# CERTIFICATION TEST REPORT

**Report Number. :** 4789739083-E2V2

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

**Model :** SM-M625F/DS, SM-E625F/DS

**FCC ID :** A3LSMM625F

**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:**
January 11, 2021

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Testing Laboratory
TL-637

## Revision History

| Rev. | Issue Date | Revisions | Revised By |
|---|---|---|---|
| V1 | 01/06/21 | Initial issue | Sungeun Lee |
| V2 | 01/11/21 | Updated to address TCB's question | 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-M625F/DS, SM-E625F/DS

**SERIAL NUMBER:** ce160881d0207e49 (CONDUCTED);
R38NB04CMGF (RADIATED)

**DATE TESTED:** NOV 30, 2020 – JAN 05, 2021;

| 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.

Approved & Released For
UL Korea, Ltd. By:

Junwhan Lee
Suwon Lab Engineer
UL Korea, Ltd.

Tested By:

Sungeun Lee
Suwon Lab Engineer
UL Korea, Ltd.


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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 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

# 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 |
| ☒ Chamber 2 |
| ☐ 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.


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# 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 = PSA reading with EUT worst orientation (dBm) + Path loss (dB) – cable loss( between the SG and substitution antenna) + Substitution Antenna Factor (dBi)

ERP = PSA reading with EUT worst orientation (dBm) + Path loss (dB) – 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 |
|---|---|
| Radiated Disturbance, 9 kHz to 30 MHz | 1.72 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.


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# 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-M625F/DS and SM-E625F/DS.
These models are identical in hardware except SM-E625F/DS has other Software name.
With some pre-scan, model SM-M625F/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 (4789739083-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 | 824~849 | GPRS | **33.08** | **2032.02** | 30.52 | 1127.20 |
| | | EGPRS | 26.20 | 416.87 | 24.29 | 268.53 |
| GSM1900 | 1850~1910 | GPRS | 30.92 | 1235.99 | **31.24** | **1330.45** |
| | | EGPRS | 26.33 | 429.20 | 28.19 | 659.17 |

**WCDMA**

| FCC Part 22/24 | | | | | | |
|---|---|---|---|---|---|---|
| Band | Frequency Range [MHz] | Modulation | Conducted | | Radiated | |
| | | | Avg [dBm] | Avg [mW] | Avg [dBm] | Avg [mW] |
| Band 5 | 824~849 | Rel. 99 | **24.73** | **297.31** | 21.22 | 132.43 |
| | | HSDPA | 23.35 | 216.48 | 21.36 | 136.77 |
| Band 4 | 1710~1755 | Rel. 99 | 24.06 | 254.47 | 23.22 | 209.89 |
| | | HSDPA | 24.16 | 260.62 | 23.20 | 208.93 |
| Band 2 | 1850~1910 | Rel. 99 | 24.23 | 264.93 | **24.97** | **314.05** |
| | | HSDPA | 24.10 | 257.04 | 24.96 | 313.33 |


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**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 | 24.48 | 280.67 | 26.16 | 413.05 |
| | | | 16QAM | 23.68 | 233.22 | 25.09 | 322.85 |
| | | 15 | QPSK | **24.60** | **288.08** | **26.31** | **427.56** |
| | | | 16QAM | 23.88 | 244.28 | 24.86 | 306.20 |
| | | 10 | QPSK | 24.44 | 277.83 | 25.32 | 340.41 |
| | | | 16QAM | 23.54 | 225.71 | 24.90 | 309.03 |
| | | 5 | QPSK | 24.51 | 282.56 | 25.27 | 336.51 |
| | | | 16QAM | 23.87 | 243.71 | 24.28 | 267.92 |
| | | 3 | QPSK | 24.58 | 286.86 | 25.41 | 347.54 |
| | | | 16QAM | 24.00 | 251.07 | 24.26 | 266.69 |
| | | 1.4 | QPSK | 24.09 | 256.46 | 25.66 | 368.13 |
| | | | 16QAM | 23.39 | 218.06 | 24.52 | 283.14 |

**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 | 24.56 | 285.55 | **19.71** | **93.54** |
| | | | 16QAM | 23.75 | 236.87 | 18.42 | 69.50 |
| | | 5 | QPSK | 24.55 | 285.40 | 19.63 | 91.83 |
| | | | 16QAM | 23.68 | 233.58 | 18.37 | 68.71 |
| | | 3 | QPSK | **24.89** | **308.04** | 19.68 | 92.90 |
| | | | 16QAM | 24.04 | 253.50 | 18.32 | 67.92 |
| | | 1.4 | QPSK | 24.58 | 286.79 | 19.50 | 89.13 |
| | | | 16QAM | 23.73 | 236.32 | 18.25 | 66.83 |


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**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 | 24.86 | 306.38 | 18.63 | 72.95 |
| | | | 16QAM | 24.00 | 251.06 | 17.43 | 55.34 |
| | | 10 | QPSK | 24.68 | 293.50 | 18.53 | 71.29 |
| | | | 16QAM | 23.85 | 242.51 | 16.86 | 48.53 |
| | | 5 | QPSK | 24.64 | 291.21 | 18.72 | 74.47 |
| | | | 16QAM | 23.98 | 249.86 | 17.81 | 60.39 |
| | | 3 | QPSK | **24.89** | **308.52** | 18.77 | 75.34 |
| | | | 16QAM | 23.75 | 237.34 | 17.85 | 60.95 |
| | | 1.4 | QPSK | 24.68 | 293.82 | **18.80** | **75.86** |
| | | | 16QAM | 23.82 | 240.96 | 17.58 | 57.28 |

**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 | 24.75 | 298.67 | 21.95 | 156.68 |
| | | | 16QAM | 24.12 | 258.22 | 20.97 | 125.03 |
| | | 10 | QPSK | 24.63 | 290.32 | 21.96 | 157.04 |
| | | | 16QAM | 24.02 | 252.13 | 20.95 | 124.45 |
| | | 5 | QPSK | **24.80** | **301.70** | 22.62 | 182.81 |
| | | | 16QAM | 23.88 | 244.56 | 21.62 | 145.21 |
| | | 3 | QPSK | 24.79 | 300.99 | **22.67** | **184.93** |
| | | | 16QAM | 23.89 | 245.04 | 21.46 | 139.96 |
| | | 1.4 | QPSK | 24.70 | 295.24 | 22.65 | 184.08 |
| | | | 16QAM | 23.89 | 244.95 | 21.53 | 142.23 |


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**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 | 22.11 | 162.55 | **23.34** | **215.77** |
| | | | 16QAM | 21.74 | 149.23 | 22.73 | 187.50 |
| | | 15 | QPSK | 22.10 | 162.01 | 22.50 | 177.83 |
| | | | 16QAM | 21.77 | 150.30 | 22.02 | 159.22 |
| | | 10 | QPSK | 22.07 | 161.07 | 23.12 | 205.12 |
| | | | 16QAM | 21.75 | 149.75 | 22.50 | 177.83 |
| | | 5 | QPSK | **22.11** | **162.61** | 22.95 | 197.24 |
| | | | 16QAM | 21.59 | 144.14 | 22.77 | 189.23 |

**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 | 24.74 | 298.03 | 24.28 | 267.92 |
| | | | 16QAM | 23.90 | 245.68 | 22.80 | 190.55 |
| | | 15 | QPSK | 24.53 | 283.66 | **25.32** | **340.41** |
| | | | 16QAM | 23.76 | 237.59 | 23.58 | 228.03 |
| | | 10 | QPSK | 24.58 | 287.03 | 25.02 | 317.69 |
| | | | 16QAM | 23.73 | 235.98 | 23.89 | 244.91 |
| | | 5 | QPSK | 24.54 | 284.60 | 24.40 | 275.42 |
| | | | 16QAM | 23.84 | 242.36 | 23.54 | 225.94 |
| | | 3 | QPSK | **24.76** | **299.20** | 24.81 | 302.69 |
| | | | 16QAM | 23.90 | 245.63 | 24.04 | 253.51 |
| | | 1.4 | QPSK | 24.20 | 263.20 | 24.57 | 286.42 |
| | | | 16QAM | 23.42 | 219.72 | 23.30 | 213.80 |


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**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<br>1850 ~ 1910 MHz | -1.62 |
| LTE Band 4 / LTE Band 66<br>1710 ~ 1780 MHz | -4.81 |
| GSM 850 / WCDMA Band 5 / LTE Band 5 / LTE Band 26<br>814 ~ 849 MHz | -5.30 |
| LTE Band 12 / LTE Band 17<br>699 ~ 716 MHz | -11.25 |
| LTE Band 41<br>2496 ~ 2690 MHz | 0.40 |


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## 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 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 | 0 |
| | 1880.0 | | 1 | 0 |
| | 1902.5 | | 1 | 37 |
| **12** | 700.5 | 3 | 1 | 8 |
| | 707.5 | | 1 | 0 |
| | 714.5 | | 1 | 8 |
| **26 (Part 90)** | 815.5 | 3 | 1 | 8 |
| | 822.5 | | 1 | 14 |
| **26 (Part 22)** | 826.5 | 5 | 1 | 12 |
| | 831.5 | | 1 | 24 |
| | 846.5 | | 1 | 12 |
| **41 (PC2)** | 2498.5 | 5 | 1 | 0 |
| | 2593.0 | | 1 | 0 |
| | 2687.5 | | 1 | 0 |
| **66** | 1711.5 | 3 | 1 | 8 |
| | 1745.0 | | 1 | 0 |
| | 1778.5 | | 1 | 8 |


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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-TA800 | R37MAVSOLC7DK3 | N/A |
| Data Cable | SAMSUNG | EP-DA705BBE | N/A | N/A |
| Earphone | SAMSUNG | EHS61ASFBE | 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.


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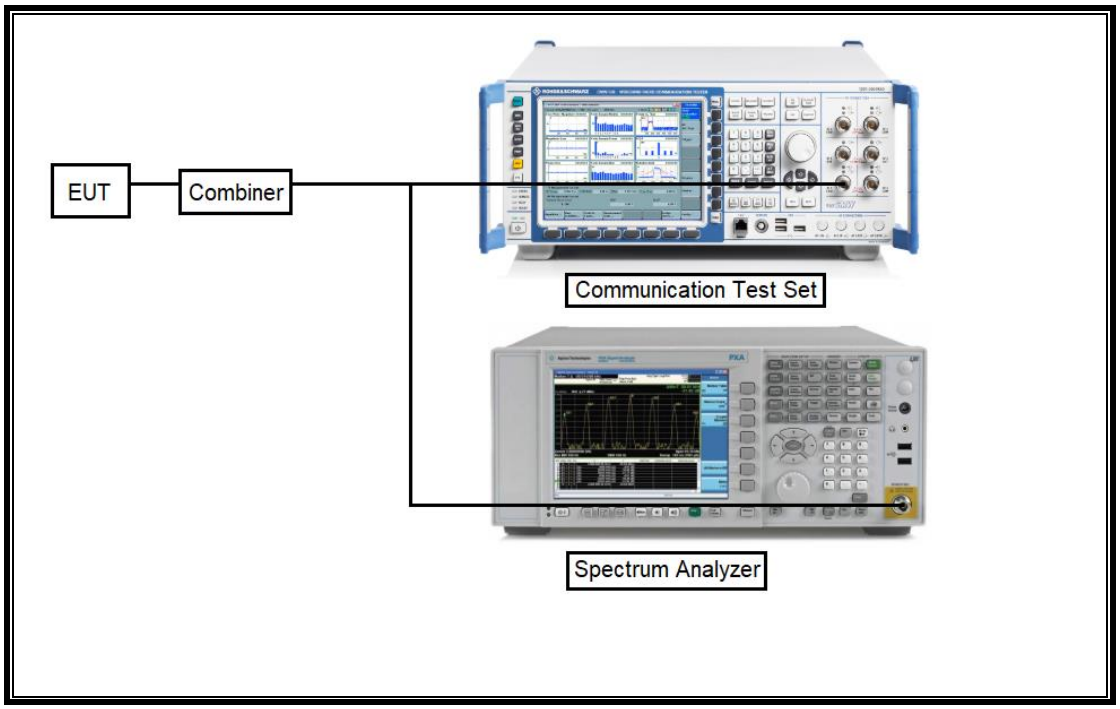
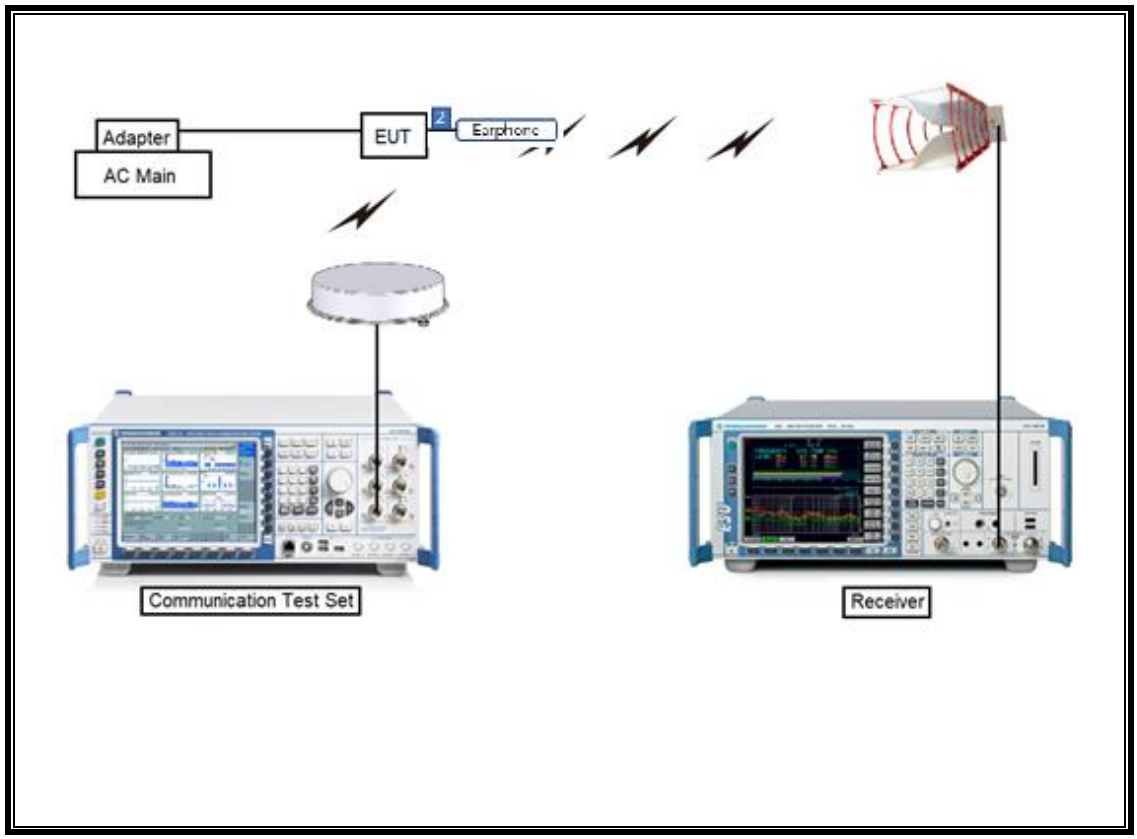
**SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)**




**SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP)**





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# 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 | Keysight | N3090B | MY57143717 | 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 |
| Direcitonal 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 | PASTERNACK | PE7087-10 | A009 | 08-05-21 |
| Attenuator | PASTERNACK | PE7087-10 | A001 | 08-03-21 |
| Attenuator | PASTERNACK | PE7087-10 | A008 | 08-03-21 |
| Attenuator | PASTERNACK | PE7004-10 | 2 | 08-04-21 |
| Attenuator | PASTERNACK | 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 | |


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# 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)<br>24.238(a)<br>27.53(g),(h)<br>90.691 | Band Edge / Conducted Spurious Emission | -13dBm | | Pass |
| 27.53(m) | Conducted Spurious Emission | -25 dBm | | Pass |
| 27.53(m)<br>90.691 | Emission mask | Section 9.2.2 | | Pass |
| 2.1046 | Conducted output power | N/A | | Pass |
| 22.355<br>24.235<br>27.54<br>90.213 | Frequency Stability | 2.5PPM | | Pass |
| 22.913(a)(5) | Effective Radiated Power | 38.5 dBm | Radiated | Pass |
| 90.635(b) | | 50 dBm | | Pass |
| 27.50(c)(10)<br>27.50(b)(10) | | 34.77 dBm | | Pass |
| 24.232(c)<br>27.50(h)(2) | Equivalent Isotropic Radiated Power | 33dBm | | Pass |
| 27.50(d)(4) | | 30dBm | | Pass |
| 22.917(a)<br>24.238(a)<br>27.53(g),(h)<br>90.691 | Radiated Spurious Emission | -13dBm | | Pass |
| 27.53 (m) | | -25dBm | | Pass |


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# 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**


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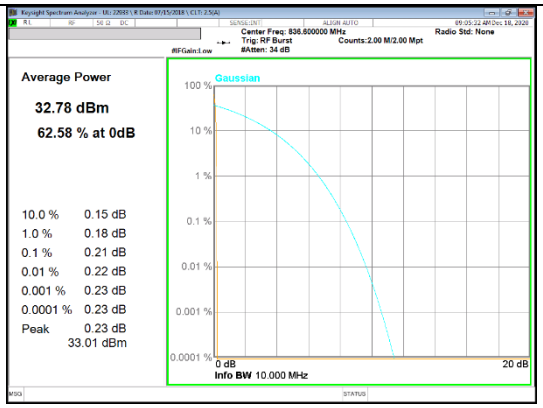
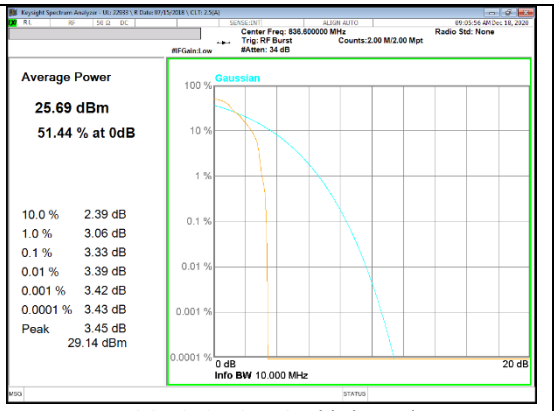
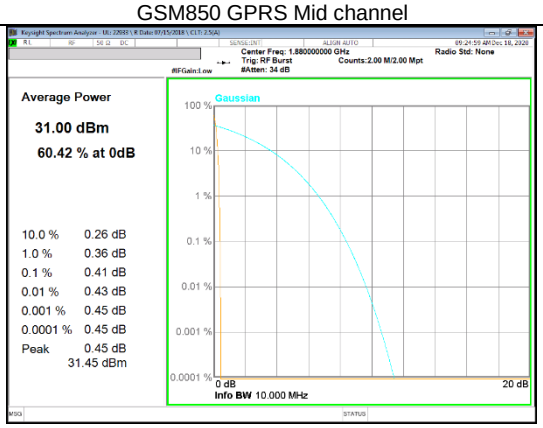
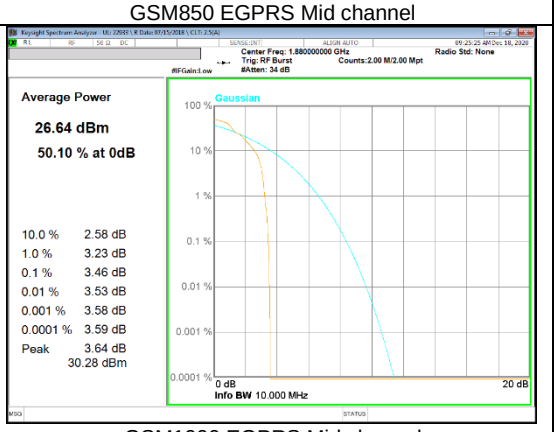
# 8.1. CONDUCTED PEAK TO AVERAGE RESULT

**GSM**

| | | |
|---|---|---|
| GSM 850 |  GSM850 GPRS Mid channel |  GSM850 EGPRS Mid channel |
| GSM 1900 |  GSM1900 GPRS Mid channel |  GSM1900 EGPRS Mid channel |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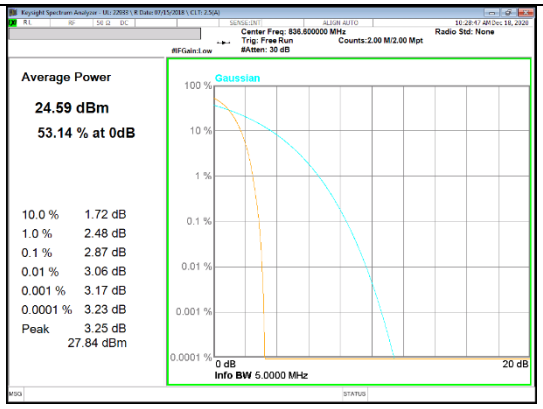
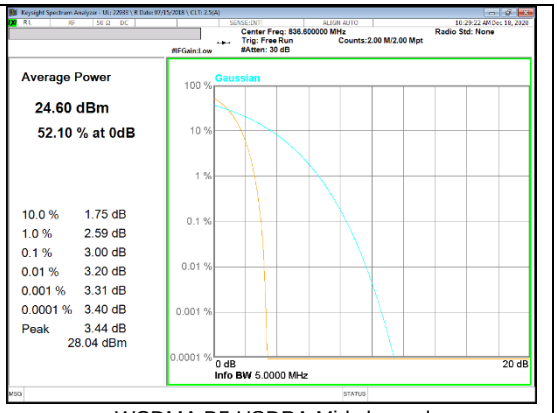
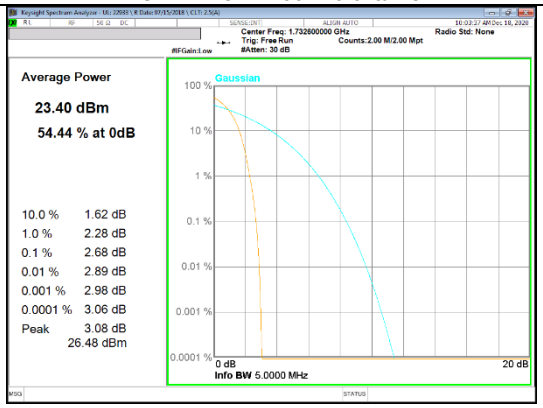
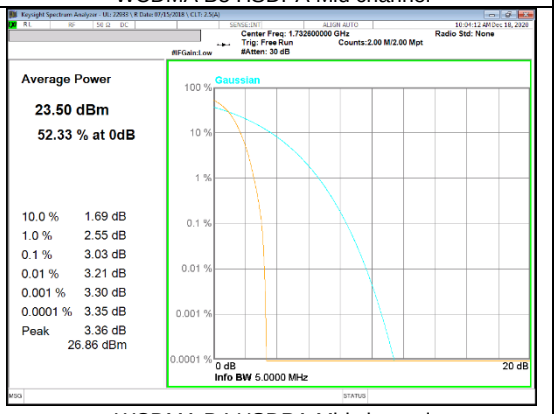
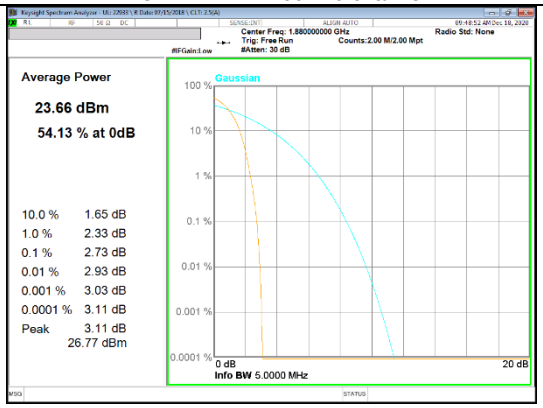
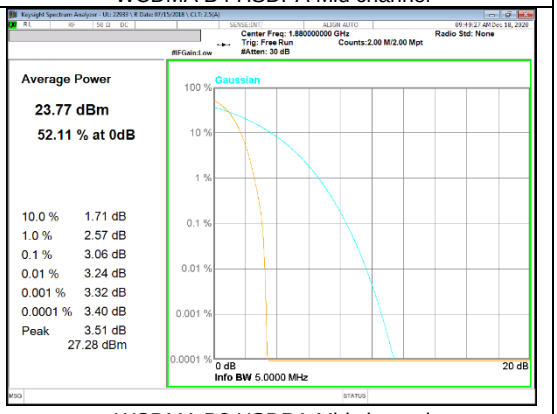
**WCDMA**

| | | |
|---|---|---|
| WCDMA Band 5 |  WCDMA B5 REL99 Mid channel |  WCDMA B5 HSDPA Mid channel |
| WCDMA Band 4 |  WCDMA B4 REL99 Mid channel |  WCDMA B4 HSDPA Mid channel |
| WCDMA Band 2 |  WCDMA B2 REL99 Mid channel |  WCDMA B2 HSDPA Mid channel |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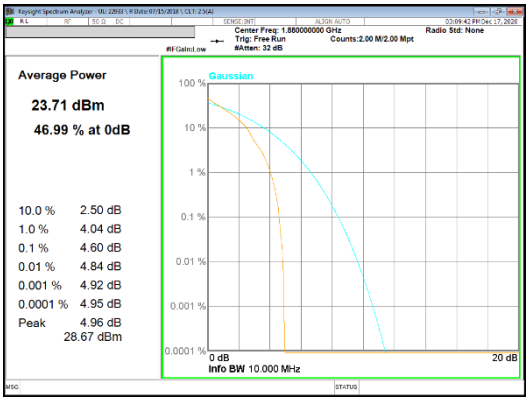
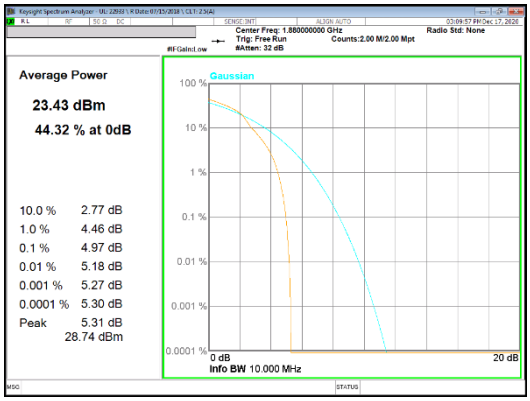
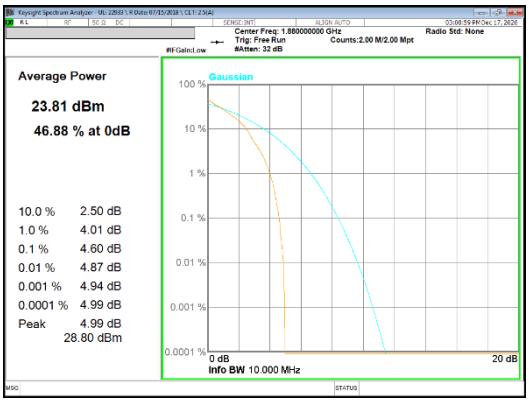
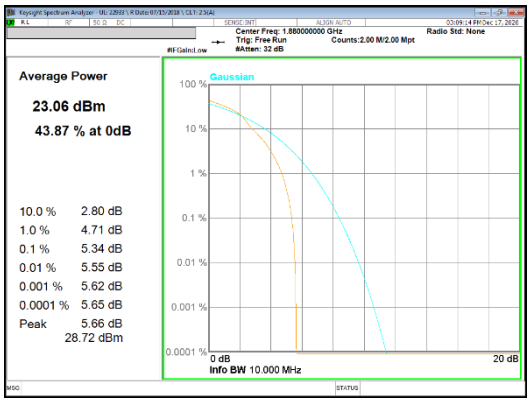
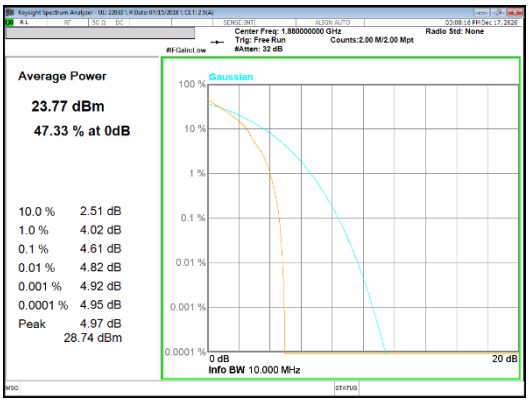
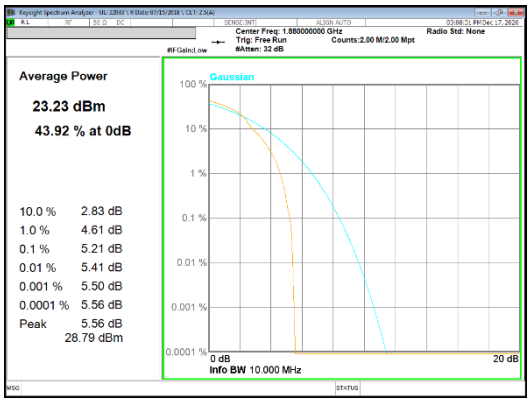
**LTE Band 2**

