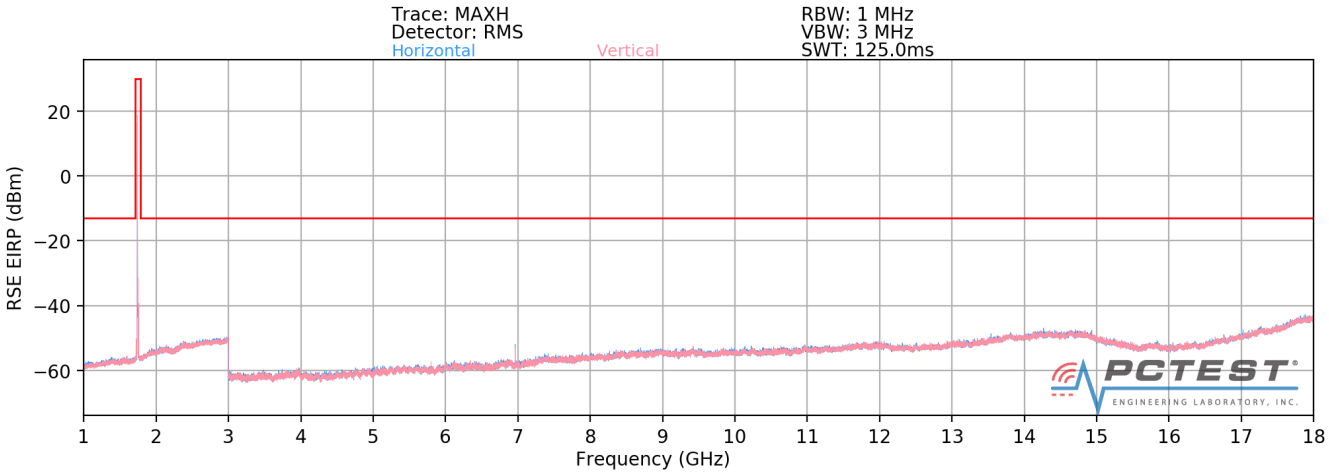
Band 66/4



Plot 7-344. Radiated Spurious Plot above 1GHz (Band 66/4)

OPERATING FREQUENCY:	1710.70	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	1.4	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]
3421.40	H	108	55	-64.53	6.22	-58.31	-45.3
5132.10	H	-	-	-70.00	8.68	-61.32	-48.3
6842.80	H	102	42	-58.57	8.76	-49.81	-36.8
8553.50	H	-	-	-65.79	9.17	-56.62	-43.6
10264.20	H	-	-	-64.49	9.64	-54.86	-41.9

Table 7-27. Radiated Spurious Data (Band 66/4 – Low Channel)

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OPERATING FREQUENCY: 1745.00 MHz
MODULATION SIGNAL: QPSK
BANDWIDTH: 1.4 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	201	18	-66.80	6.32	-60.47	-47.5
5235.00	H	-	-	-69.57	8.71	-60.85	-47.9
6980.00	H	108	48	-60.40	8.74	-51.67	-38.7
8725.00	H	-	-	-65.87	9.42	-56.46	-43.5
10470.00	H	-	-	-64.22	9.62	-54.60	-41.6

Table 7-28. Radiated Spurious Data (Band 66/4 – Mid Channel)

OPERATING FREQUENCY: 1779.30 MHz
MODULATION SIGNAL: QPSK
BANDWIDTH: 1.4 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]
3558.60	H	365	5	-67.02	6.31	-60.72	-47.7
5337.90	H	-	-	-69.44	8.74	-60.70	-47.7
7117.20	H	377	356	-64.90	8.66	-56.24	-43.2
8896.50	H	-	-	-66.26	9.53	-56.73	-43.7
10675.80	H	-	-	-63.76	9.50	-54.26	-41.3

Table 7-29. Radiated Spurious Data (Band 66/4 – High Channel)

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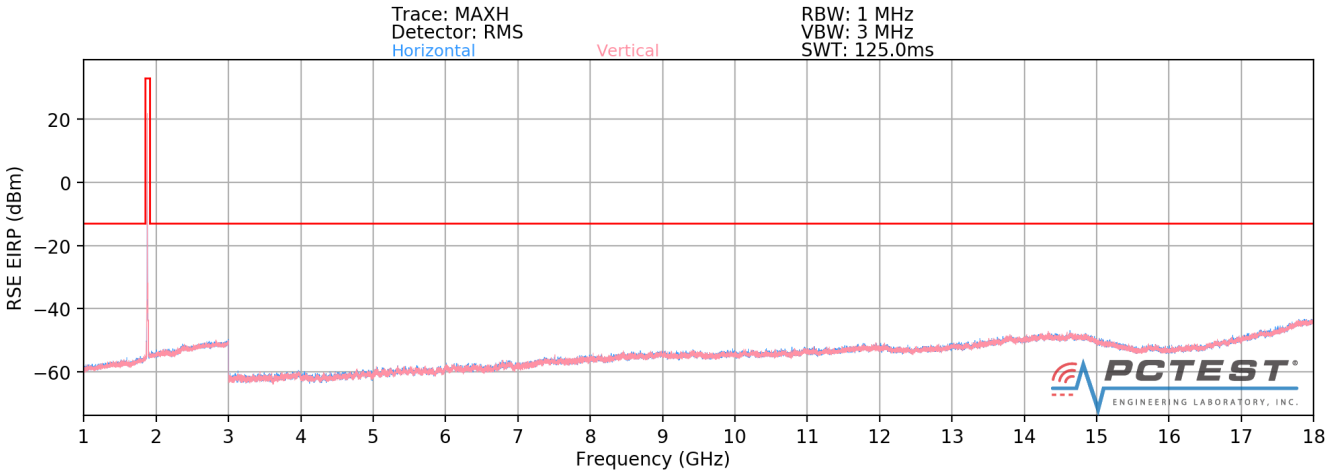
Band 25/2



Plot 7-345. 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	V	-	-	-67.75	6.58	-61.17	-48.2
5565.00	V	-	-	-69.38	8.74	-60.64	-47.6

Table 7-30. Radiated Spurious Data (Band 25/2 – Low Channel)

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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	V	-	-	-68.07	6.70	-61.38	-48.4
5647.50	V	-	-	-68.69	8.83	-59.86	-46.9

Table 7-31. 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	V	-	-	-67.74	6.94	-60.81	-47.8
5730.00	V	-	-	-67.77	8.77	-59.01	-46.0

Table 7-32. Radiated Spurious Data (Band 25/2 – High Channel)

