# 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**

ACCREDITED
Testing Certificates:
803.01, 803.02, 803.05, 803.06

**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.**

Testing the Future
CKC LABORATORIES, INC.

## TABLE OF CONTENTS

# 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) | Radiated Spurious Emissions | NA | 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 |
| |

# 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.

# FCC PART(S) 2 / 90I

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 94539 • (510) 249-1170

| | | | |
|---|---|---|---|
| Customer: | **Cellphone-Mate, Inc.** | | |
| Specification: | **Conducted Spurious Emissions, 47 CFR §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-29094K-72TC | 9/18/2014 | 9/18/2016 |
| | ANP06710 | Cable | 32026-29094K-29094K-72TC | 9/18/2014 | 9/18/2016 |
| | 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

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.**

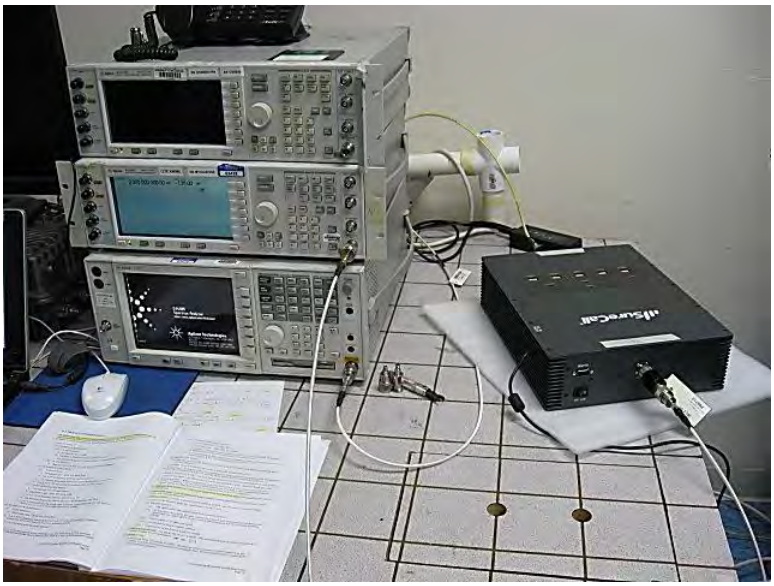
(c) Out-of-band emission limit. On any frequency outside of the frequency ranges covered by the ACP tables in this section, the power of any emission must be reduced below the mean output power (P) by at least 43 + 10log (P) dB measured in a 100 kHz bandwidth for frequencies less than 1 GHz, and in a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



# 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.

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

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

**ESMR band**

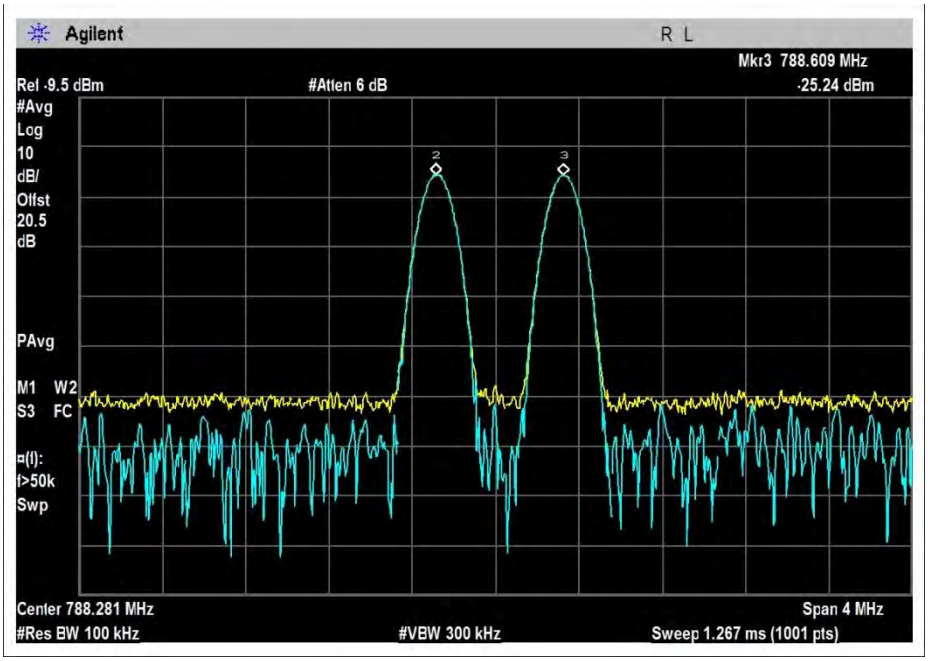
| Band | Link | Channel | Frequency (MHz) | PreAGC | AGC+10dB | Column1 |
|---|---|---|---|---|---|---|
| 800M | Uplink | L | 817 | -23.55 | -16.26 | -3.26 |
| 800M | Uplink | H | 824 | -19.09 | -14.76 | -1.76 |
| 800M | Downlink | L | 862 | -22.48 | -20.41 | -7.41 |
| 800M | Downlink | H | 869 | -17.91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

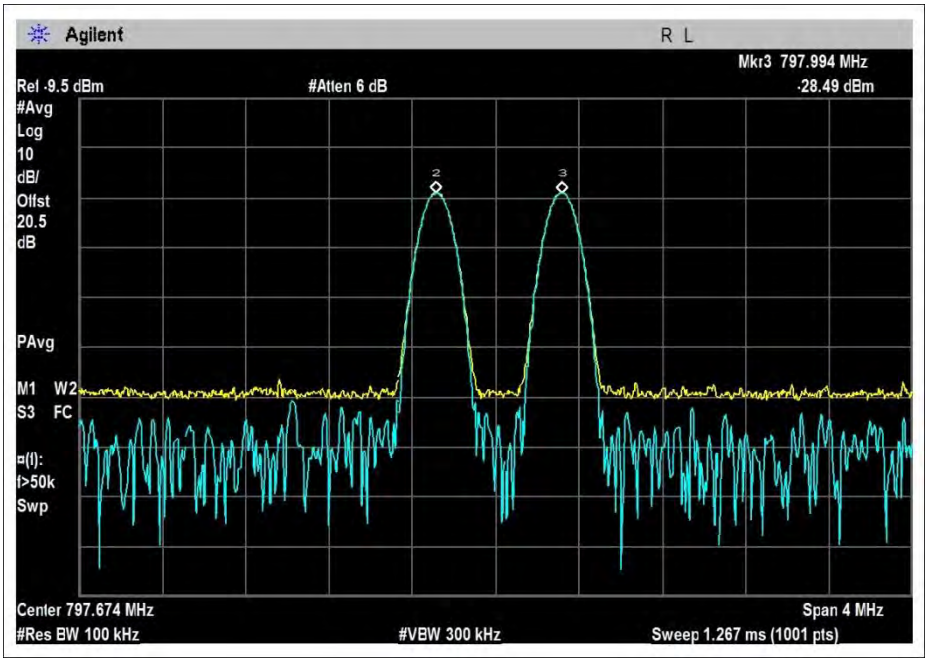
*Antenna Assembly Gain (dBd) = Antenna Gain (dBd)-Feeder Loss (dB) = Antenna Gain (dBi)-2.15-Feeder Loss (dB)*

