



CERTIFICATION TEST REPORT

Report Number. : 4789746865-E2V3

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

Model : SM-A525F/DS, SM-A525F

FCC ID : A3LSMA525F

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

Test Standard(s) : FCC CFR47 PART 22 SUBPART H
FCC CFR47 PART 24 SUBPART E
FCC CFR47 PART 27 SUBPART H,L,M
FCC CFR47 PART 90 SUBPART S

Date Of Issue:

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ACCREDITED

Testing Laboratory

TL-637

Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
V1	01/28/21	Initial issue	Sungeun Lee
V2	02/02/21	Updated to address TCB's question	Sungeun Lee
V3	02/04/21	Added LTE Band26 straddle channel	Sungeun Lee

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.
EUT DESCRIPTION: GSM/WCDMA/LTE Phone + BT/BLE, DTS/UNII a/b/g/n/ac and NFC
MODEL NUMBER: SM-A525F/DS, SM-A525F
SERIAL NUMBER: R38NB02R6KH (CONDUCTED, Original);
R38NB02R6HJ, R38NB02RCPB, R38NB02R66E (RADIATED, Original)
R38NC03HD9J, R38NC03HCYN (RADIATED, Spot check)
DATE TESTED: NOV 30, 2020 – FEB 04, 2021 (Original)
JAN 21, 2021 – FEB 04, 2021 (Spot Check)

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 22H, 24E, 27H, L, M and 90S	Pass

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.

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Tested By:



Sungeun Lee
Suwon Lab Engineer
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1.1. INTRODUCTION OF TEST DATA REUSE

This report referenced from the FCC ID: A3LSMA525M WWAN (FCC CFR 47 Part 22H, 24E, 27H, L, M and 90S).

And the applicant takes full responsibility that the test data as referenced in this report represent compliance for this FCC ID.

1.2. DIFFERENCE

The FCC ID: A3LSMA525F shares the same enclosure and circuit board as FCC ID: A3LSMA525M. The WWAN antennas and surrounding circuitry and layout are identical between these two units.

After confirming through preliminary radiated emissions that the performance of the FCC ID: A3LSMA525M remains representative of FCC ID: A3LSMA525F. The test data of FCC ID: A3LSMA525M being submitted for this application to cover WWAN features.

1.3. SPOT CHECK VERIFICATION DATA (Worst case of the radiated spurious and band edge emissions)

Band	Test Item	Worst Mode	Frequency	Test Limit	Original model	Spot check model	Deviation	Remark
					SM-A525M/DS Results	SM-A525F/DS Results		
					FCC ID : A3LSMA525M	FCC ID : A3LSMA525F		
GSM 850	ERP	GPRS	848.3 MHz	38.50 dBm	30.30 dBm	29.37 dBm	-0.93 dB	
	RSE	GPRS	2544.9 MHz	-13.00 dBm	-19.80 dBm	-32.70 dBm	-12.90 dB	
GSM 1900	EIRP	GPRS	1880.0 MHz	33.00 dBm	30.00 dBm	29.20 dBm	-0.80 dB	
	RSE	GPRS	5729.4 MHz	-13.00 dBm	-27.60 dBm	-26.50 dBm	1.10 dB	
WCDMA Band 2	EIRP	Rel99	1907.6 MHz	33.00 dBm	22.02 dBm	22.91 dBm	0.89 dB	
	RSE	Rel99	3815.2 MHz	-13.00 dBm	-30.60 dBm	-32.40 dBm	-1.80 dB	
WCDMA Band 4	ERP	Rel99	1732.6 MHz	30.00 dBm	22.44 dBm	22.63 dBm	0.19 dB	
	RSE	Rel99	3505.2 MHz	-13.00 dBm	-25.70 dBm	-22.80 dBm	2.90 dB	
WCDMA Band 5	ERP	Rel99	836.6 MHz	38.50 dBm	20.61 dBm	21.45 dBm	0.84 dB	
	RSE	Rel99	2479.2 MHz	-13.00 dBm	-42.20 dBm	-43.60 dBm	-1.40 dB	
LTE Band 2	EIRP	20M QPSK	1860.0 MHz	33.00 dBm	23.05 dBm	22.65 dBm	-0.40 dB	
	RSE	15M QPSK	3805.0 MHz	-13.00 dBm	-24.80 dBm	-22.80 dBm	2.00 dB	
LTE Band 12	EIRP	3M QPSK	714.5 MHz	34.80 dBm	20.95 dBm	21.20 dBm	0.25 dB	
	RSE	10M QPSK	2122.5 MHz	-13.00 dBm	-42.60 dBm	-44.30 dBm	-1.70 dB	
LTE Band 26(22)	ERP	15M QPSK	831.5 MHz	38.50 dBm	21.20 dBm	22.39 dBm	1.19 dB	
	RSE	5M QPSK	1663.0 MHz	-13.00 dBm	-37.20 dBm	-42.00 dBm	-4.80 dB	
LTE Band 26(90)	ERP	15M QPSK	821.5 MHz	50.00 dBm	20.63 dBm	20.91 dBm	0.28 dB	
	RSE	10M QPSK	1638.0 MHz	-13.00 dBm	-37.50 dBm	-41.30 dBm	-3.80 dB	
LTE Band 41	EIRP	15M QPSK	2682.5 MHz	33.00 dBm	23.50 dBm	24.22 dBm	0.72 dB	
	RSE	20M QPSK	5186.0 MHz	-25.00 dBm	-37.00 dBm	-36.10 dBm	0.90 dB	
LTE Band 66	EIRP	20M QPSK	1745.0 MHz	30.00 dBm	23.59 dBm	22.88 dBm	-0.71 dB	
	RSE	20M QPSK	3440.0 MHz	-13.00 dBm	-24.90 dBm	-22.00 dBm	2.90 dB	

Comparison of two models, upper deviation is within 3 dB range and all test results are under FCC Technical Limits.

1.4. REFERENCE DETAIL

Reference application that contains the reused reference data in the individual test reports:

Equipment Class	Reference FCC ID (Parent)	Application Type	Reference Test report number	Exhibit Type	Variant Test Report Number	Data Re-used
PCE	A3LSMA525M	Original Grant	4789746830-E2	Test Report	4789746865-E2	All
DTS	A3LSMA525M	Original Grant	4789746830-E3 (802.11b,g,n)	Test Report	4789746865-E3 (802.11b,g,n)	All
			4789746830-E4 (Bluetooth LE)	Test Report	4789746865-E4 (Bluetooth LE)	All
DSS	A3LSMA525M	Original Grant	4789746830-E5 (Bluetooth)	Test Report	4789746865-E5 (Bluetooth)	All
NII	A3LSMA525M	Original Grant	4789746830-E6 (802.11a,n,ac)	Test Report	4789746865-E6 (802.11a,n,ac)	All
DXX	A3LSMA525M	Original Grant	4789746830-E7 (NFC)	Test Report	4789746865-E7 (NFC)	All

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 22.
3. FCC CFR 47 Part 24.
4. FCC CFR 47 Part 27.
5. FCC CFR 47 Part 90.
6. ANSI TIA-603-E, 2016
7. ANSI C63.26, 2015
8. KDB 971168 D01 Power Meas License Digital Systems v03r01
9. 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
<input checked="" type="checkbox"/>	Chamber 2
<input type="checkbox"/>	Chamber 3

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, 9 kHz to 30 MHz	3.01 dB
Radiated Disturbance, 30 MHz to 1 GHz	4.26 dB
Radiated Disturbance, 1 GHz to 18 GHz	5.90 dB
Radiated Disturbance, Above 18 GHz	5.49 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 1, Clause 4.4.2 in IEC Guide 115:2007.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a GSM/WCDMA/LTE 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-A525F/DS and SM-A525F.
 These models are identical in hardware except SM-A525F has single SIM tray.
 With some pre-scan, model SM-A525F/DS was set for final test.

5.2. MAXIMUM OUTPUT POWER

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 (4789746830-S1 FCC Report SAR).

GSM

FCC Part 22/24						
Band	Frequency Range [MHz]	Modulation	Conducted		Radiated	
			Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
GSM850	824.2~848.8	GPRS	32.07	1611.49	30.30	1071.52
		EGPRS	25.22	332.59	23.16	207.01
GSM1900	1850.2~1909.8	GPRS	30.74	1186.45	30.00	1000.00
		EGPRS	25.64	366.19	26.37	433.51

WCDMA

FCC Part 22/24/27						
Band	Frequency Range [MHz]	Modulation	Conducted		Radiated	
			Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 5	826.4~846.6	Rel. 99	24.29	268.53	20.61	115.08
		HSDPA	23.61	229.74	20.19	104.47
Band 4	1712.4~1752.6	Rel. 99	23.31	214.15	22.44	175.39
		HSDPA	22.29	169.37	21.47	140.28
Band 2	1852.4~1907.6	Rel. 99	25.11	324.62	22.02	159.22
		HSDPA	21.99	158.16	21.47	140.28

LTE Band 2

FCC Part 24							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 2	1850 ~ 1910	20	QPSK	24.78	300.68	23.05	201.84
			16QAM	24.25	266.07	21.71	148.25
			64QAM	23.39	218.27		
		15	QPSK	24.87	306.74	22.74	187.93
			16QAM	24.11	257.63	21.61	144.88
			64QAM	23.19	208.45		
		10	QPSK	24.66	292.12	23.00	199.53
			16QAM	23.80	239.62	21.90	154.88
			64QAM	22.97	198.15		
		5	QPSK	24.68	294.06	22.61	182.39
			16QAM	23.81	240.49	21.87	153.82
			64QAM	22.87	193.82		
		3	QPSK	24.63	290.55	22.60	181.97
			16QAM	23.90	245.63	22.04	159.96
			64QAM	22.95	197.18		
		1.4	QPSK	24.81	302.88	22.70	186.21
			16QAM	23.97	249.58	21.41	138.36
			64QAM	22.91	195.46		

LTE Band 12

FCC Part 27							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 12	699 ~ 716	10	QPSK	24.34	271.41	20.56	113.76
			16QAM	23.55	226.47	20.03	100.69
			64QAM	22.59	181.61		
		5	QPSK	24.26	266.91	20.86	121.90
			16QAM	23.75	236.92	20.69	117.22
			64QAM	22.50	177.65		
		3	QPSK	24.29	268.70	20.95	124.45
			16QAM	23.55	226.63	20.25	105.93
			64QAM	22.59	181.43		
		1.4	QPSK	24.22	264.32	20.91	123.31
			16QAM	23.50	223.85	20.31	107.40
			64QAM	22.49	177.48		

LTE Band 26 (Part 90)

FCC Part 90							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 26	814 ~ 824	15	QPSK	24.24	265.32	20.63	115.61
			16QAM	24.03	252.91	20.10	102.33
			64QAM	22.82	191.55		
		10	QPSK	24.29	268.40	19.08	80.91
			16QAM	23.79	239.51	18.64	73.11
			64QAM	22.96	197.67		
		5	QPSK	24.24	265.52	19.85	96.61
			16QAM	23.82	241.10	18.95	78.52
			64QAM	23.00	199.39		
		3	QPSK	24.13	258.56	20.04	100.93
			16QAM	23.99	250.67	19.53	89.74
			64QAM	22.88	194.19		
		1.4	QPSK	24.07	255.55	20.05	101.16
			16QAM	23.64	231.15	19.48	88.72
			64QAM	22.99	199.12		