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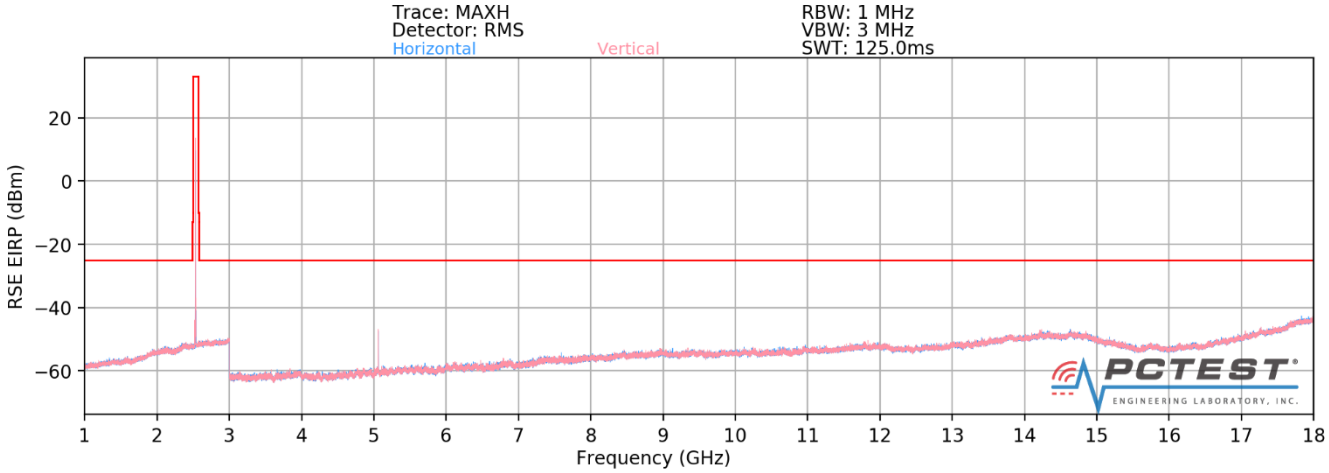
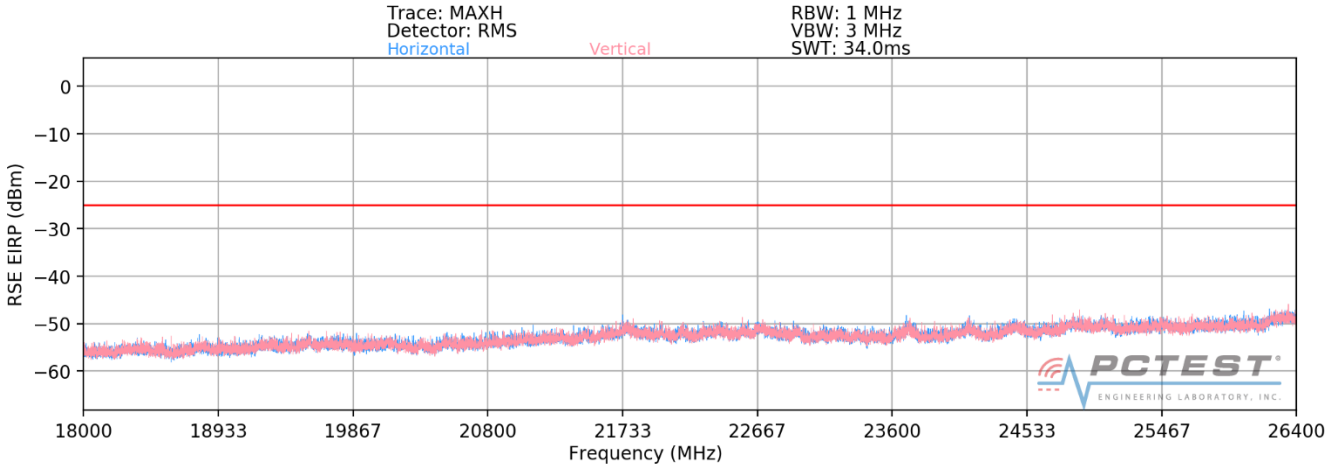
Band 7



Plot 7-346. Radiated Spurious Plot above 1GHz – 18GHz (Band 7)



Plot 7-347. Radiated Spurious Plot above 18GHz – 26.5GHz (Band 7)

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OPERATING FREQUENCY: 2502.50 MHz
MODULATION SIGNAL: QPSK
BANDWIDTH: 5.0 MHz
DISTANCE: 3 meters
LIMIT: -25 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]
5005.00	H	158	344	-54.34	8.56	-45.78	-20.8
7507.50	H	237	26	-64.63	8.52	-56.12	-31.1
10010.00	H	105	364	-63.52	9.85	-53.67	-28.7
12512.50	H	-	-	-61.43	9.08	-52.35	-27.4
15015.00	H	-	-	-58.72	8.79	-49.93	-24.9

Table 7-33. Radiated Spurious Data (Band 7 – Low Channel)

OPERATING FREQUENCY: 2535.00 MHz
MODULATION SIGNAL: QPSK
BANDWIDTH: 5.0 MHz
DISTANCE: 3 meters
LIMIT: -25 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]
5070.00	H	130	15	-54.42	8.60	-45.82	-20.8
7605.00	H	249	28	-63.33	8.48	-54.85	-29.8
10140.00	H	113	1	-62.96	9.78	-53.17	-28.2
12675.00	H	-	-	-60.58	9.08	-51.50	-26.5
15210.00	H	-	-	-57.81	8.47	-49.35	-24.3

Table 7-34. Radiated Spurious Data (Band 7 – Mid Channel)

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OPERATING FREQUENCY:	2567.50	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	5.0	MHz
DISTANCE:	3	meters
LIMIT:	-25	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]
5135.00	H	108	14	-52.45	8.66	-43.78	-18.8
7702.50	H	277	20	-64.10	8.59	-55.51	-30.5
10270.00	H	121	1	-64.21	9.64	-54.58	-29.6
12837.50	H	-	-	-61.18	9.13	-52.05	-27.0
15405.00	H	-	-	-57.70	8.47	-49.23	-24.2

Table 7-35. Radiated Spurious Data (Band 7 – High Channel)

