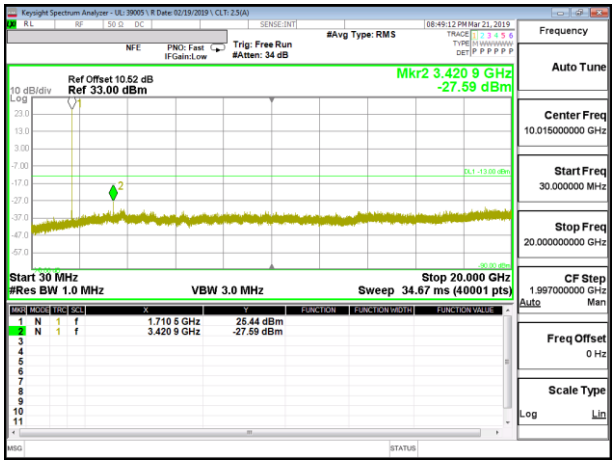
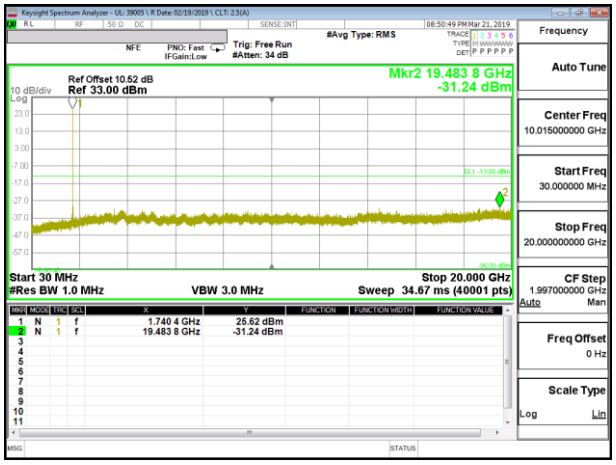
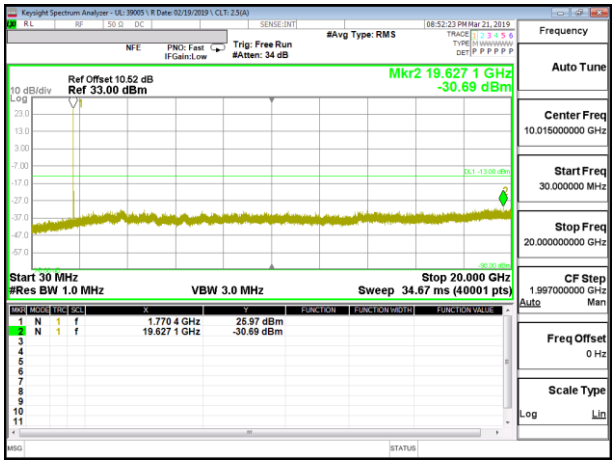


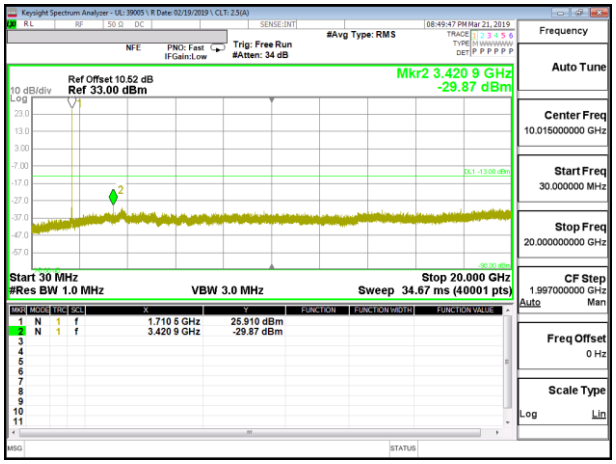
LTE B66 10MHz QPSK Low Channel RB1-0



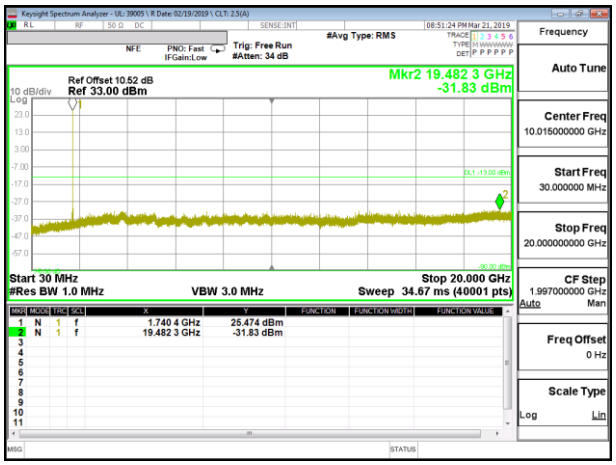
LTE B66 10MHz QPSK Mid Channel RB1-0



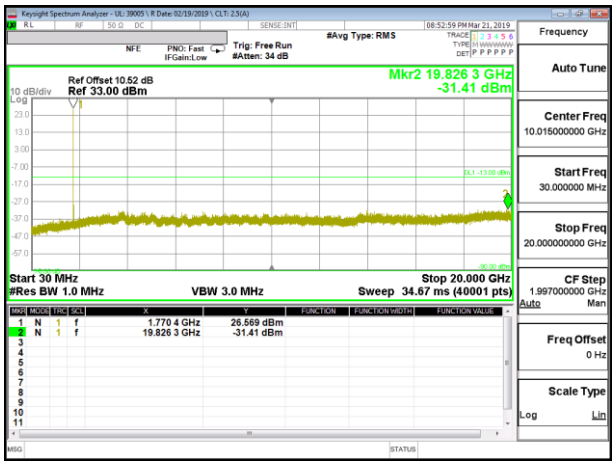
LTE B66 10MHz QPSK High Channel RB1-0



LTE B66 10MHz 16QAM Low Channel RB1-0



LTE B66 10MHz 16QAM Mid Channel RB1-0



LTE B66 10MHz 16QAM High Channel RB1-0

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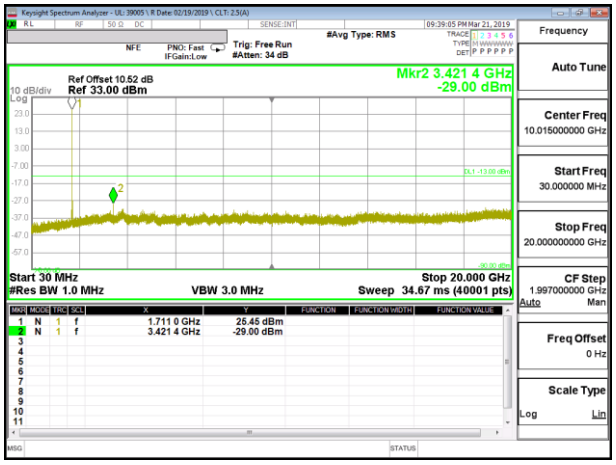
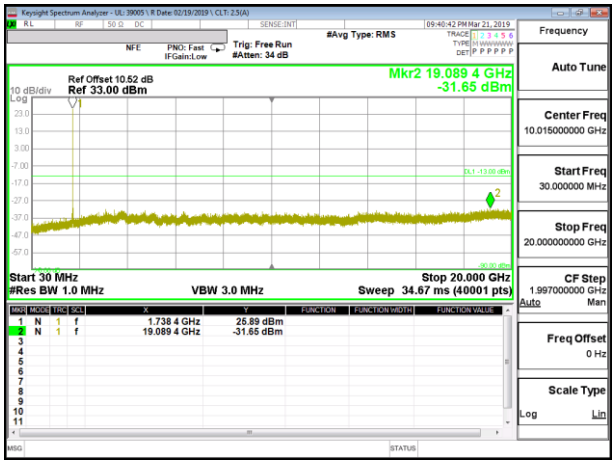
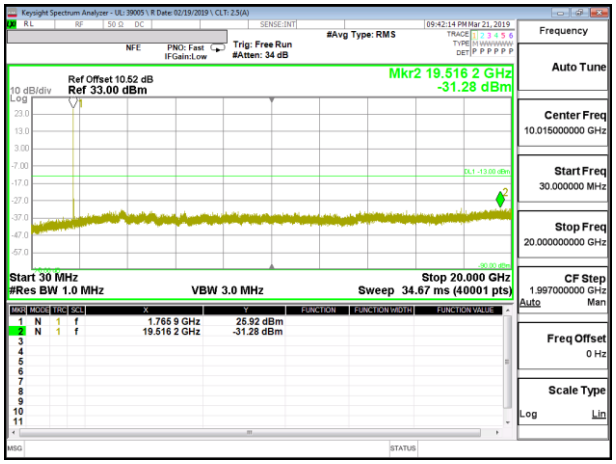


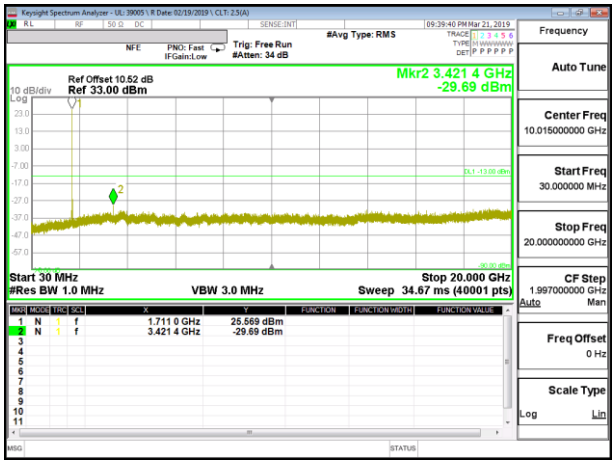
LTE B66 15MHz QPSK Low Channel RB1-0



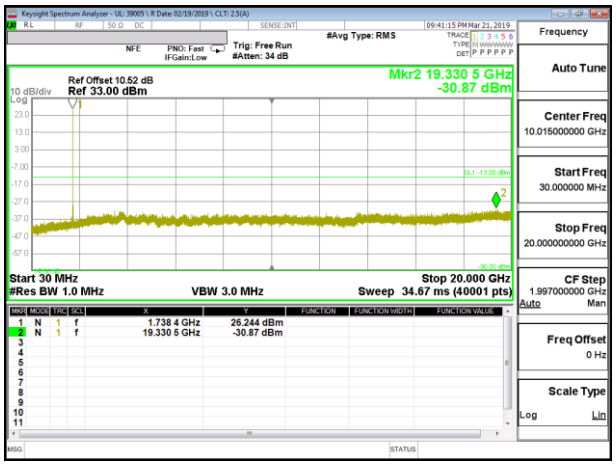
LTE B66 15MHz QPSK Mid Channel RB1-0



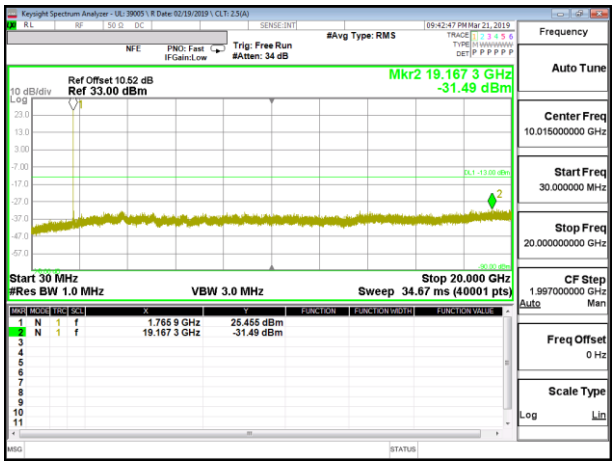
LTE B66 15MHz QPSK High Channel RB1-0



LTE B66 15MHz 16QAM Low Channel RB1-0



LTE B66 15MHz 16QAM Mid Channel RB1-0



LTE B66 15MHz 16QAM High Channel RB1-0

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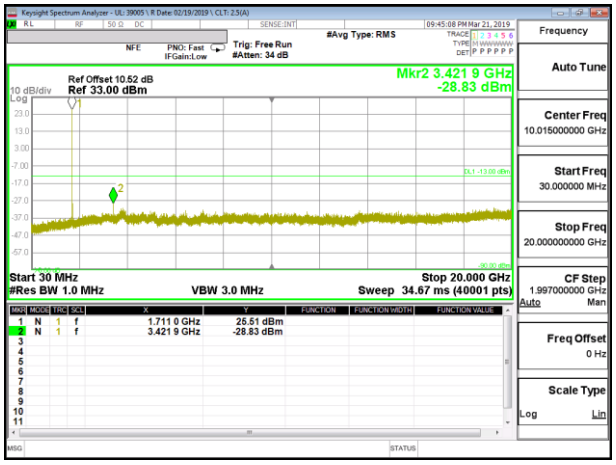
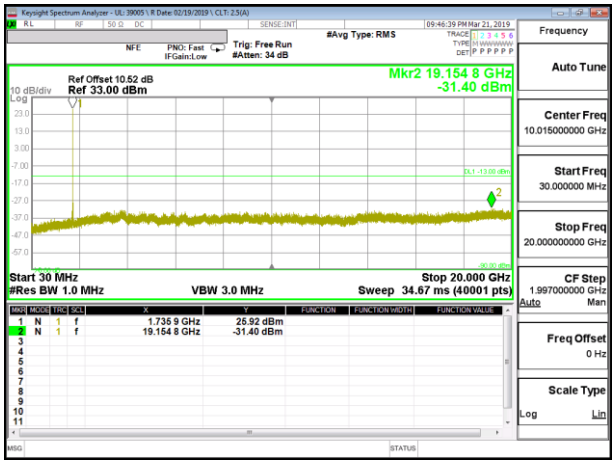
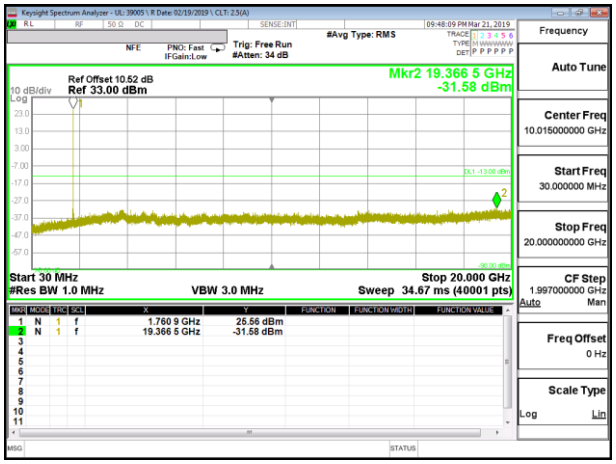


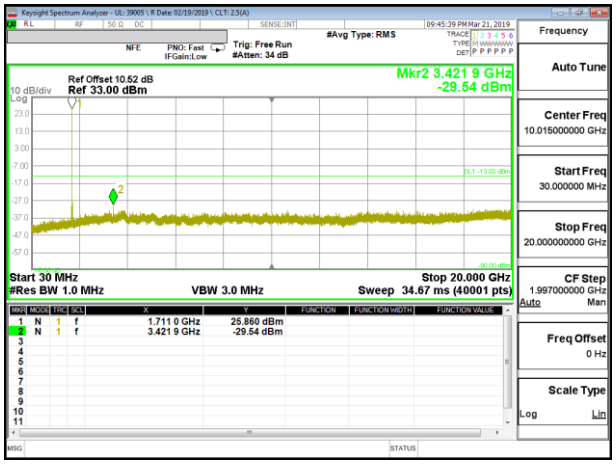
LTE B66 20MHz QPSK Low Channel RB1-0



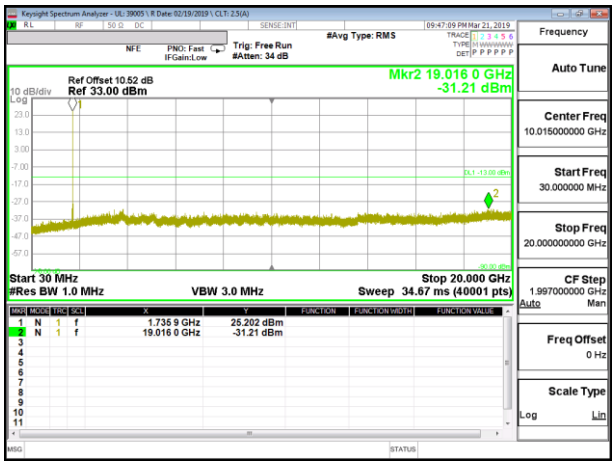
LTE B66 20MHz QPSK Mid Channel RB1-0



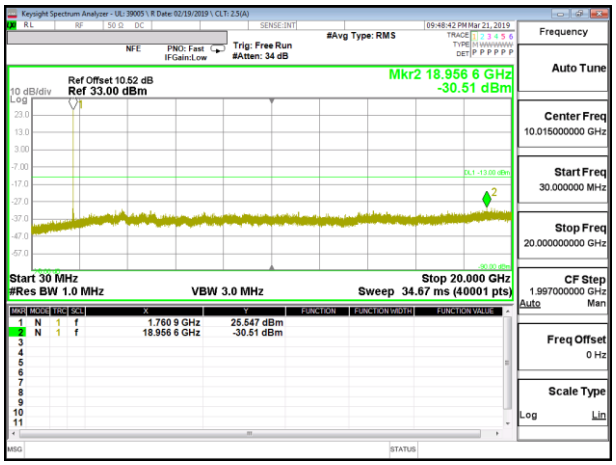
LTE B66 20MHz QPSK High Channel RB1-0



LTE B66 20MHz 16QAM Low Channel RB1-0



LTE B66 20MHz 16QAM Mid Channel RB1-0



LTE B66 20MHz 16QAM High Channel RB1-0

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9.4. FREQUENCY STABILITY

RULE PART(S)

FCC: §2.1055, §22.355, §24.235, and §27.54

LIMITS

FCC: §22.355
The carrier frequency shall not depart from the reference frequency in excess of ±2.5 ppm for mobile stations.

FCC: §24.235 & §27.54
The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

TEST PROCEDURE

Use CMW 500 with Frequency Error measurement capability.

- Temp. = −30°C to +50°C
- Voltage = (85% - 115%)

  Low voltage, 3.3VDC, Normal, 3.85VDC and High voltage, 4.43VDC.
  End Voltage, 3.2VDC.

Frequency Stability vs Temperature:
The EUT is place inside a temperature chamber. The temperature is set to 20ºC and allowed to stabilize. After sufficient soak time, the transmitting frequency error is measured. The temperature is increased by 10 degrees, allowed to stabilize and soak, and then the measurement is repeated. This is repeated until +50ºC is reached.