LTE Band 26 (Straddle Channel)

Straddle Channel							
Band	Frequency [MHz]	BandWidth [MHz]	Modulation	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 26	824	15	QPSK	24.13	258.82	20.24	105.68
			16QAM	23.46	221.82	19.57	90.57
			64QAM	22.41	174.18		
		10	QPSK	24.16	260.62	20.66	116.41
			16QAM	23.64	231.21	20.17	103.99
			64QAM	22.60	181.97		
		5	QPSK	24.17	261.22	20.53	112.98
			16QAM	23.60	229.09	20.05	101.16
			64QAM	22.83	191.87		
		3	QPSK	24.03	252.93	20.65	116.14
			16QAM	23.75	237.14	20.46	111.17
			64QAM	23.66	232.27		
		1.4	QPSK	24.06	254.68	20.45	110.92
			16QAM	23.52	224.91	19.95	98.86
			64QAM	23.63	230.67		

LTE Band 26 (Part 22)

FCC Part 22							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 26	824 ~ 849	15	QPSK	24.12	258.37	21.20	131.83
			16QAM	23.83	241.67	20.78	119.67
			64QAM	23.21	209.65		
		10	QPSK	24.13	258.56	21.16	130.62
			16QAM	23.57	227.63	20.58	114.29
			64QAM	22.95	197.14		
		5	QPSK	24.20	262.72	20.89	122.74
			16QAM	23.77	238.38	20.49	111.94
			64QAM	22.87	193.58		
		3	QPSK	24.09	256.72	20.85	121.62
			16QAM	23.65	231.60	20.15	103.51
			64QAM	22.97	197.96		
		1.4	QPSK	24.11	257.49	20.92	123.59
			16QAM	23.92	246.76	20.37	108.89
			64QAM	22.74	187.73		

LTE Band 41

FCC Part 27							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 41	2496 ~ 2690	20	QPSK	24.07	255.00	21.64	145.88
			16QAM	23.03	200.89	21.10	128.82
			64QAM	22.36	172.01		
		15	QPSK	23.97	249.70	21.61	144.88
			16QAM	23.03	200.71	21.26	133.66
			64QAM	22.05	160.28		
		10	QPSK	24.01	251.76	21.64	145.88
			16QAM	23.05	201.80	21.21	132.13
			64QAM	22.05	160.28		
		5	QPSK	24.06	254.50	21.87	153.82
			16QAM	23.20	209.02	21.24	133.05
			64QAM	22.20	165.78		

LTE Band 66

FCC Part 27							
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Conducted		Radiated	
				Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 66	1710 ~ 1780	20	QPSK	23.37	217.16	23.59	228.56
			16QAM	22.63	183.11	22.54	179.47
			64QAM	21.84	152.75		
		15	QPSK	23.27	212.55	23.07	202.77
			16QAM	22.60	181.78	21.91	155.24
			64QAM	21.84	152.76		
		10	QPSK	23.26	212.07	23.51	224.39
			16QAM	22.61	182.41	21.68	147.23
			64QAM	21.50	141.33		
		5	QPSK	23.23	210.60	23.00	199.53
			16QAM	22.82	191.38	21.88	154.17
			64QAM	21.62	145.34		
		3	QPSK	23.29	213.32	23.29	213.30
			16QAM	22.52	178.83	22.12	162.93
			64QAM	21.52	141.78		
		1.4	QPSK	23.19	208.47	22.99	199.07
			16QAM	22.45	175.78	21.82	152.05
			64QAM	21.70	148.01		

LTE Band 4

LTE Band 4 (Frequency range: 1710-1755 MHz) is covered by LTE Band 66 (Frequency range: 1710-1780 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

LTE Band 5

LTE Band 5 (Frequency range: 824-849 MHz) is covered by LTE Band 26 (Frequency range: 814-849 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

LTE Band 17

LTE Band 17 (Frequency range: 704-716 MHz) is covered by LTE Band 12 (Frequency range: 699-716 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

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

Frequency (MHz)	Peak Gain (dBi)
GSM 1900 / WCDMA Band 2/ LTE Band 2 1850 ~ 1910 MHz	-1.00
LTE Band 4 / LTE Band 66 1710 ~ 1780 MHz	-0.18
GSM 850 / WCDMA Band 5 / LTE Band 5 / LTE Band 26 814 ~ 849 MHz	-0.42
LTE Band 12 / LTE Band 17 699 ~ 716 MHz	-0.55
LTE Band 41 2496 ~ 2690 MHz	-1.91

5.4. WORST-CASE ORIENTATION

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

- GSM GPRS/EGPRS
- UMTS REL 99/HSDPA

For all LTE Bands, 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 and 64QAM 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 conducted power in QPSK.

Highest power setting for each bands				
LTE Band	Frequency (MHz)	Bandwidth (MHz)	RB size	RB offset
2	1857.5	15	1	74
	1880.0		1	0
	1902.5		1	74
12	704.0	10	1	25
	707.5		1	0
	711.0		1	0
26 (Part 90)	819.0	10	1	49
26 (Straddle Channel)	824.0	5	1	0
26 (Part 22)	826.5	5	1	12
	831.5		1	0
	846.5		1	0
41	2506.0	20	1	49
	2593.0		1	0
	2680.0		1	99
66	1720.0	20	1	99
	1745.0		1	99
	1770.0		1	99

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
GSM850	-	-	O	-	-	O
GSM1900	O	-	-	O	-	-
WCDMA B5	-	-	O	-	-	O
WCDMA B4	O	-	-	-	O	-
WCDMA B2	O	-	-	-	-	O
LTE B2	O	-	-	-	O	-
LTE B12	-	-	O	-	-	O
LTE B26	-	-	O	-	O	-
LTE B41	-	O	-	-	O	-
LTE B66	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-TA200	R37N6KYPMH2SE3	N/A
Data Cable	SAMSUNG	EP-DR140AWE	N/A	N/A
Earphone	SAMSUNG	EHS64AVFWE	N/A	N/A

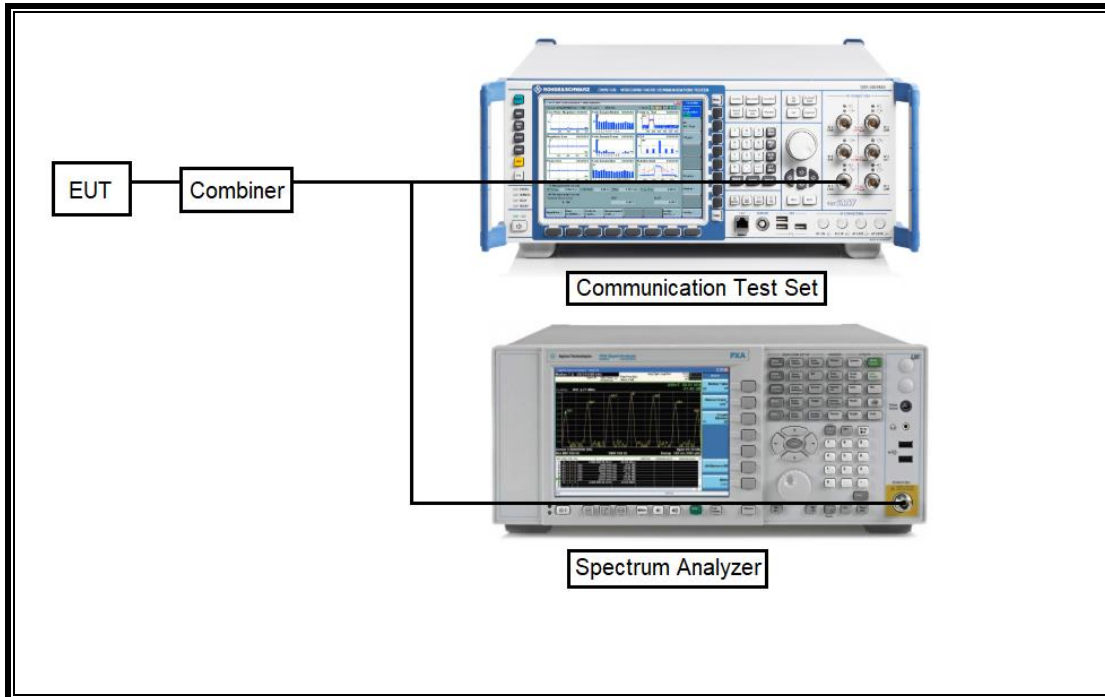
I/O CABLE

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
2	Audio	2	Mini-Jack	Unshielded	1.2 m	N/A