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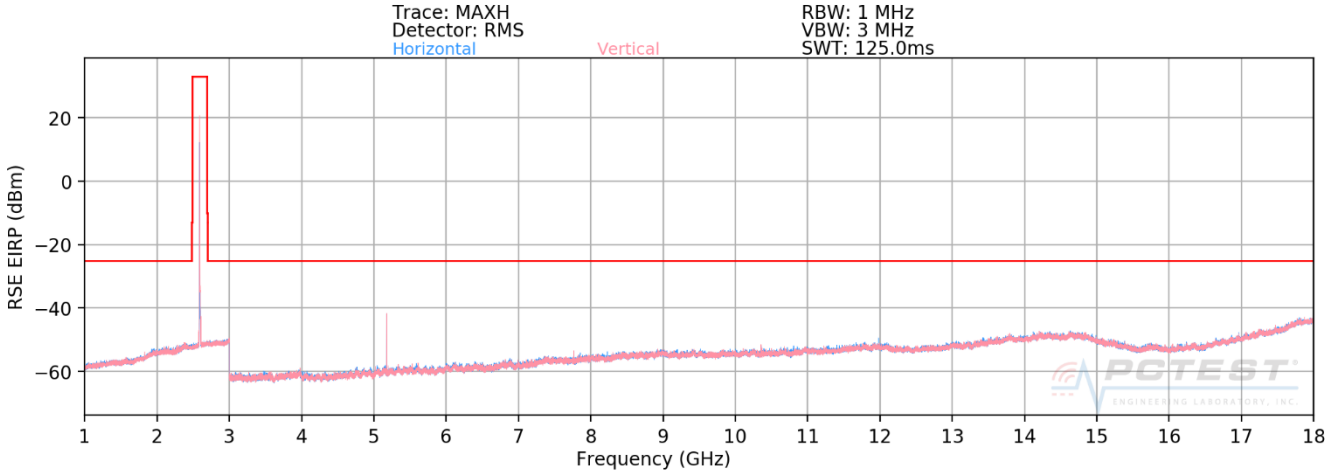
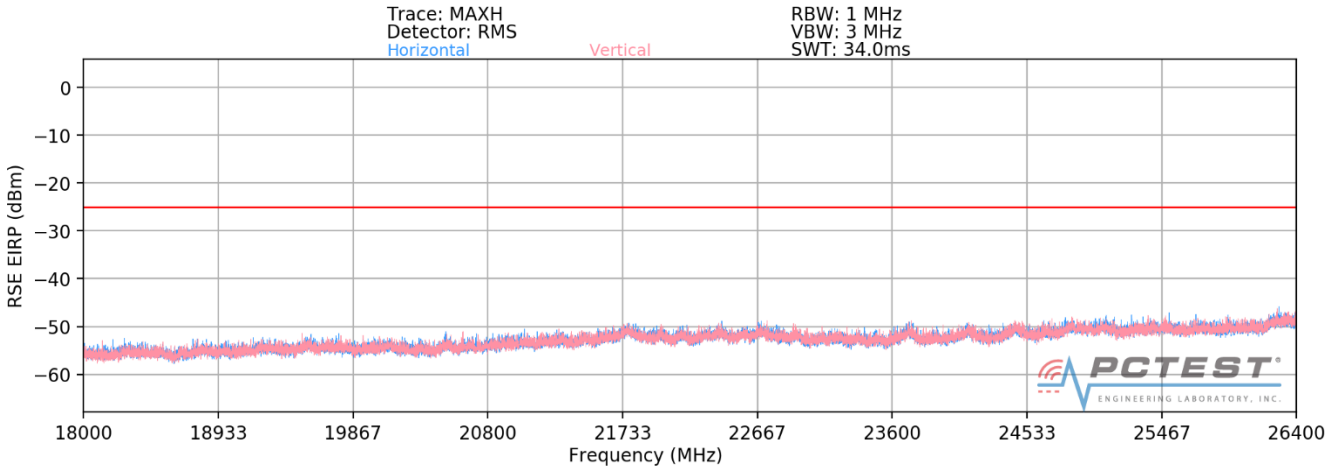
Band 41



Plot 7-348. Radiated Spurious Plot above 1GHz – 18GHz (Band 41)



Plot 7-349. Radiated Spurious Plot above 18GHz – 26.5GHz (Band 41)

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OPERATING FREQUENCY: 2507.50 MHz
MODULATION SIGNAL: QPSK
BANDWIDTH: 15.0 MHz
DISTANCE: 3 meters
LIMIT: -25 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]
5015.00	H	100	10	-48.40	8.76	-39.63	-14.6
7522.50	H	285	364	-64.25	9.31	-54.93	-29.9
10030.00	H	-	-	-62.26	9.80	-52.47	-27.5
12537.50	H	-	-	-58.58	8.84	-49.74	-24.7

Table 7-36. Radiated Spurious Data (Band 41 – Low Channel)

OPERATING FREQUENCY: 2593.00 MHz
MODULATION SIGNAL: QPSK
BANDWIDTH: 15.0 MHz
DISTANCE: 3 meters
LIMIT: -25 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]
5186.00	H	100	4	-46.82	9.03	-37.80	-12.8
7779.00	H	299	13	-60.99	9.29	-51.70	-26.7
10372.00	H	-	-	-62.69	9.50	-53.19	-28.2
12965.00	H	-	-	-58.02	8.75	-49.26	-24.3

Table 7-37. Radiated Spurious Data (Band 41 – Mid Channel)

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OPERATING FREQUENCY:	2682.50	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	15.0	MHz
DISTANCE:	3	meters
LIMIT:	-25	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]
5365.00	H	100	2	-53.95	8.99	-44.96	-20.0
8047.50	H	301	5	-62.72	9.35	-53.38	-28.4
10730.00	H	-	-	-61.26	9.38	-51.88	-26.9
13412.50	H	-	-	-57.77	8.65	-49.12	-24.1

Table 7-38. Radiated Spurious Data (Band 41 – High Channel)

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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

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Band 71 Frequency Stability Measurements

OPERATING FREQUENCY: 680,500,000 Hz

CHANNEL: 133372

REFERENCE VOLTAGE: 4.33 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.33	- 30	680,500,061	61	0.0000090
100 %		- 20	680,500,166	166	0.0000244
100 %		- 10	680,499,977	-23	-0.0000034
100 %		0	680,500,215	215	0.0000316
100 %		+ 10	680,499,959	-41	-0.0000060
100 %		+ 20	680,499,881	-119	-0.0000175
100 %		+ 30	680,499,806	-194	-0.0000285
100 %		+ 40	680,500,096	96	0.0000141
100 %		+ 50	680,500,196	196	0.0000288
BATT. ENDPOINT	2.93	+ 20	680,499,811	-189	-0.0000278

Table 7-39. 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.

