SGS-CSTC Standards Technical Services Co., Ltd.

198 Kezhu Road, Scientech Park, Guangzhou Economic & Technological Development District, Guangzhou, China 510663
Telephone: +86 (0) 20 82155555
Fax: +86 (0) 20 82075059
Email: ee.guangzhou@sgs.com



# TEST REPORT

| | |
|---|---|
| **Application No.:** | GZEM1406002679RF |
| **Applicant:** | Digital Antenna Inc. |
| **FCC ID:** | PZODA4600 |
| **Product Name:** | Dual Band Direct Connect Amplifier, Bi-directional signal Booster |
| **Model No.:** | DA4600-M(with mini UHF connectors), DA4600-S(with SMA connectors) ♣ |
| **Trade Mark:** | Digital Power Logic |
| **Standards**: | FCC Part20.21,FCC Part22,FCC Part24,FCC Part2 |
| **Date of Receipt**: | 2014-06-27 |
| **Date of Test**: | 2014-09-10 to 2014-09-17 |
| **Date of Issue**: | 2014-11-25 |
| **Test Result :** | **Pass*** |

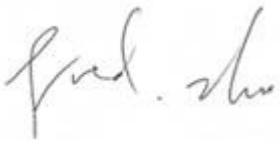
* In the configuration tested, the EUT detailed in this report complied with the standards specified above. Please refer to section 3 of this report for further details.

**Jerry Chan**

**Manager**

# 2 Version

| Revision Record | | | | |
|---|---|---|---|---|
| **Version** | **Chapter** | **Date** | **Modifier** | **Remark** |
| 00 | | 2014-11-25 | | Original |
| | | | | |
| | | | | |
| | | | | |

| | | | | |
|---|---|---|---|---|
| **Authorized for issue by:** | | | | |
| **Tested By** | |  **(Fred Zhu) /Project Engineer** | | 2014-09-10 to 2014-09-17 **Date** |
| **Prepared By** | |  **(Fred Zhu) /Project Engineer** | | 2014-10-30 **Date** |
| **Checked By** | |  **(Jerry Chan) /Reviewer** | | 2014-11-12 **Date** |

# 3 Test Summary

| Test Item | Test Requirement | Test Method | Result |
|---|---|---|---|
| Anthorized Frequency Band | FCC Part20.21(e)(3) | KDB 935210 D03 v02r01 Section7.1 | PASS |
| Maximum Power and Gain | FCC Part20.21(e)(8) (i)(B) &(i)(C) &(i)(D) | KDB 935210 D03 v02r01 Section7.2 & Section 7.3 | PASS |
| Intermodulation | FCC Part20.21(e)(8) (i)(F) | KDB 935210 D03 v02r01 Section7.4 | PASS |
| Out-of-Band Emissions | FCC Part20.21(e)(8) (i)(E) | KDB 935210 D03 v02r01 Section7.5 | PASS |
| Conducted Spurious Emissions | FCC Part2.1051<br>FCC Part22.917(a)<br>FCC Part24.238(a) | KDB 935210 D03 v02r01 Section7.6 | PASS |
| Noise Limits | FCC Part20.21(e)(8) (i)(A) &20.21(e)8(I)<br>20.21(e)(8)(i)(A) (1)Noise Limit<br>20.21(e)(8)(i)(A) (2)(i) Maximum Noise Limit:Fixed<br>20.21(e)(8)(i)(A) (2)(ii) Maximum Noise Limit:Mobile<br>20.21(e)(8)(i)(H) Tranmit Power Off Limit,Transmit Power Off timing. | KDB 935210 D03 v02r01 Section7.7 | PASS |
| Uplink Inactivity | FCC Part20.21(e)(8) (i)(I) | KDB 935210 D03 v02r01 Section7.8 | N/A (remark1) |
| Variable Gain | FCCPart20.21(e)(8) (i)(C)(1) & (C)(H) | KDB 935210 D03 v02r01 Section7.9 | PASS |
| Occupied Bandwidth | FCC Part2.1049 | KDB 935210 D03 v02r01 Section7.10 | PASS |
| Oscillation Detection | FCC Part20.21(e)(8)(ii) (A) | KDB 935210 D03 v02r01 Section7.11 | PASS |

| | | | |
|---|---|---|---|
| Ratiated Spurious | FCC Part2.1053 | KDB 935210 D03 v02r01 Section7.12 | PASS |
| Spectrum Block Filtering | FCC 20.21(e)(8)(i)(B) | KDB 935210 D03 v02r01 Section7.13 | N/A (remark2) |