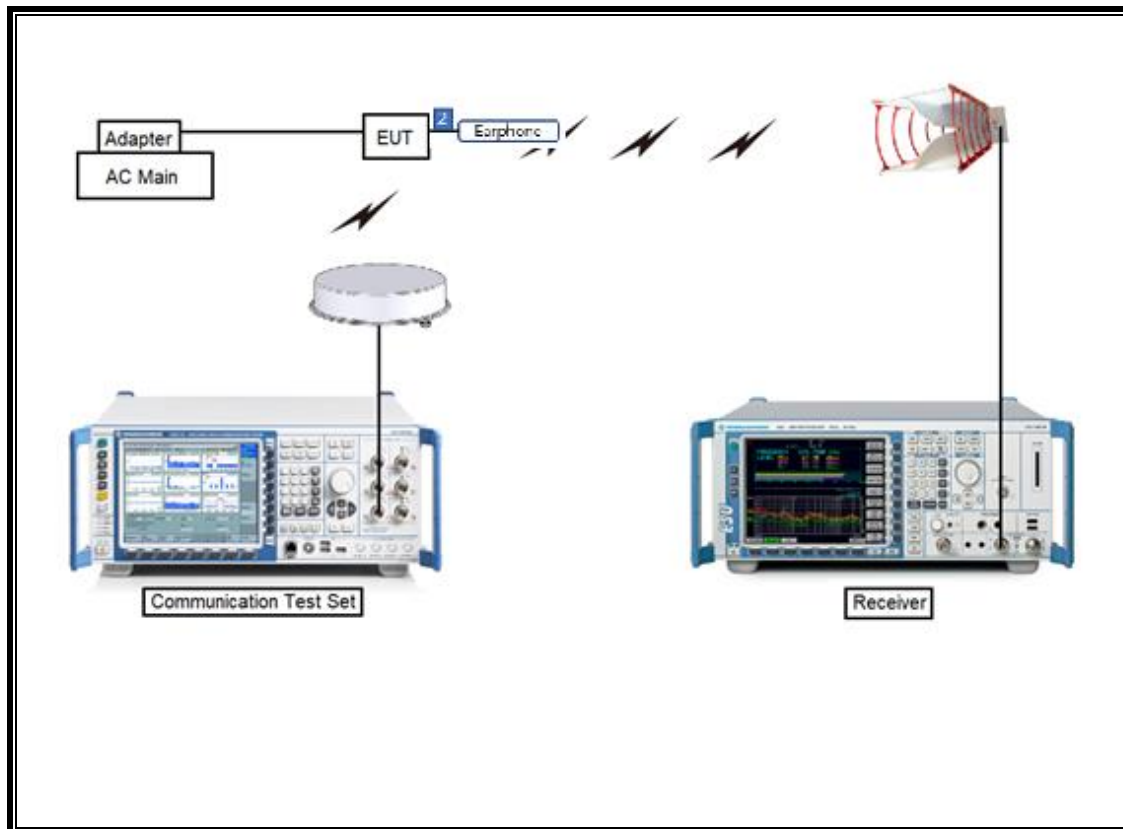
TEST SETUP

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	01-31-21
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	08-04-22
Preamplifier	ETS	3116C-PA	00168841	08-06-21
Antenna, Horn, 40 GHz	ETS	3116C	00168645	10-02-21
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	750	08-19-22
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	845	08-13-22
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	08-13-22
Antenna, Horn, 18 GHz	ETS	3115	00167211	07-27-22
Antenna, Horn, 18 GHz	ETS	3115	00161451	08-15-22
Antenna, Horn, 18 GHz	ETS	3117	00168724	07-27-22
Antenna, Horn, 18 GHz	ETS	3117	00168717	08-15-22
Communications Test Set	R&S	CMW500	115331	08-03-21
DC Power Supply	Agilent / HP	E3640A	MY54226395	08-05-21
Preamplifier, 1000 MHz	Sonoma	310N	341282	08-03-21
Preamplifier, 1000 MHz	Sonoma	310N	370599	08-06-21
Preamplifier, 1000 MHz	Sonoma	310N	351741	08-03-21
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1876511	08-03-21
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	2029169	08-04-21
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	08-03-21
Spectrum Analyzer	Agilent	N9030A	MY54170614	08-05-21
EMI Test Receive, 40 GHz	R&S	ESU40	100439	08-03-21
EMI Test Receive, 40 GHz	R&S	ESU40	100457	08-03-21
Directional Antenna	Cobham	FPA3-0.8-6.0R/1329	80108-0004	N/A
High Pass Filter 1.2GHz	Micro-Tronics	HPM50108-02	G005	08-05-21
High Pass Filter 1.2GHz	Micro-Tronics	HPM50108-02	G006	08-05-21
High Pass Filter 2.8GHz	Micro-Tronics	HPM50111-02	010	08-05-21
High Pass Filter 2.8GHz	Micro-Tronics	HPM50111-02	011	08-05-21
High Pass Filter 4GHz	Micro-Tronics	HPM50118-02	G001	08-05-21
High Pass Filter 4GHz	Micro-Tronics	HPM50118-02	G002	08-05-21
Attenuator	PASTERNAK	PE7087-10	A009	08-05-21
Attenuator	PASTERNAK	PE7087-10	A001	08-03-21
Attenuator	PASTERNAK	PE7087-10	A008	08-03-21
Attenuator	PASTERNAK	PE7004-10	2	08-04-21
Attenuator	PASTERNAK	PE7395-10	A011	08-05-21
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	10-02-21
Temperature Chamber	ESPEC	SH-642	93001109	08-04-21
Power Splitter	MINI-CIRCUITS	WA1534	UL001	02-05-21
Power Splitter	MINI-CIRCUITS	WA1534	UL002	02-05-21
UL Software				
Description	Manufacturer	Model	Version	
Antenna port test software	UL	CLT	Ver 2.5	

7. SUMMARY TABLE

FCC Part Section	Test Description	Test Limit	Test Condition	Test Result
2.1049	Occupied Band width (99%)	N/A	Conducted	Pass
22.917(a) 24.238(a) 27.53,(g),(h) 90.691	Band Edge / Conducted Spurious Emission	-13dBm		Pass
27.53(m)	Conducted Spurious Emission	-25 dBm		Pass
27.53(m) 90.691	Emission mask	Section 9.2.2		Pass
2.1046	Conducted output power	N/A		Pass
22.355 24.235 27.54 90.213	Frequency Stability	2.5PPM		Pass
22.913(a)(5)	Effective Radiated Power	38.5 dBm		Pass
90.635(b)		50 dBm	Pass	
27.50(c)(10) 27.50(b)(10)		34.77 dBm	Pass	
24.232(c) 27.50(h)(2)	Equivalent Isotropic Radiated Power	33dBm	Radiated	Pass
27.50(d)(4)		30dBm		Pass
22.917(a) 24.238(a) 27.53,(g),(h) 90.691	Radiated Spurious Emission	-13dBm		Pass
27.53 (m)		-25dBm		Pass

8. 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.

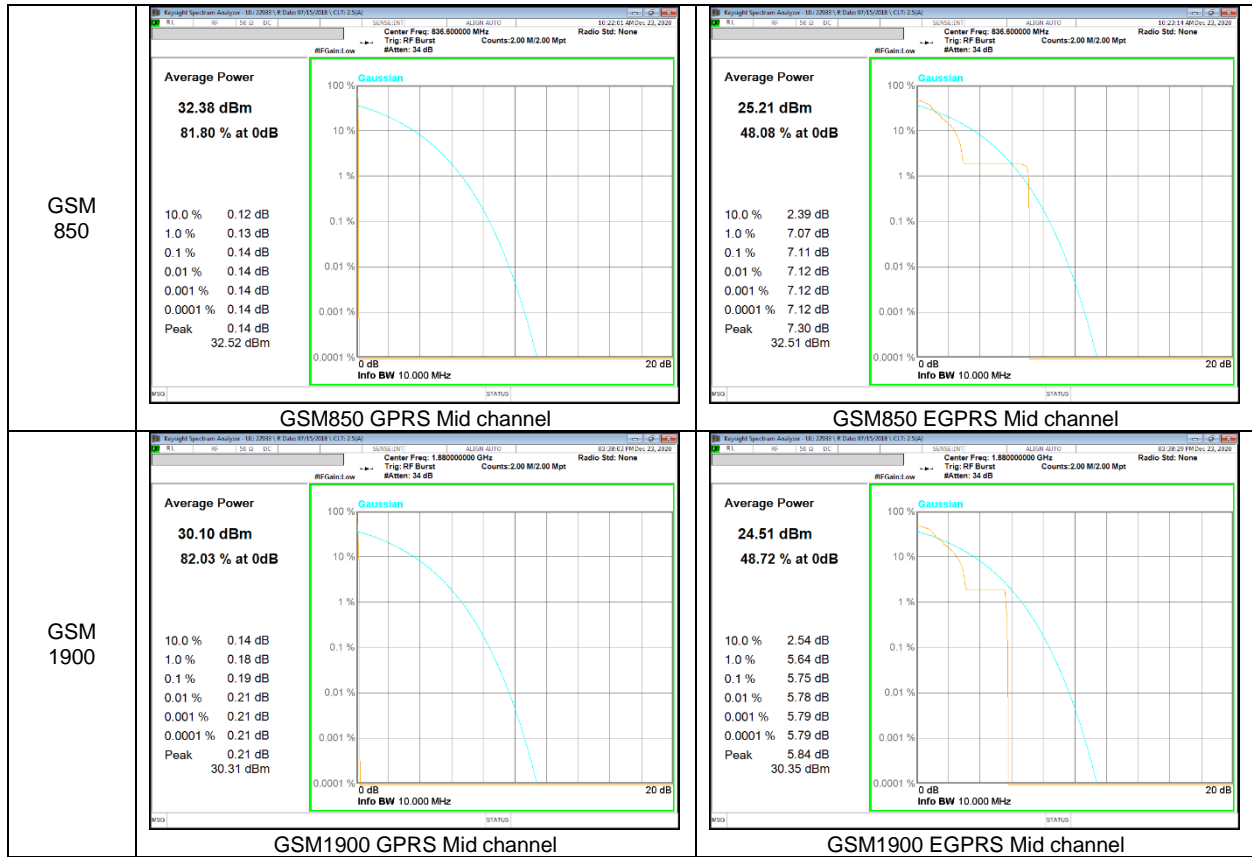
Test Spec

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.

