Certificate Number: 5055.02

TEST REPORT FOR RF TESTING

Report No.: SRTC2020-9004(F)-20050801(C)

Product Name: On-board Terminal (Telematics BOX)

Product Model: SR10006

Applicant: SiRun (Beijing) Technology Co., Ltd.

Manufacturer: SiRun (Beijing) Technology Co., Ltd.

Specification: FCC Part 2, Part 24E, Part 22H, Part 27 (2019)

FCC ID: 2AWCT-SR10006

The State Radio_monitoring_center Testing Center (SRTC)

15th Building, No.30, Shixing Street, Shijingshan District,

Beijing, P.R.China

Tel: 86-10-57996183 Fax: 86-10-57996388

CONTENTS

1. GENERAL INFORMATION

1.1 Notes of the test report

The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written permission of The State Radio_monitoring_center Testing Center (SRTC).The test results relate only to individual items of the samples which have been tested. The certification and accreditation identifiers used in this report shall not be applicable to the tested or calibrated samples thereof. The manufacturer shall not mark the tested samples or items (or a separate part of the item) with the identifiers of certification and accreditation to mislead relevant parties about the tested samples or items.

1.2 Information about the testing laboratory

Company:	The State Radio_monitoring_center Testing Center (SRTC)
Address:	15th Building, No.30 Shixing Street, Shijingshan District, P.R.China
City:	Beijing
Country or Region:	P.R.China
Contacted person:	Liu Jia
Tel:	+86 10 57996183
Fax:	+86 10 57996388
Email:	liujiaf@srtc.org.cn

1.3 Applicant's details

Company:	SiRun (Beijing) Technology Co., Ltd.
Address:	F16, Block A, Building 2, No.2 Auto Museum East Road, Fengtai District, Beijing, China
City:	Beijing
Country or Region:	China
Contacted person:	Lingrong Zhou
Tel:	15010875309
Fax:	---
Email:	lingrong.zhou@sirun.net

1.4 Manufacturer's details

Company:	SiRun (Beijing) Technology Co., Ltd.
Address:	F16, Block A, Building 2, No.2 Auto Museum East Road, Fengtai District, Beijing, China
City:	Beijing
Country or Region:	China
Contacted person:	Lingrong Zhou
Tel:	15010875309
Fax:	---
Email:	lingrong.zhou@sirun.net

1.5 Test Environment

Date of Receipt of test sample at SRTC:	2019-05-08
Testing Start Date:	2019-05-08
Testing End Date:	2019-05-22

Environmental Data:	Temperature (°C)	Humidity (%)
Ambient	25	30
Maximum Extreme	70	---
Minimum Extreme	-30	---

Normal Supply Voltage (V d.c.):	12.0
Maximum Extreme Supply Voltage (V d.c.):	18.0
Minimum Extreme Supply Voltage (V d.c.):	9.0

2 DESCRIPTION OF THE EQUIPMENT UNDER TEST

2.1 Final Equipment Build Status

Frequency Range	LTE Band 5: Tx:824~849 MHz Rx:869 ~894MHz LTE Band 40: Tx: 2305~2315MHz and 2350~2360 MHz Rx: 2305~2315MHz and 2350~2360 MHz LTE Band 41: Tx:2555~2655MHz Rx: 2555~2655MHz
Modulation Type	QPSK/16QAM/64QAM
Antenna Type	Fixed external Antenna
Antenna Gain	0dBi
Power Supply	DC Power
Hardware Version	V3.01
Software Version	V3.02
ICCID	898602F2101950003613

2.2 Summary table

FCC Rule Part	Frequency Range(MHz)	EIRP/ERP (W)	Frequency Tolerance (ppm)	Emission Designator	Emission Bandwidth (MHz)	Measured 26dBC Bandwidth (MHz)	Communication Type
LTE BAND5							
22H	824.7-848.3	0.196	0.074	1M08G7D	1.4M	1.250	QPSK
	824.7-848.3	0.141	0.074	1M08D7W	1.4M	1.266	16QAM
	824.7-848.3	0.149	0.074	1M08W7D	1.4M	1.264	64QAM
	825.5-847.5	0.195	-0.079	2M70G7D	3M	2.984	QPSK
	825.5-847.5	0.149	-0.079	2M70D7W	3M	2.954	16QAM
	825.5-847.5	0.148	-0.079	2M70W7D	3M	2.963	64QAM
	826.5-846.5	0.180	-0.078	4M48G7D	5M	4.913	QPSK
	826.5-846.5	0.151	-0.078	4M48D7W	5M	4.908	16QAM
	826.5-846.5	0.141	-0.078	4M49W7D	5M	4.969	64QAM
	829-844	0.201	-0.078	8M91G7D	10M	9.722	QPSK
	829-844	0.157	-0.078	8M94D7W	10M	9.713	16QAM
	829-844	0.142	-0.078	8M92W7D	10M	9.737	64QAM
LTE BAND40							
27	2307.5-2312.5	0.169	0.078	4M49G7D	5M	5.291	QPSK
	2307.5-2312.5	0.124	0.078	4M49D7W	5M	5.144	16QAM
	2307.5-2312.5	0.133	0.078	4M49W7D	5M	5.169	64QAM
	2352.5-2357.5	0.181	-0.078	4M49G7D	5M	5.407	QPSK
	2352.5-2357.5	0.137	-0.078	4M49D7W	5M	5.529	16QAM
	2352.5-2357.5	0.136	-0.078	4M49W7D	5M	5.040	64QAM
	2310	0.143	-0.079	8M96G7D	10M	10.590	QPSK
	2310	0.138	-0.079	8M95D7W	10M	9.734	16QAM
	2310	0.130	-0.079	8M95W7D	10M	9.910	64QAM
	2355	0.168	-0.076	8M94G7D	10M	9.665	QPSK
	2355	0.150	-0.076	8M96D7W	10M	9.719	16QAM
	2355	0.147	-0.076	8M96W7D	10M	10.010	64QAM
LTE BAND41							
27	2557.5-2652.5	0.147	-0.075	4M47G7D	5M	5.297	QPSK
	2557.5-2652.5	0.140	-0.075	4M48D7W	5M	5.416	16QAM
	2557.5-2652.5	0.139	-0.075	4M48W7D	5M	5.578	64QAM
	2560-2650	0.163	0.078	8M94G7D	10M	10.34	QPSK
	2560-2650	0.127	0.078	8M92D7W	10M	11.91	16QAM
	2560-2650	0.137	0.078	8M93W7D	10M	10.41	64QAM
	2562.5-2647.5	0.172	-0.076	13M4G7D	15M	16.55	QPSK
	2562.5-2647.5	0.144	-0.076	13M4D7W	15M	14.83	16QAM
	2562.5-2647.5	0.119	-0.076	13M4W7D	15M	14.42	64QAM
	2565-2645	0.177	0.079	17M9G7D	20M	19.02	QPSK
	2565-2645	0.119	0.079	17M8D7W	20M	19.71	16QAM
	2565-2645	0.140	0.079	17M9W7D	20M	18.86	64QAM

2.3 Support Equipment

N/A

3 REFERENCE SPECIFICATION

Specification	Version	Title
FCC Part 2	2019	Frequency allocations and radio treaty matters; general rules and regulations
FCC Part 22	2019	Public mobile services
FCC Part 24	2019	Personal communications services
FCC Part 27	2019	Miscellaneous wireless communications services
ANSI C63.26	2015	American national standard for compliance testing of transmitters used in licensed radio services
KDB 971168 D01	April 9, 2018	Measurement guidance for certification of licensed digital transmitters
TIA-603-E-2016	March 2016	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards

4 KEY TO NOTES AND RESULT CODES

The following are the definition of the test result.

Code	Meaning
PASS	Test result shows that the requirements of the relevant specification have been met.
FAIL	Test result shows that the requirements of the relevant specification have not been met.
NT	Normal Temperature
NV	Nominal voltage
HV	High voltage
LV	Low voltage

5 RESULT SUMMARY

No.	Test case	FCC reference	Verdict
1	RF Power Output	2.1046	Pass
2	Effective Radiated Power and Effective Isotropic Radiated Power	22.913(a)(5), 24.232(c), 27.50(b)(10), 27.50(c)(10), 27.50(h)(2), 27.50(d)(4), 27.50(a)(3)	Pass
3	Occupied Bandwidth	2.1049	Pass
4	Peak-Average Ratio	24.232(d), 27.50(d)(5)	Pass
5	Emission Bandwidth	2.1049	Pass
6	Spurious Emissions at antenna terminals	2.1051, 22.917(a), 24.238(a), 27.53(c), 27.53(g), 27.53(h), 27.53(m), 27.53(a)	Pass
7	Band Edges Compliance	2.1051, 22.917(a), 24.238(a), 27.53(c), 27.53(g), 27.53(h), 27.53(m), 27.53(a)	Pass
8	Frequency Stability	2.1055, 22.355, 24.235, 27.54	Pass
9	Radiated Spurious Emissions	2.1053, 22.917(a), 24.238(a), 27.53(c), 27.53(g), 27.53(h), 27.53(f), 27.53(a), 27.53(m)	Pass

This Test Report Is Issued by: Mr. Peng Zhen	Checked by: Mr. Li Bin
Tested by: Miss Jin Wanqing	Issued date: 2020/05/25

6 TEST RESULT

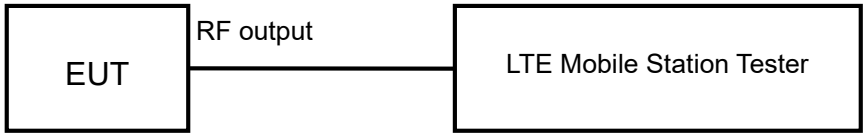
6.1 RF Power Output

Rule Part(s)
FCC: 2.1046

Ambient condition:

Temperature	Relative humidity	Pressure
25°C	30%	101.9kPa

Test Setup:



Test procedure:
After a radio link has been established between EUT and Tester, the output power of the cell signal of the testing equipment will be decreased until the output power of the EUT reach a maximum value. Then the test data can be read at the tester screen. The loss between RF output port of the EUT and the input port of the tester will be taken into consideration.

Limits: No RF Power Output requirements in part 2.1046.

Test result:
The test results are shown in Appendix A.

