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: YYOPTENC980D

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

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Report Number:	RDG160930003
Report Date:	2016-10-25
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The ***Phonetone Technology (Shenzhen) Co., Ltd.***'s product, model number: ***PTE-C980D (FCC ID: YYOPTENC980D)*** *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:54dB+/-2dB Downlink: 54dB+/-2dB
Max. Output Power (Antenna Port)	Uplink: 18dBm+/-2dB Downlink: 18dBm+/-2dB
Max.Antenna Gain:	Uplink: 9.0dBi Down Link: 7.0dBi
Max. Cable Loss	Uplink: 1.4dB Down Link: 2.8dB
Nominal Power Supply:	DC 5V from adapter
External Dimension	15.9 cm (L) x 11.0 cm (W) x 2.2 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

Note: The series product, model PTE-C980D, PTE-C980DN are electrically identical, the difference between them are the model name and apperance, we selected PTE-C980D for fully testing, the details was explained in the attached declaration letter.

**All measurement and test data in this report was gathered from final production sample, serial number: 160930003 (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.

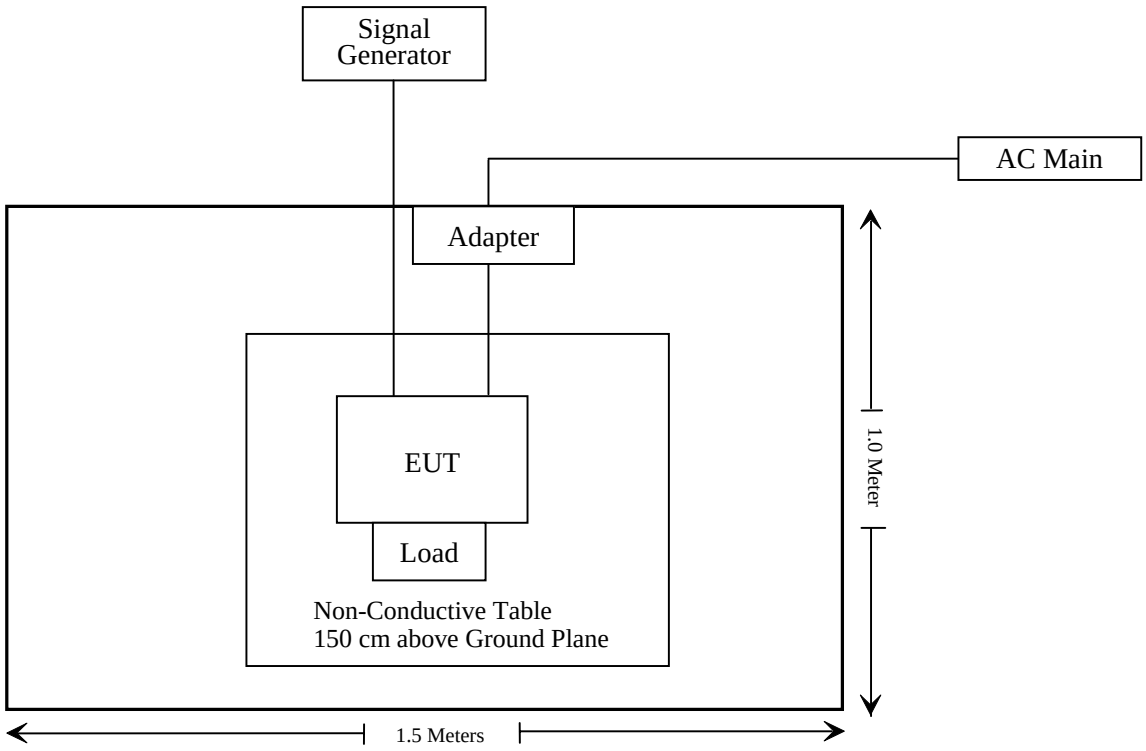
Support Equipment List and Details

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 & §22.913-MEAN OUTPUT POWER AND AMPLIFIER GAIN

Applicable Standard

According to § 22.913 (a) *Maximum ERP.* In general, the effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 Watts.

Test Procedure

According to 935210 D05 Indus Booster Basic Meas v01r01
a) Connect a signal generator to the input of the EUT.
b) Configure to generate the AWGN (broadband) test signal.
c) The frequency of the signal generator shall be set to the frequency of (f0) as determined from 3.3.
d) Connect a spectrum analyzer or power meter to the output of the EUT using appropriate attenuation as necessary.
e) Set the signal generator output power to a level that produces an EUT output level that is just below the AGC threshold (see 3.2), but not more than 0.5 dB below.
f) Measure the output power of the EUT and record (see 3.5.3 or 3.5.4 for power measurement guidance).
g) Remove the EUT from the measurement setup and using the same signal generator settings, repeat the power measurement on the input signal to the EUT and record as input power.
h) Repeat the procedure with the narrowband test signal.
i) Repeat the procedure for both test signals with input signal amplitude set to 3 dB above the AGC threshold level.
j) Repeat for all frequency bands authorized for use by the EUT.

Method 1: Power measurement with a spectrum or signal analyzer
Guidance for performing input/output power measurements using a spectrum or signal analyzer is provided in 5.2 of KDB Publication 971168.

Method 2: Power measurement with a power meter
As an alternative to measuring input and output power levels with a spectrum or signal analyzer, a broadband RF power meter may be used with appropriate detector, as specified in 5.2.3 of KDB Publication 971168.

Calculating the mean amplifier, booster, or repeater gain
NOTE–§§ 20.21 and 2.1033(c) do not require gain test data; inclusion of industrial booster gain test data in test reports submitted for FCC equipment authorization is optional.
After the mean input and output power levels have been measured as described above, the mean gain of the EUT can be determined from:

Gain (dB) = output power (dBm) − input power (dBm).
Report the mean gain for each authorized operating frequency band and each test signal stimulus.

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 2016-10-08.

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	831.1761	AWGN	Pre-AGC	-36	17.58	53.58
				3dB above AGC	-33	18.34	51.34
			GSM	Pre-AGC	-37	18.78	55.78
				3dB above AGC	-34	19.14	53.14
Downlink	Cellular	879.9344	AWGN	Pre-AGC	-37	17.16	54.16
				3dB above AGC	-34	17.80	51.8
			GSM	Pre-AGC	-37	18.26	55.26
				3dB above AGC	-34	19.42	53.42

KDB 935210 D02-OUT-OF-BAND REJECTION

Applicable Standard

According toKDB 935210 D02 Signal Boosters Certification v03r02, Out-of-band rejection–testing for rejection of out-of-band signals may be appropriate. Alternatively, filter frequency response plots are acceptable.

Test Procedure

Adjust the internal gain control of the equipment under test to the maximum gain for which equipment certification is sought.
a) Connect a signal generator to the input of the EUT.
b) Configure a swept CW signal with the following parameters:
1) Frequency range = ± 250 % of the passband from the center of the passband.
2) Level = a sufficient level to affirm that the out-of-band rejection is > 20 dB above the noise floor and will not engage the AGC during the entire sweep.
3) Dwell time = approx. 10 ms.
4) Number of points = SPAN/(RBW/2).
c) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation.
d) Set the span of the spectrum analyzer to the same as the frequency range of the signal generator.
e) Set the resolution bandwidth of the spectrum analyzer to be 1 % to 5 % of the passband and the video bandwidth shall be set to ≥ 3 × RBW.

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

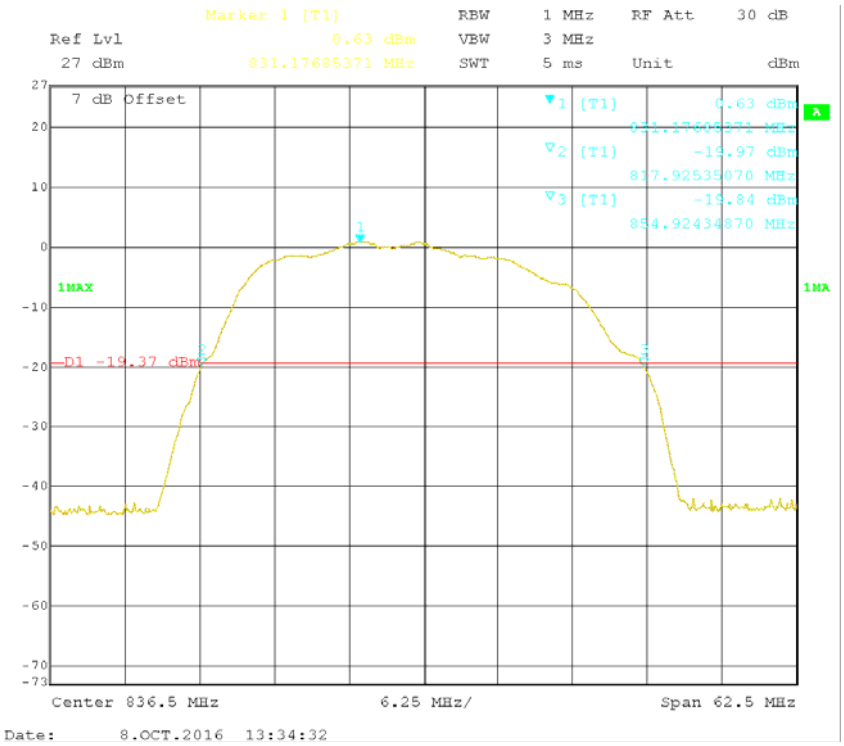
Environmental Conditions

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

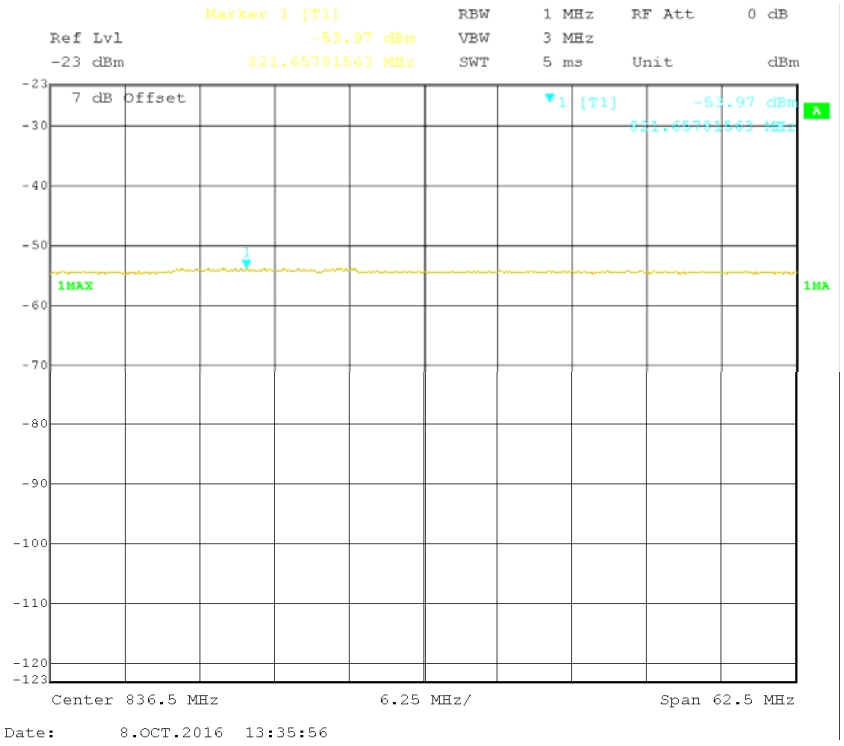
The testing was performed by Lorin Bian on 2016-10-08.

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

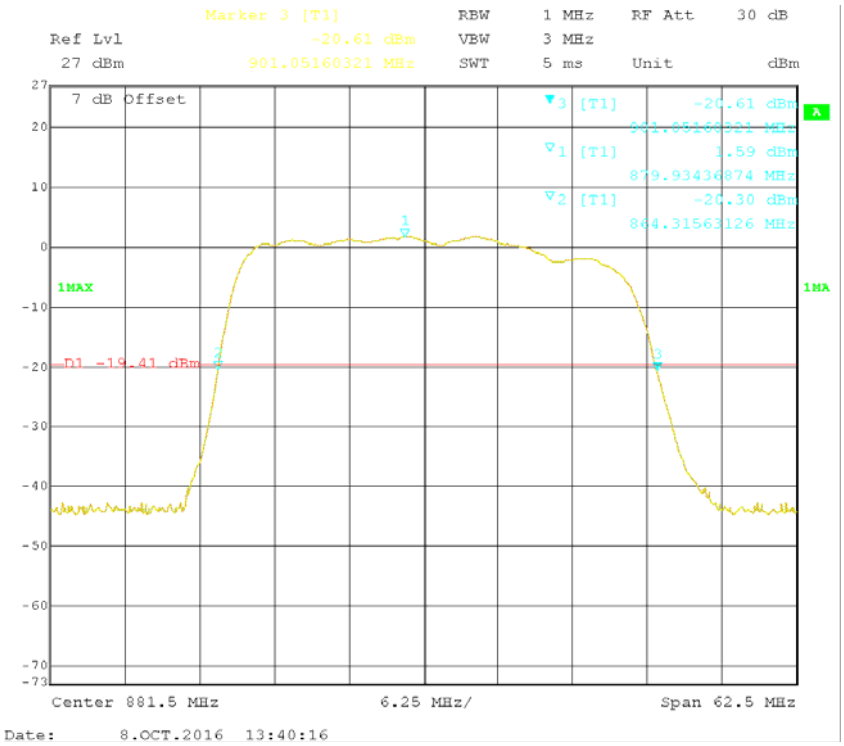
Cellular Band Uplink Output



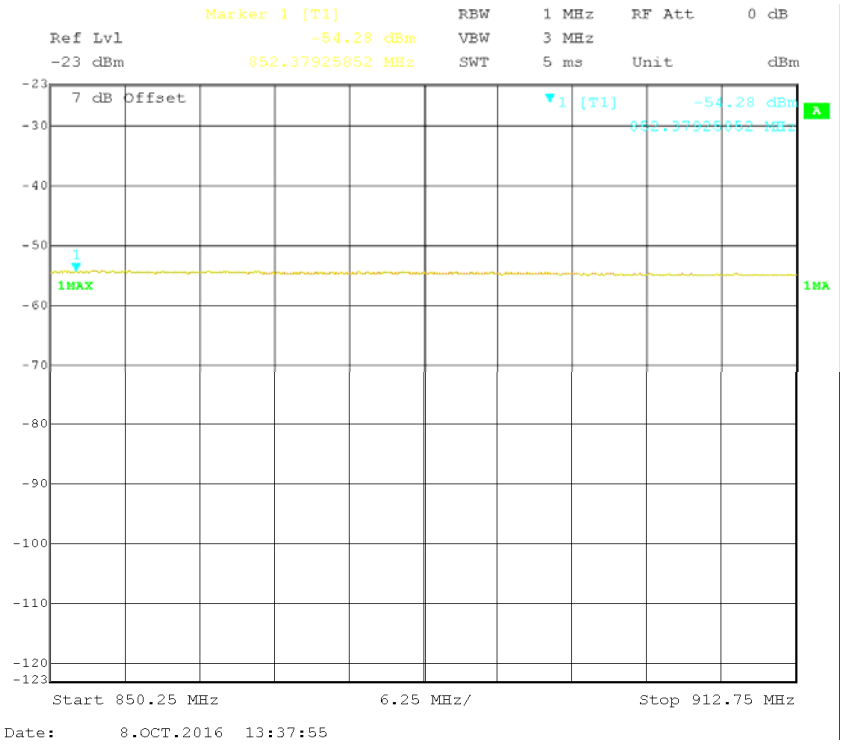
Cellular Band Uplink Input



Cellular Band Downlink Output



Cellular Band Downlink Input



§2.1049 & KDB 935210 D02-OCCUPIED BANDWIDTH AND INPUT-VERSUS-OUTPUT SIGNAL COMPARISON

Applicable Standard

According to §2.1049 and KDB 935210 D02 Signal Boosters Certification v03r02,

Report worst case results for occupied bandwidth comparison and intermodulation tests done with and without any AGC circuitry activated, for devices so equipped.

Test Procedure

A 26 dB bandwidth measurement shall be performed on the input signal and the output signal (alternatively, the 99% OBW can be measured and used) to demonstrate compliance to the technical requirements specified in §90.219(e)(4)(i) and (ii). See KDB Publication 971168 for more information regarding measuring the OBW.

a) Connect a signal generator to the input of the EUT.
b) Configure the signal generator to transmit the AWGN signal.
c) Configure the signal amplitude to be just below the AGC threshold level (see 3.2), but not more than 0.5 dB below.
d) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation.
e) Set the spectrum analyzer center frequency to the center frequency of the operational band under test. The span range of the spectrum analyzer shall be between 2 times to 5 times the EBW or alternatively, the OBW.
f) The nominal resolution bandwidth (RBW) shall be in the range of 1 % to 5 % of the anticipated OBW, and the VBW shall be ≥ 3 × RBW.
g) Set the reference level of the instrument as required to preclude the signal from exceeding the maximum spectrum analyzer input mixer level for linear operation. In general, the peak of the spectral envelope must be more than [10 log (OBW / RBW)] below the reference level.
NOTE—Steps f) and g) may require iteration to enable adjustments within the specified tolerances.
h) The noise floor of the spectrum analyzer at the selected RBW shall be at least 36 dB below the reference level.
i) Set spectrum analyzer detection function to positive peak.
j) Set the trace mode to max hold.
k) Determine the reference value: Allow the trace to stabilize. Set the spectrum analyzer marker to the highest amplitude level of the displayed trace (this is the reference value) and record the associated frequency as f0.
l) Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the −26 dB down amplitude. The 2 dB emission bandwidth is the positive frequency difference between the two markers.
NOTE—The spectral envelope may cross the −26 dB down amplitude at multiple points. If so, the lowest or highest frequency shall be selected as the frequencies the furthest removed from the center frequency at which the spectral envelope crosses the −26 dB down amplitude point.

m) Repeat steps e) to l) with the input signal connected directly to the spectrum analyzer (i.e., input signal measurement).

n) Compare the spectral plot of the input signal (determined from step m) to the output signal

(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

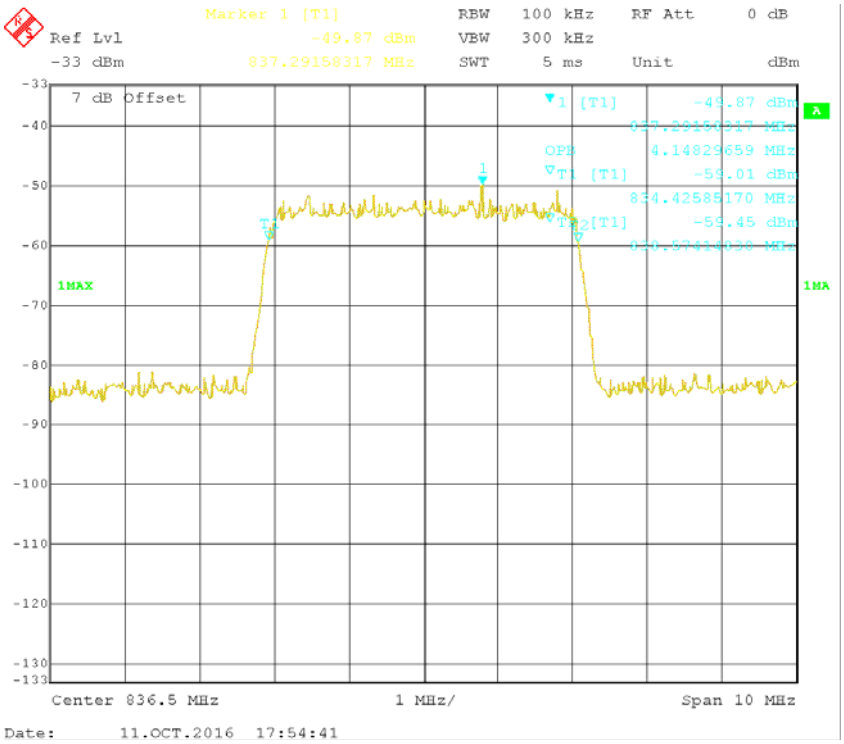
Temperature:	23.4 ℃
Relative Humidity:	40 %
ATM Pressure:	100.5 kPa

The testing was performed by Lorin Bian on 2016-10-11.

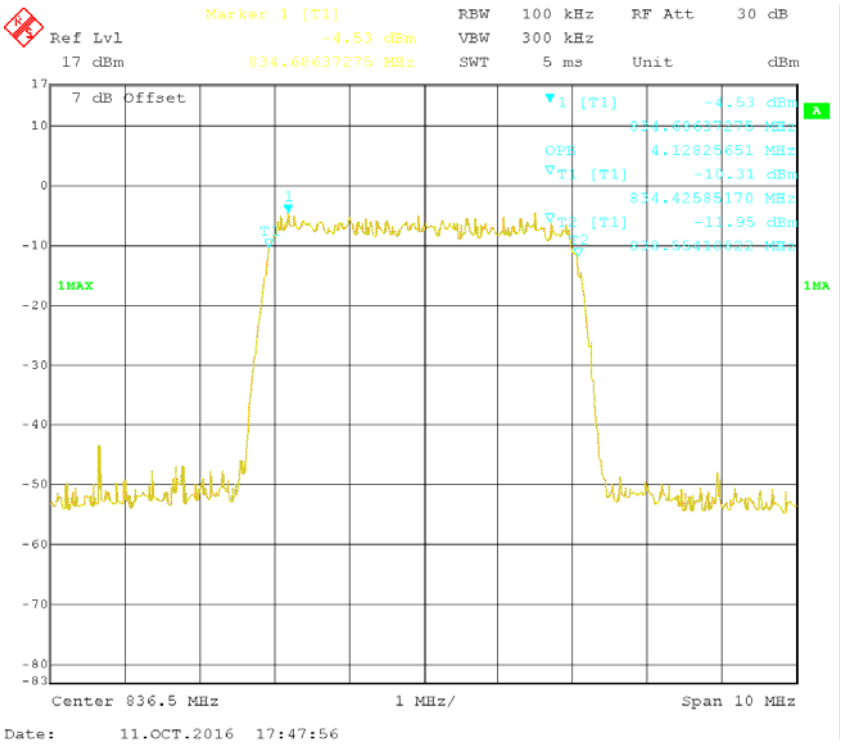
Test Result: Compliance. Please refer to the following plots.

