

Cellphone-Mate, Inc.

TEST REPORT FOR

Mobile Wideband Consumer Signal Booster Model: TriFlex-2Go-A

Tested To The Following Standards:

FCC Part 24E

Report No.: 95252-9

Date of issue: February 19, 2014



This test report bears the accreditation symbol indicating that the testing performed herein meets the test and reporting requirements of ISO/IEC 17025 under the applicable scope of EMC testing for CKC Laboratories, Inc.

We strive to create long-term, trust based relationships by providing sound, adaptive, customer first testing services. We embrace each of our customers' unique EMC challenges, not as an interruption to set processes, but rather as the reason we are in business.

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ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

Cellphone-Mate, Inc.
48346 Milmont Drive
Fremont, CA 94538

Representative: Hongtao Zahn
Customer Reference Number: CKC20140123

REPORT PREPARED BY:

Dianne Dudley
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 95252

DATE OF EQUIPMENT RECEIPT:

January 22, 2014

DATE(S) OF TESTING:

January 22 –February 10, 2014

Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the sample equipment tested in the agreed upon operational mode(s) and configuration(s) as identified herein. Compliance assessment remains the client's responsibility. This report may not be used to claim product endorsement by A2LA or any government agencies. This test report has been authorized for release under quality control from CKC Laboratories, Inc.



Steve Behm

Steve Behm
Director of Quality Assurance & Engineering Services
CKC Laboratories, Inc.

Test Facility Information



Our laboratories are configured to effectively test a wide variety of product types. CKC utilizes first class test equipment, anechoic chambers, data acquisition and information services to create accurate, repeatable and affordable test results.

TEST LOCATION(S):
CKC Laboratories, Inc.
110 Olinda Place
Brea, CA 92823

Software Versions

| CKC Laboratories Proprietary Software | Version |
|---------------------------------------|---------|
| EMITest Emissions | 5.00.14 |

Site Registration & Accreditation Information

| Location | CB # | TAIWAN | CANADA | FCC | JAPAN |
|----------|--------|----------------|---------|--------|--------|
| Brea D | US0060 | SL2-IN-E-1146R | 3082D-2 | 100638 | A-0147 |

SUMMARY OF RESULTS

Standard / Specification: FCC Part(s) 2 / 24E

| Test Procedure/Method | Description | Results |
|-----------------------|---|-----------------|
| 2.1046 | RF Power Output | NA ¹ |
| 2.1047 | Modulation Characteristics | NA ¹ |
| 2.1049(i) | Occupied Bandwidth | Pass |
| 2.1051 / 24.238(a) | Spurious Emissions at Antenna Terminals | Pass |
| 2.1053 / 24.238(a) | Field Strength of Spurious Radiation | Pass |
| 2.1055(d) / 24.235 | Frequency Stability | NA ² |

NA¹ = A different standard applies, see applicable test report.

NA² = Not applicable. See the section in the report for the reason.

Conditions During Testing

This list is a summary of the conditions noted for or modifications made to the equipment during testing.

| Summary of Conditions |
|-----------------------|
| None |
| |

EQUIPMENT UNDER TEST (EUT)

EQUIPMENT UNDER TEST

Mobile Wideband Consumer Signal Booster

Manuf: Cellphone-Mate, Inc.

Model: TriFlex-2Go-A

Serial: NA

PERIPHERAL DEVICES

The EUT was tested with the following peripheral device(s):

AC to 9VDC Power Adapter

Manuf: AC to 9VDC Power Adapter

Model: SureCall

Serial: GFP451DA-0945-1

FCC PART 24E

This report contains EMC emissions test results under United States Federal Communications Commission (FCC) requirements for licensed devices. 47 CFR Part 24 Personal Communications Services.

2.1049(i) Occupied Bandwidth

Test Conditions / Setup

Test Location: CKC Laboratories Inc • 110 N Olinda Pl • Brea CA 92823 • 7149936112

Customer: **Cellphone-Mate, Inc.**
 Specification: **47 CFR §2.1049(i) Occupied Bandwidth**
 Work Order #: **95252** Date: **1/30/2014**
 Test Type: **Conducted Emissions** Time: **16:01:09**
 Equipment: **Mobile Wideband Consumer Signal** Sequence#: **9**
Booster
 Manufacturer: Cellphone-Mate, Inc. Tested By: Don Nguyen
 Model: TriFlex-2Go-A 120V 60Hz
 S/N: NA

Test Equipment:

| ID | Asset # | Description | Model | Calibration Date | Cal Due Date |
|----|---------|-------------------|--------------------|------------------|--------------|
| T1 | AN03431 | Attenuator | 89-20-21 | 9/5/2013 | 9/5/2015 |
| T2 | AN02945 | Cable | 32022-2-2909K-36TC | 10/30/2013 | 10/30/2015 |
| T3 | AN02672 | Spectrum Analyzer | E4446A | 9/4/2012 | 9/4/2014 |

Equipment Under Test (* = EUT):

| Function | Manufacturer | Model # | S/N |
|--|----------------------|---------------|-----|
| Mobile Wideband Consumer Signal Booster* | Cellphone-Mate, Inc. | TriFlex-2Go-A | NA |

Support Devices:

| Function | Manufacturer | Model # | S/N |
|------------------|--------------|-----------------|--------------|
| Signal Generator | Agilent | E4433B | US40052164 |
| Signal Generator | Agilent | E4438C | MY42081492 |
| Power Supply | SureCall | GFP451DA-0945-1 | 1211-0000323 |

Test Conditions / Notes:

The equipment under test (EUT) is placed on the table top. EUT set at maximum gain. Signal generator is connected to input port of EUT. Output port of EUT is connected to spectrum analyzer via 20db attenuator and RF cable. Evaluation performed at the Outside (Donor) and Inside (Server) antenna port. Input and output screen captures where made at the center frequency of each of the following two bands:

UL 1850-1910

DL 1930-1990

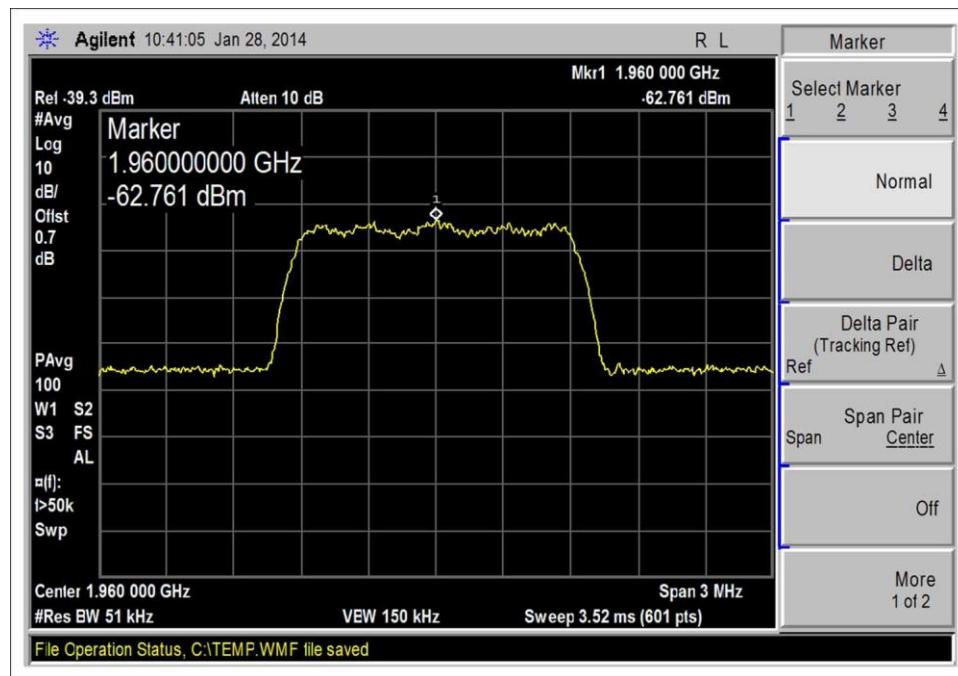
Carrier was modulated with GSM, CDMA, and LTE.