## Test Data

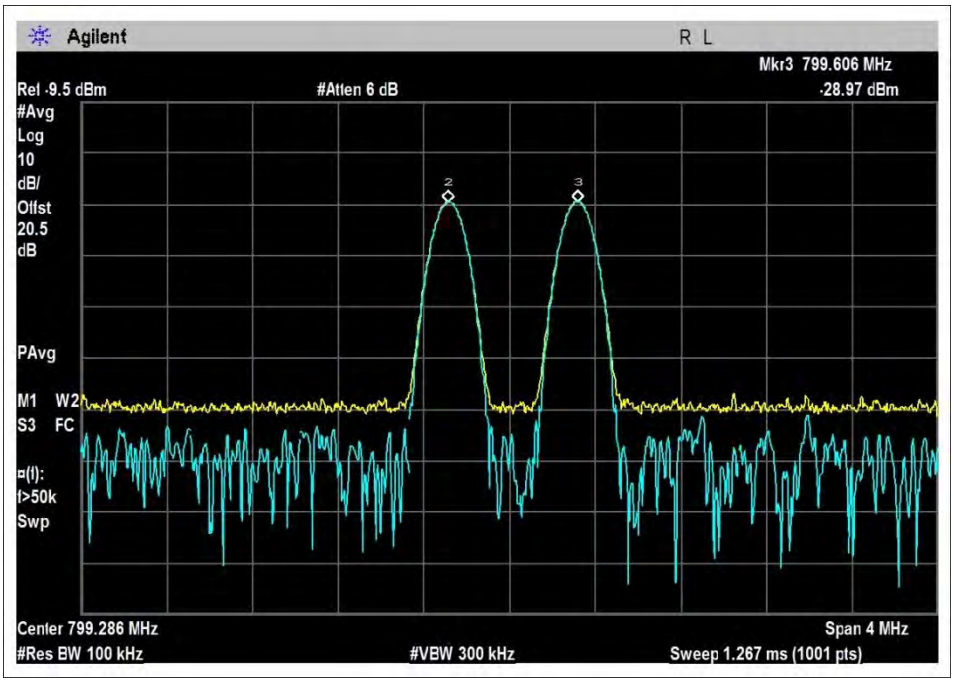
### 700MHz – UL - Input




In-700M-UL-788-798L



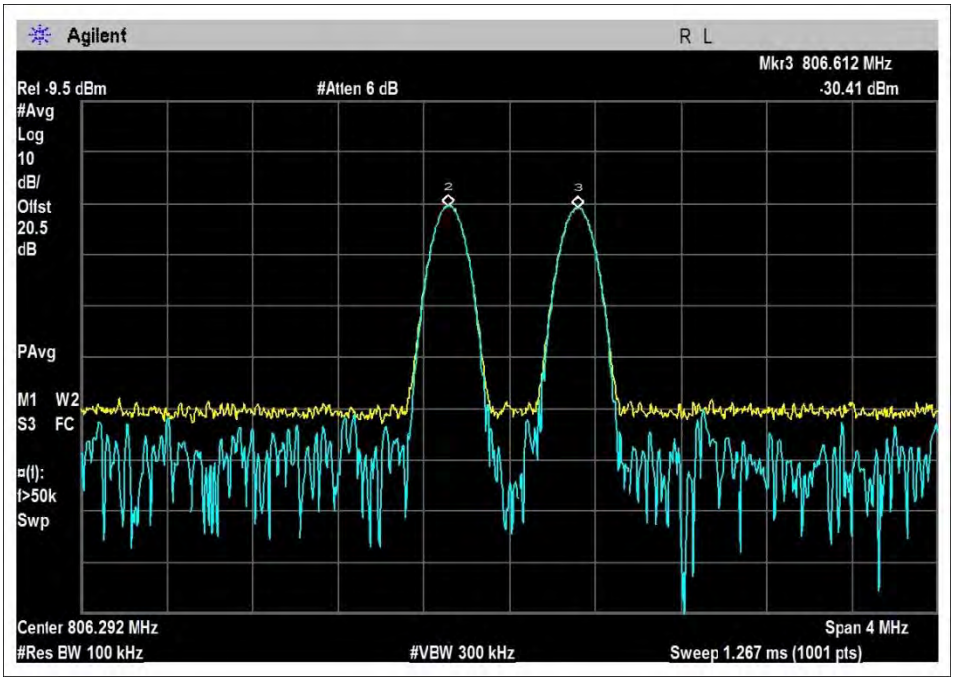

In-700M-UL-788-798H



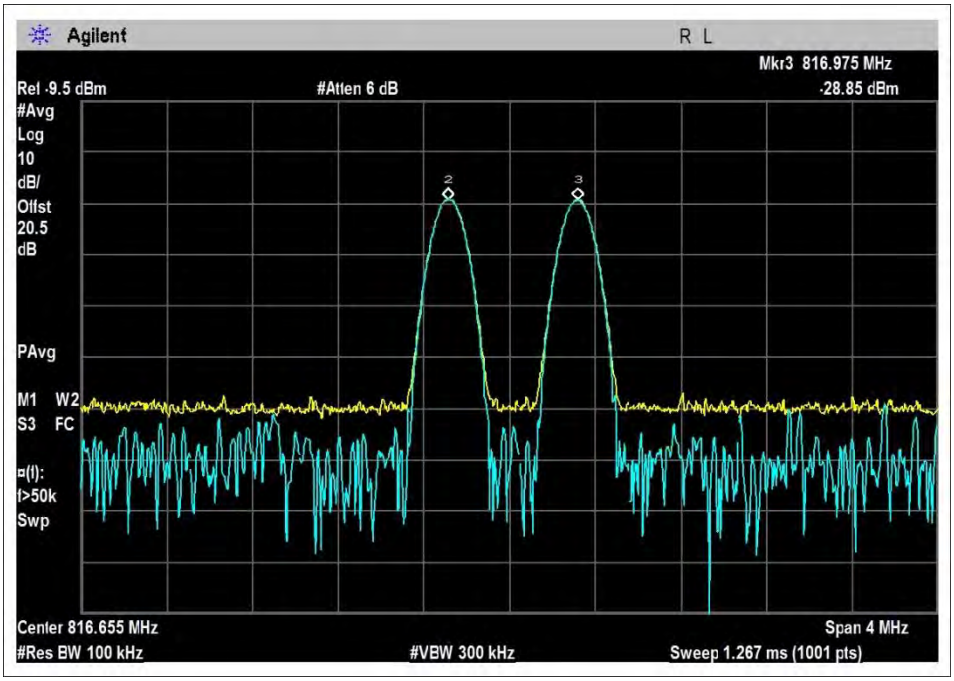

In-700M-UL-799-805L


In-700M-UL-799-805H

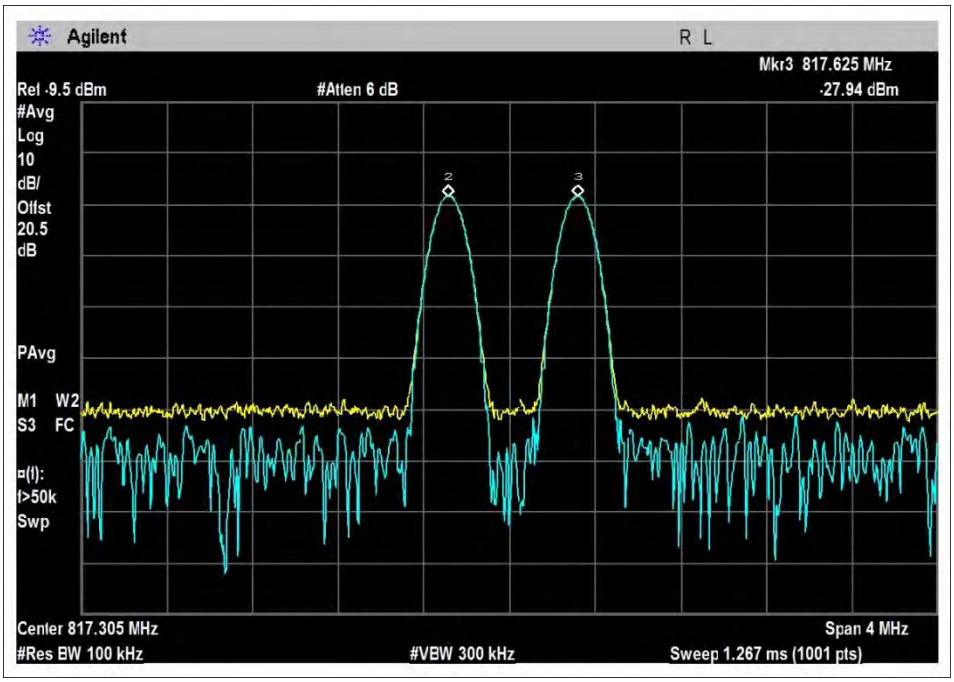
## 800MHz – UL - Input



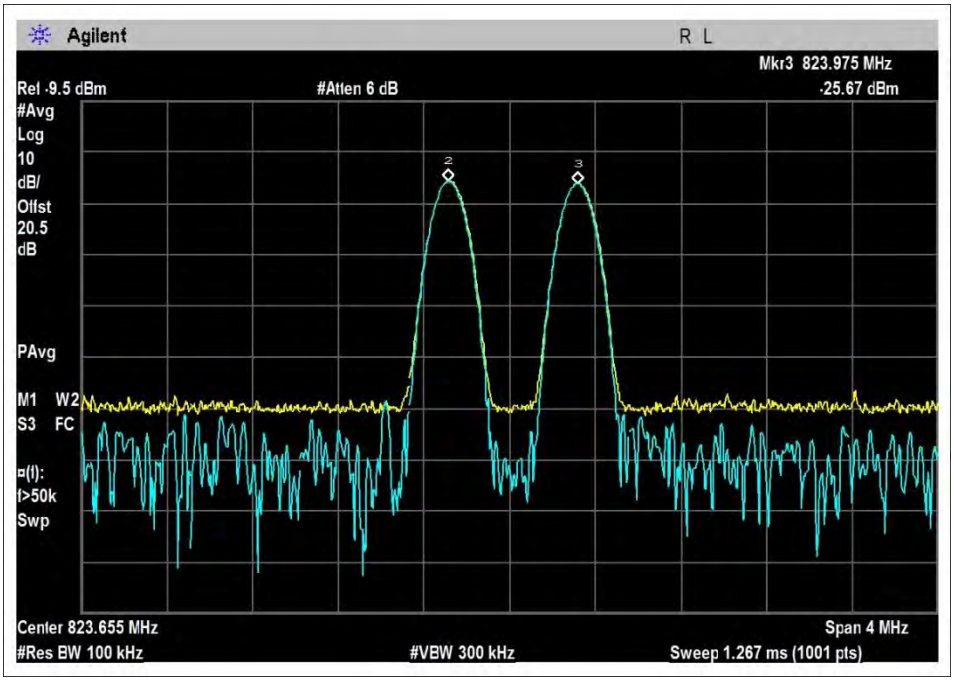

In-800M-UL-806-817L



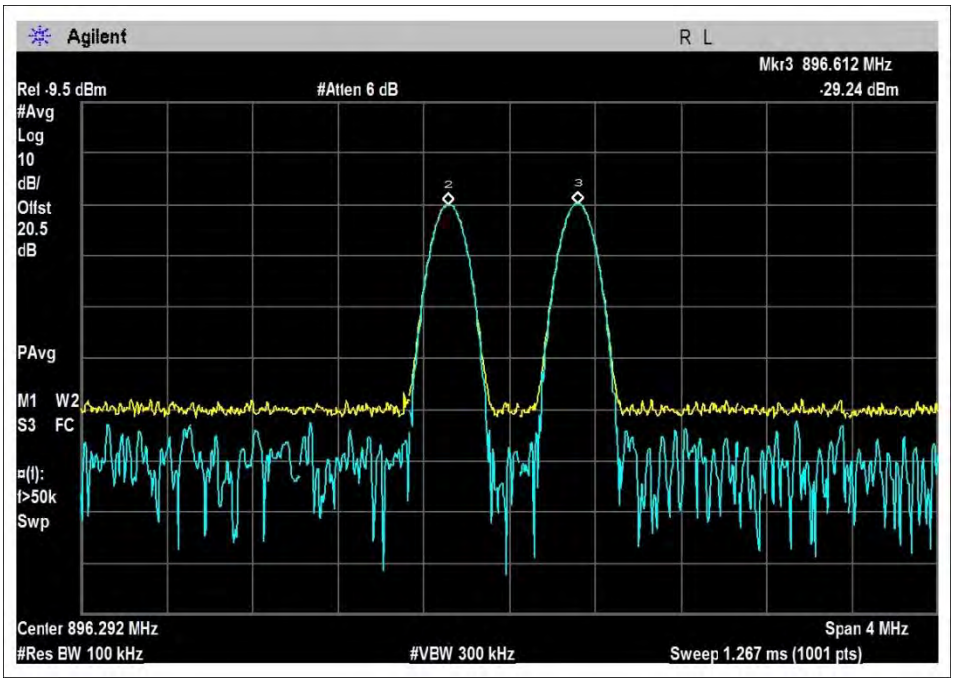

In-800M-UL-806-817H



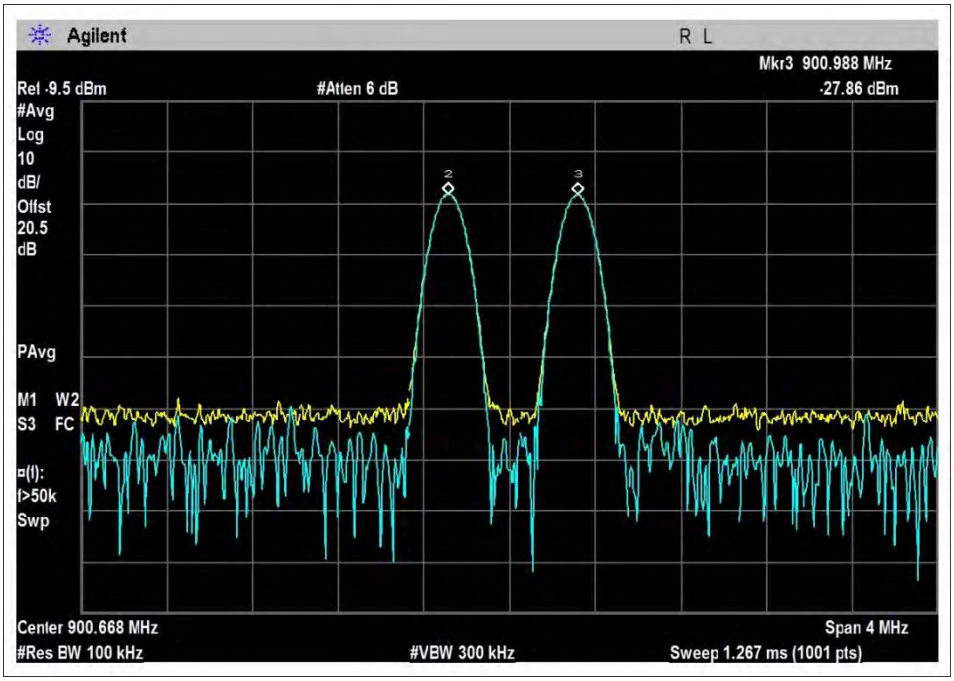

InterCW-In-800M-UL-817-824L




In-800M-UL-817-824H

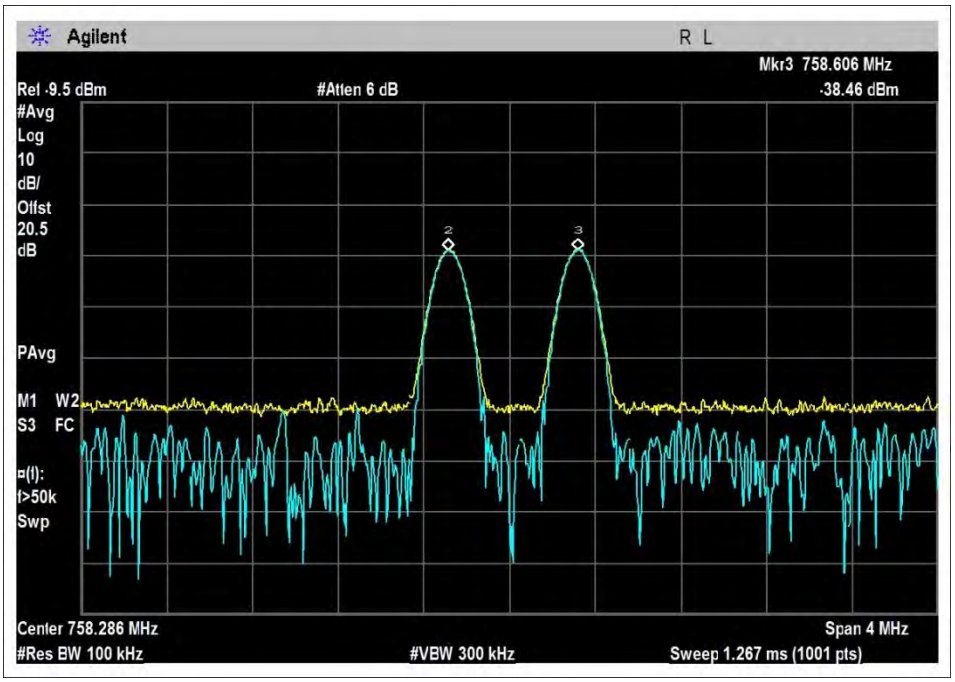



In-800M-UL-896-901L

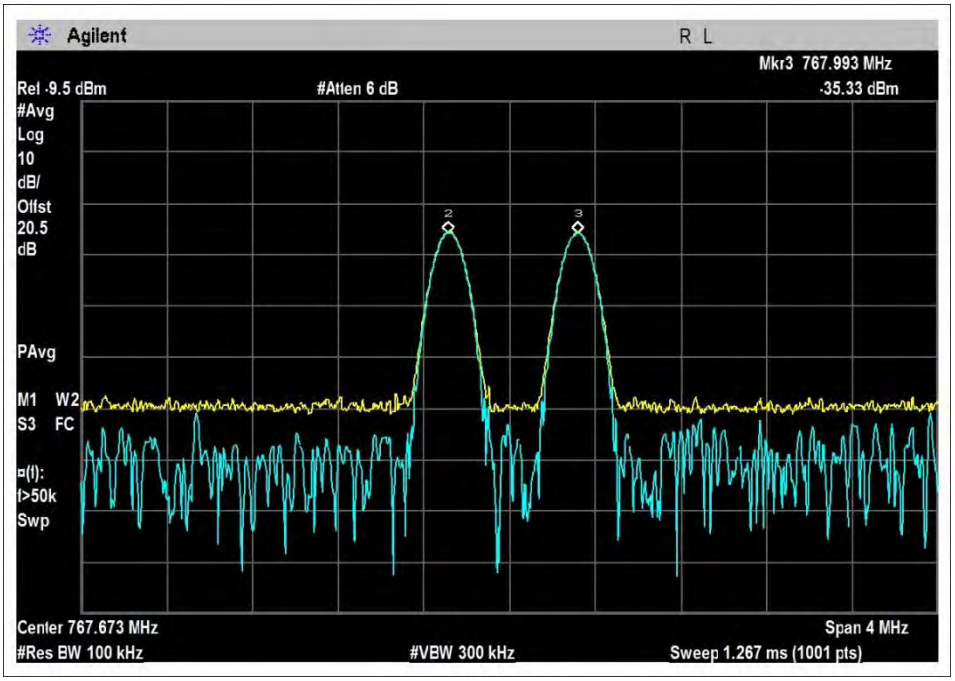



In-800M-UL-896-901H

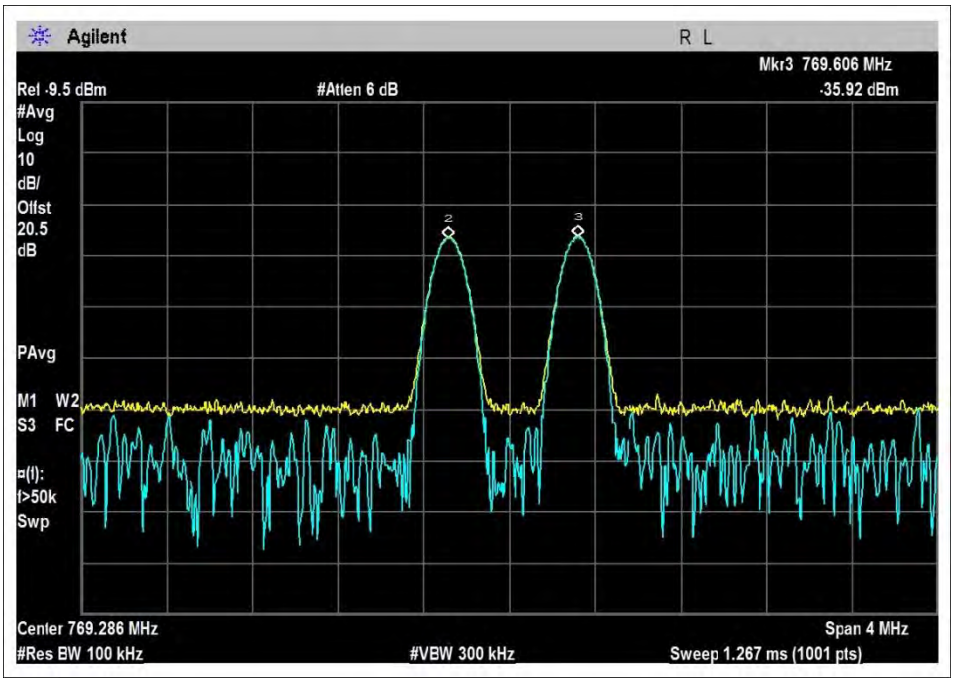
## 700MHz – DL - Input



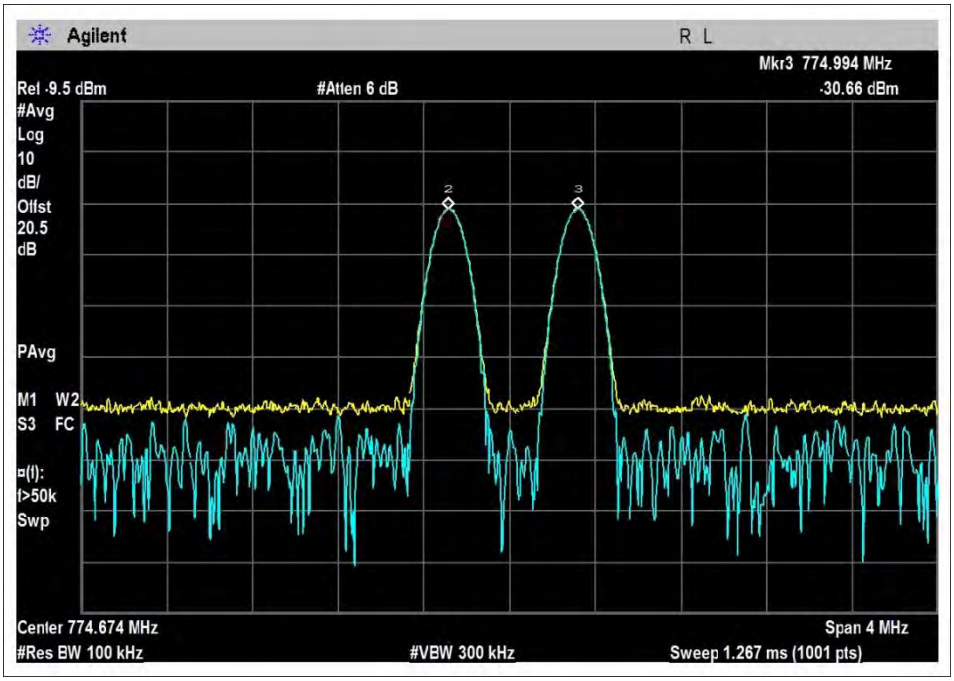

In-700M-DL-758-768L




In-700M-DL-758-768H

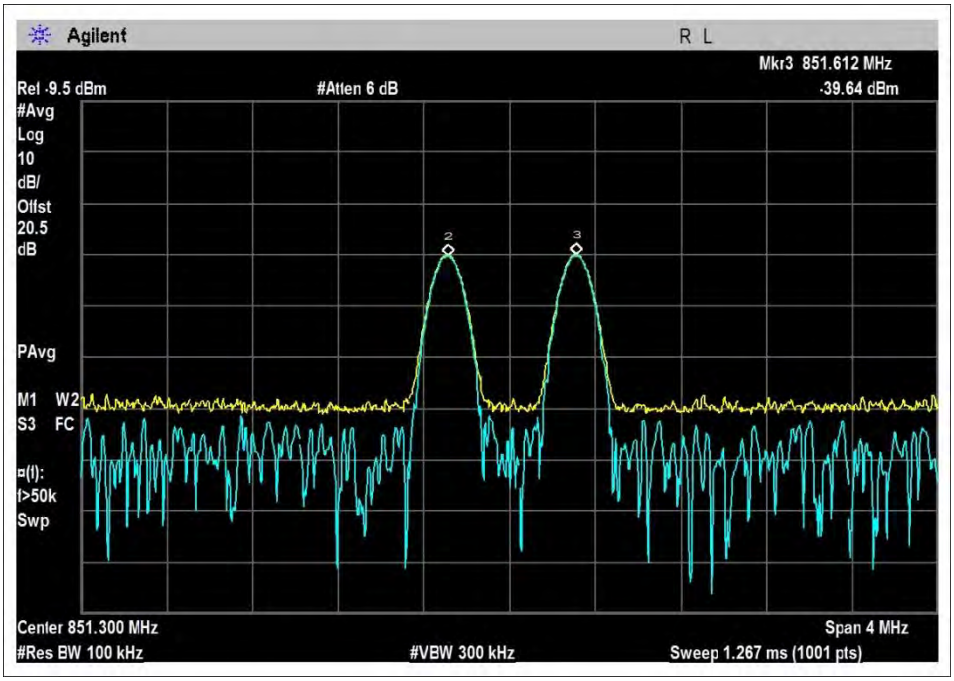



In-700M-DL-769-775L

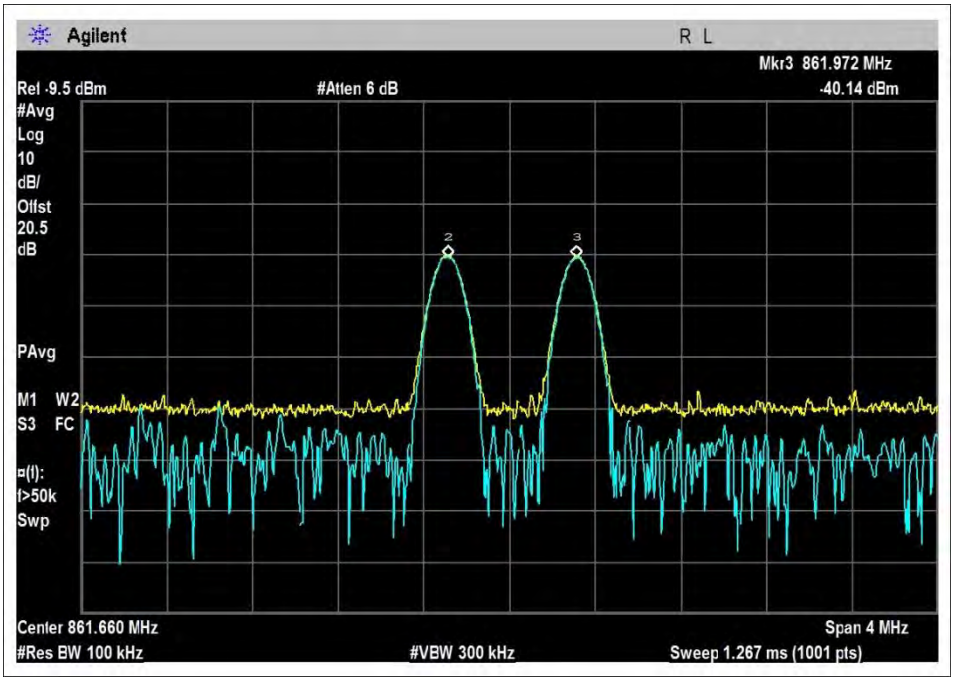



In-700M-DL-769-775H

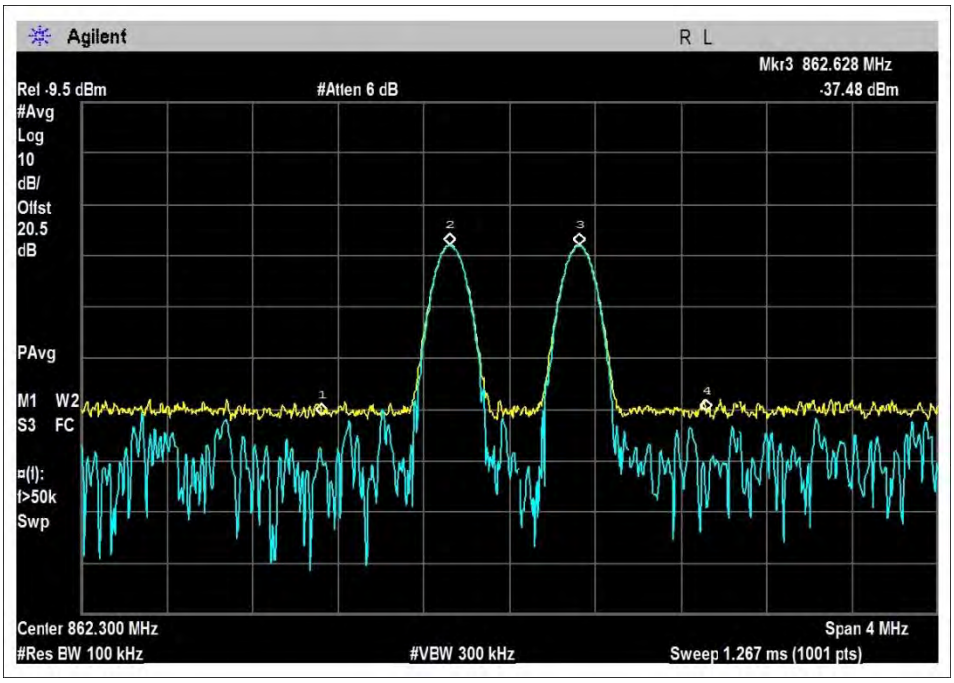
## 800MHz – DL - Input



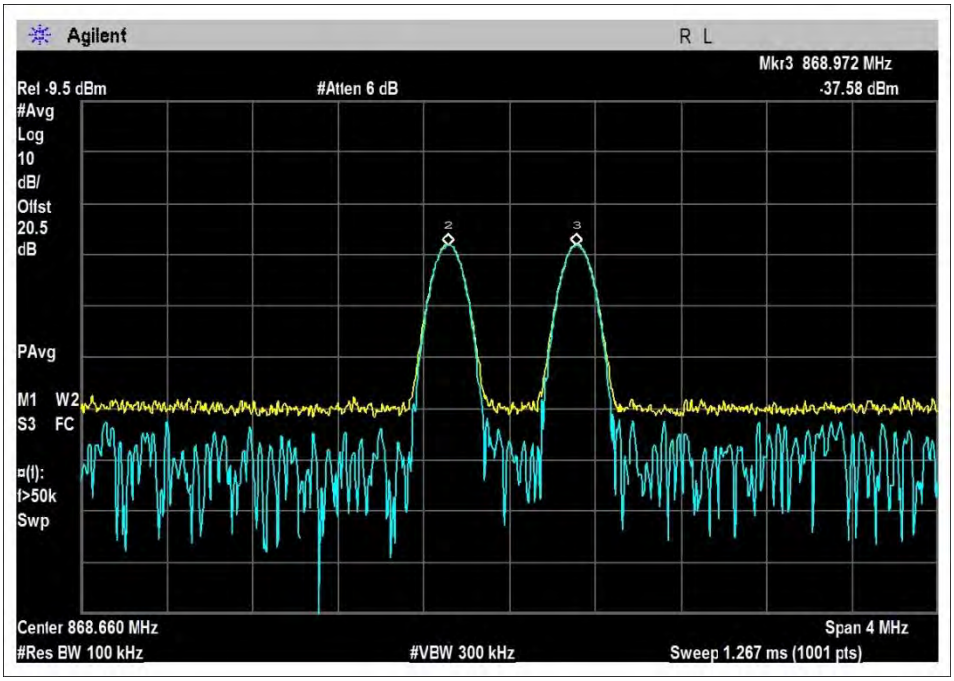

In-800M-DL-851-862L




In-800M-DL-851-862H

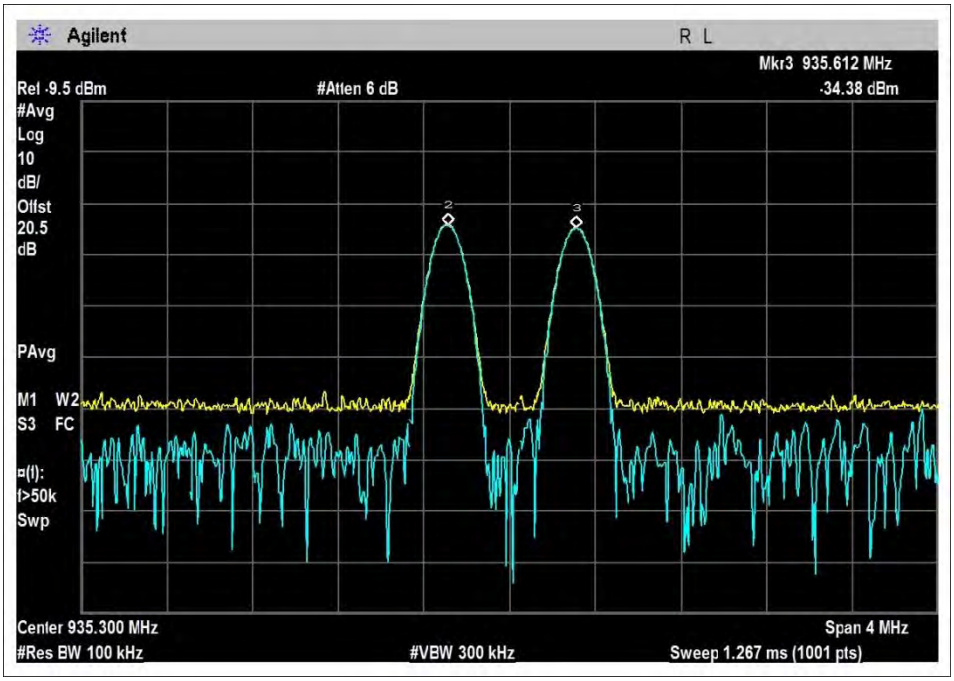



In-800M-DL-862-869L

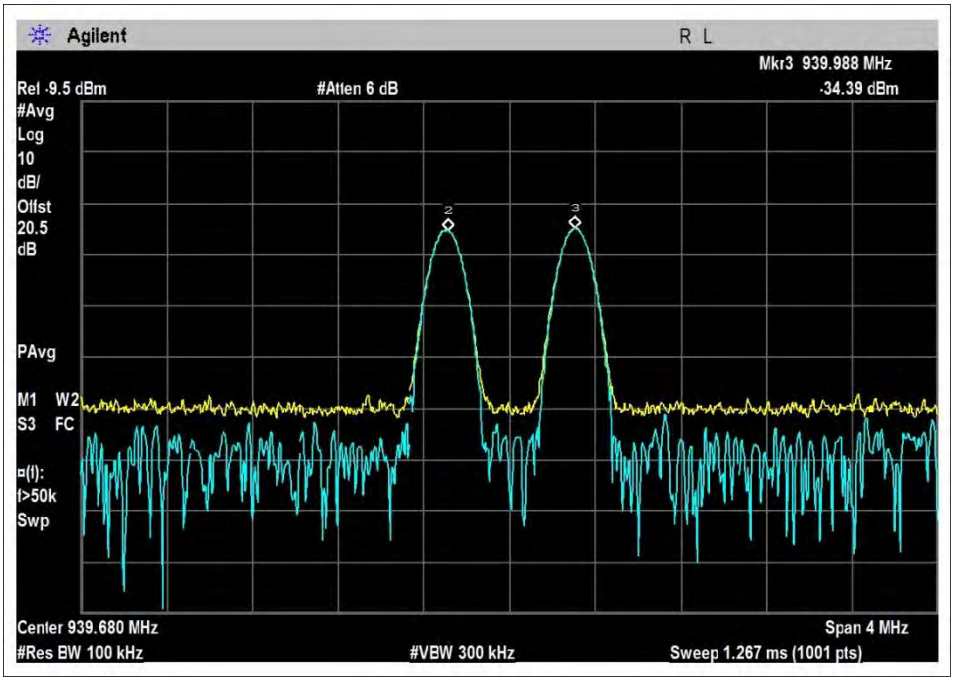



In-800M-DL-862-869H

## 900MHz – DL - Input

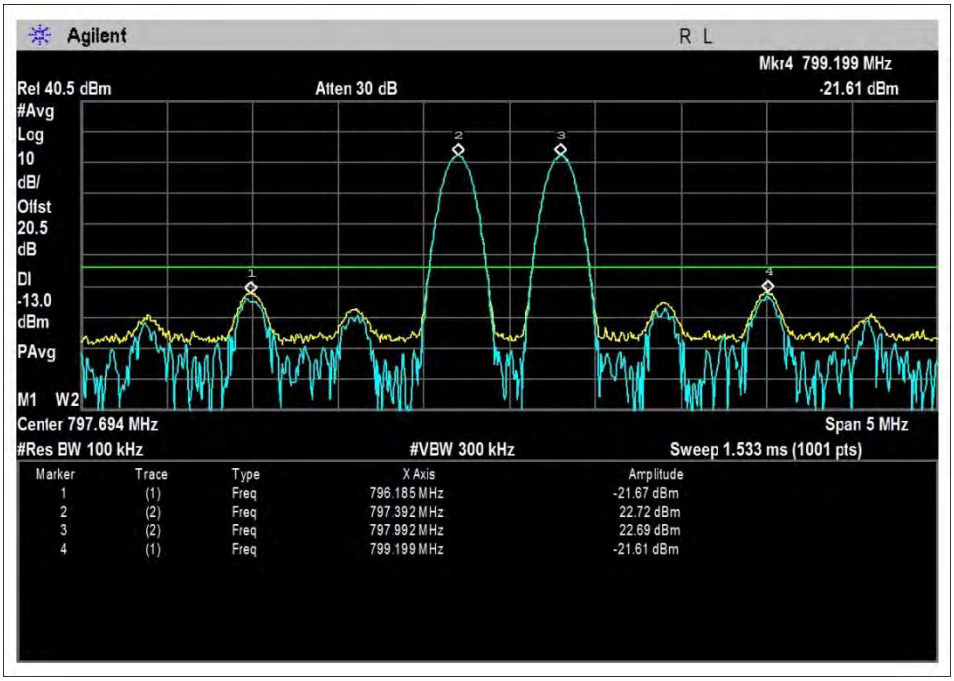



In-900M-DL-935-940L