| | | |
|---|---|---|
| LTE Band 2<br><br>20 MHz |  <br>LTE B2 20MHz QPSK Mid channel |  <br>LTE B2 20MHz 16QAM Mid channel |
| LTE Band 2<br><br>15 MHz |  <br>LTE B2 15MHz QPSK Mid channel |  <br>LTE B2 15MHz 16QAM Mid channel |
| LTE Band 2<br><br>10 MHz |  <br>LTE B2 10MHz QPSK Mid channel |  <br>LTE B2 10MHz 16QAM Mid channel |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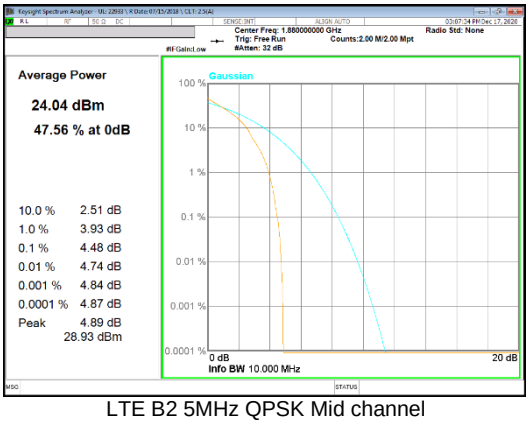
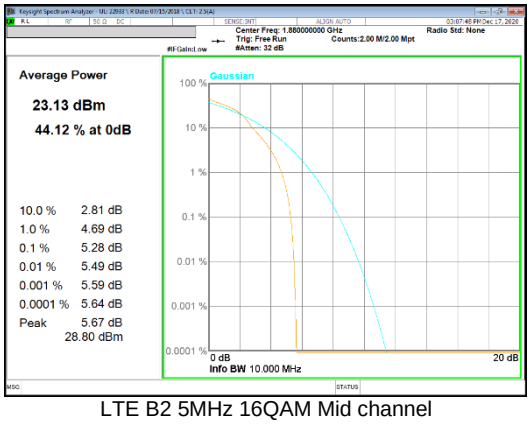
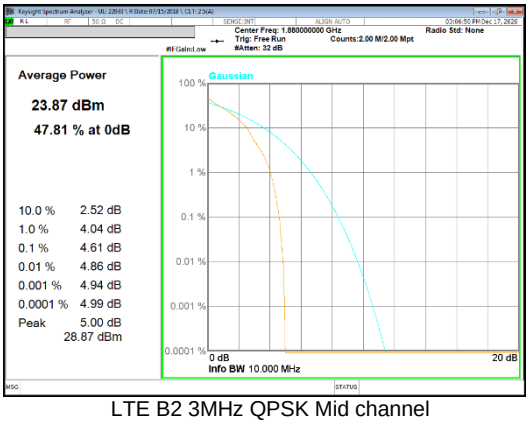
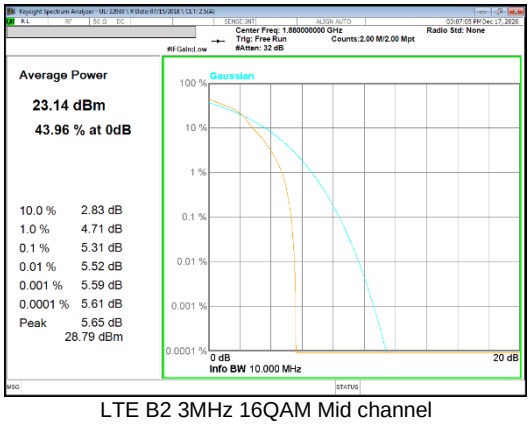
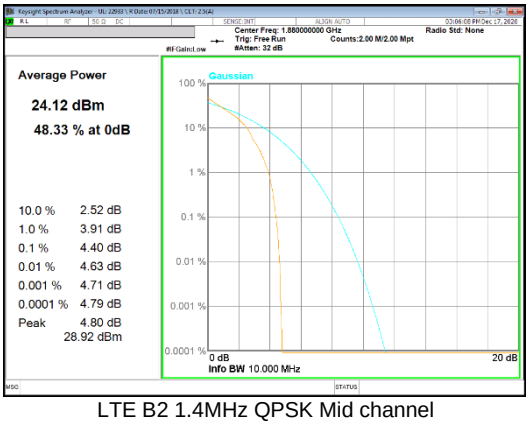
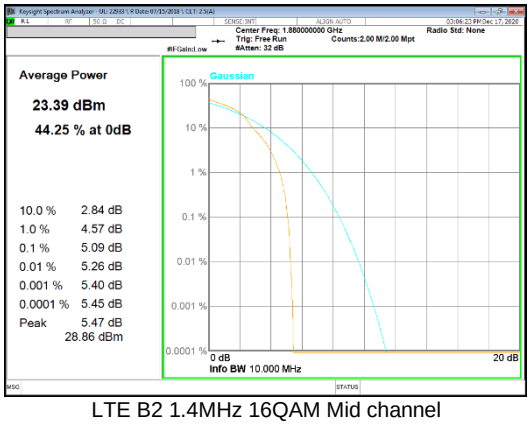
| | | |
|---|---|---|
| LTE Band 2<br><br>5 MHz |  <br>LTE B2 5MHz QPSK Mid channel |  <br>LTE B2 5MHz 16QAM Mid channel |
| LTE Band 2<br><br>3 MHz |  <br>LTE B2 3MHz QPSK Mid channel |  <br>LTE B2 3MHz 16QAM Mid channel |
| LTE Band 2<br><br>1.4 MHz |  <br>LTE B2 1.4MHz QPSK Mid channel |  <br>LTE B2 1.4MHz 16QAM Mid channel |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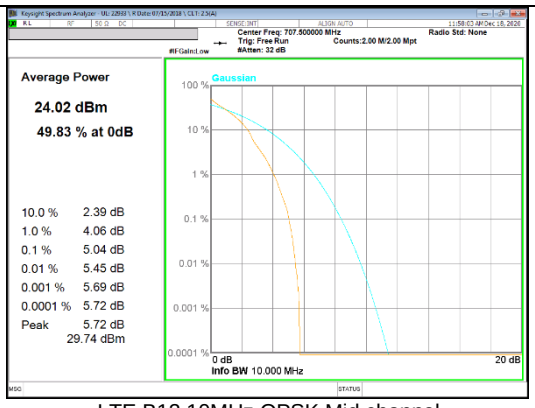
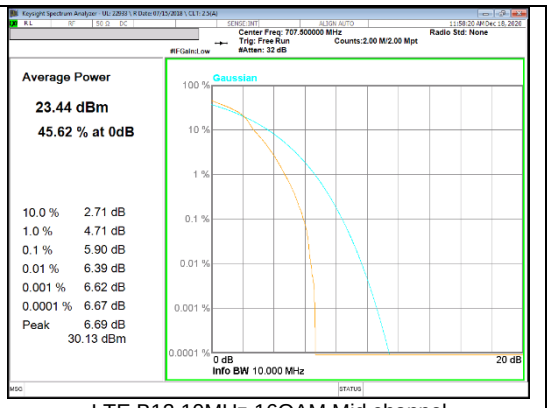
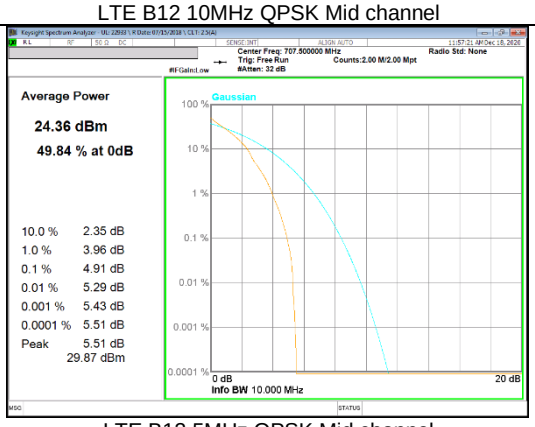
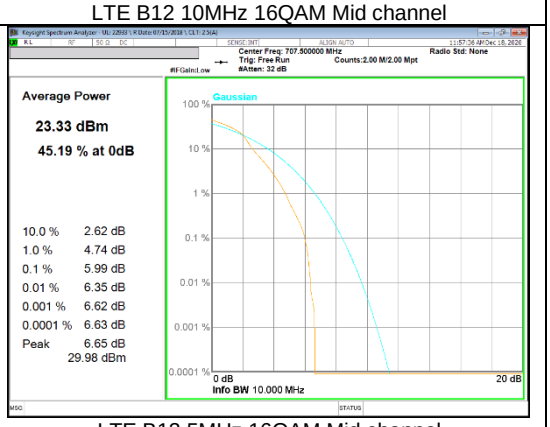
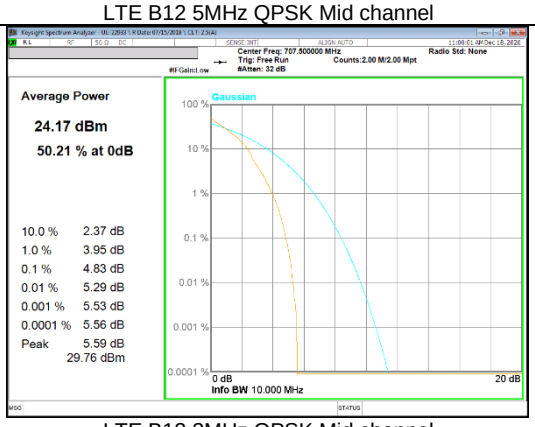
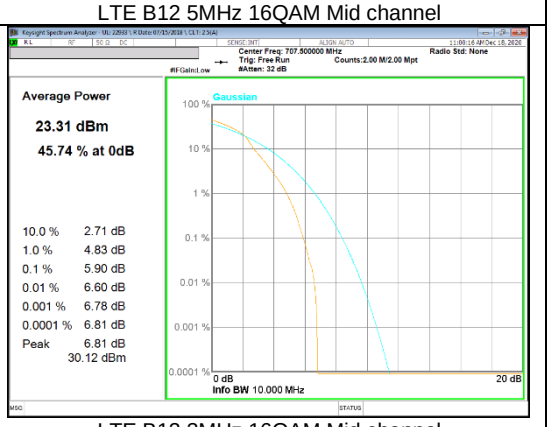
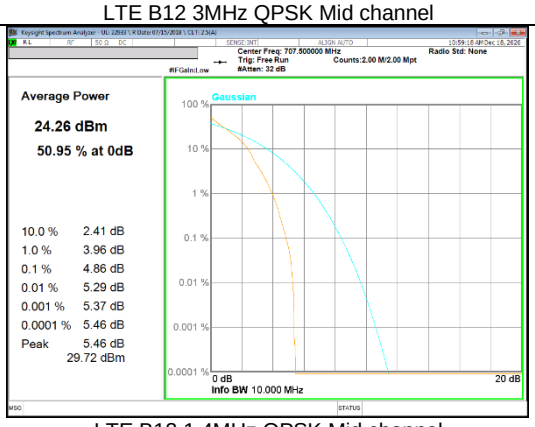
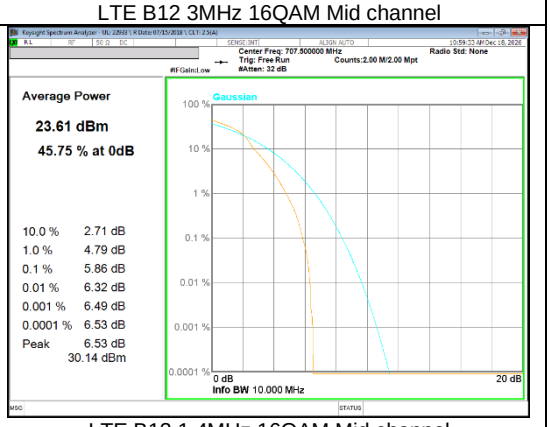
**LTE Band 12**