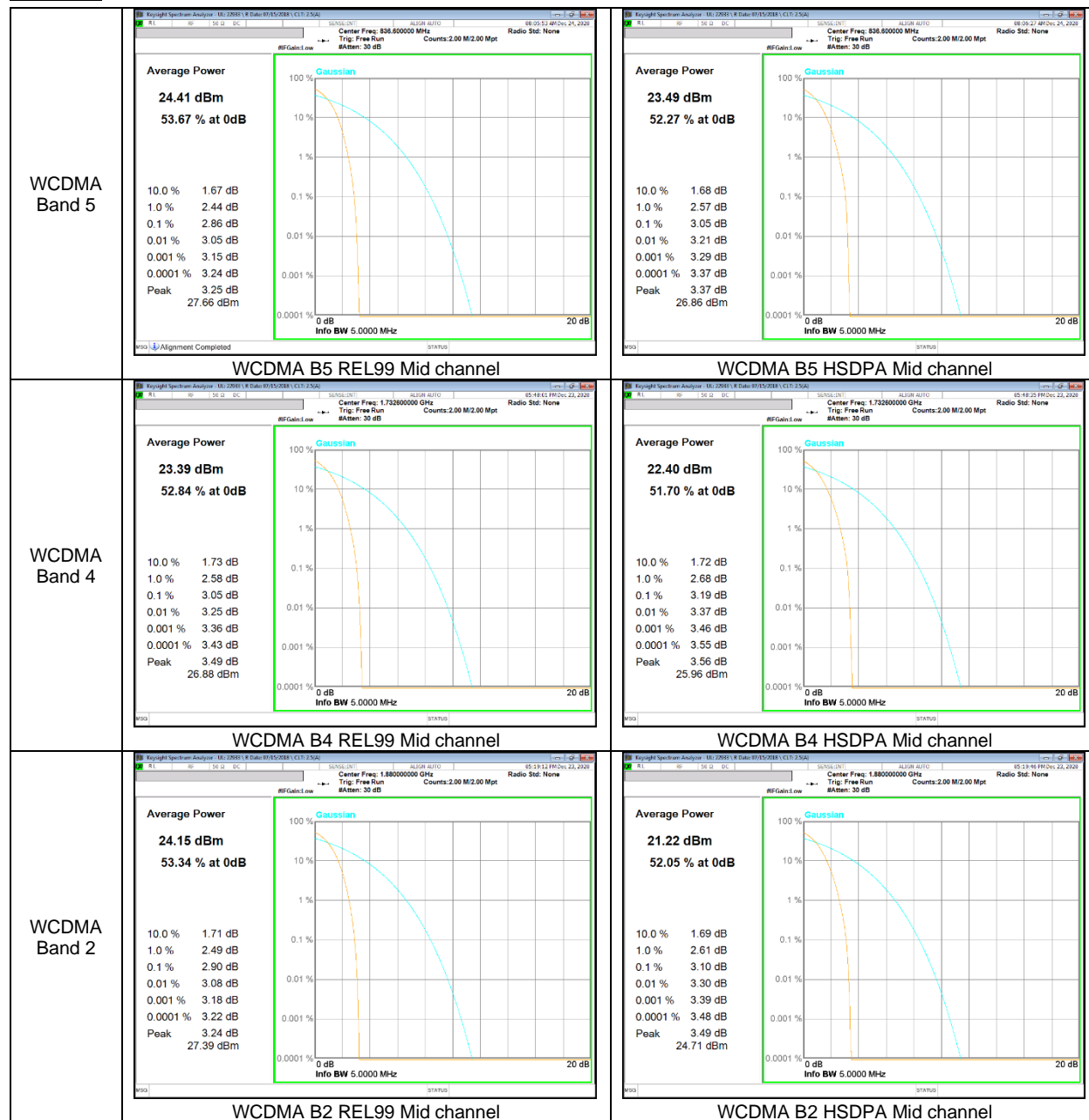
RESULTS

8.1. CONDUCTED PEAK TO AVERAGE RESULT

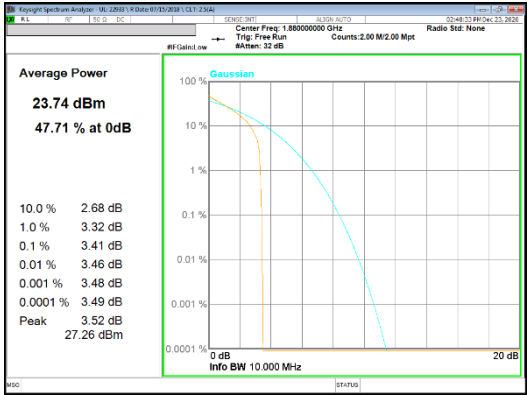
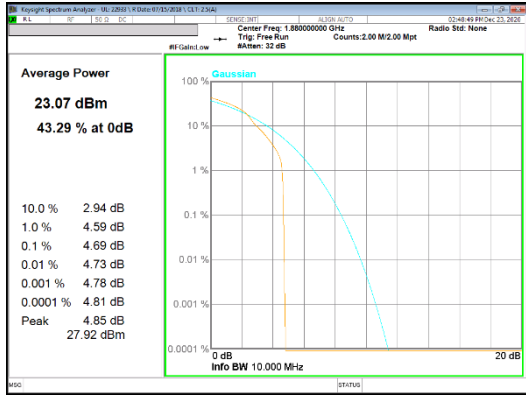
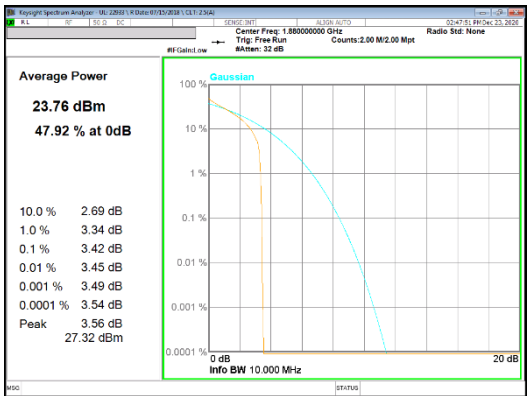
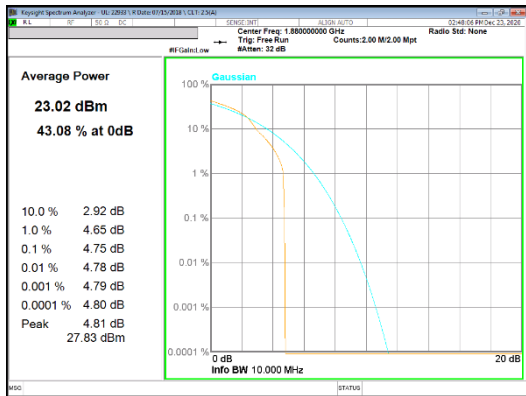
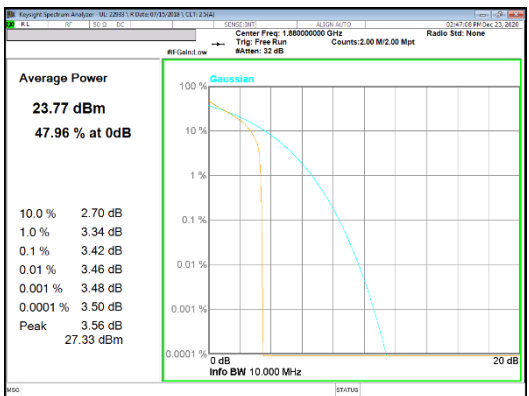
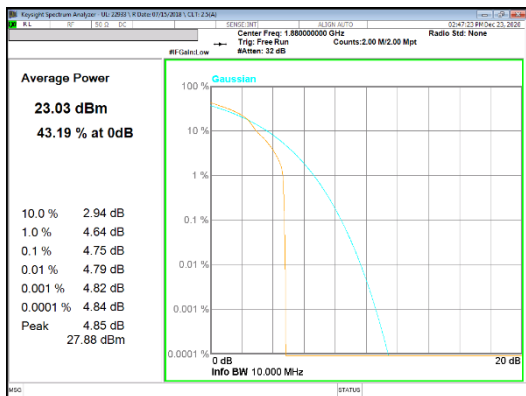
GSM

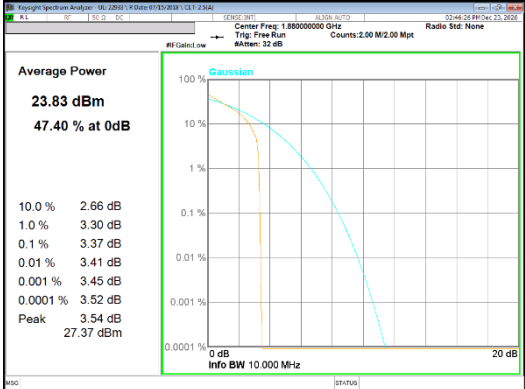
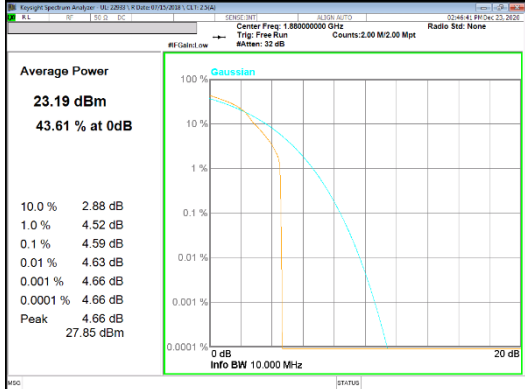
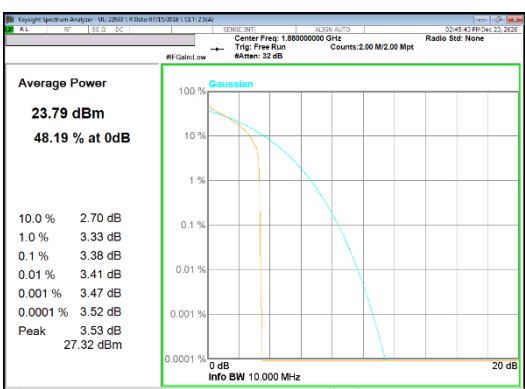
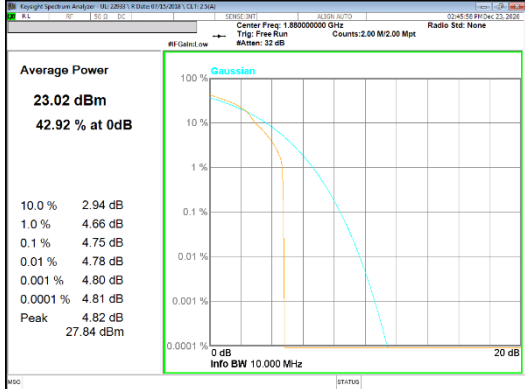
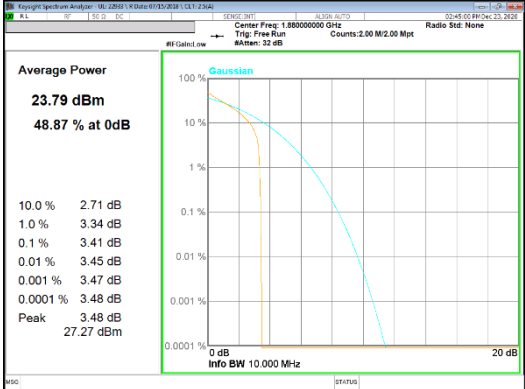
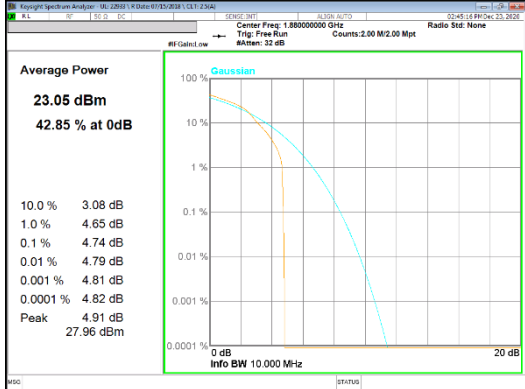


