



# Appendix B

## LTE-NB1 Band 5





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# 1 Effective (Isotropic) Radiated Power Output Data

## 1.1 Test Result for LTE NB1 Band 5

Test Band	Test Mode	Sub-carrier Spacing (kHz)	Test channel	Number of T	Conducted Power (dBm)	ERP (dBm)	limit (dBm)	Verdict
NB1 Band 5	BPSK	3.75	20401	1T0	23.02	21.99	38.45	PASS
NB1 Band 5	BPSK	3.75	20401	1T47	23.12	22.09	38.45	PASS
NB1 Band 5	BPSK	3.75	20525	1T0	23.10	22.07	38.45	PASS
NB1 Band 5	BPSK	3.75	20525	1T47	22.89	21.86	38.45	PASS
NB1 Band 5	BPSK	3.75	20649	1T0	23.11	22.08	38.45	PASS
NB1 Band 5	BPSK	3.75	20649	1T47	23.14	22.11	38.45	PASS
NB1 Band 5	QPSK	3.75	20401	1T0	22.94	21.91	38.45	PASS
NB1 Band 5	QPSK	3.75	20401	1T47	23.01	21.98	38.45	PASS
NB1 Band 5	QPSK	3.75	20525	1T0	22.87	21.84	38.45	PASS
NB1 Band 5	QPSK	3.75	20525	1T47	23.15	22.12	38.45	PASS
NB1 Band 5	QPSK	3.75	20649	1T0	23.05	22.02	38.45	PASS
NB1 Band 5	QPSK	3.75	20649	1T47	23.03	22.00	38.45	PASS

Test Band	Test Mode	Sub-carrier Spacing (kHz)	Test channel	Number of T	Conducted Power (dBm)	ERP (dBm)	limit (dBm)	Verdict
NB1 Band 5	BPSK	15	20401	1T0	23.08	22.05	38.45	PASS
NB1 Band 5	BPSK	15	20401	1T11	22.81	21.78	38.45	PASS
NB1 Band 5	BPSK	15	20525	1T0	23.00	21.97	38.45	PASS
NB1 Band 5	BPSK	15	20525	1T11	23.01	21.98	38.45	PASS
NB1 Band 5	BPSK	15	20649	1T0	23.08	22.05	38.45	PASS
NB1 Band 5	BPSK	15	20649	1T11	23.13	22.10	38.45	PASS
NB1 Band 5	QPSK	15	20401	1T0	22.93	21.90	38.45	PASS
NB1 Band 5	QPSK	15	20401	1T11	22.94	21.91	38.45	PASS
NB1 Band 5	QPSK	15	20401	12T0	21.75	20.72	38.45	PASS
NB1 Band 5	QPSK	15	20525	1T0	22.86	21.83	38.45	PASS
NB1 Band 5	QPSK	15	20525	1T11	22.87	21.84	38.45	PASS
NB1 Band 5	QPSK	15	20525	12T0	22.11	21.08	38.45	PASS
NB1 Band 5	QPSK	15	20649	1T0	23.00	21.97	38.45	PASS
NB1 Band 5	QPSK	15	20649	1T11	23.05	22.02	38.45	PASS
NB1 Band 5	QPSK	15	20649	12T0	21.86	20.83	38.45	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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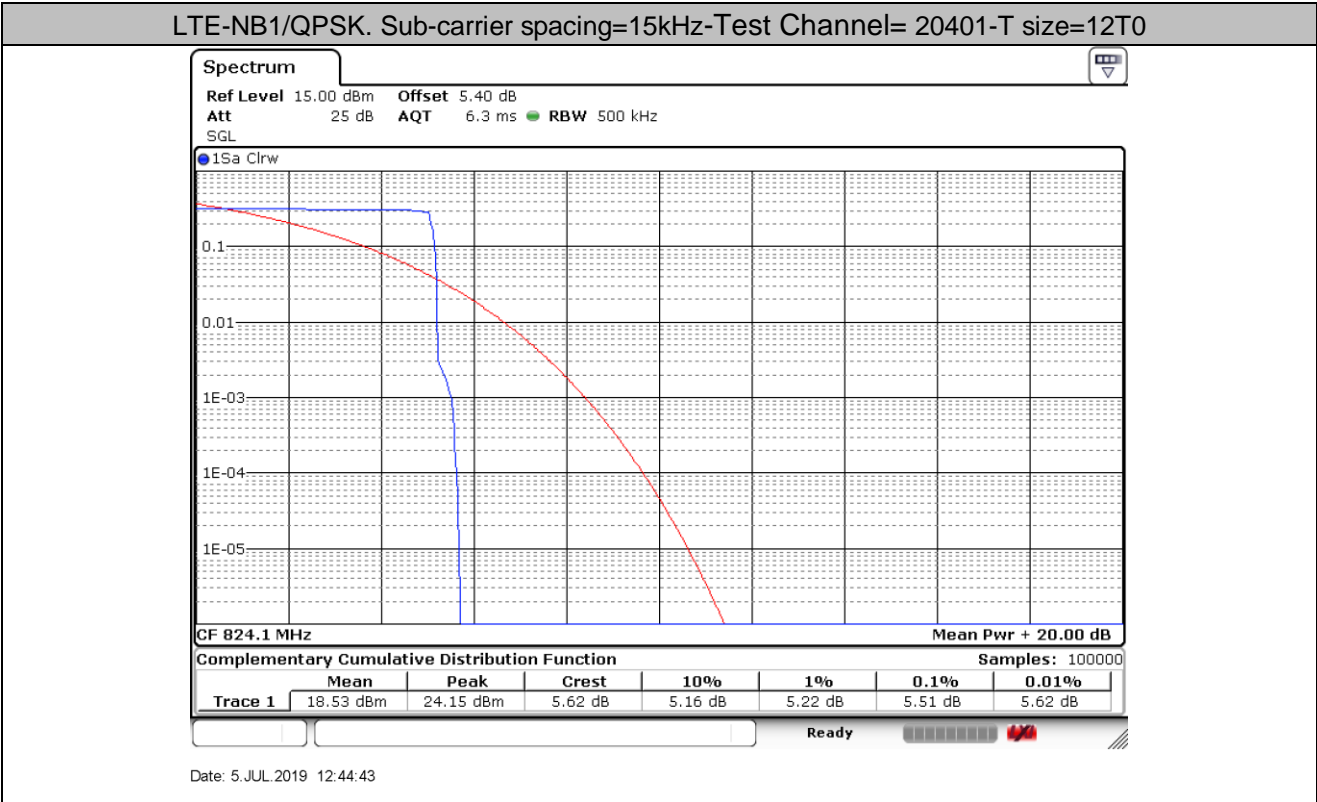
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## 2 Peak-to-Average Ratio

Test Band	Test Mode	Test Channel	Measured[dB]	Limit [dB]	Verdict
NB1 Band 5	QPSK/12T0	20401	5.51	13	PASS
NB1 Band 5	QPSK/12T0	20525	5.42	13	PASS
NB1 Band 5	QPSK/12T0	20649	5.65	13	PASS

