TEST REPORT

REPORT NUMBER: I22W00056-WWAN RF-Rev3

ON

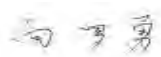
Type of Equipment:	IoT Module
Type of Designation:	L710HG
Brand Name：	LYNQ
Manufacturer:	Shanghai MobileTek Communication Ltd.
FCC ID:	2AK9D-L710-HG

ACCORDING TO

FCC CFR Part 2, FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS，e-CFR,
PART 22, PUBLIC MOBILE SERVICES，e-CFR,
PART 24, PERSONAL COMMUNICATIONS SERVICES，e-CFR,
PART 27,MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES，e-CFR,
PART 90,PRIVATE LAND MOBILE RADIO SERVICES，e-CFR,
ANSI C63.26-2015 American National Standard for Complicance Testing of Transmitters Used in Licensed Radio Services

Chongqing Academy of Information and Communications Technology

Month date, year
Sep, 02, 2022
Signature



Xiang Luoyong
Director

Note:
The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of Chongqing Academy of Information and Communications Technology.

Revision Version

Report Number	Revision	Date	Memo
I22W00056-WWAN RF	00	2022-08-10	Initial creation of test report
I22W00056-WWAN RF-Rev1	01	2022-08-30	--
I22W00056-WWAN RF-Rev2	02	2022-09-01	--
I22W00056-WWAN RF-Rev3	03	2022-09-02	--

CONTENTS

1. Test Laboratory

1.1. Testing Location

Name:	Chongqing Academy of Information and Communications Technology
FCC Registration number:	CN1239
Address:	Building C, Technology Innovation Center, No.8, Yuma Road, Chayuan New Area, Nan'an District, Chongqing, People's Republic of China
	No.19 East Road, Xiantao Big-data Valley, Yubei District, Chongqing, People's Republic of China
Postal Code:	401336
Telephone:	0086-23-88069965
Fax:	0086-23-88608777

1.2. Testing Environment

Normal Temperature:	15-35℃
Relative Humidity:	30-60%

1.3. Project data

Testing Start Date:	2022-07-11
Testing End Date:	2022-09-02

1.4. Signature

	2022-09-02
Zhang qinghao **(Prepared this test report)**	**Date**
	2022-09-02
Li Xu **(Reviewed this test report)**	**Date**
	2022-09-02
Xiang Luoyong **Director of the laboratory** **(Approved this test report)**	**Date**

2. Client Information

2.1. Applicant Information

Company Name:	Shanghai MobileTek Communication Ltd.
Address /Post:	Free Trade Zone No. 33, No. 17 building 6H3 Xiya Road China (Shanghai)
City:	Shanghai
Country:	China
Telephone:	15821966417
Fax:	--
Email:	qh.zhang@mobiletek.cn
Contact Person:	Qinghua Zhang

2.2. Manufacturer Information

Company Name:	Shanghai MobileTek Communication Ltd.
Address /Post:	Free Trade Zone No. 33, No. 17 building 6H3 Xiya Road China (Shanghai)
City:	Shanghai
Country:	China
Telephone:	15821966417
Fax:	--
Email:	qh.zhang@mobiletek.cn
Contact Person:	Qinghua Zhang

3. Equipment under Test (EUT) and Ancillary Equipment (AE)

3.1. About EUT

EUT Description	IoT Module
Model name	L710HG
Brand name	LYNQ
GSM Frequency Band	850/1900
NB-IoT Frequency Band	2/4/5/12/13/26
CAT-M Frequency Band	2/4/5/12/13/26
Type of modulation	GMSK/8PSK/BPSK/QPSK/16QAM
Nominal Voltage	3.8
Extreme High Voltage	4.2
Extreme Low Voltage	3.4

Note: Photographs of EUT are shown in ANNEX A of this test report.
Note: High and low voltage values in extreme condition test are given by manufacturer.

3.2. Internal Identification of EUT used during the test

EUT ID	SN or IMEI	HW Version	SW Version	Date of receipt
S3	866884046100624	V4	L710v09.01b01HGN_FGP.01	2022-07-11

*EUT ID: is used to identify the test sample in the lab internally.

3.3. Outline of Equipment under Test

Technology	Band	UL Freq.(MHz)	DL Freq.(MHz)	Note
GSM	GSM850	824 – 849	869 – 894	--
	PCS1900	1850 – 1910	1930 – 1990	--
NB-IoT	Band2	1850 – 1910	1930 – 1990	--
	Band4	1710-1755	2110-2155	
	Band5	824 – 849	869 – 894	Covered by Band26 (Band5 is a subset of Band26. Both Bands share the same hardware and have the same radio performance. Separate measurement in Band5 is not required.)
	Band12	699 – 716	729 – 746	--
	Band13	777 – 787	746 – 756	--
	Band26	814 – 849	859 – 894	--
CAT-M	Band2	1850 – 1910	1930 – 1990	--
	Band4	1710 – 1755	2110 – 2155	--
	Band5	824 – 849	869 – 894	Covered by Band26 (Band5 is a subset of Band26. Both Bands share the same hardware and have the same radio performance. Separate measurement in Band5 is not required.)
	Band12	699 – 716	729 – 746	--
	Band13	777 – 787	746 – 756	--
	Band26	814 – 849	859 – 894	--

3.4. Internal Identification of AE used during the test

AE ID*	Description	Manufacturer	Model
AE1	L710HG-EVB	Shanghai Mobiletek Communication Ltd	L506
AE2	Power Adapter	Shenzhen RuiChuangYi Technology Co.,ltd	RCL-X050200 C
AE3	USB Cable	Dongguan Guanlian wire Technology Co.,ltd	micro 5pin
AE4	Antenna	Shanghai Jesoncom Communication Engineering Co.,LTD	5J002B

*AE ID: is used to identify the test sample in the lab internally.

Band	Antenna Gain (dBi)
GSM850	3.5
GSM1900	2
NB-IoT/CAT-M B2	2
NB-IoT/CAT-M B4	4
NB-IoT/CAT-M B5	3.5
NB-IoT/CAT-M B12	4
NB-IoT/CAT-M B13	4
NB-IoT/CAT-M B26（814-824）	4
NB-IoT/CAT-M B26（824-849）	3.5

Antenna gain：is provided customer.

4. Reference Documents

4.1. Documents supplied by applicant

PICS/PIXIT, referring to Annex B for detailed information, is supplied by the client or manufacturer, which is the basis of testing.

4.2. Reference Documents for testing

The following documents listed in this section are referred for testing.

Reference	Title	Version
FCC CFR Part 2	FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS，e-CFR	--
PART 22	PUBLIC MOBILE SERVICES	--
PART 24	PERSONAL COMMUNICATIONS SERVICES,e-CFR,	--
PART 27	,MISCELLANEOUS WIRELESS OMMUNICATIONS SERVICES，e-CFR,	--
PART 90	PRIVATE LAND MOBILE RADIO SERVICES	--
ANSI C63.26	American National Standard for Complicance Testing of Transmitters Used in Licensed Radio Services	2015

5. Test Equipments Utilized

5.1. RF Test System

No.	Equipment	Model	SN	HW Version	SW Version	Manufacture	Cal.Due Date
1	spectrum analyzer	FSQ 26	201137/026	--	--	R&S	2023-06-29
2	Universal Radio Communication Tester	CMW500	152395	--	--	R&S	2023-06-29
3	Universal Radio Communication Tester	CMW500	164483	--	--	R&S	2023-06-29
4	spectrum analyzer	N9020A	MY50200376	--	--	Agilent	2023-06-29
5	spectrum analyzer	N9030A	MY55410223	--	--	Agilent	2023-06-29
6	DC source	EY3010ET	478620	--	--	ELECALL	2023-06-29

5.2. RSE Test System

No.	Equipment	Model	SN	HW Version	SW Version	Manufacture	Cal.Due Date
1	Test Receiver	ESU26	100367	01	4.43 SP3	R&S	2023-06-29
2	Ultra-wideband Log Periodic Antenna	VULB 9163	01392	--	--	Schwarzbeck	2024-05-04
3	Double Ridged Guide Antenna	HF907	100357	--	--	R&S	2023-02-10
4	Universal Radio Communication Tester	CMW500	128181	--	--	R&S	2023-06-29
5	Double Ridged Guide Antenna	HF907	100356	--	--	R&S	2023-07-07
6	Generator	SMU 200A	104517	--	--	R&S	2023-06-29
7	Ultra-wideband Log Periodic Antenna	VULB 9163	00995	--	--	R&S	2023-04-03
8	Amplifier1	BBA100-B	100974	--	--	R&S	2023-06-25

		250C125					
9	Amplifier2	AS0104-55 /55	1043988	--	--	MILMEGA	2023-06-25

5.3. Climate Chamber

No.	Name	Type	SN	Manufacture	Cal.Due Date
1	Climate chamber	SH-241	92010759	ESPEC	2023-06-29
2	Fully-Anechoic Chamber	FACT3-2	--	ETS	2025-04-29

5.4. Vibration table

No.	Name	Type	SN	Manufacture	Cal.Due Date
--	--	--	--	--	--

Anechoic chamber

Fully anechoic chamber by ETS-LINDGREN.

5.5. Test software

No.	Name	version	SN	Manufacture
1	EMC32	V 8.51.00	--	R&S

6. Test Results

6.1. Summary of Test Results

A brief summary of the tests carried out is shown as following.

FCC Rules	Name of Test	Result
2.1046,22.913(a),24.232(c),27.50,90.635(b)	Conducted RF Power Output	Pass
2.1046,22.913(a),24.232(c),27.50,90.635(b)	ERP and EIRP	Pass
2.1049,22.917(b), 24.238(b),90.209	Occupied Bandwidth	--
2.1051,24.238,2.1053,22.917, 27.53,90.691	Conducted spurious emissions	Pass
2.1051,24.238,2.1053,22.917, 27.53,90.691	Radiated Spurious Emission	Pass
2.1051,24.238, 2.1053, 22.917, 27.53,90.691	Band Edge	Pass
2.1055, 22.355,24.235, 27.54,90.213	Frequency Stability over Temperature Variation	Pass
2.1055, 22.355,24.235, 27.54,90.213	Frequency Stability over Voltage Variation	Pass
24.232, 27.50	Peak to Average Ratio	Pass
Note 1: No applicable performance criteria.		

6.2. Conducted RF Power Output

Specifications:	FCC Part 2.1046,22.913(a),24.232(c),27.50,90.635(b)
DUT Serial Number:	866884046100624
Test conditions:	Ambient Temperature:15℃-35℃ Relative Humidity:30%-60% Air pressure: 86-106kPa
Test Results:	Pass

Limit Level Construction:

According to Part 22.913(a), the ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

According to Part24.232(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.

According to Part 27.50(c), 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.

According to Part 27.50(d), 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.

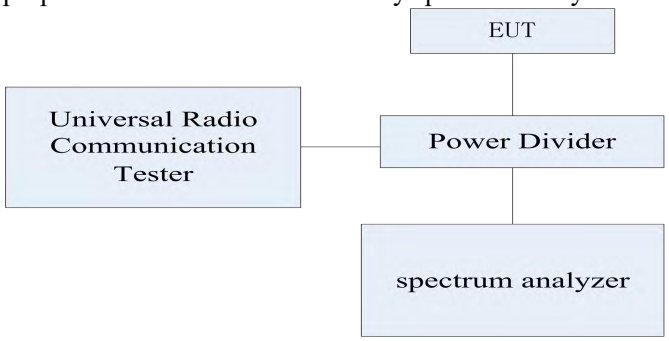
According to Part 90.635 (b),The maximum output power of the transmitter for mobile stations is 100 watts (20 dBw).

Measurement Uncertainty:

Item	Uncertainty
Expanded Uncertainty	0.62 dB (k=2)

Test Setup:

During the test, the EUT was controlled via the Wireless Telecommunications Test Set to ensure max power transmission and proper modulation and measured by spectrum analyzer.



Test Method:

1) The EUT was coupled to the spectrum analyzer and the Wireless Telecommunications Test Set through a power divider. The loss of the RF cables of the test system is calibrated to correct the readings.

2) For RMS power test, the spectrum analyzer was set to RMS Detector function and Maximum hold mode.

3) For Peak power test, the spectrum analyzer was set to Maxpeak Detector function and Maximum hold mode.

4) The resolution Bandwidth of the spectrum analyzer was comparable to the emission Bandwidth.

Note: --

6.2.1 NB-IoT Band2 Conducted RF Power Output Results

NB-IoT Band 2

Maximum Average Conducted Power（dBm）					
Sub-carrier Spacing [kHz]	Modulation	N_{tones}	Channel		
			Low18601	Mid18900	High19199
3.75	BPSK	1@0	22.29	22.48	22.49
		1@47	22.32	22.42	22.52
	QPSK	1@0	22.45	22.56	22.73
		1@47	22.37	22.46	22.68
15	BPSK	1@0	20.42	19.79	20.84
		1@11	21.37	19.74	20.76
	QPSK	1@0	21.49	20.05	20.98
		1@11	21.62	20.00	20.92
		12@0	22.23	21.95	22.12

6.2.2 NB-IoT Band4 Conducted RF Power Output Results

NB-IoT Band 4

Maximum Average Conducted Power（dBm）					
Sub-carrier Spacing [kHz]	Modulation	N_{tones}	Channel		
			Low19951	Mid20175	High20399
3.75	BPSK	1@0	22.98	22.99	23.47
		1@47	22.89	22.95	23.40
	QPSK	1@0	23.04	23.13	23.42
		1@47	22.95	23.00	23.38
15	BPSK	1@0	21.54	20.46	20.52
		1@11	21.46	20.41	20.40
	QPSK	1@0	21.56	20.53	20.55
		1@11	21.49	20.45	20.47
		12@0	21.95	21.85	21.88

6.2.3 NB-IoT Band12 Conducted RF Power Output Results

NB-IoT Band12

Maximum Average Conducted Power（dBm）					
Sub-carrier Spacing [kHz]	Modulation	N_{tones}	Channel		
			Low23011	Mid23095	High23179
3.75	BPSK	1@0	22.68	22.62	22.57
		1@47	22.64	22.66	22.45
	QPSK	1@0	22.80	22.70	22.63
		1@47	22.74	22.72	22.54
15	BPSK	1@0	20.34	20.43	20.63
		1@11	20.26	20.38	20.58
	QPSK	1@0	20.37	20.48	20.70
		1@11	20.30	20.42	20.63
		12@0	21.91	21.97	22.19

6.2.4 NB-IoT Band13 Conducted RF Power Output Results

NB-IoT Band13

Maximum Average Conducted Power（dBm）					
Sub-carrier Spacing [kHz]	Modulation	N_{tones}	Channel		
			Low23181	Mid23230	High23279
3.75	BPSK	1@0	22.31	22.38	22.54
		1@47	22.24	22.40	22.49
	QPSK	1@0	22.37	22.52	22.64
		1@47	22.29	22.44	22.50
15	BPSK	1@0	20.10	20.19	20.31
		1@11	20.03	20.15	20.23
	QPSK	1@0	20.14	20.23	20.36
		1@11	20.06	20.16	20.27
		12@0	21.67	21.72	21.83

6.2.5 NB-IoT Band 26 Conducted RF Power Output Results (824MHz-849MHz)

Maximum Average Conducted Power（dBm）					
Sub-carrier Spacing [kHz]	Modulation	N_{tones}	Channel		
			Low26791	Mid26915	High27039
3.75	BPSK	1@0	22.83	22.82	22.83
		1@47	22.75	22.66	22.77
	QPSK	1@0	22.83	22.79	22.94
		1@47	22.78	22.70	22.82
15	BPSK	1@0	20.83	20.84	21.48
		1@11	20.74	20.74	21.44
	QPSK	1@0	20.82	20.83	21.47
		1@11	20.74	21.76	21.39
		12@0	22.23	22.27	21.89

(814MHz-824MHz)

Maximum Average Conducted Power（dBm）					
Sub-carrier Spacing [kHz]	**Modulation**	**N_{tones}**	**Channel**		
			Low26691	**Mid**26740	**High**26789
3.75	BPSK	1@0	11.93	11.82	11.75
		1@47	11.77	11.77	11.65
	QPSK	1@0	11.87	11.88	11.72
		1@47	11.84	11.81	11.65
15	BPSK	1@0	9.74	9.68	9.75
		1@11	9.70	9.62	9.68
	QPSK	1@0	9.78	9.76	9.79
		1@11	9.70	9.66	9.71
		12@0	11.17	11.18	11.16

6.2.6 CAT-M B2 Conducted RF Power Output Results

Mode	Bandwidth	Channel	RB	Index	Conducted Power	
					QPSK	16QAM
Band2	1.4MHz	18607	1#0	0	23.52	22.60
			6#0	0	21.62	21.54
		18900	1#0	0	23.31	22.27
			6#0	0	21.24	21.15
		19193	1#5	0	23.57	22.60
			6#0	0	21.60	21.66
	3MHz	18615	1#0	0	23.58	22.64
			6#0	0	21.71	21.49
		18900	1#0	0	23.58	22.64
			6#0	0	21.62	21.47
		19185	1#5	1	23.70	22.87
			6#0	1	21.64	21.83
	5MHz	18625	1#0	0	23.56	23.74
			6#0	0	22.54	21.54
		18900	1#0	0	23.55	23.78
			6#0	0	22.40	21.53
		19175	1#5	3	23.59	24.10
			6#0	3	22.57	21.83

	10MHz	18650	1#0	0	23.49	23.68
			4#0	0	23.43	22.50
		18900	1#0	0	23.46	23.68
			4#0	0	23.40	22.46
		19150	1#5	7	23.50	23.99
			4#2	7	23.51	22.75
	15MHz	18675	1#0	0	23.47	23.62
			6#0	0	23.33	23.36
		18900	1#0	0	23.48	23.65
			6#0	0	23.34	23.38
		19125	1#5	0	23.46	23.94
			6#0	0	23.51	23.95
	20MHz	18700	1#0	0	23.43	23.65
			6#0	0	23.34	23.36
		18900	1#0	0	23.49	23.71
			6#0	0	23.38	23.41
		19100	1#5	0	23.43	23.91
			6#0	0	23.47	23.90

6.2.7 CAT-M B4 Conducted RF Power Output Results

Mode	Bandwidth	Channel	RB	Index	Conducted Power	
					QPSK	16QAM
Band4	1.4MHz	19957	1#0	0	23.73	22.92
			6#0	0	21.72	21.73
		20175	1#0	0	23.84	22.95
			6#0	0	21.89	21.77
		20393	1#5	0	23.55	22.65
			6#0	0	21.75	21.72
	3MHz	19965	1#0	0	23.68	22.82
			6#0	0	21.67	21.67
		20175	1#0	0	23.80	22.90
			6#0	0	21.80	21.72
		20385	1#5	1	23.56	22.66
			6#0	1	21.77	21.74
	5MHz	19975	1#0	0	23.66	23.92
			6#0	0	22.63	22.61
		20175	1#0	0	23.77	24.05
			6#0	0	22.73	21.80
		20375	1#5	3	23.68	24.29
			6#0	3	22.67	21.91

	10MHz	20000	1#0	0	23.65	23.90
			4#0	0	23.59	22.68
		20175	1#0	0	23.76	24.03
			4#0	0	23.71	22.78
		20350	1#5	7	23.57	23.82
			4#2	7	22.75	22.81
	15MHz	20025	1#0	0	23.63	23.86
			6#0	0	23.58	23.61
		20175	1#0	0	23.85	24.13
			6#0	0	23.69	23.94
		20325	1#5	0	23.42	23.80
			6#0	0	23.65	23.72
	20MHz	20050	1#0	0	22.98	22.97
			6#0	0	22.91	22.90
		20175	1#0	0	23.76	24.03
			6#0	0	23.69	23.74
		20300	1#5	0	22.98	22.95
			6#0	0	23.07	23.06

6.2.8 CAT-M B12 Conducted RF Power Output Results

Mode	Bandwidth	Channel	RB	Index	Conducted Power	
					QPSK	16QAM
Band12	1.4MHz	23017	1#0	0	23.78	22.79
			6#0	0	21.66	21.73
		23095	1#0	0	23.83	22.82
			6#0	0	21.71	21.75
		23173	1#5	0	23.71	22.69
			6#0	0	21.98	21.88
	3MHz	23025	1#0	0	23.73	22.73
			6#0	0	21.62	21.64
		23095	1#0	0	23.82	22.81
			6#0	0	21.71	21.73
		23165	1#5	1	23.72	22.70
			6#0	1	21.90	21.80
	5MHz	23035	1#0	0	23.68	23.96
			6#0	0	22.59	21.69
		23095	1#0	0	23.76	24.04
			6#0	0	22.68	21.77
		23155	1#5	3	23.59	23.82
			6#0	3	22.76	21.78
	10MHz	23060	1#0	0	23.70	23.99
			4#0	0	22.61	22.61
		23095	1#0	0	23.74	24.00
			4#0	0	23.66	22.65
		23130	1#5	7	23.50	23.79
			4#2	7	22.70	21.67

6.2.9 CAT-M B13 Conducted RF Power Output Results

Mode	Bandwidth	Channel	RB	Index	Conducted Power	
					QPSK	16QAM
Band13	5MHz	23205	1#0	0	22.84	21.60
			6#0	0	22.75	20.56
		23230	1#0	0	22.86	22.74
			6#0	3	21.68	20.62
		23255	1#5	3	23.01	23.39
			6#0	3	22.22	21.27
	10MHz	23230	1#0	0	23.45	23.81
			6#0	0	22.19	22.31
		23230	1#0	0	23.45	23.81
			6#0	0	22.19	22.31
		23230	1#5	7	23.04	23.41
			4#2	7	22.17	22.32

6.2.10 CAT-M B26 Conducted RF Power Output Results

(824MHz-849MHz)

Mode	Bandwidth	Channel	RB	Index	Conducted Power	
					QPSK	16QAM
Band26	1.4MHz	26797	1#0	0	24.05	23.03
			6#0	0	21.93	21.94
		26915	1#0	0	23.88	22.88
			6#0	0	21.83	21.72
		27033	1#5	0	23.36	22.32
			6#0	0	21.65	21.55
	3MHz	26805	1#0	0	24.01	22.99
			6#0	0	21.89	21.90
		26915	1#0	0	23.89	22.89
			6#0	0	21.84	21.73
		27025	1#5	1	23.38	22.34
			6#0	1	21.69	21.58
	5MHz	26815	1#0	0	23.98	24.22
			6#0	0	22.89	22.00
		26915	1#0	0	23.90	24.10
			6#0	0	22.74	21.82
		27015	1#5	3	23.40	23.65
			6#0	3	22.62	21.72
	10MHz	26840	1#0	0	23.94	24.17
			4#0	0	23.85	22.83
		26915	1#0	0	23.88	23.79
			4#0	0	22.79	22.79
		26990	1#5	7	23.42	23.58
			4#2	7	23.52	22.51

(814MHz-824MHz)

Mode	Bandwidth	Channel	RB	Index	Conducted Power	
					QPSK	16QAM
Band26	1.4MHz	26697	1#0	0	24.22	23.36
			6#0	0	22.02	22.10
		26740	1#0	0	24.12	23.08
			6#0	0	21.99	22.00
		26783	1#5	0	23.63	22.61
			6#0	0	21.89	21.90
	3MHz	26705	1#0	0	24.09	23.08
			6#0	0	21.98	21.99
		26740	1#0	0	24.11	23.11
			6#0	0	22.01	22.02
		26775	1#5	1	23.67	22.65
			6#0	1	21.94	21.95
	5MHz	26715	1#0	0	24.07	24.32
			6#0	0	22.97	22.06
		26740	1#0	0	24.00	24.26
			6#0	0	22.93	22.01
		26765	1#5	3	24.07	23.69
			6#0	3	22.96	22.05
	10MHz	26740	1#0	0	24.01	24.25
			4#0	0	23.92	22.93

6.3. ERP and EIRP

This is the test for the maximum radiated power from the EUT.

