



FCC TEST REPORT

FCC ID: 2A3MU-ESR2

On Behalf of

Shanghai EFIX Geomatics Co., Ltd.

Receiver

Model No.: ESR-2

Prepared for : Shanghai EFIX Geomatics Co., Ltd.
Address : Room 1137, Area D, 11th Floor, Building 1, No. 158, Shuanglian Road, Qingpu District, Shanghai

Prepared By : Shenzhen Alpha Product Testing Co., Ltd.
Address : Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103, Shenzhen, Guangdong, China

Report Number : A2410134-C09-R02
Date of Receipt : October 23, 2024
Date of Test : October 23, 2024 – November 11, 2024
Date of Report : November 14, 2024
Version Number : V0
Test Result : Pass

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TEST REPORT DECLARATION

Applicant : Shanghai EFIX Geomatics Co., Ltd.
Address : Room 1137, Area D, 11th Floor, Building 1, No. 158, Shuanglian Road, Qingpu District, Shanghai
Manufacturer : Shanghai EFIX Geomatics Co., Ltd.
Address : Room 1137, Area D, 11th Floor, Building 1, No. 158, Shuanglian Road, Qingpu District, Shanghai
EUT Description : Receiver

(A) Model No. : ESR-2

(B) Trademark :



Measurement Standard Used:

FCC CFR Title 47 Part 2
FCC CFR Title 47 Part 22 Subpart H
FCC CFR Title 47 Part 24 Subpart E
FCC CFR Title 47 Part 27

The device described above is tested by Shenzhen Alpha Product Testing Co., Ltd. to determine the maximum emission levels emanating from the device. The test results are contained in this test report and Shenzhen Alpha Product Testing Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

After the test, our opinion is that EUT compliance with the requirement of the above standards.

This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Shenzhen Alpha Product Testing Co., Ltd.

Tested by (name + signature).....:

Yannis Wen

Project Engineer



Approved by (name + signature).....:

Jack Xu

Project Manager



Date of issue.....:

November 14, 2024

Revision History

Revision	Issue Date	Revisions	Revised By
V0	November 14, 2024	Initial released Issue	Yannis Wen

1 Test Summary

Test Item	Section in CFR 47	Result
RF Output Power	Part 2.1046 Part 22.913(a) (5) Part 24.232 (c) Part 27.50 (d)(4) Part 27.50 (h)	Pass
Peak-To-Average Ratio	Part 2.1046 Part 22.913(d) Part 24.232 (d) Part 27.50(d)	Pass
Modulation Characteristics	Part 2.1047	N/A
99% & -26 dB Occupied Bandwidth	Part 2.1049 Part 22.917 Part 24.238 Part 27.53(a)	Pass
Spurious Emissions at Antenna Terminal	Part 2.1051 Part 22.917 (a) Part 24.238 (a) Part 27.53 (h)/(m)	Pass
Field Strength of Spurious Radiation	Part 2.1053 Part 22.917 (a) Part 24.238 (a) Part 27.53 (h)/(m)	Pass
Out of band emission, Band Edge	Part 22.917 (a) Part 24.238 (a) Part 27.53(h)/(m)	Pass
Frequency stability vs. temperature	Part 2.1055(a)(1)(b)	Pass
Frequency stability vs. voltage	Part 2.1055(d)(1)(2)	Pass

Note: 1. Pass: The EUT complies with the essential requirements in the standard.

2. The conclusion of this test report is judged by actual test data without considering measurement uncertainty.

2 General Information

2.1 General Description of EUT

Description of Device (EUT)

Description/PMN	: Receiver
Model No./HVIN	: ESR-2
DIFF.	: N/A
Test Voltage	: Input: 9-36Vdc 2.0A
Support Bands	: LTE Band 2/4/5/7/12/13/41
Channel Bandwidth	: LTE Band 2: 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 4: 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 5: 1.4MHz, 3MHz, 5MHz, 10MHz LTE Band 7: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 12: 1.4MHz, 3MHz, 5MHz, 10MHz LTE Band 13: 5MHz, 10MHz LTE Band 41: 5MHz, 10MHz, 15MHz, 20MHz
TX Frequency	: LTE Band 2: 1850 ~ 1910 MHz LTE Band 4: 1710 ~ 1755 MHz LTE Band 5: 824 ~ 849 MHz LTE Band 7: 2500 ~ 2570 MHz LTE Band 12: 699MHz ~ 716MHz LTE Band 13: 777MHz ~ 787MHz LTE Band 41: 2496MHz ~ 2670MHz
Modulation type	: QPSK, 16QAM
Antenna Type	: Internal antenna, LTE Band 2: Maximum Gain is 2.42dBi. LTE Band 4: Maximum Gain is -0.31dBi. LTE Band 5: Maximum Gain is 0.72dBi. LTE Band 7: Maximum Gain is -0.95dBi. LTE Band 12: Maximum Gain is -1.53dBi. LTE Band 13: Maximum Gain is 0.72dBi. LTE Band 41: Maximum Gain is -0.07dBi. (Antenna information is provided by applicant.)
Software version	: V1.2.2
Hardware version	: V1.0.1

Remark 1: The worst-case simultaneous transmission configuration was evaluated with no non-compliance found. Results in this report are only for 4G function, and there is no other transmitter involved.

2.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is filing to comply with Section Part 22 subpart H and Part 24 subpart E of the FCC CFR 47 Rules, Part 27 of the FCC CFR 47 Rules.

2.3 Test Facility

Shenzhen Alpha Product Testing Co., Ltd

Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103, Shenzhen, Guangdong, China

June 21, 2018 File on Federal Communication Commission
Registration Number: 293961

July 15, 2019 Certificated by IC
Registration Number: 12135A
CAB identifier: CN0085

2.4 Accessories of Device (EUT)

Accessories : /
Manufacturer : /
Model : /
Ratings : /

2.5 Tested Supporting System Details

No.	Description	Manufacturer	Model	Serial Number	Certification or SDoC
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2.6 Test Conditions

Items	Required	Actual
Temperature range:	15-35℃	24℃
Humidity range:	25-75%	56%
Pressure range:	86-106kPa	98kPa

2.7 Measurement Uncertainty

Item	Uncertainty
Uncertainty for Power point Conducted Emissions Test	1.63dB
Uncertainty for Radiation Emission test in 3m chamber (below 30MHz)	3.5dB
Uncertainty for Radiation Emission test in 3m chamber (30MHz to 1GHz)	3.74dB(Polarize: V)
	3.76dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (1GHz to 25GHz)	3.77dB(Polarize: V)
	3.80dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (18GHz to 40GHz)	4.31 dB(Polarize: V)
	4.30 dB(Polarize: H)
Uncertainty for radio frequency	5.06×10^{-8} GHz
Uncertainty for conducted RF Power	0.40dB
Uncertainty for temperature	0.2°C
Uncertainty for humidity	1%
Uncertainty for DC and low frequency voltages	0.06%

3 Test Instruments list

Equipment	Manufacture	Model No.	Firmware version	Serial No.	Last cal.	Cal Interval
9*6*6 anechoic chamber	CHENYU	9*6*6	/	N/A	2022.05.18	3Year
Spectrum analyzer	ROHDE&SCHWARZ	FSV40-N	2.3	102137	2024.08.08	1Year
Spectrum analyzer	Agilent	N9020A	A.14.16	MY499100060	2024.08.08	1Year
Receiver	ROHDE&SCHWARZ	ESR	2.28 SP1	1316.3003K03-102082-Wa	2024.08.08	1Year
Receiver	R&S	ESCI	4.42 SP1	101165	2024.08.08	1Year
Bilog Antenna	Schwarzbeck	VULB 9168	/	VULB 9168#627	2023.08.28	2Year
Horn Antenna	SCHWARZBECK	BBHA 9120 D	/	2106	2023.08.19	2Year
Loop Antenna	SCHWARZBECK	FMZB 1519B	/	00128	2023.08.19	2Year
RF Cable	Resenberger	Cable 1	/	RE1	2024.08.08	1Year
RF Cable	Resenberger	Cable 2	/	RE2	2024.08.08	1Year
RF Cable	Resenberger	Cable 3	/	CE1	2024.08.08	1Year
Pre-amplifier	HP	HP8347A	/	2834A00455	2024.08.08	1Year
Pre-amplifier	Agilent	8449B	/	3008A02664	2024.08.08	1Year
L.I.S.N.#1	Schwarzbeck	NSLK8126	/	8126-466	2024.08.08	1Year
L.I.S.N.#2	ROHDE&SCHWARZ	ENV216	/	101043	2024.08.08	1Year
Horn Antenna	SCHWARZBECK	BBHA 9170	/	00946	2023.08.19	2Year
Preamplifier	SKET	LNPA_1840-50	/	SK2018101801	2024.08.08	1 Year
Power Meter	Agilent	E9300A	/	MY41496628	2024.08.08	1 Year
Power Sensor	DARE	RPR3006W	/	15100041SNO91	2024.08.08	1 Year
Electronic Thermo-Hygrometer	S.H.Qixiang	HTC-1	/	N/A	2024.08.11	1 Year
Switching Mode Power Supply	JUNKE	JK12010S	/	20140927-6	2024.08.08	1 Year
Adjustable attenuator	MWRFTest	N/A	/	N/A	N/A	N/A
10dB Attenuator	Mini-Circuits	DC-6G	/	N/A	N/A	N/A

Software Information			
Test Item	Software Name	Manufacturer	Version
RE	EZ-EMC	EZ	Alpha-3A1
CE	EZ-EMC	EZ	Alpha-3A1
RF-CE	MTS 8310	MW	V2.0.0.0

4 System test configuration

4.1 Test mode

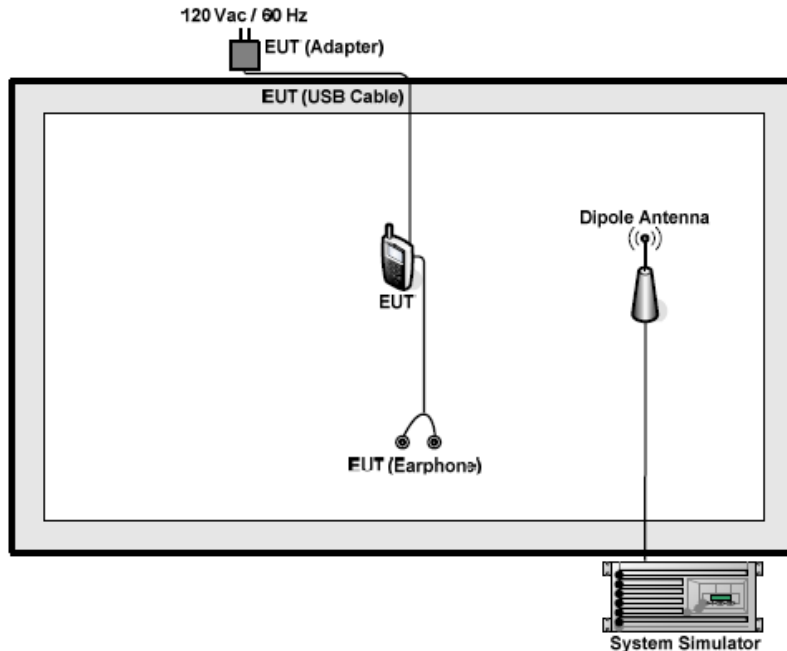
During all testing, EUT is in link mode with base station emulator at maximum power level. The spurious emission measurements were carried out in semi-anechoic chamber with 3-meter test range, and EUT is rotated on three test planes to find out the worst emission.

Test modes		
Band	Radiated	Conducted
LTE Band 2	■ QPSK link, 16QAM link	■ QPSK link, 16QAM link
LTE Band 4	■ QPSK link, 16QAM link	■ QPSK link, 16QAM link
LTE Band 5	■ QPSK link, 16QAM link	■ QPSK link, 16QAM link
LTE Band 7	■ QPSK link, 16QAM link	■ QPSK link, 16QAM link
LTE Band 12	■ QPSK link, 16QAM link	■ QPSK link, 16QAM link
LTE Band 13	■ QPSK link, 16QAM link	■ QPSK link, 16QAM link
LTE Band 41	■ QPSK link, 16QAM link	■ QPSK link, 16QAM link

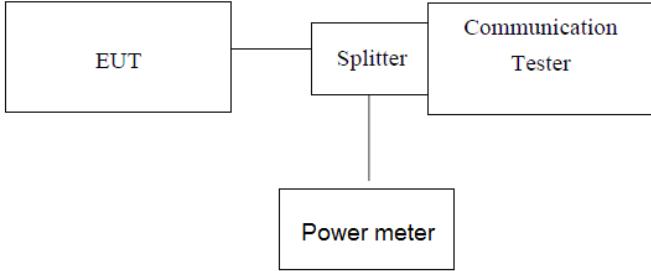
Note: Antenna port conducted and radiated test items were performed according to KDB 971168 D01 Power Meas License Digital Systems v03r1 with maximum output power.

Radiated measurements were performed with rotating EUT in different three orthogonal test planes to find the maximum emission.

