

Band 41 PC2



Plot 7-356. Radiated Spurious Plot 18GHz – 26.5GHz (Band 41 PC2)

FCC ID: ZNFK300TM	PCTEST [®] Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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OPERATING FREQUENCY:	250	6.00 MHz
MODULATION SIGNAL:	QPSK	_
BANDWIDTH:	20.0	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]
5012.00	H	338	360	-57.59	8.75	-48.84	-23.8
7518.00	H	-	-	-55.78	9.32	-46.47	-21.5
10024.00	H	-	-	-54.88	9.80	-45.08	-20.1
12530.00	Н	-	-	-46.59	8.87	-37.72	-12.7

Table 7-33. Radiated Spurious Data (Band 41 PC2 – Low Channel)

259	3.00	MHz
QPSK	_	
20.0	MHz	
3	meters	
-25	dBm	
	259 QPSK 20.0 3 -25	2593.00 QPSK 20.0 MHz 3 meters -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	Н	232	347	-57.71	9.03	-48.69	-23.7
7779.00	Н	245	335	-55.13	9.29	-45.84	-20.8
10372.00	Н	258	3	-48.74	9.50	-39.24	-14.2
12965.00	Н	-	-	-44.57	8.75	-35.81	-10.8
15558.00	Н	-	-	-42.63	8.47	-34.16	-9.2

Table 7-34. Radiated Spurious Data (Band 41 PC2 – Mid Channel)

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OPERATING FREQUENCY:	268	0.00	MHz
MODULATION SIGNAL:	QPSK	_	
BANDWIDTH:	20.0	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]
5360.00	Н	117	339	-56.00	8.99	-47.01	-22.0
8040.00	Н	-	-	-57.11	9.35	-47.75	-22.8
10720.00	Н	233	11	-48.11	9.39	-38.72	-13.7
13400.00	Н	-	-	-43.91	8.67	-35.24	-10.2
16080.00	Н	-	-	-40.88	8.46	-32.42	-7.4

Table 7-35. Radiated Spurious Data (Band 41 PC2 – High Channel)

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7.9 Uplink Carrier Aggregation Radiated Measurements

<u>§2.1053, §27.53(m)</u>

Test Overview

Radiated spurious emissions measurements are performed using the substitution method described in ANSI/TIA-603-D-2010 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 peak 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 v02r02 - Section 5.8

ANSI/TIA-603-D-2010 - Section 2.2.12

Test Settings

- 1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
- 2. VBW \ge 3 x RBW
- 3. No. of sweep points > 2 x span / RBW
- 4. Detector = RMS
- 5. Trace mode = trace average for continuous emissions, max hold for pulse emissions
- 6. The trace was allowed to stabilize

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Test Setup



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

Figure 7-9. 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) Radiated spurious emissions measurements were evaluated for the two contiguous channels using various combinations of RB size, RB offset, modulation, and channel bandwidth. The worst case (highest) emissions were found while operating with QPSK modulation with both carriers set to transmit using 1RB.
- 4) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.
- 5) 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.
- 6) No significant emissions were found as a result of two uplink carriers operating contiguously.

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ULCA Band 41 (PC2)



Plot 7-357. Radiated Spurious Plot 1GHz - 18GHz (ULCA Band 41 (PC2) Low Channel – PCC/SCC: 1RB)



Plot 7-358. Radiated Spurious Plot 1GHz - 18GHz (ULCA Band 41 (PC2) Mid Channel – PCC/SCC: 1RB)



Plot 7-359. Radiated Spurious Plot 1GHz - 18GHz (ULCA Band 41 (PC2) High Channel – PCC/SCC: 1RB)

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OPERATING FREQUENCY (PCC):	25	506.00	MHz
OPERATING FREQUENCY (SCC):	25	MHz	
CHANNEL (PCC):	39750		
CHANNEL (SCC):	3		
MODULATION SIGNAL:	QPSK		
BANDWIDTH:	20.0	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]
5012.00	Н	138	180	-70.40	10.93	-59.47	-34.5
7518.00	Н	-	-	-69.51	11.14	-58.37	-33.4
10024.00	Н	120	359	-68.26	12.03	-56.22	-31.2
12530.00	Н	-	-	-68.69	13.60	-55.09	-30.1
15036.00	Н	-	-	-64.80	13.55	-51.26	-26.3
17542.00	Н	-	-	-60.69	11.73	-48.96	-24.0

