Test Data for LTE band 4

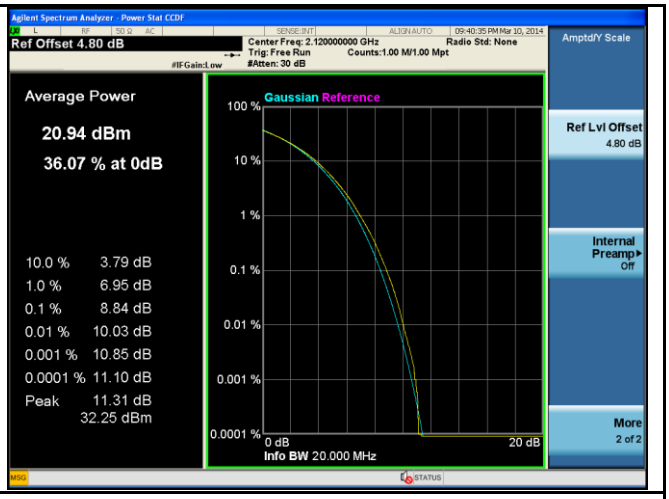
Type	Channel	Frequency (MHz)	Peak-Average Ratio (dB)	Peak-Average Ratio (dB)
5MHz BW, QPSK	Low	2112.5	9.16	13
	Mid	2132.5	9.06	13
	High	2152.5	8.86	13
5MHz BW, 64QAM	Low	2112.5	9.19	13
	Mid	2132.5	9.02	13
	High	2152.5	8.87	13
10MHz BW, QPSK	Low	2115	8.88	13
	Mid	2132	8.89	13
	High	2150	8.85	13
10MHz BW, 64QAM	Low	2115	8.77	13
	Mid	2132	8.76	13
	High	2150	8.76	13
15MHz BW, QPSK	Low	2117.5	8.73	13
	Mid	2132.5	8.53	13
	High	2147.5	8.57	13
15MHz BW, 64QAM	Low	2117.5	8.67	13
	Mid	2132.5	8.50	13
	High	2147.5	8.51	13
20MHz BW, QPSK	Low	2120	8.84	13
	Mid	2132	8.84	13
	High	2145	8.83	13
20MHz BW, 64QAM	Low	2120	9.36	13
	Mid	2132	9.33	13
	High	2145	9.36	13

Test Data for LTE band 13

Type	Channel	Frequency (MHz)	Peak-Average Ratio (dB)	Peak-Average Ratio (dB)
10MHz, QPSK	Mid	751	8.63	13
10MHz, 16QAM	Mid	751	8.63	13
10MHz, 64QAM	Mid	751	8.64	13