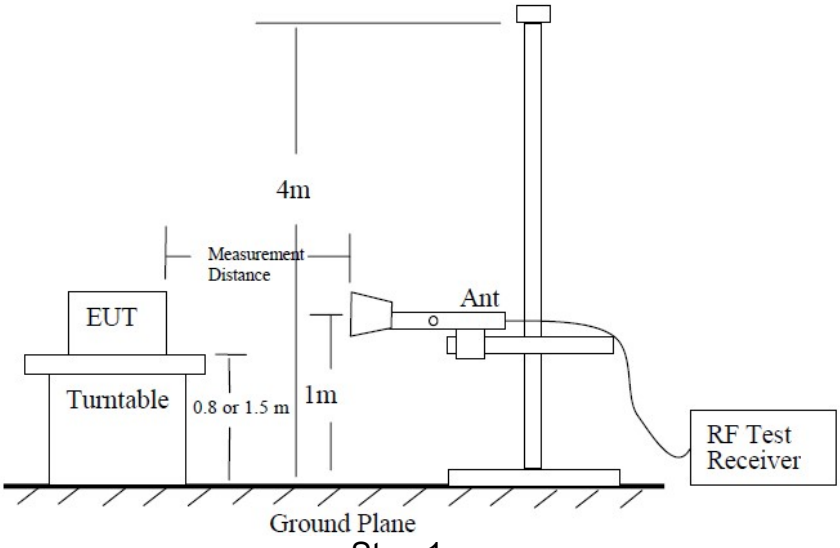
6.2 Effective Radiated Power and Effective Isotropic Radiated Power

Rule Part(s)
FCC: 22.913(a) (5), 24.232(c), 27.50(b) (10), 27.50(c) (10), 27.50(h) (2), 27.50(d) (4), 27.50(a) (3)

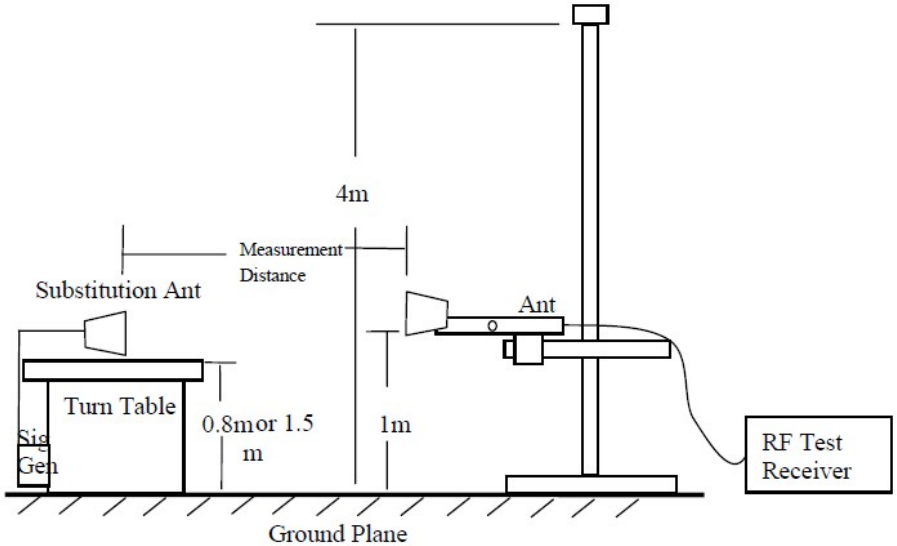
Ambient condition:

Temperature	Relative humidity	Pressure
25°C	30%	101.9kPa

Test setup:



Step 1



Step 2

Test procedure:
The measurements procedures in TIA-603-E-2016 are used.
Step 1:
The measurement is carried out in the chamber. EUT was placed on a 0.8m (f<1GHz)/ 1.5m (f>1GHz) high non-conductive table at a 3 meters test distance from the test receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT. The height of receiving antenna from 1m to 4m and varies in certain range to find the maximum power value. A radio link shall be established between EUT and Tester. The output power of the cell signal of the tester will be decreased until the output power of the EUT reach a maximum value. A peak detector is used and RBW is set to 100KHz(f<1GHz)/1MHz (f>1GHz). The antenna shall be performed under horizontal and vertical polarization. The turn table shall be rotated from 0 to 360 degrees for detecting the maximum power value on spectrum analyzer or receiver. And the maximum value of the receiver should be recorded as (Pr).
Step 2:
A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator. To repeat the same procedure as step1 and the level of signal generator will be adjusted till the same power value on the spectrum analyzer or receiver. The ERP/EIRP of the EUT can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna.
A power (Pmea) is applied to the input of the substitution antenna, and adjusts the level of the signal generator output until the value of the receiver reach the previously recorded (Pr). The power of signal source (Pmea) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
A “reference path loss” should be calculated after test. The attenuation of “reference path loss” is the cable loss between the Signal Source with the Substitution Antenna (Pca) and the Substitution Antenna Gain (Ga).
The measurement results are obtained as described below:
Power (EIRP) = Pmea+ Pca+ Ga

ERP/EIRP LIMIT

This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15dB) and known input power. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP – 2.15 (dB).
22.913(a) (5)
The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.
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.
27.50(b) (10)
Portable stations (hand-held devices) transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands are limited to 3 watts ERP.
27.50(c) (10)
Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP.
27.50(h) (2)
Mobile and other user stations.Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

27.50(d) (4)
Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP. Fixed stations operating in the 1710-1755 MHz band are limited to a maximum antenna height of 10 meters above ground. Mobile and portable stations operating in these bands must employ a means for limiting power to the minimum necessary for successful communications.
27.50(a) (3)
Mobile and portable stations (i) For mobile and portable stations transmitting in the 2305-2315 MHz band or the 2350-2360 MHz band, the average EIRP must not exceed 50 milliwatts within any 1 megahertz of authorized bandwidth, except that for mobile and portable stations compliant with 3GPP LTE standards or another advanced mobile broadband protocol that avoids concentrating energy at the edge of the operating band the average EIRP must not exceed 250 milliwatts within any 5 megahertz of authorized bandwidth but may exceed 50 milliwatts within any 1 megahertz of authorized bandwidth.

Test result:
The test results are shown in Appendix B.

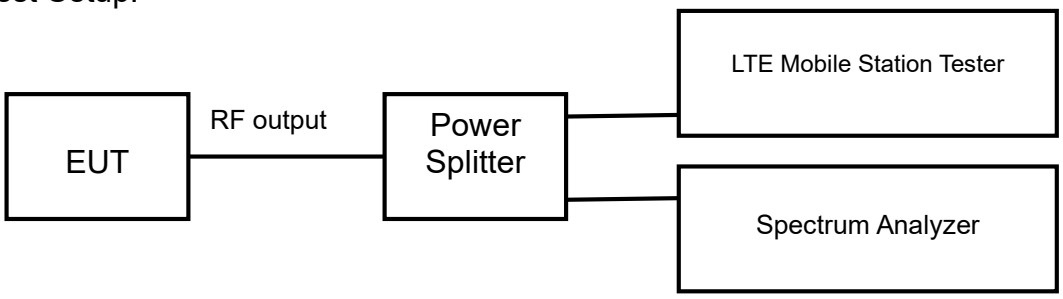
6.3 Occupied Bandwidth

Rule Part(s)
FCC: 2.1049

Ambient condition:

Temperature	Relative humidity	Pressure
25°C	30%	101.9kPa

Test Setup:



Test procedure:
KDB 971168 D01 v03r01 – Section 4.2

Test Setting:
1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
3. VBW ≥ 3 x RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of the 99% occupied bandwidth observed in Step 7

Limits: No specific occupied bandwidth requirements in part 2.1049

Test result:
The test results are shown in Appendix A.

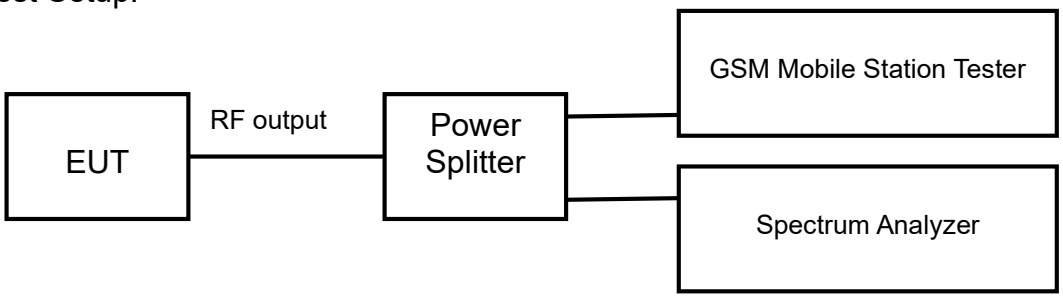
6.4 Emission Bandwidth

Rule Part(s)
FCC: 2.1049

Ambient condition:

Temperature	Relative humidity	Pressure
25°C	30%	101.9kPa

Test Setup:



Test procedure:
KDB 971168 D01 v03r01 – Section 4.2

Test Setting:

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 26dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.

2. RBW = 1 – 5% of the expected OBW

3. VBW ≥ 3 x RBW

4. Detector = Peak

5. Trace mode = max hold

6. Sweep = auto couple

7. The trace was allowed to stabilize

8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of 26dB bandwidth observed in Step 7

Limits: No specific emission bandwidth requirements in part 2.1049.

Test result:
The test results are shown in Appendix A.

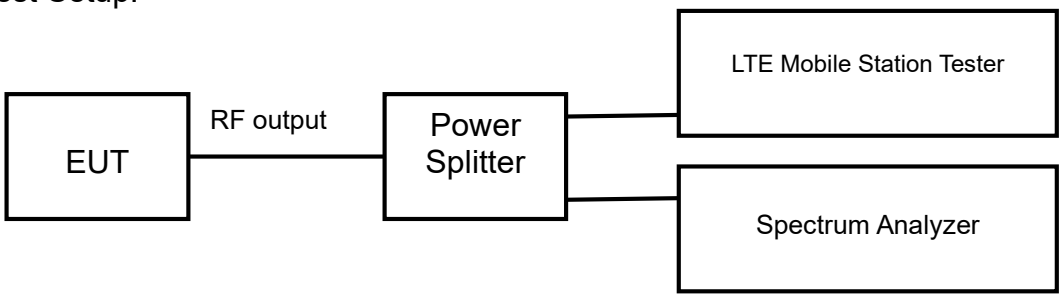
6.5 Peak-Average Ratio

Rule Part(s)
FCC: 24.232(d), 27.50(d) (5)

Ambient condition:

Temperature	Relative humidity	Pressure
25°C	30%	101.9kPa

Test Setup:



Test procedure:
KDB 971168 D01 v03r01 – Section 5.7.1

Test Setting:
1. The signal analyzer's CCDF measurement profile is enabled
2. Frequency = carrier center frequency
3. Measurement BW ≥ OBW or specified reference bandwidth
4. The signal analyzer was set to collect one million samples to generate the CCDF curve
5. The measurement interval was set depending on the type of signal analyzed. For continuous signals (>98% duty cycle), the measurement interval was set to 1ms. For burst transmissions, the spectrum analyzer is set to use an internal "RF Burst" trigger that is synced with an incoming pulse and the measurement interval is set to less than the duration of the "on time" of one burst to ensure that energy is only captured during a time in which the transmitter is operating at maximum power

Limits
24.232(d), 27.50(d) (5)
In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

Test result:
The test results are shown in Appendix A.

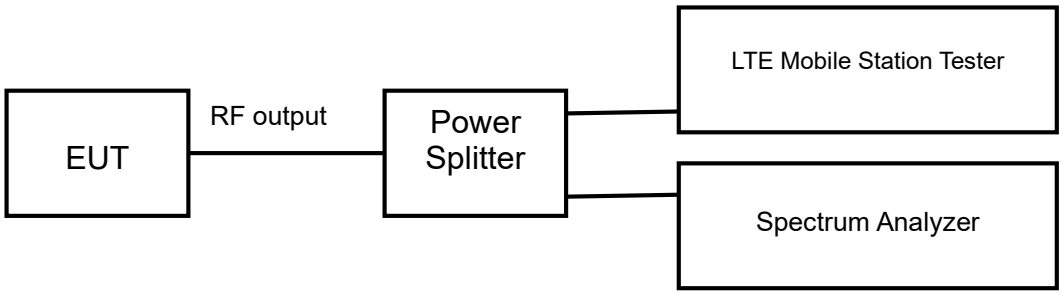
6.6 Spurious Emissions at antenna terminal

Rule Part(s)
FCC: 2.1051, 22.917(a), 24.238(a), 27.53(c), 27.53(g), 27.53(h), 27.53(m), 27.53(a)

Ambient condition:

Temperature	Relative humidity	Pressure
25°C	30%	101.9kPa

Test Setup:



Test procedure:
KDB 971168 D01 v03r01 – Section 6.0

Test Setting:
1. Start frequency was set to 30MHz and stop frequency was set to at least 10 * the fundamental frequency
2. Detector = RMS
3. RBW=1MHz
4. VBW=3MHz
5. Trace mode = trace average for continuous emissions, max hold for pulse emissions
6. Sweep time = auto couple
7. The trace was allowed to stabilize

Limits
The minimum permissible attenuation level of any spurious emission is 43 + log10 (P [Watts]), where P is the transmitter power in Watts.
For Band 30, the minimum permissible attenuation level of any spurious emission <2288MHz and >2365MHz is 70 + log10 (P [Watts]).
For Band 7 and 41, the minimum permissible attenuation level of any spurious emission is 55 + log10 (P [Watts]).