Frequency Stability vs Voltage:
The peak frequency error is recorded (worst-case).

MODES TESTED

- GSM 850
- GSM 1900
- WCDMA Band 5
- WCDMA Band 2
- WCDMA Band 4
- LTE 2
- LTE 4
- LTE 5
- LTE 12
- LTE 13
- LTE 41
- LTE 66

RESULTS

See the following pages.

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9.4.1. GSM

ID:	43575	Date:	2/20/19

GPRS 850MHz

Limit		824	849	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	824.0149	848.9743		
Extreme (50C)		824.0148	848.9743	-12.3	-0.015
Extreme (40C)		824.0148	848.9743	-12.3	-0.015
Extreme (30C)		824.0148	848.9743	-9.9	-0.012
Extreme (10C)		824.0148	848.9743	-10.3	-0.012
Extreme (0C)		824.0149	848.9743	8.5	0.010
Extreme (-10C)		824.0148	848.9743	-8.7	-0.010
Extreme (-20C)		824.0149	848.9743	8.4	0.010
Extreme (-30C)		824.0149	848.9743	8.3	0.010
20C	15%	824.0148	848.9743	-8.9	-0.011
	-15%	824.0148	848.9743	-8.6	-0.010
	End Point	824.0148	848.9743	-14.0	-0.017

GPRS 1900MHz

Limit		1850	1910	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	1850.0279	1909.9763		
Extreme (50C)		1850.0280	1909.9763	40.1	0.021
Extreme (40C)		1850.0279	1909.9763	17.1	0.009
Extreme (30C)		1850.0279	1909.9763	16.5	0.009
Extreme (10C)		1850.0279	1909.9763	21.6	0.011
Extreme (0C)		1850.0279	1909.9763	23.8	0.013
Extreme (-10C)		1850.0279	1909.9763	25.5	0.014
Extreme (-20C)		1850.0279	1909.9763	24.2	0.013
Extreme (-30C)		1850.0279	1909.9763	22.9	0.012
20C	15%	1850.0279	1909.9763	30.8	0.016
	-15%	1850.0279	1909.9763	25.2	0.013
	End Point	1850.0279	1909.9763	23.0	0.012

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9.4.2. WCDMA

ID:	43575	Date:	2/20/19

UMTS REL99 BAND 5

Limit		824	849	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	824.1653	848.8477		
Extreme (50C)		824.1653	848.8477	-1.7	-0.0020
Extreme (40C)		824.1653	848.8477	-2.0	-0.0023
Extreme (30C)		824.1653	848.8477	-1.8	-0.0022
Extreme (10C)		824.1653	848.8477	-1.8	-0.0021
Extreme (0C)		824.1653	848.8477	-2.5	-0.0030
Extreme (-10C)		824.1653	848.8477	-1.7	-0.0020
Extreme (-20C)		824.1653	848.8477	-1.9	-0.0023
Extreme (-30C)		824.1653	848.8477	-2.9	-0.0035
20C	15%	824.1653	848.8477	-1.8	-0.0021
	-15%	824.1653	848.8477	-2.3	-0.0027
	End Point	824.1653	848.8477	1.7	0.0020

UMTS REL99 BAND 2

Limit		1850	1910	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	1850.1371	1909.8379		
Extreme (50C)		1850.1371	1909.8379	13.4	0.0071
Extreme (40C)		1850.1371	1909.8379	13.5	0.0072
Extreme (30C)		1850.1371	1909.8379	13.2	0.0070
Extreme (10C)		1850.1371	1909.8379	12.6	0.0067
Extreme (0C)		1850.1371	1909.8379	12.7	0.0067
Extreme (-10C)		1850.1371	1909.8379	12.1	0.0064
Extreme (-20C)		1850.1371	1909.8379	14.1	0.0075
Extreme (-30C)		1850.1371	1909.8379	17.8	0.0095
20C	15%	1850.1371	1909.8379	12.7	0.0067
	-15%	1850.1371	1909.8379	13.4	0.0071
	End Point	1850.1371	1909.8379	13.6	0.0072

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WCDMA REL99 BAND 4

Limit		1710	1755	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	1710.0960	1754.9280		
Extreme (50C)		1710.0960	1754.9280	28.1	0.0162
Extreme (40C)		1710.0960	1754.9280	16.6	0.0096
Extreme (30C)		1710.0960	1754.9280	40.1	0.0231
Extreme (10C)		1710.0960	1754.9280	-13.5	-0.0078
Extreme (0C)		1710.0960	1754.9280	-21.1	-0.0122
Extreme (-10C)		1710.0960	1754.9280	-22.5	-0.0130
Extreme (-20C)		1710.0960	1754.9280	23.9	0.0138
Extreme (-30C)		1710.0960	1754.9280	32.7	0.0189
20C	15%	1710.0960	1754.9280	3.9	0.0023
	-15%	1710.0960	1754.9280	2.2	0.0013
	End Point	1710.0960	1754.9280	2.0	0.0012

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9.4.3. LTE BAND 2

ID:	16069 OG	Date:	3/12/19

QPSK, (20MHz BANDWIDTH)

Limit		1850	1910	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	1851.0890	1908.9120		
Extreme (50C)		1851.0890	1908.9120	20.6	0.011
Extreme (40C)		1851.0890	1908.9120	15.3	0.008
Extreme (30C)		1851.0890	1908.9120	20.7	0.011
Extreme (10C)		1851.0890	1908.9120	18.2	0.010
Extreme (0C)		1851.0890	1908.9120	16.8	0.009
Extreme (-10C)		1851.0890	1908.9120	16.8	0.009
Extreme (-20C)		1851.0890	1908.9120	21.5	0.011
Extreme (-30C)		1851.0890	1908.9120	18.8	0.010
20C	15%	1851.0890	1908.9120	17.3	0.009
	-15%	1851.0890	1908.9120	-4.8	-0.003
	End Point	1851.0890	1908.9120	17.4	0.009

9.4.4. LTE BAND 4

ID:	39005	Date:	3/25/19

QPSK, (20MHz BANDWIDTH)

Limit		1710	1755	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	1711.0783	1753.9131		
Extreme (50C)		1711.0783	1753.9131	12.0	0.007
Extreme (40C)		1711.0783	1753.9131	9.0	0.005
Extreme (30C)		1711.0783	1753.9131	12.0	0.007
Extreme (10C)		1711.0783	1753.9131	13.0	0.008
Extreme (0C)		1711.0783	1753.9131	11.0	0.006
Extreme (-10C)		1711.0783	1753.9131	10.6	0.006
Extreme (-20C)		1711.0783	1753.9131	11.5	0.007
Extreme (-30C)		1711.0783	1753.9131	12.0	0.007
20C	15%	1711.0783	1753.9131	11.0	0.006
	-15%	1711.0783	1753.9131	11.6	0.007
	End Point	1711.0783	1753.9131	13.3	0.008

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9.4.5. LTE BAND 5

ID:	43575 OS	Date:	2/19/19

QPSK, (10MHz BANDWIDTH)

Limit		824	849	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	824.3000	848.4767		
Extreme (50C)		824.3000	848.4767	-9.2	-0.011
Extreme (40C)		824.3000	848.4767	-8.0	-0.010
Extreme (30C)		824.3000	848.4767	-8.3	-0.010
Extreme (10C)		824.3000	848.4767	-7.7	-0.009
Extreme (0C)		824.3000	848.4767	-7.9	-0.009
Extreme (-10C)		824.3000	848.4767	-8.9	-0.011
Extreme (-20C)		824.3000	848.4767	-7.5	-0.009
Extreme (-30C)		824.3000	848.4767	-9.7	-0.012
20C	15%	824.3000	848.4767	-9.4	-0.011
	-15%	824.3000	848.4767	-8.5	-0.010
	End Point	824.3000	848.4767	-7.7	-0.009

9.4.6. LTE BAND 12

ID:	16069 OG	Date:	3/12/19

QPSK, (10MHz BANDWIDTH)

Limit		699	716	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	699.5400	715.4620		
Extreme (50C)		699.5400	715.4620	-8.5	-0.012
Extreme (40C)		699.5400	715.4620	-7.6	-0.011
Extreme (30C)		699.5400	715.4620	-9.0	-0.013
Extreme (10C)		699.5400	715.4620	-8.8	-0.012
Extreme (0C)		699.5400	715.4620	8.5	0.012
Extreme (-10C)		699.5400	715.4620	-9.6	-0.014
Extreme (-20C)		699.5400	715.4620	7.8	0.011
Extreme (-30C)		699.5400	715.4620	-9.1	-0.013
20C	15%	699.5400	715.4620	-8.0	-0.011
	-15%	699.5400	715.4620	-9.0	-0.013
	End Point	699.5400	715.4620	-9.3	-0.013

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9.4.7. LTE BAND 13

ID:	16069 OG	Date:	3/12/19

QPSK, (10MHz BANDWIDTH)

Limit		777	787	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	777.5240	786.4630		
Extreme (50C)		777.5240	786.4630	-9.8	-0.013
Extreme (40C)		777.5240	786.4630	-8.0	-0.010
Extreme (30C)		777.5240	786.4630	-7.6	-0.010
Extreme (10C)		777.5240	786.4630	9.4	0.012
Extreme (0C)		777.5240	786.4630	-8.0	-0.010
Extreme (-10C)		777.5240	786.4630	-9.6	-0.012
Extreme (-20C)		777.5240	786.4630	-8.8	-0.011
Extreme (-30C)		777.5240	786.4630	-11.3	-0.014
20C	15%	777.5240	786.4630	-9.8	-0.013
	-15%	777.5240	786.4630	-9.2	-0.012
	End Point	777.5240	786.4630	-10.4	-0.013

9.4.8. LTE BAND 41

ID:	43575 OS	Date:	2/19/19

QPSK, (20MHz BANDWIDTH)

Limit		2496	2690	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm (MHz)	F high @ -13dBm (MHz)		
Temperature	Voltage				
Normal (20C)	Normal	2497.1363	2688.8794		
Extreme (50C)		2497.1363	2688.8794	12.9	0.005
Extreme (40C)		2497.1363	2688.8794	15.3	0.006
Extreme (30C)		2497.1363	2688.8794	15.3	0.006
Extreme (10C)		2497.1363	2688.8794	16.3	0.006
Extreme (0C)		2497.1363	2688.8794	17.7	0.007
Extreme (-10C)		2497.1363	2688.8794	15.2	0.006
Extreme (-20C)		2497.1363	2688.8794	14.0	0.005
Extreme (-30C)		2497.1363	2688.8794	13.7	0.005
20C	15%	2497.1363	2688.8794	19.0	0.007
	-15%	2497.1363	2688.8794	14.5	0.006
	End Point	2497.1363	2688.8794	17.2	0.007

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9.4.9. LTE BAND 66

ID:	16069 OG	Date:	3/12/19

QPSK, (20MHz BANDWIDTH)

Limit		1710	1780	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm	F high @ -13dBm		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	1711.1020	1778.9090		
Extreme (50C)		1711.1020	1778.9090	12.8	0.007
Extreme (40C)		1711.1020	1778.9090	-13.9	-0.008
Extreme (30C)		1711.1020	1778.9090	11.2	0.006
Extreme (10C)		1711.1020	1778.9090	13.3	0.008
Extreme (0C)		1711.1020	1778.9090	11.0	0.006
Extreme (-10C)		1711.1020	1778.9090	13.7	0.008
Extreme (-20C)		1711.1020	1778.9090	12.3	0.007
Extreme (-30C)		1711.1020	1778.9090	-16.5	-0.009
20C	15%	1711.1020	1778.9090	11.9	0.007
	-15%	1711.1020	1778.9090	10.5	0.006
	End Point	1711.1020	1778.9090	12.3	0.007

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9.5. PEAK TO AVERAGE RATIO

LIMITS

In addition, the peak to average power ratio (PAPR) of the transmitter shall not exceed 13 dB for more than 0.1% of the time and shall use a signal corresponding to the highest PAPR during periods of continuous transmission.

RESULT

LAT 1 antenna was used to measure as the worst case. The results from all CCDF plots are passed with 13dB peak-to-average power ratio criteria.

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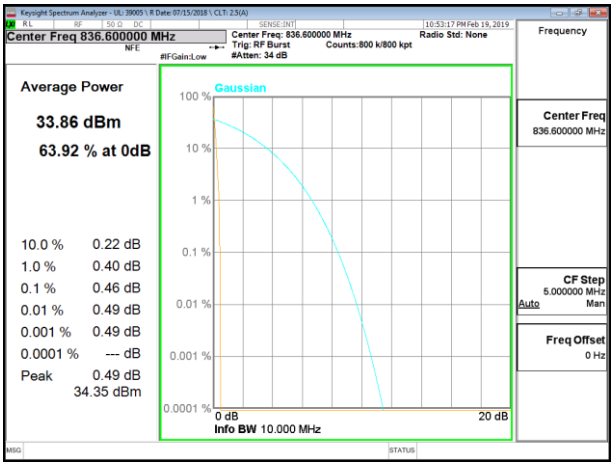
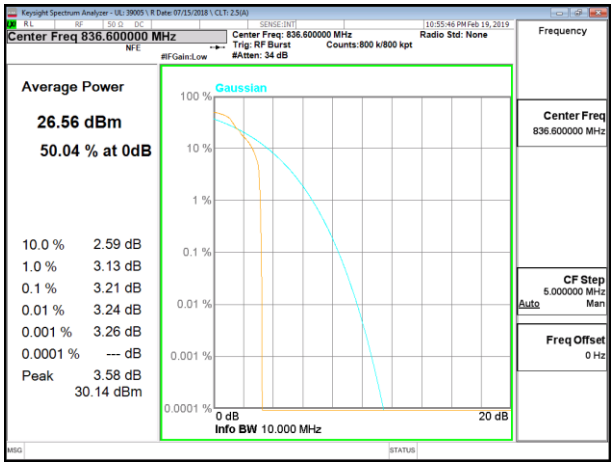
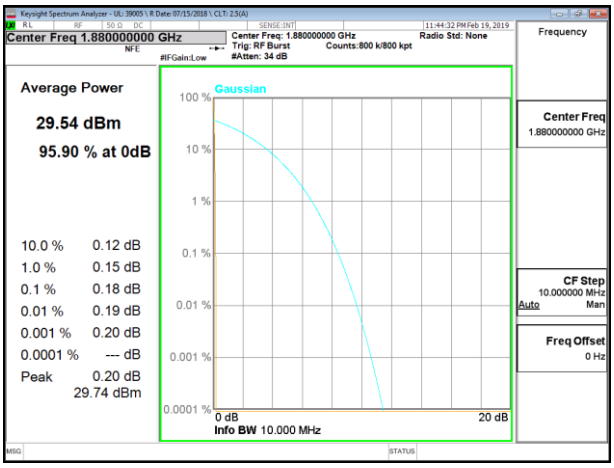
9.5.1. GSM



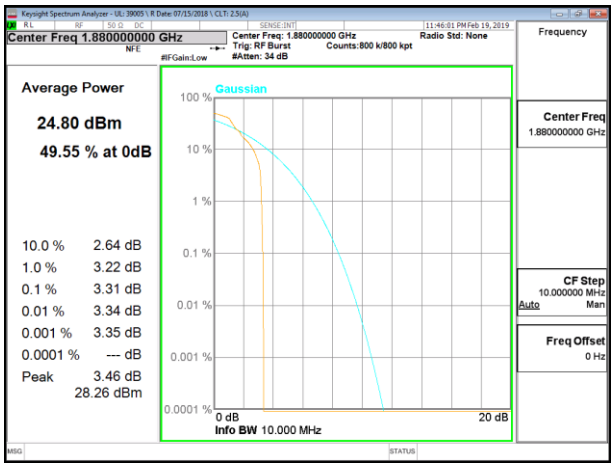
GSM 850MHz GPRS MID Channel



GSM 850MHz EGPRS MID Channel



GSM 1900MHz GPRS MID Channel



GSM 1900MHz EGPRS MID Channel

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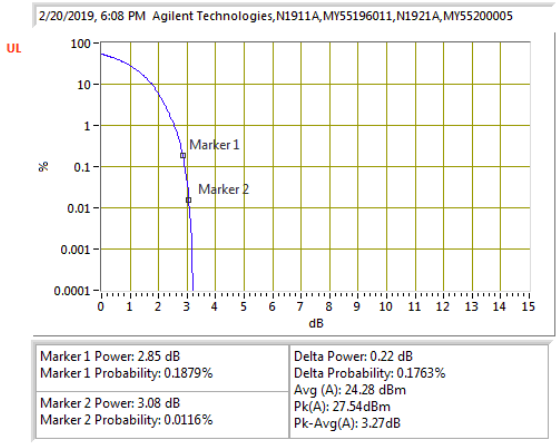
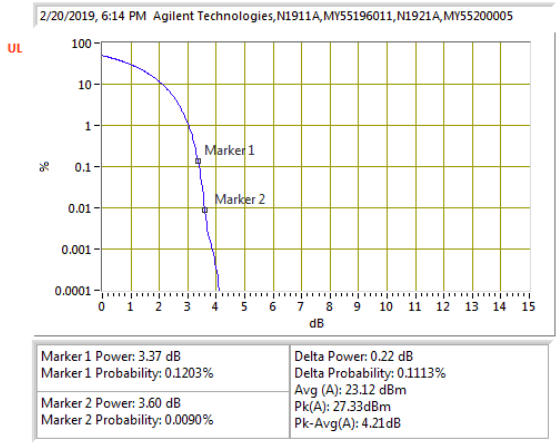
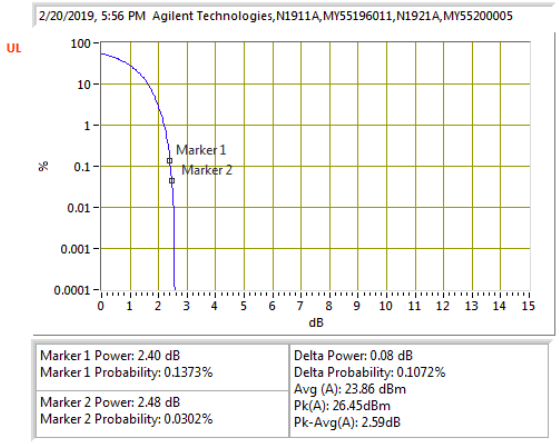
9.5.2. WCDMA



