,FCC Part 27

Prepared by: ***Rui Wu*** **Reviewed by:** ***Fan Yang*** **Approved by:** ***Min Zhang***

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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 22H	CELLULAR RADIOTELEPHONE SERVICE	--
3	FCC Part 24E	BROADBAND PCS	--
4	FCC Part 27	MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES	--
Note: FCC Part 2 have 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	Measurement Guidance for Certification of Licensed Digital Transmitters	v03r01
Note: KDB 971168 D01 have not been accredited by A2LA.			

1.3 Summary of Test Results

LTE Band 2

Items	Test Name	Clause in FCC rules	Verdict
1	Output Power	2.1046/24.232(c)	Pass Note 2 Note3
2	Emission Limit	2.1053/24.238(a)	Pass Note 2 Note3
3	Frequency Stability	2.1055/24.235	Pass Note2
4	Occupied Bandwidth	2.1049	Pass Note2
5	Emission Bandwidth	2.1049	Pass Note2
6	Band Edge Compliance	2.1051/24.238(a)	Pass Note2
7	Conducted Spurious Emission	2.1051/24.238(a)	Pass Note2
8	Peak to Average Power Ratio	24.232 (d)	Pass Note2

LTE Band 4

Items	Test Name	Clause in	Verdict

		FCC rules	
1	Output Power	2.1046/27.50(d)(4)	Pass Note 2 Note3
2	Emission Limit	2.1053/27.53(h)	Pass Note 2 Note3
3	Frequency Stability	2.1055/27.54	PassNote2
4	Occupied Bandwidth	2.1049	PassNote2
5	Emission Bandwidth	2.1049	PassNote2
6	Band Edge Compliance	2.1051/27.53(h)	PassNote2
7	Conducted Spurious Emission	2.1051/27.53(h)	PassNote2
8	Peak to Average Power Ratio	27.50(d)(5)	PassNote2

LTE Band 5

Items	Test Name	Clause in FCC rules	Verdict
1	Output Power	2.1046/22.913(a)	Pass Note 2 Note3
2	Emission Limit	2.1053/22.917(a)	Pass Note 2 Note3
3	Frequency Stability	2.1055/22.355	PassNote2
4	Occupied Bandwidth	2.1049	PassNote2
5	Emission Bandwidth	2.1049	PassNote2
6	Band Edge Compliance	2.1051/22.917(a)	PassNote2
7	Conducted Spurious Emission	2.1051/22.917(a)	PassNote2
8	Peak to Average Power Ratio	N/A	PassNote2

LTE Band 7

Items	Test Name	Clause in FCC rules	Verdict
1	Output Power	2.1046/27.50(h)	Pass Note 2 Note3
2	Emission Limit	2.1053/27.53(m)	Pass Note 2 Note3
3	Frequency Stability	2.1055/27.54	PassNote2
4	Occupied Bandwidth	2.1049	PassNote2
5	Emission Bandwidth	2.1049	PassNote2
6	Band Edge Compliance	2.1051/27.53(m)	PassNote2
7	Conducted Spurious Emission	2.1051/27.53(m)	PassNote2

LTE Band 38

Items	Test Name	Clause in FCC rules	Verdict
1	Output Power	2.1046/27.50(h)	Pass Note 2 Note3
2	Emission Limit	2.1053/27.53(m)	Pass Note 2 Note3
3	Frequency Stability	2.1055/27.54	PassNote2

4	Occupied Bandwidth	2.1049	Pass[Note2]
5	Emission Bandwidth	2.1049	Pass[Note2]
6	Band Edge Compliance	2.1051/27.53(m)	Pass[Note2]
7	Conducted Spurious Emission	2.1051/27.53(m)	Pass[Note2]

LTE Band 41

Items	Test Name	Clause in FCC rules	Verdict
1	Output Power	2.1046/27.50(h)	Pass
2	Emission Limit	2.1053/27.53(m)	Pass
3	Frequency Stability	2.1055/27.54	Pass
4	Occupied Bandwidth	2.1049	Pass
5	Emission Bandwidth	2.1049	Pass
6	Band Edge Compliance	2.1051/27.53(m)	Pass
7	Conducted Spurious Emission	2.1051/27.53(m)	Pass
8	Peak to Average Power Ratio	27.50	Pass

Note1:

The T6F10, manufactured by Shanghai Sunmi Technology Co.,Ltd. is a variant product for testing.

This project is a variant project based on the 23T04I30131-RF03-V02,original FCC ID 2AH25T6F10 with below changes:

Software Modifications:

-subtract eu bands

Hardware Modifications:

-Band changes: YES

WCDMA reduced by B6/B19

LTE reduced by B8/B18/B19/B20/B26/B34/B39/B40； B41(200M)->B41(120M);

These changes do not affect the RF performance of other frequency bands.

-Components on PCB changes: Yes

-LCD changes: Please refer to the following difference chart

-Camera changes: Please refer to the following difference chart

Type of Service	Configuration type	Scanner	Front Camera	Rear Camera	Flash Lamp	LCD (Just different manufacturers)
Original	High Configuration	Yes	Yes	5M AF+flash	Yes	SHENZHEN DJN PHOTOELECTRIC TECHNOLOGY CO., LTD (DJN)
Original	Basic Configuration	NO	Yes	5M AF+flash	Yes	CPT Technology (Group) Co.,Ltd (Hua Ying)
Variant (Based on Original)	Low Configuration	NO	NO	2M FF	NO	CPT Technology (Group) Co.,Ltd (Hua Ying)

-Other changes: PCBA Change.

According to the Product Change Description, we tested all test cases for B41 and the worst mode of conducted power and radiated spurious emission for other bands in the original report. The test data was recorded in this report.

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.

Note 2:

The test data is reported by reference to 23T04I30131-RF03-V02.

Note 3:

The test data in this report is validation data for the worst mode.

1.4 Data Provided by Applicant

No.	Item(s)	Data
1	LTE band 2	0.46
2	LTE band 4	-0.42
3	LTE band 5	-1.63
4	LTE band 7	0.39
5	LTE band 38	1.54
6	LTE band 41	2.41
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

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	January 05, 2024 to January 17, 2024

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	18826519551

3.2 Manufacturer

Company	Shanghai Sunmi Technology Co.,Ltd.
Address	Room 505, No.388,Song Hu Road, Yang Pu District, Shanghai, China
Telephone	18826519551

4. General Information of The Product

4.1 Product Description for Equipment under Test (EUT)

Product	Smart POS system
Model	T6F10
Date of Receipt	S01aa/S02aa/S04aa: December 22, 2023
EUT ID*	S01aa/S02aa/S04aa
SN/IMEI	S01aa: P303D3BM10026 S02aa: P303D3BM10050 S04aa: P303D3BM10008
Supported Radio Technology and Bands	GSM850/GSM900/DCS1800/PCS1900 WCDMA Band I/II/IV/V/VIII LTE Band 1/2/3/4/5/7/28/38/41 BT 5.0 BLE/BR/EDR WLAN 802.11b/g/n WLAN 802.11a/n/ac GPS/GLONASS/BDS/Galileo NFC
Hardware Version	V1.0(LA)
Software Version	V3.0.1
FCC ID	2AH25T6F10LA
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	N/A
CD01	Adapter	TPA-141A050200UU01	N/A
CH02	Adapter	UC13US	N/A
CI02	Adapter	TPA-23A050200UU01	N/A
UA09	USB Cable	N/A	N/A
BA12	Battery	HPPA	ICON ENERGY SYSTEM (SHENZHEN) CO., LTD.
BB07	Battery	HPPA	Guangdong Highpower New Energy TechnologyCo., Ltd.
NOTE1: AE ID is the internal identification code of the laboratory. NOTE2: By verifying that BA12+CI02 is the worst battery and adapter combination, this battery and			

adapter are used in all tests.

4.3 Additional Information

Modulation:

Type of modulation	QPSK/16QAM

Band Frequency Range:

Band	Frequency Range
Band 2	1850 - 1910 MHz
Band 4	1710 - 1755 MHz
Band 5	824 - 849 MHz
Band 7	2500 - 2570 MHz
Band 38	2570 - 2620 MHz
Band 41	2535 - 2655 MHz

Band List:

Band	BW (MHz)	Low Channel	Low Freq. (MHz)	Mid Channel	Mid Freq. (MHz)	High Channel	High Freq. (MHz)
Band 2	1.4	18607	1850.7	18900	1880	19193	1909.3
	3	18615	1851.5	18900	1880	19185	1908.5
	5	18625	1852.5	18900	1880	19175	1907.5
	10	18650	1855	18900	1880	19150	1905
	15	18675	1857.5	18900	1880	19125	1902.5
	20	18700	1860	18900	1880	19100	1900
Band 4	1.4	19957	1710.7	20175	1732.5	20393	1754.3
	3	19965	1711.5	20175	1732.5	20385	1753.5
	5	19975	1712.5	20175	1732.5	20375	1752.5
	10	20000	1715	20175	1732.5	20350	1750
	15	20025	1717.5	20175	1732.5	20325	1747.5
	20	20050	1720	20175	1732.5	20300	1745
Band 5	1.4	20407	824.7	20525	836.5	20643	848.3
	3	20415	825.5	20525	836.5	20635	847.5
	5	20425	826.5	20525	836.5	20625	846.5
	10	20450	829	20525	836.5	20600	844
Band 7	5	20775	2502.5	21100	2535	21425	2567.5
	10	20800	2505	21100	2535	21400	2565
	15	20825	2507.5	21100	2535	21375	2562.5
	20	20850	2510	21100	2535	21350	2560
Band 38	5	37775	2572.5	38000	2595	38225	2617.5
	10	37800	2575	38000	2595	38200	2615
	15	37825	2577.5	38000	2595	38175	2612.5
	20	37850	2580	38000	2595	38150	2610
Band 41	5	40065	2537.5	40620	2593	41215	2652.5
	10	40090	2540	40620	2593	41190	2650