**Remark:**
Tx: In this whole report Tx (or tx) means Transmitter.
Rx: In this whole report Rx (or rx) means Receiver.

**N/A(remark1):** Pre rule20.21e…if nosie is less than -70dBm/MHz("Transmit Power OFF Mode")

The EUT will not shut off,therefore this test will not be performed.

**N/A(remark2):**This only applies to devices utilizing spectrum block filtering.

# 4 Contents

# 5 General Information

## 5.1 Client Information

| | |
|---|---|
| Applicant Name: | Digital Antenna Inc. |
| Applicant Address: | 5325 NW 108th Avenue, Sunrise, FL 33351, U S A |
| Manufacturer: | Digital Antenna Inc. |
| Address of Manufacturer: | 5325 NW 108th Avenue, Sunrise, FL 33351, U S A |

## 5.2 General Description of E.U.T.

| | |
|---|---|
| Product Name: | Dual Band Direct Connect Amplifier, Bi-directional signal Booster |
| Model No.: | DA4600-M(with mini UHF connectors) |
| Power Supply: | AC 100-240V 50/60Hz 1.0A |
| Test power: | Model No.:GM36-100250-1<br>Input: AC 100-240V 50/60Hz 1.0A<br>Output:DC12V 2.5A |
| Operating Temperature: | -10 °C to +40°C |
| Operating Humidity: | ≤ 95% |

## 5.3 Details of E.U.T.

| | |
|---|---|
| Type of Modulation | GSM & CDMA & WCDMA |
| Emission Designator: | GXW(GSM)<br>F9W(CDMA),<br>F9W (WCDMA) |
| Frequency Band: | Band1:<br>Downlink: 869MHz to 894MHz<br>Uplink: 824MHz to 849MHz<br>include the Modulation:<br>GSM, CDMA, WCDMA<br>Band2:<br>Downlink 1930MHz to 1990MHz<br>Uplink: 1850MHz to 1910MHz<br>include the Modulation:<br>GSM, CDMA, WCDMA |
| Nominal Power Output: | -1dBm for downlink (-1dBm±1dB)<br>17dBm for uplink (17dBm±1dB) |
| Nominal System Gain: | 23dB for downlink (≤23dB)<br>23dB for Uplink ( ≤23dB) |
| Antenna Type | External Antenna |
| Antenna gain | 0dBi |

## 5.4 Product Description

Digital Antenna's direct connect cell amplifier provides maximum gain for more range on 850 and 1900MHz networks,PowerLogic boosters improve transimit and receive signals and can be used in a variety of applications including boats,vehicles,M2M,homes and offices.

## 5.5 Standards Applicable for Testing

The standard used was FCC Part20.21,FCC Part22,FCC Part24,FCC Part2

## 5.6 Test Location

All tests were performed at:
SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou EMC Laboratory,
198 Kezhu Road, Scientech Park, Guangzhou Economic & Technology Development District,
Guangzhou, China 510663
Tel: +86 20 82155555 Fax: +86 20 82075059
No tests were sub-contracted.

## 5.7 Other Information Requested by the Customer

None.

## 5.8 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **NVLAP (Lab Code: 200611-0)**

  SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou EMC Laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 200611-0.

  The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

- **ACMA**

  SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our NVLAP accreditation.

- **SGS UK(Certificate No.: 32), SGS-TUV SAARLAND and SGS-FIMKO**

  Have approved SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory as a supplier of EMC TESTING SERVICES and SAFETY TESTING SERVICES.

- **CNAS (Lab Code: L0167)**

  SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been assessed and in compliance with CNAS-CL01:2006 accreditation criteria for testing laboratories (identical to ISO/IEC 17025:2005 General Requirements) for the Competence of Testing Laboratories.

- **FCC (Registration No.: 282399)**

  SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 282399, May 31, 2002.

