



CERTIFICATION TEST REPORT

Report Number. : 4790379967-E8V2

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

Model : SM-A236U, SM-A236U1/DS, SM-S236DL

FCC ID : A3LSMA236U

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

Test Standard(s) : FCC CFR47 PART 96

Date Of Issue:
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Testing Laboratory

TL-637

Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
V1	2022-06-28	Initial issue	Yeonhee Lim
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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 and NFC.

MODEL NUMBER: SM-A236U, SM-A236U1/DS, SM-S236DL

SERIAL NUMBER: R3CT50DCD0D (CONDUCTED);
R3CT50DCD0D (RADIATED);

DATE TESTED: 2022-05-13 – 2022-06-27;

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
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2. TEST METHODOLOGY

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

1. FCC CFR 47 Part 2.
2. FCC CFR 47 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

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	
<input checked="" type="checkbox"/>	Chamber 1(3m semi-anechoic chamber)
<input type="checkbox"/>	Chamber 2(3m semi-anechoic chamber)
<input type="checkbox"/>	Chamber 3(3m semi-anechoic chamber)
<input checked="" type="checkbox"/>	Chamber 4(3m Full-anechoic chamber)
<input type="checkbox"/>	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:

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

$ERP = \text{PSA reading with EUT worst orientation (dBm)} + \text{Path loss (dB)} - \text{cable loss (between the SG and substitution antenna)}$

(Path loss = Signal generator output – PSA reading with substitution antenna)

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	3.02 dB
Radiated Disturbance, 30 MHz to 1 GHz	4.05 dB
Radiated Disturbance, 1 GHz to 18 GHz	5.78 dB
Radiated Disturbance, Above 18 GHz	5.58 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 Procedure 2, Clause 4.4.3 in IEC Guide 115:2007.

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 and NFC.
 This test report addresses the WWAN operational mode.

This report covers the Samsung models SM-A236U, SM-A236U1/DS, SM-S236DL.
 These models are identical in hardware except SM-A236U1/DS is supported dual SIM tray and SM-A236U has single SIM tray, SM-S236DL is same hardware.

All series model was same hardware thus, SM-A236U was set for final test.

5.2. DESCRIPTION OF AVAILABLE ANTENNAS

The transmitter has a maximum average radiated ERP / EIRP output powers as follows:

Note : Conducted output power results were excerpted from RF exposure test report.
 (4790379967-S1 FCC Report SAR)

LTE Band 48

FCC Part 96							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 48	3560 - 3690	20	QPSK	22.20	165.96	20.86	121.90
			16QAM	21.31	135.21	20.11	102.57
			64QAM	20.09	102.09		
			256QAM	17.29	53.58		
	3557.5 - 3692.5	15	QPSK	22.22	166.72	20.71	117.76
			16QAM	21.21	132.13	19.84	96.38
			64QAM	20.11	102.57		
			256QAM	17.43	55.34		
	3555 - 3695	10	QPSK	22.48	177.01	21.37	137.09
			16QAM	21.58	143.88	21.32	135.52
			64QAM	20.42	110.15		
			256QAM	17.51	56.36		
	3552.5 - 3697.5	5	QPSK	22.36	172.19	21.42	138.68
			16QAM	21.54	142.56	20.75	118.85
			64QAM	20.39	109.40		
			256QAM	17.50	56.23		

LTE Band 48 (Uplink CA)

Part 27			
EIRP Limit (dBm)	33	ANT Gain (dBi)	-1.09

Frequency Range (MHz)	Bandwidth (MHz)	Modulation	Output Power				Margin
			Conducted Average Power (dBm)	Antenna Gain (dBi)	EIRP Average Power		
					dBm	mW	
3550 - 3700	40MHz (20+20)	QPSK	20.34	-1.09	19.25	84.14	-13.75
		16QAM	19.43		18.34	68.23	-14.66
	35MHz (15+20)	QPSK	20.43		19.34	85.90	-13.66
		16QAM	19.48		18.39	69.02	-14.61
	30MHz (15+15)	QPSK	20.41		19.32	85.51	-13.68
		16QAM	20.37		19.28	84.72	-13.72
	25MHz (5+20)	QPSK	20.8		19.71	93.54	-13.29
		16QAM	20.31		19.22	83.56	-13.78

Note. The worst-case scenario for all measurements is based on the average conducted output power measurement investigation results It was found that QPSK and 16QAM results were worst case.

NR Band n48

FCC Part 96								
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Mode	Conducted		Radiated	
					Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
n48	3570.0 - 3680.0	40	DFT-s OFDM	$\pi/2$ BPSK	20.87	122.18		
				QPSK	20.89	122.74	20.73	118.25
				16QAM	19.91	97.95	20.41	109.96
				64QAM	18.43	69.66		
				256QAM	16.07	40.46		
			CP-OFDM	QPSK	19.56	90.36		
	3560.0 - 3690.0	20	DFT-s OFDM	$\pi/2$ BPSK	20.59	114.55		
				QPSK	20.60	114.82	20.71	117.87
				16QAM	19.60	91.20	20.35	108.46
				64QAM	17.91	61.80		
				256QAM	15.55	35.89		
			CP-OFDM	QPSK	18.95	78.52		
	3555.0 - 3695.0	10	DFT-s OFDM	$\pi/2$ BPSK	20.79	119.95		
				QPSK	20.78	119.67	21.11	129.18
				16QAM	19.87	97.05	20.54	113.29
				64QAM	18.34	68.23		
256QAM			15.98	39.63				
CP-OFDM	QPSK	19.36	86.30					

NR Band n48(SRS1)

FCC Part 96						
Band	Frequency Range [MHz]	BandWidth [MHz]	Conducted		Radiated	
			Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
n48	3570.0 - 3680.0	40	10.98	12.53		
	3560.0 - 3690.0	20	11.13	12.97		
	3555.0 - 3695.0	10	11.15	13.03	6.62	4.59

