FCC PART 20.21

MEASUREMENT AND TEST REPORT

For

Foshan Amplitec Tech Development Co.,Ltd

4 th Floor, 4 th Building，NO.60 of Langbao West Road，
Chancheng District，Foshan City，Guangdong Province，China.

FCC ID: 2AJULC10G-CP

Report Type:	**Product Type:**
Original Report	Repeater

Test Engineer:	Kevin Hu
Report Number:	RSC160118006A
Report Date:	2016-09-01
Reviewed By:	Henry Ding EMC Leader
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Chengdu) 5040, HuiLongWan Plaza, No. 1, ShaWan Road, JinNiu District, ChengDu, China Tel: 028-65525123, Fax: 028-65525125 www.baclcorp.com

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Foshan Amplitec Tech Development Co.,Ltd*'s product, model number: *C10G-CP (FCC ID: 2AJULC10G-CP)* or the "EUT" as referred to in this report is a *Repeater,*

Radio System Type	Wide Band Consumer Signal Booster
Frequency Bands	Cellular: 824-849MHz (Uplink), 869-894MHz(Downlink) PCS: 1850-1910MHz(Uplink), 1930-1990MHz(Downlink)
Gain	Uplink: 60±2 dB Downlink: 60±2 dB
AGC Level	Uplink: -43 dBm Downlink: -60 dBm
Output Power (Antenna Port)	Uplink: 19±2dBm Downlink: 0±2dBm
Max. Antenna Gain:	Uplink:10dBi Downlink:10dBi
Nominal Power Supply:	DC 5V from adapter
Physical Size:	139.5 mm (L) x 89.5 mm (W) x 21 mm (H)
Temperature Range	-10℃ to 55℃

**All measurement and test data in this report was gathered from final production sample, serial number: 160118006/01 (assigned by the BACL, Chengdu). It may have deviation from any other sample. The EUT supplied by the applicant was received on 2016-01-18, and EUT conformed to test requirement.*

Objective

This type approval report is prepared on behalf of *Foshan Amplitec Tech Development Co.,Ltd.* in accordance with Part 2, Part 20.21, Part 22, part 24 of the Federal Communication Commissions rules.

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:

Measurement Procedure: TIA/EIA 603-D. KDB 935210 D03 Signal Booster Measurements v04.

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

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 and KDB 935210 D03 v04.

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

Equipment Modifications

No modifications were made to the EUT.

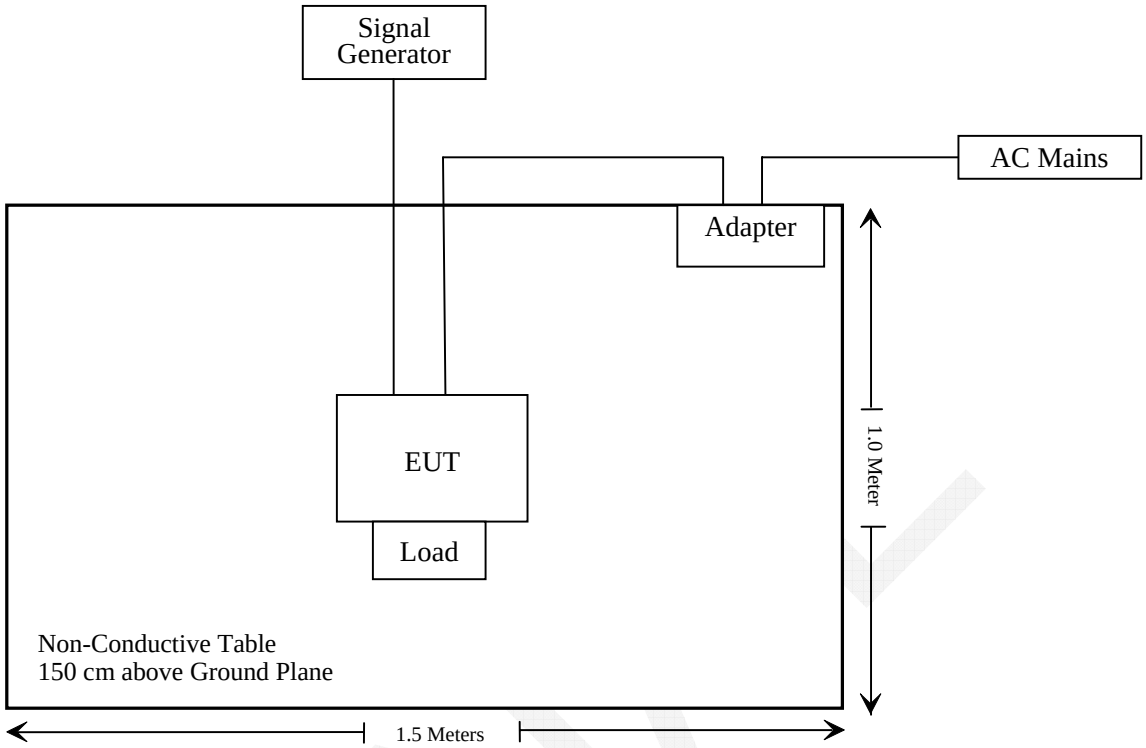
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
HP	Digital Signal Generator	ESG-D3000A	US36260285
R&S	Universal Radio Communication Tester	CMU200	11-9435686-0111

External Cable

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
Adapter Cable	no	no	1.0	Adapter	EUT
RF Coaxial Cable	yes	no	1.0	Signal generator	EUT

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	KDB 935210 D03 procedures	Result
§20.21(e)(3) Frequency Bands	§7.1 Authorized frequency band verification test	Compliant
§20.21(e)(8)(i)(A) Noise Limits §20.21(e)(8)(i)(H)Transmit Power Off Mode §20.21(e)(4) Self-monitoring	§7.7 Noise limits test procedure	Compliant
§20.21(e)(8)(i)(B) Bidirectional Capability §20.21(e)(3) Frequency Bands	§7.13 Spectrum block filtering test procedure	Not Applicable[Note4]
§20.21(e)(8)(i)(C)(1) Booster Gain Limits §20.21(e)(8) (i)(H)Transmit Power Off mode §20.21(e)(4) Self-monitoring	§7.9 Variable booster gain test procedure	Compliant
§20.21(e)(8)(i)(C)(2) Booster Gain Limits §20.21(e)(8) (i)(B)Bidirectional Capability	§7.3 Maximum booster gain computation	Compliant
§20.21(e)(8)(i)(D)Power Limits §20.21(e)(8) (i)(B)Bidirectional Capability §20.21(e)(4) Self-monitoring	§7.2 Maximum power measurement test procedure	Compliant
§20.21(e)(8)(i)(E)Out Of Band Emission Limits	§7.5 Out-of-band emissions test procedure	Compliant
§20.21(e)(8)(i)(F)Intermodulation Limits	§7.4 Intermodulation product test procedure	Compliant
§20.21(e)(8)(i)(G)Booster Antenna Kitting	Note1	Compliant
§20.21(e)(8)(i)(H)Transmit Power Off Mode	Note2	Compliant
§20.21(e)(8)(i)(I)Uplink Inactivity §20.21(e)(4) Self-monitoring	§7.8 Uplink inactivity test procedure	Compliant
§20.21(e)(8)(ii)(A)Anti-Oscillation §20.21(e)(4) Self-monitoring	§7.11 Oscillation detection test procedure	Compliant
§20.21(e)(8)(ii)(B)Gain Control	Note3	Compliant
§2.1049 Measurements Required: Occupied Bandwidth	§7.10 Occupied bandwidth test procedure	Compliant
§2.1051 Measurements Required: Spurious emissions at antenna terminals	§7.6 Conducted spurious emissions test procedure	Compliant
§2.1053 Measurements Required: Field strength of spurious radiation	§7.12 Radiated spurious emissions test procedure	Compliant

Note:

1. Generic testing requirements are not established; rather technical documentation is used describing all antennas, cables, and/or coupling devices that may be used with a consumer booster and how those meet the requirements.
2. There is no specific test for this functionality but it is instead addressed through a combination of the variable noise, variable gain, and oscillation detection tests.
3. Conformance to the requirement to include AGC circuitry is verified in 7.1 and 7.2.
4. The rest is required only for wideband consumer boosters utilizing spectrum block filtering.

§ 20.21(E)(3) – AUTHORIZED FREQUENCY BAND VERIFICATION

Applicable Standard

According to§ 20.21(e)(3) Frequency Bands

This test is intended to confirm that the signal booster only operates on the CMRS frequency bands authorized for use by the NPS. In addition, this test will identify the frequency at which the maximum gain is realized within each CMRS operational band, which then serves as a basis for subsequent tests.

Test Procedure

a) Connect the EUT to the test equipment as shown in Figure 1. Begin with the uplink output connected to the spectrum analyzer.
b) Set the spectrum analyzer RBW for 100 kHz with the VBW ≥ 3 × the RBW using a PEAK detector with the MAX HOLD function.
c) Set the center frequency of the spectrum analyzer to the center of the operational band under test with a span of 1 MHz.
d) Set the signal generator for CW mode and tune to the center frequency of the operational band under test.
e) Set the initial signal generator power to a level that is at least 6 dB below the AGC level specified by the manufacturer.
f) Slowly increase the signal generator power level until the output signal reaches the AGC operational level.
g) Reduce the signal generator power to a level that is 3 dB below the level noted above and manually reset the EUT.
h) Reset the spectrum analyzer span to 2 × the CMRS band under test. Adjust the tuned frequency of the signal generator to sweep 2 × the CMRS band using the sweep function. The AGC must not be activated throughout the entire sweep.
i) Using three markers, identify the CMRS band edges and the frequency with the highest power. Affirm that the values of all markers are visible on the display of the spectrum analyzer (e.g., marker table set to on).
j) Capture the spectrum analyzer trace for inclusion in the test report.
k) Repeat 7.1c) to 7.1j) for all operational uplink and downlink bands.

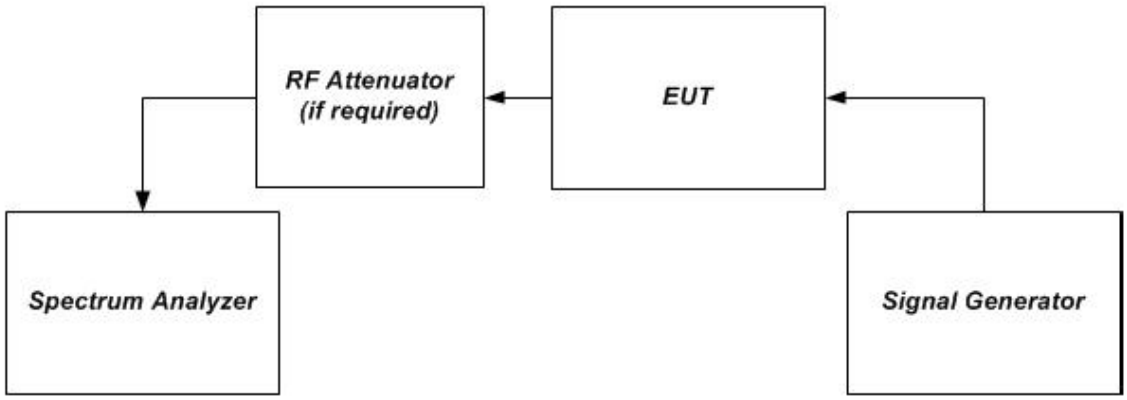


Figure 1 – Band verification test instrumentation setup

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Spectrum Analyzer	FSL18	100180	2015-12-02	2016-12-01
Agilent	Digital Signal Generator	ESG-D3000A	US36260285	2016-03-28	2017-03-27
E-Microwave	DC Block	EMDCB-00036	OE01304225	2015-12-09	2016-12-08
WEINSCHEL ENGINEERING	Attenuator(10dB)	N/A	AB1166	2015-12-09	2016-12-08
N/A	RF Coaxial Cable	LE-001-4	N/A	2015-12-09	2016-12-08

*** 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

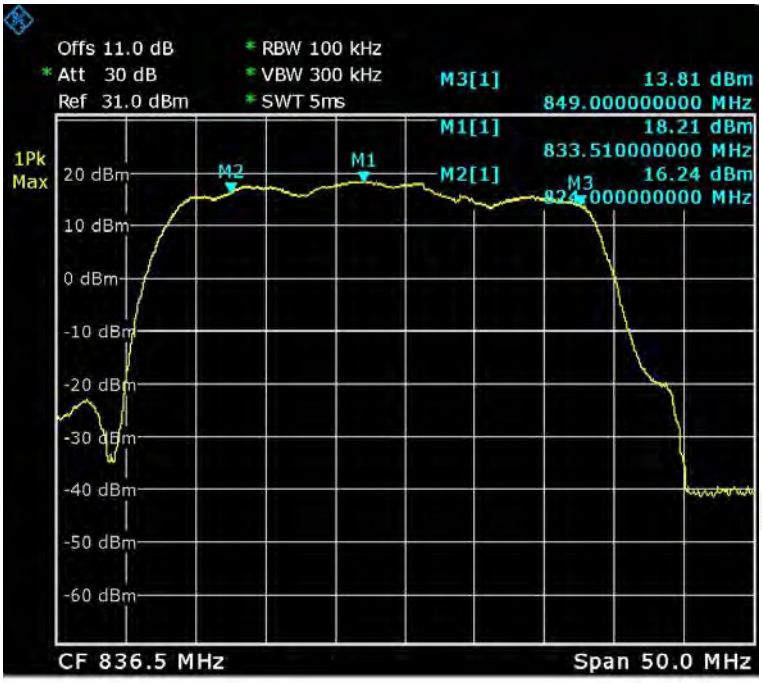
Temperature:	25.7℃
Relative Humidity:	54%
ATM Pressure:	100.2 kPa

The testing was performed by Kevin Hu on 2016-05-27.

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

Uplink:

Cellular Band



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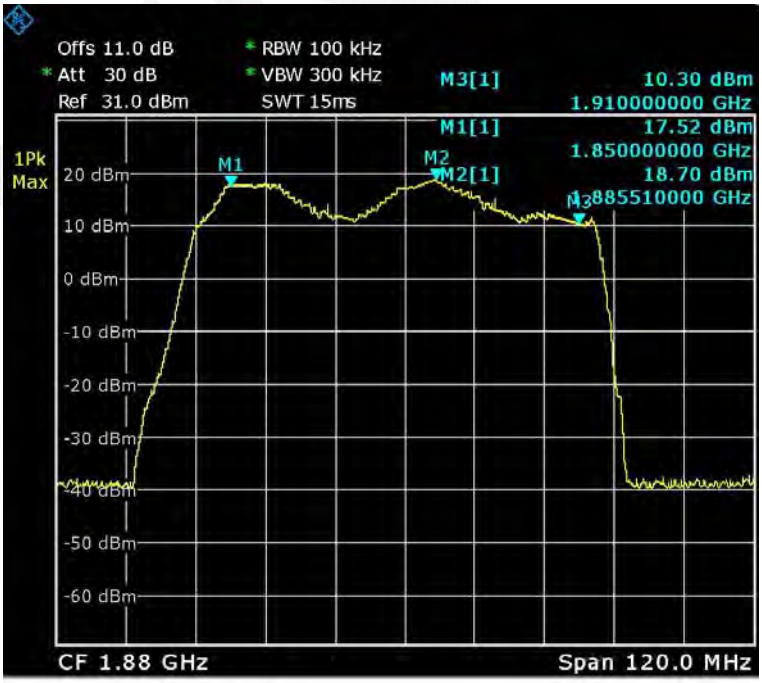

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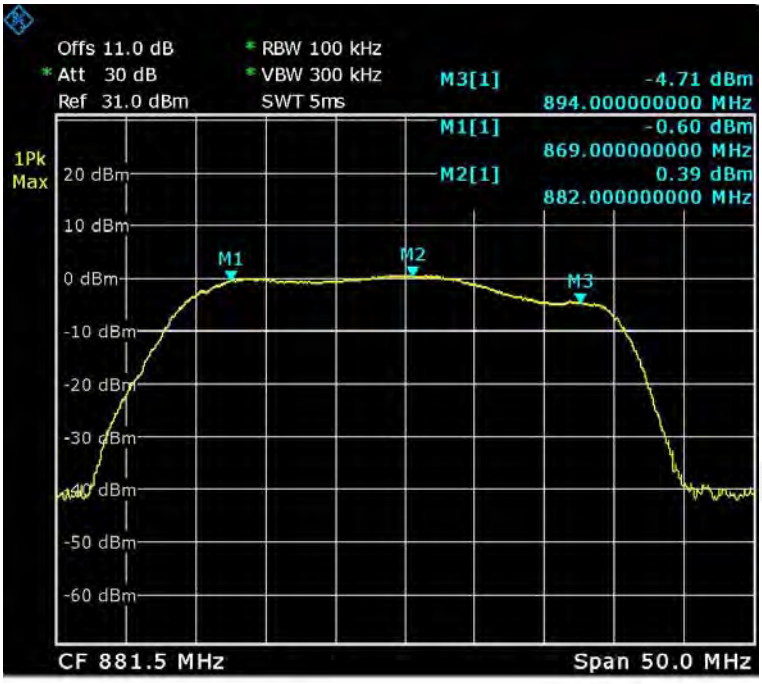
Downlink:

Cellular Band



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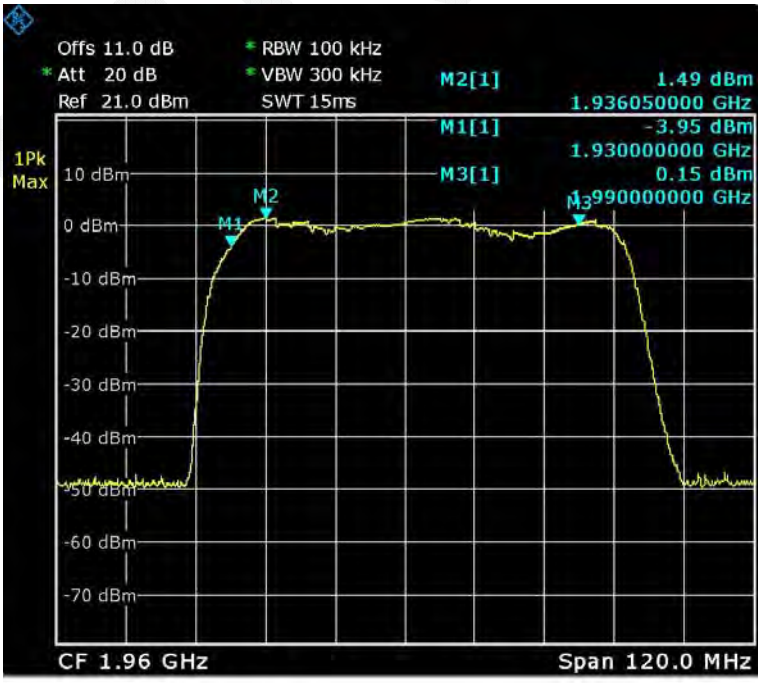
PCS Band



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§ 20.21(e)(8)(i)(D) ,§ 20.21(e)(8)(i)(B)& §20.21(e)(4)– MAXIMUM POWER MEASUREMENT

Applicable Standard

According to§ 20.21(e)(8)(i)(D) Power Limits; § 20.21(e)(8)(i)(B) Bidirectional Capability (uplink minimum conducted power output); §20.21(e)(4) Self-monitoring.

This procedure shall be used to demonstrate compliance to the signal booster power limits and requirements as specified in §§ 20.21(e)(8)(i)(D) and 20.21(e)(8)(i)(B) for wideband consumer signal boosters.

a) Compliance to authorized EIRP limits must be shown using the highest gains from the list of antennas, cabling, and coupling devices declared by the manufacturer for use with the consumer booster.
b) In addition, the maximum power levels measured in this procedure will be utilized in calculating the maximum gain as described in the next subclause.
c) The frequency with the highest power level in each operational band as determined in 7.1 is to be measured discretely by applying the following procedure utilizing the stated emission and power detector types independently.
d) Use a signal generator to create a pulsed CW or GSM signal with a pulse width of 570 µs and a duty cycle of 12.5% (i.e., one GSM timeslot), then measure utilizing the burst power function of the measuring instrument.
e) Use a signal generator to create an AWGN signal with a 99% occupied bandwidth of 4.1 MHz, then measure utilizing the channel power or band power function of the measuring instrumentation.
f) All modes of operation must be verified to maintain operation within authorized limits at the maximum uplink and downlink test levels per device type as defined in 5.4, by increasing the power level in 2 dB steps from the AGC level to the maximum input level specified in 5.5.

Test Procedure

a) Connect the EUT to the test equipment as shown in Figure 1. Begin with the uplink output (donor port) connected to the spectrum analyzer.
b) Configure the signal generator and spectrum analyzer for operation on the frequency determined in 7.1 with the highest power level, but with the center frequency of the signal no closer than 2.5 MHz from the band edge. The spectrum analyzer span shall be set to at least 10 MHz.
c) Set the initial signal generator power to a level well below that which causes AGC control.
d) Slowly increase the signal generator power level until the output signal reaches the AGC operational limit (from observation of signal behavior on the spectrum analyzer; i.e., no further increase in output power as input power is increased).
e) Reduce power sufficiently on the signal generator to ensure that the AGC is not controlling the power output.
f) Slowly increase the signal generator power to a level just below (within 0.5 dB of) the AGC limit without triggering the AGC. Note the signal generator power level as Pin.
g) Measure the output power Pout with the spectrum analyzer as follows.
    1) Set RBW = 100 kHz for AWGN signal type and 300 kHz for CW or GSM signal type.
    2) Set VBW ≥ 3 × RBW.
    3) Select either the BURST POWER or CHANNEL POWER measurement tool, as required for each signal type. The channel power integration bandwidth shall be 99% occupied bandwidth (4.1 MHz).

4) Select the RMS (power averaging) detector.
5) Ensure that the number Note: This requirement
6) Set sweep time = auto
7) Trace average at least 100 traces in power averaging (i.e., RMS) mode.

h) Record the measured power level as P_{OUT} with one set of results for the GSM or CW input stimulus and another set of results for the AWGN input stimulus.
i) Repeat step h) while increasing the signal generator amplitude in 2 dB steps until the maximum input level indicated in 5.5 is reached. If the booster has shut down at any point during the input power steps it should be noted and step h) shall be repeated at an input level 1 dB less than that found to cause the shutdown.
j) Repeat the entire procedure for each operational uplink and downlink frequency band supported by the booster.
k) Provide tabulated results in the test report.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Universal Radio Communication Tester	CMU200	11-9435686-0111	2015-11-05	2016-11-04
Rohde & Schwarz	Spectrum Analyzer	FSL18	100180	2015-12-02	2016-12-01
Agilent	Digital Signal Generator	ESG-D3000A	US36260285	2016-03-28	2017-03-27
E-Microwave	DC Block	EMDCB-00036	OE01304225	2015-12-09	2016-12-08
WEINSCHEL ENGINEERING	Attenuator(10dB)	N/A	AB1166	2015-12-09	2016-12-08
N/A	RF Coaxial Cable	LE-001-4	N/A	2015-12-09	2016-12-08

*** 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:	25.8℃
Relative Humidity:	52%
ATM Pressure:	101.4 kPa

The testing was performed by Kevin Hu on 2016-05-28.

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

Output Power:

Mode	Operation Band	Modulation	Pre AGC Input level	Conducted Output level	Antenna Gain	Cable loss	EIRP	Limit
			dBm	dBm	dBi	dB	dBm	dBm
Uplink	Cellular	GSM	-43.5	18.39	10.0	4.5	23.89	17~30
		AWGN	-40.3	20.41			25.91	
	PCS	GSM	-44.1	17.66	10.0	5.0	22.66	
		AWGN	-41.1	19.35			24.35	
Downlink	Cellular	GSM	-60.7	0.70	10.0	2.5	8.20	≤17
		AWGN	-58.5	0.96			8.46	
	PCS	GSM	-59.9	-0.37	10.0	3.0	6.63	
		AWGN	-58.4	1.03			8.03	

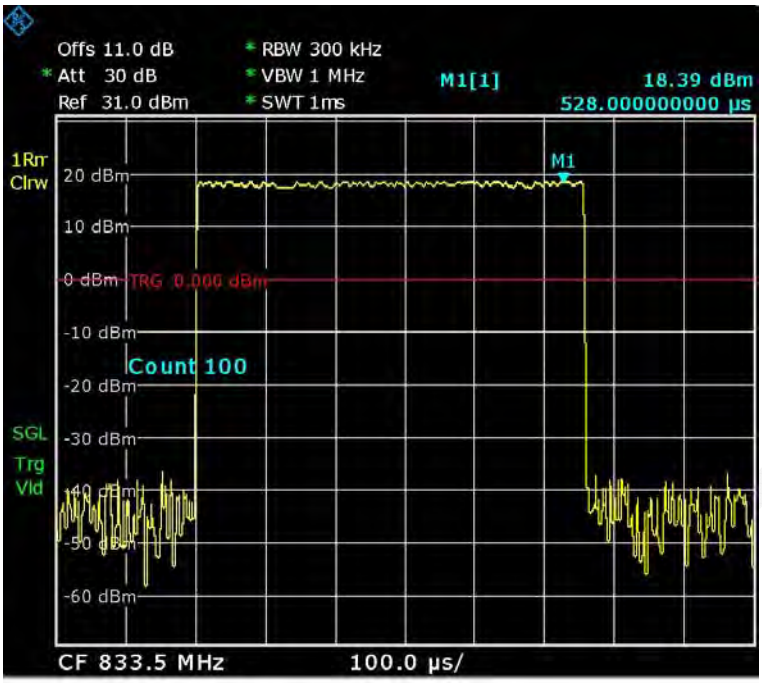
Maximum Input level:

Mode	Operation Band	Modulation	Maximum Input level	Maximum Input level Limits	Conducted Output level
			dBm	dBm	dBm
Uplink	Cellular	GSM	-43.0	27.0	18.17
		AWGN	-39.8		19.97
	PCS	GSM	-43.6		17.76
		AWGN	-40.6		19.20
Downlink	Cellular	GSM	-60.2	-20	0.59
		AWGN	-58.0		0.93
	PCS	GSM	-59.4		-0.33
		AWGN	-57.9		1.03

GSM Signal:

Output Power

Cellular Uplink



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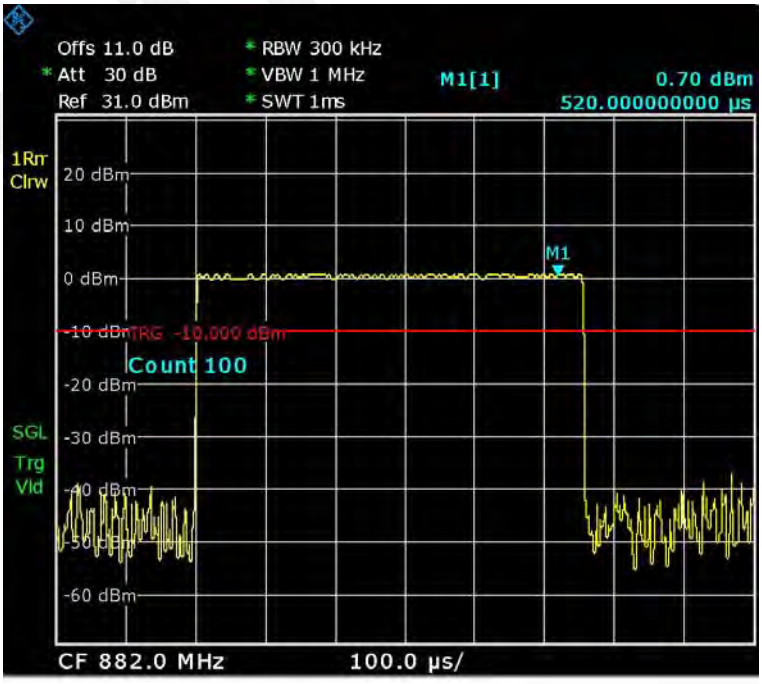
Cellular Downlink



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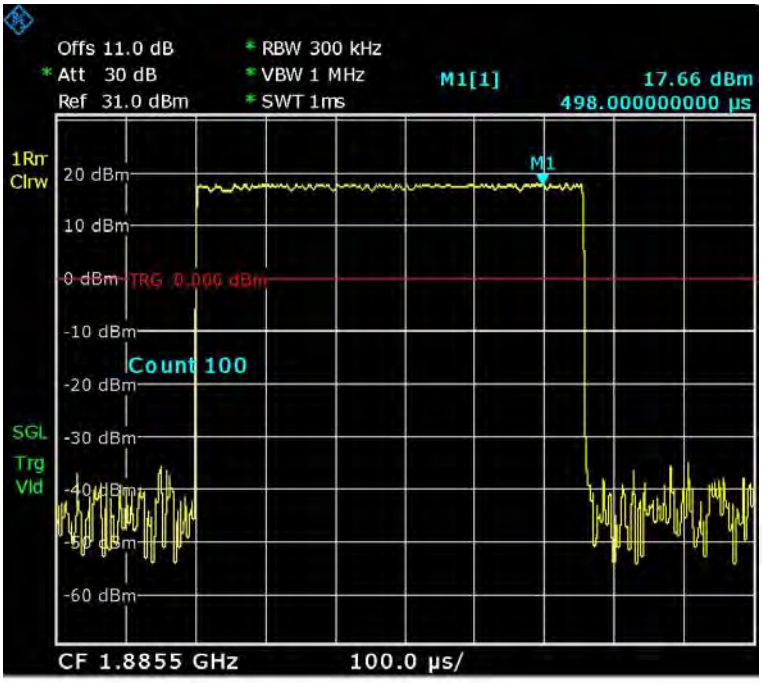
PCS Uplink



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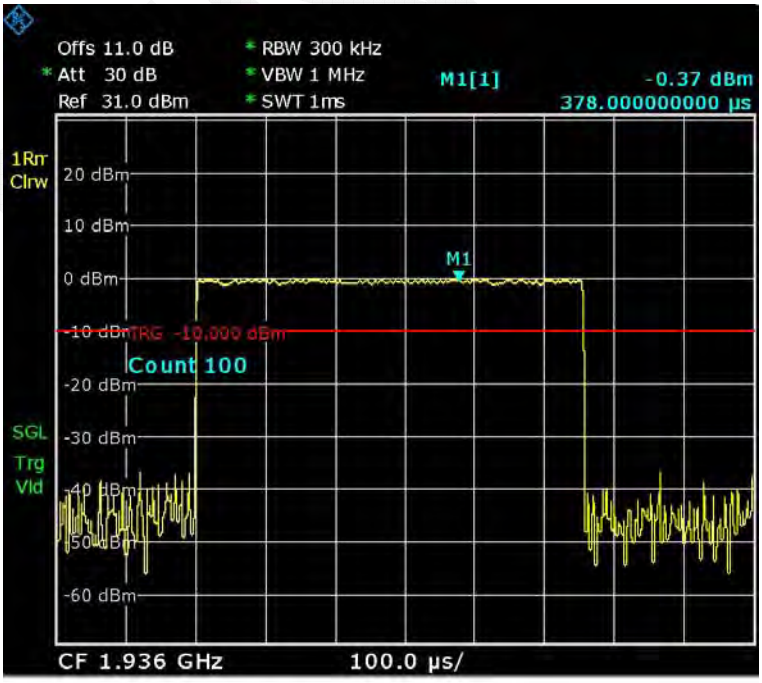
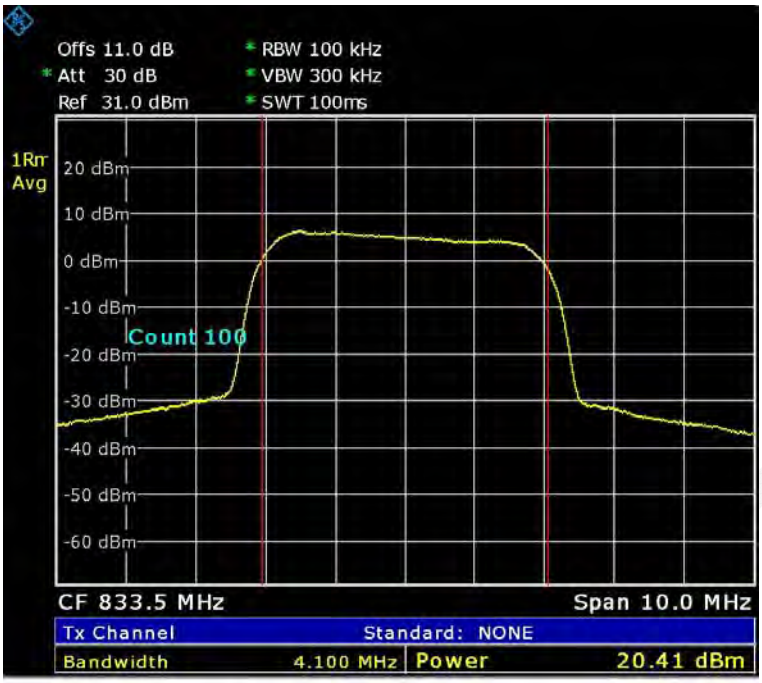


AWGN Signal:
Output Power

Cellular Uplink



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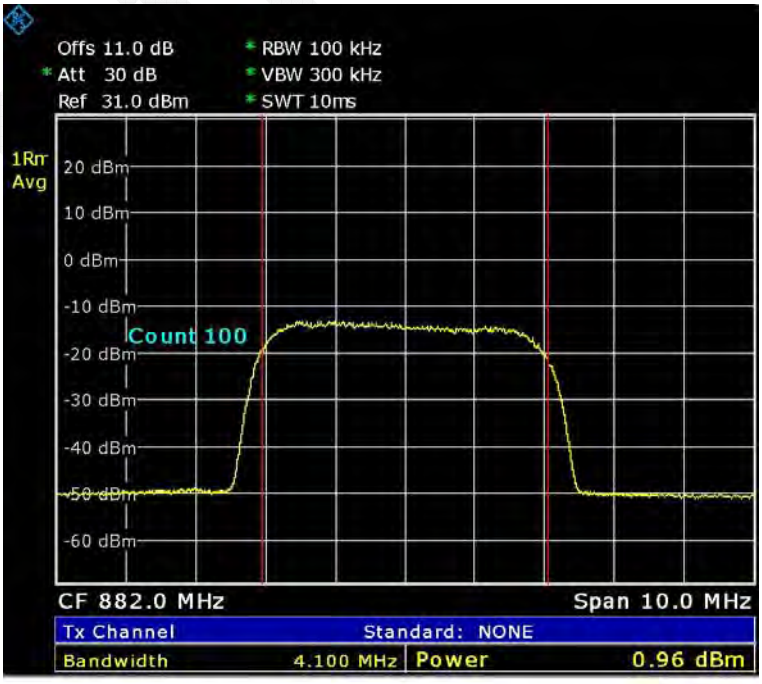
Cellular Downlink



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PCS Uplink

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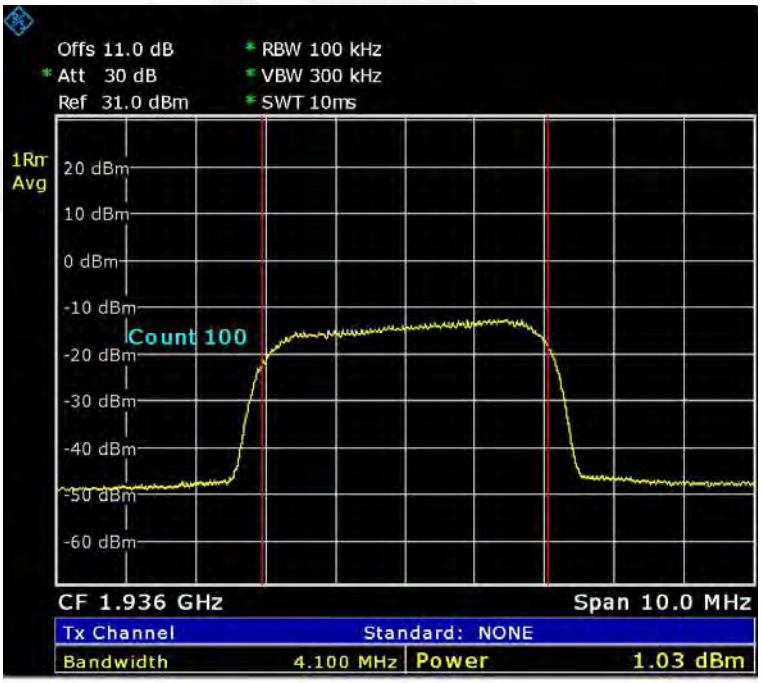
PCS Downlink



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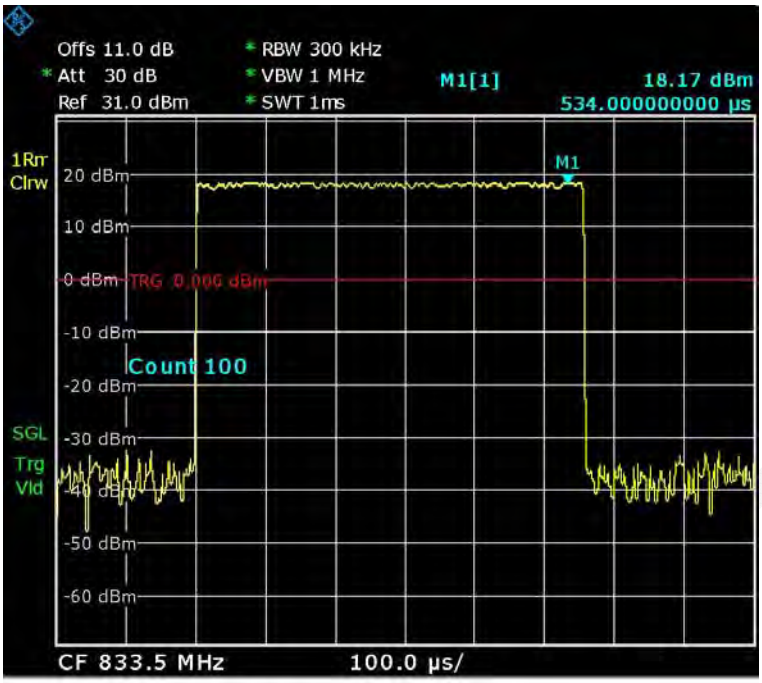
Maximum Input level (GSM Signal):

Cellular Uplink



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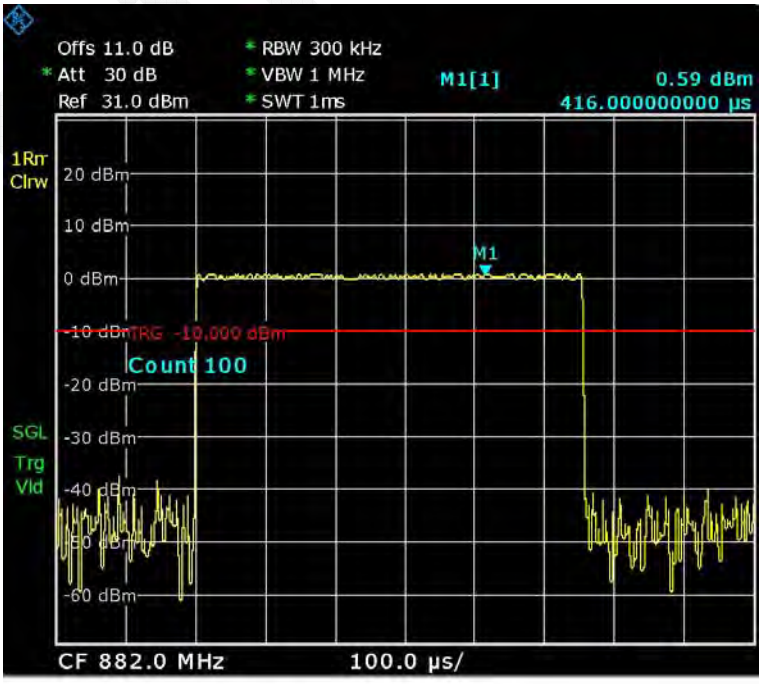
Cellular Downlink