- **Industry Canada (Registration No.: 4620B-1)**

  The 3m/10m Alternate Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd., has been registered by Certification and Engineering of Industry Canada for radio equipment testing with Registration No. 4620B-1.

- **VCCI (Registration No.: R-2460, C-2584, G-449 and T-1179)**

  The 10m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services Co. Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-2460, C-2584，G-449 and T-1179 respectively.

- **CBTL (Lab Code: TL129)**

  SGS-CSTC Standards Technical Services Co., Ltd., E&E Laboratory has been assessed and fully comply with the requirements of ISO/IEC 17025:2005, the Basic Rules, IECEE 01:2006-10 and Rules of procedure IECEE 02:2006-10, and the relevant IECEE CB-Scheme Operational documents.

# 6 Equipment Used during Test

| RE in Chamber | | | | | | |
|---|---|---|---|---|---|---|
| No. | Test Equipment | Manufacturer | Model No. | Serial No. | Cal. date (YYYY-MM-DD) | Cal.Due date (YYYY-MM-DD) |
| EMC0525 | Compact Semi-Anechoic Chamber | ChangZhou ZhongYu | N/A | N/A | 2013-12-5 | 2014-12-5 |
| EMC0522 | EMI Test Receiver | Rohde & Schwarz | ESIB26 | 100283 | 2014-04-19 | 2015-04-19 |
| EMC0056 | EMI Test Receiver | Rohde & Schwarz | ESCI | 100236 | 2014-03-03 | 2015-03-03 |
| EMC0528 | RI High frequency Cable | SGS | 20 m | N/A | 2014-05-09 | 2015-05-09 |
| EMC2025 | Trilog Broadband Antenna 30-1000MHz | SCHWARZBECK MESS-ELEKTRONIK | VULB 9160 | 9160-3372 | 2014-07-14 | 2017-07-14 |
| EMC0524 | Bi-log Type Antenna | Schaffner-Chase | CBL6112B | 2966 | 2013-08-31 | 2016-08-31 |
| EMC0519 | Bilog Type Antenna | Schaffner-Chase | CBL6143 | 5070 | 2014-05-04 | 2017-05-04 |
| EMC2026 | Horn Antenna 1-18GHz | SCHWARZBECK MESS-ELEKTRONIK | BBHA 9120D | 9120D-841 | 2013-08-31 | 2016-08-31 |
| EMC0518 | Horn Antenna | Rohde & Schwarz | HF906 | 100096 | 2012-07-01 | 2015-07-01 |
| EMC0521 | 1-26.5 GHz Pre-Amplifier | Agilent | 8449B | 3008A01649 | 2014-03-03 | 2015-03-03 |
| EMC2065 | Amplifier | HP | 8447F | N/A | 2014-08-25 | 2015-08-25 |
| EMC0075 | 310N Amplifier | Sonama | 310N | 272683 | 2014-03-03 | 2015-03-03 |
| EMC0523 | Active Loop Antenna | EMCO | 6502 | 42963 | 2014-03-03 | 2016-03-03 |
| EMC2041 | Broad-Band Horn Antenna (14)15-26.5(40)GHz | SCHWARZBECK MESS-ELEKTRONI | BBHA 9170 | 9170-375 | 2014-05-26 | 2017-05-26 |
| EMC2069 | 2.4GHz filter | Micro-Tronics | BRM 50702 | 149 | 2014-04-19 | 2015-04-19 |
| EMC0530 | 10m Semi-Anechoic Chamber | ETS | N/A | N/A | 2014-05-03 | 2016-05-03 |

