

ANNEX A.4. OCCUPIED BANDWIDTH

Reference

FCC: CFR Part 2.1049(h) (i)

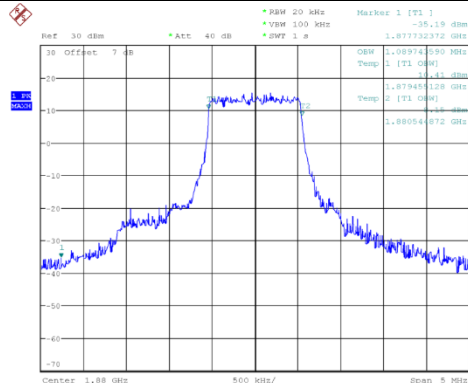
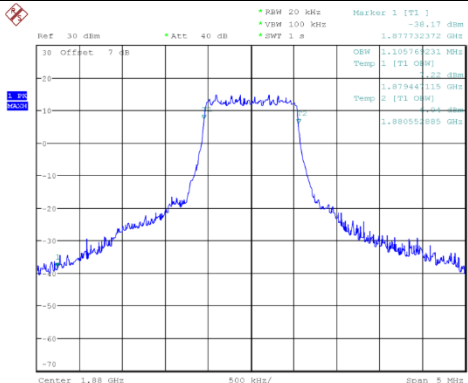
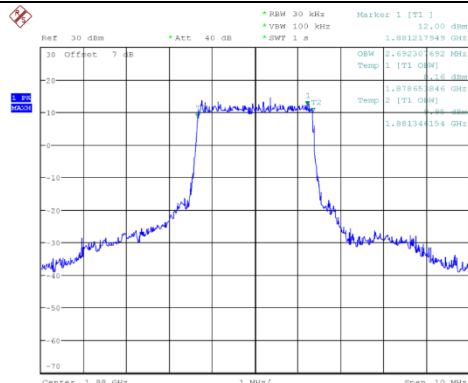
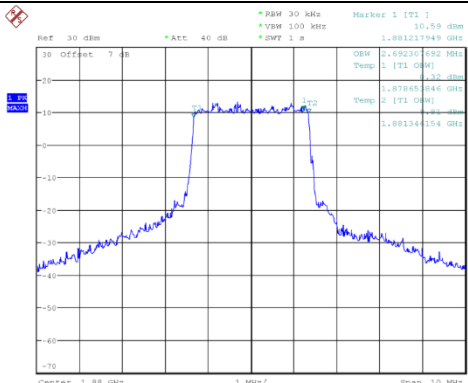
A.4.1 Occupied Bandwidth Results

Occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the US Cellular/PCS frequency bands. The table below lists the measured 99% BW. Spectrum analyzer plots are included on the following pages.

The measurement method is from KDB 971168 4:

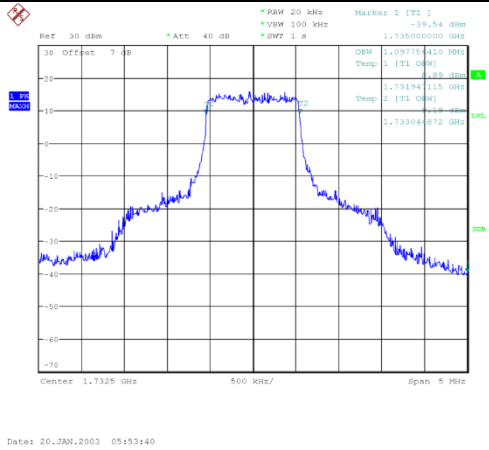
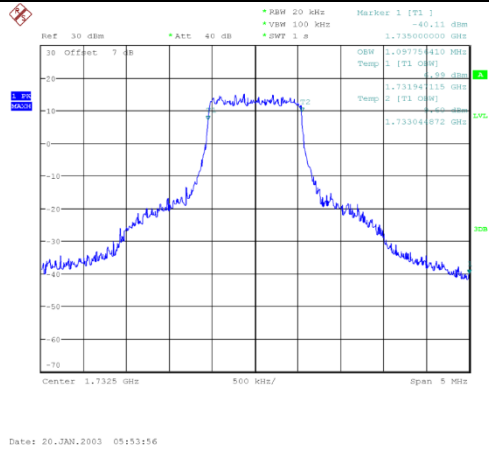
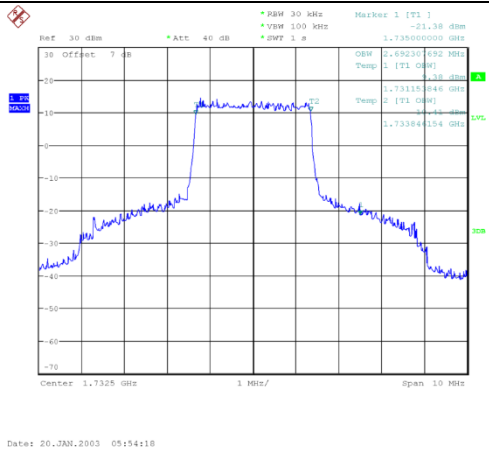
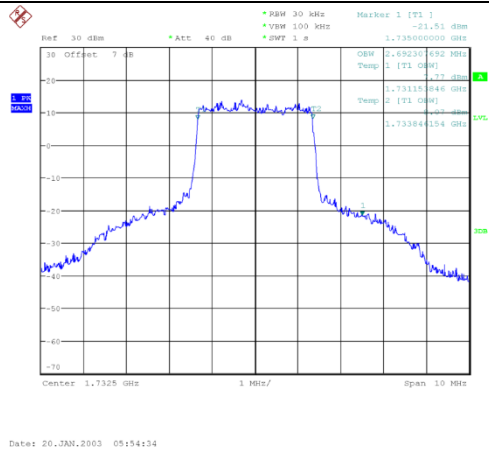
- a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts (i.e., two to five times the OBW).
- b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1 to 5 % of the anticipated OBW, and the VBW shall be at least 3 times the RBW.
- c) Set the reference level of the instrument as required to keep the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope must be at least $10\log(\text{OBW} / \text{RBW})$ below the reference level.
- d) Set the detection mode to peak, and the trace mode to max hold.
- e) Use the 99 % power bandwidth function of the spectrum analyzer and report the measured bandwidth.

Occupied Bandwidth Measurement Results:

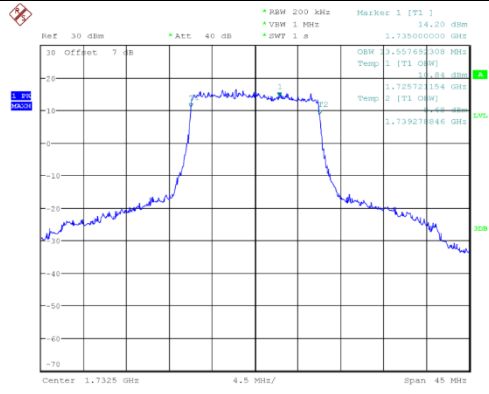
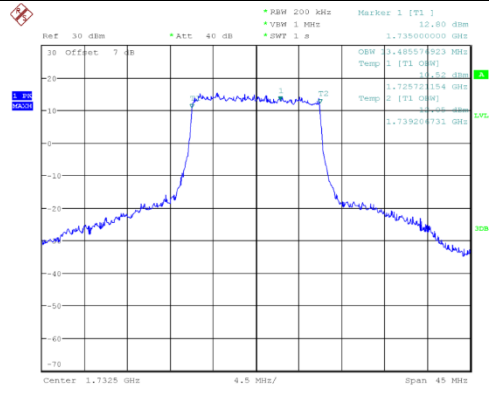
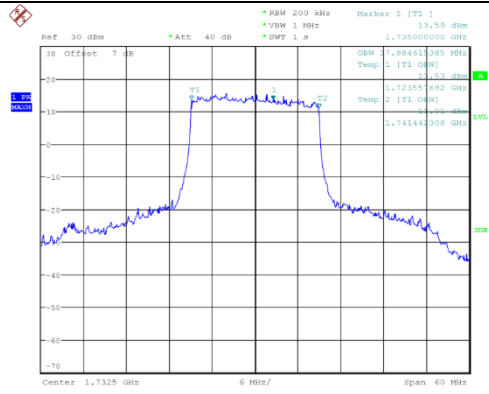
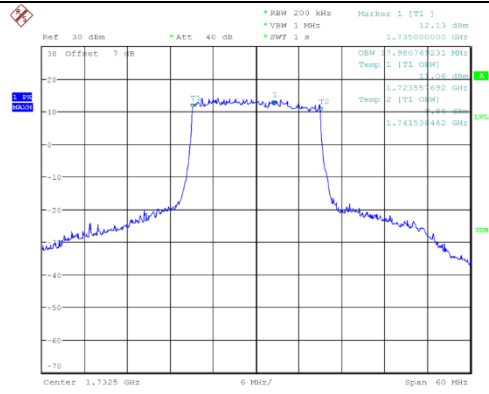
| LTE band 2 | | |
|--|---|-------|
| Frequency(MHz) | Occupied Bandwidth (99%)(MHz) | |
| 1880.0 | QPSK | 16QAM |
| | 1.09 | 1.09 |
| LTE band 2, 1.4MHz Bandwidth, QPSK (99% BW) | LTE band 2, 1.4MHz Bandwidth, 16QAM (99% BW) | |
|  <p>Ref: 30 dBm, Att: 40 dB, Span: 5 MHz, Center: 1.88 GHz, Date: 20. JAN. 2003 06:30:04</p> |  <p>Ref: 30 dBm, Att: 40 dB, Span: 5 MHz, Center: 1.88 GHz, Date: 20. JAN. 2003 06:30:20</p> | |
| Frequency(MHz) | Occupied Bandwidth (99%)(MHz) | |
| 1880.0 | QPSK | 16QAM |
| | 2.69 | 2.69 |
| LTE band 2, 3MHz Bandwidth, QPSK (99% BW) | LTE band 2, 3MHz Bandwidth, 16QAM (99% BW) | |
|  <p>Ref: 30 dBm, Att: 40 dB, Span: 10 MHz, Center: 1.88 GHz, Date: 20. JAN. 2003 05:48:22</p> |  <p>Ref: 30 dBm, Att: 40 dB, Span: 10 MHz, Center: 1.88 GHz, Date: 20. JAN. 2003 05:48:38</p> | |

Page Number: 43 of 81
Report Issued Date: Aug.07.2020

| Frequency(MHz) | Occupied Bandwidth (99%)(MHz) | |
|--|--|-------|
| 1880.0 | QPSK | 16QAM |
| | 13.56 | 13.56 |
| LTE band 2, 15MHz Bandwidth, QPSK (99% BW) | LTE band 2, 15MHz Bandwidth, 16QAM (99% BW) | |
| <div><div>Ref: 30 dBm</div><div>*Att: 40 dB</div><div>*RBW 200 kHz</div><div>*VSW 1 MHz</div><div>*Span 45 MHz</div><div>Marker 1 [T1]</div><div>13.46 dBm</div><div>1.883237949 GHz</div><div>1.557652008 MHz</div><div>Temp 1 [T1 QAM]</div><div>1.69 dBm</div><div>1.873221154 GHz</div><div>Temp 2 [T2 QAM]</div><div>1.69 dBm</div><div>1.886778846 GHz</div></div> | <div><div>Ref: 30 dBm</div><div>*Att: 40 dB</div><div>*RBW 200 kHz</div><div>*VSW 1 MHz</div><div>*Span 45 MHz</div><div>Marker 1 [T1]</div><div>13.41 dBm</div><div>1.883237949 GHz</div><div>1.557652008 MHz</div><div>Temp 1 [T1 QAM]</div><div>1.68 dBm</div><div>1.873221154 GHz</div><div>Temp 2 [T2 QAM]</div><div>1.68 dBm</div><div>1.886778846 GHz</div></div> | |
| Frequency(MHz) | Occupied Bandwidth (99%)(MHz) | |
| 1880.0 | QPSK | 16QAM |
| | 17.89 | 17.98 |
| LTE band 2, 20MHz Bandwidth, QPSK (99% BW) | LTE band 2, 20MHz Bandwidth, 16QAM (99% BW) | |
| <div><div>Ref: 30 dBm</div><div>*Att: 40 dB</div><div>*RBW 200 kHz</div><div>*VSW 1 MHz</div><div>*Span 60 MHz</div><div>Marker 1 [T1]</div><div>13.26 dBm</div><div>1.883237949 GHz</div><div>1.557652008 MHz</div><div>Temp 1 [T1 QAM]</div><div>1.16 dBm</div><div>1.873054492 GHz</div><div>Temp 2 [T2 QAM]</div><div>1.16 dBm</div><div>1.889034462 GHz</div></div> | <div><div>Ref: 30 dBm</div><div>*Att: 40 dB</div><div>*RBW 200 kHz</div><div>*VSW 1 MHz</div><div>*Span 60 MHz</div><div>Marker 1 [T1]</div><div>13.64 dBm</div><div>1.883237949 GHz</div><div>1.557652008 MHz</div><div>Temp 1 [T1 QAM]</div><div>1.79 dBm</div><div>1.873054492 GHz</div><div>Temp 2 [T2 QAM]</div><div>1.79 dBm</div><div>1.889034462 GHz</div></div> | |

| LTE band 4 | | |
|---|--------------------------------|--|
| Frequency(MHz) | Occupied Bandwidth (99%)(MHz) | |
| 1732.5 | QPSK | 16QAM |
| | 1.09 | 1.09 |
| LTE band 4, 1.4MHz Bandwidth, QPSK (99% BW) | | LTE band 4, 1.4MHz Bandwidth, 16QAM (99% BW) |
|  | |  |
| Frequency(MHz) | Occupied Bandwidth (99%)(MHz) | |
| 1732.5 | QPSK | 16QAM |
| | 2.69 | 2.69 |
| LTE band 4, 3MHz Bandwidth, QPSK (99% BW) | | LTE band 4, 3MHz Bandwidth, 16QAM (99% BW) |
|  | |  |

