



# **CERTIFICATION TEST REPORT**

**Report Number.** : 4789551399-E2V2

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

**Model** : SM-G780F/DSM, SM-G780F/DS, SM-G780F

**FCC ID** : A3LSMG780F

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

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

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ACCREDITED

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**TL-637**

Revision History

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| V1   | 08/14/20   | Initial issue                                | Jaejin Lee |
| V2   | 08/24/20   | Updated the address about the TCB's question | Jaejin Lee |

## TABLE OF CONTENTS

|                                                |           |
|------------------------------------------------|-----------|
| <b>1. ATTESTATION OF TEST RESULTS .....</b>    | <b>4</b>  |
| <b>2. TEST METHODOLOGY .....</b>               | <b>5</b>  |
| <b>3. FACILITIES AND ACCREDITATION .....</b>   | <b>5</b>  |
| <b>4. CALIBRATION AND UNCERTAINTY .....</b>    | <b>6</b>  |
| 4.1. MEASURING INSTRUMENT CALIBRATION.....     | 6         |
| 4.2. SAMPLE CALCULATION.....                   | 6         |
| 4.3. MEASUREMENT UNCERTAINTY .....             | 6         |
| 4.4. DECISION RULE .....                       | 6         |
| <b>5. EQUIPMENT UNDER TEST .....</b>           | <b>7</b>  |
| 5.1. DESCRIPTION OF EUT.....                   | 7         |
| 5.2. MAXIMUM OUTPUT POWER.....                 | 7         |
| 5.3. DESCRIPTION OF AVAILABLE ANTENNAS .....   | 14        |
| 5.4. WORST-CASE ORIENTATION.....               | 15        |
| 5.5. DESCRIPTION OF TEST SETUP .....           | 17        |
| <b>6. TEST AND MEASUREMENT EQUIPMENT .....</b> | <b>19</b> |
| <b>7. SUMMARY TABLE.....</b>                   | <b>20</b> |
| <b>8. PEAK TO AVERAGE RATIO .....</b>          | <b>21</b> |
| 8.1. CONDUCTED PEAK TO AVERAGE RESULT.....     | 22        |
| <b>9. LIMITS AND CONDUCTED RESULTS .....</b>   | <b>36</b> |
| 9.1. OCCUPIED BANDWIDTH.....                   | 36        |
| 9.1.1. OCCUPIED BANDWIDTH RESULTS .....        | 37        |
| 9.2. BAND EDGE EMISSIONS .....                 | 53        |
| 9.2.1. BAND EDGE RESULT.....                   | 56        |
| 9.2.2. EMISSION MASK RESULT .....              | 88        |
| 9.3. OUT OF BAND EMISSIONS.....                | 106       |
| 9.3.1. OUT OF BAND EMISSIONS RESULT.....       | 108       |
| 9.4. FREQUENCY STABILITY.....                  | 121       |
| 9.4.1. FREQUENCY STABILITY RESULTS .....       | 122       |
| 9.5. RADIATED POWER (ERP & EIRP) .....         | 128       |
| 9.5.1. ERP/EIRP Results .....                  | 129       |
| 9.5.2. ERP/EIRP DATA .....                     | 137       |
| 9.6. FIELD STRENGTH OF SPURIOUS RADIATION..... | 178       |
| 9.6.1. SPURIOUS RADIATION PLOTS .....          | 180       |

## 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/ax, NFC and WPT

**MODEL NUMBER:** SM-G780F/DSM, SM-G780F/DS, SM-G780F

**SERIAL NUMBER:** R38N605FLEA (CONDUCTED)  
R38N605FKMY (RADIATED);

**DATE TESTED:** July 22, 2020 – August 13, 2020;

| APPLICABLE STANDARDS                          |              |
|-----------------------------------------------|--------------|
| STANDARD                                      | TEST RESULTS |
| FCC PART 22H, 24E, 27H, 27L, 27F, 27M 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.

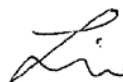
**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Korea, Ltd. and all revisions are duly noted in the revisions section. Any alteration 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:



Jaejin Lee  
Suwon Lab Engineer  
UL Korea, Ltd.

## 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                     |             |
|-------------------------------------|-------------|
| <input type="checkbox"/>            | Chamber 1   |
| <input type="checkbox"/>            | Chamber 2   |
| <input type="checkbox"/>            | Chamber 3   |
| <input checked="" type="checkbox"/> | 10m Chamber |

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

## 4. CALIBRATION AND UNCERTAINTY

### 4.1. MEASURING INSTRUMENT CALIBRATION

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

### 4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

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

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

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

### 4.3. MEASUREMENT UNCERTAINTY

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

| PARAMETER                              | UNCERTAINTY |
|----------------------------------------|-------------|
| Conducted Disturbance, 0.15 to 30 MHz  | 2.35 dB     |
| Radiated Disturbance, 30 MHz to 1 GHz  | 3.96 dB     |
| Radiated Disturbance, 1 GHz to 18 GHz  | 5.82 dB     |
| Radiated Disturbance, 18 GHz to 40 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/ax, NFC and WPT. This test report addresses the WWAN operational mode.

### 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.(4789551399-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       | <b>33.75</b> | <b>2372.51</b> | 23.22        | 209.78        |
|                |                       | EGPRS      | 26.95        | 495.78         | 19.54        | 89.87         |
| GSM1900        | 1850~1910             | GPRS       | 31.12        | 1293.43        | <b>29.37</b> | <b>864.23</b> |
|                |                       | EGPRS      | 25.44        | 349.59         | 27.55        | 568.36        |

#### WCDMA

| FCC Part 22/24/27 |                       |            |              |               |              |               |
|-------------------|-----------------------|------------|--------------|---------------|--------------|---------------|
| Band              | Frequency Range [MHz] | Modulation | Conducted    |               | Radiated     |               |
|                   |                       |            | Avg [dBm]    | Avg [mW]      | Avg [dBm]    | Avg [mW]      |
| Band 5            | 824~849               | Rel. 99    | <b>24.86</b> | <b>306.37</b> | 18.32        | 67.88         |
|                   |                       | HSDPA      | 23.50        | 223.72        | 16.92        | 49.15         |
| Band 4            | 1710~1755             | Rel. 99    | 24.72        | 296.70        | 23.09        | 203.48        |
|                   |                       | HSDPA      | 22.97        | 197.97        | 22.98        | 198.39        |
| Band 2            | 1850~1910             | Rel. 99    | 24.35        | 272.07        | <b>23.68</b> | <b>233.20</b> |
|                   |                       | HSDPA      | 23.40        | 218.70        | 22.82        | 191.31        |

## 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       | 24.29        | 268.44        | 23.54        | 225.94        |
|             |                       |                 | 16QAM      | 23.46        | 221.62        | 22.58        | 181.13        |
|             |                       |                 | 64QAM      | 22.41        | 174.22        |              |               |
|             |                       | 15              | QPSK       | 24.19        | 262.45        | 23.41        | 219.28        |
|             |                       |                 | 16QAM      | 23.53        | 225.66        | 22.29        | 169.60        |
|             |                       |                 | 64QAM      | 22.32        | 170.78        |              |               |
|             |                       | 10              | QPSK       | 24.08        | 255.74        | 23.30        | 213.99        |
|             |                       |                 | 16QAM      | 23.48        | 222.97        | 22.57        | 180.70        |
|             |                       |                 | 64QAM      | 22.33        | 170.86        |              |               |
|             |                       | 5               | QPSK       | 24.21        | 263.85        | 23.27        | 212.31        |
|             |                       |                 | 16QAM      | 23.44        | 220.79        | 22.63        | 183.40        |
|             |                       |                 | 64QAM      | 22.53        | 178.88        |              |               |
|             |                       | 3               | QPSK       | <b>24.40</b> | <b>275.36</b> | <b>23.65</b> | <b>231.87</b> |
|             |                       |                 | 16QAM      | 23.50        | 223.73        | 22.15        | 164.15        |
|             |                       |                 | 64QAM      | 22.40        | 173.90        |              |               |
|             |                       | 1.4             | QPSK       | 24.03        | 253.07        | 22.96        | 197.50        |
|             |                       |                 | 16QAM      | 23.32        | 214.69        | 22.20        | 165.79        |
|             |                       |                 | 64QAM      | 22.25        | 167.71        |              |               |

## LTE Band 5

| FCC Part 22 |                       |                 |            |              |               |              |              |
|-------------|-----------------------|-----------------|------------|--------------|---------------|--------------|--------------|
| Band        | Frequency Range [MHz] | BandWidth [MHz] | Modulation | Conducted    |               | Radiated     |              |
|             |                       |                 |            | Avg [dBm]    | Avg [mW]      | Avg [dBm]    | Avg [mW]     |
| Band 5      | 824 ~ 849             | 10              | QPSK       | 24.52        | 282.92        | <b>17.37</b> | <b>54.62</b> |
|             |                       |                 | 16QAM      | 23.60        | 229.06        | 16.26        | 42.30        |
|             |                       |                 | 64QAM      | 22.63        | 183.09        |              |              |
|             |                       | 5               | QPSK       | 24.80        | 301.81        | 16.97        | 49.77        |
|             |                       |                 | 16QAM      | 23.90        | 245.33        | 15.62        | 36.47        |
|             |                       |                 | 64QAM      | 22.80        | 190.63        |              |              |
|             |                       | 3               | QPSK       | <b>24.93</b> | <b>310.92</b> | 16.46        | 44.28        |
|             |                       |                 | 16QAM      | 23.82        | 240.71        | 15.02        | 31.78        |
|             |                       |                 | 64QAM      | 23.04        | 201.29        |              |              |
|             |                       | 1.4             | QPSK       | 24.78        | 300.87        | 16.78        | 47.60        |
|             |                       |                 | 16QAM      | 23.81        | 240.43        | 15.38        | 34.48        |
|             |                       |                 | 64QAM      | 22.64        | 183.54        |              |              |

### 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       | 24.38        | 274.32        | <b>17.09</b> | <b>51.23</b> |
|             |                       |                 | 16QAM      | 22.05        | 160.46        | 14.41        | 27.64        |
|             |                       |                 | 64QAM      | 21.06        | 127.77        |              |              |
|             |                       | 5               | QPSK       | 24.64        | 291.09        | 17.01        | 50.29        |
|             |                       |                 | 16QAM      | 22.26        | 168.14        | 14.31        | 27.01        |
|             |                       |                 | 64QAM      | 21.30        | 134.78        |              |              |
|             |                       | 3               | QPSK       | <b>24.67</b> | <b>293.13</b> | 16.94        | 49.49        |
|             |                       |                 | 16QAM      | 22.40        | 173.78        | 14.22        | 26.44        |
|             |                       |                 | 64QAM      | 21.24        | 132.98        |              |              |
|             |                       | 1.4             | QPSK       | 24.43        | 277.22        | 17.05        | 50.76        |
|             |                       |                 | 16QAM      | 22.14        | 163.72        | 14.13        | 25.91        |
|             |                       |                 | 64QAM      | 21.04        | 127.18        |              |              |

### LTE Band 13

| FCC Part 27 |                       |                 |            |              |               |              |              |
|-------------|-----------------------|-----------------|------------|--------------|---------------|--------------|--------------|
| Band        | Frequency Range [MHz] | BandWidth [MHz] | Modulation | Conducted    |               | Radiated     |              |
|             |                       |                 |            | Avg [dBm]    | Avg [mW]      | Avg [dBm]    | Avg [mW]     |
| Band 13     | 777 ~ 787             | 10              | QPSK       | 24.74        | 298.17        | <b>17.97</b> | <b>62.66</b> |
|             |                       |                 | 16QAM      | 22.28        | 168.96        | 14.98        | 31.48        |
|             |                       |                 | 64QAM      | 21.27        | 134.07        |              |              |
|             |                       | 5               | QPSK       | <b>24.85</b> | <b>305.25</b> | 17.69        | 58.75        |
|             |                       |                 | 16QAM      | 22.64        | 183.54        | 15.02        | 31.80        |
|             |                       |                 | 64QAM      | 21.55        | 142.77        |              |              |

**LTE Band 26 (Part90)**

| 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       | 24.59        | 287.56        | 16.53        | 44.93        |
|             |                       |                 | 16QAM      | 23.51        | 224.47        | 15.35        | 34.24        |
|             |                       |                 | 64QAM      | 22.66        | 184.40        |              |              |
|             |                       | 10              | QPSK       | 24.54        | 284.39        | 16.82        | 48.12        |
|             |                       |                 | 16QAM      | 23.39        | 218.18        | 14.97        | 31.43        |
|             |                       |                 | 64QAM      | 22.30        | 169.90        |              |              |
|             |                       | 5               | QPSK       | 24.43        | 277.32        | 16.80        | 47.83        |
|             |                       |                 | 16QAM      | 23.78        | 238.88        | 15.72        | 37.30        |
|             |                       |                 | 64QAM      | 22.55        | 179.92        |              |              |
|             |                       | 3               | QPSK       | <b>24.63</b> | <b>290.27</b> | 16.67        | 46.43        |
|             |                       |                 | 16QAM      | 23.51        | 224.64        | 15.41        | 34.73        |
|             |                       |                 | 64QAM      | 22.50        | 177.82        |              |              |
|             |                       | 1.4             | QPSK       | 24.40        | 275.22        | <b>16.85</b> | <b>48.38</b> |
|             |                       |                 | 16QAM      | 23.35        | 216.13        | 16.61        | 45.82        |
|             |                       |                 | 64QAM      | 22.26        | 168.37        |              |              |