Band	BW (MHz)	Low Channel	Low Freq. (MHz)	Mid Channel	Mid Freq. (MHz)	High Channel	High Freq. (MHz)
	15	40115	2542.5	40620	2593	41165	2647.5
	20	40140	2545	40620	2593	41140	2645

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℃	-10℃	50℃
Working Voltage of EUT	Normal	Minimum	Maximum
	7.7V	6.0V	8.8 V

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	2023-07-26	1 Year
3	Wideband Radio Communication Tester	CMW 500	148874	V3.5.136	N/A	R&S	2023-07-27	1 Year
4	Temperature Chamber	B-TF-107C	201804107	N/A	N/A	BoYi	2023-06-28	1 Year
5	Programmable power supply	Keithley 2303	4039070	N/A	N/A	Keithley	2023-06-23	1 Year
6	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	2023-10-16	1 Year
2	Universal Radio Communication Tester	CMW500	104178	V3.7.20	1206.0600.00	R&S	2023-10-16	1 Year

3	EMI Test Receiver	ESU40	100307	V5.1-24-3	01	R&S	2023-12-19	1 Year
4	TRILOG Broadband Antenna	VULB9163	01345	N/A	N/A	Schwarzbeck	2023-03-23	1 Year
5	Double- ridged Waveguide Antenna	ETS-3117	00135890	N/A	N/A	ETS	2022-03-09	2 Years
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	2023-10-16	1 year
8	Preamplifier	SCU18	10155	N/A	N/A	R&S	2023-10-16	1 year
9	Antenna	SWB-VUBA 9117	9117-266	N/A	N/A	Schwarzbeck	2023-9-8	1 year
10	Antenna	BBHA9120 D	02112	N/A	N/A	Schwarzbeck	2023-7-28	1 year
11	Signal Generator	SMF100A	102314	3.20.390.24	05.10	R&S	2023-10-16	1 year

Anechoic chamber

Fully anechoic chamber by ETS.

5.3 Measurement Uncertainty

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 Summary

FCC §22.913(a) (5) The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.
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.
FCC §27.50(a) 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. (EIRP≤24dBm/5MHz)
FCC §27.50(d) (4) Fixed, mobile, and portable (hand-held) stations operating in the 1710–1755 MHz band is limited to 1 watt EIRP.
FCC §27.50(h):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.

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 base station CMW500.
These measurements were done at 3 frequencies.(bottom, middle and top of operational frequency range).
1. The transmitter output port was connected to base station.
2. Set the EUT at maximum power through base station.
3. Select lowest, middle, and highest channels for each band and different modulation.
4. Measure and record maximum average power for other modulation signal.
5. During the process of testing, the EUT was controlled Rhode & Schwarz Digital Radio.
6. Communication tester to ensure max power transmission and proper modulation.
7. This result contains 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 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 base station reading.

6.1.4 Test Setup

6.1.5 Output Power Measurement result

BAND	Mode	Origina data(dBm)	Verified power(dBm)	d_{dB} Note3
Band2	QPSK	22.36	22.35	0.01
Band 4	QPSK	22.16	22.11	0.05
Band 5	QPSK	22.45	22.40	0.05
Band 7	QPSK	22.57	22.34	0.23
Band 38	QPSK	22.65	22.64	0.01

Note1: The power of the worst part is verified to meet the requirements.

Note2: The difference between Original and verified power is less than 3dB and meets the requirements of KDB484596 D01 data reference. The power listed in the original certificate still applies to this case.

Note3: $d_{dB}=|Verified_{dB}-original_{dB}|$

LTE band 41

LTE B41			Maximum Conducted Power (dBm)			
Modulation	RB	RB Offset	Tune up	5MHz		
				Channel/Frequency(MHz)		
				40065/2537.5	40640/2595	41215/2652.5
QPSK	1	Low	24.00	22.52	22.72	22.68
		Middle		22.95	23.10	23.05
		High		22.77	22.78	22.77
	50%	Low	23.00	21.88	21.98	21.95
		Middle		21.96	22.11	22.04
		High		21.77	22.06	21.79
	100%	/	23.00	21.91	22.16	22.07
16QAM	1	Low	23.00	21.94	21.82	21.76
		Middle		21.92	22.05	22.15
		High		21.80	21.97	21.80
	50%	Low	22.00	21.15	21.05	21.16
		Middle		21.17	21.21	21.19
		High		21.17	21.05	21.16
	100%	/	22.00	21.14	21.07	21.28
Modulation	RB	RB Offset	Tune up	10MHz		
				Channel/Frequency(MHz)		
				40090/2540	40640/2595	41190/2650
QPSK	1	Low	24.00	22.54	22.73	22.71
		Middle		22.98	23.12	23.09

		High		22.79	22.82	22.80
	50%	Low	23.00	21.91	22.03	21.99
		Middle		21.99	22.16	22.08
		High		21.79	22.10	21.84
	100%	/	23.00	21.90	22.13	22.06
16QAM	1	Low	23.00	21.96	21.85	21.78
		Middle		21.95	22.09	22.18
		High		21.83	21.99	21.83
	50%	Low	22.00	21.18	21.10	21.20
		Middle		21.19	21.25	21.22
		High		21.20	21.10	21.20
	100%	/	22.00	21.17	21.12	21.32
Modulation	RB	RB Offset	Tune up	15MHz		
				Channel/Frequency(MHz)		
				40115/2542.5	40640/2595	41165/2647.5
QPSK	1	Low	24.00	22.53	22.69	22.69
		Middle		22.96	23.14	23.06
		High		22.76	22.77	22.76
	50%	Low	23.00	21.89	21.99	21.96
		Middle		21.96	22.11	22.04
		High		21.76	22.07	21.80
	100%	/	23.00	21.88	22.09	22.01
16QAM	1	Low	23.00	21.91	21.83	21.76
		Middle		21.93	22.06	22.16
		High		21.80	21.95	21.80
	50%	Low	22.00	21.15	21.08	21.17
		Middle		21.16	21.20	21.18
		High		21.18	21.06	21.17
	100%	/	22.00	21.14	21.07	21.28
Modulation	RB	RB Offset	Tune up	20MHz		
				Channel/Frequency(MHz)		
				40140/2545	40640/2595	41140/2645
QPSK	1	Low	24.00	22.55	22.70	22.71
		Middle		23.00	23.15	23.09
		High		22.79	22.81	22.78
	50%	Low	23.00	21.91	21.99	21.97
		Middle		21.99	22.12	22.06
		High		21.78	22.07	21.81
	100%	/	23.00	21.90	22.09	22.02
16QAM	1	Low	23.00	21.91	21.79	21.71
		Middle		21.89	22.04	22.12
		High		21.78	21.92	21.78
	50%	Low	22.00	21.12	21.04	21.14
		Middle		21.13	21.18	21.15
		High		21.15	21.01	21.13
	100%	/	22.00	21.12	21.03	21.25

6.1.6 EIRP/ERP

LTE Band 41- EIRP 27.50(h)(2)

Limits: ≤33 dBm (2W)

LTE Band 41_5MHz_QPSK

Frequency(MHz)	EIRP(dBm)	Limit(dBm)
2498.5	25.36	33.00
2593	25.51	33.00
2687.5	25.46	33.00

LTE Band 41_10MHz_QPSK

Frequency(MHz)	EIRP(dBm)	Limit(dBm)
2501	25.39	33.00
2593	25.53	33.00
2685	25.50	33.00

LTE Band 41_15MHz_QPSK

Frequency(MHz)	EIRP(dBm)	Limit(dBm)
2503.5	25.37	33.00
2593	25.55	33.00
2682.5	25.47	33.00

LTE Band 41_20MHz_QPSK

Frequency(MHz)	EIRP(dBm)	Limit(dBm)
2506	25.41	33.00
2593	25.56	33.00
2680	25.50	33.00

LTE Band 41_5MHz_16QAM

Frequency(MHz)	EIRP(dBm)	Limit(dBm)
2498.5	24.35	33.00
2593	24.46	33.00
2687.5	24.56	33.00

LTE Band 41_10MHz_16QAM

Frequency(MHz)	EIRP(dBm)	Limit(dBm)
2501	24.37	33.00
2593	24.50	33.00
2685	24.59	33.00

LTE Band 41_15MHz_16QAM

Frequency(MHz)	EIRP(dBm)	Limit(dBm)
2503.5	24.34	33.00
2593	24.47	33.00
2682.5	24.57	33.00

LTE Band 41_20MHz_16QAM

Frequency(MHz)	EIRP(dBm)	Limit(dBm)
2506	24.32	33.00
2593	24.45	33.00

2680	24.53	33.00

6.2 Emission Limt

Reference

6.2.1 Measurement Limit

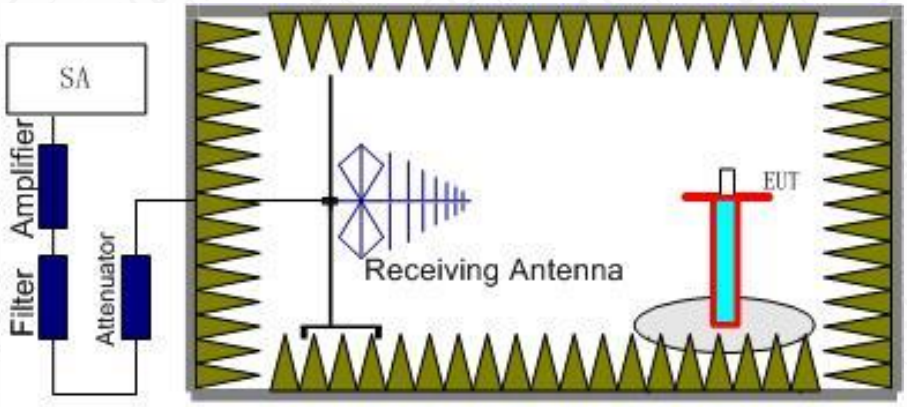
According to KDB 971168, a relaxation of the reference bandwidth is often provided for measurements within a specified frequency range at the edge of the authorized frequency block/band. This is often implemented by permitting the use of a narrower RBW (typically limited to a minimum RBW of 1% of the OBW) for measuring the out-of-band emissions without a requirement to integrate the result over the full reference bandwidth.
FCC §27.53(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.