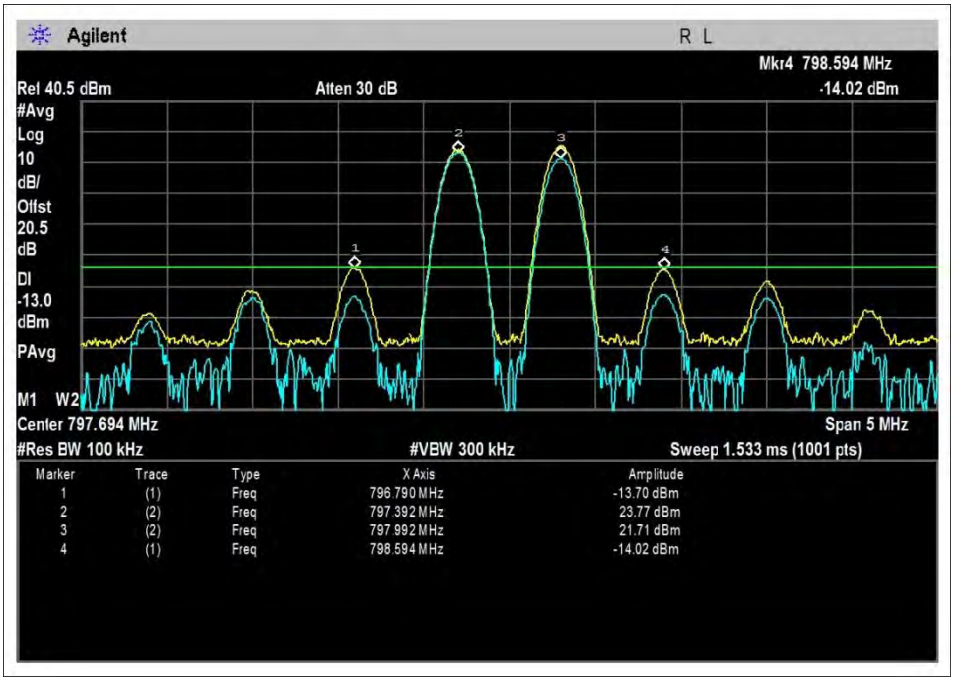



In-900M-DL-935-940H

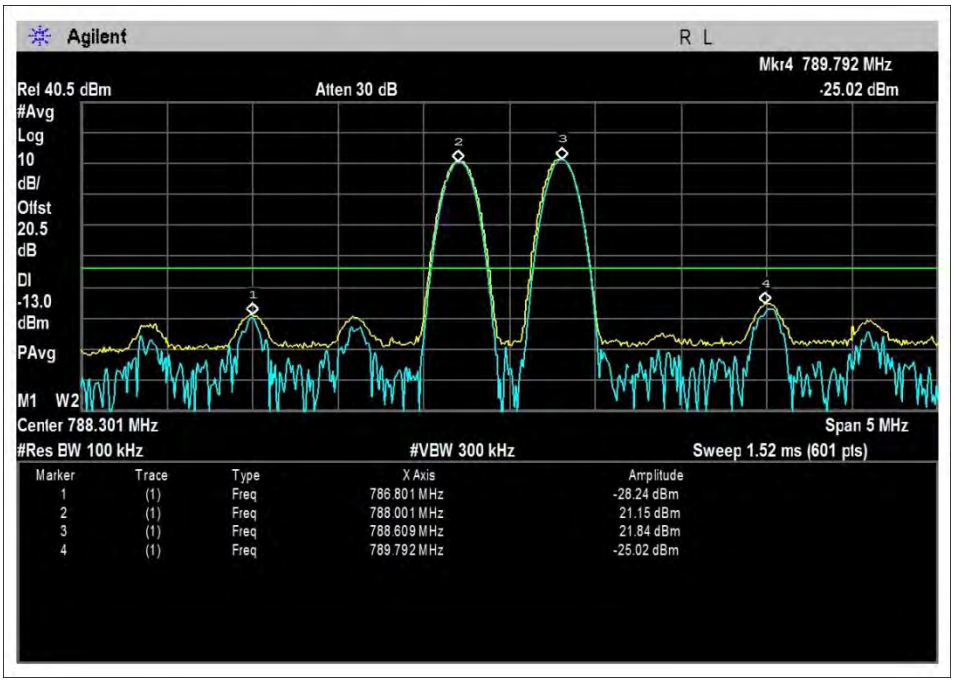
## 700MHz – UL - Output



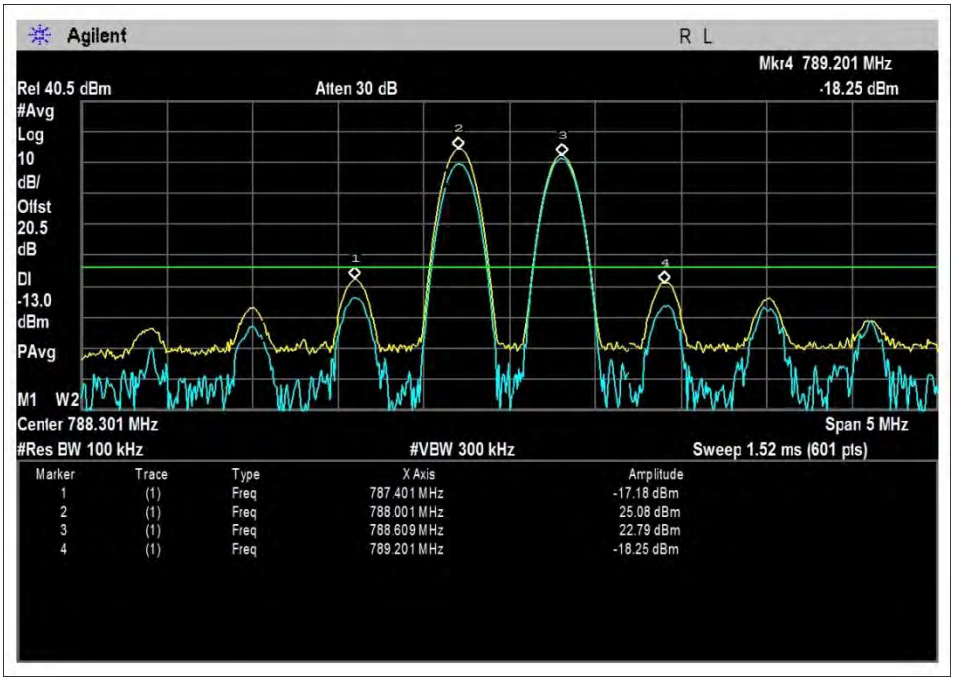

700M-UL-788-798H-22.3



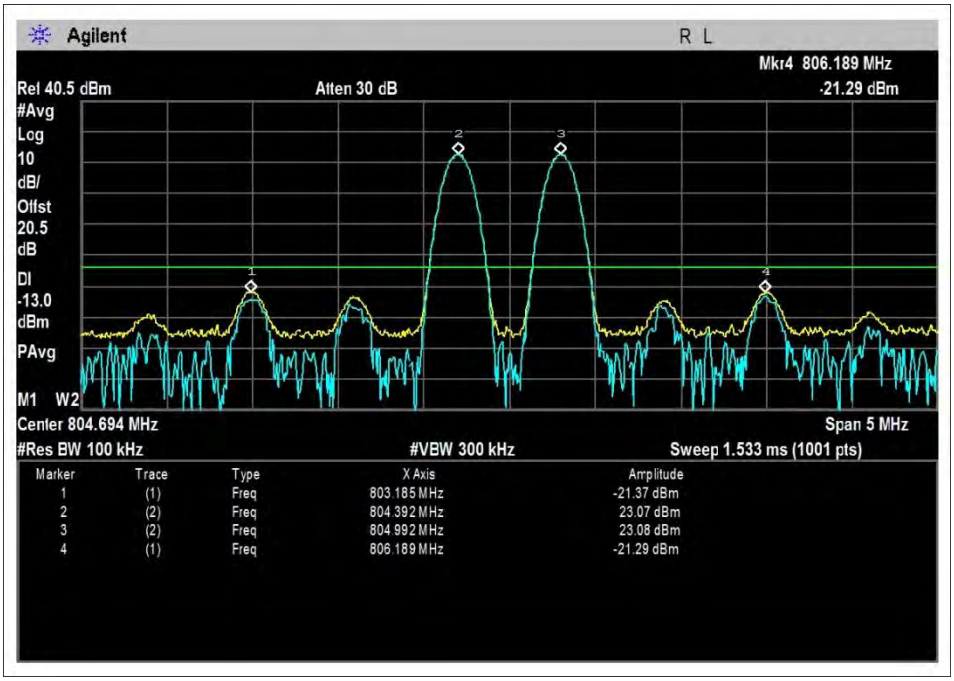

700M-UL-788-798H-AGC+10dB



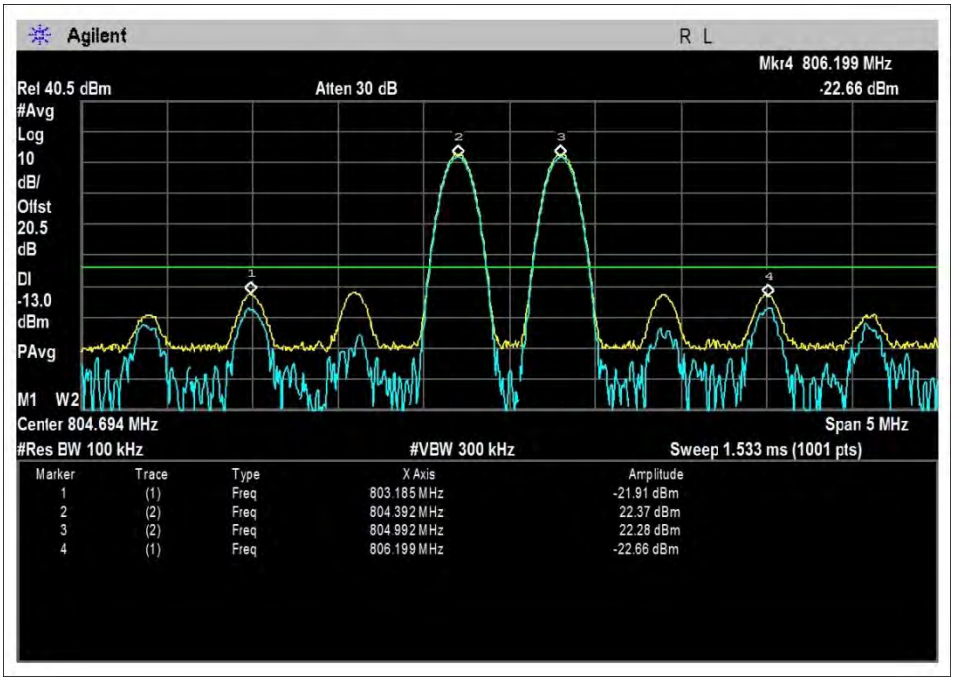

700M-UL-788-798L-19



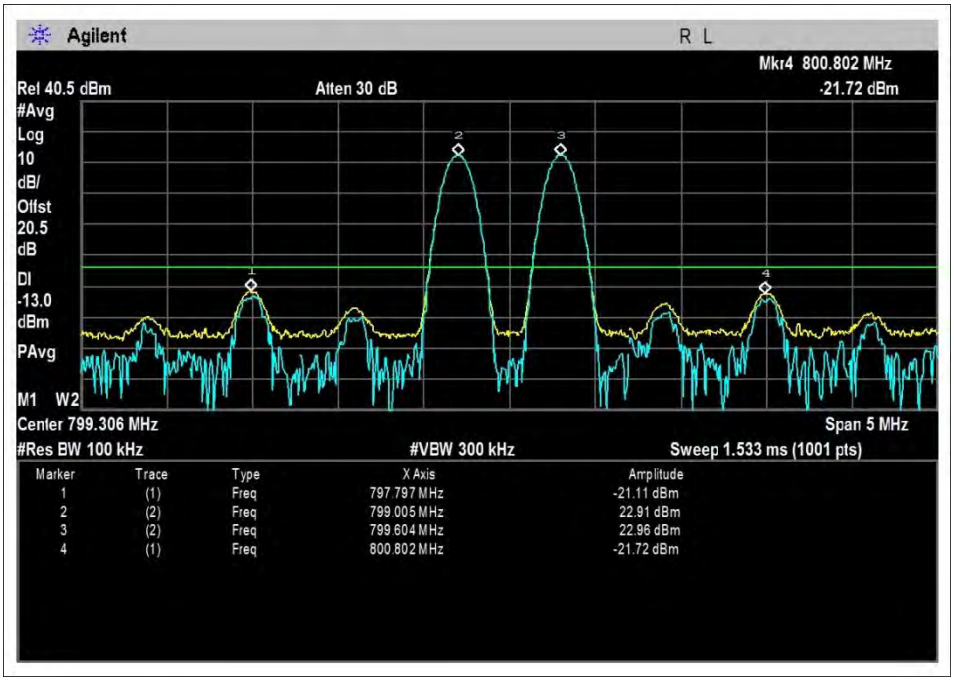

700M-UL-788-798L-AGC+10dB



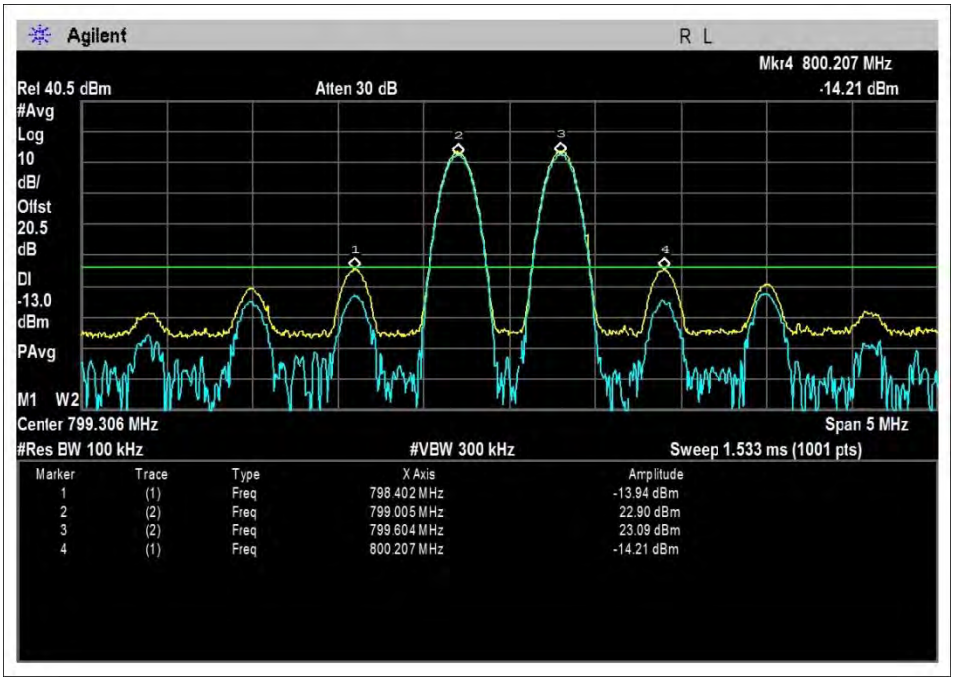

700M-UL-799-805H-23.9




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

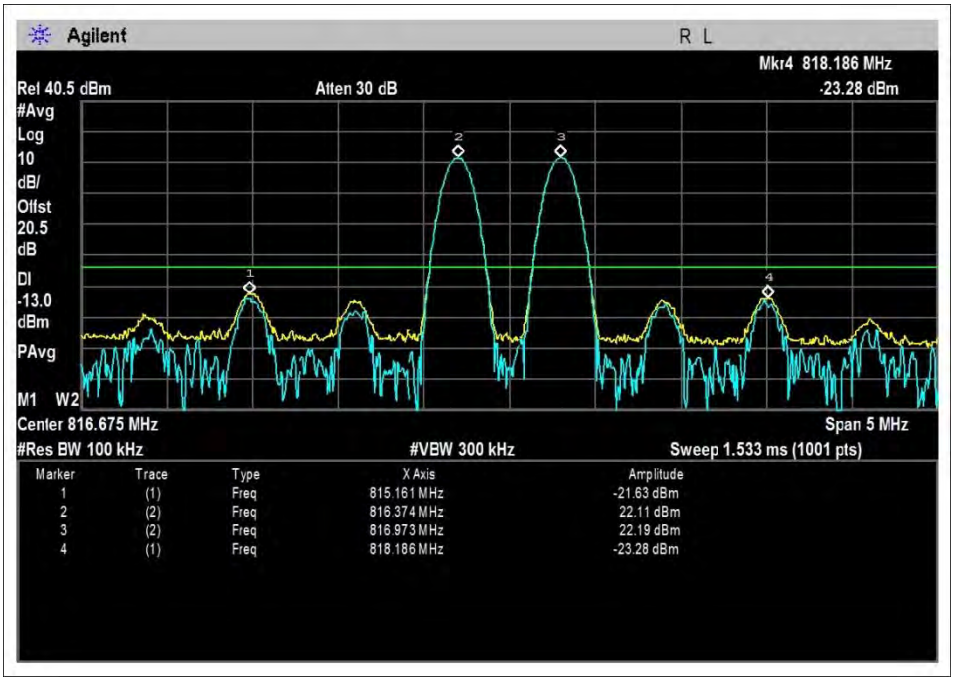



700M-UL-799-805L-22.7

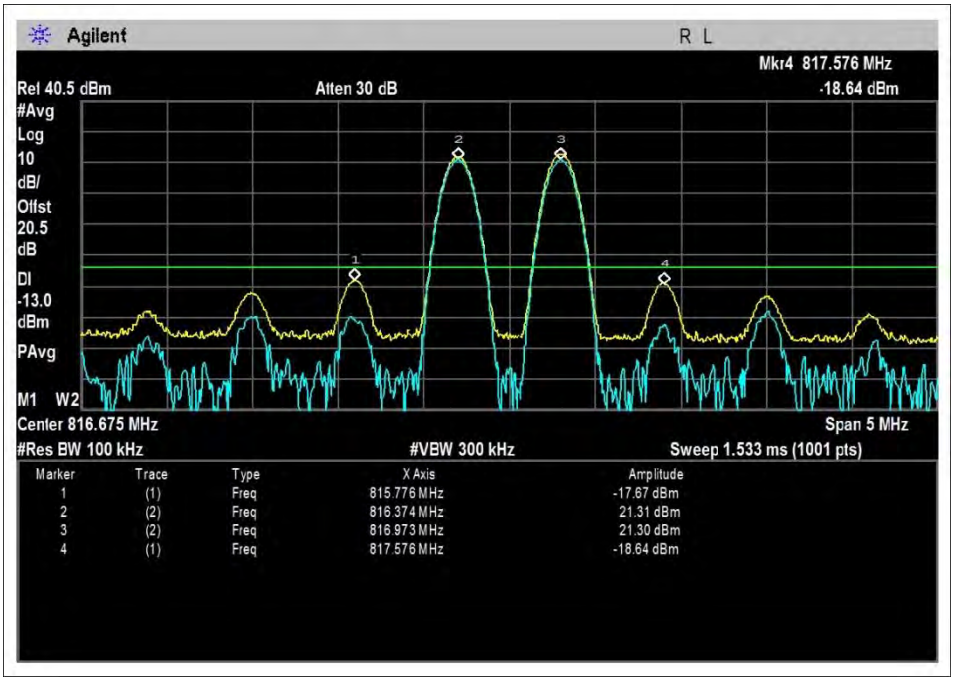



700M-UL-799-805L-AGC+10dB

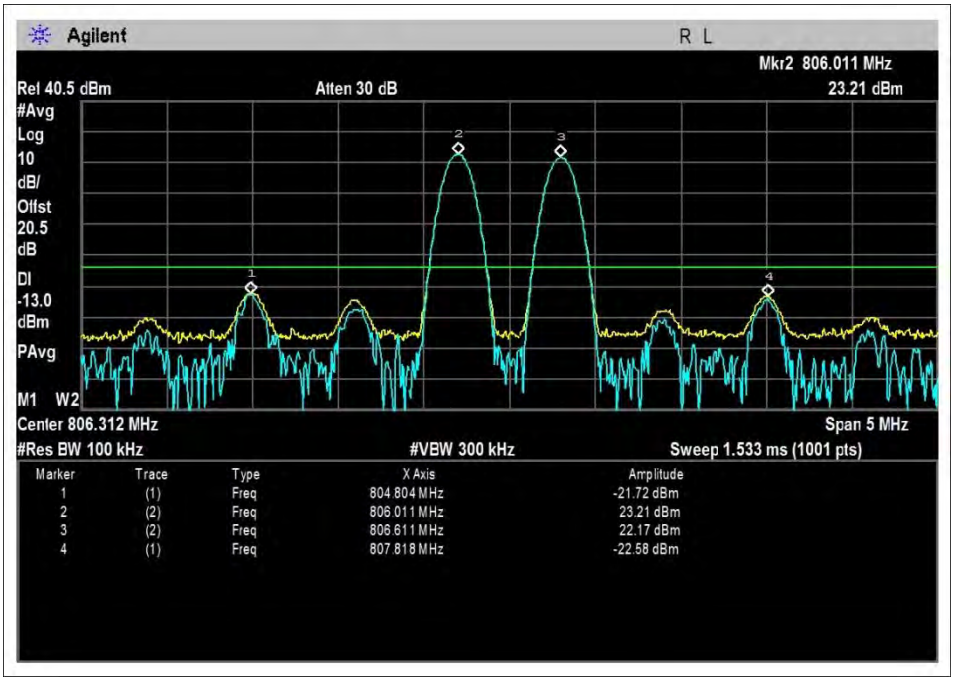
## 800MHz – UL - Output



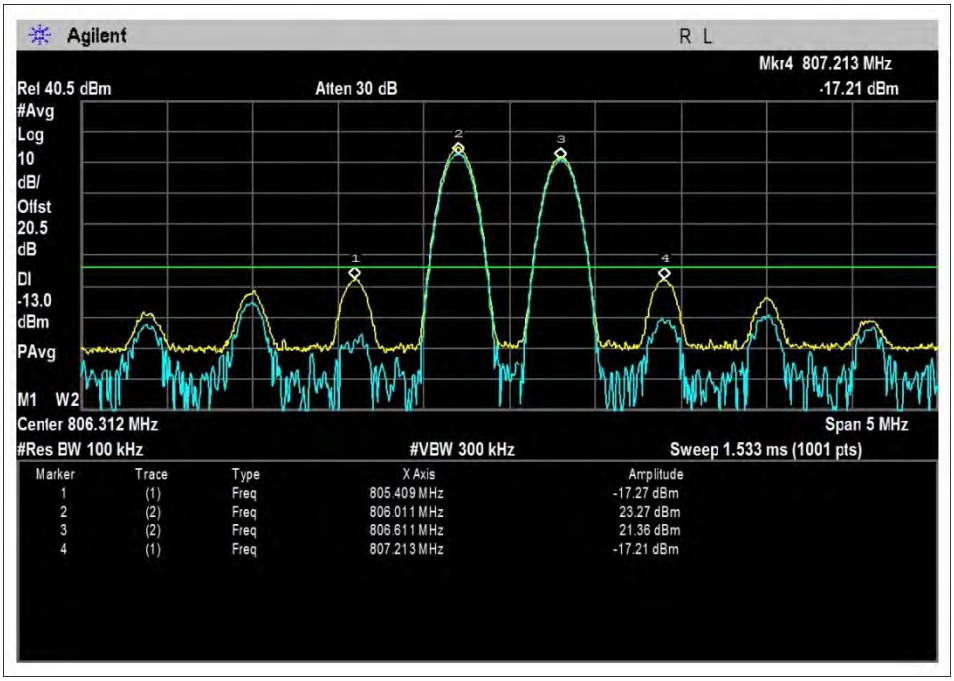

800M-UL-806-817H-22.6



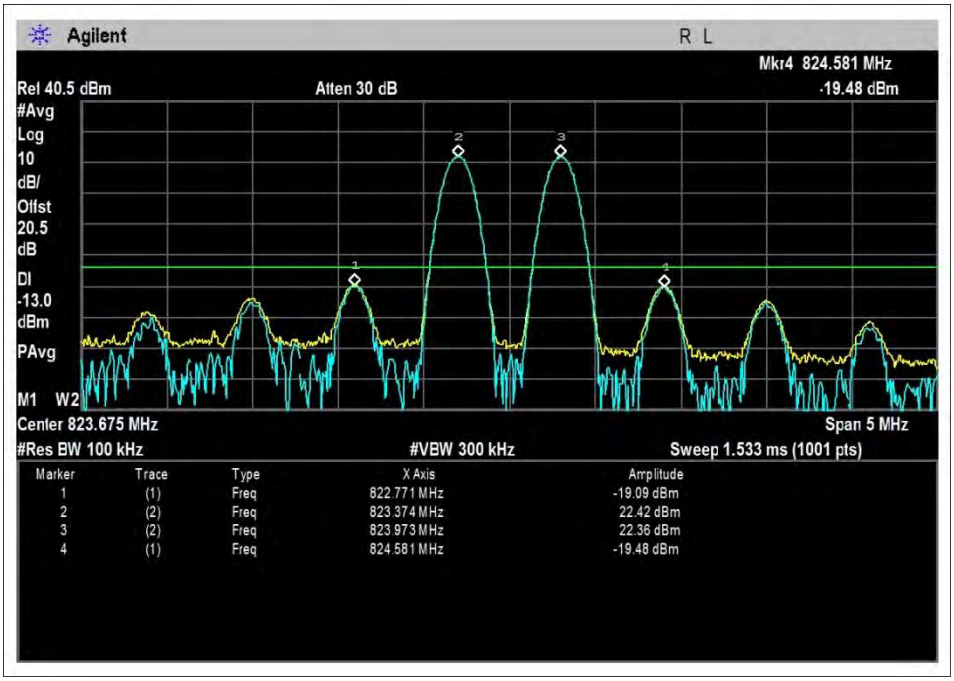

800M-UL-806-817H-AGC+10dB



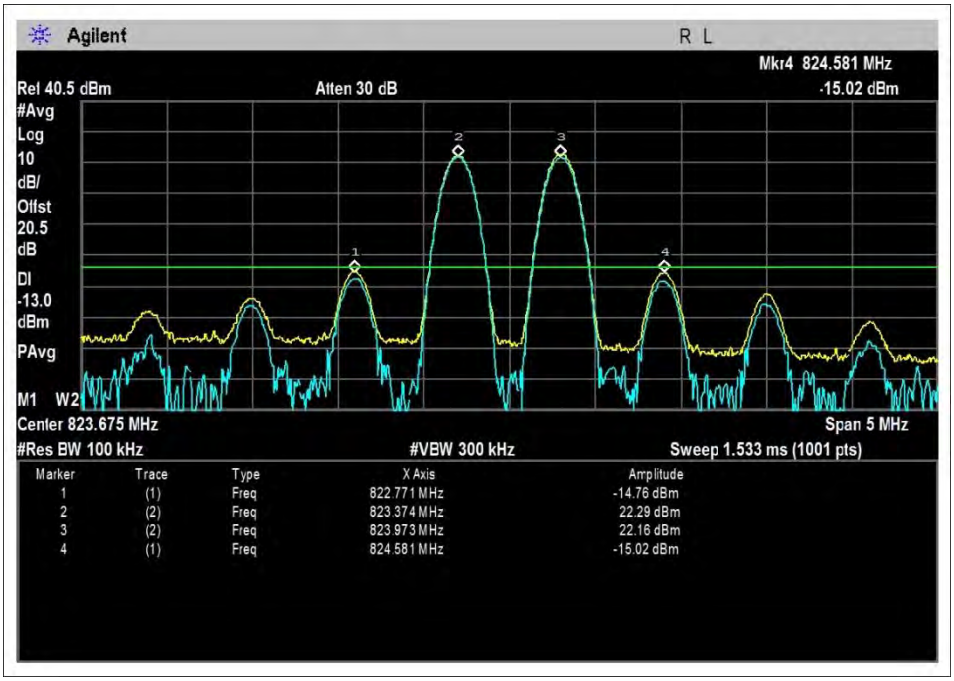

800M-UL-806-817L-24.2



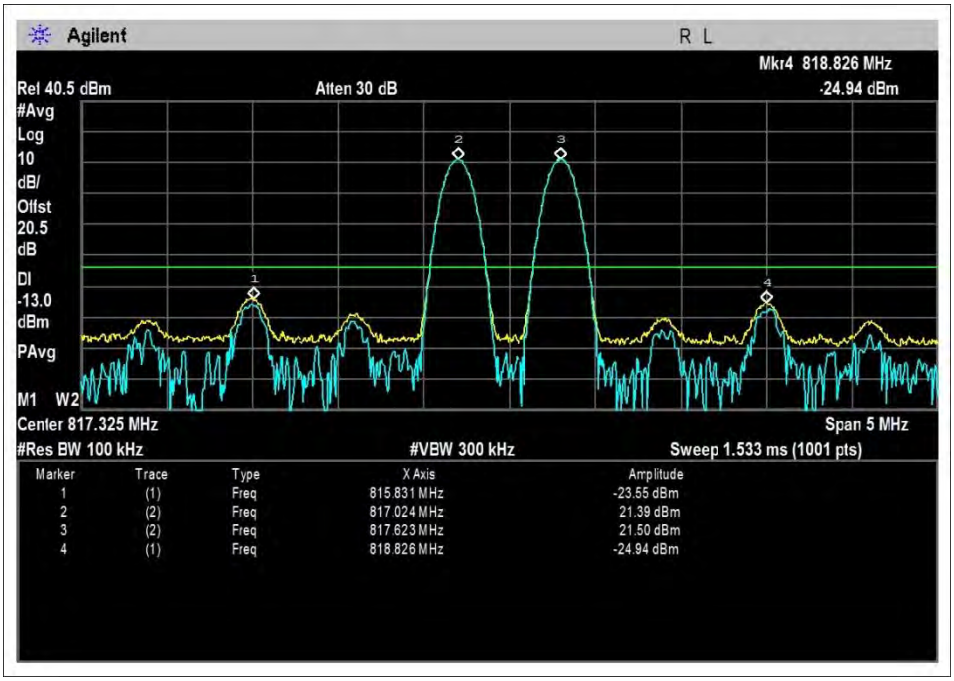

800M-UL-806-817L-AGC+10dB



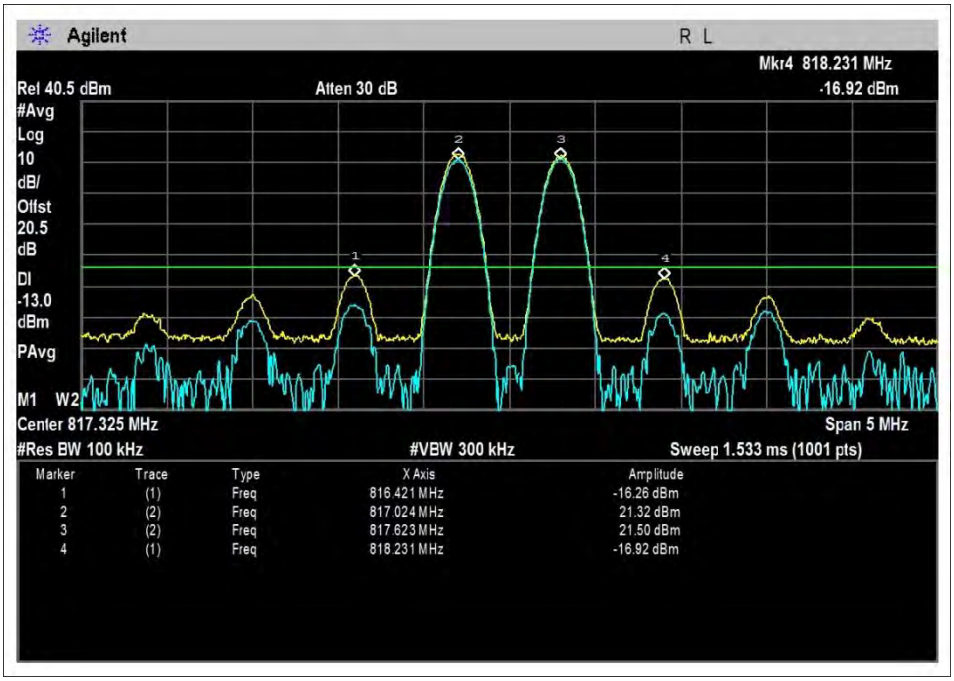

800M-UL-817-824H-19.4



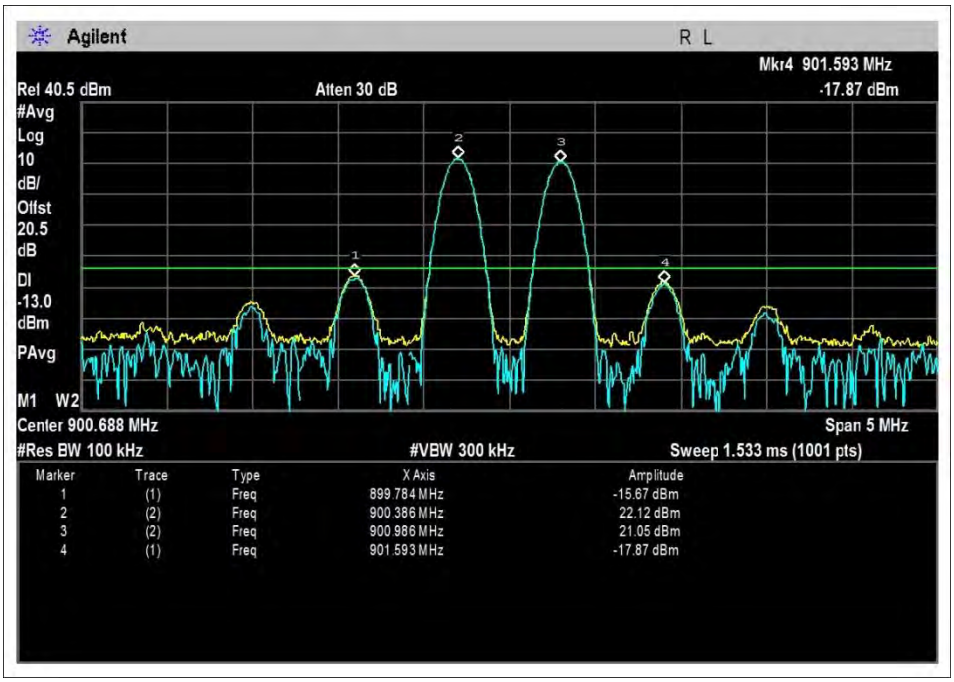

800M-UL-817-824H-AGC+10dB



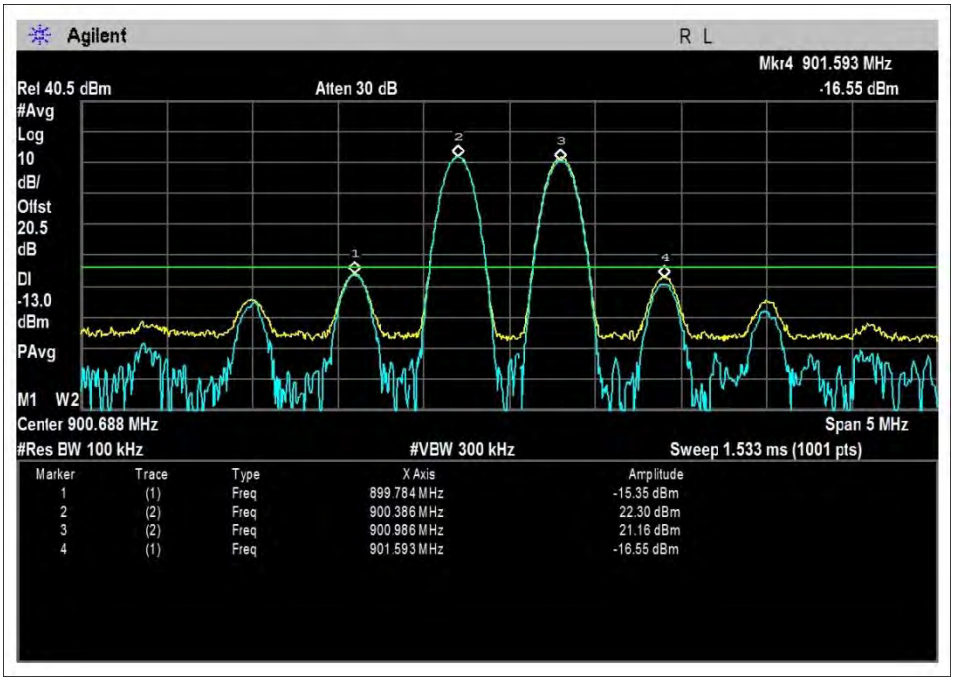

800M-UL-817-824L-21.7



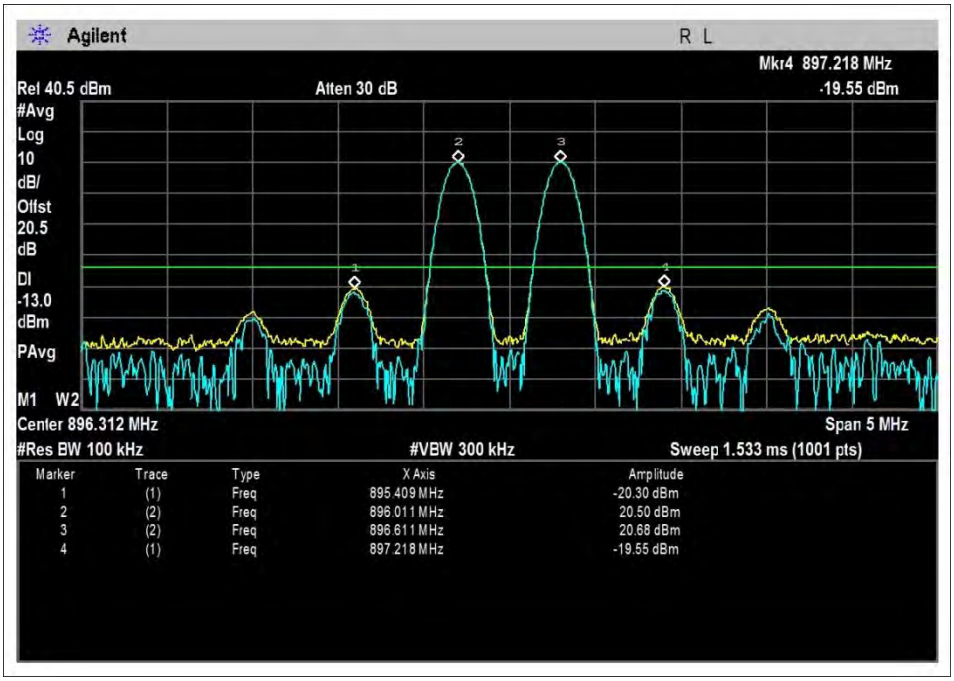

800M-UL-817-824L-AGC+10dB



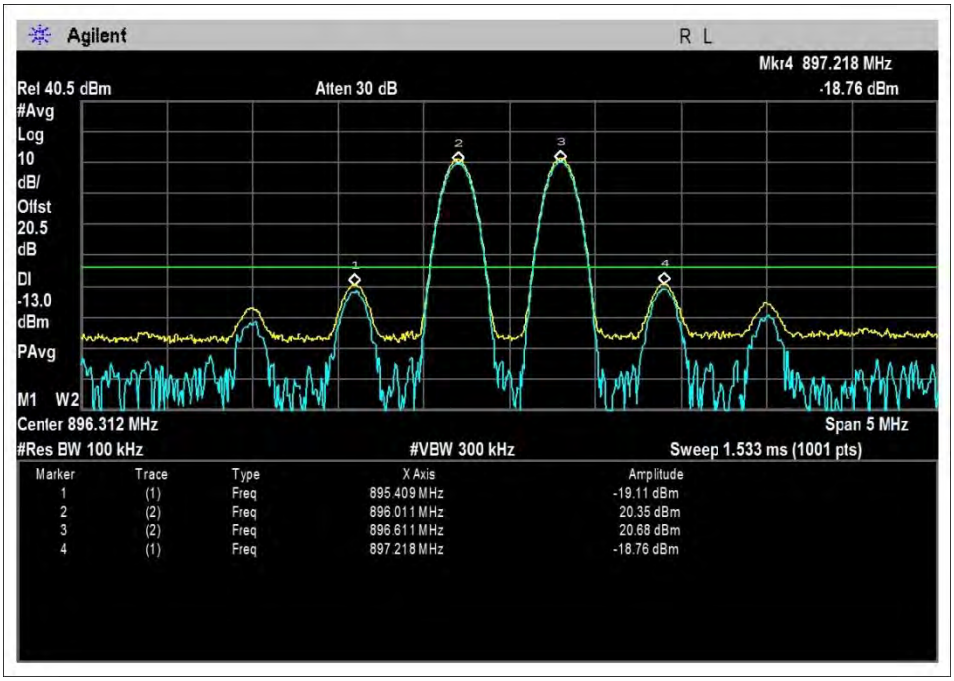