Test procedure: The test was performed in accordance with section 7.10 of the FCC Publication: 935210 D03 Wideband Consumer Signal Booster Measurement Guidance DR04-41516 January 21, 2014.

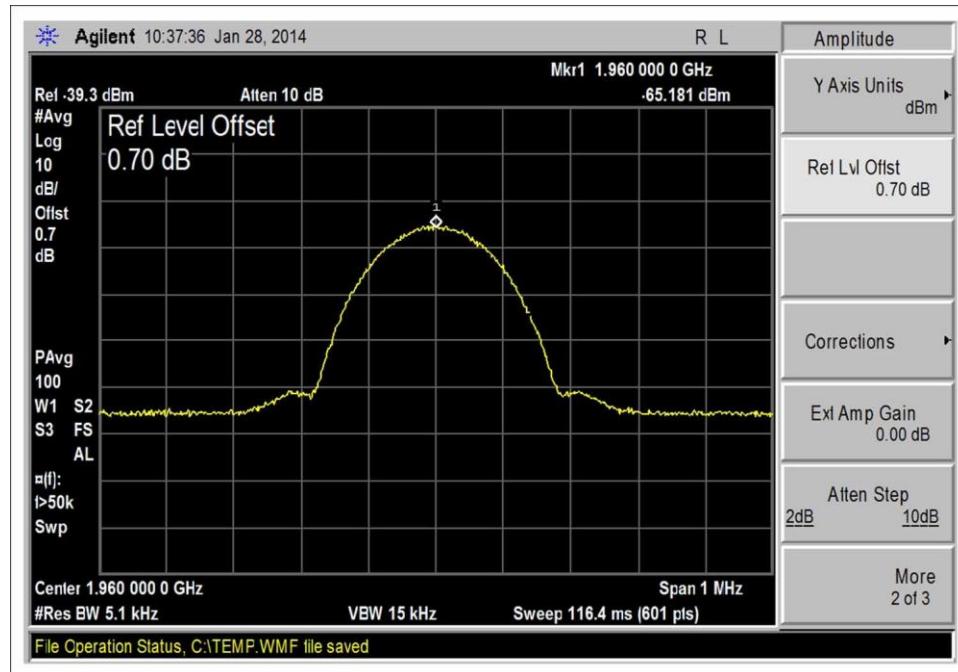
Test environment conditions: 22°C, 31%, 100kPa. Temperature: 21°C, Humidity: 39%, Pressure: 100kPa

