



CERTIFICATION TEST REPORT

Report Number. : 4789867826-E2V3

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

Model : SM-T738U

FCC ID : A3LSMT738U

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

Test Standard(s) : FCC CFR47 PART 22 SUBPART H
FCC CFR47 PART 24 SUBPART E
FCC CFR47 PART 27 SUBPART D,F,H,L,M,N,O,Q
FCC CFR47 PART 90 SUBPART R,S

Date Of Issue:

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ACCREDITED

Testing Laboratory

TL-637

Revision History

| <u>Rev.</u> | <u>Issue Date</u> | <u>Revisions</u> | <u>Revised By</u> |
|-------------|-------------------|-----------------------------------|-------------------|
| V1 | 2021-05-26 | Initial issue | SunGeun Lee |
| V2 | 2021-06-02 | Updated to address TCB's question | SunGeun Lee |
| V3 | 2021-06-10 | Updated n66 data (30MHz, 40MHz) | SunGeun Lee |

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.
EUT DESCRIPTION: WCDMA/LTE/5G NR Tablet + BT/BLE, DTS/UNII a/b/g/n/ac
MODEL NUMBER: SM-T738U
SERIAL NUMBER: 5135f051161d7ece (CONDUCTED);
5135f0517e1d7ece, 5135e169a31d7ece, R32R4004J4T (RADIATED)
DATE TESTED: 2021-04-01 – 2021-06-10;

| APPLICABLE STANDARDS | |
|--|--------------|
| STANDARD | TEST RESULTS |
| FCC PART 22H, 24E, 27 D,F,H,L,M,N,O,Q and 90 R,S | Complies |

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

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

Approved & Released For
UL Korea, Ltd. By:



Junwhan Lee
Suwon Lab Engineer
UL Korea, Ltd.

Tested By:



Sungeun 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
9. KDB 412172 D01 Determining ERP and EIRP v01r01

3. FACILITIES AND ACCREDITATION

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

| 218 Maeyeong-ro | |
|-------------------------------------|-----------|
| <input checked="" type="checkbox"/> | Chamber 1 |
| <input checked="" type="checkbox"/> | Chamber 2 |
| <input type="checkbox"/> | Chamber 3 |

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

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

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

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

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

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

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

4.3. MEASUREMENT UNCERTAINTY

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

| PARAMETER | UNCERTAINTY |
|---------------------------------------|-------------|
| Conducted Disturbance, 0.15 to 30 MHz | 3.01 dB |
| Radiated Disturbance, 30 MHz to 1 GHz | 4.26 dB |
| Radiated Disturbance, 1 GHz to 18 GHz | 5.90 dB |
| Radiated Disturbance, Above 18 GHz | 5.49 dB |

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

4.4. DECISION RULE

Decision rule for statement(s) of conformity is based on Procedure 1, Clause 4.4.2 in IEC Guide 115:2007.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a WCDMA/LTE/5G NR Tablet + BT/BLE, DTS/UNII a/b/g/n/ac.
 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 (4789867826-S1 FCC Report SAR).

WCDMA

| FCC Part 22/24/27 | | | | | | |
|-------------------|-----------------------|------------|--------------|---------------|--------------|---------------|
| Band | Frequency Range [MHz] | Modulation | Conducted | | Radiated | |
| | | | Avg [dBm] | Avg [mW] | Avg [dBm] | Avg [mW] |
| Band 5 | 826.4~846.6 | Rel. 99 | 24.07 | 255.20 | 22.80 | 190.55 |
| | | HSDPA | 23.06 | 202.20 | 21.84 | 152.76 |
| | | HSUPA | 23.06 | 202.30 | | |
| Band 4 | 1712.4~1752.6 | Rel. 99 | 22.62 | 182.90 | 23.40 | 218.78 |
| | | HSDPA | 21.63 | 145.45 | 22.46 | 176.20 |
| | | HSUPA | 21.67 | 146.89 | | |
| Band 2 | 1852.4~1907.6 | Rel. 99 | 22.94 | 196.90 | 23.68 | 233.35 |
| | | HSDPA | 21.94 | 156.27 | 22.40 | 173.78 |
| | | HSUPA | 21.92 | 155.60 | | |

LTE Band 7

| FCC Part 27 | | | | | | | |
|-------------|-----------------------|-----------------|------------|--------------|---------------|--------------|---------------|
| Band | Frequency Range [MHz] | BandWidth [MHz] | Modulation | Conducted | | Radiated | |
| | | | | Avg [dBm] | Avg [mW] | Avg [dBm] | Avg [mW] |
| Band 7 | 2510~2560 | 20 | QPSK | 23.58 | 228.07 | 24.80 | 302.00 |
| | | | 16QAM | 23.21 | 209.31 | 23.82 | 240.99 |
| | | | 64QAM | 22.94 | 196.80 | | |
| | 2507.5~2562.5 | 15 | QPSK | 23.58 | 228.12 | 24.96 | 313.33 |
| | | | 16QAM | 22.80 | 190.64 | 23.90 | 245.47 |
| | | | 64QAM | 22.73 | 187.34 | | |
| | 2505~2565 | 10 | QPSK | 23.63 | 230.63 | 25.20 | 331.13 |
| | | | 16QAM | 22.92 | 195.98 | 24.23 | 264.85 |
| | | | 64QAM | 22.65 | 183.96 | | |
| | 2502.5~2567.5 | 5 | QPSK | 23.74 | 236.74 | 25.03 | 318.42 |
| | | | 16QAM | 23.04 | 201.58 | 24.21 | 263.63 |
| | | | 64QAM | 22.63 | 183.09 | | |

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 | 704~711 | 10 | QPSK | 24.50 | 282.14 | 21.16 | 130.62 |
| | | | 16QAM | 23.99 | 250.53 | 20.07 | 101.62 |
| | | | 64QAM | 22.96 | 197.61 | | |
| | 701.5~713.5 | 5 | QPSK | 24.49 | 281.43 | 21.47 | 140.28 |
| | | | 16QAM | 24.05 | 254.25 | 20.25 | 105.93 |
| | | | 64QAM | 22.88 | 194.22 | | |
| | 700.5~714.5 | 3 | QPSK | 24.48 | 280.30 | 21.94 | 156.31 |
| | | | 16QAM | 23.87 | 243.57 | 20.89 | 122.74 |
| | | | 64QAM | 22.83 | 191.67 | | |
| | 699.7~715.3 | 1.4 | QPSK | 24.49 | 281.09 | 21.46 | 139.96 |
| | | | 16QAM | 23.96 | 248.90 | 20.54 | 113.24 |
| | | | 64QAM | 22.92 | 195.95 | | |

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 | 782 | 10 | QPSK | 24.24 | 265.61 | 21.49 | 140.93 |
| | | | 16QAM | 23.64 | 231.19 | 20.50 | 112.20 |
| | | | 64QAM | 22.37 | 172.39 | | |
| | 779.5~784.5 | 5 | QPSK | 24.30 | 269.38 | 21.82 | 152.05 |
| | | | 16QAM | 23.63 | 230.54 | 20.79 | 119.95 |
| | | | 64QAM | 22.57 | 180.87 | | |

LTE Band 14

| FCC Part 90 | | | | | | | |
|-------------|-----------------------|-----------------|------------|--------------|---------------|--------------|---------------|
| Band | Frequency Range [MHz] | BandWidth [MHz] | Modulation | Conducted | | Radiated | |
| | | | | Avg [dBm] | Avg [mW] | Avg [dBm] | Avg [mW] |
| Band 14 | 793 | 10 | QPSK | 24.06 | 254.52 | 20.36 | 108.64 |
| | | | 16QAM | 23.43 | 220.28 | 19.52 | 89.54 |
| | | | 64QAM | 22.27 | 168.75 | | |
| | 790.5~795.5 | 5 | QPSK | 24.16 | 260.36 | 20.53 | 112.98 |
| | | | 16QAM | 23.62 | 230.27 | 19.72 | 93.76 |
| | | | 64QAM | 22.38 | 172.95 | | |

LTE Band 25

| FCC Part 24 | | | | | | | |
|-------------|-----------------------|-----------------|------------|--------------|---------------|--------------|---------------|
| Band | Frequency Range [MHz] | BandWidth [MHz] | Modulation | Conducted | | Radiated | |
| | | | | Avg [dBm] | Avg [mW] | Avg [dBm] | Avg [mW] |
| Band 25 | 1860~1905 | 20 | QPSK | 24.30 | 269.11 | 25.53 | 357.27 |
| | | | 16QAM | 24.00 | 251.19 | 25.17 | 328.85 |
| | | | 64QAM | 23.00 | 199.53 | | |
| | 1857.5~1907.5 | 15 | QPSK | 24.29 | 268.70 | 25.01 | 316.96 |
| | | | 16QAM | 23.66 | 232.40 | 24.13 | 258.82 |
| | | | 64QAM | 22.87 | 193.74 | | |
| | 1855~1910 | 10 | QPSK | 24.32 | 270.24 | 25.62 | 364.75 |
| | | | 16QAM | 23.78 | 238.65 | 24.54 | 284.45 |
| | | | 64QAM | 22.73 | 187.58 | | |
| | 1852.5~1912.5 | 5 | QPSK | 24.54 | 284.37 | 25.64 | 366.44 |
| | | | 16QAM | 24.00 | 251.19 | 24.81 | 302.69 |
| | | | 64QAM | 22.77 | 189.17 | | |
| | 1851.5~1913.5 | 3 | QPSK | 24.48 | 280.72 | 25.73 | 374.11 |
| | | | 16QAM | 23.90 | 245.46 | 24.69 | 294.44 |
| | | | 64QAM | 22.66 | 184.47 | | |
| | 1850.7~1914.3 | 1.4 | QPSK | 24.44 | 278.26 | 25.53 | 357.27 |
| | | | 16QAM | 23.69 | 233.64 | 24.58 | 287.08 |
| | | | 64QAM | 22.86 | 193.02 | | |

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 | 821.5 | 15 | QPSK | 24.68 | 294.04 | 23.02 | 200.45 |
| | | | 16QAM | 24.10 | 256.83 | 22.37 | 172.58 |
| | | | 64QAM | 23.07 | 202.77 | | |
| | 819 | 10 | QPSK | 24.88 | 307.49 | 23.53 | 225.42 |
| | | | 16QAM | 24.05 | 253.81 | 22.48 | 177.01 |
| | | | 64QAM | 23.50 | 223.87 | | |
| | 816.5~821.5 | 5 | QPSK | 24.84 | 304.81 | 23.60 | 229.09 |
| | | | 16QAM | 24.01 | 251.75 | 22.59 | 181.55 |
| | | | 64QAM | 23.14 | 205.99 | | |
| | 815.5~822.5 | 3 | QPSK | 24.87 | 306.96 | 23.33 | 215.28 |
| | | | 16QAM | 24.27 | 267.16 | 21.98 | 157.76 |
| | | | 64QAM | 23.03 | 201.10 | | |
| | 814.7~823.3 | 1.4 | QPSK | 24.96 | 313.19 | 23.13 | 205.59 |
| | | | 16QAM | 24.26 | 266.65 | 22.06 | 160.69 |
| | | | 64QAM | 23.30 | 213.82 | | |

LTE Band 26 (Straddle)

| Straddle | | | | | | | |
|----------|-----------------------|-----------------|------------|--------------|---------------|--------------|---------------|
| Band | Frequency Range [MHz] | BandWidth [MHz] | Modulation | Conducted | | Radiated | |
| | | | | Avg [dBm] | Avg [mW] | Avg [dBm] | Avg [mW] |
| Band 26 | 824 | 15 | QPSK | 24.40 | 275.42 | 23.12 | 205.12 |
| | | | 16QAM | 24.23 | 264.85 | 22.43 | 174.98 |
| | | | 64QAM | 23.61 | 229.61 | | |
| | | 10 | QPSK | 24.62 | 289.73 | 23.44 | 220.56 |
| | | | 16QAM | 24.43 | 277.33 | 22.69 | 185.58 |
| | | | 64QAM | 23.39 | 218.27 | | |
| | | 5 | QPSK | 24.72 | 296.48 | 23.59 | 228.31 |
| | | | 16QAM | 24.22 | 264.24 | 22.62 | 182.61 |
| | | | 64QAM | 23.14 | 206.06 | | |
| | | 3 | QPSK | 24.65 | 291.74 | 23.66 | 232.02 |
| | | | 16QAM | 24.37 | 273.53 | 22.72 | 186.86 |
| | | | 64QAM | 23.26 | 211.84 | | |
| | | 1.4 | QPSK | 24.54 | 284.45 | 23.62 | 229.89 |
| | | | 16QAM | 23.27 | 212.32 | 22.68 | 185.15 |
| | | | 64QAM | 22.44 | 175.39 | | |

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 | 831.5~841.5 | 15 | QPSK | 24.69 | 294.59 | 24.78 | 300.61 |
| | | | 16QAM | 23.94 | 247.98 | 23.62 | 230.14 |
| | | | 64QAM | 23.31 | 214.22 | | |
| | 829~844 | 10 | QPSK | 24.90 | 309.03 | 25.00 | 316.23 |
| | | | 16QAM | 24.37 | 273.78 | 24.32 | 270.40 |
| | | | 64QAM | 23.40 | 218.54 | | |
| | 826.5~846.5 | 5 | QPSK | 24.93 | 311.31 | 24.91 | 309.74 |
| | | | 16QAM | 24.30 | 269.06 | 23.90 | 245.47 |
| | | | 64QAM | 23.12 | 205.27 | | |
| | 825.5~847.5 | 3 | QPSK | 24.82 | 303.13 | 25.09 | 322.85 |
| | | | 16QAM | 23.80 | 239.72 | 24.06 | 254.68 |
| | | | 64QAM | 23.07 | 202.98 | | |
| | 824.7~848.3 | 1.4 | QPSK | 24.91 | 309.62 | 24.37 | 273.53 |
| | | | 16QAM | 24.23 | 264.68 | 23.24 | 210.86 |
| | | | 64QAM | 23.05 | 201.72 | | |

LTE Band 30

| FCC Part 27 | | | | | | | |
|-------------|-----------------------|-----------------|------------|--------------|---------------|--------------|---------------|
| Band | Frequency Range [MHz] | BandWidth [MHz] | Modulation | Conducted | | Radiated | |
| | | | | Avg [dBm] | Avg [mW] | Avg [dBm] | Avg [mW] |
| Band 30 | 2310 | 10 | QPSK | 21.80 | 151.23 | 22.28 | 169.04 |
| | | | 16QAM | 20.85 | 121.62 | 21.42 | 138.68 |
| | | | 64QAM | 20.18 | 104.18 | | |
| | 2307.5~2312.5 | 5 | QPSK | 21.94 | 156.39 | 22.29 | 169.43 |
| | | | 16QAM | 21.05 | 127.37 | 21.65 | 146.22 |
| | | | 64QAM | 19.83 | 96.17 | | |

