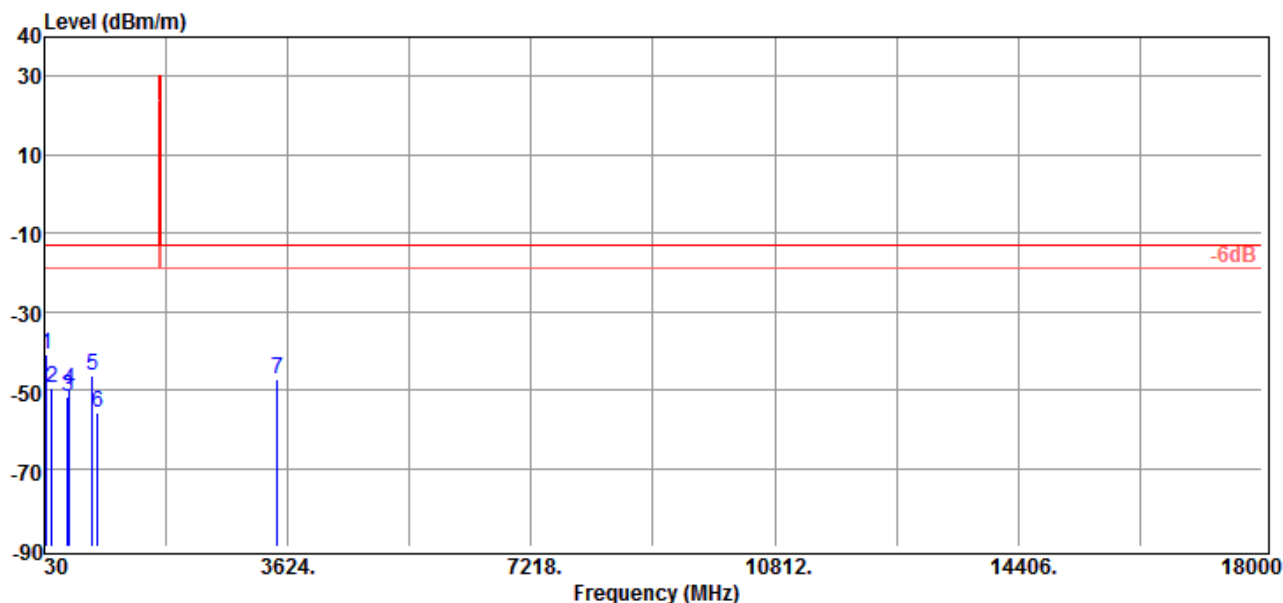


Operation Mode	:NB lot B4 BPSK 15 RB 1,11	Test Date	:2018-11-22
Test Mode	:TX CH MID	Temp./Humi.	:25/59
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:1732.5 MHz	Engineer	:Ashton



Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
62.01	-40.99	-39.79	-0.54	-0.66	-13.00	-27.99
145.43	-49.55	-50.83	2.27	-0.99	-13.00	-36.55
375.32	-51.64	-55.30	5.66	-2.00	-13.00	-38.64
396.66	-50.09	-53.63	5.57	-2.03	-13.00	-37.09
737.13	-46.42	-51.69	7.38	-2.11	-13.00	-33.42
817.64	-55.76	-60.89	7.54	-2.41	-13.00	-42.76
3465.00	-47.10	-52.49	12.23	-6.84	-13.00	-34.10

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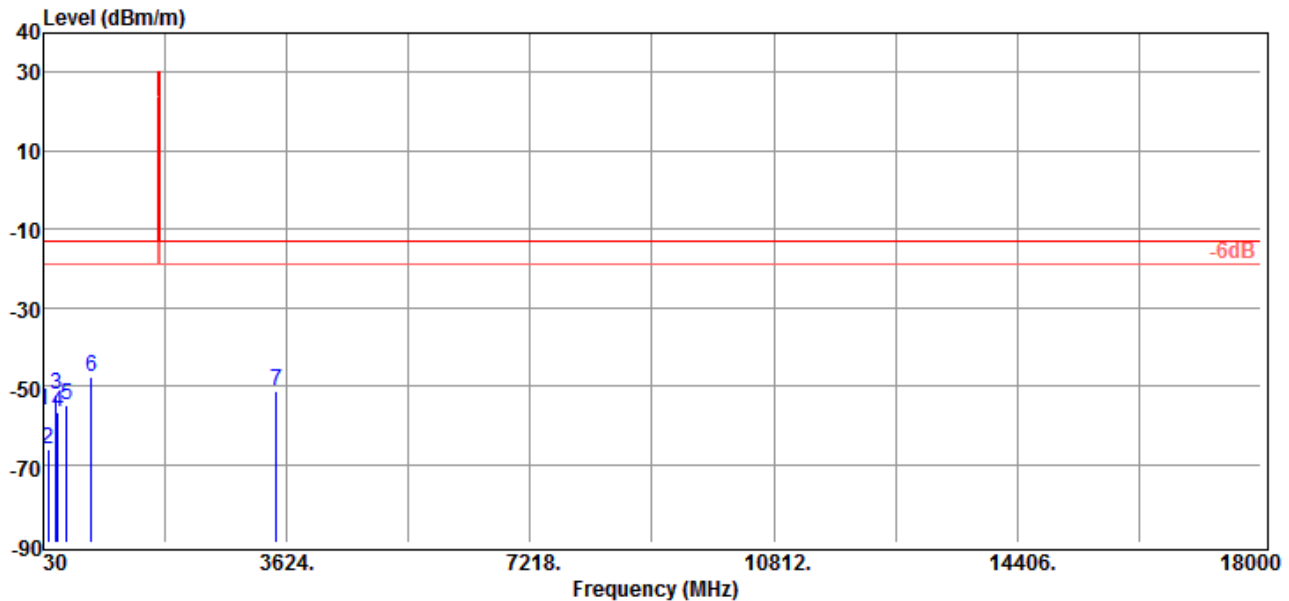
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Operation Mode	:NB lot B4 BPSK 15 RB 1,11	Test Date	:2018-11-22
Test Mode	:TX CH MID	Temp./Humi.	:25/59
EUT Pol	:E2 Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:1732.5 MHz	Engineer	:Ashton



Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
40.67	-56.06	-44.05	-11.41	-0.60	-13.00	-43.06
97.90	-66.22	-64.66	-0.71	-0.85	-13.00	-53.22
212.36	-52.05	-56.41	5.65	-1.29	-13.00	-39.05
249.22	-56.80	-60.54	5.18	-1.44	-13.00	-43.80
375.32	-54.84	-58.50	5.66	-2.00	-13.00	-41.84
741.98	-47.71	-53.01	7.39	-2.09	-13.00	-34.71
3465.00	-51.13	-56.52	12.23	-6.84	-13.00	-38.13

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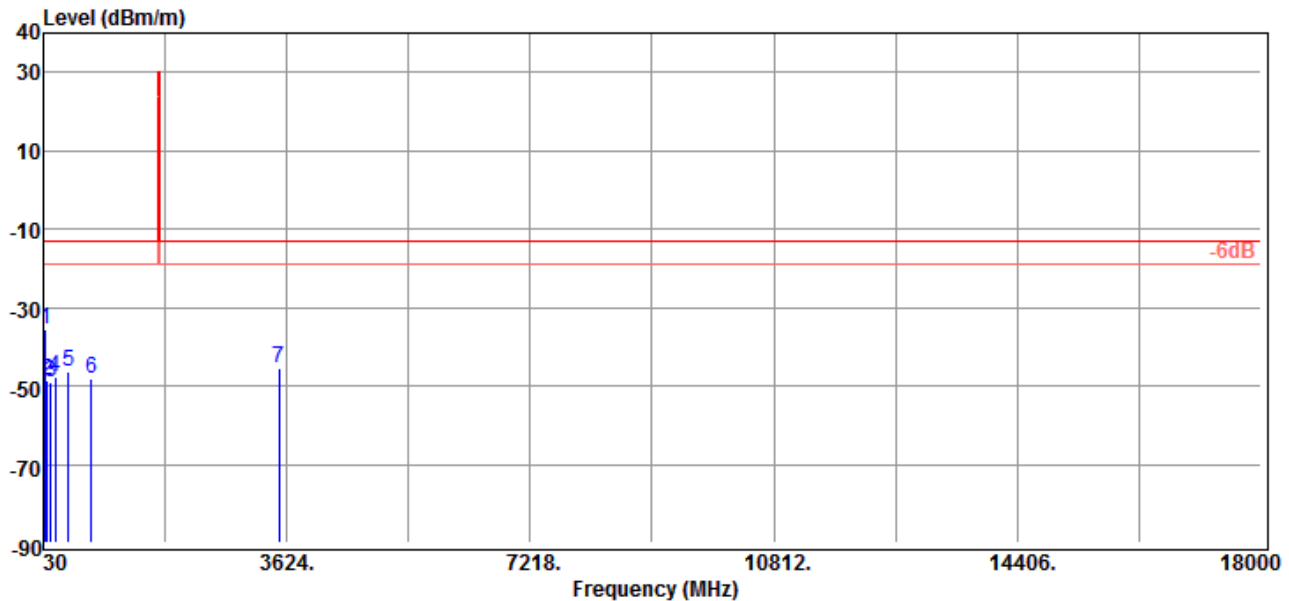
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Operation Mode	:NB lot B4 BPSK 15 RB 1,11	Test Date	:2018-11-22
Test Mode	:TX CH HIGH	Temp./Humi.	:25/59
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:1754.9 MHz	Engineer	:Ashton



Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
60.07	-35.60	-34.13	-0.82	-0.65	-13.00	-22.60
82.38	-48.69	-48.40	0.50	-0.79	-13.00	-35.69
143.49	-49.03	-50.21	2.16	-0.98	-13.00	-36.03
200.72	-47.88	-52.46	5.82	-1.24	-13.00	-34.88
402.48	-46.37	-49.91	5.58	-2.04	-13.00	-33.37
737.13	-48.33	-53.60	7.38	-2.11	-13.00	-35.33
3509.80	-45.31	-50.62	12.31	-7.00	-13.00	-32.31

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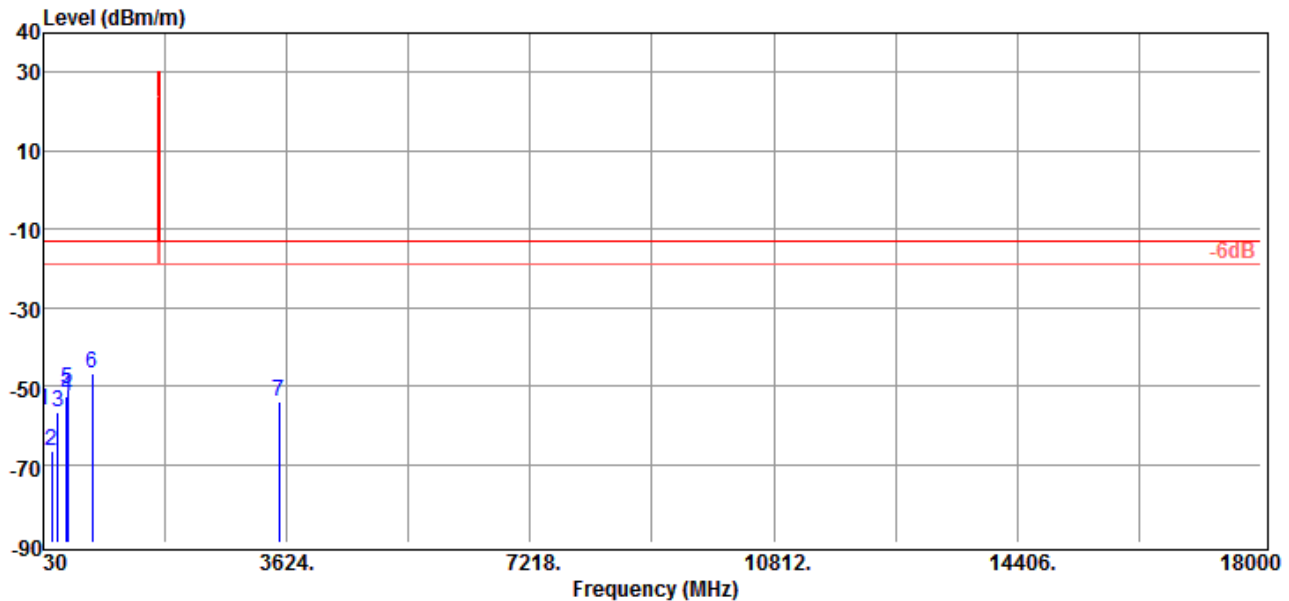
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Operation Mode	:NB lot B4 BPSK 15 RB 1,11	Test Date	:2018-11-22
Test Mode	:TX CH HIGH	Temp./Humi.	:25/59
EUT Pol	:E2 Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:1754.9 MHz	Engineer	:Ashton



Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
30.00	-56.41	-35.92	-20.05	-0.44	-13.00	-43.41
148.34	-66.77	-68.21	2.44	-1.00	-13.00	-53.77
249.22	-56.94	-60.68	5.18	-1.44	-13.00	-43.94
374.35	-52.58	-56.26	5.67	-1.99	-13.00	-39.58
390.84	-50.92	-54.49	5.59	-2.02	-13.00	-37.92
746.83	-46.98	-52.31	7.40	-2.07	-13.00	-33.98
3509.80	-54.19	-59.50	12.31	-7.00	-13.00	-41.19

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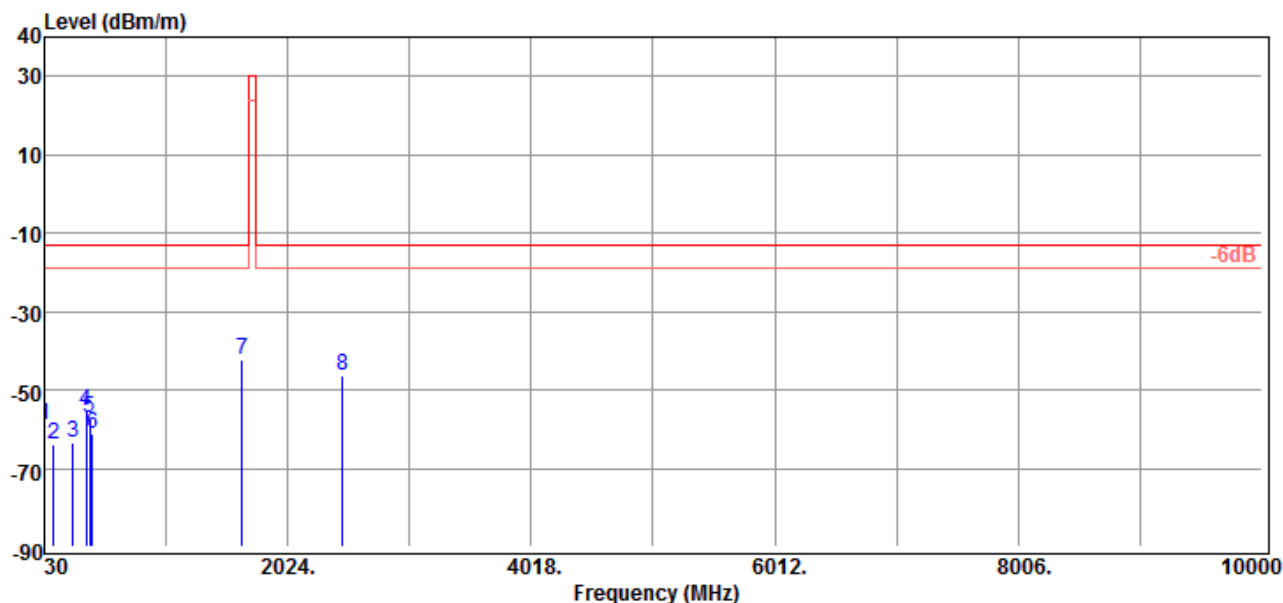
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**Radiated Spurious Emission Measurement Result: LTE-Band 5 (The Worst Case)**

Operation Mode	:NB lot B5 QPSK 15 RB 1,0	Test Date	:2018-11-22
Test Mode	:TX CH LOW	Temp./Humi.	:25/59
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:824.1 MHz	Engineer	:Ashton



Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
30.00	-58.96	-38.47	-20.05	-0.44	-13.00	-45.96
103.72	-63.84	-62.38	-0.58	-0.88	-13.00	-50.84
263.77	-63.56	-67.44	5.37	-1.49	-13.00	-50.56
374.35	-55.57	-59.25	5.67	-1.99	-13.00	-42.57
400.54	-57.15	-60.67	5.56	-2.04	-13.00	-44.15
424.79	-61.18	-64.95	5.82	-2.05	-13.00	-48.18
1648.20	-42.10	-47.06	8.79	-3.83	-13.00	-29.10
2472.30	-46.35	-52.65	10.68	-4.38	-13.00	-33.35

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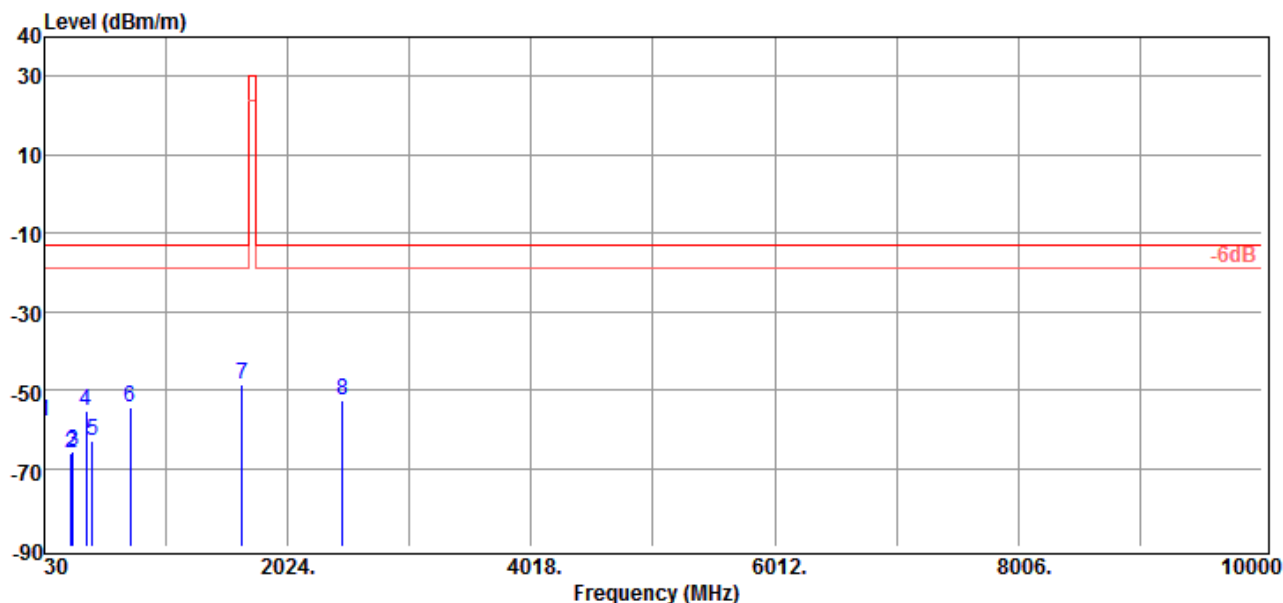
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Operation Mode	:NB lot B5 QPSK 15 RB 1,0	Test Date	:2018-11-22
Test Mode	:TX CH LOW	Temp./Humi.	:25/59
EUT Pol	:E2 Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:824.1 MHz	Engineer	:Ashton



Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
30.00	-58.07	-37.58	-20.05	-0.44	-13.00	-45.07
250.19	-66.34	-70.07	5.17	-1.44	-13.00	-53.34
261.83	-65.84	-69.70	5.34	-1.48	-13.00	-52.84
375.32	-55.56	-59.22	5.66	-2.00	-13.00	-42.56
424.79	-63.20	-66.97	5.82	-2.05	-13.00	-50.20
731.31	-54.39	-59.62	7.37	-2.14	-13.00	-41.39
1648.20	-48.74	-53.70	8.79	-3.83	-13.00	-35.74
2472.30	-52.50	-58.80	10.68	-4.38	-13.00	-39.50

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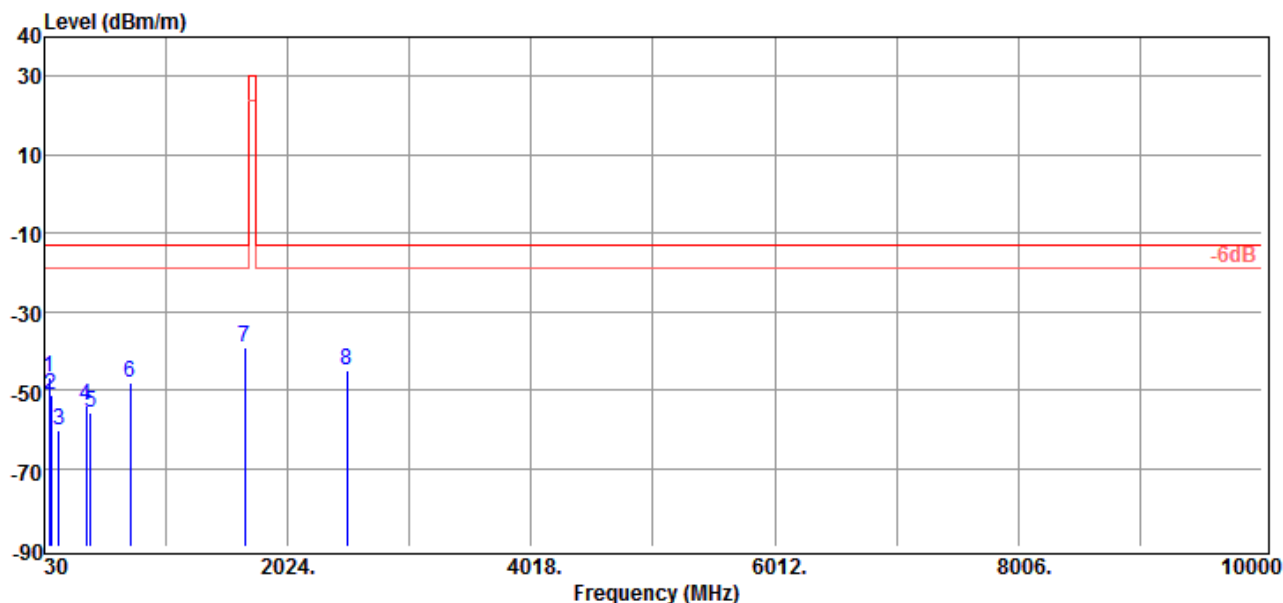
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Operation Mode	:NB lot B5 QPSK 15 RB 1,0	Test Date	:2018-11-22
Test Mode	:TX CH MID	Temp./Humi.	:25/59
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:836.5 MHz	Engineer	:Ashton



Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
70.74	-46.83	-46.62	0.52	-0.73	-13.00	-33.83
81.41	-51.27	-51.06	0.57	-0.78	-13.00	-38.27
148.34	-60.34	-61.78	2.44	-1.00	-13.00	-47.34
375.32	-53.86	-57.52	5.66	-2.00	-13.00	-40.86
405.39	-55.97	-59.54	5.61	-2.04	-13.00	-42.97
732.28	-48.04	-53.28	7.38	-2.14	-13.00	-35.04
1673.00	-39.02	-44.06	8.90	-3.86	-13.00	-26.02
2509.50	-44.96	-51.28	10.71	-4.39	-13.00	-31.96

