TEST REPORT

Eurofins KCTL Co.,Ltd. 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-31-285-0894 FAX: 82-505-299-8311 www.kctl.co.kr	Report No.: KR23-SRF0011-A Page (1) of (96)	eurofins | KCTL

1. Client

- Name : Samsung Electronics Co., Ltd.
- Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
- Date of Receipt : 2022-10-17

2. Use of Report : Certification

3. Name of Product / Model : Mobile phone / SM-A346M/DSN

4. Manufacturer / Country of Origin : Samsung Electronics Co., Ltd. / Vietnam

5. FCC ID : A3LSMA346M

6. Date of Test : 2022-11-09 to 2023-01-04

7. Location of Test : ■ Permanent Testing Lab ☐ On Site Testing
(Address:65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea)

8. Test method used : FCC Part 2
FCC Part 22 Subpart H
FCC Part 27 Subpart C

9. Test Result : Refer to the test result in the test report

	Tested by	Technical Manager
Affirmation	Name : Sunghyun Yoon (Signature)	Name : Seungyong Kim (Signature)

2023-01-11

Eurofins KCTL Co.,Ltd.

REPORT REVISION HISTORY

Date	Revision	Page No
2023-01-06	Originally issued	-
2023-01-11	Modified test condition	9
	Updated conducted output power and Spurious emission of 5GNR n66	15~18, 93

Note. The report No. KR23-SRF0011 is superseded by the report No. KR23-SRF0011-A.

General remarks for test reports

Statement concerning the uncertainty of the measurement systems used for the tests

(may be required by the product standard or client)

☐ **Internal procedure used for type testing through which traceability of the measuring uncertainty has been established:**

Procedure number, issue date and title:

Calculations leading to the reported values are on file with the testing laboratory that conducted the testing.

☒ **Statement not required by the standard or client used for type testing**

CONTENTS

1. General information

Client	:	Samsung Electronics Co., Ltd.
Address	:	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
Manufacturer	:	Samsung Electronics Co., Ltd.
Address	:	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
Factory	:	Samsung Electronics Vietnam Thai Nguyen Co., Ltd
Address	:	Yen Binh Industrial Park, Dong Tien Ward, Pho Yen Town, Thai Nguyen Province, Vietnam
Laboratory	:	Eurofins KCTL Co.,Ltd.
Address	:	65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea
Accreditations	:	FCC Site Designation No: KR0040, FCC Site Registration No: 687132 VCCI Registration No. : R-20080, G-20078, C-20059, T-20056 CAB Identifier: KR0040 ISED Number: 8035A KOLAS No.: KT231

2. Device information

Equipment under test	:	Mobile phone		
Model	:	SM-A346M/DSN		
Derivative model	:	SM-A346M/N		
Modulation technique	:	DFT-s OFDM	:	PI/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM
		CP-OFDM	:	QPSK, 16QAM, 64QAM, 256QAM
Power source	:	DC 3.88 V		
Antenna specification	:	Main Antenna 1	:	Metal Antenna (N5/66)
		Sub Antenna 2	:	Metal Antenna (N66)
Antenna operation	:	Main Antenna 1	:	SA/NSA (N5), SA (N66)
		Sub Antenna 2	:	NSA (N66)
EN-DC for NSA	:	2A-n5A, 66A-n5A, 2A-n66A, 5A-n66A, 12A-n66A, 13A-n66A, 66A-n66A		
Frequency range	:	N5	:	826.5 ㎒ ~ 846.5 ㎒
		N66	:	1 712.5 ㎒ ~ 1 777.5 ㎒
Bandwidth	:	N5	:	5 ㎒, 10 ㎒, 15 ㎒, 20 ㎒
		N66	:	5 ㎒, 10 ㎒, 15 ㎒, 20 ㎒, 25 ㎒, 30 ㎒, 40 ㎒
SCS	:	15 ㎑		
Software version	:	A346M.001		
Hardware version	:	REV1.0		
Test device serial No.	:	Conducted	:	R3CT904N24L
		Radiated	:	R3CTB0TENHL
Operation temperature	:	-20 ℃ ~ 60 ℃		

Note. The Product equality letter includes detailed information about the differences between basic and derivative model.

2.1. Frequency/channel operations

This device contains the following capabilities:
WLAN (11a/b/g/n/ac), Bluetooth (BDR/EDR/BLE), NR n5/66, LTE B2/4/5/12/13/17/26/41/66, GSM 850/1900, WCDMA 850/1700/1900, NFC

NR Band N5

Ch.	Frequency (㎒)
165300	826.5
167300	836.5
169300	846.5

Table 2.1-1. 5M BW

Ch.	Frequency (㎒)
165800	829.0
167300	836.5
168800	844.0

Table 2.1-2. 10M BW

Ch.	Frequency (㎒)
166300	831.5
167300	836.5
168300	841.5

Table 2.1-3. 15M BW

Ch.	Frequency (㎒)
166800	834.0
167300	836.5
167800	839.0

Table 2.1-4. 20M BW

NR Band N66

Ch.	Frequency (㎒)
342500	1 712.5
349000	1 745.0
355500	1 777.5

Table 2.1-5. 5M BW

Ch.	Frequency (㎒)
343000	1 715.0
349000	1 745.0
355000	1 775.0

Table 2.1-6. 10M BW

Ch.	Frequency (㎒)
343500	1 717.5
349000	1 745.0
354500	1 772.5

Table 2.1-7. 15M BW

Ch.	Frequency (㎒)
344000	1 720.0
349000	1 745.0
354000	1 770.0

Table 2.1-8. 20M BW

Ch.	Frequency (㎒)
344500	1722.5
349000	1745.0
353500	1767.5

Table 2.1-9. 25M BW

Ch.	Frequency (㎒)
345000	1725.0
349000	1745.0
353000	1765.0

Table 2.1-10. 30M BW

Ch.	Frequency (㎒)
346000	1730.0
349000	1745.0
352000	1760.0

Table 2.1-11.40M BW

3. Maximum ERP/EIRP power

Main Antenna

NR Band n5

Mode	Tx frequency (㎒)	Bandwidth (㎒)	Emission designator	ERP	
				Max. power (dBm)	Max. power (W)
N5	826.5 ~ 846.5	5	4M52G7D	20.60	0.115
			4M48W7D	19.71	0.094
	829.0 ~ 844.0	10	9M01G7D	20.58	0.114
			9M00W7D	19.59	0.091
	831.5 ~ 841.5	15	13M5G7D	20.73	0.118
			13M5W7D	19.64	0.092
	834.0 ~ 839.0	20	18M1G7D	20.34	0.108
			18M2W7D	19.66	0.092

NR Band n66

Mode	Tx frequency (㎒)	Bandwidth (㎒)	Emission designator	EIRP	
				Max. power (dBm)	Max. power (W)
N66	1 712.5 ~ 1 777.5	5	4M51G7D	20.19	0.104
			4M51W7D	19.17	0.083
	1 715.0 ~ 1 775.0	10	9M00G7D	19.86	0.097
			9M01W7D	18.98	0.079
	1 717.5 ~ 1 772.5	15	13M5G7D	19.72	0.094
			13M5W7D	18.98	0.079
	1 720.0 ~ 1 770.0	20	18M1G7D	19.72	0.094
			18M0W7D	18.89	0.077
	1 722.5 ~ 1 767.5	25	22M9G7D	18.94	0.078
			22M9W7D	18.17	0.066
	1 725.0 ~ 1 765.0	30	28M8G7D	18.52	0.071
			28M7W7D	17.57	0.057
	1 730.0 ~ 1 760.0	40	38M8G7D	18.38	0.069
			38M9W7D	17.46	0.056

