# Cellphone-Mate, Inc.

**TEST REPORT FOR** 

# Distributed Antenna System/ Booster Model: Force3 PSB

**Tested To The Following Standards:** 

FCC Part 90I

Report No.: 96794-7 Volume 2 of 2

Date of issue: May 14, 2015



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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# SUMMARY OF RESULTS

# Standard / Specification: FCC Part(s) 2 / 90I

Test Procedure/Method	Description	Modifications	Results
2.1051 / Part 90 § 219(e)(3)	Conducted Spurious Emissions NA		Pass
2.1049 / 2.1051 / Part 90 §219(e) Intermodulation		NA	Pass
2.1046 / Part 90 § 219(e)(1) Output Power		NA	Pass
Part 90 § 219(e)(2)	Noise Figure	NA	Pass
2.1053 / Part 90 § 219(e)(3)	e)(3) Radiated Spurious Emissions		Pass

NA = Not applicable

Volume 1 contains the following Sections: 2.1049 / Part 90 § 219(a) - Occupied Bandwidth Part 90 § 219(b) / 90.531(f) and (g) - Band Verification 2.1047 / 2.1051 / Part 90 § 219(b) / 210(c)(h)(g) and (j) - Emissions Mask

# **Modifications\* During Testing**

This list is a summary of the modifications made to the equipment during testing.

Summary of Conditions

No modifications were made during testing.

\*Modifications listed above must be incorporated into all production units.

# **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

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# **EQUIPMENT UNDER TEST (EUT)**

### **EQUIPMENT UNDER TEST**

#### Distributed Antenna System/ Booster

Manuf: Cellphone-Mate, Inc. Model: Force3 PSB Serial: 201502PS000001

## **PERIPHERAL DEVICES**

The EUT was not tested with peripheral devices.

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# FCC PART(S) 2 / 901

This report contains EMC emissions test results under United States Federal Communications Commission (FCC) requirements for licensed devices.

47 CFR Part 90: Private Land Mobile Radio Services

# 2.1051 / Part 90 § 219(e)(3) Conducted Spurious Emissions

# **Test Conditions / Setup**

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Place	• Fremont, CA 9	4539 • (510) 249-1170
Customer:	Cellphone-Mate, Inc.		
Specification:	<b>Conducted Spurious Emissions, 47 CFR</b>	§90.219(e)(3)	
Work Order #:	96794	Date:	4/15/2015
Test Type:	Conducted Emissions	Time:	10:40:12
Equipment:	Distributed Antenna System/Booster	Sequence#:	1
Manufacturer:	Cellphone-Mate, Inc.	Tested By:	Daniel Bertran
Model:	Force3 PSB		120V 60Hz
S/N:	201502PS000001		

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	ANP06131	Attenuator	18N20W-20	2/27/2014	2/27/2016
	ANP05713	Attenuator	PE7015-20	3/24/2015	3/24/2017
	ANP06709	Cable	32026-29094K-	9/18/2014	9/18/2016
			29094K-72TC		
	ANP06710	Cable	32026-29094K-	9/18/2014	9/18/2016
			29094K-72TC		
	AN03470	Spectrum Analyzer	E4440A	12/2/2013	12/2/2015

Equipment Under Test (* = EUT):								
Function	Manufacturer	Model #	S/N					
Distributed Antenna	Cellphone-Mate, Inc.	Force3 PSB	201502PS000001					
System/Booster *	System/Booster *							

Support Devices:			
Function	Manufacturer	Model #	S/N
AC Adapter	Adapter Tech.	STD-1805	NA
Signal Generator	Agilent	E4433B	US40052164
Signal Generator	Agilent	E4438C	MY42082260



Test Conditions / Notes:

The EUT is placed on the test bench. Evaluation performed at the Outside and Inside antenna port.

UL: 788-798, 799-805, 806-817, 817-824, 896-901 MHz DL: 758-768, 769-775, 851-862, 862-869, 935-940 MHz

TXFreq = > Frequency of low/mid/high channels of each band listed above. Modulation=> CW

Frequency range of measurement = 9 kHz- 10GHz. 30 MHz - 1000MHz -> RBW=120 kHz VBW=120 kHz 1000MHz-10000MHz -> RBW=1 MHz VBW=1 MHz

All adjustable settings on the test sample are set at max.

Test environment conditions: 20°C, 40% Relative Humidity, 102.5kPa

Test procedure: The test was performed in accordance with 47CFR, Section 2.1051 and Appendix D3 of the FCC document: 935210 D02 Signal Booster Certification Requirements v02r01 Dated July 24, 2014.

Software: SC\_S1\_Public\_V3.0 Firmware: V1.0

No emissions above 1GHz were found within 20dB of the limit line, including the 1559-1610 MHz band in accordance with 90.543 (f). No emissions below 1GHz were found within 20dB of the limit line, excluding the fundamental frequency.

#### §90.543 Emission limitations.

(c) Out-of-band emission limit. On any frequency outside of the frequency ranges covered by the ACP tables in this section, the power of any emission must be reduced below the mean output power (P) by at least 43 + 10log (P) dB measured in a 100 kHz bandwidth for frequencies less than 1 GHz, and in a 1 MHz bandwidth for frequencies greater than 1 GHz.