**LTE Band 26 (Part22)**

| 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       | <b>24.64</b> | <b>290.75</b> | 16.88        | 48.72        |
|             |                       |                 | 16QAM      | 23.76        | 237.83        | 15.59        | 36.20        |
|             |                       |                 | 64QAM      | 22.76        | 188.60        |              |              |
|             |                       | 10              | QPSK       | 24.49        | 281.34        | <b>17.33</b> | <b>54.12</b> |
|             |                       |                 | 16QAM      | 23.63        | 230.72        | 15.66        | 36.84        |
|             |                       |                 | 64QAM      | 22.56        | 180.15        |              |              |
|             |                       | 5               | QPSK       | 24.50        | 282.07        | 17.20        | 52.47        |
|             |                       |                 | 16QAM      | 23.74        | 236.84        | 15.45        | 35.07        |
|             |                       |                 | 64QAM      | 22.65        | 184.23        |              |              |
|             |                       | 3               | QPSK       | 24.47        | 280.01        | 17.26        | 53.24        |
|             |                       |                 | 16QAM      | 23.62        | 230.29        | 15.92        | 39.10        |
|             |                       |                 | 64QAM      | 22.77        | 189.10        |              |              |
|             |                       | 1.4             | QPSK       | 24.34        | 271.73        | 16.56        | 45.25        |
|             |                       |                 | 16QAM      | 23.45        | 221.45        | 15.26        | 33.54        |
|             |                       |                 | 64QAM      | 22.45        | 175.71        |              |              |

**LTE Band 41(PC3)**

| 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       | 21.91        | 155.07        | <b>21.68</b> | <b>147.15</b> |
|             |                       |                 | 16QAM      | 21.16        | 130.60        | 20.02        | 100.40        |
|             |                       |                 | 64QAM      | 20.43        | 110.50        |              |               |
|             |                       | 15              | QPSK       | <b>22.08</b> | <b>161.58</b> | 20.48        | 111.62        |
|             |                       |                 | 16QAM      | 20.90        | 123.02        | 18.75        | 74.95         |
|             |                       |                 | 64QAM      | 19.86        | 96.80         |              |               |
|             |                       | 10              | QPSK       | 21.83        | 152.33        | 17.32        | 53.94         |
|             |                       |                 | 16QAM      | 20.77        | 119.47        | 16.72        | 46.98         |
|             |                       |                 | 64QAM      | 19.86        | 96.80         |              |               |
|             |                       | 5               | QPSK       | 22.08        | 161.33        | 18.41        | 69.30         |
|             |                       |                 | 16QAM      | 20.85        | 121.49        | 16.99        | 49.97         |
|             |                       |                 | 64QAM      | 20.00        | 100.07        |              |               |

**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       | 24.28        | 268.22        | 23.31        | 214.06        |
|             |                       |                 | 16QAM      | 23.40        | 218.59        | 21.24        | 132.90        |
|             |                       |                 | 64QAM      | 22.88        | 194.09        |              |               |
|             |                       | 15              | QPSK       | 24.27        | 267.29        | 23.01        | 199.78        |
|             |                       |                 | 16QAM      | 23.69        | 233.91        | 21.44        | 139.17        |
|             |                       |                 | 64QAM      | 22.10        | 162.21        |              |               |
|             |                       | 10              | QPSK       | 24.29        | 268.46        | <b>23.54</b> | <b>225.71</b> |
|             |                       |                 | 16QAM      | 23.53        | 225.17        | 22.44        | 175.21        |
|             |                       |                 | 64QAM      | 22.13        | 163.26        |              |               |
|             |                       | 5               | QPSK       | 24.29        | 268.63        | 22.89        | 194.34        |
|             |                       |                 | 16QAM      | 23.46        | 221.63        | 21.43        | 138.85        |
|             |                       |                 | 64QAM      | 22.52        | 178.84        |              |               |
|             |                       | 3               | QPSK       | <b>24.32</b> | <b>270.66</b> | 22.23        | 166.94        |
|             |                       |                 | 16QAM      | 23.28        | 212.71        | 21.18        | 131.09        |
|             |                       |                 | 64QAM      | 22.32        | 170.54        |              |               |
|             |                       | 1.4             | QPSK       | 24.03        | 253.22        | 22.36        | 172.01        |
|             |                       |                 | 16QAM      | 23.28        | 212.57        | 21.11        | 129.15        |
|             |                       |                 | 64QAM      | 22.23        | 167.28        |              |               |

**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 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) |
|-------------------------------------------------------------------|-----------------|
| GSM1900 / WCDMA Band 2 / LTE Band 2<br>1850 ~ 1915 MHz            | -5.07           |
| WCDMA Band 4 / LTE Band 4 / LTE Band 66<br>1710 ~ 1780 MHz        | -4.18           |
| GSM850 / WCDMA Band 5 / LTE Band 5 / LTE Band 26<br>814 ~ 849 MHz | -6.61           |
| LTE Band 12 / LTE Band 17<br>699 ~ 716 MHz                        | -7.04           |
| LTE Band 41<br>2496 ~ 2690 MHz                                    | -6.17           |
| LTE Band 13<br>777 ~ 787 MHz                                      | -6.97           |

## 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. It was found that QPSK and 16QAM results were worst case. All testing was performed using QPSK and 16QAM modulations to represent the worst case. However, the out of band emissions and spurious radiation were only performed on bandwidth and RB offset(with RB size 1) with the highest power in QPSK.

| Highest power setting for each bands |                 |                 |         |           |
|--------------------------------------|-----------------|-----------------|---------|-----------|
| LTE Band                             | Frequency (MHz) | Bandwidth (MHz) | RB size | RB offset |
| 2                                    | 1851.5          | 3               | 1       | 0         |
|                                      | 1880.0          |                 | 1       | 8         |
|                                      | 1908.5          |                 | 1       | 0         |
| 5                                    | 825.5           | 3               | 1       | 8         |
|                                      | 836.5           |                 | 1       | 0         |
|                                      | 847.5           |                 | 1       | 8         |
| 12                                   | 700.5           | 3               | 1       | 14        |
|                                      | 707.5           |                 | 1       | 8         |
|                                      | 714.5           |                 | 1       | 8         |
| 13                                   | 779.5           | 5               | 1       | 24        |
|                                      | 782.0           |                 | 1       | 12        |
|                                      | 784.5           |                 | 1       | 12        |
| 26<br>(Part 90)                      | 815.5           | 3               | 1       | 8         |
|                                      | 822.5           |                 | 1       | 8         |
| 26<br>(Part 22)                      | 831.5           | 10              | 1       | 0         |
|                                      | 841.5           |                 | 1       | 37        |
| 41(PC3)                              | 2503.5          | 15              | 1       | 0         |
|                                      | 2593.0          |                 | 1       | 0         |
|                                      | 2682.5          |                 | 1       | 37        |
| 66                                   | 1712.5          | 3               | 1       | 8         |
|                                      | 1745.0          |                 | 1       | 0         |
|                                      | 1777.5          |                 | 1       | 8         |

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 B5       | O        | - | - | -   | O | - |
| LTE B12      | O        | - | - | O   | - | - |
| LTE B13      | O        | - | - | O   | - | - |
| LTE B26      | O        | - | - | O   | - | - |
| LTE B41(PC3) | -        | 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            | Manufacture | Model       | Serial Number  | FCC ID |
| Charger                | SAMSUNG     | EP-TA200    | R37M4L146R1SE3 | N/A    |
| Data Cable             | SAMSUNG     | EP-DR140AWE | N/A            | N/A    |
| Earphone               | SAMSUNG     | GH59-15252A | N/A            | N/A    |

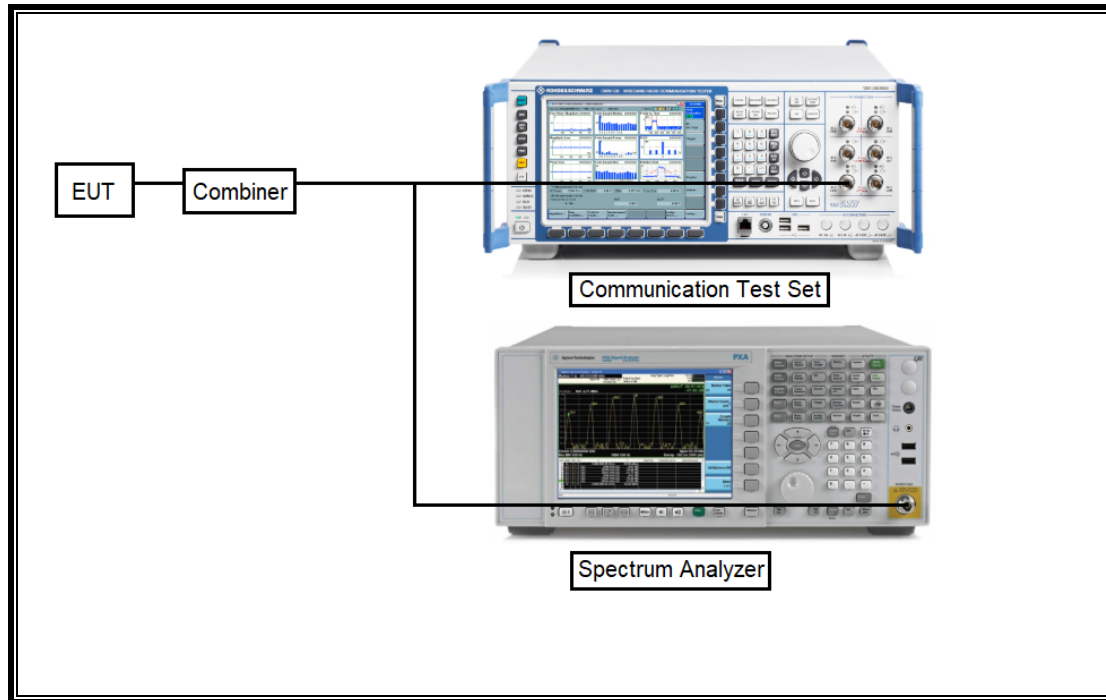
### I/O CABLE

| 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   | 1.0m             | N/A     |