LTE Band 41 (PC2)

| FCC Part 27 | | | | | | | |
|-------------|-----------------------|-----------------|------------|--------------|---------------|--------------|---------------|
| Band | Frequency Range [MHz] | BandWidth [MHz] | Modulation | Conducted | | Radiated | |
| | | | | Avg [dBm] | Avg [mW] | Avg [dBm] | Avg [mW] |
| Band 41 | 2506~2680 | 20 | QPSK | 26.95 | 494.92 | 28.95 | 785.24 |
| | | | 16QAM | 26.39 | 435.91 | 28.60 | 724.44 |
| | | | 64QAM | 25.44 | 350.20 | | |
| | 2503.5~2682.5 | 15 | QPSK | 27.10 | 512.86 | 29.13 | 818.46 |
| | | | 16QAM | 26.44 | 440.23 | 29.21 | 833.68 |
| | | | 64QAM | 25.11 | 324.63 | | |
| | 2501~2685 | 10 | QPSK | 27.12 | 515.23 | 29.36 | 862.98 |
| | | | 16QAM | 26.35 | 431.03 | 28.79 | 756.83 |
| | | | 64QAM | 25.11 | 324.63 | | |
| | 2498.5~2687.5 | 5 | QPSK | 27.15 | 518.90 | 29.68 | 928.97 |
| | | | 16QAM | 26.39 | 435.09 | 29.49 | 889.20 |
| | | | 64QAM | 25.46 | 351.38 | | |

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 | 1720~1770 | 20 | QPSK | 24.69 | 294.32 | 25.15 | 327.34 |
| | | | 16QAM | 23.99 | 250.36 | 24.02 | 252.35 |
| | | | 64QAM | 23.00 | 199.35 | | |
| | 1717.5~1772.5 | 15 | QPSK | 24.43 | 277.06 | 25.26 | 335.74 |
| | | | 16QAM | 23.49 | 223.12 | 24.26 | 266.69 |
| | | | 64QAM | 22.88 | 193.87 | | |
| | 1715~1775 | 10 | QPSK | 24.57 | 286.57 | 25.41 | 347.54 |
| | | | 16QAM | 23.72 | 235.58 | 24.20 | 263.03 |
| | | | 64QAM | 22.80 | 190.71 | | |
| | 1712.5~1777.5 | 5 | QPSK | 24.65 | 291.83 | 25.42 | 348.34 |
| | | | 16QAM | 23.86 | 243.00 | 24.03 | 252.93 |
| | | | 64QAM | 22.88 | 194.09 | | |
| | 1711.5~1778.5 | 3 | QPSK | 24.61 | 289.40 | 25.09 | 322.85 |
| | | | 16QAM | 23.72 | 235.37 | 23.99 | 250.61 |
| | | | 64QAM | 22.94 | 196.73 | | |
| | 1710.7~1779.3 | 1.4 | QPSK | 24.70 | 294.89 | 25.73 | 374.11 |
| | | | 16QAM | 23.82 | 241.22 | 24.02 | 252.35 |
| | | | 64QAM | 22.77 | 189.30 | | |

LTE Band 71

| FCC Part 27 | | | | | | | |
|-------------|--------------------------|--------------------|------------|--------------|---------------|--------------|--------------|
| Band | Frequency Range [MHz] | BandWidth [MHz] | Modulation | Conducted | | Radiated | |
| | | | | Avg [dBm] | Avg [mW] | Avg [dBm] | Avg [mW] |
| Band 71 | 673~688 | 20 | QPSK | 24.77 | 299.72 | 18.32 | 67.92 |
| | | | 16QAM | 24.44 | 278.29 | 17.40 | 54.95 |
| | | | 64QAM | 23.44 | 220.72 | | |
| | 670.5~690.5 | 15 | QPSK | 24.77 | 300.05 | 18.10 | 64.57 |
| | | | 16QAM | 24.12 | 258.26 | 17.29 | 53.58 |
| | | | 64QAM | 23.38 | 217.94 | | |
| | 668~693 | 10 | QPSK | 24.88 | 307.64 | 18.38 | 68.87 |
| | | | 16QAM | 24.19 | 262.57 | 17.21 | 52.60 |
| | | | 64QAM | 23.24 | 210.68 | | |
| | 665.5~695.5 | 5 | QPSK | 24.94 | 312.12 | 19.96 | 99.08 |
| | | | 16QAM | 24.43 | 277.27 | 18.85 | 76.74 |
| | | | 64QAM | 23.17 | 207.73 | | |

LTE Band 2

LTE Band 2(Frequency range: 1850-1910 MHz) is covered by LTE Band 25 (Frequency range: 1850-1915 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

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 Band41(PC3)

LTE Band 41(PC3, Frequency range : 2496-2690 MHz) is covered by LTE Band 41(PC2) (Frequency range: 2496-2690 MHz) due to same frequency range, same channel bandwidth and maximum tune-up limit is higher than LTE Band41(PC3).

NR Band n5

| FCC Part 22 | | | | | | | | | |
|-------------|-----------------------|-----------------|------------|--------------|--------------|---------------|--------------|---------------|--|
| Band | Frequency Range [MHz] | BandWidth [MHz] | Modulation | Mode | Conducted | | Radiated | | |
| | | | | | Avg [dBm] | Avg [mW] | Avg [dBm] | Avg [mW] | |
| n5 | 834~839 | 20 | DFT-s OFDM | $\pi/2$ BPSK | 24.50 | 282.10 | | | |
| | | | | QPSK | 24.51 | 282.31 | 22.34 | 171.40 | |
| | | | | 16QAM | 23.27 | 212.19 | 21.74 | 149.28 | |
| | | | | 64QAM | 21.86 | 153.62 | | | |
| | | | | 256QAM | 19.47 | 88.47 | | | |
| | | | | CP-OFDM | QPSK | 22.73 | 187.38 | | |
| | 831.5~841.5 | 15 | DFT-s OFDM | $\pi/2$ BPSK | 24.55 | 285.19 | | | |
| | | | | QPSK | 24.52 | 283.21 | 22.06 | 160.69 | |
| | | | | 16QAM | 23.37 | 217.17 | 21.61 | 144.88 | |
| | | | | 64QAM | 21.91 | 155.35 | | | |
| | | | | 256QAM | 19.64 | 92.06 | | | |
| | | | | CP-OFDM | QPSK | 22.80 | 190.69 | | |
| | 829~844 | 10 | DFT-s OFDM | $\pi/2$ BPSK | 24.42 | 276.94 | | | |
| | | | | QPSK | 24.42 | 276.83 | 21.90 | 154.88 | |
| | | | | 16QAM | 23.23 | 210.20 | 21.33 | 135.83 | |
| | | | | 64QAM | 21.60 | 144.69 | | | |
| | | | | 256QAM | 19.63 | 91.80 | | | |
| | | | | CP-OFDM | QPSK | 22.66 | 184.53 | | |
| | 826.5~846.5 | 5 | DFT-s OFDM | $\pi/2$ BPSK | 23.96 | 248.83 | | | |
| | | | | QPSK | 23.96 | 248.75 | 22.17 | 164.82 | |
| 16QAM | | | | 23.15 | 206.66 | 21.46 | 139.96 | | |
| 64QAM | | | | 22.37 | 172.60 | | | | |
| 256QAM | | | | 19.33 | 85.70 | | | | |
| | | | CP-OFDM | QPSK | 22.50 | 177.83 | | | |

NR Band n25

| FCC Part 24 | | | | | | | | |
|-------------|-----------------------|-----------------|------------|--------------|--------------|---------------|--------------|---------------|
| Band | Frequency Range [MHz] | BandWidth [MHz] | Modulation | Mode | Conducted | | Radiated | |
| | | | | | Avg [dBm] | Avg [mW] | Avg [dBm] | Avg [mW] |
| n25 | 1860~1905 | 20 | DFT-s OFDM | $\pi/2$ BPSK | 24.54 | 284.45 | | |
| | | | | QPSK | 24.55 | 285.36 | 25.93 | 391.74 |
| | | | | 16QAM | 23.42 | 219.96 | 24.98 | 314.77 |
| | | | | 64QAM | 22.09 | 161.90 | | |
| | | | | 256QAM | 19.77 | 94.90 | | |
| | CP-OFDM | QPSK | 22.84 | 192.31 | | | | |
| | 1857.5~1907.5 | 15 | DFT-s OFDM | $\pi/2$ BPSK | 24.52 | 283.22 | | |
| | | | | QPSK | 24.50 | 281.78 | 25.16 | 328.10 |
| | | | | 16QAM | 23.57 | 227.44 | 23.89 | 244.91 |
| | | | | 64QAM | 22.04 | 160.12 | | |
| | | | | 256QAM | 19.77 | 94.78 | | |
| | CP-OFDM | QPSK | 22.91 | 195.63 | | | | |
| | 1855~1910 | 10 | DFT-s OFDM | $\pi/2$ BPSK | 24.59 | 287.43 | | |
| | | | | QPSK | 24.64 | 290.80 | 25.94 | 392.64 |
| | | | | 16QAM | 23.60 | 229.24 | 24.97 | 314.05 |
| | | | | 64QAM | 22.05 | 160.47 | | |
| | | | | 256QAM | 19.78 | 95.05 | | |
| | CP-OFDM | QPSK | 23.04 | 201.55 | | | | |
| | 1852.5~1912.5 | 5 | DFT-s OFDM | $\pi/2$ BPSK | 24.63 | 290.26 | | |
| | | | | QPSK | 24.67 | 293.16 | 25.90 | 389.05 |
| 16QAM | | | | 23.74 | 236.51 | 24.76 | 299.23 | |
| 64QAM | | | | 22.32 | 170.55 | | | |
| 256QAM | | | | 19.83 | 96.21 | | | |
| CP-OFDM | QPSK | 23.12 | 205.12 | | | | | |

NR Band n41

| FCC Part 27 | | | | | | | | |
|-------------|-----------------------|-----------------|--------------|--------------|-----------|--------------|---------------|---------------|
| Band | Frequency Range [MHz] | BandWidth [MHz] | Modulation | Mode | Conducted | | Radiated | |
| | | | | | Avg [dBm] | Avg [mW] | Avg [dBm] | Avg [mW] |
| n41 | 2546~2640 | 100 | DFT-s OFDM | $\pi/2$ BPSK | 25.07 | 321.48 | | |
| | | | | QPSK | 25.00 | 316.19 | 26.56 | 452.90 |
| | | | | 16QAM | 24.97 | 313.82 | 26.30 | 426.58 |
| | | | | 64QAM | 23.42 | 219.87 | | |
| | | | | 256QAM | 21.77 | 150.31 | | |
| | CP-OFDM | QPSK | 24.28 | 267.92 | | | | |
| | 2541~2645 | 90 | DFT-s OFDM | $\pi/2$ BPSK | 25.12 | 325.20 | | |
| | | | | QPSK | 25.14 | 326.68 | 26.77 | 475.34 |
| | | | | 16QAM | 24.99 | 315.50 | 26.26 | 422.67 |
| | | | | 64QAM | 23.49 | 223.36 | | |
| | | | | 256QAM | 21.87 | 153.82 | | |
| | CP-OFDM | QPSK | 24.38 | 274.16 | | | | |
| | 2536~2650 | 80 | DFT-s OFDM | $\pi/2$ BPSK | 25.00 | 315.98 | | |
| | | | | QPSK | 25.06 | 320.29 | 26.62 | 459.20 |
| | | | | 16QAM | 24.83 | 304.09 | 26.15 | 412.10 |
| | | | | 64QAM | 23.66 | 232.27 | | |
| | | | | 256QAM | 21.98 | 157.76 | | |
| | CP-OFDM | QPSK | 24.44 | 277.97 | | | | |
| | 2526~2660 | 60 | DFT-s OFDM | $\pi/2$ BPSK | 25.16 | 327.79 | | |
| | | | | QPSK | 25.19 | 330.72 | 26.50 | 446.68 |
| | | | | 16QAM | 24.56 | 286.05 | 26.03 | 400.87 |
| | | | | 64QAM | 23.33 | 215.26 | | |
| | | | | 256QAM | 21.48 | 140.66 | | |
| | CP-OFDM | QPSK | 24.42 | 276.78 | | | | |
| | 2521~2665 | 50 | DFT-s OFDM | $\pi/2$ BPSK | 25.21 | 331.68 | | |
| | | | | QPSK | 25.22 | 332.61 | 26.62 | 459.20 |
| | | | | 16QAM | 24.86 | 306.35 | 26.07 | 404.58 |
| | | | | 64QAM | 23.49 | 223.36 | | |
| | | | | 256QAM | 21.91 | 155.24 | | |
| | CP-OFDM | QPSK | 24.50 | 281.77 | | | | |
| | 2516~2670 | 40 | DFT-s OFDM | $\pi/2$ BPSK | 25.50 | 354.70 | | |
| | | | | QPSK | 25.50 | 354.81 | 25.78 | 378.44 |
| 16QAM | | | | 25.18 | 329.61 | 25.78 | 378.44 | |
| 64QAM | | | | 23.78 | 238.78 | | | |
| 256QAM | | | | 22.00 | 158.49 | | | |
| CP-OFDM | QPSK | 24.50 | 281.84 | | | | | |
| 2511~2675 | 30 | DFT-s OFDM | $\pi/2$ BPSK | 25.49 | 354.00 | | | |
| | | | QPSK | 25.49 | 354.00 | 27.10 | 512.86 | |
| | | | 16QAM | 25.48 | 353.18 | 26.97 | 497.74 | |
| | | | 64QAM | 23.76 | 237.68 | | | |
| | | | 256QAM | 21.55 | 142.89 | | | |
| CP-OFDM | QPSK | 24.26 | 266.81 | | | | | |
| 2506~2680 | 20 | DFT-s OFDM | $\pi/2$ BPSK | 25.29 | 338.04 | | | |
| | | | QPSK | 25.29 | 337.79 | 26.60 | 457.09 | |
| | | | 16QAM | 25.47 | 352.01 | 25.91 | 389.94 | |
| | | | 64QAM | 23.93 | 247.31 | | | |
| | | | 256QAM | 21.94 | 156.33 | | | |
| CP-OFDM | QPSK | 24.96 | 313.37 | | | | | |

NR Band n66

| FCC Part 27 | | | | | | | | |
|---------------|-----------------------|-----------------|--------------|--------------|--------------|---------------|--------------|---------------|
| Band | Frequency Range [MHz] | BandWidth [MHz] | Modulation | Mode | Conducted | | Radiated | |
| | | | | | Avg [dBm] | Avg [mW] | Avg [dBm] | Avg [mW] |
| n66 | 1730~1760 | 40 | DFT-s OFDM | $\pi/2$ BPSK | 24.14 | 259.42 | | |
| | | | | QPSK | 24.12 | 258.23 | 26.13 | 410.20 |
| | | | | 16QAM | 23.53 | 225.42 | 25.05 | 319.89 |
| | | | | 64QAM | 21.66 | 146.55 | | |
| | | | | 256QAM | 20.34 | 108.14 | | |
| | CP-OFDM | QPSK | 23.19 | 208.45 | | | | |
| | 1725~1765 | 30 | DFT-s OFDM | $\pi/2$ BPSK | 24.00 | 251.19 | | |
| | | | | QPSK | 23.95 | 248.31 | 25.99 | 397.19 |
| | | | | 16QAM | 23.08 | 203.24 | 25.04 | 319.15 |
| | | | | 64QAM | 22.02 | 159.22 | | |
| | | | | 256QAM | 20.24 | 105.68 | | |
| | CP-OFDM | QPSK | 23.44 | 220.80 | | | | |
| | 1720~1770 | 20 | DFT-s OFDM | $\pi/2$ BPSK | 24.40 | 275.33 | | |
| | | | | QPSK | 24.36 | 272.63 | 25.73 | 374.11 |
| | | | | 16QAM | 22.94 | 196.95 | 24.56 | 285.76 |
| | | | | 64QAM | 21.67 | 147.00 | | |
| | | | | 256QAM | 19.40 | 87.10 | | |
| | CP-OFDM | QPSK | 22.53 | 178.98 | | | | |
| | 1717.5~1772.5 | 15 | DFT-s OFDM | $\pi/2$ BPSK | 24.36 | 272.97 | | |
| | | | | QPSK | 24.39 | 274.51 | 25.91 | 389.94 |
| | | | | 16QAM | 23.02 | 200.29 | 25.12 | 325.09 |
| | | | | 64QAM | 22.05 | 160.19 | | |
| | | | | 256QAM | 19.61 | 91.38 | | |
| | CP-OFDM | QPSK | 22.56 | 180.16 | | | | |
| | 1715~1775 | 10 | DFT-s OFDM | $\pi/2$ BPSK | 24.27 | 267.18 | | |
| | | | | QPSK | 24.27 | 267.00 | 25.88 | 387.26 |
| | | | | 16QAM | 23.18 | 208.15 | 24.52 | 283.14 |
| | | | | 64QAM | 21.96 | 156.91 | | |
| | | | | 256QAM | 19.65 | 92.36 | | |
| | CP-OFDM | QPSK | 22.57 | 180.64 | | | | |
| 1712.5~1777.5 | 5 | DFT-s OFDM | $\pi/2$ BPSK | 24.24 | 265.17 | | | |
| | | | QPSK | 24.23 | 264.85 | 25.57 | 360.58 | |
| | | | 16QAM | 23.05 | 201.65 | 24.35 | 272.27 | |
| | | | 64QAM | 22.06 | 160.56 | | | |
| | | | 256QAM | 19.48 | 88.63 | | | |
| CP-OFDM | QPSK | 22.65 | 184.13 | | | | | |