According to Part 22.913(a), the ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

According to Part24.232(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.

According to Part 27.50(c), 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.

According to Part 27.50(d), 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.

According to 22.913(a), The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts."

Conducted RF Power+Antenna Gain(dBi)=EIRP
Conducted RF Power+Antenna Gain(dBd)=ERP
Antenna Gain(dBd)= Antenna Gain(dBi)-2.15

Frequency Band	AntennaGain (dBi)	AntennaGain (dBd)
GSM 850	N/A	1.35
GSM 1900	2	N/A
NB-IOT Band2/CAT-M Band2	2	N/A
NB-IOT Band4/CAT-M Band 4	4	N/A
NB-IOT Band5/CAT-M Band5	N/A	1.35
NB-IOT Band12/CAT-M Band12	N/A	1.85
NB-IOT Band13/CAT-M Band13	N/A	1.85
NB-IoT/CAT-M B26（814-824）	N/A	1.85
NB-IoT/CAT-M B26（824-849）	N/A	1.35

NB-IoT Band 2

EIRP（dBm）EIRP Limit ： 33dBm Max EIRP=24.73dBm					
Sub-carrier Spacing [kHz]	Modulation	Ntones	Channel		
			Low18601	Mid18900	High19199
3.75	BPSK	1@0	24.29	24.48	24.49
		1@47	24.32	24.42	24.52
	QPSK	1@0	24.45	24.56	24.73
		1@47	24.37	24.46	24.68
15	BPSK	1@0	22.42	21.79	22.84
		1@11	23.37	21.74	22.76
	QPSK	1@0	23.49	22.05	22.98
		1@11	23.62	22.00	22.92
		12@0	24.23	23.95	24.12

NB-IoT Band 4

EIRP（dBm）EIRP Limit ： 30dBm Max EIRP=27.47dBm					
Sub-carrier Spacing [kHz]	Modulation	Ntones	Channel		
			Low19951	Mid20175	High20399
3.75	BPSK	1@0	26.98	26.99	27.47
		1@47	26.89	26.95	27.40
	QPSK	1@0	27.04	27.13	27.42
		1@47	26.95	27.00	27.38
15	BPSK	1@0	25.54	24.46	24.52
		1@11	25.46	24.41	24.40
	QPSK	1@0	25.56	24.53	24.55

		1@11	25.49	24.45	24.47
		12@0	25.95	25.85	25.88

NB-IoT B 12

ERP（Limits 34.8dBm ）					
Sub-carrier Spacing [kHz]	**Modulation**	**N_{tones}**	**Channel**		
			Low23011	**Mid23095**	**High23179**
3.75	**BPSK**	**1@0**	24.53	24.47	24.42
		1@47	24.49	24.51	24.30
	QPSK	**1@0**	24.65	24.55	24.48
		1@47	24.59	24.57	24.39
15	**BPSK**	**1@0**	22.19	22.28	22.48
		1@11	22.11	22.23	22.43
	QPSK	**1@0**	22.22	22.33	22.55
		1@11	22.15	22.27	22.48
		12@0	23.76	23.82	24.04

NB-IoT B 13

ERP（Limits 34.8dBm ）					
Sub-carrier Spacing [kHz]	**Modulation**	**N_{tones}**	**Channel**		
			Low23181	**Mid23230**	**High23279**
3.75	**BPSK**	**1@0**	24.16	24.23	24.39
		1@47	24.09	24.25	24.34
	QPSK	**1@0**	24.22	24.37	24.49
		1@47	24.14	24.29	24.35
15	**BPSK**	**1@0**	21.95	22.04	22.16
		1@11	21.88	22.00	22.08
	QPSK	**1@0**	21.99	22.08	22.21

		1@11	21.91	22.01	22.12
		12@0	23.52	23.57	23.68

NB-IoT B26
(824MHz-849MHz)

ERP（Limits 38.5dBm ）					
Sub-carrier Spacing [kHz]	Modulation	N_{tones}	Channel		
			Low26791	Mid26915	High27039
3.75	BPSK	1@0	24.18	24.17	24.18
		1@47	24.10	24.01	24.12
	QPSK	1@0	24.18	24.14	24.29
		1@47	24.13	24.05	24.17
15	BPSK	1@0	22.18	22.19	22.83
		1@11	22.09	22.09	22.79
	QPSK	1@0	22.17	22.18	22.82
		1@11	22.09	23.11	22.74
		12@0	23.58	23.62	23.24

(814MHz-824MHz)

ERP（Limits 51.5 dBm ）					
Sub-carrier Spacing [kHz]	Modulation	N_{tones}	Channel		
			Low26691	Mid26740	High26789
3.75	BPSK	1@0	13.78	13.67	13.60
		1@47	13.62	13.62	13.50
	QPSK	1@0	13.72	13.73	13.57
		1@47	13.69	13.66	13.50
15	BPSK	1@0	11.59	11.53	11.60
		1@11	11.55	11.47	11.53

	QPSK	1@0	11.63	11.61	11.64
		1@11	11.55	11.51	11.56
		12@0	13.02	13.03	13.01

CAT-M B2

Mode	Bandwidth	Channel	RB	Index	EIRP(Limits 33.0 dBm)	
					QPSK	16QAM
Band2	1.4MHz	18607	1#0	0	25.52	24.60
			6#0	0	23.62	23.54
		18900	1#0	0	25.31	24.27
			6#0	0	23.24	23.15
		19193	1#5	0	25.57	24.60
			6#0	0	23.60	23.66
	3MHz	18615	1#0	0	25.58	24.64
			6#0	0	23.71	23.49
		18900	1#0	0	25.58	24.64
			6#0	0	23.62	23.47
		19185	1#5	1	25.70	24.87
			6#0	1	23.64	23.83
	5MHz	18625	1#0	0	25.56	25.74
			6#0	0	24.54	23.54
		18900	1#0	0	25.55	25.78

			6#0	0	24.40	23.53
		19175	1#5	3	25.59	26.10
			6#0	3	24.57	23.83
	10MHz	18650	1#0	0	25.49	25.68
			4#0	0	25.43	24.50
		18900	1#0	0	25.46	25.68
			4#0	0	25.40	24.46
		19150	1#5	7	25.50	25.99
			4#2	7	25.51	24.75
	15MHz	18675	1#0	0	25.47	25.62
			6#0	0	25.33	25.36
		18900	1#0	0	25.48	25.65
			6#0	0	25.34	25.38
		19125	1#5	0	25.46	25.94
			6#0	0	25.51	25.95
	20MHz	18700	1#0	0	25.43	25.65
			6#0	0	25.34	25.36
		18900	1#0	0	25.49	25.71
			6#0	0	25.38	25.41

		19100	1#5	0	25.43	25.91
			6#0	0	25.47	25.90

CAT-M B4

Mode	Bandwidth	Channel	RB	Index	EIRP(Limits 30.0 dBm)	
					QPSK	16QAM
Band4	1.4MHz	19957	1#0	0	27.73	26.92
			6#0	0	25.72	25.73
		20175	1#0	0	27.84	26.95
			6#0	0	25.89	25.77
		20393	1#5	0	27.55	26.65
			6#0	0	25.75	25.72
	3MHz	19965	1#0	0	27.68	26.82
			6#0	0	25.67	25.67
		20175	1#0	0	27.80	26.90
			6#0	0	25.80	25.72
		20385	1#5	1	27.56	26.66
			6#0	1	25.77	25.74
	5MHz	19975	1#0	0	27.66	27.92
			6#0	0	26.63	26.61
		20175	1#0	0	27.77	28.05
			6#0	0	26.73	25.80
		20375	1#5	3	27.68	28.29
			6#0	3	26.67	25.91

	10MHz	20000	1#0	0	27.65	27.90
			4#0	0	27.59	26.68
		20175	1#0	0	27.76	28.03
			4#0	0	27.71	26.78
		20350	1#5	7	27.57	27.82
			4#2	7	26.75	26.81
	15MHz	20025	1#0	0	27.63	27.86
			6#0	0	27.58	27.61
		20175	1#0	0	27.85	28.13
			6#0	0	27.69	27.94
		20325	1#5	0	27.42	27.80
			6#0	0	27.65	27.72
	20MHz	20050	1#0	0	26.98	26.97
			6#0	0	26.91	26.90
		20175	1#0	0	27.76	28.03
			6#0	0	27.69	27.74
		20300	1#5	0	26.98	26.95
			6#0	0	27.07	27.06

CAT-M B12

Mode	Bandwidth	Channel	RB	Index	ERP（Limits 34.8dBm）	
					QPSK	16QAM
Band12	1.4MHz	23017	1#0	0	25.63	24.64
			6#0	0	23.51	23.58
		23095	1#0	0	25.68	24.67
			6#0	0	23.56	23.60
		23173	1#5	0	25.56	24.54
			6#0	0	23.83	23.73
	3MHz	23025	1#0	0	25.58	24.58
			6#0	0	23.47	23.49
		23095	1#0	0	25.67	24.66
			6#0	0	23.56	23.58
		23165	1#5	1	25.57	24.55
			6#0	1	23.75	23.65
	5MHz	23035	1#0	0	25.53	25.81
			6#0	0	24.44	23.54
		23095	1#0	0	25.61	25.89
			6#0	0	24.53	23.62
		23155	1#5	3	25.44	25.67
			6#0	3	24.61	23.63
	10MHz	23060	1#0	0	25.55	25.84
			4#0	0	24.46	24.46
		23095	1#0	0	25.59	25.85
			4#0	0	25.51	24.50
		23130	1#5	7	25.35	25.64
			4#2	7	24.55	23.52

CAT-M B13

Mode	Bandwidth	Channel	RB	Index	ERP（Limits 34.8dBm ）	
					QPSK	16QAM
Band13	5MHz	23205	1#0	0	24.69	23.45
			6#0	0	24.60	22.41
		23230	1#0	0	24.71	24.59
			6#0	3	23.53	22.47
		23255	1#5	3	24.86	25.24
			6#0	3	24.07	23.12
	10MHz	23230	1#0	0	25.30	25.66
			6#0	0	24.04	24.16
		23230	1#0	0	25.30	25.66
			6#0	0	24.04	24.16
		23230	1#5	7	24.89	25.26
			4#2	7	24.02	24.17

CAT-M B26
(824MHz-849MHz)

Mode	Bandwidth	Channel	RB	Index	ERP（Limits 38.5dBm）	
					QPSK	16QAM
Band26	1.4MHz	26797	1#0	0	25.40	24.38
			6#0	0	23.28	23.29
		26915	1#0	0	25.23	24.23
			6#0	0	23.18	23.07
		27033	1#5	0	24.71	23.67
			6#0	0	23.00	22.90
	3MHz	26805	1#0	0	25.36	24.34
			6#0	0	23.24	23.25
		26915	1#0	0	25.24	24.24
			6#0	0	23.19	23.08
		27025	1#5	1	24.73	23.69
			6#0	1	23.04	22.93
	5MHz	26815	1#0	0	25.33	25.57
			6#0	0	24.24	23.35
		26915	1#0	0	25.25	25.45
			6#0	0	24.09	23.17
		27015	1#5	3	24.75	25.00
			6#0	3	23.97	23.07
	10MHz	26840	1#0	0	25.29	25.52
			4#0	0	25.20	24.18
		26915	1#0	0	25.23	25.14
			4#0	0	24.14	24.14
		26990	1#5	7	24.77	24.93
			4#2	7	24.87	23.86

(814MHz-824MHz)

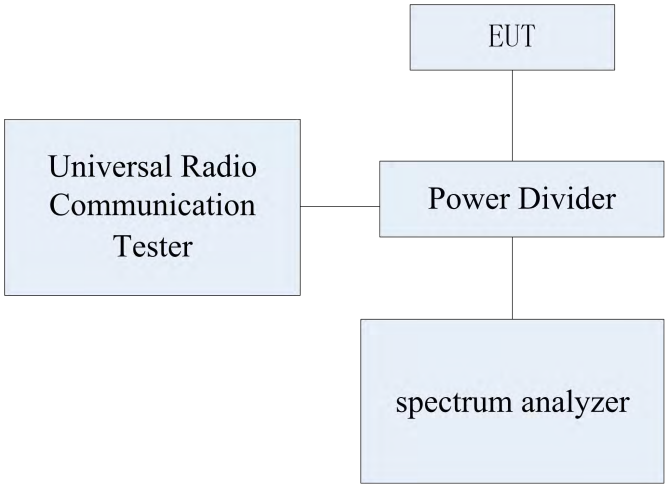
Mode	Bandwidth	Channel	RB	Index	ERP（Limits 51.5dBm ）	
					QPSK	16QAM
Band26	1.4MHz	26697	1#0	0	26.07	25.21
			6#0	0	23.87	23.95
		26740	1#0	0	25.97	24.93
			6#0	0	23.84	23.85
		26783	1#5	0	25.48	24.46
			6#0	0	23.74	23.75
	3MHz	26705	1#0	0	25.94	24.93
			6#0	0	23.83	23.84
		26740	1#0	0	25.96	24.96
			6#0	0	23.86	23.87
		26775	1#5	1	25.52	24.50
			6#0	1	23.79	23.80
	5MHz	26715	1#0	0	25.92	26.17
			6#0	0	24.82	23.91
		26740	1#0	0	25.85	26.11
			6#0	0	24.78	23.86
		26765	1#5	3	25.92	25.54
			6#0	3	24.81	23.90
	10MHz	26740	1#0	0	25.86	26.10
			4#0	0	25.77	24.78

6.4. Occupied Bandwidth

Specifications:	FCC Part 2.1049,22.917(b), 24.238(b),90.209
DUT Serial Number:	866884046100624
Test conditions:	Ambient Temperature:15℃-35℃ Relative Humidity:30%-60% Air pressure: 86-106kPa
Test Results:	--

Test Setup

During the test, the EUT was controlled via the Wireless Communications Test Set to ensure max power transmission and proper modulation and measured by spectrum analyzer.



Measurement Uncertainty:

Item	Uncertainty
Expanded Uncertainty	500 kHz (k=2)

Test Method

The 99% occupied Bandwidth was calculated from the spectrum analyzer. Markers in the spectrum analyzer were then placed between the calculated frequencies to show the calculated 99% power Band. The 26dB Bandwidth was also measured and recorded.

Note: --

6.4.1 NB-IoT B2 Mode Occupied Bandwidth Results

Frequency ID	N_{UL}	N_{tones}	Sub-carrier Spacing [kHz]	Occupied Bandwidth（99%）（kHz）		Occupied Bandwidth（26dB）（kHz）	
				QPSK	BPSK	QPSK	BPSK
Low	18601	12@0	15	190.7	187.1	240.3	251.3
Mid Range	18900			192.0	198.3	253.1	241.6
High	19199			191.9	189.0	251.4	241.5

6.4.2 NB-IoT B4 Mode Occupied Bandwidth Results

Frequency ID	N_{UL}	N_{tones}	Sub-carrier Spacing [kHz]	Occupied Bandwidth（99%）（kHz）		Occupied Bandwidth（26dB）（kHz）	
				QPSK	BPSK	QPSK	BPSK
Low	19951	12@0	15	185.9	194.4	240.3	228.5
Mid Range	20175			185.1	191.3	248.9	248.2
High	20399			185.8	199.8	246.9	250.2

6.4.3 NB-IoT B12 Mode Occupied Bandwidth Results

Frequency ID	N_{UL}	N_{tones}	Sub-carrier Spacing [kHz]	Occupied Bandwidth（99%）（kHz）		Occupied Bandwidth（26dB）（kHz）	
				QPSK	BPSK	QPSK	BPSK
Low	23011	12@0	15	189.2	185.7	262.4	236.8
Mid Range	23095			189.0	190.3	246.8	242.2
High	23179			188.1	190.9	237.7	240.0

6.4.4 NB-IoT B13 Mode Occupied Bandwidth Results

Frequency ID	N_{UL}	N_{tones}	Sub-carrier Spacing [kHz]	Occupied Bandwidth（99%）（kHz）		Occupied Bandwidth（26dB）（kHz）	
				QPSK	BPSK	QPSK	BPSK
Low	23181	12@0	15	185.2	185.7	258.5	251.3
Mid Range	23230			188.8	185.7	252.2	252.0
High	23279			184.3	199.0	252.7	239.2

6.4.5 NB-IoT B26 Mode Occupied Bandwidth Results

(814 MHz ~824MHz)

Mode	Channel/Ferquency（MHz）	Occupied Bandwidth 99%（kHz）	Occupied Bandwidth 26dB（kHz）
BPSK	26691/814.1	192.0	238.3
QPSK	26691/814.1	182.9	250.9
BPSK	26740/819.0	191.7	243.5
QPSK	26740/819.0	185.5	250.0
BPSK	26789/823.9	193.5	237.0
QPSK	26789/823.9	185.5	251.5

(824 MHz ~849MHz)

Mode	Channel/Ferquency（MHz）	Occupied Bandwidth 99%（kHz）	Occupied Bandwidth 26dB（kHz）
BPSK	26791/824.1	191.7	234.9
QPSK	26791/824.1	185.1	248.4
BPSK	26915/836.5	193.8	261.7
QPSK	26915/836.5	186.0	238.5
BPSK	27039/848.9	187.3	242.1
QPSK	27039/848.9	187.7	257.5

6.4.6 CAT-M B2 Mode Occupied Bandwidth Results

Bandwidth	Modulation	Channel/Ferquency（MHz）	RB	Index	Occupied Bandwidth 99%（MHz）	Occupied Bandwidth 26dB（MHz）
1.4MHz	QPSK	18900/1880	6#0	0	1.092	1.266
	16QAM	18900/1880			0.923	1.132
3MHz	QPSK	18900/1880	6#0	0	1.112	1.316
	16QAM	18900/1880			0.944	1.176
5MHz	QPSK	18900/1880	6#0	0	1.137	1.470
	16QAM	18900/1880			0.991	1.241
10MHz	QPSK	18900/1880	6#0	0	1.126	1.450
	16QAM	18900/1880			0.992	1.237
15MHz	QPSK	18900/1880	6#0	0	1.141	1.456
	16QAM	18900/1880			0.977	1.252
20MHz	QPSK	18900/1880	6#0	0	1.134	1.439
	16QAM	18900/1880			0.975	1.223

6.4.7 CAT-M B4 Mode Occupied Bandwidth Results

Bandwidth	Modulation	Channel/Ferquency（MHz）	RB	Index	Occupied Bandwidth 99%（MHz）	Occupied Bandwidth 26dB（MHz）
1.4MHz	QPSK	20175/1732.5	6#0	0	1.087	1.255
	16QAM	20175/1732.5			0.917	1.092
3MHz	QPSK	20175/1732.5	6#0	0	1.102	1.281
	16QAM	20175/1732.5			0.935	1.139
5MHz	QPSK	20175/1732.5	6#0	0	1.139	1.350
	16QAM	20175/1732.5			0.984	1.222
10MHz	QPSK	20175/1732.5	6#0	0	1.124	1.324
	16QAM	20175/1732.5			0.988	1.233
15MHz	QPSK	20175/1732.5	6#0	0	1.140	1.373
	16QAM	20175/1732.5			0.975	1.333
20MHz	QPSK	20175/1732.5	6#0	0	1.126	1.356
	16QAM	20175/1732.5			0.981	1.296

6.4.8 CAT-M B12 Mode Occupied Bandwidth Results

Bandwidth	Modulation	Channel/Ferquency（MHz）	RB	Index	Occupied Bandwidth 99%（MHz）	Occupied Bandwidth 26dB（MHz）
1.4MHz	QPSK	23095/707.5	6#0	0	1.081	1.256
	16QAM	23095/707.5			0.912	1.090
3MHz	QPSK	23095/707.5	6#0	0	1.096	1.281
	16QAM	23095/707.5			0.924	1.128
5MHz	QPSK	23095/707.5	6#0	0	1.123	1.315
	16QAM	23095/707.5			0.954	1.172
10MHz	QPSK	23095/707.5	6#0	0	1.124	1.324
	16QAM	23095/707.5			0.981	1.250

6.4.9 CAT-M B13 Mode Occupied Bandwidth Results

Bandwidth	Modulation	Channel/Ferquency（MHz）	RB	Index	Occupied Bandwidth 99%（MHz）	Occupied Bandwidth 26dB（MHz）
5MHz	QPSK	23230/782	6#0	0	1.125	1.313
	16QAM	23230/782			0.956	1.176
10MHz	QPSK	23230/782	6#0	0	1.124	1.326
	16QAM	23230/782			0.986	1.216

6.4.10 CAT-M B26 Mode Occupied Bandwidth Results

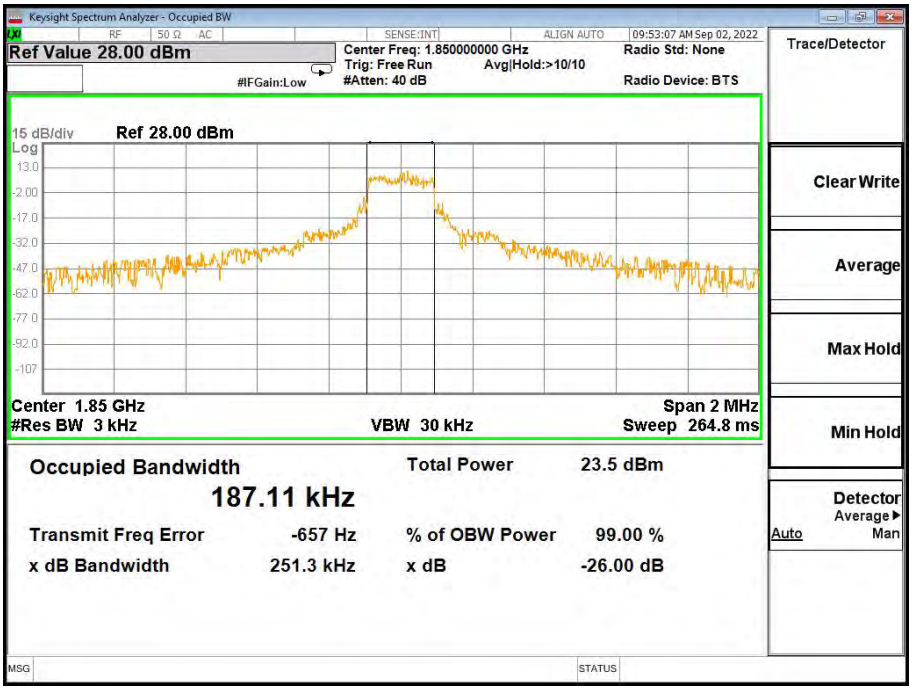
(814 MHz ~824MHz)

Bandwidth	Modulation	Channel/Ferquency（MHz）	RB	Index	Occupied Bandwidth 99%（MHz）	Occupied Bandwidth 26dB（MHz）
1.4MHz	QPSK	26740/819	6#0	0	1.081	1.249
	16QAM	26740/819			0.912	1.088
3MHz	QPSK	26740/819	6#0	0	1.097	1.277
	16QAM	26740/819			0.928	1.130
5MHz	QPSK	26740/819	6#0	0	1.123	1.310
	16QAM	26740/819			0.957	1.174
10MHz	QPSK	26740/819	6#0	0	1.124	1.329
	16QAM	26740/819			0.982	1.232