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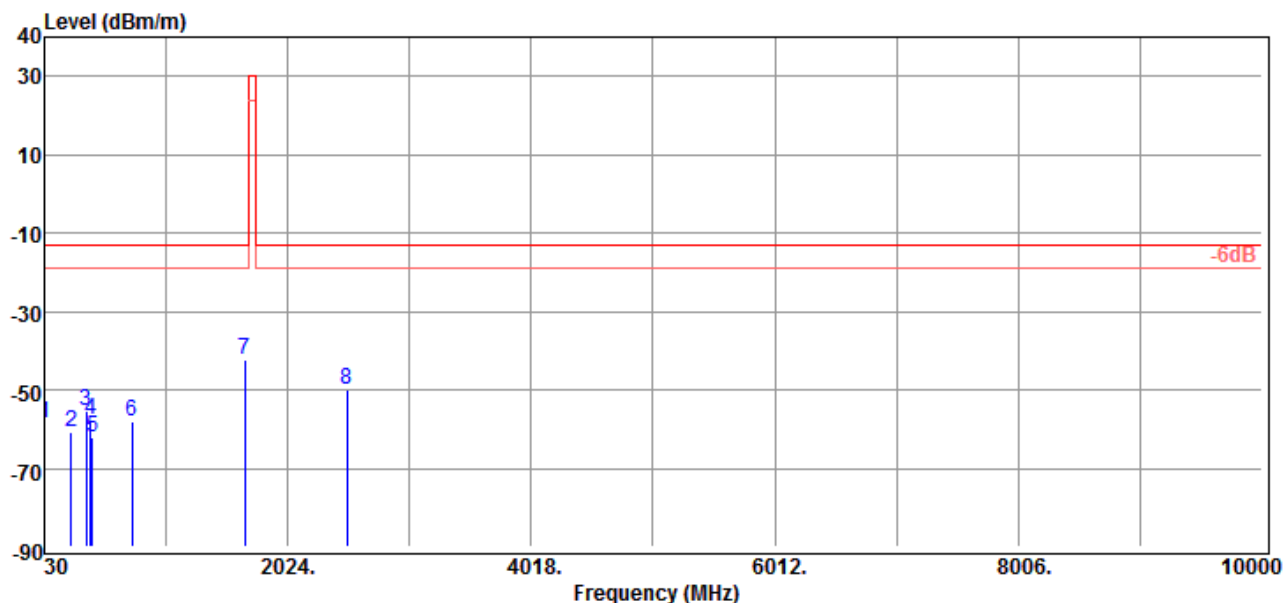
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Operation Mode	:NB lot B5 QPSK 15 RB 1,0	Test Date	:2018-11-22
Test Mode	:TX CH MID	Temp./Humi.	:25/59
EUT Pol	:E2 Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:836.5 MHz	Engineer	:Ashton



Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
30.00	-58.43	-37.94	-20.05	-0.44	-13.00	-45.43
250.19	-60.84	-64.57	5.17	-1.44	-13.00	-47.84
374.35	-55.32	-59.00	5.67	-1.99	-13.00	-42.32
407.33	-57.60	-61.19	5.63	-2.04	-13.00	-44.60
424.79	-62.17	-65.94	5.82	-2.05	-13.00	-49.17
747.80	-58.25	-63.60	7.41	-2.06	-13.00	-45.25
1673.00	-42.26	-47.30	8.90	-3.86	-13.00	-29.26
2509.50	-49.84	-56.16	10.71	-4.39	-13.00	-36.84

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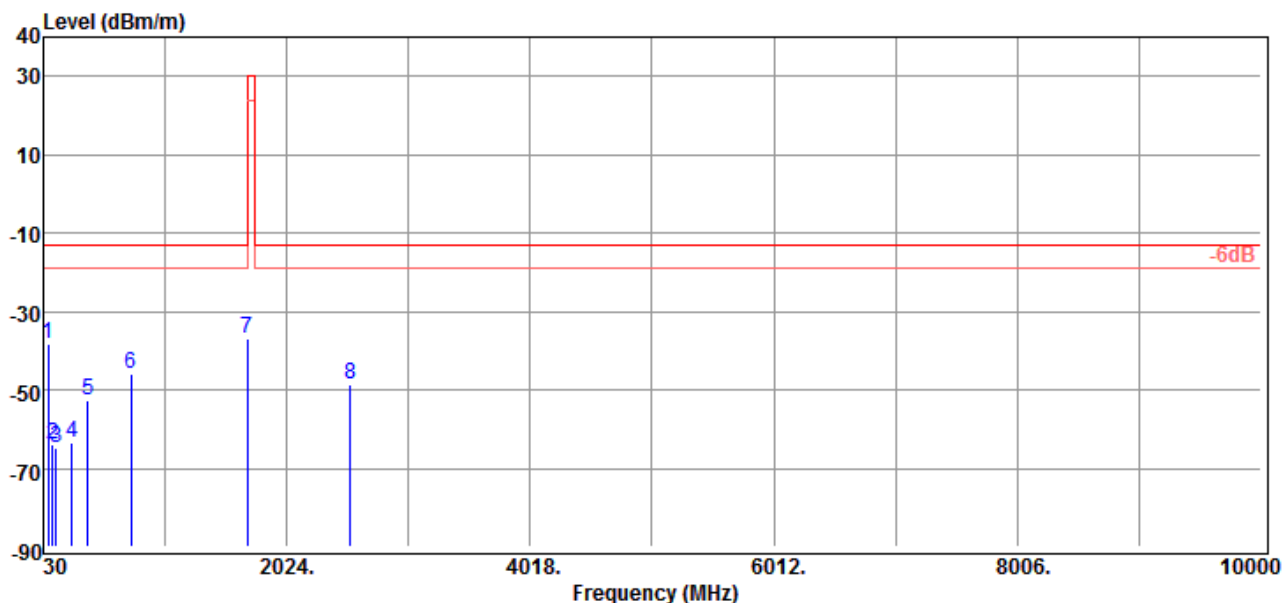
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Operation Mode	:NB lot B5 QPSK 15 RB 1,0	Test Date	:2018-11-22
Test Mode	:TX CH HIGH	Temp./Humi.	:25/59
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:848.9 MHz	Engineer	:Ashton



Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
67.83	-38.48	-38.01	0.24	-0.71	-13.00	-25.48
102.75	-64.10	-62.57	-0.66	-0.87	-13.00	-51.10
136.70	-64.75	-65.54	1.75	-0.96	-13.00	-51.75
264.74	-63.52	-67.41	5.38	-1.49	-13.00	-50.52
394.72	-52.84	-56.38	5.57	-2.03	-13.00	-39.84
746.83	-45.87	-51.20	7.40	-2.07	-13.00	-32.87
1697.80	-37.08	-42.19	9.00	-3.89	-13.00	-24.08
2546.70	-48.69	-55.04	10.76	-4.41	-13.00	-35.69

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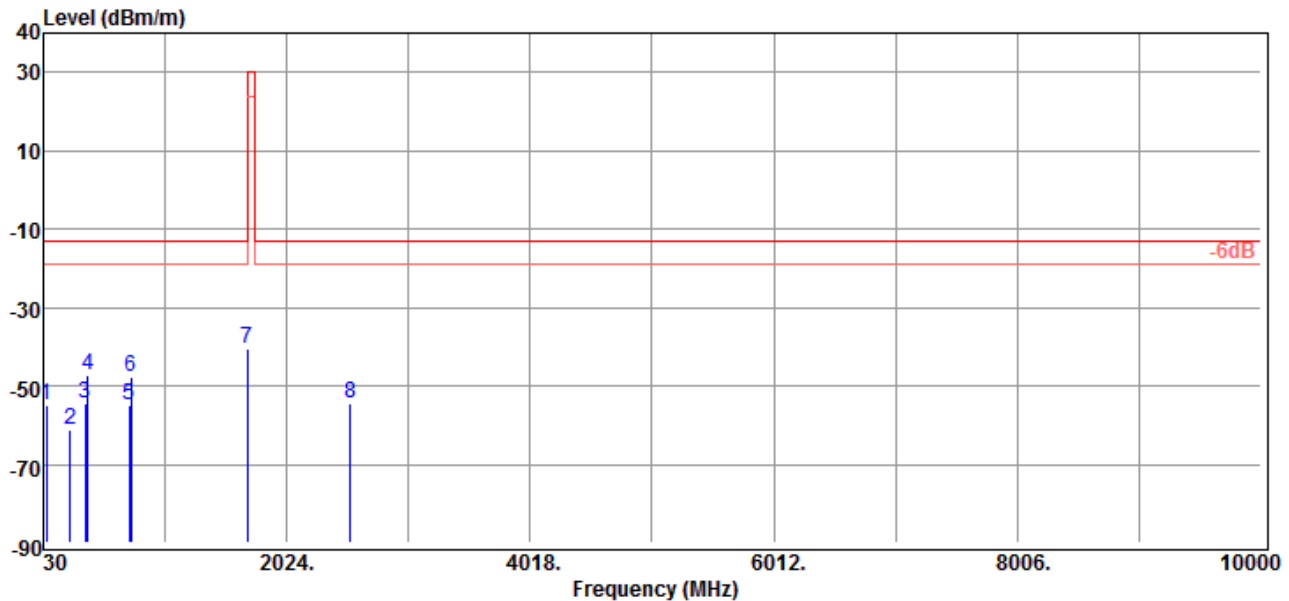
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Operation Mode	:NB lot B5 QPSK 15 RB 1,0	Test Date	:2018-11-22
Test Mode	:TX CH HIGH	Temp./Humi.	:25/59
EUT Pol	:E2 Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:848.9 MHz	Engineer	:Ashton



Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
52.31	-54.89	-50.48	-3.75	-0.66	-13.00	-41.89
250.19	-61.10	-64.83	5.17	-1.44	-13.00	-48.10
375.32	-54.46	-58.12	5.66	-2.00	-13.00	-41.46
391.81	-47.18	-50.74	5.59	-2.03	-13.00	-34.18
731.31	-54.92	-60.15	7.37	-2.14	-13.00	-41.92
746.83	-47.53	-52.86	7.40	-2.07	-13.00	-34.53
1697.80	-40.43	-45.54	9.00	-3.89	-13.00	-27.43
2546.70	-54.27	-60.62	10.76	-4.41	-13.00	-41.27

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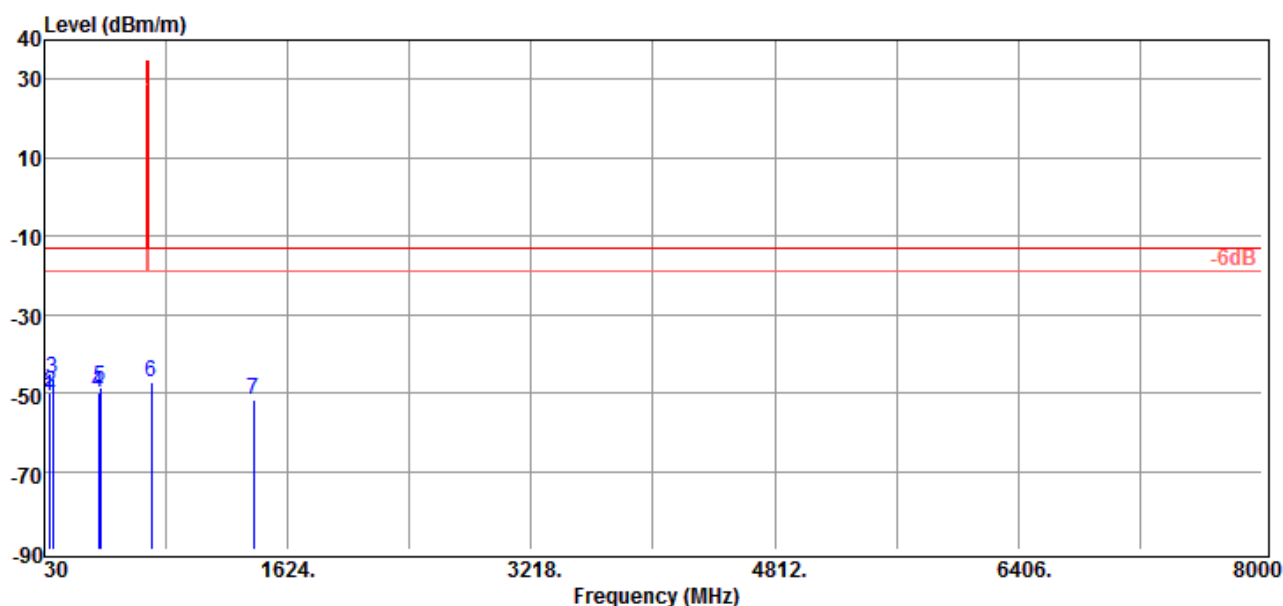
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**Radiated Spurious Emission Measurement Result: LTE-Band 12 (The Worst Case)**

Operation Mode	:NB lot B12 BPSK 15 RB 1,11	Test Date	:2018-11-23
Test Mode	:TX CH LOW	Temp./Humi.	:24/55
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:699.1 MHz	Engineer	:Ashton



Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
62.01	-51.04	-49.84	-0.54	-0.66	-13.00	-38.04
69.77	-50.06	-49.81	0.48	-0.73	-13.00	-37.06
83.35	-46.51	-46.15	0.43	-0.79	-13.00	-33.51
385.02	-50.14	-53.75	5.62	-2.01	-13.00	-37.14
396.66	-48.79	-52.33	5.57	-2.03	-13.00	-35.79
731.31	-47.35	-52.58	7.37	-2.14	-13.00	-34.35
1398.20	-51.93	-56.14	7.68	-3.47	-13.00	-38.93

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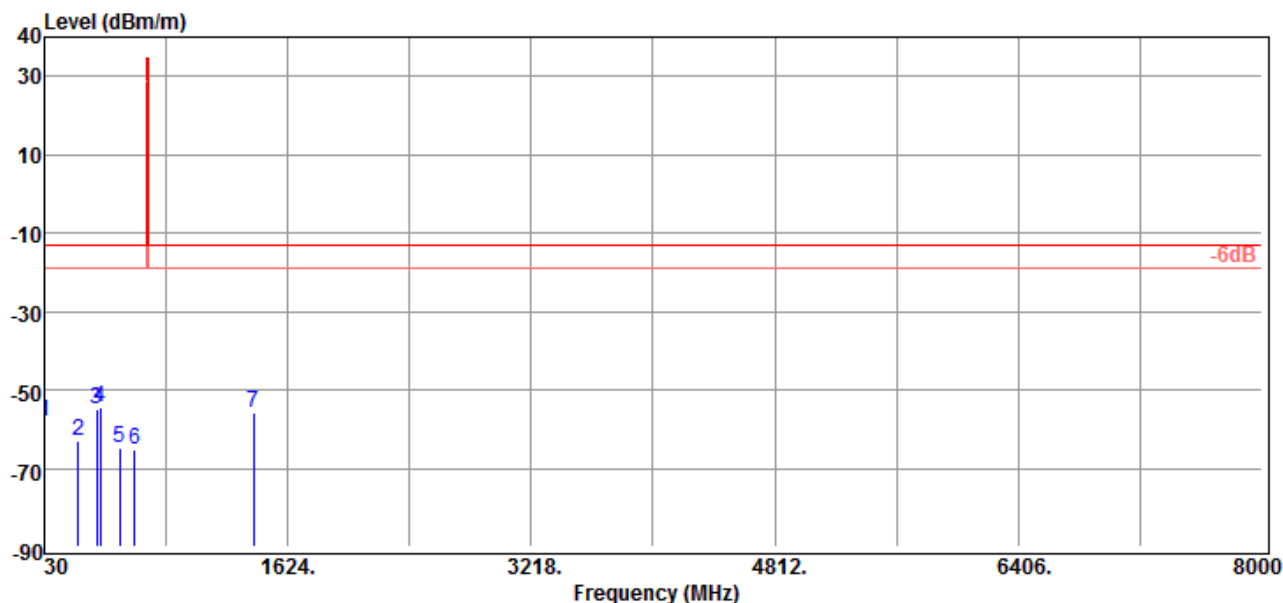
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Operation Mode	:NB lot B12 BPSK 15 RB 1,11	Test Date	:2018-11-23
Test Mode	:TX CH LOW	Temp./Humi.	:24/55
EUT Pol	:E2 Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:699.1 MHz	Engineer	:Ashton



Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
30.00	-58.25	-37.76	-20.05	-0.44	-13.00	-45.25
250.19	-63.14	-66.87	5.17	-1.44	-13.00	-50.14
375.32	-55.02	-58.68	5.66	-2.00	-13.00	-42.02
396.66	-54.40	-57.94	5.57	-2.03	-13.00	-41.40
524.70	-64.91	-68.67	6.25	-2.49	-13.00	-51.91
620.73	-65.34	-69.80	6.75	-2.29	-13.00	-52.34
1398.20	-55.93	-60.14	7.68	-3.47	-13.00	-42.93

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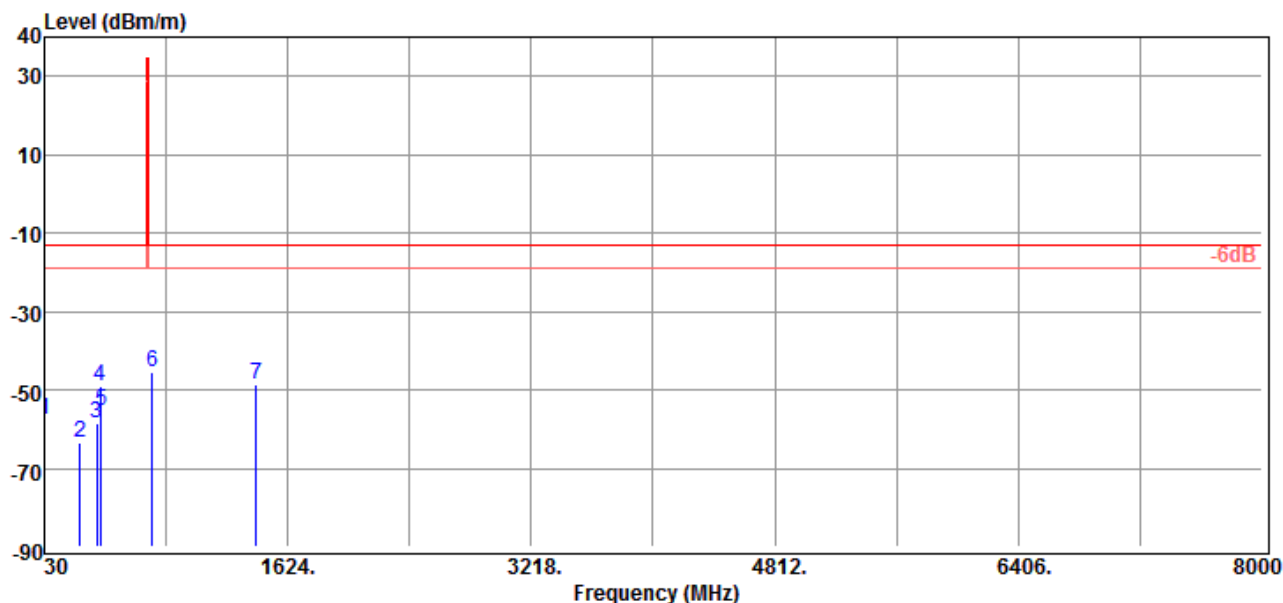
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Operation Mode	:NB lot B12 BPSK 15 RB 1,11	Test Date	:2018-11-23
Test Mode	:TX CH MID	Temp./Humi.	:24/55
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:707.5 MHz	Engineer	:Ashton



Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
30.00	-57.82	-37.33	-20.05	-0.44	-13.00	-44.82
264.74	-63.26	-67.15	5.38	-1.49	-13.00	-50.26
375.32	-58.42	-62.08	5.66	-2.00	-13.00	-45.42
395.69	-49.10	-52.64	5.57	-2.03	-13.00	-36.10
403.45	-55.39	-58.94	5.59	-2.04	-13.00	-42.39
737.13	-45.63	-50.90	7.38	-2.11	-13.00	-32.63
1415.00	-48.73	-52.98	7.75	-3.50	-13.00	-35.73

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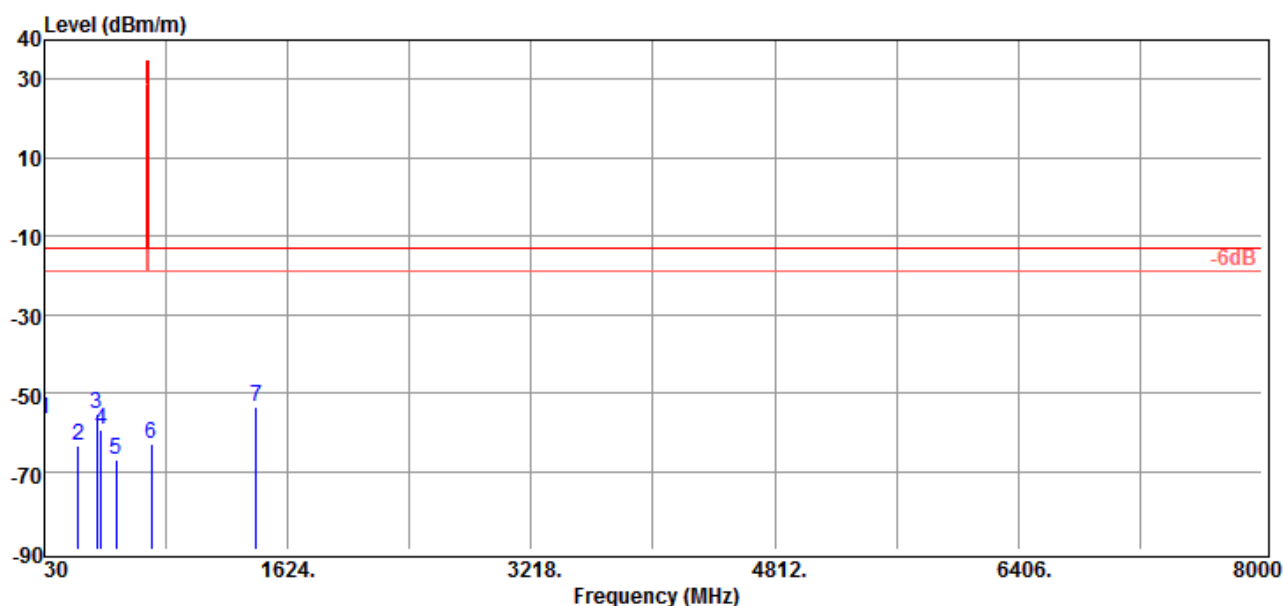
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Operation Mode	:NB lot B12 BPSK 15 RB 1,11	Test Date	:2018-11-23
Test Mode	:TX CH MID	Temp./Humi.	:24/55
EUT Pol	:E2 Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:707.5 MHz	Engineer	:Ashton



Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
30.97	-56.84	-37.23	-19.15	-0.46	-13.00	-43.84
250.19	-63.43	-67.16	5.17	-1.44	-13.00	-50.43
375.32	-55.46	-59.12	5.66	-2.00	-13.00	-42.46
401.51	-59.20	-62.73	5.57	-2.04	-13.00	-46.20
499.48	-66.98	-70.66	6.29	-2.61	-13.00	-53.98
730.34	-62.80	-68.03	7.37	-2.14	-13.00	-49.80
1415.00	-53.48	-57.73	7.75	-3.50	-13.00	-40.48