NR Band n48(SRS2)

FCC Part 96						
Band	Frequency Range [MHz]	BandWidth [MHz]	Conducted		Radiated	
			Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
n48	3570.0 - 3680.0	40	20.03	100.69		
	3560.0 - 3690.0	20	20.30	107.15		
	3555.0 - 3695.0	10	20.41	109.90	16.19	41.59

NR Band n48(SRS3)

FCC Part 96						
Band	Frequency Range [MHz]	BandWidth [MHz]	Conducted		Radiated	
			Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
n48	3570.0 - 3680.0	40	21.05	127.35		
	3560.0 - 3690.0	20	21.13	129.72		
	3555.0 - 3695.0	10	21.24	133.05	11.41	13.85

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)	Peak Gain (dBi)
LTE Band 48/ NR Band n48 3550 ~ 3700 MHz	-1.09
NR Band n48(SRS1) 3550 ~ 3700 MHz	-3.63
NR Band n48(SRS2) 3550 ~ 3700 MHz	-1.09
NR Band n48(SRS3) 3550 ~ 3700 MHz	-4.04

5.4. WORST-CASE ORIENTATION

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

For all 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. However, the out of band emissions and spurious radiation were only performed on bandwidth and RB offset(with RB size 1) with the highest power in QPSK.

For all 5G 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 measured on $\pi/2$ BPSK, QPSK, 16QAM, 64QAM and 256QAM modulations. It was found that QPSK and 16QAM results were worst case.

This device supports SRS (sounding reference signal) 1, 2, 3 mode for NR TDD bands. For each SRS 1, 2 and 3, Conducted power and radiated measurement were performed through FTM mode provide by the customer.

Both 'Main ANT' and 'Sub ANT' were tested and the worst case of either 'Main ANT' or 'Sub ANT' is reported.

Highest power setting for each bands				
LTE Band	Frequency (MHz)	Bandwidth (MHz)	RB size	RB offset
48	3555.0	10	1	0
	3625.0		1	0
	3695.0		1	25

Highest power setting for each bands				
NR Band	Frequency (MHz)	Bandwidth (MHz)	RB size	RB offset
48	3570.00	40	1	1
	3624.99		1	1
	3679.98		1	104

Highest power setting for each bands					
LTE Band	Component Carrier	Frequency (MHz)	Bandwidth (MHz)	RB size	RB offset
48 (Uplink CA)	PCC	3552.5	5	1	24
	SCC	3564.2	20	1	0

- Radiated spurious emissions

For LTE CA_48C, the spurious emissions was investigated in three orthogonal orientations X, Y and Z it was determined that X orientation was worst-case orientation.

Note : For EIRP testing, the EUT didn't attached with travel adapter. But 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.

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

Band	ERP/EIRP			RSE		
	X	Y	Z	X	Y	Z
LTE B48	-	-	O	-	-	O
NR n48	-	-	O	-	-	O
NR n48 SRS1	-	-	O	-	-	O
NR n48 SRS2	-	O	-	-	O	-
NR n48 SRS3	-	O	-	-	O	-

Note : For ERP/EIRP testing, the EUT didn't attached with travel adapter. But 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.

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Charger	SAMSUNG	EP-TA800	R37MANQ1E72SE3	N/A
Data Cable	SAMSUNG	EP-DN980	GH39-02115A BWE	N/A
Earphone	SAMSUNG	GH59-15055A	EHS64AVFWE	N/A

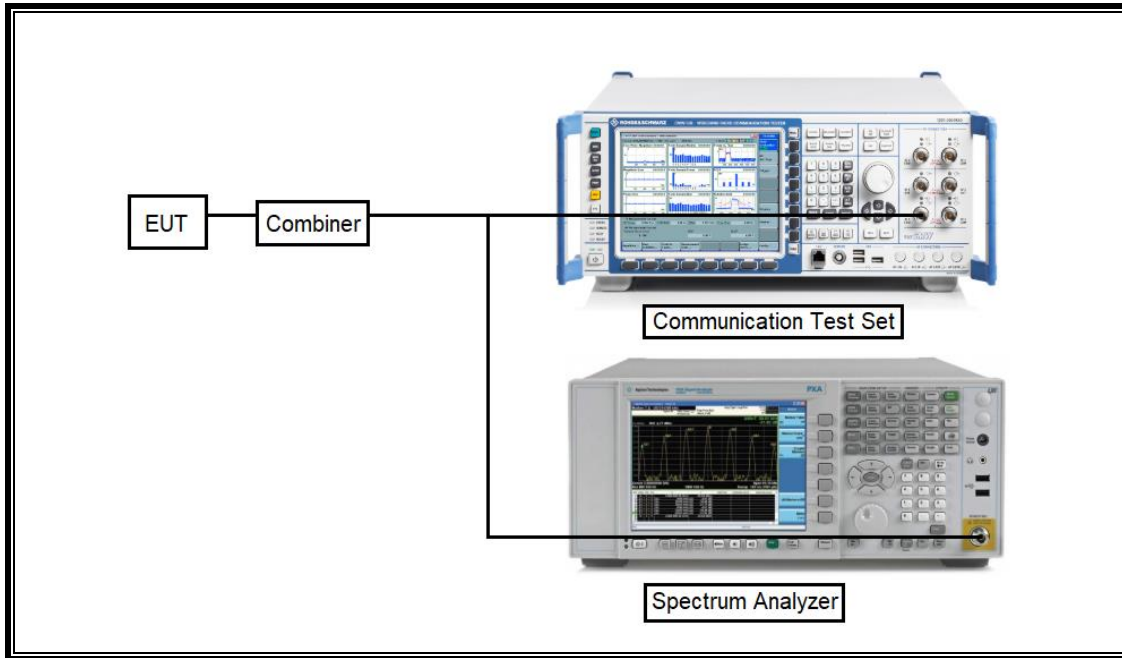
I/O CABLE

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
2	Audio	2	Mini-Jack	Unshielded	0.7 m	N/A