Sub Antenna

NR Band n66

Mode	Tx frequency (㎒)	Bandwidth (㎒)	Modulation	EIRP	
				Max. power (dBm)	Max. power (W)
N66	1 712.5 ~ 1 777.5	5	QPSK	19.59	0.091
			16QAM	18.88	0.077
	1 715.0 ~ 1 775.0	10	QPSK	19.33	0.086
			16QAM	18.71	0.074
	1 717.5 ~ 1 772.5	15	QPSK	19.44	0.088
			16QAM	18.77	0.075
	1 720.0 ~ 1 770.0	20	QPSK	19.55	0.090
			16QAM	18.67	0.074
	1 722.5 ~ 1 767.5	25	QPSK	18.84	0.077
			16QAM	17.76	0.060
	1 725.0 ~ 1 765.0	30	QPSK	17.75	0.060
			16QAM	16.75	0.047
	1 730.0 ~ 1 760.0	40	QPSK	17.63	0.058
			16QAM	17.22	0.053

Notes:

1. Emission designator of main antenna with highest EIRP was reported instead of sub antenna.

4. Summary of tests

FCC Part section(s)	Parameter	Test Limit	Test Condition	Test results
2.1046	Conducted Output Power	N/A	Conducted	Pass
2.1049	Occupied Bandwidth 26 dB Bandwidth	N/A		Pass
2.1051 22.917(a) 27.53(h)	Band Edge Emissions at Antenna Terminal	<43 + 10Log$_{10}$(P) dB for all out of band emissions		Pass
	Spurious Emissions at Antenna Terminal			Pass
27.50(d)(5)	Peak to Average Ratio	< 13 dB		Pass
2.1055 22.355	Frequency stability	< 2.5 ppm		Pass
27.54		Emission must remain in band		
22.913(a)(5)	Effective Radiated Power	< 7 Watts max. ERP	Radiated	Pass
27.50(d)(4)	Equivalent Isotropic Radiated Power	< 1 Watts max. EIRP		Pass
				Pass
2.1053 22.917(a) 27.53(h)	Radiated Spurious Emissions	<43 + 10Log$_{10}$(P) dB for all out of band emissions		Pass

Notes:

1. The test procedure(s) in this report were performed in accordance as following.
   - ANSI C63.26-2015
   - ANSI/TIA-603-E-2016
   - KDB 971168 D01 v03r01
   - KDB 971168 D02 v02r01

4.1. Worst case orientation

1. All modes of operation were investigated and the worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations in the test data.
2. Output power measurements were measured on PI/2 BPSK, QPSK, 16QAM, 64QAM and 256QAM modulation. All tests except output power was performed with QPSK and 16QAM modulation with highest power.
   - Waveform: DFT-s OFDM
   - Modes: NSA/SA [Worst Case: n5 – NSA, n66 (main) – SA, n66 (Sub) – NSA]
3. In case of EN-DC mode, highest EIRP/ERP for stand-alone test case for LTE or 5GNR was configured then the spurious emissions were evaluated for simultaneous transmission.
   - EN-DC modes: 2A-n5A, 66A-n5A, 2A-n66A, 5A-n66A, 12A-n66A, 13A-n66A, 66A-n66A
   - Worst case : 2A-n5A, 2A-n66A
4. However, the PAPR was evaluated for all waveforms and modulations during pre-test, then all bandwidth was performed for the modulations with the highest result.
   - Worst Modulation: CP-OFDM (QPSK, 256QAM)
5. EUT was investigated in three orthogonal orientations X, Y and Z. It was determined that **Z** orientation was worst-case orientation. Therefore, all final radiated testing was performed with the EUT in **Z** orientation.
6. In case of sub antenna 2 (n66 - NSA), n66 was investigated additionally for EIRP and spurious emission.
7. All the radiated tests have been performed several case. (Stand-alone, with accessories (DLC Cable etc.))
   - Worst case: Stand-alone
8. Test Condition

Test condition	NR Band	Waveform	Modulation	Bandwidth (㎒)	RB size	RB offset
Radiated (ERP&EIRP)	N5	DFT-s OFDM	QPSK, 16QAM	5, 10, 15, 20	1	1, 23, 50, 77, 104
	N66			5, 10, 15, 20, 25, 30, 40	1	1, 23, 50, 77, 104, 131, 158, 214
Radiated (RSE)	N5			15	1	1
	N66			5	1	1
Conducted (All)	N5	DFT-s OFDM	QPSK, 16QAM	15, 10, 15, 20	1	1, 23, 50, 77, 104
					Full	0
	N66			5, 10, 15, 20, 25, 30, 40	1	1, 23, 50, 77, 104, 131, 158, 214
					Full	0
Conducted (Output Power)	N5	DFT-s OFDM, CP-OFDM	PI/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM	15, 10, 15, 20	1 ~ 100	0 ~ 104
	N66			5, 10, 15, 20, 25, 30, 40	1 ~ 216	0 ~ 214
Conducted (PAPR)	N5	CP-OFDM	QPSK, 256QAM	5, 10, 15, 20	Full	0
	N66			5, 10, 15, 20, 25, 30, 40	Full	0

5. Measurement uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014.

All measurement uncertainty values are shown with a coverage factor of k=2 to indicated a 95 % level of confidence. The measurement data shown herein meets of exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded uncertainty (±)	
Conducted RF power	0.9 dB	
Conducted spurious emissions	1.1 dB	
Radiated spurious emissions	Below 1 000 ㎒	4.3 dB
	1 000 ㎒ ~ 18 000 ㎒	3.8 dB
	Above 1 8000 ㎒	5.9 dB

6. Measurement results explanation example

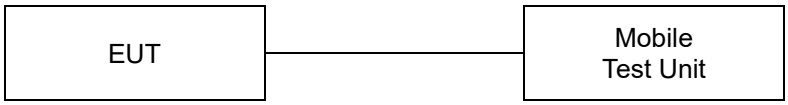
Frequency (㎒)	Factor(㏈)	Frequency (㎒)	Factor(㏈)
30	6.05	9 000	8.87
50	6.09	10 000	9.02
100	6.17	11 000	9.37
200	6.29	12 000	9.73
300	6.38	13 000	9.91
400	6.47	14 000	9.63
500	6.53	15 000	9.35
600	6.60	16 000	9.49
700	6.67	17 000	10.25
800	6.74	18 000	11.25
900	6.80	19 000	11.18
1 000	6.85	20 000	10.60
2 000	7.29	21 000	9.64
3 000	7.58	22 000	9.83
4 000	7.79	23 000	10.91
5 000	8.17	24 000	12.14
6 000	8.39	25 000	11.26
7 000	8.69	26 000	13.27
8 000	8.81	26 500	13.63

Note.
Offset(㏈) = RF cable loss(㏈) + Divider(㏈)

7. Test results

7.1. Conducted output power

Test setup



Test procedure

971168 D01 v03r01 – Section 5.2
ANSI C63.26-2015 – Section 5.2.4.2
CFR 47 - Section §2.1046

Test settings

When an average power meter is used to perform RF output power measurements, the fundamental condition that measurement be performed only over durations of active transmissions at maximum output power level applies. Thus, an average power meter can always be used to perform the measurement when the EUT can be configured to transmit continuously.

If the EUT cannot be configured to transmit continuously (i.e., burst duty cycle < 98%), then the following options can be implemented to facilitate measurement of the average power with an average power meter:

a) A gated average power meter can be used to perform the measurement if the gating parameters can be adjusted such that the power is measured only during active transmission bursts at maximum output power levels.
b) A conventional average power meter with no signal gating capability can also be used if the measured burst duty cycle is constant (i.e., duty cycle variations are less than or equal to ± 2%) by performing the measurement over the on/off burst cycles and then correcting (increasing) the measured level by a factor equal to [10log (1/duty cycle)]. See 5.2.4.3.4 for guidance with respect to measuring the transmitter duty cycle.