Site D

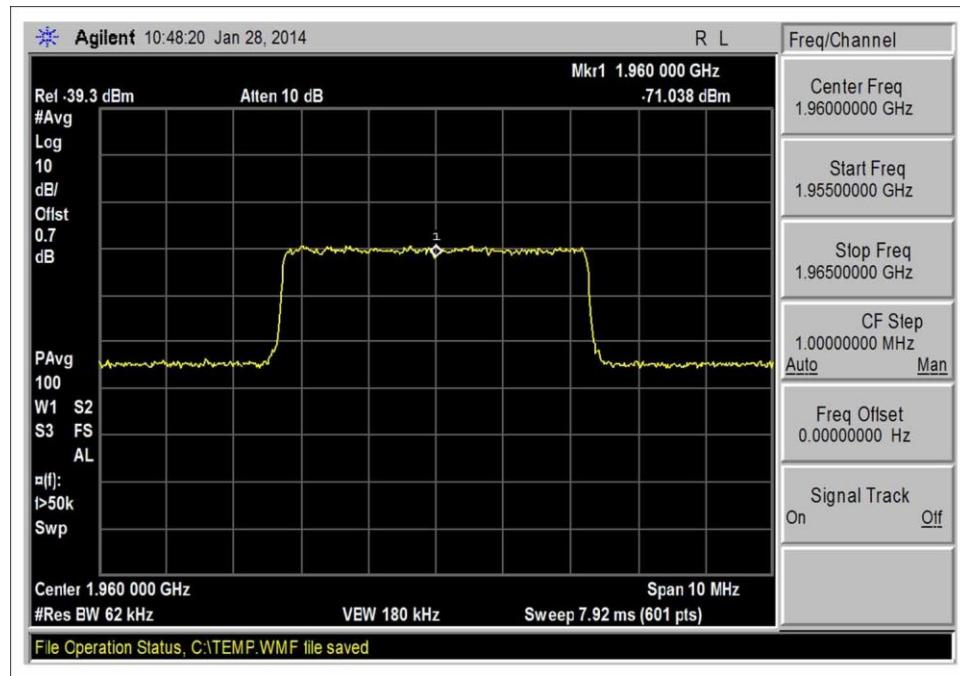
Test Data



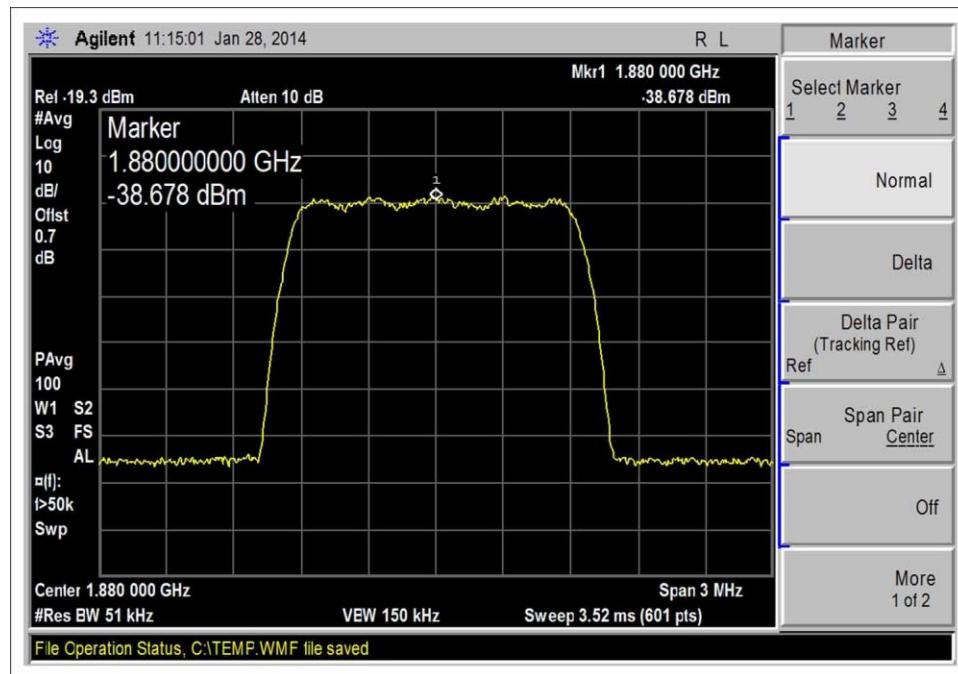
CDMA_DL 1930-1990_Input



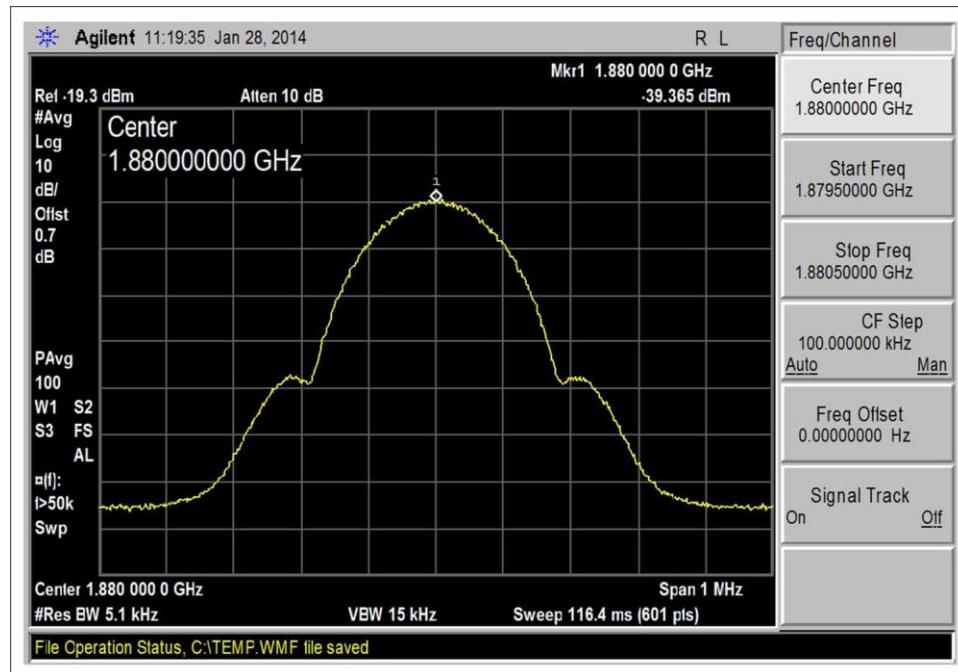
GSM_DL 1930-1990_Input



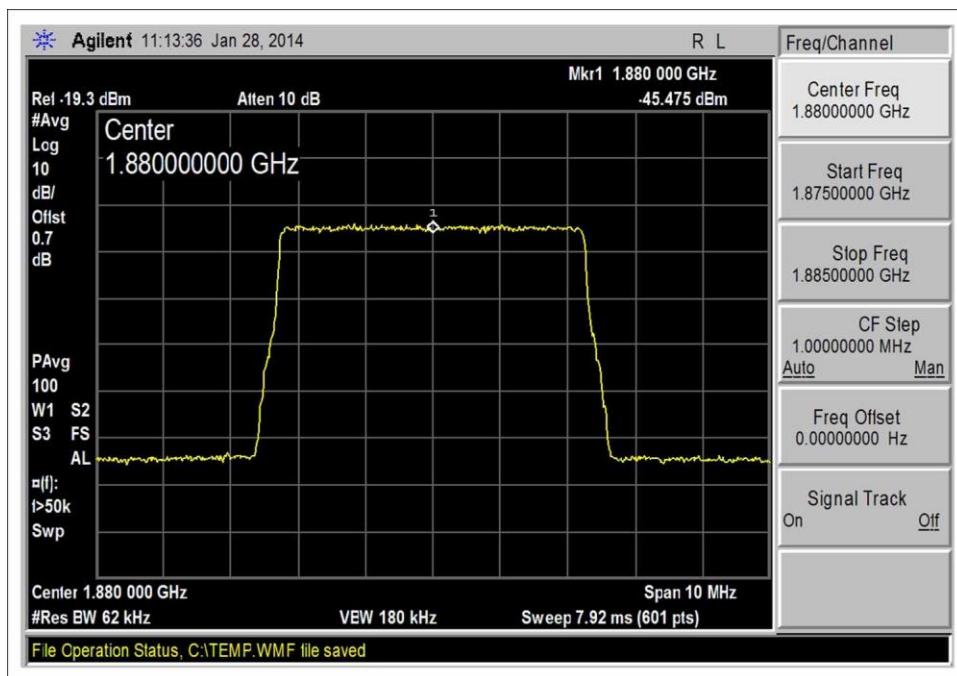
LTE_DL 1930-1990_Input



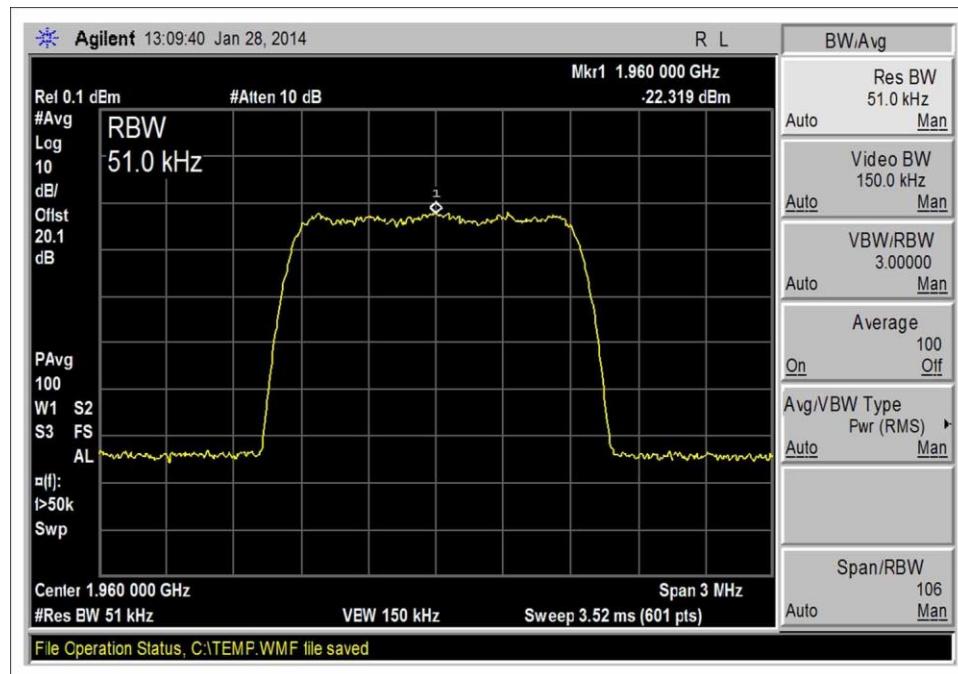
CDMA_UL 1850-1910_Input



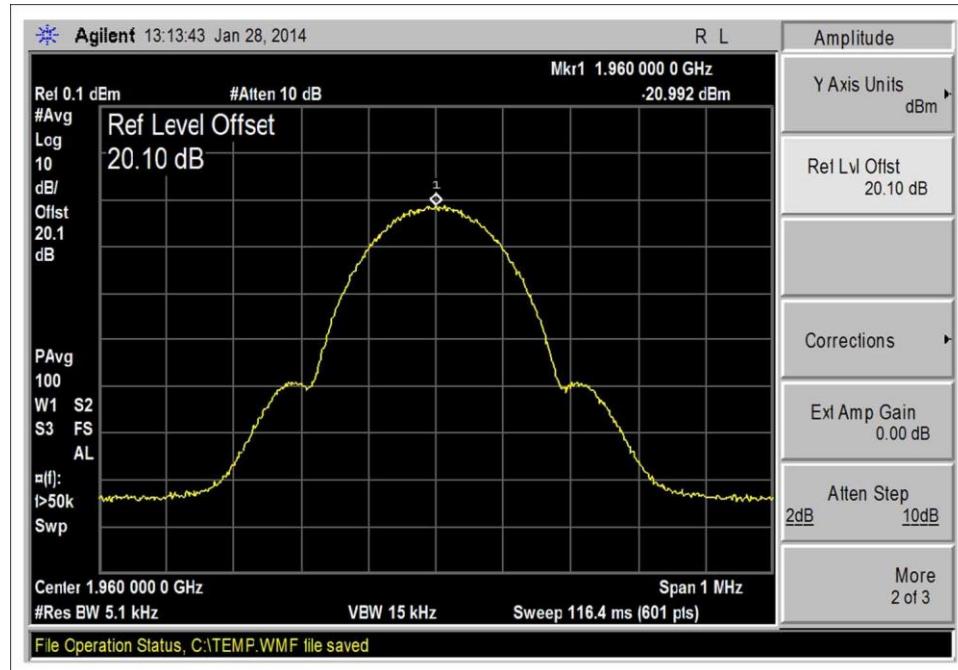
GSM_UL 1850-1910_Input



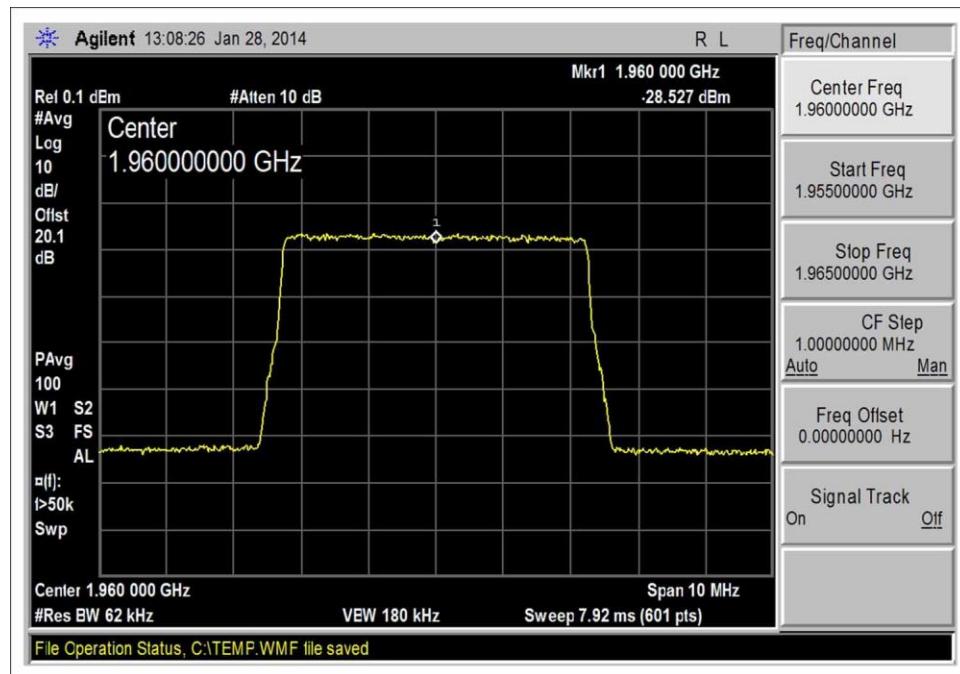
LTE_UL 1850-1910_Input



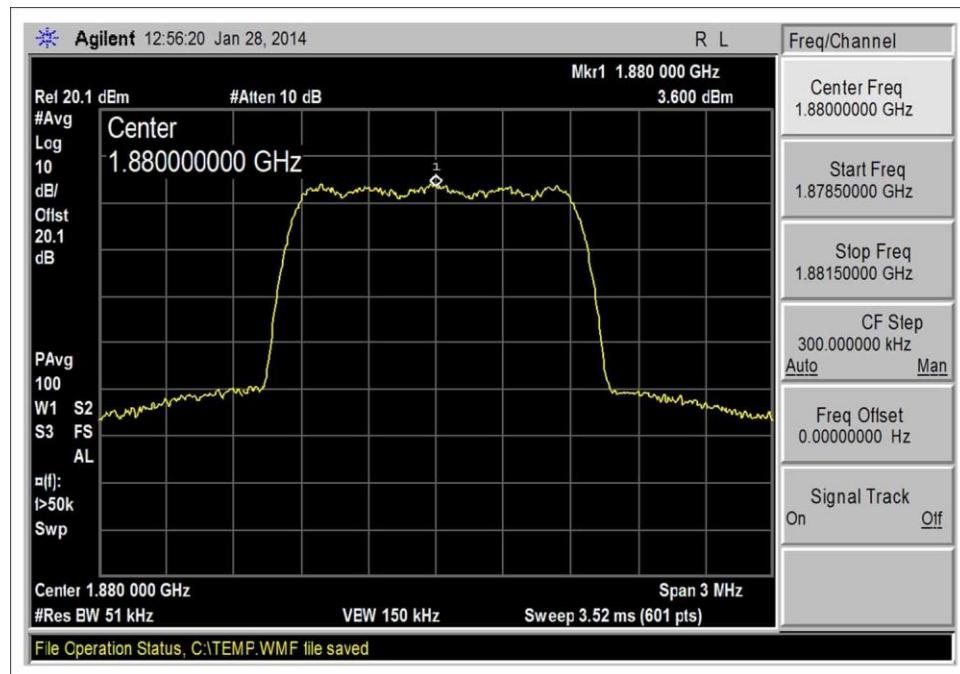
CDMA_DL 1930-1990_Output



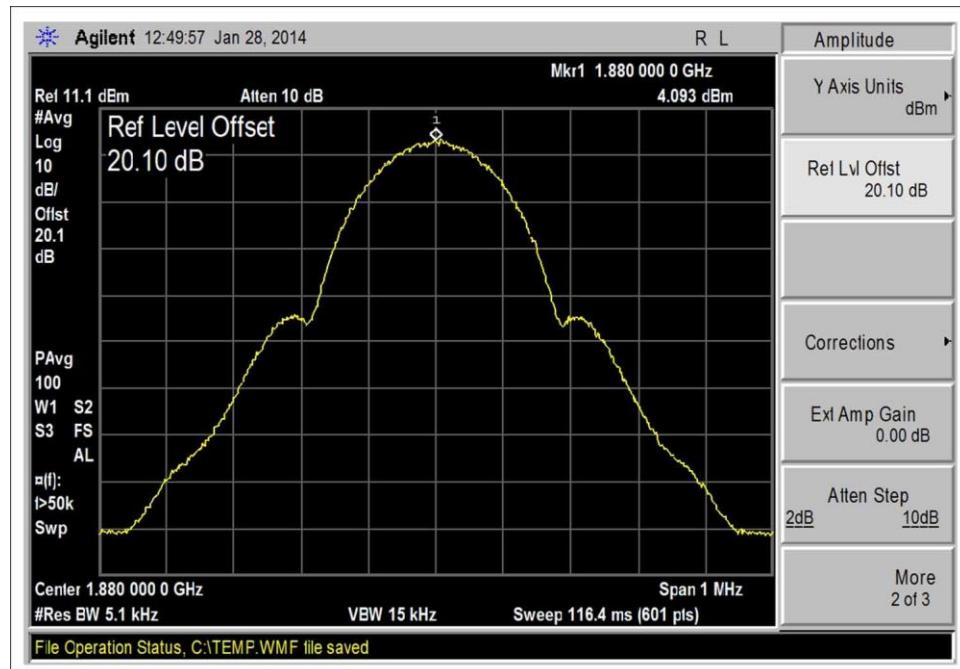
GSM_DL 1930-1990_Output



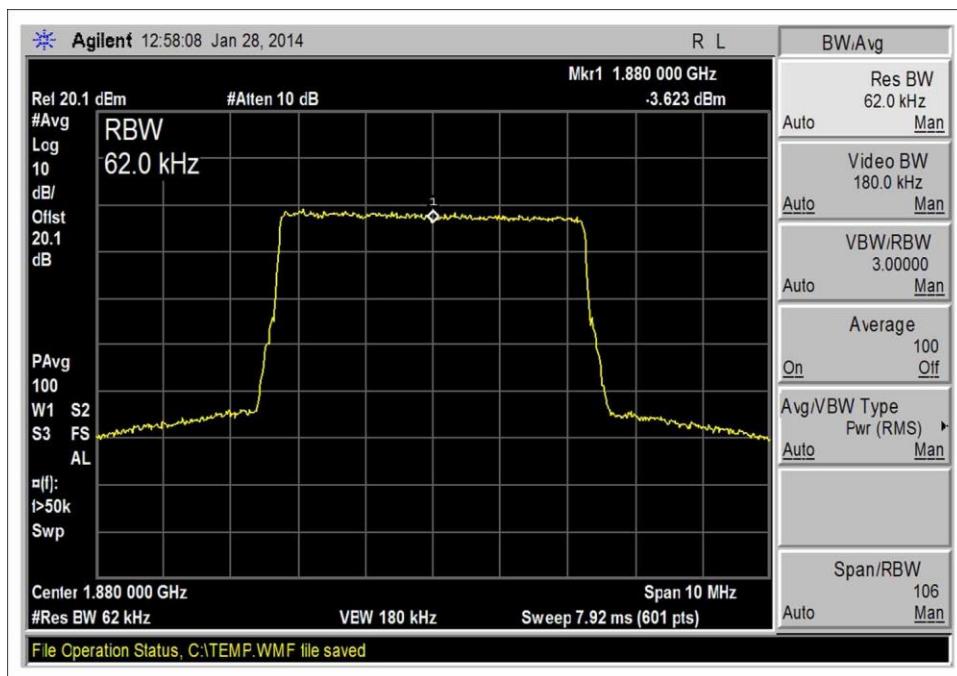
LTE_DL 1930-1990_Output



CDMA_UL 1850-1910_Output

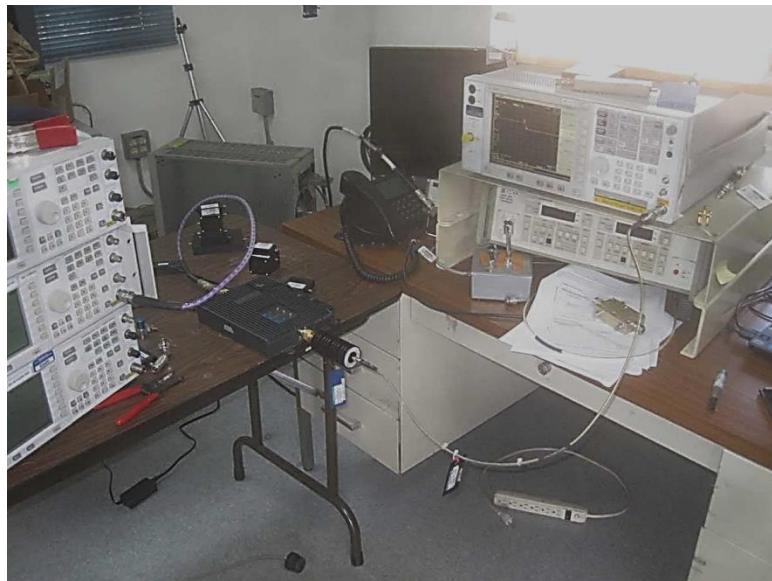


GSM_UL 1850-1910_Output



LTE_UL 1850-1910_Output

Test Setup Photo(s)



2.1051 / 24.238(a) Spurious Emissions at Antenna Terminals

Test Data

Test Location: CKC Laboratories Inc • 110 N Olinda Pl • Brea CA 92823 • 7149936112

Customer: **Cellphone-Mate, Inc.**

Specification: **47 CFR §24.238 Spurious Emissions**