(f) For operations in the 758-775 MHz and 788-805 MHz bands, all emissions including harmonics in the band 1559-1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

## **Conducted Spurious Emissions - Summary of Results**

Pass: No data provided since all emissions above and below 1GHz were found within 20dB of the limit line.



# Test Setup Photo(s)



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# 2.1049 / 2.1051 / Part 90 § 219(e) Intermodulation

# **Test Conditions / Setup**

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170

Customer:	Cellphone-Mate, Inc.		
Specification:	Intermodulation, Part 90 Section 219 (e)		
Work Order #:	96794	Date:	4/15/2015
Test Type:	Conducted Emissions	Time:	10:40:12
Equipment:	Distributed Antenna System/Booster	Sequence#:	1
Manufacturer:	Cellphone-Mate, Inc.	Tested By:	Daniel Bertran
Model:	Force3 PSB		120V 60Hz
S/N:	201502PS000001		

#### Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	ANP06131	Attenuator	18N20W-20	2/27/2014	2/27/2016
	ANP05713	Attenuator	PE7015-20	3/24/2015	3/24/2017
	ANP06709	Cable	32026-29094K-29094K-72TC	9/18/2014	9/18/2016
	ANP06710	Cable	32026-29094K-29094K-72TC	9/18/2014	9/18/2016
	ANP06711	Cable	32022-29094K-29094K-132TC	11/21/2014	11/21/2014
	AN03470	Spectrum Analyzer	E4440A	12/2/2013	12/2/2015
	C00087	Combiner	44000	010914	1/9/2016
	AN03470	Spectrum Analyzer	E4440A	12/2/2013	12/2/2015

#### Equipment Under Test (\* = EUT):

Function	Manufacturer	Model #	S/N
Distributed Antenna System/Booster *	Cellphone-Mate, Inc.	Force3 PSB	201502PS000001

Support Devices:			
Function	Manufacturer	Model #	S/N
AC Adapter	Adapter Tech.	STD-1805	NA
Signal Generator	Agilent	E4433B	US40052164
Signal Generator	Agilent	E4438C	MY42082260

#### Test Conditions / Notes:

The EUT is placed on the test bench. Evaluation performed at the Outside and Inside antenna port.

UL: 788-798, 799-805, 806-817, 817-824, 896-901 MHz; DL: 758-768, 769-775, 851-862, 862-869, 935-940 MHz All adjustable settings on the test sample are set at max.

Test environment conditions: 20°C, 40% Relative Humidity, 102.5kPa

The EUT is connected to the SA via a 20dB attenuator and two signal generators are used to inject two CWS signals to the EUT via an RF combiner.

Signal generator A is configured for CW operation at the low frequency of appropriate frequency band. Signal generator B is configured for CW operation tuned 600kHz above the low frequency band. The signal generator amplitudes are set so that the power from each into RF combiner is equivalent. The signal generator's amplitudes are increased equally until just before the EUT AGC threshold (0.5dB below) and all intermodulation products are measured with spectrum analyzer. The EUT is tested at the AGC level and AGC+10dB to show AGC operation, worst case results are shown. The same test is repeated for high frequency of appropriate frequency band with signal generator B configured for CW operation tuned 600kHz below the high frequency band. Same test is repeated for all uplink and downlink operational bands. Software: SC\_S1\_Public\_V3.0; Firmware: V1.0



# Intermodulation - Summary of Results

**Pass:** As summarized in tables and plots below, all intermodulation products are measured below -13dBm. Worst case results are reported for intermodulation test, done with and without AGC circuitry activated.

50010112 111							
Band	Link	Channel	Frequency (MHz)	PreAGC (dBm)	AGC+10dB (dBm)	Margin (dB)	
700M	Uplink	L	788	-25.02	-17.18	-4.18	
700M	Uplink	Н	798	-21.61	-13.70	-0.70	
700M	Uplink	L	799	-21.11	-13.94	-0.94	
700M	Uplink	Н	805	-21.29	-21.91	-8.29	
700M	Downlink	L	758	-19.05	-18.71	-5.71	
700M	Downlink	Н	768	-18.53	-18.24	-5.24	
700M	Downlink	L	769	-17.92	-17.92	-4.92	
700M	Downlink	Н	775	-22.31	-20.65	-7.65	
800M	Uplink	L	806	-21.72	-17.21	-4.21	
800M	Uplink	Н	817	-21.63	-17.67	-4.67	
800M	Downlink	L	851	-21.99	-17.97	-4.97	
800M	Downlink	Н	862	-22.94	-20.47	-7.47	
900M	Uplink	L	896	-19.55	-18.76	-5.76	
900M	Uplink	Н	901	-15.67	-15.35	-2.35	
900M	Downlink	L	935	-19.32	-16.85	-3.85	
900M	Downlink	Н	940	-17.62	-15.84	-2.84	

## 900MHz Interleaved and Public Safety 700MHz/800MHz bands

#### ESMR band

Band	Link	Channel	Frequency (MHz)	PreAGC	AGC+10dB	Column1
800M	Uplink	L	817	-23.55	-16.26	-3.26
800M	Uplink	Н	824	-19.09	-14.76	-1.76
800M	Downlink	L	862	-22.48	-20.41	-7.41
800M	Downlink	Н	869	-17.91	-16.48	-3.48

\*There are no specific antennas and cables supplied with the EUT. Cable loss and antenna gain must not exceed the power margin in dB.