| | | |
|---|---|---|
| LTE Band 12<br><br>10 MHz |  <br>LTE B12 10MHz QPSK Mid channel |  <br>LTE B12 10MHz 16QAM Mid channel |
| LTE Band 12<br><br>5 MHz |  <br>LTE B12 5MHz QPSK Mid channel |  <br>LTE B12 5MHz 16QAM Mid channel |
| LTE Band 12<br><br>3 MHz |  <br>LTE B12 3MHz QPSK Mid channel |  <br>LTE B12 3MHz 16QAM Mid channel |
| LTE Band 12<br><br>1.4 MHz |  <br>LTE B12 1.4MHz QPSK Mid channel |  <br>LTE B12 1.4MHz 16QAM Mid channel |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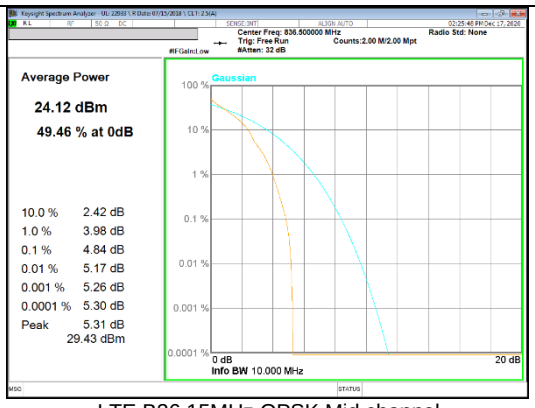
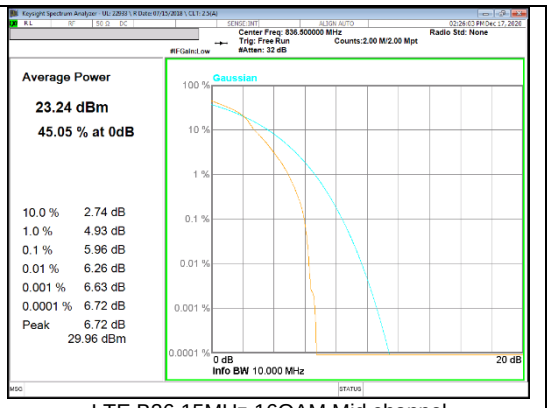
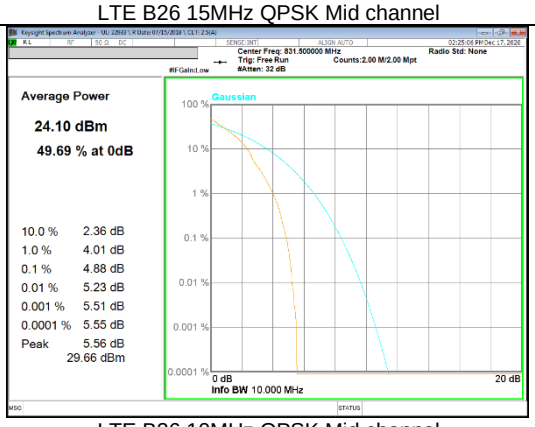
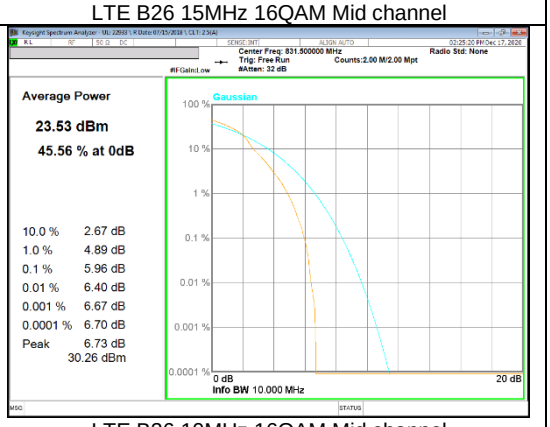
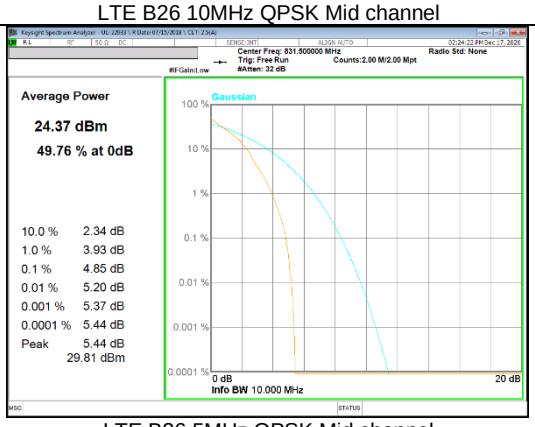
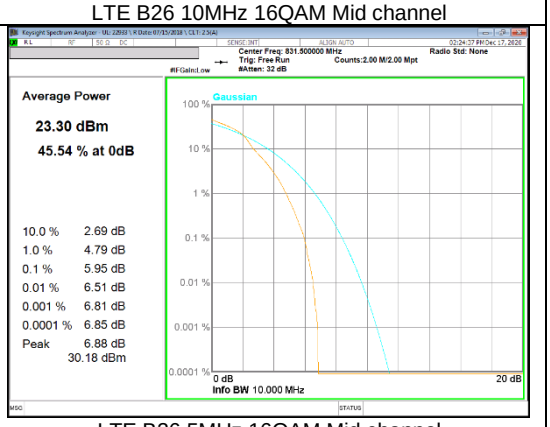
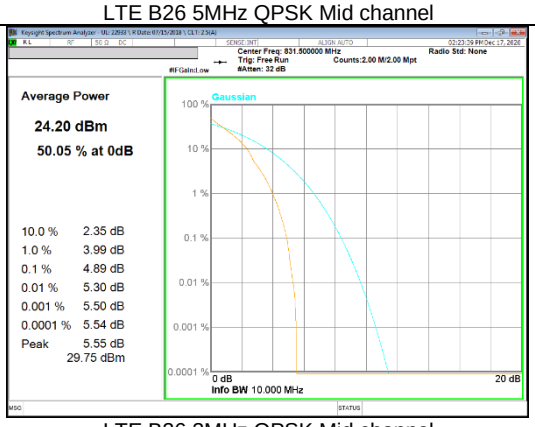
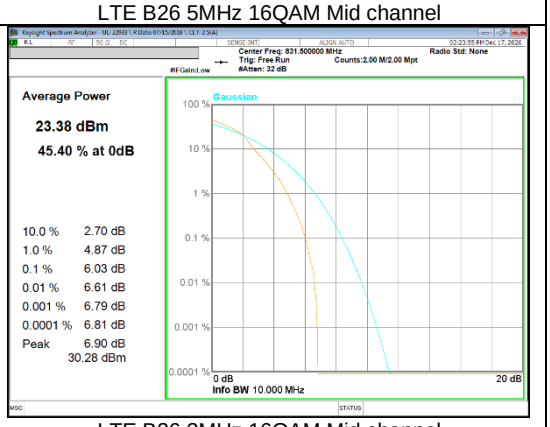
**LTE Band 26**

| | | |
|---|---|---|
| LTE Band 26<br><br>15 MHz |  <br>LTE B26 15MHz QPSK Mid channel |  <br>LTE B26 15MHz 16QAM Mid channel |
| LTE Band 26<br><br>10 MHz |  <br>LTE B26 10MHz QPSK Mid channel |  <br>LTE B26 10MHz 16QAM Mid channel |
| LTE Band 26<br><br>5 MHz |  <br>LTE B26 5MHz QPSK Mid channel |  <br>LTE B26 5MHz 16QAM Mid channel |
| LTE Band 26<br><br>3 MHz |  <br>LTE B26 3MHz QPSK Mid channel |  <br>LTE B26 3MHz 16QAM Mid channel |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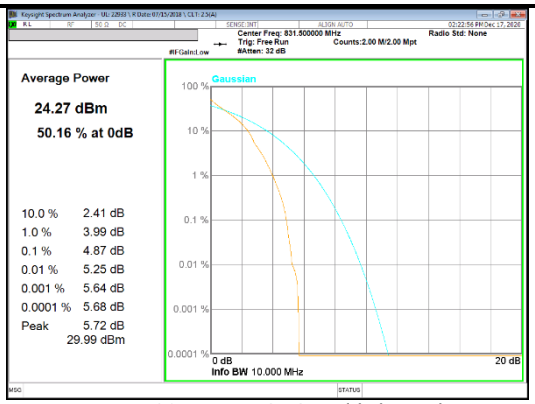
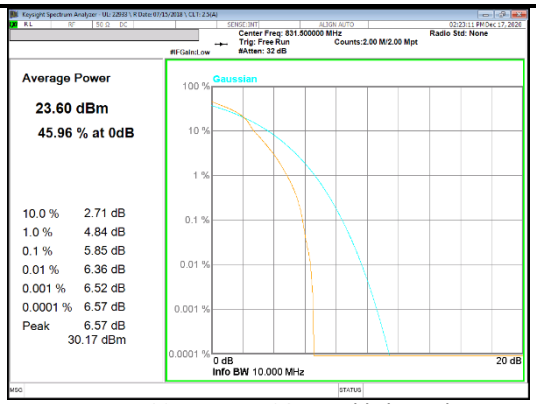
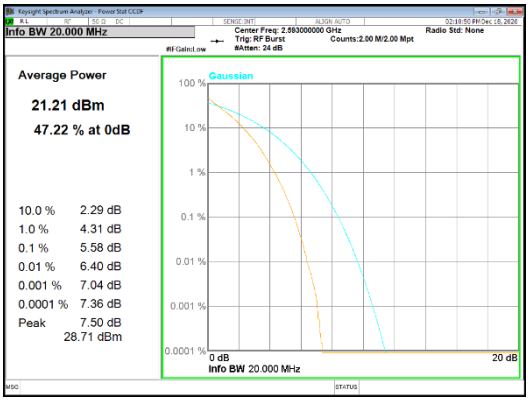
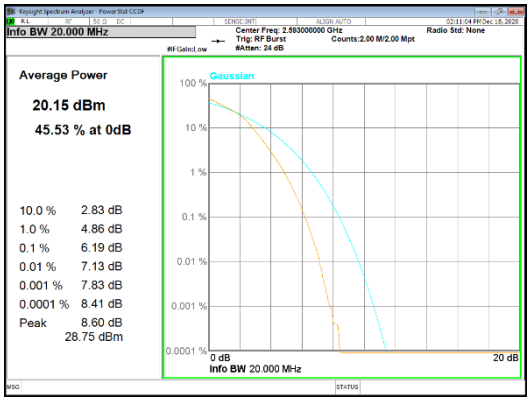
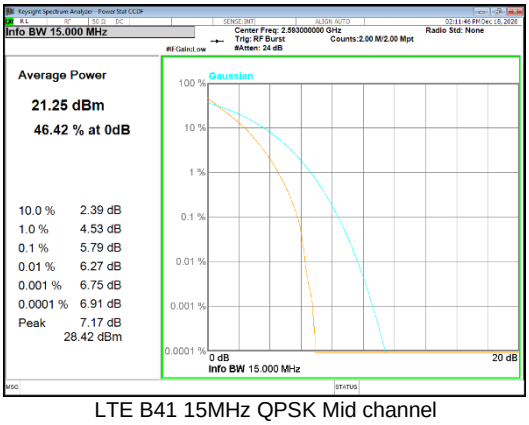
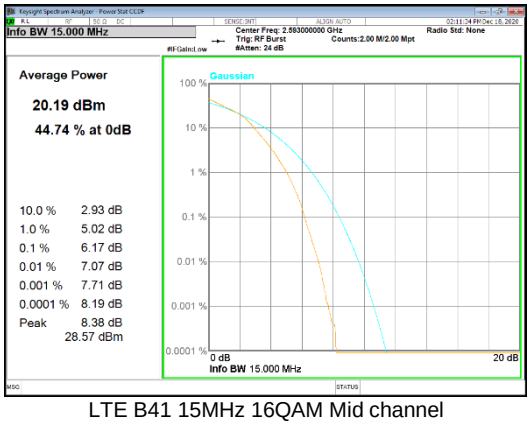
| | | |
|---|---|---|
| LTE Band 26<br><br>1.4 MHz |  <br>LTE B26 1.4MHz QPSK Mid channel |  <br>LTE B26 1.4MHz 16QAM Mid channel |

## LTE Band 41

| | | |
|---|---|---|
| LTE Band 41<br><br>20 MHz |  <br>LTE B41 20MHz QPSK Mid channel |  <br>LTE B41 20MHz 16QAM Mid channel |
| LTE Band 41<br><br>15 MHz |  <br>LTE B41 15MHz QPSK Mid channel |  <br>LTE B41 15MHz 16QAM Mid channel |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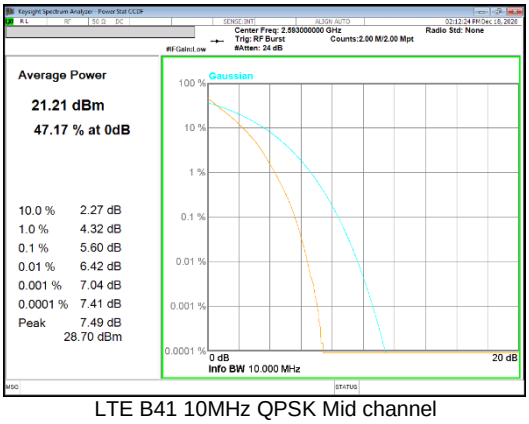
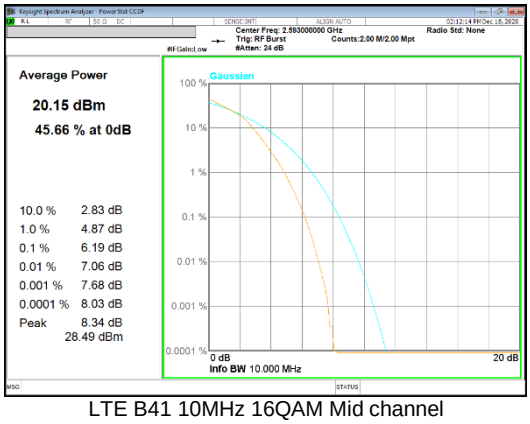
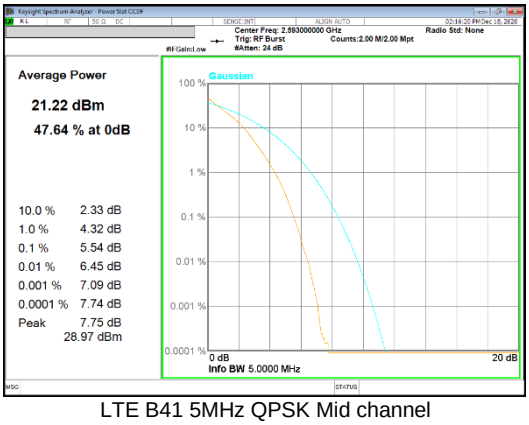
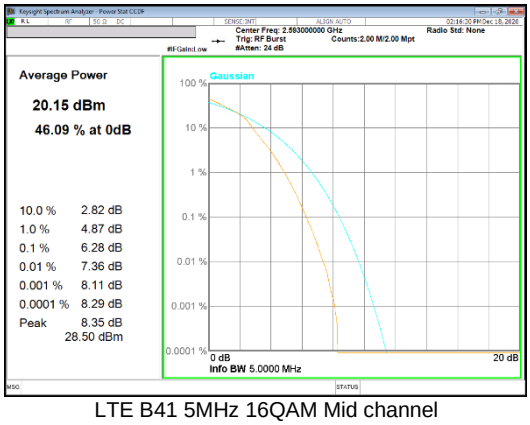
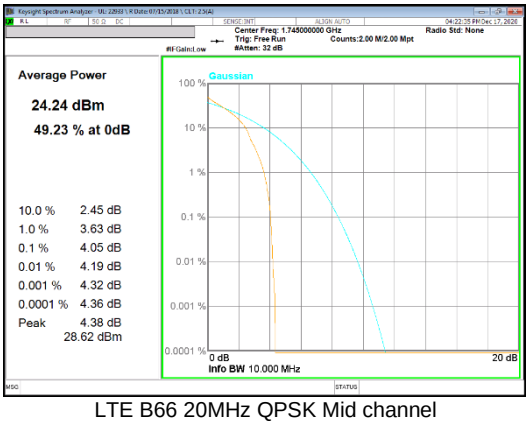
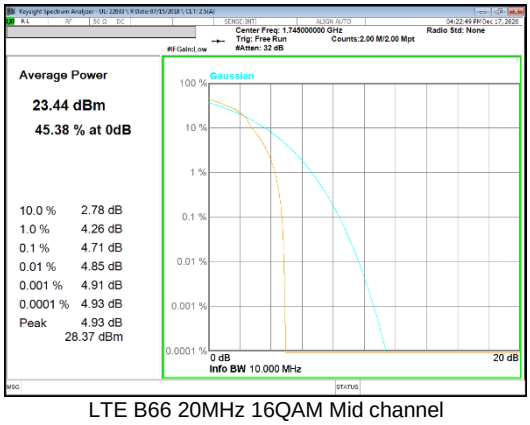
| | | |
|---|---|---|
| LTE Band 41<br><br>10 MHz |  <br>LTE B41 10MHz QPSK Mid channel |  <br>LTE B41 10MHz 16QAM Mid channel |
| LTE Band 41<br><br>5 MHz |  <br>LTE B41 5MHz QPSK Mid channel |  <br>LTE B41 5MHz 16QAM Mid channel |