| | Other equipment | | | | | |
|---|---|---|---|---|---|---|
| **No:** | **Test Equipment** | **Manufacturer** | **Model No.** | **Serial No.** | **Cal. Date (dd-mm-yy)** | **Cal. Due Date (dd-mm-yy)** |
| NA | Power Meter | Agilent | E4419B | MY45100856 | 2014.6.12 | 2015.6.12 |
| NA | Signal Generator | Agilent | E4437B | US39260800 | 2014.6.17 | 2015.6.17 |
| NA | Signal Generator | Agilent | E4438C | US39260800 | 2014.6.14 | 2015.6.14 |
| NA | Spectrum Analyzer | Agilent | N9020A | MY48011385 | 2014.6.14 | 2015.6.14 |
| NA | Spectrum Analyzer | Rohde&Schwarz | FSQ 8 | SN0805772 | 2014.6.14 | 2015.6.14 |
| NA | Attenuator | SHX manufacturer | 30dB/50W | 09031816 | ---- | ---- |
| NA | Attenuator | SHX manufacturer | 40dB/50W | 09031312 | ---- | ---- |
| NA | Attenuator | SHX manufacturer | 50dB/50W | 09053023 | ---- | ---- |
| NA | Signal Generator | Rohde&Schwarz | SMU 200A | 08103303 | 2014.6.12 | 2015.6.12 |

| **General used equipment** | | | | | | |
|---|---|---|---|---|---|---|
| **No.** | **Test Equipment** | **Manufacturer** | **Model No.** | **Serial No.** | **Cal. date** | **Cal.Due date** |
| | | | | | **(YYYY-MM-DD)** | **(YYYY-MM-DD)** |
| EMC0006 | DMM | Fluke | 73 | 70681569 | 2014-09-15 | 2015-09-15 |
| EMC0007 | DMM | Fluke | 73 | 70671122 | 2014-09-15 | 2015-09-15 |

# 7 Test Results

## 7.1 E.U.T. test conditions

| | |
|---|---|
| Input Voltage: | AC 120V |
| Operating Environment: | |
| Temperature: | 22°C ~26°C |
| Humidity: | 46%~56% RH |
| Atmospheric Pressure: | 990~1005mbar |
| Test Requirement: | The RF output power of the EUT was measured at the antenna port, by adjusting the input power of signal generter to drive the EUT to get to maximum output power point and keep the EUT at maximum gain setteing for all tests. The device should be tested on downlink.<br>For detail test Modulation and Frequency, please refer to 7.2. |

**Remark:**
**GENERAL DEFINITIONS FOR CERTIFICATION PURPOSES:**
The following three general definitions follow from those stated in the Part 22, 24, and 90 rule sections as listed above. Two of the definitions replace previous EAB internal definitions given for booster, repeater and extender. The general term “extender” is the same as booster, but booster should be used rather than extender. The general term “translator” is the same as repeater, but repeater should be used rather than translator.
***External radio frequency power amplifier (ERFPA)*** - any device which, (1) when used in conjunction with a radio transmitter signal source, is capable of amplification of that signal, and (2) is not an integral part of a radio transmitter as manufactured. The EAS equipment class AMP is used only for an ERFPA device inserted between a transmitter (TNB/PCB) and an antenna (has only one antenna port)
***Booster*** is a device that automatically reradiates signals from base transmitters without channel translation, for the purpose of improving the reliability of existing service by increasing the signal strength in dead spots. An “in-building radiation system” is a signal booster. These devices are not intended to extend the size of coverage from the originating base station. A booster can be either single or multiple channels**.**
***Repeater*** is a device that retransmits the signals of other stations. Repeaters are different from boosters in that they can include frequency translation and can extend coverage beyond the design of the original base station. A repeater is typically single channel but can also be multiple channels.
ERFPA (AMP) and boosters/repeaters (TNB/PCB) can generally be authorized for all rule parts except 15 and 18.
Tests should be done with each typical signal. e.g., for F3E emissions use 2500 Hz with 2.5 or 5 kHz deviation. Use of CW signal for some tests is acceptable in lieu of actual emission, in some cases when CW signal gives worst case.

Digital Antenna’s direct connect cell amplifier provides maximum gain for more range on 850 and 1900MHz networks,PowerLogic boosters improve transimit and receive signals and can be used in a variety of applications including boats,vehicles,M2M,homes and offices..