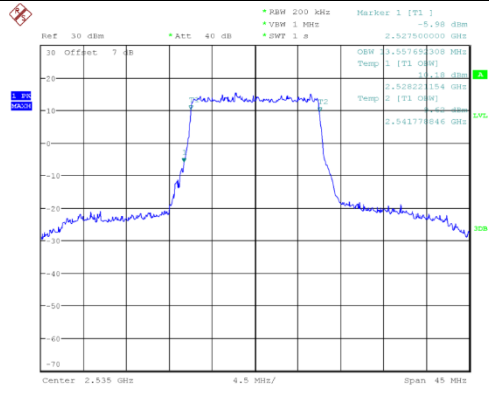
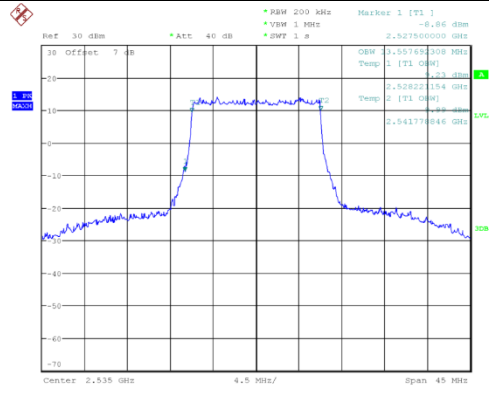
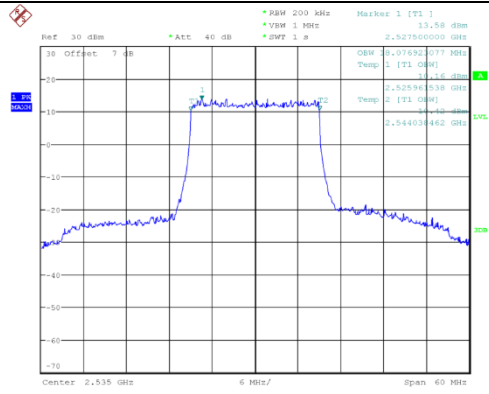
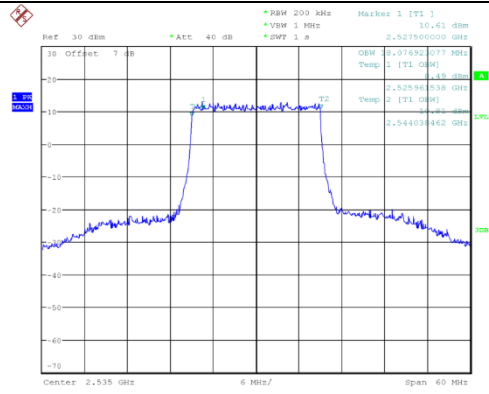
| Frequency(MHz) | Occupied Bandwidth (99%)(MHz) | |
|---|--|-------|
| 1732.5 | QPSK | 16QAM |
| | 4.50 | 4.50 |
| LTE band 4, 5MHz Bandwidth, QPSK (99% BW) | LTE band 4, 5MHz Bandwidth, 16QAM (99% BW) | |
| | | |
| Frequency(MHz) | Occupied Bandwidth (99%)(MHz) | |
| 1732.5 | QPSK | 16QAM |
| | 8.94 | 8.94 |
| LTE band 4, 10MHz Bandwidth, QPSK (99% BW) | LTE band 4, 10MHz Bandwidth, 16QAM (99% BW) | |
| | | |

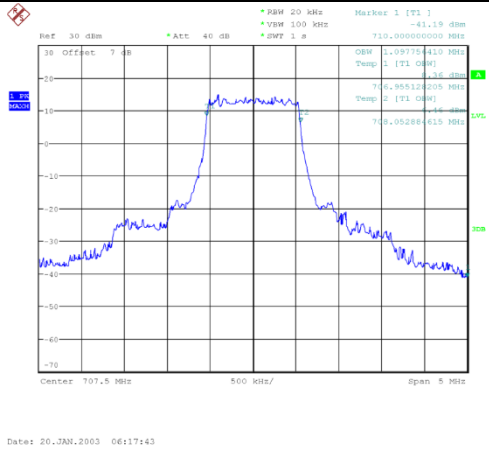
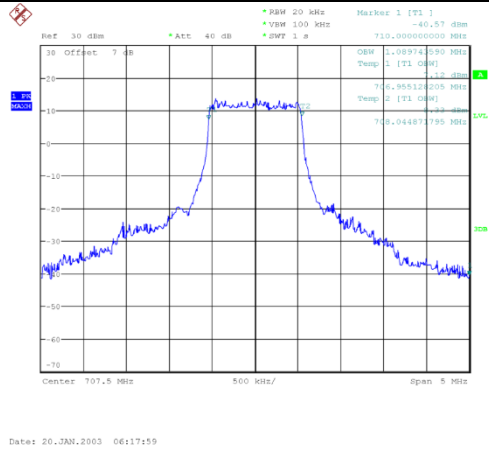
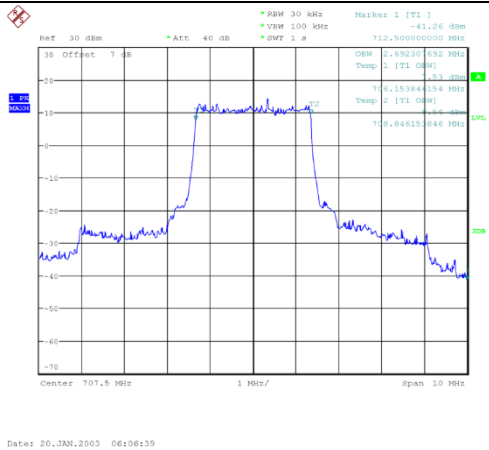
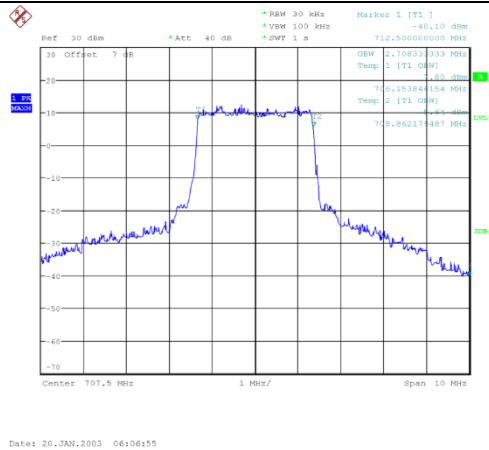
| Frequency(MHz) | Occupied Bandwidth (99%)(MHz) | |
|--|---|-------|
| 1732.5 | QPSK | 16QAM |
| | 13.56 | 13.49 |
| LTE band 4, 15MHz Bandwidth, QPSK (99% BW) | LTE band 4, 15MHz Bandwidth, 16QAM (99% BW) | |
|  <p>Ref: 30 dBm * RBW 200 kHz Marker 1 [T1] 14.20 dBm * VBW 1 MHz 1.732500000 GHz * SWF 1 #</p> <p>OSW 13.55762308 MHz Temp 1 [T1] 0dB 1.72572154 GHz Temp 2 [T1] 0dB 1.73927046 GHz</p> <p>Center 1.7325 GHz 4.5 MHz/ Span 45 MHz</p> <p>Date: 20.JAN.2003 05:56:43</p> |  <p>Ref: 30 dBm * RBW 200 kHz Marker 1 [T1] 12.80 dBm * VBW 1 MHz 1.732500000 GHz * SWF 1 #</p> <p>OSW 13.489574023 MHz Temp 1 [T1] 0dB 1.72572154 GHz Temp 2 [T1] 0dB 1.73927046 GHz</p> <p>Center 1.7325 GHz 4.5 MHz/ Span 45 MHz</p> <p>Date: 20.JAN.2003 05:56:59</p> | |
| Frequency(MHz) | Occupied Bandwidth (99%)(MHz) | |
| 1732.5 | QPSK | 16QAM |
| | 17.89 | 17.89 |
| LTE band 4, 20MHz Bandwidth, QPSK (99% BW) | LTE band 4, 20MHz Bandwidth, 16QAM (99% BW) | |
|  <p>Ref: 30 dBm * RBW 200 kHz Marker 1 [T1] 13.59 dBm * VBW 1 MHz 1.730000000 GHz * SWF 1 #</p> <p>OSW 17.884411305 MHz Temp 1 [T1] 0dB 1.72358492 GHz Temp 2 [T1] 0dB 1.74144208 GHz</p> <p>Center 1.7325 GHz 6 MHz/ Span 60 MHz</p> <p>Date: 20.JAN.2003 05:57:22</p> |  <p>Ref: 30 dBm * RBW 200 kHz Marker 1 [T1] 12.13 dBm * VBW 1 MHz 1.730000000 GHz * SWF 1 #</p> <p>OSW 17.88074231 MHz Temp 1 [T1] 0dB 1.72358492 GHz Temp 2 [T1] 0dB 1.74153442 GHz</p> <p>Center 1.7325 GHz 6 MHz/ Span 60 MHz</p> <p>Date: 20.JAN.2003 05:57:38</p> | |

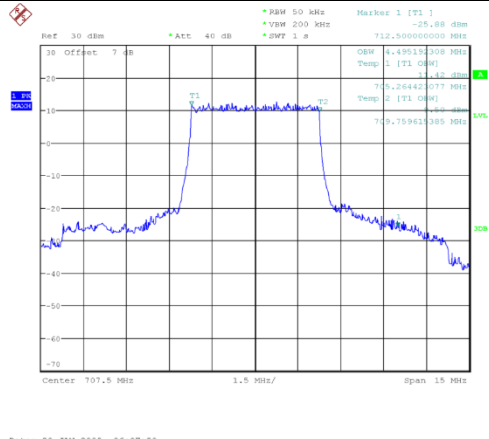
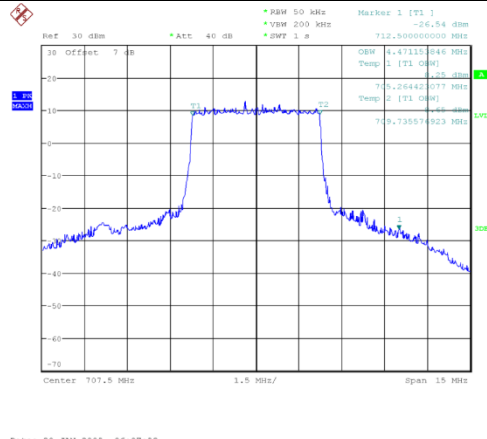
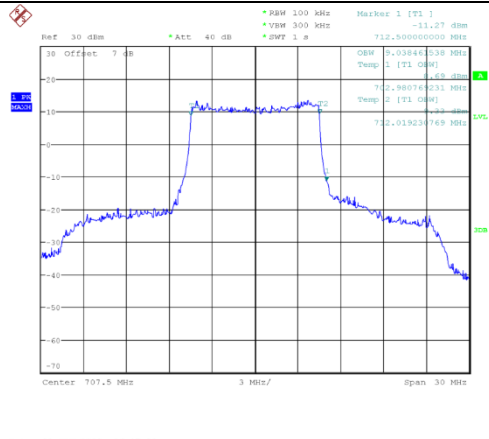
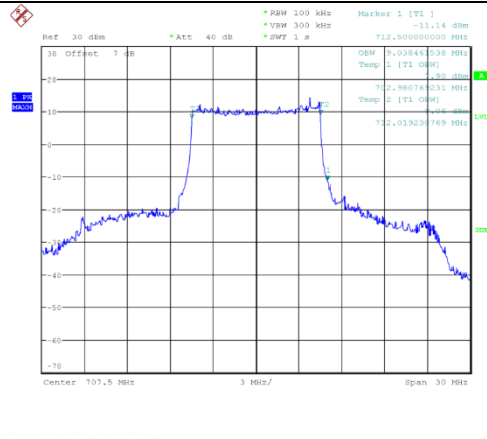
Page Number: 48 of 81
Report Issued Date: Aug.07.2020

Page Number: 49 of 81
Report Issued Date: Aug.07.2020

Page Number: 50 of 81
Report Issued Date: Aug.07.2020

| Frequency(MHz) | Occupied Bandwidth (99%)(MHz) | |
|---|--|-------|
| 2535.0 | QPSK | 16QAM |
| | 13.36 | 13.36 |
| LTE band 7, 15MHz Bandwidth, QPSK (99% BW) | LTE band 7, 15MHz Bandwidth, 16QAM (99% BW) | |
|  |  | |
| Date: 20.JAN.2003 06:03:25 | Date: 20.JAN.2003 06:03:41 | |
| Frequency(MHz) | Occupied Bandwidth (99%)(MHz) | |
| 2535.0 | QPSK | 16QAM |
| | 18.07 | 18.07 |
| LTE band 7, 20MHz Bandwidth, QPSK (99% BW) | LTE band 7, 20MHz Bandwidth, 16QAM (99% BW) | |
|  |  | |
| Date: 20.JAN.2003 06:04:02 | Date: 20.JAN.2003 06:04:18 | |

| LTE band 12 | | |
|---|--------------------------------|--|
| Frequency(MHz) | Occupied Bandwidth (99%)(MHz) | |
| 707.5 | QPSK | 16QAM |
| | 1.09 | 1.09 |
| LTE band 12, 1.4MHz Bandwidth, QPSK (99% BW) | | LTE band 12, 1.4MHz Bandwidth, 16QAM (99% BW) |
|  | |  |
| Frequency(MHz) | Occupied Bandwidth (99%)(MHz) | |
| 707.5 | QPSK | 16QAM |
| | 2.69 | 2.68 |
| LTE band 12, 3MHz Bandwidth, QPSK (99% BW) | | LTE band 12, 3MHz Bandwidth, 16QAM (99% BW) |
|  | |  |

| Frequency(MHz) | Occupied Bandwidth (99%)(MHz) | |
|---|--|-------|
| 707.5 | QPSK | 16QAM |
| | 4.49 | 4.47 |
| LTE band 12, 5MHz Bandwidth, QPSK (99% BW) | LTE band 12, 5MHz Bandwidth, 16QAM (99% BW) | |
|  |  | |
| Frequency(MHz) | Occupied Bandwidth (99%)(MHz) | |
| 707.5 | QPSK | 16QAM |
| | 9.04 | 9.04 |
| LTE band 12, 10MHz Bandwidth, QPSK (99% BW) | LTE band 12, 10MHz Bandwidth, 16QAM (99% BW) | |
|  |  | |