InterCW-800M-UL-896-901H-21.6




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

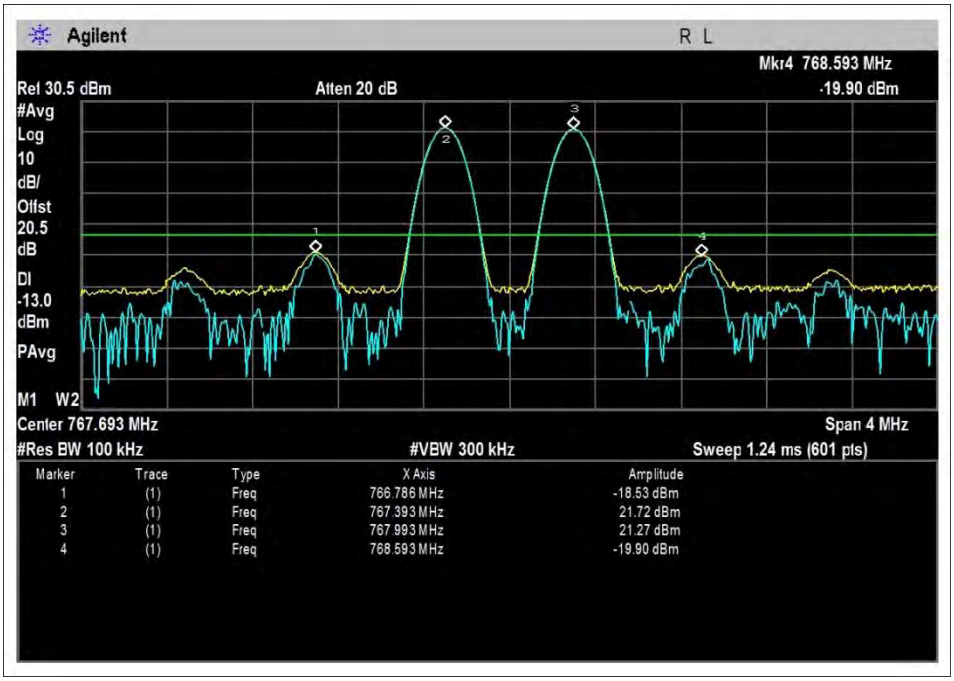



800M-UL-896-901L-23

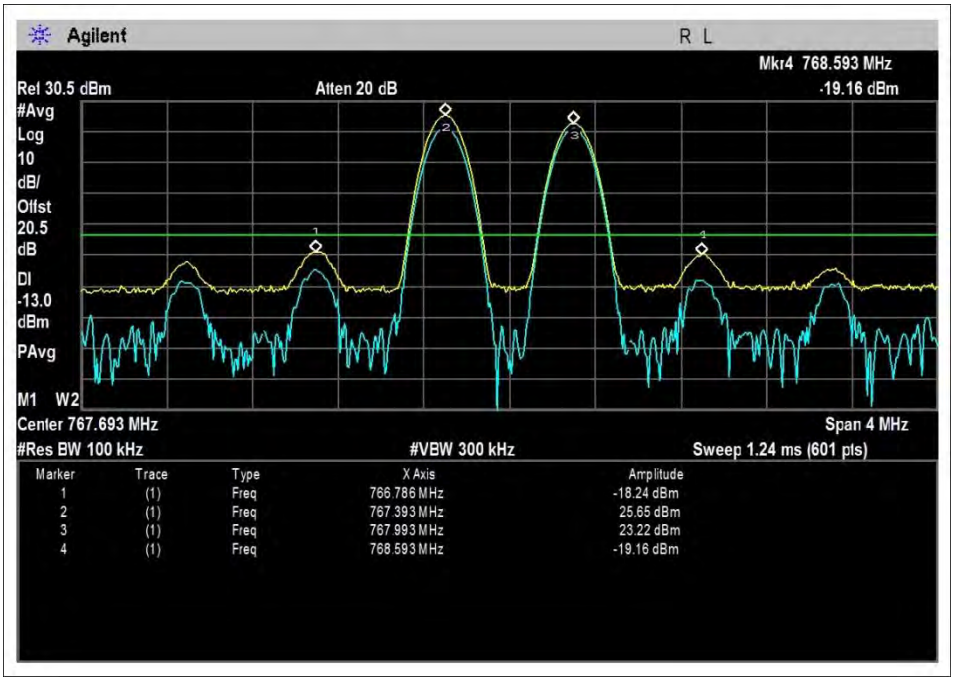



800M-UL-896-901L-AGC+10dB

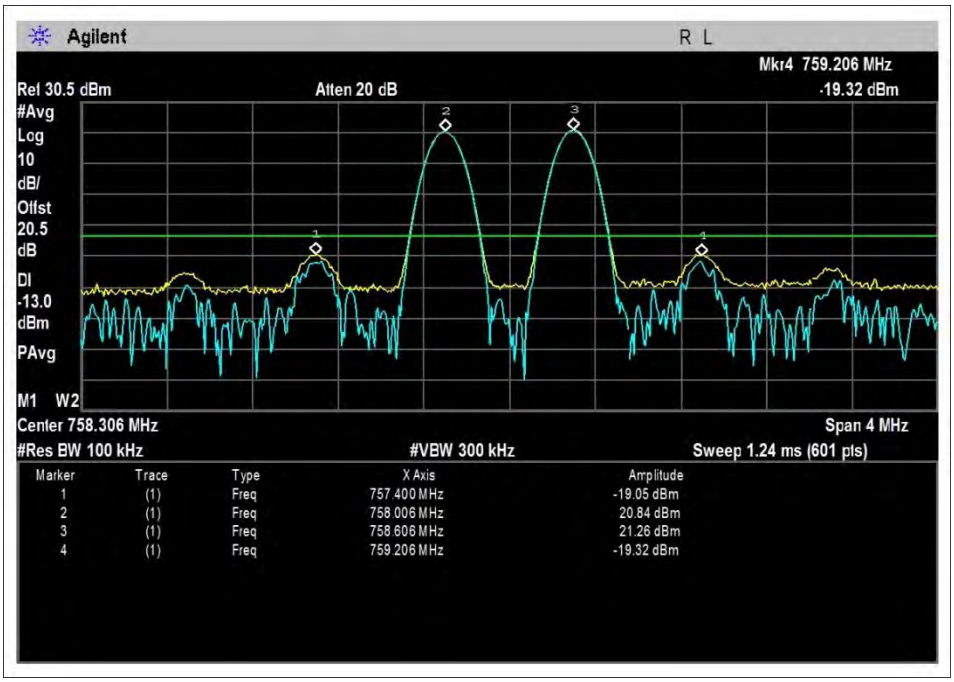
## 700MHz – DL - Output



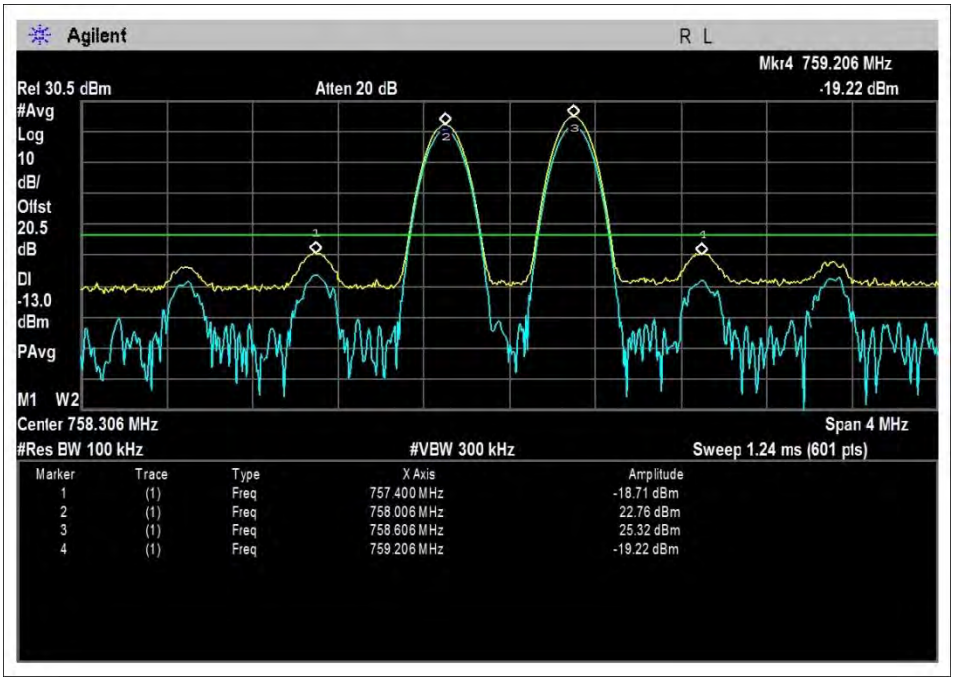

700M-DL-758-768H-29.1



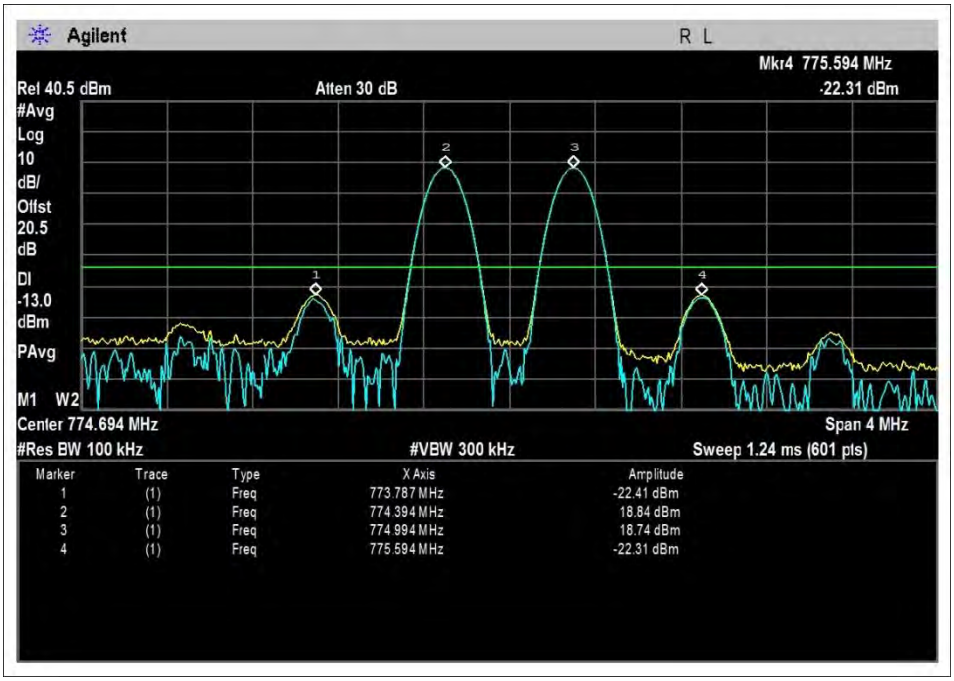

InterCW-700M-DL-758-768H-AGC+10dB



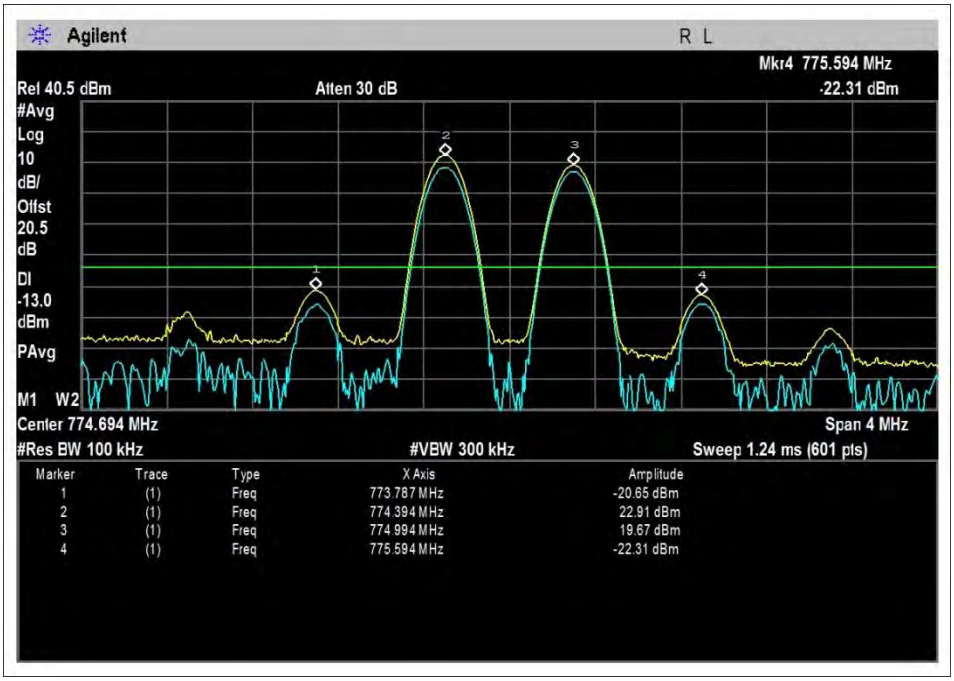

700M-DL-758-768L-32.2



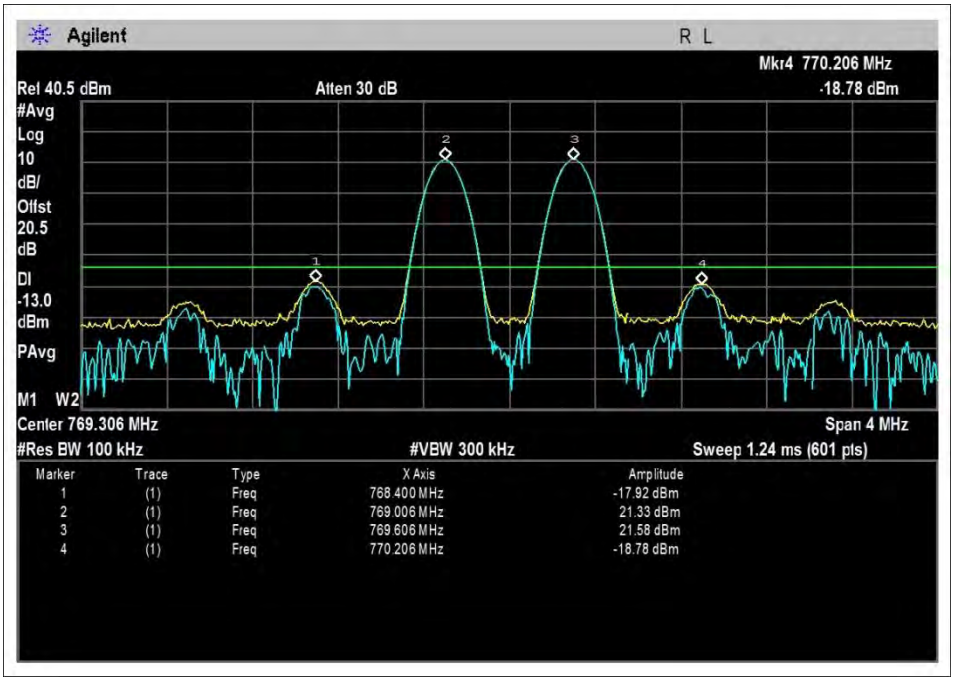

700M-DL-758-768L-AGC+10dB



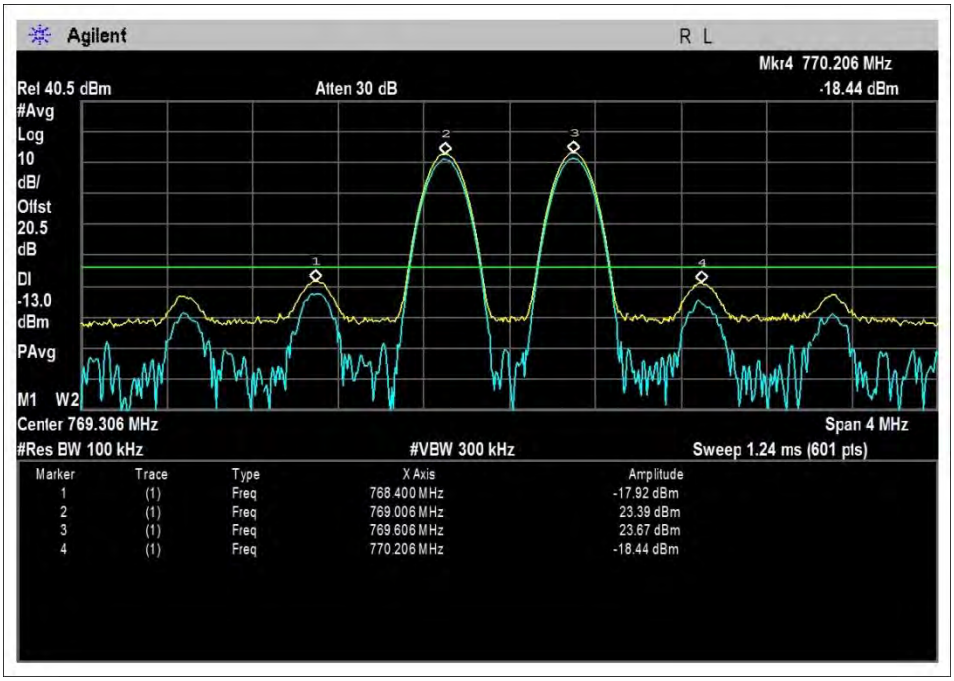

700M-DL-769-775H-24.4




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

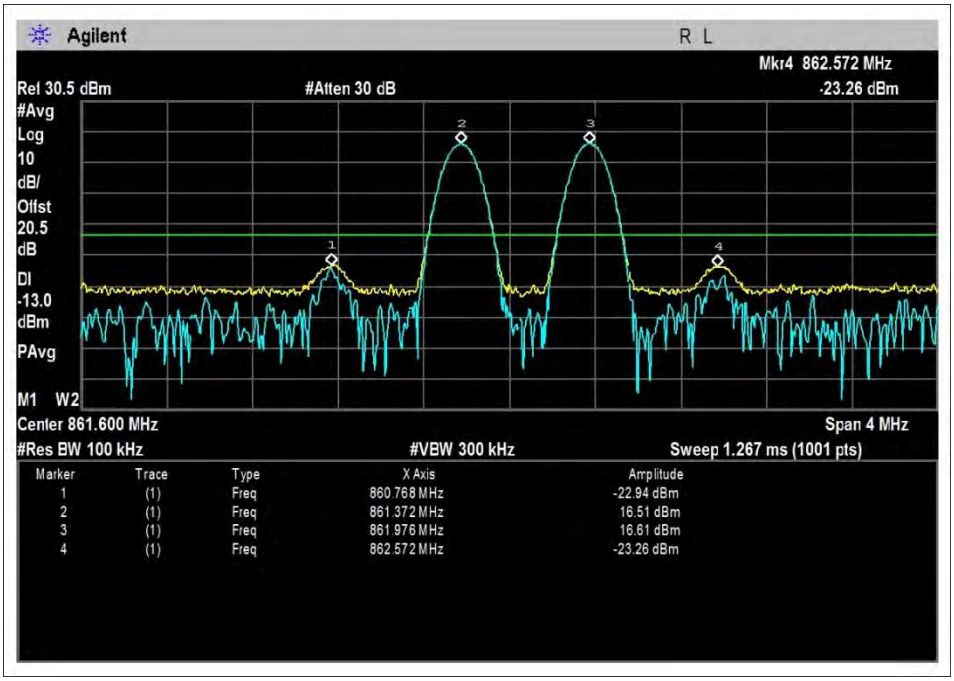



700M-DL-769-775L-29.7



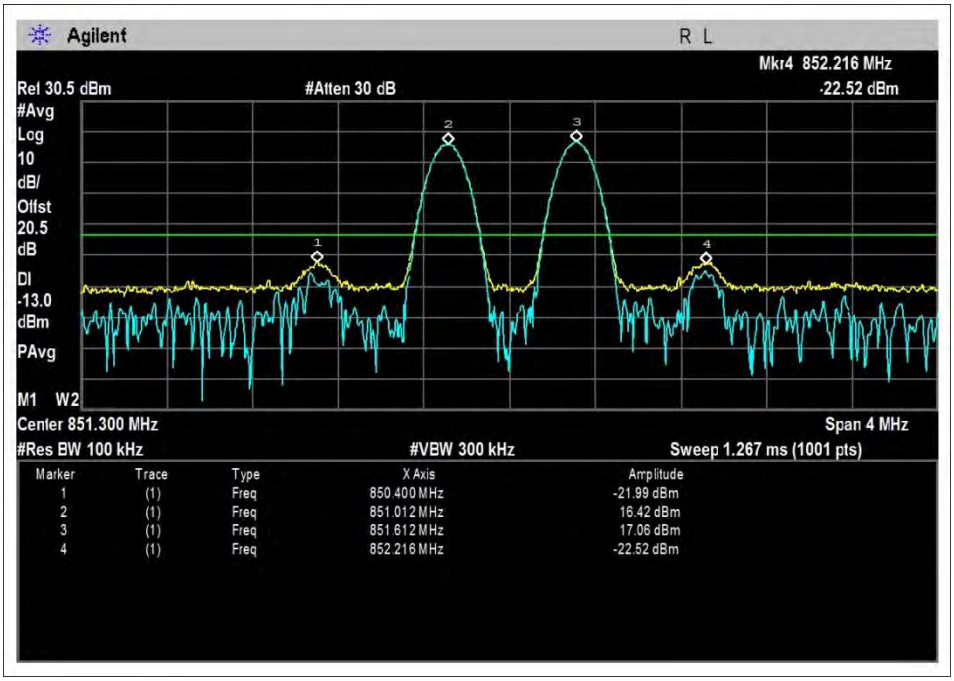

700M-DL-769-775L-AGC+10dB

## 800MHz – DL - Output

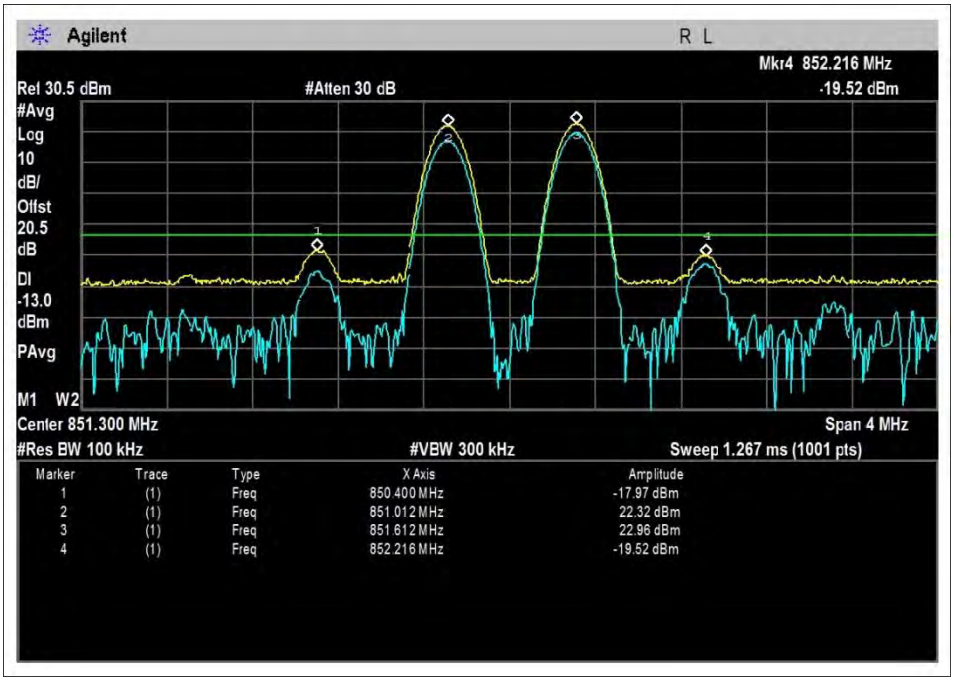



800M-DL-851-862H-33.7

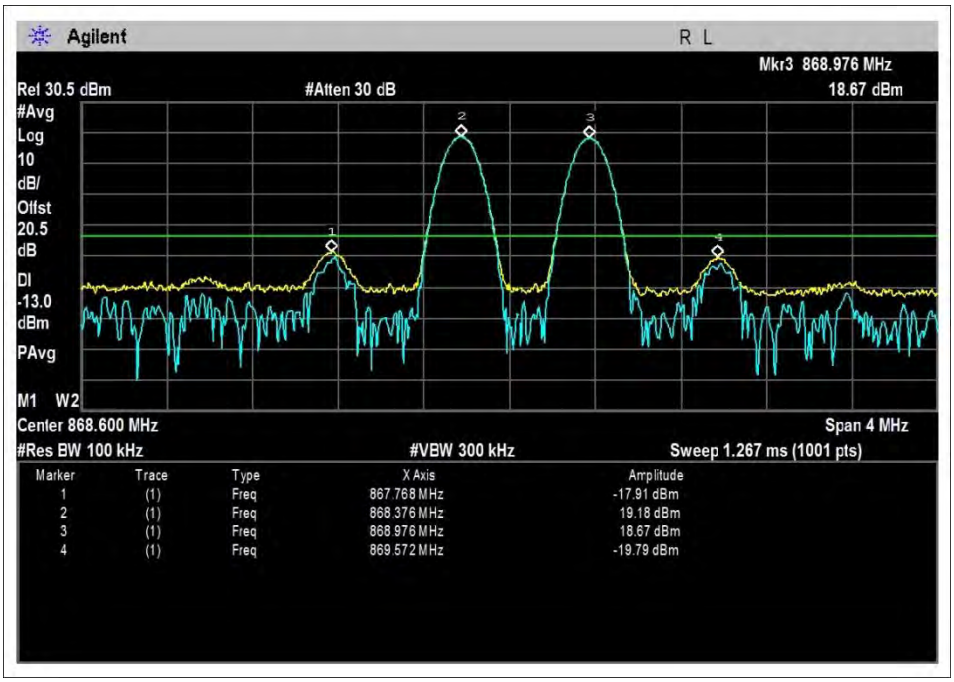

800M-DL-851-862H-AGC+10dB



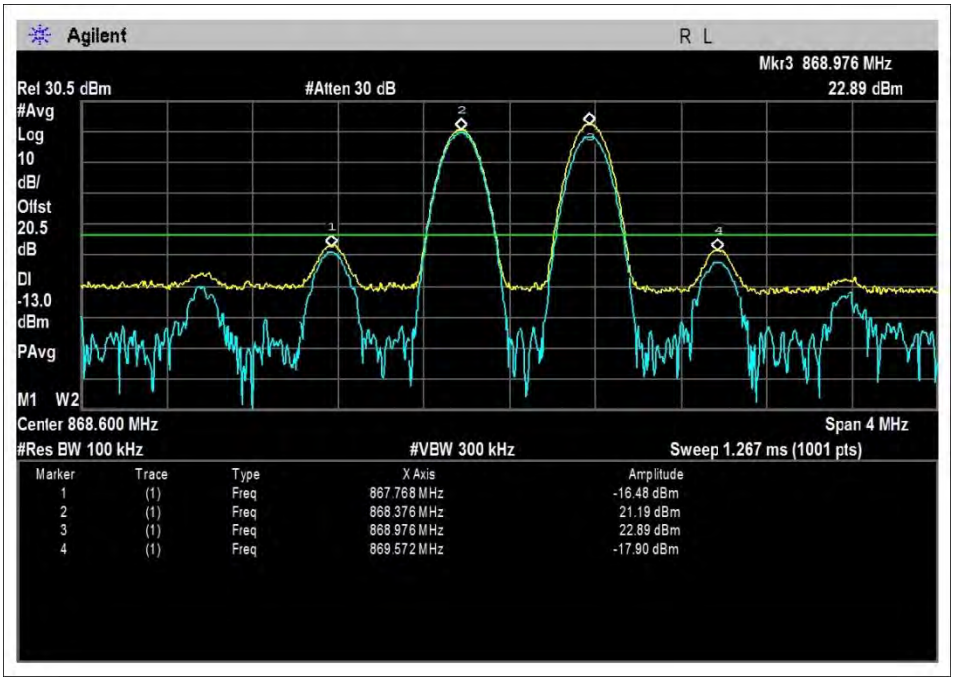

InterCW-800M-DL-851-862L-33.4



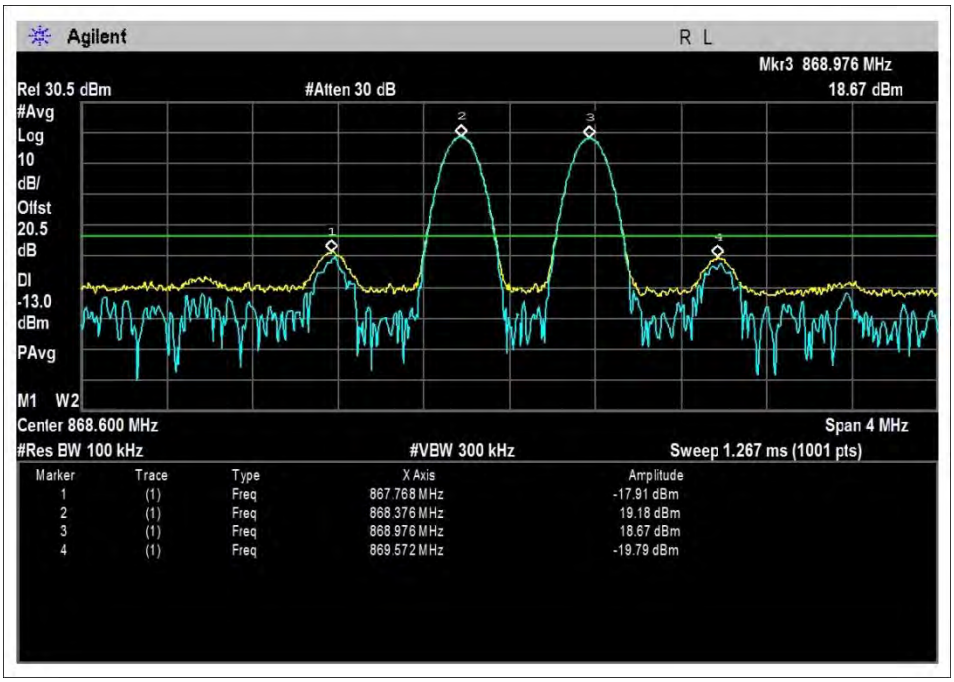

800M-DL-851-862L-AGC+10dB



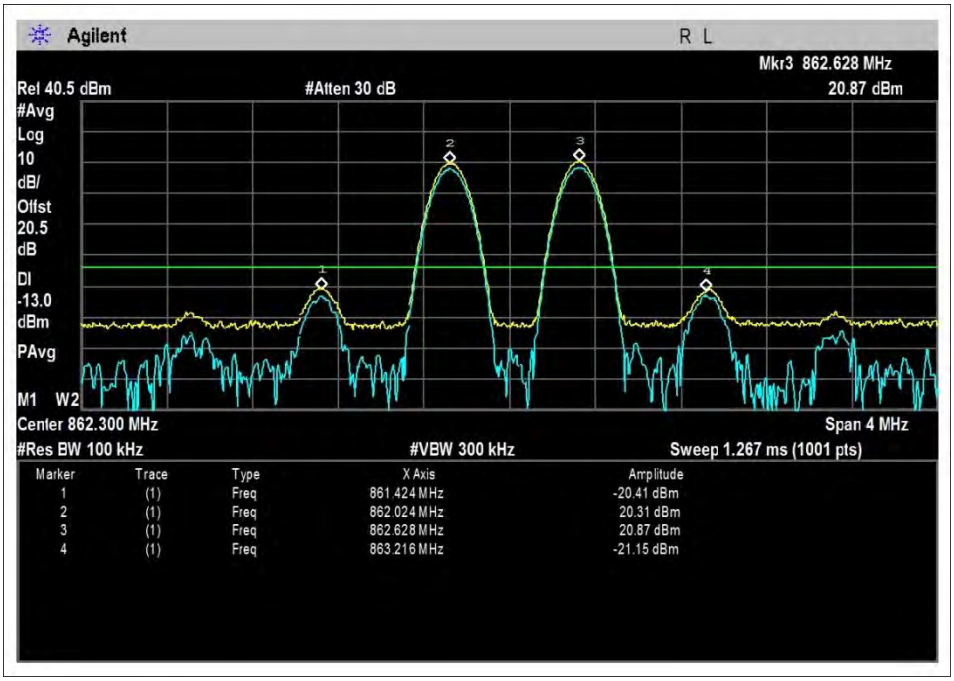

800M-DL-862-869H-31.3




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

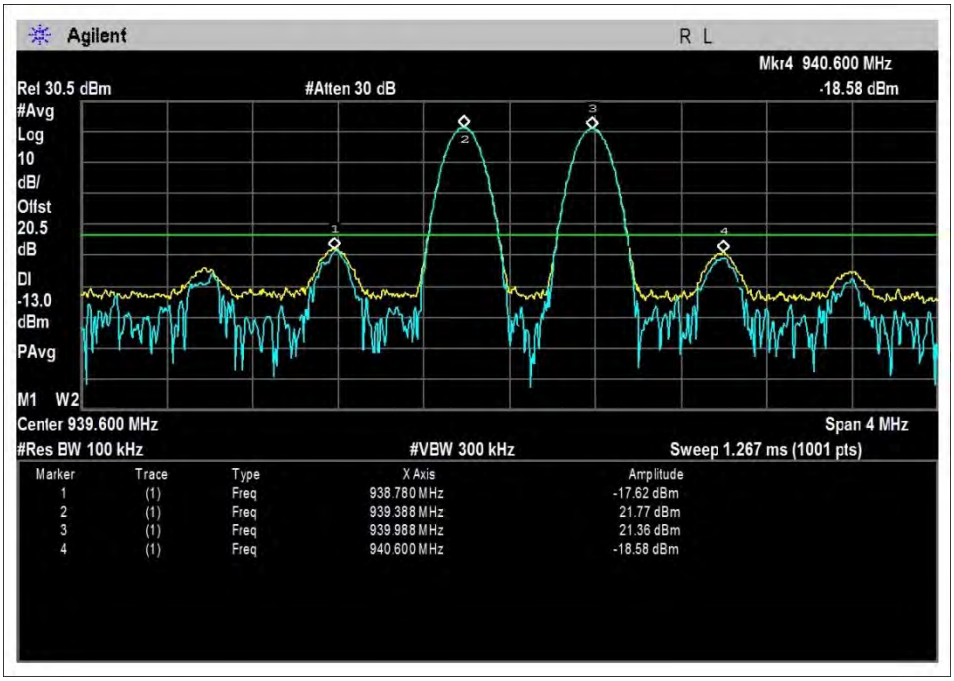



800M-DL-862-869L-31.3