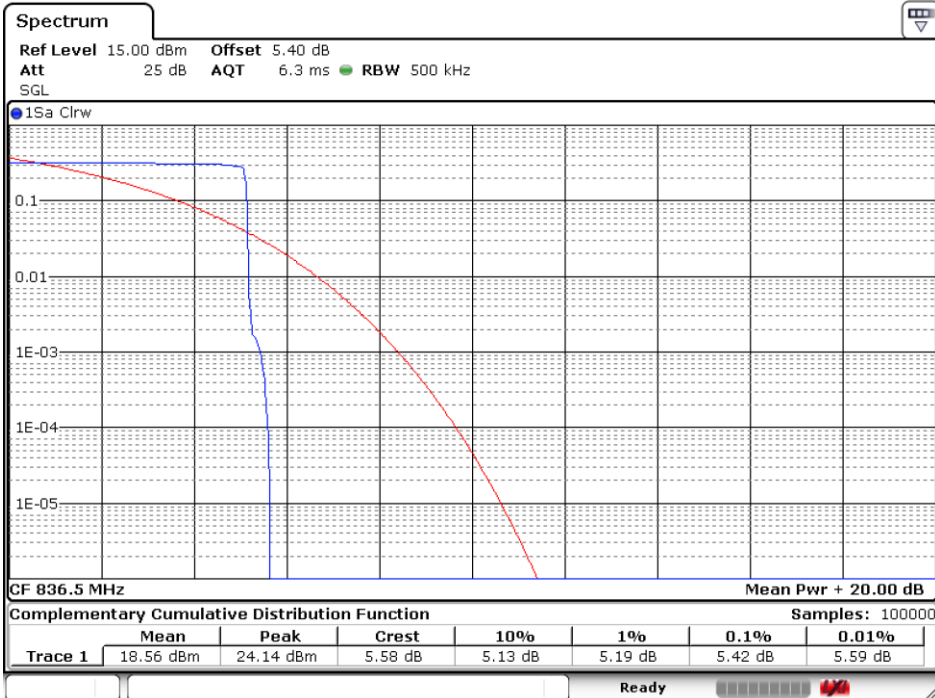
### 2.1 For LTE-NB1

#### 2.1.1 Test Band = LTE-NB1 Band 5



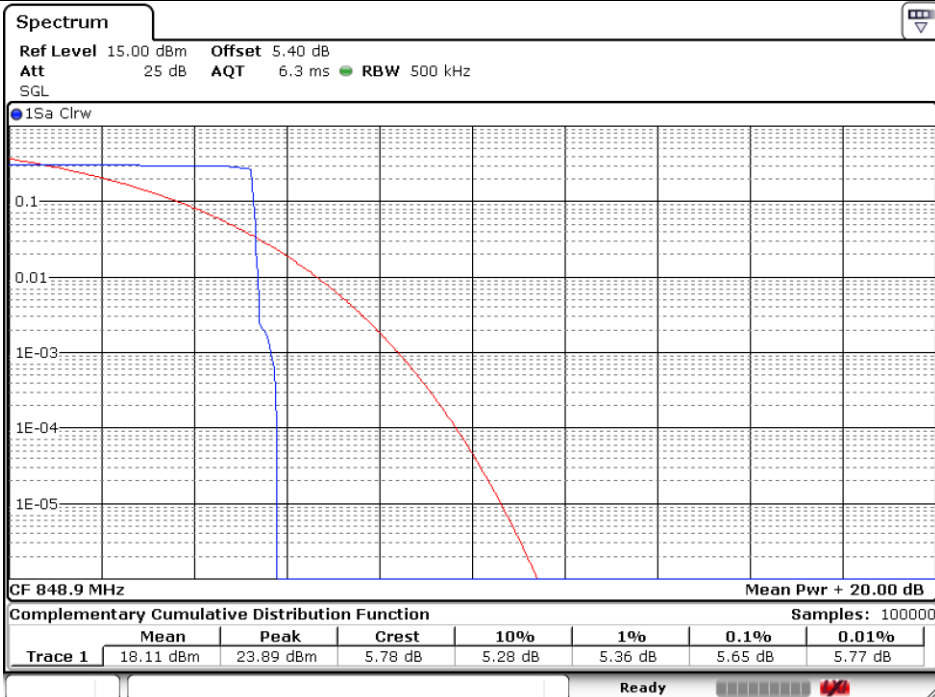


## LTE-NB1/QPSK. Sub-carrier spacing=15kHz-Test Channel= 20525-T size=12T0



Date: 5 JUL 2019 12:50:02

## LTE-NB1/QPSK. Sub-carrier spacing=15kHz-Test Channel= 20649-T size=12T0



Date: 5 JUL 2019 12:57:13



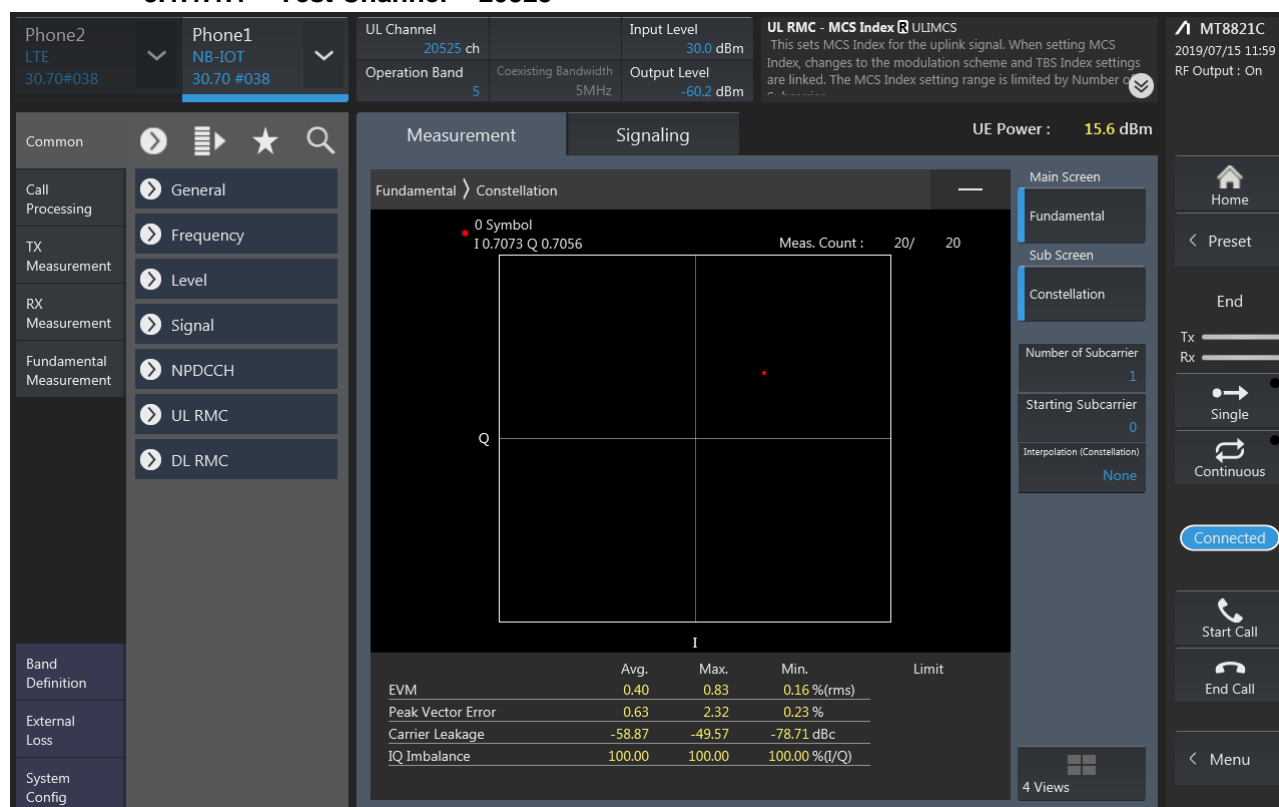
## 3 Modulation Characteristics

### 3.1 For LTE-NB1

#### 3.1.1 Test Band = LTE-NB1 Band 5

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

##### 3.1.1.1.1 Test Channel = 20525

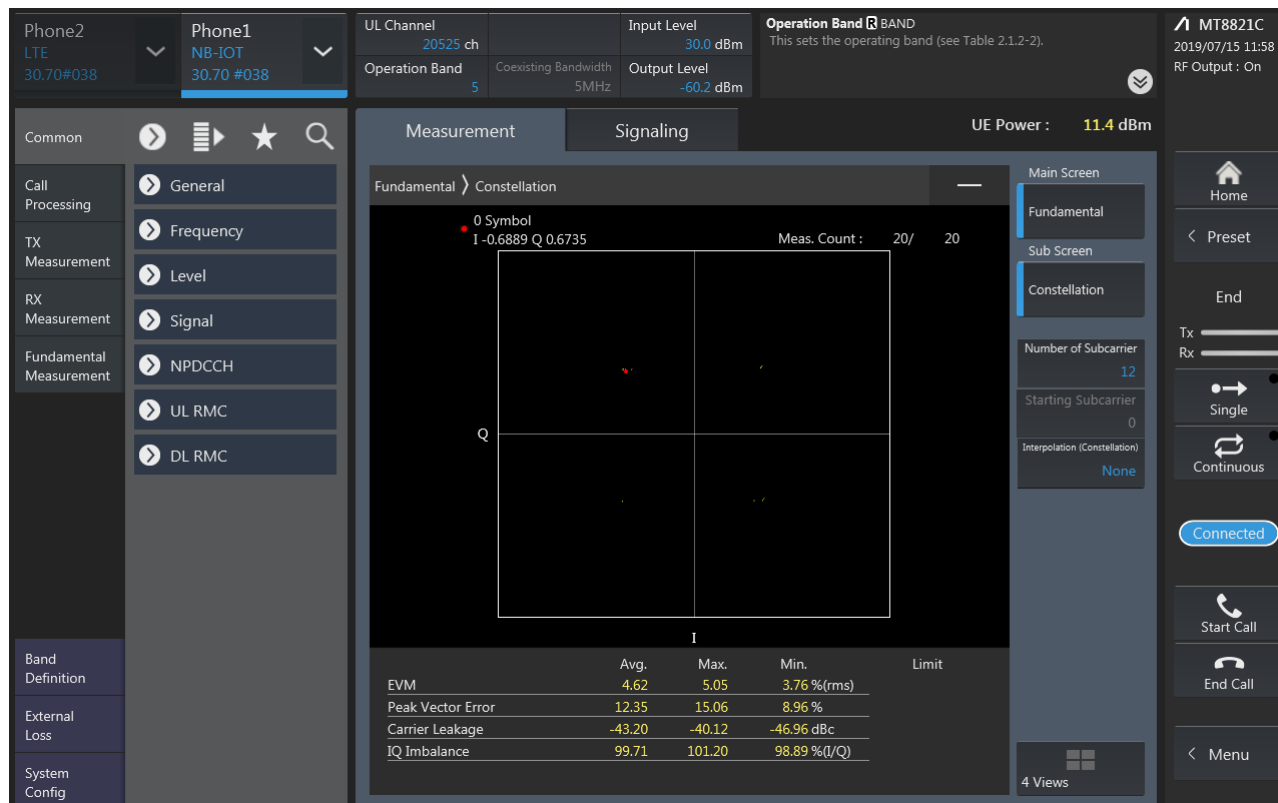


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### 3.1.1.2 Test Mode = LTE-NB1/QPSK. Sub-carrier spacing=15kHz.T size=12T0