4.2 Configuration of Tested System



4.3 Conducted Output Power

Test Requirement:	FCC part22.913(a) (5), FCC part24.232(b) and FCC Part 27.50 (d)(4)/(h)
Test Method:	ANSI C63.26:2015
Limit:	LTE Band 2: 2W LTE Band 4: 1W LTE Band 5: 7W LTE Band 7: 2W LTE Band 12: 3W LTE Band 13: 3W LTE Band 41: 2W
Test setup:	 <pre> graph LR EUT[EUT] --- Splitter[Splitter] Splitter --- CT[Communication Tester] Splitter --- PM[Power meter] </pre> <i>Note: Measurement setup for testing on Antenna connector</i>
Test Procedure:	1. The transmitter output port was connected to base station. 2. The RF output of EUT was connected to the power meter by RF cable and attenuator, the path loss was compensated to the results for each measurement. 3. Set EUT at maximum power through base station. 4. Select lowest, middle, and highest channels for each band and different modulation. 5. Measure the maximum burst average power.
Test Instruments:	Refer to section 3 for details
Test mode:	Refer to section 4.1 for details
Test results:	Pass

Measurement Data

LTE Band2

Bandwidth	Modulation	RB size	RB offset	Output Power (dBm) for low/mid/high channel		
				18607/1850.7	18900/1880	19193/1909.3
1.4MHz	QPSK	1	0	23.68	23.29	23.92
			2	23.78	23.73	23.84
			5	23.34	23.45	23.52
		3	0	23.18	23.70	23.38
			2	23.12	23.58	23.88
			3	23.77	23.49	23.11
		6	0	23.77	23.61	23.84
	QAM16	1	0	23.41	23.72	23.15
			2	23.38	23.35	23.07
			5	23.47	23.94	23.28
		3	0	23.58	23.70	23.30
			2	23.43	23.52	23.64
			3	23.52	23.33	23.25
		6	0	23.35	23.04	23.74

Bandwidth	Modulation	RB size	RB offset	Output Power (dBm) for low/mid/high channel		
				18615/1851.5	18900/1880	19185/1908.5
3MHz	QPSK	1	0	22.75	23.18	23.14
			7	22.75	22.93	23.51
			14	23.61	22.94	23.44
		8	0	23.45	23.44	23.33
			4	22.97	23.11	23.62
			7	23.01	22.79	22.74
		15	0	23.13	23.02	23.30
	QAM16	1	0	23.06	23.02	23.16
			7	23.40	23.29	23.20
			14	23.01	23.09	23.06
		8	0	22.93	23.64	23.14
			4	23.26	23.63	22.84
			7	23.66	23.24	23.63
		15	0	23.40	23.06	23.33

Bandwidth	Modulation	RB size	RB offset	Output Power (dBm) for low/mid/high channel		
				18625/1852.5	18900/1880	19175/1907.5
5MHz	QPSK	1	0	23.19	23.13	22.62
			13	22.31	23.02	23.06
			24	22.93	22.55	22.70
		12	0	23.04	22.96	22.34
			6	22.99	22.49	22.31
			13	23.22	23.16	22.70
		25	0	22.60	22.92	23.07
	QAM16	1	0	22.50	22.45	23.09
			13	22.36	22.59	22.44
			24	22.30	22.67	22.86
		12	0	22.92	22.45	23.14
			6	22.35	23.17	22.29
			13	22.92	22.97	22.28
		25	0	22.62	22.57	22.42

Bandwidth	Modulation	RB size	RB offset	Output Power (dBm) for low/mid/high channel		
				18650/1855	18900/1880	19150/1905
10MHz	QPSK	1	0	22.16	22.59	22.14
			25	22.59	22.57	21.80
			49	22.29	22.13	22.35
		25	0	21.87	21.87	21.87
			13	22.21	22.05	22.67
			25	22.58	22.54	22.49
		50	0	22.42	21.91	22.50
	QAM16	1	0	21.88	22.65	21.84
			25	22.35	21.91	22.06
			49	21.85	22.72	22.32
		25	0	21.87	21.93	21.99
			13	22.40	22.62	22.19
			25	22.61	22.05	22.73
		50	0	22.02	22.37	21.80

Bandwidth	Modulation	RB size	RB offset	Output Power (dBm) for low/mid/high channel		
				18675/1857.5	18900/1880	19125/1902.5
15MHz	QPSK	1	0	21.61	21.40	21.79
			38	21.45	21.50	21.57
			74	21.59	21.26	22.06
		36	0	22.06	22.00	22.11
			18	21.78	21.69	21.40
			39	22.08	21.63	22.24
		75	0	21.75	22.00	21.42
	QAM16	1	0	21.63	22.11	21.67
			38	21.80	22.19	21.28
			74	21.70	21.59	22.05
		36	0	21.98	22.04	22.03
			18	21.40	21.88	22.00
			39	21.76	22.01	22.07
		75	0	21.36	21.78	22.16

Bandwidth	Modulation	RB size	RB offset	Output Power (dBm) for low/mid/high channel		
				18700/1860	18900/1880	19100/1900
20MHz	QPSK	1	0	21.37	21.45	21.51
			50	21.73	21.47	20.90
			99	21.66	21.10	21.81
		50	0	21.04	21.02	21.02
			25	21.29	21.31	21.16
			50	21.45	20.99	21.63
		100	0	21.17	21.34	21.33
	QAM16	1	0	20.84	21.76	21.36
			50	21.41	21.70	21.65
			99	21.23	20.99	20.94
		50	0	21.39	21.42	21.60
			25	20.99	21.01	21.52
			50	21.64	21.24	21.47
		100	0	21.68	21.77	21.06

LTE Band4

Bandwidth	Modulation	RB size	RB offset	Output Power (dBm) for low/mid/high channel		
				19957/1710.7	20175/1732.5	20393/1754.3
1.4MHz	QPSK	1	0	23.15	22.73	23.62
			2	23.64	22.85	23.65
			5	22.91	22.84	23.33
		3	0	23.47	22.99	22.96
			2	23.57	22.95	22.67
			3	23.23	23.52	23.50
		6	0	22.89	23.07	23.54
	QAM16	1	0	22.79	22.68	22.88
			2	23.14	22.90	23.57
			5	22.81	23.25	22.93
		3	0	23.42	22.71	22.89
			2	23.56	22.93	23.14
			3	23.31	23.55	23.46
		6	0	23.19	23.43	22.99

Bandwidth	Modulation	RB size	RB offset	Output Power (dBm) for low/mid/high channel		
				19965/1711.5	20175/1732.5	20385/1753.5
3MHz	QPSK	1	0	22.73	23.20	22.72
			7	22.84	22.94	23.00
			14	22.43	23.04	23.27
		8	0	23.18	22.30	23.19
			4	22.61	23.03	22.98
			7	22.35	22.59	23.00
		15	0	22.77	22.75	23.23
	QAM16	1	0	22.54	22.60	22.75
			7	22.28	22.48	23.03
			14	22.42	22.66	22.43
		8	0	22.88	23.15	22.56
			4	22.62	22.61	22.32
			7	22.88	23.18	22.58
		15	0	23.16	22.54	22.83

Bandwidth	Modulation	RB size	RB offset	Output Power (dBm) for low/mid/high channel		
				19975/1712.5	20175/1732.5	20375/1752.5
5MHz	QPSK	1	0	22.48	22.57	22.05
			13	22.54	22.24	22.03
			24	22.09	22.23	22.26
		12	0	21.85	22.61	22.03
			6	22.48	22.38	22.33
			13	22.75	21.96	22.75
		25	0	22.60	22.36	22.05
	QAM16	1	0	22.72	22.05	22.11
			13	21.99	22.65	22.59
			24	22.24	21.90	22.16
		12	0	22.29	22.03	22.30
			6	22.61	21.95	22.82
			13	22.40	22.09	22.32
		25	0	22.56	22.16	22.28

Bandwidth	Modulation	RB size	RB offset	Output Power (dBm) for low/mid/high channel		
				20000/1715	20175/1732.5	20350/1750
10MHz	QPSK	1	0	22.06	21.53	22.18
			25	21.98	21.72	22.13
			49	22.21	21.81	21.57
		25	0	21.71	21.61	22.13
			13	21.65	22.30	21.68
			25	22.07	21.63	21.81
		50	0	21.78	22.22	22.45
	QAM16	1	0	21.65	22.35	22.08
			25	21.73	22.11	22.21
			49	22.02	22.35	21.91
		25	0	21.90	21.78	22.12
			13	22.16	21.53	21.98
			25	21.75	21.98	22.24
		50	0	21.77	21.51	21.68

Bandwidth	Modulation	RB size	RB offset	Output Power (dBm) for low/mid/high channel		
				20025/1717.5	20175/1732.5	20325/1747.5
15MHz	QPSK	1	0	21.82	21.07	21.41
			38	21.95	21.52	21.81
			74	21.52	21.95	21.84
		36	0	21.28	21.82	21.22
			18	21.76	21.48	21.84
			39	21.76	21.83	21.46
		75	0	21.96	21.34	21.59
	QAM16	1	0	21.61	21.29	21.56
			38	21.24	21.57	21.79
			74	21.11	21.07	21.15
		36	0	21.06	21.12	21.47
			18	21.19	22.02	21.15
			39	21.49	21.90	21.76
		75	0	21.41	21.63	21.48

Bandwidth	Modulation	RB size	RB offset	Output Power (dBm) for low/mid/high channel		
				20050/1720	20175/1732.5	20300/1745
20MHz	QPSK	1	0	20.92	21.31	21.09
			50	20.93	21.14	20.79
			99	21.53	20.83	20.95
		50	0	20.70	20.89	20.82
			25	20.71	20.69	20.76
			50	20.76	21.41	21.16
		100	0	21.13	21.30	21.21
	QAM16	1	0	21.64	21.44	20.90
			50	20.94	21.45	21.36
			99	21.06	20.93	21.21
		50	0	20.97	21.44	20.85
			25	21.15	21.35	21.12
			50	20.69	21.40	21.39
		100	0	20.90	21.30	21.64

LTE Band5

Bandwidth	Modulation	RB size	RB offset	Output Power (dBm) for low/mid/high channel		
				20417/825.7	20530/837	20643/848.3
1.4MHz	QPSK	1	0	23.21	23.15	22.75
			2	23.46	23.44	23.59
			5	23.06	23.05	23.31
		3	0	23.58	23.14	23.34
			2	23.54	23.29	23.04
			3	22.77	23.31	22.64
		6	0	23.01	23.00	22.91
	QAM16	1	0	22.66	23.44	23.50
			2	22.71	23.10	23.34
			5	22.66	22.91	23.01
		3	0	23.25	23.49	22.86
			2	22.85	23.14	23.30
			3	22.91	23.45	23.14
		6	0	22.90	22.98	22.86

Bandwidth	Modulation	RB size	RB offset	Output Power (dBm) for low/mid/high channel		
				20425/826.5	20530/837	20635/847.5
3MHz	QPSK	1	0	22.41	23.03	22.34
			7	22.54	22.31	22.72
			14	22.30	22.99	22.91
		8	0	22.77	22.48	23.04
			4	22.30	23.09	23.14
			7	22.25	22.54	22.75
		15	0	23.08	22.93	22.40
	QAM16	1	0	22.65	22.62	22.30
			7	22.67	23.17	22.24
			14	22.25	22.62	22.64
		8	0	22.26	22.61	22.57
			4	22.95	22.63	22.57
			7	22.89	22.95	23.00
		15	0	22.24	23.21	22.79

Bandwidth	Modulation	RB size	RB offset	Output Power (dBm) for low/mid/high channel		
				20435/827.5	20530/837	20625/846.5
5MHz	QPSK	1	0	22.22	22.64	21.93
			13	22.11	22.45	22.53
			24	22.50	22.24	22.56
		12	0	22.85	22.51	22.63
			6	22.58	22.85	21.91
			13	22.02	22.07	22.66
		25	0	22.47	22.89	22.78
	QAM16	1	0	22.53	22.40	22.64
			13	21.95	22.55	22.30
			24	22.48	22.46	21.96
		12	0	21.93	22.59	22.77
			6	21.90	22.74	22.26
			13	22.63	22.06	21.98
		25	0	22.40	22.73	22.16

Bandwidth	Modulation	RB size	RB offset	Output Power (dBm) for low/mid/high channel		
				20460/830	20530/837	20600/844
10MHz	QPSK	1	0	21.58	21.58	21.54
			25	22.07	22.19	21.47
			49	21.61	21.98	22.34
		25	0	21.94	21.63	21.53
			13	22.02	21.57	22.23
			25	22.21	22.02	22.41
		50	0	21.77	22.41	22.32
	QAM16	1	0	22.09	22.32	22.09
			25	22.29	21.61	21.98
			49	22.27	21.61	21.52
		25	0	22.09	21.76	22.22
			13	22.01	21.80	21.68
			25	22.18	21.64	21.49
		50	0	22.10	21.51	22.20