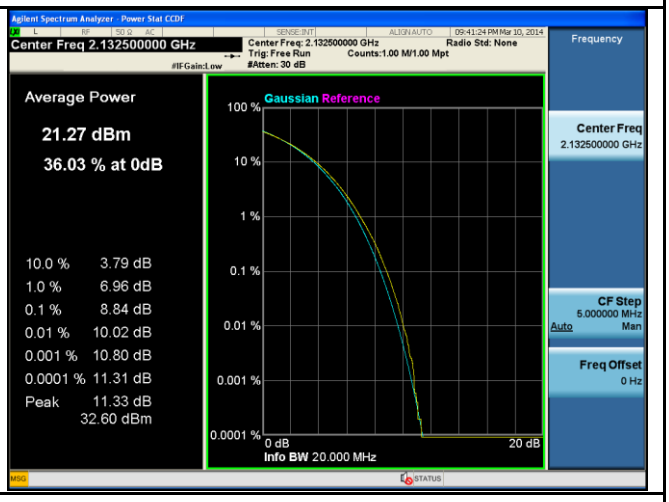
Test Plots

PK-AV-Ratio-Band4-QPSK-10M BW-Low

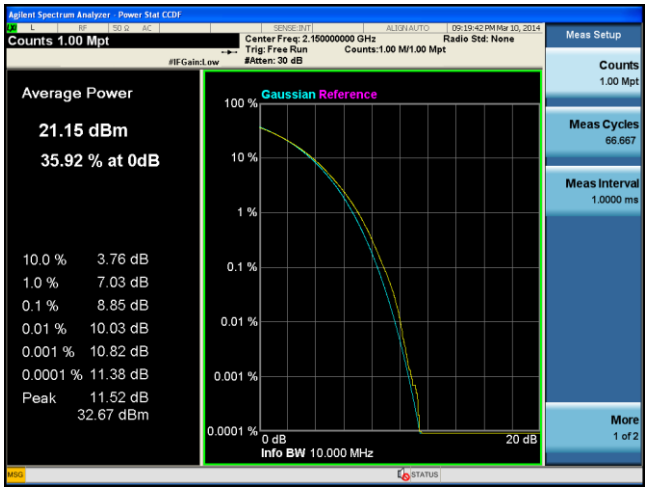


PK-AV-Ratio-Band4-QPSK-20M BW-Low

PK-AV-Ratio-Band4-QPSK-10M BW-Mid

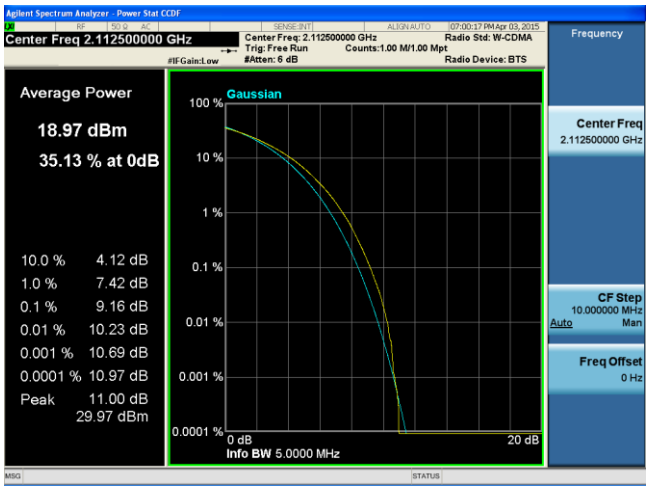


PK-AV-Ratio-Band4-QPSK-20M BW-Mid

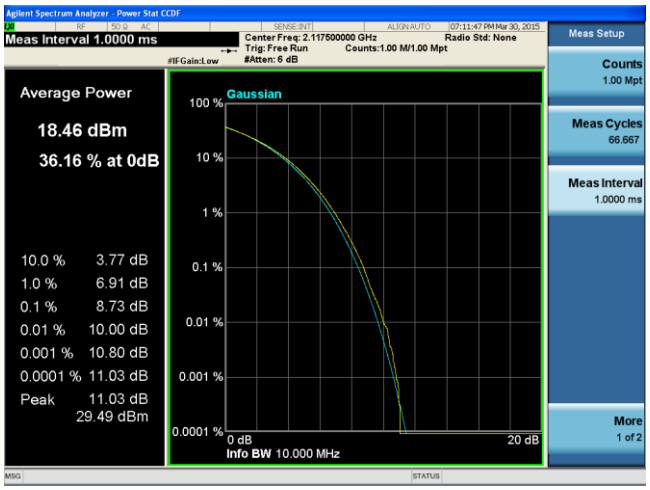


PK-AV-Ratio-Band4-QPSK-10M BW-High

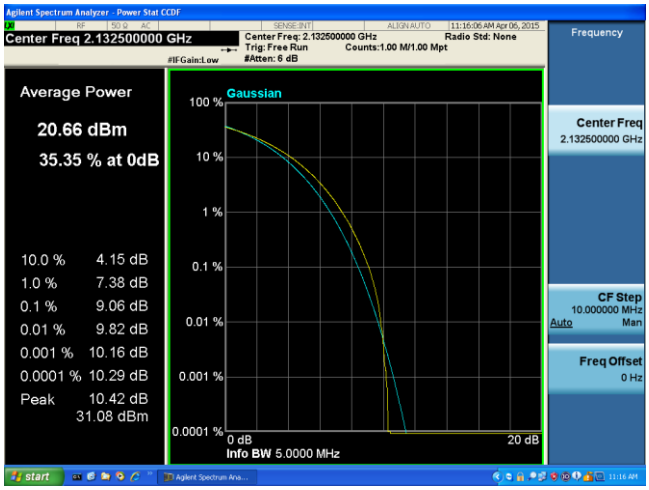
PK-AV-Ratio-Band4-QPSK-20M BW-High



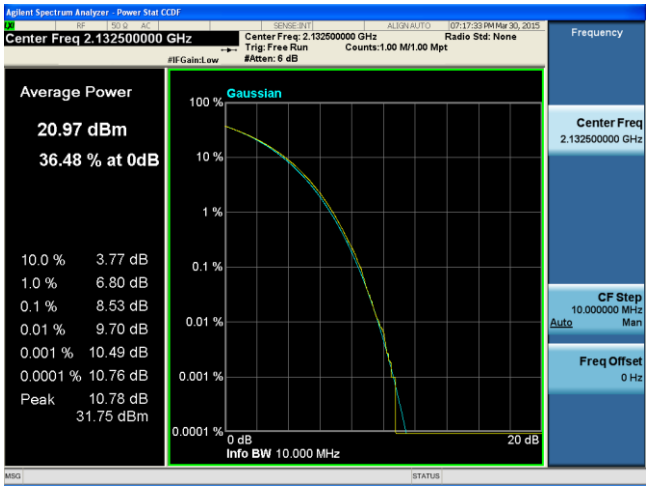
PK-AV-Ratio-Band4-QPSK-5M BW-Low



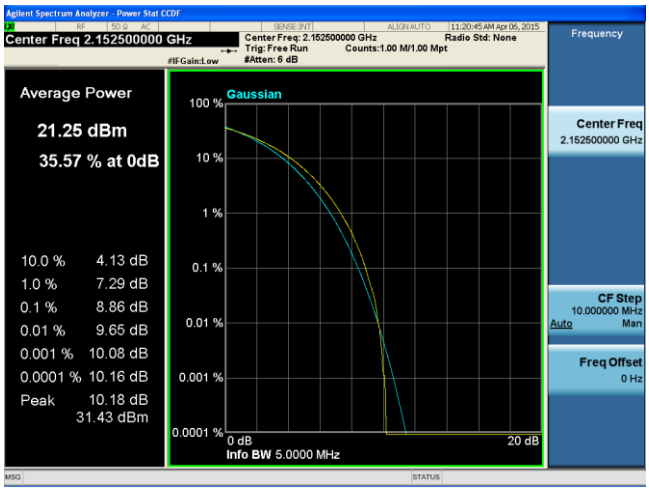
PK-AV-Ratio-Band4-QPSK-15M BW-Low



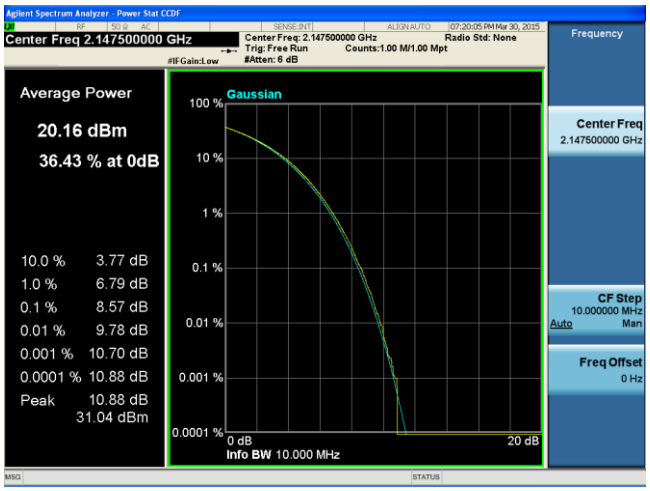
PK-AV-Ratio-Band4-QPSK-5M BW-Mid



PK-AV-Ratio-Band4-QPSK-15M BW-Mid



PK-AV-Ratio-Band4-QPSK-5M BW-High

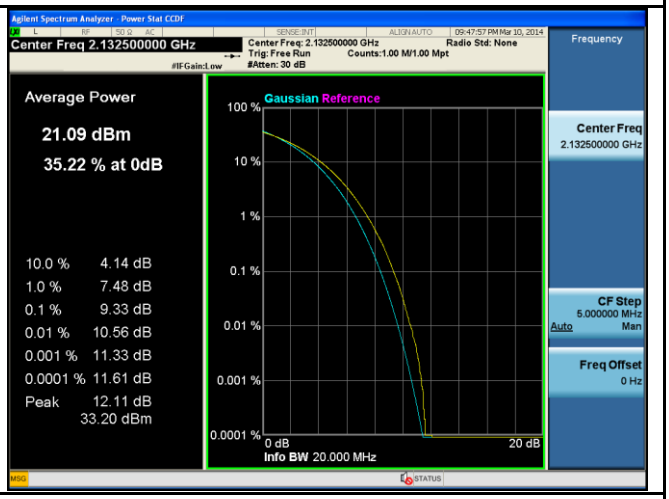


PK-AV-Ratio-Band4-QPSK-15M BW-High

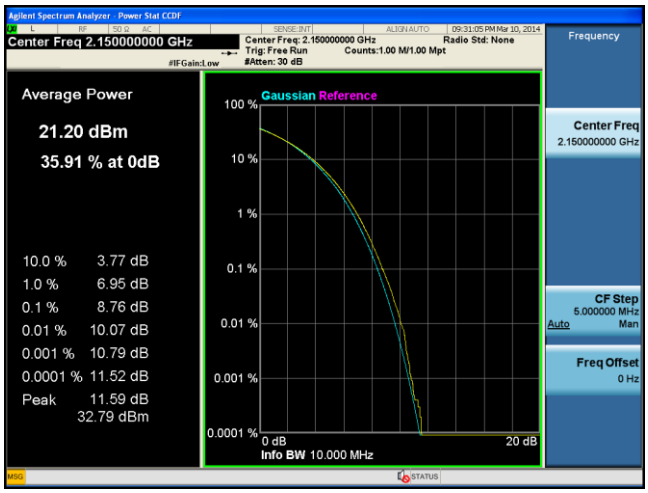
PK-AV-Ratio-Band4-64QAM-10M BW-Low

PK-AV-Ratio-Band4-64QAM-20M BW-Low

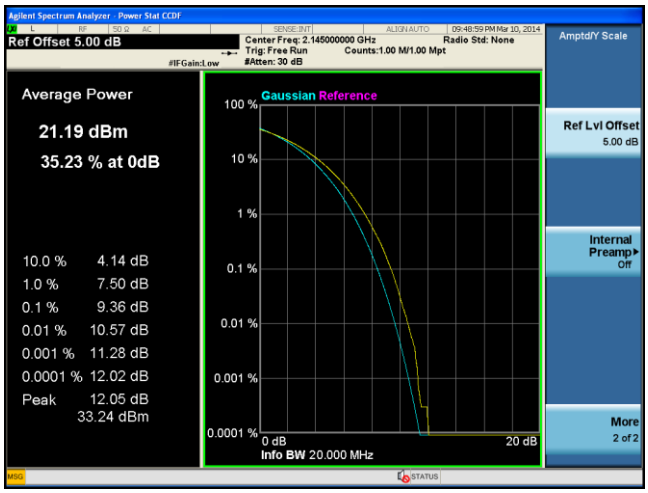
PK-AV-Ratio-Band4-64QAM-10M BW-Mid



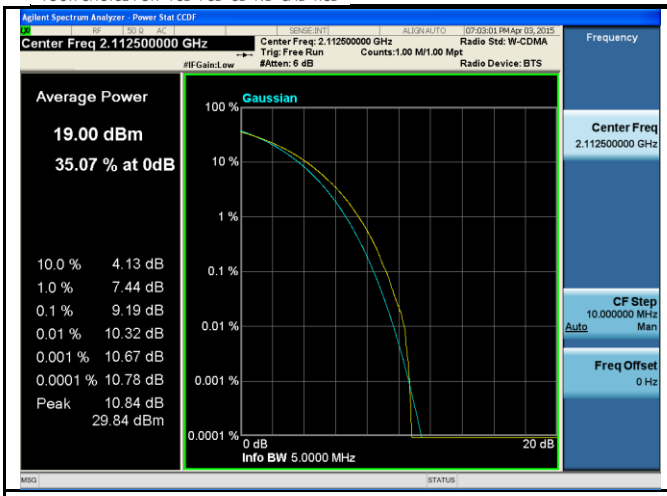
PK-AV-Ratio-Band4-64QAM-20M BW-Mid



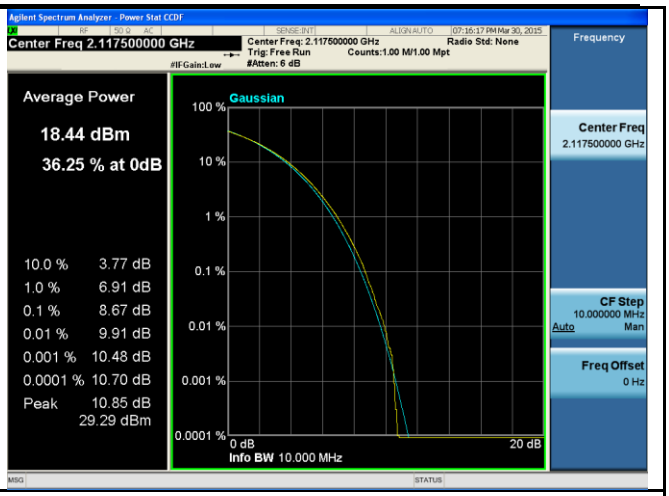
PK-AV-Ratio-Band4-64QAM-10M BW-High



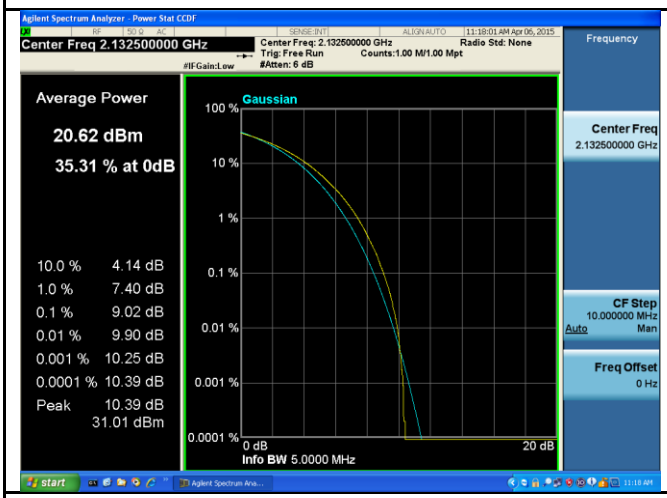
PK-AV-Ratio-Band4-64QAM-20M BW-High



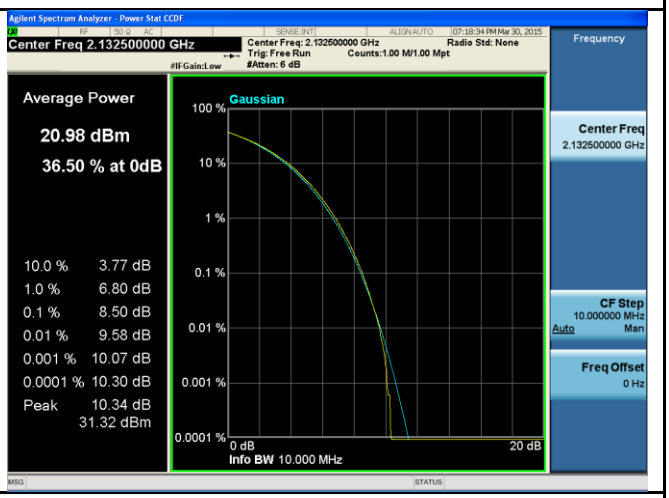
PK-AV-Ratio-Band4-64QAM-5M BW-Low



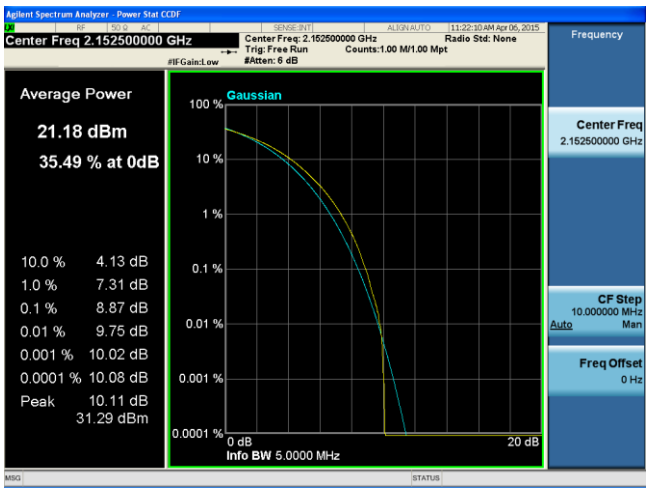
PK-AV-Ratio-Band4-64QAM-15M BW-Low



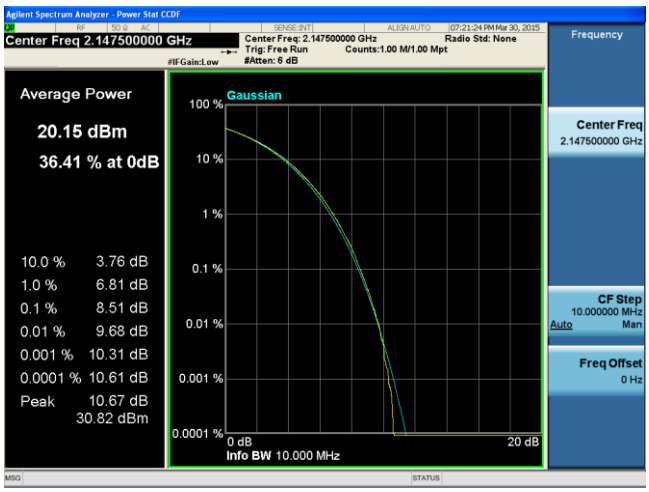
PK-AV-Ratio-Band4-64QAM-5M BW-Mid



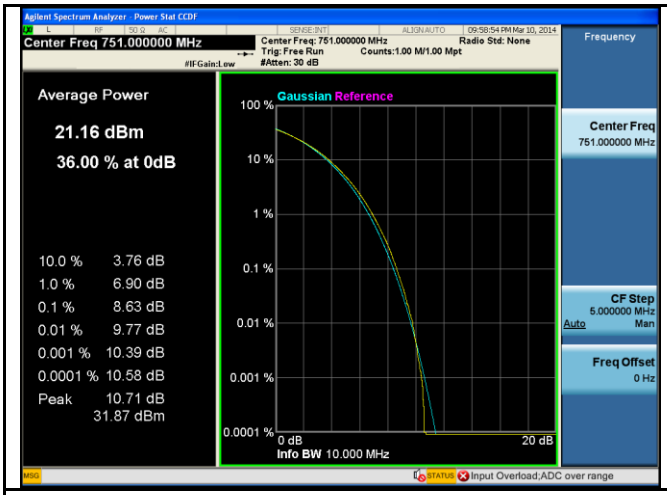
PK-AV-Ratio-Band4-64QAM-15M BW-Mid



PK-AV-Ratio-Band4-64QAM-5M BW-High

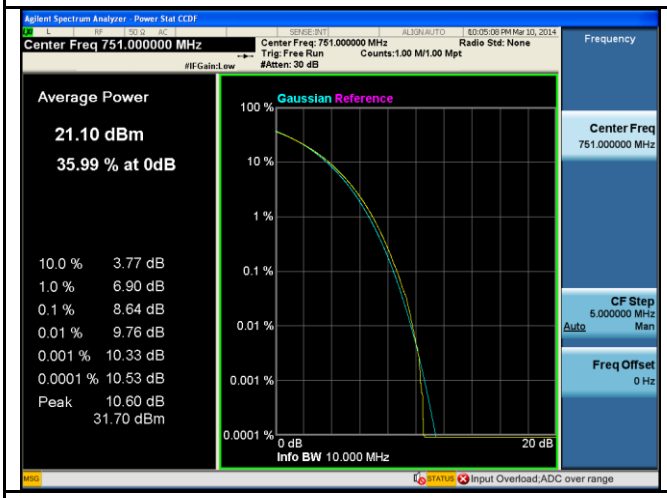


PK-AV-Ratio-Band4-64QAM-15M BW-High



PK-AV-Ratio-Band13-QPSK-10M BW-Mid

PK-AV-Ratio-Band13-16QAM-10M BW-Mid



PK-AV-Ratio-Band13-64QAM-10M BW-Mid

10.3 Occupied Bandwidth

Requirement(s):

