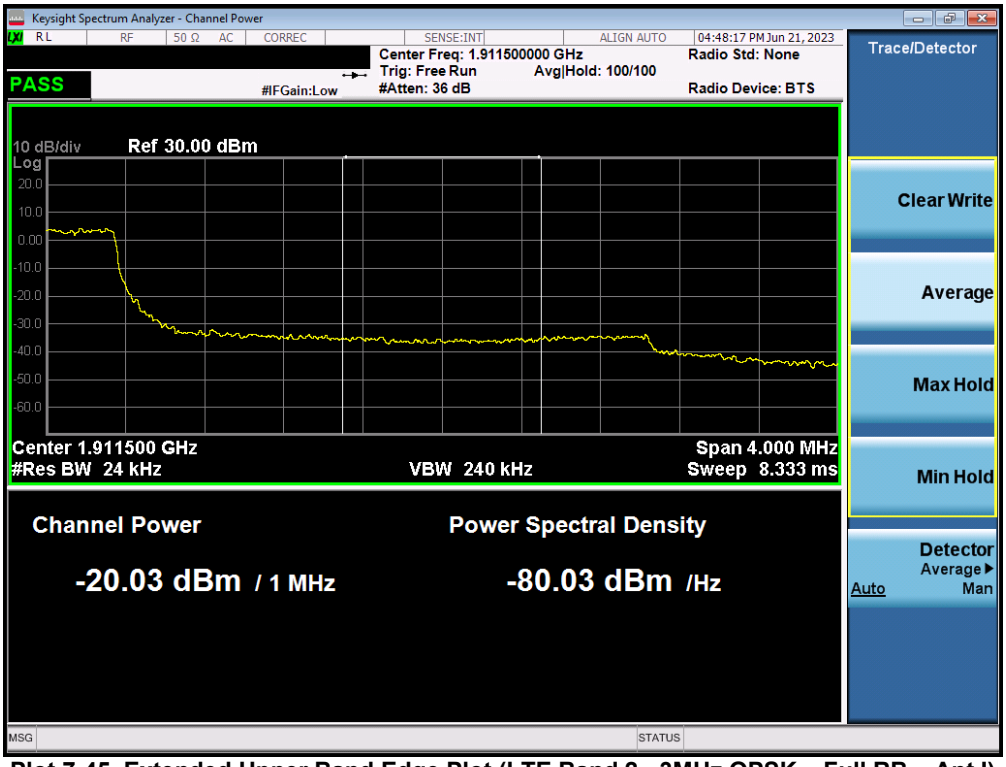
Plot 7-44. Upper Band Edge Plot (LTE Band 2 - 3MHz QPSK – Full RB – Ant I)



Plot 7-45. Extended Upper Band Edge Plot (LTE Band 2 - 3MHz QPSK – Full RB – Ant I)

7.6 Peak-Average Ratio

Test Overview

A peak to average ratio measurement is performed at the conducted port of the EUT. The spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signal spends at or above the level defines the probability for that particular power level.

The peak-to-average power ratio (PAPR) of the transmitter output power must not exceed 13 dB.

Test Procedure Used

ANSI C63.26-2015 – Section 5.2.3.4

Test Settings

1. The signal analyzer's CCDF measurement profile is enabled
2. Frequency = carrier center frequency
3. Measurement BW ≥ OBW or specified reference bandwidth
4. The signal analyzer was set to collect one million samples to generate the CCDF curve
5. The measurement interval was set depending on the type of signal analyzed. For continuous signals (>98% duty cycle), the measurement interval was set to 1ms. For burst transmissions, the spectrum analyzer is set to use an internal "RF Burst" trigger that is synced with an incoming pulse and the measurement interval is set to less than the duration of the "on time" of one burst to ensure that energy is only captured during a time in which the transmitter is operating at maximum power

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

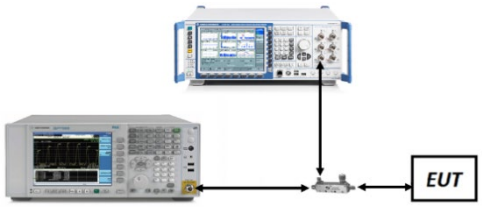


Figure 7-5. Test Instrument & Measurement Setup

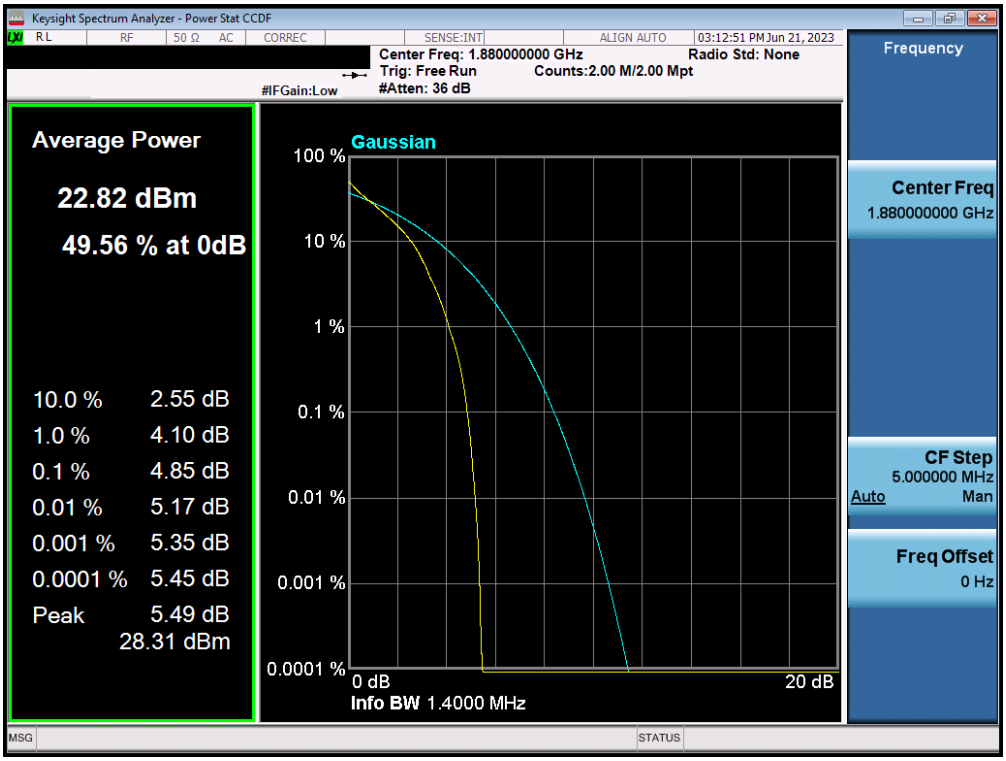
Test Notes

For the QAM modulations, 64QAM was found to have the worst-case peak-to-average ratio so it is the only QAM measurement included in this section.

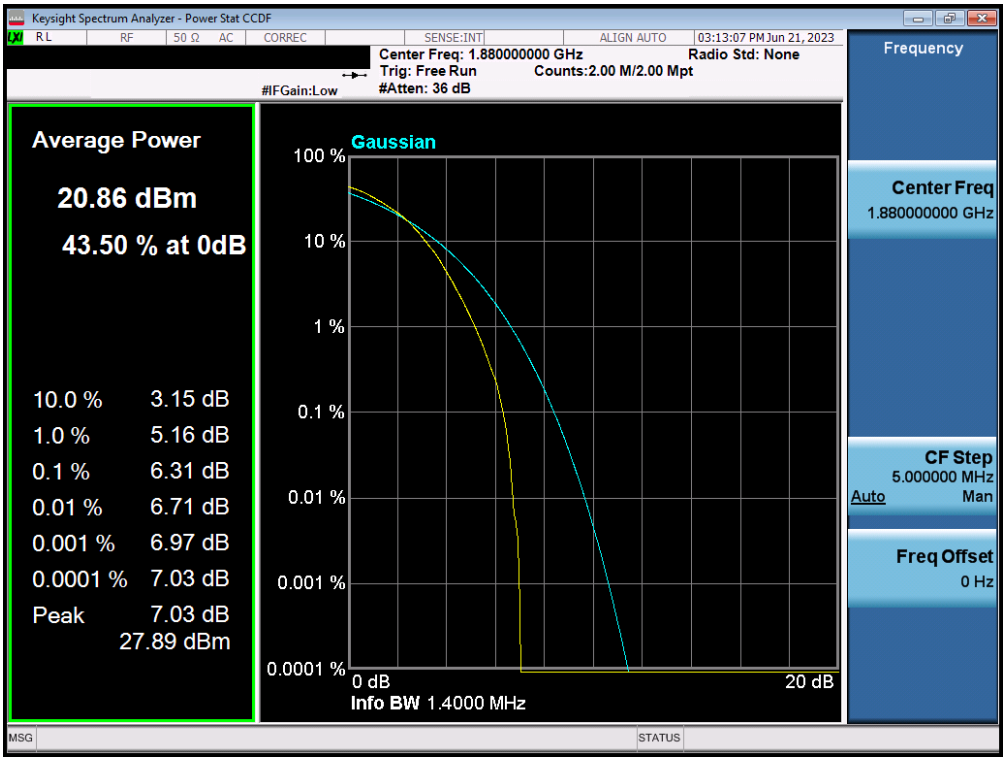
Mode	Bandwidth	Modulation	Average Power [dBm]	PAR at 0.1% [dB]	PAR Limit [dB]	Margin [dB]
GSM1900	N/A	N/A	29.38	0.60	13.0	-12.40
EDGE1900			22.81	7.91	13.0	-5.09
LTE-B2	20 MHz	QPSK	22.72	4.94	13.00	-8.06
		64QAM	20.76	6.27	13.00	-6.73
	15 MHz	QPSK	23.71	5.06	13.00	-7.94
		64QAM	20.76	6.29	13.00	-6.71
	10 MHz	QPSK	21.88	5.23	13.00	-7.77
		64QAM	20.86	6.28	13.00	-6.72
	5 MHz	QPSK	22.83	4.93	13.00	-8.07
		64QAM	20.86	6.26	13.00	-6.74
	3 MHz	QPSK	22.84	4.88	13.00	-8.12
		64QAM	20.88	6.28	13.00	-6.72
	1.4 MHz	QPSK	22.82	4.85	13.00	-8.15
		64QAM	20.86	6.31	13.00	-6.69