NR Band n71

| FCC Part 27 | | | | | | | | |
|-------------|-----------------------|-----------------|------------|--------------|--------------|---------------|--------------|---------------|
| Band | Frequency Range [MHz] | BandWidth [MHz] | Modulation | Mode | Conducted | | Radiated | |
| | | | | | Avg [dBm] | Avg [mW] | Avg [dBm] | Avg [mW] |
| n71 | 673~688 | 20 | DFT-s OFDM | $\pi/2$ BPSK | 25.10 | 323.60 | | |
| | | | | QPSK | 25.10 | 323.51 | 20.90 | 123.03 |
| | | | | 16QAM | 23.71 | 234.95 | 19.79 | 95.28 |
| | | | | 64QAM | 22.48 | 177.01 | | |
| | | | | 256QAM | 20.21 | 104.95 | | |
| | | | CP-OFDM | QPSK | 23.21 | 209.37 | | |
| | 670.5~690.5 | 15 | DFT-s OFDM | $\pi/2$ BPSK | 25.11 | 324.21 | | |
| | | | | QPSK | 25.08 | 321.78 | 20.78 | 119.67 |
| | | | | 16QAM | 23.84 | 242.30 | 19.37 | 86.50 |
| | | | | 64QAM | 22.64 | 183.64 | | |
| | | | | 256QAM | 20.32 | 107.76 | | |
| | | | CP-OFDM | QPSK | 23.32 | 214.81 | | |
| | 668~693 | 10 | DFT-s OFDM | $\pi/2$ BPSK | 25.36 | 343.40 | | |
| | | | | QPSK | 25.34 | 341.85 | 21.07 | 127.94 |
| | | | | 16QAM | 24.20 | 263.03 | 20.01 | 100.23 |
| | | | | 64QAM | 22.80 | 190.55 | | |
| | | | | 256QAM | 20.62 | 115.38 | | |
| | | | CP-OFDM | QPSK | 23.74 | 236.57 | | |
| | 665.5~695.5 | 5 | DFT-s OFDM | $\pi/2$ BPSK | 25.44 | 349.81 | | |
| | | | | QPSK | 25.41 | 347.44 | 20.90 | 123.03 |
| 16QAM | | | | 24.28 | 267.79 | 19.71 | 93.54 | |
| 64QAM | | | | 22.80 | 190.55 | | | |
| 256QAM | | | | 20.82 | 120.69 | | | |
| CP-OFDM | | | QPSK | 23.79 | 239.37 | | | |

NR Band n77 (3450 – 3550 MHz)

| FCC Part 27 | | | | | | | | |
|--------------|-----------------------|-----------------|--------------|--------------|-----------|----------|--------------|---------------|
| Band | Frequency Range [MHz] | BandWidth [MHz] | Modulation | Mode | Conducted | | Radiated | |
| | | | | | Avg [dBm] | Avg [mW] | Avg [dBm] | Avg [mW] |
| n77 | 3499.98 | 100 | DFT-s OFDM | $\pi/2$ BPSK | 24.77 | 299.62 | | |
| | | | | QPSK | 24.80 | 301.79 | 26.27 | 423.64 |
| | | | | 16QAM | 23.45 | 221.07 | 25.41 | 347.54 |
| | | | | 64QAM | 22.43 | 175.02 | | |
| | | | | 256QAM | 20.17 | 104.10 | | |
| | CP-OFDM | QPSK | 22.88 | 194.14 | | | | |
| | 3495~3504.99 | 90 | DFT-s OFDM | $\pi/2$ BPSK | 24.91 | 309.98 | | |
| | | | | QPSK | 24.94 | 311.92 | 26.31 | 427.56 |
| | | | | 16QAM | 23.61 | 229.52 | 25.82 | 381.94 |
| | | | | 64QAM | 22.59 | 181.36 | | |
| | | | | 256QAM | 20.32 | 107.69 | | |
| | CP-OFDM | QPSK | 23.32 | 214.95 | | | | |
| | 3490.02~3510 | 80 | DFT-s OFDM | $\pi/2$ BPSK | 24.91 | 309.98 | | |
| | | | | QPSK | 24.94 | 311.92 | 26.31 | 427.56 |
| | | | | 16QAM | 23.61 | 229.52 | 25.96 | 394.46 |
| | | | | 64QAM | 22.59 | 181.36 | | |
| | | | | 256QAM | 20.32 | 107.69 | | |
| | CP-OFDM | QPSK | 23.32 | 214.95 | | | | |
| | 3480~3519.99 | 60 | DFT-s OFDM | $\pi/2$ BPSK | 24.58 | 286.85 | | |
| | | | | QPSK | 24.60 | 288.51 | 26.42 | 438.53 |
| | | | | 16QAM | 23.89 | 244.95 | 26.07 | 404.58 |
| | | | | 64QAM | 22.36 | 172.13 | | |
| | | | | 256QAM | 20.21 | 105.00 | | |
| | CP-OFDM | QPSK | 23.24 | 210.74 | | | | |
| | 3475.02~3525 | 50 | DFT-s OFDM | $\pi/2$ BPSK | 24.63 | 290.74 | | |
| | | | | QPSK | 24.69 | 294.27 | 26.74 | 472.06 |
| | | | | 16QAM | 23.80 | 240.01 | 26.00 | 398.11 |
| | | | | 64QAM | 22.17 | 165.01 | | |
| | | | | 256QAM | 20.32 | 107.68 | | |
| | CP-OFDM | QPSK | 23.31 | 214.40 | | | | |
| | 3470.01~3529.98 | 40 | DFT-s OFDM | $\pi/2$ BPSK | 24.64 | 290.79 | | |
| | | | | QPSK | 24.55 | 285.42 | 26.64 | 461.32 |
| 16QAM | | | | 23.75 | 237.28 | 25.97 | 395.37 | |
| 64QAM | | | | 22.46 | 176.29 | | | |
| 256QAM | | | | 20.37 | 108.79 | | | |
| CP-OFDM | QPSK | 23.12 | 204.94 | | | | | |
| 3460.02~3540 | 20 | DFT-s OFDM | $\pi/2$ BPSK | 24.78 | 300.59 | | | |
| | | | QPSK | 24.84 | 304.94 | 26.59 | 456.04 | |
| | | | 16QAM | 24.11 | 257.83 | 26.07 | 404.58 | |
| | | | 64QAM | 22.59 | 181.62 | | | |
| | | | 256QAM | 20.48 | 111.78 | | | |
| CP-OFDM | QPSK | 23.55 | 226.58 | | | | | |

NR Band n77 (3700 – 3980 MHz)

| FCC Part 27 | | | | | | | | |
|-----------------|-----------------------|-----------------|--------------|--------------|-----------|--------------|---------------|---------------|
| Band | Frequency Range [MHz] | BandWidth [MHz] | Modulation | Mode | Conducted | | Radiated | |
| | | | | | Avg [dBm] | Avg [mW] | Avg [dBm] | Avg [mW] |
| n77 | 3750~3930 | 100 | DFT-s OFDM | $\pi/2$ BPSK | 25.49 | 354.39 | | |
| | | | | QPSK | 25.56 | 359.65 | 25.75 | 375.84 |
| | | | | 16QAM | 24.43 | 277.10 | 25.51 | 355.63 |
| | | | | 64QAM | 22.81 | 191.12 | | |
| | | | | 256QAM | 20.84 | 121.25 | | |
| | CP-OFDM | QPSK | 23.80 | 239.88 | | | | |
| | 3745.02~3934.98 | 90 | DFT-s OFDM | $\pi/2$ BPSK | 25.49 | 354.24 | | |
| | | | | QPSK | 25.49 | 354.12 | 25.83 | 382.82 |
| | | | | 16QAM | 24.47 | 279.66 | 25.48 | 353.18 |
| | | | | 64QAM | 22.81 | 191.12 | | |
| | | | | 256QAM | 20.84 | 121.25 | | |
| | CP-OFDM | QPSK | 23.73 | 236.23 | | | | |
| | 3740.01~3939.99 | 80 | DFT-s OFDM | $\pi/2$ BPSK | 25.49 | 354.09 | | |
| | | | | QPSK | 25.49 | 354.04 | 25.67 | 368.98 |
| | | | | 16QAM | 24.26 | 266.66 | 25.22 | 332.66 |
| | | | | 64QAM | 22.94 | 196.99 | | |
| | | | | 256QAM | 20.81 | 120.58 | | |
| | CP-OFDM | QPSK | 23.81 | 240.67 | | | | |
| | 3730.02~3949.98 | 60 | DFT-s OFDM | $\pi/2$ BPSK | 25.42 | 348.69 | | |
| | | | | QPSK | 25.42 | 348.10 | 25.29 | 338.06 |
| | | | | 16QAM | 23.90 | 245.43 | 25.09 | 322.85 |
| | | | | 64QAM | 22.41 | 174.14 | | |
| | | | | 256QAM | 20.27 | 106.43 | | |
| | CP-OFDM | QPSK | 23.26 | 211.76 | | | | |
| | 3725.01~3954.99 | 50 | DFT-s OFDM | $\pi/2$ BPSK | 25.47 | 352.23 | | |
| | | | | QPSK | 25.47 | 351.99 | 25.07 | 321.37 |
| | | | | 16QAM | 24.41 | 276.31 | 24.78 | 300.61 |
| | | | | 64QAM | 22.96 | 197.79 | | |
| 256QAM | | | | 20.87 | 122.09 | | | |
| CP-OFDM | QPSK | 23.88 | 244.52 | | | | | |
| 3720~3960 | 40 | DFT-s OFDM | $\pi/2$ BPSK | 25.09 | 322.68 | | | |
| | | | QPSK | 25.15 | 327.50 | 25.19 | 330.37 | |
| | | | 16QAM | 23.96 | 249.13 | 24.75 | 298.54 | |
| | | | 64QAM | 22.52 | 178.64 | | | |
| | | | 256QAM | 20.43 | 110.46 | | | |
| CP-OFDM | QPSK | 23.49 | 223.46 | | | | | |
| 3710.01~3969.99 | 20 | DFT-s OFDM | $\pi/2$ BPSK | 25.29 | 337.94 | | | |
| | | | QPSK | 25.17 | 328.53 | 25.25 | 334.97 | |
| | | | 16QAM | 24.38 | 273.89 | 24.69 | 294.44 | |
| | | | 64QAM | 22.62 | 182.75 | | | |
| | | | 256QAM | 20.54 | 113.22 | | | |
| CP-OFDM | QPSK | 23.57 | 227.30 | | | | | |

5G NR Band 2

5G NR Band 2(Frequency range: 1850-1910 MHz) is covered by 5G NR Band 25 (Frequency range: 1850-1915 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) |
|---|-----------------|
| LTE Band 26 (Part 90) 814 ~ 824 MHz | -3.12 |
| WCDMA Band 5 / LTE Band 5 / LTE Band 26 (Part 22) / NR Band n5 824 ~ 849 MHz | -3.48 |
| WCDMA Band 4 / LTE Band 4 / LTE Band 66 / NR Band n66 1710 ~ 1780 MHz | -1.87 |
| WCDMA Band 2 / LTE Band 2 / LTE Band 25 / NR Band n2 / NR Band n25 1850 ~ 1915 MHz | -1.29 |
| LTE Band 12 / LTE Band 17 699 ~ 716 MHz | -3.71 |
| LTE Band 7 2500 ~ 2570 MHz | -1.74 |
| LTE Band 13 777 ~ 787 MHz | -2.53 |
| LTE Band 14 788 ~ 798 MHz | -2.53 |
| LTE Band 30 2305 ~ 2315 MHz | -1.60 |
| LTE Band 41 2496 ~ 2690 MHz | -1.58 |
| NR Band n41 2496 ~ 2690 MHz | -3.77 |
| LTE Band 71 / NR Band n71 663 ~ 698 MHz | -4.44 |
| NR Band n77(Lower) 3450 ~ 3550 MHz | -1.18 |
| NR Band n77(Upper) 3700 ~ 3980 MHz | -2.71 |

5.4. WORST-CASE ORIENTATION

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

- 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.

For all 5G NR 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, 64QAM and 256QAM modulations. It was found that QPSK and 16QAM results were worst case. Both NSA and SA modes were tested and only NSA modes were reported. There is no difference between the two modes.

