Cellphone-Mate, Inc.

TEST REPORT FOR

Wideband Consumer Booster
Model: EZ 4GV V1.0

Tested to The Following Standard:

FCC Part 20.21 / 27

Report No.: 102393-8

Date of issue: April 29, 2019

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 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.

Test Certificate # 803.06

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ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

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

Representative: Dennis Findley
Customer Reference Number: CKC03272019

REPORT PREPARED BY:

Morgan Tramontin
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 102393

DATE OF EQUIPMENT RECEIPT: April 1, 2019
DATE(S) OF TESTING: April 1 – 3, 2019

Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the equipment provided by the client, 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
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.
1120 Fulton Place
Fremont, CA 94539

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.12
EMITest Immunity	5.03.10

Site Registration & Accreditation Information

Location	*NIST CB #	FCC	JAPAN
Fremont, CA	US0082	US1023	A-0149

*CKC's list of NIST designated countries can be found at: https://standards.gov/cabs/designations.html

SUMMARY OF RESULTS

Standard / Specification: FCC Part 20.21/27
Wideband Consumer Signal Booster Measurement Guidance: DO3 v04r02, June 19, 2018

Correlation Matrix & Results					
Guidance Section	**Guidance Description**	**FCC Section**	**FCC Rule Description**	**Mods**	**Results**
7.1 a) - k)	Authorized Frequency Band Verification Test	20.21(e)(3)	Frequency Bands	NA	Pass
7.2.2 a) - k)	Maximum Power Measurement Procedure	2.1046/20.21(e)(8)(i)(D)	Power Limit	NA	Pass
7.3 a) - d)	Maximum Booster Gain Computation	20.21(e)(8)(i)(B)	Bidirectional Capabilities	NA	Pass
7.4 a) - n)	Intermodulation Product	20.21(e)(8)(i)(F)	Intermodulation Limit	NA	Pass
7.5 a) - n)	Out of Band Emissions	20.21(e)(8)(i)(E)	Out of Band Emission	NA	Pass
7.6 a) - e)	Conducted Spurious Emission	2.1051/22H/24E/27	Spurious emission	NA	Pass
7.7.1 a) - g) 7.7.1 h) - n) 7.7.2 a) - g)	Noise Limit Procedure Variable Noise Variable Noise Timing	20.21(e)(8)(i)(A)(2)(i) 20.21(e)(8)(i)(A)(1) 20.21(e)(8)(i)(H)	Noise Limits Transmit Power Off Mode	NA	Pass
7.8 a) - l)	Uplink inactivity	20.21(e)(8)(i)(I)	Uplink Inactivity	NA	Pass

NA = Not Applicable

Standard / Specification: FCC Part 20.21/27 - continued

Correlation Matrix & Results					
Guidance Section	**Guidance Description**	**FCC Section**	**FCC Rule Description**	**Mods**	**Results**
7.9.1 a) - l) 7.9.2 a) - f)	Variable Booster Gain Variable Uplink Gain Timing	20.21(e)(8)(i)(C) (1), (2)(i) 20.21(e)(8)(i)(H)	Booster Gain Transmit Power Off Mode	NA	Pass
7.10.a) - j)	Occupied Band Width	2.1049/22H/24E/27	Occupied Band Width	NA	Pass
7.11.2 a) - r) 7.11.3 a) - h) 7.11.4 a) - h) (alternate to 7.11.3)	Anti-Oscillation	20.21(e)(8)(ii)(A)	Anti-Oscillation	NA	Pass
7.12a) - f)	Radiated Spurious Emission	2.1053/ 22H/24E/27	Spurious Emission	NA	Pass
7.13 a) - c)	Spectrum Block Filter			NA	NA1
7.14.2 7.14.3	Verification of self-monitoring Verification of two-enclosure booster system operation			NA	NA**2**

NA = Not applicable
NA1 = Not applicable because the EUT does not have spectrum blocking.
NA2 = Not applicable because this device does not employ dual enclosure operation.

ISO/IEC 17025 Decision Rule
The declaration of pass or fail herein is based upon assessment to the specification(s) listed above, including where applicable, assessment of measurement uncertainties. For performance related tests, equipment was monitored for specified criteria identified in that section of testing.

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 to the equipment during testing.

Summary of Conditions
None

EQUIPMENT UNDER TEST (EUT)

During testing, numerous configurations may have been utilized. The configurations listed below support compliance to the standard(s) listed in the Summary of Results section.

Configuration 1

Equipment Tested:

Device	Manufacturer	Model #	S/N
Power Supply	Surecall	GME18A-050300FUR	NA
Wideband Consumer Booster	Cellphone-Mate, Inc.	EZ 4GV V1.0	4

Support Equipment:

Device	Manufacturer	Model #	S/N
NA			

General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Type of Equipment	Wideband Consumer booster/Zone Enhancer
Operating Frequency Range:	UL: 776-787MHz DL: 746-757MHz
Emissions Type(s):	GXW (GSM) G7W (EDGE) F9W(CDMA) F9W(WCDMA) W7D (LTE)
Modulation Type(s):	0.3 GMSK (GSM) 3p/8 8-PSK (EDGE) QPSK (CDMA) BPSK/QPSK (WCDMA) OFDM (LTE)
Number of TX Chains:	1
Antenna Type(s) and Gain:	Dedicated, See antenna kitting information
Beamforming Type:	NA
Antenna Connection Type:	Donor/Outdoor integral antenna/ UL: 50 Ohm SMA Server / indoor antenna/ DL: 75 Ohm F
Nominal Input Voltage:	120V/60
Firmware / Software used for Test:	EZ_LTEV_V1005SC

FCC PART 20.21/27

General Test Setup

Summary of Conditions
The equipment under test (EUT) is a Fixed Wideband Consumer Booster. The EUT is placed on the Styrofoam platform for radiated emission and a test bench for conducted emission measurement. Conducted measurement performed at the Outside (Donor) and Inside (Server) antenna port. The EUT Server port is a type F connector and 75-ohm impedance. The EUT Donor port is SMA connector and 50-ohm impedance. The EUT uses an integral Donor antenna installed in the enclosure. UL: 776-787MHz DL: 746-757MHz Test procedure: The test was performed IAW the FCC document: 935210 D03 Signal Booster Measurements v04r02, dated June 19, 2018. Test environment conditions: Temperature: 22.3 – 25°C, Relative Humidity: 47 - 52 %, Atmospheric Pressure: 101kPa

7.1 Authorized Frequency Band Verification

Test Conditions / Setup

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • 510 249 1170		
Customer:	**Cellphone-Mate, Inc.**		
Specification:	7.1 Band verification		
Work Order #:	**102393**	Date:	4/1/19
Test Type:	**Conducted Emissions**	Time:	08:04:00 AM
Tested By:	E. Wong	Sequence#:	1

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

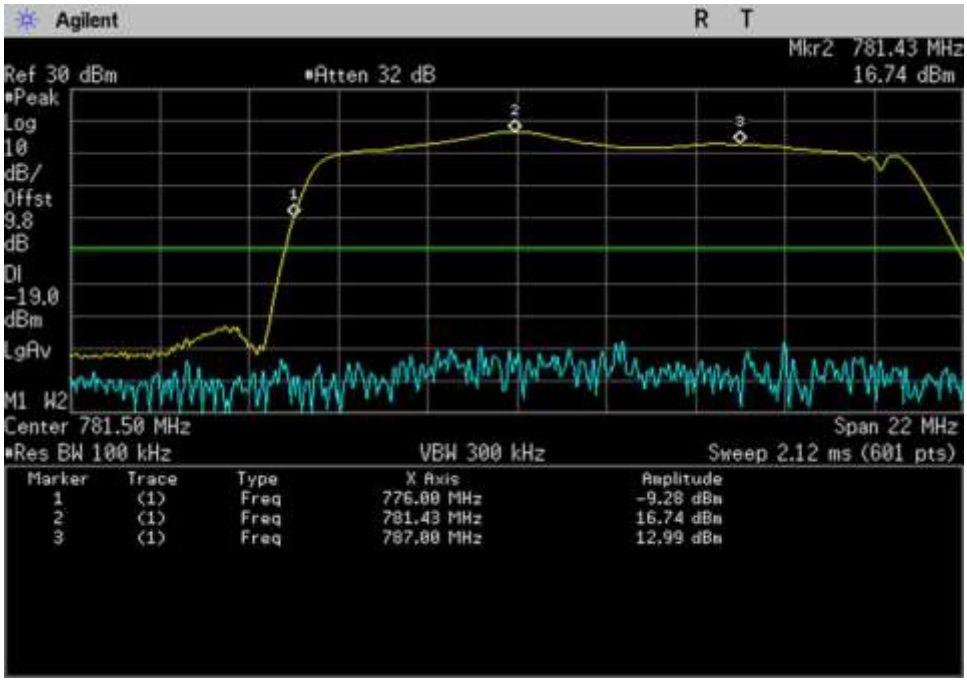
Test Equipment:

Asset #	Description	Model	Calibration Date	Cal Due Date
03471	Spectrum Analyzer	E4440A	1/18/2018	1/18/2020
P05411	Attenuator	54A-10	1/19/2018	1/19/2020
P07191	Cable	32022-29094K-29094K-48TC	10/30/2017	10/30/2019
P07192	Cable	32022-29094K-29094K-48TC	10/9/2017	10/9/2019
P06909	Attenuator	PE7083	12/20/2017	12/20/2019
03418	Signal Generator	E4438C	6/19/2017	6/19/2019

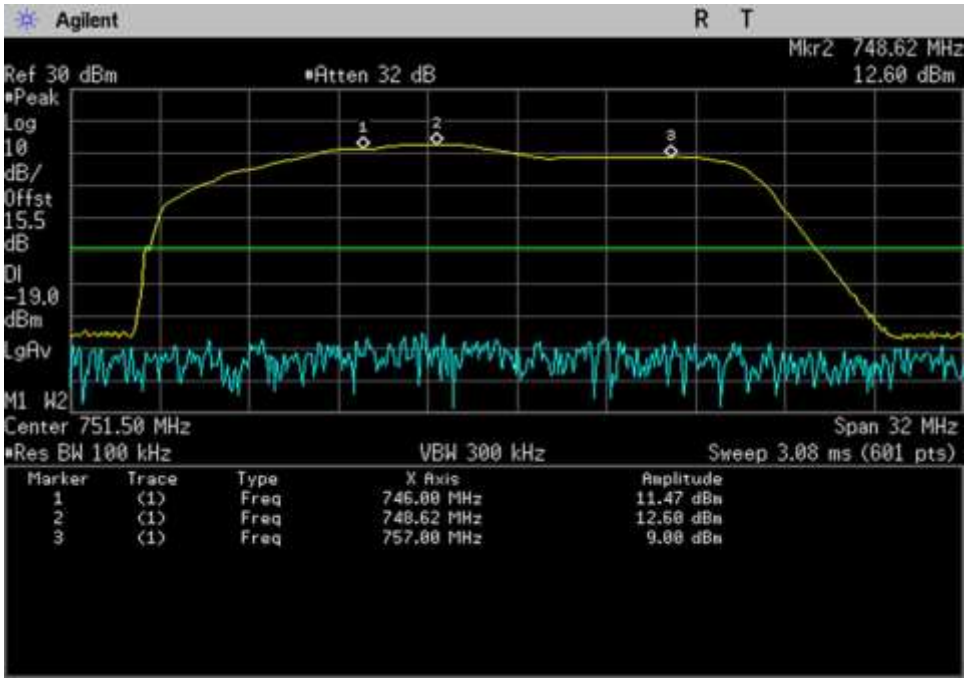
Summary of Results

Pass: The plots below show the device only operates on the CMRS frequency bands authorized for use by the NPS.

Plots



UL_776-787_ 776- 781.43MHz_SN4



DL_746-757_ 746- 748.62MHz_SN4

7.2 Maximum Power / 7.3 Maximum Gain

Test Conditions / Setup

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

Customer: **Cellphone-Mate, Inc.**
Specification: **7.2 Maximum Power Measurement**
7.3 Maximum Booster Gain
Work Order #: **102393** Date: 4/1/19
Test Type: **Conducted Emissions** Time: 09:04:00 AM
Tested By: E. Wong Sequence#: 1

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Equipment:

Asset #	Description	Model	Calibration Date	Cal Due Date
03471	Spectrum Analyzer	E4440A	1/18/2018	1/18/2020
P05411	Attenuator	54A-10	1/19/2018	1/19/2020
P07191	Cable	32022-29094K-29094K-48TC	10/30/2017	10/30/2019
P07192	Cable	32022-29094K-29094K-48TC	10/9/2017	10/9/2019
P06909	Attenuator	PE7083	12/20/2017	12/20/2019
03418	Signal Generator	E4438C	6/19/2017	6/19/2019

Summary of Results

Pass: As summarized in table below, measured EIRP, Gain and UL/DL gain ratio are within limits.

Pre AGC				Pre AGC		
Pulse GSM				4.1 MHz AWGN		
Frequency (MHz)	**Input (dBm)**	**Output (dBm)**	**Gain (dB)**	**Input (dBm)**	**Output (dBm)**	**Gain (dB)**
UL776-787	-37.1	25.3	62.4	-35.3	25.4	60.7
DL 746-757	-44.2	15.8	60.0	-46.8	15.9	62.7

Max Fixed Gain limit:
Fixed Wideband Consumer booster

UL	**dB**
776-787 MHz	64.4
DL	
746-757 MHz	64.4

Pulse GSM					Conducted	Conducted and EIRP
Frequency (MHz)	**Output Power (dBm)**	***Ant Gain- (dBi)**	**Cable loss (dB)**	**EIRP (dBm)**	**Limit Min (dBm)**	**Limit Max (dBm)**
UL776-787	25.3	4.0	0.0	29.3	17	30
DL 746-757	15.8	2.5	3.3	15.0	NA	17

4.1MHz AWGN					Conducted	Conducted and EIRP
Frequency (MHz)	**Output Power (dBm)**	***Ant Gain- (dBi)**	**Cable loss (dB)**	**EIRP (dBm)**	**Limit Min (dBm)**	**Limit Max (dBm)**
UL776-787	25.4	4.0	0.0	29.4	17	30
DL 746-757	15.9	2.5	3.3	15.1	NA	17

* Antenna gain and cable losses indicated from the antenna kitting

UL Ant kit number	SC500W (integral antenna)
DL Ant Kit number	SC312W, SC-RG6-50

Section 5.5 power						
	Pulse GSM			4.1 MHz AWGN		
Frequency (MHz)	Input (dBm)	Output (dBm)	Gain (dB)	Input (dBm)	Output (dBm)	Gain (dB)
UL776-787	0.0	25.1	25.1	0.0	25.4	25.4
DL 746-757	-20.0	15.2	35.2	-20.0	14.8	34.8

UL gain vs DL gain	Pulse GSM (dB)	4.1MHz AWGN (dB)	Limit (dB)
UL gain vs DL gain 776/746	2.4	-2.0	9.0

7.4 Intermodulation Product

Test Conditions / Setup

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • 510 249 1170		
Customer:	**Cellphone-Mate, Inc.**		
Specification:	**7.4 Intermodulation**		
Work Order #:	**102393**	Date:	4/1/19
Test Type:	**Conducted Emissions**	Time:	13:04:00 AM
Tested By:	E. Wong	Sequence#:	1

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Equipment:

Asset #	Description	Model	Calibration Date	Cal Due Date
03471	Spectrum Analyzer	E4440A	1/18/2018	1/18/2020
P05411	Attenuator	54A-10	1/19/2018	1/19/2020
P07191	Cable	32022-29094K-29094K-48TC	10/30/2017	10/30/2019
P07192	Cable	32022-29094K-29094K-48TC	10/9/2017	10/9/2019
P06909	Attenuator	PE7083	12/20/2017	12/20/2019
03418	Signal Generator	E4438C	6/19/2017	6/19/2019

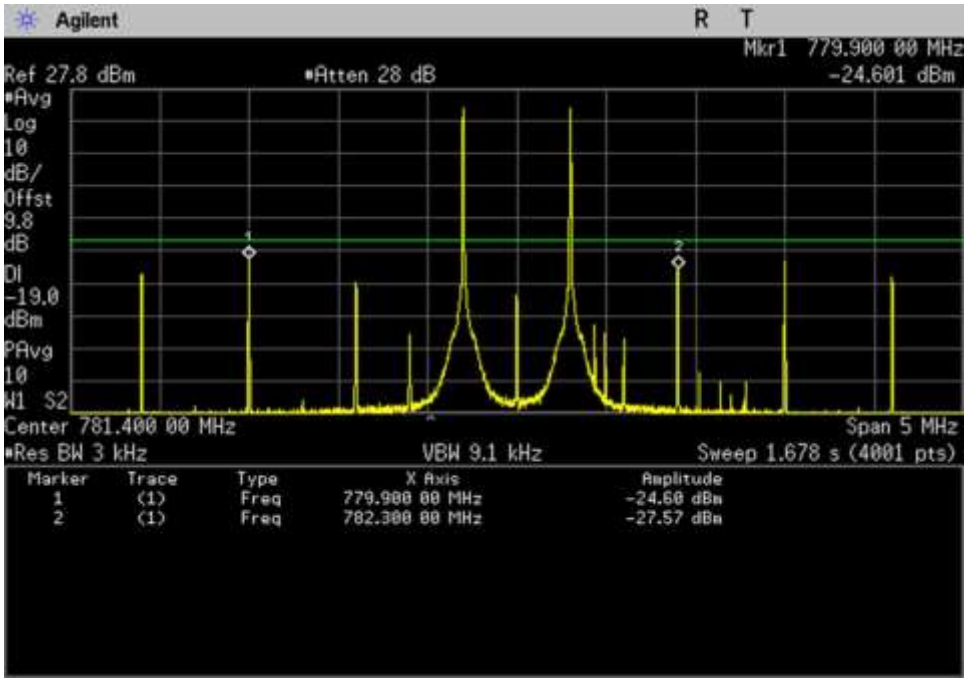
Summary of Results

Pass: As shown on the plots, all intermodulation products measured are below -19dbm limit.

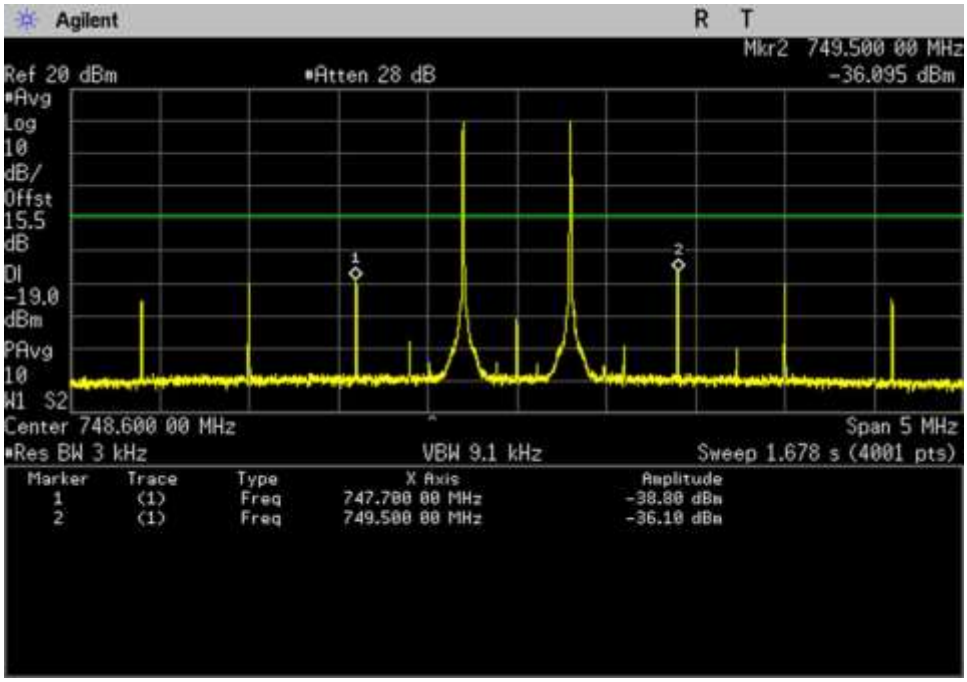
Inter Modulation Product			
Frequency* (MHz)	**Pre AGC (dBm)**	**Limit (dBm)**	**Results**
UL 776-787	-24.6	-19	Pass
DL 746-757	-36.1	-19	Pass

Note: The EUT maintains compliance with the intermodulation limit at input power of AGC+10dB

Plots



UL_776-787_ 781.4MHz_SN4_B



DL_746-757_ 748.6MHz_SN4

7.5 Out of Band Emissions

Test Conditions / Setup

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • 510 249 1170		
Customer:	**Cellphone-Mate, Inc.**		
Specification:	**7.5 Out of Band Emission**		
Work Order #:	**102393**	Date:	4/2/19
Test Type:	**Conducted Emissions**	Time:	14:00:00 PM
Tested By:	E. Wong	Sequence#:	1

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Additional plots taken to show compliance under different RBW requirement as applicable.