Table 7-10. PAR Test Results – Ant A

LTE Band 2 – Ant A

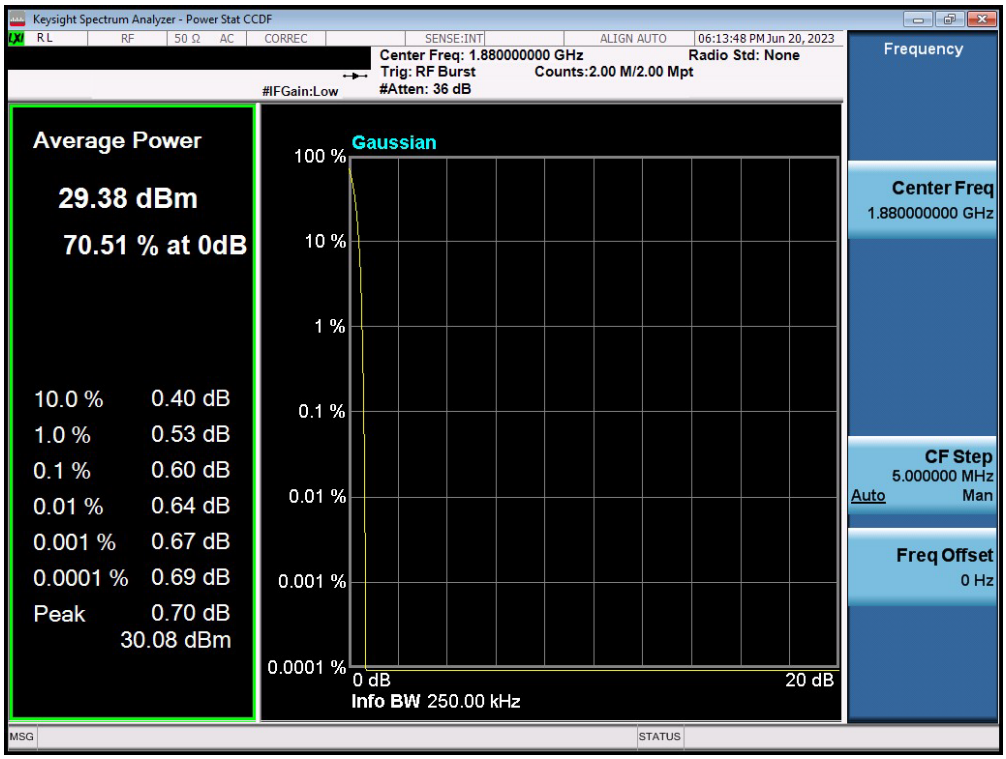


Plot 7-46. PAR Plot (LTE Band 2 - 1.4MHz QPSK - Full RB – Ant A)

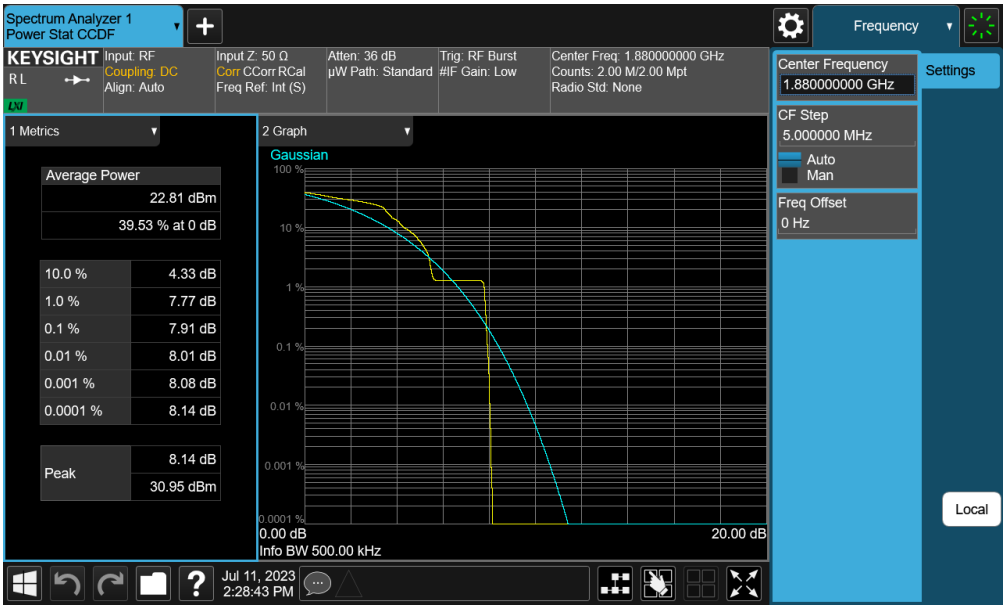


Plot 7-47. PAR Plot (LTE Band 2 - 1.4MHz 64-QAM - Full RB – Ant A)

GSM/GPRS PCS – Ant A



Plot 7-48. PAR Plot (GPRS, Ch. 661 – Ant A)

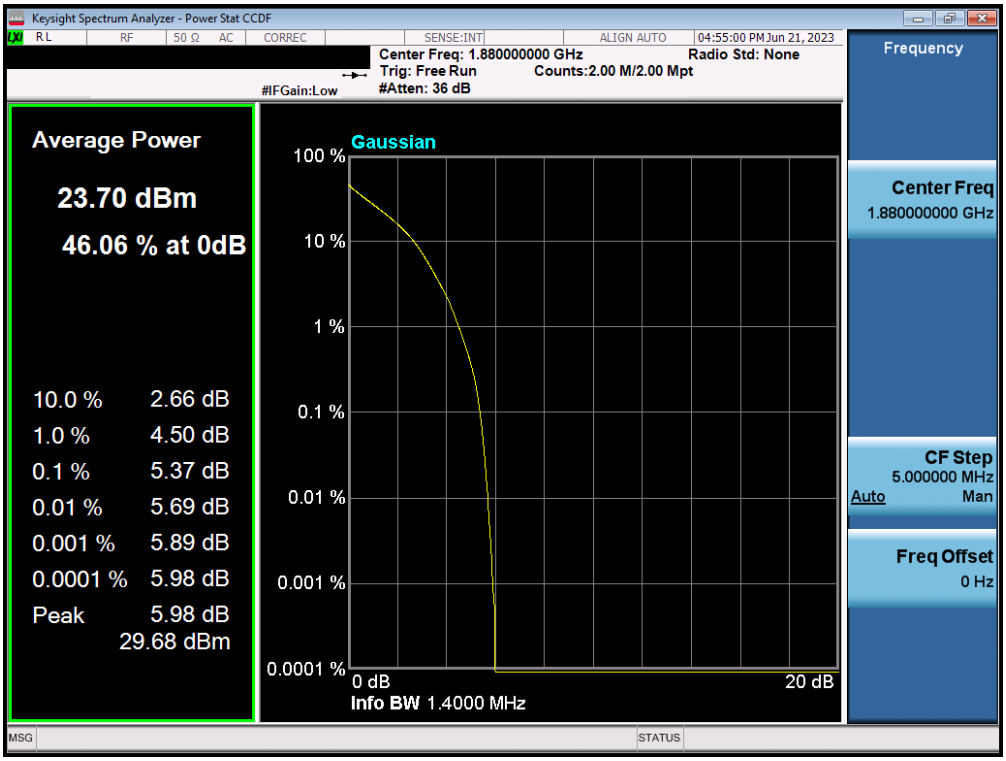


Plot 7-49. PAR Plot (EDGE, Ch. 661 – Ant A)

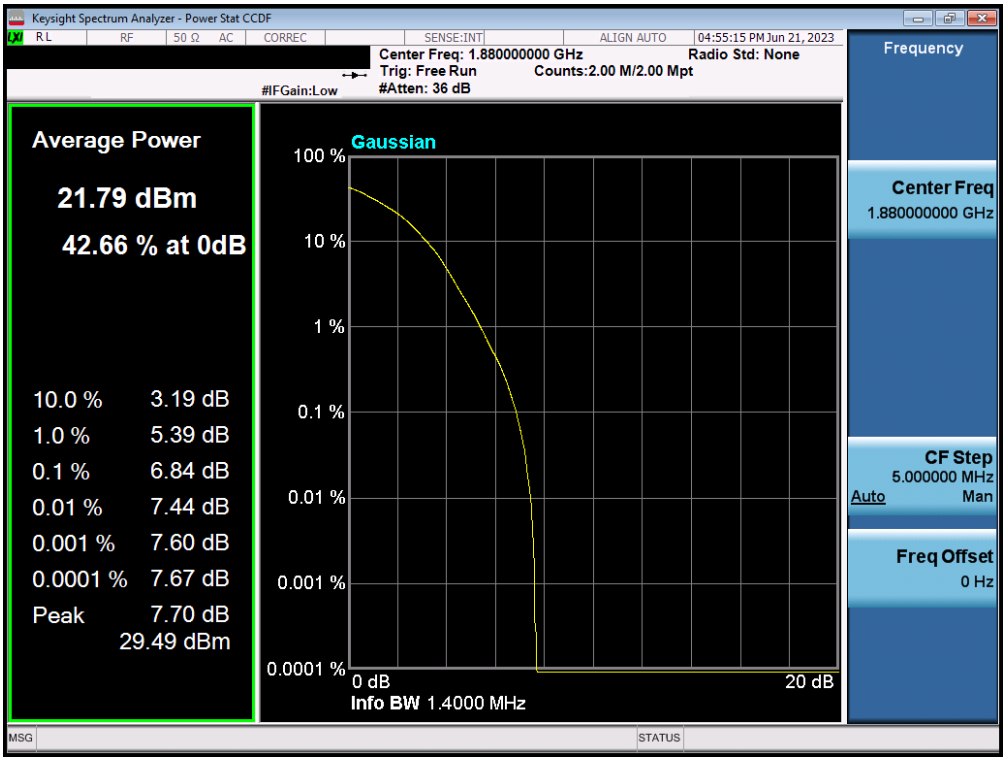
Mode	Bandwidth	Modulation	Average Power [dBm]	PAR at 0.1% [dB]	PAR Limit [dB]	Margin [dB]
LTE-B2	20 MHz	QPSK	23.69	5.32	13.00	-7.68
		64QAM	21.74	6.66	13.00	-6.34
	15 MHz	QPSK	23.71	5.47	13.00	-7.53
		64QAM	21.70	6.70	13.00	-6.30
	10 MHz	QPSK	22.81	5.55	13.00	-7.45
		64QAM	21.84	6.67	13.00	-6.33
	5 MHz	QPSK	23.74	5.37	13.00	-7.63
		64QAM	21.82	6.68	13.00	-6.32
	3 MHz	QPSK	23.75	5.28	13.00	-7.72
		64QAM	21.81	6.70	13.00	-6.30
	1.4 MHz	QPSK	23.70	5.37	13.00	-7.63
		64QAM	21.79	6.84	13.00	-6.16