So **the Equipment belongs to the consumer signal booster.**

## 7.2 Test **Procedure** & Measurement Data

Test Modulation and Frequency

1.Downlink: 869MHz to 894MHz

| Modulation | Lowest frequency | Middle frequency | Highest frequency |
|---|---|---|---|
| GSM | 869.6. | 881.5 | 893.4 |
| CDMA | 871 | 881.5 | 892 |
| WCDMA | 872 | 881.5 | 891 |

2.Uplink: 824MHz to 849MHz

| Modulation | Lowest frequency | Middle frequency | Highest frequency |
|---|---|---|---|
| GSM | 824.6 | 836.5 | 848.4 |
| CDMA | 826 | 836.5 | 847 |
| WCDMA | 827 | 836.5 | 846 |

3.Downlink: 1930MHz to 1990MHz

| Modulation | Lowest frequency | Middle frequency | Highest frequency |
|---|---|---|---|
| GSM | 1930.6 | 1960 | 1989.4 |
| CDMA | 1932 | 1960 | 1988 |
| WCDMA | 1933 | 1960 | 1987 |

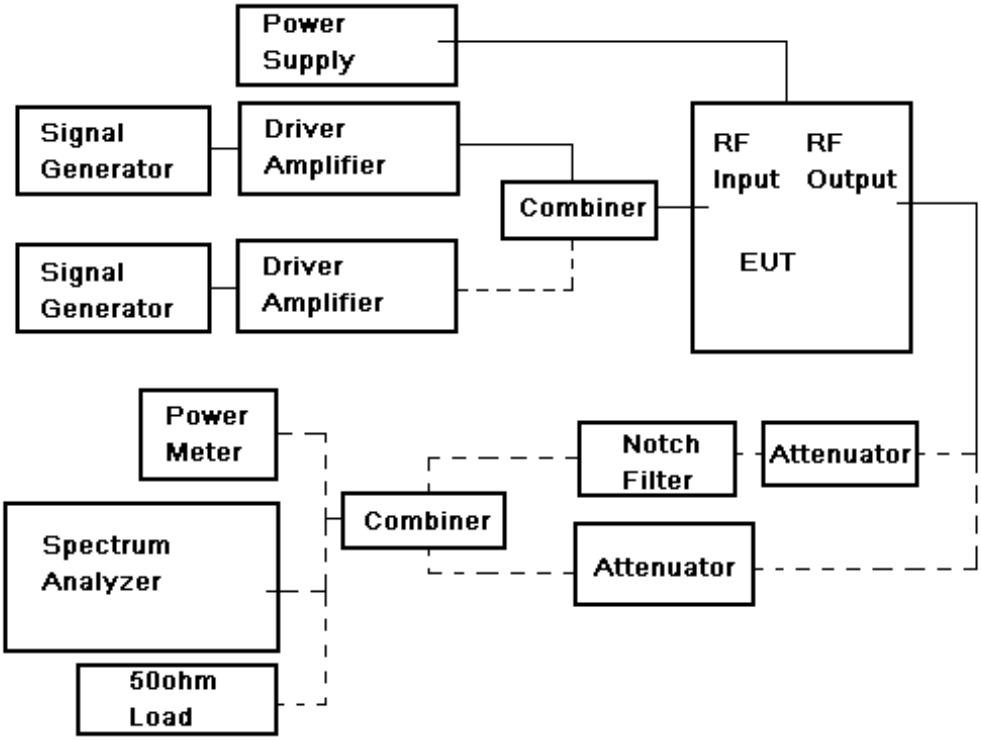
4.Uplink: 1850MHz to 1910MHz

| Modulation | Lowest frequency | Middle frequency | Highest frequency |
|---|---|---|---|
| GSM | 1850.6 | 1880 | 1909.4 |
| CDMA | 1852 | 188 | 1908 |
| WCDMA | 1853 | 188 | 1907 |

**Remark:**

1) We test the downlink and uplink in the lowest band; the middle band; the hightest band and test the respective frequency as above table;

General Test Setup:



### 7.2.1 Authorized Frequency Band

Test Date: 2014-09-10 to 2014-09-17

Test Requirement: FCC Part20.21(e)(3)

FCC Part20.21(e)(3) Frequency Bands. Consumer Signal Boosters must be designed and manufactured such that they only operate on the frequencies used for the provision of subscriber-based services under parts 22 (Cellular), 24 (Broadband PCS), 27 (AWS-1, 700 MHz Lower A-E Blocks, and 700 MHz Upper C Block), and 90 (Specialized Mobile Radio) of this chapter. The Commission will not certificate any Consumer Signal Boosters for operation on part 90 of this chapter (Specialized Mobile Radio) frequencies until the Commission releases a public notice announcing the date Consumer Signal Boosters may be used in the band.

