# FCC PART 20.21, PART 22H

# MEASUREMENT AND TEST REPORT

For

## Phonetone Technology (Shenzhen) Co., Ltd.

Room 404, Building 12, Qianlong Garden, Minzhi Street, Bao'an District, Shenzhen, China

**FCC ID: YYOPTENC60**

| **Report Type:** | **Product Name:** |
|---|---|
| Original Report | Cell Phone Signal Booster |

| | |
|---|---|
| **Test Engineer:** | *Lorin Bian* |
| **Report Number:** | RDG160930002 |
| **Report Date:** | 2016-10-31 |
| **Reviewed By:** | Henry Ding<br>EMC Leader |
| **Test Laboratory:** | Bay Area Compliance Laboratories Corp. (Chengdu)<br>5040, HuiLongWan Plaza, No. 1, ShaWan Road,<br>JinNiu District, ChengDu, China<br>Tel: 028-65523123, Fax: 028-65525125<br>www.baclcorp.com |

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# GENERAL INFORMATION

## Product Description for Equipment under Test (EUT)

The ***Phonetone Technology (Shenzhen) Co., Ltd.***'s product, model number: ***PTE-C70 (FCC ID: YYOPTENC60)*** *or* the "EUT" as referred to in this report was the ***Cell Phone Signal Booster****,*

| | |
|---|---|
| Radio System Type | CMRS Industrial Signal Booster |
| Frequency Bands | Cellular: 824-849MHz (Uplink), 869-894MHz(Downlink) |
| Max. Gain | Uplink:60dB+/-2dB<br>Downlink: 60dB+/-2dB |
| Max. Output Power (Antenna Port) | Uplink: 20dBm+/-2dB<br>Downlink: 20dBm+/-2dB |
| Max.Antenna Gain: | Uplink: 9.0dBi<br>Down Link: 7.0dBi |
| Nominal Power Supply: | DC 5V～24V from adapter |
| External Dimension | 15.8 cm (L) x 11.0 cm (W) x 2.4 cm (H) |
| Temperature Range | -25℃ to 55℃ |

Adapter Information:
MODEL: GFP121U-050200B-1
I/P: AC 100-240V 50-60Hz 0.36A
O/P: DC 5V, 2A

**All measurement and test data in this report was gathered from final production sample, serial number: 160930002 (assigned by the BACL, Chengdu). It may have deviation from any other sample. The EUT supplied by the applicant was received on 2016-09-30, and EUT conformed to test requirement.*

## Objective

This type approval report is prepared on behalf of ***Phonetone Technology (Shenzhen) Co., Ltd.*** in accordance with Part 2, Part 20, Part 22 of the Federal Communication Commissions rules, and KDB 935210 D02 Signal Boosters Certification v03r02.

## Related Submittal(s)/Grant(s)

No related submittal(s).

## Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2, Sub-part J as well as the following parts:

Applicable Standards: TIA-1037, TIA/EIA 603-D. KDB 935210 D05 Indus Booster Basic Meas v01r01.

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Chengdu). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

The uncertainty of any RF tests which use conducted method measurement is ±3.17 dB, the uncertainty of any radiation on emissions measurement is:

30M~200MHz: ±4.7 dB;
200M~1GHz: ±6.0 dB;
1G-6GHz: ±5.13dB;
6G~25GHz: ±5.47dB;

And the uncertainty will not be taken into consideration for all test data recorded in the report.

## Test Facility

The test site used by BACL to collect test data is located in the 5040, HuiLongWan Plaza, No. 1, ShaWan Road, JinNiu District, ChengDu, China

Test site at BACL has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on April 24, 2015. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 560332. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

# SYSTEM TEST CONFIGURATION

## Justification

The EUT was configured for testing according to TIA/EIA-603-D.

The final qualification test was performed with the EUT operating at normal mode.

## Equipment Modifications

No modifications were made to the EUT.

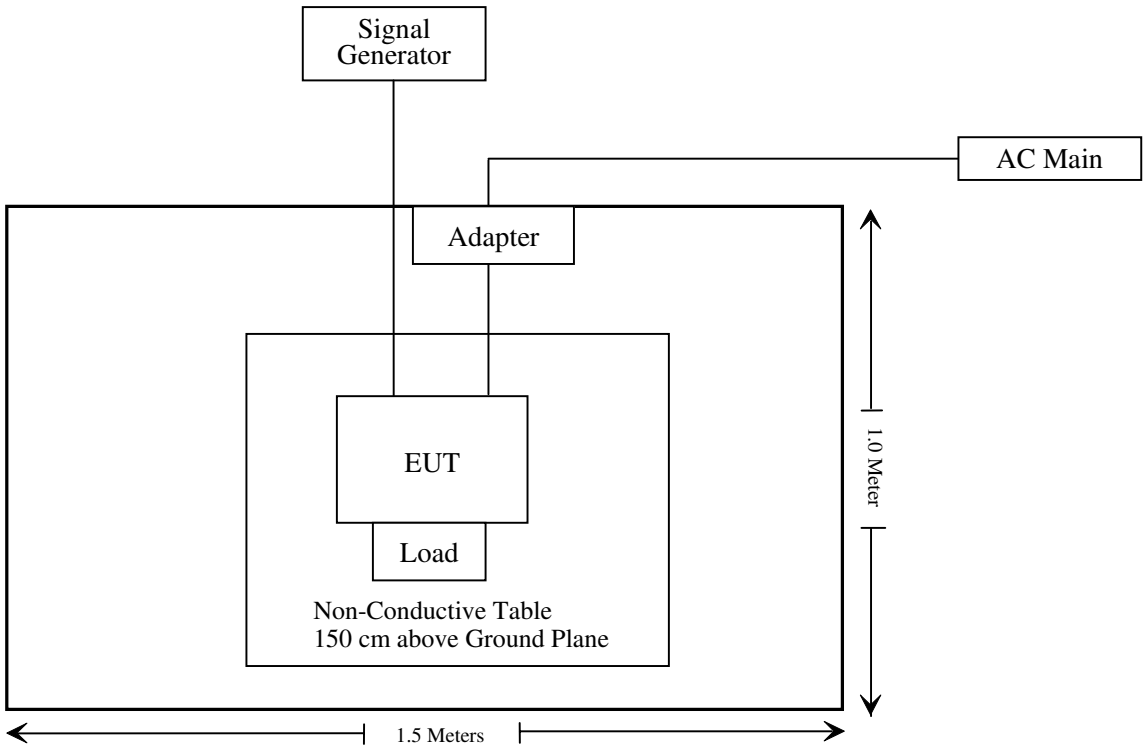
## Support Equipment List and Details

| Manufacturer | Description | Model | Serial Number |
|---|---|---|---|
| Agilent | MXG Vector Signal Generator | N5182B | MY513501224 |
| / | Load(1 W) | / | / |

## External I/O Cable

| Cable Description | Length (m) | From | To |
|---|---|---|---|
| DC power Cable | 1.0 | Adapter | EUT |

## Block Diagram of Test Setup



# SUMMARY OF TEST RESULTS

| FCC Rules | Description of Test | Result |
|---|---|---|
| §2.1047, §22.913, KDB 935210 D02 | Mean output power and amplifier gain | Compliant |
| KDB 935210 D02 | Out-of-band rejection | Compliant |
| §2.1049, KDB 935210 D02 | Occupied bandwidth and Input-versus-output signal comparison | Compliant |
| §2.1051, §22.917, KDB 935210 D02 | Out-of-band/block (including intermodulation) emissions | Compliant |
| §2.1051&§22.917 | Spurious emissions at antenna terminals | Compliant |
| §2.1053&§22.917 | Radiated spurious emissions | Compliant |
| §2.1055&§22.355 | Frequency tolerance | Not Applicable* |

Not Applicable*: the device is a booster does not alter the input signal.

# §2.1046

## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| Rohde & Schwarz | Signal Analyzer | FSIQ26 | 831929/005 | 2016-09-21 | 2017-09-20 |
| R & S | Wideband Radio Communication Tester | CMW500 | 149216 | 2016-10-07 | 2017-10-06 |

*** Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 24.3℃ |
| **Relative Humidity:** | 45% |
| **ATM Pressure:** | 100.2 kPa |

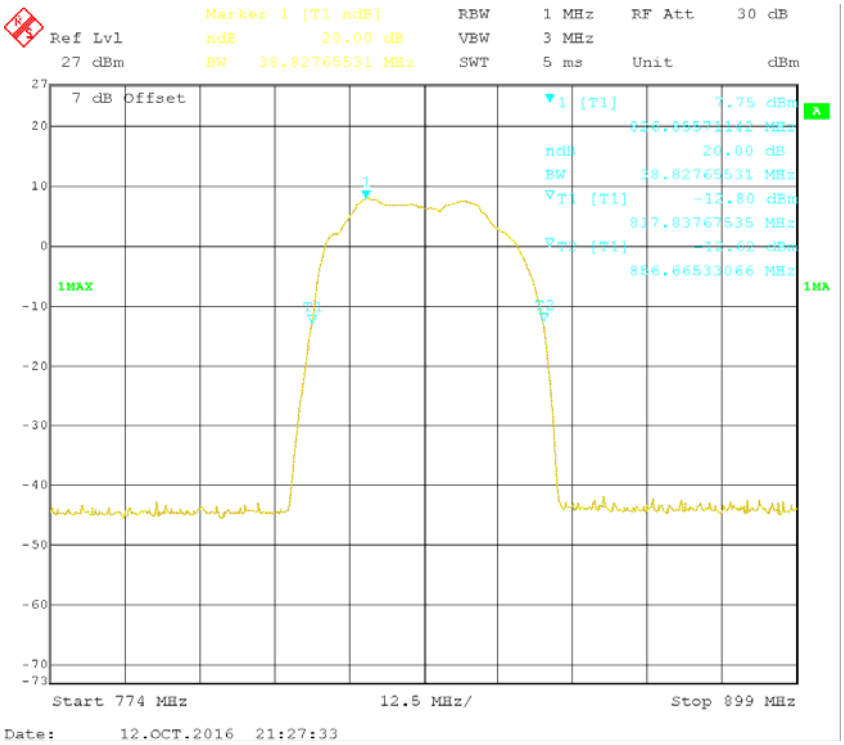
*The testing was performed by Lorin Bian on 2016-10-26.*

*Test Result: Compliance. Please refer to the following table.*

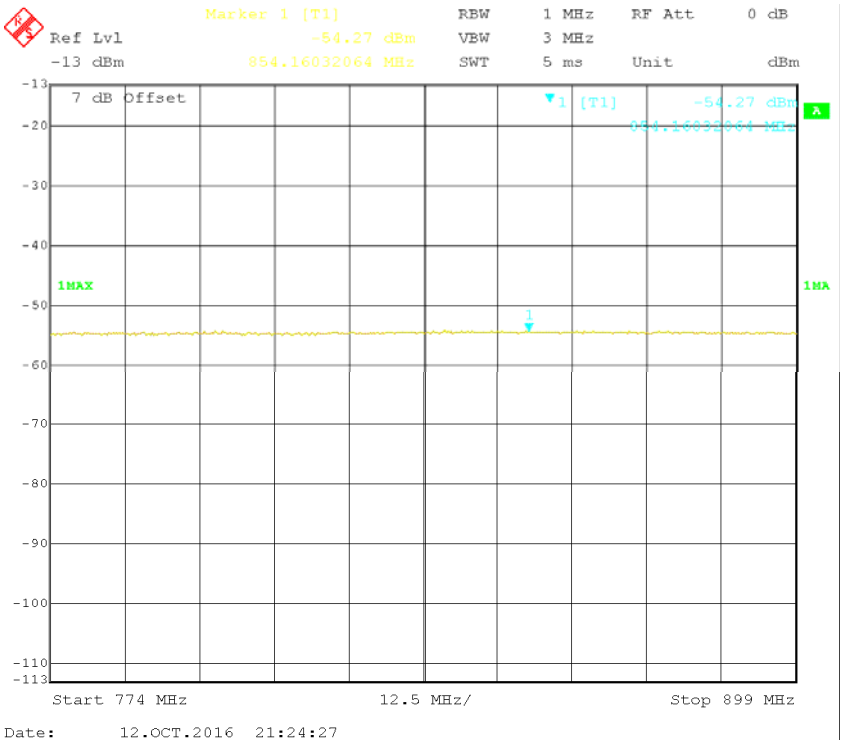
| Mode | Operation Bands | Frequency (MHz) | Signal Type | Signal Level | Input Power (dBm) | Output Power (dBm) | Gain (dB) |
|---|---|---|---|---|---|---|---|
| Uplink | Cellular | 826.8557 | AWGN | Pre-AGC | -42 | 19.16 | 61.16 |
| | | | | 3dB above AGC | -39 | 20.96 | 59.96 |
| | | | GSM | Pre-AGC | -42 | 19.08 | 61.08 |
| | | | | 3dB above AGC | -39 | 21.41 | 60.41 |
| Downlink | Cellular | 877.1162 | AWGN | Pre-AGC | -43 | 18.44 | 61.44 |
| | | | | 3dB above AGC | -40 | 20.40 | 60.4 |
| | | | GSM | Pre-AGC | -43 | 18.61 | 61.61 |
| | | | | 3dB above AGC | -40 | 18.55 | 58.55 |

# KDB 935210 D02

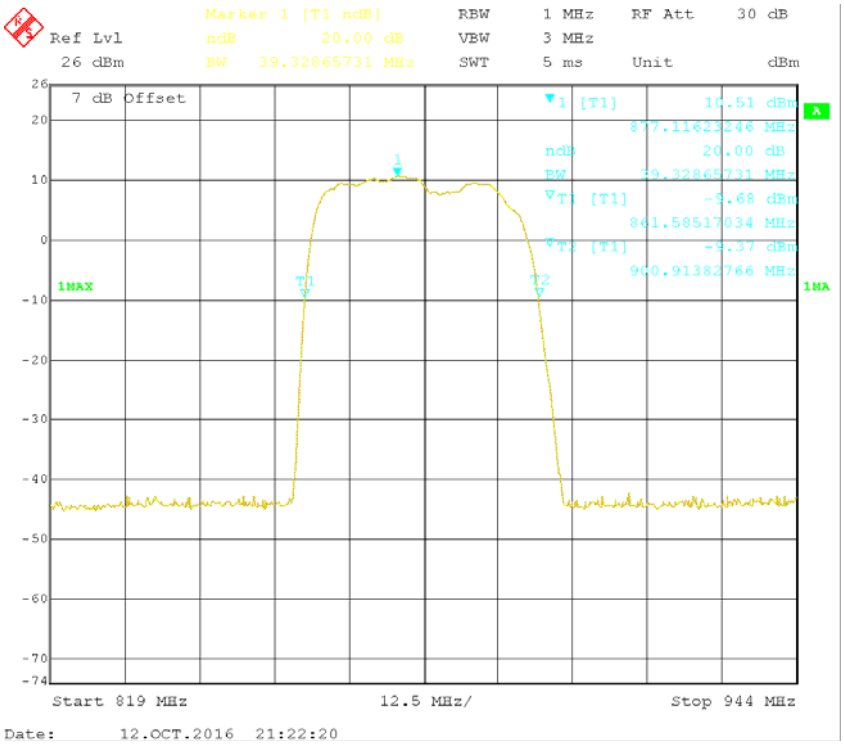
## Cellular Band Uplink Output



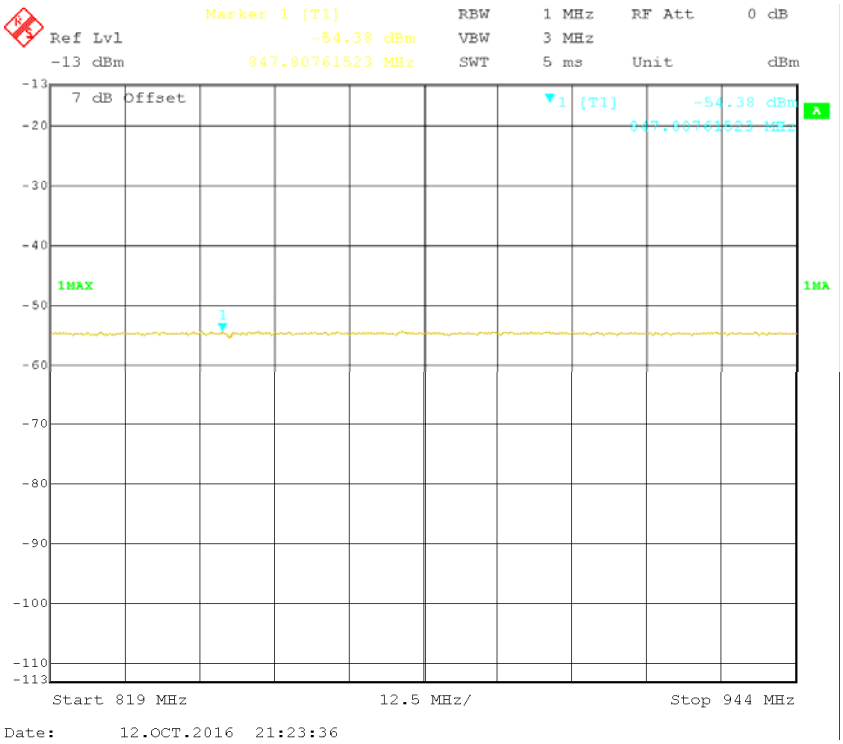

## Cellular Band Uplink Input



## Cellular Band Downlink Output




## Cellular Band Downlink Input



# §2.1049

(determined from step l) to affirm that they are similar (in passband and rolloff characteristic features and relative spectral locations), and include plot(s) and descriptions in test report.

o) Repeat steps a) to n) with the signal generator set to the narrowband signal.
p) Repeat the procedure for both test signals with the input signal amplitude set 3 dB above the AGC threshold.
q) Repeat for all frequency bands authorized for use by the EUT.

## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| Rohde & Schwarz | Signal Analyzer | FSIQ26 | 831929/005 | 2016-09-21 | 2017-09-20 |
| R & S | Wideband Radio Communication Tester | CMW500 | 149216 | 2016-10-07 | 2017-10-06 |

*** Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

## Test Data

### Environmental Conditions

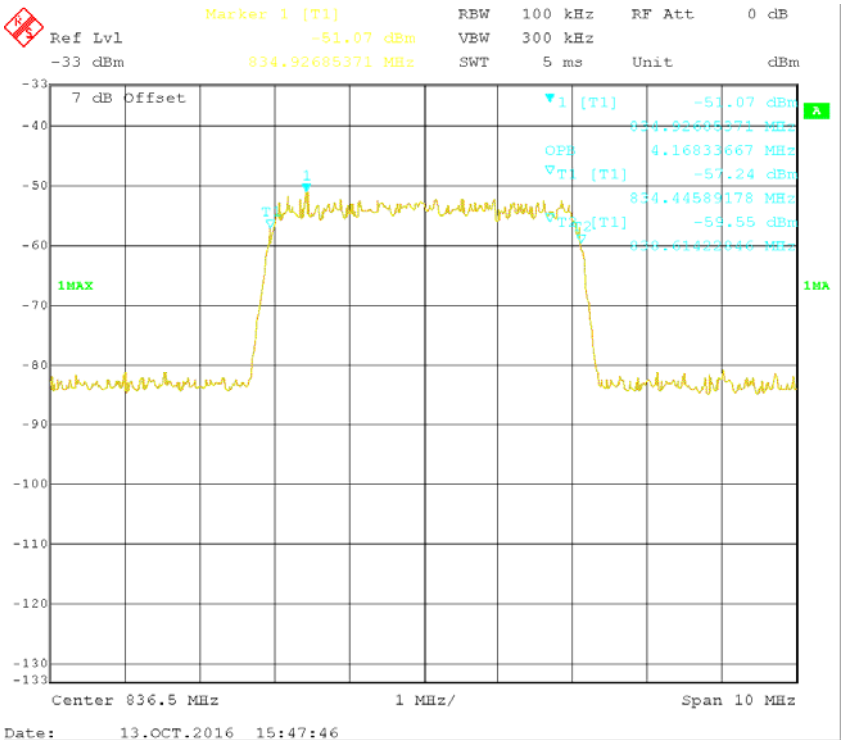
| | |
|---|---|
| **Temperature:** | 26.4 ℃ |
| **Relative Humidity:** | 33 % |
| **ATM Pressure:** | 100.8 kPa |

*The testing was performed by Lorin Bian on 2016-10-13.*

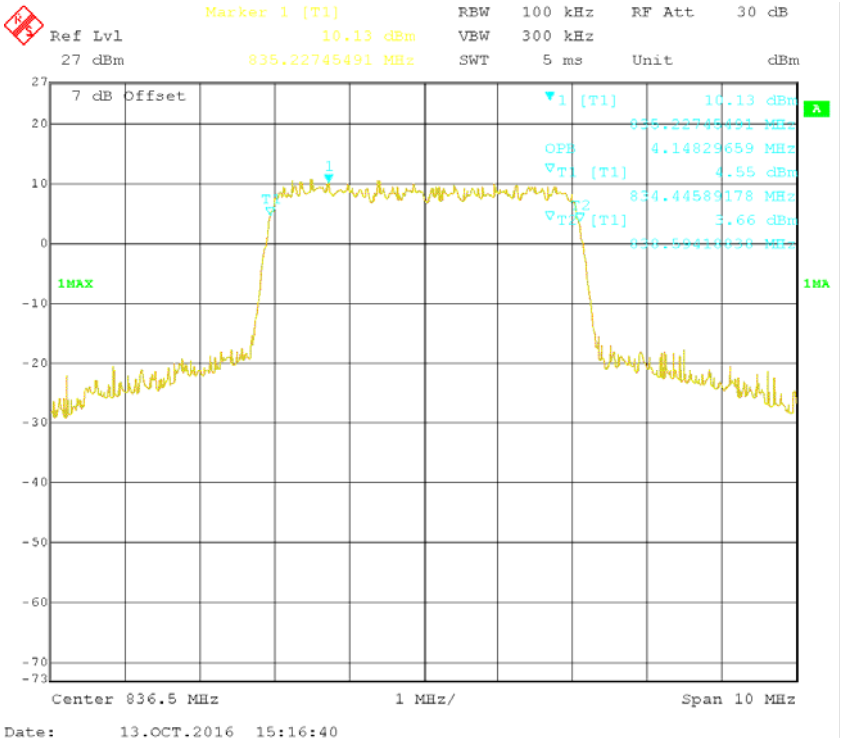
Test Result: Compliance. Please refer to the following plots.

