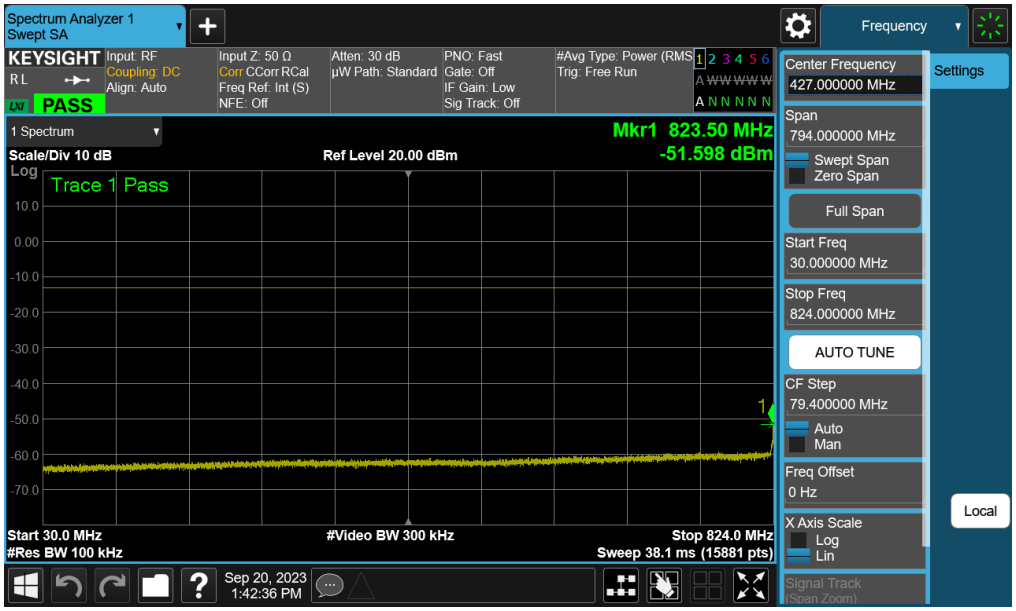
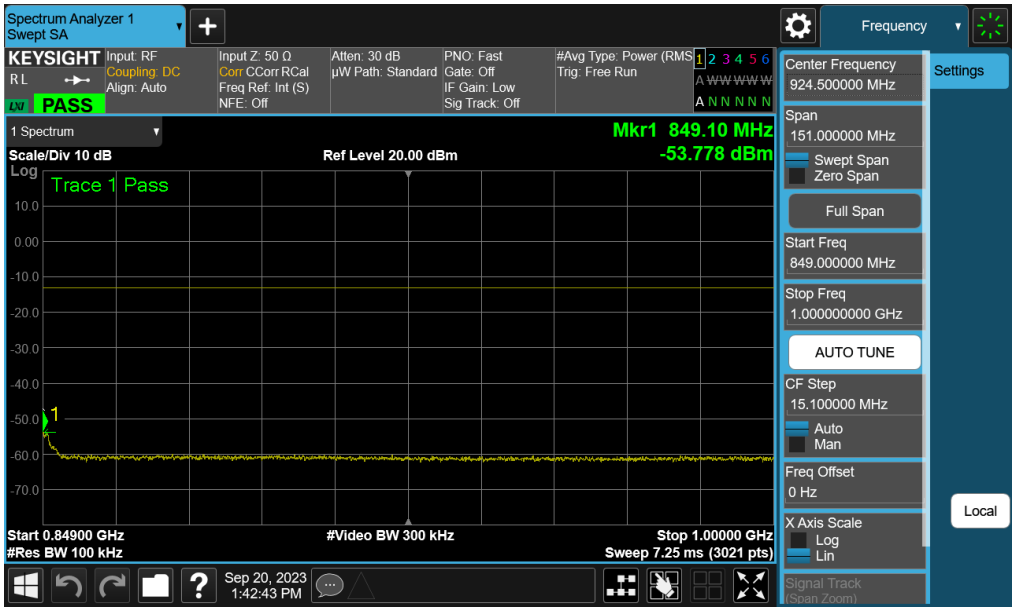
WCDMA Cell



Plot 7-35. Conducted Spurious Plot (WCDMA Ch. 4183)



Plot 7-36. Conducted Spurious Plot (WCDMA Ch. 4183)

Plot 7-37. Conducted Spurious Plot (WCDMA Ch. 4183)

7.5 Band Edge Emissions at Antenna Terminal

Test Overview

All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

The minimum permissible attenuation level of any spurious emission is 43 + 10 $log_{10}(P_{[Watts]})$, where P is the transmitter power in Watts.

Test Procedure Used

ANSI C63.26-2015 – Section 5.7.3

Test Settings

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW ≥ 1% of the emission bandwidth
4. VBW ≥ 3 x RBW
5. Detector = RMS
6. Number of sweep points ≥ 2 x Span/RBW
7. Trace mode = trace average for continuous emissions, max hold for pulse emissions
8. Sweep time = auto couple
9. The trace was allowed to stabilize

Test Setup

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

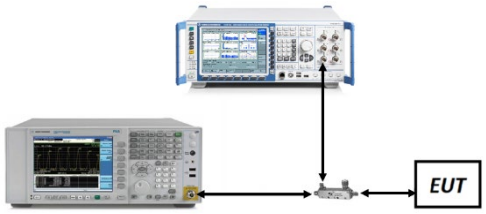


Figure 7-4. Test Instrument & Measurement Setup

Test Notes

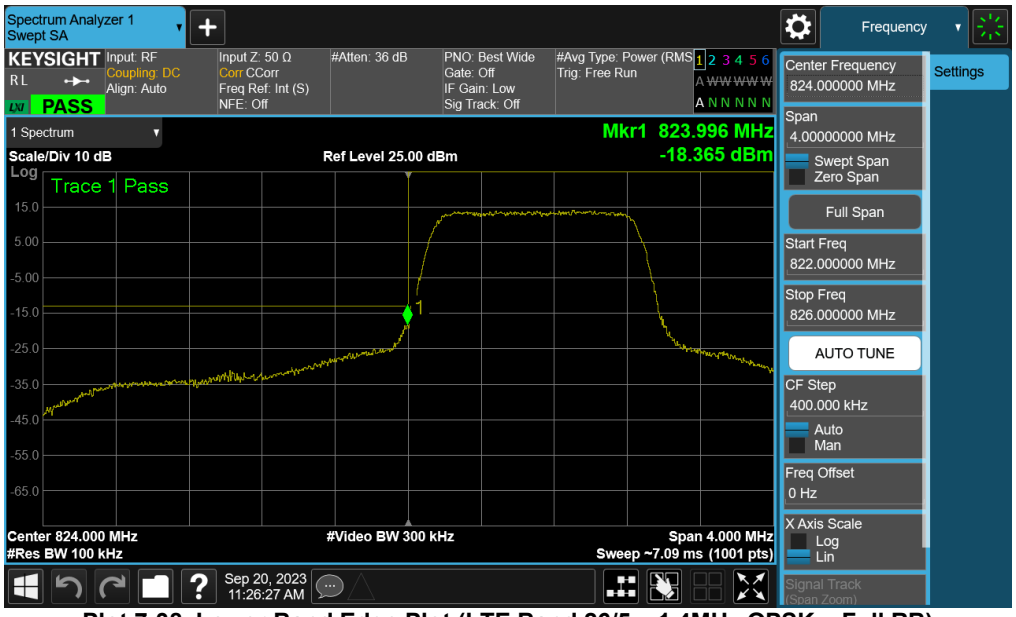
1. Per 22.917(b) and RSS-132(5.5), in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to demonstrate compliance with the out-of-band emissions limit. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

2. For NR operation, all subcarrier spacings (SCS) and transmission schemes (e.g. CP-OFDM and DFT-s-OFDM) were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

Mode	Bandwidth	Channel	Test Case	Level [dBm]	Limit [dBm]	Margin [dB]
GSM-Cell	250kHz	Low	Band Edge	-14.53	-13	-1.53
		High	Band Edge	-14.54	-13	-1.54
WCDMA-Cell	5MHz	Low	Band Edge	-20.35	-13	-7.35
		High	Band Edge	-18.70	-11	-5.70
LTE-B26-5	15MHz (B26 Only)	Low	Band Edge	-32.44	-13	-19.44
		High	Band Edge	-30.85	-13	-17.85
	10MHz	Low	Band Edge	-33.77	-13	-20.77
		High	Band Edge	-32.47	-13	-19.47
	5MHz	Low	Band Edge	-27.48	-13	-14.48
		High	Band Edge	-27.51	-13	-14.51
	3MHz	Low	Band Edge	-24.46	-13	-11.46
		High	Band Edge	-23.62	-13	-10.62
	1.4MHz	Low	Band Edge	-18.37	-13	-5.36
		High	Band Edge	-17.90	-13	-4.90
NR-n5	20MHz	Low	Band Edge	-34.47	-13	-21.47
		High	Band Edge	-35.23	-13	-22.23
	15MHz	Low	Band Edge	-33.36	-13	-20.36
		High	Band Edge	-35.08	-13	-22.08
	10MHz	Low	Band Edge	-34.00	-13	-21.00
		High	Band Edge	-34.89	-13	-21.89
	5MHz	Low	Band Edge	-27.02	-13	-14.02
		High	Band Edge	-29.85	-13	-16.85