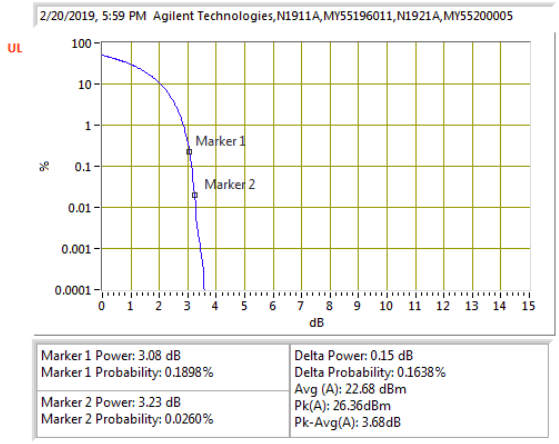
WCDMA BAND5 Rel99 MID Channel



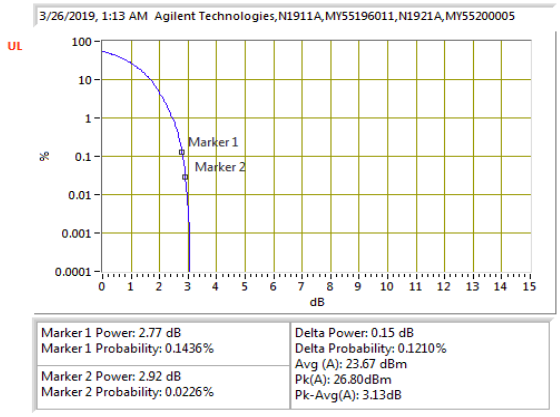
WCDMA BAND5 HSDPA MID Channel



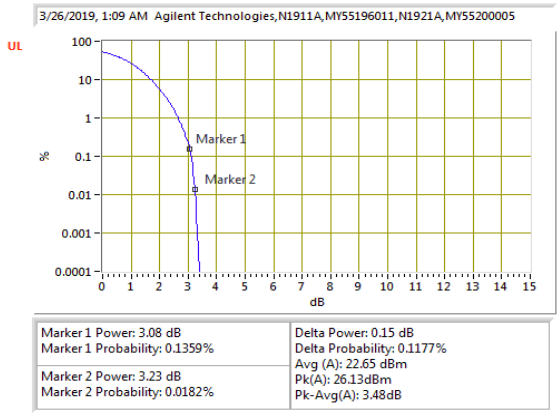
WCDMA BAND2 Rel99 MID Channel



WCDMA BAND2 HSDPA MID Channel



WCDMA BAND4 Rel99 MID Channel



WCDMA BAND4 HSDPA MID Channel

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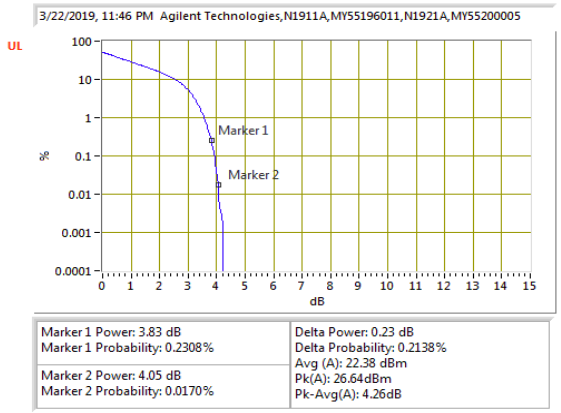
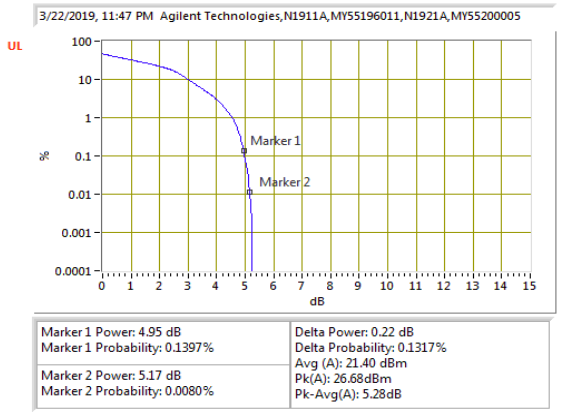
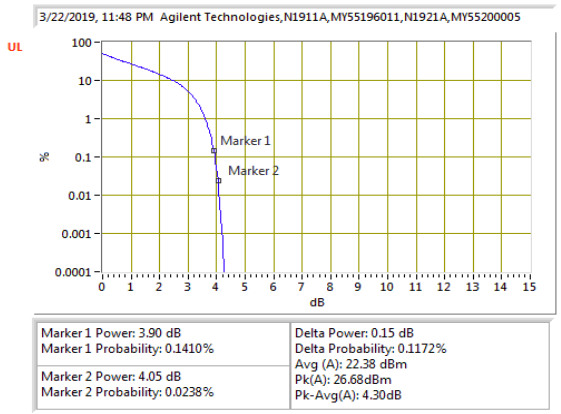
9.5.3. LTE BAND 2



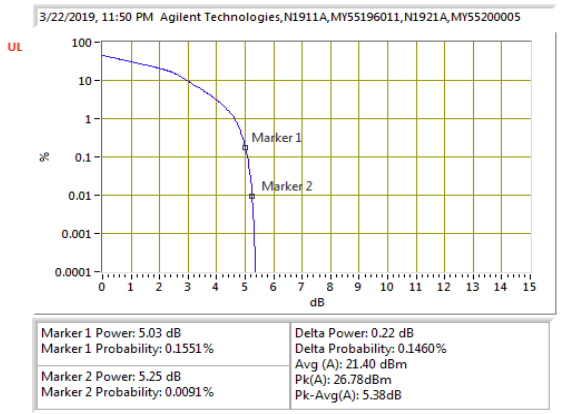
LTE B2 1.4MHz QPSK Mid Channel



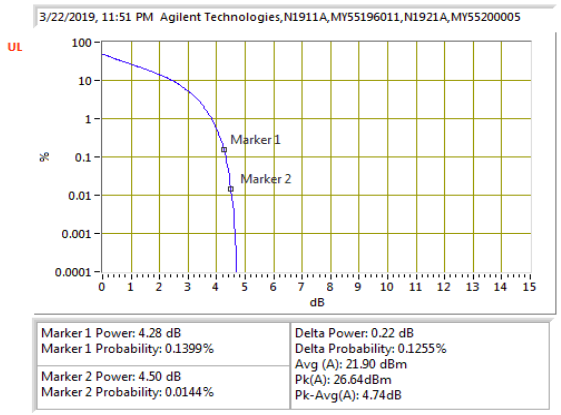
LTE B2 1.4MHz 16QAM Mid Channel



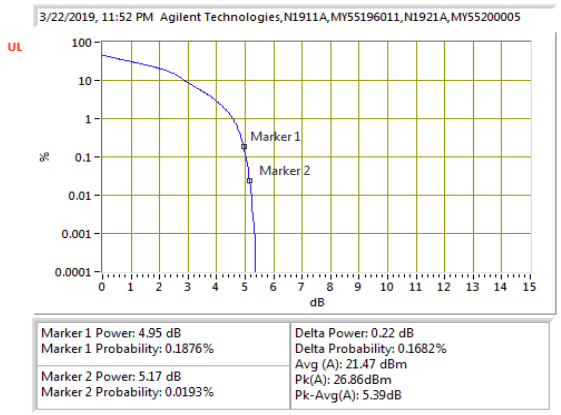
LTE B2 3MHz QPSK Mid Channel



LTE B2 3MHz 16QAM Mid Channel



LTE B2 5MHz QPSK Mid Channel



LTE B2 5MHz 16QAM Mid Channel

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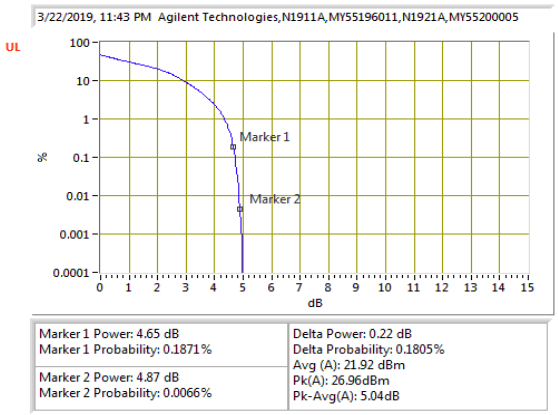
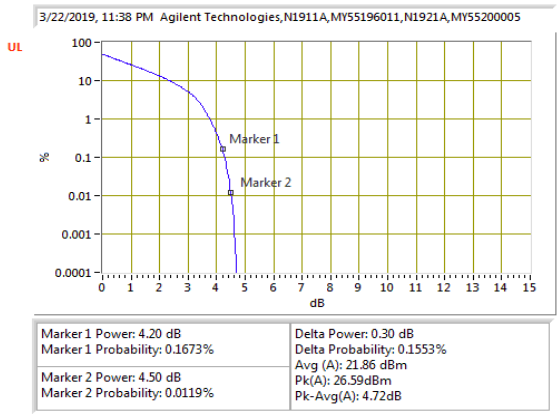
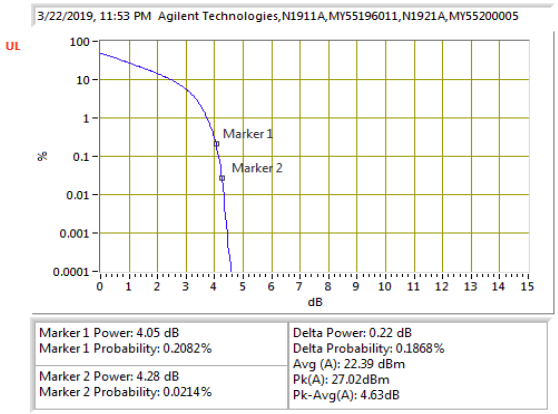


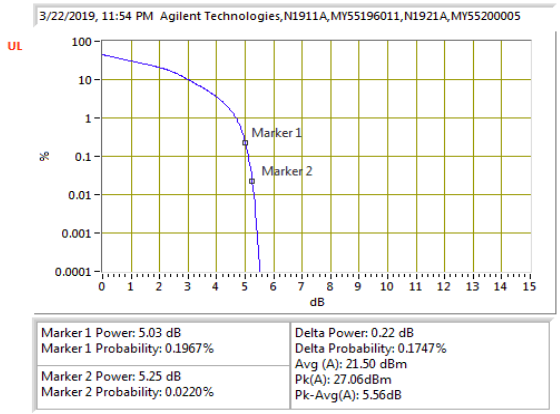
LTE B2 10MHz QPSK Mid Channel



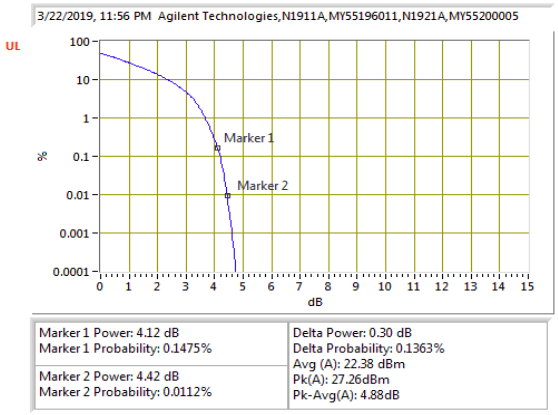
LTE B2 10MHz 16QAM Mid Channel



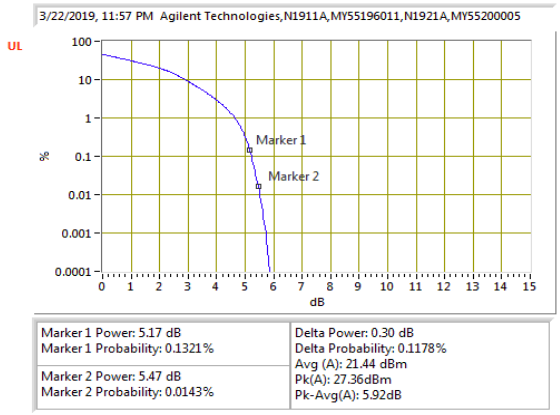
LTE B2 15MHz QPSK Mid Channel



LTE B2 15MHz 16QAM Mid Channel



LTE B2 20MHz QPSK Mid Channel



LTE B2 20MHz 16QAM Mid Channel

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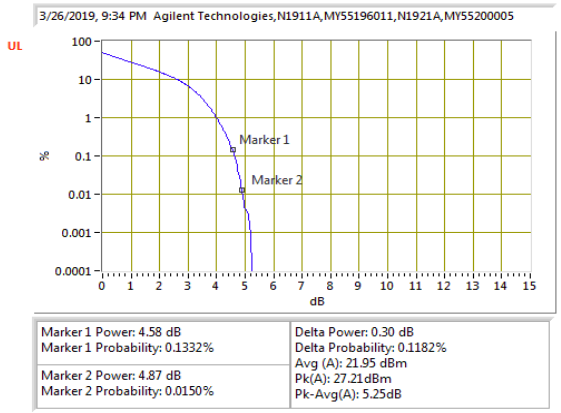
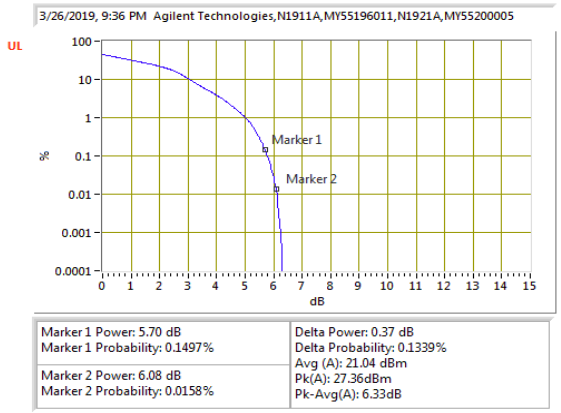
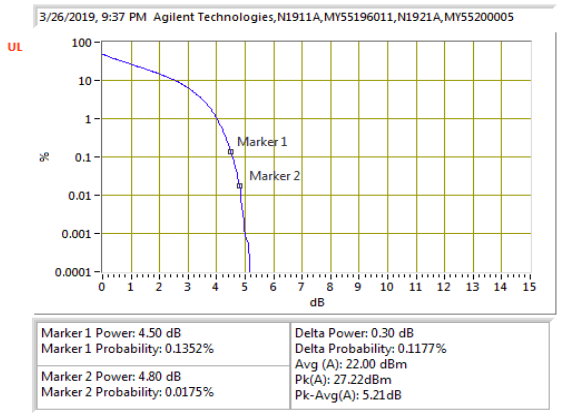
9.5.4. LTE BAND 4



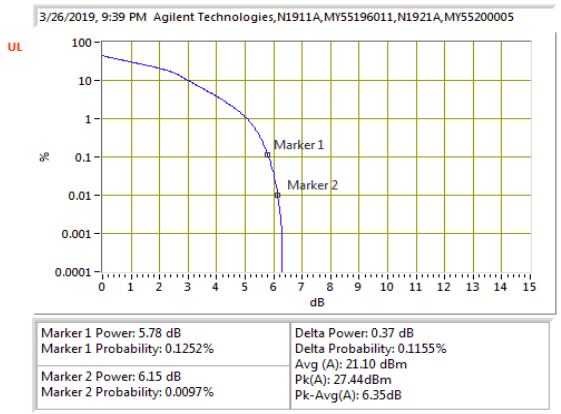
LTE B4 1.4MHz QPSK Mid Channel



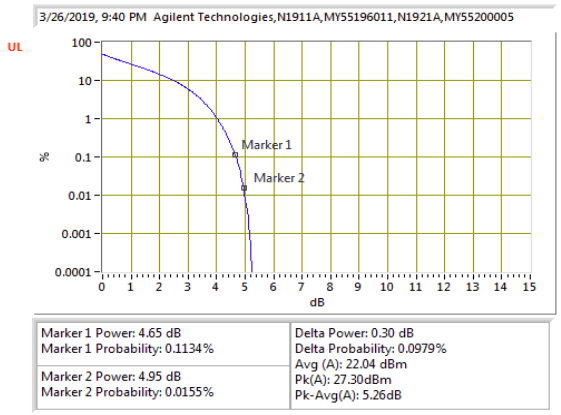
LTE B4 1.4MHz 16QAM Mid Channel



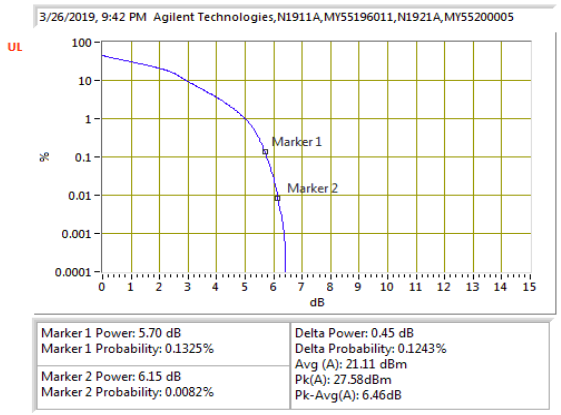
LTE B4 3MHz QPSK Mid Channel



LTE B4 3MHz 16QAM Mid Channel



LTE B4 5MHz QPSK Mid Channel



LTE B4 5MHz 16QAM Mid Channel

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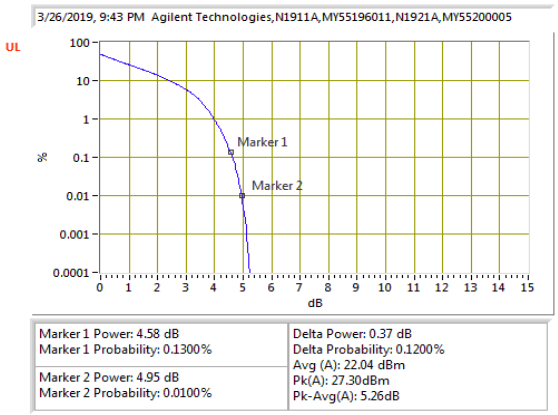
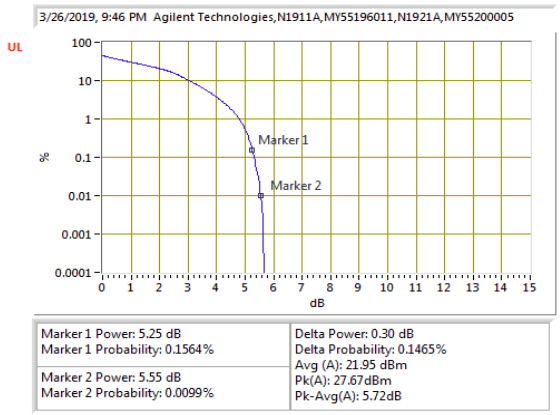
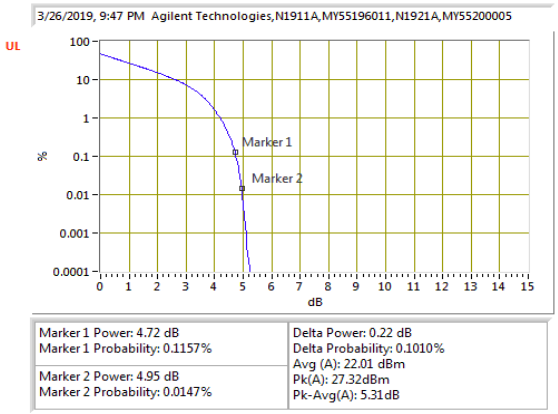