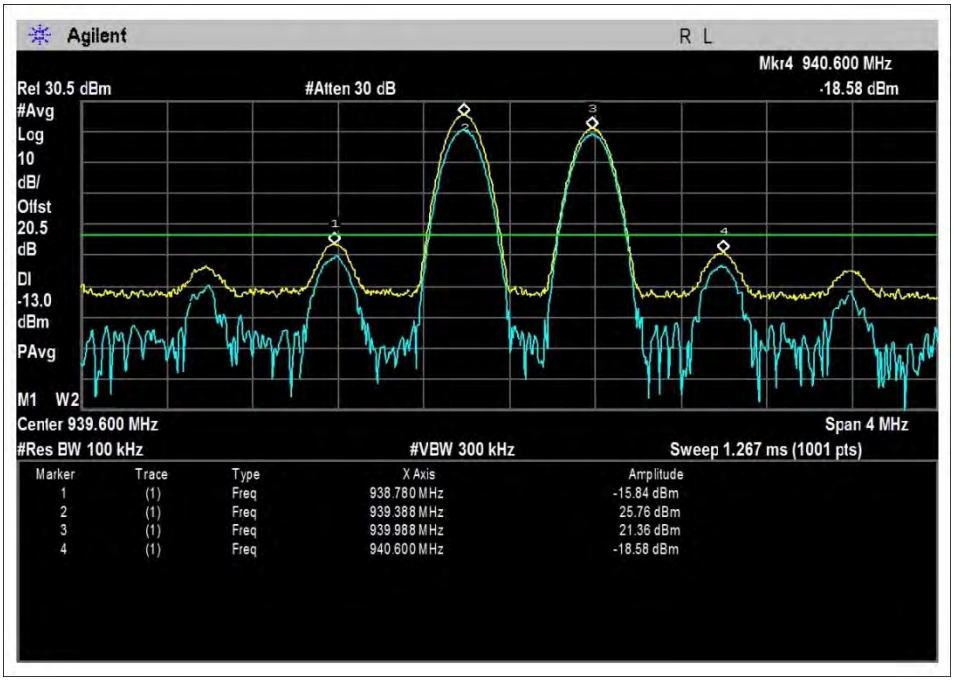



800M-DL-862-869L-AGC+10dB

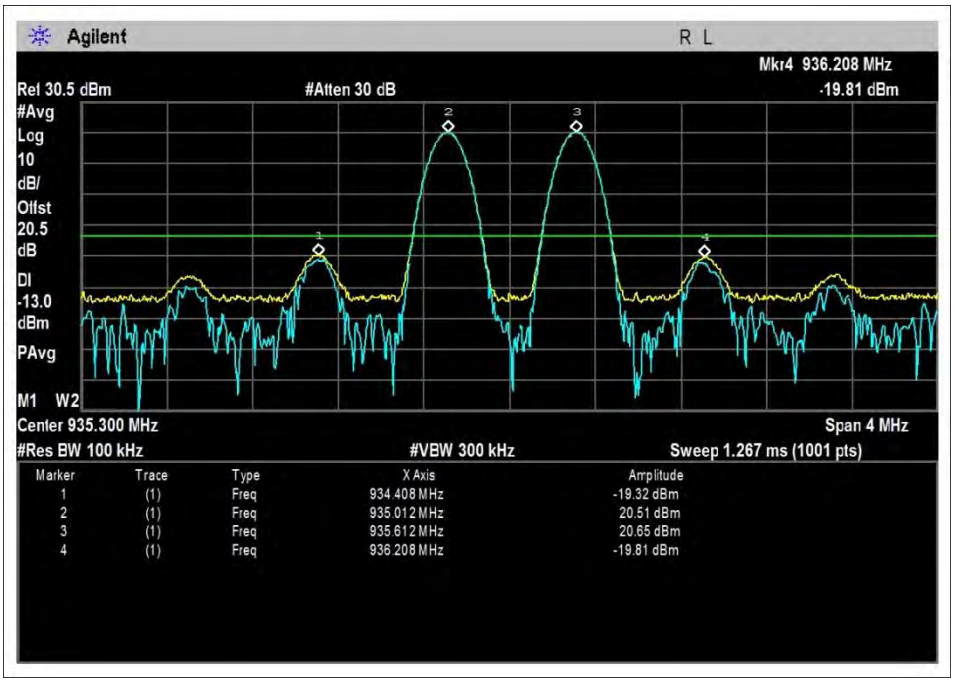
## 900MHz – DL - Output



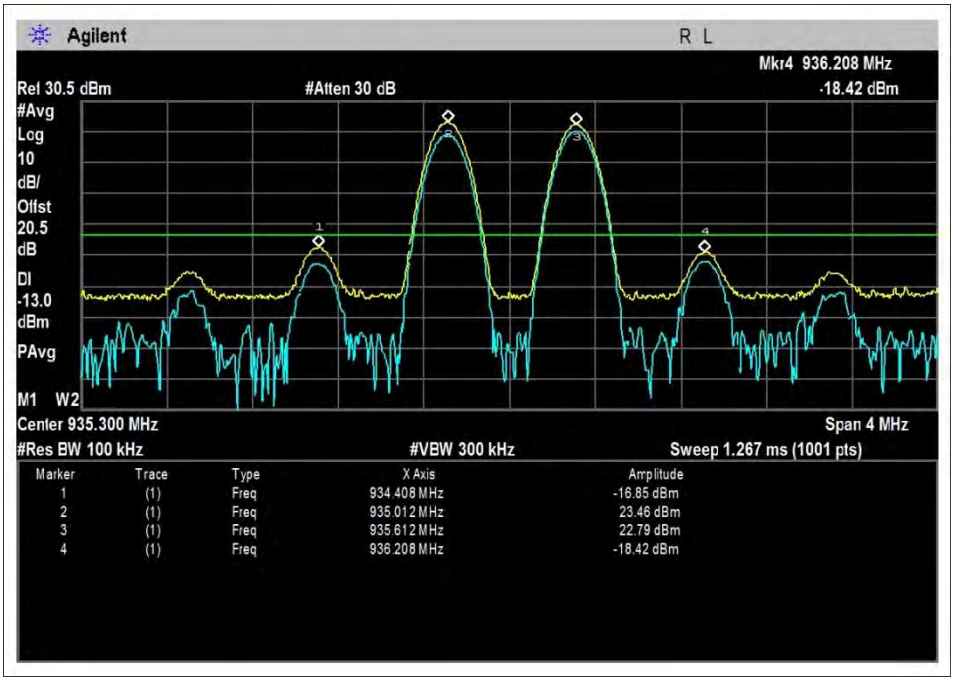

900M-DL-935-940H-28.1




InterCW-900M-DL-935-940H-AGC+10dB

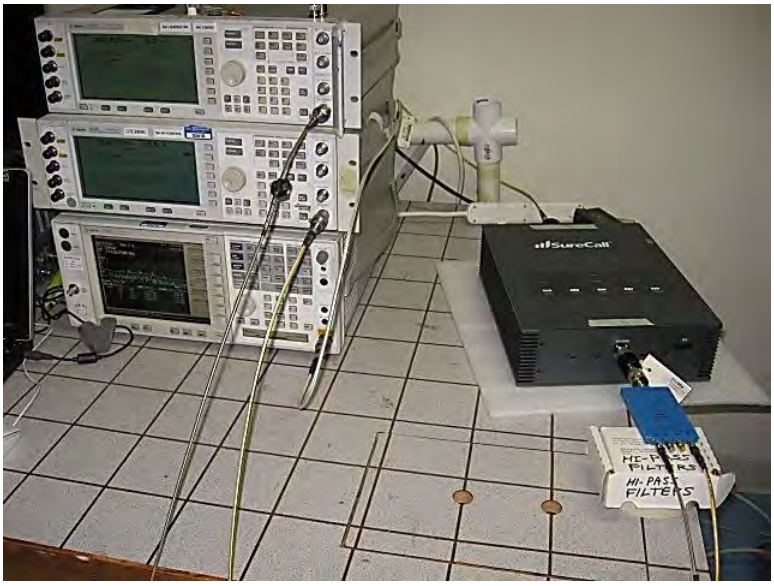



900M-DL-935-940L-28




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

## Test Setup Photo



# 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 §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 |
|---|---|---|---|---|---|
| | 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 |
| | 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
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.

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

| 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** |

**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** |

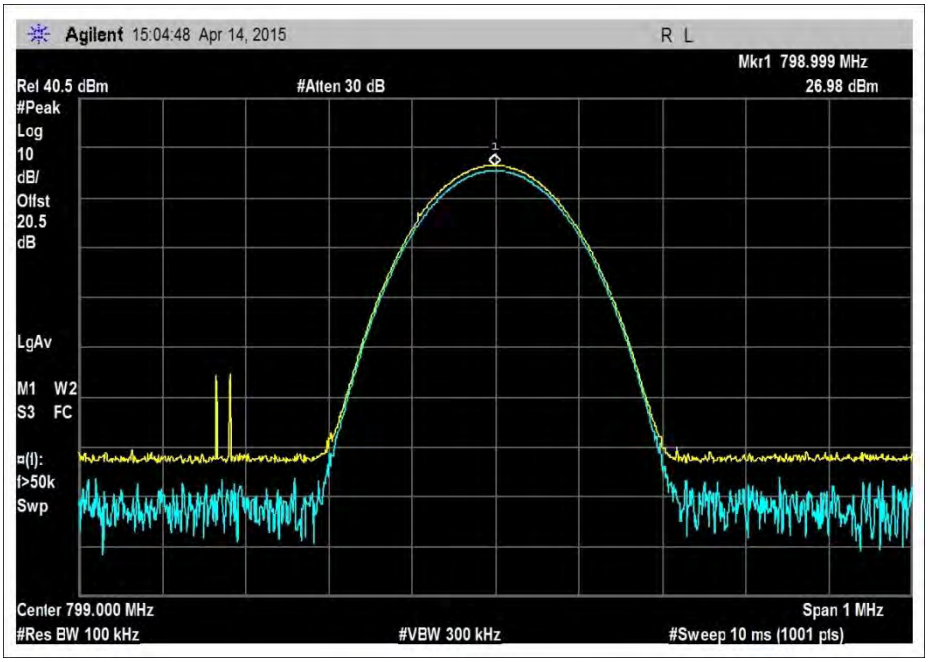
*The frequency with the highest power level in each operational band is measured using procedure as determined in section 7.1 of 935210 D03 Signal Booster Measurements v02r01 Dated July 24, 2014.

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

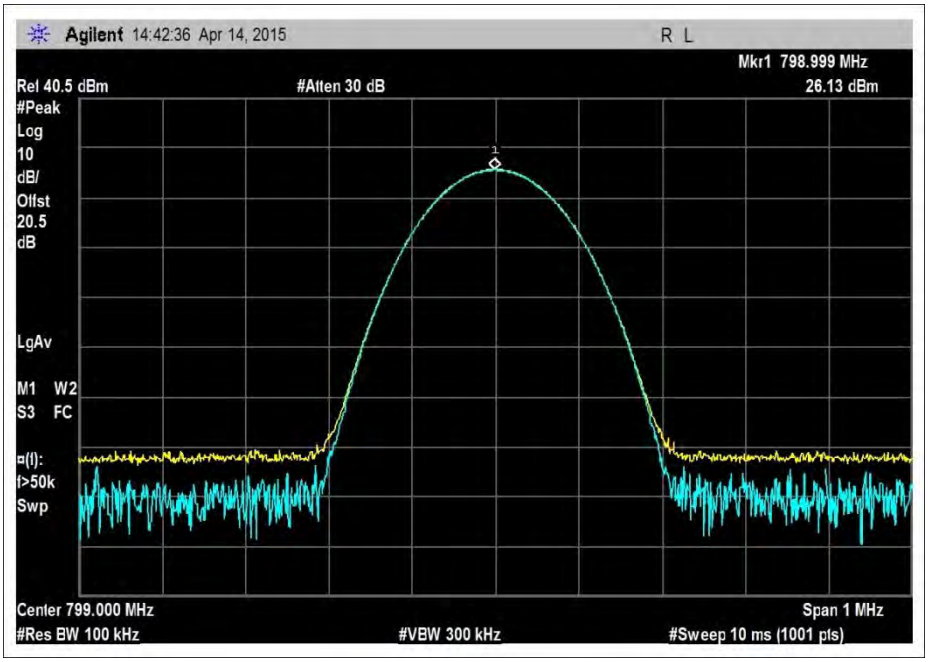
*Antenna Assembly Gain (dBd) = Antenna Gain (dBd)-Feeder Loss (dB) = Antenna Gain (dBi)-2.15-Feeder Loss (dB)*