Spec	Requirement			Applicable
47 CFR §2.1049	The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions of § 2.1049 (a) through (i)			☒
Test Setup				
Procedure	1. EUT was set for low, mid, high channel with modulated mode and highest RF output power. 2. The spectrum analyzer was connected to the antenna terminal. 3. The 99% bandwidths are measured using spectrum analyzer's internal meas function.			
Test Date	02/27/2014 – 03/202014 03/03/2015 – 04/13/2015	Environmental condition	Temperature Relative Humidity Atmospheric Pressure	23°C 48% 1008mbar
Remark	NONE			
Result	☒ Pass ☐ Fail			

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test Data

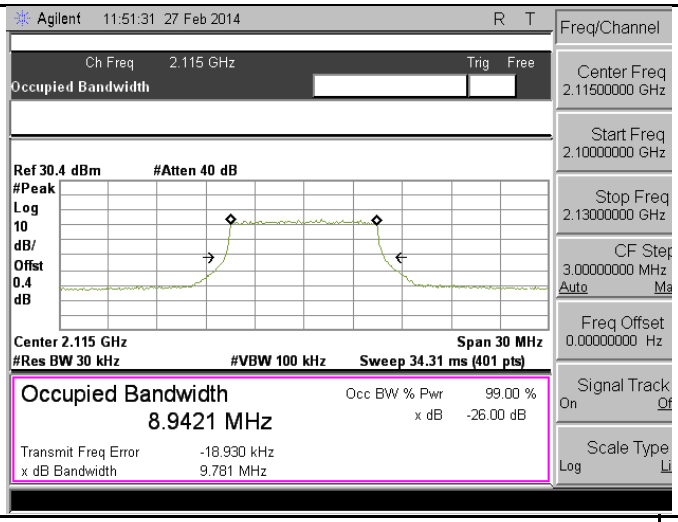
99% Bandwidth measurement result for LTE band4

Type	Channel	Channel Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB Occupied Bandwidth (MHz)
5MHz BW, QPSK	Low	2112.5	4.48	5.06
	Mid	2132.5	4.48	5.10
	High	2152.5	4.48	5.07
5MHz BW, 64QAM	Low	2112.5	4.48	5.09
	Mid	2132.5	4.48	5.03
	High	2152.5	4.48	5.06
10MHz BW, QPSK	Low	2115	8.94	9.78
	Mid	2132	8.93	9.79
	High	2150	8.93	9.70
10MHz BW, 64QAM	Low	2115	8.96	9.29
	Mid	2132	8.94	9.25
	High	2150	8.93	9.90
15MHz BW, QPSK	Low	2117.5	13.36	14.21
	Mid	2132.5	13.35	14.06
	High	2147.5	13.38	14.25
15MHz BW, 64QAM	Low	2117.5	13.37	14.30
	Mid	2132.5	13.36	14.29
	High	2147.5	13.35	14.30
20MHz BW, QPSK	Low	2120	17.80	19.19
	Mid	2132	17.81	18.94
	High	2145	17.81	19.31
20MHz BW, 64QAM	Low	2120	17.82	18.66
	Mid	2132	17.79	18.61
	High	2145	17.81	18.83

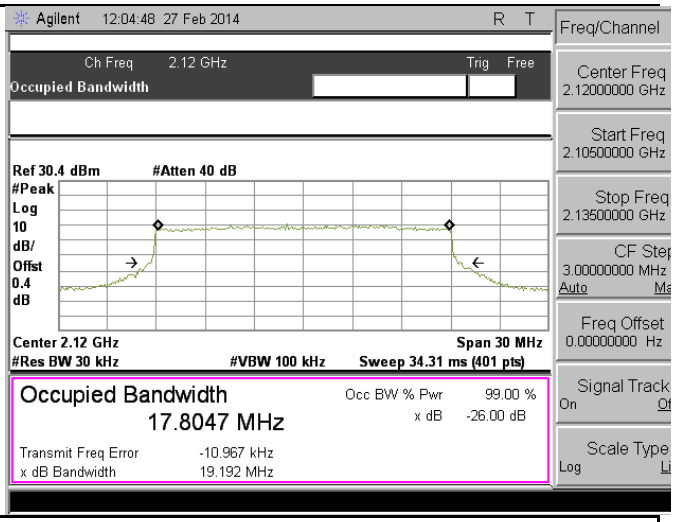
99% Bandwidth measurement result for LTE band 13

Type	Channel	Channel Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB Occupied Bandwidth (MHz)
10MHz BW, QPSK	Mid	751	8.95	9.79
10MHz BW, 16QAM	Mid	751	8.94	9.79
10MHz BW, 64QAM	Mid	751	8.96	9.84