Test Method: KDB 935210 D03 v02r01 Section7.1

EUT Operation:

Status: Drive the EUT to maximum output power.

Conditions: Normal conditions

Application: Cellular Band RF output ports

Test Configuration:

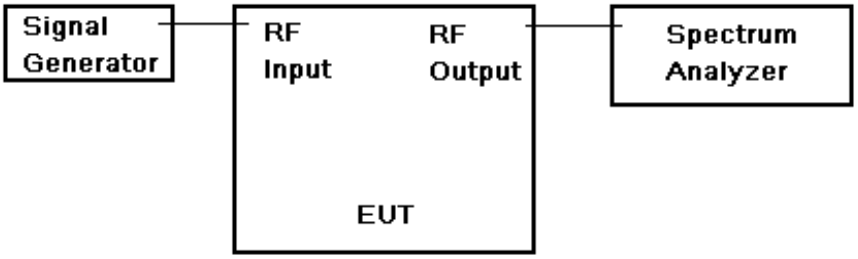



Fig.1 RF Output Power test configuration

Test Procedure:

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 with each CMRS operational band, which then serves as a basis for subsequent tests.

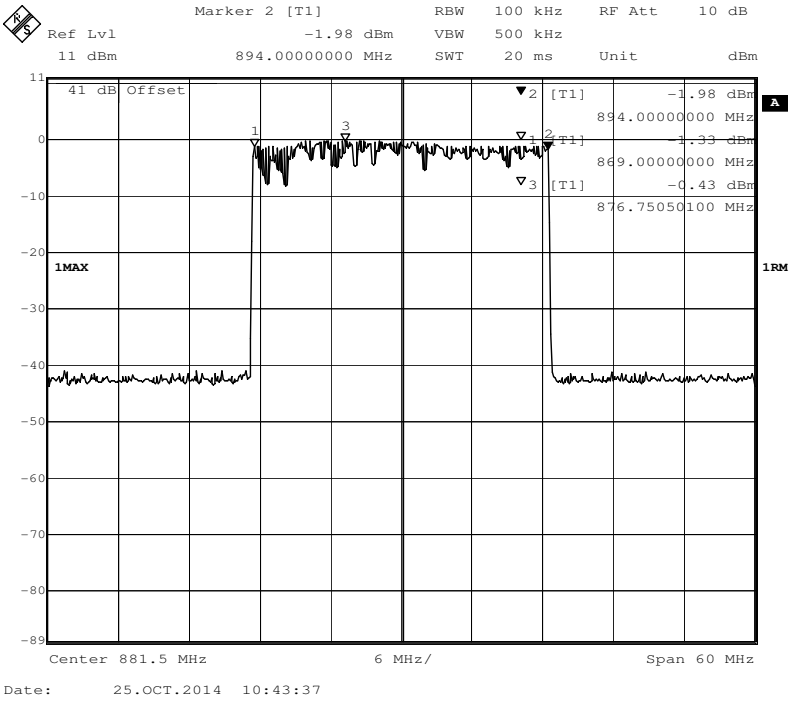
a) Connect the EUT to the test equipment as shown in **Figure 1**. Begin with the uplink output connected to the spectrum analyzer.
b) Set the spectrum analyzer RBW for 100 kHz with the VBW ≥ 3X the RBW using a PEAK detector with the MAX HOLD function.
c) Set the center frequency of the spectrum analyzer 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 times the CMRS band under test. Adjust the tuned frequency of the signal generator to sweep 2 times the CMRS band using the sweep function. Note: The AGC must not be activated throughout entire sweep.

i) Using three markers identify the CMRS band edges and the frequency with the highest power. Ensure 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 steps 7.1c) to 7.1j) for all operational uplink and downlink bands.

