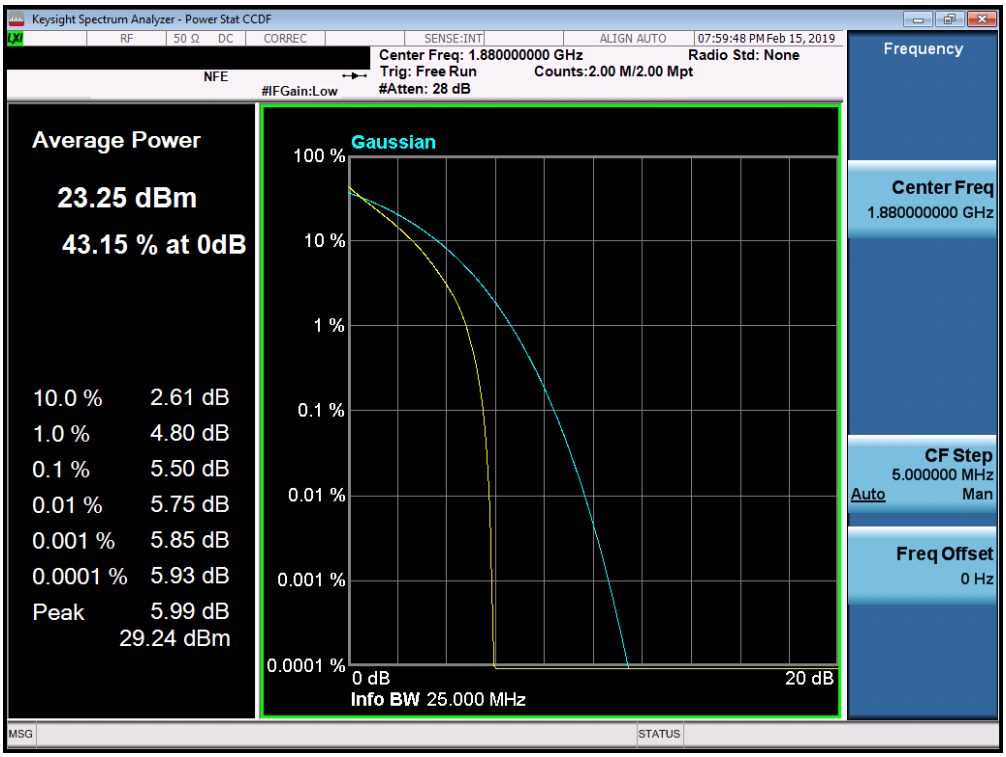
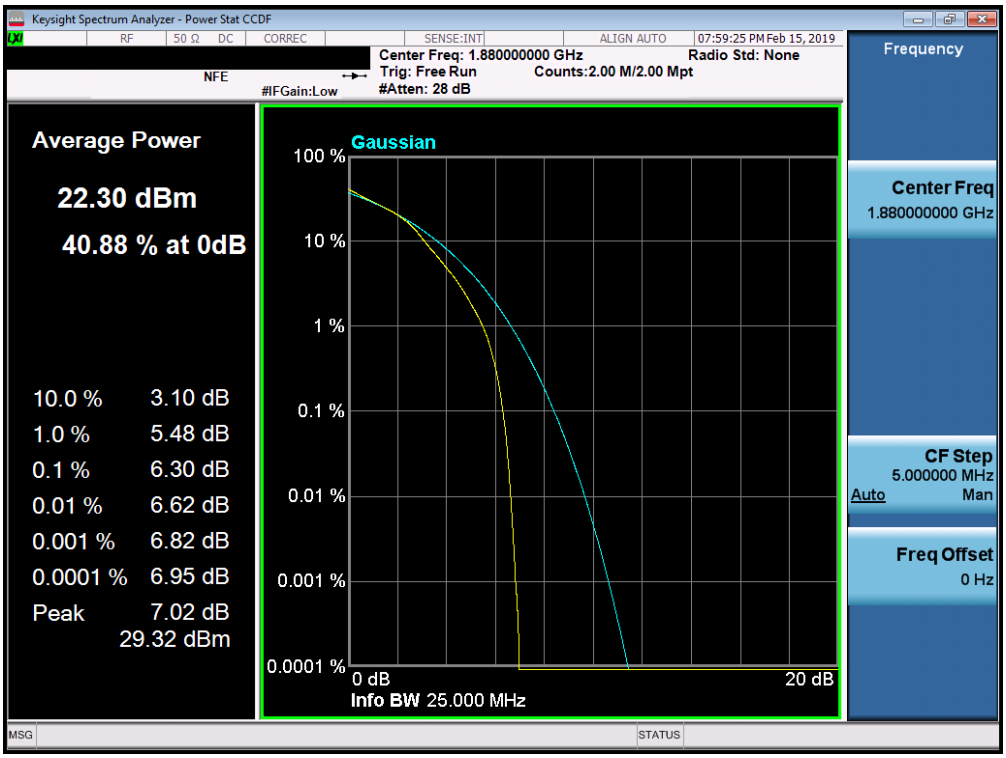
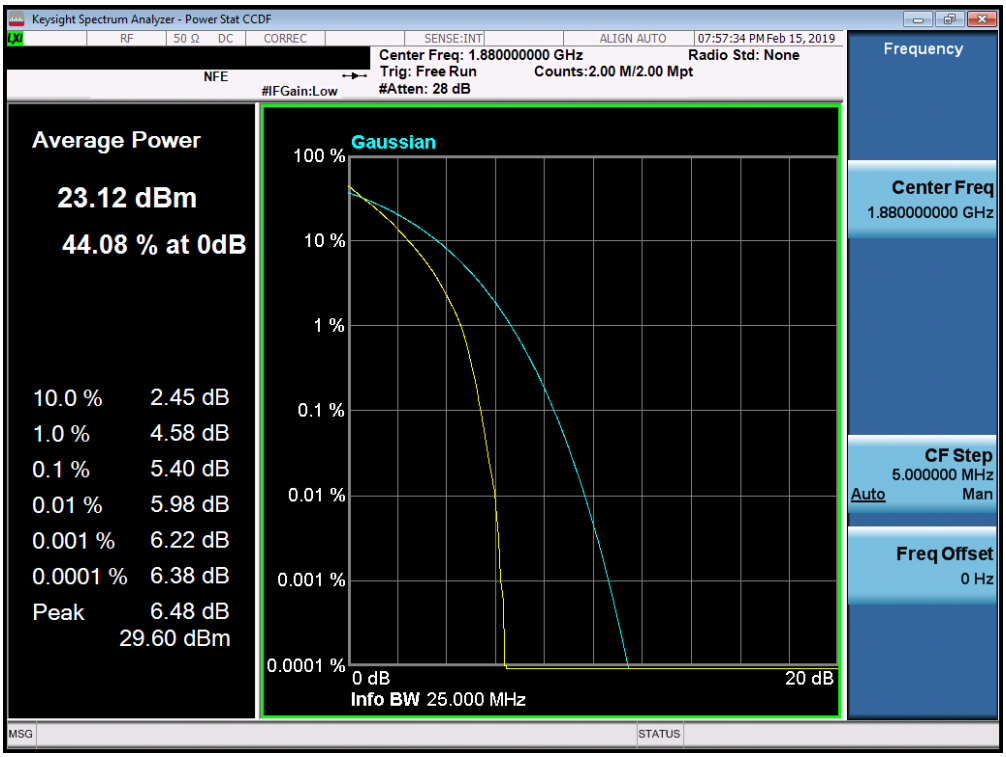