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Band 71 Frequency Stability Measurements

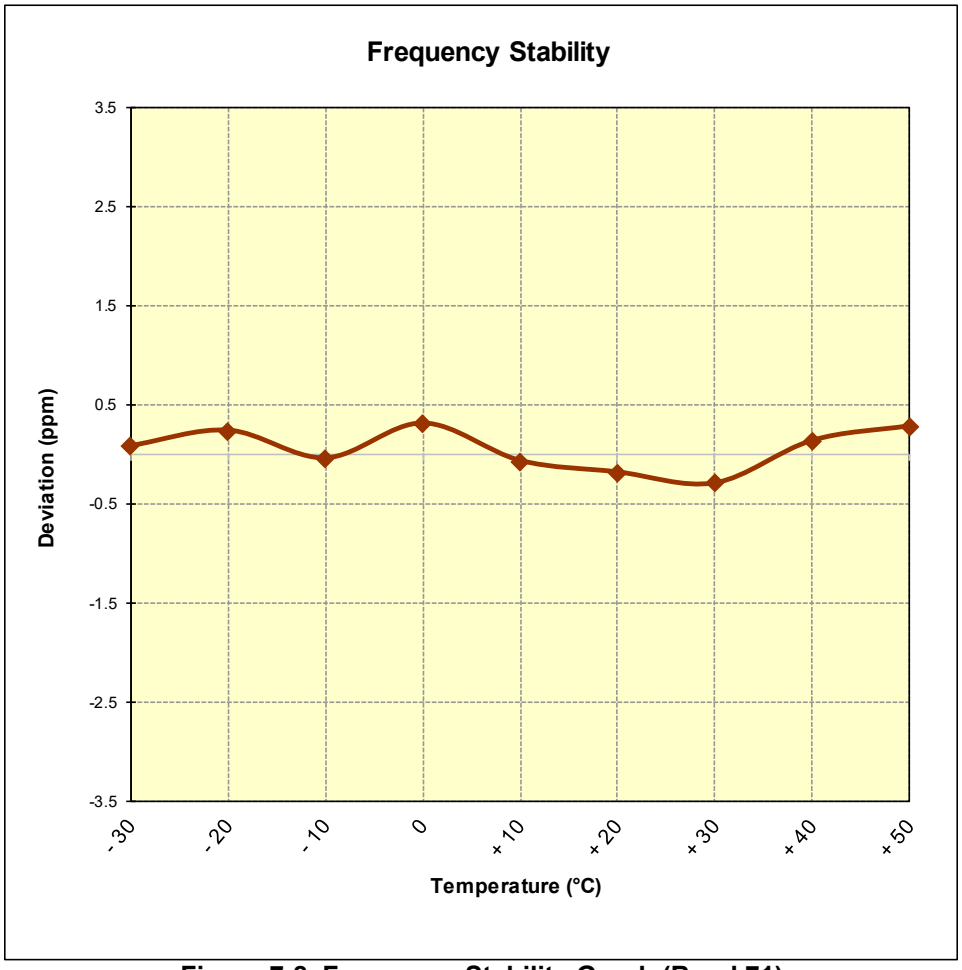

Figure 7-8. Frequency Stability Graph (Band 71)

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Band 12/17 Frequency Stability Measurements

OPERATING FREQUENCY: 707,500,000 Hz

CHANNEL: 23790

REFERENCE VOLTAGE: 4.33 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.33	- 30	707,499,963	-37	-0.0000052
100 %		- 20	707,500,319	319	0.0000451
100 %		- 10	707,499,918	-82	-0.0000116
100 %		0	707,499,807	-193	-0.0000273
100 %		+ 10	707,500,112	112	0.0000158
100 %		+ 20	707,499,788	-212	-0.0000300
100 %		+ 30	707,500,198	198	0.0000280
100 %		+ 40	707,500,106	106	0.0000150
100 %		+ 50	707,499,805	-195	-0.0000276
BATT. ENDPOINT	2.93	+ 20	707,500,125	125	0.0000177

Table 7-40. Frequency Stability Data (Band 12/17)

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.

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Band 12/17 Frequency Stability Measurements

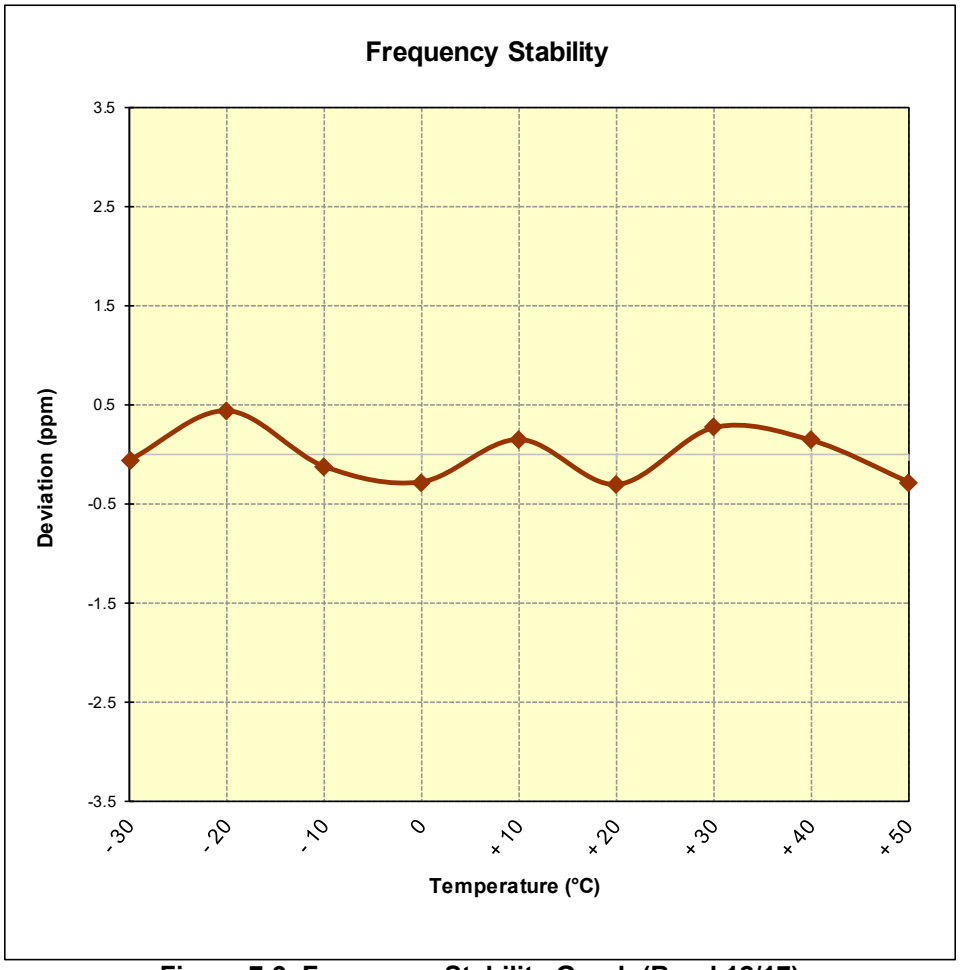

Figure 7-9. Frequency Stability Graph (Band 12/17)

