FCC PART 90S TEST REPORT

Report Number	BWTR-2025-NAPCE
FCC ID	2ADOBHLTE232E
Applicant	Hisense International Co., Ltd.
Product Name	Mobile Phone
Marketing Name	Hisense E50
Brand Name	Hisense
Model Name	HLTE232E
Serial Number	No.1 (1st Source): 869130050001937 No.2 (2nd Source): 869130050001515
Test Standard	FCC 47 CFR Part 90 Subpart S
Tested Date	Nov. 15, 2020 - Nov. 23, 2020

CONTENTS

Revision History

Revision	Description	Issued Date
A	Initial issue of report	2020/11/24
B	Update the information of Manufacturer in section 2.2	2020/11/25

1 Summary of Test Result

Report Section	FCC Section	Description	Result
3.1	90.635 (b)	RF Output Power and Effective Radiated Power	Pass
3.2	KDB 971168 D01 - 5.7	Peak to Average Power Ratio (PAPR)	Pass
3.3	90.209 (a)	Occupied Bandwidth	Pass
3.4	90.691	Spurious Emission at Antenna Terminal	Pass
3.5	90.691	Field Strength of Spurious Radiation	Pass
3.6	90.691	Band Edge	Pass
3.7	90.213	Frequency Stability	Pass

We, Beijing Boomwave Test Service Co. Ltd., would like to declare that the tested sample has been evaluated and in compliance with the requirements of applicable standards.

Prepared by: 2020.11.25 17:41:49 +08'00'

Reviewed by: 2020.11.25 17:51:30 +08'00'

Approved by: 2020.11.25 18:52:13 +08'00'

Rationale:
The test results in this report apply exclusively to the tested model / sample.
The electrical copy of test report is invalid without the signatures. The hard copy is invalid without seal.
The test report shall not be modified, republished or copied without the written authorization of the laboratory.

2 General Information

2.1 Applicant

Hisense International Co., Ltd.

Floor 22, Hisense Tower, 17 Donghai Xi Road, Qingdao, 266071, China

2.2 Manufacturer

Hisense Communications Co., Ltd.

218 Qianwangang Road, Qingdao Economic & Technological Development Zone, Qingdao, China

2.3 Product Feature of Equipment Under Test

Product Name	Mobile Phone
Marketing Name	Hisense E50
Model Name	HLTE232E
Sample Status	Production
Operating Frequency Range	814MHz~824MHz
Type of Wireless Technology	FDD LTE - Band 26
Modulation Type	QPSK, 16QAM
Channel Bandwidth	1.4MHz, 3MHz, 5MHz, 10MHz
Antenna Type	Internal Antenna
Antenna Gain	-0.95dBi
Extreme Operating Temperature	Minimum: 0℃
	Maximum: +55℃
Power Supply	Normal Voltage: 3.50V
	Lowest Voltage: 3.80V
	Highest Voltage: 4.35V
Hardware Version	FS185-MB-V5.0
Software Version	Hisense_HLTE232E_10_S01_01_01_MX05 _debug_KS232D_0003673_20201107_0713
Sample Received Date	2020/11/13

2.4 Ancillary Equipment

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following ancillary equipment were used to form a representative test configuration during the tests.

Support Unit	Li-Lon Battery
Manufacturer	Shenzhen Aerospace Electronic Co.,Ltd
Model Name	PLG496590
Capacity	5000mAh
Nominal Voltage	4.40V
Serial Number	---

Note: This battery model is only used by EUT No.1.

Support Unit	Li-Lon Battery
Manufacturer	DONGGUANG MILEY Electronic Co.,Ltd
Model Name	PLG496590
Capacity	5000mAh
Nominal Voltage	4.40V
Serial Number	---

Note: This battery model is only used by EUT No.2.

2.5 Description of Test Modes

The EUT has two sources whose differences are only the battery, camera and fingerprint. So all tests in this test report were performed with EUT No.1 (1st Source), except for secton 3.5 Field Strength of Spurious Radiation.

The EUT was linked by base station simulator to work in continious trasmitting and receiving mode. Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, bandwidth, resource block (RB) and RB offset.

Following channels were selected for test:

Channel Bandwidth	Low Channel		Mid Channel		High Channel	
	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.
1.4MHz	814.7	26697	819.0	26740	823.3	26783
3MHz	815.5	26705	819.0	26740	822.5	26775
5MHz	816.5	26715	819.0	26740	821.5	26765
10MHz	---		819.0	26740	---	

Following modes were selected as the worst case configuration for each test:

Test Items	Channel	BW (MHz)	RB Size	RB Offset	Modulation	Antenna Orientation
RF Output Power	L\M\H	1.4	1\3\6	0\1\3\5	QPSK,16QAM	N/A
		3	1\8\15	0\8\14\4\7		
		5	1\12\25	0\12\24\7\13		
		10	1\24\50	0\25\49\12		
Peak to Average Power Ratio	L\M\H	1.4	1\6	5\0	QPSK,16QAM	N/A
		3	1\15	14\0		
		5	1\25	24\0		
		10	1\50	49\0		
Effective Radiated Power	L\M\H	1.4\3\5\10	1	0	QPSK,16QAM	X axis
Occupied Bandwidth	L\M\H	1.4	6	0	QPSK,16QAM	N/A
		3	15			
		5	25			
		10	50			
Spurious Emission at Antenna Terminal	M	10	1	49	QPSK	N/A
Field Strength of Spurious Radiation	M	10	1	0	QPSK	X axis
Band Edge	L\H	1.4	1\6	0\5	QPSK	N/A
		3	1\15	0\14		
		5	1\25	0\24		
		10	1\50	0\49		
Frequency Stability	L\H	1.4\3\5\10	1	0	QPSK	N/A

2.6 Applicable Standards

Standard	Version	Title
FCC 47 CFR Part 90 Subpart S	2019	Regulations Governing Licensing and Use of Frequencies in the 806-824, 851-869, 896-901, and 935-940 MHz Bands
ANSI C63.26	2015	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services

2.7 Test Facilities

Company Name: Beijing Boomwave Test Service Co. Ltd

Address: EMC Building, No.1 Wang Jing East Road, Chao Yang District Beijing, P.R. China 100102

FCC Test Firm Registration Number: 613197

ISED Canada Registration No.: 24289 (CAB Identifier: CN0010)

VCCI Registration No.: R-20062, G-20063, C-20050, T-20049

Test Site	Description	Dimension	Ground Plane Size
☐ SAC10	10m semi-anechoic chamber	19.5m×12.9m×8.6m	4m×4m
☒ SAC3	3m semi-anechoic chamber	9.6m×6.4m×6.0m	9.6m×6.4m
☐ SR#1	Shielding Room for EMS test	8.1m×4.05m×2.755m	8.1m×4.05m
☒ SR#2	Shielding Room for RF test	8.1m×4.05m×2.755m	---

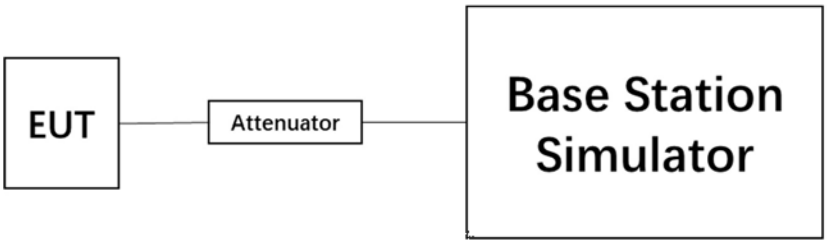
3 Test Result

3.1 RF Output Power and Effective Radiated Power

3.1.1. Limit

FCC 47 CFR Part 90 Subpart S - §90.635(b)
The maximum output power of the transmitter for mobile station is 100 watts (20dBw).

3.1.2. Test Setup



3.1.3. Test Procedures

1) The measurement procedure follows ANSI C63.26-2015, clause 5.2.
2) The RF output of EUT and BS simulator are connected via a sufficient attenuation.
3) EUT is configured to transmit the maximum output power while the measurement is performed.
4) Then calculate the ERP from:
   ERP (dBm) = PMeas (dBm) + G_T (dBi) – L_C (dB) – 2.15
   where:
   ERP = effective radiated power
   PMeas: measured transmitter output power or PSD
   G_T: gain of the transmitting antenna
   L_C: signal attenuation in the connecting cable between the transmitter and antenna

3.1.4. Test Result

Test Engineer	Xu Dongxu	Test Date	2020/11/15
Temperature	22.1°C	Relative Humidity	46.1%
Pressure	102.1kPa	Test Sample Selected	No.1

Modulation Type	Frequency (MHz)	BW (MHz)	RB Size	RB Offset	Output Power (dBm)
QPSK	814.7	1.4	1	0	22.81
			1	3	22.81
			1	5	22.90
			3	0	22.89
			3	1	22.79
			3	3	22.85
			6	0	21.78
	819.0		1	0	22.33
			1	3	22.29
			1	5	22.42
			3	0	21.87
			3	1	21.96
			3	3	21.85
			6	0	20.98
	823.3		1	0	22.71
			1	3	22.68
			1	5	22.77
			3	0	22.27
			3	1	22.35
			3	3	22.22
			6	0	21.37
16QAM	814.7	1.4	1	0	22.39
			1	3	22.24
			1	5	22.10
			3	0	21.94
			3	1	21.93
			3	3	21.91
			6	0	21.03
	819.0		1	0	22.31
			1	3	22.18
			1	5	22.03
			3	0	21.50
			3	1	21.69
			3	3	21.59
			6	0	20.53
	823.3		1	0	22.42
			1	3	22.33
			1	5	22.18
			3	0	21.65
			3	1	21.81
			3	3	21.70
			6	0	20.67

Modulation Type	Frequency (MHz)	BW (MHz)	RB Size	RB Offset	Output Power (dBm)
QPSK	815.5	3	1	0	22.85
			1	8	22.90
			1	14	22.88
			8	0	21.84
			8	4	21.81
			8	7	21.80
			15	0	21.76
	819.0		1	0	22.92
			1	8	22.84
			1	14	22.84
			8	0	21.82
			8	4	21.84
			8	7	21.83
			15	0	21.84
	822.5		1	0	22.78
			1	8	22.66
			1	14	22.78
			8	0	21.66
			8	4	21.57
			8	7	21.57
			15	0	21.69
16QAM	815.5	3	1	0	22.02
			1	8	22.10
			1	14	22.08
			8	0	21.17
			8	4	21.17
			8	7	21.17
			15	0	20.83
	819.0		1	0	22.36
			1	8	22.26
			1	14	22.53
			8	0	20.85
			8	4	20.88
			8	7	20.88
			15	0	20.83
	822.5		1	0	21.33
			1	8	21.28
			1	14	21.43
			8	0	20.78
			8	4	20.70
			8	7	20.69
			15	0	20.58

Modulation Type	Frequency (MHz)	BW (MHz)	RB Size	RB Offset	Output Power (dBm)
QPSK	816.5	5	1	0	22.86
			1	12	22.82
			1	24	22.81
			12	0	21.86
			12	7	21.69
			12	13	21.69
			25	0	21.78
	819.0		1	0	23.05
			1	12	22.80
			1	24	22.79
			12	0	21.68
			12	7	21.70
			12	13	21.70
			25	0	21.71
	821.5		1	0	22.69
			1	12	22.52
			1	24	22.50
			12	0	21.65
			12	7	21.52
			12	13	21.51
			25	0	21.77
16QAM	816.5	5	1	0	21.23
			1	12	21.18
			1	24	21.18
			12	0	20.80
			12	7	20.72
			12	13	20.72
			25	0	20.88
	819.0		1	0	21.73
			1	12	21.77
			1	24	21.72
			12	0	20.75
			12	7	20.62
			12	13	20.63
			25	0	20.75
	821.5		1	0	21.56
			1	12	21.51
			1	24	21.60
			12	0	20.63
			12	7	20.63
			12	13	20.58
			25	0	20.59

Modulation Type	Frequency (MHz)	BW (MHz)	RB Size	RB Offset	Output Power (dBm)
QPSK	819.0	10	1	0	22.82
			1	25	22.77
			1	49	22.76
			25	0	21.92
			25	12	21.77
			25	25	21.77
			50	0	21.65
16QAM	819.0	10	1	0	22.20
			1	25	22.10
			1	49	22.10
			25	0	20.71
			25	12	20.83
			25	25	20.84
			50	0	20.83

Modulation	BW (MHz)	Frequency (MHz)	RB/RB offset	Output Power (dBm)	ERP (dBm)	ERP (W)
QPSK	1.4	814.7	1#0	22.81	19.71	0.09
QPSK	1.4	819.0	1#0	22.33	19.23	0.08
QPSK	1.4	823.3	1#0	22.71	19.61	0.09
16QAM	1.4	814.7	1#0	22.39	19.29	0.09
16QAM	1.4	819.0	1#0	22.31	19.21	0.08
16QAM	1.4	823.3	1#0	22.42	19.32	0.09
QPSK	3	815.5	1#0	22.85	19.75	0.09
QPSK	3	819.0	1#0	22.92	19.82	0.10
QPSK	3	822.5	1#0	22.78	19.68	0.09
16QAM	3	815.5	1#0	22.02	18.92	0.08
16QAM	3	819.0	1#0	22.36	19.26	0.08
16QAM	3	822.5	1#0	21.33	18.23	0.07
QPSK	5	816.5	1#0	22.86	19.76	0.10
QPSK	5	819.0	1#0	23.05	19.95	0.10
QPSK	5	821.5	1#0	22.69	19.59	0.09
16QAM	5	816.5	1#0	21.23	18.13	0.07
16QAM	5	819.0	1#0	21.73	18.63	0.07
16QAM	5	821.5	1#0	21.56	18.46	0.07
QPSK	10	819.0	1#0	22.82	19.72	0.09
16QAM	10	819.0	1#0	22.20	19.10	0.08

3.1.5. Uncertainty

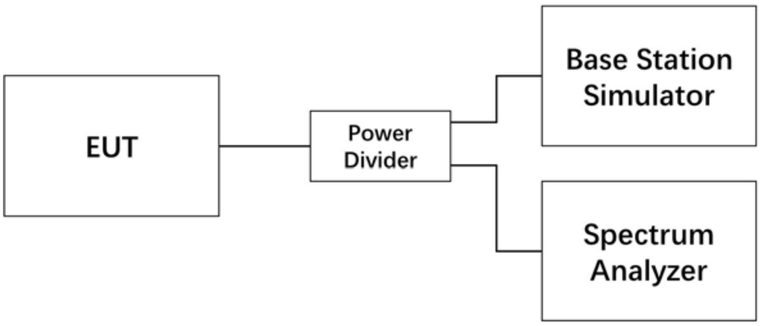
U_{lab}=1.48dB (k=2)

3.2 Peak to Average Power Ratio (PAPR)

3.2.1. Limit

In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13dB.

3.2.2. Test Setup



3.2.3. Test Procedures

1) The measurement procedure follows ANSI C63.26-2015, clause 5.2.6.
2) The RF output of the EUT, BS simulator and spectrum analyzer are connected via a power divider.
3) Measure the total peak power and record as P_{Pk}.
4) Measure the total average power and record as P_{Avg}.
5) Calculate the PAPR from: PAPR (dB) = P_{Pk} (dBm) - P_{Avg} (dBm).