Antenna Assembly Gain (dBd) = Antenna Gain (dBd)-Feeder Loss (dB) = Antenna Gain (dBi)-2.15-Feeder Loss (dB)



# **Test Data**





#### In-700M-UL-788-798L



In-700M-UL-788-798H





#### In-700M-UL-799-805L



In-700M-UL-799-805H





## 800MHz – UL - Input

#### In-800M-UL-806-817L



In-800M-UL-806-817H

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InterCW-In-800M-UL-817-824L



In-800M-UL-817-824H





In-800M-UL-896-901L



In-800M-UL-896-901H





## 700MHz – DL - Input

#### In-700M-DL-758-768L



In-700M-DL-758-768H





#### In-700M-DL-769-775L



In-700M-DL-769-775H





### 800MHz – DL - Input

#### In-800M-DL-851-862L



In-800M-DL-851-862H





In-800M-DL-862-869L



In-800M-DL-862-869H





### 900MHz – DL - Input

#### In-900M-DL-935-940L



In-900M-DL-935-940H





## 700MHz – UL - Output

700M-UL-788-798H-22.3



700M-UL-788-798H-AGC+10dB





700M-UL-788-798L-19



700M-UL-788-798L-AGC+10dB





700M-UL-799-805H-23.9









700M-UL-799-805L-22.7



700M-UL-799-805L-AGC+10dB





## 800MHz – UL - Output

#### 800M-UL-806-817H-22.6



800M-UL-806-817H-AGC+10dB





800M-UL-806-817L-24.2









800M-UL-817-824H-19.4









800M-UL-817-824L-21.7



800M-UL-817-824L-AGC+10dB





InterCW-800M-UL-896-901H-21.6



800M-UL-896-901H-AGC+10dB





800M-UL-896-901L-23









## 700MHz – DL - Output

700M-DL-758-768H-29.1









700M-DL-758-768L-32.2



700M-DL-758-768L-AGC+10dB





700M-DL-769-775H-24.4



700M-DL-769-775H-AGC+10dB





700M-DL-769-775L-29.7



700M-DL-769-775L-AGC+10dB





### 800MHz – DL - Output

800M-DL-851-862H-33.7



800M-DL-851-862H-AGC+10dB





InterCW-800M-DL-851-862L-33.4



800M-DL-851-862L-AGC+10dB





800M-DL-862-869H-31.3



800M-DL-862-869H-AGC+10dB




800M-DL-862-869L-31.3



800M-DL-862-869L-AGC+10dB





### 900MHz – DL - Output

900M-DL-935-940H-28.1









900M-DL-935-940L-28



900M-DL-935-940L-AGC+10dB



# **Test Setup Photo**



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# 2.1046 / Part 90 § 219(e)(1) Output Power

# **Test Conditions / Setup**

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170

Customer:	Cellphone-Mate, Inc.		
Specification:	Maximum Power Measurement, 47 CFR	k §90.219(e)(1)	
Work Order #:	96794	Date:	4/15/2015
Test Type:	Conducted Emissions	Time:	10:40:12
Equipment:	Distributed Antenna System/Booster	Sequence#:	1
Manufacturer:	Cellphone-Mate, Inc.	Tested By:	Daniel Bertran
Model:	Force3 PSB		120V 60Hz
S/N:	201502PS000001		

#### Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
10	110000 11	Description	model	Cultoration Date	Cui Due Dute
	ANP06131	Attenuator	18N20W-20	2/27/2014	2/27/2016
	ANP05713	Attenuator	PE7015-20	3/24/2015	3/24/2017
	ANP06709	Cable	32026-29094K-	9/18/2014	9/18/2016
			29094K-72TC		
	ANP06710	Cable	32026-29094K-	9/18/2014	9/18/2016
			29094K-72TC		
	AN03470	Spectrum Analyzer	E4440A	12/2/2013	12/2/2015

#### Equipment Under Test (\* = EUT):

<u> </u>			
Function	Manufacturer	Model #	S/N
Distributed Antenna	Cellphone-Mate, Inc.	Force3 PSB	201502PS000001
System/Booster *			

#### Support Devices:

Function	Manufacturer	Model #	S/N
AC Adapter	Adapter Tech.	STD-1805	NA
Signal Generator	Agilent	E4433B	US40052164
Signal Generator	Agilent	E4438C	MY42082260

#### Test Conditions / Notes:

The EUT is placed on the test bench. Evaluation performed at the Outside and Inside antenna port.

- UL: 788-798, 799-805, 806-817, 817-824, 896-901 MHz
- DL: 758-768, 769-775, 851-862, 862-869, 935-940 MHz

All adjustable settings on the test sample are set at max.

Test environment conditions: 20°C, 40% Relative Humidity, 102.5kPa

Test procedure: The test was performed in accordance with Appendix D3 of the FCC document: 935210 D02 Signal Booster Certification Requirements v02r01 Dated July 24, 2014

Software: SC\_S1\_Public\_V3.0; Firmware: V1.0

Notes: The frequency with the highest power level in each operational band is measured.

Since the equipment under test (EUT) uses automatic gain control (AGC), results are shown with and without AGC activated. Results, unless otherwise noted, are worst-case measurements. Maximum gain is also verified; plots show the output power is maintained or decreased while the input drive level is increased 3dB over the AGC level. As shown on the plots in the below test data section, the output power was maintained at the measured output level while input power was increased until the booster shuts down.