ANNEX A.5. EMISSION BANDWIDTH

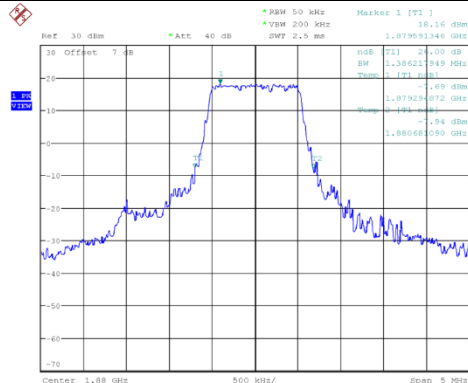
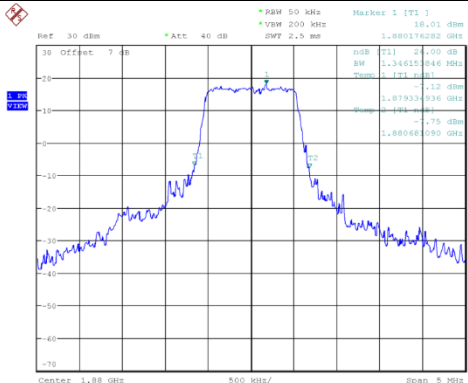
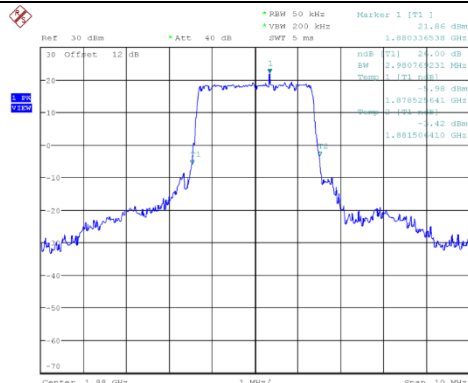
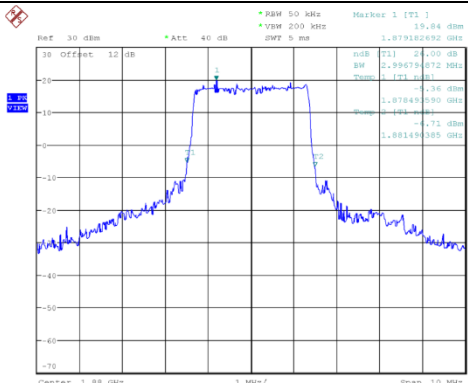
Reference

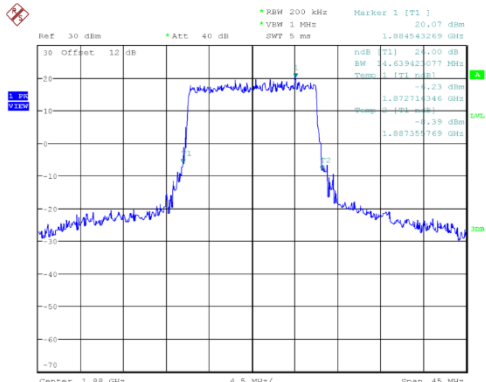
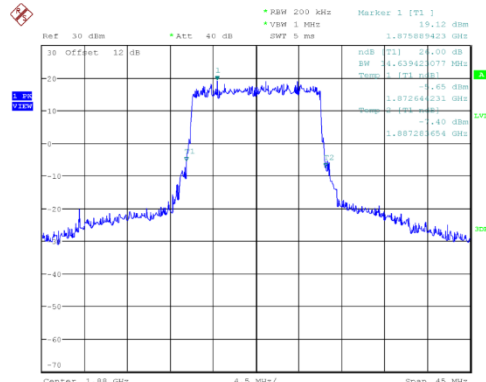
FCC: CFR Part 22.917(b),24.238(a), 27.53(g),27.53(h), 27.53(m)

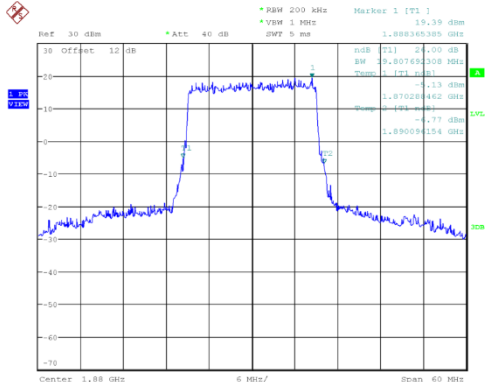
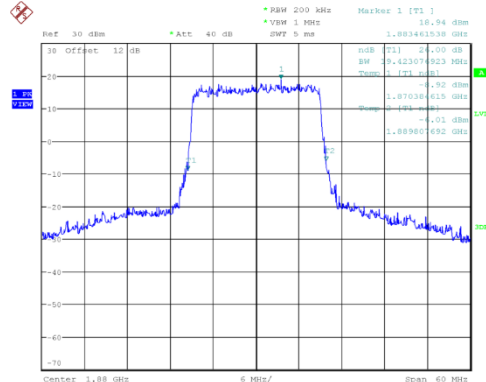
A.5.1 Emission Bandwidth Results

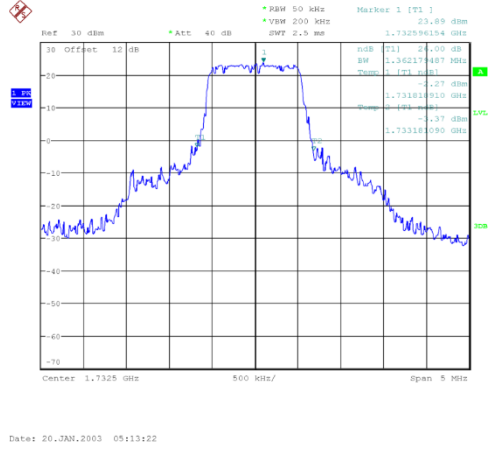
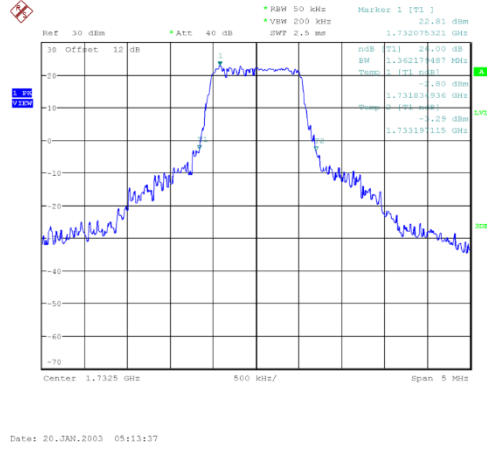
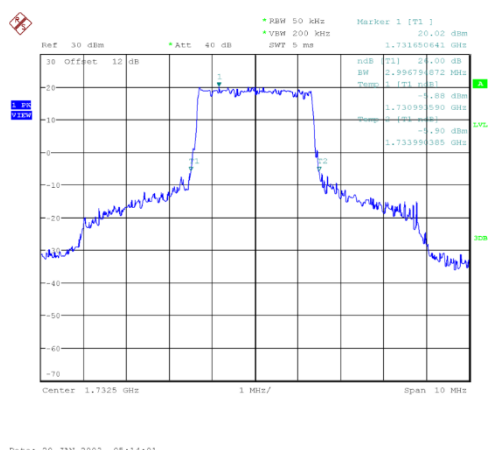
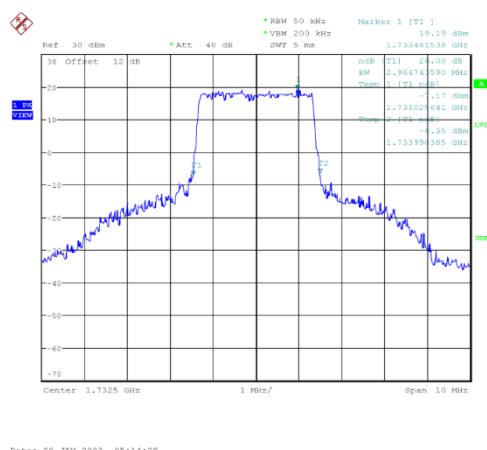
The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. Table below lists the measured -26dBc BW. Spectrum analyzer plots are included on the following pages.

Emission Bandwidth Measurement Results:

| LTE band 2 | | |
|---|--|-------|
| Frequency(MHz) | Occupied Bandwidth (-26dBc)(MHz) | |
| 1880.0 | QPSK | 16QAM |
| | 1.39 | 1.35 |
| LTE band 2, 1.4MHz Bandwidth, QPSK (-26dBc BW) | LTE band 2, 1.4MHz Bandwidth, 16QAM (-26dBc BW) | |
|  |  | |
| Date: 20..JAN.2003 06:35:03 | | |
| Date: 20..JAN.2003 06:35:19 | | |
| Frequency(MHz) | Occupied Bandwidth (-26dBc)(MHz) | |
| 1880.0 | QPSK | 16QAM |
| | 2.98 | 2.99 |
| LTE band 2, 3MHz Bandwidth, QPSK (-26dBc BW) | LTE band 2, 3MHz Bandwidth, 16QAM (-26dBc BW) | |
|  |  | |
| Date: 20..JAN.2003 05:10:14 | | |
| Date: 20..JAN.2003 05:10:30 | | |

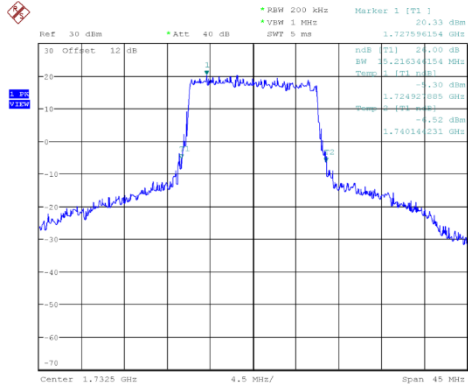
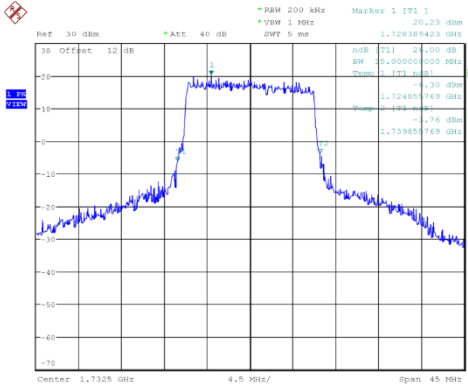
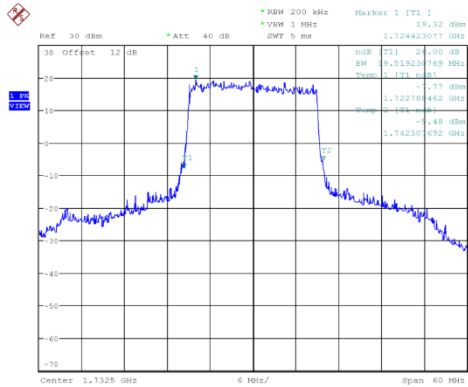
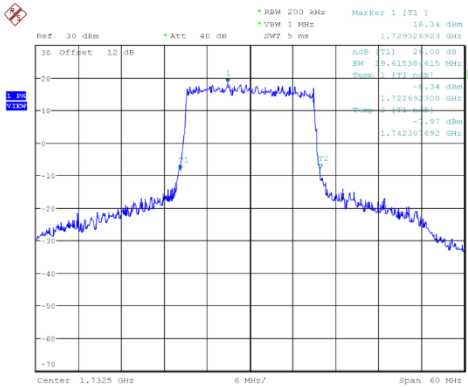
| Frequency(MHz) | | Occupied Bandwidth (-26dBc)(MHz) | |
|---|-------|--|--|
| 1880.0 | QPSK | 16QAM | |
| | 14.64 | 14.64 | |
| LTE band 2, 15MHz Bandwidth, QPSK (-26dBc BW) | | LTE band 2, 15MHz Bandwidth, 16QAM (-26dBc BW) | |
|  | |  | |
| Date: 20.JAN.2003 05:12:08 | | Date: 20.JAN.2003 05:12:21 | |

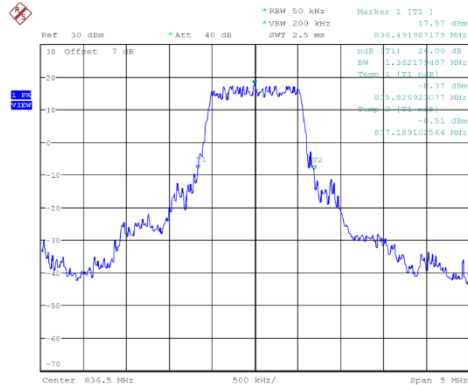
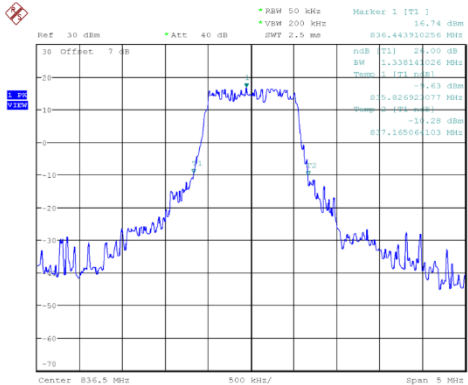
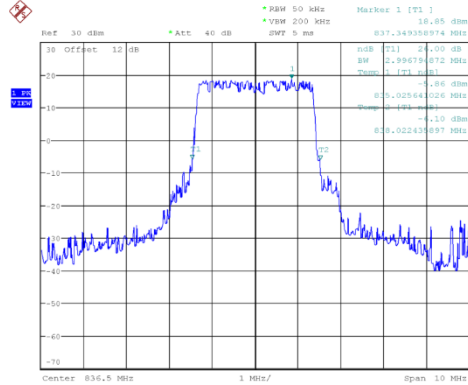
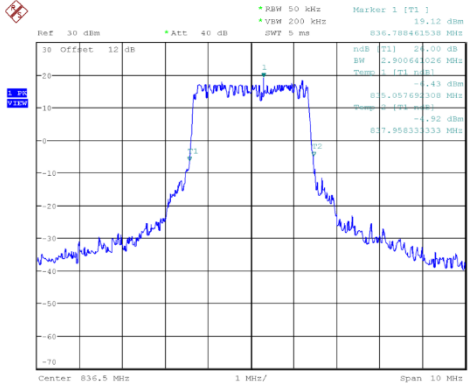
| Frequency(MHz) | | Occupied Bandwidth (-26dBc)(MHz) | |
|---|-------|--|--|
| 1880.0 | QPSK | 16QAM | |
| | 19.81 | 19.42 | |
| LTE band 2, 20MHz Bandwidth, QPSK (-26dBc BW) | | LTE band 2, 20MHz Bandwidth, 16QAM (-26dBc BW) | |
|  | |  | |
| Date: 20.JAN.2003 05:12:41 | | Date: 20.JAN.2003 05:12:54 | |