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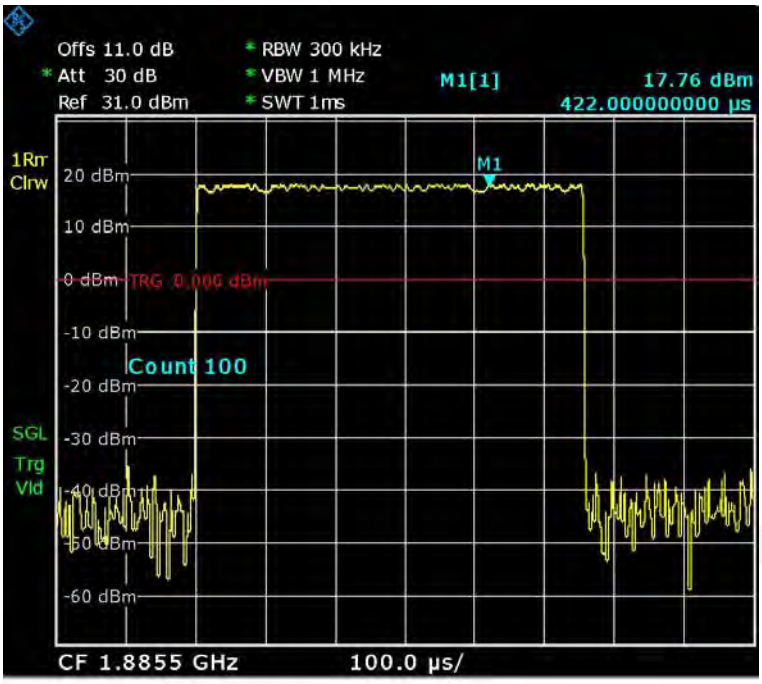
PCS Uplink



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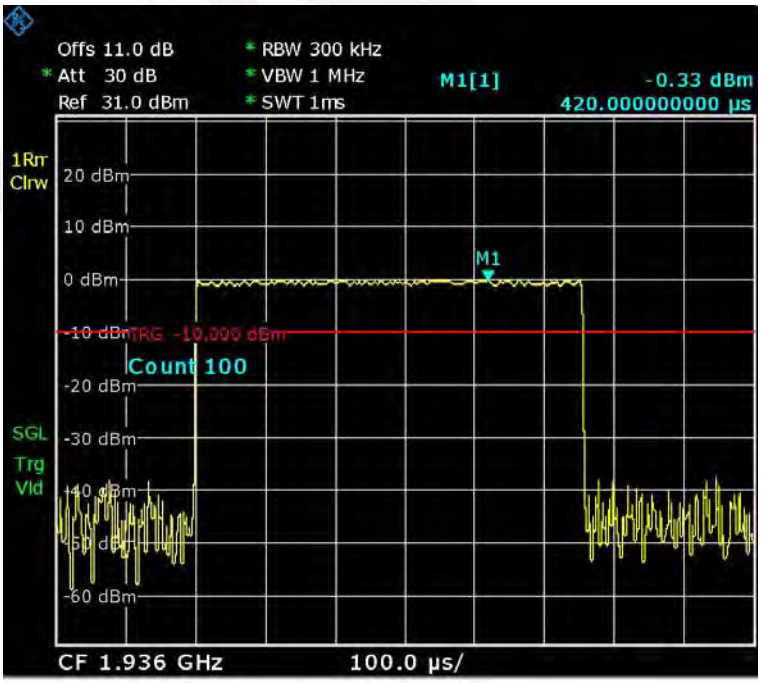
PCS Downlink



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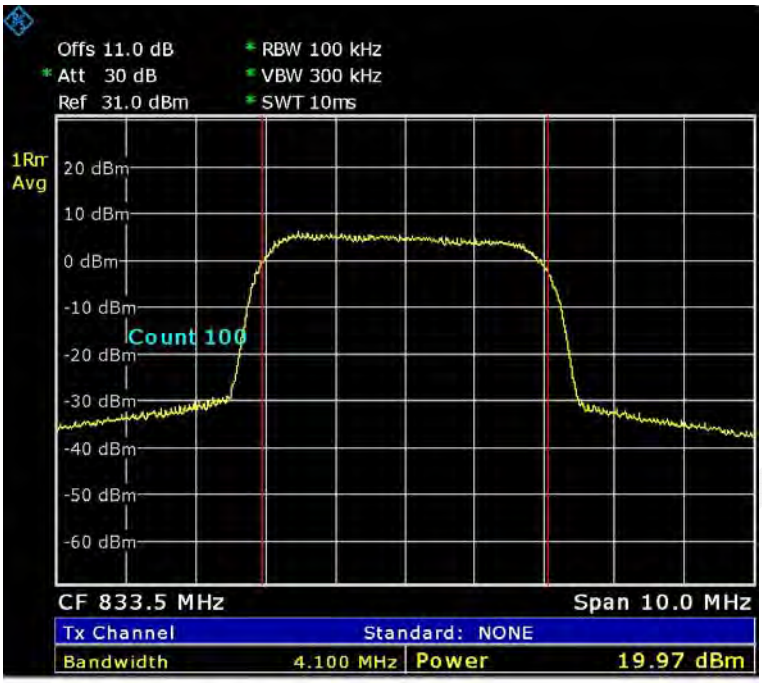
Maximum Input level (AWGN Signal):

Cellular Uplink



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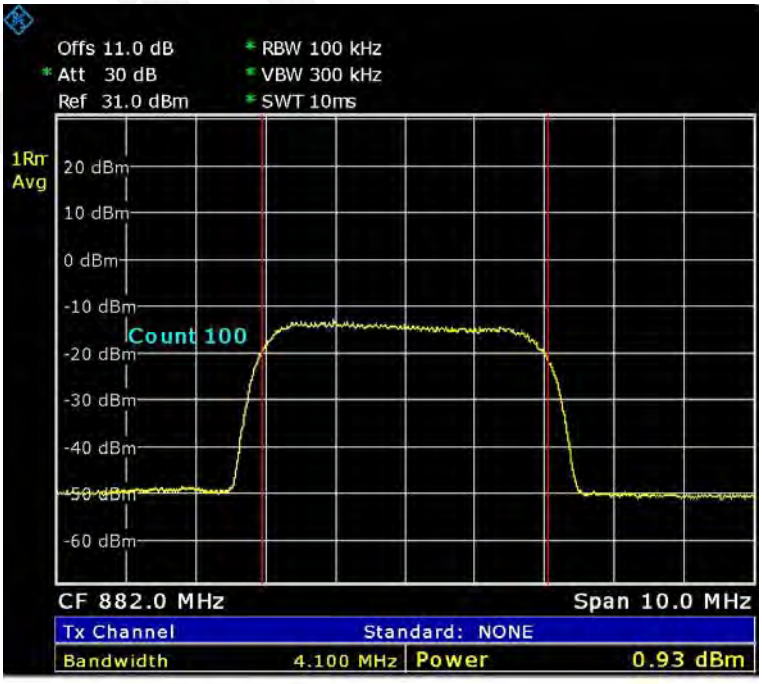
Cellular Downlink



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PCS Uplink

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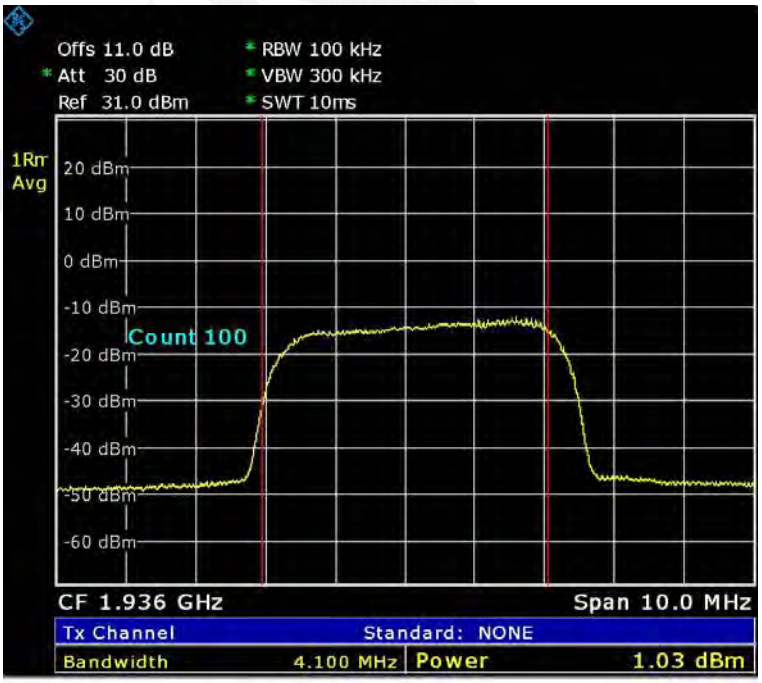
PCS Downlink



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§ 20.21(e)(8)(i)(C)(2), § 20.21(e)(8)(i)(B)&§20.21(e)(4) – MAXIMUM BOOSTER GIAN COMPUTATION

Applicable Standards

According to§ 20.21(e)(8)(i)(C)(2) Booster Gain Limits (maximum gain); § 20.21(e)(8)(i)(B) Bidirectional Capability (equivalent uplink and downlink gain); §20.21(e)(4) Self-monitoring.

This subclause provides guidance on the computation of the maximum gain based on the results obtained from previous measurements. The NPS limits on maximum gain for fixed and mobile wideband consumer signal boosters are provided in § 20.21(e)(8)(i)(C)(*2*). Additionally, § 20.21(e)(8)(i)(B) requires that wideband consumer signal boosters be able to provide equivalent uplink and downlink gain (within 9 dB)

Test Procedure

a) Calculate the maximum gain of the booster as follows to demonstrate compliance to the applicable gain limits as specified.
b) For both the uplink and downlink in each supported frequency band, use each of the P_{OUT} and P_{IN} result pairs for all signal types used in 7.2 in the following equation to determine the maximum gain (G) of the booster:

$$G\ (dB) = P_{OUT}(dBm) - P_{IN}(dBm).$$

c) Record the maximum gain of the uplink and downlink paths for each supported frequency band, and verify that the each gain value complies with the applicable limit.
d) Provide tabulated results in the test report.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Universal Radio Communication Tester	CMU200	11-9435686-0111	2015-11-05	2016-11-04
Rohde & Schwarz	Spectrum Analyzer	FSL18	100180	2015-12-02	2016-12-01
Agilent	Digital Signal Generator	ESG-D3000A	US36260285	2016-03-28	2017-03-27
E-Microwave	DC Block	EMDCB-00036	OE01304225	2015-12-09	2016-12-08
WEINSCHEL ENGINEERING	Attenuator(10dB)	N/A	AB1166	2015-12-09	2016-12-08
N/A	RF Coaxial Cable	LE-001-4	N/A	2015-12-09	2016-12-08

*** 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:	25.8℃
Relative Humidity:	52%
ATM Pressure:	101.4 kPa

The testing was performed by Kevin Hu on 2016-05-28.

Test Result: Compliance. Please refer to the below tables and the plots in section 7.2

Maximum gain:

Mode	Operation Band	Modulation	Pre AGC Input level	Conducted Output level	Gain	Limit
			dBm	dBm	dB	dB
Uplink	Cellular	GSM	-43.5	18.39	61.89	64.95
		AWGN	-40.3	20.41	60.71	
	PCS	GSM	-44.1	17.66	61.76	71.98
		AWGN	-41.1	19.35	60.45	
Downlink	Cellular	GSM	-60.7	0.70	61.40	64.95
		AWGN	-58.5	0.96	59.46	
	PCS	GSM	-59.9	-0.37	59.53	71.98
		AWGN	-58.4	1.03	59.43	

Note: Fixed Booster maximum gain shall not exceed 6.5 dB + 20 Log_{10} (Frequency), Where, Frequency is the uplink mid-band frequency of the supported spectrum bands in MHz.

Equivalent Uplink and downlink gain:

Operation Band	Modulation	Uplink Gain	Downlink Gain	Difference	Limit
		dB	dB	dB	dB
Cellular	GSM	61.89	61.40	0.49	±9
	AWGN	60.71	59.46	1.25	
PCS	GSM	61.76	59.53	2.23	
	AWGN	60.45	59.43	1.02	

§ 20.21(e)(8)(i)(F)- INTERMODULATION PRODUCT

Applicable Standards

According to§ 20.21(e)(8)(i)(F) Intermodulation Limits.

Test Procedure

The following procedures shall be used to demonstrate compliance to the intermodulation limit specified in § 20.21(e)(8)(i)(F) for wideband consumer signal boosters.

a) Connect the signal booster to the test equipment as shown in **Figure 2**. Begin with the uplink output connected to the spectrum analyzer.
b) Set the spectrum analyzer RBW = 3 kHz.
c) Set the VBW ≥ 3 × RBW.
d) Select the RMS detector.
e) Set the spectrum analyzer center frequency to the center of the supported operational band under test.
f) Set the span to 5 MHz. Affirm that the number of measurement points per sweep ≥ (2 × span)/RBW.
g) Configure the two signal generators for CW operation with generator 1 tuned 300 kHz below the operational band center frequency and generator 2 tuned 300 kHz above the operational band center frequency.
h) Set the signal generator amplitudes so that the power from each into the RF combiner is equivalent, then turn on the RF output.
i) Increase the signal generators' amplitudes equally until just before the EUT begins AGC and affirm that all intermodulation products (if any exist) are below the specified limit of −19 dBm.
j) Utilize the trace averaging function of the spectrum analyzer and wait for the trace to stabilize. Place a marker at the highest amplitude intermodulation product.
k) Record the maximum intermodulation product amplitude level that is observed.
l) Capture the spectrum analyzer trace for inclusion in the test report.
m) Repeat 7.4e) to 7.4l) for all uplink and downlink operational bands.

Note: *If using a single signal generator with dual outputs, affirm that intermodulation products are not the result of the generator.*

n) Increase the signal generator amplitude in 2 dB steps to 10 dB above the AGC threshold determined in 7.4i), but to not to exceed the maximum input level in 5.5, to affirm that the EUT maintains compliance with the intermodulation limit

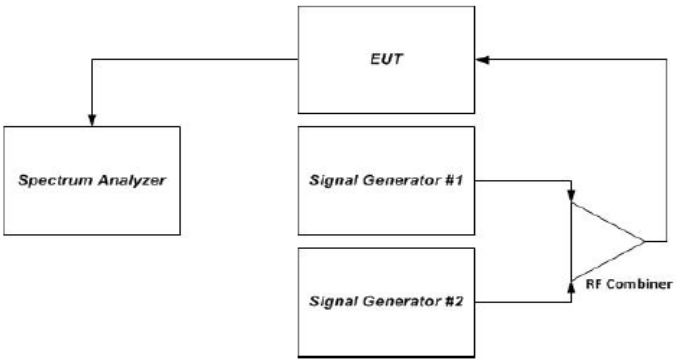


Figure 2 – Intermodulation product instrumentation test setup

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Universal Radio Communication Tester	CMU200	11-9435686-0111	2015-11-05	2016-11-04
Rohde & Schwarz	Spectrum Analyzer	FSL18	100180	2015-12-02	2016-12-01
Agilent	Digital Signal Generator	ESG-D3000A	US36260285	2016-03-28	2017-03-27
E-Microwave	DC Block	EMDCB-00036	OE01304225	2015-12-09	2016-12-08
WEINSCHEL ENGINEERING	Attenuator(10dB)	N/A	AB1166	2015-12-09	2016-12-08
N/A	RF Coaxial Cable	T-E130	N/A	2015-12-09	2016-12-08
N/A	RF Coaxial Cable	LE-001-4	N/A	2015-12-09	2016-12-08

*** 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

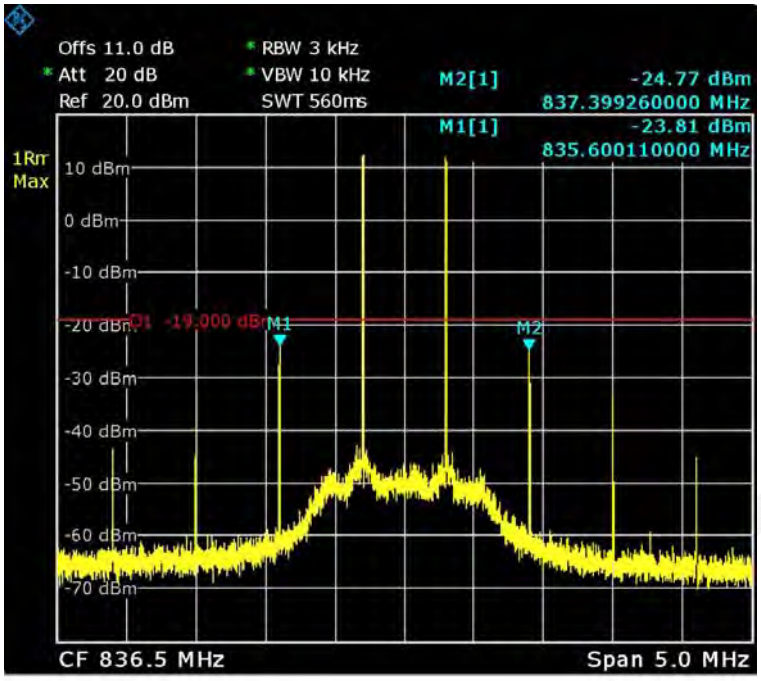
Temperature:	25.6℃
Relative Humidity:	54%
ATM Pressure:	101.3 kPa

The testing was performed by Kevin Hu on 2016-05-29.

Test Result: Compliant. Please refer to the below plots.

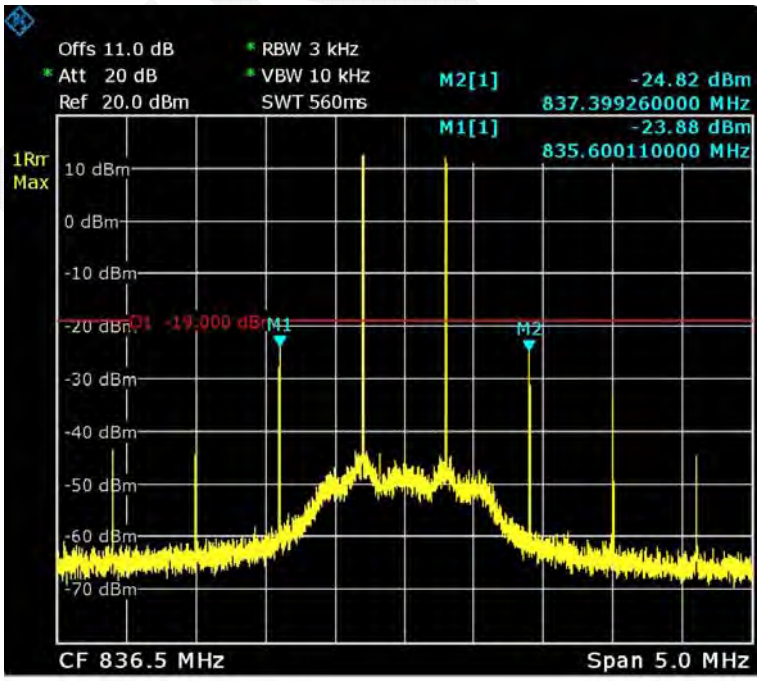
Uplink

Cellular Pre-AGC



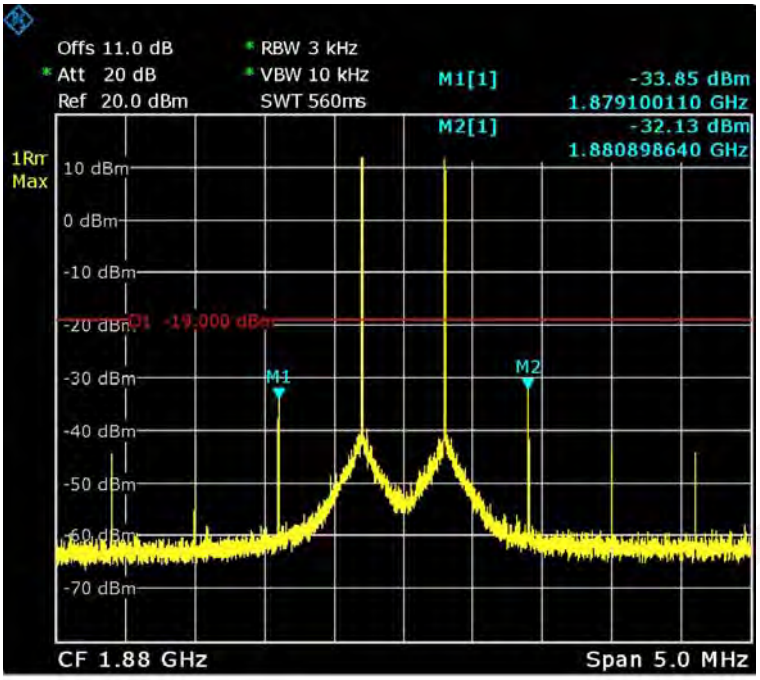
Date: 29.MAY.2016 10:55:35

Cellular Above AGC



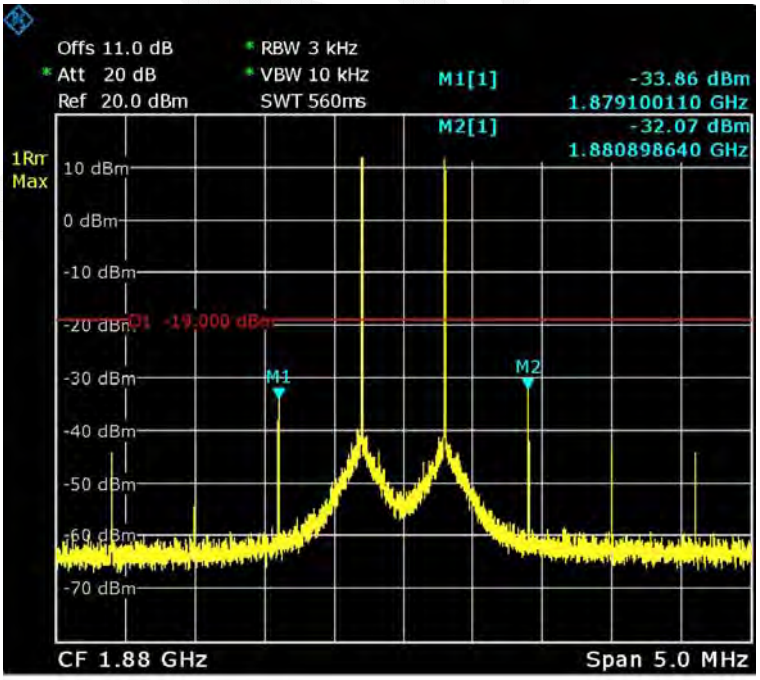
Date: 29.MAY.2016 10:56:34

PCS Pre-AGC



Date: 29.MAY.2016 11:00:08

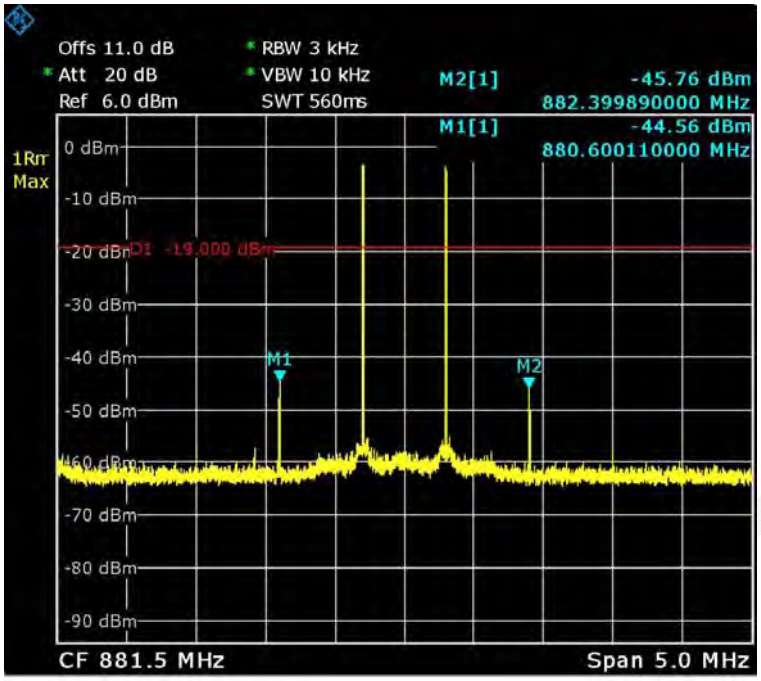
PCS Above AGC



Date: 29.MAY.2016 11:00:51

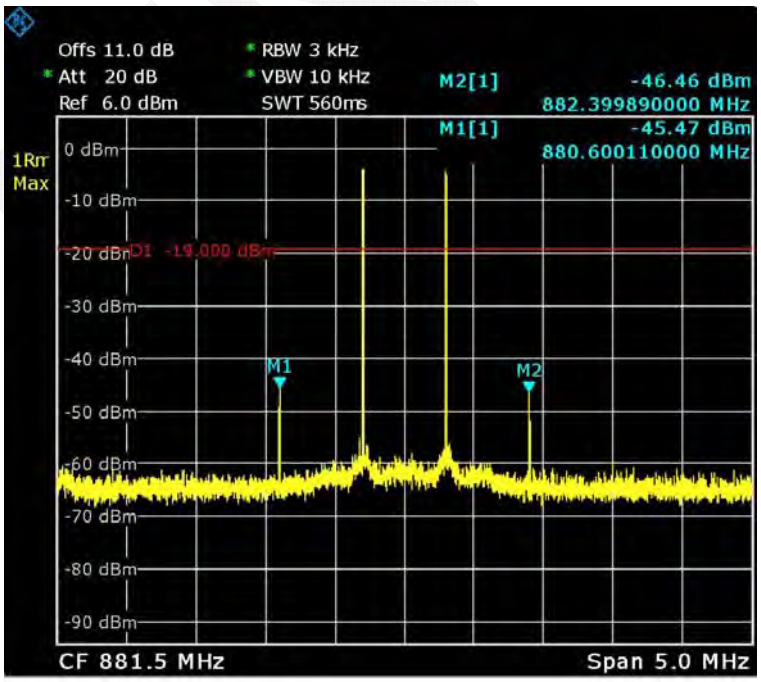
Downlink

Cellular Pre-AGC



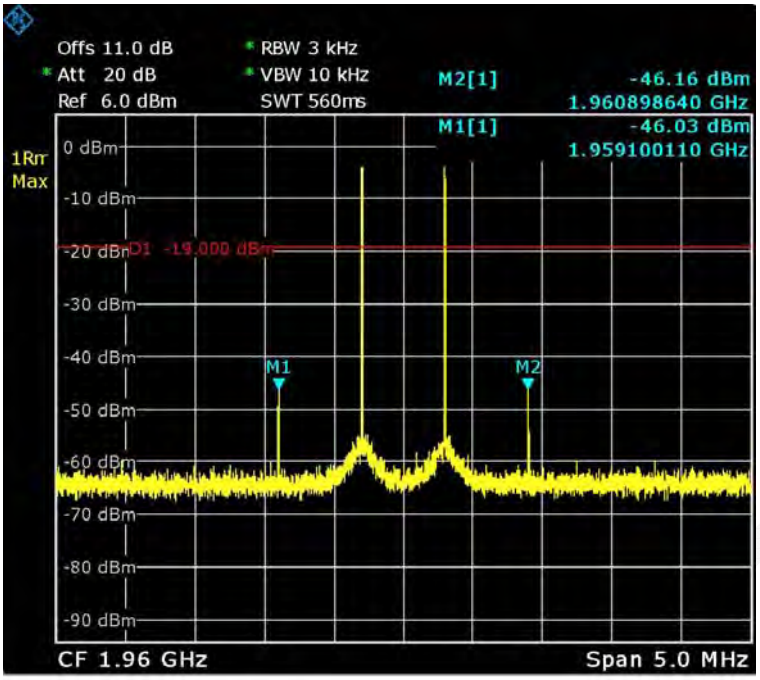
Date: 29.MAY.2016 10:26:23

Cellular Above AGC



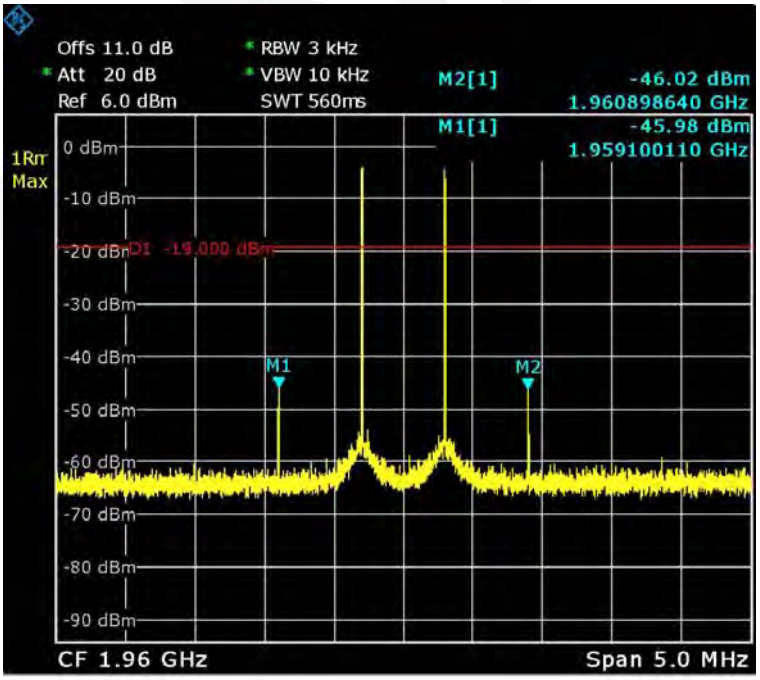
Date: 29.MAY.2016 10:44:52

PCS Pre-AGC



Date: 29.MAY.2016 10:38:40

PCS Above AGC



Date: 29.MAY.2016 10:41:09

§ 20.21(e)(8)(i)(E)- OUT OF BAND EMISSIONS

Applicable Standards

According to§ 20.21(e)(8)(i)(E) Out of Band Emission Limits.

Test Procedure

This measurement is intended to demonstrate compliance to the limit specified in § 20.21(e)(8)(i)(E). The mobile emission limit applicable to the supported band of operation can be determined from the applicable rule part as listed in Annex A for each authorized operating band.

a) Connect the EUT to the test equipment as shown in **Figure 1**. Begin with the uplink output connected to the spectrum analyzer.
b) Configure the signal generator for the appropriate operation for all uplink and downlink bands:
   i) GSM: 0.2 MHz from upper and lower band edges.
   ii) LTE (5 MHz): 2.5 MHz from upper and lower band edges.
   iii) CDMA: 1.25 MHz from upper and lower band edges, except for cellular band as follows (only the upper and lower frequencies need to be tested):

824.88 MHz, 845.73 MHz, 836.52 MHz, 848.10 MHz, 869.88 MHz, 890.73 MHz, 881.52 MHz, 893.10 MHz.

Note 1: *Alternative test modulation types:*
- CDMA (alternative 1.25 MHz AWGN)
- LTE 5 MHz (alternative W-CDMA or 4.1 MHz AWGN)

Note 2: *For LTE, the signal generator should utilize the uplink and downlink signal types for these modulations in uplink and downlink tests, respectively. LTE shall use 5 MHz signal, 25 resource blocks transmitting.*

Note 3: *When using an AWGN test signal, the bandwidth shall be the measured 99% occupied bandwidth.*

c) Set the signal generator amplitude to the maximum power level prior to AGC similar to the procedures in 7.2.2e) to 7.2.2f) of power measurement procedure for appropriate modulations.
d) Set RBW = measurement bandwidth specified in the applicable rule section for the supported frequency band (*see Annex A for cross-reference to applicable rule section*).
e) Set VBW = 3 × RBW.
f) Select the RMS (power averaging) detector.
g) Sweep time = auto-couple.
h) Set the analyzer start frequency to the upper band/block edge frequency and the stop frequency to the upper band/block edge frequency plus 300 kHz (when operational frequency is < 1 GHz) or 3 MHz (when operational frequency is ≥ 1 GHz).
i) Trace average at least 100 traces in power averaging (i.e., RMS) mode.
j) Use peak marker function to find the maximum power level.
k) Capture the spectrum analyzer trace of the power level for inclusion in the test report.
l) Increase the signal generator amplitude in 2 dB steps until the maximum input level indicated in 5.5 is reached. Affirm that the EUT maintains compliance with the OOBE limits.

m) Reset the analyzer start frequency to the lower band/block edge frequency minus 300 kHz (when operational frequency is < 1 GHz) or 3 MHz (when operational frequency is ≥ 1 GHz), and the stop frequency to the lower band/block edge frequency and repeat 7.5j) to 7.5l).
n) Repeat 7.5b) through 7.5m) for each uplink and downlink operational band.

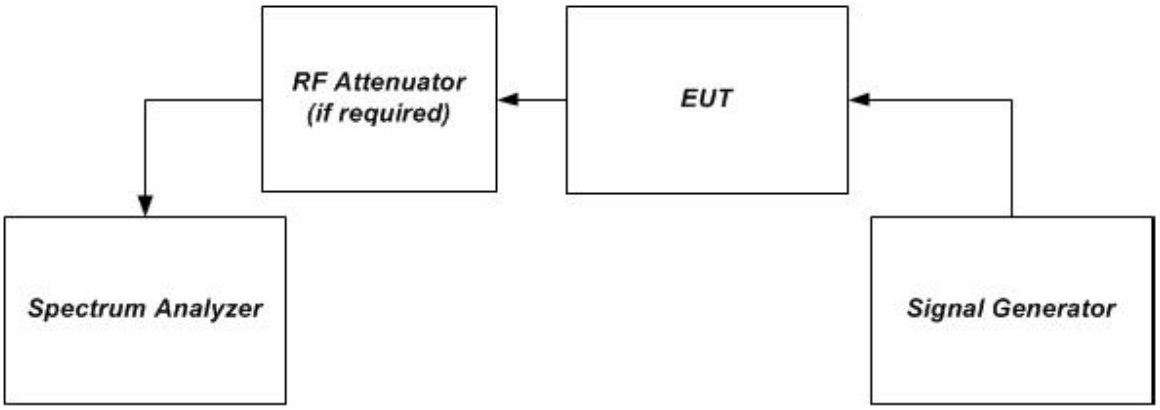


Figure 1 – Band verification test instrumentation setup

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Universal Radio Communication Tester	CMU200	11-9435686-0111	2015-11-05	2016-11-04
Rohde & Schwarz	Spectrum Analyzer	FSL18	100180	2015-12-02	2016-12-01
Agilent	Digital Signal Generator	ESG-D3000A	US36260285	2016-03-28	2017-03-27
E-Microwave	DC Block	EMDCB-00036	OE01304225	2015-12-09	2016-12-08
WEINSCHEL ENGINEERING	Attenuator(10dB)	N/A	AB1166	2015-12-09	2016-12-08
N/A	RF Coaxial Cable	LE-001-4	N/A	2015-12-09	2016-12-08

*** 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

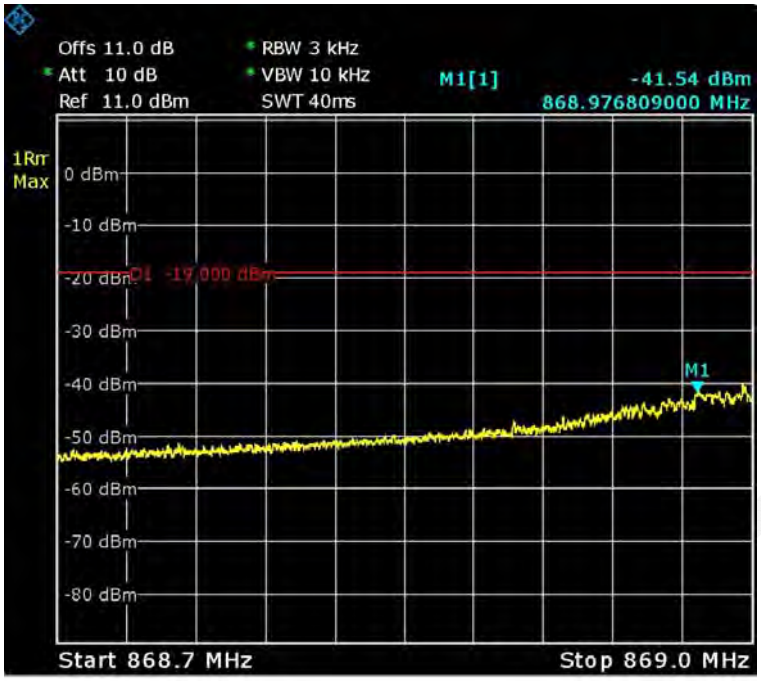
Temperature:	25.6℃
Relative Humidity:	54%
ATM Pressure:	101.3 kPa

The testing was performed by Kevin Hu on 2016-05-29.

Test Result: Compliant. Please refer to the below plots.