Measurement Record:

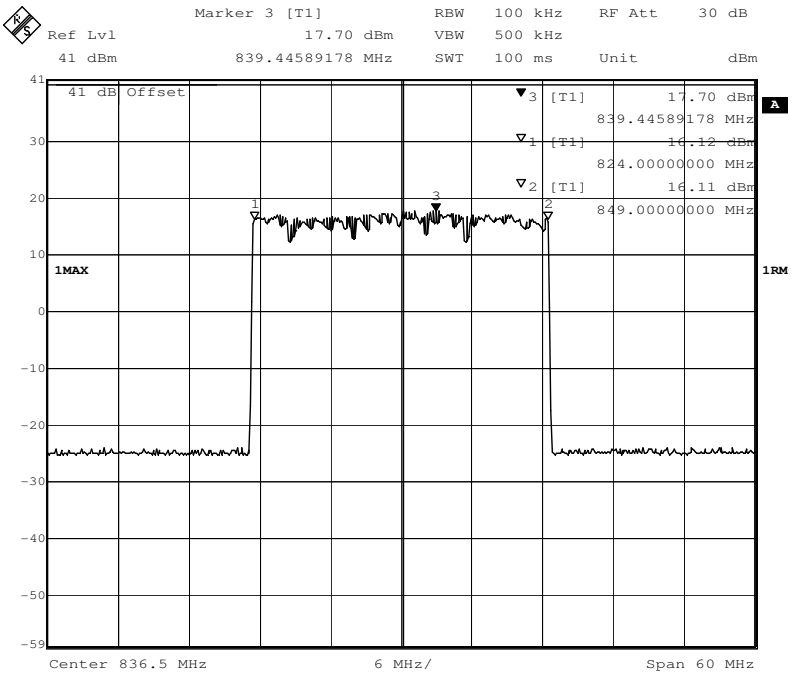
**For the band1:**

Downlink:869MHz to 894MHz




Remark:output power is lower than the rate power 3dB,Using three markers identify the CMRS band edges and the frequency with the highest power.

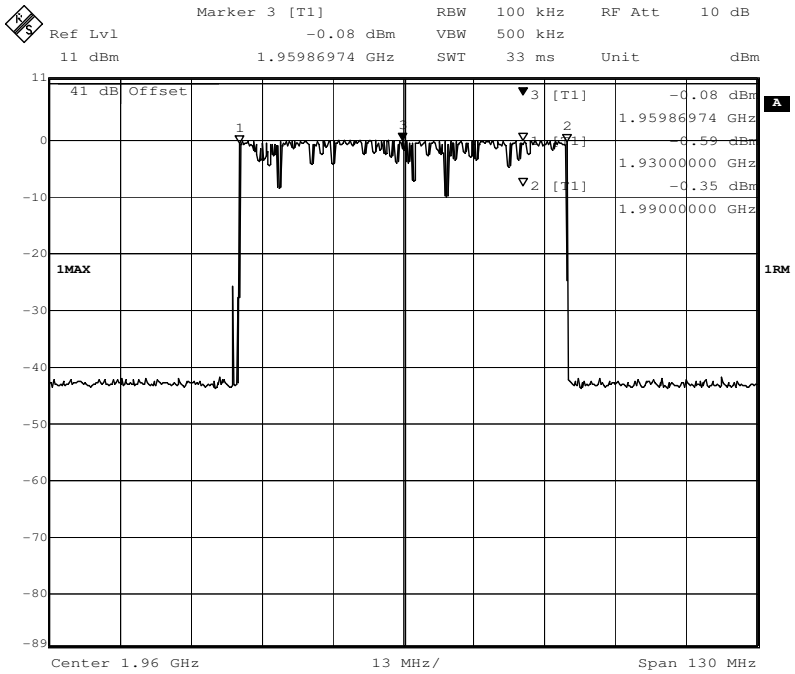
Uplink:824MHz to 849MHz




Remark:output power is lower than the rate power 3dB,Using three markers identify the CMRS band edges and the frequency with the highest power.