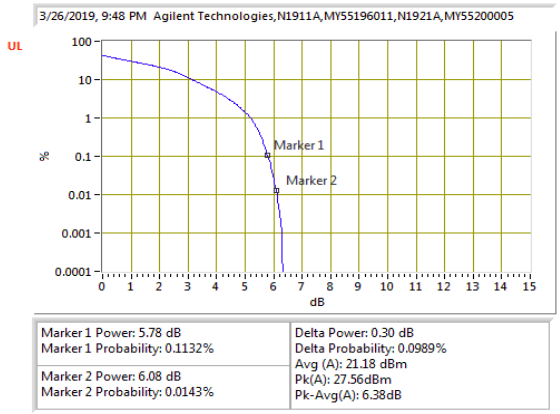
LTE B4 10MHz QPSK Mid Channel



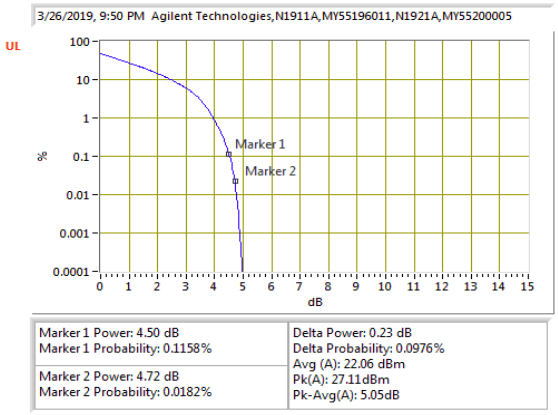
LTE B4 10MHz 16QAM Mid Channel



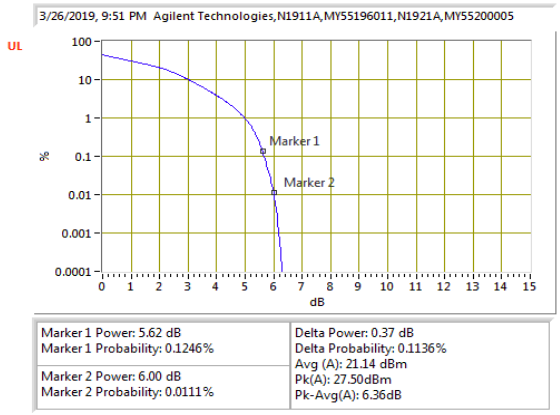
LTE B4 15MHz QPSK Mid Channel



LTE B4 15MHz 16QAM Mid Channel



LTE B4 20MHz QPSK Mid Channel



LTE B4 20MHz 16QAM Mid Channel

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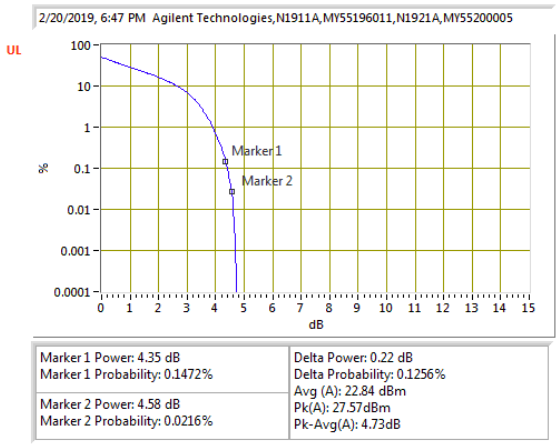
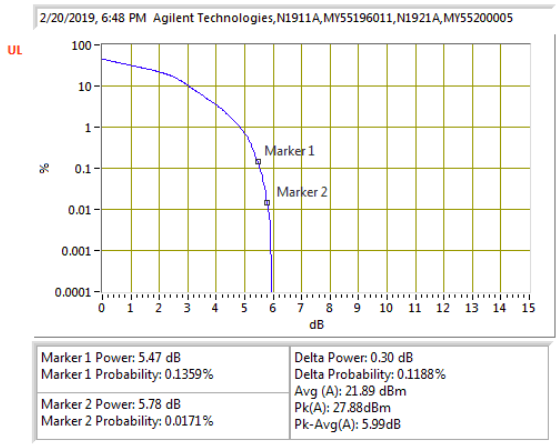
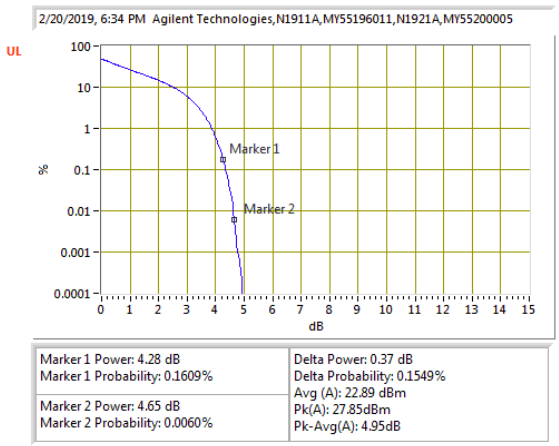
9.5.5. LTE BAND 5



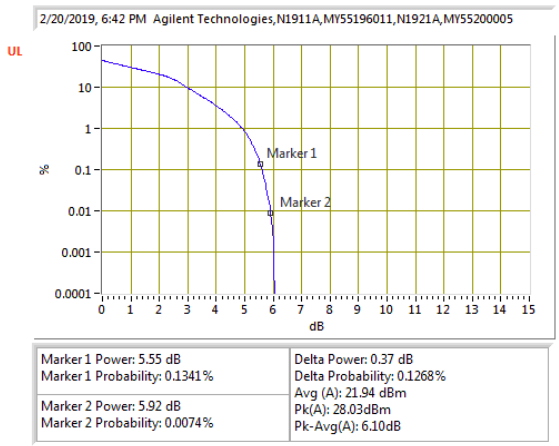
LTE B5 1.4MHz QPSK Mid Channel



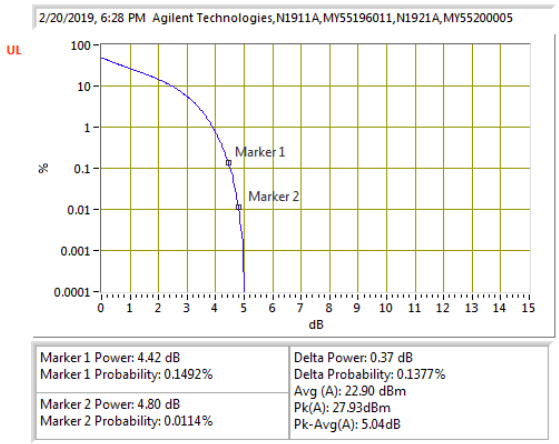
LTE B5 1.4MHz 16QAM Mid Channel



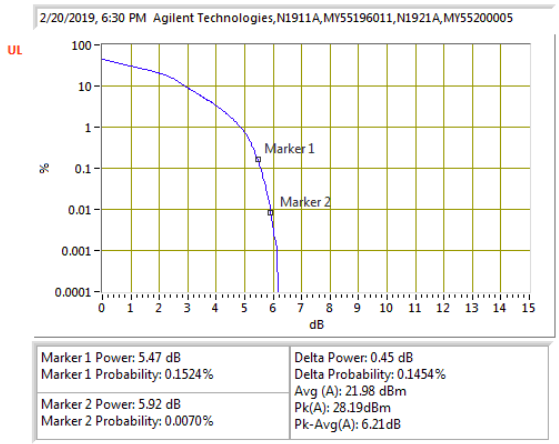
LTE B5 3MHz QPSK Mid Channel



LTE B5 3MHz 16QAM Mid Channel



LTE B5 5MHz QPSK Mid Channel



LTE B5 5MHz 16QAM Mid Channel

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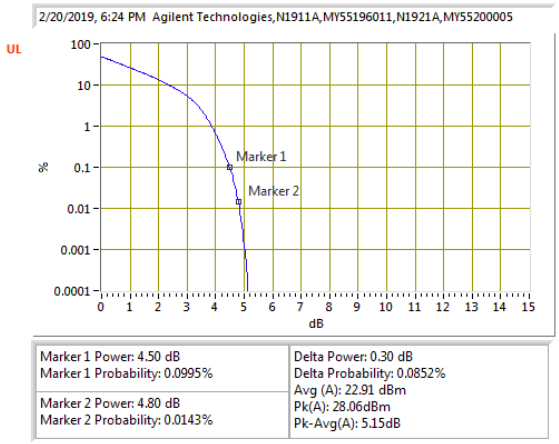
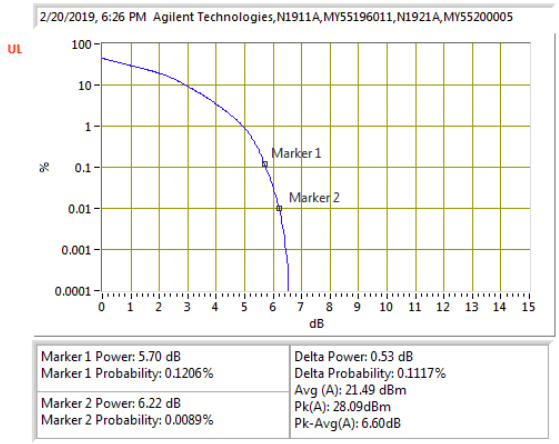


LTE B5 10MHz QPSK Mid Channel



LTE B5 10MHz 16QAM Mid Channel

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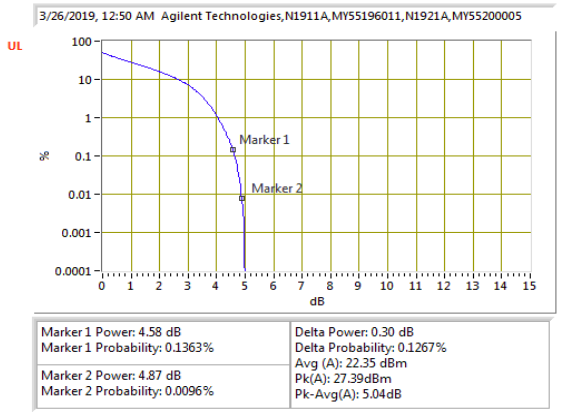
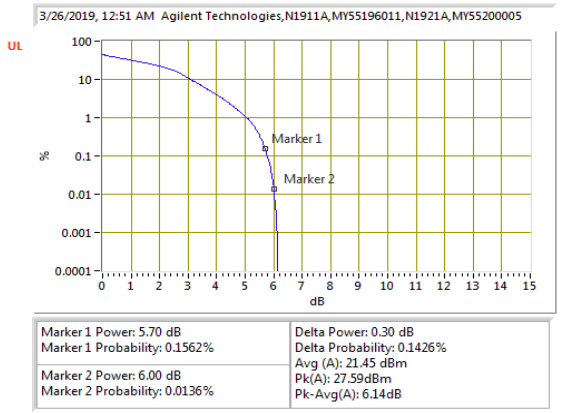
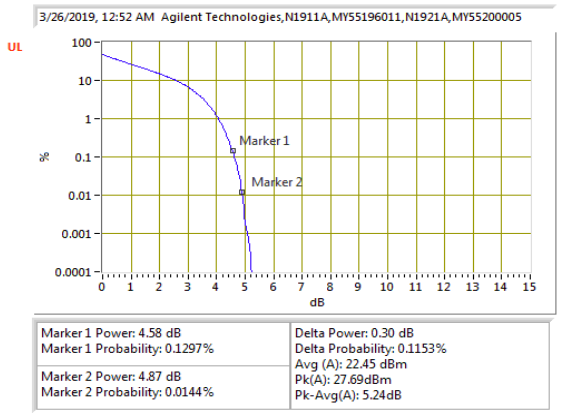
9.5.6. LTE BAND 12



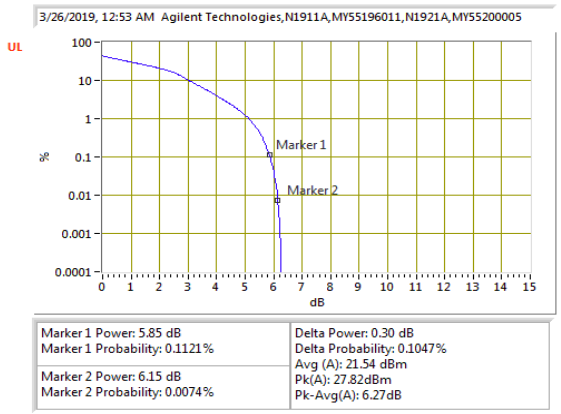
LTE B12 1.4MHz QPSK Mid Channel



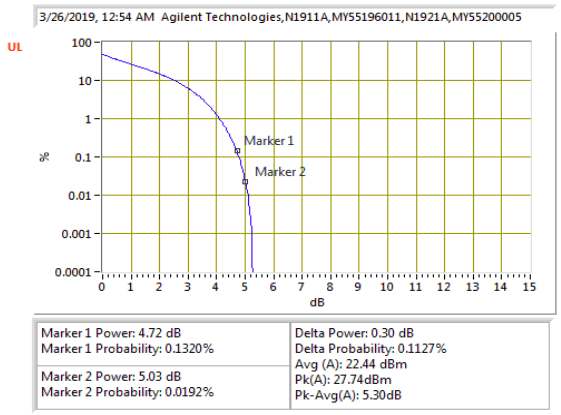
LTE B12 1.4MHz 16QAM Mid Channel



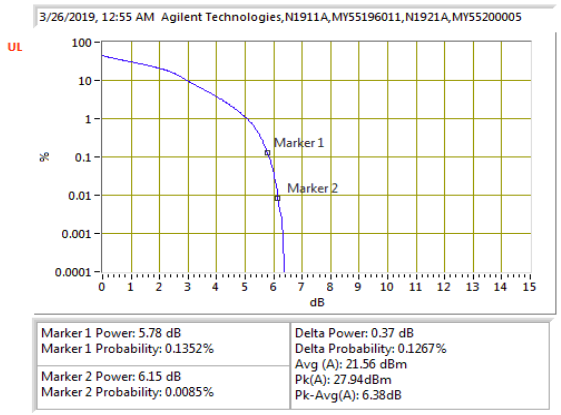
LTE B12 3MHz QPSK Mid Channel



LTE B12 3MHz 16QAM Mid Channel



LTE B12 5MHz QPSK Mid Channel



LTE B12 5MHz 16QAM Mid Channel

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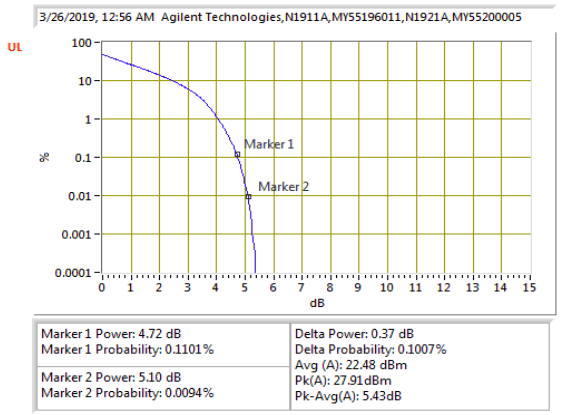
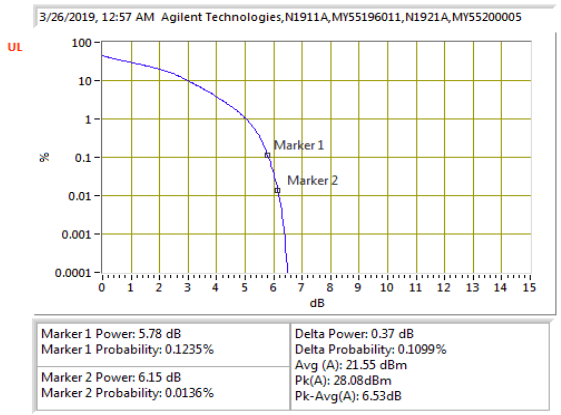


LTE B12 10MHz QPSK Mid Channel



LTE B12 10MHz 16QAM Mid Channel

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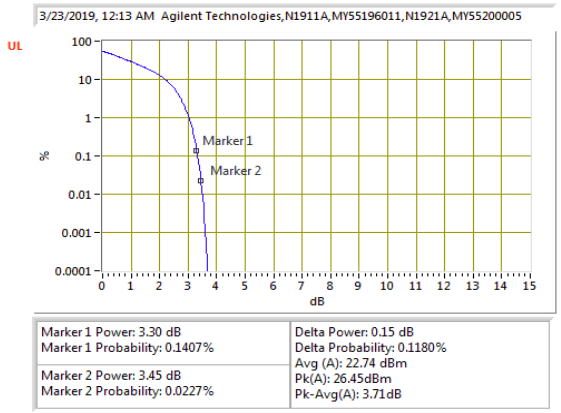
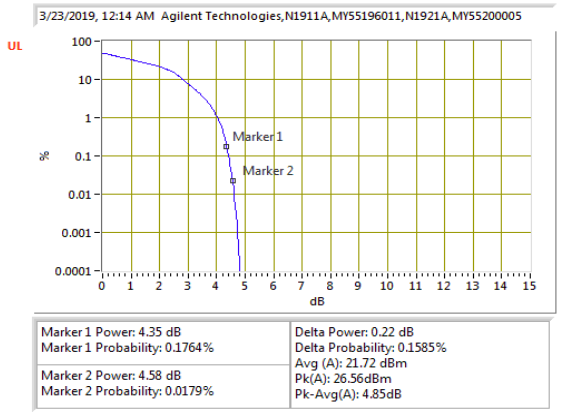
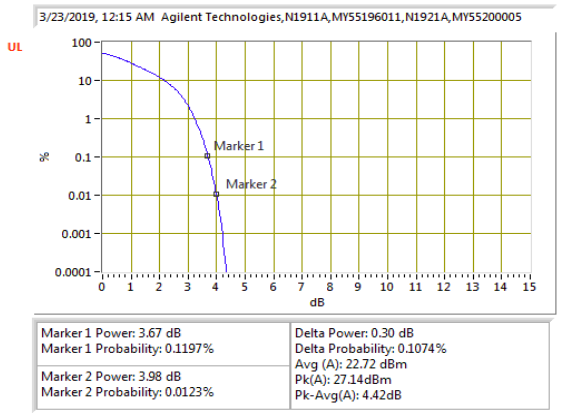
9.5.7. LTE BAND 13