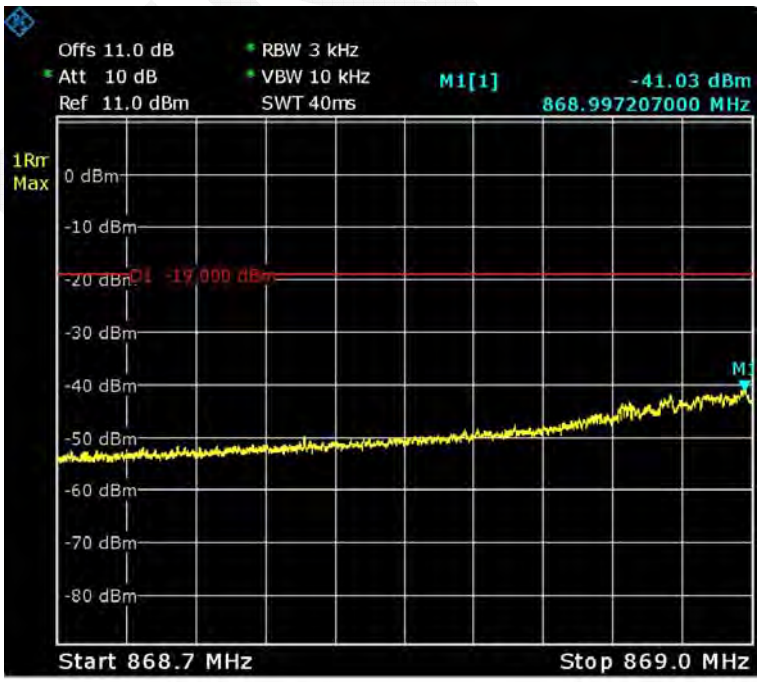
Downlink

Cellular Band GSM Left Side 869.2MHz Pre-AGC



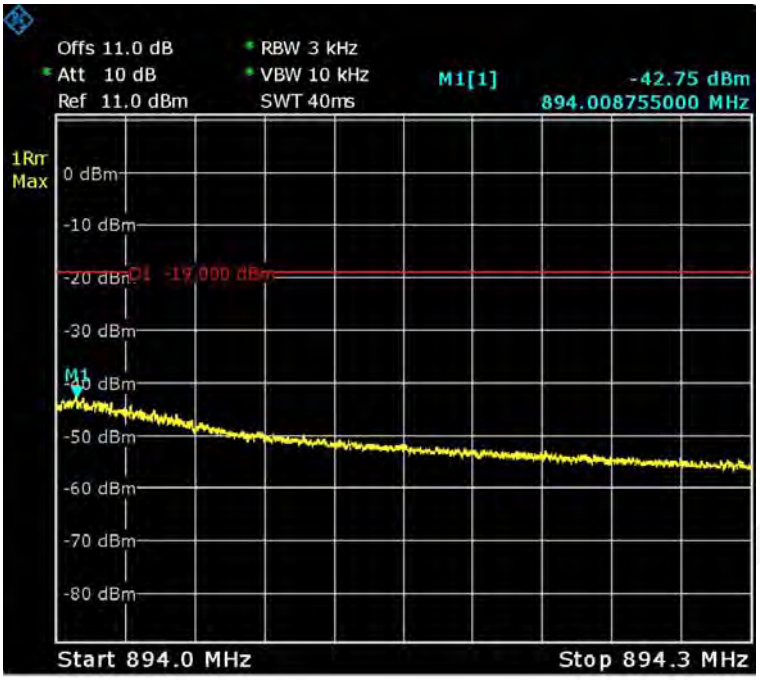
Date: 29.MAY.2016 17:30:52

Cellular Band GSM Left Side 869.2MHz Above AGC



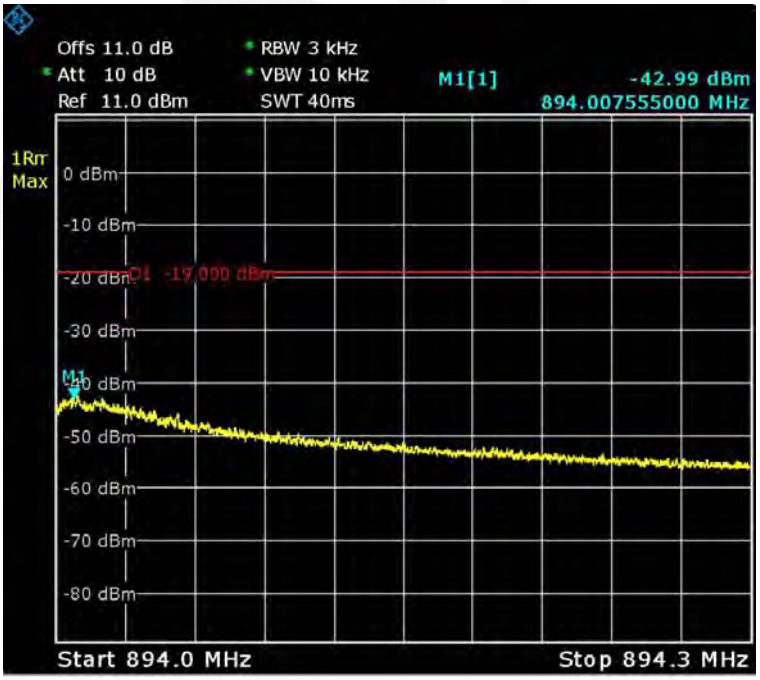
Date: 29.MAY.2016 17:32:13

Cellular Band GSM Right Side 893.8MHz Pre-AGC



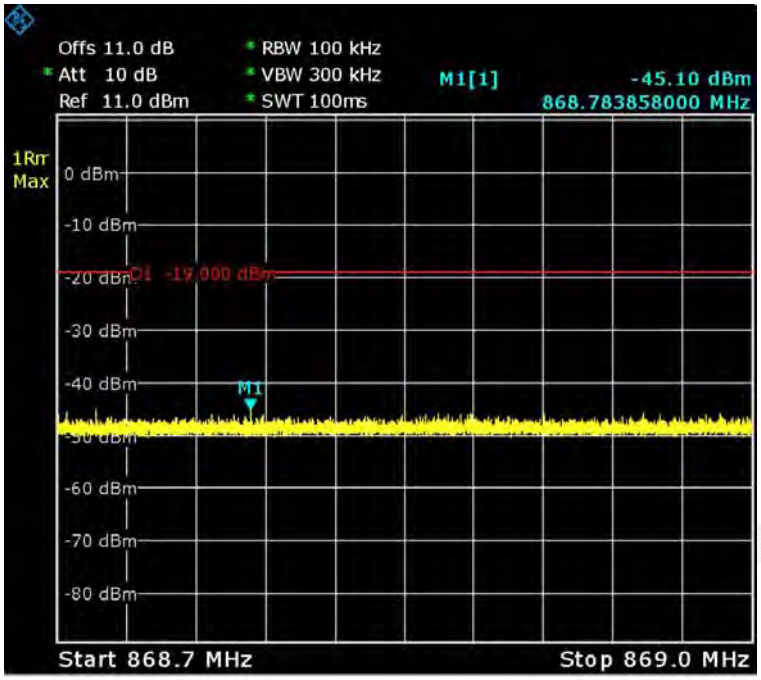
Date: 29.MAY.2016 17:34:19

Cellular Band GSM Right Side 893.8MHz Above AGC



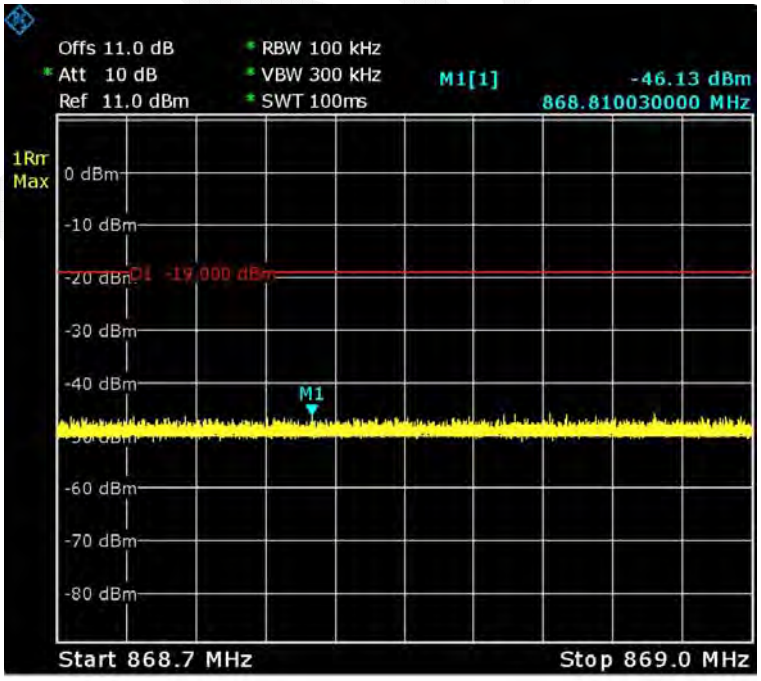
Date: 29.MAY.2016 17:35:30

Cellular Band W-CDMA Left Side 871.5MHz Pre-AGC



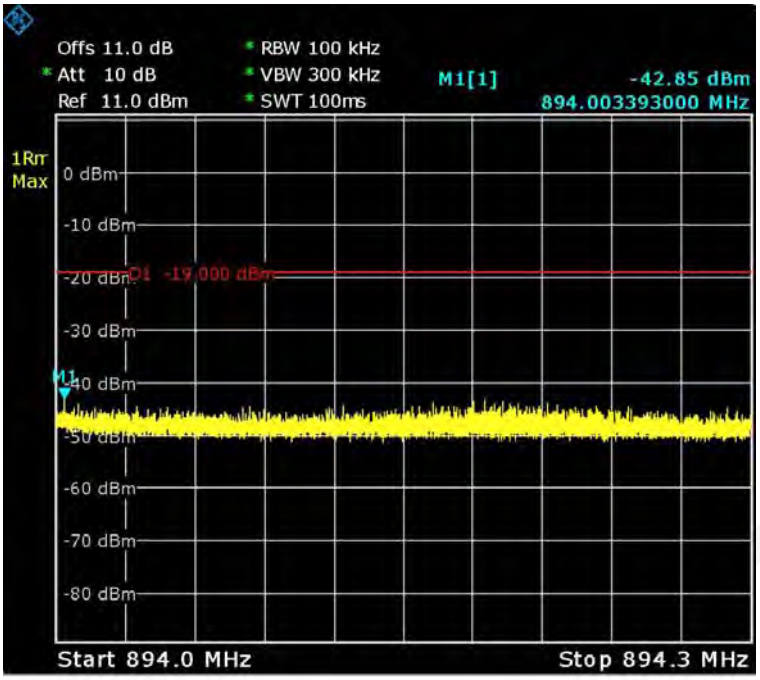
Date: 29.MAY.2016 16:50:43

Cellular Band W-CDMA Left Side 871.5MHz Above AGC



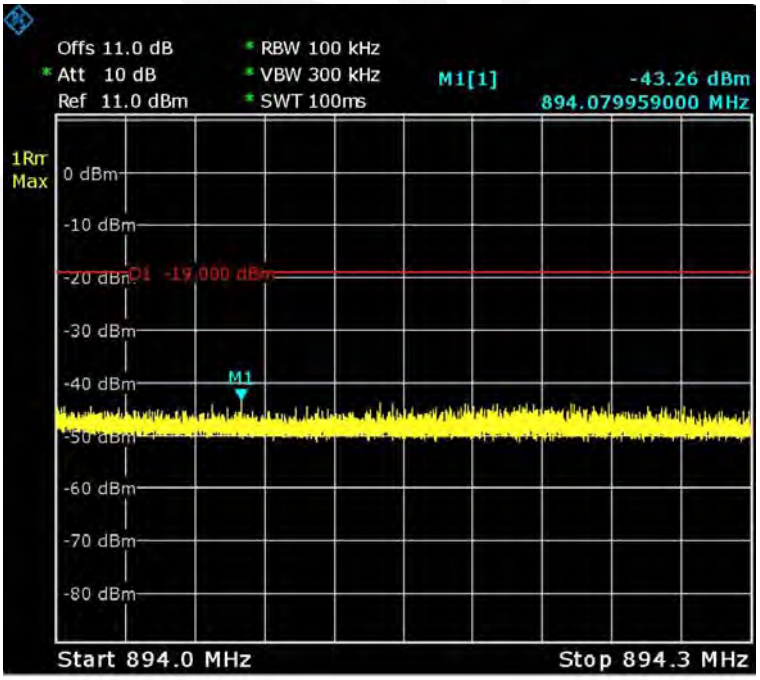
Date: 29.MAY.2016 16:52:11

Cellular Band W-CDMA Right Side 891.5MHz Pre-AGC



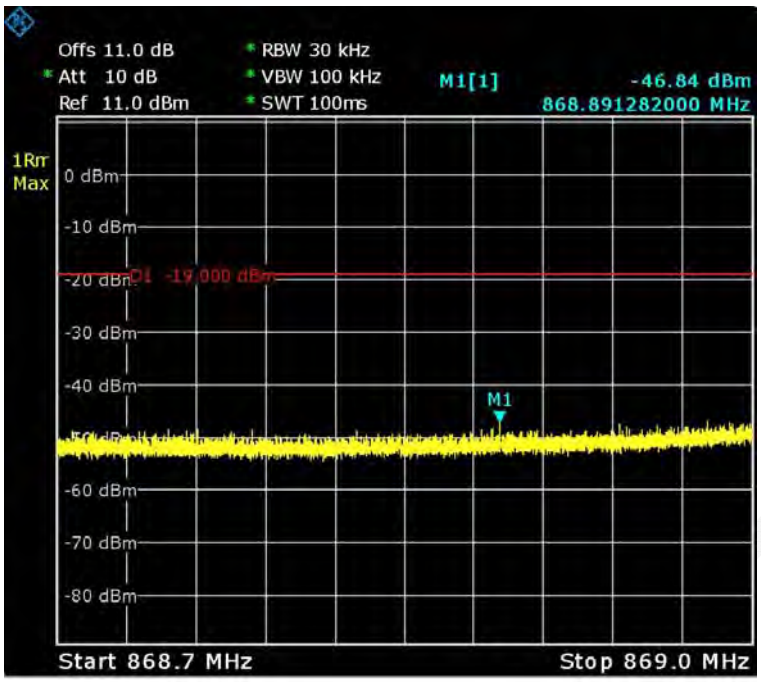
Date: 29.MAY.2016 16:54:52

Cellular Band W-CDMA Right Side 891.5MHz Above AGC



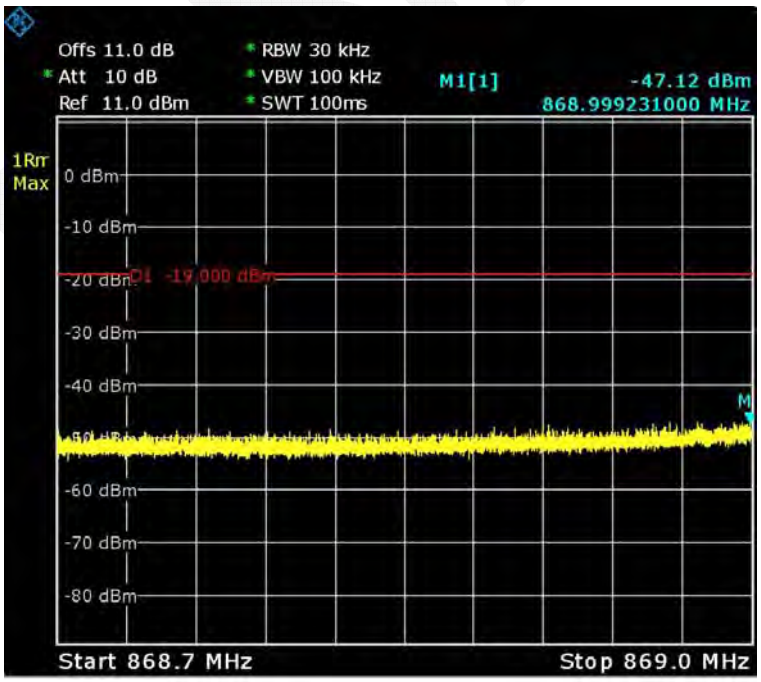
Date: 29.MAY.2016 16:56:08

Cellular Band CDMA Left Side 869.88MHz Pre-AGC



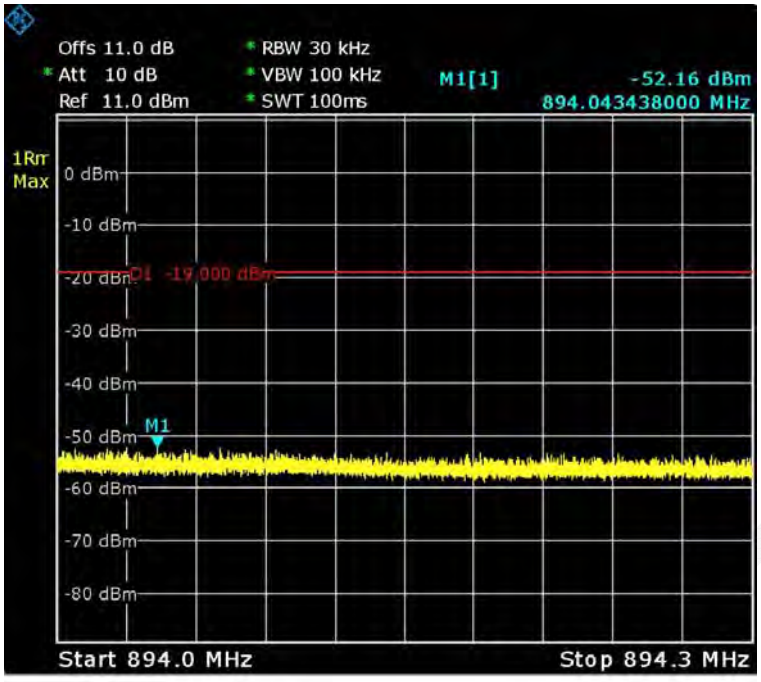
Date: 29.MAY.2016 15:15:41

Cellular Band CDMA Left Side 869.88MHz Above AGC



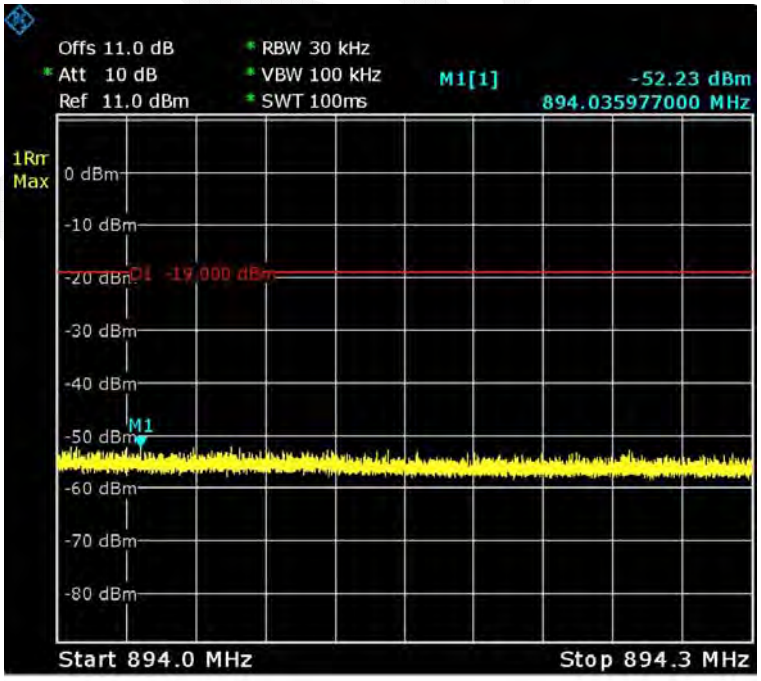
Date: 29.MAY.2016 15:16:49

Cellular Band CDMA Right Side 893.1MHz Pre-AGC



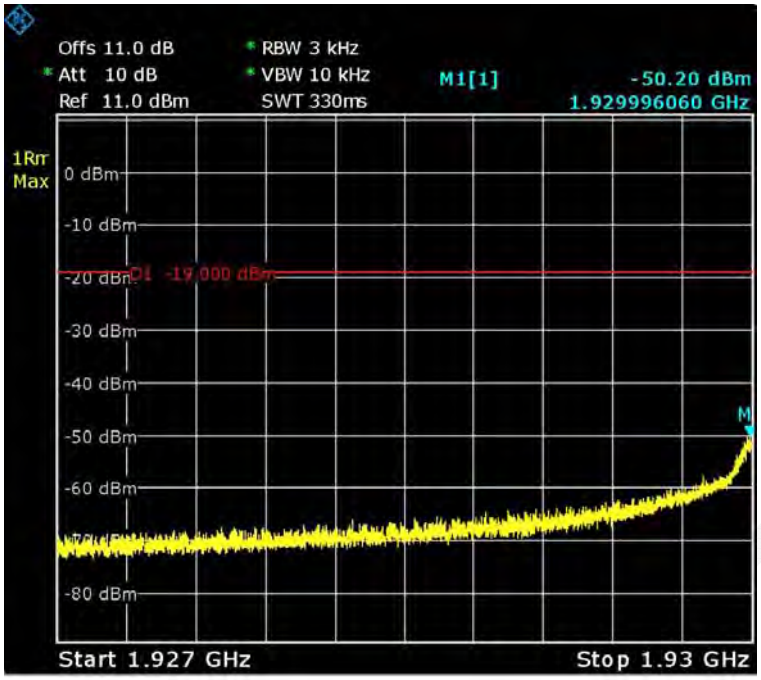
Date: 29.MAY.2016 15:18:57

Cellular Band CDMA Right Side 893.1MHz Above AGC



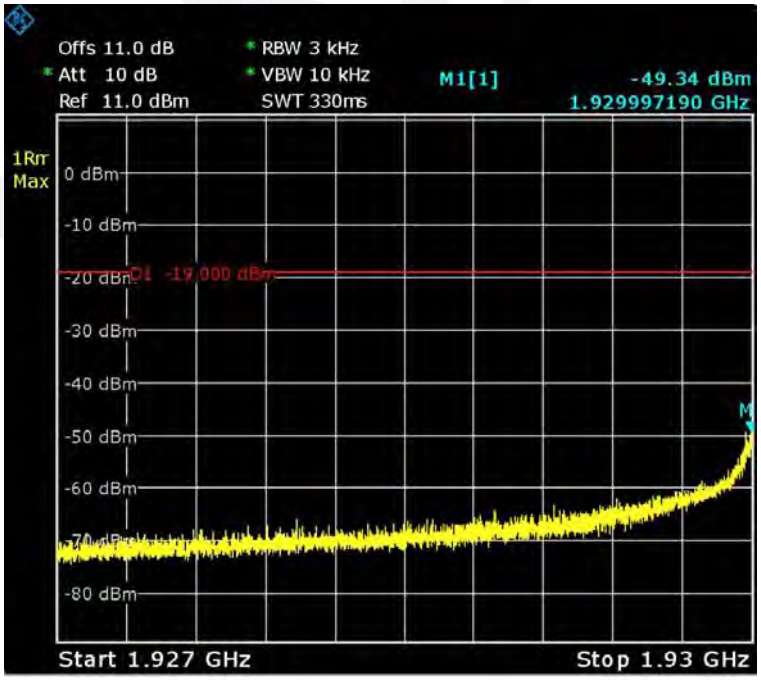
Date: 29.MAY.2016 15:20:33

PCS Band GSM Left Side 1930.20MHz Pre-AGC



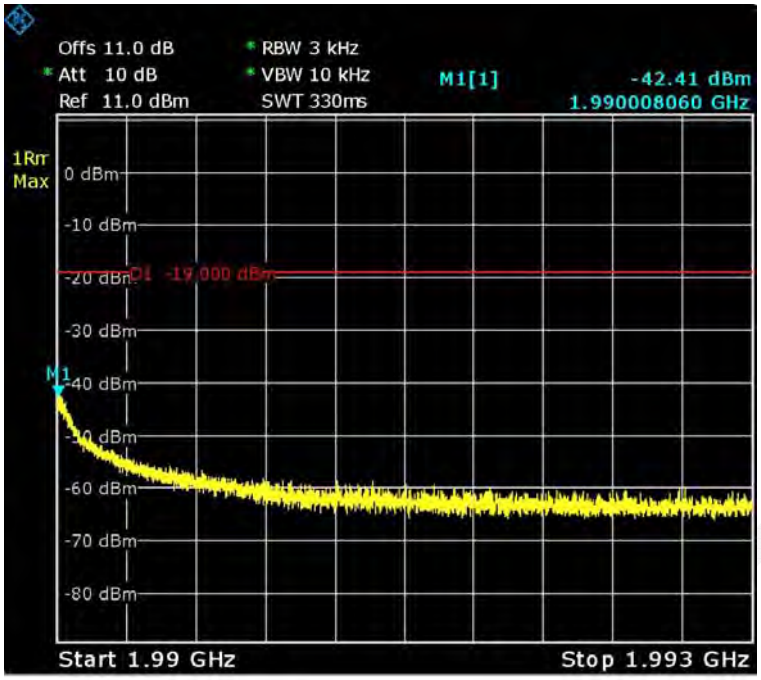
Date: 29.MAY.2016 17:19:11

PCS Band GSM Left Side 1930.20MHz Above AGC



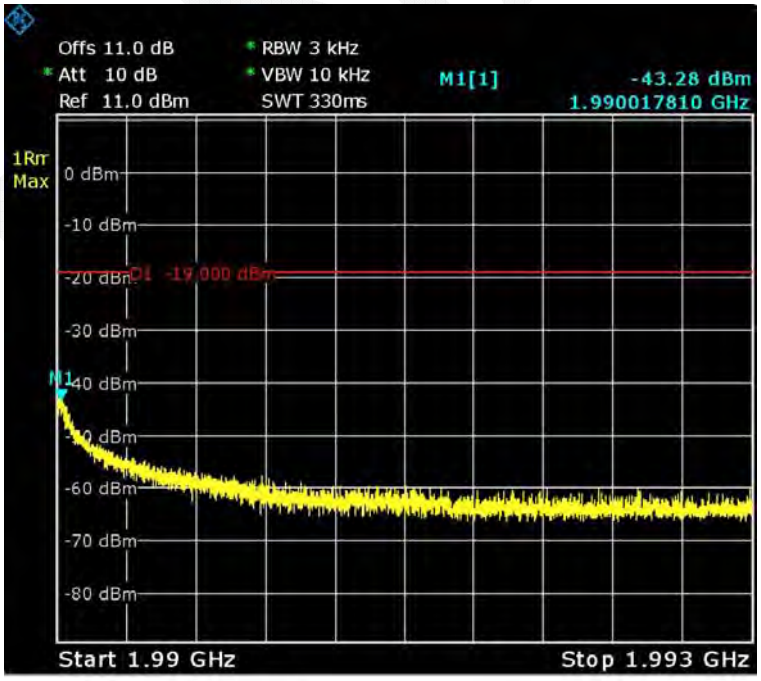
Date: 29.MAY.2016 17:20:28

PCS Band GSM Right Side 1989.80MHz Pre-AGC



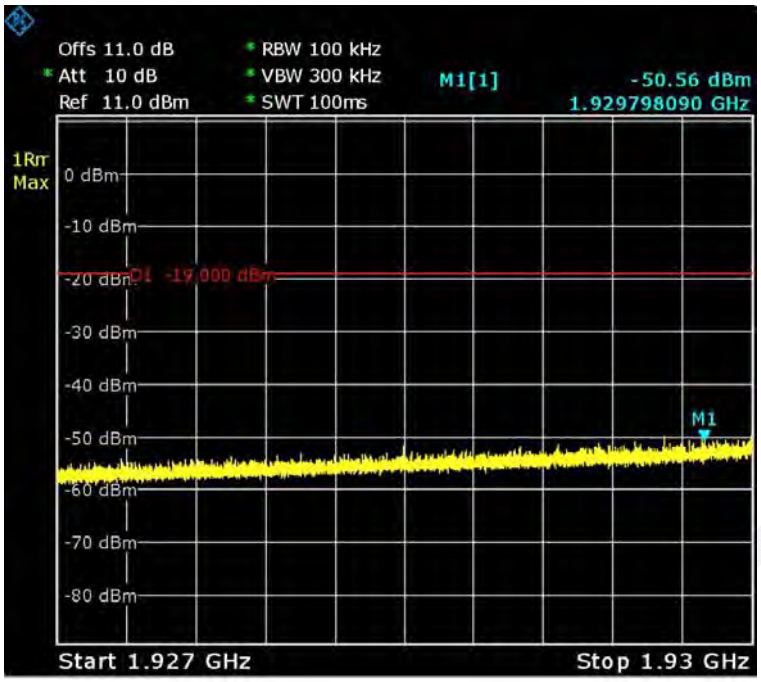
Date: 29.MAY.2016 17:23:10

PCS Band GSM Right Side 1989.80MHz Above AGC



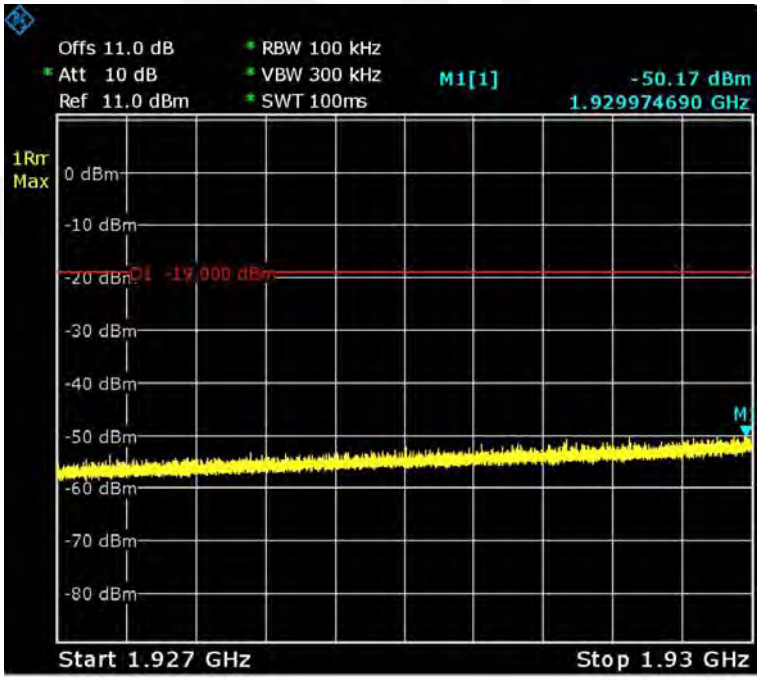
Date: 29.MAY.2016 17:24:16

PCS Band W-CDMA Left Side 1932.5MHz Pre-AGC



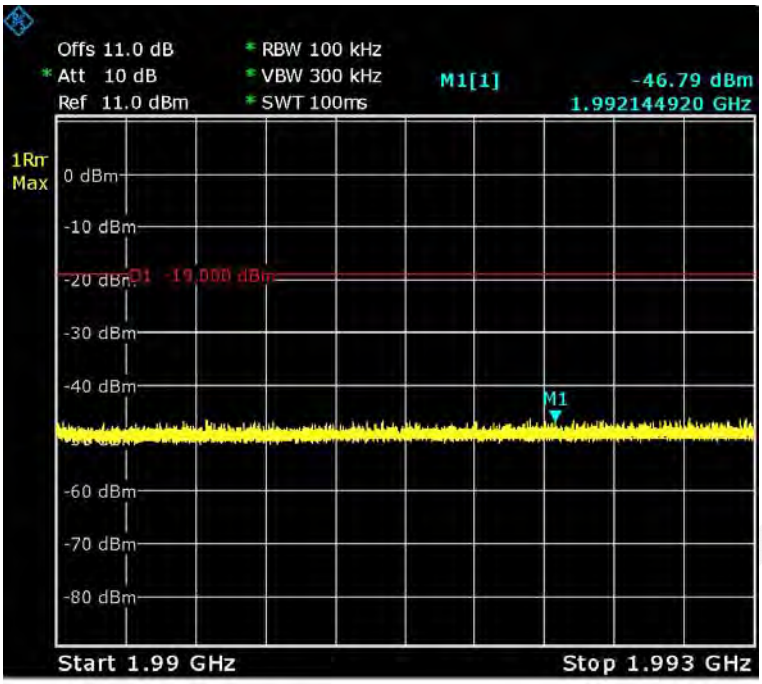
Date: 29.MAY.2016 17:00:41

PCS Band W-CDMA Left Side 1932.5MHz Above AGC



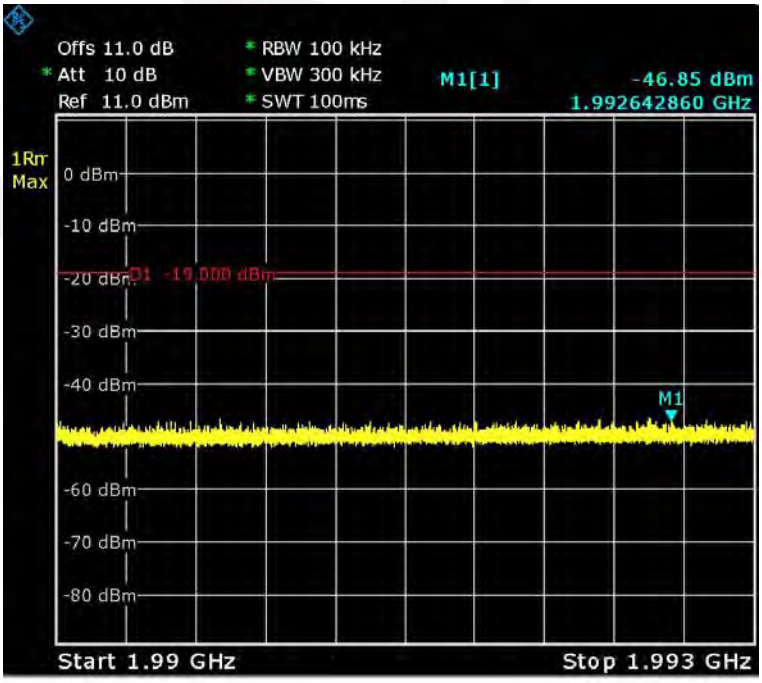
Date: 29.MAY.2016 17:04:26

PCS Band W-CDMA Right Side 1987.5MHz Pre-AGC



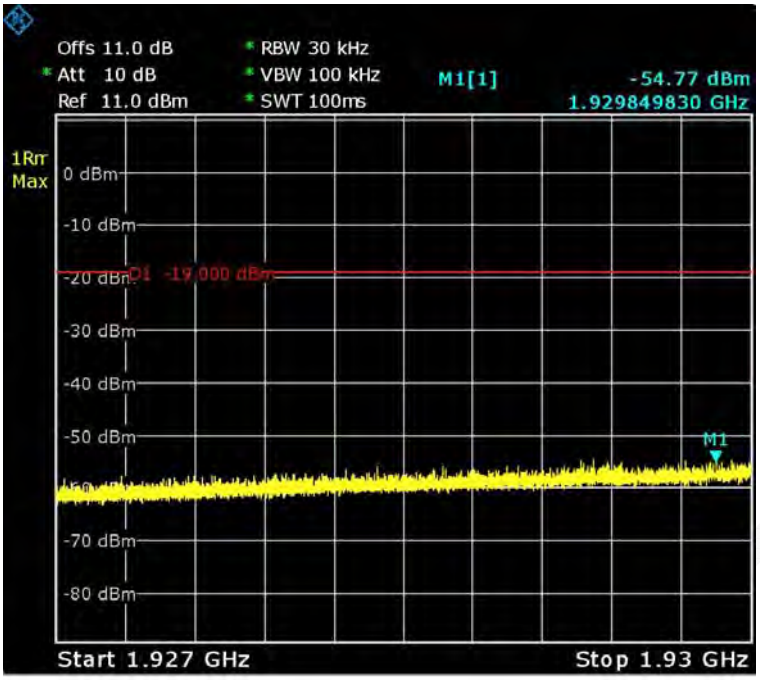
Date: 29.MAY.2016 17:09:08

PCS Band W-CDMA Right Side 1987.5MHz Above AGC



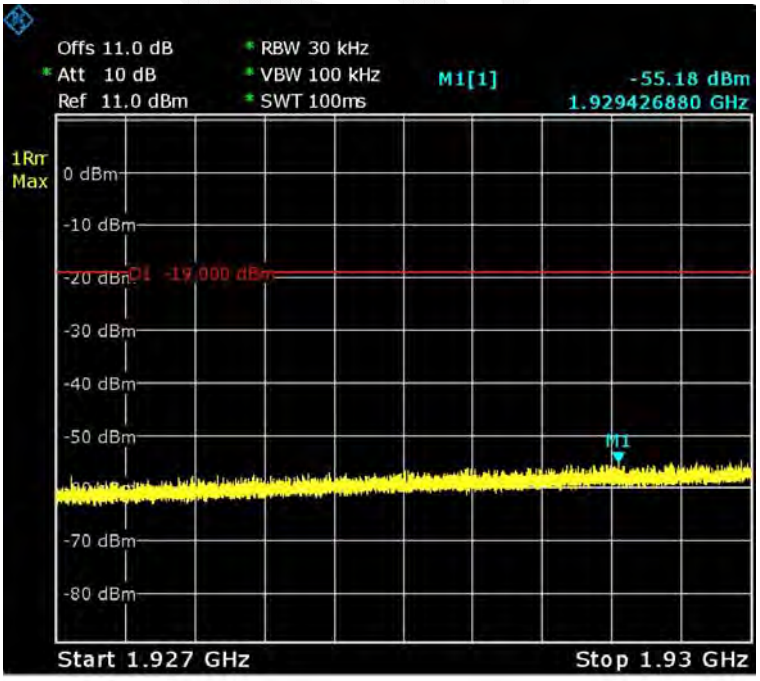
Date: 29.MAY.2016 17:10:13

PCS Band CDMA Left Side 1931.25MHz Pre-AGC



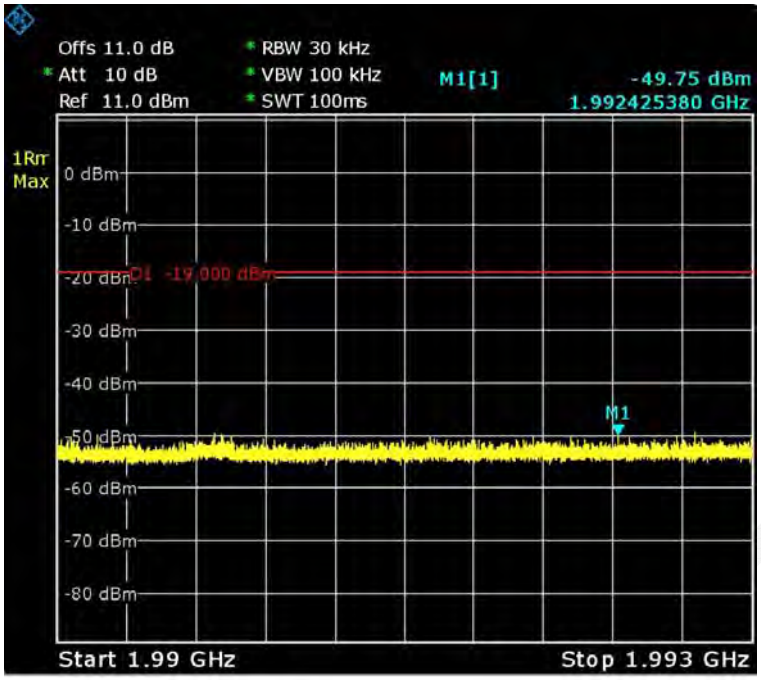
Date: 29.MAY.2016 15:07:38

PCS Band CDMA Left Side 1931.25MHz Above AGC



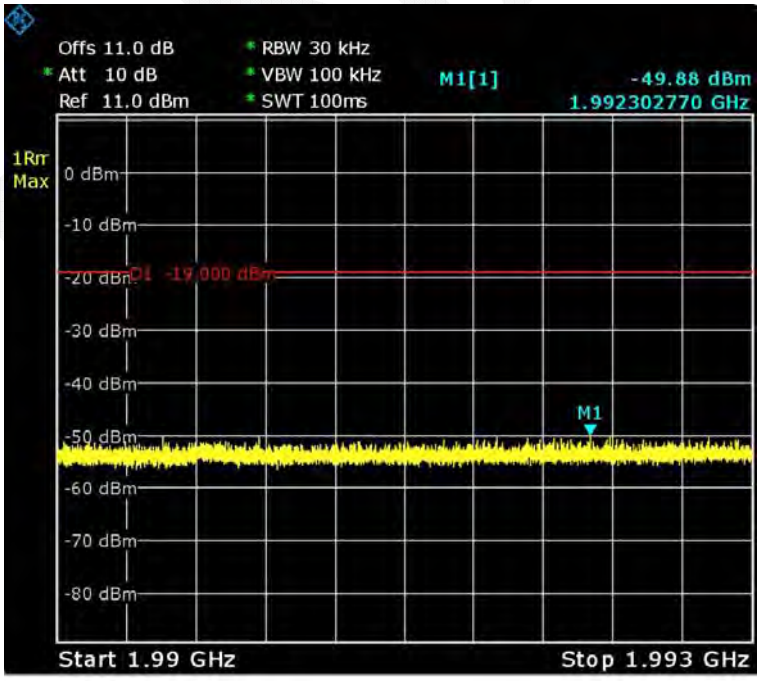
Date: 29.MAY.2016 15:09:49

PCS Band CDMA Right Side 1988.75MHz Pre-AGC



Date: 29.MAY.2016 15:12:17

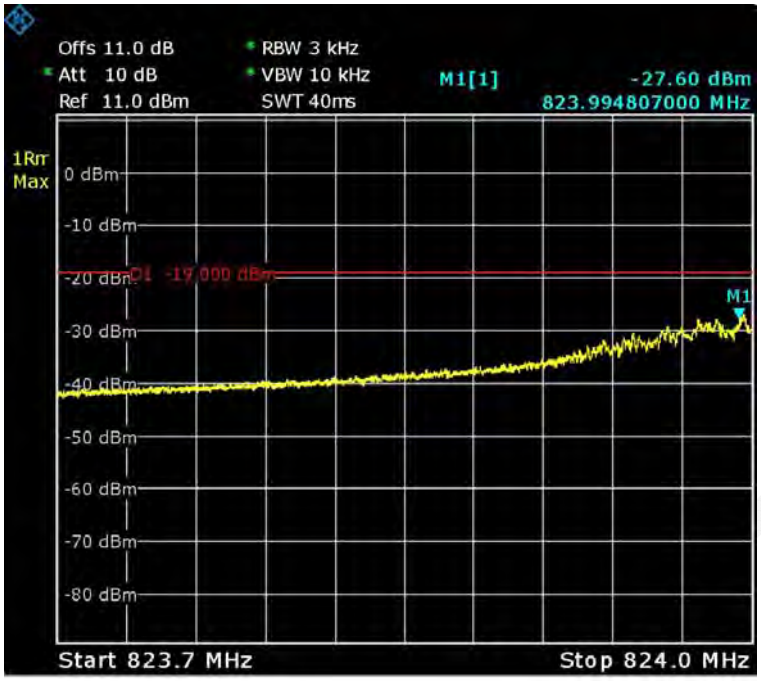
PCS Band CDMA Right Side 1988.75MHz Above AGC