Test Equipment:

Asset #	Description	Model	Calibration Date	Cal Due Date
03471	Spectrum Analyzer	E4440A	1/18/2018	1/18/2020
P05411	Attenuator	54A-10	1/19/2018	1/19/2020
P07191	Cable	32022-29094K-29094K-48TC	10/30/2017	10/30/2019
P07192	Cable	32022-29094K-29094K-48TC	10/9/2017	10/9/2019
P06909	Attenuator	PE7083	12/20/2017	12/20/2019
03418	Signal Generator	E4438C	6/19/2017	6/19/2019

Summary of Results

CDMA (alternative 1.25 MHz AWGN)

Low			
Out of Band Emission			
Frequency (MHz)	Pre AGC	Limit (dBm)	Results
UL776-787	-33.0	-19	Pass
DL 746-757	-45.2	-19	Pass

High			
Out of Band Emission			
Frequency (MHz)	Pre AGC	Limit (dBm)	Results
UL776-787	-33.2	-19	Pass
DL 746-757	-45.2	-19	Pass

GSM

Low			
Out of Band Emission			
Frequency (MHz)	Pre AGC	Limit (dBm)	Results
UL776-787	-20.7	-19	Pass
DL 746-757	-32.9	-19	Pass

High			
Out of Band Emission			
Frequency (MHz)	Pre AGC	Limit (dBm)	Results
UL776-787	-24.4	-19	Pass
DL 746-757	-31.0	-19	Pass

LTE (alternative 4.1MHz AWGN)

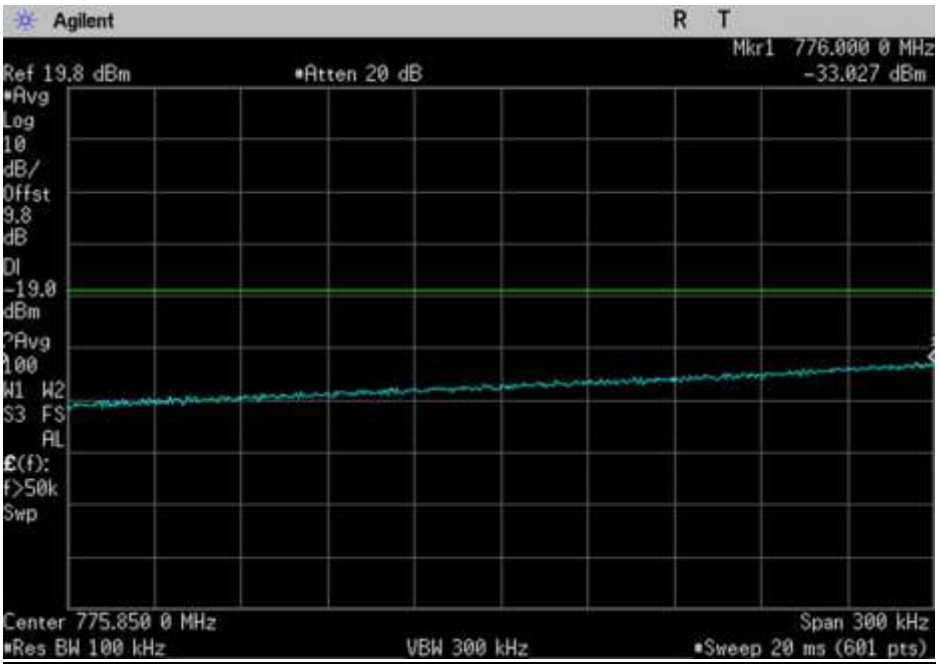
Low			
Out of Band Emission			
Frequency (MHz)	Pre AGC	Limit (dBm)	Results
UL776-787	-33.9	-19	Pass
DL 746-757	-34.7	-19	Pass

High			
Out of Band Emission			
Frequency (MHz)	Pre AGC	Limit (dBm)	Results
UL776-787	-24.4	-19	Pass
DL 746-757	-34.0	-19	Pass

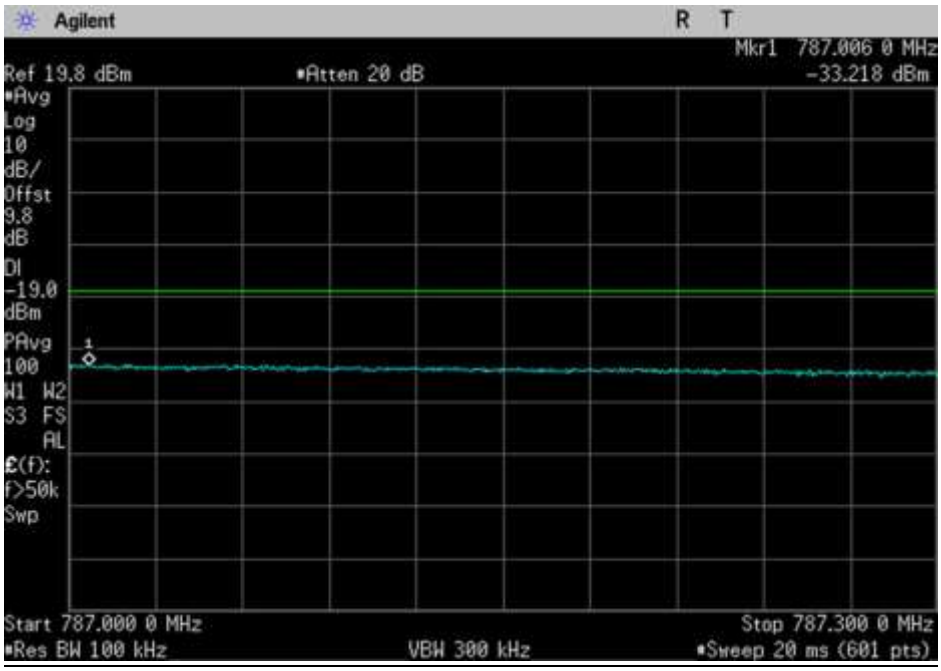
Note: The EUT also maintains compliance with the out-of-band emissions limit at input power 10dB above AGC or indicated in section 5.5.

Plots

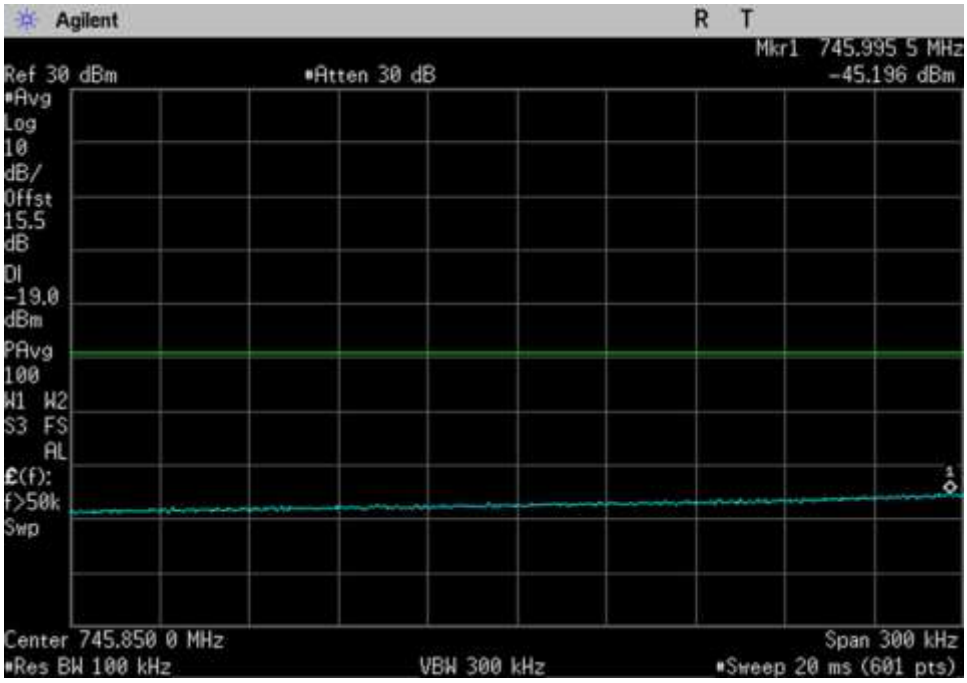
CDMA



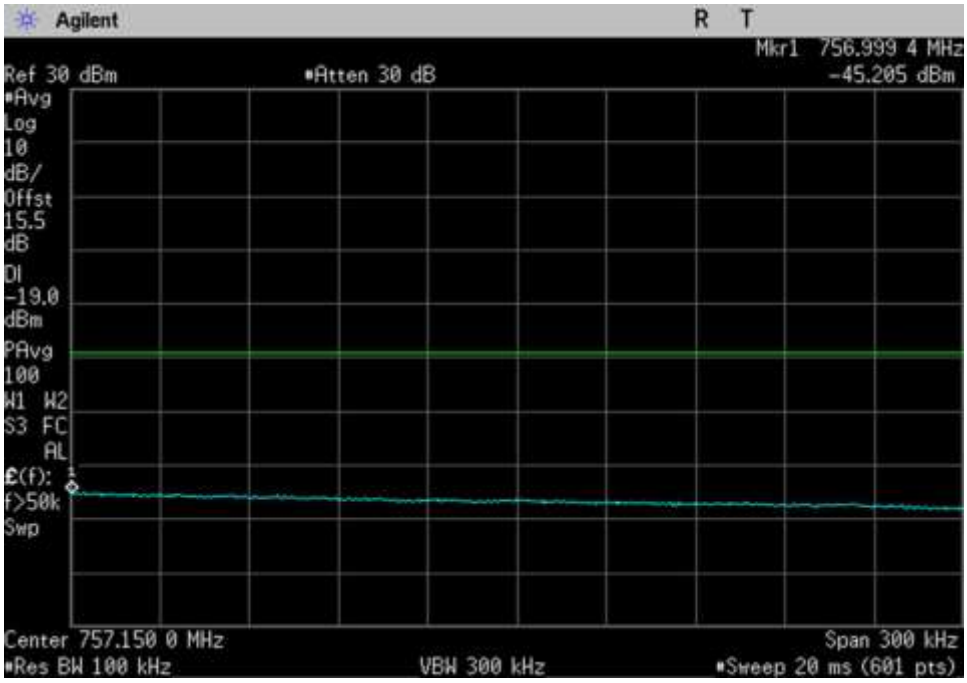
UL_776-787_CDMA_ 775.7- 776MHz_SN4



UL_776-787_CDMA_ 787- 787.3MHz_SN4

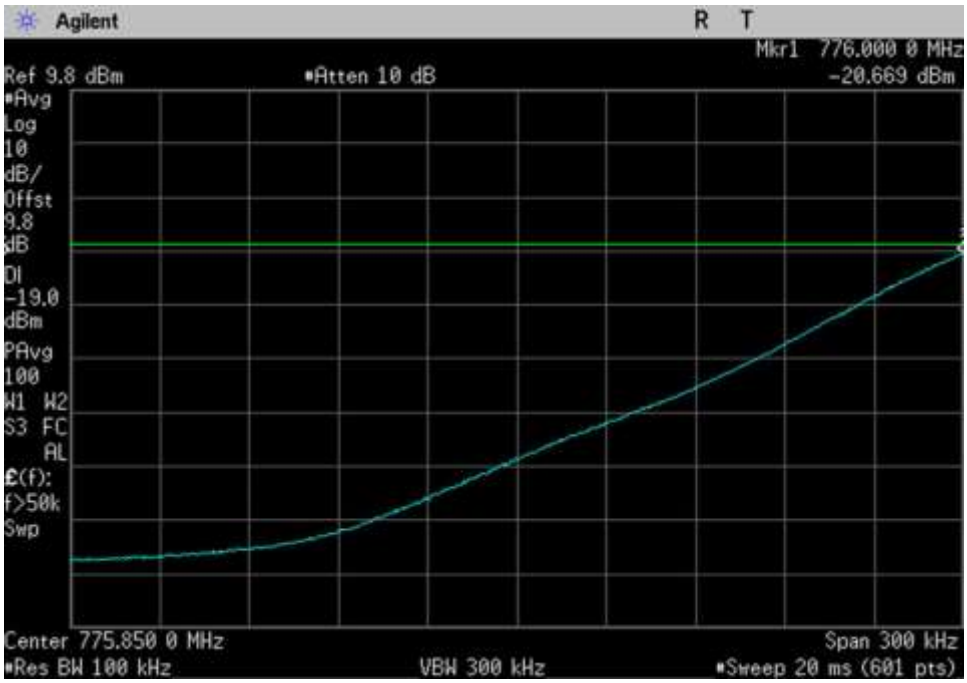


DL_746-757_CDMA_ 745.7- 746MHz_SN4

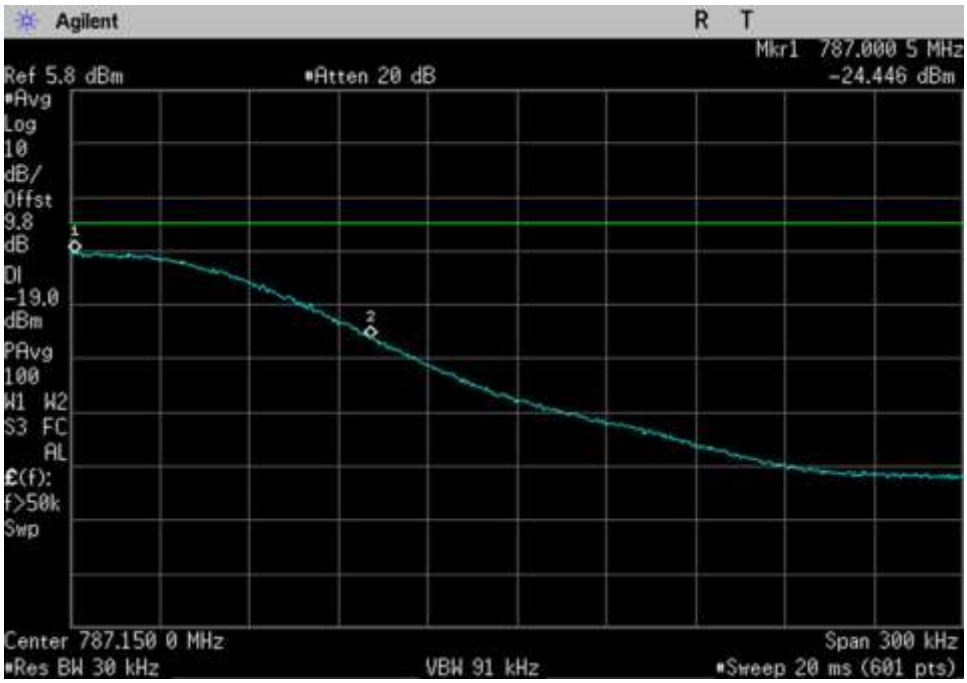


DL_746-757_CDMA_ 757- 757.3MHz_SN4

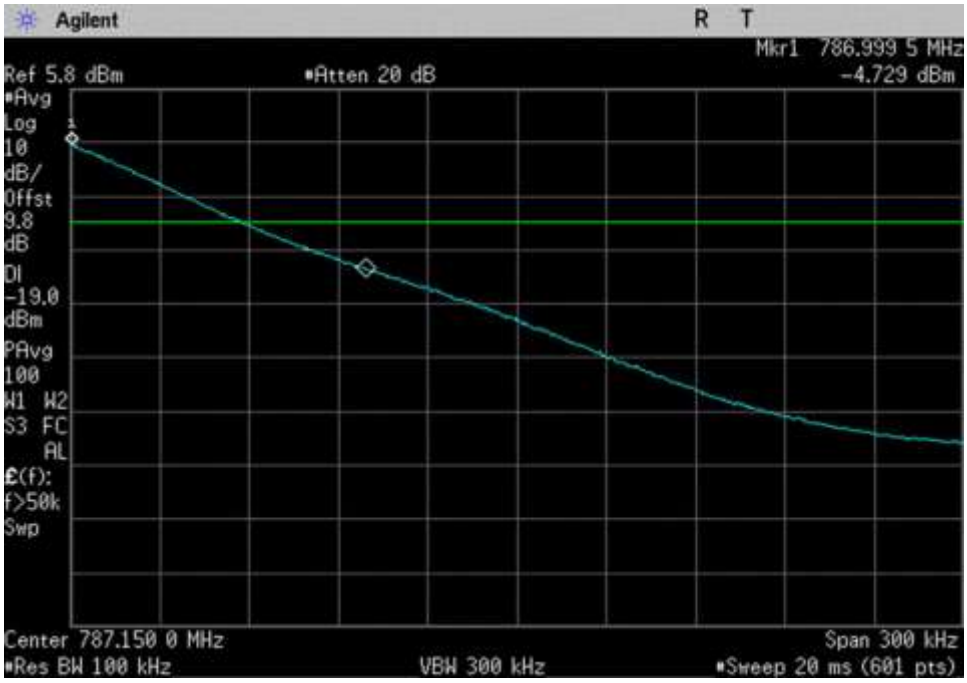
GSM



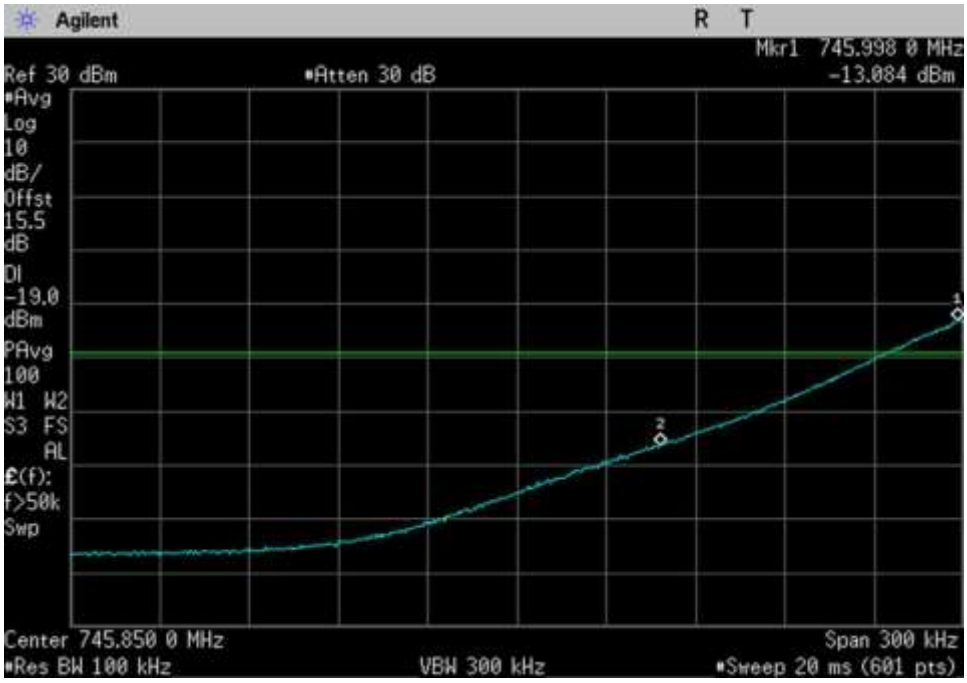
UL_776-787_GSM_ 775.7- 776MHz_SN4_



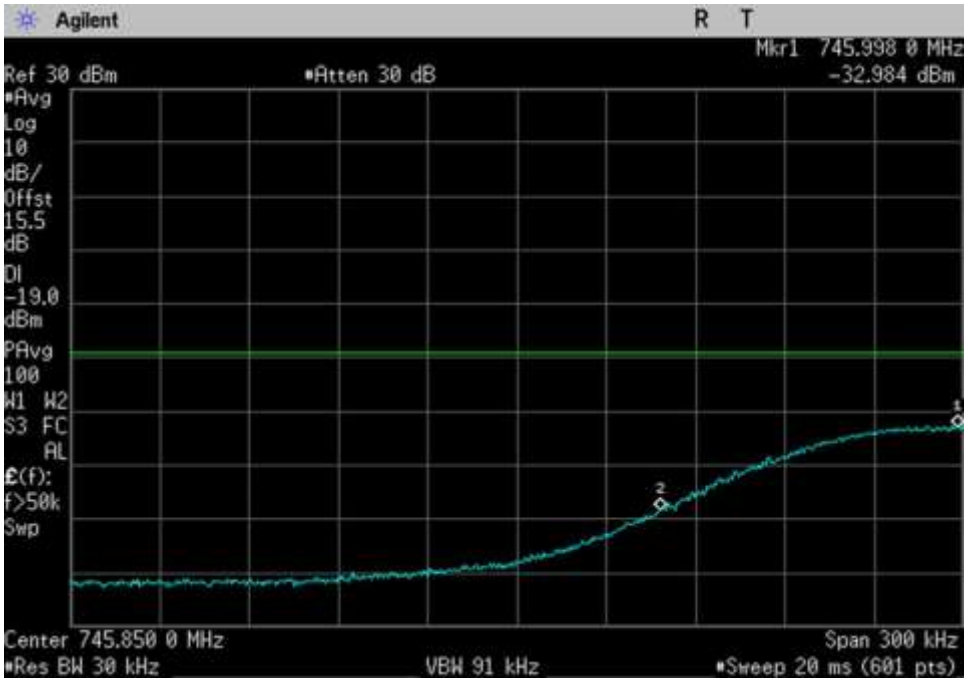
UL_776-787_GSM_ 787- 787.3MHz_a_SN4_30K_



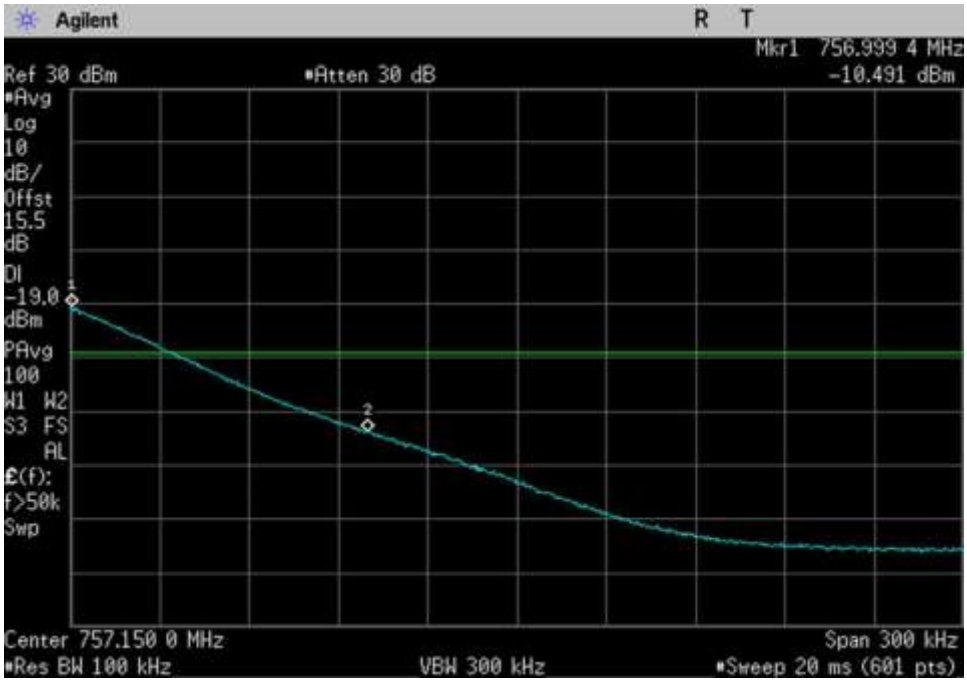
UL_776-787_GSM_ 787- 787.3MHz_b_SN4_100K