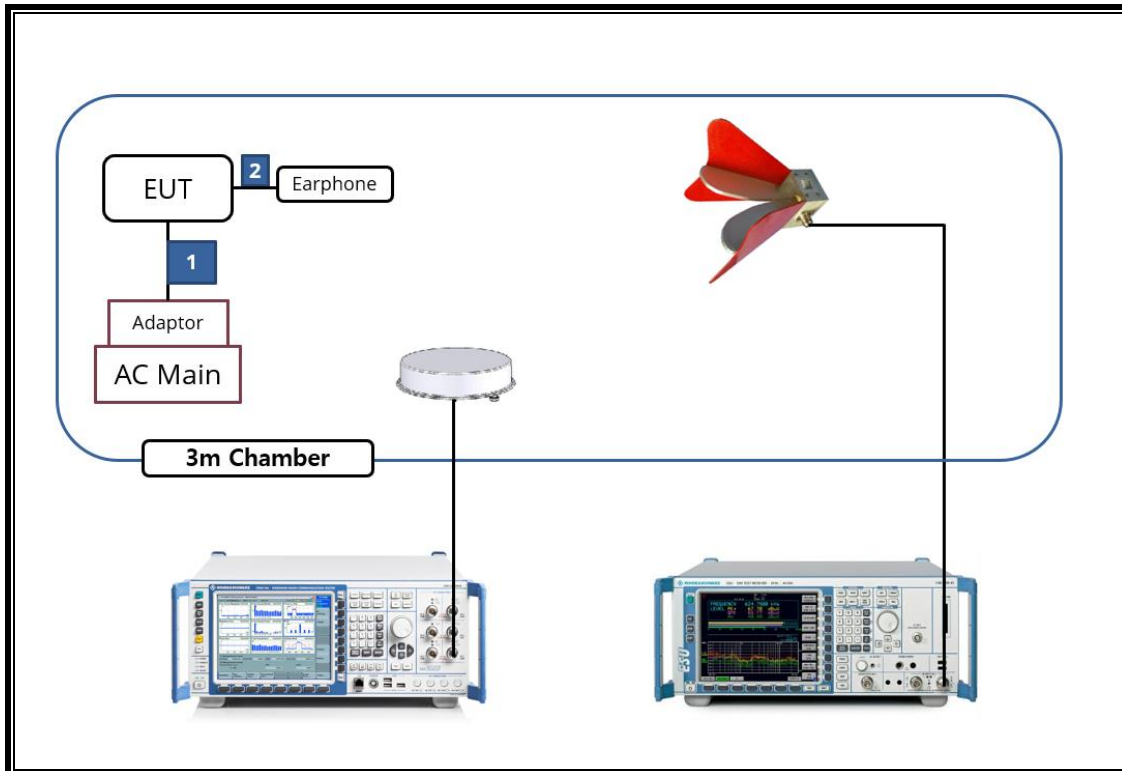
TEST SETUP

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)



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 DB4	00164753	2023-02-08
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	2022-08-04
Antenna, Horn, 40 GHz	ETS	3116C	00168645	2023-10-13
Preamplifier	ETS	3116C-PA	00168841	2022-08-04
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	750	2022-08-19
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	845	2022-08-13
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	2022-08-13
Antenna, Horn, 18 GHz	ETS	3115	00167211	2022-07-27
Antenna, Horn, 18 GHz	ETS	3115	00161451	2022-08-15
Antenna, Horn, 18 GHz	ETS	3117	00168724	2022-07-27
Antenna, Horn, 18 GHz	ETS	3117	00168717	2022-08-15
Communications Test Set	R&S	CMW500	169796	2023-01-07
DC Power Supply	Agilent / HP	E3640A	MY54226395	2022-08-02
Preamplifier, 1000 MHz	Sonoma	310N	341282	2022-08-02
Preamplifier, 1000 MHz	Sonoma	310N	370599	2022-08-02
Preamplifier, 1000 MHz	Sonoma	310N	351741	2022-08-02
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1876511	2022-08-02
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	2029168	2022-08-02
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	2022-08-02
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54170614	2022-08-04
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54490312	2022-08-04
EMI Test Receive, 40 GHz	R&S	ESU40	100439	2022-08-02
EMI Test Receive, 40 GHz	R&S	ESU40	100457	2022-08-02
High Pass Filter 1.2GHz	Micro-Tronics	HPM50108-02	G005	2022-08-03
High Pass Filter 1.2GHz	Micro-Tronics	HPM50108-02	G006	2022-08-02
High Pass Filter 2.8GHz	Micro-Tronics	HPM50111-02	010	2022-08-03
High Pass Filter 2.8GHz	Micro-Tronics	HPM50111-02	011	2022-08-02
High Pass Filter 4GHz	Micro-Tronics	HPM50118-02	G001	2022-08-03
High Pass Filter 4GHz	Micro-Tronics	HPM50118-02	G002	2022-08-02
Attenuator	PASTERNAK	PE7087-10	A009	2022-08-03
Attenuator	PASTERNAK	PE7087-10	A001	2022-08-03
Attenuator	PASTERNAK	PE7087-10	A008	2022-08-03
Attenuator	PASTERNAK	PE7004-10	2	2022-08-02
Attenuator	PASTERNAK	PE7395-10	A011	2022-08-03
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	2023-10-06
Temperature Chamber	ESPEC	SH-642	93001109	2022-08-02
Power Splitter	MINI-CIRCUITS	WA1534	UL003	2023-01-11
Power Splitter	MINI-CIRCUITS	WA1534	UL004	2023-01-11
UXM 5G Wireless Test Platform	KEYSIGHT	E7515B	MY58120110	2023-01-07
UL Software				
Description	Manufacturer	Model	Version	
Antenna port test software	UL	CLT	Ver 3.4	
Radiated software	UL	UL EMC	Ver 9.5	
Antenna port test software (5G NR FR1)	UL	UL iM	Ver 1.06	