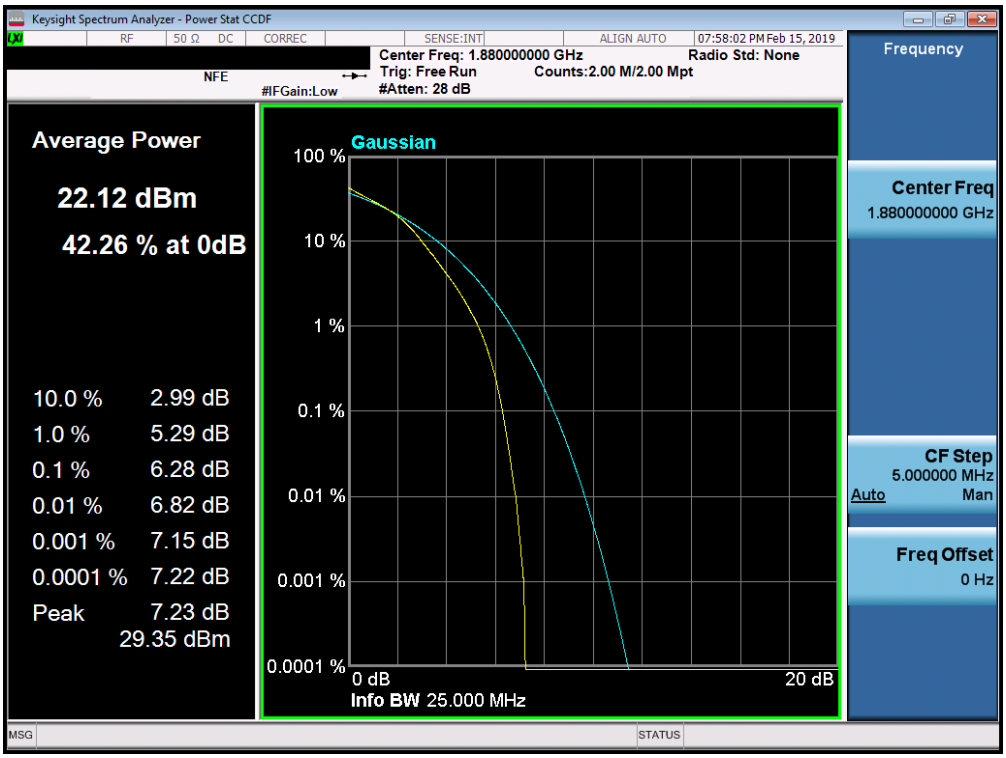
Plot 7-218. PAR Plot (Band 25/2 - 15.0MHz QPSK - Full RB Configuration)



Plot 7-219. PAR Plot (Band 25/2 - 15.0MHz 16-QAM - Full RB Configuration)



Plot 7-220. PAR Plot (Band 25/2 - 20.0MHz QPSK - Full RB Configuration)



Plot 7-221. PAR Plot (Band 25/2 - 20.0MHz 16-QAM - Full RB Configuration)

7.6 Radiated Power (ERP/EIRP)

Test Overview

Effective Radiated Power (ERP) and Equivalent Isotropic Radiated Power (EIRP) measurements are performed using the substitution method described in ANSI/TIA-603-E-2016 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using vertically and horizontally polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.2.1

ANSI/TIA-603-E-2016 – Section 2.2.17

Test Settings

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
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".
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation.
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.

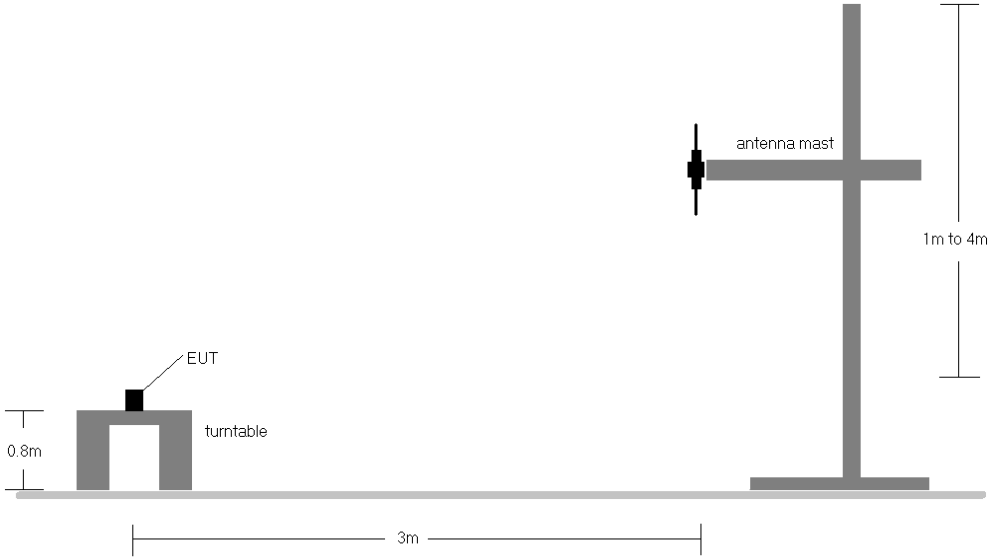


Figure 7-5. Radiated Test Setup <1GHz

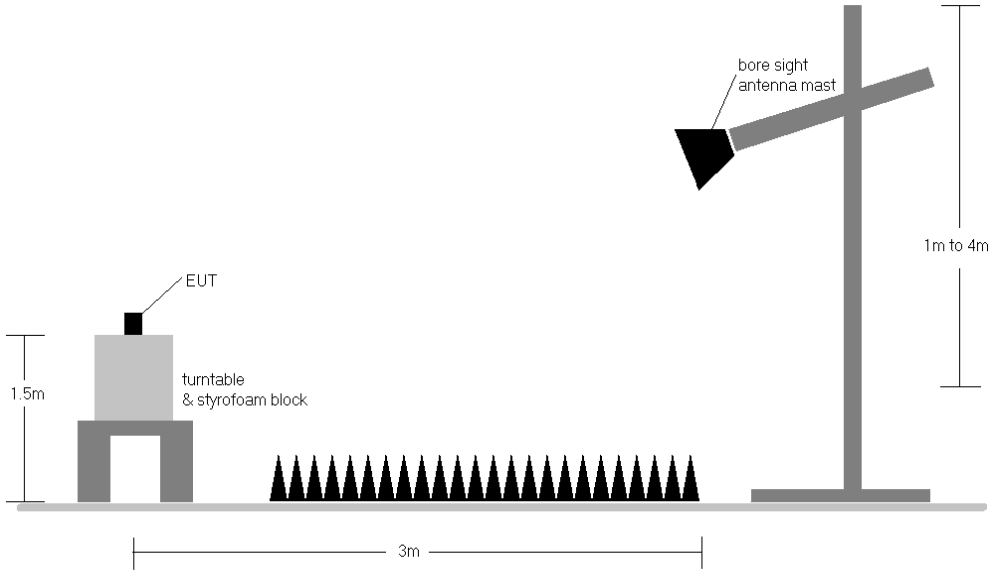


Figure 7-6. Radiated Test Setup >1GHz

Test Notes

1) 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.

2) This unit was tested with its standard battery.

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]
665.50	5	QPSK	H	152	280	1 / 0	16.94	3.84	18.63	0.073	34.77	-16.15
680.50	5	QPSK	H	148	275	1 / 0	17.84	3.91	**19.60**	**0.091**	34.77	-15.17
695.50	5	QPSK	H	155	282	1 / 0	16.94	3.98	18.77	0.075	34.77	-16.00
680.50	5	16-QAM	H	148	275	1 / 0	16.14	3.91	**17.90**	0.062	34.77	-16.87
668.00	10	QPSK	H	154	284	1 / 0	16.67	3.85	18.37	0.069	34.77	-16.40
680.50	10	QPSK	H	141	297	1 / 0	16.94	3.91	**18.70**	0.074	34.77	-16.07
693.00	10	QPSK	H	149	296	1 / 0	16.78	3.97	18.60	0.072	34.77	-16.17
693.00	10	16-QAM	H	149	296	1 / 0	15.49	3.97	**17.31**	0.054	34.77	-17.46
670.50	15	QPSK	H	151	291	1 / 0	16.59	3.86	18.30	0.068	34.77	-16.47
680.50	15	QPSK	H	142	292	1 / 0	17.51	3.91	**19.27**	0.084	34.77	-15.50
690.50	15	QPSK	H	146	288	1 / 0	17.37	3.96	19.18	0.083	34.77	-15.60
690.50	15	16-QAM	H	146	288	1 / 0	16.59	3.96	**18.40**	0.069	34.77	-16.38
673.00	20	QPSK	H	137	291	1 / 0	16.50	3.87	18.22	0.066	34.77	-16.55
680.50	20	QPSK	H	144	291	1 / 0	17.24	3.91	19.00	0.079	34.77	-15.77
688.00	20	QPSK	H	146	301	1 / 0	17.29	3.94	**19.08**	0.081	34.77	-15.69
688.00	20	16-QAM	H	146	301	1 / 0	15.74	3.94	**17.53**	0.057	34.77	-17.24
680.50	5	QPSK	V	122	355	17.84	17.56	3.91	19.32	0.086	34.77	-15.45

Table 7-3. ERP Data (Band 71)