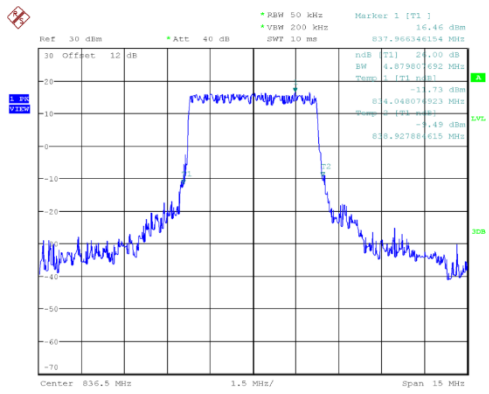
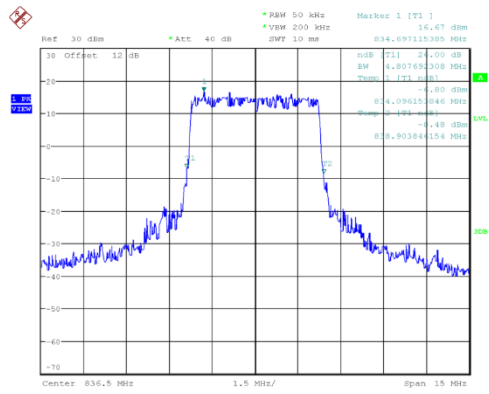
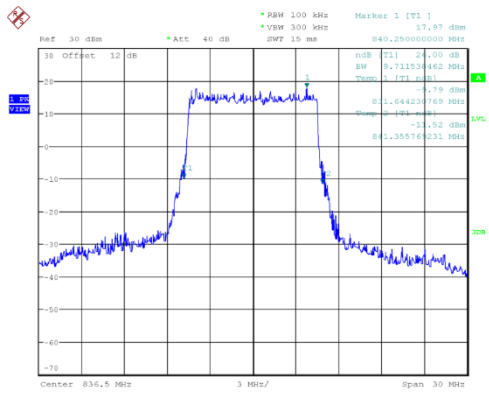
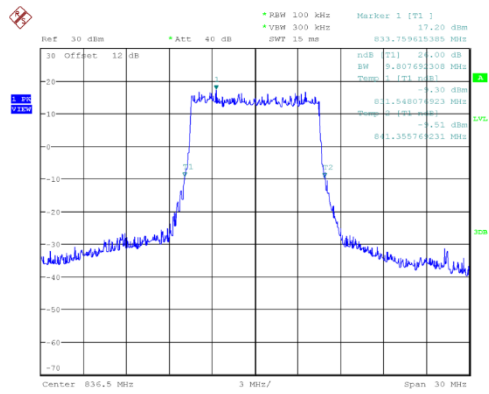
| LTE band 4 | | |
|---|--|-------|
| Frequency(MHz) | Occupied Bandwidth (-26dBc)(MHz) | |
| 1732.5 | QPSK | 16QAM |
| | 1.36 | 1.36 |
| LTE band 4, 1.4MHz Bandwidth, QPSK (-26dBc BW) | LTE band 4, 1.4MHz Bandwidth, 16QAM (-26dBc BW) | |
|  |  | |
| Frequency(MHz) | Occupied Bandwidth (-26dBc)(MHz) | |
| 1732.5 | QPSK | 16QAM |
| | 2.99 | 2.96 |
| LTE band 4, 3MHz Bandwidth, QPSK (-26dBc BW) | LTE band 4, 3MHz Bandwidth, 16QAM (-26dBc BW) | |
|  |  | |

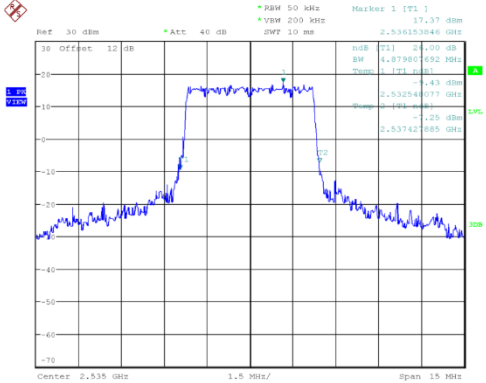
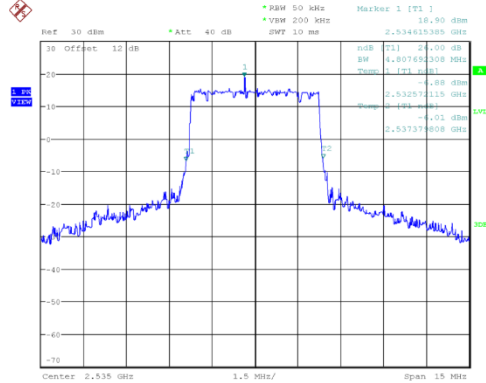
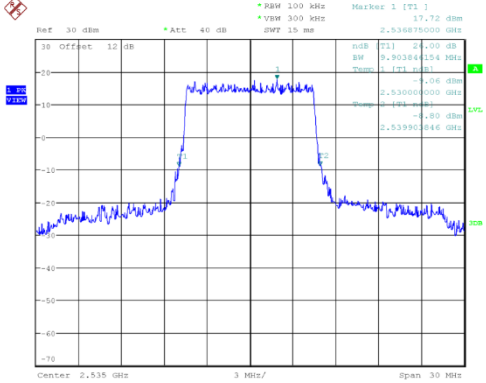
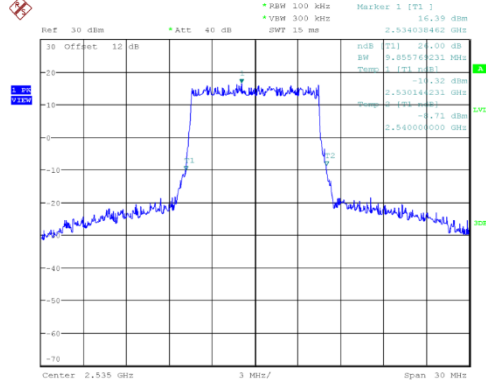
| Frequency(MHz) | Occupied Bandwidth (-26dBc)(MHz) | |
|--|--|-------|
| 1732.5 | QPSK | 16QAM |
| | 4.93 | 4.86 |
| LTE band 4, 5MHz Bandwidth, QPSK (-26dBc BW) | LTE band 4, 5MHz Bandwidth, 16QAM (-26dBc BW) | |
| <p>Ref 30 dBm Offset 12 dB Att 40 dB BW 50 kHz VM 200 kHz SWT 10 ms Marker 1 [T1] 1.7325000 GHz 24.00 dBm BW 5.0000000 MHz Tspan 1.731 GHz -0.46 dBm 1.730000000 GHz -0.48 dBm 1.734920000 GHz</p> | <p>Ref 30 dBm Offset 12 dB Att 40 dB BW 50 kHz VM 200 kHz SWT 10 ms Marker 1 [T1] 1.7325000 GHz 24.00 dBm BW 5.0000000 MHz Tspan 1.731 GHz -0.84 dBm 1.730000000 GHz -0.35 dBm 1.734920000 GHz</p> | |
| Date: 20.JAN.2003 05:15:09 | | |
| Date: 20.JAN.2003 05:15:25 | | |

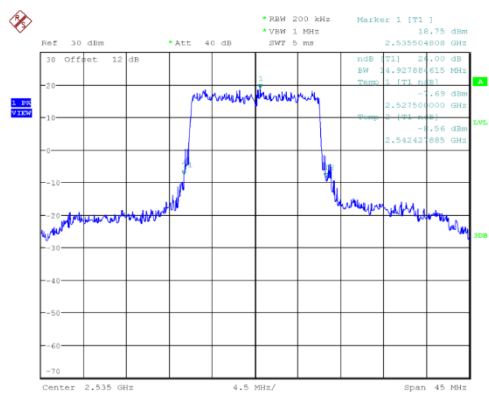
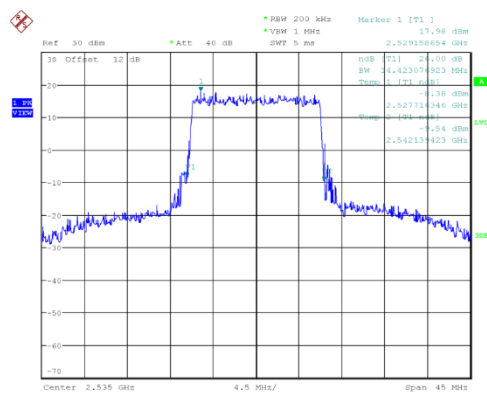
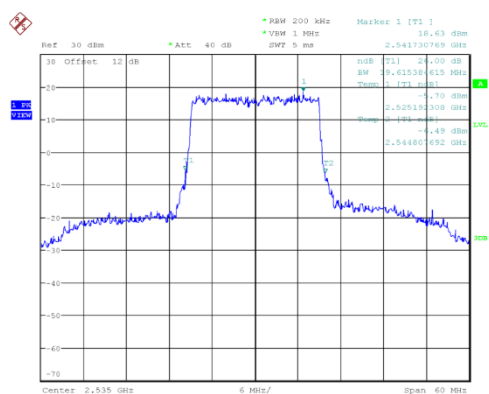
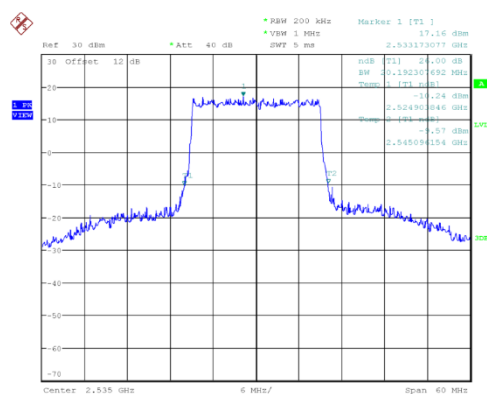
| Frequency(MHz) | Occupied Bandwidth (-26dBc)(MHz) | |
|--|--|-------|
| 1732.5 | QPSK | 16QAM |
| | 9.95 | 9.76 |
| LTE band 4, 10MHz Bandwidth, QPSK (-26dBc BW) | LTE band 4, 10MHz Bandwidth, 16QAM (-26dBc BW) | |
| <p>Ref 30 dBm Offset 12 dB Att 40 dB BW 100 kHz VM 300 kHz SWT 10 ms Marker 1 [T1] 1.7325000 GHz 24.00 dBm BW 10.0000000 MHz Tspan 1.731 GHz -0.77 dBm 1.727500000 GHz -0.02 dBm 1.737490000 GHz</p> | <p>Ref 30 dBm Offset 12 dB Att 40 dB BW 100 kHz VM 300 kHz SWT 10 ms Marker 1 [T1] 1.7325000 GHz 24.00 dBm BW 10.0000000 MHz Tspan 1.731 GHz -0.19 dBm 1.727500000 GHz -0.46 dBm 1.737350000 GHz</p> | |
| Date: 20.JAN.2003 05:15:43 | | |
| Date: 20.JAN.2003 05:15:56 | | |