AWGN Signal:

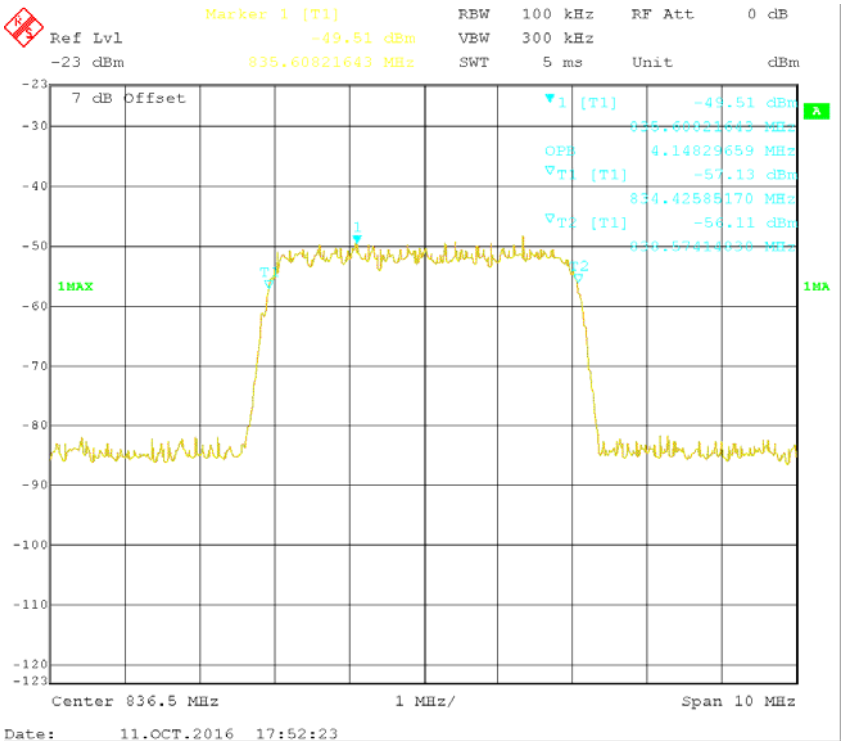
Cellular Band Uplink Pre-AGC Input



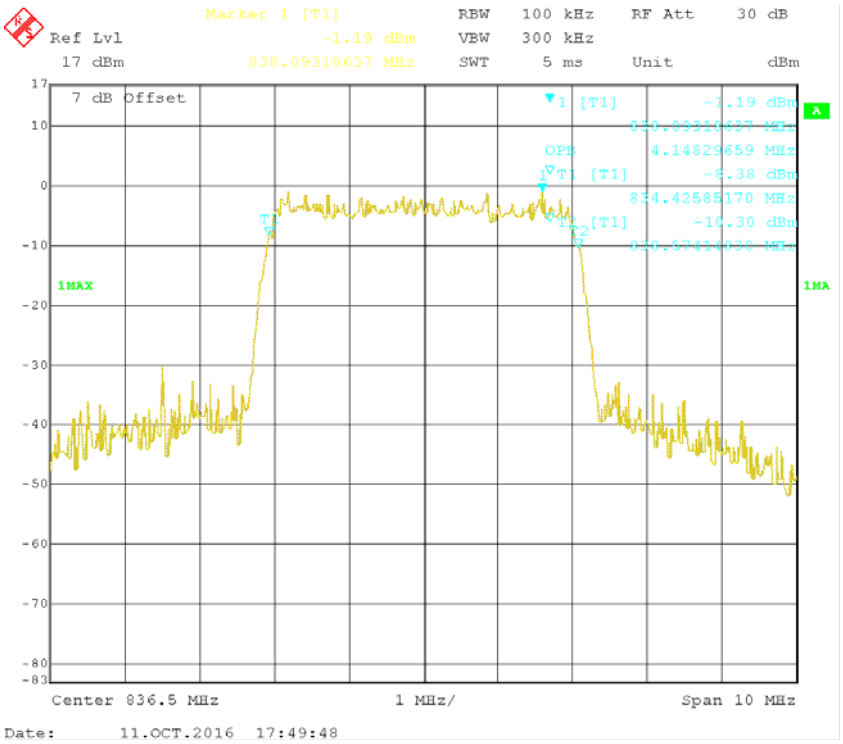
Cellular Band Uplink Pre-AGC Output



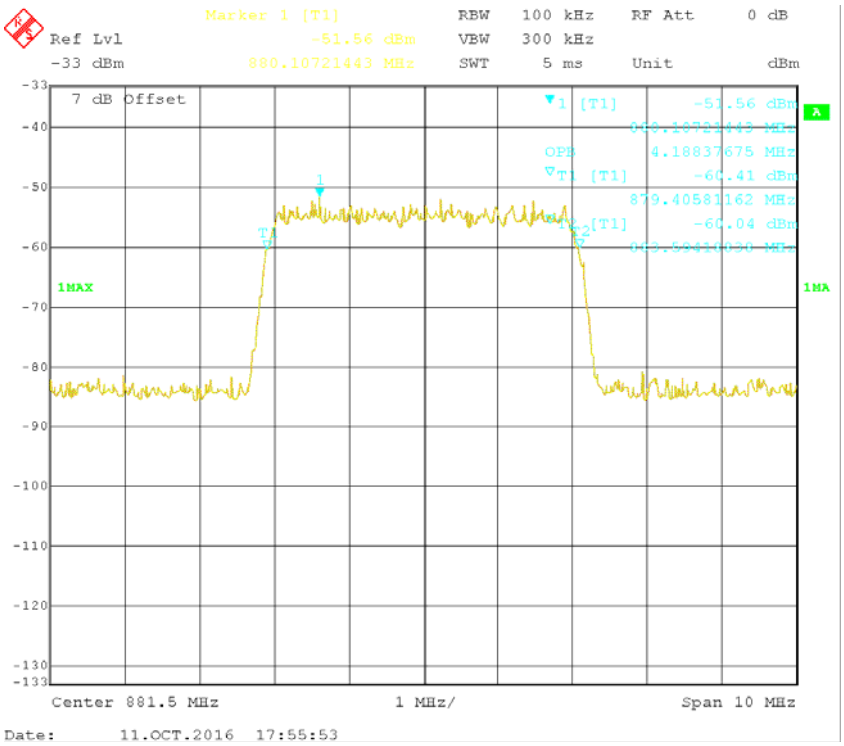
Cellular Band Uplink 3dB above AGC Input



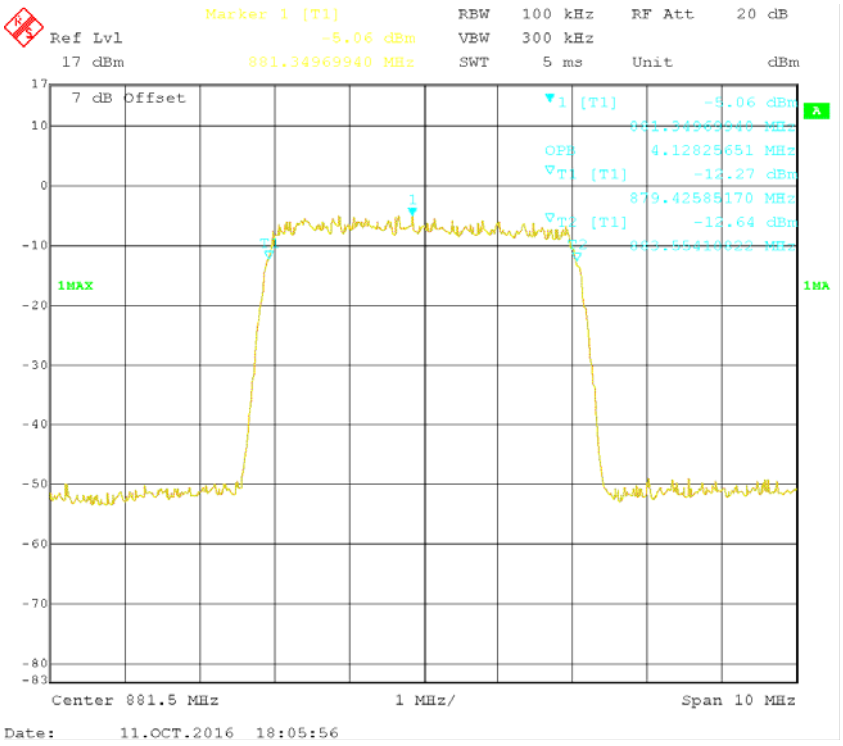
Cellular Band Uplink 3dB above AGC Output



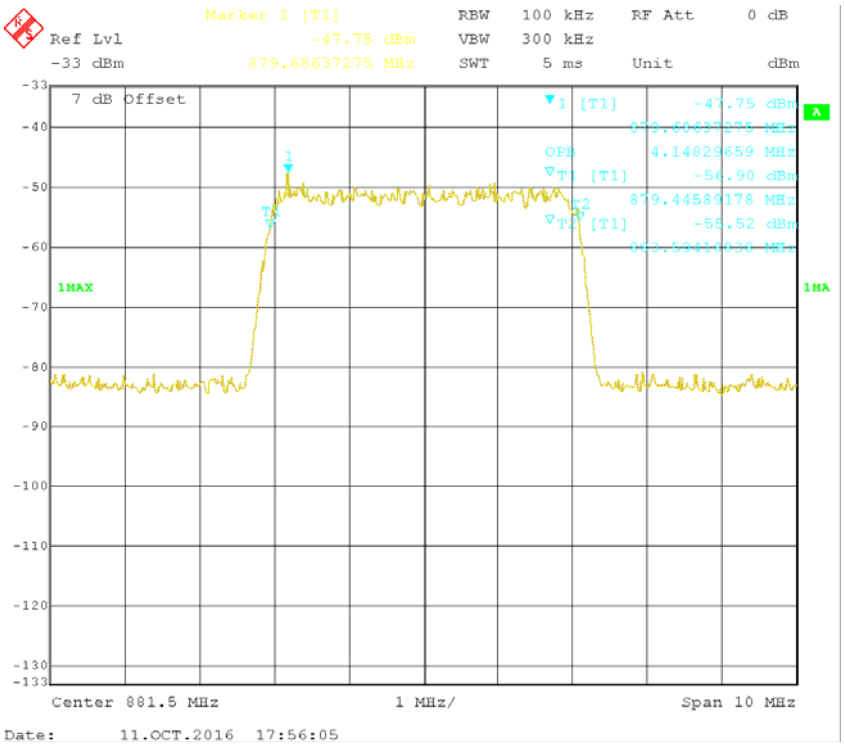
Cellular Band Downlink Pre-AGC Input



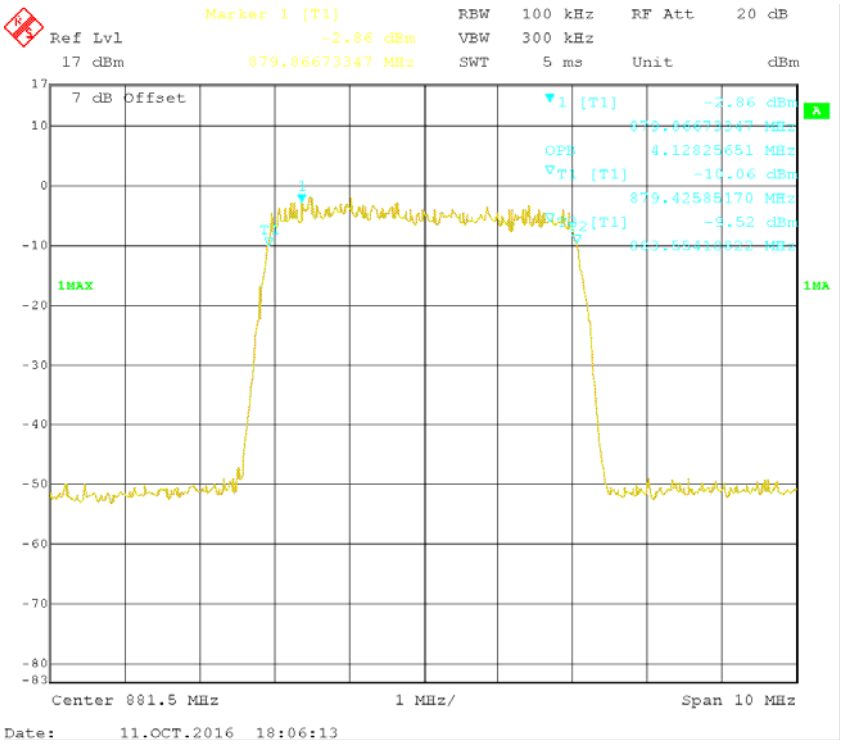
Cellular Band Downlink Pre-AGC Output



Cellular Band Downlink 3dB above AGC Input

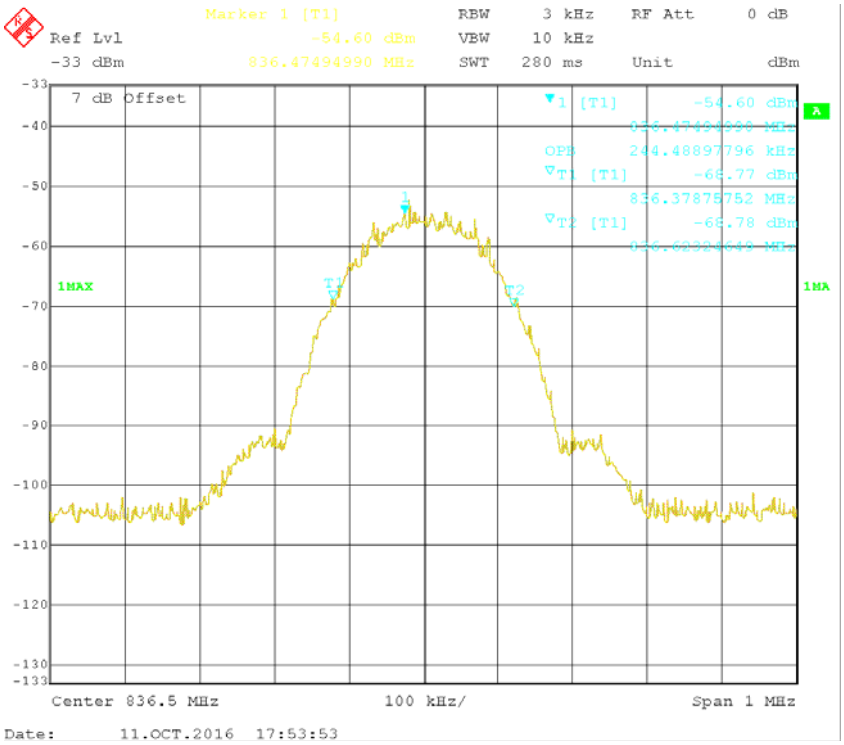


Cellular Band Downlink 3dB above AGC Output

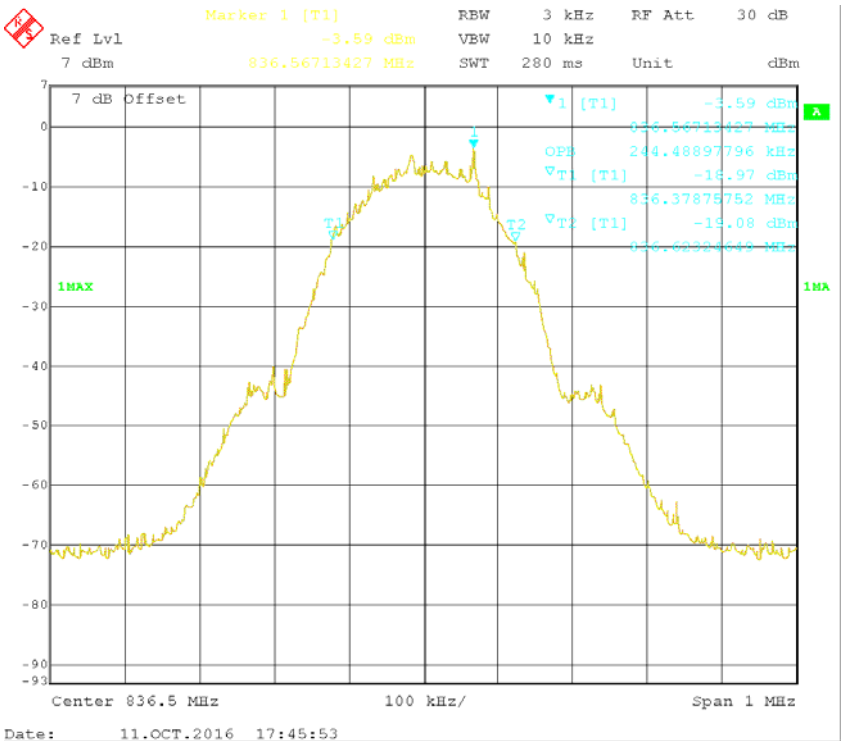


GSM Signal:

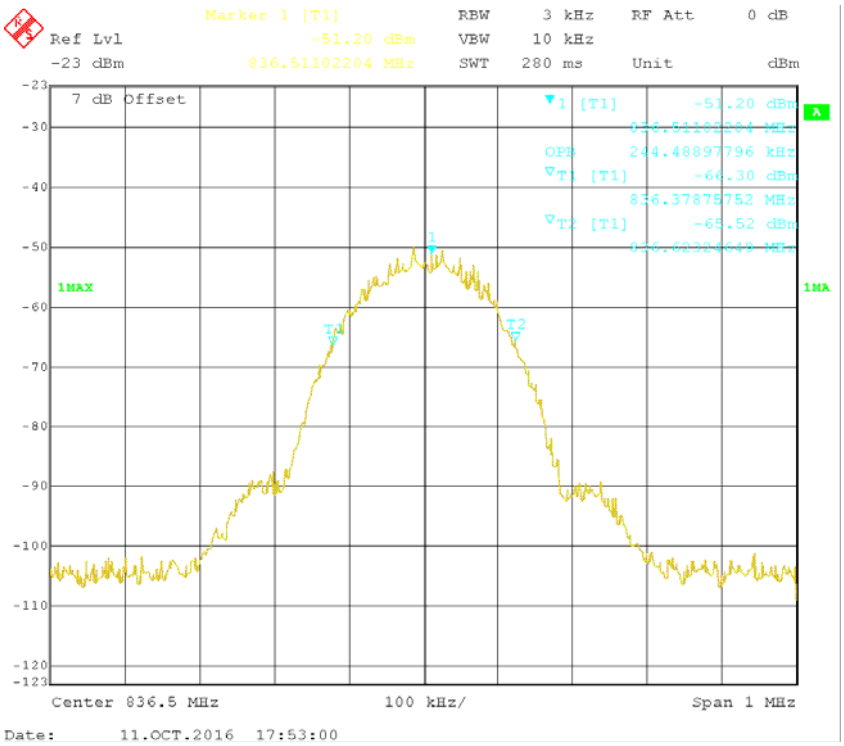
Cellular Band Uplink Pre-AGC Input



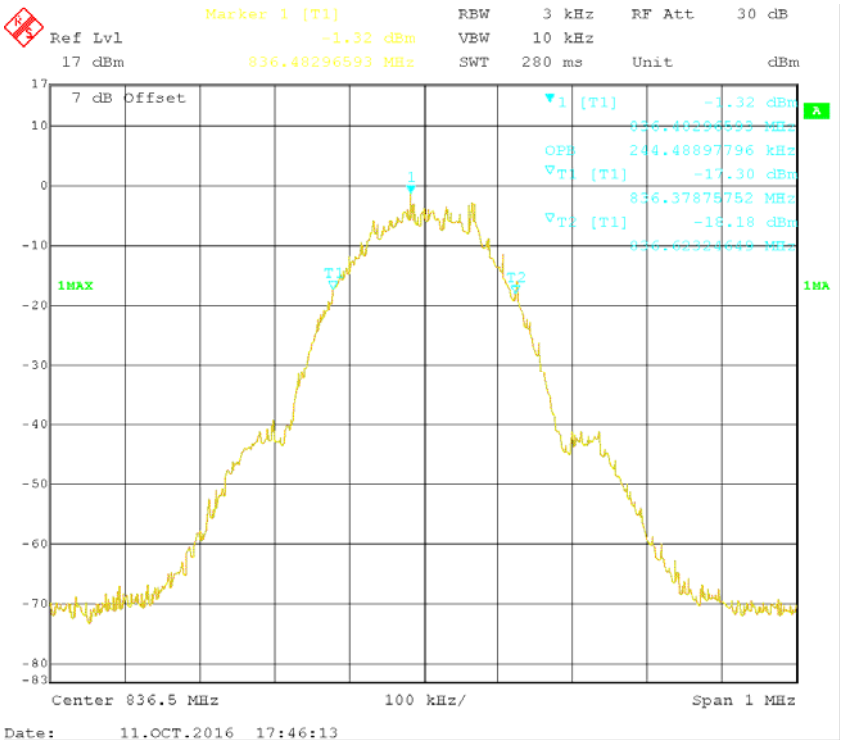
Cellular Band Uplink Pre-AGC Output



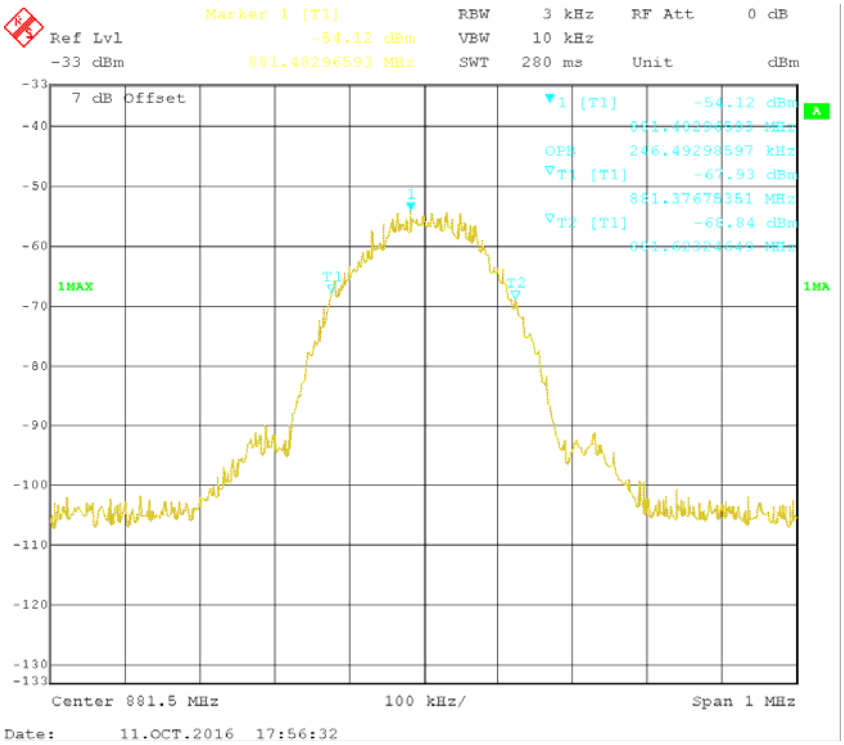
Cellular Band Uplink 3dB above AGC Input



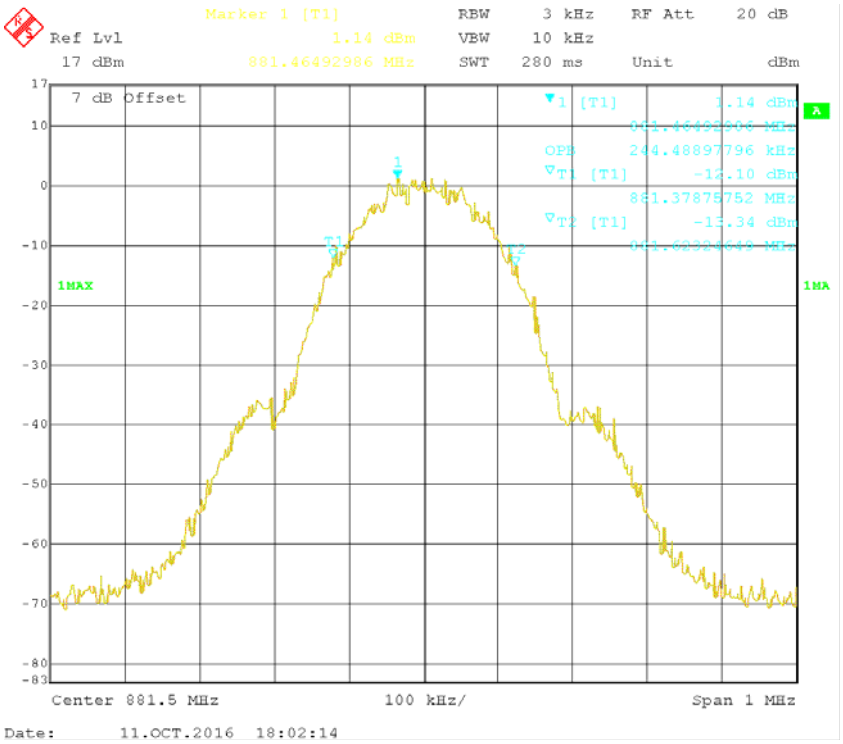
Cellular Band Uplink 3dB above AGC Output



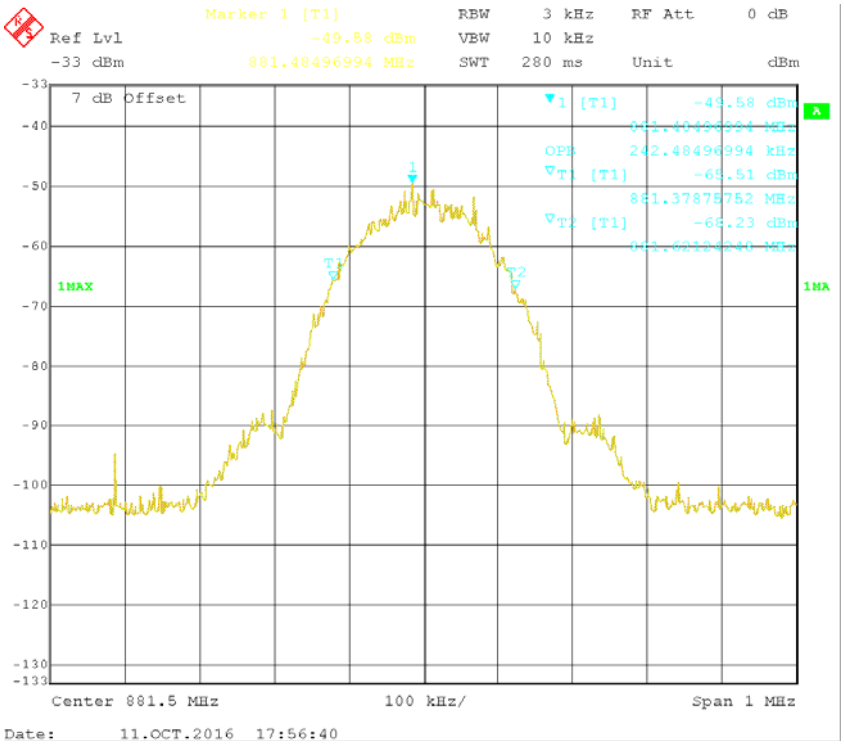
Cellular Band Downlink Pre-AGC Input



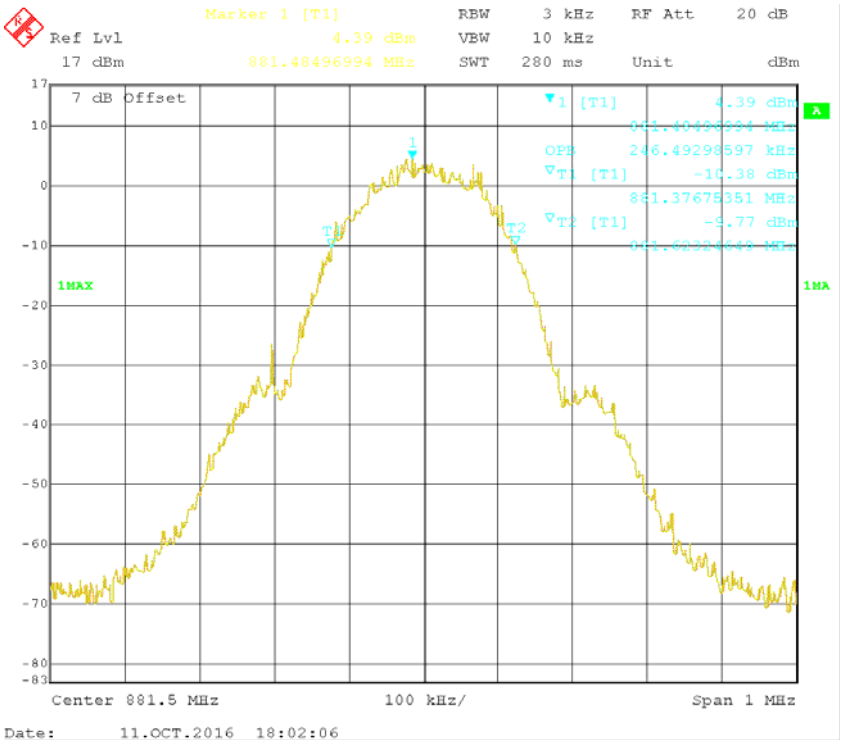
Cellular Band Downlink Pre-AGC Output



Cellular Band Downlink 3dB above AGC Input



Cellular Band Downlink 3dB above AGC Output



§2.1051, §22.917 & KDB 935210 D02-OUT-OF-BAND/BLOCK EMISSIONS (INCLUDING INTERNODULATION PRODUCTS)

Applicable Standards

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.