Date: 29.MAY.2016 15:13:43

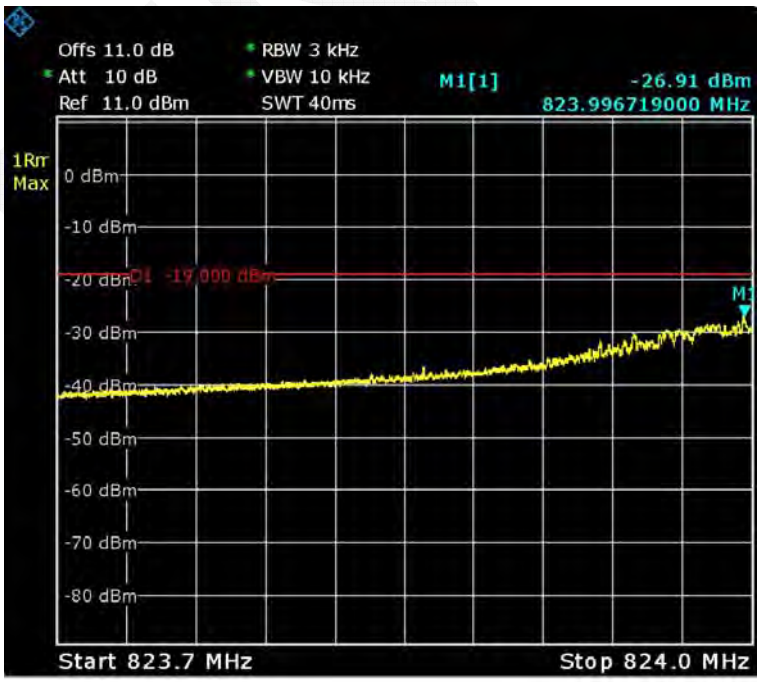
Uplink

Cellular Band GSM Left Side 824.2MHz Pre-AGC



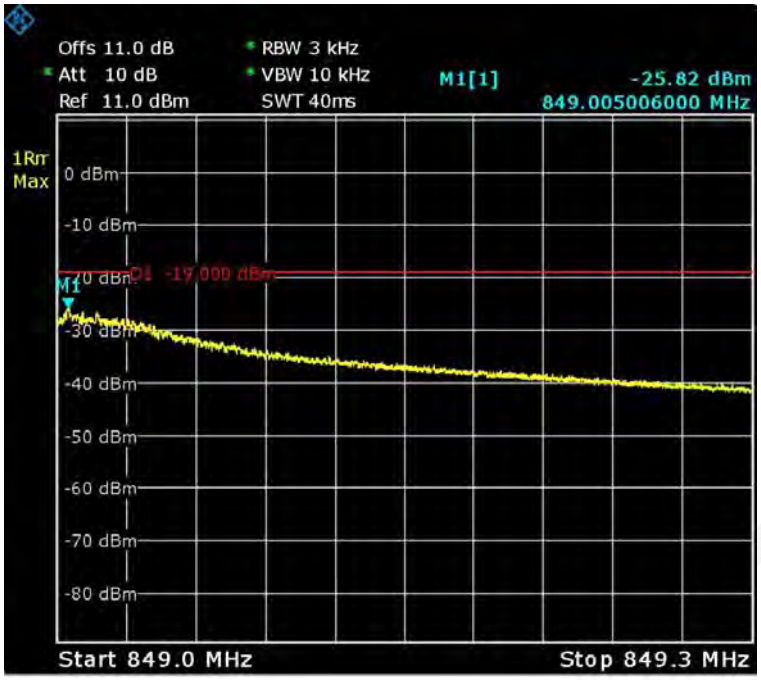
Date: 29.MAY.2016 17:42:44

Cellular Band GSM Left Side 824.2MHz Above AGC



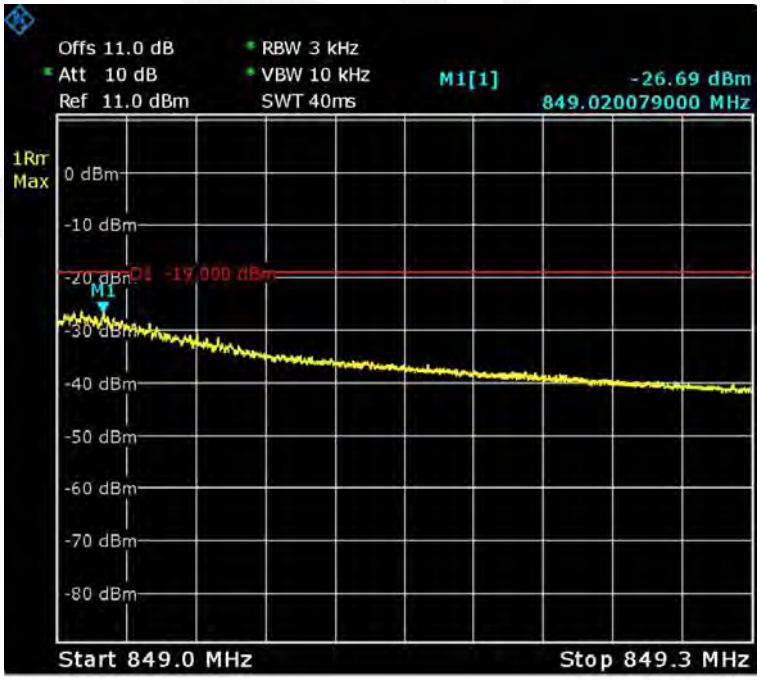
Date: 29.MAY.2016 17:44:06

Cellular Band GSM Right Side 848.8MHz Pre-AGC



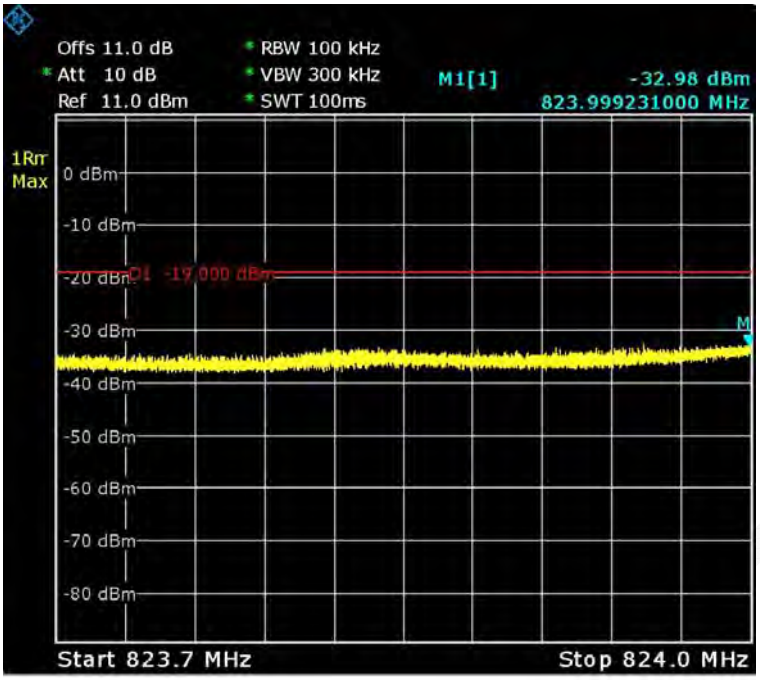
Date: 29.MAY.2016 17:48:15

Cellular Band GSM Right Side 848.8MHz Above AGC



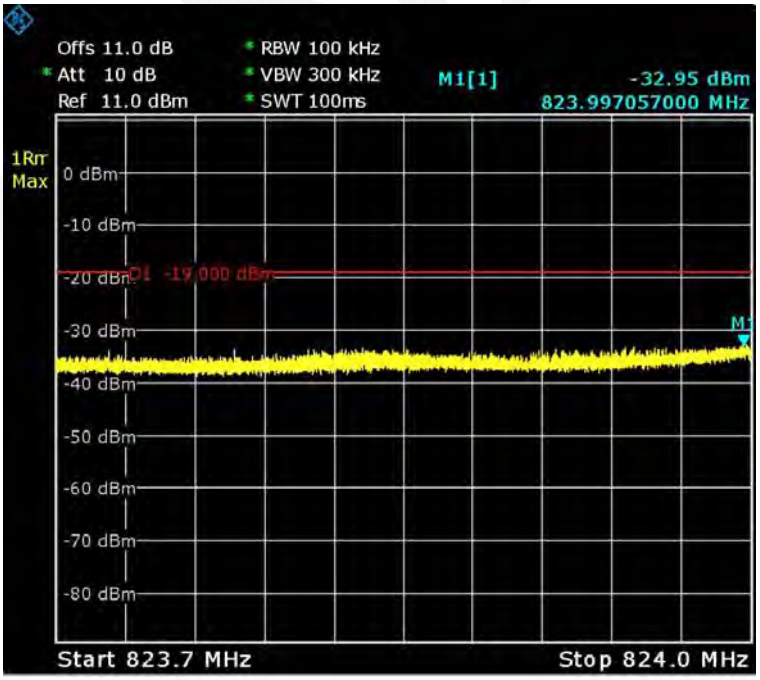
Date: 29.MAY.2016 17:49:34

Cellular Band W-CDMA Left Side 826.5MHz Pre-AGC



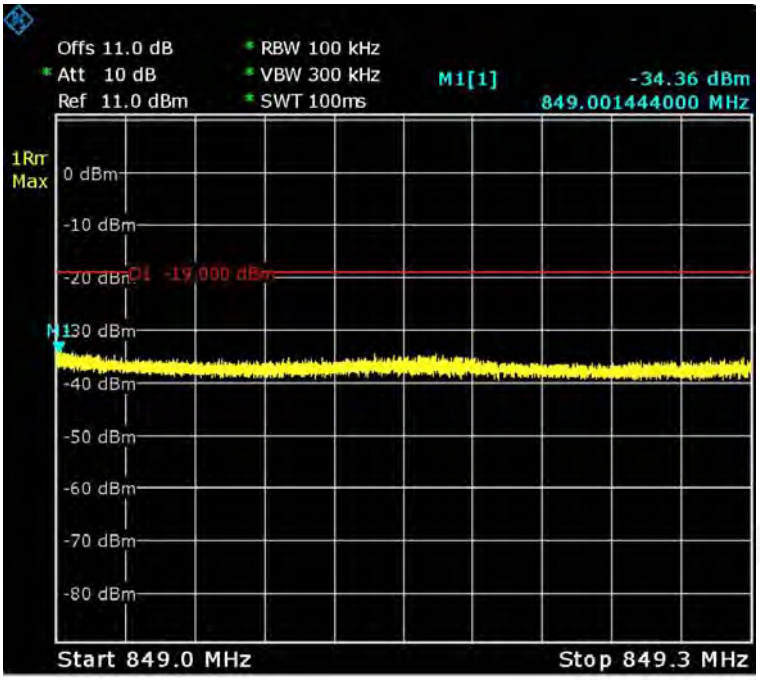
Date: 29.MAY.2016 16:23:48

Cellular Band W-CDMA Left Side 826.5MHz Above AGC



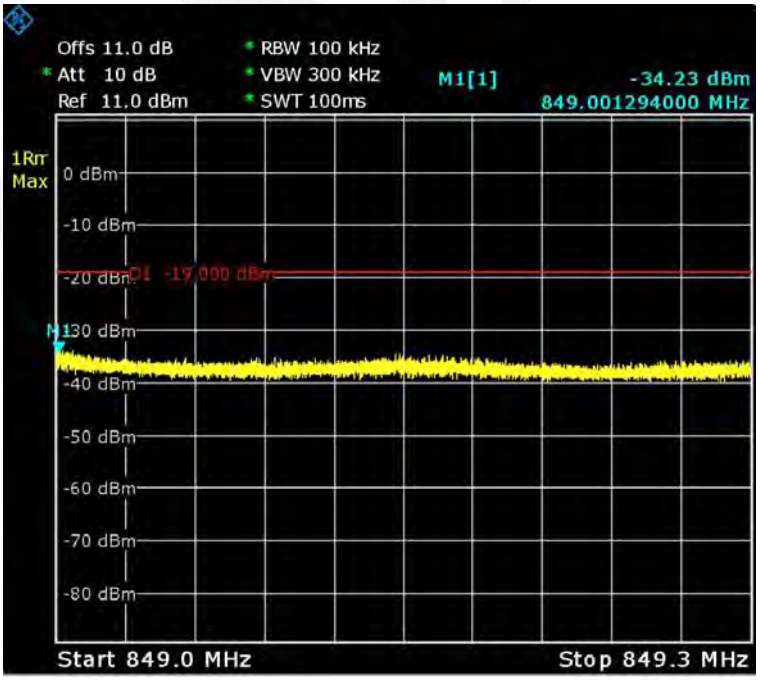
Date: 29.MAY.2016 16:25:39

Cellular Band W-CDMA Right Side 846.5MHz Pre-AGC



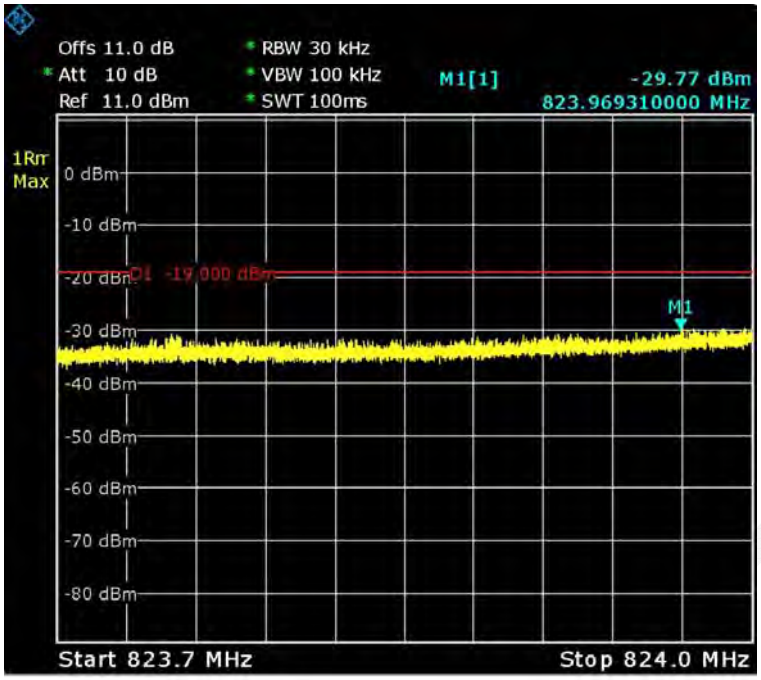
Date: 29.MAY.2016 16:28:01

Cellular Band W-CDMA Right Side 846.5MHz Above AGC



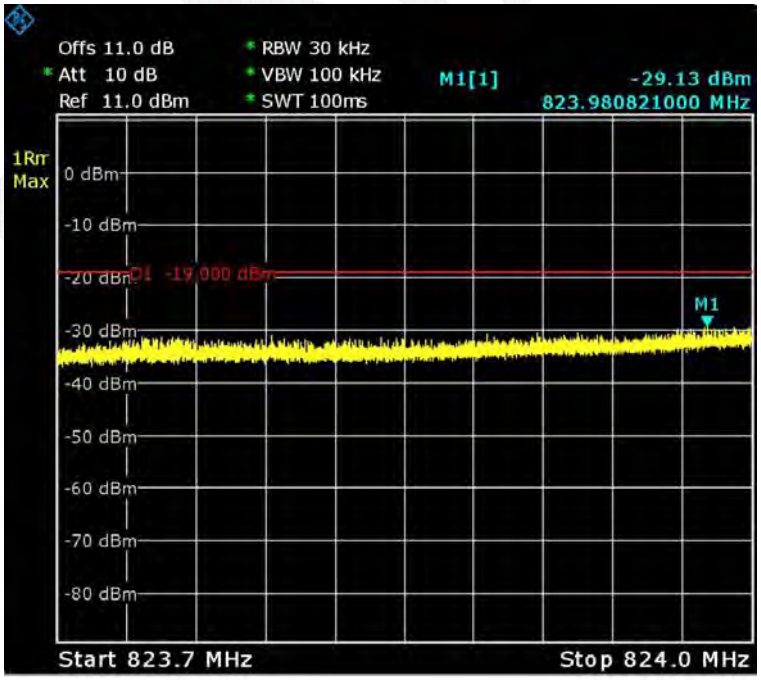
Date: 29.MAY.2016 16:29:24

Cellular Band CDMA Left Side 824.88MHz Pre-AGC



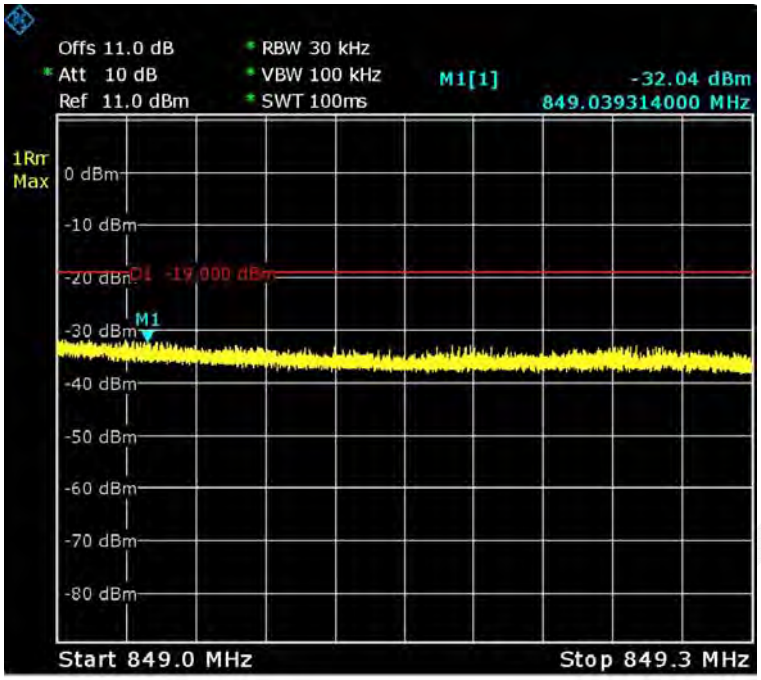
Date: 29.MAY.2016 15:29:54

Cellular Band CDMA Left Side 824.88MHz Above AGC



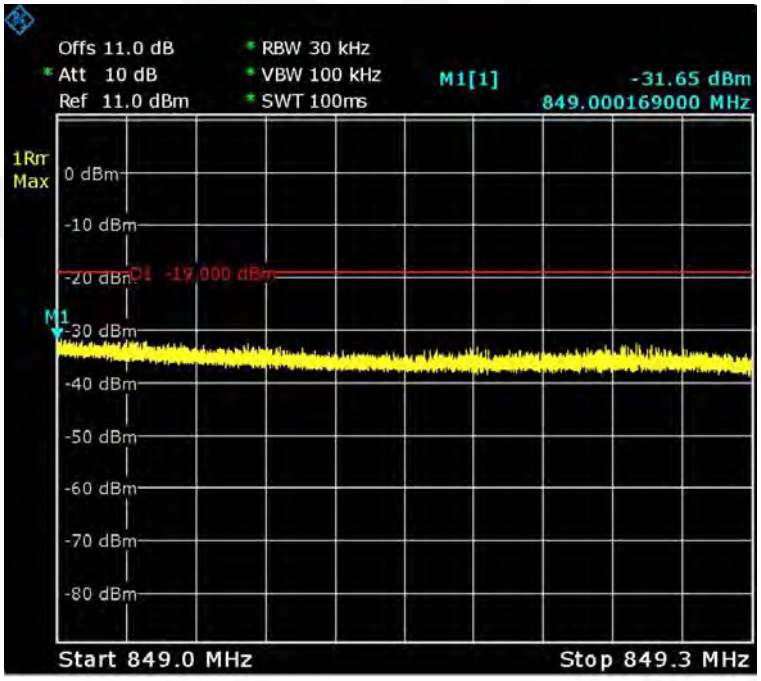
Date: 29.MAY.2016 15:31:43

Cellular Band CDMA Right Side 848.10MHz Pre-AGC



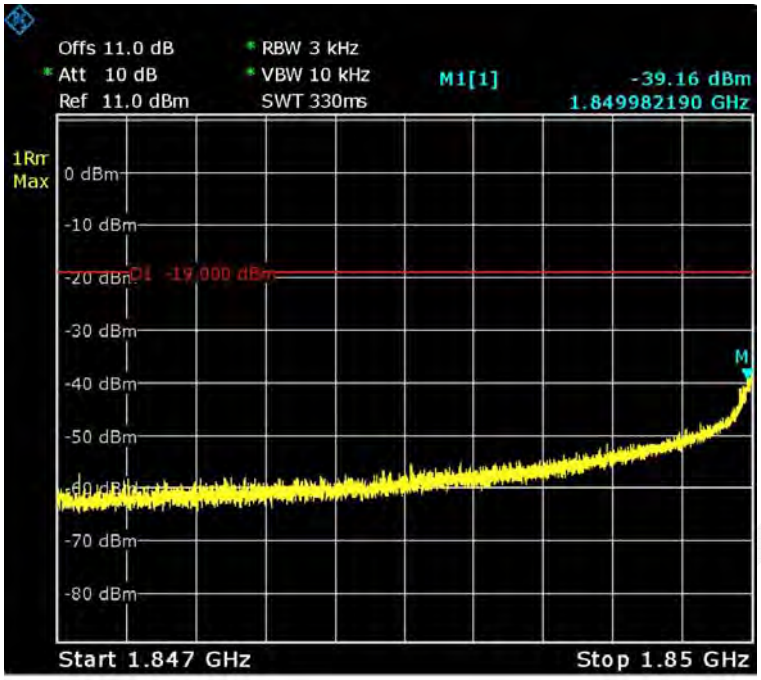
Date: 29.MAY.2016 15:36:33

Cellular Band CDMA Right Side 848.10MHz Above AGC



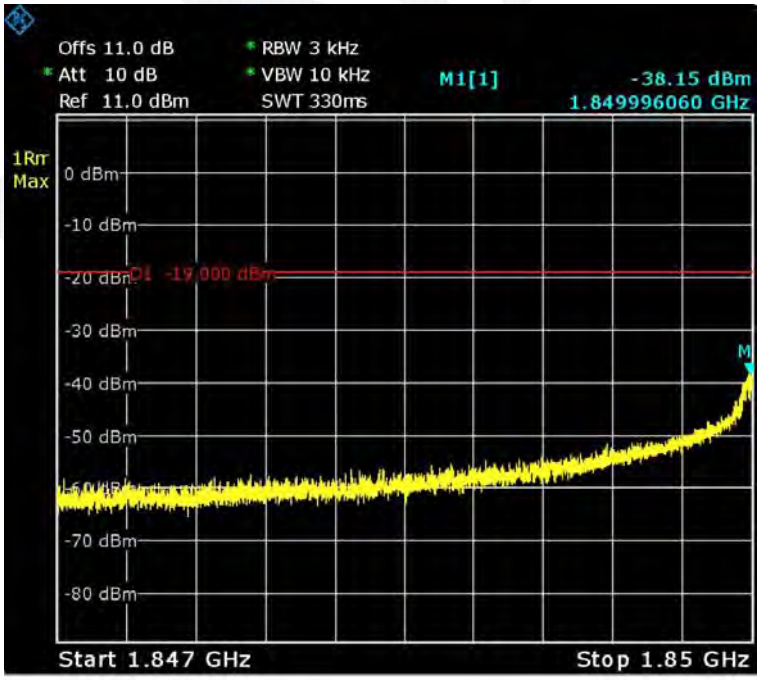
Date: 29.MAY.2016 15:38:29

PCS Band GSM Left Side 1850.2MHz Pre-AGC



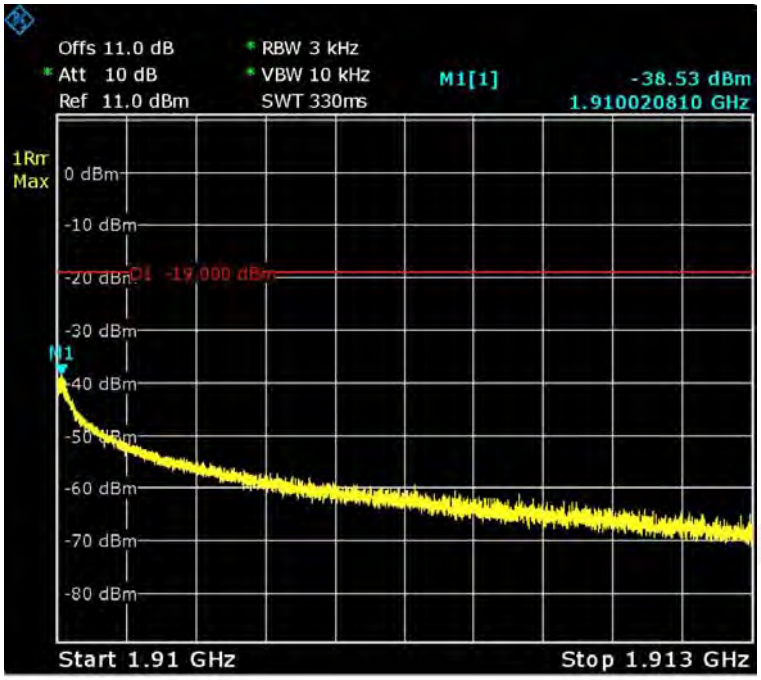
Date: 29.MAY.2016 17:54:30

PCS Band GSM Left Side 1850.2MHz Above AGC



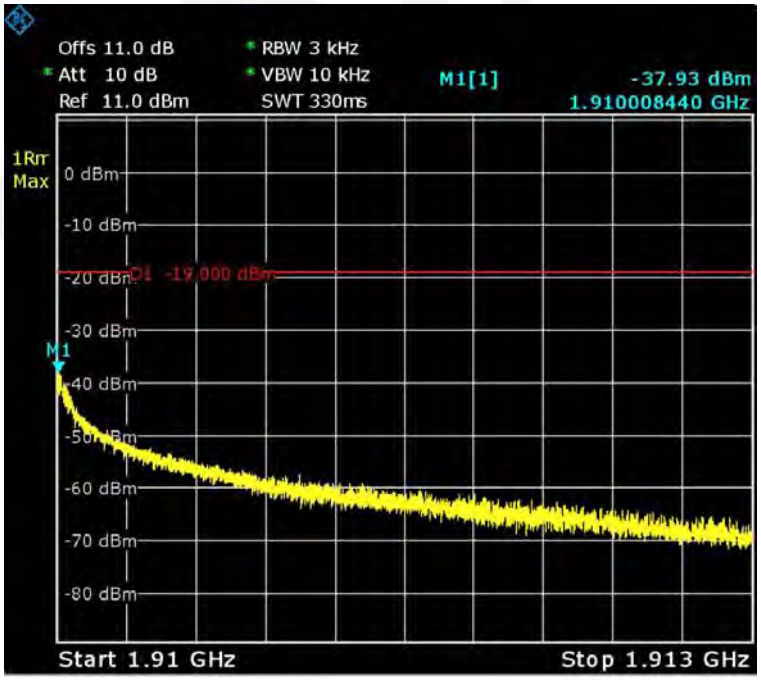
Date: 29.MAY.2016 17:56:07

PCS Band GSM Right Side 1909.8MHz Pre-AGC



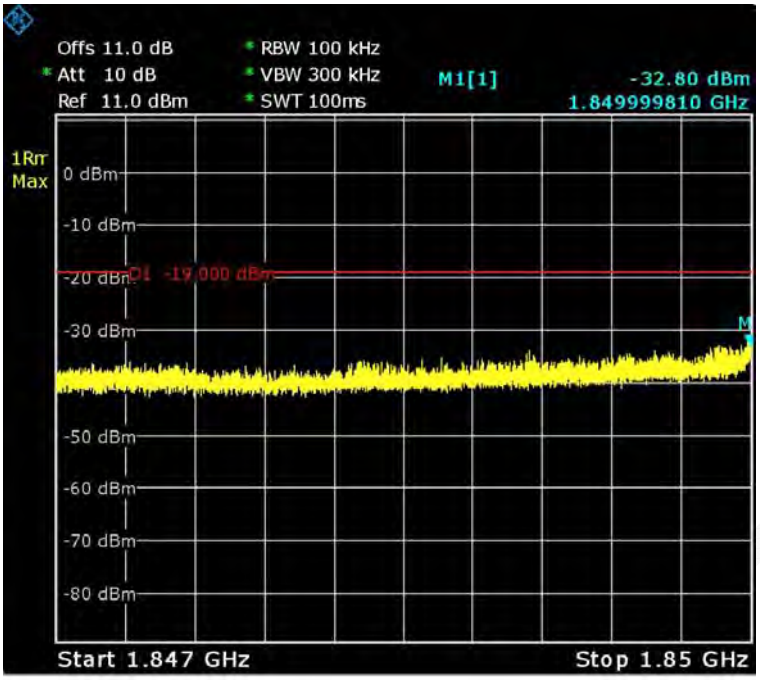
Date: 29.MAY.2016 17:59:51

PCS Band GSM Right Side 1909.8MHz Above AGC



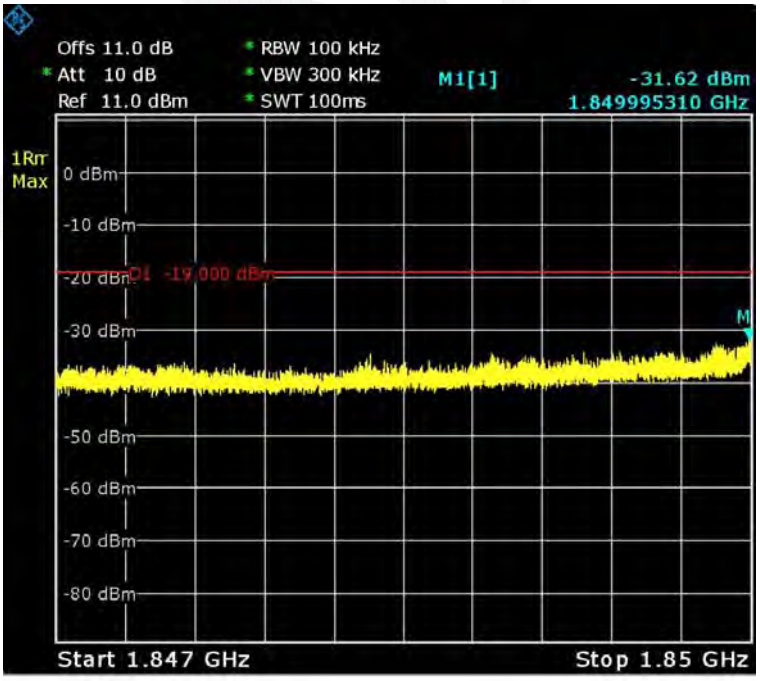
Date: 29.MAY.2016 18:01:13

PCS Band W-CDMA Left Side 1852.5MHz Pre-AGC



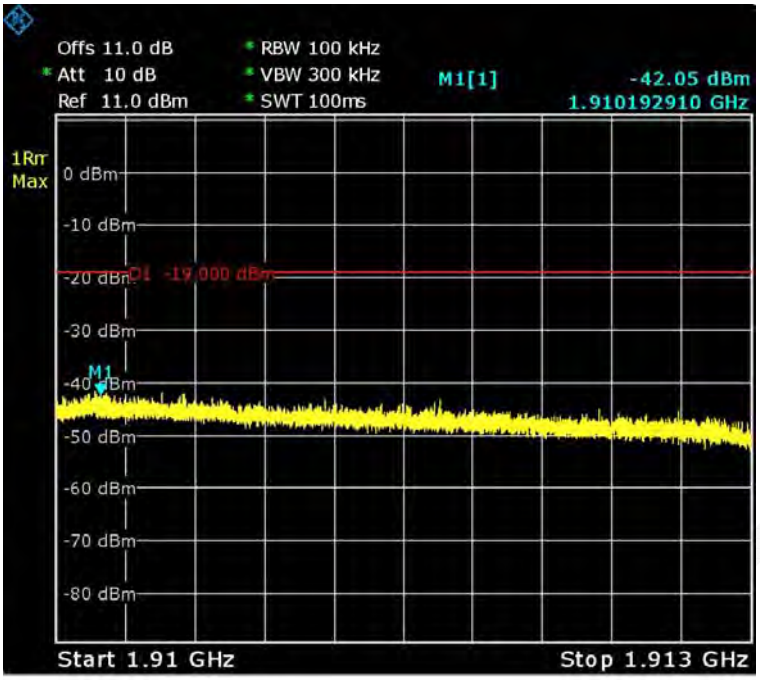
Date: 29.MAY.2016 16:35:01

PCS Band W-CDMA Left Side 1852.5MHz Above AGC



Date: 29.MAY.2016 16:36:33

PCS Band W-CDMA Right Side 1907.5MHz Pre-AGC



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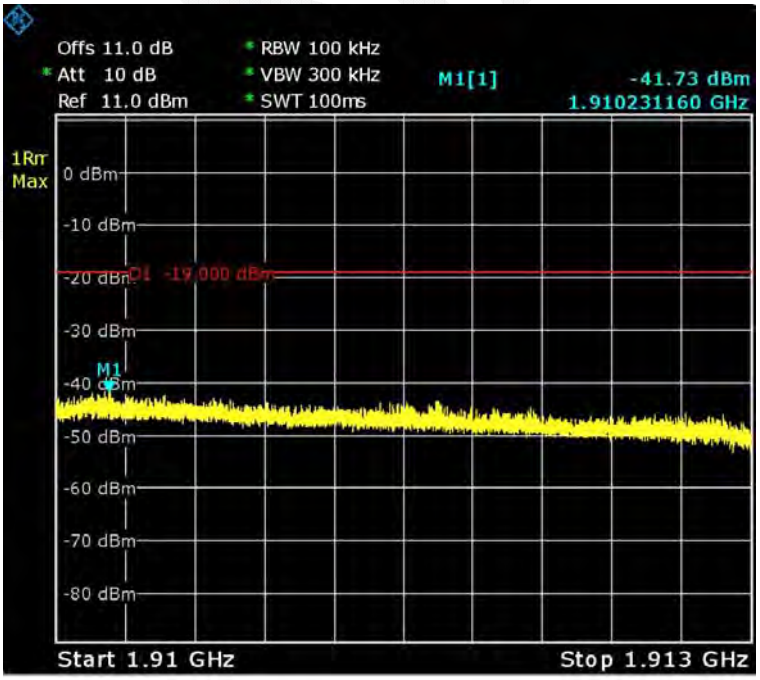
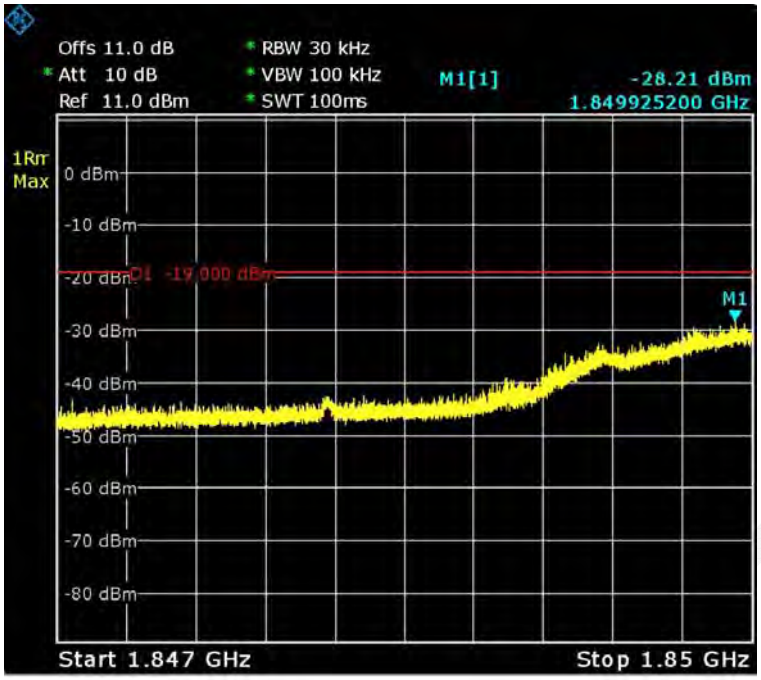
PCS Band W-CDMA Right Side 1907.5MHz Above AGC



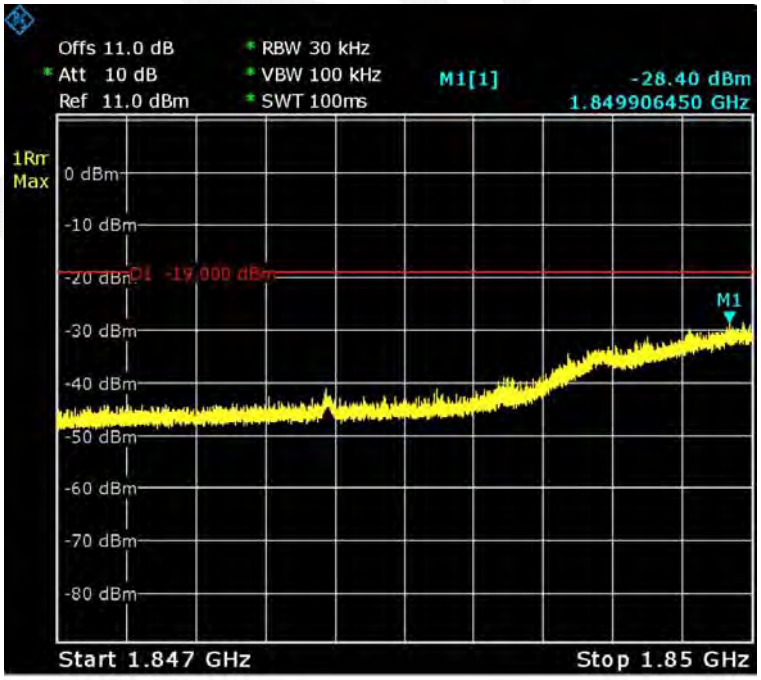
Date: 29.MAY.2016 16:43:00

PCS Band CDMA Left Side 1851.25MHz Pre-AGC



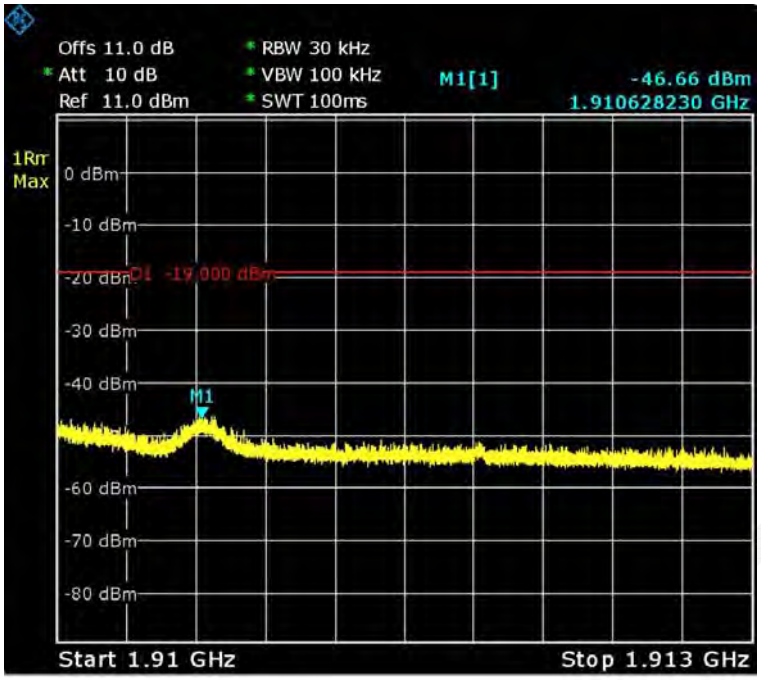
Date: 29.MAY.2016 15:42:52

PCS Band CDMA Left Side 1851.25MHz Above AGC



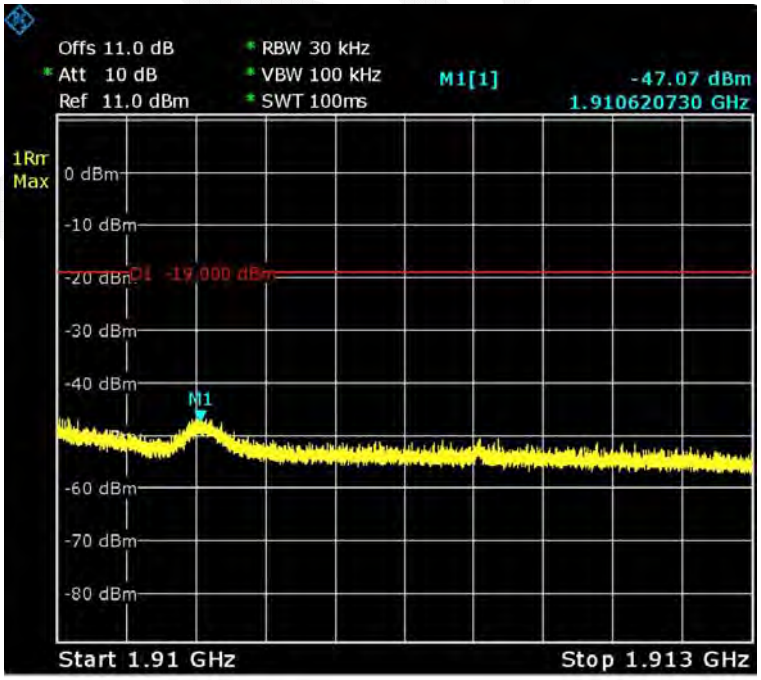
Date: 29.MAY.2016 15:44:54

PCS Band CDMA Right Side 1908.75MHz Pre-AGC



Date: 29.MAY.2016 15:54:16

PCS Band CDMA Right Side 1908.75MHz Above AGC



Date: 29.MAY.2016 15:56:13

§ 20.21(e)(8)(i)(A), § 20.21(e)(8)(i)(H) &§20.21(e)(4) - NOISE LIMITS

Applicable Standards

According to§ 20.21(e)(8)(i)(A) Noise Limits; § 20.21(e)(8)(i)(H) Transmit Power Off Mode (uplink and downlink noise power); §20.21(e)(4) Self-monitoring.