#### 3.1.1.2.1 Test Channel = 20525

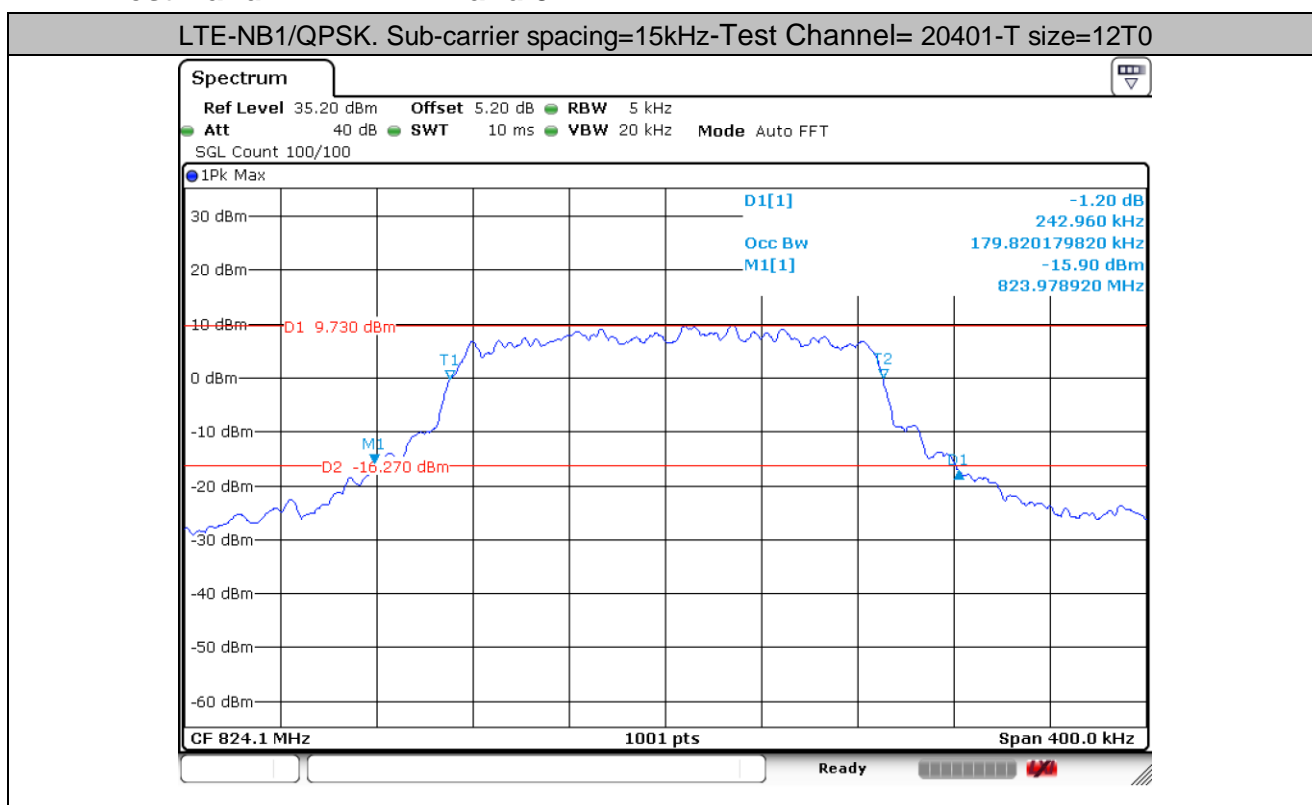


## 4 Bandwidth

Test Band	Test Mode	T size	Test Channel	Occupied Bandwidth [kHz]	Emission Bandwidth [kHz]	Verdict
NB1 Band 5	QPSK/15kHz	12T0	20401	179.82	242.96	PASS
NB1 Band 5	QPSK/15kHz	12T0	20525	179.82	241.36	PASS
NB1 Band 5	QPSK/15kHz	12T0	20649	179.02	240.16	PASS

#### 4.1 For LTE-NB1

#### 4.1.1 Test Band = LTE-NB1 Band 5



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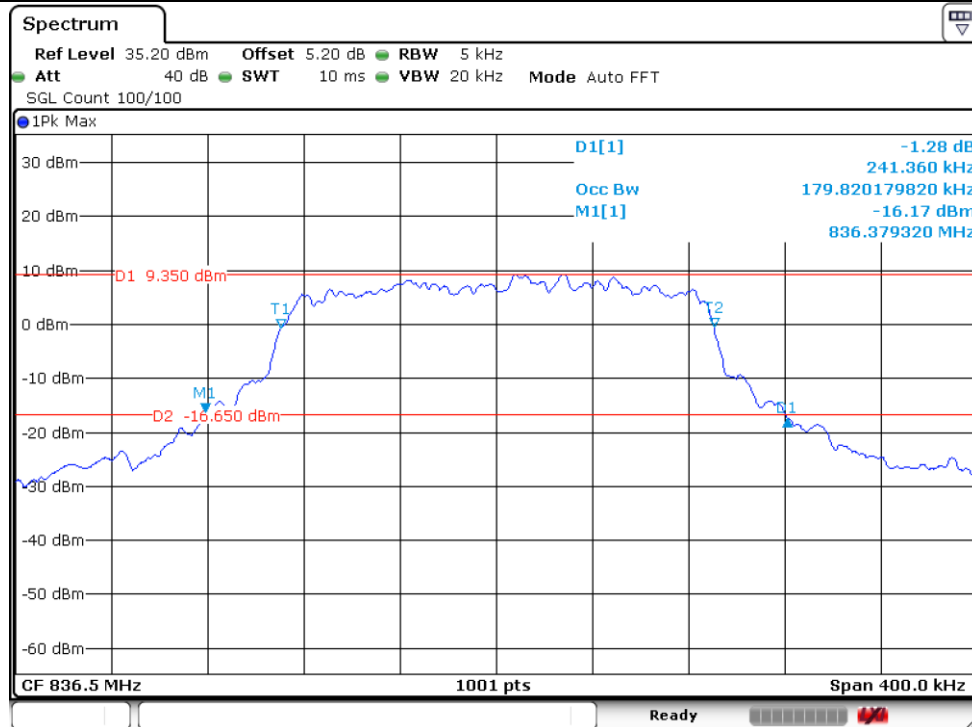
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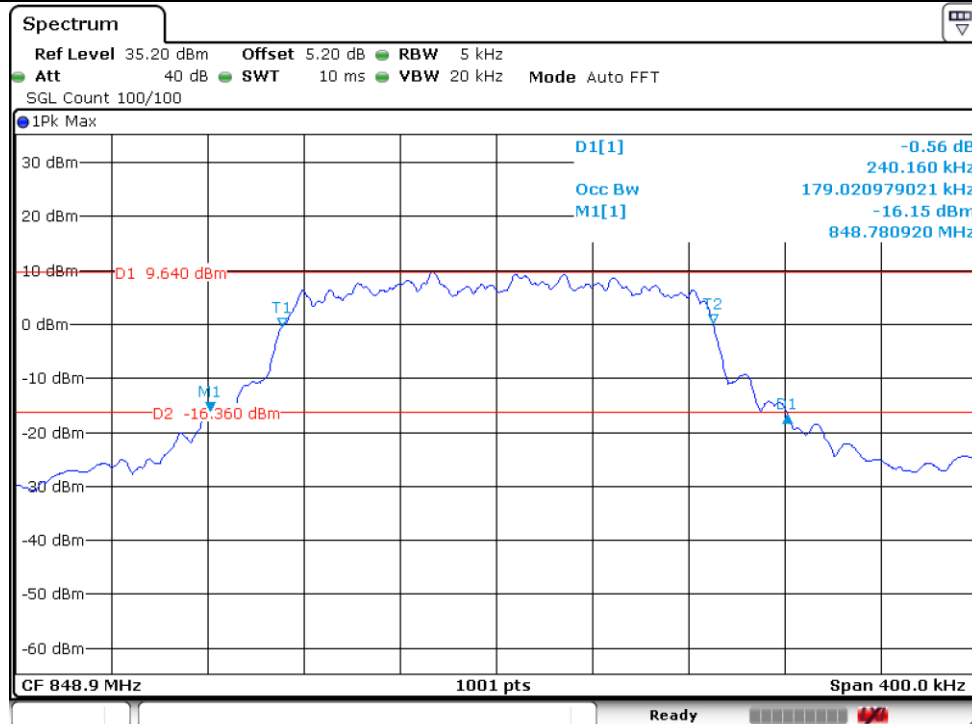
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## LTE-NB1/QPSK. Sub-carrier spacing=15kHz-Test Channel= 20525-T size=12T0