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 conducted power in QPSK.

| Highest power setting for each bands | | | | |
|--------------------------------------|-----------------|-----------------|---------|-----------|
| LTE Band | Frequency (MHz) | Bandwidth (MHz) | RB size | RB offset |
| 7 | 2502.5 | 5 | 1 | 0 |
| | 2535.0 | | 1 | 12 |
| | 2567.5 | | 1 | 0 |
| 12 | 704.0 | 10 | 1 | 0 |
| | 707.5 | | 1 | 0 |
| | 711.0 | | 1 | 0 |
| 13 | 779.5 | 5 | 1 | 12 |
| | 782.0 | | 1 | 24 |
| | 784.5 | | 1 | 24 |
| 14 | 790.5 | 5 | 1 | 0 |
| | 793.0 | | 1 | 24 |
| | 795.5 | | 1 | 12 |
| 25 | 1852.5 | 5 | 1 | 24 |
| | 1882.5 | | 1 | 24 |
| | 1912.5 | | 1 | 12 |
| 26(Part 90) | 814.7 | 1.4 | 1 | 0 |
| | 823.3 | | 1 | 3 |
| 26(Straddle) | 824.0 | 5 | 1 | 12 |
| 26(Part 22) | 826.5 | 5 | 1 | 12 |
| | 831.5 | | 1 | 24 |
| | 846.5 | | 1 | 0 |
| 30 | 2307.5 | 5 | 1 | 0 |
| | 2310.0 | | 1 | 0 |
| | 2312.5 | | 1 | 12 |
| 41 | 2498.5 | 5 | 1 | 12 |
| | 2593.0 | | 1 | 12 |
| | 2687.5 | | 1 | 12 |
| 66 | 1710.7 | 1.4 | 1 | 3 |
| | 1745.0 | | 1 | 3 |
| | 1779.3 | | 1 | 3 |
| 71 | 665.5 | 5 | 1 | 0 |
| | 680.5 | | 1 | 12 |
| | 695.5 | | 1 | 24 |

| NR Band | Frequency (MHz) | Bandwidth (MHz) | RB size | RB offset |
|------------|-----------------|-----------------|---------|-----------|
| 5 | 826.5 | 5 | 1 | 1 |
| | 836.5 | | 1 | 23 |
| | 846.5 | | 1 | 13 |
| 25 | 1852.5 | 5 | 1 | 23 |
| | 1882.5 | | 1 | 23 |
| | 1912.5 | | 1 | 1 |
| 41 | 2516.01 | 40 | 1 | 104 |
| | 2592.99 | | 1 | 53 |
| | 2670.0 | | 1 | 104 |
| 66 | 1717.5 | 15 | 1 | 77 |
| | 1745.0 | | 1 | 40 |
| | 1772.5 | | 1 | 40 |
| 71 | 665.5 | 5 | 1 | 1 |
| | 680.5 | | 1 | 13 |
| | 695.5 | | 1 | 13 |
| 77 (Lower) | 3460.02 | 20 | 1 | 49 |
| | 3499.98 | | 1 | 1 |
| | 3540.0 | | 1 | 1 |
| 77 (Upper) | 3740.01 | 80 | 1 | 109 |
| | 3840.0 | | 1 | 1 |
| | 3939.99 | | 1 | 215 |

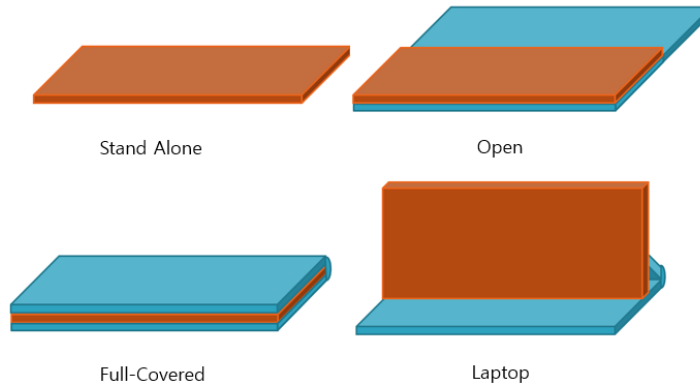
i. Worst Axis Condition

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 | Laptop | X | Y | Z | Laptop |
| WCDMA B5 | - | Stand Alone | - | - | - | Stand Alone | - | - |
| WCDMA B4 | Stand Alone | - | - | - | Stand Alone | - | - | - |
| WCDMA B2 | Stand Alone | - | - | - | Stand Alone | - | - | - |
| LTE B7 | Stand Alone | - | - | - | Stand Alone | - | - | - |
| LTE B12 | Stand Alone | - | - | - | Stand Alone | - | - | - |
| LTE B13 | - | Stand Alone | - | - | Stand Alone | - | - | - |
| LTE B14 | - | - | Stand Alone | - | Stand Alone | - | - | - |
| LTE B25 | - | - | Stand Alone | - | - | - | Stand Alone | - |
| LTE B26 | - | Stand Alone | - | - | Stand Alone | - | - | - |
| LTE B30 | Stand Alone | - | - | - | - | - | Stand Alone | - |
| LTE B41 | Stand Alone | - | - | - | - | - | - | O |
| LTE B66 | Stand Alone | - | - | - | Stand Alone | - | - | - |
| LTE B71 | - | Stand Alone | - | - | - | Stand Alone | - | - |
| NR n5 | - | Stand Alone | - | - | - | Stand Alone | - | - |
| NR n25 | - | - | Stand Alone | - | - | - | Stand Alone | - |
| NR n41 | Stand Alone | - | - | - | Stand Alone | - | - | - |
| NR n66 | - | - | Stand Alone | - | - | - | Stand Alone | - |
| NR n71 | Stand Alone | - | - | - | Stand Alone | - | - | - |
| NR n77 (Lower) | Stand Alone | - | - | - | Stand Alone | - | - | - |
| NR n77 (Upper) | Full Coverd | | | | Stand Alone | | | |

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.

- ii. **Foldable Condition**
 The Fundamental of the EUT was investigated four foldable conditions(Stand Alone, , Open, Full-Coverd, Laptop).



5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

| Support Equipment List | | | | |
|------------------------|--------------|-------------|----------------|--------|
| Description | Manufacturer | Model | Serial Number | FCC ID |
| Charger | SAMSUNG | EP-TA200 | R37N5GR6871SE3 | N/A |
| Data Cable | SAMSUNG | EP-DT725BBE | N/A | N/A |

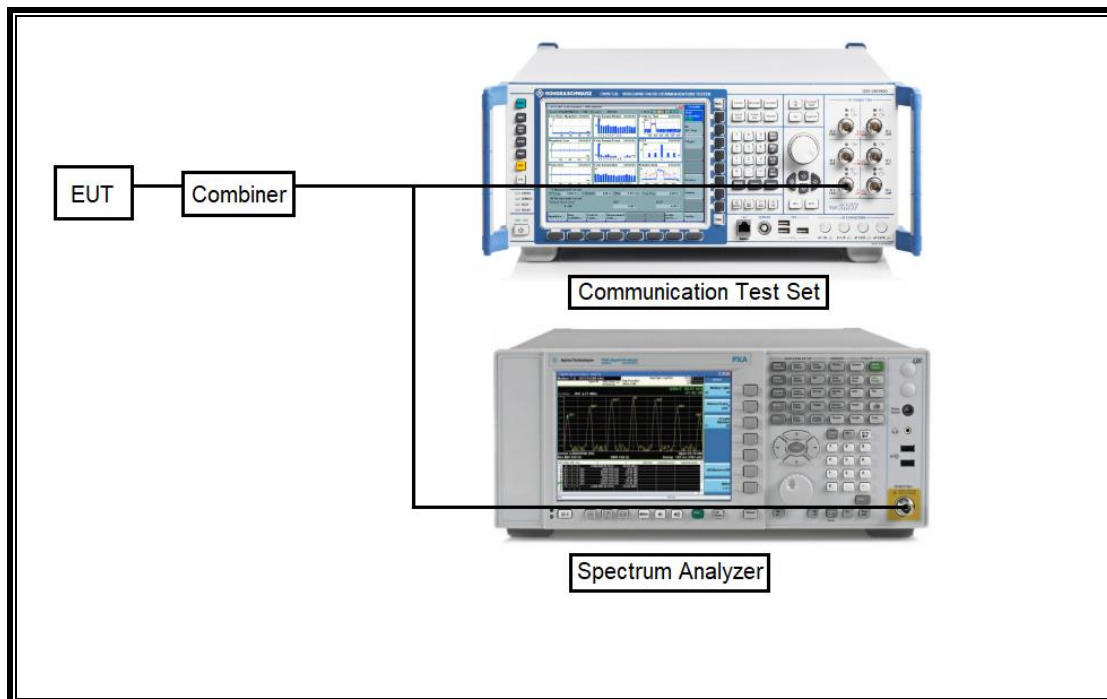
I/O CABLE

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

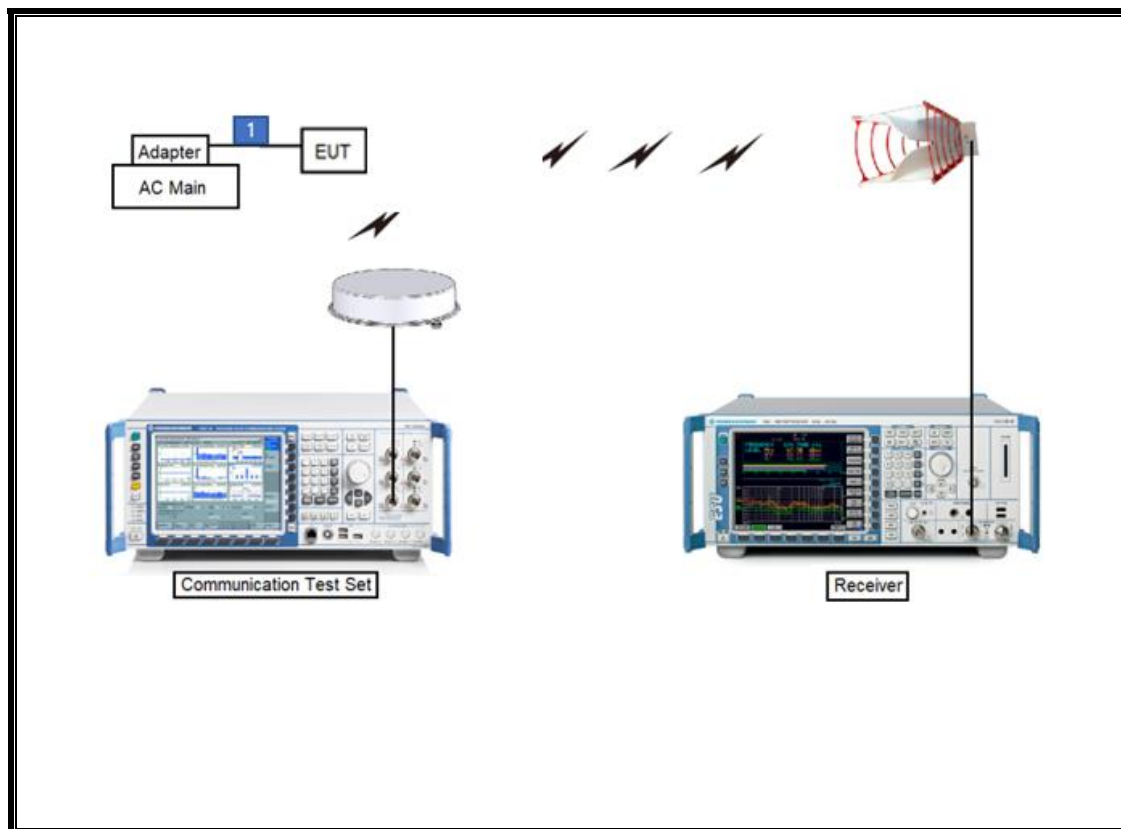
TEST SETUP

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

SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)



SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP)



6. TEST AND MEASUREMENT EQUIPMENT

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

| Test Equipment List | | | | |
|--|---------------|------------------------|-------------|------------|
| Description | Manufacturer | Model | S/N | Cal Due |
| Antenna, Tuned Dipole 400~1000 MHz | ETS | 3121D DB4 | 00164753 | 2023-02-08 |
| Directional Antenna | Cobham | FPA3-0.8-6.0R/1329 | 110367-0003 | N/A |
| Directional Antenna | Cobham | FPA3-0.8-6.0R/1329 | 80108-0004 | N/A |
| Antenna, Horn, 40 GHz | ETS | 3116C | 00166155 | 2022-08-04 |
| Antenna, Horn, 40 GHz | ETS | 3116C | 00168645 | 2021-10-02 |
| Preamplifier | ETS | 3116C-PA | 00168841 | 2021-08-06 |
| Antenna, Bilog, 30MHz-1GHz | SCHWARZBECK | VULB9163 | 750 | 2022-08-19 |
| Antenna, Bilog, 30MHz-1GHz | SCHWARZBECK | VULB9163 | 845 | 2022-08-13 |
| Antenna, Bilog, 30MHz-1GHz | SCHWARZBECK | VULB9163 | 749 | 2022-08-13 |
| Antenna, Horn, 18 GHz | ETS | 3115 | 00167211 | 2022-07-27 |
| Antenna, Horn, 18 GHz | ETS | 3115 | 00161451 | 2022-08-15 |
| Antenna, Horn, 18 GHz | ETS | 3117 | 00168724 | 2022-07-27 |
| Antenna, Horn, 18 GHz | ETS | 3117 | 00168717 | 2022-08-15 |
| Communications Test Set | R&S | CMW500 | 150314 | 2021-08-04 |
| DC Power Supply | Agilent / HP | E3640A | MY54226395 | 2021-08-05 |
| Preamplifier, 1000 MHz | Sonoma | 310N | 341282 | 2021-08-03 |
| Preamplifier, 1000 MHz | Sonoma | 310N | 370599 | 2021-08-06 |
| Preamplifier, 1000 MHz | Sonoma | 310N | 351741 | 2021-08-03 |
| Preamplifier, 18 GHz | Miteq | AFS42-00101800-25-S-42 | 1876511 | 2021-08-03 |
| Preamplifier, 18 GHz | Miteq | AFS42-00101800-25-S-42 | 2029169 | 2021-08-04 |
| Preamplifier, 18 GHz | Miteq | AFS42-00101800-25-S-42 | 1896138 | 2021-08-03 |
| Spectrum Analyzer, 44 GHz | Agilent / HP | N9030A | MY54170614 | 2021-08-05 |
| Spectrum Analyzer, 44 GHz | Agilent / HP | N9030A | MY54490312 | 2021-08-05 |
| EMI Test Receive, 40 GHz | R&S | ESU40 | 100439 | 2021-08-03 |
| EMI Test Receive, 40 GHz | R&S | ESU40 | 100457 | 2021-08-03 |
| High Pass Filter 1.2GHz | Micro-Tronics | HPM50108-02 | G005 | 2021-08-05 |
| High Pass Filter 1.2GHz | Micro-Tronics | HPM50108-02 | G006 | 2021-08-05 |
| High Pass Filter 2.8GHz | Micro-Tronics | HPM50111-02 | 010 | 2021-08-05 |
| High Pass Filter 2.8GHz | Micro-Tronics | HPM50111-02 | 011 | 2021-08-05 |
| High Pass Filter 4GHz | Micro-Tronics | HPM50118-02 | G001 | 2021-08-05 |
| High Pass Filter 4GHz | Micro-Tronics | HPM50118-02 | G002 | 2021-08-05 |
| Attenuator | PASTERNAK | PE7087-10 | A009 | 2021-08-05 |
| Attenuator | PASTERNAK | PE7087-10 | A001 | 2021-08-03 |
| Attenuator | PASTERNAK | PE7087-10 | A008 | 2021-08-03 |
| Attenuator | PASTERNAK | PE7004-10 | 2 | 2021-08-04 |
| Attenuator | PASTERNAK | PE7395-10 | A011 | 2021-08-05 |
| Antenna, Loop, 9kHz-30MHz | R&S | HFH2-Z2 | 100418 | 2021-10-02 |
| Temperature Chamber | ESPEC | SH-642 | 93001109 | 2021-08-04 |
| Power Splitter | MINI-CIRCUITS | WA1534 | UL001 | 2022-01-27 |
| Power Splitter | MINI-CIRCUITS | WA1534 | UL002 | 2022-01-27 |
| UL Software | | | | |
| Description | Manufacturer | Model | Version | |
| Antenna port test software | UL | CLT | Ver 2.5 | |
| Radiated software | UL | UL EMC | Ver 9.5 | |
| Antenna port test software (5G NR FR1) | UL | UL iM | Ver 1.04 | |

7. SUMMARY TABLE

| FCC Part Section | Test Description | Test Limit | Test Condition | Test Result |
|--|---|----------------|----------------|-------------|
| 2.1049 | Occupied Bandwidth(99%) | N/A | Conducted | Pass |
| 22.917(a) 24.238(a) 27.53(c),(g),(h) 90.691 | Band Edge / Conducted Spurious Emission | -13 dBm | | Pass |
| 90.543(e) | | -35 dBm | | Pass |
| 27.53(m) | Conducted Spurious Emission | -25 dBm | | Pass |
| 27.53(a),(m) 90.691 | Emission mask | Section 9.2.2. | | Pass |
| 2.1046 | Conducted output power | N/A | | Pass |
| 22.355 24.235 90.213 | Frequency Stability | 2.5ppm | | Pass |
| 22.913(a)(5) | Effective Radiated Power | 38.5 dbm | | Pass |
| 90.635(b) | | 50 dBm | Pass | |
| 27.50(b)(10) 27.50(c)(10) | | 34.77 dBm | Pass | |
| 24.232(c) 27.50(h)(2) | Equivalent Isotropic Radiated Power | 33 dBm | Radiated | Pass |
| 27.50(d)(4) | | 30 dBm | | Pass |
| 22.917(a) 24.238(a) 27.53(c),(g),(h) 90.691 | Radiated Spurious Emission | -13 dBm | Pass | |
| 27.53(m) | | -25 dBm | 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.

