

CERTIFICATION TEST REPORT

Report Number. : S-4792147575-E5V2

Applicant : SAMSUNG ELECTRONICS CO., LTD.
129 SAMSUNG-RO, YEONGTONG-GU, SUWON-SI,
GYEONGGI-DO, 16677, KOREA

Model : SM-F971U, SM-F971U1

FCC ID : A3LSMF971U

EUT Description : GSM/WCDMA/LTE/5G NR Phone + BT/BLE,
DTS/UNII a/b/g/n/ac/ax/be, NFC, WPT, UWB and NB NTN

Test Standard(s) : FCC CFR47 PART 96

Date Of Issue:

2026-04-29

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Revision History

Rev.	Issue Date	Revisions	Revised By
V1	2026-04-17	Initial issue	Yeonghwan Hong
V2	2026-04-29	Updated to address TCB's question	Yeonghwan Hong

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.

EUT DESCRIPTION: GSM/WCDMA/LTE/5G NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax/be, NFC, WPT, UWB and NB NTN

MODEL NUMBER: SM-F971U, SM-F971U1

SERIAL NUMBER: 9ac255adee507ece, 9ac30a91824d7ece, 9bb3df7c2c4f7ece, 9bb3df78484f7ece (CONDUCTED); R3GL10KMCMT, R3GL20D3TMF, R3GL20D3TNY, R3GL20D3P4X (RADIATED)

DATE TESTED: 2026-02-24 – 2026-04-17

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 96	Complies

UL KOREA LTD. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL KOREA LTD. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL KOREA LTD. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL KOREA LTD. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by IAS, any agency of the Federal Government, or any agency of any government.

Approved & Released For
UL KOREA LTD. By:

Tested By:



Seokhwan Hong
Suwon Lab Engineer
UL KOREA LTD.

Yeonghwan Hong
Suwon Lab Engineer
UL KOREA LTD.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with following methods.

1. FCC 47 CFR Part 2.
2. FCC 47 CFR Part 96.
3. ANSI TIA-603-E, 2016
4. ANSI C63.26, 2015
5. KDB 971168 D01 Power Meas License Digital Systems v03r01
6. KDB 412172 D01 Determining ERP and EIRP v01r01
7. KDB 940660 D01 Part 96 CBRS v03
8. WINNF-TS-0122-v1.0.2.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea. Line conducted emissions are measured only at the 218 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

218 Maeyeong-ro	
☒	Chamber 1(3m semi-anechoic chamber)
☒	Chamber 2(3m semi-anechoic chamber)
☐	Chamber 3(3m semi-anechoic chamber)
☒	Chamber 4(3m Full-anechoic chamber)
☐	Chamber 5(3m Full-anechoic chamber)

UL KOREA LTD. is accredited by IAS, Laboratory Code TL-637. The full scope of accreditation can be viewed at <https://www.iasonline.org/wp-content/uploads/2017/05/TL-637-cert-New.pdf>.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

$EIRP = SG \text{ reading with EUT worst orientation (dBm)} - \text{cable loss (between the SG and substitution antenna)} + \text{Substitution Antenna Factor (dBi)}$

$\text{For Radiated Spurious Emission (dBm)} = SA \text{ reading with EUT worst orientation (dBm)} + \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} + \text{Conversion Factor (dB)}$

$SA \text{ reading with EUT worst orientation (dBm)} = \text{Measured amplitude level (dBuV)} + 107$
 $\text{Conversion Factor} = 107 + 20 \log(D) - 104.8 = 107 + 9.54 - 104.8 = 11.74 \text{ dB}$
where D is the measurement distance (in the far field) in m

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	1.84 dB
Radiated Disturbance, 9 kHz to 30 MHz	2.41 dB
Radiated Disturbance, 30 MHz to 1 GHz	3.78 dB
Radiated Disturbance, 1 GHz to 18 GHz	5.25 dB
Radiated Disturbance, Above 18 GHz	5.07 dB

Uncertainty figures are valid to a confidence level of 95%.

4.4. DECISION RULE

Decision rule for statement(s) of conformity is based on Clause 4.3.3 in IEC Guide 115:2023.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a GSM/WCDMA/LTE/5G NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax/be, NFC, WPT, UWB and NB NTN. This test report addresses the WWAN Operational mode.

Representative model	Comparison Criteria	Derivative model
		SM-F971U1
SM-F971U	Hardware	Identical
	Software	UI modified according to Service Provider specifications

The SM-F971U model was used as the representative model for final testing. All test results in this report apply to both the representative model and its derivative variants.

The test utility software used during testing was WINNF-TS-0122 V1.0.2

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum average radiated EIRP output powers as follows:
Radiated samples were tested to a higher power than conducted resulting in radiated EIRP greater than conducted measurements.

LTE Band 48

FCC Part 96							
Band	Frequency Range	BandWidth	Modulation	Conducted Power (ANT E)		EIRP (ANT E)	
	[MHz]	[MHz]		Max. Power [dBm]	Max. Power [W]	Max. Power [dBm/10 MHz]	Max. Power [W/10 MHz]
Band 48	3560.00 - 3690.00	20	QPSK	23.38	0.218	20.70	0.117
			16QAM	22.45	0.176	19.49	0.089
			64QAM	21.41	0.138		
			256QAM	18.34	0.068		
	3557.50 - 3692.50	15	QPSK	23.41	0.219	20.29	0.107
			16QAM	22.39	0.173	19.55	0.090
			64QAM	21.36	0.137		
			256QAM	18.42	0.070		
	3555.00 - 3695.00	10	QPSK	23.40	0.219	20.38	0.109
			16QAM	22.35	0.172	19.79	0.095
			64QAM	21.38	0.137		
			256QAM	18.33	0.068		
	3552.50 - 3697.50	5	QPSK	23.40	0.219	20.58	0.114
			16QAM	22.50	0.178	19.78	0.095
			64QAM	21.42	0.139		
			256QAM	18.39	0.069		

LTE Band 48C (UL CA)

FCC Part 96							
Band	Frequency Range	BandWidth	Modulation	Conducted Power (ANT E)		EIRP (ANT E)	
	[MHz]	[MHz]		Max. Power [dBm]	Max. Power [W]	Max. Power [dBm/10 MHz]	Max. Power [W/10 MHz]
48C	3560.00 - 3690.00	40MHz (20MHz / 20MHz)	QPSK	23.37	0.217	21.04	0.127
			16QAM	22.44	0.175	20.10	0.102
	3557.50 - 3690.00	35MHz (15MHz / 20MHz)	QPSK	23.36	0.217		
			16QAM	22.42	0.175		
	3555.00 - 3690.00	30MHz (10MHz / 20MHz)	QPSK	23.36	0.217		
			16QAM	22.35	0.172		
	3552.50 - 3690.00	25MHz (5MHz / 20MHz)	QPSK	23.36	0.217		
			16QAM	22.43	0.175		

NR Band n48

FCC Part 96								
Band	Frequency Range	BandWidth	Modulation	Mode	Conducted Power (ANT E)		EIRP (ANT E)	
	[MHz]	[MHz]			Max. Power [dBm]	Max. Power [W]	Max. Power [dBm/10 MHz]	Max. Power [W/10 MHz]
n48	3570.00 - 3679.98	40	DFT-s OFDM	π/2 BPSK	24.45	0.279		
				QPSK	24.38	0.274	21.42	0.139
				16QAM	23.45	0.221	20.68	0.117
				64QAM	21.60	0.145		
				256QAM	19.71	0.094		
			CP-OFDM	QPSK	23.16	0.207		
				16QAM	22.50	0.178		
				64QAM	20.66	0.116		
				256QAM	17.73	0.059		
	3565.02 - 3684.99	30	DFT-s OFDM	π/2 BPSK	24.52	0.283		
				QPSK	24.41	0.276	21.24	0.133
				16QAM	23.51	0.224	20.25	0.106
				64QAM	21.65	0.146		
				256QAM	19.71	0.094		
			CP-OFDM	QPSK	23.05	0.202		
	3560.01 - 3690.00	20	DFT-s OFDM	π/2 BPSK	24.46	0.279		
				QPSK	24.62	0.290	21.35	0.136
				16QAM	23.50	0.224	20.42	0.110
				64QAM	21.53	0.142		
				256QAM	19.71	0.094		
			CP-OFDM	QPSK	23.00	0.200		
	3557.52 - 3692.49	15	DFT-s OFDM	π/2 BPSK	24.50	0.282		
				QPSK	24.40	0.275	21.74	0.149
				16QAM	23.53	0.225	20.43	0.110
				64QAM	21.74	0.149		
				256QAM	19.76	0.095		
			CP-OFDM	QPSK	23.09	0.204		
3555.00 - 3694.98	10	DFT-s OFDM	π/2 BPSK	24.62	0.290			
			QPSK	24.45	0.279	21.64	0.146	
			16QAM	23.54	0.226	21.07	0.128	
			64QAM	21.72	0.149			
			256QAM	19.87	0.097			
		CP-OFDM	QPSK	23.19	0.208			

NR Band n48 (SRS2, ANT A)

FCC Part 96						
Band	Frequency Range	BandWidth	Conducted Power (ANT A)		EIRP (ANT A)	
	[MHz]	[MHz]	Max. Power [dBm]	Max. Power [W]	Max. Power [dBm/10 MHz]	Max. Power [W/10 MHz]
n48	3570.00 - 3679.98	40	21.05	0.127		
	3565.02 - 3684.99	30	21.06	0.128		
	3560.00 - 3690.00	20	21.09	0.129		
	3557.52 - 3692.49	15	21.16	0.131		
	3555.00 - 3694.98	10	21.18	0.131	14.59	0.029

NR Band n48 (SRS3, ANT F)

FCC Part 96						
Band	Frequency Range	BandWidth	Conducted Power (ANT F)		EIRP (ANT F)	
	[MHz]	[MHz]	Max. Power [dBm]	Max. Power [W]	Max. Power [dBm/10 MHz]	Max. Power [W/10 MHz]
n48	3570.00 - 3679.98	40	21.53	0.142		
	3565.02 - 3684.99	30	21.48	0.141		
	3560.00 - 3690.00	20	21.42	0.139		
	3557.52 - 3692.49	15	21.49	0.141		
	3555.00 - 3694.98	10	21.54	0.143	21.96	0.157

NR Band n48 (SRS4, ANT C)

FCC Part 96						
Band	Frequency Range	BandWidth	Conducted Power (ANT C)		EIRP (ANT C)	
	[MHz]	[MHz]	Max. Power [dBm]	Max. Power [W]	Max. Power [dBm/10 MHz]	Max. Power [W/10 MHz]
n48	3570.00 - 3679.98	40	20.48	0.112		
	3565.02 - 3684.99	30	20.45	0.111		
	3560.00 - 3690.00	20	20.43	0.110		
	3557.52 - 3692.49	15	20.49	0.112		
	3555.00 - 3694.98	10	20.53	0.113	14.54	0.028

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a internal antenna for the supported bands with a maximum peak gain as follow:

Frequency (MHz)	ANT	Peak Gain (dBi)
LTE Band 48 / NR Band n48 3550 – 3700 MHz	E	-3.1
	A	-3.9
	F	-2.8
	C	-4.6

5.4. WORST-CASE ORIENTATION

Following modes should be considered as worst-case scenario for all other measurements.

- **LTE Band 48**
The worst-case scenario for all measurements is based on the average conducted output power measurement investigation results. Output power measurements were measured on QPSK, 16QAM, 64QAM and 256QAM modulations. It was found QPSK and 16QAM results were worst case.
- **NR Band n48**
The worst-case scenario for all measurements is based on the average conducted output power measurement investigation results. Output power measurements were performed for $\pi/2$ BPSK, QPSK, 16QAM, 64QAM, and 256QAM modulation.
The worst-case scenario was determined by distinguishing between PSK-based modulation ($\pi/2$ BPSK, QPSK) and QAM-based modulation (16QAM, 64QAM, 256QAM). Within each modulation group, QPSK and 16QAM showed the worst results.

NR Band	NSA	SA
N48	-	<u>Stand Alone</u>

- **SRS**
The worst-case bandwidth scenario is based on the average conducted output power measurement investigation results.