See item r) of 4.1 for more information regarding power meter functional requirements and limitations, and consult the instrumentation-specific application literature for proper set-up and use.

Test results

Main Antenna

Test Band	Bandwidth (㎒)	Waveform	SCS (㎑)	Modulation	RB size	RB offset	MPR	Maximum power		
								Frequency (㎒)		
								Low	Middle	High
NR n5	5	DFT-s OFDM	15	PI/2 BPSK	1	1	0	24.07	24.15	24.07
					1	13	0	24.13	24.21	24.07
					1	23	0	24.14	24.21	24.06
					12	0	0.5	23.73	23.78	23.69
					12	7	0	24.21	24.22	24.09
					12	13	0.5	23.65	23.72	23.64
					25	0	0.5	23.68	23.73	23.63
				QPSK	1	1	0	24.16	24.18	24.06
					1	13	0	24.09	24.11	24.06
					1	23	0	24.06	24.14	24.09
					12	0	1	23.24	23.30	23.29
					12	7	0	24.17	24.23	24.18
					12	13	1	23.21	23.24	23.13
					25	0	1	23.25	23.27	23.18
				16QAM	1	1	1	23.29	23.32	23.18
				64QAM	1	1	2.5	21.53	21.56	21.51
				256QAM	1	1	4.5	19.98	20.03	19.97
		CP-OFDM		QPSK	1	1	1.5	22.84	22.86	22.81
	10	DFT-s OFDM		PI/2 BPSK	1	1	0	24.00	24.08	24.01
					1	26	0	24.11	24.14	24.10
					1	50	0	24.15	24.17	24.14
					25	0	0.5	23.67	23.77	23.73
					25	14	0	24.13	24.14	24.12
					25	27	0.5	24.12	24.13	24.12
					50	0	0.5	23.75	23.79	23.75
				QPSK	1	1	0	24.05	24.18	24.07
					1	26	0	23.97	23.98	23.95
					1	50	0	23.88	23.85	23.81
					25	0	1	22.99	23.08	22.97
					25	14	0	24.05	24.06	23.98
					25	27	1	23.00	23.07	22.97
					50	0	1	22.94	23.02	23.00
				16QAM	1	1	1	23.17	23.24	23.10
				64QAM	1	1	2.5	21.52	21.52	21.52
				256QAM	1	1	4.5	19.95	20.00	19.86
		CP-OFDM		QPSK	1	1	1.5	22.57	22.67	22.64

Test Band	Bandwidth (㎒)	Waveform	SCS (㎑)	Modulation	RB size	RB offset	MPR	Maximum power		
								Frequency (㎒)		
								Low	Middle	High
NR n5	15	DFT-s OFDM	15	PI/2 BPSK	1	1	0	24.00	24.05	24.02
					1	40	0	24.17	24.19	24.06
					1	77	0	23.94	24.02	23.95
					36	0	0.5	23.72	23.81	23.71
					36	22	0	24.18	24.24	24.18
					36	43	0.5	23.82	23.82	23.72
					75	0	0.5	23.71	23.78	23.75
				QPSK	1	1	0	24.12	24.19	24.07
					1	40	0	24.16	24.17	24.15
					1	77	0	23.95	24.04	24.02
					36	0	1	23.26	23.36	23.33
					36	22	0	24.18	24.26	24.20
					36	43	1	23.23	23.32	23.22
					75	0	1	23.27	23.36	23.25
				16QAM	1	1	1	23.20	23.25	23.11
				64QAM	1	1	2.5	21.42	21.51	21.46
				256QAM	1	1	4.5	19.98	20.01	19.98
		CP-OFDM		QPSK	1	1	1.5	22.79	22.84	22.77
	20	DFT-s OFDM		PI/2 BPSK	1	1	0	23.96	24.06	23.99
					1	53	0	24.21	24.21	24.18
					1	104	0	23.89	23.97	23.85
					50	0	0.5	23.91	23.95	23.84
					50	28	0	24.20	24.26	24.21
					50	56	0.5	23.68	23.75	23.74
					100	0	0.5	23.80	23.84	23.78
				QPSK	1	1	0	24.01	24.08	24.05
					1	53	0	24.10	24.18	24.08
					1	104	0	23.89	23.97	23.94
					50	0	1	23.37	23.46	23.45
					50	28	0	24.25	24.30	24.15
					50	56	1	23.20	23.25	23.16
					100	0	1	23.40	23.41	23.26
				16QAM	1	1	1	23.15	23.22	23.20
				64QAM	1	1	2.5	21.47	21.51	21.36
				256QAM	1	1	4.5	20.01	20.01	19.95
		CP-OFDM		QPSK	1	1	1.5	22.76	22.76	22.62

Test Band	Bandwidth (㎒)	Waveform	SCS (㎑)	Modulation	RB size	RB offset	MPR	Maximum power		
								Frequency (㎒)		
								Low	Middle	High
NR n66	5	DFT-s OFDM	15	PI/2 BPSK	1	1	0	23.20	23.16	23.20
					1	13	0	23.15	23.01	23.08
					1	23	0	23.06	23.01	23.17
					12	0	0.5	22.83	22.89	22.86
					12	7	0	23.21	23.19	23.13
					12	13	0.5	22.63	22.70	22.65
					25	0	0.5	22.71	22.72	22.69
				QPSK	1	1	0	22.98	23.24	23.06
					1	13	0	23.19	23.10	23.20
					1	23	0	23.07	23.12	23.23
					12	0	1	22.28	22.23	22.22
					12	7	0	23.26	23.22	23.26
					12	13	1	22.06	22.28	22.15
					25	0	1	22.20	22.24	22.15
				16QAM	1	1	1	21.92	22.06	21.95
				64QAM	1	1	2.5	20.73	20.78	20.90
				256QAM	1	1	4.5	18.82	18.75	18.65
		CP-OFDM		QPSK	1	1	1.5	21.75	21.68	21.69
	10	DFT-s OFDM		PI/2 BPSK	1	1	0	22.83	22.82	22.83
					1	26	0	22.89	22.85	23.00
					1	50	0	22.88	22.84	22.79
					25	0	0.5	22.61	22.65	22.59
					25	14	0	23.04	23.05	23.15
					25	27	0.5	22.69	22.58	22.58
					50	0	0.5	22.49	22.63	22.56
				QPSK	1	1	0	22.90	22.99	22.88
					1	26	0	23.12	23.17	22.99
					1	50	0	22.92	22.87	22.76
					25	0	1	22.05	22.14	22.10
					25	14	0	23.21	23.12	23.04
					25	27	1	22.16	22.07	22.09
					50	0	1	22.09	22.13	22.08
				16QAM	1	1	1	21.76	21.83	21.81
				64QAM	1	1	2.5	20.67	20.70	20.45
				256QAM	1	1	4.5	18.35	18.47	18.43
		CP-OFDM		QPSK	1	1	1.5	21.61	21.60	21.63