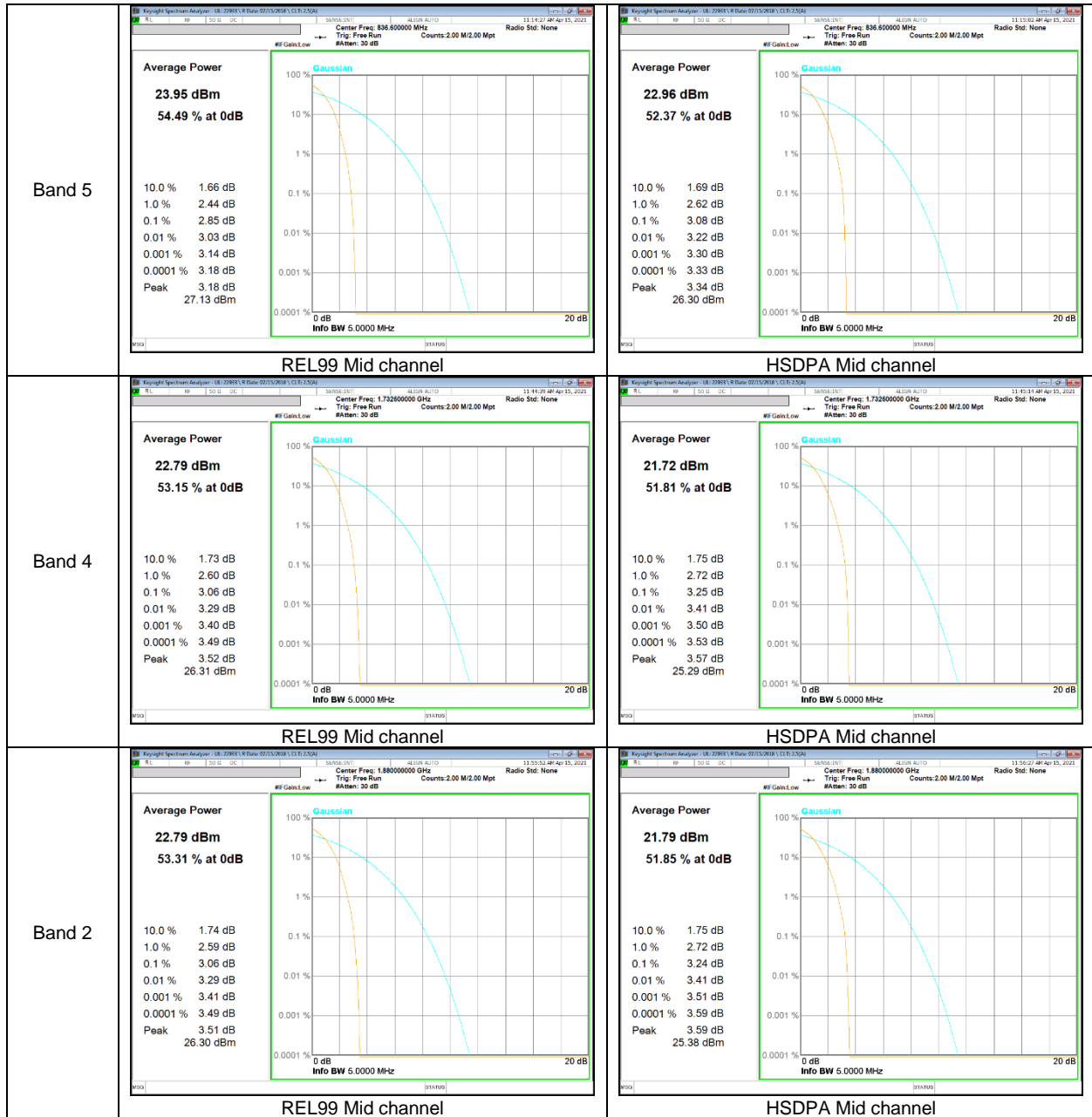
Note

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

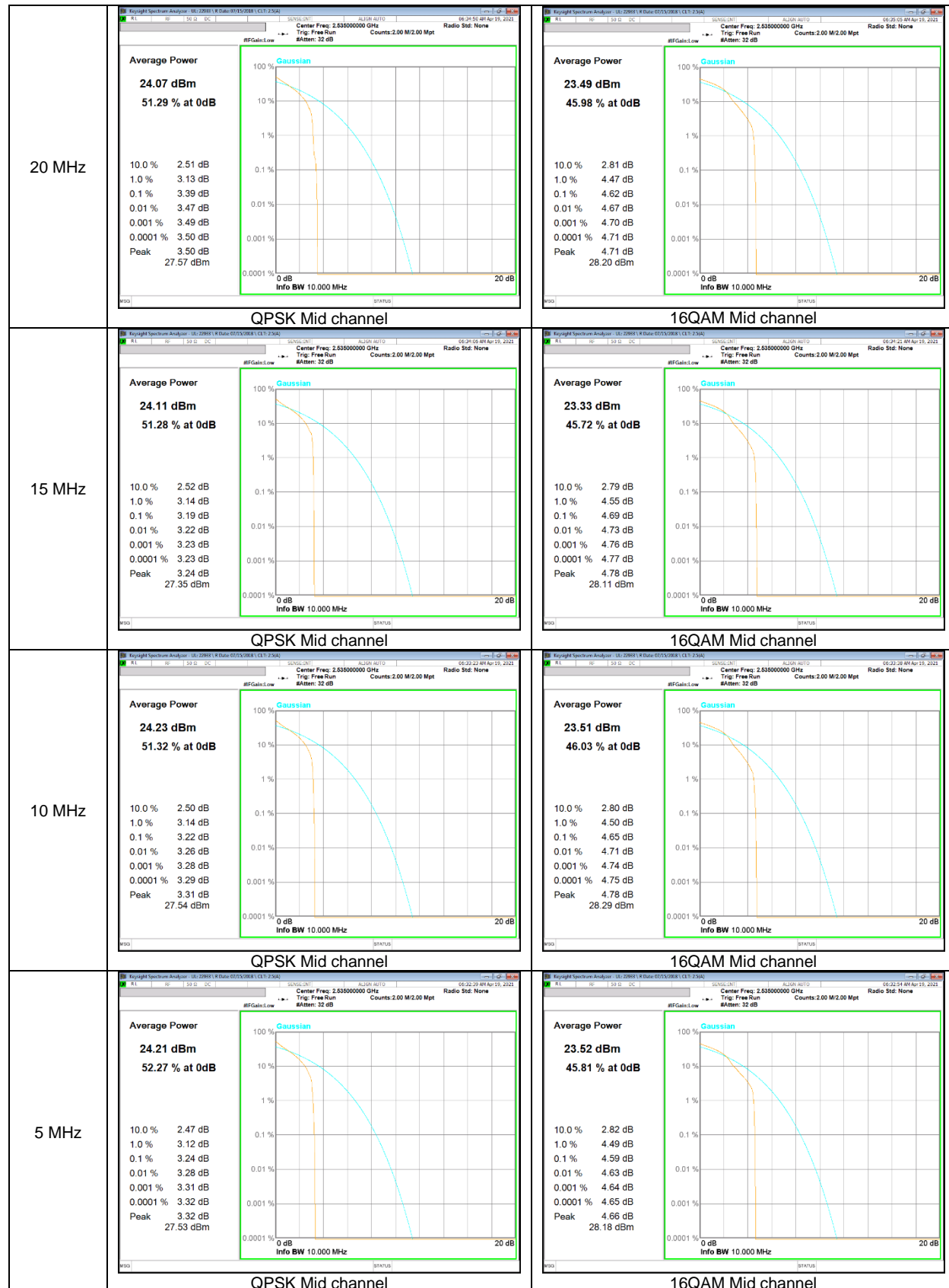
RESULTS

8.1. CONDUCTED PEAK TO AVERAGE RESULT

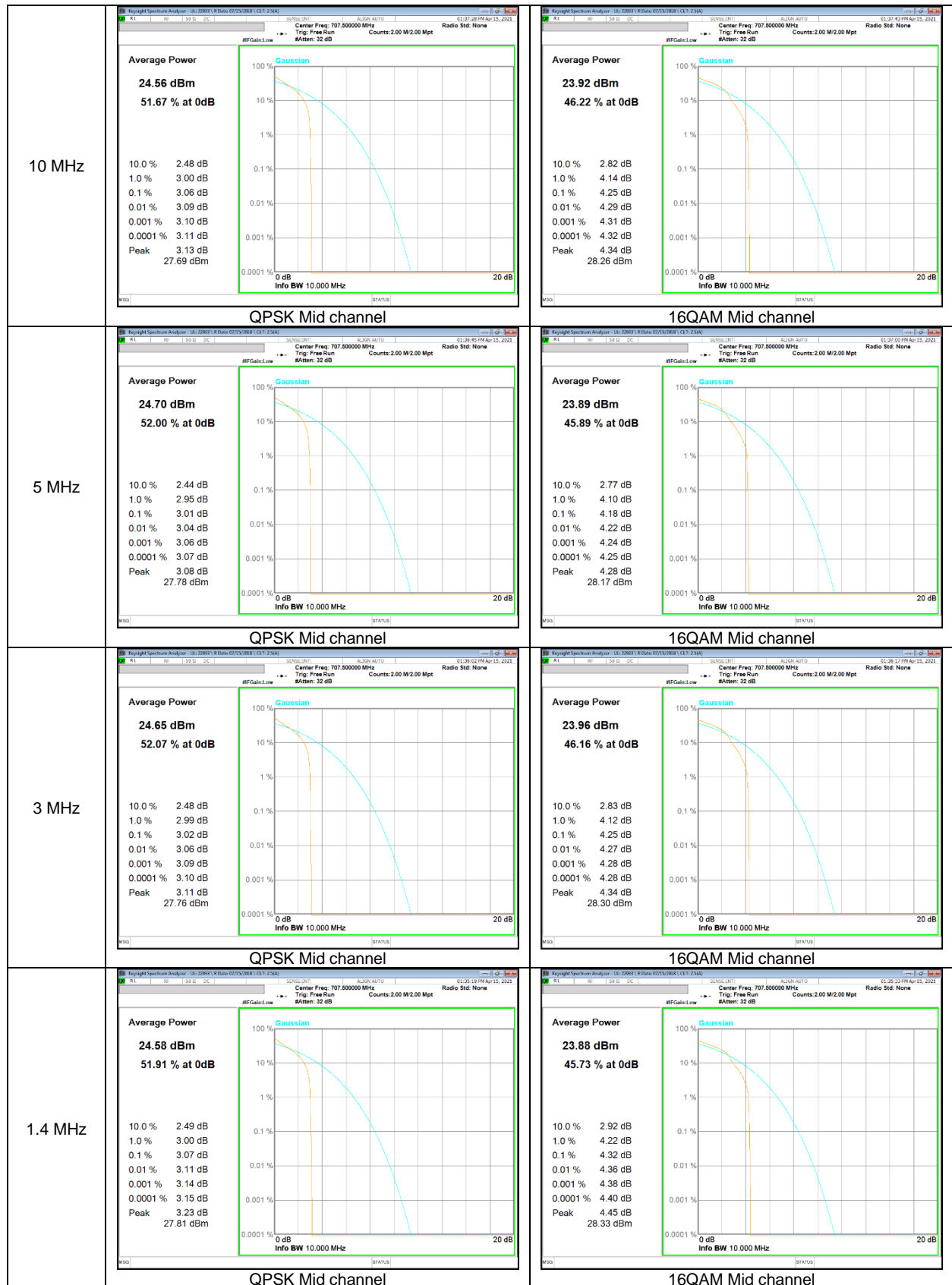
WCDMA



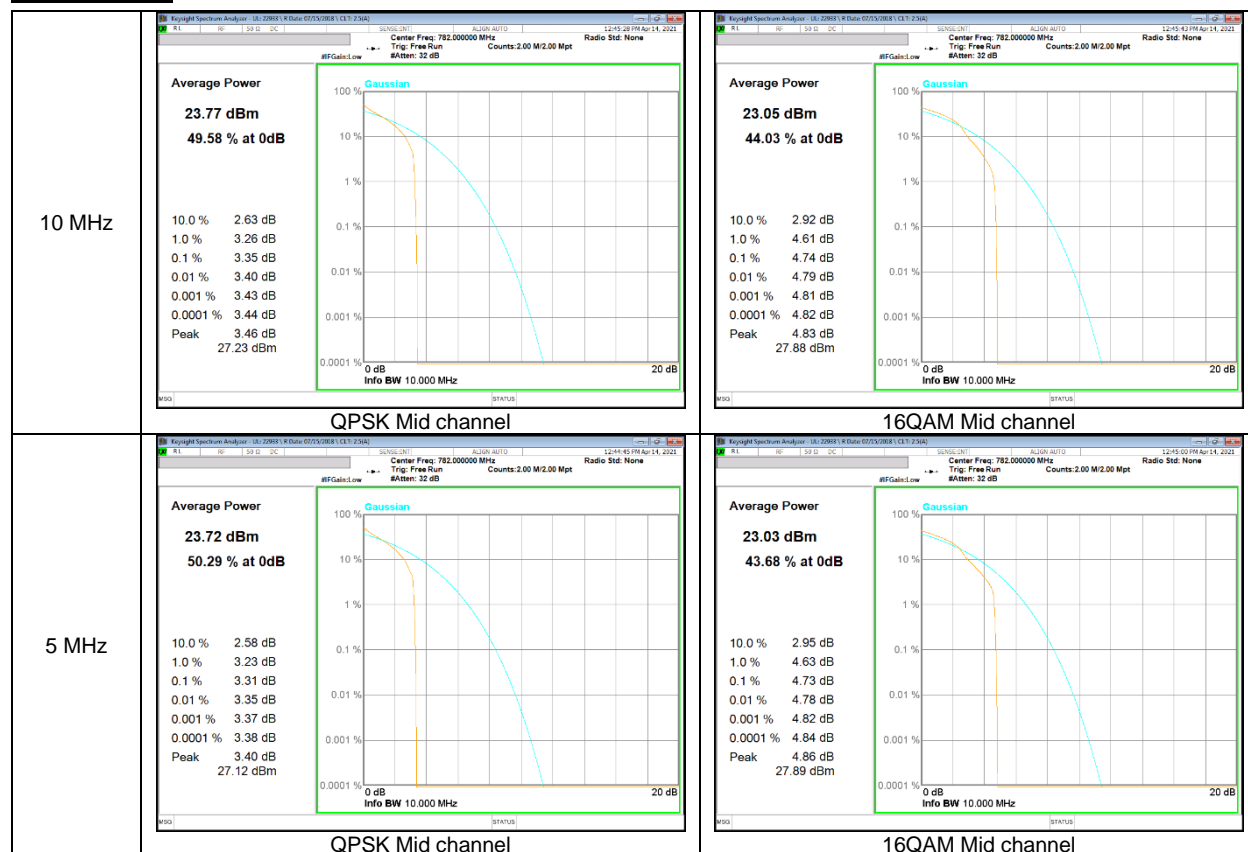