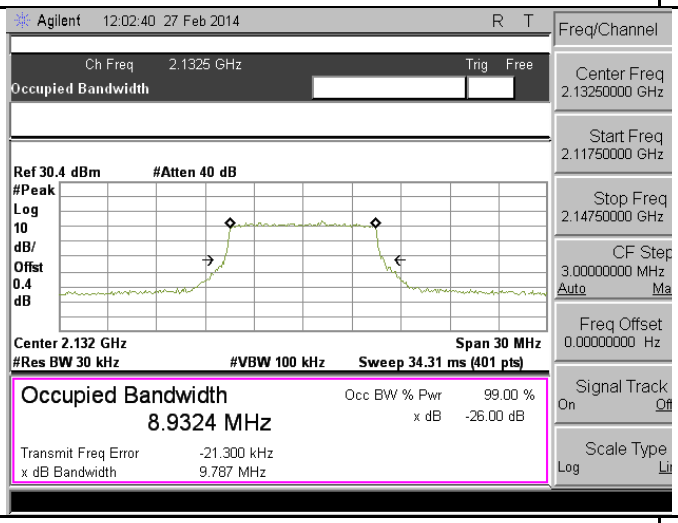
Test Plots for LTE Band4 QPSK



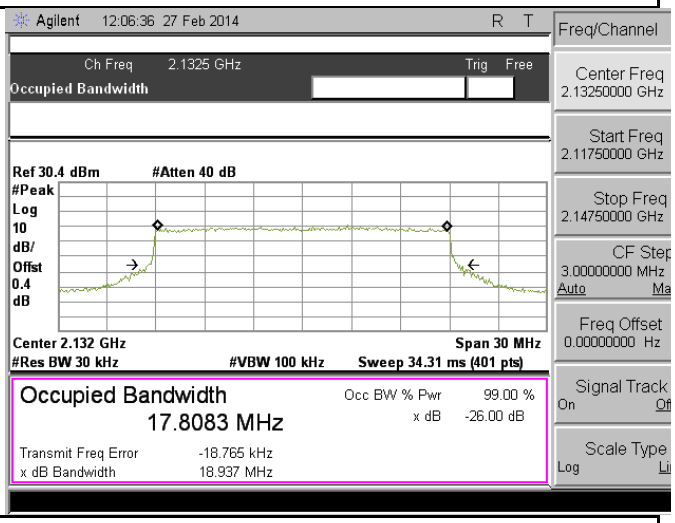
OBW-Band4-10M BW-Low



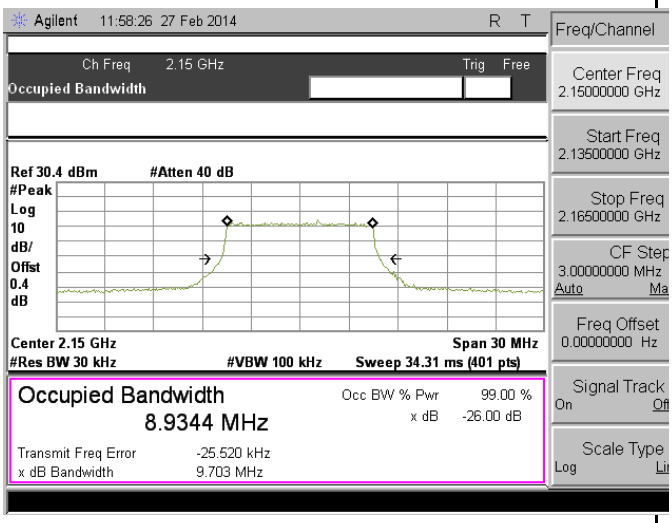
OBW-Band4-20M BW-Low



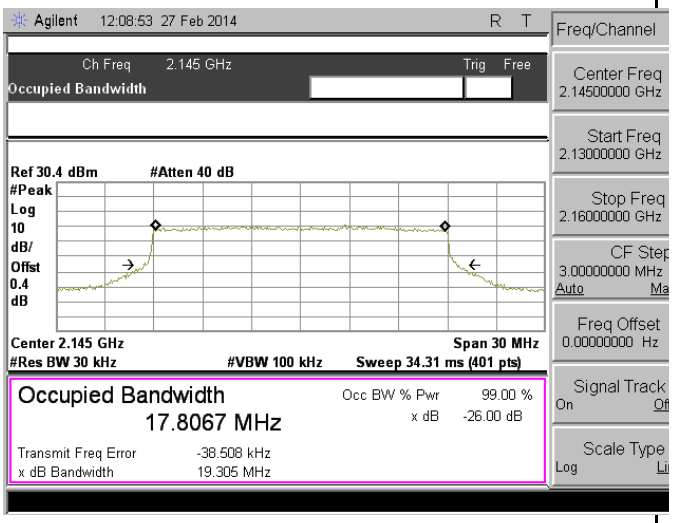
OBW-Band4-10M BW-Mid



OBW-Band4-20M BW-Mid

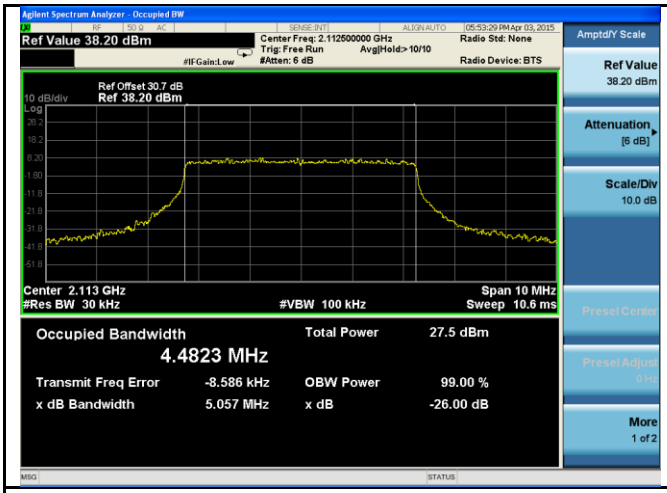


OBW-Band4-10M BW-High

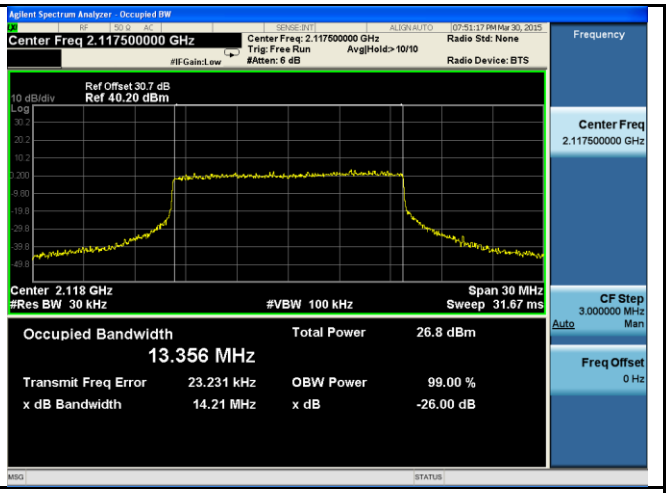


OBW-Band4-20M BW-High

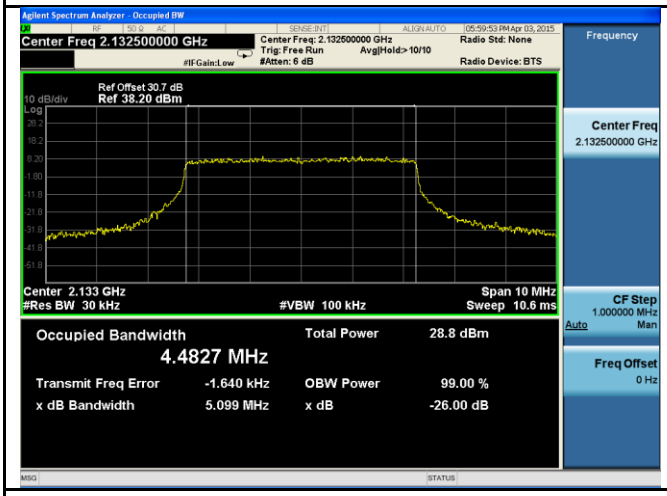
Test Plots for LTE Band4 QPSK



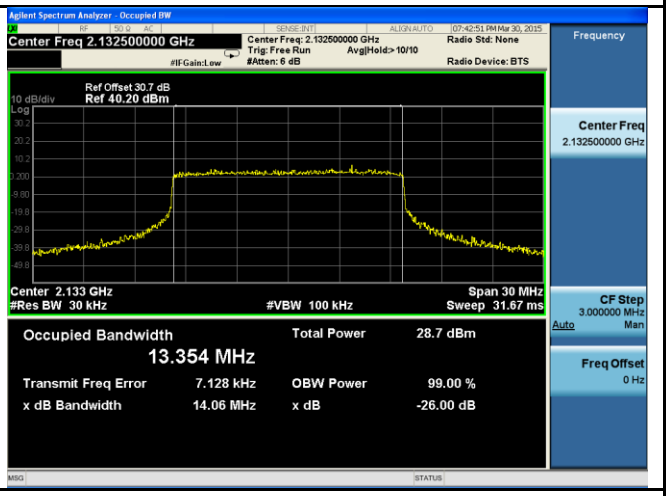
OBW-Band4-5M BW-Low



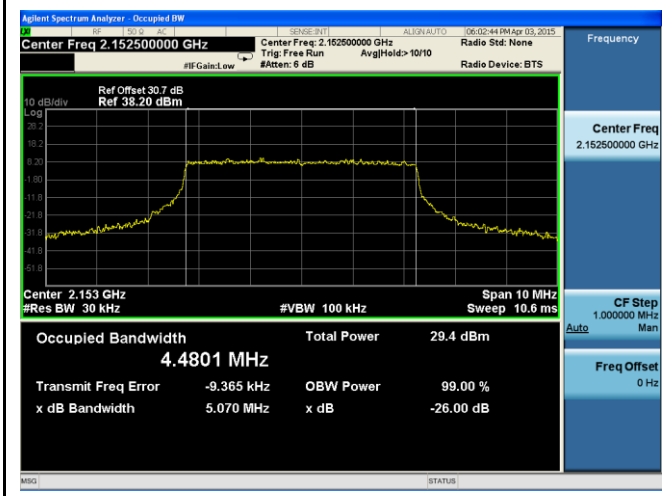
OBW-Band4-15M BW-Low



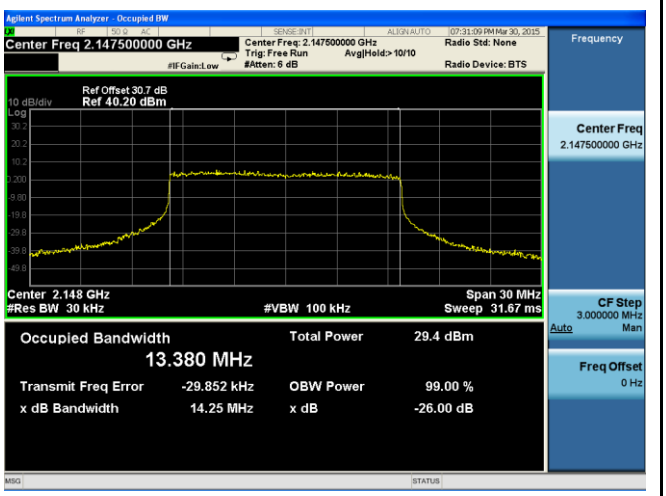
OBW-Band4-5M BW-Mid



OBW-Band4-15M BW-Mid

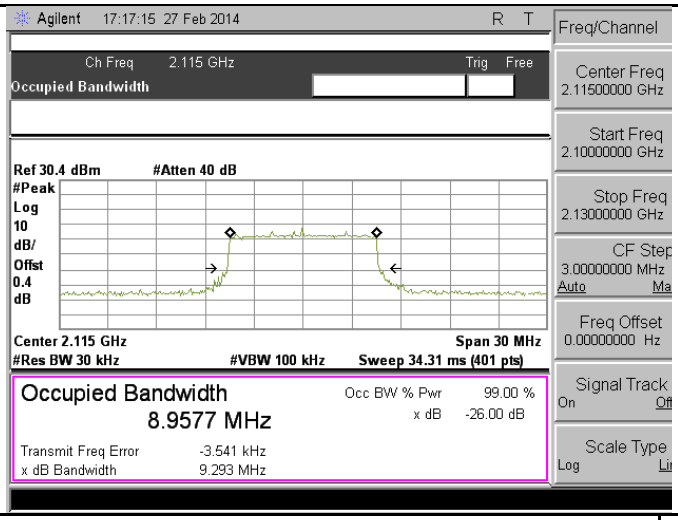


OBW-Band4-5M BW-High

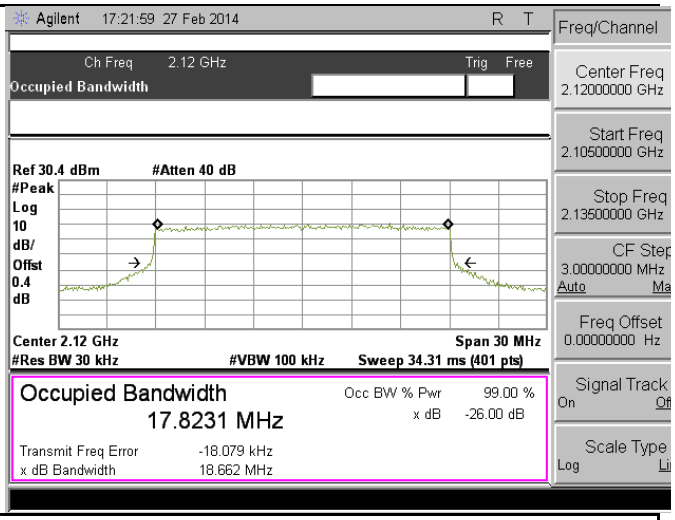


OBW-Band4-15M BW-High

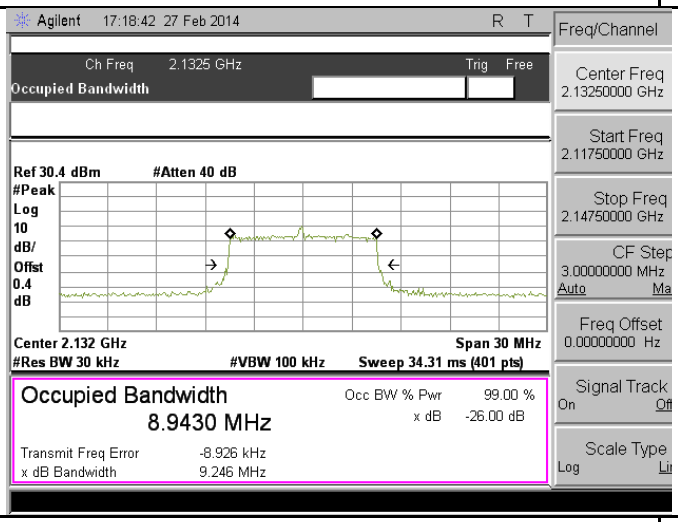
Test Plots for LTE Band4 64QAM



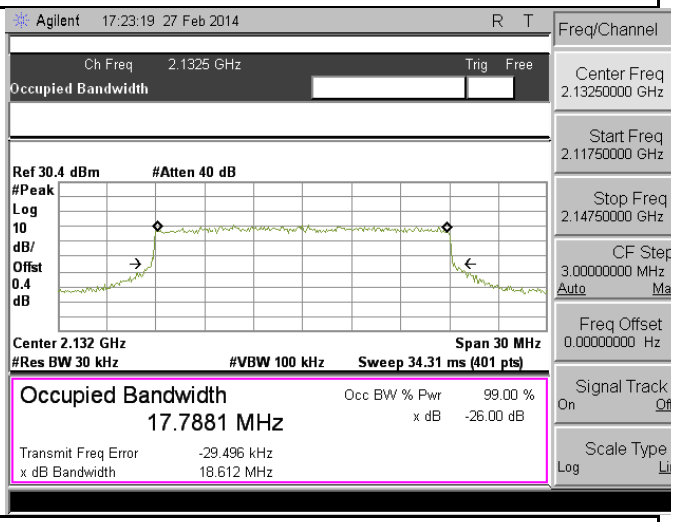
OBW-Band4-10M BW-Low



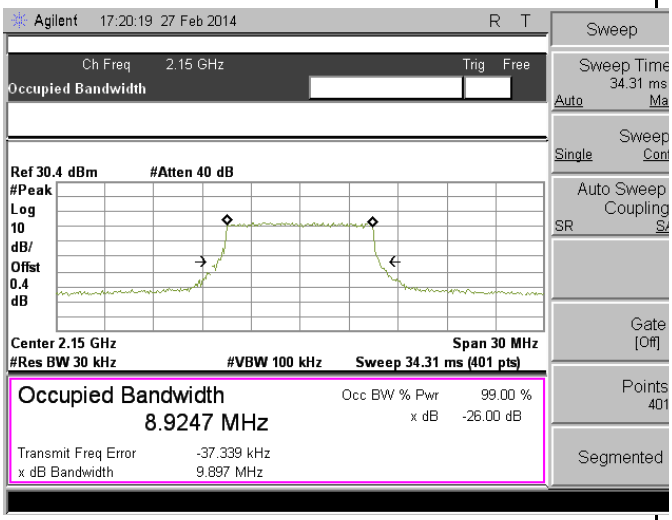
OBW-Band4-20M BW-Low



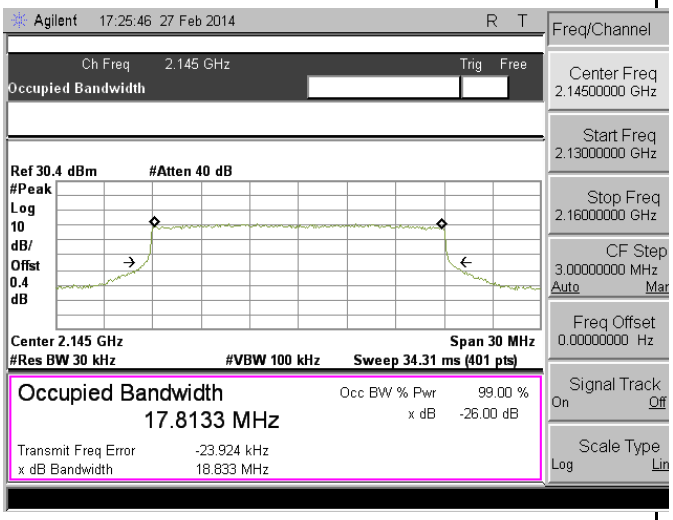
OBW-Band4-10M BW-Mid



OBW-Band4-20M BW-Mid

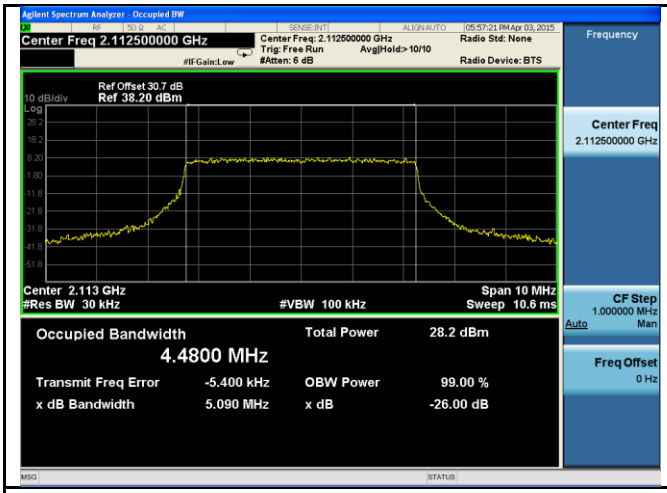


OBW-Band4-10M BW-High

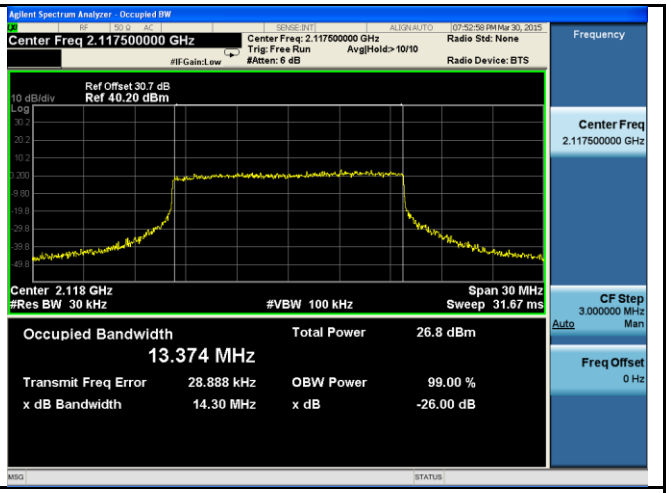


OBW-Band4-20M BW-High

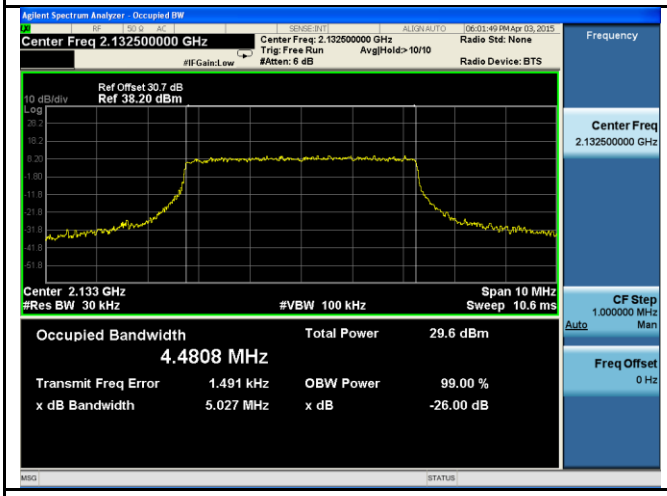
Test Plots for LTE Band4 64QAM



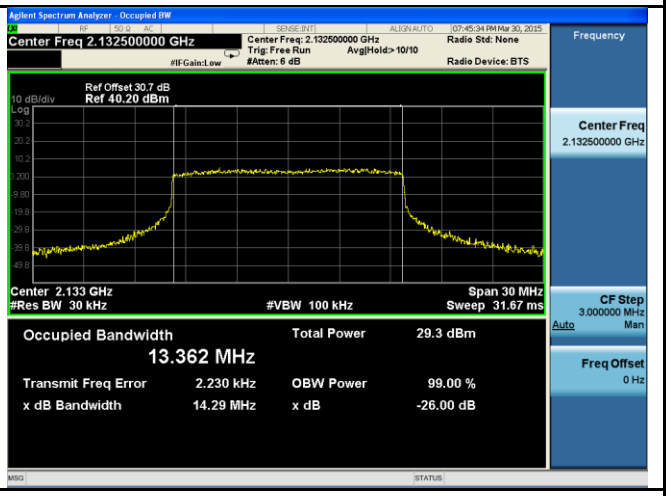
OBW-Band4-5M BW-Low



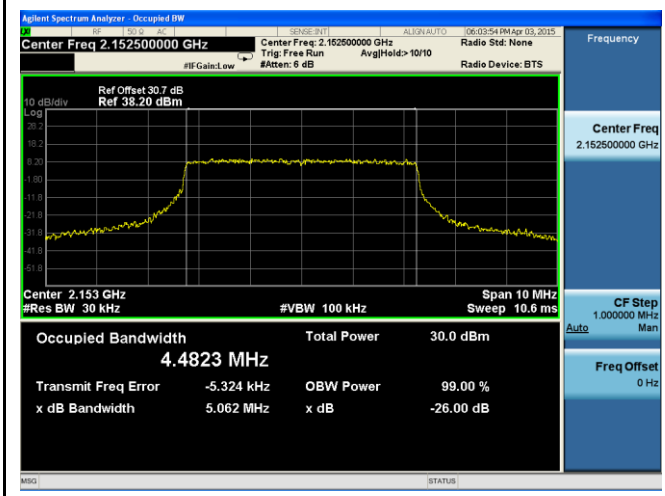
OBW-Band4-15M BW-Low



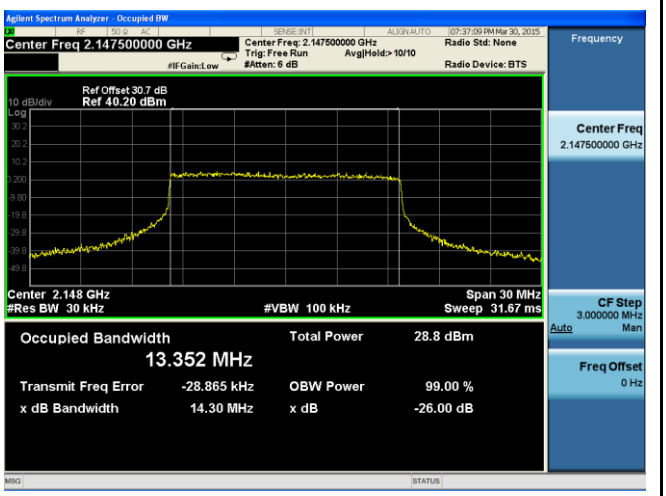
OBW-Band4-5M BW-Mid