● Conducted Spurious Emission

Highest conducted output power setting for each bands						
LTE Band	ANT	Frequency (MHz)	Bandwidth (MHz)	Modulation	RB size	RB offset
48	E	3557.50	15	QPSK	1	37
		3625.00			1	0
		3692.50			1	37
NR Band	ANT	Frequency (MHz)	Bandwidth (MHz)	Modulation	RB size	RB offset
48	E	3560.01	20	DFT-s OFDM QPSK	1	49
		3624.99			1	49
		3690.00			1	26

● Uplink CA Conducted Spurious Emission

Highest conducted output power setting for each bands							
LTE Band	ANT	Component Carrier	Frequency (MHz)	Bandwidth (MHz)	Modulation	RB size	RB offset
48C	E	PCC	3560.00	20+20	QPSK + QPSK	1	99
		SCC	3579.80			1	0
		PCC	3615.10			1	99
		SCC	3634.90			1	0
		PCC	3670.20			1	99
		SCC	3690.00			1	0

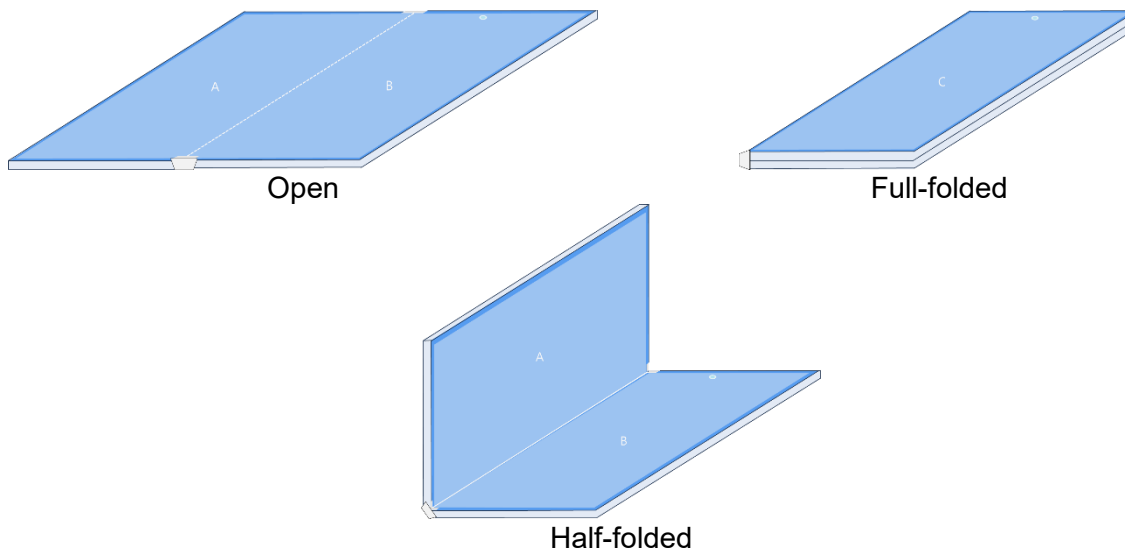
● Radiated Spurious Emission

Highest EIRP setting for each bands						
LTE Band	ANT	Frequency (MHz)	Bandwidth (MHz)	Modulation	RB size	RB offset
48	E	3560.00	20	QPSK	1	49
		3625.00			1	49
		3690.00			1	49
NR Band	ANT	Frequency (MHz)	Bandwidth (MHz)	Modulation	RB size	RB offset
48	E	3557.52	15	DFT-s OFDM QPSK	1	36
		3624.99			1	36
		3692.49			1	1
48 (SRS2)	A	3555.00	10	-	-	-
		3624.99			-	-
		3694.98			-	-
48 (SRS3)	F	3555.00	10	-	-	-
		3624.99			-	-
		3694.98			-	-
48 (SRS4)	C	3555.00	10	-	-	-
		3624.99			-	-
		3694.98			-	-

● Uplink CA Radiated Spurious Emission

Highest EIRP setting for each bands							
LTE Band	ANT	Component Carrier	Frequency (MHz)	Bandwidth (MHz)	Modulation	RB size	RB offset
48C	E	PCC	3560.00	20+20	QPSK + QPSK	1	99
		SCC	3579.80			1	0
		PCC	3615.10			1	99
		SCC	3634.90			1	0
		PCC	3670.20			1	99
		SCC	3690.00			1	0

The fundamental and radiated spurious emission were investigated in three orthogonal orientations X, Y and Z and folded conditions it was determined that below orientation was worst-case orientation for each band.



Band	ANT	ERP			RSE		
		X	Y	Z	X	Y	Z
LTE B48	E	Half-folded	-	-	-	-	Half-folded
LTE ULCA 48C	E	Open	-	-	Open	-	-
NR n48	E	Half-folded	-	-	Half-folded	-	-
	A(SRS2)	-	-	Open	-	-	Open
	F(SRS3)	Open	-	-	Open	-	-
	C(SRS4)	Open	-	-	Open	-	-

Note1 : For the radiated spurious testing, the EUT attached with travel adapter for the worst case condition. The EUT is continuously communicated with the call box during the tests.

Note2 : Antenna switching-related actions according to foldable conditions were force operated and tested in factory mode.

Note 3: In this report, HF and FF denote Half-folded and Full-folded configurations, respectively.

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacture	Model	Serial Number	FCC ID
Charger	SAMSUNG	EP-TA800	R37N3FS0G88DK3	N/A
Data Cable	SAMSUNG	N/A	N/A	N/A

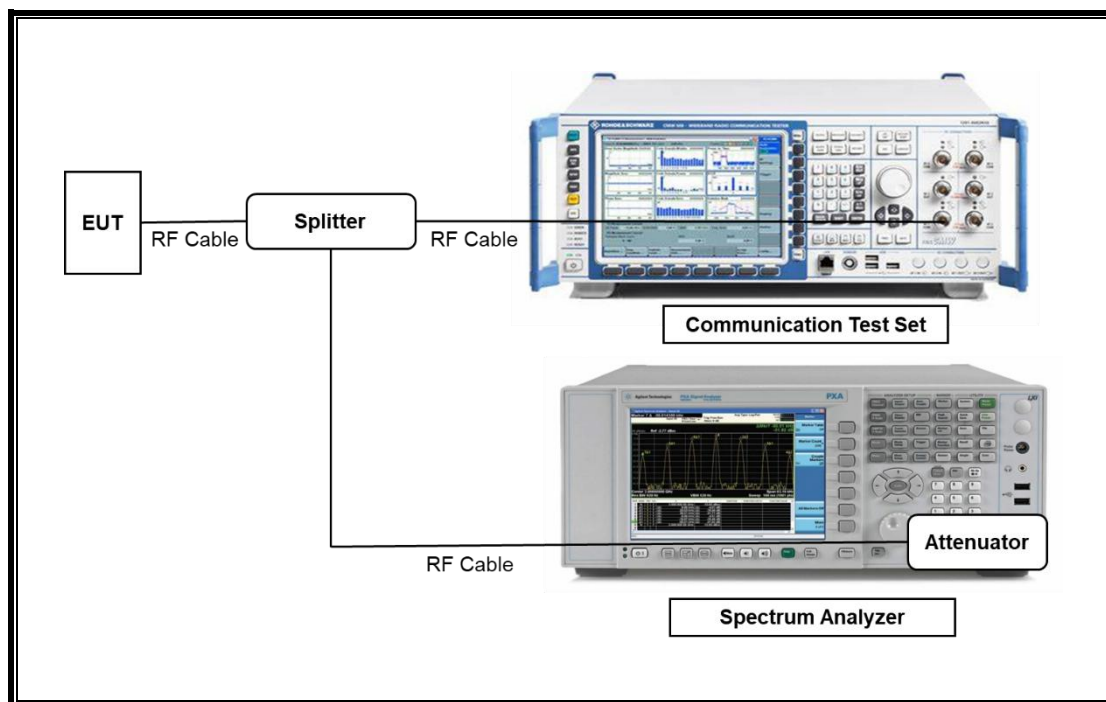
I/O CABLE

I/O Cable List						
Cable No.	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	C Type	Shielded	1.0 m	N/A

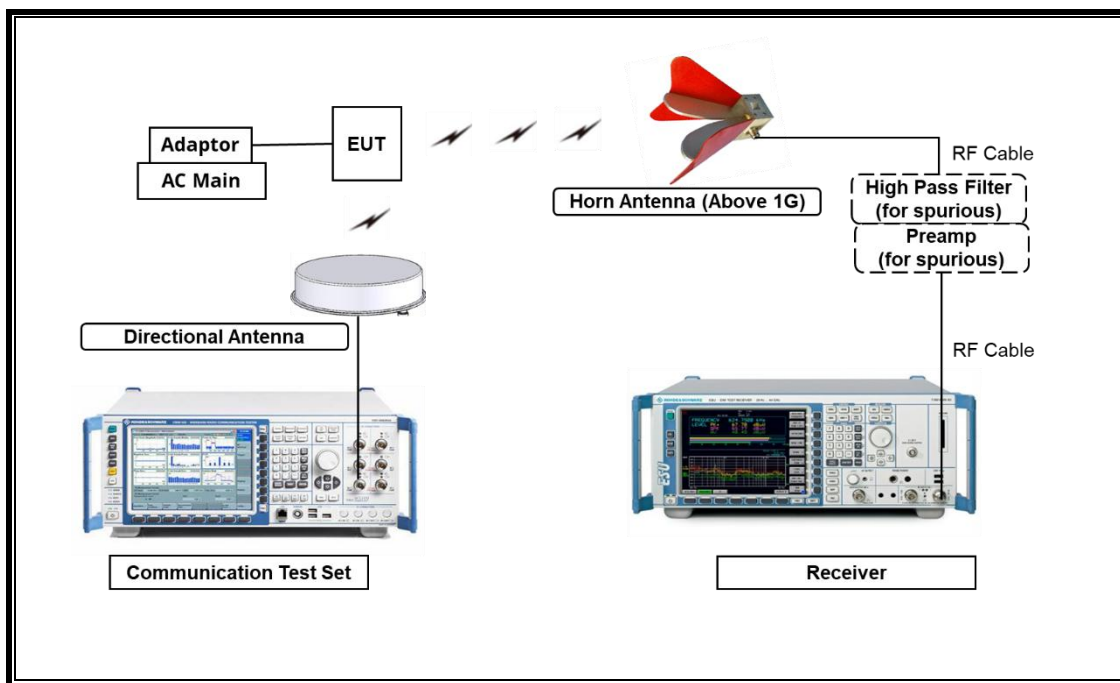
TEST SETUP

The EUT is continuously communicated with the call box during the tests.

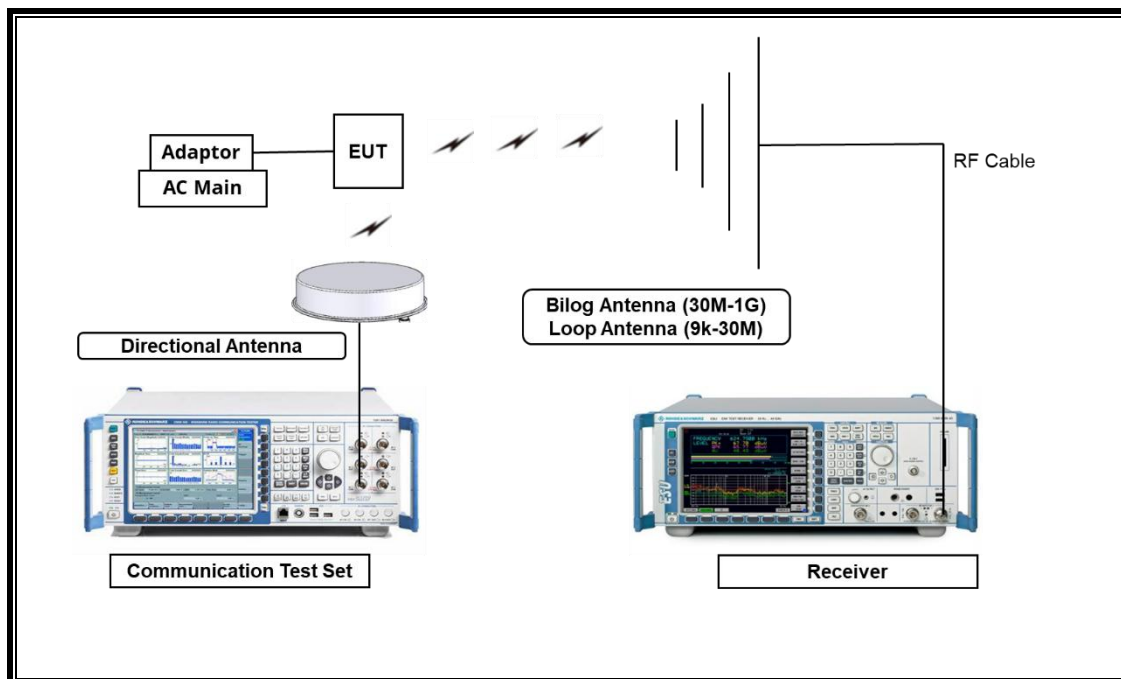
SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)