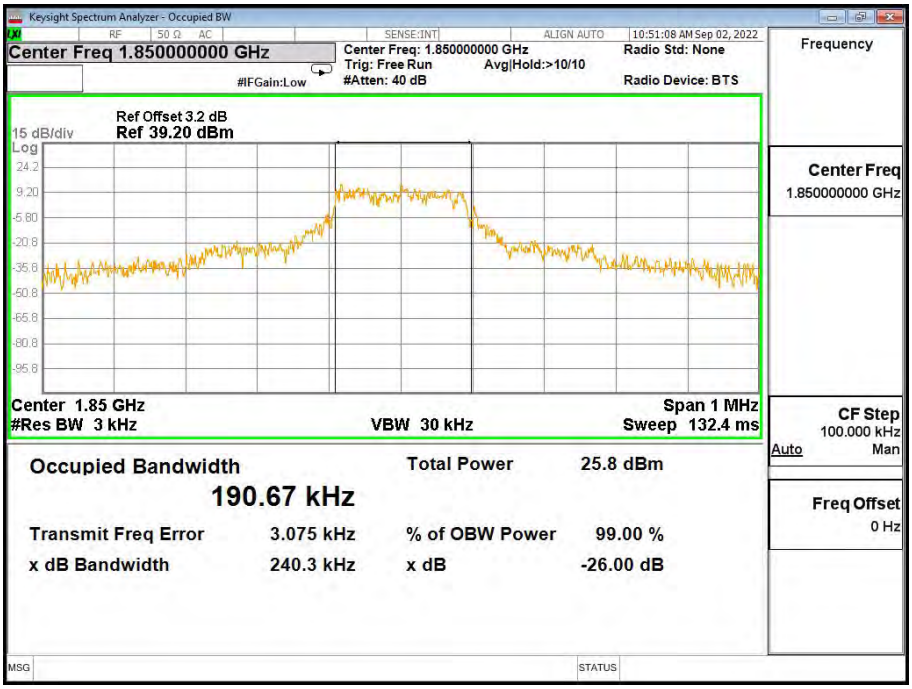
(824 MHz ~849MHz)

Bandwidth	Modulation	Channel/Ferquency（MHz）	RB	Index	Occupied Bandwidth 99%（MHz）	Occupied Bandwidth 26dB（MHz）
1.4MHz	QPSK	26915/836.5	6#0	0	1.081	1.250
	16QAM	26915/836.5			0.911	1.086
3MHz	QPSK	26915/836.5	6#0	0	1.095	1.276
	16QAM	26915/836.5			0.927	1.129
5MHz	QPSK	26915/836.5	6#0	0	1.123	1.325
	16QAM	26915/836.5			0.955	1.168
10MHz	QPSK	26915/836.5	6#0	0	1.121	1.320
	16QAM	26915/836.5			0.982	1.228

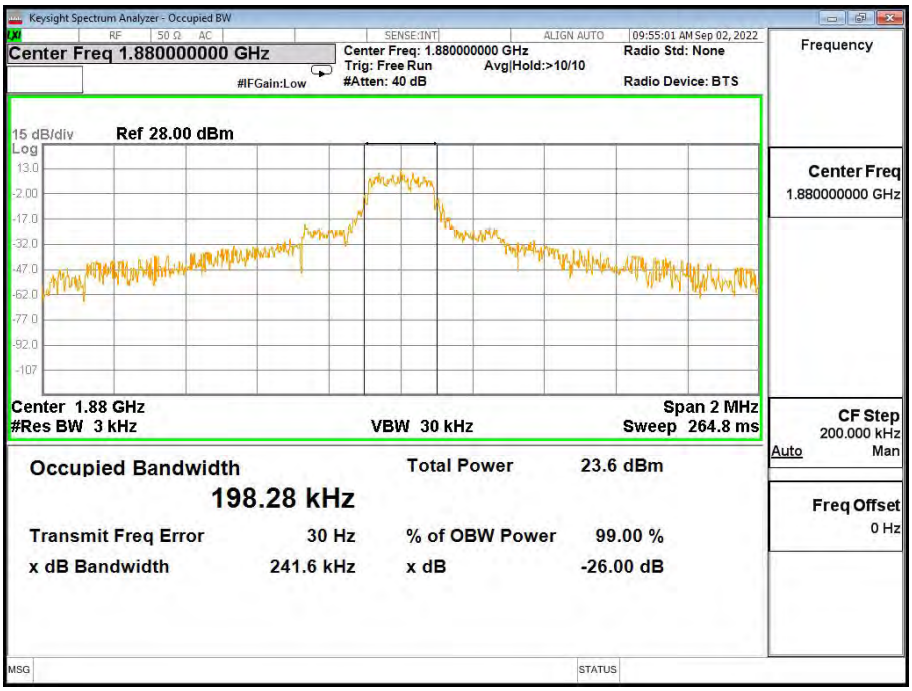
Graphical results for NB-IoT:



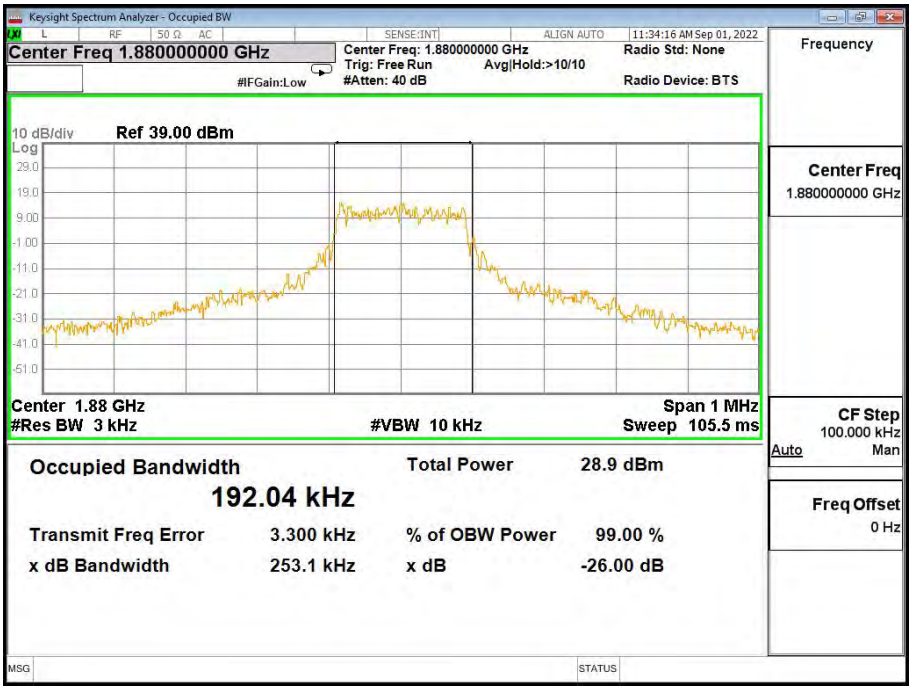
Band2-26dB/99% OBW-18601 Channel-BPSK



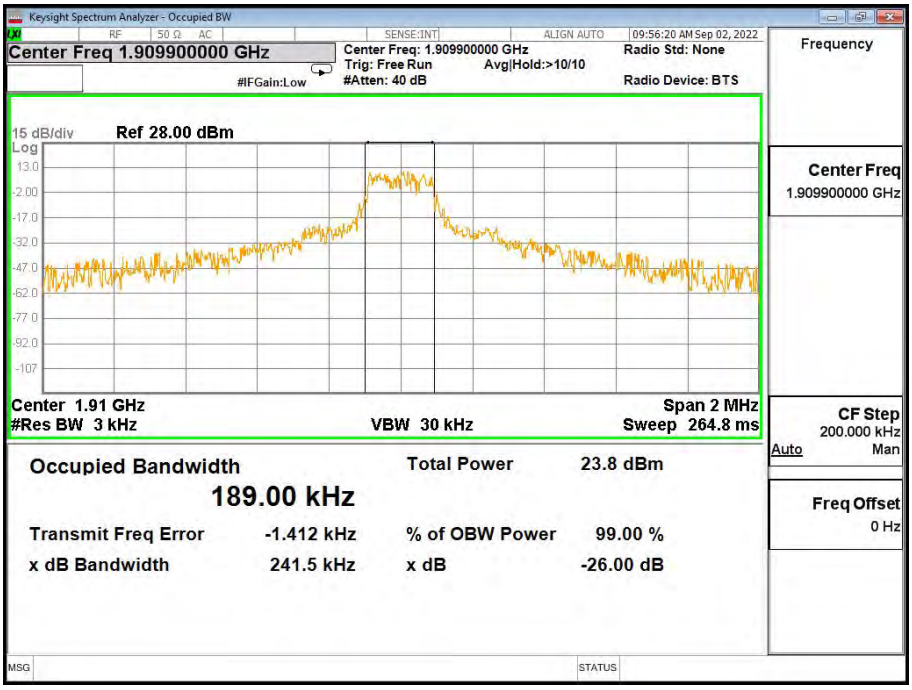
Band2-26dB/99% OBW-18601 Channel-QPSK



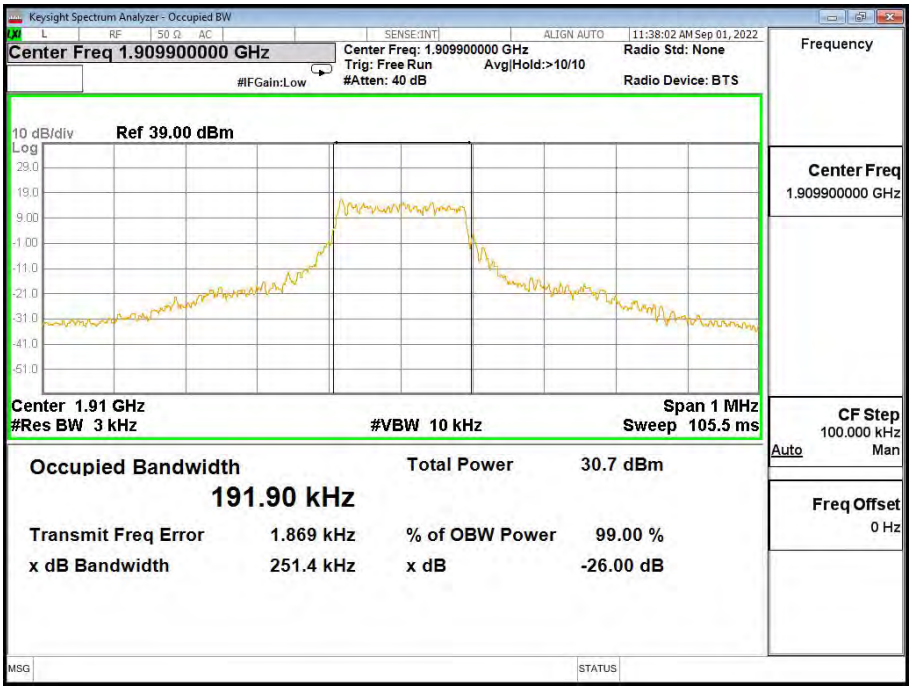
Band2-26dB/99% OBW-18900 Channel-BPSK



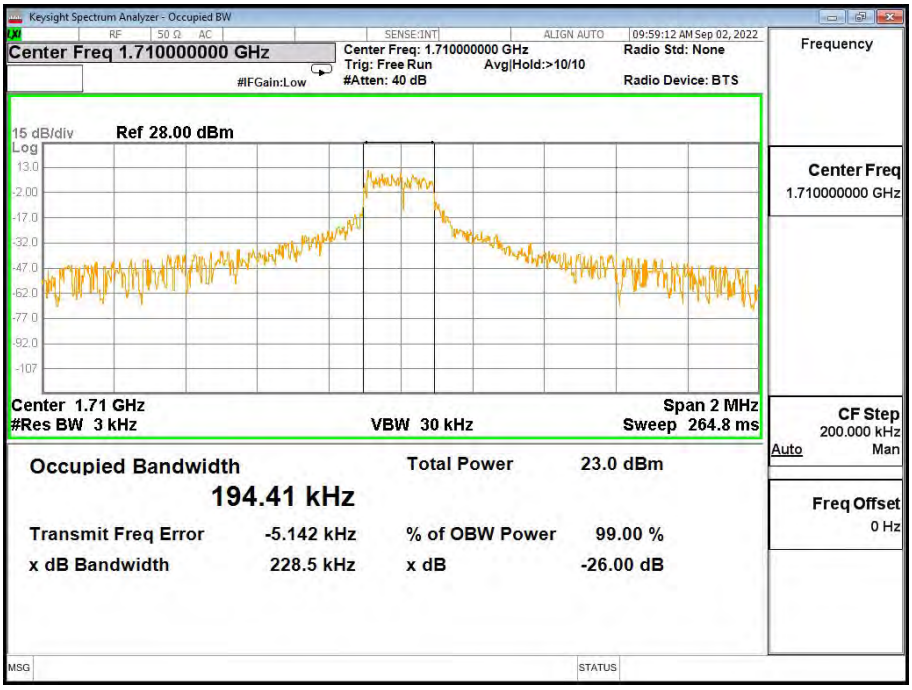
Band2-26dB/99% OBW-18900 Channel-QPSK



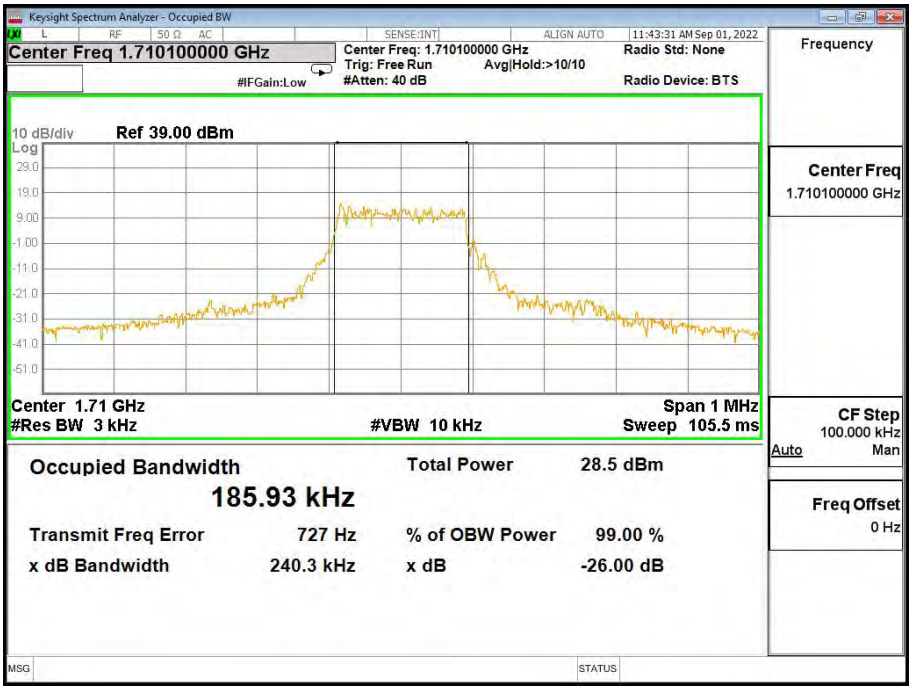
Band2-26dB/99% OBW-19199 Channel-BPSK



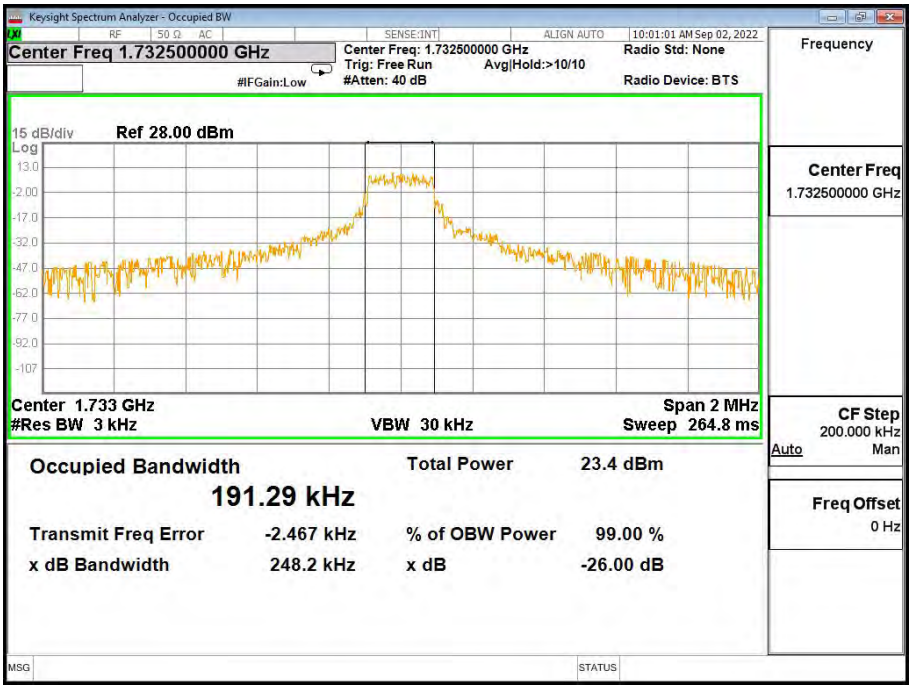
Band2-26dB/99% OBW-19199 Channel-QPSK



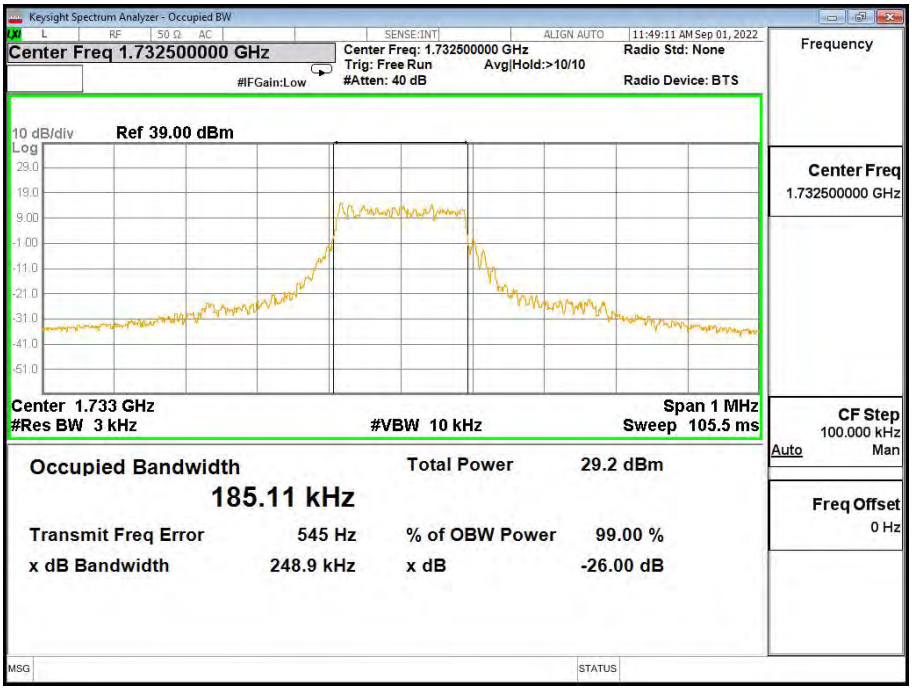
Band4-26dB/99% OBW-19951 Channel-BPSK



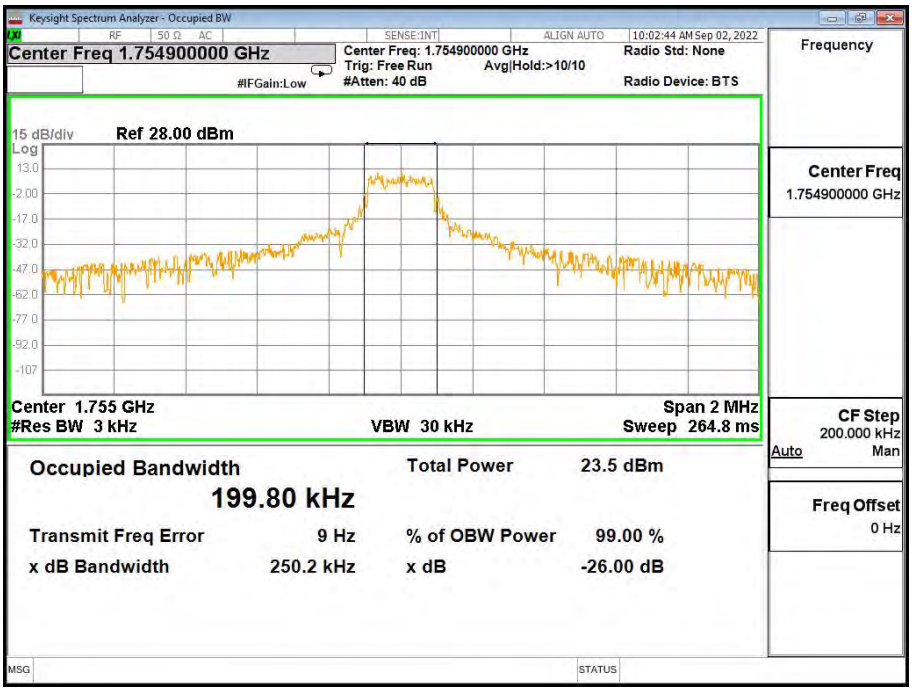
Band4-26dB/99% OBW-19951 Channel-QPSK



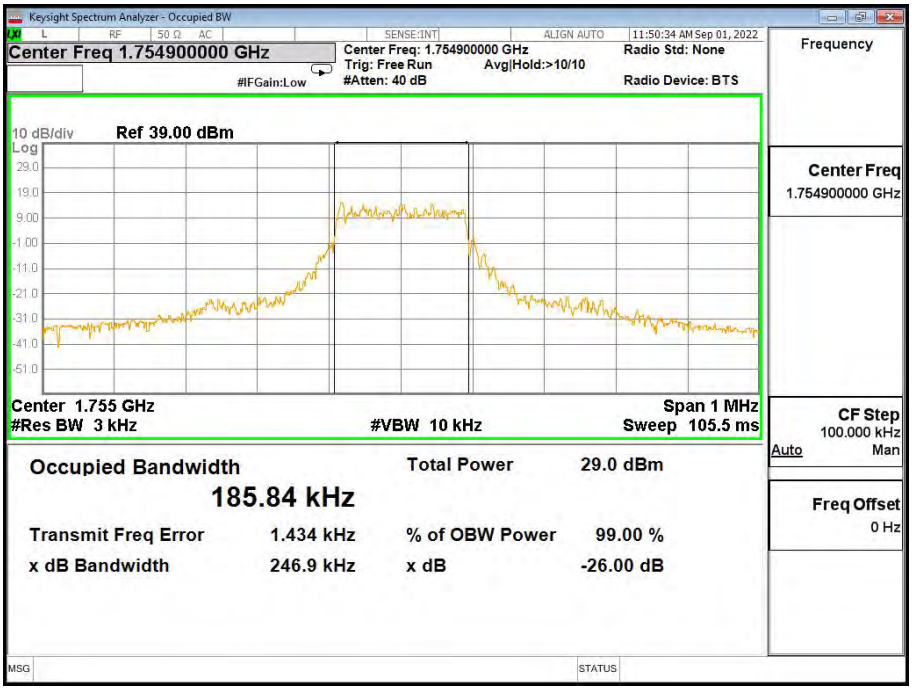
Band4-26dB/99% OBW-20175 Channel-BPSK



Band4-26dB/99% OBW-20175 Channel-QPSK

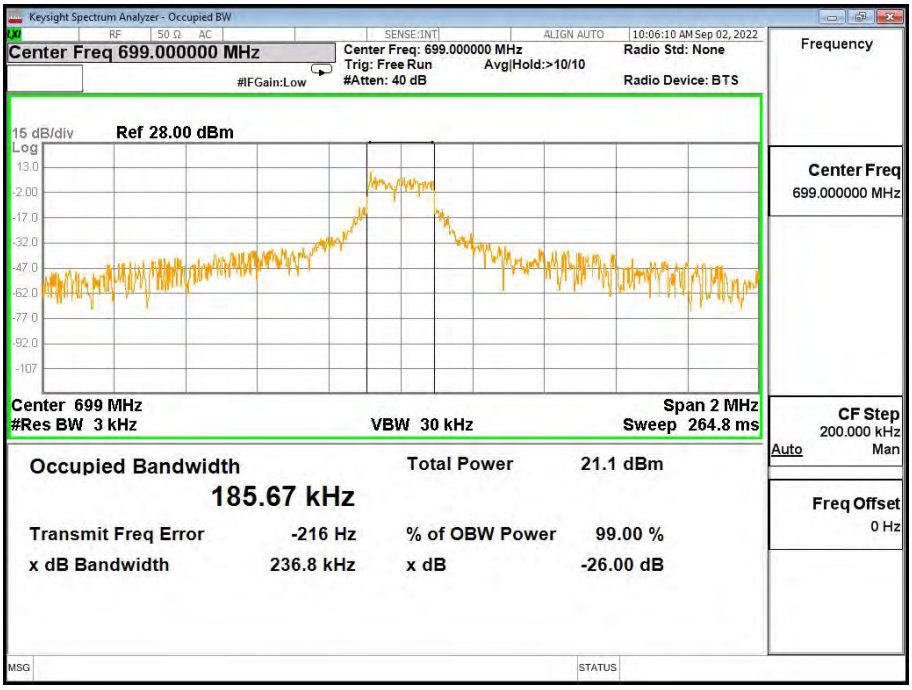


Band4-26dB/99% OBW-20399 Channel-BPSK

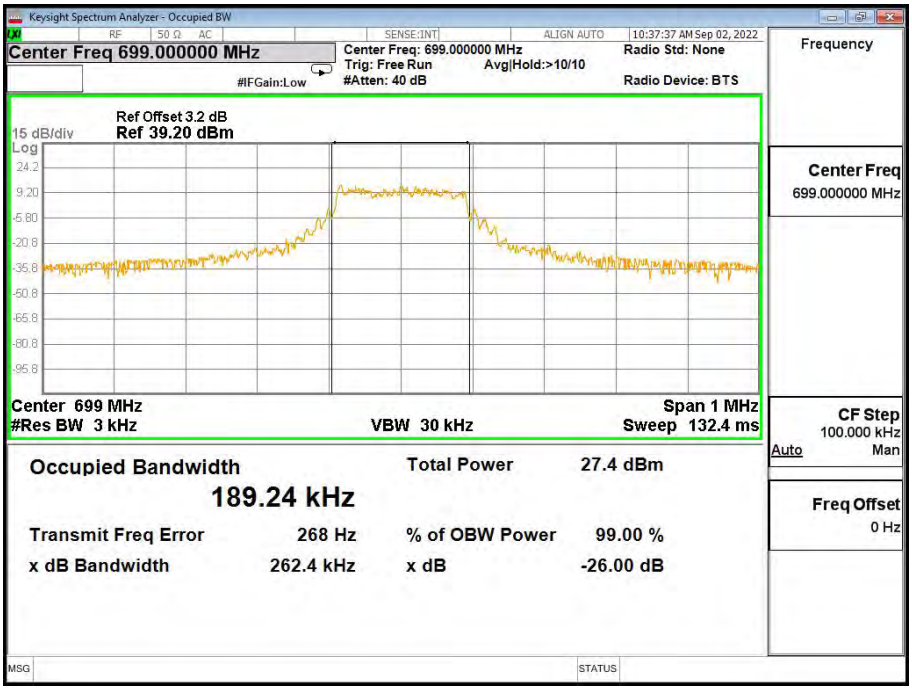


Band4-26dB/99% OBW-20399 Channel-QPSK

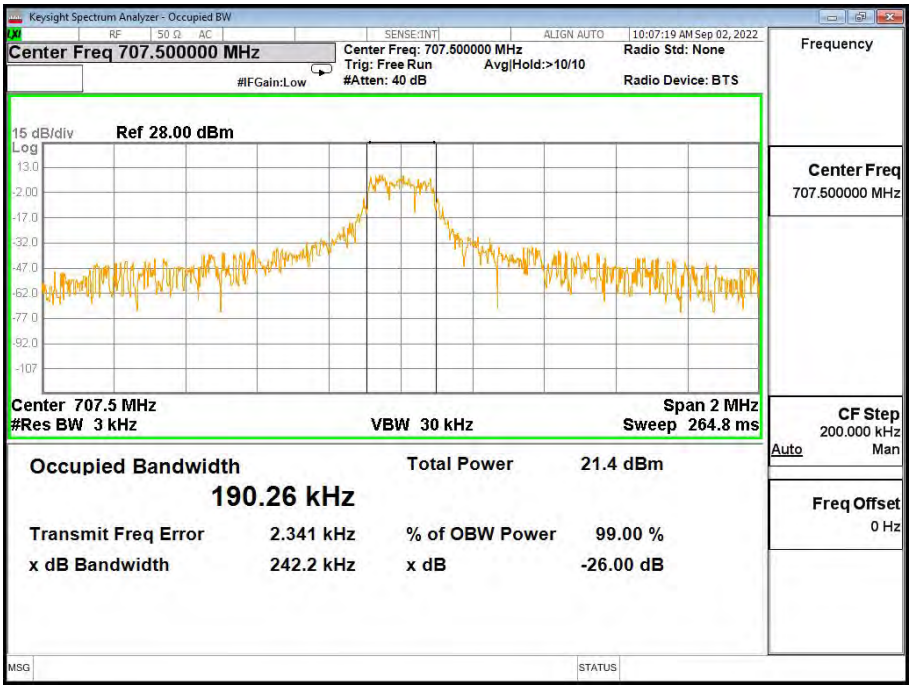
185.7



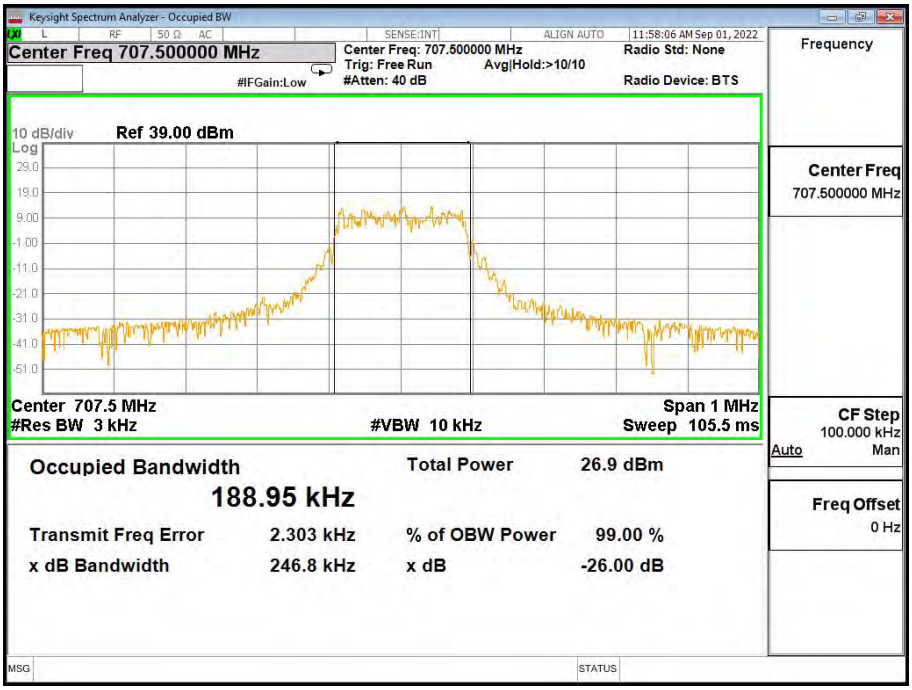
Band12-26dB/99% OBW-23011 Channel-BPSK



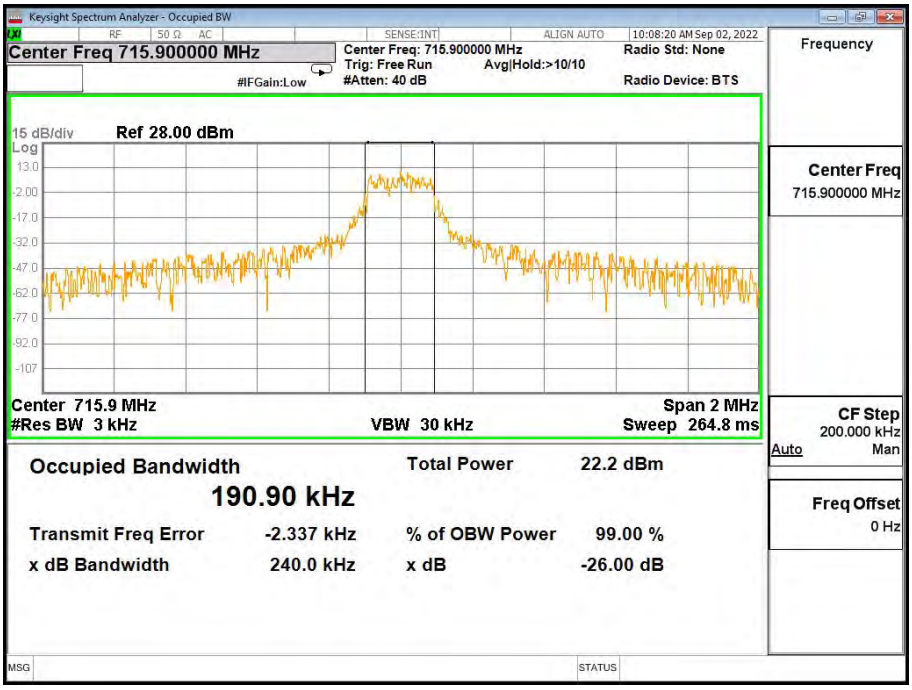
Band12-26dB/99% OBW-23011 Channel-QPSK



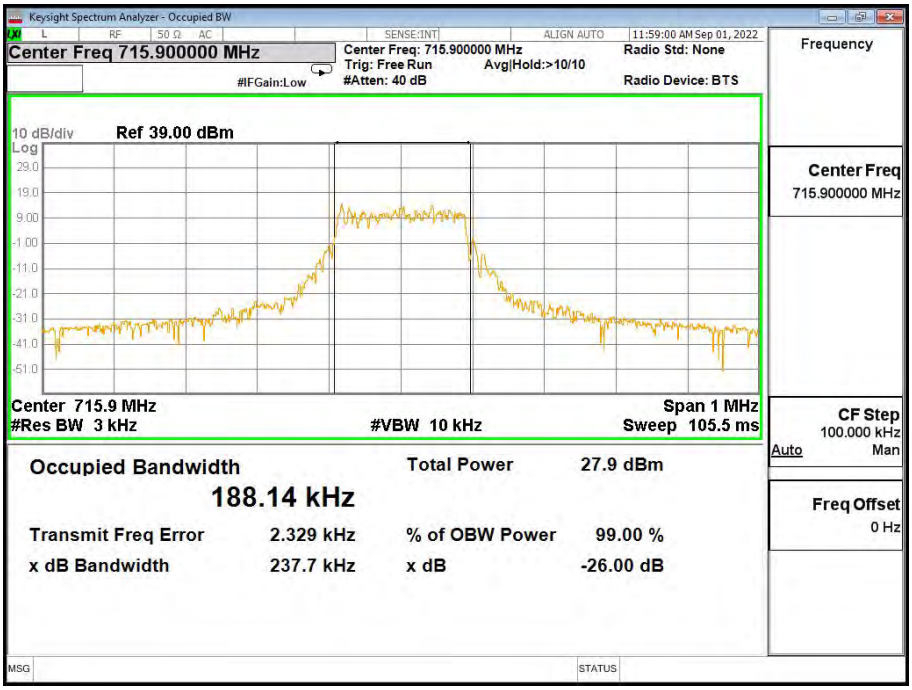
Band12-26dB/99% OBW-23095 Channel-BPSK



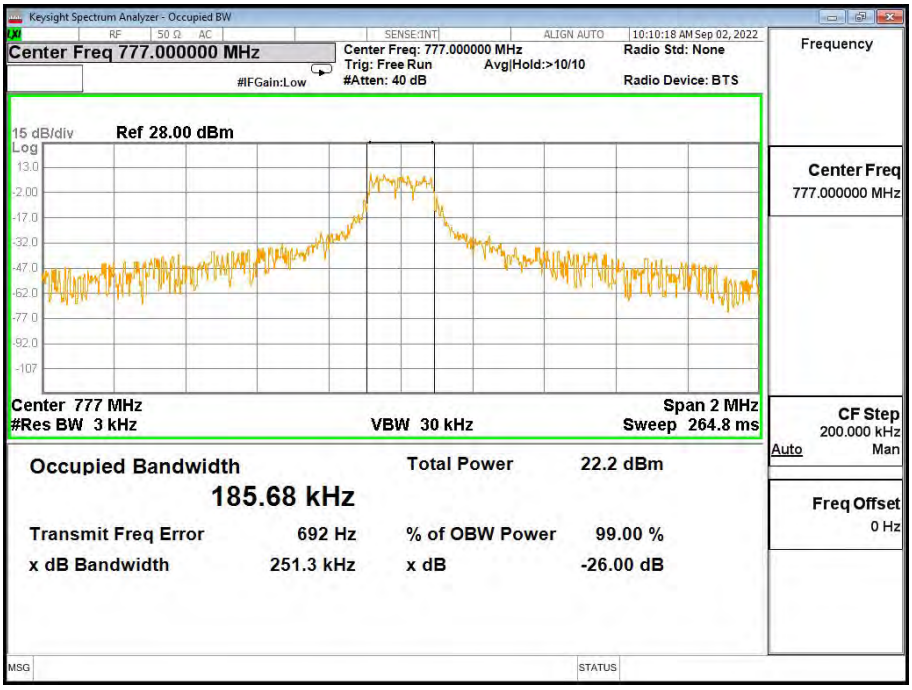
Band12-26dB/99% OBW-23095 Channel-QPSK



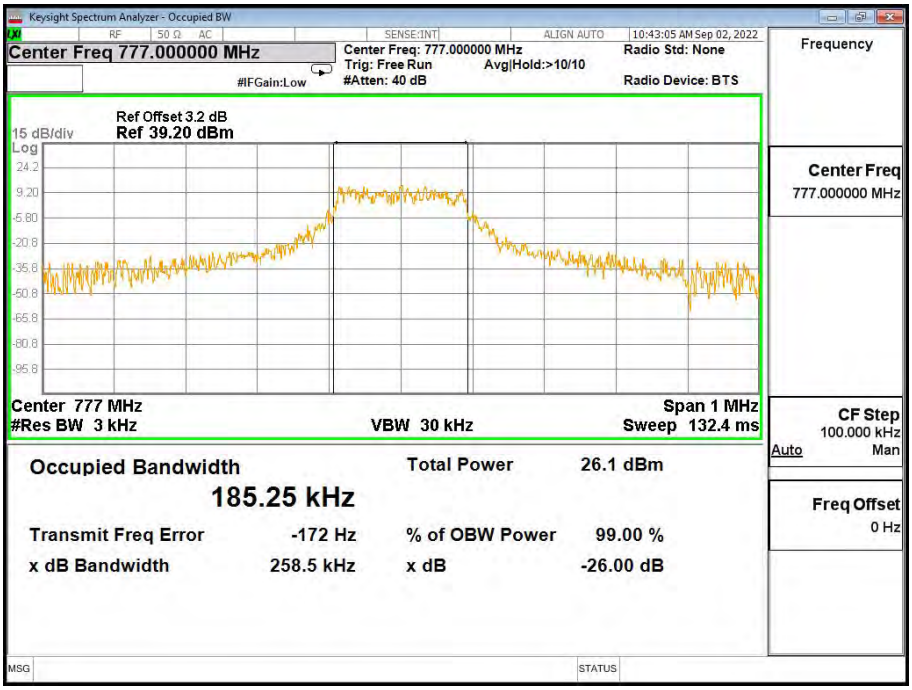
Band12-26dB/99% OBW-23179 Channel-BPSK



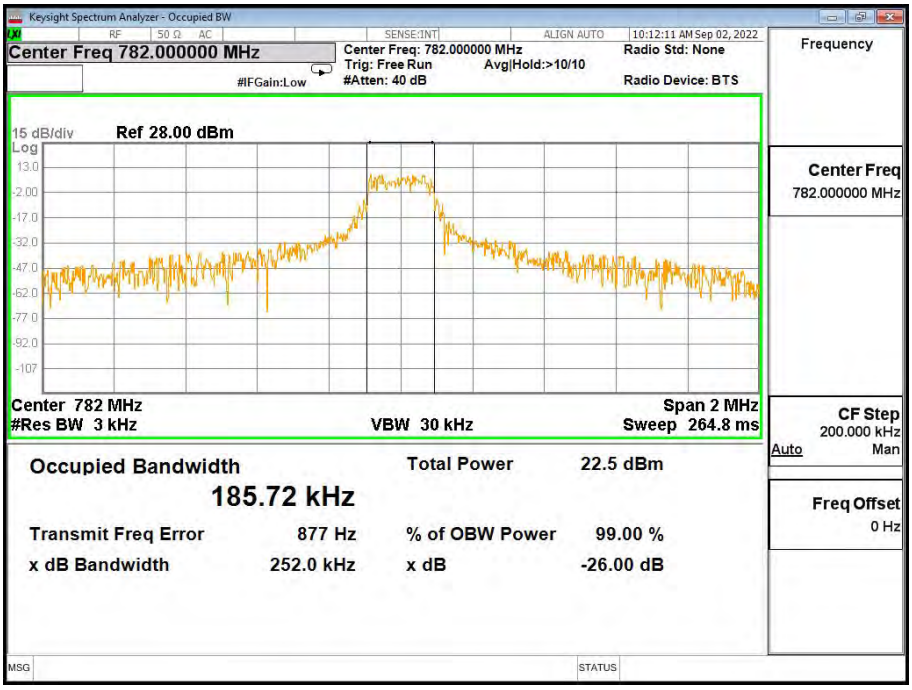