Test Procedure

Maximum transmitter noise power level

a) Connect the EUT to the test equipment as shown in **Figure 3**. Begin with the uplink output connected to the spectrum analyzer. When measuring downlink noise, connect the downlink output to the spectrum analyzer.
b) Set the spectrum analyzer RBW to 1 MHz with the VBW ≥ 3 × RBW.
c) Select the power averaging (RMS) detector and trace average over at least 100 traces.
d) Set the center frequency of the spectrum analyzer to the center of the CMRS band under test with the span ≥ 2 × the CMRS band.
e) Measure the maximum transmitter noise power level.
f) Save the spectrum analyzer plot as necessary for inclusion in the final test report.
g) Repeat 7.7b) to 7.7f) for all operational uplink and downlink bands.
h) Connect the EUT to the test equipment as shown in **Figure 4** for uplink. Affirm the coupled path of the RF coupler is connected to the spectrum analyzer.
i) Configure the signal generator for 4.1 MHz AWGN operation.
j) Set the spectrum analyzer RBW for 1 MHz with the VBW ≥ 3 × RBW with a power averaging (rms) detector with at least 100 trace averages.
k) Set the center frequency of the spectrum analyzer to the center of the CMRS band under test with the span ≥ 2 × the CMRS band. This shall include all spectrum blocks in the particular CMRS band under test (see Annex A).
l) For uplink noise measurements, set the spectrum analyzer center frequency for the uplink band under test and tune the signal generator to the center of the paired downlink band.
m) Measure the maximum transmitter noise power level when varying the downlink signal generator output level from −90 dBm to −20 dBm, as measured at the input port, in 1 dB steps inside the RSSI-dependent region and in 10 dB steps outside the RSSI-dependent region. Report the six values closest to the limit with at least two points within the RSSI-dependent region of the limit. See noise limit in Annex D.
n) Repeat 7.7.1h) through 7.7.1m) for all operational uplink.

Variable uplink noise timing

Variable uplink noise timing is to be measured as follows.

a) Set the spectrum analyzer to the uplink frequency to be measured.
b) Set the span to 0 Hz with a sweep time of 10 seconds.
c) Set the power level of signal generator 1 to the lowest level of the RSSI-dependent noise.
d) Select MAX HOLD and increase the power level of signal generator 1 by 10 dB for mobile boosters and 20 dB for fixed boosters.
e) Confirm that the uplink noise decreases to the specified level within 1 second for mobile devices and 3 seconds for fixed devices
f) Repeat 7.7.2a) to 7.7.2e) for all operational uplink bands.
g) Include plots and summary table in test report.

Note: *Some signal boosters will require a signal generator input because they will not operate unless a signal is received at the input terminals. If this is the case, connect a second signal generator and cycle the*

RF output to simulate this function.

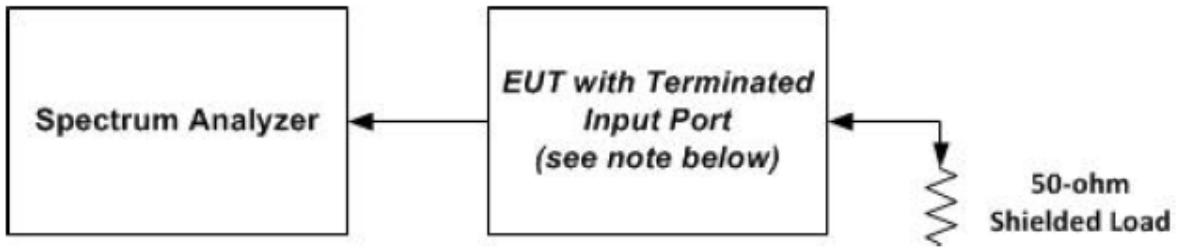


Figure 3 – Noise limit test setup (also used for 7.8)

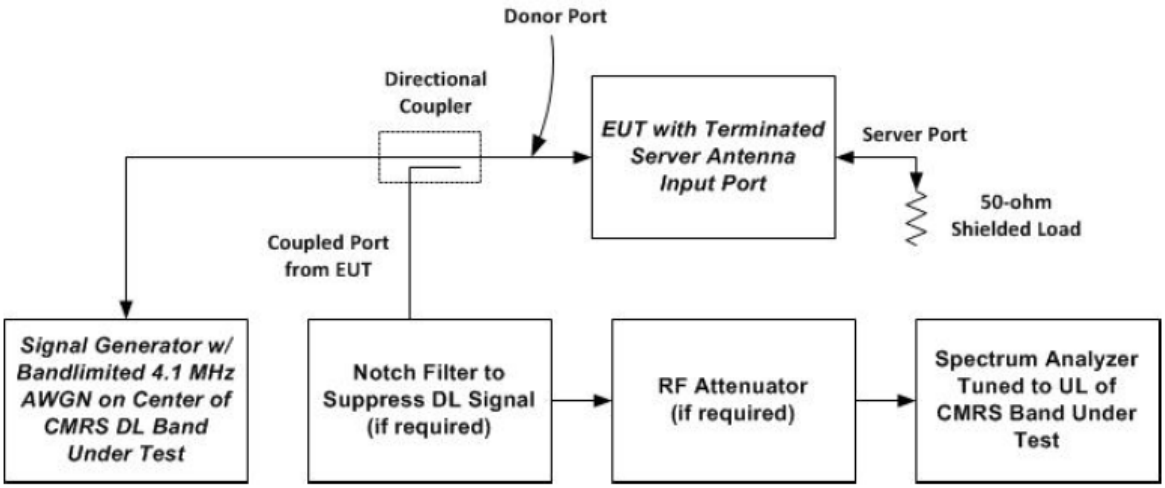


Figure 4 – Test setup for uplink noise power measurement in the presence of a downlink signal

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Universal Radio Communication Tester	CMU200	11-9435686-0111	2015-11-05	2016-11-04
Rohde & Schwarz	Spectrum Analyzer	FSL18	100180	2015-12-02	2016-12-01
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2015-12-02	2016-12-01
Agilent	Digital Signal Generator	ESG-D3000A	US36260285	2016-03-28	2017-03-27
E-Microwave	DC Block	EMDCB-00036	OE01304225	2015-12-09	2016-12-08
WEINSCHEL ENGINEERING	Attenuator(10dB)	N/A	AB1166	2015-12-09	2016-12-08
Narda	Directional Coupler	4242-10	02934	2015-12-09	2016-12-08
Narda	Terminal Load(5W)	370BNM	N/A	2015-12-09	2016-12-08
N/A	RF Coaxial Cable	T-E130	N/A	2015-12-09	2016-12-08
N/A	RF Coaxial Cable	LE-001-4	N/A	2015-12-09	2016-12-08

*** 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:	25.1℃
Relative Humidity:	48 %
ATM Pressure:	101.8 kPa

The testing was performed by Kevin Hu from 2016-08-17.

Test Result: Compliant. Please refer to the below tables and plots.

Maximum Noise:

Mode	Operation Bands	Measured Value (dBm/MHz)	Limit (dBm/MHz)
Uplink	Cellular	-48.88	-44.05
	PCS	-46.27	-37.02
Downlink	Cellular	-50.22	-44.05
	PCS	-46.29	-37.02

Note: Fixed booster maximum noise power shall not exceed −102.5 dBm/MHz + $20\log_{10}$ (Frequency), Where Frequency is the uplink mid-band frequency of the supported spectrum bands in MHz.

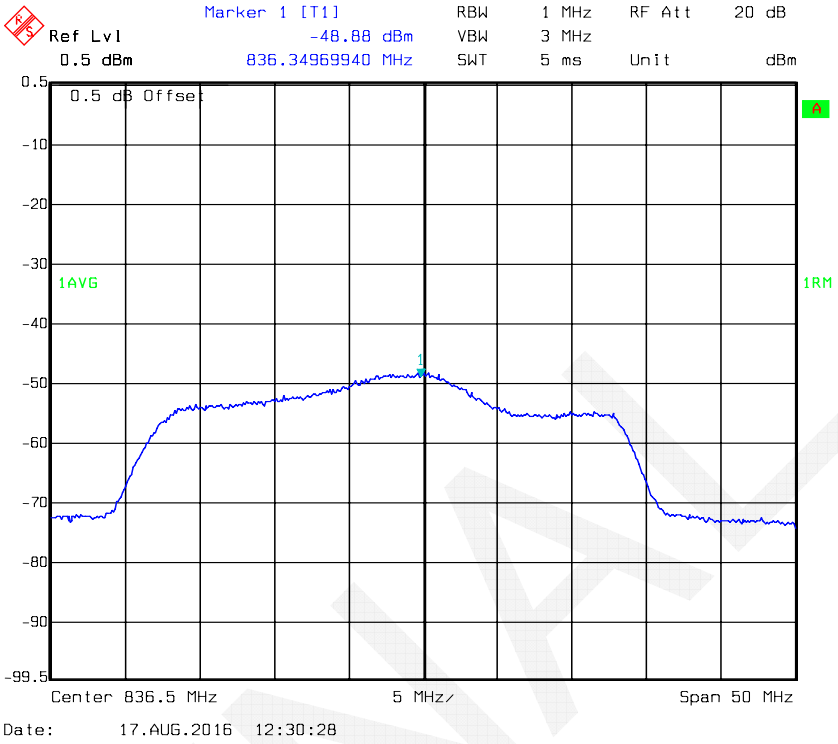
Variable uplink noise limit test result:

Operation Bands	RSSI dBm	Measured Value (dBm/MHz)	Limit (dBm/MHz)
Cellular	-46	-65.07	-57.00
	-45	-65.07	-58.00
	-44	-64.24	-59.00
	-43	-64.24	-60.00
	-42	-65.07	-61.00
	-41	-65.82	-62.00
PCS	-46	-64.76	-57.00
	-45	-65.05	-58.00
	-44	-65.95	-59.00
	-43	-65.02	-60.00
	-42	-65.48	-61.00
	-41	-66.01	-62.00

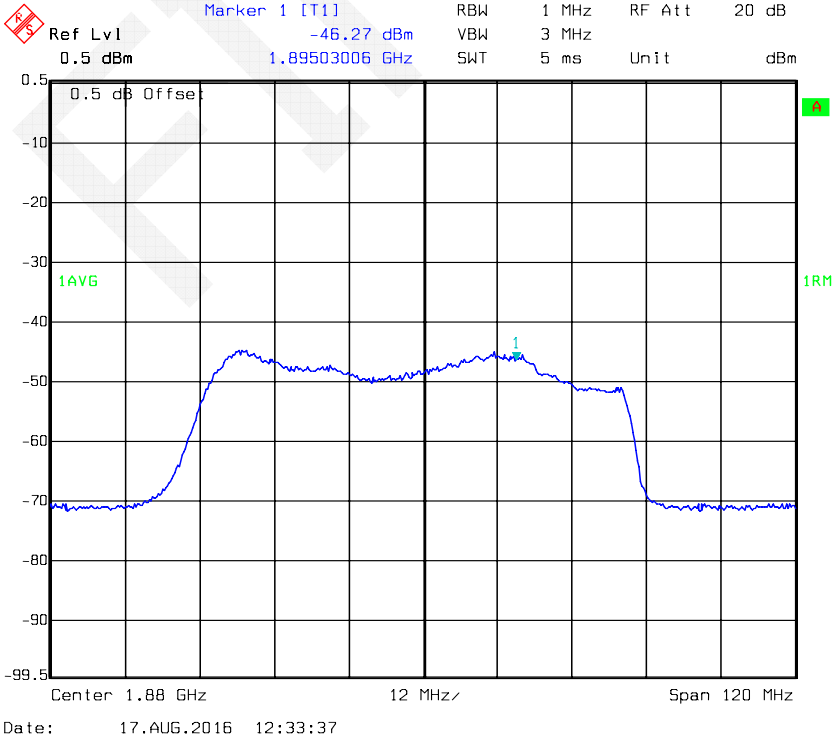
Note: The transmitted noise power in dBm/MHz of consumer boosters at their uplink port shall not exceed −103 dBm/MHz−RSSI.

Maximum Noise:

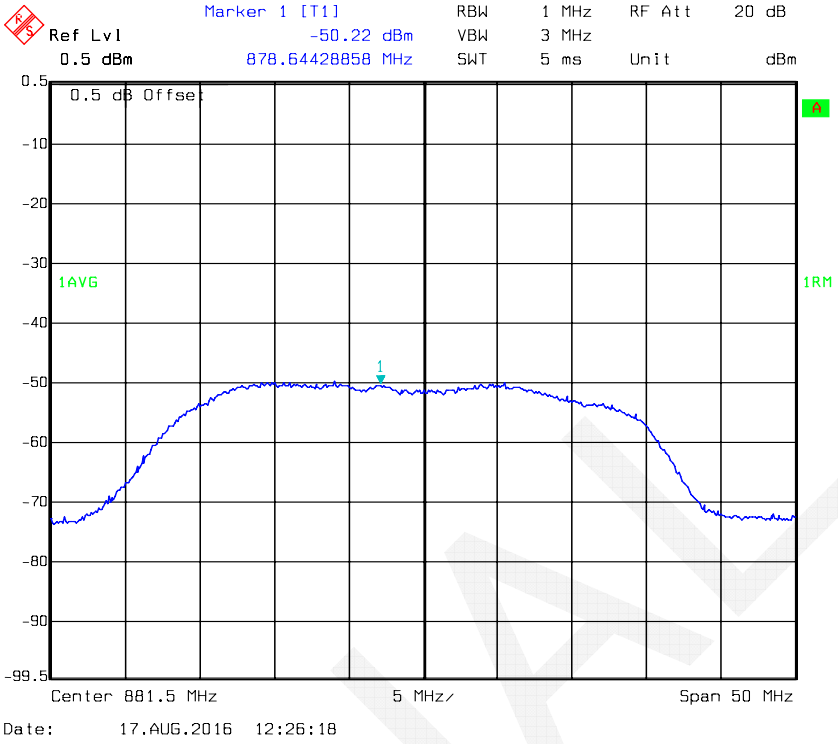
Uplink Cellular Band



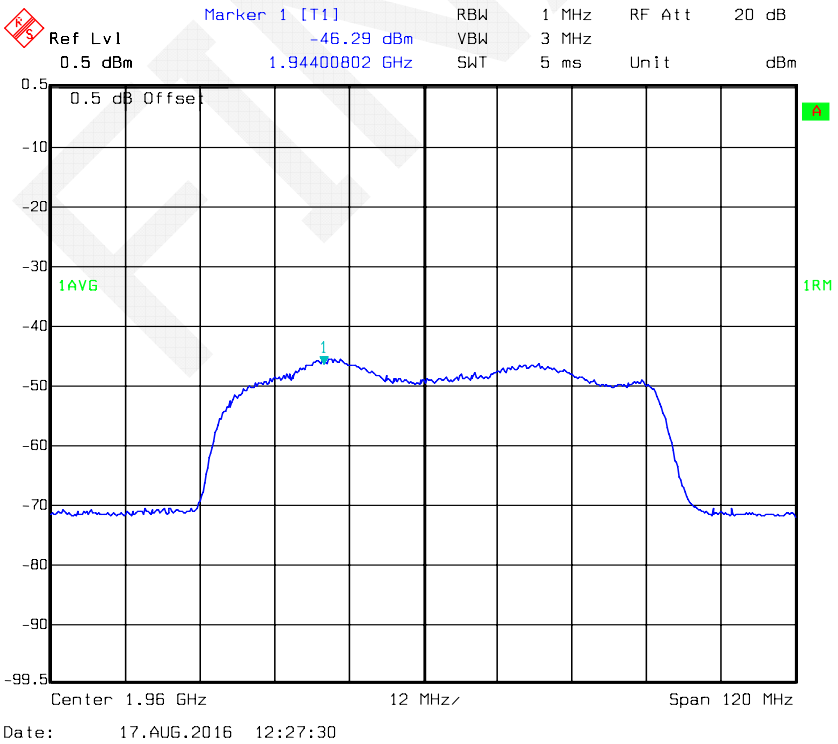
Uplink PCS Band



Down Link Cellular Band



Down Link PCS Band

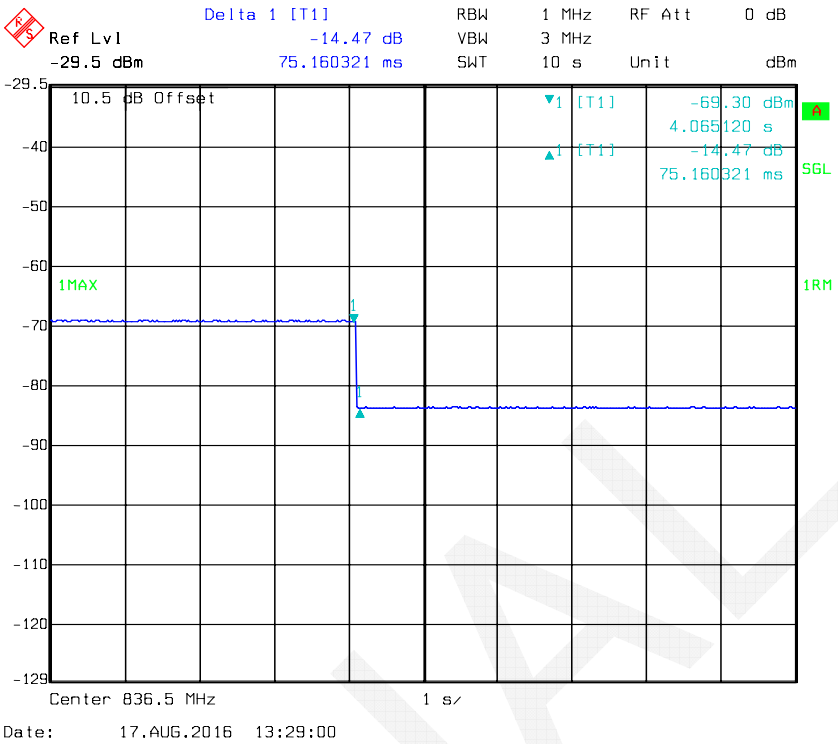


Variable Uplink Noise Timing:

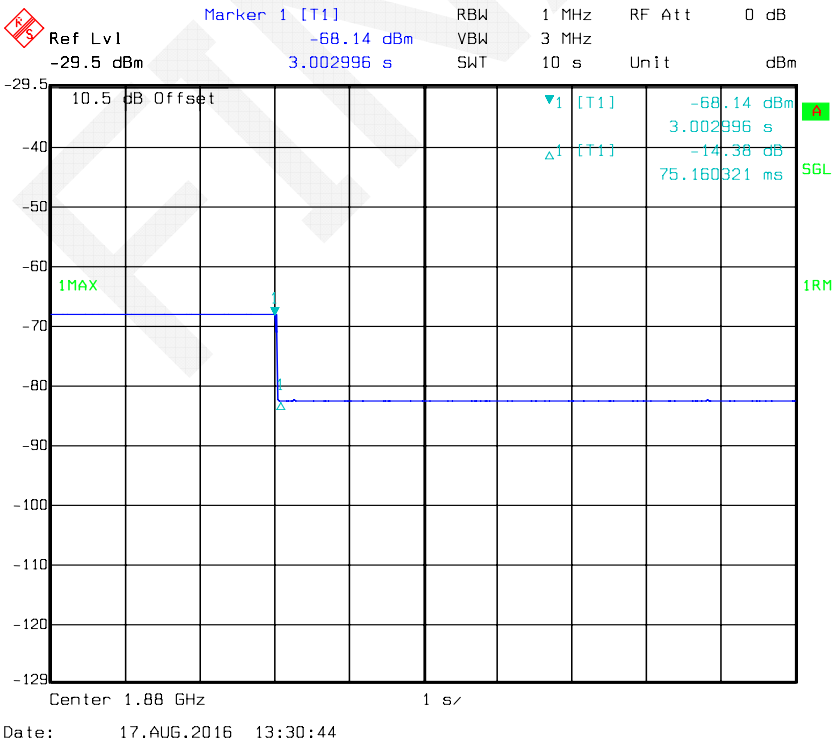
Operating Band	Measured Value	Limit
	s	s
Cellular	0.075	3
PCS	0.075	3

Note: The uplink noise decreases to the specified level within 1 second for mobile devices and 3 seconds for fixed devices.

Cellular Band



PCS Band



§ 20.21(e)(8)(i)(I) &§20.21(e)(4) - UPLINK INACTIVITY

Applicable Standards

According to§ 20.21(e)(8)(i)(I) Uplink Inactivity&§20.21(e)(4); §20.21(e)(4) Self-monitoring.

(I) Uplink Inactivity. When a consumer booster is not serving an active device connection after 5 minutes the uplink noise power shall not exceed -70 dBm/MHz.

Test Procedure

This measurement procedure is intended to demonstrate compliance to the uplink inactivity requirements specified for wideband consumer signal boosters in § 20.21(e)(8)(i)(I).

a) Connect the EUT to the test equipment as shown in **Figure 3** with the uplink output connected to the spectrum analyzer.
b) Select the RMS power averaging detector.
c) Set the spectrum analyzer RBW for 1 MHz with the VBW ≥ 3 × RBW.
d) Set the center frequency of the spectrum analyzer to the center of the uplink operational band.
e) Set the span for 0 Hz with a single sweep time for a minimum of 330 seconds.
f) Start to capture a new trace using MAX HOLD.
g) After approximately 15 seconds turn on the EUT power.
h) Once the full spectrum analyzer trace is complete place a MARKER on the leading edge of the pulse and use the DELTA MARKER METHOD to measure the time until the uplink becomes inactive.
i) Affirm that the noise level for the squelched signal is below the uplink inactivity noise power limit, as specified by the rules.
j) Capture the plot for inclusion in the test report.
k) Measure noise using procedures in 7.7.1a) to 7.7.1e).
l) Repeat 7.8d) through 7.8k) for all operational uplink bands.

Note: *Some signal boosters will require a signal generator input because they will not operate unless a signal is received at the input terminals. If this is the case, connect a signal generator and cycle the RF output to simulate this function.*

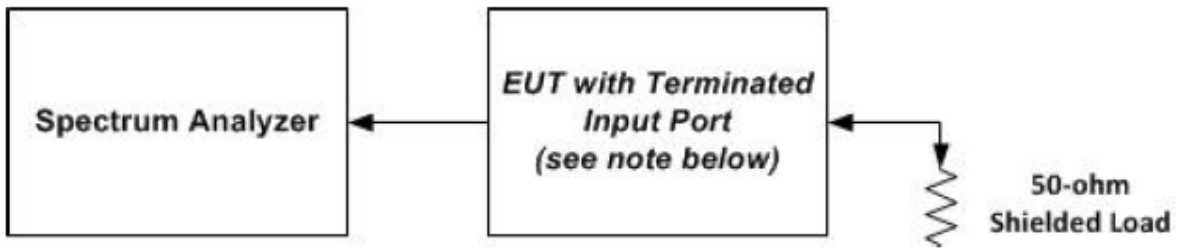


Figure 3

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Spectrum Analyzer	FSL18	100180	2015-12-02	2016-12-01
Narda	Terminal Load(5W)	370BNM	N/A	2015-12-09	2016-12-08

*** 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:	25.5℃
Relative Humidity:	53%
ATM Pressure:	101.5 kPa

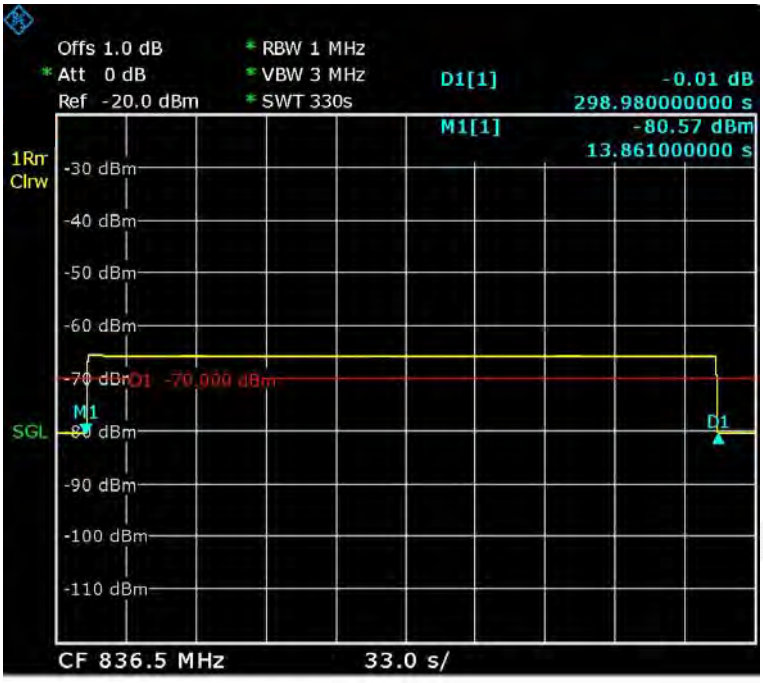
The testing was performed by Kevin Hu on 2016-05-31.

Test Result: Compliant. Please refer to the below plots.

Operation Band	Measured value	Limit
	s	s
824-849 MHz	298.98	300
1850-1910 MHz	298.98	

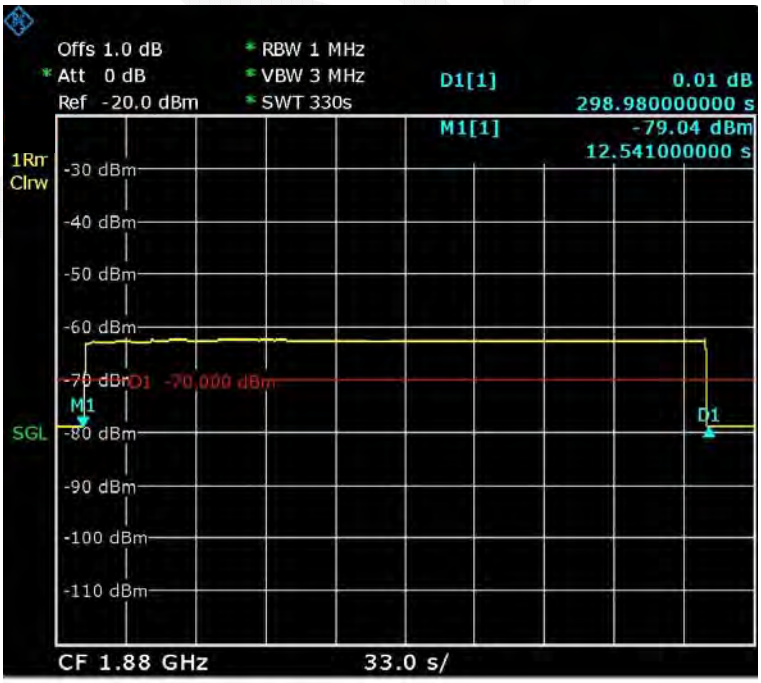
Note: When a consumer booster is not serving an active device connection after 5 minutes the uplink noise power shall not exceed -70 dBm/MHz.

Cellular Band



Date: 31.MAY.2016 16:33:26

PCS Band



Date: 31.MAY.2016 16:40:33

§ 20.21(e)(8)(i)(C)(1) & § 20.21(e)(8)(i)(H) - VARIABLE BOOSTER GAIN

Applicable Standards

Rule paragraph(s): § 20.21(e)(8)(i)(C)(1) *Booster Gain Limits* (variable gain); § 20.21(e)(8)(i)(H) *Transmit Power Off Mode* (uplink gain).

Test Procedure

Maximum gain

This procedure shall be used to demonstrate compliance to the booster gain limits specified for wideband consumer signal boosters in § 20.21(e)(8)(i)(C) or § 20.21(e)(8)(i)(H). The variable booster gain limits are expressed as a function of RSSI and MSCL. The RSSI is varied over a range of values as specified within the procedure. Refer to Annex B of this document for guidance on determining the applicable MSCL value.

a) Connect the EUT to the test equipment as shown in **Figure 5** with the uplink output connected to signal generator 1. Confirm that the coupled path of the RF coupler is connected to the spectrum analyzer.
b) Configure downlink signal generator 1 for AWGN operation with a 99% occupied bandwidth of 4.1 MHz tuned to the center of the operational band.
c) Set the power level and frequency of signal generator 2 to a value 5 dB below the AGC level determined from 7.2. The signal type is AWGN with a 99% OBW of 4.1 MHz.
d) Set RBW = 100 kHz.
e) Set VBW ≥ 300 kHz.
f) Select the CHANNEL POWER measurement mode.
g) Select the RMS (power averaging) detector.
h) Ensure that the number of measurement points per sweep ≥ (2 × span)/RBW.
i) Sweep time = auto couple or as necessary (but no less than auto couple value).
j) Trace average at least 10 traces in power averaging (i.e., RMS) mode.
k) Measure the maximum channel power and compute maximum gain when varying the signal generator 1 output to a level from −90 dBm to −20 dBm as measured at the input port in 1 dB steps inside the RSSI-dependent region and 10 dB steps outside the RSSI-dependent region and report the six values closest to the limit, including at least two points from within the RSSI-dependent region of operation. See gain limit in charts in Annex D for uplink gain requirements. Additionally, document that the EUT provides equivalent uplink and downlink gain, and when operating in shutoff mode the uplink and downlink gain is within the transmit power off mode gain limits.
l) Repeat 7.9.1c) to 7.9.1k) for all operational uplink bands.

Variable uplink gain timing

Variable uplink gain timing is to be measured as follows.
a) Set the spectrum analyzer to the uplink frequency to be measured.
b) Set the span to 0 Hz with a sweep time of 10 seconds.
c) Set the power level of signal generator 1 to the lowest level of the RSSI-dependent gain.
d) Select MAX HOLD and increase the power level of signal generator 1 by 10 dB for mobile boosters and 20 dB for fixed indoor boosters. Signal generator 2 remains same, as described in 7.9.1c).

e) Confirm that the uplink gain decreases to the specified levels within 1 second for mobile devices and 3 seconds for fixed devices.
f) Repeat 7.9.2a) to 7.9.2e) for all operational uplink bands.

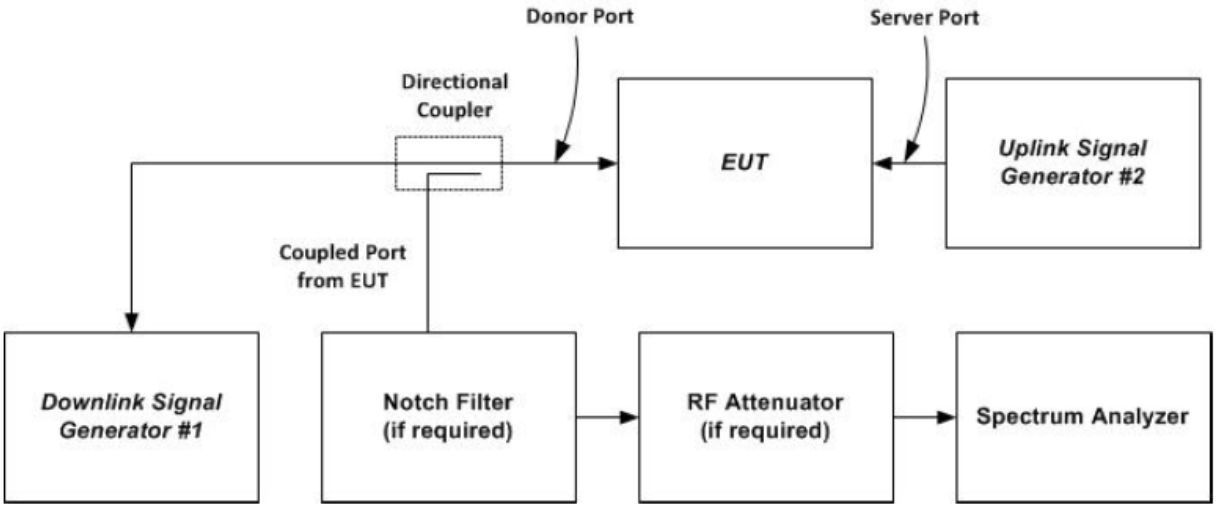


Figure 5 – Variable gain instrumentation test setup

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Universal Radio Communication Tester	CMU200	11-9435686-0111	2015-11-05	2016-11-04
Rohde & Schwarz	Spectrum Analyzer	FSL18	100180	2015-12-02	2016-12-01
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2015-12-02	2016-12-01
Agilent	Digital Signal Generator	ESG-D3000A	US36260285	2016-03-28	2017-03-27
E-Microwave	DC Block	EMDCB-00036	OE01304225	2015-12-09	2016-12-08
WEINSCHEL ENGINEERING	Attenuator(10dB)	N/A	AB1166	2015-12-09	2016-12-08
Narda	Directional Coupler	4242-10	02934	2015-12-09	2016-12-08
N/A	RF Coaxial Cable	T-E130	N/A	2015-12-09	2016-12-08
N/A	RF Coaxial Cable	LE-001-4	N/A	2015-12-09	2016-12-08

*** 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:	25.6℃
Relative Humidity:	52%
ATM Pressure:	101.3 kPa

The testing was performed by Kevin Hu on 2016-08-28.

Test Result: Compliant. Please refer to the below tables and plots.

MSCL calculation:

Operation Bands	Frequency	Distance	Path Loss	Indoor Antenna Gain	Indoor Cable Loss	Polarity Loss	MSCL
	MHz	m	dB	(dBi)	(dB)	(dB)	
Cellular	836.5	5.0	44.93	10.0	2.5	3.01	40.44
PCS	1880	5.0	51.96	10.0	3.0	3.01	47.97

Note:
Path loss=20logf+20logd-27.5
Polarity loss=20log (1/sin(45))=3.01
MSCL=Path loss + Polarity –Antenna Gain + Cable loss

Variable booster gain:

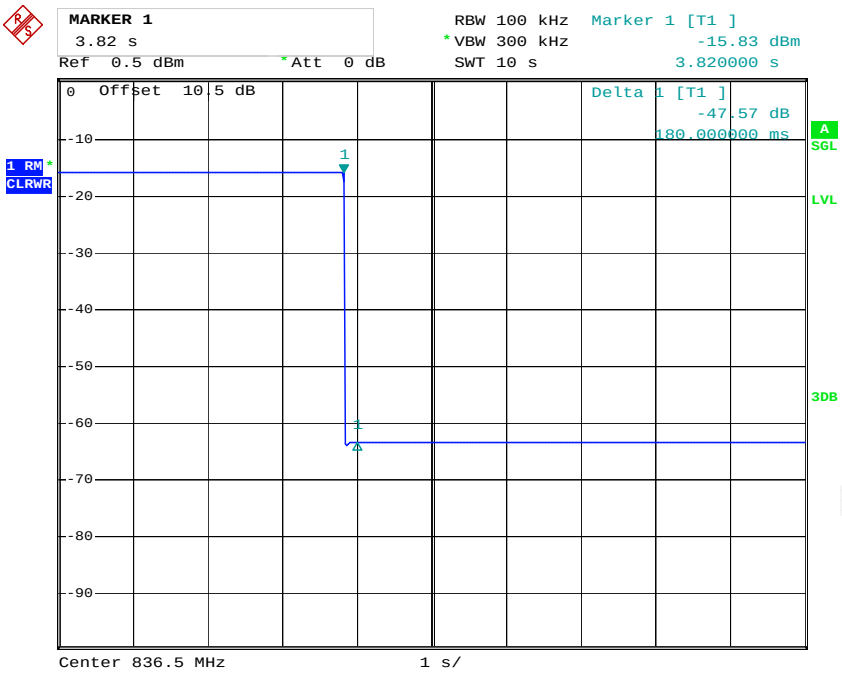
Operation Bands	RSSI	P_{in}	P_{out}	MSCL	Measured Value	Limit
	dBm	dBm	dBm	dB	dB	dB
Cellular	-90	-45.3	10.13	40.44	52.13	64.95
	-50	-45.3	-8.71	40.44	33.29	56.44
	-49	-45.3	-8.55	40.44	33.45	55.44
	-45	-45.3	-13.68	40.44	28.32	51.44
	-42	-45.3	-15.32	40.44	26.68	48.44
	-41	-45.3	-15.32	40.44	26.68	47.44
PCS	-60	-46.1	2.35	47.97	47.35	71.98
	-50	-46.1	-5.35	47.97	39.65	63.97
	-49	-46.1	-7.88	47.97	37.12	62.97
	-45	-46.1	-13.56	47.97	31.44	58.97
	-42	-46.1	-16.25	47.97	28.75	55.97
	-41	-46.1	-18.02	47.97	26.98	54.97

Note: Variable booster gain Limit: −34 dB-RSSI + MSCL.