Work Order #: **95252**

Date: 1/30/2014

Test Type: **Conducted Emissions**

Time: 16:01:09

Equipment: **Mobile Wideband Consumer Signal**

Sequence#: 9

Booster

Manufacturer: Cellphone-Mate, Inc.

Tested By: Don Nguyen

Model: TriFlex-2Go-A

120V 60Hz

S/N: NA

Test Equipment:

| ID | Asset # | Description | Model | Calibration Date | Cal Due Date |
|----|---------|-------------------|--------------------|------------------|--------------|
| T1 | AN03431 | Attenuator | 89-20-21 | 9/5/2013 | 9/5/2015 |
| T2 | AN02945 | Cable | 32022-2-2909K-36TC | 10/30/2013 | 10/30/2015 |
| T3 | AN02672 | Spectrum Analyzer | E4446A | 9/4/2012 | 9/4/2014 |

Equipment Under Test (* = EUT):

| Function | Manufacturer | Model # | S/N |
|--|----------------------|---------------|-----|
| Mobile Wideband Consumer Signal Booster* | Cellphone-Mate, Inc. | TriFlex-2Go-A | NA |
| | | | |

Support Devices:

| Function | Manufacturer | Model # | S/N |
|------------------|--------------|-----------------|--------------|
| Signal Generator | Agilent | E4433B | US40052164 |
| Power Supply | SureCall | GFP451DA-0945-1 | 1211-0000323 |

Test Conditions / Notes:

The equipment under test (EUT) is placed on the table top. EUT set at maximum gain. Signal generator is connected to input port of EUT. Output port of EUT is connected to spectrum analyzer via 20db attenuator and RF cable. Evaluation performed at the Outside (Donor) and Inside (Server) antenna port.

UL 1850-1910

DL 1930-1990

TXFreq = Center frequency of above listed bands.

Modulation: CW

Frequency range of measurement = 9kHz to 20GHz.

9kHz-150 kHz, RBW=200Hz,VBW=200Hz;150kHz-30MHz, RBW=9kHz,VBW=9kHz;30MHz-1000MHz, RBW=120kHz,VBW=120kHz;1000MHz-2000MHz, RBW=1MHz,VBW=1MHz

Test procedure: The test was performed in accordance with section 7.6 of the FCC Publication: 935210 D03 Wideband Consumer Signal Booster Measurement Guidance DR04-41516 January 21, 2014

Temperature: 21°C, Humidity: 39%, Pressure: 100kPa

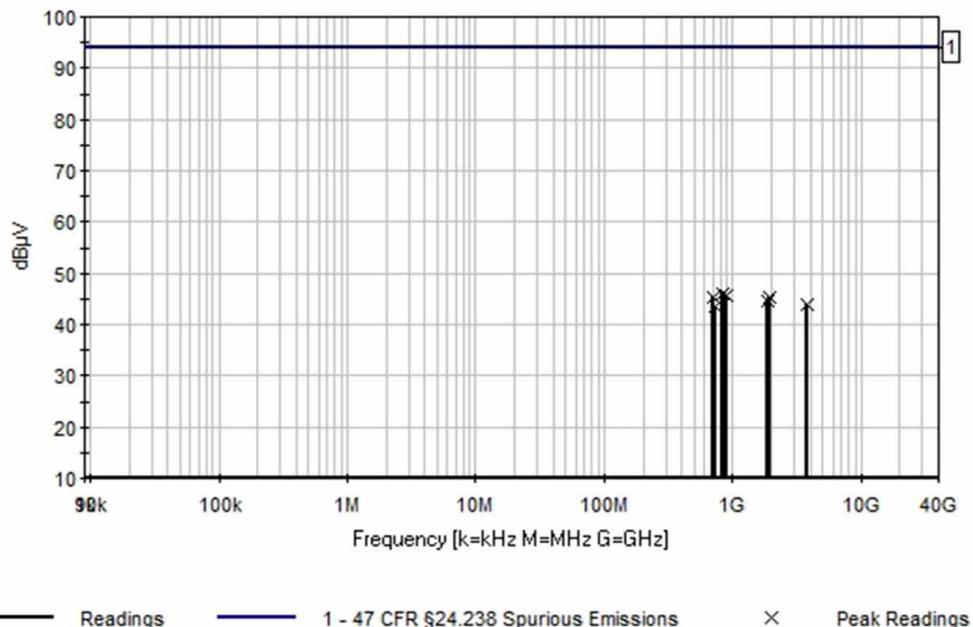
Site D

No emission found when measuring downlink output port.