Band12-26dB/99% OBW-23179 Channel-QPSK



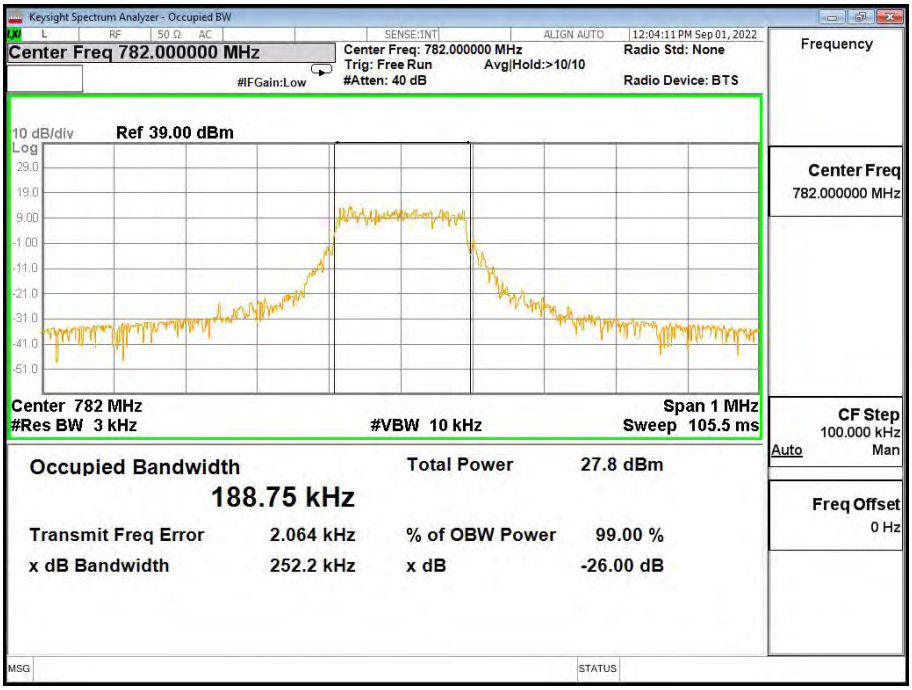
Band13-26dB/99% OBW-23181 Channel-BPSK



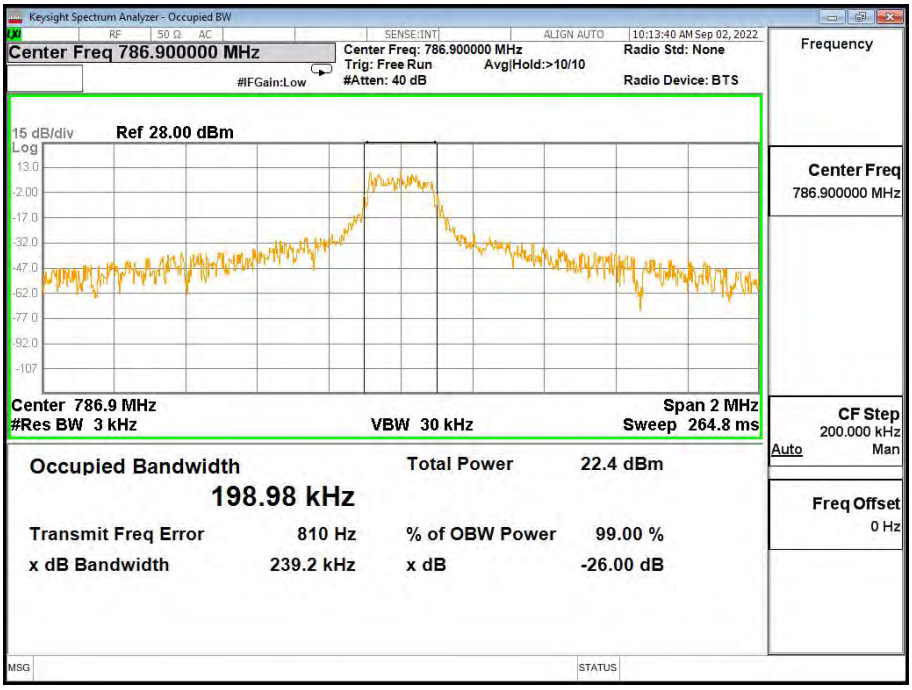
Band13-26dB/99% OBW-23181 Channel-QPSK



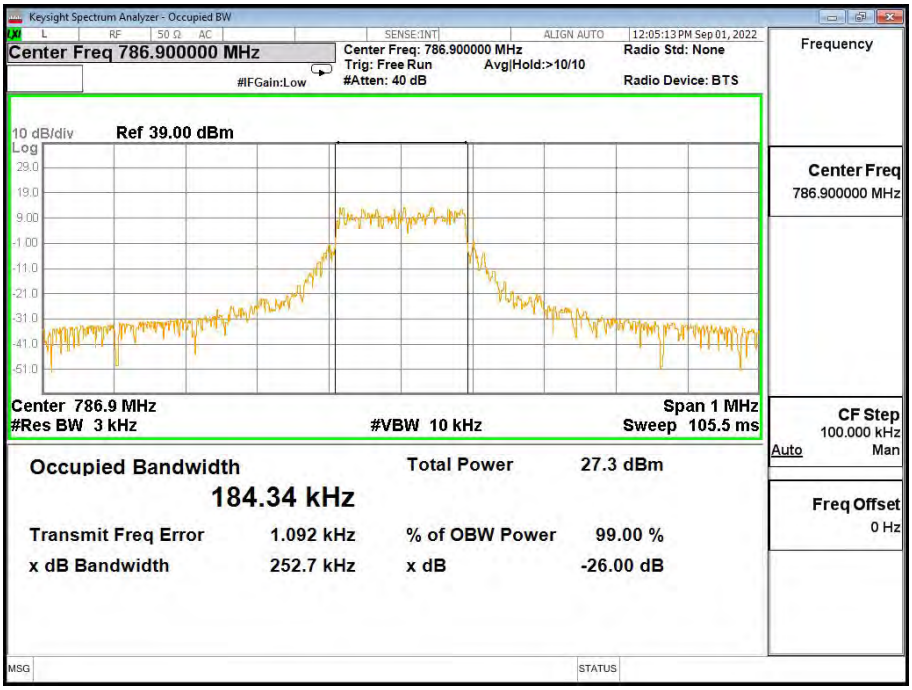
Band13-26dB/99% OBW-23230 Channel-BPSK



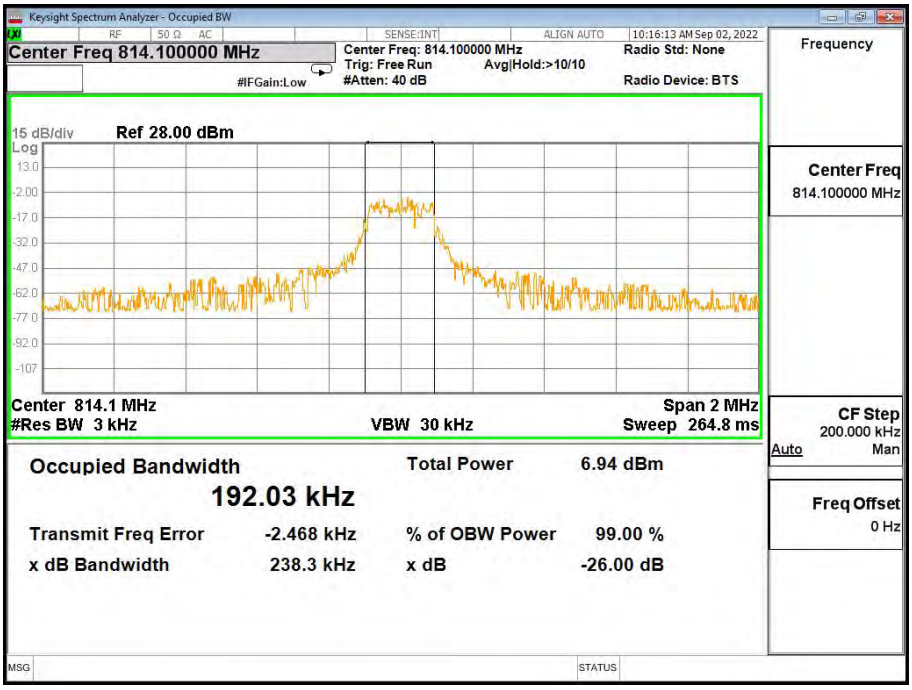
Band13-26dB/99% OBW-23230 Channel-QPSK



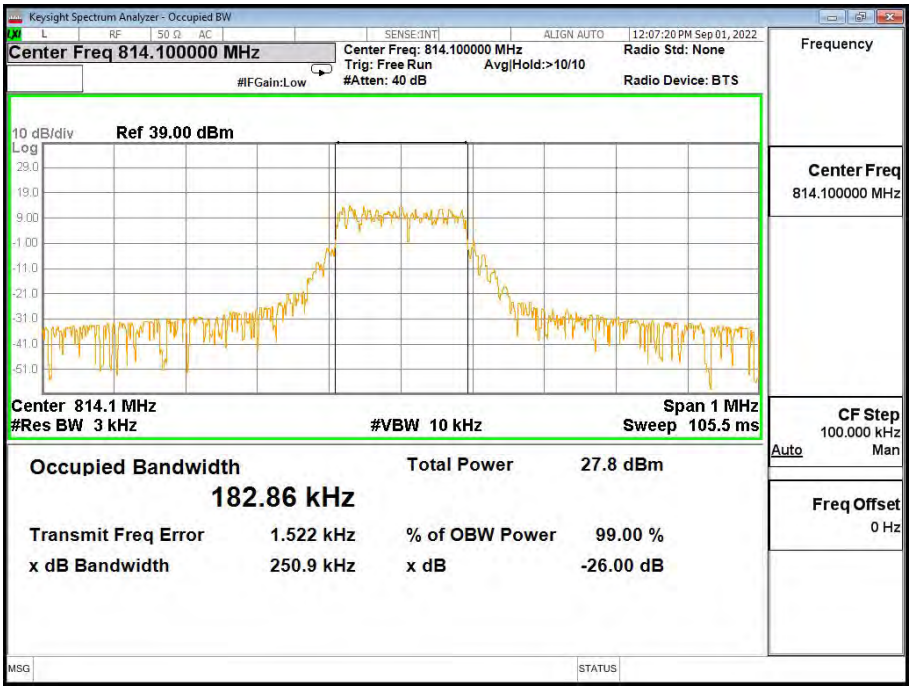
Band13-26dB/99% OBW-23279 Channel-BPSK



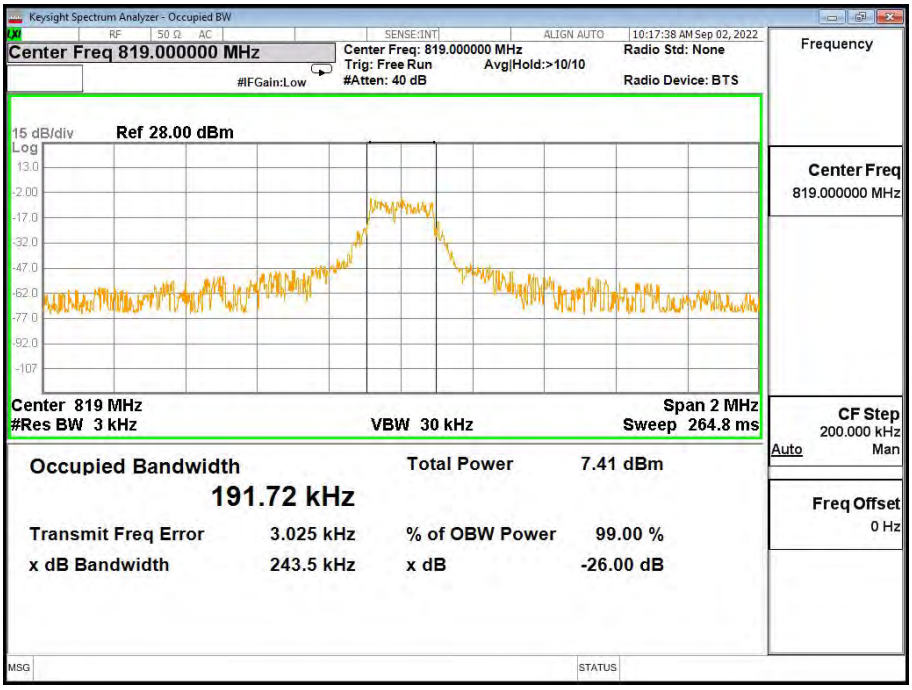
Band13-26dB/99% OBW-23279 Channel-QPSK



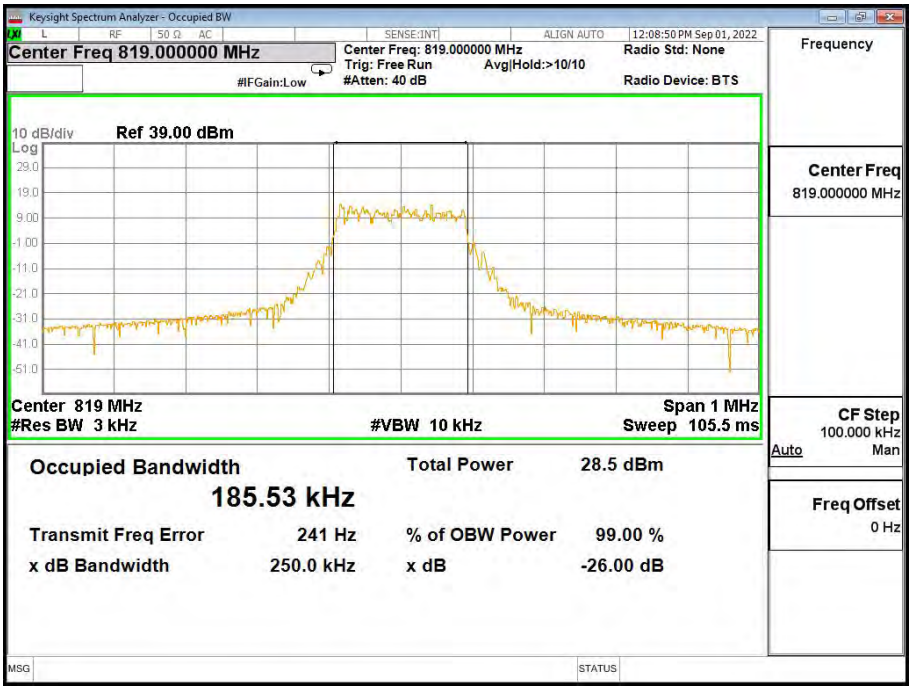
Band26-26dB/99% OBW-26691 Channel-BPSK



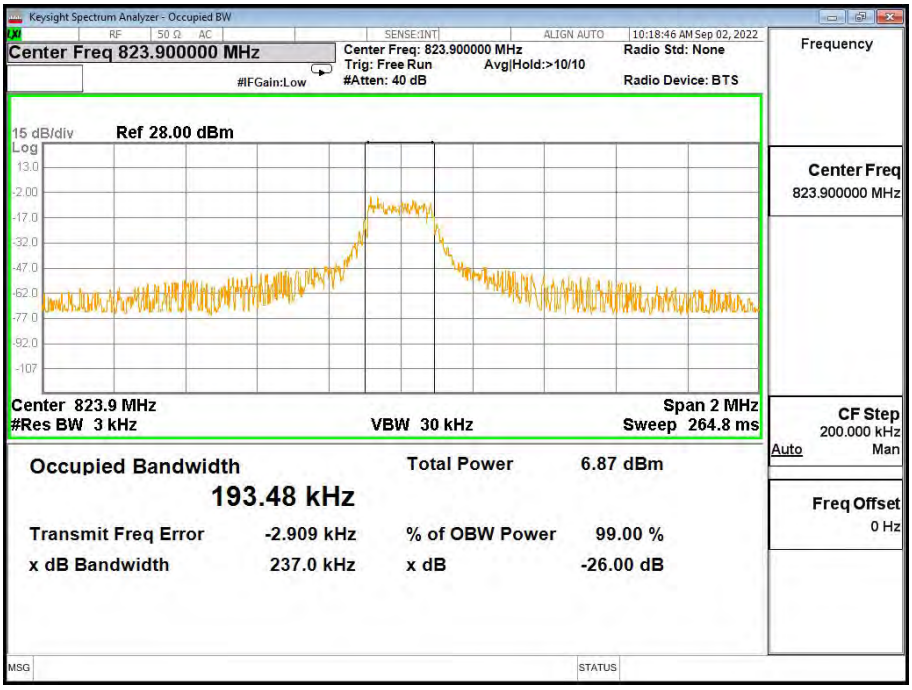
Band26-26dB/99% OBW-26691 Channel-QPSK



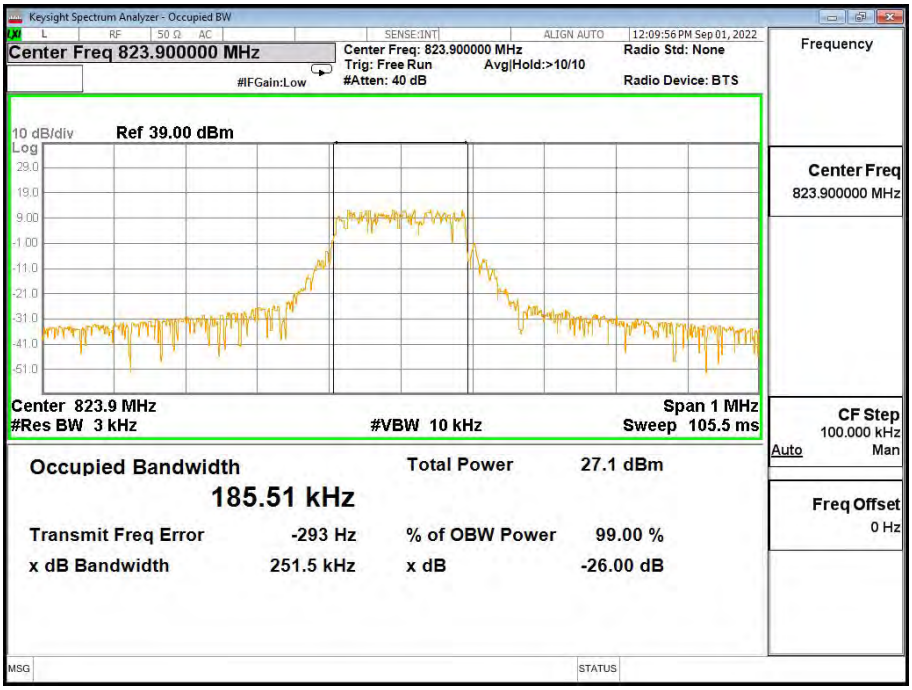
Band26-26dB/99% OBW-26740 Channel-BPSK



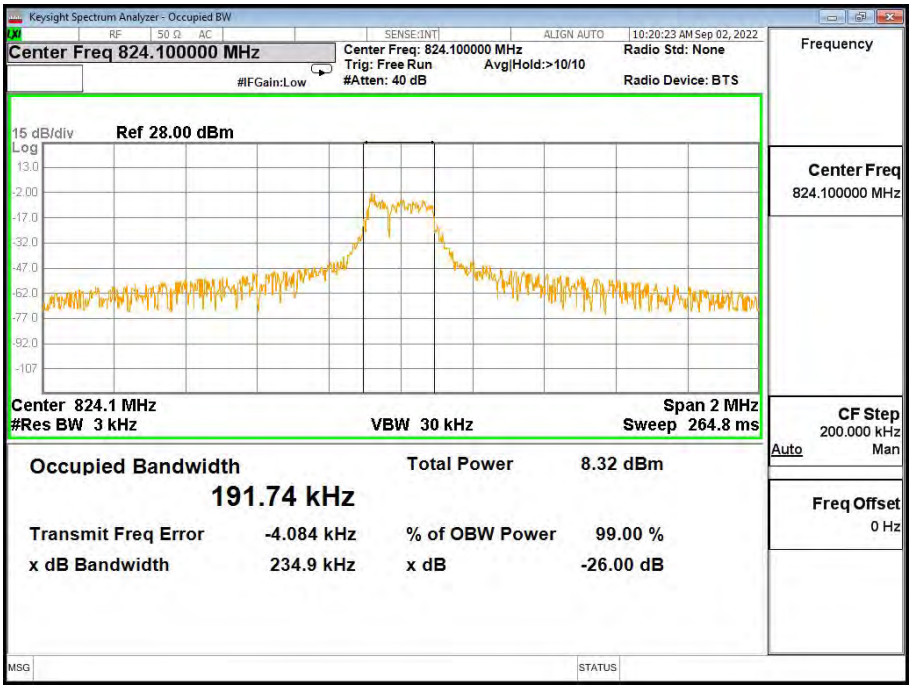
Band26-26dB/99% OBW-26740 Channel-QPSK



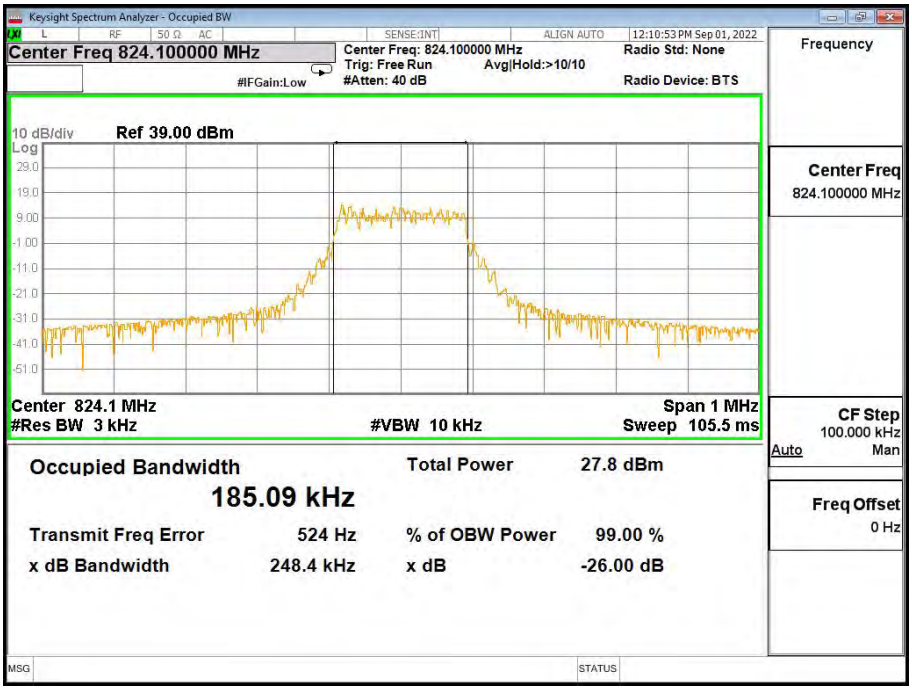
Band26-26dB/99% OBW-26789 Channel-BPSK



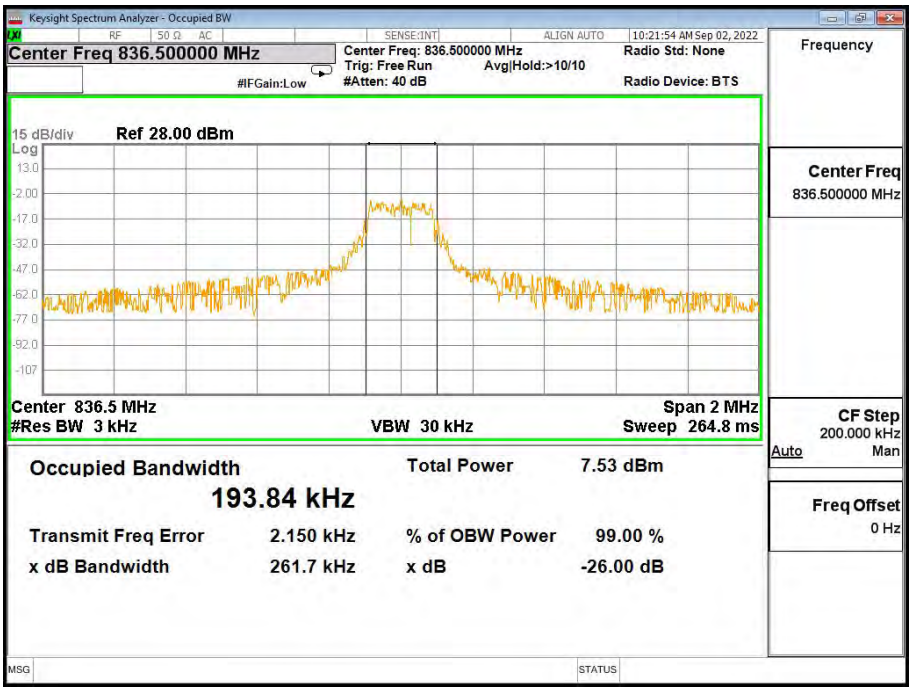
Band26-26dB/99% OBW-26789 Channel-QPSK



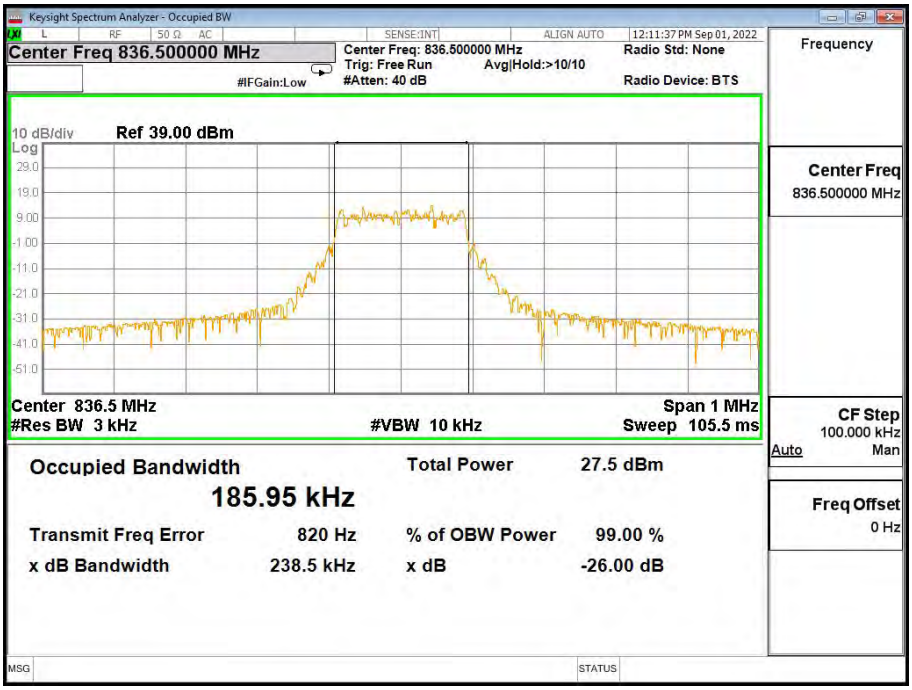
Band26-26dB/99% OBW-26791 Channel-BPSK



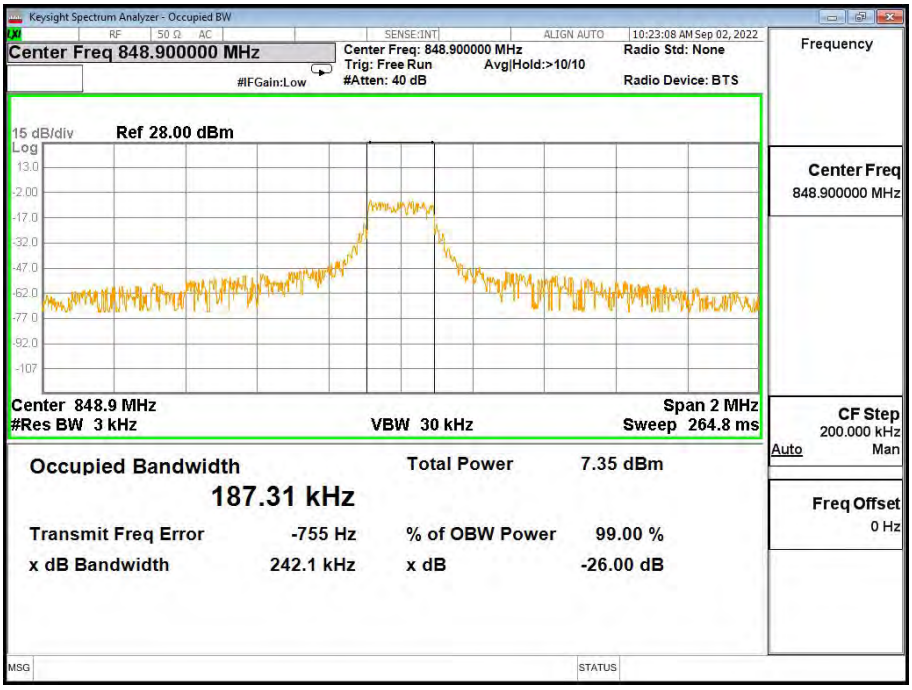
Band26-26dB/99% OBW-26791 Channel-QPSK



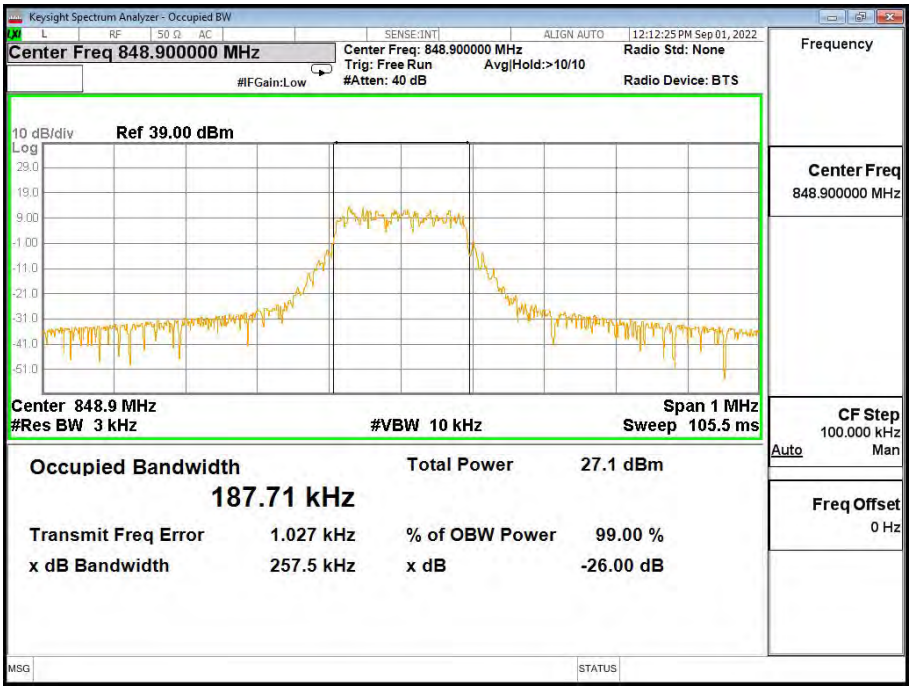
Band26-26dB/99% OBW-26915 Channel-BPSK



Band26-26dB/99% OBW-26915 Channel-QPSK



Band26-26dB/99% OBW-27039 Channel-BPSK



Band26-26dB/99% OBW-27039 Channel-QPSK

Graphical results for CAT-M:

Band2-26dB/99% OBW-1.4MHz Bandwidth-16QAM

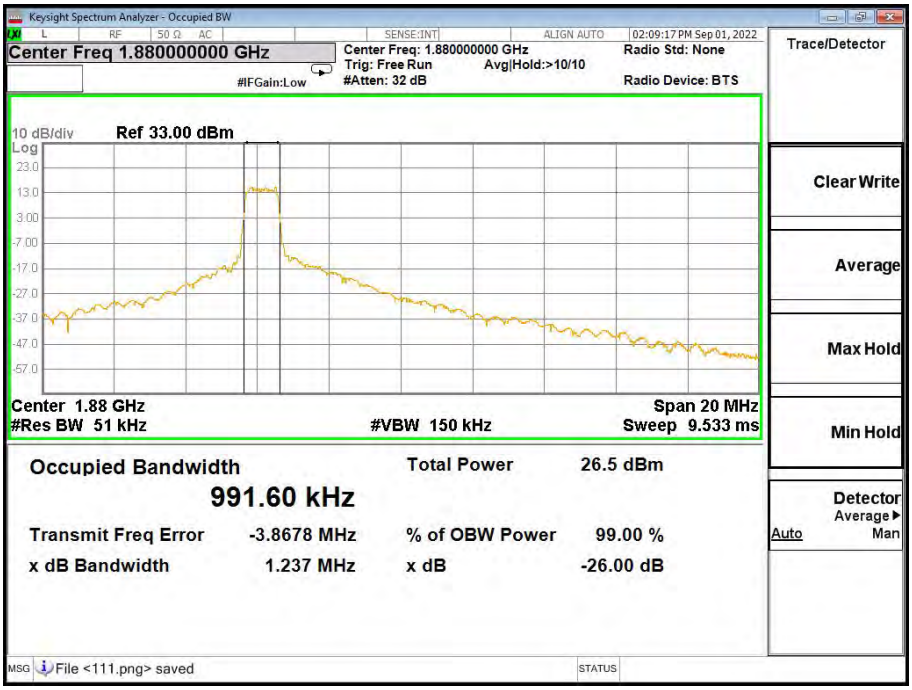
Band2-26dB/99% OBW-1.4MHz Bandwidth-QPSK

Band2-26dB/99%OBW-3MHz Bandwidth-16QAM

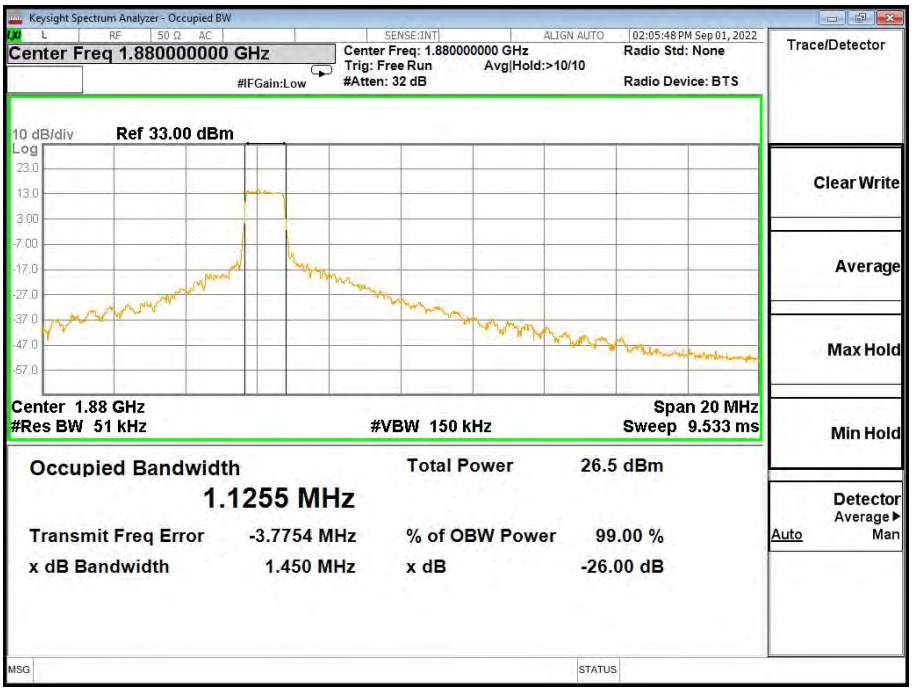
Band2-26dB/99% OBW-3MHz Bandwidth-QPSK

Band2-26dB/99% OBW-5MHz Bandwidth-16QAM

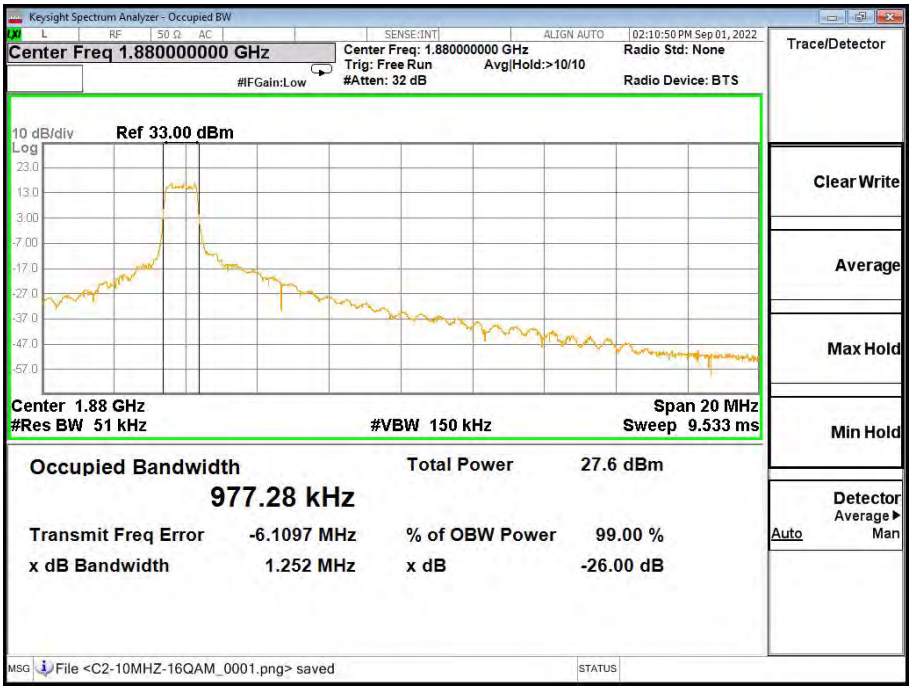
Band2-26dB/99% OBW-5MHz Bandwidth-QPSK



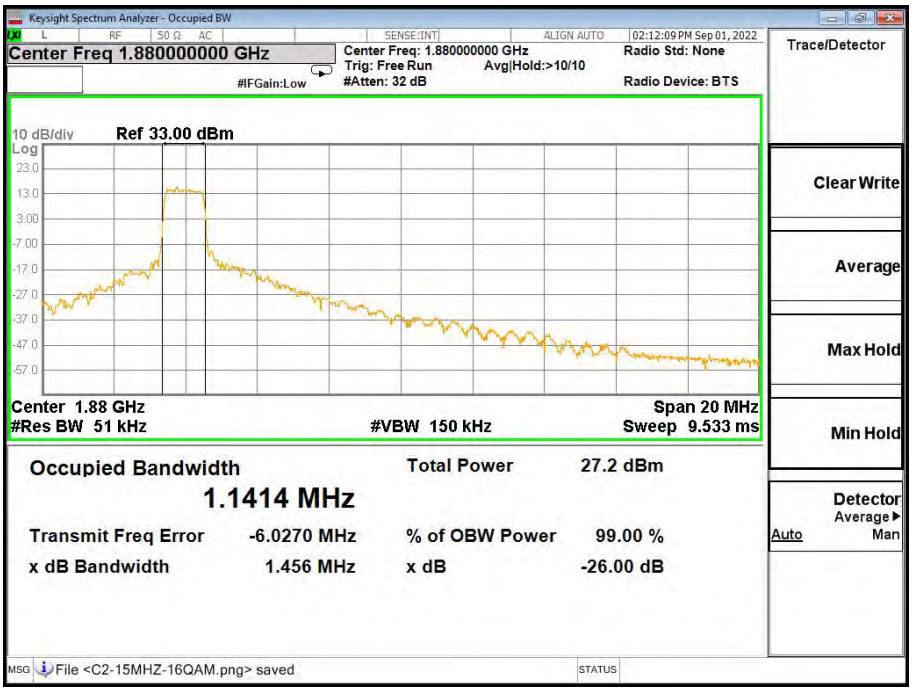
Band2-26dB/99% OBW-10MHz Bandwidth-16QAM



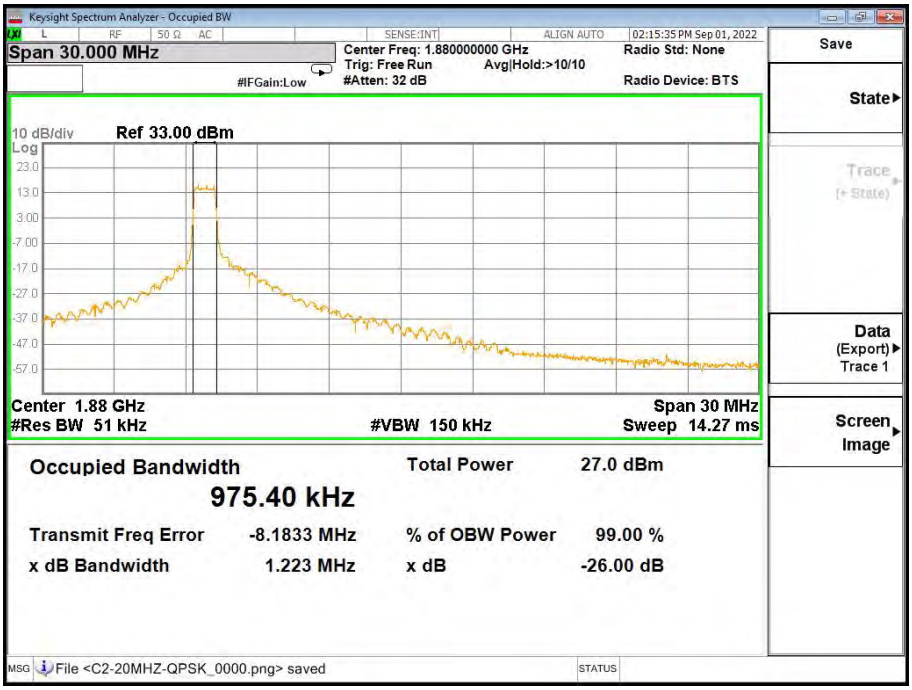
Band2-26dB/99% OBW-10MHz Bandwidth-QPSK



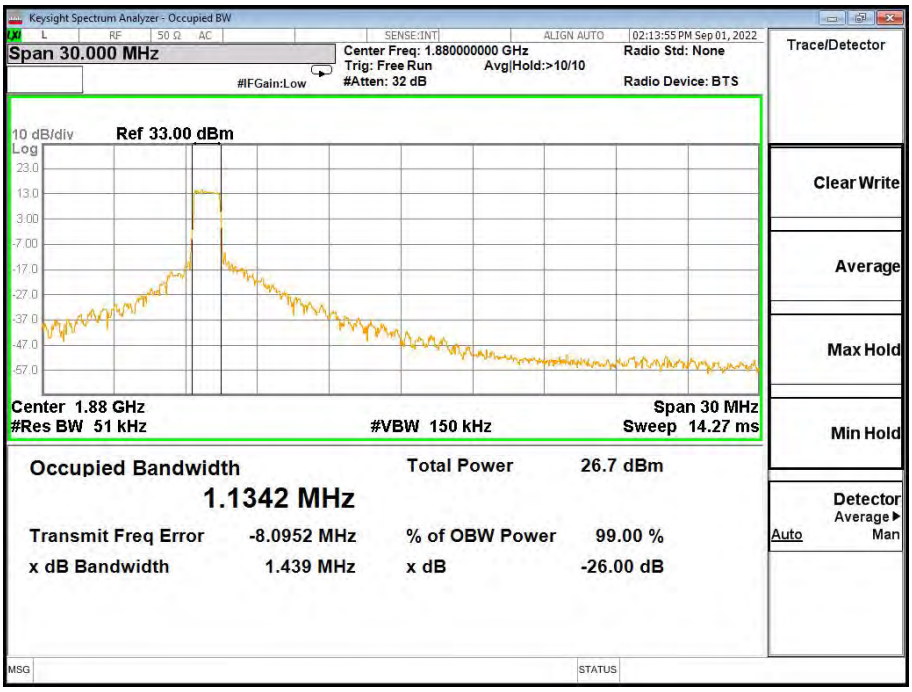
Band2-26dB/99% OBW-15MHz Bandwidth-16QAM



Band2-26dB /99%OBW-15MHz Bandwidth-QPSK



Band2-26dB/99% OBW-20MHz Bandwidth-16QAM

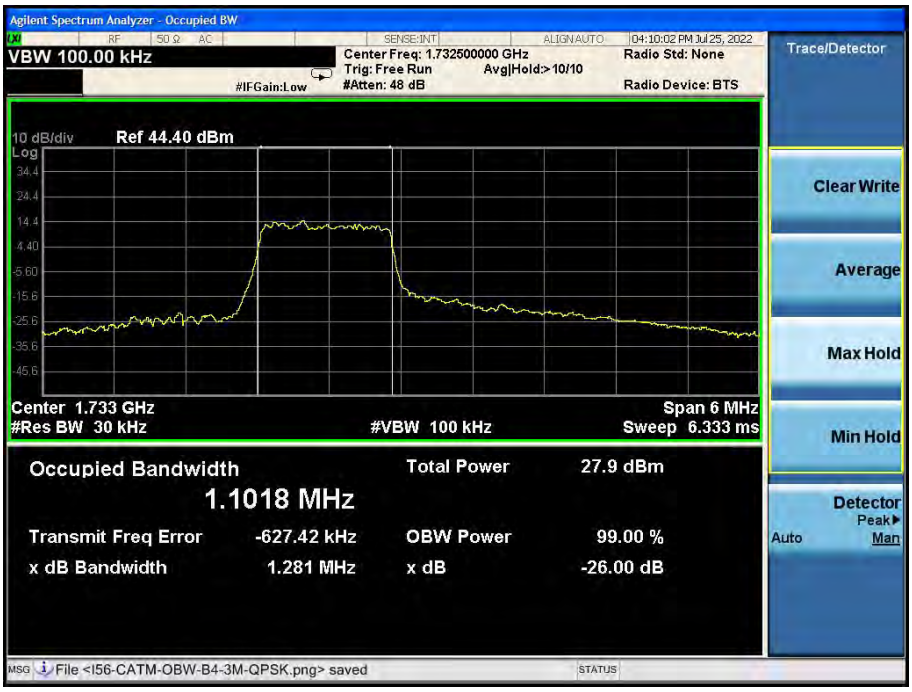


Band2-26dB/99% OBW-20MHz Bandwidth-QPSK

Band4-26dB/99% OBW-1.4MHz Bandwidth-16QAM

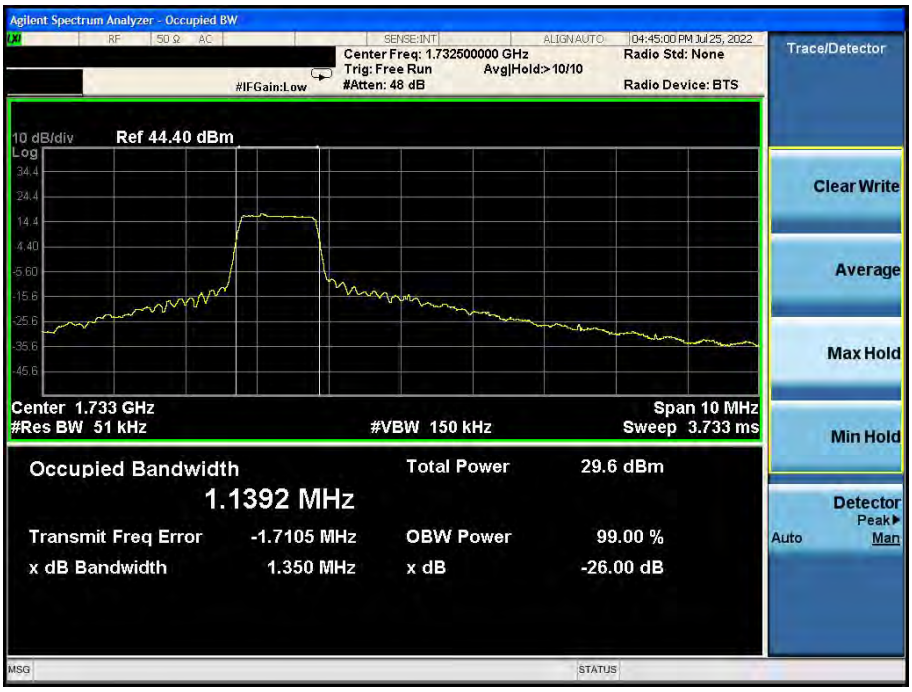
Band4-26dB/99% OBW-1.4MHz Bandwidth-QPSK