7. SUMMARY TABLE

FCC Part Section	Test Description	Test Limit	Test Condition	Test Result
2.1049	Occupied Bandwidth(99%)	N/A	Conducted	Pass
2.1046	Conducted output power	N/A		Pass
2.1051 96.41(e)(ii)	Out of band emissions	Section 9.2 & 9.3		Pass
2.1055	Frequency Stability	Fundamental emissions stay within authorized frequency block		Pass
96.47	End user device additional requirements (CBSD Protocol)	Section 9.5		Not performed ^{Note}
96.41(b)	Equivalent Isotropic Radiated Power	23 dBm/10 MHz	Radiated	Pass
2.1053 96.41(e)	Radiated Spurious Emission	-40 dBm/MHz		Pass

Note. Please refer to CBSD Protocol test report. See the Section 9.5

8. RF OUTPUT POWER

8.1. CONDUCTED AND EIRP VERIFICATION

Rule Part(s)

FCC: §2.1046, §96.41

EIRP Limit

FCC: §96.41(b)

(b) Unless otherwise specified in this section, the maximum effective isotropic radiated power (EIRP) and maximum Power Spectral Density (PSD) of any CBSD and End User Device must comply with the limits shown in the table.

Device	Maximum EIRP (dBm/10 megahertz)	Maximum PSD (dBm/MHz)
End User Device	23	n/a

Test Procedure

TIA-603-E Clause 2.2.17
KDB 971168 Section 5.6

$$ERP/EIRP = P_{Meas} + G_T - L_C$$

where:

ERP/EIRP = effective or equivalent radiated power, respectively (expressed in the same units as P_{Meas} , typically dBW or dBm);

P_{Meas} = measured transmitter output power or PSD, in dBm or dBW;

G_T = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP);

L_C = signal attenuation in the connecting cable between the transmitter and antenna, in dB.2

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 and ERP/EIRP output powers as follows:

OUTPUT POWER FOR LTE BAND 48C (5 MHz + 20 MHz)

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)	3552.5	3564.2	1	24	1	0	20.80	20.31
			1	0	1	99	12.94	12.53
			25	0	100	0	19.15	18.14
	3615.6	3627.3	1	24	1	0	20.36	19.44
			1	0	1	99	11.75	11.95
			25	0	100	0	18.29	17.30
	3678.3	3690	1	24	1	0	20.41	19.34
			1	0	1	99	12.05	12.03
			25	0	100	0	18.47	17.52

OUTPUT POWER FOR LTE BAND 48C (10 MHz + 20 MHz)

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	3569.4	1	49	1	0	20.41	20.37
			1	0	1	99	12.53	12.85
			50	0	100	0	19.14	18.11
	3615.4	3629.8	1	49	1	0	20.22	19.18
			1	0	1	99	11.89	11.94
			50	0	100	0	18.36	17.37
	3675.6	3690	1	49	1	0	20.67	19.80
			1	0	1	99	12.14	12.29
			50	0	100	0	18.63	17.66

OUTPUT POWER FOR LTE BAND 48C (15 MHz + 20 MHz)

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)	3557.5	3574.6	1	74	1	0	20.43	19.48
			1	0	1	99	12.84	12.50
			75	0	100	0	19.02	18.03
	3615.2	3632.3	1	74	1	0	20.15	19.21
			1	0	1	99	11.82	11.93
			75	0	100	0	18.33	17.36
	3672.9	3690	1	74	1	0	20.55	19.46
			1	0	1	99	12.05	12.11
			75	0	100	0	18.61	17.60

OUTPUT POWER FOR LTE BAND 48C (20 MHz + 20 MHz)

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	3579.8	1	99	1	0	20.34	19.43
			1	0	1	99	12.29	12.73
			100	0	100	0	18.62	18.04
	3615.1	3634.9	1	99	1	0	20.38	19.24
			1	0	1	99	12.10	12.19
			100	0	100	0	18.57	17.61
	3670.2	3690	1	99	1	0	20.63	19.81
			1	0	1	99	12.22	12.27
			100	0	100	0	18.71	17.85

8.2. PEAK TO AVERAGE RATIO

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 PAR were measured on the Spectrum Analyzer.

Test Spec

In addition, when the transmitter power is measured in terms of average value, the peak-to-average ratio of the power shall not exceed 13 dB.