## Test Data

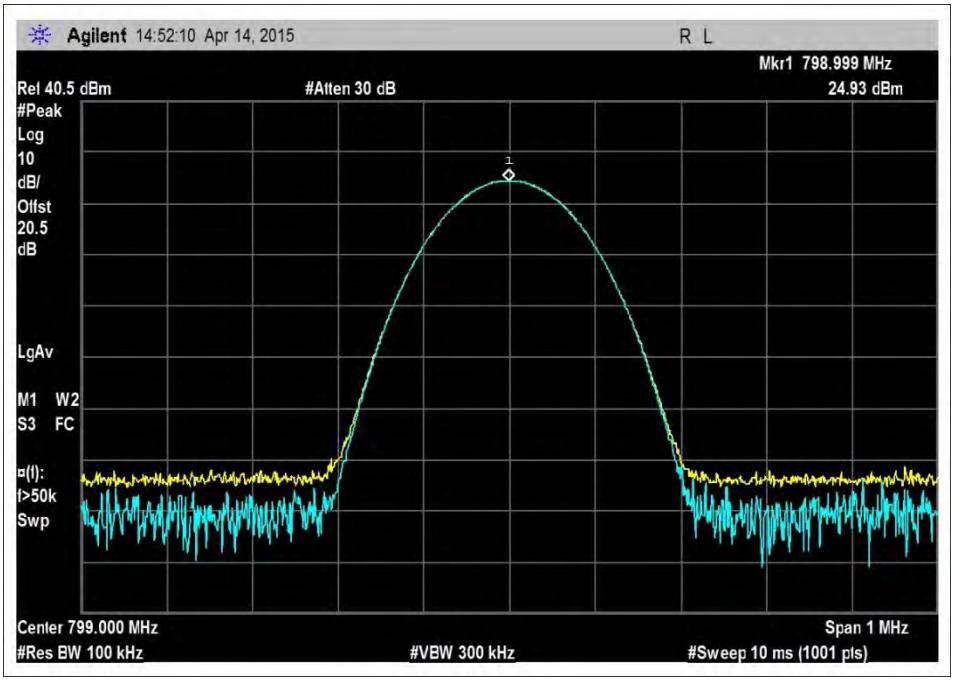
**700MHz – UL**




PS_700M_UL_M+3

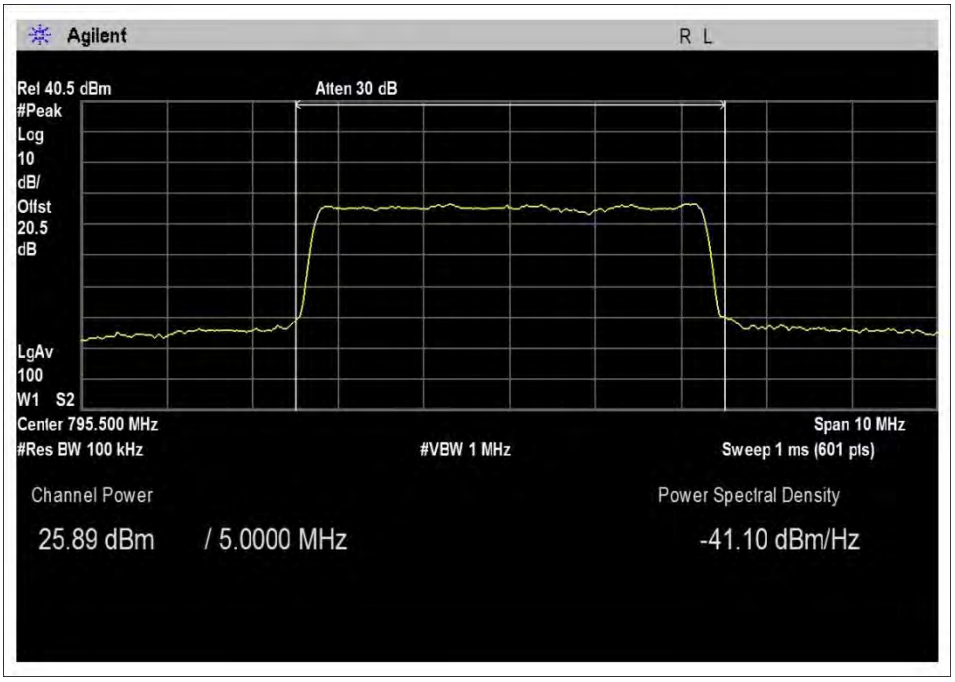



PS_700M_UL_M-29.5

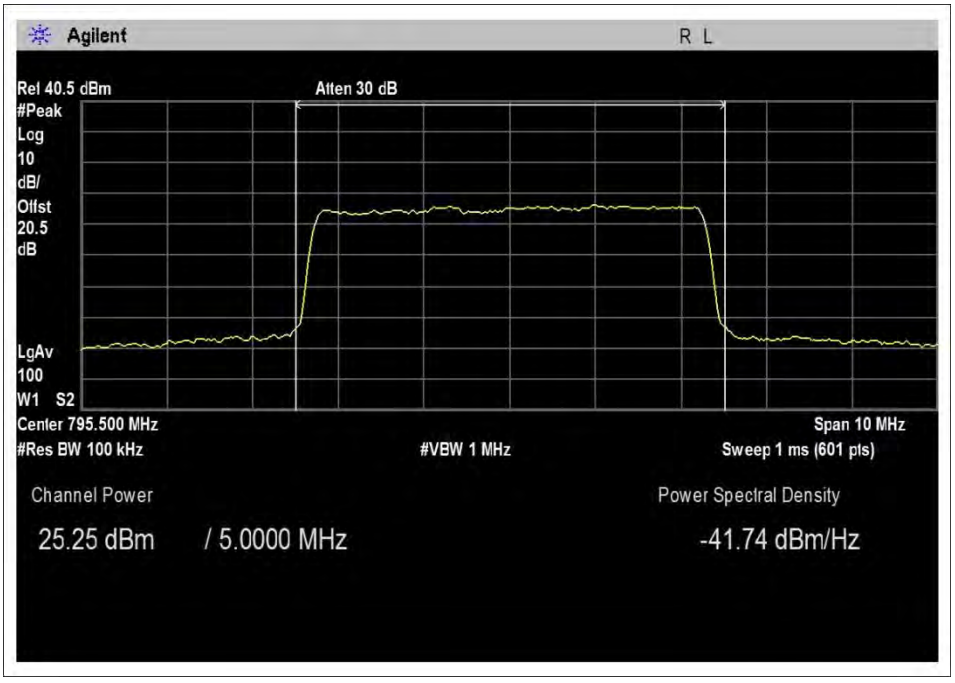



PS_700M_UL_M-AGC

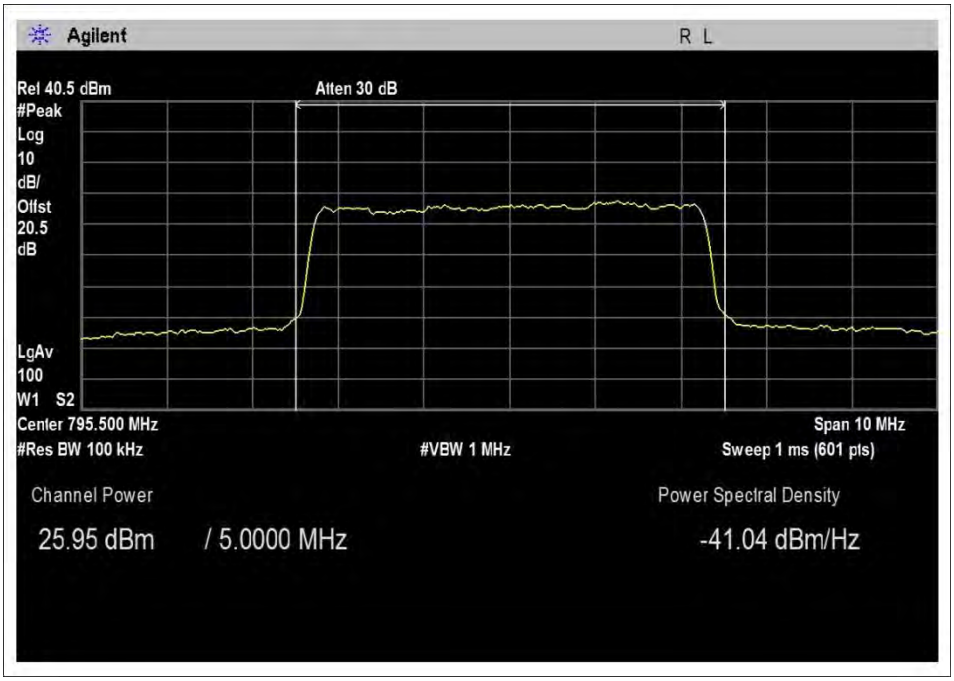
## LTE- 700MHz – UL




LTE_700M_UL-788-798H-AGC

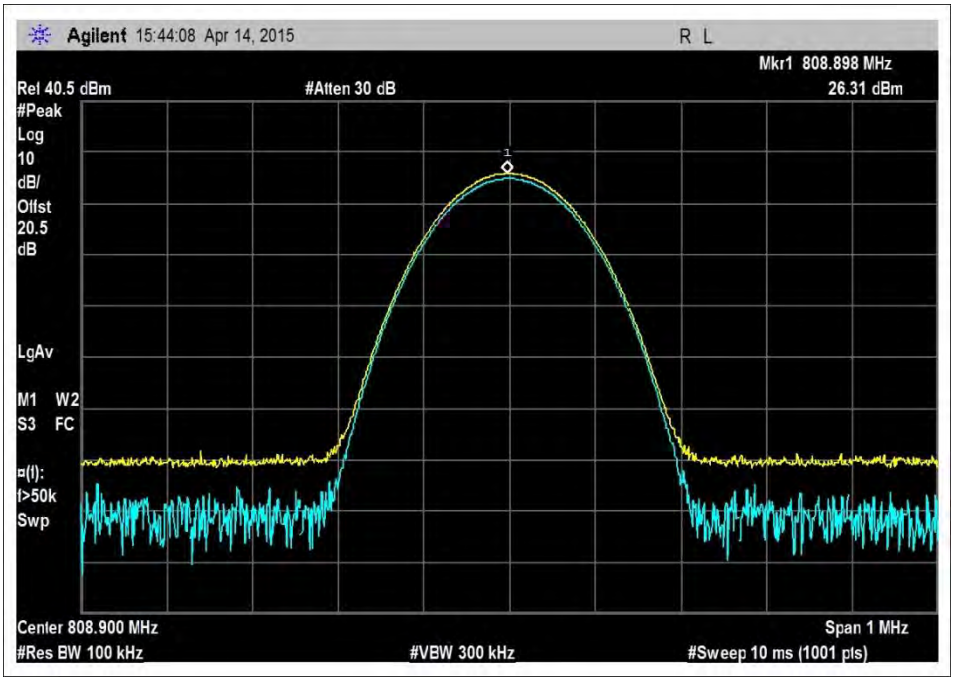



LTE_700M_UL-788-798H-AGC+3

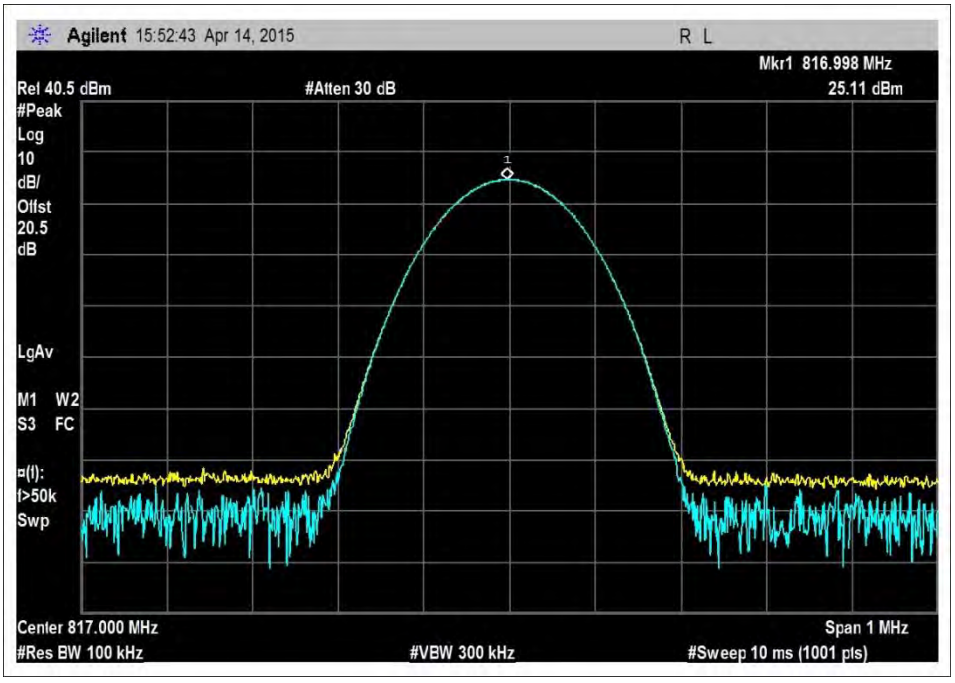



LTE_700M_UL-788-798H-PreAGC

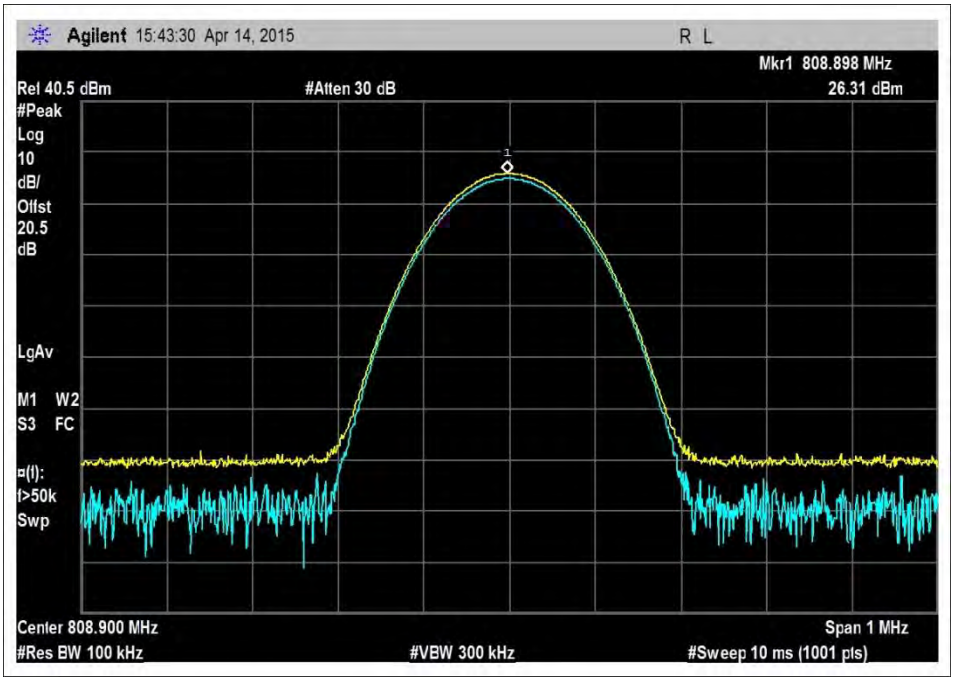
## PS 800MHz – UL




PS_800M_UL_M+3

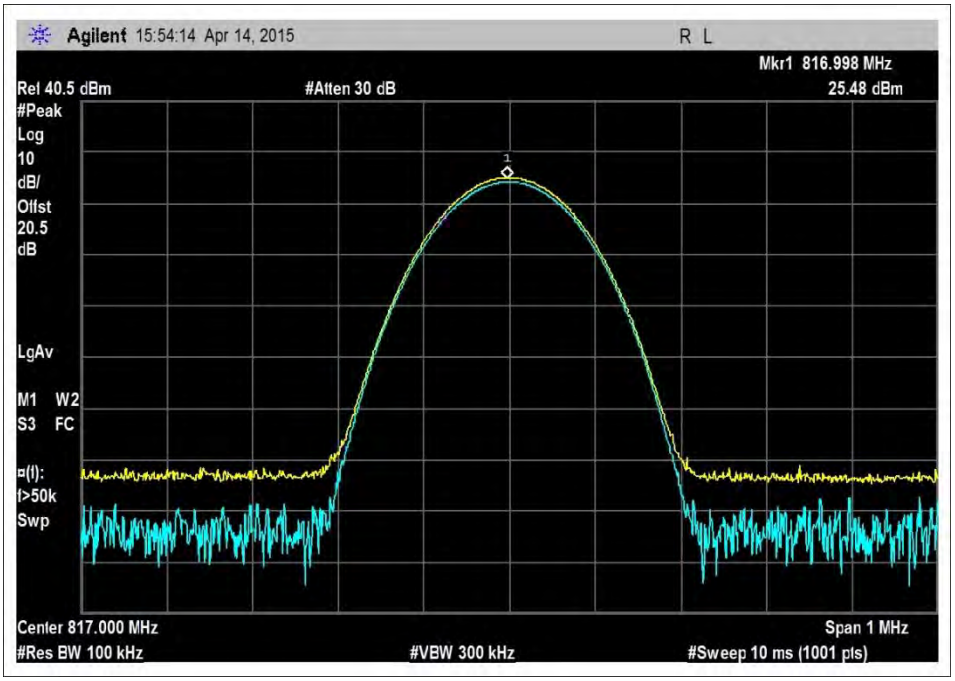



PS_800M_UL_M-31.1

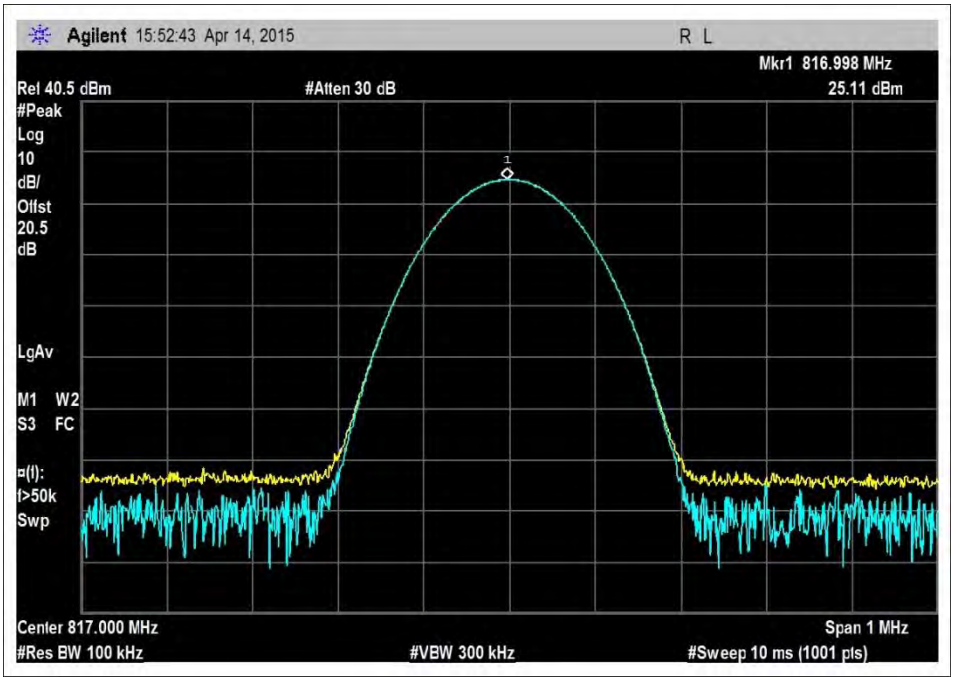



PS_800M_UL_M-AGC

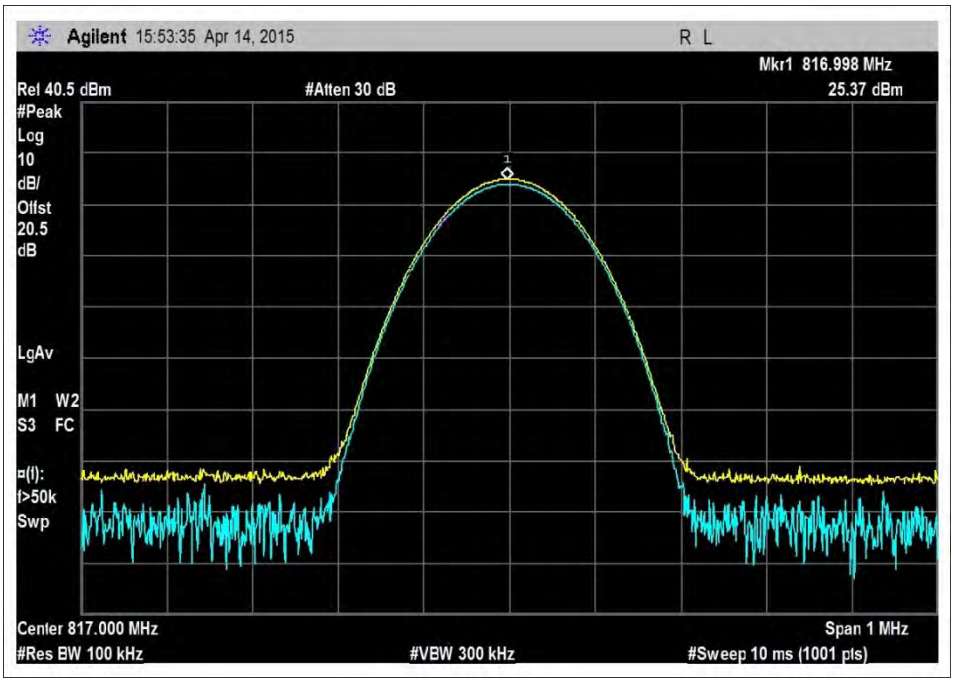
## SMR 800MHz – UL




SMR_800M_UL_M+3

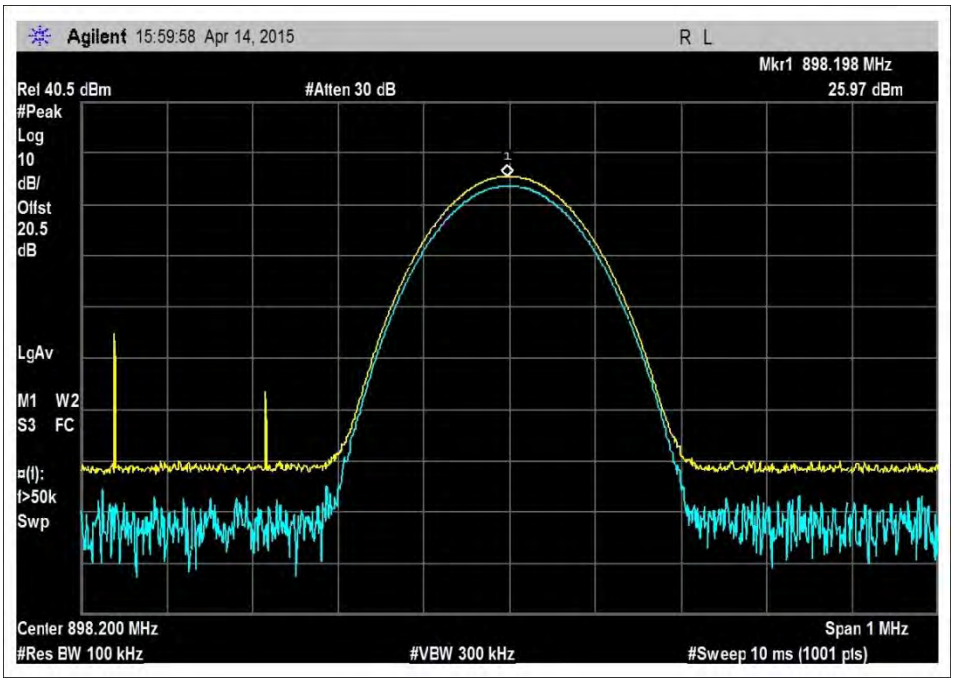



SMR_800M_UL_M-28.8

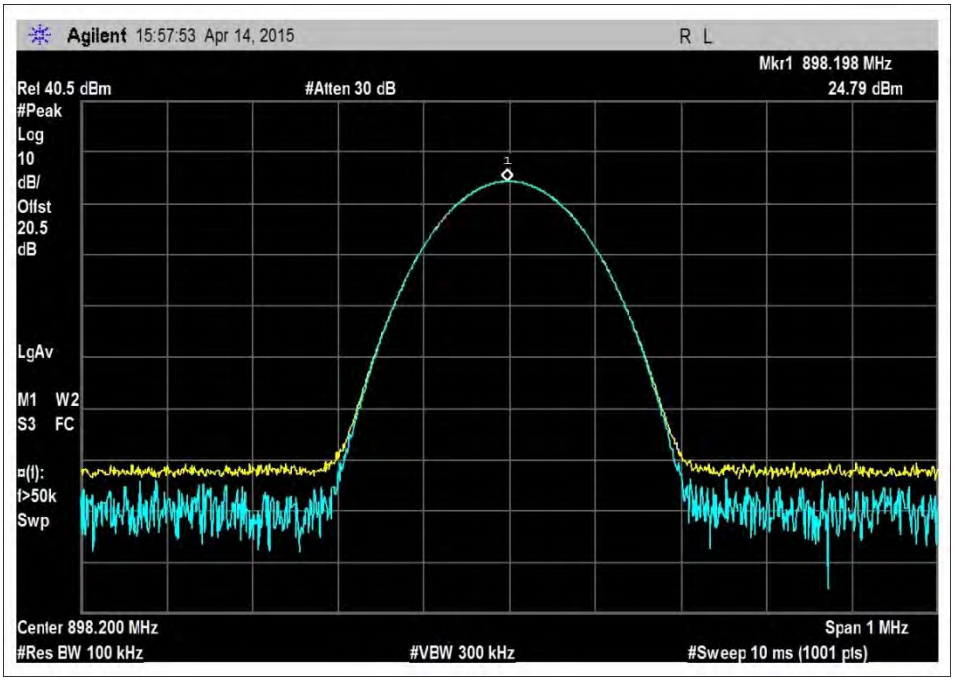



SMR_800M_UL_M-AGC

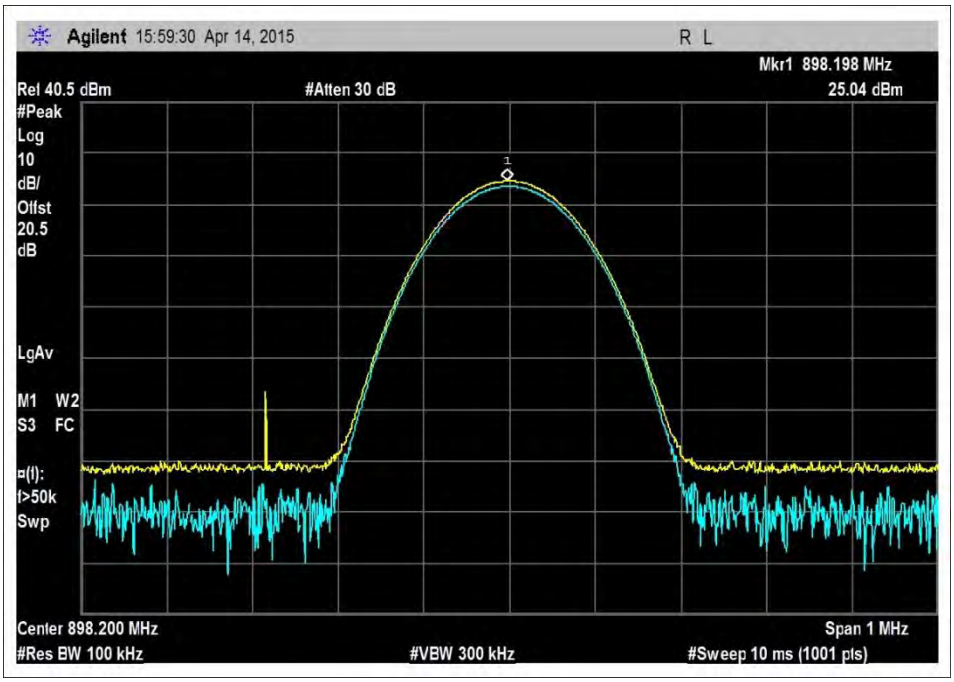
## SMR 900MHz – UL




SMR_900M_UL_M+3

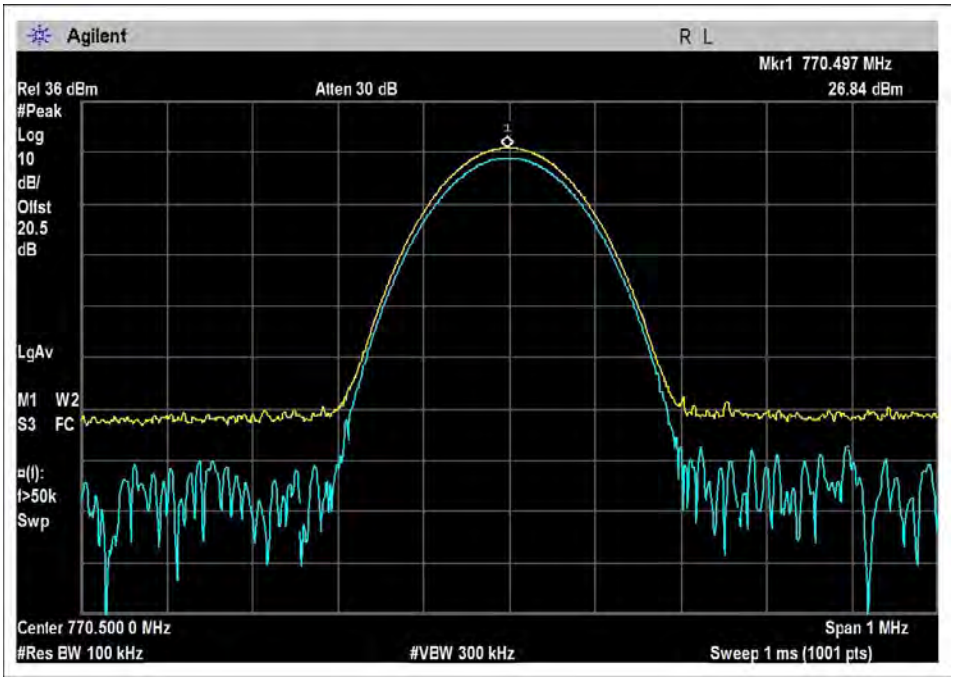



SMR_900M_UL_M-30.2

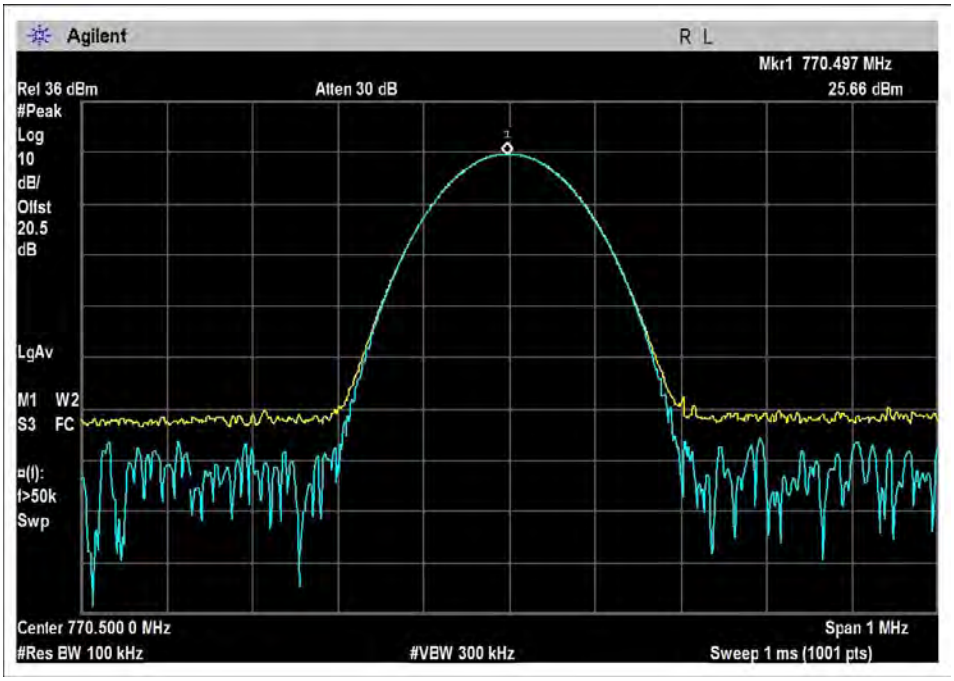



SMR_900M_UL_M-AGC

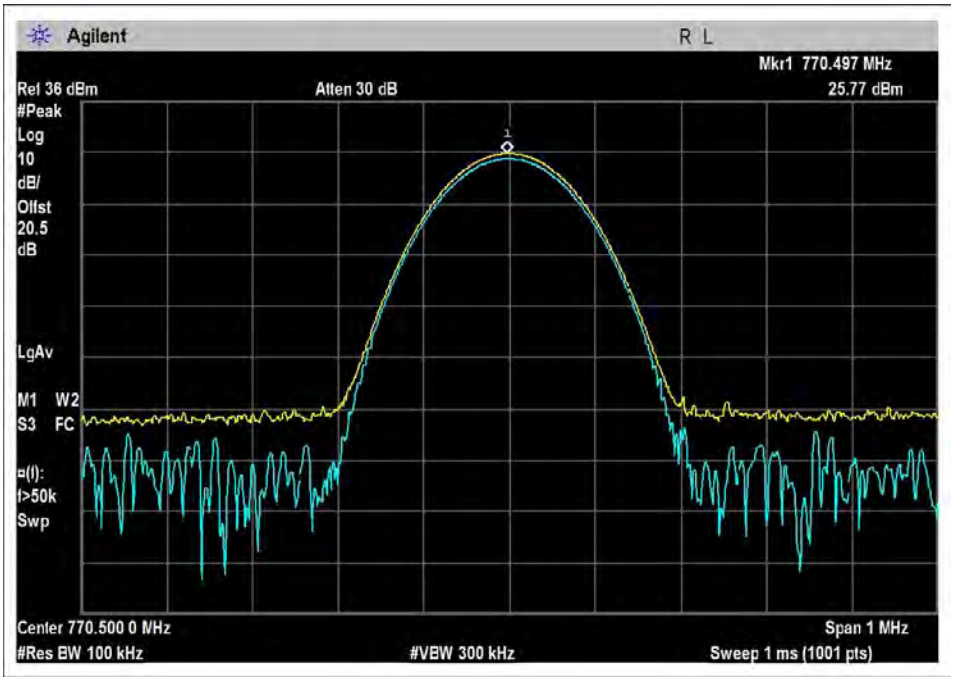
## PS 700MHz – DL




PS_700M_DL_M+3

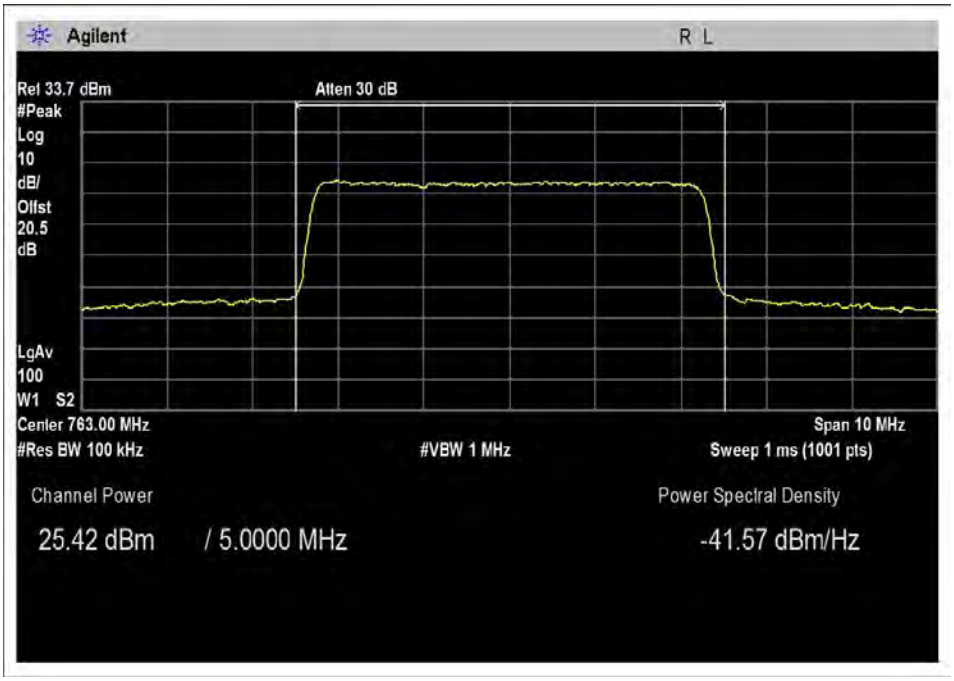



PS_700M_DL_M-36.1

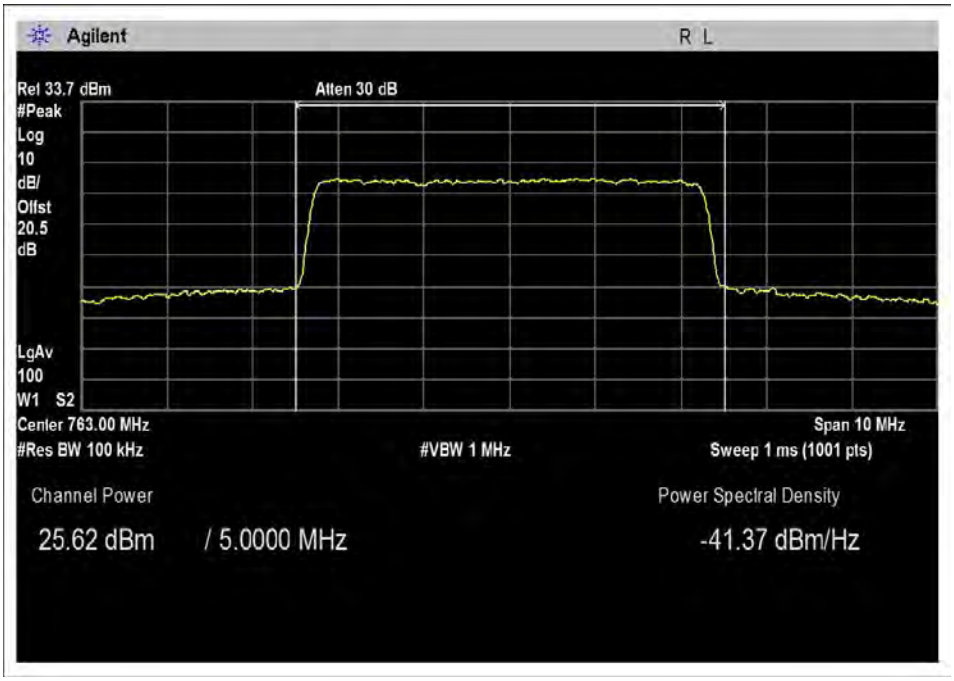



PS_700M_DL_M-AGC

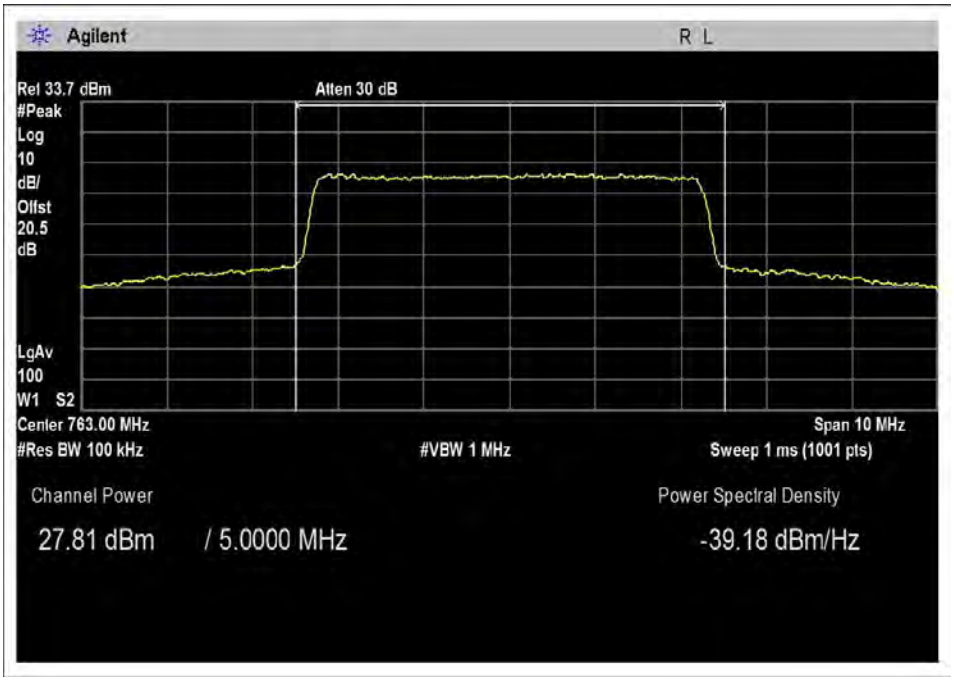
## LTE- 700MHz – DL




LTE_700M_DL-758-768M-PreAGC

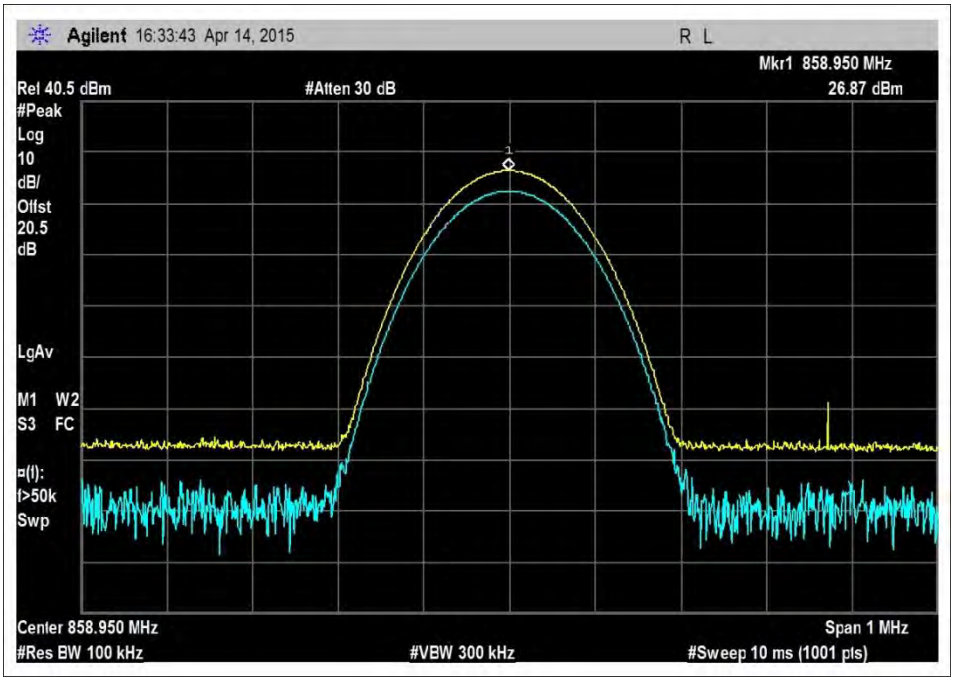