KDB935210 D02 Signal Boosters Certification v03r02: Report worst case results for occupied bandwidth comparison and intermodulation tests done with and without any AGC circuitry activated, for devices so equipped.

Test Procedure

Out-of-band/block emissions (including intermodulation products) shall be measured under each of the following two stimulus conditions:
a) two adjacent test signals sequentially tuned to the lower and upper frequency band/block edges;
b) a single test signal, sequentially tuned to the lowest and highest frequencies or channels within the frequency band/block under examination.

NOTE—Single channel boosters that cannot accommodate two simultaneous signals within the passband, can be excluded from the test stipulated in step a).

EUT out-of-band/block emissions conducted measurement

a) Connect a signal generator to the input of the EUT.
NOTE—If the signal generator is not capable of generating two modulated carriers simultaneously, then two discrete signal generators can be connected with an appropriate combining network to support the two-tone test.

b) Set the signal generator to produce two AWGN signals as previously described (e.g., 4.1 MHz OBW).
c) Set the center frequencies such that the AWGN signals occupy adjacent channels, as defined by industry standards such as 3GPP or 3GPP2, at the upper edge of the frequency band or block of interest.
d) Set the composite power levels such that the input signal is just below the AGC threshold (see 3.2), but not more than 0.5 dB below. The composite power can be measured using the procedures provided in KDB Publication 971168, but it will be necessary to expand the power integration bandwidth so as to include both of the transmit channels. Alternatively, the composite power can be measured using an average power meter as described in KDB Publication 971168.
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 (typically 1 % of the emission bandwidth, 100 kHz, or 1 MHz)
g) Set the VBW = 3 × RBW.
h) Set the detector to power averaging (rms) detector.
i) Set the Sweep time = auto-couple.

j) Set the analyzer start frequency to the upper block edge frequency and the stop frequency to the upper block edge frequency plus 300 kHz or 3 MHz for frequencies below and above 1 GHz, respectively.

k) Trace average at least 100 traces in power averaging (i.e., rms) mode.

l) Use the marker function to find the maximum power level.

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

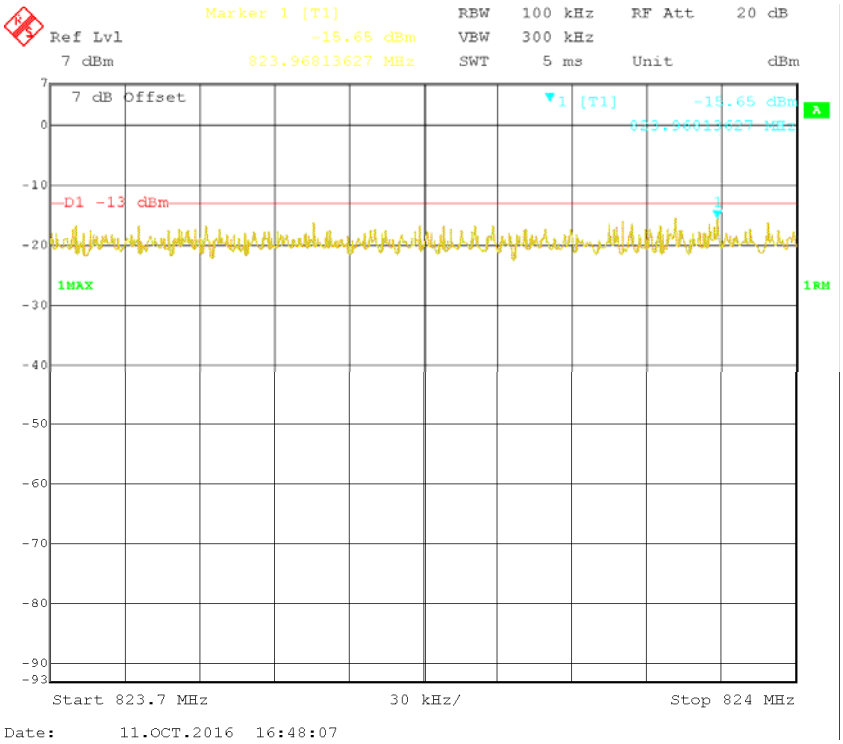
Temperature:	23.4℃
Relative Humidity:	40 %
ATM Pressure:	100.5 kPa

The testing was performed by Lorin Bian on 2016-10-11.

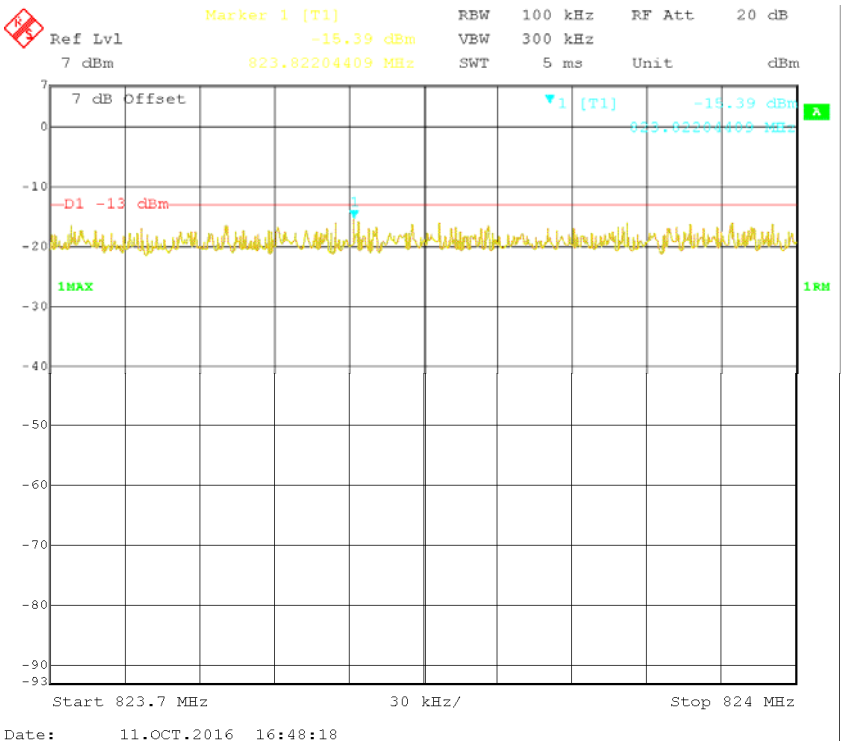
Please refer to the following plots.

Single channel:
Uplink:

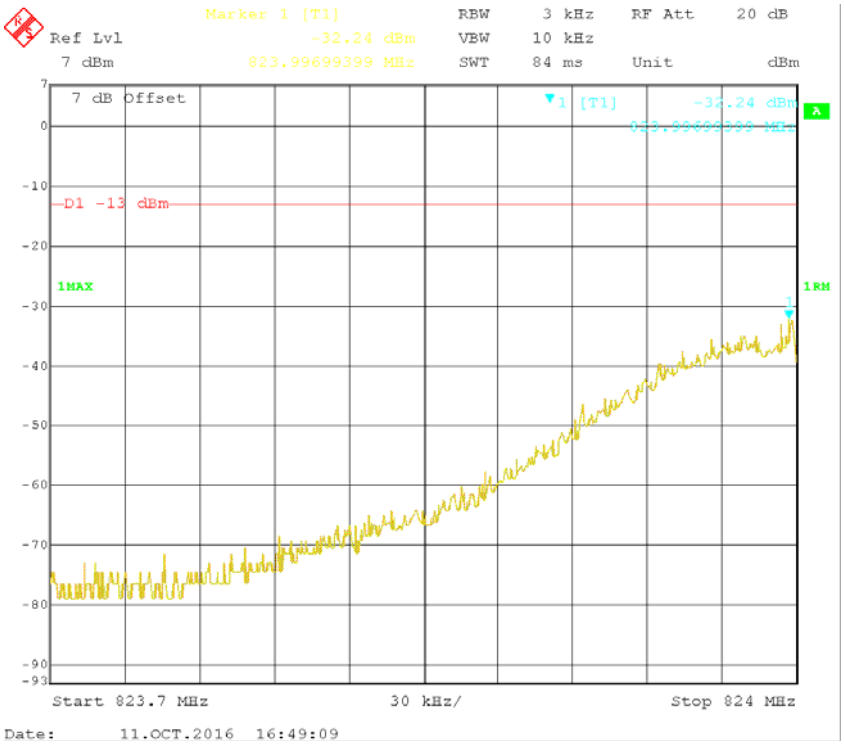
Cellular Band AWGN Left Side Pre-AGC



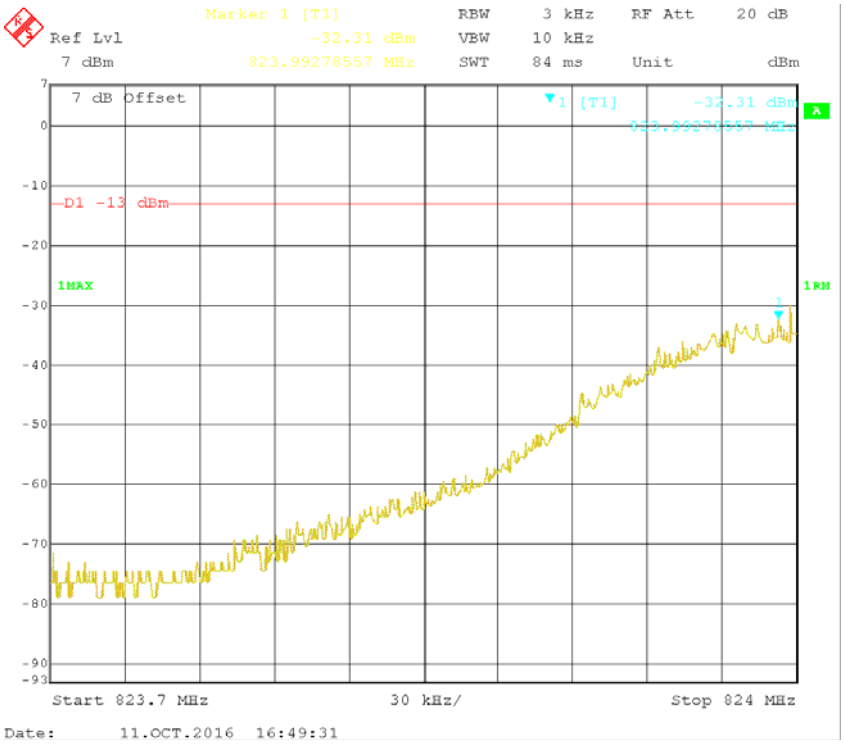
Cellular Band AWGN Left Side 3dB Above AGG



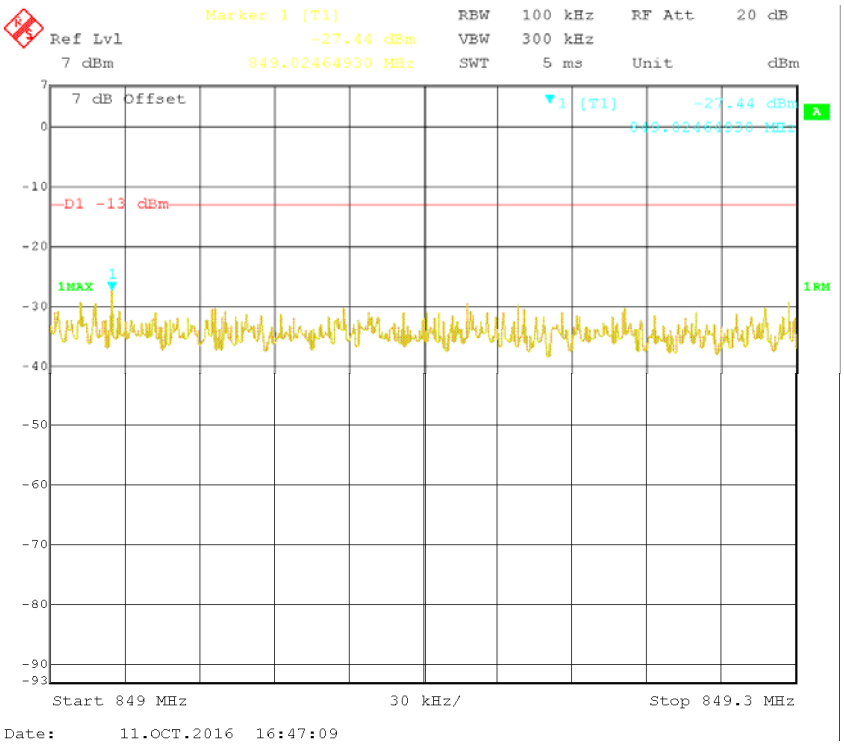
Cellular Band GSM Left Side Pre-AGC



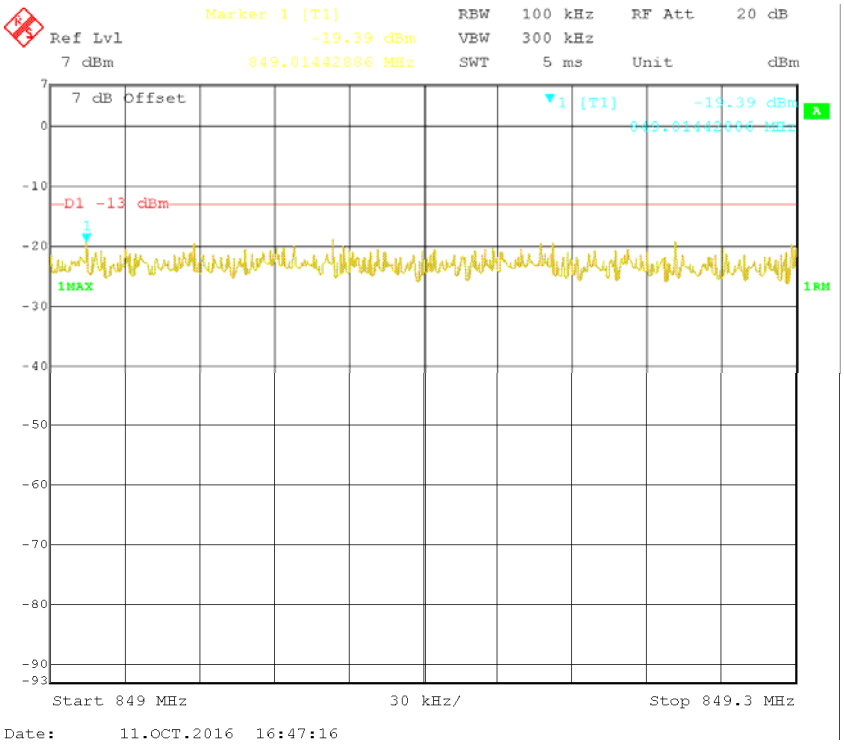
Cellular Band GSM Left Side 3dB Above AGC



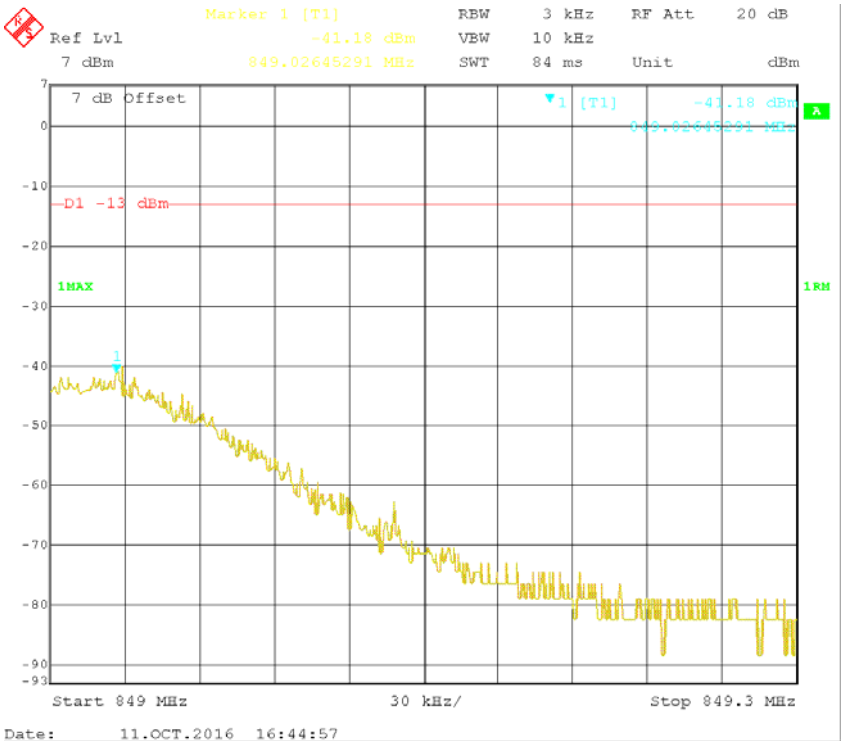
Cellular Band AWGN Right Side Pre-AGC



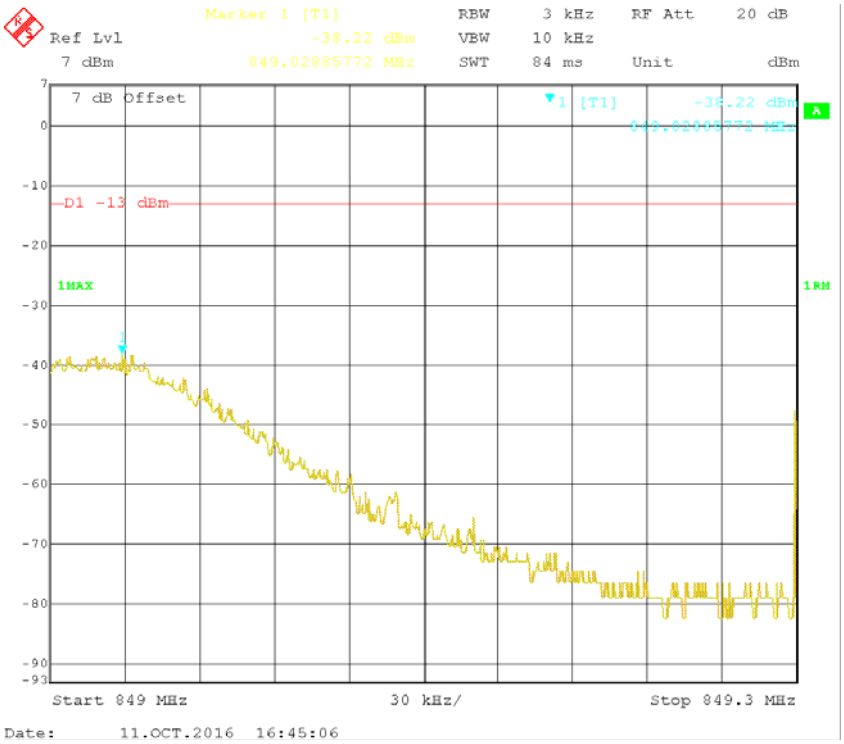
Cellular Band AWGN Right Side 3dB Above AGG