6.2.2 Method of Measurement

The measurements procedures in TIA-603E-2016 are used. This measurement is carried out in fully-anechoic chamber FAC-3.
The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier. The resolution bandwidth is set 1MHz as outlined in Part 22.917(a)/24.238(a)/27.53(g)/27.53(h)/27.53(m)(4). The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the LTE Bands 2/4/5/7/38/41.

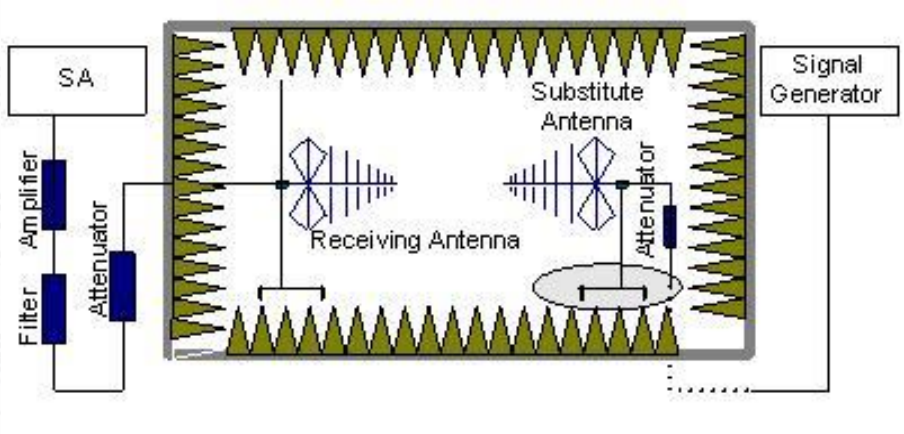
The procedure of radiated spurious emissions is as follows:

1.Below 1 GHz, EUT was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna. Above 1 GHz, EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna.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 10th harmonic 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. Adjust the level of the signal generator output until the value of the receiver reaches 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 (Pcl) between the Signal Source with the Substitution Antenna and the Substitution Antenna Gain (Ga) should be recorded after test.

An amplifier should be connected in for the test.

The Path loss (Pcl) is the summation of the cable loss and the gain of the amplifier.

The measurement results are obtained as described below:

Power (EIRP) =PMea- Pcl + Ga

5.This value is EIRP since the measurement is calibrated using an antenna of known gain (unit: dBi) and known input power.

6.ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.15dBi.

6.2.3 Measurement Results

Radiated emissions measurements were made at the upper, middle, and lower carrier frequencies of the LTE Bands.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 LTE Bands. 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. The evaluated frequency range is from 30MHz to ten times the main frequency signal. The final data result takes the worst pattern data and places it in the report.

test Frequency range：30M-26G

Band	BW (MHz)	Low Freq. (MHz)	Mid Freq. (MHz)	High Freq. (MHz)	Result
Band 41	5	2498.5	2593	2687.5	PASS
	10	2501	2593	2685	PASS
	15	2503.5	2593	2682.5	PASS
	20	2506	2593	2680	PASS

Only the worst mode data is provided

RSE-LTE41-QPSK-5MHz-1RB_Low-Low Channel

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Test Result(dBm)	Limit （dBm）	Margin(dBm)	Polarization
3796.4	-51.57	6.7	7.9	-50.37	-25	25.37	H
5091.2	-48	7.9	9.6	-46.3	-25	21.30	H
7611.2	-42.55	9.7	11.6	-40.65	-25	15.65	V
10140.0	-45.48	11.3	12.5	-44.28	-25	19.28	H
12653.8	-42.03	12.7	12.3	-42.43	-25	17.43	H
15221.0	-35.25	14.5	12.3	-37.45	-25	12.45	H

RSE-LTE41-QPSK-5MHz-1RB_Low-Mid Channel

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Test Result(dBm)	Limit （dBm）	Margin(dBm)	Polarization
3860.8	-51.71	6.7	7.9	-50.51	-25	25.51	H
5190.4	-48.49	8.0	9.4	-47.09	-25	22.09	V
7777.6	-41.27	9.9	11.8	-39.37	-25	14.37	V
10350.4	-45.62	11.6	12.3	-44.92	-25	19.92	V
12993.2	-40.64	13.2	12.3	-41.54	-25	16.54	H
15525.5	-35.89	14.5	12.3	-38.09	-25	13.09	H

RSE-LTE41-QPSK-5MHz-1RB_Low-High Channel

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Test Result(dBm)	Limit （dBm）	Margin(dBm)	Polarization

3719.2	-50.9	6.6	7.9	-49.6	-25	24.60	H
5305.2	-47.17	8.0	9.4	-45.77	-25	20.77	H
7957.6	-37.98	9.8	12.2	-35.58	-25	10.58	V
10609.6	-45.35	11.6	12.3	-44.65	-25	19.65	H
13282.0	-39.24	13.6	12.3	-40.54	-25	15.54	V
15936.8	-32.91	15.0	12.3	-35.61	-25	10.61	H

6.3 Frequency Stability

6.3.1 Measurement Limit

FCC §2.1055 The frequency stability shall be measured with variation of ambient temperature as follows:
(1) From −30° to + 50° centigrade for all equipment except that specified in paragraphs (a) (2) and (3) of this section.
(2) From −20° to + 50° centigrade for equipment to be licensed for use in the Maritime Services under part 80 of this chapter, except for Class A, B, and S Emergency Position Indicating Radiobeacons (EPIRBS), and equipment to be licensed for use above 952 MHz at operational fixed stations in all services, stations in the Local Television Transmission Service and Point-to-Point Microwave Radio Service under part 21 of this chapter, equipment licensed for use aboard aircraft in the Aviation Services under part 87 of this chapter, and equipment authorized for use in the Family Radio Service under part 95 of this chapter.
FCC §24.235 Frequency stability.The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.
FCC §22.355 Frequency tolerance.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.
FCC §27.54 The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

6.3.2 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 middle channel for LTE band 7. 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 1.5 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 1.5 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 CMW500 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 ℃ decrements 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.

6.3.3 Test Setup

6.3.4 Measurement results

Temperature	Voltage	Band	BandWidth (MHz)	Channel	RbMode	QPSK (Hz)	Q16 (Hz)	QPSK (ppm)	Q16 (ppm)
Normal	Low	TDD41	5	Mid	fullRB	-18.497	-21.057	0.007	0.008
Normal	Normal	TDD41	5	Mid	fullRB	-16.651	-25.02	0.006	0.01
Normal	High	TDD41	5	Mid	fullRB	-19.083	-19.298	0.007	0.007
50	Normal	TDD41	5	Mid	fullRB	-15.721	-11.873	0.006	0.005
40	Normal	TDD41	5	Mid	fullRB	-12.245	-9.685	0.005	0.004
30	Normal	TDD41	5	Mid	fullRB	-17.881	-20.084	0.007	0.008
20	Normal	TDD41	5	Mid	fullRB	-7.467	-18.067	0.003	0.007
10	Normal	TDD41	5	Mid	fullRB	-13.018	5.579	0.005	0.002
0	Normal	TDD41	5	Mid	fullRB	-12.774	-13.604	0.005	0.005
-10	Normal	TDD41	5	Mid	fullRB	-14.72	-16.408	0.006	0.006
-20	Normal	TDD41	5	Mid	fullRB	-13.618	-17.681	0.005	0.007
-30	Normal	TDD41	5	Mid	fullRB	-13.905	-8.941	0.005	0.003

6.4 Occupied Bandwidth

6.4.1 Summary

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated.

6.4.2 Method of Measurement

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 the US Cellular/PCS frequency bands. The table below lists the measured 99% BW. Spectrum analyzer plots are included on the following pages.

The measurement method is from KDB 9711684:

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 (i.e., two to five times the OBW).

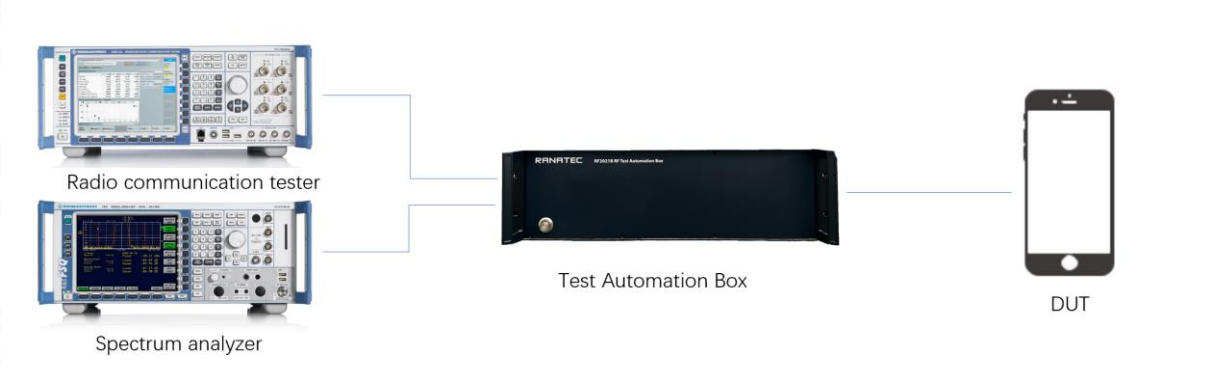
b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1 to 5 % of the anticipated OBW, and the VBW shall be at least 3 times the RBW.

c) Set the reference level of the instrument as required to keep the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope must be at least 10log (OBW / RBW) below the reference level.