## LTE-NB1/QPSK. Sub-carrier spacing=15kHz-Test Channel= 20649-T size=12T0

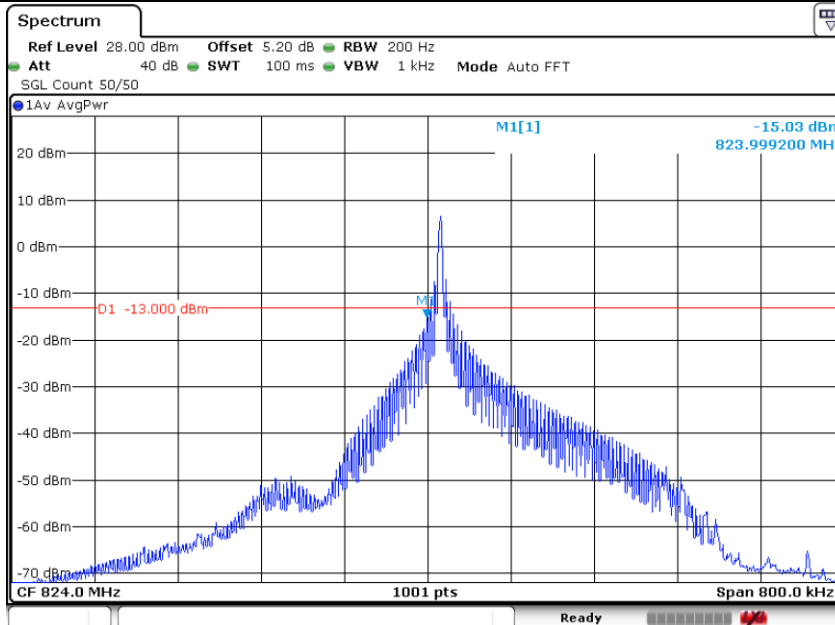


## 5 Band Edges Compliance

### 5.1 For LTE-NB1

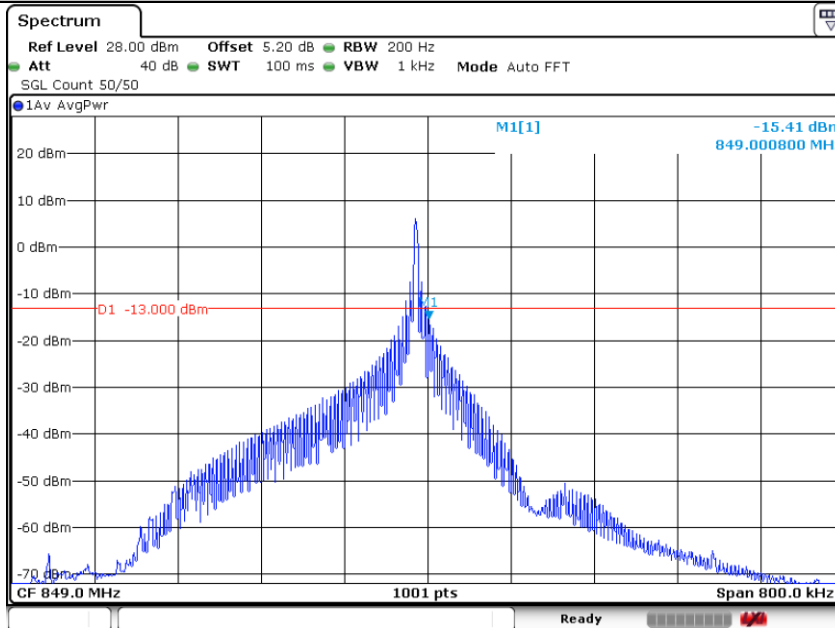
#### 5.1.1 Test Band = LTE-NB1 Band 5

LTE-NB1/BPSK. Sub-carrier spacing=3.75kHz-Test Channel=20401-T size=1T0



Date: 20.AUG.2019 05:30:42

LTE-NB1/BPSK. Sub-carrier spacing=3.75kHz-Test Channel=20649-T size=1T47



Date: 20.AUG.2019 05:40:44



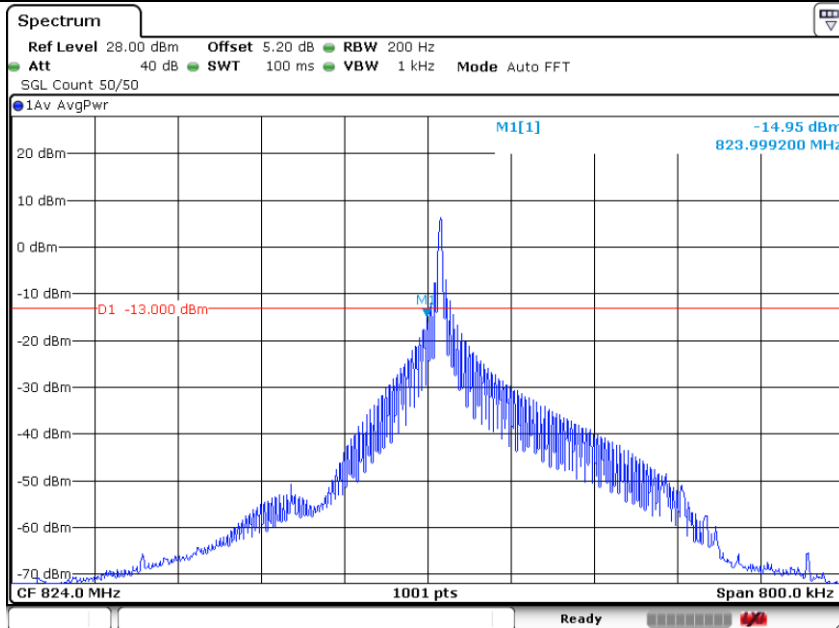
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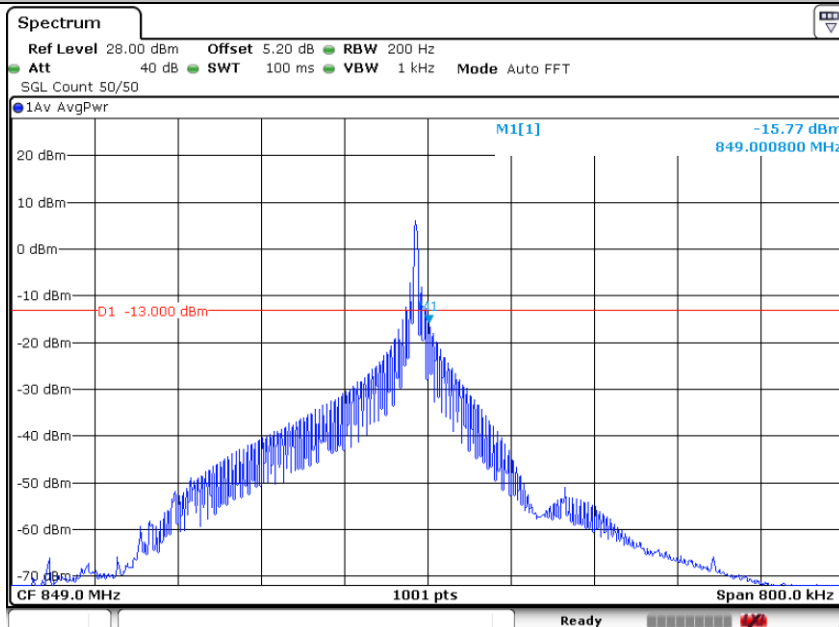
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## LTE-NB1/QPSK. Sub-carrier spacing=3.75kHz-Test Channel=20401-T size=1T0



Date: 20.AUG.2019 05:32:47

## LTE-NB1/QPSK. Sub-carrier spacing=3.75kHz-Test Channel=20649-T size=1T47



Date: 20.AUG.2019 05:40:18



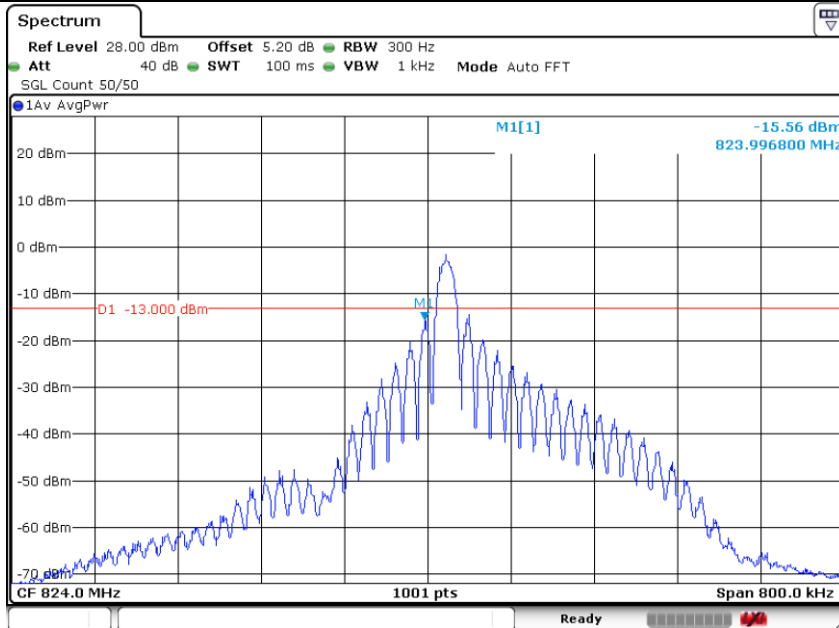
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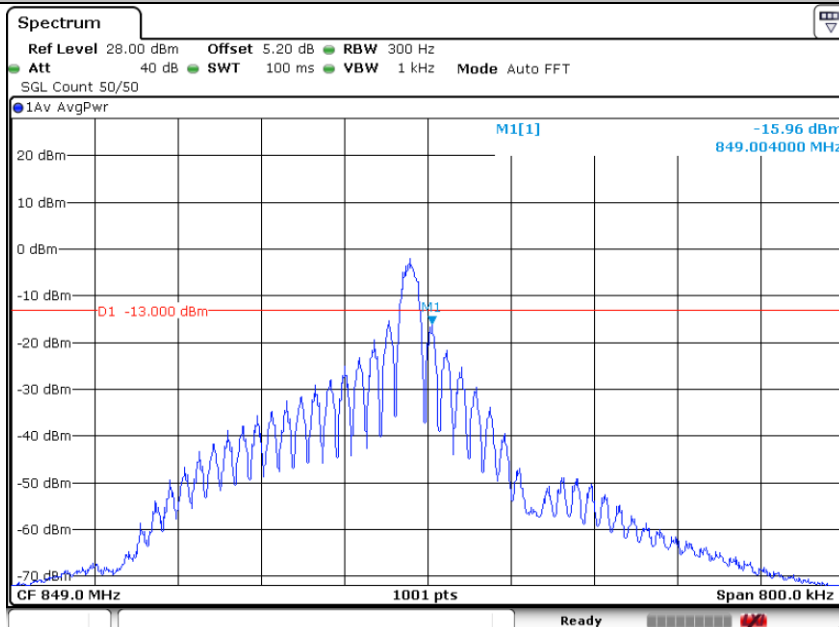
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## LTE-NB1/BPSK. Sub-carrier spacing=15kHz-Test Channel=20401-T size=1T0



Date: 20.AUG.2019 05:35:50

## LTE-NB1/BPSK. Sub-carrier spacing=15kHz-Test Channel=20649-T size=1T11



Date: 20.AUG.2019 05:39:32



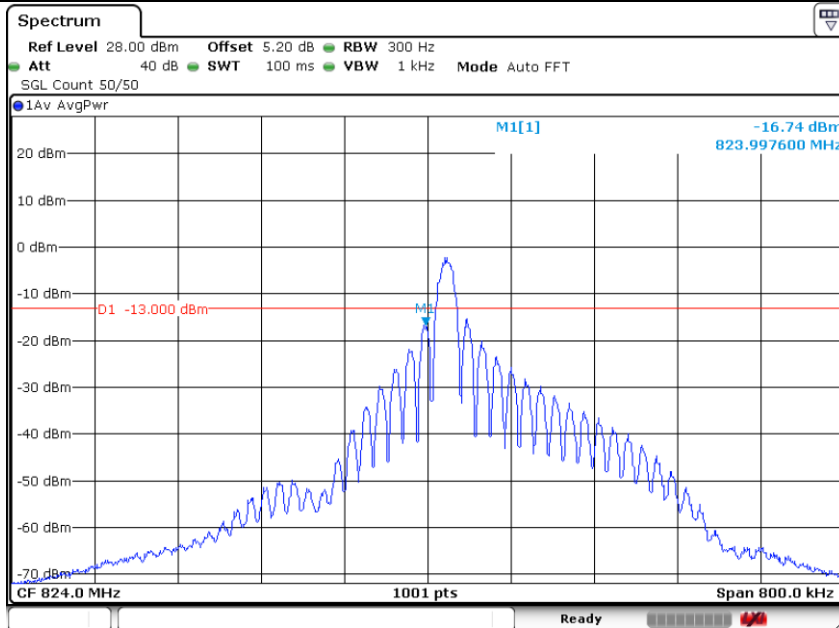
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## LTE-NB1/QPSK. Sub-carrier spacing=15kHz-Test Channel=20401-T size=1T0



Date: 20.AUG.2019 05:35:20

## LTE-NB1/QPSK. Sub-carrier spacing=15kHz-Test Channel=20401-T size=12T0



Date: 20.AUG.2019 05:36:37



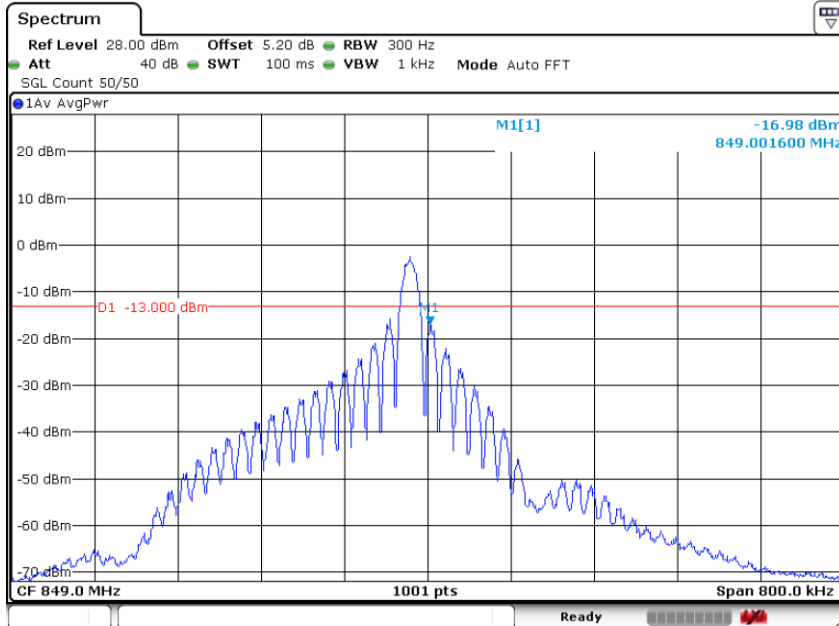
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**LTE-NB1/QPSK. Sub-carrier spacing=15kHz-Test Channel=20649-T size=1T11**