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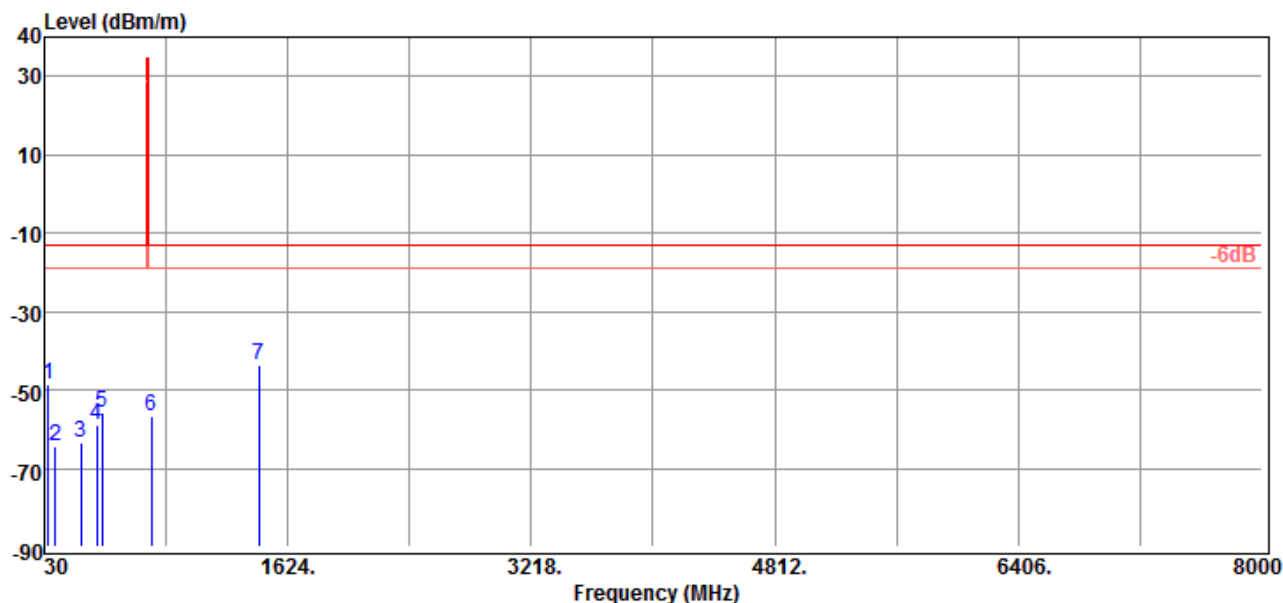
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Operation Mode	:NB lot B12 BPSK 15 RB 1,11	Test Date	:2018-11-23
Test Mode	:TX CH HIGH	Temp./Humi.	:24/55
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:715.9 MHz	Engineer	:Ashton



Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
56.19	-48.76	-45.88	-2.23	-0.65	-13.00	-35.76
102.75	-64.18	-62.65	-0.66	-0.87	-13.00	-51.18
270.56	-63.67	-67.62	5.46	-1.51	-13.00	-50.67
375.32	-58.82	-62.48	5.66	-2.00	-13.00	-45.82
409.27	-55.60	-59.21	5.65	-2.04	-13.00	-42.60
733.25	-56.72	-61.97	7.38	-2.13	-13.00	-43.72
1431.80	-43.72	-48.01	7.82	-3.53	-13.00	-30.72

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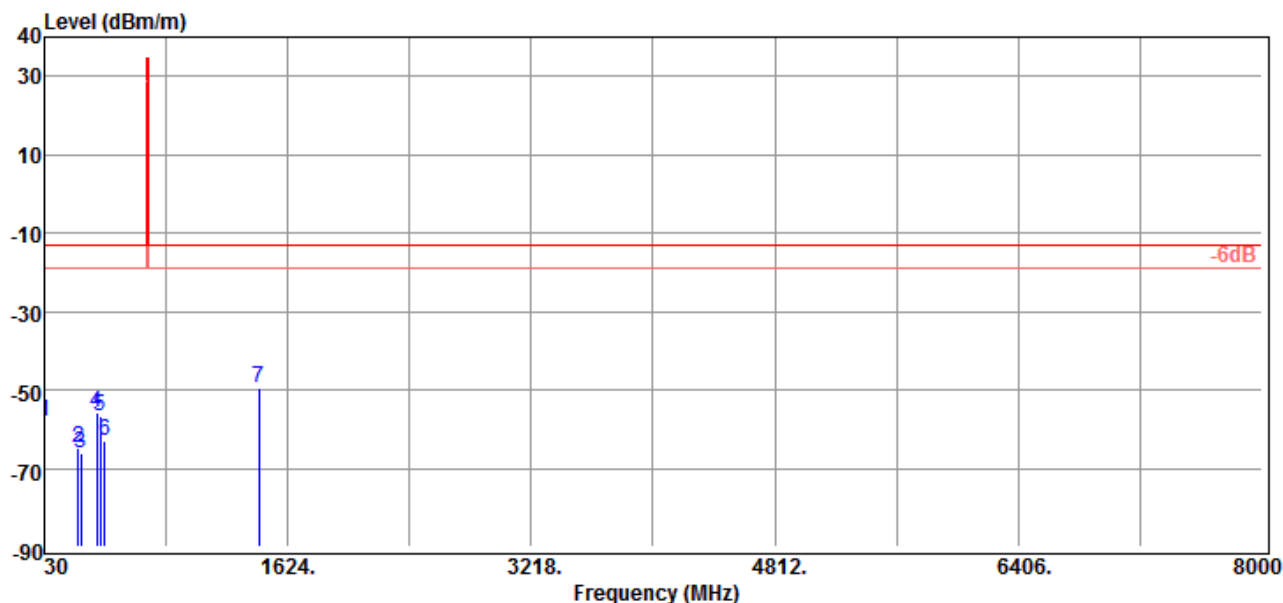
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Operation Mode	:NB lot B12 BPSK 15 RB 1,11	Test Date	:2018-11-23
Test Mode	:TX CH HIGH	Temp./Humi.	:24/55
EUT Pol	:E2 Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:715.9 MHz	Engineer	:Ashton



Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
30.00	-58.16	-37.67	-20.05	-0.44	-13.00	-45.16
250.19	-64.66	-68.39	5.17	-1.44	-13.00	-51.66
267.65	-66.31	-70.23	5.42	-1.50	-13.00	-53.31
375.32	-55.59	-59.25	5.66	-2.00	-13.00	-42.59
395.69	-56.82	-60.36	5.57	-2.03	-13.00	-43.82
424.79	-62.93	-66.70	5.82	-2.05	-13.00	-49.93
1431.80	-49.63	-53.91	7.80	-3.52	-13.00	-36.63

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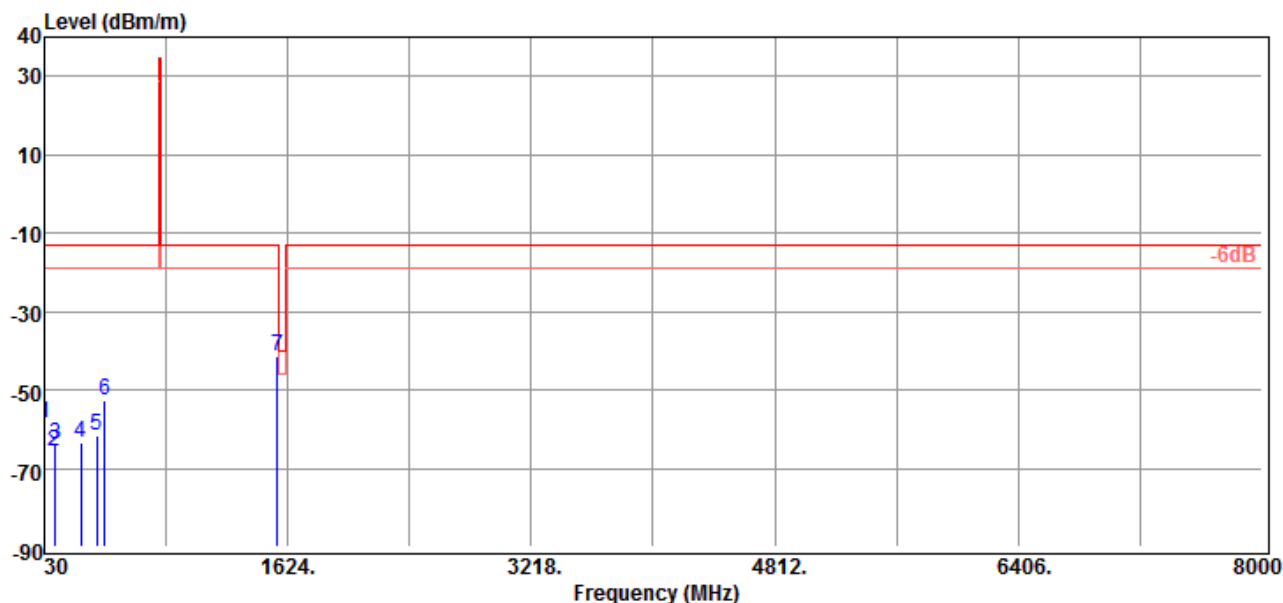
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## Radiated Spurious Emission Measurement Result: LTE-Band 13 (The Worst Case)

Operation Mode	:NB lot B13 QPSK 15 RB 1,0	Test Date	:2018-11-23
Test Mode	:TX CH LOW	Temp./Humi.	:24/55
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:777.1 MHz	Engineer	:Ashton



Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
30.00	-58.52	-38.03	-20.05	-0.44	-13.00	-45.52
94.02	-65.86	-64.66	-0.37	-0.83	-13.00	-52.86
102.75	-64.00	-62.47	-0.66	-0.87	-13.00	-51.00
267.65	-63.48	-67.40	5.42	-1.50	-13.00	-50.48
375.32	-61.72	-65.38	5.66	-2.00	-13.00	-48.72
426.73	-52.84	-56.63	5.84	-2.05	-13.00	-39.84
1554.20	-41.55	-46.20	8.36	-3.71	-13.00	-28.55

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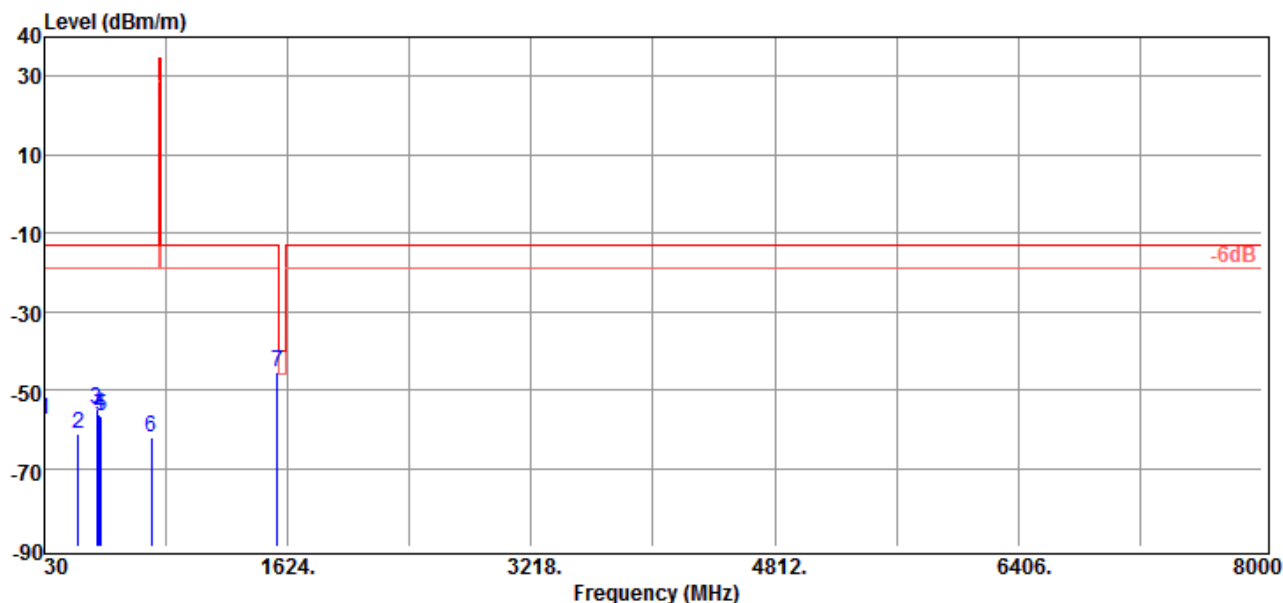
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Operation Mode	:NB lot B13 QPSK 15 RB 1,0	Test Date	:2018-11-23
Test Mode	:TX CH LOW	Temp./Humi.	:24/55
EUT Pol	:E2 Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:777.1 MHz	Engineer	:Ashton



Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
30.00	-57.57	-37.08	-20.05	-0.44	-13.00	-44.57
249.22	-61.32	-65.06	5.18	-1.44	-13.00	-48.32
375.32	-55.02	-58.68	5.66	-2.00	-13.00	-42.02
389.87	-56.09	-59.67	5.60	-2.02	-13.00	-43.09
399.57	-56.83	-60.34	5.55	-2.04	-13.00	-43.83
731.31	-62.02	-67.25	7.37	-2.14	-13.00	-49.02
1554.20	-45.43	-50.08	8.36	-3.71	-13.00	-32.43

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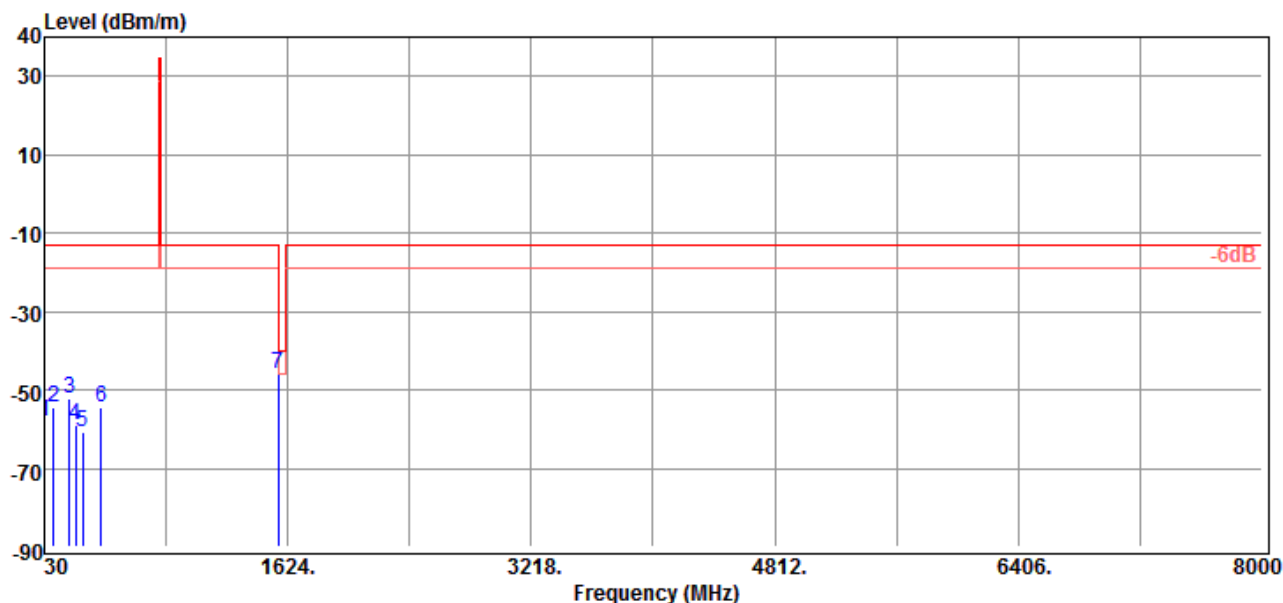
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Operation Mode	:NB lot B13 QPSK 15 RB 1,0	Test Date	:2018-11-23
Test Mode	:TX CH MID	Temp./Humi.	:24/55
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:782 MHz	Engineer	:Ashton



Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
30.00	-58.15	-37.66	-20.05	-0.44	-13.00	-45.15
93.05	-54.57	-53.45	-0.29	-0.83	-13.00	-41.57
196.84	-52.34	-56.77	5.65	-1.22	-13.00	-39.34
233.70	-58.93	-62.93	5.37	-1.37	-13.00	-45.93
280.26	-60.91	-64.96	5.60	-1.55	-13.00	-47.91
404.42	-54.33	-57.89	5.60	-2.04	-13.00	-41.33
1564.00	-45.79	-50.47	8.40	-3.72	-40.00	-5.79

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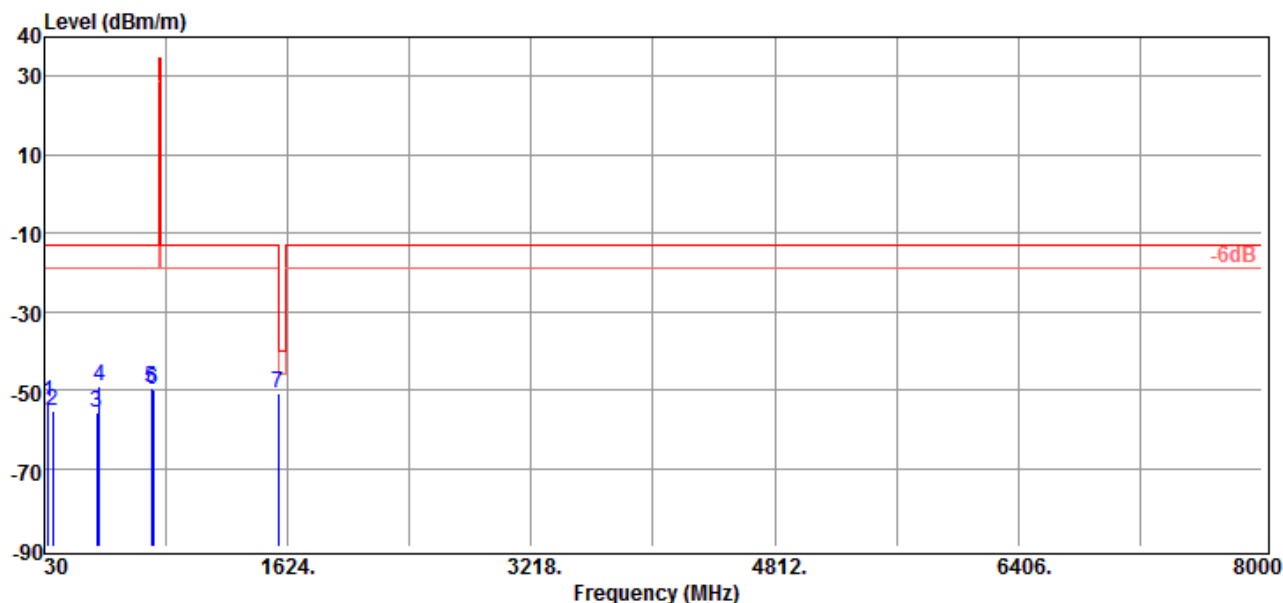
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Operation Mode	:NB lot B13 QPSK 15 RB 1,0	Test Date	:2018-11-23
Test Mode	:TX CH MID	Temp./Humi.	:24/55
EUT Pol	:E2 Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:782 MHz	Engineer	:Ashton



Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
57.16	-53.28	-50.77	-1.86	-0.65	-13.00	-40.28
83.35	-55.57	-55.21	0.43	-0.79	-13.00	-42.57
374.35	-55.76	-59.44	5.67	-1.99	-13.00	-42.76
390.84	-49.17	-52.74	5.59	-2.02	-13.00	-36.17
732.28	-49.74	-54.98	7.38	-2.14	-13.00	-36.74
744.89	-50.11	-55.44	7.40	-2.07	-13.00	-37.11
1564.00	-50.77	-55.45	8.40	-3.72	-40.00	-10.77

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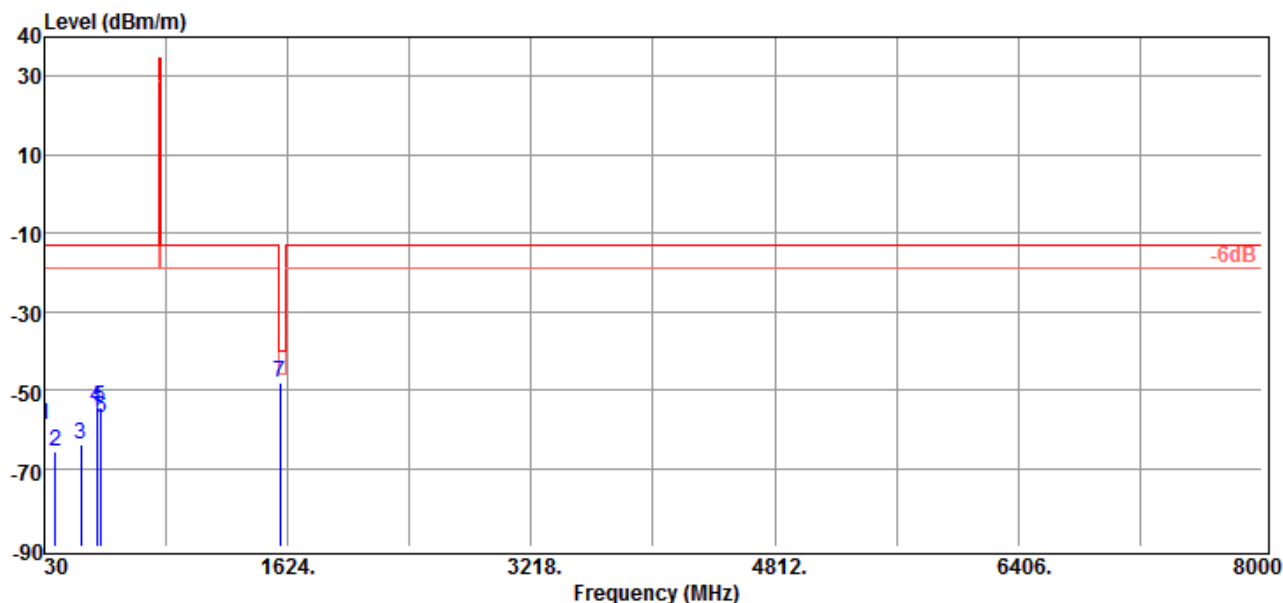
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Operation Mode	:NB lot B13 QPSK 15 RB 1,0	Test Date	:2018-11-23
Test Mode	:TX CH HIGH	Temp./Humi.	:24/55
EUT Pol	:E2 Plan	Antenna Pol.	:VERTICAL
Test Channel	:786.9 MHz	Engineer	:Ashton



Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
30.00	-58.82	-38.33	-20.05	-0.44	-13.00	-45.82
102.75	-65.64	-64.11	-0.66	-0.87	-13.00	-52.64
271.53	-63.99	-67.95	5.48	-1.52	-13.00	-50.99
374.35	-54.43	-58.11	5.67	-1.99	-13.00	-41.43
395.69	-54.34	-57.88	5.57	-2.03	-13.00	-41.34
404.42	-56.94	-60.50	5.60	-2.04	-13.00	-43.94
1573.80	-48.12	-52.84	8.45	-3.73	-40.00	-8.12

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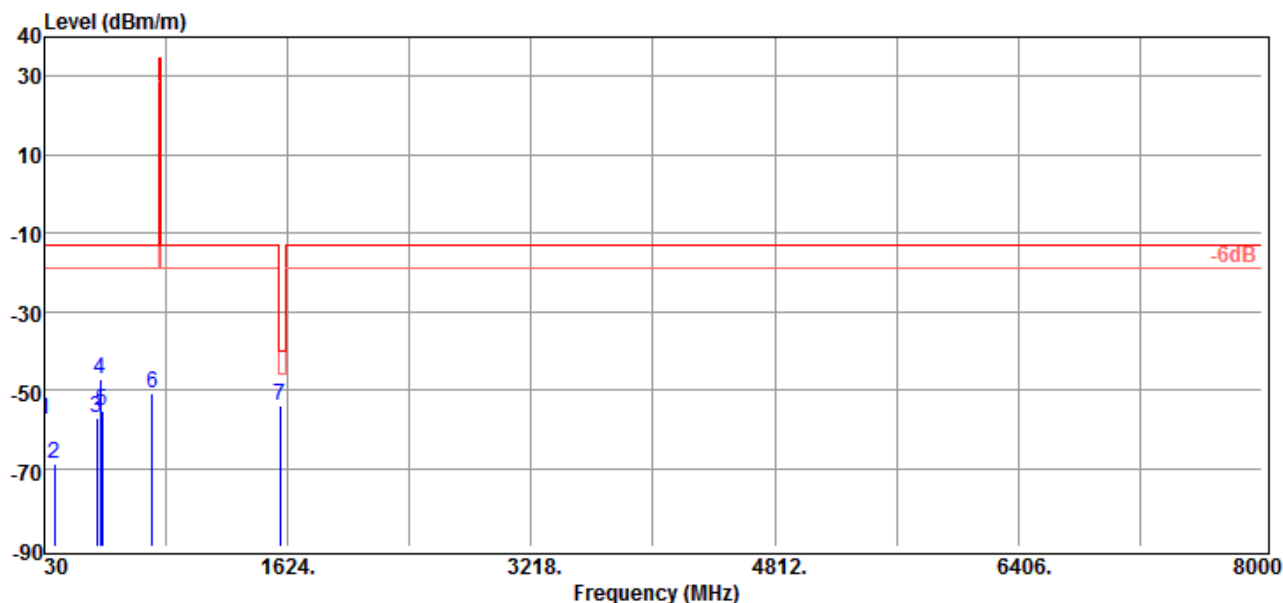
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Test Mode	:TX CH HIGH	Temp./Humi.	:24/55
EUT Pol	:E2 Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:786.9 MHz	Engineer	:Ashton



Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
30.00	-57.63	-37.14	-20.05	-0.44	-13.00	-44.63
97.90	-68.85	-67.29	-0.71	-0.85	-13.00	-55.85
375.32	-57.02	-60.68	5.66	-2.00	-13.00	-44.02
395.69	-47.47	-51.01	5.57	-2.03	-13.00	-34.47
409.27	-55.20	-58.81	5.65	-2.04	-13.00	-42.20
734.22	-50.76	-56.01	7.38	-2.13	-13.00	-37.76
1573.80	-54.09	-58.81	8.45	-3.73	-40.00	-14.09

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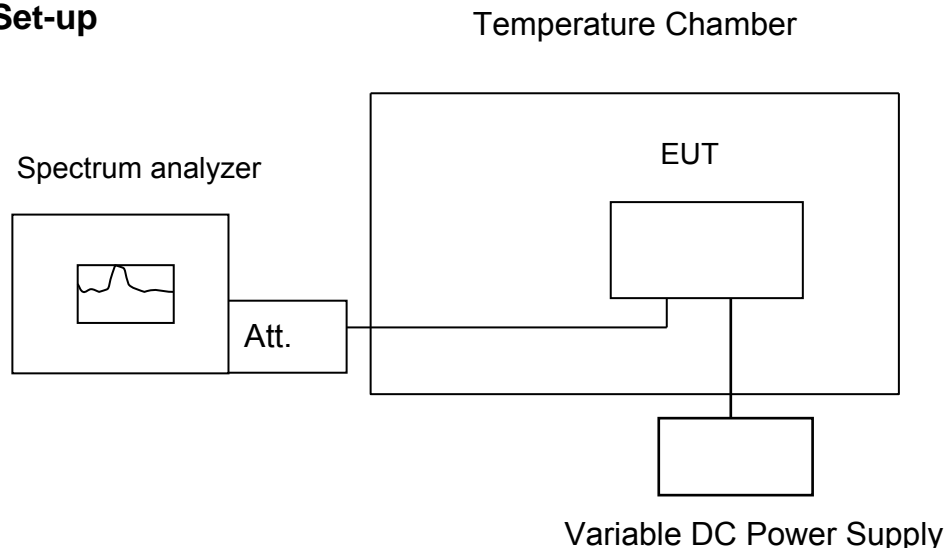
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## 10 FREQUENCY STABILITY MEASUREMENT

### 10.3 Standard Applicabl

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

### 10.4 Test Set-up



**Note:** Measurement setup for testing on Antenna connector

### 10.5 Measurement Procedure

The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 25°C operating frequency as reference frequency. Turn EUT off and set the chamber temperature to -30°C. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10°C increased per stage until the highest temperature of +50°C reached.

Set chamber temperature to 25°C. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.

Reduce the input voltage to specify extreme voltage variation (+/- 15%) and endpoint as declared by the manufacturer, record the maximum frequency change.

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## 10.6 Measurement Equipment Used

Conducted Emission (measured at antenna port) Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	N9010A	MY51440113	2018/06/20	2019/06/19
Radio Communication Analyzer	Anritsu	MT8821C	6261786084	2018/01/03	2019/01/02
DC Power Supply	Agilent	E3640A	MY53140006	2018/05/30	2019/05/29
Attenuator	Marvelous	MVE2213-10	RF30	2017/12/26	2018/12/25
Splitter	Woken	DOM35LW1A2	RF36	2017/12/26	2018/12/25

## 10.7 Measurement Result

### Cat M1

Reference Freq.:		M1 B2 Mid Channel		1880	MHz 20M QPSK CH 18900
Power Supply Vdc	Temp. (°C)	Freq. (MHz)	Delta (Hz)	Limit = +/- 2.5 ppm (Hz)	
Freq. ERROR vs. VOLTAGE					
48	25	1880.000010	9.900000123	4700	
12	25	1879.999993	-6.799999937	4700	
9	25	1879.999989	-11.09999994	4700	
5.7 (End Point)	25	1880.000000	-0.099999852	4700	
Freq. ERROR vs. Temp.					
12	-30	1880.000001	1.000000111	4700	
12	-20	1879.999982	-18.4999999	4700	
12	-10	1880.000011	11.29999987	4700	
12	0	1880.000001	0.700000101	4700	
12	10	1879.999996	-4.40000008	4700	
12	20	1880.000007	7.400000186	4700	
12	30	1879.999993	-6.900000017	4700	
12	40	1880.000001	1.299999894	4700	
12	50	1879.999985	-14.70000007	4700	

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Reference Freq.:		M1 B4 Mid Channel	1732.5	MHz 20M QPSK CH 20175
Power Supply Vdc	Temp. (°C)	Freq. (MHz)	Delta (Hz)	Limit = +/- 2.5 ppm (Hz)
Freq. ERROR vs. VOLTAGE				
48	25	1732.499989	-11.4000002	4331
12	25	1732.500019	18.89999999	4331
9	25	1732.499990	-10.3	4331
5.7 (End Point)	25	1732.499994	-5.59999989	4331
Freq. ERROR vs. Temp.				
12	-30	1732.500001	0.599999794	4331
12	-20	1732.500006	6.099999837	4331
12	-10	1732.499998	-1.59999991	4331
12	0	1732.500017	17.00000007	4331
12	10	1732.500019	19.09999992	4331
12	20	1732.499988	-12.20000001	4331
12	30	1732.500015	14.9	4331
12	40	1732.500008	7.699999969	4331
12	50	1732.499988	-12.40000001	4331

Reference Freq.:		M1 B5 Mid Channel		836.5	MHz 10M QPSK CH 20525
Power Supply Vdc	Temp. (°C)	Freq. (MHz)	Delta (Hz)	Limit = +/- 2.5 ppm (Hz)	
Freq. ERROR vs. VOLTAGE					
48	25	836.499996	-3.799999945	2091	
12	25	836.499980	-19.70000005	2091	
9	25	836.500012	11.99999997	2091	
5.7 (End Point)	25	836.499997	-2.700000096	2091	
Freq. ERROR vs. Temp.					
12	-30	836.499990	-9.599999998	2091	
12	-20	836.500014	13.79999992	2091	
12	-10	836.500000	-0.100000079	2091	
12	0	836.500015	14.99999996	2091	
12	10	836.500002	2.300000006	2091	
12	20	836.500004	4.100000069	2091	
12	30	836.499993	-7.100000062	2091	
12	40	836.499985	-14.79999992	2091	
12	50	836.499996	-4.300000001	2091	

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Reference Freq.:		M1 B12 Mid Channel	707.5	MHz 10M QPSK CH 23095
Power Supply Vdc	Temp. (°C)	Freq. (MHz)	Delta (Hz)	Limit = +/- 2.5 ppm (Hz)
Freq. ERROR vs. VOLTAGE				
48	25	707.499994	-6.100000064	1769
12	25	707.499993	-7.200000027	1769
9	25	707.500004	4.399999966	1769
5.7 (End Point)	25	707.500015	14.99999996	1769
Freq. ERROR vs. Temp.				
12	-30	707.500020	19.59999997	1769
12	-20	707.500016	16.39999994	1769
12	-10	707.499981	-19.10000003	1769
12	0	707.499982	-17.99999995	1769
12	10	707.500016	16.39999994	1769
12	20	707.499986	-14.50000002	1769
12	30	707.499990	-10.20000002	1769
12	40	707.500017	17.10000004	1769
12	50	707.500015	15.20000001	1769

Reference Freq.:		M1 B13 Mid Channel		782	MHz 10M QPSK CH 23230
Power Supply Vdc	Temp. (°C)	Freq. (MHz)	Delta (Hz)	Limit = +/- 2.5 ppm (Hz)	
Freq. ERROR vs. VOLTAGE					
48	25	781.999996	-3.90000002	1955	
12	25	781.999984	-16	1955	
9	25	781.999989	-11	1955	
5.7 (End Point)	25	781.999986	-14.3999999	1955	
Freq. ERROR vs. Temp.					
12	-30	781.999998	-1.7000001	1955	
12	-20	782.000009	8.999999977	1955	
12	-10	781.999987	-12.7000001	1955	
12	0	782.000004	3.500000048	1955	
12	10	782.000004	3.600000014	1955	
12	20	781.999982	-17.9	1955	
12	30	782.000009	8.999999977	1955	
12	40	781.999984	-15.7999999	1955	
12	50	781.999981	-19.2	1955	

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# NB IoT

LTE NB IoT Band 2 1880 MHz				
Limit: within frequency block				
Vdc	Temp. (°C)	Freq. (MHz)	Delta (kHz)	Frequency error (PPM)
FREQUENCY ERROR vs. VOLTAGE				
48	20	1879.999997	-0.003	-0.002
12	20	1879.999995	-0.005	-0.003
9	20	1880.000009	0.009	0.005
5.7(End point)	20	1879.999996	-0.004	-0.002
FREQUENCY ERROR vs. Temp.				
12	50	1880.00000	-0.005	-0.003
12	40	1880.00000	-0.002	-0.001
12	30	1880.00000	0.001	0.001
12	20	1879.99999	-0.006	-0.003
12	10	1880.00001	0.005	0.003
12	0	1880.00000	-0.005	-0.003
12	-10	1880.00000	-0.001	-0.001
12	-20	1880.00000	-0.002	-0.001
12	-30	1880.00000	0.002	0.001

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LTE NB IoT Band 4      1732.5      MHz				
Limit: within frequency block				
Vdc	Temp. (°C)	Freq. (MHz)	Delta (kHz)	Frequency error (PPM)
FREQUENCY ERROR vs. VOLTAGE				
48	20	1732.499993	-0.007	-0.004
12	20	1732.499995	-0.005	-0.003
9	20	1732.500003	0.003	0.002
5.7(End point)	20	1732.500009	0.009	0.005
FREQUENCY ERROR vs. Temp.				
12	50	1732.49999	-0.006	-0.003
12	40	1732.50000	-0.004	-0.002
12	30	1732.50000	-0.005	-0.003
12	20	1732.49999	-0.009	-0.005
12	10	1732.50000	-0.001	-0.001
12	0	1732.50000	0.003	0.002
12	-10	1732.50001	0.005	0.003
12	-20	1732.50000	-0.004	-0.002
12	-30	1732.50000	0.002	0.001

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LTE NB IoT Band 5 888 MHz				
Limit: +/- 2.5 ppm				
Vdc	Temp. (°C)	Freq. (MHz)	Delta (kHz)	Frequency error (PPM)
FREQUENCY ERROR vs. VOLTAGE				
48	20	888.000005	0.005	0.006
12	20	888.000003	0.003	0.006
9	20	888.000004	0.004	0.006
5.7(End point)	20	888.000005	0.005	0.006
FREQUENCY ERROR vs. Temp.				
12	50	888.00000	0.001	0.001
12	40	888.00000	-0.005	-0.006
12	30	888.00000	-0.002	-0.002
12	20	888.00000	0.002	0.002
12	10	888.00000	-0.005	-0.006
12	0	888.00000	0.003	0.003
12	-10	888.00000	-0.004	-0.005
12	-20	887.99999	-0.007	-0.008
12	-30	887.99999	-0.009	-0.010

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LTE NB IoT Band 12      707.5      MHz				
Limit: within frequency block				
Vdc	Temp. (°C)	Freq. (MHz)	Delta (kHz)	Frequency error (PPM)
FREQUENCY ERROR vs. VOLTAGE				
48	20	707.499995	-0.005	-0.007
12	20	707.500003	0.003	0.004
9	20	707.500005	0.005	0.007
5.7(End point)	20	707.499999	-0.001	-0.001
FREQUENCY ERROR vs. Temp.				
12	50	707.49999	-0.006	-0.008
12	40	707.49999	-0.008	-0.011
12	30	707.50000	0	0.000
12	20	707.50001	0.005	0.007
12	10	707.50000	0.003	0.004
12	0	707.50000	0.004	0.006
12	-10	707.50000	-0.004	-0.006
12	-20	707.49999	-0.007	-0.010
12	-30	707.50000	-0.001	-0.001

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LTE NB IoT Band 13 782 MHz				
Limit: within frequency block				
Vdc	Temp. (°C)	Freq. (MHz)	Delta (kHz)	Frequency error (PPM)
FREQUENCY ERROR vs. VOLTAGE				
48	20	782.000002	0.002	0.003
12	20	782.000002	0.002	0.003
9	20	782	0	0.000
5.7(End point)	20	782.000005	0.005	0.006
FREQUENCY ERROR vs. Temp.				
12	50	782.00001	0.005	0.006
12	40	782.00000	-0.003	-0.004
12	30	782.00001	0.006	0.008
12	20	782.00001	0.009	0.012
12	10	782.00000	0.004	0.005
12	0	781.99999	-0.006	-0.008
12	-10	781.99999	-0.007	-0.009
12	-20	782.00000	-0.002	-0.003
12	-30	782.00000	0.001	0.001

**Note: The power supply is rated 12V.**

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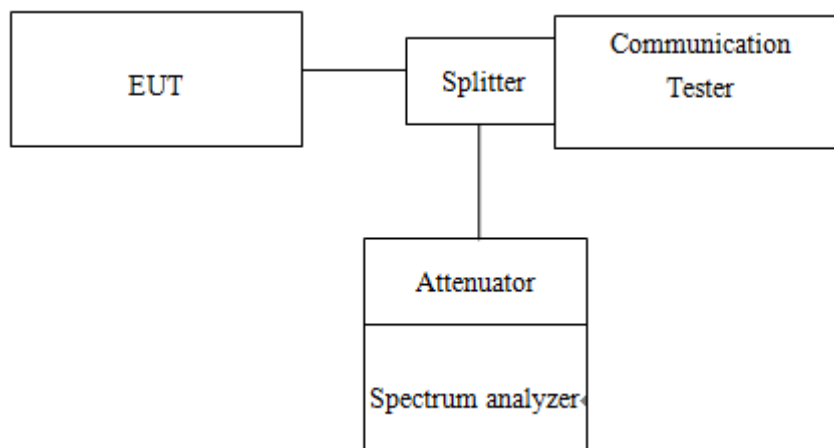
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## 11 PEAK TO AVERAGE RATIO

### 11.3 Standard Applicable

The peak-to-average ratio (PAR) of the transmission may not exceed 13dB.

### 11.4 Test SET-UP



### 11.5 Measurement Procedure

1. KDB 971168 D01 is employed as the following procedure is proper adjusted accordingly:
2. Set resolution/measurement bandwidth  $\geq$  signal's occupied bandwidth; & internal = 1ms
3. Set the number of counts to a value that stabilizes the measured CCDF curve.

### 11.6 Measurement Equipment Used

Conducted Emission (measured at antenna port) Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	N9010A	MY51440113	2018/06/20	2019/06/19
Radio Communication Analyzer	Anritsu	MT8821C	6261786084	2018/01/03	2019/01/02
DC Power Supply	Agilent	E3640A	MY53140006	2018/05/30	2019/05/29
Attenuator	Marvelous	MVE2213-10	RF30	2017/12/26	2018/12/25
Splitter	Woken	DOM35LW1A2	RF36	2017/12/26	2018/12/25

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## 11.7 Measurement Result

### Tabular Results:

#### Cat M1

M1 BAND 2							
Channel bandwidth: 1.4MHz				Channel bandwidth: 3MHz			
Freq. (MHz)	CH	PAPR (dB)		Freq. (MHz)	CH	PAPR (dB)	
		16QAM	Limit			16QAM	Limit
1850.7	18607	8.08	13	1851.5	18615	10.16	13
1880.0	18900	8.55	13	1880.0	18900	10.44	13
1909.3	19193	8.68	13	1908.5	19185	9.95	13

M1 BAND 2							
Channel bandwidth: 5MHz				Channel bandwidth: 10MHz			
Freq. (MHz)	CH	PAPR (dB)		Freq. (MHz)	CH	PAPR (dB)	
		16QAM	Limit			16QAM	Limit
1852.5	18625	9.31	13	1855.0	18650	10.52	13
1880.0	18900	10.39	13	1880.0	18900	10.65	13
1907.5	19175	7.99	13	1905.0	19150	10.26	13

M1 BAND 2							
Channel bandwidth: 15MHz				Channel bandwidth: 20MHz			
Freq. (MHz)	CH	PAPR (dB)		Freq. (MHz)	CH	PAPR (dB)	
		16QAM	Limit			16QAM	Limit
1857.5	18675	8.56	13	1860.0	18700	8.53	13
1880.0	18900	8.05	13	1880.0	18900	8.95	13
1902.5	19125	8.53	13	1900.0	19100	8.82	13

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M1 BAND 4							
Channel bandwidth: 1.4MHz				Channel bandwidth: 3MHz			
Freq. (MHz)	CH	PAPR (dB)		Freq. (MHz)	CH	PAPR (dB)	
		16QAM	Limit			16QAM	Limit
1710.7	19957	8.88	13	1711.5	19965	10.63	13
1732.5	20175	9.63	13	1732.5	20175	8.21	13
1754.3	20393	9.46	13	1753.5	20385	8.42	13

M1 BAND 4							
Channel bandwidth: 5MHz				Channel bandwidth: 10MHz			
Freq. (MHz)	CH	PAPR (dB)		Freq. (MHz)	CH	PAPR (dB)	
		16QAM	Limit			16QAM	Limit
1712.5	19975	8.54	13	1715.0	20000	10.21	13
1732.5	20175	9.95	13	1732.5	20175	9.94	13
1752.5	20375	9.11	13	1750.0	20350	9.47	13

M1 BAND 4							
Channel bandwidth: 15MHz				Channel bandwidth: 20MHz			
Freq. (MHz)	CH	PAPR (dB)		Freq. (MHz)	CH	PAPR (dB)	
		16QAM	Limit			16QAM	Limit
1717.5	20025	8.58	13	1720.0	20050	8.43	13
1732.5	20175	8.91	13	1732.5	20175	8.53	13
1747.5	20325	8.58	13	1745.0	20300	9.06	13

M1 BAND 5							
Channel bandwidth: 1.4MHz				Channel bandwidth: 3MHz			
Freq. (MHz)	CH	PAPR (dB)		Freq. (MHz)	CH	PAPR (dB)	
		16QAM	Limit			16QAM	Limit
824.7	20407	10.10	13	825.5	20415	7.34	13
836.5	20525	10.36	13	836.5	20525	7.42	13
848.3	20643	8.50	13	847.5	20635	7.55	13

M1 BAND 5							
Channel bandwidth: 5MHz				Channel bandwidth: 10MHz			
Freq. (MHz)	CH	PAPR (dB)		Freq. (MHz)	CH	PAPR (dB)	
		16QAM	Limit			16QAM	Limit
826.5	20425	7.52	13	829.0	20450	11.53	13
836.5	20525	9.93	13	836.5	20525	10.39	13
846.5	20625	10.34	13	844.0	20600	11.02	13

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M1 BAND 12							
Channel bandwidth: 1.4MHz				Channel bandwidth: 3MHz			
Freq. (MHz)	CH	PAPR (dB)		Freq. (MHz)	CH	PAPR (dB)	
		16QAM	Limit			16QAM	Limit
699.7	23017	10.57	13	700.5	23025	8.95	13
707.5	23095	10.03	13	707.5	23095	9.39	13
715.3	23173	11.63	13	714.5	23165	10.61	13

M1 BAND 12							
Channel bandwidth: 5MHz				Channel bandwidth: 10MHz			
Freq. (MHz)	CH	PAPR (dB)		Freq. (MHz)	CH	PAPR (dB)	
		16QAM	Limit			16QAM	Limit
701.5	23035	9.93	13	704.0	23060	8.55	13
707.5	23095	8.99	13	707.5	23095	10.11	13
713.5	23155	8.89	13	711.0	23130	9.47	13

M1 BAND 13							
Channel bandwidth: 5MHz				Channel bandwidth: 10MHz			
Freq. (MHz)	CH	PAPR (dB)		Freq. (MHz)	CH	PAPR (dB)	
		16QAM	Limit			16QAM	Limit
779.5	23205	8.35	13	782.0	23230	10.70	13
782.0	23230	9.91	13				
784.5	23255	11.26	13				

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## NB-IoT

15K LTE NB-IoT Band 2 CCDF			
Channel	18601	18900	19199
Freq. (MHz)	1850.1	1880	1909.9
Modulation(BPSK)	8.05	9.64	10.52
Modulation(QPSK)	9.98	11.55	11.05

15K LTE NB-IoT Band 4 CCDF			
Channel	19951	20175	10399
Freq. (MHz)	1710.1	1732.5	1754.9
Modulation(BPSK)	10.53	9.7	9.98
Modulation(QPSK)	12.02	11.46	11.21

15K LTE NB-IoT Band 5 CCDF			
Channel	20401	20525	20649
Freq. (MHz)	824.1	836.5	848.9
Modulation(BPSK)	10.02	9.54	9.39
Modulation(QPSK)	11.93	10.56	10.92

15K LTE NB-IoT Band 12 CCDF			
Channel	23011	23095	23179
Freq. (MHz)	699.1	707.5	715.9
Modulation(BPSK)	9.56	9.61	9.35
Modulation(QPSK)	11.19	10.88	11.68

15K LTE NB-IoT Band 13 CCDF			
Channel	23181	23230	23279
Freq. (MHz)	777.1	782	786.9
Modulation(BPSK)	10.75	10.25	9.57
Modulation(QPSK)	10.84	10.69	11.4