Test result:
The test results are shown in Appendix A.

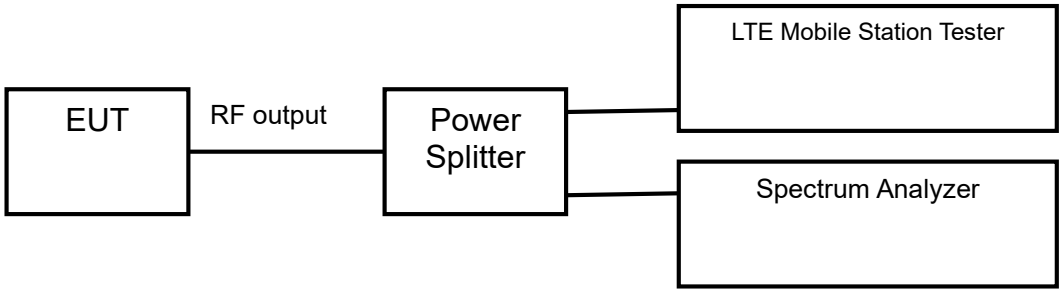
6.7 Band Edges Compliance

Rule Part(s)
FCC: 2.1051, 22.917(a), 24.238(a), 27.53(c), 27.53(g), 27.53(h), 27.53(m), 27.53(a)

Ambient condition:

Temperature	Relative humidity	Pressure
25°C	30%	101.9kPa

Test Setup:



Test procedure:
KDB 971168 D01 v03r01 – Section 6.0

Test Setting:
1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW > 1% of the emission bandwidth
4. VBW > 3 x RBW
5. Detector = RMS
6. Number of sweep points ≥ 2 x Span/RBW
7. Trace mode = trace average for continuous emissions, max hold for pulse emissions
8. Sweep time = auto couple
9. The trace was allowed to stabilize

Limits
The minimum permissible attenuation level of any spurious emission is 43 + log10 (P [Watts]), where P is the transmitter power in Watts.
The minimum permissible attenuation level for Band 30 is > 43 + 10log10 (P [Watts] at 2300-2305MHz & 2345-2360MHz, > 55 + 10log10 (P [Watts]) at 2320-2324MHz & 2341-2345MHz, > 61 + 10log10 (P [Watts]) at 2324-2328MHz & 2337-2341MHz, > 67 + 10log10 (P [Watts]) at 2288-2292MHz & 2328- 2337MHz, and > 70 + 10log10 (P [Watts]) at frequencies < 2288MHz & >2365MHz.
Per 22.917(b) 24.238(a) 27.53(h) in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to demonstrate compliance with the out-of-band emissions limit. 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 emission are attenuated at least 26 dB below the transmitter power.
Per 27.53(g) for operations in the 698-746 MHz band, in the 100 kHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 30 kHz may be employed to demonstrate compliance with the out-of-band emissions limit.
Per 27.53(c)(5) for operations in the 776-788 MHz band, in the 100 kHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 30 kHz may be employed to demonstrate compliance with the out-of-band emissions limit.
For all plots showing emissions in the 763 – 775MHz and 793 – 805MHz band, the FCC limit per 27.53(c)(4) is 65 + 10log10(P) = -35dBm in a 6.25kHz bandwidth.
Per 27.53(a)(5) in the 1 MHz bands immediately outside and adjacent to the channel blocks at 2305, 2310, 2315, 2320, 2345, 2350, 2355, and 2360 MHz, a resolution bandwidth of at least 1 percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e., 1 MHz). 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.
Per 27.53(m) for operations in the BRS/EBS bands, 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. 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 2490.5MHz.

Test result:
The test results are shown in Appendix A.

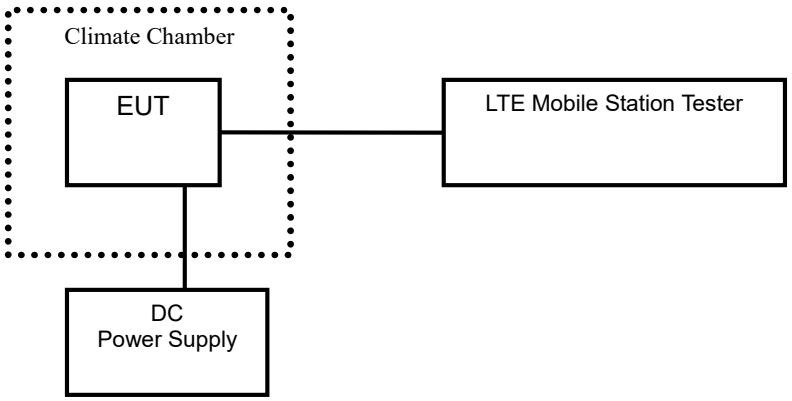
6.8 Frequency Stability

Rule Part(s)
FCC: 2.1055, 22.355, 24.235, 27.54

Ambient condition:

Temperature	Relative humidity	Pressure
25°C	30%	101.9kPa

Test setup:



Test Procedure:
ANSI/TIA-603-E-2016

Test Settings
1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
2. The equipment is turned on in a “standby” condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C (The temperature range can be declared by the manufacturer). A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

Limits: For Part 22, the frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5 ppm) of the center frequency. For Part 24, Part 27, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test result:
The test results are shown in Appendix A.

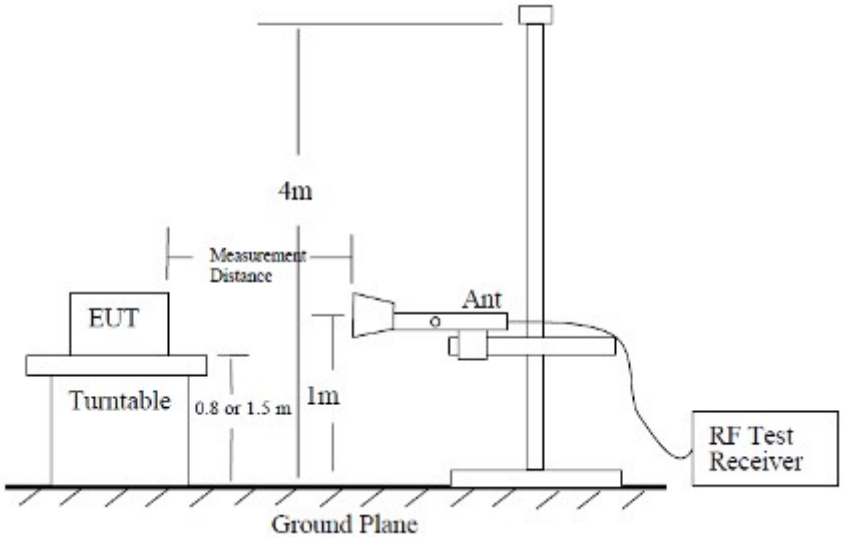
6.9 Radiated Spurious Emissions

Rule Part(s)
FCC: 2.1053, 22.917(a), 24.238(a), 27.53(c), 27.53(g), 27.53(h), 27.53(f), 27.53(a), 27.53(m)

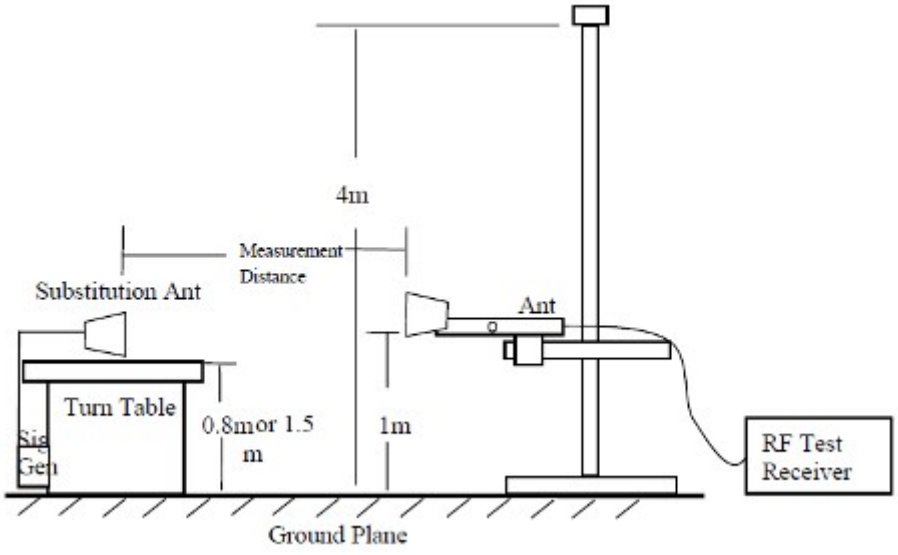
Ambient condition:

Temperature	Relative humidity	Pressure
25°C	30%	101.9kPa

Test Setup:



Step 1



Step 2

Test procedure:
The measurements procedures in TIA-603-E-2016 are used.
The spectrum was scanned from 30MHz to the 10th harmonic of the highest frequency generated within the equipment.
Step 1:
The measurement is carried out in the chamber. EUT was placed on a 0.8m (f<1GHz)/ 1.5m (f>1GHz) high non-conductive table at a 3 meters test distance from the test receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT. The height of receiving antenna from 1m to 4m and varies in certain range to find the maximum power value. A radio link shall be established between EUT and Tester. The output power of the cell signal of the tester will be decreased until the output power of the EUT reach a maximum value. A peak detector is used and RBW is set to 100 kHz (f<1GHz)/1MHz (f>1GHz). The antenna shall be performed under horizontal and vertical polarization. The turn table shall be rotated from 0 to 360 degrees for detecting the maximum power value on spectrum analyzer or receiver. The spectrum analyzer scans from 30MHz to 10th harmonic of the carrier. A notch filter is necessary in the band near to the carrier frequency. A high pass filter is needed to avoid the distortion of the testing equipment in the band above the carrier frequency.
Step 2:
A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
A power (Pmea) is applied to the input of the substitution antenna, and adjusts the level of the signal generator output until the value of the receiver reach the previously recorded (Pr). The power of signal source (Pmea) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
A “reference path loss” should be calculated after test. The attenuation of “reference path loss” is the cable loss between the Signal Source with the Substitution Antenna (Pca) and the Substitution Antenna Gain (Ga).
Calculation procedure:
The data of cable loss and antenna gain has been calibrated in full testing frequency range before the testing.
The power of the Radiated Spurious Emissions is calculated by adding the cable loss and antenna gain. The basic equation with a sample calculation is as followed:
Power (EIRP) = Pmea+ Pca + Ga
This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15dB) and known input power. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP – 2.15 (dB).
Assumed the power of signal source record is -20dBm. A cable loss of -30dB, and an antenna gain of 11dB are added.
P=Pmea+Pca+Ga=(-20dBm)+(-30dB)+(11dB)= -39dBm

Test result:
The test results are shown in Appendix B.