Variable gain timing:

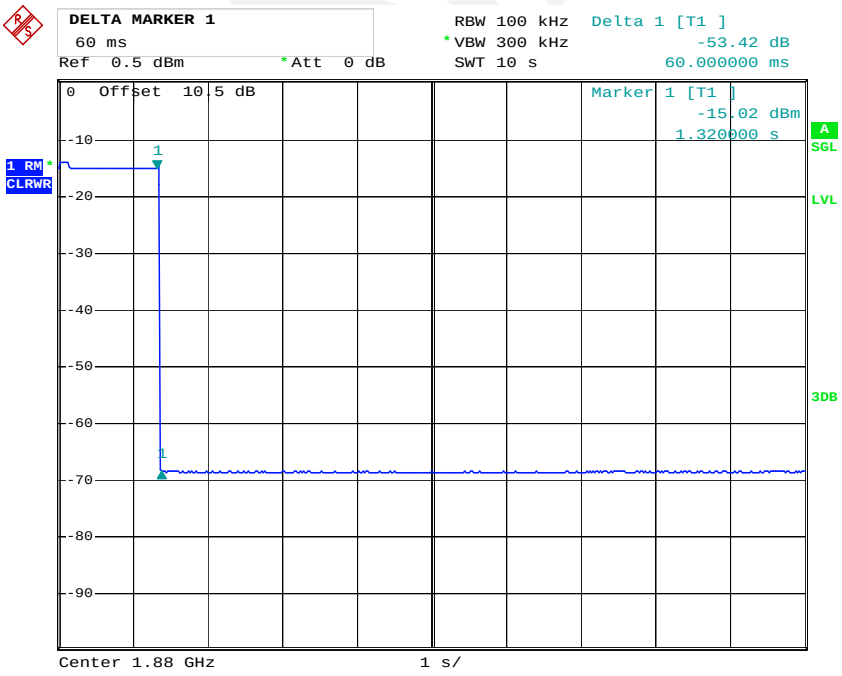
Operation Bands	Measured value	Limit
MHz	s	s
824-849	0.18	3
1850-1910	0.06	

Cellular Band



Date: 28.AUG.2016 04:02:54

PCS Band



Date: 28.AUG.2016 04:00:36

§ 2.1049 - OCCUPIED BANDWIDTH

Applicable Standards

According to§ 2.1049 Measurements required: Occupied bandwidth.

Test Procedure

This measurement is required to compare the uniformity of the output signal relative to the input signal and to satisfy the requirements of § 2.1049.

a) Connect the test equipment as shown in **Figure 6** to measure the characteristics of the test signals produced by the signal generator.
b) Set VBW to ≥ 3 × RBW.
c) Set the center frequency of the spectrum analyzer to the center of the operational band. The span will be adjusted for each modulation type and occupied bandwidth as necessary for accurately viewing the signals.
d) Set the signal generator for power level to match the values obtained in 7.2.
e) Set the signal generator modulation type for GSM with a PRBS pattern and allow the trace on the signal generator to stabilize adjusting the span as necessary.
f) Set the spectrum analyzer RBW for 1% to 5% of the emissions bandwidth.
g) Capture the spectrum analyzer trace for inclusion in the test report.
h) Repeat 7.10c) to 7.10g) for CDMA and W-CDMA modulation adjusting the span as necessary for all uplink and downlink operational bands. AWGN or LTE may be used in place of W-CDMA, as an option.
i) Connect the test equipment as shown in **Figure 1**. Begin with the uplink output connected to the spectrum analyzer.
j) Repeat 7.10c) to 7.10h) in this new configuration.

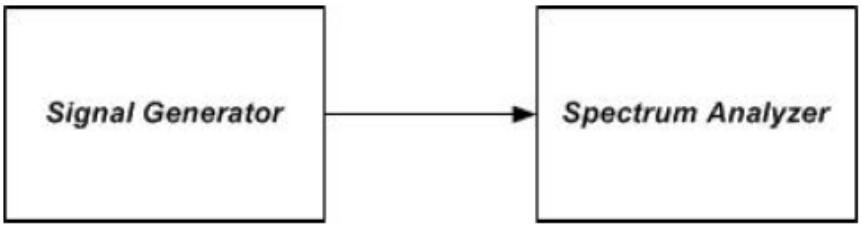


Figure 6 – Occupied bandwidth instrumentation test setup

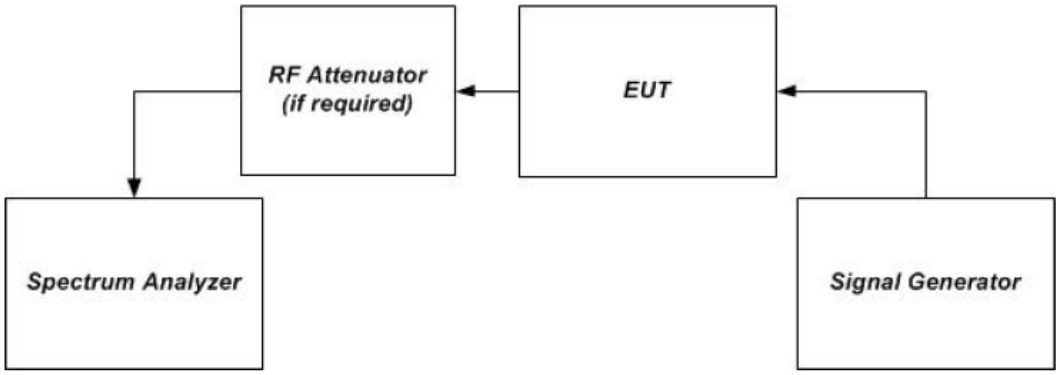


Figure 1 – Band verification test instrumentation setup

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Universal Radio Communication Tester	CMU200	11-9435686-0111	2015-11-05	2016-11-04
Rohde & Schwarz	Spectrum Analyzer	FSL18	100180	2015-12-02	2016-12-01
Agilent	Digital Signal Generator	ESG-D3000A	US36260285	2016-03-28	2017-03-27
E-Microwave	DC Block	EMDCB-00036	OE01304225	2015-12-09	2016-12-08
WEINSCHEL ENGINEERING	Attenuator(10dB)	N/A	AB1166	2015-12-09	2016-12-08
N/A	RF Coaxial Cable	LE-001-4	N/A	2015-12-09	2016-12-08

*** 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:	25.4℃
Relative Humidity:	53%
ATM Pressure:	101.2 kPa

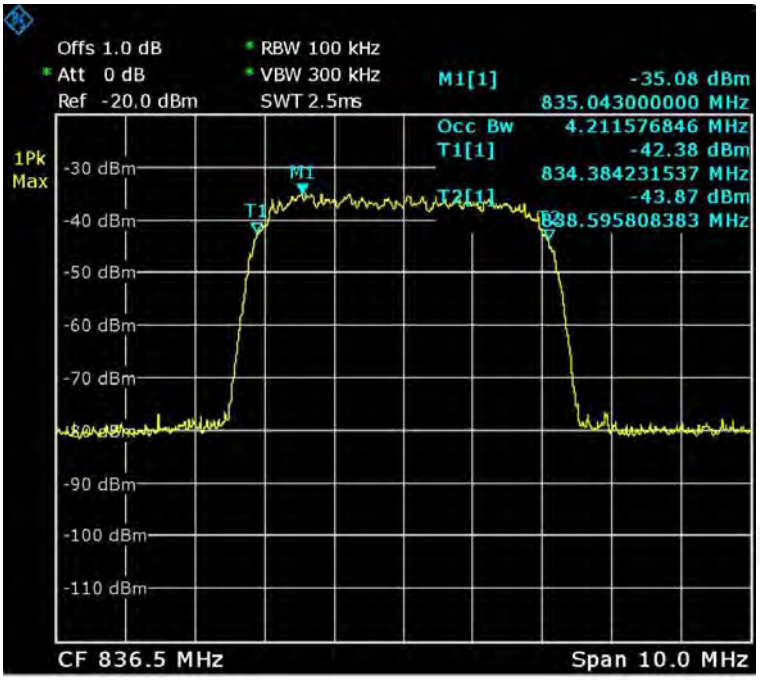
The testing was performed by Kevin Hu on 2016-05-30.

Test Result: Compliant. Please refer to the below table and plots.

Input-versus-output signal comparison:

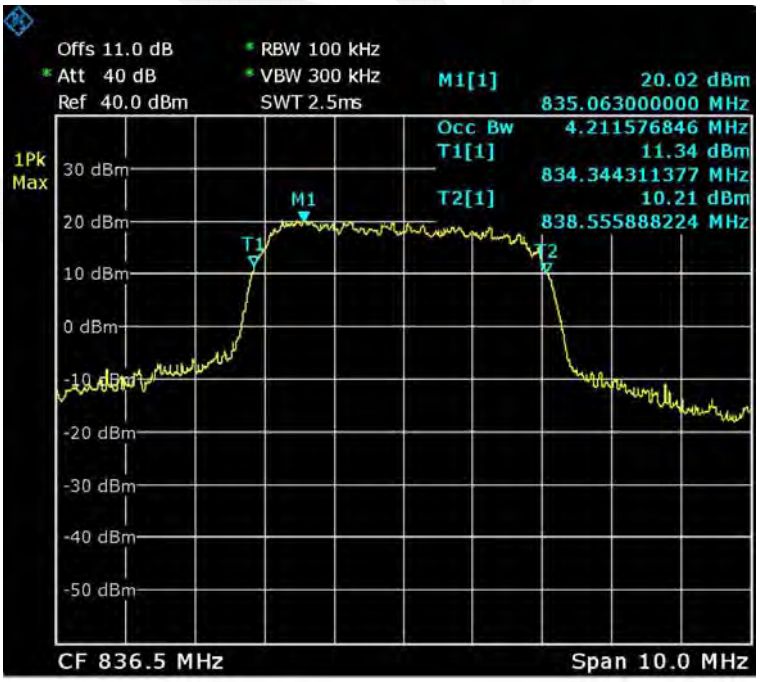
Mode	Operation Band	Modulation	Input OBW	Output OBW
			MHz	MHz
Uplink	Cellular	AWGN	4.212	4.212
		CDMA	1.269	1.269
		GSM	0.251	0.250
	PCS	AWGN	4.232	4.212
		CDMA	1.263	1.263
		GSM	0.251	0.250
Downlink	Cellular	AWGN	4.231	4.212
		CDMA	1.275	1.269
		GSM	0.255	0.248
	PCS	AWGN	4.271	4.212
		CDMA	1.281	1.263
		GSM	0.253	0.250

Uplink, 836.5MHz -AWGN(Input)



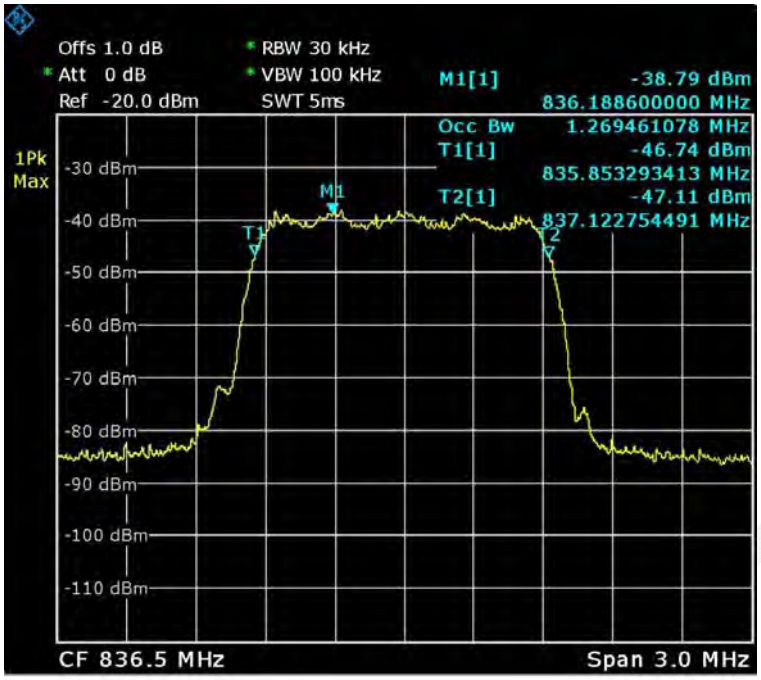
Date: 30.MAY.2016 16:52:11

Uplink, 836.5MHz -AWGN(Output)



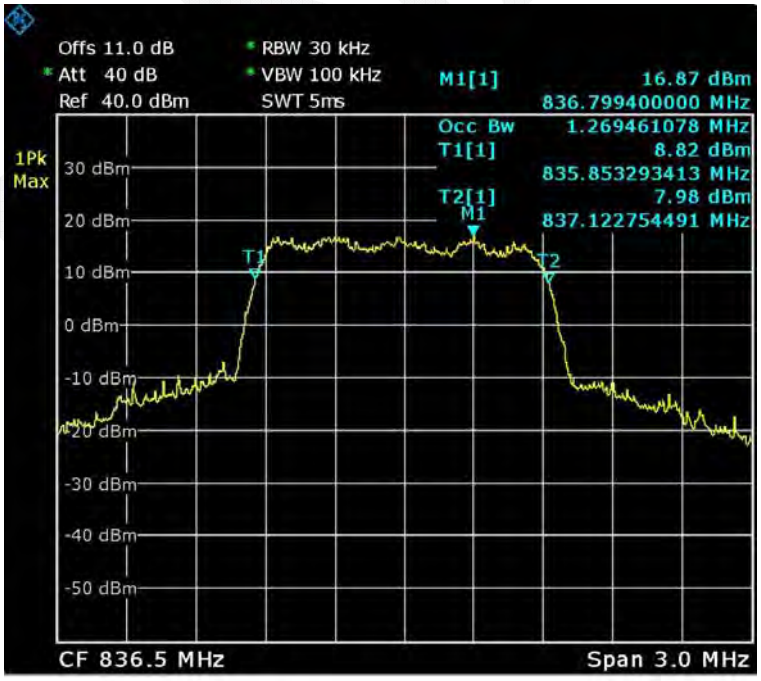
Date: 30.MAY.2016 16:46:10

Uplink, 836.5MHz -CDMA(Input)



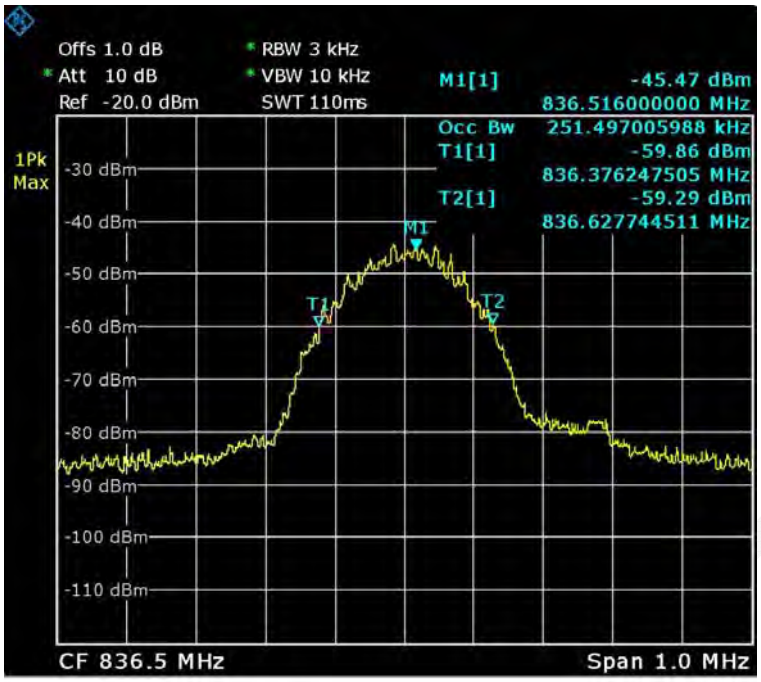
Date: 30.MAY.2016 17:26:36

Uplink, 836.5MHz -CDMA(Output)



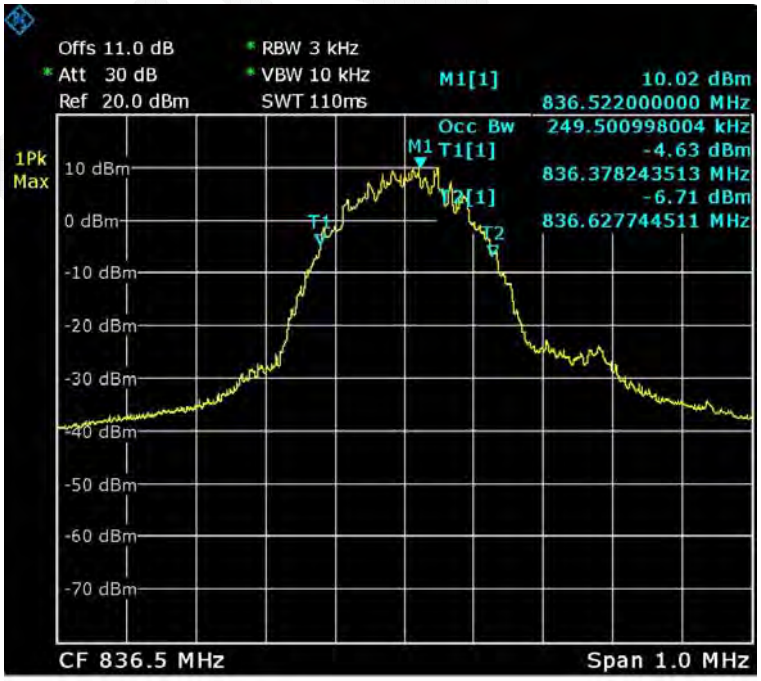
Date: 30.MAY.2016 17:33:46

Uplink, 836.5MHz -GSM(Input)



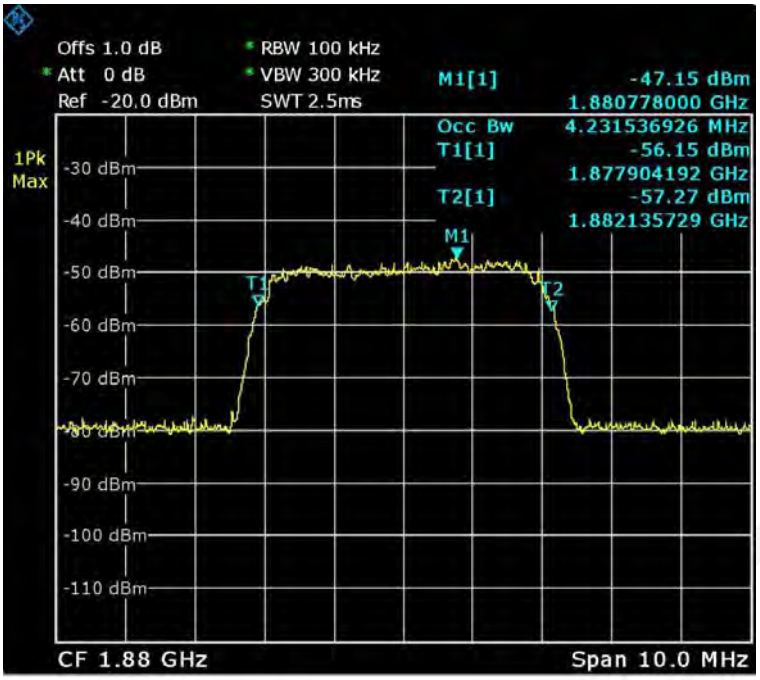
Date: 30.MAY.2016 18:38:47

Uplink, 836.5MHz -GSM(Output)



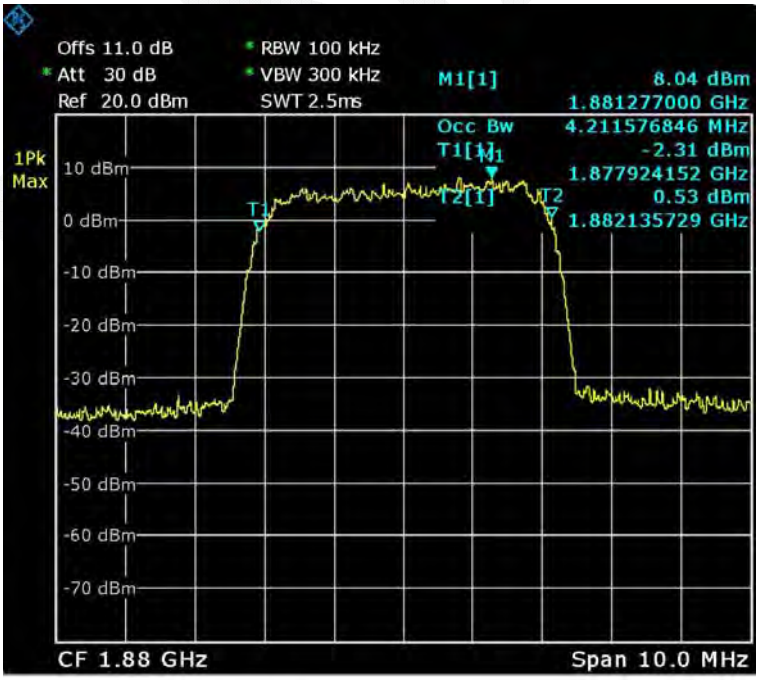
Date: 30.MAY.2016 14:31:36

Uplink, 1880MHz-AWGN(Input)



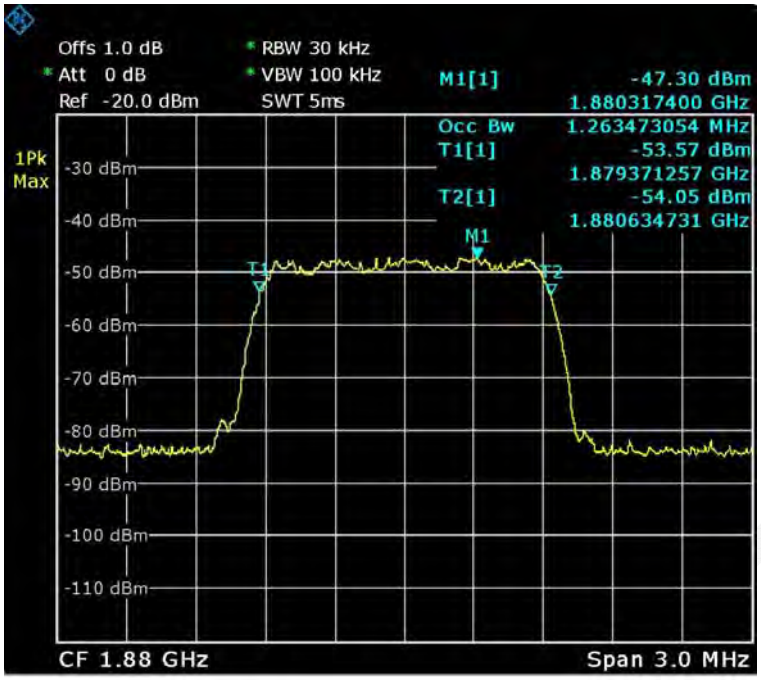
Date: 30.MAY.2016 17:16:36

Uplink, 1880MHz-AWGN(Output)



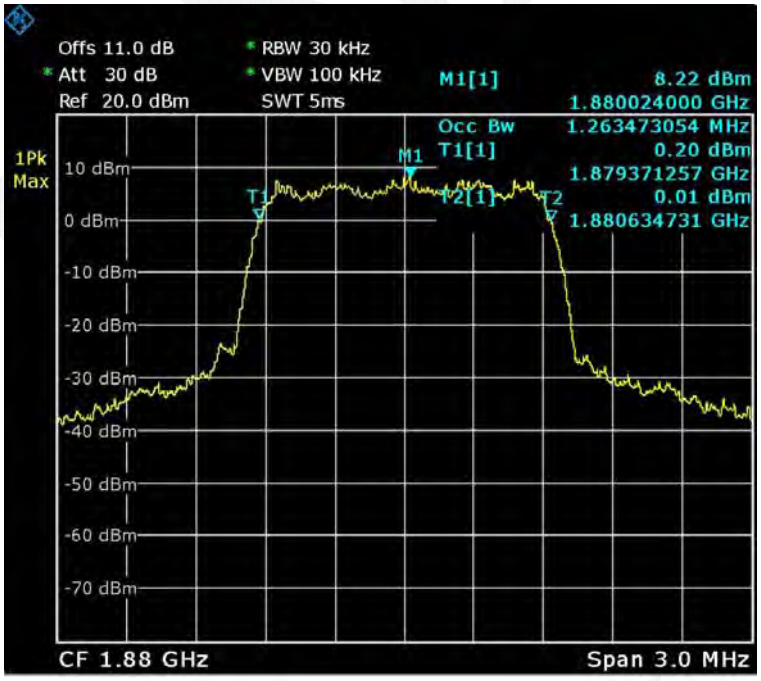
Date: 30.MAY.2016 17:11:12

Uplink, 1880MHz-CDMA(Input)



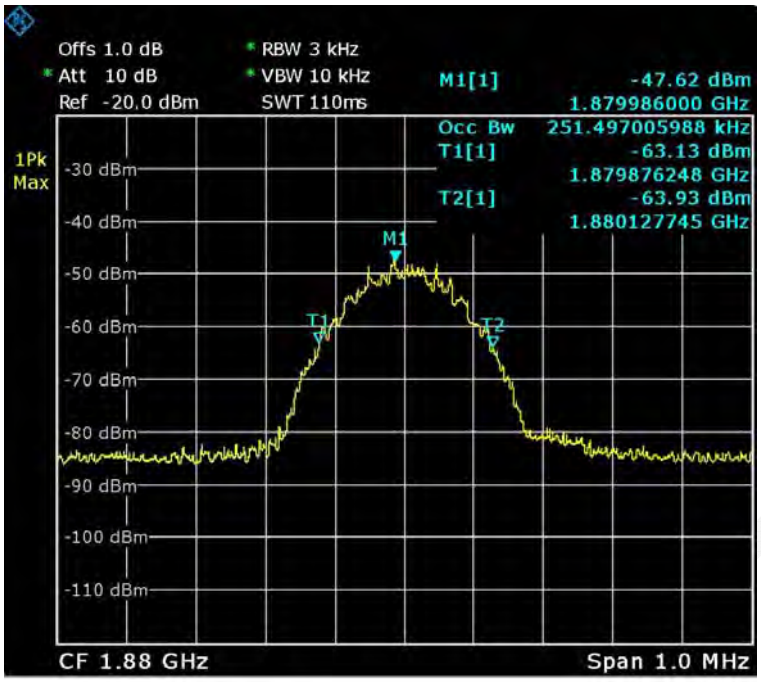
Date: 30.MAY.2016 18:22:01

Uplink, 1880MHz-CDMA(Output)



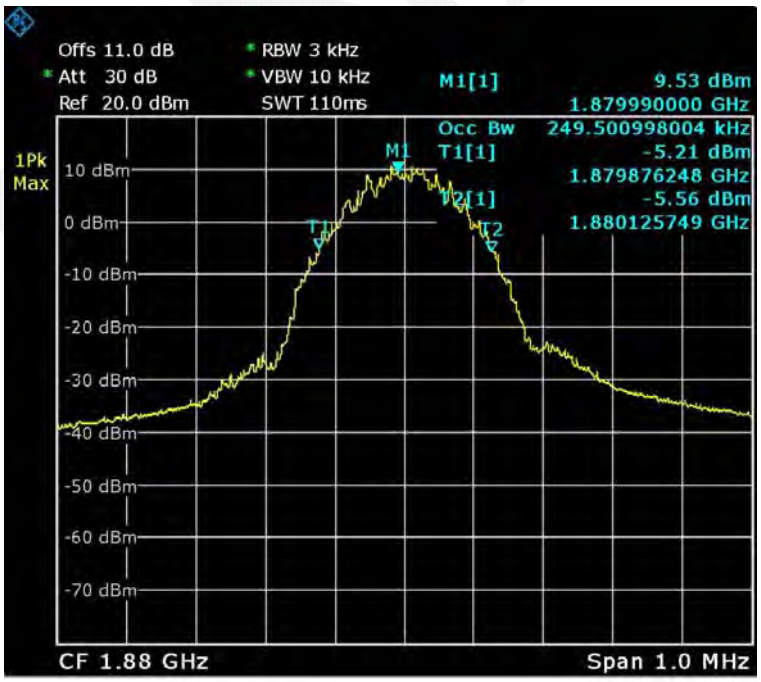
Date: 30.MAY.2016 18:18:45

Uplink, 1880MHz-GSM(Input)



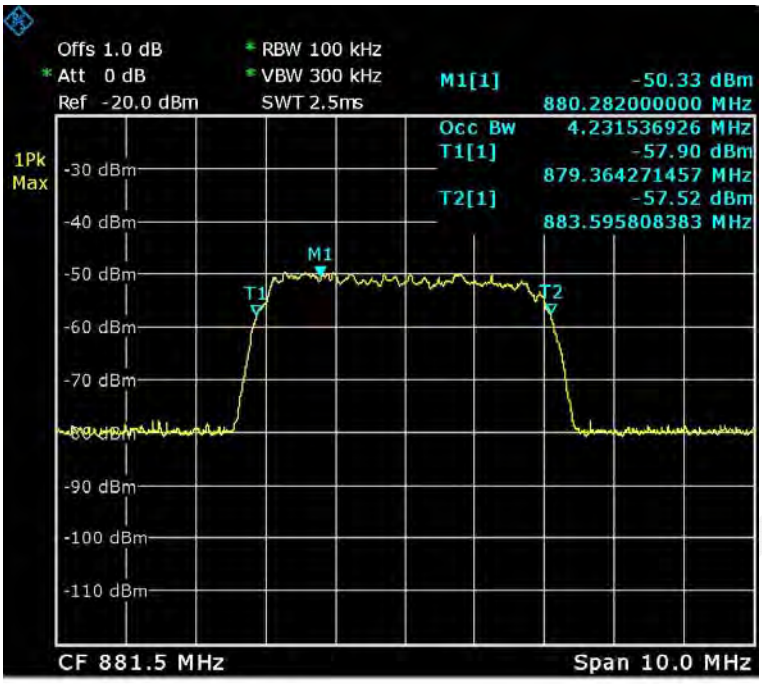
Date: 30.MAY.2016 18:28:09

Uplink, 1880MHz-GSM(Output)



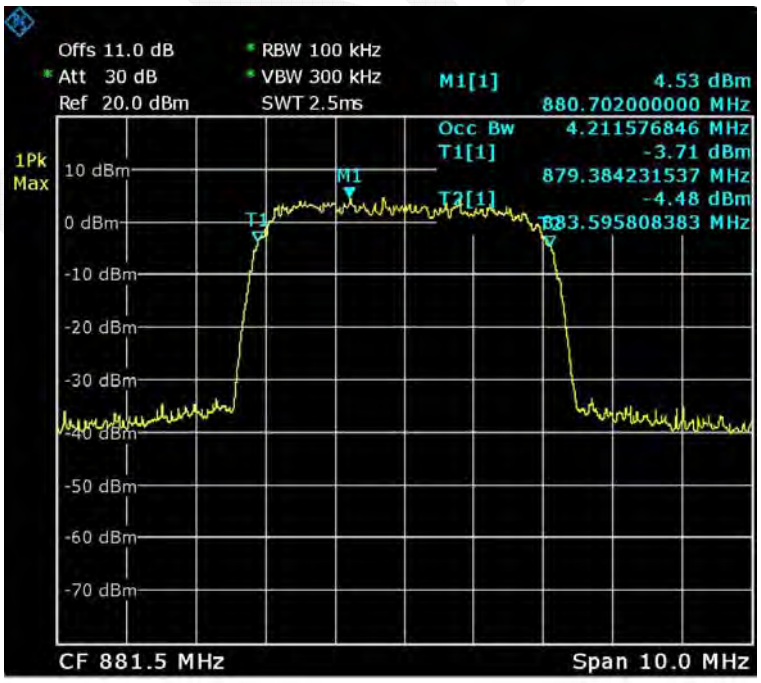
Date: 30.MAY.2016 15:29:27

Downlink, 881.5MHz -AWGN(Input)



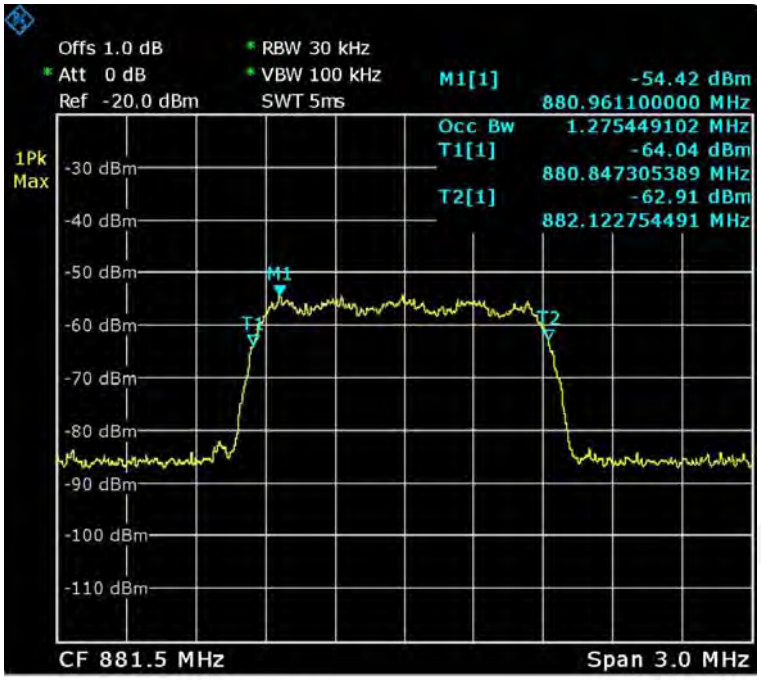
Date: 30.MAY.2016 16:23:50

Downlink, 881.5MHz -AWGN(Output)



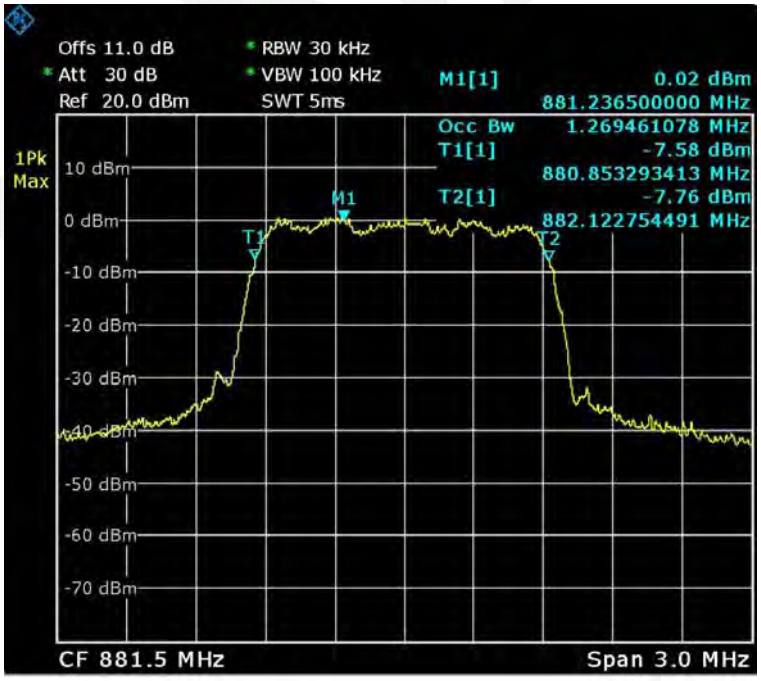
Date: 30.MAY.2016 17:01:07

Downlink, 881.5MHz -CDMA(Input)



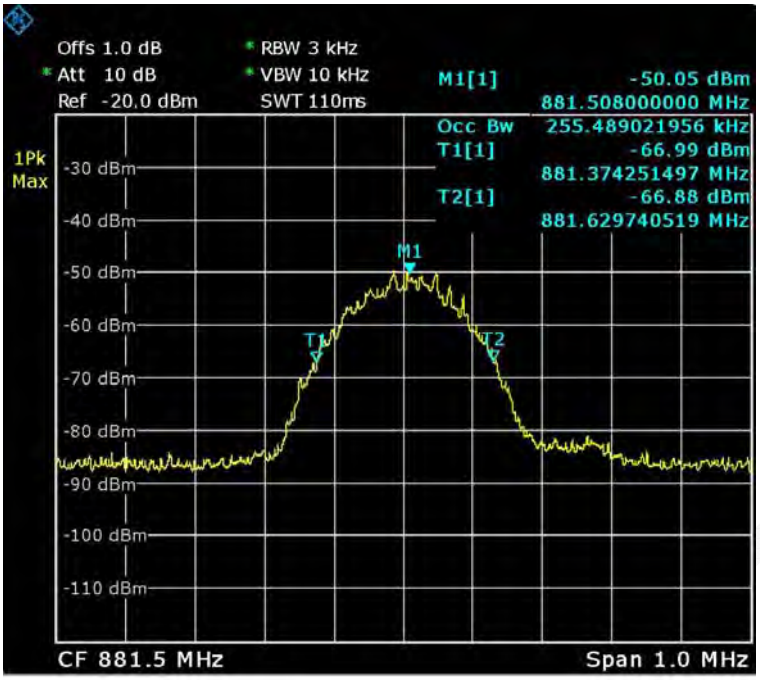
Date: 30.MAY.2016 17:54:53

Downlink, 881.5MHz -CDMA(Output)



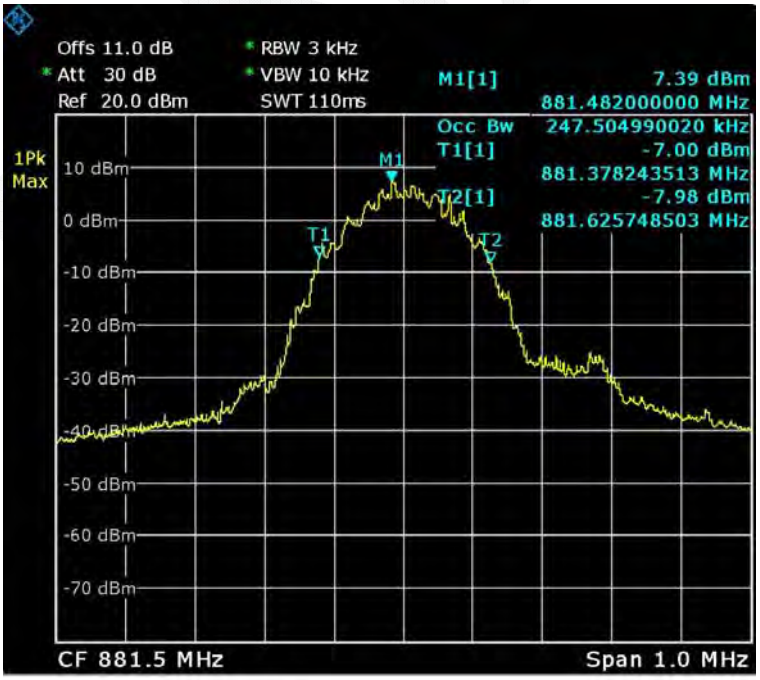
Date: 30.MAY.2016 17:51:48

Downlink, 881.5MHz -GSM(Input)