**Please refer to next page for test plots.**

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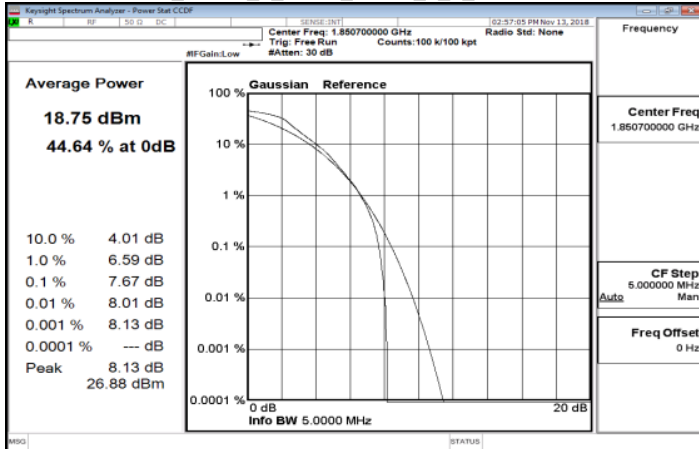
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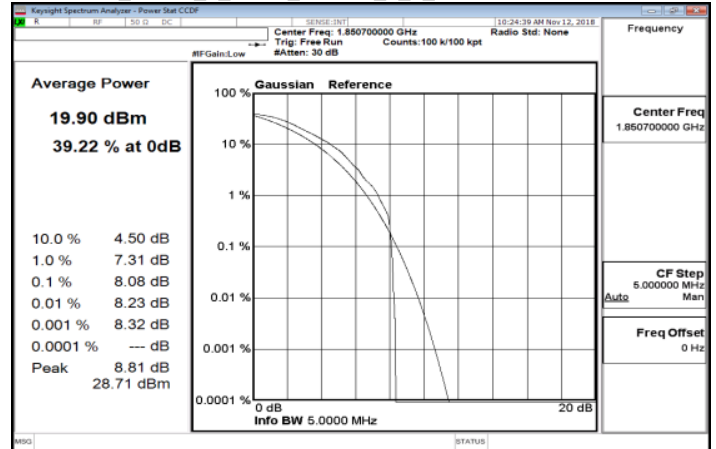
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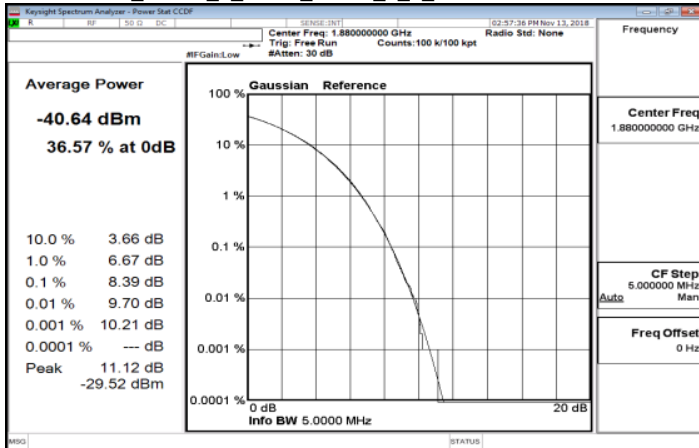
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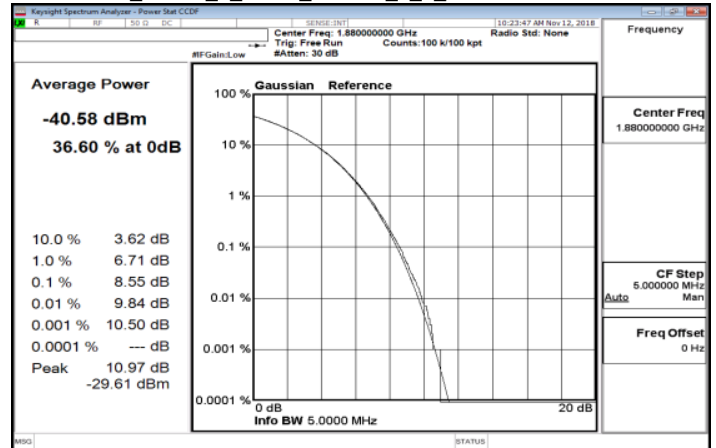
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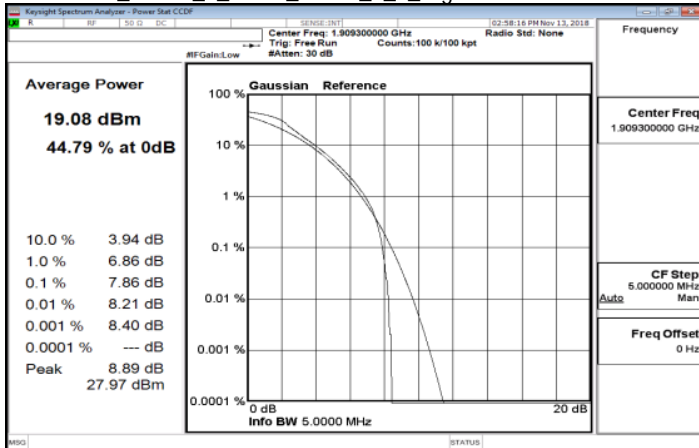
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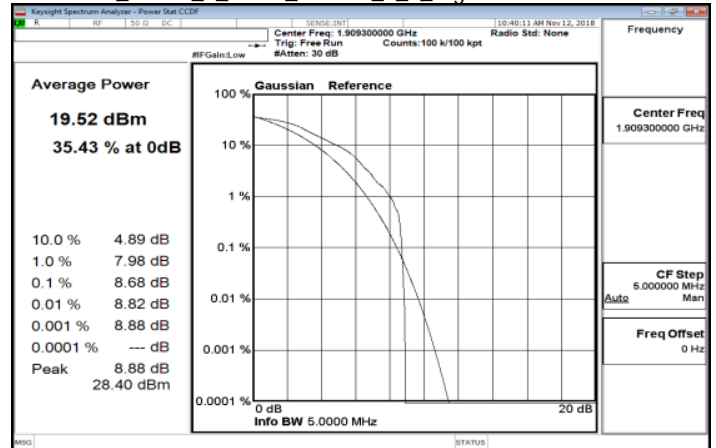
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LTE\_Band2\_1\_4MHz\_QPSK\_6\_0\_HighCH19193-1909.3



LTE\_Band2\_1\_4MHz\_16QAM\_6\_0\_HighCH19193-1909.3



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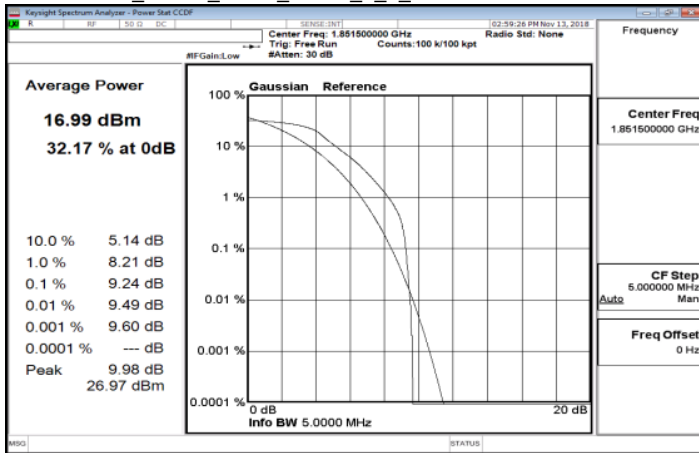
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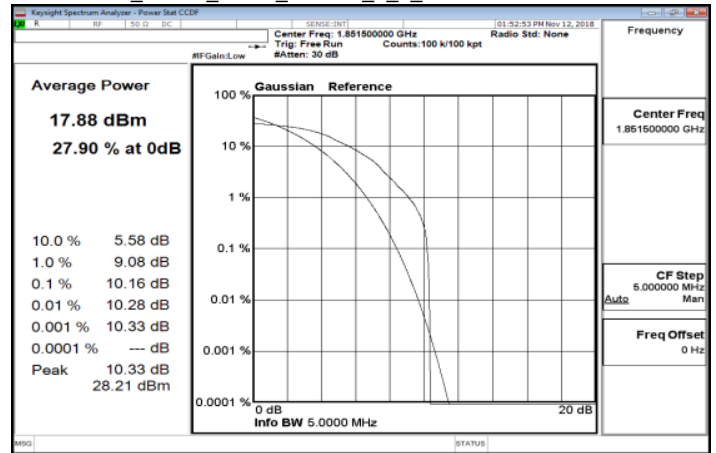
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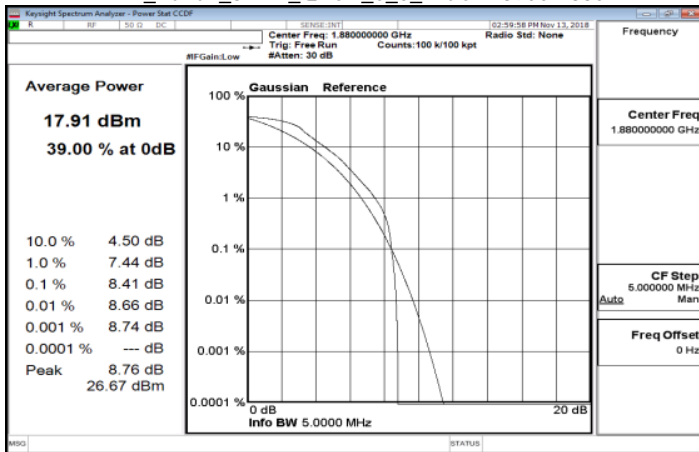
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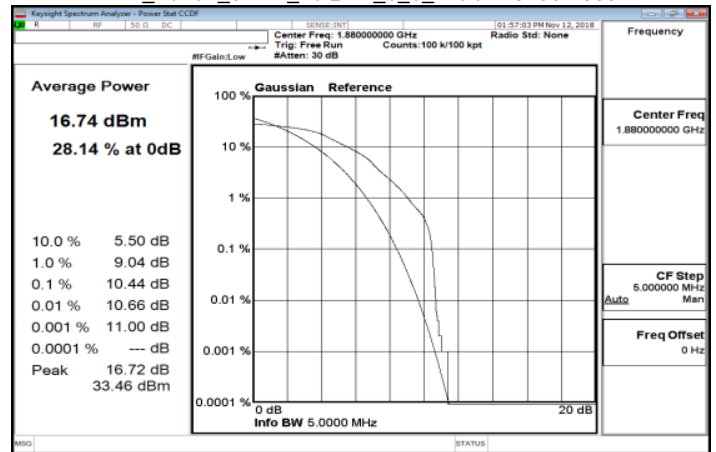
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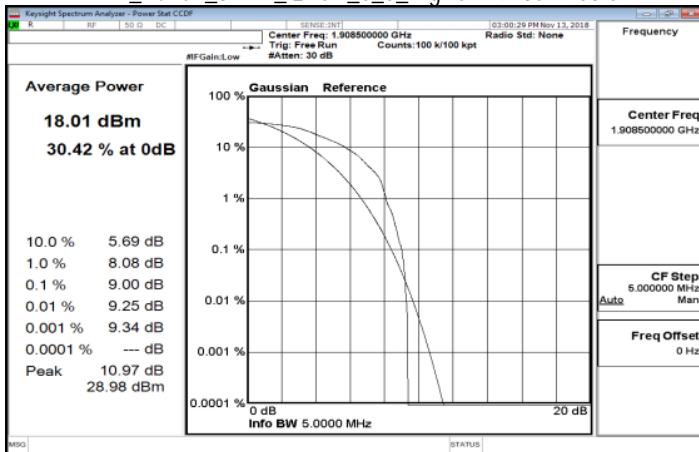
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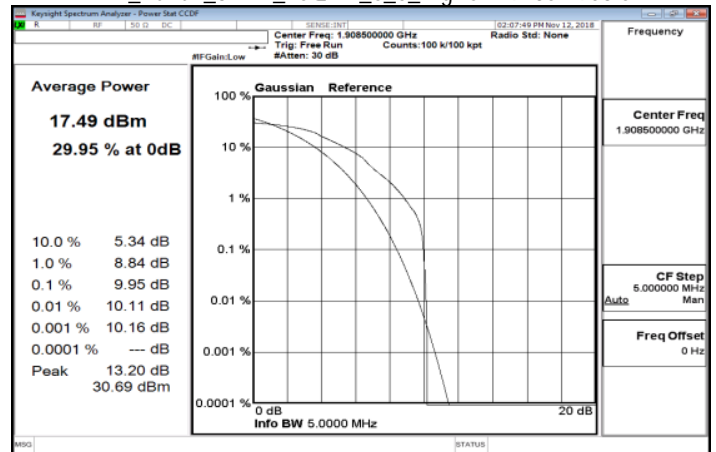
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LTE\_Band2\_3MHz\_QPSK\_6\_0\_HighCH19185-1908.5



LTE\_Band2\_3MHz\_16QAM\_6\_0\_HighCH19185-1908.5



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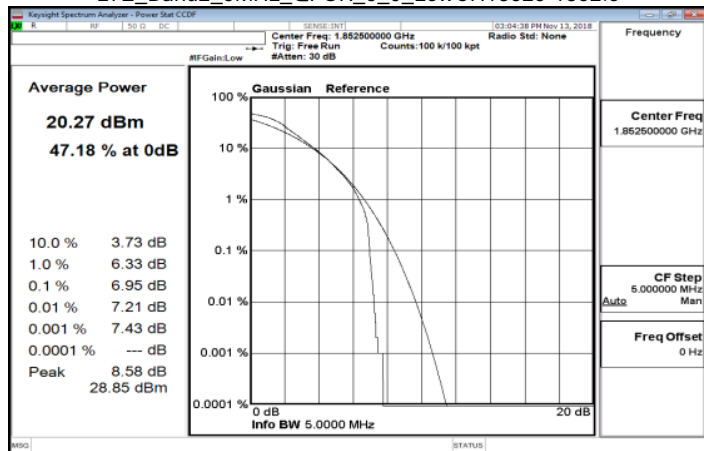
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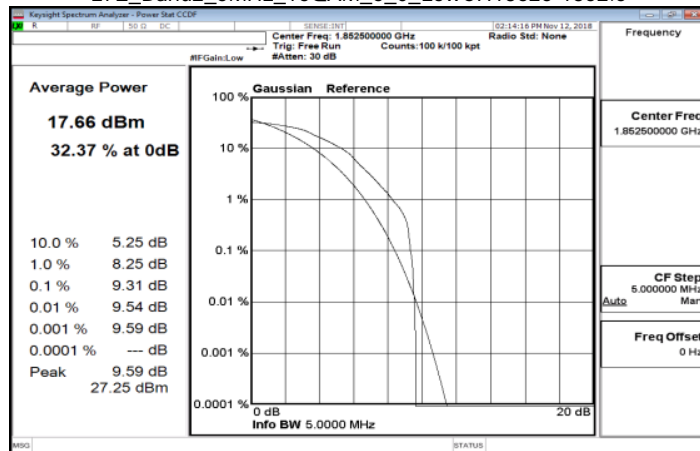
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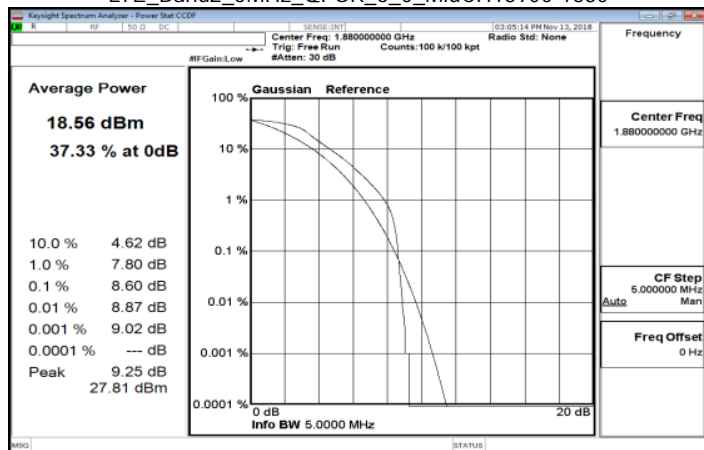
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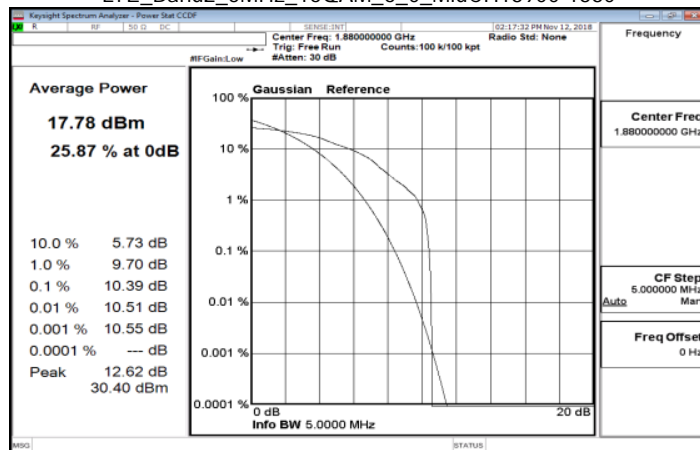
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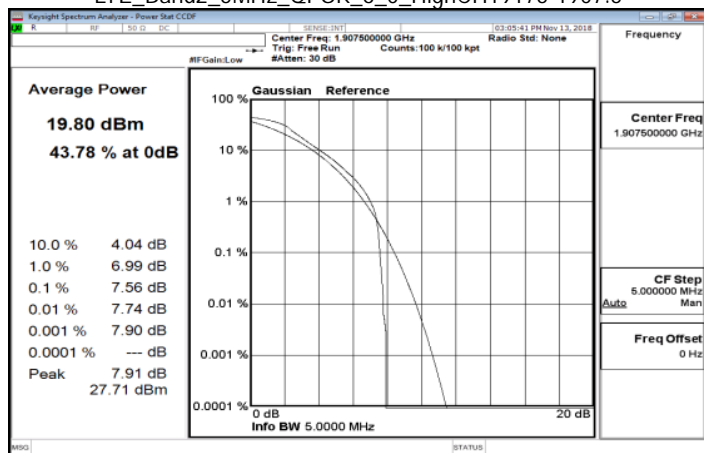
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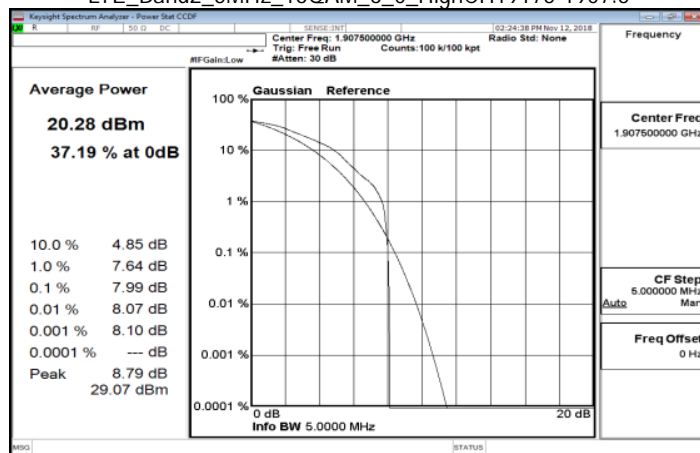
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LTE\_Band2\_5MHz\_16QAM\_6\_0\_HighCH19175-1907.5



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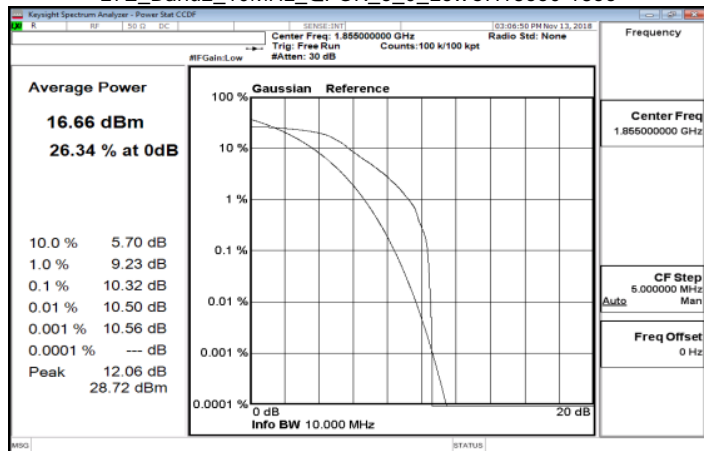
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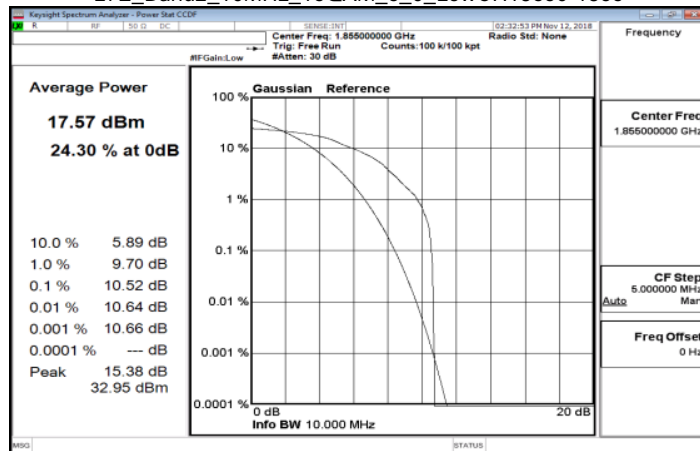
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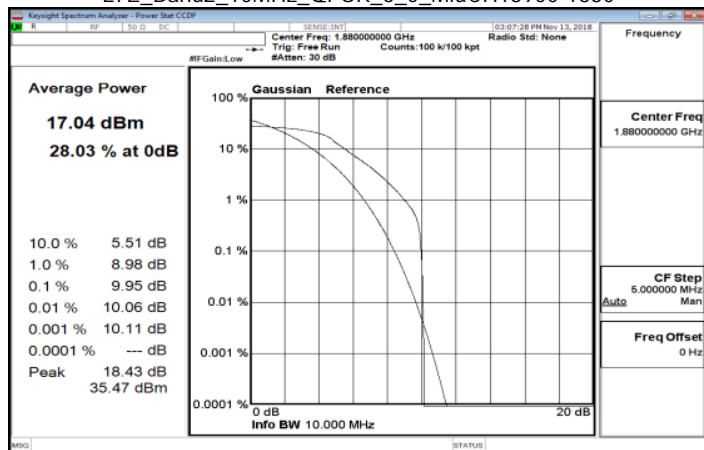
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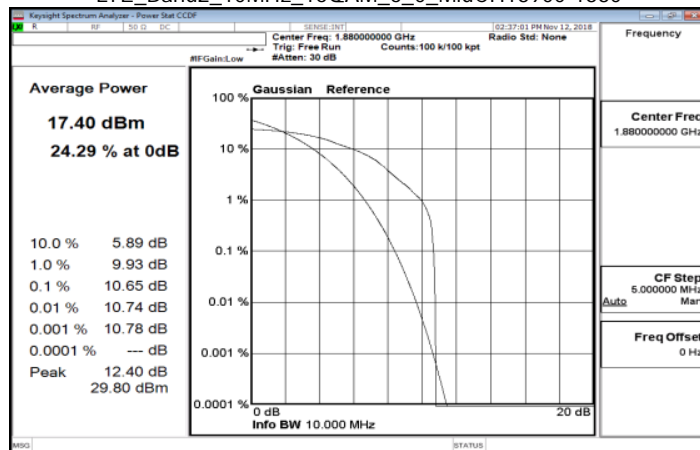
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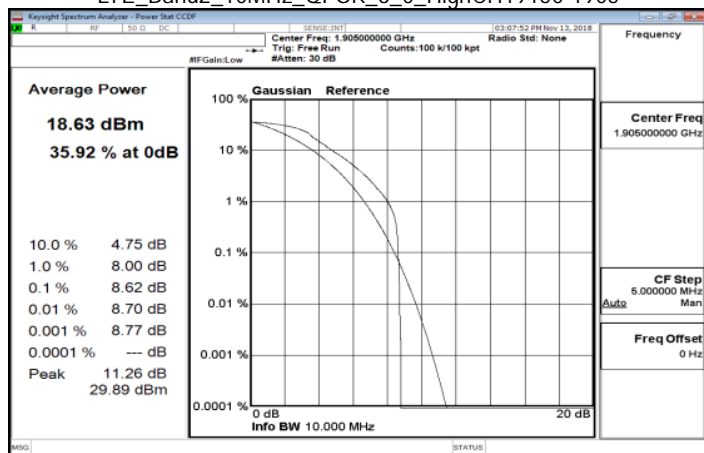
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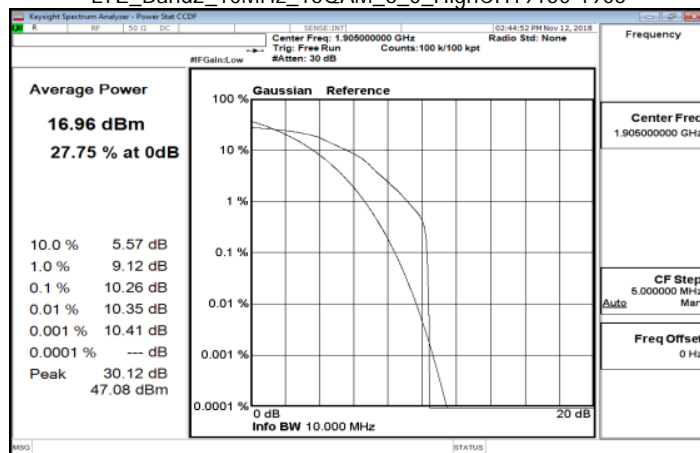
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LTE\_Band2\_10MHz\_QPSK\_6\_0\_HighCH19150-1905