#### Part 90.219– Emission Limits

(e)(1) The output power capability of a signal booster must be designed for deployments providing a radiated power not exceeding 5 Watts ERP for each retransmitted channel.

# **Carrier Output Power (Conducted) Summary of Results**

Pass: As summarized in tables below, calculated ERP from measured Conducted Power and Gain, are within limits.

Band	Link	Carrier frequency*	SA reading (dBm) PreAGC (AGC-0.5dB)	SA reading (dBm) AGC	SA reading (dBm) AGC+3dB	Conducted Output Power (dBm)	Limit (dBm)	Margin (dBm)	Result
700M	Uplink	799	24.93	26.13	26.98	26.98	37	-10.02	Pass**
800M	Uplink	808.9	26.04	26.31	26.31	26.31	37	-10.69	Pass**
700M	Downlink	770.5	25.91	26.17	27.20	27.20	37	-9.80	Pass**
800M	Downlink	858.95	24.45	25.85	26.87	26.87	37	-10.13	Pass**
700M	Uplink	795.5	25.95	25.89	25.25	25.95	37	-11.05	Pass**
700M	Downlink	763	25.42	25.62	27.81	27.81	37	-9.19	Pass**

900MHz Interleaved and Public Safety 700MHz/800MHz bands

#### ESMR band

Band	Link	Carrier frequency*	SA reading (dBm) PreAGC (AGC-0.5dB)	SA reading (dBm) AGC	SA reading (dBm) AGC+3dB	Output Power (dBm)	Limit (dBm)	Margin (dBm)	Result
800M	Uplink	817	25.11	25.37	25.48	25.48	37	-11.52	Pass**
900M	Uplink	898.2	24.79	25.04	25.97	25.97	37	-11.03	Pass**
800M	Downlink	865.95	24.19	24.25	25.42	25.42	37	-11.58	Pass**
900M	Downlink	938.696	25.03	26.03	26.9	26.9	37	-10.1	Pass**

\*The frequency with the highest power level in each operational band is measured using procedure as determined in section 7.1 of 935210 D03 Signal Booster Measurements v02r01 Dated July 24, 2014.

\*\*There are no specific antennas and cables supplied with the EUT. Cable loss and antenna gain must not exceed the power margin in dB.

Antenna Assembly Gain (dBd) = Antenna Gain (dBd)-Feeder Loss (dB) = Antenna Gain (dBi)-2.15-Feeder Loss (dB)



# **Test Data**





### PS\_700M\_UL\_M+3



PS\_700M\_UL\_M-29.5





PS\_700M\_UL\_M-AGC

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# <u>LTE- 700MHz – UL</u>

LTE\_700M\_UL-788-798H-AGC









LTE\_700M\_UL-788-798H-PreAGC

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🔆 Agilent 15:44:08 Apr 14, 2015 RL Mkr1 808.898 MHz Rei 40.5 dBm #Peak #Atten 30 dB 26.31 dBm Log 10 dB/ Offst 20.5 dB Ô LgAv M1 S3 W2 FC ¤(1): f>50k Mu MMARANA Swp Center 808.900 MHz Span 1 MHz #Res BW 100 kHz #VBW 300 kHz #Sweep 10 ms (1001 pts)

## <u>PS 800MHz – UL</u>





PS\_800M\_UL\_M-31.1





PS\_800M\_UL\_M-AGC

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### <u>SMR 800MHz – UL</u>

#### SMR\_800M\_UL\_M+3



SMR\_800M\_UL\_M-28.8





SMR\_800M\_UL\_M-AGC

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<u>SMR 900MHz – UL</u>

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#Atten 30 dB

RL

Mkr1 898.198 MHz

25.97 dBm



Agilent 15:59:58 Apr 14, 2015

莱

Log 10 dB/ Offst 20.5 dB

LgAv

M1 W2 S3 FC

¤(1): f>50k

Rei 40.5 dBm #Peak





SMR\_900M\_UL\_M-AGC

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<u>PS 700MHz – DL</u>

#### PS\_700M\_DL\_M+3



PS\_700M\_DL\_M-36.1





PS\_700M\_DL\_M-AGC

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<u>LTE- 700MHz – DL</u>



#### LTE\_700M\_DL-758-768M-PreAGC



LTE\_700M\_DL-758-768M-AGC





LTE\_700M\_DL-758-768M-AGC +3

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### <u> PS 800MHz –DL</u>

#### PS\_800M\_DL\_M+3



PS\_800M\_DL\_M-30.4





PS\_800M\_DL\_M-AGC

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#### 🔆 Agilent 16:48:45 Apr 14, 2015 RL Mkr1 865.950 MHz Rei 40.5 dBm #Peak 25.42 dBm #Atten 30 dB Log 10 dB/ Offst 20.5 dB Ô LgAv M1 S3 W2 FC ¤(1): f>50k A.A.A.A. shall at the number of the man Swp Center 865.950 MHz Span 1 MHz #Res BW 100 kHz #VBW 300 kHz #Sweep 10 ms (1001 pts)

