



Appendix B

LTE-NB1 Band 2





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1 Effective (Isotropic) Radiated Power Output Data

1.1 Test Result for LTE NB1 band 2

Test Band	Test Mode	Sub-carrier Spacing (kHz)	Test channel	Number of T	Conducted Power (dBm)	EIRP (dBm)	limit (dBm)	Verdict
NB1 Band 2	BPSK	3.75	18601	1T0	23.29	26.51	33.00	PASS
NB1 Band 2	BPSK	3.75	18601	1T47	23.28	26.50	33.00	PASS
NB1 Band 2	BPSK	3.75	18900	1T0	23.21	26.43	33.00	PASS
NB1 Band 2	BPSK	3.75	18900	1T47	23.19	26.41	33.00	PASS
NB1 Band 2	BPSK	3.75	19199	1T0	23.14	26.36	33.00	PASS
NB1 Band 2	BPSK	3.75	19199	1T47	23.11	26.33	33.00	PASS
NB1 Band 2	QPSK	3.75	18601	1T0	23.14	26.36	33.00	PASS
NB1 Band 2	QPSK	3.75	18601	1T47	23.02	26.24	33.00	PASS
NB1 Band 2	QPSK	3.75	18900	1T0	22.84	26.06	33.00	PASS
NB1 Band 2	QPSK	3.75	18900	1T47	23.17	26.39	33.00	PASS
NB1 Band 2	QPSK	3.75	19199	1T0	23.08	26.30	33.00	PASS
NB1 Band 2	QPSK	3.75	19199	1T47	23.14	26.36	33.00	PASS

Test Band	Test Mode	Sub-carrier Spacing (kHz)	Test channel	Number of T	Conducted Power (dBm)	EIRP (dBm)	limit (dBm)	Verdict
NB1 Band 2	BPSK	15	18601	1T0	22.99	26.21	33.00	PASS
NB1 Band 2	BPSK	15	18601	1T11	22.98	26.20	33.00	PASS
NB1 Band 2	BPSK	15	18900	1T0	23.07	26.29	33.00	PASS
NB1 Band 2	BPSK	15	18900	1T11	23.07	26.29	33.00	PASS
NB1 Band 2	BPSK	15	19199	1T0	23.09	26.31	33.00	PASS
NB1 Band 2	BPSK	15	19199	1T11	23.00	26.22	33.00	PASS
NB1 Band 2	QPSK	15	18601	1T0	22.98	26.20	33.00	PASS
NB1 Band 2	QPSK	15	18601	1T11	23.14	26.36	33.00	PASS
NB1 Band 2	QPSK	15	18601	12T0	21.08	24.30	33.00	PASS
NB1 Band 2	QPSK	15	18900	1T0	22.94	26.16	33.00	PASS
NB1 Band 2	QPSK	15	18900	1T11	23.08	26.30	33.00	PASS
NB1 Band 2	QPSK	15	18900	12T0	20.91	24.13	33.00	PASS
NB1 Band 2	QPSK	15	19199	1T0	22.85	26.07	33.00	PASS
NB1 Band 2	QPSK	15	19199	1T11	23.08	26.30	33.00	PASS
NB1 Band 2	QPSK	15	19199	12T0	20.88	24.10	33.00	PASS

Note:

a: For getting the EIRP (Efficient Isotropic Radiated Power) in substitution method, the following formula should be taken to calculate it,

$EIRP [dBm] = \text{Conducted Power} [dBm] + \text{Gain} [dBi]$

$ERP [dBm] = \text{Conducted Power} [dBm] + \text{Gain} [dBi] - 2.15$



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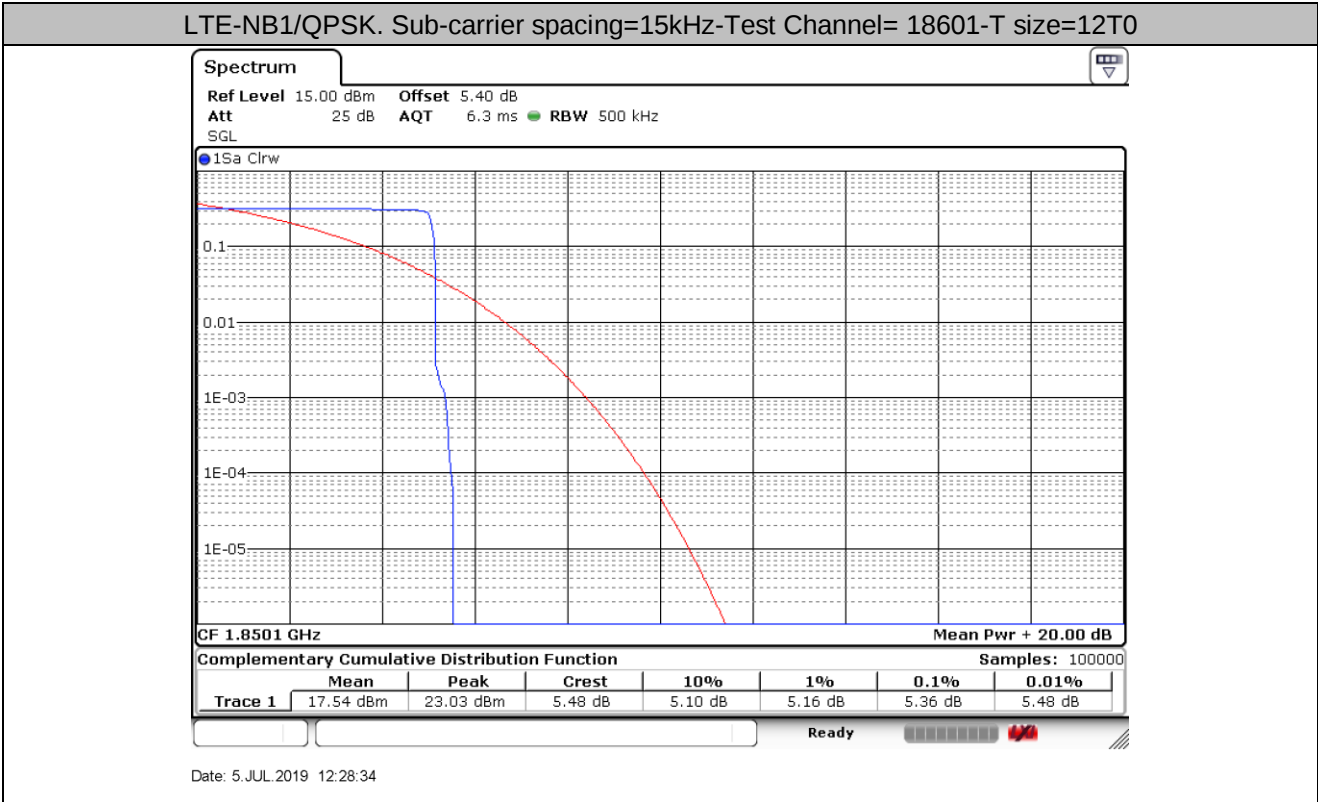
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2 Peak-to-Average Ratio

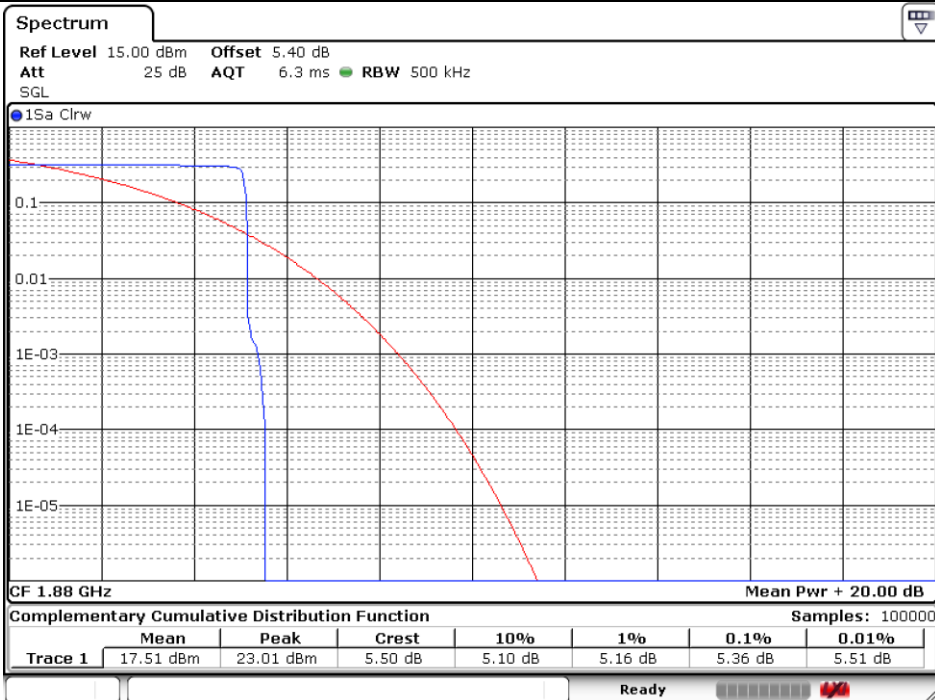
Test Band	Test Mode	Test Channel	Measured[dB]	Limit [dB]	Verdict
NB1 Band 2	QPSK/12T0	18601	5.36	13	PASS
NB1 Band 2	QPSK/12T0	18900	5.36	13	PASS
NB1 Band 2	QPSK/12T0	19199	5.45	13	PASS