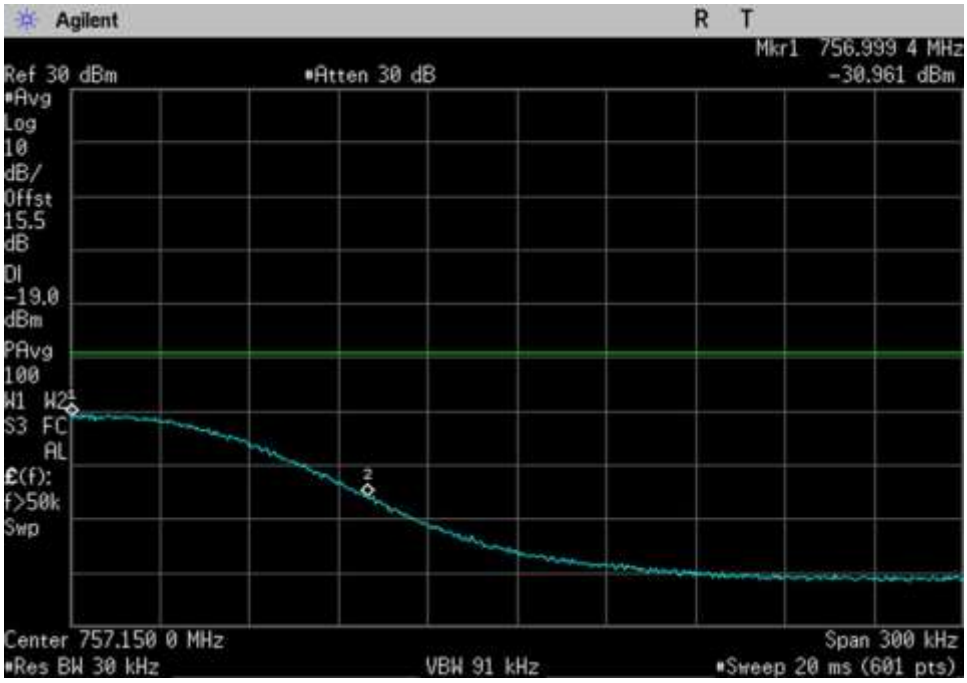
DL_746-757_GSM_ 745.7- 746MHz_a_SN4_100kHz_



DL_746-757_GSM_ 745.7- 746MHz_b_SN4_30kHz

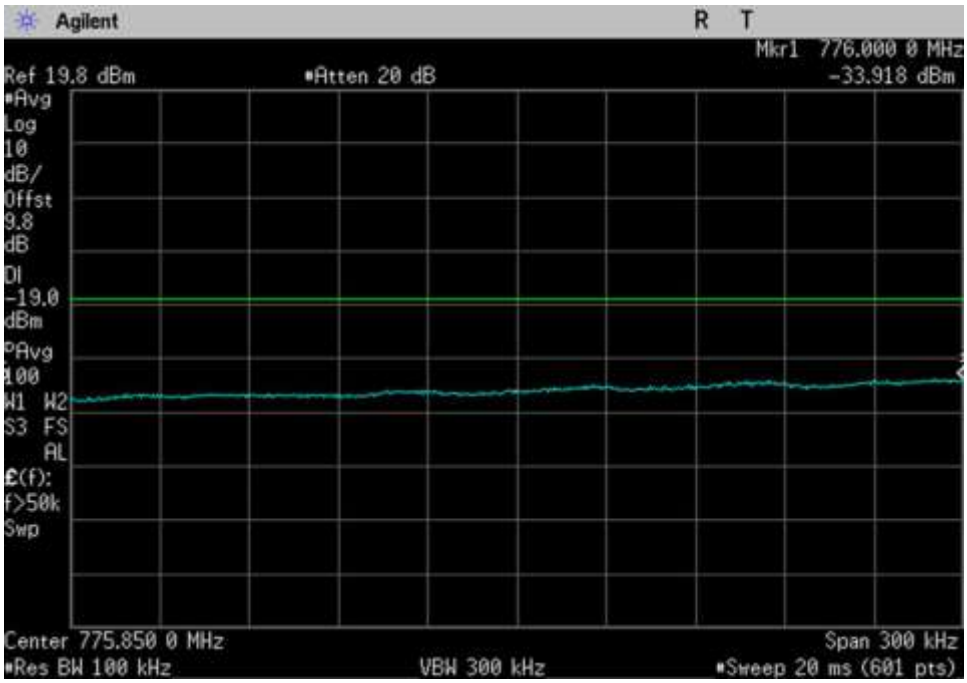


DL_746-757_GSM_ 757- 757.3MHz_a-SN4-100kHz

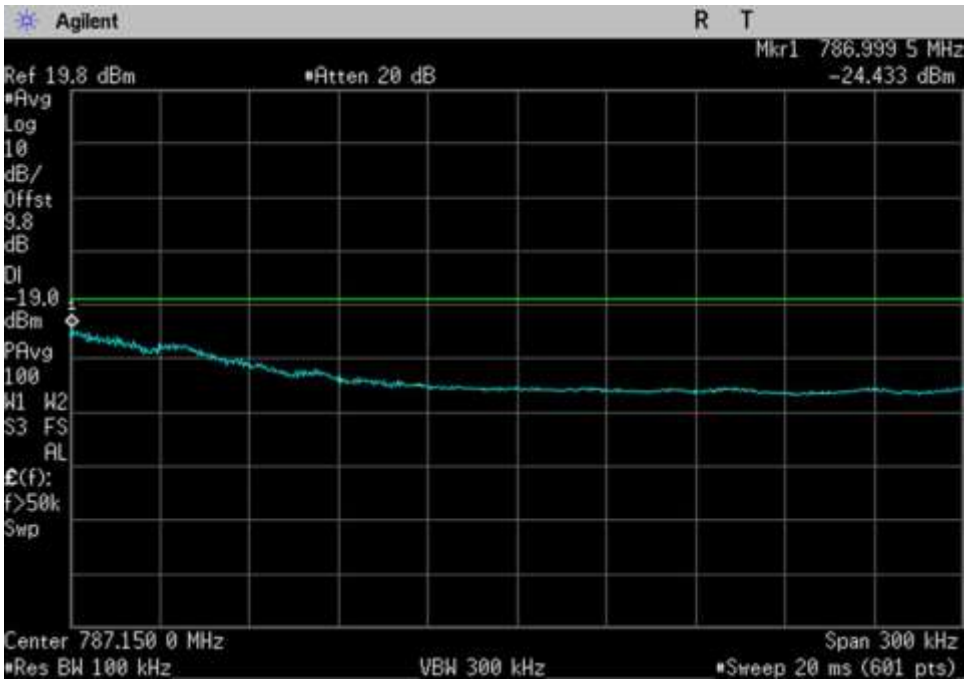


DL_746-757_GSM_ 757- 757.3MHz_b_SN4_30kHz

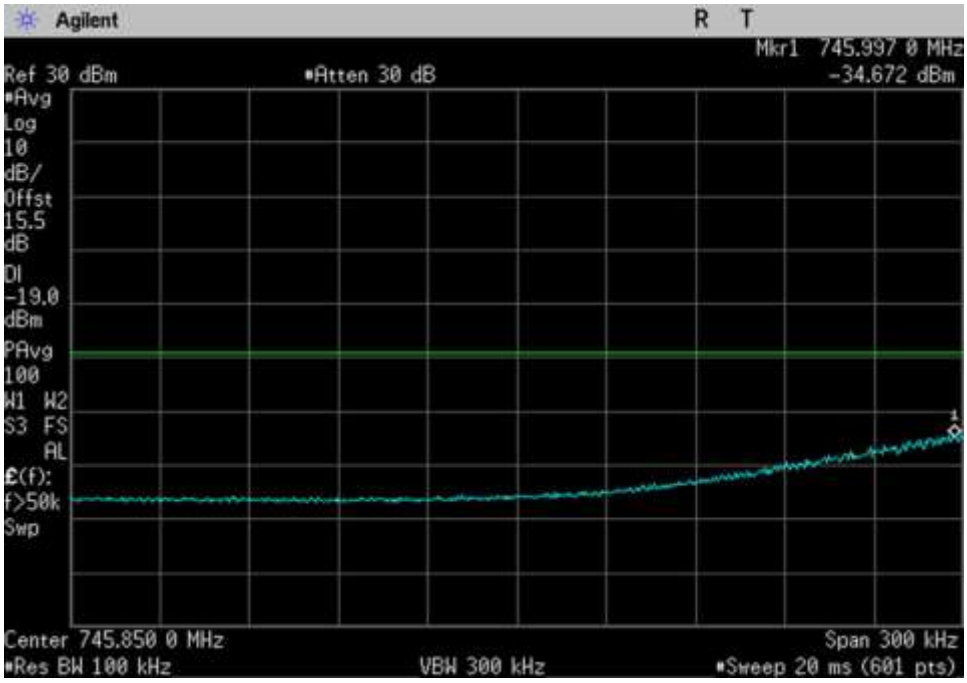
LTE



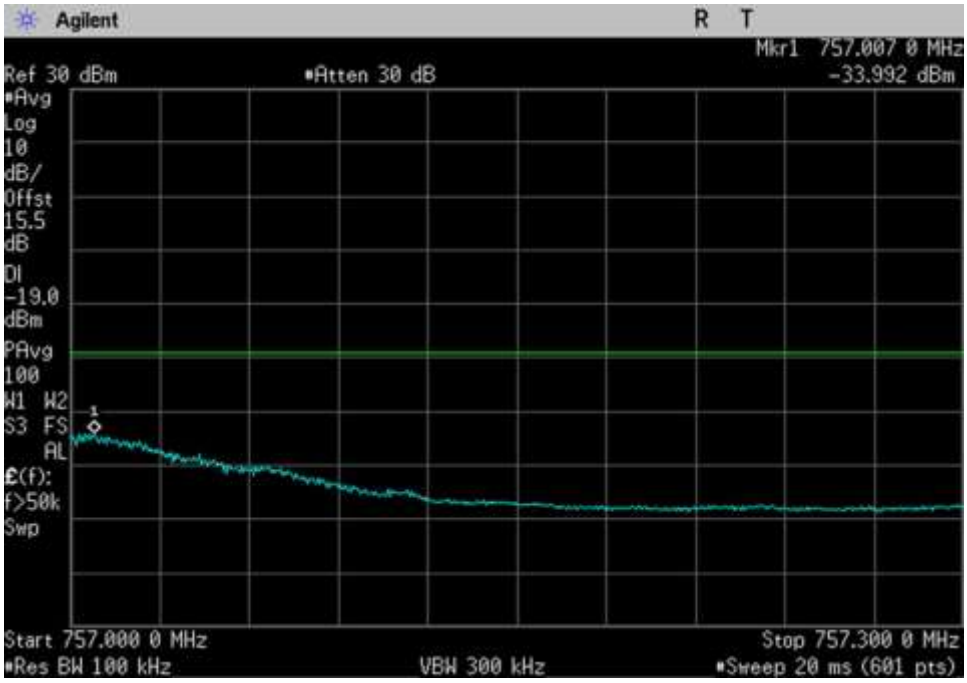
UL_776-787_LTE_ 775.7- 776MHz_SN4



UL_776-787_LTE_ 787- 787.3MHz_SN4



DL_746-757_LTE_ 745.7- 746MHz_SN4



DL_746-757_LTE_ 757- 757.3MHz_SN4

7.6 Conducted Spurious Emissions

Test Conditions / Setup

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • 510 249 1170		
Customer:	**Cellphone-Mate, Inc.**		
Specification:	**7.6 Conducted Spurious Emissions**		
Work Order #:	**102393**	Date:	4/2/19
Test Type:	**Conducted Emissions**	Time:	15:00:00
Tested By:	E. Wong	Sequence#:	1

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency range of measurement = 9kHz- 8GHz.
9 kHz - 150 kHz -> RBW= 200Hz VBW= 200Hz
150 kHz - 30 MHz -> RBW= 9kHz VBW= 9kHz
30 MHz - 1000MHz -> RBW*= 1MHz VBW= 3MHz
1000 MHz - 8000MHz ->RBW= 1MHz VBW= 3MHz

*As specified on 7.6 Conducted spurious emissions test procedure of 935210 D03 Signal Booster Measurements, for frequencies below 1 GHz, an RBW of 1 MHz may be used in a preliminary measurement. If non-compliant emissions are detected, a final measurement shall be made with a 100 kHz RBW. Additionally, a peak detector may also be used for the preliminary measurement. If non-compliant emissions are detected, then a final measurement of these emissions shall be made with the power averaging (RMS) detector.

**Visual inspection of analyzer trace from 9kHz-30MHz, no emission found, trace not included in plots.

In addition, for operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to −70 dBW/MHz equivalent isotopically 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

Test Equipment:

Asset #	Description	Model	Calibration Date	Cal Due Date
03471	Spectrum Analyzer	E4440A	1/18/2018	1/18/2020
P05411	Attenuator	54A-10	1/19/2018	1/19/2020
P07191	Cable	32022-29094K-29094K-48TC	10/30/2017	10/30/2019
P07192	Cable	32022-29094K-29094K-48TC	10/9/2017	10/9/2019
P06909	Attenuator	PE7083	12/20/2017	12/20/2019
03418	Signal Generator	E4438C	6/19/2017	6/19/2019

Summary of Results

Pass: As summarized in plots below, the conducted spurious emissions are within limits.

9 kHz-30 MHz

No Conducted Spurious Emissions were found within 20dB of the limit.

The 1559-1610 band was also investigated and found emission within limits using applied correction (see calculation below).

Limit Line Calculation*					
Frequency	**Antenna Gain- cable loss**		**Limit line EIRP**	**Limit line EIRP**	**Limit line EIRP corrected**
(MHz)	**(dBi)**		**(dBW/MHz)**	**(dBm)**	**(dBm)**
UL 776-787	4		-70.0	-40	-44

LIMIT LINE FOR SPURIOUS CONDUCTED EMISSION

REQUIRED ATTENUATION = 43+10 LOG P DB

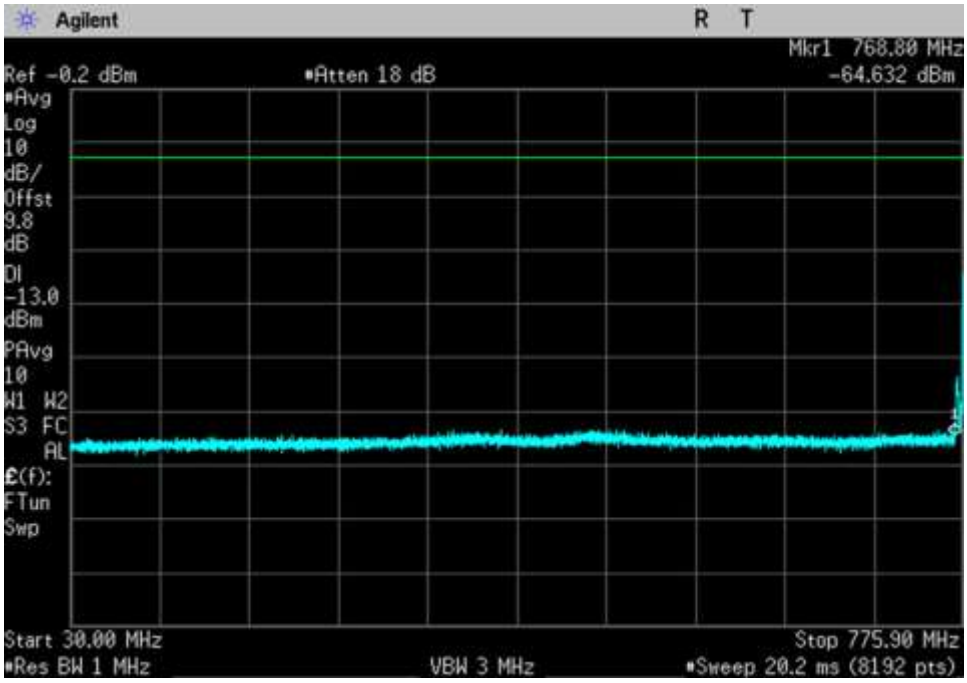
Limit line (dBuV) = V_{dBuv} - Attenuation

$$V_{dBuV} = 20\,\mathrm{Log}\,\frac{V}{1\,x\,10^{-6}}$$
$$= 20\left(\mathrm{Log}\,V - \mathrm{Log}\,1\,x\,10^{-6}\right)$$
$$= 20\,\mathrm{Log}\,V - 20\,\mathrm{Log}1\,x\,10^{-6}$$
$$= 20\,\mathrm{Log}\,V - 20\,(-6)$$
$$= 20\,\mathrm{Log}\,V + 120$$

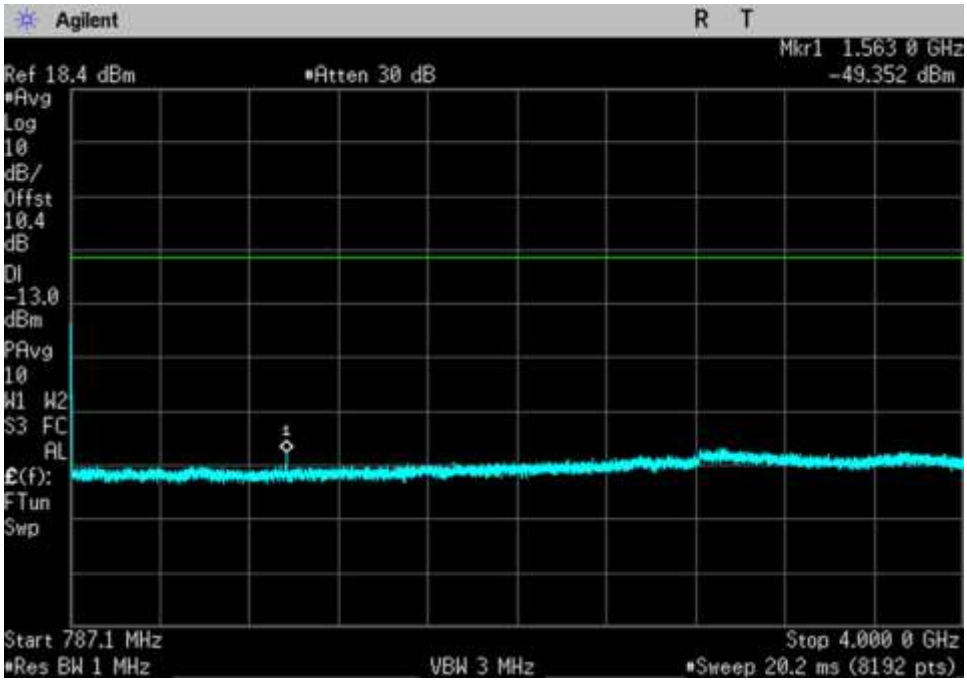
$$\mathrm{Attenuation} = 43 + 10\,\mathrm{Log}\,P$$
$$= 43 + 10\,\mathrm{Log}\,\frac{V^2}{R}$$
$$= 43 + 10\left(\mathrm{Log}\,V^2 - \mathrm{Log}\,R\right)$$
$$= 43 + 10\left(2\,\mathrm{Log}\,V - \mathrm{Log}\,R\right)$$
$$= 43 + 20\,\mathrm{Log}\,V - 10\,\mathrm{Log}\,R$$

Limit line = V_{dBuv} - Attenuation
= 20 Log V + 120 – (43 + 20 Log V – 10Log R)
= 20 Log V + 120 – 43 – 20 Log V + 10Log R
= 20 Log V + 120 – 43 – 20 Log V + 10Log R
= 120 – 43 + 10 Log 50 Note : R = 50 Ω
= 120 –43 + 16.897
= 94 dBuV at any power level