Cellular Band GSM Right Side Pre-AGC

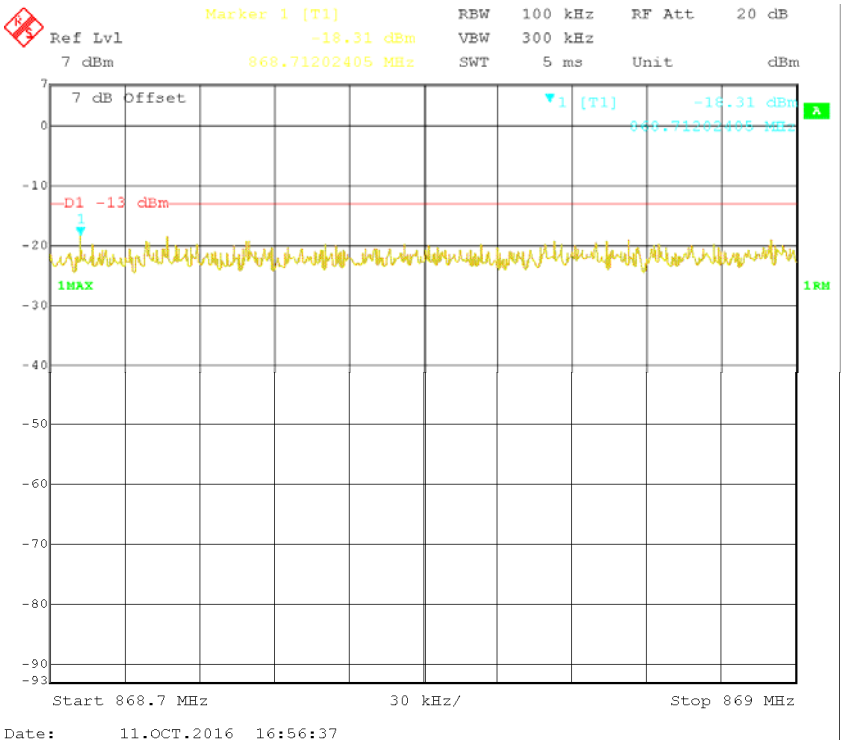


Cellular Band GSM Right Side 3dB Above AGC

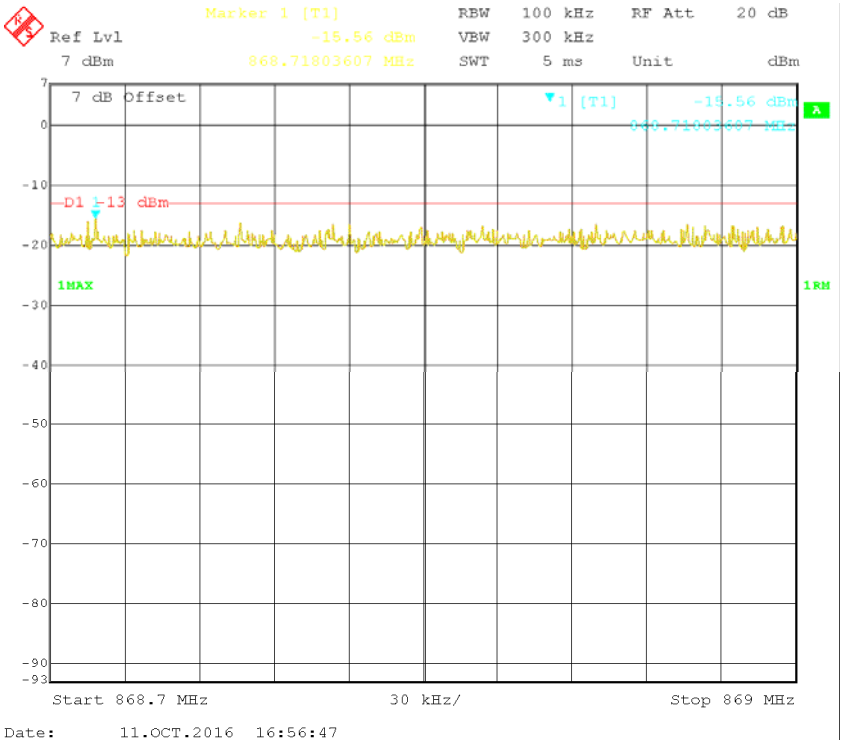


Downlink

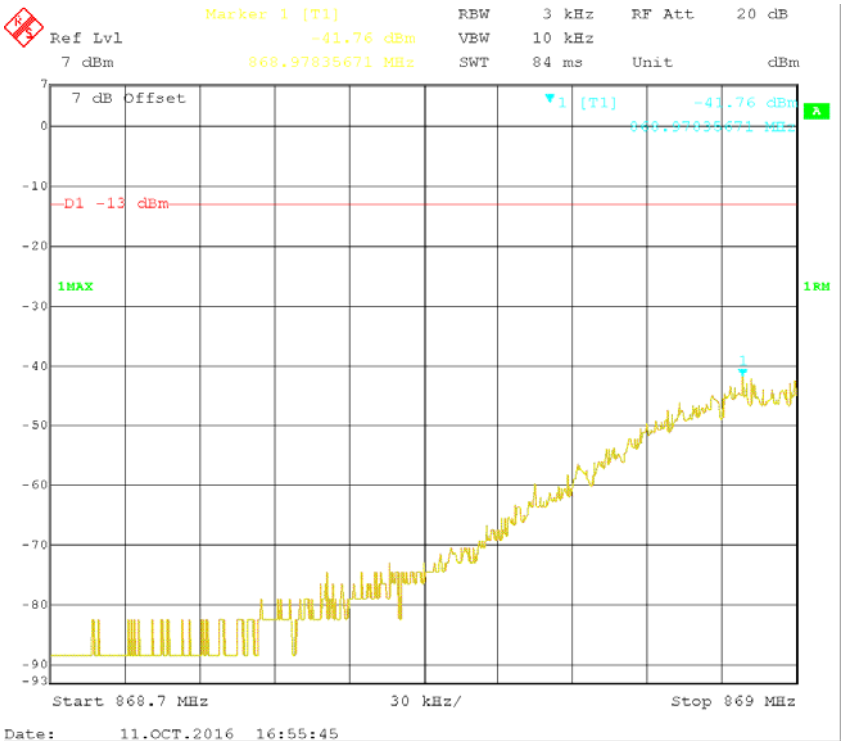
Cellular Band AWGN Left Side Pre-AGC



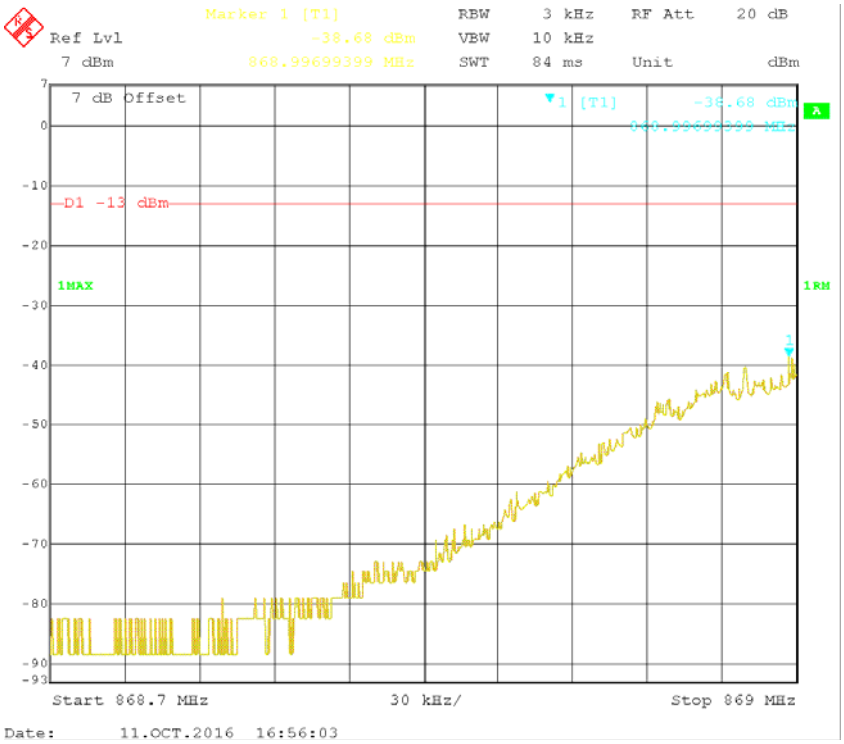
Cellular Band AWGN Left Side 3dB Above AGG



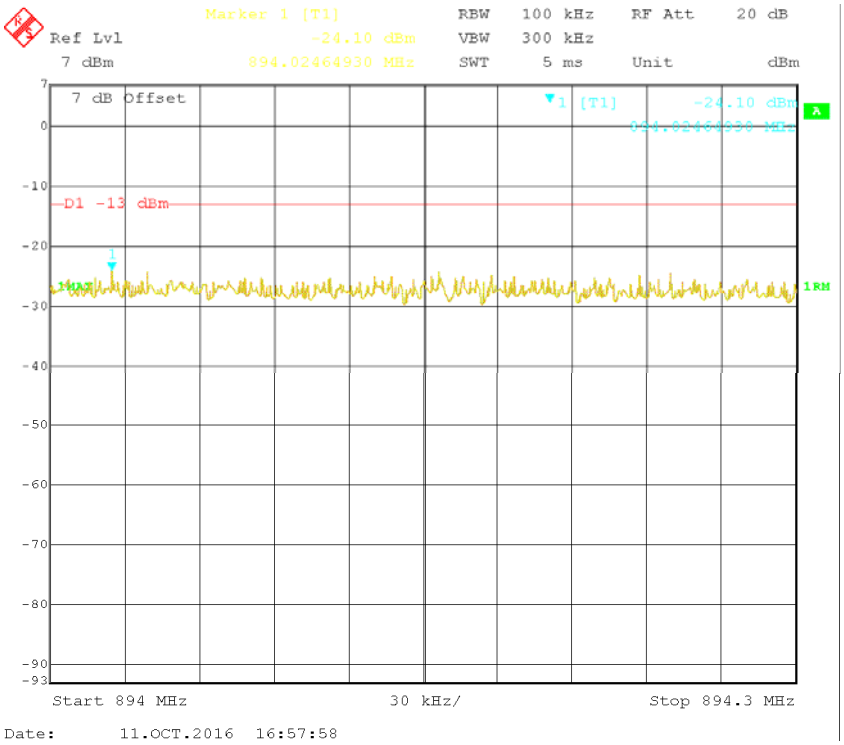
Cellular Band GSM Left Side Pre-AGC



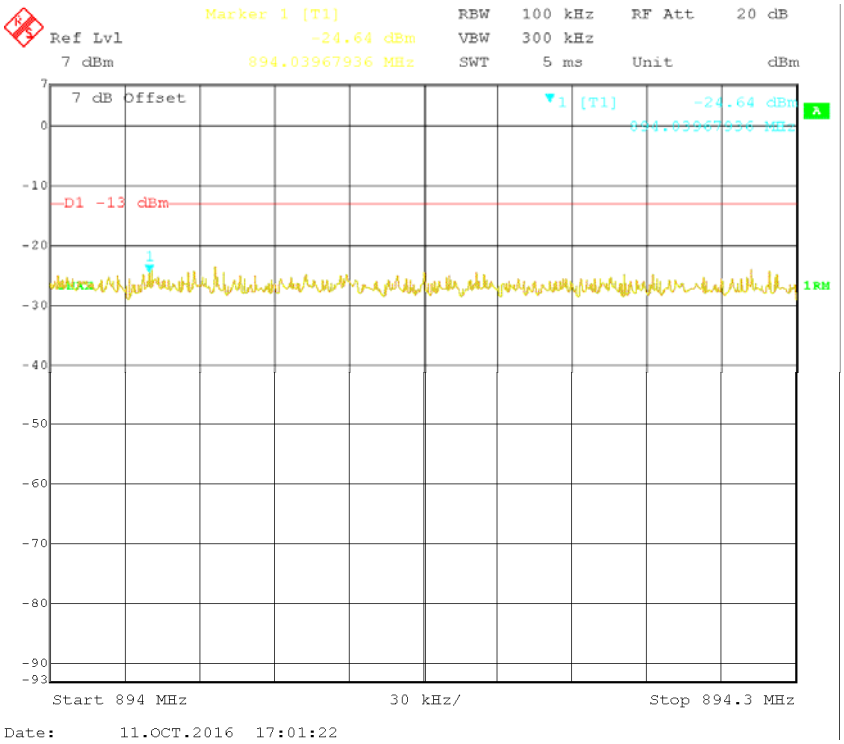
Cellular Band GSM Left Side 3dB Above AGC



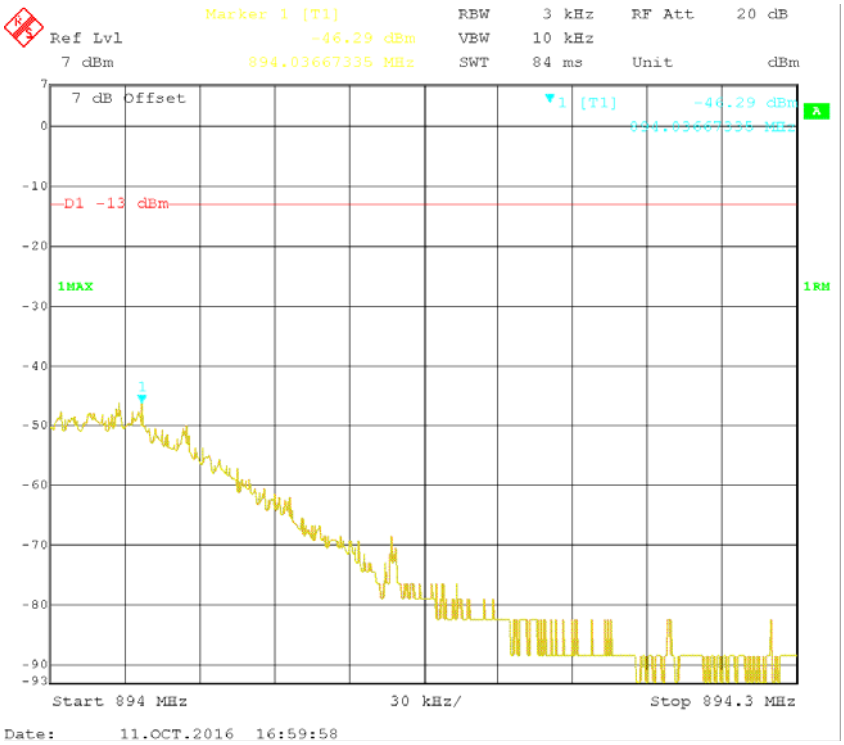
Cellular Band AWGN Right Side Pre-AGC



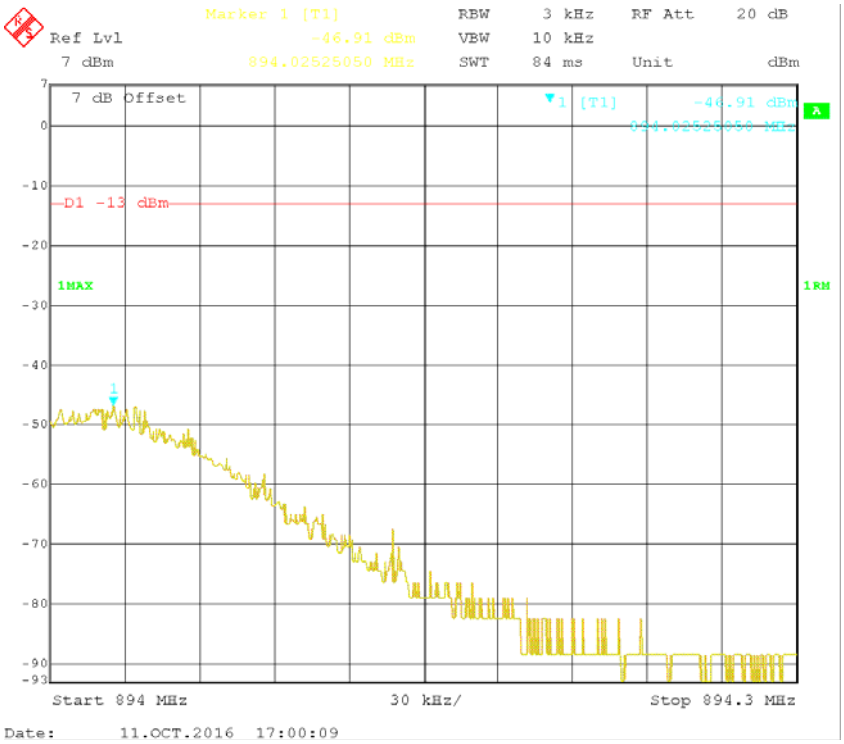
Cellular Band AWGN Right Side 3dB Above AGG



Cellular Band GSM Right Side Pre-AGC



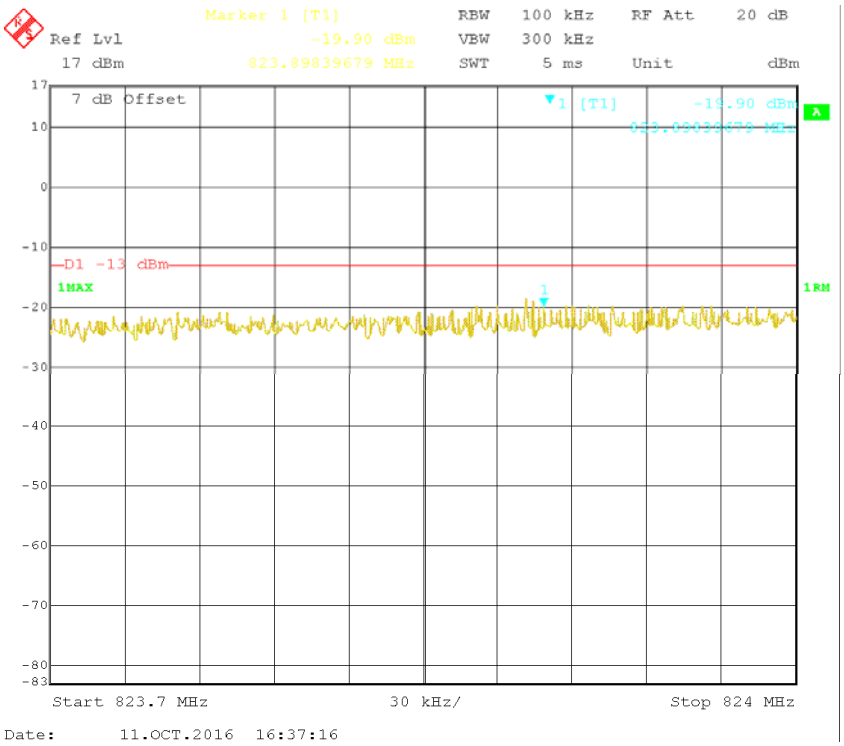
Cellular Band GSM Right Side 3dB Above AGC



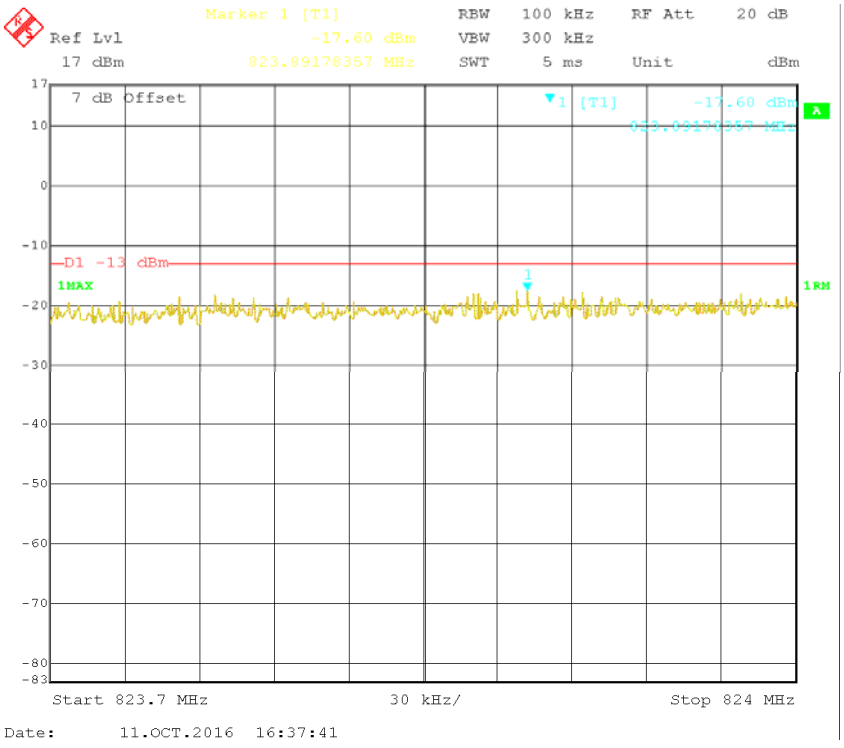
Two adjacent channels:

Uplink:

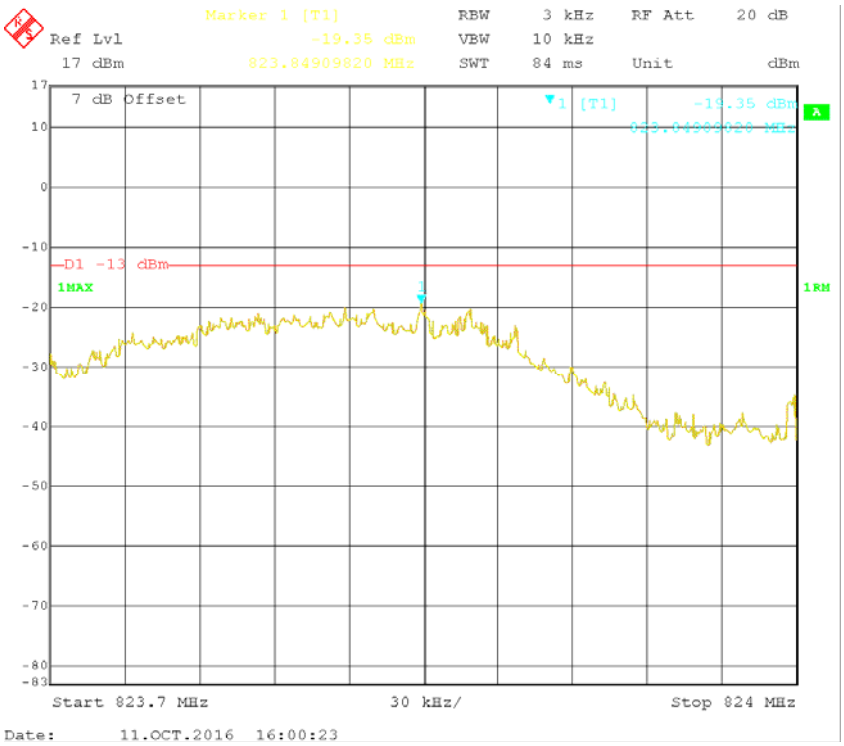
Cellular Band AWGN Left Side Pre-AGC



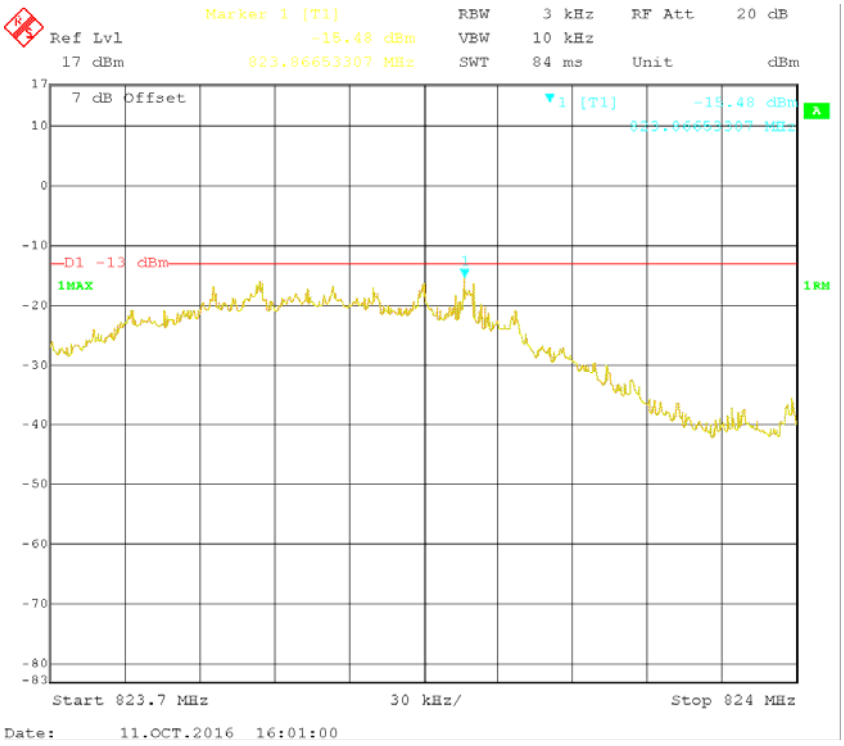
Cellular Band AWGN Left Side 3dB Above AGG



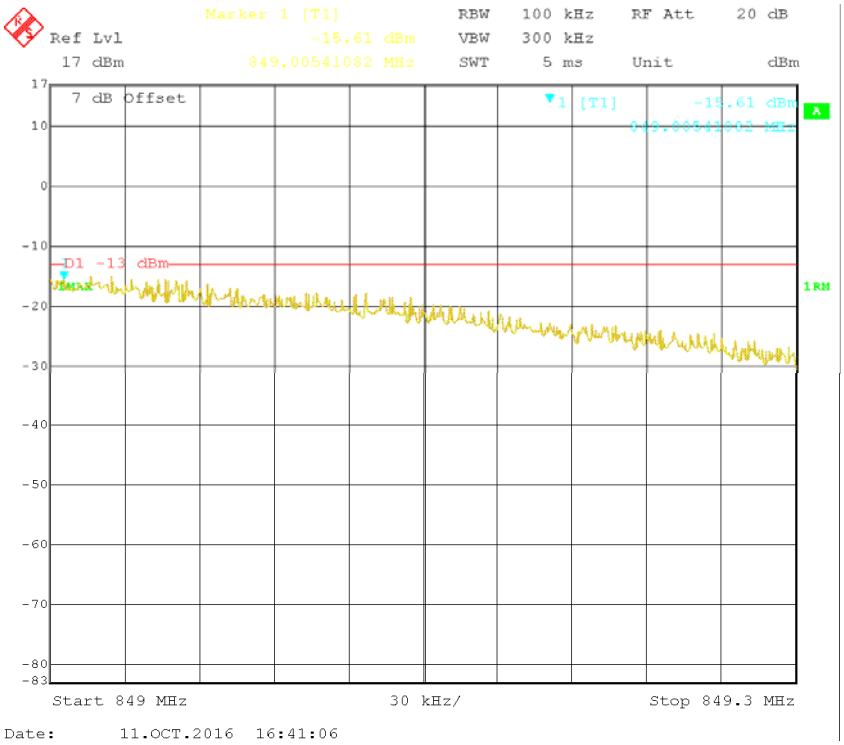
Cellular Band GSM Left Side Pre-AGC



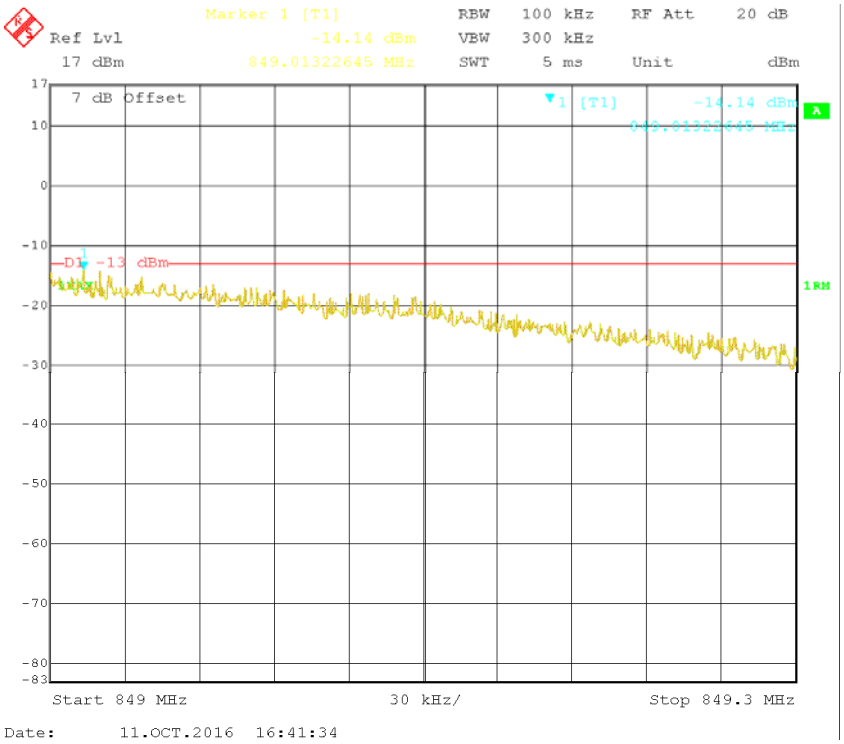
Cellular Band GSM Left Side 3dB Above AGC