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Band 13 Frequency Stability Measurements

OPERATING FREQUENCY: 782,000,000 Hz

CHANNEL: 23230

REFERENCE VOLTAGE: 4.33 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.33	- 30	782,000,101	101	0.0000129
100 %		- 20	782,000,332	332	0.0000425
100 %		- 10	782,000,028	28	0.0000036
100 %		0	782,000,125	125	0.0000160
100 %		+ 10	781,999,928	-72	-0.0000092
100 %		+ 20	781,999,517	-483	-0.0000618
100 %		+ 30	781,999,894	-106	-0.0000136
100 %		+ 40	782,000,022	22	0.0000028
100 %		+ 50	782,000,005	5	0.0000006
BATT. ENDPOINT	2.93	+ 20	781,999,866	-134	-0.0000171

Table 7-41. Frequency Stability Data (Band 13)

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.

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Band 13 Frequency Stability Measurements

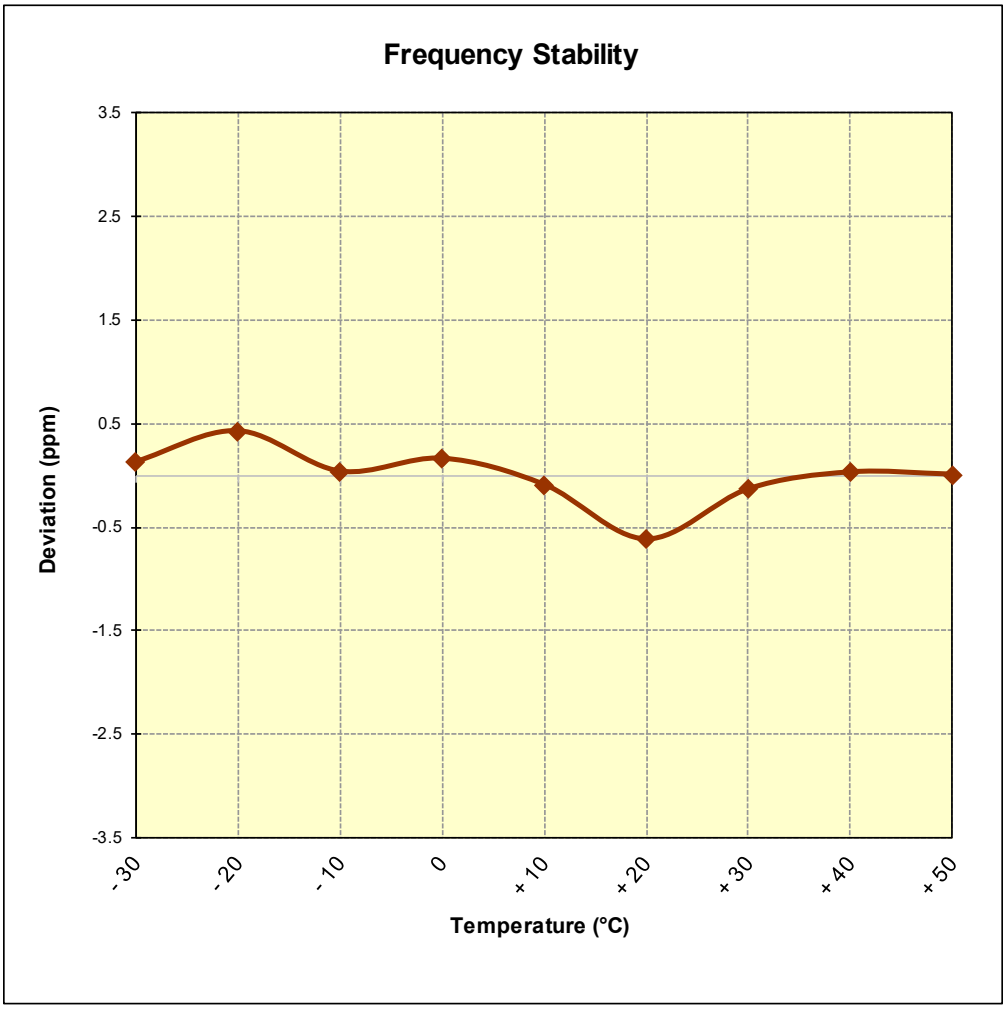

Figure 7-10. Frequency Stability Graph (Band 13)

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Band 26/5 Frequency Stability Measurements

OPERATING FREQUENCY:	831,500,000	Hz
CHANNEL:	26865	
REFERENCE VOLTAGE:	4.33	VDC
DEVIATION LIMIT:	± 0.00025 % or 2.5 ppm	

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.33	- 30	831,499,788	-212	-0.0000255
100 %		- 20	831,499,963	-37	-0.0000044
100 %		- 10	831,500,044	44	0.0000053
100 %		0	831,499,722	-278	-0.0000334
100 %		+ 10	831,499,954	-46	-0.0000055
100 %		+ 20	831,499,840	-160	-0.0000192
100 %		+ 30	831,499,992	-8	-0.0000010
100 %		+ 40	831,500,033	33	0.0000040
100 %		+ 50	831,499,857	-143	-0.0000172
BATT. ENDPOINT	2.93	+ 20	831,500,218	218	0.0000262

Table 7-42. Frequency Stability Data (Band 26/5)

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Band 26/5 Frequency Stability Measurements