2.1 For LTE-NB1

2.1.1 Test Band = LTE-NB1 Band 2

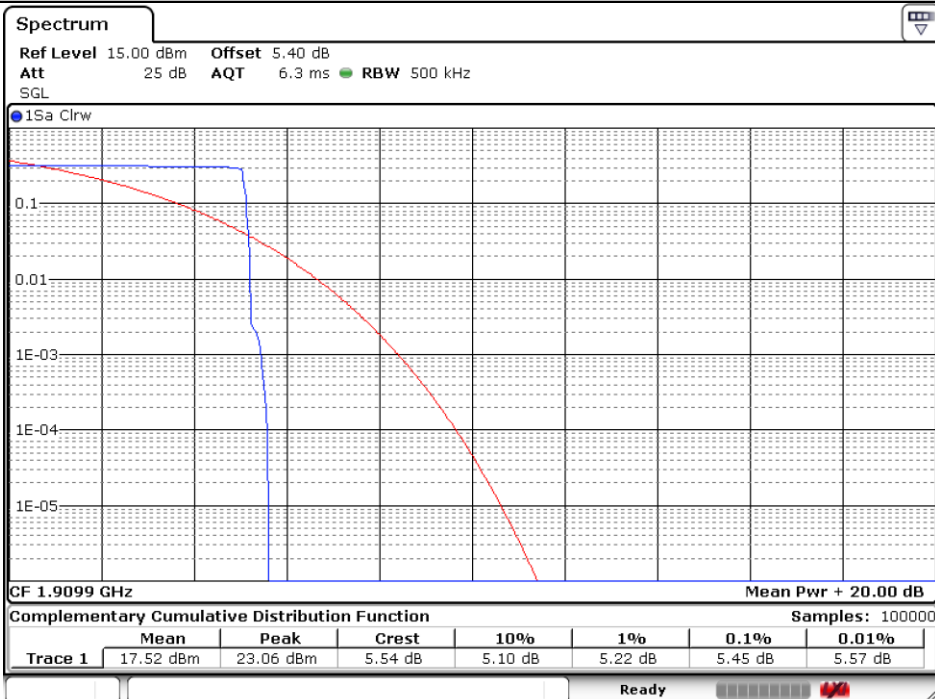


LTE-NB1/QPSK. Sub-carrier spacing=15kHz-Test Channel= 18900-T size=12T0



Date: 5 JUL 2019 12:29:20

LTE-NB1/QPSK. Sub-carrier spacing=15kHz-Test Channel= 19199-T size=12T0



Date: 5 JUL 2019 12:31:26





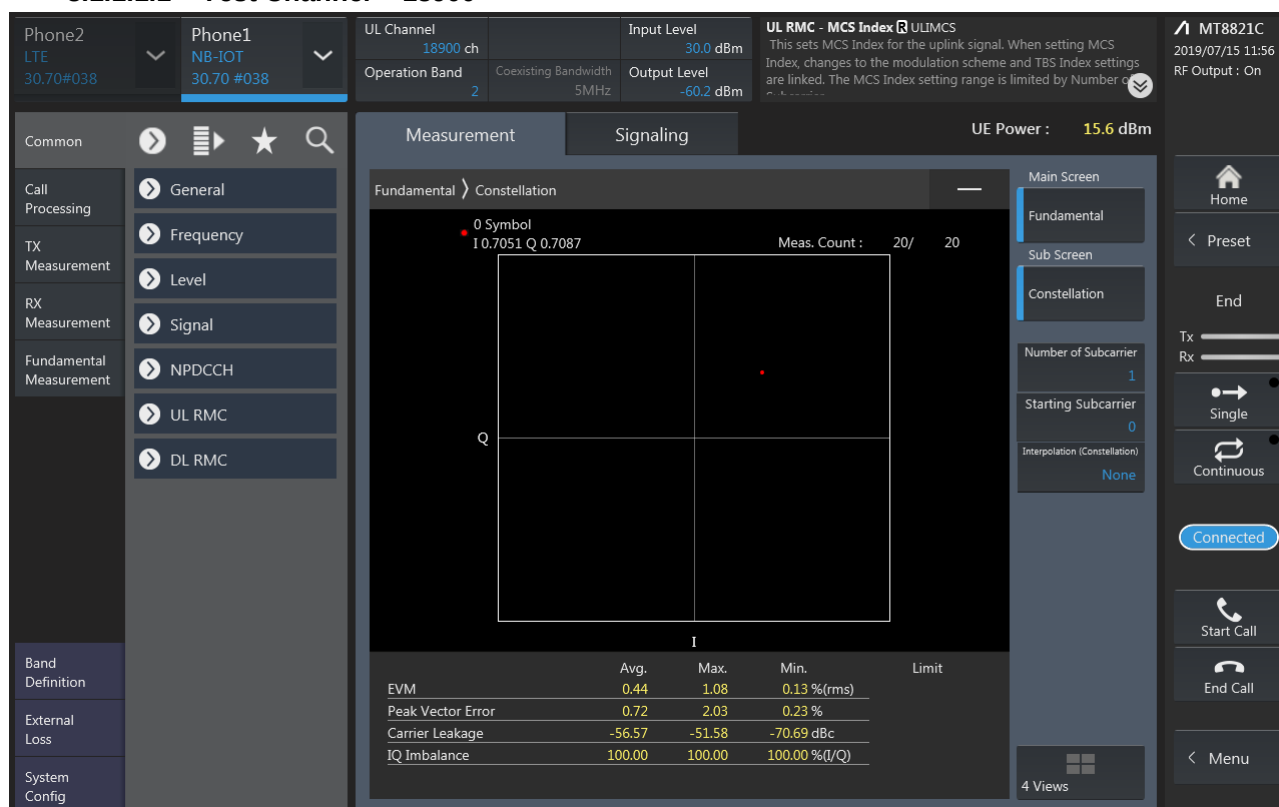
3 Modulation Characteristics

3.1 For LTE-NB1

3.1.1 Test Band = LTE-NB1 Band 2

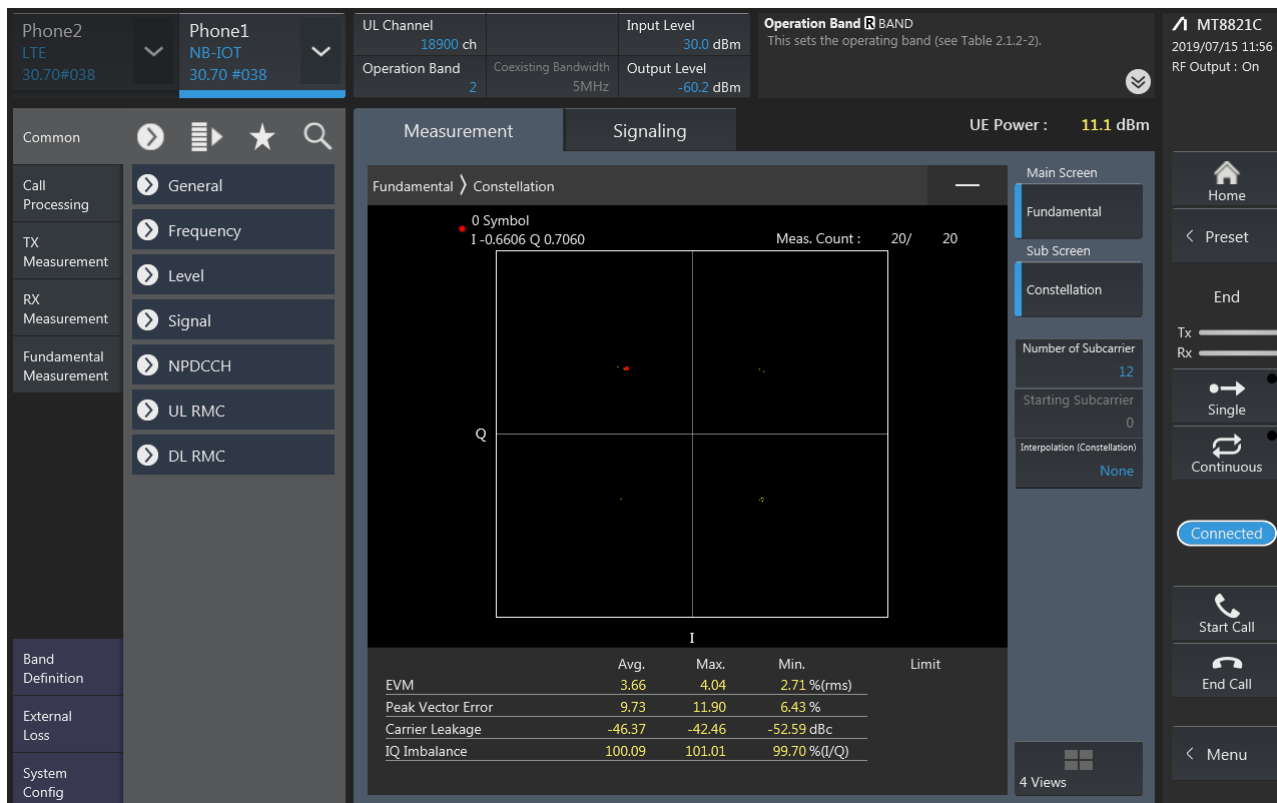
3.1.1.1 Test Mode = LTE-NB1/BPSK. Sub-carrier spacing=15kHz.T size=12T0