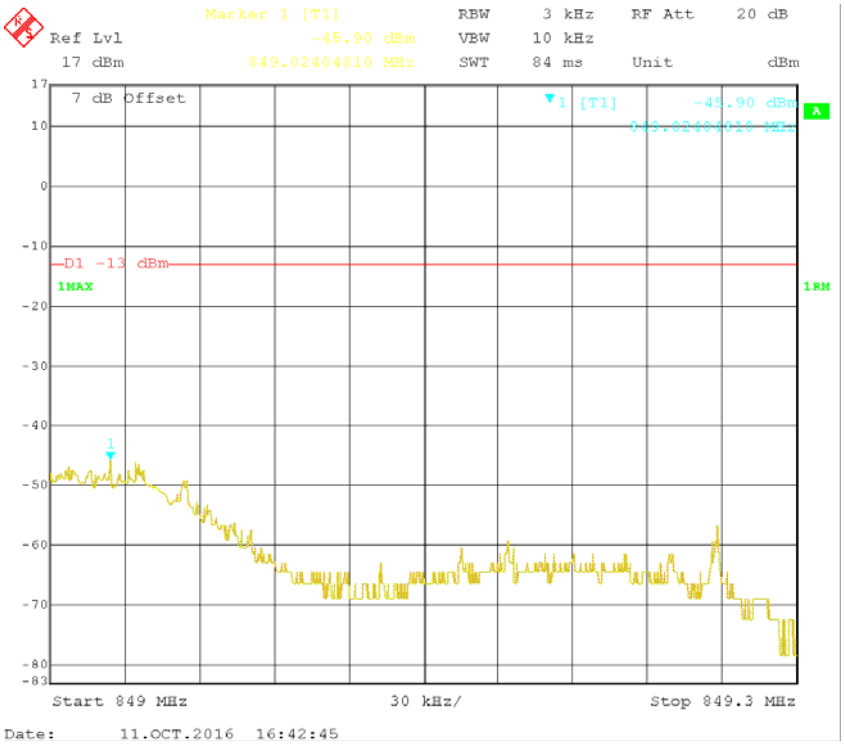
Cellular Band AWGN Right Side Pre-AGC



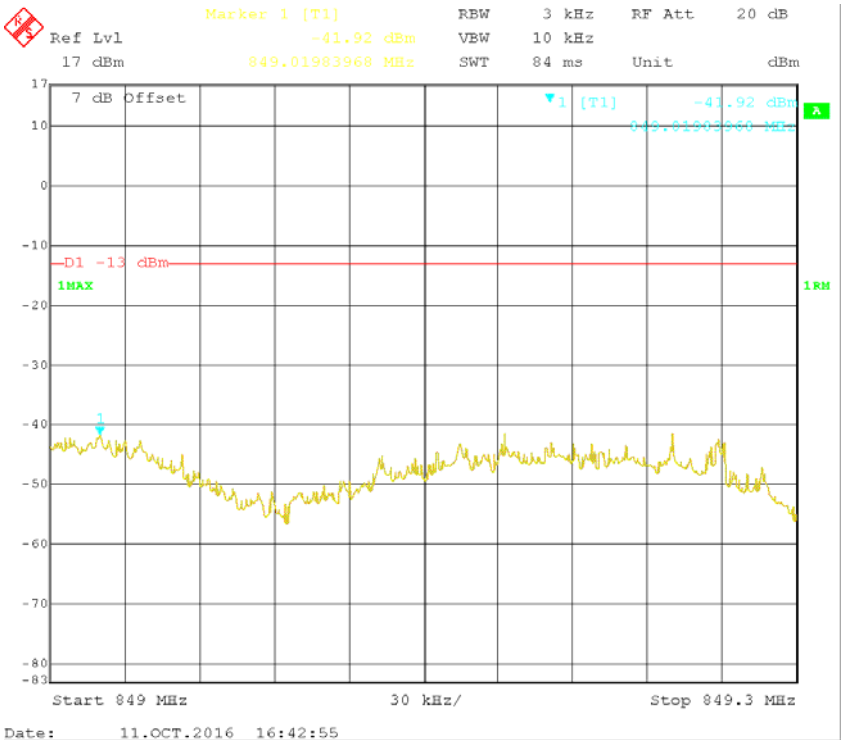
Cellular Band AWGN Right Side 3dB Above AGG



Cellular Band GSM Right Side Pre-AGC

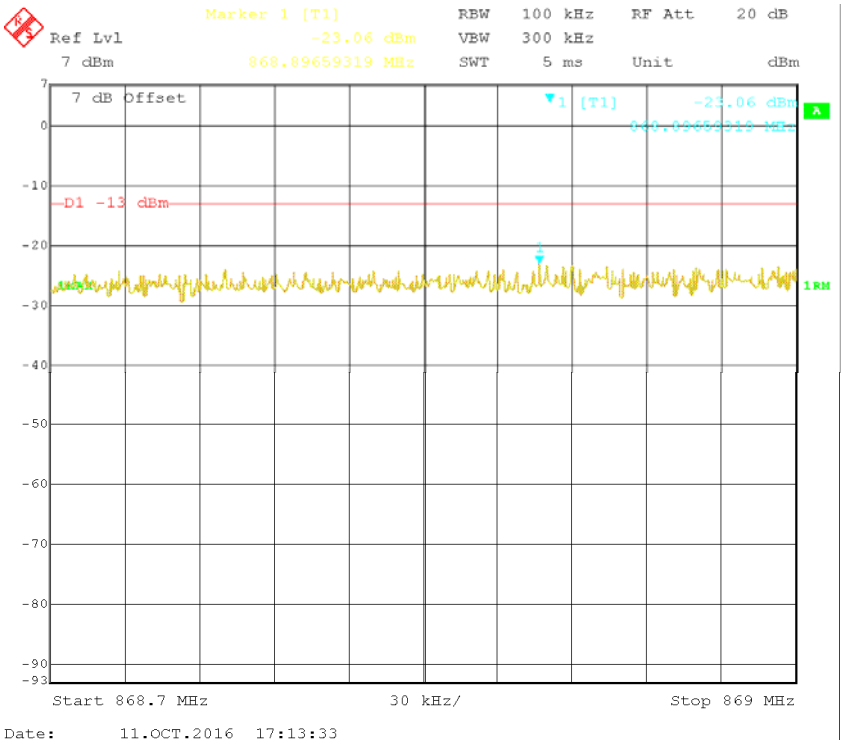


Cellular Band GSM Right Side 3dB Above AGC

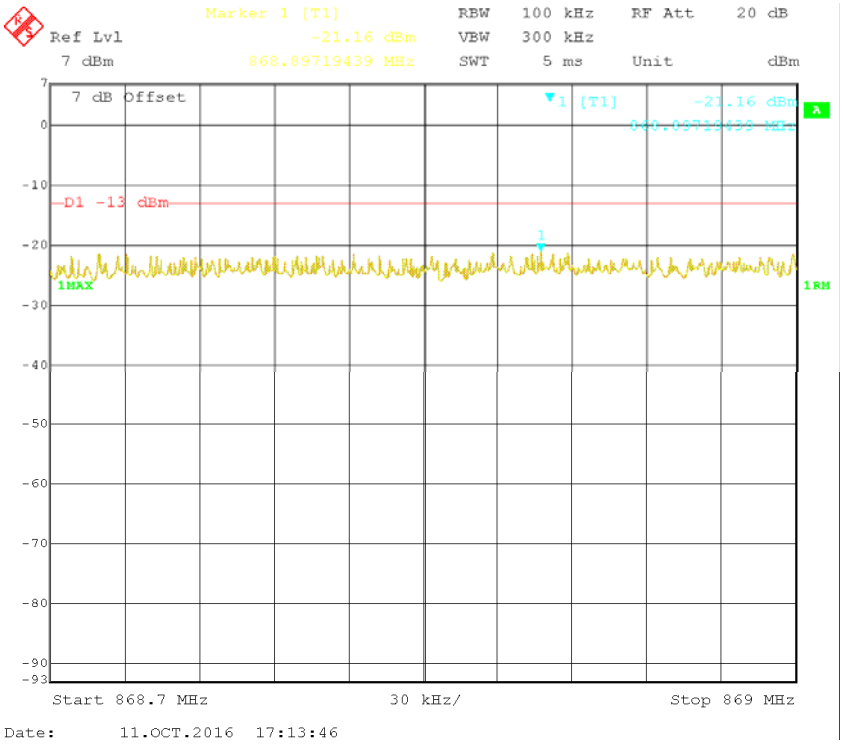


Downlink

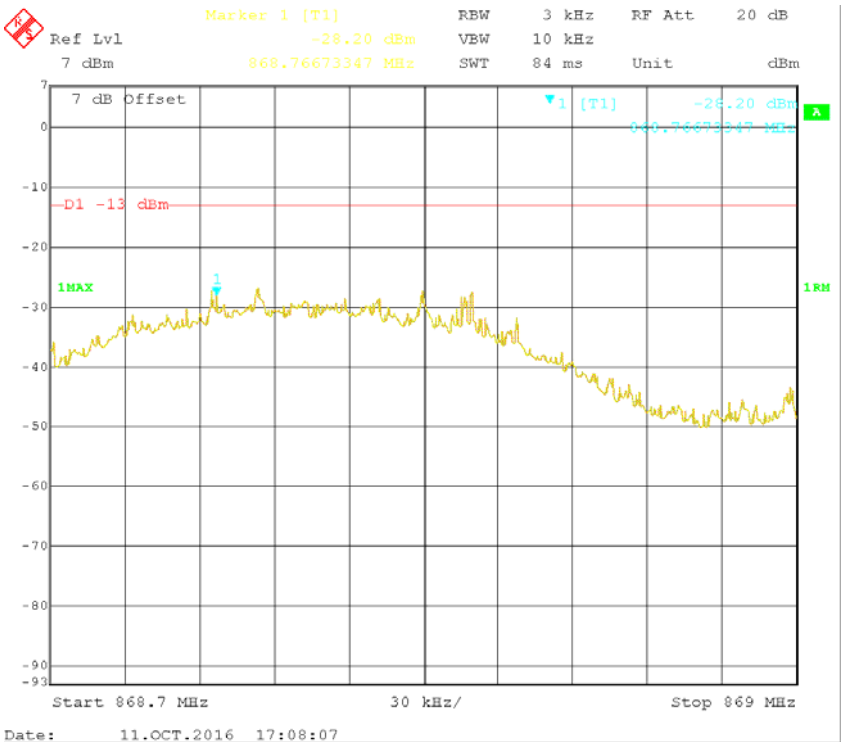
Cellular Band AWGN Left Side Pre-AGC



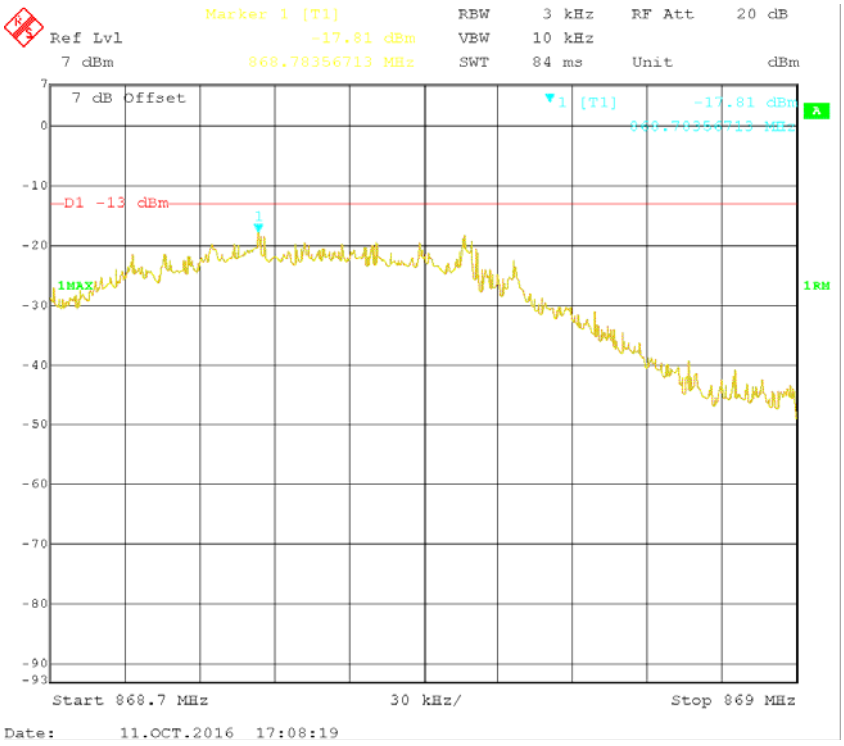
Cellular Band AWGN Left Side 3dB Above AGG



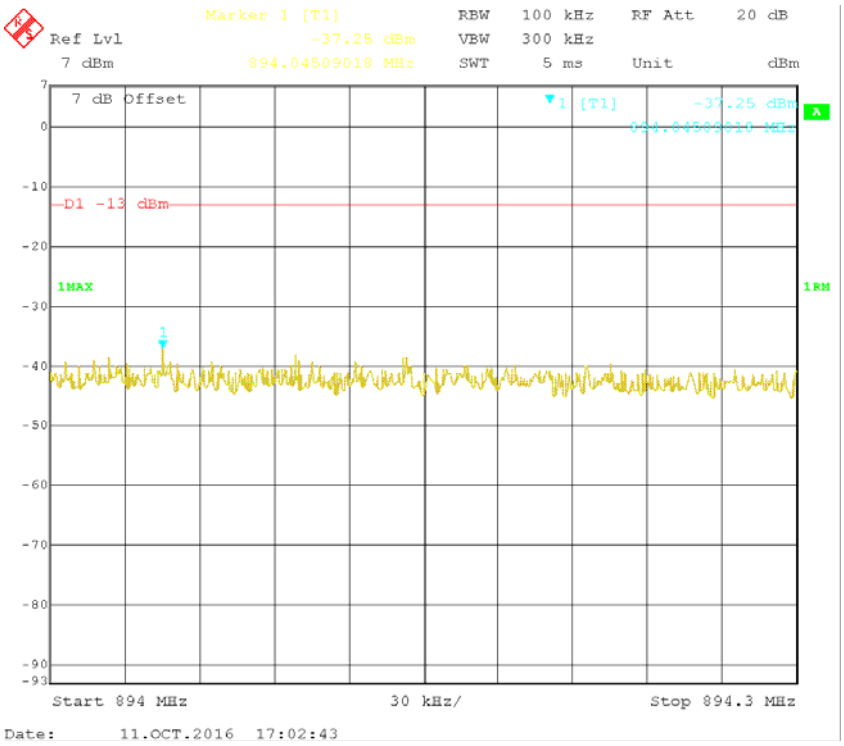
Cellular Band GSM Left Side Pre-AGC



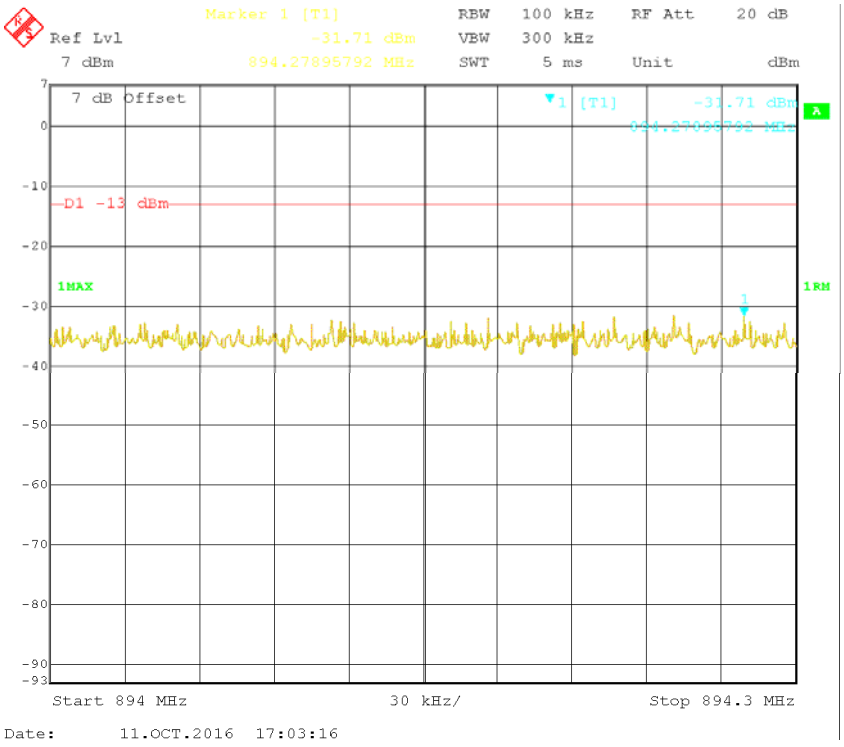
Cellular Band GSM Left Side 3dB Above AGC



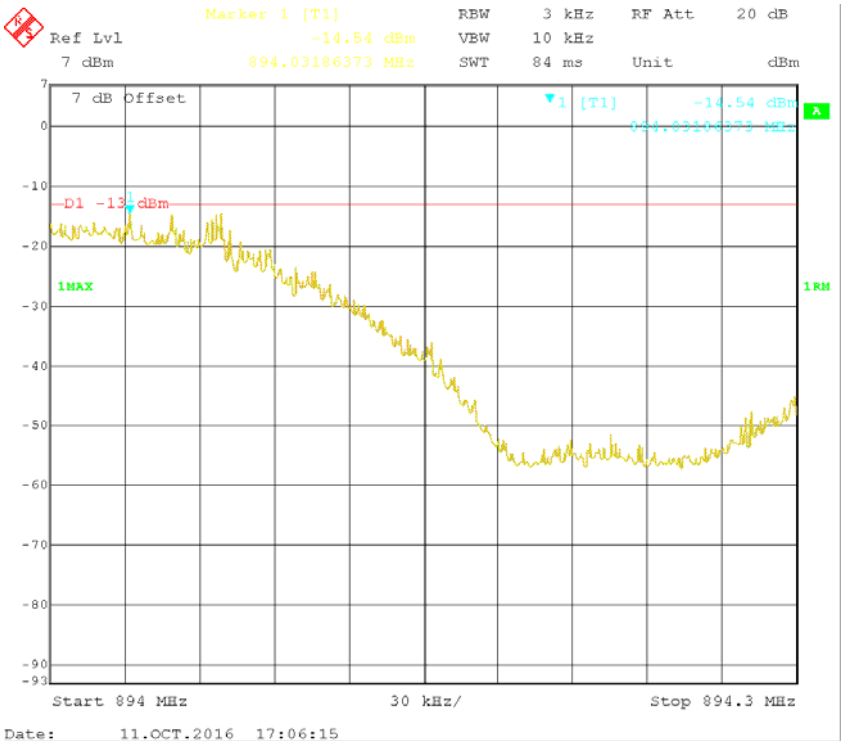
Cellular Band AWGN Right Side Pre-AGC



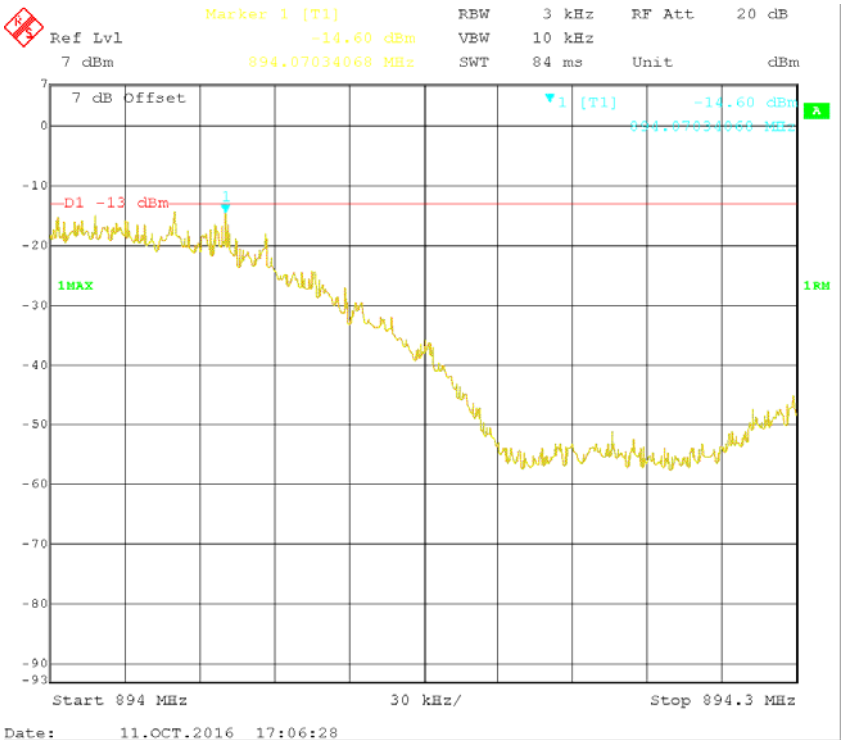
Cellular Band AWGN Right Side 3dB Above AGG



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

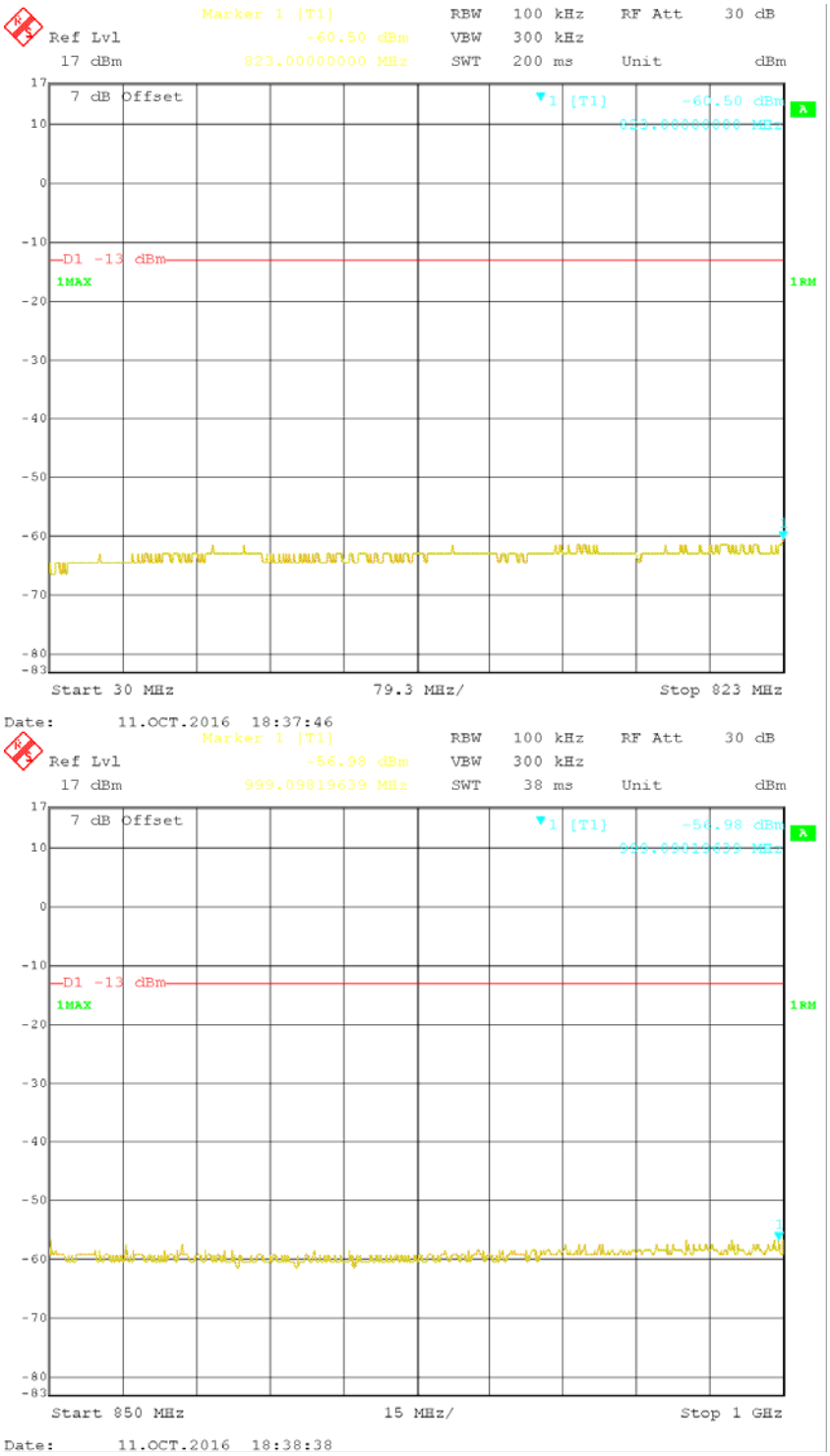
Temperature:	23.4 ℃
Relative Humidity:	40 %
ATM Pressure:	100.5 kPa

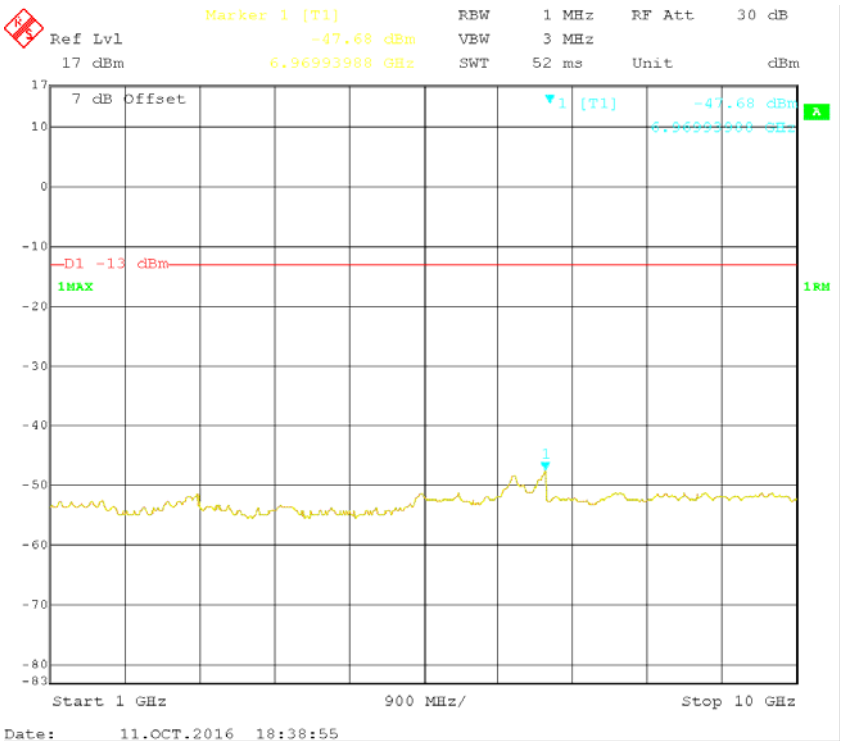
The testing was performed by Lorin Bian on 2016-10-11..