Date: 20.AUG.2019 05:38:29

**LTE-NB1/QPSK. Sub-carrier spacing=15kHz-Test Channel=20649-T size=12T0**



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## 6 Spurious Emission at Antenna Terminal

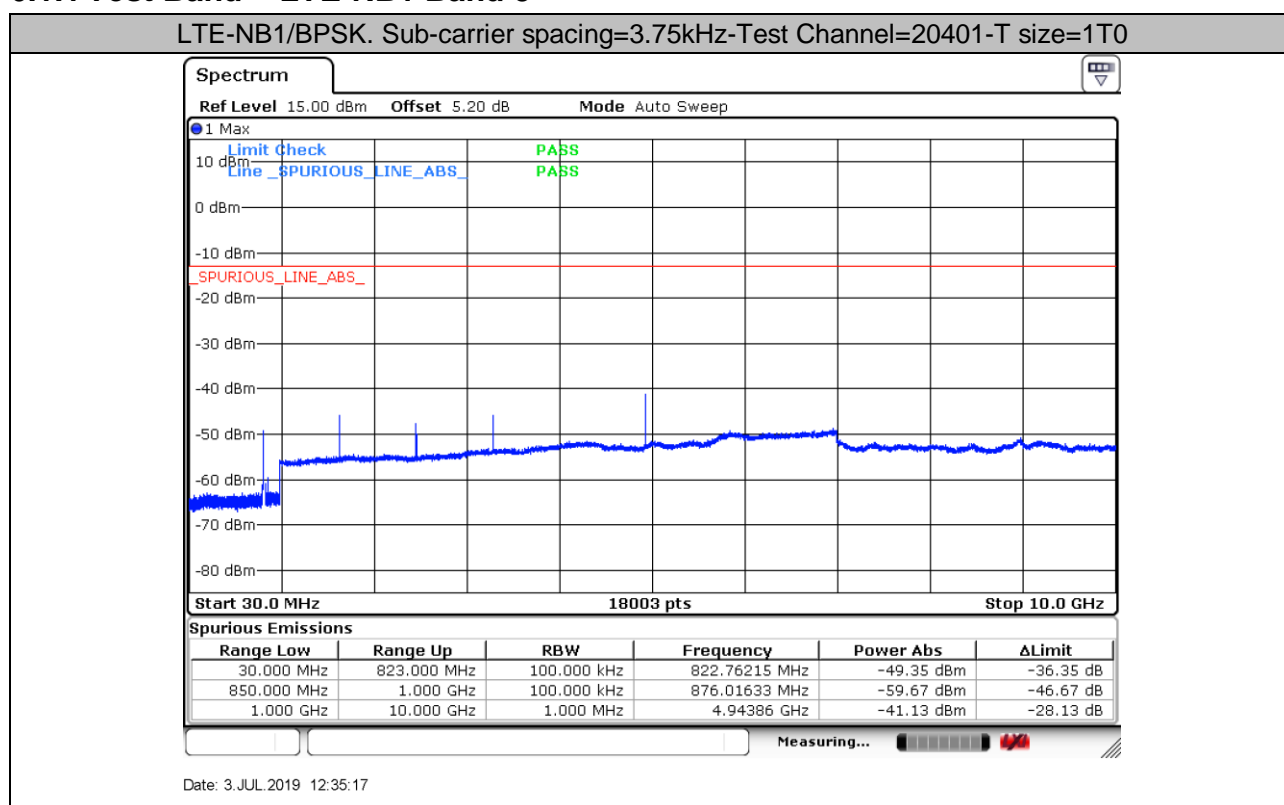
NOTE1: For the averaged unwanted emissions measurements, the measurement points in each sweep is greater than twice the Span/RBW in order to ensure bin-to-bin spacing of  $< RBW/2$  so that narrowband signals are not lost between frequency bins. As to the present test item, the "Measurement Points =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