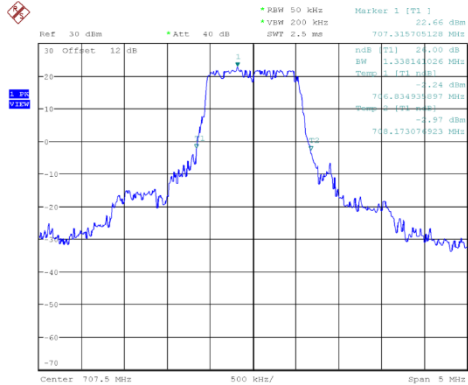
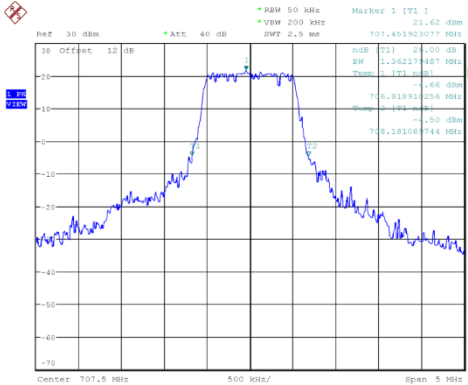
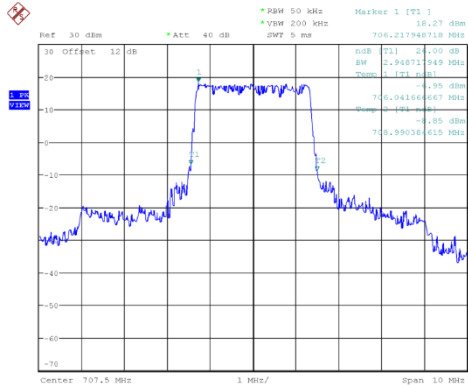
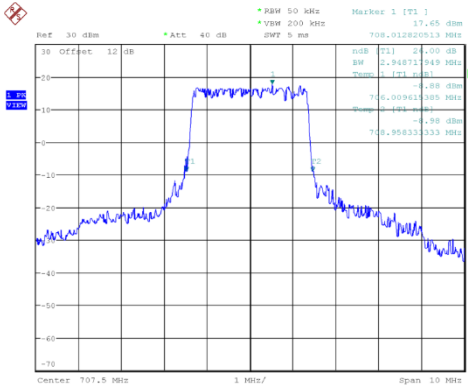
| Frequency(MHz) | | Occupied Bandwidth (-26dBc)(MHz) | |
|---|--|--|-------|
| 1732.5 | | QPSK | 16QAM |
| | | 15.22 | 15.00 |
| LTE band 4, 15MHz Bandwidth, QPSK (-26dBc BW) | | LTE band 4, 15MHz Bandwidth, 16QAM (-26dBc BW) | |
|  <p>Ref: 30 dBm *Att: 40 dB *RBW: 200 kHz Marker: 1 [T1: 1] 20.33 dBm *VBW: 1 MHz BW: 20.33 dBm SWF: 5 ms 1.727596154 GHz dBm [T1: 24.00 dB BW: 20.33 dBm Tspan: 1 [T1: 60.00] 1.724821605 GHz -10.30 dBm 1.740541231 GHz -10.30 dBm 1.738681408 GHz -10.30 dBm 1.739851749 GHz -10.30 dBm 1.738681408 GHz -10.30 dBm 1.740541231 GHz -10.30 dBm 1.724821605 GHz -10.30 dBm 1.727596154 GHz -10.30 dBm 1.7325 GHz 4.5 MHz/ Span: 45 MHz Date: 20.JAN.2003 05:16:15</p> | |  <p>Ref: 30 dBm *Att: 40 dB *RBW: 200 kHz Marker: 1 [T1: 1] 20.23 dBm *VBW: 1 MHz BW: 20.23 dBm SWF: 5 ms 1.728389423 GHz dBm [T1: 24.00 dB BW: 20.23 dBm Tspan: 1 [T1: 60.00] 1.724821605 GHz -10.30 dBm 1.740541231 GHz -10.30 dBm 1.738681408 GHz -10.30 dBm 1.739851749 GHz -10.30 dBm 1.738681408 GHz -10.30 dBm 1.740541231 GHz -10.30 dBm 1.724821605 GHz -10.30 dBm 1.728389423 GHz -10.30 dBm 1.7325 GHz 4.5 MHz/ Span: 45 MHz Date: 20.JAN.2003 05:16:28</p> | |
| Frequency(MHz) | | Occupied Bandwidth (-26dBc)(MHz) | |
| 1732.5 | | QPSK | 16QAM |
| | | 19.52 | 19.61 |
| LTE band 4, 20MHz Bandwidth, QPSK (-26dBc BW) | | LTE band 4, 20MHz Bandwidth, 16QAM (-26dBc BW) | |
|  <p>Ref: 30 dBm *Att: 40 dB *RBW: 200 kHz Marker: 1 [T1: 1] 19.32 dBm *VBW: 1 MHz BW: 19.32 dBm SWF: 5 ms 1.724423077 GHz dBm [T1: 24.00 dB BW: 19.51923769 MHz Tspan: 1 [T1: 60.00] 1.722784462 GHz -10.30 dBm 1.742301692 GHz -10.30 dBm 1.739851749 GHz -10.30 dBm 1.738681408 GHz -10.30 dBm 1.740541231 GHz -10.30 dBm 1.724821605 GHz -10.30 dBm 1.724423077 GHz -10.30 dBm 1.7325 GHz 6 MHz/ Span: 60 MHz Date: 20.JAN.2003 05:16:47</p> | |  <p>Ref: 30 dBm *Att: 40 dB *RBW: 200 kHz Marker: 1 [T1: 1] 19.14 dBm *VBW: 1 MHz BW: 19.14 dBm SWF: 5 ms 1.729326923 GHz dBm [T1: 24.00 dB BW: 19.61538115 MHz Tspan: 1 [T1: 60.00] 1.722784462 GHz -10.30 dBm 1.742301692 GHz -10.30 dBm 1.739851749 GHz -10.30 dBm 1.738681408 GHz -10.30 dBm 1.740541231 GHz -10.30 dBm 1.724821605 GHz -10.30 dBm 1.729326923 GHz -10.30 dBm 1.7325 GHz 6 MHz/ Span: 60 MHz Date: 20.JAN.2003 05:17:00</p> | |

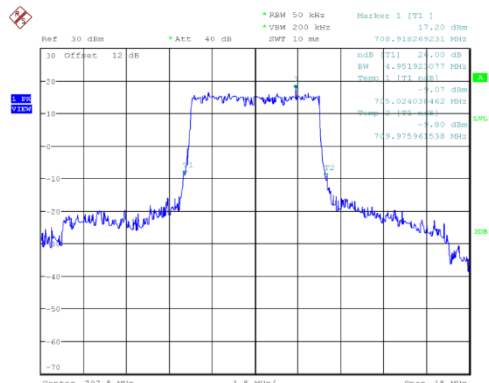
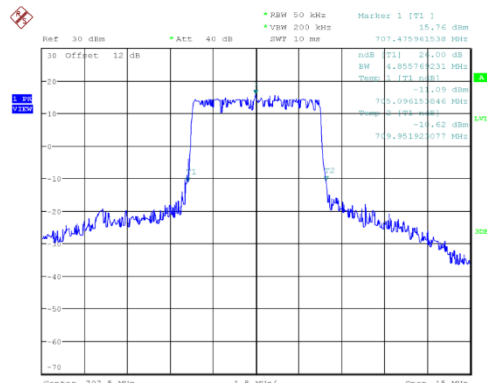
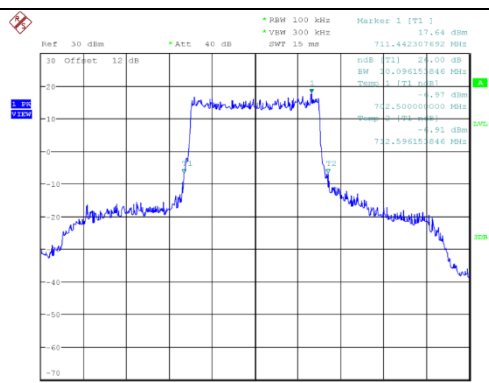
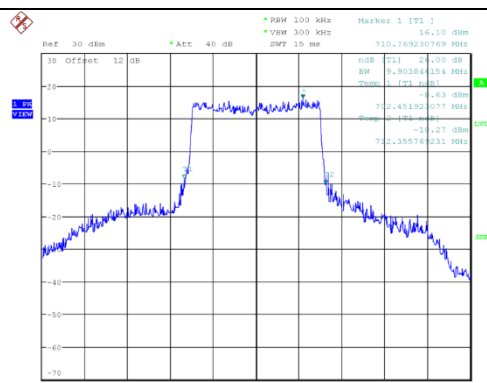
| LTE band 5 | | |
|--|---|-------|
| Frequency(MHz) | Occupied Bandwidth (-26dBc)(MHz) | |
| 836.5 | QPSK | 16QAM |
| | 1.36 | 1.34 |
| LTE band 5, 1.4MHz Bandwidth, QPSK (-26dBc BW) | LTE band 5, 1.4MHz Bandwidth, 16QAM (-26dBc BW) | |
| <div><p>Center: 836.5 MHz 500 kHz/ Span: 5 MHz</p><p>Date: 20..JAN.2003 06:35:14</p></div> | <div><p>Center: 836.5 MHz 500 kHz/ Span: 5 MHz</p><p>Date: 20..JAN.2003 06:36:09</p></div> | |
| Frequency(MHz) | Occupied Bandwidth (-26dBc)(MHz) | |
| 836.5 | QPSK | 16QAM |
| | 2.99 | 2.90 |
| LTE band 5, 3MHz Bandwidth, QPSK (-26dBc BW) | LTE band 5, 3MHz Bandwidth, 16QAM (-26dBc BW) | |
| <div><p>Center: 836.5 MHz 1 MHz/ Span: 10 MHz</p><p>Date: 20..JAN.2003 05:19:13</p></div> | <div><p>Center: 836.5 MHz 1 MHz/ Span: 10 MHz</p><p>Date: 20..JAN.2003 05:19:28</p></div> | |

| Frequency(MHz) | | Occupied Bandwidth (-26dBc)(MHz) | |
|---|--|--|-------|
| 836.5 | | QPSK | 16QAM |
| | | 4.88 | 4.81 |
| LTE band 5, 5MHz Bandwidth, QPSK (-26dBc BW) | | LTE band 5, 5MHz Bandwidth, 16QAM (-26dBc BW) | |
|  | |  | |
| Frequency(MHz) | | Occupied Bandwidth (-26dBc)(MHz) | |
| 836.5 | | QPSK | 16QAM |
| | | 9.71 | 9.81 |
| LTE band 5, 10MHz Bandwidth, QPSK (-26dBc BW) | | LTE band 5, 10MHz Bandwidth, 16QAM (-26dBc BW) | |
|  | |  | |

| LTE band 7 | | |
|--|-----------------------------------|---|
| Frequency(MHz) | Occupied Bandwidth (-26dBc)(MHz) | |
| 2535.0 | QPSK | 16QAM |
| | 4.88 | 4.81 |
| LTE band 7, 5MHz Bandwidth, QPSK (-26dBc BW) | | LTE band 7, 5MHz Bandwidth, 16QAM (-26dBc BW) |
|  <p>Ref: 30 dBm *Att: 40 dB *RBW 50 kHz Marker 1 [T1] 17.37 dBm *VSW 200 kHz *BW 10 MHz 2.534833846 GHz dBm [T1] 24.00 dB BW 4.879654552 MHz Tspan 1 [T1] 6.881 dBm [T2] -1.43 dBm 2.532549077 GHz dBm [T3] -1.25 dBm 2.537421885 GHz Center 2.535 GHz 1.5 MHz/ Span 15 MHz Date: 20.JAN.2003 05:21:04</p> | |  <p>Ref: 30 dBm *Att: 40 dB *RBW 50 kHz Marker 1 [T1] 16.90 dBm *VSW 200 kHz *BW 10 MHz 2.534833846 GHz dBm [T1] 24.00 dB BW 4.807652359 MHz Tspan 1 [T1] 6.881 dBm [T2] -1.38 dBm 2.532571119 GHz dBm [T3] -1.05 dBm 2.537371808 GHz Center 2.535 GHz 1.5 MHz/ Span 15 MHz Date: 20.JAN.2003 05:21:20</p> |
| Frequency(MHz) | Occupied Bandwidth (-26dBc)(MHz) | |
| 2535.0 | QPSK | 16QAM |
| | 9.91 | 9.86 |
| LTE band 7, 10MHz Bandwidth, QPSK (-26dBc BW) | | LTE band 7, 10MHz Bandwidth, 16QAM (-26dBc BW) |
|  <p>Ref: 30 dBm *Att: 40 dB *RBW 100 kHz Marker 1 [T1] 17.72 dBm *VSW 300 kHz *BW 15 MHz 2.535887000 GHz dBm [T1] 24.00 dB BW 9.903844154 MHz Tspan 1 [T1] 6.881 dBm [T2] -1.06 dBm 2.530000000 GHz dBm [T3] -1.20 dBm 2.539951846 GHz Center 2.535 GHz 3 MHz/ Span 30 MHz Date: 20.JAN.2003 05:21:38</p> | |  <p>Ref: 30 dBm *Att: 40 dB *RBW 100 kHz Marker 1 [T1] 16.39 dBm *VSW 300 kHz *BW 15 MHz 2.534833846 GHz dBm [T1] 24.00 dB BW 9.855749331 MHz Tspan 1 [T1] 6.881 dBm [T2] -1.32 dBm 2.530141231 GHz dBm [T3] -1.71 dBm 2.540000000 GHz Center 2.535 GHz 3 MHz/ Span 30 MHz Date: 20.JAN.2003 05:21:51</p> |

| Frequency(MHz) | Occupied Bandwidth (-26dBc)(MHz) | |
|---|--|-------|
| 2535.0 | QPSK | 16QAM |
| | 14.93 | 14.42 |
| LTE band 7, 15MHz Bandwidth, QPSK (-26dBc BW) | LTE band 7, 15MHz Bandwidth, 16QAM (-26dBc BW) | |
|  |  | |
| Frequency(MHz) | Occupied Bandwidth (-26dBc)(MHz) | |
| 2535.0 | QPSK | 16QAM |
| | 19.62 | 20.19 |
| LTE band 7, 20MHz Bandwidth, QPSK (-26dBc BW) | LTE band 7, 20MHz Bandwidth, 16QAM (-26dBc BW) | |
|  |  | |

| LTE band 12 | | |
|---|-----------------------------------|--|
| Frequency(MHz) | Occupied Bandwidth (-26dBc)(MHz) | |
| 707.5 | QPSK | 16QAM |
| | 1.34 | 1.36 |
| LTE band 12, 1.4MHz Bandwidth, QPSK (-26dBc BW) | | LTE band 12, 1.4MHz Bandwidth, 16QAM (-26dBc BW) |
|  <p>Ref: 30 dBm *Att: 40 dB *PSW 50 kHz *VSW 200 kHz *BW 2.0 MHz</p> <p>Marker 1 [T1] 707.513074823 MHz -1.97 dBm</p> <p>Center 707.5 MHz 500 kHz/ Span 5 MHz</p> <p>Date: 20.JAN.2003 05:31:14</p> | |  <p>Ref: 30 dBm *Att: 40 dB *PSW 50 kHz *VSW 200 kHz *BW 2.0 MHz</p> <p>Marker 1 [T1] 707.513074823 MHz -1.97 dBm</p> <p>Center 707.5 MHz 500 kHz/ Span 5 MHz</p> <p>Date: 20.JAN.2003 05:31:31</p> |
| Frequency(MHz) | Occupied Bandwidth (-26dBc)(MHz) | |
| 707.5 | QPSK | 16QAM |
| | 2.95 | 2.95 |
| LTE band 12, 3MHz Bandwidth, QPSK (-26dBc BW) | | LTE band 12, 3MHz Bandwidth, 16QAM (-26dBc BW) |
|  <p>Ref: 30 dBm *Att: 40 dB *PSW 50 kHz *VSW 200 kHz *BW 2.0 MHz</p> <p>Marker 1 [T1] 707.517940716 MHz -1.95 dBm</p> <p>Center 707.5 MHz 1 MHz/ Span 10 MHz</p> <p>Date: 20.JAN.2003 05:25:50</p> | |  <p>Ref: 30 dBm *Att: 40 dB *PSW 50 kHz *VSW 200 kHz *BW 2.0 MHz</p> <p>Marker 1 [T1] 707.517940716 MHz -1.95 dBm</p> <p>Center 707.5 MHz 1 MHz/ Span 10 MHz</p> <p>Date: 20.JAN.2003 05:26:12</p> |

| Frequency(MHz) | Occupied Bandwidth (-26dBc)(MHz) | |
|--|---|-------|
| 707.5 | QPSK | 16QAM |
| | 4.95 | 4.86 |
| LTE band 12, 5MHz Bandwidth, QPSK (-26dBc BW) | LTE band 12, 5MHz Bandwidth, 16QAM (-26dBc BW) | |
|  <p>Center 707.5 MHz 1.5 MHz/ Span 15 MHz</p> <p>Date: 20.JAN.2003 05:26:35</p> |  <p>Center 707.5 MHz 1.5 MHz/ Span 15 MHz</p> <p>Date: 20.JAN.2003 05:26:54</p> | |
| Frequency(MHz) | Occupied Bandwidth (-26dBc)(MHz) | |
| 707.5 | QPSK | 16QAM |
| | 10.10 | 9.91 |
| LTE band 12, 10MHz Bandwidth, QPSK (-26dBc BW) | LTE band 12, 10MHz Bandwidth, 16QAM (-26dBc BW) | |
|  <p>Center 707.5 MHz 3 MHz/ Span 30 MHz</p> <p>Date: 20.JAN.2003 05:27:12</p> |  <p>Center 707.5 MHz 3 MHz/ Span 30 MHz</p> <p>Date: 20.JAN.2003 05:27:25</p> | |