Please refer to the following plots.

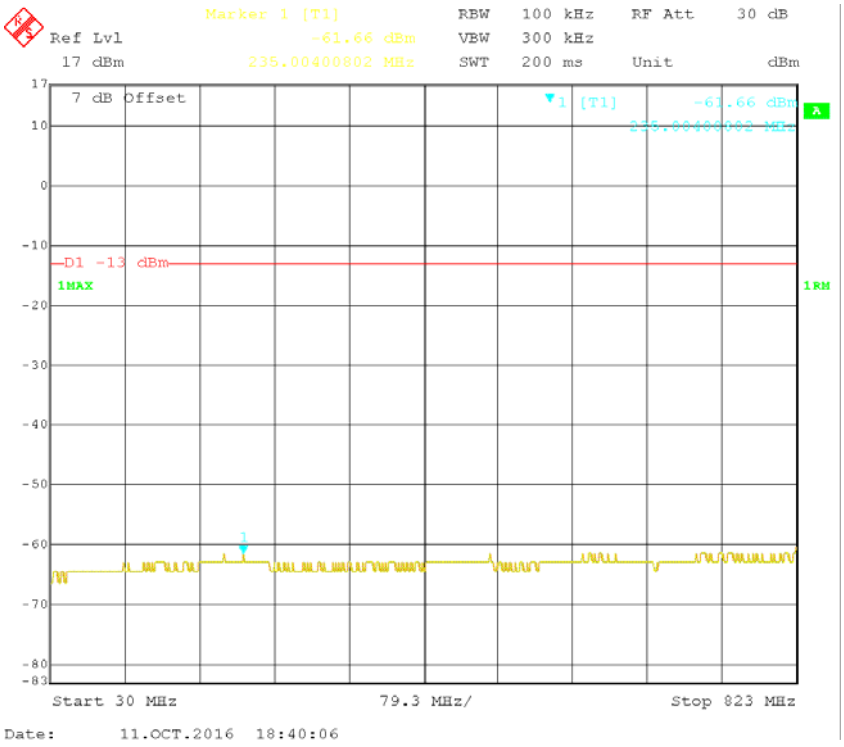
Uplink:

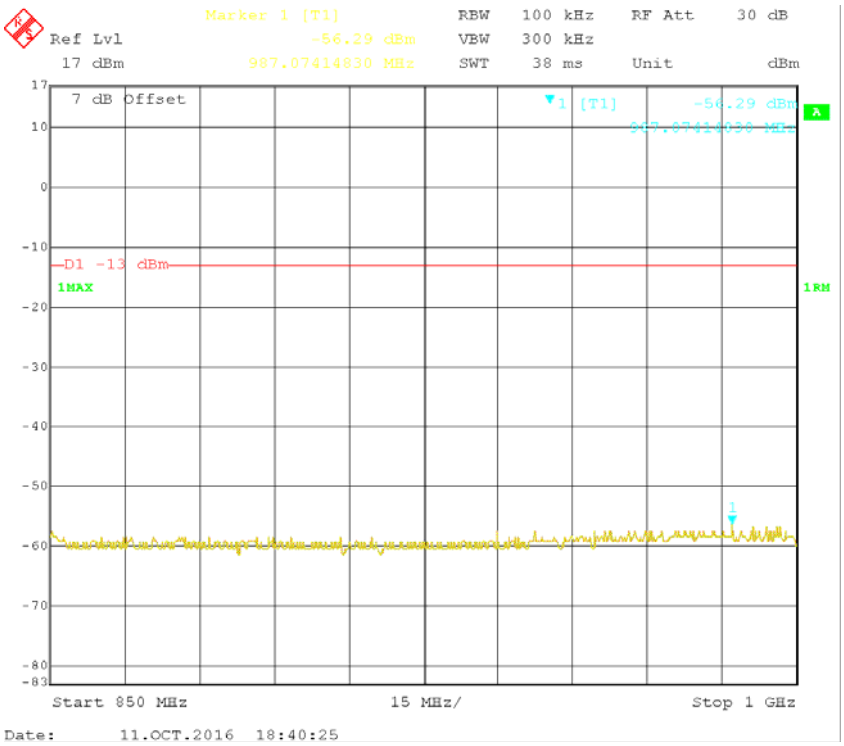
Cellular Band Lower Channel AWGN

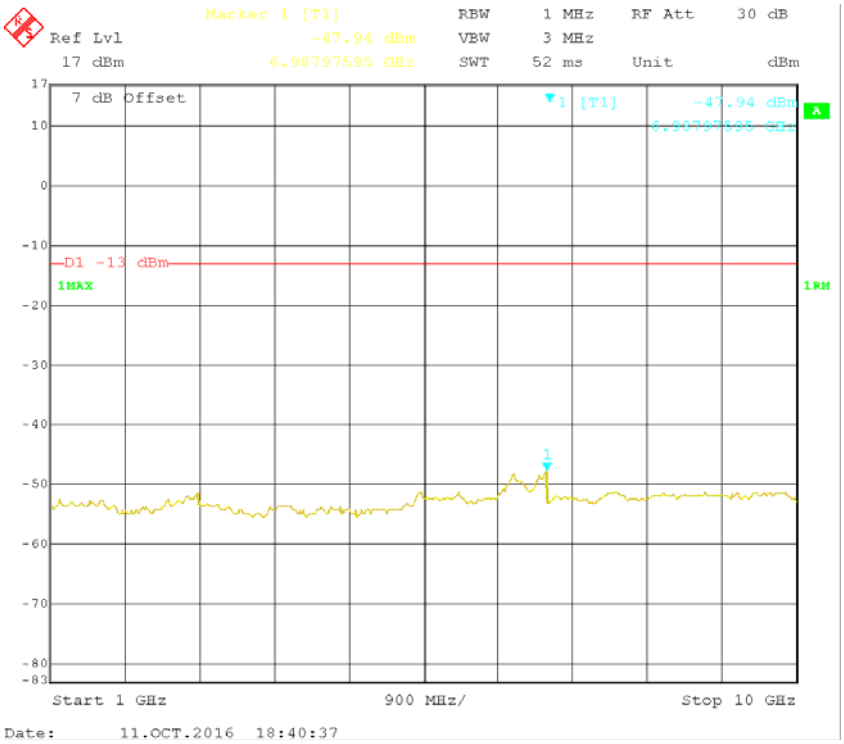




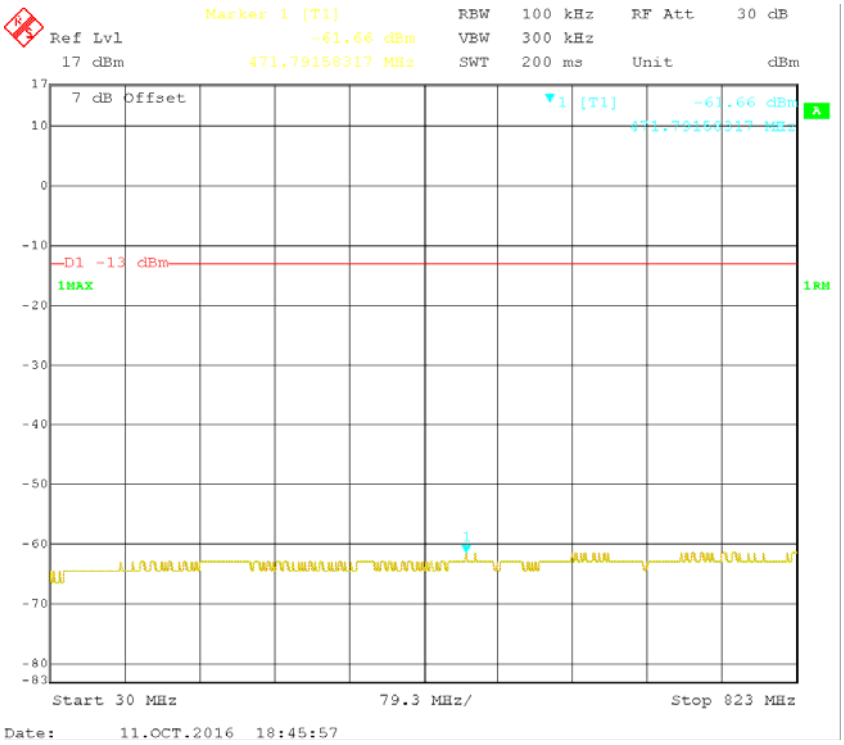
Cellular Band Middle Channel AWGN

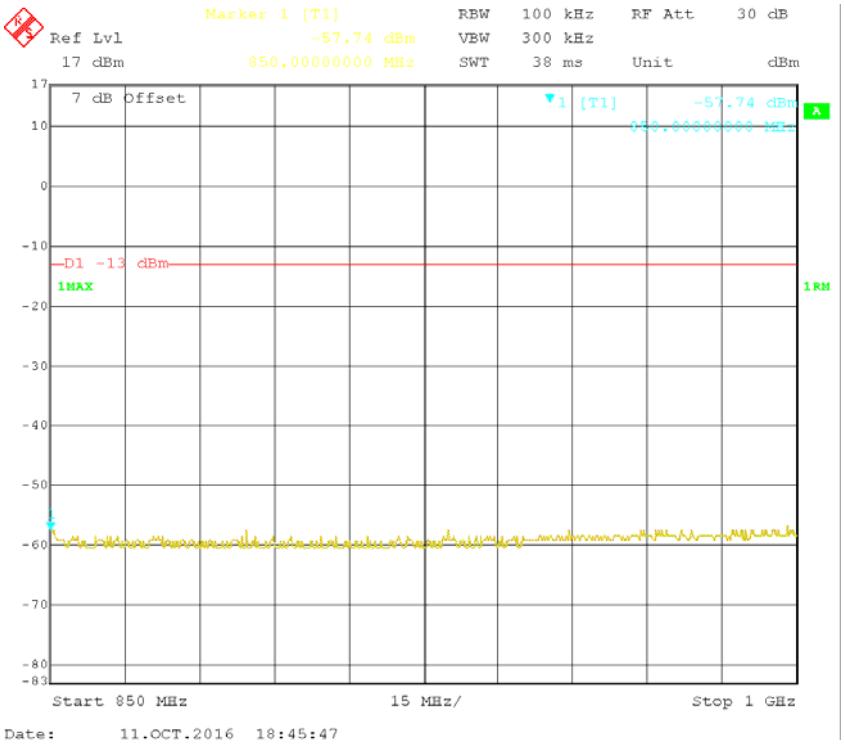


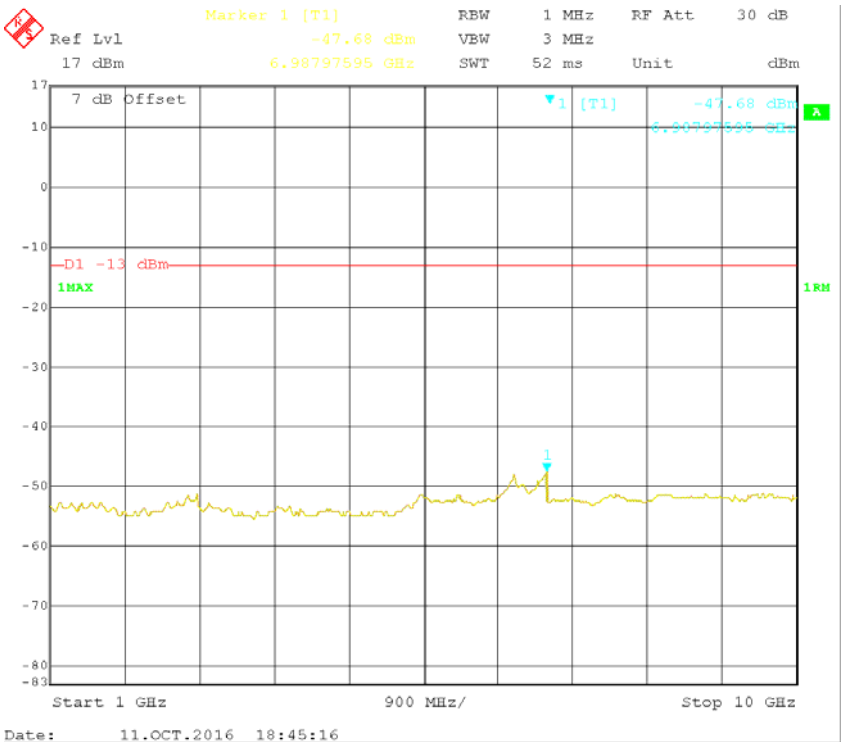

Marker 1 [T1]
Ref Lvl
17 dBm
RBW 100 kHz
VBW 300 kHz
SWT 38 ms
RF Att 30 dB
Unit dBm
7 dB Offset
1 [T1] -56.29 dBm
D1 -13 dBm
1MAX
1RM
Start 850 MHz
15 MHz/
Stop 1 GHz
Date: 11.OCT.2016 18:40:25


Marker 1 [T1]
Ref Lvl
17 dBm
RBW 1 MHz
VBW 3 MHz
SWT 52 ms
RF Att 30 dB
Unit dBm
7 dB Offset
1 [T1] -47.94 dBm
6.98797595 GHz
D1 -13 dBm
1MAX
1RM
Start 1 GHz
900 MHz/
Stop 10 GHz
Date: 11.OCT.2016 18:40:37

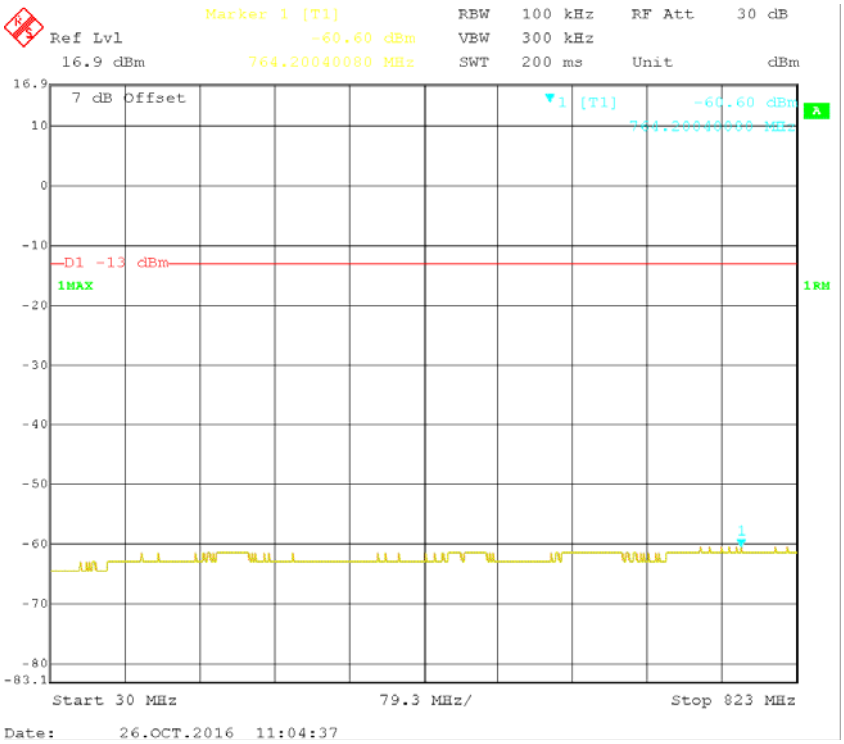
Cellular Band High Channel AWGN

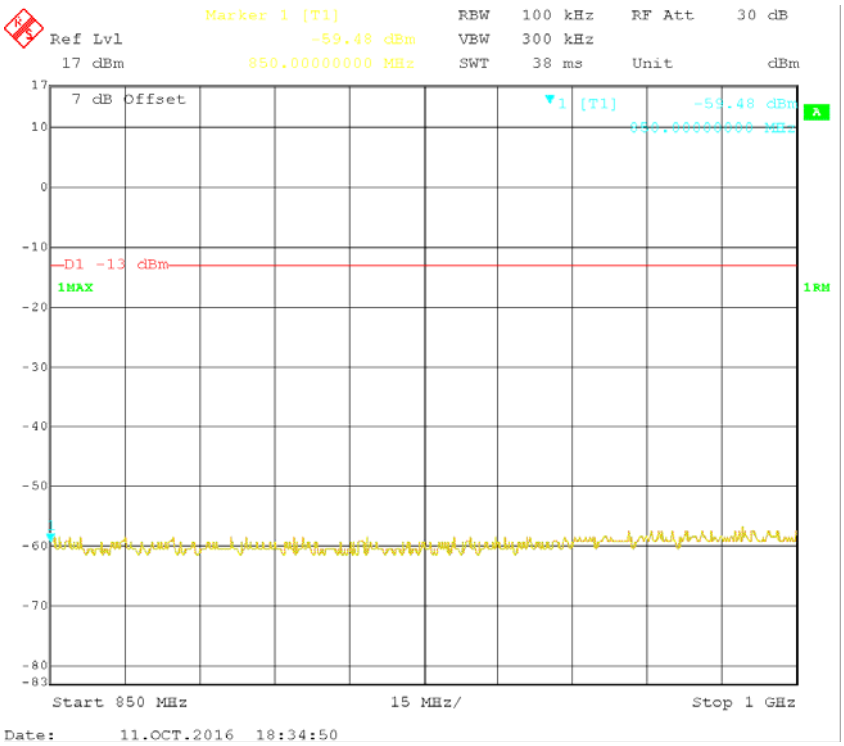


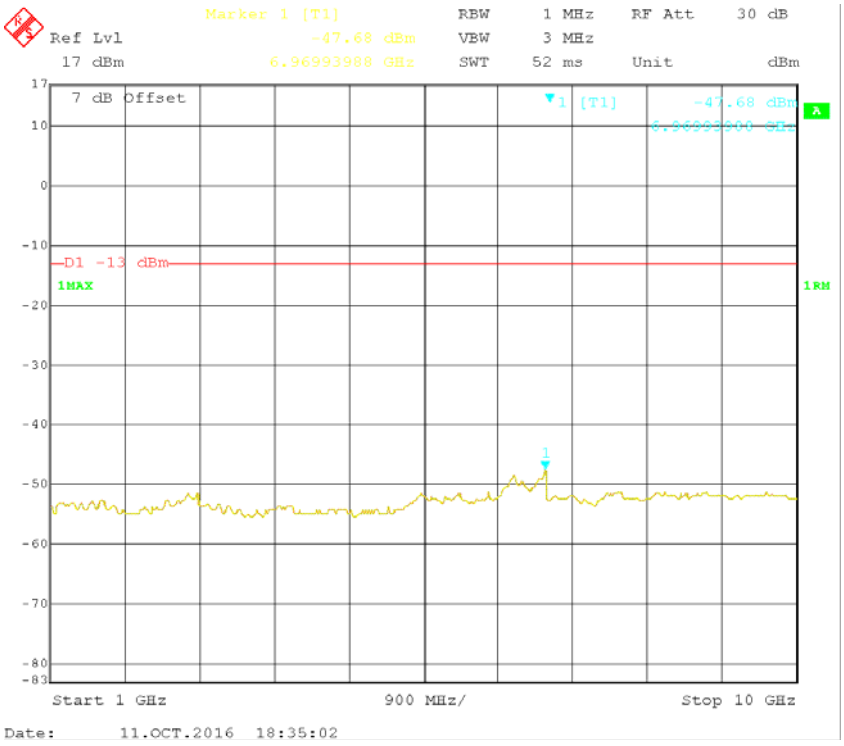




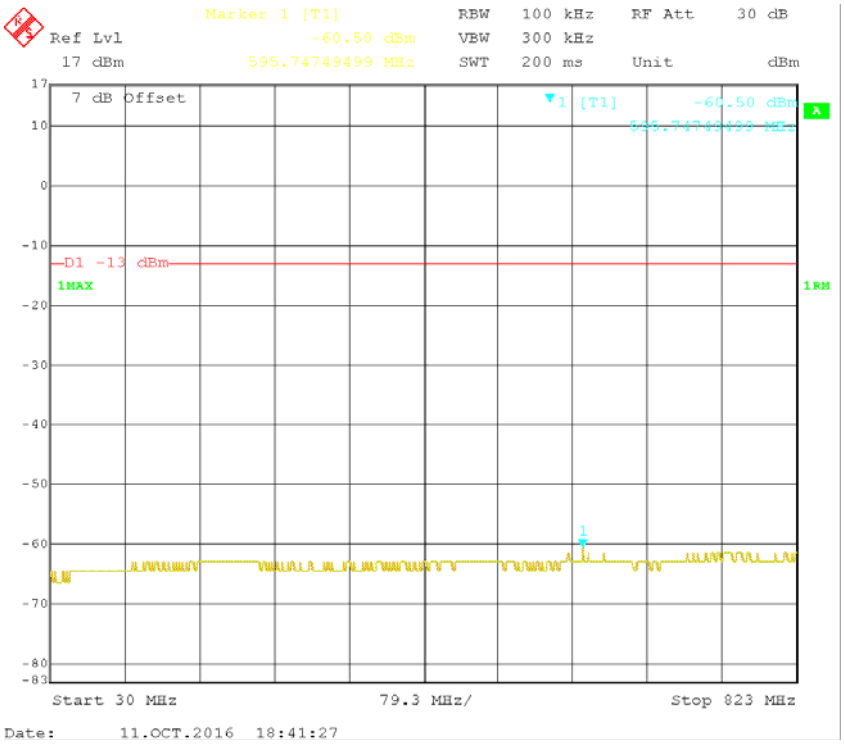
Cellular Band Lower Channel GSM

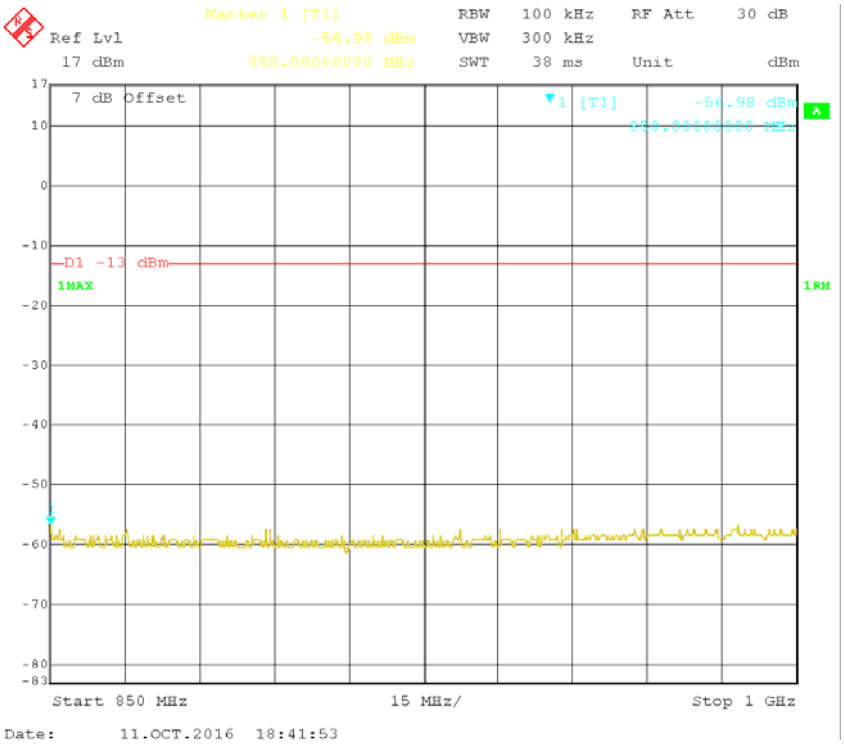


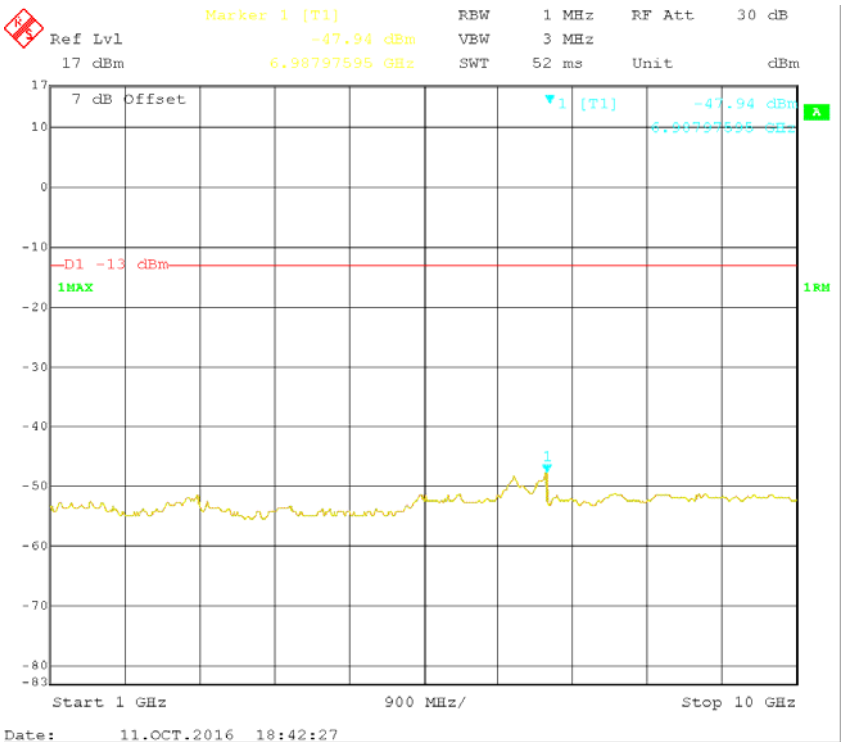

Marker 1 [T1]
Ref Lvl
17 dBm
-59.48 dBm
850.00000000 MHz
RBW 100 kHz
VBW 300 kHz
SWT 38 ms
RF Att 30 dB
Unit dBm
7 dB Offset
1 [T1] -59.48 dBm
850.00000000 MHz
D1 -13 dBm
1MAX
1RM
A
17
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-83
Start 850 MHz
15 MHz/
Stop 1 GHz
Date: 11.OCT.2016 18:34:50