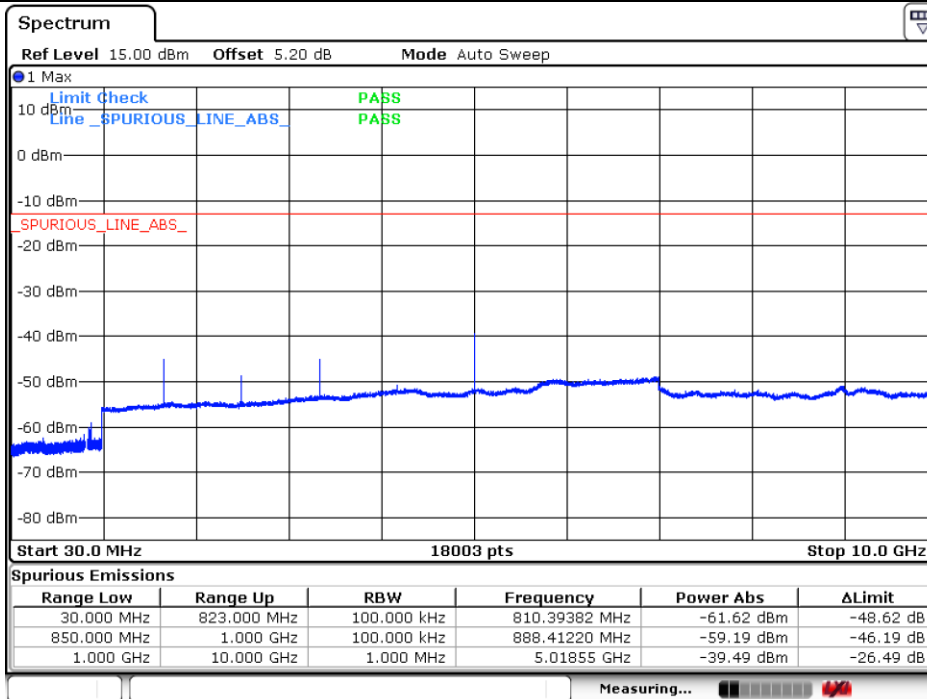
Part I - Test Plots

### 6.1 For LTE-NB1

#### 6.1.1 Test Band = LTE-NB1 Band 5

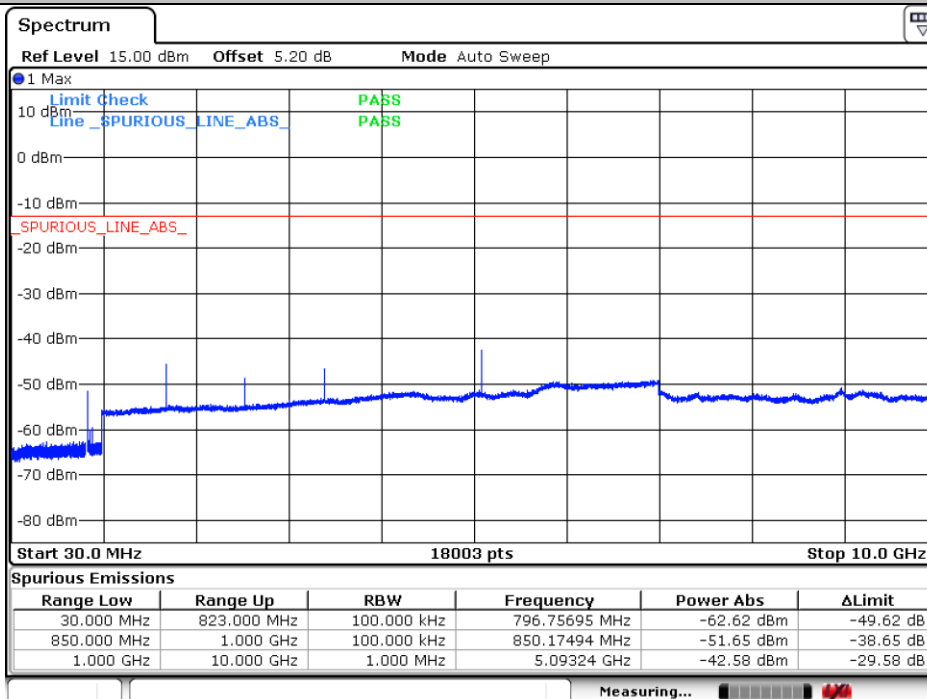


LTE-NB1/BPSK. Sub-carrier spacing=3.75kHz-Test Channel=20525-T size=1T0



Date: 3 JUL 2019 12:42:58

LTE-NB1/BPSK. Sub-carrier spacing=3.75kHz-Test Channel=20649-T size=1T0



Date: 3 JUL 2019 12:45:38



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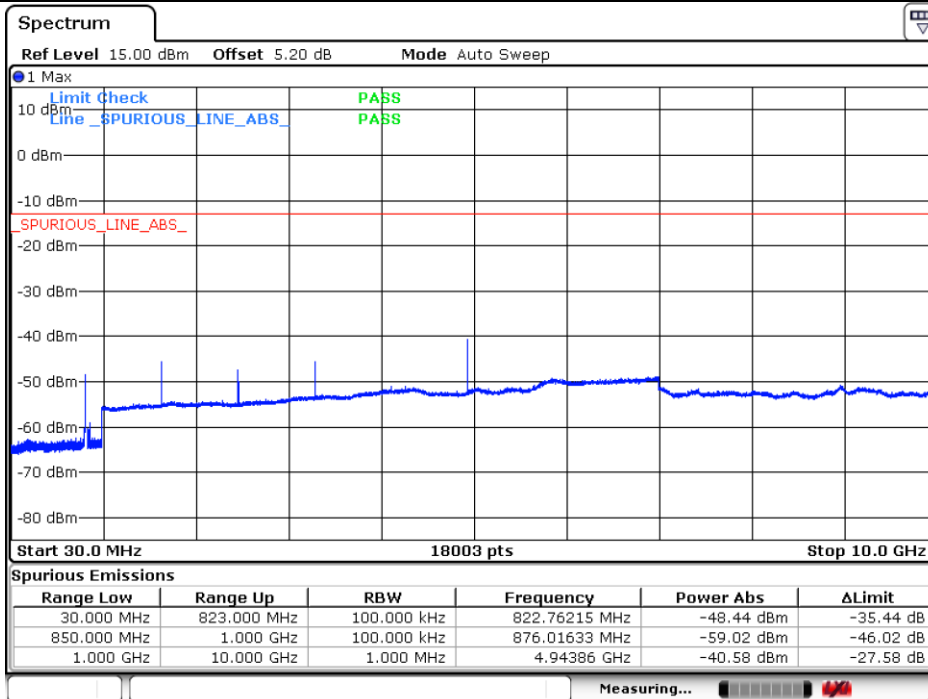
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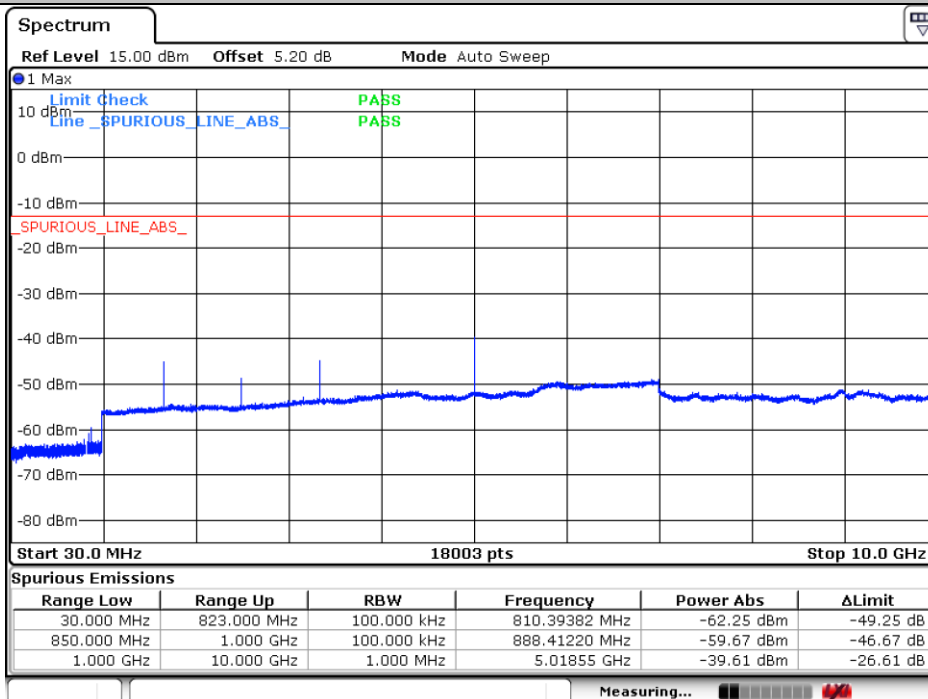


## LTE-NB1/QPSK. Sub-carrier spacing=3.75kHz-Test Channel=20401-T size=1T0



Date: 3 JUL 2019 12:36:41

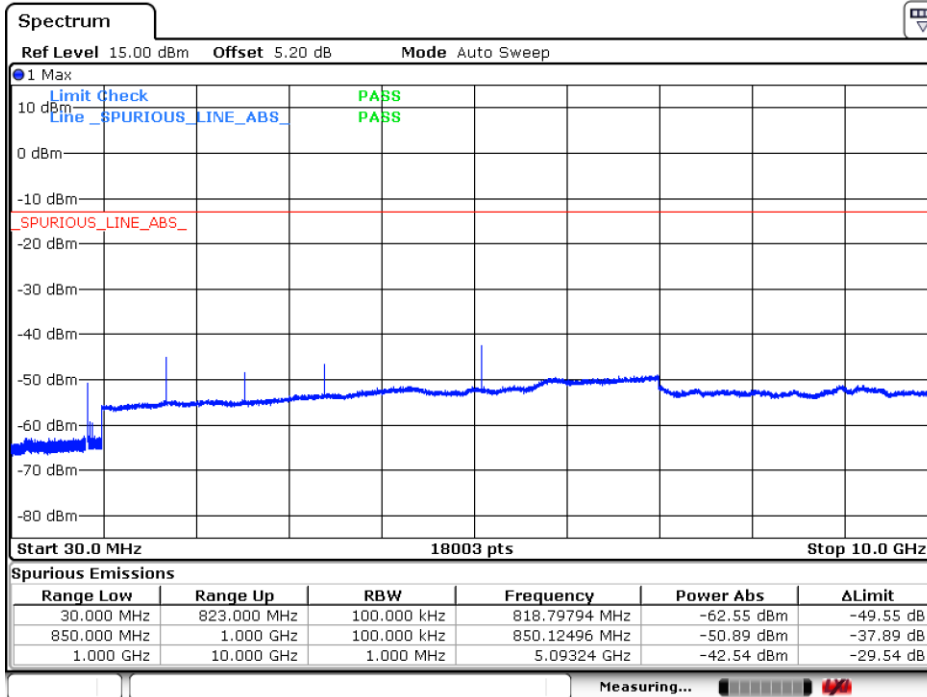
## LTE-NB1/QPSK. Sub-carrier spacing=3.75kHz-Test Channel=20525-T size=1T0