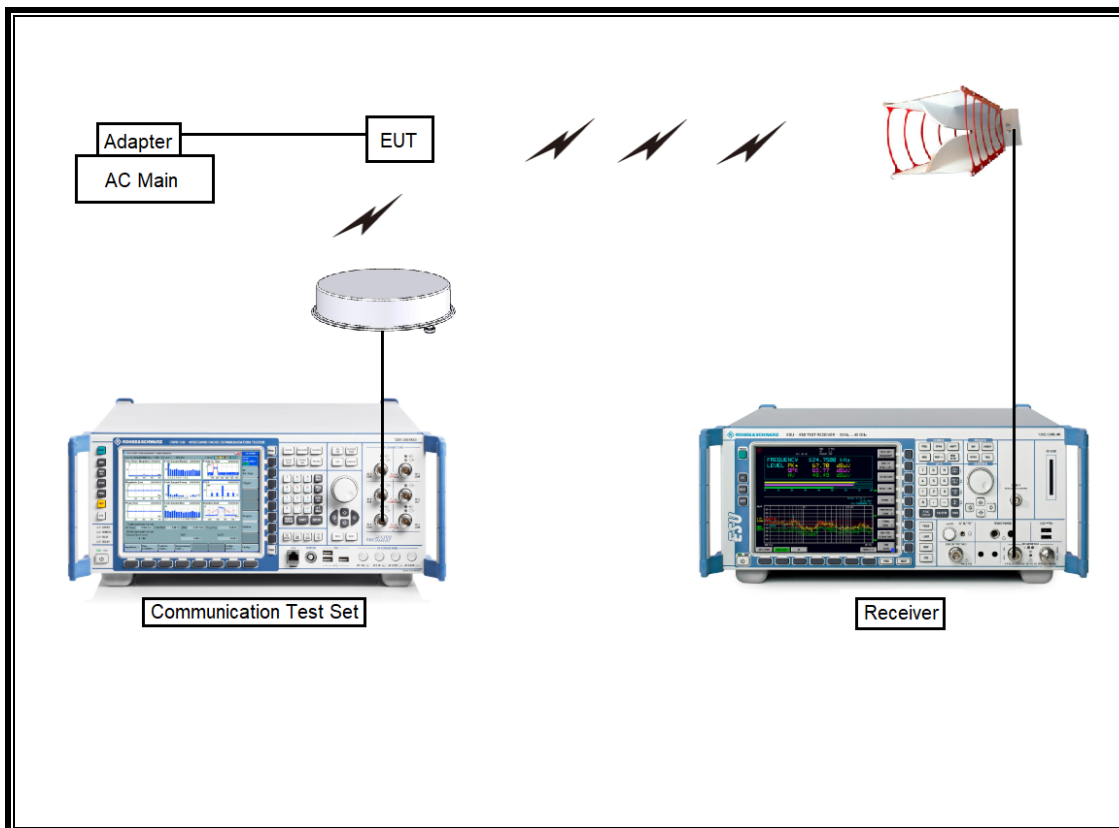
### TEST SETUP

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        | Nex. Cal Due |          |
| Antenna, Tuned Dipole<br>400~1000 MHz | ETS           | 3121D DB4          | 00164753   | 01-30-21     |          |
| Antenna, Horn, 40 GHz                 | ETS           | 3116C              | 00166155   | 08-13-20     | 08-04-21 |
| Preamplifier                          | ETS           | 3116C-PA           | 00168841   | 08-08-20     | 08-06-21 |
| Antenna, Horn, 40 GHz                 | ETS           | 3116C              | 00168645   | 10-02-21     |          |
| Antenna, Bilog, 30MHz-1GHz            | SCHWARZBECK   | VULB9163           | 1241       | 09-30-21     |          |
| Antenna, Horn, 18 GHz                 | ETS           | 3115               | 00167211   | 08-04-20     | 07-27-22 |
| Antenna, Horn, 18 GHz                 | ETS           | 3117               | 227048     | 09-18-21     |          |
| Power Divider                         | WEINSCHL      | 1580               | SQ373      | 08-08-20     | 08-07-21 |
| Attenuator                            | WEINSCHL      | 54A-10             | 74560      | 08-08-20     | 08-07-21 |
| Spectrum Analyzer, 44 GHz             | KEYSIGHT      | N9030B             | MY57143717 | 01-20-21     |          |
| Communications Test Set               | R&S           | CMW500             | 115331     | 08-05-20     | 08-03-21 |
| DC Power Supply                       | KEYSIGHT      | N5747A             | MY57300040 | 08-06-20     | 08-06-21 |
| Preamplifier, 1000 MHz                | R&S           | SCU08F2            | 100725     | 09-16-20     | 08-03-21 |
| Preamplifier, 18 GHz                  | R&S           | SCU18F             | 100721     | 09-16-20     | 08-03-21 |
| Open Switch and Control               | R&S           | OSP220             | 101456     | N/A          |          |
| EMI Test Receive, 40 GHz              | R&S           | ESU40              | 100457     | 08-06-20     | 08-03-21 |
| EMI Test Receive, 44 GHz              | R&S           | ESW44              | 101590     | 08-05-20     | 08-04-21 |
| Directional Antenna                   | Cobham        | FPA3-0.8-6.0R/1329 | 80108-0004 | N/A          |          |
| High Pass Filter 1.2GHz               | Micro-Tronics | HPM50108-02        | G005       | 08-05-20     | 08-05-21 |
| High Pass Filter 2.8GHz               | Micro-Tronics | HPM50111-02        | 010        | 08-05-20     | 08-05-21 |
| High Pass Filter 4GHz                 | Micro-Tronics | HPM50118-02        | G001       | 08-05-20     | 08-05-21 |
| Antenna, Loop, 9kHz-30MHz             | R&S           | HFH2-Z2            | 100418     | 10-02-21     |          |
| Temperature Chamber                   | ESPEC         | PL-3J              | 15011850   | 08-06-20     | 08-04-21 |
| 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)<br>24.238(a)<br>27.53(c),(g),(h)<br>90.691  | Band Edge / Conducted Spurious Emission | -13dBm        |                | Pass        |
| 27.53(m)                                              | Conducted Spurious Emission             | -25dBm        |                | 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                | 38.5dBm       | Radiated       | Pass        |
| 90.635(b)                                             |                                         | 50 dBm        |                | Pass        |
| 27.50(c)(10)<br>27.50(b)(10)                          |                                         | 34.77dBm      |                | 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 (c),(g),(h)<br>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

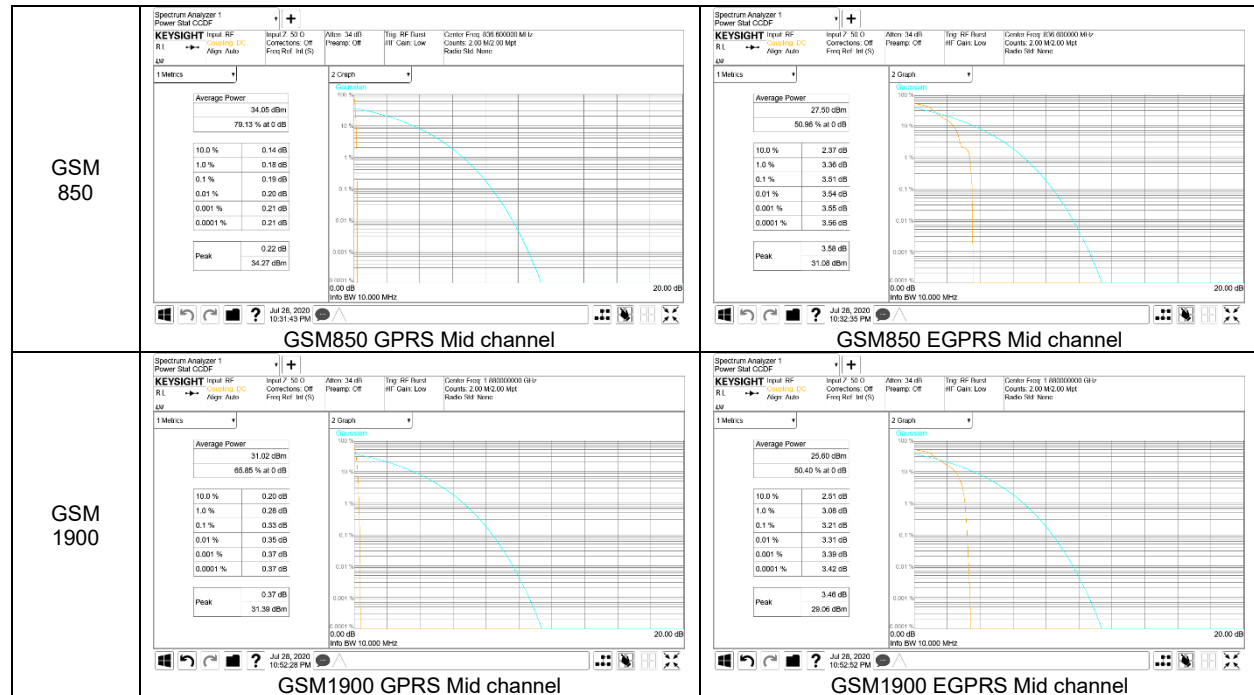
In addition, when the transmitter power is measured in terms of average value, the peak-to-average ratio of the power shall not exceed 13 dB.

### RESULTS

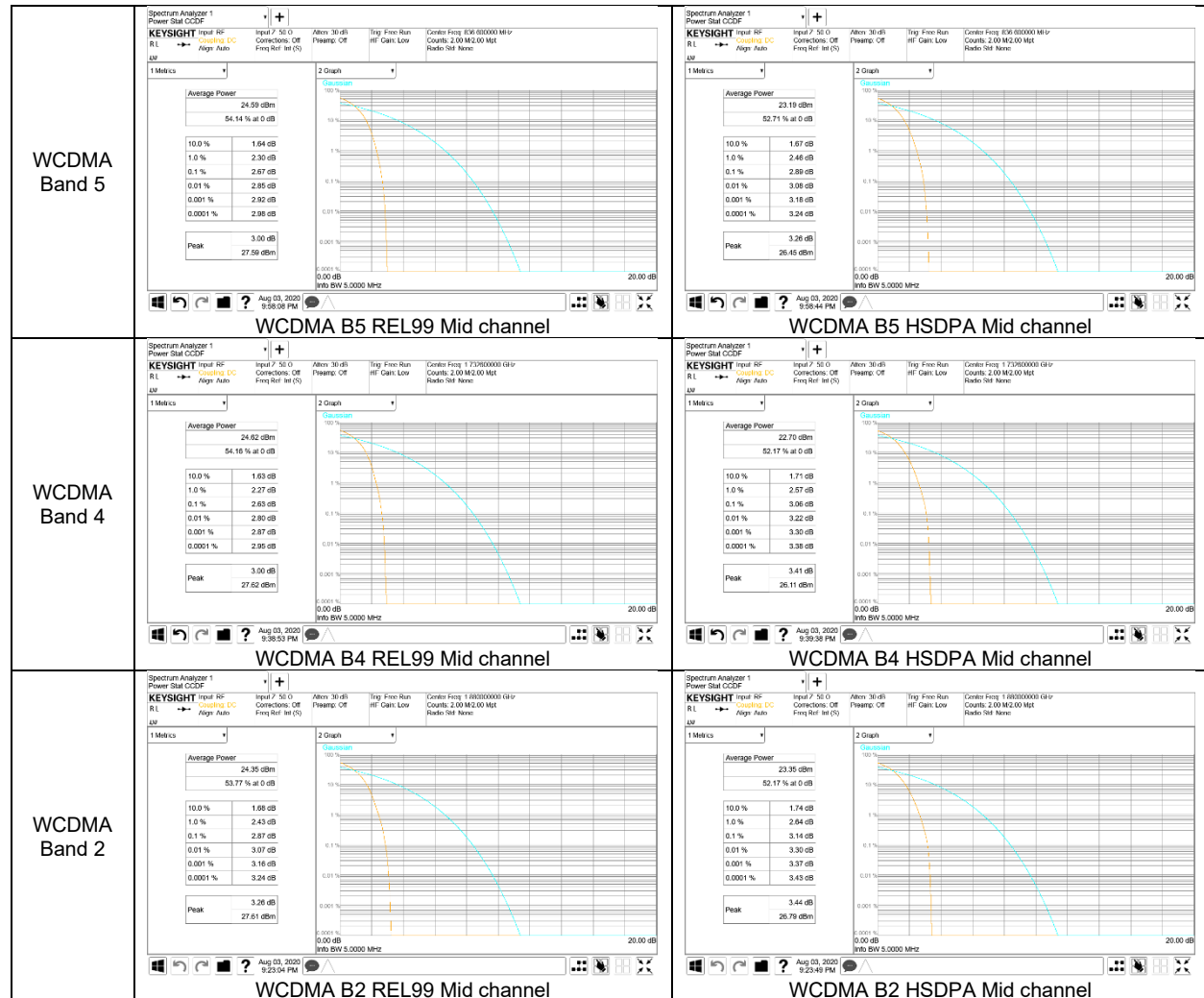
See the following pages.