Table 7-5. Band Edge Test Results

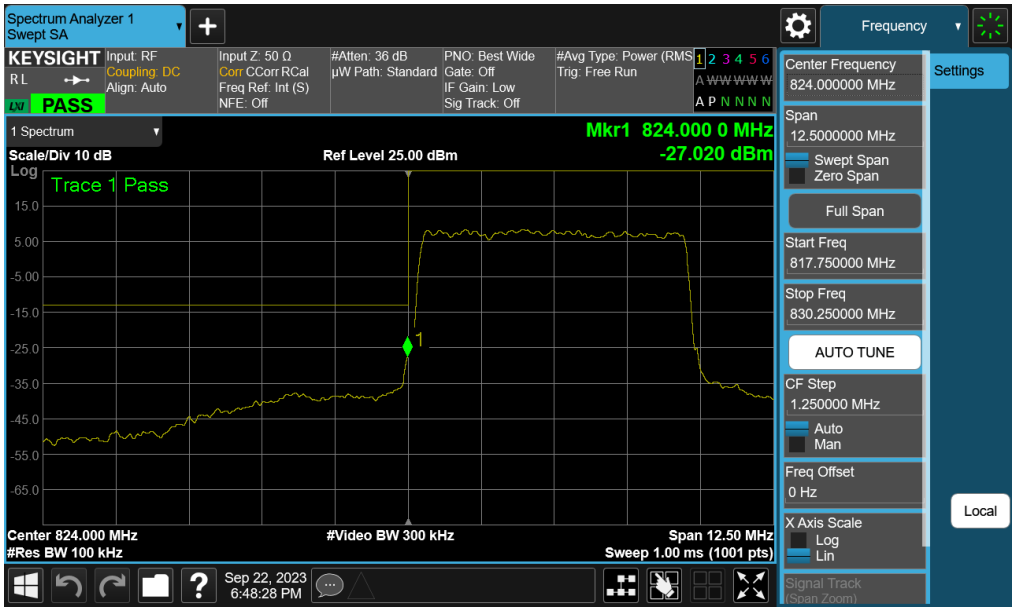
LTE Band 26/5



Plot 7-38. Lower Band Edge Plot (LTE Band 26/5 – 1.4MHz QPSK – Full RB)

Plot 7-39. Upper Band Edge Plot (LTE Band 26/5 – 1.4MHz QPSK – Full RB)

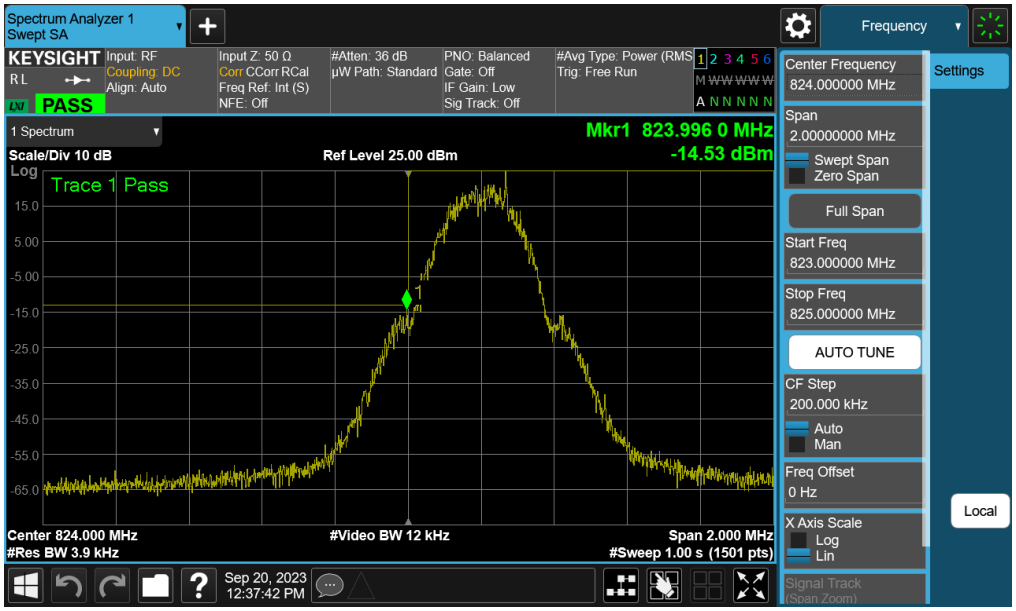
NR Band n5



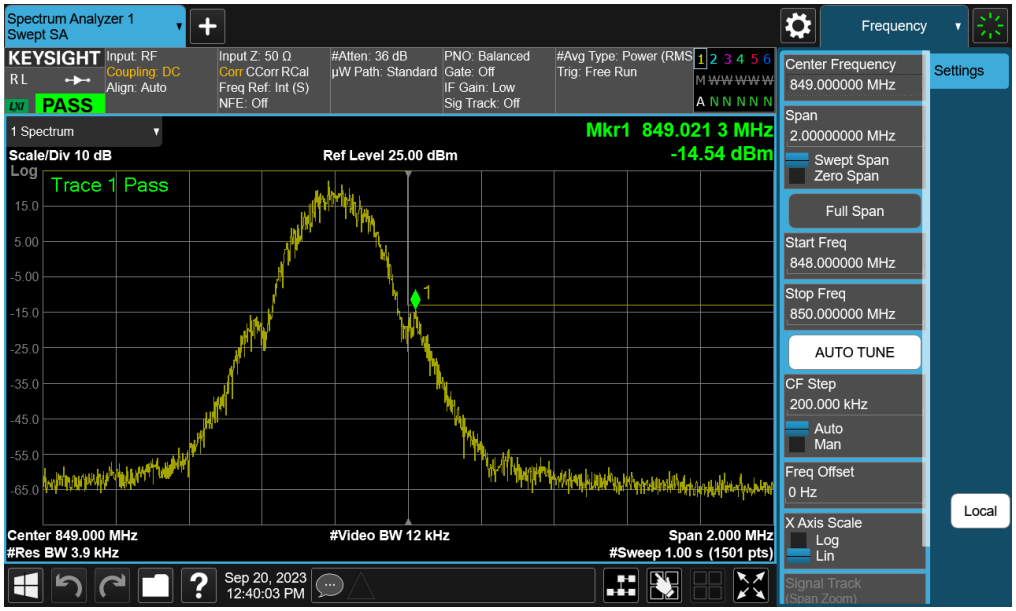
Plot 7-40. Lower Band Edge Plot (NR Band n5 – 5.0MHz BPSK - Full RB)

Plot 7-41. Upper Band Edge Plot (NR Band n5 – 5.0MHz CP - Full RB)

GSM/GPRS Cell

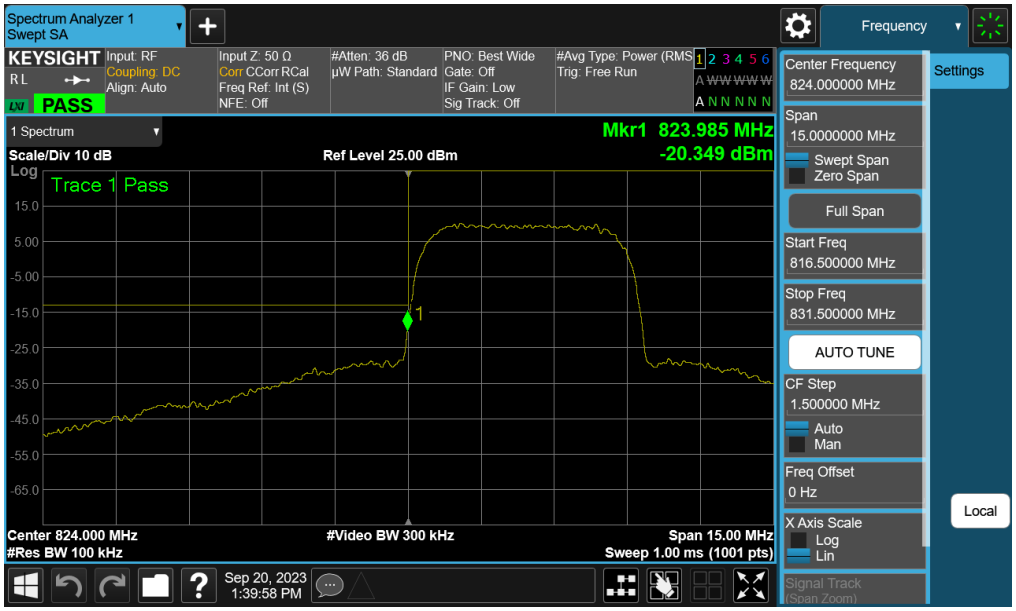


Plot 7-42. Lower Band Edge Plot (GPRS Cell – Ch. 128)



Plot 7-43. Upper Band Edge Plot (GPRS Cell – Ch. 251)

WCDMA Cell



Plot 7-44. Lower Band Edge Plot (WCDMA Cell – Ch. 4132)

Plot 7-45. Upper Band Edge Plot (WCDMA Cell – Ch. 4233)

7.6 Radiated Power (ERP)

Test Overview

Effective Radiated Power (ERP) 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.