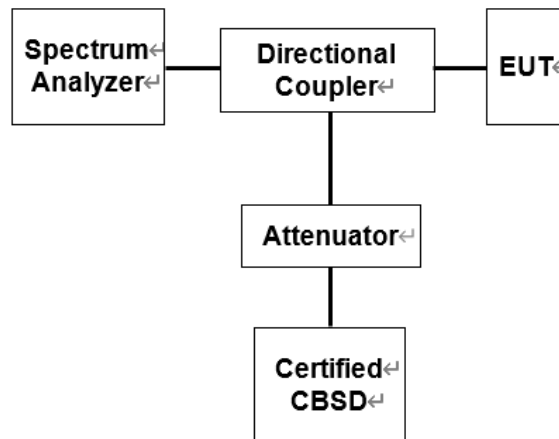
SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP) Above 1G



SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP) Below 1G



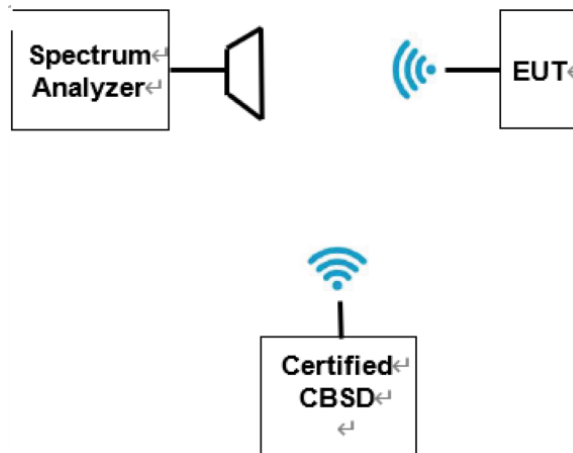
SETUP DIAGRAM FOR TESTS (LTE B48 CBSD TEST SETUP)



Remarks:

Certified CBSD – FCC ID: 2AS48SC-220
Connection between Certified CBSD and EUT is conducted method.
EUT is an End User Device (EUD)

SETUP DIAGRAM FOR TESTS (5G NR n48 CBSD TEST SETUP)



Remarks:

Certified CBSD – FCC ID: PIDAS2900
Connection between Certified CBSD and EUT is radiated method.
EUT is an End User Device (EUD)

6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment List				
Description	Manufacturer	Model	S/N	Cal Due
Antenna, Tuned Dipole 400~1000 MHz	ETS	3121D DB-4	00164753	2027-01-08
Directional Antenna	Cobham	FPA3-0.8-6.0R/1329	110367-0003	N/A
Directional Antenna	Cobham	FPA3-0.8-6.0R/1329	80108-0004	N/A
Antenna, Horn, 40 GHz	ETS	3116C	00166155	2026-07-23
Antenna, Horn, 40 GHz	ETS	3116C	00168645	2027-07-23
Preamplifier	ETS	3116C-PA	00168841	2026-07-28
Antenna, Horn, 18 GHz	ETS	3115	00167211	2026-07-17
Antenna, Horn, 18 GHz	ETS	3115	00161451	2026-07-17
Antenna, Horn, 18 GHz	ETS	3117	00168724	2026-07-17
Antenna, Horn, 18 GHz	ETS	3117	00168717	2026-07-17
Communications Test Set	R&S	CMW500	169797	2026-07-21
DC Power Supply	Agilent / HP	E3640A	MY54226395	2026-07-23
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	2029169	2026-07-21
Preamplifier, 18 GHz	B&Z Technologies, LLC	BZR-01001800-231040-182020	28451	2026-07-21
Preamplifier, 18 GHz	B&Z Technologies, LLC	BZR-01001800-231040-181515	23576	2026-07-22
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54170614	2026-07-21
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54490312	2026-12-29
Spectrum Analyzer, 44 GHz	KEYSIGHT	N9030B	MY57143717	2026-07-21
EMI Test Receive, 40 GHz	R&S	ESU40	100439	2026-07-21
EMI Test Receive, 40 GHz	R&S	ESU40	100457	2026-07-21
High Pass Filter 4GHz	Micro-Tronics	HPM50118-02	G001	2026-07-23
High Pass Filter 4GHz	Micro-Tronics	HPM50118-02	G002	2026-07-23
Attenuator	PASTERNAK	PE7087-10	A009	2026-07-22
Attenuator	PASTERNAK	PE7087-10	A001	2026-07-22
Attenuator	PASTERNAK	PE7087-10	A008	2026-07-22
Attenuator	PASTERNAK	PE7004-10	2	2026-07-22
Attenuator	PASTERNAK	PE7395-10	A011	2026-07-22
Temperature Chamber	ESPEC	SH-642	93001109	2026-07-21
Power Splitter	MINI-CIRCUITS	WA1534	UL003	2026-12-29
Power Splitter	MINI-CIRCUITS	WA1534	UL004	2027-01-06
UXM 5G Wireless Test Platform	KEYSIGHT	E7515B	MY57510655	2026-12-30
UL Software				
Description	Manufacturer	Model	Version	
Antenna port test software	UL	CLT	Ver 3.4	
Antenna port test software (5G NR FR1)	UL	UL iM	Ver 1.06	
CBSD Test Equipment List				
Description	Manufacturer	Model	S/N	Cal Due
Spectrum Analyzer, EXA	Agilent (Keysight) Technologies	N9010A	MY54200580	2026-07-21
Step Attenuator	Keysight	8494B	MY42155321	2026-07-22
Directional Coupler	KRYTAR	1850	164429	2026-07-23
CBSD support software and equipment				
Description	Manufacturer	Model	Version	
Laptop (SAS – WINNForum Test Harness)	SAMSUNG	NT550XDA-KC58G	Ver 2.0	
Laptop for n48 CBSD connection	HP	HP EliteBook 830 G5	-	
Laptop for n48 CBSD connection	DELL	Latitude 5520	-	

7. SUMMARY TABLE

FCC Part Section	Test Description	Test Limit	Test Condition	Test Result
2.1049	Occupied Bandwidth(99%)	N/A	Conducted	Complies
2.1046	Conducted output power	N/A		Complies
2.1051 96.41(e)(1)(ii)	Out of band emissions	Section 8.3 & 8.4		Complies
2.1055	Frequency Stability	Fundamental emissions stay within authorized frequency block		Complies
96.47	End user device additional requirements (CBSD Protocol)	Section 8.7		Complies
96.41(b)	Equivalent Isotropic Radiated Power	23 dBm /10 MHz	Radiated	Complies
2.1053 96.41(e)	Radiated Spurious Emission	-40 dBm/MHz		Complies

8. CONDUCTED RESULTES

8.1. CONDUCTED AND EIRP VERIFICATION

Test Procedurer

Per KDB 971168 D01 Power Meas License Digital Systems v03r01;
The transmitter output was connected to either CMW500 Test Set or E7515B Test set and configured to operate at maximum power.

NOTE1

LTE, 5G NR : Conducted output power has been verified across Low, Mid, and High channels for each resource block configuration. Compliance of MPR (Maximum Power Reduction) and Tune-up limits has also been confirmed. Therefore, representative measurements at 1 RB and Full RB configurations are reported for each channel.

NOTE2

5G NR: All Waveforms (CP-OFDM vs DFT-s_OFDM) and modulations ($\pi/2$ BPSK, QPSK, 16QAM, 64QAM, 256QAM) were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

RESULTS

EUT includes different power levels for head use configuration and body use configuration and the below tables contain the highest of all configurations average conducted output powers as follows:

8.1.1. CONDUCTED AVERAGE OUTPUT POWER

LTE Band 48 (ANT E)

BW (MHz)	Mode	RB Allocation	RB offset	55340	55990	56640
				3560.00 MHz	3625.00 MHz	3690.00 MHz
20 MHz	QPSK	1	0	23.20	23.33	23.22
		1	49	23.27	23.38	23.38
		1	99	23.19	23.26	23.11
		100	0	22.18	22.22	22.13
	16QAM	1	0	22.10	22.07	22.07
		1	49	22.04	22.19	22.45
		1	99	21.97	22.12	21.91
		100	0	21.09	21.31	21.22
	64QAM	1	0	21.16	21.26	21.29
		1	49	21.02	21.41	21.14
		1	99	21.20	21.35	21.22
		100	0	20.15	20.25	20.24
	256QAM	1	0	18.11	18.12	18.26
		1	49	18.23	18.34	18.29
		1	99	18.03	18.24	18.22
		100	0	18.11	18.25	18.27
BW (MHz)	Mode	RB Allocation	RB offset	55315	55990	56665
				3557.50 MHz	3625.00 MHz	3692.50 MHz
15 MHz	QPSK	1	0	23.14	23.40	23.27
		1	37	23.27	23.34	23.41
		1	74	23.07	23.24	23.20
		75	0	22.16	22.37	22.09
	16QAM	1	0	22.17	22.31	22.03
		1	37	22.23	22.27	22.39
		1	74	22.12	22.08	22.13
		75	0	21.23	21.32	21.30
	64QAM	1	0	21.19	21.30	21.19
		1	37	21.30	21.36	21.22
		1	74	21.08	21.22	21.29
		75	0	20.25	20.31	20.27
	256QAM	1	0	18.21	18.23	18.20
		1	37	18.08	18.42	18.32
		1	74	18.39	17.91	18.19
		75	0	18.11	18.24	18.27

BW (MHz)	Mode	RB Allocation	RB offset	55290	55990	56690
				3555.00 MHz	3625.00 MHz	3695.00 MHz
10 MHz	QPSK	1	0	23.25	23.31	23.32
		1	25	23.20	23.40	23.27
		1	49	23.13	23.23	23.30
		50	0	22.04	22.21	22.25
	16QAM	1	0	22.29	22.20	22.27
		1	25	22.11	22.31	22.35
		1	49	22.21	22.20	22.24
		50	0	21.07	21.22	21.26
	64QAM	1	0	21.10	21.30	21.34
		1	25	21.28	21.38	21.31
		1	49	21.36	21.26	21.23
		50	0	20.19	20.29	20.34
	256QAM	1	0	18.18	18.21	18.10
		1	25	18.06	18.20	18.33
		1	49	18.16	18.26	18.02
		50	0	18.08	18.26	18.19
BW (MHz)	Mode	RB Allocation	RB offset	55265	55990	56715
				3552.50 MHz	3625.00 MHz	3697.50 MHz
5 MHz	QPSK	1	0	23.10	23.21	23.03
		1	12	23.21	23.40	23.27
		1	24	23.07	23.15	23.08
		25	0	22.14	22.23	22.26
	16QAM	1	0	22.03	22.31	22.14
		1	12	22.16	22.50	22.31
		1	24	22.06	22.35	22.05
		25	0	21.16	21.28	21.25
	64QAM	1	0	21.24	21.29	21.36
		1	12	21.30	21.40	21.42
		1	24	21.19	21.37	21.37
		25	0	20.29	20.34	20.38
	256QAM	1	0	18.15	18.38	18.39
		1	12	18.16	18.32	18.34
		1	24	18.20	18.24	18.30
		25	0	18.15	18.33	18.28

LTE Band 48C (UL CA) (ANT E)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average Power (dBm)	
			Size	Offset	Size	Offset	QPSK	16QAM
40MHz (20MHz / 20MHz)	3560.00	3579.80	1	99	1	0	23.37	22.44
			1	0	1	99	14.73	14.77
			100	0	100	0	21.30	20.39
	3615.10	3634.90	1	99	1	0	23.28	22.36
			1	0	1	99	14.72	14.74
			100	0	100	0	21.36	20.34
	3670.20	3690.00	1	99	1	0	23.26	22.19
			1	0	1	99	14.68	14.58
			100	0	100	0	21.41	20.42

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average Power (dBm)	
			Size	Offset	Size	Offset	QPSK	16QAM
35MHz (15MHz / 20MHz)	3557.50	3574.60	1	74	1	0	23.35	22.42
			1	0	1	99	14.83	14.77
			75	0	100	0	21.30	20.28
	3615.20	3632.30	1	74	1	0	23.36	22.39
			1	0	1	99	14.87	14.93
			75	0	100	0	21.33	20.37
	3672.90	3690.00	1	74	1	0	23.34	22.28
			1	0	1	99	14.78	14.73
			75	0	100	0	21.27	20.30