OBW-Band4-15M BW-Mid

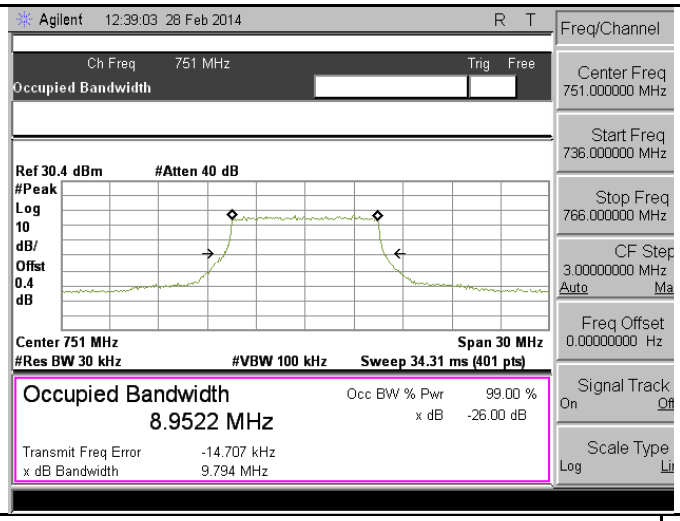


OBW-Band4-5M BW-High

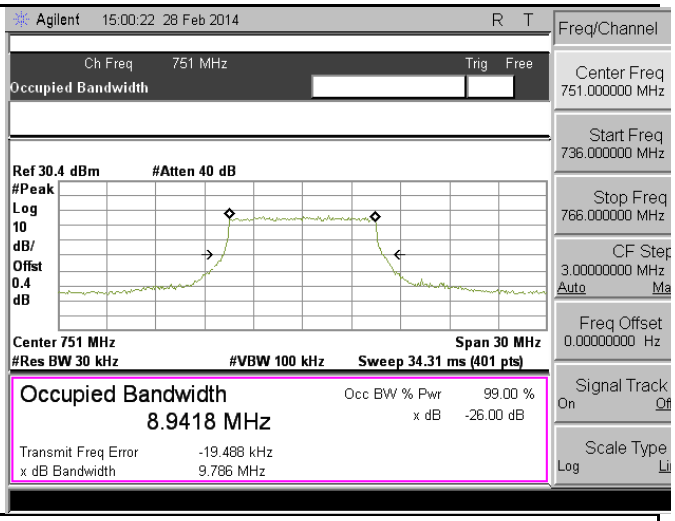


OBW-Band4-15M BW-High

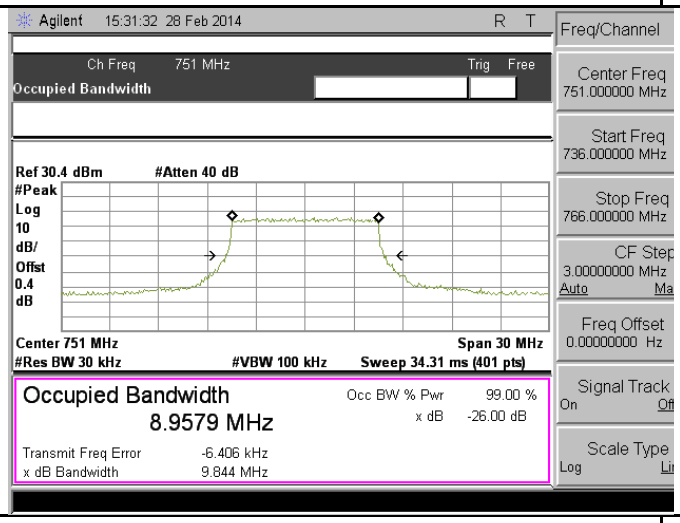
Test Plots for LTE band 13



OBW-Band13-Mid-QPSK



OBW-Band13-Mid-16QAM



OBW-Band13-Mid-64QAM

10.4 Band Edge

Requirement(s):

Spec	Item	Requirement	Applicable
47CFR22.917	-	Out of band emissions. 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.	☐
47CFR24.238	-	Out of band emissions. 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.	☐
47CFR27.53	-	Out of band emissions. 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.	☒

Test Setup				
Test Procedure	1. EUT was set for low, mid, high channel with modulated mode and highest RF output power. 2. The spectrum analyzer was connected to the antenna terminal. 3. A RBW of 1% greater than the 26 dB emission bandwidth should be used for band edge measurement or if narrower RBW is used, a correct factor calculated with formula 10*log (EBW/BW_{meas}) will be added to the result.			
Test Date	03/17/2014 03/03/2015 – 04/13/2015	Environmental condition	Temperature Relative Humidity Atmospheric Pressure	22°C 48% 1008mbar
Remark	100KHz RBW was used to make measurement for LTE Band 4 with 15MHz and 20MHz BW, so the correction factor will be added to correct the result to be using 150KHz and 200 KHz RBW, respectively.			
Result	☒ Pass ☐ Fail			

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

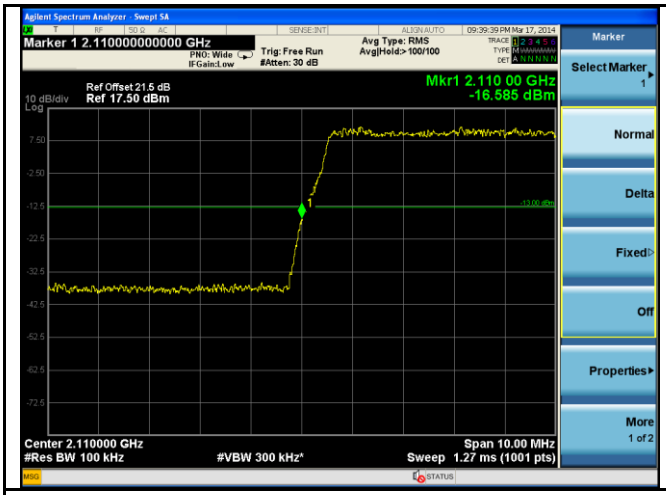
Band Edge Measurement Data for LTE band 4