Table 7-11. PAR Test Results – Ant I

LTE Band 2 – Ant I



Plot 7-50. PAR Plot (LTE Band 2 - 1.4MHz QPSK - Full RB – Ant A)



Plot 7-51. PAR Plot (LTE Band 2 - 1.4MHz 64-QAM - Full RB – Ant A)

7.7 Radiated Power (EIRP)

Test Overview

Equivalent Isotropic Radiated Power (EIRP) measurements are performed using the substitution method described in ANSI C63.26-2015 with the EUT transmitting into an integral antenna. Measurements are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as RMS average measurements while the EUT is operating at maximum power, and at the appropriate frequencies.

Test Procedures Used

ANSI C63.26-2015 – Section 5.2.4.4

Test Settings

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation. For signals with burst transmission, the signal analyzer's "time domain power" measurement capability is used
2. RBW = 1 – 5% of the expected OBW, not to exceed 1MHz
3. VBW ≥ 3 x RBW
4. Span = 1.5 times the OBW
5. No. of sweep points ≥ 2 x span / RBW
6. Detector = RMS
7. Trigger is set to "free run" for signals with continuous operation with the sweep times set to "auto". Trigger is set to enable triggering only on full power bursts with the sweep time set less than or equal to the transmission burst duration.
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation. For signals with burst transmission, the "gating" function was enabled to ensure that measurements are performed during times in which the transmitter is operating at its maximum power.
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize.

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

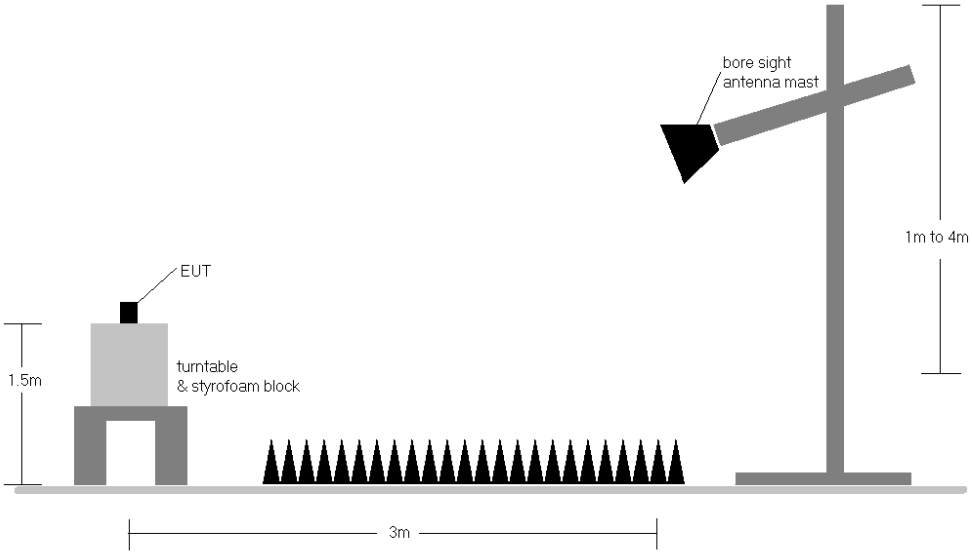


Figure 7-6. Radiated Test Setup >1GHz

Test Notes

1) This device employs GSM, GPRS, and EDGE capabilities. The EUT was tested under all configurations and the highest powers are reported in GPRS mode while transmitting with one slot active.

2) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst-case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.

3) This unit was tested with its standard battery.

Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	EUT Config	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
20 MHz	QPSK	1860.0	V	Half	159	281	3.67	1 / 99	16.49	20.16	0.104	33.01	-12.85
	QPSK	1880.0	V	Half	158	284	3.47	1 / 0	16.80	**20.27**	0.106	33.01	-12.74
	QPSK	1900.0	V	Half	151	282	3.44	1 / 0	15.72	19.16	0.082	33.01	-13.85
	16-QAM	1880.0	V	Half	158	284	3.47	1 / 0	16.04	19.51	0.089	33.01	-13.50
15 MHz	QPSK	1857.5	V	Half	159	281	3.71	1 / 74	16.57	**20.28**	0.107	33.01	-12.73
	QPSK	1880.0	V	Half	158	284	3.47	1 / 74	16.77	20.23	0.106	33.01	-12.78
	QPSK	1902.5	V	Half	151	282	3.46	1 / 0	15.94	19.40	0.087	33.01	-13.61
	16-QAM	1857.5	V	Half	159	281	3.71	1 / 37	15.68	19.39	0.087	33.01	-13.62
10 MHz	QPSK	1855.0	V	Half	159	281	3.75	1 / 49	16.53	20.28	0.107	33.01	-12.73
	QPSK	1880.0	V	Half	158	284	3.47	1 / 49	16.83	**20.30**	0.107	33.01	-12.72
	QPSK	1905.0	V	Half	151	282	3.48	1 / 0	15.94	19.43	0.088	33.01	-13.58
	16-QAM	1880.0	V	Half	158	284	3.47	1 / 0	15.85	19.31	0.085	33.01	-13.70
5 MHz	QPSK	1852.5	V	Half	159	281	3.79	1 / 12	16.55	**20.34**	0.108	33.01	-12.67
	QPSK	1880.0	V	Half	158	284	3.47	1 / 24	16.85	20.32	0.108	33.01	-12.69
	QPSK	1907.5	V	Half	151	282	3.50	1 / 0	15.99	19.50	0.089	33.01	-13.51
	16-QAM	1852.5	V	Half	159	281	3.79	1 / 0	15.60	19.39	0.087	33.01	-13.62
3 MHz	QPSK	1851.5	V	Half	159	281	3.81	1 / 14	16.54	20.35	0.108	33.01	-12.66
	QPSK	1880.0	V	Half	158	284	3.47	1 / 14	16.94	**20.41**	0.110	33.01	-12.60
	QPSK	1908.5	V	Half	151	282	3.51	1 / 14	16.03	19.54	0.090	33.01	-13.47
	16-QAM	1880.0	V	Half	158	284	3.47	1 / 7	15.90	19.36	0.086	33.01	-13.65
1.4 MHz	QPSK	1850.7	V	Half	159	281	3.82	1 / 3	16.49	20.31	0.107	33.01	-12.70
	QPSK	1880.0	V	Half	158	284	3.47	1 / 0	16.91	**20.38**	0.109	33.01	-12.63
	QPSK	1909.3	V	Half	151	282	3.52	1 / 3	15.88	19.40	0.087	33.01	-13.61
	16-QAM	1880.0	V	Half	158	284	3.47	1 / 5	15.88	19.35	0.086	33.01	-13.66
20 MHz	QPSK (Opposite Pol.)	1880.0	H	Half	149	345	3.47	1 / 50	16.04	19.51	0.089	33.01	-13.50
	QPSK (WCP)	1880.0	V	Half	154	268	3.47	1 / 50	13.88	17.35	0.054	33.01	-15.66
	QPSK	1880.0	V	Open	185	285	3.67	1 / 99	16.40	20.07	0.102	33.01	-12.94

Table 7-12. EIRP Data (LTE Band 2 – Ant A)

Frequency [MHz]	Mode	Ant. Pol. [H/V]	EUT Config	Antenna Height [cm]	Turntable Azimuth [degree]	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
1850.20	GSM1900	V	Half	165	271	22.32	3.83	**26.15**	**0.412**	33.01	-6.86
1880.00	GSM1900	V	Half	155	270	21.63	3.47	25.10	0.323	33.01	-7.91
1909.80	GSM1900	V	Half	151	273	21.21	3.52	24.73	0.297	33.01	-8.28
1850.20	GSM1900	H	Half	117	183	21.81	3.83	25.64	0.367	33.01	-7.37
1850.20	EDGE1900	V	Half	165	271	17.93	3.83	**21.76**	0.150	33.01	-11.25
1850.20	GSM1900 (WCP)	V	Half	119	293	19.42	3.83	23.25	0.211	33.01	-9.76
1850.20	GSM 1900	V	Open	132	327	21.46	3.83	25.29	0.338	33.01	-7.72

Table 7-13. EIRP Data (GPRS PCS – Ant A)

Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	EUT Config	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
20 MHz	QPSK	1860.0	H	Open	150	264	3.67	1 / 50	18.22	**21.89**	0.154	33.01	-11.12
	QPSK	1880.0	H	Open	156	261	3.47	1 / 50	17.69	21.16	0.130	33.01	-11.85
	QPSK	1900.0	H	Open	147	261	3.44	1 / 0	17.62	21.06	0.128	33.01	-11.95
	16-QAM	1860.0	H	Open	150	264	3.67	1 / 50	17.63	21.30	0.135	33.01	-11.71
15 MHz	QPSK	1857.5	H	Open	150	264	3.71	1 / 74	18.23	**21.94**	0.156	33.01	-11.07
	QPSK	1880.0	H	Open	156	261	3.47	1 / 74	17.88	21.34	0.136	33.01	-11.67
	QPSK	1902.5	H	Open	147	261	3.46	1 / 37	17.57	21.03	0.127	33.01	-11.98
	16-QAM	1857.5	H	Open	150	264	3.71	1 / 74	17.55	21.26	0.134	33.01	-11.75
10 MHz	QPSK	1855.0	H	Open	150	264	3.75	1 / 49	18.38	**22.14**	0.163	33.01	-10.88
	QPSK	1880.0	H	Open	156	261	3.47	1 / 25	17.95	21.41	0.138	33.01	-11.60
	QPSK	1905.0	H	Open	147	261	3.48	1 / 25	17.85	21.33	0.136	33.01	-11.68
	16-QAM	1855.0	H	Open	150	264	3.75	1 / 49	17.42	21.18	0.131	33.01	-11.84
5 MHz	QPSK	1852.5	H	Open	150	264	3.79	1 / 24	18.27	**22.06**	0.161	33.01	-10.95
	QPSK	1880.0	H	Open	156	261	3.47	1 / 0	17.89	21.35	0.137	33.01	-11.66
	QPSK	1907.5	H	Open	147	261	3.50	1 / 24	17.85	21.36	0.137	33.01	-11.65
	16-QAM	1852.5	H	Open	150	264	3.79	1 / 12	17.57	21.36	0.137	33.01	-11.65
3 MHz	QPSK	1851.5	H	Open	150	264	3.81	1 / 7	18.34	**22.15**	0.164	33.01	-10.86
	QPSK	1880.0	H	Open	156	261	3.47	1 / 7	17.86	21.32	0.136	33.01	-11.69
	QPSK	1908.5	H	Open	147	261	3.51	1 / 14	17.77	21.28	0.134	33.01	-11.73
	16-QAM	1851.5	H	Open	150	264	3.81	1 / 14	17.52	21.33	0.136	33.01	-11.68
1.4 MHz	QPSK	1850.7	H	Open	150	264	3.82	1 / 3	18.25	**22.07**	0.161	33.01	-10.94
	QPSK	1880.0	H	Open	156	261	3.47	1 / 3	17.81	21.28	0.134	33.01	-11.73
	QPSK	1909.3	H	Open	147	261	3.52	1 / 5	17.88	21.40	0.138	33.01	-11.61
	16-QAM	1850.7	H	Open	150	264	3.82	1 / 3	17.64	21.47	0.140	33.01	-11.54
20 MHz	OPSK (Opposite Pol.)	1860.0	V	Open	173	282	3.67	1 / 99	16.83	20.50	0.112	33.01	-12.51
	QPSK (WCP)	1860.0	H	Open	150	268	3.67	1 / 50	17.30	20.97	0.125	33.01	-12.04
	QPSK	1860.0	H	Half	226	263	3.67	1 / 99	17.86	21.53	0.142	33.01	-11.48

Table 7-14. EIRP Data (LTE Band 2 – Ant I)

7.8 Radiated Spurious Emissions Measurements

Test Overview

Radiated spurious emissions measurements are performed using the field strength conversion method described in ANSI C63.26-2015 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using hybrid (biconical/log) antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as RMS measurements while the EUT is operating at maximum power, and at the appropriate frequencies.

Test Procedures Used

ANSI C63.26-2015 – Section 5.5.4

Test Settings

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW ≥ 3 x RBW
3. Span = 1.5 times the OBW
4. No. of sweep points ≥ 2 x span / RBW
5. Detector = RMS
6. Trace mode = Average (Max Hold for pulsed emissions)
7. The trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

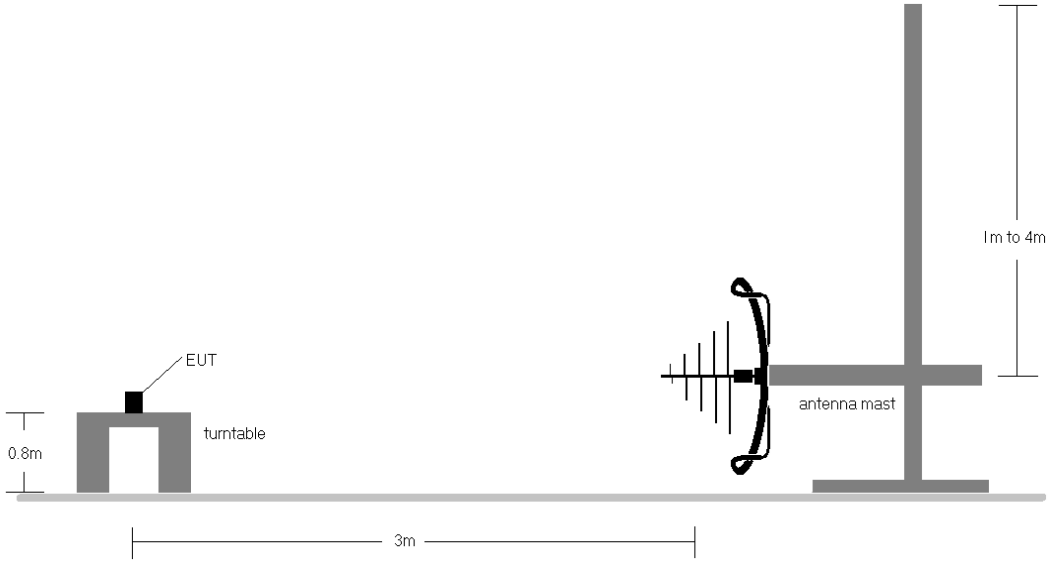


Figure 7-7. Test Instrument & Measurement Setup < 1GHz

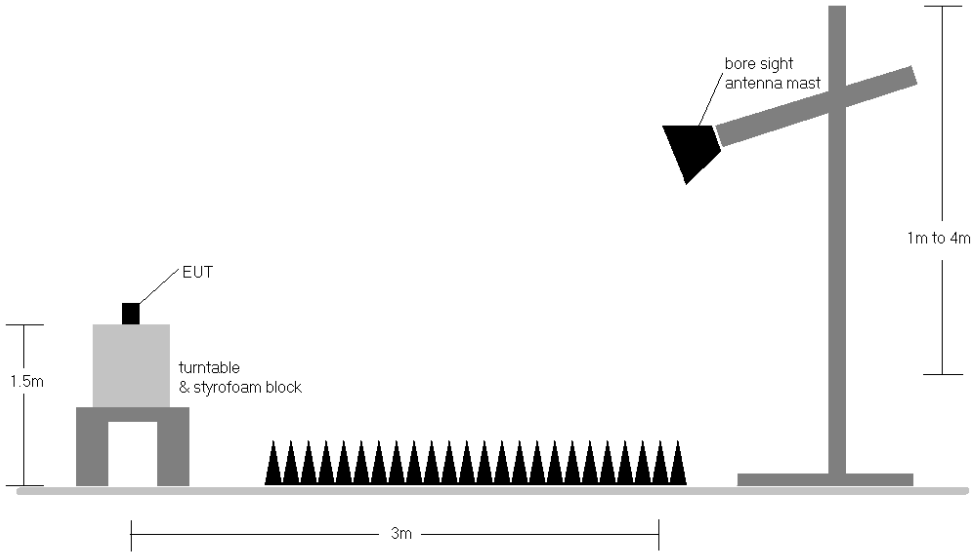


Figure 7-8. Test Instrument & Measurement Setup >1 GHz

Test Notes

1) Field strengths are calculated using the Measurement quantity conversions in ANSI C63.26-2015 Section 5.2.7:
   a) E(dBµV/m) = Measured amplitude level (dBm) + 107 + Cable Loss (dB) + Antenna Factor (dB/m)
   b) EIRP (dBm) = E(dBµV/m) + 20logD – 104.8; where D is the measurement distance in meters.

2) This device employs GSM, GPRS, and EDGE capabilities. The EUT was tested under all configurations and the highest powers are reported in GPRS mode while transmitting with one slot active.

3) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst-case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.

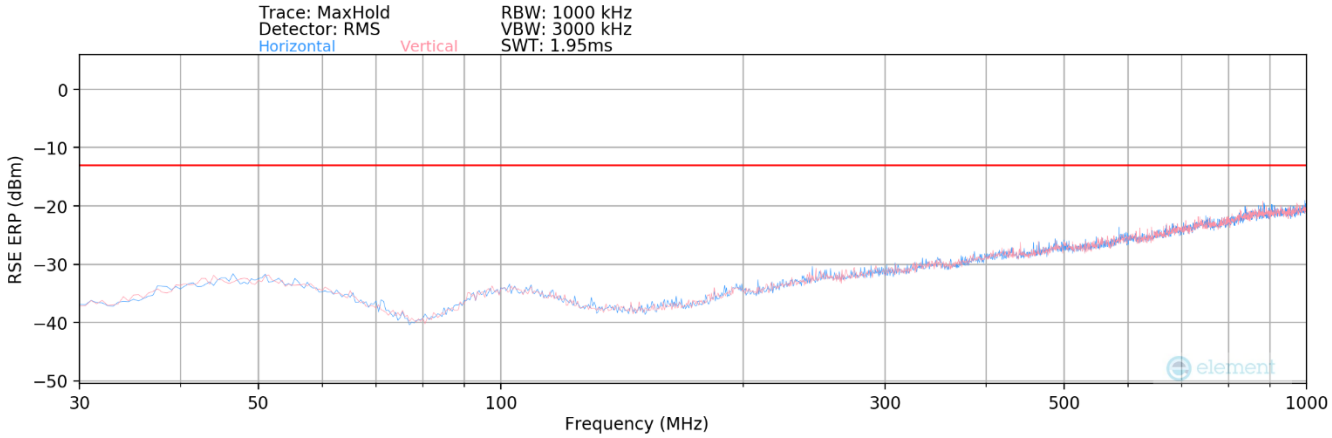
4) This unit was tested with its standard battery.

5) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.

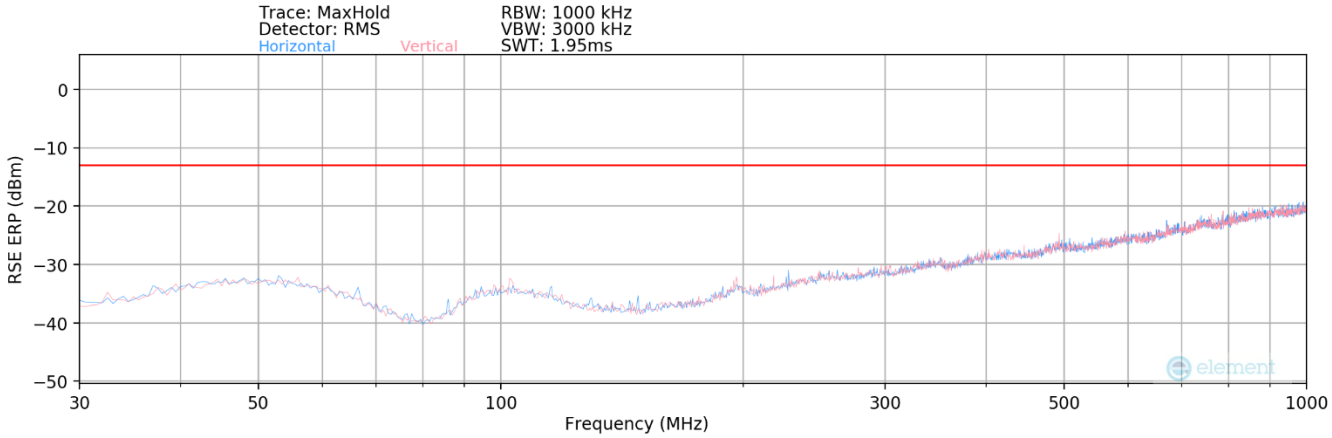
6) Emissions below 18GHz were measured at a 3-meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.

7) The "-" shown in the following RSE tables are used to denote a noise floor measurement.

LTE Band 2 – Ant A



Plot 7-52. Radiated Spurious Plot Below 1GHz (LTE Band 2 – Ant A) – CLOSE

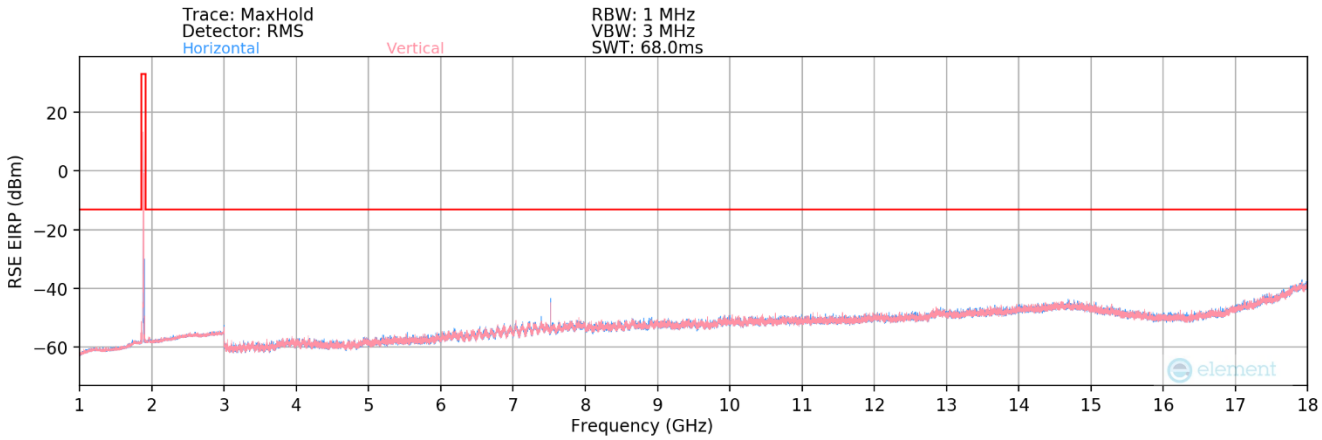


Plot 7-53. Radiated Spurious Plot Below 1GHz (LTE Band 2 – Ant A) – OPEN

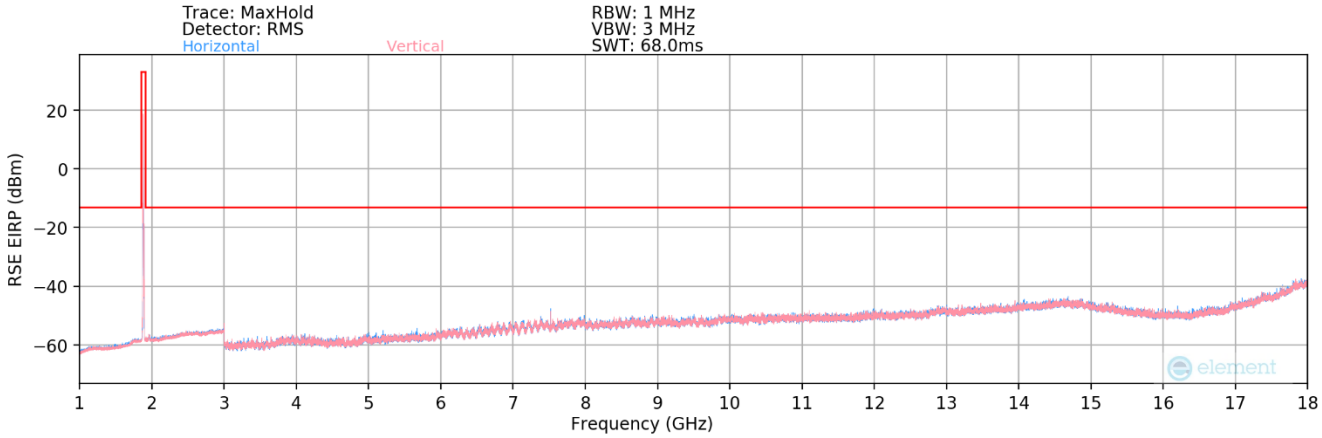
Bandwidth (MHz):	20
Frequency (MHz):	1860
RB / Offset:	1 / 0

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	ERP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
387.08	H	-	-	-79.01	22.64	50.63	-46.77	-13.00	-33.77
565.18	H	-	-	-82.13	25.56	50.43	-46.98	-13.00	-33.98
814.89	H	-	-	-80.52	29.37	55.85	-41.56	-13.00	-28.56

Table 7-15. Radiated Spurious Data Below 1GHz (LTE Band 2 – Ant A) – CLOSE



Plot 7-54. Radiated Spurious Plot Above 1GHz (LTE Band 2 – Ant A) – CLOSE



Plot 7-55. Radiated Spurious Plot Above 1GHz (LTE Band 2 – Ant A) – OPEN

Bandwidth (MHz):	20
Frequency (MHz):	1860
RB / Offset:	1 / 0

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3720.00	H	243	233	-73.92	-0.81	32.27	-62.99	-13.00	-49.99
5580.00	H	235	236	-74.35	2.14	34.79	-60.47	-13.00	-47.47
7440.00	H	225	222	-65.99	7.00	48.01	-47.25	-13.00	-34.25
9300.00	H	-	-	-79.87	9.80	36.93	-58.33	-13.00	-45.33
11160.00	H	-	-	-79.97	11.57	38.60	-56.66	-13.00	-43.66
13020.00	H	-	-	-80.77	14.90	41.13	-54.12	-13.00	-41.12
14880.00	H	-	-	-81.35	17.92	43.57	-51.69	-13.00	-38.69
16740.00	H	-	-	-81.20	15.66	41.46	-53.80	-13.00	-40.80

Table 7-16. Radiated Spurious Data Above 1GHz (LTE Band 2 – Low Channel – Ant A) – CLOSE

Bandwidth (MHz):	20
Frequency (MHz):	1880
RB / Offset:	1 / 0

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3760.00	H	223	231	-72.63	0.05	34.42	-60.84	-13.00	-47.84
5640.00	H	229	227	-73.99	2.43	35.44	-59.82	-13.00	-46.82
7520.00	H	228	219	-65.74	6.53	47.79	-47.47	-13.00	-34.47
9400.00	H	-	-	-79.40	9.76	37.36	-57.90	-13.00	-44.90
11280.00	H	-	-	-79.96	11.49	38.53	-56.73	-13.00	-43.73
13160.00	H	-	-	-80.44	14.72	41.28	-53.98	-13.00	-40.98
15040.00	H	-	-	-80.72	17.01	43.29	-51.97	-13.00	-38.97
16920.00	H	-	-	-82.09	16.79	41.70	-53.56	-13.00	-40.56