## <u>SMR 800MHz – DL</u>

#### SMR\_800M\_DL\_M+3



SMR\_800M\_DL\_M-30.7





SMR\_800M\_DL\_M-AGC

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# <u>SMR 900MHz – DL</u>



#### SMR\_900M\_DL\_M+3



SMR\_900M\_DL\_M-33.6





SMR\_900M\_DL\_M-AGC

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# **Test Setup Photo**



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# Part 90 § 219(e)(2) Noise Figure

# **Test Conditions / Setup**

Date: 4/15/2015 Time: 10:40:12

Tested By: Daniel Bertran

120V 60Hz

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170

Customer:	Cellphone-Mate, Inc.		
Specification:	47 CFR §90.219(e)(2) Noise Figure		
Work Order #:	96794	Date:	4/
Test Type:	Conducted Emissions	Time:	1
Equipment:	Distributed Antenna System/Booster	Sequence#:	1
Manufacturer:	Cellphone-Mate, Inc.	Tested By:	D
Model:	Force3 PSB		12
S/N:	201502PS000001		

#### **Test Eauipment:**

100. 24.	P memor					
ID	Asset #	Description	Model	Calibration Date	Cal Due Date	
	ANP01210	Cable	FSJ1P-50A-4A	1/15/2015	1/15/2017	
	AN03471	<b>RF</b> Characteristics	E4440A	12/19/2013	12/19/2015	
		Analyzer				
	AN03537	Noise Source	346A	3/10/2015	3/10/2017	

#### Equipment Under Test (\* = EUT):

Equipment Chaer Test (	= EUT).		
Function	Manufacturer	Model #	S/N
Distributed Antenna	Cellphone-Mate, Inc.	Force3 PSB	201502PS000001
System /Booster*			

#### Support Devices:

Function	Manufacturer	Model #	S/N
AC Adapter	Adapter Tech.	STD-1805	NA

#### Test Conditions / Notes:

The equipment under test (EUT) is placed on the test bench. Evaluation performed at the Outside and Inside antenna port. EUT set at maximum gain.

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

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

UL: 788-798, 799-805, 806-817, 817-824, 896-901 MHz

DL: 758-768, 769-775, 851-862, 862-869, 935-940 MHz

All adjustable settings on the test sample are set at max.

Test environment conditions: 20°C, 40% Relative Humidity, 102.5kPa

The EUT is set up as shown in the setup picture. A calibrated noise source is connected to outside port and powered with a +28 (pulsed) using a 1 meter BNC cable (50 ohms) which is connected at the rear of the spectrum analyzer. Noise figure is measured on the downlink path following the Noise Figure Measurements Personality Guide provided by Agilent. The same test is repeated for all uplink operational bands with the calibrated noise source connected to inside port. Software: SC S1 Public V3.0

Firmware: V1.0



#### Figure 4-1 PSA Basic Noise Figure Measurement - No Frequency Conversion



# **Noise Figure - Summary of Results**

Pass: As summarized in tables and plots below, the noise figure are within limits.

Link	Band	Noise Figure (dB)	Limit (dB)	Margin (dB)
UL	PS-700M	6.84	9	2.16
UL	PS-800M	5.58	9	3.42
UL	ESMR-800M	6.44	9	2.56
UL	Interleaved-900M	6.68	9	2.32
DL	PS-700M	6.14	9	2.86
DL	PS-800ML	5.73	9	3.27
DL	ESMR-800MH	6.09	9	2.91
DL	Interleaved-900M	5.46	9	3.54



Agilent			RL
Frequency	Ncise F	igure	Gain
788.00000 MHz	6.83	67 dB	70.5053 dB
789.54545 MHz	6.44	16 dB	71.3648 dB
791.09091 MHz	6.01	94 dB	72.6179 dB
792.63636 MHz	5.86	02 dB	73.4517 dB
794.18182 MHz	5.87	03 dB	73.8898 dB
795.72727 MHz	5.90	58 dB	74.1218 dB
797.27273 MHz	5.82	98 dB	74.4160 dB
798.81818 MHz	5.67	70 dB	74.9350 dB
800.36364 MHz	5.50	81 dB	75.5155 dB
801.90909 MHz	5,29	19 dB	75.9560 dB
803.45455 MHz	5,19	00 dB	76.2711 dB
805.00000 MHZ	5.20	18 08	/6.52/0 dB
General		NFIG	GAIN
Markers MKr1	66.0000 MHZ 6.	030/0B	<u>/0.0003.08</u>
Courses			

## <u>700MHz –UL</u>





UL-700M-Graphs



Agilent			R L
Frequency	Nois	se Figure	Gain
806.00000 MHz		5.1782 dB	76.8550 dB
807.63636 MHz		5.3019 dB	77.2120 dB
809.27273 MHz		5.4516 dB	77.3188 dB
810.90909 MHz		5.5657 dB	77.1007 dB
812.54545 MHz		5.5789 dB	76.7079 dB
814.18182 MHz		5.5576 dB	76.1006 dB
815.81818 MHz		5.5594 dB	75.1699 dB
817.45455 MHz		5.5968 dB	74.0560 dB
819.09091 MHz		5.7351 dB	73.1941 dB
820.72727 MHz		5,9335 dB	73.0456 dB
822.36364 MHz		6,1615 dB	73.2192 dB
824.00000 MHz		6,4363 dB	71.1797 dB
Contract of Contra			
General		NFIG	GAIN
Mkr1 8	24 0000 MHz	6 4363 dB	////////