Type	Channel	Channel Frequency (MHz)	Measurement Band Edge (dBm)	RBW Correction factor (dB)	Corrected Band Edge (dBm)	Limit (dBm)
5MHz BW, QPSK	Low	2112.5	-24.011	0	-24.011	-13
	High	2152.5	-25.676	0	-25.676	-13
5MHz BW, 64QAM	Low	2112.5	-22.79	0	-22.79	-13
	High	2152.5	-23.05	0	-23.05	-13
10MHz BW, QPSK	Low	2115	-16.585	0	-16.585	-13
	High	2150	-16.782	0	-16.782	-13
10MHz BW, 64QAM	Low	2115	-17.989	0	-17.989	-13
	High	2150	-18.330	0	-18.33	-13
15MHz BW, QPSK	Low	2117.5	-33.148	1.76	-31.388	-13
	High	2147.5	-35.78	1.76	-34.02	-13
15MHz BW, 64QAM	Low	2117.5	-33.83	1.76	-32.07	-13
	High	2147.5	-32.88	1.76	-31.12	-13
20MHz BW, QPSK	Low	2120	-23.696	3.01	-20.686	-13
	High	2145	-25.753	3.01	-22.743	-13
20MHz BW, 64QAM	Low	2120	-21.896	3.01	-18.886	-13
	High	2145	-20.486	3.01	-17.476	-13
Note:	Correction Factor (15MHz BW): 10 log (150/100)= 1.76 Correction Factor (20MHz BW): 10 log (200/100)= 3.01					

Band Edge Measurement Data for LTE band 13

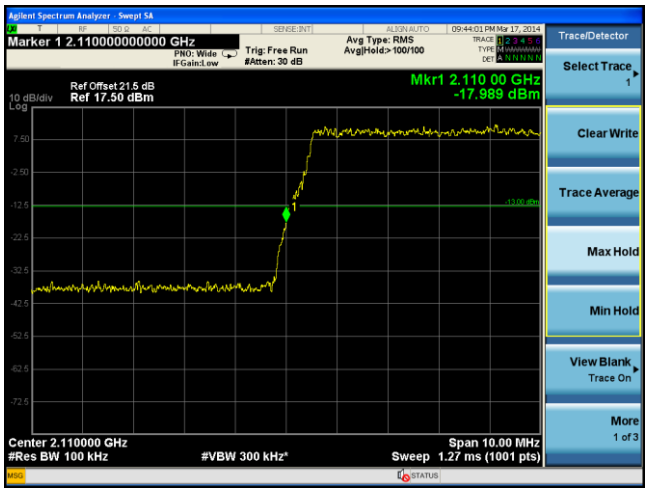
Type	Channel	Channel Frequency (MHz)	Measurement Band Edge (dBm)	RBW Correction factor (dB)	Corrected Band Edge (dBm)	Limit (dBm)
10MHz BW, QPSK	Low	751	-16.224	0	-16.224	-13
10MHz BW, QPSK	High	751	-36.463	0	-36.463	-13
10MHz BW, 16QAM	Low	751	-16.691	0	-16.691	-13
10MHz BW, 16QAM	High	751	-39.017	0	-39.017	-13
10MHz BW, 64QAM	Low	751	-17.485	0	-17.485	-13
10MHz BW, 64QAM	High	751	-37.717	0	-37.717	-13