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average Power (dBm)	
			Size	Offset	Size	Offset	QPSK	16QAM
30MHz (10MHz / 20MHz)	3555.00	3569.40	1	49	1	0	23.36	22.28
			1	0	1	99	14.91	14.74
			50	0	100	0	21.31	20.30
	3615.40	3629.80	1	49	1	0	23.36	22.35
			1	0	1	99	14.78	14.87
			50	0	100	0	21.33	20.31
	3675.60	3690.00	1	49	1	0	23.33	22.15
			1	0	1	99	14.79	14.91
			50	0	100	0	21.40	20.38

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average Power (dBm)	
			Size	Offset	Size	Offset	QPSK	16QAM
25MHz (5MHz / 20MHz)	3552.50	3564.20	1	24	1	0	23.29	22.36
			1	0	1	99	14.81	14.79
			25	0	100	0	21.26	20.24
	3615.60	3627.30	1	24	1	0	23.35	22.38
			1	0	1	99	14.84	14.73
			25	0	100	0	21.34	20.29
	3678.30	3690.00	1	24	1	0	23.36	22.43
			1	0	1	99	14.89	14.72
			25	0	100	0	21.23	20.21

NR Band n48 (ANT E)

BW (MHz)	Modulation	Mode	RB Allocation	RB offset	638000	641666	645332
					3570.00 MHz	3624.99 MHz	3679.98 MHz
40 MHz	DFT-s-OFDM	$\pi/2$ BPSK	1	0	23.32	23.78	23.82
			1	1	23.91	24.38	24.45
			1	52	24.08	24.28	24.24
			1	104	24.24	24.40	24.24
			1	105	23.60	23.82	23.62
			100	0	23.60	23.93	23.98
		QPSK	1	0	22.81	23.19	23.33
			1	1	23.83	24.33	24.38
			1	52	23.98	24.17	24.17
			1	104	24.14	24.36	24.14
			1	105	23.09	23.24	23.02
			100	0	23.09	23.35	23.37
		16QAM	1	0	22.04	22.37	22.40
			1	1	22.83	23.45	23.45
			1	52	22.84	23.16	23.24
			1	104	23.06	23.40	23.17
			1	105	22.24	22.42	22.22
			100	0	22.03	22.32	22.26
		64QAM	1	1	21.09	21.57	21.60
		256QAM	1	1	19.20	19.54	19.71
	CP-OFDM	QPSK	1	0	21.06	21.66	21.62
			1	1	22.64	22.98	23.16
			1	52	22.65	22.93	22.91
			1	104	22.75	23.10	22.81
			1	105	21.19	21.60	21.29
			100	0	21.18	21.41	21.34
		16QAM	1	0	21.14	21.31	21.53
			1	1	22.00	22.50	22.43
			1	52	22.18	22.28	22.25
			1	104	22.20	22.30	22.10
			1	105	21.29	21.39	21.17
			100	0	21.12	21.36	21.31
		64QAM	1	1	20.09	20.66	20.61
		256QAM	1	1	17.32	17.72	17.73
BW (MHz)	Modulation	Mode	RB Allocation	RB offset	637668	641666	645666
					3565.02 MHz	3624.99 MHz	3684.99 MHz
30 MHz	DFT-s-OFDM	$\pi/2$ BPSK	1	0	23.39	23.82	23.89
			1	1	24.02	24.50	24.52
			1	39	24.08	24.37	24.36
			1	76	24.33	24.52	24.40
			1	77	23.62	23.90	23.77
			75	0	23.65	24.02	23.94
		QPSK	1	0	22.87	23.24	23.29
			1	1	23.92	24.35	24.36
			1	39	23.94	24.25	24.28
			1	76	24.18	24.41	24.27
			1	77	23.17	23.35	23.13
			75	0	23.12	23.46	23.38
		16QAM	1	1	22.92	23.49	23.34
			1	39	23.00	23.30	23.13
			1	76	23.26	23.51	23.23
		64QAM	1	1	21.27	21.65	21.59
		256QAM	1	1	19.32	19.71	19.68
	CP-OFDM	QPSK	1	1	22.67	23.05	23.03

BW (MHz)	Modulation	Mode	RB Allocation	RB offset	637333	641666	646000
					3560.00 MHz	3624.99 MHz	3690.00 MHz
20 MHz	DFT-s-OFDM	$\pi/2$ BPSK	1	0	23.42	23.92	23.82
			1	1	24.03	24.46	24.44
			1	26	24.08	24.44	24.41
			1	49	24.16	24.40	24.30
			1	50	23.52	23.83	23.68
			50	0	23.65	24.00	23.97
		QPSK	1	0	22.90	23.24	23.17
			1	1	23.93	24.28	24.25
			1	26	23.92	24.31	24.32
			1	49	24.05	24.62	24.24
			1	50	22.89	23.20	23.16
			50	0	23.14	23.48	23.35
		16QAM	1	1	23.12	23.50	23.34
			1	26	22.95	23.33	23.25
			1	49	22.99	23.49	23.24
		64QAM	1	1	21.13	21.53	21.53
		256QAM	1	1	19.30	19.71	19.63
	CP-OFDM	QPSK	1	1	22.60	22.98	23.00
BW (MHz)	Modulation	Mode	RB Allocation	RB offset	637168	641666	646166
					3557.52 MHz	3624.99 MHz	3692.49 MHz
15 MHz	DFT-s-OFDM	$\pi/2$ BPSK	1	0	23.57	23.94	23.93
			1	1	24.05	24.50	24.50
			1	19	24.08	24.47	24.33
			1	36	24.33	24.50	24.46
			1	37	23.64	23.94	23.78
			36	0	23.63	24.06	23.95
		QPSK	1	0	22.87	23.30	23.33
			1	1	23.94	24.38	24.36
			1	19	23.94	24.32	24.21
			1	36	24.09	24.40	24.26
			1	37	23.12	23.34	23.23
			36	0	23.16	23.55	23.39
		16QAM	1	1	22.96	23.53	23.28
			1	19	23.03	23.36	23.30
			1	36	23.19	23.35	23.32
		64QAM	1	1	21.27	21.74	21.60
		256QAM	1	1	19.30	19.76	19.72
	CP-OFDM	QPSK	1	1	22.69	23.09	23.08
BW (MHz)	Modulation	Mode	RB Allocation	RB offset	637000	641666	646332
					3555.00 MHz	3624.99 MHz	3694.98 MHz
10 MHz	DFT-s-OFDM	$\pi/2$ BPSK	1	0	23.51	23.92	23.82
			1	1	24.10	24.62	24.49
			1	12	24.11	24.57	24.45
			1	22	24.23	24.48	24.43
			1	23	23.55	23.83	23.76
			24	0	23.61	24.02	23.97
		QPSK	1	0	22.91	23.35	23.23
			1	1	23.94	24.45	24.33
			1	12	23.96	24.39	24.34
			1	22	24.05	24.43	24.34
			1	23	22.95	23.26	23.27
			24	0	23.13	23.43	23.44
		16QAM	1	1	23.00	23.54	23.33
			1	12	22.90	23.27	23.39
			1	22	23.10	23.45	23.37
		64QAM	1	1	21.19	21.72	21.59
		256QAM	1	1	19.36	19.87	19.72
	CP-OFDM	QPSK	1	1	22.82	23.19	23.05

NR Band n48 (SRS2 (ANT A) / SRS3 (ANT F) / SRS4 (ANT C))

Maximum Average Power (dBm) SRS2			Tune-up Limit	Maximum Average Power (dBm) SRS3			Tune-up Limit	Maximum Average Power (dBm) SRS4			Tune-up Limit
			22.5				23.0				22.0
BW (MHz)	RB Allocation	RB offset	MPR	BW (MHz)	RB Allocation	RB offset	MPR	BW (MHz)	RB Allocation	RB offset	MPR
	1	1	0.0		1	1	0.0		1	1	0.0
Measured Pwr (dBm)				Measured Pwr (dBm)				Measured Pwr (dBm)			
40 MHz	638000	641666	645332	40 MHz	638000	641666	645332	40 MHz	638000	641666	645332
	3570.00 MHz	3624.99 MHz	3679.98 MHz		3570.00 MHz	3624.99 MHz	3679.98 MHz		3570.00 MHz	3624.99 MHz	3679.98 MHz
	21.05	20.34	20.31		21.53	20.81	21.03		20.48	19.91	19.84
30 MHz	637668	641666	645666	30 MHz	637668	641666	645666	30 MHz	637668	641666	645666
	3565.02 MHz	3624.99 MHz	3684.99 MHz		3565.02 MHz	3624.99 MHz	3684.99 MHz		3565.02 MHz	3624.99 MHz	3684.99 MHz
	21.06	20.31	20.33		21.48	20.80	21.09		20.45	19.85	19.88
20 MHz	637334	641666	646000	20 MHz	637334	641666	646000	20 MHz	637334	641666	646000
	3560.01 MHz	3624.99 MHz	3690.00 MHz		3560.01 MHz	3624.99 MHz	3690.00 MHz		3560.01 MHz	3624.99 MHz	3690.00 MHz
	21.09	20.24	20.38		21.42	20.79	21.11		20.43	19.81	19.91
15 MHz	637168	641666	646166	15 MHz	637168	641666	646166	15 MHz	637168	641666	646166
	3557.52 MHz	3624.99 MHz	3692.49 MHz		3557.52 MHz	3624.99 MHz	3692.49 MHz		3557.52 MHz	3624.99 MHz	3692.49 MHz
	21.16	20.25	20.31		21.49	20.75	21.18		20.49	19.80	19.87
10 MHz	637000	641666	646332	10 MHz	637000	641666	646332	10 MHz	637000	641666	646332
	3555.00 MHz	3624.99 MHz	3694.98 MHz		3555.00 MHz	3624.99 MHz	3694.98 MHz		3555.00 MHz	3624.99 MHz	3694.98 MHz
	21.18	20.23	20.43		21.54	20.72	21.29		20.53	19.78	19.85

8.2. OCCUPIED BANDWIDTH

RULE PART(S)

FCC: §2.1049

LIMITS

For reporting purposes only

TEST PROCEDURE

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The occupied bandwidth was measured with the spectrum analyzer at the low, middle and high channel in each band. The -26dB bandwidth was also measured and recorded.

(KDB 971168 D01 Power Meas License Digital Systems v03r01)

OCCUPIED BANDWIDTH RESULTS

See the following pages.

- LTE Band 48 (ANT E)

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B48	20M	QPSK	3625.00	17.912	19.110
		16QAM		17.893	19.580
	15M	QPSK		13.436	14.510
		16QAM		13.403	14.390
	10M	QPSK		8.974	9.657
		16QAM		8.954	9.809
	5M	QPSK		4.483	5.054
		16QAM		4.488	5.160

- LTE Band 48C (UL CA) (ANT E)

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B48	20+20M	QPSK	3625.00	37.459	39.000
		16QAM		37.508	39.010
	15+20M	QPSK		32.771	33.730
		16QAM		32.449	34.260
	10+20M	QPSK		27.832	28.780
		16QAM		27.763	28.960
	5+20M	QPSK		22.927	23.760
		16QAM		22.871	23.920

- NR Band n48 (ANT E)

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
NR n48	40M	QPSK	3624.99	37.863	39.930
		16QAM		37.734	40.080
	30M	QPSK		27.839	29.260
		16QAM		27.881	29.510
	20M	QPSK		18.256	19.810
		16QAM		18.306	19.380
	15M	QPSK		13.635	15.200
		16QAM		13.621	14.580
	10M	QPSK		8.626	11.870
		16QAM		8.625	9.693