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
699.70	1.4	QPSK	V	150	200	1 / 5	14.61	4.00	16.46	0.044	34.77	-18.31	18.61	0.073	36.99	-18.38
707.50	1.4	QPSK	V	145	190	1 / 5	15.89	4.22	17.96	0.062	34.77	-16.82	20.11	0.102	36.99	-16.88
715.30	1.4	QPSK	V	142	192	1 / 5	16.51	4.44	**18.80**	0.076	34.77	-15.97	**20.95**	0.124	36.99	-16.04
715.30	1.4	16-QAM	V	142	192	1 / 5	15.36	4.44	**17.65**	0.058	34.77	-17.12	**19.80**	0.095	36.99	-17.19
700.50	3	QPSK	V	147	218	1 / 14	15.51	4.01	17.37	0.055	34.77	-17.40	19.52	0.090	36.99	-17.47
707.50	3	QPSK	V	149	218	1 / 0	16.71	4.22	18.78	0.075	34.77	-16.00	20.93	0.124	36.99	-16.06
714.50	3	QPSK	V	156	223	1 / 14	17.11	4.41	**19.37**	0.087	34.77	-15.40	**21.52**	0.142	36.99	-15.47
714.50	3	16-QAM	V	156	223	1 / 14	16.11	4.41	**18.37**	0.069	34.77	-16.40	**20.52**	0.113	36.99	-16.47
701.50	5	QPSK	V	145	210	1 / 24	16.34	4.04	18.23	0.067	34.77	-16.54	20.38	0.109	36.99	-16.61
707.50	5	QPSK	V	155	210	1 / 0	16.51	4.22	18.58	0.072	34.77	-16.20	20.73	0.118	36.99	-16.26
713.50	5	QPSK	V	147	199	1 / 24	17.23	4.39	**19.47**	0.088	34.77	-15.30	**21.62**	0.145	36.99	-15.37
713.50	5	16-QAM	V	147	199	1 / 24	16.11	4.39	**18.35**	0.068	34.77	-16.42	**20.50**	0.112	36.99	-16.49
704.00	10	QPSK	V	147	222	1 / 49	17.19	4.12	19.16	0.082	34.77	-15.62	21.31	0.135	36.99	-15.68
707.50	10	QPSK	V	149	213	1 / 49	17.43	4.22	**19.50**	**0.089**	34.77	-15.28	**21.65**	**0.146**	36.99	-15.34
711.00	10	QPSK	V	151	221	1 / 49	16.58	4.32	18.75	0.075	34.77	-16.03	20.90	0.123	36.99	-16.09
707.50	10	16-QAM	V	149	213	1 / 49	15.95	4.22	**18.02**	0.063	34.77	-16.76	**20.17**	0.104	36.99	-16.82
707.50	10	QPSK	H	136	294	17.43	17.36	4.22	19.43	0.088	34.77	-15.34	21.58	0.144	36.99	-15.41

Table 7-4. ERP Data (Band 12)

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
824.70	1.4	QPSK	V	138	206	1 / 0	15.22	6.75	**19.82**	0.096	38.45	-18.63	**21.97**	0.157	40.61	-18.64
836.50	1.4	QPSK	V	137	196	1 / 0	14.63	6.78	19.26	0.084	38.45	-19.20	21.41	0.138	40.61	-19.20
848.30	1.4	QPSK	V	128	198	1 / 0	13.57	6.80	18.22	0.066	38.45	-20.23	20.37	0.109	40.61	-20.24
824.70	1.4	16-QAM	V	138	206	1 / 0	14.62	6.75	**19.22**	0.084	38.45	-19.23	**21.37**	0.137	40.61	-19.24
825.50	3	QPSK	V	138	189	1 / 0	15.67	6.75	**20.27**	0.106	38.45	-18.18	**22.42**	0.175	40.61	-18.18
836.50	3	QPSK	V	143	198	1 / 0	15.62	6.78	20.25	0.106	38.45	-18.21	22.40	0.174	40.61	-18.21
847.50	3	QPSK	V	125	199	1 / 0	14.26	6.80	18.91	0.078	38.45	-19.54	21.06	0.128	40.61	-19.55
825.50	3	16-QAM	V	138	189	1 / 0	15.02	6.75	**19.62**	0.092	38.45	-18.83	**21.77**	0.150	40.61	-18.83
826.50	5	QPSK	V	146	205	1 / 0	16.12	6.76	**20.73**	0.118	38.45	-17.73	**22.88**	0.194	40.61	-17.73
836.50	5	QPSK	V	137	190	1 / 0	15.77	6.78	20.40	0.110	38.45	-18.06	22.55	0.180	40.61	-18.06
846.50	5	QPSK	V	131	199	1 / 0	14.95	6.80	19.60	0.091	38.45	-18.86	21.75	0.149	40.61	-18.86
836.50	5	16-QAM	V	137	190	1 / 0	14.21	6.78	**18.84**	0.076	38.45	-19.62	**20.99**	0.125	40.61	-19.62
829.00	10	QPSK	V	137	195	1 / 0	16.15	6.76	20.76	0.119	38.45	-17.69	22.91	0.195	40.61	-17.70
836.50	10	QPSK	V	136	199	1 / 0	16.62	6.78	**21.25**	0.133	38.45	-17.21	**23.40**	**0.219**	40.61	-17.21
844.00	10	QPSK	V	135	191	1 / 0	15.36	6.79	20.00	0.100	38.45	-18.45	22.15	0.164	40.61	-18.46
836.50	10	16-QAM	V	136	199	1 / 0	15.11	6.78	**19.74**	0.094	38.45	-18.72	**21.89**	0.154	40.61	-18.72
836.50	10	QPSK	H	228	286	1 / 0	15.27	6.78	19.90	0.098	38.45	-18.55	22.05	0.160	40.61	-18.56

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

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
831.50	15	QPSK	V	144	196	1 / 0	16.14	6.77	20.76	0.119	38.45	-17.70	22.91	0.195	40.61	-17.70
836.50	15	QPSK	V	133	193	1 / 0	16.58	6.78	**21.21**	0.132	38.45	-17.25	**23.36**	0.217	40.61	-17.25
841.50	15	QPSK	V	122	192	1 / 0	15.68	6.79	20.32	0.108	38.45	-18.14	22.47	0.176	40.61	-18.14
836.50	15	16-QAM	V	133	193	1 / 0	15.46	6.78	**20.09**	0.102	38.45	-18.37	**22.24**	0.167	40.61	-18.37

Table 7-6. ERP Data (Band 26)

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
1710.70	1.4	QPSK	V	162	307	1 / 0	12.99	8.16	21.15	0.130	30.00	-8.85
1745.00	1.4	QPSK	V	153	305	1 / 0	14.43	8.19	**22.62**	0.183	30.00	-7.38
1779.30	1.4	QPSK	V	152	294	1 / 0	12.29	8.25	20.54	0.113	30.00	-9.46
1745.00	1.4	16-QAM	V	153	305	1 / 0	13.69	8.19	**21.88**	0.154	30.00	-8.12
1711.50	3	QPSK	V	183	307	1 / 0	14.76	8.16	22.92	0.196	30.00	-7.08
1745.00	3	QPSK	V	198	307	1 / 0	14.89	8.19	**23.08**	0.203	30.00	-6.92
1778.50	3	QPSK	V	168	301	1 / 0	13.69	8.25	21.94	0.156	30.00	-8.06
1745.00	3	16-QAM	V	198	307	1 / 0	13.79	8.19	**21.98**	0.158	30.00	-8.02
1712.50	5	QPSK	V	208	308	1 / 0	15.19	8.16	23.35	0.216	30.00	-6.65
1745.00	5	QPSK	V	202	304	1 / 0	15.79	8.19	**23.98**	0.250	30.00	-6.02
1777.50	5	QPSK	V	201	294	1 / 0	13.50	8.25	21.75	0.150	30.00	-8.25
1745.00	5	16-QAM	V	202	304	1 / 0	13.89	8.19	**22.08**	0.162	30.00	-7.92
1715.00	10	QPSK	V	158	131	1 / 0	14.53	8.16	22.69	0.186	30.00	-7.31
1745.00	10	QPSK	V	144	134	1 / 0	16.28	8.19	**24.47**	**0.280**	30.00	-5.53
1775.00	10	QPSK	V	161	125	1 / 0	13.68	8.24	21.92	0.156	30.00	-8.08
1745.00	10	16-QAM	V	144	134	1 / 0	15.69	8.19	**23.88**	0.245	30.00	-6.12
1717.50	15	QPSK	V	207	306	1 / 0	15.07	8.16	23.23	0.211	30.00	-6.77
1745.00	15	QPSK	V	204	302	1 / 0	15.59	8.19	**23.78**	0.239	30.00	-6.22
1772.50	15	QPSK	V	194	293	1 / 0	14.63	8.24	22.87	0.194	30.00	-7.13
1745.00	15	16-QAM	V	204	302	1 / 0	14.29	8.19	**22.48**	0.177	30.00	-7.52
1720.00	20	QPSK	V	198	305	1 / 0	14.81	8.17	22.98	0.198	30.00	-7.02
1745.00	20	QPSK	V	203	308	1 / 0	14.64	8.19	22.83	0.192	30.00	-7.17
1770.00	20	QPSK	V	193	294	1 / 0	14.89	8.23	**23.12**	0.205	30.00	-6.88
1770.00	20	16-QAM	V	193	294	1 / 0	13.18	8.23	**21.41**	0.138	30.00	-8.59
1745.00	10	QPSK	H	112	300	16.28	15.79	8.19	23.98	0.250	30.00	-6.02