3.2.4. Test Result

Test Engineer	Xu Dongxu	Test Date	2020/11/17
Temperature	22.4°C	Relative Humidity	46.6%
Pressure	102.1kPa	Test Sample Selected	No.1

Frequency (MHz)	Channel No.	BW (MHz)	RB Size	RB Offset	QPSK	16-QAM
814.7	26697	1.4	1	5	Fig.1	Fig.2
814.7	26697	1.4	6	0	Fig.3	Fig.4
819	26740	1.4	1	5	Fig.5	Fig.6
819	26740	1.4	6	0	Fig.7	Fig.8
823.3	26783	1.4	1	5	Fig.9	Fig.10
823.3	26783	1.4	6	0	Fig.11	Fig.12
815.5	26705	3	1	14	Fig.13	Fig.14
815.5	26705	3	15	0	Fig.15	Fig.16
819	26740	3	1	14	Fig.17	Fig.18
819	26740	3	15	0	Fig.19	Fig.20
822.5	26775	3	1	14	Fig.21	Fig.22
822.5	26775	3	15	0	Fig.23	Fig.24
816.5	26715	5	1	24	Fig.25	Fig.26
816.5	26715	5	25	0	Fig.27	Fig.28
819	26740	5	1	24	Fig.29	Fig.30
819	26740	5	25	0	Fig.31	Fig.32
821.5	26765	5	1	24	Fig.33	Fig.34
821.5	26765	5	25	0	Fig.35	Fig.36
819	26740	10	1	49	Fig.37	Fig.38
819	26740	10	50	0	Fig.39	Fig.40