LTE Band 7



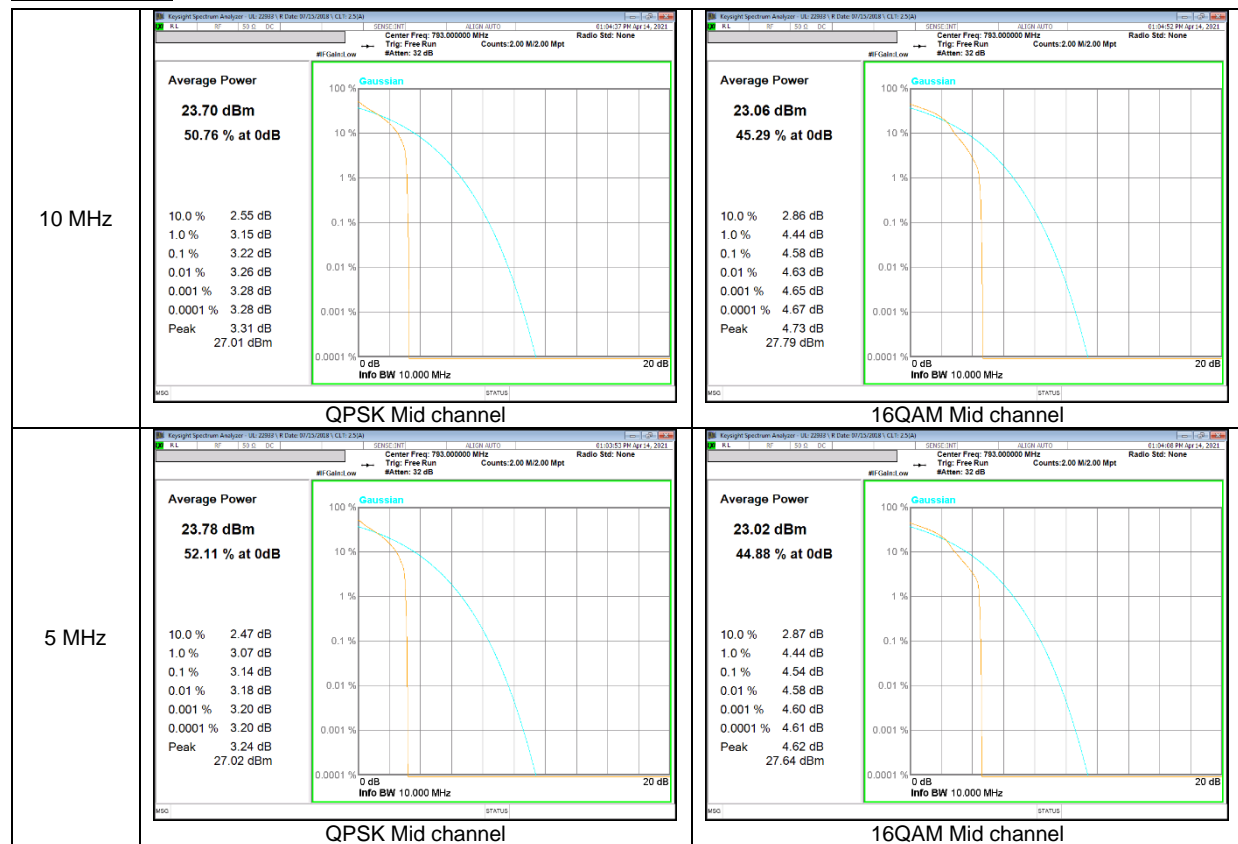
LTE Band 12



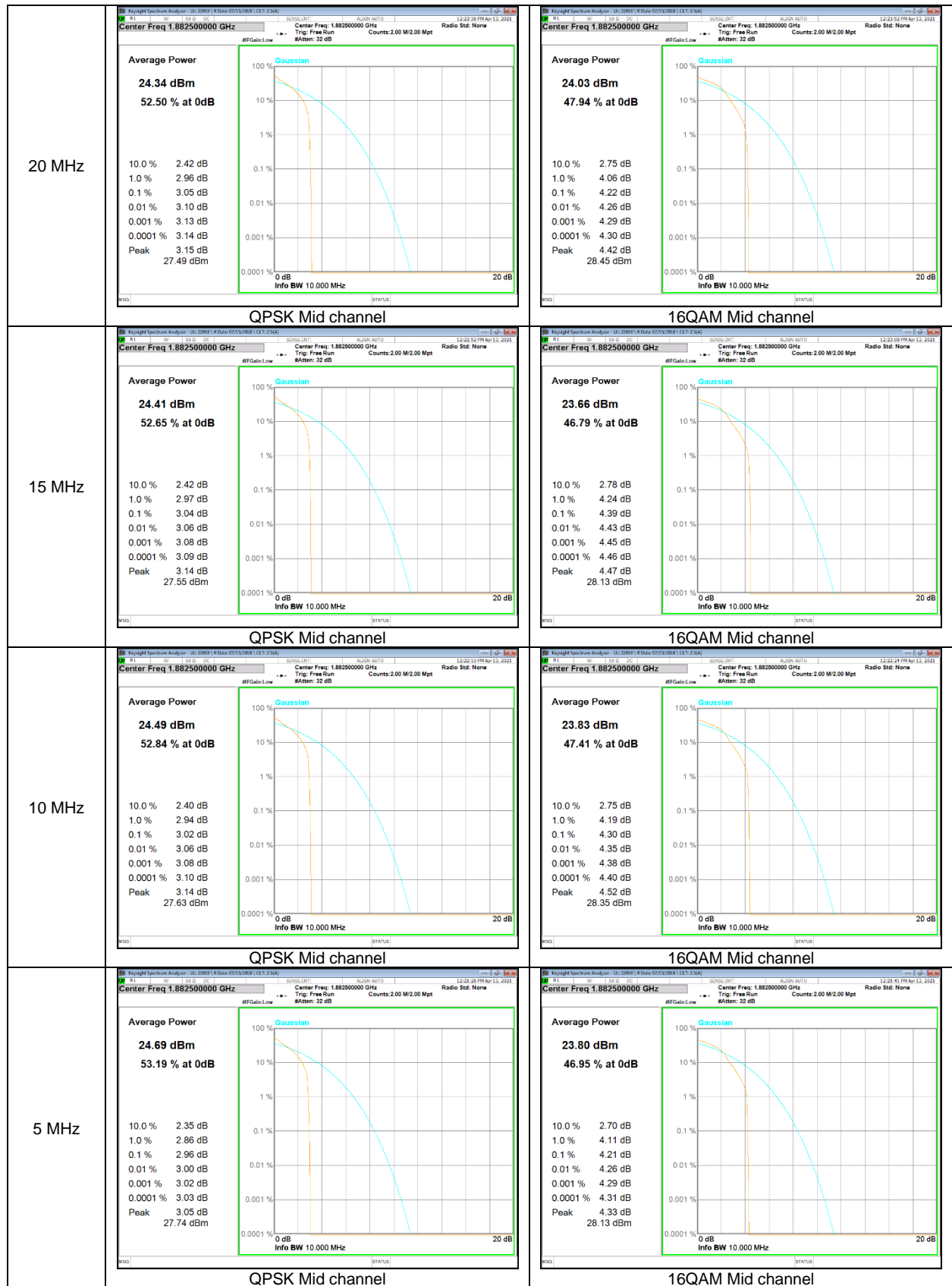
LTE Band 13

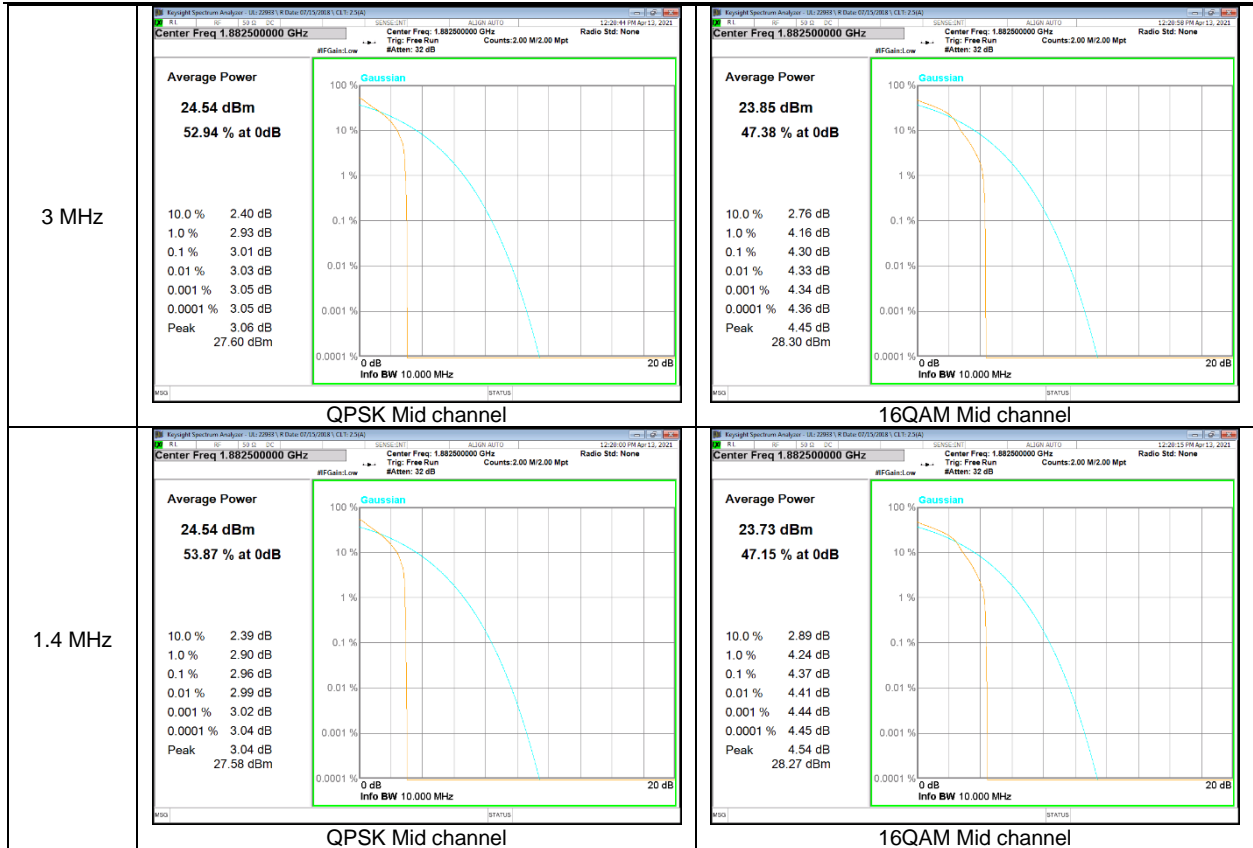


LTE Band 14

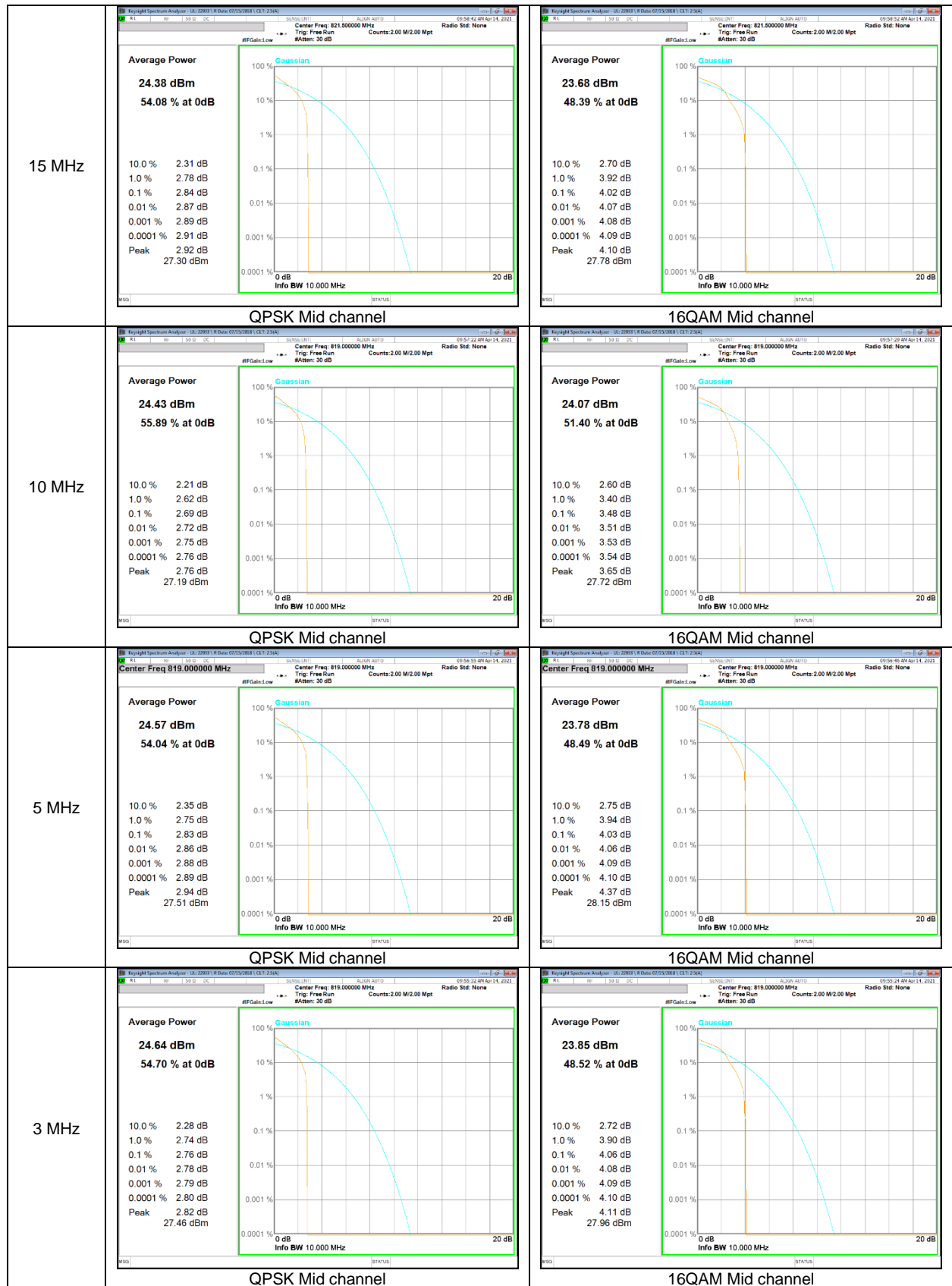


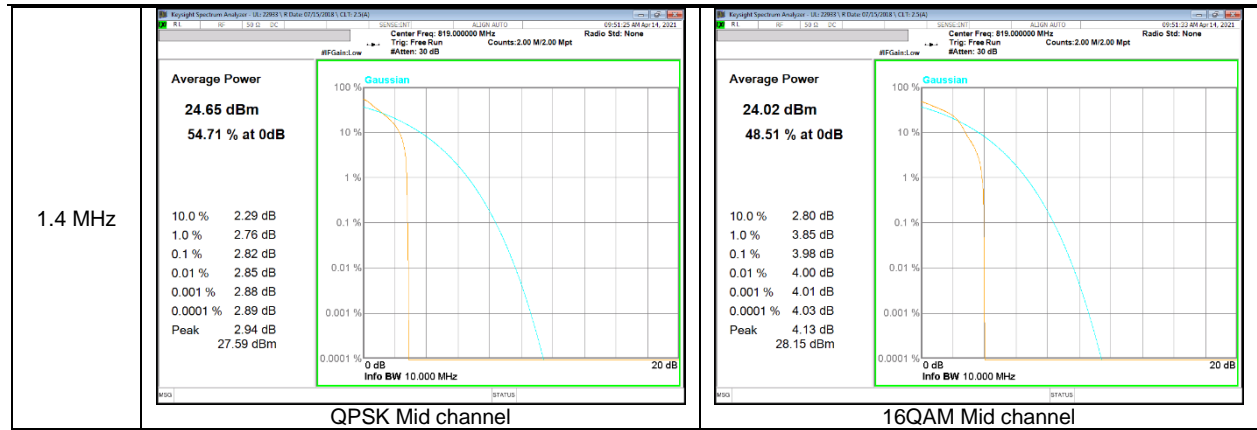
LTE Band 25