Table 7-7. EIRP Data (Band 66)

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
1850.70	1.4	QPSK	H	110	20	1 / 0	14.30	8.37	**22.67**	0.185	33.01	-10.34
1882.50	1.4	QPSK	H	113	17	1 / 0	13.18	8.42	21.60	0.144	33.01	-11.41
1914.30	1.4	QPSK	H	115	22	1 / 0	13.64	8.47	22.11	0.163	33.01	-10.90
1850.70	1.4	16-QAM	H	110	20	1 / 0	12.96	8.37	**21.33**	0.136	33.01	-11.68
1851.50	3	QPSK	H	113	19	1 / 0	14.65	8.37	23.02	0.200	33.01	-9.99
1882.50	3	QPSK	H	113	22	1 / 0	14.25	8.42	22.67	0.185	33.01	-10.34
1913.50	3	QPSK	H	100	16	1 / 0	14.74	8.47	**23.21**	0.209	33.01	-9.80
1913.50	3	16-QAM	H	100	16	1 / 0	13.67	8.47	**22.14**	0.164	33.01	-10.87
1852.50	5	QPSK	H	154	12	1 / 0	15.41	8.37	**23.78**	0.239	33.01	-9.23
1882.50	5	QPSK	H	145	13	1 / 0	15.30	8.42	23.72	0.235	33.01	-9.29
1912.50	5	QPSK	H	152	9	1 / 0	15.30	8.47	23.77	0.238	33.01	-9.24
1852.50	5	16-QAM	H	154	12	1 / 0	13.33	8.37	21.70	0.148	33.01	-11.31
1855.00	10	QPSK	H	155	14	1 / 0	14.97	8.37	23.34	0.216	33.01	-9.67
1882.50	10	QPSK	H	146	15	1 / 0	16.58	8.42	**25.00**	**0.316**	33.01	-8.01
1910.00	10	QPSK	H	150	14	1 / 0	15.18	8.46	23.64	0.231	33.01	-9.37
1882.50	10	16-QAM	H	146	15	1 / 0	14.30	8.42	**22.72**	0.187	33.01	-10.29
1857.50	15	QPSK	H	152	11	1 / 0	15.21	8.38	23.59	0.228	33.01	-9.42
1882.50	15	QPSK	H	146	15	1 / 0	15.46	8.42	**23.88**	0.244	33.01	-9.13
1907.50	15	QPSK	H	147	21	1 / 0	14.69	8.46	23.15	0.206	33.01	-9.86
1882.50	15	16-QAM	H	146	15	1 / 0	14.37	8.42	**22.79**	0.190	33.01	-10.22
1860.00	20	QPSK	H	117	17	1 / 0	15.36	8.38	**23.74**	0.237	33.01	-9.27
1882.50	20	QPSK	H	146	15	1 / 0	14.84	8.42	23.26	0.212	33.01	-9.75
1905.00	20	QPSK	H	115	18	1 / 0	15.27	8.45	23.72	0.236	33.01	-9.29
1860.00	20	16-QAM	H	117	17	1 / 0	13.60	8.38	**21.98**	0.158	33.01	-11.03
1882.50	10	QPSK	V	115	20	16.58	16.40	8.42	24.82	0.303	33.01	-8.19

Table 7-8. EIRP Data (Band 25)

7.7 Radiated Spurious Emissions Measurements

Test Overview

Radiated spurious emissions measurements are performed using the substitution method described in ANSI/TIA-603-E-2016 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using vertically and horizontally polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas.

Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.8

ANSI/TIA-603-E-2016 – Section 2.2.12

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.

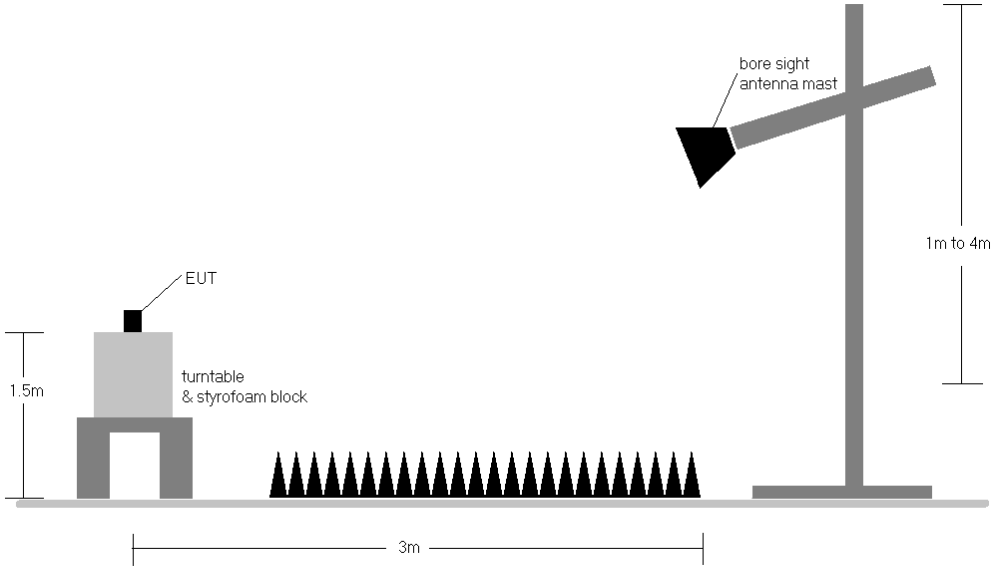


Figure 7-7. Test Instrument & Measurement Setup

Test Notes

1) 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.

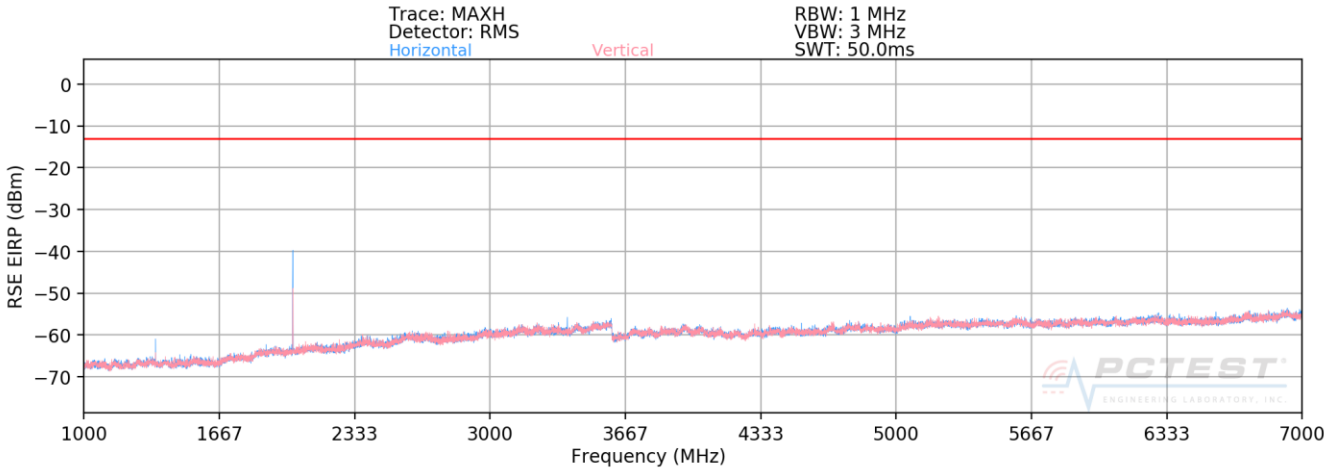
2) This unit was tested with its standard battery.

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

4) 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.