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

e) Use the 99 % power bandwidth function of the spectrum analyzer and report the measured bandwidth.

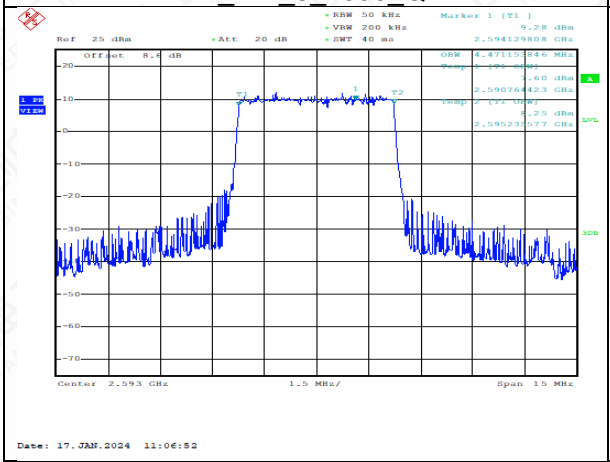
6.4.3 Test Setup



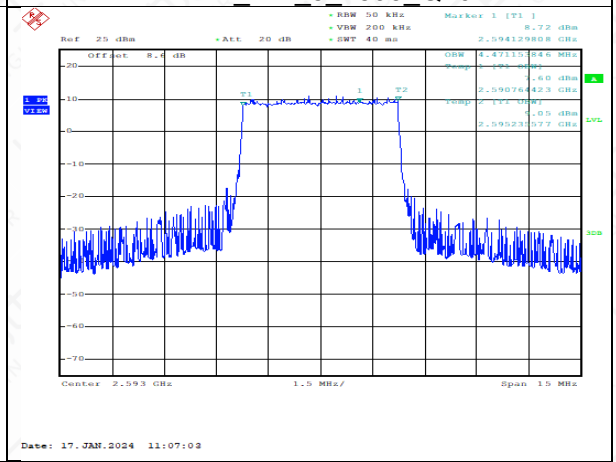
6.4.4 Measurement Results

Band	Channel	BandWidth	Frequency(MHz)	QPSK(MHz)	Q16(MHz)
TDD41	Mid	5	2593	4.47	4.47
TDD41	Mid	10	2593	8.99	8.99
TDD41	Mid	15	2593	13.49	13.49
TDD41	Mid	20	2593	17.98	17.98