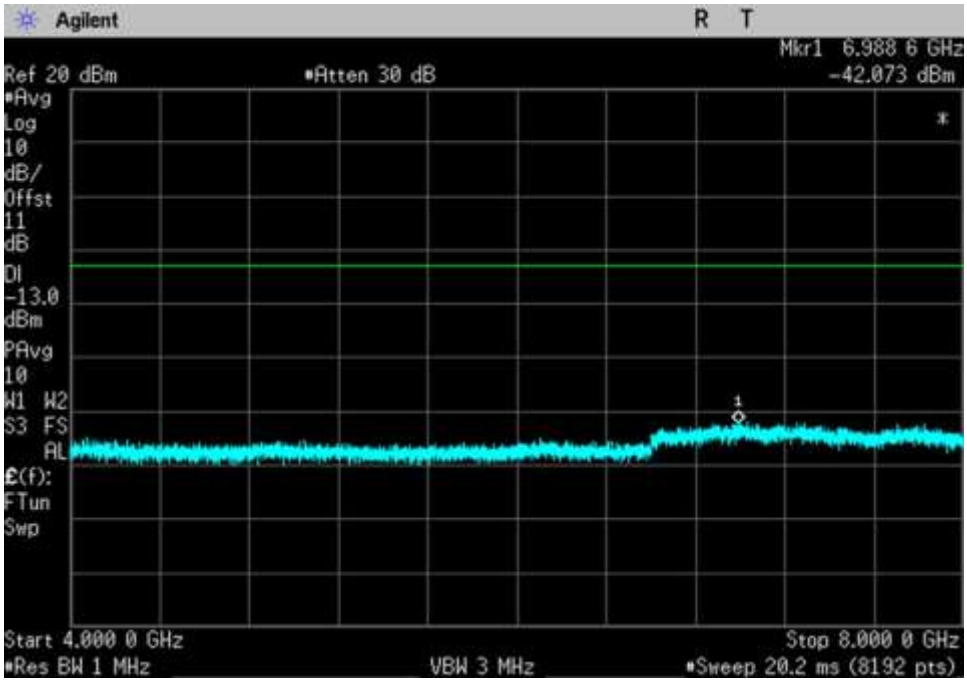
Plots



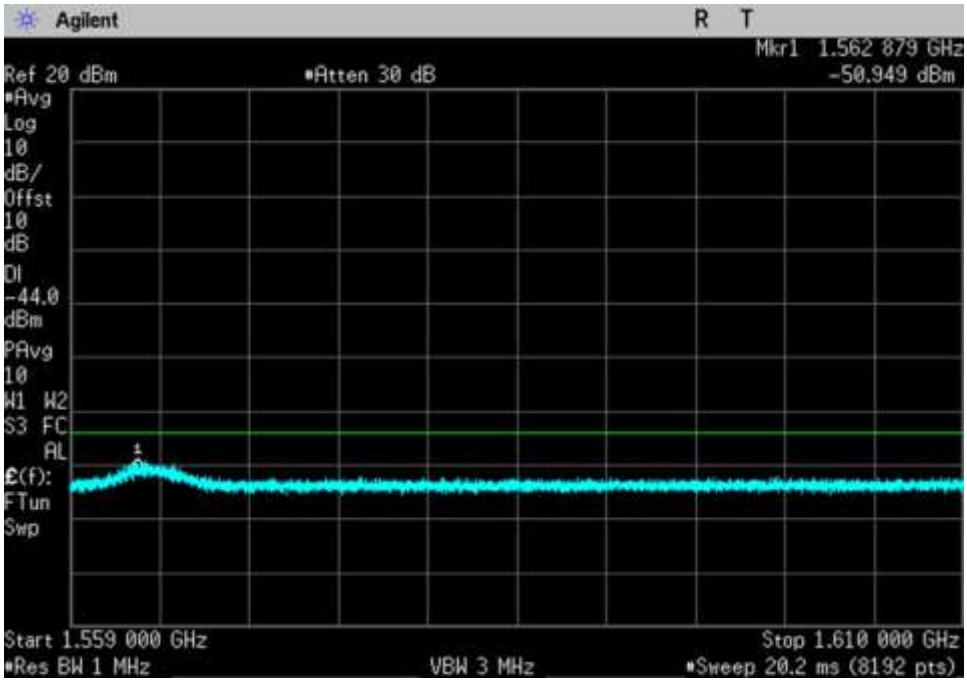
UL_776-787_a 30- 775.9MHz_SN4



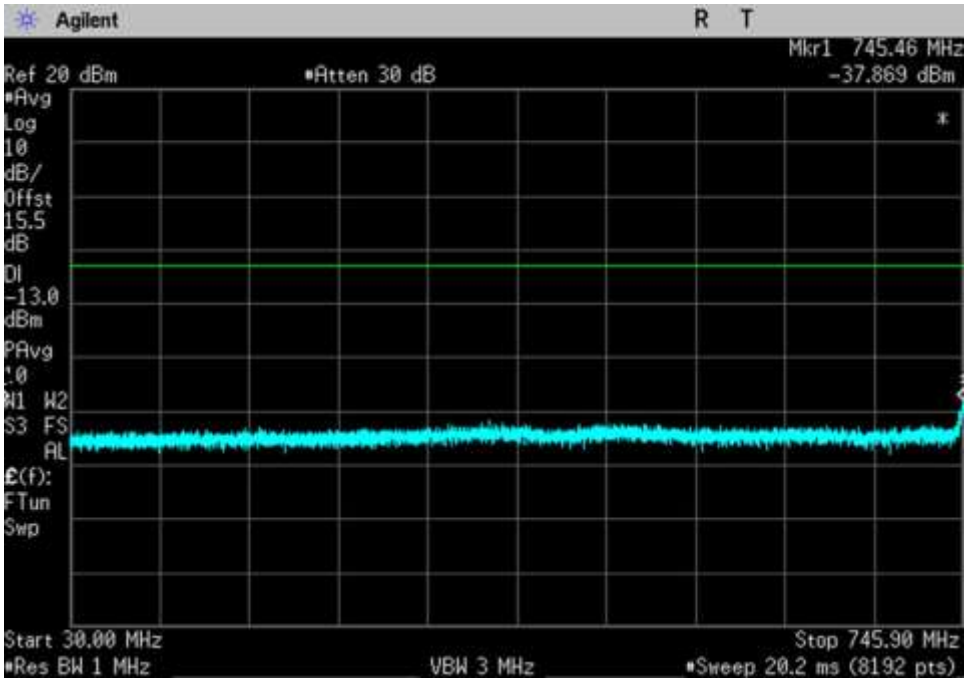
UL_776-787_b 787.1- 4000MHz_SN4



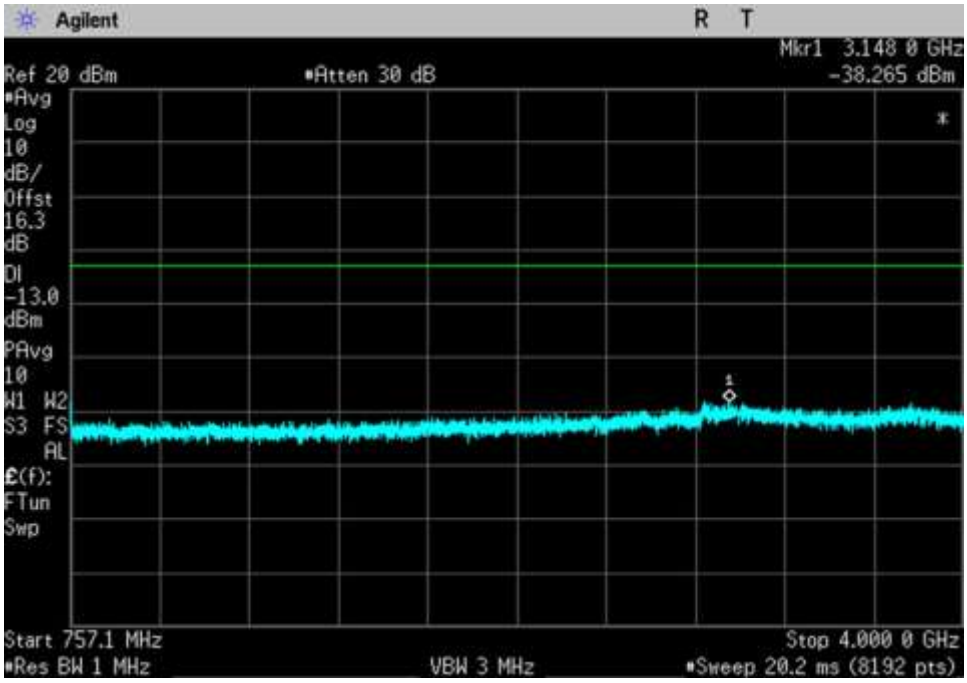
UL_776-787_c 4000- 8000MHz_SN4



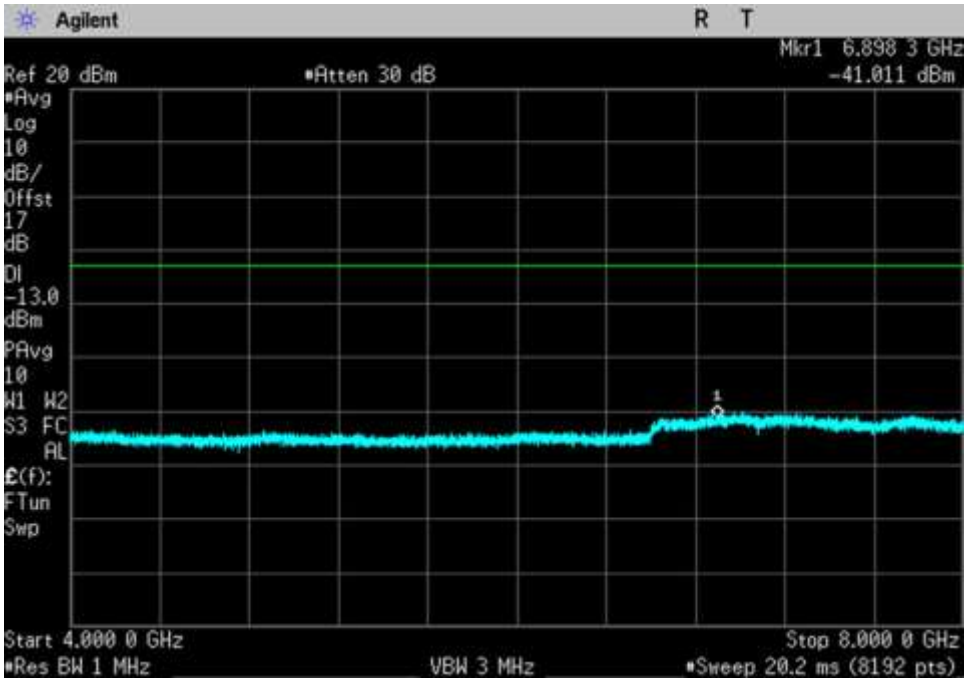
UL_776-787_d 1559- 1610MHz_SN4



DL_746-757_ 30- 745.9MHz_SN4



DL_746-757_ 757.1- 4000MHz_SN4



DL_746-757_ 4000- 8000MHz_SN4

7.7 Noise limit

Test Conditions / Setup

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • 510 249 1170		
Customer:	**Cellphone-Mate, Inc.**		
Specification:	**7.7 Noise Limit (Maximum Transmitter Noise Power Level / Variable UL Noise Timing)**		
Work Order #:	**102393**	Date:	4/2/19
Test Type:	**Conducted Emissions**	Time:	11:28:00
Tested By:	E. Wong	Sequence#:	1

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Equipment:

Asset #	Description	Model	Calibration Date	Cal Due Date
03471	Spectrum Analyzer	E4440A	1/18/2018	1/18/2020
P05411	Attenuator	54A-10	1/19/2018	1/19/2020
P07191	Cable	32022-29094K-29094K-48TC	10/30/2017	10/30/2019
P07192	Cable	32022-29094K-29094K-48TC	10/9/2017	10/9/2019
P06909	Attenuator	PE7083	12/20/2017	12/20/2019
C00082	Directional Coupler	722-10-1.500V	9/18/2017	9/18/2019
03418	Signal Generator	E4438C	6/19/2017	6/19/2019

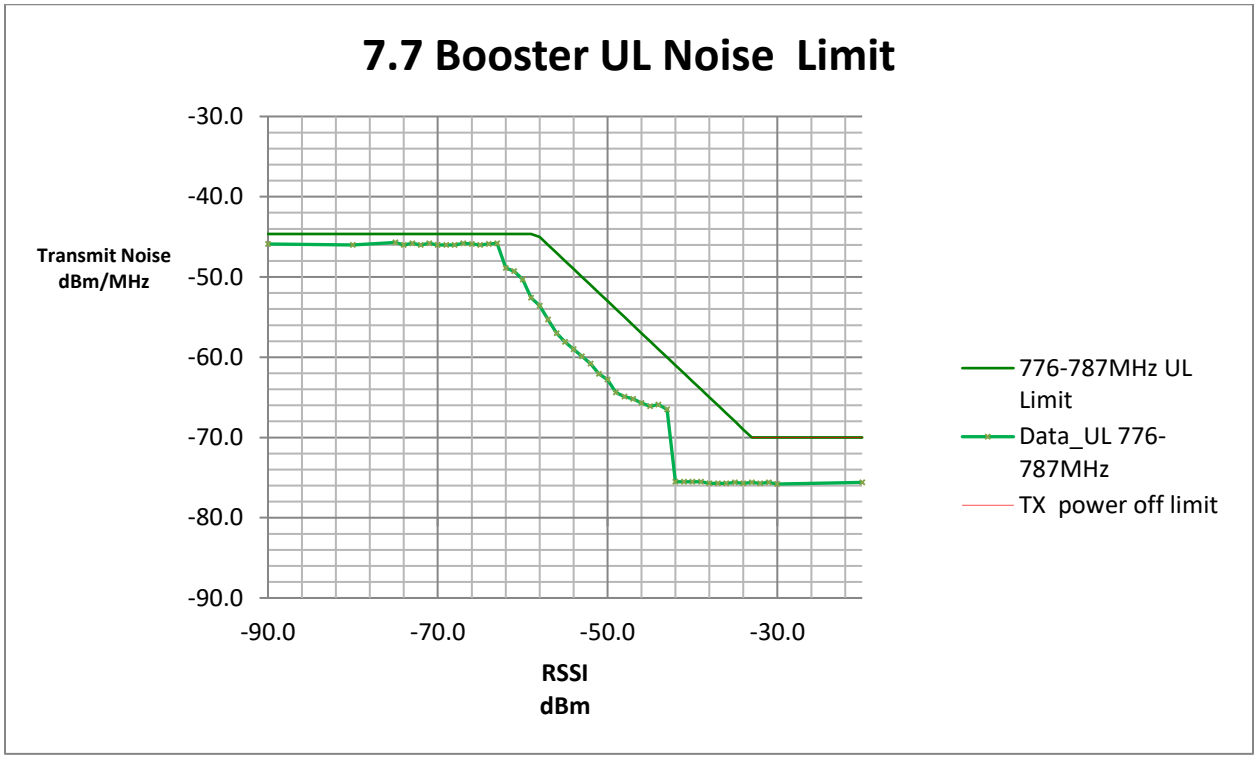
Summary of Results

Pass: As demonstrated, measured noise are within the limit. All maximum variable uplink noise timings are within 3 second limit.

7.7.1 Maximum transmitter noise power level

- 7.7.1 a-g: Maximum transmitter noise with 50-ohm shielded load

Maximum Noise Power			
Frequency MHz	**Measured dBm./MHz**	**Limit dBm/MHz**	**Margin**
UL 776-787	-45.7	-44.6	-1.1
DL 746-757	-45.20	-44.60	-0.60



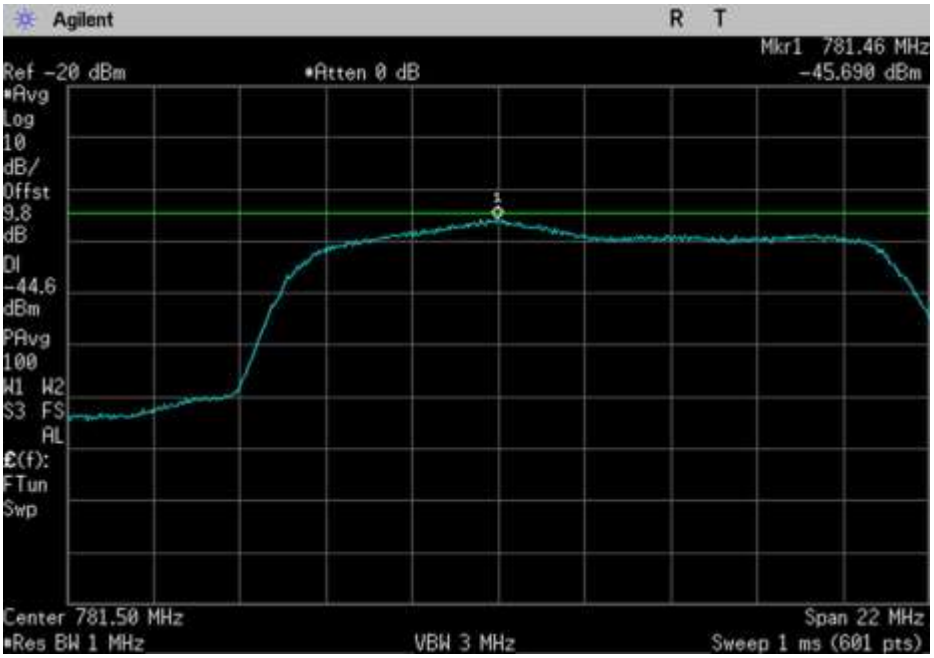
776.0- 787.0 MHz					
		Limit			Margin
RSSI (dBm)	Measured Noise (dBm/MHz)	RSSI Dependent	Fixed Booster	TX off	
-75.0	-45.7		-44.6		-1.1
-73.0	-45.8		-44.6		-1.2
-33.0	-75.6	-70.0			-5.6
-43.0	-66.5	-60.0			-6.5
-34.0	-75.7	-69.0			-6.7
-44.0	-65.9	-59.0			-6.9
-31.0	-75.6			-70	-5.6

7.7.2 Variable uplink noise timing

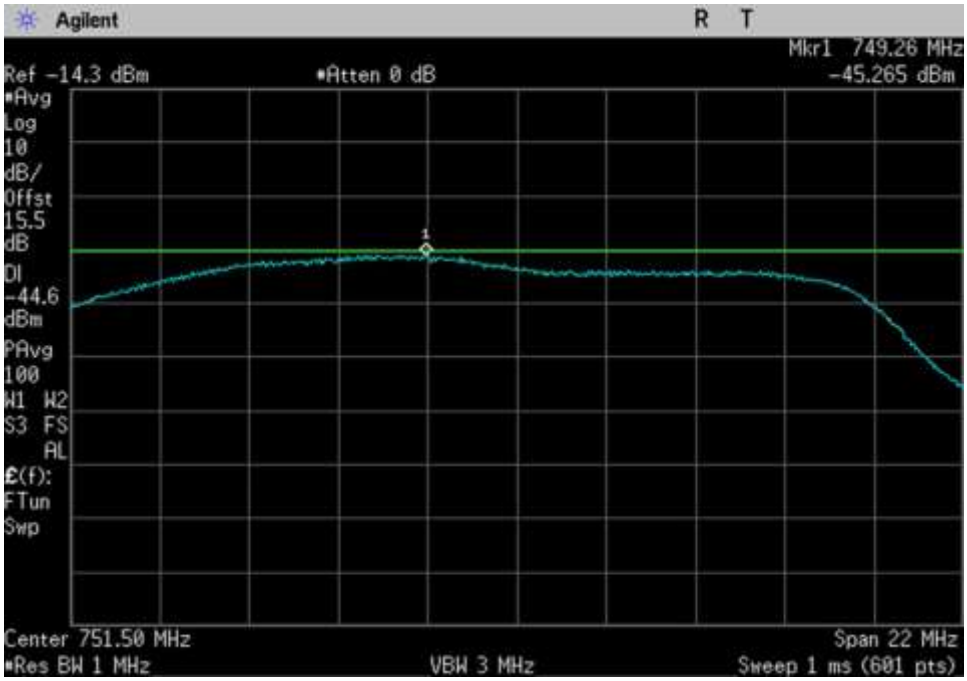
Uplink Noise timing		
Frequency MHz	Measured Sec	Limit sec
UL776-787	0.33	3

7.7.1 Maximum Transmitter Noise Power Level

Plots



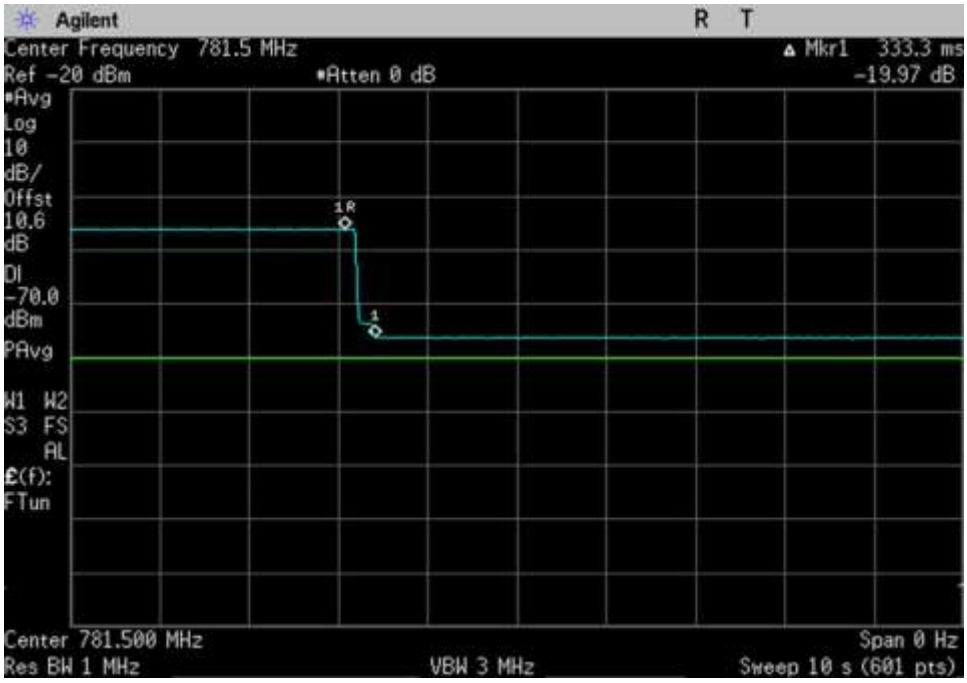
UL_776-787_ 781.5MHz_SN4



DL_746-757_ 751.5MHz_SN4

7.7.2 Variable UL Noise Timing

Plots



UL_776-787_ 781.5MHz_SN4_variable UL noise timing

7.8 Uplink Inactivity

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • 510 249 1170		
Customer:	**Cellphone-Mate, Inc.**		
Specification:	**7.8 Uplink Inactivity**		
Work Order #:	**102393**	Date:	4/1/19
Test Type:	**Conducted Emissions**	Time:	14:06:00 PM
Tested By:	E. Wong	Sequence#:	1

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Equipment:

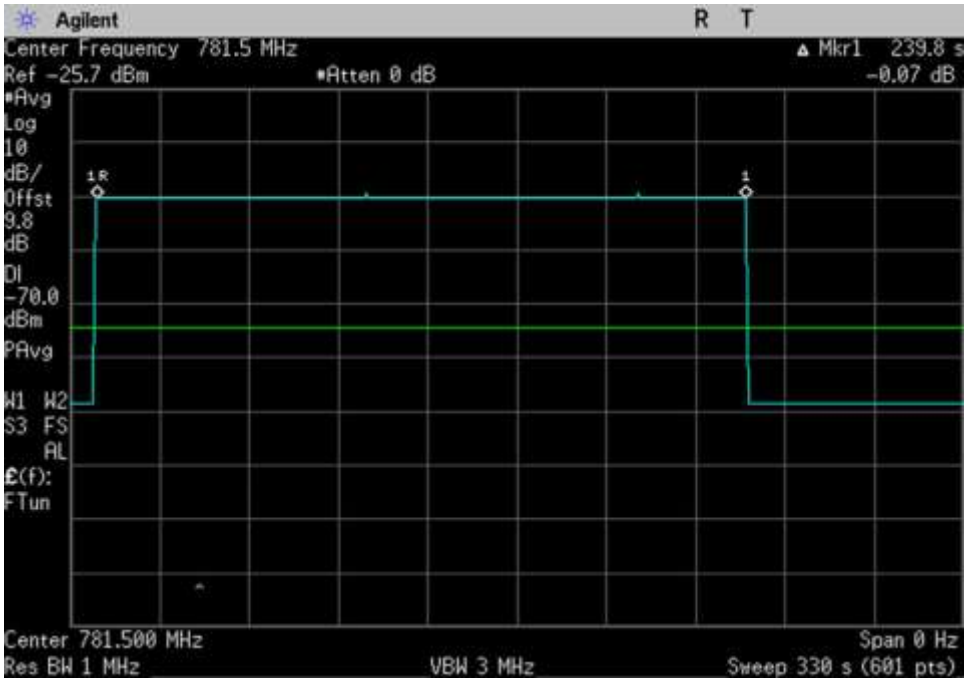
Asset #	Description	Model	Calibration Date	Cal Due Date
03471	Spectrum Analyzer	E4440A	1/18/2018	1/18/2020
P05411	Attenuator	54A-10	1/19/2018	1/19/2020
P07191	Cable	32022-29094K-29094K-48TC	10/30/2017	10/30/2019
P06909	Attenuator	PE7083	12/20/2017	12/20/2019

Summary of Results

Pass: As demonstrated, when the booster is not serving an active device connection after 5 minutes the uplink noise power does not exceed -70dBm/MHz

Uplink Inactivity		
Frequency MHz	Measured Min	Limit Min
UL776-787	4.0	5.0

Plots



UL_776-787_ 781.5MHz_SN4

7.9 Booster Gain Limit

Test Conditions / Setup

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • 510 249 1170		
Customer:	**Cellphone-Mate, Inc.**		
Specification:	**7.9 Variable Booster gain(Max Gain / Variable Uplink Gain Timing)**		
Work Order #:	**102393**	Date:	4/3/19
Test Type:	**Conducted Emissions**	Time:	8:10: 00
Tested By:	E. Wong	Sequence#:	1

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Manufacturer provided MSCL calculation based on

MSCL Calculations of fixed booster EZ 4GV

MSCL

Band (MHz)	Path loss (dB)	Indoor Antenna Gain (dBi)	Indoor Cable Loss(dB)	Polarity Loss(dB)	MSCL(dB)
LTE(776-787)	36.3	2.5	3.32	3	40.1

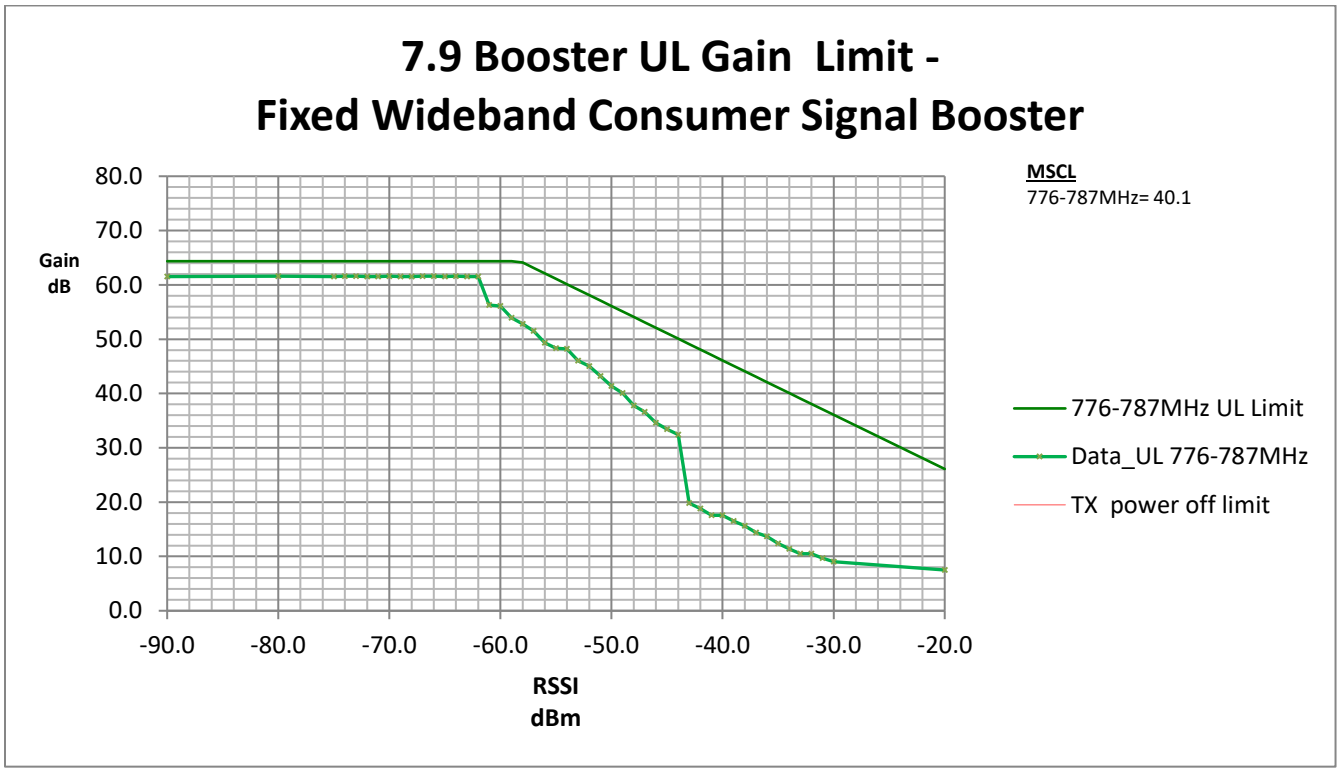
Test Equipment:

Asset #	Description	Model	Calibration Date	Cal Due Date
03471	Spectrum Analyzer	E4440A	1/18/2018	1/18/2020
P05411	Attenuator	54A-10	1/19/2018	1/19/2020
P07191	Cable	32022-29094K-29094K-48TC	10/30/2017	10/30/2019
P07192	Cable	32022-29094K-29094K-48TC	10/9/2017	10/9/2019
P06909	Attenuator	PE7083	12/20/2017	12/20/2019
C00082	Directional Coupler	722-10-1.500V	9/18/2017	9/18/2019
03418	Signal Generator	E4438C	6/19/2017	6/19/2019

Summary of Results

Pass: As demonstrated, computed gains are within the gain limit. All maximum variable uplink gain timings are within 3 second limit.

7.9.1 Maximum gain



776.0 - 787.0 MHz							
				Limit			Margin
RSSI (dBm)	Input (dBm)	Measured Output (dBm)	Measured Gain (dBm)	RSSI Dependent	Fixed Booster	TX off	
-80.0	-41.2	20.4	61.6	-	64.4	-	-2.8
-74.0	-41.2	20.4	61.6	-	64.4	-	-2.8
-58.0	-41.2	11.6	52.8	64.1	-	-	-11.3
-57.0	-41.2	10.3	51.5	63.1	-	-	-11.6
-54.0	-41.2	7.0	48.2	60.1	-	-	-11.9
-56.0	-41.2	8.1	49.3	62.1	-	-	-12.8

7.9.2 Variable uplink gain timing

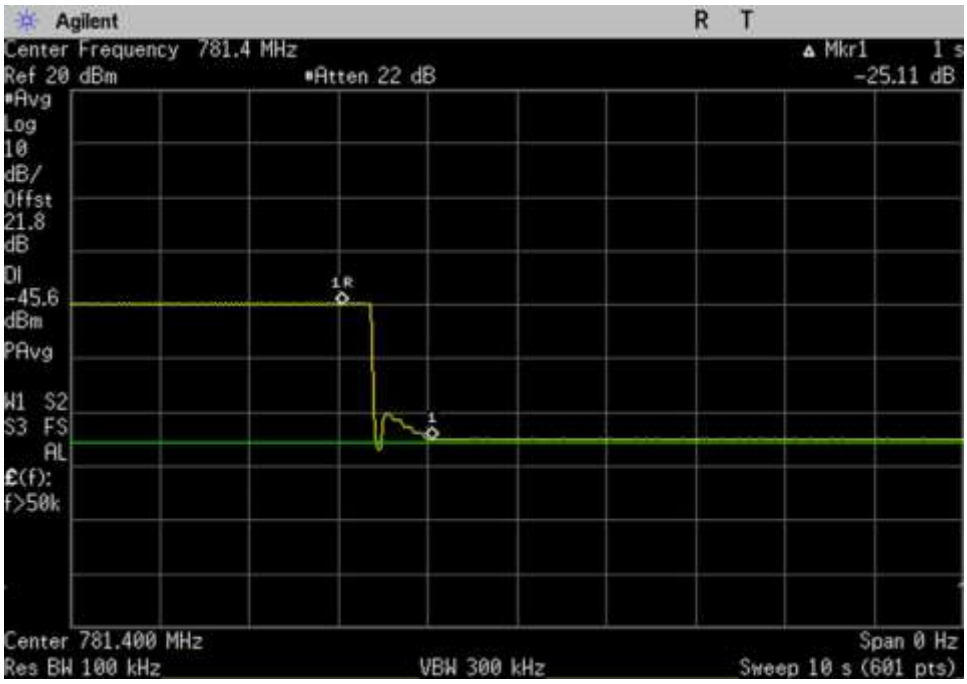
Uplink Gain Timing		
Frequency (MHz)	**Measured (Sec)**	**Limit (Sec)**
UL 776-787	1	3

7.9.1 Maximum Gain

For this subsection, see summary of results of 7.9
7.9.1 Maximum gain

7.9.2 Variable uplink Gain Timing

Plot



UL_776-787_ 781.4MHz_SN4

7.10 Occupied Band Width

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • 510 249 1170		
Customer:	**Cellphone-Mate, Inc.**		
Specification:	**7.10 Occupied Band Width**		
Work Order #:	**102393**	Date:	4/1/19
Test Type:	**Conducted Emissions**	Time:	14:41:00
Tested By:	E. Wong	Sequence#:	1

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

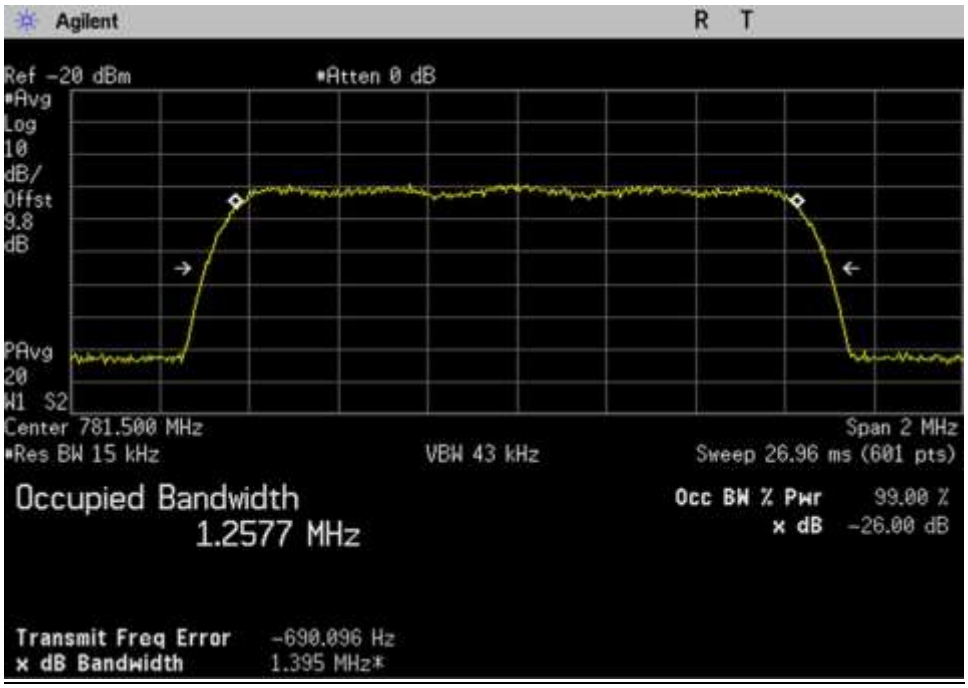
Test Equipment:

Asset #	Description	Model	Calibration Date	Cal Due Date
03471	Spectrum Analyzer	E4440A	1/18/2018	1/18/2020
P05411	Attenuator	54A-10	1/19/2018	1/19/2020
P07191	Cable	32022-29094K-29094K-48TC	10/30/2017	10/30/2019
P07192	Cable	32022-29094K-29094K-48TC	10/9/2017	10/9/2019
P06909	Attenuator	PE7083	12/20/2017	12/20/2019
03418	Signal Generator	E4438C	6/19/2017	6/19/2019

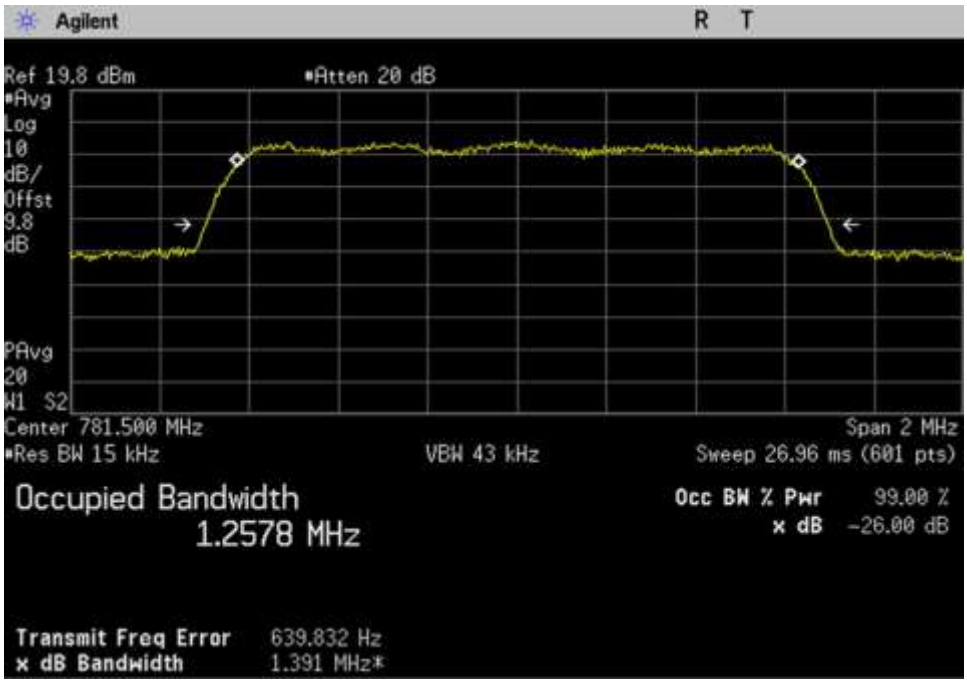
Summary of Results

Pass: As summarized in plots below, the uniformity of the output signal relative to the input signal are practically identical. Therefore, the comparison is within limits.