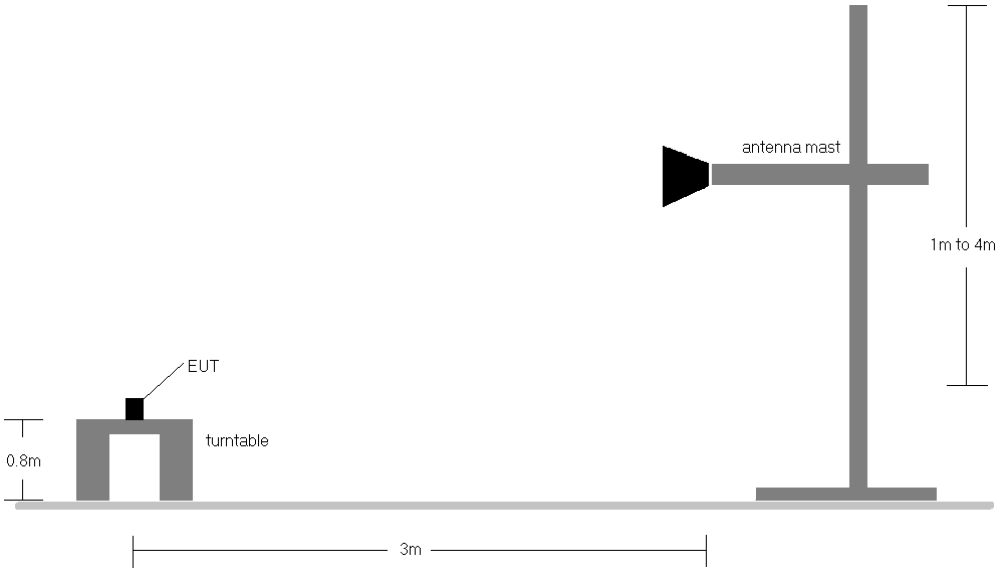


Figure 7-5. Radiated Test Setup < 1GHz

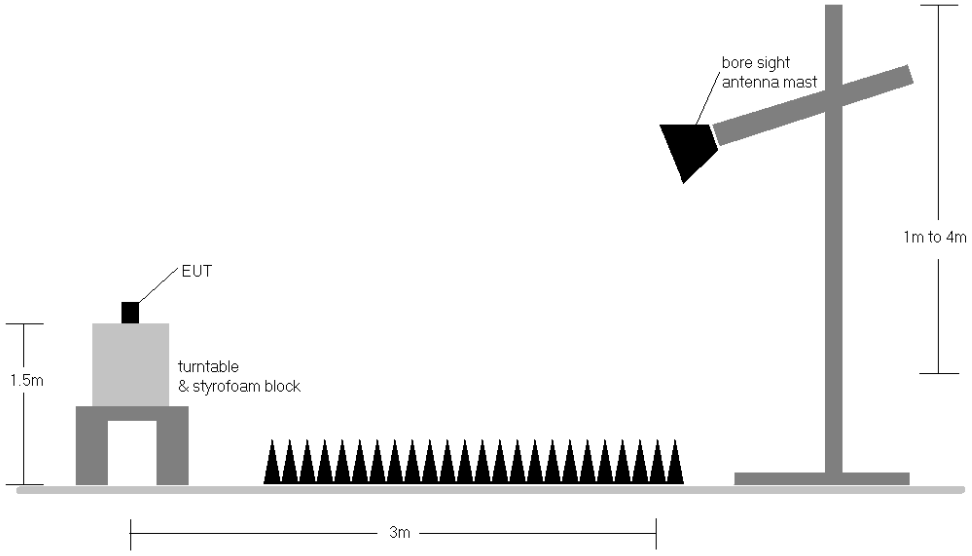


Figure 7-6. Radiated Test Setup > 1GHz

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) This device employs UMTS technology with WCDMA (AMR/RMC) and HSDPA capabilities. The EUT was tested under all configurations and the highest powers are reported in WCDMA mode with HSDPA Inactive at 12.2 kbps RMC and TPC bits all set to “1”.

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) For NR operation, all subcarrier spacings (SCS) and transmission schemes (e.g. CP-OFDM and DFT-s-OFDM) were investigated to determine the worst case configuration. All modes of operation were investigated and the worst-case configuration results are reported in this section.

Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
15MHz (Band 26 only)	QPSK	831.50	V	140	240	1.29	1 / 37	22.04	21.18	0.131	38.45	-17.27	23.33	0.215	40.61	-17.28
	QPSK	836.50	V	140	240	1.31	1 / 0	22.19	**21.35**	0.136	38.45	-17.10	**23.50**	0.224	40.61	-17.11
	QPSK	841.50	V	140	240	1.33	1 / 0	21.18	20.36	0.109	38.45	-18.09	22.51	0.178	40.61	-18.09
	16-QAM	836.50	V	140	240	1.31	1 / 0	21.16	20.32	0.108	38.45	-18.13	22.47	0.177	40.61	-18.14
10 MHz	QPSK	829.00	V	140	240	1.27	1 / 25	21.99	21.11	0.129	38.45	-17.34	23.26	0.212	40.61	-17.34
	QPSK	836.50	V	140	240	1.31	1 / 25	22.38	**21.54**	0.143	38.45	-16.91	**23.69**	0.234	40.61	-16.91
	QPSK	844.00	V	140	240	1.35	1 / 0	21.16	20.35	0.108	38.45	-18.10	22.50	0.178	40.61	-18.10
	16-QAM	836.50	V	140	240	1.31	1 / 25	21.16	20.32	0.108	38.45	-18.13	22.47	0.177	40.61	-18.14
5 MHz	QPSK	826.50	V	140	240	1.26	1 / 24	22.10	21.21	0.132	38.45	-17.24	23.36	0.217	40.61	-17.25
	QPSK	836.50	V	140	240	1.31	1 / 24	22.31	**21.47**	0.140	38.45	-16.98	**23.62**	0.230	40.61	-16.99
	QPSK	846.50	V	140	240	1.36	1 / 12	21.14	20.35	0.108	38.45	-18.10	22.50	0.178	40.61	-18.11
	16-QAM	836.50	V	140	240	1.31	1 / 24	21.35	20.51	0.112	38.45	-17.94	22.66	0.184	40.61	-17.95
3 MHz	QPSK	825.50	V	140	240	1.26	1 / 14	21.85	20.96	0.125	38.45	-17.49	23.11	0.205	40.61	-17.50
	QPSK	836.50	V	140	240	1.31	1 / 0	22.19	**21.35**	0.137	38.45	-17.10	**23.50**	0.224	40.61	-17.10
	QPSK	847.50	V	140	240	1.36	1 / 14	21.09	20.30	0.107	38.45	-18.15	22.45	0.176	40.61	-18.15
	16-QAM	836.50	V	140	240	1.31	1 / 0	20.97	20.13	0.103	38.45	-18.33	22.28	0.169	40.61	-18.33
1.4 MHz	QPSK	824.70	V	140	240	1.25	1 / 5	21.10	20.21	0.105	38.45	-18.25	22.36	0.172	40.61	-18.25
	QPSK	836.50	V	140	240	1.31	1 / 3	22.26	**21.42**	0.139	38.45	-17.03	**23.57**	0.228	40.61	-17.04
	QPSK	848.30	V	140	240	1.37	1 / 5	21.13	20.35	0.108	38.45	-18.10	22.50	0.178	40.61	-18.11
	16-QAM	836.50	V	140	240	1.31	1 / 3	20.85	20.01	0.100	38.45	-18.44	22.16	0.165	40.61	-18.44
15MHz	QPSK (Opposite Pol.)	836.50	H	125	295	1.31	1 / 0	20.68	19.84	0.096	38.45	-18.61	21.99	0.158	40.61	-18.62

Table 7-6. ERP Data (LTE Band 26/5)

Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
20 MHz	π/2 BPSK	834.00	V	144	226	1.30	1 / 104	20.04	19.19	0.083	38.45	-19.26	21.34	0.136	40.61	-19.27
	π/2 BPSK	836.50	V	144	226	1.31	1 / 104	20.13	**19.29**	0.085	38.45	-19.16	**21.44**	0.139	40.61	-19.17
	π/2 BPSK	839.00	V	144	226	1.32	1 / 104	20.08	19.25	0.084	38.45	-19.20	21.40	0.138	40.61	-19.20
	QPSK	834.00	V	144	226	1.30	1 / 104	19.91	19.06	0.081	38.45	-19.39	21.21	0.132	40.61	-19.40
	QPSK	836.50	V	144	226	1.31	1 / 104	19.99	19.15	0.082	38.45	-19.30	21.30	0.135	40.61	-19.31
	QPSK	839.00	V	144	226	1.32	1 / 104	19.96	19.13	0.082	38.45	-19.32	21.28	0.134	40.61	-19.32
	16-QAM	836.50	V	144	226	1.31	1 / 104	19.08	18.24	0.067	38.45	-20.21	20.39	0.109	40.61	-20.22
15 MHz	π/2 BPSK	831.50	V	144	226	1.29	1 / 77	20.19	19.33	0.086	38.45	-19.12	21.48	0.141	40.61	-19.13
	π/2 BPSK	836.50	V	144	226	1.31	1 / 77	20.04	19.20	0.083	38.45	-19.25	21.35	0.136	40.61	-19.26
	π/2 BPSK	841.50	V	144	226	1.33	1 / 77	20.26	**19.45**	0.088	38.45	-19.00	**21.60**	0.145	40.61	-19.01
	QPSK	831.50	V	144	226	1.29	1 / 39	19.93	19.07	0.081	38.45	-19.39	21.22	0.132	40.61	-19.39
	QPSK	836.50	V	144	226	1.31	1 / 77	20.06	19.22	0.083	38.45	-19.24	21.37	0.137	40.61	-19.24
	QPSK	841.50	V	144	226	1.33	1 / 77	20.14	19.32	0.086	38.45	-19.13	21.47	0.140	40.61	-19.13
	16-QAM	831.50	V	144	226	1.29	1 / 77	18.89	18.02	0.063	38.45	-20.43	20.17	0.104	40.61	-20.44
	16-QAM	836.50	V	144	226	1.31	1 / 77	19.18	18.34	0.068	38.45	-20.11	20.49	0.112	40.61	-20.11
	16-QAM	841.50	V	144	226	1.33	1 / 77	18.92	18.10	0.065	38.45	-20.35	20.25	0.106	40.61	-20.35
10 MHz	π/2 BPSK	829.00	V	144	226	1.27	1 / 50	19.92	19.04	0.080	38.45	-19.41	21.19	0.132	40.61	-19.41
	π/2 BPSK	836.50	V	144	226	1.31	1 / 26	20.06	19.22	0.084	38.45	-19.23	21.37	0.137	40.61	-19.23
	π/2 BPSK	844.00	V	144	226	1.35	1 / 26	20.37	**19.56**	0.090	38.45	-18.89	**21.71**	0.148	40.61	-18.90
	QPSK	829.00	V	144	226	1.27	1 / 50	20.06	19.18	0.083	38.45	-19.27	21.33	0.136	40.61	-19.28
	QPSK	836.50	V	144	226	1.31	1 / 50	20.21	19.38	0.087	38.45	-19.08	21.53	0.142	40.61	-19.08
	QPSK	844.00	V	144	226	1.35	1 / 1	20.17	19.37	0.086	38.45	-19.08	21.52	0.142	40.61	-19.09
	16-QAM	844.00	V	144	226	1.35	1 / 26	19.12	18.31	0.068	38.45	-20.14	20.46	0.111	40.61	-20.14
5 MHz	π/2 BPSK	829.00	V	144	226	1.26	1 / 23	20.12	19.24	0.084	38.45	-19.22	21.39	0.138	40.61	-19.22
	π/2 BPSK	836.50	V	144	226	1.31	1 / 23	20.07	19.23	0.084	38.45	-19.22	21.38	0.137	40.61	-19.23
	π/2 BPSK	844.00	V	144	226	1.36	1 / 12	20.25	**19.46**	0.088	38.45	-18.99	**21.61**	0.145	40.61	-19.00
	QPSK	829.00	V	144	226	1.26	1 / 12	20.06	19.18	0.083	38.45	-19.27	21.33	0.136	40.61	-19.28
	QPSK	836.50	V	144	226	1.31	1 / 12	20.04	19.21	0.083	38.45	-19.25	21.36	0.137	40.61	-19.25
	QPSK	844.00	V	144	226	1.36	1 / 1	20.19	19.40	0.087	38.45	-19.05	21.55	0.143	40.61	-19.06
	16-QAM	844.00	V	144	226	1.36	1 / 1	18.99	18.19	0.066	38.45	-20.26	20.34	0.108	40.61	-20.26
20 MHz	QPSK (CP-OFDM)	836.50	V	140	313	1.31	1 / 104	17.33	**16.49**	0.045	38.45	-21.96	18.64	0.073	40.61	-21.97
	QPSK (Opposite Pol.)	836.50	H	114	297	1.31	1 / 53	19.66	18.82	0.076	38.45	-19.63	20.97	0.125	40.61	-19.64

Table 7-7. ERP Data (NR Band n5)

Frequency [MHz]	Mode	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Substitute Level [dBm]	Ant. Gain [dBi]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
824.20	GSM850	V	145	240	29.39	1.25	28.49	0.706	38.45	-9.96	30.64	1.159	40.61	-9.97
836.60	GSM850	V	145	240	30.40	1.31	**29.56**	**0.904**	38.45	-8.89	**31.71**	**1.483**	40.61	-8.90
848.80	GSM850	V	145	240	29.71	1.37	28.93	0.781	38.45	-9.52	31.08	1.282	40.61	-9.53
836.60	GSM850	H	123	296	28.02	1.31	27.18	0.522	38.45	-11.27	29.33	0.857	40.61	-11.28
836.60	EDGE850	V	145	240	22.96	1.31	**22.12**	0.163	38.45	-16.33	**24.27**	**0.267**	40.61	-16.34

Table 7-8. ERP Data (GPRS Cell)

Frequency [MHz]	Mode	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Substitute Level [dBm]	Ant. Gain [dBi]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
826.40	WCDMA850	V	144	248	21.25	1.26	**20.36**	**0.109**	38.45	-18.09	**22.51**	**0.178**	40.61	-18.10
836.60	WCDMA850	V	144	248	21.18	1.31	20.34	0.108	38.45	-18.11	22.49	0.177	40.61	-18.12
846.60	WCDMA850	V	141	246	20.16	1.36	19.37	0.086	38.45	-19.08	21.52	0.142	40.61	-19.09
826.40	WCDMA850	H	123	296	20.02	1.31	19.18	0.083	38.45	-19.27	21.33	0.136	40.61	-19.28

Table 7-9. ERP Data (WCDMA Cell)

7.7 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.

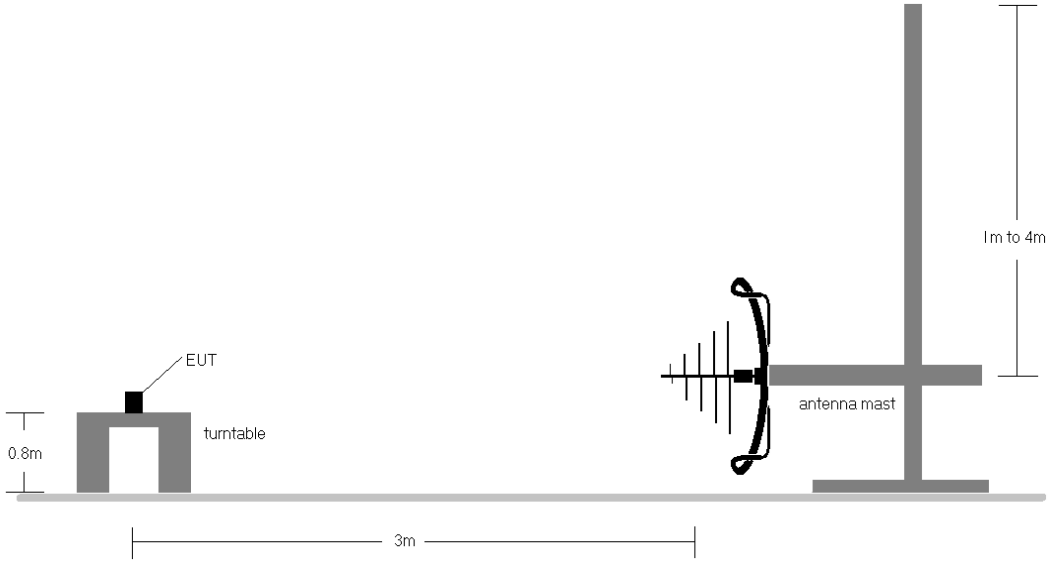


Figure 7-7. Test Instrument & Measurement Setup < 1GHz

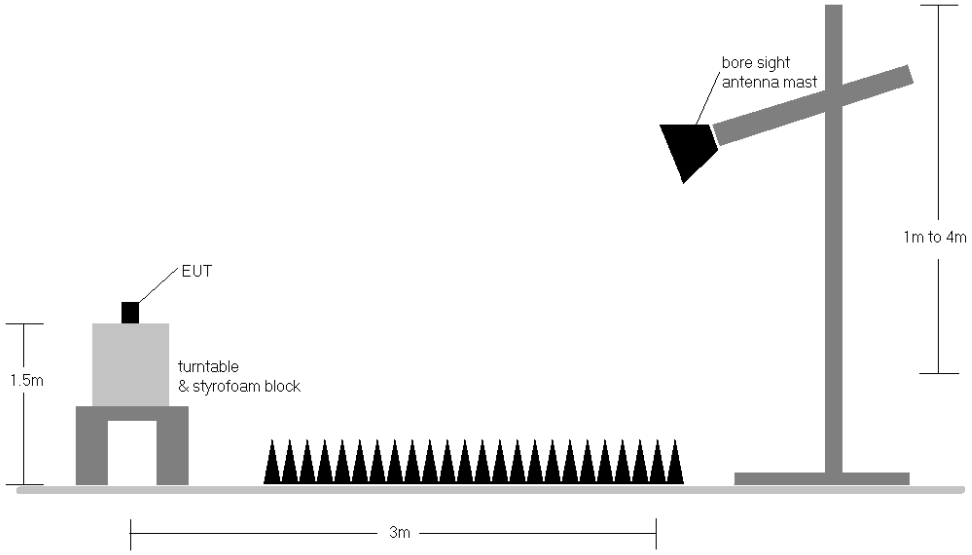


Figure 7-8. Test Instrument & Measurement Setup > 1GHz

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) This device employs UMTS technology with WCDMA (AMR/RMC) and HSDPA capabilities. The EUT was tested under all configurations and the highest powers are reported in WCDMA mode with HSDPA Inactive at 12.2 kbps RMC and TPC bits all set to “1”.