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

Band 71



Plot 7-222. Radiated Spurious Plot above 1GHz (Band 71)

OPERATING FREQUENCY:	665.50	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	5.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1331.00	H	264	320	-70.76	7.38	-63.39	-50.4
1996.50	H	250	300	-68.91	8.59	-60.32	-47.3
2662.00	H	-	-	-71.57	9.91	-61.66	-48.7

Table 7-9. Radiated Spurious Data (Band 71 – Low Channel)

OPERATING FREQUENCY:	680.50	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	5.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1361.00	H	100	235	-70.61	7.48	-63.13	-50.1
2041.50	H	112	250	-68.13	8.76	-59.37	-46.4
2722.00	H	-	-	-72.14	10.08	-62.06	-49.1

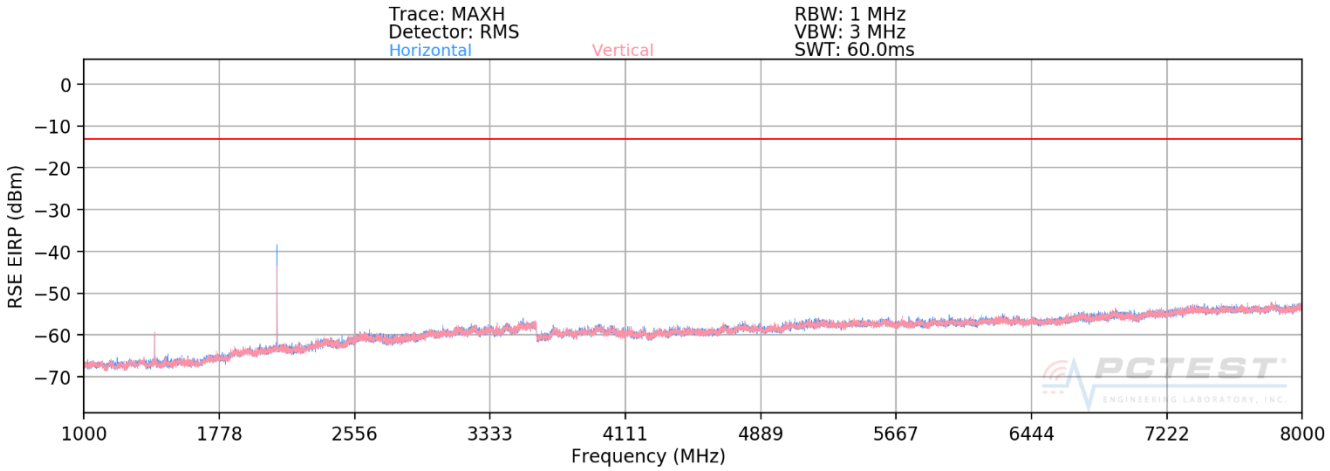
Table 7-10. Radiated Spurious Data (Band 71 – Mid Channel)

OPERATING FREQUENCY:	695.50	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	5.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1391.00	H	108	324	-68.85	7.45	-61.40	-48.4
2086.50	H	112	132	-68.17	8.82	-59.35	-46.3
2782.00	H	-	-	-71.82	10.16	-61.66	-48.7

Table 7-11. Radiated Spurious Data (Band 71 – High Channel)

Band 12



Plot 7-223. Radiated Spurious Plot above 1GHz (Band 12)

OPERATING FREQUENCY:	704.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1408.00	H	100	228	-67.92	7.54	-60.38	-47.4
2112.00	H	125	222	-64.41	8.85	-55.56	-42.6
2816.00	H	-	-	-72.06	10.12	-61.94	-48.9

Table 7-12. Radiated Spurious Data (Band 12 – Low Channel)

OPERATING FREQUENCY:	707.50	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1415.00	H	220	339	-68.20	7.63	-60.57	-47.6
2122.50	H	200	300	-69.90	8.86	-61.04	-48.0
2830.00	H	-	-	-72.00	10.10	-61.90	-48.9

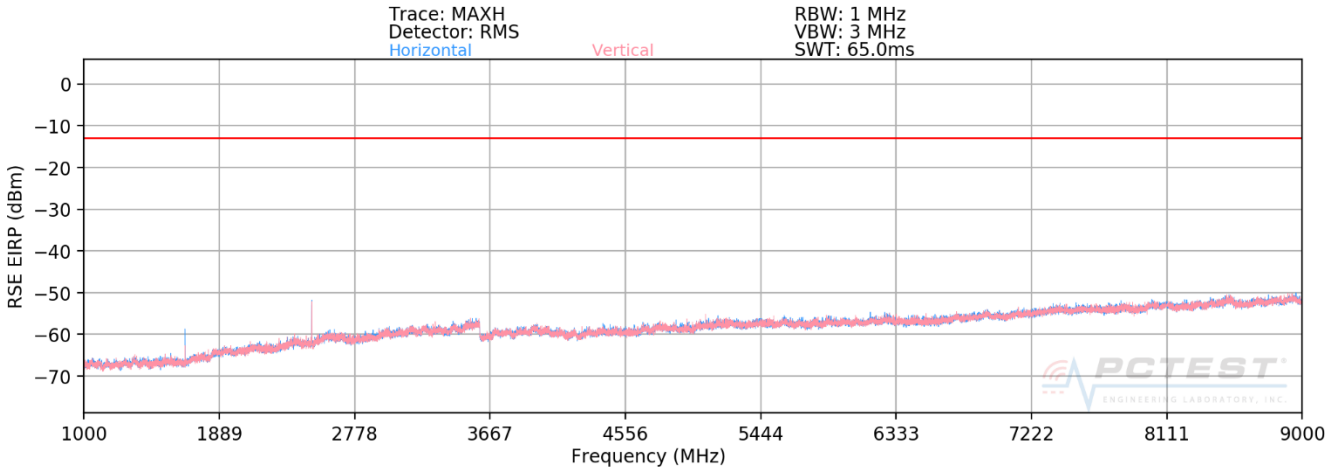
Table 7-13. Radiated Spurious Data (Band 12 – Mid Channel)

OPERATING FREQUENCY:	711.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1422.00	H	105	320	-66.16	7.72	-58.43	-45.4
2133.00	H	115	300	-62.81	8.87	-53.94	-40.9
2844.00	H	-	-	-71.99	10.07	-61.92	-48.9

Table 7-14. Radiated Spurious Data (Band 12 – High Channel)

Band 26/5



Plot 7-224. Radiated Spurious Plot above 1GHz (Band 26)

OPERATING FREQUENCY:	829.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1658.00	H	375	362	-78.62	8.95	-69.67	-56.7
2487.00	H	-	-	-76.89	9.70	-67.19	-54.2

Table 7-15. Radiated Spurious Data (Band 26/5 – Low Channel)

OPERATING FREQUENCY:	836.50	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1673.00	H	159	36	-76.92	8.95	-67.96	-55.0
2509.50	H	-	-	-77.50	9.75	-67.75	-54.8

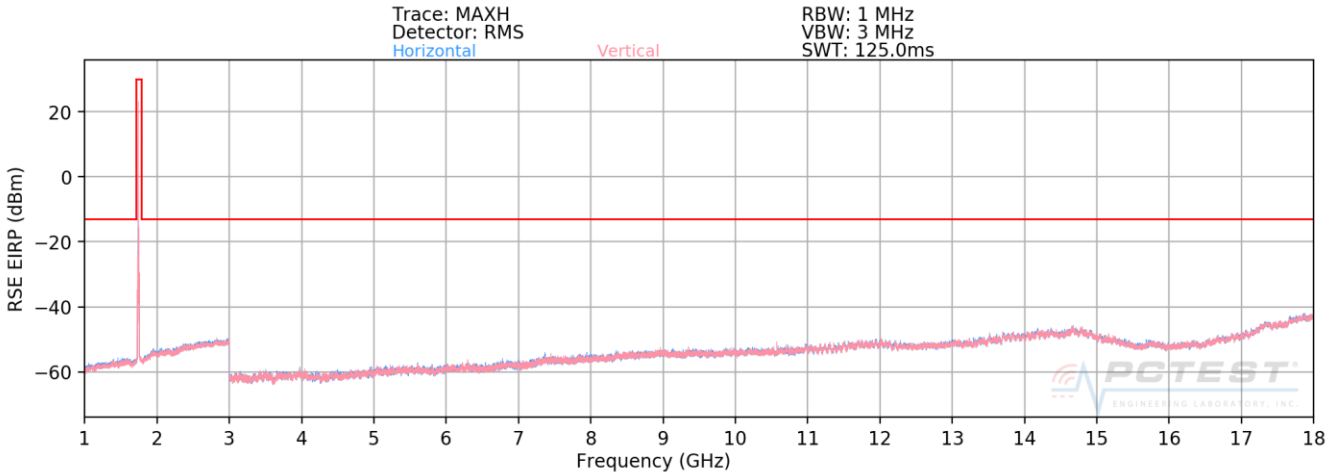
Table 7-16. Radiated Spurious Data (Band 26/5 – Mid Channel)