LTE Band7

Bandwidth	Modulation	RB size	RB offset	Output Power (dBm) for low/mid/high channel		
				20775/2502.5	21100/2535	21425/2567.5
5MHz	QPSK	1	0	22.89	23.07	23.38
			13	22.65	23.27	23.53
			24	22.58	23.56	23.03
		12	0	23.05	22.79	23.46
			6	22.96	22.72	22.81
			13	22.60	22.56	22.56
		25	0	23.35	23.51	23.05
	QAM16	1	0	23.32	23.17	22.67
			13	23.45	23.33	23.08
			24	23.33	22.65	23.21
		12	0	22.82	23.37	23.43
			6	23.25	22.86	22.97
			13	22.73	22.85	23.18
		25	0	23.37	22.59	23.23

Bandwidth	Modulation	RB size	RB offset	Output Power (dBm) for low/mid/high channel		
				20800/2505	21100/2535	21400/2565
10MHz	QPSK	1	0	22.74	22.84	22.82
			25	22.96	22.35	22.36
			49	22.86	22.91	22.93
		25	0	23.00	22.38	22.61
			13	22.08	22.73	22.07
			25	22.85	22.99	22.46
		50	0	22.16	22.69	22.11
	QAM16	1	0	22.53	22.21	22.25
			25	22.33	22.26	22.96
			49	22.84	22.50	22.29
		25	0	22.54	22.58	22.82
			13	22.52	22.81	22.48
			25	22.28	22.44	22.49
		50	0	22.83	22.81	22.12

Bandwidth	Modulation	RB size	RB offset	Output Power (dBm) for low/mid/high channel		
				20825/2507.5	21100/2535	21375/2562.5
15MHz	QPSK	1	0	22.27	21.72	21.62
			38	22.13	21.83	22.16
			74	22.15	22.37	22.24
		36	0	22.26	21.99	21.83
			18	22.02	22.42	22.50
			39	22.41	22.04	21.68
		75	0	22.56	21.91	22.07
	QAM16	1	0	22.45	21.92	21.65
			38	22.20	22.05	22.44
			74	22.01	22.31	21.93
		36	0	22.35	21.85	22.27
			18	21.96	22.08	22.42
			39	21.88	21.97	21.63
		75	0	22.13	22.51	22.32

Bandwidth	Modulation	RB size	RB offset	Output Power (dBm) for low/mid/high channel		
				20850/2510	21100/2535	21350/2560
20MHz	QPSK	1	0	21.84	21.32	21.74
			50	21.84	21.34	21.45
			99	21.92	21.27	21.44
		50	0	21.60	21.36	21.61
			25	21.36	21.94	21.51
			50	21.24	21.51	22.01
		100	0	21.20	22.07	21.69
	QAM16	1	0	21.21	21.94	21.85
			50	21.74	21.53	21.43
			99	21.29	21.30	21.72
		50	0	21.51	21.83	21.75
			25	21.56	21.83	21.60
			50	22.03	21.42	21.36
		100	0	21.56	22.12	21.68

LTE Band12

Bandwidth	Modulation	RB size	RB offset	Output Power (dBm) for low/mid/high channel		
				23017/699.7	23095/707.5	23173/715.3
1.4MHz	QPSK	1	0	23.17	23.21	23.33
			2	22.98	23.38	22.87
			5	23.45	23.41	22.88
		3	0	23.36	23.20	23.39
			2	23.09	23.02	22.84
			3	23.02	23.45	23.23
		6	0	23.36	23.01	23.03
	QAM16	1	0	22.91	23.50	22.87
			2	22.98	23.14	23.42
			5	23.49	22.87	22.91
		3	0	23.42	23.39	23.18
			2	22.97	23.32	23.03
			3	22.83	22.89	23.47
		6	0	23.01	23.19	22.90

Bandwidth	Modulation	RB size	RB offset	Output Power (dBm) for low/mid/high channel		
				23025/700.5	23095/707.5	23165/714.5
3MHz	QPSK	1	0	22.62	22.71	22.64
			7	22.88	22.99	22.81
			14	23.01	22.71	22.96
		8	0	22.76	22.88	22.88
			4	22.61	22.36	22.39
			7	22.68	22.69	22.47
		15	0	22.35	22.92	22.68
	QAM16	1	0	22.52	22.77	22.42
			7	22.94	22.61	22.86
			14	22.89	22.44	22.62
		8	0	22.62	22.70	22.55
			4	22.87	22.90	22.77
			7	22.76	22.58	22.39
		15	0	22.65	22.42	22.62

Bandwidth	Modulation	RB size	RB offset	Output Power (dBm) for low/mid/high channel		
				23035/701.5	23095/707.5	23155/713.5
5MHz	QPSK	1	0	22.12	22.00	22.32
			13	21.90	22.43	22.31
			24	22.11	21.95	22.53
		12	0	22.47	22.36	22.24
			6	22.42	22.14	21.93
			13	21.91	21.93	21.96
		25	0	21.91	22.30	22.31
	QAM16	1	0	21.94	21.89	21.99
			13	22.35	22.27	21.94
			24	22.30	22.58	22.41
		12	0	22.42	21.93	22.26
			6	22.35	22.47	22.04
			13	21.95	22.44	22.20
		25	0	22.10	22.55	22.03

Bandwidth	Modulation	RB size	RB offset	Output Power (dBm) for low/mid/high channel		
				23060/704	23095/707.5	23130/711
10MHz	QPSK	1	0	22.07	21.94	21.89
			25	21.96	21.93	21.66
			49	21.62	21.77	21.94
		25	0	21.98	21.66	21.52
			13	21.45	21.55	21.75
			25	21.62	21.91	21.90
		50	0	21.84	21.95	21.51
	QAM16	1	0	22.00	21.46	21.83
			25	21.93	21.85	21.94
			49	21.73	21.50	21.86
		25	0	22.06	21.60	21.80
			13	21.47	21.82	21.90
			25	21.92	21.55	21.83
		50	0	22.03	21.90	22.12

LTE Band13

Bandwidth	Modulation	RB size	RB offset	Output Power (dBm) for low/mid/high channel		
				23205/779.5	23230/782	23255/784.5
5MHz	QPSK	1	0	22.79	22.76	23.17
			13	22.53	22.68	22.58
			24	22.99	22.63	22.69
		12	0	23.07	22.74	22.87
			6	23.09	22.64	22.62
			13	22.72	22.80	22.73
		25	0	22.65	22.83	22.69
	QAM16	1	0	22.55	22.63	22.71
			13	22.57	23.01	23.22
			24	22.97	22.91	22.70
		12	0	22.71	22.58	22.82
			6	22.54	22.74	22.56
			13	22.99	22.56	23.04
		25	0	22.65	22.82	22.78

Bandwidth	Modulation	RB size	RB offset	Output Power (dBm) for low/mid/high channel		
				23230/782	23230/782	23230/782
10MHz	QPSK	1	0	22.38	22.03	22.45
			25	22.15	22.09	22.06
			49	22.06	21.96	22.55
		25	0	22.12	22.31	22.13
			13	22.65	22.16	22.28
			25	21.99	22.34	22.43
		50	0	22.11	22.53	22.15
	QAM16	1	0	22.08	22.48	22.49
			25	22.51	22.37	22.10
			49	22.24	22.17	22.09
		25	0	22.37	22.07	22.30
			13	22.02	22.57	22.44
			25	22.16	22.45	22.40
		50	0	22.40	22.46	22.50

LTE Band41

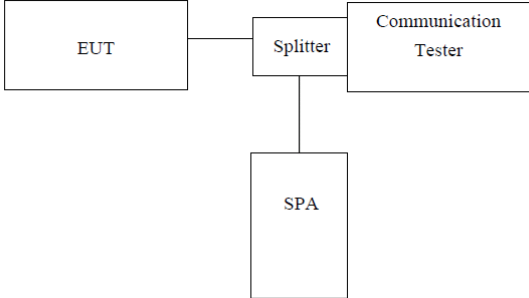
Bandwidth	Modulation	RB size	RB offset	Output Power (dBm) for low/mid/high channel		
				39675/2498.5	40620/2593	41565/2687.5
5MHz	QPSK	1	0	23.43	23.00	23.30
			13	22.91	22.99	22.98
			24	22.82	22.89	23.01
		12	0	22.83	23.40	23.38
			6	23.17	23.07	22.92
			13	22.94	22.84	23.01
		25	0	22.76	23.05	23.23
	QAM16	1	0	23.01	23.07	23.24
			13	23.37	23.11	23.39
			24	23.15	22.89	23.17
		12	0	22.94	23.06	23.33
			6	23.32	22.76	23.03
			13	22.77	23.00	23.17
		25	0	22.83	23.07	23.31

Bandwidth	Modulation	RB size	RB offset	Output Power (dBm) for low/mid/high channel		
				39700/2501	40620/2593	41540/2685
10MHz	QPSK	1	0	22.39	22.78	22.65
			25	22.39	22.22	22.58
			49	22.81	22.62	22.77
		25	0	22.44	22.29	22.83
			13	22.37	22.73	22.83
			25	22.50	22.33	22.40
		50	0	22.74	22.58	22.30
	QAM16	1	0	22.37	22.72	22.47
			25	22.32	22.86	22.40
			49	22.64	22.57	22.35
		25	0	22.89	22.33	22.85
			13	22.34	22.83	22.61
			25	22.23	22.57	22.73
		50	0	22.48	22.45	22.44

Bandwidth	Modulation	RB size	RB offset	Output Power (dBm) for low/mid/high channel		
				39725/2503.5	40620/2593	41515/2682.5
15MHz	QPSK	1	0	21.75	21.90	22.15
			38	22.30	22.18	21.81
			74	21.80	22.07	21.72
		36	0	22.04	21.75	22.08
			18	22.14	21.88	22.31
			39	21.97	21.99	22.27
		75	0	22.32	22.06	21.97
	QAM16	1	0	22.12	22.33	21.73
			38	22.20	22.34	22.00
			74	21.82	22.24	22.07
		36	0	21.85	21.70	21.91
			18	22.38	22.30	22.16
			39	22.15	21.81	21.91
		75	0	22.04	22.23	22.32