3.1.1.1.1 Test Channel = 18900



3.1.1.1.2 Test Mode = LTE-NB1/QPSK. Sub-carrier spacing=15kHz.T size=12T0

3.1.1.2.1 Test Channel = 18900

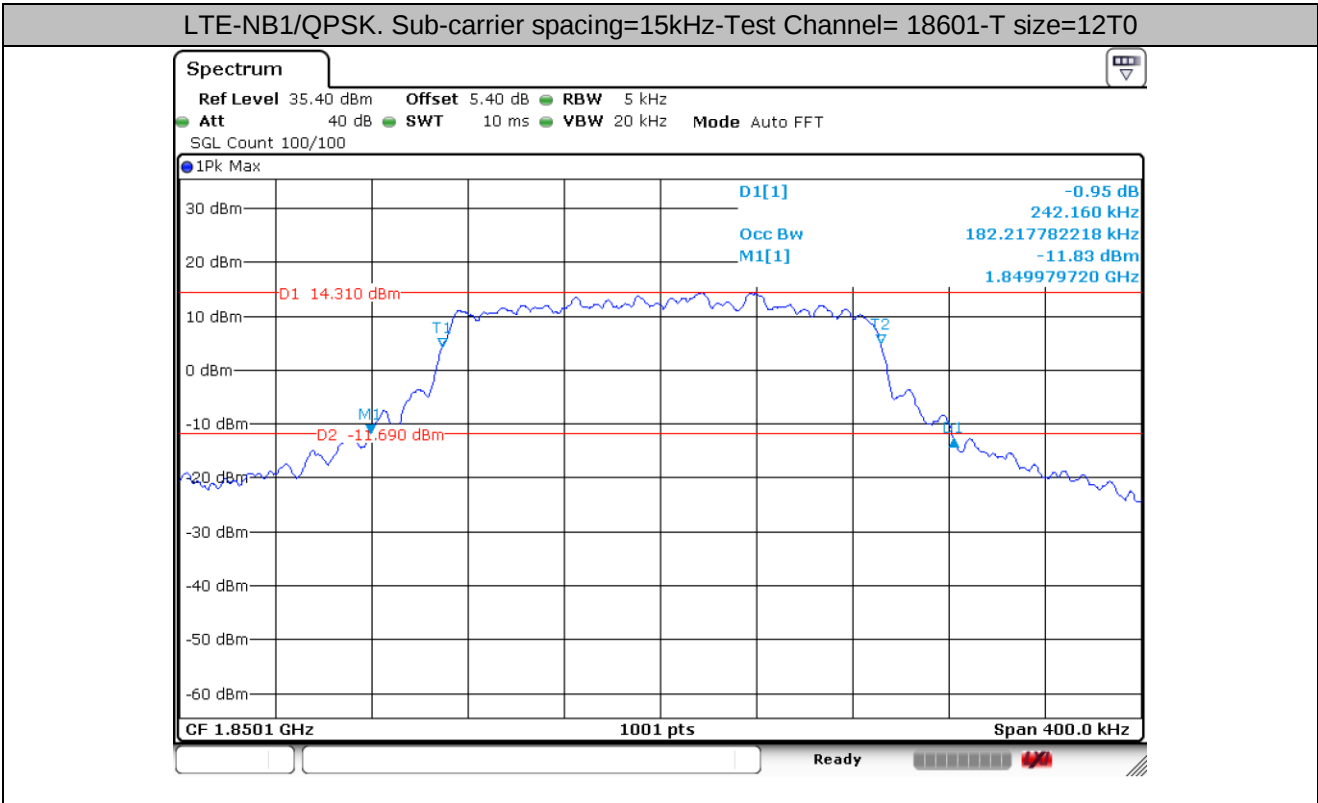


4 Bandwidth

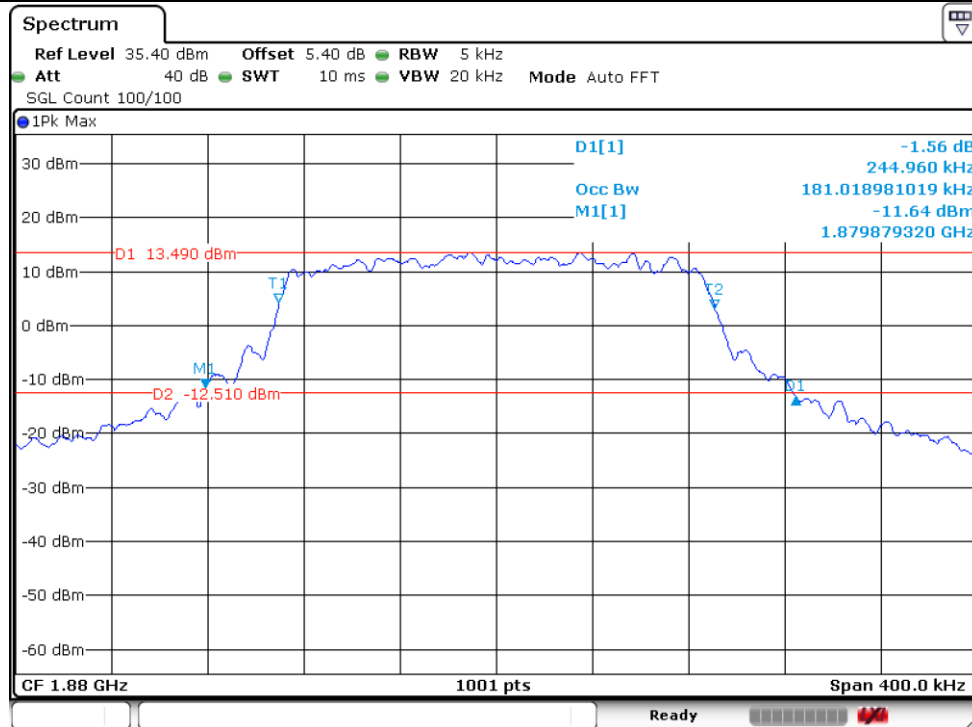
Test Band	Test Mode	T size	Test Channel	Occupied Bandwidth [kHz]	Emission Bandwidth [kHz]	Verdict
NB1 Band 2	QPSK/15kHz	12T0	18601	182.22	242.16	PASS
NB1 Band 2	QPSK/15kHz	12T0	18900	181.02	244.96	PASS
NB1 Band 2	QPSK/15kHz	12T0	19199	181.02	244.56	PASS