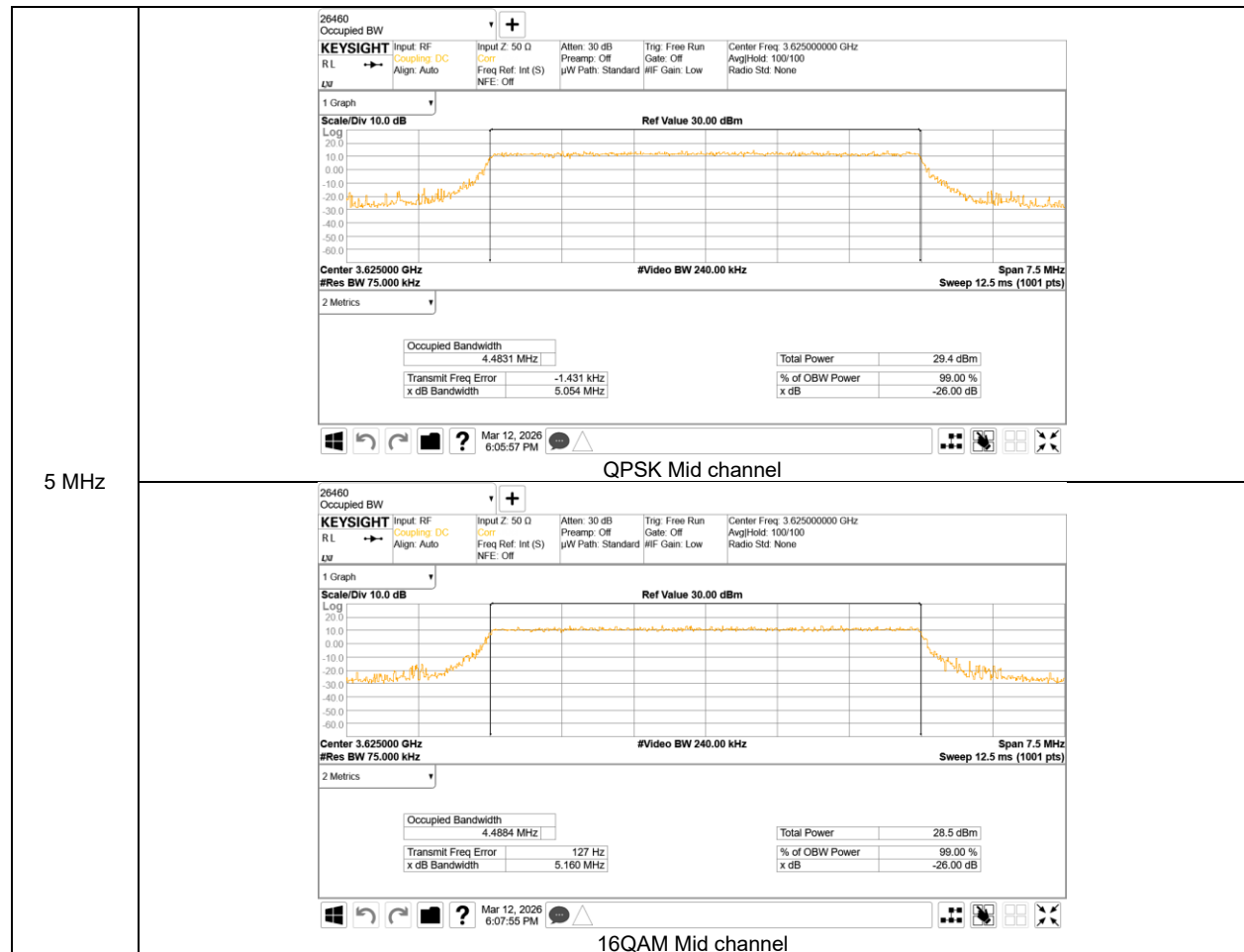
8.2.1. OCCUPIED BANDWIDTH RESULT

LTE Band 48

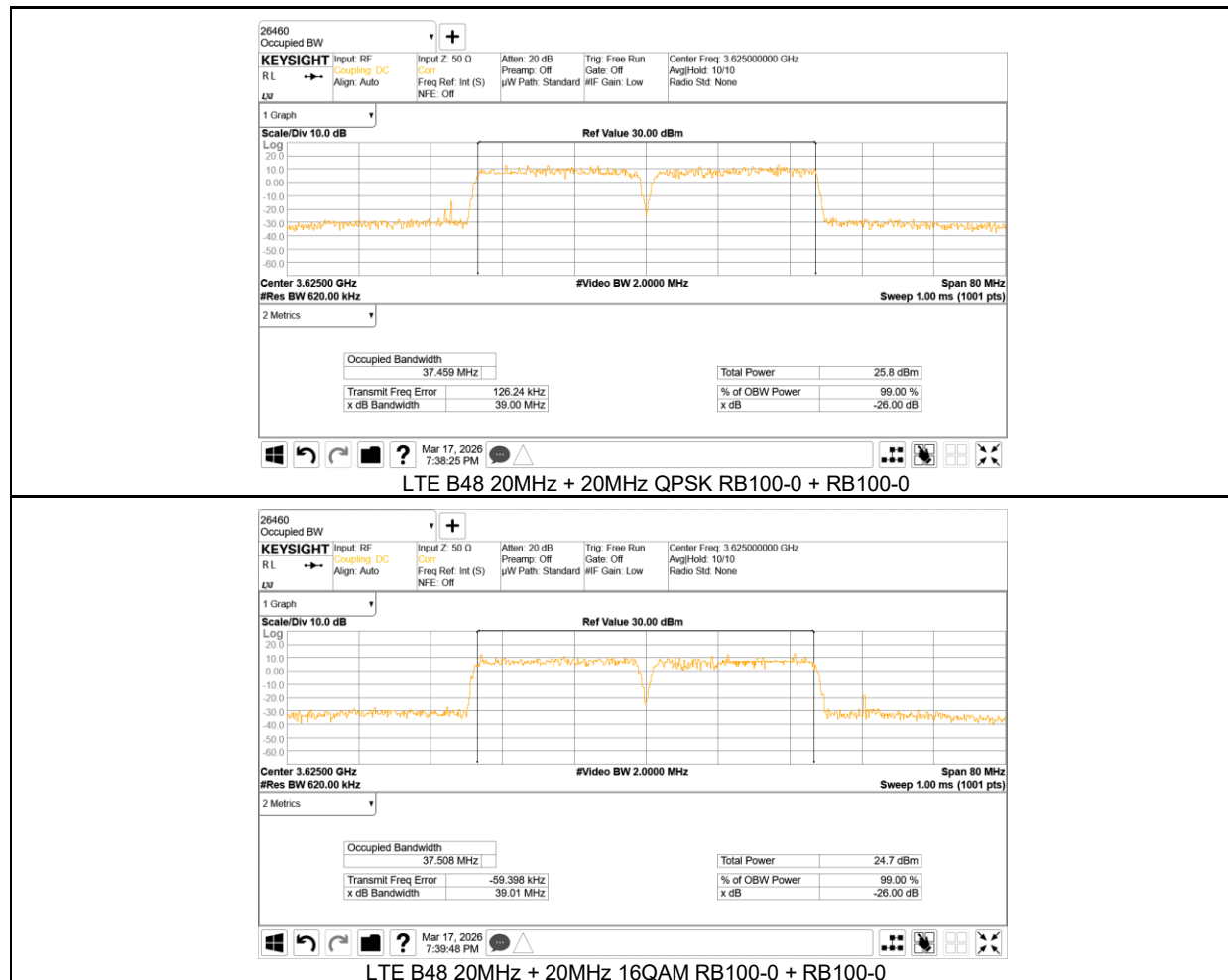


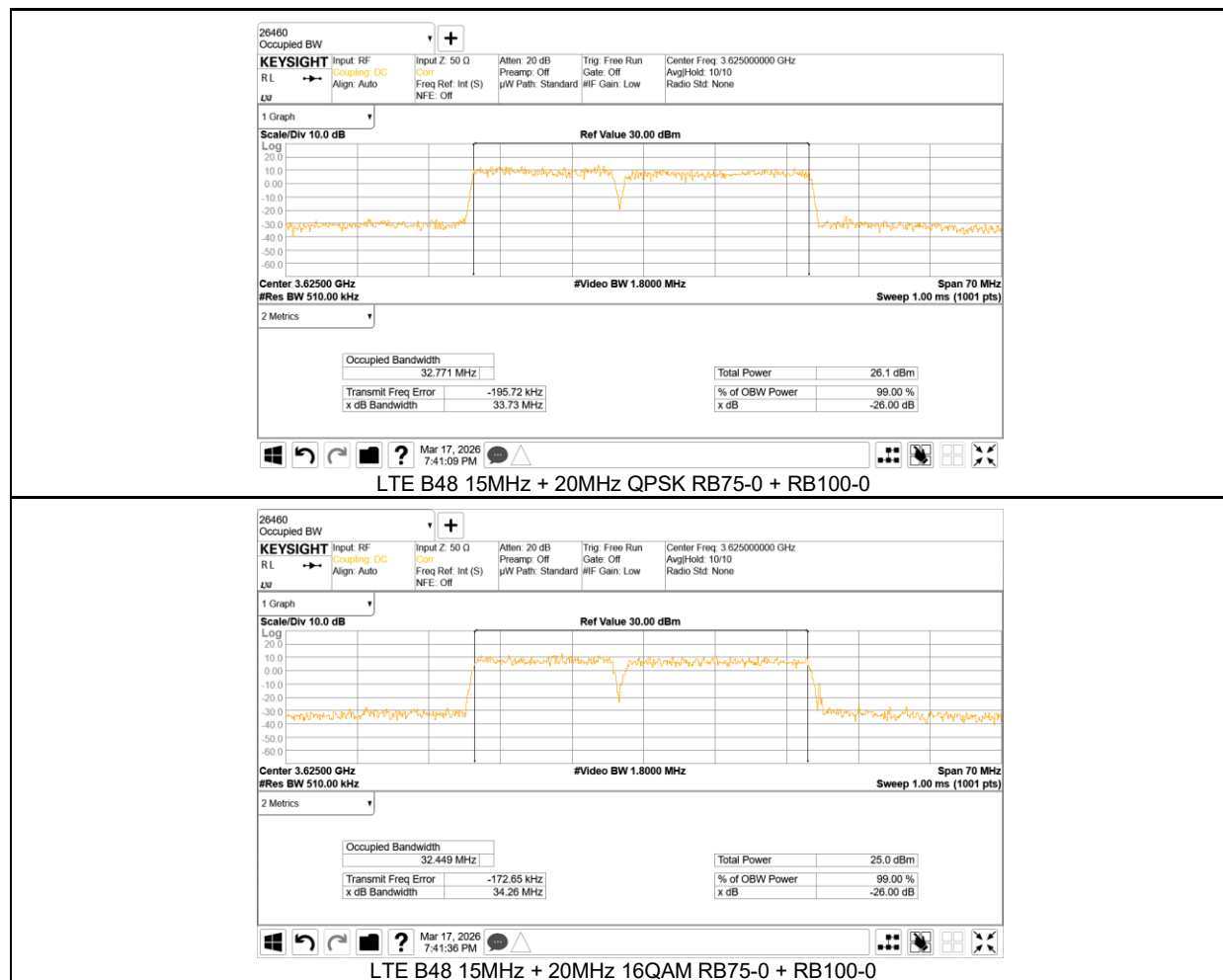




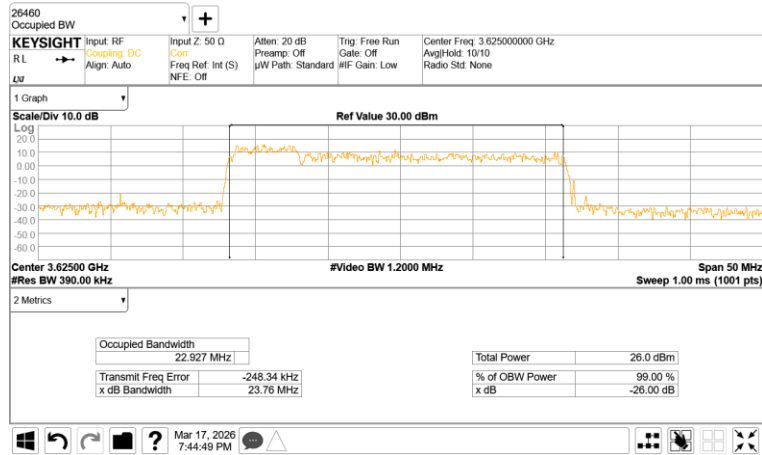


LTE Band 48C (UL CA)