Test Plots



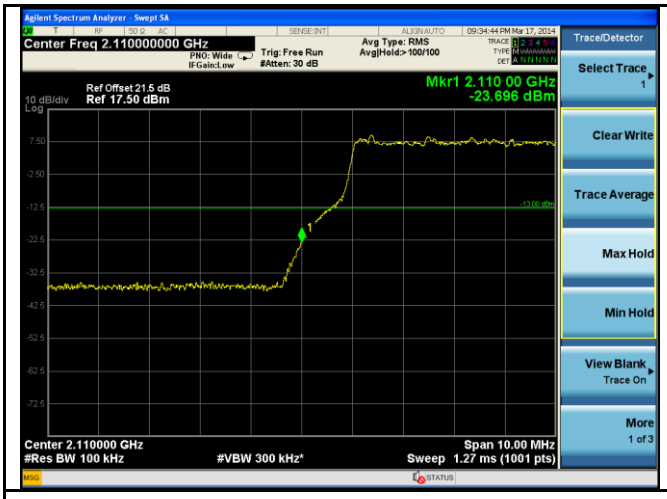
BandEdge-LTE-Band4-10MHz-QPSK-Low

BandEdge-LTE-Band4-10MHz-QPSK-High



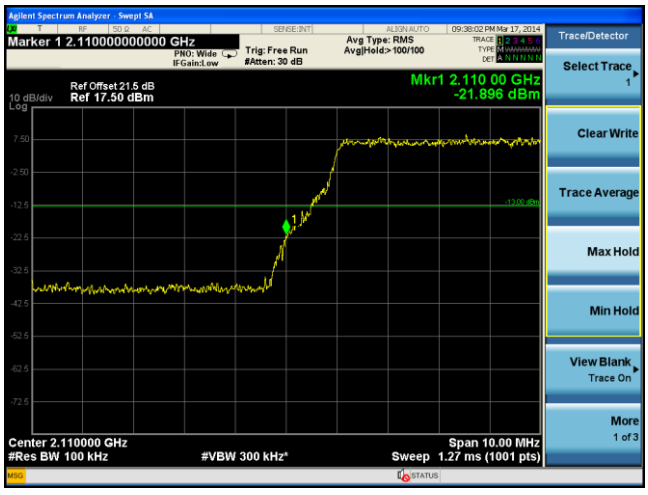
BandEdge-LTE-Band4-10MHz-64QAM-Low

BandEdge-LTE-Band4-10MHz-64QAM-High



BandEdge-LTE-Band4-20MHz-QPSK-Low

BandEdge-LTE-Band4-20MHz-QPSK-High



BandEdge-LTE-Band4-20MHz-64QAM-Low

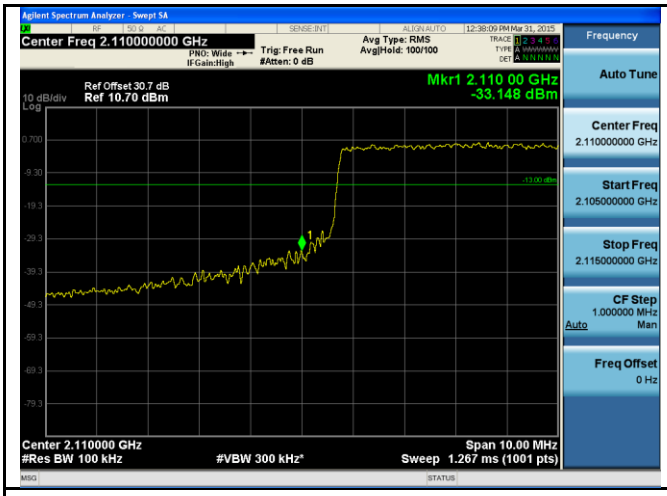
BandEdge-LTE-Band4-20MHz-64QAM-High

BandEdge-LTE-Band4-5MHz-QPSK-Low

BandEdge-LTE-Band4-5MHz -QPSK-High

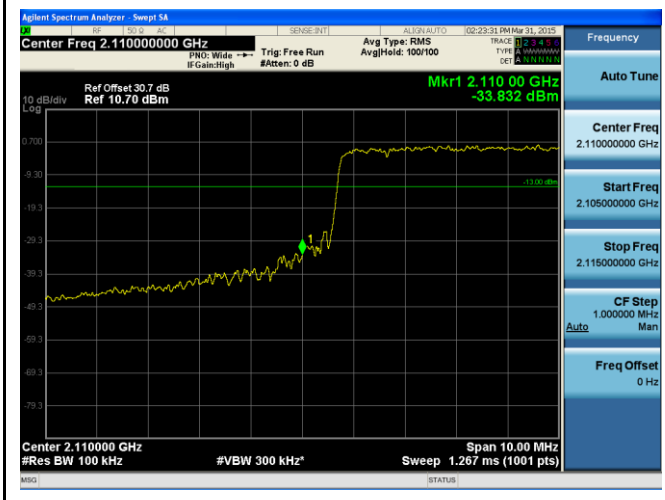
BandEdge-LTE-Band4-5MHz -64QAM-Low

BandEdge-LTE-Band4-5MHz -64QAM-High



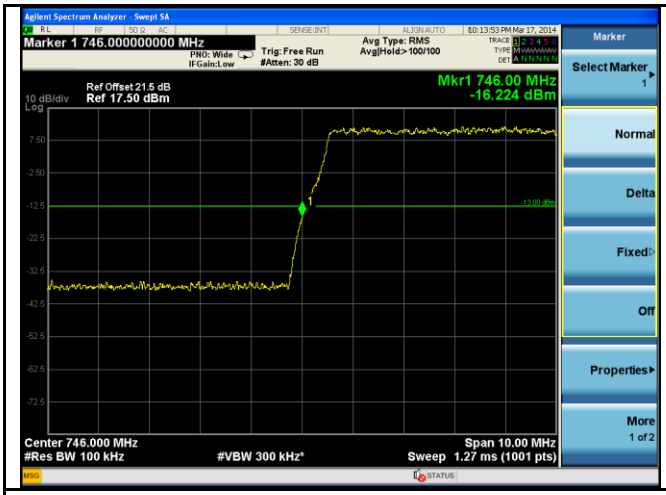
BandEdge-LTE-Band4-15MHz-QPSK-Low

BandEdge-LTE-Band4-15MHz -QPSK-High

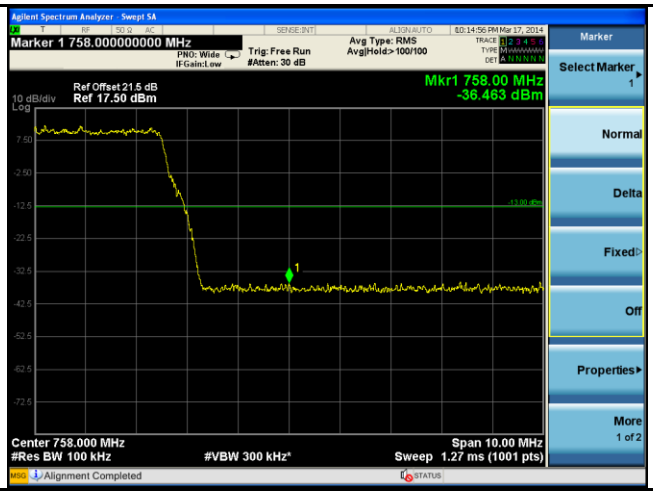


BandEdge-LTE-Band4-15MHz -64QAM-Low

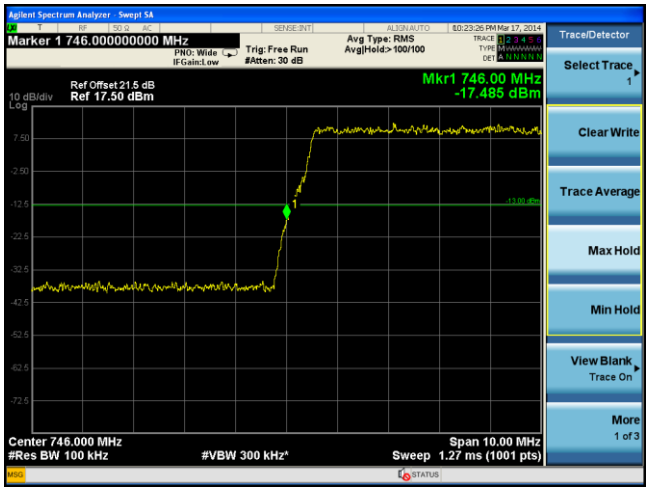
BandEdge-LTE-Band4-15MHz -64QAM-High



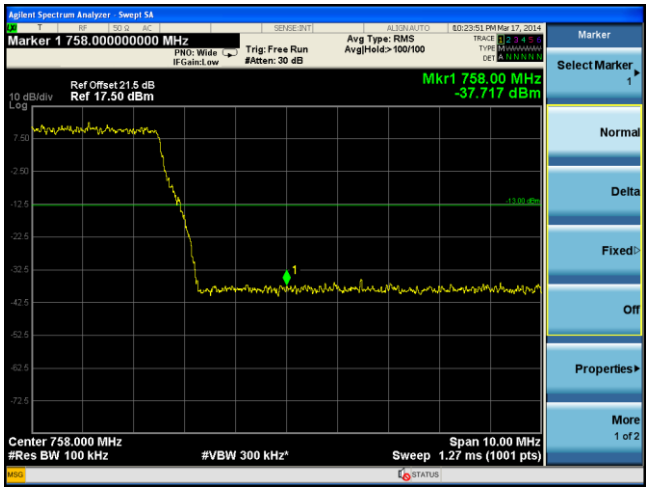
BandEdge-LTE-Band13-10MHz-QPSK-Low



BandEdge-LTE-Band13-10MHz-QPSK-High



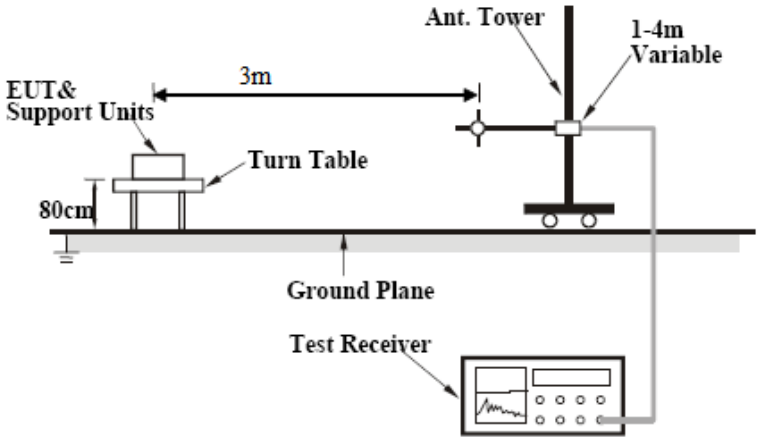
BandEdge-LTE-Band13-10MHz-64QAM-Low



BandEdge-LTE-Band13-10MHz-64QAM-High

10.5 Radiated Spurious Emission below 1GHz

Requirement(s):

Spec	Item	Requirement	Applicable
47CFR22.917	-	Out of band emissions. 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.	☐
47CFR24.238	-	Out of band emissions. 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.	☐
47CFR27.53	-	Out of band emissions. 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.	☒
Test Setup			
Procedure	Substitution method: 1. The EUT was switched on and allowed to warm up to its normal operating condition. 2. The test was carried out at the selected frequency points obtained from the EUT characterisation. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner: a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen. b. The EUT was then rotated to the direction that gave the maximum emission. c. Finally, the antenna height was adjusted to the height that gave the maximum emission. 3. Remove the transmitter and replace it with a substitution antenna (the antenna should be half-wavelength for each frequency involved). The center of the substitution antenna should be approximately at the same location as the center of the transmitter. 4. Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a non-radiating cable. With the antennas at both ends horizontally polarized, and with the signal generator tuned to a particular spurious frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained. 5. Steps 4 were repeated for the next frequency point, until all selected frequency points were measured.		
Remark	All different modulation and bandwidth configuration has been verified and only the test data of worst case with QPSK modulation and greatest bandwidth (20MHz) was presented in this report. Power limit = P_{dBm} – [43+ 10 log (P_W)] ➔ 10log(1000 x P_W) - 43 - 10log(P_W) ➔ 30-43 = -13dBm		
Result	☒ Pass ☐ Fail		

Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☐ Yes (See below) ☒ N/A

Radiated Emission Test Results

Test specification	below 1GHz		Result	Pass
Environmental Conditions:	Temp (°C):	22		
	Humidity (%)	45		
	Atmospheric (mbar):	1008		
Mains Power:	56VDC PoE			
Tested by:	David Zhang			
Test Date:	02/13/2014			
Remarks:	LTE band4-Mid CH-20MHz BW, QPSK			

Frequency MHz	Raw dBm	Cable Loss	AF dB	Level dBm	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBm	Margin dB	Pass /Fail
996.89	-63.80	6.58	12.52	-44.70	RMS Max	H	359.00	357.00	-13.00	-31.70	Pass
186.40	-50.86	2.67	0.06	-48.13	RMS Max	V	100.00	356.00	-13.00	-35.13	Pass
242.88	-51.91	2.99	0.32	-48.60	RMS Max	V	100.00	9.00	-13.00	-35.60	Pass
58.24	-57.04	1.64	-3.92	-59.32	RMS Max	V	100.00	291.00	-13.00	-46.32	Pass

Test specification	below 1GHz		Result	Pass
Environmental Conditions:	Temp (°C):	22		
	Humidity (%)	45		
	Atmospheric (mbar):	1008		
Mains Power:	56VDC PoE			
Tested by:	David Zhang			
Test Date:	02/13/2014			
Remarks:	LTE Band 13 Mid CH, QPSK			

Frequency MHz	Raw dBm	Cable Loss	AF dB	Level dBm	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBm	Margin dB	Pass /Fail
999.52	-59.61	18.36	2.09	-39.15	RMS Max	H	103.00	45.00	-13.00	-26.15	Pass
185.69	-45.49	14.44	-10.43	-41.48	RMS Max	V	105.00	354.00	-13.00	-28.48	Pass
240.98	-47.51	14.75	-10.18	-42.94	RMS Max	H	281.00	102.00	-13.00	-29.94	Pass
58.61	-59.13	13.41	-14.34	-60.06	RMS Max	V	100.00	14.00	-13.00	-47.06	Pass
82.36	-59.82	13.65	-13.87	-60.05	RMS Max	V	100.00	291.00	-13.00	-47.05	Pass

Test specification	below 1GHz		Result	Pass
Environmental Conditions:	Temp (°C):	22		
	Humidity (%)	45		
	Atmospheric (mbar):	1008		
Mains Power:	56VDC PoE			
Tested by:	David Zhang			
Test Date:	02/13/2014			
Remarks:	LTE band4 & LTE band 13 transmit simultaneously at Mid CH, QPSK			

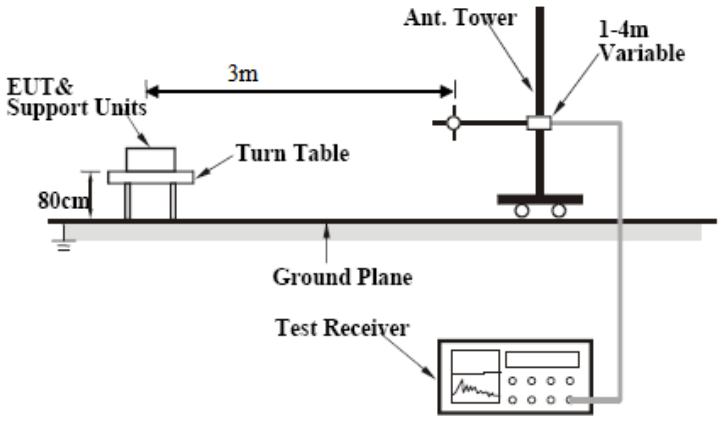
Frequency MHz	Raw dBm	Cable Loss	AF dB	Level dBm	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBm	Margin dB	Pass /Fail
185.20	-43.56	14.44	-10.48	-39.60	RMS Max	V	100.00	22.00	-13.00	-26.60	Pass
995.64	-62.10	18.34	2.04	-41.71	RMS Max	H	182.00	291.00	-13.00	-28.71	Pass
100.23	-60.65	13.78	-11.25	-58.12	RMS Max	V	100.00	102.00	-13.00	-45.12	Pass
36.06	-62.02	13.12	-4.91	-53.81	RMS Max	V	100.00	100.00	-13.00	-40.81	Pass
756.71	-61.77	17.22	-1.10	-45.65	RMS Max	H	221.00	24.00	-13.00	-32.65	Pass
253.39	-59.25	14.81	-9.93	-54.37	RMS Max	V	100.00	162.00	-13.00	-41.37	Pass

10.6 Radiated Spurious Emissions above 1GHz

Requirement(s):

Spec	Item	Requirement	Applicable
47CFR22.917	-	Out of band emissions. 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.	☐
47CFR24.238	-	Out of band emissions. 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.	☐
47CFR27.53	-	Out of band emissions. 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.	☒

Test Setup



Procedure

Substitution method:

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. The test was carried out at the selected frequency points obtained from the EUT characterisation. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:
   a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen.
   b. The EUT was then rotated to the direction that gave the maximum emission.
   c. Finally, the antenna height was adjusted to the height that gave the maximum emission.
3. Remove the transmitter and replace it with a substitution antenna (the antenna should be half-wavelength for each frequency involved). The center of the substitution antenna should be approximately at the same location as the center of the transmitter.
4. Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a non-radiating cable. With the antennas at both ends horizontally polarized, and with the signal generator tuned to a particular spurious frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained.
5. Steps 4 were repeated for the next frequency point, until all selected frequency points were measured.

Test Date	02/13/2014 – 03/17/2014	Environmental condition	Temperature	23°C
			Relative Humidity	48%
			Atmospheric Pressure	1008mbar

Remark

All different modulation and bandwidth configuration has been verified and only the test data of worst case with QPSK modulation and greatest bandwidth (20MHz) was presented in this report.
Power limit = P_{dBm} – [43+ 10 log (P_W)] ➔ 10log(1000 x P_W) - 43 - 10log(P_W) ➔ 30-43 = -13dBm

Result ☒ Pass ☐ Fail

Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☐ Yes (See below) ☒ N/A

Radiated Emission Test Results (Above 1GHz)

LTE band 4 Low Channel, 20MHz BW, QPSK

Frequency MHz	SG Level dBm	Cable Loss dB	Antenna Gain dBd	Substituted Level dBm	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBm	Margin dB	Pass /Fail
4218.353	-60.85	4.74	8.32	-47.79	RMS Max	H	125.00	350.00	-13.00	-34.79	Pass
6849.014	-71.95	6.23	9.74	-55.98	RMS Max	V	107.00	243.00	-13.00	-42.98	Pass
2110.337	-59.11	3.74	6.33	-49.04	RMS Max	H	100.00	29.00	-13.00	-36.04	Pass
8441.214	-71.43	5.81	9.37	-56.25	RMS Max	V	194.0	211.00	-13.00	-43.25	Pass
Remark	Emissions were scanned up to 40GHz; no emissions were detected above the noise floor which was at least 20dB below the specification limit. Both horizontal and vertical polarizations were verified.										

LTE band 4 Mid Channel, 20MHz BW, QPSK

Frequency MHz	SG Level dBm	Cable Loss dB	Antenna Gain dBd	Substituted Level dBm	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBm	Margin dB	Pass /Fail
4266.415	-61.99	4.76	8.32	-48.91	RMS Max	H	142.00	102.00	-13.00	-35.91	Pass
6935.074	-71.22	6.31	9.65	-55.26	RMS Max	V	145.00	175.00	-13.00	-42.26	Pass
8525.015	-70.74	5.82	9.12	-55.80	RMS Max	V	100.00	89.00	-13.00	-42.80	Pass
4266.415	-61.98	4.76	8.31	-48.91	RMS Max	H	142.00	102.00	-13.00	-35.91	Pass
Remark	Emissions were scanned up to 40GHz; no emissions were detected above the noise floor which was at least 20dB below the specification limit. Both horizontal and vertical polarizations were verified.										