OPERATING FREQUENCY:	844.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1688.00	H	-	-	-78.99	8.95	-70.04	-57.0
2532.00	H	-	-	-76.14	9.75	-66.39	-53.4

Table 7-17. Radiated Spurious Data (Band 26/5 – High Channel)

Band 66/4



Plot 7-225. Radiated Spurious Plot above 1GHz (Band 66/4)

OPERATING FREQUENCY:	1715.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3430.00	H	113	309	-68.68	9.83	-58.84	-45.8
5145.00	H	-	-	-69.41	10.69	-58.71	-45.7

Table 7-18. Radiated Spurious Data (Band 66/4 – Low Channel)

OPERATING FREQUENCY:	1745.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3490.00	H	100	318	-68.41	9.91	-58.50	-45.5
5235.00	H	-	-	-69.21	10.73	-58.47	-45.5

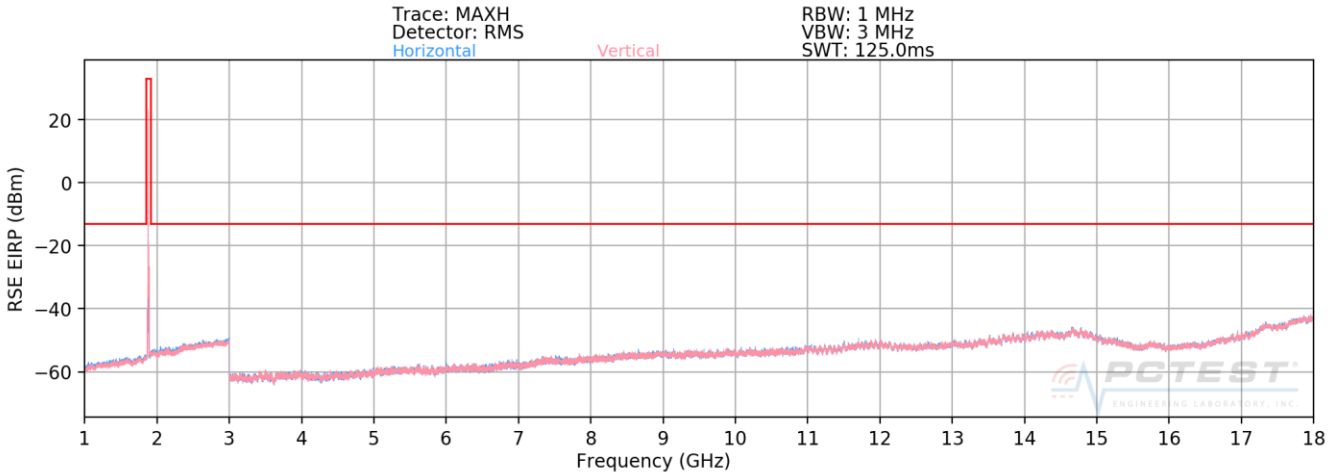
Table 7-19. Radiated Spurious Data (Band 66/4 – Mid Channel)

OPERATING FREQUENCY:	1775.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3550.00	H	119	357	-68.46	9.89	-58.57	-45.6
5325.00	H	-	-	-69.00	10.69	-58.31	-45.3

Table 7-20. Radiated Spurious Data (Band 66/4 – High Channel)

Band 25/2



Plot 7-226. Radiated Spurious Plot above 1GHz (Band 25/2)

OPERATING FREQUENCY:	1855.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3710.00	H	125	150	-69.17	9.55	-59.62	-46.6
5565.00	H	-	-	-68.82	10.96	-57.86	-44.9

Table 7-21. Radiated Spurious Data (Band 25/2 – Low Channel)

OPERATING FREQUENCY:	1882.50	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3765.00	H	111	152	-65.58	9.36	-56.23	-43.2
5647.50	H	-	-	-69.30	11.19	-58.11	-45.1

Table 7-22. Radiated Spurious Data (Band 25/2 – Mid Channel)

OPERATING FREQUENCY:	1910.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3820.00	H	-	-	-64.35	9.31	-55.05	-42.0
5730.00	H	-	-	-69.05	11.39	-57.66	-44.7

Table 7-23. Radiated Spurious Data (Band 25/2 – High Channel)

7.8 Frequency Stability / Temperature Variation

Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI/TIA-603-E-2016. 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, the frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5 ppm) of the center frequency. For Part 24, Part 27, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test Procedure Used

ANSI/TIA-603-E-2016

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

Band 71 Frequency Stability Measurements

OPERATING FREQUENCY:	680,500,000	Hz
CHANNEL:	133297	
REFERENCE VOLTAGE:	3.85	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	- 30	680,500,101	101	0.0000148
100 %		- 20	680,499,965	-35	-0.0000051
100 %		- 10	680,499,787	-213	-0.0000313
100 %		0	680,500,089	89	0.0000131
100 %		+ 10	680,500,116	116	0.0000170
100 %		+ 20	680,500,214	214	0.0000314
100 %		+ 30	680,500,069	69	0.0000101
100 %		+ 40	680,499,769	-231	-0.0000339
100 %		+ 50	680,499,777	-223	-0.0000328
85 %		+ 20	680,499,799	-201	-0.0000295
BATT. ENDPOINT	3.40	+ 20	680,499,983	-17	-0.0000025

Table 7-24. Frequency Stability Data (Band 71)

Note:

Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

Band 71 Frequency Stability Measurements

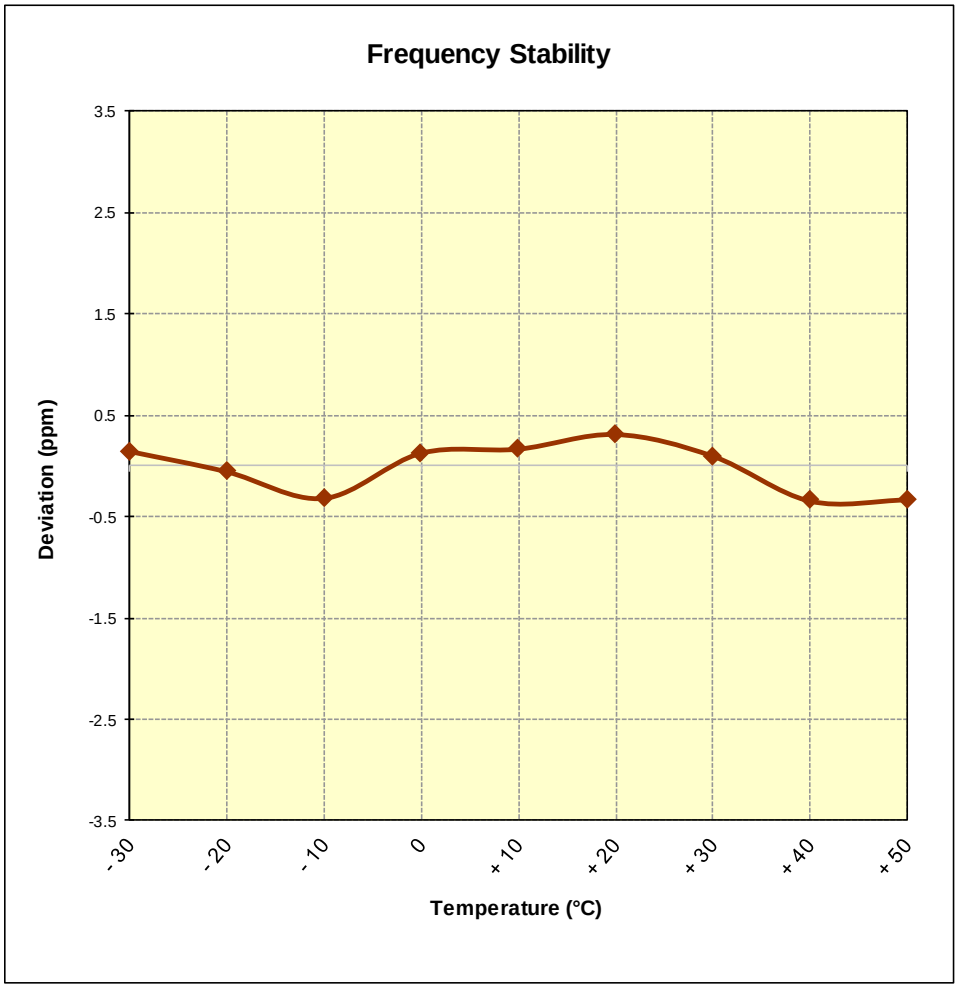


Figure 7-8. Frequency Stability Graph (Band 71)