7 MEASUREMENT UNCERTAINTIES

Items	Uncertainty	
RF Power Output	0.6 dB	
Occupied Bandwidth	3 kHz	
Spurious Emissions	30MHz～1GHz	2.83 dB
	1GHz～12.75GHz	2.50 dB
	12.75GHz～25GHz	2.75 dB
Band Edges Compliance	1.2dB	
Frequency Stability	4 Hz	

8 TEST EQUIPMENTS

No.	Name/Model	Manufacturer	S/N	Calibration Date	Calibration Due Date
1	MT8820C Mobile Station Tester	Anritsu	6201300660	2019.08.20	2020.08.19
2	FSV40 Spectrum Analyzer	R&S	101065	2019.08.20	2020.08.19
2	N9020A Spectrum Analyzer	Agilent	MY48010771	2019.08.20	2020.08.19
3	6007 Power Divider	Weinschel	6007-GJ-1	2019.08.20	2020.08.19
4	DC Power Supply E3645A	Agilent	MY40000741	2019.03.01	2020.02.28
5	Temperature chamber SH241	ESPEC	92013758	2019.08.20	2020.08.19
6	12.65m×8.03m×7.50m Fully-Anechoic Chamber	FRANKONIA	-----	-----	-----
7	23.18m×16.88m×9.60m Semi-Anechoic Chamber	FRANKONIA	---	-----	-----
8	Turn table Diameter:1m	FRANKONIA	-----	-----	-----
9	Turn table Diameter:5m	FRANKONIA	-----	-----	-----
10	Antenna master FAC(MA4.0)	MATURO	-----	-----	-----
11	Antenna master SAC(MA4.0)	MATURO	-----	-----	-----
12	9.080m×5.255m×3.525m Shielding room	FRANKONIA	-----	-----	-----
13	HF 907 Double-Ridged Waveguide Horn Antenna	R&S	100512	2019.08.20	2020.08.19
14	HF 907 Double-Ridged Waveguide Horn Antenna	R&S	100513	2019.08.20	2020.08.19
15	HL562 Ultra log antenna	R&S	100016	2019.08.20	2020.08.19
16	3160-09 Receive antenna	SCHWARZ-BECK	002058-002	2019.08.20	2020.08.19
17	ESI 40 EMI test receiver	R&S	100015	2019.08.20	2020.08.19
18	ESCS30 EMI test receiver	R&S	100029	2019.08.20	2020.08.19
19	HL562 Receive antenna	R&S	100167	2019.08.20	2020.08.19
20	ENV216 AMN	R&S	3560.6550.12	2019.08.20	2020.08.19

APPENDIX A – TEST DATA OF CONDUCTED EMISSION

LTE Band 5

1 RF Power Output

Modulation	Carrier frequency (MHz)	UL Channel	BW	RB Size	RB Offset	Conducted power (dBm)
QPSK	824.7	20407	1.4	1	0	23.17
				1	5	23.03
				3	2	23.04
				6	0	21.98
	836.5	20525		1	0	23.11
				1	5	23.17
				3	2	23.04
				6	0	22.05
	848.3	20643		1	0	23.11
				1	5	23.07
				3	2	23.12
				6	0	22.16
16QAM	824.7	20407	1.4	1	0	21.64
				1	5	21.75
				3	2	21.83
				6	0	20.70
	836.5	20525		1	0	22.08
				1	5	21.90
				3	2	22.26
				6	0	21.15
	848.3	20643		1	0	21.96
				1	5	21.94
				3	2	22.11
				6	0	20.98
64QAM	824.7	20407	1.4	1	0	21.58
				1	5	21.69
				3	2	21.73
				6	0	20.69
	836.5	20525		1	0	21.96
				1	5	21.80
				3	2	22.13
				6	0	21.07
	848.3	20643		1	0	21.94
				1	5	21.88
				3	2	22.01
				6	0	20.89

Modulation	Carrier frequency (MHz)	UL Channel	BW	RB Size	RB Offset	Conducted power (dBm)
QPSK	825.5	20415	3	1	0	23.05
				1	14	23.01
				8	4	22.13
				15	0	22.08
	836.5	20525		1	0	23.16
				1	14	23.20
				8	4	22.07
				15	0	22.04
	847.5	20635		1	0	23.10
				1	14	22.97
				8	4	22.15
				15	0	22.12
16QAM	825.5	20415	3	1	0	21.87
				1	14	21.60
				8	4	21.07
				15	0	21.08
	836.5	20525		1	0	21.90
				1	14	21.79
				8	4	21.00
				15	0	21.00
	847.5	20635		1	0	21.91
				1	14	21.84
				8	4	21.06
				15	0	21.06
64QAM	825.5	20415	3	1	0	21.85
				1	14	21.57
				8	4	20.97
				15	0	20.98
	836.5	20525		1	0	21.73
				1	14	21.71
				8	4	20.99
				15	0	20.89
	847.5	20635		1	0	21.86
				1	14	21.67
				8	4	21.05
				15	0	20.98

Modulation	Carrier frequency (MHz)	UL Channel	BW	RB Size	RB Offset	Conducted power (dBm)
QPSK	826.5	20425	5	1	0	22.96
				1	24	22.98
				12	6	22.13
				25	0	22.07
	836.5	20525		1	0	22.91
				1	24	23.10
				12	6	22.14
				25	0	22.14
	846.5	20625		1	0	23.12
				1	24	23.01
				12	6	22.12
				25	0	22.07
16QAM	826.5	20425	5	1	0	21.81
				1	24	21.84
				12	6	21.03
				25	0	21.04
	836.5	20525		1	0	21.79
				1	24	21.85
				12	6	21.11
				25	0	21.10
	846.5	20625		1	0	22.01
				1	24	21.80
				12	6	21.02
				25	0	21.10
64QAM	826.5	20425	5	1	0	21.64
				1	24	21.77
				12	6	20.97
				25	0	20.97
	836.5	20525		1	0	21.63
				1	24	21.73
				12	6	21.00
				25	0	21.07
	846.5	20625		1	0	21.95
				1	24	21.64
				12	6	20.88
				25	0	21.08

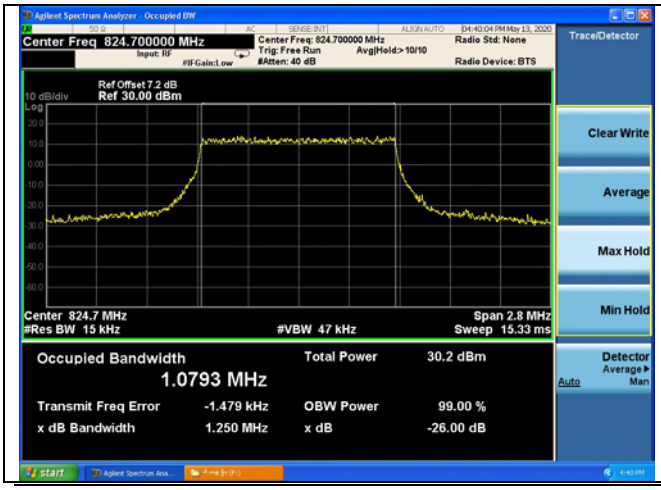
Modulation	Carrier frequency (MHz)	UL Channel	BW	RB Size	RB Offset	Conducted power (dBm)
QPSK	829	20450	10	1	0	23.30
				1	49	23.22
				24	12	22.38
				50	0	22.38
	836.5	20525		1	0	23.50
				1	49	23.62
				24	12	22.48
				50	0	22.48
	844	20600		1	0	23.17
				1	49	23.56
				24	12	22.43
				50	0	22.32
16QAM	829	20450	10	1	0	21.94
				1	49	21.88
				24	12	21.13
				50	0	21.08
	836.5	20525		1	0	21.98
				1	49	22.04
				24	12	21.11
				50	0	21.14
	844	20600		1	0	21.90
				1	49	22.04
				24	12	21.27
				50	0	21.30
64QAM	829	20450	10	1	0	21.78
				1	49	21.80
				24	12	21.02
				50	0	21.05
	836.5	20525		1	0	21.90
				1	49	21.98
				24	12	21.02
				50	0	21.11
	844	20600		1	0	21.84
				1	49	21.97
				24	12	21.24
				50	0	21.17

2 Occupied Bandwidth

Test result

Band	Carrier frequency (MHz)	Channel	BW (MHz)	RB Size	RB Offset	Bandwidth of 99% Power (MHz)					
						QPSK		16-QAM		64-QAM	
5	824.7	20407	1.4	6	0	1.0793	Fig.1	1.0808	Fig.2	1.0758	Fig.3
	836.5	20525		6	0	1.0771	Fig.4	1.0799	Fig.5	1.0817	Fig.6
	848.3	20643		6	0	1.0764	Fig.7	1.0797	Fig.8	1.0823	Fig.9
	825.5	20415	3	15	0	2.6910	Fig.10	2.7047	Fig.11	2.6912	Fig.12
	836.5	20525		15	0	2.7004	Fig.13	2.6988	Fig.14	2.6831	Fig.15
	847.5	20635		15	0	2.6924	Fig.16	2.6927	Fig.17	2.7079	Fig.18
	826.5	20425	5	25	0	4.4704	Fig.19	4.4770	Fig.20	4.4892	Fig.21
	836.5	20525		25	0	4.4716	Fig.22	4.4741	Fig.23	4.4739	Fig.24
	846.5	20625		25	0	4.4787	Fig.25	4.4721	Fig.26	4.4662	Fig.27
	829	20450	10	50	0	8.9042	Fig.28	8.9402	Fig.29	8.9180	Fig.30
	836.5	20525		50	0	8.9149	Fig.31	9.9307	Fig.32	8.9150	Fig.33
	844	20600		50	0	8.9194	Fig.34	8.9415	Fig.35	8.9211	Fig.36

Band	Carrier frequency (MHz)	Channel	BW (MHz)	RB Size	RB Offset	Bandwidth of -26dB transmitter power (MHz)					
						QPSK		16-QAM		64-QAM	
5	824.7	20407	1.4	6	0	1.250	Fig.1	1.266	Fig.2	1.264	Fig.3
	836.5	20525		6	0	1.240	Fig.4	1.254	Fig.5	1.246	Fig.6
	848.3	20643		6	0	1.229	Fig.7	1.263	Fig.8	1.226	Fig.9
	825.5	20415	3	15	0	2.972	Fig.10	1.948	Fig.11	2.963	Fig.12
	836.5	20525		15	0	2.984	Fig.13	2.954	Fig.14	2.945	Fig.15
	847.5	20635		15	0	2.982	Fig.16	2.949	Fig.17	2.936	Fig.18
	826.5	20425	5	25	0	4.913	Fig.19	4.908	Fig.20	4.899	Fig.21
	836.5	20525		25	0	4.883	Fig.22	4.889	Fig.23	4.969	Fig.24
	846.5	20625		25	0	4.874	Fig.25	4.844	Fig.26	4.814	Fig.27
	829	20450	10	50	0	9.722	Fig.28	9.693	Fig.29	9.706	Fig.30
	836.5	20525		50	0	9.637	Fig.31	9.713	Fig.32	9.565	Fig.33
	844	20600		50	0	9.632	Fig.34	9.686	Fig.35	9.737	Fig.36