Band4-26dB/99% OBW-3MHz Bandwidth-16QAM

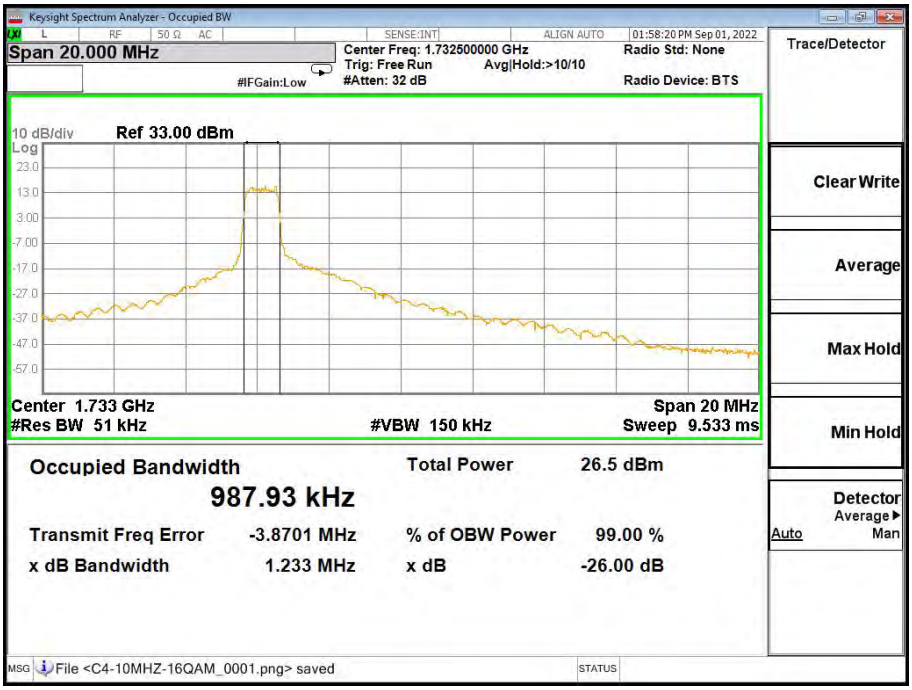


Band4-26dB/99% OBW-3MHz Bandwidth-QPSK

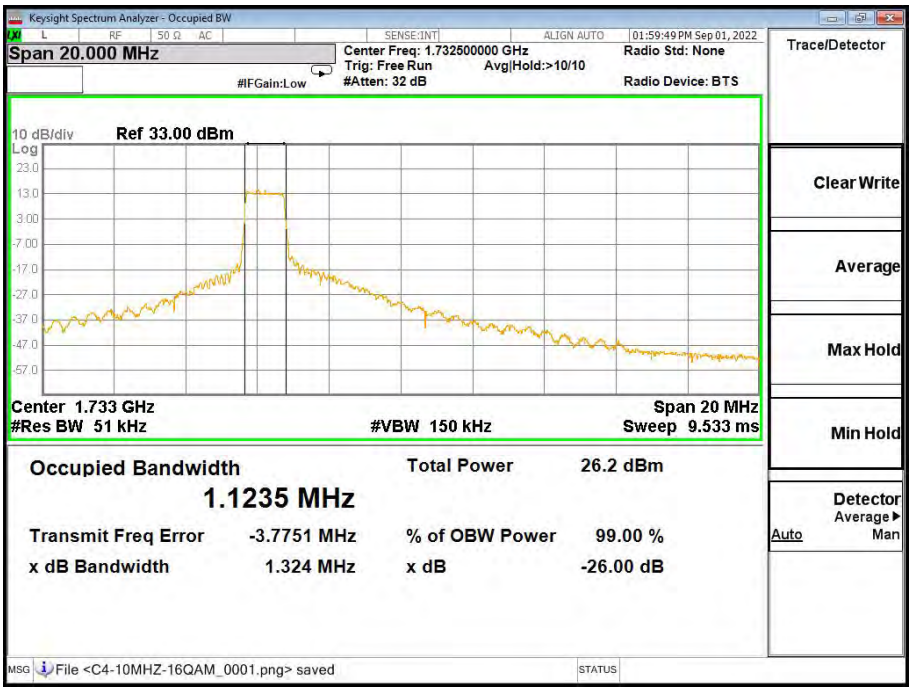
Band4-26dB/99% OBW-5MHz Bandwidth-16QAM



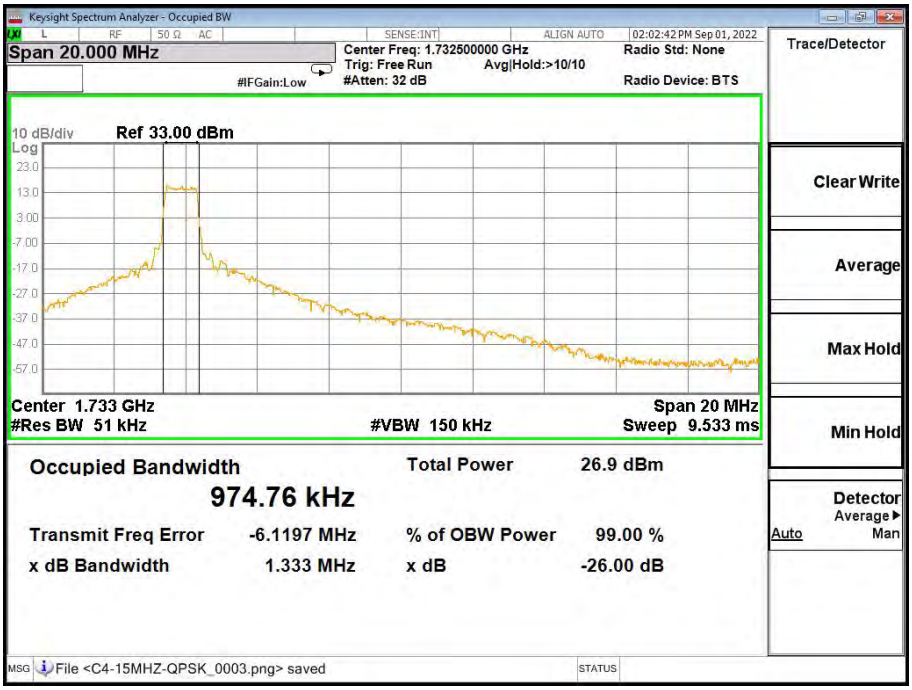
Band4-26dB/99% OBW-5MHz Bandwidth-QPSK



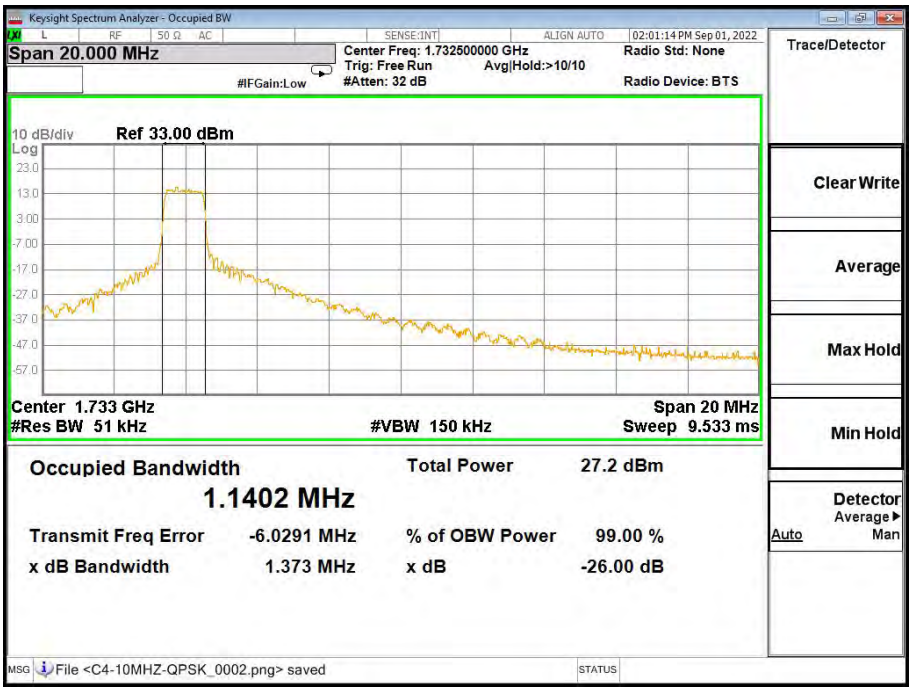
Band4-26dB/99% OBW-10MHz Bandwidth-16QAM



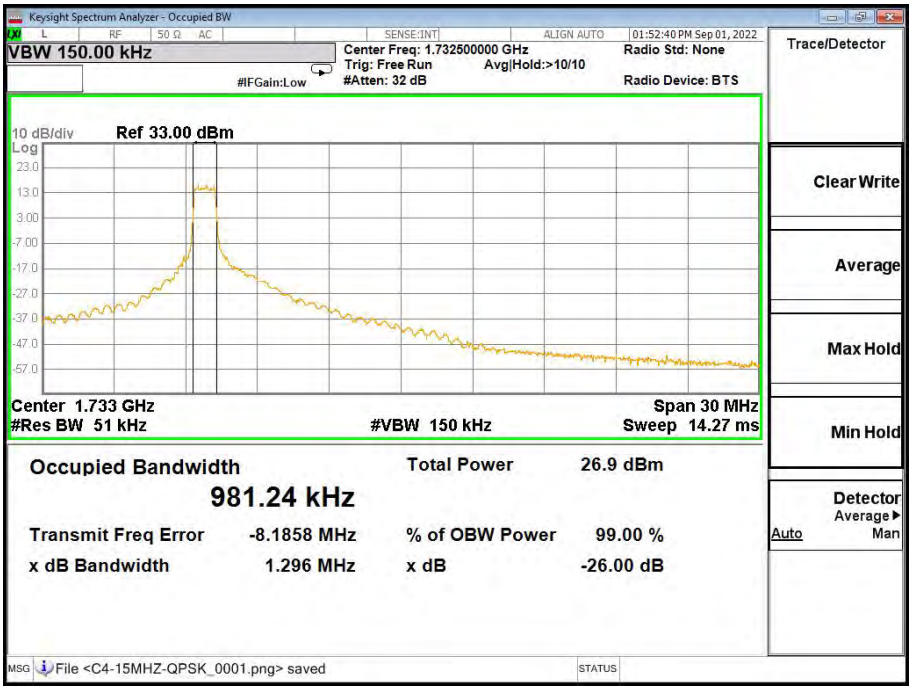
Band4-26dB/99% OBW-10MHz Bandwidth-QPSK



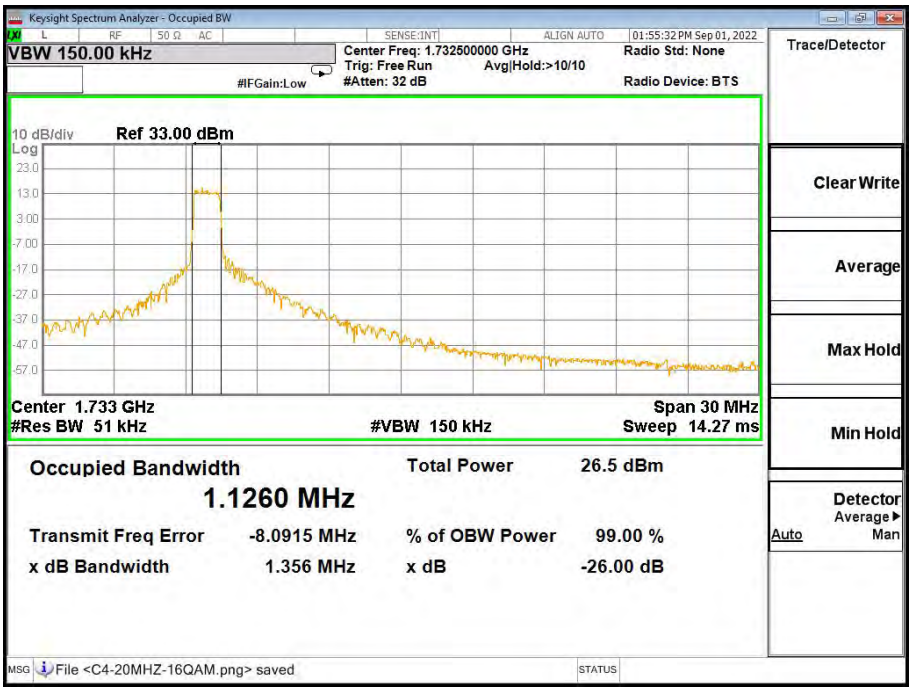
Band4-26dB/99% OBW-15MHz Bandwidth-16QAM



Band4-26dB/99% OBW-15MHz Bandwidth-QPSK



Band4-26dB/99% OBW-20MHz Bandwidth-16QAM



Band4-26dB/99% OBW-20MHz Bandwidth-QPSK

Band12-26dB/99% OBW-1.4MHz Bandwidth-16QAM

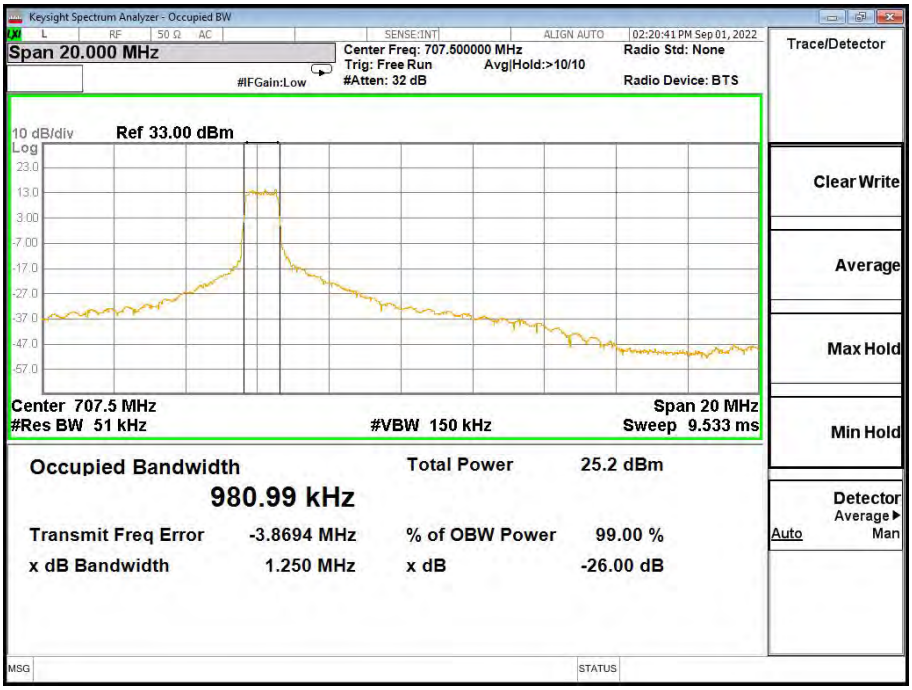
Band12-26dB/99% OBW-1.4MHz Bandwidth-QPSK

Band12-26dB/99% OBW-3MHz Bandwidth-16QAM

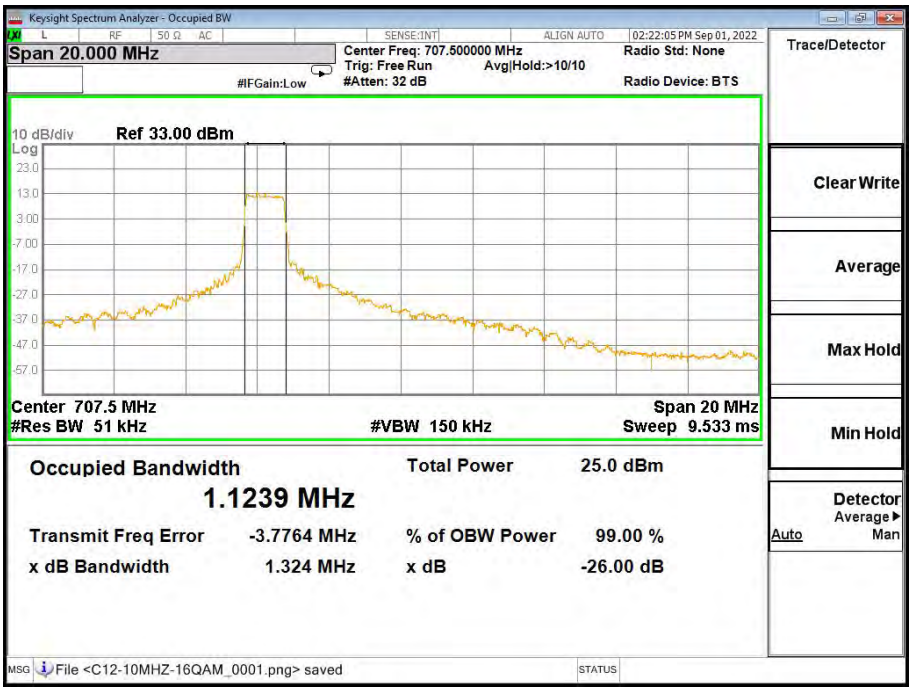
Band12-26dB/99% OBW-3MHz Bandwidth-QPSK

Band12-26dB/99% OBW-5MHz Bandwidth-16QAM

Band12-26dB/99% OBW-5MHz Bandwidth-QPSK



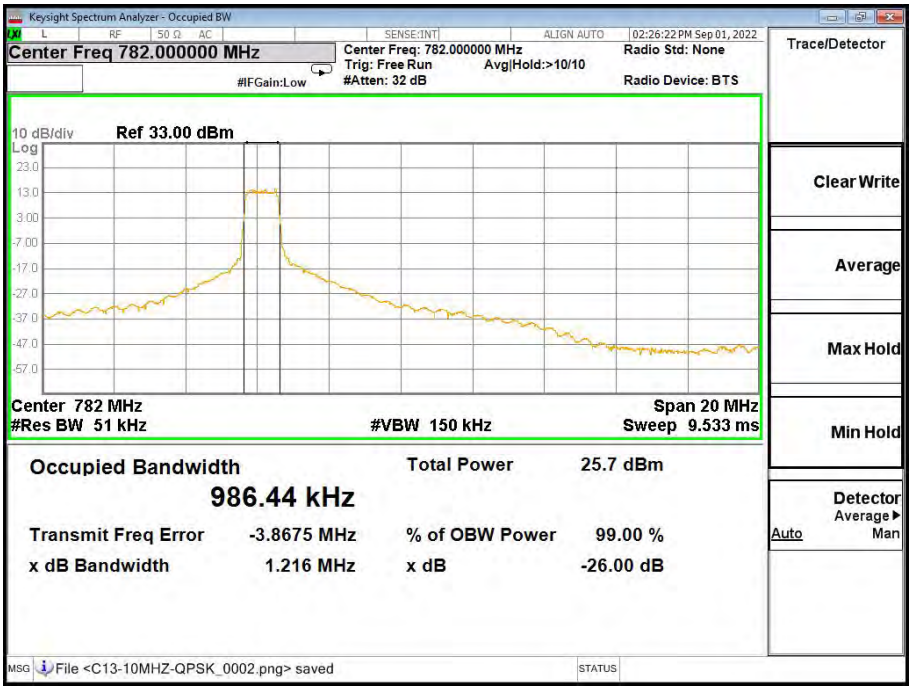
Band12-26dB/99% OBW-10MHz Bandwidth-16QAM



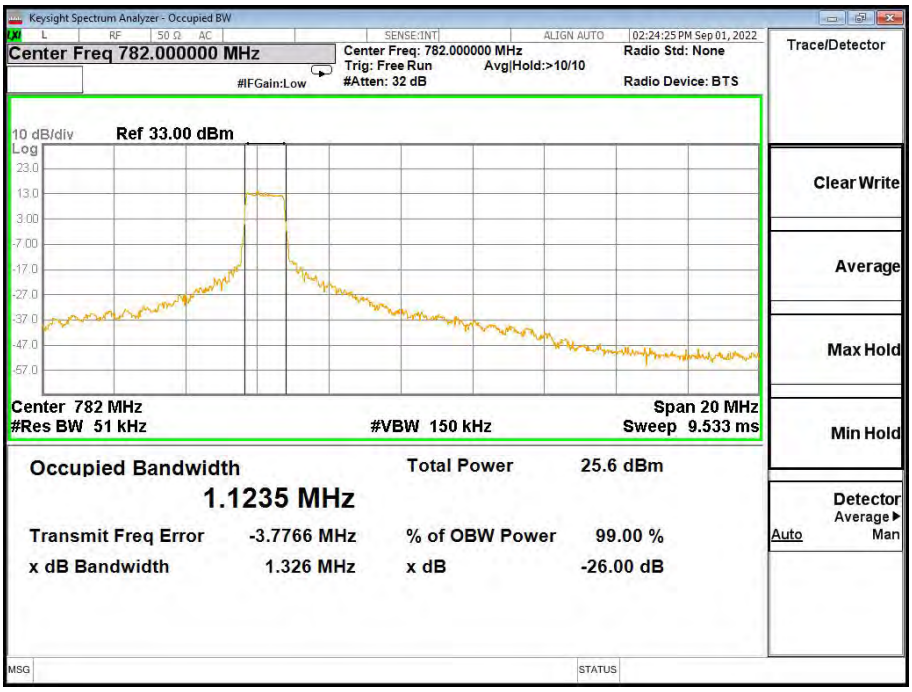
Band12-26dB/99% OBW-10MHz Bandwidth-QPSK

Band13-26dB/99% OBW-5MHz Bandwidth-16QAM

Band13-26dB/99% OBW-5MHz Bandwidth-QPSK



Band13-26dB/99% OBW-10MHz Bandwidth-16QAM



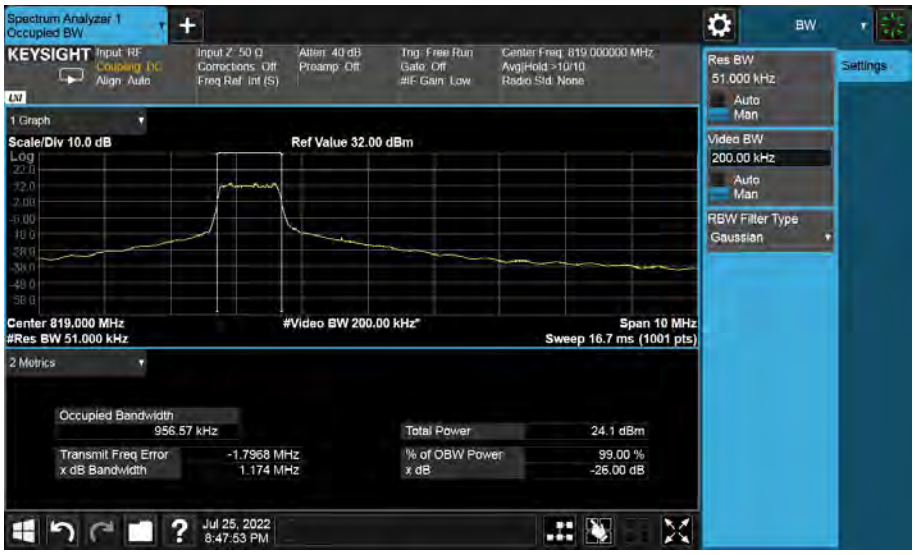
Band13-26dB/99% OBW-10MHz Bandwidth-QPSK

Band26-26dB/99% OBW-26740 Channel-1.4MHz Bandwidth-16QAM

Band26-26dB/99% OBW-26740 Channel-1.4MHz Bandwidth-QPSK

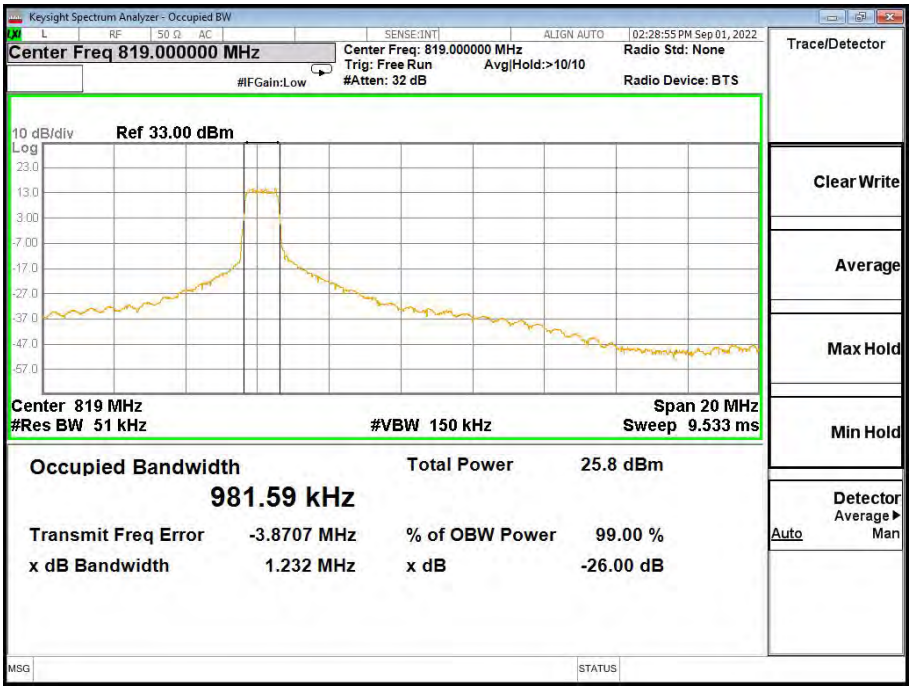
Band26-26dB/99% OBW-26740 Channel-3MHz Bandwidth-16QAM