## 8.1. CONDUCTED PEAK TO AVERAGE RESULT

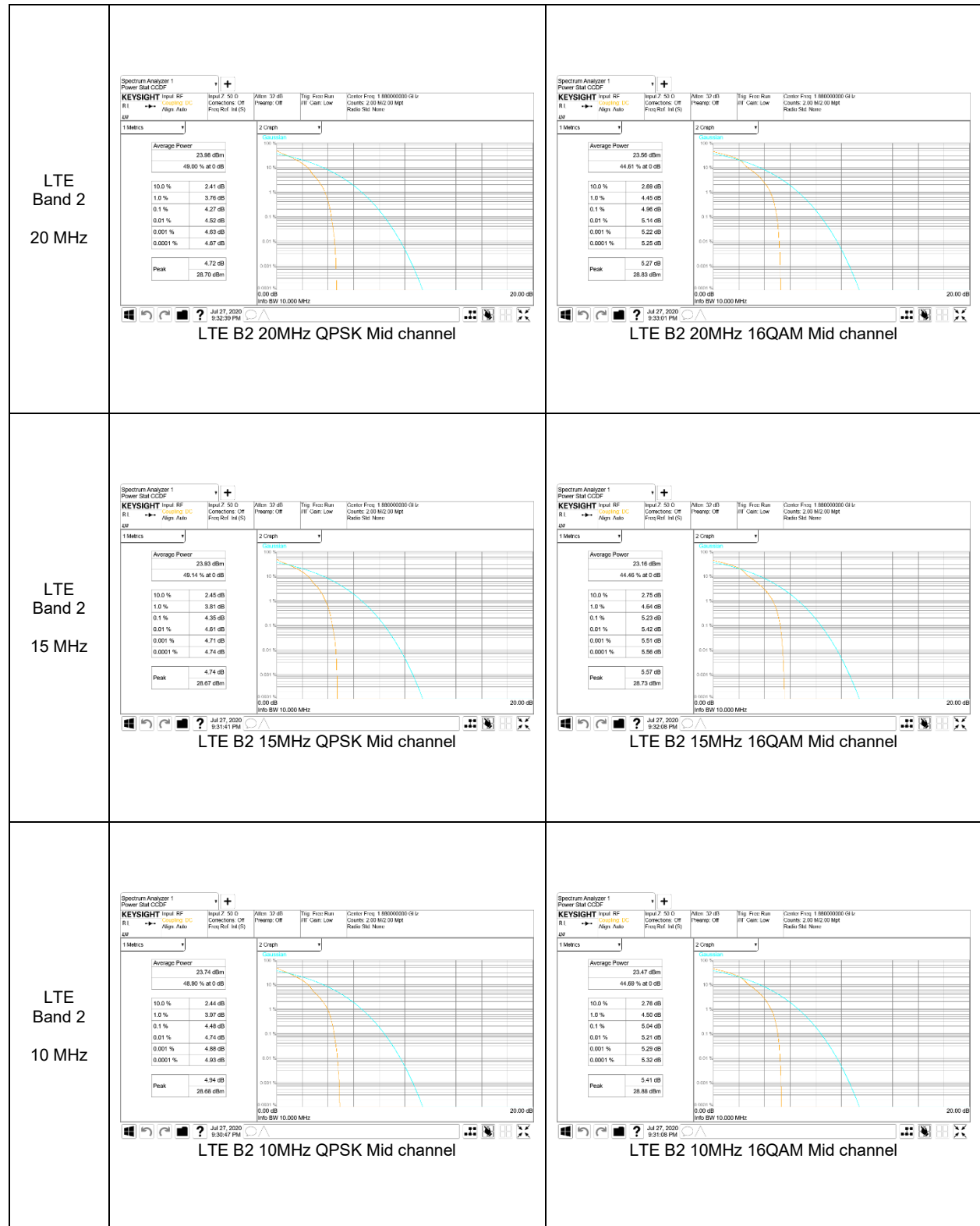
### GSM

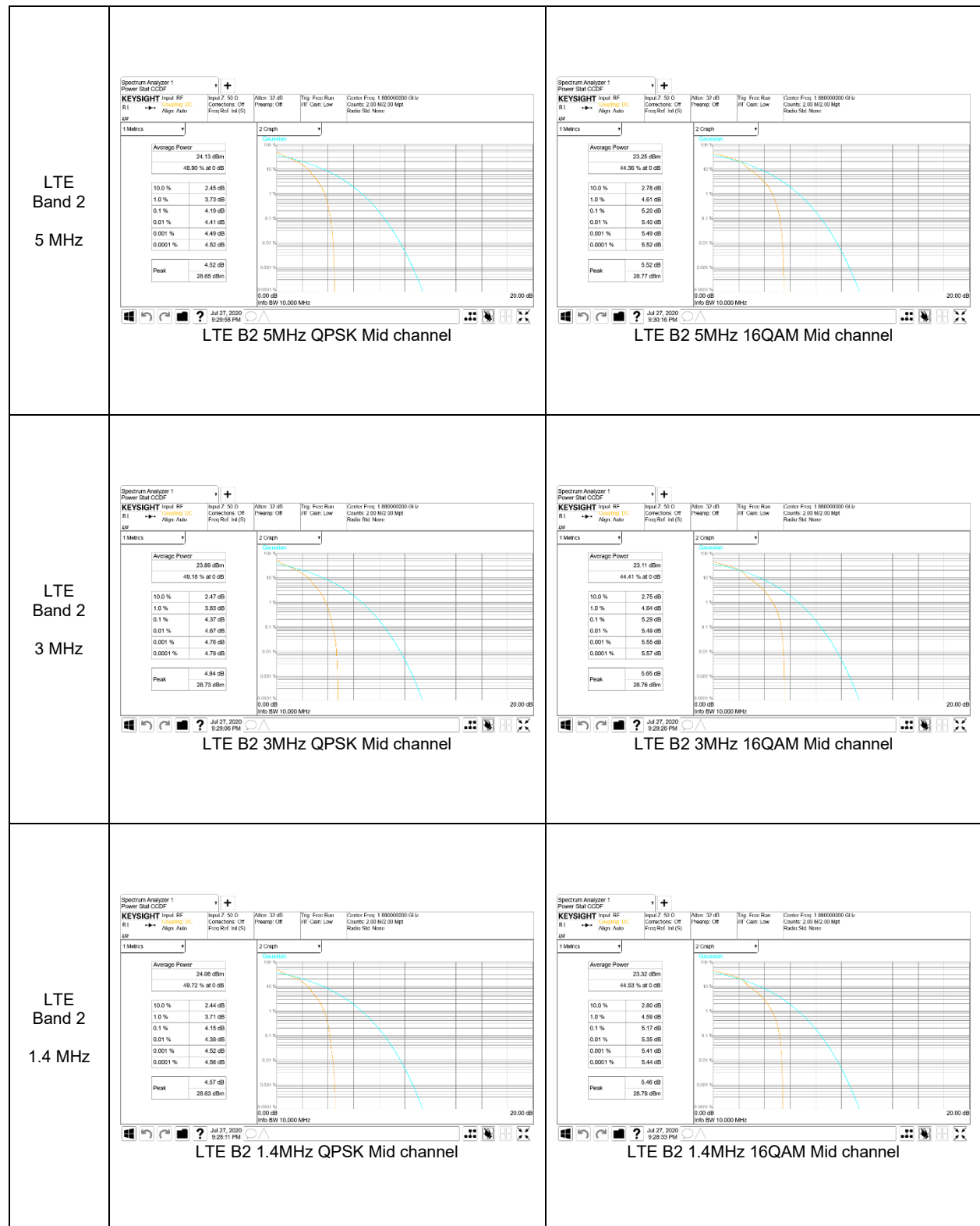


# WCDMA

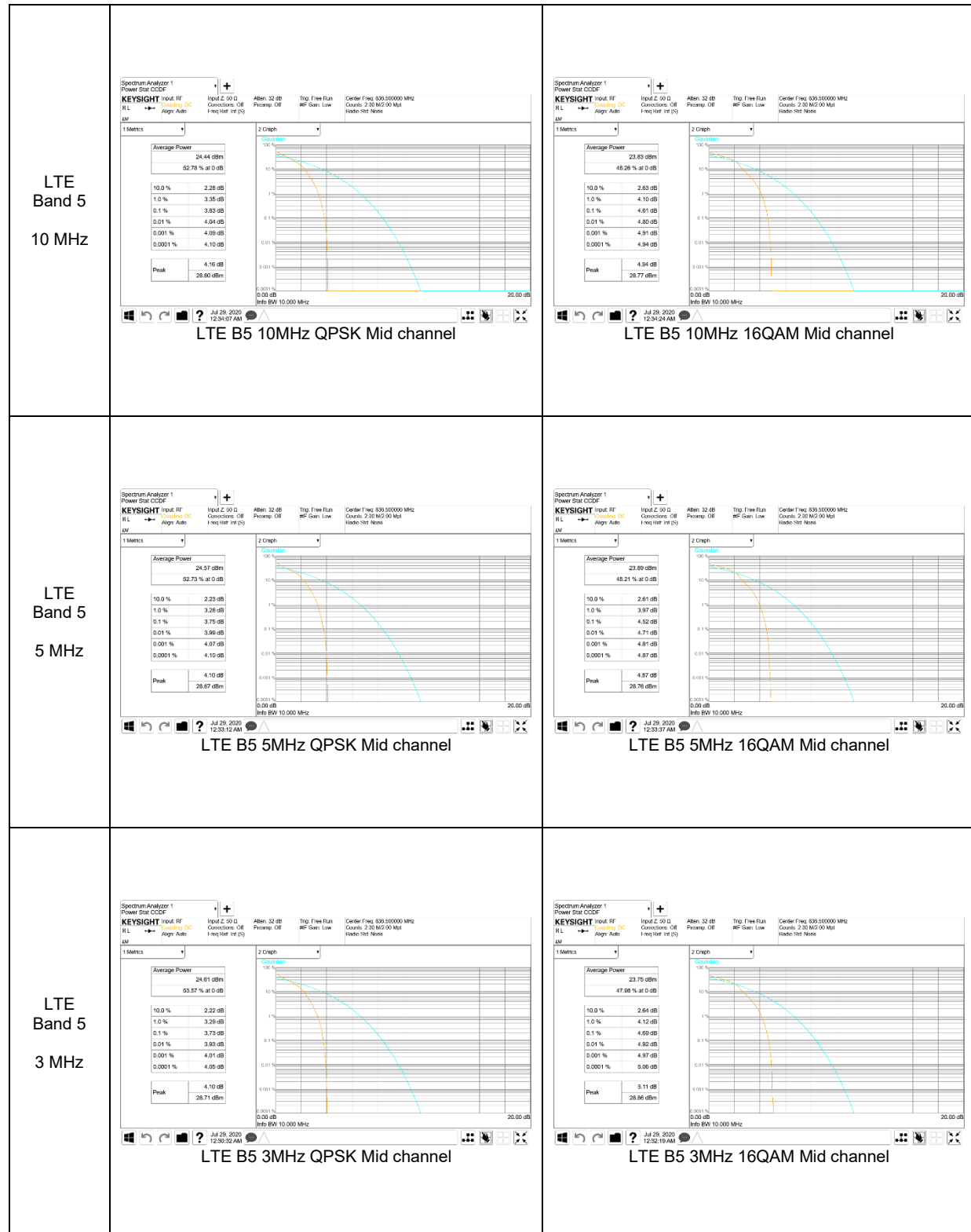


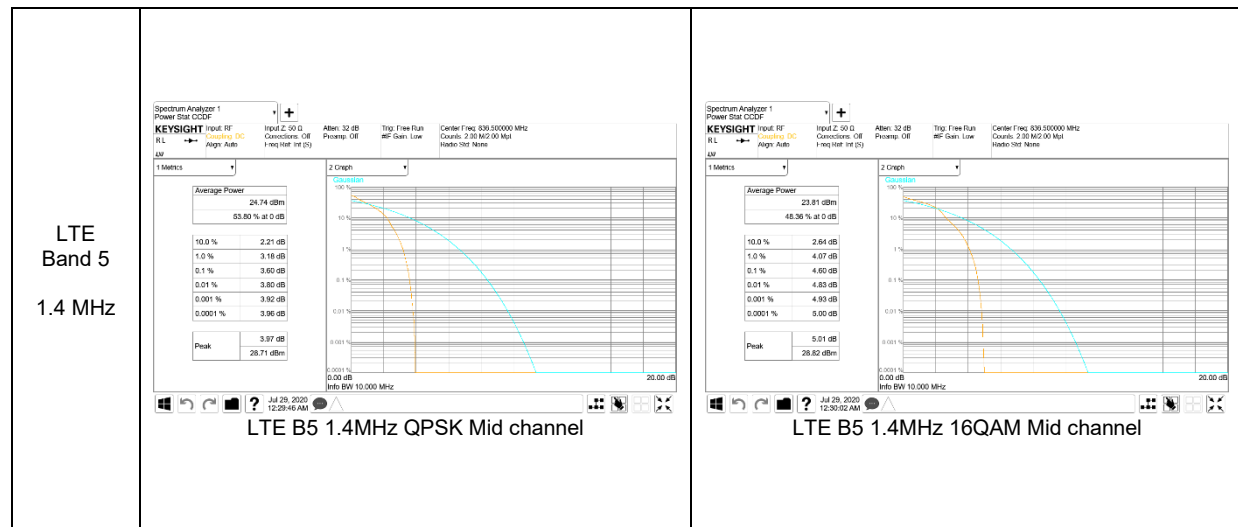
## LTE Band 2



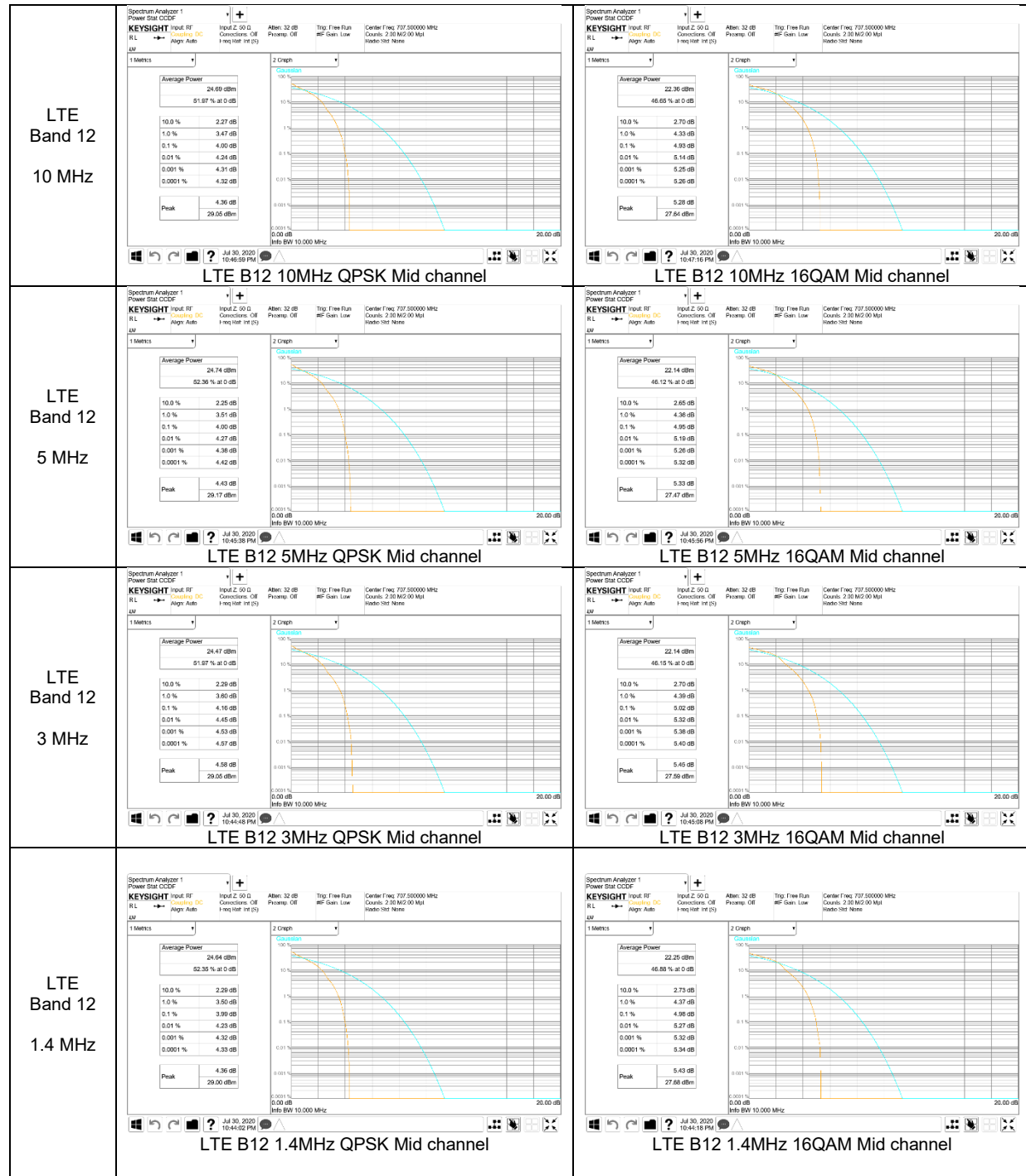