Band 12 Frequency Stability Measurements

OPERATING FREQUENCY:	707,500,000	Hz
CHANNEL:	23790	
REFERENCE VOLTAGE:	3.85	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	- 30	707,500,024	24	0.0000034
100 %		- 20	707,499,731	-269	-0.0000380
100 %		- 10	707,500,111	111	0.0000157
100 %		0	707,499,760	-240	-0.0000339
100 %		+ 10	707,499,736	-264	-0.0000373
100 %		+ 20	707,499,878	-122	-0.0000172
100 %		+ 30	707,500,075	75	0.0000106
100 %		+ 40	707,499,984	-16	-0.0000023
100 %		+ 50	707,499,902	-98	-0.0000139
85 %		+ 20	707,500,028	28	0.0000040
BATT. ENDPOINT	3.40	+ 20	707,500,086	86	0.0000122

Table 7-25. Frequency Stability Data (Band 12)

Note:

Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

Band 12 Frequency Stability Measurements

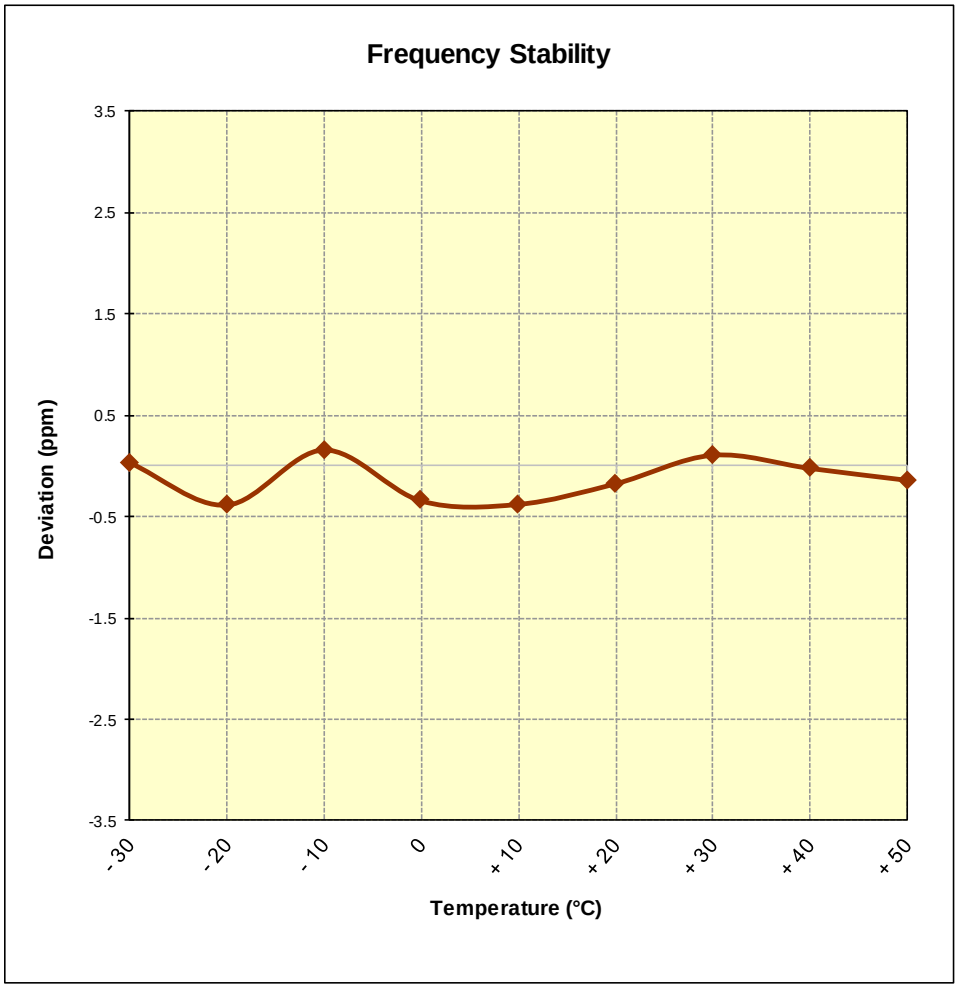


Figure 7-9. Frequency Stability Graph (Band 12)

Band 26/5 Frequency Stability Measurements

OPERATING FREQUENCY:	831,500,000	Hz
CHANNEL:	26865	
REFERENCE VOLTAGE:	3.85	VDC
DEVIATION LIMIT:	± 0.00025 % or 2.5 ppm	

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	- 30	831,500,319	319	0.0000384
100 %		- 20	831,500,122	122	0.0000147
100 %		- 10	831,500,037	37	0.0000044
100 %		0	831,499,621	-379	-0.0000456
100 %		+ 10	831,500,095	95	0.0000114
100 %		+ 20	831,500,253	253	0.0000304
100 %		+ 30	831,500,435	435	0.0000523
100 %		+ 40	831,499,812	-188	-0.0000226
100 %		+ 50	831,499,727	-273	-0.0000328
85 %		+ 20	831,500,002	2	0.0000002
BATT. ENDPOINT	3.40	+ 20	831,500,092	92	0.0000111

Table 7-26. Frequency Stability Data (Band 26/5)

Band 26/5 Frequency Stability Measurements

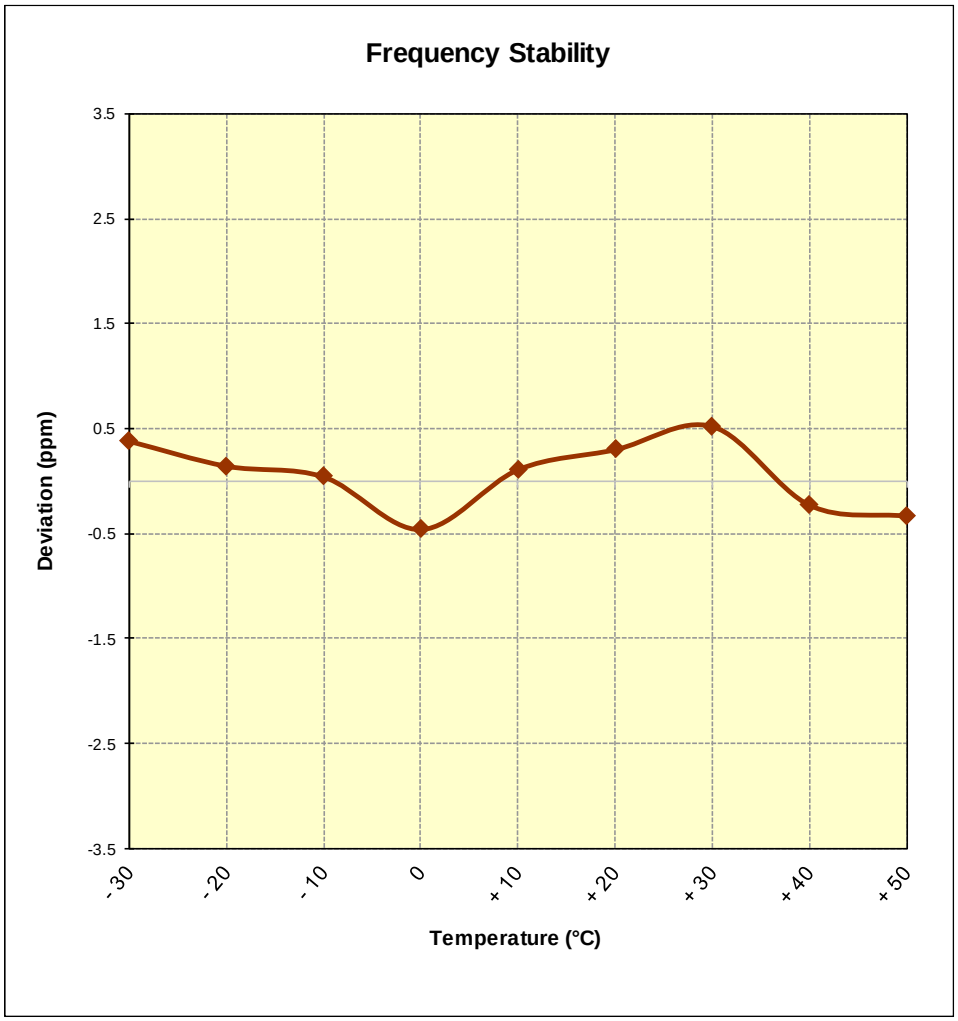


Figure 7-10. Frequency Stability Graph (Band 26/5)