NOTE

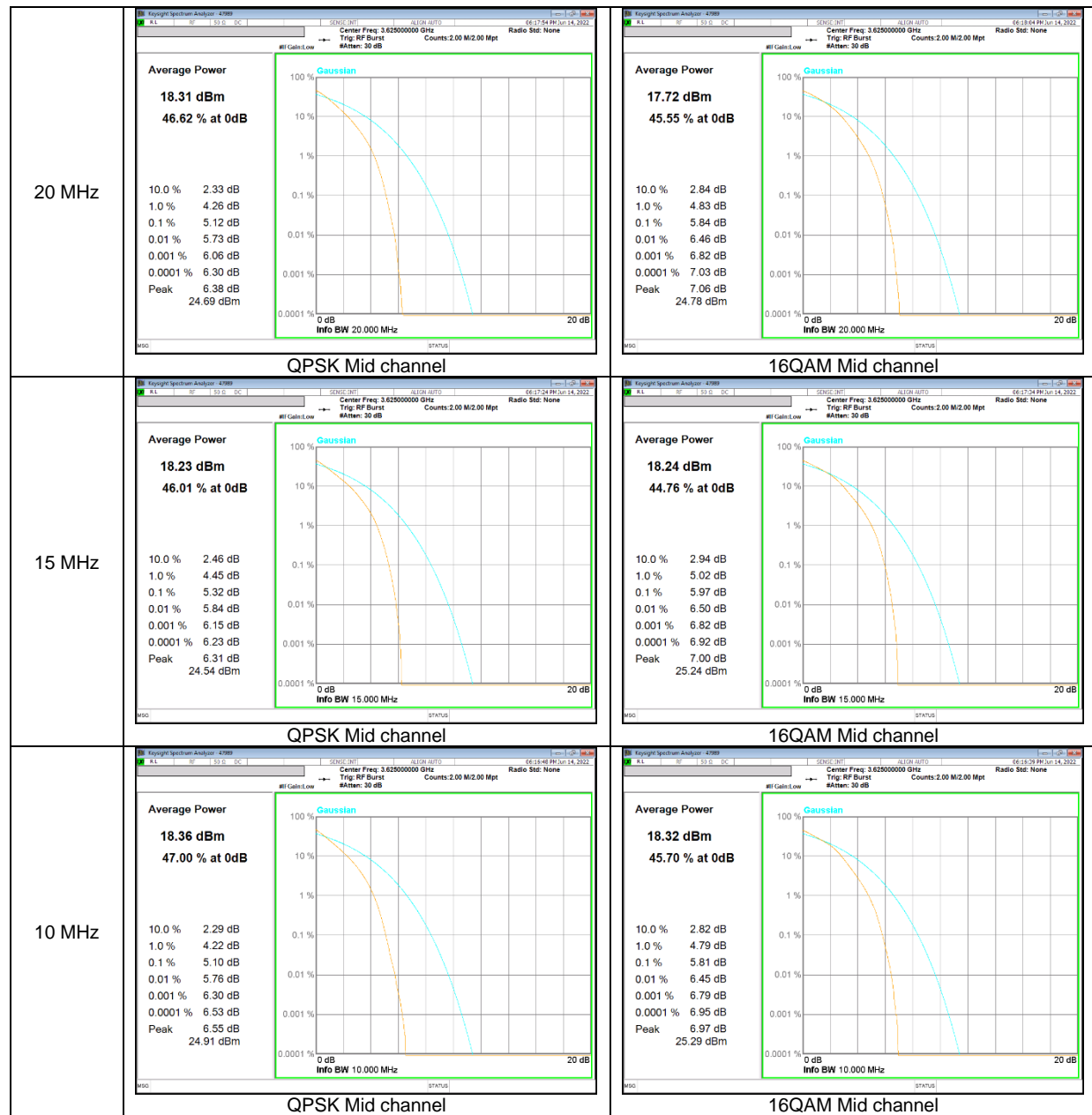
5G NR: All Waveforms (CP-OFDM vs DFT-s_OFDM) and modulations ($\pi/2$ BPSK, QPSK, 16QAM, 64QAM, 256QAM) were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

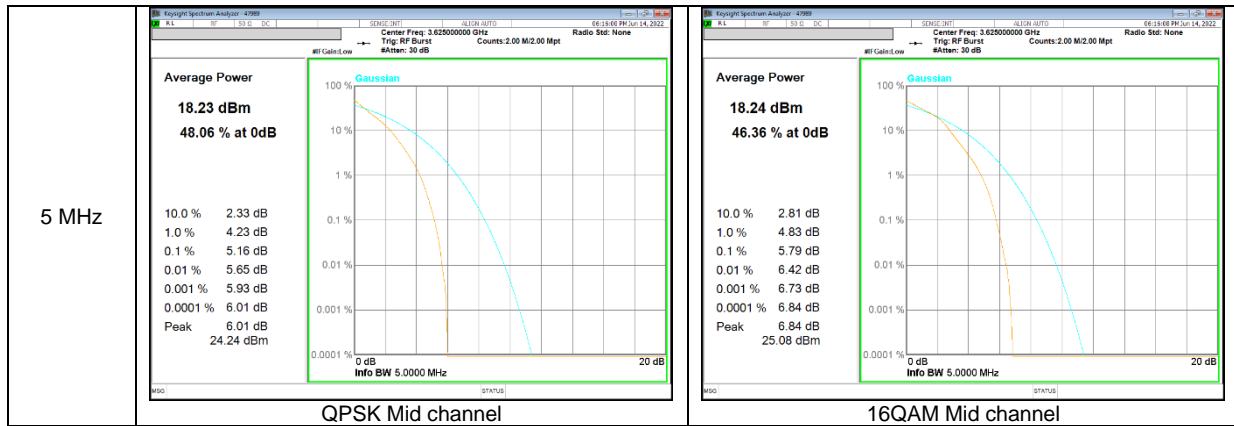
RESULTS

See the following pages.