## LTE Band 66

| | | |
|---|---|---|
| LTE Band 66<br><br>20 MHz |  <br>LTE B66 20MHz QPSK Mid channel |  <br>LTE B66 20MHz 16QAM Mid channel |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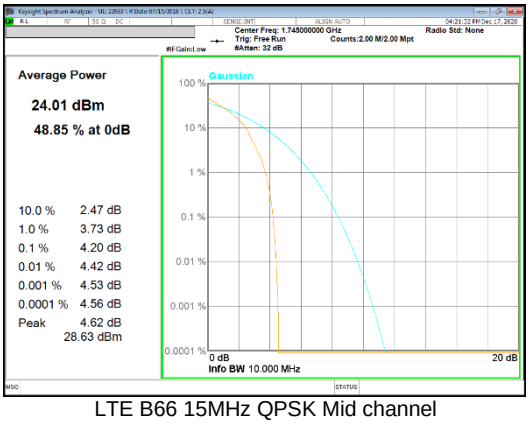
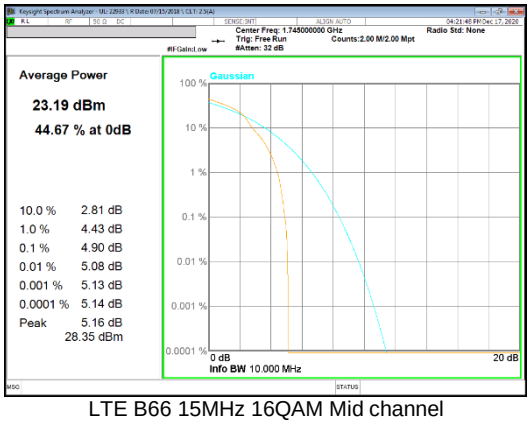
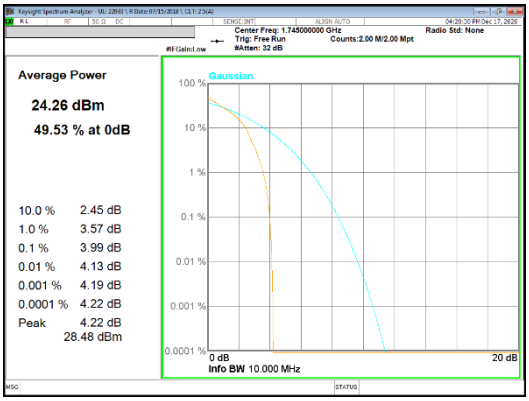
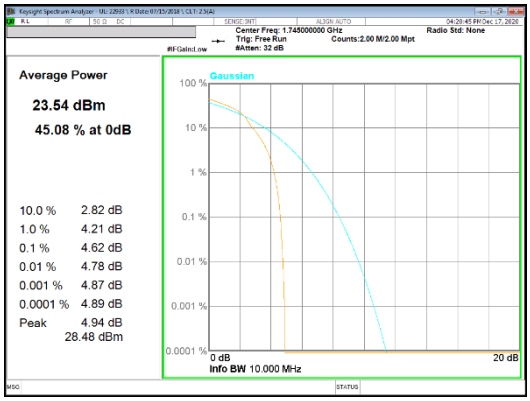
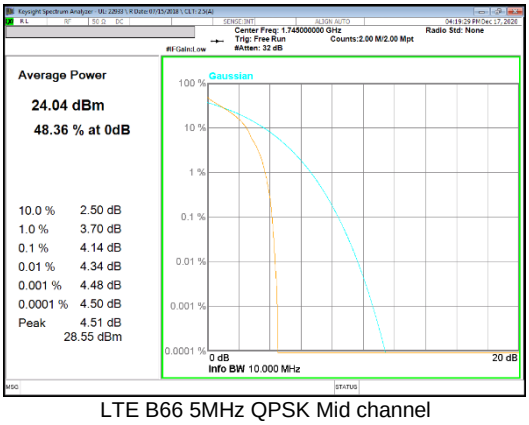
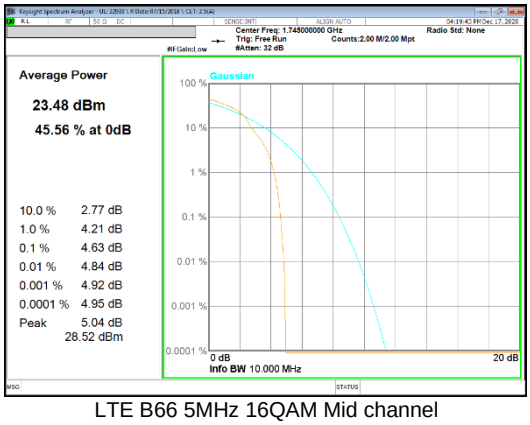
| | | |
|---|---|---|
| LTE Band 66<br><br>15 MHz |  <br><br>LTE B66 15MHz QPSK Mid channel |  <br><br>LTE B66 15MHz 16QAM Mid channel |
| LTE Band 66<br><br>10 MHz |  <br><br>LTE B66 10MHz QPSK Mid channel |  <br><br>LTE B66 10MHz 16QAM Mid channel |
| LTE Band 66<br><br>5 MHz |  <br><br>LTE B66 5MHz QPSK Mid channel |  <br><br>LTE B66 5MHz 16QAM Mid channel |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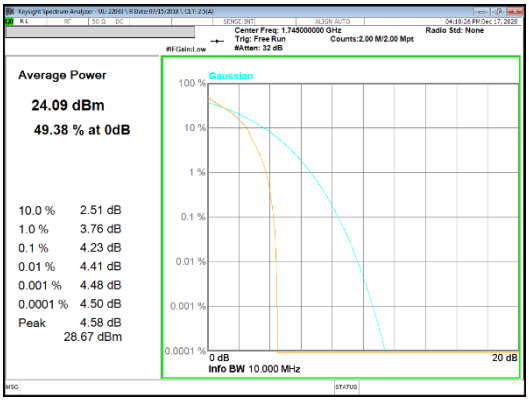
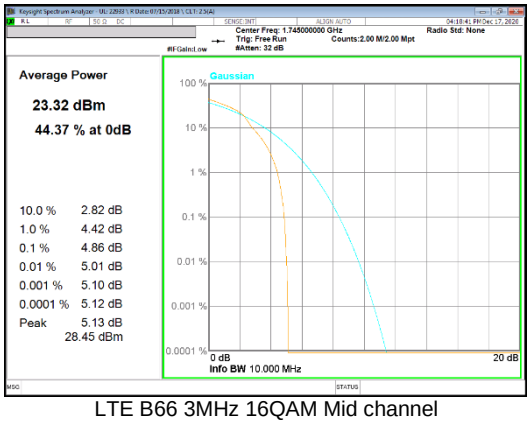
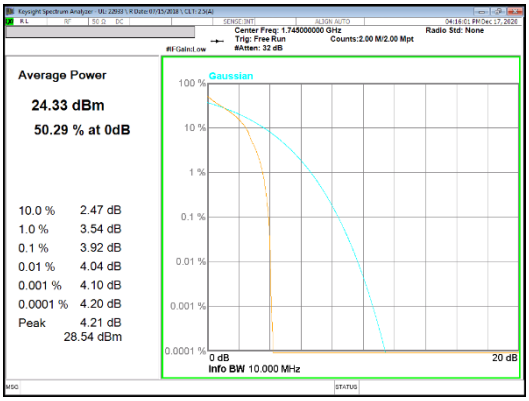
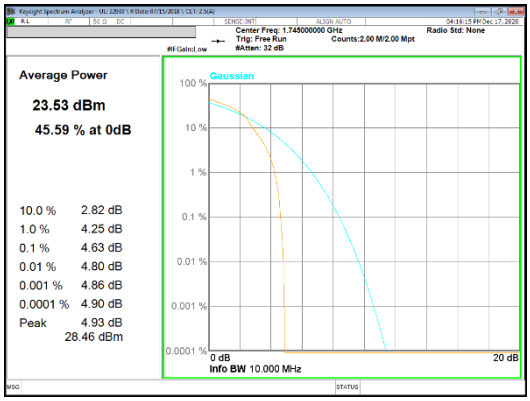
| | | |
|---|---|---|
| LTE Band 66<br><br>3 MHz |  <br>LTE B66 3MHz QPSK Mid channel |  <br>LTE B66 3MHz 16QAM Mid channel |
| LTE Band 66<br><br>1.4 MHz |  <br>LTE B66 1.4MHz QPSK Mid channel |  <br>LTE B66 1.4MHz 16QAM Mid channel |

**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.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# 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 | 237.09 | 295.80 |
| | EGPRS | | | 241.22 | 303.90 |
| GSM1900 | GPRS | 661 | 1880.0 | 237.70 | 307.50 |
| | EGPRS | | | 242.12 | 304.20 |

**- WCDMA**

| Band | Modulation | Channel | f [MHz] | 99% BW (MHz) | -26dB BW (MHz) |
|---|---|---|---|---|---|
| WCDMAB5 | Rel. 99 | 4183 | 836.6 | 4.174 | 4.718 |
| | HSDPA | | | 4.164 | 4.723 |
| WCDMAB4 | Rel. 99 | 1412 | 1732.4 | 4.172 | 4.750 |
| | HSDPA | | | 4.186 | 4.694 |
| WCDMAB2 | Rel. 99 | 9400 | 1880.0 | 4.178 | 4.744 |
| | HSDPA | | | 4.179 | 4.701 |


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**- LTE B2**

| Band | BW | Modulation | Channel | f [MHz] | 99% BW (MHz) | -26dB BW (MHz) |
|---|---|---|---|---|---|---|
| LTE B2 | 20M | QPSK | 18900 | 1880.0 | 17.927 | 19.920 |
| | | 16QAM | | | 17.952 | 19.950 |
| | 15M | QPSK | 18900 | 1880.0 | 13.409 | 15.090 |
| | | 16QAM | | | 13.408 | 15.100 |
| | 10M | QPSK | 18900 | 1880.0 | 8.991 | 10.140 |
| | | 16QAM | | | 8.971 | 10.220 |
| | 5M | QPSK | 18900 | 1880.0 | 4.500 | 5.254 |
| | | 16QAM | | | 4.505 | 5.346 |
| | 3M | QPSK | 18900 | 1880.0 | 2.698 | 3.110 |
| | | 16QAM | | | 2.703 | 3.134 |
| | 1.4M | QPSK | 18900 | 1880.0 | 1.092 | 1.298 |
| | | 16QAM | | | 1.088 | 1.303 |

**- LTE B12**

| Band | BW | Modulation | Channel | f [MHz] | 99% BW (MHz) | -26dB BW (MHz) |
|---|---|---|---|---|---|---|
| LTE B12 | 10M | QPSK | 23095 | 707.5 | 8.978 | 10.350 |
| | | 16QAM | | | 8.983 | 10.260 |
| | 5M | QPSK | 23095 | 707.5 | 4.498 | 5.356 |
| | | 16QAM | | | 4.500 | 5.227 |
| | 3M | QPSK | 23095 | 707.5 | 2.697 | 3.048 |
| | | 16QAM | | | 2.701 | 3.075 |
| | 1.4M | QPSK | 23095 | 707.5 | 1.085 | 1.317 |
| | | 16QAM | | | 1.087 | 1.313 |

**- LTE B26 (Part90)**

| Band | BW | Modulation | Channel | f [MHz] | 99% BW (MHz) | -26dB BW (MHz) |
|---|---|---|---|---|---|---|
| LTE B26 (Part90) | 15M | QPSK | 26765 | 821.5 | 13.431 | 15.040 |
| | | 16QAM | | | 13.409 | 15.030 |
| | 10M | QPSK | 26740 | 819.0 | 8.977 | 10.240 |
| | | 16QAM | | | 8.968 | 10.370 |
| | 5M | QPSK | 23205 | 816.5 | 4.501 | 5.294 |
| | | 16QAM | | | 4.994 | 5.143 |
| | 3M | QPSK | 26705 | 815.5 | 2.693 | 3.050 |
| | | 16QAM | | | 2.696 | 3.078 |
| | 1.4M | QPSK | 26697 | 814.7 | 1.087 | 1.292 |
| | | 16QAM | | | 1.091 | 1.327 |