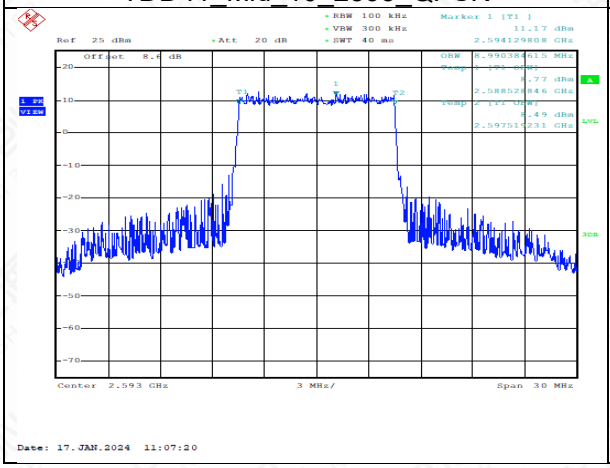
TDD41_Mid_5_2593_QPSK



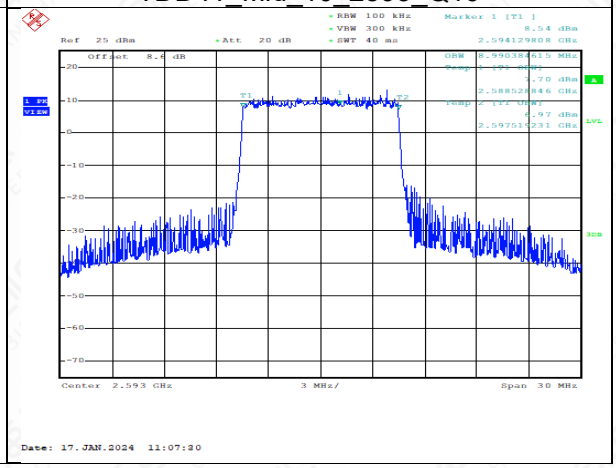
TDD41_Mid_5_2593_Q16



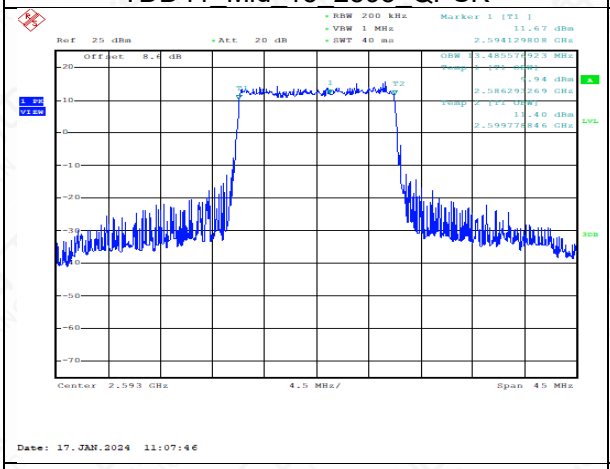
TDD41_Mid_10_2593_QPSK



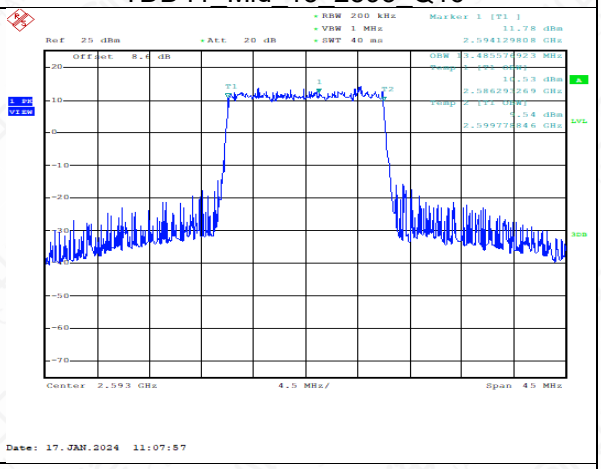
TDD41_Mid_10_2593_Q16



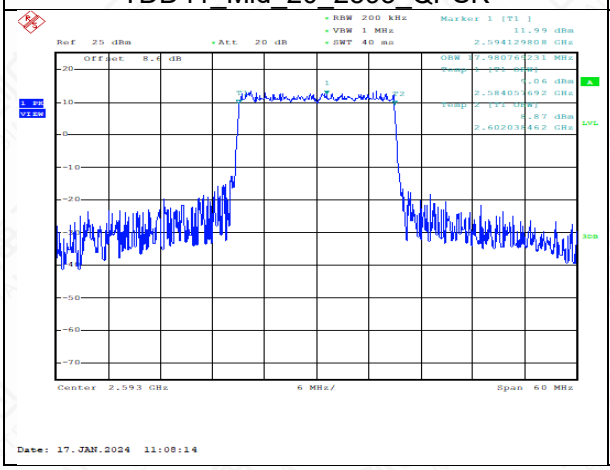
TDD41_Mid_15_2593_QPSK



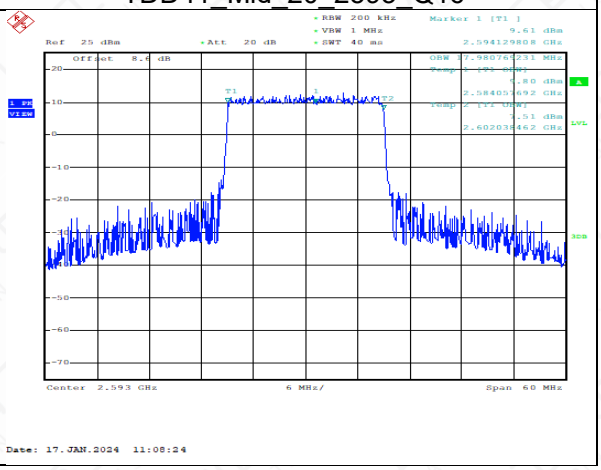
TDD41_Mid_15_2593_Q16



TDD41_Mid_20_2593_QPSK



TDD41_Mid_20_2593_Q16

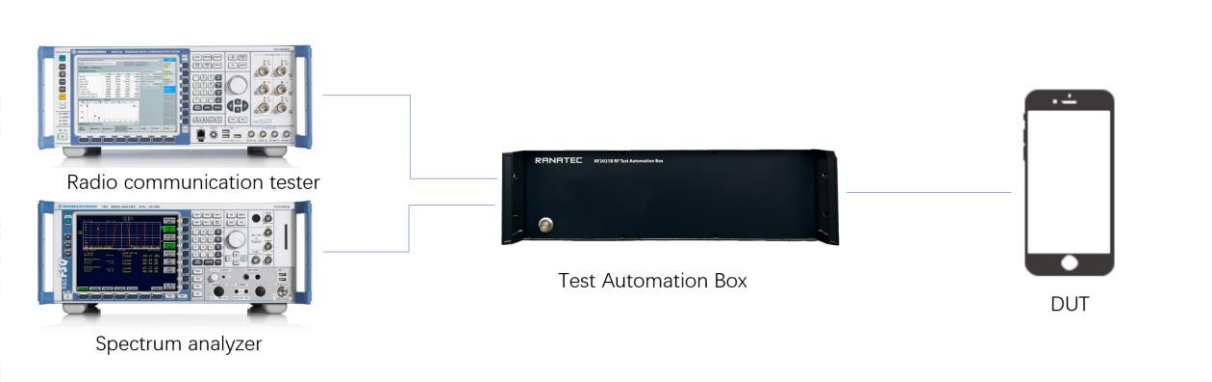


6.5 Emission Bandwidth

6.5.1 Method of Measurement

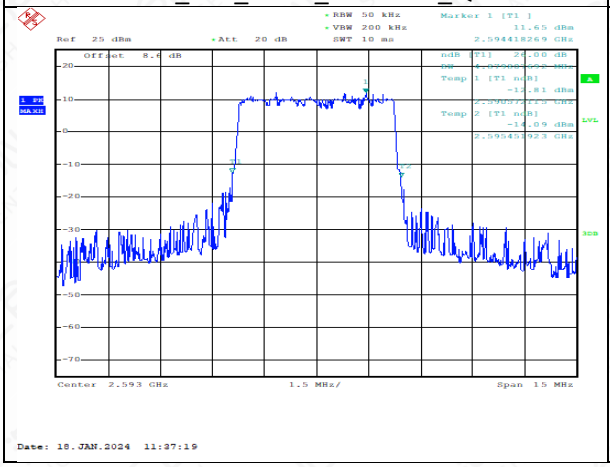
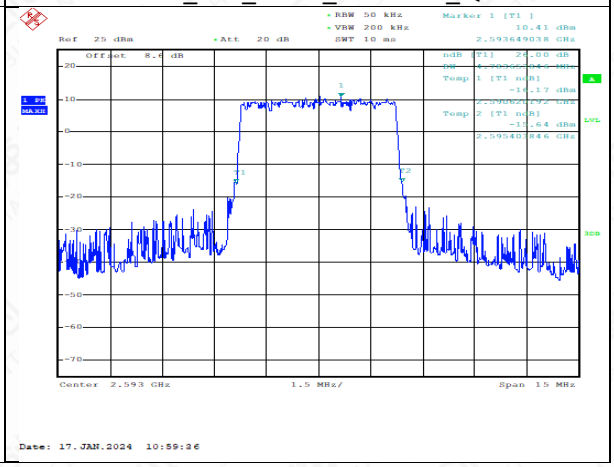
The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. Table below lists the measured -26dBc BW. Spectrum analyzer plots are included on the followinag pages.

6.5.2 Test Setup

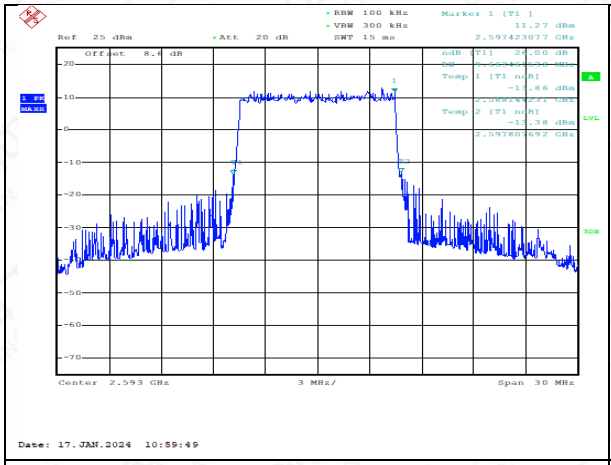


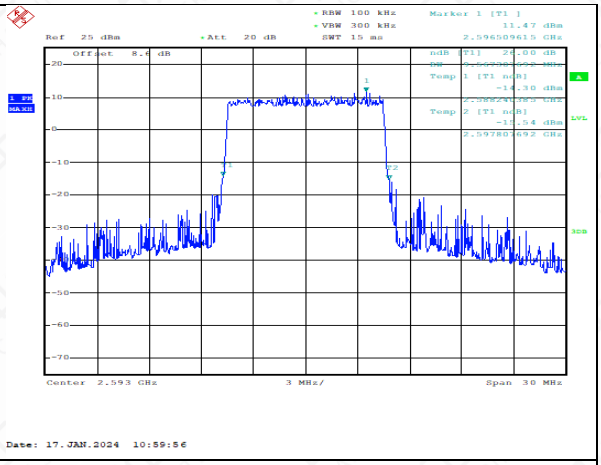
6.5.3 Measurement results

Band	Channel	BandWidth	Frequency(MHz)	QPSK(MHz)	Q16(MHz)
TDD41	Mid	5	2593	4.88	4.78
TDD41	Mid	10	2593	9.66	9.57
TDD41	Mid	15	2593	14.50	14.42
TDD41	Mid	20	2593	18.94	19.13

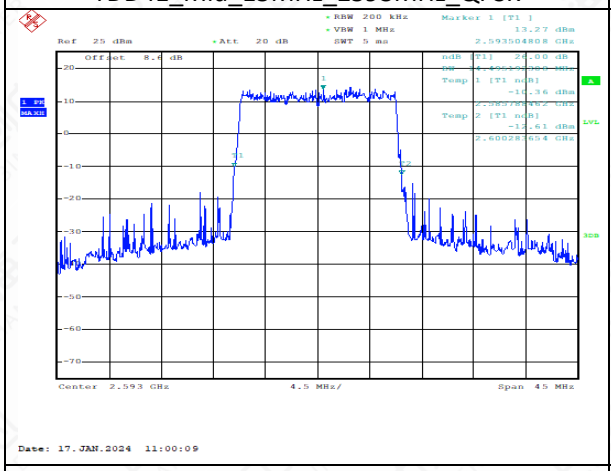
TDD41_Mid_5MHz_2593MHz_QPSK	TDD41_Mid_5MHz_2593MHz_Q16
	