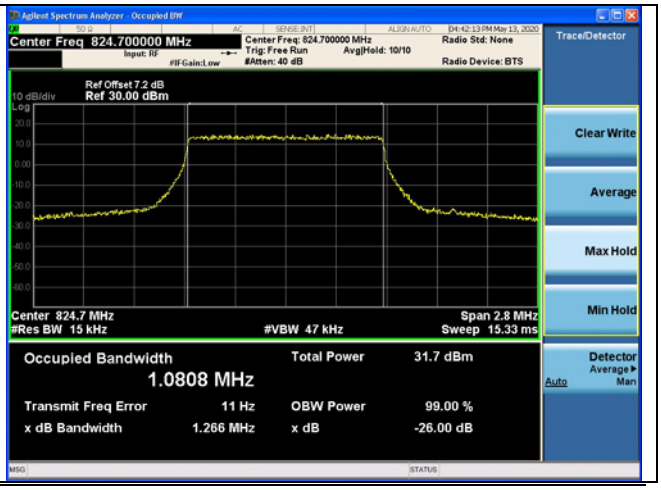


Fig.1

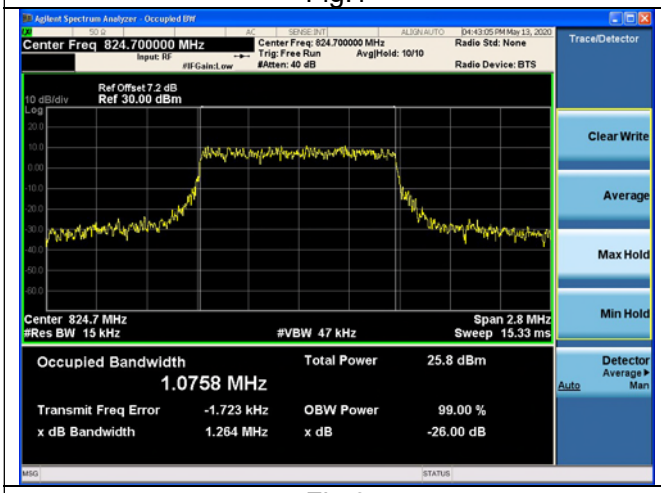


Fig.2

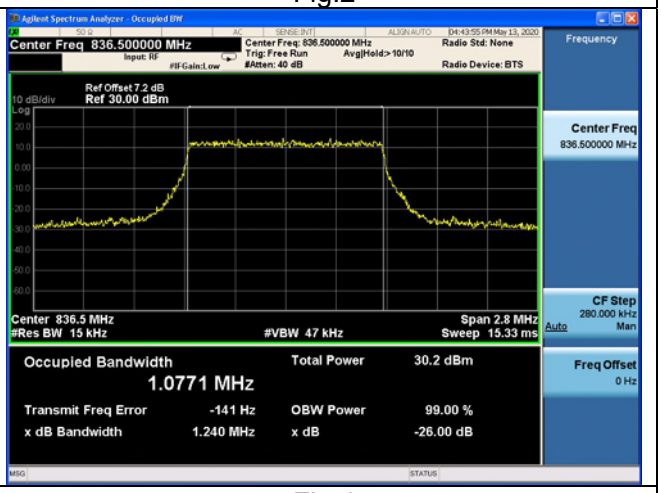


Fig.3

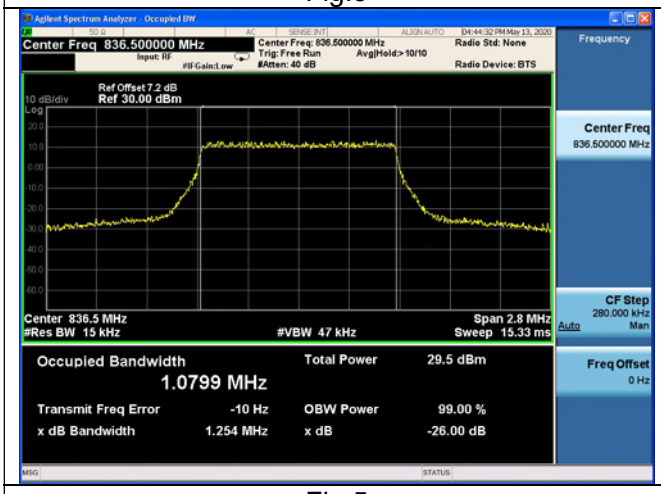


Fig.4

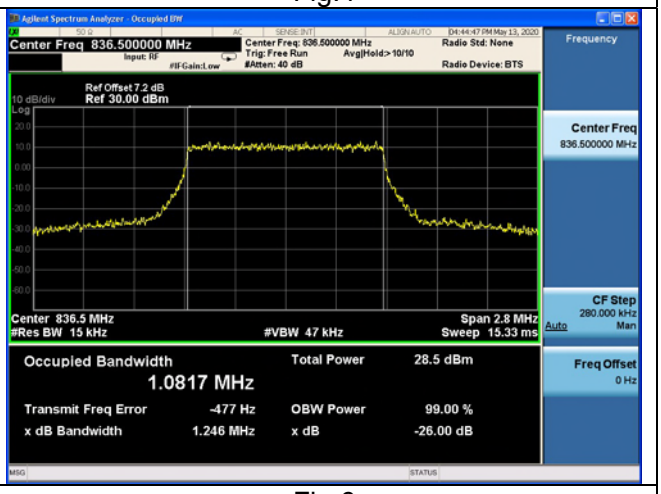


Fig.5

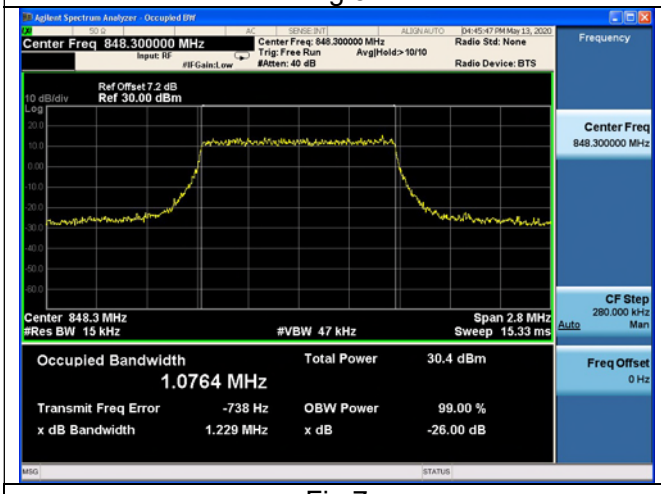


Fig.6

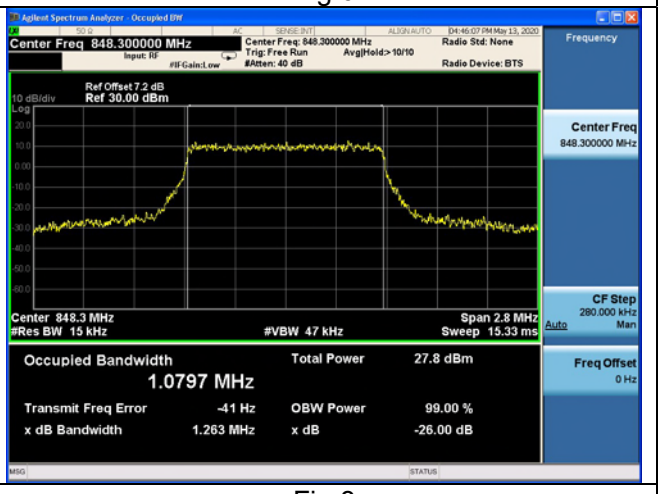


Fig.7

Fig.8

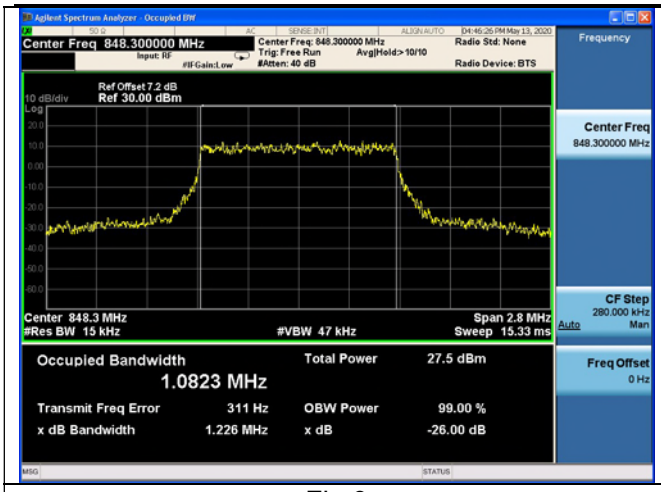


Fig.9

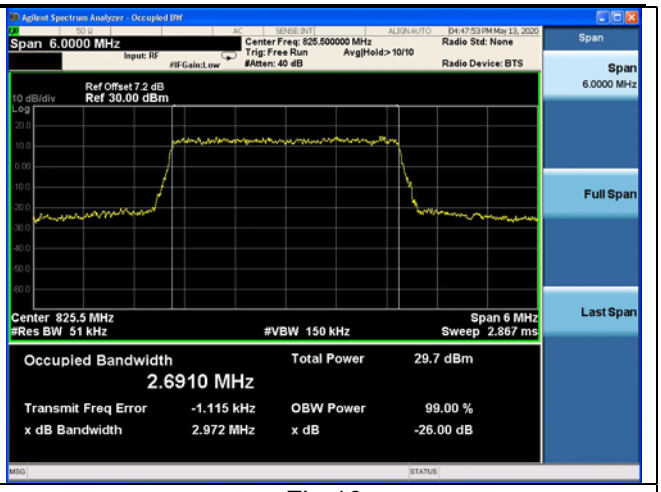


Fig.10

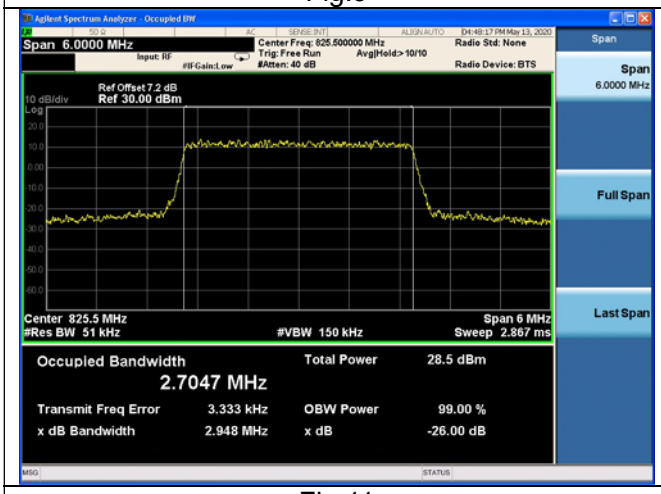


Fig.11

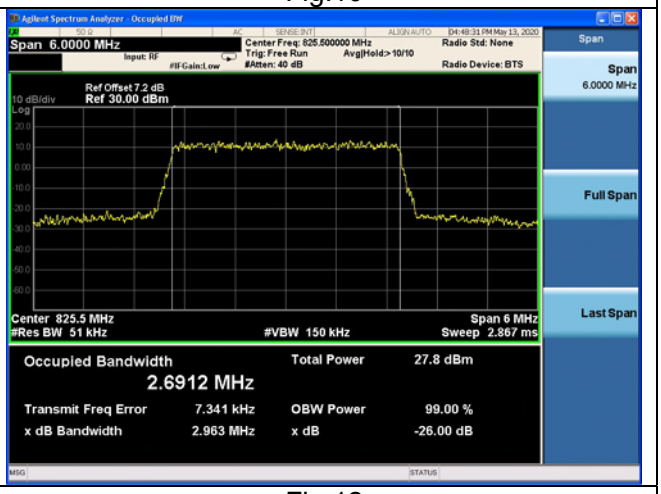


Fig.12

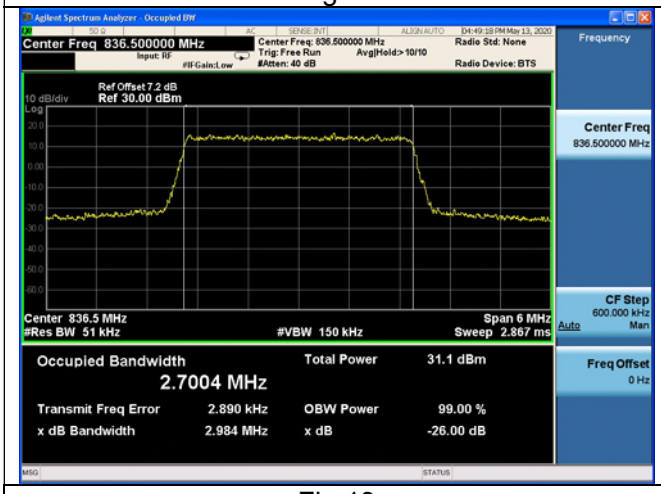


Fig.13