# LTE Band 5

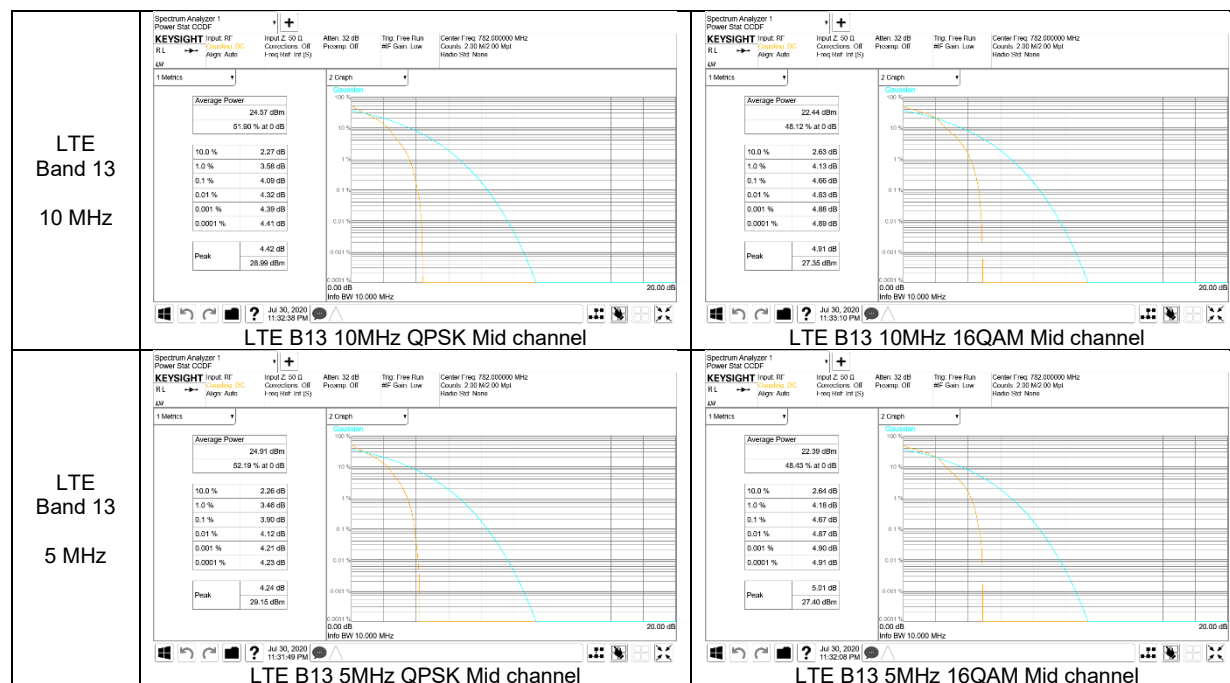




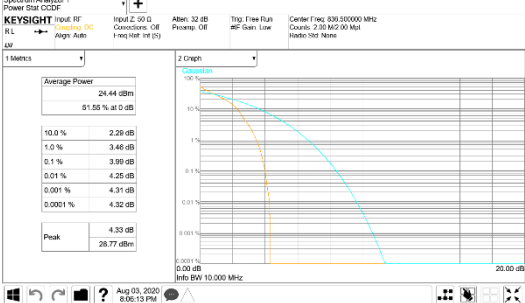
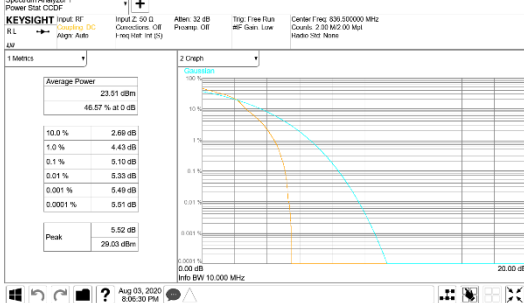
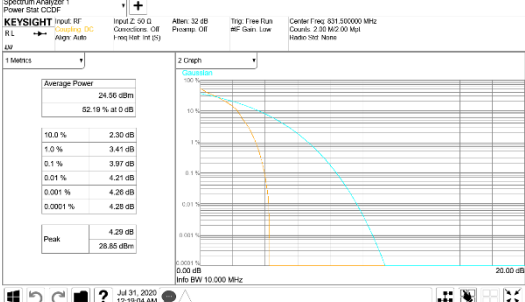
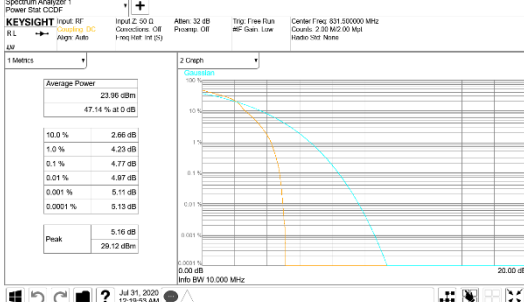
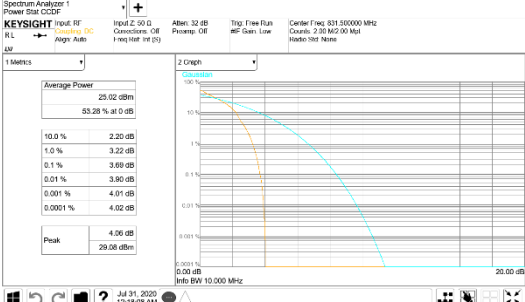
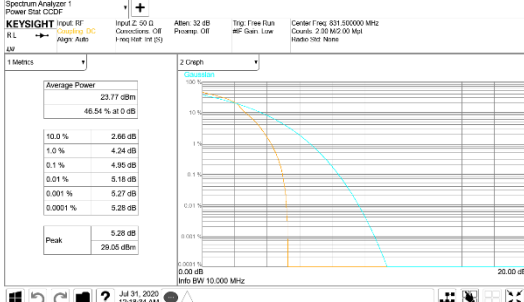
# LTE Band 12