LTE_700M_DL-758-768M-AGC

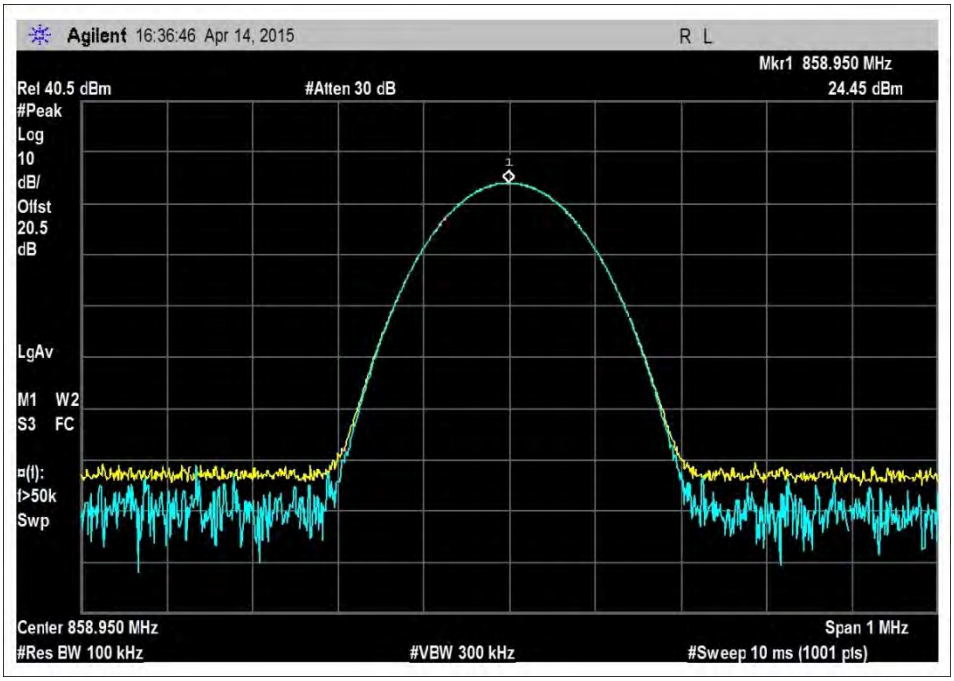



LTE_700M_DL-758-768M-AGC +3

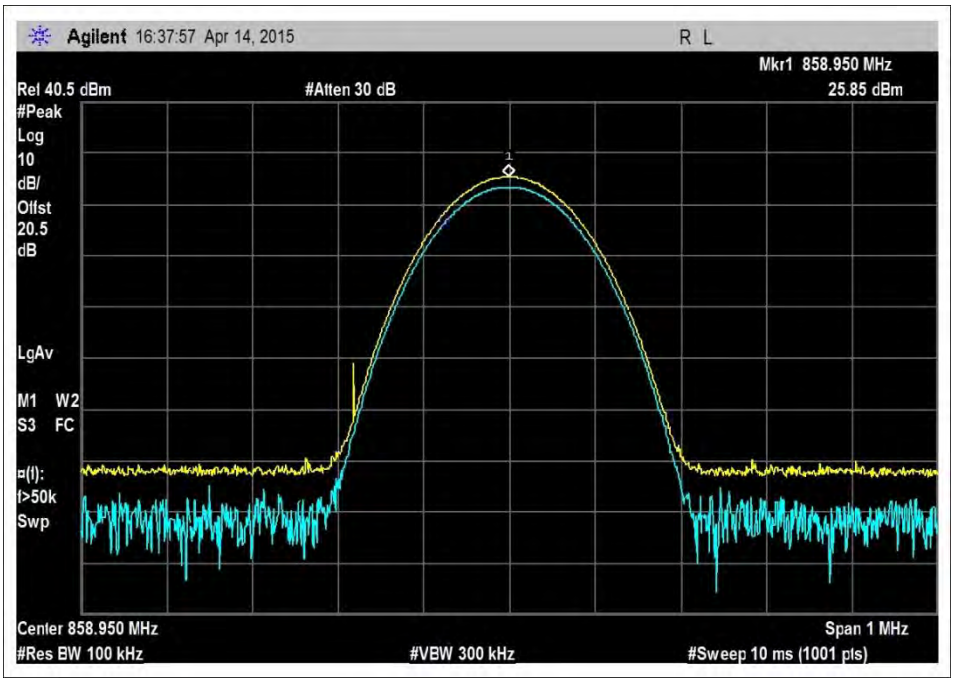
## PS 800MHz –DL




PS_800M_DL_M+3

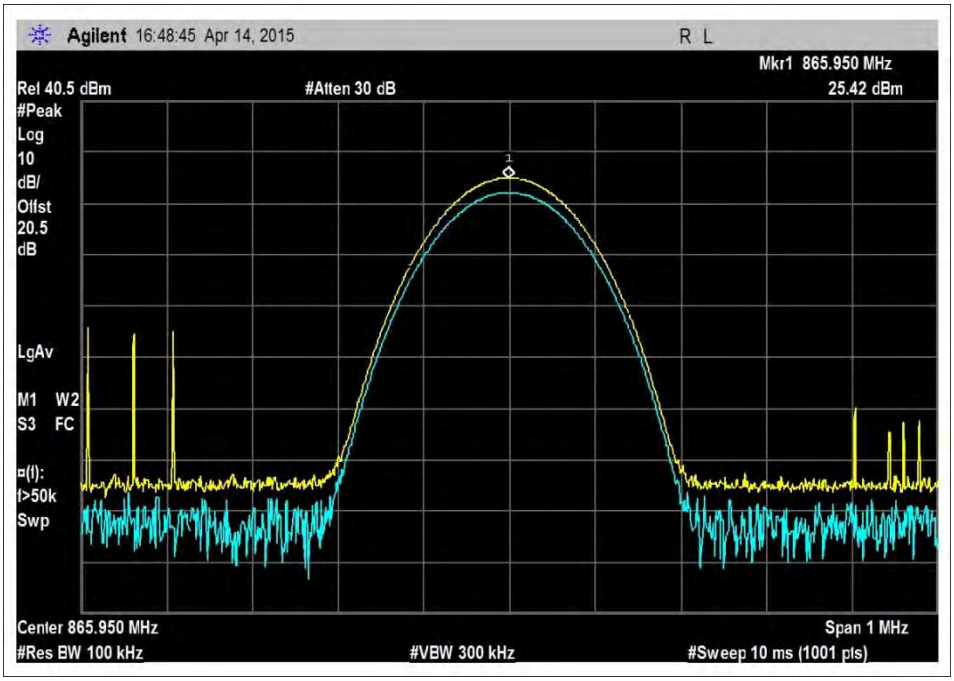



PS_800M_DL_M-30.4

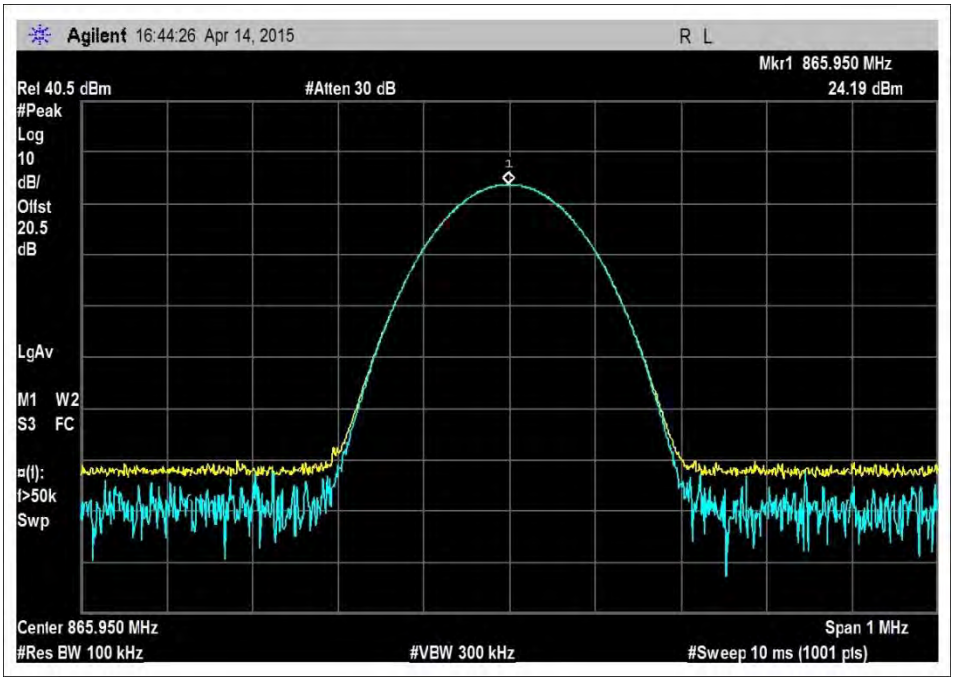



PS_800M_DL_M-AGC

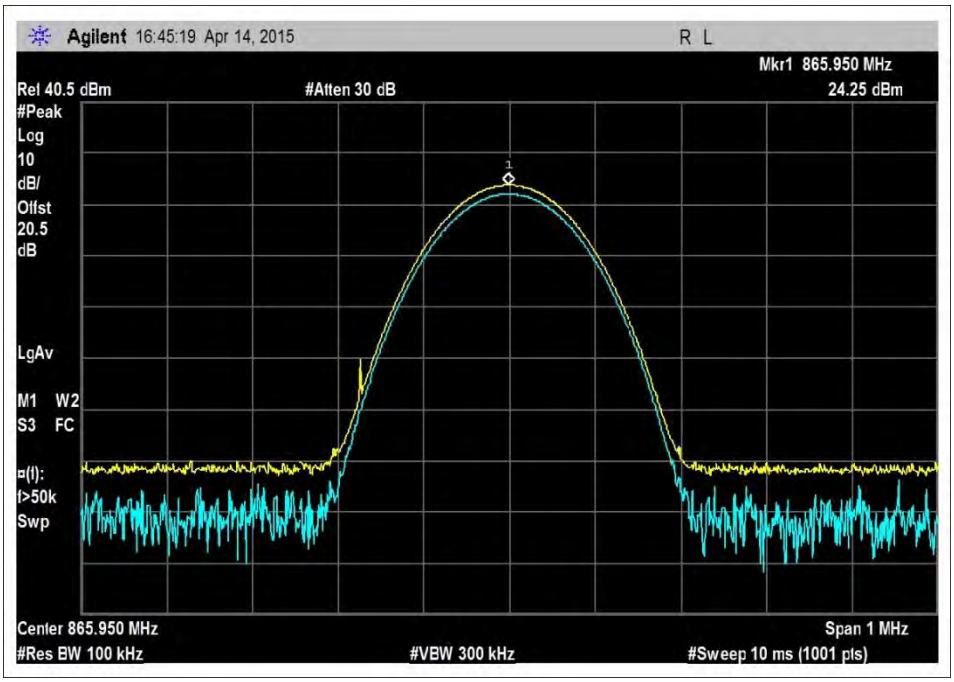
## SMR 800MHz –DL




SMR_800M_DL_M+3

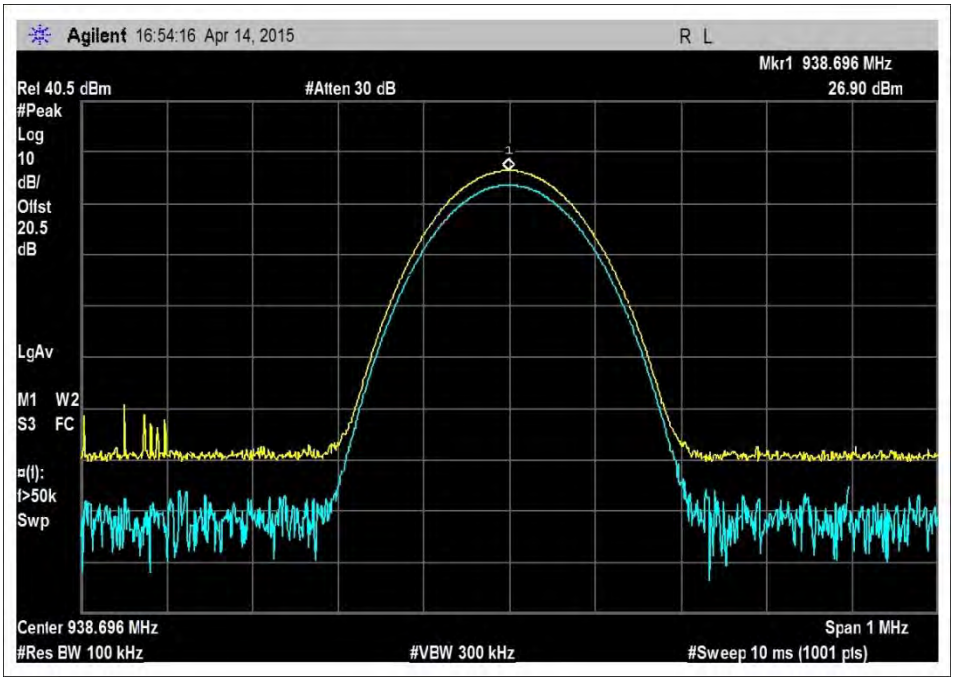



SMR_800M_DL_M-30.7

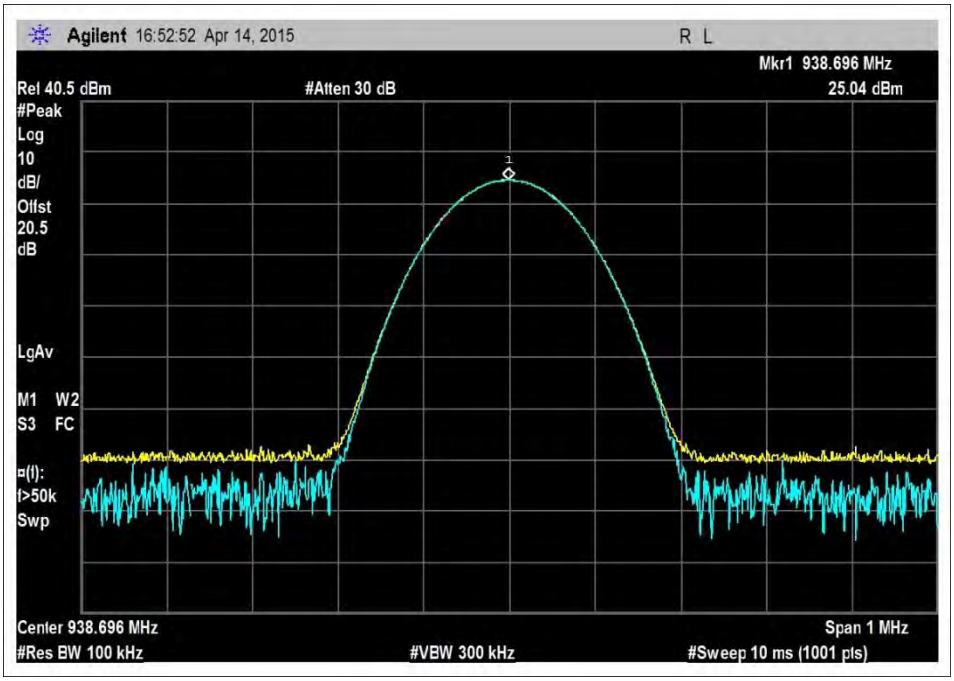



SMR_800M_DL_M-AGC

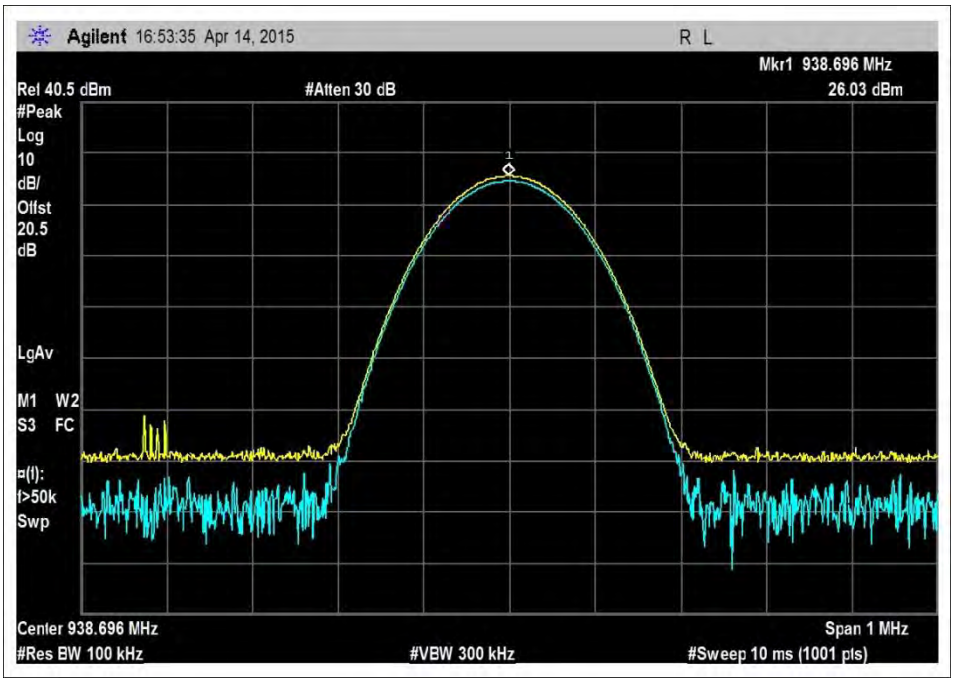
## SMR 900MHz –DL




SMR_900M_DL_M+3

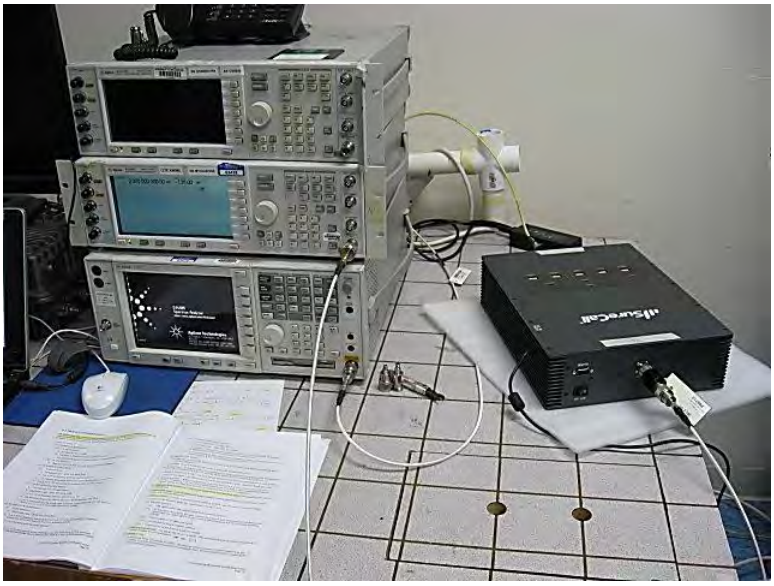



SMR_900M_DL_M-33.6




SMR_900M_DL_M-AGC

## Test Setup Photo



# Part 90 § 219(e)(2) Noise Figure

## Test Conditions / Setup

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: | 4/15/2015 |
| 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 |
|---|---|---|---|---|---|
| | ANP01210 | Cable | FSJ1P-50A-4A | 1/15/2015 | 1/15/2017 |
| | AN03471 | RF Characteristics Analyzer | E4440A | 12/19/2013 | 12/19/2015 |
| | AN03537 | Noise Source | 346A | 3/10/2015 | 3/10/2017 |

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

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

***Support Devices:***

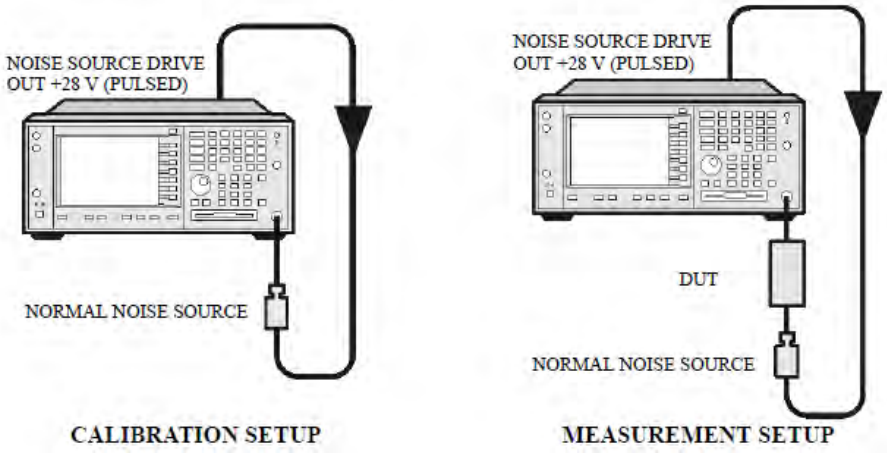
| Function | Manufacturer | Model # | S/N |
|---|---|---|---|
| AC Adapter | Adapter Tech. | STD-1805 | NA |