LTE band 4 High Channel, 20MHz BW, QPSK

Frequency MHz	SG Level dBm	Cable Loss dB	Antenna Gain dBd	Substituted Level dBm	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBm	Margin dB	Pass /Fail
4310.894	-61.27	4.76	8.32	-48.19	RMS Max	H	153.00	102.00	-13.00	-35.19	Pass
6934.573	-71.22	6.31	9.65	-55.26	RMS Max	V	146.00	14.00	-13.00	-42.26	Pass
8525.925	-70.94	5.82	9.12	-56.00	RMS Max	V	170.00	174.00	-13.00	-43.00	Pass
Remark	Emissions were scanned up to 40GHz; no emissions were detected above the noise floor which was at least 20dB below the specification limit. Both horizontal and vertical polarizations were verified.										

LTE Band 13 Mid Channel, 10MHz BW, QPSK

Frequency MHz	SG Level dBm	Cable Loss dB	Antenna Gain dBd	Substituted Level dBm	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBm	Margin dB	Pass /Fail
4532.93	-57.46	4.55	9.08	-43.83	RMS Max	H	122.00	109.00	-13.00	-30.83	Pass
1491.34	-74.54	3.19	5.41	-65.94	RMS Max	V	103.00	312.00	-13.00	-52.94	Pass
1624.44	-60.48	3.33	6.46	-50.69	RMS Max	V	183.00	28.00	-13.00	-37.69	Pass
Remark	Emissions were scanned up to 40GHz; no emissions were detected above the noise floor which was at least 20dB below the specification limit. Both horizontal and vertical polarizations were verified.										

LTE Band 4 and band 13 Mid Channel transmit simultaneously, QPSK

Frequency MHz	SG Level dBm	Cable Loss dB	Antenna Gain dBd	Substituted Level dBm	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBm	Margin dB	Pass /Fail
8118.33	-70.61	5.51	9.92	-55.18	RMS Max	V	118.00	109.00	-13.00	-42.18	Pass
6888.76	-72.19	6.07	9.65	-56.47	RMS Max	H	109.00	107.00	-13.00	-43.47	Pass
5739.20	-73.41	5.04	9.5	-58.87	RMS Max	V	198.00	310.00	-13.00	-45.87	Pass
4054.83	-73.58	4.45	7.67	-61.46	RMS Max	V	126.00	110.00	-13.00	-48.46	Pass
Remark	Emissions were scanned up to 40GHz; no emissions were detected above the noise floor which was at least 20dB below the specification limit. Both horizontal and vertical polarizations were verified.										

10.7 Frequency Stability

Requirement(s):

<table>
<tr><th>Spec</th><th>Item</th><th>Requirement</th><th>Applicable</th></tr>
<tr><td>47 CFR 2.1055,
47 CFR 22.355</td><td>-</td><td>Except as otherwise provided in this part, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table at below,
<table>
<tr><th>Frequency range (MHz)</th><th>Base, fixed (ppm)</th><th>Mobile ≤3 watts (ppm)</th><th>Mobile ≤3 watts (ppm)</th></tr>
<tr><td>25 to 50</td><td>20</td><td>20</td><td>50</td></tr>
<tr><td>50 to 450</td><td>5</td><td>5</td><td>50</td></tr>
<tr><td>450 to 512</td><td>2.5</td><td>5</td><td>5</td></tr>
<tr><td>821 to 896</td><td>1.5</td><td>2.5</td><td>2.5</td></tr>
<tr><td>928 to 929</td><td>5</td><td>n/a</td><td>n/a</td></tr>
<tr><td>929 to 960</td><td>1.5</td><td>n/a</td><td>n/a</td></tr>
<tr><td>2110 to 2220</td><td>10</td><td>n/a</td><td>n/a</td></tr>
</table></td><td>☐</td></tr>
<tr><td>47 CFR 2.1055,
47 CFR 24.135(a)</td><td>-</td><td>The frequency stability of the transmitter shall be maintained within ±0.0001 percent (±1 ppm) of the center frequency over a temperature variation of −30 °Celsius to +50 °Celsius at normal supply voltage, and over a variation in the primary supply voltage of 85 percent to 115 percent of the rated supply voltage at a temperature of 20 °Celsius.</td><td>☐</td></tr>
<tr><td>47 CFR 2.1055,
47 CFR 27.54</td><td>-</td><td>The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.</td><td>☒</td></tr>
<tr><td>Test Setup</td><td colspan="3"> 
</td></tr>
<tr><td>Test Procedure</td><td colspan="3">The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
1. The equipment is turned on in a “standby” condition for one minute before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
2. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A period of at least one half hour is provided to allow stabilization of the equipment at each temperature level.</td></tr>
<tr><td>Test Date</td><td>03/10/2014</td><td>Environmental condition</td><td>Temperature 23°C
Relative Humidity 48%
Atmospheric Pressure 1008mbar</td></tr>
<tr><td>Remark</td><td colspan="3">All different modulation and bandwidth configuration has been verified and only the test data of worst case with QPSK modulation and greatest bandwidth (20MHz) at mid channel was presented in this report.</td></tr>
<tr><td>Result</td><td colspan="3">☒ Pass ☐ Fail</td></tr>
</table>

Test Data ☒ Yes ☒ N/A

Test Plot ☐ Yes (See below) ☒ N/A

Test Data for LTE band2

Voltage (%)	Power (VDC)	Temp. (°)	Frequency (KHz)	Frequency Error (Hz)	Deviation (ppm)
100%	56	20 (ref)	2132000.012	0	0.000
100%		-30	2132000.001	-11	-0.005
100%		-20	2132000.003	-9	-0.004
100%		-10	2132000.01	-2	-0.001
100%		0	2132000.01	-2	-0.001
100%		10	2132000.021	9	0.004
100%		30	2132000.019	7	0.003
100%		40	2132000.015	3	0.001
100%		50	2132000.026	14	0.007
115%	64.4	20	2132000.02	8	0.004
85%	47.6	20	2132000.019	7	0.003

Test Data for LTE band 13

Voltage (%)	Power (VDC)	Temp. (°)	Frequency (KHz)	Frequency Error (Hz)	Deviation (ppm)
100%	56	20 (ref)	751000.042	0	0.000
100%		-30	751000.012	-30	-0.040
100%		-20	751000.023	-19	-0.025
100%		-10	751000.015	-27	-0.036
100%		0	751000.036	-6	-0.008
100%		10	751000.034	-8	-0.011
100%		30	751000.045	3	0.004
100%		40	751000.028	-14	-0.019
100%		50	751000.046	4	0.005
115%	64.4	20	751000.041	-1	-0.001
85%	47.6	20	751000.040	-2	-0.003

Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Cycle	Cal Due	In use
Conducted Emissions						
EMI Test Receiver (9 kHz – 30 MHz)	ESHS10	830223/0009	04/08/2014	1 Year	04/08/2015	☐
Spectrum Analyzer	FSIQ7	825555/013	05/31/2014	1 Year	05/31/2015	☐
V-LISN (150 kHz – 30 MHz)	NNLK 8129	8129-190	08/11/2014	1 Year	08/11/2015	☐
LISN (9 kHz – 30 MHz)	MN2050B	1018	07/31/2014	1 Year	07/31/2015	☐
Hygro Hermograph	ST-50	HE01-000092	05/25/2014	1 Year	05/25/2015	☐
Radiated Emissions						
EMI Test Receiver	ESIB 40	100179	05/24/2014	1 Year	05/24/2015	☑
Bi-Log antenna (30MHz~2GHz)	JB1	A030702	08/12/2014	1 Year	08/12/2015	☑
Horn Antenna (1-18GHz)	3115	10SL0059	08/11/2014	1 Year	08/11/2015	☑
Horn Antenna (18-40 GHz)	AH-840	101013	08/11/2014	1 Year	08/11/2015	☑
Pre-Amplifier	LPA-6-30	11140711	02/19/2015	1 Year	02/19/2016	☑
Microwave Preamplifier (18-40 GHz)	PA-840	181251	02/19/2015	1 Year	02/19/2016	☑
3 Meters SAC	3M	N/A	08/29/2014	1 Year	08/29/2015	☑
10 Meters SAC	10M	N/A	09/05/2014	1 Year	09/05/2015	☑
Hygro Hermograph	ST-50	HE01-000092	05/25/2014	1 Year	05/25/2015	☑
RF Conducted Measurement						
Spectrum Analyzer	N9010A	MY50210206	08/13/2014	1 Year	08/13/2015	☑
EMI Test Receiver	ESIB 40	100179	05/24/2014	1 Year	05/24/2015	☑
Agilent Signal Generator	MXG N5182A	MY47071065	05/13/2014	1 Year	05/13/2015	☑

Annex B. SIEMIC Accreditation

Accreditations	Document	Scope / Remark
ISO 17025 (A2LA)		Please see the documents for the detailed scope
ISO Guide 65 (A2LA)		Please see the documents for the detailed scope
TCB Designation		A1, A2, A3, A4, B1, B2, B3, B4, C
FCC DoC Accreditation		FCC Declaration of Conformity Accreditation
FCC Site Registration		3 meter site
FCC Site Registration		10 meter site
IC Site Registration		3 meter site
IC Site Registration		10 meter site
EU NB		**Radio & Telecommunications Terminal Equipment:** EN45001 – EN ISO/IEC 17025
		Electromagnetic Compatibility: EN45001 – EN ISO/IEC 17025
Singapore iDA CB(Certification Body)		Phase I, Phase II
Vietnam MIC CAB Accreditation		Please see the document for the detailed scope
Hong Kong OFCA		**(Phase II)** OFCA Foreign Certification Body for Radio and Telecom
		(Phase I) Conformity Assessment Body for Radio and Telecom
Industry Canada CAB		**Radio:** Scope A – All Radio Standard Specification in Category I
		Telecom: CS-03 Part I, II, V, VI, VII, VIII

Japan Recognized Certification Body Designation		**Radio**: A1. Terminal equipment for purpose of calling **Telecom**: B1. Specified radio equipment specified in Article 38-2, Paragraph 1, Item 1 of the Radio Law
Korea CAB Accreditation		**EMI:** KCC Notice 2008-39, RRL Notice 2008-3: CA Procedures for EMI KN22: Test Method for EMI**EMS:** KCC Notice 2008-38, RRL Notice 2008-4: CA Procedures for EMS KN24, KN61000-4-2, -4-3, -4-4, -4-5, -4-6, -4-8, -4-11: Test Method for EMS
		Radio: RRL Notice 2008-26, RRL Notice 2008-2, RRL Notice 2008-10, RRL Notice 2007-49, RRL Notice 2007-20, RRL Notice 2007-21, RRL Notice 2007-80, RRL Notice 2004-68
		Telecom: President Notice 20664, RRL Notice 2007-30, RRL Notice 2008-7 with attachments 1, 3, 5, 6; President Notice 20664, RRL Notice 2008-7 with attachment 4
Taiwan NCC CAB Recognition		LP0002, PSTN01, ADSL01, ID0002, IS6100, CNS14336, PLMN07, PLMN01, PLMN08
Taiwan BSMI CAB Recognition		CNS 13438
Japan VCCI		R-3083: Radiation 3 meter site C-3421: Main Ports Conducted Interference Measurement T-1597: Telecommunication Ports Conducted Interference Measurement
Australia CAB Recognition		**EMC:** AS/NZS CISPR 11, AS/NZS CISPR 14.1, AS/NZS CISPR22, AS/NZS 61000.6.3, AS/NZS 61000.6.4
		Radio communications: AS/NZS 4281, AS/NZS 4268, AS/NZS 4280.1, AS/NZS 4280.2, AS/NZS 4295, AS/NZS 4582, AS/NZS 4583, AS/NZS 4769.1, AS/NZS 4769.2, AS/NZS 4770, AS/NZS 4771
		Telecommunications: AS/ACIF S002:05, AS/ACIF S003:06, AS/ACIF S004:06 AS/ACIF S006:01, AS/ACIF S016:01, AS/ACIF S031:01, AS/ACIF S038:01, AS/ACIF S040:01, AS/ACIF S041:05, AS/ACIF S043.2:06, AS/ACIF S60950.1
Australia NATA Recognition		AS/ACIF S002, AS/ACIF S003, AS/ACIF S004, AS/ACIF S006, AS/ACIF S016,AS/ACIF S031, AS/ACIF S038, AS/ACIF S040, AS/ACIF S041, AS/ACIF S043.2