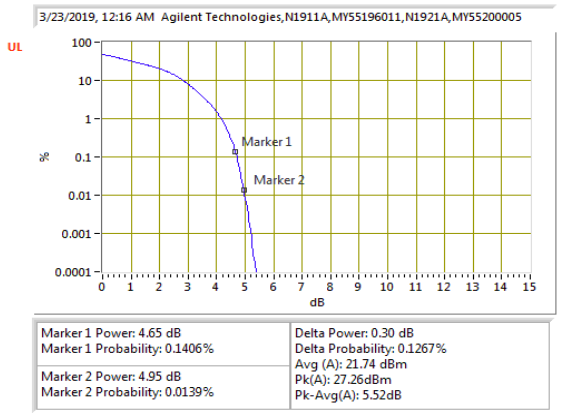
LTE B13 5MHz QPSK Mid Channel



LTE B13 5MHz 16QAM Mid Channel



LTE B13 10MHz QPSK Mid Channel



LTE B13 10MHz 16QAM Mid Channel

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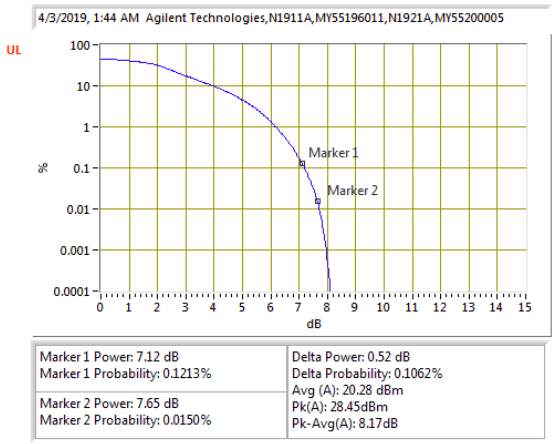
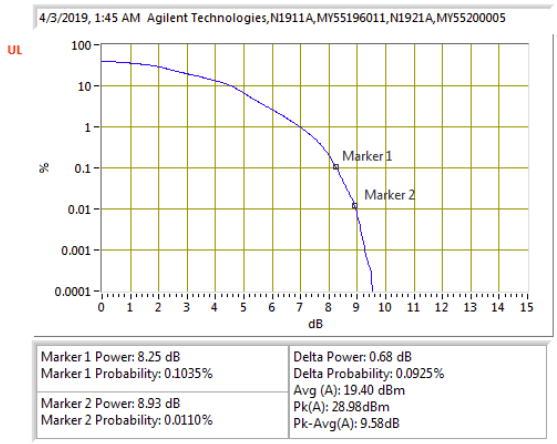
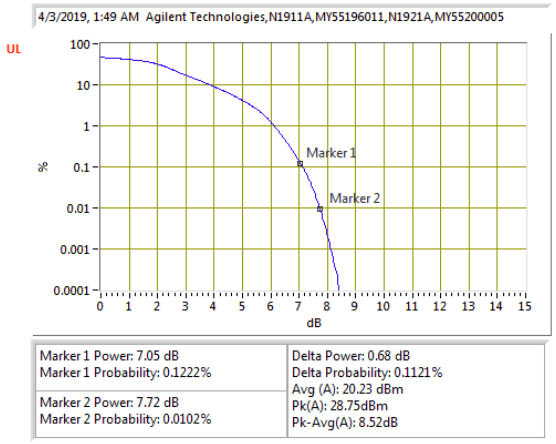
9.5.8. LTE BAND 41



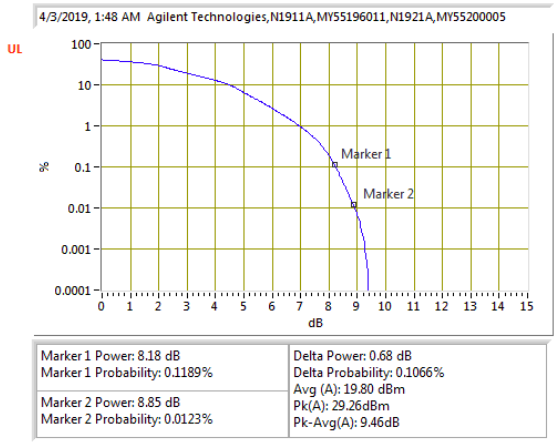
LTE B41 5MHz QPSK Middle Channel



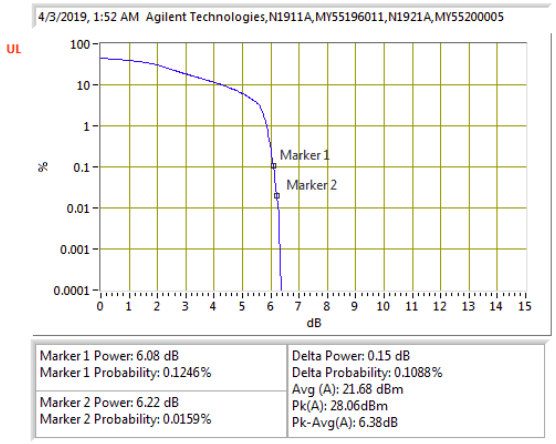
LTE B41 5MHz 16QAM Middle Channel



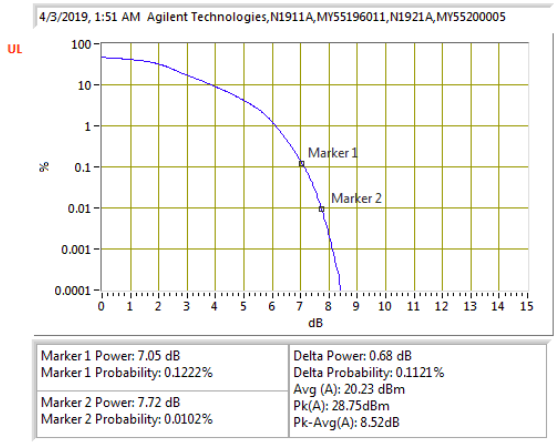
LTE B41 10MHz QPSK Middle Channel



LTE B41 10MHz 16QAM Middle Channel



LTE B41 15MHz QPSK Middle Channel



LTE B41 15MHz 16QAM Middle Channel

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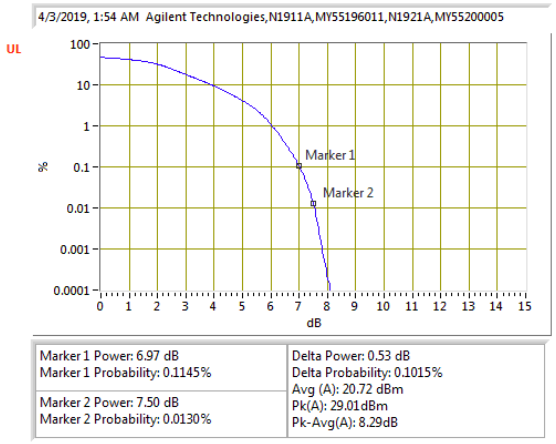
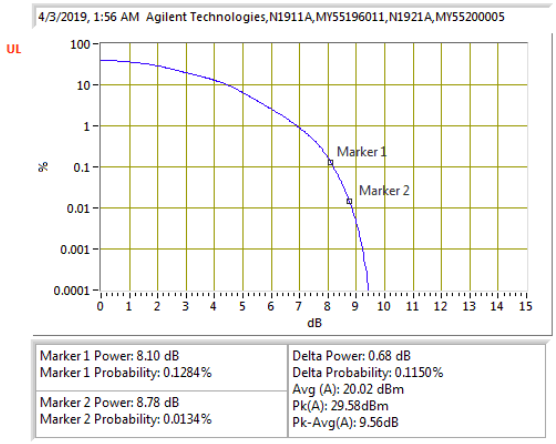


LTE B41 20MHz QPSK Middle Channel



LTE B41 20MHz 16QAM Middle Channel

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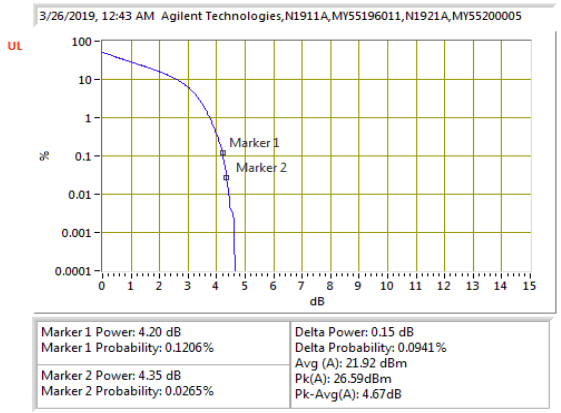
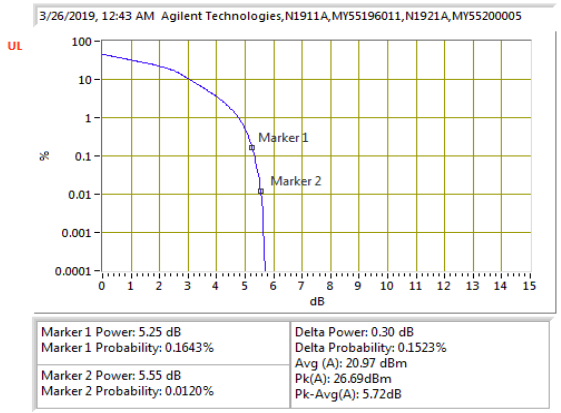
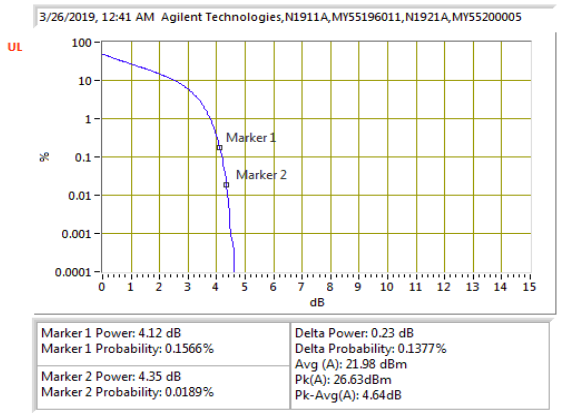
9.5.9. LTE BAND 66



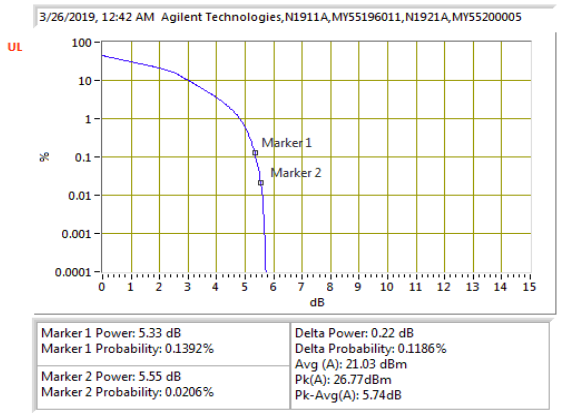
LTE B66 1.4MHz QPSK Mid Channel



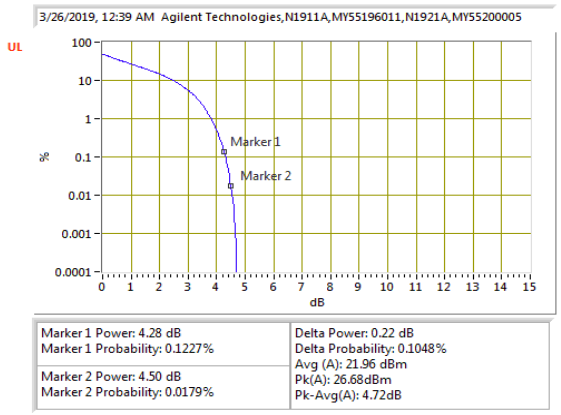
LTE B66 1.4MHz 16QAM Mid Channel



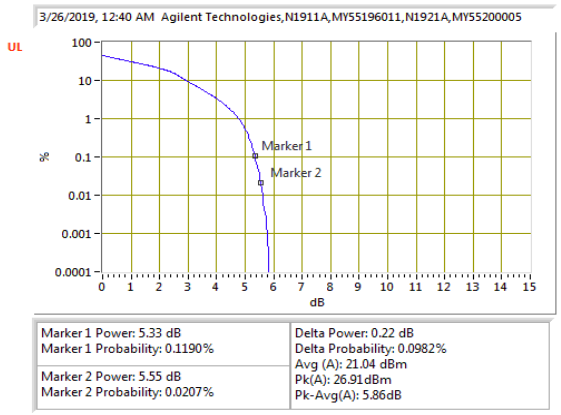
LTE B66 3MHz QPSK Mid Channel



LTE B66 3MHz 16QAM Mid Channel



LTE B66 5MHz QPSK Mid Channel



LTE B66 5MHz 16QAM Mid Channel

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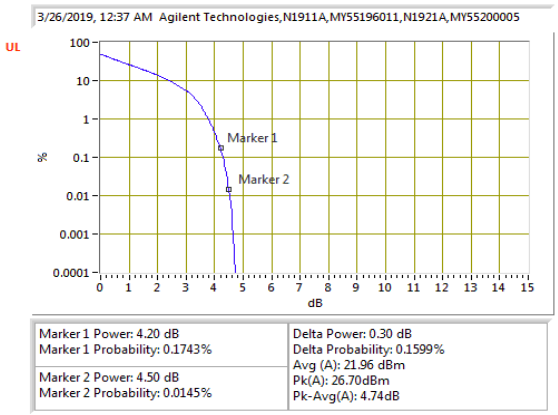
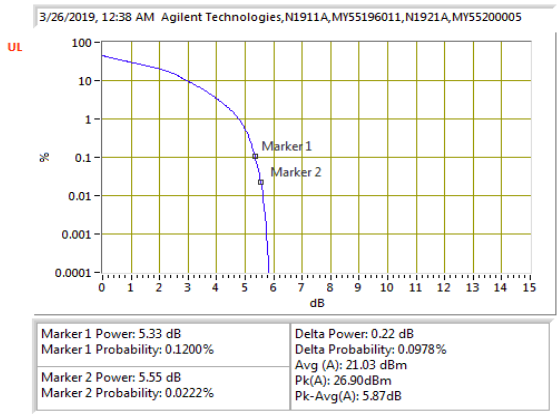
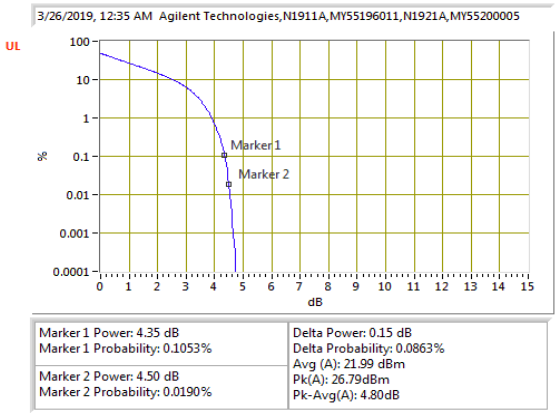


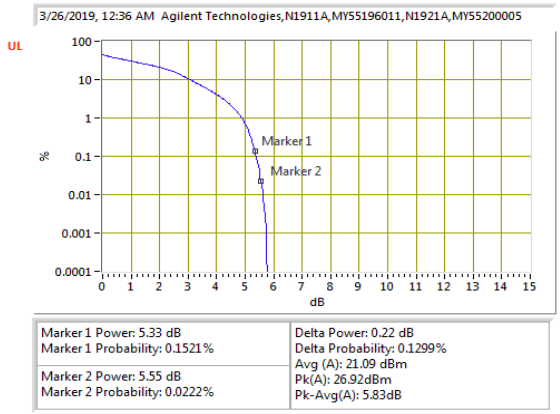
LTE B66 10MHz QPSK Mid Channel



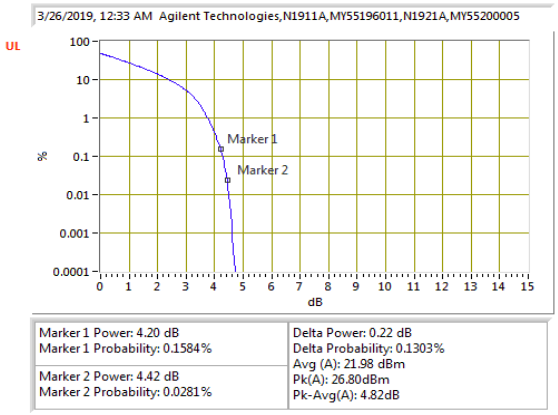
LTE B66 10MHz 16QAM Mid Channel



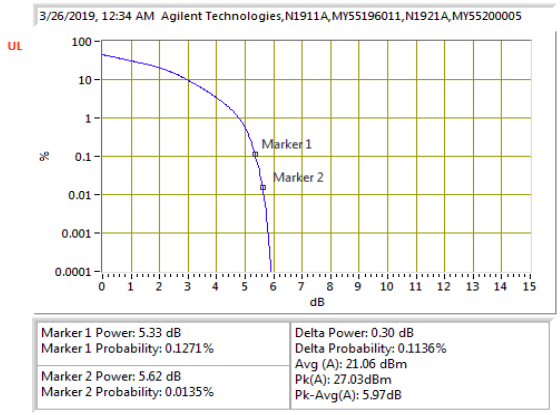
LTE B66 15MHz QPSK Mid Channel



LTE B66 15MHz 16QAM Mid Channel



LTE B66 20MHz QPSK Mid Channel



LTE B66 20MHz 16QAM Mid Channel

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10. RADIATED TEST RESULTS

10.1. EFFECTIVE RADIATED POWER ERP/EIRP

RULE PART(S)

FCC: §2.1053, §22.917, §24.238, and §27.50

LIMITS

22.913(a) - The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

24.232(c) - Mobile/portable stations are limited to 2 watts e.i.r.p. peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.