WCDMA

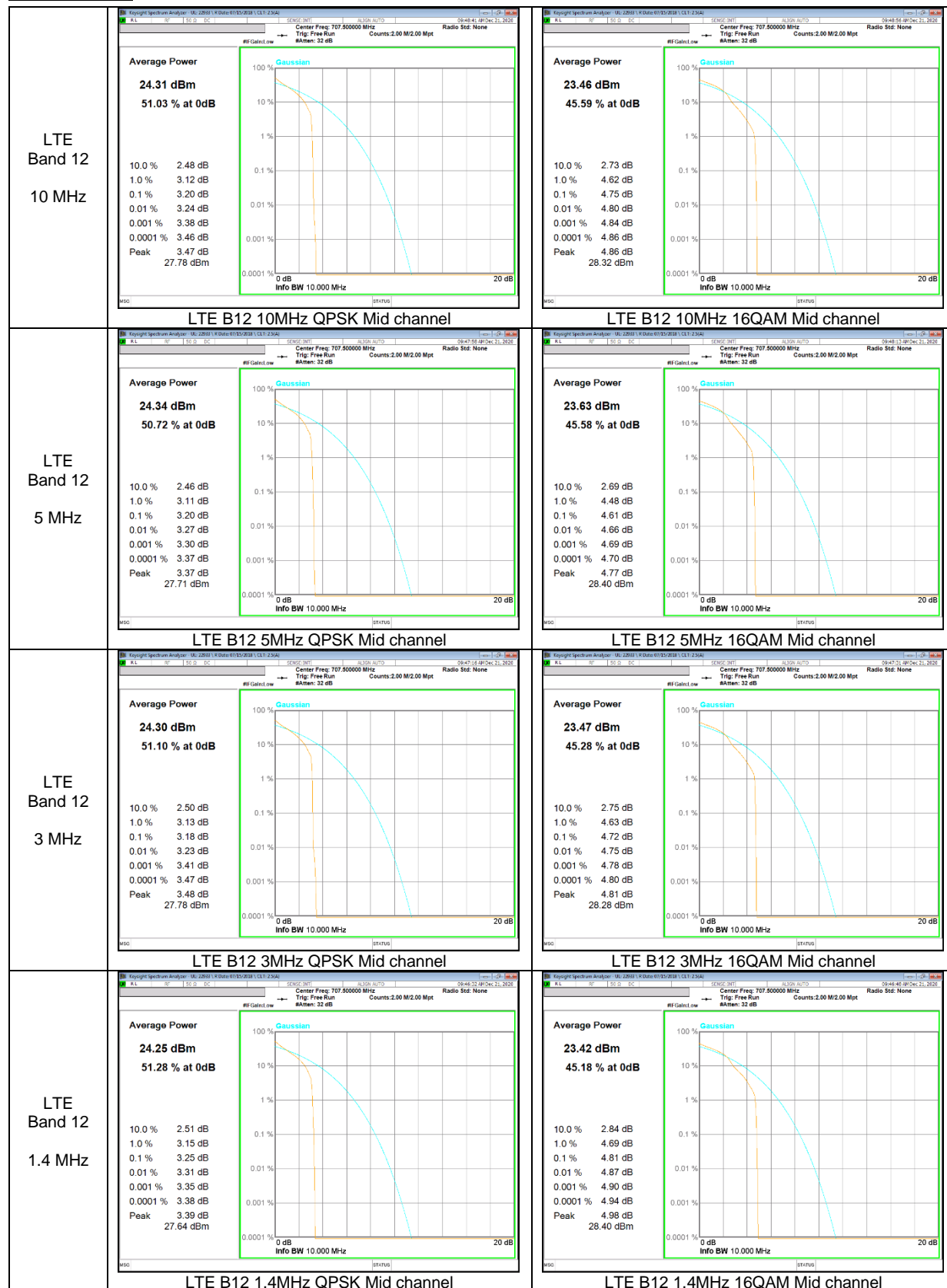


LTE Band 2

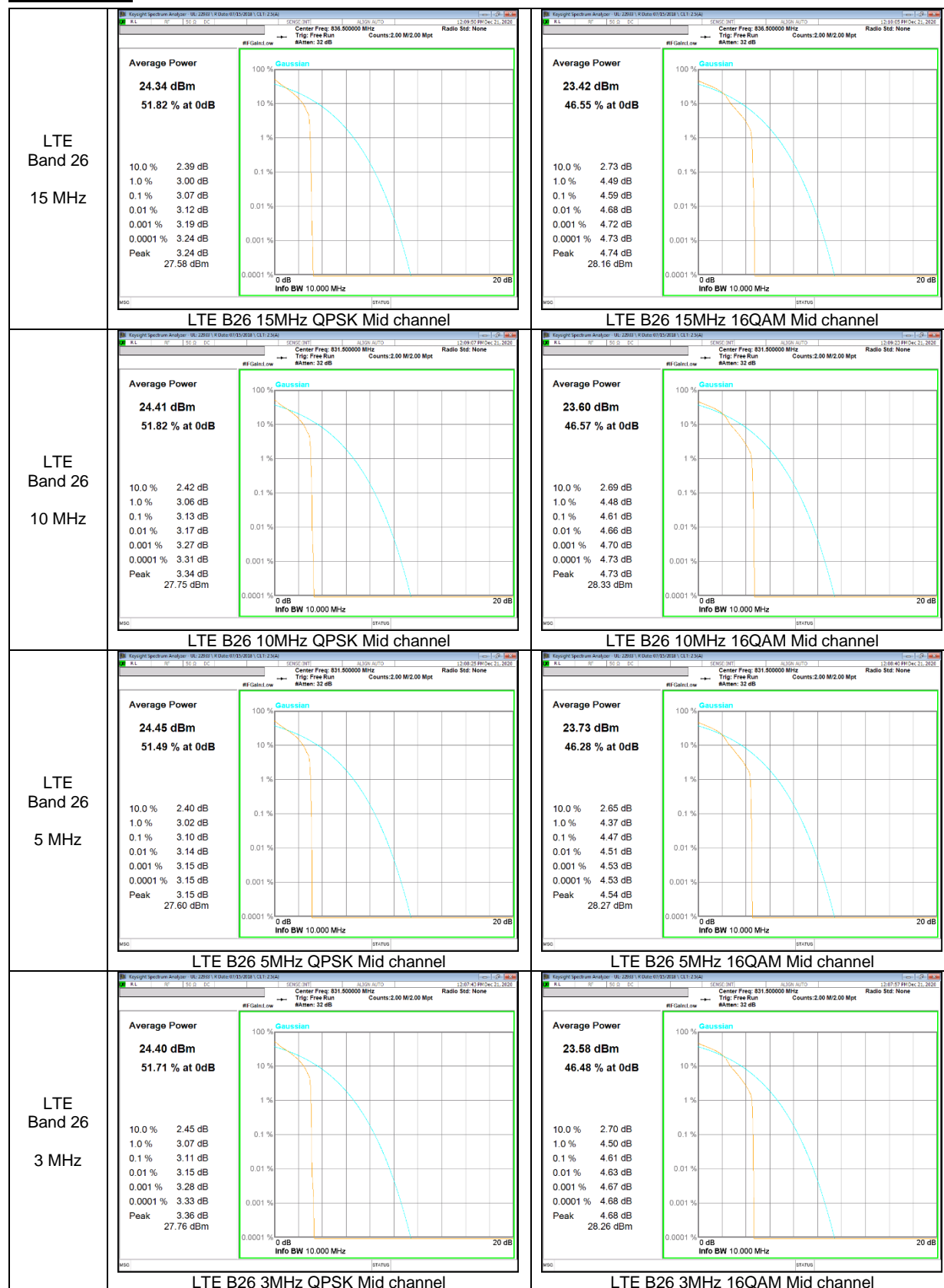
<p>LTE Band 2 20 MHz</p>	 <p>LTE B2 20MHz QPSK Mid channel</p>	 <p>LTE B2 20MHz 16QAM Mid channel</p>
<p>LTE Band 2 15 MHz</p>	 <p>LTE B2 15MHz QPSK Mid channel</p>	 <p>LTE B2 15MHz 16QAM Mid channel</p>
<p>LTE Band 2 10 MHz</p>	 <p>LTE B2 10MHz QPSK Mid channel</p>	 <p>LTE B2 10MHz 16QAM Mid channel</p>

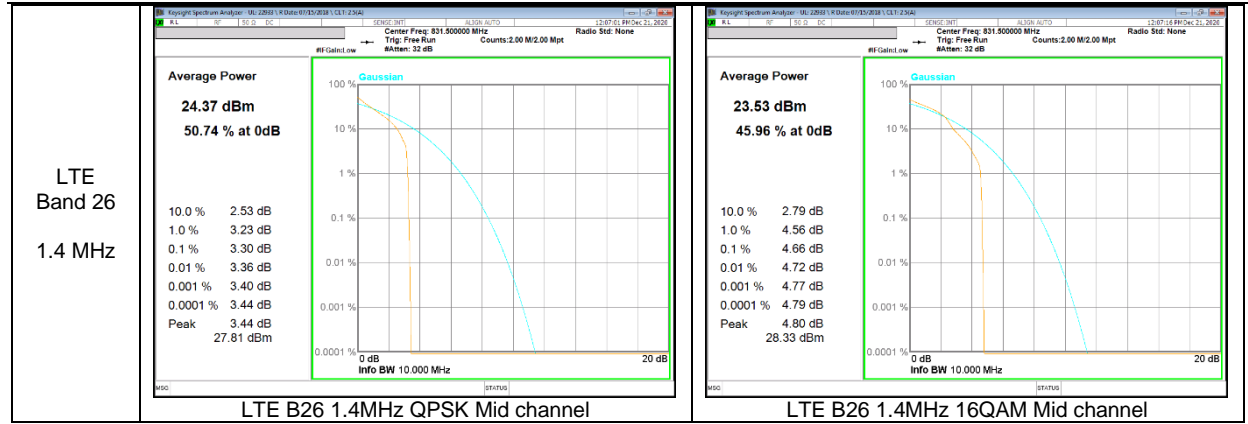
<p>LTE Band 2 5 MHz</p>	 <p>LTE B2 5MHz QPSK Mid channel</p>	 <p>LTE B2 5MHz 16QAM Mid channel</p>
<p>LTE Band 2 3 MHz</p>	 <p>LTE B2 3MHz QPSK Mid channel</p>	 <p>LTE B2 3MHz 16QAM Mid channel</p>
<p>LTE Band 2 1.4 MHz</p>	 <p>LTE B2 1.4MHz QPSK Mid channel</p>	 <p>LTE B2 1.4MHz 16QAM Mid channel</p>