Test Band	Bandwidth (㎒)	Waveform	SCS (㎑)	Modulation	RB size	RB offset	MPR	Maximum power		
								Frequency (㎒)		
								Low	Middle	High
NR n66	15	DFT-s OFDM	15	PI/2 BPSK	1	1	0	23.13	23.03	22.98
					1	40	0	23.09	23.09	23.03
					1	77	0	22.97	23.03	23.05
					36	0	0.5	22.77	22.79	22.78
					36	22	0	23.26	23.25	23.15
					36	43	0.5	22.75	22.70	22.60
					75	0	0.5	22.75	22.82	22.61
				QPSK	1	1	0	23.18	23.15	23.11
					1	40	0	23.19	23.27	23.02
					1	77	0	23.09	23.13	22.91
					36	0	1	22.80	22.87	22.78
					36	22	0	23.33	23.28	23.31
					36	43	1	22.19	22.28	22.24
					75	0	1	22.33	22.38	22.31
				16QAM	1	1	1	21.85	22.00	21.93
				64QAM	1	1	2.5	20.66	20.80	20.77
				256QAM	1	1	4.5	18.63	18.78	18.72
		CP-OFDM		QPSK	1	1	1.5	21.54	21.60	21.59
	20	DFT-s OFDM		PI/2 BPSK	1	1	0	23.23	23.19	23.06
					1	53	0	23.13	23.16	23.03
					1	104	0	23.03	23.01	22.99
					50	0	0.5	22.65	22.75	22.75
					50	28	0	23.33	23.24	23.20
					50	56	0.5	22.64	22.76	22.57
					100	0	0.5	22.63	22.77	22.68
				QPSK	1	1	0	23.31	23.29	23.01
					1	53	0	23.15	23.27	23.06
					1	104	0	23.01	23.02	22.96
					50	0	1	22.27	22.35	22.29
					50	28	0	23.50	23.38	23.52
					50	56	1	22.11	22.20	22.10
					100	0	1	22.76	22.28	22.76
				16QAM	1	1	1	21.82	22.01	22.07
				64QAM	1	1	2.5	20.66	20.69	20.81
				256QAM	1	1	4.5	18.69	18.63	18.62
		CP-OFDM		QPSK	1	1	1.5	21.68	21.65	21.66

Test Band	Bandwidth (㎒)	Waveform	SCS (㎑)	Modulation	RB size	RB offset	MPR	Maximum power		
								Frequency (㎒)		
								Low	Middle	High
NR n66	25	DFT-s OFDM	15	PI/2 BPSK	1	1	0	23.31	23.23	23.16
					1	67	0	23.14	23.11	23.29
					1	131	0	23.25	22.84	22.92
					64	0	0.5	22.66	22.73	22.75
					64	35	0	23.38	23.25	23.24
					64	69	0.5	22.63	22.64	22.57
					128	0	0.5	22.78	22.73	22.64
				QPSK	1	1	0	23.20	23.25	23.23
					1	67	0	23.11	23.26	23.17
					1	131	0	22.85	23.07	22.93
					64	0	1	22.44	22.46	22.16
					64	35	0	23.45	23.48	23.44
					64	69	1	22.15	22.27	22.05
					128	0	1	22.24	22.22	22.25
				16QAM	1	1	1	21.67	21.88	21.98
				64QAM	1	1	2.5	20.78	20.83	20.77
				256QAM	1	1	4.5	18.81	18.84	18.56
		CP-OFDM		QPSK	1	1	1.5	21.55	21.81	21.66
	30	DFT-s OFDM		PI/2 BPSK	1	1	0	23.04	23.09	23.26
					1	80	0	23.04	23.14	22.91
					1	158	0	23.08	22.90	22.83
					80	0	0.5	22.80	22.85	22.82
					80	40	0	23.29	23.29	23.15
					80	80	0.5	22.77	22.85	22.55
					160	0	0.5	22.78	22.83	22.72
				QPSK	1	1	0	23.03	23.26	23.02
					1	80	0	23.20	23.21	23.01
					1	158	0	22.85	22.91	23.08
					80	0	1	22.30	22.27	22.48
					80	40	0	23.32	23.55	23.47
					80	80	1	22.22	22.30	22.14
					160	0	1	22.32	22.41	22.36
				16QAM	1	1	1	21.94	22.02	21.86
				64QAM	1	1	2.5	20.63	20.88	20.57
				256QAM	1	1	4.5	18.73	18.72	18.81
		CP-OFDM		QPSK	1	1	1.5	21.55	21.68	21.57

Test Band	Bandwidth (㎒)	Waveform	SCS (㎑)	Modulation	RB size	RB offset	MPR	Maximum power		
								Frequency (㎒)		
								Low	Middle	High
NR n66	40	DFT-s OFDM	15	PI/2 BPSK	1	1	0	23.18	23.41	23.14
					1	108	0	23.23	23.07	23.12
					1	214	0	23.13	23.00	22.99
					108	0	0.5	22.61	22.84	22.82
					108	54	0	23.47	23.31	23.31
					108	108	0.5	22.73	22.77	22.71
					216	0	0.5	22.76	22.87	22.70
				QPSK	1	1	0	23.36	23.49	23.21
					1	108	0	23.13	23.18	23.15
					1	214	0	23.02	23.02	22.91
					108	0	1	22.44	22.55	22.53
					108	54	0	23.35	23.37	23.33
					108	108	1	22.27	22.39	22.22
					216	0	1	22.27	22.28	22.26
				16QAM	1	1	1	22.00	21.89	22.19
				64QAM	1	1	2.5	20.62	20.77	20.77
				256QAM	1	1	4.5	18.52	18.74	18.77
		CP-OFDM		QPSK	1	1	1.5	21.65	21.82	21.52

Sub Antenna

- -	Bandwidth (㎒)	Waveform	SCS (㎑)	Modulation	RB size	RB offset	MPR	Maximum power Frequency (㎒) Low	Middle	High
NR n66	5	DFT-s OFDM	15	PI/2 BPSK	1	1	0	22.49	22.51	22.42
					1	13	0	22.51	22.55	22.52
					1	23	0	22.50	22.56	22.42
					12	0	0.5	22.68	22.68	22.55
					12	7	0	23.09	23.11	22.97
					12	13	0.5	22.63	22.64	22.61
					25	0	0.5	22.57	22.67	22.67
				QPSK	1	1	0	22.71	22.73	22.67
					1	13	0	22.69	22.74	22.62
					1	23	0	22.63	22.70	22.70
					12	0	1	22.13	22.17	22.13
					12	7	0	23.09	23.18	23.18
					12	13	1	22.04	22.13	21.99
					25	0	1	22.20	22.22	22.14
				16QAM	1	1	1	21.82	21.92	21.78
				64QAM	1	1	2.5	20.04	20.12	20.02
				256QAM	1	1	4.5	18.49	18.55	18.50
		CP-OFDM		QPSK	1	1	1.5	21.22	21.25	21.18
	10	DFT-s OFDM		PI/2 BPSK	1	1	0	22.32	22.39	22.24
					1	26	0	22.40	22.40	22.38
					1	50	0	22.33	22.37	22.26
					25	0	0.5	22.47	22.56	22.53
					25	14	0	22.98	23.05	22.92
					25	27	0.5	22.42	22.51	22.50
					50	0	0.5	22.46	22.56	22.47
				QPSK	1	1	0	22.40	22.48	22.33
					1	26	0	22.52	22.55	22.49
					1	50	0	22.43	22.51	22.38
					25	0	1	22.03	22.11	22.04
					25	14	0	22.99	23.07	22.97
					25	27	1	21.95	22.00	22.00
					50	0	1	22.06	22.11	22.05
				16QAM	1	1	1	21.75	21.81	21.71
				64QAM	1	1	2.5	19.93	19.96	19.83
				256QAM	1	1	4.5	18.33	18.42	18.41
		CP-OFDM		QPSK	1	1	1.5	21.06	21.06	21.02