LTE\_Band2\_10MHz\_16QAM\_6\_0\_HighCH19150-1905



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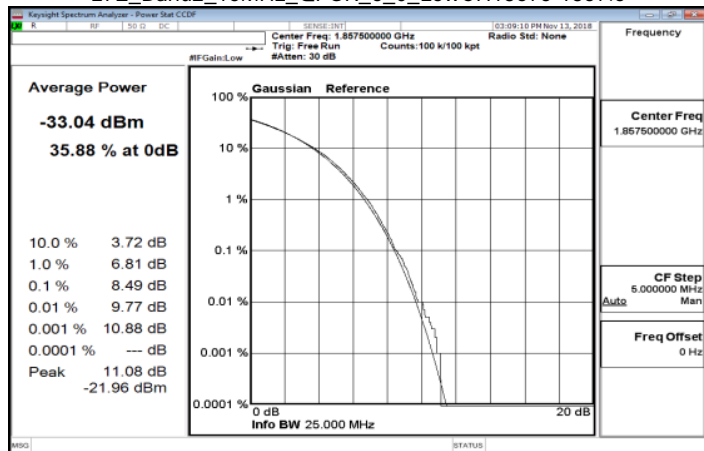
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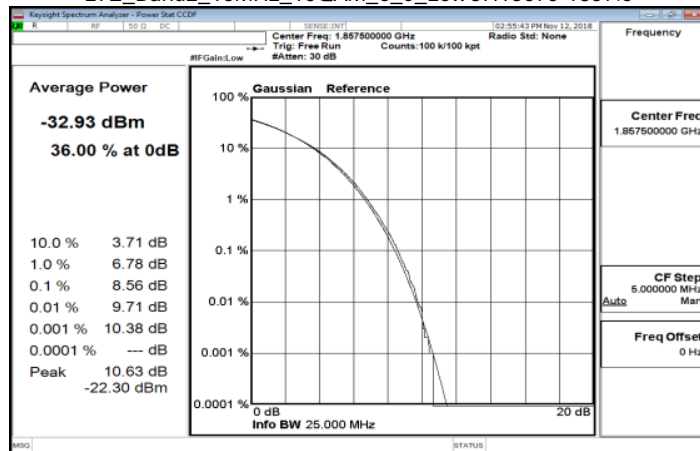
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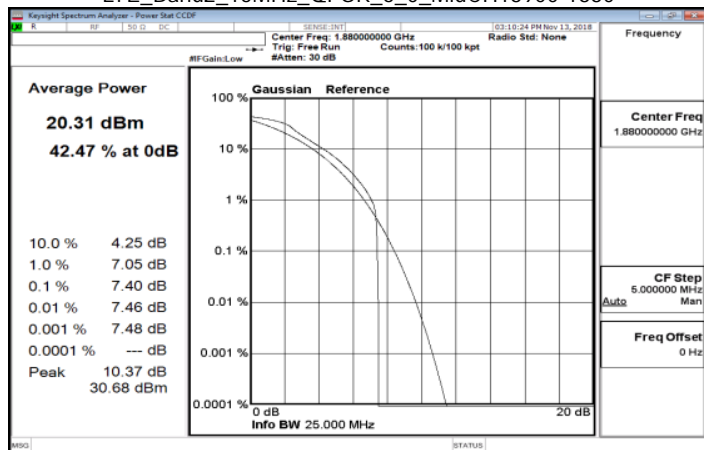
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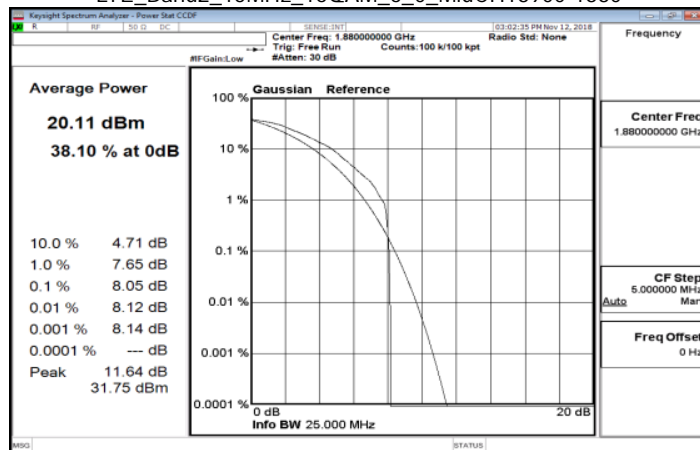
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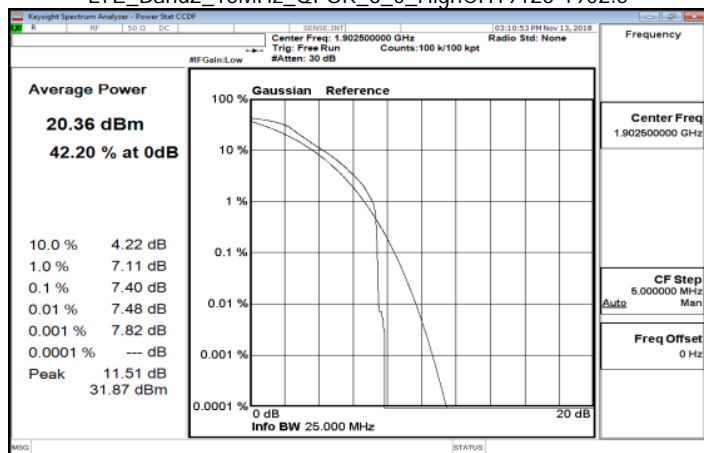
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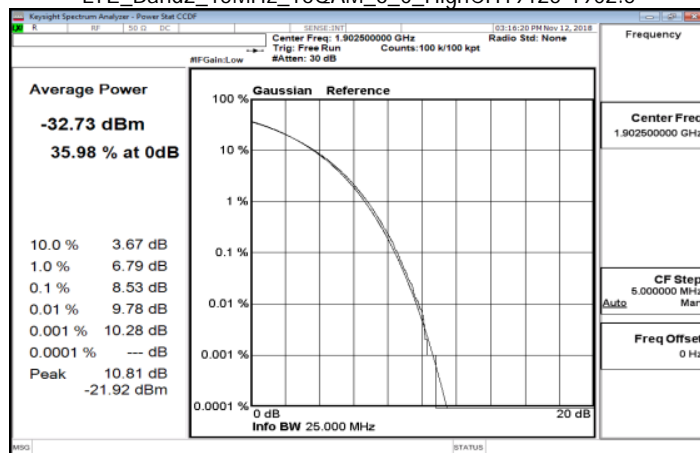
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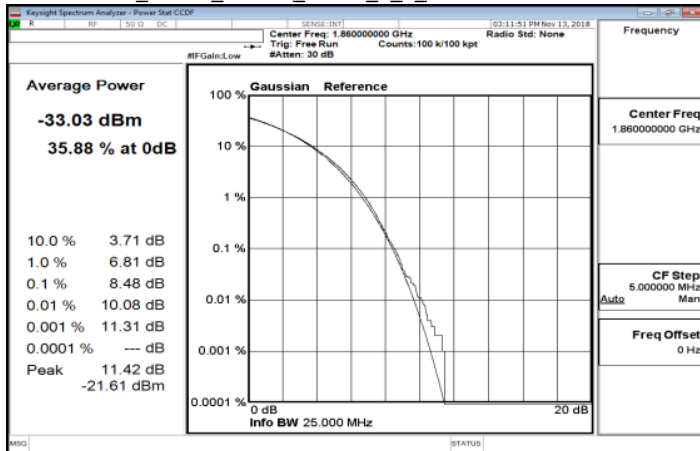
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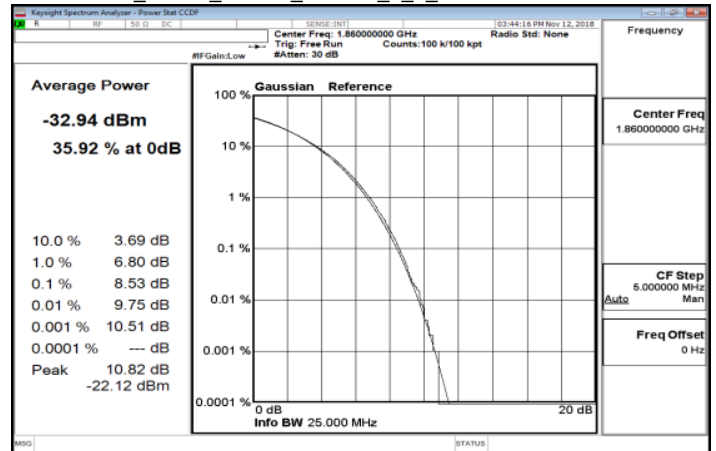
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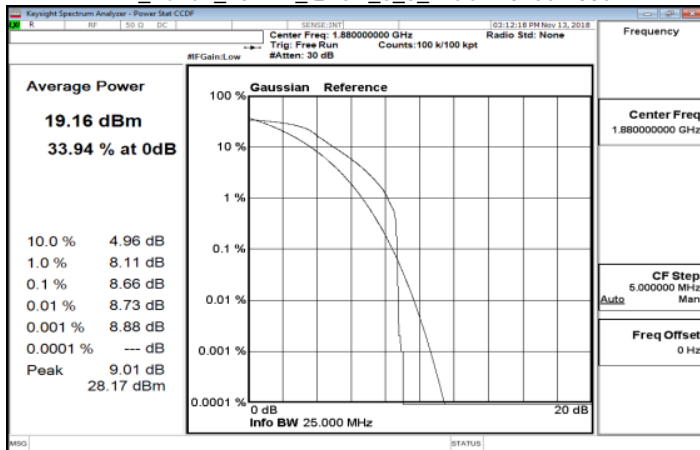
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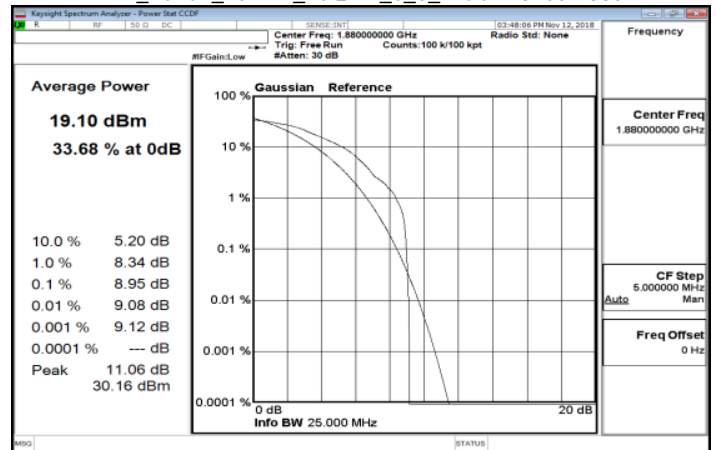
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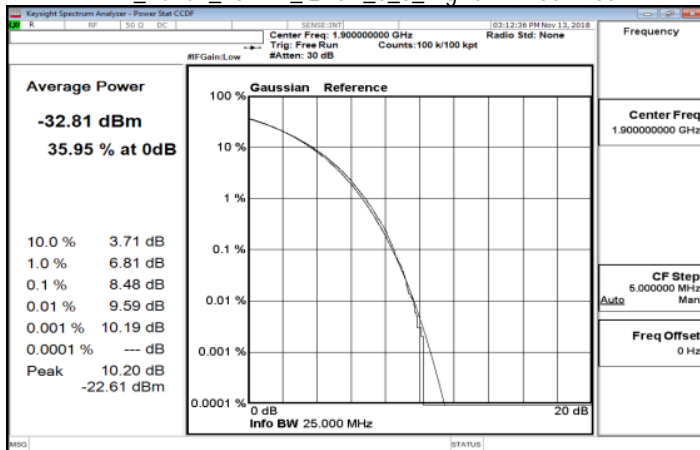
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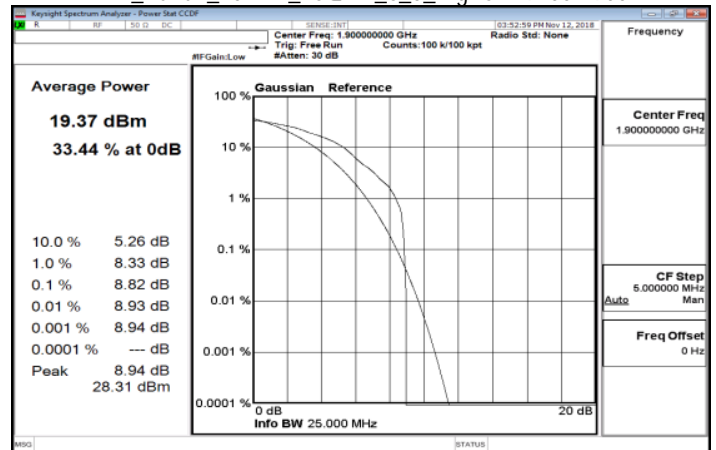
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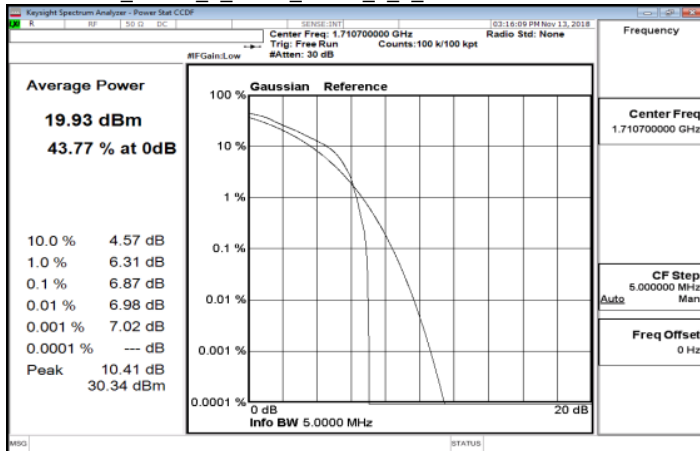
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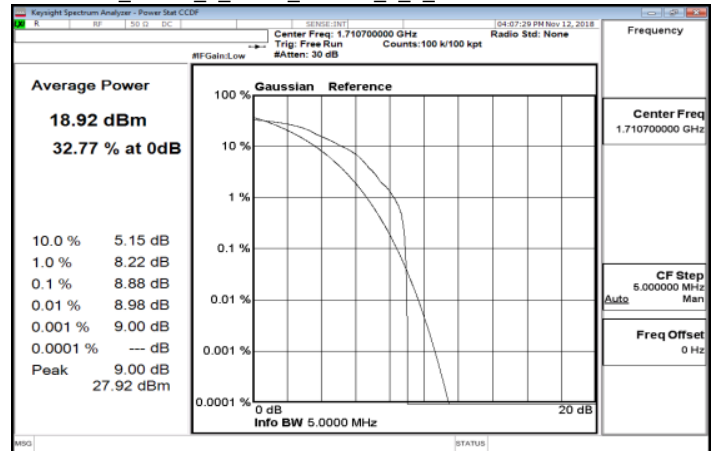
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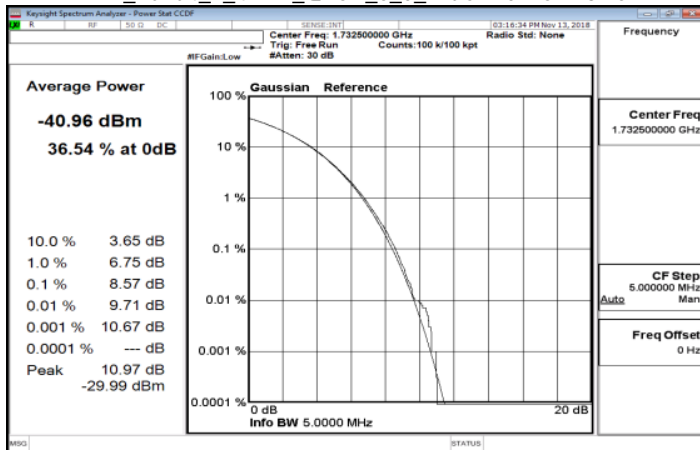
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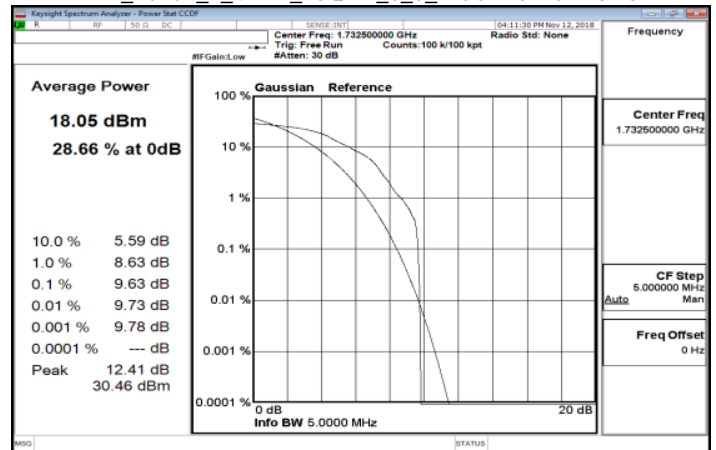
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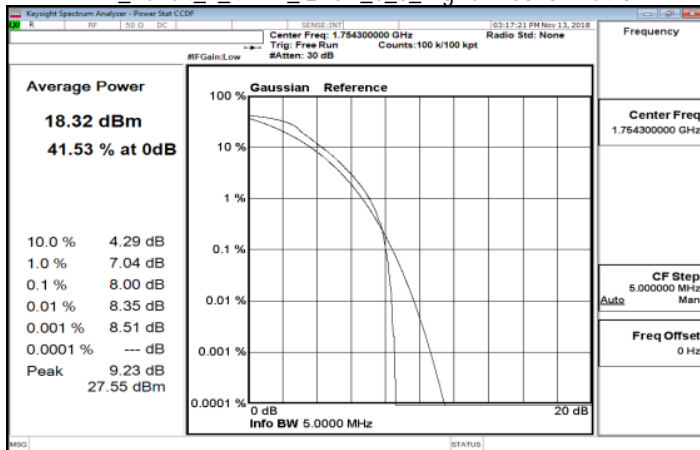
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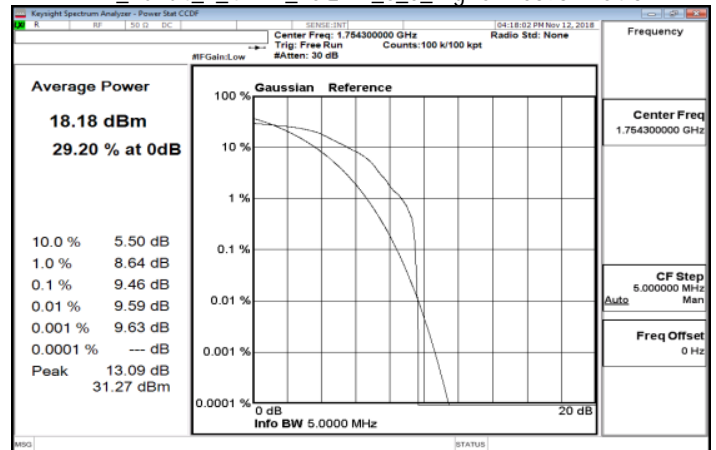
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LTE\_Band4\_1\_4MHz\_16QAM\_6\_0\_HighCH20393-1754.3