Band26-26dB/99% OBW-26740 Channel-3MHz Bandwidth-QPSK

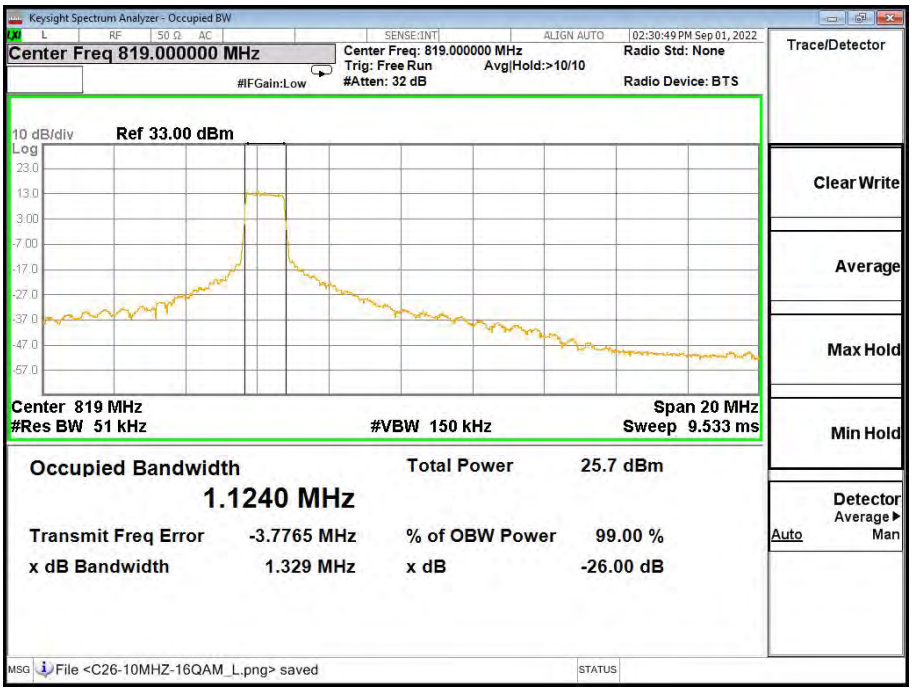


Band26-26dB/99% OBW-26740 Channel-5MHz Bandwidth-16QAM

Band26-26dB/99% OBW-26740 Channel-5MHz Bandwidth-QPSK



Band26-26dB/99% OBW-26740 Channel-10MHz Bandwidth-16QAM



Band26-26dB/99% OBW-26740 Channel-10MHz Bandwidth-QPSK

Band26-26dB/99% OBW-26915 Channel-1.4MHz Bandwidth-16QAM

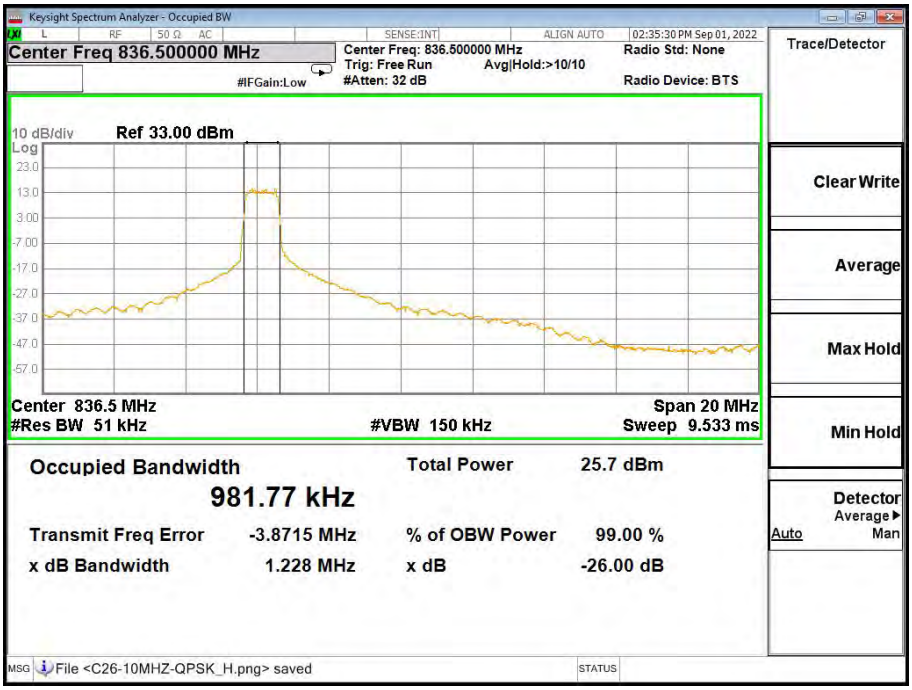
Band26-26dB/99% OBW-26915 Channel-1.4MHz Bandwidth-QPSK

Band26-26dB/99% OBW-26915 Channel-3MHz Bandwidth-16QAM

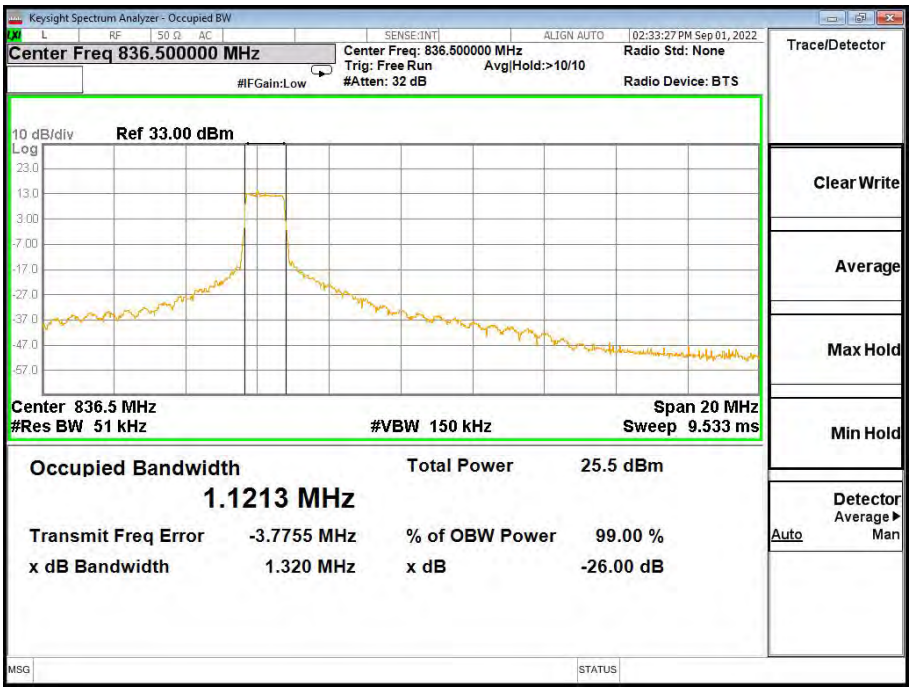
Band26-26dB/99% OBW-26915 Channel-3MHz Bandwidth-QPSK

Band26-26dB/99% OBW-26915 Channel-5MHz Bandwidth-16QAM

Band26-26dB/99% OBW-26915 Channel-5MHz Bandwidth-QPSK



Band26-26dB/99% OBW-26915 Channel-10MHz Bandwidth-16QAM



Band26-26/99%dB OBW-26915 Channel-10MHz Bandwidth-QPSK

6.5. Conducted spurious emissions

Specifications:	FCC Part 2.1051,24.238,2.1053,22.917, 27.53,90.691
DUT Serial Number:	866884046100624
Test conditions:	Ambient Temperature:15℃-35℃ Relative Humidity:30%-60% Air pressure: 86-106kPa
Test Results:	Pass

Limit Level Construction:

According to Part 22.917 (a), i.e., Out of Band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

According to Part 24.238 (a), i.e., Out of Band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB, so the limit level is: P(dBm)– (43 + 10 log(P)) dB= -13dBm.

According to Part 27.53(h):

Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 Bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 log10(P) dB.

According to Part 27.53(g):

For operations in the 600 MHz Band and the 698-746 MHz Band, the power of any emission outside a licensee's frequency Band(s) of operation shall be attenuated below the transmitter power (P) within the licensed Band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution Bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz Bands immediately outside and adjacent to a licensee's frequency block, a resolution Bandwidth of at least 30 kHz may be employed.

According to Part 90.691:

(a) Out-of-band emission requirement shall apply only to the “outer” channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

(1) 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 Log10(f/6.1) decibels or 50 + 10 Log10(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.

(2) 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.

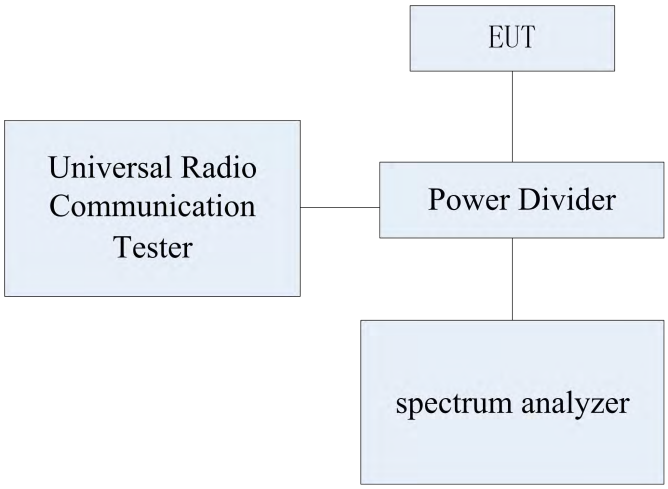
(b) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

Measurement Uncertainty:

Item	Uncertainty	
Expanded Uncertainty	9kHz < f≤4GHz	0.71 dB (k=2)
	4GHz≤f < 12.75GHz	0.74 dB (k=2)
	12.75GHz≤f < 26GHz	2.70 dB (k=2)

Test Setup:

During the test, the EUT was controlled via the Wireless Communications Test Set to ensure max power transmission and proper modulation and measured by spectrum analyzer.

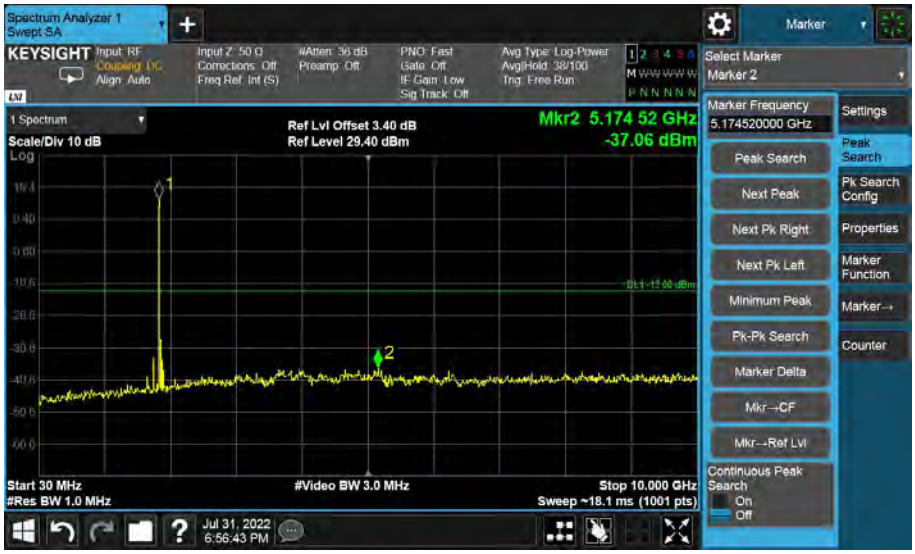


Test Method:

The RF output of the transmitter was connected to a spectrum analyzer through a calibrated coaxial cable. Sufficient scans were taken to show the out-of-Band emissions, if any, up to 10th harmonic. The EUT was scanned for spurious emissions from 30MHz to 20GHz with sufficient Bandwidth and video resolution. The spectrum analyzer was set to Maximum hold mode to ensure that the worst-case emissions were captured.

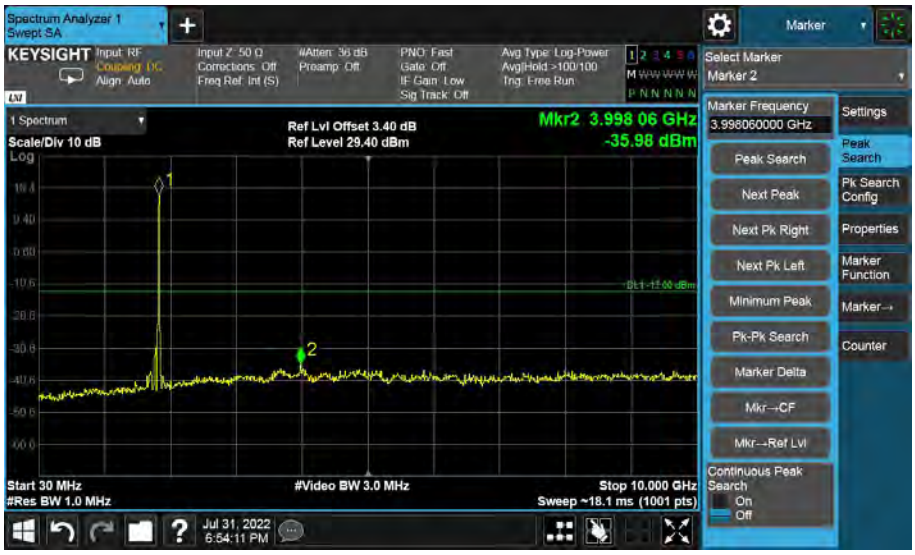
Note: --

6.5.1 NB-IoT B2 Conducted Spurious Emission Results



30MHz to 10GHz, Low Channel, Subcarrier (3.75kHz), QPSK, 1@0

10GHz to 20GHz, Low Channel, Subcarrier (3.75kHz), QPSK, 1@0



30MHz to 10GHz, Low Channel, Subcarrier (3.75kHz), BPSK, 1@0

10GHz to 20GHz, Low Channel, Subcarrier (3.75kHz), BPSK, 1@0

30MHz to 10GHz, Low Channel, Subcarrier (15kHz), QPSK, 1@0

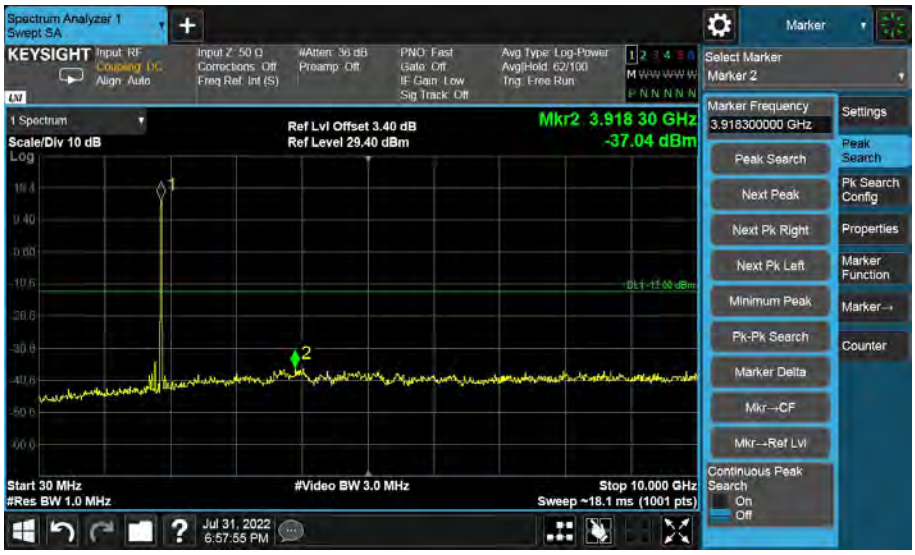
10GHz to 20GHz, Low Channel, Subcarrier (15kHz), QPSK, 1@0

30MHz to 10GHz, Low Channel, Subcarrier (15kHz), QPSK, 12@0

10GHz to 20GHz, Low Channel, Subcarrier (15kHz), QPSK, 12@0

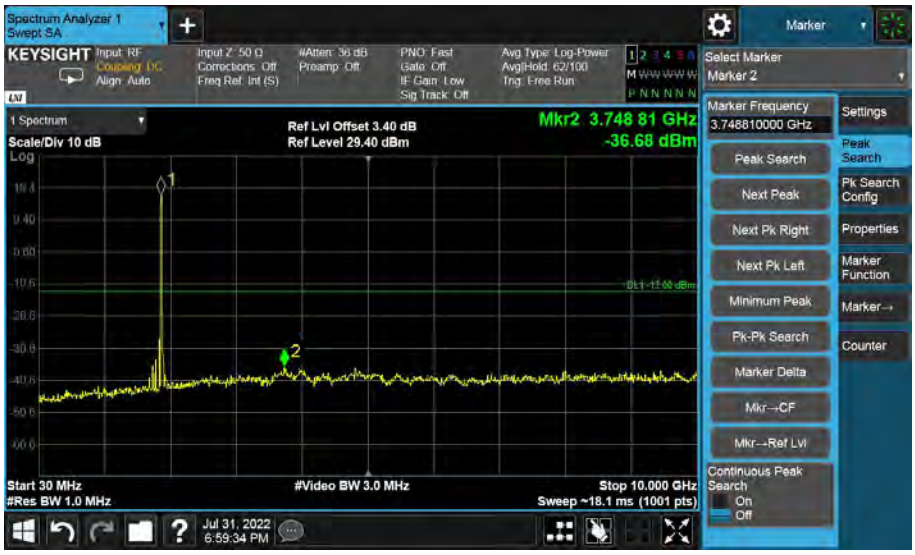
30MHz to 10GHz, Low Channel, Subcarrier (15kHz), BPSK, 1@0

10GHz to 20GHz, Low Channel, Subcarrier (15kHz), BPSK, 1@0

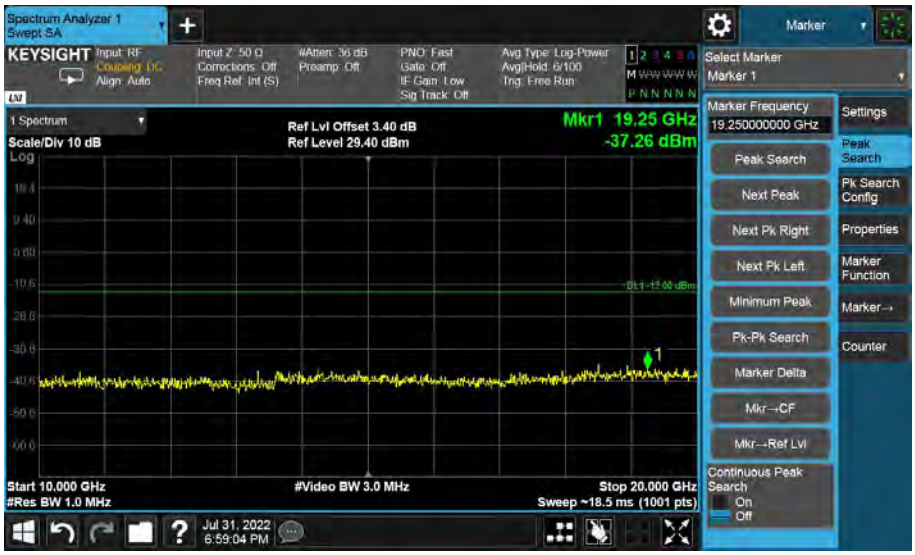


30MHz to 10GHz, Mid Channel, Subcarrier (3.75kHz), QPSK, 1@0

10GHz to 20GHz, Mid Channel, Subcarrier (3.75kHz), QPSK, 1@0



30MHz to 10GHz, Mid Channel, Subcarrier (3.75kHz), BPSK, 1@0



10GHz to 20GHz, Mid Channel, Subcarrier (3.75kHz), BPSK, 1@0

30MHz to 10GHz, Mid Channel, Subcarrier (15kHz), QPSK, 1@0

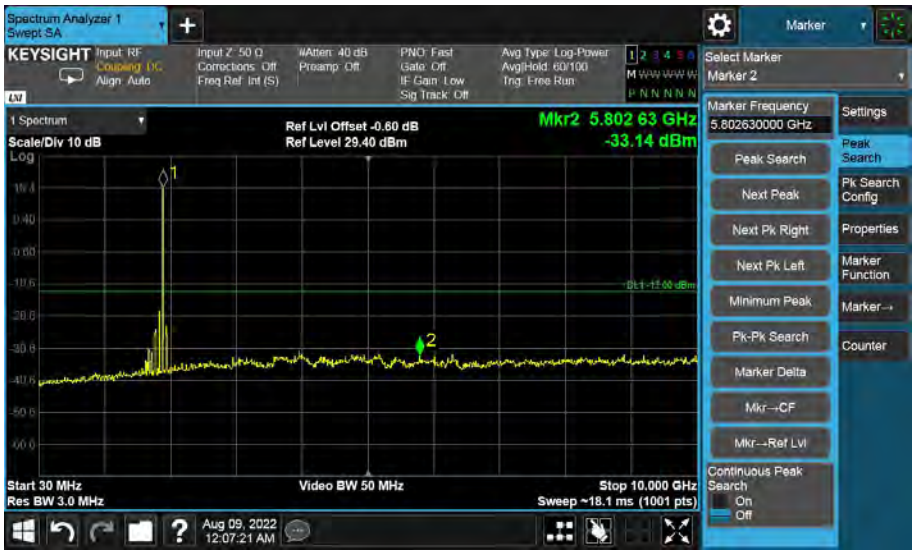
10GHz to 20GHz, Mid Channel, Subcarrier (15kHz), QPSK, 1@0

30MHz to 10GHz, Mid Channel, Subcarrier (15kHz), QPSK, 12@0

10GHz to 20GHz, Mid Channel, Subcarrier (15kHz), QPSK, 12@0

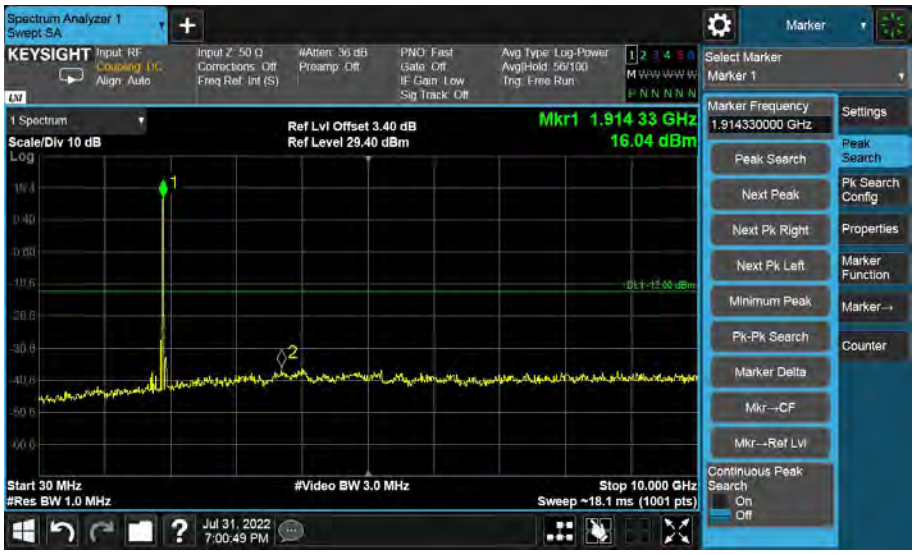
30MHz to 10GHz, Mid Channel, Subcarrier (15kHz), BPSK, 1@0

10GHz to 20GHz, Mid Channel, Subcarrier (15kHz), BPSK, 1@0

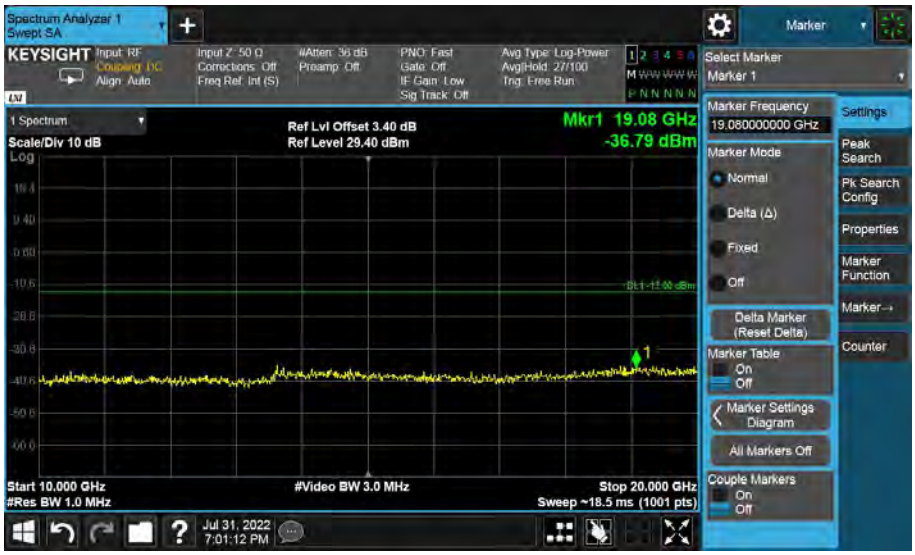


30MHz to 10GHz, High Channel, Subcarrier (3.75kHz), QPSK, 1@0

10GHz to 20GHz, High Channel, Subcarrier (3.75kHz), QPSK, 1@0



30MHz to 10GHz, High Channel, Subcarrier (3.75kHz), BPSK, 1@0



10GHz to 20GHz, High Channel, Subcarrier (3.75kHz), BPSK, 1@0

30MHz to 10GHz, High Channel, Subcarrier (15kHz), QPSK, 1@0

10GHz to 20GHz, High Channel, Subcarrier (15kHz), QPSK, 1@0