**AWGN Signal:**

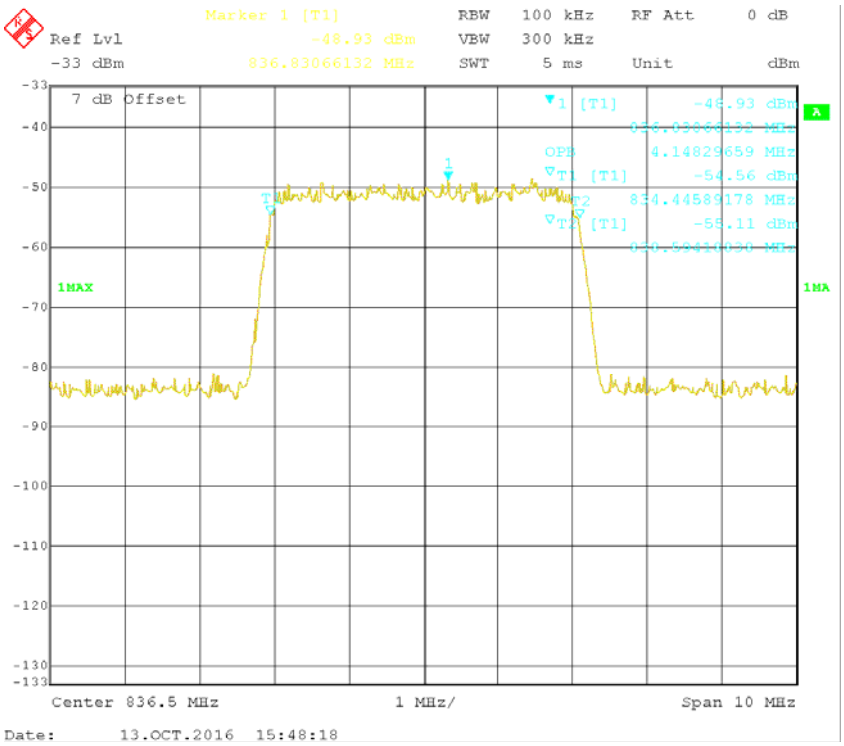
**Cellular Band Uplink Pre-AGC Input**



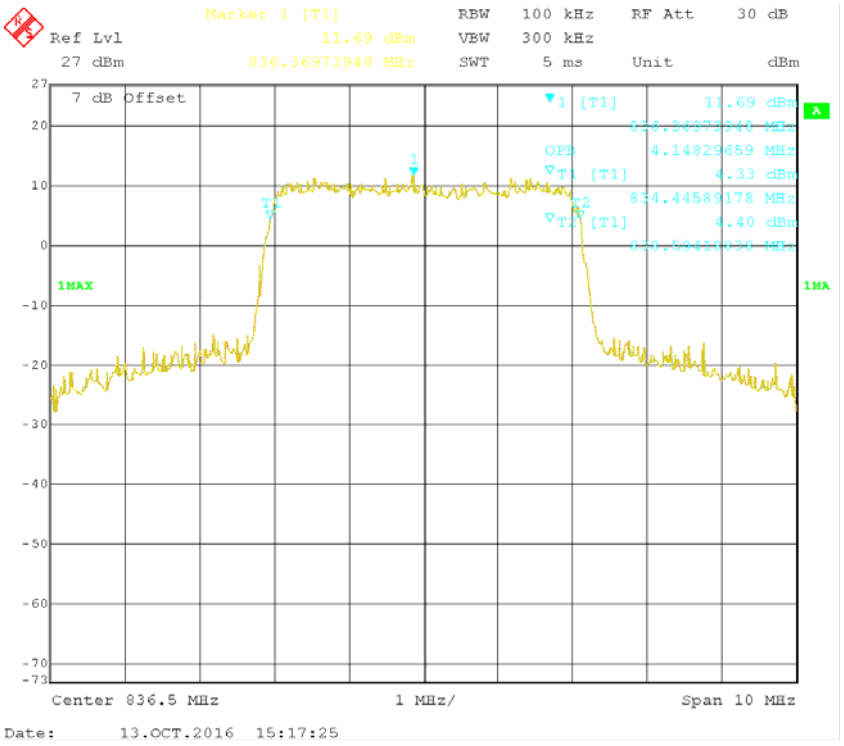

**Cellular Band Uplink Pre-AGC Output**



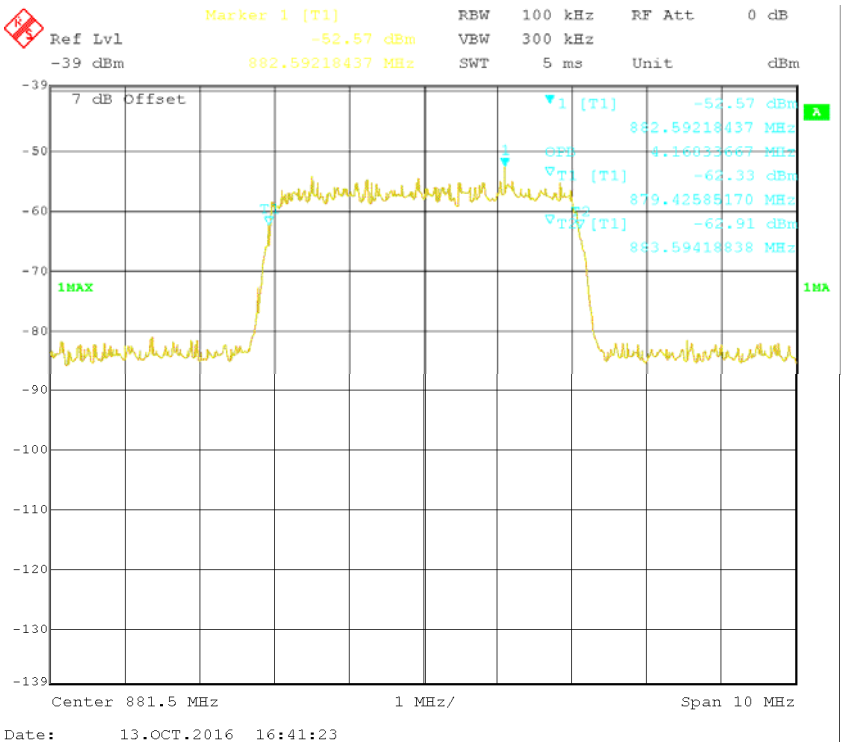
**Cellular Band Uplink 3dB above AGC Input**



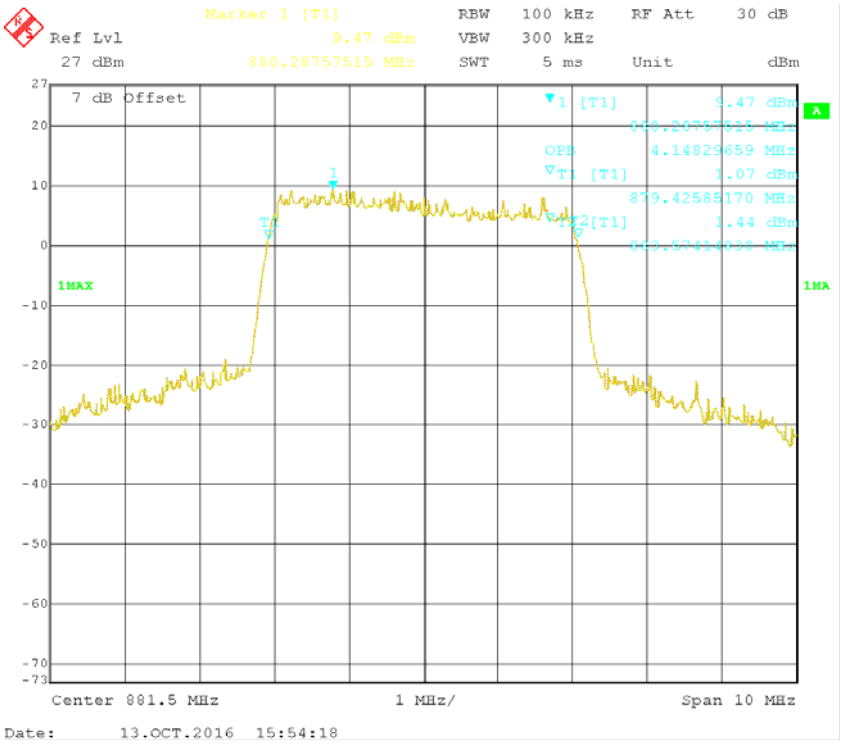

**Cellular Band Uplink 3dB above AGC Output**



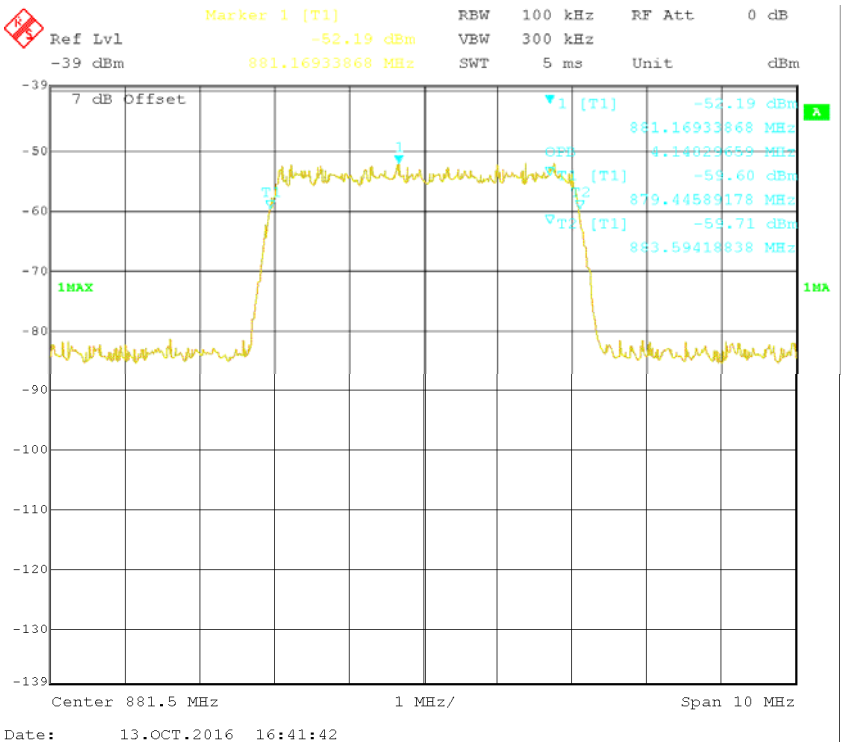
## Cellular Band Downlink Pre-AGC Input



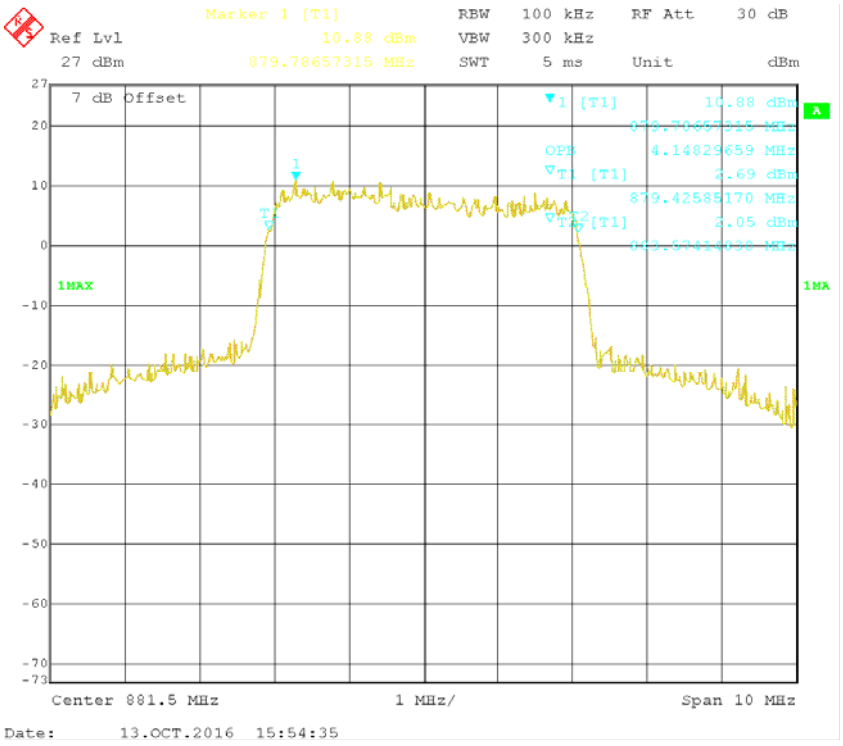

## Cellular Band Downlink Pre-AGC Output



**Cellular Band Downlink 3dB above AGC Input**

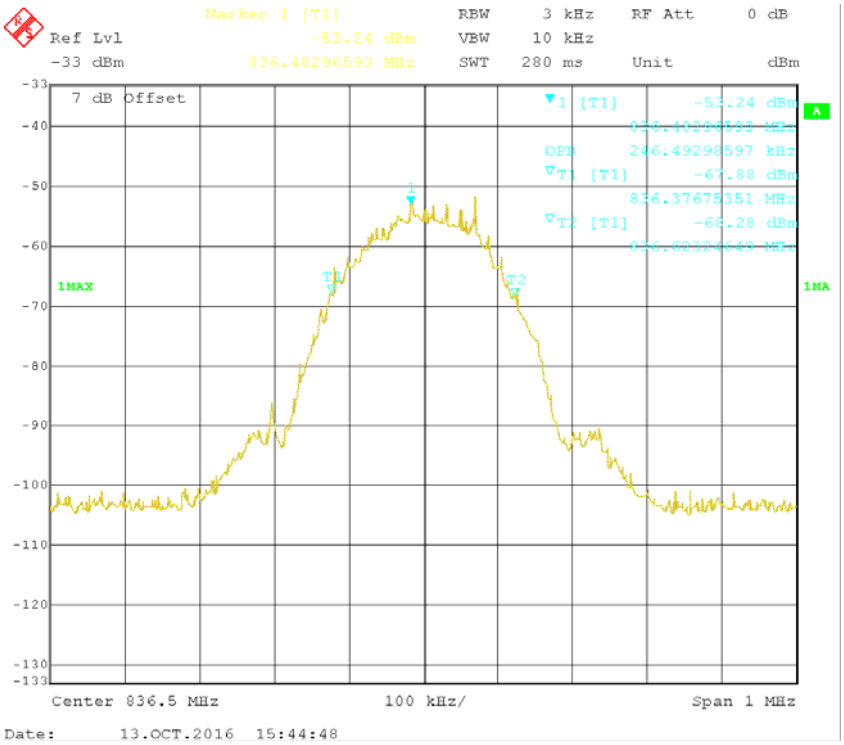



**Cellular Band Downlink 3dB above AGC Output**

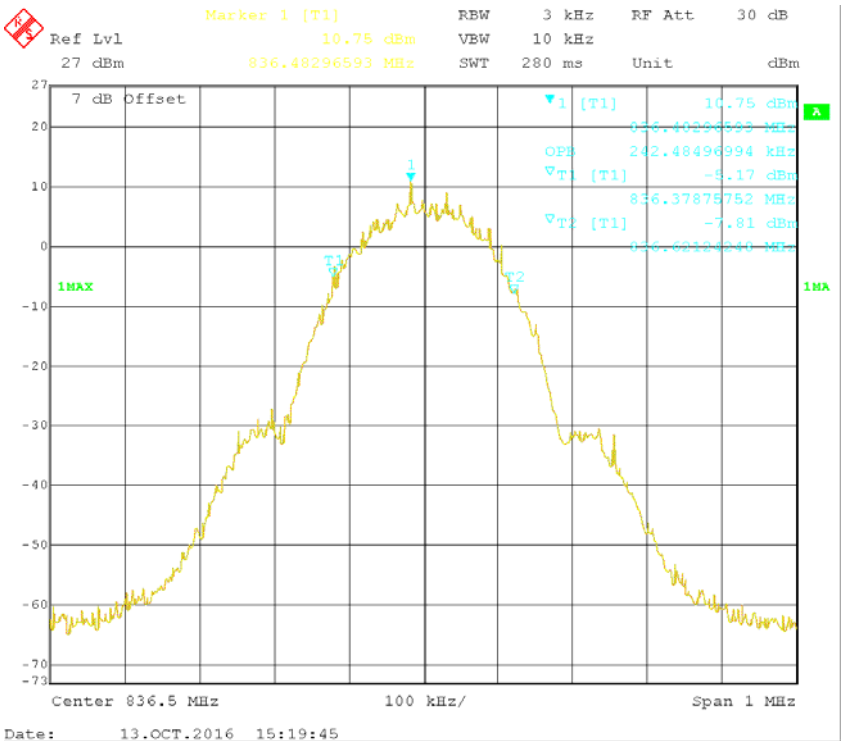


**GSM Signal:**

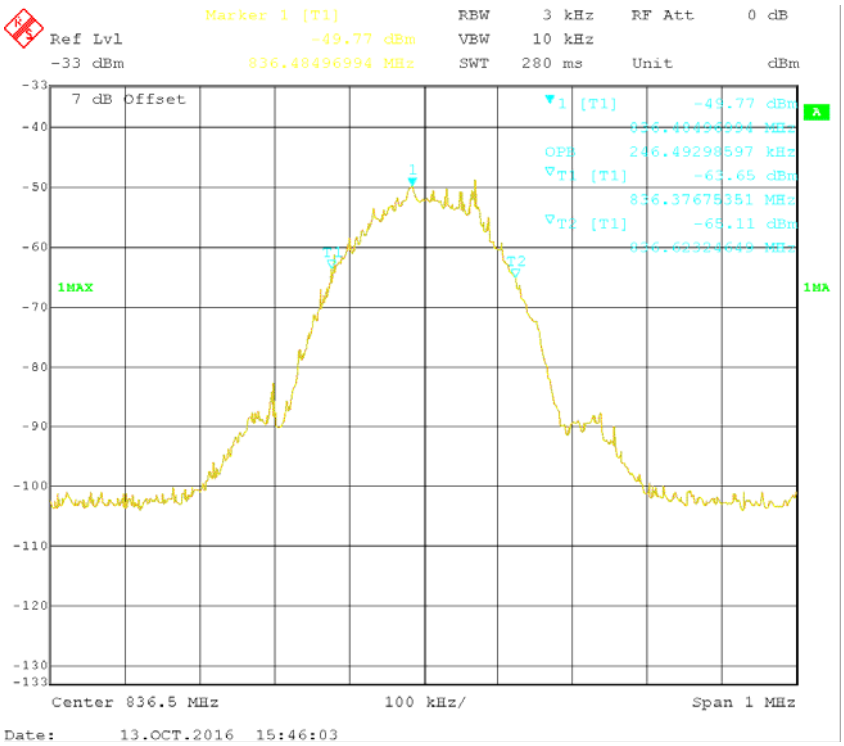
**Cellular Band Uplink Pre-AGC Input**



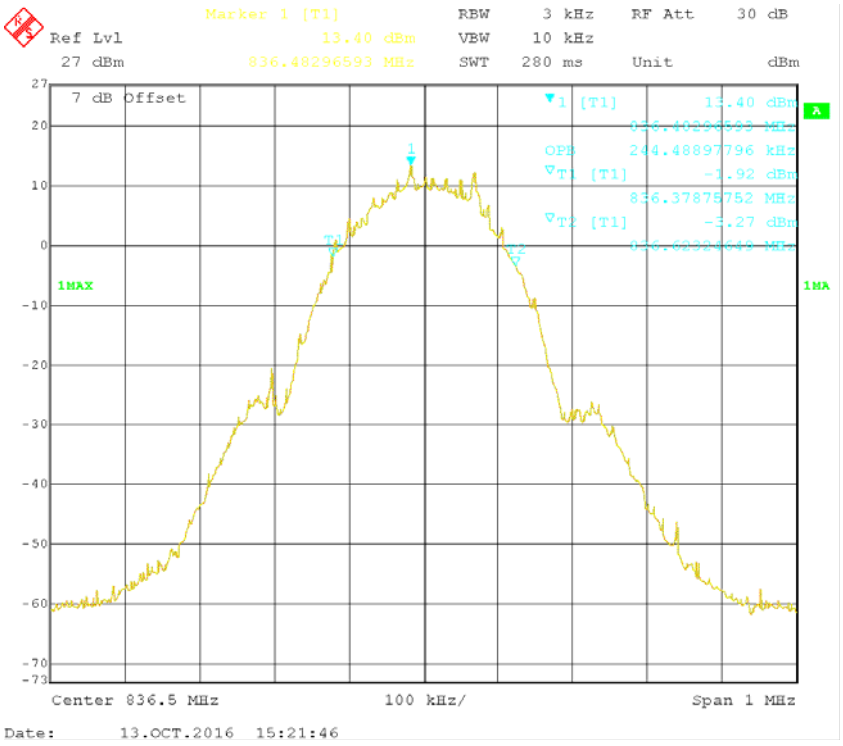

**Cellular Band Uplink Pre-AGC Output**



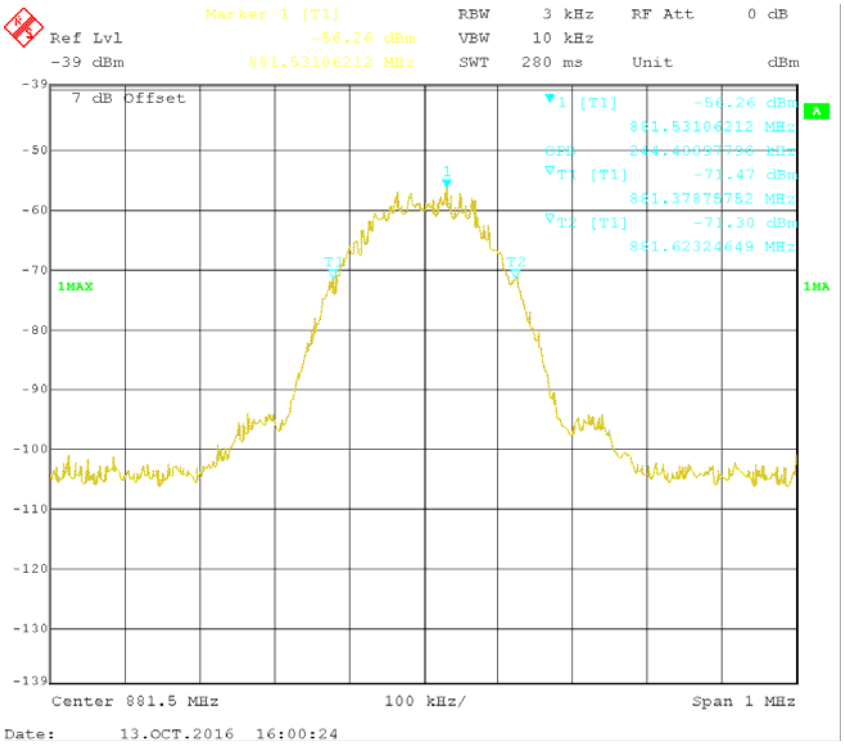
**Cellular Band Uplink 3dB above AGC Input**



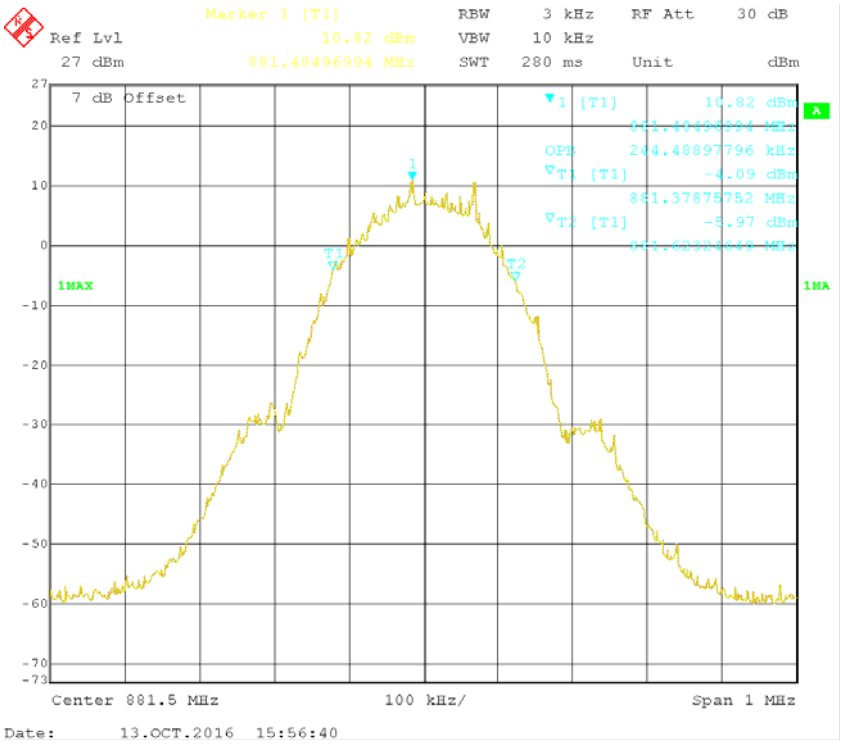

**Cellular Band Uplink 3dB above AGC Output**



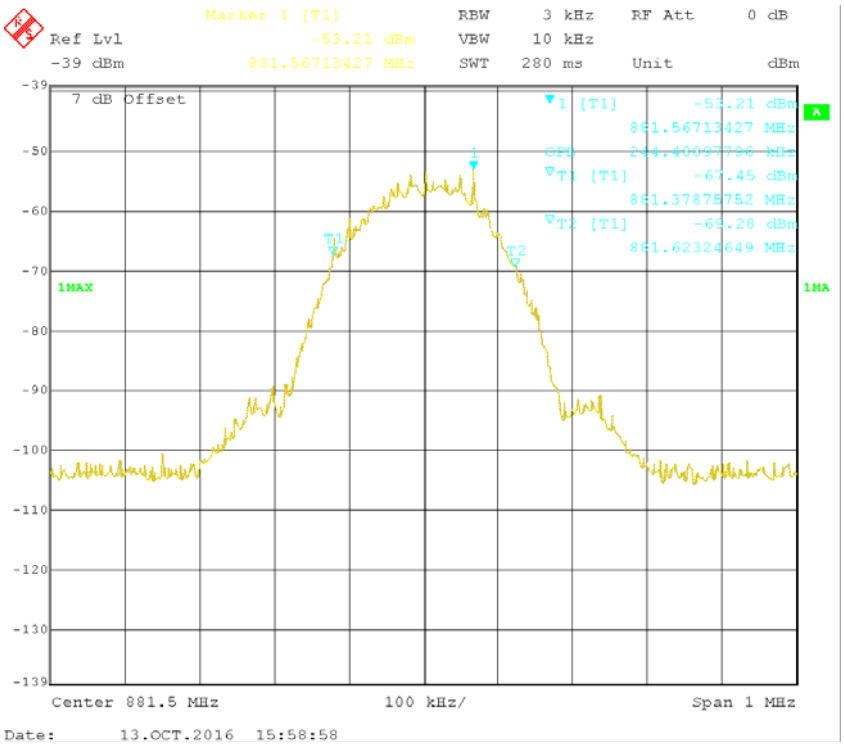
**Cellular Band Downlink Pre-AGC Input**



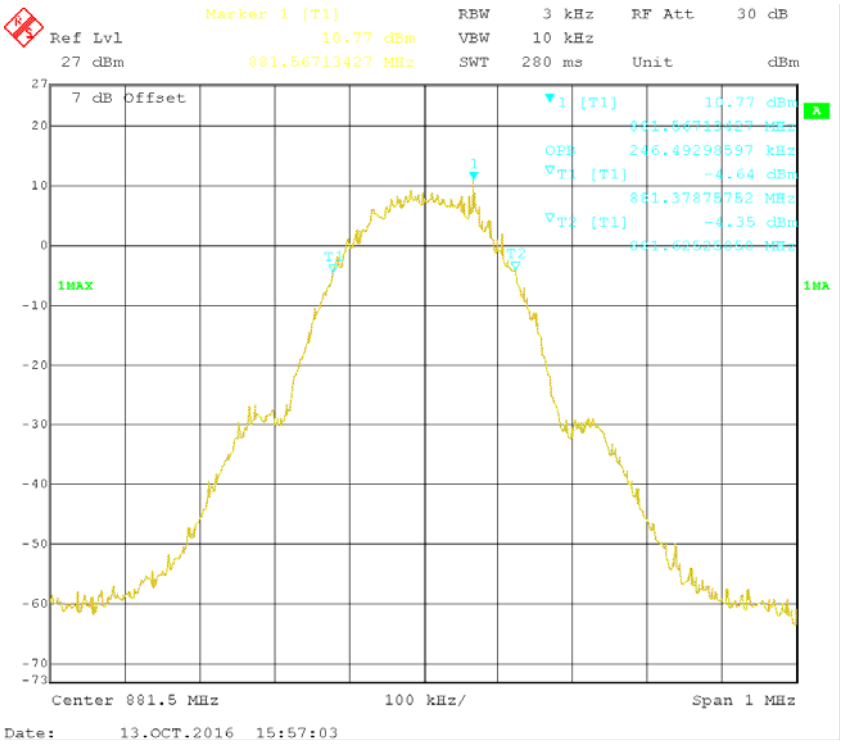

**Cellular Band Downlink Pre-AGC Output**



**Cellular Band Downlink 3dB above AGC Input**




**Cellular Band Downlink 3dB above AGC Output**



# §2.1051

m) Capture the spectrum analyzer trace of the power level for inclusion in the test report.
n) Repeat the procedure with the composite input power level set to 3 dB above the AGC threshold.
o) Reset the input signals frequencies to the lower edge of the frequency block or band under examination.
p) Reset the spectrum analyzer start frequency to the lower block edge frequency minus 300 kHz, or 3 MHz (for frequencies below and above 1 GHz, respectively), and the stop frequency to the lower band or block edge frequency.
q) Repeat steps k) to n).
r) Repeat steps a) to q) with the signal generator configured for a single test signal tuned as close as possible to the block edges.
s) Repeat steps a) to r) with the narrowband test signal.
t) Repeat steps a) to s) for all authorized frequency bands or blocks used by the EUT.

## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| Rohde & Schwarz | Signal Analyzer | FSIQ26 | 831929/005 | 2016-09-21 | 2017-09-20 |
| R & S | Wideband Radio Communication Tester | CMW500 | 149216 | 2016-10-07 | 2017-10-06 |
| Agilent | MXG Vector Signal Generator | N5182B | MY513501224 | 2016-05-10 | 2017-05-09 |

*** Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

## Test Data

### Environmental Conditions

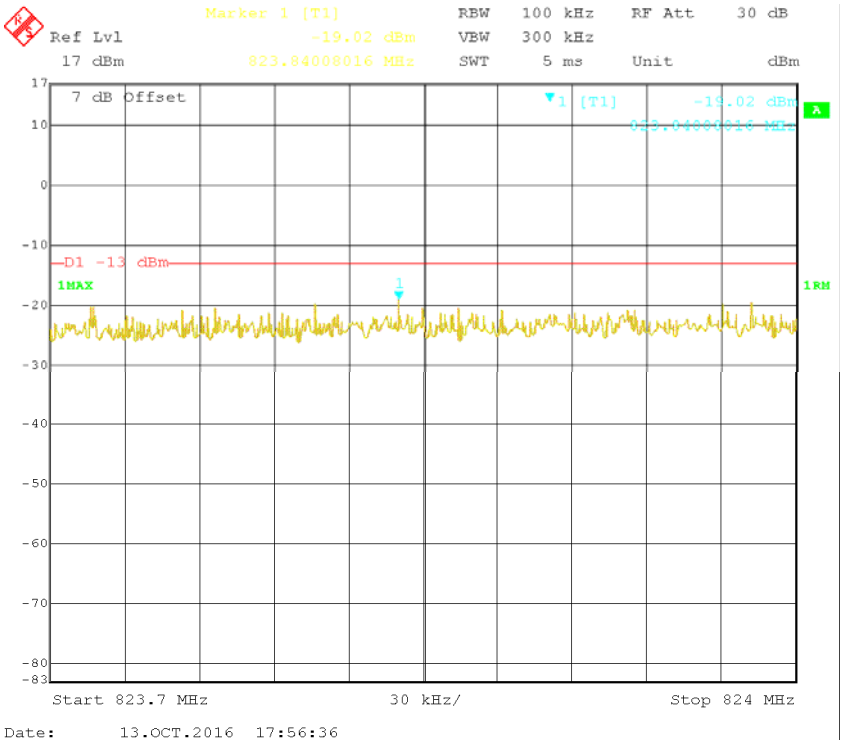
| | |
|---|---|
| **Temperature:** | 26.4℃ |
| **Relative Humidity:** | 33 % |
| **ATM Pressure:** | 100.8 kPa |

*The testing was performed by Lorin Bian on 2016-10-13.*

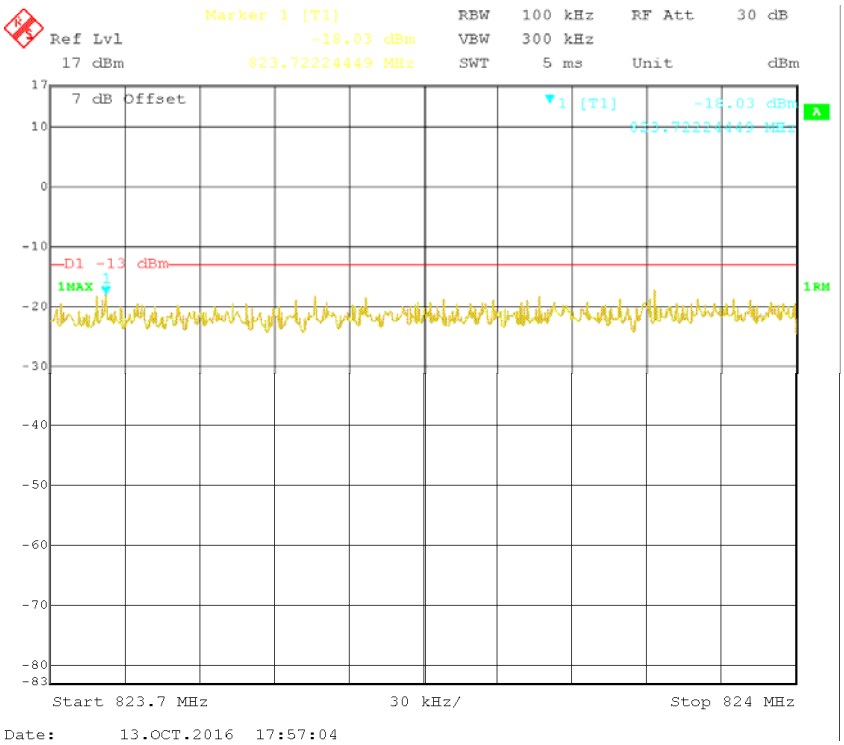
Please refer to the following plots.

**Single channel:**
Uplink:

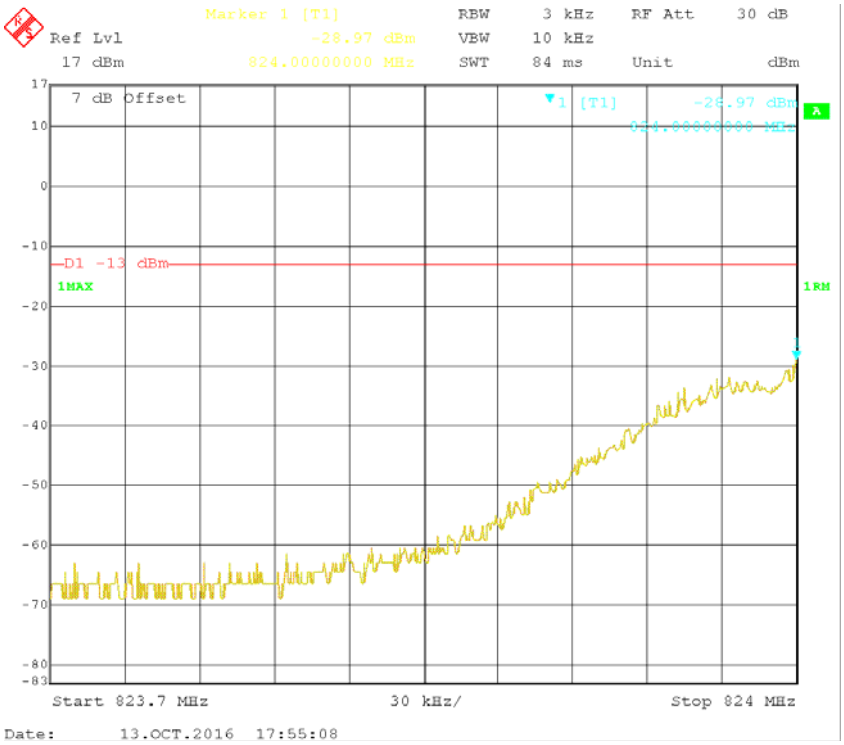
**Cellular Band AWGN Left Side Pre-AGC**



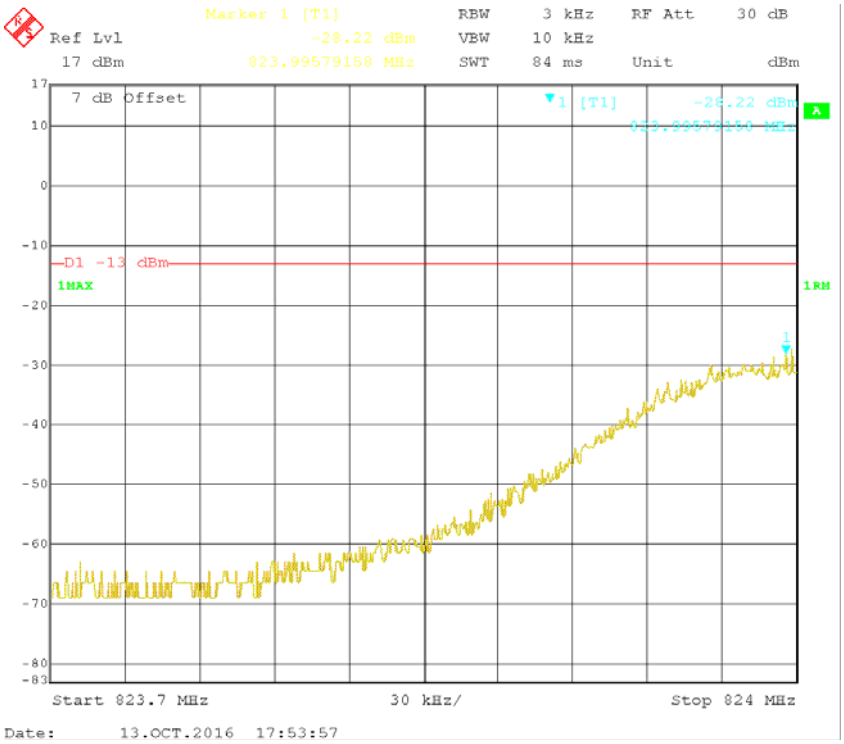

**Cellular Band AWGN Left Side 3dB Above AGG**



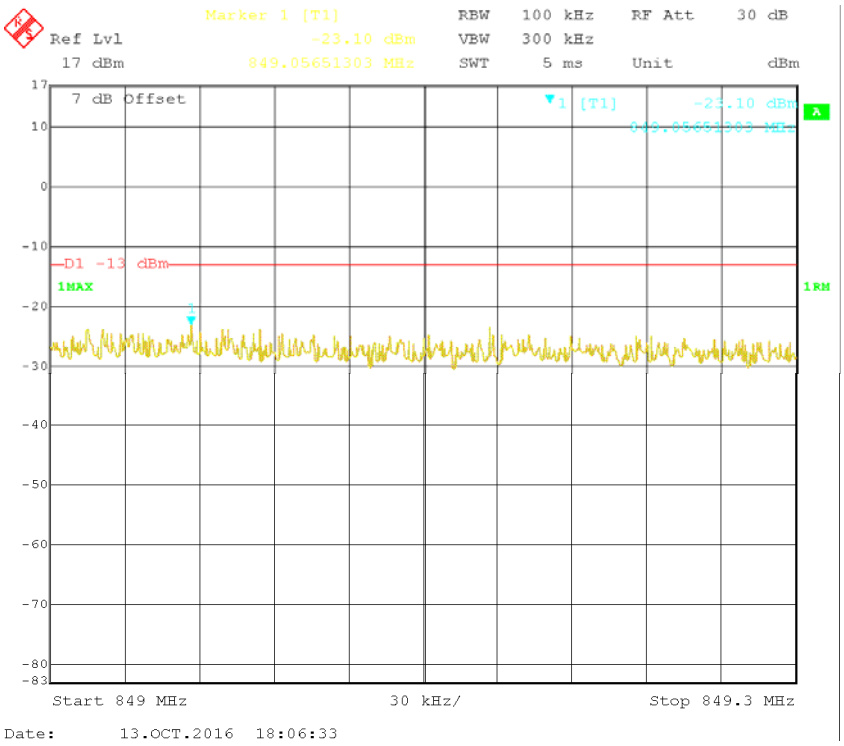
**Cellular Band GSM Left Side Pre-AGC**



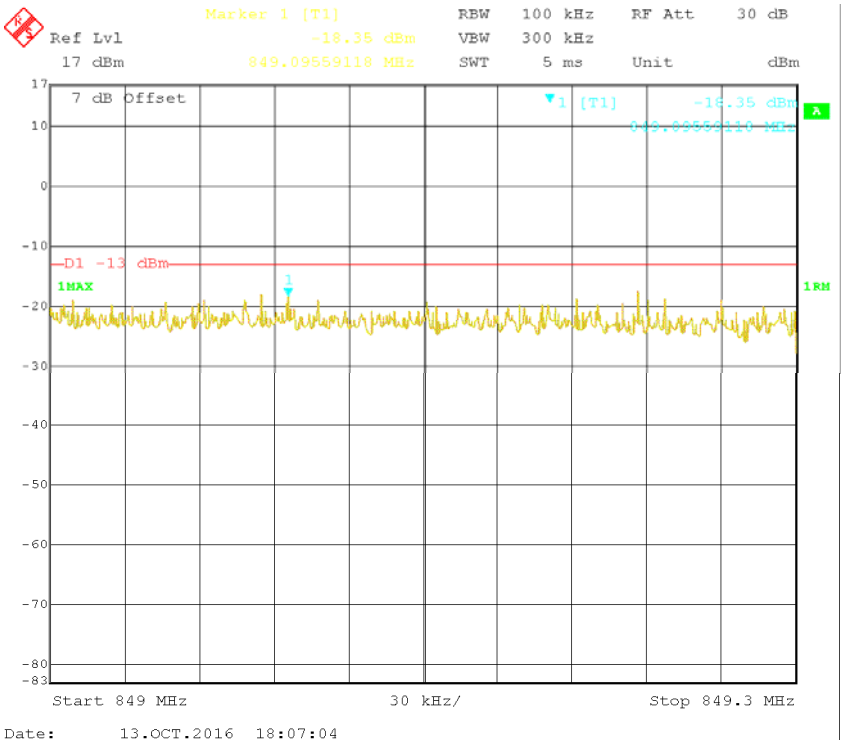

**Cellular Band GSM Left Side 3dB Above AGC**



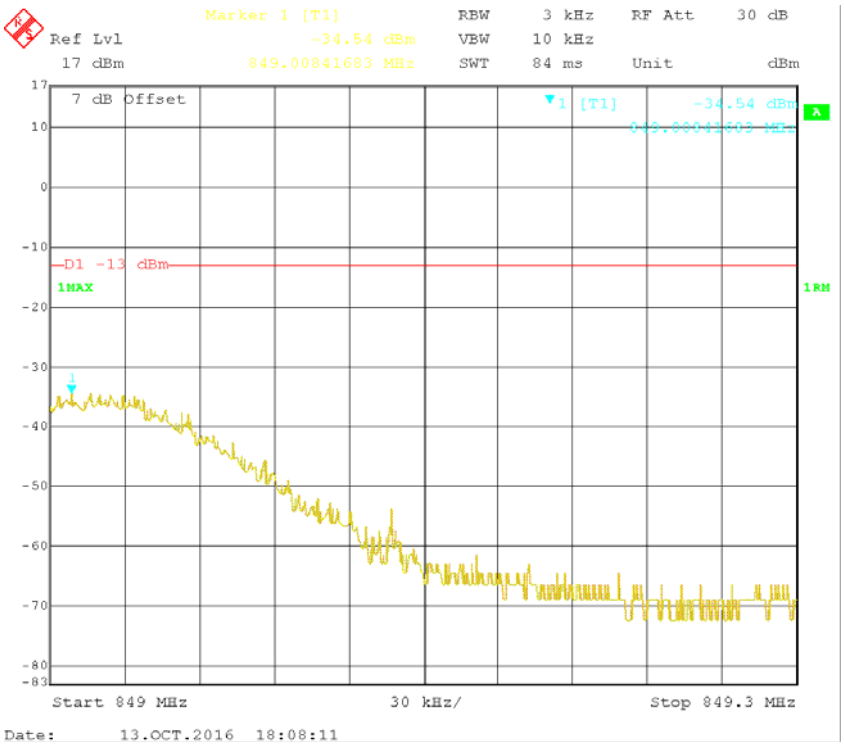
## Cellular Band AWGN Right Side Pre-AGC



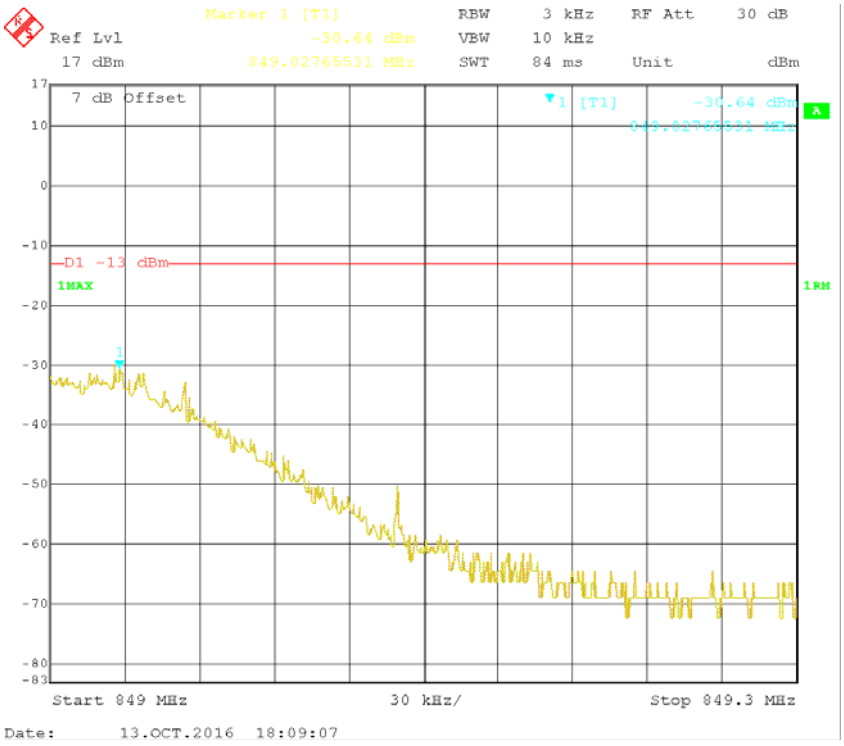

## Cellular Band AWGN Right Side 3dB Above AGG



**Cellular Band GSM Right Side Pre-AGC**

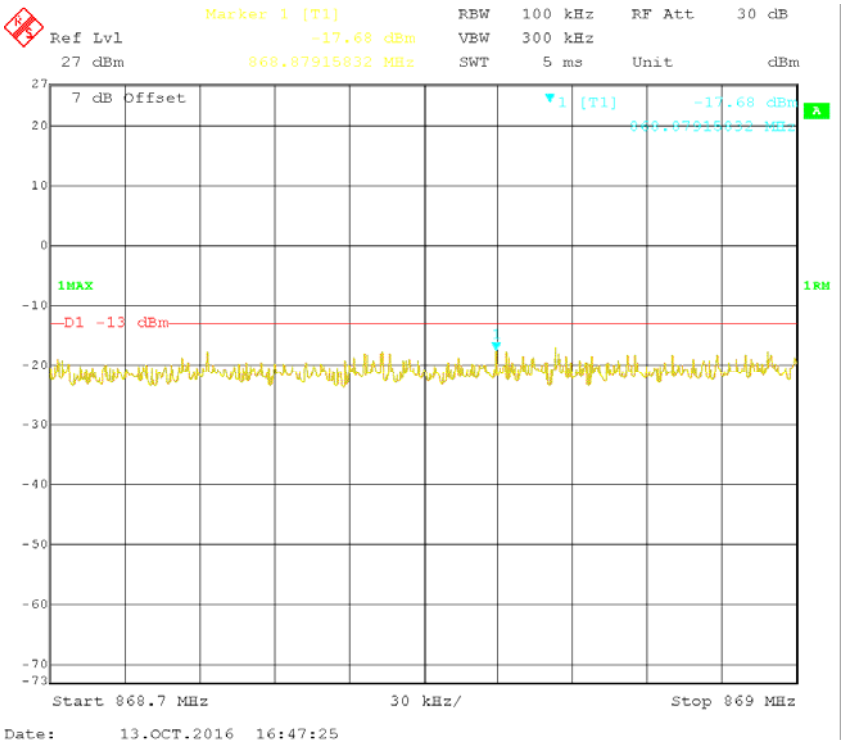



**Cellular Band GSM Right Side 3dB Above AGC**

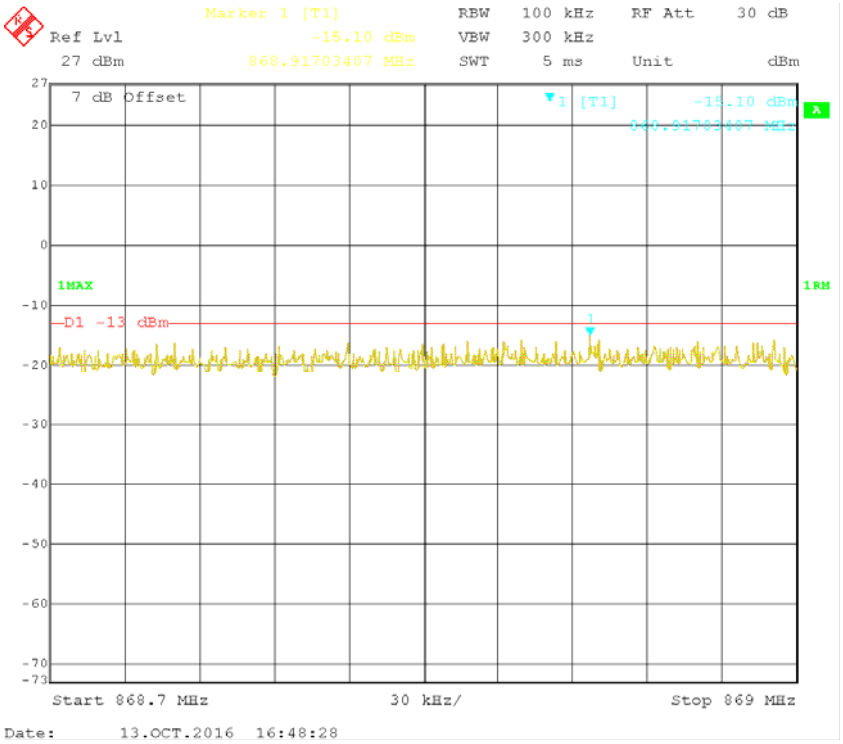


Downlink

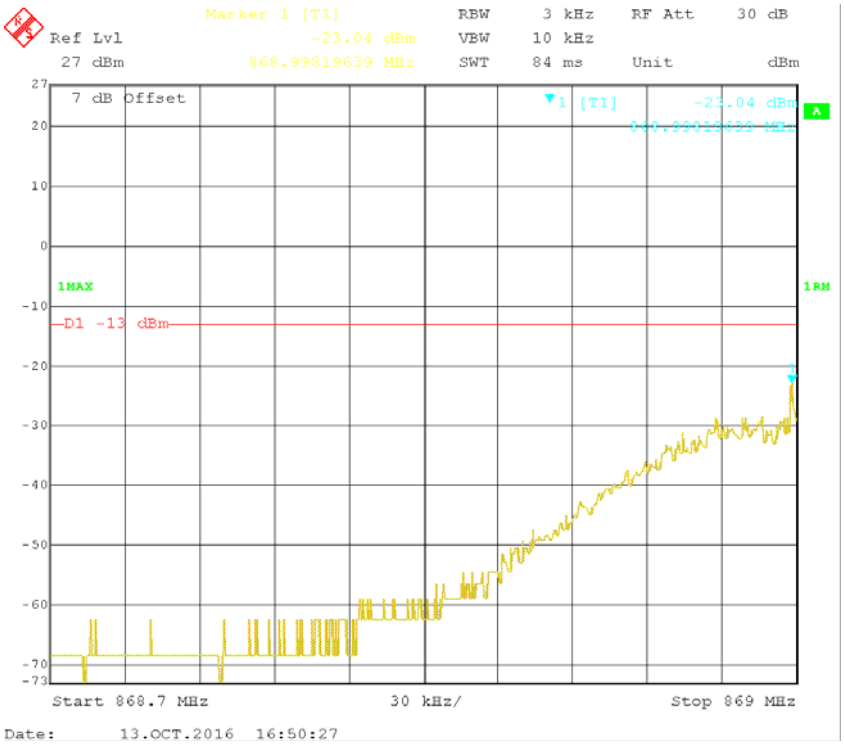
**Cellular Band AWGN Left Side Pre-AGC**