TDD41_Mid_10MHz_2593MHz_QPSK	TDD41_Mid_10MHz_2593MHz_Q16

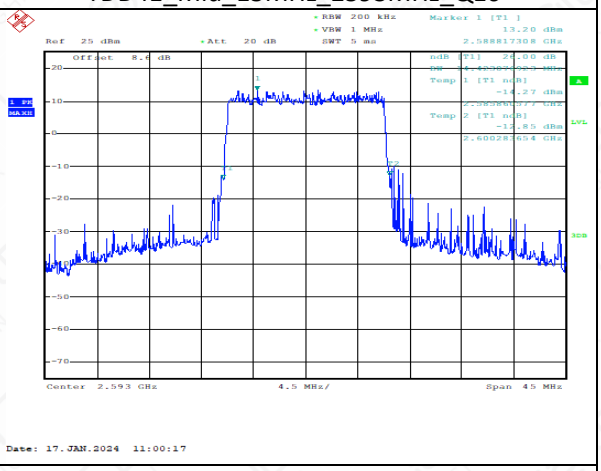




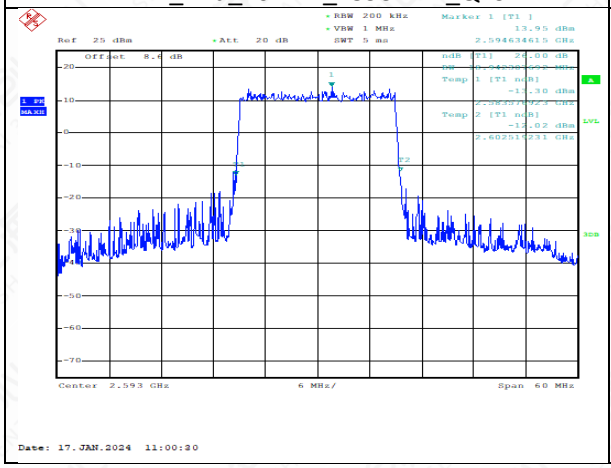
TDD41_Mid_15MHz_2593MHz_QPSK



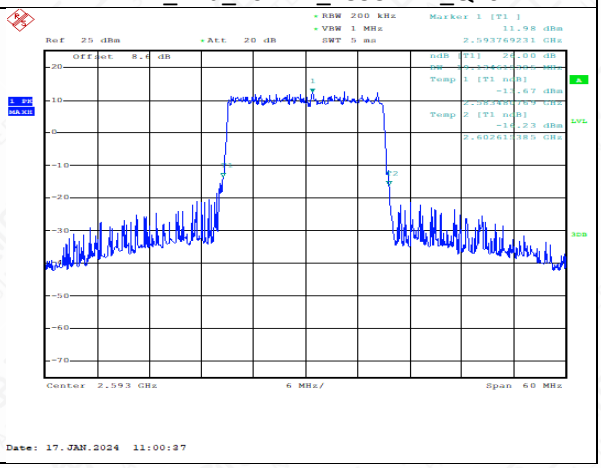
TDD41_Mid_15MHz_2593MHz_Q16



TDD41_Mid_20MHz_2593MHz_QPSK



TDD41_Mid_20MHz_2593MHz_Q16



6.6 Band Edge Compliance

6.6.1 Measurement Limit

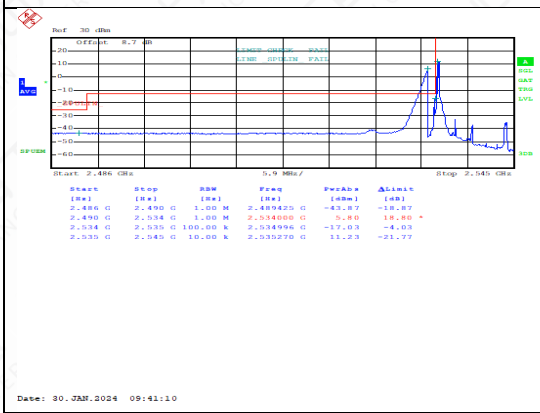
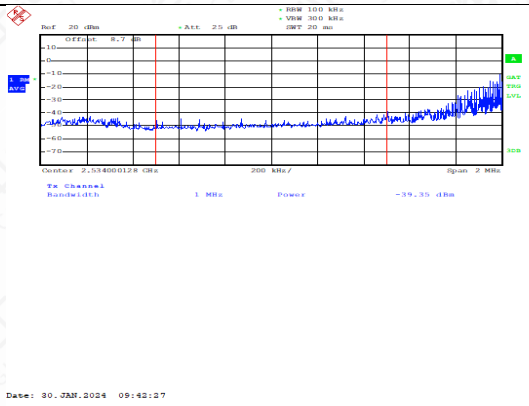
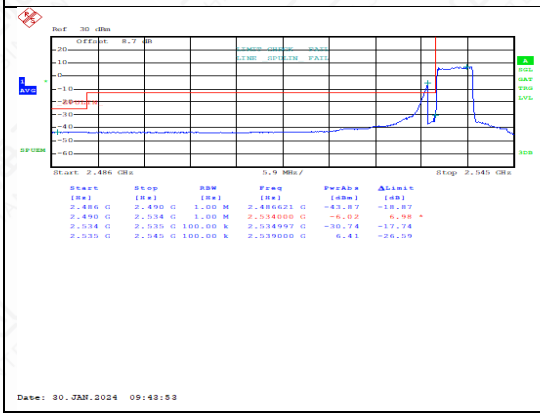
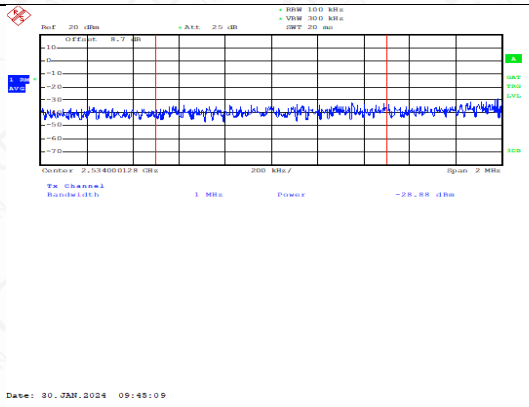
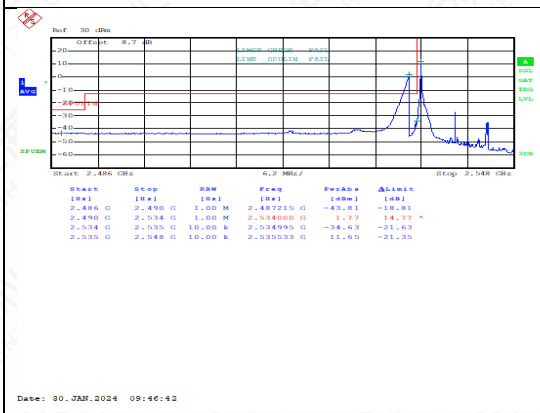
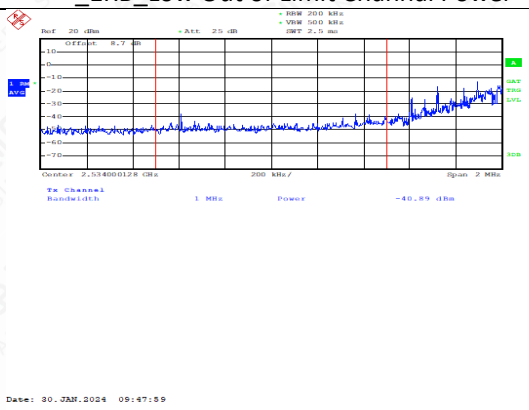
FCC §27.53(m)(4) For mobile digital stations, the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 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.

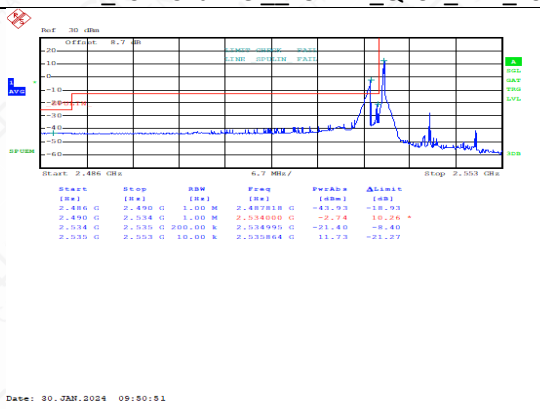
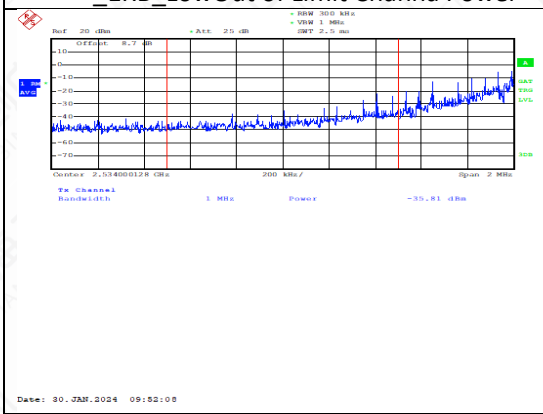
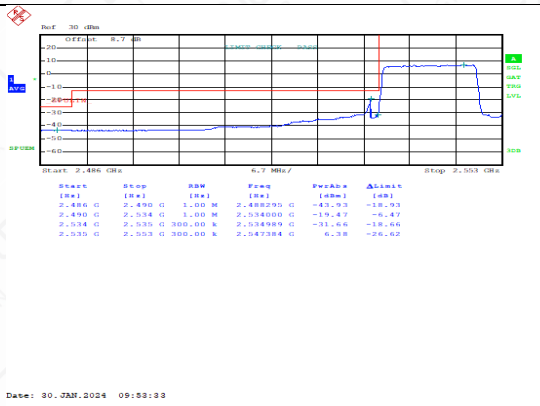
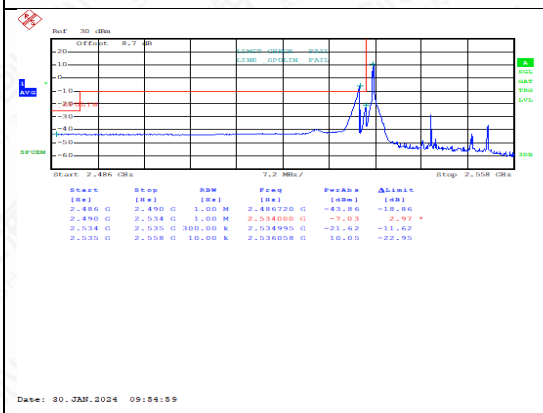
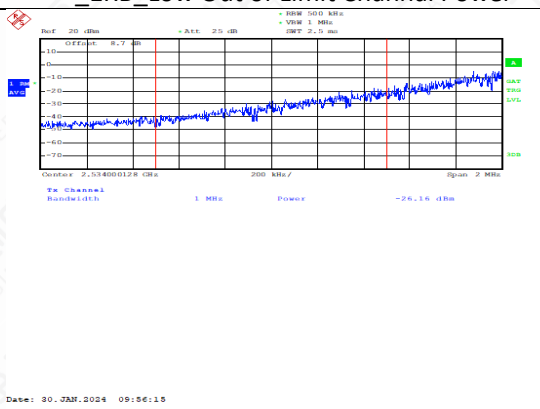
6.6.2 Method of Measurement

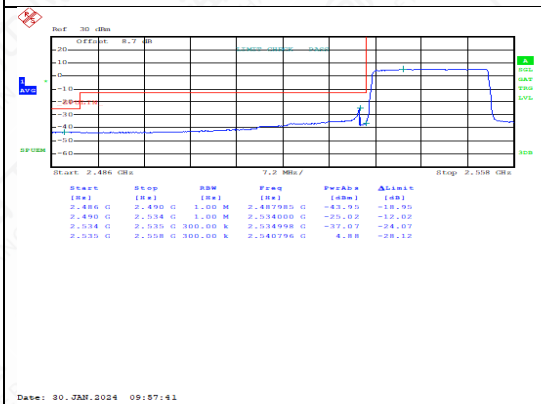
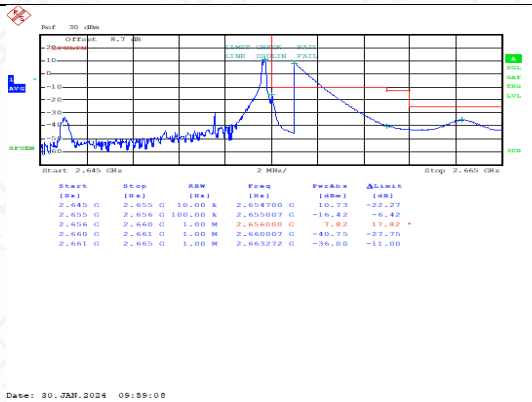
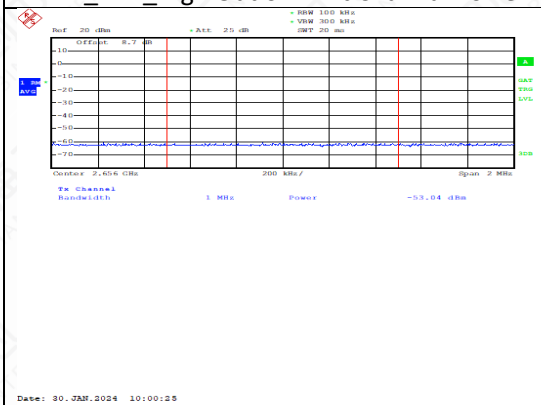
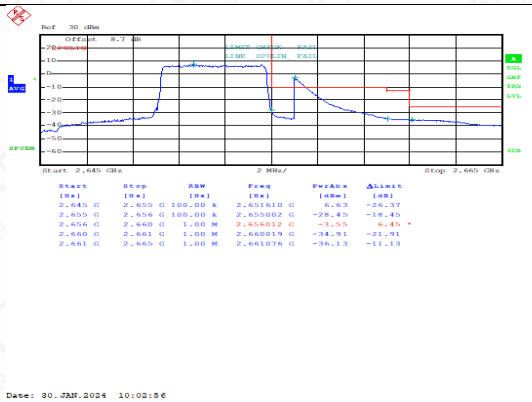
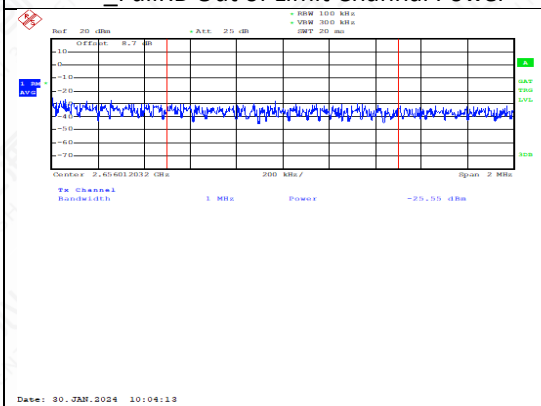
Measurement Procedure: FCC KDB 971168 D01 V03r01 Section 6.0
The transmitter output was connected to a calibrated coaxial cable, attenuator and Spectrum analyzer. the other end of which was connected to a Base Station Simulator, The Base Station Simulator was set to force the EUT to its maximum power setting. The tests were performed at two frequencies (low channel and high channel).in the 1MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of 100kHz or 1% of the emission bandwidth of the fundamental emission of the transmitter may be employed. The EUT emission bandwidth is measured as the width of the signal between two points. Outside of which all emission are attenuated at east 26dB below the transmitter power. The video bandwidth of the spectrum analyzer was set at thrice the resolution bandwidth. Detector Mode was set to RMS.