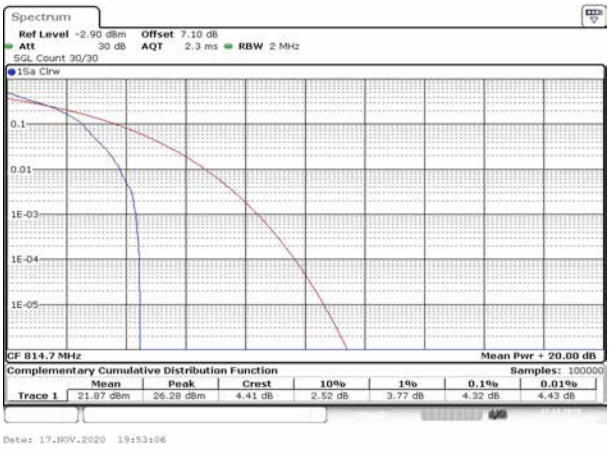


Fig.1

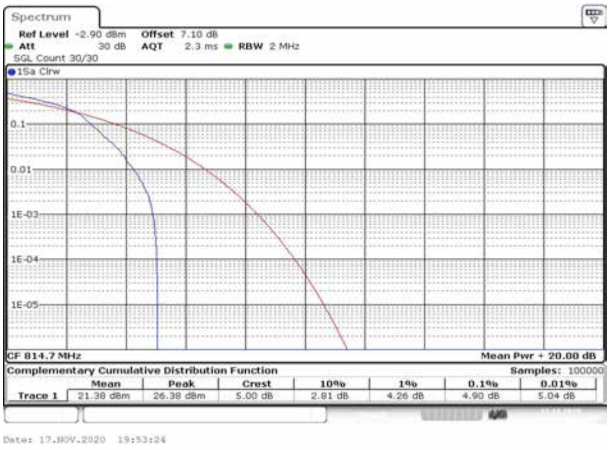


Fig.2

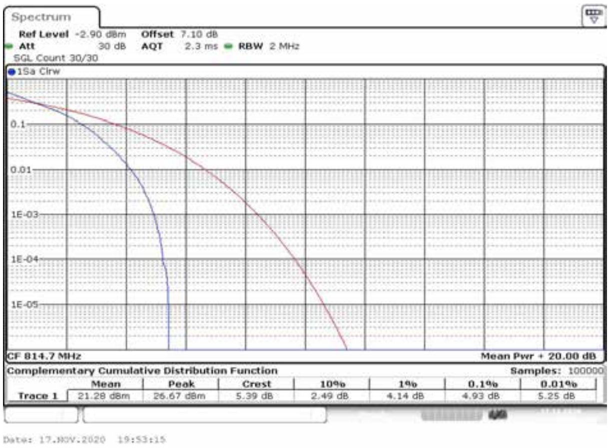


Fig.3

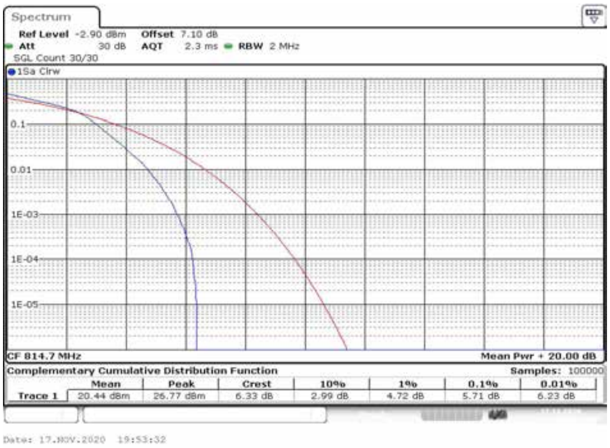


Fig.4

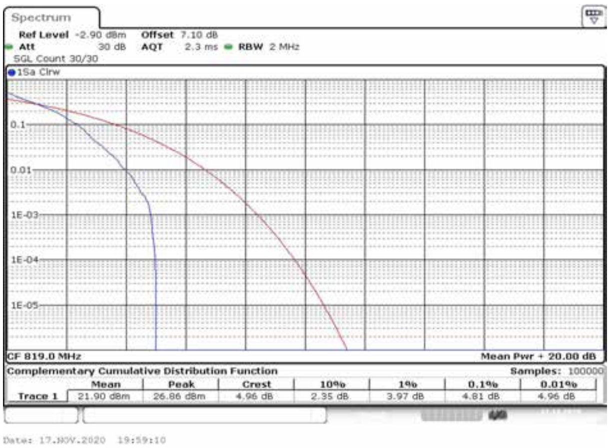


Fig.5

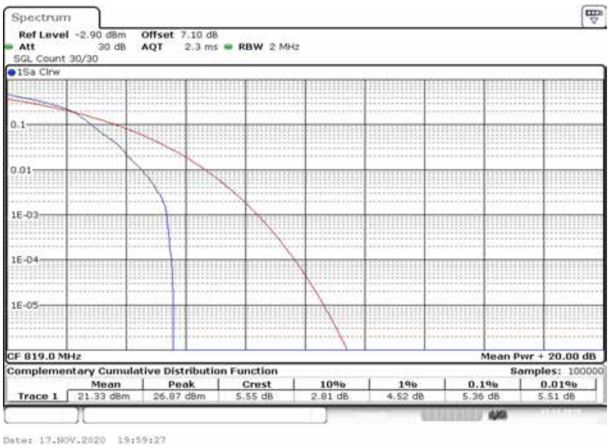


Fig.6

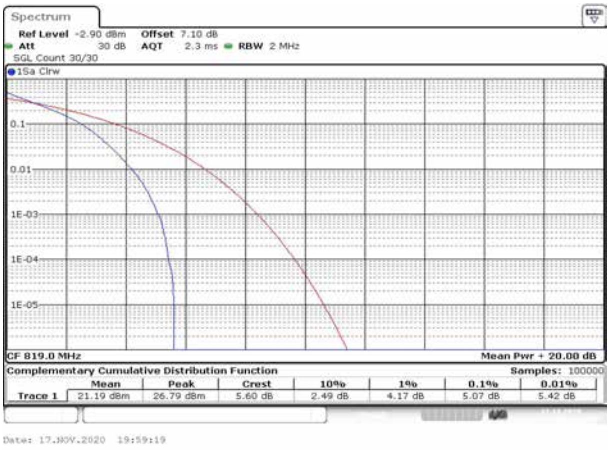


Fig.7

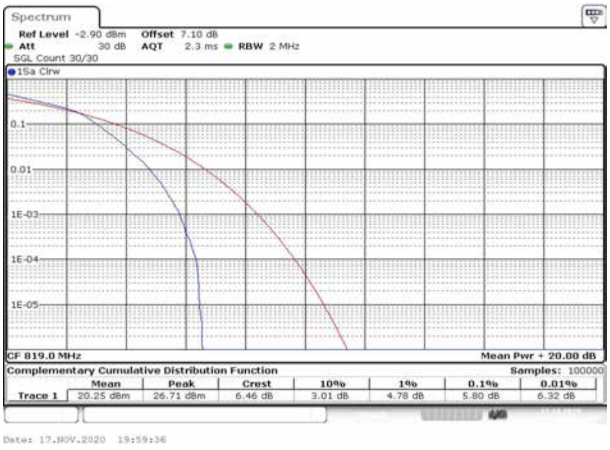


Fig.8

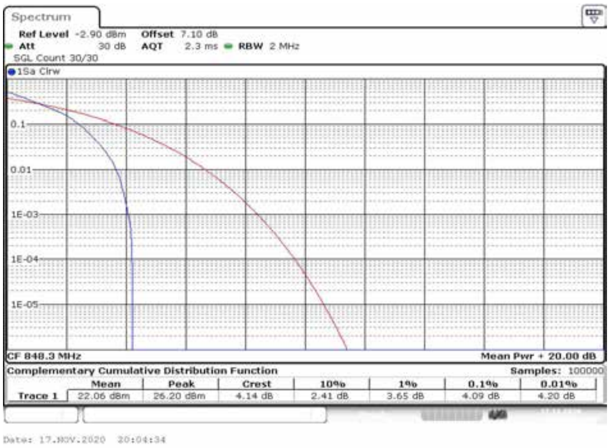


Fig.9

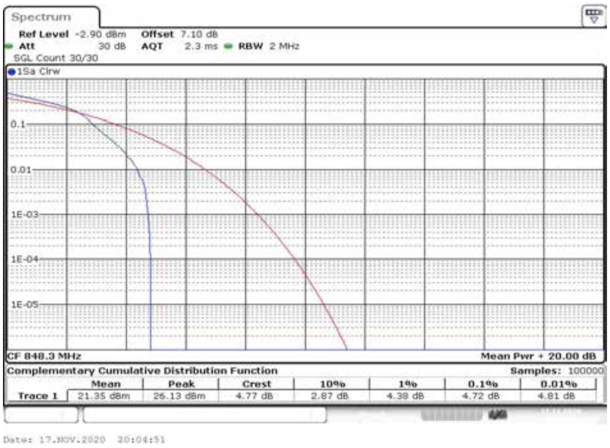


Fig.10

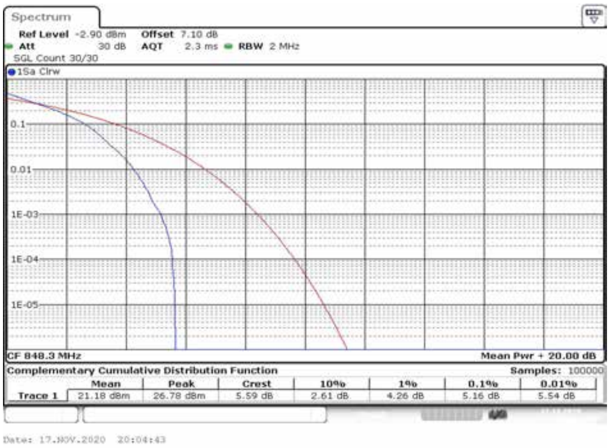


Fig.11

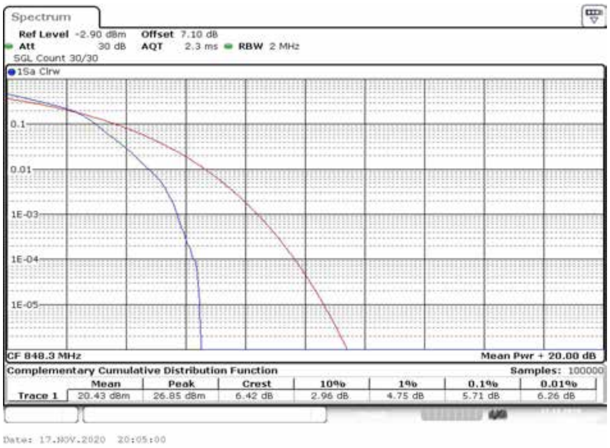


Fig.12

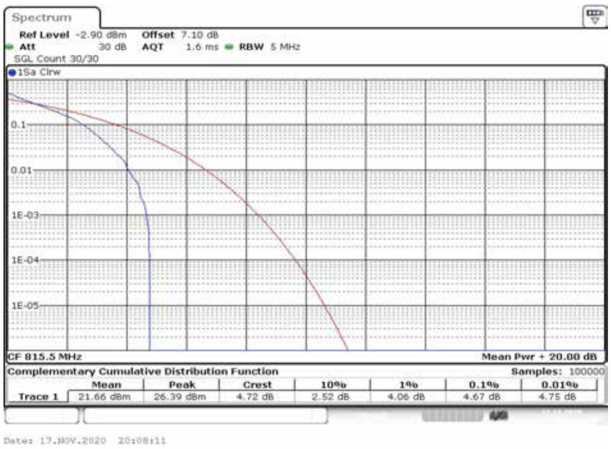


Fig.13

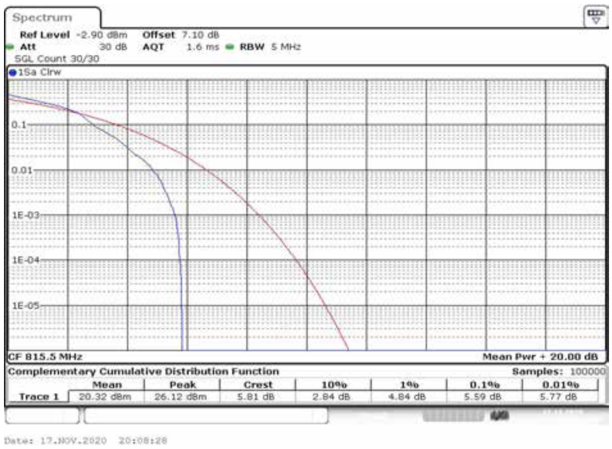


Fig.14

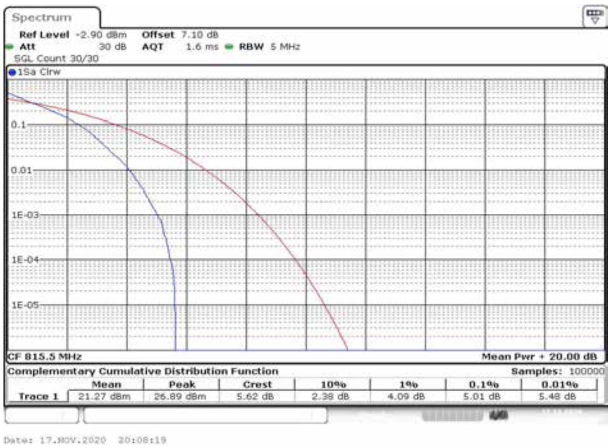


Fig.15

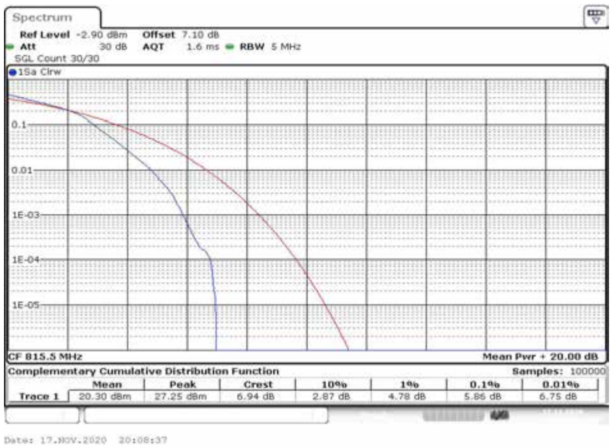


Fig.16

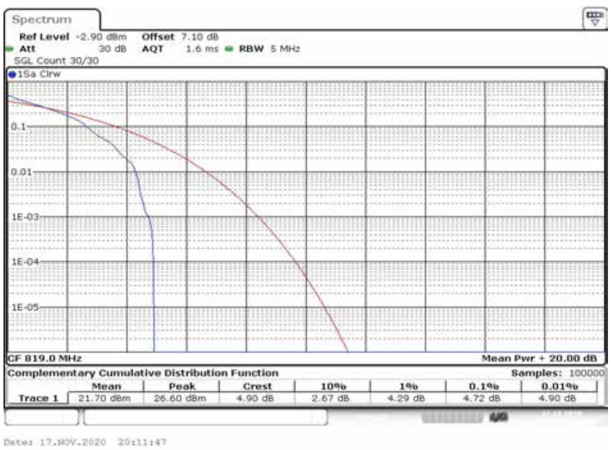


Fig.17

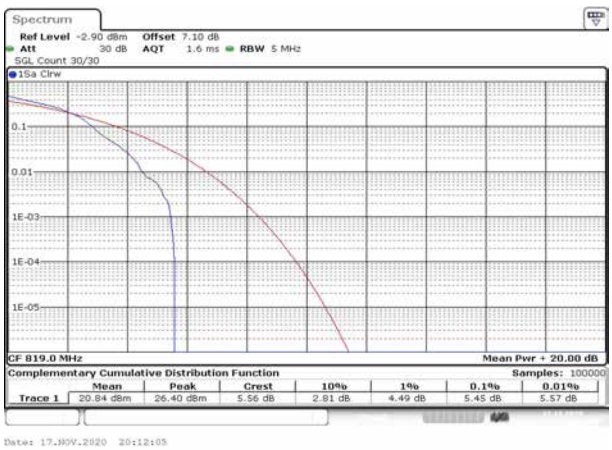


Fig.18

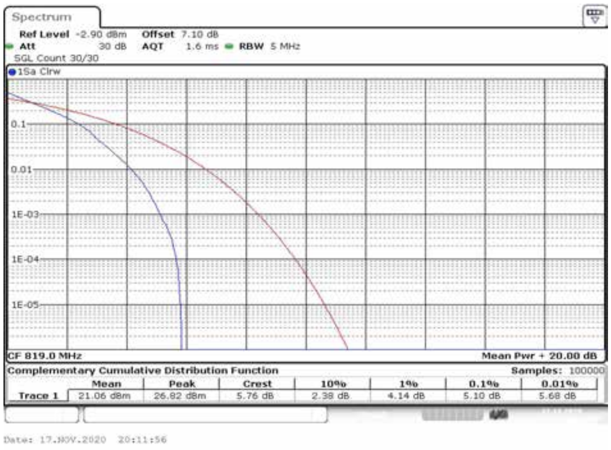


Fig.19

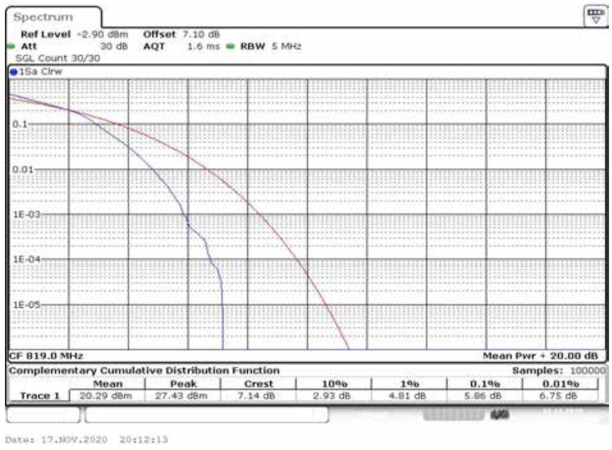


Fig.20

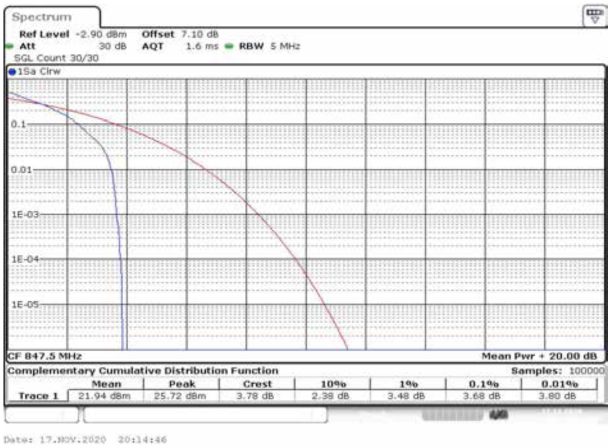


Fig.21

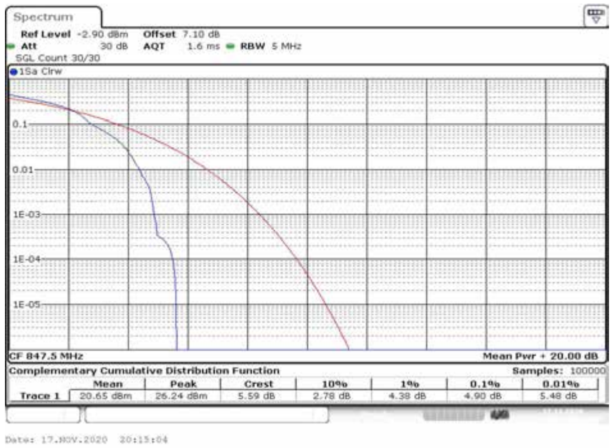


Fig.22

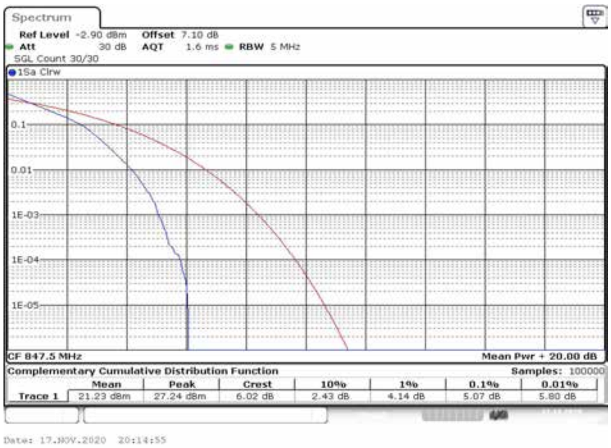


Fig.23

Fig.24

Tel: +86-010-64711866
Fax: +86-010-64711866-810

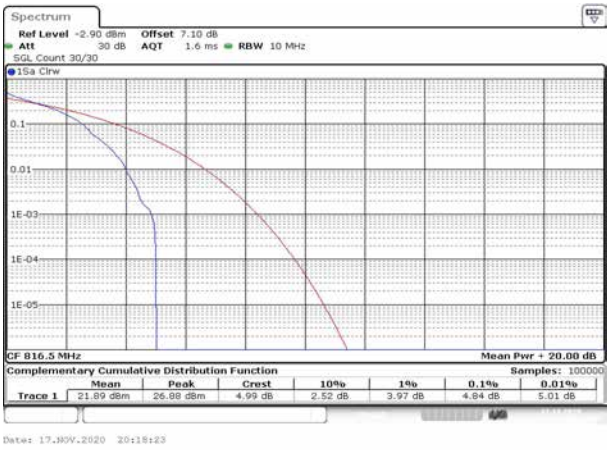


Fig.25

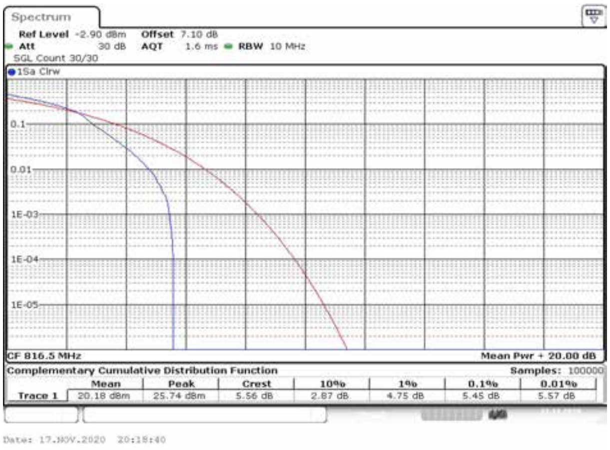


Fig.26

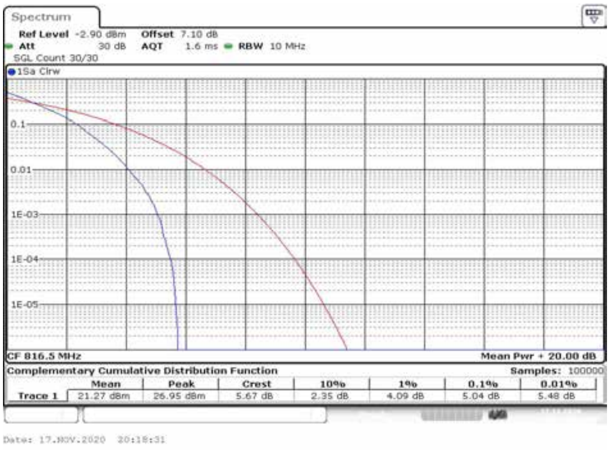


Fig.27

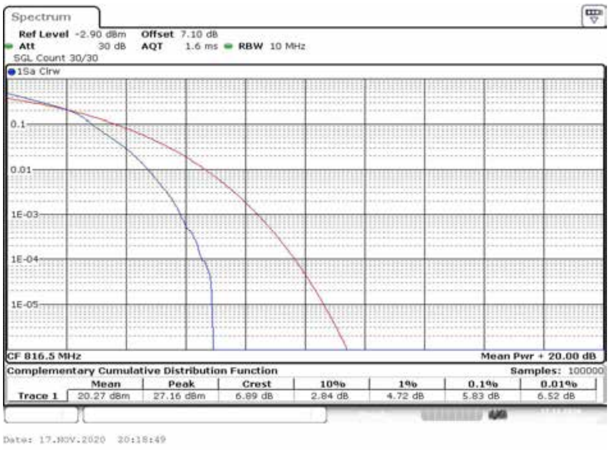


Fig.28

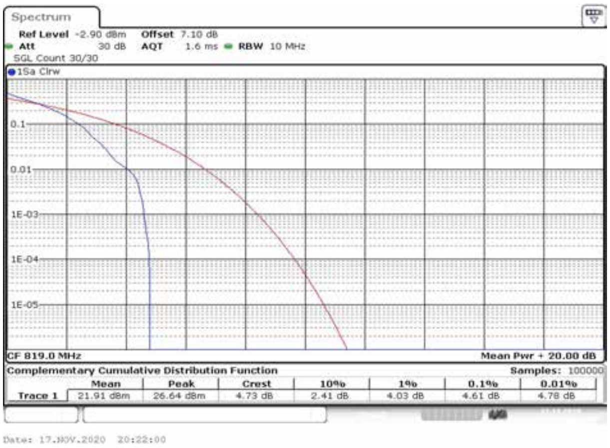


Fig.29

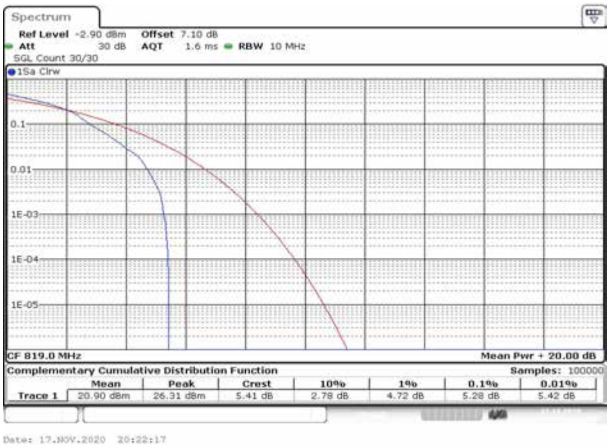


Fig.30

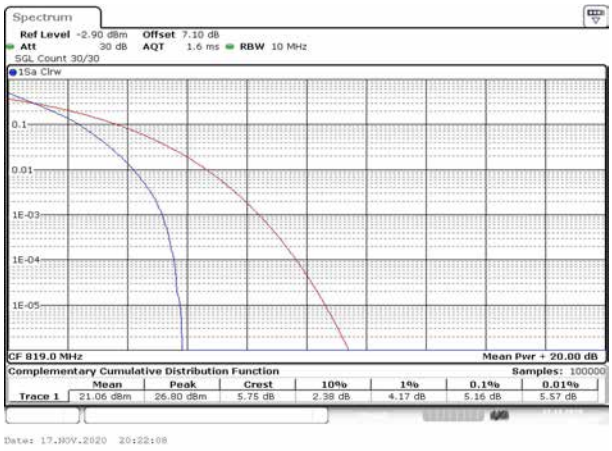


Fig.31

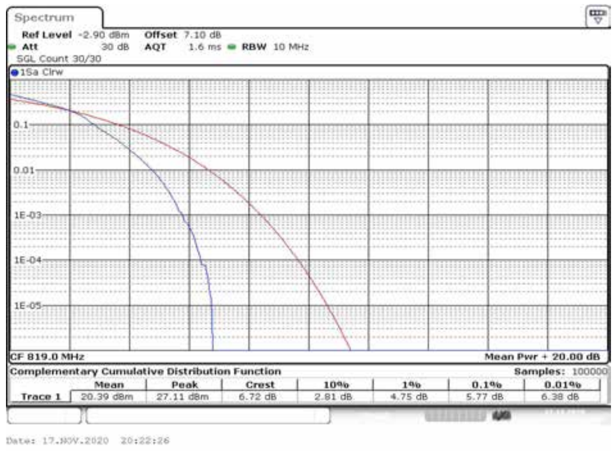


Fig.32

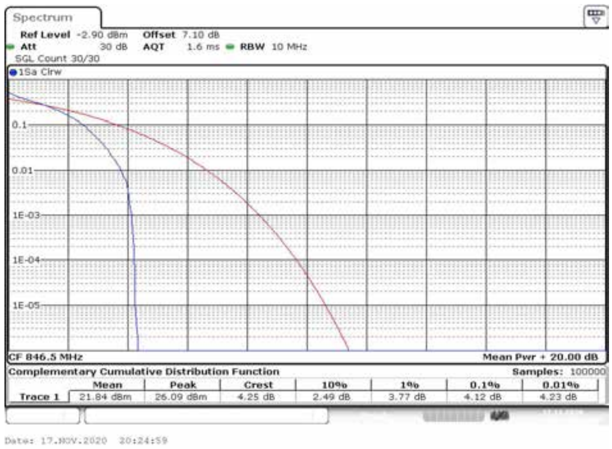


Fig.33

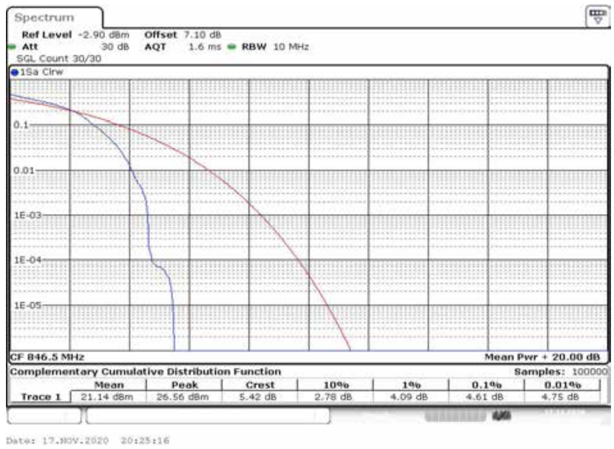


Fig.34

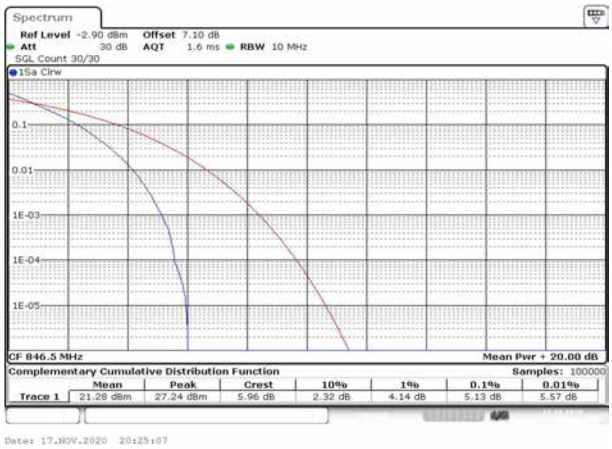


Fig.35

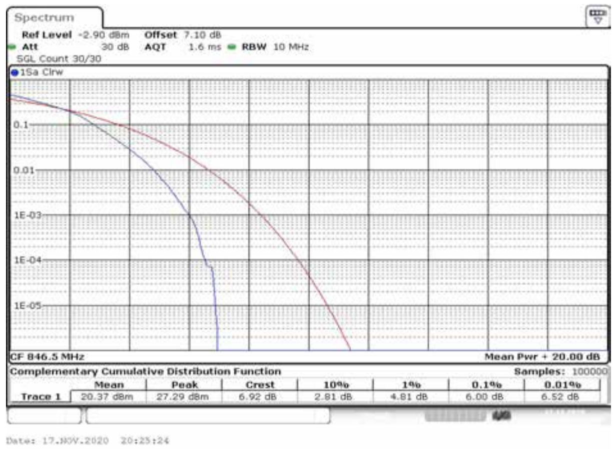


Fig.36

Tel: +86-010-64711866
Fax: +86-010-64711866-810

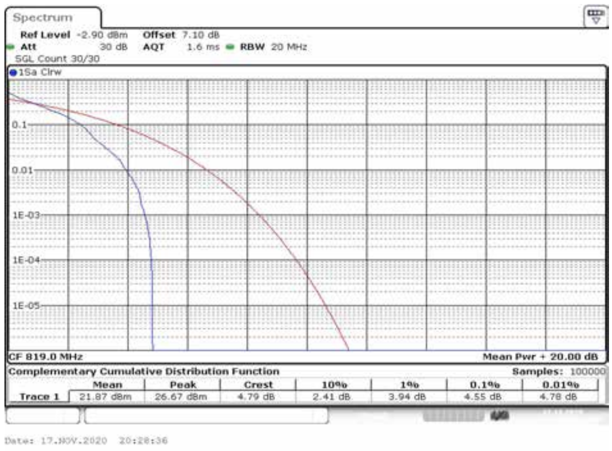