Ext Attn: 0 dB

| Measurement Data: | | Reading listed by order taken. | | | | | Test Lead: Antenna port | | | |
|--------------------------|-------------|--------------------------------|----------|----------|----------|---------------|-------------------------|--------------------|--------------|--|
| # | Freq MHz | Rdng dB μ V | T1 dB | T2 dB | T3 dB | Dist Table | Corr dB μ V | Spec dB μ V | Margin dB | Polar Ant |
| 1 | 3760.450M | 23.6 | +19.4 | +0.8 | +0.0 | +0.0 | 43.8 | 94.0 | -50.2 | Anten UL 1850-1910MHz |
| 2 | 703.360M | 25.6 | +19.3 | +0.3 | +0.0 | +0.0 | 45.2 | 94.0 | -48.8 | Anten Max Noise_UL 698-716, no input signal |
| 3 | 845.330M | 26.4 | +19.2 | +0.3 | +0.0 | +0.0 | 45.9 | 94.0 | -48.1 | Anten Max Noise_UL 824-849, no input signal |
| 4 | 1869.400M | 24.7 | +19.3 | +0.7 | +0.0 | +0.0 | 44.7 | 94.0 | -49.3 | Anten Max Noise_UL 1850-1910, no input signal |
| 5 | 735.920M | 24.1 | +19.2 | +0.3 | +0.0 | +0.0 | 43.6 | 94.0 | -50.4 | Anten Max Noise_DL 728-746, no input signal |
| 6 | 882.080M | 25.9 | +19.3 | +0.3 | +0.0 | +0.0 | 45.5 | 94.0 | -48.5 | Anten Max Noise_DL 869-894, no input signal |
| 7 | 1952.600M | 25.2 | +19.4 | +0.7 | +0.0 | +0.0 | 45.3 | 94.0 | -48.7 | Anten Max Noise_DL 1930-1990, no input signal |

CKC Laboratories Inc Date: 1/30/2014 Time: 16:01:09 Cellphone-Mate, Inc. WO#: 95252
47 CFR §24.238 Spurious Emissions Test Lead: Antenna port 120V 60Hz Sequence#: 9 Ext ATTN: 0 dB



LIMIT LINE FOR SPURIOUS CONDUCTED EMISSION

$$\text{REQUIRED ATTENUATION} = 43 + 10 \log P \text{ DB}$$

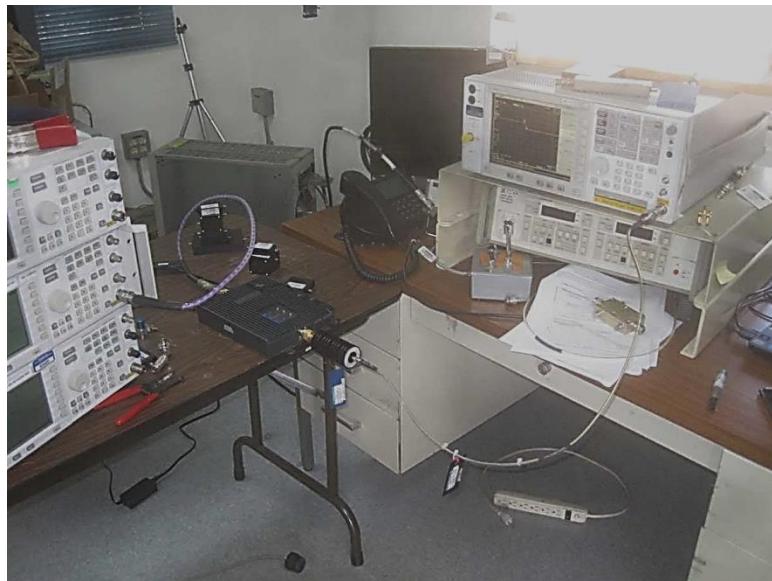
$$\text{Limit line (dBuV)} = V_{\text{dBuV}} - \text{Attenuation}$$

$$\begin{aligned} V_{\text{dBuV}} &= 20 \log \frac{V}{1 \times 10^{-6}} \\ &= 20 (\log V - \log 1 \times 10^{-6}) \\ &= 20 \log V - 20 \log 1 \times 10^{-6} \\ &= 20 \log V - 20(-6) \\ &= 20 \log V + 120 \end{aligned}$$

$$\begin{aligned} \text{Attenuation} &= 43 + 10 \log P \\ &= 43 + 10 \log \frac{V^2}{R} \\ &= 43 + 10 (\log V^2 - \log R) \\ &= 43 + 10 (2 \log V - \log R) \\ &= 43 + 20 \log V - 10 \log R \end{aligned}$$

$$\begin{aligned} \text{Limit line} &= V_{\text{dBuV}} - \text{Attenuation} \\ &= 20 \log V + 120 - (43 + 20 \log V - 10 \log R) \\ &= 20 \log V + 120 - 43 - 20 \log V + 10 \log R \\ &= 20 \log V + 120 - 43 - 20 \log V + 10 \log R \\ &= 120 - 43 + 10 \log 50 \quad \text{Note : } R = 50 \Omega \\ &= 120 - 43 + 16.897 \\ &= 94 \text{ dBuV at any power level} \end{aligned}$$

Test Setup Photo(s)



2.1053 / 24.238(a) Field Strength of Spurious Radiation

Test Data

Test Location: CKC Laboratories Inc • 110 N Olinda Pl • Brea CA 92823 • 7149936112

Customer: **Cellphone-Mate, Inc.**
 Specification: **47 CFR §24.238 Spurious Emissions**
 Work Order #: **95252** Date: 1/30/2014
 Test Type: **Maximized Emissions** Time: 12:47:59
 Equipment: **Mobile Wideband Consumer Signal** Sequence#: 8
Booster
 Manufacturer: Cellphone-Mate, Inc. Tested By: Don Nguyen
 Model: TriFlex-2Go-A
 S/N: NA

Test Equipment:

| ID | Asset # | Description | Model | Calibration Date | Cal Due Date |
|----|----------|-------------------|--------------------|------------------|--------------|
| T1 | AN00010 | Preamp | 8447D | 3/29/2012 | 3/29/2014 |
| T2 | AN00851 | Biconilog Antenna | CBL6111C | 5/16/2012 | 5/16/2014 |
| T3 | ANP05555 | Cable | RG223/U | 6/19/2012 | 6/19/2014 |
| T4 | ANP06360 | Cable | L1-PNMNM-48 | 8/29/2012 | 8/29/2014 |
| T5 | ANP04382 | Cable | LDF-50 | 8/30/2012 | 8/30/2014 |
| T6 | AN02672 | Spectrum Analyzer | E4446A | 9/4/2012 | 9/4/2014 |
| | AN00787 | Preamp | 83017A | 5/31/2013 | 5/31/2015 |
| | AN01646 | Horn Antenna | 3115 | 4/13/2012 | 4/13/2014 |
| | AN02945 | Cable | 32022-2-2909K-36TC | 10/30/2013 | 10/30/2015 |
| | AN00314 | Loop Antenna | 6502 | 6/29/2012 | 6/29/2014 |
| | AN01413 | Horn Antenna-ANSI | 84125-80008 | 11/9/2012 | 11/9/2014 |
| | | | C63.5 (dB/m) | | |