6.6.3 Test Setup

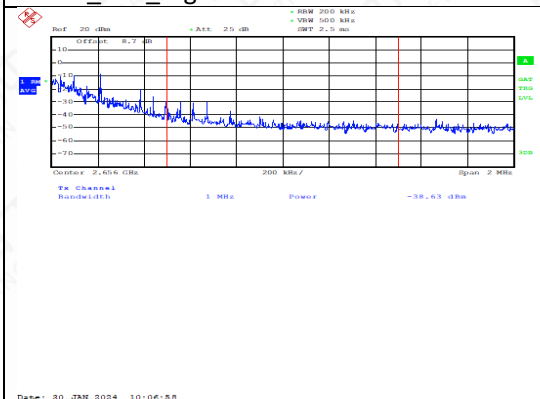
6.6.4 Measurement result

TDD41_Low Channel__5MHz_QPSK_1RB_Low	TDD41_Channel Low_5_2534000128Hz_Out of Limit Channal Power
	
TDD41_Low Channel__5MHz_QPSK_FullRB	TDD41_Channel Low_5_2534000128Hz_FullRB Out of Limit Channal Power
	
TDD41_Low Channel__10MHz_QPSK_1RB_Low	TDD41_Channel Low_10_2534000128Hz _1RB_Low Out of Limit Channal Power
	

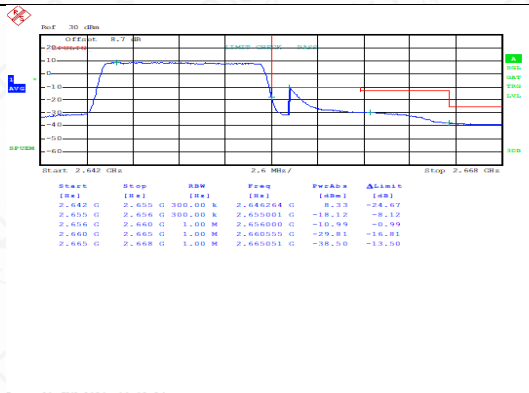
TDD41_Low Channel__10MHz_QPSK_FullRB	TDD41_Low Channel__15MHz_QPSK_1RB_Low
	
TDD41_Channel Low_15_2534000128Hz _1RB_LowOut of Limit Channa Power	TDD41_Low Channel__15MHz_QPSK_FullRB
	
TDD41_Low Channel__20MHz_QPSK_1RB_Low	TDD41_Channel Low_20_2534000128Hz _1RB_Low Out of Limit Channal Power
	

TDD41_Low Channel__20MHz_QPSK_FullRB	TDD41_Channel High_5MHz_QPSK_1RB_HighRange
	
TDD41_Channel High_5_2656000000Hz _1RB_High Out of Limit Channal Power	TDD41_Channel High_5MHz_QPSK_FullRB
	
TDD41_Channel High_5_2656012032Hz _FullRB Out of Limit Channal Power	TDD41_Channel High_10MHz_QPSK_1RB_HighRange
	

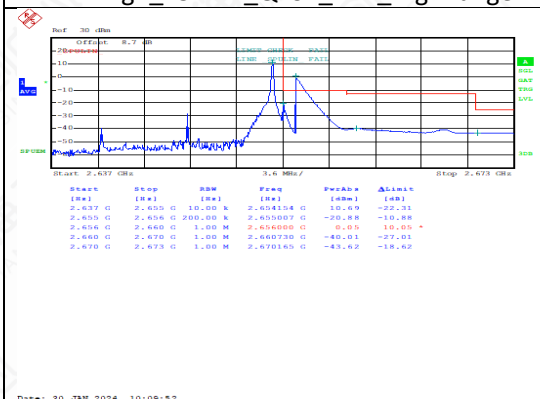
TDD41_Channel High_10_2656000000Hz _1RB_HighOut of Limit Channal Power



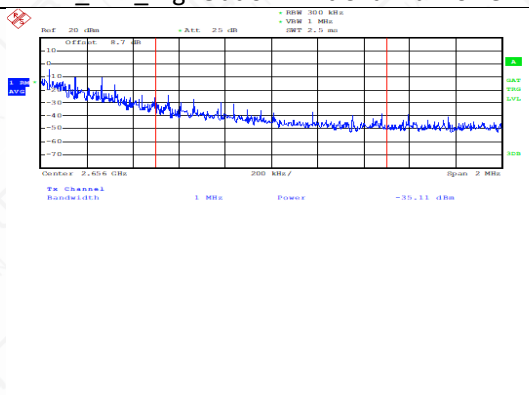
TDD41_Channel High_10MHz_QPSK_FullRB



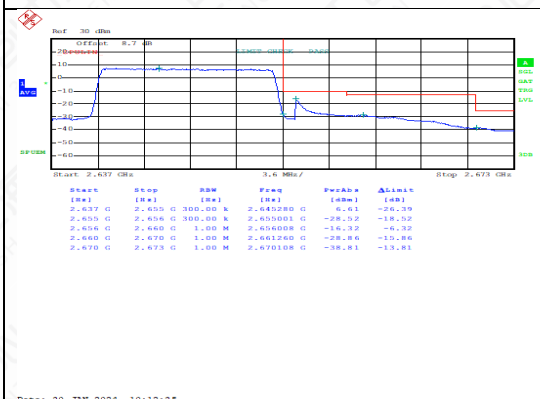
TDD41_Channel High_15MHz_QPSK_1RB_HighRange



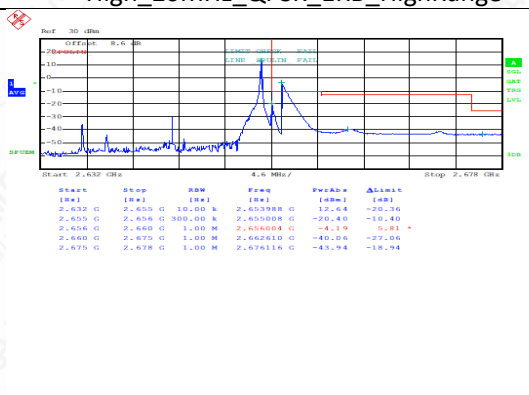
TDD41_Channel High_15_2656000000Hz _1RB_HighOut of Limit Channal Power

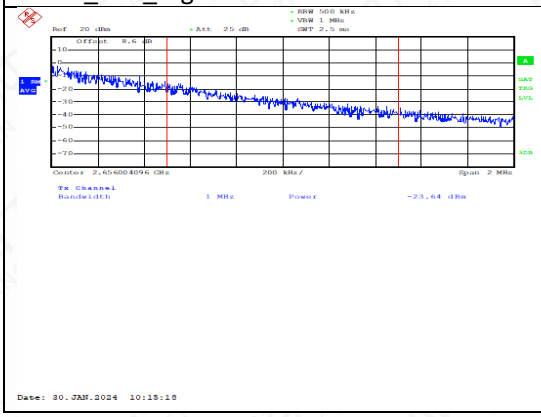
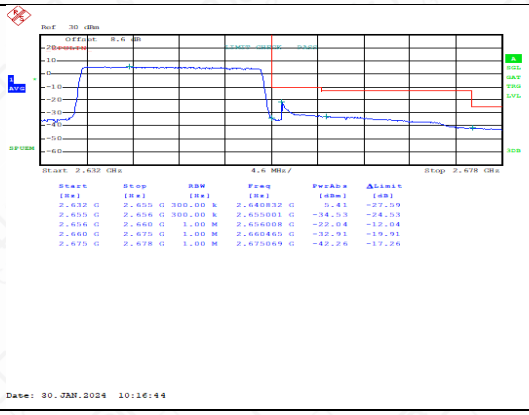


TDD41_Channel High_15MHz_QPSK_FullRB



TDD41_Channel High_20MHz_QPSK_1RB_HighRange



TDD41_Channel High_20_2656004096Hz _1RB_High Out of Limit Channal Power	TDD41_Channel High_20MHz_QPSK_FullRB
	