Fig.37

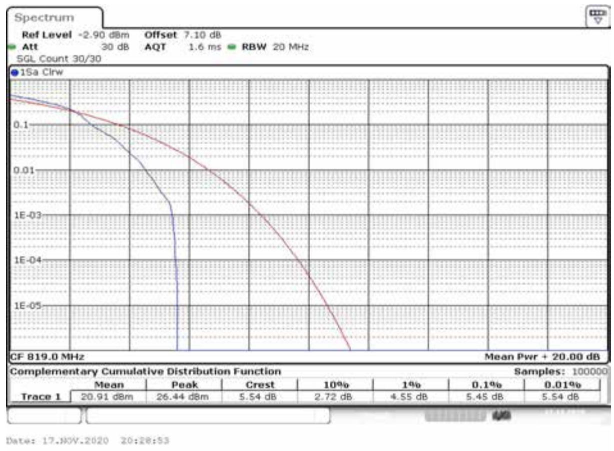


Fig.38

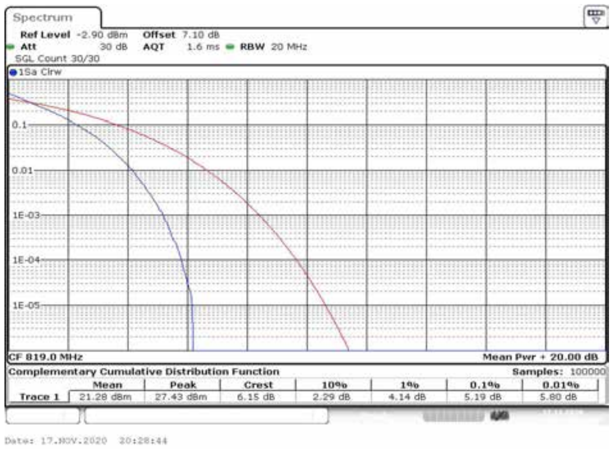


Fig.39

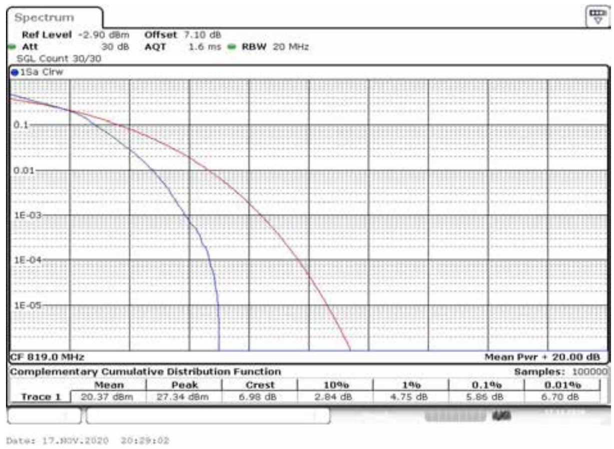


Fig.40

3.2.5. Uncertainty

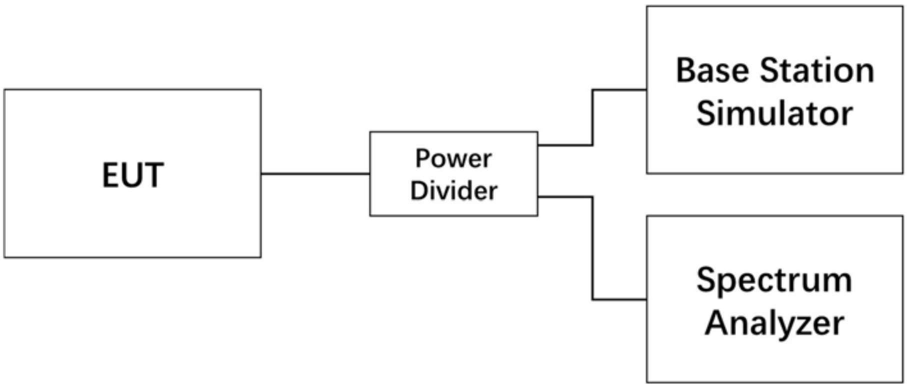
U_{lab}=2.46dB (k=2)

3.3 Occupied Bandwidth

3.3.1. Limit

FCC 47 CFR Part 90 Subpart S - §90.209 (a)
Each authorization issued to a station licensed under this part will show an emission designator representing the class of emission authorized. The designator will be prefixed by a specified necessary bandwidth. This number does not necessarily indicate the bandwidth occupied by the emission at any instant. In those cases where §2.202 of this chapter does not provide a formula for the computation of necessary bandwidth, the occupied bandwidth, as defined in part 2 of this chapter, may be used in lieu of the necessary bandwidth.

3.3.2. Test Setup



3.3.3. Test Procedures

1) The measurement procedure follows ANSI C63.26-2015, clause 5.2.7
2) The RF output of the EUT, BS simulator and spectrum analyzer are connected via a power divider.
3) The nominal RBW of spectrum analyzer shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set ≥ 3 × RBW.
4) Record the measured results of 26dB and 99% bandwidth.

3.3.4. Test Result

Test Engineer	Xu Dongxu	**Test Date**	2020/11/17
Temperature	22.4°C	**Relative Humidity**	46.6%
Pressure	102.1kPa	**Test Sample Selected**	No.1

Frequency (MHz)	Channel No.	BW (MHz)	RB Size	RB Offset	Bandwidth of 99% Power (MHz)			
					QPSK		16-QAM	
814.7	26697	1.4	6	0	1.08	Fig.1	1.09	Fig.2
819.0	26740		6	0	1.08	Fig.3	1.09	Fig.4
823.3	26783		6	0	1.08	Fig.5	1.09	Fig.6
815.5	26705	3	15	0	2.68	Fig.7	2.68	Fig.8
819.0	26740		15	0	2.68	Fig.9	2.68	Fig.10
822.5	26775		15	0	2.68	Fig.11	2.70	Fig.12
816.5	26715	5	25	0	4.47	Fig.13	4.47	Fig.14
819.0	26740		25	0	4.49	Fig.15	4.47	Fig.16
821.5	26765		25	0	4.47	Fig.17	4.47	Fig.18
819.0	26740	10	50	0	8.99	Fig.19	8.94	Fig.20