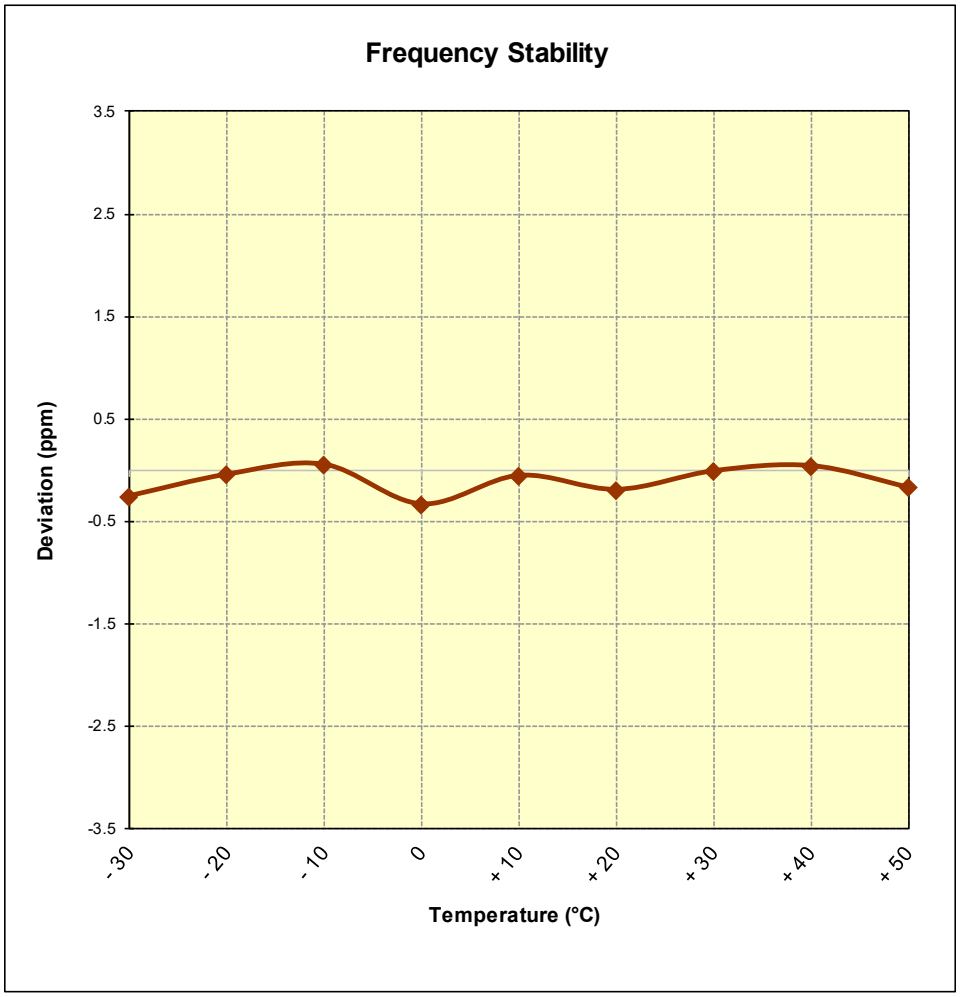

Figure 7-11. Frequency Stability Graph (Band 26/5)

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Band 66/4 Frequency Stability Measurements

OPERATING FREQUENCY: 1,745,000,000 Hz

CHANNEL: 132322

REFERENCE VOLTAGE: 4.33 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.33	- 30	1,744,999,968	-32	-0.0000018
100 %		- 20	1,744,999,959	-41	-0.0000023
100 %		- 10	1,744,999,962	-38	-0.0000022
100 %		0	1,745,000,099	99	0.0000057
100 %		+ 10	1,744,999,954	-46	-0.0000026
100 %		+ 20	1,744,999,947	-53	-0.0000030
100 %		+ 30	1,744,999,768	-232	-0.0000133
100 %		+ 40	1,745,000,015	15	0.0000009
100 %		+ 50	1,744,999,911	-89	-0.0000051
BATT. ENDPOINT	2.93	+ 20	1,744,999,789	-211	-0.0000121

Table 7-43. 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.

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Band 66/4 Frequency Stability Measurements

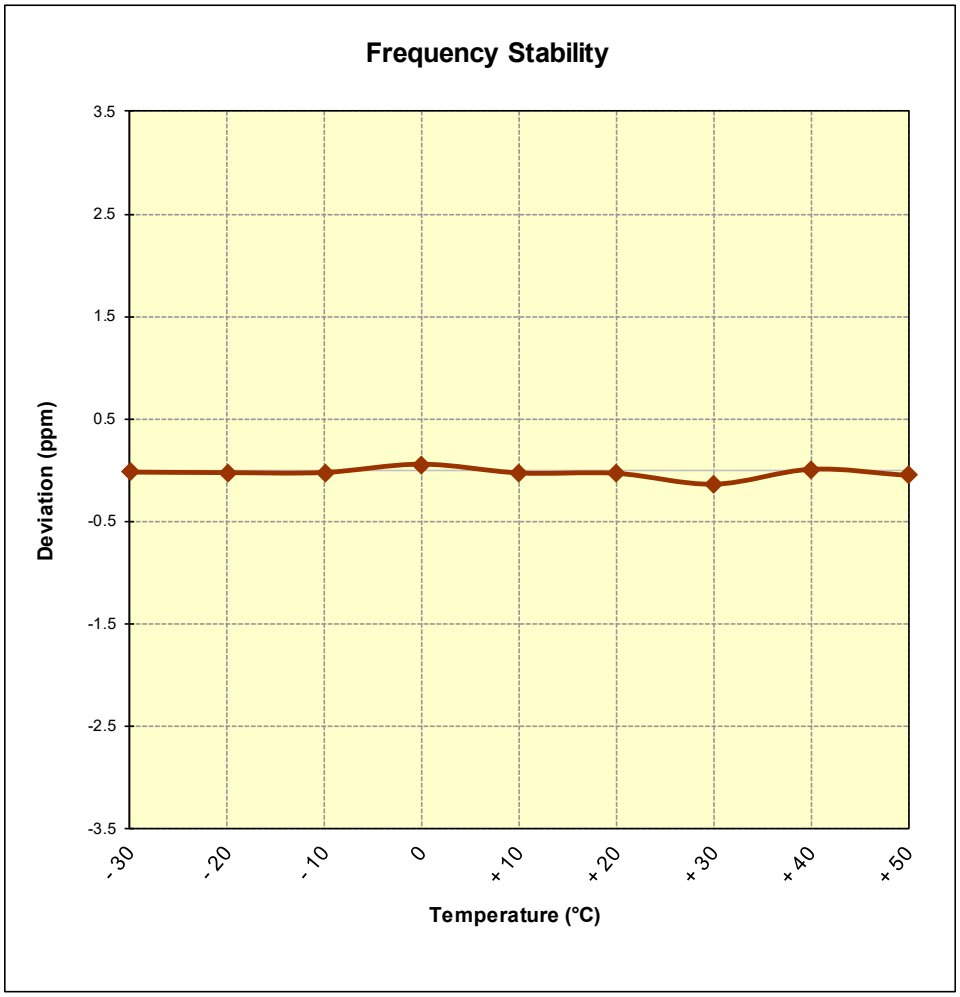

Figure 7-12. Frequency Stability Graph (Band 66/4)