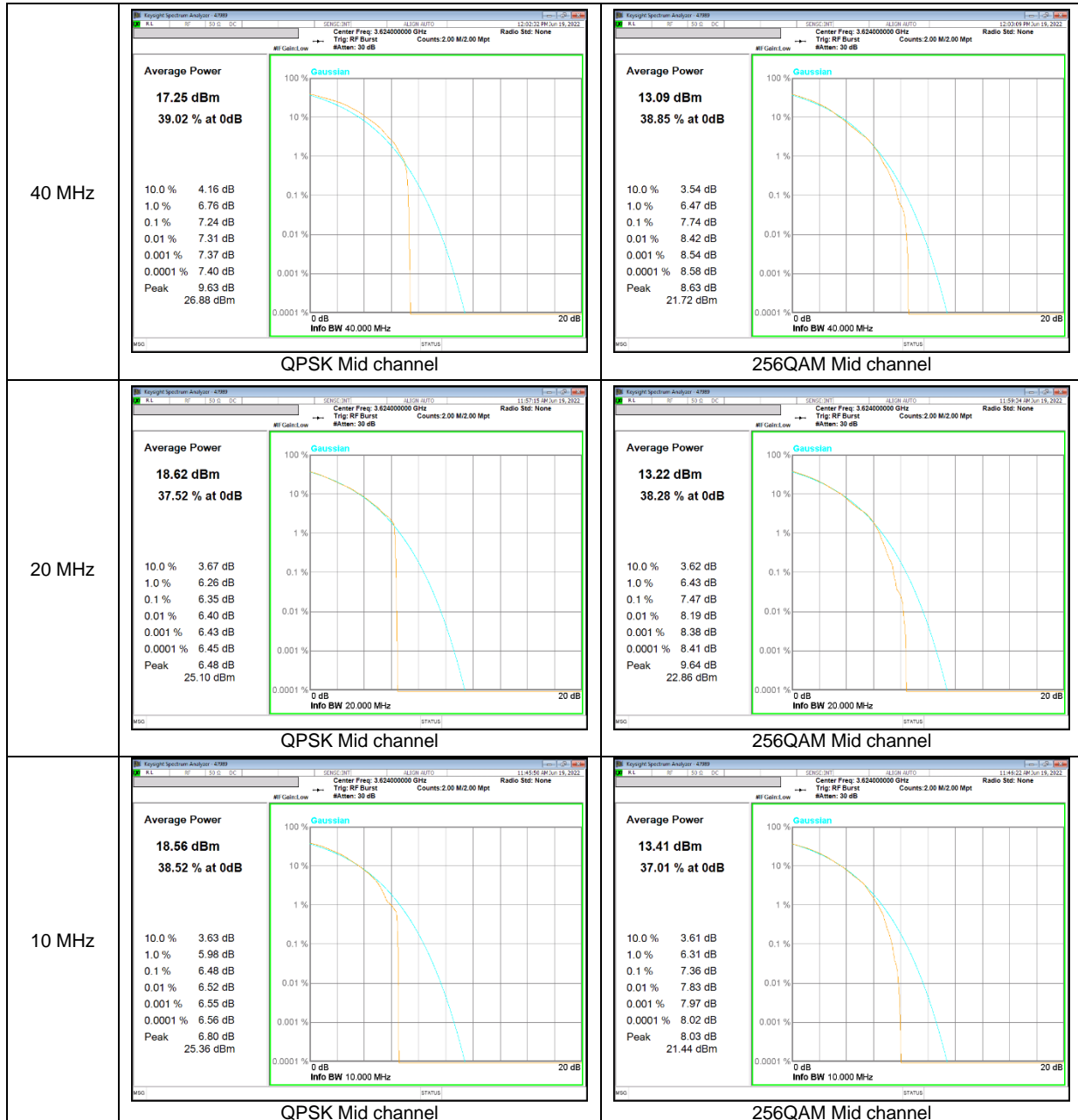
8.2.1. CONDUCTED PEAK TO AVERAGE RESULT

LTE Band 48





NR Band n48 CP-OFDM



9. LIMITS AND CONDUCTED RESULTS

9.1. 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

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B48	20M	QPSK	1882.5	17.946	20.420
		16QAM		17.862	19.740
	15M	QPSK	1882.5	13.449	14.330
		16QAM		13.426	14.400
	10M	QPSK	1882.5	8.977	9.745
		16QAM		8.969	9.662
	5M	QPSK	1882.5	4.489	4.892
		16QAM		4.482	4.902