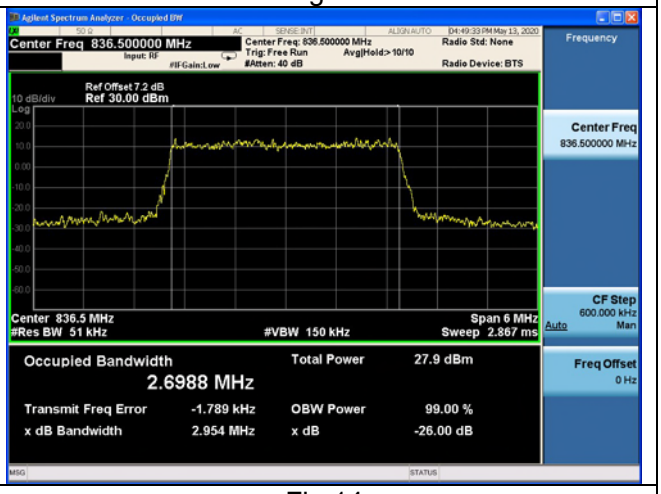


Fig.14

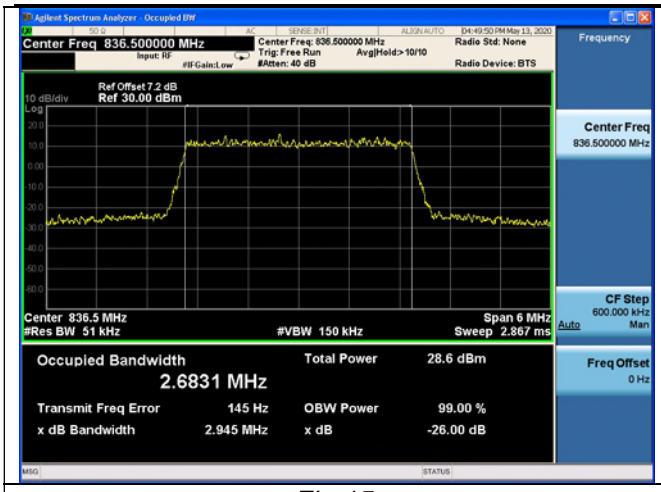


Fig.15

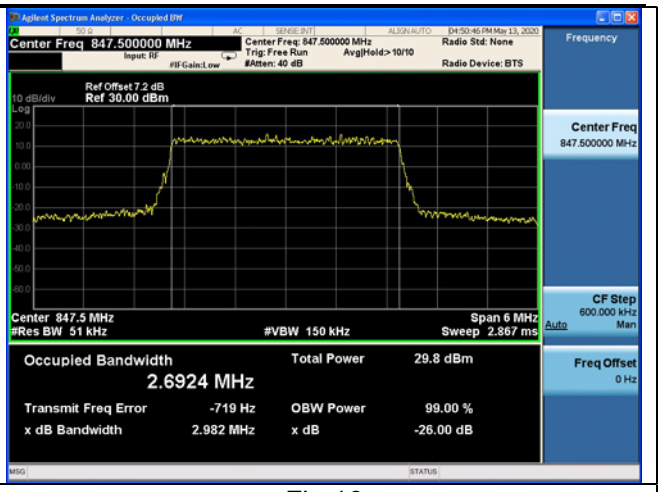


Fig.16

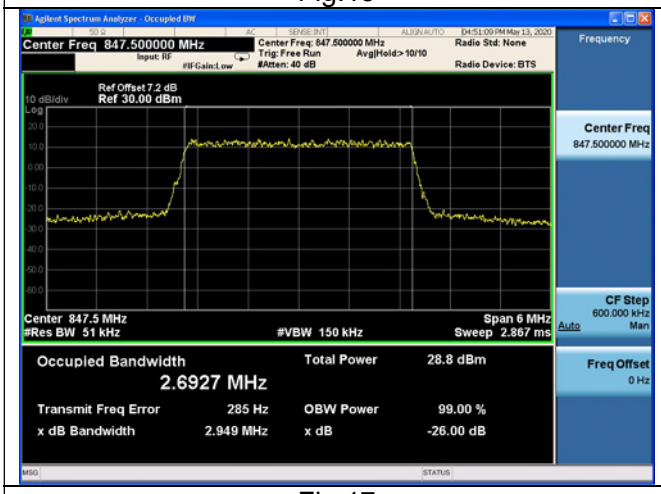


Fig.17

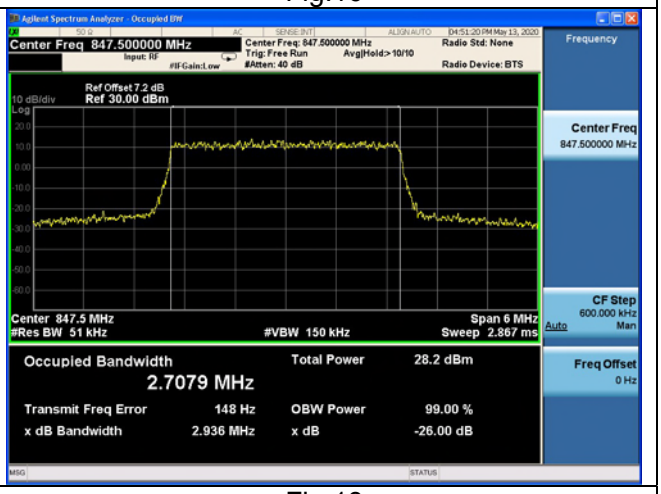


Fig.18

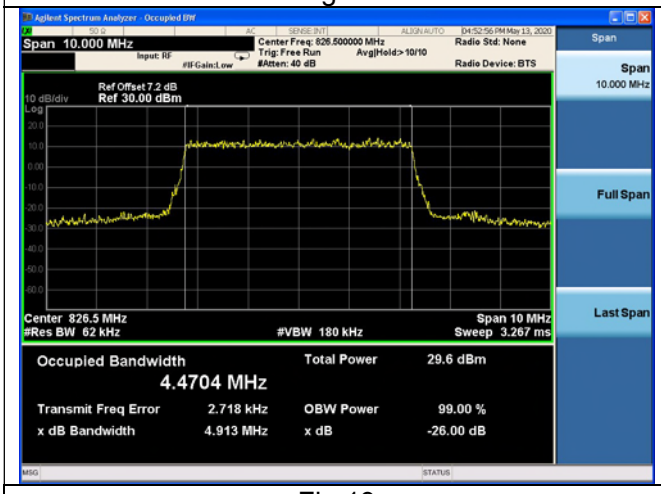


Fig.19

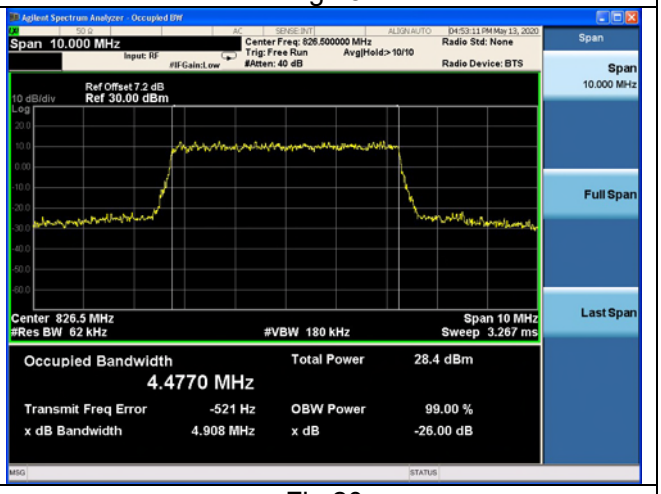


Fig.20

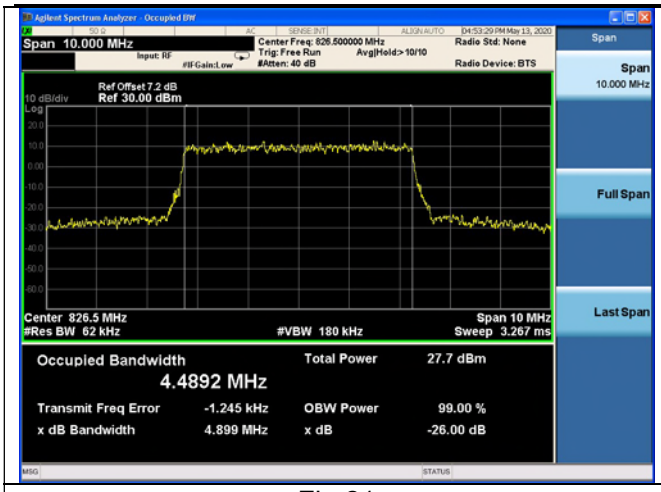


Fig.21

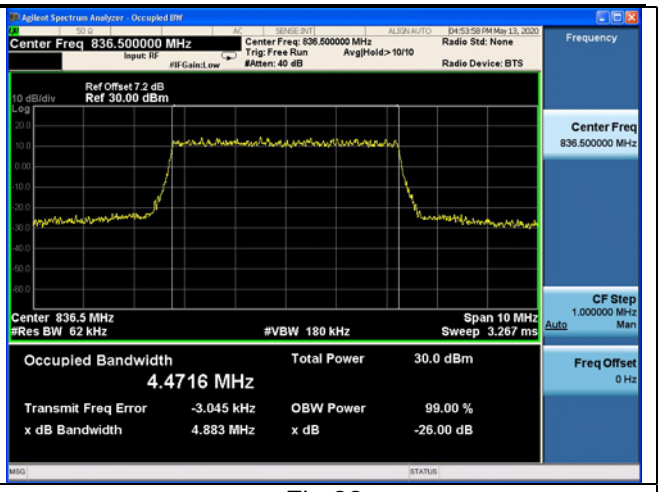


Fig.22

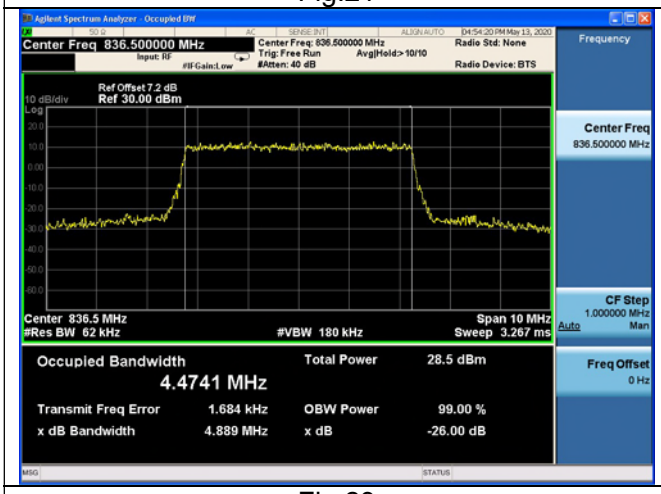


Fig.23

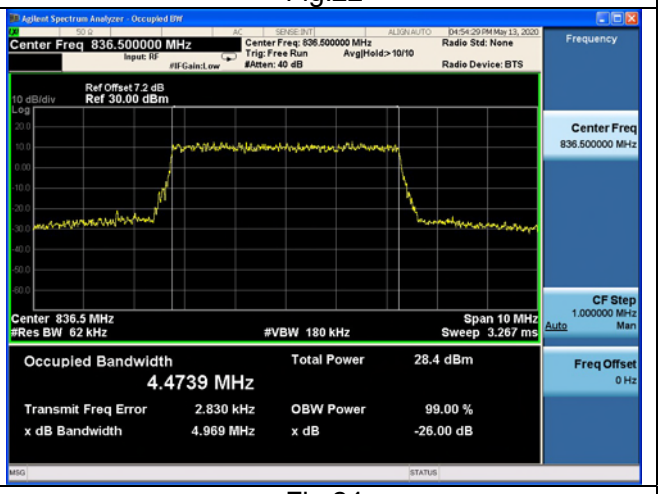


Fig.24

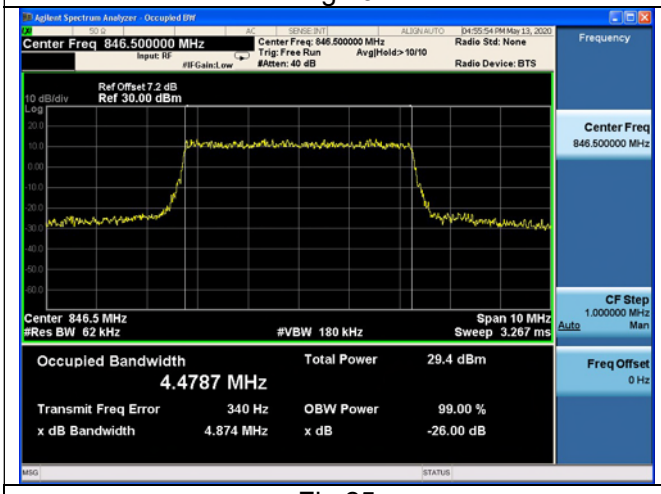


Fig.25