6.7 Conducted Spurious Emission

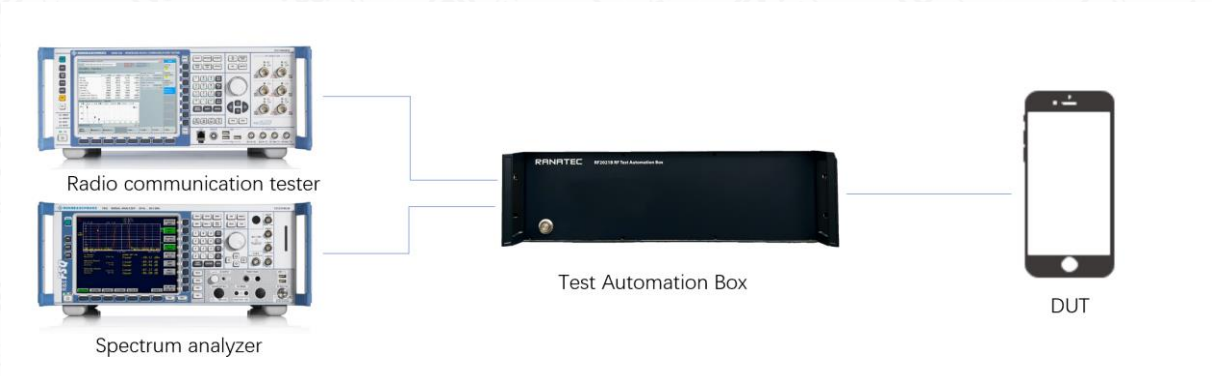
6.7.1 Summary

FCC §27.53(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.

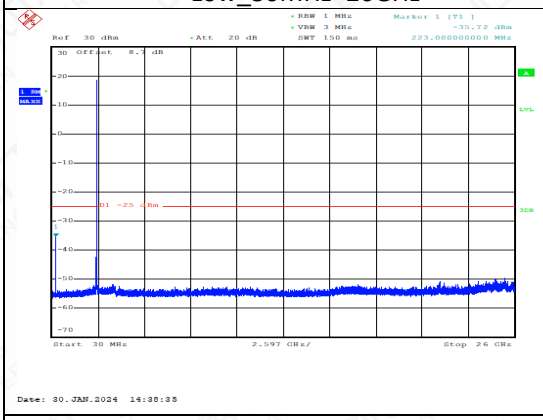
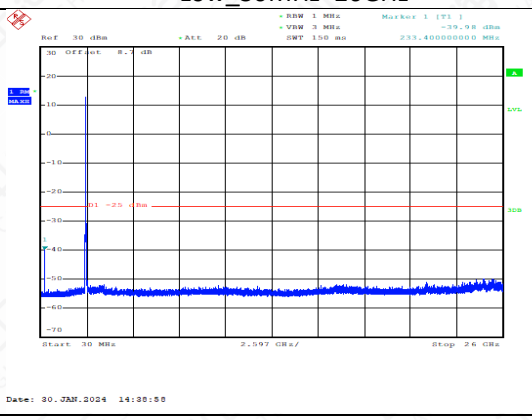
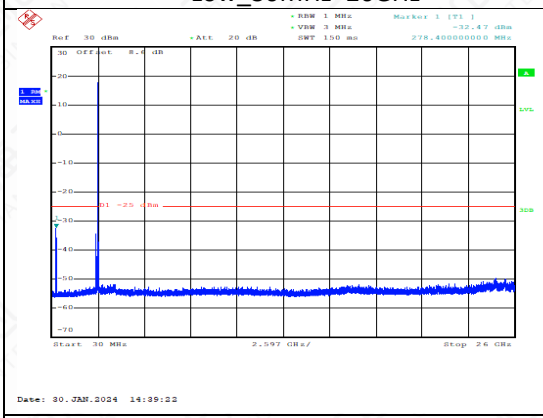
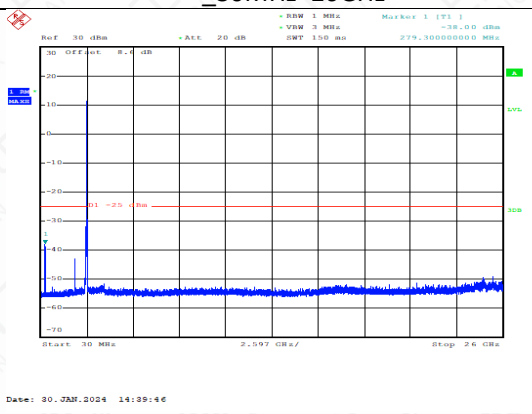
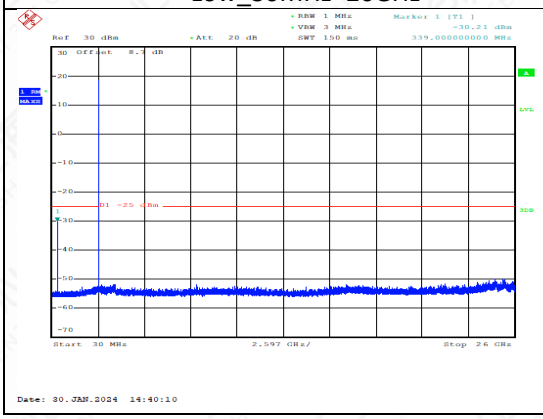
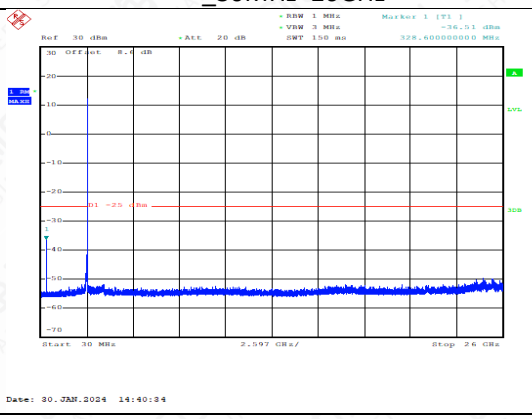
6.7.2 Method of Measurement

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 mobile station equipment tested, this equates to a frequency range of 13 MHz to 9 GHz, data taken from 10 MHz to 25 GHz.
2.Determine EUT transmit frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.
3.The number of sweep points of spectrum analyzer is set to 30001 which is greater than span/RBW.

6.7.3 Test Setup



6.7.4 Measurement result

TDD41_Low Channel_QPSK_5MHz_1RB-Low_30MHz~26GHz	TDD41_Low Channel_ QPSK_20MHz_1RB-Low_30MHz~26GHz
	
TDD41_Mid Channel_ QPSK_5MHz_1RB-Low_30MHz~26GHz	TDD41_Mid Channel_ QPSK_20MHz_1RB-Low_30MHz~26GHz
	
TDD41_High Channel_ QPSK_5MHz_1RB-Low_30MHz~26GHz	TDD41_High Channel_ QPSK_20MHz_1RB-Low_30MHz~26GHz
	

Only the worst mode data is provided

6.8 Peak-To-Average Power Ratio

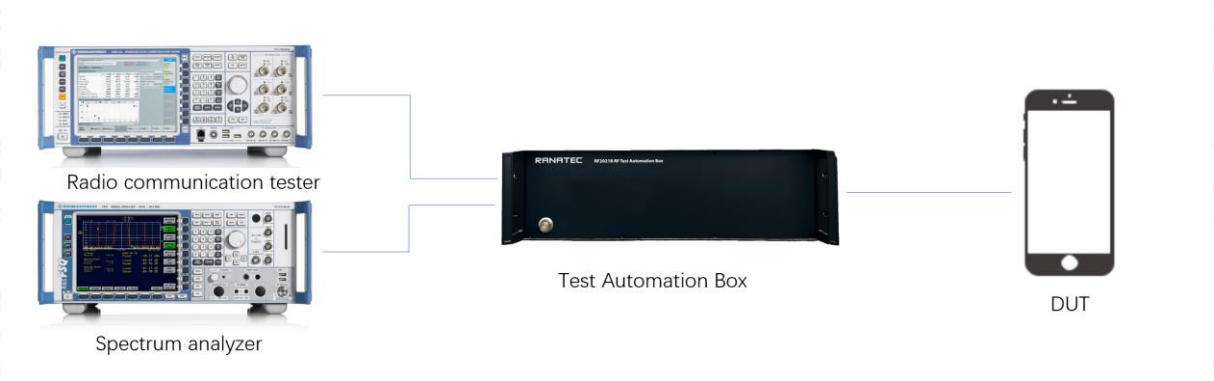
6.8.1 Summary

CFR Part 22.913(d)/24.232(d)/27.50 :The peak-to-average ratio (PAR) of the transmission must not exceed 13 dB

6.8.2 Method of Measurement

The peak-to-average power ratio (PAPR) of the transmitter output power must not exceed 13 dB. The PAPR measurements should be made using either an instrument with complementary cumulative distribution function (CCDF) capabilities to determine that PAPR will not exceed 13 dB for more than 0.1 percent of the time or other Commission approved procedure. The measurement must be performed using a signal corresponding to the highest PAPR expected during periods of continuous transmission.
According to KDB 971168 5.7:
a) Refer to instrument's analyzer instruction manual for details on how to use the power statistics/CCDF function;
b) Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;
c) Set the number of counts to a value that stabilizes the measured CCDF curve;
d) Set the measurement interval to 1 ms
e) Record the maximum PAPR level associated with a probability of 0.1%

6.8.3 Test Setup



6.8.4 Measurement results

Band	Channel	BandWidth	RbMode	QPSK(dBm)	Q16(dBm)
TDD41	Low	20	fullRB	8.17	10.00
TDD41	Mid	20	fullRB	8.69	10.32
TDD41	High	20	fullRB	9.52	10.87

Annex A: Revised History

Version	Revised Content
V00	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