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Band 25/2 Frequency Stability Measurements

OPERATING FREQUENCY: 1,882,500,000 Hz

CHANNEL: 26365

REFERENCE VOLTAGE: 4.33 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.33	- 30	1,882,500,085	85	0.0000045
100 %		- 20	1,882,500,110	110	0.0000058
100 %		- 10	1,882,499,807	-193	-0.0000103
100 %		0	1,882,500,024	24	0.0000013
100 %		+ 10	1,882,499,959	-41	-0.0000022
100 %		+ 20	1,882,500,133	133	0.0000071
100 %		+ 30	1,882,500,190	190	0.0000101
100 %		+ 40	1,882,499,807	-193	-0.0000103
100 %		+ 50	1,882,500,087	87	0.0000046
BATT. ENDPOINT	2.93	+ 20	1,882,499,661	-339	-0.0000180

Table 7-44. Frequency Stability Data (Band 25/2)

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.

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Band 25/2 Frequency Stability Measurements

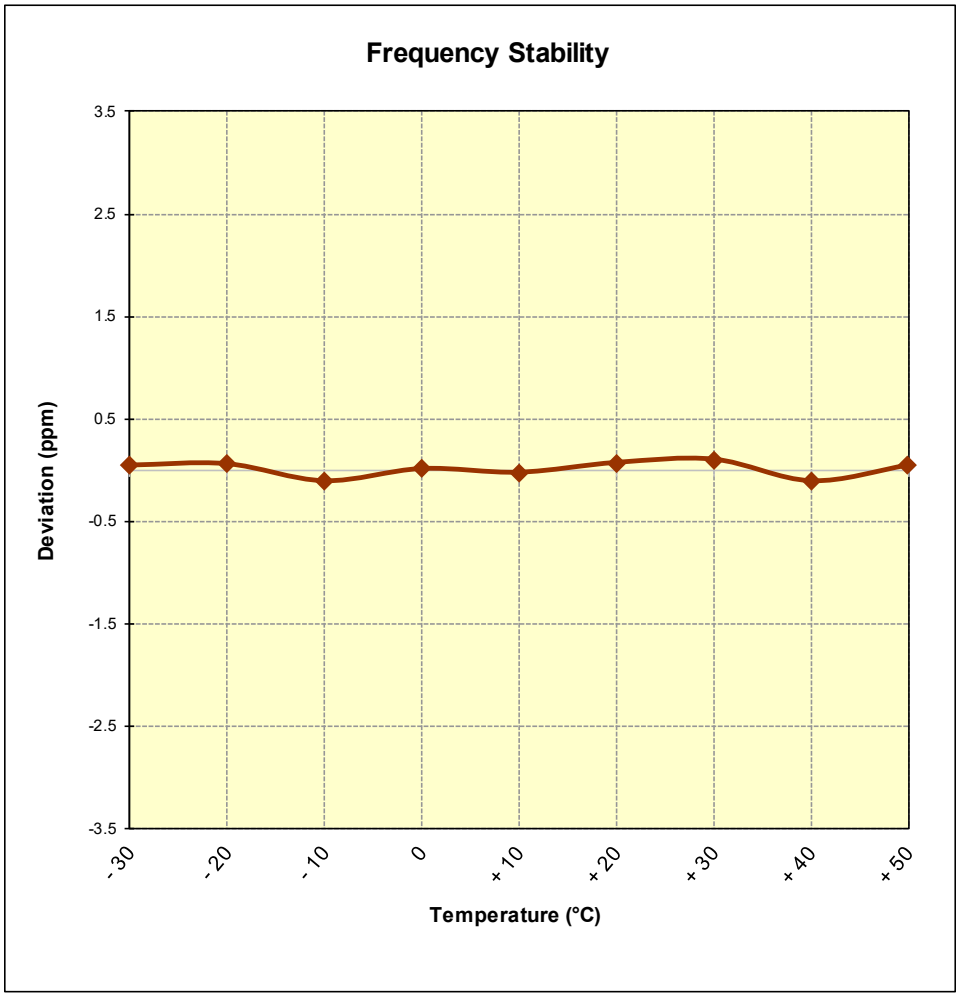

Figure 7-13. Frequency Stability Graph (Band 25/2)

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Band 7 Frequency Stability Measurements

OPERATING FREQUENCY: 2,535,000,000 Hz

CHANNEL: 21100

REFERENCE VOLTAGE: 4.33 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.33	- 30	2,535,000,258	258	0.0000102
100 %		- 20	2,535,000,363	363	0.0000143
100 %		- 10	2,534,999,790	-210	-0.0000083
100 %		0	2,535,000,183	183	0.0000072
100 %		+ 10	2,535,000,138	138	0.0000054
100 %		+ 20	2,534,999,822	-178	-0.0000070
100 %		+ 30	2,534,999,726	-274	-0.0000108
100 %		+ 40	2,534,999,712	-288	-0.0000114
100 %		+ 50	2,535,000,096	96	0.0000038
BATT. ENDPOINT	2.93	+ 20	2,534,999,720	-280	-0.0000110

Table 7-45. Frequency Stability Data (Band 7)

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.

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Band 7 Frequency Stability Measurements