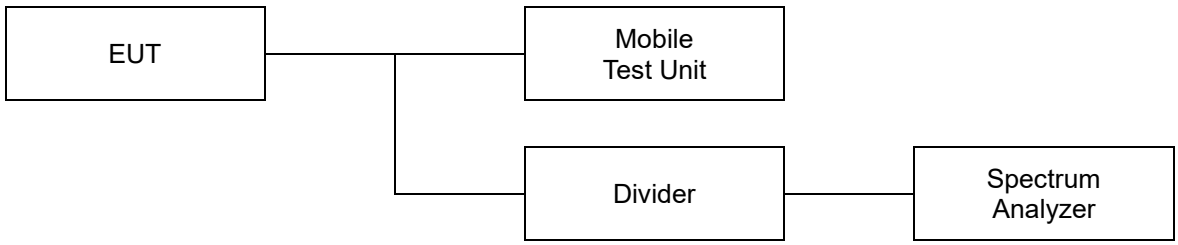
Test Band	Bandwidth (㎒)	Waveform	SCS (㎑)	Modulation	RB size	RB offset	MPR	Maximum power		
								Frequency (㎒)		
								Low	Middle	High
NR n66	15	DFT-s OFDM	15	PI/2 BPSK	1	1	0	22.49	22.55	22.41
					1	40	0	22.50	22.53	22.51
					1	77	0	22.55	22.59	22.59
					36	0	0.5	22.71	22.78	22.76
					36	22	0	23.16	23.22	23.13
					36	43	0.5	22.63	22.63	22.50
					75	0	0.5	22.70	22.73	22.61
				QPSK	1	1	0	22.67	22.67	22.63
					1	40	0	22.74	22.75	22.71
					1	77	0	22.67	22.67	22.62
					36	0	1	22.30	22.30	22.28
					36	22	0	23.24	23.24	23.19
					36	43	1	22.19	22.22	22.20
					75	0	1	22.25	22.30	22.22
				16QAM	1	1	1	21.79	21.79	21.79
				64QAM	1	1	2.5	20.06	20.07	19.95
				256QAM	1	1	4.5	18.42	18.51	18.41
		CP-OFDM		QPSK	1	1	1.5	21.16	21.24	21.16
	20	DFT-s OFDM		PI/2 BPSK	1	1	0	22.48	22.56	22.42
					1	53	0	22.53	22.54	22.41
					1	104	0	22.60	22.61	22.59
					50	0	0.5	22.65	22.75	22.75
					50	28	0	23.18	23.21	23.19
					50	56	0.5	22.57	22.67	22.53
					100	0	0.5	22.63	22.70	22.56
				QPSK	1	1	0	22.53	22.60	22.49
					1	53	0	22.64	22.72	22.67
					1	104	0	22.56	22.64	22.63
					50	0	1	22.26	22.32	22.25
					50	28	0	23.35	23.36	23.21
					50	56	1	22.10	22.16	22.08
					100	0	1	22.19	22.27	22.20
				16QAM	1	1	1	21.65	21.74	21.61
				64QAM	1	1	2.5	20.10	20.11	20.07
				256QAM	1	1	4.5	18.55	18.58	18.50
		CP-OFDM		QPSK	1	1	1.5	21.63	21.65	21.50

Test Band	Bandwidth (㎒)	Waveform	SCS (㎑)	Modulation	RB size	RB offset	MPR	Maximum power		
								Frequency (㎒)		
								Low	Middle	High
NR n66	25	DFT-s OFDM	15	PI/2 BPSK	1	1	0	22.52	22.53	22.31
					1	67	0	22.57	22.65	22.43
					1	131	0	22.59	22.46	22.51
					64	0	0.5	22.57	22.71	22.72
					64	35	0	23.32	23.25	23.22
					64	69	0.5	22.45	22.56	22.41
					128	0	0.5	22.75	22.71	22.57
				QPSK	1	1	0	22.39	22.60	22.55
					1	67	0	22.67	22.79	22.74
					1	131	0	22.69	22.68	22.50
					64	0	1	22.37	22.44	22.11
					64	35	0	23.36	23.47	23.32
					64	69	1	22.07	22.10	22.02
					128	0	1	22.21	22.21	22.21
				16QAM	1	1	1	21.50	21.88	21.61
				64QAM	1	1	2.5	20.07	20.08	20.02
				256QAM	1	1	4.5	18.57	18.51	18.51
		CP-OFDM		QPSK	1	1	1.5	21.55	21.77	21.40
	30	DFT-s OFDM		PI/2 BPSK	1	1	0	22.39	22.62	22.28
					1	80	0	22.38	22.50	22.29
					1	158	0	22.59	22.55	22.44
					80	0	0.5	22.80	22.79	22.79
					80	40	0	23.27	23.29	23.07
					80	80	0.5	22.72	22.71	22.55
					160	0	0.5	22.75	22.83	22.45
				QPSK	1	1	0	22.61	22.67	22.57
					1	80	0	22.76	22.72	22.75
					1	158	0	22.46	22.62	22.78
					80	0	1	22.25	22.23	22.36
					80	40	0	23.32	23.51	23.25
					80	80	1	22.13	22.24	22.00
					160	0	1	22.32	22.37	22.33
				16QAM	1	1	1	21.66	21.74	21.58
				64QAM	1	1	2.5	20.07	19.97	19.93
				256QAM	1	1	4.5	18.70	18.68	18.60
		CP-OFDM		QPSK	1	1	1.5	21.53	21.67	21.57

Test Band	Bandwidth (㎒)	Waveform	SCS (㎑)	Modulation	RB size	RB offset	MPR	Maximum power		
								Frequency (㎒)		
								Low	Middle	High
NR n66	40	DFT-s OFDM	15	PI/2 BPSK	1	1	0	22.37	22.55	22.50
					1	108	0	22.62	22.60	22.51
					1	214	0	22.52	22.62	22.53
					108	0	0.5	22.60	22.84	22.80
					108	54	0	23.20	23.07	23.28
					108	108	0.5	22.45	22.56	22.41
					216	0	0.5	22.68	22.65	22.64
				QPSK	1	1	0	22.60	22.70	22.37
					1	108	0	22.63	22.83	22.82
					1	214	0	22.49	22.79	22.52
					108	0	1	22.35	22.42	22.29
					108	54	0	23.24	23.31	23.30
					108	108	1	22.06	22.12	22.07
					216	0	1	22.26	22.27	22.25
				16QAM	1	1	1	21.62	21.68	21.66
				64QAM	1	1	2.5	20.16	19.98	20.16
				256QAM	1	1	4.5	18.46	18.69	18.44
		CP-OFDM		QPSK	1	1	1.5	21.64	21.80	21.46

7.2. 99% Occupied Bandwidth & 26 dB Bandwidth

Test setup



Limit

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

Test procedure

971168 D01 v03r01 – Section 4.2 and 4.3
ANSI C63.26-2015 – Section 5.4.3 and 5.4.4

Test settings

◆ **26dB Bandwidth**

a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be wide enough to see sufficient roll off of the signal to make the measurement.

b) The nominal RBW shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set ≥ 3 × RBW.

c) Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation.
See guidance provided in 4.2.3.

d) The dynamic range of the spectrum analyzer at the selected RBW shall be more than 10 dB below the target "−X dB" requirement, i.e., if the requirement calls for measuring the −26 dB OBW, the spectrum analyzer noise floor at the selected RBW shall be at least 36 dB below the reference level.

e) Set spectrum analyzer detection mode to peak, and the trace mode to max hold.

f) Determine the reference value by either of the following:
   1) Set the EUT to transmit a modulated signal. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace (this is the reference value).
   2) Set the EUT to transmit an unmodulated carrier. Set the spectrum analyzer marker to the level of the carrier.

g) Determine the "−X dB amplitude" as equal to (Reference Value − X). Alternatively, this calculation can be performed on the spectrum analyzer using the delta-marker measurement function.

h) If the reference value was determined using an unmodulated carrier, turn the EUT modulation on, then either clear the existing trace or start a new trace on the spectrum analyzer and allow the new trace to stabilize. Otherwise the trace from step f) shall be used for step i).

i) Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display such that each marker is at or slightly below the "−X dB amplitude" determined in step f). If a marker is below this "−X dB amplitude" value it should be as close as possible to this value. The OBW is the positive frequency difference between the two markers.

j) The spectral envelope can cross the "−X dB amplitude" at multiple points. The lowest or highest frequency shall be selected as the frequencies that are the farthest away from the center frequency at which the spectral envelope crosses the "−X dB amplitude."

k) The OBW shall be reported by providing plot(s) of the measuring instrument display, to include markers depicting the relevant frequency and amplitude information (e.g., marker table). The frequency and amplitude axis and scale shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

◆ 99% Occupied Bandwidth

a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts (typically a span of 1.5 × OBW is sufficient).