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**- LTE B26 (Part22)**

| Band | BW | Modulation | Channel | f [MHz] | 99% BW (MHz) | -26dB BW (MHz) |
|---|---|---|---|---|---|---|
| LTE B26 (Part22) | 15M | QPSK | 26915 | 836.5 | 13.386 | 14.820 |
| | | 16QAM | | | 13.389 | 14.950 |
| | 10M | QPSK | 26865 | 831.5 | 8.984 | 10.320 |
| | | 16QAM | | | 8.969 | 10.140 |
| | 5M | QPSK | 26865 | 831.5 | 4.498 | 5.296 |
| | | 16QAM | | | 4.500 | 5.351 |
| | 3M | QPSK | 26865 | 831.5 | 2.694 | 3.030 |
| | | 16QAM | | | 2.696 | 3.054 |
| | 1.4M | QPSK | 26865 | 831.5 | 1.086 | 1.301 |
| | | 16QAM | | | 1.084 | 1.324 |

**- LTE B41**

| Band | BW | Modulation | Channel | f [MHz] | 99% BW (MHz) | -26dB BW (MHz) |
|---|---|---|---|---|---|---|
| LTE B41 | 20M | QPSK | 40620 | 2593.0 | 17.882 | 19.770 |
| | | 16QAM | | | 17.889 | 19.670 |
| | 15M | QPSK | 40620 | 2593.0 | 13.412 | 15.240 |
| | | 16QAM | | | 13.411 | 15.080 |
| | 10M | QPSK | 40620 | 2593.0 | 8.964 | 10.280 |
| | | 16QAM | | | 8.961 | 10.190 |
| | 5M | QPSK | 40620 | 2593.0 | 4.487 | 5.251 |
| | | 16QAM | | | 4.511 | 5.285 |

**- LTE B66**

| Band | BW | Modulation | Channel | f [MHz] | 99% BW (MHz) | -26dB BW (MHz) |
|---|---|---|---|---|---|---|
| LTE B66 | 20M | QPSK | 132322 | 1745.0 | 17.946 | 19.890 |
| | | 16QAM | | | 17.937 | 19.740 |
| | 15M | QPSK | 132322 | 1745.0 | 13.462 | 15.310 |
| | | 16QAM | | | 13.458 | 15.060 |
| | 10M | QPSK | 132322 | 1745.0 | 8.959 | 10.290 |
| | | 16QAM | | | 8.969 | 10.270 |
| | 5M | QPSK | 132322 | 1745.0 | 4.504 | 5.244 |
| | | 16QAM | | | 4.510 | 5.300 |
| | 3M | QPSK | 132322 | 1745.0 | 2.697 | 3.088 |
| | | 16QAM | | | 2.704 | 3.106 |
| | 1.4M | QPSK | 132322 | 1745.0 | 1.086 | 1.308 |
| | | 16QAM | | | 1.088 | 1.339 |


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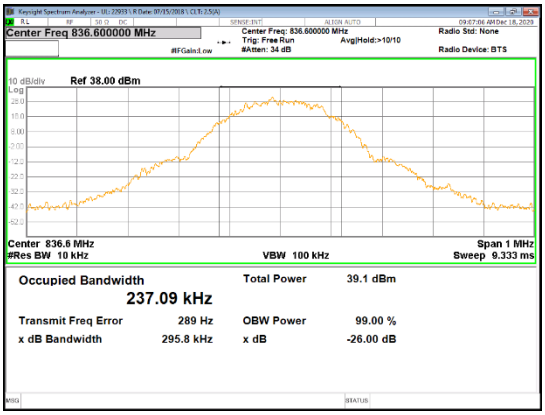
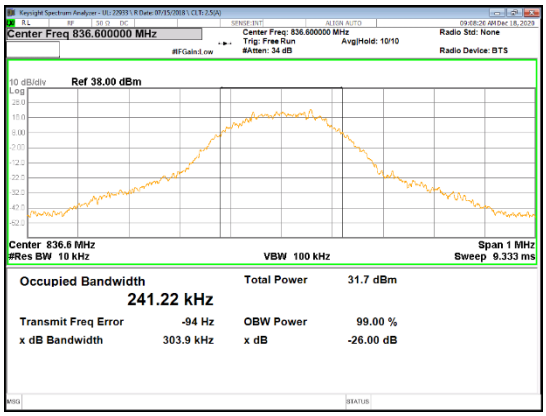
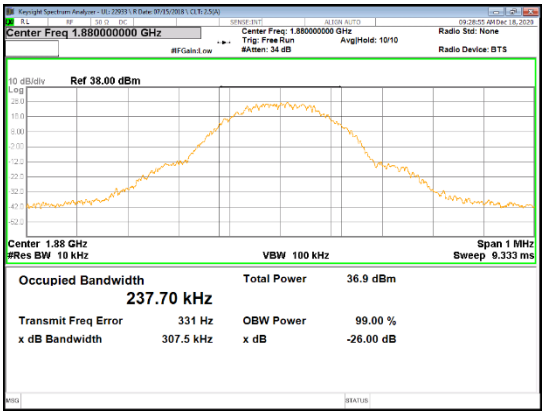
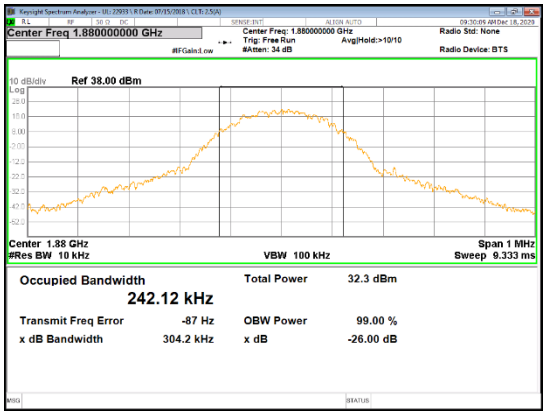
## 9.1.1. OCCUPIED BANDWIDTH RESULTS

**GSM 850**

| | | |
|---|---|---|
| GSM 850 |  <br>GSM850 GPRS Mid channel |  <br>GSM850 EGPRS Mid channel |

**GSM 1900**

| | | |
|---|---|---|
| GSM 1900 |  <br>GSM1900 GPRS Mid channel |  <br>GSM1900 EGPRS Mid channel |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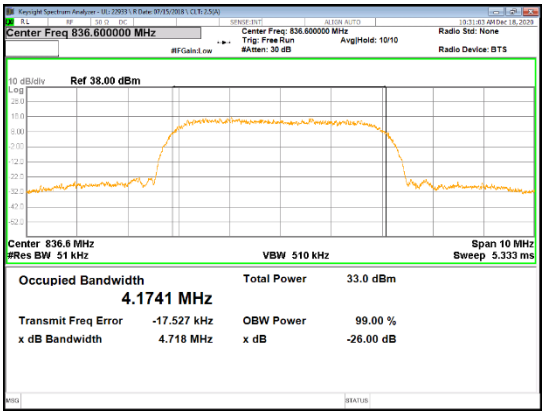
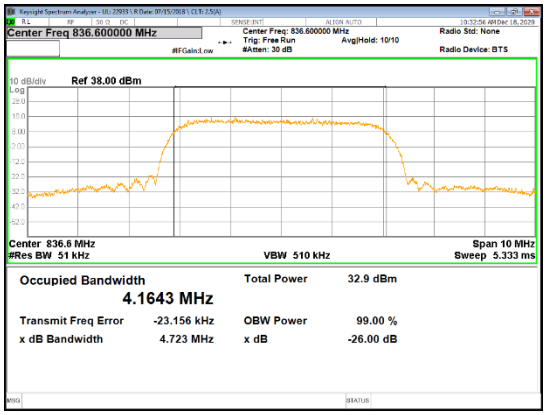
## WCDMA Band 5

Band 5



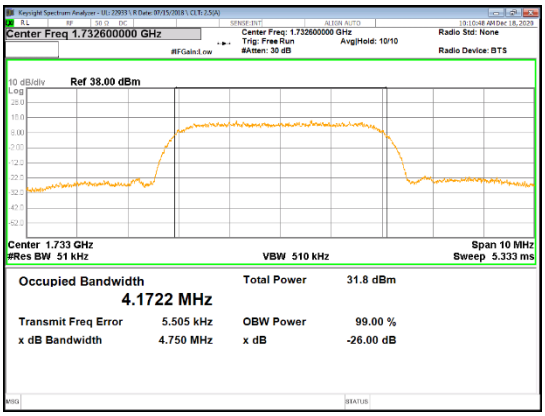

REL99 Mid channel



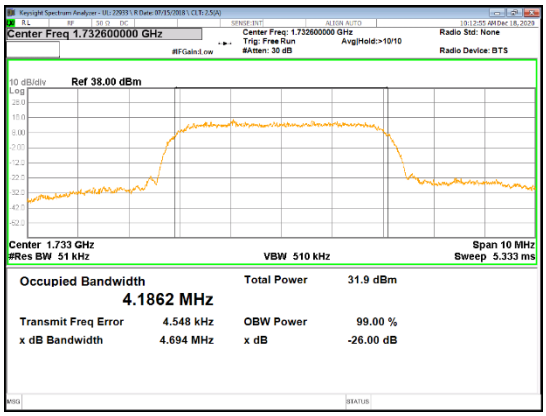

HSDPA Mid channel

## WCDMA Band 4

Band 4



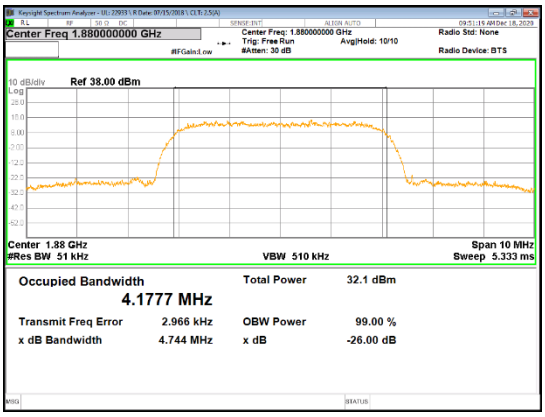

REL99 Mid channel



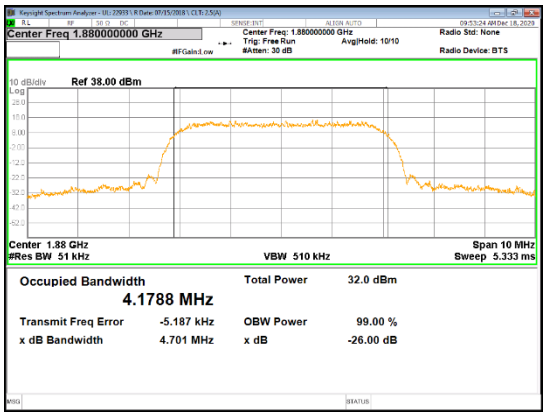

HSDPA Mid channel

## WCDMA Band 2

Band 2




REL99 Mid channel




HSDPA Mid channel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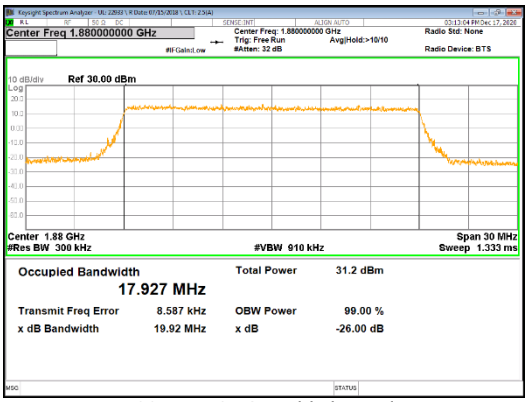
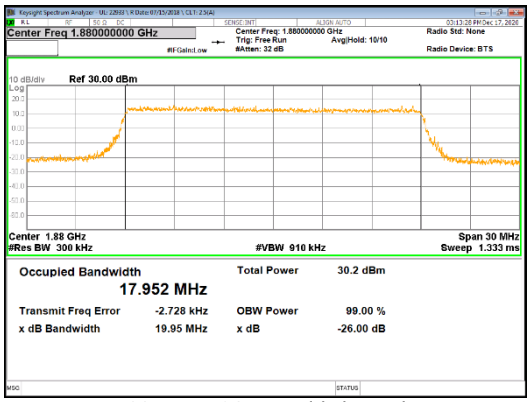
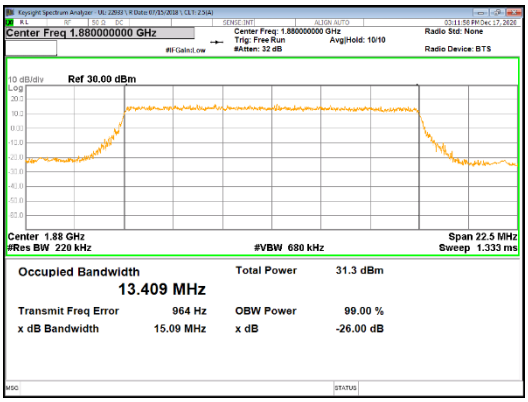
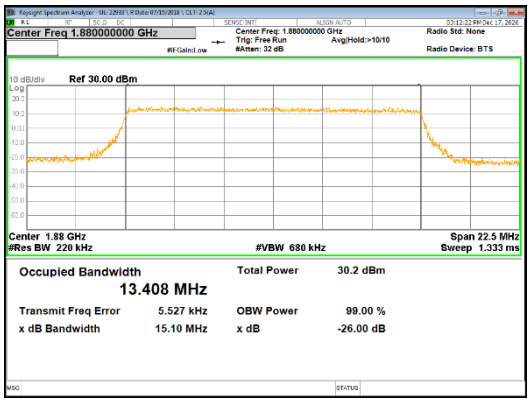
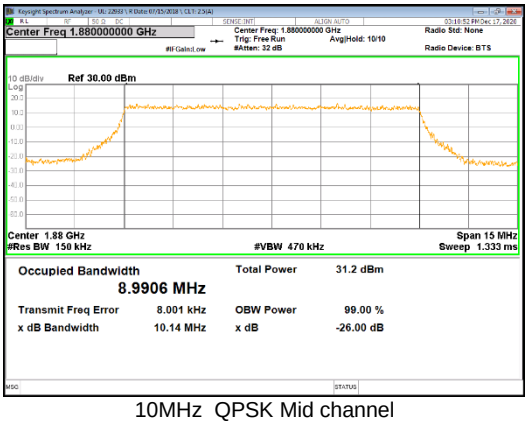
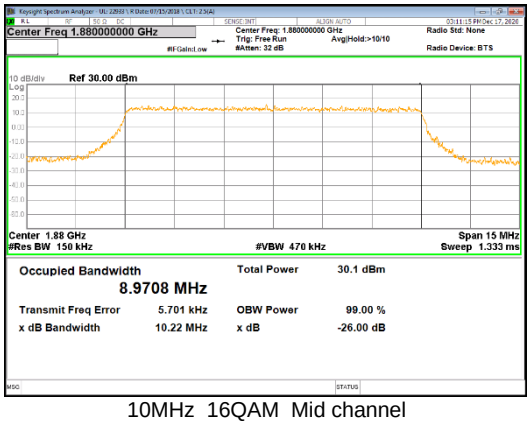
**LTE Band 2**