ANNEX A.6. BAND EDGE COMPLIANCE

Reference

FCC: CFR Part 22.917(b),24.238(a), 27.53(g),27.53(h), 27.53(m)

A.6.1 Measurement limit

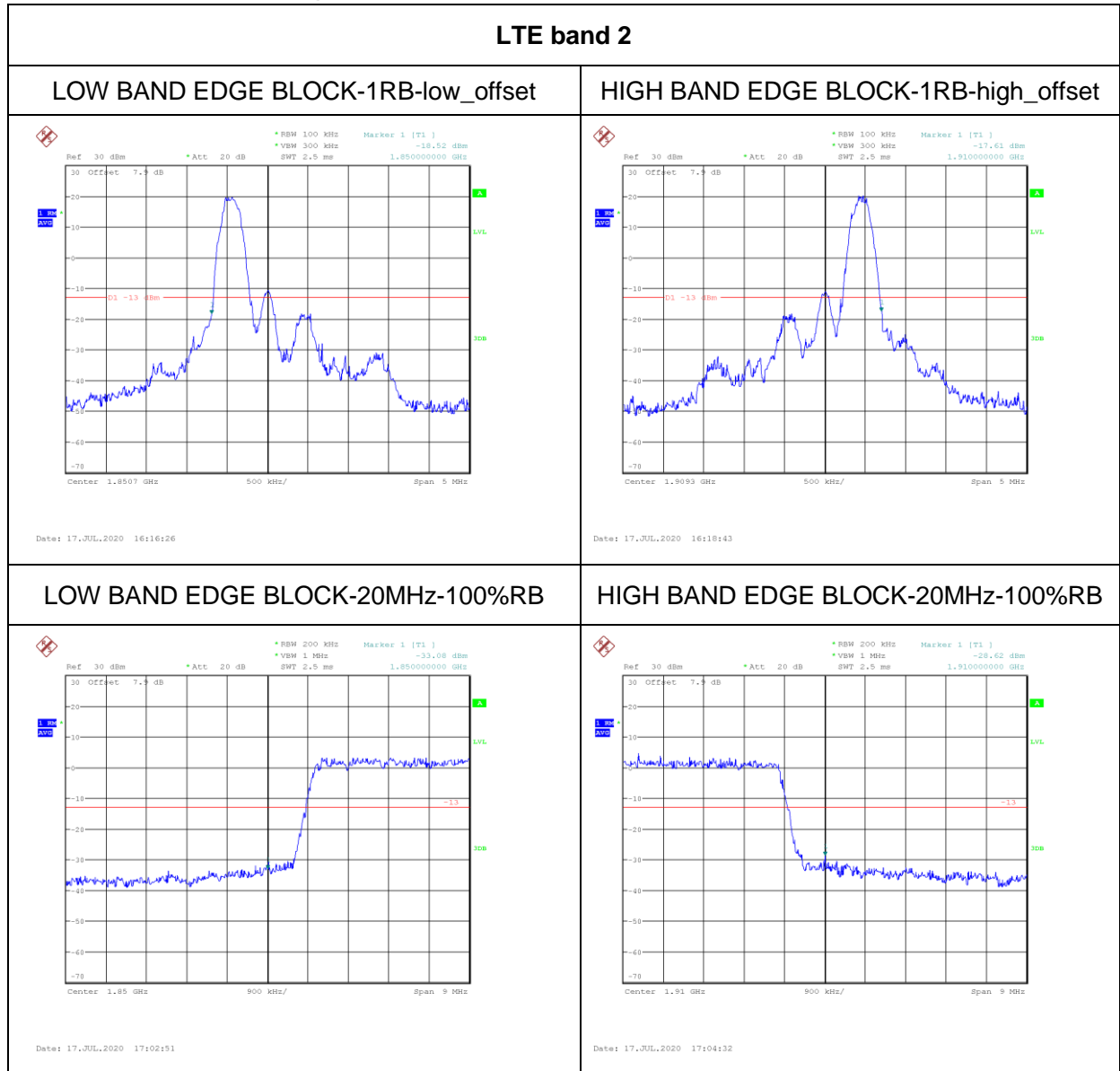
Part 22.917(b),24.238(a), 27.53(g),27.53(h), 27.53(m) state that on any frequency outside frequency band of the US Cellular/PCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least $43+10\log(P)$ dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

According to KDB 971168 6, a relaxation of the reference bandwidth is often provided for measurements within a specified frequency range at the edge of the authorized frequency block/band. This is often implemented by permitting the use of a narrower RBW (typically limited to a minimum RBW of 1% of the OBW) for measuring the out-of-band emissions without a requirement to integrate the result over the full reference bandwidth.

Part 27.53(m) states that for mobile digital stations, the attenuation factor shall be not less than $40 + 10 \log(P)$ dB on all frequencies between the channel edge and 5 megahertz from the channel edge, $43 + 10 \log(P)$ dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and $55 + 10 \log(P)$ dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less than $43 + 10 \log(P)$ dB on all frequencies between 2490.5 MHz and 2496 MHz and $55 + 10 \log(P)$ dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