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

c) Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation. See guidance provided in 4.2.3.

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

e) If the instrument does not have a 99% OBW function, recover the trace data points and sum directly in linear power terms. Place the recovered amplitude data points, beginning at the lowest frequency, in a running sum until 0.5% of the total is reached. Record that frequency as the lower OBW frequency. Repeat the process until 99.5% of the total is reached and record that frequency as the u pper OBW frequency. The 99% power OBW can be determined by computing the difference these two frequencies.

f) The OBW shall be reported and plot(s) of the measuring instrument display shall be provided with the test report. The frequency and amplitude axis and scale shall be clearly labeled. Tabular data can be reported in addition to the plot(s).

Notes:

1. The EUT was setup to maximum output power as its lowest and highest channel with all bandwidth, Modulation.

Test results

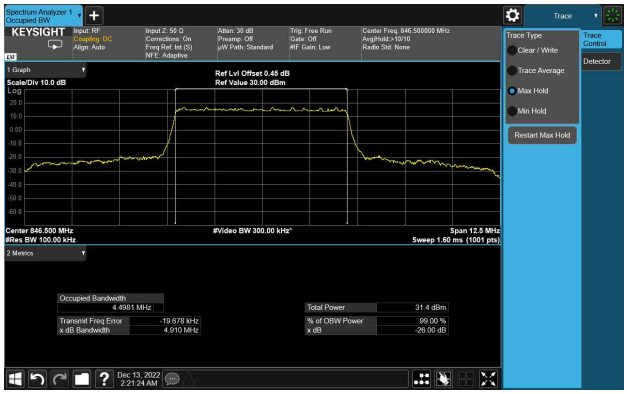
Test Band	Bandwidth (㎒)	Frequency (㎒)	Waveform	SCS (㎑)	Modulation	26㏈ bandwidth (㎒)	99 % bandwidth (㎒)
NR N5	5	826.5	DFT-s OFDM	15	QPSK	4.96	4.50
					16QAM	4.93	4.48
		836.5			QPSK	4.98	4.52
					16QAM	4.89	4.47
		846.5			QPSK	4.91	4.50
					16QAM	4.89	4.48
	10	829.0	DFT-s OFDM		QPSK	9.85	9.00
					16QAM	9.75	8.99
		836.5			QPSK	9.80	9.01
					16QAM	9.83	9.00
		844.0			QPSK	9.82	9.00
					16QAM	9.76	8.99
	15	831.5	DFT-s OFDM		QPSK	14.57	13.53
					16QAM	14.46	13.52
		836.5			QPSK	14.51	13.53
					16QAM	14.51	13.53
		841.5			QPSK	14.44	13.50
					16QAM	14.42	13.48
	20	834.0	DFT-s OFDM		QPSK	19.81	18.13
					16QAM	19.65	18.18
		836.5			QPSK	19.63	18.12
					16QAM	19.59	18.11
		839.0			QPSK	19.72	18.11
					16QAM	19.71	18.07

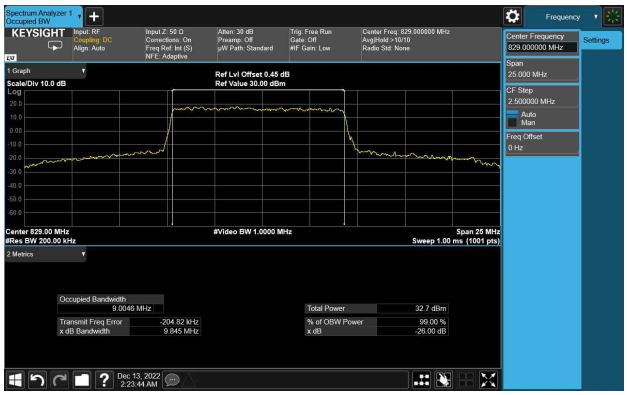
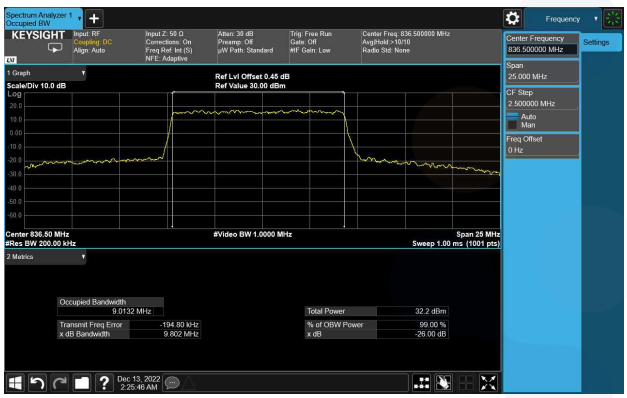
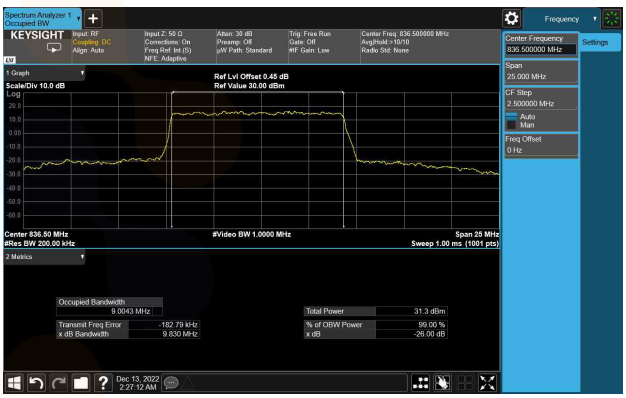
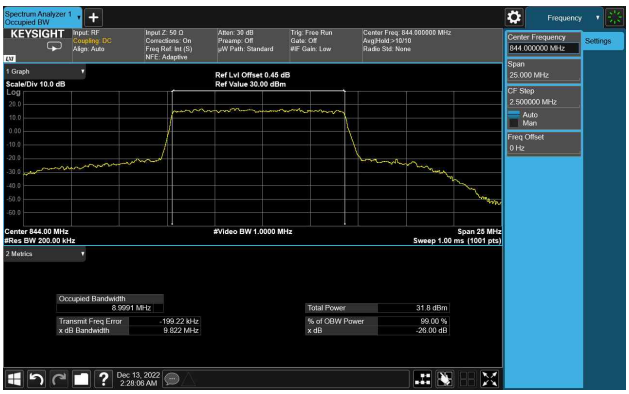
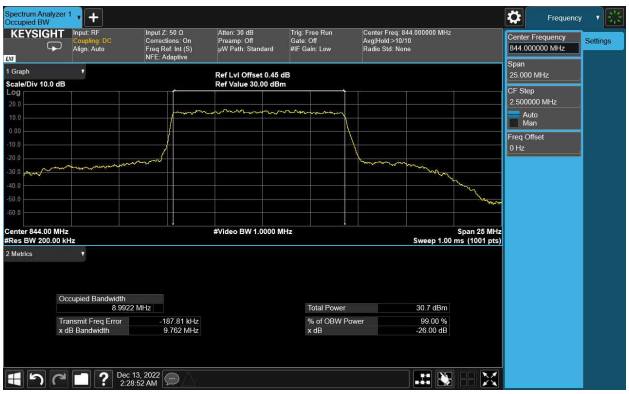
Test Band	Bandwidth (㎒)	Frequency (㎒)	Waveform	SCS (㎑)	Modulation	26㏈ bandwidth (㎒)	99 % bandwidth (㎒)
NR N66	5	1 712.5	DFT-s OFDM	15	QPSK	5.06	4.48
					16QAM	4.99	4.51
		1 745.0			QPSK	4.97	4.51
					16QAM	4.96	4.50
		1 777.5			QPSK	4.96	4.50
					16QAM	4.97	4.50
	10	1 715.0	DFT-s OFDM		QPSK	9.82	8.99
					16QAM	9.77	8.98
		1 745.0			QPSK	9.81	9.00
					16QAM	9.77	9.00
		1 775.0			QPSK	9.77	9.00
					16QAM	9.82	9.01
	15	1 717.5	DFT-s OFDM		QPSK	14.48	13.45
					16QAM	14.45	13.47
		1 745.0			QPSK	14.46	13.44
					16QAM	14.50	13.45
		1 772.5			QPSK	14.35	13.44
					16QAM	14.48	13.49
	20	1 720.0	DFT-s OFDM		QPSK	19.70	18.01
					16QAM	19.59	17.99
		1 745.0			QPSK	19.57	18.03
					16QAM	19.61	18.04
		1 770.0			QPSK	19.82	18.09
					16QAM	19.66	18.00