Marker 1 [T1]
Ref Lvl
17 dBm
-47.68 dBm
6.96993988 GHz
RBW 1 MHz
VBW 3 MHz
SWT 52 ms
RF Att 30 dB
Unit dBm
7 dB Offset
1 [T1] -47.68 dBm
6.96993988 GHz
D1 -13 dBm
1MAX
1RM
A
17
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-83
Start 1 GHz
900 MHz/
Stop 10 GHz
Date: 11.OCT.2016 18:35:02

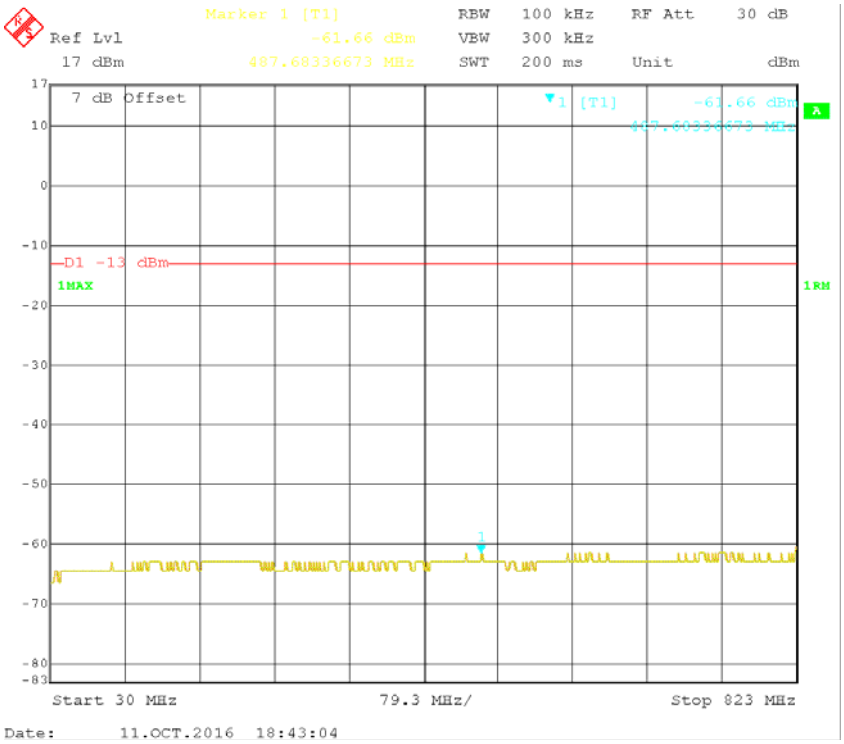
Cellular Band Middle Channel GSM

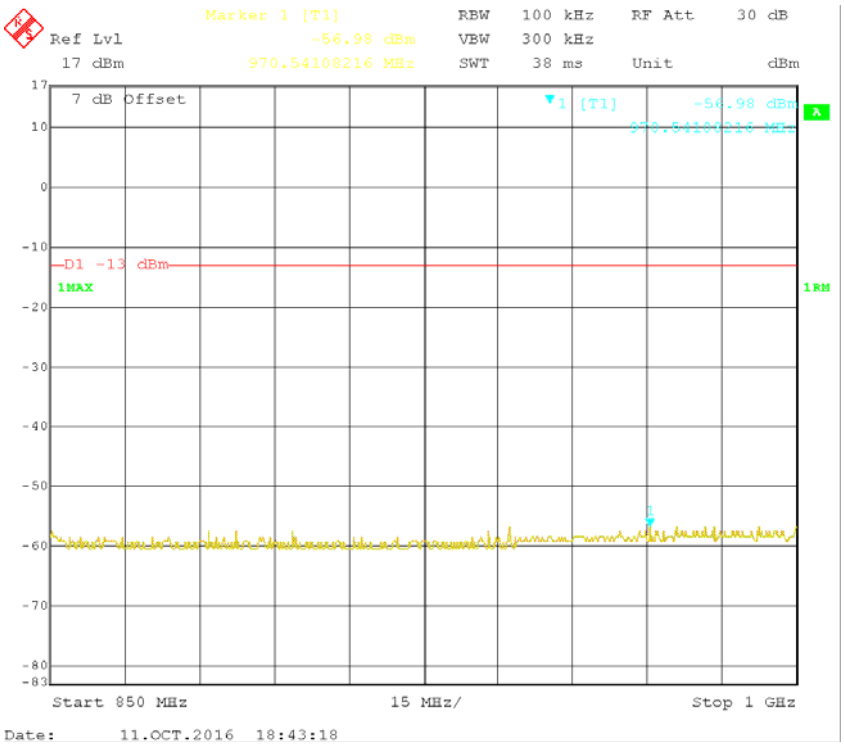


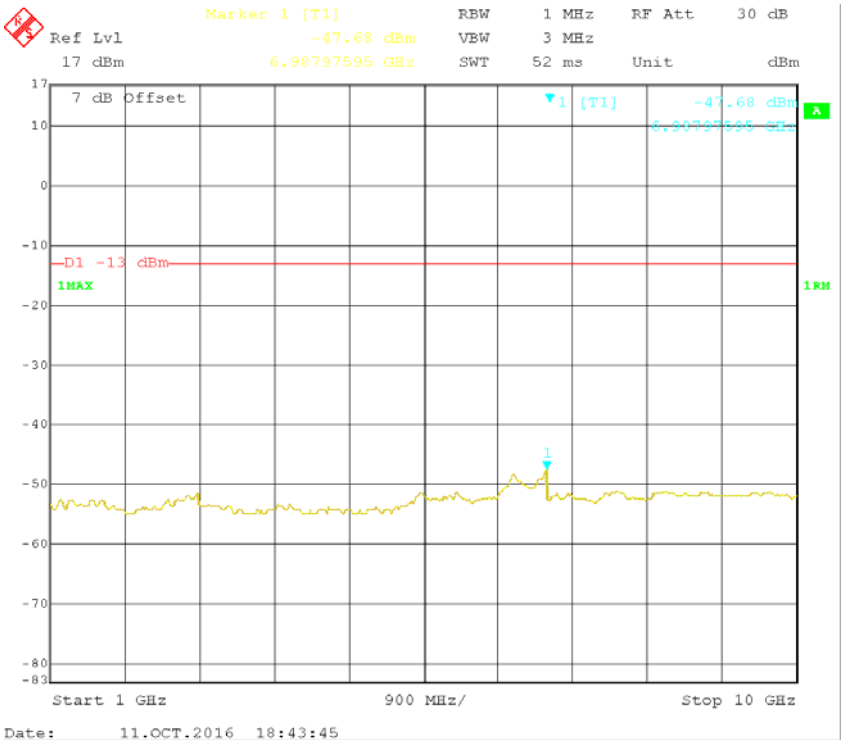




Cellular Band High Channel GSM

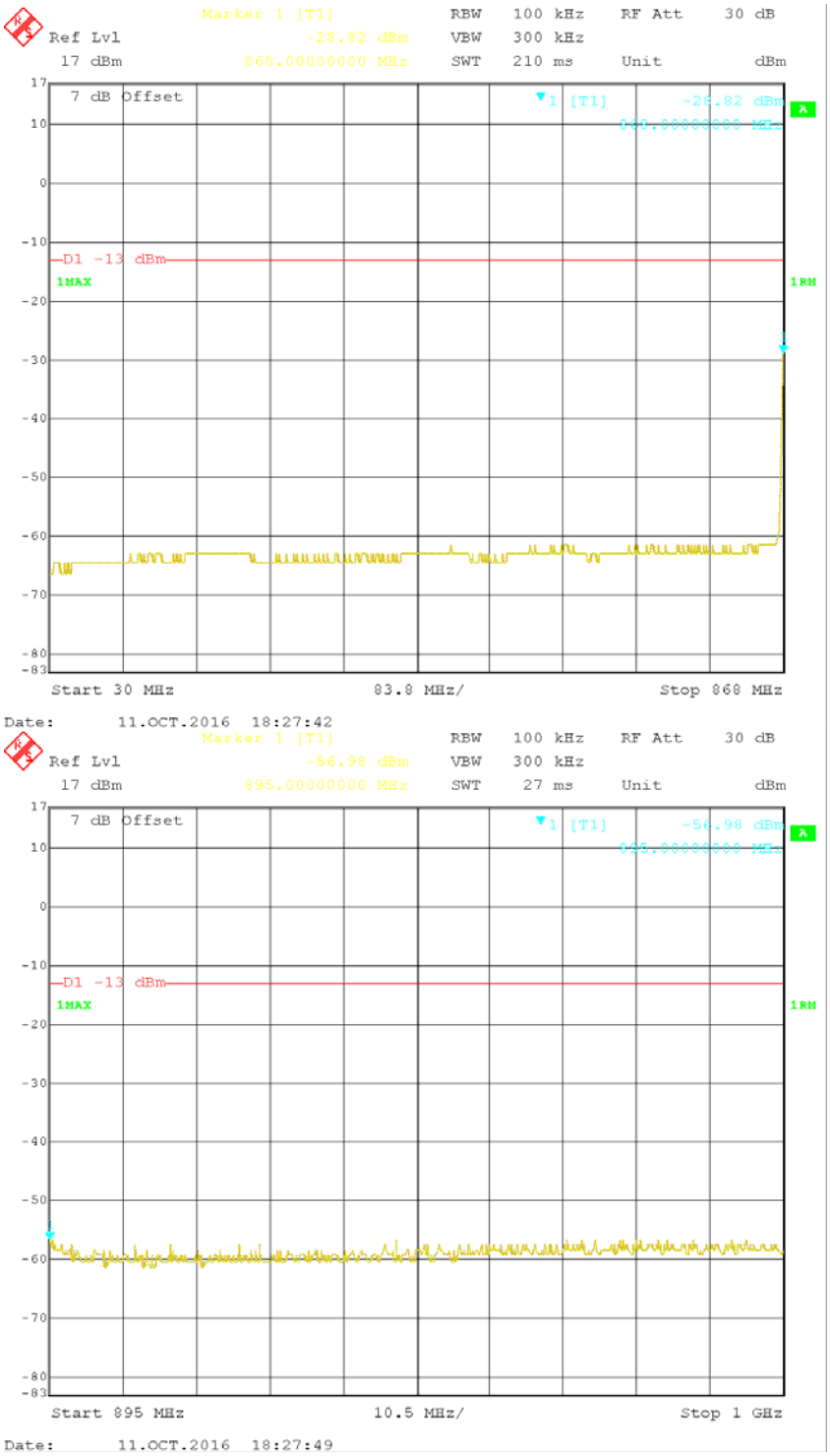


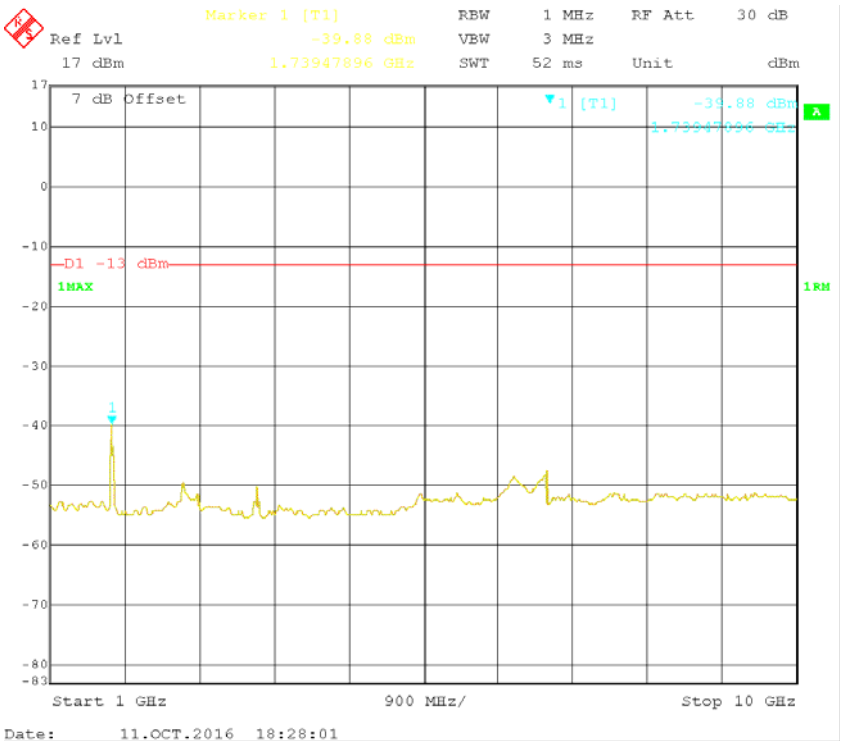

Marker 1 [T1]
Ref Lvl
17 dBm
970.54108216 MHz
RBW 100 kHz
VBW 300 kHz
SWT 38 ms
RF Att 30 dB
Unit dBm
7 dB Offset
1 [T1]
-56.98 dBm
970.54108216 MHz
D1 -13 dBm
1MAX
1RM
Start 850 MHz
15 MHz/
Stop 1 GHz
Date: 11.OCT.2016 18:43:18


Marker 1 [T1]
Ref Lvl
17 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
6.98797595 GHz
D1 -13 dBm
1MAX
1RM
Start 1 GHz
900 MHz/
Stop 10 GHz
Date: 11.OCT.2016 18:43:45

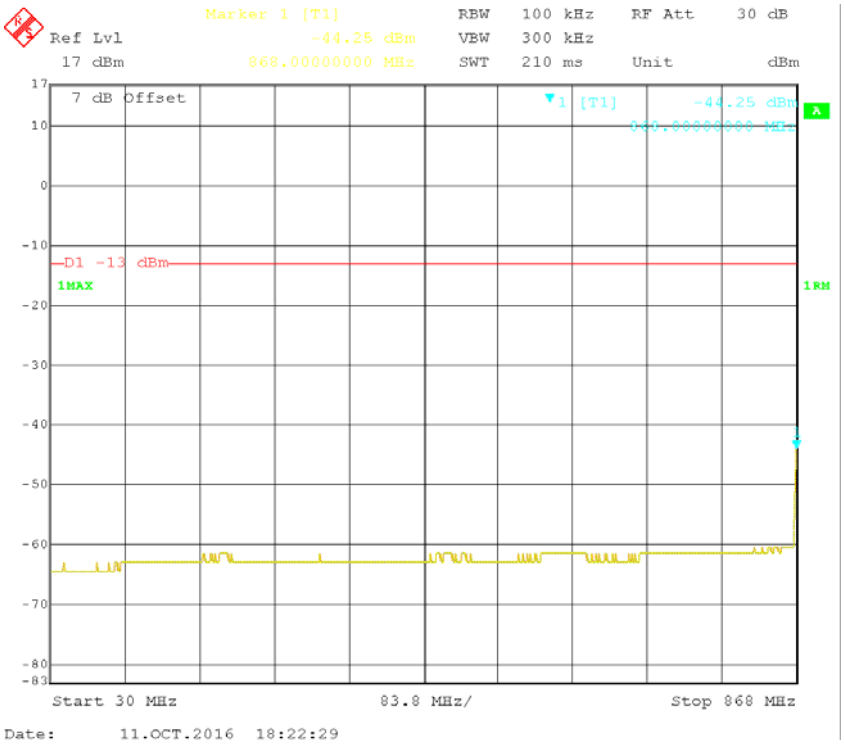
Downlink

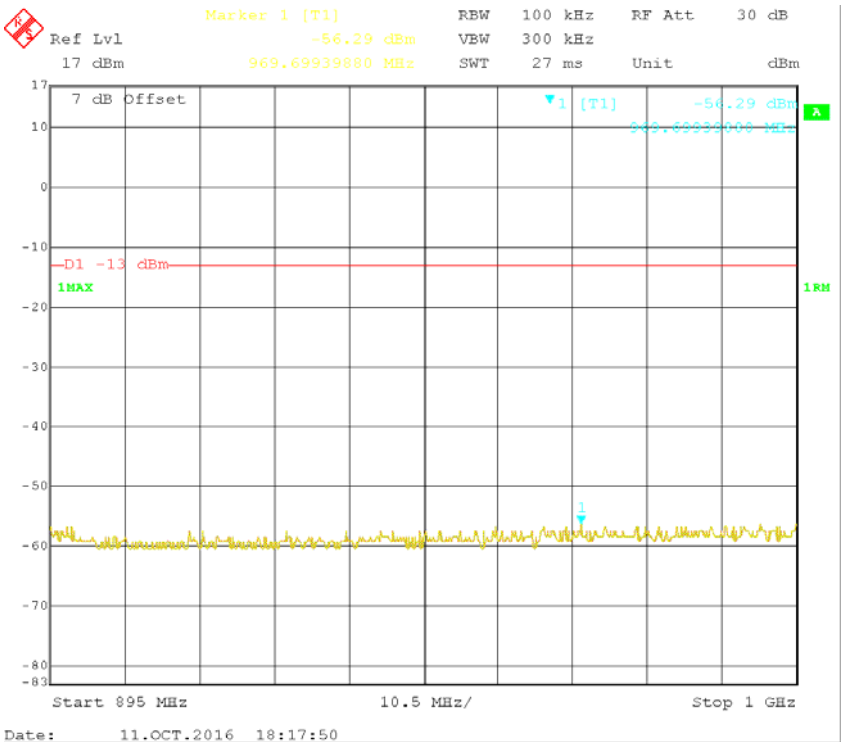
Cellular Band Lower Channel AWGN

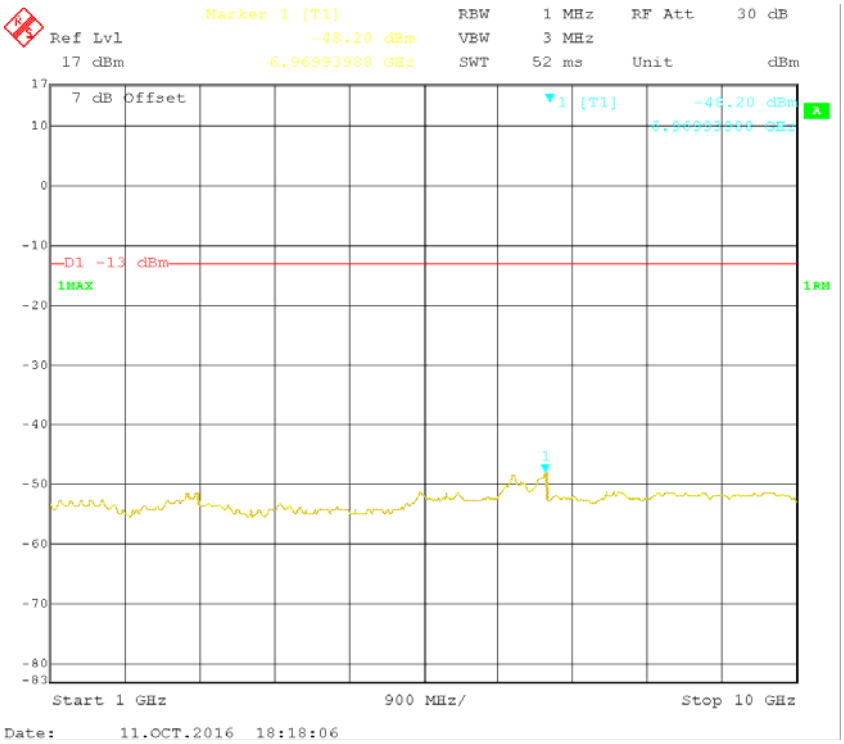




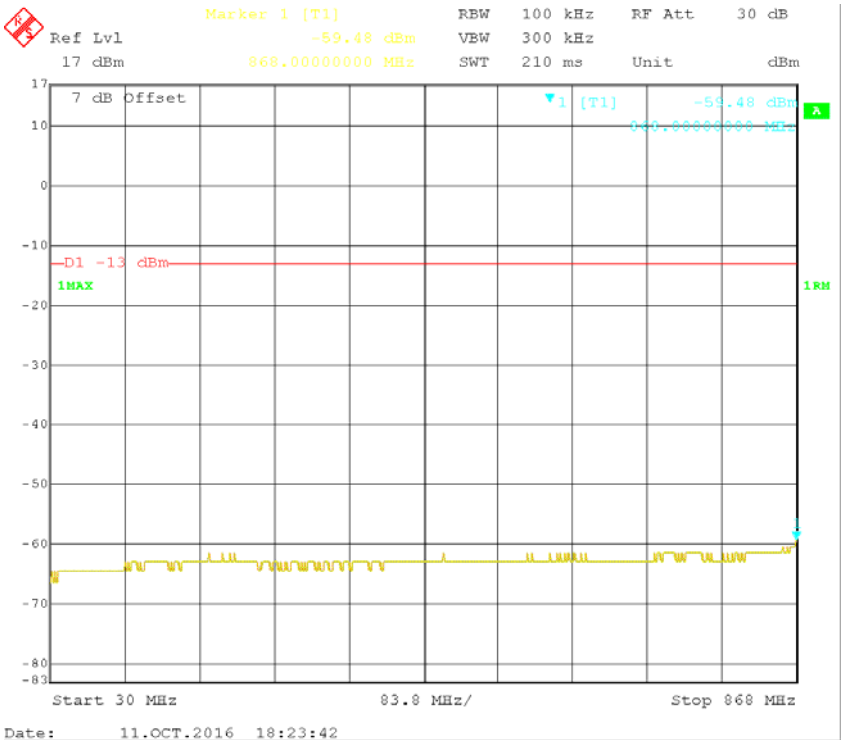
Cellular Band Middle Channel AWGN

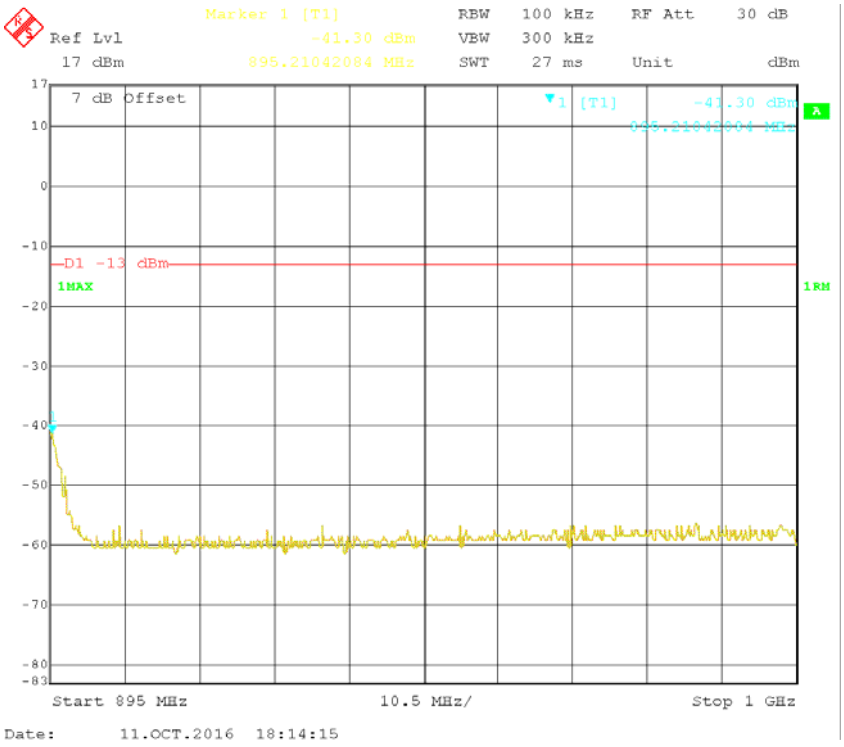


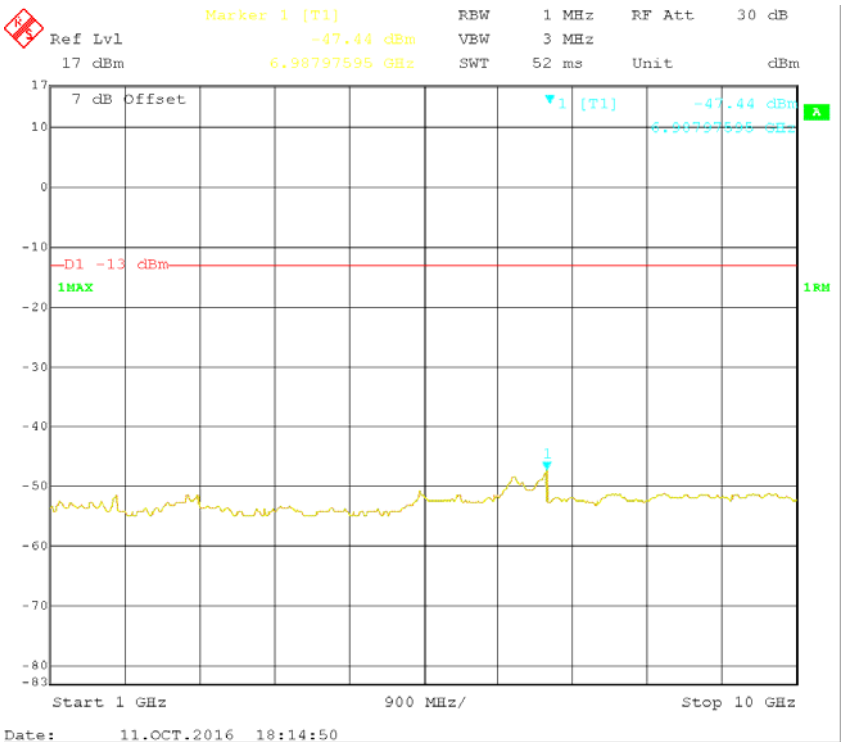

Marker 1 [T1]
Ref Lvl
17 dBm
-56.29 dBm
969.69939880 MHz
RBW 100 kHz
VBW 300 kHz
SWT 27 ms
RF Att 30 dB
Unit dBm
7 dB Offset
1 [T1] -56.29 dBm
D1 -13 dBm
1MAX
1RM
Start 895 MHz
10.5 MHz/
Stop 1 GHz
Date: 11.OCT.2016 18:17:50