4) 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.

5) This unit was tested with its standard battery.

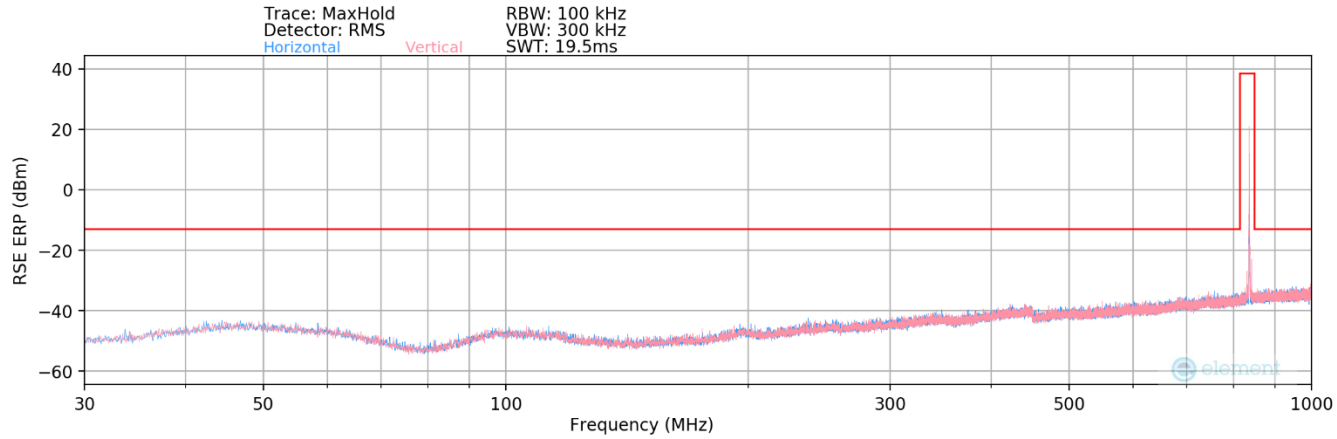
6) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.

7) 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.

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

9) For NR operation, all subcarrier spacings (SCS) and transmission schemes (e.g. CP-OFDM and DFT-s-OFDM) were investigated to determine the worst case configuration. All modes of operation were investigated and the worst-case configuration results are reported in this section.

LTE Band 26/5

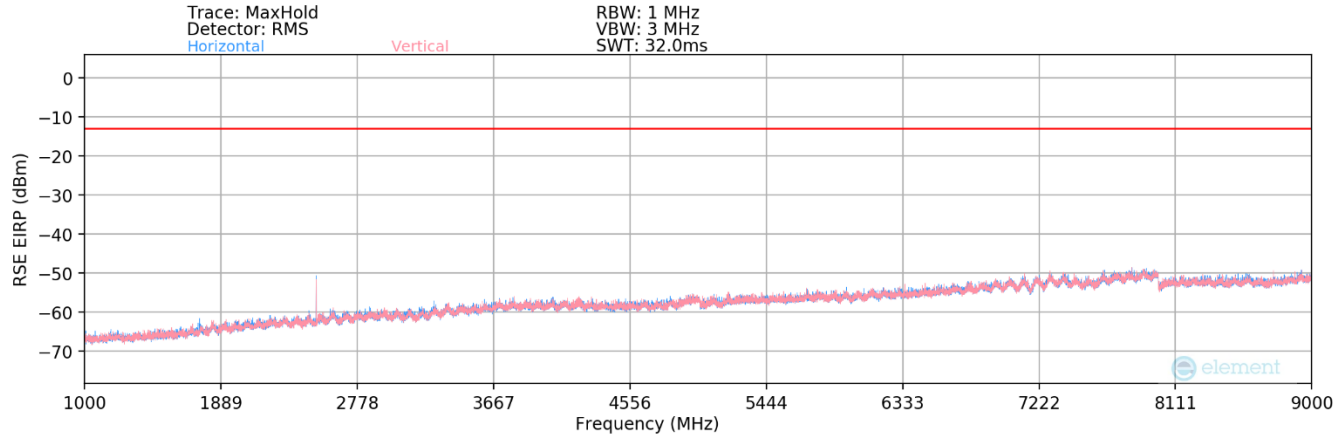


Plot 7-46. Radiated Spurious Plot Below 1GHz (LTE Band 26/5)

Bandwidth (MHz):	10
Frequency (MHz):	836.5
RB / Offset:	1 / 25

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]
992.13	H	-	-	-82.14	31.13	55.99	-41.41	-13.00	-28.41

Table 7-10. Radiated Spurious Data Below 1GHz (LTE Band 26/5)



Plot 7-47. Radiated Spurious Plot Above 1GHz (LTE Band 26/5)

Bandwidth (MHz):	10
Frequency (MHz):	829
RB / Offset:	1 / 25

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]
1658.00	H	-	-	-73.82	-8.90	24.28	-70.98	-13.00	-57.98
2487.00	H	247	359	-66.89	-5.48	34.63	-60.62	-13.00	-47.62
3316.00	H	-	-	-75.45	-2.22	29.33	-65.93	-13.00	-52.93
4145.00	H	-	-	-75.44	-0.26	31.30	-63.96	-13.00	-50.96
4974.00	H	-	-	-75.18	0.97	32.79	-62.47	-13.00	-49.47

Table 7-11. Radiated Spurious Data Above 1GHz (LTE Band 26/5 – Low Channel)

Bandwidth (MHz):	10
Frequency (MHz):	836.5
RB / Offset:	1 / 25

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]
1673.00	H	-	-	-73.57	-8.82	24.61	-70.64	-13.00	-57.64
2509.50	H	251	359	-65.93	-5.28	35.79	-59.47	-13.00	-46.47
3346.00	H	-	-	-74.93	-1.97	30.10	-65.16	-13.00	-52.16
4182.50	H	-	-	-75.57	-0.02	31.41	-63.85	-13.00	-50.85
5019.00	H	-	-	-75.09	0.52	32.43	-62.83	-13.00	-49.83

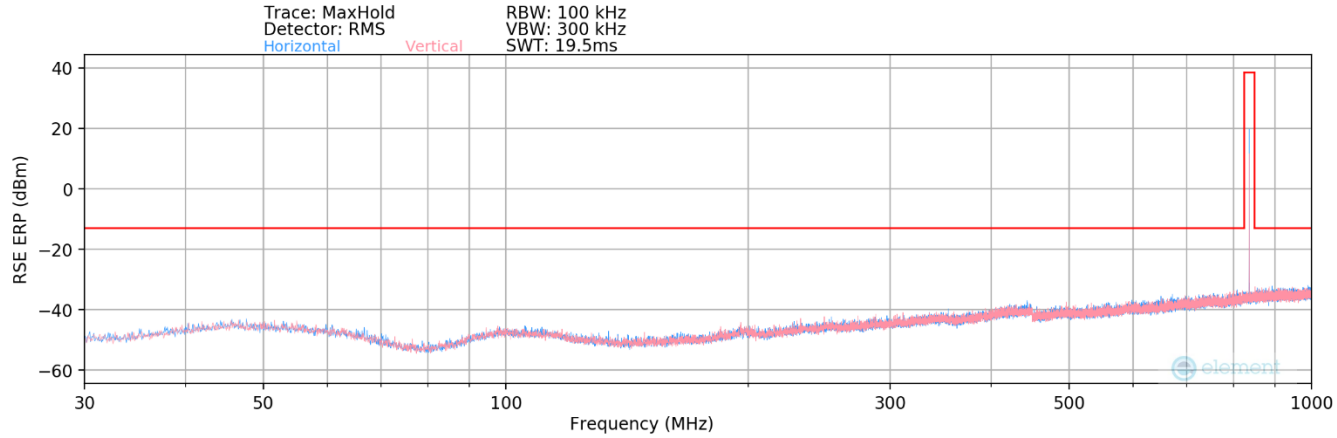
Table 7-12. Radiated Spurious Data Above 1GHz (LTE Band 26/5 – Mid Channel)