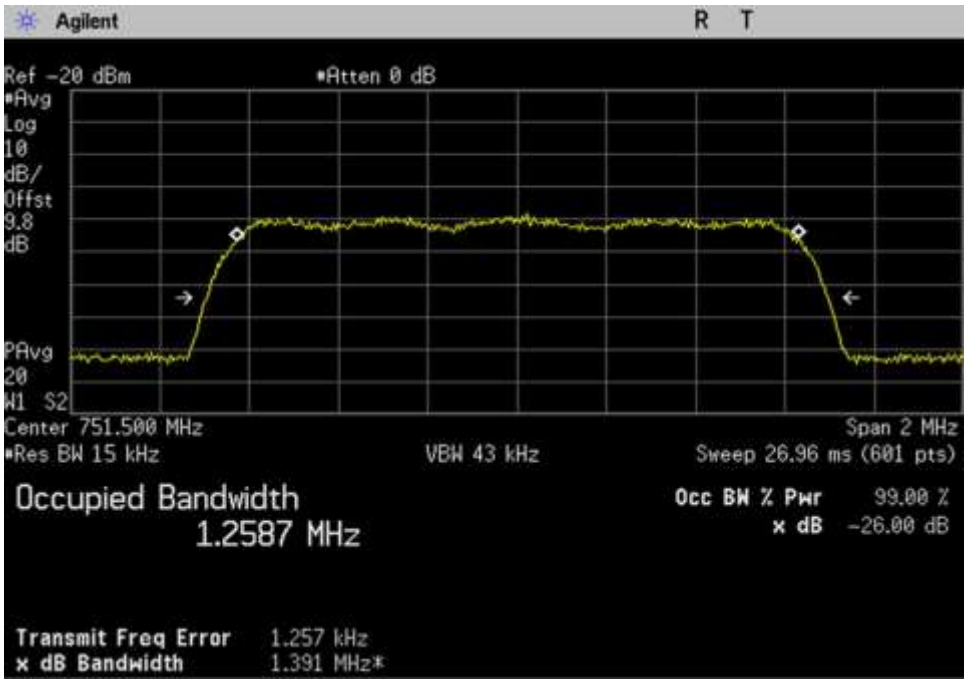
Plots



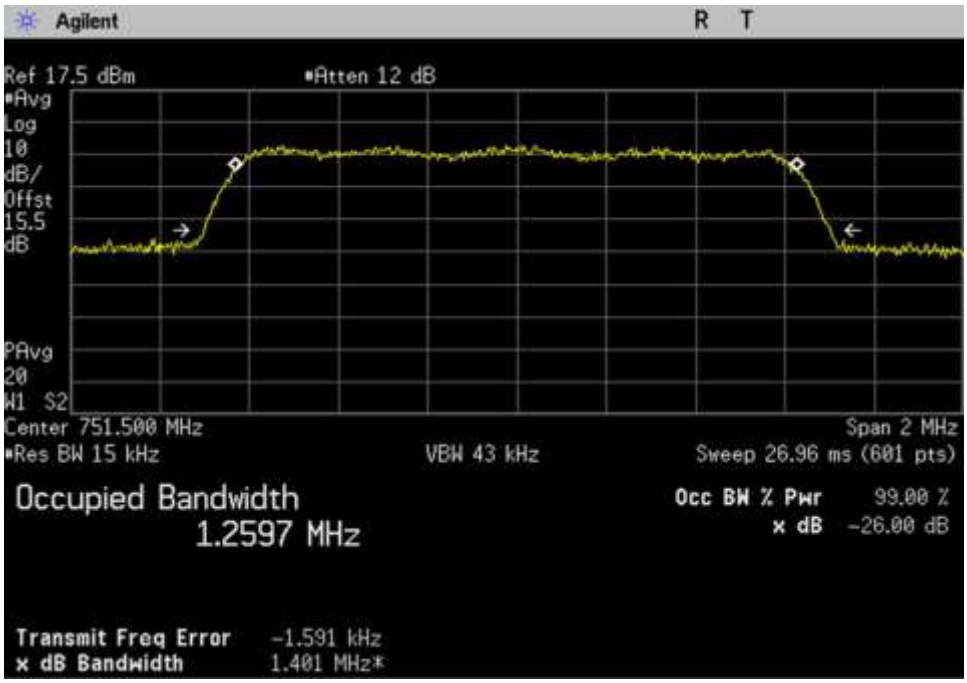
In_UL_776-787_CDMA_ 781.5MHz



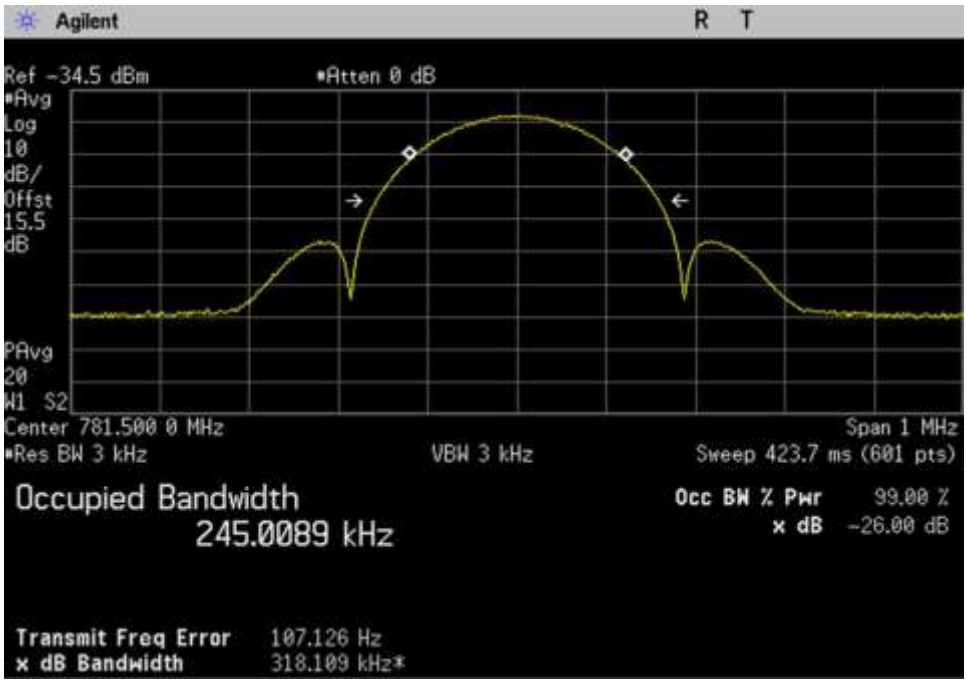
Out_UL_776-787_CDMA_ 781.5MHz



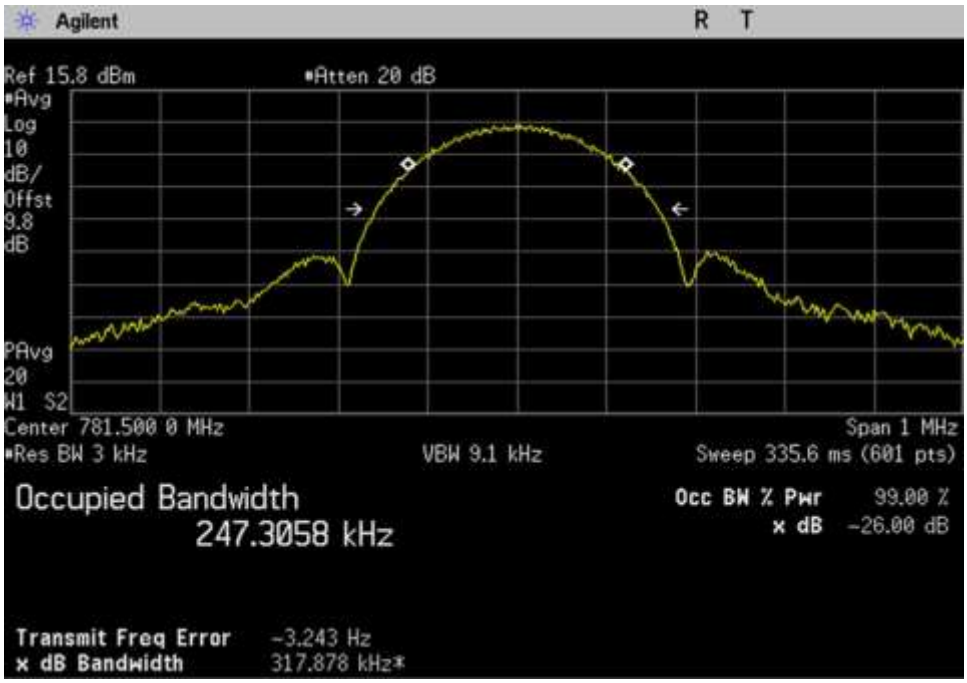
In_DL_746-757_CDMA_ 751.5MHz



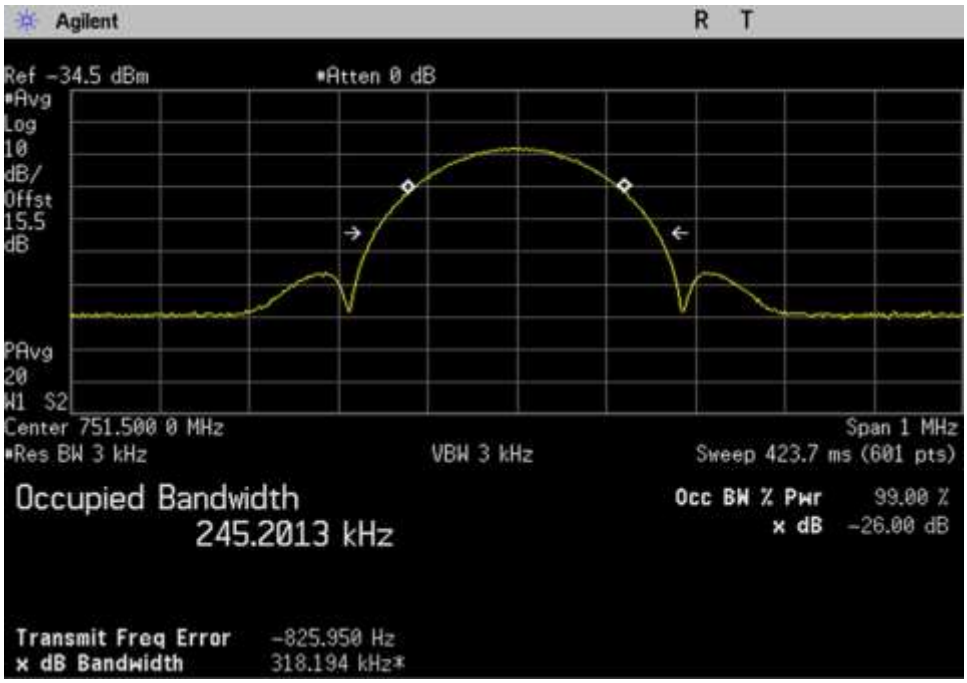
Out_DL_746-757_CDMA_ 751.5MHz



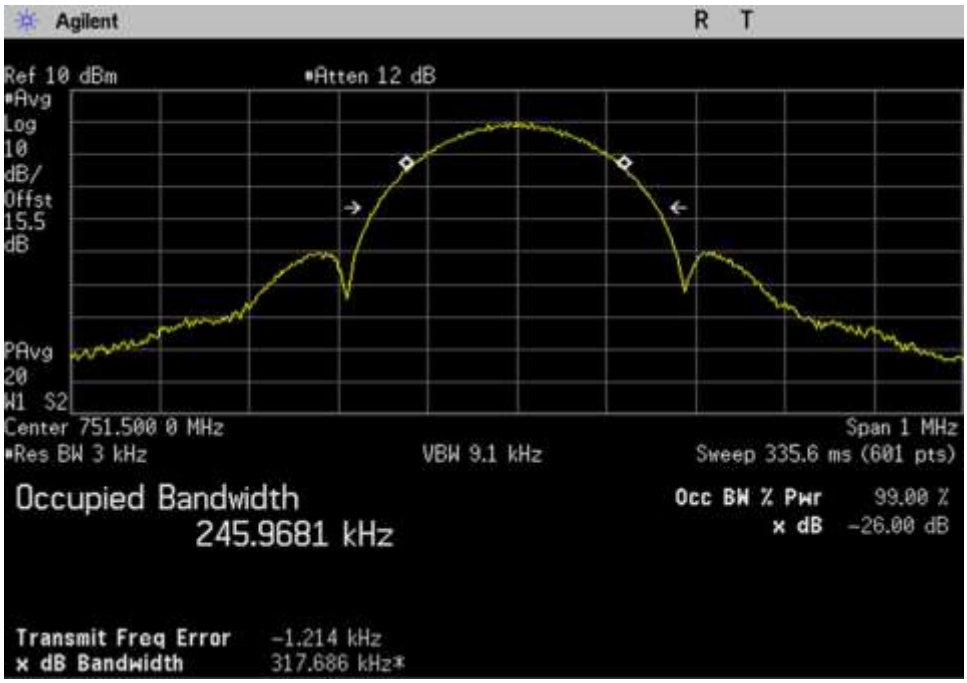
In_UL_776-787_EDGE_ 781.5MHz



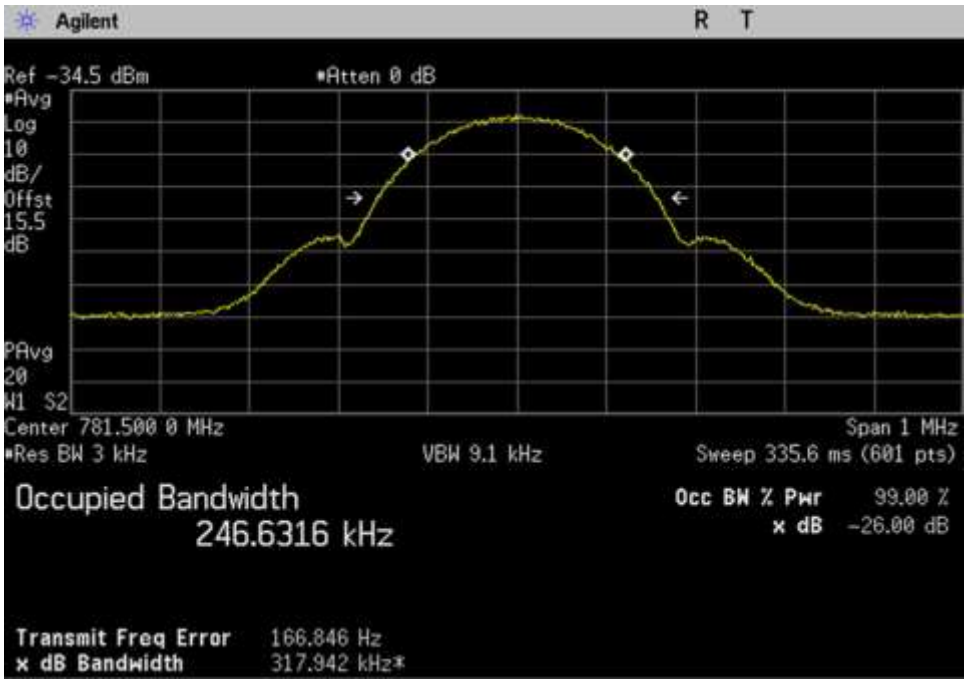
Out_UL_776-787_EDGE_ 781.5MHz



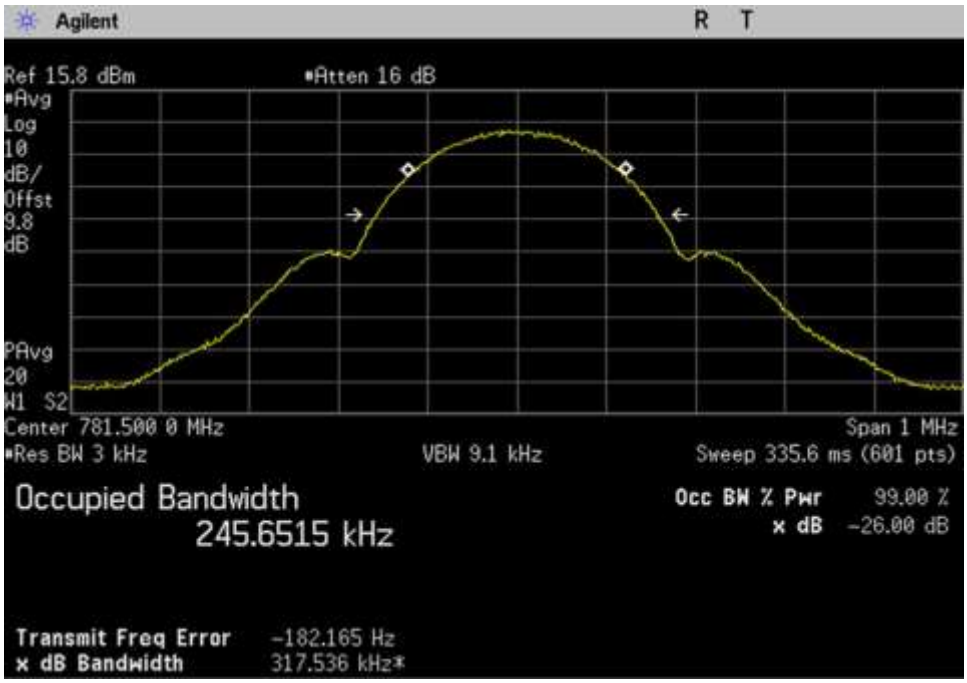
In_DL_746-757_EDGE_ 751.5MHz



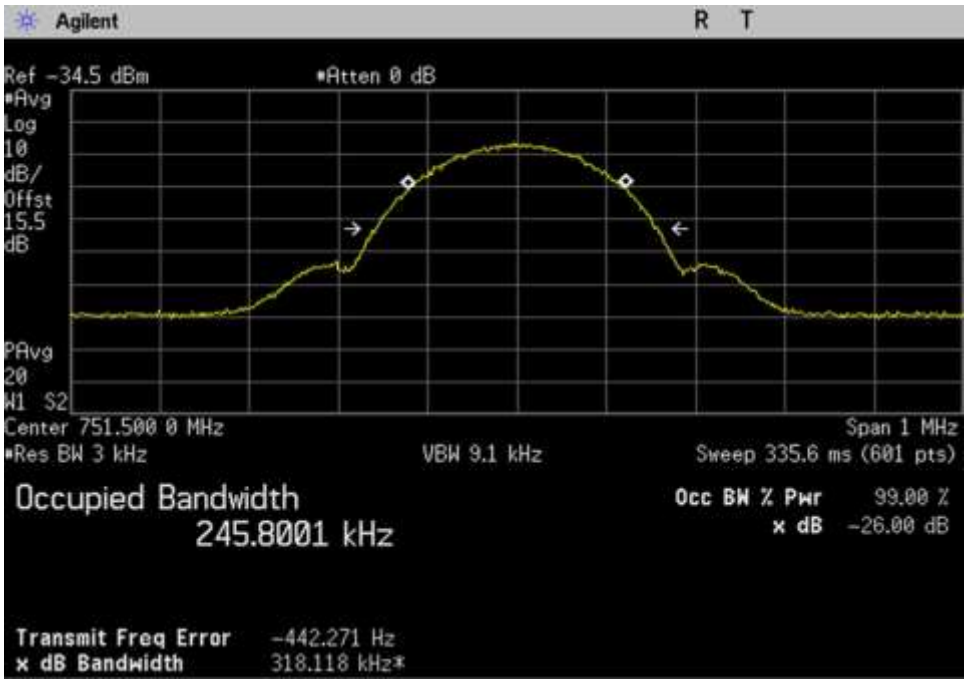
Out_DL_746-757_EDGE_ 751.5MHz



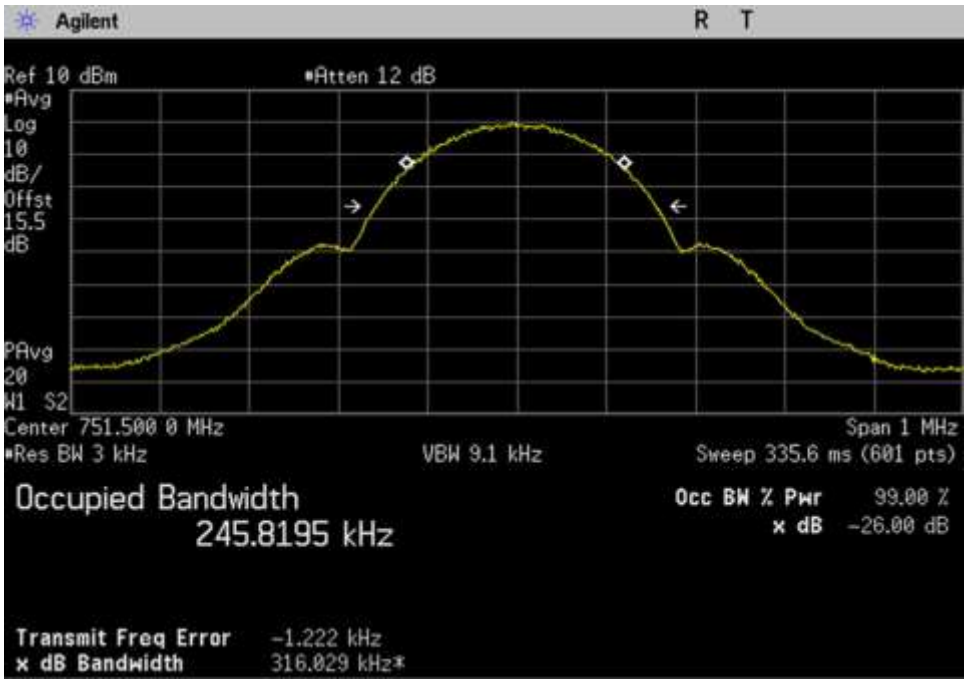
In_UL_776-787_GSM_ 781.5MHz



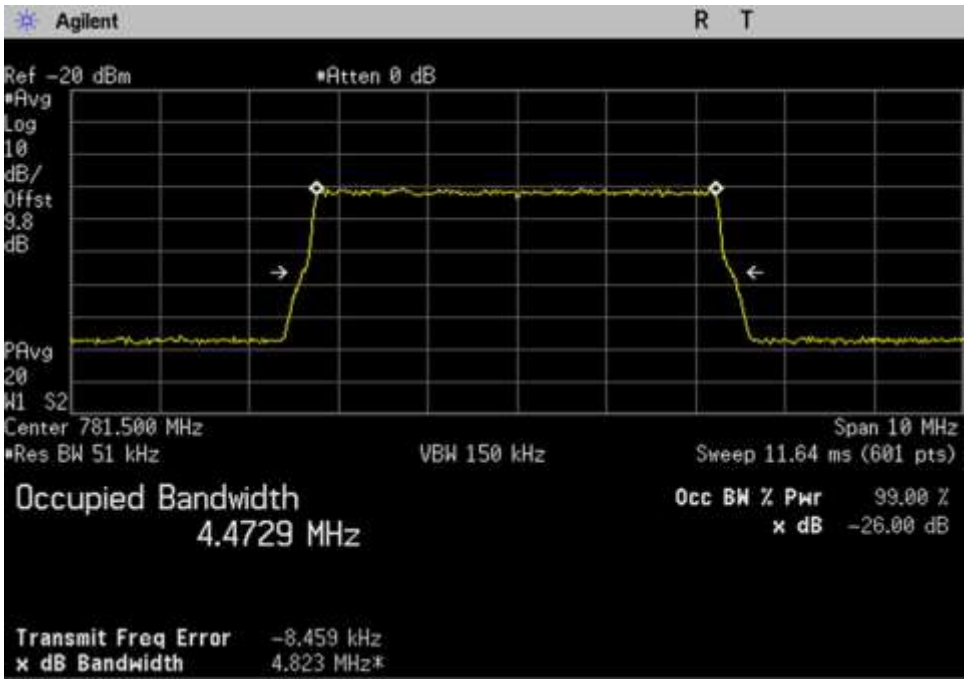
Out_UL_776-787_GSM_ 781.5MHz



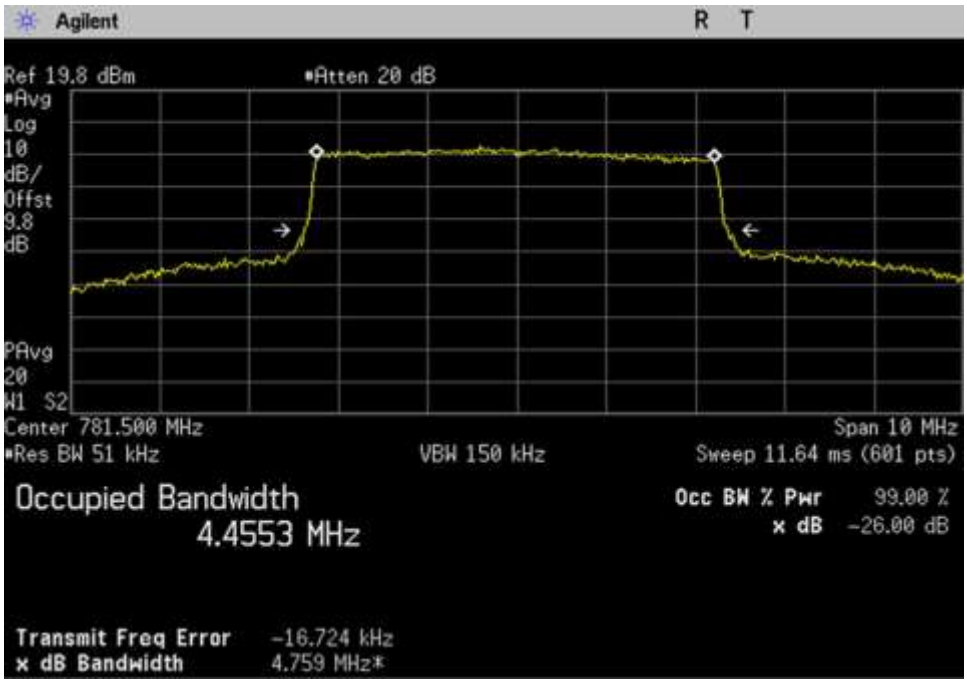
In_DL_746-757_GSM_ 751.5MHz



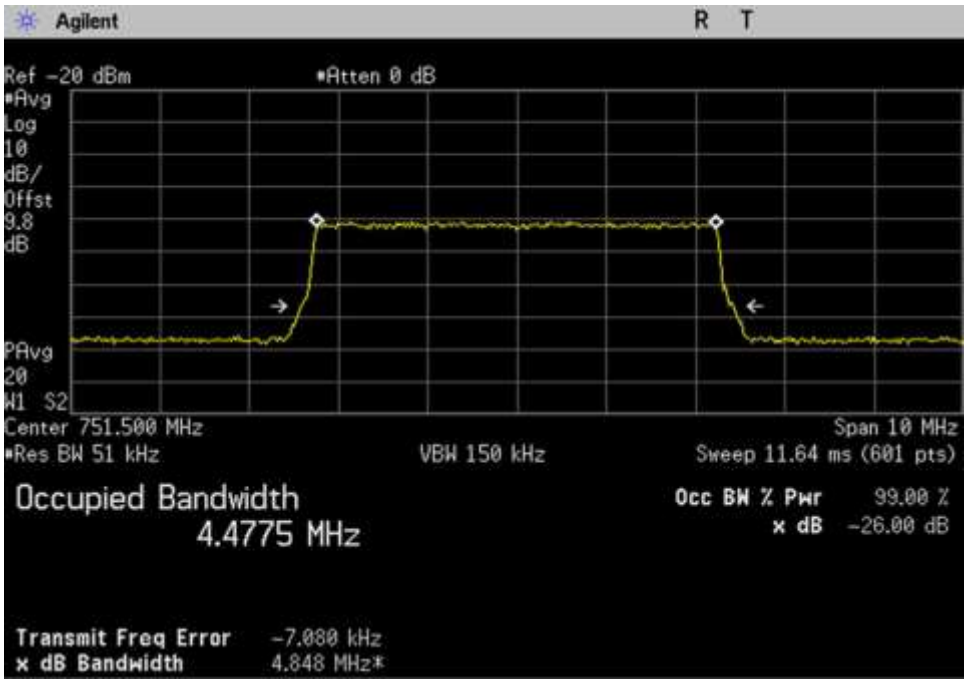
Out_DL_746-757_GSM_ 751.5MHz



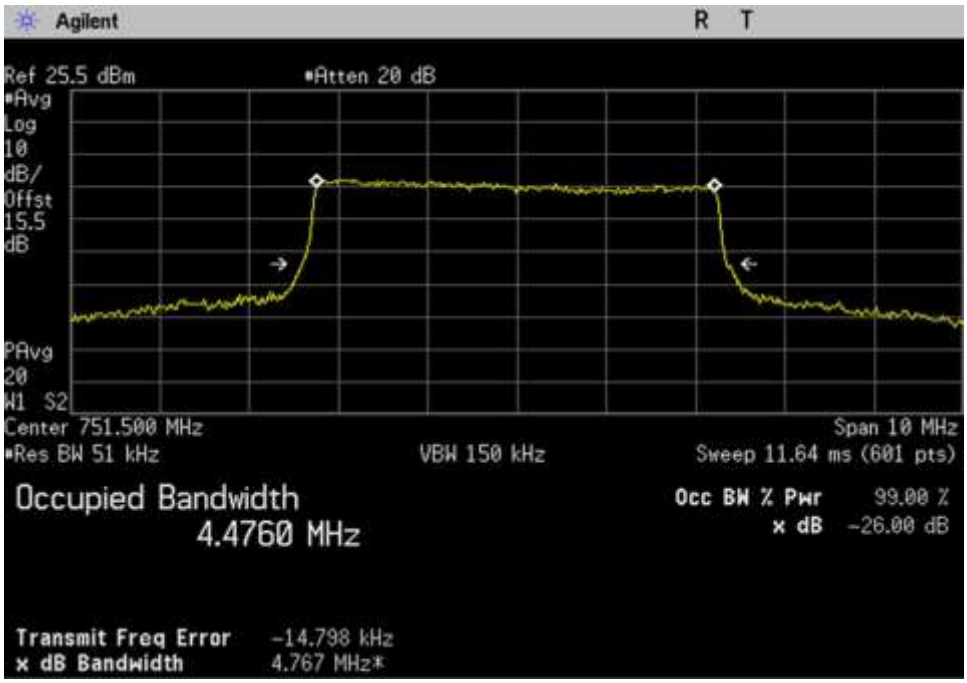
In_UL_776-787_LTE_ 781.5MHz



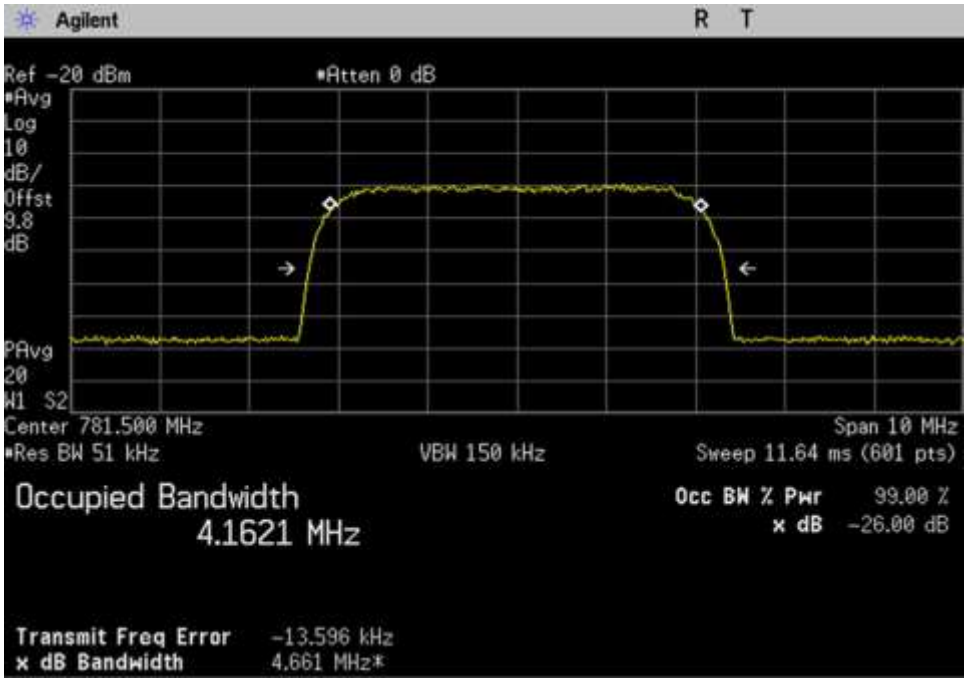
Out_UL_776-787_LTE_ 781.5MHz



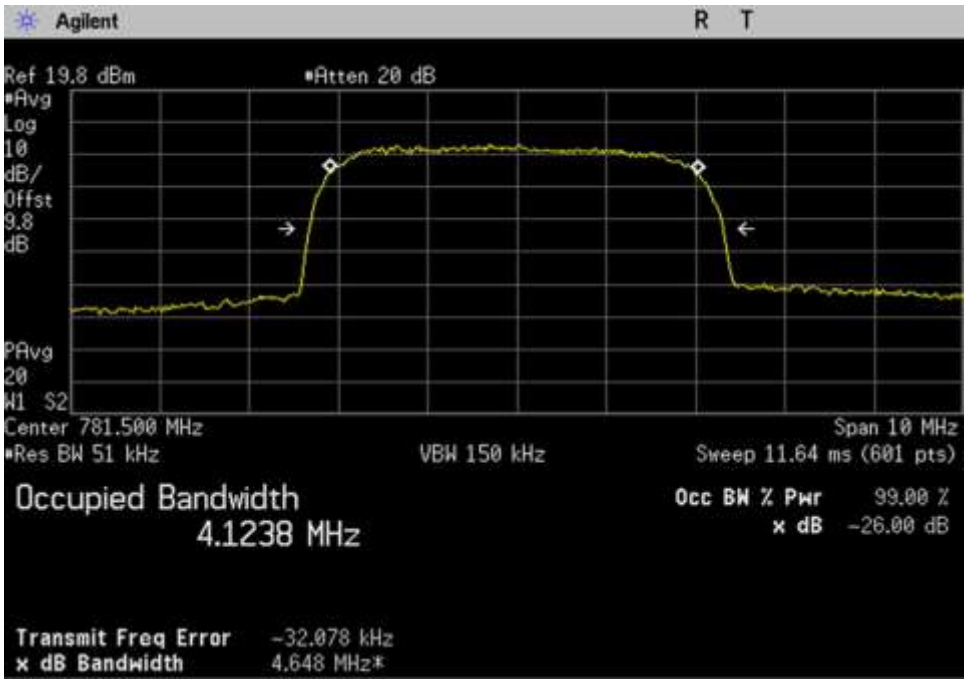
In_DL_746-757_LTE_ 751.5MHz



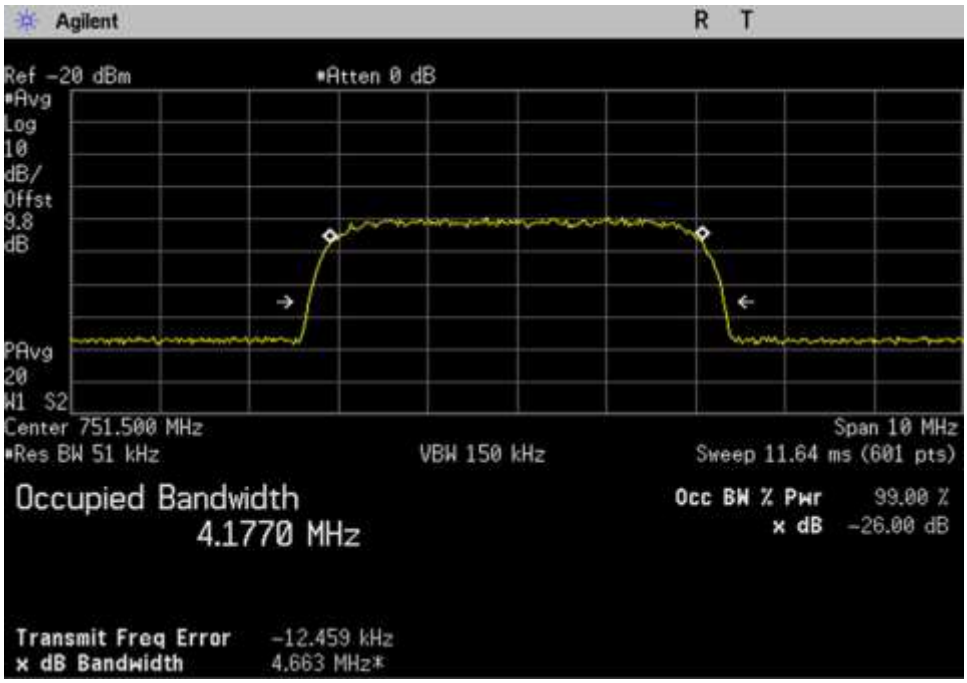
Out_DL_746-757_LTE_ 751.5MHz



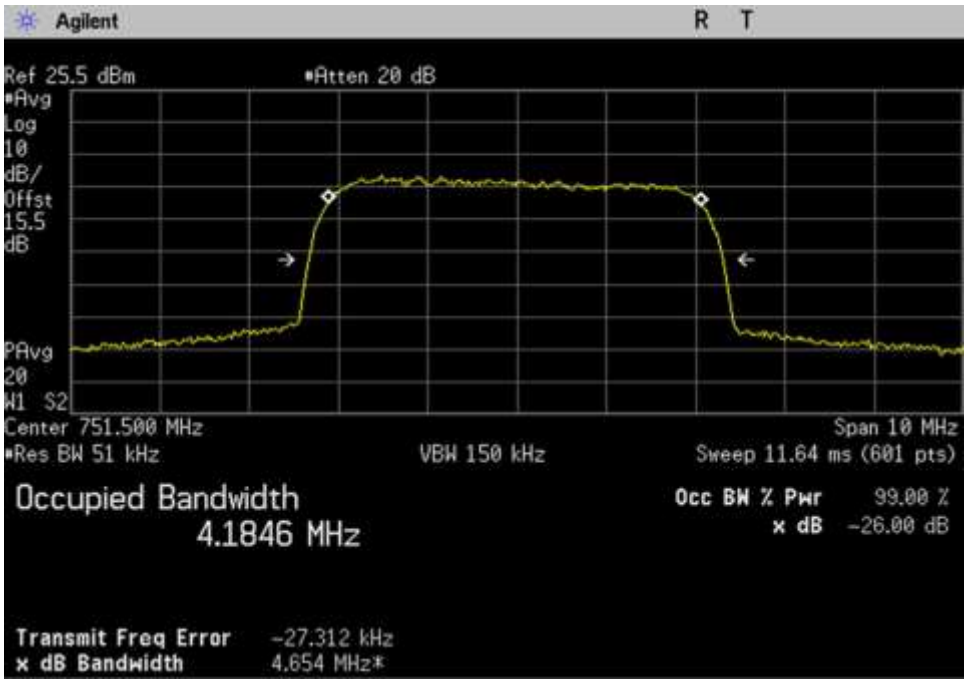
In_UL_776-787_WCDMA_ 781.5MHz



Out_UL_776-787_WCDMA_ 781.5MHz



In_DL_746-757_WCDMA_ 751.5MHz



Out_DL_746-757_WCDMA_ 751.5MHz

7.11 Oscillation Detection

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • 510 249 1170		
Customer:	**Cellphone-Mate, Inc.**		
Specification:	**7.11 Anti-Oscillation (Oscillation Restarts / Oscillation mitigation or shutdown)**		
Work Order #:	**102393**	Date:	4/3/19
Test Type:	**Conducted Emissions**	Time:	9:53:00
Tested By:	E. Wong	Sequence#:	1

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Note:
- +5 denotes a variable attenuator adjusted such that the insertion loss for center of band under test (isolation) between the booster's donor and server ports is 5 dB greater than the maximum gain, as recorded in the maximum gain test procedure, for the band under test.

Test Equipment:

Asset #	Description	Model	Calibration Date	Cal Due Date