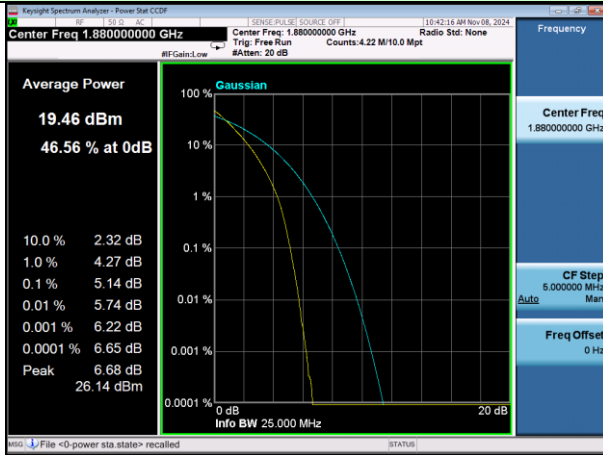
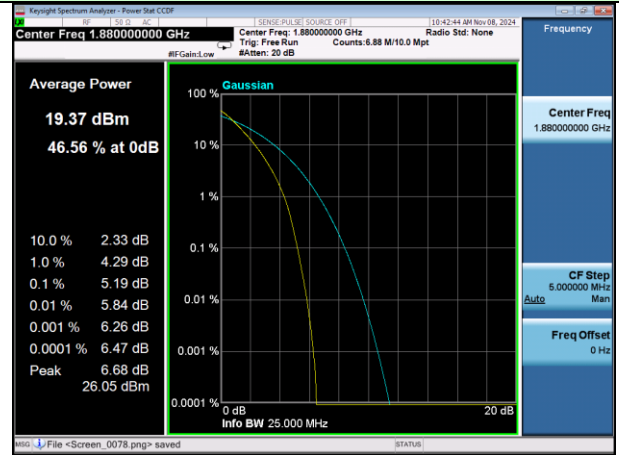
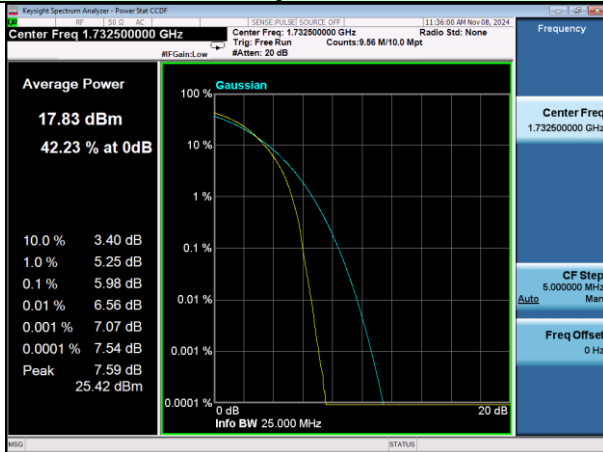
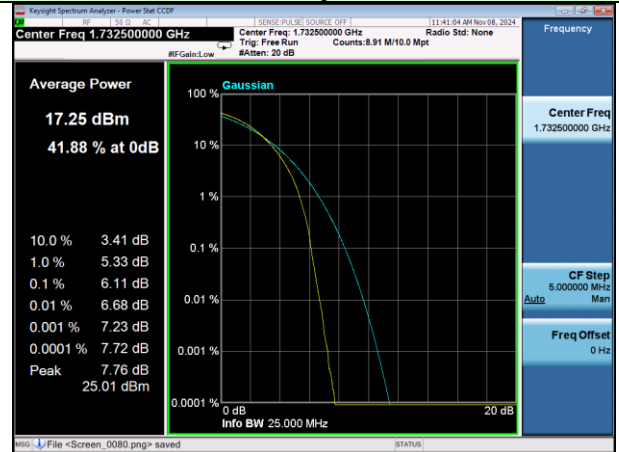
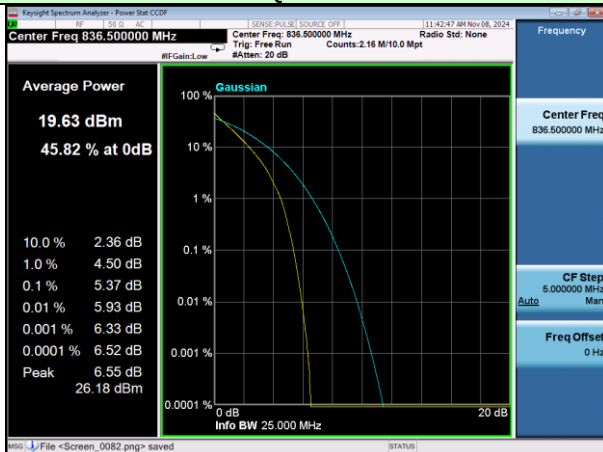
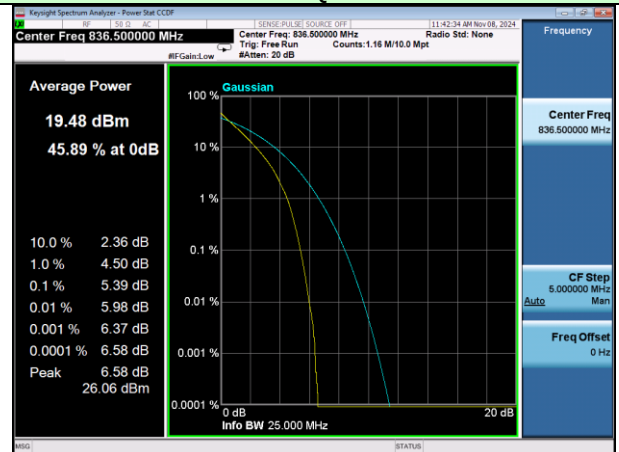
Bandwidth	Modulation	RB size	RB offset	Output Power (dBm) for low/mid/high channel		
				39750/2506	40620/2593	41490/2680
20MHz	QPSK	1	0	21.52	21.57	21.71
			50	21.49	21.45	21.32
			99	21.60	21.35	21.37
		50	0	21.46	21.36	21.83
			25	21.66	21.35	21.31
			50	21.73	21.43	21.82
		100	0	21.58	21.57	21.92
	QAM16	1	0	21.85	21.87	21.38
			50	21.73	21.45	21.52
			99	21.57	21.39	21.47
		50	0	21.90	21.27	21.47
			25	21.52	21.93	21.76
			50	21.31	21.58	21.35
		100	0	21.86	21.41	21.35

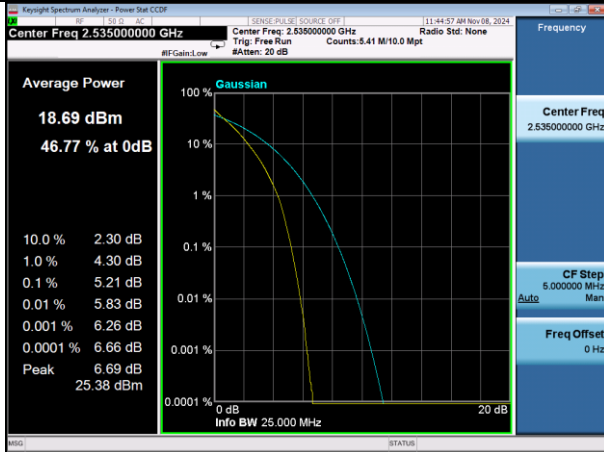
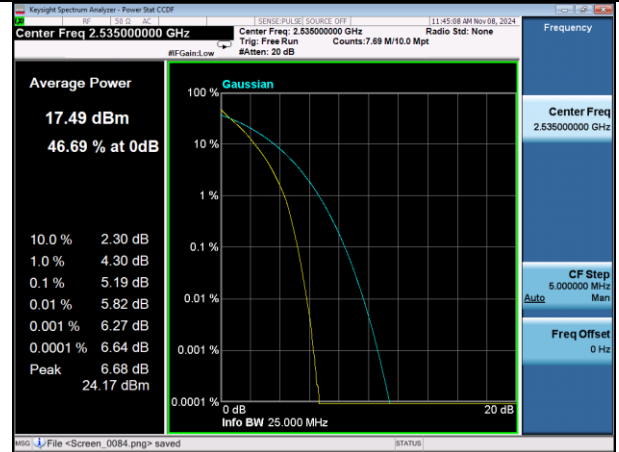
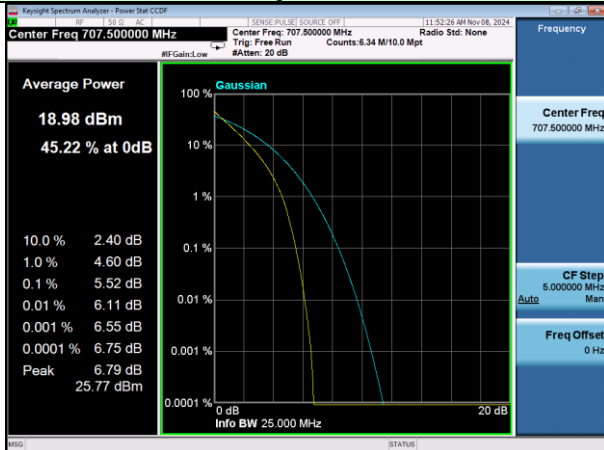
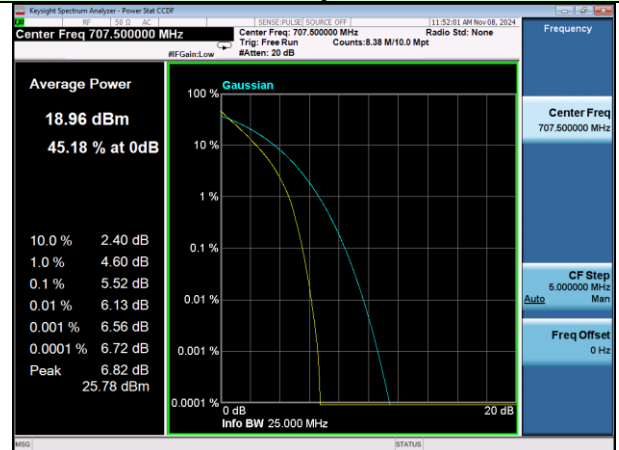
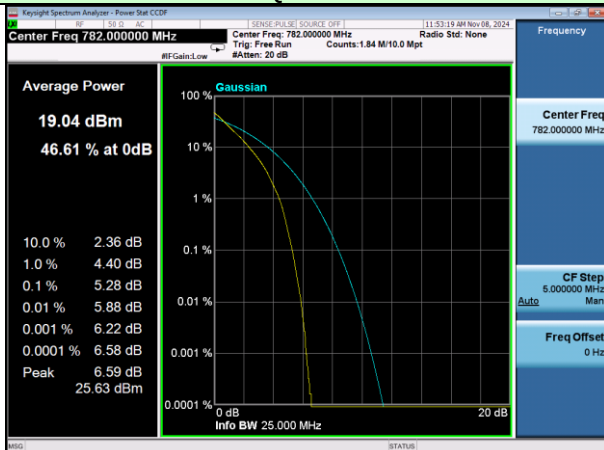
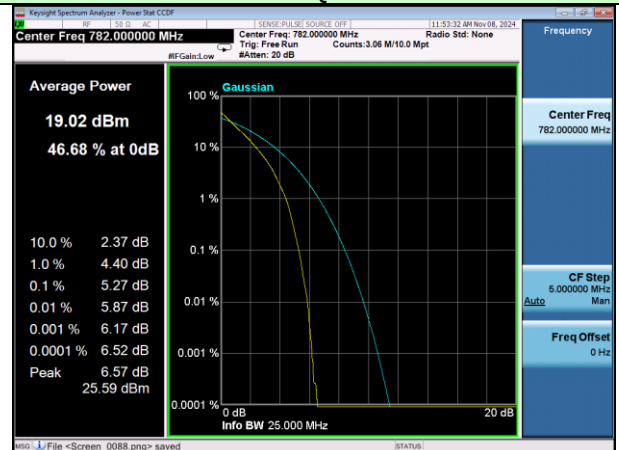
4.4 Peak-to-Average Ratio

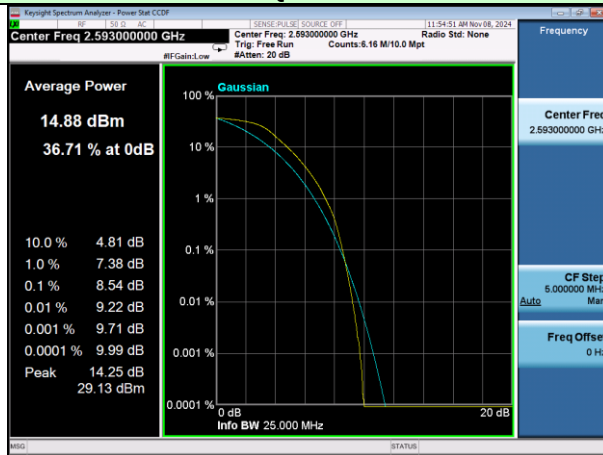
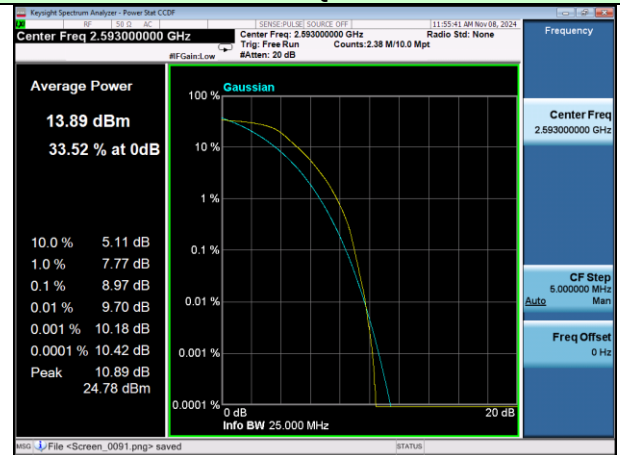
Test Requirement:	Part 22.913(d), FCC part24.232(d) and FCC part27.50(d)(5)
Test Method:	ANSI C63.26:2015
Test Limit:	Used complementary cumulative distribution function (CCDF) of analyzer to determine that PAPR will not exceed 13 dB for more than 0.1 percent of the time
Test setup:	 <pre> graph LR EUT[EUT] --- Splitter[Splitter] Splitter --- CT[Communication Tester] Splitter --- SPA[SPA] </pre> <i>Note: Measurement setup for testing on Antenna connector</i>
Test Procedure:	1. The testing follows FCC KDB 971168 D01 v03r01 Section 5.7 2. The EUT was connected to spectrum and system simulator via a power divider 3. Using the CCDF measurement of spectrum analyzer; 4. Set $RBW \geq OBW$ or specified reference bandwidth; 5. Set the number of counts to a value that stabilizes the measured CCDF curve; 6. Set the measurement interval as 1ms 7. Record the maximum PAPR level associated with a probability of 0.1%.
Test Instruments:	Refer to section 3 for details
Test mode:	Refer to section 4.1 for details
Test results:	Pass

Test plots are listed as below:

Test mode	Peak to Average Ratio (dB)	Limit (dB)	Result
LTE Band 2 Middle channel/20MHz/QPSK	5.14	13	Pass
LTE Band 2 Middle channel/20MHz/16-QAM	5.19	13	Pass
LTE Band 4 Middle channel/20MHz/QPSK	5.98	13	Pass
LTE Band 4 Middle channel/20MHz/16-QAM	6.11	13	Pass
LTE Band 5 Middle channel/10MHz/QPSK	5.37	13	Pass
LTE Band 5 Middle channel/10MHz/16-QAM	5.39	13	Pass
LTE Band 7 Middle channel/20MHz/QPSK	5.21	13	Pass
LTE Band 7 Middle channel/20MHz/16-QAM	5.19	13	Pass
LTE Band 12 Middle channel/10MHz/QPSK	5.24	13	Pass
LTE Band 12 Middle channel/10MHz/16-QAM	5.52	13	Pass
LTE Band 13 Middle channel/10MHz/QPSK	5.28	13	Pass
LTE Band 13 Middle channel/10MHz/16-QAM	5.27	13	Pass
LTE Band 41 Middle channel/20MHz/QPSK	8.54	13	Pass
LTE Band 41 Middle channel/20MHz/16-QAM	8.97	13	Pass