Equipment Under Test (* = EUT):

| Function | Manufacturer | Model # | S/N |
|--|----------------------|---------------|-----|
| Mobile Wideband Consumer Signal Booster* | Cellphone-Mate, Inc. | TriFlex-2Go-A | NA |
| | | | |

Support Devices:

| Function | Manufacturer | Model # | S/N |
|------------------|----------------------|-----------------|--------------|
| Signal Generator | Agilent | E4433B | US40052164 |
| Signal Generator | Agilent | E4433B | US40053279 |
| Power Divider | Anaren | 44000 | 0583 |
| 50 ohm Load | Generic | Generic | NA |
| Power Supply | SureCall | GFP451DA-0945-1 | 1211-0000323 |
| Signal Generator | Agilent | E4438C | MY42081492 |
| Programmer | Cellphone-Mate, Inc. | SureCall | NA |

Test Conditions / Notes:

The equipment under test (EUT) is placed on the Styrofoam table top. EUT set at maximum gain. Three remotely located signal generators are connected to power divider. The output of power divider is connected to input of EUT. Port GUI is terminated with supported programmer.

Evaluation of DL path was performed with signal fed into the Outside (Donor) antenna port while Inside (Server) antenna port terminated with 50 Ohm load.

Evaluation of UL path was performed with signal fed into the Inside (Server) antenna port while Outside (Donor) antenna port terminated with 50 Ohm load.

UL 1850-1910

DL 1930-1990

TXFreq = Center frequency of above listed bands.

Modulation: CW

Frequency range of measurement = 9 kHz to 20 GHz.

9kHz-150kHz, RBW=200Hz, VBW=200Hz; 150kHz-30MHz, RBW=9kHz, VBW=9kHz; 30MHz-1000MHz, RBW=120kHz, VBW=120kHz; 1000MHz-20000MHz, RBW=1MHz, VBW=1MHz

Test procedure: The test was performed in accordance with section 7.12 of the FCC Publication: 935210 D03 Wideband Consumer Signal Booster Measurement Guidance DR04-41516 January 21, 2014

Temperature: 19°C, Humidity: 39%, Pressure: 100kPa

Site D

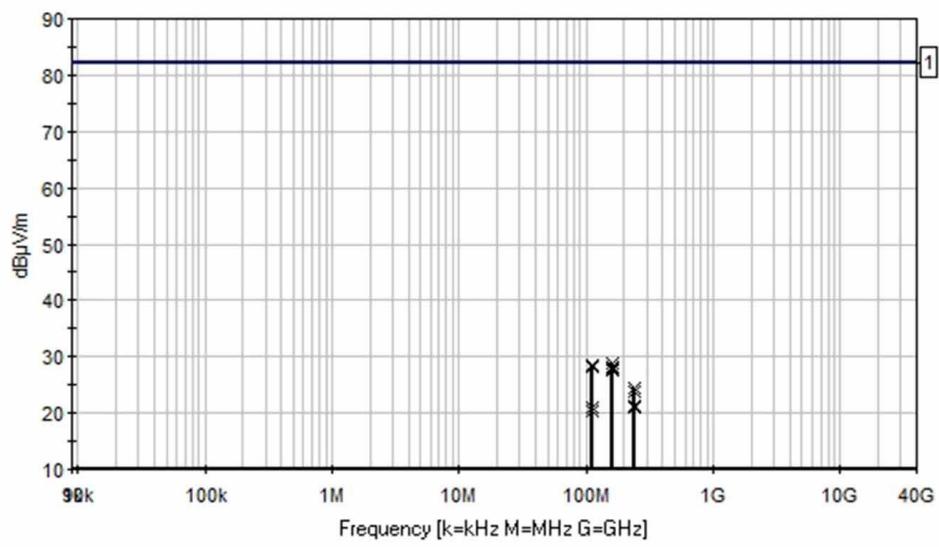
No emission above 1GHz was found.

Ext Attn: 0 dB

| Measurement Data: | | | Reading listed by order taken. | | | | Test Distance: 3 Meters | | | | |
|-------------------|----------|------|--------------------------------|------------|------|------|-------------------------|--------------|--------------|--------|--------------------------------|
| # | Freq | Rdng | T1 | T2 | T3 | T4 | Dist | Corr | Spec | Margin | Polar |
| | | | T5 | T6 | | | Table | dB μ V/m | dB μ V/m | | |
| | | | MHz | dB μ V | dB | dB | dB | Table | dB μ V/m | | Ant |
| 1 | 160.170M | 42.2 | -26.8 | +10.4 | +0.2 | +0.8 | +0.0 | 28.3 | 82.2 | -53.9 | Horiz |
| | | | +1.5 | +0.0 | | | | | | | UL 698-716, 824-849, 1850-1910 |
| 2 | 111.670M | 34.6 | -26.9 | +11.0 | +0.2 | +0.7 | +0.0 | 20.8 | 82.2 | -61.4 | Horiz |
| | | | +1.2 | +0.0 | | | | | | | UL 698-716, 824-849, 1850-1910 |
| 3 | 241.170M | 32.7 | -26.5 | +12.0 | +0.3 | +1.0 | +0.0 | 21.3 | 82.2 | -60.9 | Horiz |
| | | | +1.8 | +0.0 | | | | | | | UL 698-716, 824-849, 1850-1910 |
| 4 | 160.170M | 41.5 | -26.8 | +10.4 | +0.2 | +0.8 | +0.0 | 27.6 | 82.2 | -54.6 | Vert |
| | | | +1.5 | +0.0 | | | | | | | UL 698-716, 824-849, 1850-1910 |
| 5 | 111.670M | 42.3 | -26.9 | +11.0 | +0.2 | +0.7 | +0.0 | 28.5 | 82.2 | -53.7 | Vert |
| | | | +1.2 | +0.0 | | | | | | | UL 698-716, 824-849, 1850-1910 |
| 6 | 241.170M | 35.1 | -26.5 | +12.0 | +0.3 | +1.0 | +0.0 | 23.7 | 82.2 | -58.5 | Vert |
| | | | +1.8 | +0.0 | | | | | | | UL 698-716, 824-849, 1850-1910 |

| | | | | | | | | | | | |
|----|----------|------|---------------|---------------|------|------|------|------|--------------------------------|-------|-------|
| 7 | 241.170M | 35.7 | -26.5 +1.8 | +12.0 +0.0 | +0.3 | +1.0 | +0.0 | 24.3 | 82.2 | -57.9 | Vert |
| | | | | | | | | | DL 728-746, 869-894, 1930-1990 | | |
| 8 | 111.670M | 42.1 | -26.9 +1.2 | +11.0 +0.0 | +0.2 | +0.7 | +0.0 | 28.3 | 82.2 | -53.9 | Vert |
| | | | | | | | | | DL 728-746, 869-894, 1930-1990 | | |
| 9 | 160.170M | 41.8 | -26.8 +1.5 | +10.4 +0.0 | +0.2 | +0.8 | +0.0 | 27.9 | 82.2 | -54.3 | Vert |
| | | | | | | | | | DL 728-746, 869-894, 1930-1990 | | |
| 10 | 160.170M | 42.6 | -26.8 +1.5 | +10.4 +0.0 | +0.2 | +0.8 | +0.0 | 28.7 | 82.2 | -53.5 | Horiz |
| | | | | | | | | | DL 728-746, 869-894, 1930-1990 | | |
| 11 | 111.670M | 34.3 | -26.9 +1.2 | +11.0 +0.0 | +0.2 | +0.7 | +0.0 | 20.5 | 82.2 | -61.7 | Horiz |
| | | | | | | | | | DL 728-746, 869-894, 1930-1990 | | |
| 12 | 241.170M | 32.4 | -26.5 +1.8 | +12.0 +0.0 | +0.3 | +1.0 | +0.0 | 21.0 | 82.2 | -61.2 | Horiz |
| | | | | | | | | | DL 728-746, 869-894, 1930-1990 | | |