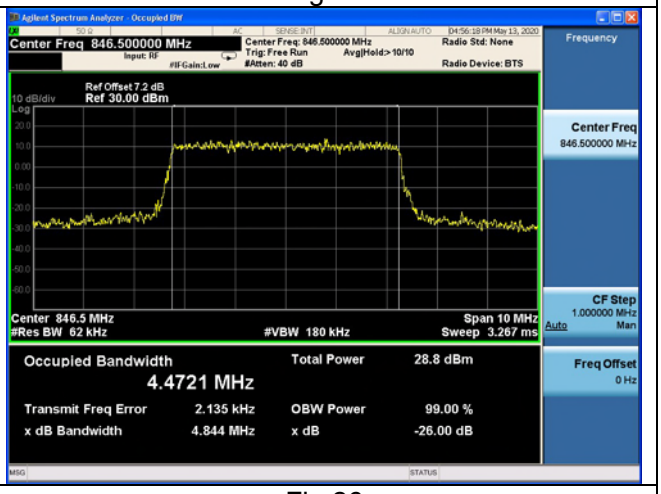


Fig.26

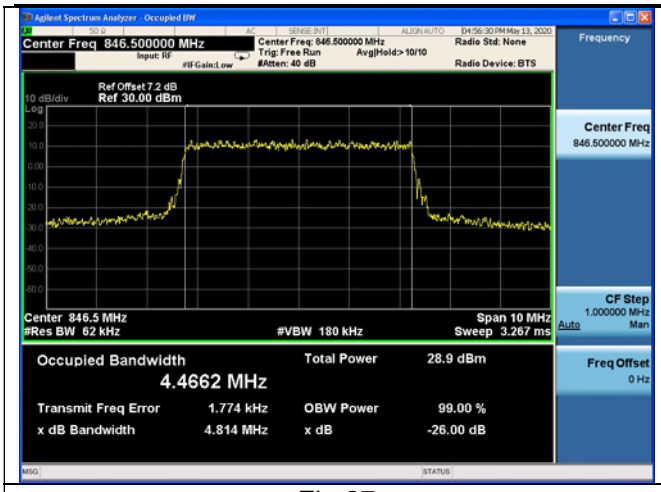


Fig.27

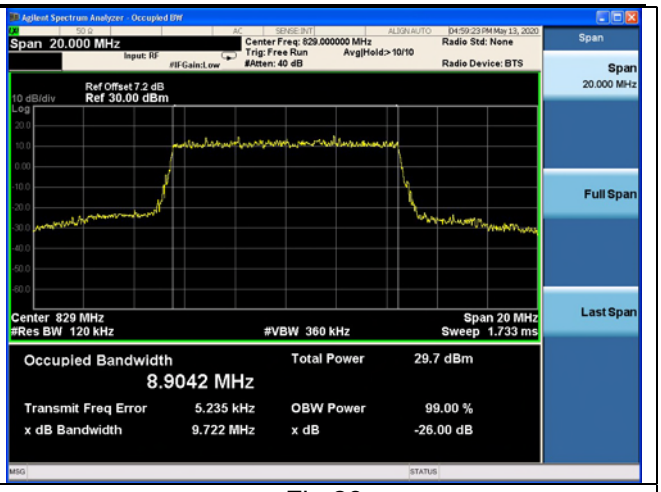


Fig.28

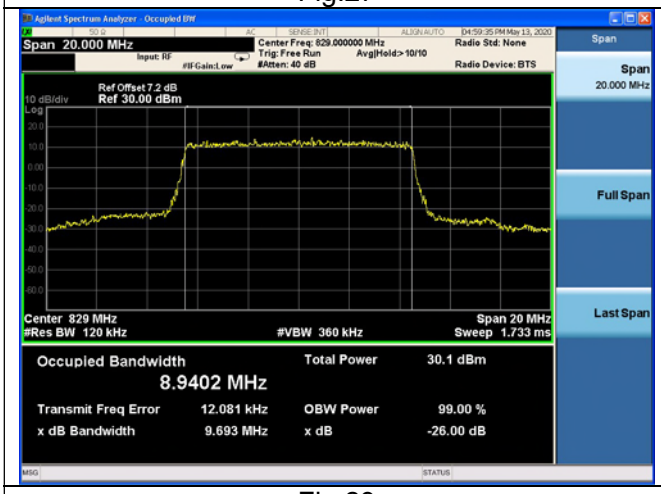


Fig.29

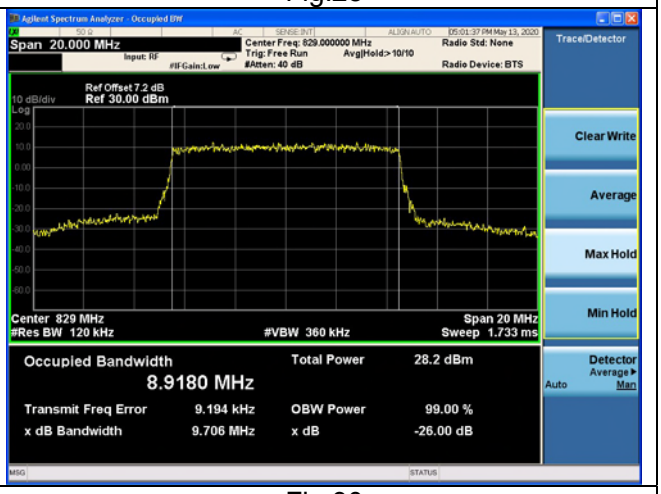


Fig.30

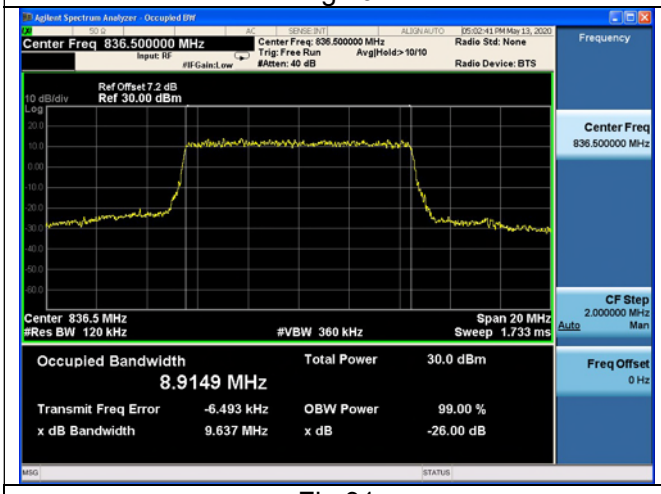


Fig.31

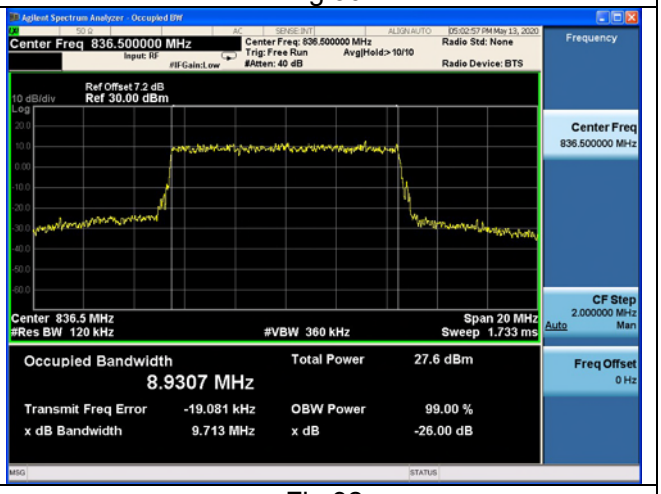


Fig.32

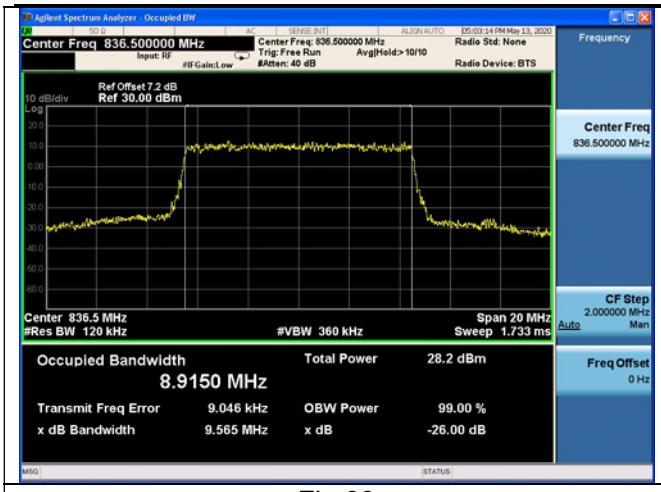


Fig.33

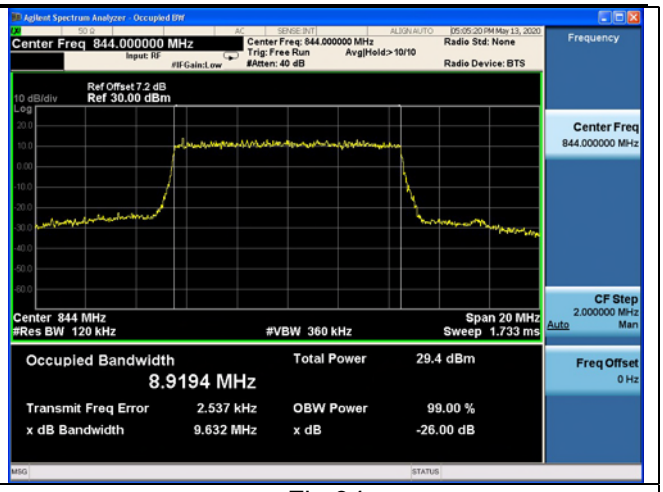


Fig.34

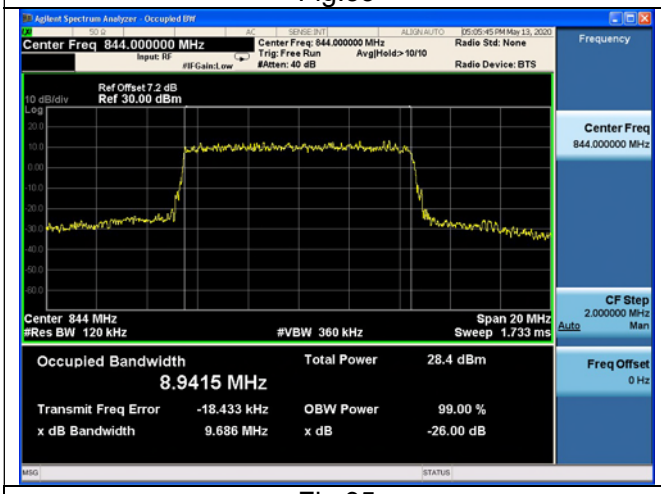


Fig.35

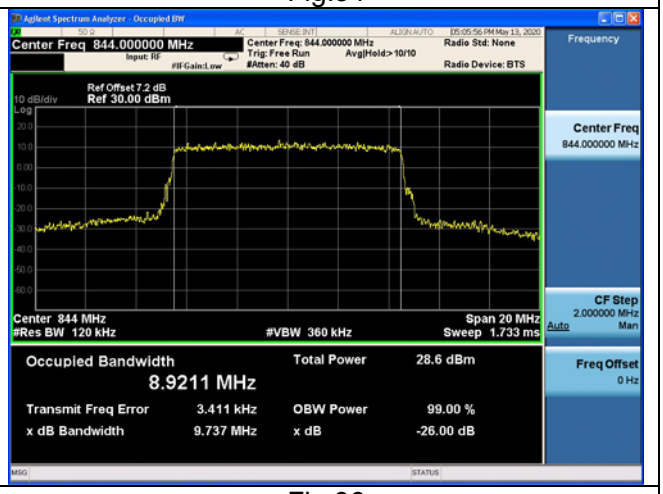


Fig.36

3 Peak-Average Ratio

Band	Carrier frequency (MHz)	Channel	BW (MHz)	RB Size	RB Offset	QPSK	16-QAM	64-QAM