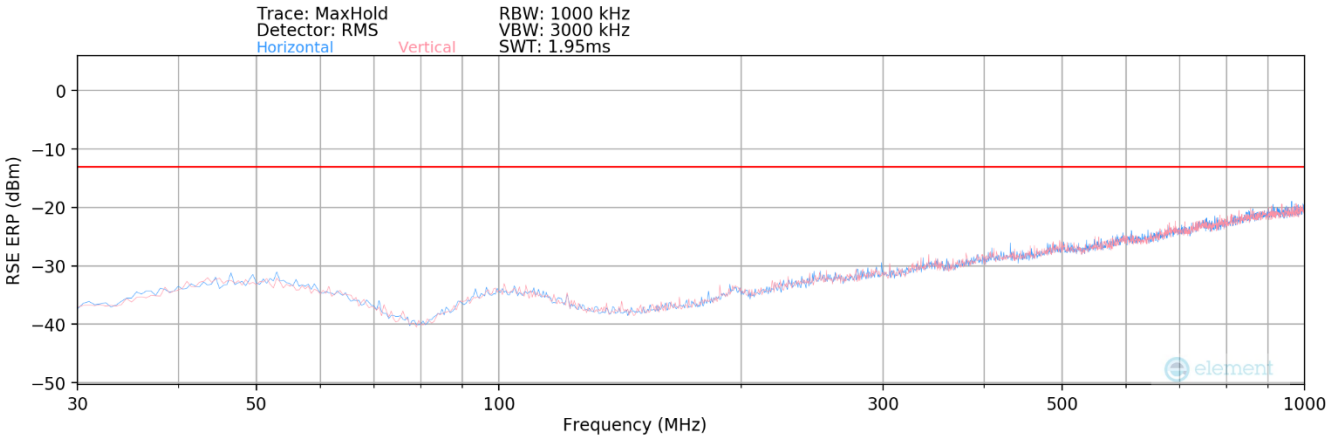
Table 7-17. Radiated Spurious Data Above 1GHz (LTE Band 2 – Mid Channel – Ant A) – CLOSE

Bandwidth (MHz):	20
Frequency (MHz):	1900
RB / Offset:	1 / 0

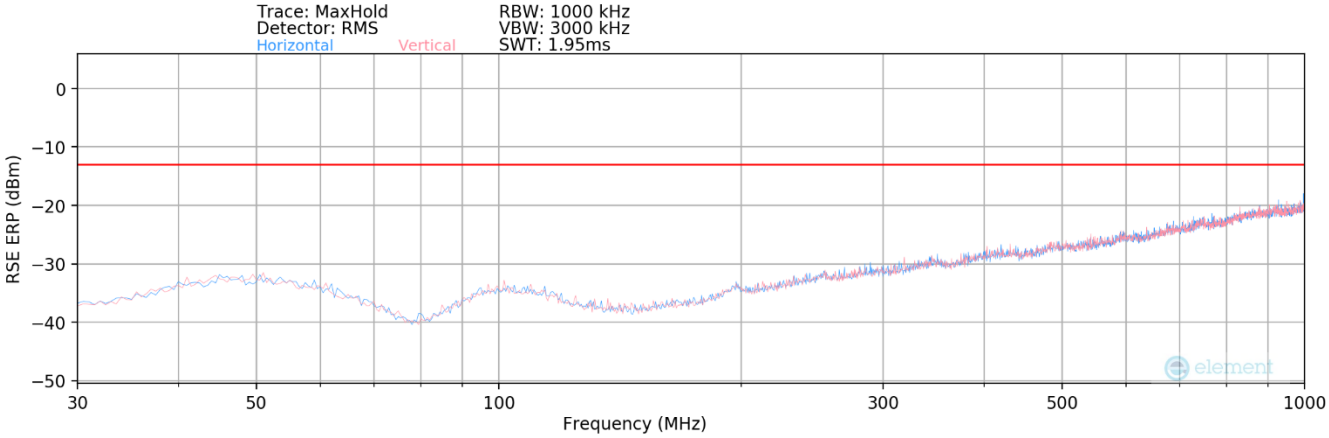
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3800.00	H	243	223	-72.20	-0.10	34.70	-60.56	-13.00	-47.56
5700.00	H	232	230	-73.23	2.13	35.90	-59.36	-13.00	-46.36
7600.00	H	229	218	-67.17	6.58	46.41	-48.85	-13.00	-35.85
9500.00	H	-	-	-79.09	9.84	37.75	-57.51	-13.00	-44.51
11400.00	H	-	-	-79.73	12.06	39.33	-55.93	-13.00	-42.93
13300.00	H	-	-	-80.41	15.46	42.05	-53.21	-13.00	-40.21
15200.00	H	-	-	-80.80	16.33	42.53	-52.73	-13.00	-39.73
17100.00	H	-	-	-81.67	18.10	43.43	-51.83	-13.00	-38.83

Table 7-18. Radiated Spurious Data Above 1GHz (LTE Band 2 – High Channel – Ant A) – CLOSE

GSM/GPRS PCS – Ant A



Plot 7-56. Radiated Spurious Plot Below 1GHz (GPRS PCS – Ant A) – CLOSE

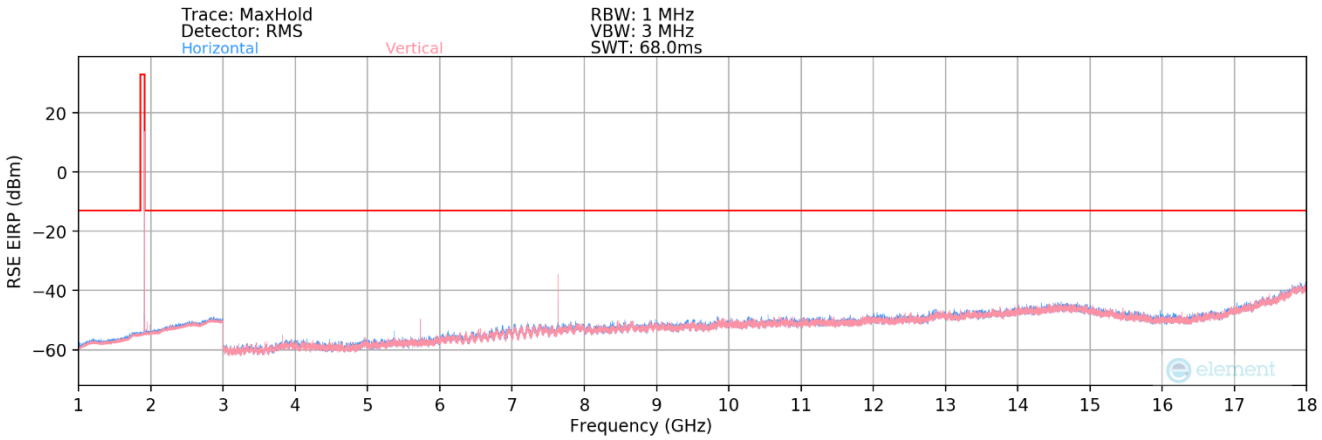


Plot 7-57. Radiated Spurious Plot Below 1GHz (GPRS PCS – Ant A) – OPEN

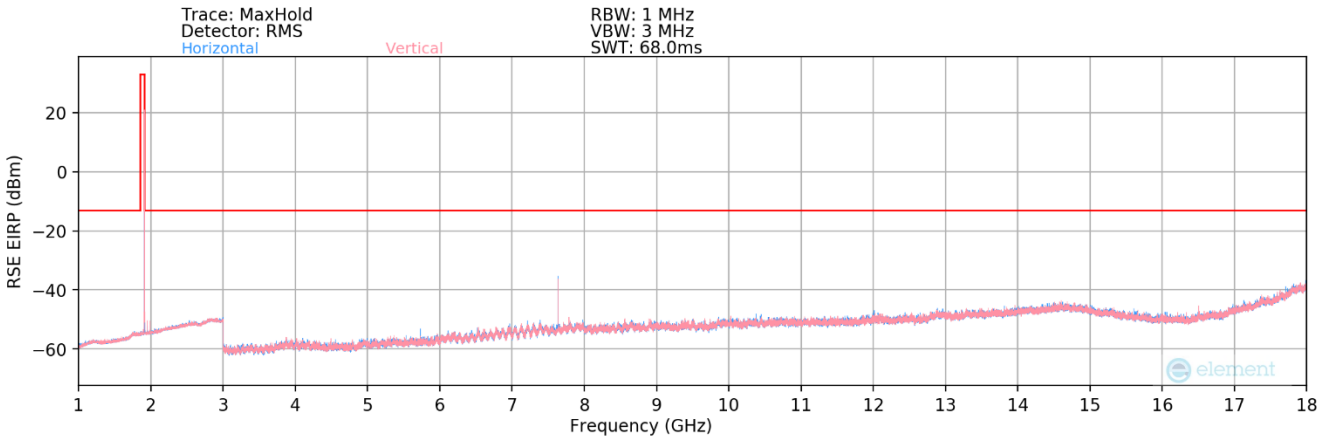
Mode:	GPRS 1 Tx Slot
Channel:	810
Frequency (MHz):	1909.8

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	ERP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
499.15	H	-	-	-72.33	24.68	59.35	-38.06	-13.00	-25.06
568.08	H	-	-	-71.15	25.56	61.41	-36.00	-13.00	-23.00
953.48	H	-	-	-71.42	30.60	66.18	-31.23	-13.00	-18.23

Table 7-19. Radiated Spurious Data Below 1GHz (GPRS PCS – Ant A) – CLOSE



Plot 7-58. Radiated Spurious Plot Above 1GHz (GPRS PCS – Ant A) – CLOSE



Plot 7-59. Radiated Spurious Plot Above 1GHz (GPRS PCS – Ant A) – OPEN

Mode:	GPRS 1 Tx Slot
Channel:	512
Frequency (MHz):	1850.2

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3700.40	H	123	242	-65.18	-0.99	40.83	-54.42	-13.00	-41.42
5550.60	H	125	246	-64.90	1.90	44.00	-51.26	-13.00	-38.26
7400.80	H	110	247	-62.04	7.90	52.86	-42.40	-13.00	-29.40
9251.00	H	138	257	-70.00	9.52	46.52	-48.73	-13.00	-35.73
11101.20	H	-	-	-71.69	11.69	47.00	-48.26	-13.00	-35.26
12951.40	H	-	-	-72.86	14.99	49.13	-46.12	-13.00	-33.12
14801.60	H	-	-	-73.80	18.06	51.26	-43.99	-13.00	-30.99
16651.80	H	-	-	-73.42	15.80	49.38	-45.88	-13.00	-32.88