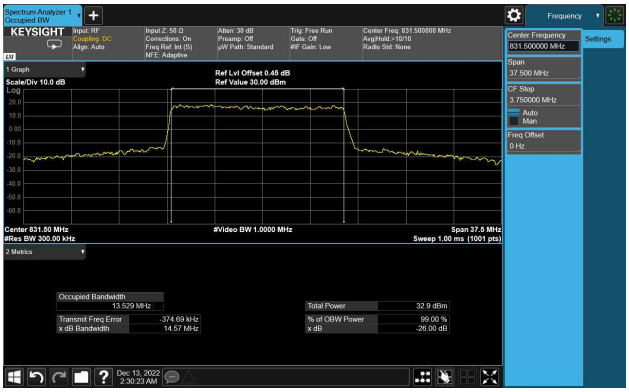
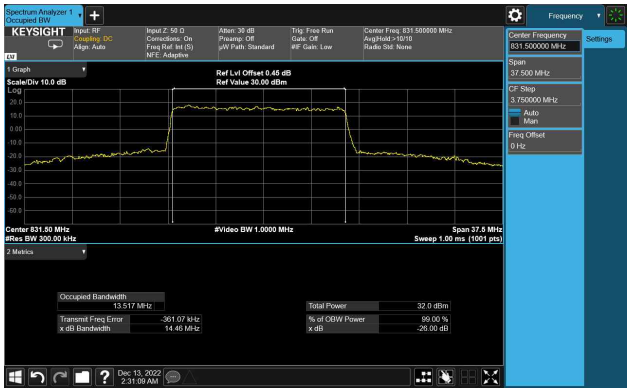
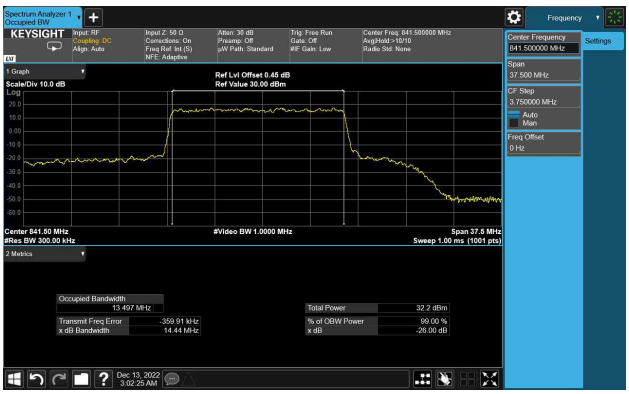
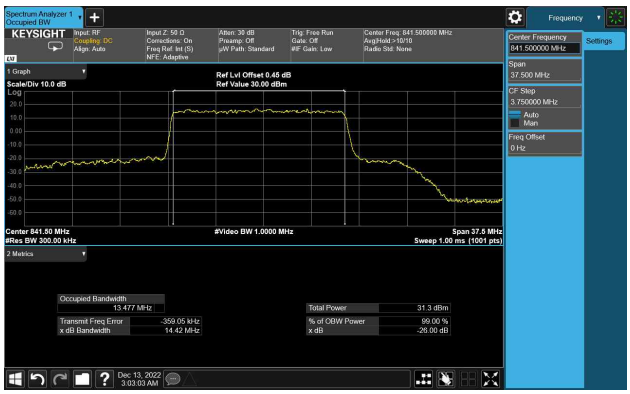
Test Band	Bandwidth (㎒)	Frequency (㎒)	Waveform	SCS (㎑)	Modulation	26㏈ bandwidth (㎒)	99 % bandwidth (㎒)
NR N66	25	1 722.5	DFT-s OFDM	15	QPSK	24.57	22.93
					16QAM	24.53	22.93
		1 745.0			QPSK	24.55	22.88
					16QAM	24.64	22.89
		1 767.5			QPSK	24.68	22.93
					16QAM	24.54	22.93
	30	1 725.0	DFT-s OFDM		QPSK	30.27	28.76
					16QAM	30.38	28.68
		1 745.0			QPSK	30.26	28.70
					16QAM	30.24	28.61
		1 765.0			QPSK	30.32	28.75
					16QAM	30.35	28.66
	40	1 730.0	DFT-s OFDM		QPSK	40.94	38.83
					16QAM	41.16	38.94
		1 745.0			QPSK	40.91	38.59
					16QAM	40.84	38.69
		1 760.0			QPSK	40.85	38.54
					16QAM	40.84	38.64