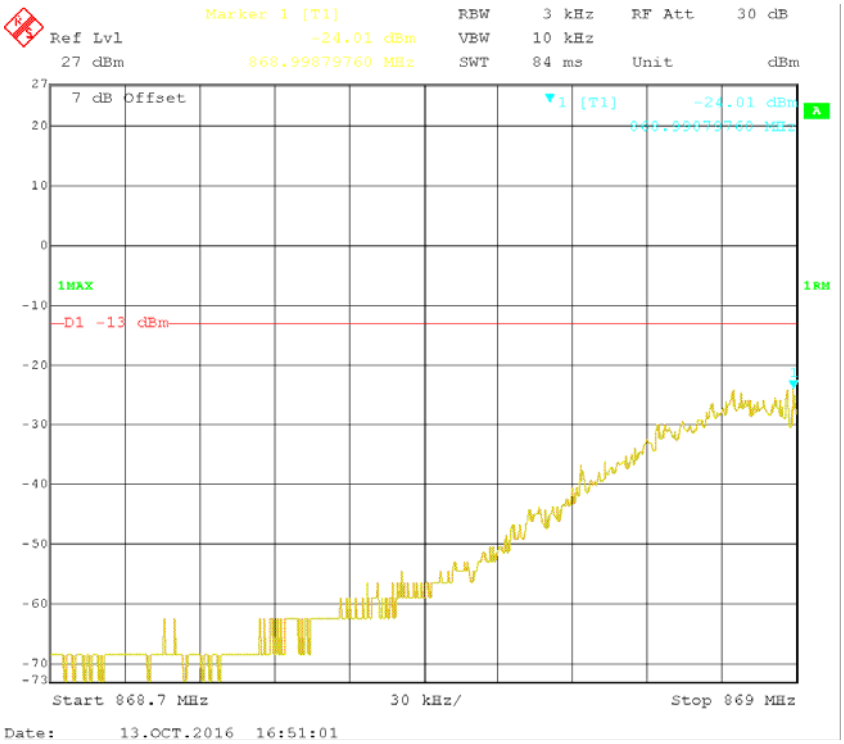

**Cellular Band AWGN Left Side 3dB Above AGG**



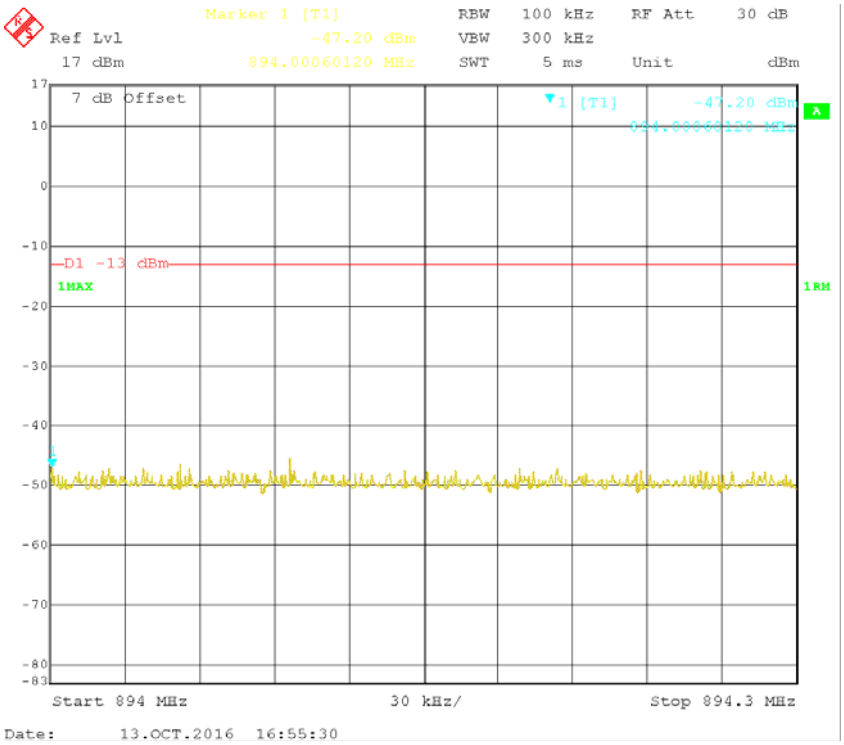
**Cellular Band GSM Left Side Pre-AGC**



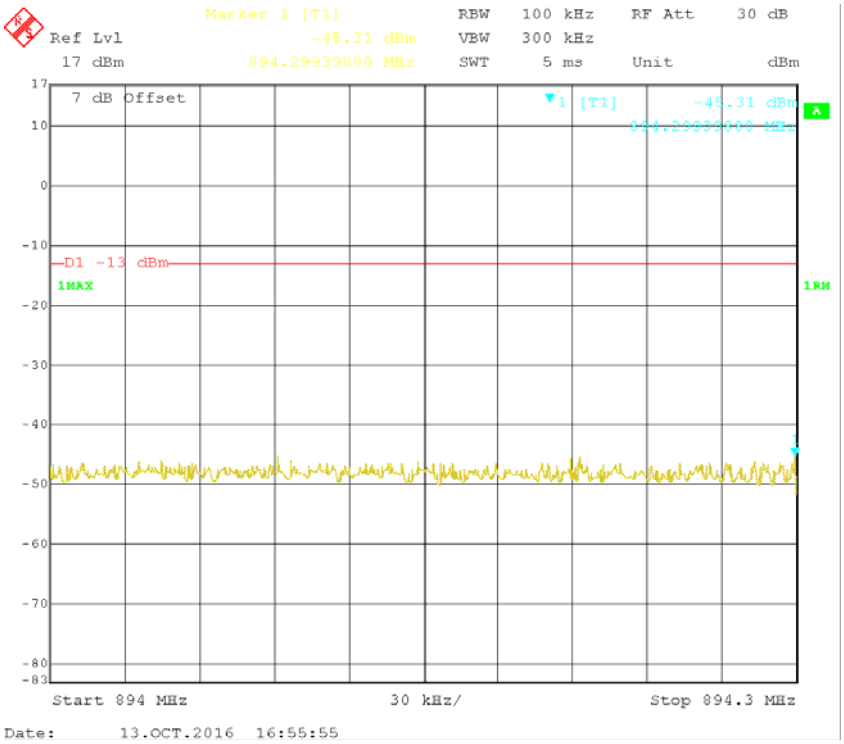

**Cellular Band GSM Left Side 3dB Above AGC**



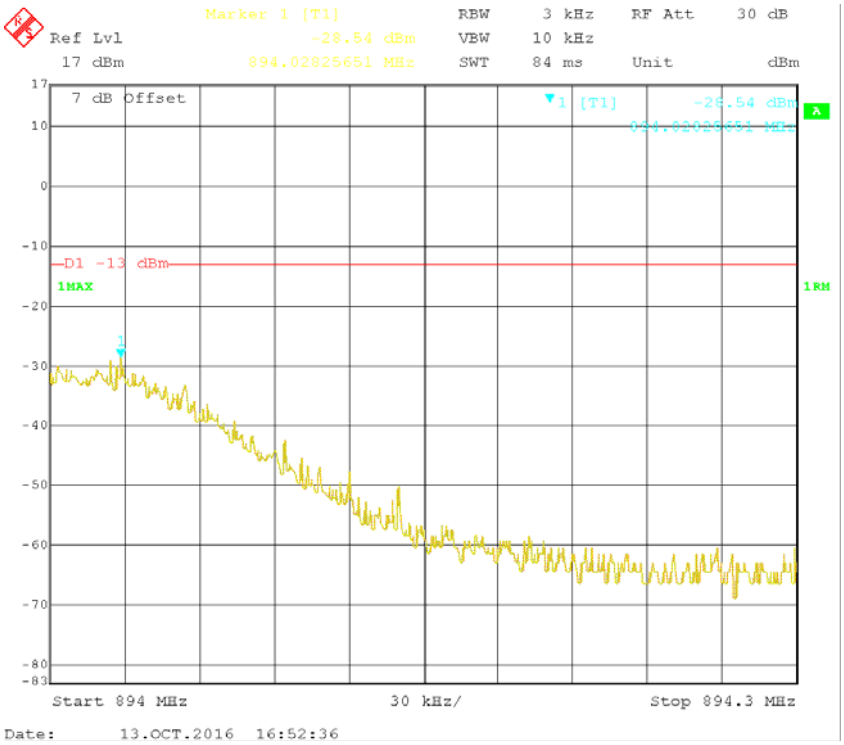
**Cellular Band AWGN Right Side Pre-AGC**



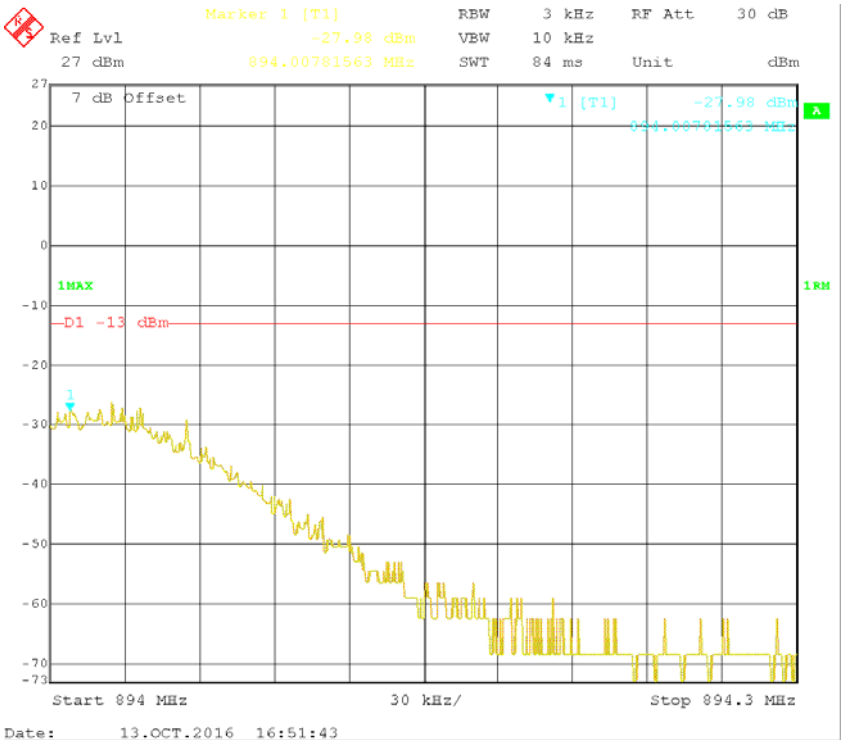

**Cellular Band AWGN Right Side 3dB Above AGG**



**Cellular Band GSM Right Side Pre-AGC**

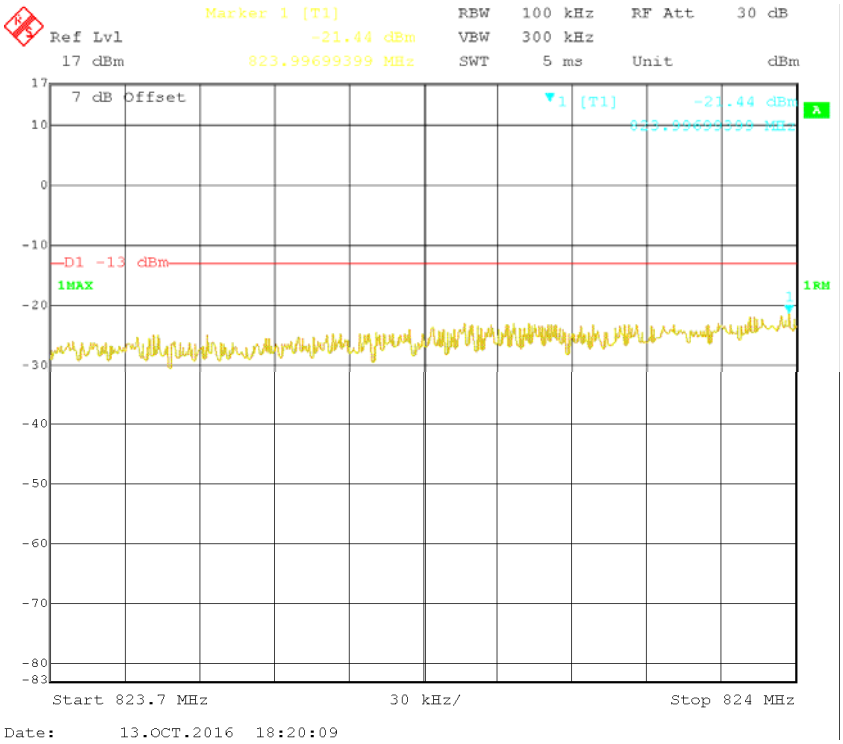



**Cellular Band GSM Right Side 3dB Above AGC**

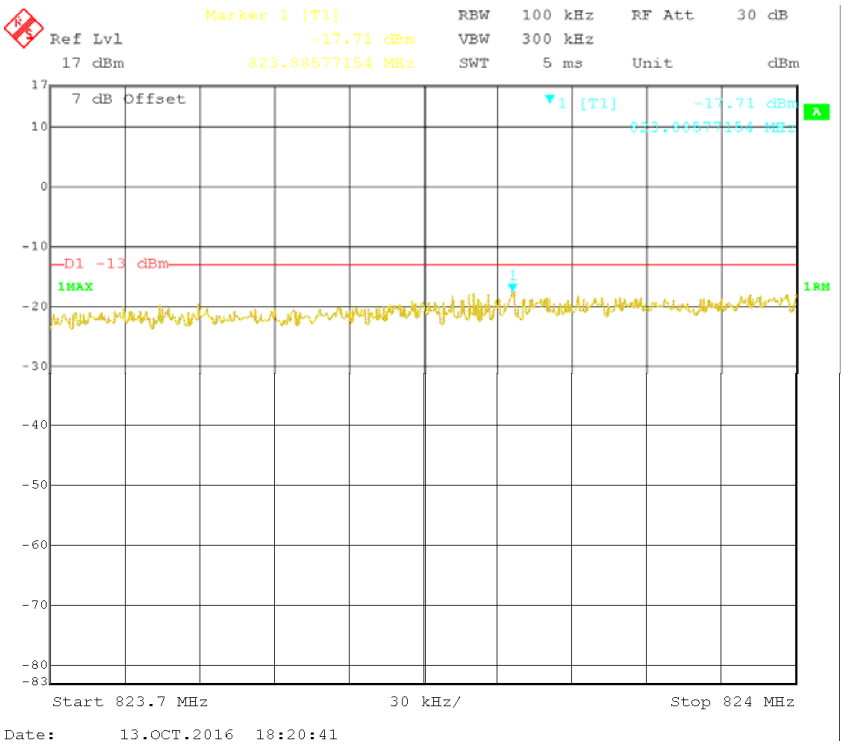


**Two adjacent channels:**
Uplink:

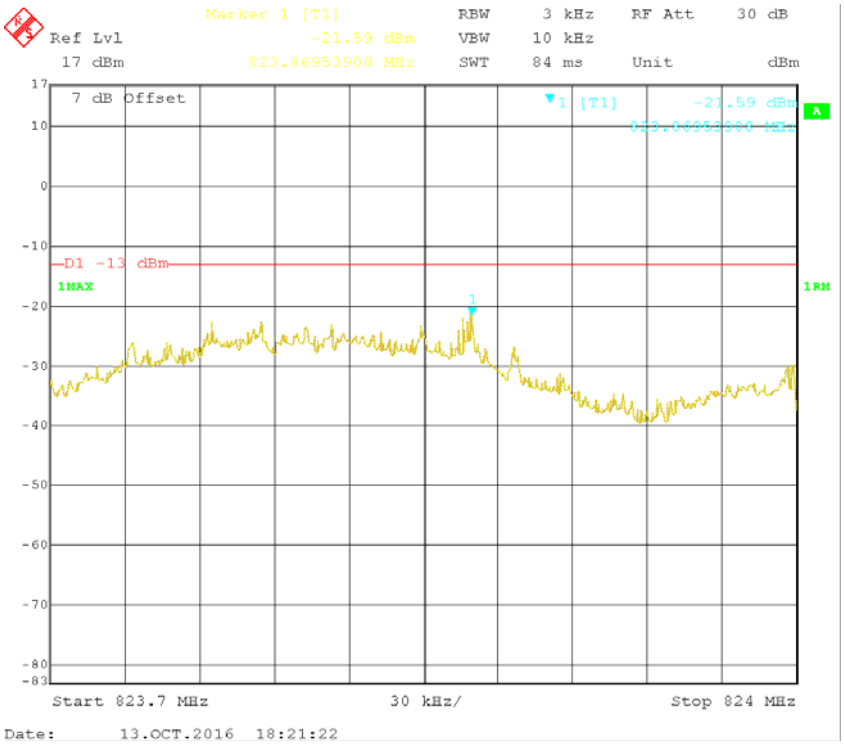
**Cellular Band AWGN Left Side Pre-AGC**



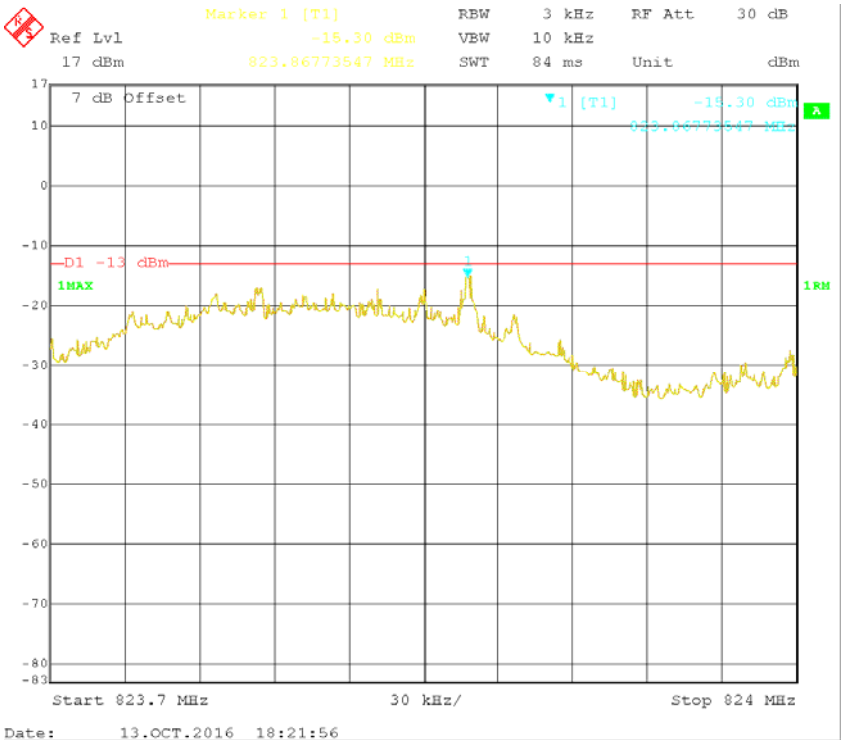

**Cellular Band AWGN Left Side 3dB Above AGG**



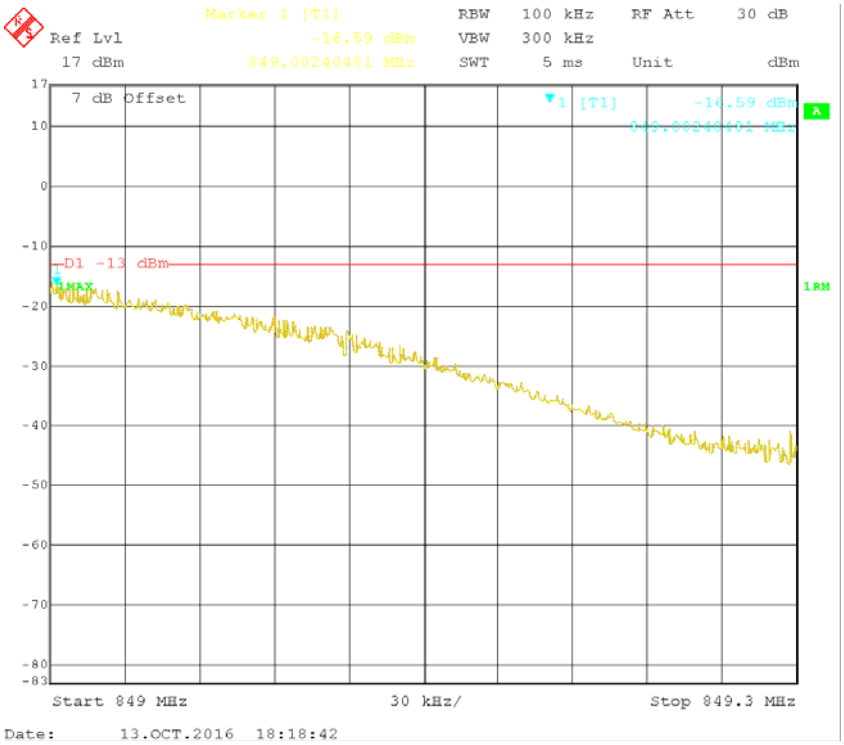
**Cellular Band GSM Left Side Pre-AGC**



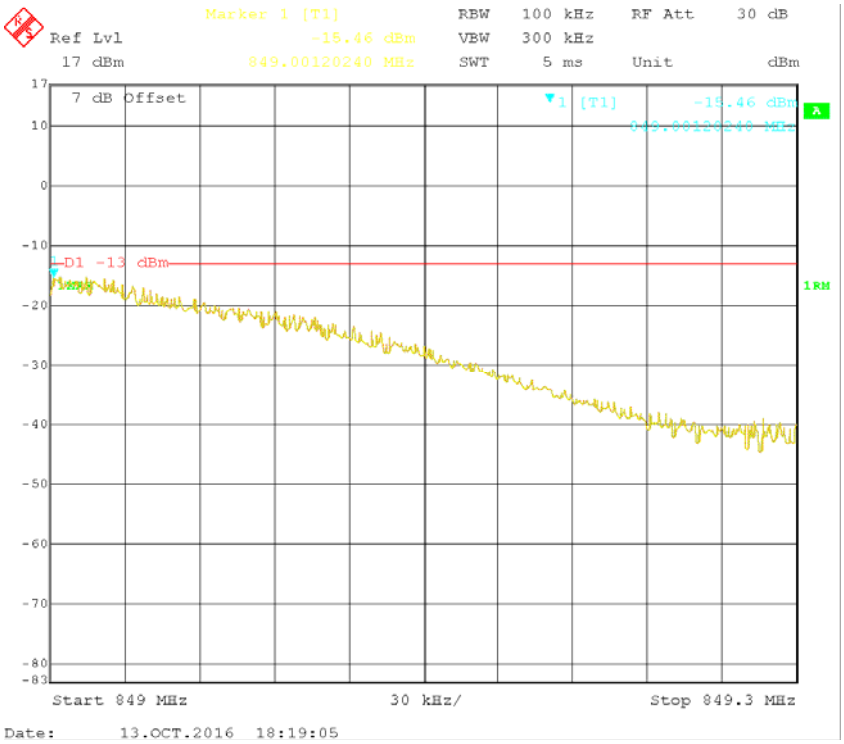

**Cellular Band GSM Left Side 3dB Above AGC**



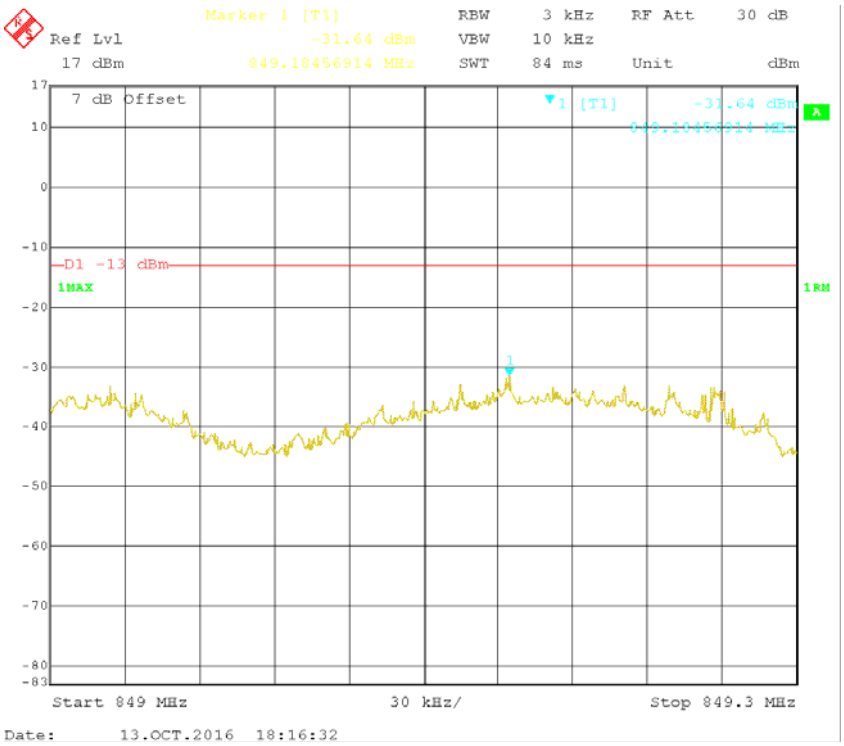
**Cellular Band AWGN Right Side Pre-AGC**