Table 7-20. Radiated Spurious Data Above 1GHz (GPRS PCS – Low Channel – Ant A) – CLOSE

Channel:	661
Frequency (MHz):	1880

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3760.00	H	118	220	-64.95	0.05	42.10	-53.16	-13.00	-40.16
5640.00	H	123	225	-61.74	2.43	47.69	-47.57	-13.00	-34.57
7520.00	H	113	235	-62.61	6.53	50.92	-44.34	-13.00	-31.34
9400.00	H	111	240	-70.68	9.76	46.08	-49.18	-13.00	-36.18
11280.00	H	-	-	-71.75	11.49	46.74	-48.52	-13.00	-35.52
13160.00	H	-	-	-72.10	14.72	49.62	-45.64	-13.00	-32.64
15040.00	H	-	-	-73.00	17.01	51.01	-44.25	-13.00	-31.25
16920.00	H	-	-	-74.17	16.79	49.62	-45.64	-13.00	-32.64

Table 7-21. Radiated Spurious Data Above 1GHz (GPRS PCS – Mid Channel – Ant A) – CLOSE

Mode:	GPRS 1 Tx Slot
Channel:	810
Frequency (MHz):	1909.8

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3819.60	H	125	240	-67.75	0.21	39.46	-55.79	-13.00	-42.79
5729.40	H	110	246	-61.66	2.32	47.66	-47.59	-13.00	-34.59
7639.20	H	110	253	-55.59	7.20	58.61	-36.65	-13.00	-23.65
9549.00	H	118	241	-72.10	9.46	44.36	-50.89	-13.00	-37.89
11458.80	H	-	-	-71.81	12.07	47.26	-47.99	-13.00	-34.99
13368.60	H	-	-	-72.90	15.46	49.56	-45.70	-13.00	-32.70
15278.40	H	-	-	-73.56	16.23	49.67	-45.59	-13.00	-32.59
17188.20	H	-	-	-73.57	18.88	52.31	-42.95	-13.00	-29.95

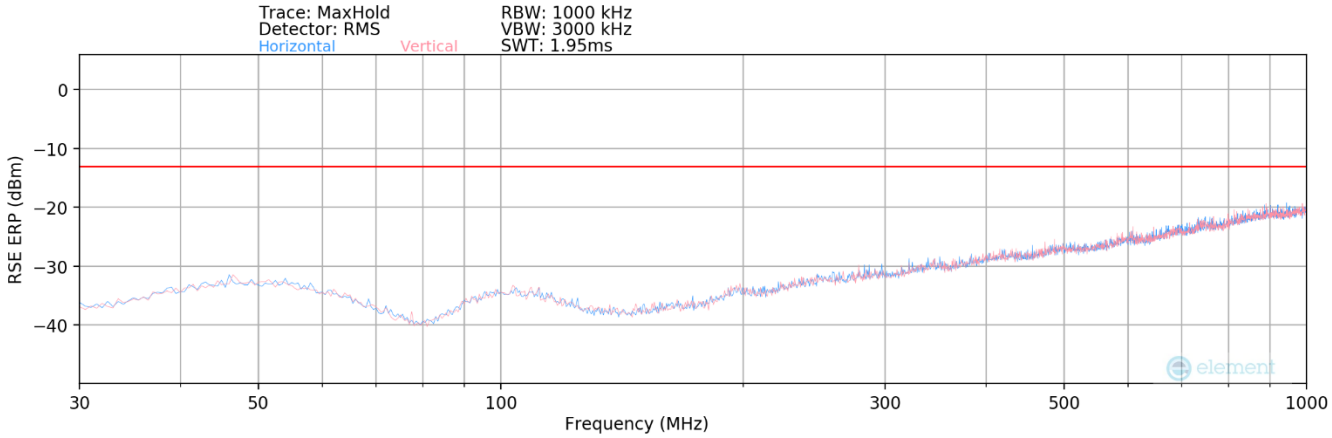
Table 7-22. Radiated Spurious Data Above 1GHz (GPRS PCS – High Channel – Ant A) – CLOSE

Case:	w/ Wireless Charging Pad
Mode:	GPRS 1 Tx Slot
Channel:	810
Frequency (MHz):	1909.8

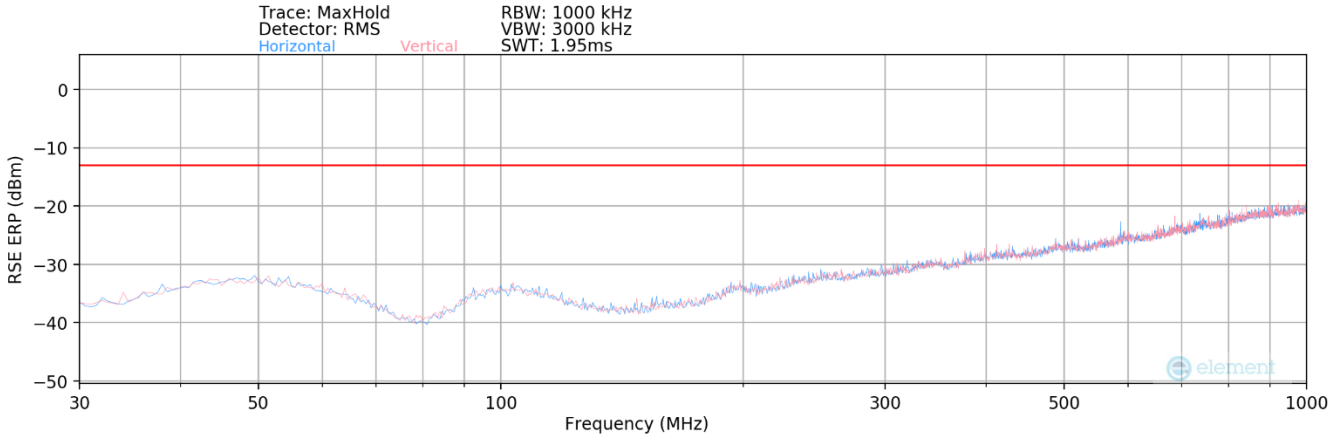
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3819.60	H	162	258	-62.61	0.21	44.60	-50.65	-13.00	-37.65
5729.40	H	164	249	-61.73	2.32	47.59	-47.66	-13.00	-34.66
7639.20	H	149	246	-57.71	7.20	56.49	-38.77	-13.00	-25.77
9549.00	H	162	271	-71.63	9.46	44.83	-50.42	-13.00	-37.42
11458.80	H	-	-	-71.78	12.07	47.29	-47.96	-13.00	-34.96
13368.60	H	-	-	-72.54	15.46	49.92	-45.34	-13.00	-32.34
15278.40	H	-	-	-73.35	16.23	49.88	-45.38	-13.00	-32.38
17188.20	H	-	-	-73.23	18.88	52.65	-42.61	-13.00	-29.61

Table 7-23. Radiated Spurious Data Above 1GHz (GPRS PCS – High Channel – Ant A) – CLOSE (WCP)