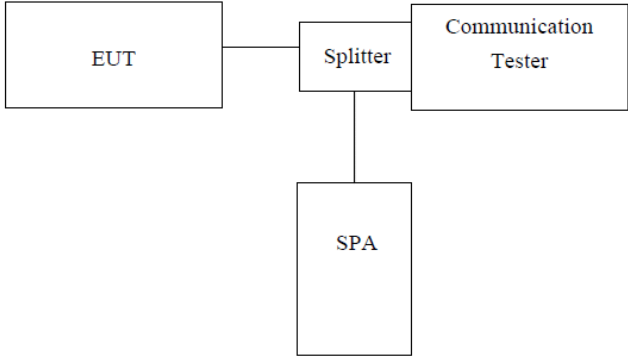
Test Mode: LTE Band 2
Middle channel/20MHz/QPSK**Test Mode: LTE Band 2**
Middle channel/20MHz/16-QAM**Test Mode: LTE Band 4**
Middle channel/20MHz/QPSK**Test Mode: LTE Band 4**
Middle channel/20MHz/16-QAM**Test Mode: LTE Band 5**
Middle channel/10MHz/QPSK**Test Mode: LTE Band 5**
Middle channel/10MHz/16-QAM

**Test Mode: LTE Band 7
Middle channel/20MHz/QPSK****Test Mode: LTE Band 7
Middle channel/20MHz/16-QAM****Test Mode: LTE Band 12
Middle channel/10MHz/QPSK****Test Mode: LTE Band 12
Middle channel/10MHz/16-QAM****Test Mode: LTE Band 13
Middle channel/10MHz/QPSK****Test Mode: LTE Band 13
Middle channel/10MHz/16-QAM**

Test Mode: LTE Band 41
Middle channel/20MHz/QPSK**Test Mode: LTE Band 41**
Middle channel/20MHz/16-QAM

Note: All bandwidth and modulation are tested, only the worst results are reported.

4.5 Occupy Bandwidth

Test Requirement:	FCC part22.913(a), FCC part24.232(b) and FCC part27.53(a)
Test Method:	ANSI C63.26:2015
Test setup:	 <i>Note: Measurement setup for testing on Antenna connector</i>
Test Procedure:	1. The EUT's output RF connector was connected with a short cable to the spectrum analyzer, set center frequency to channel center frequency. 2. RBW was set to about 1%-5% of emission OBW, VBW$\geq$ 3 X RBW. 3. Set spectrum analyzer detection mode to peak, and the trace mode to max hold. 4. Use the 99% OBW function, The 99% power OBW can be found on the plot, determine the "-26dB amplitude" as equal to reference value -26dB.
Test Instruments:	Refer to section 3 for details
Test mode:	Refer to section 4.1 for details
Test results:	Pass

Measurement Data

Band2						
RB	Modulation	Bandwidth (MHz)	Channel	Frequency (MHz)	99% Power Bandwidth(MHz)	-26dBc Bandwidth(MHz)
100%	QPSK	1.4	18900	1880	1.1053	1.283
		3	18900	1880	2.7351	3.054
		5	18900	1880	4.5268	4.998
		10	18900	1880	8.9288	9.654
		15	18900	1880	13.440	14.52
		20	18900	1880	17.816	19.09
	QAM16	1.4	18900	1880	1.1047	1.271
		3	18900	1880	2.7344	3.050
		5	18900	1880	4.5079	4.994
		10	18900	1880	8.9316	9.705
		15	18900	1880	13.436	14.68
		20	18900	1880	17.867	19.01

Band4						
RB	Modulation	Bandwidth (MHz)	Channel	Frequency (MHz)	99% Power Bandwidth(MHz)	-26dBc Bandwidth(MHz)
100%	QPSK	1.4	20175	1732.5	1.0967	1.310
		3	20175	1732.5	2.7347	3.040
		5	20175	1732.5	4.5247	4.990
		10	20175	1732.5	8.9295	9.674
		15	20175	1732.5	13.429	14.71
		20	20175	1732.5	17.845	18.84
	QAM16	1.4	20175	1732.5	1.0954	1.310
		3	20175	1732.5	2.7343	3.059
		5	20175	1732.5	4.5263	5.022
		10	20175	1732.5	8.9247	9.702
		15	20175	1732.5	13.415	14.72
		20	20175	1732.5	17.845	19.07

Band5						
RB	Modulation	Bandwidth (MHz)	Channel	Frequency (MHz)	99% Power Bandwidth(MHz)	-26dBc Bandwidth(MHz)
100%	QPSK	1.4	20530	837	1.1043	1.270
		3	20530	837	2.7369	3.058
		5	20530	837	4.5118	4.959
		10	20530	837	8.9387	9.628
	QAM16	1.4	20530	837	1.0990	1.272
		3	20530	837	2.7340	3.035
		5	20530	837	4.5109	4.993
		10	20530	837	8.9460	9.665

Band7						
RB	Modulation	Bandwidth (MHz)	Channel	Frequency (MHz)	99% Power Bandwidth(MHz)	-26dBc Bandwidth(MHz)
100%	QPSK	5	21100	2535	4.4960	4.976
		10	21100	2535	8.9410	9.677
		15	21100	2535	13.462	14.79
		20	21100	2535	17.839	19.00
	QAM16	5	21100	2535	4.4921	5.015
		10	21100	2535	8.9323	9.678
		15	21100	2535	13.475	14.69
		20	21100	2535	17.851	19.22

Band12						
RB	Modulation	Bandwidth (MHz)	Channel	Frequency (MHz)	99% Power Bandwidth(MHz)	-26dBc Bandwidth(MHz)
100%	QPSK	1.4	23095	707.5	1.1054	1.277
		3	23095	707.5	2.7400	3.038
		5	23095	707.5	4.5061	4.989
		10	23095	707.5	8.9330	9.639
	QAM16	1.4	23095	707.5	1.1035	1.280
		3	23095	707.5	2.7405	3.036
		5	23095	707.5	4.5182	4.979
		10	23095	707.5	8.9480	9.682

Band13						
RB	Modulation	Bandwidth (MHz)	Channel	Frequency (MHz)	99% Power Bandwidth(MHz)	-26dBc Bandwidth(MHz)
100%	QPSK	5	23230	782	4.5204	5.004
		10	23230	782	8.9224	9.611
	QAM16	5	23230	782	4.5089	4.993
		10	23230	782	8.9107	9.641

Band41						
RB	Modulation	Bandwidth (MHz)	Channel	Frequency (MHz)	99% Power Bandwidth(MHz)	-26dBc Bandwidth(MHz)
100%	QPSK	5	40620	2593	4.4958	5.034
		10	40620	2593	8.9262	10.07
		15	40620	2593	13.453	15.85
		20	40620	2593	17.842	19.08
100%	QAM16	5	40620	2593	4.5045	5.000
		10	40620	2593	8.9292	10.07
		15	40620	2593	13.458	15.93
		20	40620	2593	17.802	19.14

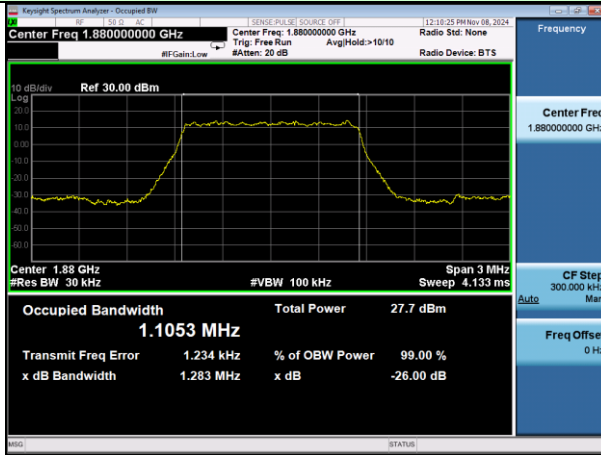
Test plot as follows:

Test Mode: LTE Band 2

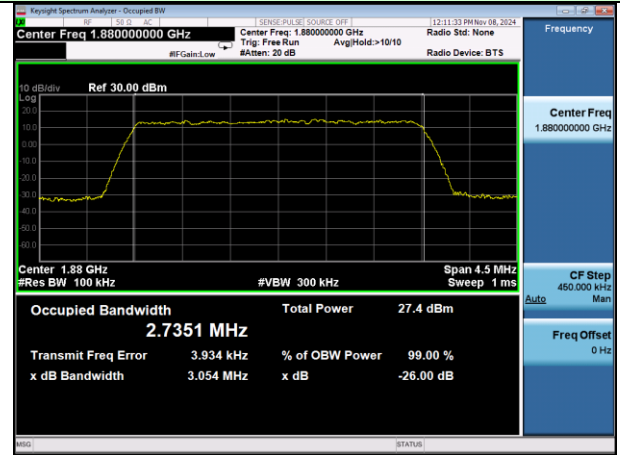
Channel Bandwidth: 1.4MHz

Test Mode: LTE Band 2

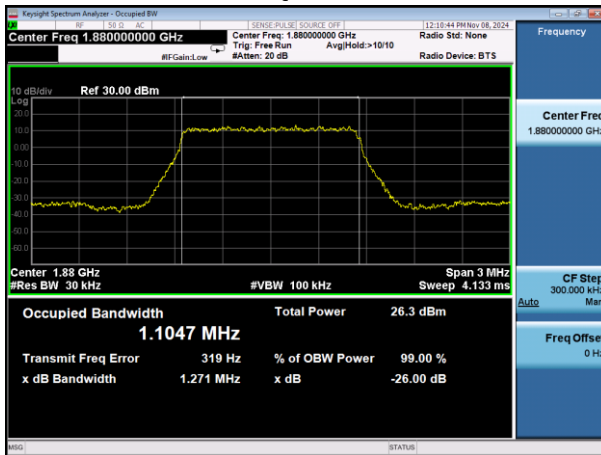
Channel Bandwidth: 3MHz



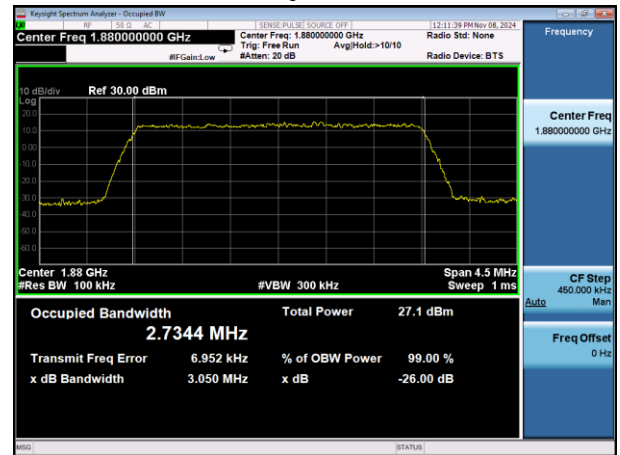
QPSK



QPSK

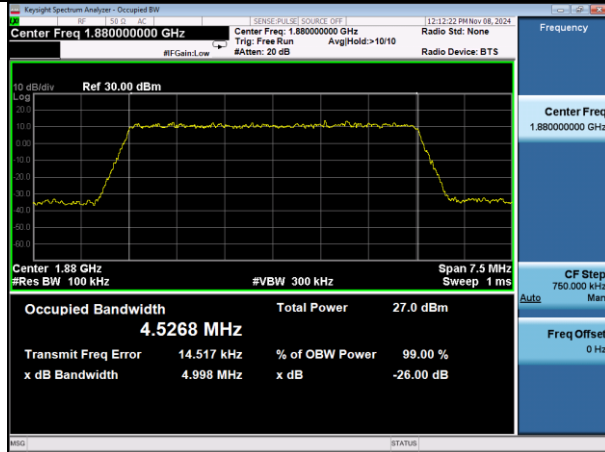


16-QAM



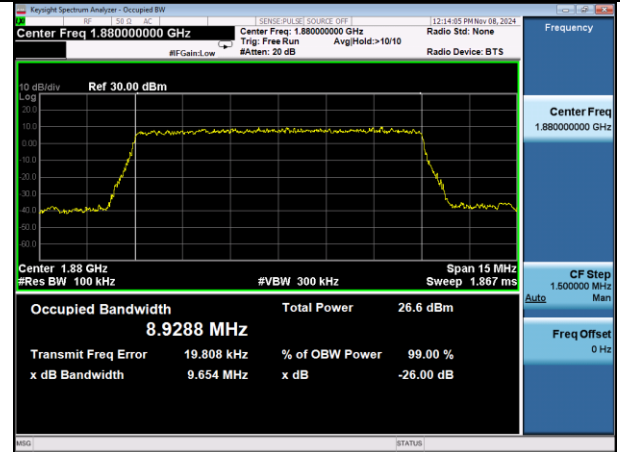
16-QAM

Test Mode: LTE Band 2
Channel Bandwidth: 5MHz

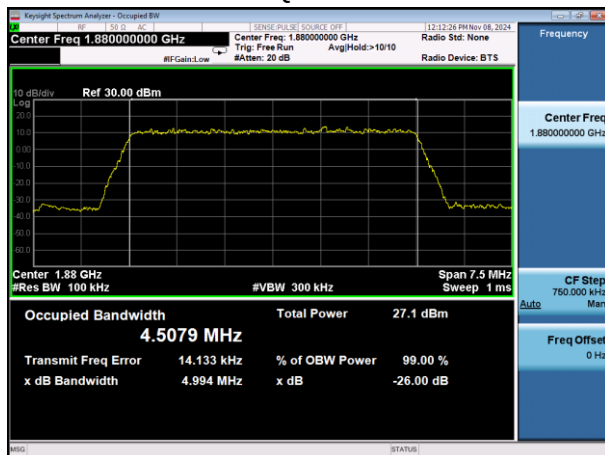


QPSK

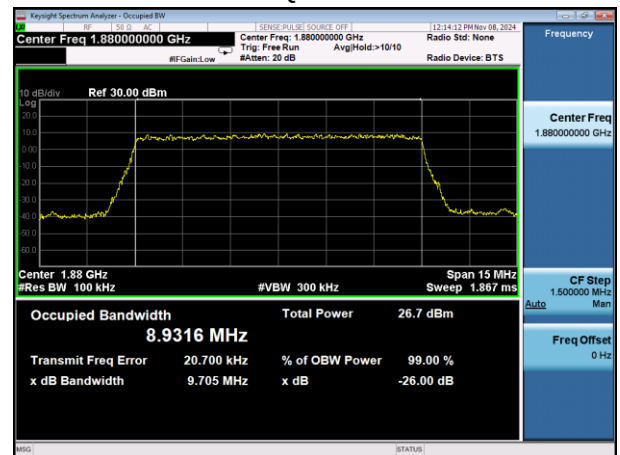
Test Mode: LTE Band 2
Channel Bandwidth: 10MHz



QPSK

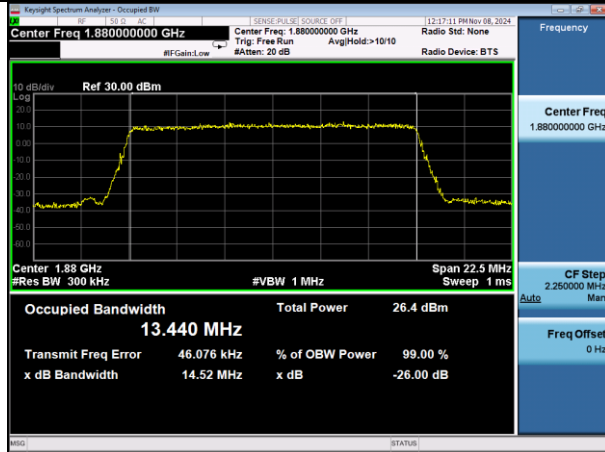


16-QAM



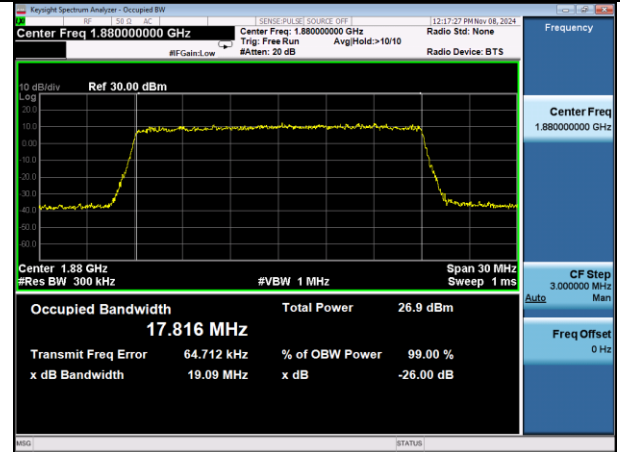
16-QAM

Test Mode: LTE Band 2
Channel Bandwidth: 15MHz

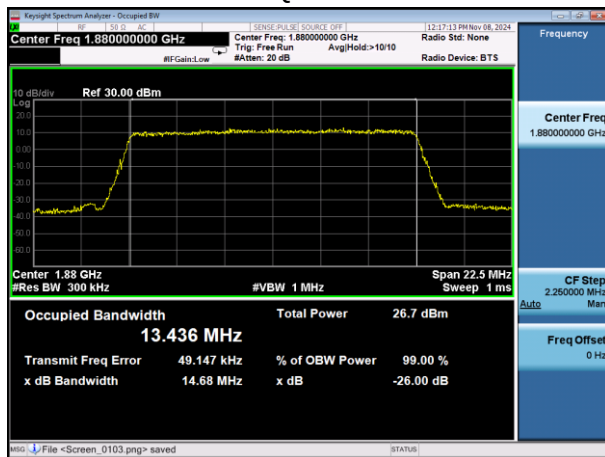


QPSK

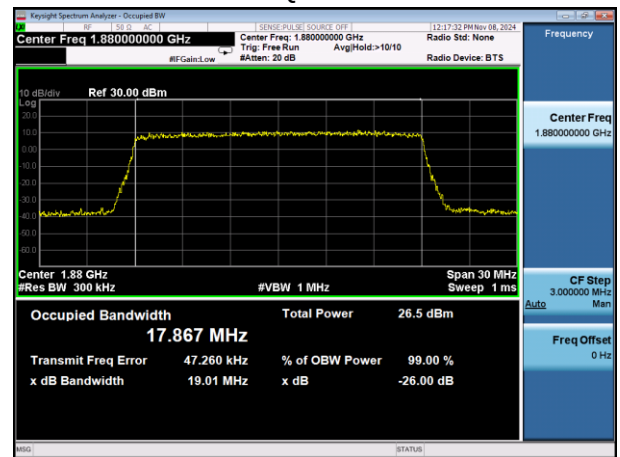
Test Mode: LTE Band 2
Channel Bandwidth: 20MHz



QPSK

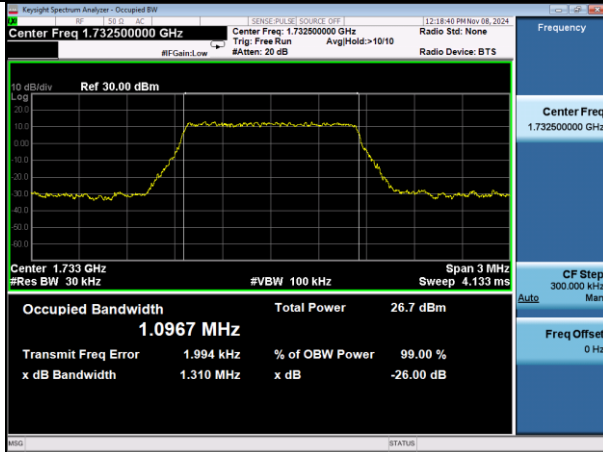


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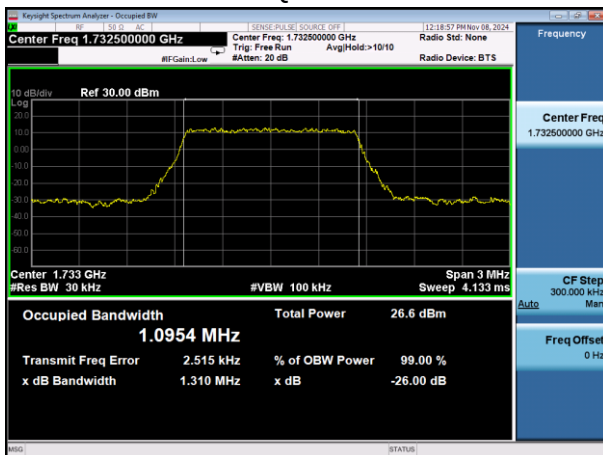


16-QAM

Test Mode: LTE Band 4
Channel Bandwidth: 1.4MHz

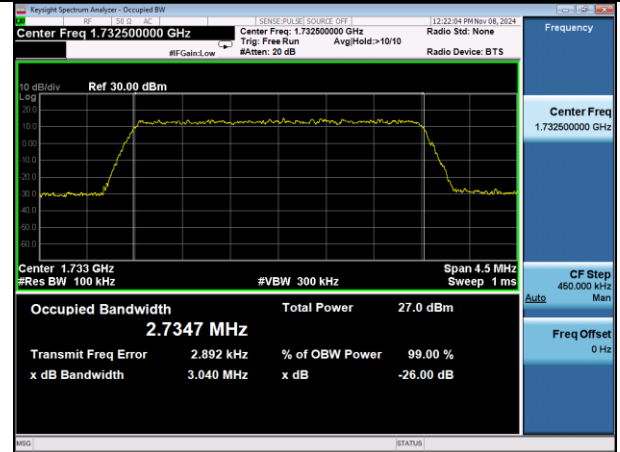


QPSK

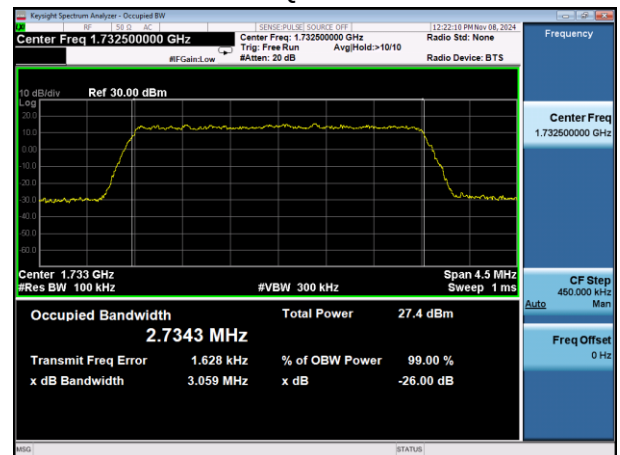


16-QAM

Test Mode: LTE Band 4
Channel Bandwidth: 3MHz

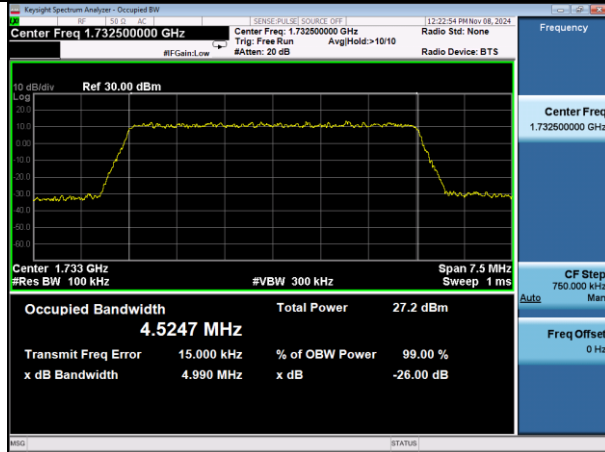


QPSK

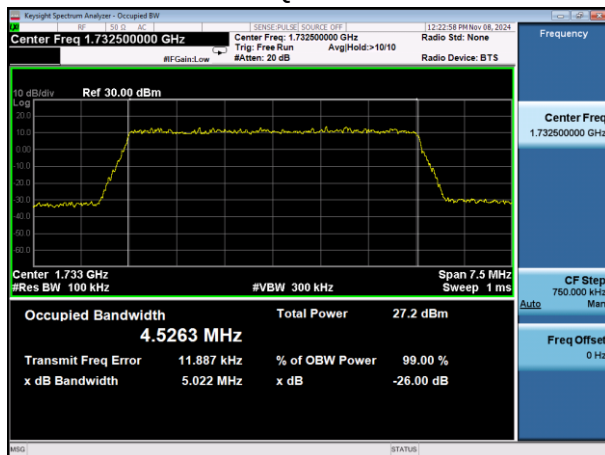


16-QAM

Test Mode: LTE Band 4
Channel Bandwidth: 5MHz

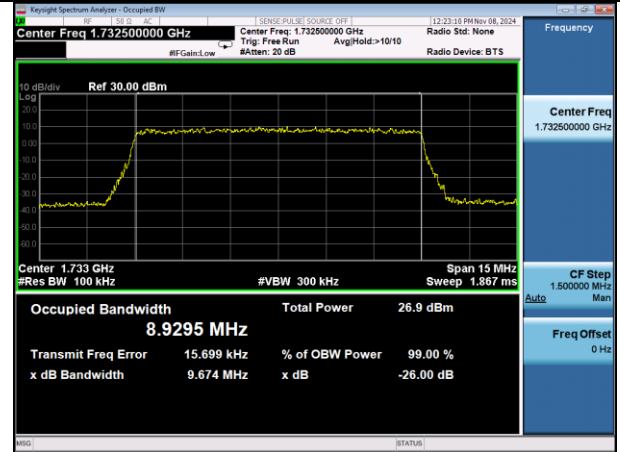


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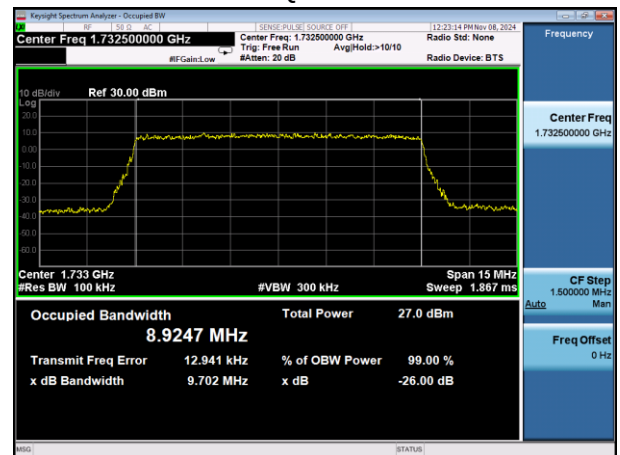