***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**

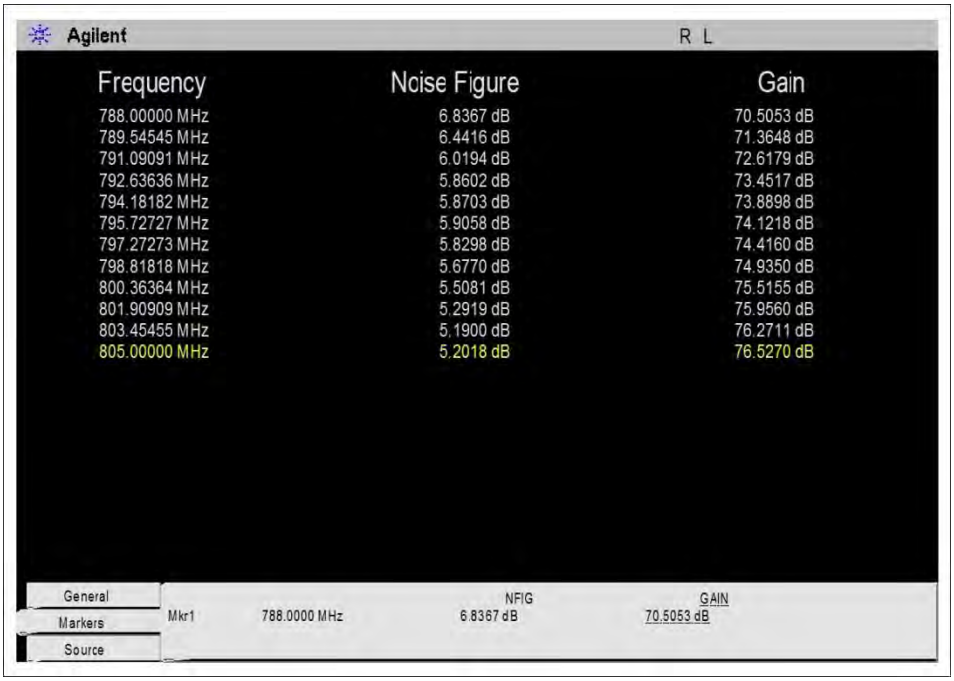



## Noise Figure - Summary of Results

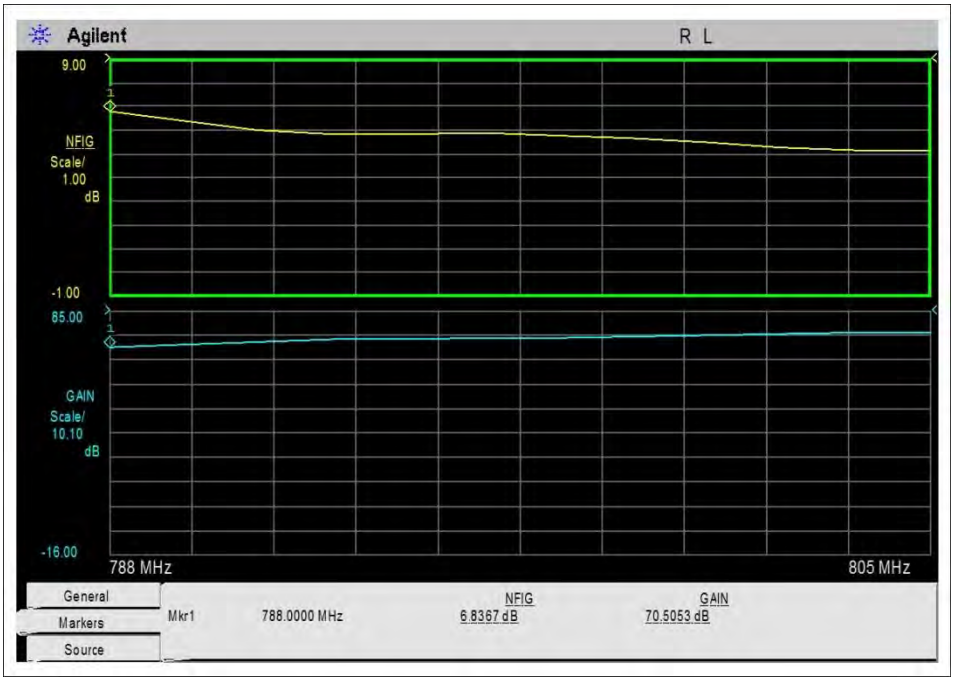
**Pass:** As summarized in tables and plots below, the noise figure are within limits.

| 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 |

## 700MHz –UL

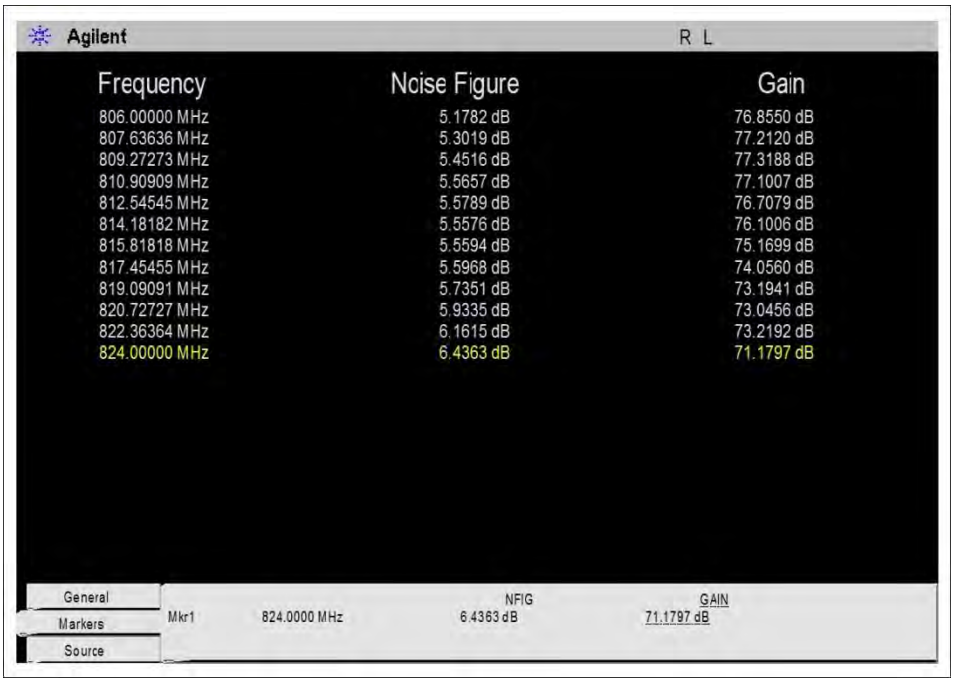



NF-UL-700M-Data

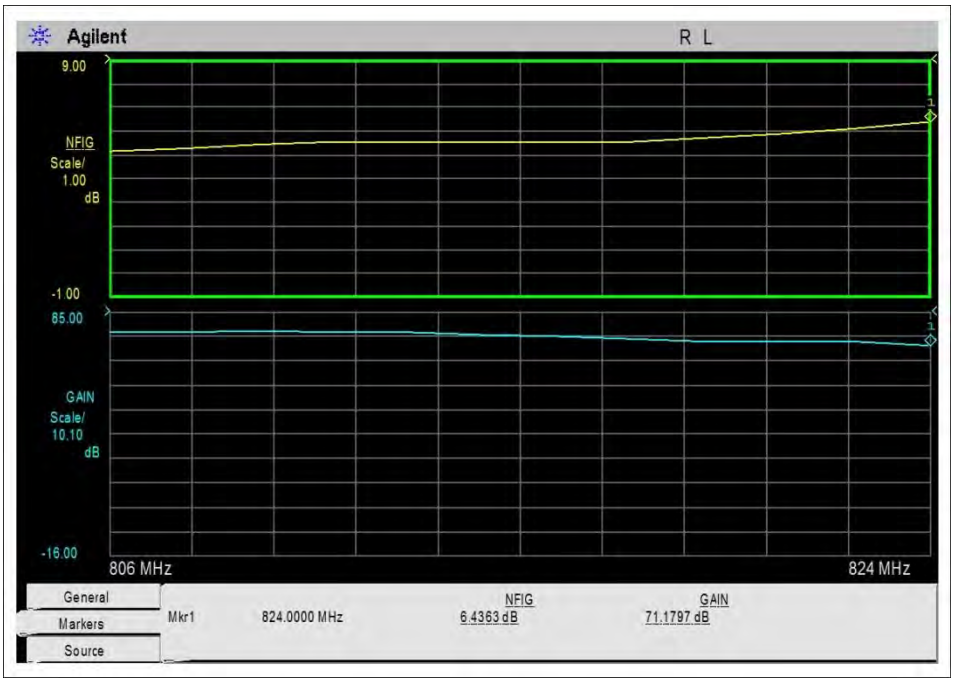



UL-700M-Graphs

## 800MHz –UL

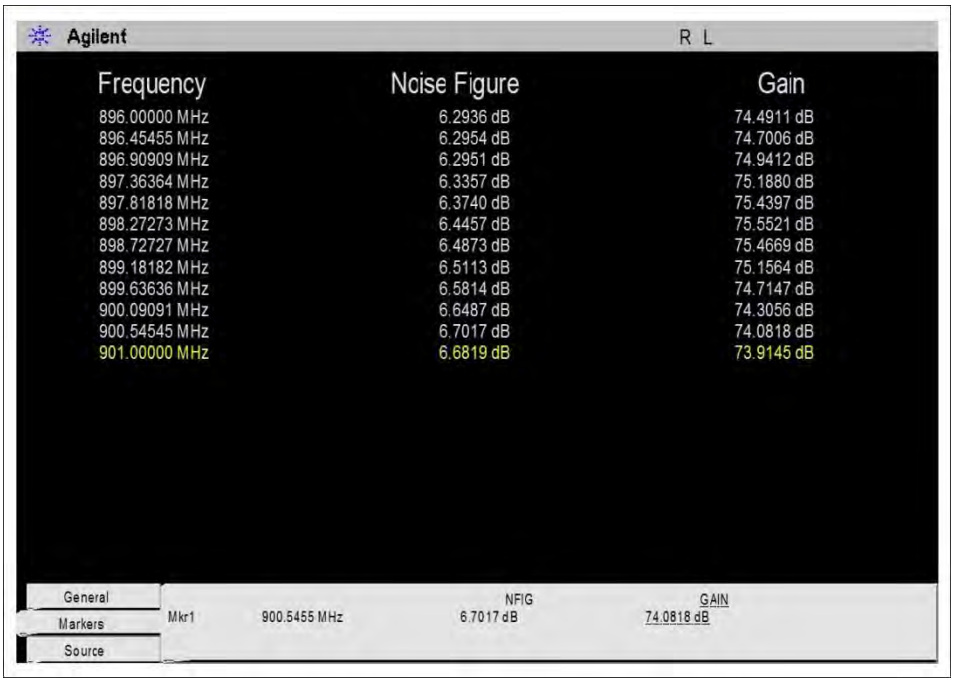



UL-800M-Data

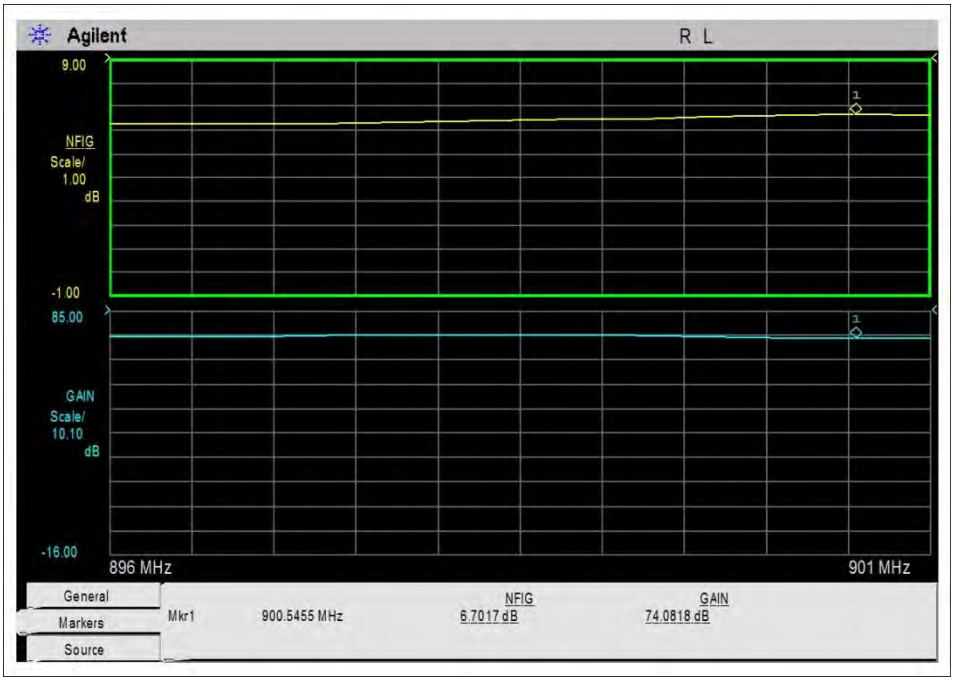



UL-800M-Graphs

## 900MHz –UL

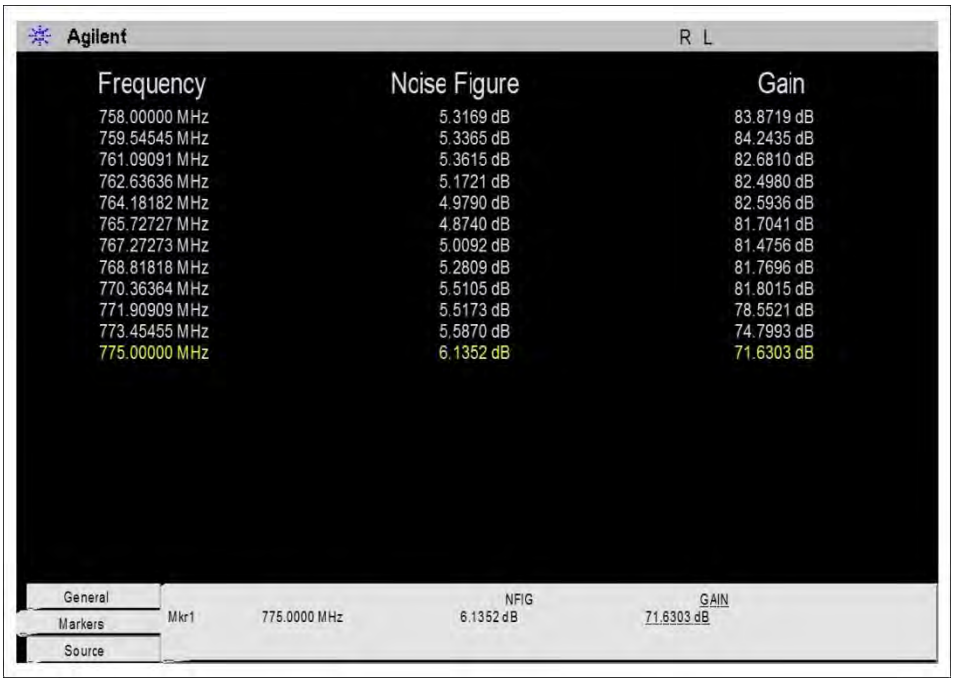



UL-900M-Data

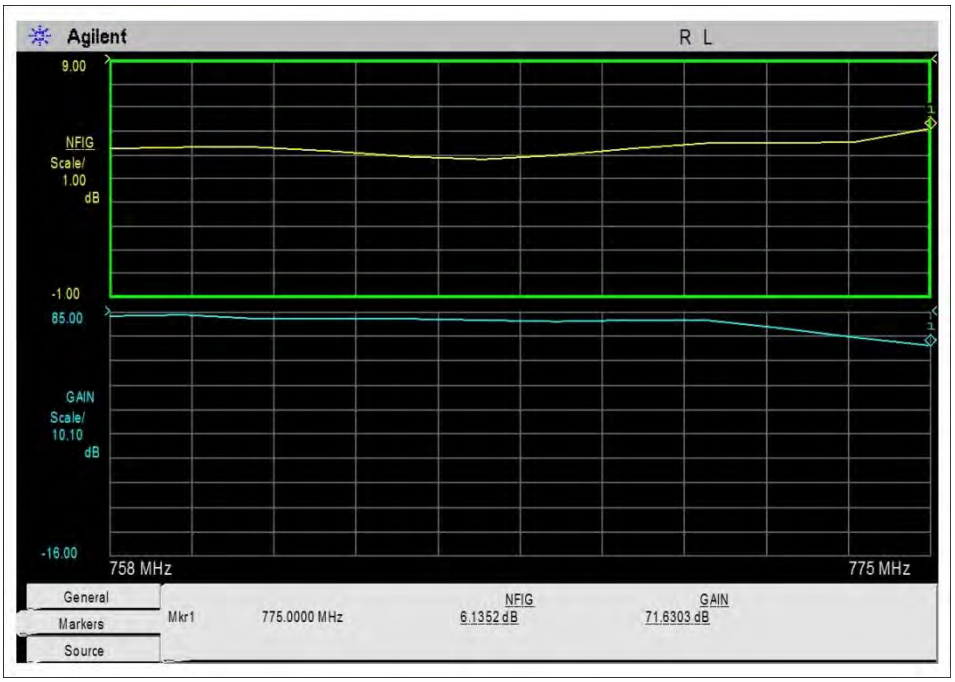



UL-900M-Graphs

## 700MHz –DL

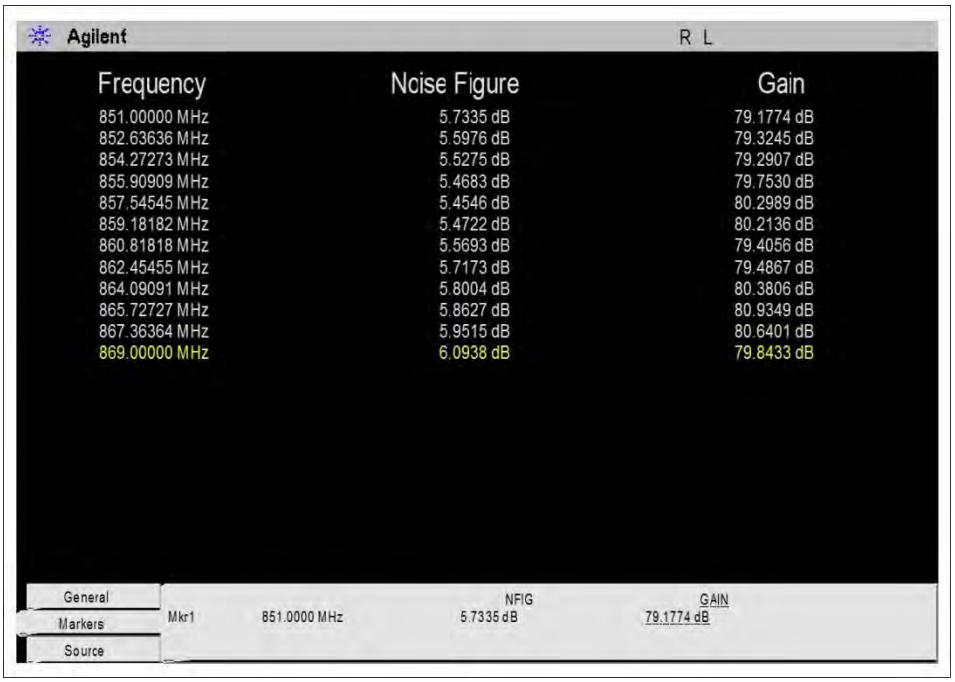



DL-700M-Data

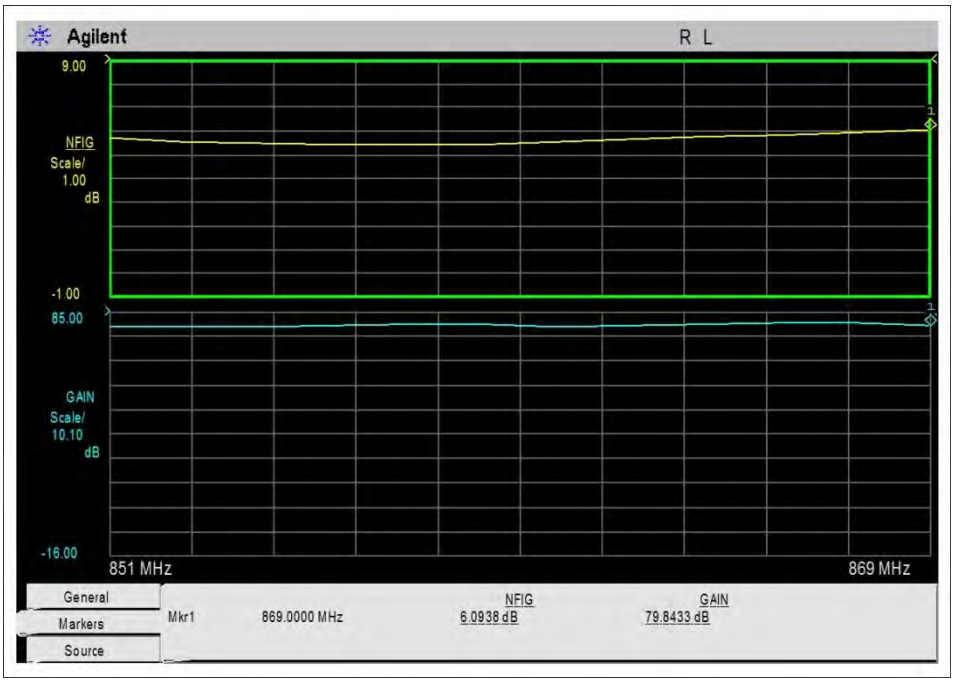



DL-700M-Graphs

## 800MHz – DL

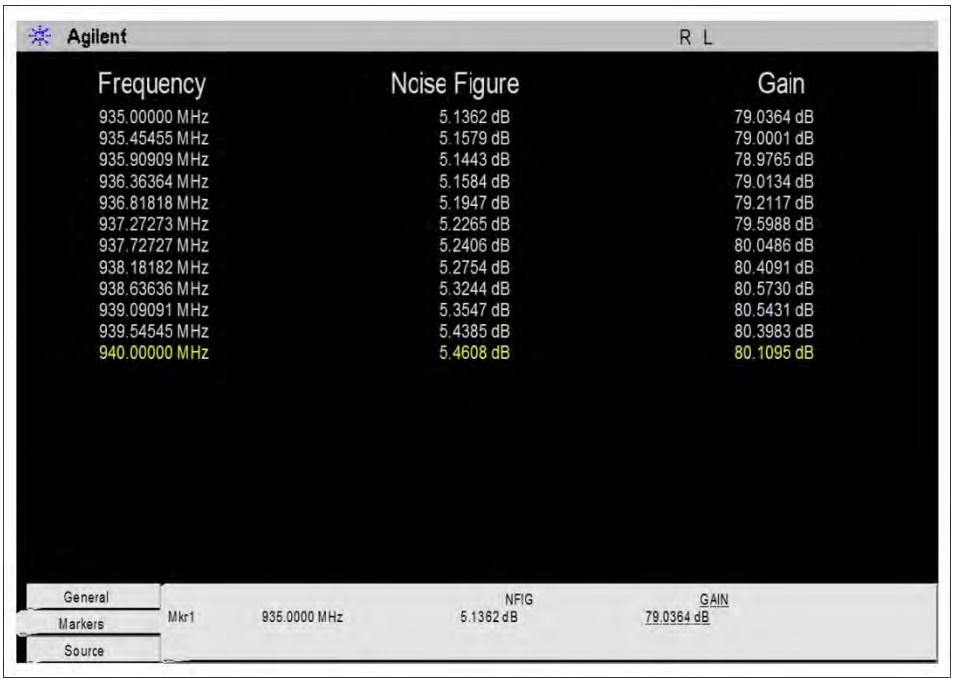



DL-800M-Data

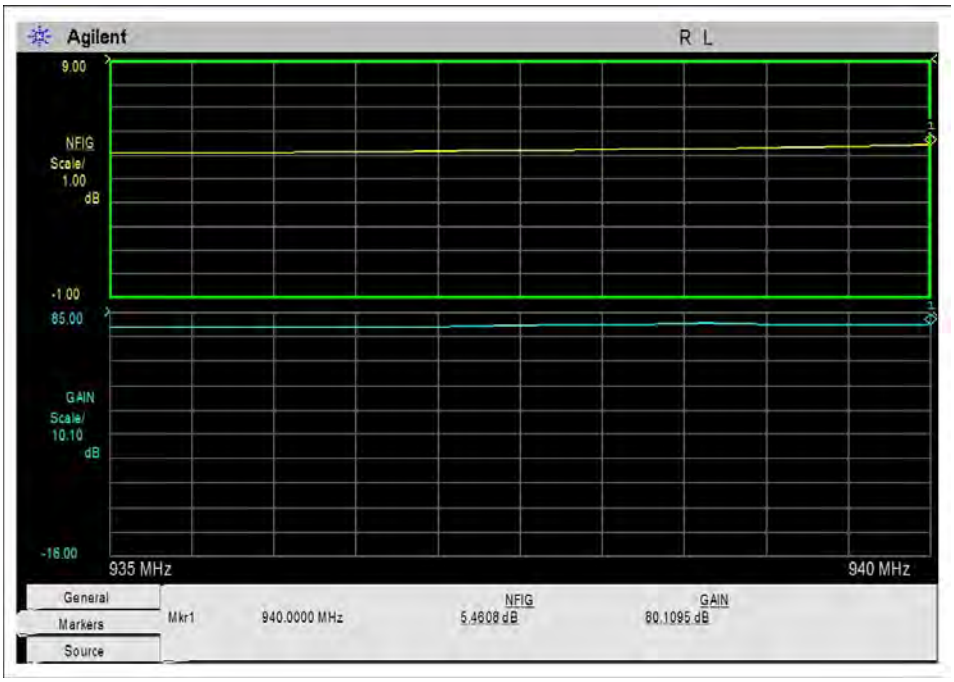



DL-800M-Graphs

## 900MHz –DL




DL-900M-Data




DL-900M-Graphs

## Test Setup Photos

# 2.1053 / Part 90 § 219(e)(3) 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 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 C63.5 Calibration | 3115 | 12/2/2014 | 12/2/2016 |
| | ANP06712 | Cable | 32022-29094K-29094K-48TC | 9/18/2014 | 9/18/2016 |
| | 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-29094K-72TC | 3/24/2014 | 3/24/2016 |
| | AN03471 | RF Characteristics Analyzer | E4440A | 12/19/2013 | 12/19/2015 |
| | AN00052 | Loop Antenna | 6502 | 5/20/2014 | 5/20/2016 |

***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 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.

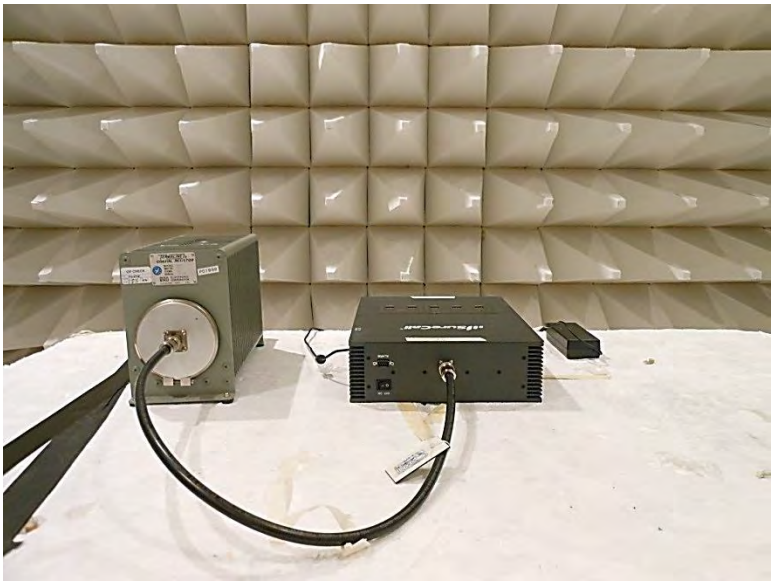
Software: SC_S1_Public_V3.0
Firmware: V1.0

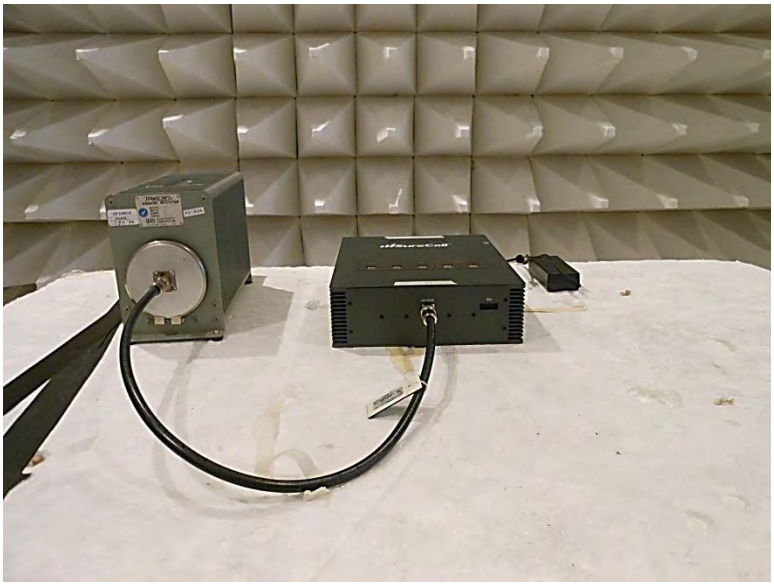
**No emissions below 30MHz were found within 20dB of the limit line.**
**No emissions above 30MHz were found within 20dB of the limit line.**

## 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





# Emissions Designator

**2.1033 Application for certification.**
**(c)**

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

| Emission Designator / Band | Public safety | | | | Public Safety | ESMR | Public Safety | ESMR | 900 Interleaved | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 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 | | X | | X | | | | | | |
| 5M00G7D | X | | X | | | | | | | |
| 8K10F1E/F1D | | | | | X | | X | | | |
| 10K1F3E | | | | | X | | X | | | |
| 8K70D1W | | | | | | X | | X | | |
| 10K1F3E | | | | | | | | | X | X |

**(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.

**5M00G7D** (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.