27.50 - (2) Mobile and other user stations. Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

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

TEST PROCEDURE

ANSI / TIA / EIA 603-E (2016), Clause 2.2.17; PSA setting reference to 971168 D01 v03r01

For peak power measurement with a PSA:

a) Set the RBW ≥ OBW; b) Set VBW ≥ 3 × RBW; c) Set span ≥ 2 x RBW; d) Sweep time = auto couple; e) Detector = peak; f) Ensure that the number of measurement points ≥ span/RBW; g) Trace mode = max hold;

For average power measurement with a PSA:

a) Set span to at least 1.5 times the OBW; b) Set RBW = 1-5% of the OBW, not to exceed 1 MHz; c) Set VBW ≥ 3 x RBW; d) Set number of points in sweep ≥ 2 × span / RBW; e) Sweep time = auto-couple; f) Detector = RMS (power averaging); g) Use free run trigger If burst duty cycle ≥ 98; h) Use trigger to capture bursts If burst duty cycle < 98; i) Trace average at least 100 traces in power averaging (*i.e.*, RMS) mode. j) Compute the power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function.

MODES TESTED

- GSM 850
- GSM 1900
- WCDMA Band 5
- WCDMA Band 2
- WCDMA Band 4
- LTE 2
- LTE 4
- LTE 5
- LTE 12
- LTE 13
- LTE 41
- LTE 66

TEST RESULTS

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GSM

Band	Mode	Channel	f(MHz)	ERP/EIRP	
				dBm	W
GSM 850	GPRS	128	824.2	26.17	0.4140
		190	836.6	24.85	0.3055
		251	848.8	25.87	0.3864
	EGPRS	128	824.2	22.27	0.1687
		190	836.6	20.41	0.1099
		251	848.8	21.90	0.1549
GSM 1900	GPRS	512	1850.2	24.31	0.2698
		661	1880.0	23.71	0.2350
		810	1909.8	23.50	0.2239
	EGPRS	512	1850.2	21.78	0.1507
		661	1880.0	21.00	0.1259
		810	1909.8	20.73	0.1183

WCDMA

Band	Mode	Channel	f(MHz)	ERP/EIRP	
				dBm	W
Band 2	REL99	9262	1852.4	19.73	0.0940
		9400	1880	18.25	0.0668
		9538	1907.6	19.35	0.0861
	HSDPA	9262	1852.4	18.82	0.0762
		9400	1880.0	17.16	0.0520
		9538	1907.6	18.31	0.0678
Band 5	REL99	4132	826.4	18.27	0.0671
		4183	836.6	17.78	0.0600
		4233	846.6	18.33	0.0681
	HSDPA	4132	826.4	17.65	0.0582
		4183	836.6	17.24	0.0530
		4233	846.6	17.45	0.0560
Band 4	REL99	1312	1712.4	20.26	0.1062
		1413	1732.6	21.33	0.1358
		1513	1752.6	21.87	0.1538
	HSDPA	1312	1712.4	19.18	0.0828
		1413	1732.6	20.18	0.1042
		1513	1752.6	20.90	0.1230

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LTE Band 2

BW (MHz)	Mode	RB/RB Size	f(MHz)	EIRP	
				dBm	W
20	QPSK	1/0	1860	23.01	0.2000
		1/0	1880	22.39	0.1734
		1/0	1900	22.03	0.1596
	16QAM	1/0	1860	21.95	0.1567
		1/0	1880	21.62	0.1452
		1/0	1900	21.62	0.1452
15	QPSK	1/0	1857.5	22.98	0.1986
		1/0	1880	22.06	0.1607
		1/0	1902.5	22.13	0.1633
	16QAM	1/0	1857.5	21.90	0.1549
		1/0	1880	21.28	0.1343
		1/0	1902.5	21.34	0.1361
10	QPSK	1/0	1855	23.51	0.2244
		1/0	1880	22.46	0.1762
		1/0	1905	21.84	0.1528
	16QAM	1/0	1855	22.31	0.1702
		1/0	1880	21.58	0.1439
		1/0	1905	21.05	0.1274
5	QPSK	1/0	1852.5	23.24	0.2109
		1/0	1880	22.11	0.1626
		1/0	1907.5	21.65	0.1462
	16QAM	1/0	1852.5	22.20	0.1660
		1/0	1880	21.20	0.1318
		1/0	1907.5	20.71	0.1178
3	QPSK	1/0	1851.5	23.35	0.2163
		1/0	1880	22.30	0.1698
		1/0	1908.5	21.61	0.1445
	16QAM	1/0	1851.5	22.17	0.1648
		1/0	1880	21.37	0.1371
		1/0	1908.5	20.59	0.1146
1.4	QPSK	1/0	1850.7	23.23	0.2104
		1/0	1880	22.26	0.1683
		1/0	1909.3	20.67	0.1167
	16QAM	1/0	1850.7	22.12	0.1629
		1/0	1880	21.22	0.1324
		1/0	1909.3	19.65	0.0923

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LTE Band 4

BW (MHz)	Mode	RB/RB Size	f(MHz)	EIRP	
				dBm	W
20	QPSK	1/0	1720	20.28	0.1067
		1/0	1732.5	20.81	0.1205
		1/0	1745	20.57	0.1140
	16QAM	1/0	1720	19.40	0.0871
		1/0	1732.5	20.11	0.1026
		1/0	1745	19.72	0.0938
15	QPSK	1/0	1717.5	19.26	0.0843
		1/0	1732.5	20.72	0.1180
		1/0	1747.5	20.56	0.1138
	16QAM	1/0	1717.5	18.42	0.0695
		1/0	1732.5	20.00	0.1000
		1/0	1747.5	19.55	0.0902
10	QPSK	1/0	1715	20.16	0.1038
		1/0	1732.5	19.73	0.0940
		1/0	1750	20.88	0.1225
	16QAM	1/0	1715	19.23	0.0838
		1/0	1732.5	19.04	0.0802
		1/0	1750	19.97	0.0993
5	QPSK	1/0	1712.5	20.13	0.1030
		1/0	1732.5	20.79	0.1199
		1/0	1752.5	20.92	0.1236
	16QAM	1/0	1712.5	19.36	0.0863
		1/0	1732.5	20.08	0.1019
		1/0	1752.5	20.13	0.1030
3	QPSK	1/0	1711.5	19.64	0.0920
		1/0	1732.5	20.65	0.1161
		1/0	1753.5	20.81	0.1205
	16QAM	1/0	1711.5	18.70	0.0741
		1/0	1732.5	19.91	0.0979
		1/0	1753.5	20.07	0.1016
1.4	QPSK	1/0	1710.7	18.96	0.0787
		1/0	1732.5	20.06	0.1014
		1/0	1754.3	20.79	0.1199
	16QAM	1/0	1710.7	18.01	0.0632
		1/0	1732.5	19.32	0.0855
		1/0	1754.3	20.05	0.1012

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LTE Band 5

BW (MHz)	Mode	RB/RB Size	f(MHz)	ERP	
				dBm	W
10	QPSK	1/0	829	17.07	0.0509
		1/0	836.5	16.48	0.0445
		1/0	844	16.48	0.0445
	16QAM	1/0	829	16.35	0.0432
		1/0	836.5	15.60	0.0363
		1/0	844	15.77	0.0378
5	QPSK	1/0	826.5	16.53	0.0450
		1/0	836.5	16.12	0.0409
		1/0	846.5	15.90	0.0389
	16QAM	1/0	826.5	15.86	0.0385
		1/0	836.5	15.23	0.0333
		1/0	846.5	15.16	0.0328
3	QPSK	1/0	825.5	16.01	0.0399
		1/0	836.5	15.51	0.0356
		1/0	847.5	15.76	0.0377
	16QAM	1/0	825.5	15.25	0.0335
		1/0	836.5	14.57	0.0286
		1/0	847.5	14.81	0.0303
1.4	QPSK	1/0	824.7	15.96	0.0394
		1/0	836.5	15.59	0.0362
		1/0	848.3	15.40	0.0347
	16QAM	1/0	824.7	15.15	0.0327
		1/0	836.5	14.70	0.0295
		1/0	848.3	14.57	0.0286

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LTE Band 12

BW (MHz)	Mode	RB/RB Size	f(MHz)	ERP	
				dBm	W
10	QPSK	1/0	704	15.86	0.0385
		1/0	707.5	15.80	0.0380
		1/0	711	15.75	0.0376
	16QAM	1/0	704	15.02	0.0318
		1/0	707.5	14.97	0.0314
		1/0	711	14.89	0.0308
5	QPSK	1/0	701.5	15.83	0.0383
		1/0	707.5	16.18	0.0415
		1/0	713.5	16.09	0.0406
	16QAM	1/0	701.5	15.10	0.0324
		1/0	707.5	15.46	0.0352
		1/0	713.5	15.33	0.0341
3	QPSK	1/0	700.5	15.75	0.0376
		1/0	707.5	16.34	0.0431
		1/0	714.5	16.32	0.0429
	16QAM	1/0	700.5	14.92	0.0310
		1/0	707.5	15.50	0.0355
		1/0	714.5	15.54	0.0358
1.4	QPSK	1/0	699.7	15.51	0.0356
		1/0	707.5	16.05	0.0403
		1/0	715.3	15.84	0.0384
	16QAM	1/0	699.7	14.65	0.0292
		1/0	707.5	15.20	0.0331
		1/0	715.3	15.02	0.0318

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LTE Band 13

BW (MHz)	Mode	RB/RB Size	f(MHz)	ERP	
				dBm	W
10	QPSK				
		1/0	782	20.27	0.1064
	16QAM				
		1/0	782	19.28	0.0847
5	QPSK	1/0	779.5	20.59	0.1146
		1/0	782	20.23	0.1054
		1/0	784.5	20.61	0.1151
	16QAM	1/0	779.5	19.65	0.0923
		1/0	782	19.22	0.0836
		1/0	784.5	19.60	0.0912

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LTE Band 41

BW (MHz)	Mode	RB/RB Size	f(MHz)	EIRP	
				dBm	W
20	QPSK	1/0	2506	16.67	0.0465
		1/0	2593	17.24	0.0530
		1/0	2680	15.39	0.0346
	16QAM	1/0	2506	15.83	0.0383
		1/0	2593	16.35	0.0432
		1/0	2680	14.44	0.0278
15	QPSK	1/0	2503.5	16.20	0.0417
		1/0	2593	16.78	0.0476
		1/0	2682.5	15.11	0.0324
	16QAM	1/0	2503.5	15.42	0.0348
		1/0	2593	15.83	0.0383
		1/0	2682.5	14.04	0.0254
10	QPSK	1/0	2501	18.84	0.0766
		1/0	2593	17.20	0.0525
		1/0	2685	14.54	0.0284
	16QAM	1/0	2501	18.02	0.0634
		1/0	2593	16.32	0.0429
		1/0	2685	13.36	0.0217
5	QPSK	1/0	2498.5	18.76	0.0752
		1/0	2593	16.82	0.0481
		1/0	2687.5	14.41	0.0276
	16QAM	1/0	2498.5	17.86	0.0611
		1/0	2593	16.03	0.0401
		1/0	2687.5	13.33	0.0215

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LTE Band 66

BW (MHz)	Mode	RB/RB Size	f(MHz)	EIRP	
				dBm	W
20	QPSK	1/0	1720	20.95	0.1245
		1/0	1745	21.83	0.1524
		1/0	1770	21.89	0.1545
	16QAM	1/0	1720	20.28	0.1067
		1/0	1745	21.22	0.1324
		1/0	1770	21.32	0.1355
15	QPSK	1/0	1717.5	20.22	0.1052
		1/0	1745	21.34	0.1361
		1/0	1772.5	21.60	0.1445
	16QAM	1/0	1717.5	19.84	0.0964
		1/0	1745	20.92	0.1236
		1/0	1772.5	21.06	0.1276
10	QPSK	1/0	1715	20.37	0.1089
		1/0	1745	21.44	0.1393
		1/0	1775	21.35	0.1365
	16QAM	1/0	1715	19.58	0.0908
		1/0	1745	20.65	0.1161
		1/0	1775	20.80	0.1202
5	QPSK	1/0	1712.5	20.50	0.1122
		1/0	1745	21.44	0.1393
		1/0	1777.5	21.73	0.1489
	16QAM	1/0	1712.5	19.74	0.0942
		1/0	1745	20.72	0.1180
		1/0	1777.5	21.18	0.1312
3	QPSK	1/0	1711.5	19.59	0.0910
		1/0	1745	21.07	0.1279
		1/0	1778.5	21.18	0.1312
	16QAM	1/0	1711.5	18.56	0.0718
		1/0	1745	20.03	0.1007
		1/0	1778.5	20.39	0.1094
1.4	QPSK	1/0	1710.7	20.13	0.1030
		1/0	1745	21.33	0.1358
		1/0	1779.3	20.20	0.1047
	16QAM	1/0	1710.7	19.09	0.0811
		1/0	1745	20.27	0.1064
		1/0	1779.3	19.00	0.0794

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10.1.1. GSM

GPRS 850

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726900
Date: 2/22/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber J
Mode: GPRS 850 MHz Fundamentals

Test Equipment:
Receiving: Hybrid PRE0181575, and Chamber J SMA Cables
Substitution: Dipole T416, Chamber J Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
824.20	22.50	V	3.1	0.1	19.51	38.5	-19.0	
824.20	29.07	H	3.1	0.2	26.17	38.5	-12.3	
Mid Ch								
836.60	20.79	V	3.1	0.1	17.72	38.5	-20.8	
836.60	27.82	H	3.1	0.2	24.85	38.5	-13.7	
High Ch								
848.80	21.41	V	3.2	0.0	18.26	38.5	-20.2	
848.80	28.92	H	3.2	0.1	25.87	38.5	-12.6	

EGPRS 850

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726900
Date: 2/22/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber J
Mode: EGPRS 850 MHz Fundamentals

Test Equipment:
Receiving: Hybrid PRE0181575, and Chamber J SMA Cables
Substitution: Dipole T416, Chamber J Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
824.20	15.98	V	3.1	0.1	12.99	38.5	-25.5	
824.20	25.17	H	3.1	0.2	22.27	38.5	-16.2	
Mid Ch								
836.60	15.38	V	3.1	0.1	12.31	38.5	-26.2	
836.60	23.38	H	3.1	0.2	20.41	38.5	-18.1	
High Ch								
848.80	15.50	V	3.2	0.0	12.35	38.5	-26.1	
848.80	24.95	H	3.2	0.1	21.90	38.5	-16.6	

GPRS 1900

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726900
Date: 2/22/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber J
Mode: GPRS 1900 MHz Fundamentals

Test Equipment:
Receiving: Horn PRE0101793, and Chamber J SMA Cables
Substitution: Horn PRE0181258, Chamber J Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1850.20	19.54	V	5.0	9.8	24.31	33.0	-8.7	
1850.20	15.90	H	5.0	9.8	20.67	33.0	-12.3	
Mid Ch								
1880.00	18.83	V	5.1	10.0	23.71	33.0	-9.3	
1880.00	15.58	H	5.1	10.0	20.46	33.0	-12.5	
High Ch								
1909.80	18.55	V	5.2	10.1	23.50	33.0	-9.5	
1909.80	11.56	H	5.2	10.1	16.51	33.0	-16.5	

EGPRS 1900

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726900
Date: 2/22/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber J
Mode: EGPRS 1900 MHz Fundamentals

Test Equipment:
Receiving: Horn PRE0101793, and Chamber J SMA Cables
Substitution: Horn PRE0181258, Chamber J Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1850.20	17.01	V	5.0	9.8	21.78	33.0	-11.2	
1850.20	13.14	H	5.0	9.8	17.91	33.0	-15.1	
Mid Ch								
1880.00	16.12	V	5.1	10.0	21.00	33.0	-12.0	
1880.00	13.38	H	5.1	10.0	18.26	33.0	-14.7	
High Ch								
1909.80	15.78	V	5.2	10.1	20.73	33.0	-12.3	
1909.80	8.99	H	5.2	10.1	13.94	33.0	-19.1	

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10.1.2. WCDMA

B2 REL99

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726900
Date: 2/23/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber J
Mode: Rel99 Band 2 Fundamentals

Test Equipment:
Receiving: Horn PRE0101793, and Chamber J SMA Cables
Substitution: Horn PRE0181258, Chamber J Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1852.40	14.95	V	5.0	9.8	19.73	33.0	-13.3	
1852.40	13.25	H	5.0	9.8	18.03	33.0	-15.0	
Mid Ch								
1880.00	13.37	V	5.1	10.0	18.25	33.0	-14.8	
1880.00	11.39	H	5.1	10.0	16.27	33.0	-16.7	
High Ch								
1907.60	14.40	V	5.2	10.1	19.35	33.0	-13.7	
1907.60	6.67	H	5.2	10.1	11.62	33.0	-21.4	

B2 HSDPA

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726900
Date: 2/23/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber J
Mode: HSDPA Band 2 Fundamentals

Test Equipment:
Receiving: Horn PRE0101793, and Chamber J SMA Cables
Substitution: Horn PRE0181258, Chamber J Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1852.40	14.04	V	5.0	9.8	18.82	33.0	-14.2	
1852.40	12.31	H	5.0	9.8	17.09	33.0	-15.9	
Mid Ch								
1880.00	12.28	V	5.1	10.0	17.16	33.0	-15.8	
1880.00	10.36	H	5.1	10.0	15.24	33.0	-17.8	
High Ch								
1907.60	13.36	V	5.2	10.1	18.31	33.0	-14.7	
1907.60	5.61	H	5.2	10.1	10.56	33.0	-22.4	

B4 REL99

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726919
Date: 3/25/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber I
Mode: Rel99 Band 4 Fundamentals

Test Equipment:
Receiving: Horn T862, and Chamber I SMA Cables
Substitution: Horn PRE0181258, Chamber I Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1712.40	12.09	V	4.8	9.3	16.61	30.0	-13.4	
1712.40	15.74	H	4.8	9.3	20.26	30.0	-9.7	
Mid Ch								
1732.60	12.78	V	4.8	9.3	17.27	30.0	-12.7	
1732.60	16.84	H	4.8	9.3	21.33	30.0	-8.7	
High Ch								
1752.60	11.45	V	4.8	9.3	15.92	30.0	-14.1	
1752.60	17.40	H	4.8	9.3	21.87	30.0	-8.1	