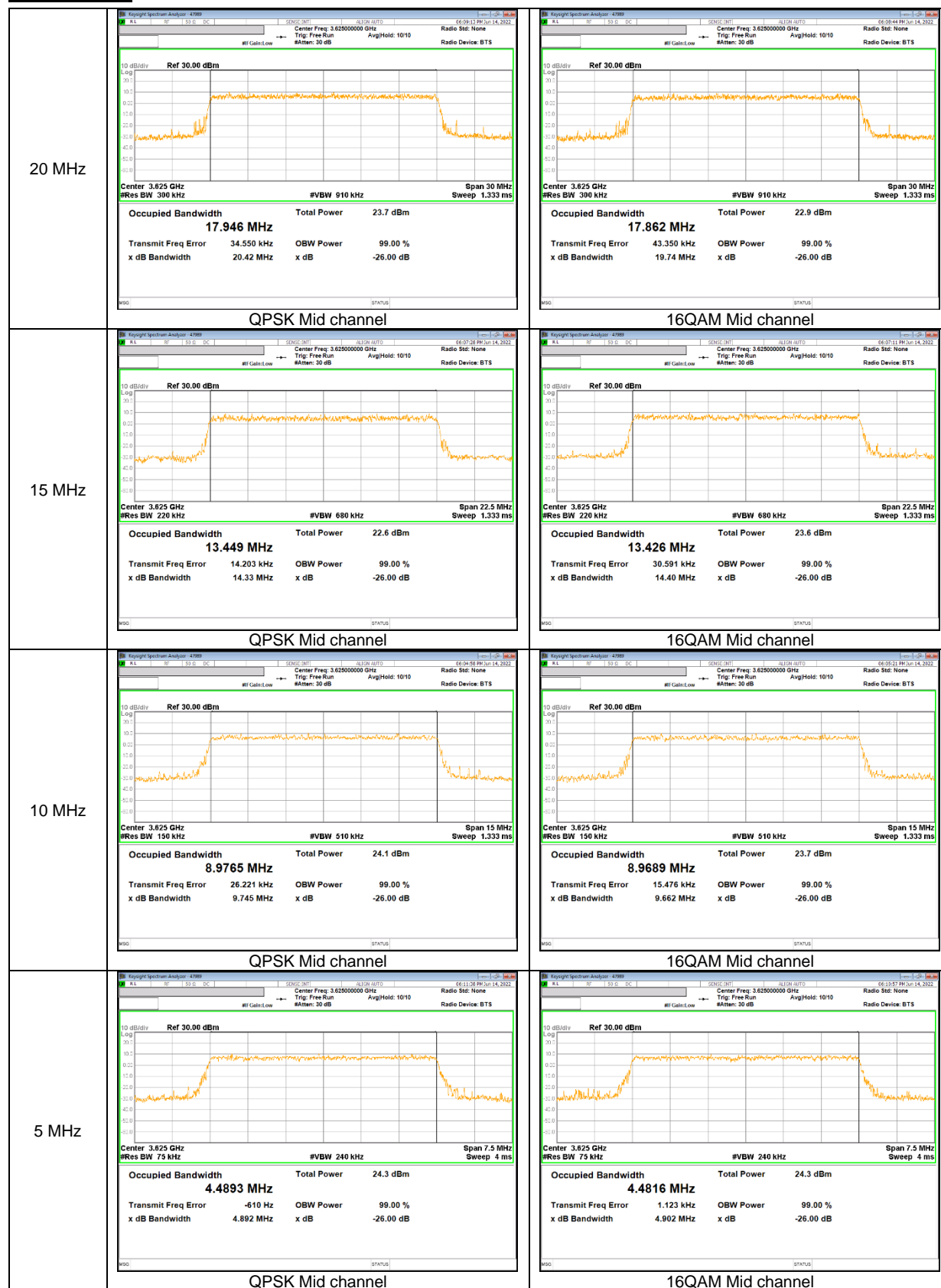
- LTE Band 48C

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B48 Uplink CA	20+20	QPSK	2593.0	37.525	39.200
		16QAM		37.481	39.120

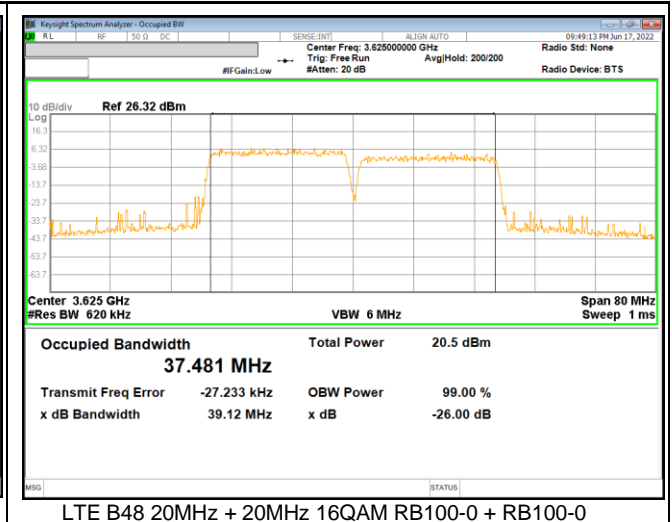
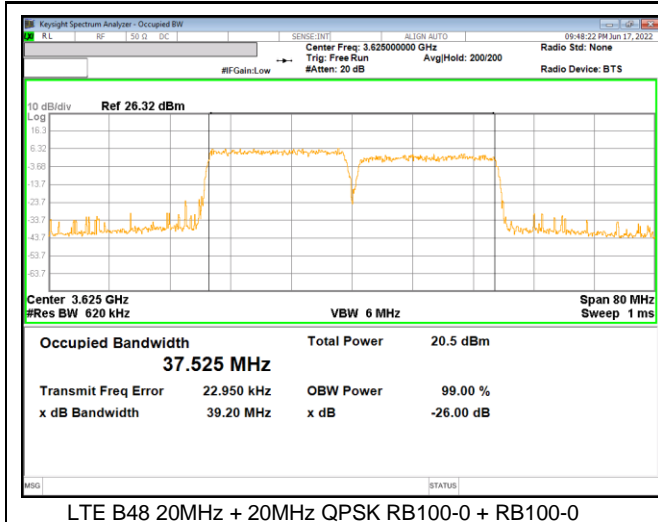
- NR Band n48

Band	BW	Modulation	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
NR n48	40M	QPSK	1882.5	37.899	39.790
		16QAM		37.864	39.530
	20M	QPSK	1882.5	18.182	19.380
		16QAM		18.248	19.470
	10M	QPSK	1882.5	8.608	9.498
		16QAM		8.617	9.150