Plot 7-36. Radiated Spurious Data (ULCA B41 (PC2) PCC: RB 1 Offset 99, SCC: RB 1 Offset 0 - Low Channel)

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OPERATING FREQUENCY (PCC):	259	93.00	_MHz
OPERATING FREQUENCY (SCC):	2612.80		MHz
CHANNEL (PCC):	40620		
CHANNEL (SCC):	40	818	
MODULATION SIGNAL:	QPSK	_	_
BANDWIDTH:	20.0	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	Н	122	358	-70.59	10.77	-59.82	-34.8
7779.00	Н	-	-	-69.72	11.47	-58.25	-33.2
10372.00	Н	120	352	-65.52	12.48	-53.04	-28.0
12965.00	Н	-	-	-66.77	13.34	-53.42	-28.4

Plot 7-37. Radiated Spurious Data (ULCA B41 (PC2) PCC: RB 1 Offset 99, SCC: RB 1 Offset 0 – Mid Channel)



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]
5360.00	Н	178	342	-63.55	10.73	-52.82	-27.8
8040.00	Н	-	-	-68.21	11.19	-57.02	-32.0
10720.00	Н	225	333	-57.75	12.63	-45.12	-20.1
13400.00	Н	-	-	-65.41	12.62	-52.78	-27.8
16080.00	Н	134	76	-69.90	16.73	-53.17	-28.2

Plot 7-38. Radiated Spurious Data (ULCA B41 (PC2) PCC: RB 1 Offset 0, SCC: RB 1 Offset 99 - High Channel)

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7.10 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 $\pm 0.00025\%$ (± 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:	133297	
REFERENCE VOLTAGE:	4.11	VDC

VOLTAGE (%)	POWER (VDC)	ТЕМР (°С)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.11	- 30	680,500,038	38	0.0000056
100 %		- 20	680,499,879	-121	-0.0000178
100 %		- 10	680,499,696	-304	-0.0000447
100 %		0	680,499,949	-51	-0.0000075
100 %		+ 10	680,499,958	-42	-0.0000062
100 %		+ 20	680,500,153	153	0.0000225
100 %		+ 30	680,499,946	-54	-0.0000079
100 %		+ 40	680,500,325	325	0.0000478
100 %		+ 50	680,500,237	237	0.0000348
BATT. ENDPOINT	3.67	+ 20	680,499,788	-212	-0.0000312

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 7-10. Frequency Stability Graph (Band 71)

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Band 12 Frequency Stability Measurements

OPERATING FREQUENCY:	707,500,000	Hz
CHANNEL:	23790	<u>.</u>
REFERENCE VOLTAGE:	4.11	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.11	- 30	707,499,828	-172	-0.0000243
100 %		- 20	707,499,544	-456	-0.0000645
100 %		- 10	707,499,692	-308	-0.0000435
100 %		0	707,499,754	-246	-0.0000348
100 %		+ 10	707,500,019	19	0.0000027
100 %		+ 20	707,499,972	-28	-0.0000040
100 %		+ 30	707,500,164	164	0.0000232
100 %		+ 40	707,499,600	-400	-0.0000565
100 %		+ 50	707,499,951	-49	-0.0000069
BATT. ENDPOINT	3.67	+ 20	707,499,987	-13	-0.0000018

Table 7-40. 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.