B4 HSDPA

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726919
Date: 3/25/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber I
Mode: HSDPA Band 4 Fundamentals

Test Equipment:
Receiving: Horn T862, and Chamber I SMA Cables
Substitution: Horn PRE0181258, Chamber I Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1712.40	11.09	V	4.8	9.3	15.61	30.0	-14.4	
1712.40	14.66	H	4.8	9.3	19.18	30.0	-10.8	
Mid Ch								
1732.60	11.72	V	4.8	9.3	16.21	30.0	-13.8	
1732.60	15.69	H	4.8	9.3	20.18	30.0	-9.8	
High Ch								
1752.60	10.54	V	4.8	9.3	15.01	30.0	-15.0	
1752.60	16.43	H	4.8	9.3	20.90	30.0	-9.1	

B5 REL99

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726900
Date: 2/21/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber J
Mode: Rel99 Band 5 Fundamentals

Test Equipment:
Receiving: Hybrid PRE0181575, and Chamber J SMA Cables
Substitution: Dipole T416, Chamber J Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
826.40	14.12	V	3.1	0.1	11.11	38.5	-27.4	
826.40	21.18	H	3.1	0.2	18.27	38.5	-20.2	
Mid Ch								
836.60	13.72	V	3.1	0.1	10.65	38.5	-27.9	
836.60	20.75	H	3.1	0.2	17.78	38.5	-20.7	
High Ch								
846.60	14.02	V	3.1	0.0	10.89	38.5	-27.6	
846.60	21.36	H	3.1	0.1	18.33	38.5	-20.2	

B5 HSDPA

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726900
Date: 2/21/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber J
Mode: HSDPA Band 5 Fundamentals

Test Equipment:
Receiving: Hybrid PRE0181575, and Chamber J SMA Cables
Substitution: Dipole T416, Chamber J Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
826.40	13.36	V	3.1	0.1	10.35	38.5	-28.1	
826.40	20.56	H	3.1	0.2	17.65	38.5	-20.8	
Mid Ch								
836.60	13.04	V	3.1	0.1	9.97	38.5	-28.5	
836.60	20.21	H	3.1	0.2	17.24	38.5	-21.3	
High Ch								
846.60	13.04	V	3.1	0.0	9.91	38.5	-28.6	
846.60	20.48	H	3.1	0.1	17.45	38.5	-21.1	

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10.1.3. LTE Band 2

20MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726919
Date: 3/25/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber I
Mode: LTE_QPSK Band 2 Fundamentals, 20MHz Bandwidth

Test Equipment:
Receiving: Horn T862, and Chamber I SMA Cables
Substitution: Horn PRE0181258, Chamber I Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1860.00	14.65	V	5.0	9.8	19.46	33.0	-13.5	
1860.00	18.20	H	5.0	9.8	23.01	33.0	-10.0	
Mid Ch								
1880.00	13.71	V	5.1	10.0	18.59	33.0	-14.4	
1880.00	17.51	H	5.1	10.0	22.39	33.0	-10.6	
High Ch								
1900.00	14.11	V	5.1	10.1	19.06	33.0	-13.9	
1900.00	17.08	H	5.1	10.1	22.03	33.0	-11.0	

20MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726919
Date: 3/25/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber I
Mode: LTE_16QAM Band 2 Fundamentals, 20MHz Bandwidth

Test Equipment:
Receiving: Horn T862, and Chamber I SMA Cables
Substitution: Horn PRE0181258, Chamber I Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1860.00	13.69	V	5.0	9.8	18.50	33.0	-14.5	
1860.00	17.14	H	5.0	9.8	21.95	33.0	-11.1	
Mid Ch								
1880.00	12.94	V	5.1	10.0	17.82	33.0	-15.2	
1880.00	16.74	H	5.1	10.0	21.62	33.0	-11.4	
High Ch								
1900.00	13.36	V	5.1	10.1	18.31	33.0	-14.7	
1900.00	16.31	H	5.1	10.1	21.26	33.0	-11.7	

15MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726919
Date: 3/25/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber I
Mode: LTE_QPSK Band 2 Fundamentals, 15MHz Bandwidth

Test Equipment:
Receiving: Horn T862, and Chamber I SMA Cables
Substitution: Horn PRE0181258, Chamber I Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1857.50	14.18	V	5.0	9.8	18.98	33.0	-14.0	
1857.50	18.18	H	5.0	9.8	22.98	33.0	-10.0	
Mid Ch								
1880.00	13.65	V	5.1	10.0	18.53	33.0	-14.5	
1880.00	17.18	H	5.1	10.0	22.06	33.0	-10.9	
High Ch								
1902.50	13.26	V	5.1	10.1	18.21	33.0	-14.8	
1902.50	17.18	H	5.1	10.1	22.13	33.0	-10.9	

15MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726919
Date: 3/25/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber I
Mode: LTE_16QAM Band 2 Fundamentals, 15MHz Bandwidth

Test Equipment:
Receiving: Horn T862, and Chamber I SMA Cables
Substitution: Horn PRE0181258, Chamber I Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1857.50	13.12	V	5.0	9.8	17.92	33.0	-15.1	
1857.50	17.10	H	5.0	9.8	21.90	33.0	-11.1	
Mid Ch								
1880.00	12.87	V	5.1	10.0	17.75	33.0	-15.3	
1880.00	16.40	H	5.1	10.0	21.28	33.0	-11.7	
High Ch								
1902.50	12.45	V	5.1	10.1	17.40	33.0	-15.6	
1902.50	16.39	H	5.1	10.1	21.34	33.0	-11.7	

10MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726919
Date: 3/26/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber I
Mode: LTE_QPSK Band 2 Fundamentals, 10MHz Bandwidth

Test Equipment:
Receiving: Horn T862, and Chamber I SMA Cables
Substitution: Horn PRE0181258, Chamber I Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1855.00	15.49	V	5.0	9.8	20.28	33.0	-12.7	
1855.00	18.72	H	5.0	9.8	23.51	33.0	-9.5	
Mid Ch								
1880.00	13.07	V	5.1	10.0	17.95	33.0	-15.1	
1880.00	17.58	H	5.1	10.0	22.46	33.0	-10.5	
High Ch								
1905.00	13.30	V	5.1	10.1	18.25	33.0	-14.8	
1905.00	16.89	H	5.1	10.1	21.84	33.0	-11.2	

10MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726919
Date: 3/26/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber I
Mode: LTE_16QAM Band 2 Fundamentals, 10MHz Bandwidth

Test Equipment:
Receiving: Horn T862, and Chamber I SMA Cables
Substitution: Horn PRE0181258, Chamber I Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1855.00	14.31	V	5.0	9.8	19.10	33.0	-13.9	
1855.00	17.52	H	5.0	9.8	22.31	33.0	-10.7	
Mid Ch								
1880.00	12.22	V	5.1	10.0	17.10	33.0	-15.9	
1880.00	16.70	H	5.1	10.0	21.58	33.0	-11.4	
High Ch								
1905.00	12.51	V	5.1	10.1	17.46	33.0	-15.5	
1905.00	16.10	H	5.1	10.1	21.05	33.0	-12.0	

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5MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726919
Date: 3/26/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber I
Mode: LTE_QPSK Band 2 Fundamentals, 5MHz Bandwidth

Test Equipment:
Receiving: Horn T862, and Chamber I SMA Cables
Substitution: Horn PRE0181258, Chamber I Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1852.50	14.80	V	5.0	9.8	19.58	33.0	-13.4	
1852.50	18.46	H	5.0	9.8	23.24	33.0	-9.8	
Mid Ch								
1880.00	13.73	V	5.1	10.0	18.61	33.0	-14.4	
1880.00	17.23	H	5.1	10.0	22.11	33.0	-10.9	
High Ch								
1907.50	12.90	V	5.1	10.1	17.85	33.0	-15.2	
1907.50	16.70	H	5.1	10.1	21.65	33.0	-11.4	

5MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726919
Date: 3/26/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber I
Mode: LTE_16QAM Band 2 Fundamentals, 5MHz Bandwidth

Test Equipment:
Receiving: Horn T862, and Chamber I SMA Cables
Substitution: Horn PRE0181258, Chamber I Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1852.50	13.75	V	5.0	9.8	18.53	33.0	-14.5	
1852.50	17.42	H	5.0	9.8	22.20	33.0	-10.8	
Mid Ch								
1880.00	12.84	V	5.1	10.0	17.72	33.0	-15.3	
1880.00	16.32	H	5.1	10.0	21.20	33.0	-11.8	
High Ch								
1907.50	11.95	V	5.1	10.1	16.90	33.0	-16.1	
1907.50	15.76	H	5.1	10.1	20.71	33.0	-12.3	

3MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726919
Date: 3/26/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber I
Mode: LTE_QPSK Band 2 Fundamentals, 3MHz Bandwidth

Test Equipment:
Receiving: Horn T862, and Chamber I SMA Cables
Substitution: Horn PRE0181258, Chamber I Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1851.50	15.10	V	5.0	9.8	19.88	33.0	-13.1	
1851.50	18.57	H	5.0	9.8	23.35	33.0	-9.7	
Mid Ch								
1880.00	13.20	V	5.1	10.0	18.08	33.0	-14.9	
1880.00	17.42	H	5.1	10.0	22.30	33.0	-10.7	
High Ch								
1908.50	13.06	V	5.2	10.1	18.01	33.0	-15.0	
1908.50	16.66	H	5.2	10.1	21.61	33.0	-11.4	

3MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726919
Date: 3/26/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber I
Mode: LTE_16QAM Band 2 Fundamentals, 3MHz Bandwidth

Test Equipment:
Receiving: Horn T862, and Chamber I SMA Cables
Substitution: Horn PRE0181258, Chamber I Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1851.50	13.92	V	5.0	9.8	18.70	33.0	-14.3	
1851.50	17.39	H	5.0	9.8	22.17	33.0	-10.8	
Mid Ch								
1880.00	12.25	V	5.1	10.0	17.13	33.0	-15.9	
1880.00	16.49	H	5.1	10.0	21.37	33.0	-11.6	
High Ch								
1908.50	12.04	V	5.2	10.1	16.99	33.0	-16.0	
1908.50	15.64	H	5.2	10.1	20.59	33.0	-12.4	

1.4MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726919
Date: 3/26/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber I
Mode: LTE_QPSK Band 2 Fundamentals, 1.4MHz Bandwidth

Test Equipment:
Receiving: Horn T862, and Chamber I SMA Cables
Substitution: Horn PRE0181258, Chamber I Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1850.70	15.34	V	5.0	9.8	20.11	33.0	-12.9	
1850.70	18.46	H	5.0	9.8	23.23	33.0	-9.8	
Mid Ch								
1880.00	13.57	V	5.1	10.0	18.45	33.0	-14.6	
1880.00	17.38	H	5.1	10.0	22.26	33.0	-10.7	
High Ch								
1909.30	12.67	V	5.2	10.1	17.62	33.0	-15.4	
1909.30	15.72	H	5.2	10.1	20.67	33.0	-12.3	

1.4MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726919
Date: 3/26/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber I
Mode: LTE_16QAM Band 2 Fundamentals, 1.4MHz Bandwidth

Test Equipment:
Receiving: Horn T862, and Chamber I SMA Cables
Substitution: Horn PRE0181258, Chamber I Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1850.70	14.24	V	5.0	9.8	19.01	33.0	-14.0	
1850.70	17.35	H	5.0	9.8	22.12	33.0	-10.9	
Mid Ch								
1880.00	12.53	V	5.1	10.0	17.41	33.0	-15.6	
1880.00	16.34	H	5.1	10.0	21.22	33.0	-11.8	
High Ch								
1909.30	11.66	V	5.2	10.1	16.61	33.0	-16.4	
1909.30	14.70	H	5.2	10.1	19.65	33.0	-13.4	

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10.1.4. LTE Band 4

20MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726919
Date: 3/26/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber I
Mode: LTE_QPSK Band 4 Fundamentals, 20MHz Bandwidth

Test Equipment:
Receiving: Horn T862, and Chamber I SMA Cables
Substitution: Horn PRE0181258, Chamber I Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1720.00	10.91	V	4.8	9.3	15.42	30.0	-14.6	
1720.00	15.77	H	4.8	9.3	20.28	30.0	-9.7	
Mid Ch								
1732.50	11.37	V	4.8	9.3	15.86	30.0	-14.1	
1732.50	16.32	H	4.8	9.3	20.81	30.0	-9.2	
High Ch								
1745.00	12.49	V	4.8	9.3	16.96	30.0	-13.0	
1745.00	16.10	H	4.8	9.3	20.57	30.0	-9.4	

20MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726919
Date: 3/26/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber I
Mode: LTE_16QAM Band 4 Fundamentals, 20MHz Bandwidth

Test Equipment:
Receiving: Horn T862, and Chamber I SMA Cables
Substitution: Horn PRE0181258, Chamber I Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1720.00	9.99	V	4.8	9.3	14.50	30.0	-15.5	
1720.00	14.89	H	4.8	9.3	19.40	30.0	-10.6	
Mid Ch								
1732.50	10.63	V	4.8	9.3	15.12	30.0	-14.9	
1732.50	15.62	H	4.8	9.3	20.11	30.0	-9.9	
High Ch								
1745.00	11.65	V	4.8	9.3	16.12	30.0	-13.9	
1745.00	15.25	H	4.8	9.3	19.72	30.0	-10.3	

15MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726919
Date: 3/26/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber I
Mode: LTE_QPSK Band 4 Fundamentals, 15MHz Bandwidth

Test Equipment:
Receiving: Horn T862, and Chamber I SMA Cables
Substitution: Horn PRE0181258, Chamber I Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1717.50	11.17	V	4.8	9.3	15.68	30.0	-14.3	
1717.50	14.75	H	4.8	9.3	19.26	30.0	-10.7	
Mid Ch								
1732.50	11.92	V	4.8	9.3	16.41	30.0	-13.6	
1732.50	16.23	H	4.8	9.3	20.72	30.0	-9.3	
High Ch								
1747.50	12.32	V	4.8	9.3	16.79	30.0	-13.2	
1747.50	16.09	H	4.8	9.3	20.56	30.0	-9.4	

15MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726919
Date: 3/26/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber I
Mode: LTE_16QAM Band 4 Fundamentals, 15MHz Bandwidth

Test Equipment:
Receiving: Horn T862, and Chamber I SMA Cables
Substitution: Horn PRE0181258, Chamber I Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1717.50	10.25	V	4.8	9.3	14.76	30.0	-15.2	
1717.50	13.91	H	4.8	9.3	18.42	30.0	-11.6	
Mid Ch								
1732.50	11.25	V	4.8	9.3	15.74	30.0	-14.3	
1732.50	15.51	H	4.8	9.3	20.00	30.0	-10.0	
High Ch								
1747.50	11.30	V	4.8	9.3	15.77	30.0	-14.2	
1747.50	15.08	H	4.8	9.3	19.55	30.0	-10.5	

10MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726919
Date: 3/26/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber I
Mode: LTE_QPSK Band 4 Fundamentals, 10MHz Bandwidth

Test Equipment:
Receiving: Horn T862, and Chamber I SMA Cables
Substitution: Horn PRE0181258, Chamber I Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1715.00	10.91	V	4.8	9.3	15.43	30.0	-14.6	
1715.00	15.64	H	4.8	9.3	20.16	30.0	-9.8	
Mid Ch								
1732.50	11.74	V	4.8	9.3	16.23	30.0	-13.8	
1732.50	15.24	H	4.8	9.3	19.73	30.0	-10.3	
High Ch								
1750.00	11.08	V	4.8	9.3	15.54	30.0	-14.5	
1750.00	16.42	H	4.8	9.3	20.88	30.0	-9.1	

10MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726919
Date: 3/26/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber I
Mode: LTE_16QAM Band 4 Fundamentals, 10MHz Bandwidth

Test Equipment:
Receiving: Horn T862, and Chamber I SMA Cables
Substitution: Horn PRE0181258, Chamber I Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1715.00	10.07	V	4.8	9.3	14.59	30.0	-15.4	
1715.00	14.71	H	4.8	9.3	19.23	30.0	-10.8	
Mid Ch								
1732.50	10.98	V	4.8	9.3	15.47	30.0	-14.5	
1732.50	14.55	H	4.8	9.3	19.04	30.0	-11.0	
High Ch								
1750.00	10.15	V	4.8	9.3	14.61	30.0	-15.4	
1750.00	15.51	H	4.8	9.3	19.97	30.0	-10.0	

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5MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726919
Date: 3/26/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber I
Mode: LTE_QPSK Band 4 Fundamentals, 5MHz Bandwidth

Test Equipment:
Receiving: Horn T862, and Chamber I SMA Cables
Substitution: Horn PRE0181258, Chamber I Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1712.50	11.12	V	4.8	9.3	15.64	30.0	-14.4	
1712.50	15.61	H	4.8	9.3	20.13	30.0	-9.9	
Mid Ch								
1732.50	12.49	V	4.8	9.3	16.98	30.0	-13.0	
1732.50	16.30	H	4.8	9.3	20.79	30.0	-9.2	
High Ch								
1752.50	11.06	V	4.8	9.3	15.53	30.0	-14.5	
1752.50	16.45	H	4.8	9.3	20.92	30.0	-9.1	

5MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726919
Date: 3/26/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber I
Mode: LTE_16QAM Band 4 Fundamentals, 5MHz Bandwidth

Test Equipment:
Receiving: Horn T862, and Chamber I SMA Cables
Substitution: Horn PRE0181258, Chamber I Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1712.50	10.34	V	4.8	9.3	14.86	30.0	-15.1	
1712.50	14.84	H	4.8	9.3	19.36	30.0	-10.6	
Mid Ch								
1732.50	11.75	V	4.8	9.3	16.24	30.0	-13.8	
1732.50	15.59	H	4.8	9.3	20.08	30.0	-9.9	
High Ch								
1752.50	10.28	V	4.8	9.3	14.75	30.0	-15.2	
1752.50	15.66	H	4.8	9.3	20.13	30.0	-9.9	

3MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726919
Date: 3/26/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber I
Mode: LTE_QPSK Band 4 Fundamentals, 3MHz Bandwidth

Test Equipment:
Receiving: Horn T862, and Chamber I SMA Cables
Substitution: Horn PRE0181258, Chamber I Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1711.50	10.30	V	4.8	9.3	14.82	30.0	-15.2	
1711.50	15.12	H	4.8	9.3	19.64	30.0	-10.4	
Mid Ch								
1732.50	11.84	V	4.8	9.3	16.33	30.0	-13.7	
1732.50	16.16	H	4.8	9.3	20.65	30.0	-9.3	
High Ch								
1753.50	10.61	V	4.8	9.3	15.09	30.0	-14.9	
1753.50	16.33	H	4.8	9.3	20.81	30.0	-9.2	

3MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726919
Date: 3/26/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber I
Mode: LTE_16QAM Band 4 Fundamentals, 3MHz Bandwidth

Test Equipment:
Receiving: Horn T862, and Chamber I SMA Cables
Substitution: Horn PRE0181258, Chamber I Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1711.50	9.36	V	4.8	9.3	13.88	30.0	-16.1	
1711.50	14.18	H	4.8	9.3	18.70	30.0	-11.3	
Mid Ch								
1732.50	11.01	V	4.8	9.3	15.50	30.0	-14.5	
1732.50	15.42	H	4.8	9.3	19.91	30.0	-10.1	
High Ch								
1753.50	9.85	V	4.8	9.3	14.33	30.0	-15.7	
1753.50	15.59	H	4.8	9.3	20.07	30.0	-9.9	

1.4MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726919
Date: 3/26/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber I
Mode: LTE_QPSK Band 4 Fundamentals, 1.4MHz Bandwidth

Test Equipment:
Receiving: Horn T862, and Chamber I SMA Cables
Substitution: Horn PRE0181258, Chamber I Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1710.70	11.00	V	4.8	9.3	15.53	30.0	-14.5	
1710.70	14.43	H	4.8	9.3	18.96	30.0	-11.0	
Mid Ch								
1732.50	12.01	V	4.8	9.3	16.50	30.0	-13.5	
1732.50	15.57	H	4.8	9.3	20.06	30.0	-9.9	
High Ch								
1754.30	10.69	V	4.8	9.3	15.17	30.0	-14.8	
1754.30	16.31	H	4.8	9.3	20.79	30.0	-9.2	

1.4MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726919
Date: 3/26/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber I
Mode: LTE_16QAM Band 4 Fundamentals, 1.4MHz Bandwidth

Test Equipment:
Receiving: Horn T862, and Chamber I SMA Cables
Substitution: Horn PRE0181258, Chamber I Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1710.70	10.05	V	4.8	9.3	14.58	30.0	-15.4	
1710.70	13.48	H	4.8	9.3	18.01	30.0	-12.0	
Mid Ch								
1732.50	11.25	V	4.8	9.3	15.74	30.0	-14.3	
1732.50	14.83	H	4.8	9.3	19.32	30.0	-10.7	
High Ch								
1754.30	9.93	V	4.8	9.3	14.41	30.0	-15.6	
1754.30	15.57	H	4.8	9.3	20.05	30.0	-9.9	

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10.1.5. LTE Band 5

10MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726900
Date: 2/22/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber J
Mode: LTE_QPSK Band 5 Fundamentals, 10MHz Bandwidth

Test Equipment:
Receiving: Hybrid PRE0181575, and Chamber J SMA Cables
Substitution: Dipole T416, Chamber J Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
829.00	15.25	V	3.1	0.1	12.23	38.5	-26.3	
829.00	19.99	H	3.1	0.2	17.07	38.5	-21.4	
Mid Ch								
836.50	14.80	V	3.1	0.1	11.73	38.5	-26.8	
836.50	19.45	H	3.1	0.2	16.48	38.5	-22.0	
High Ch								
844.00	14.98	V	3.1	0.0	11.86	38.5	-26.6	
844.00	19.50	H	3.1	0.1	16.48	38.5	-22.0	

10MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726900
Date: 2/22/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber J
Mode: LTE_16QAM Band 5 Fundamentals, 10MHz Bandwidth

Test Equipment:
Receiving: Hybrid PRE0181575, and Chamber J SMA Cables
Substitution: Dipole T416, Chamber J Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
829.00	14.53	V	3.1	0.1	11.51	38.5	-27.0	
829.00	19.27	H	3.1	0.2	16.35	38.5	-22.2	
Mid Ch								
836.50	13.91	V	3.1	0.1	10.84	38.5	-27.7	
836.50	18.57	H	3.1	0.2	15.60	38.5	-22.9	
High Ch								
844.00	14.22	V	3.1	0.0	11.10	38.5	-27.4	
844.00	18.79	H	3.1	0.1	15.77	38.5	-22.7	

5MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726900
Date: 2/22/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber J
Mode: LTE_QPSK Band 5 Fundamentals, 5MHz Bandwidth

Test Equipment:
Receiving: Hybrid PRE0181575, and Chamber J SMA Cables
Substitution: Dipole T416, Chamber J Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
826.50	14.62	V	3.1	0.1	11.61	38.5	-26.9	
826.50	19.44	H	3.1	0.2	16.53	38.5	-22.0	
Mid Ch								
836.50	14.54	V	3.1	0.1	11.47	38.5	-27.0	
836.50	19.09	H	3.1	0.2	16.12	38.5	-22.4	
High Ch								
846.50	14.65	V	3.1	0.0	11.52	38.5	-27.0	
846.50	18.93	H	3.1	0.1	15.90	38.5	-22.6	

5MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726900
Date: 2/22/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber J
Mode: LTE_16QAM Band 5 Fundamentals, 5MHz Bandwidth

Test Equipment:
Receiving: Hybrid PRE0181575, and Chamber J SMA Cables
Substitution: Dipole T416, Chamber J Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
826.50	13.98	V	3.1	0.1	10.97	38.5	-27.5	
826.50	18.77	H	3.1	0.2	15.86	38.5	-22.6	
Mid Ch								
836.50	13.64	V	3.1	0.1	10.57	38.5	-27.9	
836.50	18.20	H	3.1	0.2	15.23	38.5	-23.3	
High Ch								
846.50	13.91	V	3.1	0.0	10.78	38.5	-27.7	
846.50	18.19	H	3.1	0.1	15.16	38.5	-23.3	

3MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726900
Date: 2/22/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber J
Mode: LTE_QPSK Band 5 Fundamentals, 3MHz Bandwidth

Test Equipment:
Receiving: Hybrid PRE0181575, and Chamber J SMA Cables
Substitution: Dipole T416, Chamber J Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
825.50	14.30	V	3.1	0.1	11.30	38.5	-27.2	
825.50	18.91	H	3.1	0.2	16.01	38.5	-22.5	
Mid Ch								
836.50	14.13	V	3.1	0.1	11.06	38.5	-27.4	
836.50	18.48	H	3.1	0.2	15.51	38.5	-23.0	
High Ch								
847.50	14.11	V	3.1	0.0	10.97	38.5	-27.5	
847.50	18.80	H	3.1	0.1	15.76	38.5	-22.7	

3MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726900
Date: 2/22/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber J
Mode: LTE_16QAM Band 5 Fundamentals, 3MHz Bandwidth

Test Equipment:
Receiving: Hybrid PRE0181575, and Chamber J SMA Cables
Substitution: Dipole T416, Chamber J Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
825.50	13.54	V	3.1	0.1	10.54	38.5	-28.0	
825.50	18.15	H	3.1	0.2	15.25	38.5	-23.3	
Mid Ch								
836.50	13.18	V	3.1	0.1	10.11	38.5	-28.4	
836.50	17.54	H	3.1	0.2	14.57	38.5	-23.9	
High Ch								
847.50	13.19	V	3.1	0.0	10.05	38.5	-28.4	
847.50	17.85	H	3.1	0.1	14.81	38.5	-23.7	

1.4MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726900
Date: 2/22/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber J
Mode: LTE_QPSK Band 5 Fundamentals, 1.4MHz Bandwidth

Test Equipment:
Receiving: Hybrid PRE0181575, and Chamber J SMA Cables
Substitution: Dipole T416, Chamber J Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
824.70	14.32	V	3.1	0.1	11.32	38.5	-27.2	
824.70	18.86	H	3.1	0.2	15.96	38.5	-22.5	
Mid Ch								
836.50	13.96	V	3.1	0.1	10.89	38.5	-27.6	
836.50	18.56	H	3.1	0.2	15.59	38.5	-22.9	
High Ch								
848.30	13.99	V	3.2	0.0	10.85	38.5	-27.7	
848.30	18.44	H	3.2	0.1	15.40	38.5	-23.1	

1.4MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726900
Date: 2/22/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber J
Mode: LTE_16QAM Band 5 Fundamentals, 1.4MHz Bandwidth

Test Equipment:
Receiving: Hybrid PRE0181575, and Chamber J SMA Cables
Substitution: Dipole T416, Chamber J Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
824.70	13.52	V	3.1	0.1	10.52	38.5	-28.0	
824.70	18.05	H	3.1	0.2	15.15	38.5	-23.3	
Mid Ch								
836.50	13.05	V	3.1	0.1	9.98	38.5	-28.5	
836.50	17.67	H	3.1	0.2	14.70	38.5	-23.8	
High Ch								
848.30	13.15	V	3.2	0.0	10.01	38.5	-28.5	
848.30	17.61	H	3.2	0.1	14.57	38.5	-23.9	

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10.1.6. LTE Band 12

10MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726919
Date: 3/27/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber I
Mode: LTE_QPSK Band 12 Fundamentals, 10MHz Bandwidth

Test Equipment:
Receiving: Hybrid PRE0184971, and Chamber I SMA Cables
Substitution: Dipole T416, Chamber I Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
704.00	9.34	V	2.8	1.2	7.66	34.8	-27.1	
704.00	17.16	H	2.8	1.6	15.86	34.8	-18.9	
Mid Ch								
707.50	9.58	V	2.9	1.1	7.87	34.8	-26.9	
707.50	17.14	H	2.9	1.5	15.80	34.8	-19.0	
High Ch								
711.00	10.09	V	2.9	1.1	8.34	34.8	-26.5	
711.00	17.14	H	2.9	1.5	15.75	34.8	-19.1	

10MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726919
Date: 3/27/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber I
Mode: LTE_16QAM Band 12 Fundamentals, 10MHz Bandwidth

Test Equipment:
Receiving: Hybrid PRE0184971, and Chamber I SMA Cables
Substitution: Dipole T416, Chamber I Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
704.00	8.50	V	2.8	1.2	6.82	34.8	-28.0	
704.00	16.32	H	2.8	1.6	15.02	34.8	-19.8	
Mid Ch								
707.50	8.73	V	2.9	1.1	7.02	34.8	-27.8	
707.50	16.31	H	2.9	1.5	14.97	34.8	-19.8	
High Ch								
711.00	9.24	V	2.9	1.1	7.49	34.8	-27.3	
711.00	16.28	H	2.9	1.5	14.89	34.8	-19.9	

5MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726919
Date: 3/27/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber I
Mode: LTE_QPSK Band 12 Fundamentals, 5MHz Bandwidth

Test Equipment:
Receiving: Hybrid PRE0184971, and Chamber I SMA Cables
Substitution: Dipole T416, Chamber I Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
701.50	9.10	V	2.8	1.2	7.45	34.8	-27.4	
701.50	17.09	H	2.8	1.6	15.83	34.8	-19.0	
Mid Ch								
707.50	9.80	V	2.9	1.1	8.09	34.8	-26.7	
707.50	17.52	H	2.9	1.5	16.18	34.8	-18.6	
High Ch								
713.50	10.43	V	2.9	1.1	8.66	34.8	-26.1	
713.50	17.52	H	2.9	1.4	16.09	34.8	-18.7	

5MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726919
Date: 3/27/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber I
Mode: LTE_16QAM Band 12 Fundamentals, 5MHz Bandwidth

Test Equipment:
Receiving: Hybrid PRE0184971, and Chamber I SMA Cables
Substitution: Dipole T416, Chamber I Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
701.50	8.33	V	2.8	1.2	6.68	34.8	-28.1	
701.50	16.36	H	2.8	1.6	15.10	34.8	-19.7	
Mid Ch								
707.50	9.08	V	2.9	1.1	7.37	34.8	-27.4	
707.50	16.80	H	2.9	1.5	15.46	34.8	-19.3	
High Ch								
713.50	9.60	V	2.9	1.1	7.83	34.8	-27.0	
713.50	16.76	H	2.9	1.4	15.33	34.8	-19.5	

3MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726919
Date: 3/27/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber I
Mode: LTE_QPSK Band 12 Fundamentals, 3MHz Bandwidth

Test Equipment:
Receiving: Hybrid PRE0184971, and Chamber I SMA Cables
Substitution: Dipole T416, Chamber I Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
700.50	9.37	V	2.8	1.2	7.73	34.8	-27.1	
700.50	17.00	H	2.8	1.6	15.75	34.8	-19.0	
Mid Ch								
707.50	9.93	V	2.9	1.1	8.22	34.8	-26.6	
707.50	17.68	H	2.9	1.5	16.34	34.8	-18.5	
High Ch								
714.50	10.03	V	2.9	1.1	8.25	34.8	-26.6	
714.50	17.76	H	2.9	1.4	16.32	34.8	-18.5	

3MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726919
Date: 3/27/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber I
Mode: LTE_16QAM Band 12 Fundamentals, 3MHz Bandwidth

Test Equipment:
Receiving: Hybrid PRE0184971, and Chamber I SMA Cables
Substitution: Dipole T416, Chamber I Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
700.50	8.52	V	2.8	1.2	6.88	34.8	-27.9	
700.50	16.17	H	2.8	1.6	14.92	34.8	-19.9	
Mid Ch								
707.50	9.08	V	2.9	1.1	7.37	34.8	-27.4	
707.50	16.84	H	2.9	1.5	15.50	34.8	-19.3	
High Ch								
714.50	9.25	V	2.9	1.1	7.47	34.8	-27.3	
714.50	16.98	H	2.9	1.4	15.54	34.8	-19.3	

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1.4MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726919
Date: 3/27/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber I
Mode: LTE_QPSK Band 12 Fundamentals, 1.4MHz Bandwidth

Test Equipment:
Receiving: Hybrid PRE0184971, and Chamber I SMA Cables
Substitution: Dipole T416, Chamber I Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
699.70	8.76	V	2.8	1.2	7.12	34.8	-27.7	
699.70	16.75	H	2.8	1.6	15.51	34.8	-19.3	
Mid Ch								
707.50	9.62	V	2.9	1.1	7.91	34.8	-26.9	
707.50	17.39	H	2.9	1.5	16.05	34.8	-18.8	
High Ch								
715.30	9.51	V	2.9	1.1	7.72	34.8	-27.1	
715.30	17.29	H	2.9	1.4	15.84	34.8	-19.0	

1.4MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726919
Date: 3/27/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber I
Mode: LTE_16QAM Band 12 Fundamentals, 1.4MHz Bandwidth

Test Equipment:
Receiving: Hybrid PRE0184971, and Chamber I SMA Cables
Substitution: Dipole T416, Chamber I Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
699.70	7.61	V	2.8	1.2	5.97	34.8	-28.8	
699.70	15.89	H	2.8	1.6	14.65	34.8	-20.2	
Mid Ch								
707.50	8.77	V	2.9	1.1	7.06	34.8	-27.7	
707.50	16.54	H	2.9	1.5	15.20	34.8	-19.6	
High Ch								
715.30	8.69	V	2.9	1.1	6.90	34.8	-27.9	
715.30	16.47	H	2.9	1.4	15.02	34.8	-19.8	

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10.1.7. LTE Band 13

10MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726919
Date: 3/27/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber I
Mode: LTE_QPSK Band 13 Fundamentals, 10MHz Bandwidth

Test Equipment:
Receiving: Hybrid PRE0184971, and Chamber I SMA Cables
Substitution: Dipole T416, Chamber I Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
782.00	0.00	V	3.0	0.3	0.00	34.8	0.0	
782.00	0.00	H	3.0	0.5	0.00	34.8	0.0	
Mid Ch								
782.00	14.99	V	3.0	0.3	12.33	34.8	-22.4	
782.00	22.79	H	3.0	0.5	20.27	34.8	-14.5	
High Ch								
782.00	0.00	V	3.0	0.3	0.00	34.8	0.0	
782.00	0.00	H	3.0	0.5	0.00	34.8	0.0	

10MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726919
Date: 3/27/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber I
Mode: LTE_16QAM Band 13 Fundamentals, 10MHz Bandwidth

Test Equipment:
Receiving: Hybrid PRE0184971, and Chamber I SMA Cables
Substitution: Dipole T416, Chamber I Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
782.00	0.00	V	3.0	0.3	0.00	34.8	0.0	
782.00	0.00	H	3.0	0.5	0.00	34.8	0.0	
Mid Ch								
782.00	13.99	V	3.0	0.3	11.33	34.8	-23.4	
782.00	21.80	H	3.0	0.5	19.28	34.8	-15.5	
High Ch								
782.00	0.00	V	3.0	0.3	0.00	34.8	0.0	
782.00	0.00	H	3.0	0.5	0.00	34.8	0.0	

5MHz QPSK

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726919
Date: 3/27/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber I
Mode: LTE_QPSK Band 13 Fundamentals, 5MHz Bandwidth

Test Equipment:
Receiving: Hybrid PRE0184971, and Chamber I SMA Cables
Substitution: Dipole T416, Chamber I Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
779.50	15.65	V	3.0	0.4	13.02	34.8	-21.8	
779.50	23.06	H	3.0	0.5	20.59	34.8	-14.2	
Mid Ch								
782.00	14.80	V	3.0	0.3	12.14	34.8	-22.6	
782.00	22.75	H	3.0	0.5	20.23	34.8	-14.5	
High Ch								
784.50	15.21	V	3.0	0.3	12.53	34.8	-22.2	
784.50	23.17	H	3.0	0.4	20.61	34.8	-14.2	

5MHz 16QAM

UL Verification Services, Inc.
High Frequency Substitution Measurement

Company: Samsung
Project #: 12726919
Date: 3/27/2019
Test Engineer: 19480 BS
Configuration: EUT Only
Location: Chamber I
Mode: LTE_16QAM Band 13 Fundamentals, 5MHz Bandwidth

Test Equipment:
Receiving: Hybrid PRE0184971, and Chamber I SMA Cables
Substitution: Dipole T416, Chamber I Passthrough Cables

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
779.50	14.59	V	3.0	0.4	11.96	34.8	-22.8	
779.50	22.12	H	3.0	0.5	19.65	34.8	-15.1	
Mid Ch								
782.00	13.76	V	3.0	0.3	11.10	34.8	-23.7	
782.00	21.74	H	3.0	0.5	19.22	34.8	-15.5	
High Ch								
784.50	14.19	V	3.0	0.3	11.51	34.8	-23.3	
784.50	22.16	H	3.0	0.4	19.60	34.8	-15.2	

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