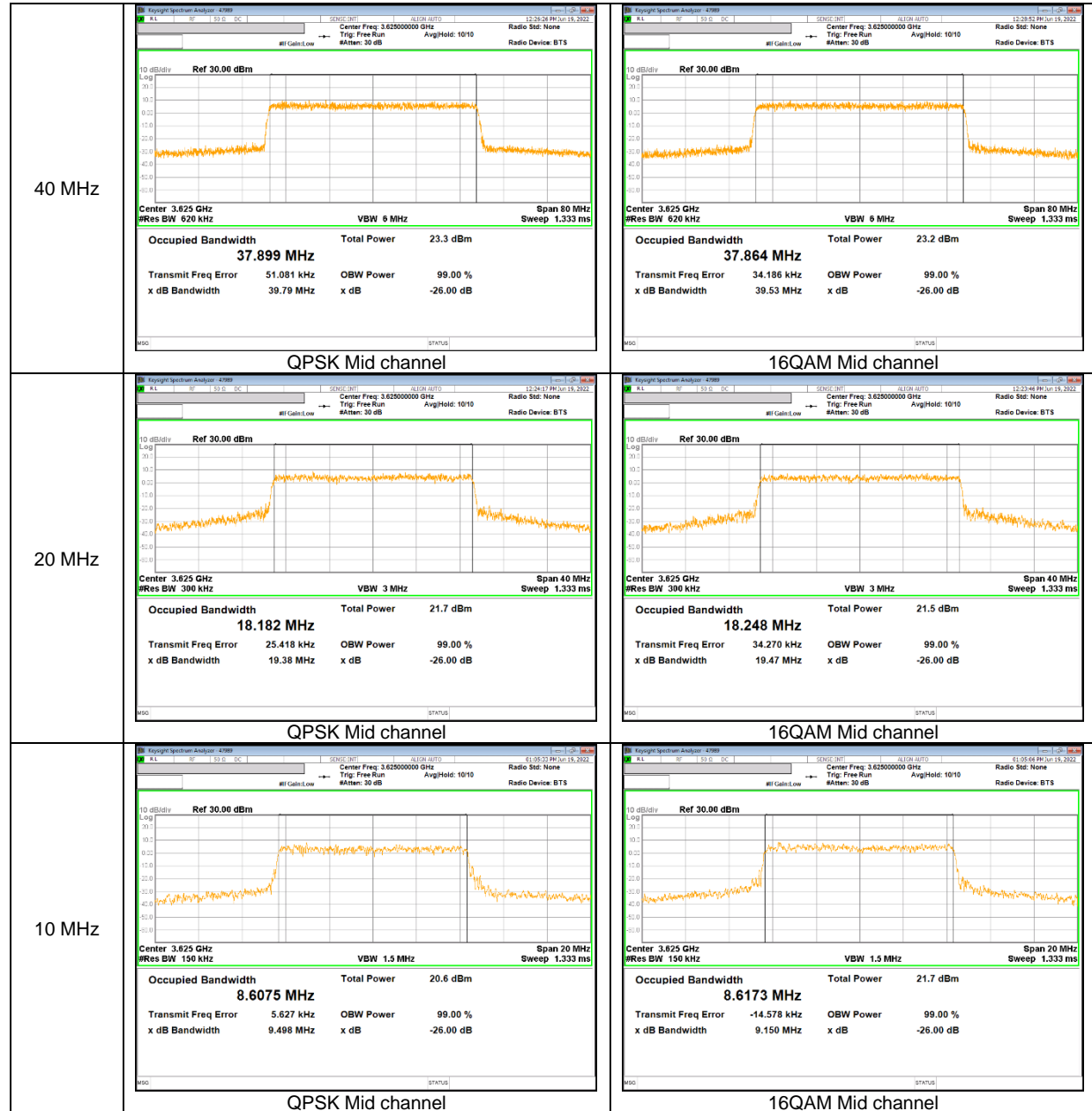
LTE Band 48



LTE Band 48C (UL CA)



NR Band n48 CP-OFDM



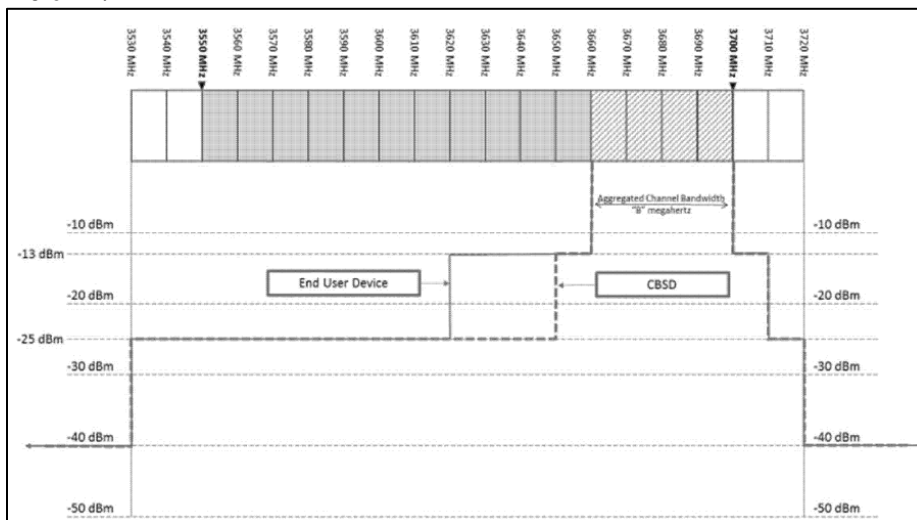
9.2. BAND EDGE EMISSIONS

RULE PART(S)

FCC: §2.1051 and §96.41(e)(ii)

LIMITS

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. 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

LTE Band 48 A-MPR is implemented in this EUT per the A-MPR specification in 3GPP TS 36.101 (Table 6.2.4-22). Conducted output power verification data are shown Appendix A. Also only Emission mask test item were performed A-MPR condition. Also only Emission mask test item were performed A-MPR condition (Especially 15MHz, 20MHz Channel Bandwidth).

LTE Band 48C A-MPR is implemented in this EUT per the A-MPR specification in 3GPP TS 36.101 (Table 6.2.4A,10-1, Table 6.2.4A,10-2). Conducted output power verification data are shown Appendix A. Also only Emission mask test item were performed A-MPR condition. Also only Emission mask test item were performed A-MPR condition (Especially 15MHz, 20MHz Channel Bandwidth).

NR Band n48 A-MPR is implemented in this EUT per the A-MPR specification in 3GPP TS 36.101 (Table 6.2.4-22). Conducted output power verification data are shown Appendix A. Also only Emission mask test item were performed A-MPR condition. Also only Emission mask test item were performed A-MPR condition (Especially 20MHz, 40MHz Channel Bandwidth).

NOTE2

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

NOTE3

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.

LTE Band 48



20MHz