LTE Band 2 – Ant I



Plot 7-60. Radiated Spurious Plot Below 1GHz (LTE Band 2 – Ant I) – CLOSE

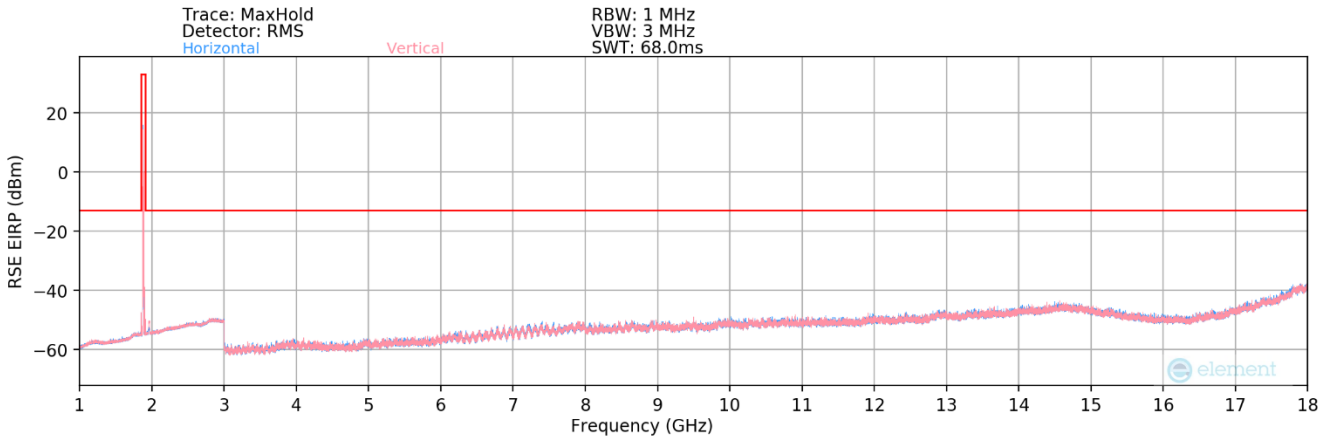


Plot 7-61. Radiated Spurious Plot Below 1GHz (LTE Band 2 – Ant I) – HALF OPEN

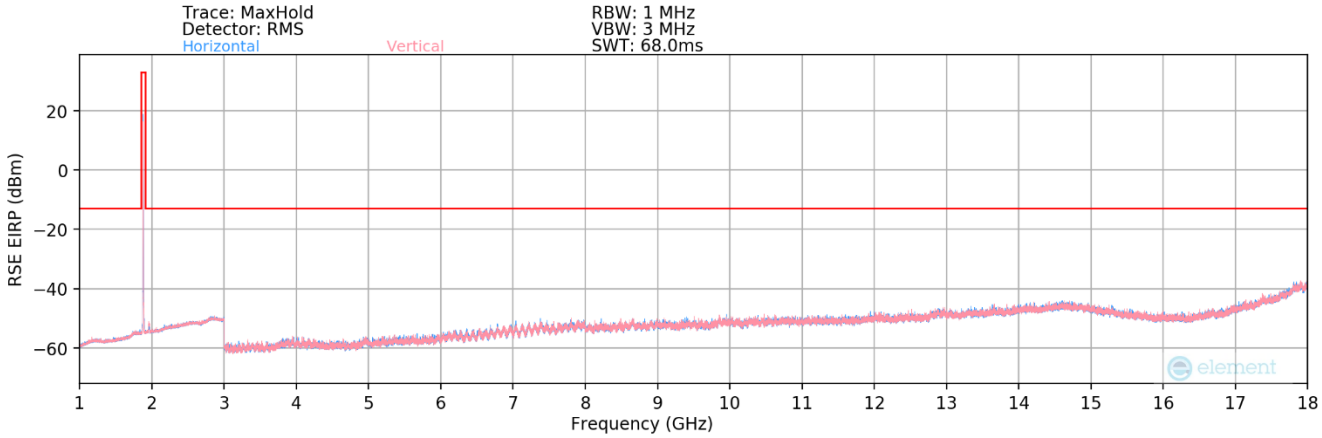
Bandwidth (MHz):	20
Frequency (MHz):	1900
RB / Offset:	1 / 0

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	ERP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
424.64	V	-	-	-79.01	23.35	51.34	-46.07	-13.00	-33.07
546.45	V	-	-	-79.10	25.25	53.15	-44.26	-13.00	-31.26
956.39	V	-	-	-82.02	30.63	55.61	-41.80	-13.00	-28.80

Table 7-24. Radiated Spurious Data Below 1GHz (LTE Band 2 – Ant I) – CLOSE



Plot 7-62. Radiated Spurious Plot Above 1GHz (LTE Band 2 – Ant I) – CLOSE



Plot 7-63. Radiated Spurious Plot Above 1GHz (LTE Band 2 – Ant I) – HALF OPEN

Bandwidth (MHz):	20
Frequency (MHz):	1860
RB / Offset:	1 / 0

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3720.00	V	339	148	-73.24	-0.81	32.95	-62.31	-13.00	-49.31
5580.00	V	-	-	-76.36	2.14	32.78	-62.48	-13.00	-49.48
7440.00	V	-	-	-77.86	7.00	36.14	-59.12	-13.00	-46.12
9300.00	V	-	-	-79.78	9.80	37.02	-58.24	-13.00	-45.24
11160.00	V	-	-	-80.06	11.57	38.51	-56.75	-13.00	-43.75
13020.00	V	-	-	-80.95	14.90	40.95	-54.30	-13.00	-41.30

Table 7-25. Radiated Spurious Data Above 1GHz (LTE Band 2 – Low Channel – Ant I) – CLOSE

Bandwidth (MHz):	20
Frequency (MHz):	1880
RB / Offset:	1 / 50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3760.00	V	328	149	-74.39	0.05	32.66	-62.60	-13.00	-49.60
5640.00	V	-	-	-76.59	2.43	32.84	-62.42	-13.00	-49.42
7520.00	V	-	-	-77.59	6.53	35.94	-59.32	-13.00	-46.32
9400.00	V	-	-	-79.63	9.76	37.13	-58.13	-13.00	-45.13
11280.00	V	-	-	-80.06	11.49	38.43	-56.83	-13.00	-43.83
13160.00	V	-	-	-80.18	14.72	41.54	-53.72	-13.00	-40.72

Table 7-26. Radiated Spurious Data Above 1GHz (LTE Band 2 – Mid Channel – Ant I) – CLOSE

Bandwidth (MHz):	20
Frequency (MHz):	1900
RB / Offset:	1 / 50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3800.00	V	342	160	-73.53	-0.10	33.37	-61.89	-13.00	-48.89
5700.00	V	-	-	-76.23	2.13	32.90	-62.36	-13.00	-49.36
7600.00	V	-	-	-77.54	6.58	36.04	-59.22	-13.00	-46.22
9500.00	V	-	-	-78.96	9.84	37.88	-57.38	-13.00	-44.38
11400.00	V	-	-	-79.76	12.06	39.30	-55.96	-13.00	-42.96
13300.00	V	-	-	-80.11	15.46	42.35	-52.91	-13.00	-39.91

Table 7-27. Radiated Spurious Data Above 1GHz (LTE Band 2 – High Channel – Ant I) – CLOSE

7.9 Frequency Stability / Temperature Variation

Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI C63.26-2015. The frequency stability of the transmitter is measured by:

a.) **Temperature:** The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.

b.) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

For Part 24, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test Procedure Used

ANSI C63.26-2015 – Section 5.6

Test Settings

1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
2. The equipment is turned on in a "standby" condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

Test Setup

The EUT was connected via an RF cable to a spectrum analyzer with the EUT placed inside an environmental chamber.

Test Notes

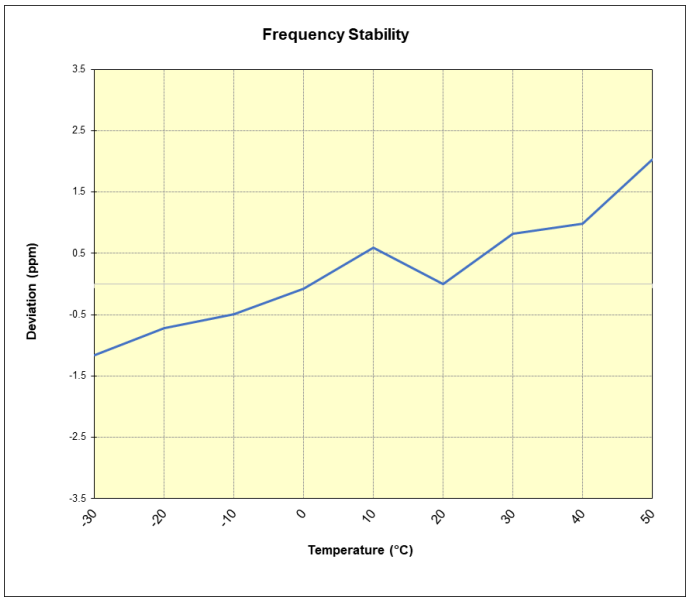
None

LTE Band 2

LTE Band 2	
Operating Frequency (Hz):	1,880,000,000
Ref. Voltage (VDC):	4.15

Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.15	- 30	1,880,148,333	-2,171	-0.0001155
		- 20	1,880,149,147	-1,357	-0.0000722
		- 10	1,880,149,584	-920	-0.0000489
		0	1,880,150,366	-138	-0.0000073
		+ 10	1,880,151,627	1,123	0.0000597
		+ 20 (Ref)	1,880,150,504	0	0.0000000
		+ 30	1,880,152,045	1,541	0.0000820
		+ 40	1,880,152,369	1,865	0.0000992
		+ 50	1,880,154,335	3,831	0.0002038
Battery Endpoint	3.71	+ 20	1,880,151,647	1,143	0.0000608

Table 7-28. LTE Band 2 Frequency Stability Data



Plot 7-64. LTE Band 2 Frequency Stability Chart

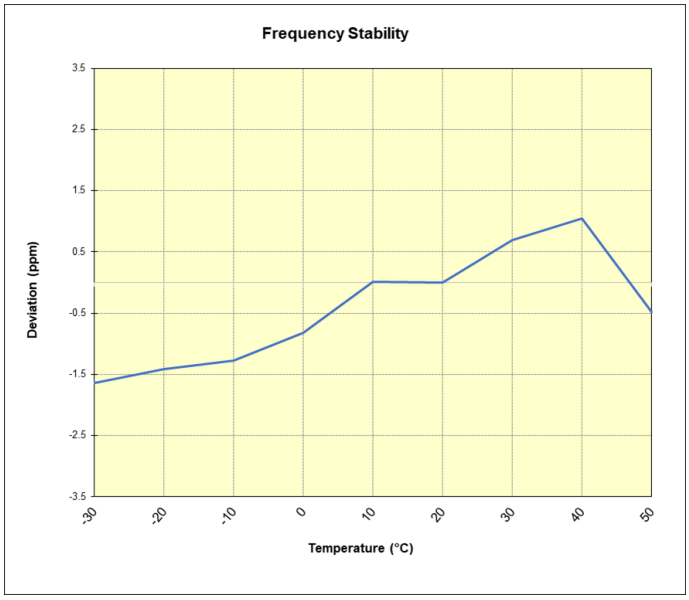
GSM/GPRS PCS

GSM/GPRS PCS

Operating Frequency (Hz):	1,880,000,000
Ref. Voltage (VDC):	4.15

Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.15	- 30	1,880,450,569	-3,086	-0.0001641
		- 20	1,880,450,989	-2,666	-0.0001418
		- 10	1,880,451,269	-2,386	-0.0001269
		0	1,880,452,111	-1,544	-0.0000821
		+ 10	1,880,453,677	22	0.0000012
		+ 20 (Ref)	1,880,453,655	0	0.0000000
		+ 30	1,880,454,957	1,302	0.0000692
		+ 40	1,880,455,630	1,975	0.0001050
		+ 50	1,880,452,760	-895	-0.0000476
Battery Endpoint	3.71	+ 20	1,880,454,666	1,011	0.0000538

Table 7-29. GSM/GPRS PCS Frequency Stability Data



Plot 7-65. GSM/GPRS PCS Frequency Stability Chart

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Portable Handset FCC ID: A3LSMF731JPN** complies with all the requirements of Part 24 of the FCC rules.