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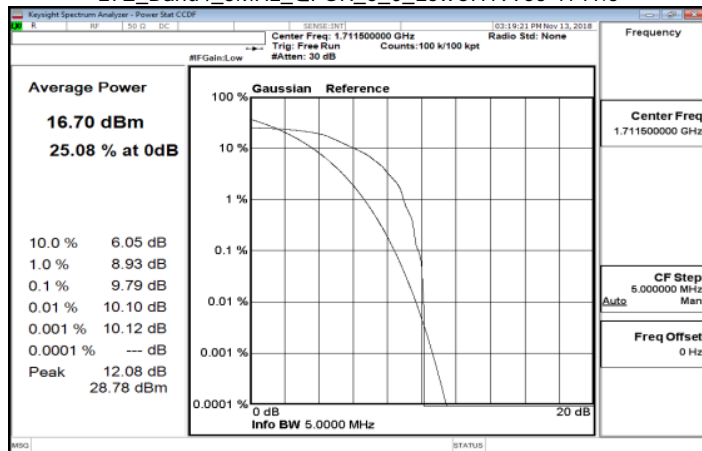
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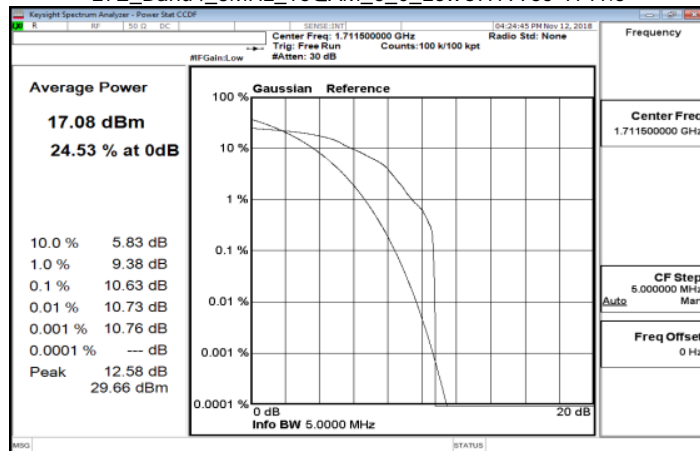
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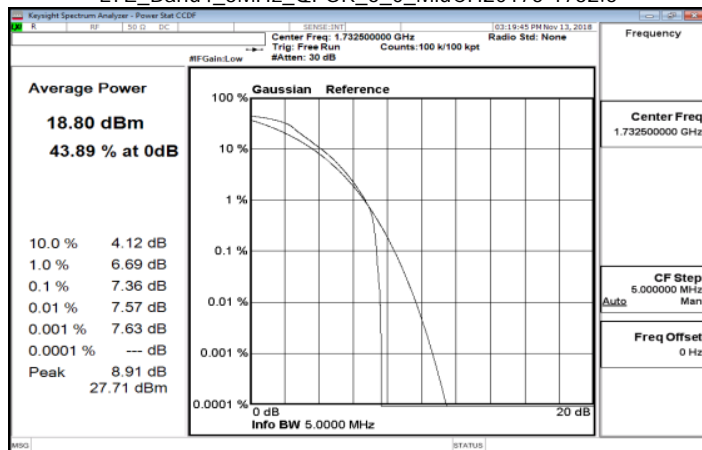
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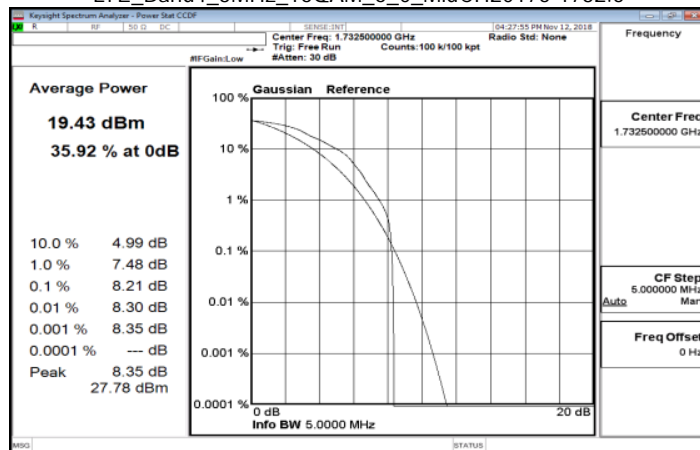
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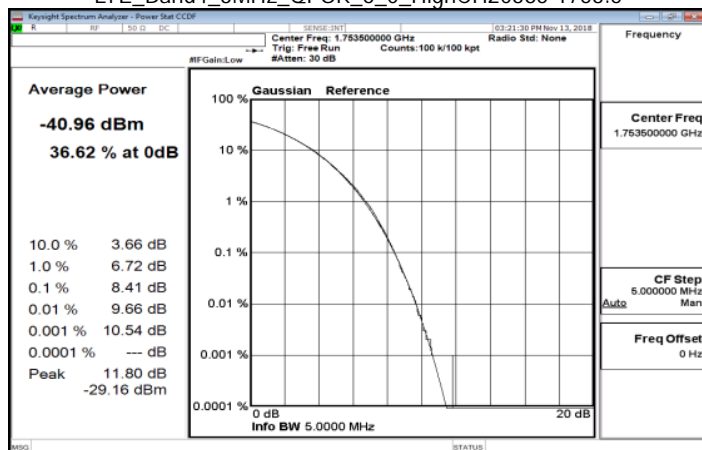
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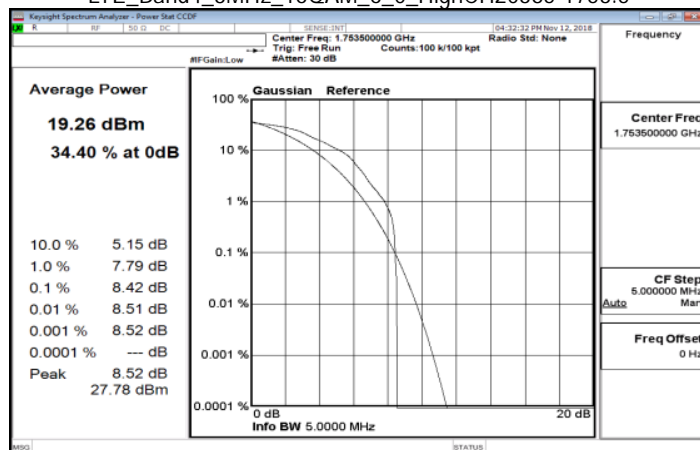
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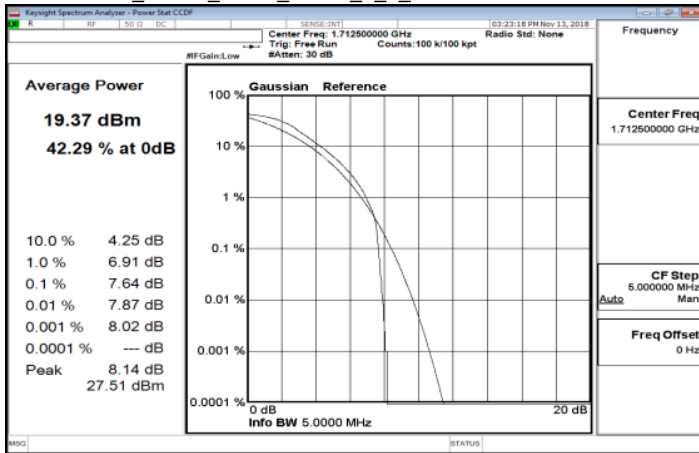
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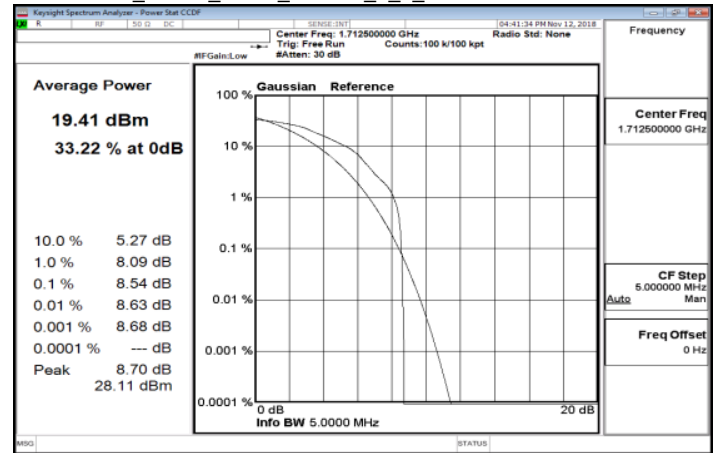
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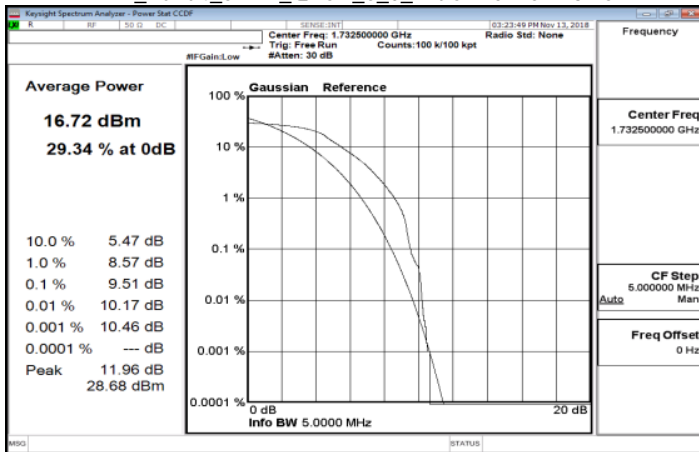
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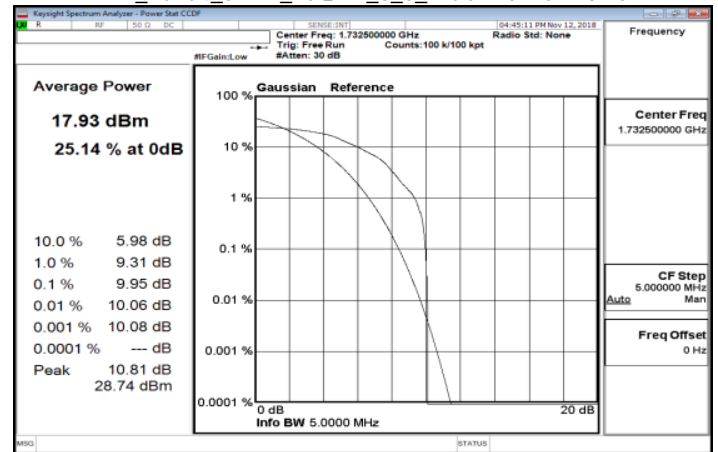
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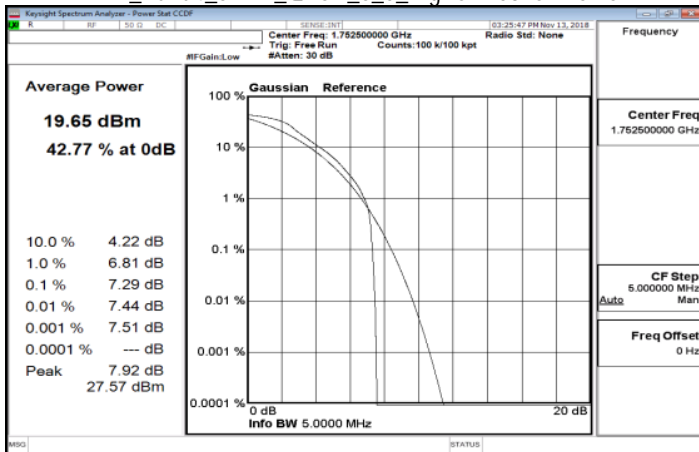
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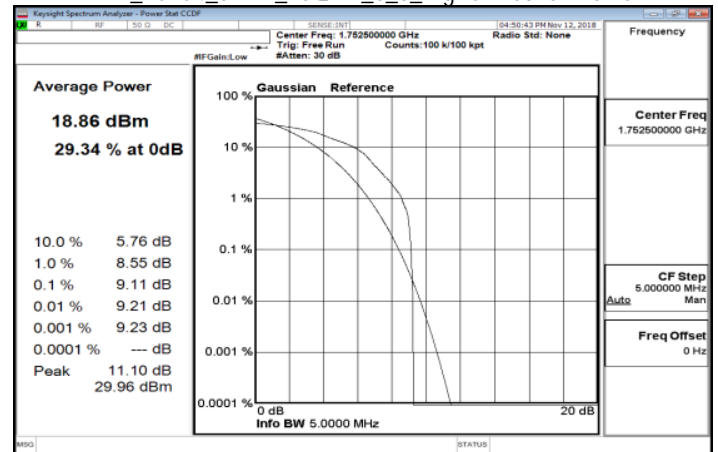
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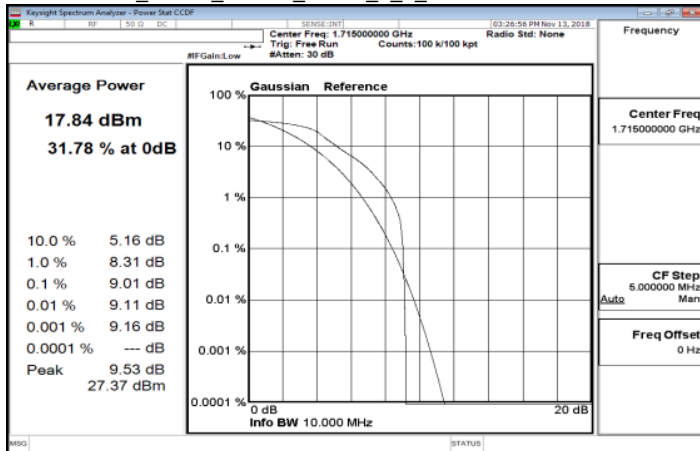
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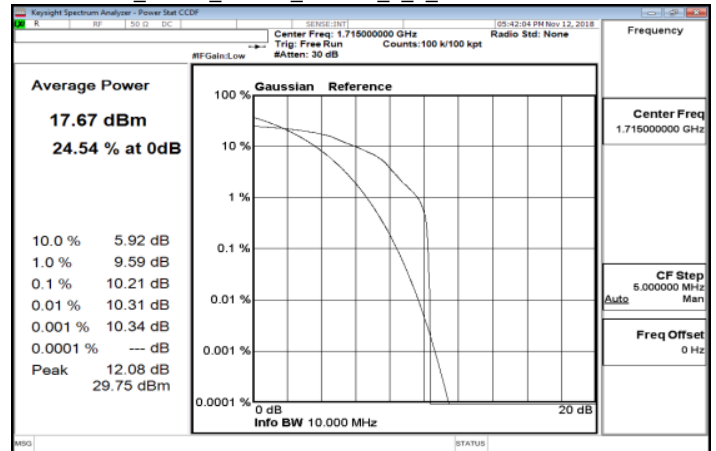
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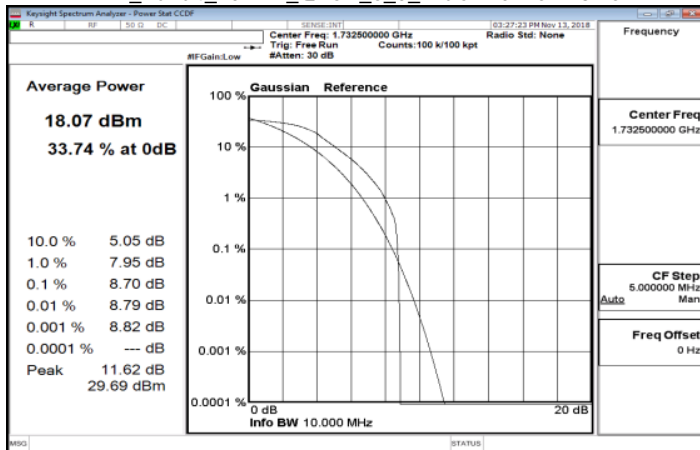
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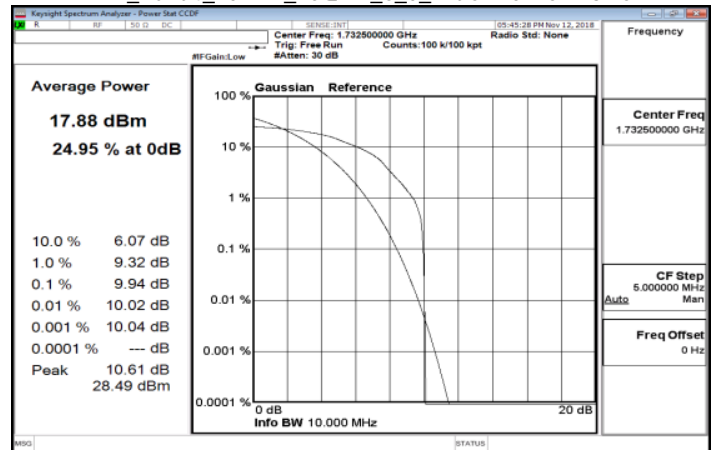
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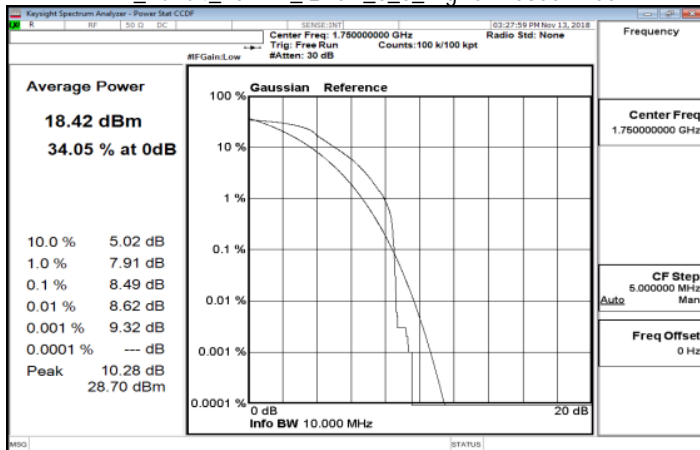
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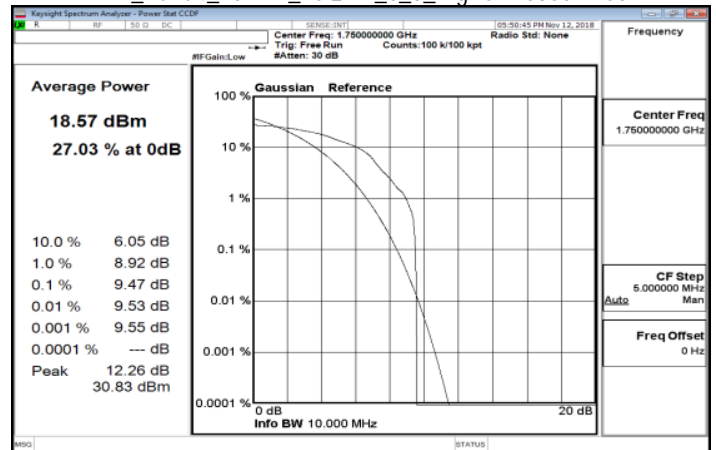
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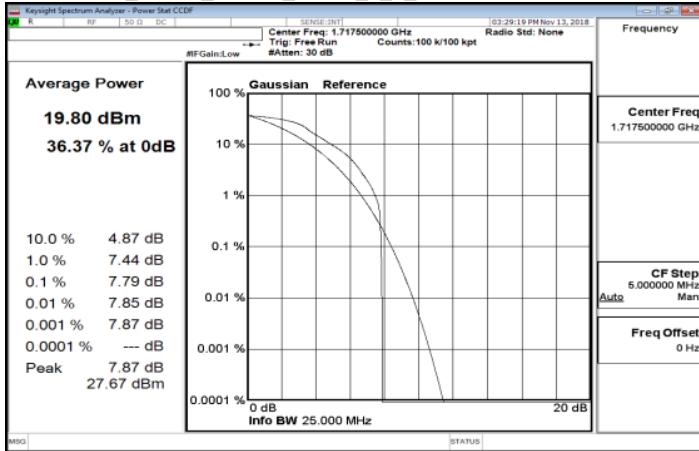
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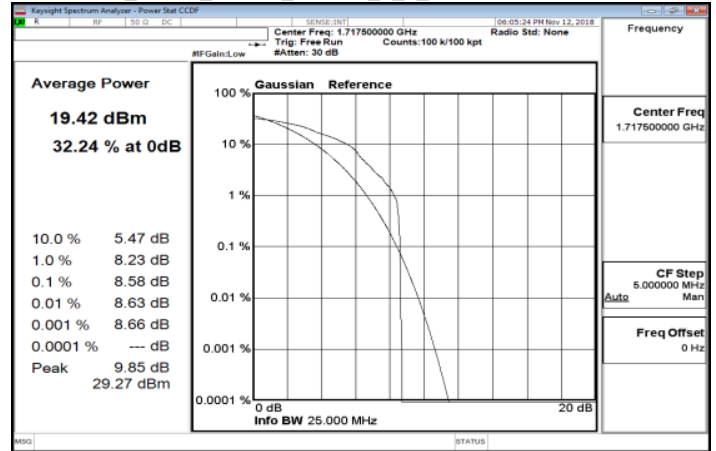
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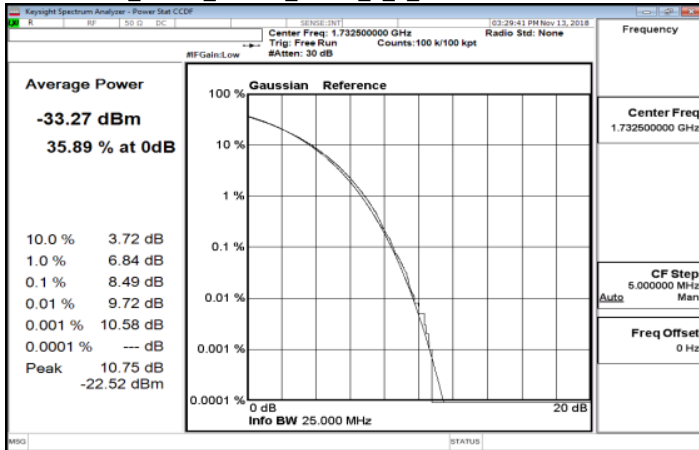
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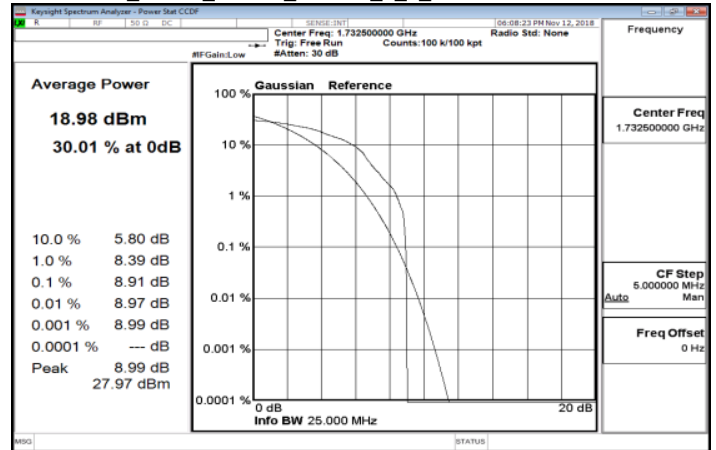
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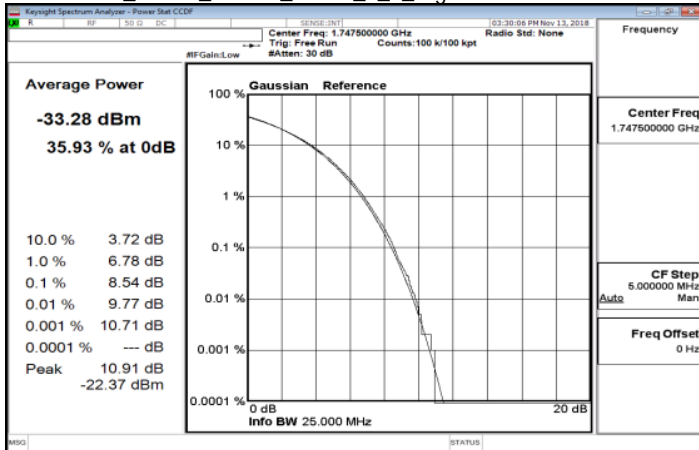
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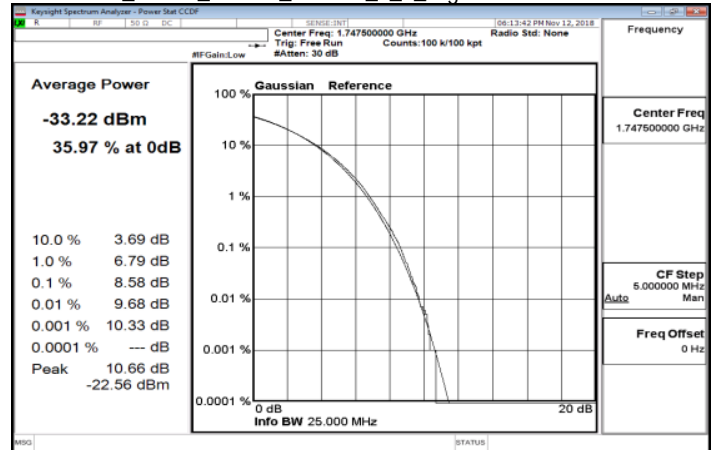
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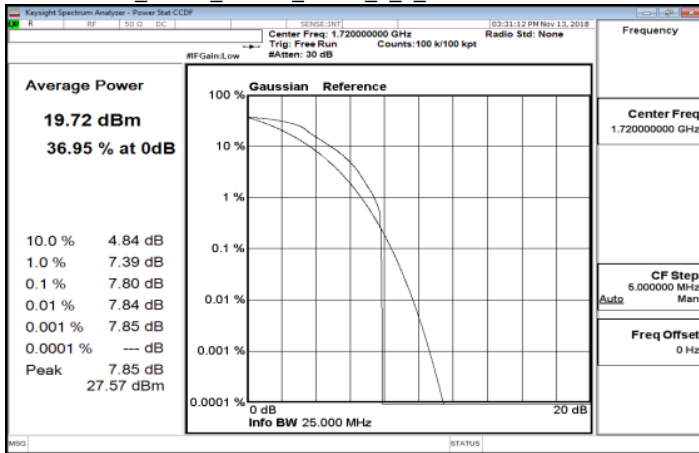
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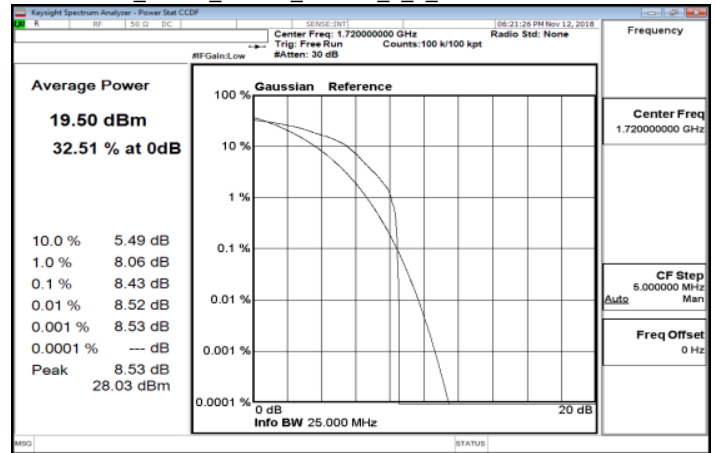
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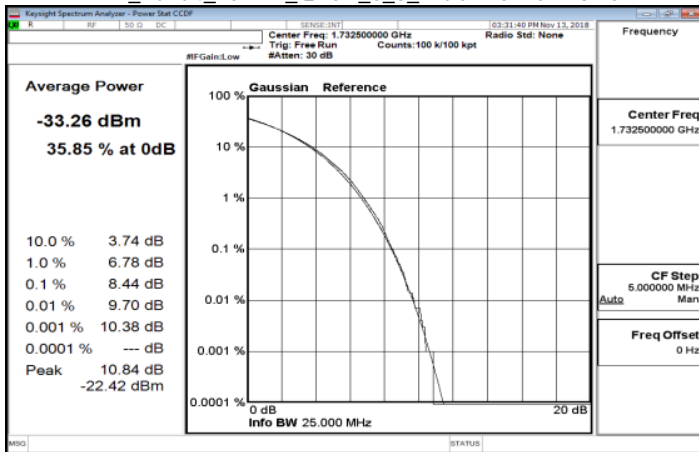
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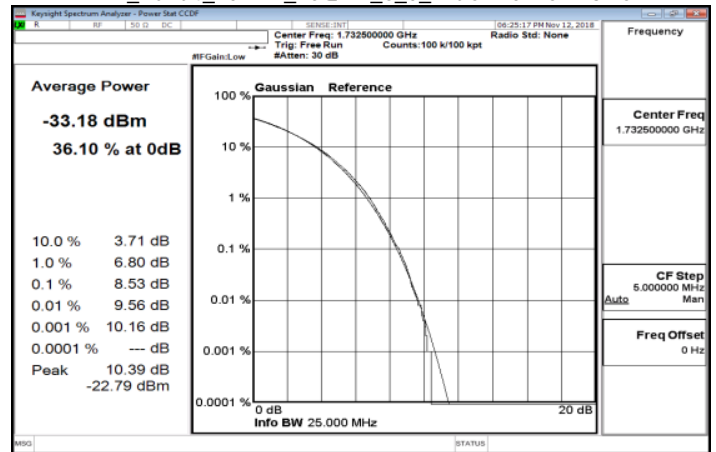
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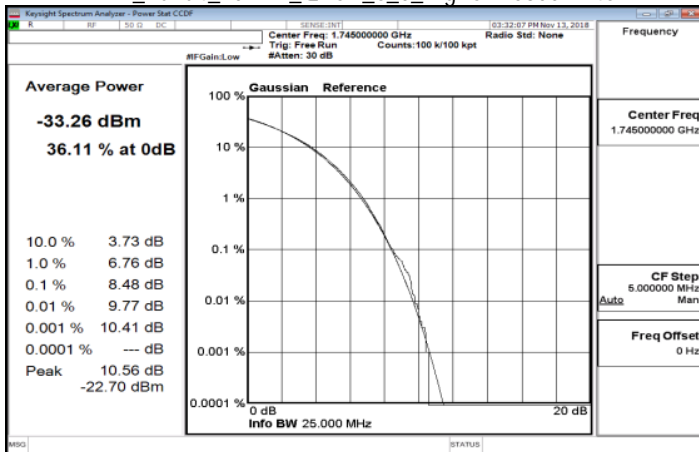
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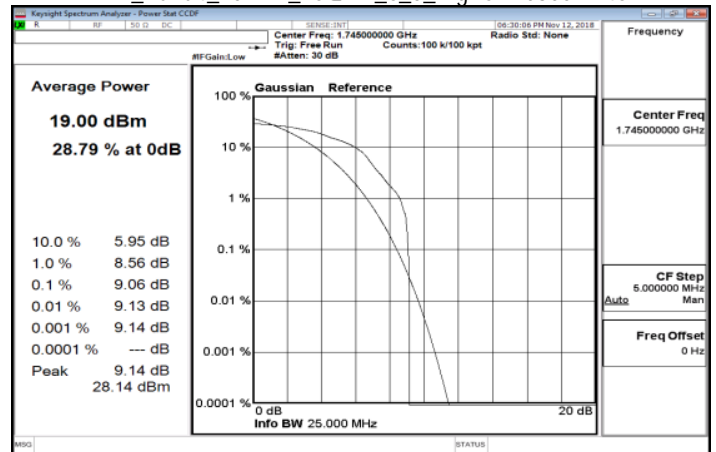
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LTE\_Band4\_20MHz\_QPSK\_6\_0\_HighCH20300-1745