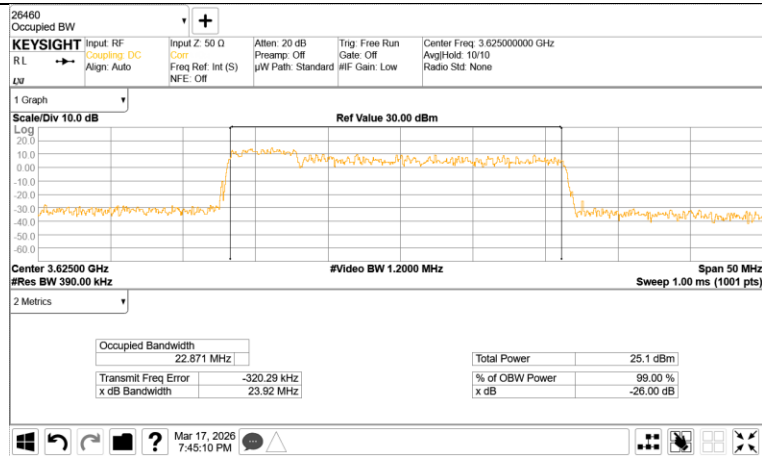






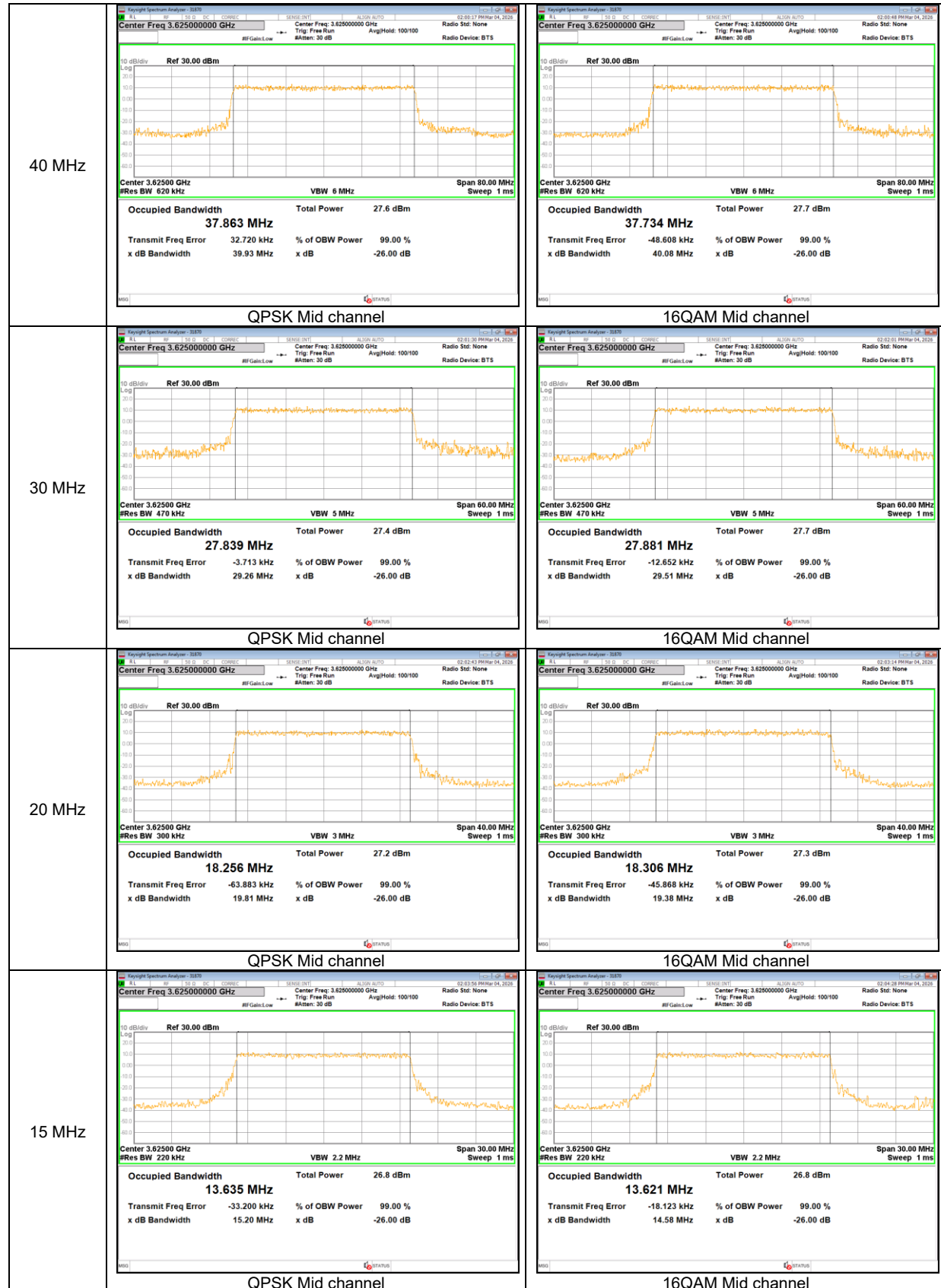


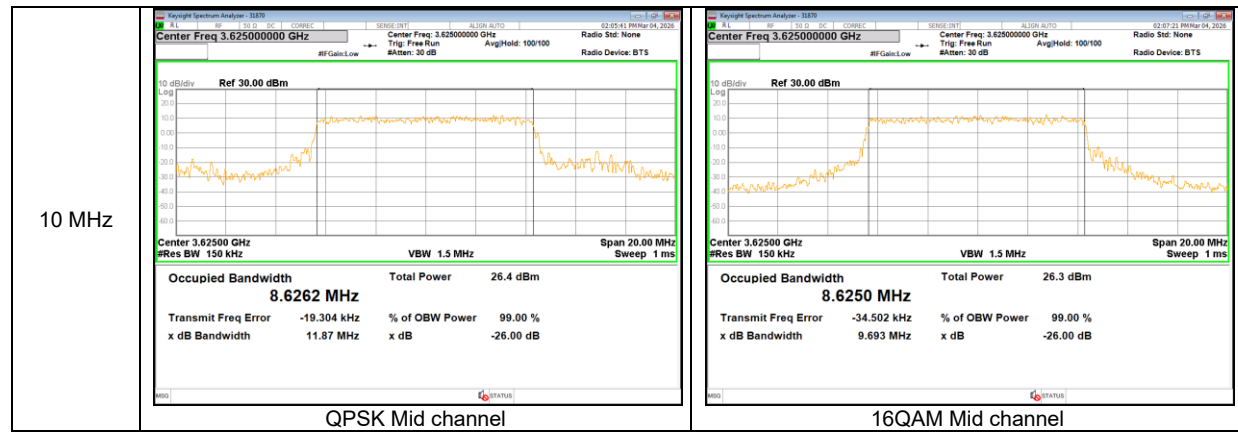
LTE B48 5MHz + 20MHz QPSK RB50-0 + RB100-0



LTE B48 5MHz + 20MHz 16QAM RB50-0 + RB100-0

NR Band n48 CP-OFDM





8.3. BAND EDGE EMISSIONS

RULE PART(S)

FCC: §2.1051 and §96.41(e)(1) (ii) & (e)(2).

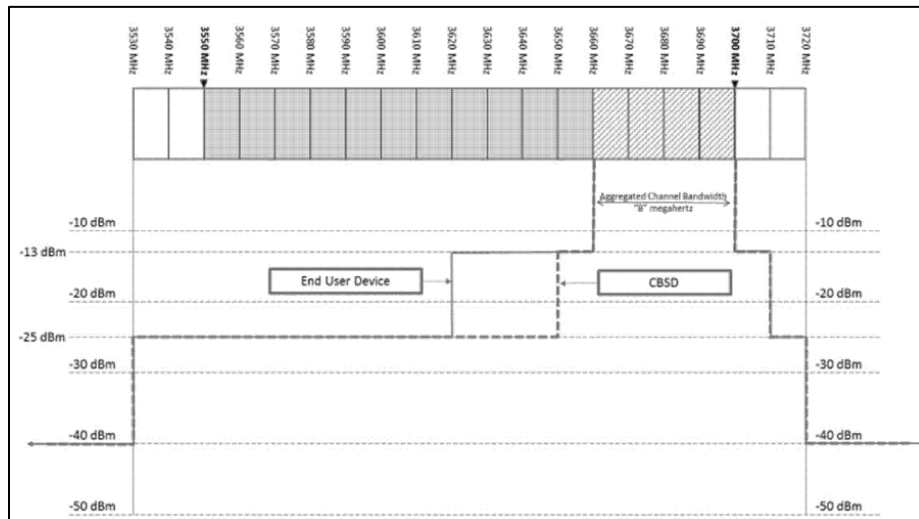
LIMITS

§96.41

(e)(1) (ii) For channel and frequency assignments made by a CBSD to End User Devices, the conducted power of any End User Device emission outside the fundamental emission (whether in or outside of the authorized band) shall not exceed -13 dBm/MHz within 0 to B megahertz (where B is the bandwidth in megahertz of the assigned channel or multiple contiguous channels of the End User Device) above the upper CBSD-assigned channel edge and within 0 to B megahertz below the lower CBSD-assigned channel edge. At all frequencies greater than B megahertz above the upper CBSD assigned channel edge and less than B megahertz below the lower CBSD-assigned channel edge, the conducted power of any End User Device emission shall not exceed -25 dBm/MHz .

Notwithstanding the emission limits in this paragraph, the Adjacent Channel Leakage Ratio for End User Devices shall be at least 30 dB.

(e)(2) The conducted power of any emissions below 3530 MHz or above 3720 MHz shall not exceed -40 dBm/MHz .



TEST PROCEDURE

Per KDB 971168 D01 Power Meas License Digital Systems v03r01

The transmitter output was connected to a CMW500 Test Set and configured to operate at maximum power. The band edge emissions were measured at the required operating frequencies in each band on the Spectrum Analyzer.

- Set the RBW = $1 \sim 1.5 \%$ of OBW (Typically limited to a minimum RBW of 1% of the OBW)
- Set VBW $\geq 3 \times$ RBW;
- Set span ≥ 1.5 times the OBW;
- Sweep time = Auto;
- Detector = RMS;
- Ensure that the number of measurement points $\geq 2 \times$ span/RBW;
- Trace mode = Average (100);

NOTE1



For LTE B48, LTE B48C

DCF: 4 dB=10log(2/5)

Measure offset (Gate trigger off):
The reference offset for RF path loss was applied as a correction factor, and the emission mask result in section 8.4.1 was applied with an additional DCF of 4 dB.

For 5G NR n48

DCF : 7 dB=10log(0.999/5)

Measure offset (Gate trigger off):
The reference offset for RF path loss was applied as a correction factor, and the emission mask result in section 8.4.1 was applied with an additional DCF of 7 dB.

NOTE2

Please refer to section 5.4 for bandwidth and RB setting about LTE, 5G NR bands.

NOTE3

LTE B48C A-MPR is implemented in this EUT when operating the A-MPR Specification in 3GPP TS 36.101 (Table 6.6.2.2A.4-1). Also only Emission mask test item were performed A-MPR condition.

NOTE4

The test procedure was referenced in §96.41(e)(3)(i).

Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's authorized frequency channel, a resolution bandwidth of no less than one percent of the fundamental emission bandwidth may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full reference bandwidth (i.e., 1 MHz or 1 percent of emission bandwidth, as specified). The fundamental emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

NOTE5

5G NR: All Waveforms (CP-OFDM vs DFT-s_OFDM) and modulations ($\pi/2$ BPSK, QPSK, 16QAM, 64QAM, 256QAM) were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

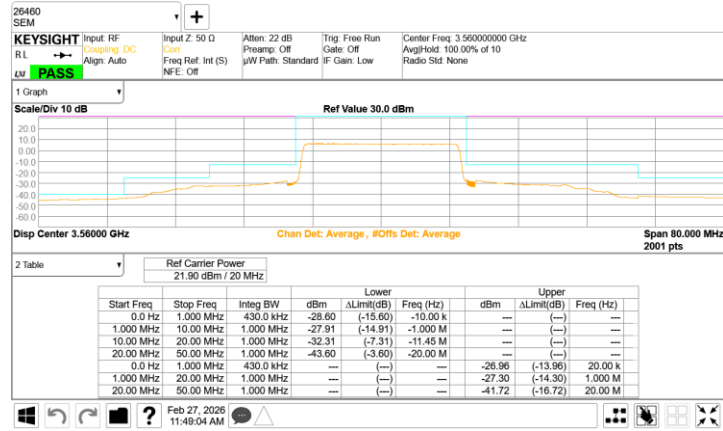
RESULTS

See the following pages.