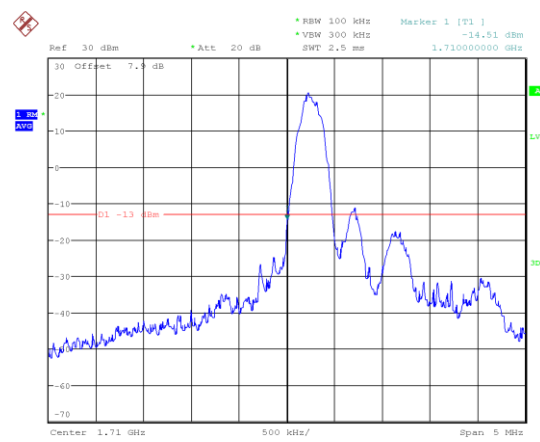
A.6.2 Measurement result

Only worst case result is given below



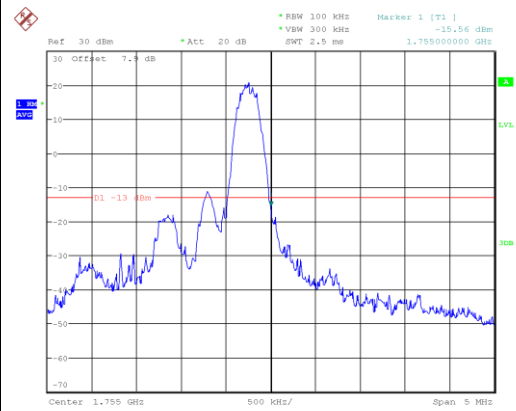
LTE band 4

LOW BAND EDGE BLOCK-1RB-low_offset



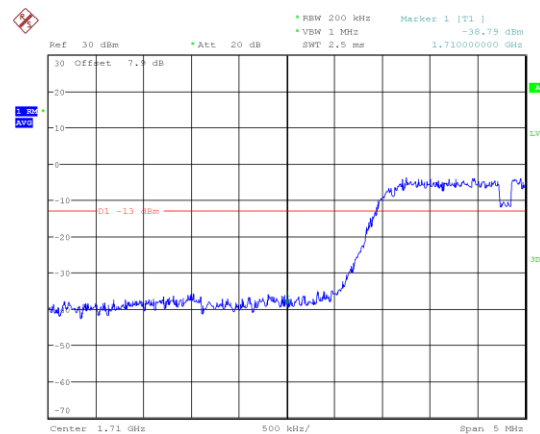
Date: 18.JUL.2020 10:48:32

HIGH BAND EDGE BLOCK-1RB-high_offset



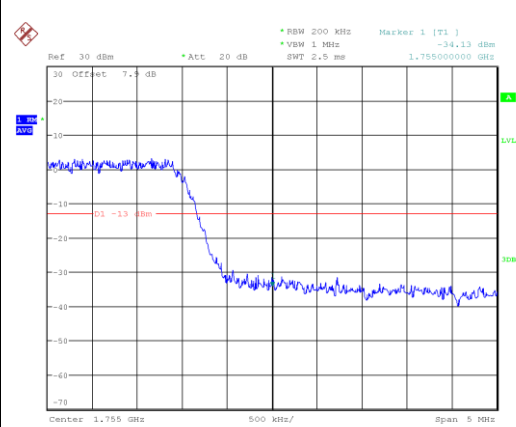
Date: 18.JUL.2020 11:23:23

LOW BAND EDGE BLOCK-20MHz-100%RB



Date: 18.JUL.2020 11:17:46

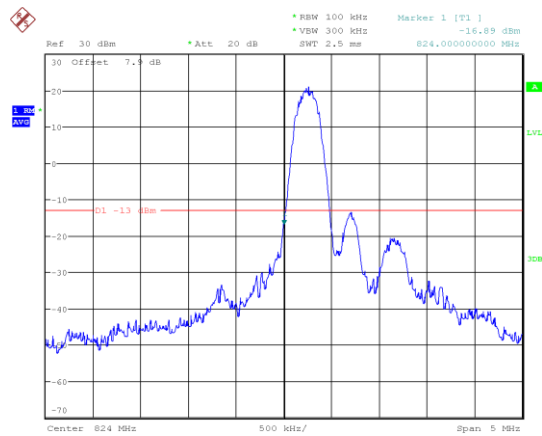
HIGH BAND EDGE BLOCK-20MHz-100%RB



Date: 18.JUL.2020 11:26:13

LTE band 5

LOW BAND EDGE BLOCK-1RB-low_offset



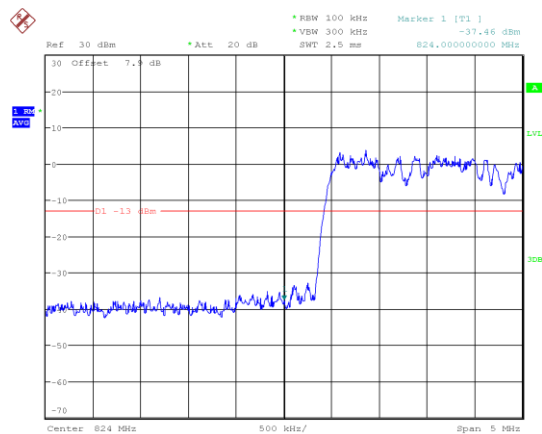
Date: 18.JUL.2020 11:34:24

HIGH BAND EDGE BLOCK-1RB-high_offset



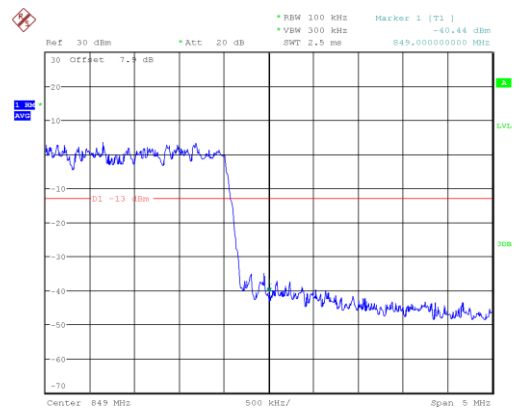
Date: 18.JUL.2020 11:36:15

LOW BAND EDGE BLOCK-10MHz-100%RB



Date: 18.JUL.2020 11:40:31

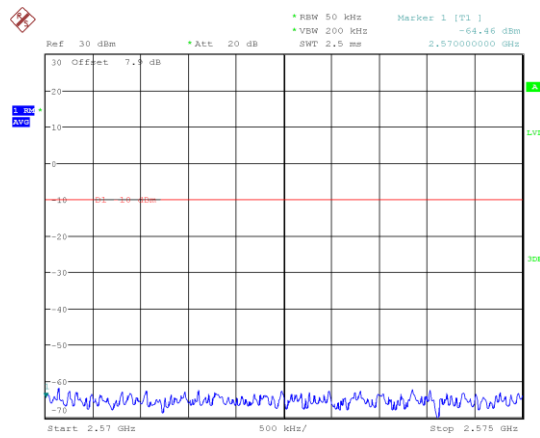
HIGH BAND EDGE BLOCK-10MHz-100%RB



Date: 18.JUL.2020 11:41:57

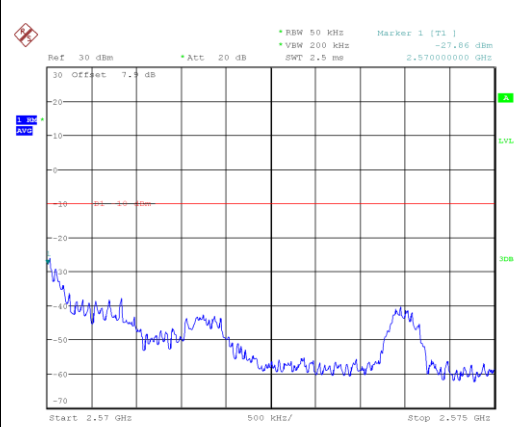
LTE band 7

LOW BAND EDGE BLOCK-1RB- high_offset



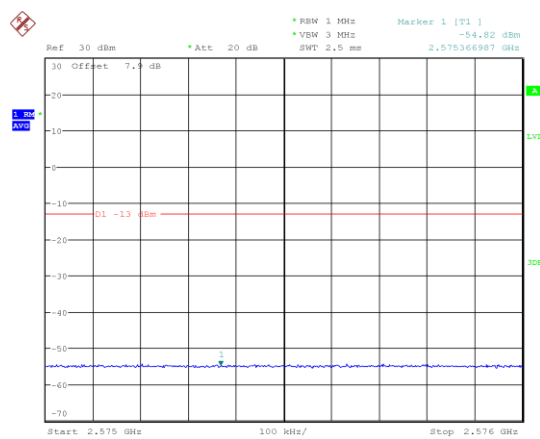
Date: 17.JUL.2020 17:13:37

HIGH BAND EDGE BLOCK-1RB-high_offset



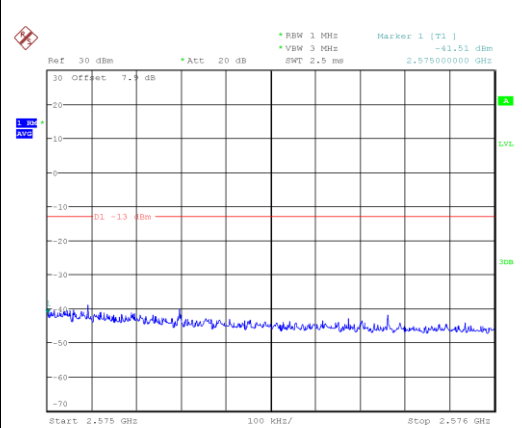
Date: 18.JUL.2020 09:39:22

LOW BAND EDGE BLOCK-1RB- high_offset



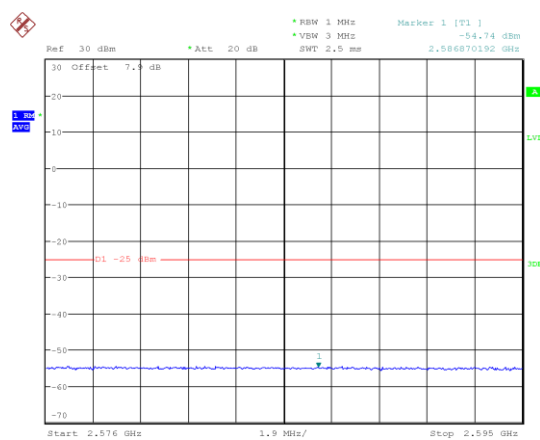
Date: 17.JUL.2020 17:15:46

HIGH BAND EDGE BLOCK-1RB-high_offset



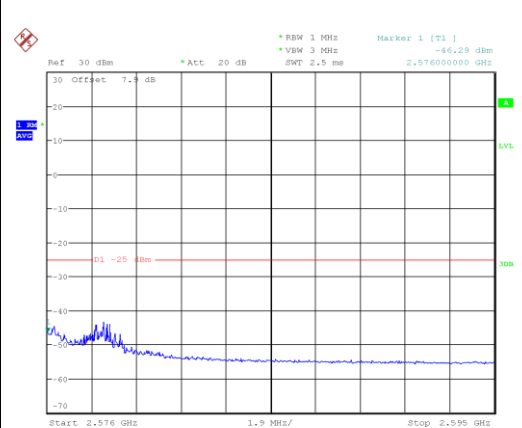
Date: 18.JUL.2020 09:40:55

LOW BAND EDGE BLOCK-1RB- high_offset

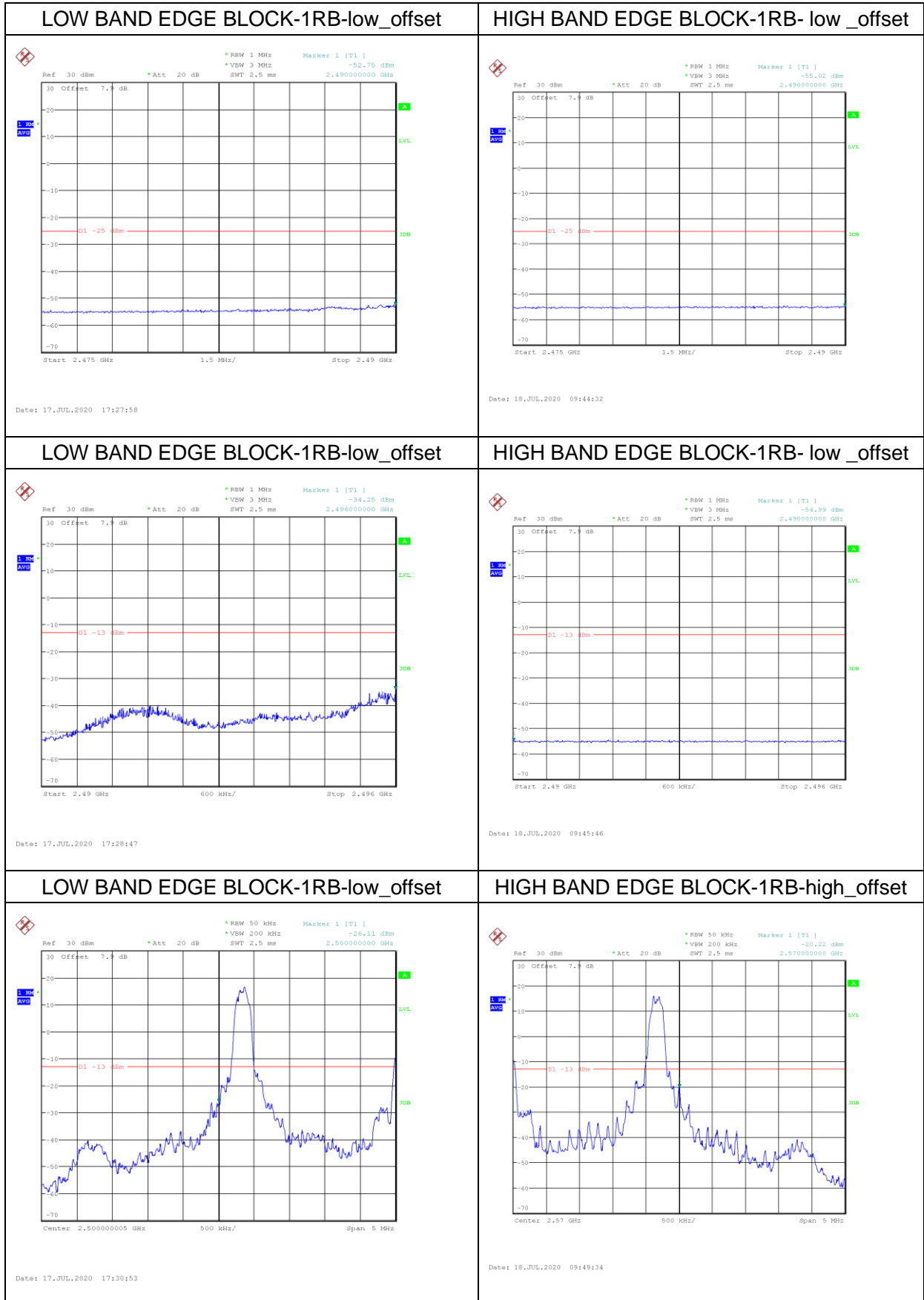


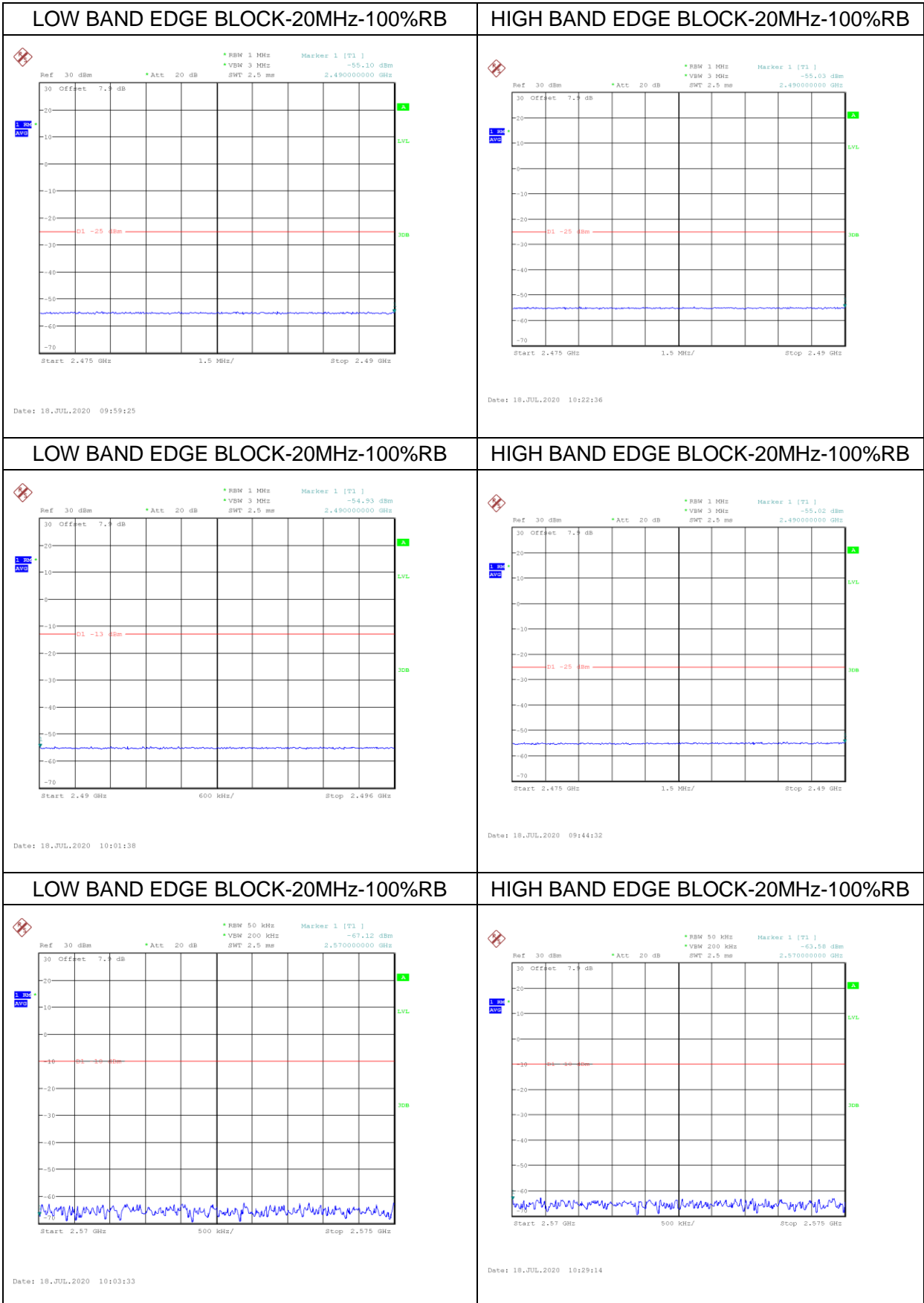
Date: 17.JUL.2020 17:16:33

HIGH BAND EDGE BLOCK-1RB-high_offset

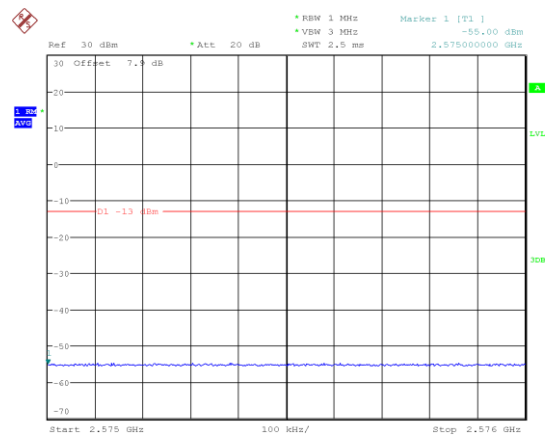


Date: 18.JUL.2020 09:42:25



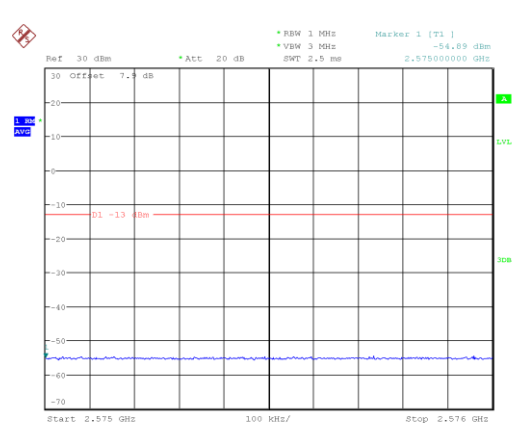


LOW BAND EDGE BLOCK-20MHz-100%RB



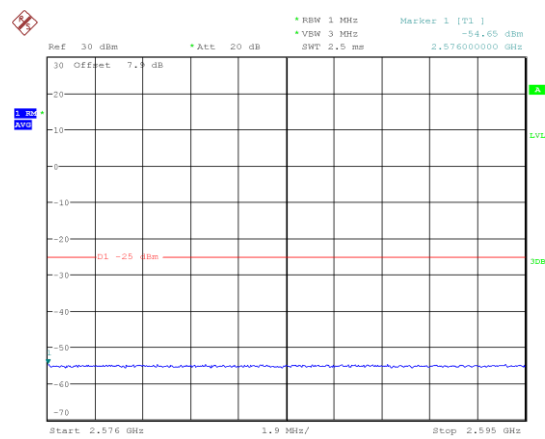
Date: 18.JUL.2020 10:04:53

HIGH BAND EDGE BLOCK-20MHz-100%RB



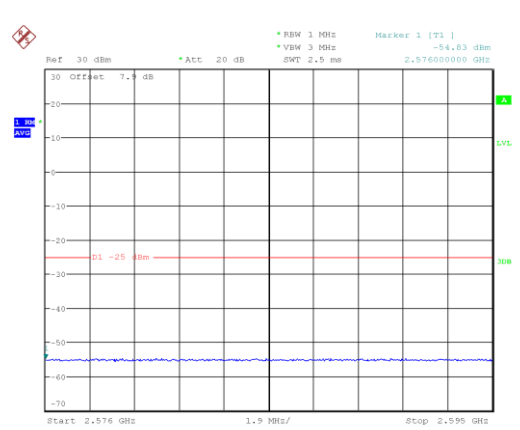
Date: 18.JUL.2020 10:30:48

LOW BAND EDGE BLOCK-20MHz-100%RB



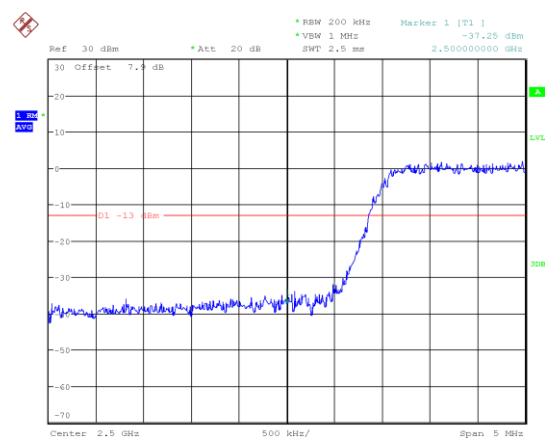
Date: 18.JUL.2020 10:06:08

HIGH BAND EDGE BLOCK-20MHz-100%RB



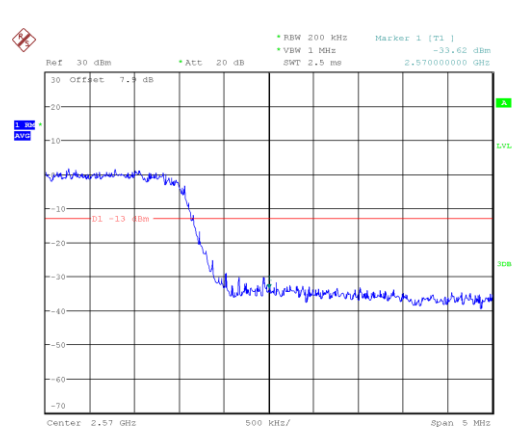
Date: 18.JUL.2020 10:32:35

LOW BAND EDGE BLOCK-20MHz-100%RB



Date: 18.JUL.2020 10:18:46

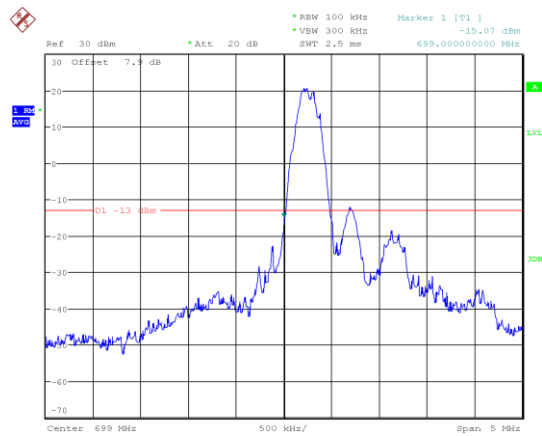
HIGH BAND EDGE BLOCK-20MHz-100%RB



Date: 18.JUL.2020 10:38:53

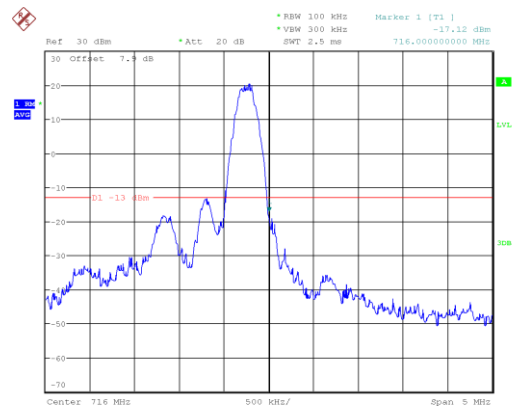
LTE band 12

LOW BAND EDGE BLOCK-1RB-low_offset



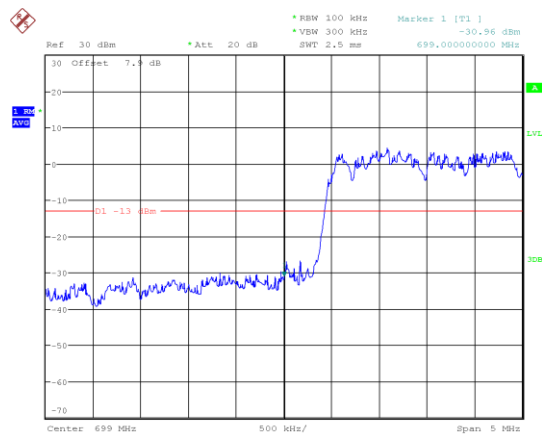
Date: 18.JUL.2020 13:47:30

HIGH BAND EDGE BLOCK-1RB-high_offset



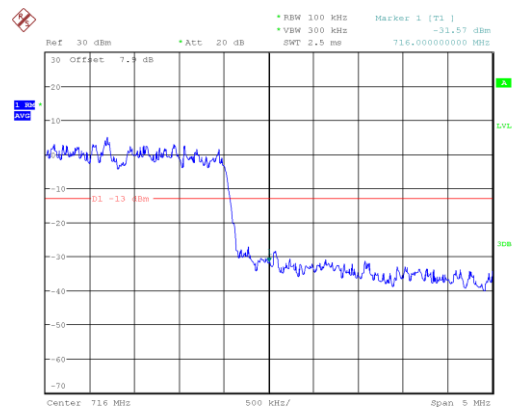
Date: 18.JUL.2020 13:49:04

LOW BAND EDGE BLOCK-10MHz-100%RB



Date: 18.JUL.2020 13:50:42

HIGH BAND EDGE BLOCK-10MHz-100%RB



Date: 18.JUL.2020 13:53:15

ANNEX A.7. CONDUCTED SPURIOUS EMISSION

Reference

FCC: CFR Part 22.917(b),24.238(a), 27.53(g),27.53(h), 27.53(m)

A.7.1 Measurement Method

The following steps outline the procedure used to measure the conducted emissions from the EUT.

1. Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency. For the mobile station equipment tested, this equates to a frequency range of 13 MHz to 9 GHz, data taken from 10 MHz to 25 GHz.
2. Determine EUT transmit frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.
3. The number of sweep points of spectrum analyzer is set to 30001 which is greater than span/RBW.

A. 7.2 Measurement Limit

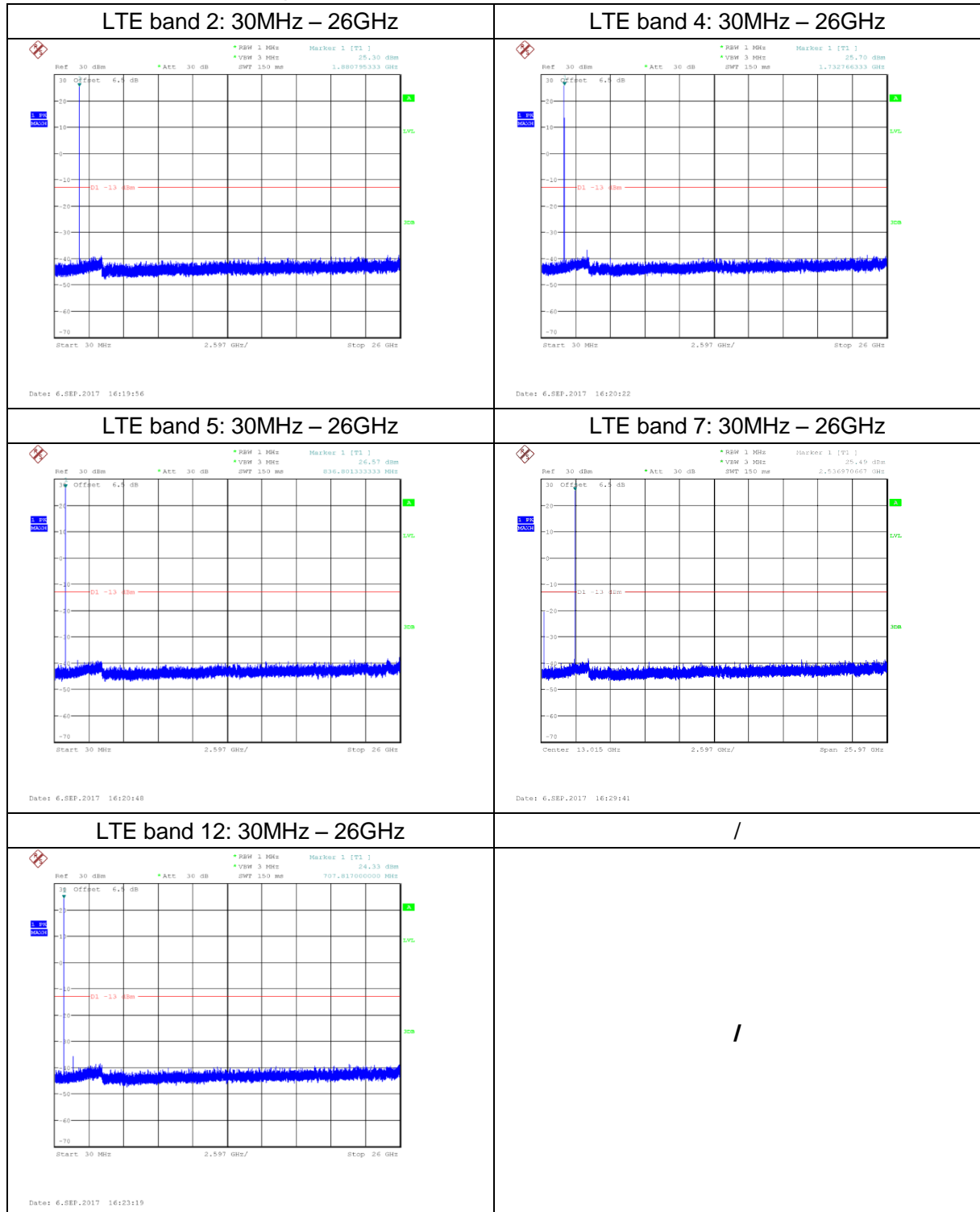
Part 22.917(b),24.238(a), 27.53(g),27.53(h), 27.53(m) specify that the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

The specification that emissions shall be attenuated below the transmitter power (P) by at least $43 + 10 \log(P)$ dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