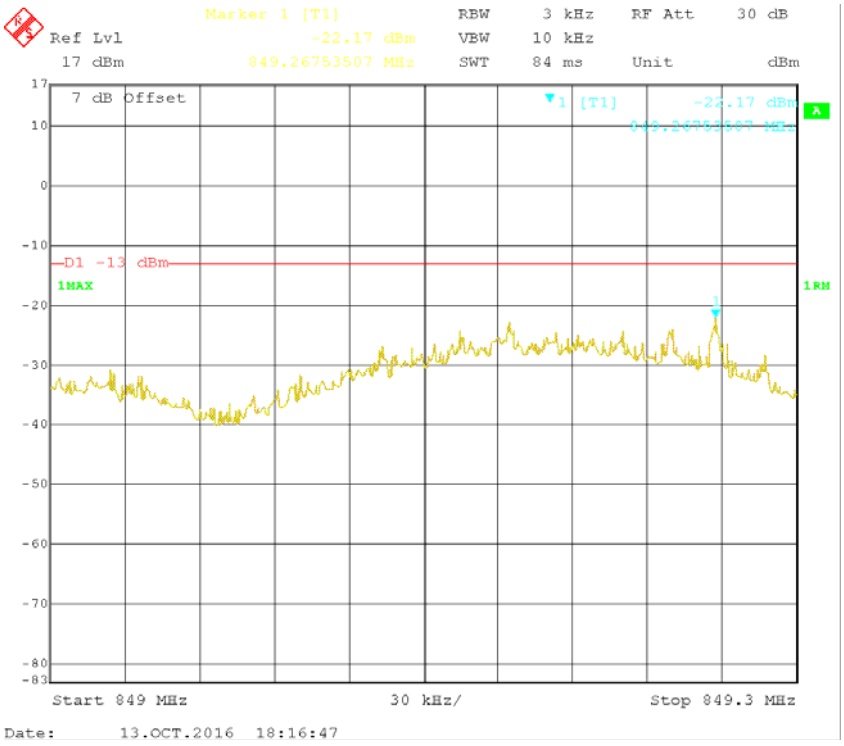

**Cellular Band AWGN Right Side 3dB Above AGG**



**Cellular Band GSM Right Side Pre-AGC**

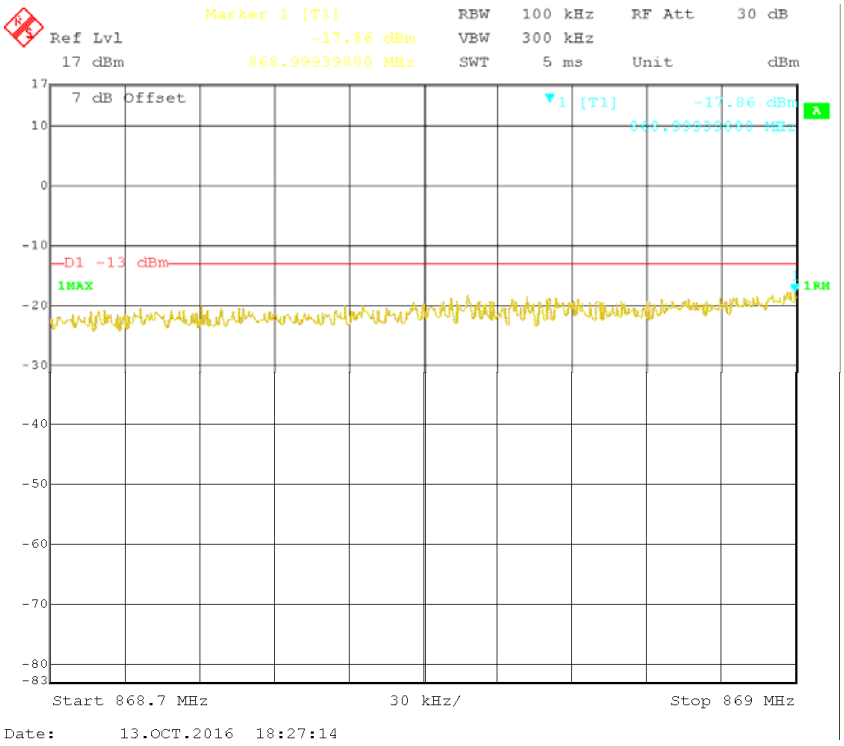



**Cellular Band GSM Right Side 3dB Above AGC**

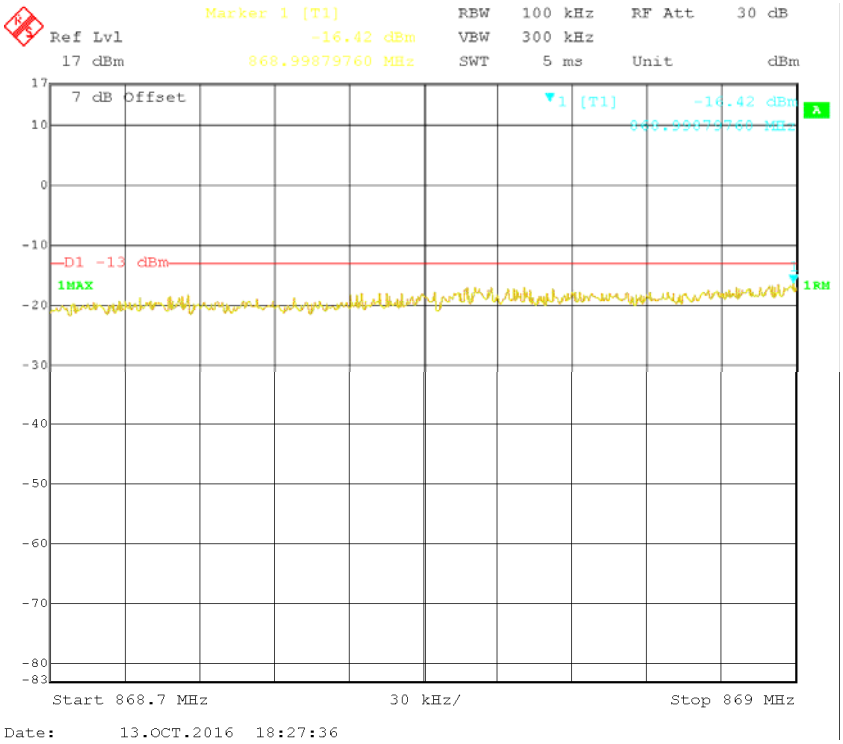


Downlink

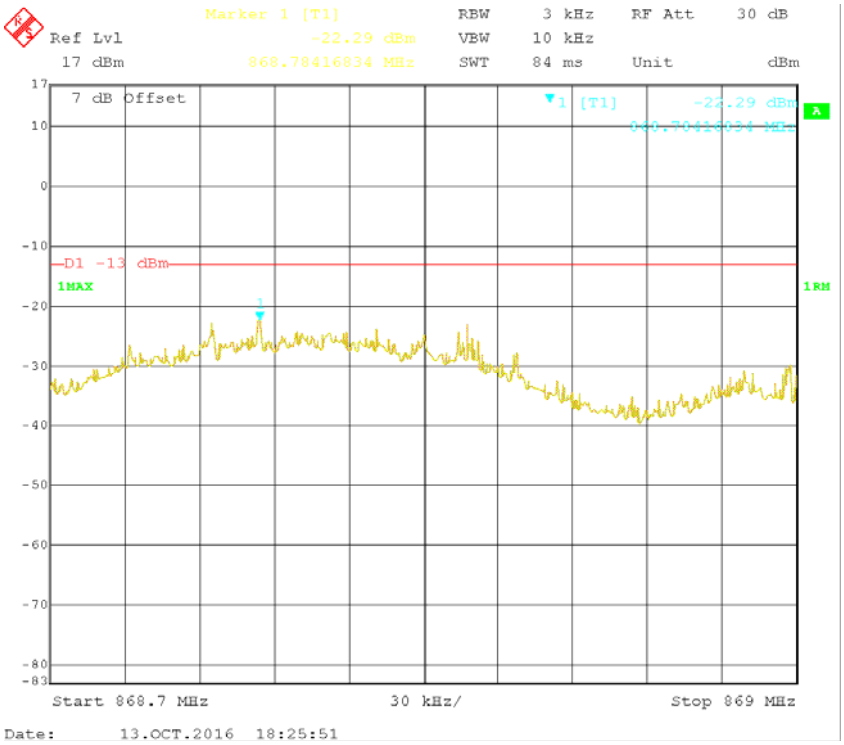
**Cellular Band AWGN Left Side Pre-AGC**



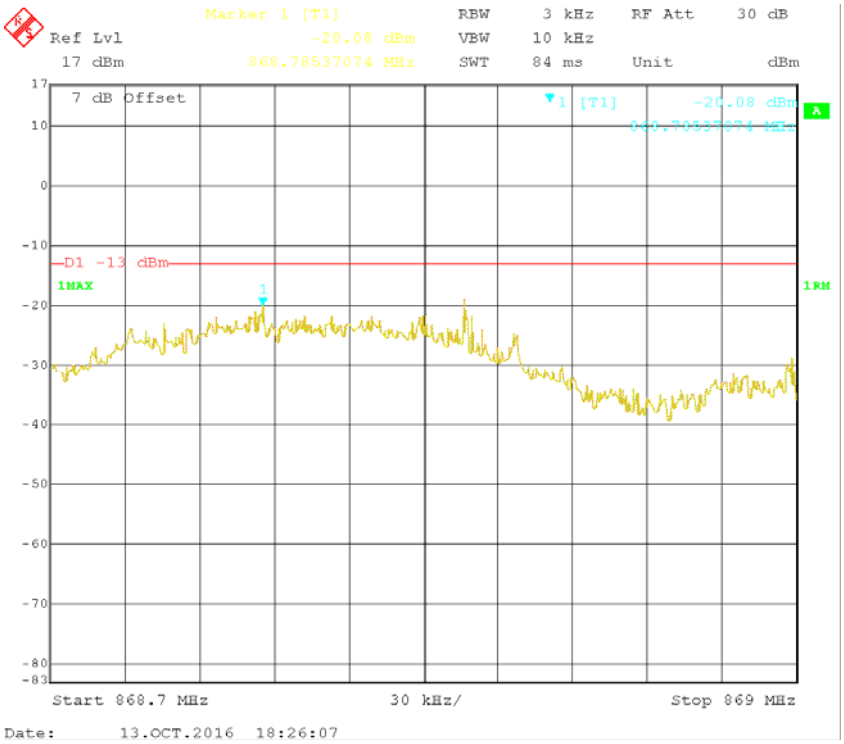

**Cellular Band AWGN Left Side 3dB Above AGG**



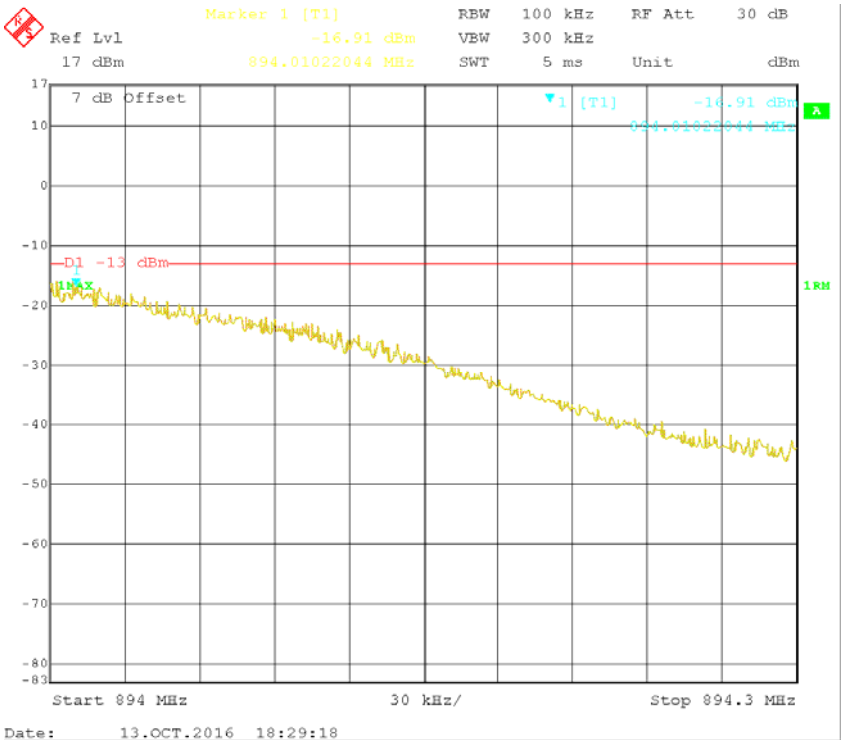
**Cellular Band GSM Left Side Pre-AGC**



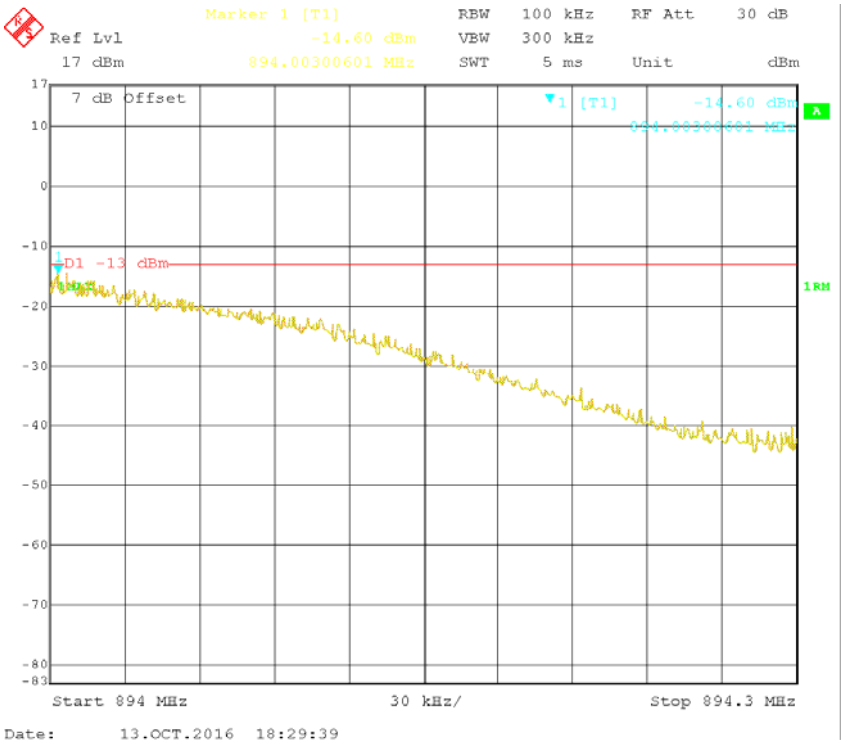

**Cellular Band GSM Left Side 3dB Above AGC**



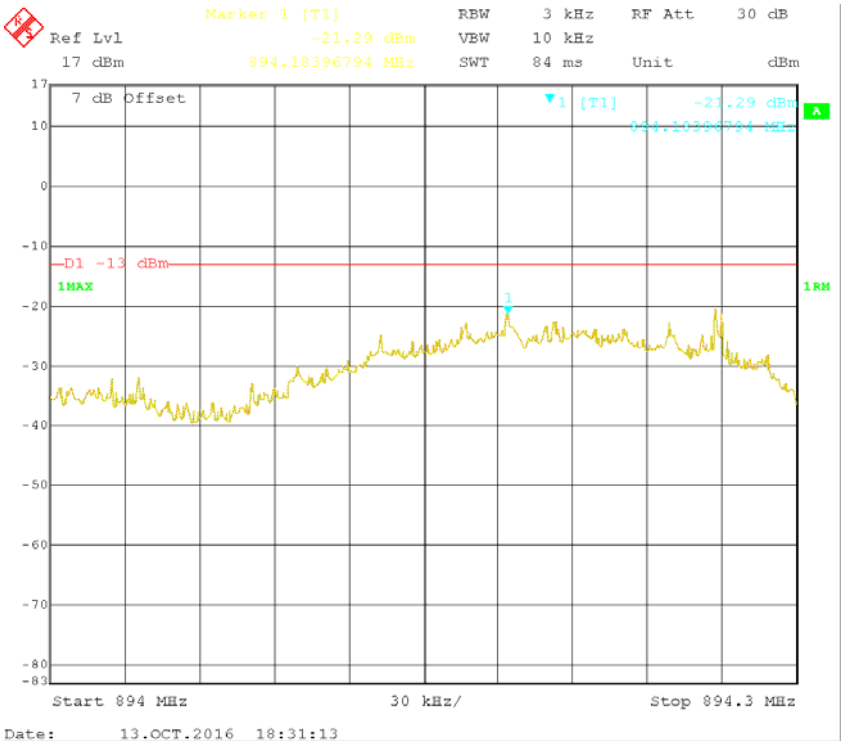
**Cellular Band AWGN Right Side Pre-AGC**



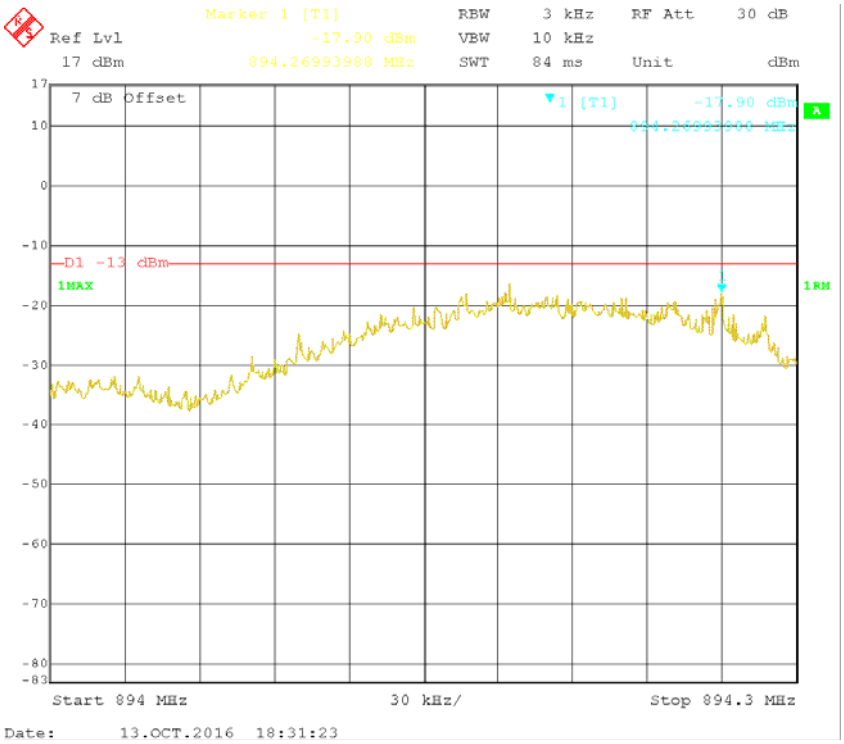

**Cellular Band AWGN Right Side 3dB Above AGG**



**Cellular Band GSM Right Side Pre-AGC**




**Cellular Band GSM Right Side 3dB Above AGC**



# §2.1051 & §22.917-SPURIOUS EMISSIONS AT ANTENNA TERMINALS

## Applicable Standards

According to§2.1051 *Measurements required: Spurious emissions at antenna terminals.*

According to §22.917(a) *Out of band emissions.* The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

## Test Procedure

a) Connect a signal generator to the input of the EUT.
b) Set the signal generator to produce the broadband test signal as previously described (e.g., 4.1 MHz OBW AWGN).
c) Set the center frequency of the test signal to the lowest available channel within the frequency band or block.
d) Set the EUT input power to a level that is just below the AGC threshold (see 3.2), but not more than 0.5 dB below.
e) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation as necessary.
f) Set the RBW = reference bandwidth in the applicable rule section for the supported frequency band of operation (e.g., reference bandwidth is typically 100 kHz or 1 MHz).
g) Set the VBW ≥ 3 × RBW.
h) Set the Sweep time = auto-couple.
i) Set the analyzer start frequency to the lowest radio frequency signal generated in the equipment, without going below 9 kHz, and the stop frequency to the lower band/block edge frequency minus 100 kHz or 1 MHz, as specified in the applicable rule part.
NOTE—The number of measurement points in each sweep must be ≥ (2 × span/RBW) which may require that the measurement range defined by the start and stop frequencies be subdivided, depending on the available number of measurement points provided by the spectrum analyzer.
j) Select the power averaging (rms) detector function.
k) Trace average at least 10 traces in power averaging (i.e., rms) mode.
l) Use the peak marker function to identify the highest amplitude level over each measured frequency range. Record the frequency and amplitude and capture a plot for inclusion in the test report.
m) Reset the analyzer start frequency to the upper band/block edge frequency plus 100 kHz or 1 MHz, as specified in the applicable rule part, and the analyzer stop frequency to 10 times the highest frequency of the fundamental emission (see §2.1057). Note that the number of measurement points in each sweep must be ≥ (2 × span/RBW) which may require that the measurement range defined by the start and stop frequencies be subdivided, depending on the available number of measurement points provided by the spectrum analyzer.
n) Trace average at least 10 traces in power averaging (i.e., rms) mode.

o) Use the peak marker function to identify the highest amplitude level over each of the measured frequency ranges. Record the frequency and amplitude and capture a plot for inclusion in the test report and provide tabular data, if required.

p) Repeat the procedure with the input test signals tuned to a middle band/block frequency/channel and then a high band/block frequency/channel.

q) Repeat entire procedure with the narrowband test signal.
r) Repeat for all authorized frequency bands/blocks used by the EUT.

## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| Rohde & Schwarz | Signal Analyzer | FSIQ26 | 831929/005 | 2016-09-21 | 2017-09-20 |
| R & S | Wideband Radio Communication Tester | CMW500 | 149216 | 2016-10-07 | 2017-10-06 |
| Agilent | MXG Vector Signal Generator | N5182B | MY513501224 | 2016-05-10 | 2017-05-09 |

*** Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

## Test Data

### Environmental Conditions

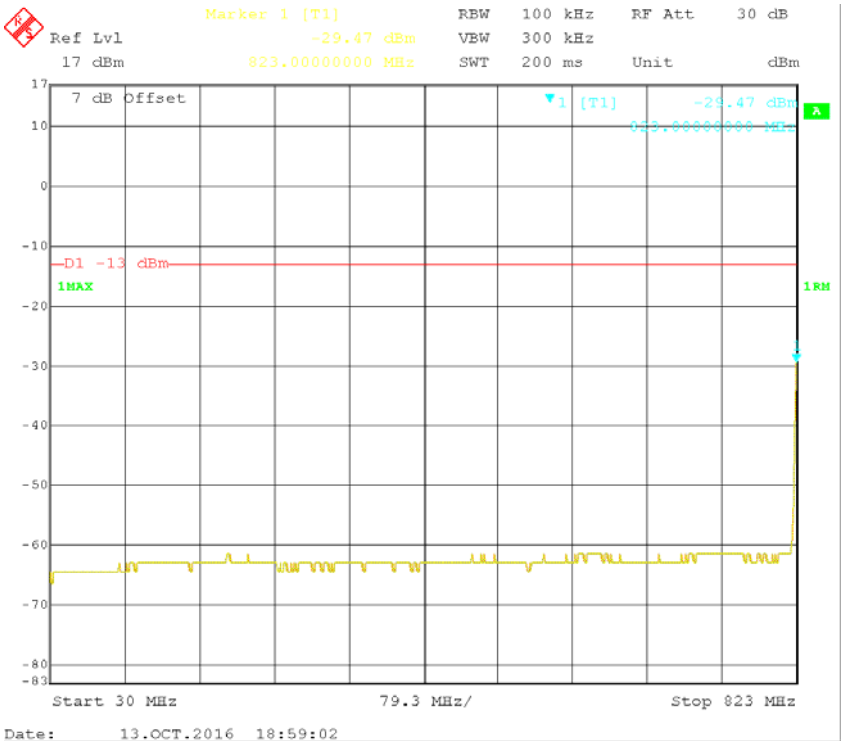
| | |
|---|---|
| **Temperature:** | 26.4 ℃ |
| **Relative Humidity:** | 33 % |
| **ATM Pressure:** | 100.8 kPa |

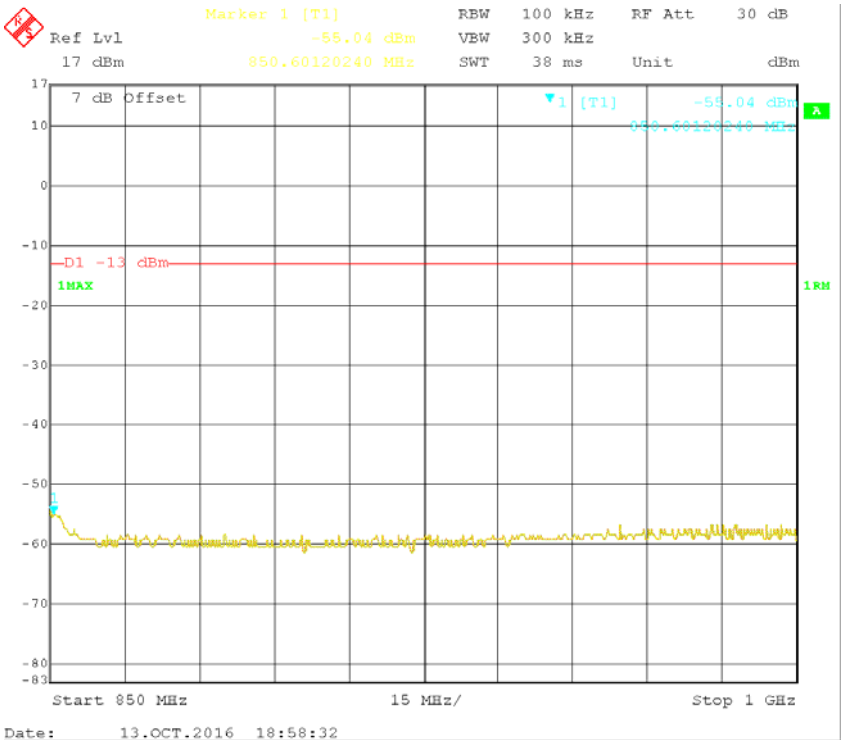
*The testing was performed by Lorin Bian on 2016-10-13.*

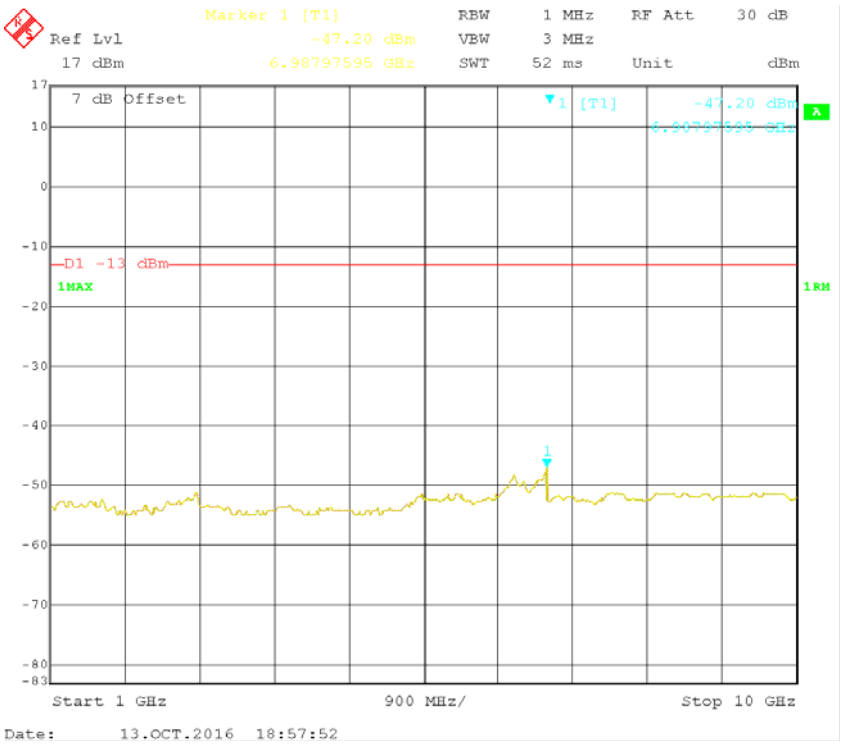
Please refer to the following plots.