| | | |
|---|---|---|
| Band 2<br>20MHz |  <br>20MHz QPSK Mid channel |  <br>20MHz 16QAM Mid channel |
| Band 2<br>15MHz |  <br>15MHz QPSK Mid channel |  <br>15MHz 16QAM Mid channel |
| Band 2<br>10MHz |  <br>10MHz QPSK Mid channel |  <br>10MHz 16QAM Mid channel |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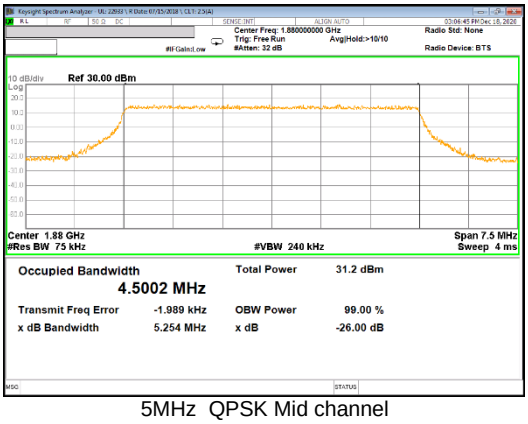
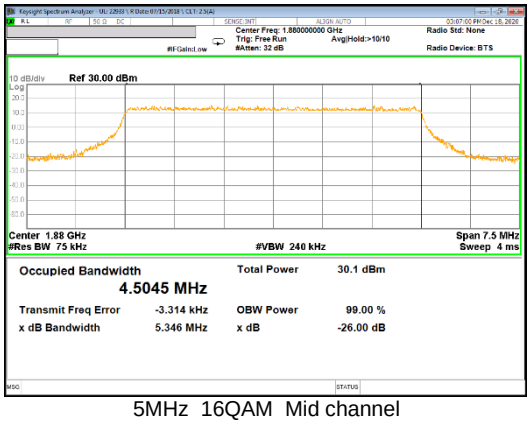
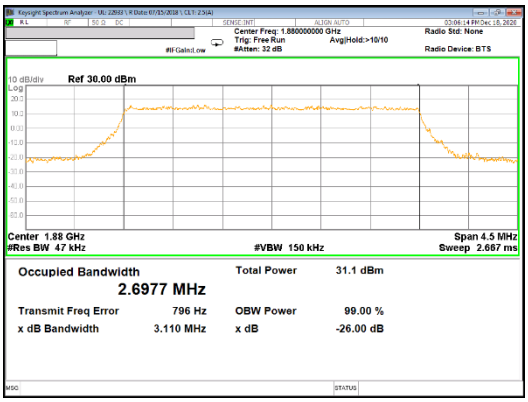
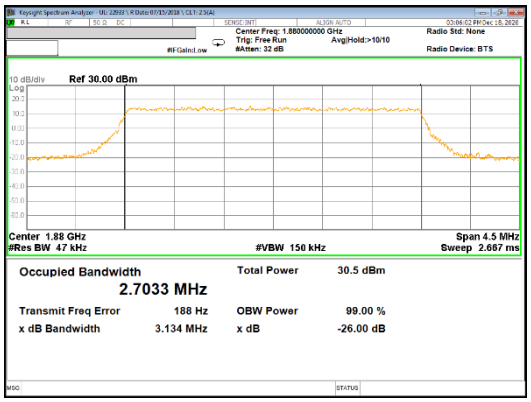
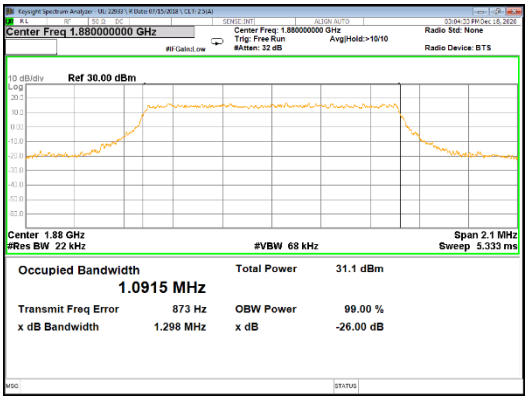
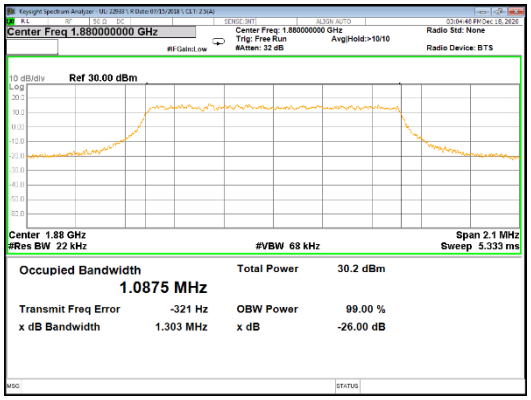
| | | |
|---|---|---|
| Band 2<br>5MHz |  <br>5MHz QPSK Mid channel |  <br>5MHz 16QAM Mid channel |
| Band 2<br>3MHz |  <br>3MHz QPSK Mid channel |  <br>3MHz 16QAM Mid channel |
| Band 2<br>1.4MHz |  <br>1.4MHz QPSK Mid channel |  <br>1.4MHz 16QAM Mid channel |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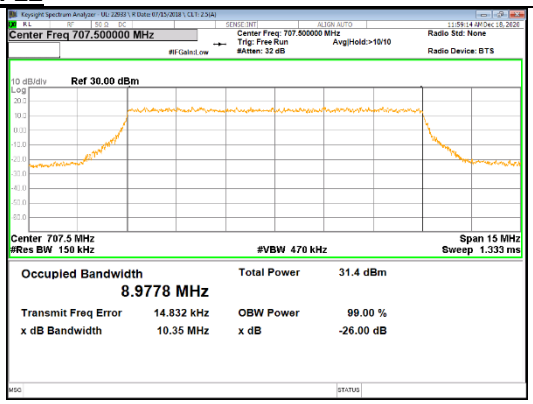
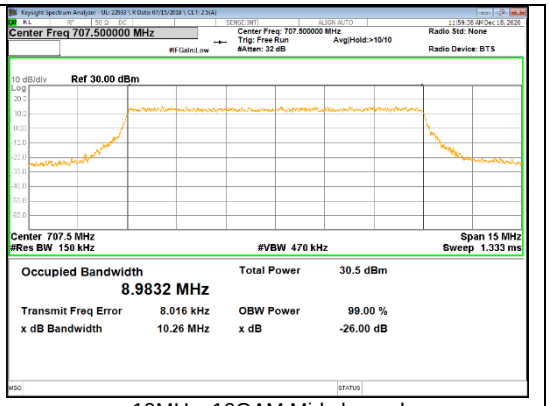
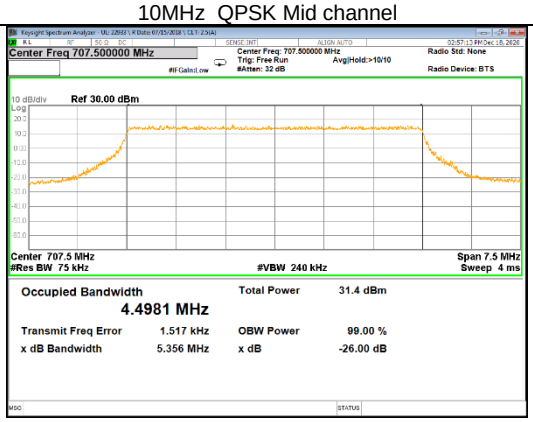
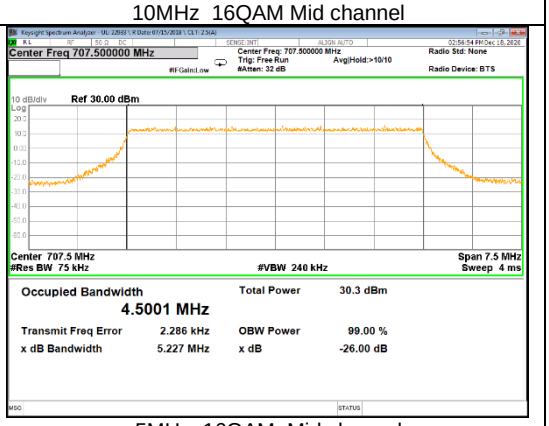
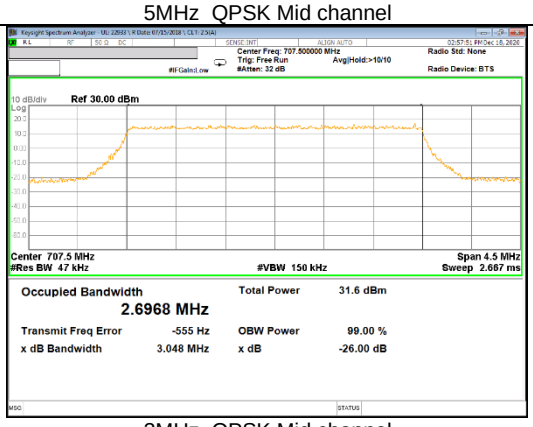
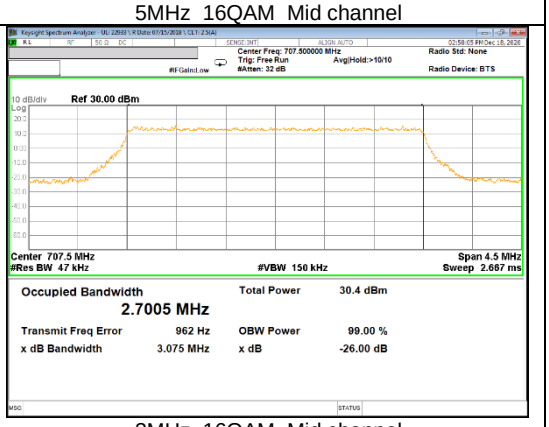
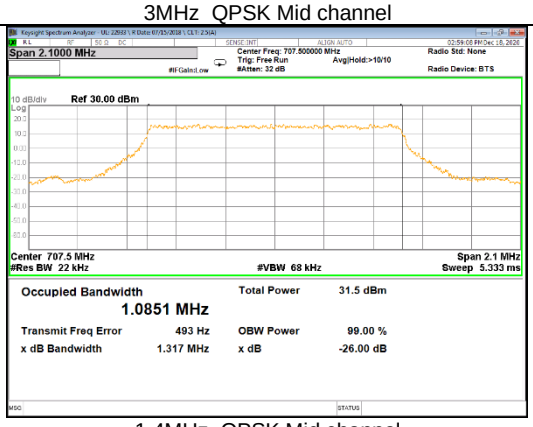
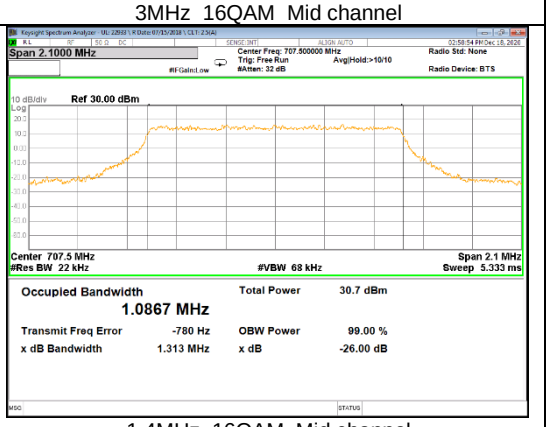
**LTE Band 12**