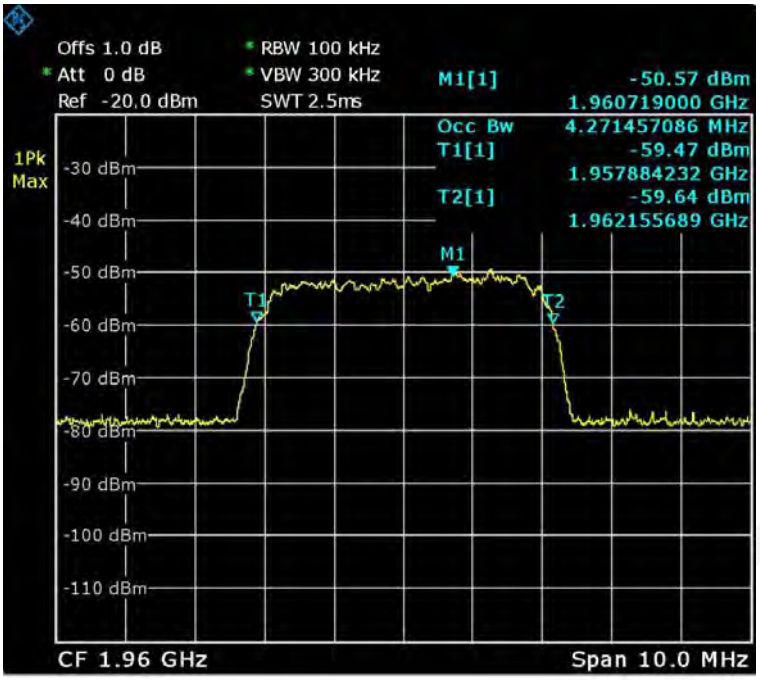
Date: 30.MAY.2016 14:42:52

Downlink, 881.5MHz -GSM(Output)



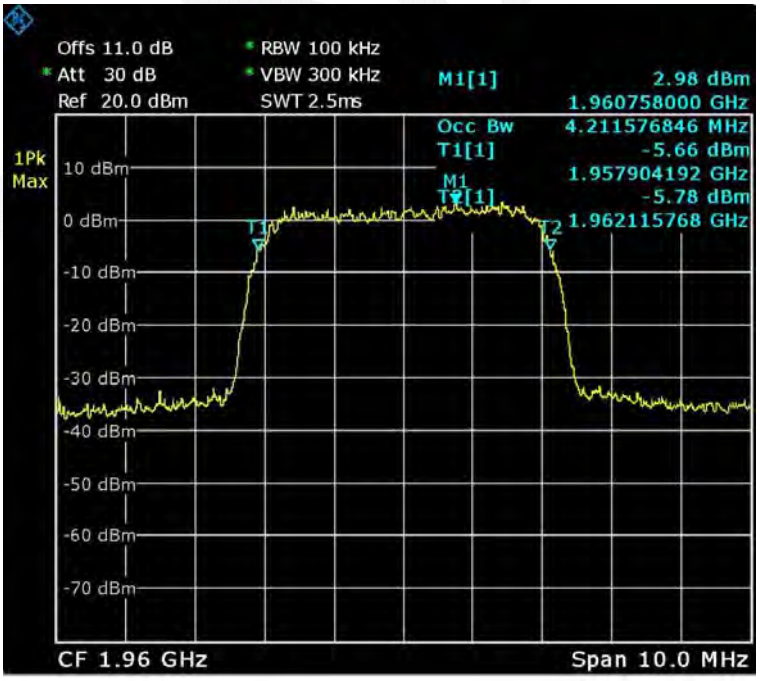
Date: 30.MAY.2016 14:54:54

Downlink, 1960MHz -AWGN(Input)



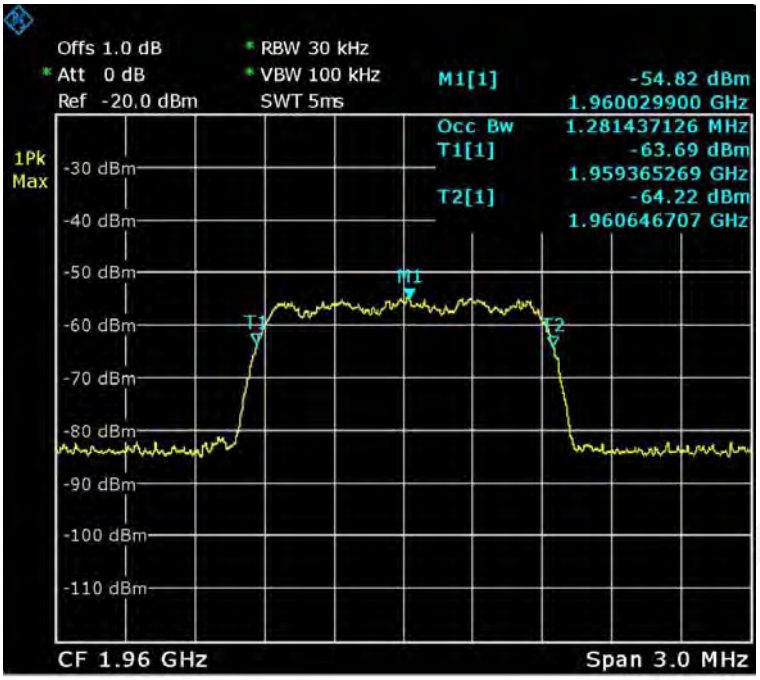
Date: 30.MAY.2016 16:24:56

Downlink, 1960MHz -AWGN(Output)



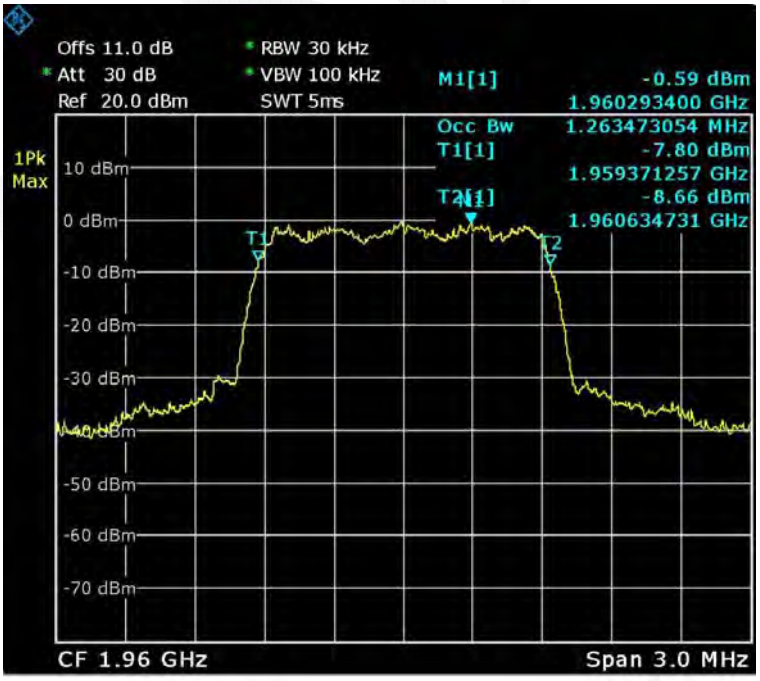
Date: 30.MAY.2016 16:29:49

Downlink, 1960MHz -CDMA(Input)



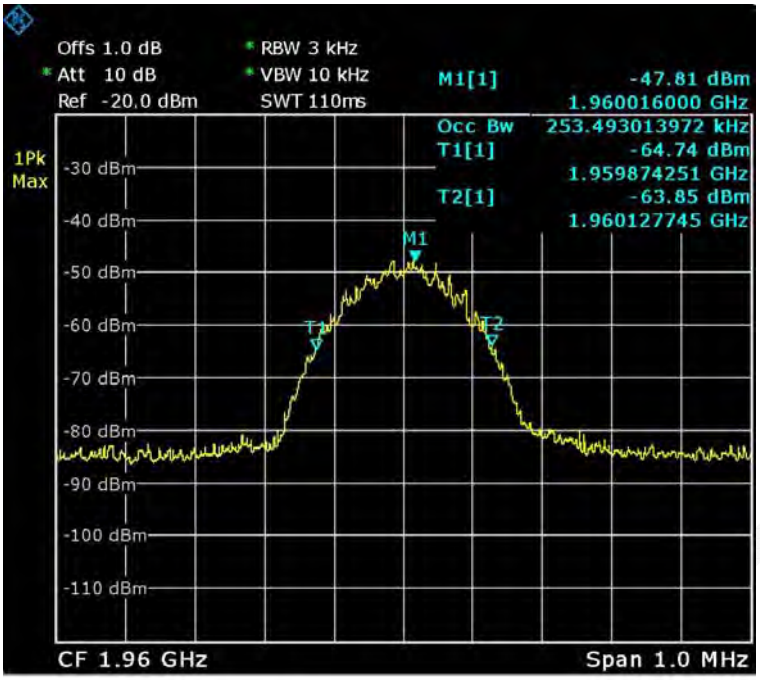
Date: 30.MAY.2016 18:08:17

Downlink, 1960MHz -CDMA(Output)



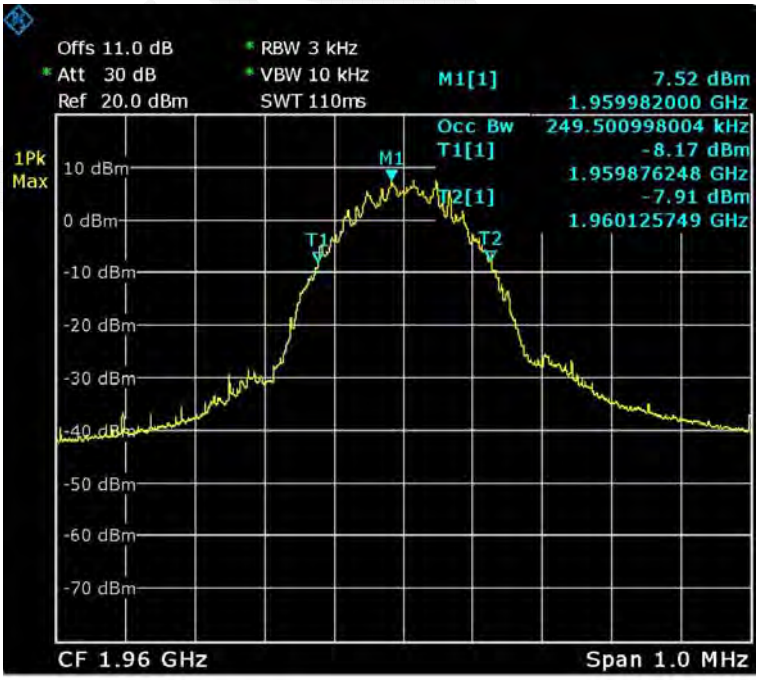
Date: 30.MAY.2016 18:02:41

Downlink, 1960MHz -GSM(Input)



Date: 30.MAY.2016 15:04:44

Downlink, 1960MHz -GSM(Output)



Date: 30.MAY.2016 15:18:46

§ 20.21(e)(8)(ii)(A) &§20.21(e)(4) - OSCILLATION DETECTION

Applicable Standards

Rule paragraph(s): § 20.21(e)(8)(ii)(A) Anti-Oscillation, §20.21(e)(4) Self-monitoring

For this measurement two EUTs will be permitted, one operating in a normal mode and the second operating in a test mode that is capable of disabling the uplink inactivity squelching and or a reduction of the time between restarts to 5 seconds. This will greatly decrease the test time required.

NOTE — Consumer boosters certified as direct connection mobile boosters having gain of less than or equal to 15 dB are exempt from compliance to testing procedures in 7.11.3 and 7.11.4.

Test Procedure

According to KDB 935210 D03 Signal Booster Measurements v04, §7.11.2 Oscillation restart tests and §7.11.3 Test procedure for measuring oscillation mitigation or shutdown.

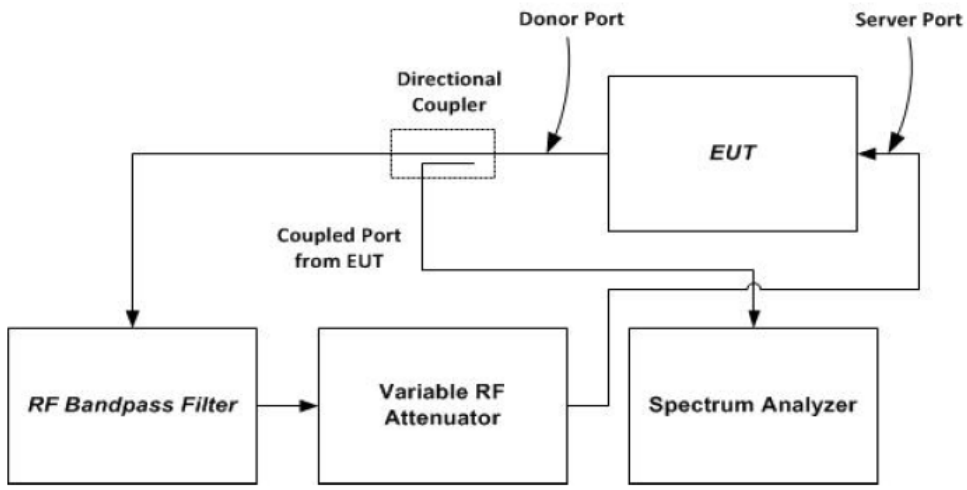


Figure 7 – Oscillation detection (7.11.2) test setup

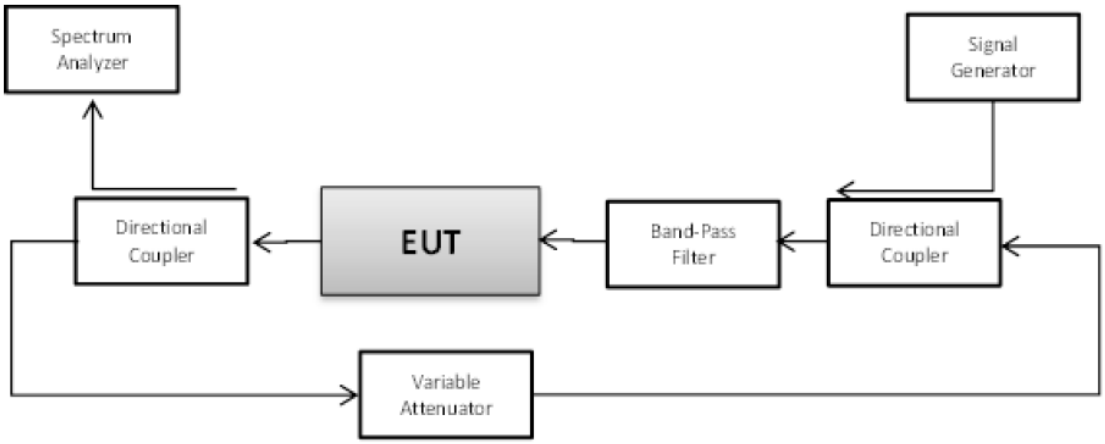


Figure 8 – Oscillation mitigation/shutdown test setup

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Universal Radio Communication Tester	CMU200	11-9435686-0111	2015-11-05	2016-11-04
Rohde & Schwarz	Spectrum Analyzer	FSL18	100180	2015-12-02	2016-12-01
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2015-12-02	2016-12-01
Agilent	Digital Signal Generator	ESG-D3000A	US36260285	2016-03-28	2017-03-27
E-Microwave	DC Block	EMDCB-00036	OE01304225	2015-12-09	2016-12-08
WEINSCHEL ENGINEERING	Attenuator(10dB)	N/A	AB1166	2015-12-09	2016-12-08
TRILITHICASIA	Adjustable Attenuator	RSA-2570D-SMA	T200537364	2015-12-09	2016-12-08
Narda	Directional Coupler	4242-10	02934	2015-12-09	2016-12-08
Narda	Directional Coupler	4242-10	02935	2015-12-09	2016-12-08
N/A	RF Coaxial Cable	T-E130	N/A	2015-12-09	2016-12-08
N/A	RF Coaxial Cable	LE-001-4	N/A	2015-12-09	2016-12-08

*** 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:	25.6℃
Relative Humidity:	52%
ATM Pressure:	101.3 kPa

The testing was performed by Kevin Hu on 2016-08-28.

Test Result: Compliant. Please refer to the below tables and plots.

Oscillation Restart Time:

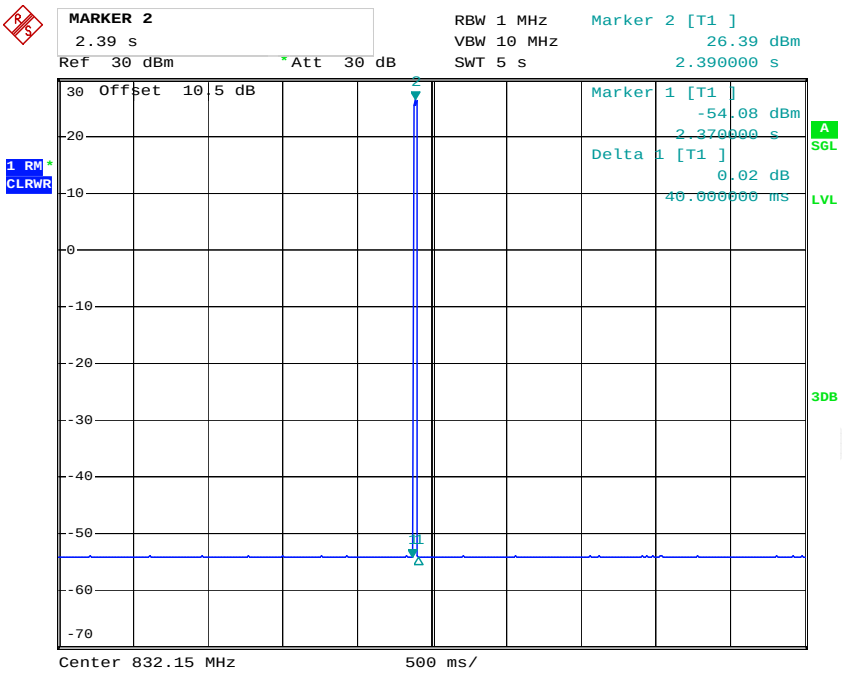
Mode	Operation Bands	Detection Time (s)		Between restart time (s)		Number of restart	
		Reading	Limit	Reading	Limit	Reading	Limit
Uplink	Cellular	0.04	<0.3	110.4	>60	3	≤5
	PCS	0.05		111.6		3	
Downlink	Cellular	0.05	<1.0	110.4	>60	3	≤5
	PCS	0.05		220.8		2	

Note: Consumer boosters must be able to detect and mitigate (i.e., by automatic gain reduction or shut down), any oscillations in uplink and downlink bands. Oscillation detection and mitigation must occur automatically within 0.3 seconds in the uplink band and within 1 second in the downlink band. In cases where oscillation is detected, the booster must continue mitigation for at least one minute before restarting.

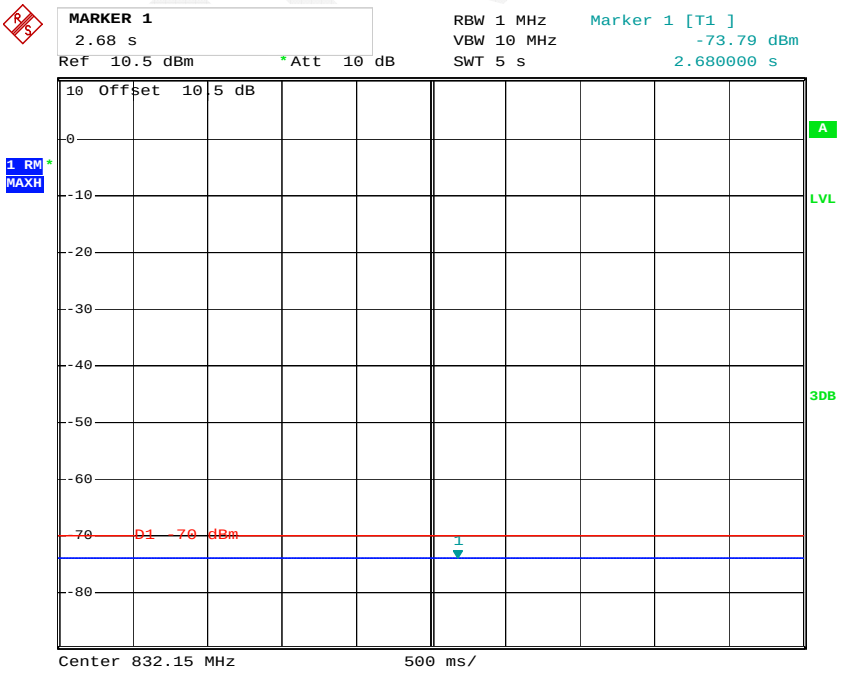
Oscillation Restart Test:

Uplink:

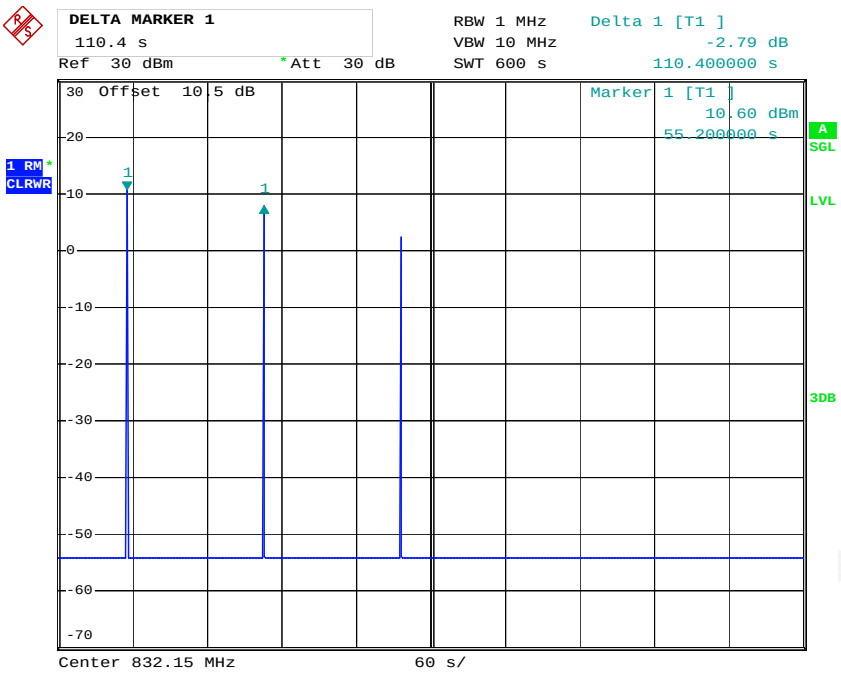
Cellular Band



Date: 28.AUG.2016 00:35:55

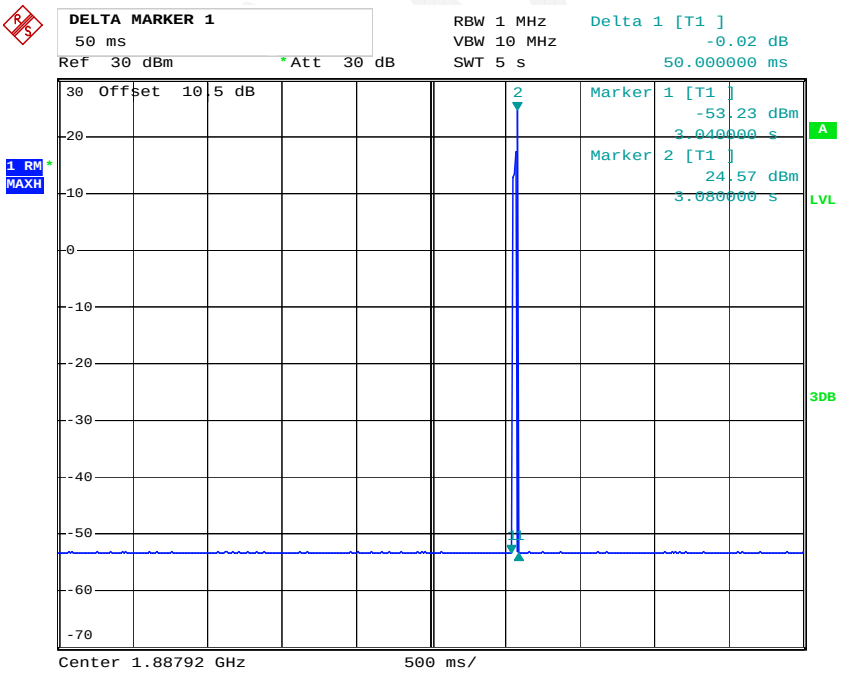


Date: 28.AUG.2016 00:46:48

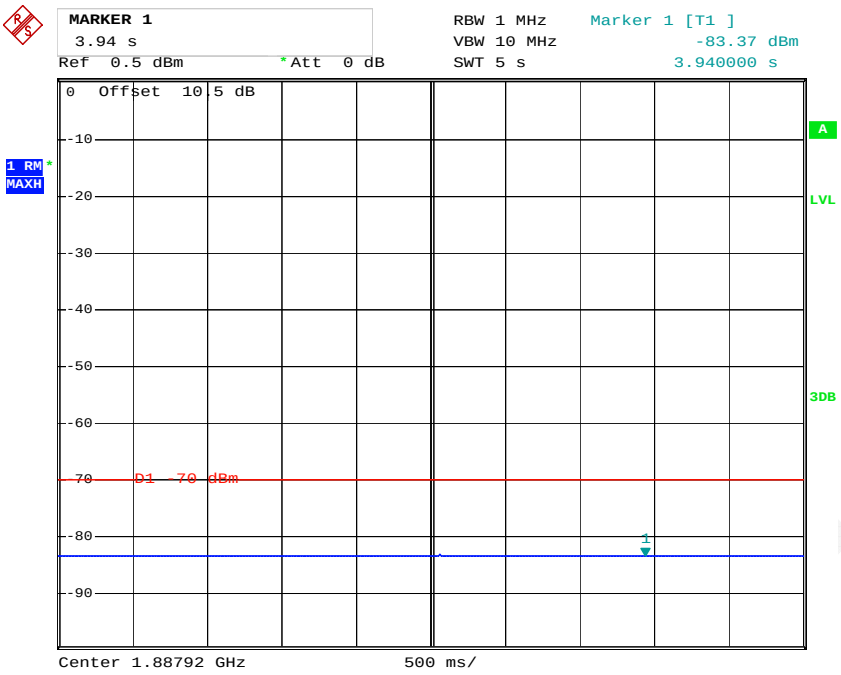


Date: 28.AUG.2016 00:46:08

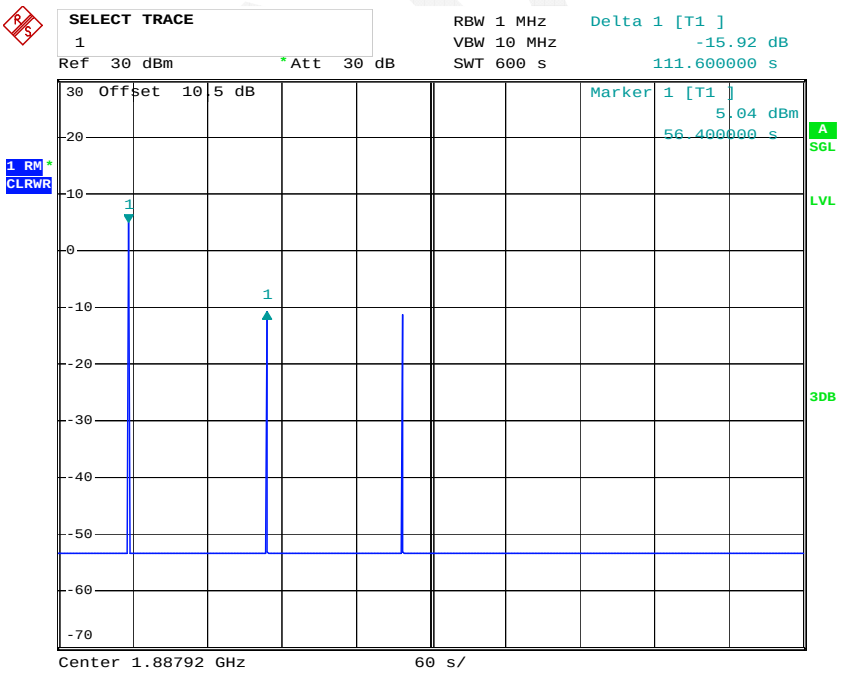
PCS Band



Date: 28.AUG.2016 23:17:33



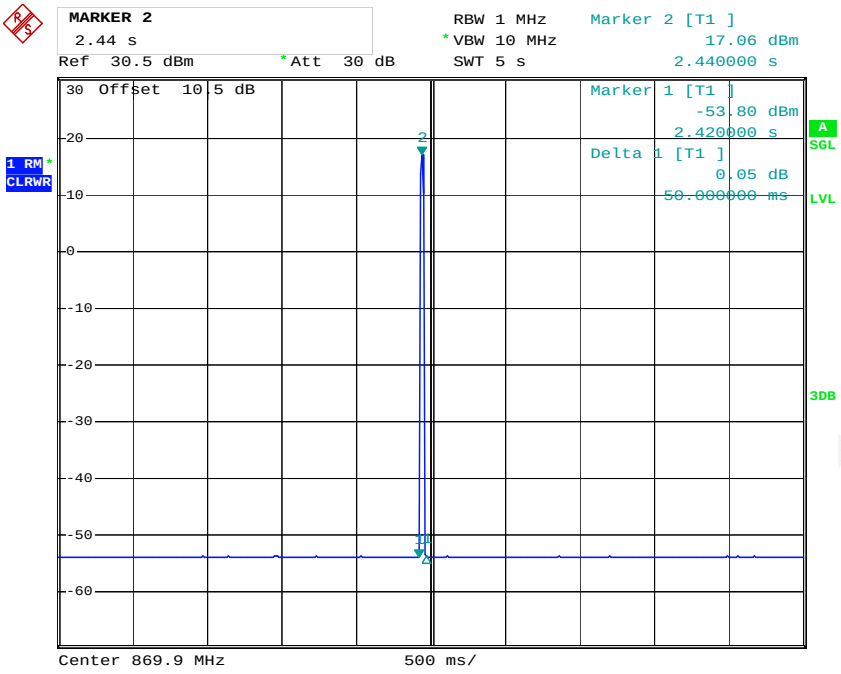
Date: 28.AUG.2016 00:47:22



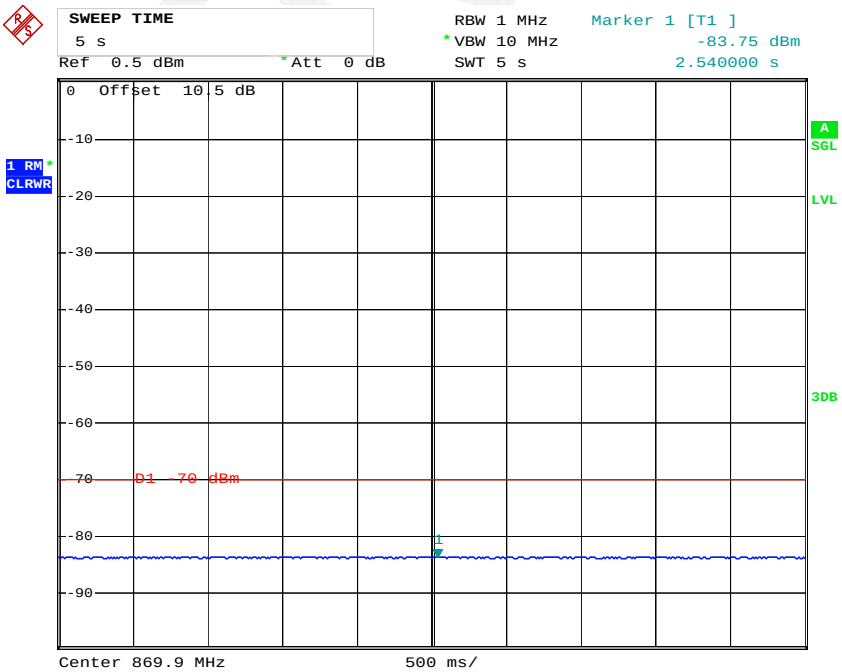
Date: 28.AUG.2016 00:32:35

Downlink:

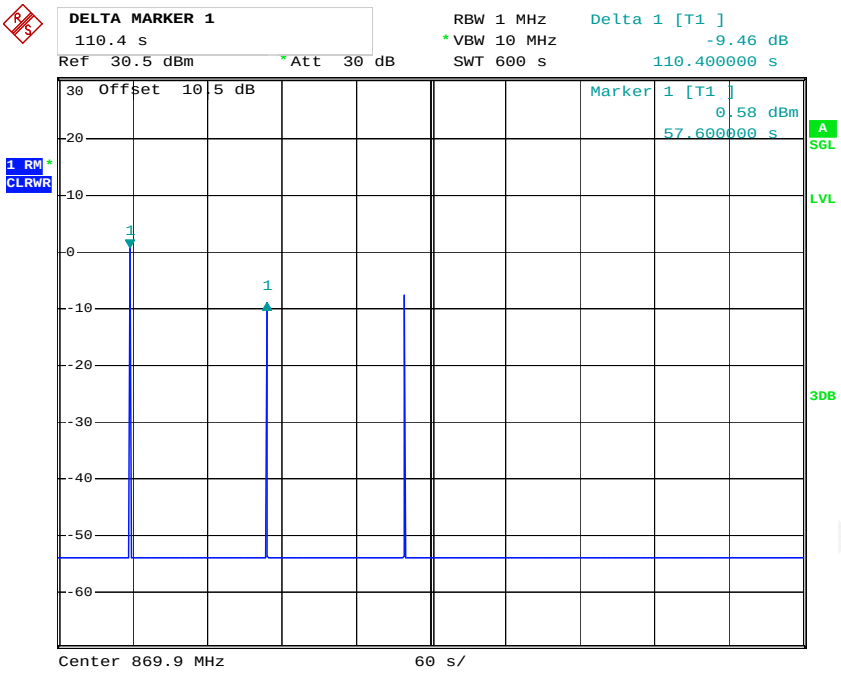
Cellular Band



Date: 28.AUG.2016 00:52:08

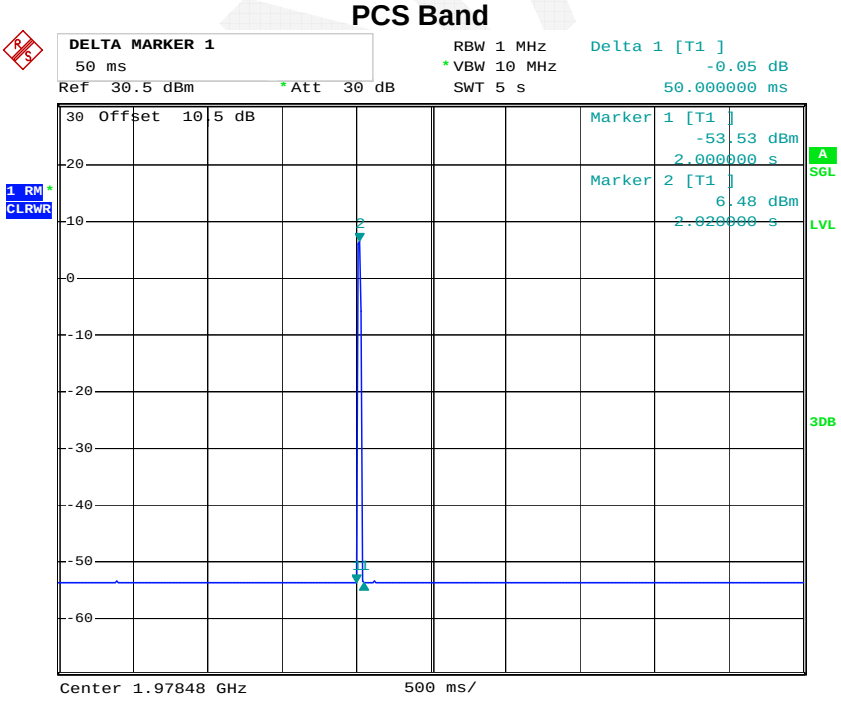


Date: 28.AUG.2016 01:31:42

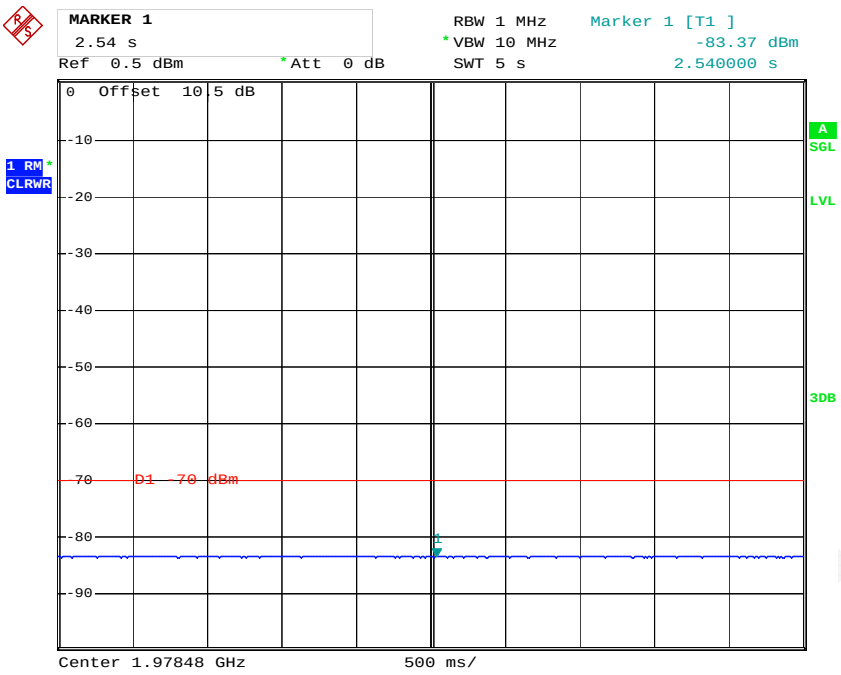


Date: 28.AUG.2016 01:02:25

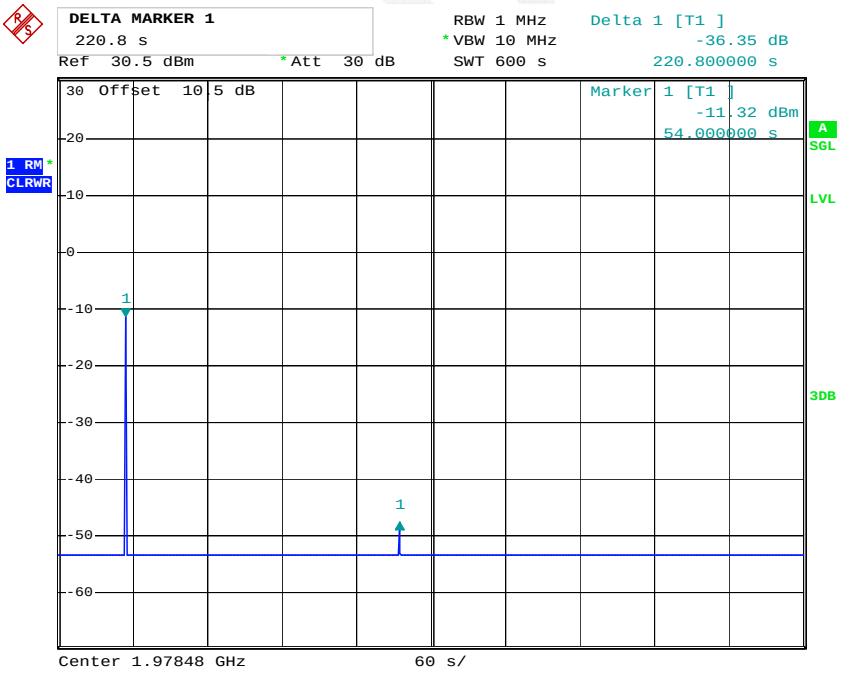
PCS Band



Date: 28.AUG.2016 02:02:56



Date: 28.AUG.2016 01:31:21



Date: 28.AUG.2016 01:30:52

Oscillation Mitigation or Shutdown:

Oscillation Mitigation or Shutdown (Uplink)									
Operation Band	Cellular Band: 824-849 MHz								
Test Signal Type	WCDMA								
Variable Attenuator Setting	Oscillations		Lowest Output Power Level		Margin	Limit	Time to Mitigate Oscillation	Mitigation Time Limit	Result
	Frequency	Level	Frequency	Level					
dB	MHz	dBm	MHz	dBm	dB	dB	S	S	
+5	833.32	-59.02	841.6	-69.63	10.61	＜12	N/A	＜300	Compliant
+4	833.32	-58.67	841.6	-69.58	10.91	＜12	N/A	＜300	Compliant
+3	833.32	-56.37	841.6	-69.51	13.14	＜12	54	＜300	Compliant
Note: EUT shut down in 54 seconds									

Oscillation Mitigation or Shutdown (Uplink)									
Operation Band	PCS Band: 1850-1910 MHz								
Test Signal Type	WCDMA								
Variable Attenuator Setting	Oscillations		Lowest Output Power Level		Margin	Limit	Time to Mitigate Oscillation	Mitigation Time Limit	Result
	Frequency	Level	Frequency	Level					
dB	MHz	dBm	MHz	dBm	dB	dB	S	S	
+5	1863.92	-57.41	1870.24	-68.76	11.35	＜12	N/A	＜300	Compliant
+4	1863.92	-55.47	1870.24	-68.83	13.36	＜12	46	＜300	Compliant
Note: EUT shut down in 46 seconds									

Oscillation Mitigation or Shutdown (Downlink)									
Operation Band	Cellular Band: 869-894 MHz								
Test Signal Type	WCDMA								
Variable Attenuator Setting	Oscillations		Lowest Output Power Level		Margin	Limit	Time to Mitigate Oscillation	Mitigation Time Limit	Result
	Frequency	Level	Frequency	Level					
dB	MHz	dBm	MHz	dBm	dB	dB	S	S	
+5	882.332	-57.57	885.716	-68.81	11.24	＜12	N/A	＜300	Compliant
+4	882.332	-56.68	885.716	-69.49	12.81	＜12	52	＜300	Compliant
Note: EUT shut down in 52 seconds									

Oscillation Mitigation or Shutdown (Downlink)									
Operation Band	PCS Band: 1930-1990 MHz								
Test Signal Type	WCDMA								
Variable Attenuator Setting	Oscillations		Lowest Output Power Level		Margin	Limit	Time to Mitigate Oscillation	Mitigation Time Limit	Result
	Frequency	Level	Frequency	Level					
dB	MHz	dBm	MHz	dBm	dB	dB	S	S	
+5	1977.76	-56.18	1958.98	-67.67	11.49	＜12	N/A	＜300	Compliant
+4	1977.76	-55.44	1958.98	-68.98	13.54	＜12	38	＜300	Compliant
Note: EUT shut down in 38 seconds									

§2.1051- SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Applicable Standards

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

§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.