LTE Band 12

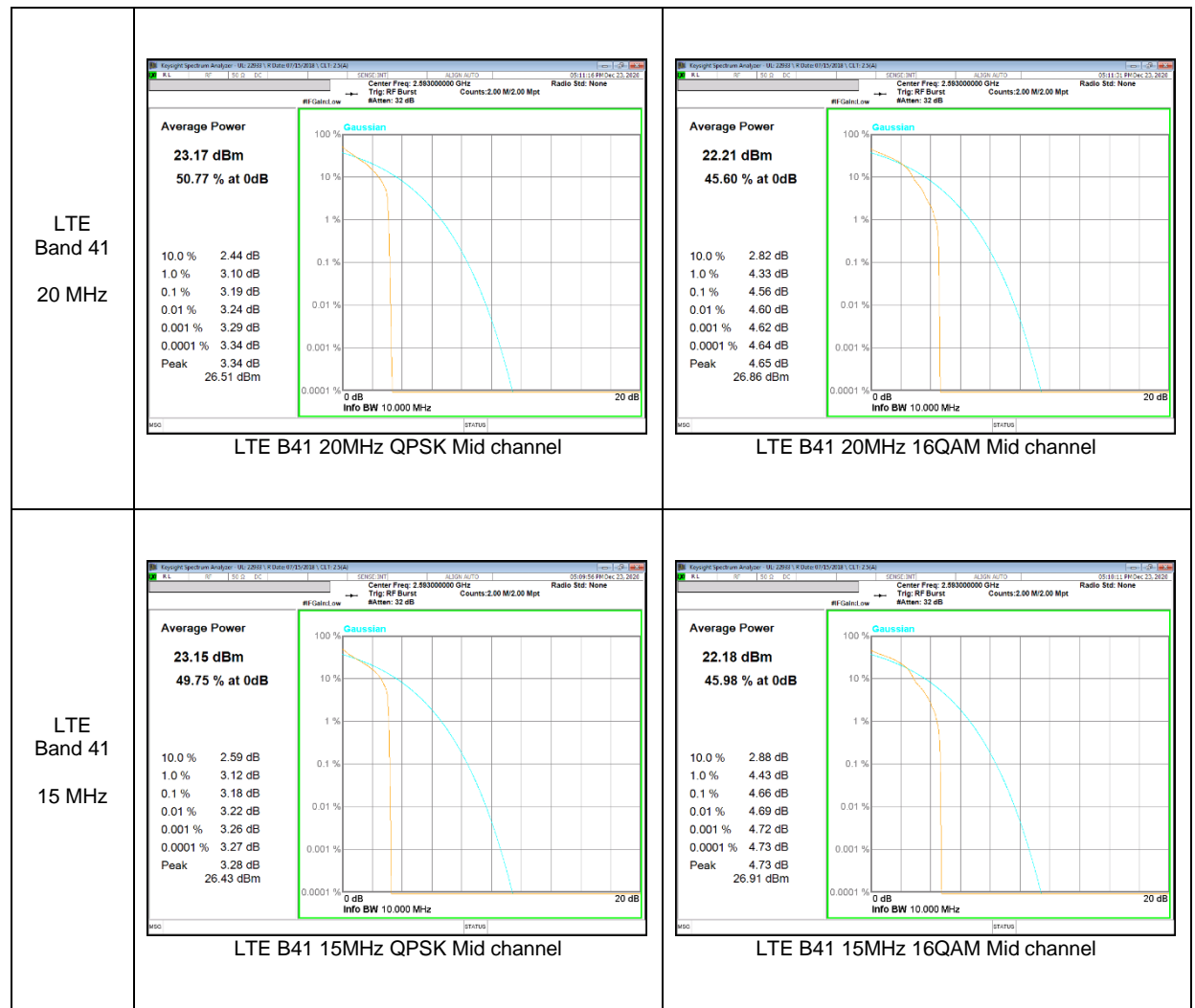


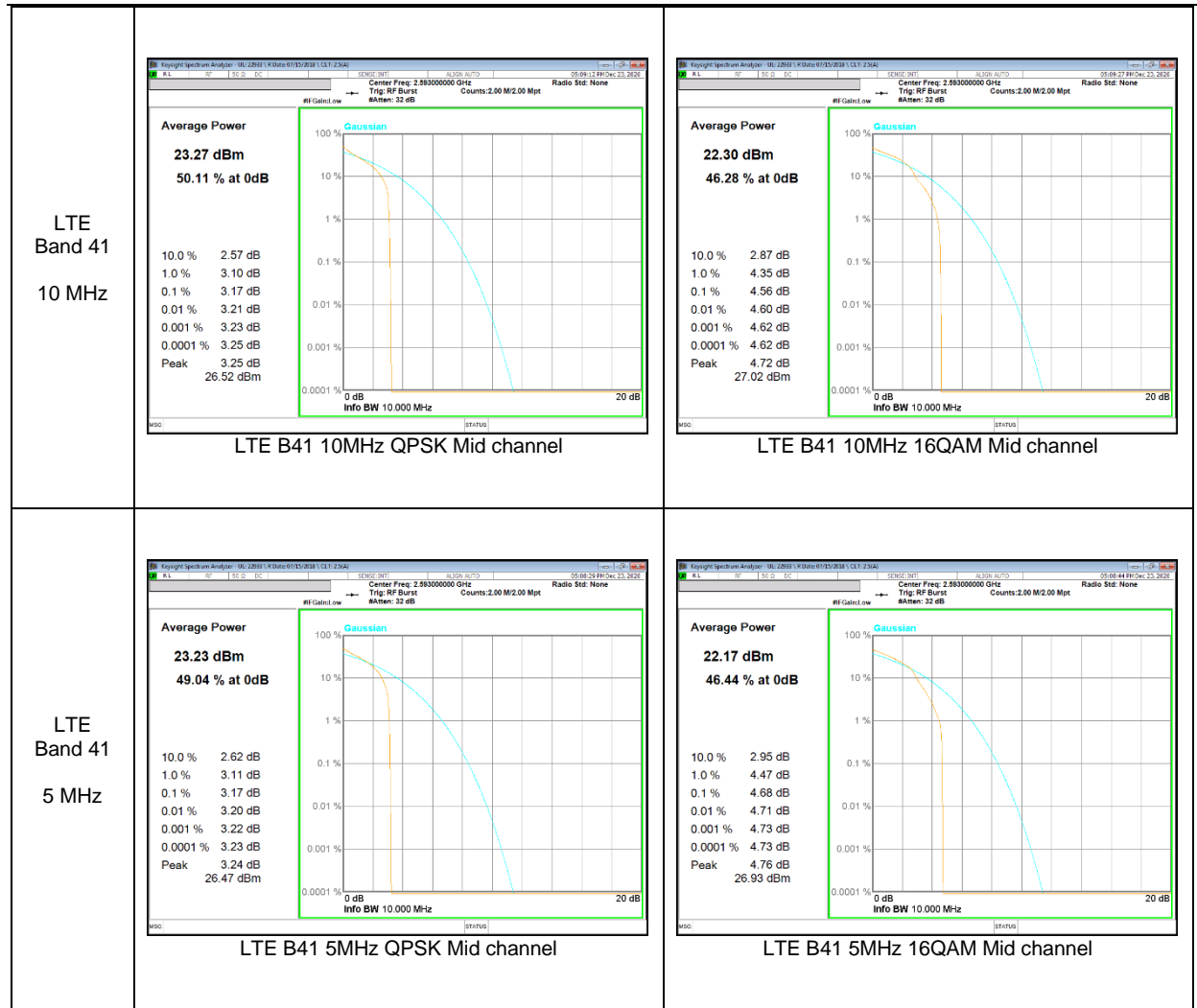
LTE Band 26



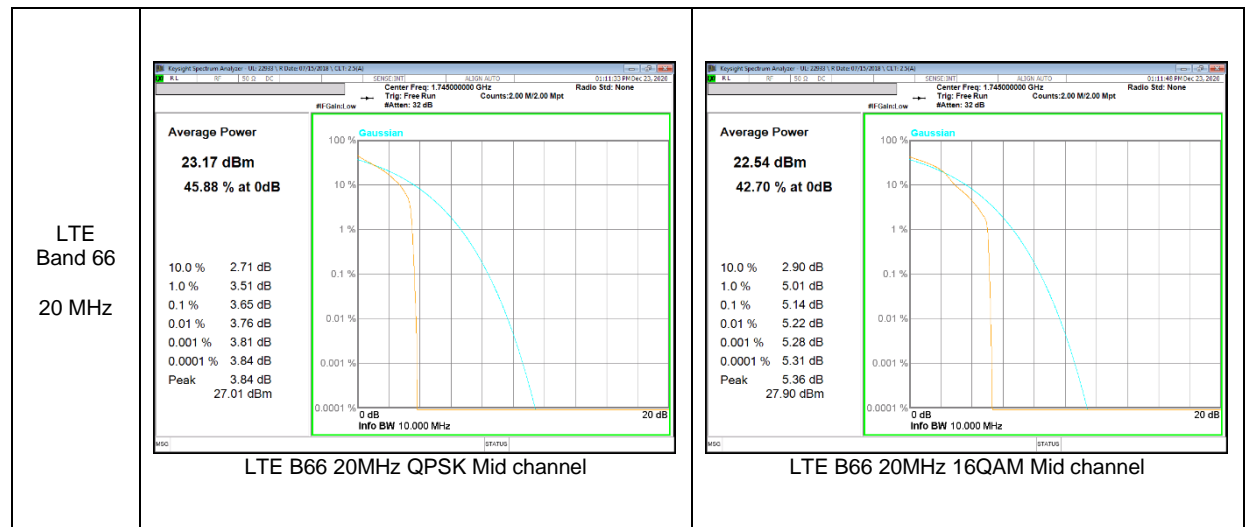


LTE Band 41

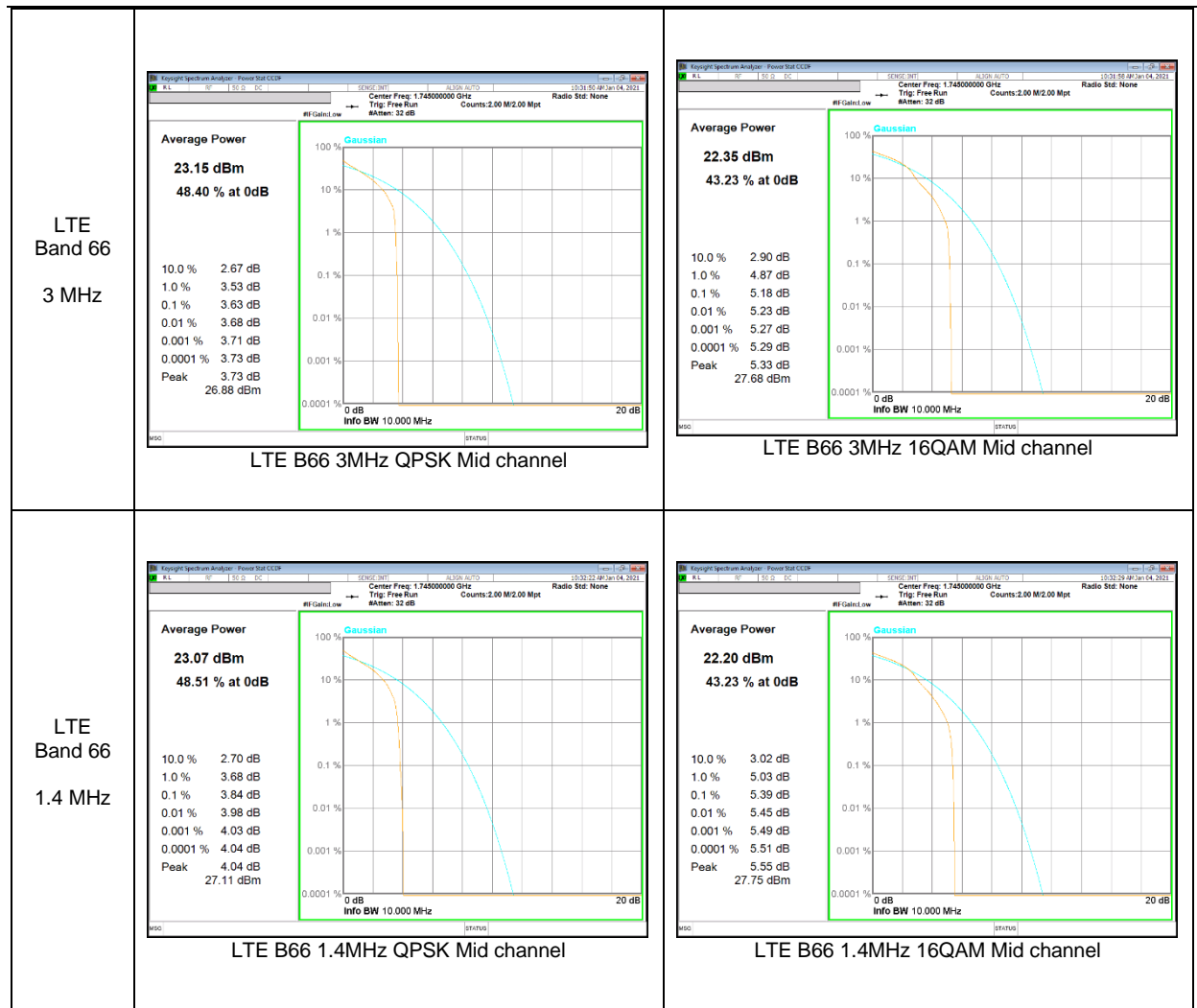




LTE Band 66







LTE Band 4

LTE Band 4 (Frequency range: 1710-1755 MHz) is covered by LTE Band 66 (Frequency range: 1710-1780 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

LTE Band 5

LTE Band 5 (Frequency range: 824-849 MHz) is covered by LTE Band 26 (Frequency range: 814-849 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

LTE Band 17

LTE Band 17 (Frequency range: 704-716 MHz) is covered by LTE Band 12 (Frequency range: 699-716 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

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 middle channel in each band. The -26dB bandwidth was also measured and recorded.

(KDB 971168 D01 Power Meas License Digital Systems v03r01)

RESULTS

There is no limit required and power is the same for low, middle and high channel; therefore, only middle channel was tested.