LTE\_Band4\_20MHz\_16QAM\_6\_0\_HighCH20300-1745



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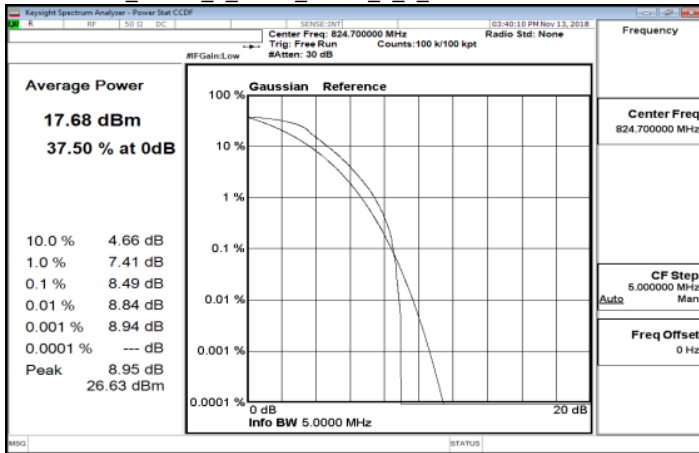
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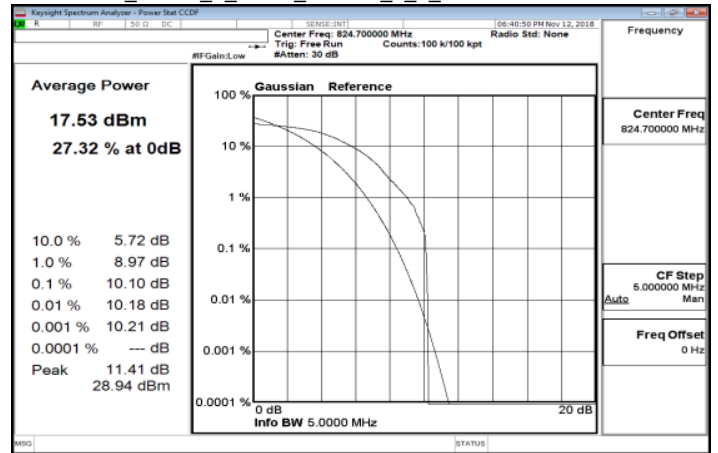
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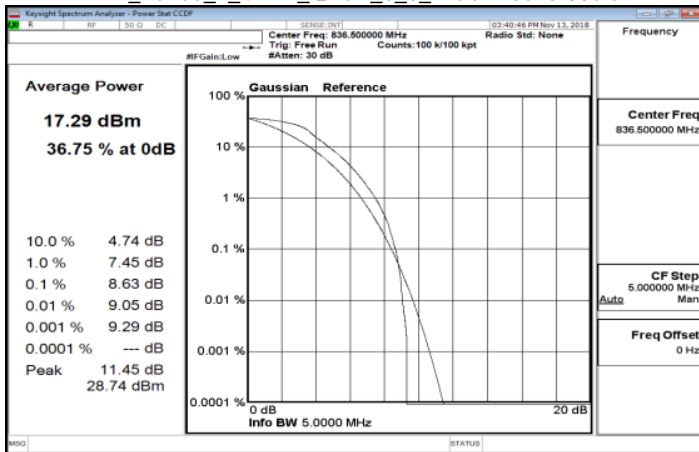
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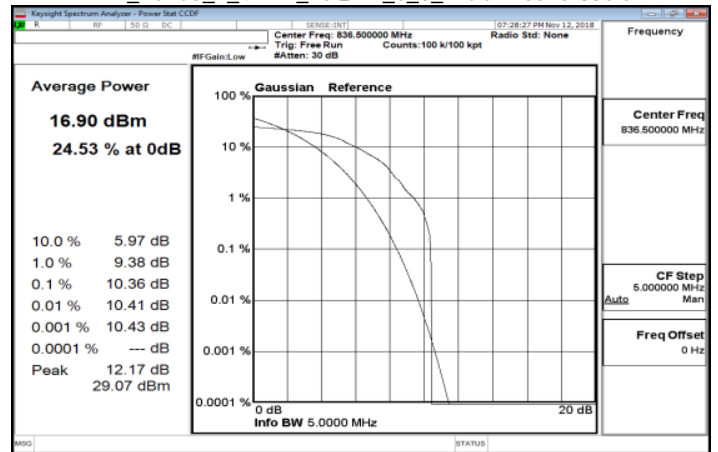
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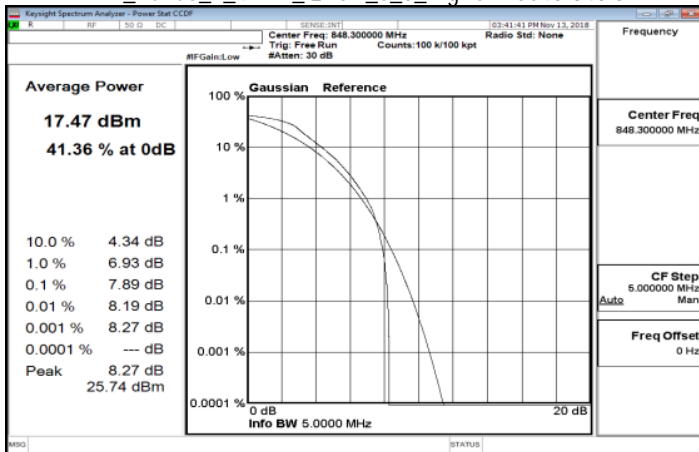
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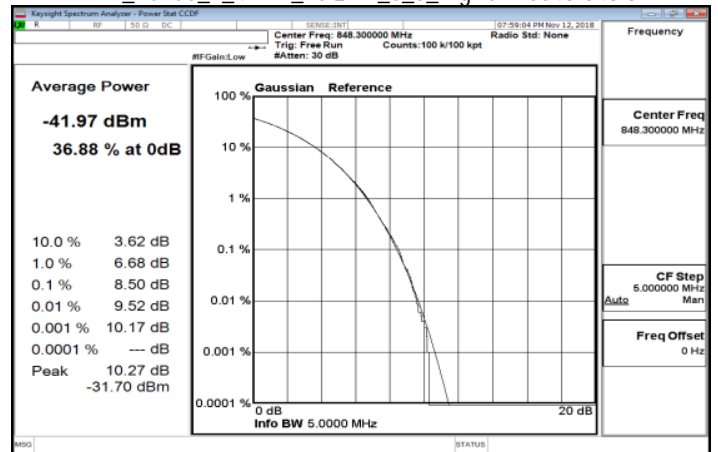
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LTE\_Band5\_1\_4MHz\_QPSK\_6\_0\_HighCH20643-848.3



LTE\_Band5\_1\_4MHz\_16QAM\_6\_0\_HighCH20643-848.3



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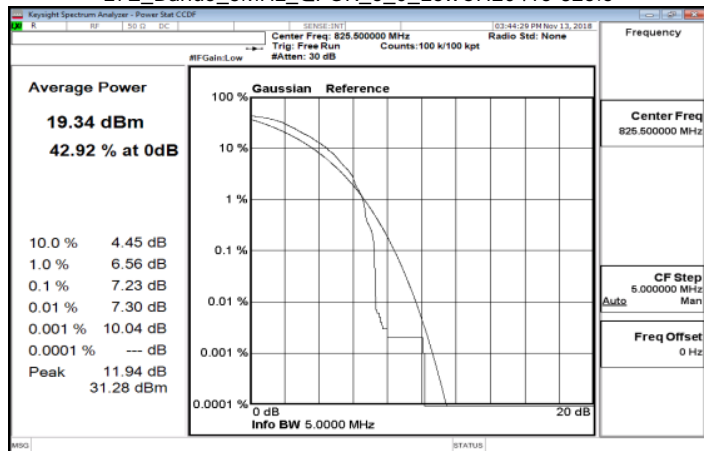
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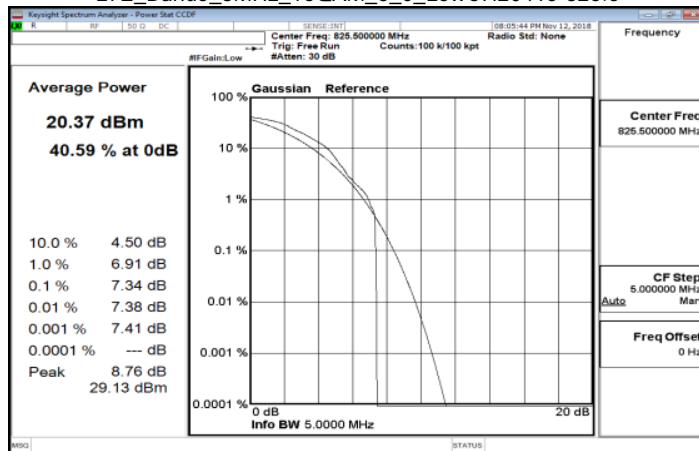
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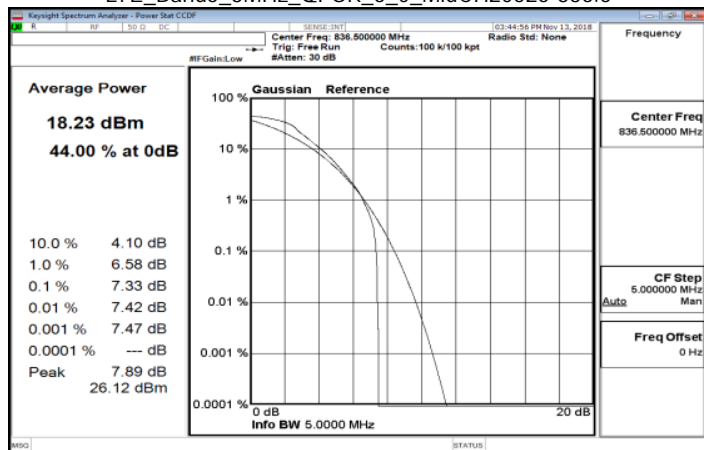
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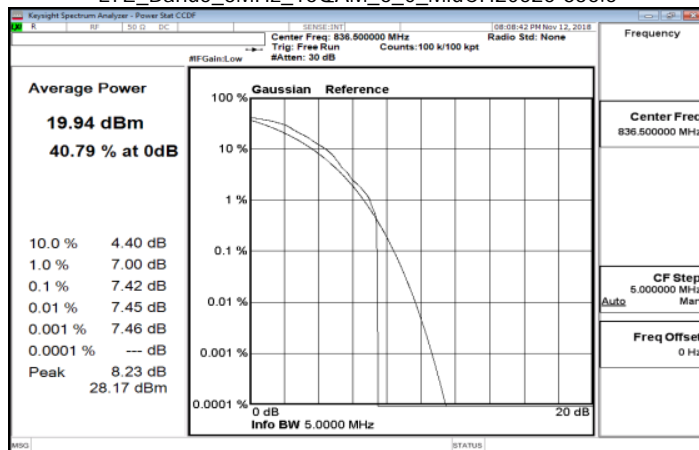
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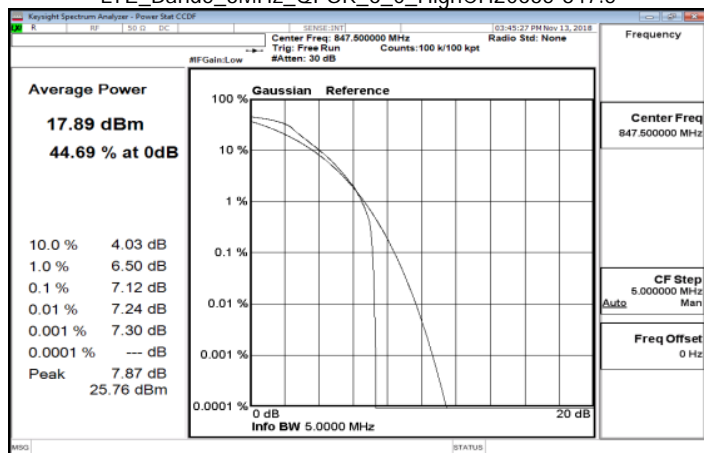
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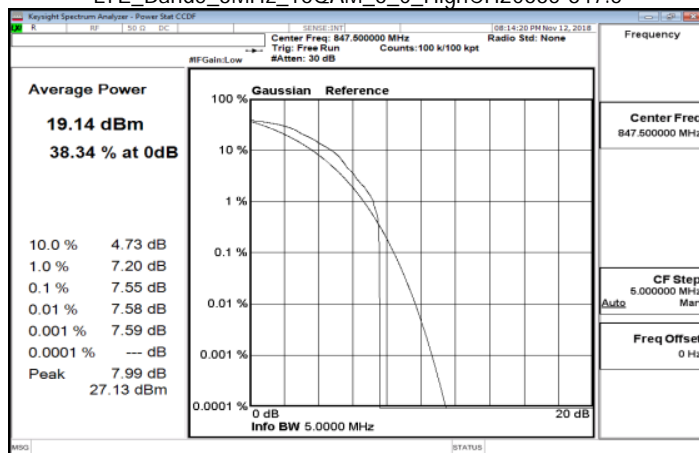
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LTE\_Band5\_3MHz\_16QAM\_6\_0\_HighCH20635-847.5



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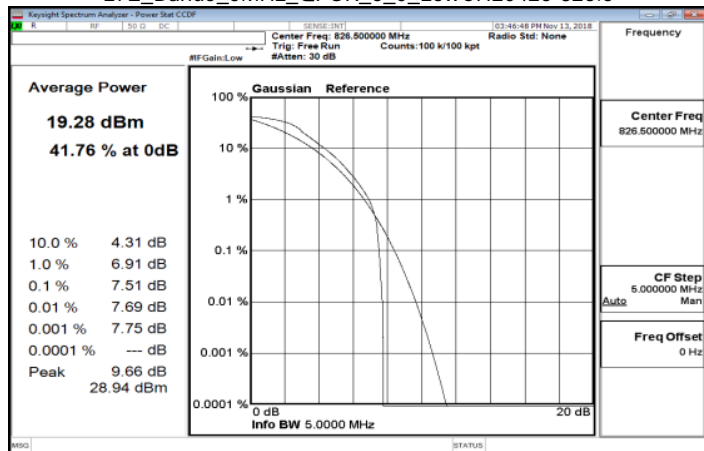
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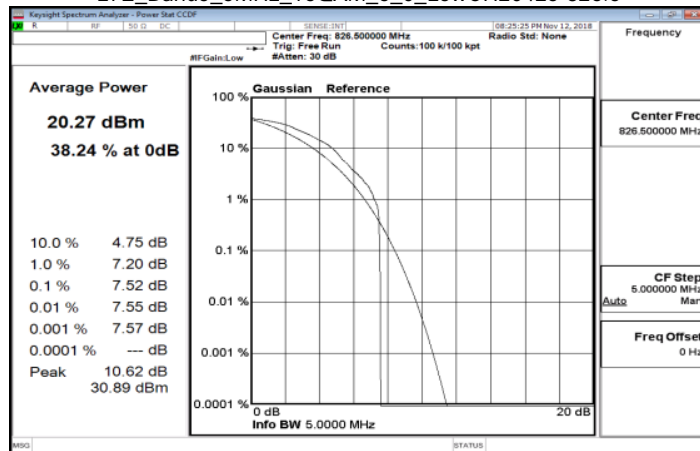
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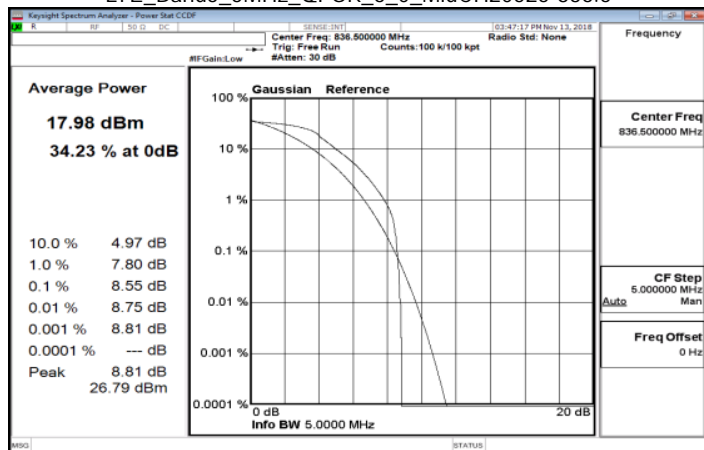
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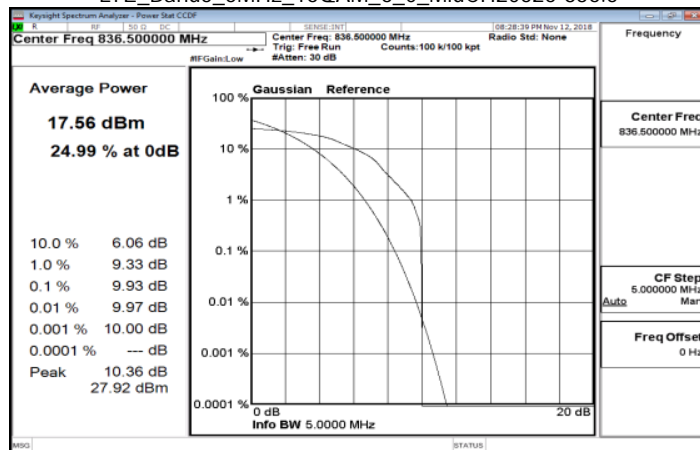
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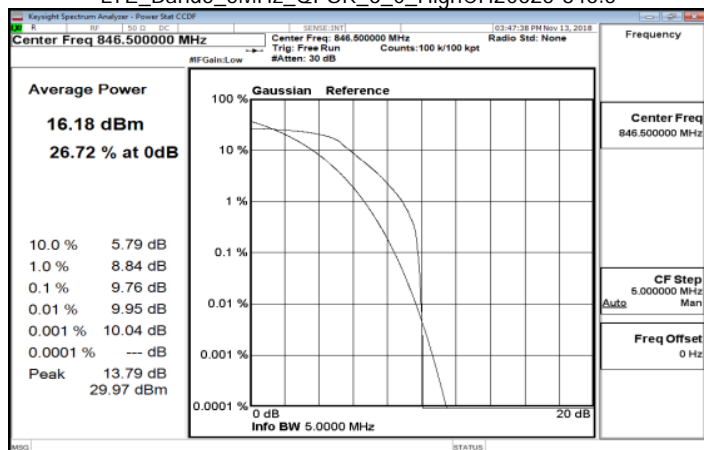
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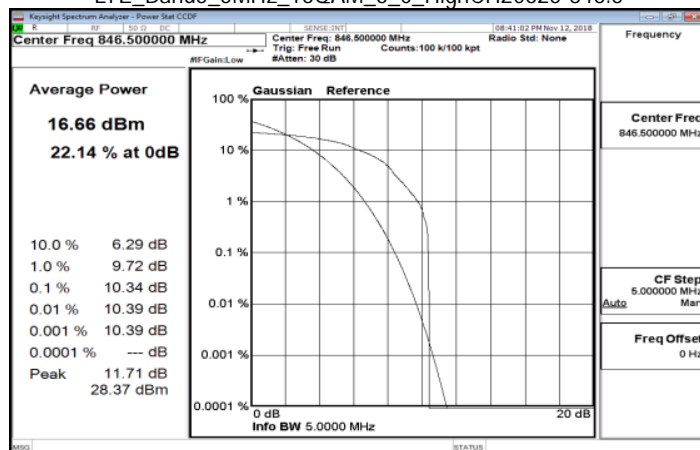
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LTE\_Band5\_5MHz\_QPSK\_6\_0\_HighCH20625-846.5



LTE\_Band5\_5MHz\_16QAM\_6\_0\_HighCH20625-846.5



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