Date: 3 JUL 2019 12:42:14

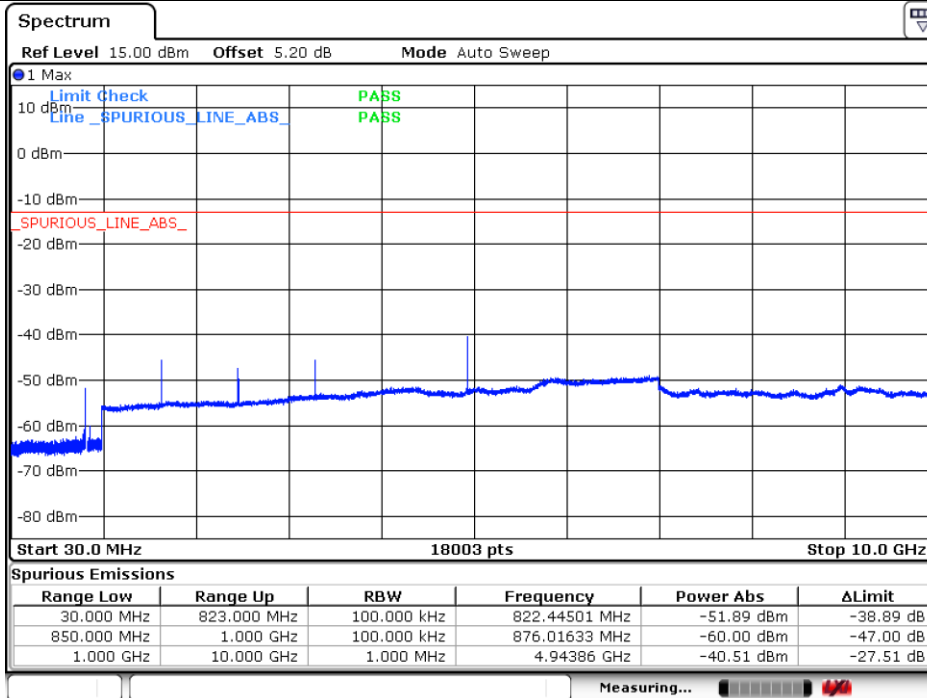


## LTE-NB1/QPSK. Sub-carrier spacing=3.75kHz-Test Channel=20649-T size=1T0



Date: 3 JUL 2019 12:47:06

## LTE-NB1/BPSK. Sub-carrier spacing=15kHz-Test Channel=20401-T size=1T0



Date: 3 JUL 2019 12:38:02

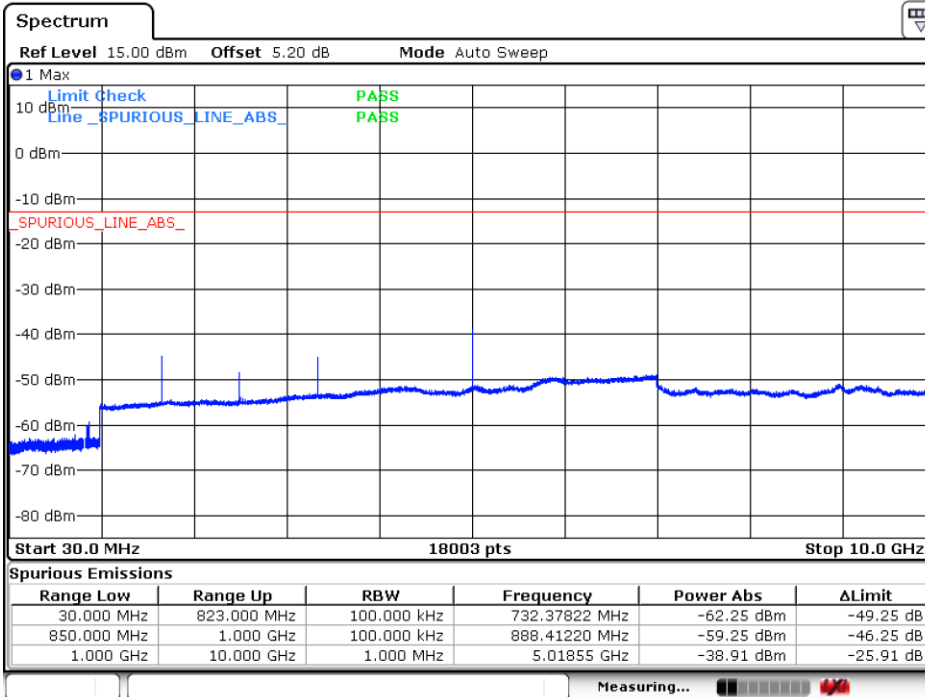


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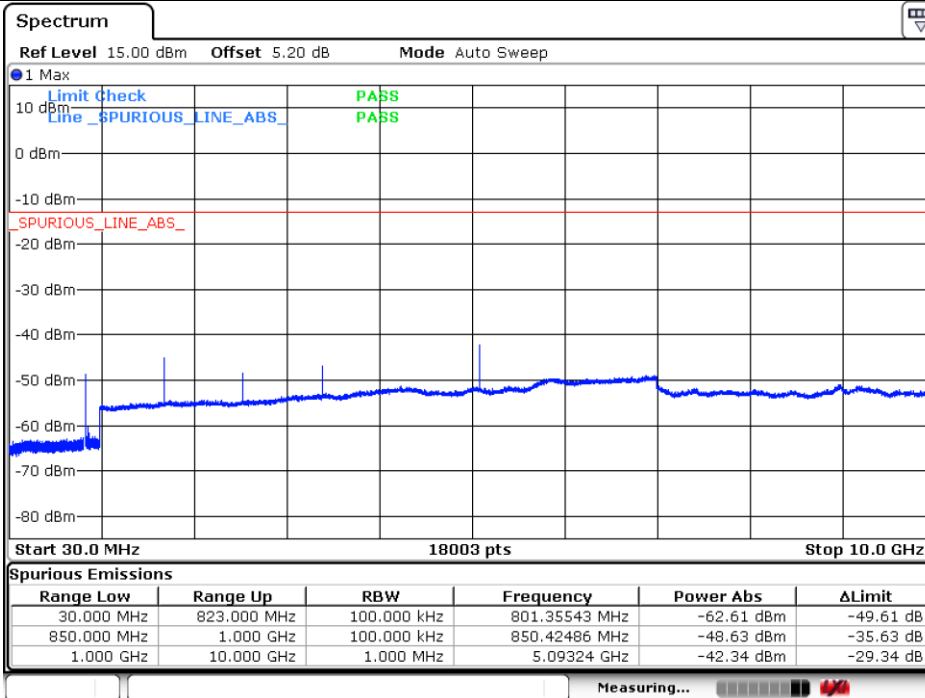
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## LTE-NB1/BPSK. Sub-carrier spacing=15kHz-Test Channel=20525-T size=1T0



Date: 3 JUL 2019 12:41:28

## LTE-NB1/BPSK. Sub-carrier spacing=15kHz-Test Channel=20649-T size=1T0



Date: 3 JUL 2019 12:50:01



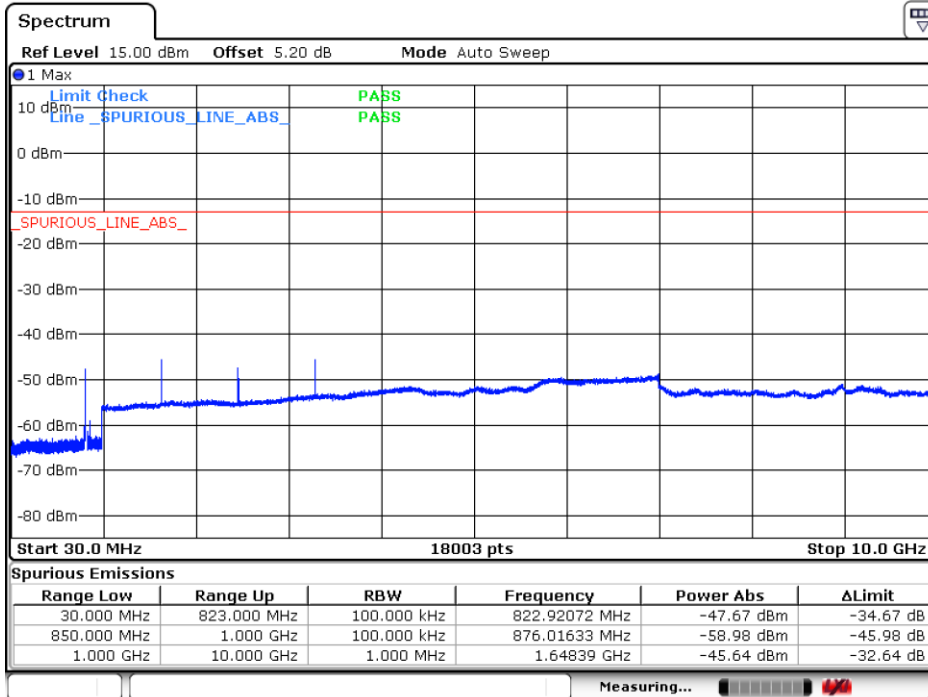
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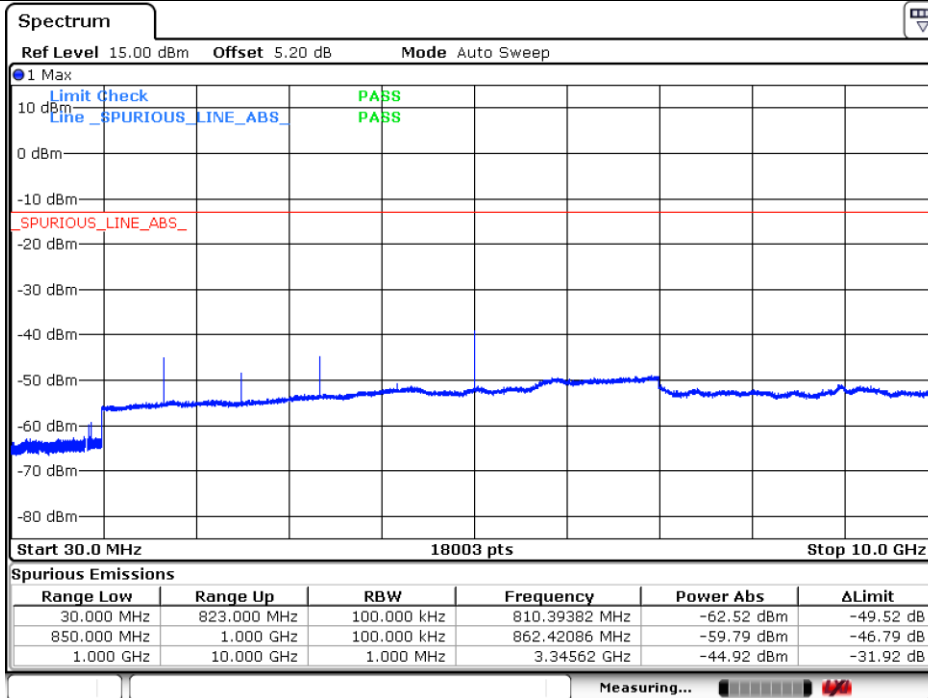
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## LTE-NB1/QPSK. Sub-carrier spacing=15kHz-Test Channel=20401-T size=1T0



Date: 3 JUL 2019 12:37:22

## LTE-NB1/QPSK. Sub-carrier spacing=15kHz-Test Channel=20525-T size=1T0

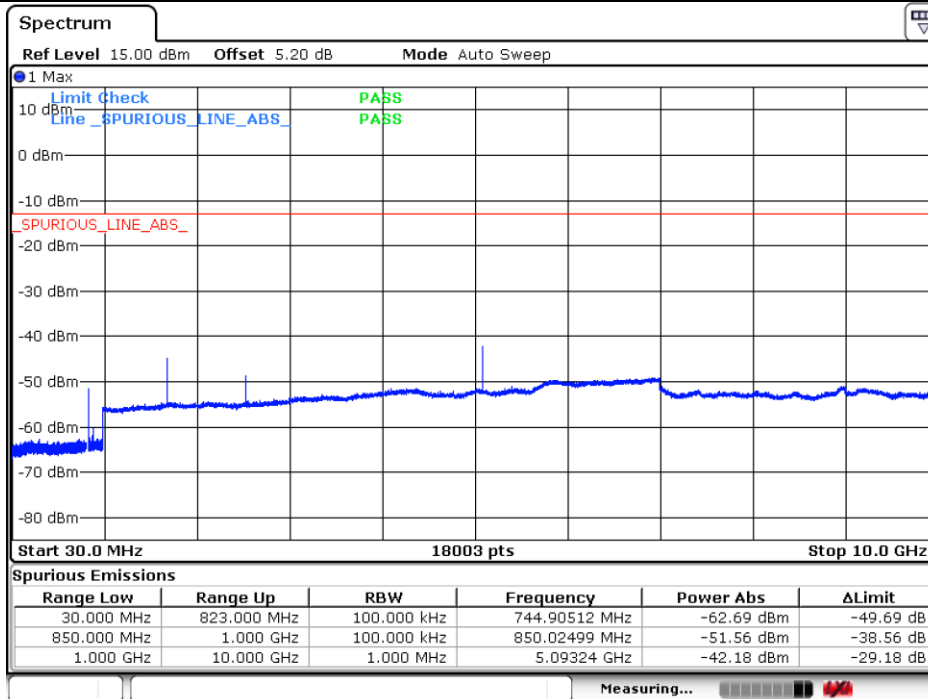


Date: 3 JUL 2019 12:40:36





LTE-NB1/QPSK. Sub-carrier spacing=15kHz-Test Channel=20649-T size=1T0



Date: 3 JUL 2019 12:48:15



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## 7 Field Strength of Spurious Radiation

### 7.1 For LTE-NB1

#### 7.1.1 Test Band = LTE-NB1 Band 5

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

##### 7.1.1.1.1 Test Channel = 20401

Frequency (MHz)	Level (dBm)	Limit Line (dBm)	Over Limit (dB)	Polarization
65.046667	-80.56	-13.00	67.56	Vertical
365.486667	-84.58	-13.00	71.58	Vertical
1653.000000	-61.79	-13.00	48.79	Vertical
2652.000000	-57.69	-13.00	44.69	Vertical
4958.287500	-62.49	-13.00	49.49	Vertical
8603.812500	-62.48	-13.00	49.48	Vertical
63.693333	-75.47	-13.00	62.47	Horizontal
256.846667	-86.80	-13.00	73.80	Horizontal
1653.000000	-54.82	-13.00	41.82	Horizontal
3306.150000	-60.82	-13.00	47.82	Horizontal
4959.262500	-50.91	-13.00	37.91	Horizontal
8856.337500	-63.05	-13.00	50.05	Horizontal

##### 7.1.1.1.2 Test Channel = 20525

Frequency (MHz)	Level (dBm)	Limit Line (dBm)	Over Limit (dB)	Polarization
63.786667	-80.61	-13.00	67.61	Vertical
333.940000	-85.08	-13.00	72.08	Vertical
1673.000000	-62.56	-13.00	49.56	Vertical
2583.000000	-58.49	-13.00	45.49	Vertical
5018.250000	-63.80	-13.00	50.80	Vertical
7933.012500	-63.14	-13.00	50.14	Vertical
62.246667	-76.75	-13.00	63.75	Horizontal
269.820000	-86.18	-13.00	73.18	Horizontal
1673.000000	-52.37	-13.00	39.37	Horizontal
3345.637500	-60.93	-13.00	47.93	Horizontal
5018.250000	-53.05	-13.00	40.05	Horizontal
9222.937500	-62.22	-13.00	49.22	Horizontal



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7.1.1.1.3 Test Channel = 20649

Frequency (MHz)	Level (dBm)	Limit Line (dBm)	Over Limit (dB)	Polarization
64.533333	-80.43	-13.00	67.43	Vertical
336.506667	-84.85	-13.00	71.85	Vertical
1693.000000	-61.99	-13.00	48.99	Vertical
2582.000000	-58.48	-13.00	45.48	Vertical
4305.037500	-65.84	-13.00	52.84	Vertical
8099.250000	-63.24	-13.00	50.24	Vertical
62.340000	-75.88	-13.00	62.88	Horizontal
277.520000	-85.49	-13.00	72.49	Horizontal
1693.000000	-54.02	-13.00	41.02	Horizontal
3385.612500	-60.95	-13.00	47.95	Horizontal
5079.187500	-59.59	-13.00	46.59	Horizontal
7963.237500	-62.64	-13.00	49.64	Horizontal

NOTE:

- 1) The disturbance 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.