- GSM

Band	Modulation	Channel	f [MHz]	99% BW (kHz)	-26dB BW (kHz)
GSM850	GPRS	190	836.6	248.04	318.30
	EGPRS			250.68	308.40
GSM1900	GPRS	661	1880.0	247.19	317.10
	EGPRS			241.43	296.00

- WCDMA

Band	Modulation	Channel	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
WCDMA5	Rel. 99	4183	836.6	4.152	4.693
	HSDPA			4.155	4.688
WCDMA4	Rel. 99	1412	1732.4	4.154	4.695
	HSDPA			4.149	4.676
WCDMA2	Rel. 99	9400	1880.0	4.141	4.697
	HSDPA			4.139	4.686

- LTE B2

Band	BW	Modulation	Channel	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B2	20M	QPSK	18900	1880.0	17.880	19.300
		16QAM			17.896	19.250
	15M	QPSK	18900	1880.0	13.381	14.360
		16QAM			13.373	14.450
	10M	QPSK	18900	1880.0	8.950	9.713
		16QAM			8.953	9.745
	5M	QPSK	18900	1880.0	4.493	4.921
		16QAM			4.480	4.894
	3M	QPSK	18900	1880.0	2.689	2.981
		16QAM			2.694	2.967
	1.4M	QPSK	18900	1880.0	1.087	1.239
		16QAM			1.080	1.237

- LTE B12

Band	BW	Modulation	Channel	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B12	10M	QPSK	23095	707.5	8.952	9.720
		16QAM			8.933	9.710
	5M	QPSK	23095	707.5	4.502	4.941
		16QAM			4.493	4.959
	3M	QPSK	23095	707.5	2.694	2.966
		16QAM			2.691	3.000
	1.4M	QPSK	23095	707.5	1.087	1.229
		16QAM			1.091	1.227

- LTE B26 (Part90)

Band	BW	Modulation	Channel	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B26 (Part90)	15M	QPSK	26765	821.5	13.338	14.450
		16QAM			13.354	14.350
	10M	QPSK	26740	819.0	8.931	9.788
		16QAM			8.923	9.695
	5M	QPSK	23205	816.5	4.496	4.980
		16QAM			4.491	4.969
	3M	QPSK	26705	815.5	2.691	2.993
		16QAM			2.684	2.995
	1.4M	QPSK	26697	814.7	1.082	1.227
		16QAM			1.083	1.225

LTE B26 (Straddle Channel)

Band	BW	Modulation	Channel	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B26 (Straddle)	15M	QPSK	26790	824.0	13.387	14.530
		16QAM			13.373	14.410
	10M	QPSK	26790	824.0	8.956	9.782
		16QAM			8.949	9.655
	5M	QPSK	26790	824.0	4.493	4.922
		16QAM			4.479	4.905
	3M	QPSK	26790	824.0	2.699	2.975
		16QAM			2.700	2.965
	1.4M	QPSK	26790	824.0	1.083	1.236
		16QAM			1.085	1.231

- LTE B26 (Part22)

Band	BW	Modulation	Channel	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B26 (Part22)	15M	QPSK	26915	836.5	13.360	14.450
		16QAM			13.356	14.410
	10M	QPSK	26865	831.5	8.948	9.723
		16QAM			8.944	9.772
	5M	QPSK	26865	831.5	4.483	4.907
		16QAM			4.480	4.890
	3M	QPSK	26865	831.5	2.690	3.010
		16QAM			2.694	2.962
	1.4M	QPSK	26865	831.5	1.086	1.224
		16QAM			1.090	1.237

- LTE B41

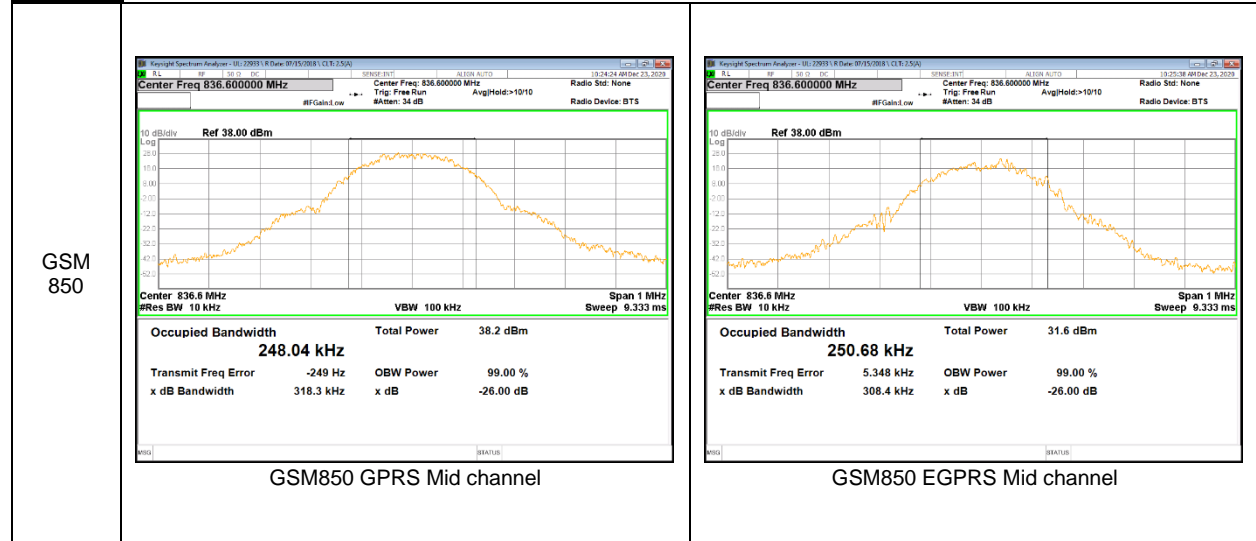
Band	BW	Modulation	Channel	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B41	20M	QPSK	40620	2593.0	17.885	19.220
		16QAM			17.880	19.210
	15M	QPSK	40620	2593.0	13.353	14.370
		16QAM			13.376	14.340
	10M	QPSK	40620	2593.0	8.945	9.711
		16QAM			8.946	9.835
	5M	QPSK	40620	2593.0	4.497	5.191
		16QAM			4.483	4.943

- LTE B66

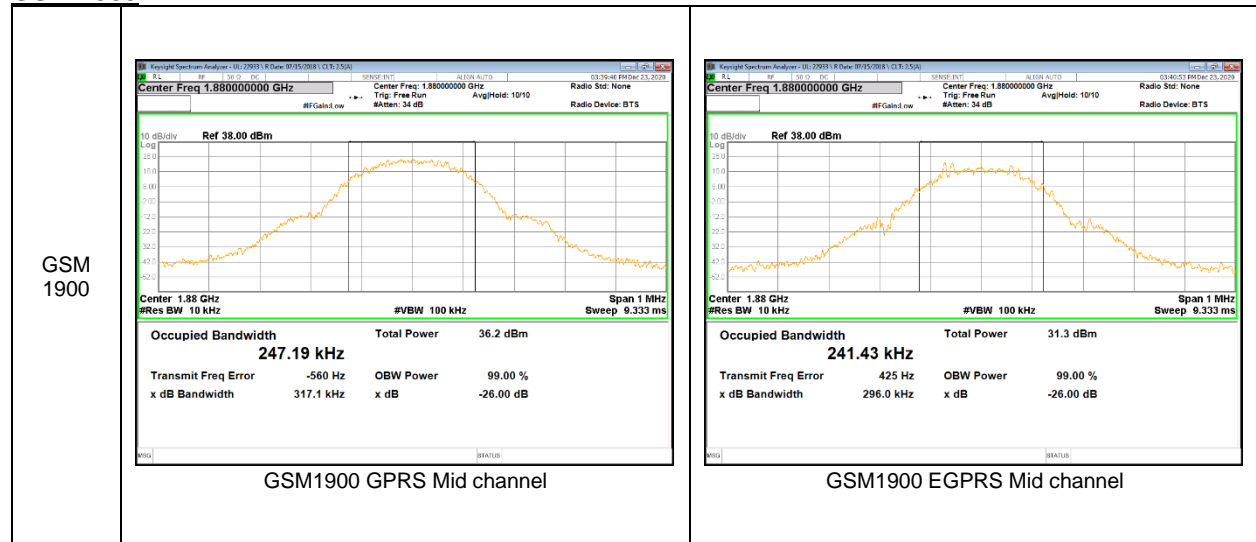
Band	BW	Modulation	Channel	f [MHz]	99% BW (MHz)	-26dB BW (MHz)
LTE B66	20M	QPSK	132322	1745.0	17.897	19.530
		16QAM			17.906	19.360
	15M	QPSK	132322	1745.0	13.375	14.530
		16QAM			13.385	14.440
	10M	QPSK	132322	1745.0	8.971	9.674
		16QAM			8.980	9.699
	5M	QPSK	132322	1745.0	4.501	4.916
		16QAM			4.488	4.955
	3M	QPSK	132322	1745.0	2.699	2.961
		16QAM			2.694	2.964
	1.4M	QPSK	132322	1745.0	1.084	1.229
		16QAM			1.090	1.232