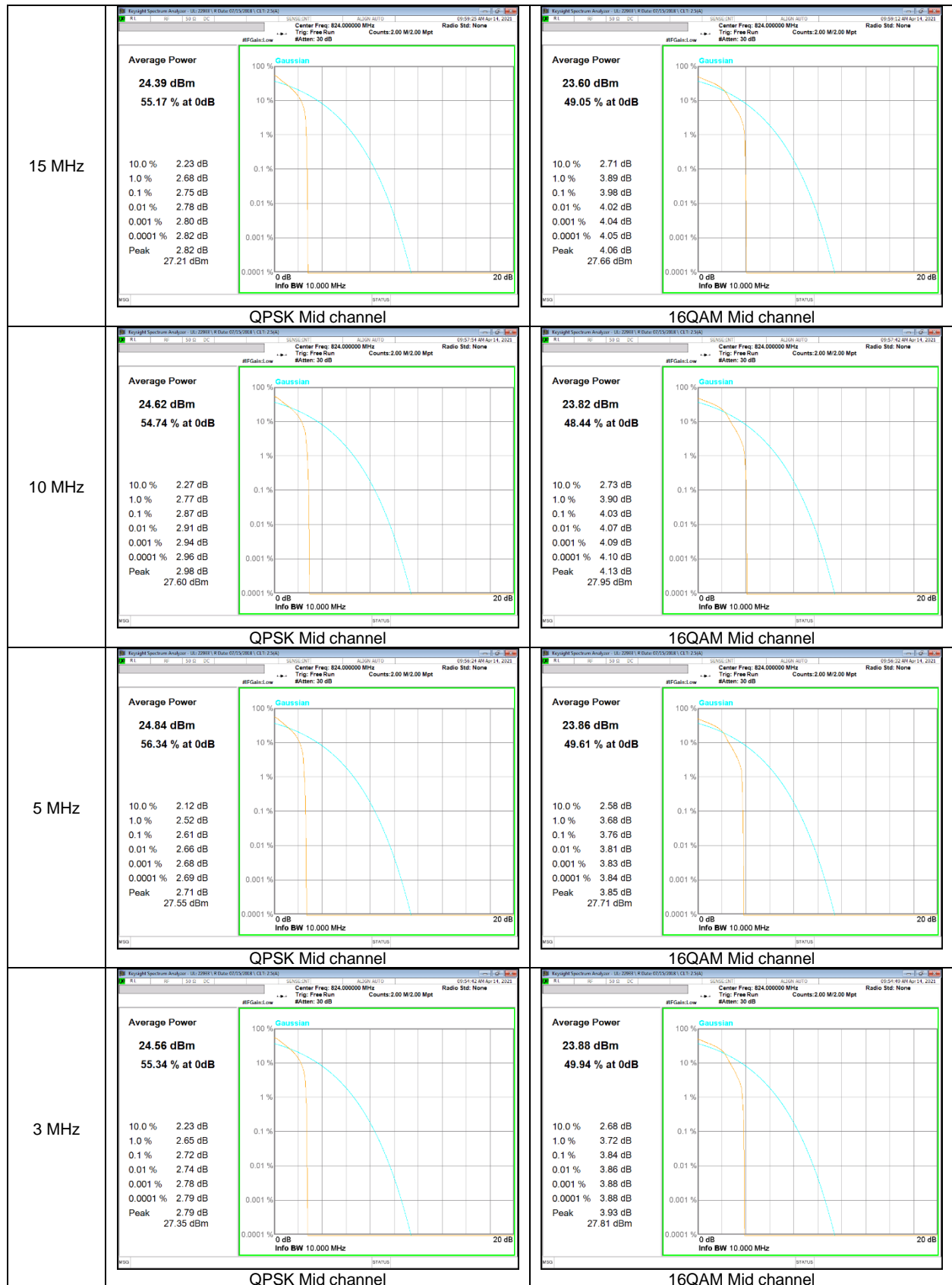


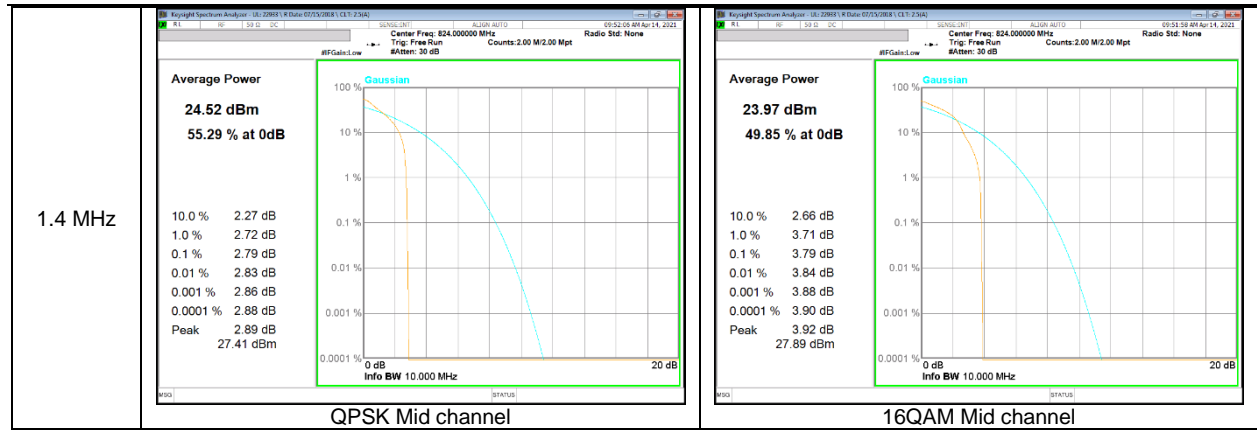
LTE Band 26 (Part 90)



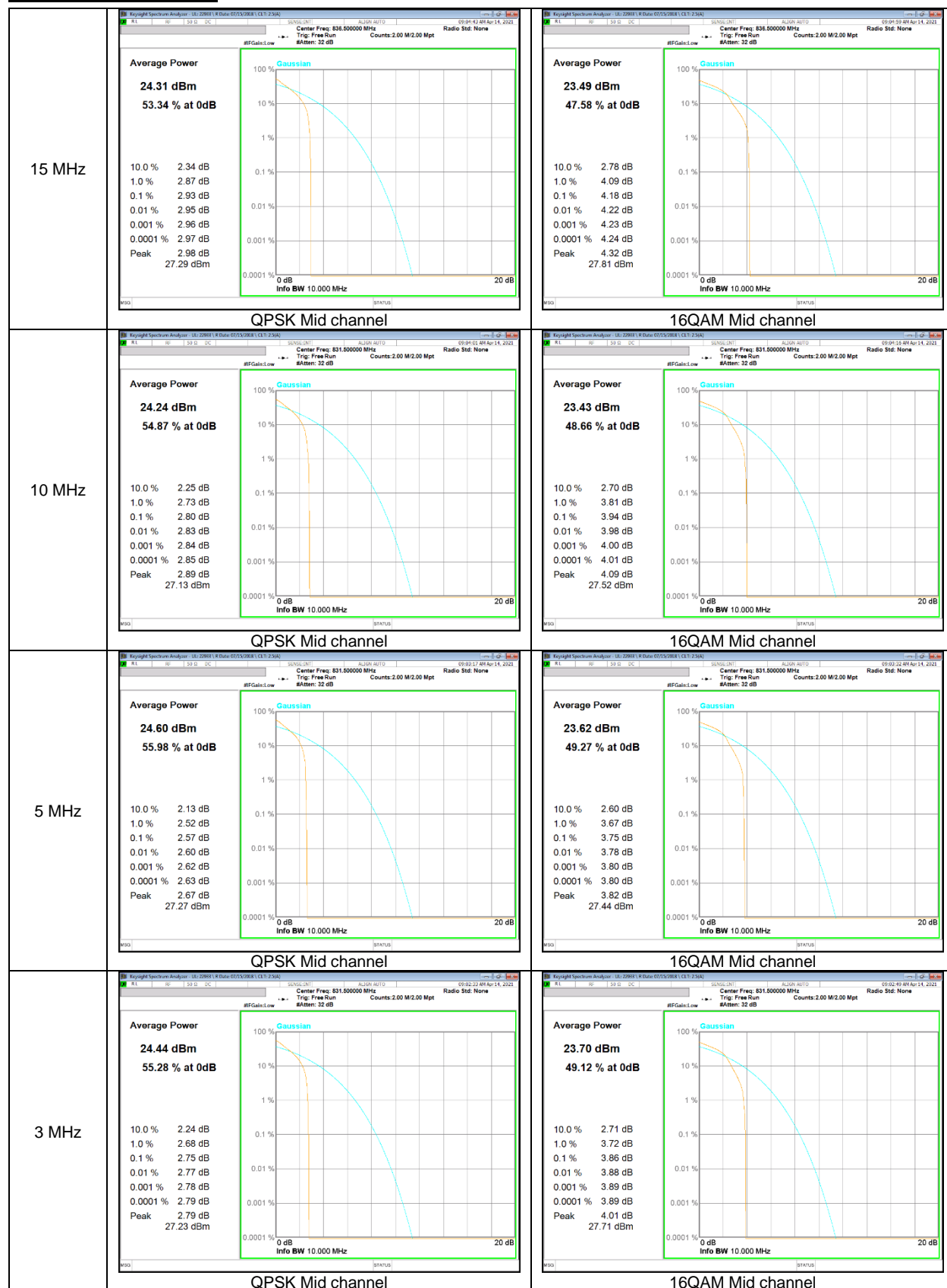


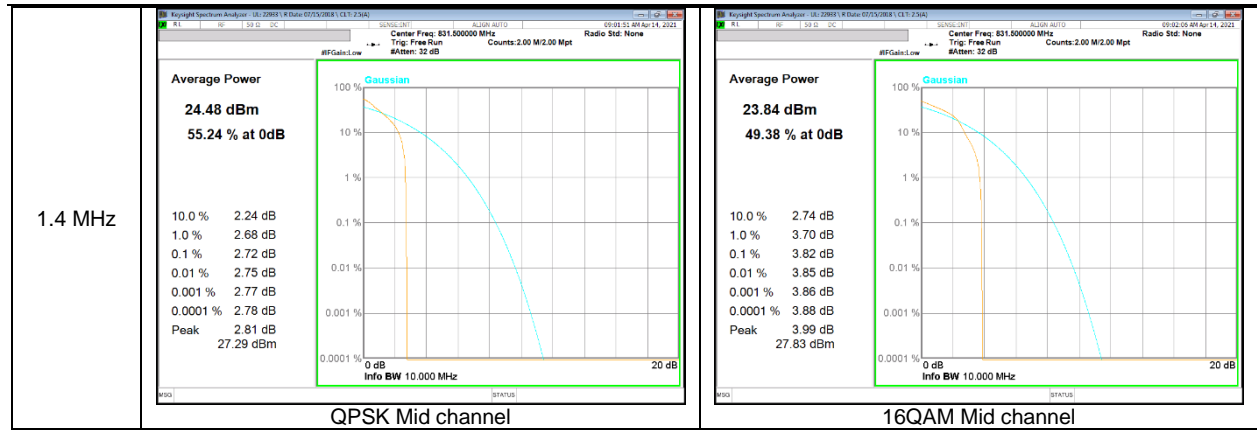
LTE Band 26 (Straddle)



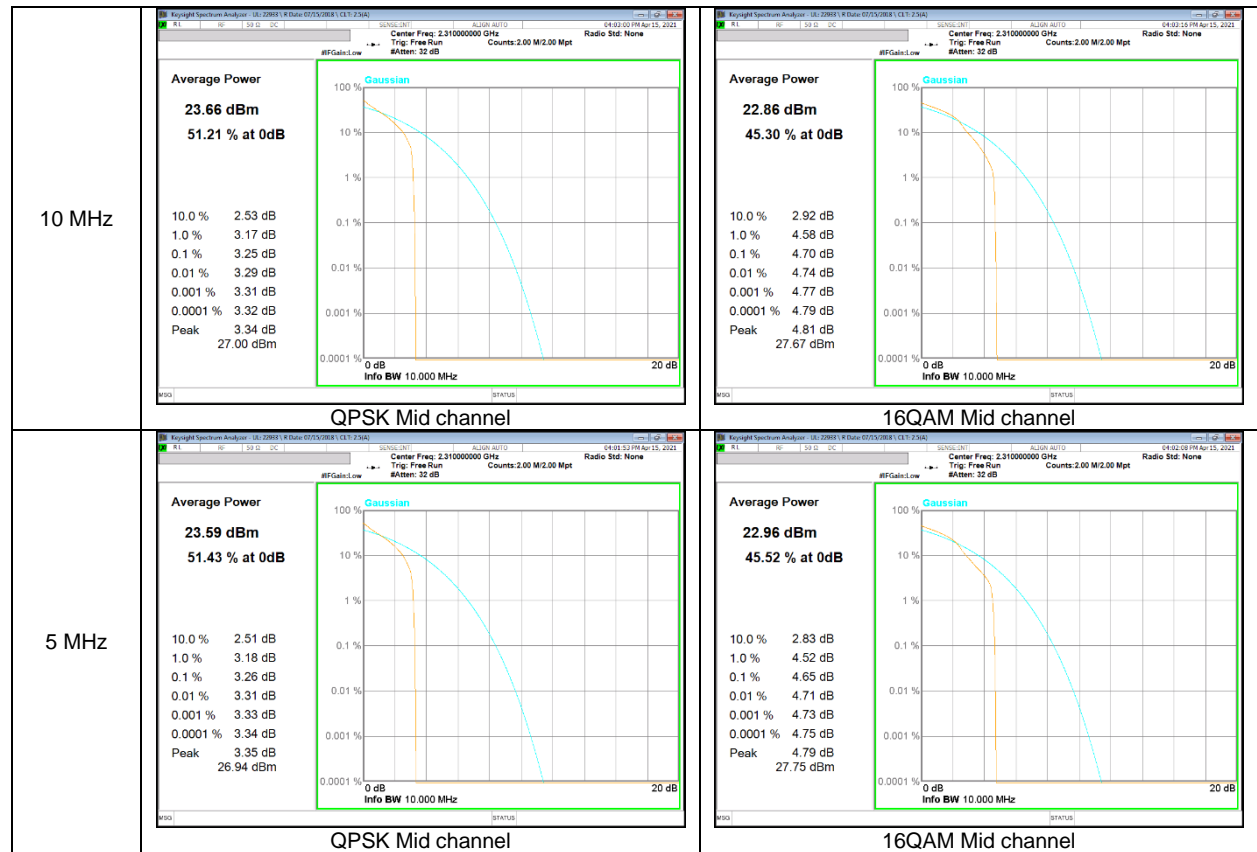


LTE Band 26 (Part 22)