**Uplink:**

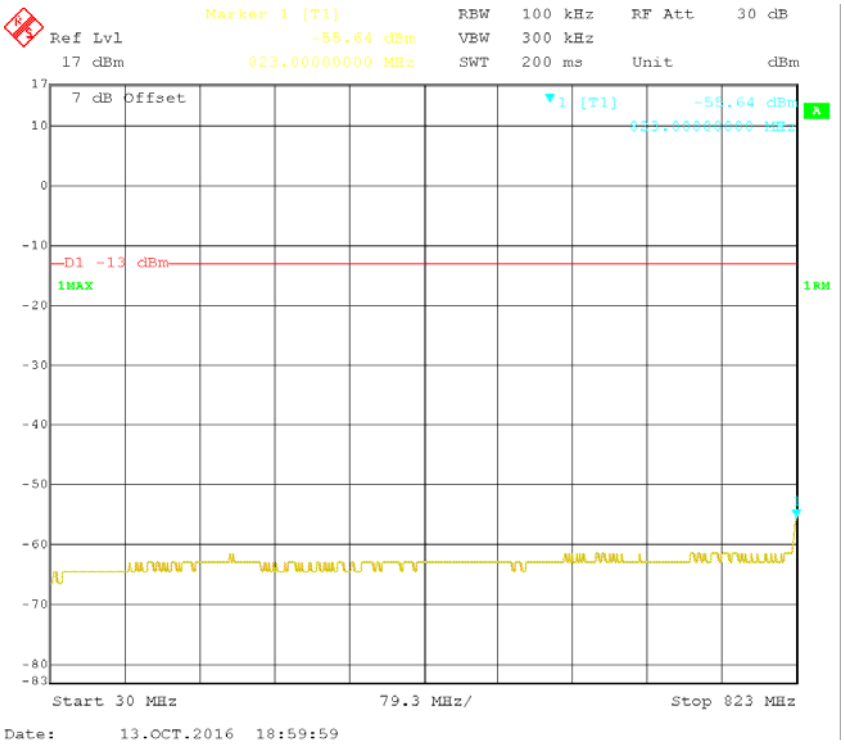
**Cellular Band Lower Channel AWGN**

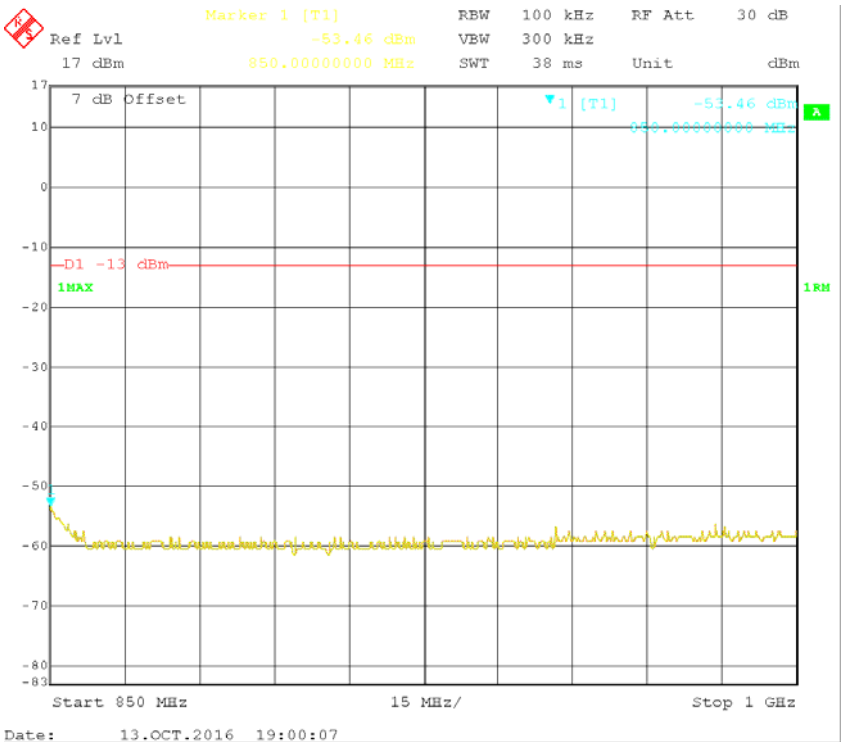


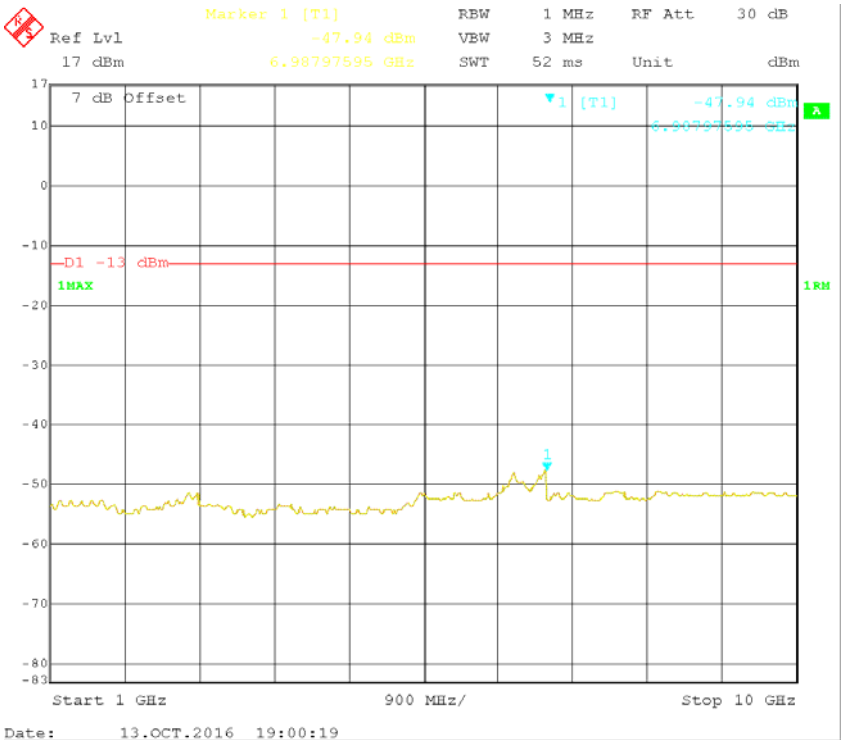





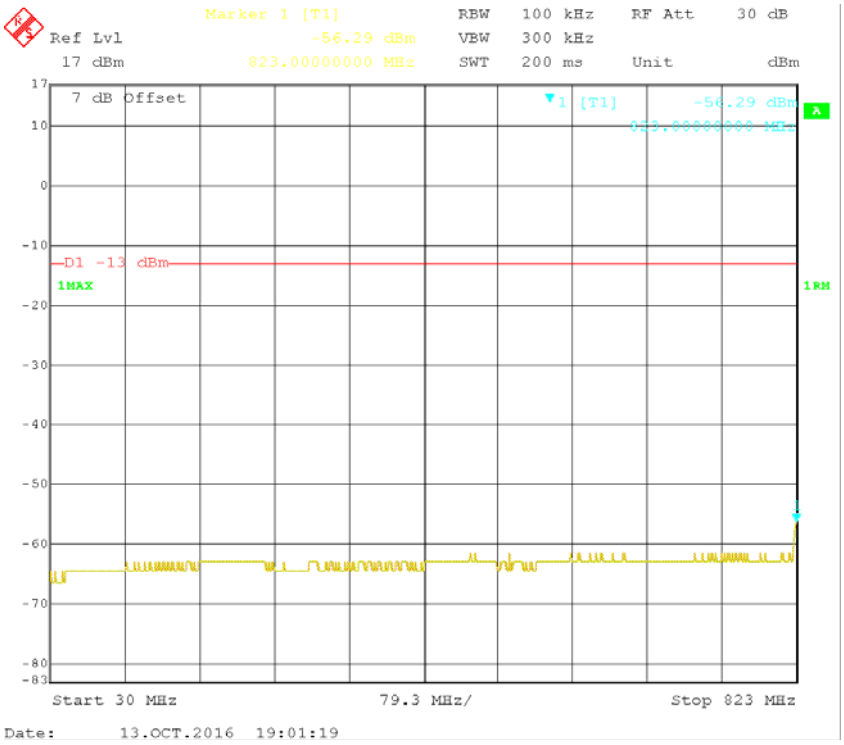

**Cellular Band Middle Channel AWGN**

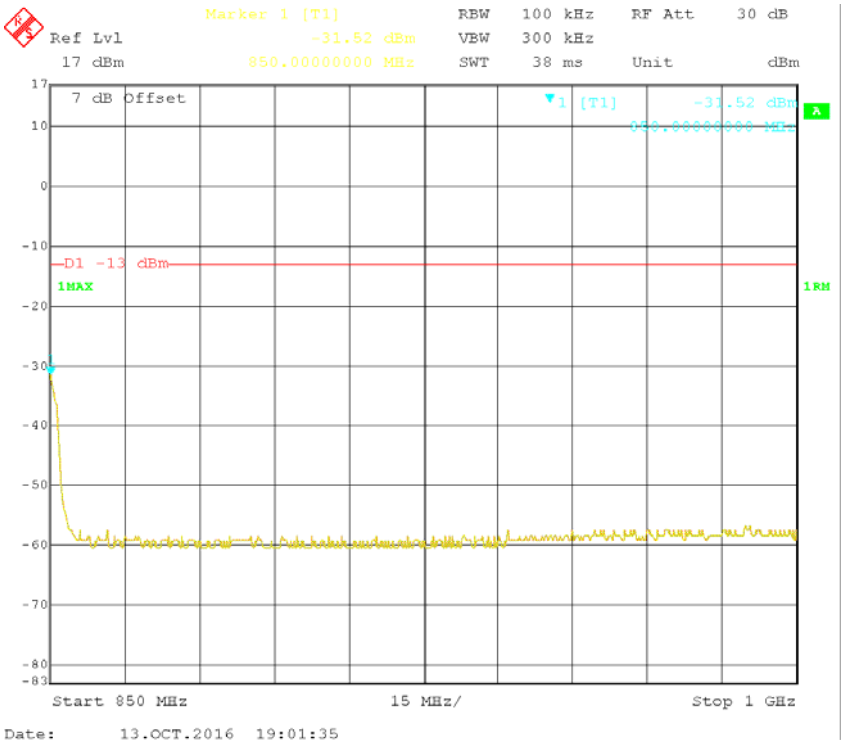


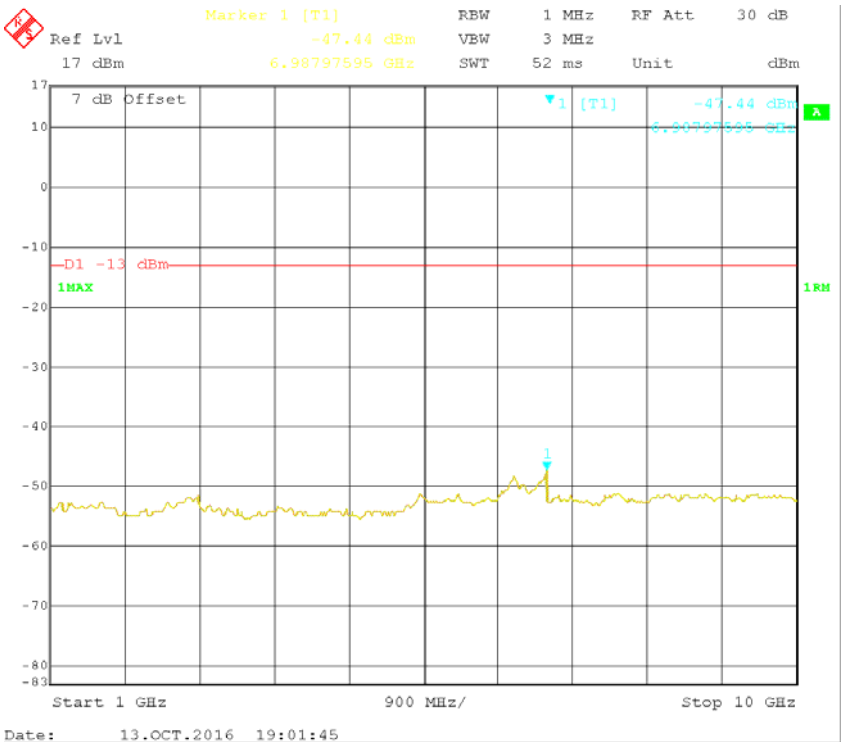

Marker 1 [T1]
Ref Lvl
17 dBm
-53.46 dBm
850.00000000 MHz
RBW 100 kHz
VBW 300 kHz
SWT 38 ms
RF Att 30 dB
Unit dBm
7 dB Offset
1 [T1]
-53.46 dBm
D1 -13 dBm
1MAX
1RM
Start 850 MHz
15 MHz/
Stop 1 GHz
Date: 13.OCT.2016 19:00:07


Marker 1 [T1]
Ref Lvl
17 dBm
-47.94 dBm
6.98797595 GHz
RBW 1 MHz
VBW 3 MHz
SWT 52 ms
RF Att 30 dB
Unit dBm
7 dB Offset
1 [T1]
-47.94 dBm
D1 -13 dBm
1MAX
1RM
Start 1 GHz
900 MHz/
Stop 10 GHz
Date: 13.OCT.2016 19:00:19

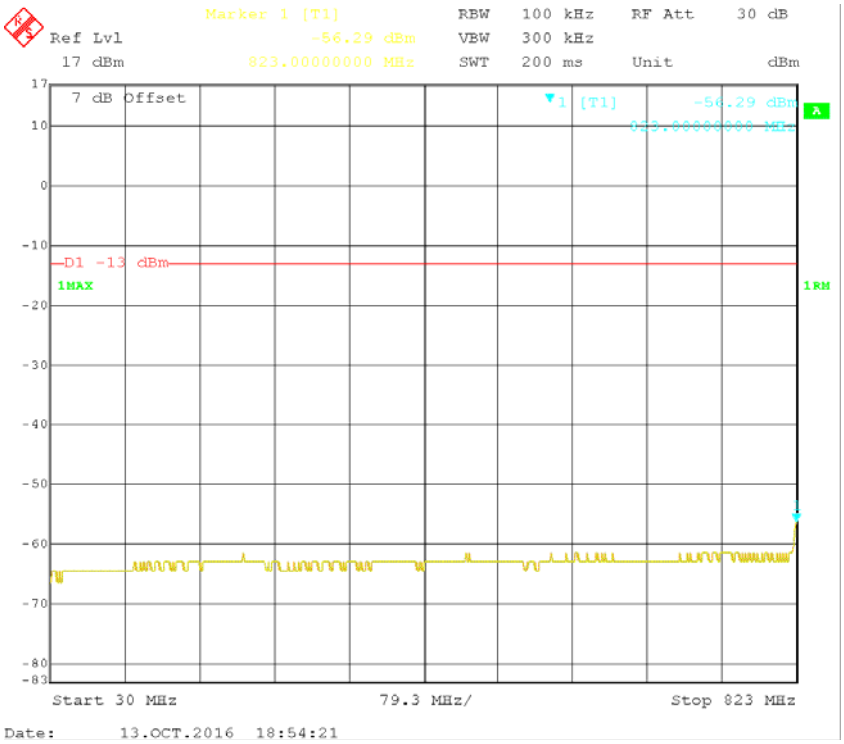
## Cellular Band High Channel AWGN

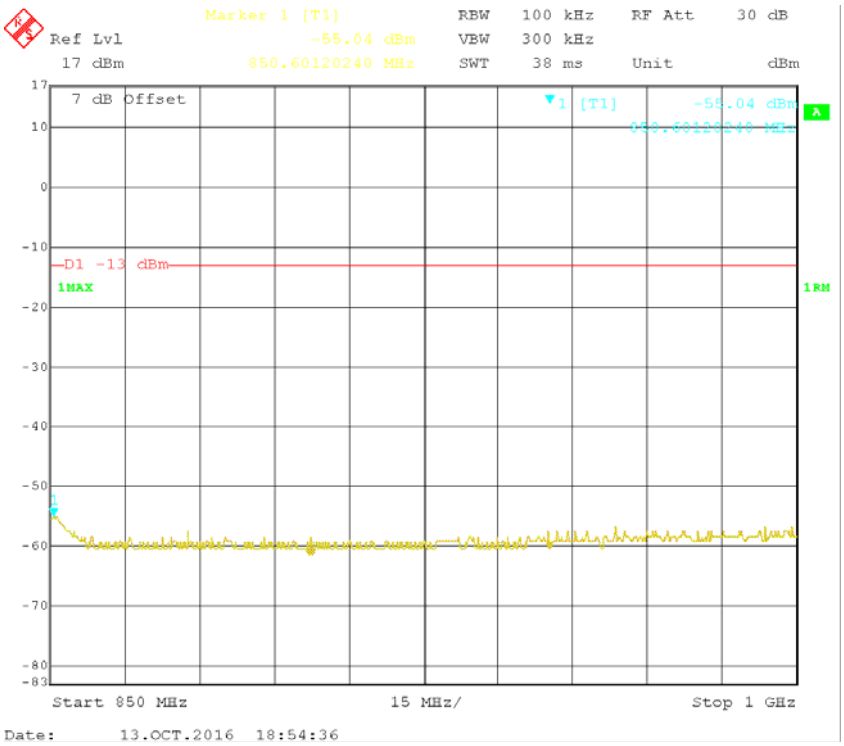


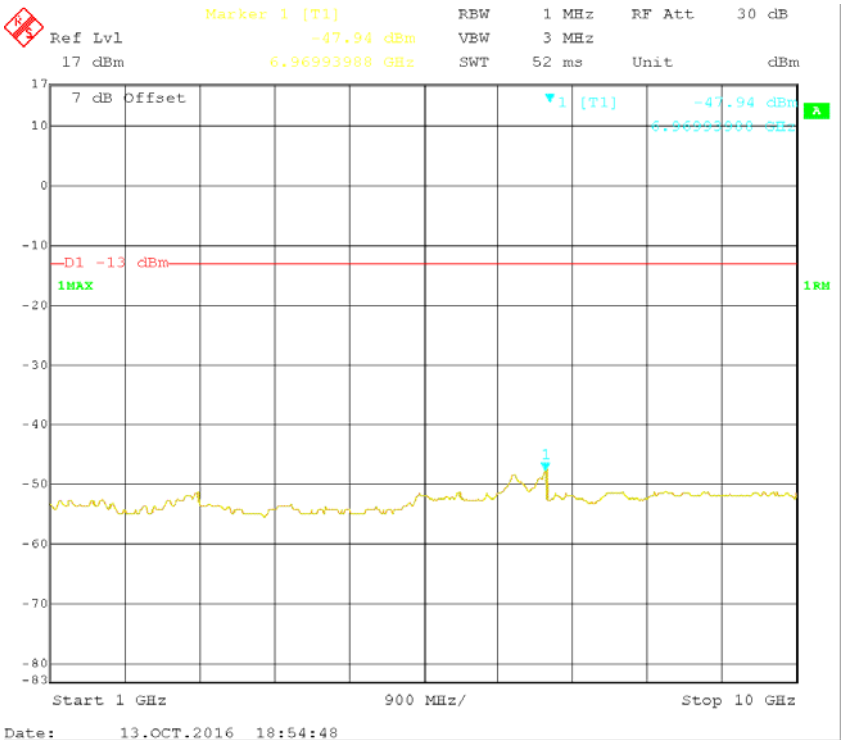





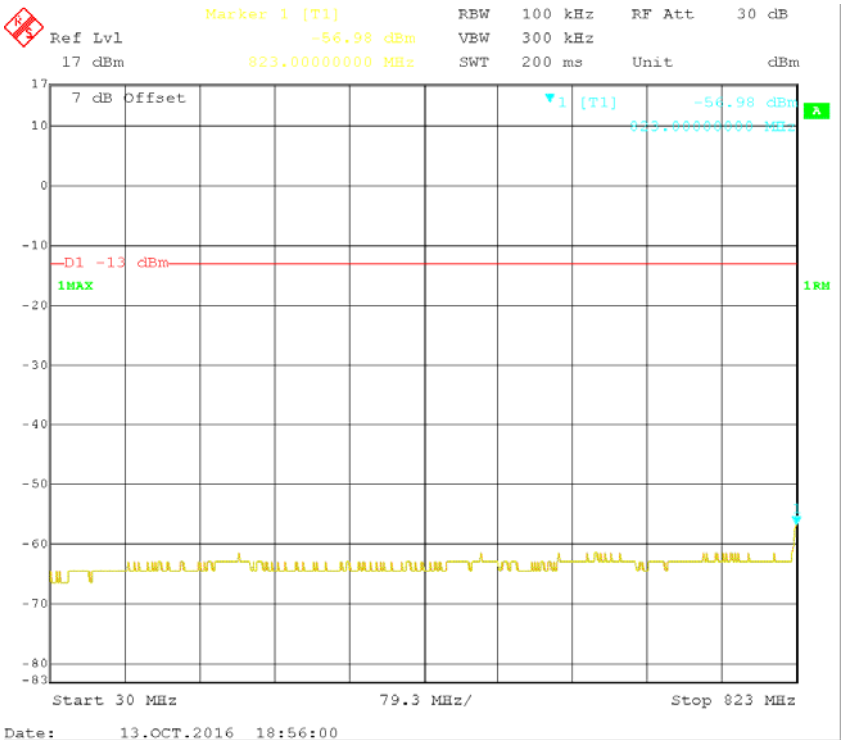

**Cellular Band Lower Channel GSM**

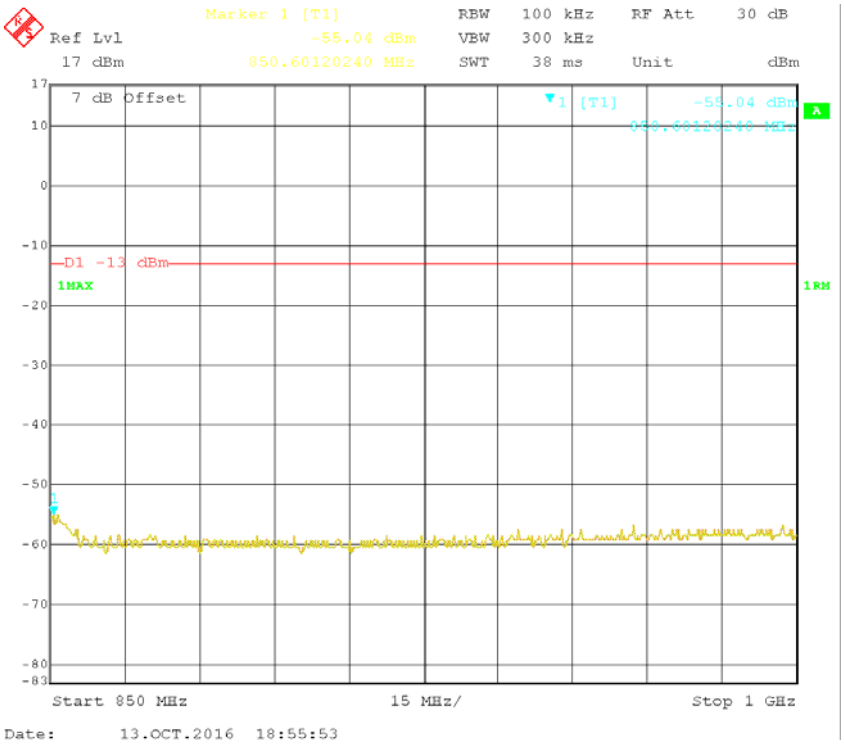


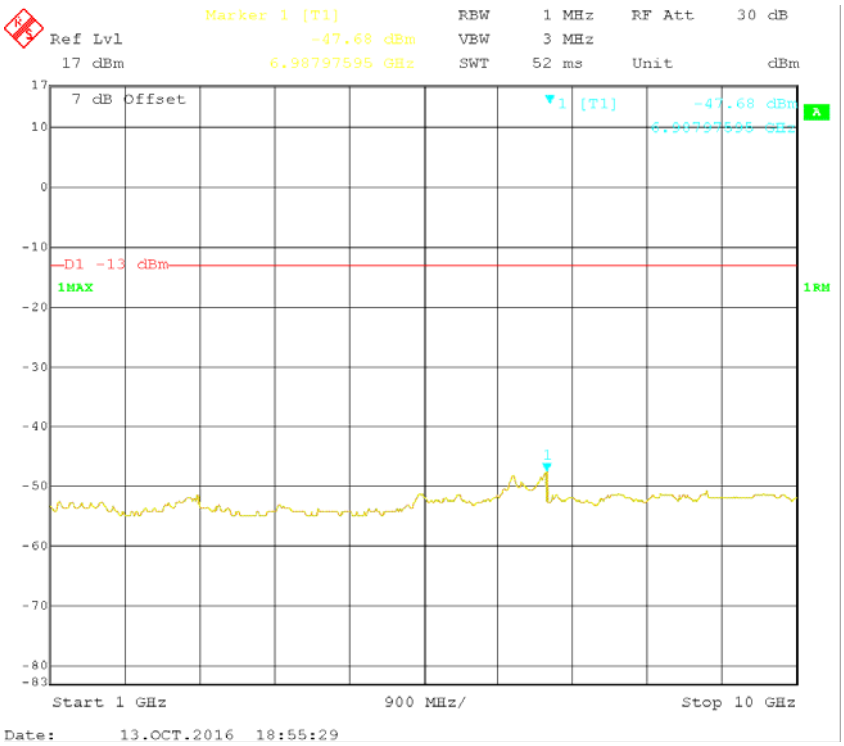

Marker 1 [T1]
RBW 100 kHz
RF Att 30 dB
Ref Lvl
-55.04 dBm
VBW 300 kHz
17 dBm
850.60120240 MHz
SWT 38 ms
Unit dBm
7 dB Offset
1 [T1]
-55.04 dBm
850.60120240 MHz
D1 -13 dBm
1MAX
1RM
Start 850 MHz
15 MHz/
Stop 1 GHz
Date: 13.OCT.2016 18:54:36