5	836.5	20525	1.4	1	0	Fig.1	Fig.2	Fig.3
			3	1	0	Fig.4	Fig.5	Fig.6
			5	1	0	Fig.7	Fig.8	Fig.9
			10	1	0	Fig.10	Fig.11	Fig.12

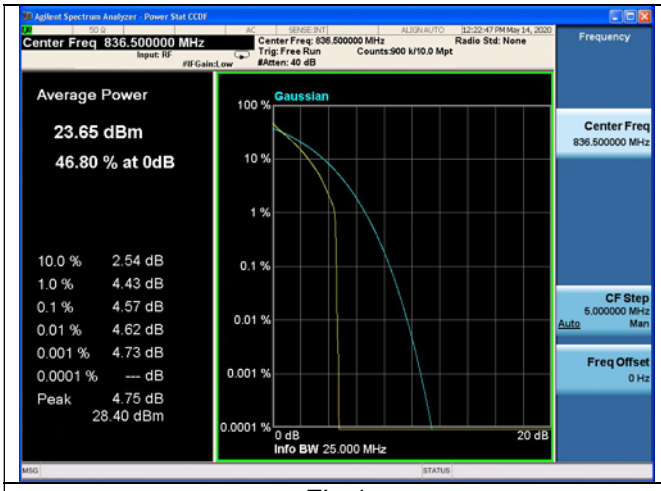


Fig.1

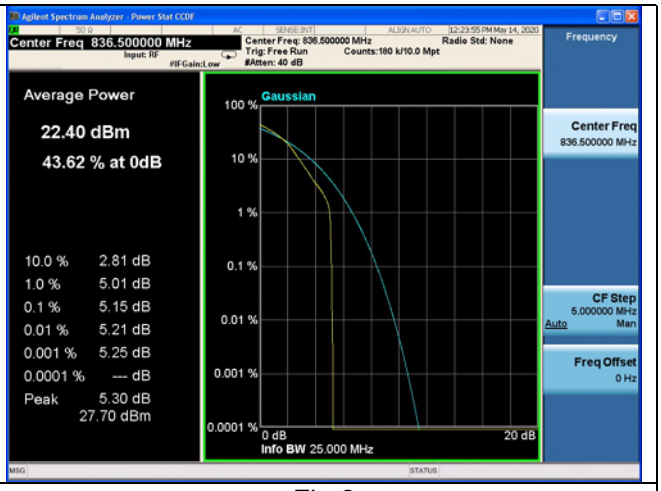


Fig.2

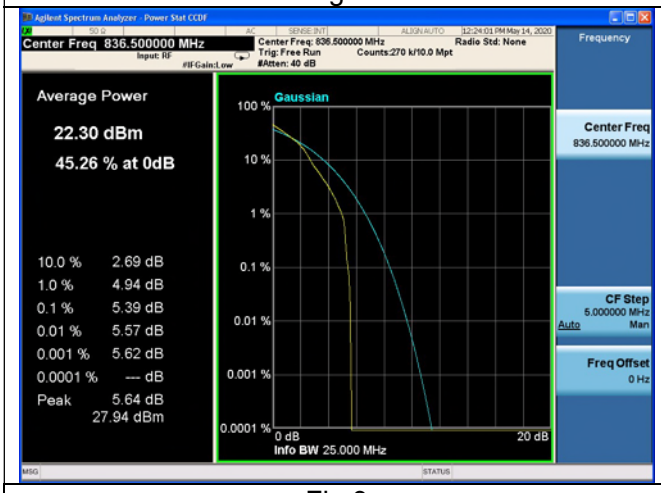


Fig.3

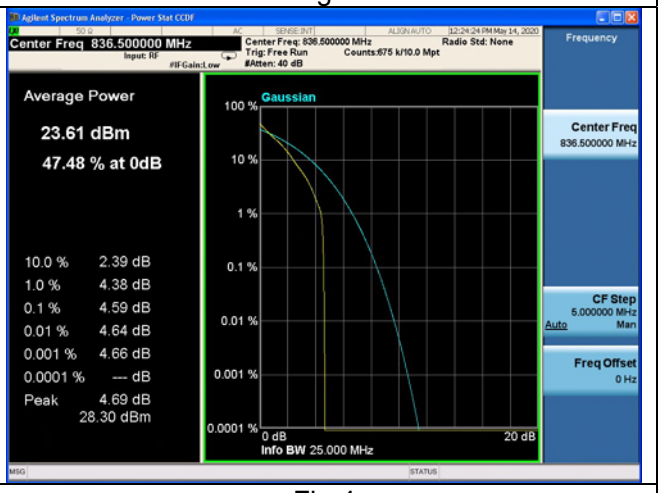


Fig.4

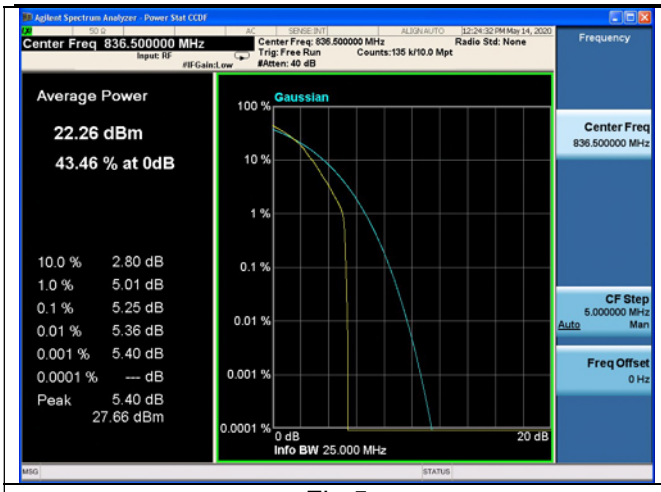


Fig.5

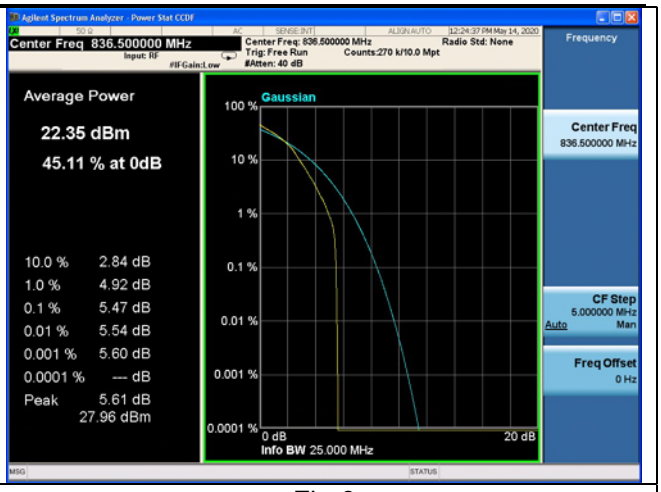


Fig.6

Fig.7

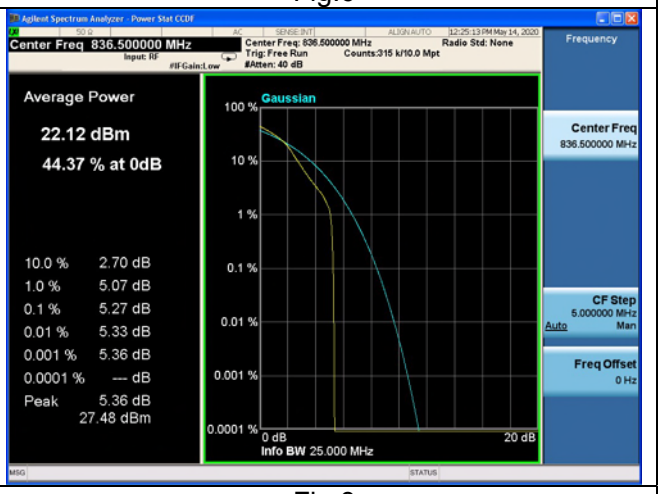


Fig.8

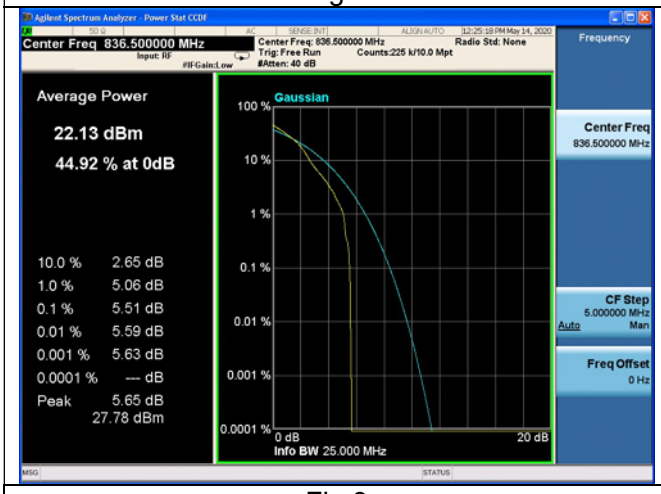


Fig.9

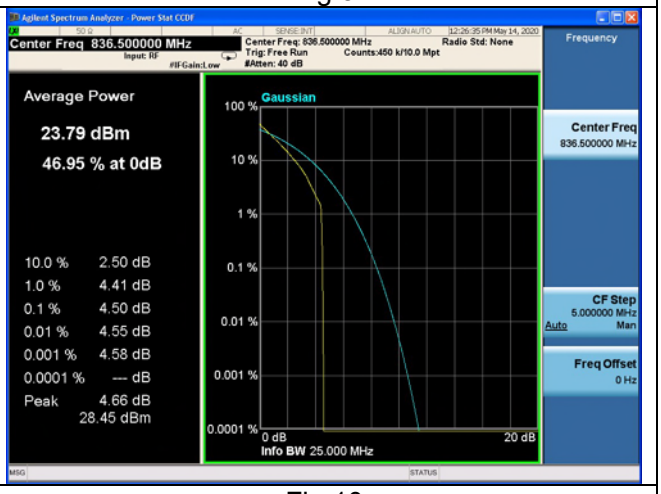


Fig.10