## 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 5	180KHz	BPSK/15KHz	20401	12T0	VL	TN	1.71	0.002081	±2.5	PASS
NB1 Band 5	180KHz	BPSK/15KHz	20401	12T0	VN	TN	-10.28	-0.012480	±2.5	PASS
NB1 Band 5	180KHz	BPSK/15KHz	20401	12T0	VH	TN	-9.95	-0.012075	±2.5	PASS
NB1 Band 5	180KHz	BPSK/15KHz	20525	12T0	VL	TN	3.22	0.003846	±2.5	PASS
NB1 Band 5	180KHz	BPSK/15KHz	20525	12T0	VN	TN	7.72	0.009230	±2.5	PASS
NB1 Band 5	180KHz	BPSK/15KHz	20525	12T0	VH	TN	6.45	0.007710	±2.5	PASS
NB1 Band 5	180KHz	BPSK/15KHz	20649	12T0	VL	TN	9.32	0.010976	±2.5	PASS
NB1 Band 5	180KHz	BPSK/15KHz	20649	12T0	VN	TN	-7.62	-0.008981	±2.5	PASS
NB1 Band 5	180KHz	BPSK/15KHz	20649	12T0	VH	TN	-4.53	-0.005331	±2.5	PASS
NB1 Band 5	180KHz	QPSK/15KHz	20401	12T0	VL	TN	3.82	0.004639	±2.5	PASS
NB1 Band 5	180KHz	QPSK/15KHz	20401	12T0	VN	TN	-13.11	-0.015911	±2.5	PASS
NB1 Band 5	180KHz	QPSK/15KHz	20401	12T0	VH	TN	-2.37	-0.002877	±2.5	PASS
NB1 Band 5	180KHz	QPSK/15KHz	20525	12T0	VL	TN	-5.68	-0.006794	±2.5	PASS
NB1 Band 5	180KHz	QPSK/15KHz	20525	12T0	VN	TN	-4.51	-0.005391	±2.5	PASS
NB1 Band 5	180KHz	QPSK/15KHz	20525	12T0	VH	TN	-4.18	-0.004999	±2.5	PASS
NB1 Band 5	180KHz	QPSK/15KHz	20649	12T0	VL	TN	-1.82	-0.002143	±2.5	PASS
NB1 Band 5	180KHz	QPSK/15KHz	20649	12T0	VN	TN	9.62	0.011334	±2.5	PASS
NB1 Band 5	180KHz	QPSK/15KHz	20649	12T0	VH	TN	7.75	0.009131	±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 5	180KHz	BPSK/15KHz	20401	12T0	NV	-30	-5.40	-0.006550	±2.5	PASS
NB1 Band 5	180KHz	BPSK/15KHz	20401	12T0	NV	-20	12.08	0.014662	±2.5	PASS
NB1 Band 5	180KHz	BPSK/15KHz	20401	12T0	NV	0	-9.10	-0.011044	±2.5	PASS
NB1 Band 5	180KHz	BPSK/15KHz	20401	12T0	NV	10	10.00	0.012129	±2.5	PASS
NB1 Band 5	180KHz	BPSK/15KHz	20401	12T0	NV	20	11.62	0.014097	±2.5	PASS
NB1 Band 5	180KHz	BPSK/15KHz	20401	12T0	NV	30	-7.55	-0.009157	±2.5	PASS
NB1 Band 5	180KHz	BPSK/15KHz	20401	12T0	NV	40	14.38	0.017452	±2.5	PASS
NB1 Band 5	180KHz	BPSK/15KHz	20401	12T0	NV	50	11.63	0.014107	±2.5	PASS
NB1 Band 5	180KHz	BPSK/15KHz	20525	12T0	NV	-30	-5.97	-0.007133	±2.5	PASS
NB1 Band 5	180KHz	BPSK/15KHz	20525	12T0	NV	-20	-8.00	-0.009565	±2.5	PASS
NB1 Band 5	180KHz	BPSK/15KHz	20525	12T0	NV	0	4.79	0.005722	±2.5	PASS
NB1 Band 5	180KHz	BPSK/15KHz	20525	12T0	NV	10	13.01	0.015554	±2.5	PASS
NB1 Band 5	180KHz	BPSK/15KHz	20525	12T0	NV	20	-3.08	-0.003677	±2.5	PASS
NB1 Band 5	180KHz	BPSK/15KHz	20525	12T0	NV	30	3.95	0.004719	±2.5	PASS
NB1 Band 5	180KHz	BPSK/15KHz	20525	12T0	NV	40	-7.13	-0.008520	±2.5	PASS
NB1 Band 5	180KHz	BPSK/15KHz	20525	12T0	NV	50	14.52	0.017363	±2.5	PASS
NB1 Band 5	180KHz	BPSK/15KHz	20649	12T0	NV	-30	13.57	0.015987	±2.5	PASS
NB1 Band 5	180KHz	BPSK/15KHz	20649	12T0	NV	-20	-5.68	-0.006686	±2.5	PASS
NB1 Band 5	180KHz	BPSK/15KHz	20649	12T0	NV	0	-0.88	-0.001040	±2.5	PASS
NB1 Band 5	180KHz	BPSK/15KHz	20649	12T0	NV	10	1.98	0.002331	±2.5	PASS



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NB1 Band 5	180KHz	BPSK/15KHz	20649	12T0	NV	20	-6.83	-0.008051	±2.5	PASS
NB1 Band 5	180KHz	BPSK/15KHz	20649	12T0	NV	30	1.09	0.001289	±2.5	PASS
NB1 Band 5	180KHz	BPSK/15KHz	20649	12T0	NV	40	0.24	0.000286	±2.5	PASS
NB1 Band 5	180KHz	BPSK/15KHz	20649	12T0	NV	50	1.31	0.001547	±2.5	PASS
NB1 Band 5	180KHz	QPSK/15KHz	20401	12T0	NV	-30	9.11	0.011057	±2.5	PASS
NB1 Band 5	180KHz	QPSK/15KHz	20401	12T0	NV	-20	1.93	0.002347	±2.5	PASS
NB1 Band 5	180KHz	QPSK/15KHz	20401	12T0	NV	0	-10.71	-0.012994	±2.5	PASS
NB1 Band 5	180KHz	QPSK/15KHz	20401	12T0	NV	10	3.43	0.004157	±2.5	PASS
NB1 Band 5	180KHz	QPSK/15KHz	20401	12T0	NV	20	8.65	0.010500	±2.5	PASS
NB1 Band 5	180KHz	QPSK/15KHz	20401	12T0	NV	30	5.59	0.006786	±2.5	PASS
NB1 Band 5	180KHz	QPSK/15KHz	20401	12T0	NV	40	-2.83	-0.003435	±2.5	PASS
NB1 Band 5	180KHz	QPSK/15KHz	20401	12T0	NV	50	5.80	0.007035	±2.5	PASS
NB1 Band 5	180KHz	QPSK/15KHz	20525	12T0	NV	-30	5.21	0.006233	±2.5	PASS
NB1 Band 5	180KHz	QPSK/15KHz	20525	12T0	NV	-20	12.43	0.014860	±2.5	PASS
NB1 Band 5	180KHz	QPSK/15KHz	20525	12T0	NV	0	0.64	0.000767	±2.5	PASS
NB1 Band 5	180KHz	QPSK/15KHz	20525	12T0	NV	10	7.96	0.009512	±2.5	PASS
NB1 Band 5	180KHz	QPSK/15KHz	20525	12T0	NV	20	13.63	0.016288	±2.5	PASS
NB1 Band 5	180KHz	QPSK/15KHz	20525	12T0	NV	30	-5.73	-0.006846	±2.5	PASS
NB1 Band 5	180KHz	QPSK/15KHz	20525	12T0	NV	40	-13.02	-0.015566	±2.5	PASS
NB1 Band 5	180KHz	QPSK/15KHz	20525	12T0	NV	50	-9.02	-0.010786	±2.5	PASS
NB1 Band 5	180KHz	QPSK/15KHz	20649	12T0	NV	-30	-7.42	-0.008746	±2.5	PASS
NB1 Band 5	180KHz	QPSK/15KHz	20649	12T0	NV	-20	4.76	0.005609	±2.5	PASS
NB1 Band 5	180KHz	QPSK/15KHz	20649	12T0	NV	0	14.30	0.016844	±2.5	PASS
NB1 Band 5	180KHz	QPSK/15KHz	20649	12T0	NV	10	-6.77	-0.007975	±2.5	PASS
NB1 Band 5	180KHz	QPSK/15KHz	20649	12T0	NV	20	-10.67	-0.012566	±2.5	PASS
NB1 Band 5	180KHz	QPSK/15KHz	20649	12T0	NV	30	11.93	0.014049	±2.5	PASS
NB1 Band 5	180KHz	QPSK/15KHz	20649	12T0	NV	40	-1.65	-0.001938	±2.5	PASS
NB1 Band 5	180KHz	QPSK/15KHz	20649	12T0	NV	50	-12.58	-0.014820	±2.5	PASS

The End



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