Marker 1 [T1]
RBW 1 MHz
RF Att 30 dB
Ref Lvl
-47.94 dBm
VBW 3 MHz
17 dBm
6.96993988 GHz
SWT 52 ms
Unit dBm
7 dB Offset
1 [T1]
-47.94 dBm
6.96993988 GHz
D1 -13 dBm
1MAX
1RM
Start 1 GHz
900 MHz/
Stop 10 GHz
Date: 13.OCT.2016 18:54:48

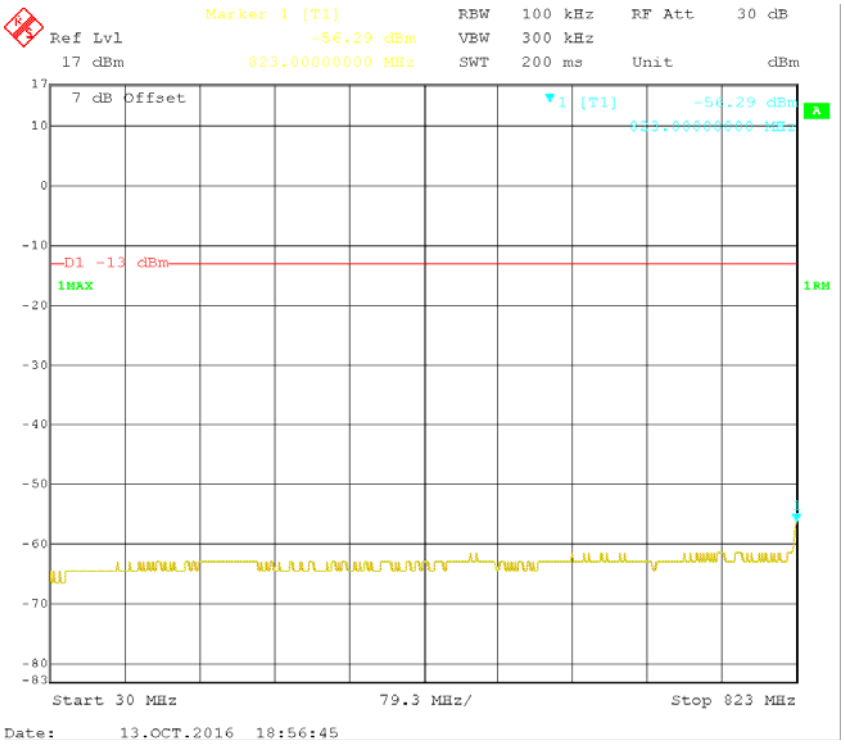
## Cellular Band Middle Channel GSM

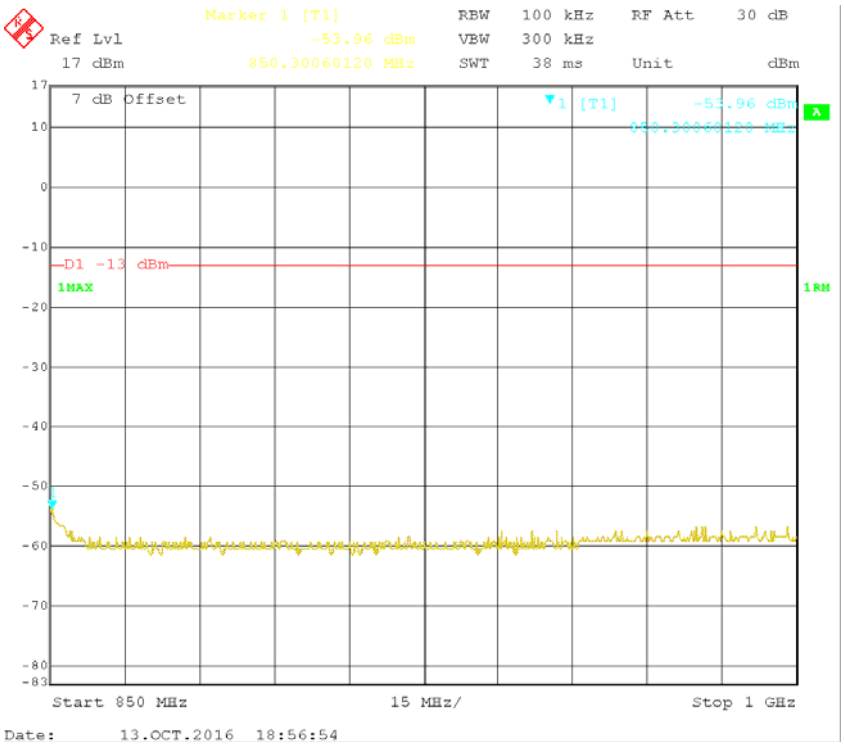


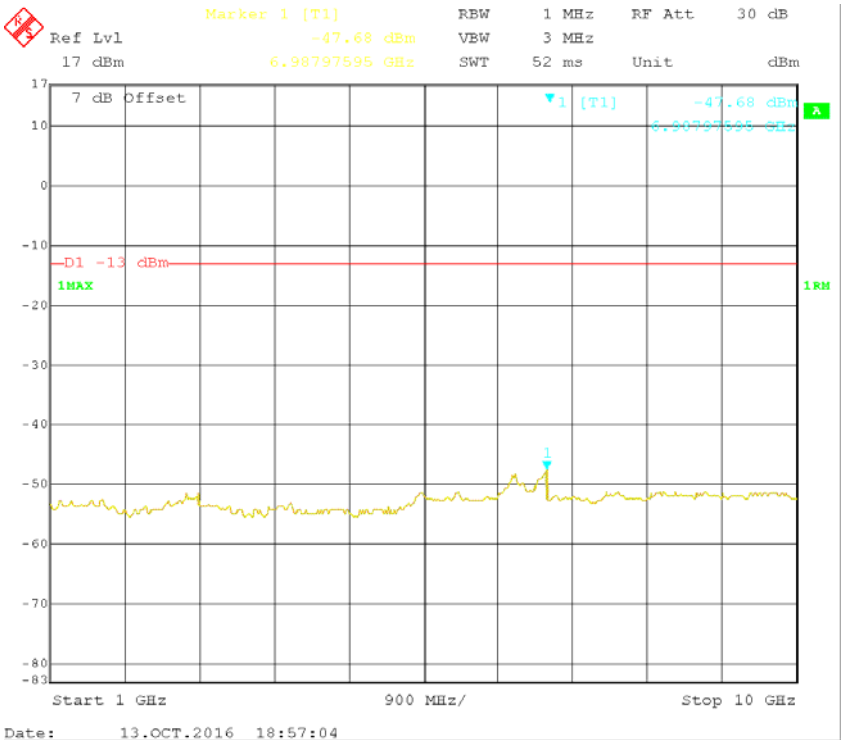






**Cellular Band High Channel GSM**

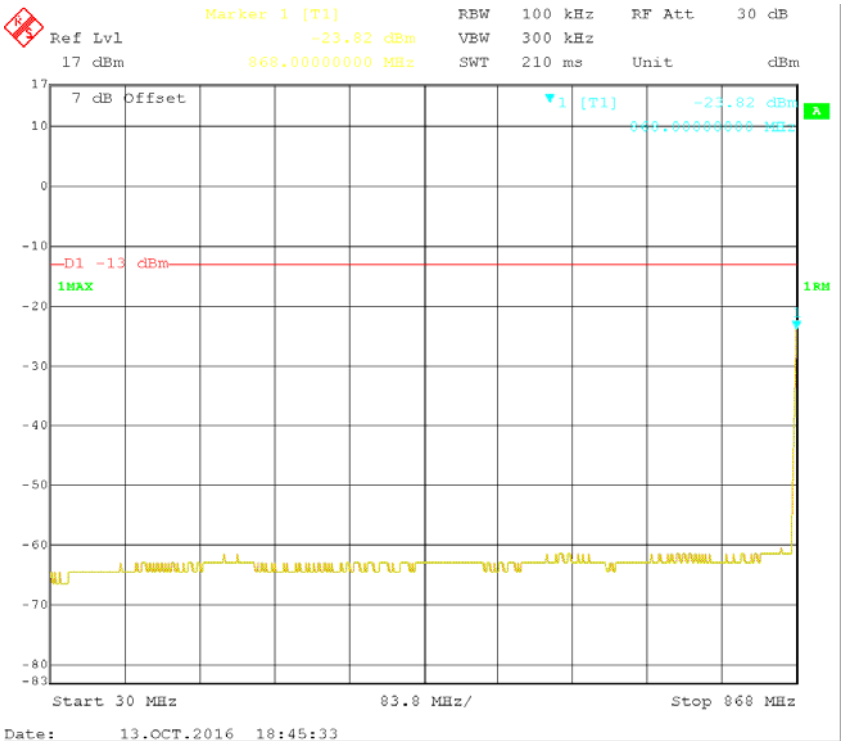


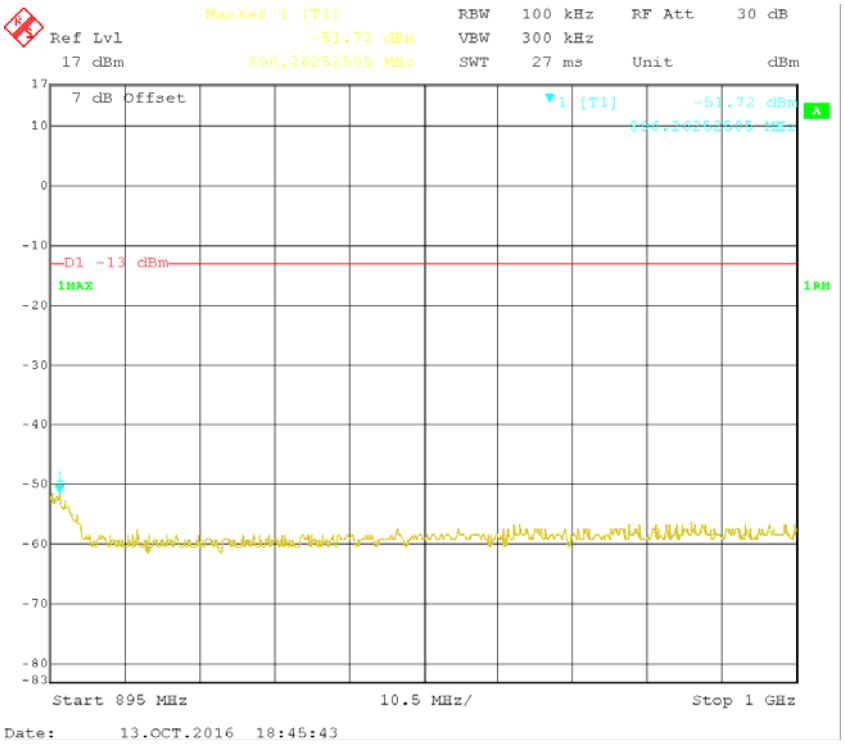

Marker 1 [T1]
Ref Lvl
17 dBm
-53.96 dBm
850.30060120 MHz
RBW 100 kHz
VBW 300 kHz
SWT 38 ms
RF Att 30 dB
Unit dBm
7 dB Offset
1 [T1] -53.96 dBm
D1 -13 dBm
1MAX
1RM
Start 850 MHz
15 MHz/
Stop 1 GHz
Date: 13.OCT.2016 18:56:54

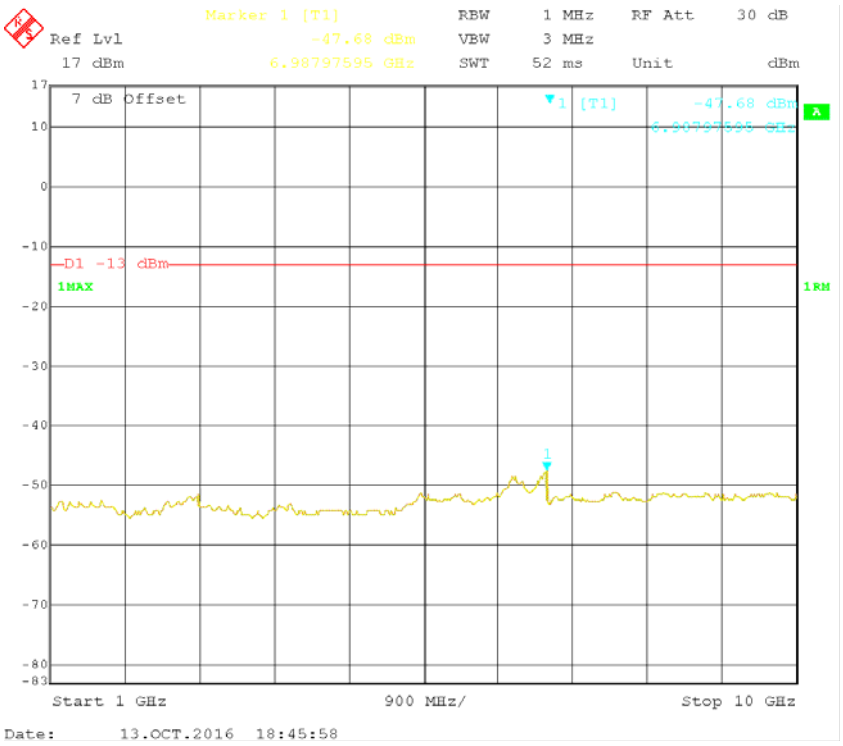

Marker 1 [T1]
Ref Lvl
17 dBm
-47.68 dBm
6.98797595 GHz
RBW 1 MHz
VBW 3 MHz
SWT 52 ms
RF Att 30 dB
Unit dBm
7 dB Offset
1 [T1] -47.68 dBm
D1 -13 dBm
1MAX
1RM
Start 1 GHz
900 MHz/
Stop 10 GHz
Date: 13.OCT.2016 18:57:04

**Downlink**

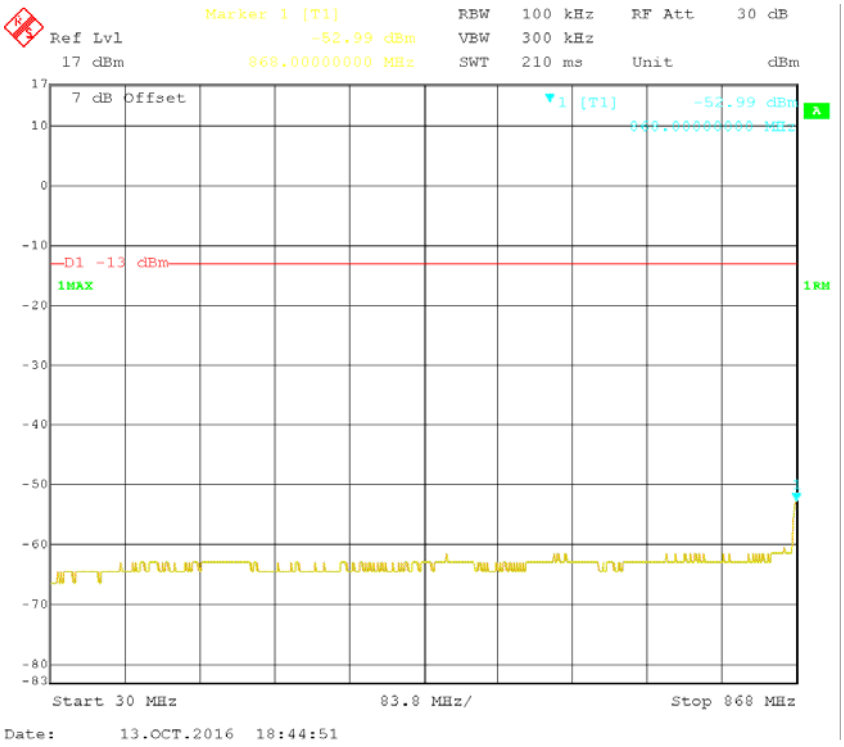
**Cellular Band Lower Channel AWGN**

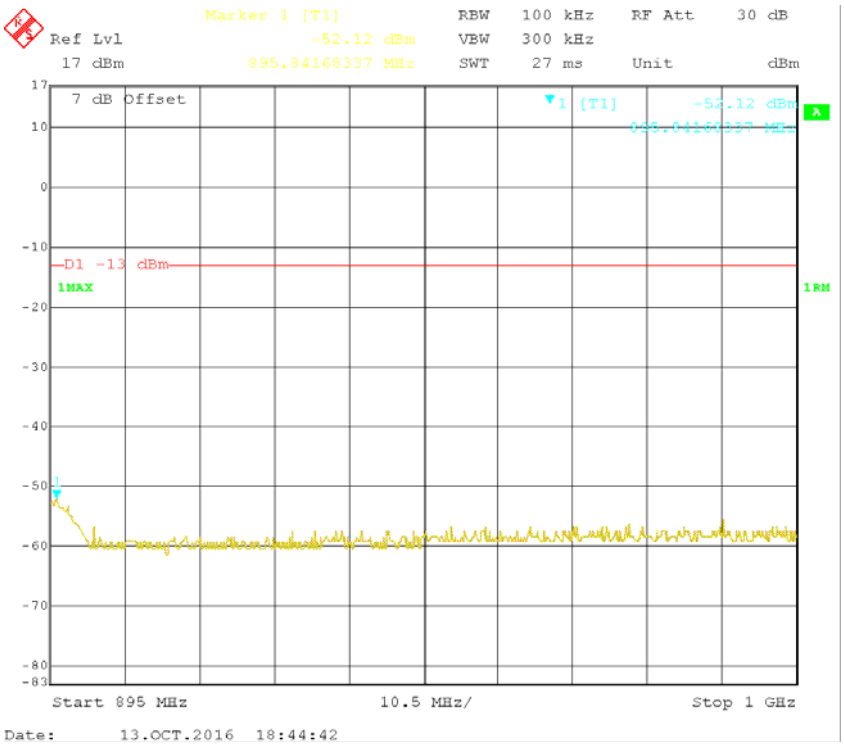


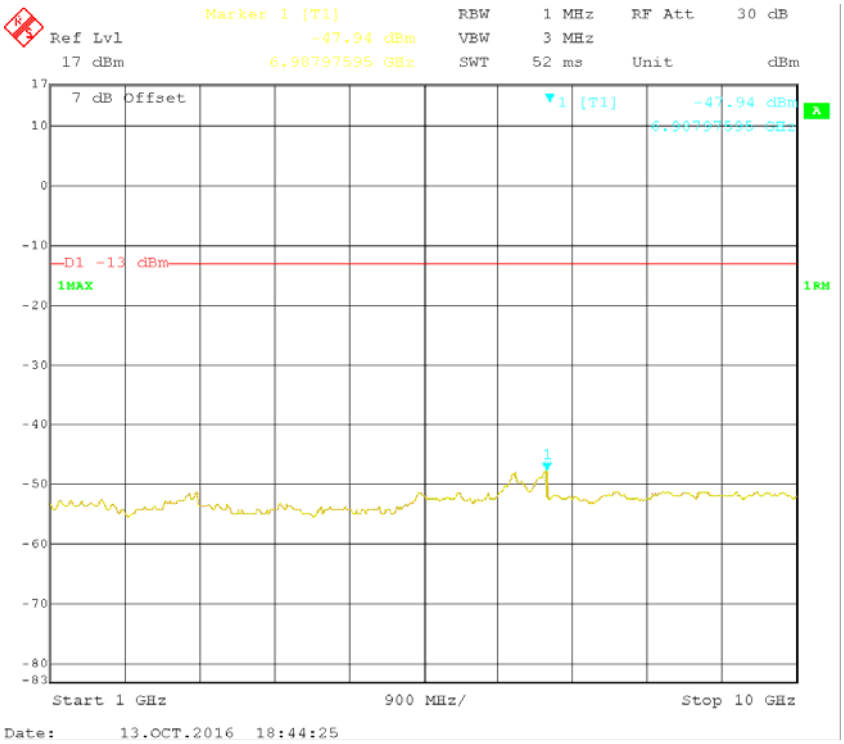





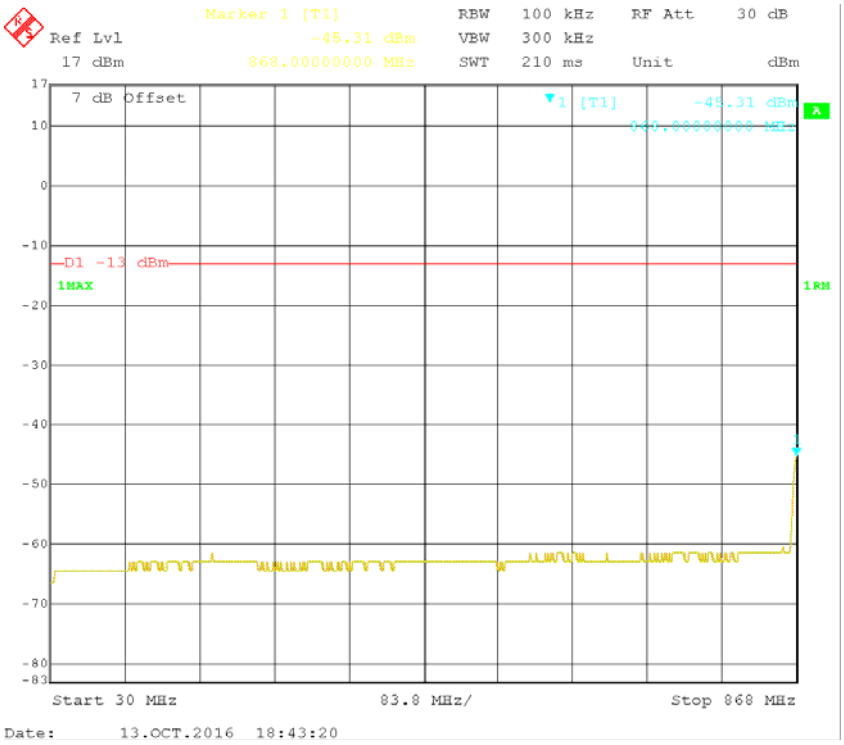

**Cellular Band Middle Channel AWGN**

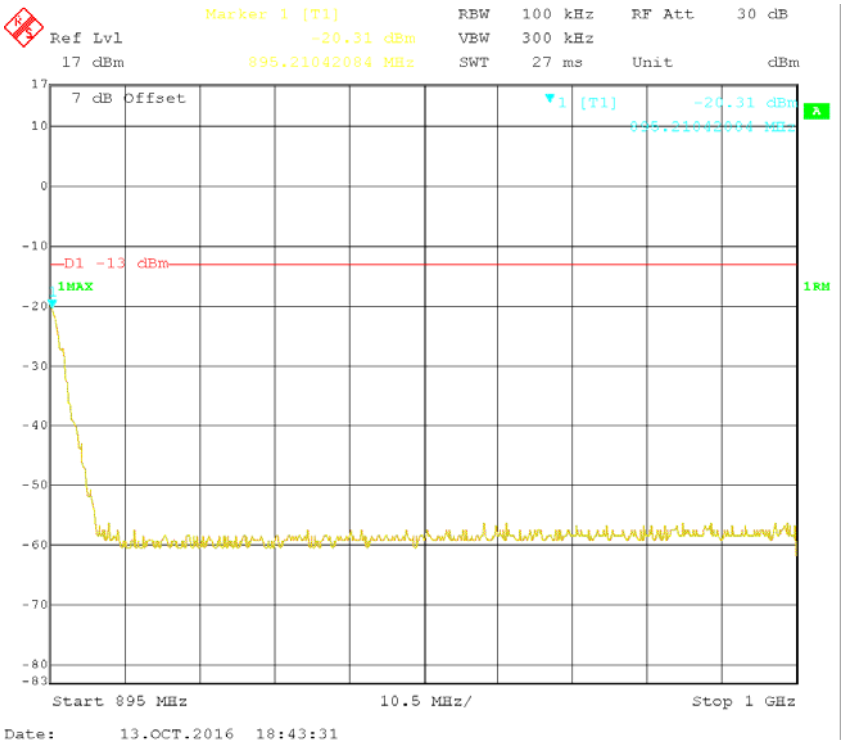


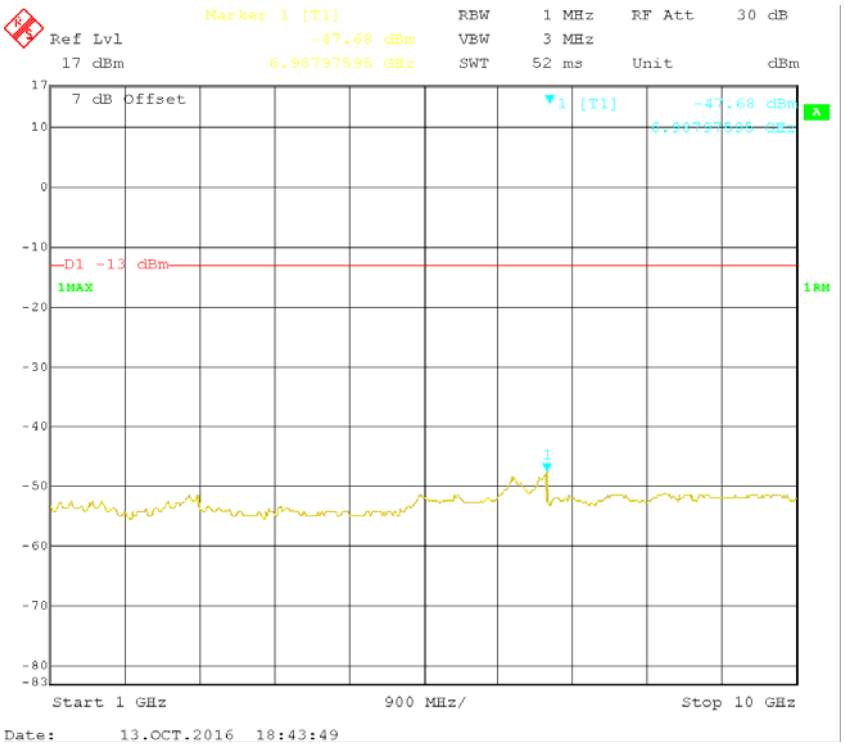

Marker 1 [T1]
Ref Lvl
17 dBm
-52.12 dBm
895.84168337 MHz
RBW 100 kHz
VBW 300 kHz
SWT 27 ms
RF Att 30 dB
Unit dBm
7 dB Offset
1 [T1] -52.12 dBm
D1 -13 dBm
1MAX
1RM
Start 895 MHz
10.5 MHz/
Stop 1 GHz
Date: 13.OCT.2016 18:44:42