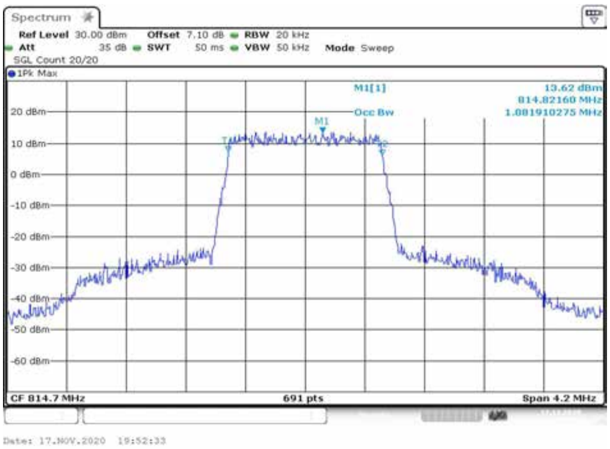


Fig.1

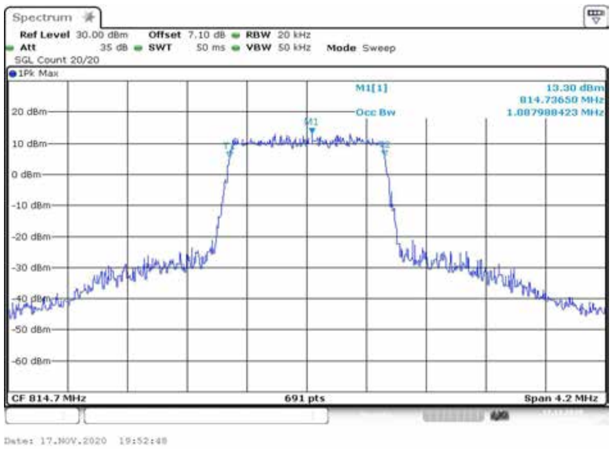


Fig.2

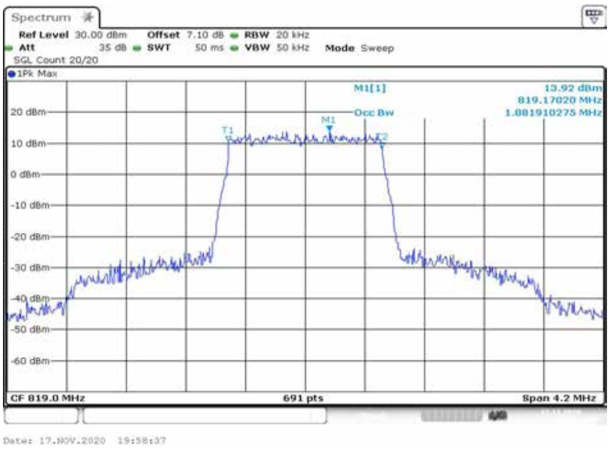


Fig.3

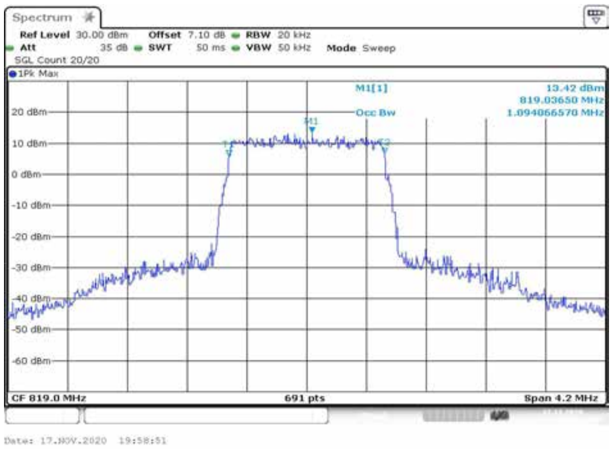


Fig.4

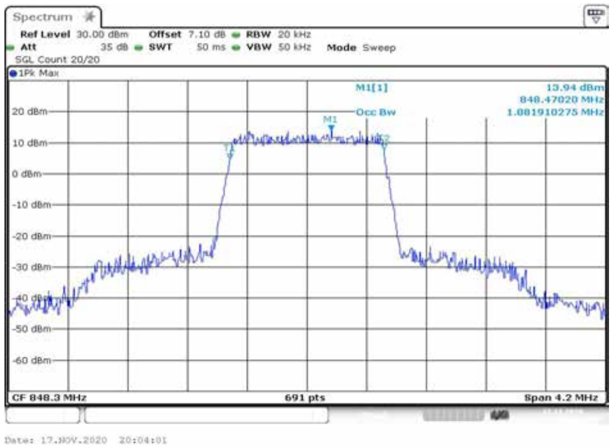


Fig.5

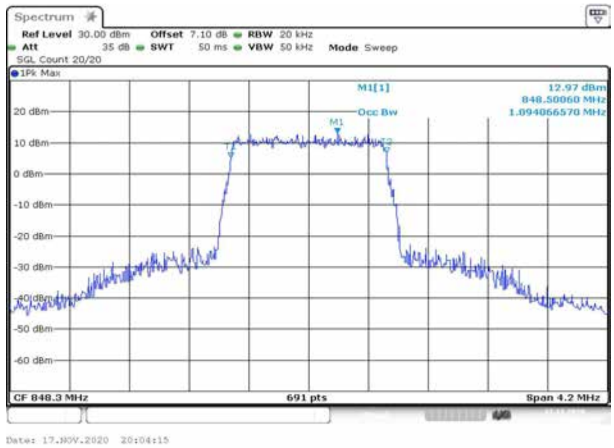


Fig.6

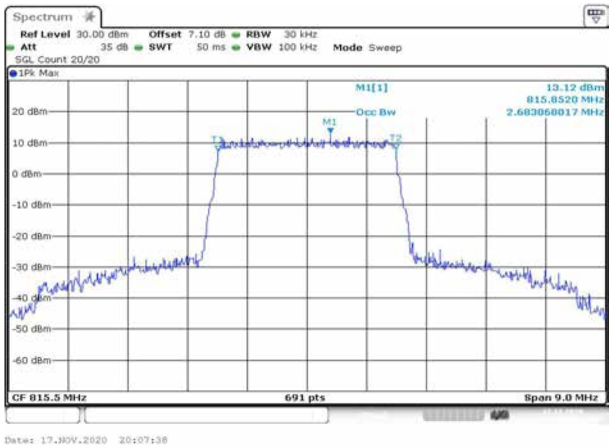


Fig.7

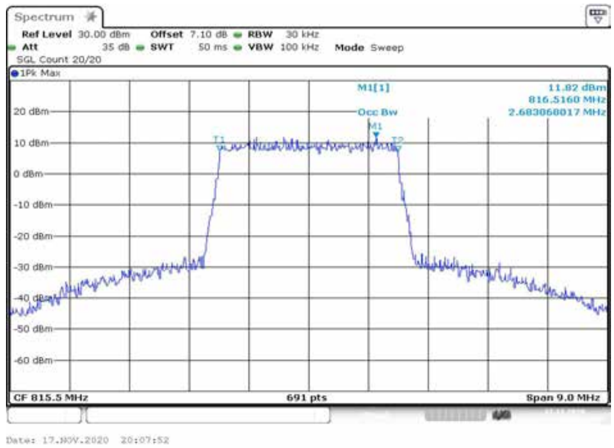


Fig.8

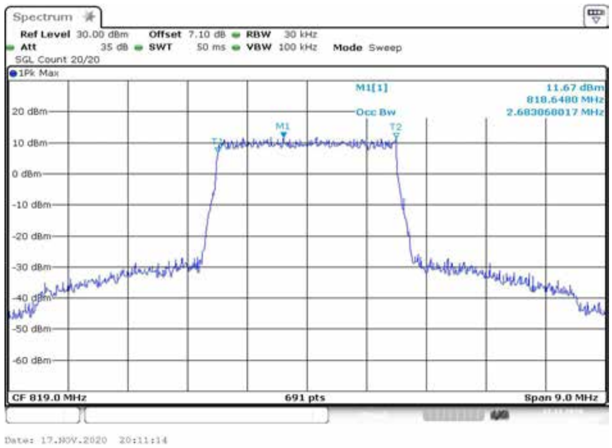


Fig.9

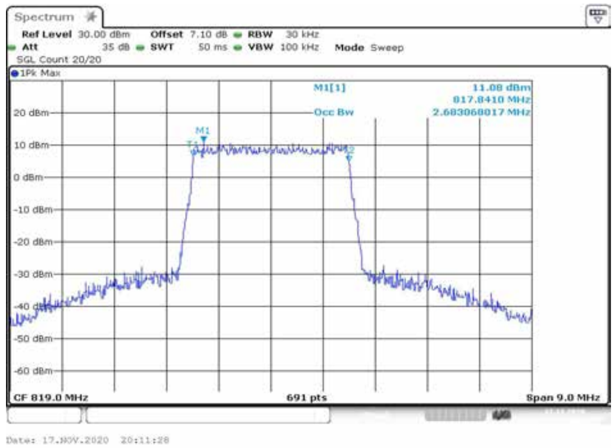


Fig.10

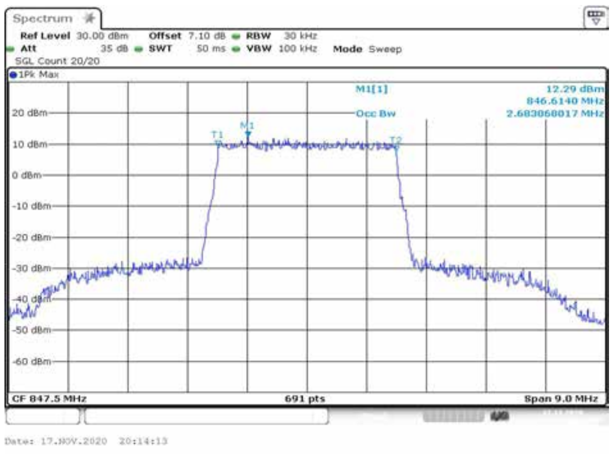
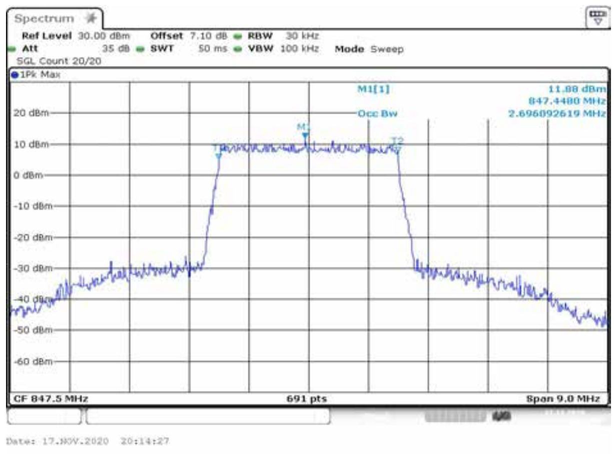
	

Fig.11	Fig.12

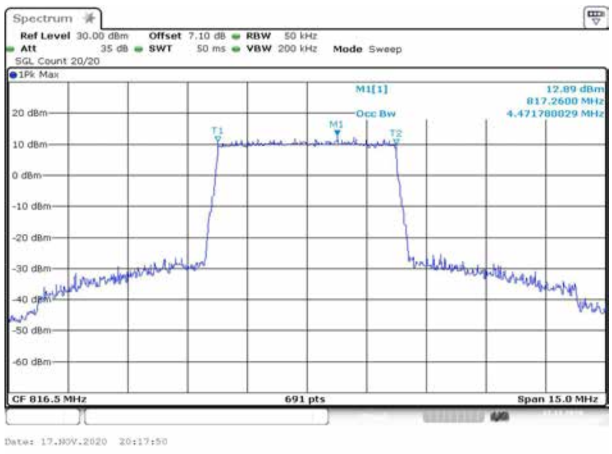
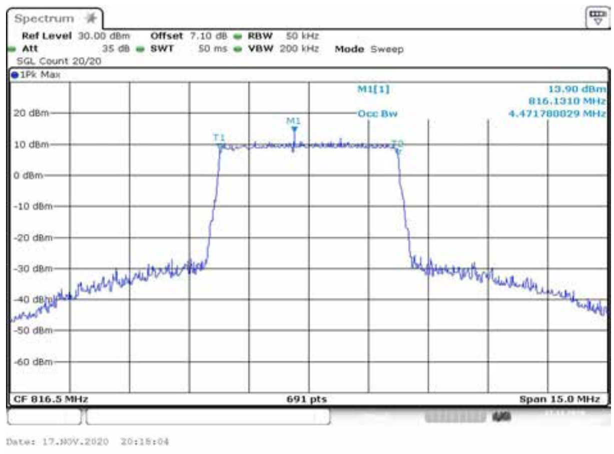

	

Fig.13	Fig.14

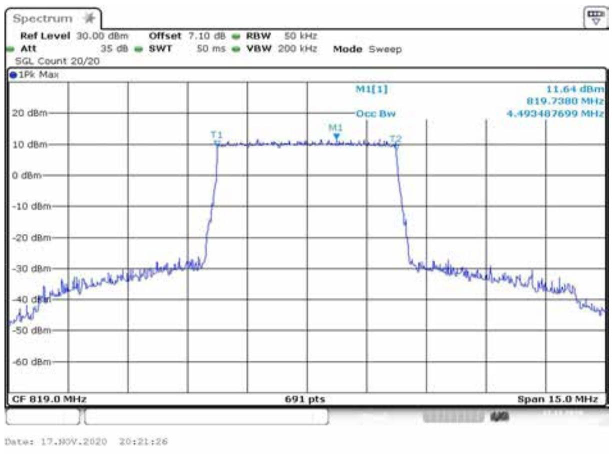
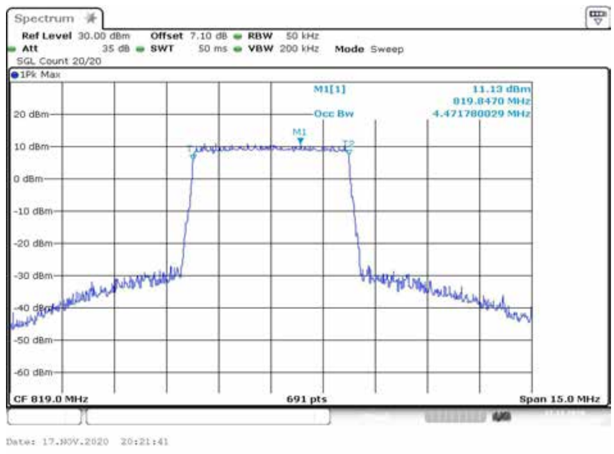

	

Fig.15	Fig.16

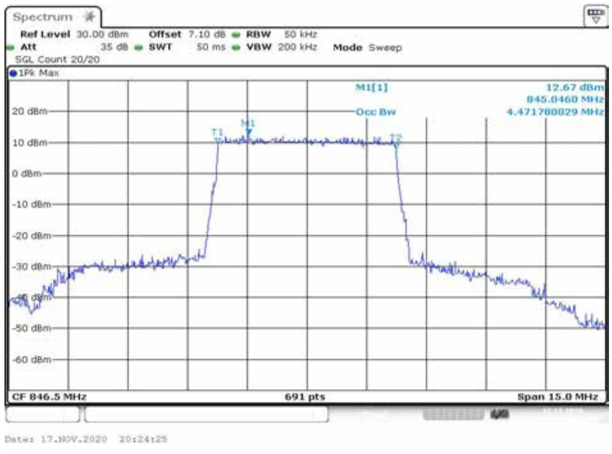


Fig.17

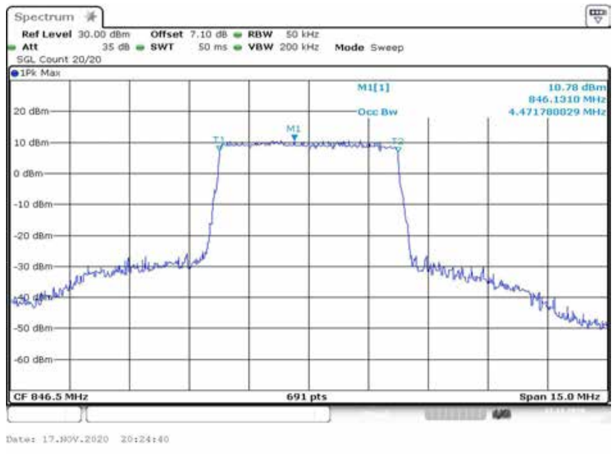


Fig.18

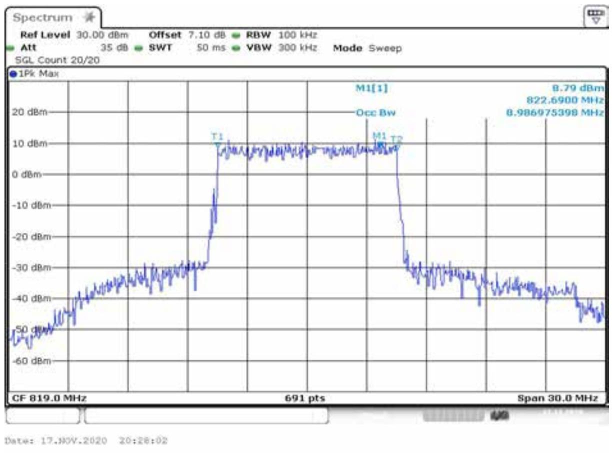


Fig.19

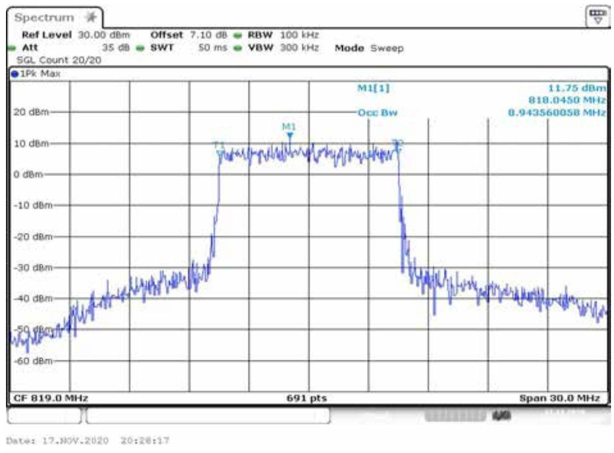


Fig.20

Frequency (MHz)	Channel No.	BW (MHz)	RB Size	RB Offset	Bandwidth of -26dB (MHz)			
					QPSK		16-QAM	
814.7	26697	1.4	6	0	1.23	Fig.1	1.25	Fig.2
819.0	26740		6	0	1.23	Fig.3	1.23	Fig.4
823.3	26783		6	0	1.23	Fig.5	1.23	Fig.6
815.5	26705	3	15	0	2.97	Fig.7	2.98	Fig.8
819.0	26740		15	0	2.97	Fig.9	2.97	Fig.10
822.5	26775		15	0	3.01	Fig.11	3.00	Fig.12
816.5	26715	5	25	0	4.88	Fig.13	4.88	Fig.14
819.0	26740		25	0	4.86	Fig.15	4.91	Fig.16
821.5	26765		25	0	4.88	Fig.17	4.93	Fig.18
819.0	26740	10	50	0	9.73	Fig.19	9.64	Fig.20