## <u>800MHz –UL</u>

#### UL-800M-Data



UL-800M-Graphs



Agilent		R L
Frequency	Ncise Figure	Gain
896.00000 MHz	6.2936 dB	74.4911 dB
896.45455 MHz	6.2954 dB	74.7006 dB
896.90909 MHz	6.2951 dB	74.9412 dB
897.36364 MHz	6.3357 dB	75.1880 dB
897.81818 MHz	6.3740 dB	75.4397 dB
898.27273 MHz	6.4457 dB	75.5521 dB
898.72727 MHz	6.4873 dB	75.4669 dB
899.18182 MHz	6.5113 dB	75.1564 dB
899.63636 MHz	6.5814 dB	74.7147 dB
900.09091 MHz	6.6487 dB	74.3056 dB
900.54545 MHz	6.7017 dB	74.0818 dB
901.00000 MHz	6.6819 dB	73.9145 dB
Sanaral	NEIC	CAIN
Mkr1 90	0.5455 MHz 6.7017 dB	74.0818 dB
arkers		

# <u>900MHz –UL</u>

#### UL-900M-Data



UL-900M-Graphs



Agilent			R L
Frequency		Ncise Figure	Gain
758.00000 MHz		5.3169 dB	83.8719 dB
759.54545 MHz		5.3365 dB	84.2435 dB
761.09091 MHz		5.3615 dB	82.6810 dB
762.63636 MHz		5.1721 dB	82.4980 dB
764.18182 MHz		4.9790 dB	82.5936 dB
765.72727 MHz		4.8740 dB	81.7041 dB
767.27273 MHz		5.0092 dB	81.4756 dB
768.81818 MHz		5.2809 dB	81.7696 dB
770.36364 MHz		5.5105 dB	81.8015 dB
771.90909 MHz		5.5173 dB	78.5521 dB
773.45455 MHz		5,5870 dB	74.7993 dB
775.00000 MHZ		6,1332 UB	(1.6303 06
General		NFIG	GAIN
Markers Mkr1	775.0000 MHz	6.1352 dB	71.6303 dB
And the second sec			

# <u>700MHz –DL</u>

#### DL-700M-Data



DL-700M-Graphs



Agilent			R L
Frequency	1	Noise Figure	Gain
851.00000 MHz		5.7335 dB	79.1774 dB
852.63636 MHz		5.5976 dB	79.3245 dB
854.27273 MHz		5.5275 dB	79.2907 dB
855.90909 MHz		5.4683 dB	79.7530 dB
857.54545 MHz		5.4546 dB	80.2989 dB
859.18182 MHz		5.4722 dB	80.2136 dB
860.81818 MHz		5.5693 dB	79.4056 dB
862.45455 MHz		5.7173 dB	79.4867 dB
864.09091 MHz		5.8004 dB	80.3806 dB
865.72727 MHz		5.8627 dB	80.9349 dB
867.36364 MHz		5,9515 dB	80.6401 dB
869.00000 MHZ		6.0938 dB	79.8433 dB
General		NFIG	GAIN
arkers Mkr1 I	851.0000 MHz	5.7335 dB	79.1774 dB