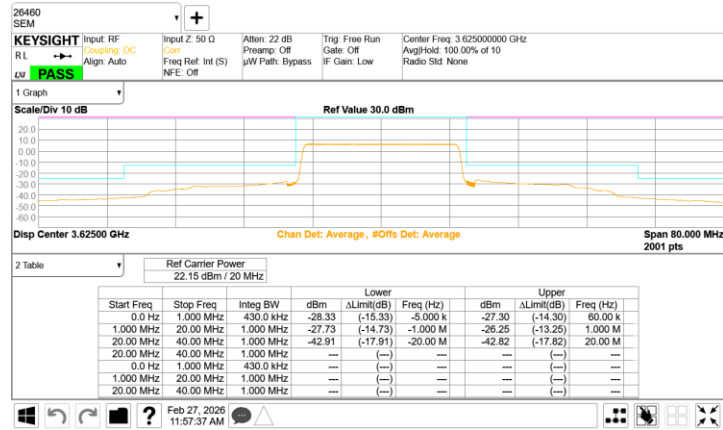
8.3.1. EMISSION MASK RESULT

LTE Band 48 (ANT E)

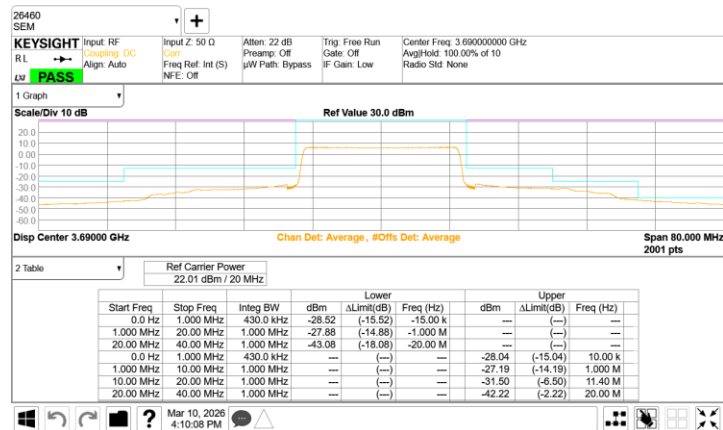
20 MHz
QPSK
FRB



Low channel

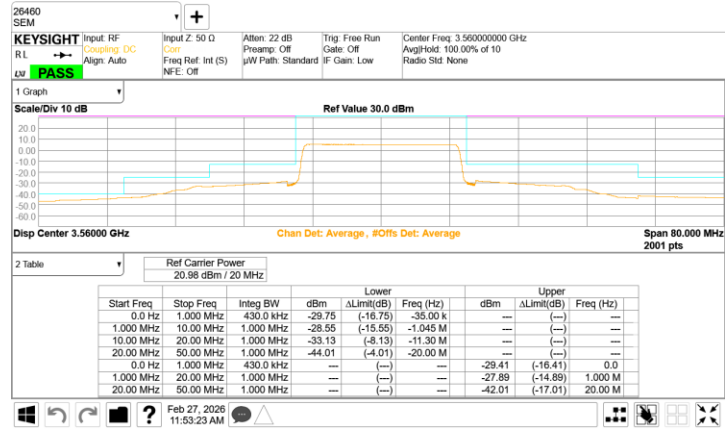


Mid channel

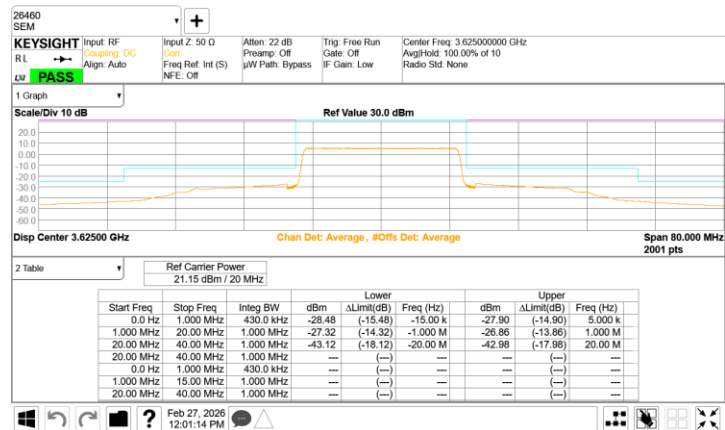


High channel

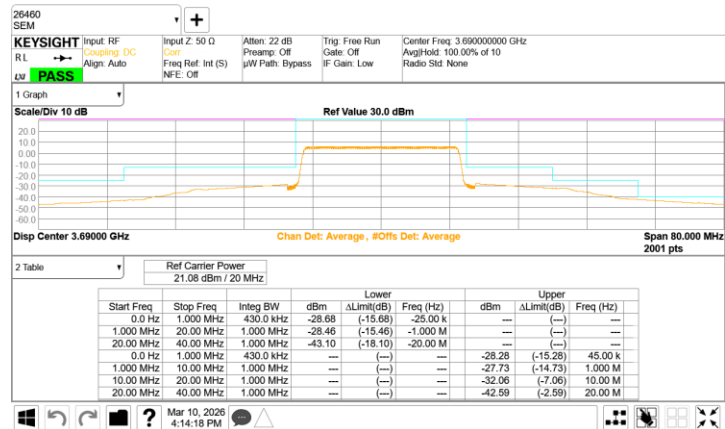
20 MHz
16QAM
FRB



Low channel

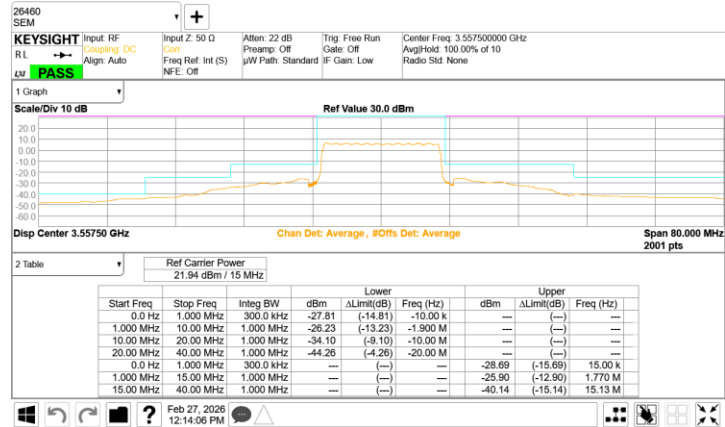


Mid channel

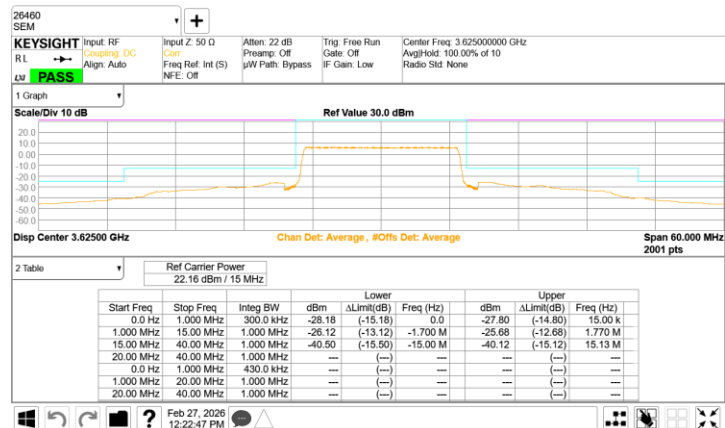


High channel

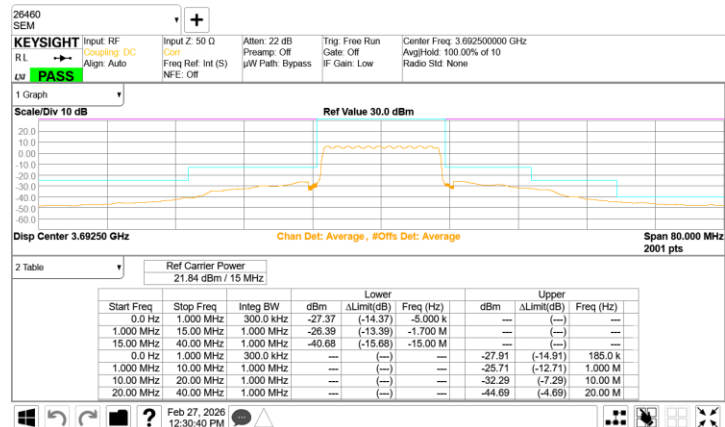
15 MHz
QPSK
FRB



Low channel

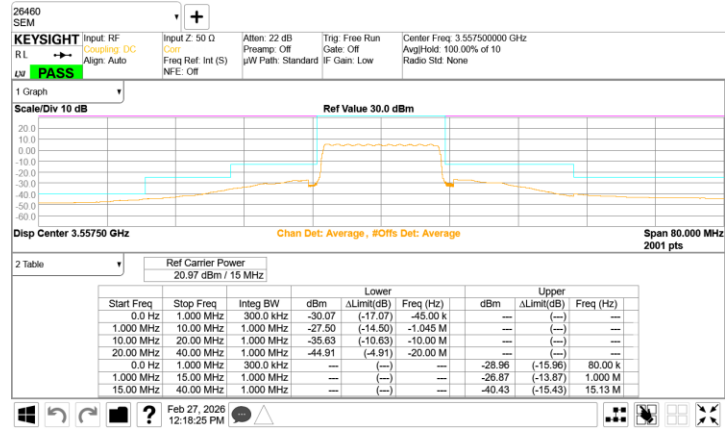


Mid channel

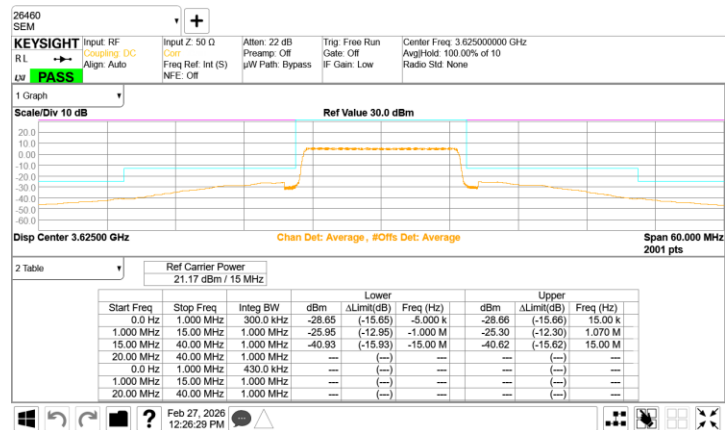


High channel

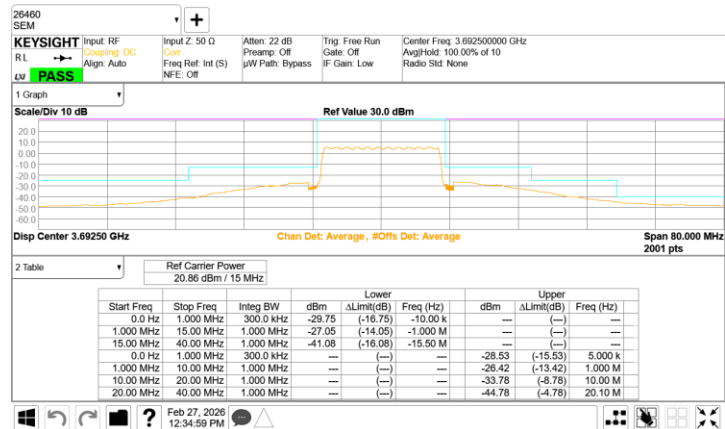
15 MHz
16QAM
FRB



Low channel

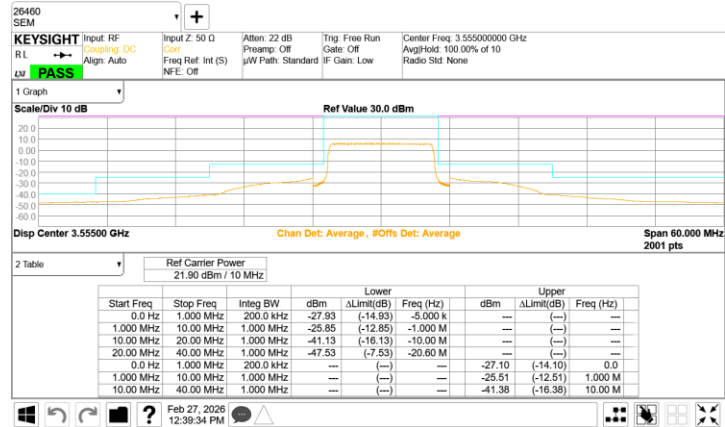


Mid channel

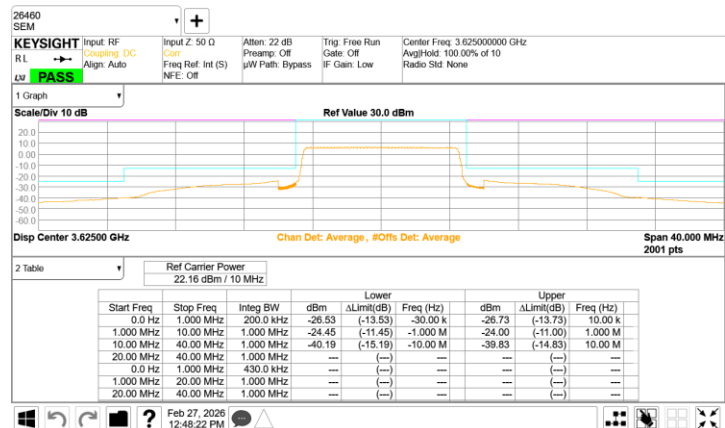