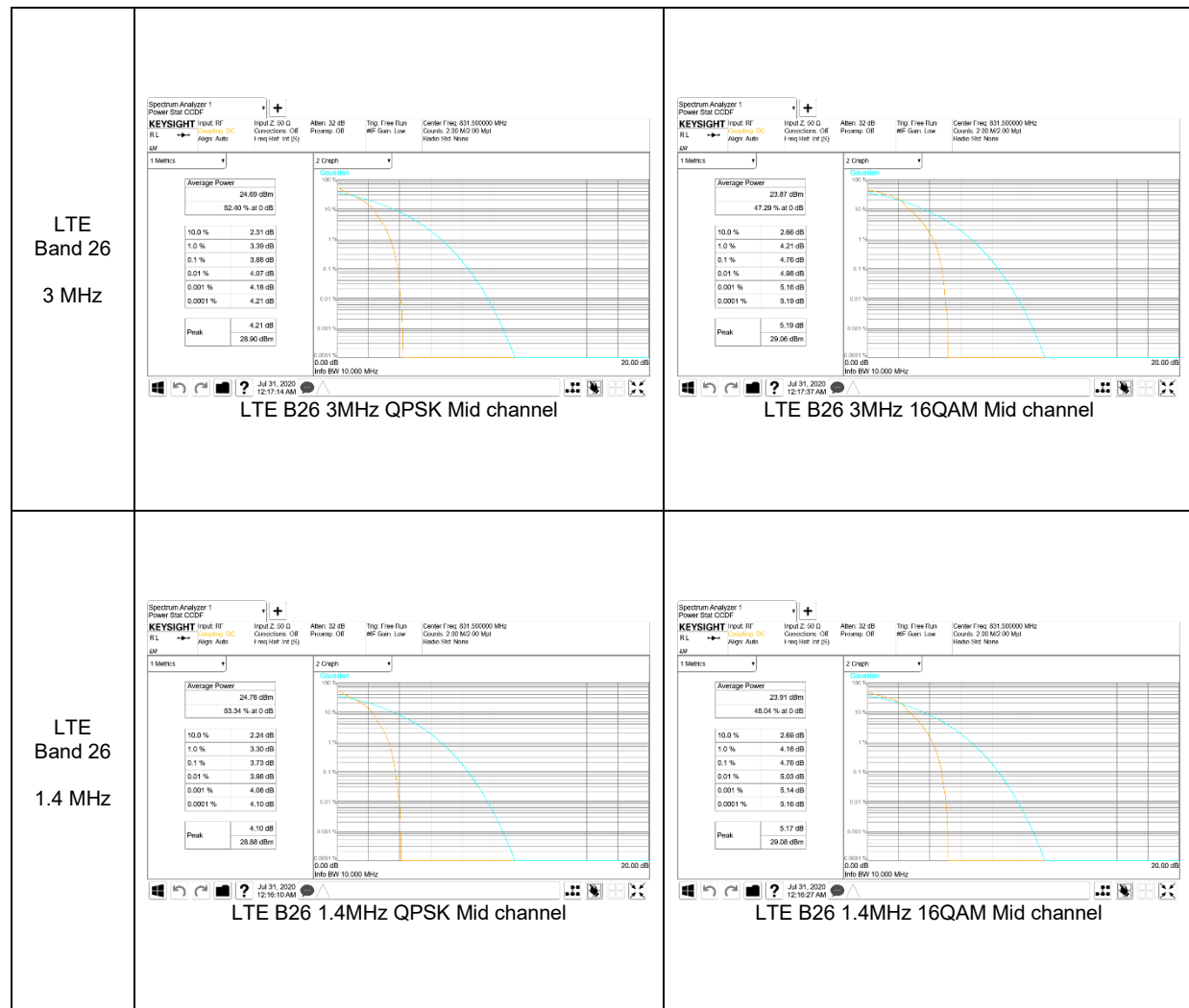


# **LTE Band 13**

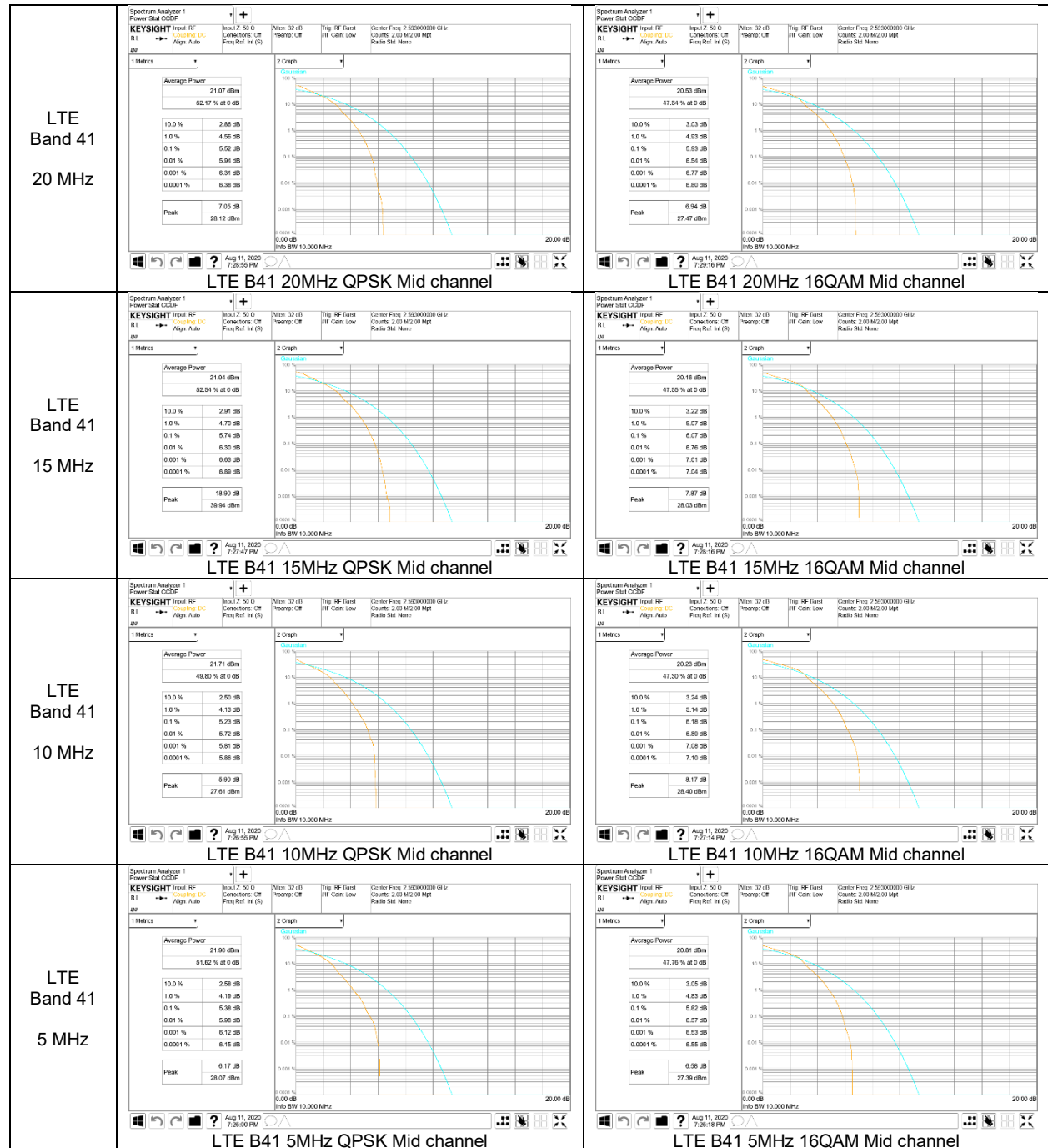


# **LTE Band 26**

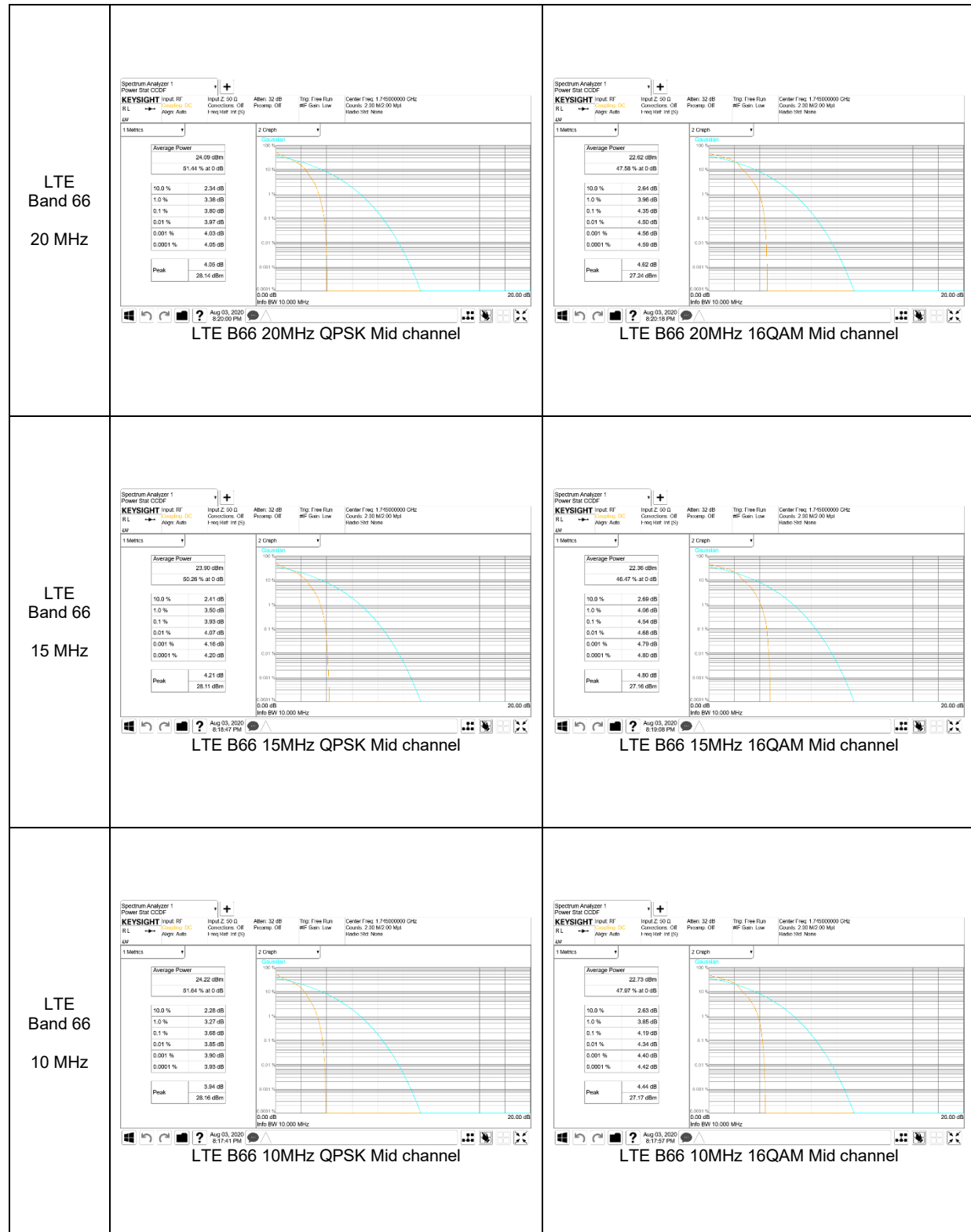
|                                        |                                                                                                                          |                                                                                                                            |
|----------------------------------------|-------------------------------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

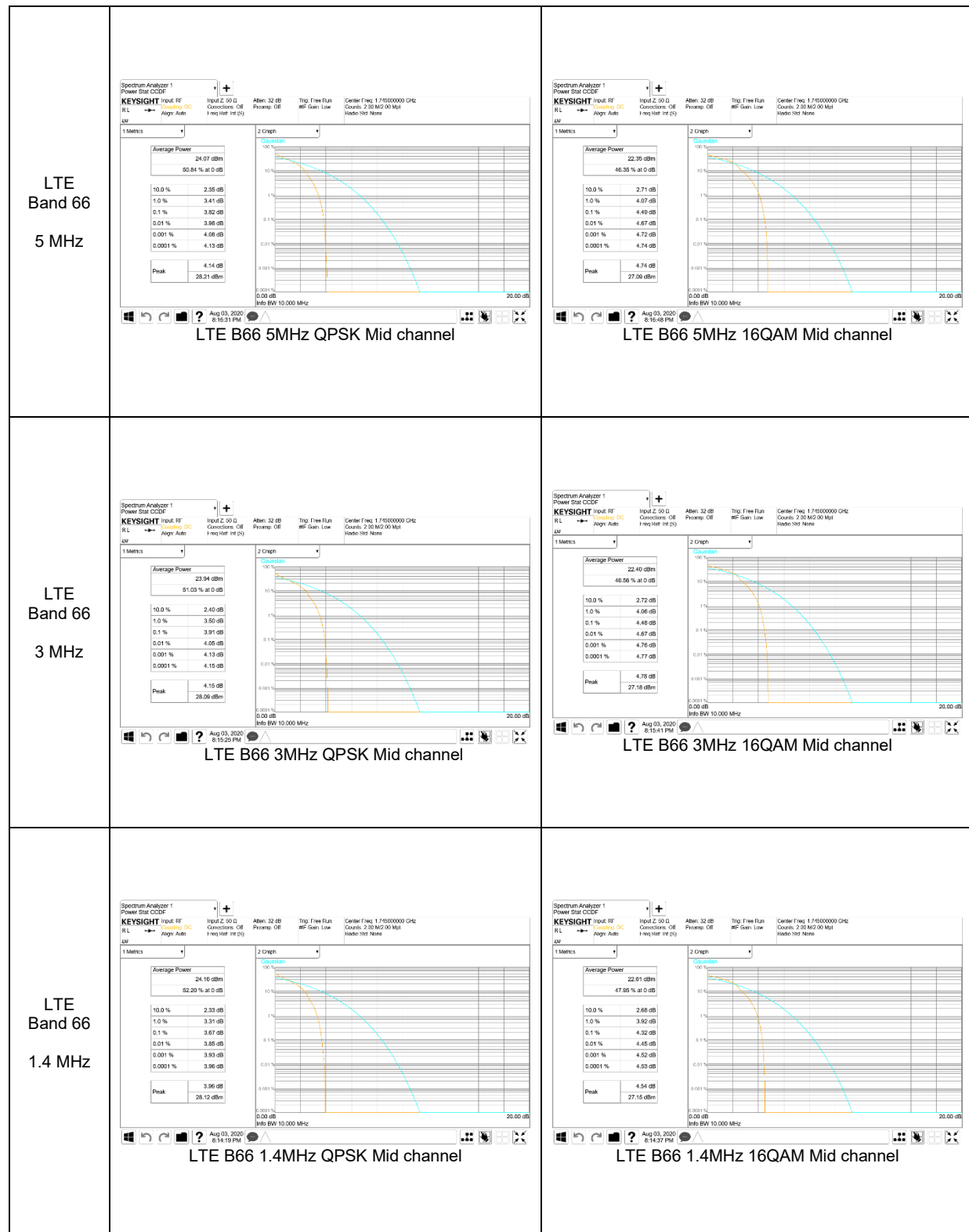


# **LTE Band 41(PC3)**



# 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 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.

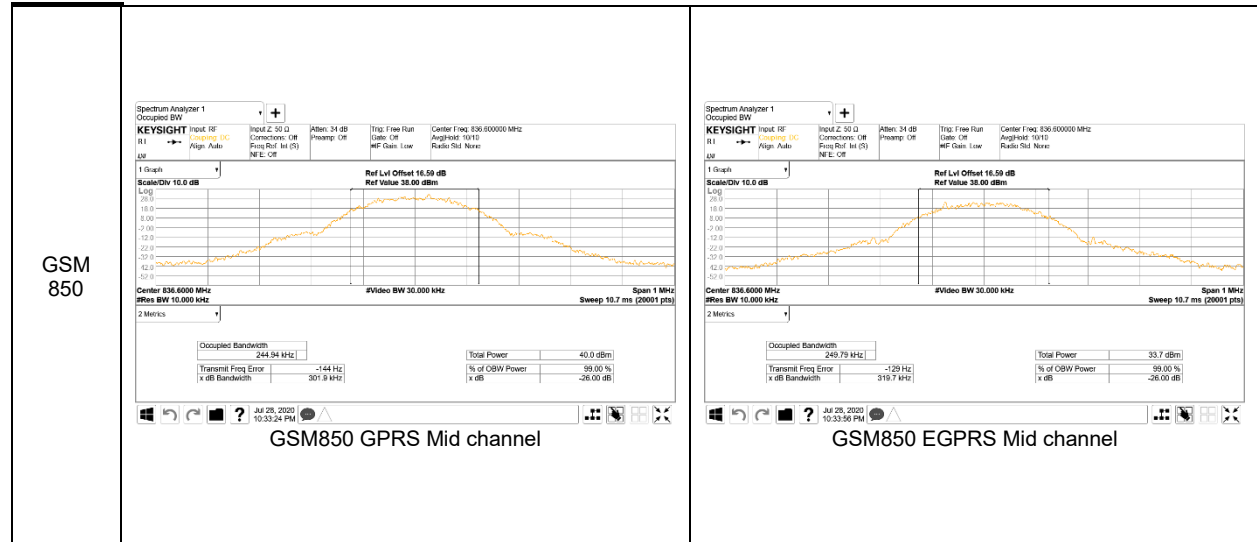
(KDB 971168 D01 Power Meas License Digital Systems v03r01)

#### RESULTS

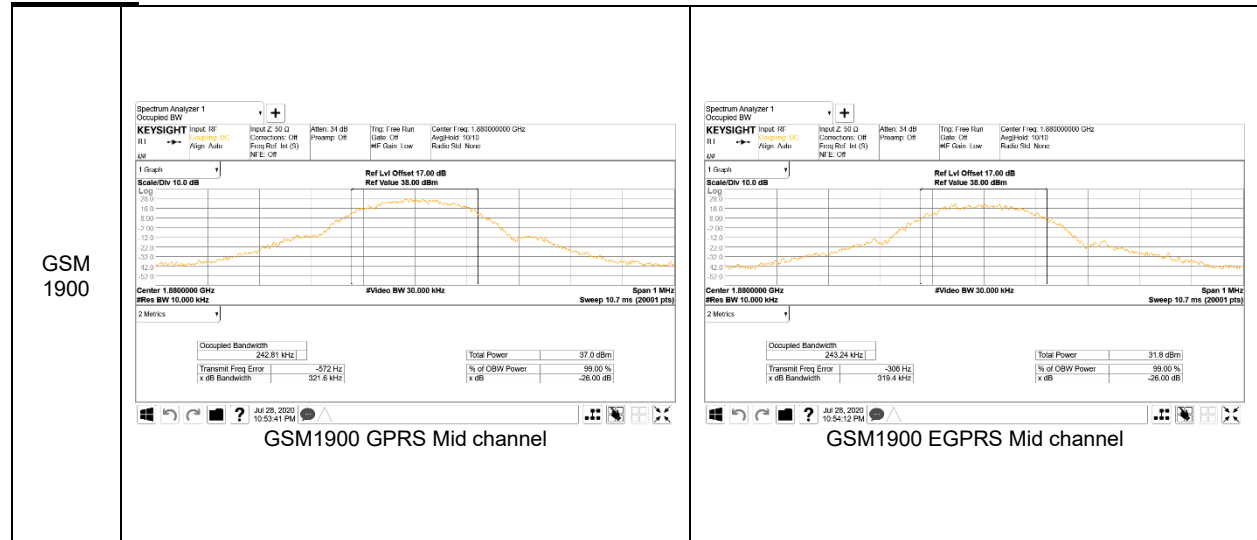
See the following pages.