Bandwidth (MHz):	10
Frequency (MHz):	844
RB / Offset:	1 / 25

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]
1688.00	H	-	-	-73.41	-8.69	24.90	-70.36	-13.00	-57.36
2532.00	H	255	1	-64.36	-5.10	37.54	-57.71	-13.00	-44.71
3376.00	H	-	-	-74.14	-1.62	31.24	-64.02	-13.00	-51.02
4220.00	H	-	-	-74.74	-0.17	32.09	-63.16	-13.00	-50.16
5064.00	H	-	-	-74.77	0.86	33.09	-62.17	-13.00	-49.17

Table 7-13. Radiated Spurious Data Above 1GHz (LTE Band 26/5 – High Channel)

NR Band n5

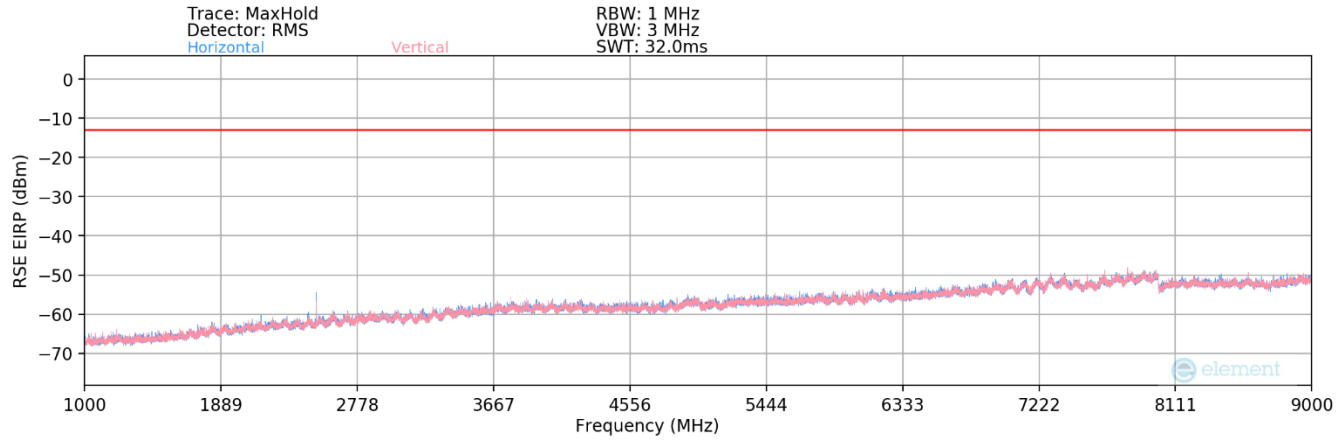


Plot 7-48. Radiated Spurious Plot Below 1GHz (NR Band n5)

Bandwidth (MHz):	20
Frequency (MHz):	836.5
RB / Offset:	1/53

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]
877.54	H	-	-	-81.89	30.26	55.37	-42.03	-13.00	-29.03

Table 7-14. Radiated Spurious Data Below 1GHz (NR Band n5)



Plot 7-49. Radiated Spurious Plot Above 1GHz (NR Band n5)

Bandwidth (MHz):	20
Frequency (MHz):	834
RB / Offset:	1 / 53

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]
1668.00	H	-	-	-74.52	-8.86	23.62	-71.63	-13.00	-58.63
2502.00	H	149	337	-69.84	-5.38	31.78	-63.48	-13.00	-50.48
3336.00	H	-	-	-75.47	-2.09	29.44	-65.81	-13.00	-52.81
4170.00	H	-	-	-76.12	-0.10	30.78	-64.48	-13.00	-51.48
5004.00	H	-	-	-75.97	1.00	32.03	-63.23	-13.00	-50.23

Table 7-15. Radiated Spurious Data Above 1GHz (NR Band n5 – Low Channel)

Bandwidth (MHz):	20
Frequency (MHz):	836.5
RB / Offset:	1 / 53

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]
1673.00	H	-	-	-74.39	-8.82	23.79	-71.46	-13.00	-58.46
2509.50	H	149	338	-69.85	-5.28	31.87	-63.39	-13.00	-50.39
3346.00	H	-	-	-75.37	-1.97	29.66	-65.60	-13.00	-52.60
4182.50	H	-	-	-75.99	-0.02	30.99	-64.27	-13.00	-51.27
5019.00	H	-	-	-76.02	0.52	31.50	-63.76	-13.00	-50.76

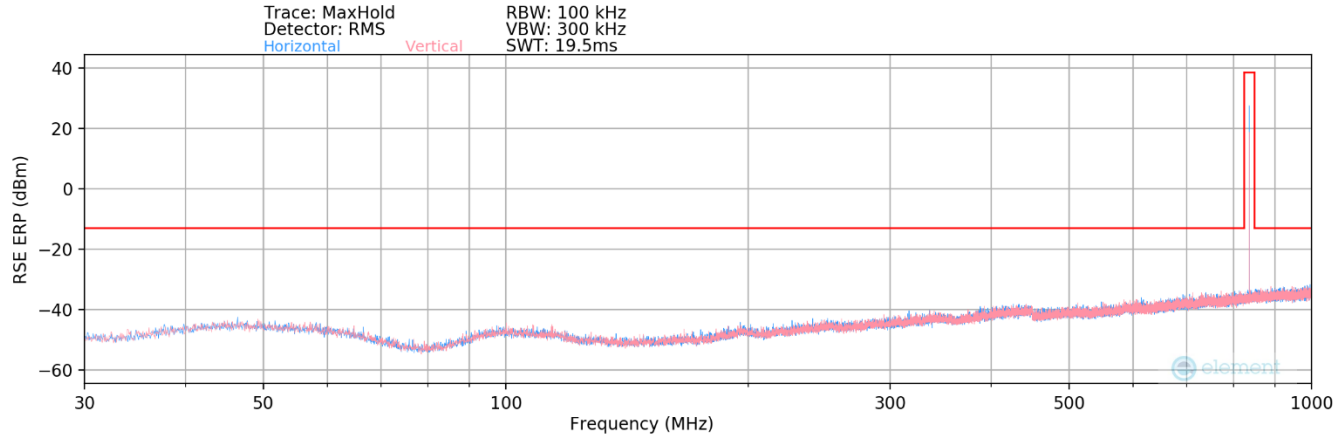
Table 7-16. Radiated Spurious Data Above 1GHz (NR Band n5 – Mid Channel)

Bandwidth (MHz):	20
Frequency (MHz):	839
RB / Offset:	1 / 53

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]
1678.00	H	-	-	-73.42	-8.76	24.82	-70.44	-13.00	-57.44
2517.00	H	151	342	-68.54	-5.17	33.29	-61.97	-13.00	-48.97
3356.00	H	-	-	-74.35	-1.81	30.84	-64.41	-13.00	-51.41
4195.00	H	-	-	-75.40	-0.06	31.54	-63.72	-13.00	-50.72
5034.00	H	-	-	-75.19	0.64	32.45	-62.81	-13.00	-49.81

Table 7-17. Radiated Spurious Data Above 1GHz (NR Band n5 – High Channel)

GSM/GPRS Cell

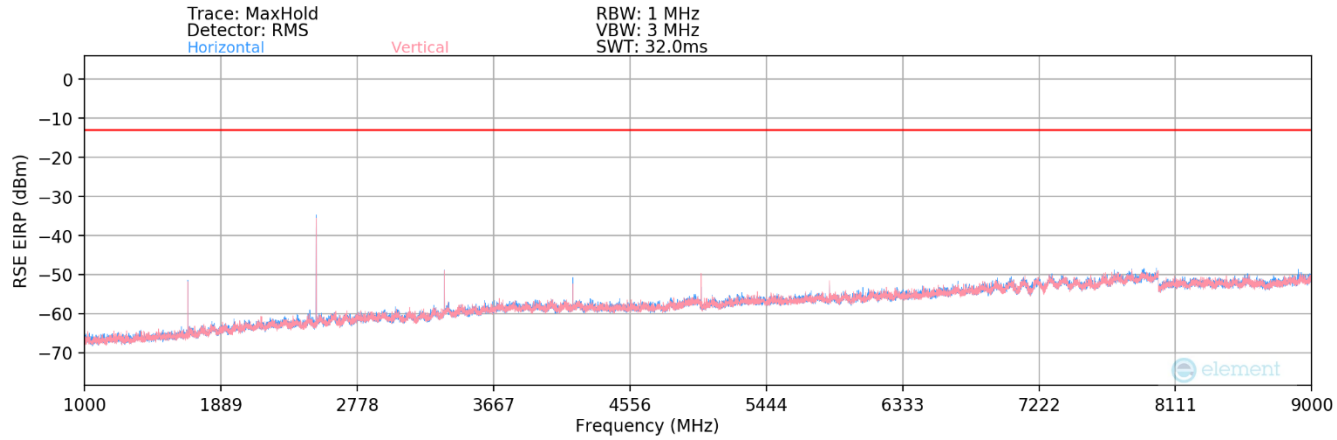


Plot 7-50. Radiated Spurious Plot Below 1GHz (GPRS Cell)

Mode:	GPRS 1 Tx Slot
Channel:	190
Frequency (MHz):	836.6

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]
989.24	H	-	-	-81.79	31.07	56.28	-41.12	-13.00	-28.12