CKC Laboratories Inc Date: 1/30/2014 Time: 12:47:59 Cellphone-Mate, Inc. WO#: 95252
 47 CFR §24.238 Spurious Emissions Test Distance: 3 Meters Sequence#: 8 Ext ATTN: 0 dB



— Readings — 1 - 47 CFR §24.238 Spurious Emissions X Peak Readings

LIMIT LINE FOR SPURIOUS RADIATED EMISSION

$$\text{REQUIRED ATTENUATION} = 43 + 10 \log P \text{ (dB)}$$

For radiated spurious emission measured at 3 meter test distance,

$$\begin{aligned} \text{Required attenuation} &= 43 + 10 \log P_t \text{ at 3 meter dB} \\ \text{Limit line (dBuV)} &= E_{\text{dBuV}} - \text{Attenuation} \end{aligned}$$

E_{dBuV} = Measured field strength at 3 meter in dBuV/m

Power Density (Isotropic)

$$P_D = \frac{P_t}{4\pi r^2}$$

P_D = Power Density in Watts /m²

P_t = Average Transmit Power

r = Test distance

Field Intensity E (V/m)

$$E = \sqrt{P_D \times 377}$$

$$E = \frac{\sqrt{P_t \times 377}}{4\pi r^2}$$

$$E = \sqrt{\frac{P_t \times 30}{r^2}}$$

$$P_t = \left(\frac{E^2 \times r^2}{30} \right)$$

$$10 \log P_t = 10 \log E^2 \text{ (V/m)} + 10 \log r^2 - 10 \log 30$$

$$10 \log P_t = 20 \log E \text{ (V/m)} + 20 \log r - 10 \log 30$$

At 3 meter, $r = 3 \text{ m}$

$$10 \log P_t = 20 \log E \text{ (V/m)} + 20 \log 3 - 10 \log 30$$

$$10 \log P_t = 20 \log E (\text{V/m}) + 9.54 - 14.77$$

$$10 \log P_t = 20 \log E (\text{V/m}) - 5.23$$

Since $20 \log E (\text{V/m}) = 20 \log E (\text{uV/m}) - 120$

$$10 \log P_t = 20 \log E (\text{uV/m}) - 120 - 5.23$$

$$10 \log P_t = 20 \log E (\text{uV/m}) - 125.23$$

$$\begin{aligned}
 \text{Limit line (dBuV) at 3 meter} &= E_{\text{dBuV}} - \text{Attenuation} \\
 &= E_{\text{dBuV}} - (43 + 10 \log P_t \text{ at 3 meter}) \\
 &= E_{\text{dBuV}} - 43 - 10 \log P_t \text{ at 3 meter} \\
 &= E_{\text{dBuV}} - 43 - (20 \log E (\text{uV/m}) - 125.23) \\
 &= E_{\text{dBuV}} - 43 - 20 \log E (\text{uV/m}) + 125.23 \\
 &= E_{\text{dBuV}} - 20 \log E (\text{uV/m}) + 82.23
 \end{aligned}$$

Since $20 \log E (\text{uV/m}) = E \text{ in dBuV/m}$

$$= E_{\text{dBuV}} - E_{\text{dBuV}} + 82.23$$

$$\text{Radiated Emission limit 3 meter} = 82.23 \text{ dBuV at any power level measured in dBuV}$$

Test Setup Photo(s)



2.1055(d) / 24.235 Frequency Stability

Note: Not applicable because the EUT is an amplified device.

SUPPLEMENTAL INFORMATION

Measurement Uncertainty

| Uncertainty Value | Parameter |
|-------------------|---------------------------|
| 4.73 dB | Radiated Emissions |
| 3.34 dB | Mains Conducted Emissions |
| 3.30 dB | Disturbance Power |

The reported measurement uncertainties are calculated based on the worst case of all laboratory environments from CKC Laboratories, Inc. test sites. Only those parameters which require estimation of measurement uncertainty are reported. The reported worst case measurement uncertainty is less than the maximum values derived in CISPR 16-4-2. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of $k=2$. Compliance is deemed to occur provided measurements are below the specified limits.

Emissions Test Details

TESTING PARAMETERS

Unless otherwise indicated, the following configuration parameters are used for equipment setup: The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. Cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected.

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the setup photographs. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables.

The emissions data was taken with a spectrum analyzer or receiver. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the table below. The corrected data was then compared to the applicable emission limits. Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in $\text{dB}\mu\text{V}/\text{m}$, the spectrum analyzer reading in $\text{dB}\mu\text{V}$ was corrected by using the following formula. This reading was then compared to the applicable specification limit.

| SAMPLE CALCULATIONS | |
|----------------------------|----------------|
| Meter reading | (dB μ V) |
| + Antenna Factor | (dB) |
| + Cable Loss | (dB) |
| - Distance Correction | (dB) |
| - Preamplifier Gain | (dB) |
| = Corrected Reading | (dB μ V/m) |

TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed were used to collect the emissions data. A spectrum analyzer or receiver was used for all measurements. Unless otherwise specified, the following table shows the measuring equipment bandwidth settings that were used in designated frequency bands. For testing emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used.

| MEASURING EQUIPMENT BANDWIDTH SETTINGS PER FREQUENCY RANGE | | | |
|---|---------------------|------------------|-------------------|
| TEST | BEGINNING FREQUENCY | ENDING FREQUENCY | BANDWIDTH SETTING |
| CONDUCTED EMISSIONS | 150 kHz | 30 MHz | 9 kHz |
| RADIATED EMISSIONS | 9 kHz | 150 kHz | 200 Hz |
| RADIATED EMISSIONS | 150 kHz | 30 MHz | 9 kHz |
| RADIATED EMISSIONS | 30 MHz | 1000 MHz | 120 kHz |
| RADIATED EMISSIONS | 1000 MHz | >1 GHz | 1 MHz |

SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in the emissions tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "positive peak" detector mode. Whenever a "quasi-peak" or "average" reading was recorded, the measurement was annotated with a "QP" or an "Ave" on the appropriate rows of the data sheets. In cases where quasi-peak or average limits were employed and data exists for multiple measurement types for the same frequency then the peak measurement was retained in the report for reference, however the numbering for the affected row was removed and an arrow or carrot ("") was placed in the far left-hand column indicating that the row above takes precedence for comparison to the limit. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data.

Peak

In this mode, the spectrum analyzer or receiver recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature called "peak hold," the measurement device had the ability to measure intermittent or low duty cycle transient emission peak levels. In this mode the measuring device made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

Quasi-Peak

Quasi-peak measurements were taken using the quasi-peak detector when the true peak values exceeded or were within 2 dB of a quasi-peak specification limit. Additional QP measurements may have been taken at the discretion of the operator.

Average

Average measurements were taken using the average detector when the true peak values exceeded or were within 2 dB of an average specification limit. Additional average measurements may have been taken at the discretion of the operator. If the specification or test procedure requires trace averaging, then the averaging was performed using 100 samples or as required by the specification. All other average measurements are performed using video bandwidth averaging. To make these measurements, the test engineer reduces the video bandwidth on the measuring device until the modulation of the signal is filtered out. At this point the measuring device is set into the linear mode and the scan time is reduced.