4.1 For LTE-NB1

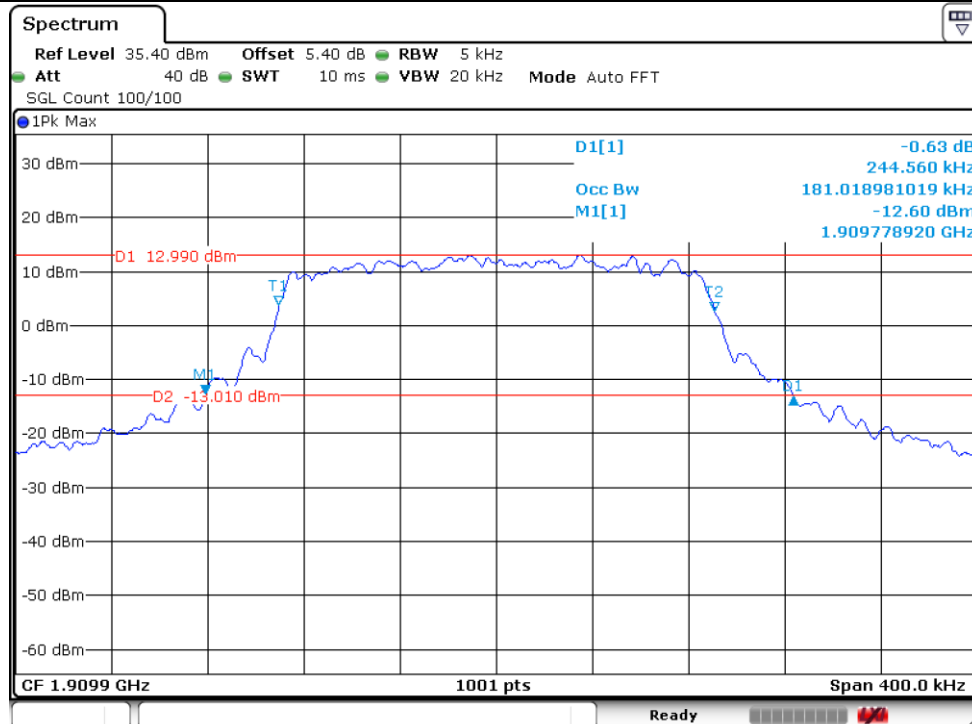
4.1.1 Test Band = LTE-NB1 Band 2



LTE-NB1/QPSK. Sub-carrier spacing=15kHz-Test Channel= 18900-T size=12T0



LTE-NB1/QPSK. Sub-carrier spacing=15kHz-Test Channel= 19199-T size=12T0

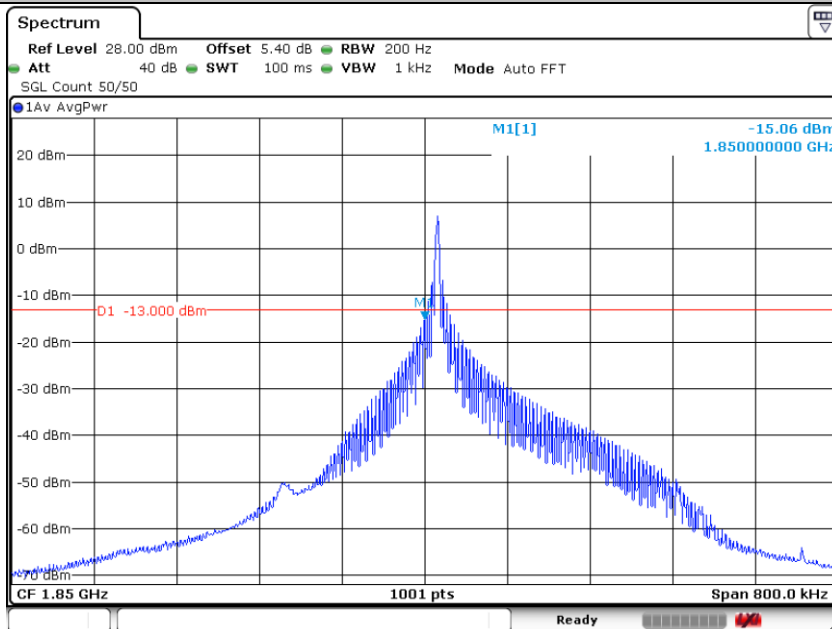


5 Band Edges Compliance

5.1 For LTE-NB1

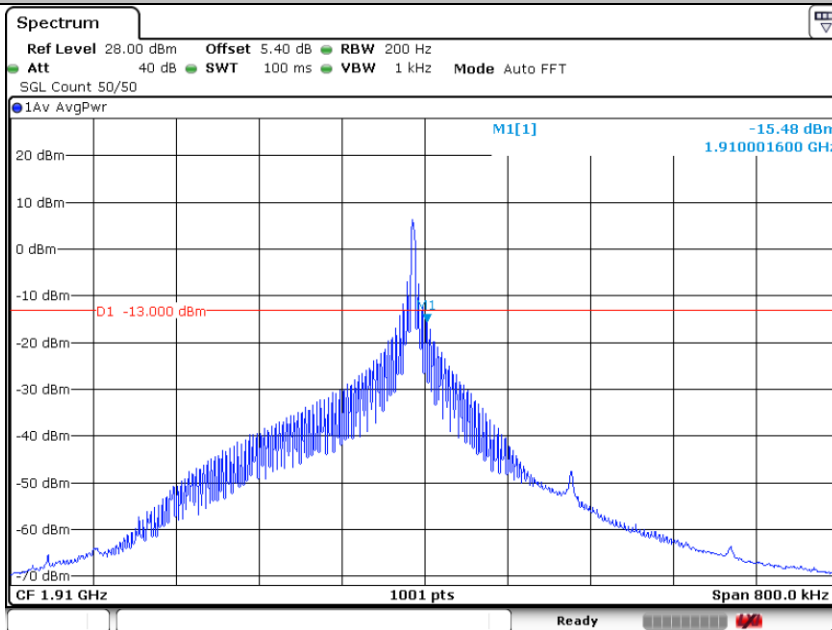
5.1.1 Test Band = LTE-NB1 Band 2

LTE-NB1/BPSK. Sub-carrier spacing=3.75kHz-Test Channel=18601-T size=1T0



Date: 20 AUG.2019 05:06:34

LTE-NB1/BPSK. Sub-carrier spacing=3.75kHz-Test Channel=19199-T size=1T47



Date: 20 AUG.2019 05:17:47



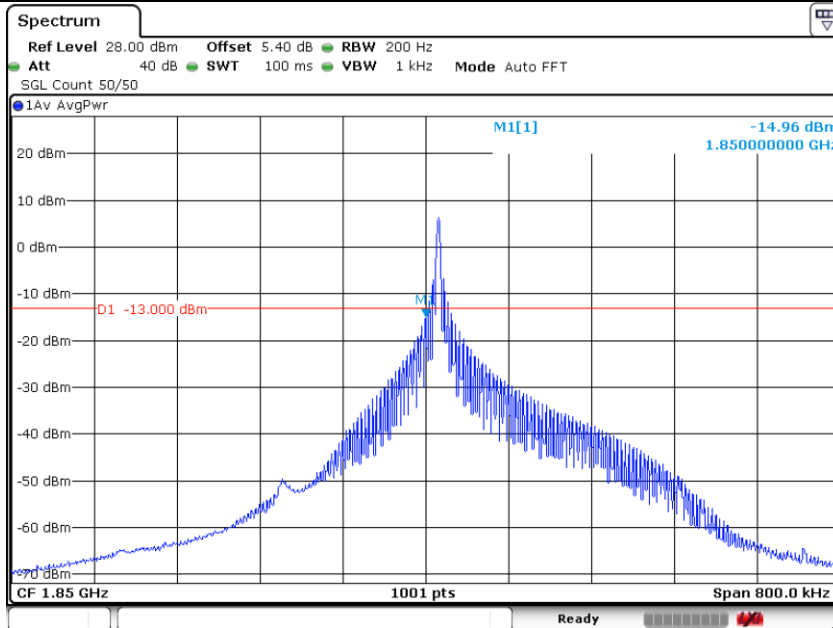
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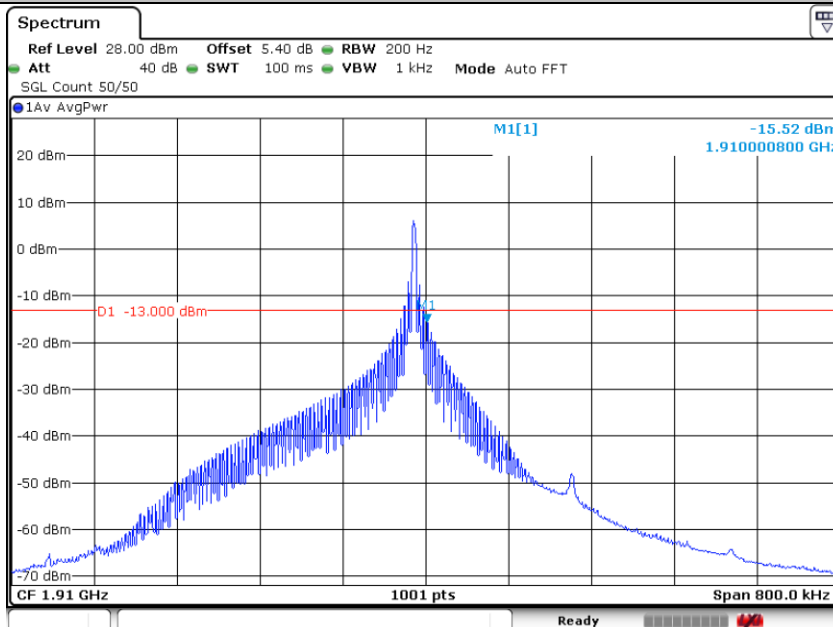
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LTE-NB1/QPSK. Sub-carrier spacing=3.75kHz-Test Channel=18601-T size=1T0



Date: 20.AUG.2019 05:07:49

LTE-NB1/QPSK. Sub-carrier spacing=3.75kHz-Test Channel=19199-T size=1T47



Date: 20.AUG.2019 05:17:16

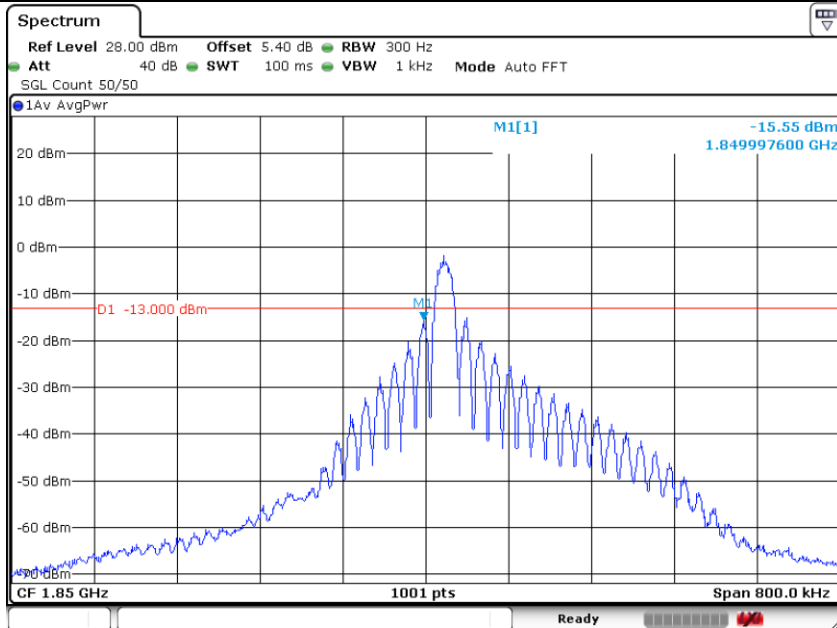


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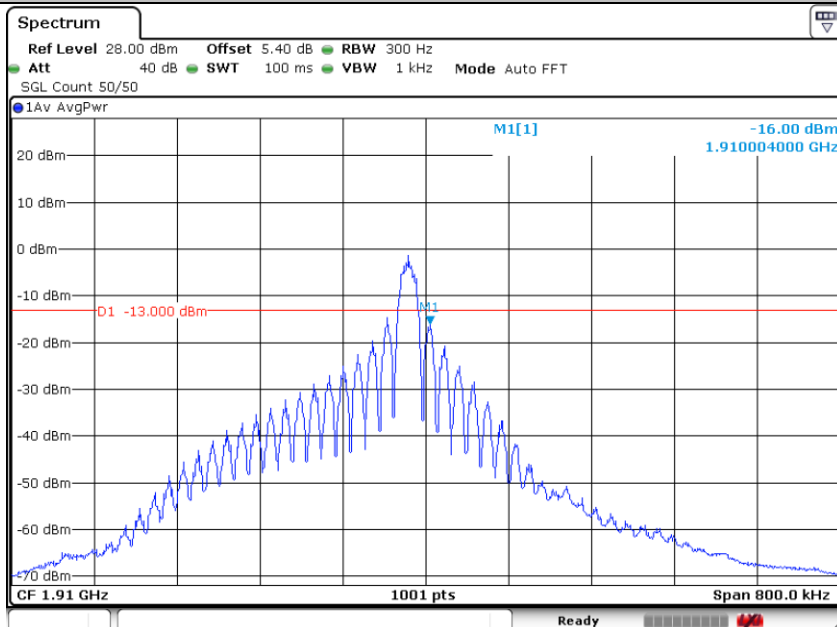
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LTE-NB1/BPSK. Sub-carrier spacing=15kHz-Test Channel=18601-T size=1T0



Date: 20.AUG.2019 05:08:55

LTE-NB1/BPSK. Sub-carrier spacing=15kHz-Test Channel=19199-T size=1T11



Date: 20.AUG.2019 05:15:37

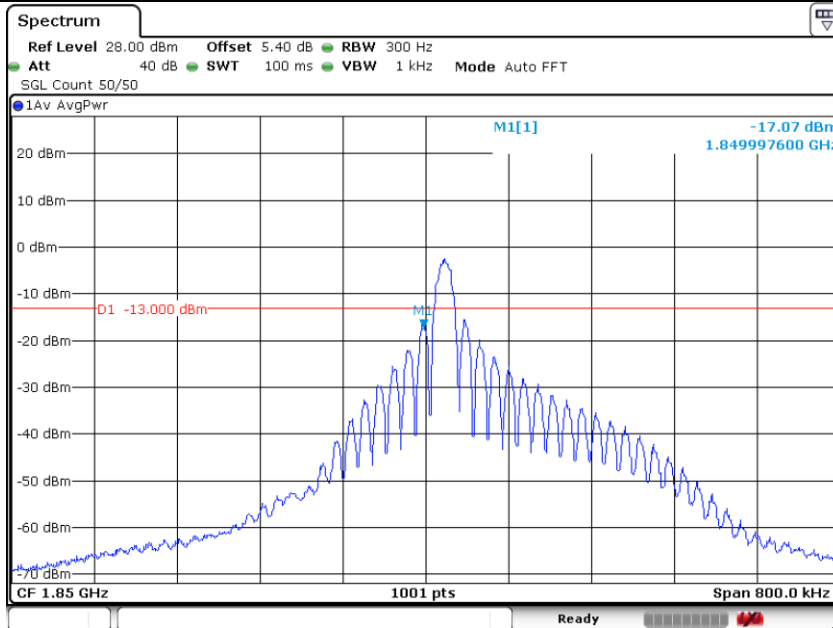


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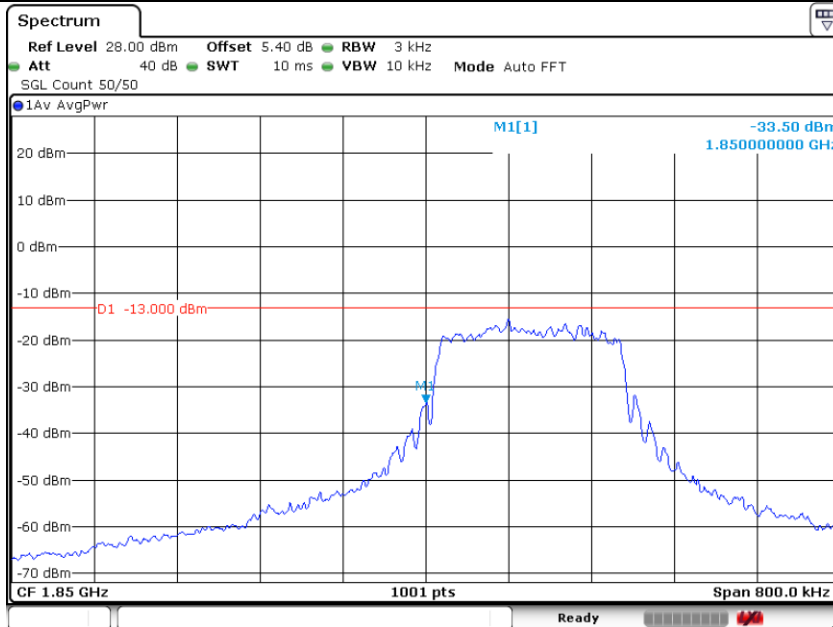
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LTE-NB1/QPSK. Sub-carrier spacing=15kHz-Test Channel=18601-T size=1T0