Marker 1 [T1]
Ref Lvl
17 dBm
-48.20 dBm
6.96993988 GHz
RBW 1 MHz
VBW 3 MHz
SWT 52 ms
RF Att 30 dB
Unit dBm
7 dB Offset
1 [T1] -48.20 dBm
D1 -13 dBm
1MAX
1RM
Start 1 GHz
900 MHz/
Stop 10 GHz
Date: 11.OCT.2016 18:18:06

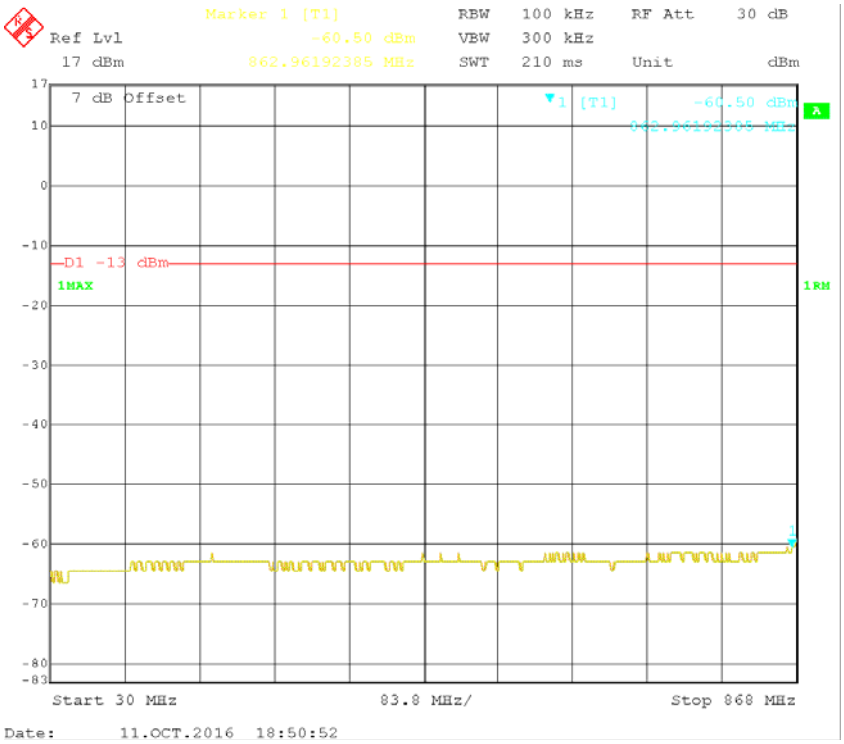
Cellular Band High Channel AWGN

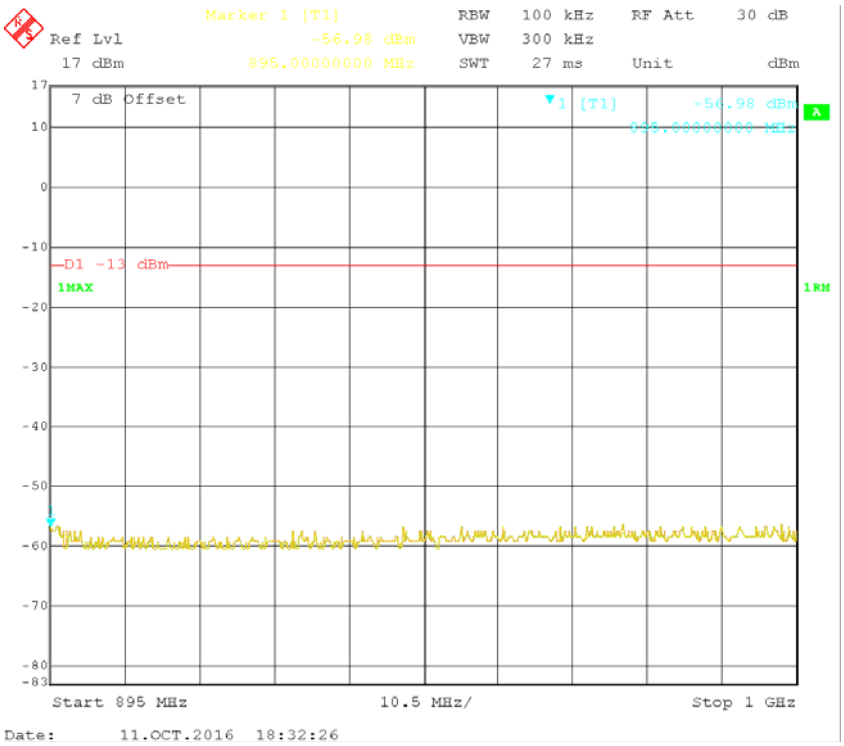


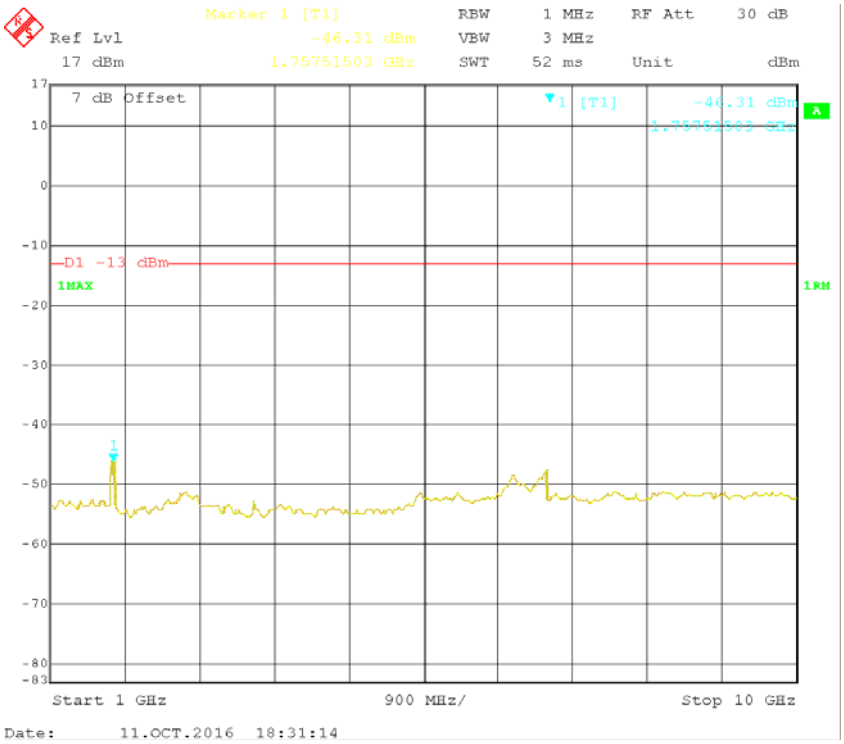




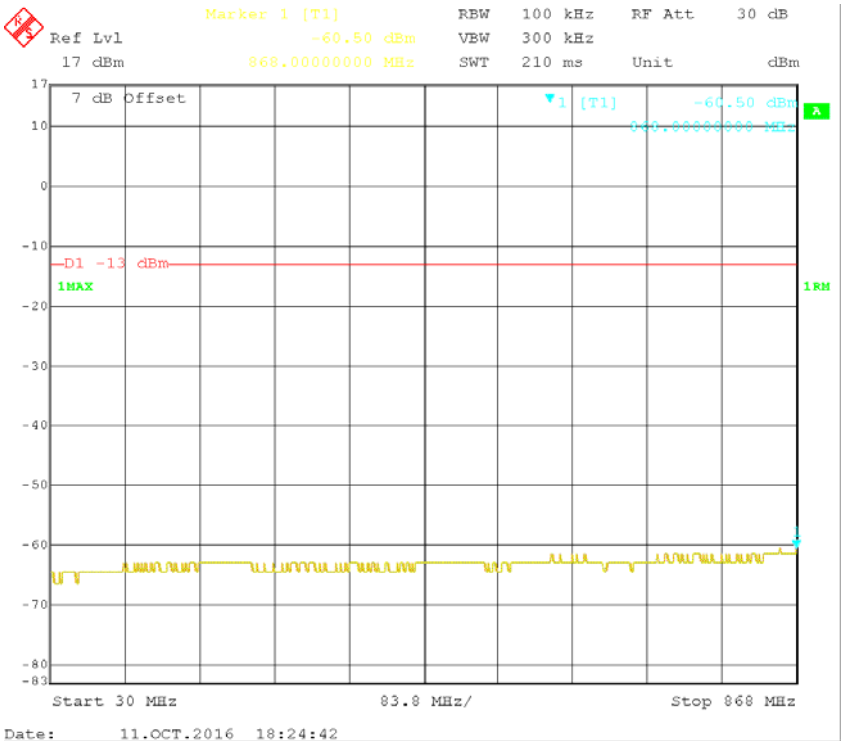
Cellular Band Low Channel GSM

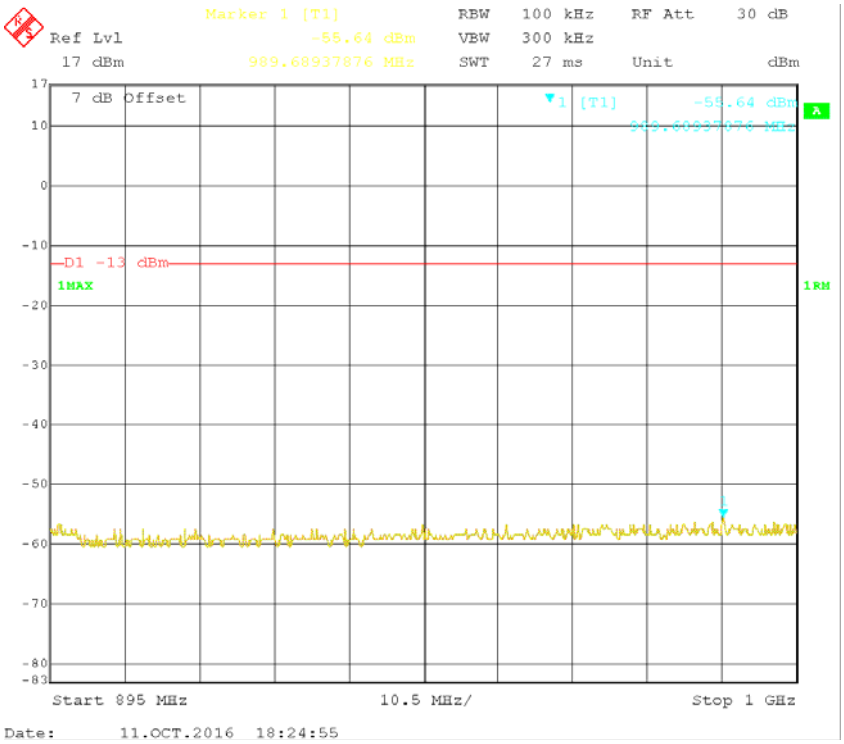


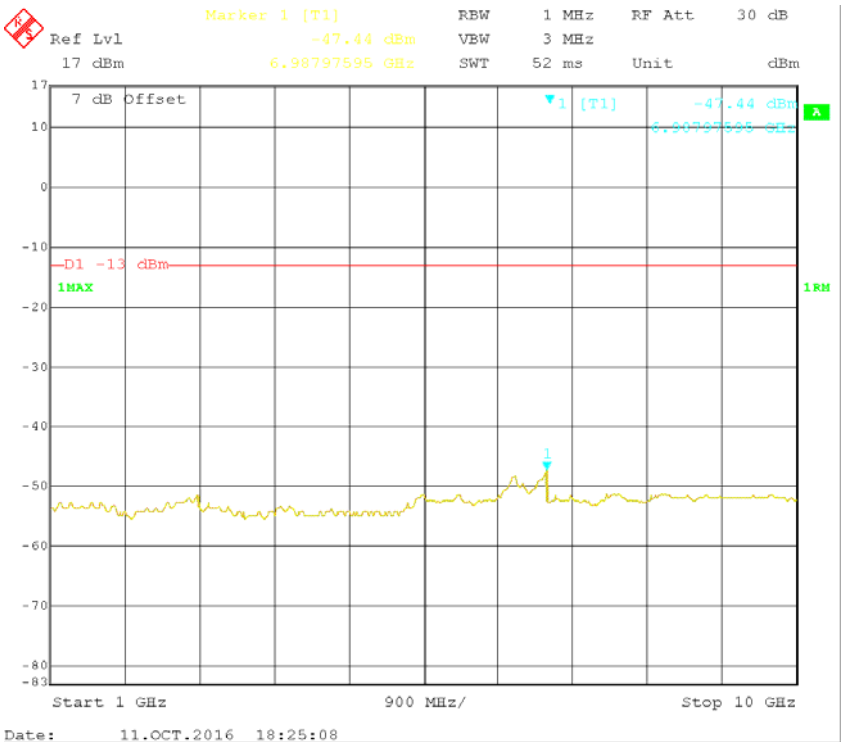

Marker 1 [T1]
Ref Lvl
17 dBm
-56.98 dBm
895.00000000 MHz
RBW 100 kHz
VBW 300 kHz
SWT 27 ms
RF Att 30 dB
Unit dBm
7 dB Offset
1 [T1]
-56.98 dBm
D1 -13 dBm
1MAX
1RM
Start 895 MHz
10.5 MHz/
Stop 1 GHz
Date: 11.OCT.2016 18:32:26


Marker 1 [T1]
Ref Lvl
17 dBm
-46.31 dBm
1.75751503 GHz
RBW 1 MHz
VBW 3 MHz
SWT 52 ms
RF Att 30 dB
Unit dBm
7 dB Offset
1 [T1]
-46.31 dBm
D1 -13 dBm
1MAX
1RM
Start 1 GHz
900 MHz/
Stop 10 GHz
Date: 11.OCT.2016 18:31:14

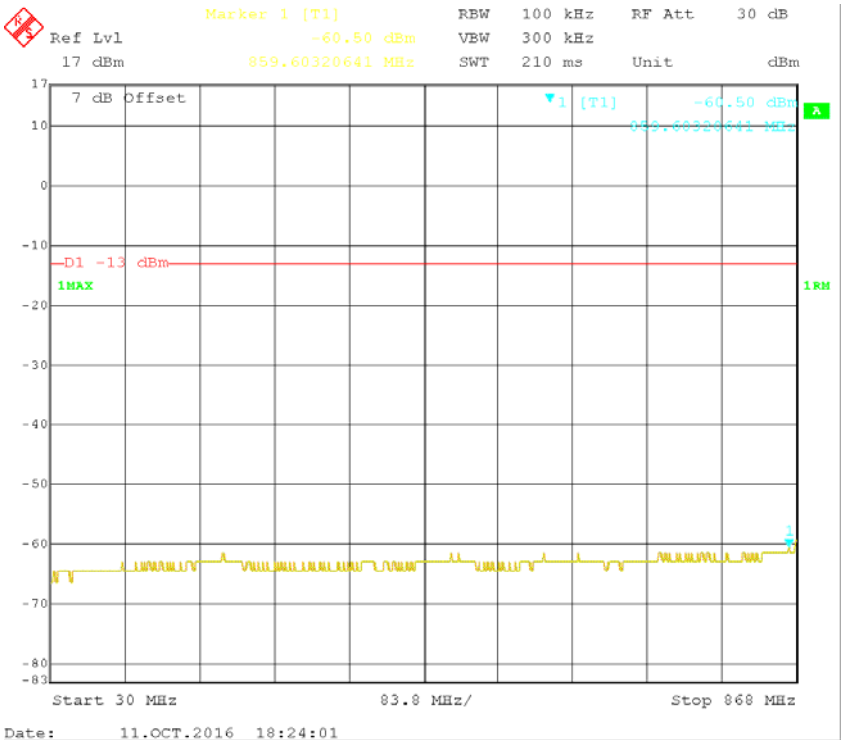
Cellular Band Middle Channel GSM

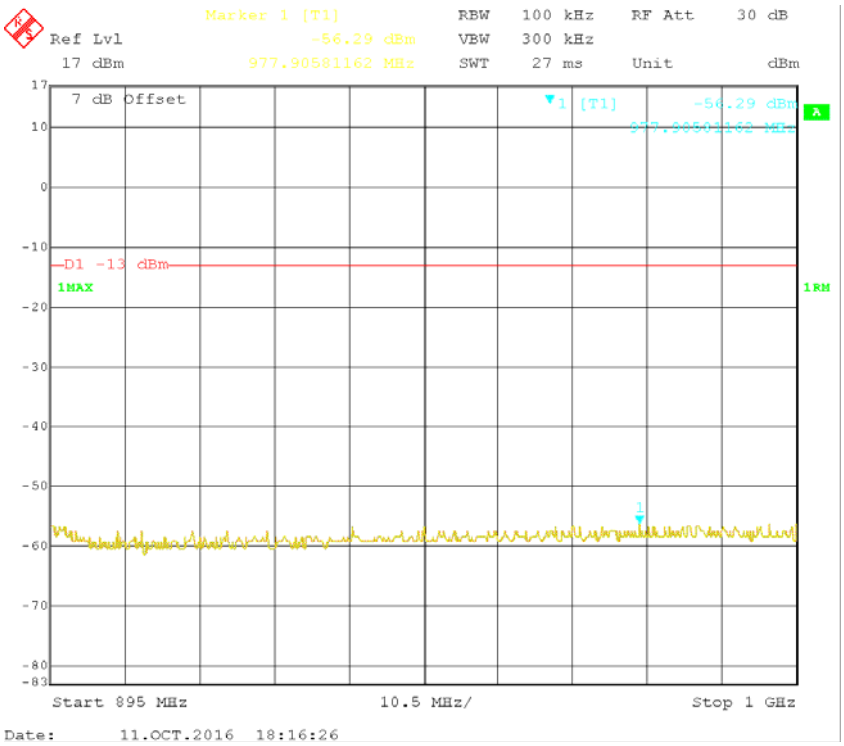


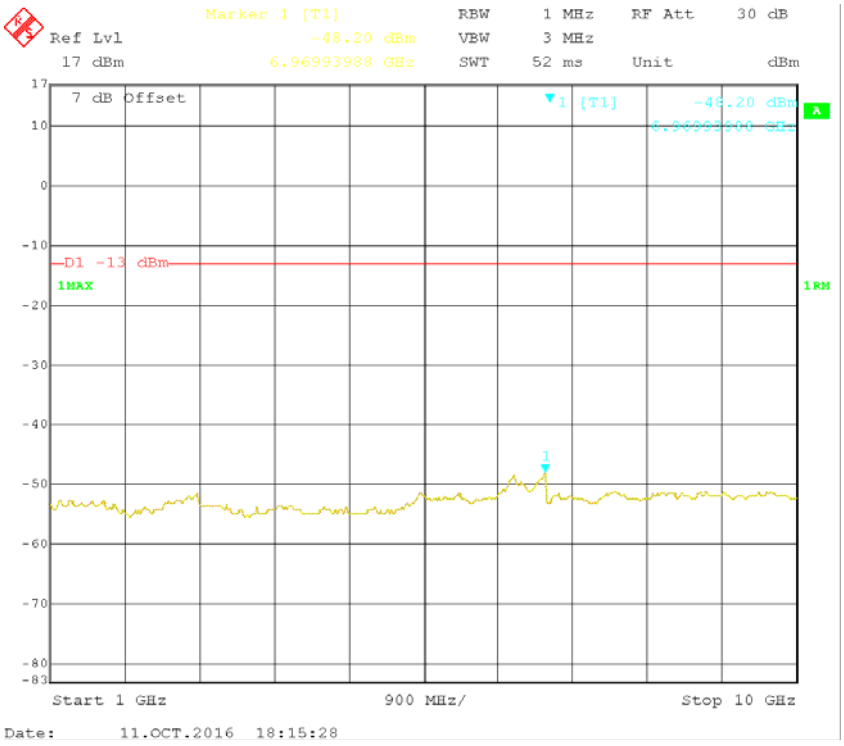




Cellular Band High Channel GSM




Marker 1 [T1]
Ref Lvl
17 dBm
977.90581162 MHz
-56.29 dBm
RBW 100 kHz
VBW 300 kHz
SWT 27 ms
RF Att 30 dB
Unit dBm
7 dB Offset
1 [T1]
-56.29 dBm
977.90581162 MHz
D1 -13 dBm
1MAX
1RM
A
17
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-83
Start 895 MHz
10.5 MHz/
Stop 1 GHz
Date: 11.OCT.2016 18:16:26


Marker 1 [T1]
Ref Lvl
17 dBm
6.96993988 GHz
-48.20 dBm
RBW 1 MHz
VBW 3 MHz
SWT 52 ms
RF Att 30 dB
Unit dBm
7 dB Offset
1 [T1]
-48.20 dBm
6.96993988 GHz
D1 -13 dBm
1MAX
1RM
A
17
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-83
Start 1 GHz
900 MHz/
Stop 10 GHz
Date: 11.OCT.2016 18:15:28

§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	2015-10-16	2016-10-15
Mini-circuits	Amplifier	ZVA-213-S+	771001215	2016-5-20	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 2016-10-11.

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	35.26	-67.9	7.9	0.8	-60.8	-13.0	47.8
1673	V	35.56	-65.8	7.9	0.8	-58.7	-13.0	45.7
2509.5	H	33.49	-66.3	8.9	1.3	-58.7	-13.0	45.7
2509.5	V	32.25	-65.3	8.9	1.3	-57.7	-13.0	44.7
824	H	25.83	-78.8	0.0	0.6	-79.4	-13.0	66.4
824	V	24.76	-78.8	0.0	0.6	-79.4	-13.0	66.4
Downlink, Test Frequency 881.500MHz								
1763	H	47.22	-54.2	8.0	0.9	-47.1	-13.0	34.1
1763	V	43.08	-57	8.0	0.9	-49.9	-13.0	36.9
2644.5	H	49	-50.4	8.8	1.2	-42.8	-13.0	29.8
2644.5	V	42.83	-55.2	8.8	1.2	-47.6	-13.0	34.6
484	H	25.6	-85.2	0.0	0.4	-85.6	-13.0	72.6
484	V	23.06	-86	0.0	0.4	-86.4	-13.0	73.4

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

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