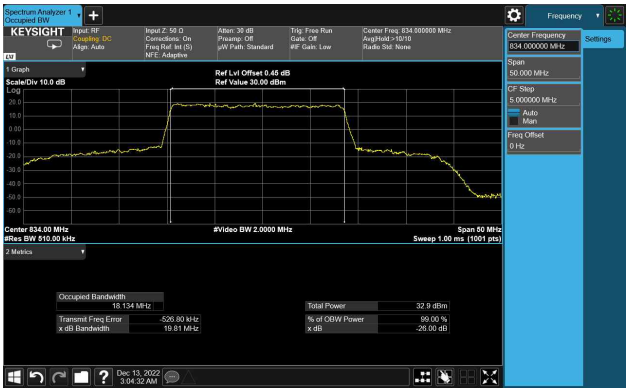
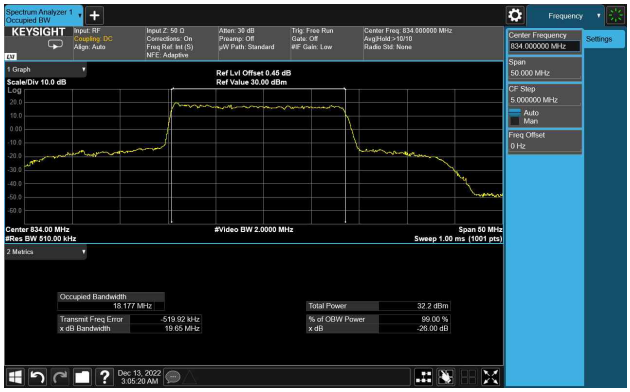
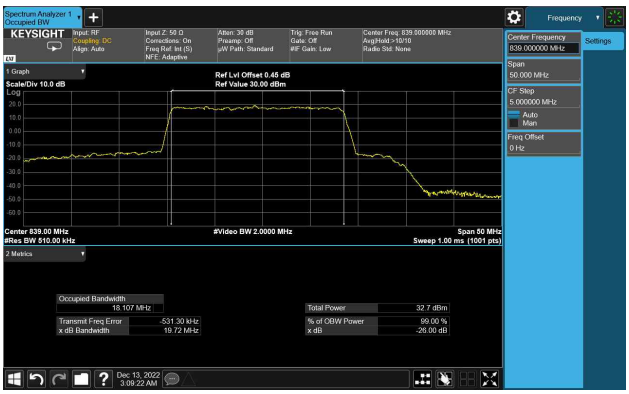
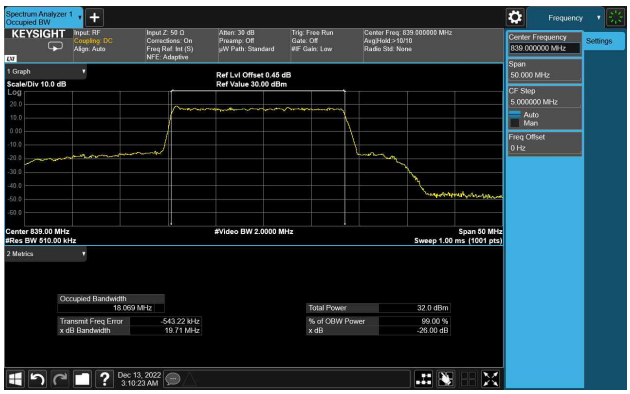
26 dB Bandwidth & 99% Bandwidth

Test mode: NR N5

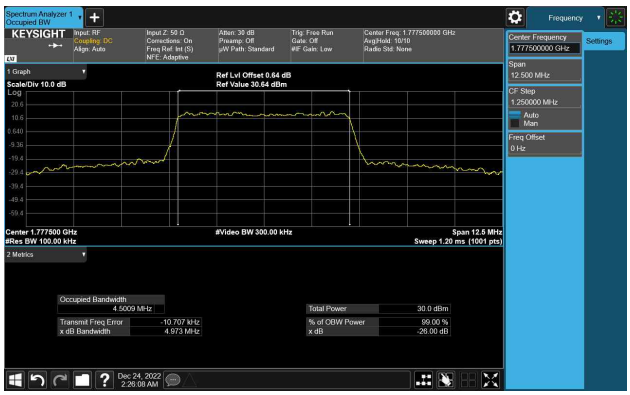
5M BW QPSK Low ch.	5M BW 16QAM Low ch.
	
5M BW QPSK Mid ch.	**5M BW 16QAM Mid ch.**
	
5M BW QPSK High ch.	**5M BW 16QAM High ch.**
	

10M BW QPSK Low ch.	10M BW 16QAM Low ch.
	
10M BW QPSK Mid ch.	**10M BW 16QAM Mid ch.**
	
10M BW QPSK High ch.	**10M BW 16QAM High ch.**
	

15M BW QPSK Low ch.	15M BW 16QAM Low ch.
	
15M BW QPSK Mid ch.	**15M BW 16QAM Mid ch.**
	
15M BW QPSK High ch.	**15M BW 16QAM High ch.**
	

20M BW QPSK Low ch.	20M BW 16QAM Low ch.
	
20M BW QPSK Mid ch.	**20M BW 16QAM Mid ch.**
	
20M BW QPSK High ch.	**20M BW 16QAM High ch.**
	

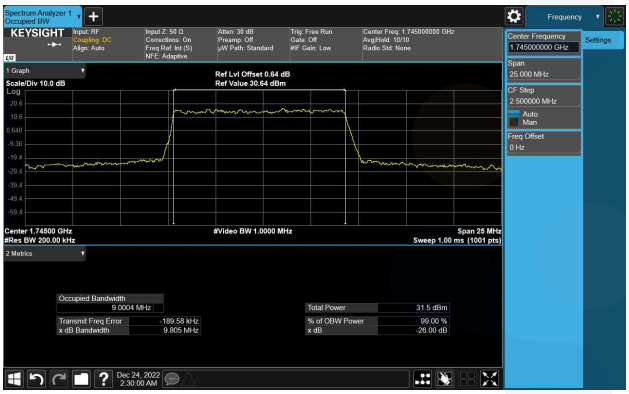
Test mode: NR N66

5M BW QPSK Low ch.	5M BW 16QAM Low ch.
	
5M BW QPSK Mid ch.	**5M BW 16QAM Mid ch.**
	
5M BW QPSK High ch.	**5M BW 16QAM High ch.**
	

10M BW QPSK Low ch.

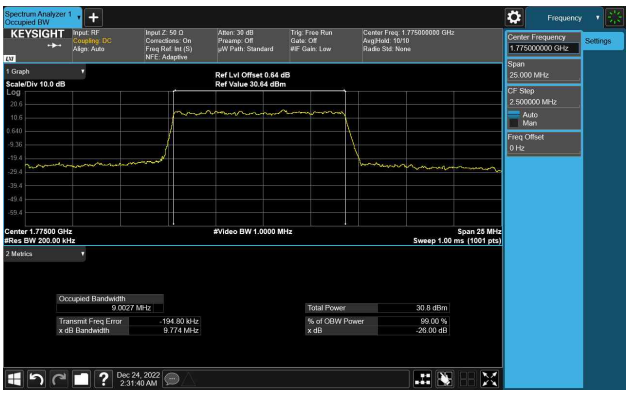
10M BW 16QAM Low ch.

10M BW QPSK Mid ch.

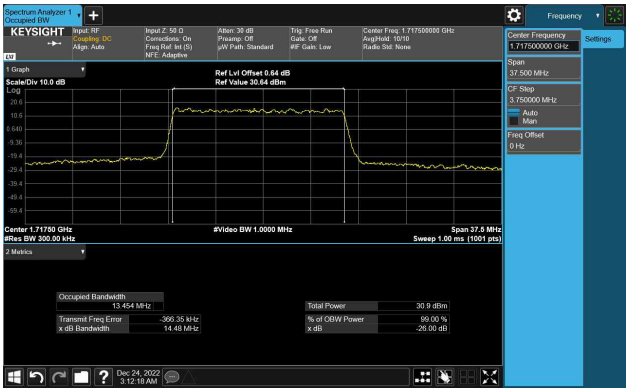
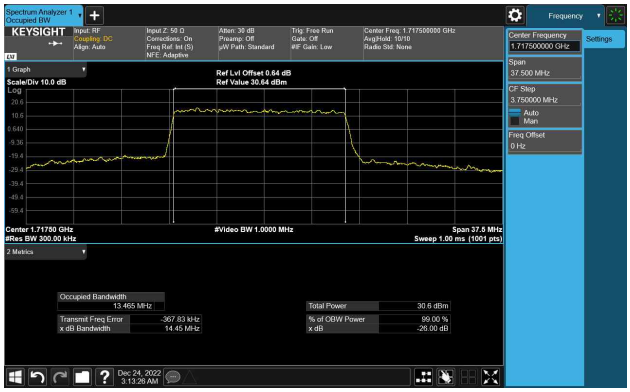


10M BW 16QAM Mid ch.

10M BW QPSK High ch.



10M BW 16QAM High ch.

15M BW QPSK Low ch.	15M BW 16QAM Low ch.
	
15M BW QPSK Mid ch.	**15M BW 16QAM Mid ch.**
	
15M BW QPSK High ch.	**15M BW 16QAM High ch.**