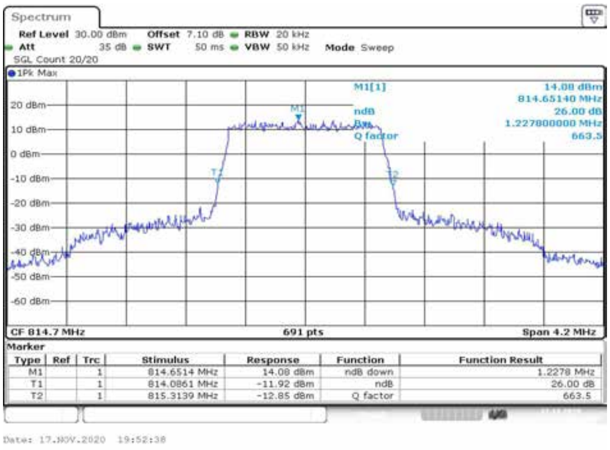


Fig.1

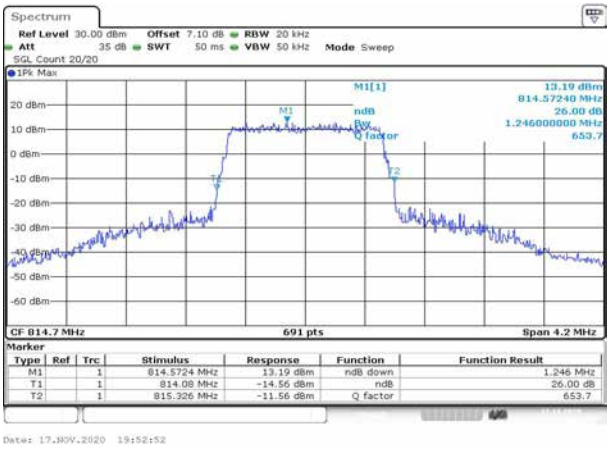


Fig.2

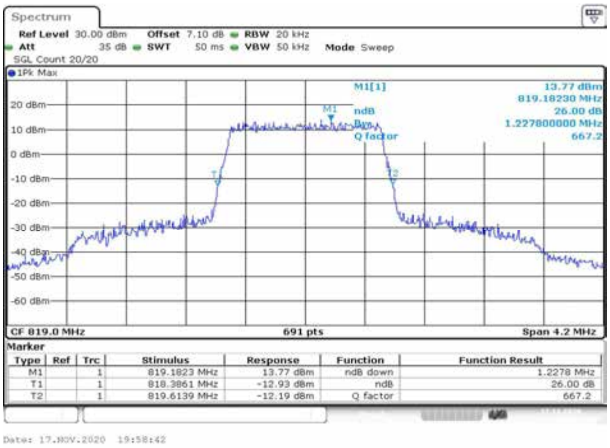


Fig.3

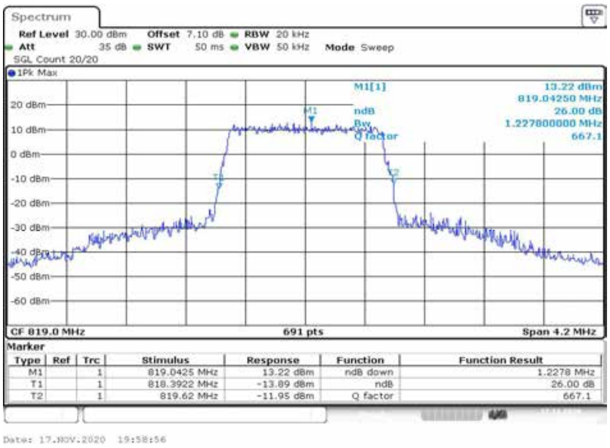


Fig.4

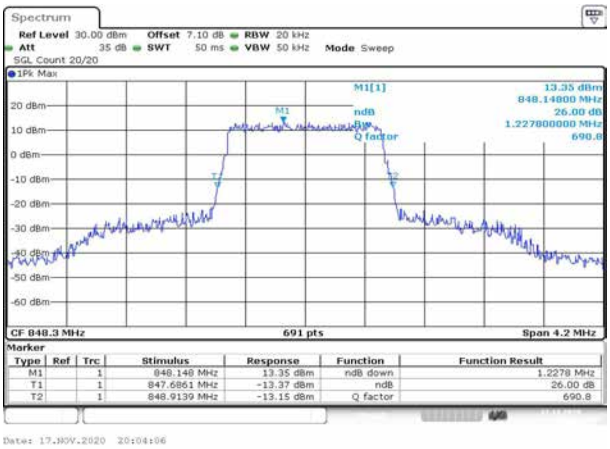


Fig.5

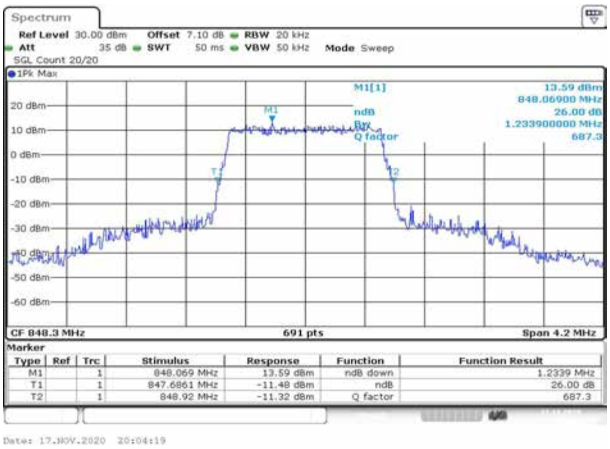


Fig.6

Tel: +86-010-64711866
Fax: +86-010-64711866-810

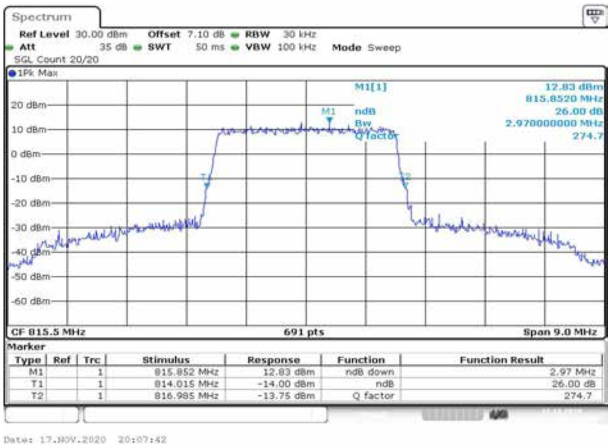


Fig.7

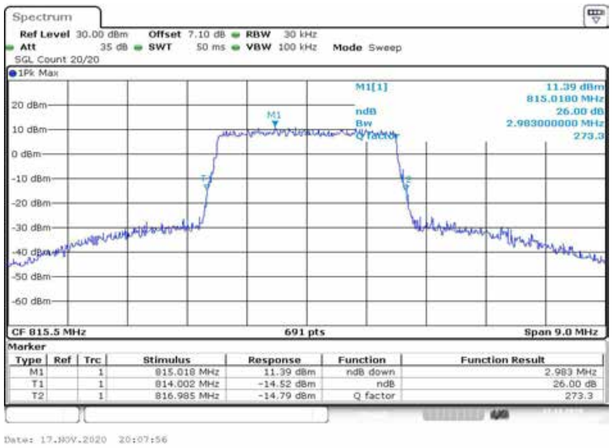


Fig.8

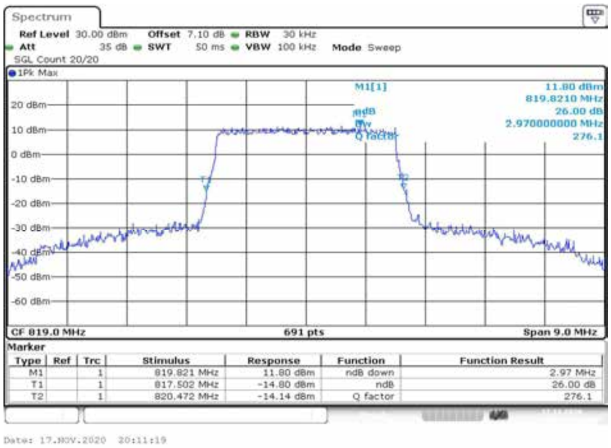


Fig.9

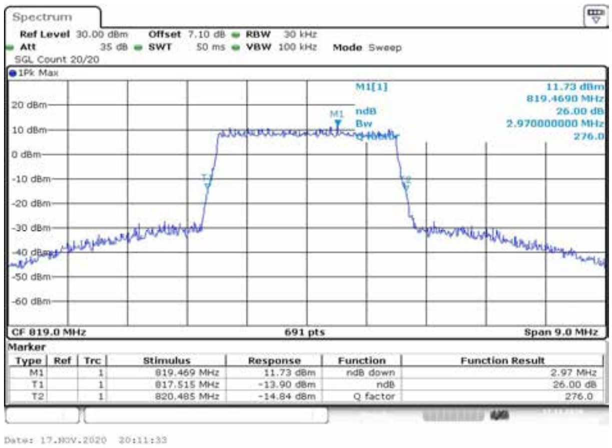


Fig.10

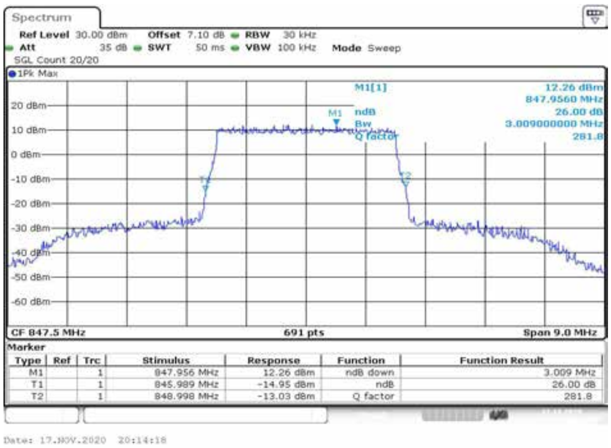


Fig.11

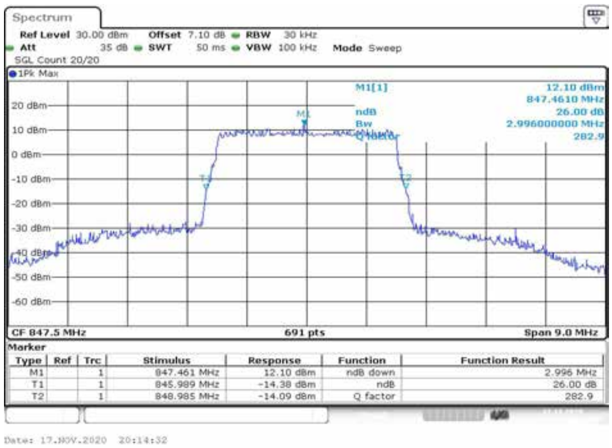


Fig.12

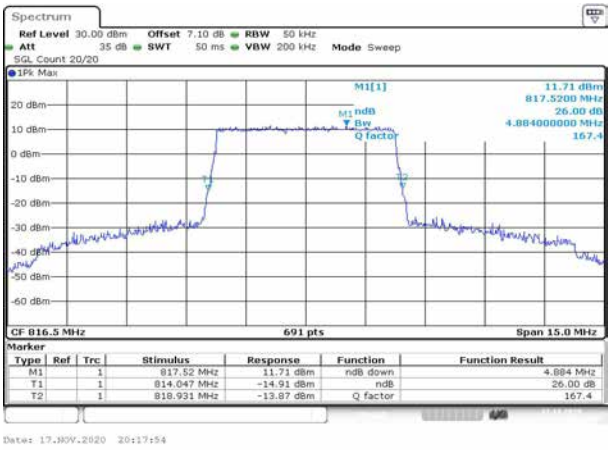


Fig.13

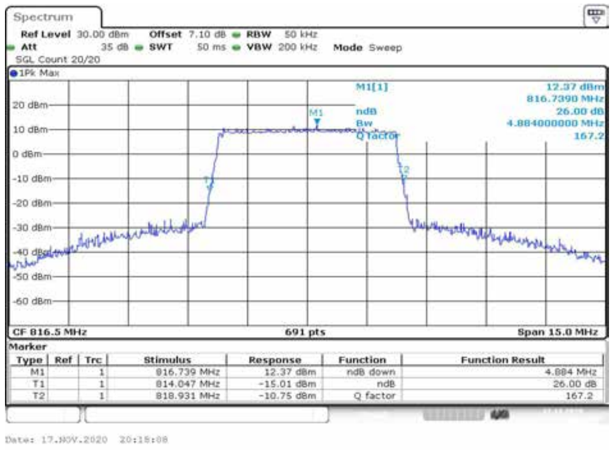


Fig.14

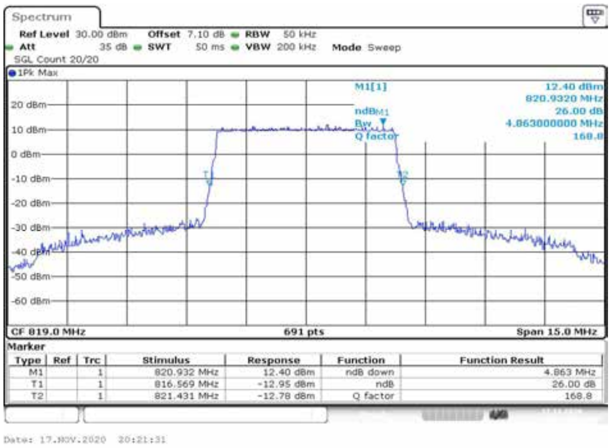


Fig.15

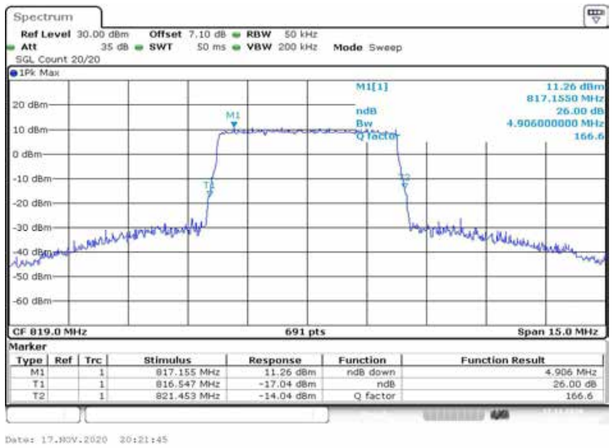


Fig.16

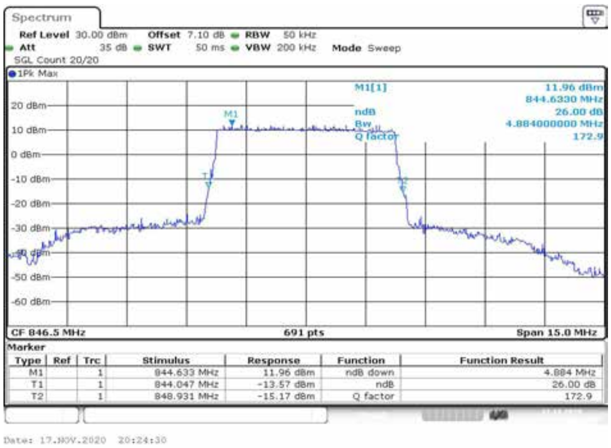


Fig.17

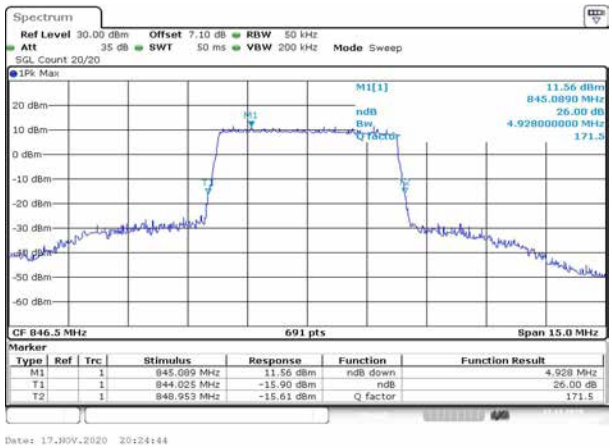


Fig.18

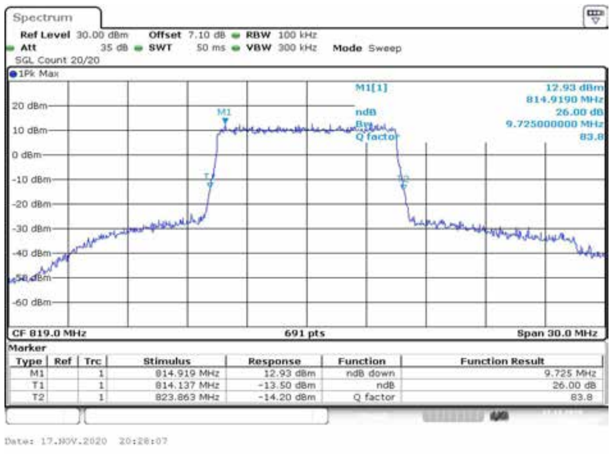
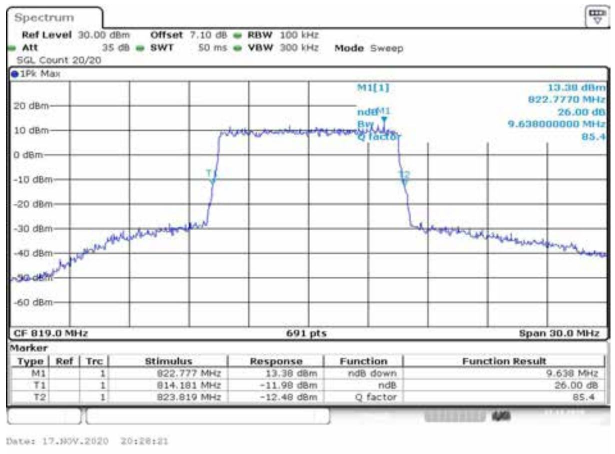
	

Fig.19	Fig.20

3.3.5. Uncertainty

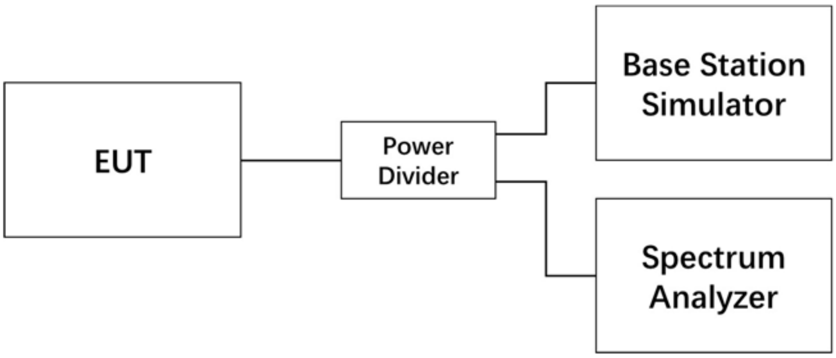
Frequency (MHz)	*Ulab*	*k*
814.7	71.15Hz	2
819.0	71.44Hz	2
823.3	71.73Hz	2
815.5	71.21Hz	2
822.5	71.68Hz	2
816.5	71.27Hz	2
821.5	71.61Hz	2