Date: 20.AUG.2019 05:08:25

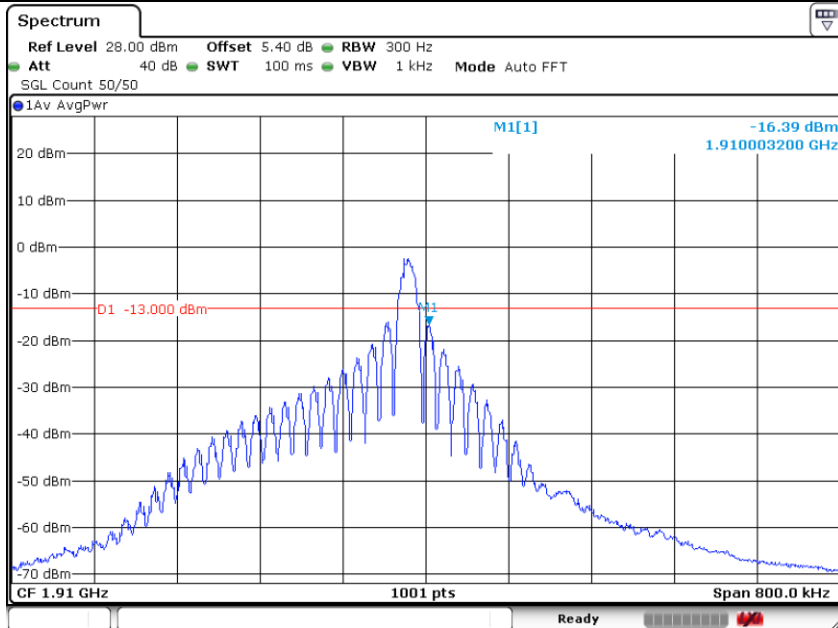
LTE-NB1/QPSK. Sub-carrier spacing=15kHz-Test Channel=18601-T size=12T0



Date: 20.AUG.2019 05:10:07



LTE-NB1/QPSK. Sub-carrier spacing=15kHz-Test Channel=19199-T size=1T11



Date: 20.AUG.2019 05:16:08

LTE-NB1/QPSK. Sub-carrier spacing=15kHz-Test Channel=19199-T size=12T0



Date: 20.AUG.2019 05:12:49



6 Spurious Emission at Antenna Terminal

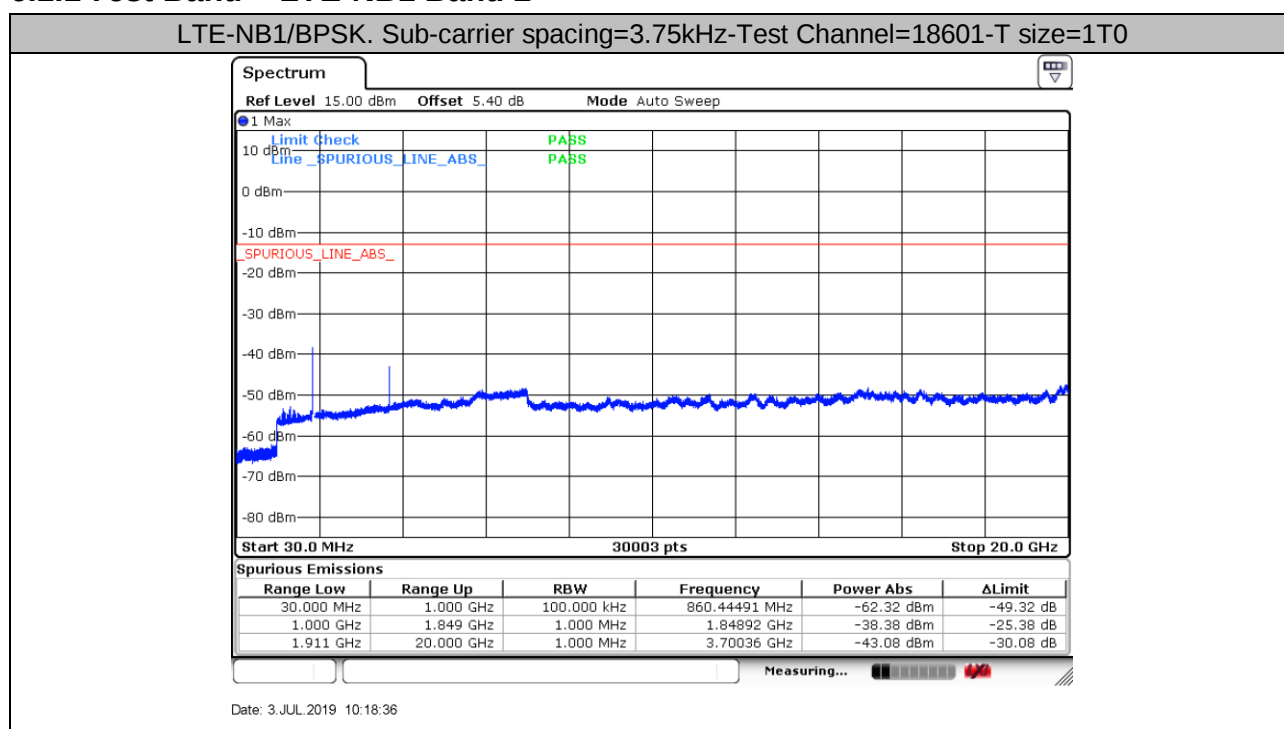
NOTE1: For the averaged unwanted emissions measurements, the measurement points in each sweep is greater than twice the Span/RBW in order to ensure bin-to-bin spacing of $< RBW/2$ so that narrowband signals are not lost between frequency bins. As to the present test item, the "Measurement Points = $k * (Span / RBW)$ " with k between 4 and 5, which results in an acceptable level error of less than 0.5 dB.

NOTE2: only the worst case data displayed in this report.