## 9.1.1. OCCUPIED BANDWIDTH RESULTS

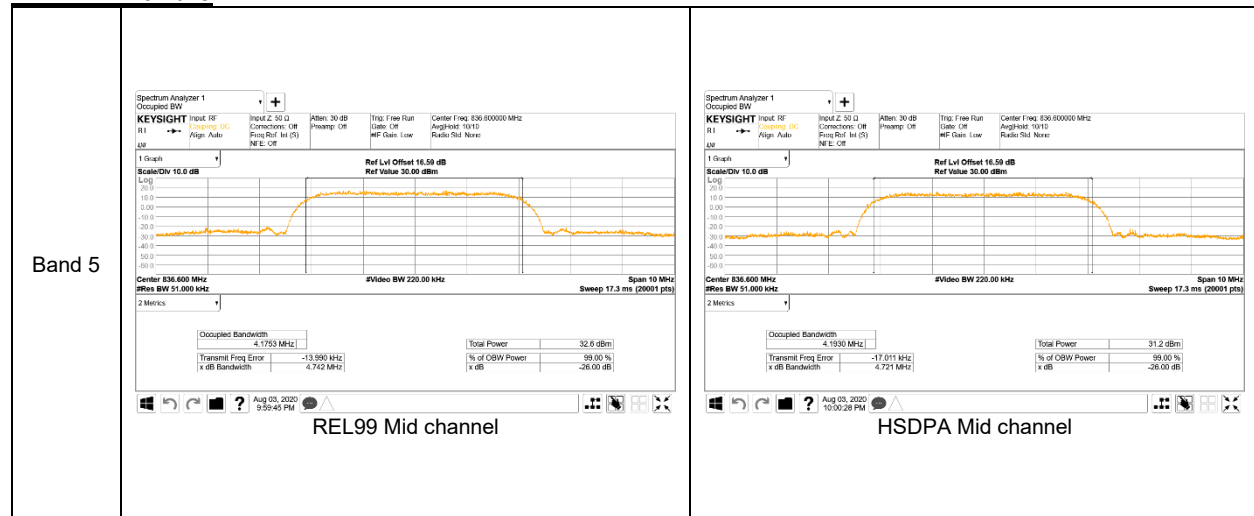
### GSM 850



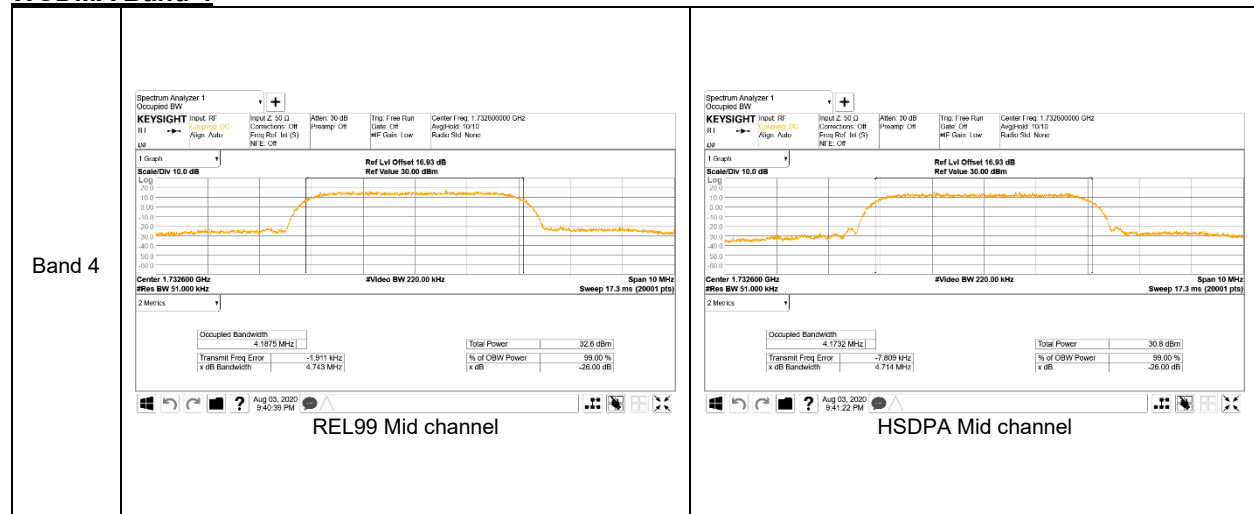
### GSM 1900



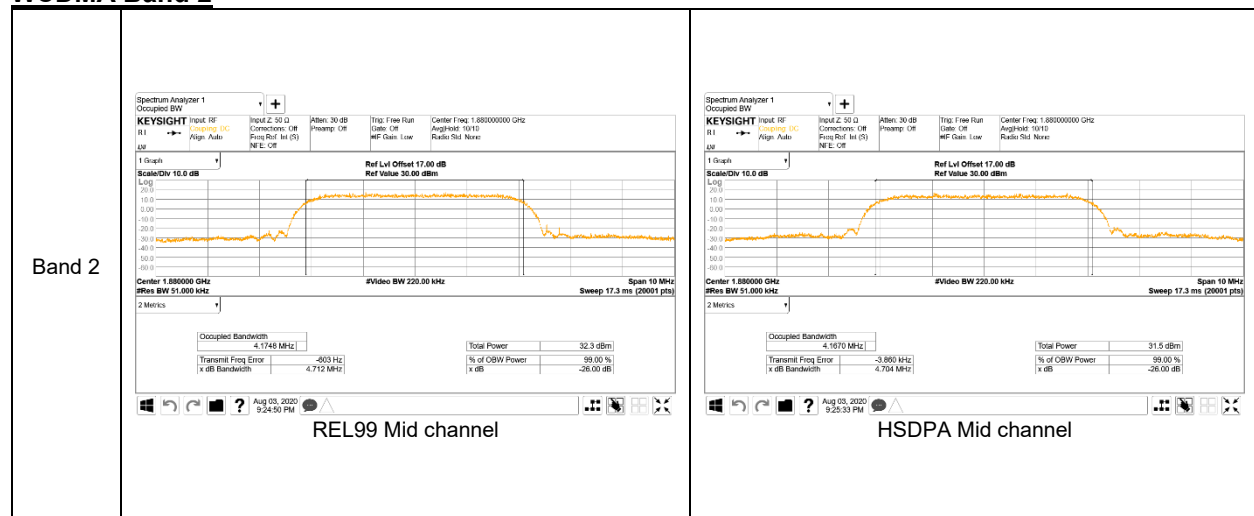
## WCDMA Band 5



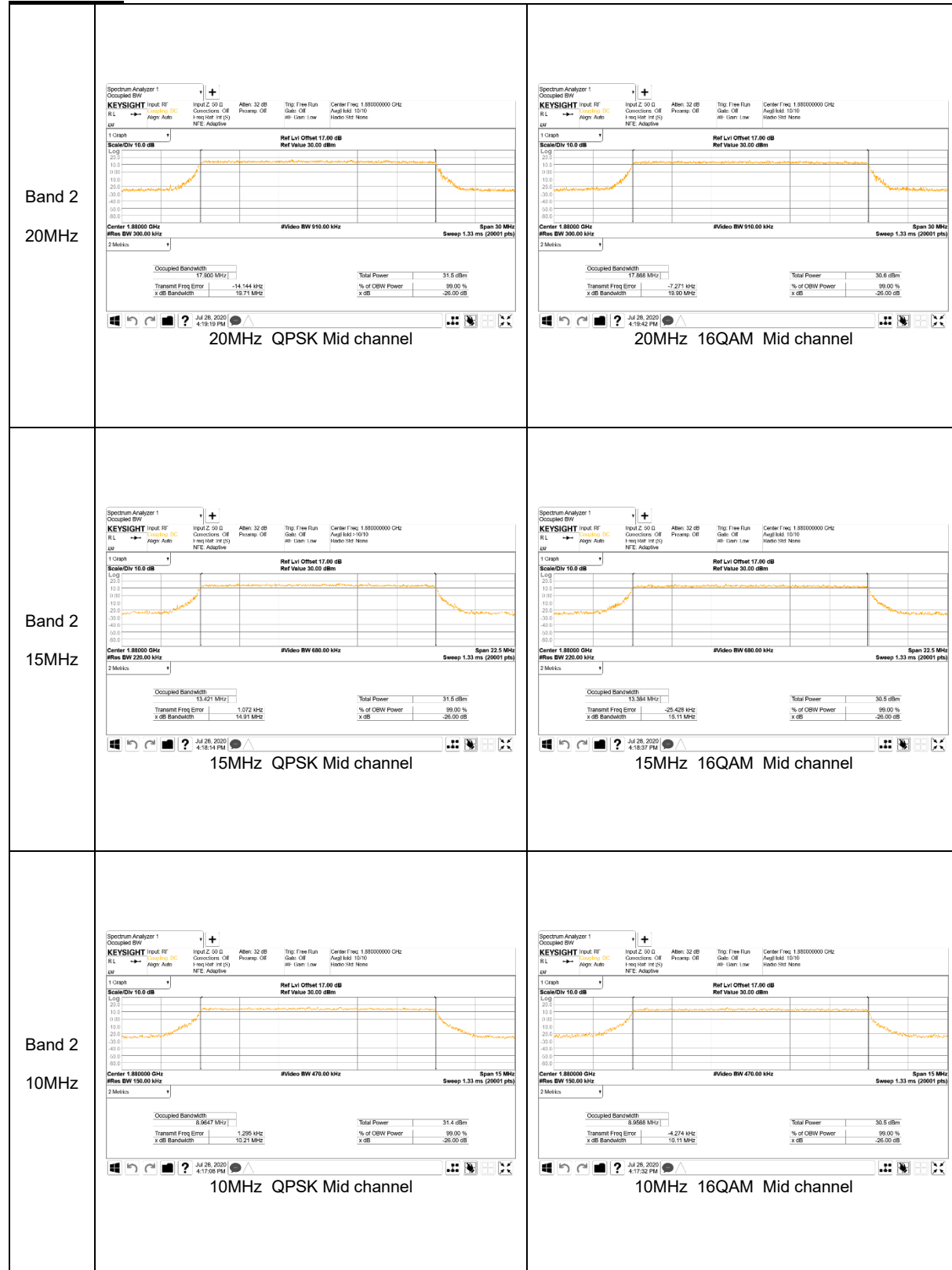
## WCDMA Band 4

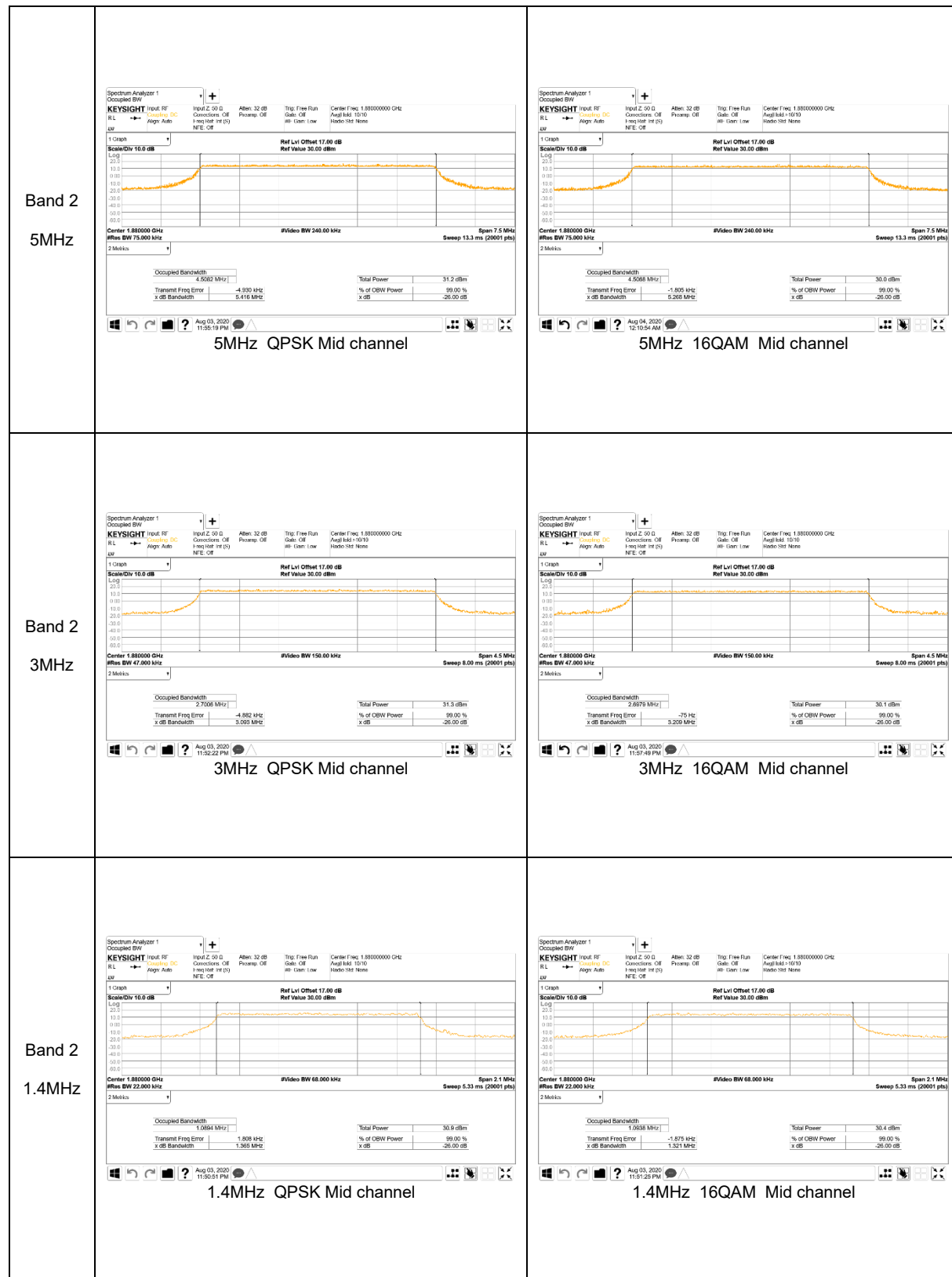