Table 7-18. Radiated Spurious Data Below 1GHz (GPRS Cell)



Plot 7-51. Radiated Spurious Plot Above 1GHz (GPRS Cell)

Mode:	GPRS 1 Tx Slot
Channel:	128
Frequency (MHz):	824.2

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]
1648.40	H	111	234	-55.39	-9.05	42.56	-52.70	-13.00	-39.70
2472.60	H	123	236	-40.74	-5.69	60.57	-34.69	-13.00	-21.69
3296.80	H	117	235	-52.20	-2.58	52.22	-43.04	-13.00	-30.04
4121.00	H	131	232	-68.19	-0.18	38.63	-56.63	-13.00	-43.63
4945.20	H	141	246	-69.98	1.04	38.06	-57.19	-13.00	-44.19
5769.40	H	124	245	-69.00	3.05	41.05	-54.21	-13.00	-41.21
6593.60	H	122	239	-69.44	4.29	41.85	-53.41	-13.00	-40.41
7417.80	H	132	250	-69.84	6.06	43.22	-52.04	-13.00	-39.04

Table 7-19. Radiated Spurious Data Above 1GHz (GPRS Cell – Low Channel)

Mode:	GPRS 1 Tx Slot
Channel:	190
Frequency (MHz):	836.6

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]
1673.20	H	117	221	-54.47	-8.81	43.72	-51.54	-13.00	-38.54
2509.80	H	117	239	-40.27	-5.28	61.45	-33.80	-13.00	-20.80
3346.40	H	132	241	-60.50	-1.96	44.54	-50.72	-13.00	-37.72
4183.00	H	113	240	-70.63	-0.03	36.34	-58.91	-13.00	-45.91
5019.60	H	110	255	-67.37	0.50	40.13	-55.13	-13.00	-42.13
5856.20	H	112	254	-66.23	2.19	42.96	-52.29	-13.00	-39.29
6692.80	H	119	249	-68.44	4.40	42.96	-52.29	-13.00	-39.29
7529.40	H	117	250	-69.16	5.83	43.67	-51.59	-13.00	-38.59

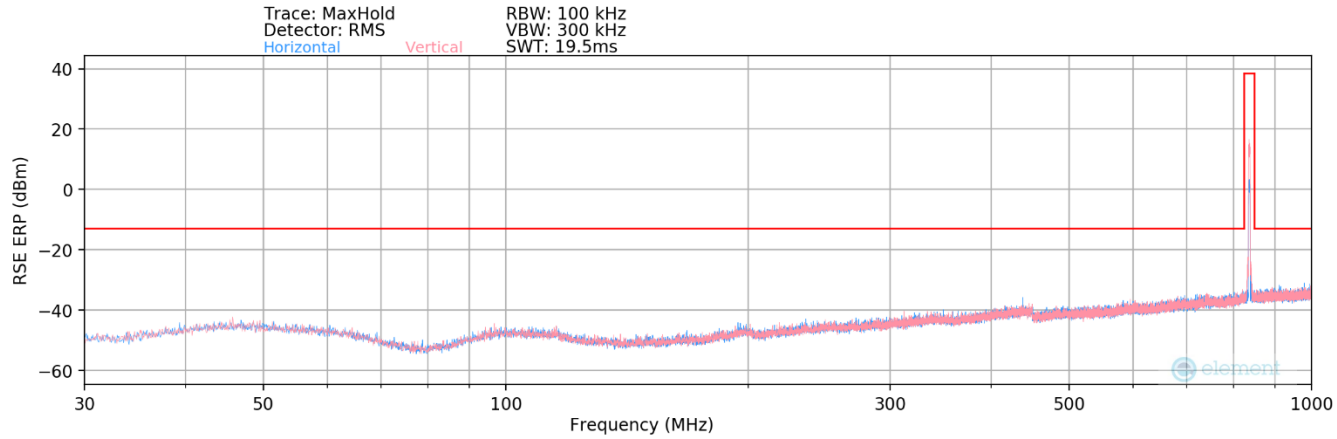
Table 7-20. Radiated Spurious Data Above 1GHz (GPRS Cell – Mid Channel)

Mode:	GPRS 1 Tx Slot
Channel:	251
Frequency (MHz):	848.8

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]
1697.60	H	131	233	-54.58	-8.50	43.92	-51.33	-13.00	-38.33
2546.40	H	146	246	-39.32	-4.96	62.72	-32.54	-13.00	-19.54
3395.20	H	143	254	-60.47	-1.65	44.88	-50.38	-13.00	-37.38
4244.00	H	113	230	-59.28	-0.60	47.12	-48.14	-13.00	-35.14
5092.80	H	112	245	-64.02	1.11	44.09	-51.16	-13.00	-38.16
5941.60	H	121	255	-62.92	2.56	46.64	-48.61	-13.00	-35.61
6790.40	H	125	250	-65.32	4.48	46.16	-49.10	-13.00	-36.10
7639.20	H	133	258	-64.98	7.00	49.02	-46.24	-13.00	-33.24

Table 7-21. Radiated Spurious Data Above 1GHz (GPRS Cell – High Channel)

WCDMA Cell

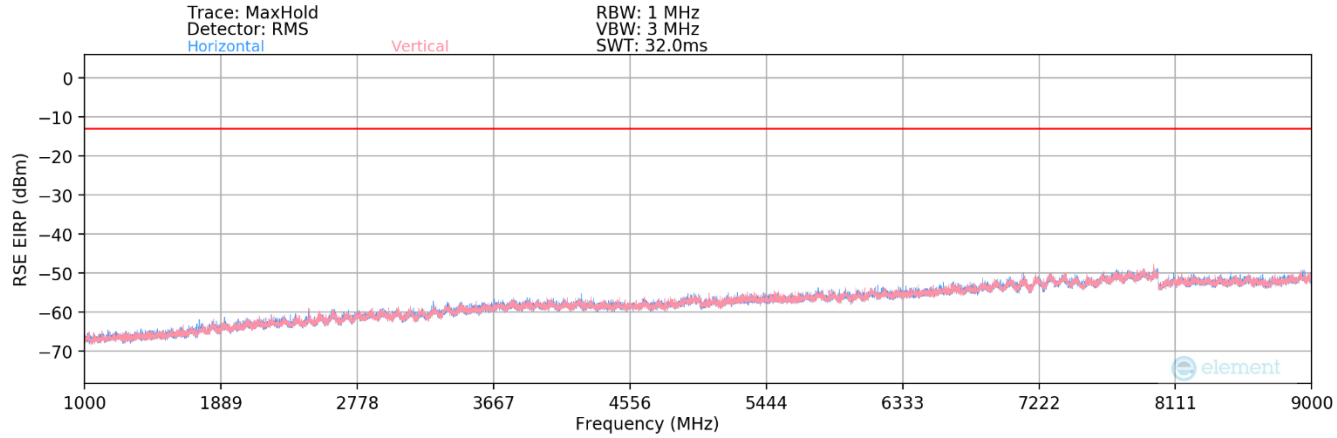


Plot 7-52. Radiated Spurious Plot Below 1GHz (WCDMA Cell)

Mode:	WCDMA RMC
Channel:	4183
Frequency (MHz):	836.6

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]
987.69	H	-	-	-82.42	31.04	55.62	-41.79	-13.00	-28.79

Table 7-22. Radiated Spurious Data Below 1GHz (WCDMA Cell)



Plot 7-53. Radiated Spurious Plot Above 1GHz (WCDMA Cell)

Mode:	WCDMA RMC
Channel:	4132
Frequency (MHz):	826.4

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]
1652.80	H	-	-	-73.52	-9.00	24.48	-70.78	-13.00	-57.78
2479.20	H	-	-	-73.44	-5.64	27.92	-67.34	-13.00	-54.34
3305.60	H	-	-	-74.85	-2.50	29.65	-65.61	-13.00	-52.61

Table 7-23. Radiated Spurious Data Above 1GHz (WCDMA Cell – Low Channel)

Mode:	WCDMA RMC
Channel:	4183
Frequency (MHz):	836.6

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]
1673.20	H	-	-	-73.75	-8.81	24.44	-70.82	-13.00	-57.82
2509.80	H	-	-	-74.22	-5.28	27.50	-67.75	-13.00	-54.75
3346.40	H	-	-	-74.67	-1.96	30.37	-64.89	-13.00	-51.89

Table 7-24. Radiated Spurious Data Above 1GHz (WCDMA Cell – Mid Channel)

Mode:	WCDMA RMC
Channel:	4233
Frequency (MHz):	846.6

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]
1693.20	H	-	-	-73.24	-8.56	25.20	-70.05	-13.00	-57.05
2539.80	H	-	-	-73.82	-5.00	28.18	-67.08	-13.00	-54.08
3386.40	H	-	-	-75.06	-1.63	30.31	-64.95	-13.00	-51.95

Table 7-25. Radiated Spurious Data Above 1GHz (WCDMA Cell – High Channel)

7.8 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 22 and RSS-132, the frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5 ppm) of the center frequency.