# <u>800MHz – DL</u>





DL-800M-Graphs



Frequency     Ncise Figure       935.00000 MHz     5.1362 dB       935.45455 MHz     5.1579 dB       935.90909 MHz     5.1443 dB       936.36364 MHz     5.1947 dB       937.27273 MHz     5.2406 dB       937.27273 MHz     5.2406 dB       938.18182 MHz     5.3244 dB       938.63636 MHz     5.3244 dB       939.09091 MHz     5.3547 dB       939.54545 MHz     5.3547 dB       939.54545 MHz     5.4608 dB		R L				Agilent
935.00000 MHz 5.1362 dB 935.45455 MHz 5.1579 dB 935.90909 MHz 5.1443 dB 936.36364 MHz 5.1584 dB 937.7273 MHz 5.2265 dB 937.7272 MHz 5.2265 dB 938.18182 MHz 5.2754 dB 938.6366 MHz 5.3244 dB 939.54545 MHz 5.3547 dB 939.54545 MHz 5.4385 dB 940.00000 MHz 5.4608 dB	Gain	(	Ncise Figure		ency	Frequ
935.45455 MHz 5.1579 dB   935.90909 MHz 5.1443 dB   936.36364 MHz 5.1584 dB   936.8181 MHz 5.1947 dB   937.7273 MHz 5.2265 dB   937.72727 MHz 5.2406 dB   938.18182 MHz 5.2754 dB   938.63636 MHz 5.3244 dB   939.09091 MHz 5.3547 dB   939.54545 MHz 5.4608 dB	79.0364 dB	79.0	5.1362 dB		00 MHz	935.000
935.90909 MHz 5.1443 dB 936.36364 MHz 5.1584 dB 937.27273 MHz 5.1947 dB 937.27277 MHz 5.266 dB 938.18182 MHz 5.2754 dB 938.63636 MHz 5.3244 dB 939.09091 MHz 5.3547 dB 939.64545 MHz 5.4354 dB 940.00000 MHz 5.4608 dB	79.0001 dB	79.0	5.1579 dB		55 MHz	935.454
936.36364 MHz   5.1584 dB     936.81818 MHz   5.1947 dB     937.27273 MHz   5.2265 dB     937.27277 MHz   5.2406 dB     938.18182 MHz   5.2754 dB     938.63636 MHz   5.3244 dB     939.09091 MHz   5.3647 dB     939.54545 MHz   5.4385 dB     940.00000 MHz   5.4608 dB	78.9765 dB	78.9	5.1443 dB		09 MHz	935,909
936.81818 MHz 5.1947 dB 937.2727 MHz 5.265 dB 937.72727 MHz 5.2406 dB 938.18182 MHz 5.2754 dB 938.63636 MHz 5.3244 dB 939.09091 MHz 5.3547 dB 939.54545 MHz 5.4385 dB 940.00000 MHz 5.4608 dB	79.0134 dB	79.0	5.1584 dB		64 MHz	936.363
937.27273 MHz     5.2265 dB       937.72727 MHz     5.2406 dB       938.18182 MHz     5.2754 dB       938.63636 MHz     5.3244 dB       939.09091 MHz     5.3347 dB       939.54545 MHz     5.4385 dB       940.00000 MHz     5.4608 dB	79.2117 dB	79.2	5.1947 dB		18 MHz	936.818
937.72727 MHz 5.2406 dB 938.18182 MHz 5.2754 dB 938.63636 MHz 5.3244 dB 939.0991 MHz 5.3247 dB 939.54545 MHz 5.4385 dB 940.00000 MHz 5.4608 dB	79.5988 dB	79.5	5.2265 dB		73 MHz	937.272
938, 18182 MHz 5.2754 dB 938, 63636 MHz 5.3244 dB 939, 09091 MHz 5.3547 dB 939, 5455 MHz 5.4385 dB 940.00000 MHz 5.4608 dB	80.0486 dB	80.0	5.2406 dB		27 MHz	937.727
938. 63636 MHz 5. 3244 dB 939. 09091 MHz 5. 3547 dB 939. 54545 MHz 5. 4385 dB 940. 00000 MHz 5. 4608 dB	80.4091 dB	80.4	5.2754 dB		82 MHz	938.181
939.09091 MHz 5.3547 dB 939.54545 MHz 5.4385 dB 940.00000 MHz 5.4608 dB	80.5730 dB	80.5	5.3244 dB		36 MHz	938.636
939.54545 MHz 5.4385 dB 940.00000 MHz 5.4608 dB	80.5431 dB	80.5	5,3547 dB		91 MHz	939.090
940.00000 MHz 5.4608 dB	80.3983 dB	80.3	5,4385 dB		45 MHz	939.545
General NFIG G	80.1095 dB	80.1	5.4608 dB		00 MHz	940.000
General NFIG <u>G</u>						
General NFIG G						
General NFIG <u>G</u>						
General NFIG G		19.00	1. Sec. at			
Must 035 0000 MHz 5 1362 dB 70 0364 dB	N	GAIN 79 0364 dB	NFIG 5 1362 dB	935 0000 MH-	Mirt	General
Aarkers		<u>18.0304 0D</u>	0.1302.08	833.0000 MHZ	WIKI I	larkers

## <u>900MHz –DL</u>

#### DL-900M-Data



DL-900M-Graphs



# **Test Setup Photos**



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# 2.1053 / Part 90 § 219(e)(3) Radiated Spurious Emissions

## Test Conditions / Setup

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Place	• Fremont, CA 9	4539 • (510) 249-1170
Customer:	Cellphone-Mate, Inc.		
Specification:	Radiated Spurious Emissions, 47 CFR §	90.219(e)(3)	
Work Order #:	96794	Date:	4/15/2015
Test Type:	Maximized Emissions	Time:	10:40:12
Equipment:	Distributed Antenna System/Booster	Sequence#:	1
Manufacturer:	Cellphone-Mate, Inc.	Tested By:	Daniel Bertran
Model:	Force3 PSB		120V 60Hz
S/N:	201502PS000001		

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date	
	AN00852	Biconilog Antenna	CBL 6111C	11/24/2014	11/24/2016	
	ANP00880	Cable	RG214U	6/13/2014	6/13/2016	
	AN00686	Preamp	8447D Opt 010	5/27/2014	5/27/2016	
	ANP06691	Cable	PE3062-180	8/8/2014	8/8/2016	
	ANP01183	Cable	CNT-195	9/3/2013	9/3/2015	
	AN02157	Horn Antenna-ANSI	3115	12/2/2014	12/2/2016	
		C63.5 Calibration				
	ANP06712	Cable	32022-29094K-	9/18/2014	9/18/2016	
			29094K-48TC			
	AN03172	High Pass Filter	HM1155-11SS	1/15/2014	1/15/2016	
	AN02810	Preamp	83051A	2/19/2014	2/19/2016	
	ANP01210	Cable	FSJ1P-50A-4A	1/15/2015	1/15/2017	
	AN03302	Cable	32026-29094K-	3/24/2014	3/24/2016	
			29094K-72TC			
	AN03471	<b>RF</b> Characteristics	E4440A	12/19/2013	12/19/2015	
		Analyzer				
	AN00052	Loop Antenna	6502	5/20/2014	5/20/2016	

#### Equipment Under Test (\* = EUT):

Function	Manufacturer	Model #	S/N
Distributed Antenna	Cellphone-Mate, Inc.	Force3 PSB	201502PS000001
System/Booster *			

Support Devices:			
Function	Manufacturer	Model #	S/N
AC Adapter	Adapter Tech.	STD-1805	NA
Signal Generator	Agilent	E4433B	US40052164
Signal Generator	Agilent	E4438C	MY42082260



Test Conditions / Notes:

The equipment under test (EUT) is placed on the Styrofoam table top. EUT set at maximum gain. A remotely located signal generator is connected to input of EUT.