Part 27.53(m)(4) specifies for mobile digital stations, the attenuation factor shall be not less than $40 + 10 \log(P)$ dB on all frequencies between the channel edge and 5 megahertz from the channel edge, $43 + 10 \log(P)$ dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and $55 + 10 \log(P)$ dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less than $43 + 10 \log(P)$ dB on all frequencies between 2490.5 MHz and 2496 MHz and $55 + 10 \log(P)$ dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

A. 7.3 Measurement result

Only worst case result is given below



ANNEX A.8. PEAK-TO-AVERAGE POWER RATIO

Reference

FCC: CFR Part 24.232 (d), 27.50(a)

The peak-to-average power ratio (PAPR) of the transmitter output power must not exceed 13 dB. The PAPR measurements should be made using either an instrument with complementary cumulative distribution function (CCDF) capabilities to determine that PAPR will not exceed 13 dB for more than 0.1 percent of the time or other Commission approved procedure. The measurement must be performed using a signal corresponding to the highest PAPR expected during periods of continuous transmission.

According to KDB 971168 5.7:

- Refer to instrument's analyzer instruction manual for details on how to use the power statistics/CCDF function;
- Set resolution/measurement bandwidth \geq signal's occupied bandwidth;
- Set the number of counts to a value that stabilizes the measured CCDF curve;
- Set the measurement interval to 1 ms
- Record the maximum PAPR level associated with a probability of 0.1%

A.8.1 Measurement limit

Not exceed 13 dB

A.8.2 Measurement results

LTE band 2, 20MHz

| Frequency(MHz) | PAPR(dB) | |
|----------------|----------|-------|
| 1880.0 | QPSK | 16QAM |
| | 5.90 | 6.98 |

LTE band 4, 20MHz

| Frequency(MHz) | PAPR(dB) | |
|----------------|----------|-------|
| 1732.5 | QPSK | 16QAM |
| | 4.98 | 6.66 |

LTE band 5, 10MHz

| Frequency(MHz) | PAPR(dB) | |
|----------------|----------|-------|
| 836.5 | QPSK | 16QAM |
| | 4.98 | 6.66 |

LTE band 7, 20MHz

| Frequency(MHz) | PAPR(dB) | |
|----------------|----------|-------|
| 2535.0 | QPSK | 16QAM |
| | 6.79 | 7.31 |

LTE band 12, 10MHz

| Frequency(MHz) | PAPR(dB) | |
|----------------|----------|-------|
| 707.5 | QPSK | 16QAM |
| | 4.99 | 6.05 |

ANNEX B. Deviations from Prescribed Test Methods

No deviation from Prescribed Test Methods.

ANNEX C. Detailed Test Results**ANNEX C.1. Main Terms**

| | |
|------------|--|
| Verdict | Verdict of each test cases. |
| Test cases | Test cases identification number and description in ETSI EN 300 328 test specification and ETSI specification. |

ANNEX C.2. Terms used in Condition column

| | |
|------|--------------------|
| Tnom | Normal temperature |
| Tmin | Low temperature |
| Tmax | High temperature |
| Vnom | Normal voltage |

ANNEX C.3. Terms used in Verdict column

| | |
|----|--|
| P | Pass, the EUT complies with the essential requirements in the standard. |
| NM | Not measure, the test was not measured by ECIT. |
| NA | Not applicable, the test was not applicable. |
| F | Fail, the EUT does not comply with the essential requirements in the standard. |

ANNEX C.4. Terms used in Note column

| | |
|----------|---|
| EUT ID | EUT ID (e.g N01, N02.....) is used to identify the EUT tested used for each test cases as specified in section 3 of this test report. |
| Lab Code | Lab code is used to identify the subcontracted lab if this test cases is performed in the subcontracted lab. |

Subcontracted test lab code: N/A

ANNEX D. Accreditation Certificate



*****END OF REPORT*****