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Figure 7-11. Frequency Stability Graph (Band 12)

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Band 13 Frequency Stability Measurements

OPERATING FREQUENCY:	782,000,000	Hz
CHANNEL:	23230	<u>.</u>
REFERENCE VOLTAGE:	4.11	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.11	- 30	781,999,927	-73	-0.0000093
100 %		- 20	782,000,009	9	0.0000012
100 %		- 10	781,999,988	-12	-0.0000015
100 %		0	781,999,930	-70	-0.0000090
100 %		+ 10	781,999,970	-30	-0.000038
100 %		+ 20	782,000,011	11	0.0000014
100 %		+ 30	781,999,939	-61	-0.0000078
100 %		+ 40	782,000,158	158	0.0000202
100 %		+ 50	781,999,895	-105	-0.0000134
BATT. ENDPOINT	3.67	+ 20	781,999,874	-126	-0.0000161

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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Figure 7-12. 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:	4.11	VDC
DEVIATION LIMIT:	± 0.00025 % or 2.5 ppm	

VOLTAGE (%)	POWER (VDC)	ТЕМР ([°] С)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.11	- 30	831,500,176	176	0.0000212
100 %		- 20	831,500,039	39	0.0000047
100 %		- 10	831,500,031	31	0.0000037
100 %		0	831,499,817	-183	-0.0000220
100 %		+ 10	831,500,079	79	0.0000095
100 %		+ 20	831,500,173	173	0.0000208
100 %		+ 30	831,499,512	-488	-0.0000587
100 %		+ 40	831,499,824	-176	-0.0000212
100 %		+ 50	831,500,185	185	0.0000222
BATT. ENDPOINT	3.67	+ 20	831,500,087	87	0.0000105

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

FCC ID: ZNFK300TM	Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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Figure 7-13. 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:	4.11	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.11	- 30	1,744,999,989	-11	-0.0000006
100 %		- 20	1,745,000,047	47	0.0000027
100 %		- 10	1,744,999,982	-18	-0.0000010
100 %		0	1,745,000,210	210	0.0000120
100 %		+ 10	1,745,000,164	164	0.0000094
100 %		+ 20	1,745,000,242	242	0.0000139
100 %		+ 30	1,745,000,003	3	0.0000002
100 %		+ 40	1,744,999,604	-396	-0.0000227
100 %		+ 50	1,745,000,168	168	0.0000096
BATT. ENDPOINT	3.67	+ 20	1,745,000,319	319	0.0000183

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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Figure 7-14. 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:
 4.11
 VDC

 DEVIATION LIMIT:
 ± 0.00025 % or 2.5 ppm

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.11	- 30	1,882,499,835	-165	-0.0000088
100 %		- 20	1,882,500,236	236	0.0000125
100 %		- 10	1,882,500,070	70	0.0000037
100 %		0	1,882,499,636	-364	-0.0000193
100 %		+ 10	1,882,499,778	-222	-0.0000118
100 %		+ 20	1,882,500,048	48	0.0000025
100 %		+ 30	1,882,500,235	235	0.0000125
100 %		+ 40	1,882,500,439	439	0.0000233
100 %		+ 50	1,882,500,170	170	0.0000090
BATT. ENDPOINT	3.67	+ 20	1,882,500,325	325	0.0000173

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

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Figure 7-15. Frequency Stability Graph (Band 25/2)

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Band 41 Frequency Stability Measurements

OPERATING FREQUENCY:	2,593,000,000	Hz
CHANNEL:	40620	_
REFERENCE VOLTAGE:	4.11	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.11	- 30	2,593,000,325	325	0.0000125
100 %		- 20	2,592,999,941	-59	-0.0000023
100 %		- 10	2,593,000,062	62	0.0000024
100 %		0	2,593,000,179	179	0.0000069
100 %		+ 10	2,593,000,029	29	0.0000011
100 %		+ 20	2,593,000,402	402	0.0000155
100 %		+ 30	2,593,000,021	21	0.000008
100 %		+ 40	2,593,000,130	130	0.0000050
100 %		+ 50	2,593,000,380	380	0.0000147
BATT. ENDPOINT	3.67	+ 20	2,593,000,185	185	0.0000071

Table 7-45. 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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Figure 7-16. 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: ZNFK300TM** complies with all the requirements of Part 22, 24, & 27 of the FCC Rules for LTE operation only.

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