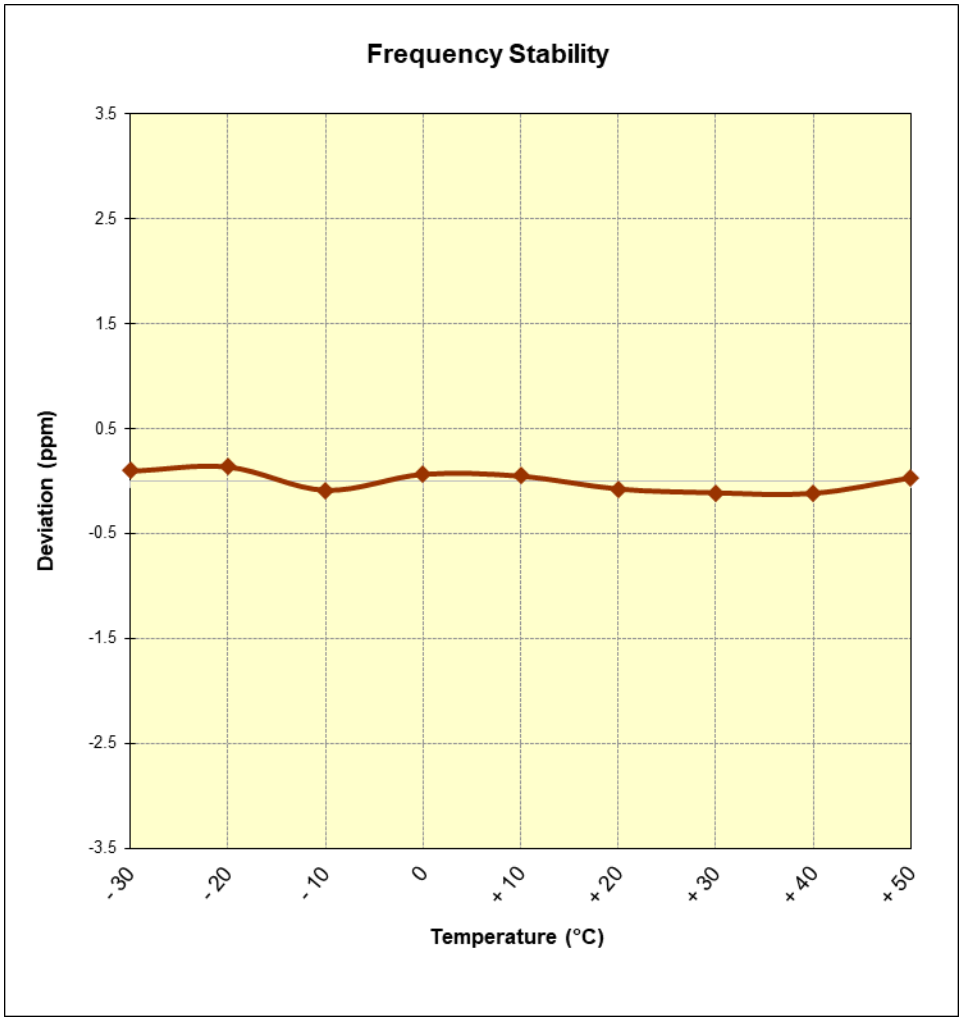

Figure 7-14. Frequency Stability Graph (Band 7)

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Band 41 Frequency Stability Measurements

OPERATING FREQUENCY: 2,593,000,000 Hz

CHANNEL: 40620

REFERENCE VOLTAGE: 4.33 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.33	- 30	2,592,999,771	-229	-0.0000088
100 %		- 20	2,592,999,989	-11	-0.0000004
100 %		- 10	2,592,999,939	-61	-0.0000024
100 %		0	2,593,000,003	3	0.0000001
100 %		+ 10	2,593,000,297	297	0.0000115
100 %		+ 20	2,593,000,401	401	0.0000155
100 %		+ 30	2,592,999,859	-141	-0.0000054
100 %		+ 40	2,592,999,611	-389	-0.0000150
100 %		+ 50	2,592,999,902	-98	-0.0000038
BATT. ENDPOINT	2.93	+ 20	2,593,000,124	124	0.0000048

Table 7-46. Frequency Stability Data (Band 41)

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.

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Band 41 Frequency Stability Measurements

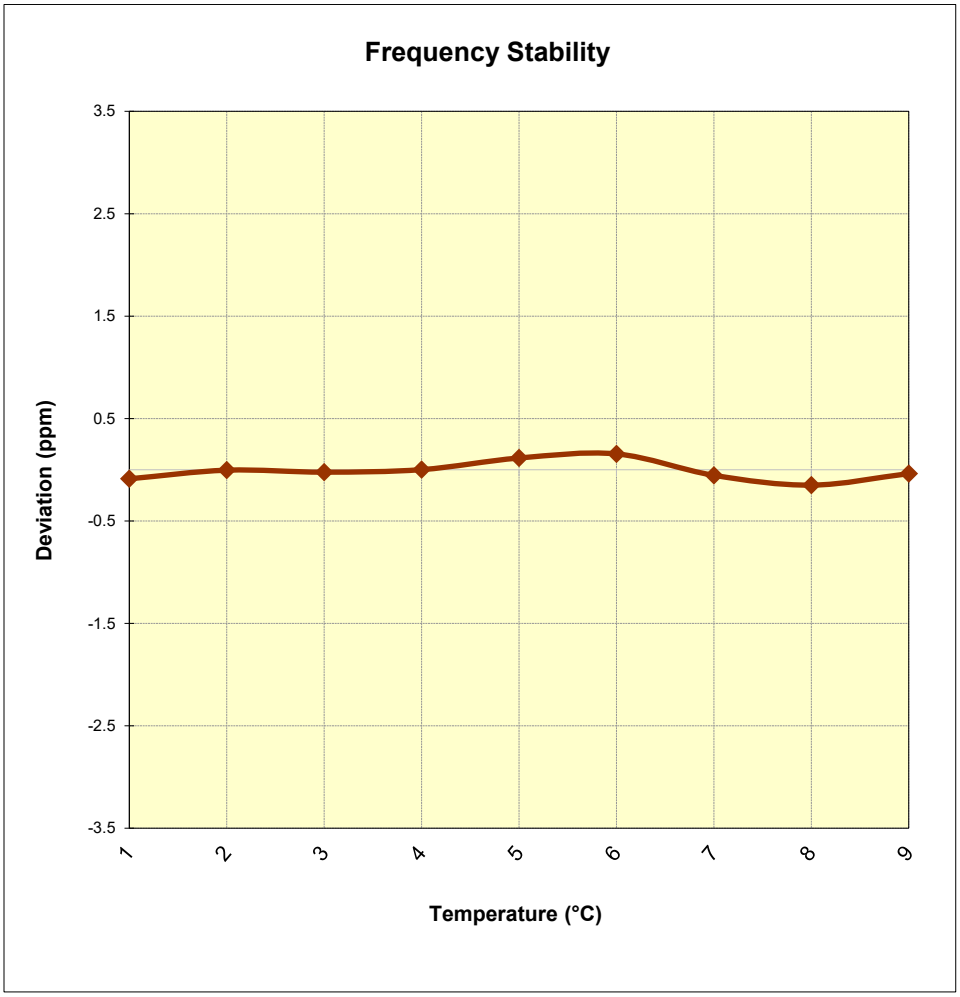

Figure 7-15. Frequency Stability Graph (Band 41)

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8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **LG Portable Handset FCC ID: ZNFQ620WA** complies with all the requirements of Part 22, 24, & 27 of the FCC Rules for LTE operation only.

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