§24.238 (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 following procedures shall be used to demonstrate compliance to the applicable conducted spurious emissions limits as per § 2.1051.

Note: *For frequencies below 1 GHz, an RBW of 1 MHz may be used in a preliminary measurement. If non-compliant emissions are detected, a final measurement shall be made with a 100 kHz RBW. Additionally, a peak detector may also be used for the preliminary measurement. If non-compliant emissions are detected then a final measurement of these emissions shall be made with the power averaging (RMS) detector.*

a) Connect the EUT to the test equipment as shown in **Figure 1**. Begin with the uplink output connected to the spectrum analyzer.
b) Configure the signal generator for AWGN with a 99% occupied bandwidth of 4.1 MHz with a center frequency corresponding to the center of the CMRS band under test.
c) Set the signal generator amplitude to the level determined in the power measurement procedure in 7.2.
d) Turn on the signal generator RF output and measure the spurious emission power levels with an appropriate measurement instrument as follows.
   1) Set RBW = measurement bandwidth specified in the applicable rule section for the operational frequency band under consideration (see Annex A for relevant cross-references). Note that many of the individual rule sections permit the use of a narrower RBW (typically ≥ 1% of the emission bandwidth) to enhance measurement accuracy, but the result must then be integrated over the specified measurement bandwidth.
   2) Set VBW = 3 × RBW.
   3) Select the power averaging (RMS) detector. (See above note regarding the use of a peak detector for preliminary measurements.)
   4) Sweep time = auto-couple.
   5) 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 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 above be subdivided, depending on the available number of measurement points provided by the spectrum analyzer. Trace average at least 10 traces in power averaging (i.e., RMS) mode.

6) 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.
7) 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 × the highest frequency of the fundamental emission. 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 above be subdivided, depending on the available number of measurement points provided by the spectrum analyzer.
8) 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.

e) Repeat 7.6b) through 7.6d) for each supported frequency band of operation.

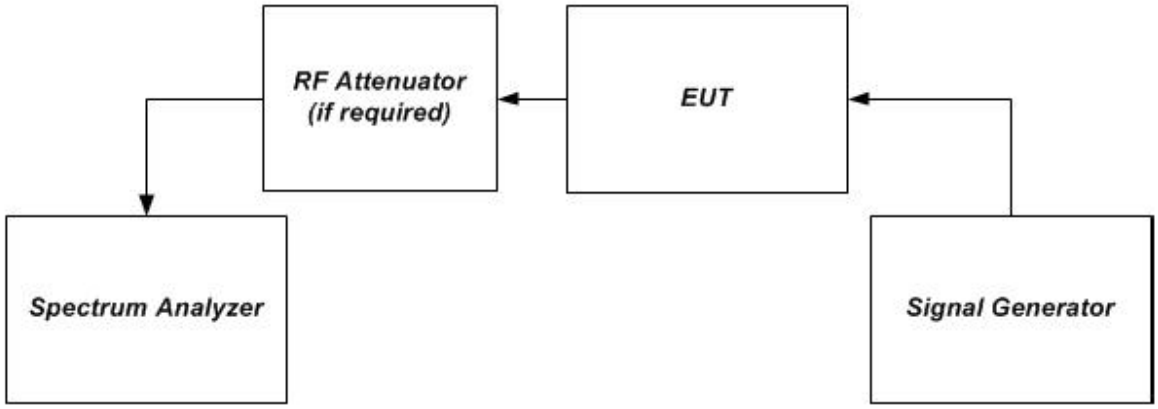


Figure 1 – Band verification test instrumentation setup

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Universal Radio Communication Tester	CMU200	11-9435686-0111	2015-11-05	2016-11-04
Rohde & Schwarz	Spectrum Analyzer	FSL18	100180	2015-12-02	2016-12-01
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2015-12-02	2016-12-01
Agilent	Digital Signal Generator	ESG-D3000A	US36260285	2016-03-28	2017-03-27
E-Microwave	DC Block	EMDCB-00036	OE01304225	2015-12-09	2016-12-08
WEINSCHEL ENGINEERING	Attenuator(10dB)	N/A	AB1166	2015-12-09	2016-12-08
N/A	RF Coaxial Cable	LE-001-4	N/A	2015-12-09	2016-12-08

*** 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

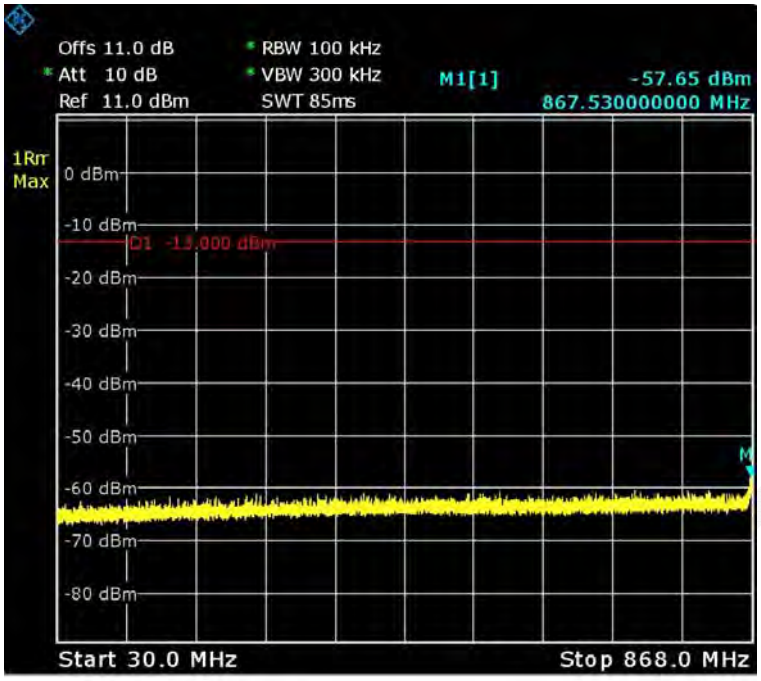
Temperature:	25.6℃
Relative Humidity:	54%
ATM Pressure:	101.3 kPa

The testing was performed by Kevin Hu on 2016-05-29.

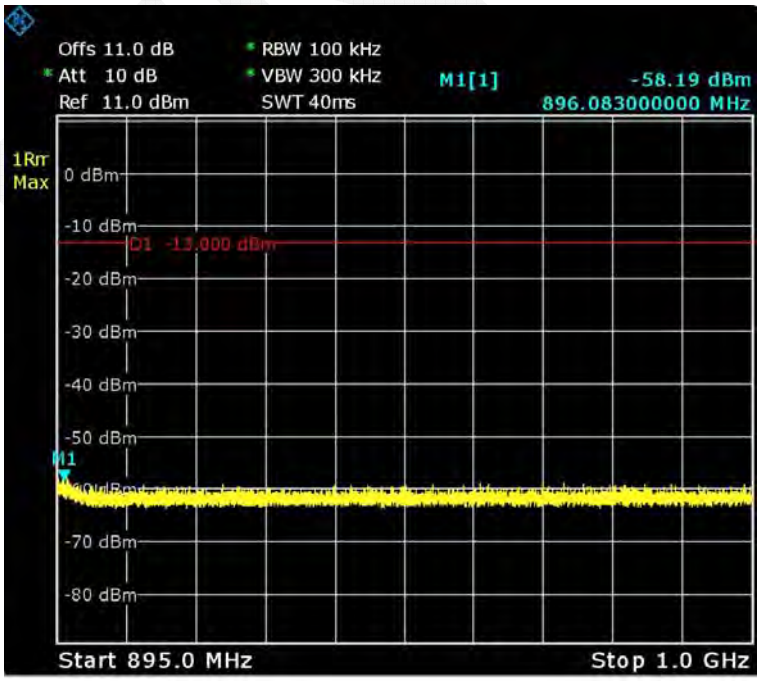
Test Result: Compliant. Please refer to the below plots.

Downlink:

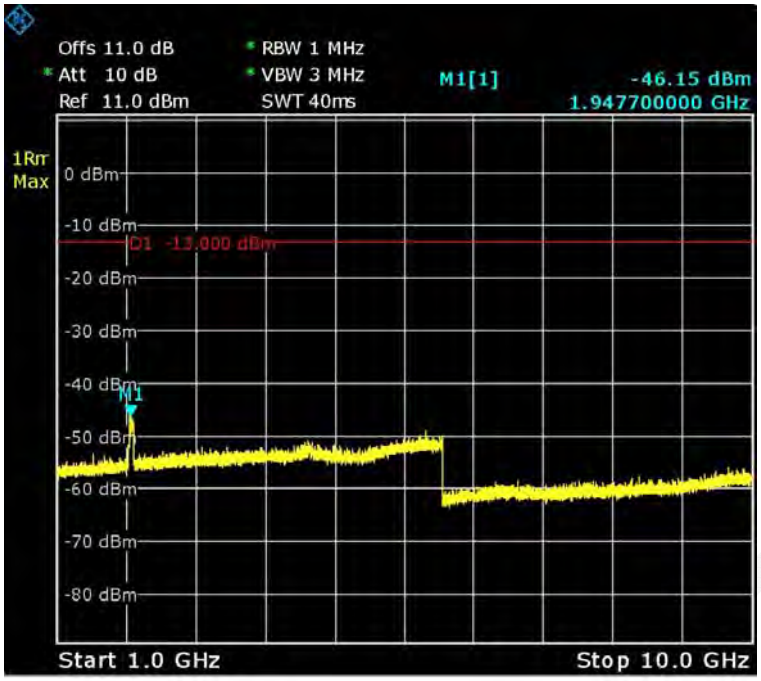
Cellular Band



Date: 29.MAY.2016 11:29:12

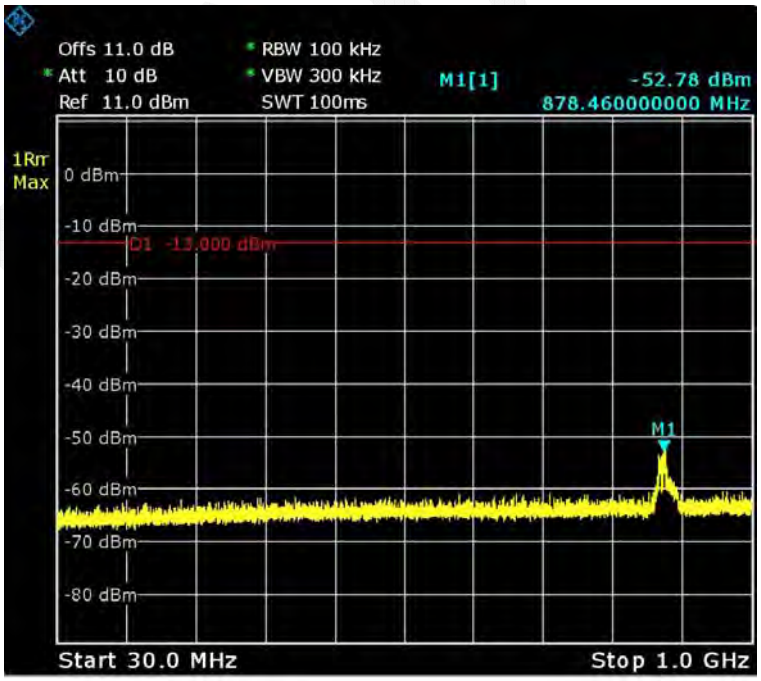


Date: 29.MAY.2016 11:35:40

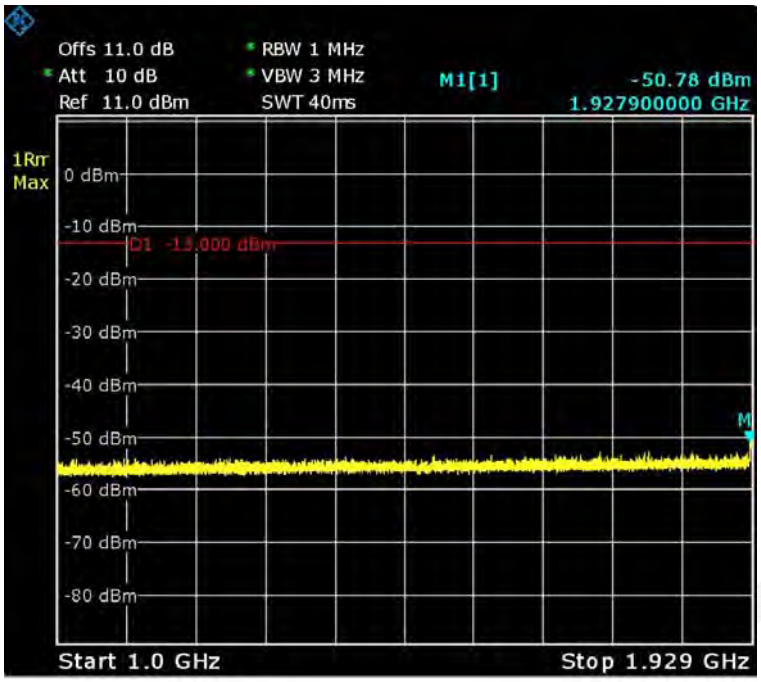


Date: 29.MAY.2016 11:37:25

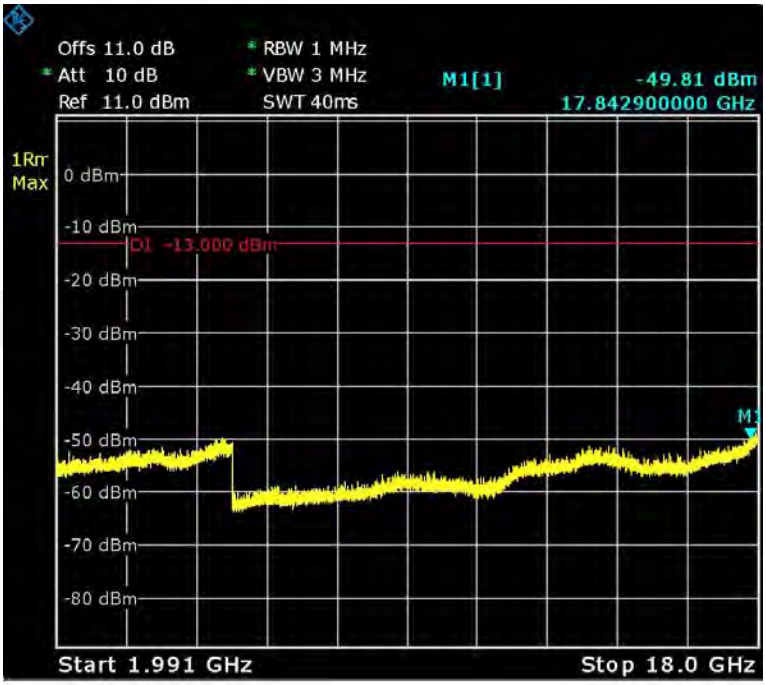
PCS Band



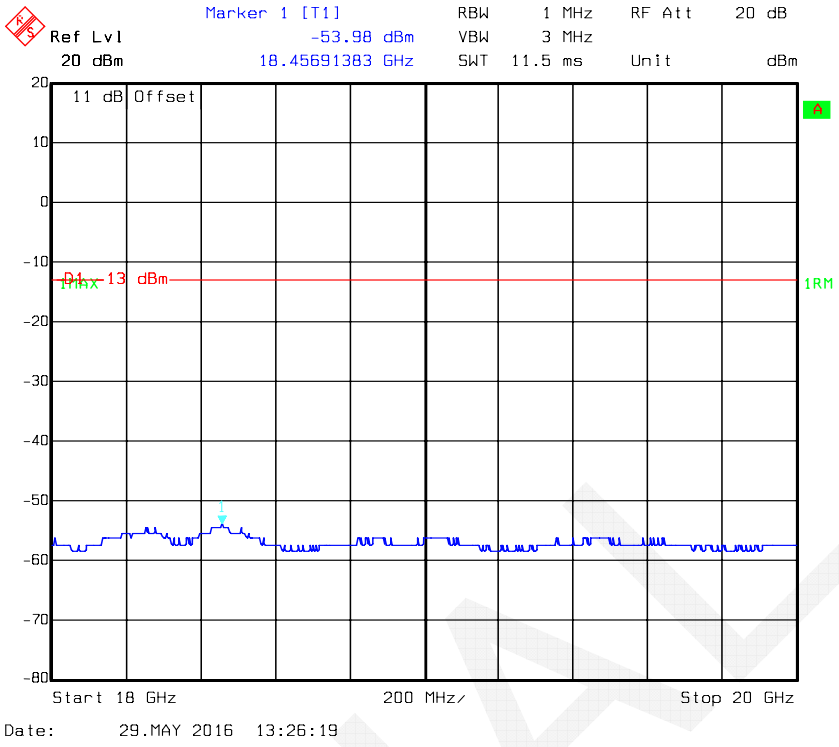
Date: 29.MAY.2016 11:43:12



Date: 29.MAY.2016 11:45:25

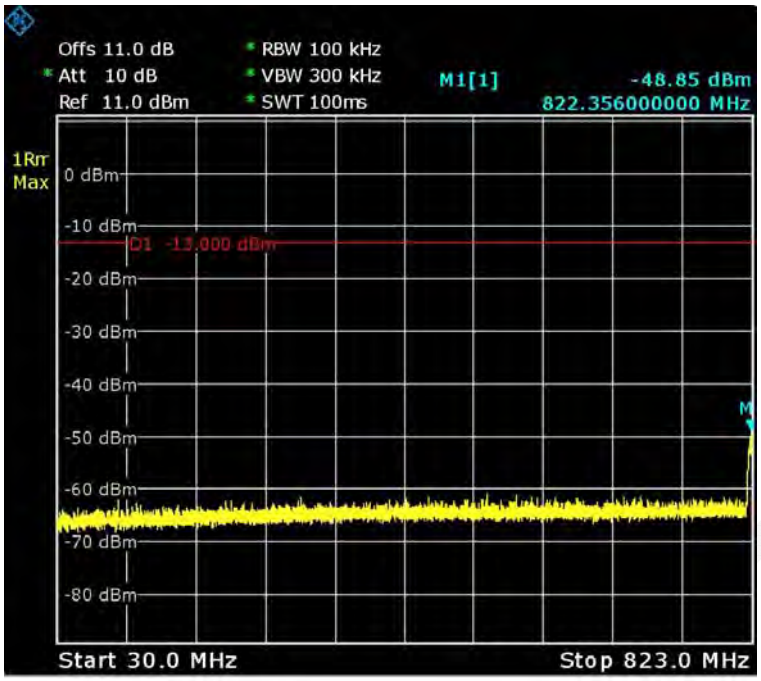


Date: 29.MAY.2016 11:47:33

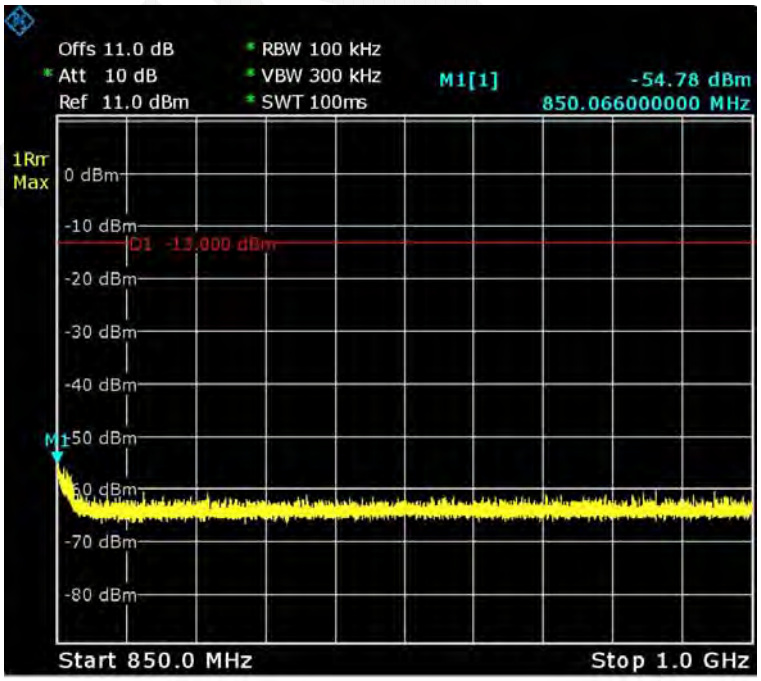

Marker 1 [T1]
Ref Lvl
20 dBm
-53.98 dBm
18.45691383 GHz
RBW 1 MHz
VBW 3 MHz
SWT 11.5 ms
RF Att 20 dB
Unit dBm
11 dB Offset
D1 -13 dBm
1MAX
1RM
A
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Start 18 GHz
200 MHz/
Stop 20 GHz
Date: 29.MAY 2016 13:26:19

Uplink:

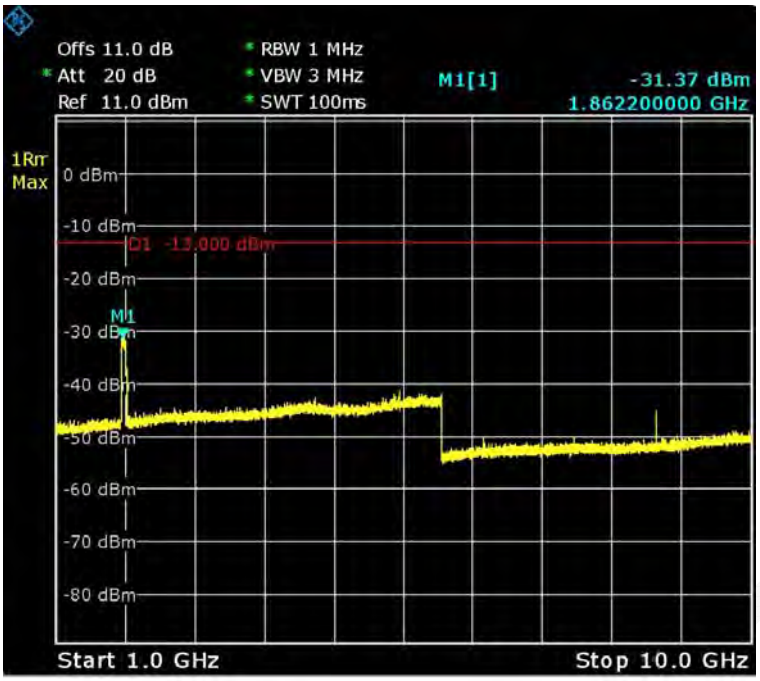
Cellular Band



Date: 29.MAY.2016 11:57:14

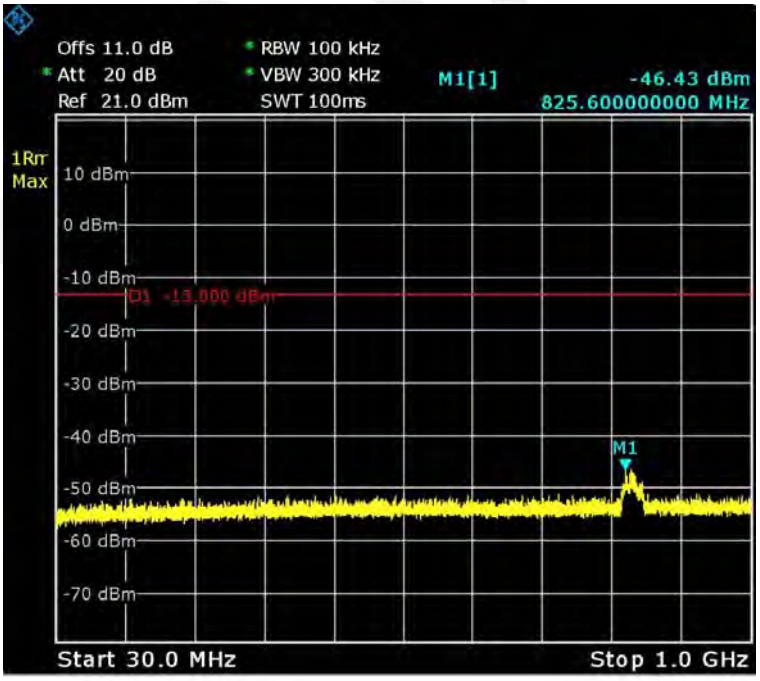


Date: 29.MAY.2016 11:58:08

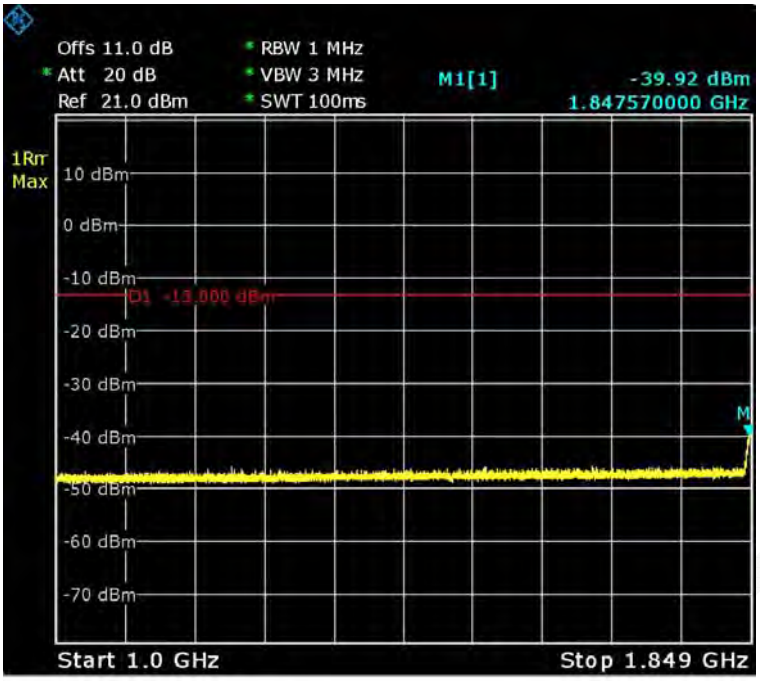


Date: 29.MAY.2016 11:59:22

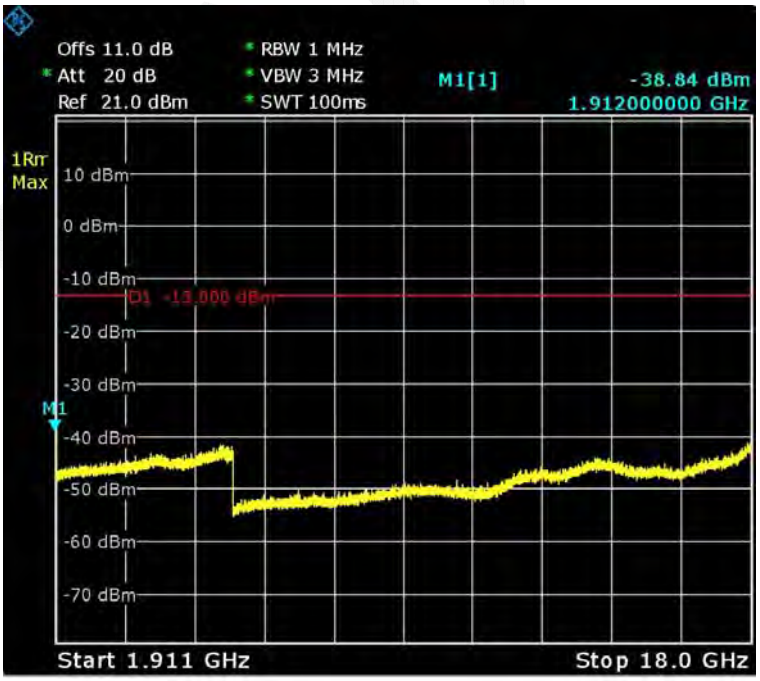
PCS Band



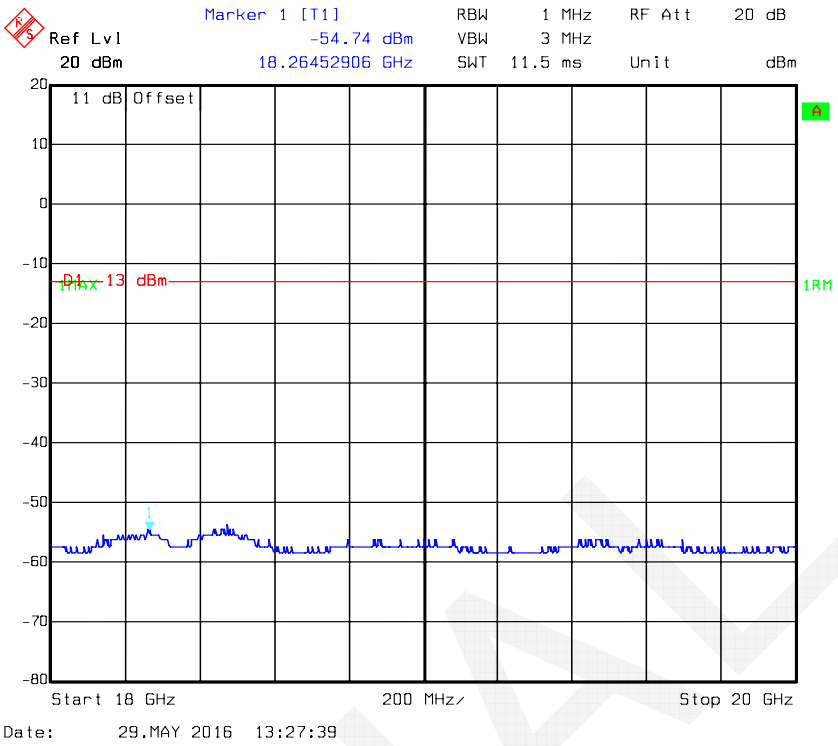
Date: 29.MAY.2016 19:29:44



Date: 29.MAY.2016 13:17:23



Date: 29.MAY.2016 13:18:33


Marker 1 [T1]
Ref Lvl
20 dBm
-54.74 dBm
18.26452906 GHz
RBW 1 MHz
VBW 3 MHz
SWT 11.5 ms
RF Att 20 dB
Unit dBm
11 dB Offset
D1 -13 dBm
1MAX
1RM
Start 18 GHz
200 MHz/
Stop 20 GHz
Date: 29.MAY 2016 13:27:39

§ 2.1053 - RADIATED SPURIOUS EMISSIONS

Applicable Standards

§ 2.1053 *Measurements required: Field strength of spurious radiation.*

Test Procedure

This procedure is intended to satisfy the requirements specified in § 2.1053. The applicable limits are those specified for mobile emissions in the rule part appropriate to the band of operation (see Annex A).

a) Place the EUT on an OATS or semi-anechoic chamber turntable 3 m from the receiving antenna. [12]
b) Connect the EUT to the test equipment as shown in **Figure 10** beginning with the uplink output.
c) Set the signal generator to produce a CW signal with the frequency set to the center of the operational band under test and the power level set at P_{IN} as determined from 7.2.
d) Measure the radiated spurious emissions from the EUT from lowest to the highest frequencies as specified in § 2.1057. Maximize the radiated emissions by utilizing the procedures described in Clause 8 of ANSI C63.4-2014.
e) Capture the peak emissions plots using a peak detector with Max-Hold for inclusion in the test report. Tabular data is acceptable in lieu of spectrum analyzer plots.
f) Repeat 7.12c) through 7.12e) for all operational bands.

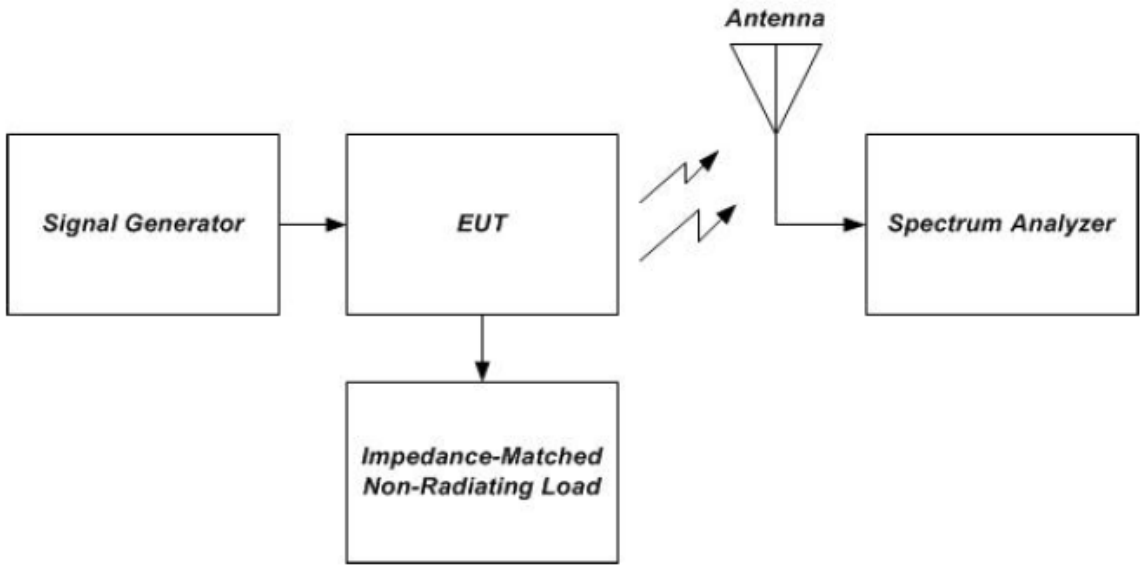


Figure 10 – Radiated spurious emissions test instrumentation setup

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
ETS	Horn Antenna	3115	003-6076	2015-12-02	2016-12-01
ETS	Horn Antenna	3115	6751	2014-06-16	2017-06-15
Mini-circuits	Amplifier	ZVA-183-S+	771001215	2016-5-20	2017-5-19
EMCO	Adjustable Dipole Antenna	3121C	9109-753	N/A	N/A
HP	Signal Generator	8648C	3623A04150	2016-5-23	2017-5-22
WILTRON	SWEPT FREQUENCY SYNTHESIZER	6737B-20	213001	2016-5-23	2017-5-22
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
WEINSCHEL ENGINEERING	Attenuator	1A10dB	AA4135	2015-11-10	2016-11-09
Narda	Terminal Load(5W)	370BNM	N/A	2015-12-09	2016-12-08

*** 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:	25.4℃
Relative Humidity:	53%
ATM Pressure:	101.2 kPa

The testing was performed by Kevin Hu on 2016-05-30.

Test mode: Transmitting

Test Result: Compliant. Please refer to the below table.

Uplink:

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)			
Cellular Band, Test Frequency 836.5 MHz								
90.140	V	52.86	-56.9	0.0	0.1	-57.0	-13.0	44.0
90.140	H	46.83	-67.4	0.0	0.1	-67.5	-13.0	54.5
299.660	V	38.38	-72.6	0.0	0.3	-72.9	-13.0	59.9
299.660	H	37.82	-75	0.0	0.3	-75.3	-13.0	62.3
1673.200	V	36.59	-64.8	7.9	0.8	-57.7	-13.0	44.7
1673.200	H	35.80	-67.3	7.9	0.8	-60.2	-13.0	47.2
2509.800	V	33.68	-63.9	8.9	1.3	-56.3	-13.0	43.3
2509.800	H	34.75	-65	8.9	1.3	-57.4	-13.0	44.4
PCS Band, Test Frequency 1880 MHz								
90.140	V	52.93	-56.8	0.0	0.1	-56.9	-13.0	43.9
90.140	H	47.12	-67.1	0.0	0.1	-67.2	-13.0	54.2
299.660	V	38.23	-72.8	0.0	0.3	-73.1	-13.0	60.1
299.660	H	37.32	-75.5	0.0	0.3	-75.8	-13.0	62.8
3760.000	V	36.98	-57.9	8.8	1.4	-50.5	-13.0	37.5
3760.000	H	35.05	-59.8	8.8	1.4	-52.4	-13.0	39.4
5640.000	V	34.01	-59.1	10.3	1.8	-50.6	-13.0	37.6
5640.000	H	34.61	-58.5	10.3	1.8	-50.0	-13.0	37.0

Downlink:

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)			
Cellular Band, Test Frequency 881.5 MHz								
90.140	H	49.48	-64.7	0.0	0.1	-64.8	-13.0	51.8
90.140	V	53.78	-55.9	0.0	0.1	-56.0	-13.0	43.0
192.960	H	44.87	-70	0.0	0.2	-70.2	-13.0	57.2
192.920	V	39.70	-72.4	0.0	0.2	-72.6	-13.0	59.6
1763.000	H	36.20	-65.2	8.0	0.9	-58.1	-13.0	45.1
1763.000	V	35.89	-64.2	8.0	0.9	-57.1	-13.0	44.1
2644.500	H	35.17	-64.2	8.8	1.2	-56.6	-13.0	43.6
2644.500	V	34.50	-63.5	8.8	1.2	-55.9	-13.0	42.9
PCS Band, Test Frequency 1960 MHz								
90.140	H	50.11	-64.1	0.0	0.1	-64.2	-13.0	51.2
90.140	V	53.34	-56.4	0.0	0.1	-56.5	-13.0	43.5
192.960	H	45.08	-69.8	0.0	0.2	-70.0	-13.0	57.0
192.920	V	39.85	-72.2	0.0	0.2	-72.4	-13.0	59.4
3920.000	H	33.82	-60.7	8.8	1.6	-53.5	-13.0	40.5
3920.000	V	35.05	-59.4	8.8	1.6	-52.2	-13.0	39.2
5880.000	H	34.35	-58.7	10.6	1.9	-50.0	-13.0	37.0
5880.000	V	35.86	-57.3	10.6	1.9	-48.6	-13.0	35.6

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

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