## WCDMA Band 2

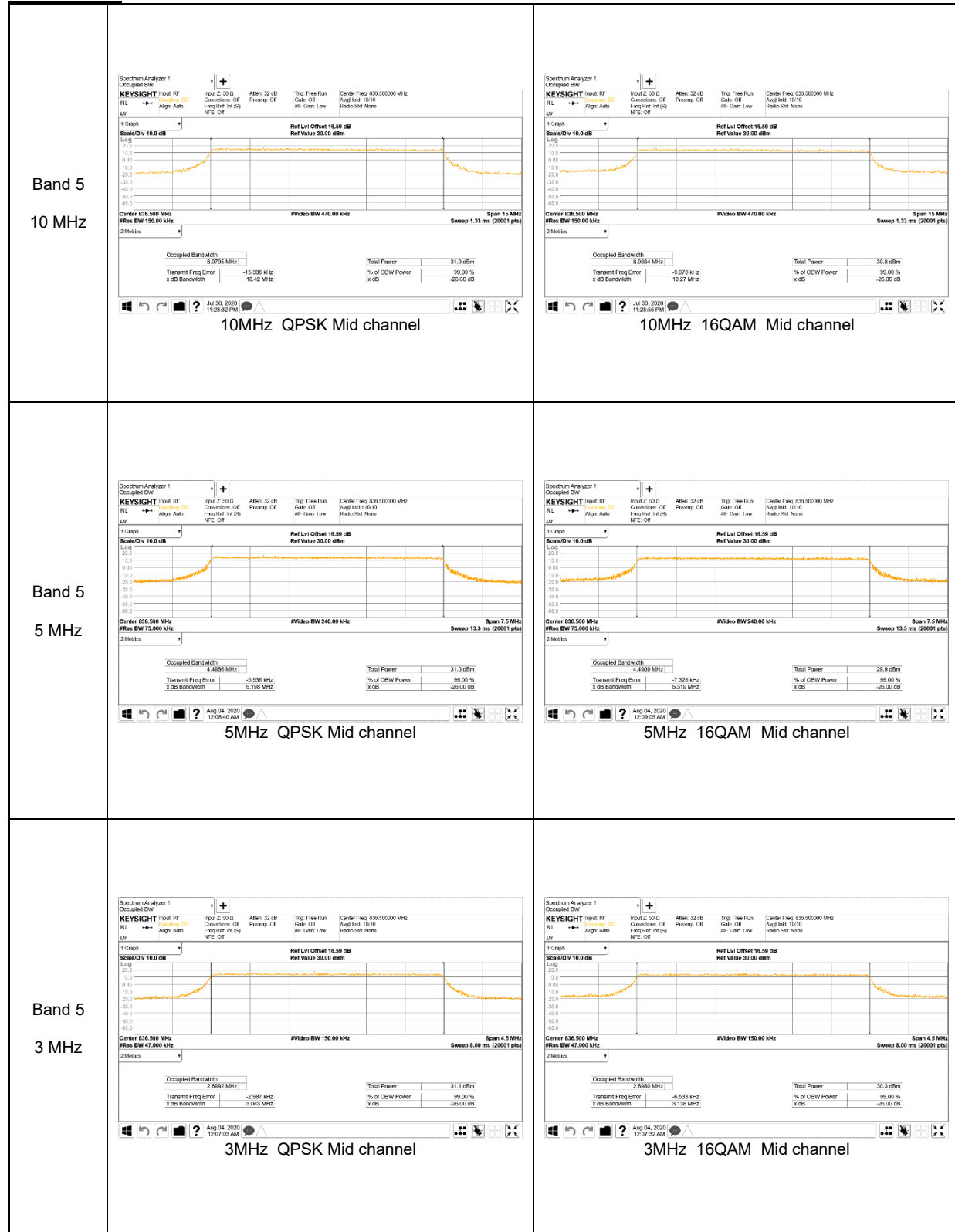


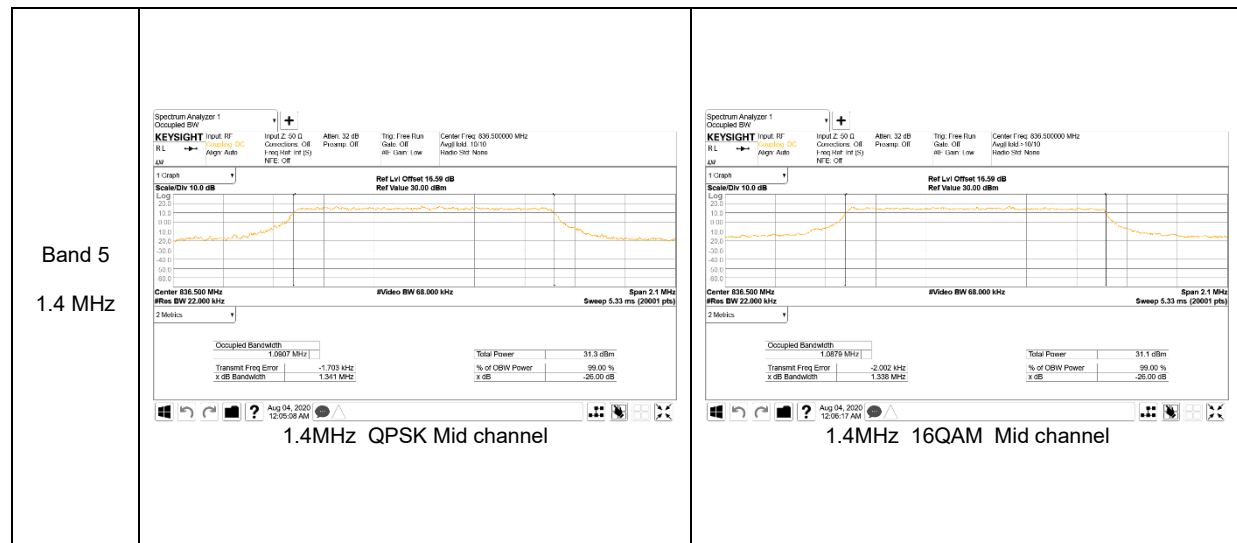
# LTE Band 2



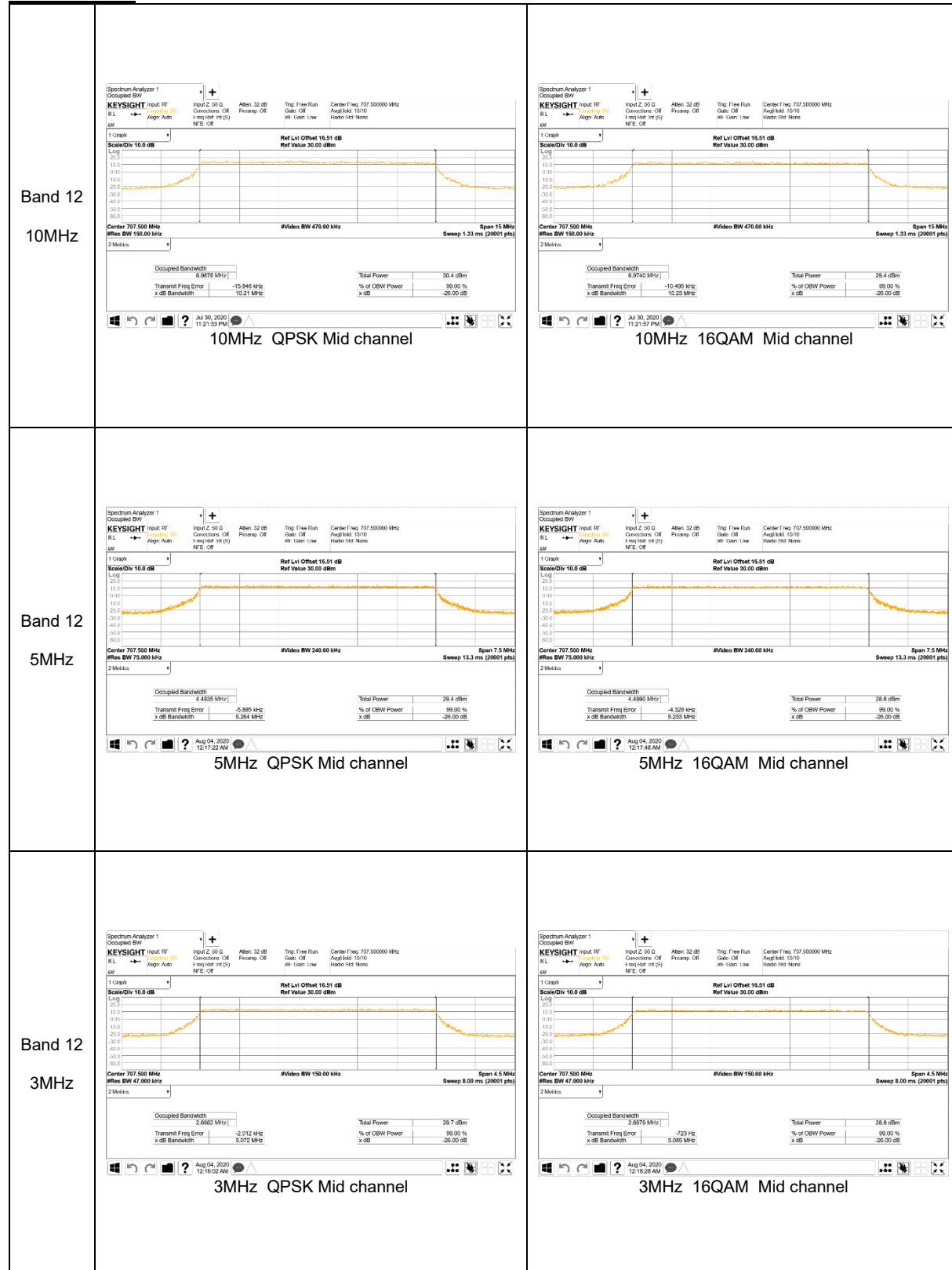


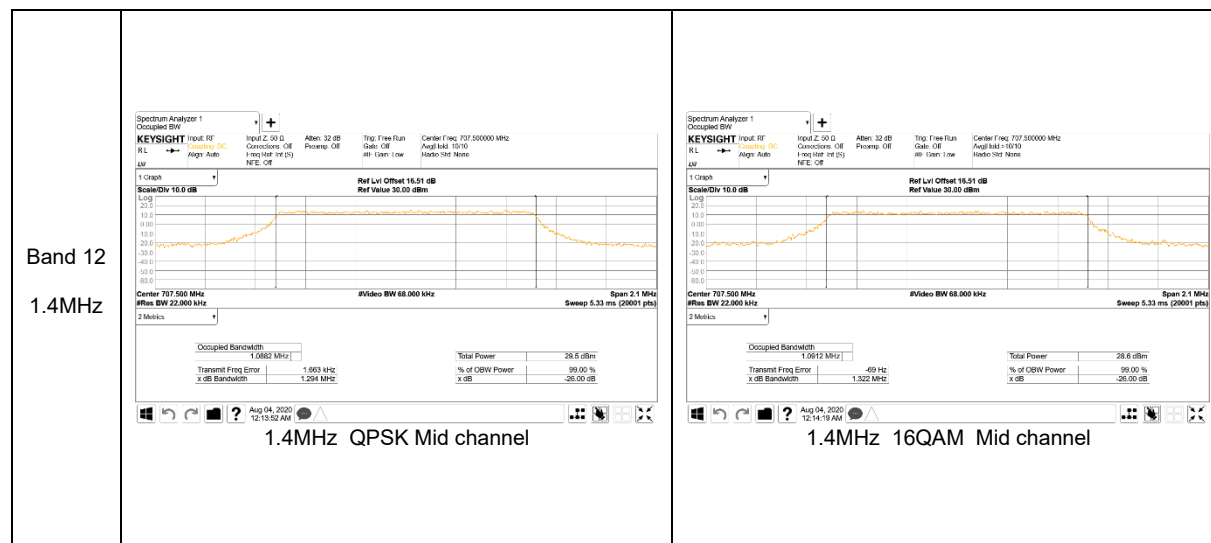
# LTE Band 5





# LTE Band 12





# LTE Band 13