9.1.1. OCCUPIED BANDWIDTH RESULTS

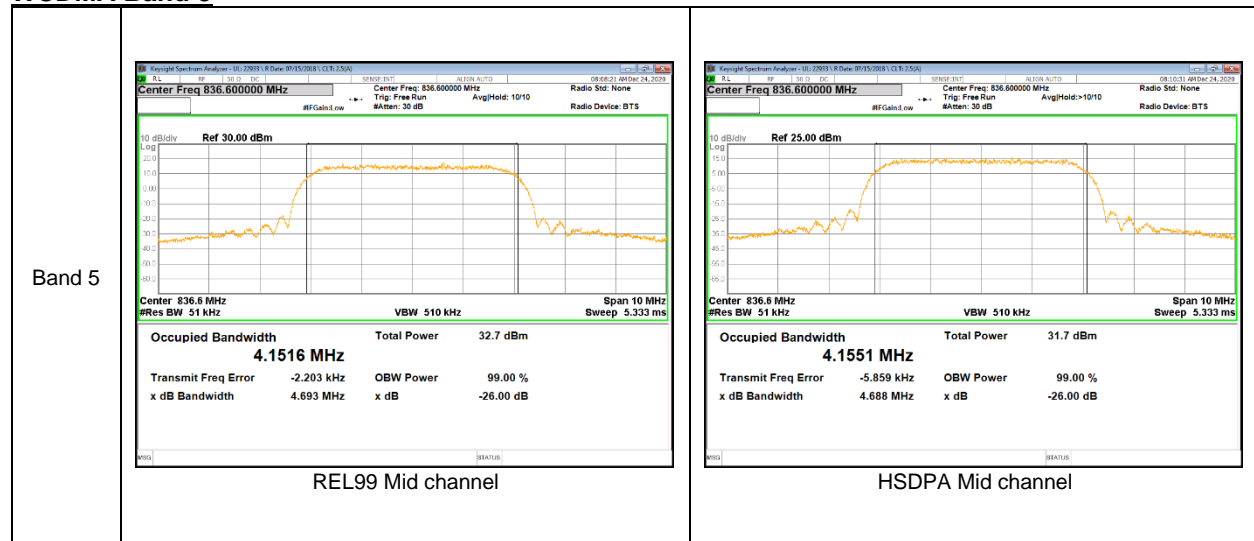
GSM 850



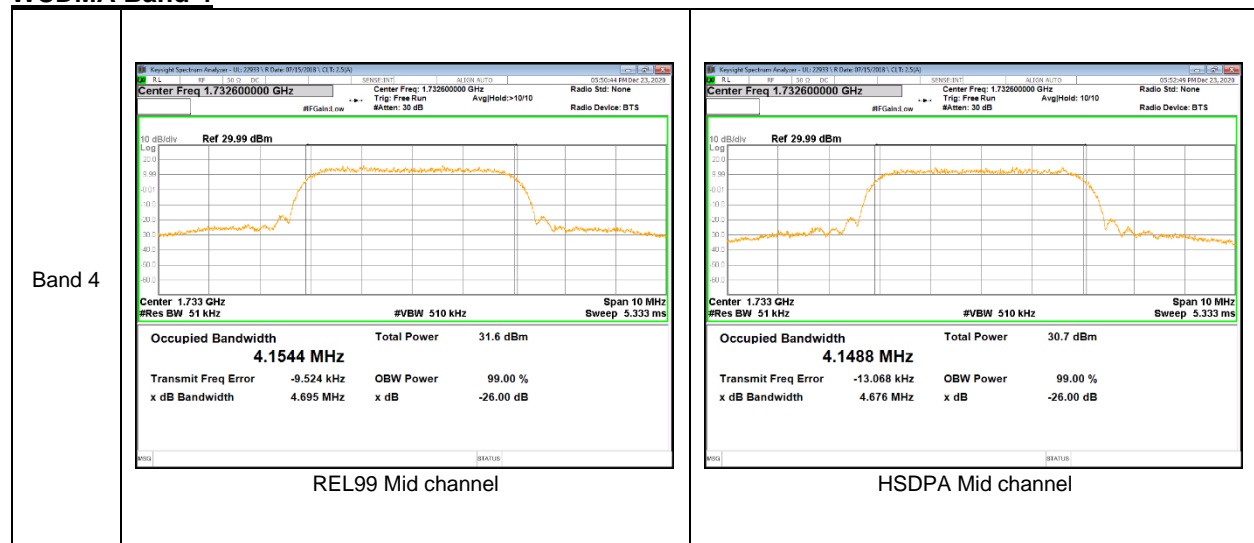
GSM 1900



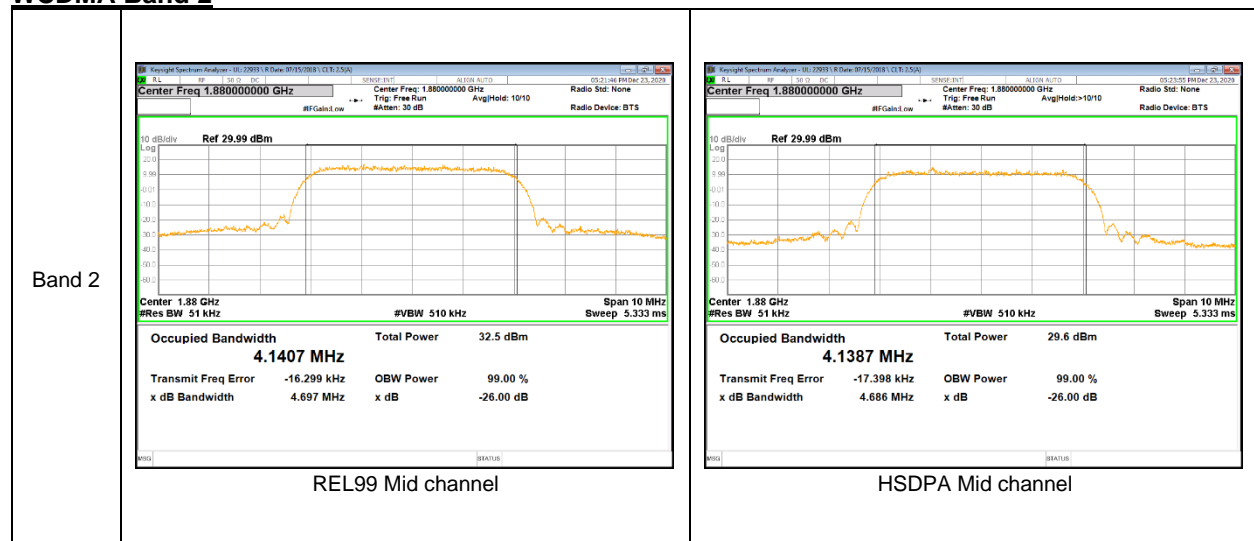
WCDMA Band 5



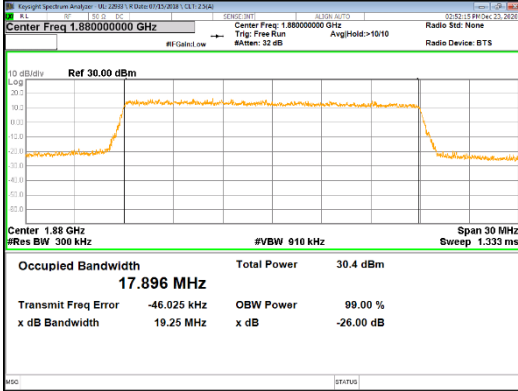
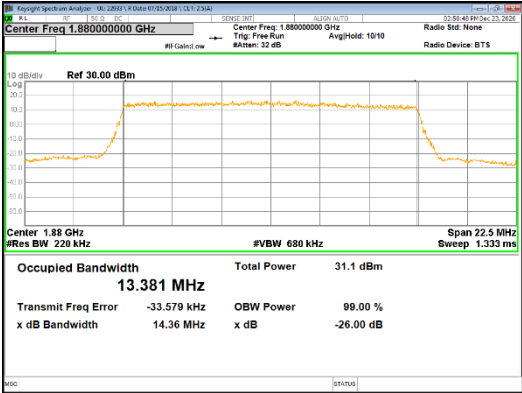
WCDMA Band 4

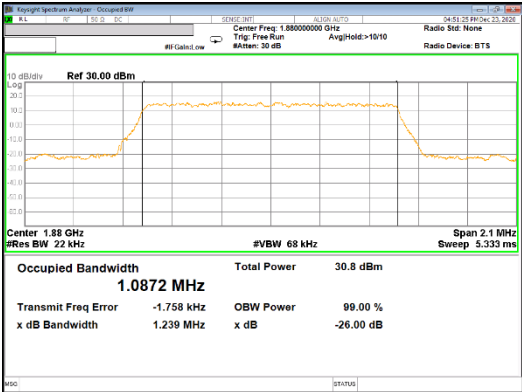
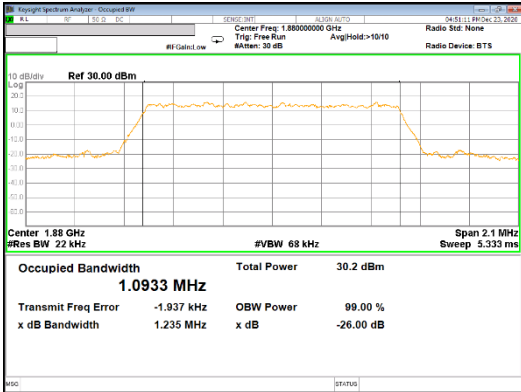


WCDMA Band 2

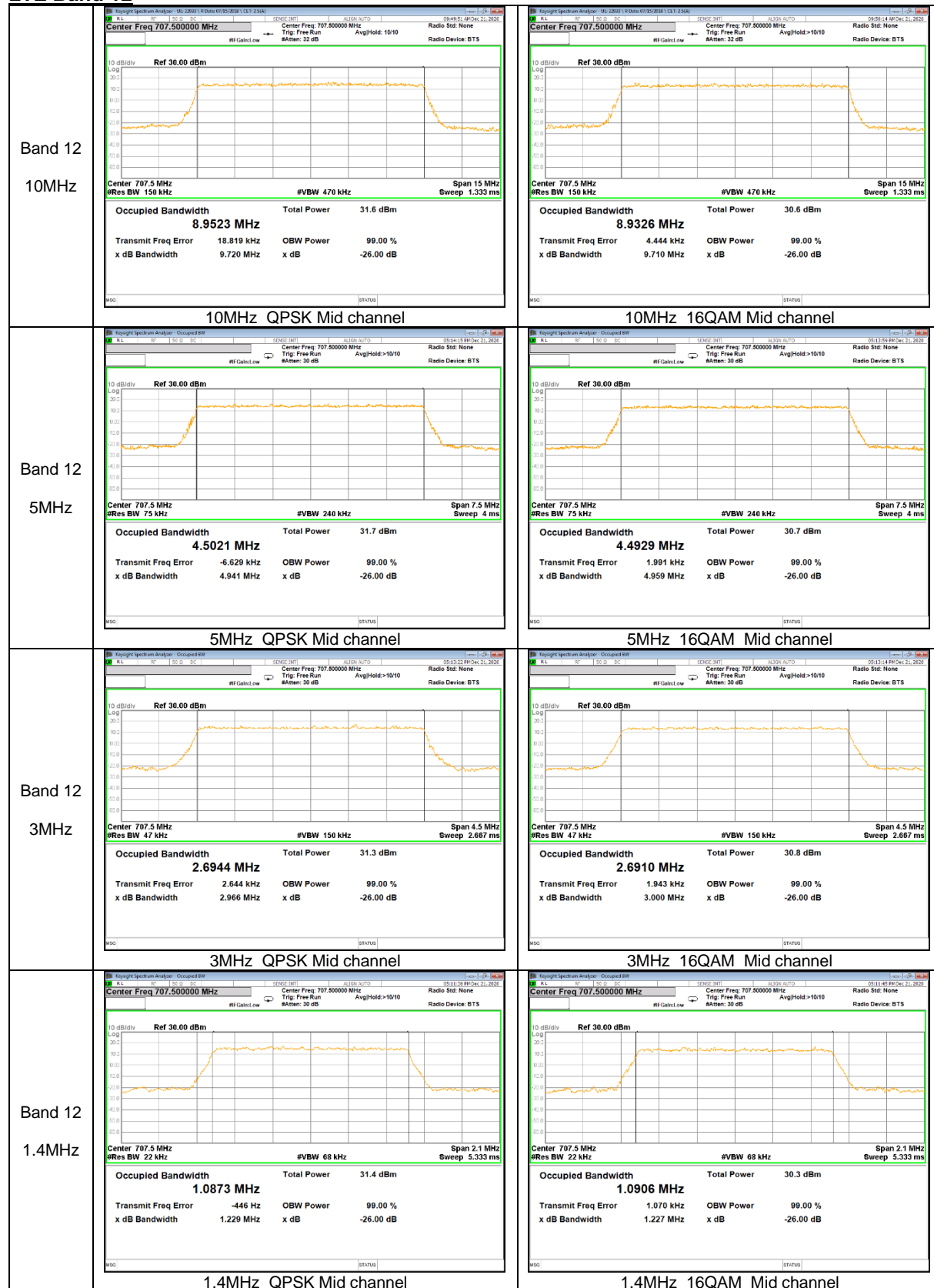


LTE Band 2

<p>Band 2 20MHz</p>	 <p>20MHz QPSK Mid channel</p>	 <p>20MHz 16QAM Mid channel</p>
<p>Band 2 15MHz</p>	 <p>15MHz QPSK Mid channel</p>	 <p>15MHz 16QAM Mid channel</p>
<p>Band 2 10MHz</p>	 <p>10MHz QPSK Mid channel</p>	 <p>10MHz 16QAM Mid channel</p>

<p>Band 2 5MHz</p>	 <p>5MHz QPSK Mid channel</p>	 <p>5MHz 16QAM Mid channel</p>
<p>Band 2 3MHz</p>	 <p>3MHz QPSK Mid channel</p>	 <p>3MHz 16QAM Mid channel</p>
<p>Band 2 1.4MHz</p>	 <p>1.4MHz QPSK Mid channel</p>	 <p>1.4MHz 16QAM Mid channel</p>

LTE Band 12



LTE Band 26 (Part90)