16-QAM

Test Mode: LTE Band 4
Channel Bandwidth: 10MHz

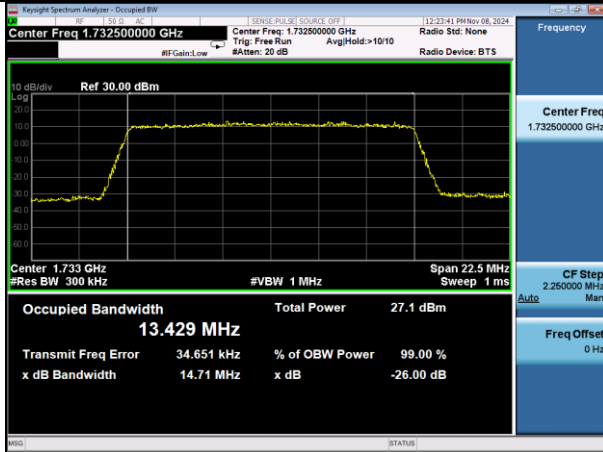


QPSK



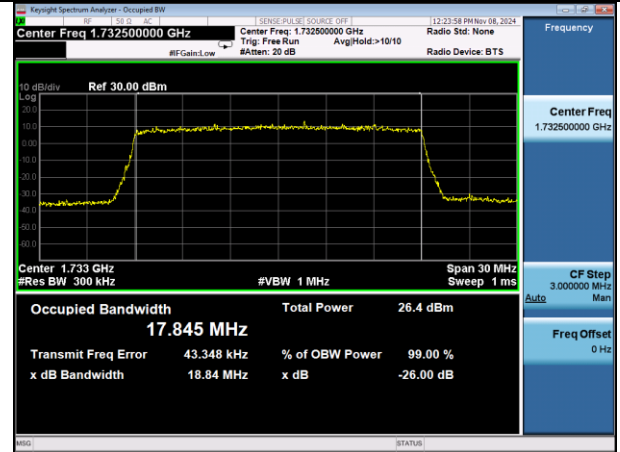
16-QAM

Test Mode: LTE Band 4
Channel Bandwidth: 15MHz

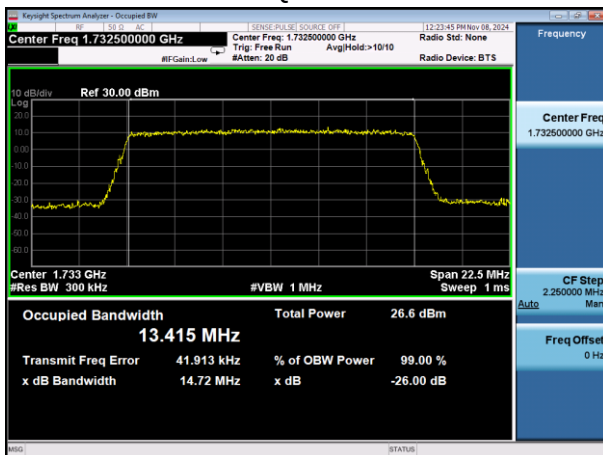


QPSK

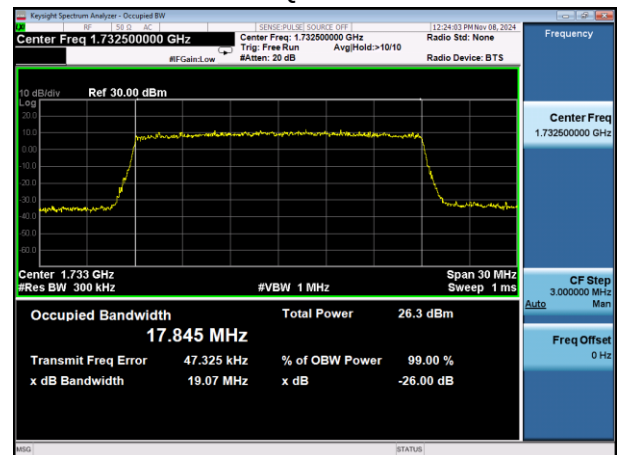
Test Mode: LTE Band 4
Channel Bandwidth: 20MHz



QPSK

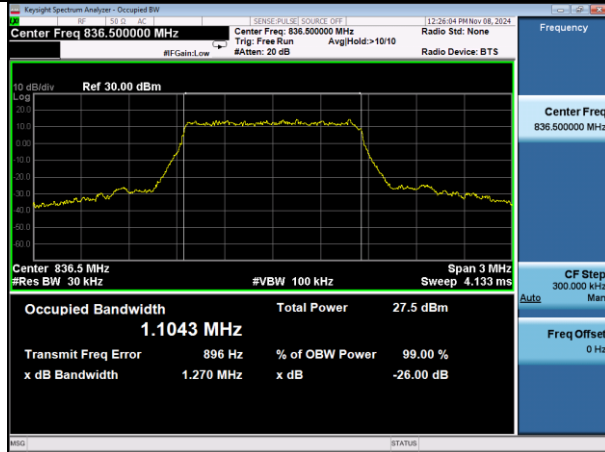


16-QAM



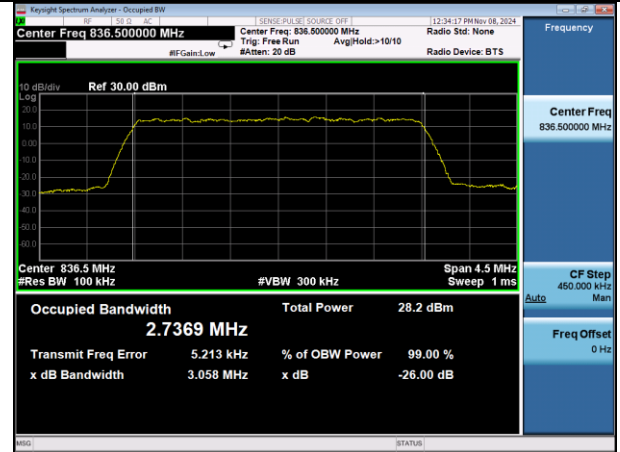
16-QAM

Test Mode: LTE Band 5
Channel Bandwidth: 1.4MHz



QPSK

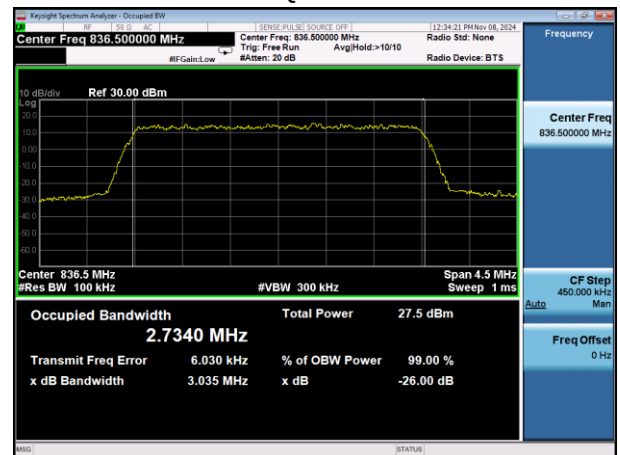
Test Mode: LTE Band 5
Channel Bandwidth: 3MHz



QPSK

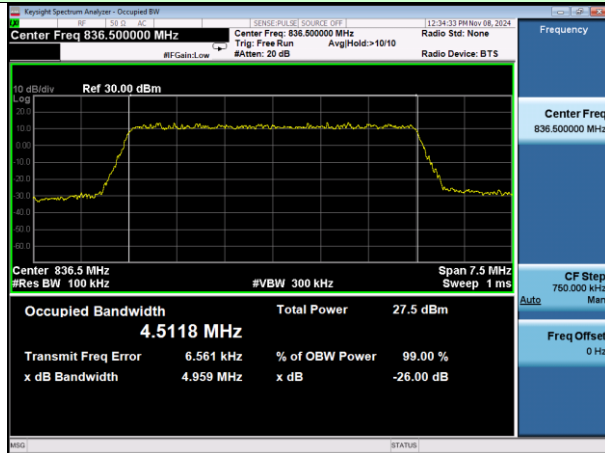


16-QAM

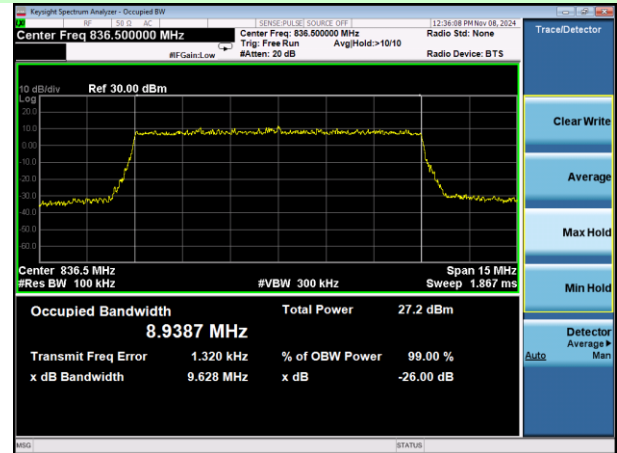


16-QAM

Test Mode: LTE Band 5
Channel Bandwidth: 5MHz



Test Mode: LTE Band 5
Channel Bandwidth: 10MHz

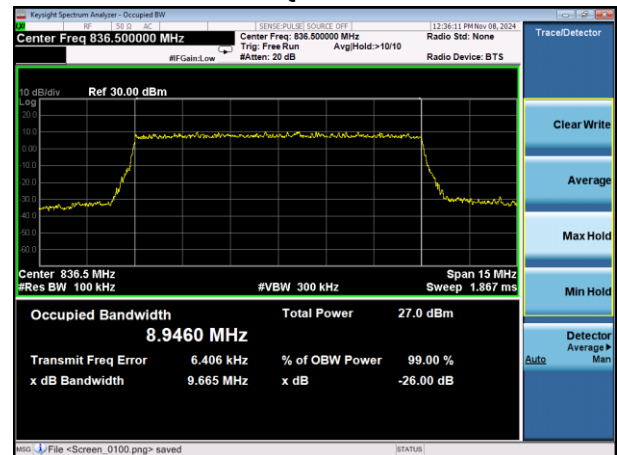


QPSK



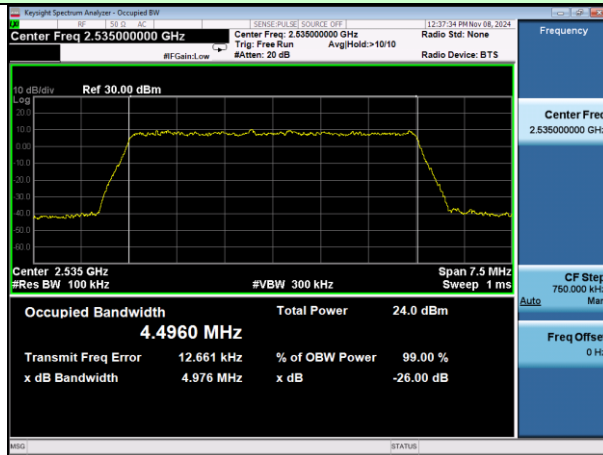
16-QAM

QPSK

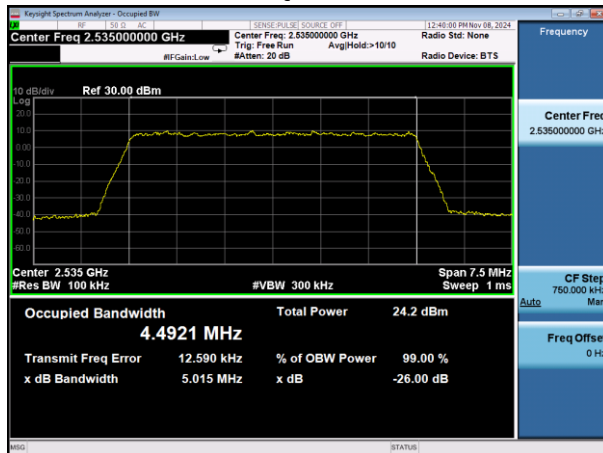


16-QAM

Test Mode: LTE Band 7
Channel Bandwidth: 5MHz

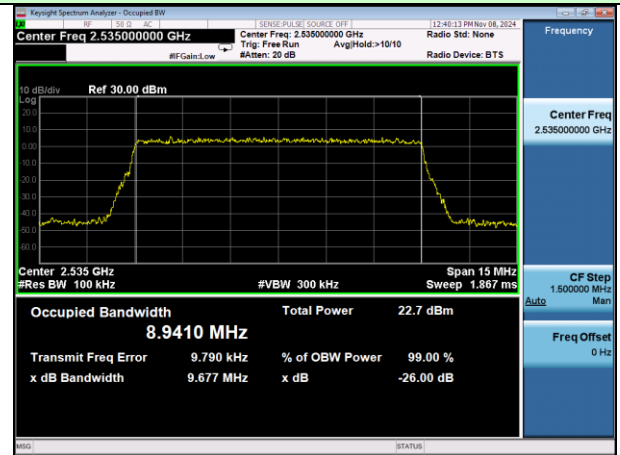


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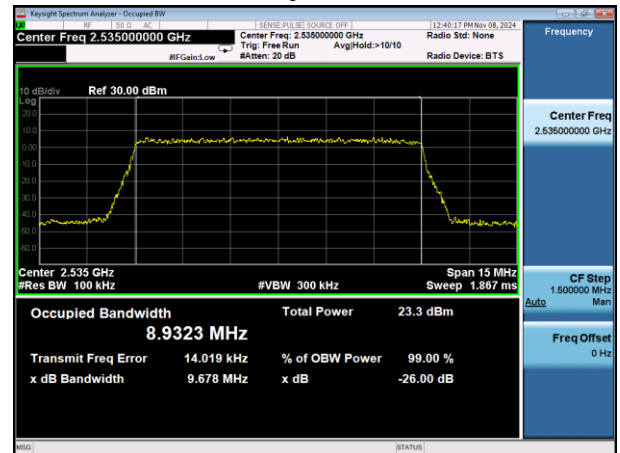