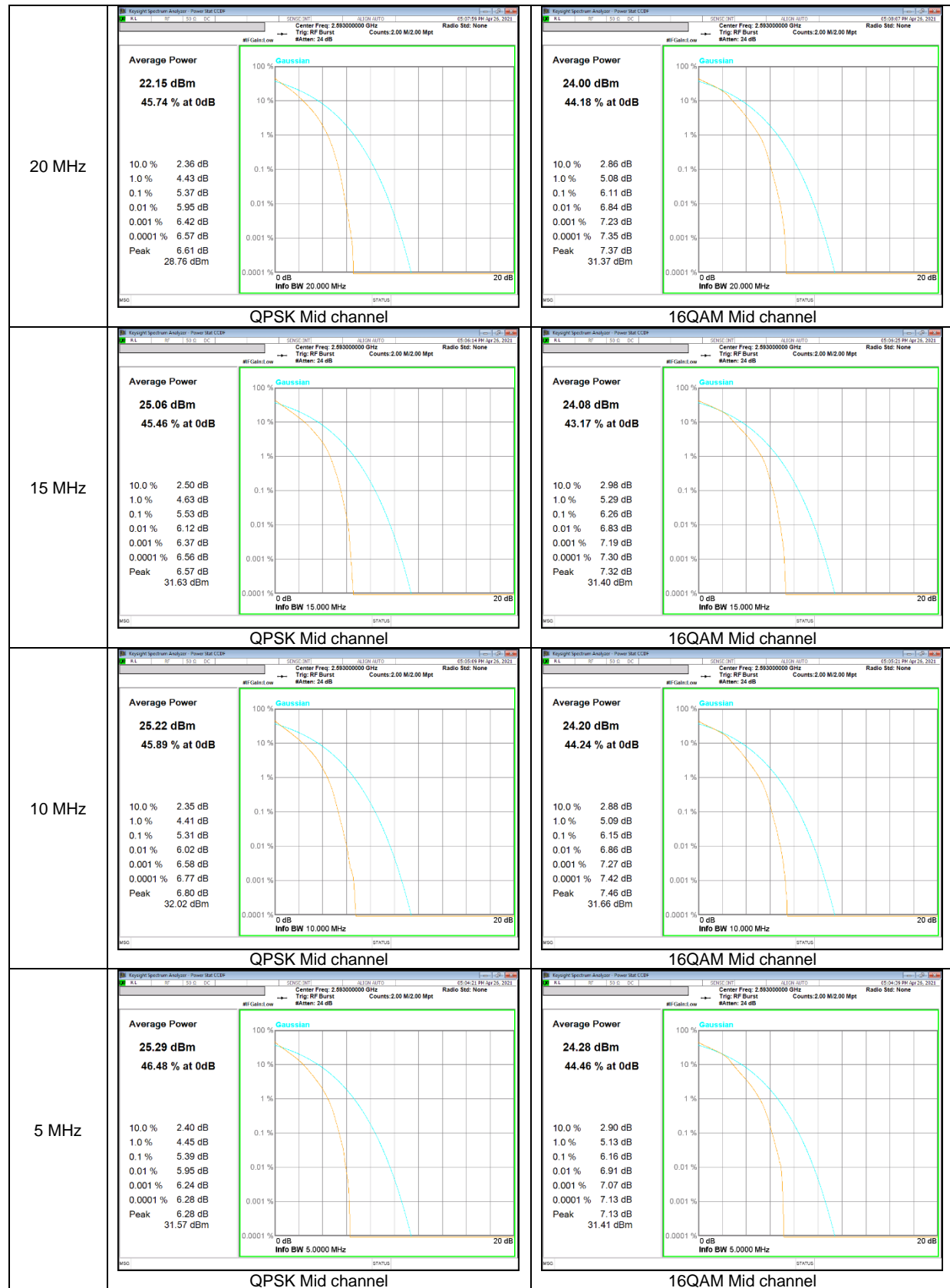




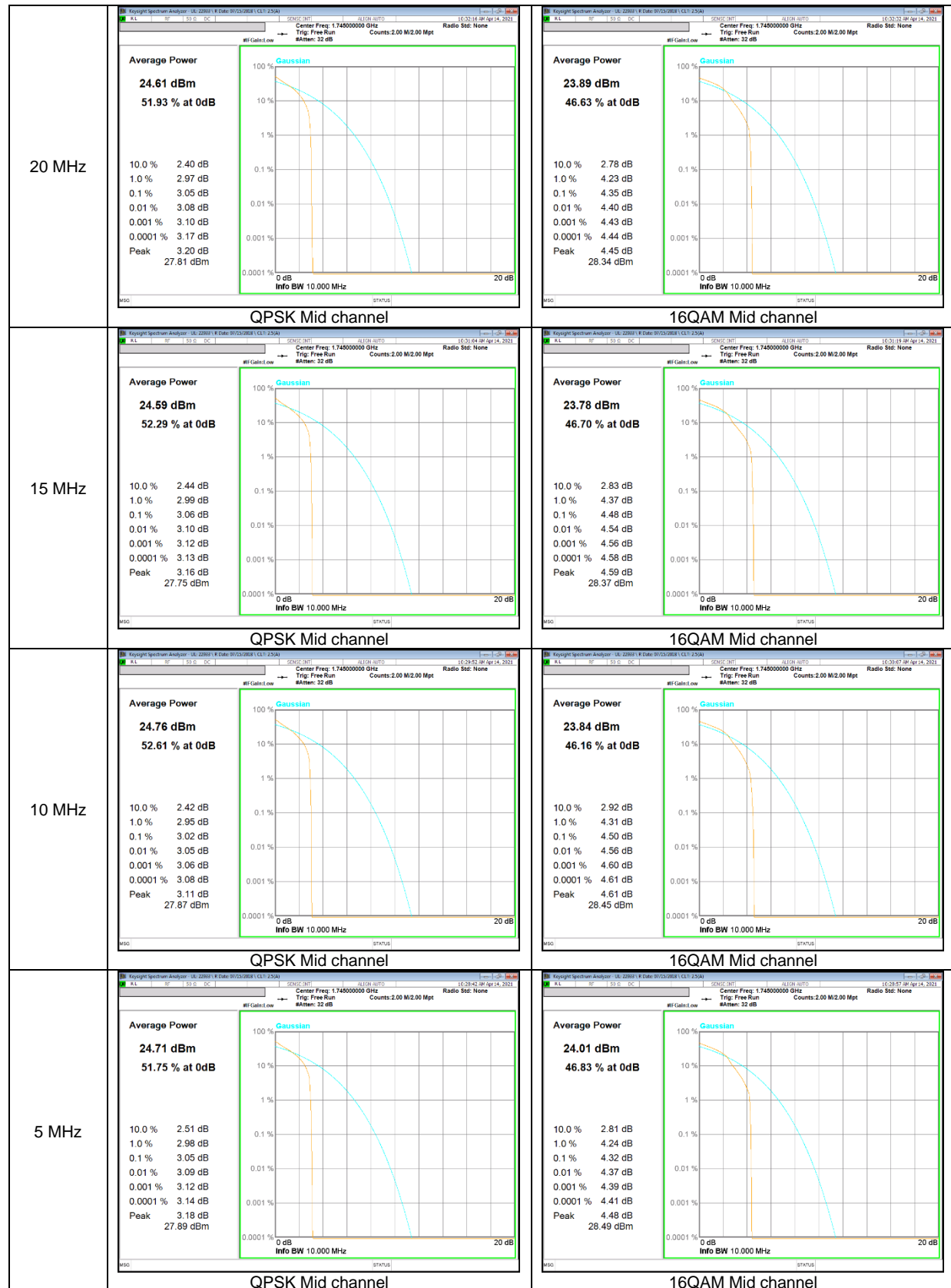
LTE Band 30

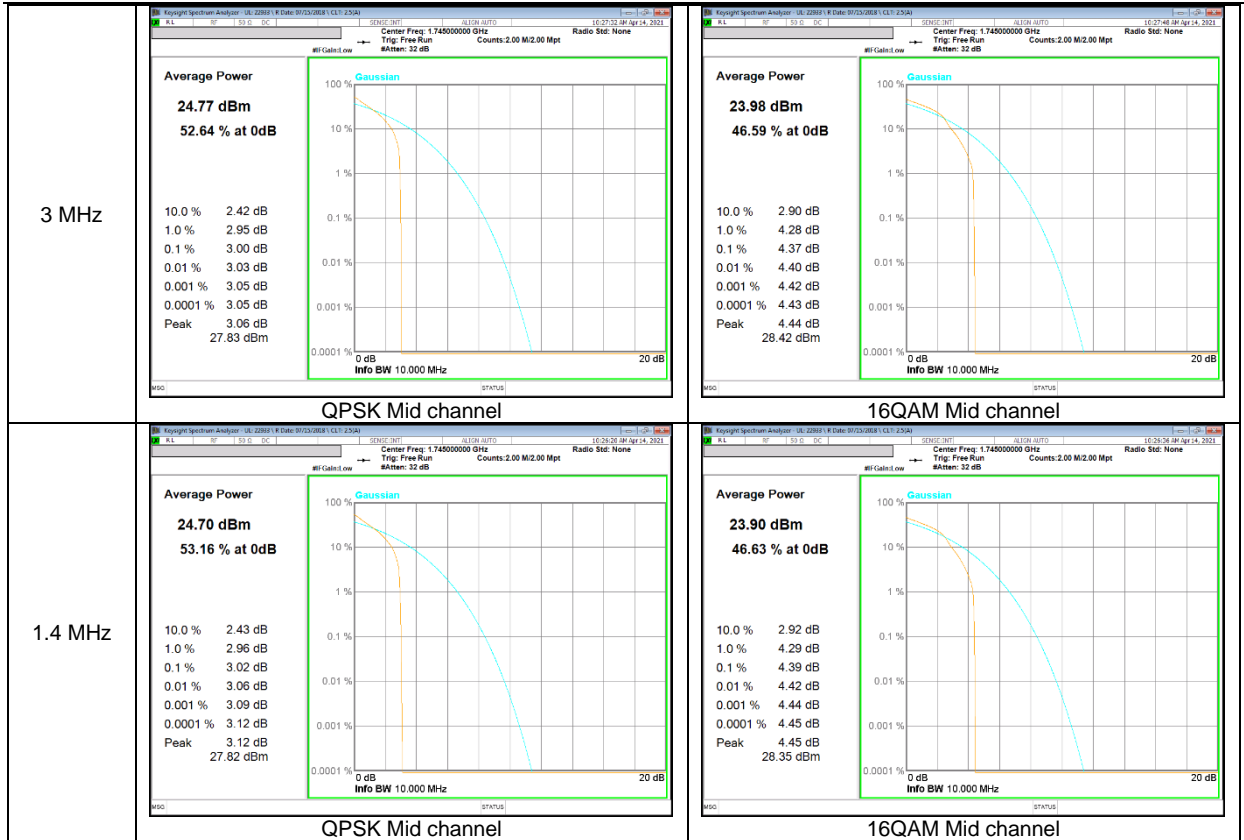


LTE Band 41 (PC2)

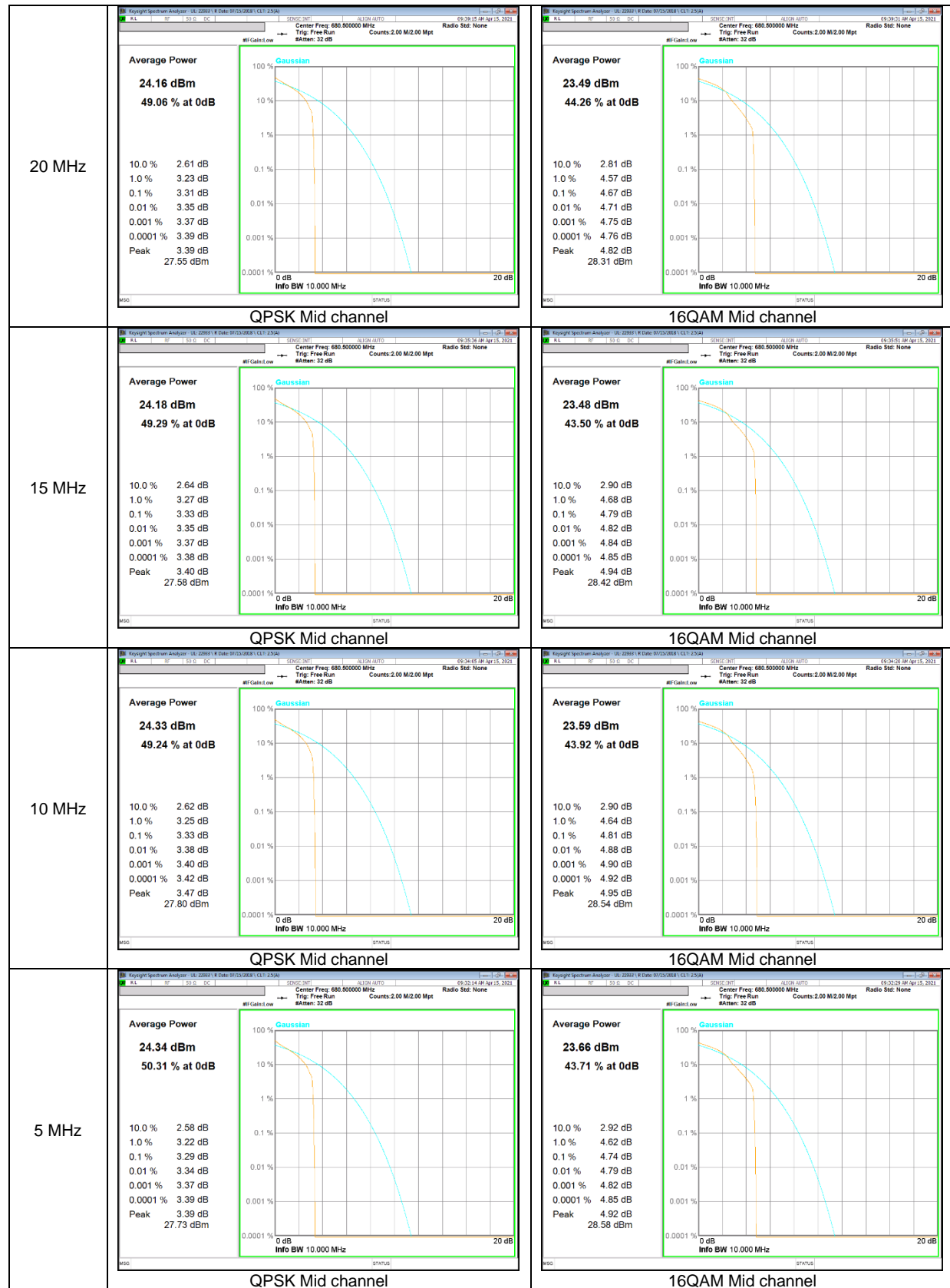


LTE Band 66





LTE Band 71



LTE Band 2

LTE Band 2(Frequency range: 1850-1910 MHz) is covered by LTE Band 25 (Frequency range: 1850-1915 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

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 Band41(PC3)

LTE Band 41(PC3, Frequency range : 2496-2690 MHz) is covered by LTE Band 41(PC2) (Frequency range: 2496-2690 MHz) due to same frequency range, same channel bandwidth and maximum tune-up limit is higher than LTE Band41(PC3).