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

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

UL: 788-798, 799-805, 806-817, 817-824, 896-901 MHz DL: 758-768, 769-775, 851-862, 862-869, 935-940 MHz

TXFreq = > Frequency of low/mid/high channels of each band listed above. Modulation=> CW

 Frequency range of measurement = 9 kHz- 10GHz.

 9 kHz
 - 150 kHz ->
 RBW=200 Hz
 VBW=200 Hz

 150 kHz
 - 30 MHz ->
 RBW=9 kHz
 VBW=9 kHz

 30 MHz
 - 1000MHz ->
 RBW=120 kHz
 VBW=120 kHz

 1000MHz-10000MHz ->
 RBW=1 MHz
 VBW=1 MHz

Test environment conditions: Temperature: 21.4°C, Relative Humidity: 45%, Pressure: 100.9kPa FC3

Test procedure: The test was performed in accordance with 47CFR, Section 2.1053 and Appendix D3 of the FCC document: 935210 D02 Signal Booster Certification Requirements v02r01 Dated July 24, 2014.

Software: SC\_S1\_Public\_V3.0 Firmware: V1.0

No emissions below 30MHz were found within 20dB of the limit line. No emissions above 30MHz were found within 20dB of the limit line.

#### **Radiated Spurious Emissions - Summary of Results**

Pass: No data provided since all emissions above and below 30MHz were found within 20dB of the limit line.



## **Test Setup Photo**





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### **Emissions Designator**

2.1033 Application for certification.

(c)

(4) Type or types of emission & (5) Frequency range.

Emission Designator / Band	d Public safety			Public Safety	ESMR	Public Safety	ESMR	900 Inte	erleaved	
					NPSPAC/Interleave		NPSPAC/Interleave			
	UL		DL		UL		DL		UL	DL
	788-805		758-775		806-824		851-869		896-901	935-940
	788-798	799-805	758-768	769-775	806-817	817-824	851-862	862-869		
8K10F1E/F1D		Х		х						
5M00G7D	х		х							
8K10F1E/F1D					х		х			
10K1F3E					х		х			
8K70D1W						x		x		
10K1F3E									Х	Х

(13) For equipment employing digital modulation techniques, a detailed description of the modulation system to be used, including the response characteristics (frequency, phase and amplitude) of any filters provided, and a description of the modulating wavetrain, shall be submitted for the maximum rated conditions under which the equipment will be operated.

CW signals were used for all tests except for occupied bandwidth and emissions masks since CW signals gives worst case results IAW Appendix D3 of the FCC document: 935210 D02 Signal Booster Certification Requirements v02r01 Dated July 24, 2014

8K10F1E/F1D (C4FM, compatible four-level frequency modulation) in a 12.5 kHz channel

The basic characteristics of Project 25 radios (Phase I) C4FM is an APCO 25-compliant, 4-level FSK (frequency shift keying) modulation that transmits data at the rate of 2 bits per symbol (4.8 ksps).

For F1E / F1D according to the APCO 25 information, the necessary bandwidth is calculated from the P25 high deviation pattern of 2850 Hz deviation at a 1200 Hz symbol rate.

Bn = 2 x D + 2 x M

Where D = high deviation pattern: 2850 kHz

Where M = symbol rate: 1200Hz

Bn = 8.1 kHz

This is confirmed in the emission designations 8k10F1E & 8k10F1D

\*F1E emission designator provides usage for telephony and F1D provides usage for data/telecommand. Since these are spectrally identical, worst measurements are provided for occupied bandwidth and emission masks.



**<u>5M00G7D</u>** (Long Term Evolution) in a 5MHz channel

LTE uses 5MHz signal 25 resource blocks transmitting uplink with SC-FDMA and downlink with OFDM modulation.

The necessary bandwidth is based upon a 99% power measurement of the transmitter spectrum, per §2.202(a) / TRC-43 section

8K70D1W (Linear Simulcast Modulation) in a 12.5 kHz channel

The necessary bandwidth of the modulation signal is not directly calculable per the composite modulation formulas defined in 47 CFR §2.202(g) / TRC-43 section 8.

Quadrature Phase Shift Keying is used to modulate a carrier with a digital bit stream: Data Rate: R = 9600 bps; Bits per Symbol: S=4; Bn =2BK; B = R/log2(s) = 9600/log2 (4) = 4800; K= 0.9; Bn = 2\*4800\*0.9; Bn = 8700 Hz.

\*D1W emission designator provides for usage as a combination of data /Telecommand and telephony.

#### 10K1F3E

Using the formulas contained in Part 2.202 the necessary bandwidth calculation will be:

Bn = 2 x D + 2 x M Where D = maximum deviation: 2.5 kHz Where M = maximum modulation frequency: 2.55 kHz Bn = 10.1 kHz This is confirmed in the emission designation 10k10F3

Measurements have also been made to verify these calculated bandwidths. Measurements have been made of each modulation type using a spectrum analyzer.