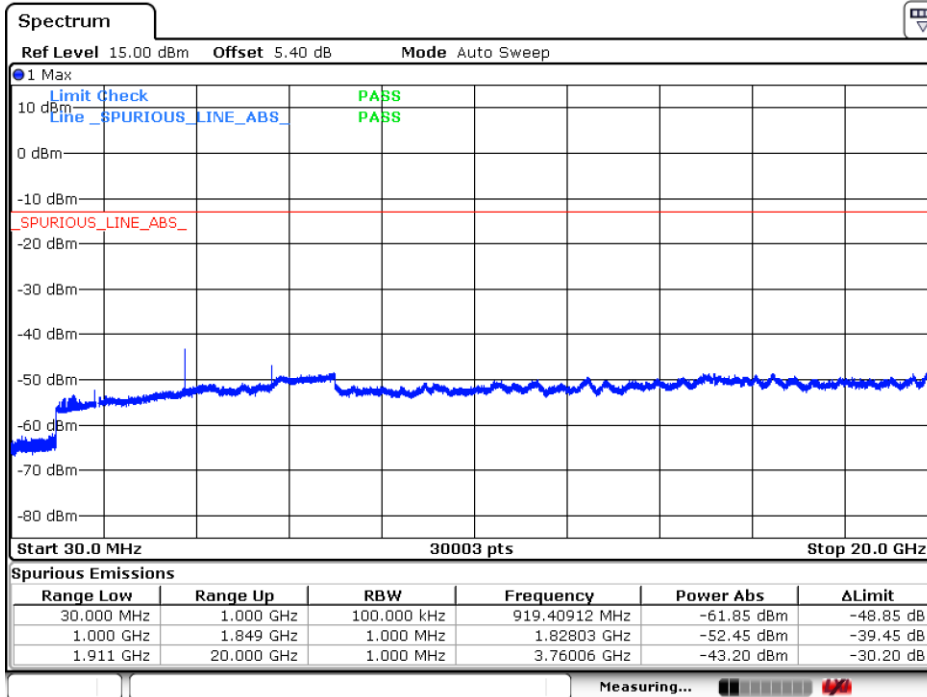
Part I - Test Plots

6.1 For LTE-NB1

6.1.1 Test Band = LTE-NB1 Band 2

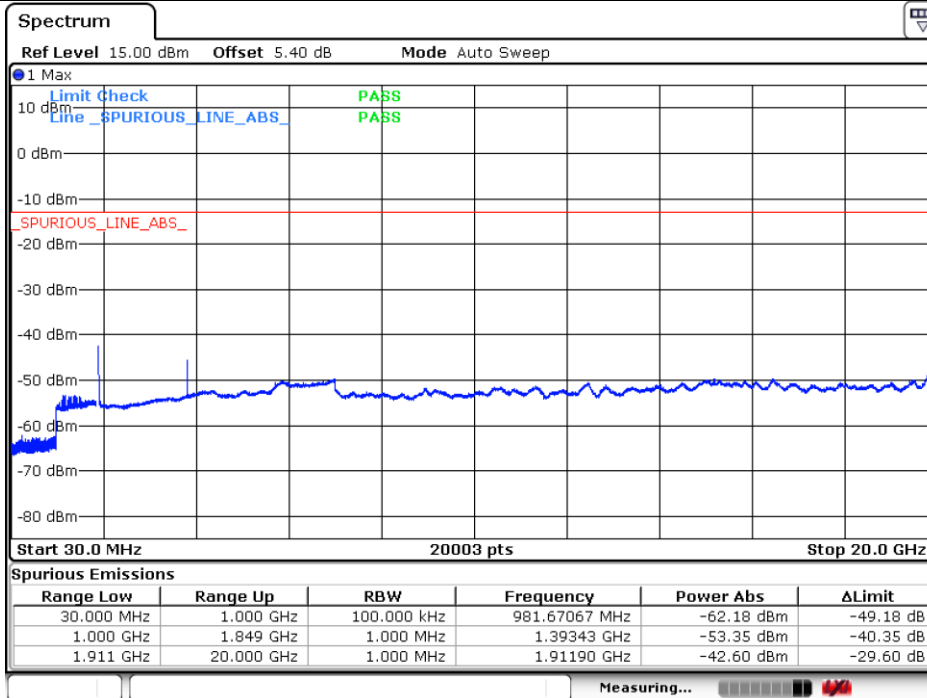


LTE-NB1/BPSK. Sub-carrier spacing=3.75kHz-Test Channel=18900-T size=1T0



Date: 3 JUL 2019 10:23:59

LTE-NB1/BPSK. Sub-carrier spacing=3.75kHz-Test Channel=19199-T size=1T0



Date: 3 JUL 2019 10:40:40

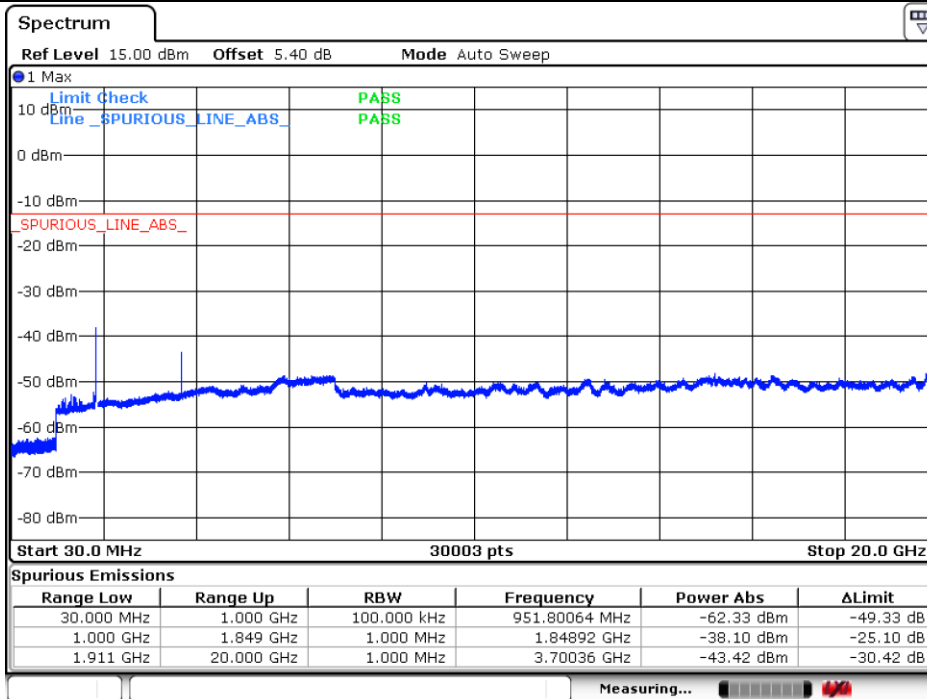


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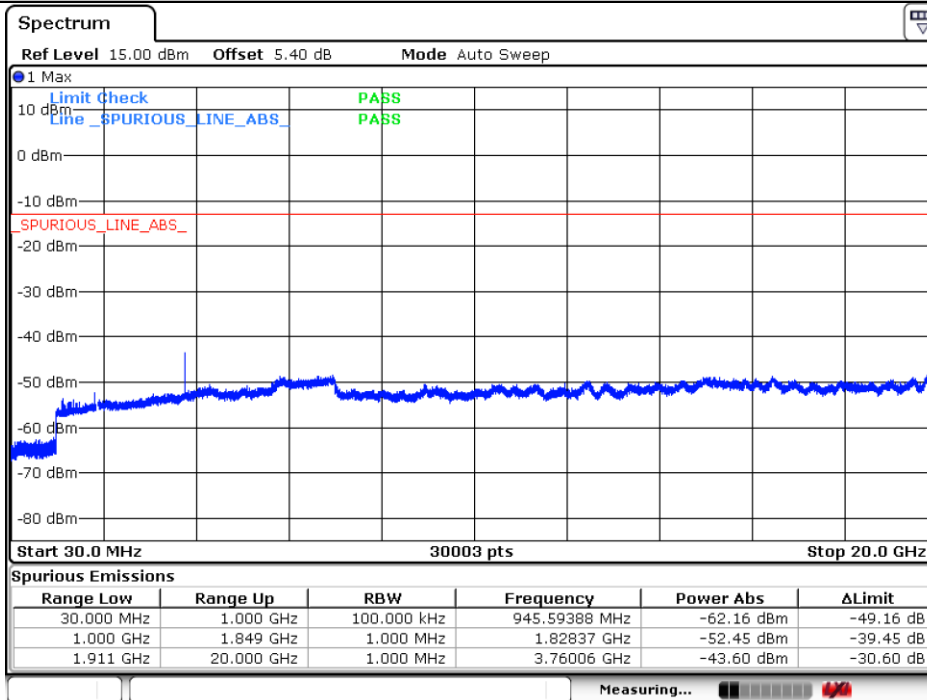
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LTE-NB1/QPSK. Sub-carrier spacing=3.75kHz-Test Channel=18601-T size=1T0



Date: 3 JUL 2019 10:18:08

LTE-NB1/QPSK. Sub-carrier spacing=3.75kHz-Test Channel=18900-T size=1T0



Date: 3 JUL 2019 10:31:33



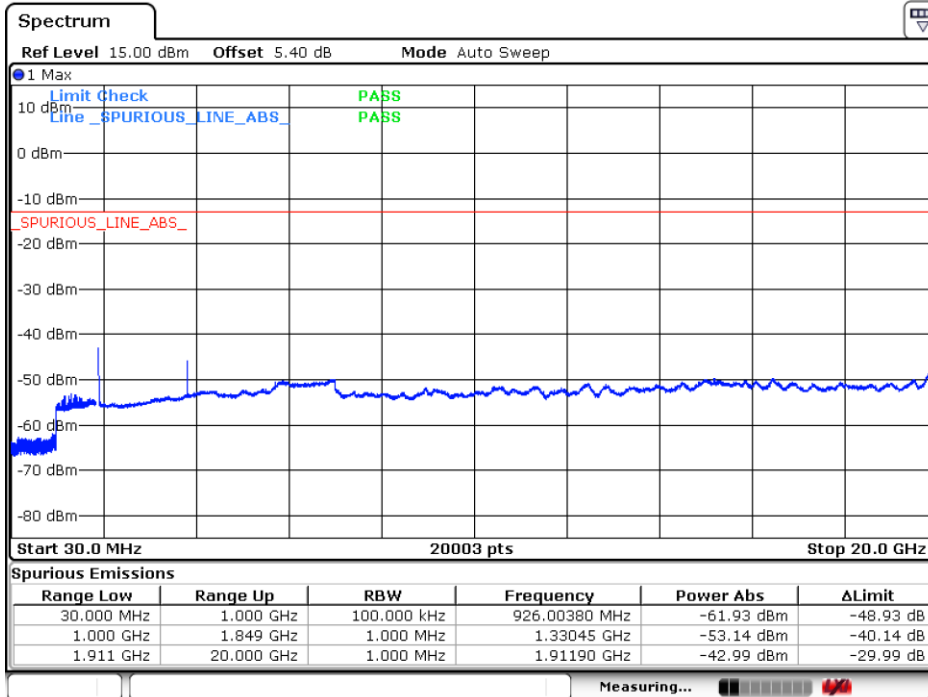
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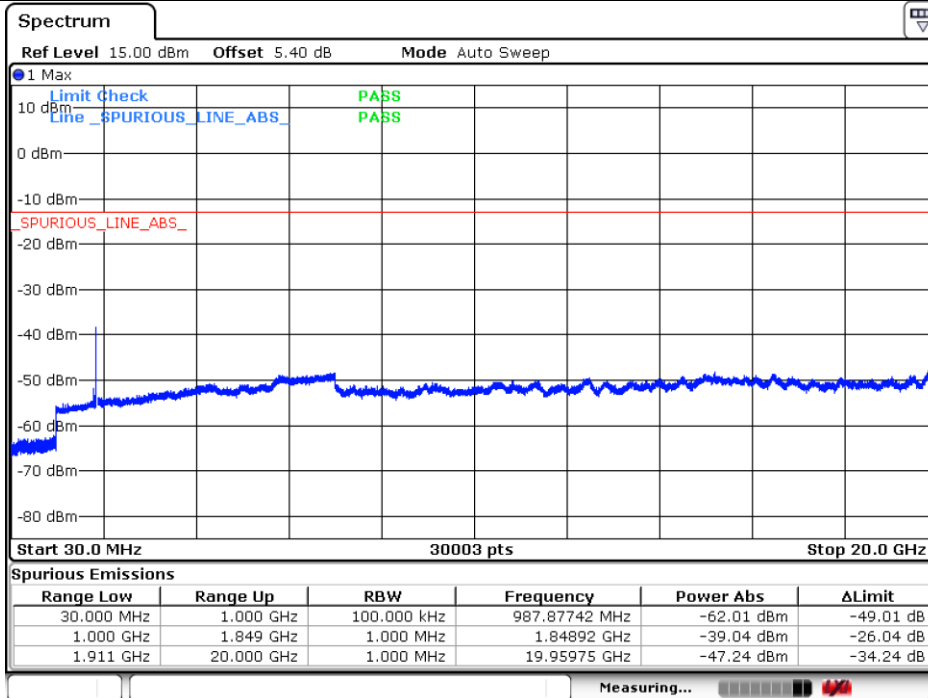
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LTE-NB1/QPSK. Sub-carrier spacing=3.75kHz-Test Channel=19199-T size=1T0



Date: 3 JUL 2019 10:39:55

LTE-NB1/BPSK. Sub-carrier spacing=15kHz-Test Channel=18601-T size=1T0



Date: 3 JUL 2019 10:16:52

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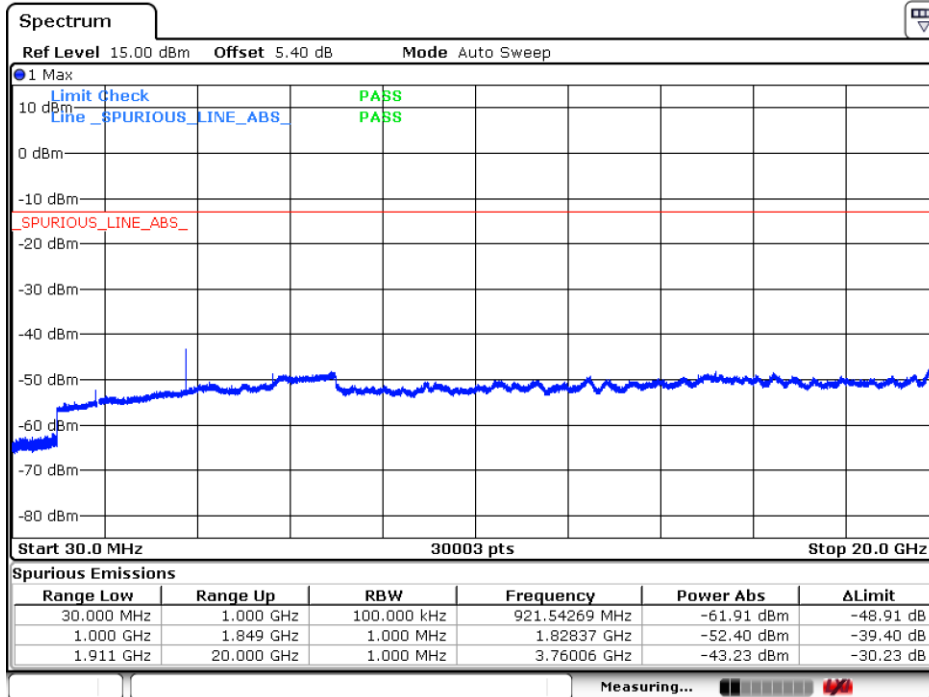
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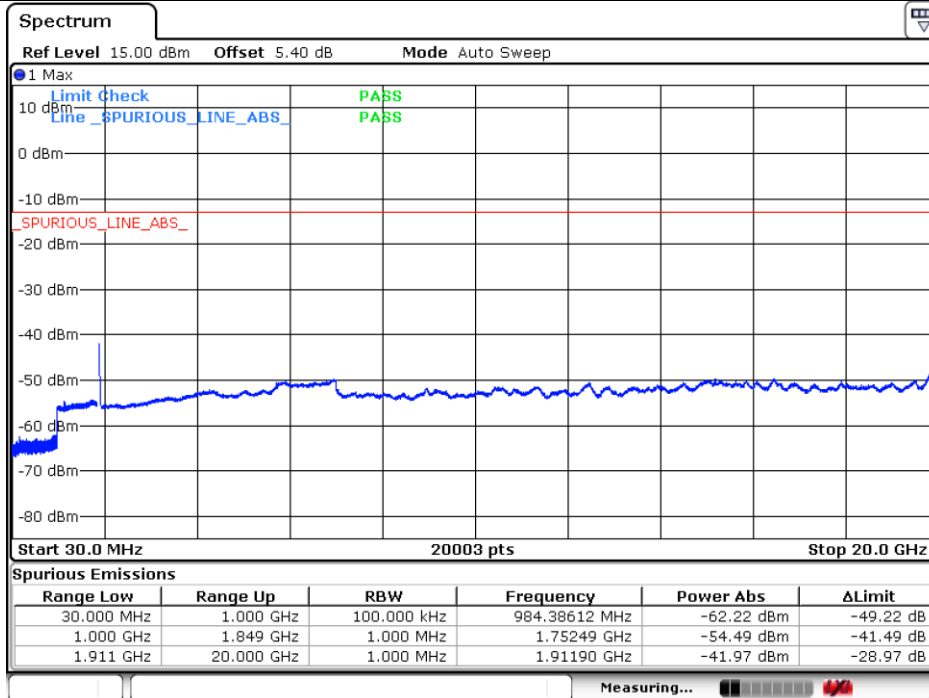
sgs.china@sgs.com