3.4 Spurious Emission at Antenna Terminal

3.4.1. Limit

FCC 47 CFR Part 90 Subpart S - §90.691
For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + $10Log_{10}$(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

3.4.2. Test Setup

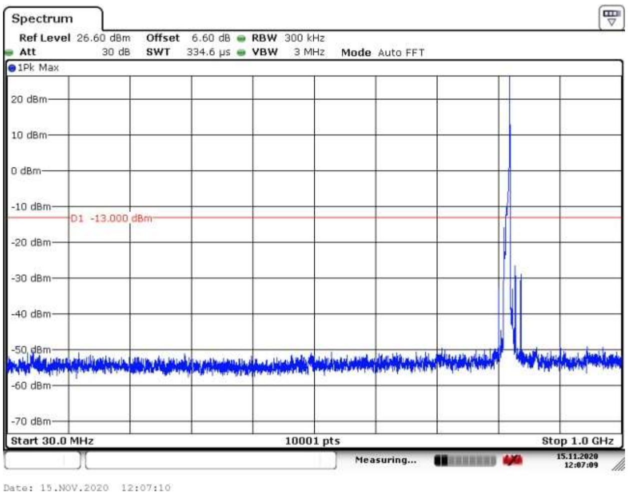


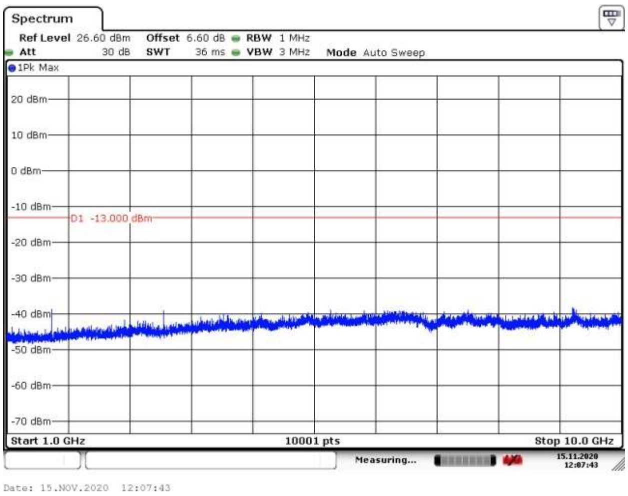
3.4.3. Test Procedures

1) The measurement procedure follows ANSI C63.26-2015, clause 5.7.
2) The RF output of EUT, BS simulator and spectrum analyzer is connected via a power divider.
3) EUT is configured to transmit continuously at fully power while the compliance measurement is performed.
4) The span in Spectrum analyzer shall be from 30MHz to 10 times the operating frequency in GHz, with an appropriate resolution bandwidth, video bandwidth, sweep time and detector type.
5) Check if some unwanted emission happens, and if amplitude of unwanted emission is higher than the limit.
6) The result in worse case will be recorded.

3.4.4. Test Result

Test Engineer	Xu Dongxu	**Test Date**	2020/11/15
Temperature	22.1°C	**Relative Humidity**	46.1%
Pressure	102.1kPa	**Test Sample Selected**	No.1





3.4.5. Uncertainty

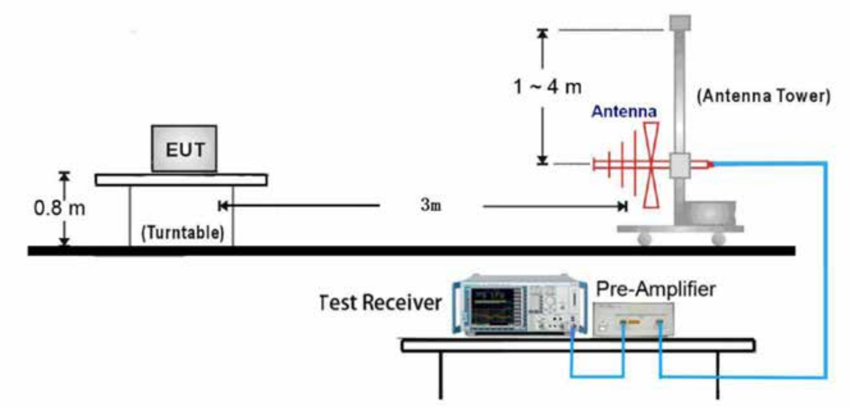
U_{lab}=2.46dB (k=2)

3.5 Field Strength of Spurious Radiation

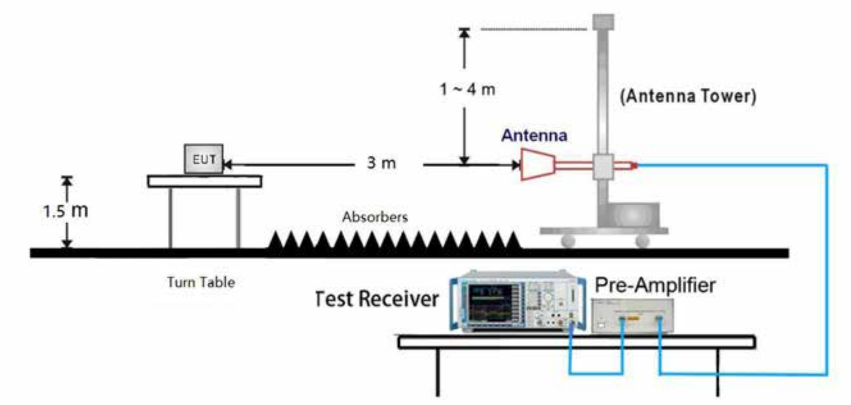
3.5.1. Limit

FCC 47 CFR Part 90 Subpart S - §90.691
For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + 10Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

3.5.2. Test Setup



30MHz-1GHz Test Setup



Above 1GHz Test Setup

3.5.3. Test Procedures

1) The measurement procedure follows ANSI C63.26-2015, clause 5.5.2.5 and 5.5.3.
2) Pre-scan is performed to determine the general EUT radiated emissions characteristics and, when necessary, the EUT-to-measurement antenna orientation that produces the maximum emission amplitude.
3) Use the substitution method to measure the spurious emissions:
   (a) Place the EUT in the center of the turntable. The antenna of EUT shall be positioned to produces the worst-case emission at the fundamental operating frequency;
   (b) Each emission under consideration shall be evaluated:
      i) Raise and lower the measurement antenna to enable detection of the maximum emission amplitude relative to measurement antenna height.
      ii) Rotate the EUT through 360° to determine the maximum emission level relative to the axial position.

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

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

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

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

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

(e) Connect a signal generator to the substitution antenna. Set the signal generator to the frequency where emissions are detected, and set an output power level such that the radiated signal can be detected by the measurement instrument, with sufficient dynamic range relative to the noise floor.

(f) For each emission that was detected and measured in the initial test [in step (b) and step (c)].

(g) Repeat step (f) with the measurement antenna oriented in the opposite polarization.

(h) Calculate the emission power in dBm referenced to a half-wave dipole using the following equation: Pe = Ps(dBm) − cable loss (dB) + antenna gain (dBd)

where

Pe = equivalent emission power in dBm

Ps = source (signal generator) power in dBm

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

3.5.4. Test Result

Test Engineer	Gao Yanan	**Test Date**	2020/11/19
Temperature	20.5°C	**Relative Humidity**	51.1%
Pressure	104.5kPa	**Test Sample Selected**	No.1

Frequency (MHz)	Generator Level (dBm)	Cable Loss (dB)	Gain (dBi)	Level (dBm)	Limit (dBm)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
106.900000	-40.29	0.86	-1.40	-42.55	-13.00	29.55	400.0	V	131.0
985.837500	-45.31	1.03	7.70	-38.64	-13.00	25.64	200.0	V	0.0
2458.500000	-64.67	0.83	10.70	-54.80	-13.00	41.80	200.0	H	231.0
4280.300000	-55.66	1.23	12.60	-44.29	-13.00	31.29	100.0	V	94.0
7303.250000	-50.61	2.70	11.70	-41.61	-13.00	28.61	100.0	V	329.0
8923.750000	-44.19	3.04	11.50	-35.73	-13.00	22.73	200.0	V	158.0

Test Engineer	Gao Yanan	**Test Date**	2020/11/23
Temperature	20.7°C	**Relative Humidity**	35.1%
Pressure	105.8kPa	**Test Sample Selected**	No.2

Frequency (MHz)	Generator Level (dBm)	Cable Loss (dB)	Gain (dBi)	Level (dBm)	Limit (dBm)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
106.500000	-41.33	0.86	-1.40	-43.59	-13.00	30.59	200.0	V	0.0
710.516667	-46.82	1.03	7.60	-40.25	-13.00	27.25	200.0	H	96.0
2855.500000	-59.79	0.39	9.10	-51.08	-13.00	38.08	100.0	H	1.0
3257.950000	-54.06	0.84	9.00	-45.90	-13.00	32.90	100.0	H	318.0
7337.900000	-50.54	2.71	11.70	-41.55	-13.00	28.55	200.0	H	301.0
8917.100000	-46.22	3.04	12.40	-36.86	-13.00	23.86	200.0	H	171.0

3.5.5. Uncertainty

Frequency (MHz)	U_{lab}	k
Below 1GHz	3.24	2
1GHz - 18GHz	3.40	2

3.6 Band Edge

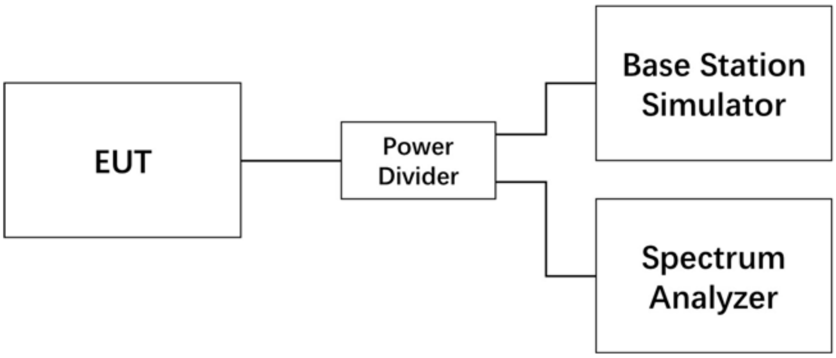
3.6.1. Limit

FCC 47 CFR Part 90 Subpart S - §90.691

For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 116 Log_{10}(f/6.1) decibels or 50 + 10 Log_{10}(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + 10Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

3.6.2. Test Setup



3.6.3. Test Procedures

1) The measurement procedure follows ANSI C63.26-2015, clause 5.7.3.
2) The RF output of EUT, BS simulator and spectrum analyzer are connected via a power divider.
3) EUT is configured to transmit continuously at fully power while the compliance measurement is performed.
4) Set the spectrum analyzer center frequency to the block, band, or channel edge frequency.
5) Set the span wide enough to capture the fundamental emission closest to the band edge, and to include all modulation products that spill into the immediately adjacent frequency band.
6) Set the number of points in sweep ⩾ 2 × span / RBW. And Sweep time should be auto.

3.6.4. Test Result

Test Engineer	Xu Dongxu	**Test Date**	2020/11/15
Temperature	22.1°C	**Relative Humidity**	46.1%
Pressure	102.1kPa	**Test Sample Selected**	No.1

Frequency (MHz)	Channel No.	BW (MHz)	RB Size	RB Offset	Band Edges Plot
					QPSK
814.7	26697	1.4	1	0	Fig.1
			6	0	Fig.2
823.3	26783		1	5	Fig.3
			6	0	Fig.4
815.5	26705	3	1	0	Fig.5
			15	0	Fig.6
822.5	26775		1	14	Fig.7
			15	0	Fig.8
816.5	26715	5	1	0	Fig.9
			25	0	Fig.10
821.5	26765		1	24	Fig.11
			25	0	Fig.12
819.0	26740	10	1	0	Fig.13
			50	0	Fig.14
			1	49	Fig.15
			50	0	Fig.16