High channel

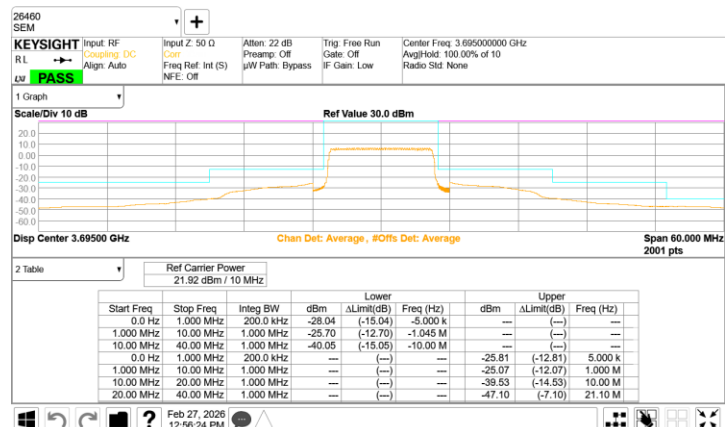
10 MHz
QPSK
FRB



Low channel

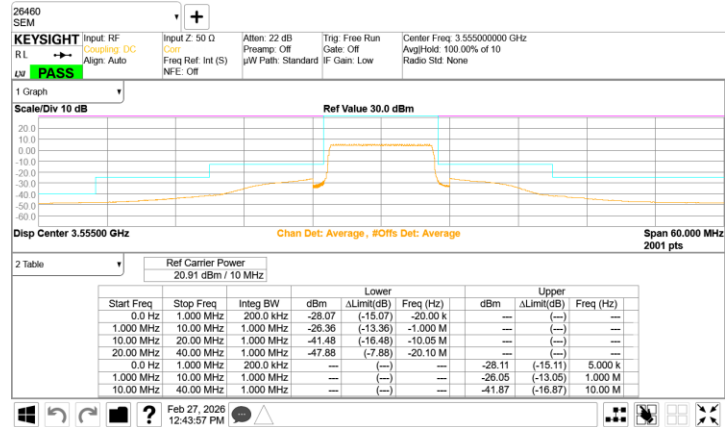


Mid channel

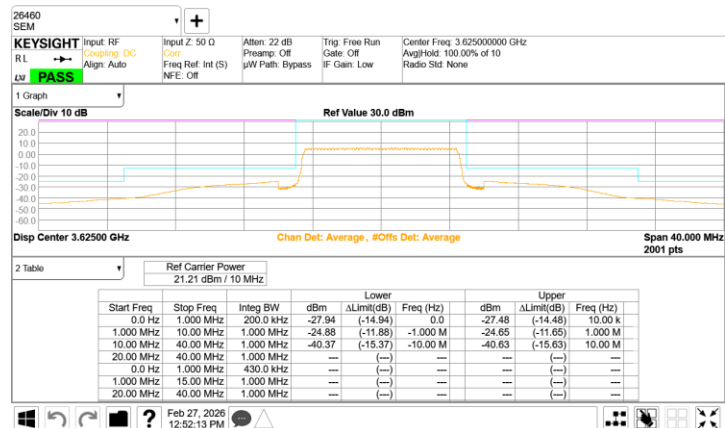


High channel

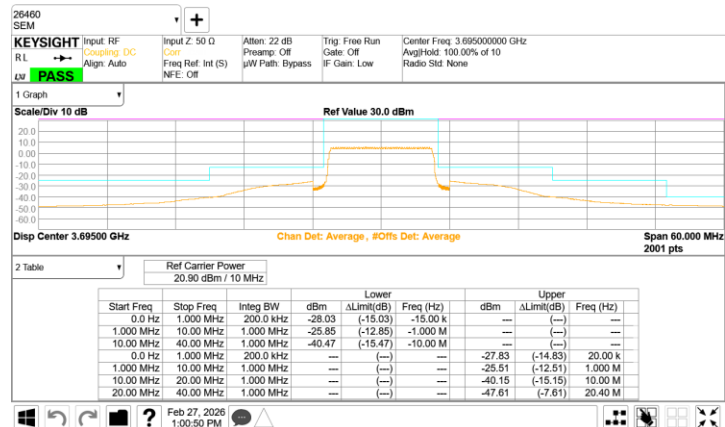
10 MHz
16QAM
FRB



Low channel

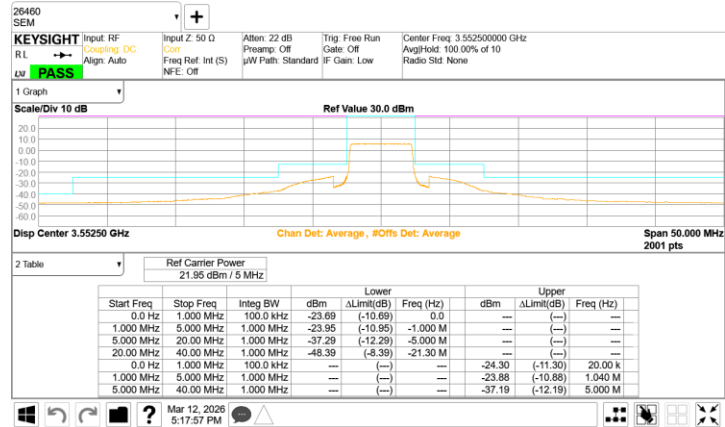


Mid channel

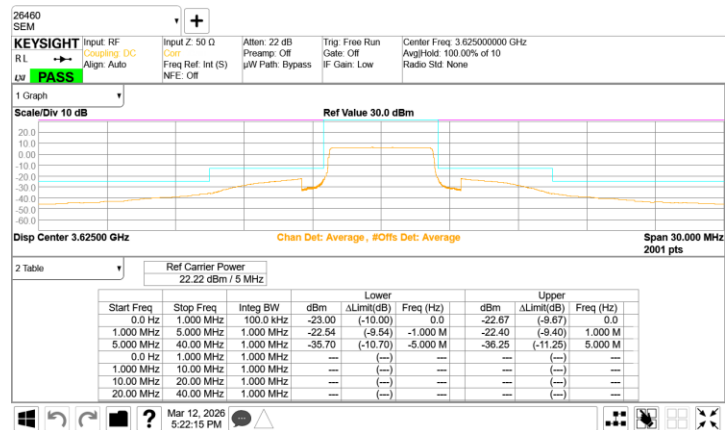


High channel

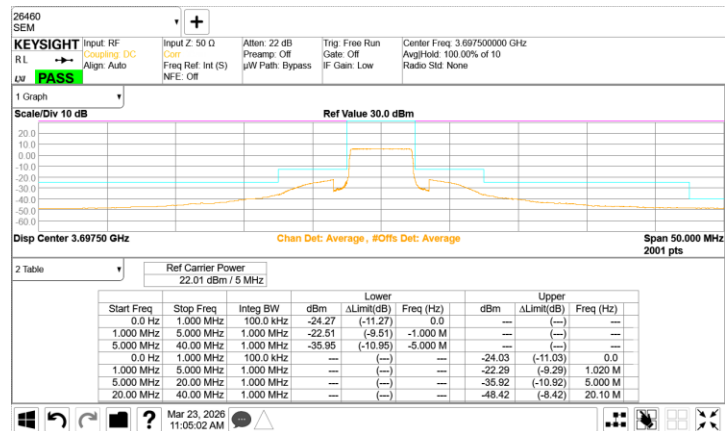
5 MHz
QPSK
FRB



Low channel

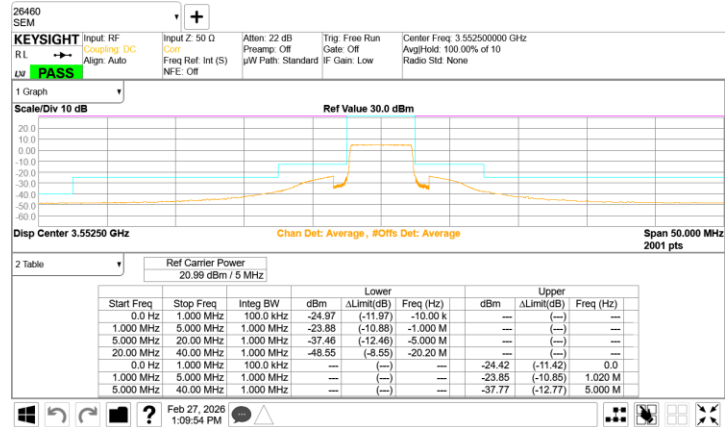


Mid channel

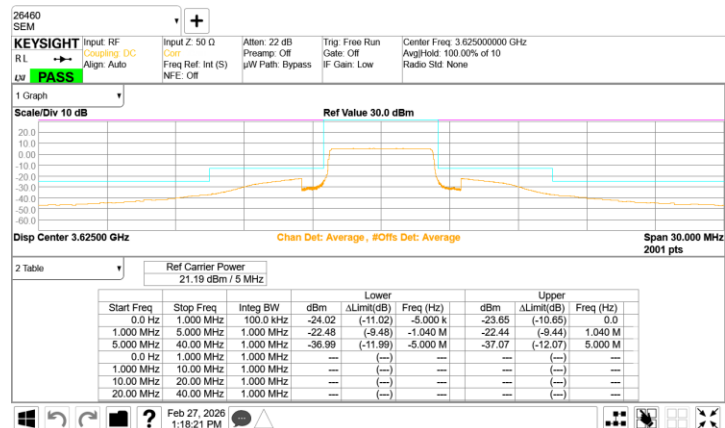


High channel

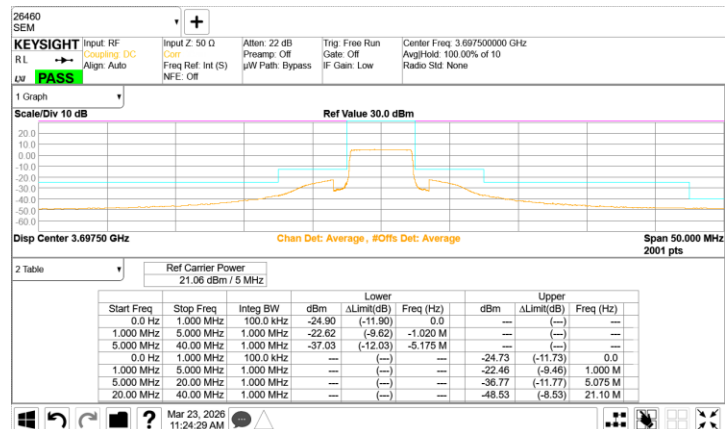
5 MHz
16QAM
FRB



Low channel

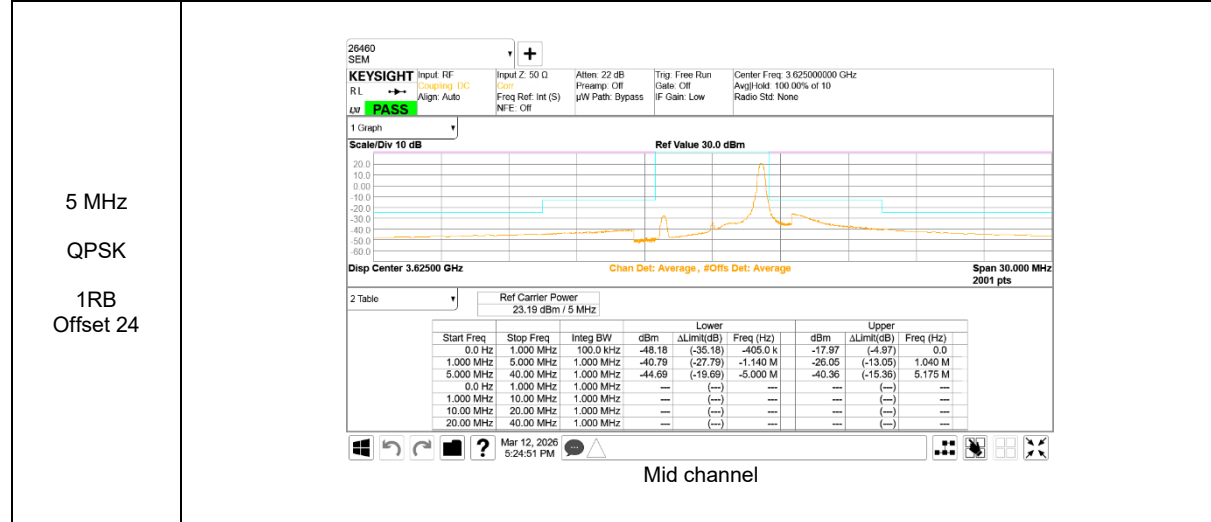


Mid channel



High channel

LTE Band 48 1 RB (Worst Case) (ANT E)



LTE Band 48C (UL CA) (ANT E)