Band 66/4 Frequency Stability Measurements

OPERATING FREQUENCY:	1,745,000,000	Hz
CHANNEL:	132322	
REFERENCE VOLTAGE:	3.85	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	- 30	1,744,999,755	-245	-0.0000140
100 %		- 20	1,745,000,059	59	0.0000034
100 %		- 10	1,744,999,977	-23	-0.0000013
100 %		0	1,745,000,249	249	0.0000143
100 %		+ 10	1,745,000,206	206	0.0000118
100 %		+ 20	1,745,000,187	187	0.0000107
100 %		+ 30	1,744,999,897	-103	-0.0000059
100 %		+ 40	1,744,999,726	-274	-0.0000157
100 %		+ 50	1,744,999,984	-16	-0.0000009
85 %		+ 20	1,745,000,071	71	0.0000041
BATT. ENDPOINT	3.40	+ 20	1,745,000,045	45	0.0000026

Table 7-27. Frequency Stability Data (Band 66/4)

Note:

Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

Band 66/4 Frequency Stability Measurements

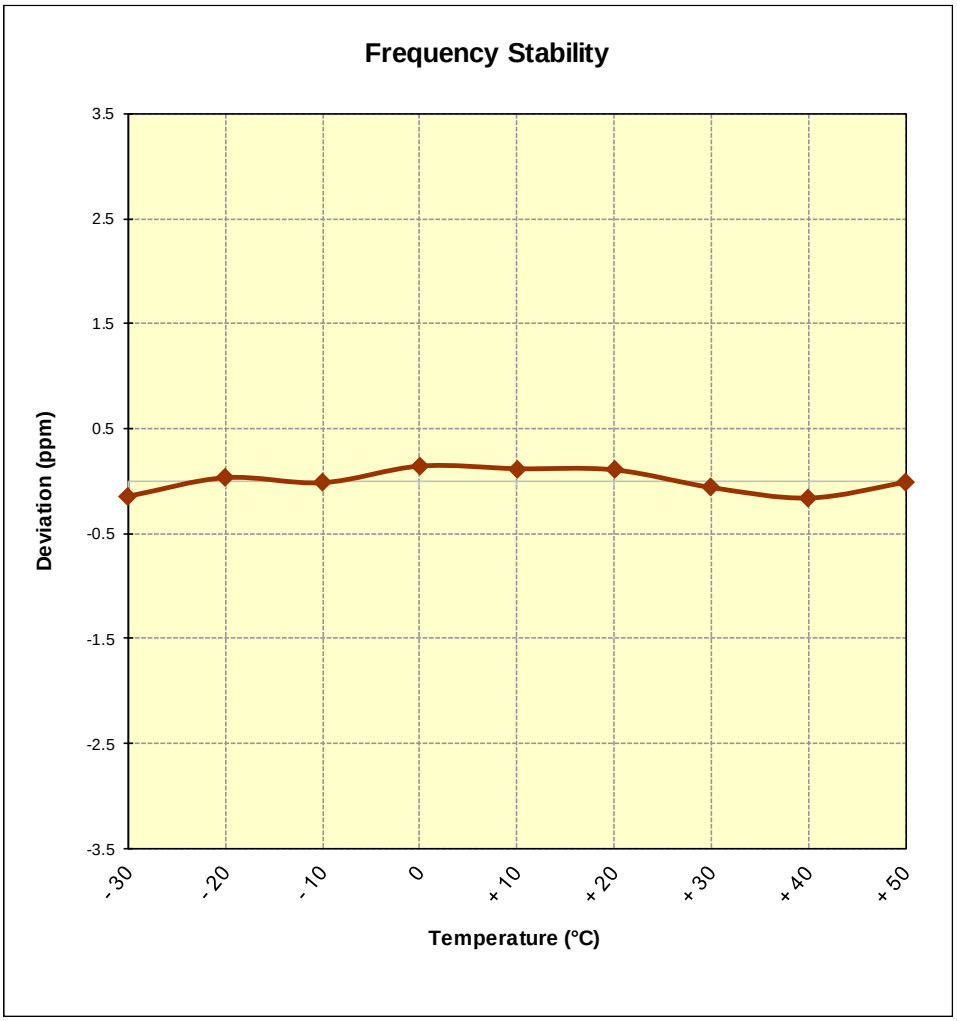


Figure 7-11. Frequency Stability Graph (Band 66/4)

Band 25/2 Frequency Stability Measurements

OPERATING FREQUENCY:	1,882,500,000	Hz
CHANNEL:	26365	
REFERENCE VOLTAGE:	3.85	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	- 30	1,882,499,887	-113	-0.0000060
100 %		- 20	1,882,500,051	51	0.0000027
100 %		- 10	1,882,500,168	168	0.0000089
100 %		0	1,882,500,117	117	0.0000062
100 %		+ 10	1,882,499,803	-197	-0.0000105
100 %		+ 20	1,882,500,093	93	0.0000049
100 %		+ 30	1,882,500,388	388	0.0000206
100 %		+ 40	1,882,499,855	-145	-0.0000077
100 %		+ 50	1,882,499,840	-160	-0.0000085
85 %		+ 20	1,882,499,988	-12	-0.0000006
BATT. ENDPOINT	3.40	+ 20	1,882,499,969	-31	-0.0000016

Table 7-28. Frequency Stability Data (Band 25/2)

Band 25/2 Frequency Stability Measurements

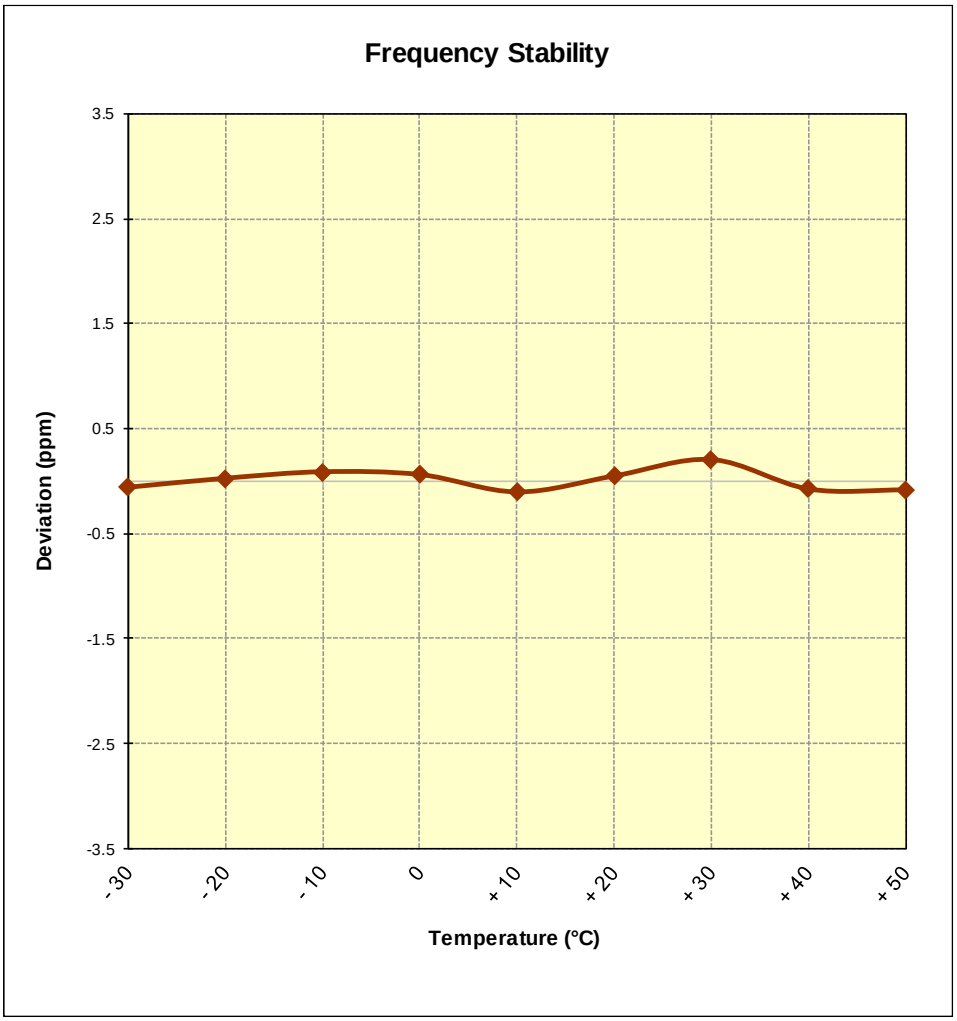


Figure 7-12. Frequency Stability Graph (Band 25/2)

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **LG Portable Handset FCC ID: ZNFX220TB** complies with all the requirements of Part 22, 24, & 27 of the FCC Rules for LTE operation only.