03471	Spectrum Analyzer	E4440A	1/18/2018	1/18/2020
P05411	Attenuator	54A-10	1/19/2018	1/19/2020
P07191	Cable	32022-29094K-29094K-48TC	10/30/2017	10/30/2019
P07192	Cable	32022-29094K-29094K-48TC	10/9/2017	10/9/2019
P06909	Attenuator	PE7083	12/20/2017	12/20/2019
03468	Band Pass Filter	4CS10-781.5/E12.2-O/O	8/16/2017	8/16/2019
03469	Band Pass Filter	4CS10-751.5/E12-O/O	8/16/2017	8/16/2019
C00082	Directional Coupler	722-10-1.500V	9/18/2017	9/18/2019
02475	Attenuator	8494B	6/8/2017	6/8/2019
03418	Signal Generator	E4438C	6/19/2017	6/19/2019

Summary of Results

Pass: All oscillations detections and mitigations occur within 0.3 seconds in uplink bands, within 1 second in the downlink bands and the noise level is below the -70dBm/MHz limit.

7.11.2 Oscillation restart tests

Oscillation detection				Time Between restart		Number of restart	
Frequency MHz	Measured Sec	Limit Sec	Peak Level dBm	Measured Sec	Limit At least sec	Measured	Limit
UL776-787	0.258	0.3	32.0	70	60	1	5
DL 746-757	0.250	1.0	18.4	68	60	1	5

The booster continues to mitigate at least 1 minute before restarting. The plots demonstrate after 1 restart (the limit is 5 restart), the booster does not resume operation until manually reset.

7.11.3 Test procedure for measuring oscillation mitigation or shutdown

	UL 776-787	
Max Gain Isolation	**Pk-Pk Difference**	**Limit**
dB	dB	dB
+5dB	(14.0)*	12.0
+4dB	(19.0)*	12.0
+3dB	(21.0)*	12.0
+2dB	(38.0)*	12.0
+1dB	**	12.0
0dB	**	12.0
-1dB	**	12.0
-2dB	**	12.0
-3dB	**	12.0
-4dB	**	12.0
-5dB	**	12.0

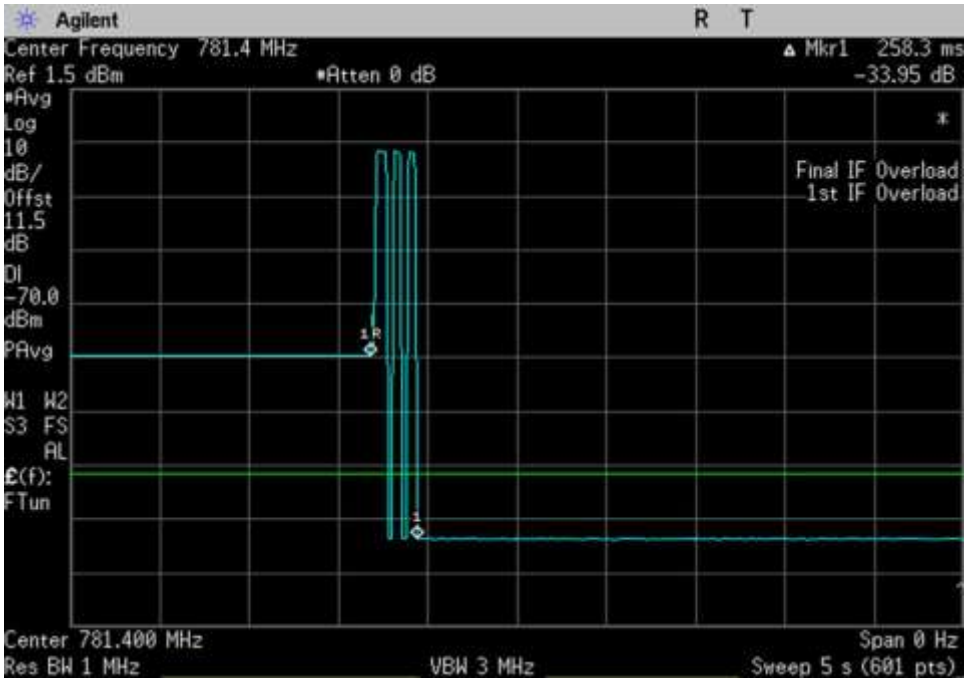
	DL 746-775	
Max Gain Isolation	**Pk-Pk Difference**	**Limit**
dB	dB	dB
+5dB	(12.2)*	12.0
+4dB	(13.2)*	12.0
+3dB	(16.0)*	12.0
+2dB	(17.0)*	12.0
+1dB	(20.0)*	12.0
0dB	(46.0)*	12.0
-1dB	**	12.0
-2dB	**	12.0
-3dB	**	12.0
-4dB	**	12.0
-5dB	**	12.0

Note:
* The measured difference exceeds the limit for a period of less than 300 second before device mitigates or shuts down. The maximum recorded time prior to shutdown was 84 seconds for the Uplink bands and 97 seconds for the Downlink bands.

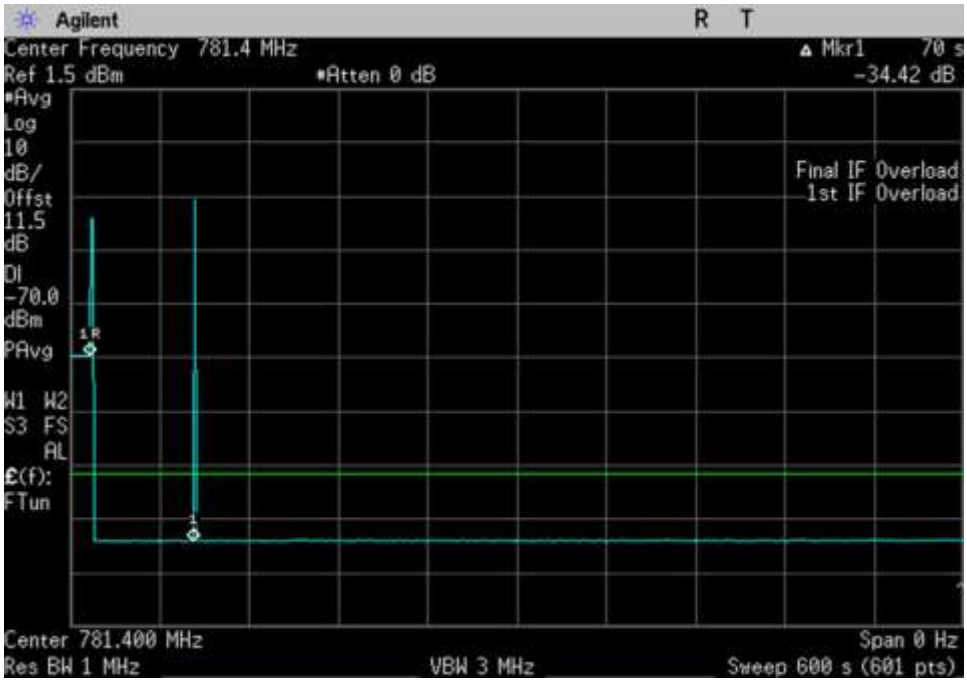
** The device shuts down immediately.