LTE-NB1/BPSK. Sub-carrier spacing=15kHz-Test Channel=18900-T size=1T0



Date: 3 JUL 2019 10:29:53

LTE-NB1/BPSK. Sub-carrier spacing=15kHz-Test Channel=19199-T size=1T0



Date: 3 JUL 2019 10:41:41

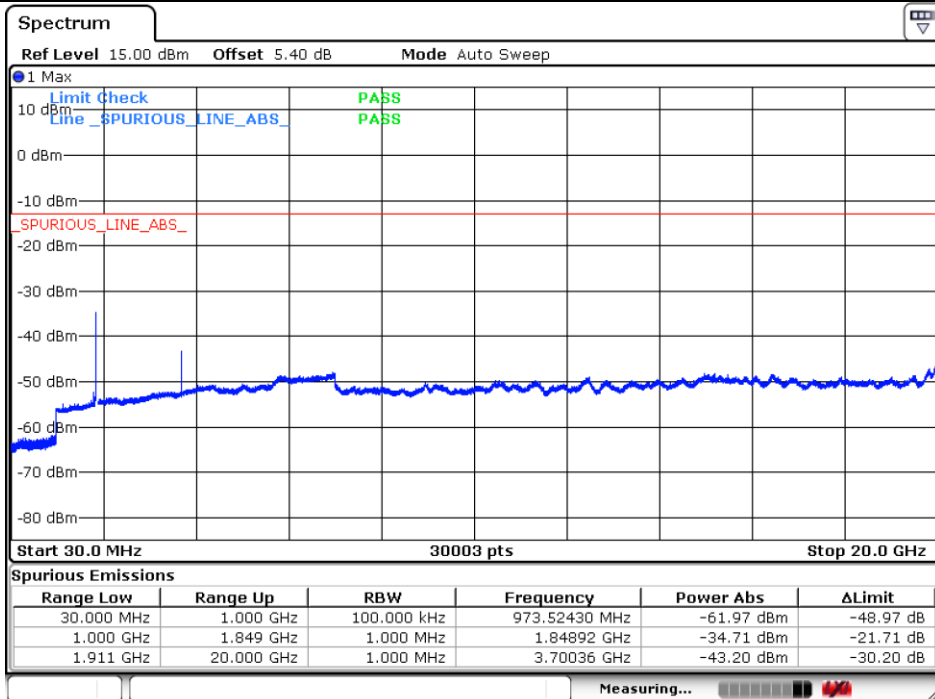


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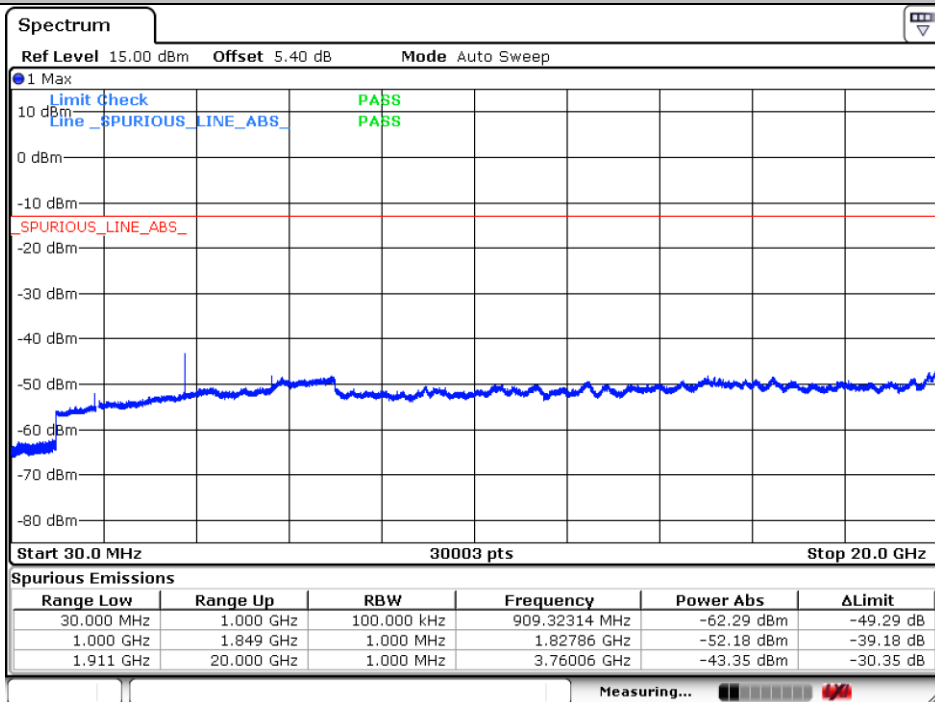
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LTE-NB1/QPSK. Sub-carrier spacing=15kHz-Test Channel=18601-T size=1T0



Date: 3 JUL 2019 10:15:36

LTE-NB1/QPSK. Sub-carrier spacing=15kHz-Test Channel=18900-T size=1T0



Date: 3 JUL 2019 10:27:27

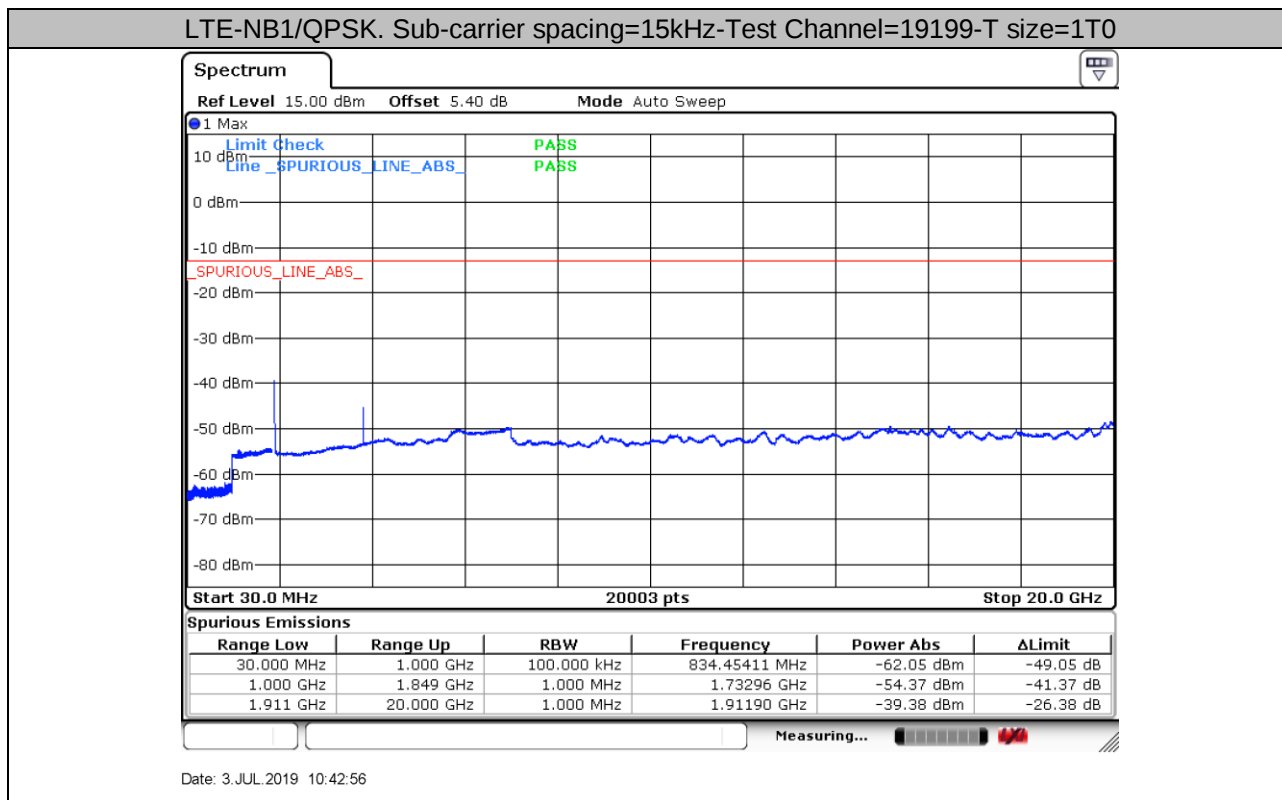


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7 Field Strength of Spurious Radiation

7.1 For LTE-NB1

7.1.1 Test Band = LTE-NB1 Band 2

7.1.1.1 Test Mode = LTE-NB1/BPSK. Sub-carrier spacing=3.75kHz

7.1.1.1.1 Test Channel = 18601

Frequency (MHz)	Level (dBm)	Limit Line (dBm)	Over Limit (dB)	Polarization
64.600000	-80.51	-13.00	67.51	Vertical
270.400000	-87.33	-13.00	74.33	Vertical
785.729167	-78.51	-13.00	65.51	Vertical
3704.925000	-60.87	-13.00	47.87	Vertical
5557.425000	-63.18	-13.00	50.18	Vertical
7410.412500	-56.89	-13.00	43.89	Vertical
62.350000	-76.74	-13.00	63.74	Horizontal
264.800000	-85.83	-13.00	72.83	Horizontal
780.366667	-78.95	-13.00	65.95	Horizontal
3704.925000	-48.90	-13.00	35.90	Horizontal
5557.425000	-63.77	-13.00	50.77	Horizontal
7409.437500	-61.52	-13.00	48.52	Horizontal

7.1.1.1.2 Test Channel = 18900

Frequency (MHz)	Level (dBm)	Limit Line (dBm)	Over Limit (dB)	Polarization
64.600000	-80.68	-13.00	67.68	Vertical
349.750000	-84.80	-13.00	71.80	Vertical
922.587500	-76.40	-13.00	63.40	Vertical
3759.525000	-61.37	-13.00	48.37	Vertical
5639.812500	-61.80	-13.00	48.80	Vertical
7519.612500	-58.48	-13.00	45.48	Vertical
62.900000	-76.65	-13.00	63.65	Horizontal
267.450000	-85.70	-13.00	72.70	Horizontal
788.983333	-78.57	-13.00	65.57	Horizontal
3759.525000	-53.02	-13.00	40.02	Horizontal
5939.137500	-64.71	-13.00	51.71	Horizontal
7520.100000	-61.48	-13.00	48.48	Horizontal



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7.1.1.1.3 Test Channel = 19199

Frequency (MHz)	Level (dBm)	Limit Line (dBm)	Over Limit (dB)	Polarization
64.050000	-80.12	-13.00	67.12	Vertical
329.100000	-85.70	-13.00	72.70	Vertical
793.750000	-78.02	-13.00	65.02	Vertical
3814.612500	-63.04	-13.00	50.04	Vertical
5722.200000	-61.07	-13.00	48.07	Vertical
7630.275000	-59.39	-13.00	46.39	Vertical
63.250000	-76.59	-13.00	63.59	Horizontal
266.600000	-86.00	-13.00	73.00	Horizontal
854.754167	-77.79	-13.00	64.79	Horizontal
3814.612500	-51.86	-13.00	38.86	Horizontal
5815.312500	-65.02	-13.00	52.02	Horizontal
7629.300000	-62.42	-13.00	49.42	Horizontal

NOTE:

- 1) The disturbance above 13GHz and below 30MHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed.
- 2) only the worst case data presented in this report.