Marker 1 [T1]
Ref Lvl
17 dBm
-47.94 dBm
6.98797595 GHz
RBW 1 MHz
VBW 3 MHz
SWT 52 ms
RF Att 30 dB
Unit dBm
7 dB Offset
1 [T1] -47.94 dBm
D1 -13 dBm
1MAX
1RM
Start 1 GHz
900 MHz/
Stop 10 GHz
Date: 13.OCT.2016 18:44:25

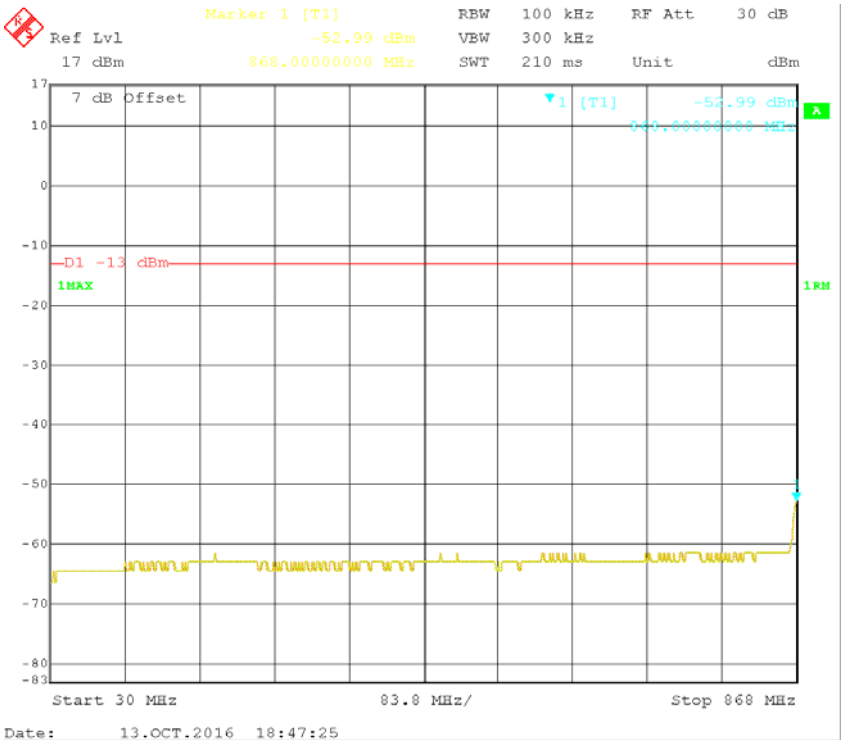
## Cellular Band High Channel AWGN

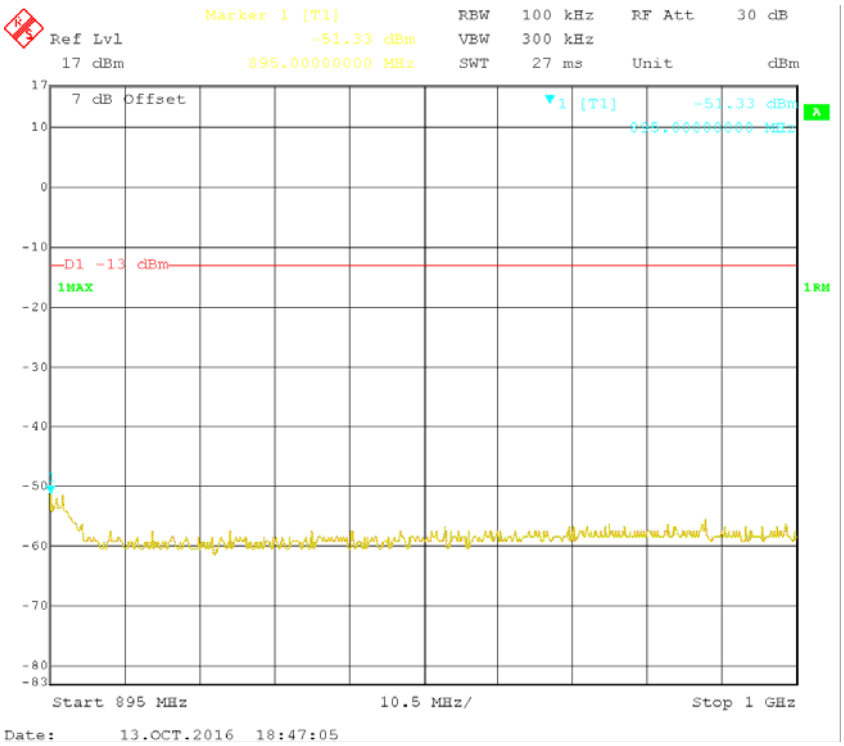


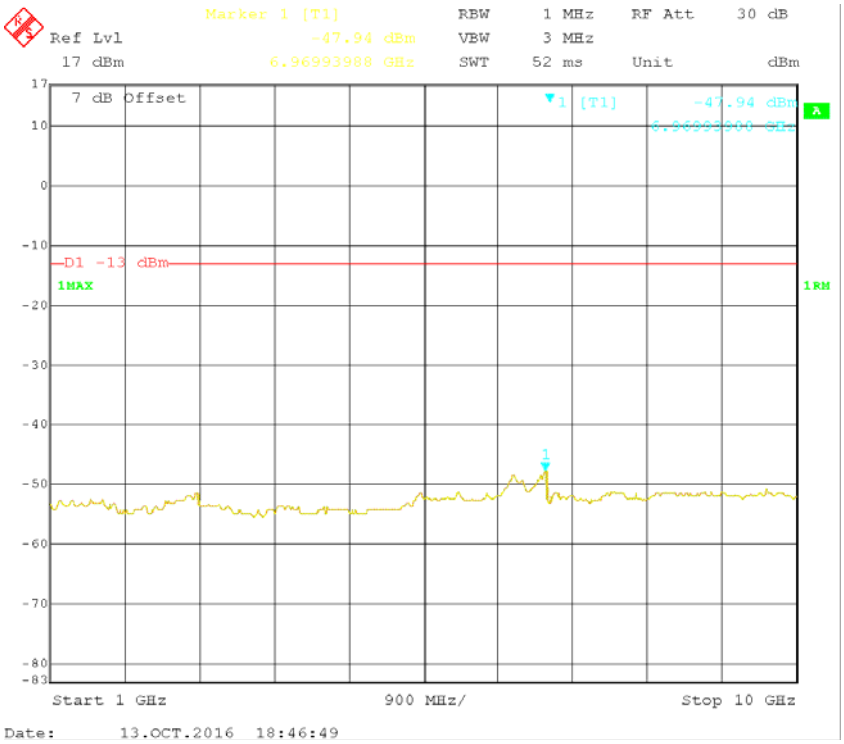





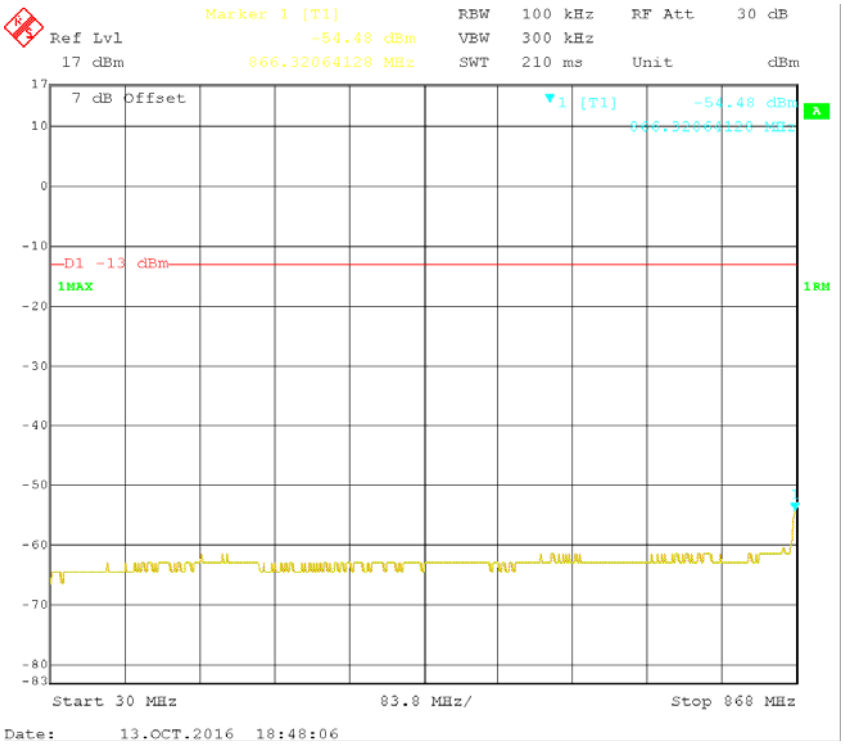

**Cellular Band Low Channel GSM**

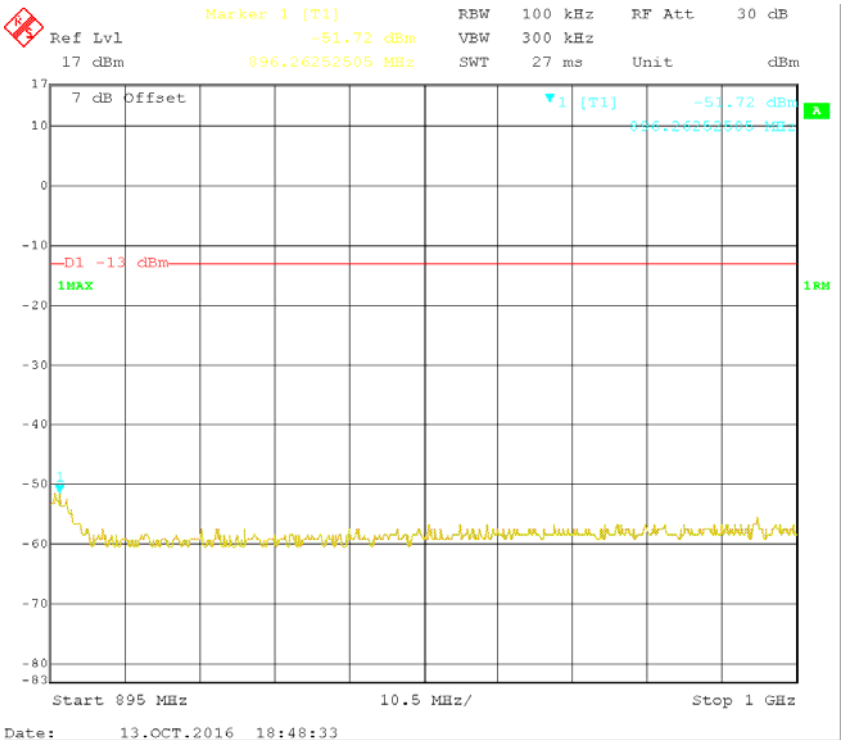


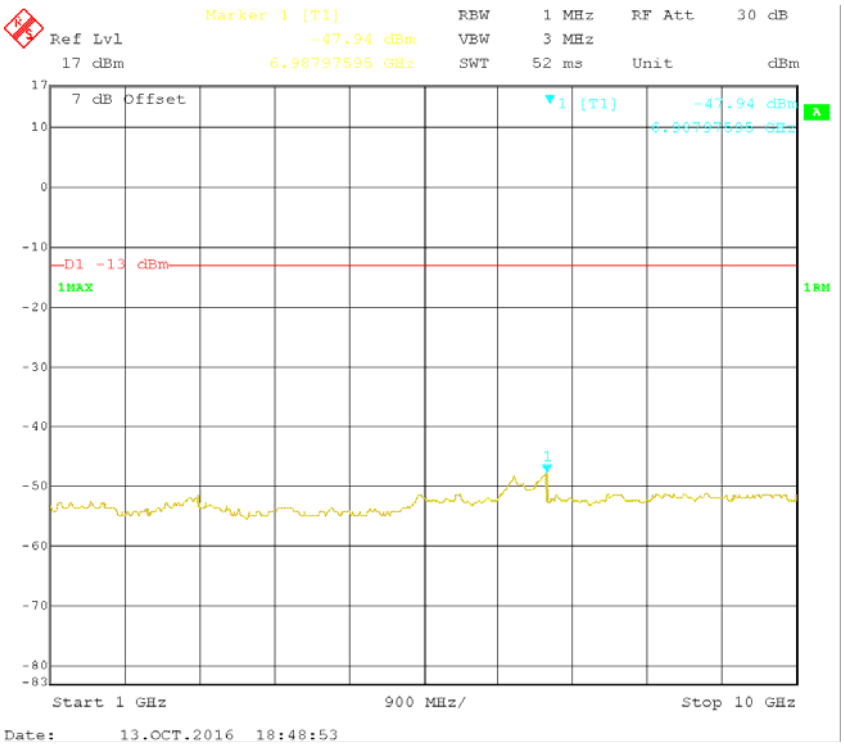

Marker 1 [T1]
Ref Lvl
17 dBm
-51.33 dBm
895.00000000 MHz
RBW 100 kHz
VBW 300 kHz
SWT 27 ms
RF Att 30 dB
Unit dBm
7 dB Offset
1 [T1]
-51.33 dBm
D1 -13 dBm
1MAX
1RM
Start 895 MHz
10.5 MHz/
Stop 1 GHz
Date: 13.OCT.2016 18:47:05


Marker 1 [T1]
Ref Lvl
17 dBm
-47.94 dBm
6.96993988 GHz
RBW 1 MHz
VBW 3 MHz
SWT 52 ms
RF Att 30 dB
Unit dBm
7 dB Offset
1 [T1]
-47.94 dBm
D1 -13 dBm
1MAX
1RM
Start 1 GHz
900 MHz/
Stop 10 GHz
Date: 13.OCT.2016 18:46:49

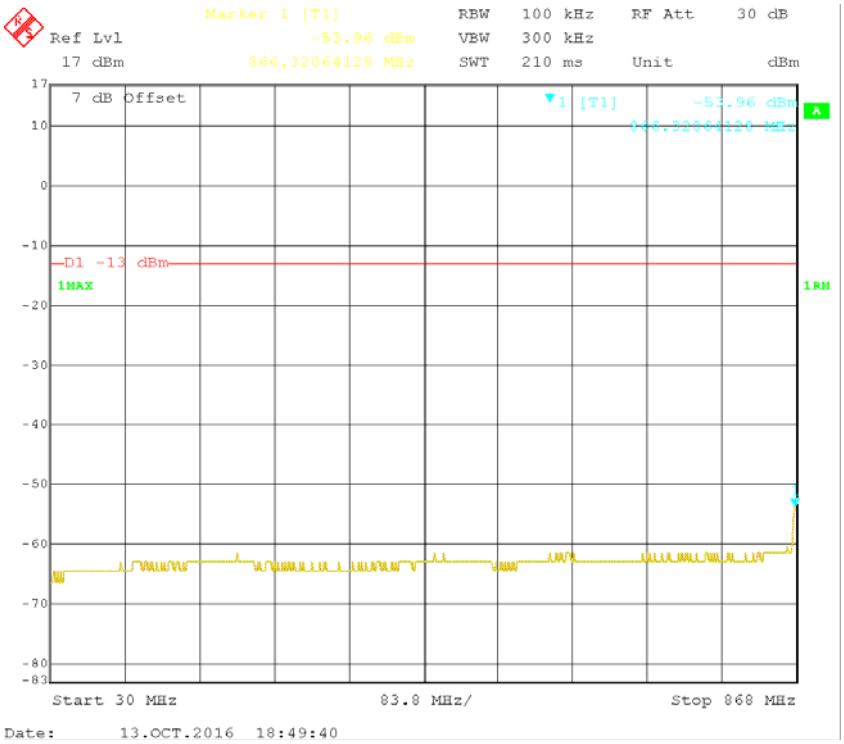
## Cellular Band Middle Channel GSM

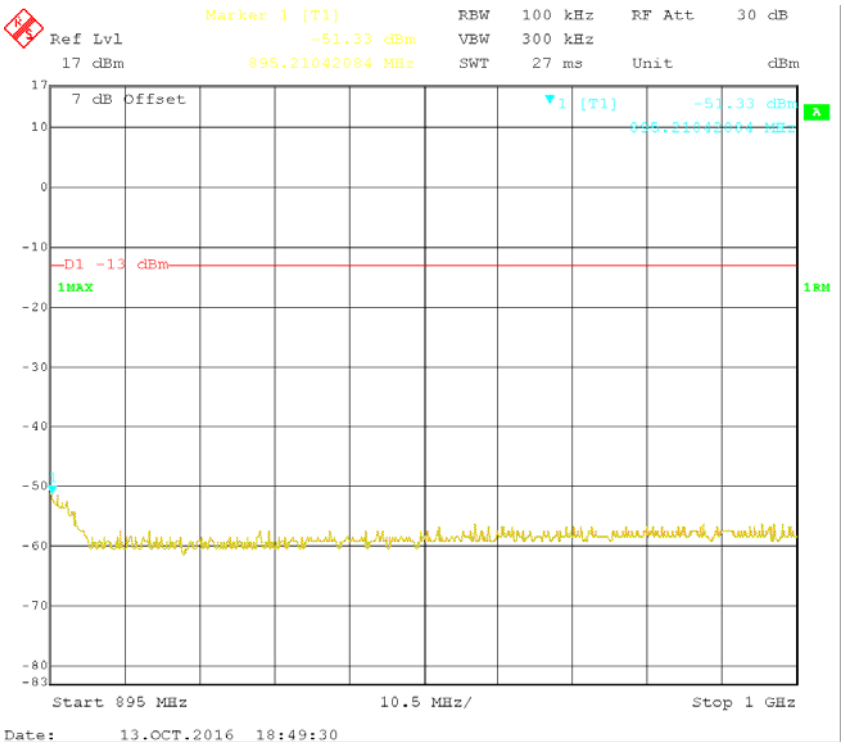


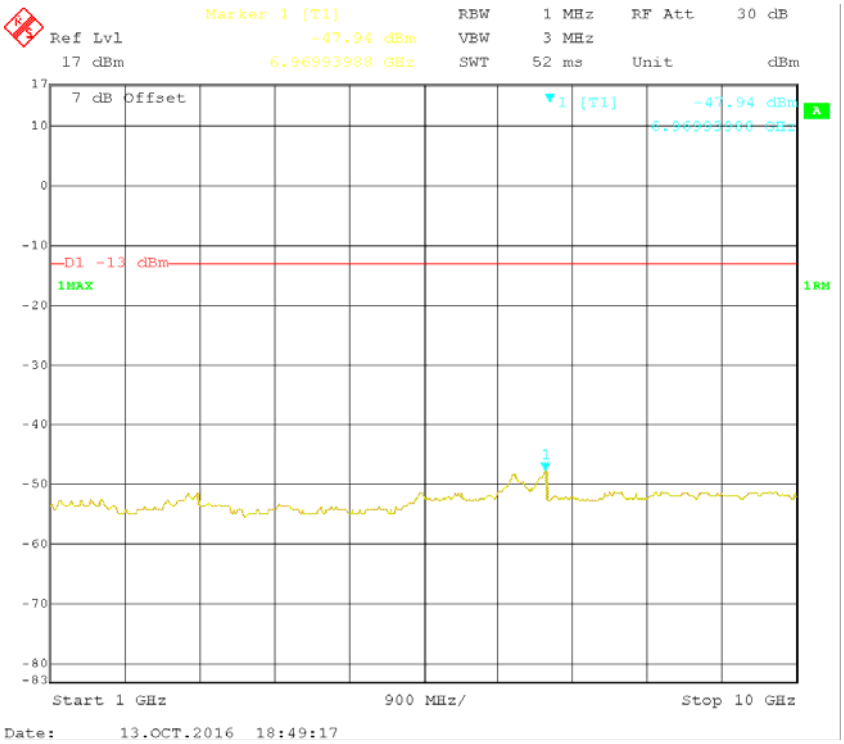






**Cellular Band High Channel GSM**




Marker 1 [T1]
Ref Lvl
17 dBm
-51.33 dBm
895.21042084 MHz
RBW 100 kHz
VBW 300 kHz
SWT 27 ms
RF Att 30 dB
Unit dBm
7 dB Offset
1 [T1] -51.33 dBm
D1 -13 dBm
1MAX
1RM
Start 895 MHz
10.5 MHz/
Stop 1 GHz
Date: 13.OCT.2016 18:49:30


Marker 1 [T1]
Ref Lvl
17 dBm
-47.94 dBm
6.96993988 GHz
RBW 1 MHz
VBW 3 MHz
SWT 52 ms
RF Att 30 dB
Unit dBm
7 dB Offset
1 [T1] -47.94 dBm
D1 -13 dBm
1MAX
1RM
Start 1 GHz
900 MHz/
Stop 10 GHz
Date: 13.OCT.2016 18:49:17

# §2.1053 & §22.917-RADIATED SPURIOUS EMISSIONS

## Applicable Standards

According to§2.1053 Measurements required: Field strength of spurious radiation.

According to §22.917(a) *Out of band emissions.* The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

## Test Procedure

The transmitter was placed on a turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

## Test Equipment List and Details

| Manufacturer | Description | Model Number | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| Agilent | Amplifier | 8447D | 2944A10442 | 2015-12-02 | 2016-12-01 |
| Rohde & Schwarz | EMI Test Receiver | ESCI | 100028 | 2015-12-02 | 2016-12-01 |
| Sunol Sciences | Broadband Antenna | JB3 | A101808 | 2016-04-10 | 2019-04-09 |
| Rohde & Schwarz | Spectrum Analyzer | FSEM30 | 100018 | 2015-12-02 | 2016-12-01 |
| EM TEST | Horn Antenna | 3115 | 003-6076 | 2015-12-02 | 2016-12-01 |
| EM TEST | Horn Antenna | 3115 | 000 527 35 | 2015-12-02 | 2016-12-01 |
| EMCO | Adjustable Dipole Antenna | 3121C | 9109-753 | N/A | N/A |
| HP | Signal Generator | 8648A | 3426A00831 | 2015-11-06 | 2016-11-05 |
| Agilent | Signal Generator | E8247C | MY43321350 | 2016-10-16 | 2017-10-15 |
| Mini-circuits | Amplifier | ZVA-213-S+ | 771001215 | 2016-05-20 | 2017-05-19 |
| EMCT | Semi-Anechoic Chamber | 966 | N/A | 2015-04-24 | 2018-04-23 |
| N/A | RF Cable (below 1GHz) | NO.1 | N/A | 2015-11-10 | 2016-11-09 |
| N/A | RF Cable (below 1GHz) | NO.4 | N/A | 2015-11-10 | 2016-11-09 |
| N/A | RF Cable (above 1GHz) | NO.2 | N/A | 2015-11-10 | 2016-11-09 |

*** Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 23.4℃ |
| **Relative Humidity:** | 40 % |
| **ATM Pressure:** | 100.5 kPa |

*The testing was performed by Lorin Bian on 2016-10-26.*

*Test mode: Transmitting*

| Frequency (MHz) | Polar (H/V) | Receiver Reading (dBμV) | Substituted Method | | | Absolute Level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| | | | S.G. Level (dBm) | Antenna Gain (dBd/dBi) | Cable Loss (dB) | | | |
| **Uplink, Test Frequency 836.500MHz** | | | | | | | | |
| 1673 | H | 44.23 | -58.9 | 7.9 | 0.8 | -51.8 | -13.0 | 38.8 |
| 1673 | V | 39.35 | -62 | 7.9 | 0.8 | -54.9 | -13.0 | 41.9 |
| 2509.5 | H | 34.25 | -65.5 | 8.9 | 1.3 | -57.9 | -13.0 | 44.9 |
| 2509.5 | V | 33.98 | -63.6 | 8.9 | 1.3 | -56.0 | -13.0 | 43.0 |
| 583 | H | 26.05 | -81.9 | 0.0 | 0.4 | -82.3 | -13.0 | 69.3 |
| 583 | V | 25.61 | -79.2 | 0.0 | 0.4 | -79.6 | -13.0 | 66.6 |
| **Downlink, Test Frequency 881.500MHz** | | | | | | | | |
| 1763 | H | 45.46 | -55.9 | 8.0 | 0.9 | -48.8 | -13.0 | 35.8 |
| 1763 | V | 42.16 | -57.9 | 8.0 | 0.9 | -50.8 | -13.0 | 37.8 |
| 2644.5 | H | 34.77 | -64.6 | 8.8 | 1.2 | -57.0 | -13.0 | 44.0 |
| 2644.5 | V | 24.49 | -73.5 | 8.8 | 1.2 | -65.9 | -13.0 | 52.9 |
| 646 | H | 23.37 | -83 | 0.0 | 0.5 | -83.5 | -13.0 | 70.5 |
| 646 | V | 25.03 | -80.3 | 0.0 | 0.5 | -80.8 | -13.0 | 67.8 |

**Note:**
1) Absolute Level = SG Level - Cable loss + Antenna Gain
2) Margin = Limit- Absolute Level

***** END OF REPORT *****