7.11.2 Oscillation Restart Tests

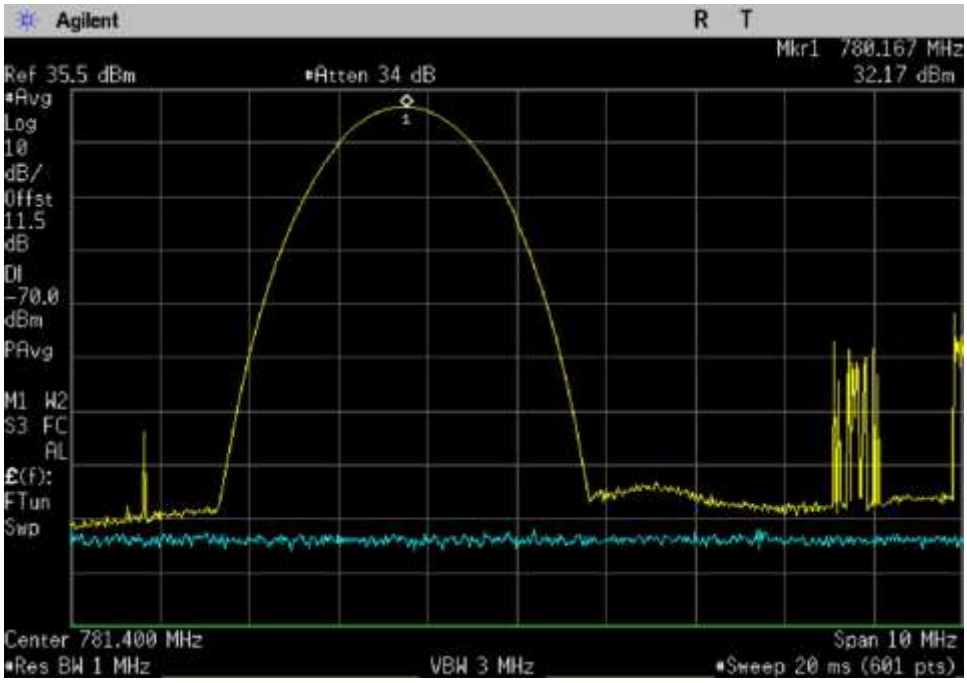
Plots



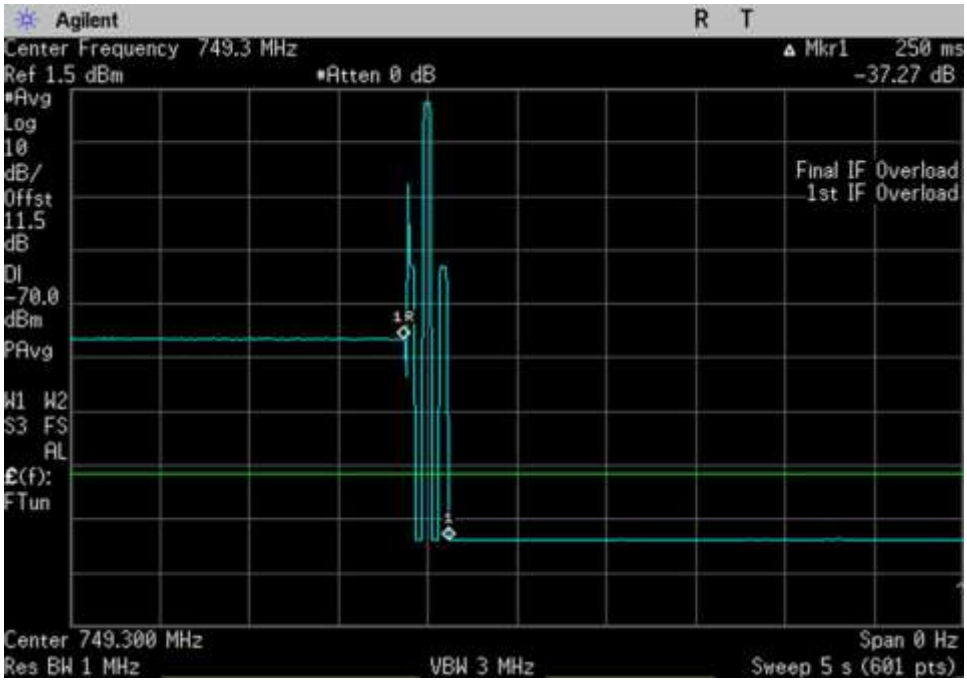
UL_776-787_ 781.4MHz_SN4_



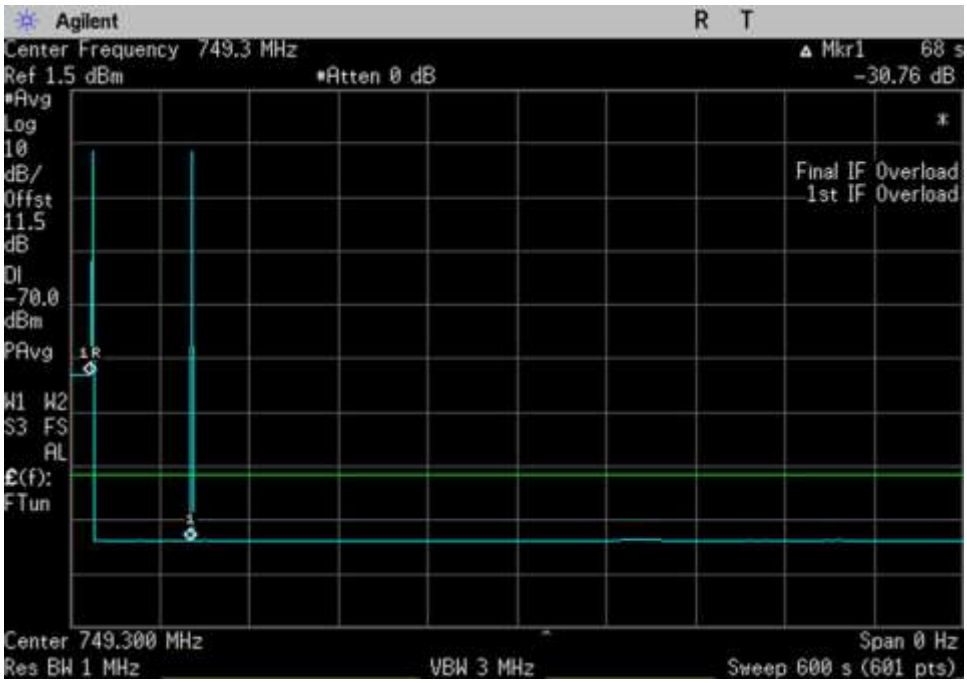
UL_776-787_600sec_ 781.4MHz_SN4



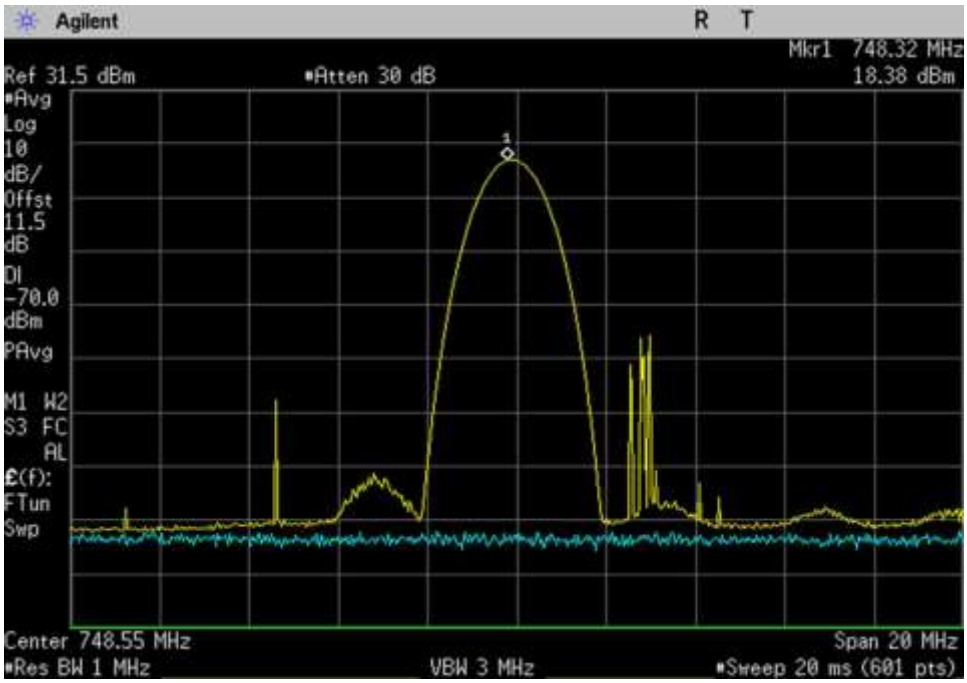
UL_776-787_Pk_ 781.4MHz_SN4



DL_746-757_ 749.3MHz_SN4



DL_746-757_600sec_ 749.3MHz_SN4



DL_746-757_Pk_ 748.55MHz_SN4

7.12 Radiated Spurious Emissions

Test Conditions / Setup

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • 510 249 1170		
Customer:	**Cellphone-Mate, Inc.**		
Specification:	**Radiated Emissions**		
Work Order #:	**102393**	Date:	4/3/19
Test Type:	**Radiated Emissions**	Time:	16:30
Tested By:	E. Wong	Sequence#:	1

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency range of measurement = 9 kHz- 8 GHz.
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
1000 MHz-8000MHz - RBW=1 MHz VBW=1 MHz

No spurious emissions were found within 20dB of the limit line.
Emissions in the band 1559-1610 MHz were investigated and these were not found within 20dB of the limit line.

For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to −70 dBW/MHz equivalent isotopically radiated power (EIRP) for wideband signals, and −80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth.

Test Equipment:

Asset #	Description	Model	Calibration Date	Cal Due Date
AN03471	RF Characteristics Analyzer	E4440A	1/18/2018	1/18/2020
ANP07508	Preamp	310N	10/15/2018	10/15/2020
AN00852	Biconilog Antenna	CBL 6111C	5/1/2018	5/1/2020
ANP06049	Attenuator	PE7002-6	5/14/2018	5/14/2020
ANP00880	Cable	RG214U	5/14/2018	5/14/2020
ANP01187	Cable	CNT-195	8/20/2018	8/20/2020
ANP06691	Cable	PE3062-180	5/14/2018	5/14/2020
AN03607	Preamp	AMF-7D-00101800-30-10P	6/6/2017	6/6/2019
AN02157	Horn Antenna-ANSI C63.5	3115	1/15/2019	1/15/2021
AN03302	Cable	32026-29094K-29094K-72TC	1/15/2018	1/15/2020
ANP01210	Cable	FSJ1P-50A-4A	12/18/2018	12/18/2020
AN00432	Loop Antenna	6502	2/19/2019	2/19/2021
AN03013	Cable	32022-2-2909K-36TC	6/25/2018	6/25/2020

Summary of Results

Pass: All Radiated Spurious Emissions were found with more than 20dB margin of the limit line.

Frequency Range of measurement 9kHz – 8GHz

LIMIT LINE FOR SPURIOUS RADIATED EMISSION

REQUIRED ATTENUATION = 43+10 LOG P (DB)
FOR RADIATED SPURIOUS EMISSION MEASURED AT 3-METER TEST DISTANCE,

Required attenuation = 43+10 Log $P_{t\ at\ 3\ meter}$ dB
Limit line (dBuV) = E_{dBuv} - Attenuation

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 /m^2
Pt = 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 (V/m)+ 10 Log r^2 – 10 Log 30
10 Log P_t = 20 Log E (V/m) + 20 Log r – 10 Log 30

At 3 meter, r = 3 m
10 Log P_t = 20 Log E (V/m) + 20 Log 3 – 10 Log 30
10 Log P_t = 20 Log E (V/m) + 9.54 – 14.77
10 Log P_t = 20 Log E (V/m) - 5.23

Since 20 Log E (V/m) = 20 Log E (uV/m) –120
10 Log P_t = 20 Log E (uV/m) - 120 - 5.23

10 Log P_t = 20 Log E (uV/m) –125.23

Limit line (dBuV) at 3 meter = E_{dBuv} – Attenuation

= E_{dBuv} - (43+10 Log $P_{t\ at\ 3\ meter}$)

= E_{dBuv} - 43 - 10 Log $P_{t\ at\ 3\ meter}$

= E_{dBuv} - 43 – (20 Log E (uV/m) –125.23)

= E_{dBuv} - 43 - 20 Log E (uV/m) + 125.23

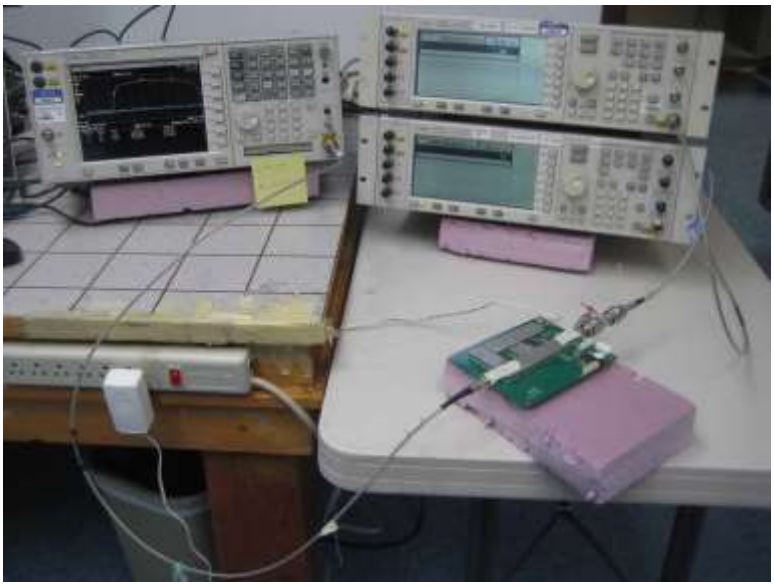
= E_{dBuv} - 20 Log E (uV/m) + 82.23

Since 20 Log E (uV/m) = E in dBuV/m= ~~E_{dBuv}~~ - ~~E_{dBuv}~~ + 82.23

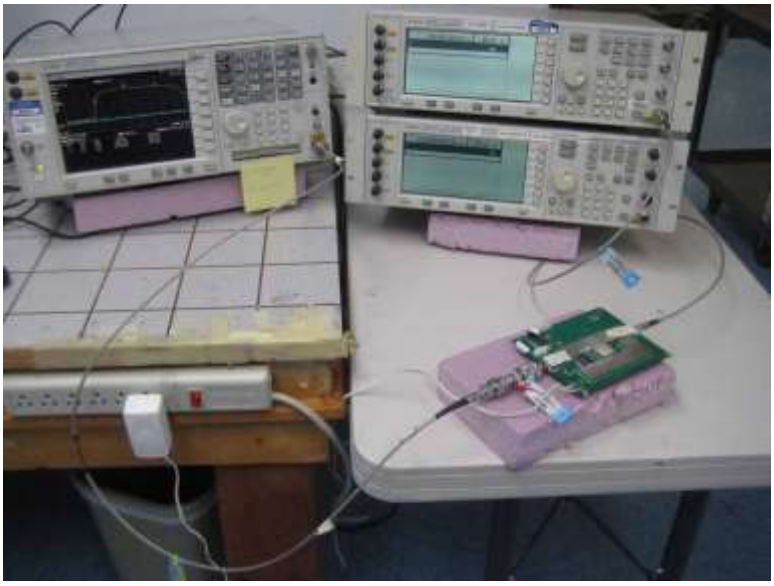
Radiated Emission limit 3 meter = 82.23 dBuV at any power level measured in dBuV

EXHIBIT A: TEST SETUP PHOTOS

Section 7.1, 7.2, 7.3, 7.4, 7.5, 7.6 Test Setup



UL

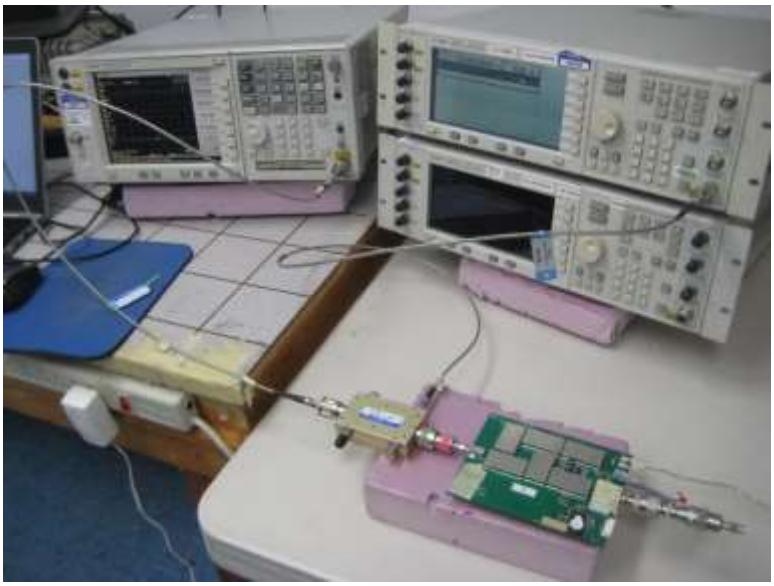


DL

Section 7.7.1 and 7.7.2 Test Setup

UL

DL

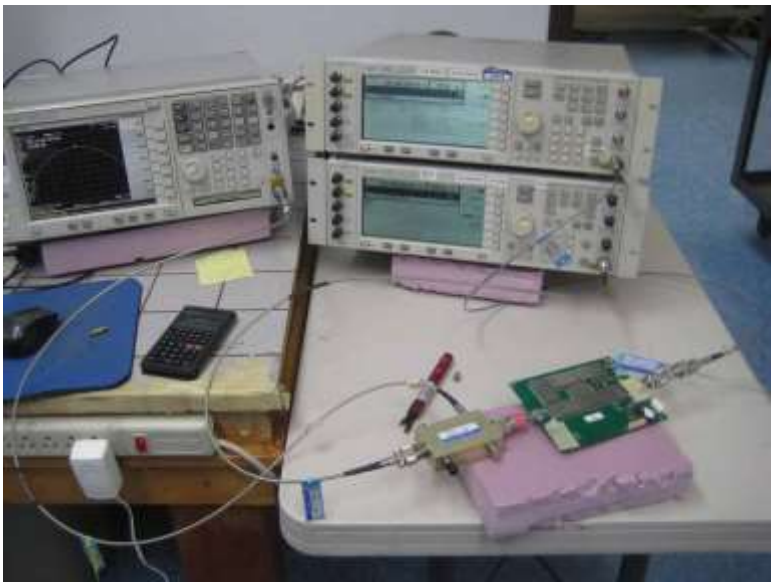


UL, Variable

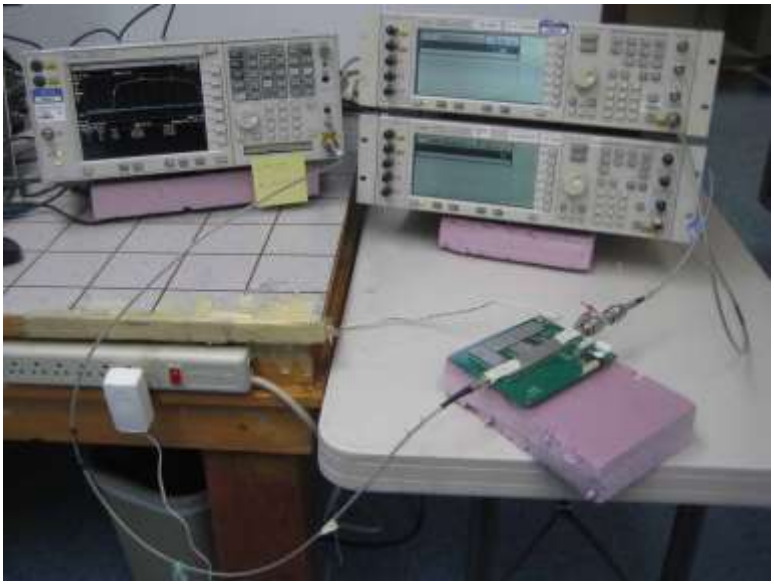
Section 7.8 Test Setup

UL

Section 7.9 Test Setup



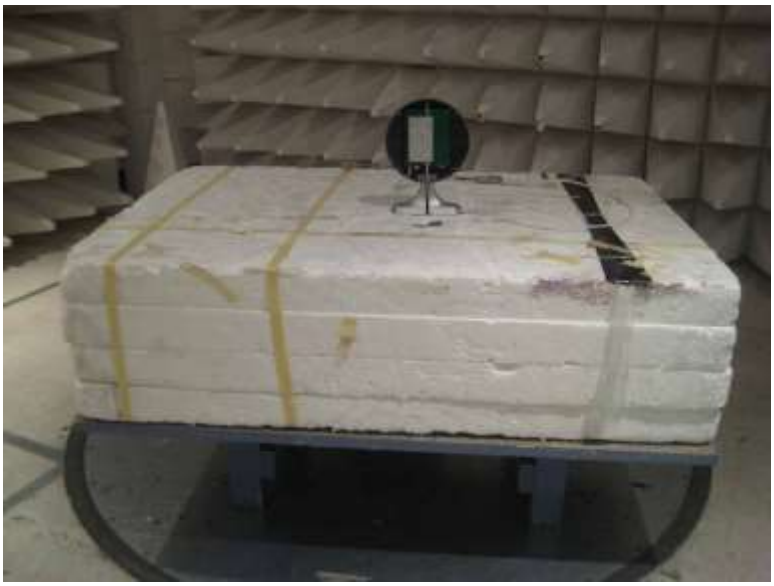
Section 7.10 Test Setup



Section 7.11 Test Setup

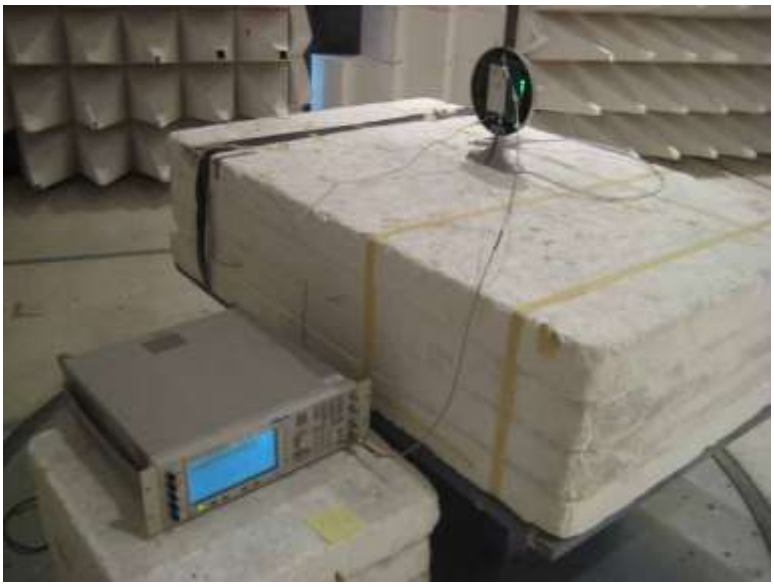
Section 7.12 Test Setup

Below 1GHz



Below 1GHz

Below 1GHz



Below 1GHz

Above 1GHz

Above 1GHz

SUPPLEMENTAL INFORMATION

Measurement Uncertainty

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

Uncertainties reported are worst case for all CKC Laboratories' sites and 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 dBµV/m, the spectrum analyzer reading in dBµV was corrected by using the following formula. This reading was then compared to the applicable specification limit. Individual measurements were compared with the displayed limit value in the margin column. The margin was calculated based on subtracting the limit value from the corrected measurement value; a positive margin represents a measurement exceeding the limit, while a negative margin represents a measurement less than the limit.

SAMPLE CALCULATIONS		
	Meter reading	(dBµV)
+	Antenna Factor	(dB/m)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dBµV/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 caret ("^") 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.