16-QAM

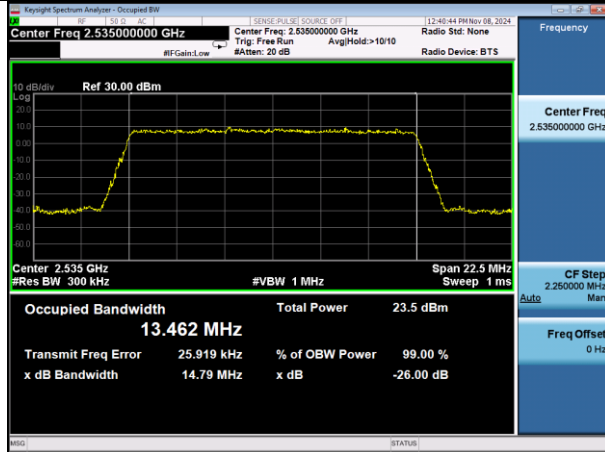
Test Mode: LTE Band 7
Channel Bandwidth: 10MHz



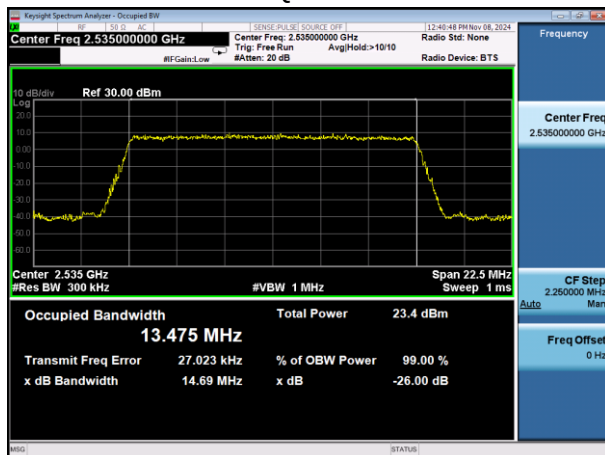
QPSK



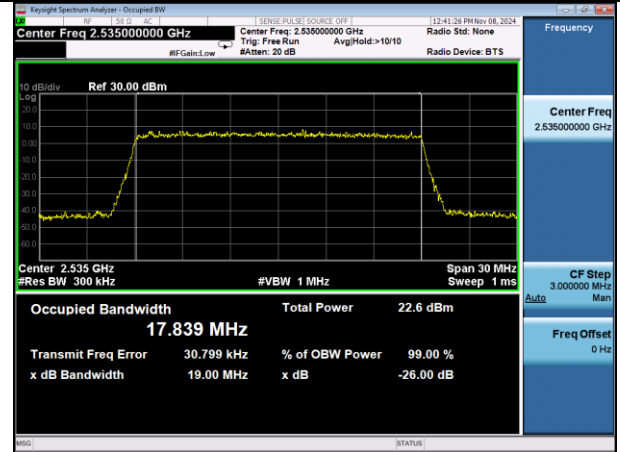
16-QAM

Test Mode: LTE Band 7
Channel Bandwidth: 15MHz

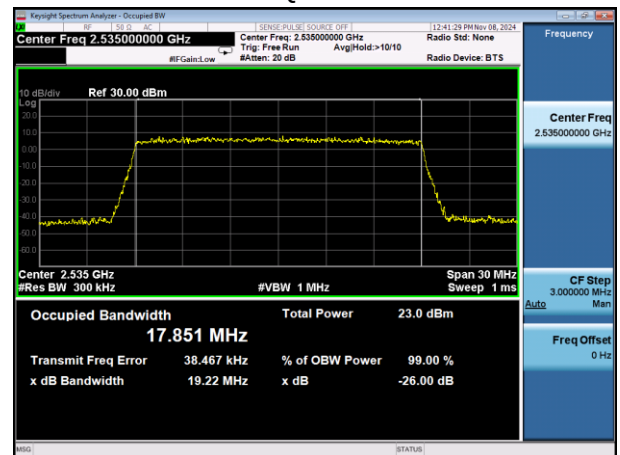
QPSK



16-QAM

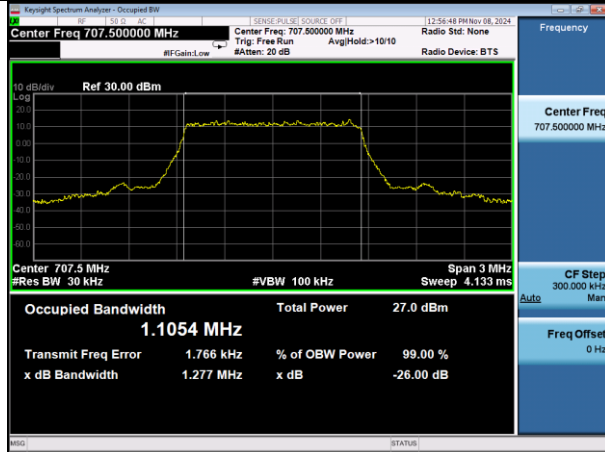
Test Mode: LTE Band 7
Channel Bandwidth: 20MHz

QPSK



16-QAM

Test Mode: LTE Band 12
Channel Bandwidth: 1.4MHz

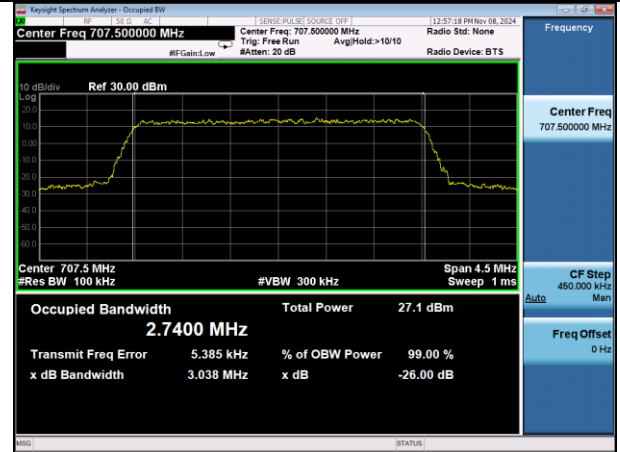


QPSK

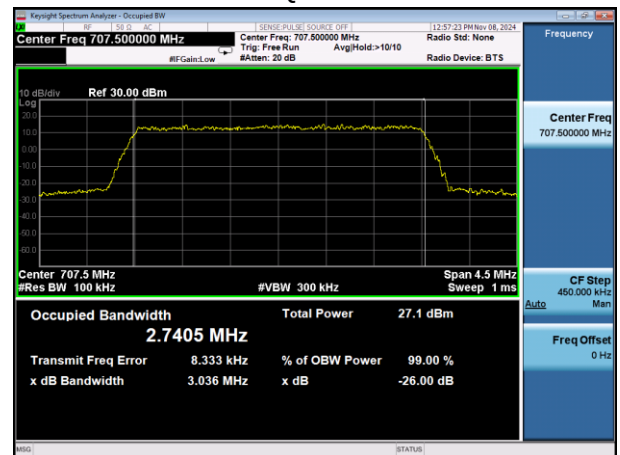


16-QAM

Test Mode: LTE Band 12
Channel Bandwidth: 3MHz

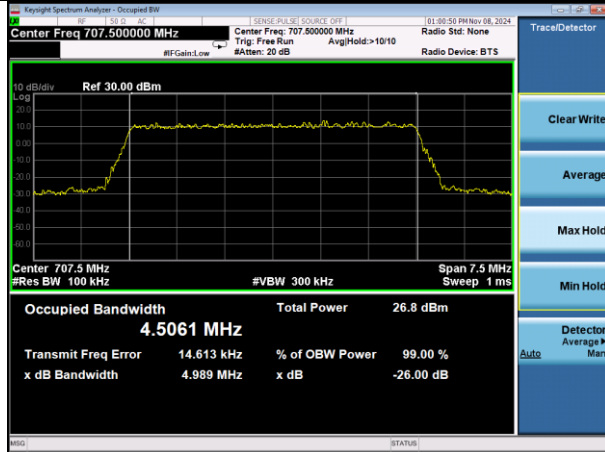


QPSK

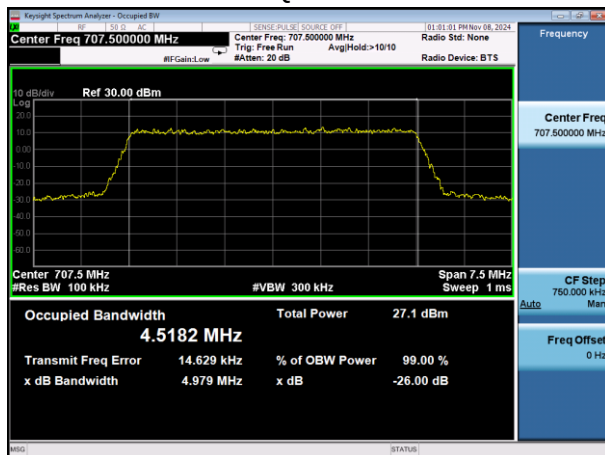


16-QAM

Test Mode: LTE Band 12
Channel Bandwidth: 5MHz

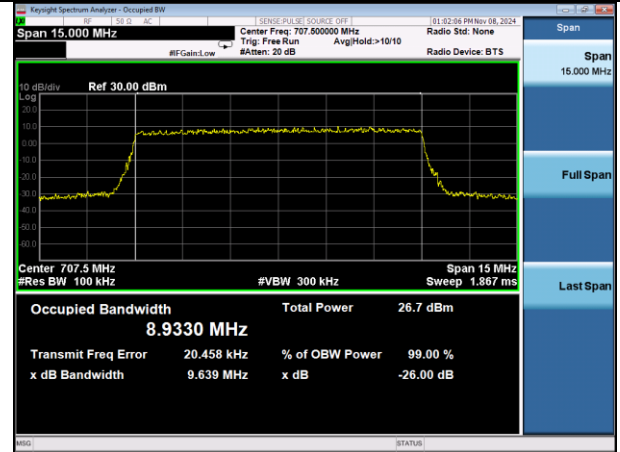


QPSK

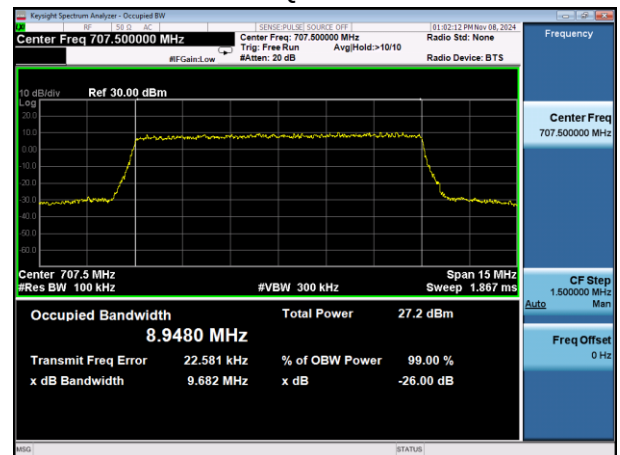


16-QAM

Test Mode: LTE Band 12
Channel Bandwidth: 10MHz



QPSK



16-QAM