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

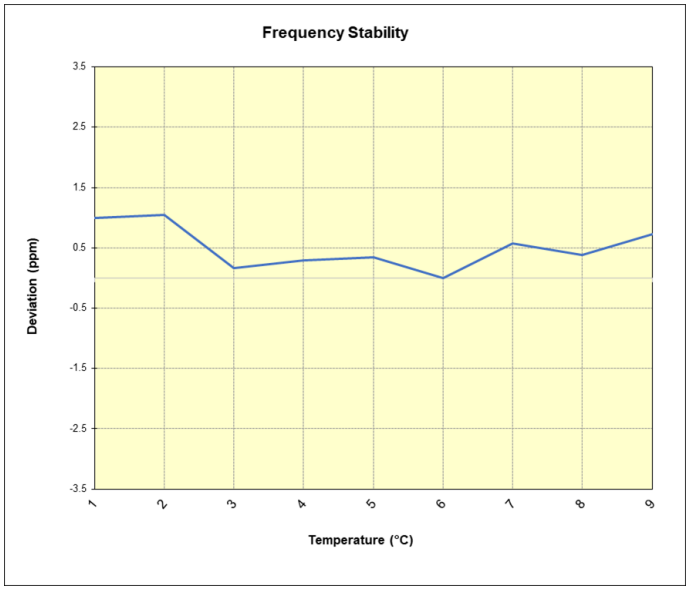
None

LTE Band 26/5

LTE Band 26/5	
Operating Frequency (Hz):	836,500,000
Ref. Voltage (VDC):	4.358
Deviation Limit:	± 0.00025% or 2.5 ppm

Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.358	- 30	836,499,720	828	0.0000990
		- 20	836,499,764	872	0.0001043
		- 10	836,499,024	132	0.0000158
		0	836,499,134	242	0.0000289
		+ 10	836,499,175	283	0.0000339
		+ 20 (Ref)	836,498,892	0	0.0000000
		+ 30	836,499,373	481	0.0000575
		+ 40	836,499,213	321	0.0000384
		+ 50	836,499,501	609	0.0000729
Battery Endpoint	3.372	+ 20	836,499,349	457	0.0000547

Table 7-26. LTE Band 26/5 Frequency Stability Data



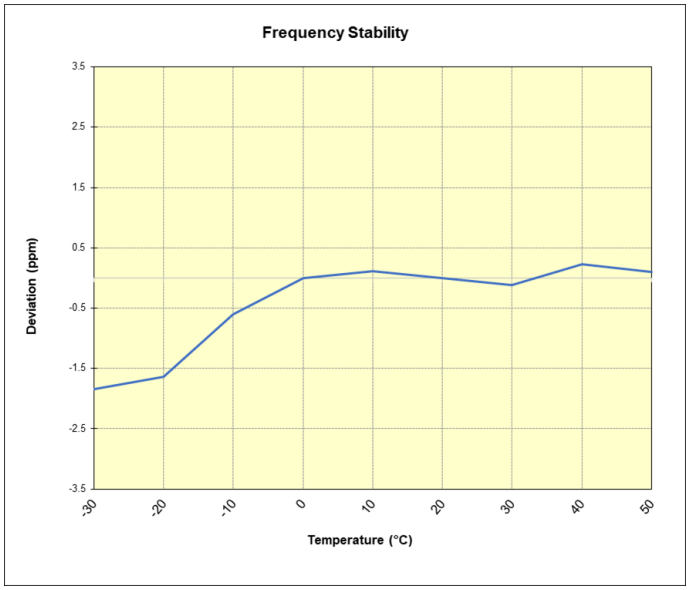
Plot 7-54. LTE Band 26/5 Frequency Stability Chart

NR Band n5

NR Band n5	
Operating Frequency (Hz):	836,500,000
Ref. Voltage (VDC):	4.358
Deviation Limit:	± 0.00025% or 2.5 ppm

Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.358	- 30	836,492,054	-1,542	-0.0001843
		- 20	836,492,228	-1,368	-0.0001636
		- 10	836,493,087	-509	-0.0000609
		0	836,493,598	1	0.0000002
		+ 10	836,493,690	94	0.0000112
		+ 20 (Ref)	836,493,596	0	0.0000000
		+ 30	836,493,496	-100	-0.0000120
		+ 40	836,493,788	192	0.0000230
		+ 50	836,493,678	82	0.0000098
Battery Endpoint	3.372	+ 20	836,492,483	-1,113	-0.0001331

Table 7-27. NR Band n5 Frequency Stability Data



Plot 7-55. NR Band n5 Frequency Stability Chart

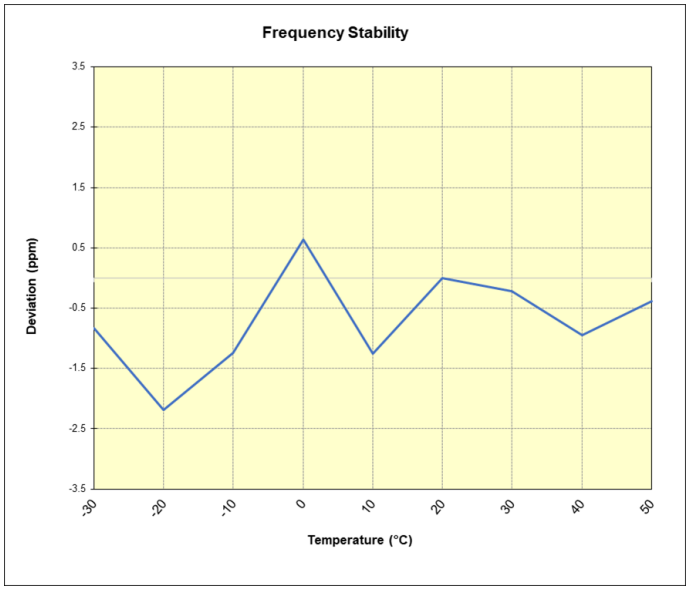
GSM/GPRS Cell

GSM/GPRS Cellular

Operating Frequency (Hz):	836,600,000
Ref. Voltage (VDC):	4.358
Deviation Limit:	± 0.00025% or 2.5 ppm

Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.358	- 30	836,601,634	-701	-0.0000837
		- 20	836,600,505	-1,830	-0.0002187
		- 10	836,601,291	-1,044	-0.0001247
		0	836,602,868	533	0.0000637
		+ 10	836,601,279	-1,055	-0.0001261
		+ 20 (Ref)	836,602,335	0	0.0000000
		+ 30	836,602,152	-182	-0.0000218
		+ 40	836,601,539	-796	-0.0000951
		+ 50	836,602,008	-327	-0.0000390
Battery Endpoint	3.372	+ 20	836,602,982	647	0.0000774

Table 7-28. GSM/GPRS Cell Frequency Stability Data



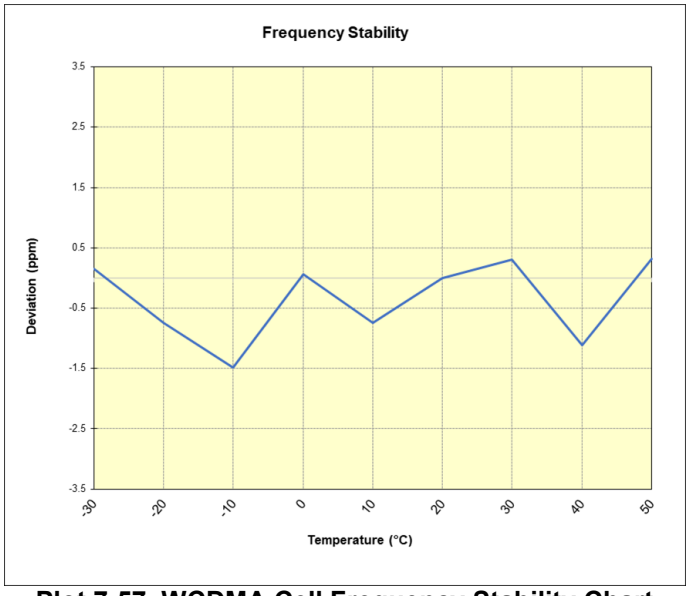
Plot 7-56. GSM/GPRS Cell Frequency Stability Chart

WCDMA Cell

WCDMA Cellular	
Operating Frequency (Hz):	836,600,000
Ref. Voltage (VDC):	4.358
Deviation Limit:	± 0.00025% or 2.5 ppm

Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.358	- 30	836,603,821	130	0.0000156
		- 20	836,603,069	-621	-0.0000743
		- 10	836,602,444	-1,247	-0.0001490
		0	836,603,743	52	0.0000063
		+ 10	836,603,074	-617	-0.0000738
		+ 20 (Ref)	836,603,691	0	0.0000000
		+ 30	836,603,951	260	0.0000311
		+ 40	836,602,753	-938	-0.0001121
		+ 50	836,603,956	265	0.0000317
Battery Endpoint	3.372	+ 20	836,607,006	3,315	0.0003963

Table 7-29. WCDMA Cell Frequency Stability Data



Plot 7-57. WCDMA Cell 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: A3LSMA156U** complies with all the requirements of Part 22 of the FCC rules.