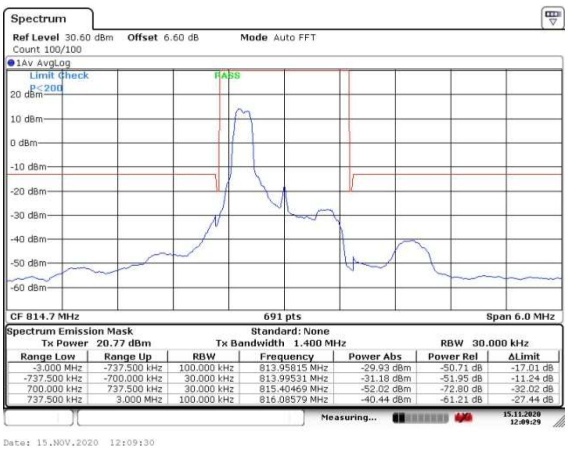


Fig.1

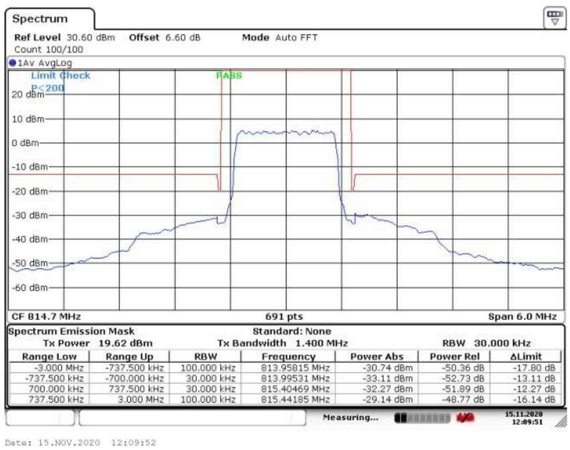


Fig.2

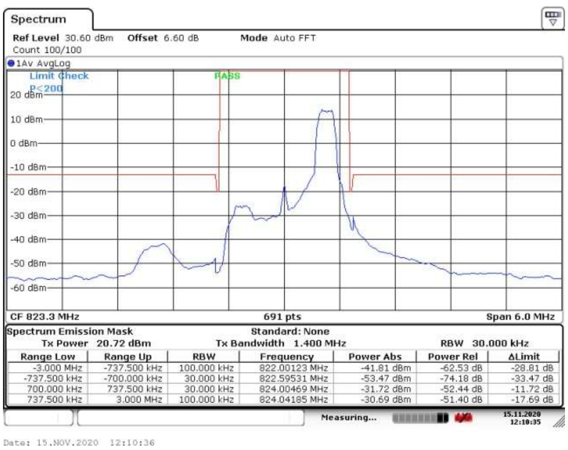


Fig.3

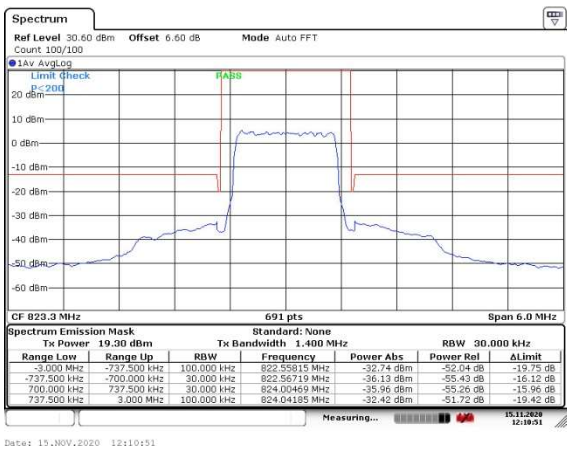


Fig.4

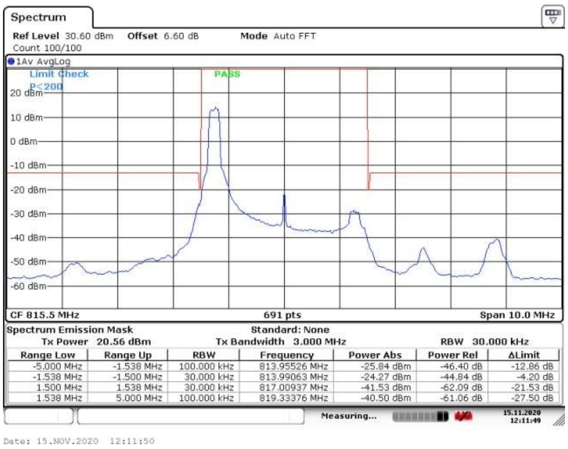


Fig.5

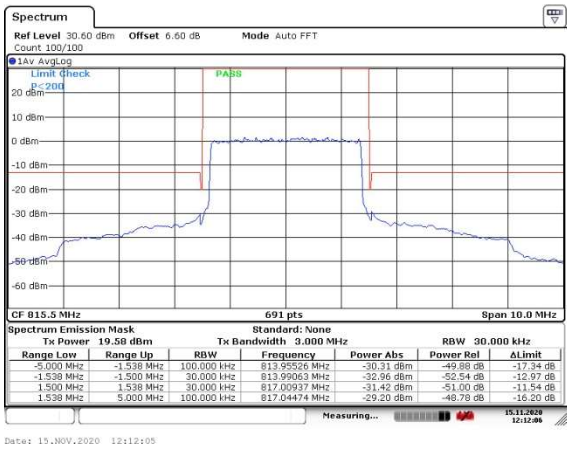


Fig.6

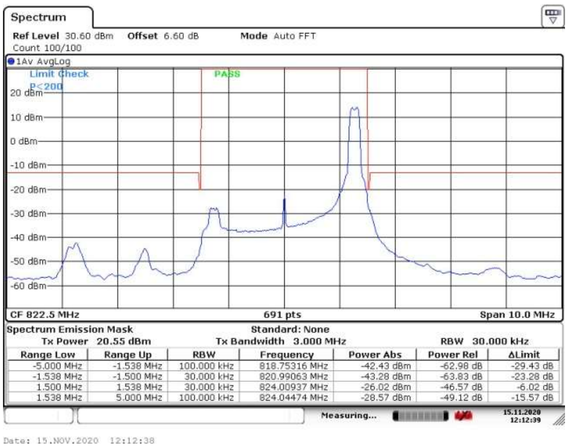


Fig.7

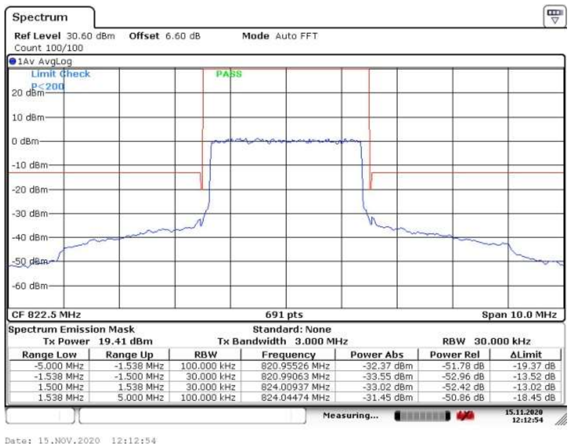


Fig.8

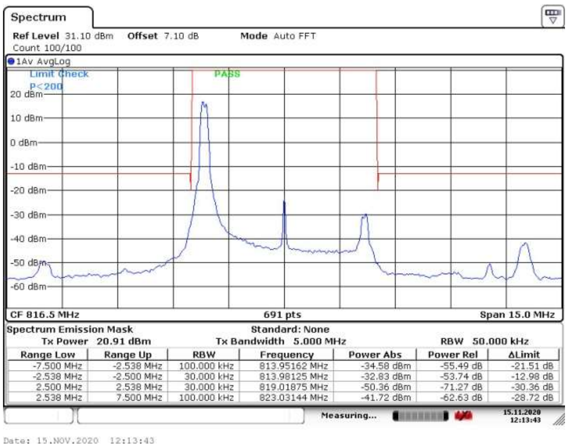


Fig.9

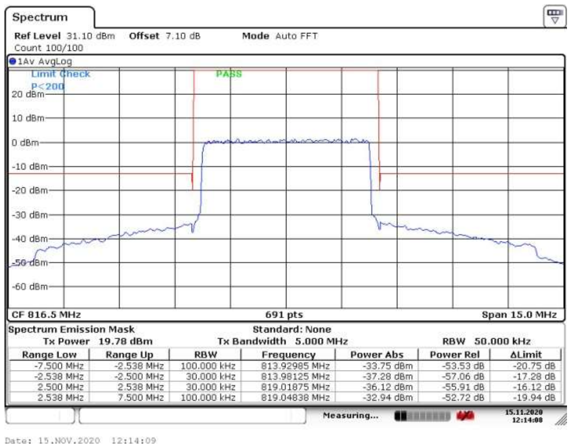


Fig.10

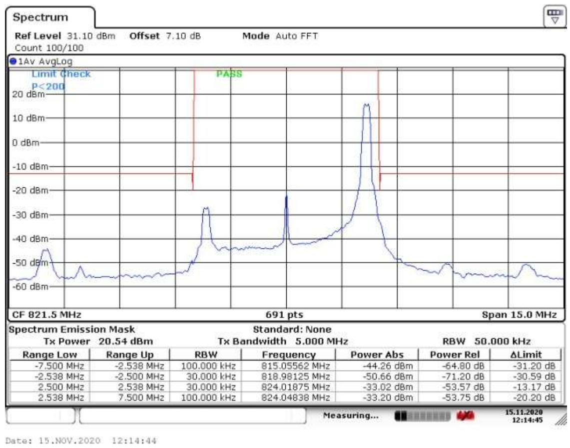


Fig.11

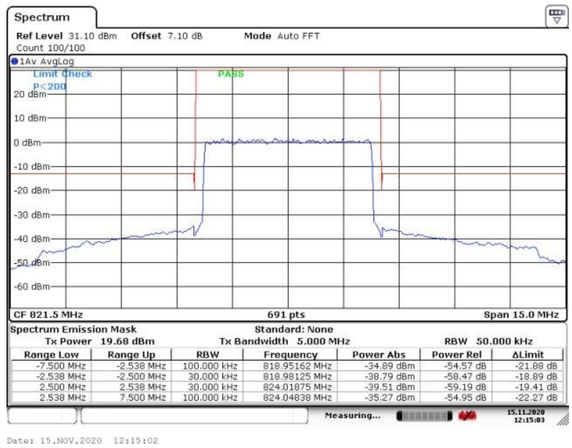


Fig.12

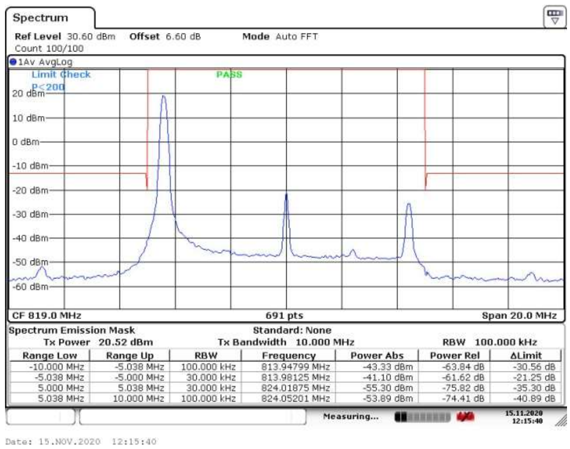


Fig.13

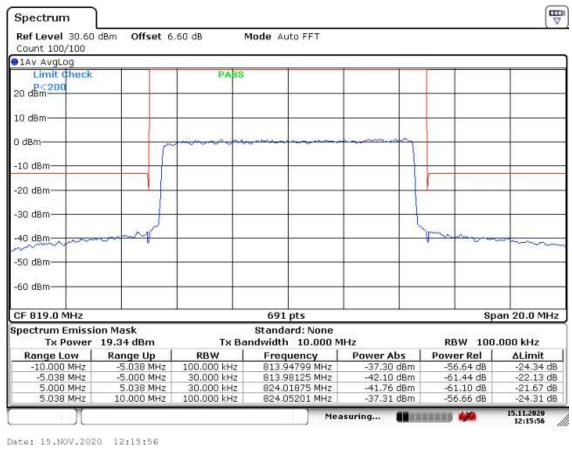


Fig.14

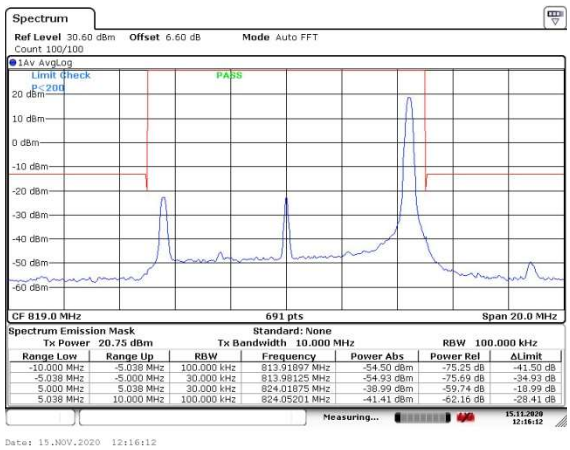


Fig.15

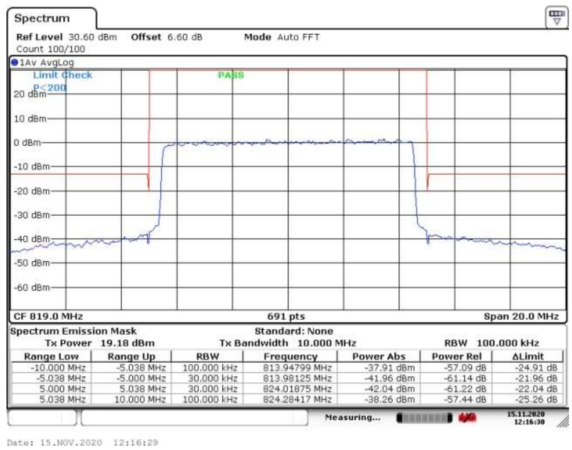


Fig.16

3.6.5. Uncertainty

U_{lab}=2.46dB (k=2)

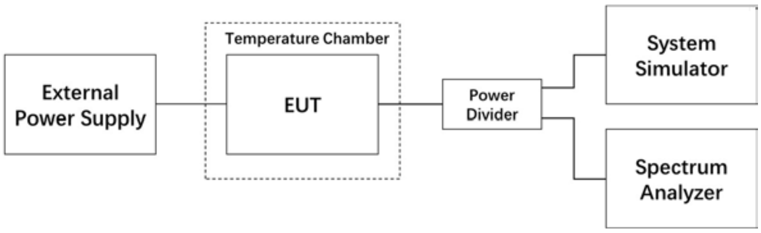
3.7 Frequency Stability

3.7.1. Limit

FCC 47 CFR Part 90 Subpart S - §90.213

Frequency Range (MHz)	Fixed and Base Stations	Mobile Stations	
		Over 2 watts output Power	2 watts or less output Power
809 ~ 824	1.5ppm	2.5ppm	2.5ppm

3.7.2. Test Setup



3.7.3. Test Procedures

1) The measurement procedure follows ANSI C63.26-2015, clause 5.6.3.
2) Frequency Stability over variations in temperature:
   a) The EUT can power on and work in rated supply voltage via an external power supply.
   b) The EUT is configured to transmit RF power via a communication test set.
   c) The EUT is placed in temperature chamber.
   d) Measure the result of frequency error at 10°C intervals of temperature from -10°C to +55°C.

3) Frequency stability when varying supply voltage
   a) The EUT is placed in a temperature chamber. The temperature in chamber is set to +20℃.
   b) The EUT is configured to transmit RF power via a communication test set.
   c) Measure the result of frequency error in Low voltage and high voltage mode.

3.7.4. Test Result

Test Engineer	Xu Dongxu	**Test Date**	2020/11/16
Temperature	22.2°C	**Relative Humidity**	46.7%
Pressure	102.1kPa	**Test Sample Selected**	No.1

1) Frequency Stability when varying temperature:

Temperature(°C)	Voltage	Test Result (ppm) @ Low Channel			
		1.4M	3M	5M	10M
0	NV	0.02	0.02	-0.02	0.04
+10	NV	0.01	0.03	0.02	-0.01
+20	NV	0.00	0.00	0.00	0.00
+30	NV	0.00	0.02	0.04	0.02
+40	NV	0.00	-0.04	0.03	-0.02
+50	NV	0.03	-0.02	-0.01	0.00
+55	NV	-0.01	-0.02	-0.02	-0.01

Temperature(°C)	Voltage	Test Result (ppm) @ High Channel			
		1.4M	3M	5M	10M
0	NV	0.01	-0.04	0.03	0.02
+10	NV	0.02	-0.03	-0.01	-0.01
+20	NV	0.00	0.00	0.00	0.00
+30	NV	0.00	0.03	0.00	0.01
+40	NV	-0.01	0.04	-0.03	0.02
+50	NV	0.00	-0.01	-0.01	-0.02
+55	NV	0.02	0.03	0.01	0.01

2) Frequency stability when varying supply voltage:

Temperature(°C)	Voltage	Test Result (ppm) @ Low Channel			
		1.4M	3M	5M	10M
+20	LV	-0.03	0.03	0.03	0.03
+20	HV	-0.03	-0.01	-0.01	0.03

Temperature(°C)	Voltage	Test Result (ppm) @ High Channel			
		1.4M	3M	5M	10M
+20	LV	0.03	0.01	-0.03	0.03
+20	HV	0.02	-0.04	-0.03	0.02

3.7.5. Uncertainty

Frequency (MHz)	U_{lab}	k
816.5	71.27Hz	2
821.5	71.61Hz	2

4 Test Instruments

Description	Model Name	S/N	Manufacturer	Next Cal Date
Spectrum Analyzer	FSV40	101403	R&S	2021/1/1
Three-way Power Supply	E3646A	MY43007301	Agilent	2021/1/1
Base Station Simulator	CMW500	115895	R&S	2021/1/1
Power Divider	87302C	MY44300481	Agilent	2021/7/14
Temperature Chamber	HTLH-015/40	JT1906018	Shang Hai Jing Tian	2021/7/2
EMI TEST RECERVER	ESR26	101320	R&S	2020/12/28
Double Ridged Broadband Horn Antenna	HF907	100096	R&S	2021/3/17
Hybrid antenna	VULB9163	01266	SCHWARZBECK	2021/7/3
Double Ridged Broadband Horn Antenna	BBHA 9120D	1276	SCHWARZBECK	2021/3/17
Pre-amplifier	PE15A1009	V00140120181115 E822	Pasternack Enterprises	2021/1/1
Pre-amplifier	8849B	3008A02589	Agilent	2021/3/17
Signal Generator	E8257D	MY46520023	Agilent	2021/1/1
10m Semi Anechoic Chamber	SAC10	--	TDK	2022/12/24
Shielding Room for RF test	SR#2	--	TDK	2024/9/17
Digital Display Temperature and Humidity Recorder	TM320	15082	DICKSON	2021/5/8
Aneroid Barometer	DYM3	868	Shanghai Boji	2022/5/5

--- End of Test Report ---