| | | |
|---|---|---|
| Band 12<br>10MHz |  <br>10MHz QPSK Mid channel |  <br>10MHz 16QAM Mid channel |
| Band 12<br>5MHz |  <br>5MHz QPSK Mid channel |  <br>5MHz 16QAM Mid channel |
| Band 12<br>3MHz |  <br>3MHz QPSK Mid channel |  <br>3MHz 16QAM Mid channel |
| Band 12<br>1.4MHz |  <br>1.4MHz QPSK Mid channel |  <br>1.4MHz 16QAM Mid channel |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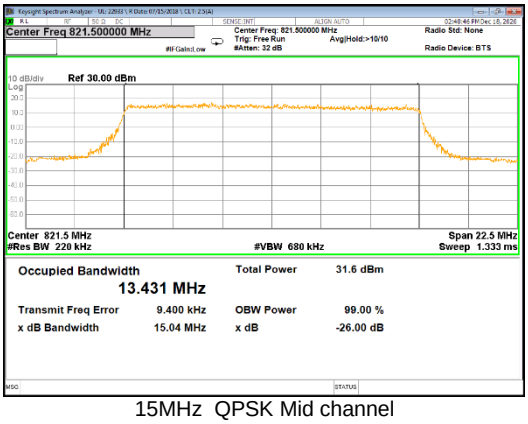
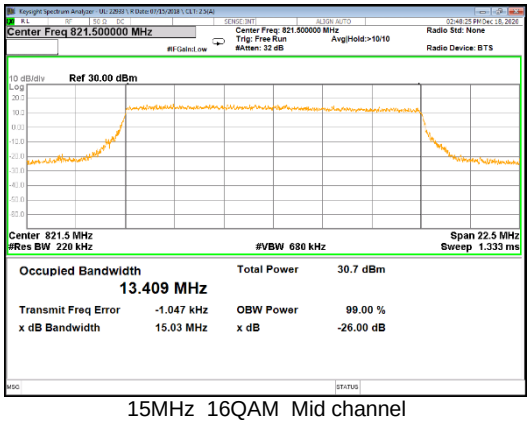
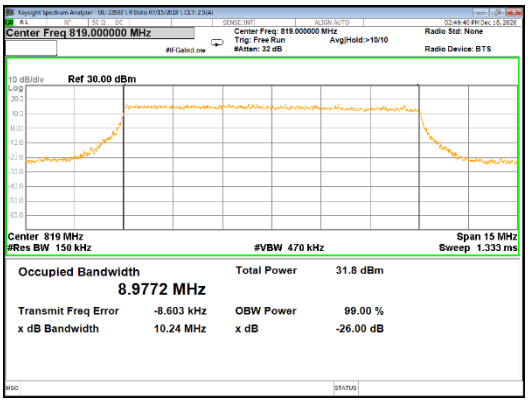
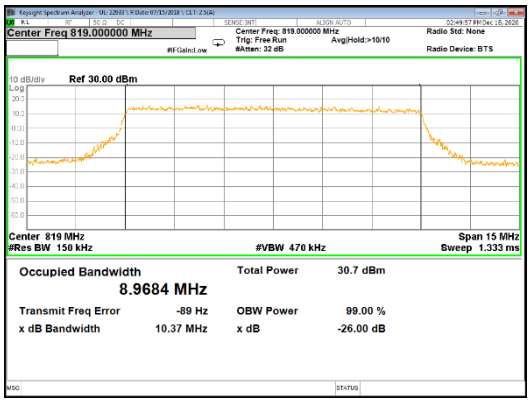
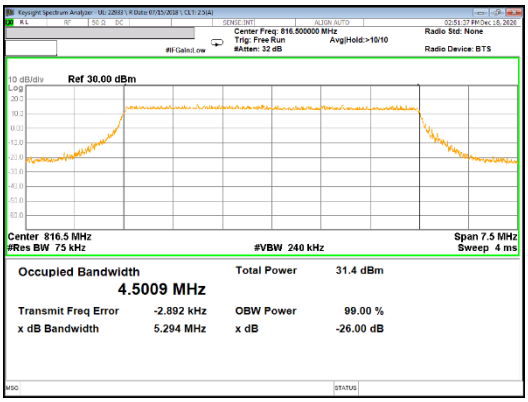
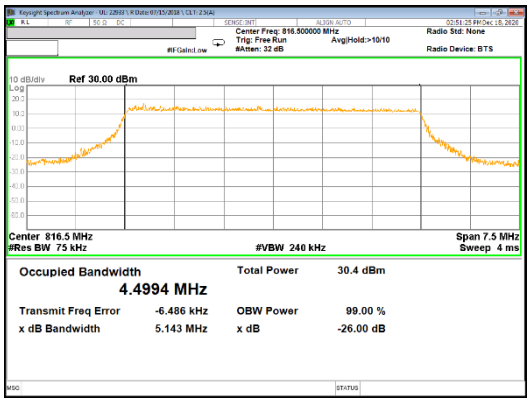
**LTE Band 26 (Part90)**

| | | |
|---|---|---|
| Band 26<br>15MHz |  <br>15MHz QPSK Mid channel |  <br>15MHz 16QAM Mid channel |
| Band 26<br>10MHz |  <br>10MHz QPSK Mid channel |  <br>10MHz 16QAM Mid channel |
| Band 26<br>5MHz |  <br>5MHz QPSK Mid channel |  <br>5MHz 16QAM Mid channel |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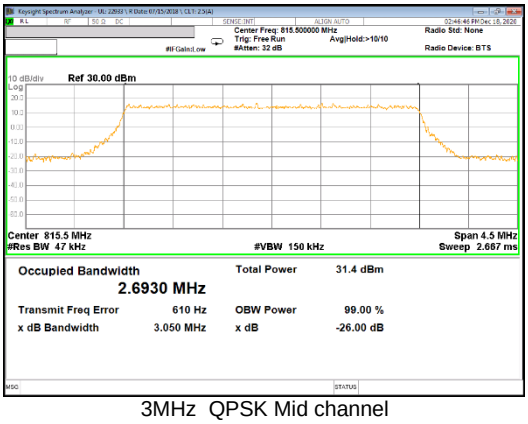
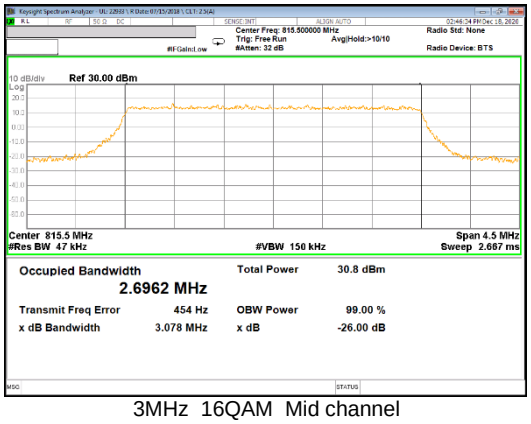
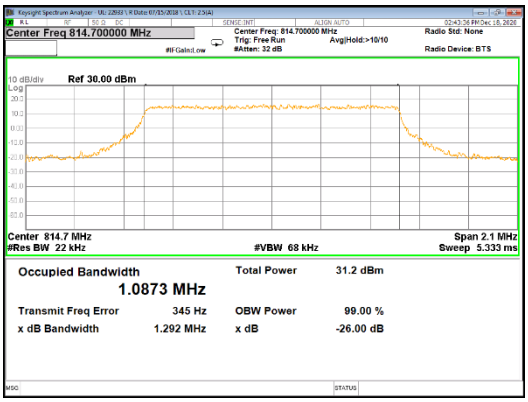
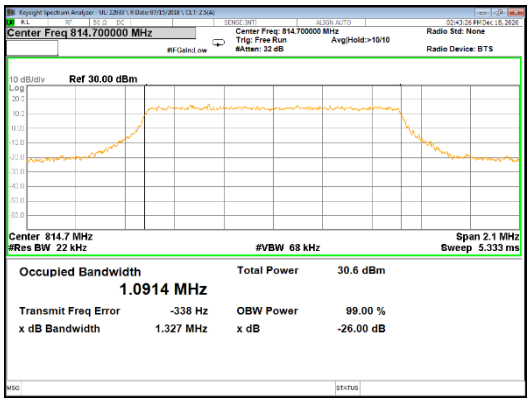
| | | |
|---|---|---|
| Band 26<br><br>3MHz |  <br>3MHz QPSK Mid channel |  <br>3MHz 16QAM Mid channel |
| Band 26<br><br>1.4MHz |  <br>1.4MHz QPSK Mid channel |  <br>1.4MHz 16QAM Mid channel |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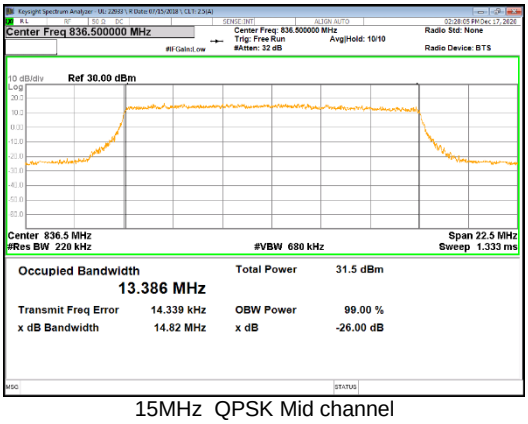
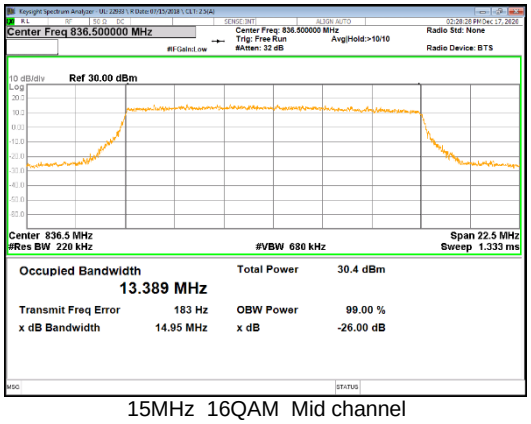
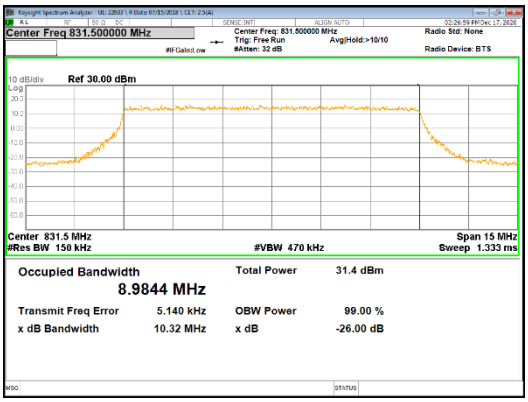
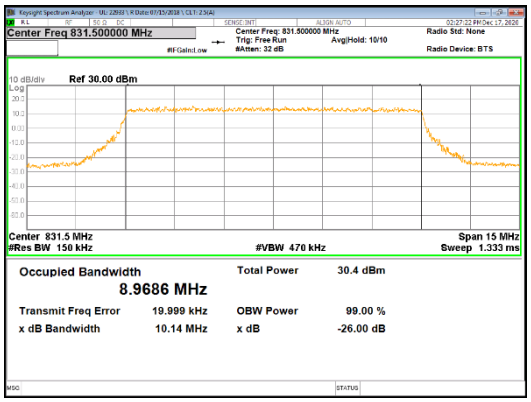
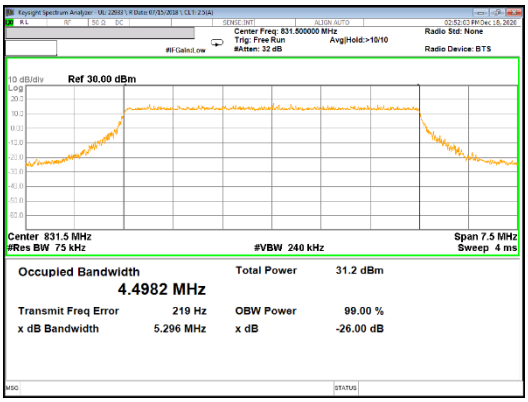
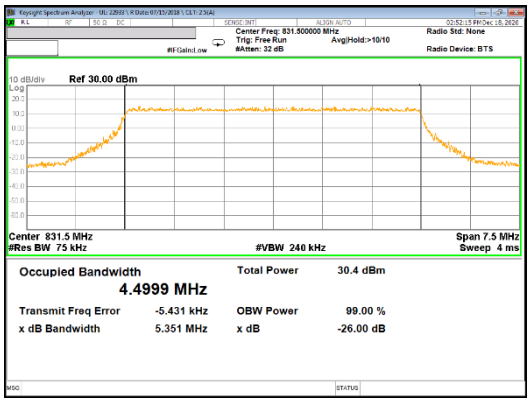
**LTE Band 26 (Part22)**

| | | |
|---|---|---|
| Band 26<br>15MHz |  <br>15MHz QPSK Mid channel |  <br>15MHz 16QAM Mid channel |
| Band 26<br>10MHz |  <br>10MHz QPSK Mid channel |  <br>10MHz 16QAM Mid channel |
| Band 26<br>5MHz |  <br>5MHz QPSK Mid channel |  <br>5MHz 16QAM Mid channel |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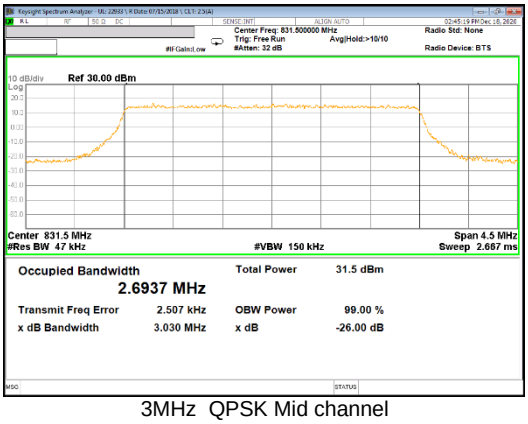
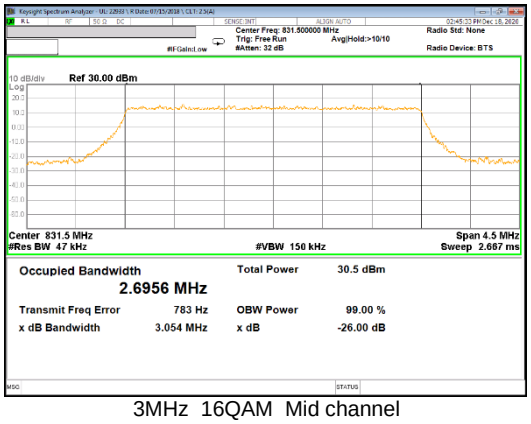
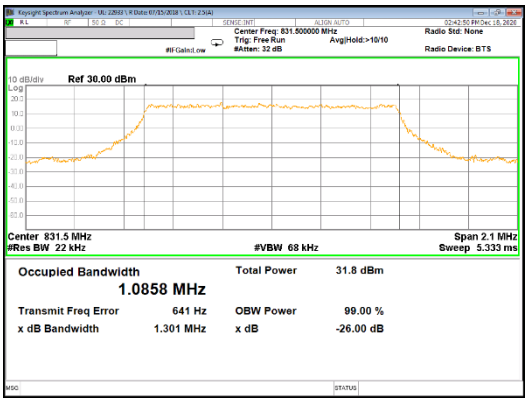
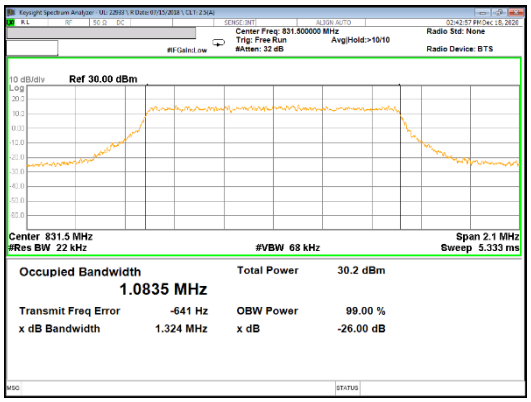
|---|---|---|
| Band 26<br><br>3MHz |  <br>3MHz QPSK Mid channel |  <br>3MHz 16QAM Mid channel |
| Band 26<br><br>1.4MHz |  <br>1.4MHz QPSK Mid channel |  <br>1.4MHz 16QAM Mid channel |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