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8 Frequency Stability

8.1 Frequency Error VS. Voltage

BAND	Band width	Modulation	Channel	Number of T	Voltage [Vdc]	Temperature (°C)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Verdict
NB1 Band 2	180KHz	BPSK/15KHz	18601	12T0	VL	TN	-10.91	-0.005897	±2.5	PASS
NB1 Band 2	180KHz	BPSK/15KHz	18601	12T0	VN	TN	-14.64	-0.007911	±2.5	PASS
NB1 Band 2	180KHz	BPSK/15KHz	18601	12T0	VH	TN	13.81	0.007466	±2.5	PASS
NB1 Band 2	180KHz	BPSK/15KHz	18900	12T0	VL	TN	-12.05	-0.006407	±2.5	PASS
NB1 Band 2	180KHz	BPSK/15KHz	18900	12T0	VN	TN	11.12	0.005916	±2.5	PASS
NB1 Band 2	180KHz	BPSK/15KHz	18900	12T0	VH	TN	9.32	0.004955	±2.5	PASS
NB1 Band 2	180KHz	BPSK/15KHz	19199	12T0	VL	TN	1.96	0.001028	±2.5	PASS
NB1 Band 2	180KHz	BPSK/15KHz	19199	12T0	VN	TN	10.80	0.005656	±2.5	PASS
NB1 Band 2	180KHz	BPSK/15KHz	19199	12T0	VH	TN	9.30	0.004868	±2.5	PASS
NB1 Band 2	180KHz	QPSK/15KHz	18601	12T0	VL	TN	-4.40	-0.002377	±2.5	PASS
NB1 Band 2	180KHz	QPSK/15KHz	18601	12T0	VN	TN	-2.21	-0.001192	±2.5	PASS
NB1 Band 2	180KHz	QPSK/15KHz	18601	12T0	VH	TN	12.57	0.006796	±2.5	PASS
NB1 Band 2	180KHz	QPSK/15KHz	18900	12T0	VL	TN	13.89	0.007390	±2.5	PASS
NB1 Band 2	180KHz	QPSK/15KHz	18900	12T0	VN	TN	-8.38	-0.004456	±2.5	PASS
NB1 Band 2	180KHz	QPSK/15KHz	18900	12T0	VH	TN	-12.38	-0.006585	±2.5	PASS
NB1 Band 2	180KHz	QPSK/15KHz	19199	12T0	VL	TN	-9.31	-0.004876	±2.5	PASS
NB1 Band 2	180KHz	QPSK/15KHz	19199	12T0	VN	TN	9.94	0.005202	±2.5	PASS
NB1 Band 2	180KHz	QPSK/15KHz	19199	12T0	VH	TN	12.68	0.006640	±2.5	PASS

8.2 Frequency Error VS. Temperature

BAND	Band width	Modulation	Channel	Number of T	Voltage [Vdc]	Temperature (°C)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Verdict
NB1 Band 2	180KHz	BPSK/15KHz	18601	12T0	NV	-30	-10.55	-0.005703	±2.5	PASS
NB1 Band 2	180KHz	BPSK/15KHz	18601	12T0	NV	-20	-2.43	-0.001312	±2.5	PASS
NB1 Band 2	180KHz	BPSK/15KHz	18601	12T0	NV	0	7.81	0.004221	±2.5	PASS
NB1 Band 2	180KHz	BPSK/15KHz	18601	12T0	NV	10	7.81	0.004222	±2.5	PASS
NB1 Band 2	180KHz	BPSK/15KHz	18601	12T0	NV	20	4.61	0.002490	±2.5	PASS
NB1 Band 2	180KHz	BPSK/15KHz	18601	12T0	NV	30	-0.71	-0.000383	±2.5	PASS
NB1 Band 2	180KHz	BPSK/15KHz	18601	12T0	NV	40	-12.68	-0.006854	±2.5	PASS
NB1 Band 2	180KHz	BPSK/15KHz	18601	12T0	NV	50	-5.10	-0.002755	±2.5	PASS
NB1 Band 2	180KHz	BPSK/15KHz	18900	12T0	NV	-30	4.89	0.002604	±2.5	PASS
NB1 Band 2	180KHz	BPSK/15KHz	18900	12T0	NV	-20	5.51	0.002930	±2.5	PASS
NB1 Band 2	180KHz	BPSK/15KHz	18900	12T0	NV	0	-8.41	-0.004476	±2.5	PASS
NB1 Band 2	180KHz	BPSK/15KHz	18900	12T0	NV	10	10.87	0.005781	±2.5	PASS
NB1 Band 2	180KHz	BPSK/15KHz	18900	12T0	NV	20	0.43	0.000226	±2.5	PASS
NB1 Band 2	180KHz	BPSK/15KHz	18900	12T0	NV	30	-12.47	-0.006631	±2.5	PASS
NB1 Band 2	180KHz	BPSK/15KHz	18900	12T0	NV	40	-11.45	-0.006090	±2.5	PASS
NB1 Band 2	180KHz	BPSK/15KHz	18900	12T0	NV	50	5.58	0.002970	±2.5	PASS
NB1 Band 2	180KHz	BPSK/15KHz	19199	12T0	NV	-30	0.99	0.000519	±2.5	PASS
NB1 Band 2	180KHz	BPSK/15KHz	19199	12T0	NV	-20	10.90	0.005705	±2.5	PASS
NB1 Band 2	180KHz	BPSK/15KHz	19199	12T0	NV	0	6.50	0.003404	±2.5	PASS
NB1 Band 2	180KHz	BPSK/15KHz	19199	12T0	NV	10	5.41	0.002834	±2.5	PASS



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NB1 Band 2	180KHz	BPSK/15KHz	19199	12T0	NV	20	3.76	0.001968	±2.5	PASS
NB1 Band 2	180KHz	BPSK/15KHz	19199	12T0	NV	30	7.85	0.004112	±2.5	PASS
NB1 Band 2	180KHz	BPSK/15KHz	19199	12T0	NV	40	13.53	0.007086	±2.5	PASS
NB1 Band 2	180KHz	BPSK/15KHz	19199	12T0	NV	50	-11.79	-0.006171	±2.5	PASS
NB1 Band 2	180KHz	QPSK/15KHz	18601	12T0	NV	-30	12.44	0.006722	±2.5	PASS
NB1 Band 2	180KHz	QPSK/15KHz	18601	12T0	NV	-20	14.93	0.008067	±2.5	PASS
NB1 Band 2	180KHz	QPSK/15KHz	18601	12T0	NV	0	-6.93	-0.003745	±2.5	PASS
NB1 Band 2	180KHz	QPSK/15KHz	18601	12T0	NV	10	-2.84	-0.001533	±2.5	PASS
NB1 Band 2	180KHz	QPSK/15KHz	18601	12T0	NV	20	-1.56	-0.000843	±2.5	PASS
NB1 Band 2	180KHz	QPSK/15KHz	18601	12T0	NV	30	13.38	0.007234	±2.5	PASS
NB1 Band 2	180KHz	QPSK/15KHz	18601	12T0	NV	40	7.08	0.003828	±2.5	PASS
NB1 Band 2	180KHz	QPSK/15KHz	18601	12T0	NV	50	14.05	0.007592	±2.5	PASS
NB1 Band 2	180KHz	QPSK/15KHz	18900	12T0	NV	-30	-10.65	-0.005666	±2.5	PASS
NB1 Band 2	180KHz	QPSK/15KHz	18900	12T0	NV	-20	4.56	0.002423	±2.5	PASS
NB1 Band 2	180KHz	QPSK/15KHz	18900	12T0	NV	0	-9.21	-0.004897	±2.5	PASS
NB1 Band 2	180KHz	QPSK/15KHz	18900	12T0	NV	10	7.12	0.003786	±2.5	PASS
NB1 Band 2	180KHz	QPSK/15KHz	18900	12T0	NV	20	4.18	0.002224	±2.5	PASS
NB1 Band 2	180KHz	QPSK/15KHz	18900	12T0	NV	30	-11.59	-0.006166	±2.5	PASS
NB1 Band 2	180KHz	QPSK/15KHz	18900	12T0	NV	40	-13.33	-0.007093	±2.5	PASS
NB1 Band 2	180KHz	QPSK/15KHz	18900	12T0	NV	50	-2.17	-0.001154	±2.5	PASS
NB1 Band 2	180KHz	QPSK/15KHz	19199	12T0	NV	-30	-12.49	-0.006541	±2.5	PASS
NB1 Band 2	180KHz	QPSK/15KHz	19199	12T0	NV	-20	-14.99	-0.007850	±2.5	PASS
NB1 Band 2	180KHz	QPSK/15KHz	19199	12T0	NV	0	7.02	0.003678	±2.5	PASS
NB1 Band 2	180KHz	QPSK/15KHz	19199	12T0	NV	10	-2.47	-0.001294	±2.5	PASS
NB1 Band 2	180KHz	QPSK/15KHz	19199	12T0	NV	20	-10.87	-0.005689	±2.5	PASS
NB1 Band 2	180KHz	QPSK/15KHz	19199	12T0	NV	30	5.67	0.002967	±2.5	PASS
NB1 Band 2	180KHz	QPSK/15KHz	19199	12T0	NV	40	-1.96	-0.001025	±2.5	PASS
NB1 Band 2	180KHz	QPSK/15KHz	19199	12T0	NV	50	-12.59	-0.006592	±2.5	PASS

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