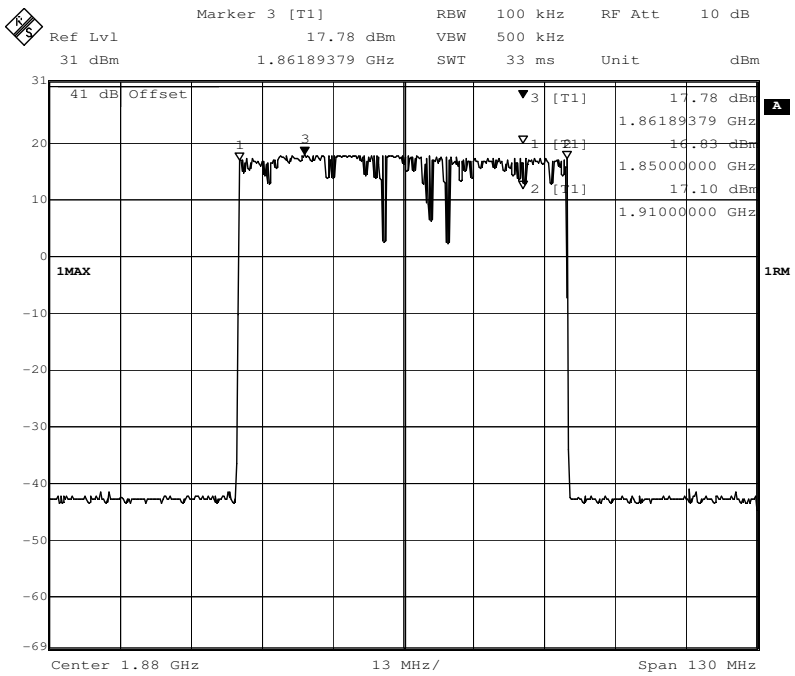
**For the band2:**

Downlink:1930MHz to 1990MHz




Remark:output power is lower than the rate power 3dB,Using three markers identify the CMRS band edges and the frequency with the highest power.

Uplink:1850MHz to 1910MHz




Remark:output power is lower than the rate power 3dB,Using three markers identify the CMRS band edges and the frequency with the highest power.

## 7.2.2 Maximum Power and Gain

Test Date: 2014-09-10 to 2014-09-17

Test Requirement: FCC Part20.21(e)(8) (i)(B) & (i)(C) & (i)(D)

(B) Bidirectional Capability. Consumer Boosters must be able to provide equivalent uplink and downlink gain and conducted uplink power output that is at least 0.05 watts. One-way consumer boosters (i.e., uplink only, downlink only, uplink impaired, downlink impaired) are prohibited. Spectrum block filtering may be used provided the uplink filter attenuation is not less than the downlink filter attenuation, and where RSSI is measured after spectrum block filtering is applied referenced to the booster's input port for each band of operation.

(C) Booster Gain Limits.

(1) The uplink gain in dB of a consumer booster referenced to its input and output ports shall not exceed –34 dB—RSSI + MSCL.

(i) Where RSSI is the downlink composite received signal power in dBm at the booster donor port for all base stations in the band of operation. RSSI is expressed in negative dB units relative to 1 mW.

(ii) Where MSCL (Mobile Station Coupling Loss) is the minimum coupling loss in dB between the wireless device and input port of the consumer booster. MSCL must be calculated or measured for each band of operation and provided in compliance test reports.

(2) The uplink and downlink maximum gain of a Consumer Booster referenced to its input and output ports shall not exceed the following limits:

(i) Fixed Booster maximum gain shall not exceed 6.5 dB + 20 Log10 (Frequency)

(ii) Where, Frequency is the uplink mid-band frequency of the supported spectrum bands in MHz.

(iii) Mobile Booster maximum gain shall not exceed 50 dB when using an inside antenna (e.g., inside a vehicle), 23 dB when using direct contact coupling (e.g., cradle-type boosters), or 15 dB when directly connected (e.g., boosters with a physical connection to the phone).

(D) Power Limits. A booster's uplink power must not exceed 1 watt composite conducted power and equivalent isotropic radiated power (EIRP) for each band of operation. Composite downlink power shall not exceed 0.05 watt (17 dBm) conducted and EIRP for each band of operation. Compliance with power limits will use instrumentation calibrated in terms of RMS equivalent voltage.

Test Method: KDB 935210 D03 v02r01 Section7.2 & Section7.3

EUT Operation:

Status: Drive the EUT to maximum output power.

Conditions: Normal conditions

Application: Cellular Band RF output ports

Test Configuration:

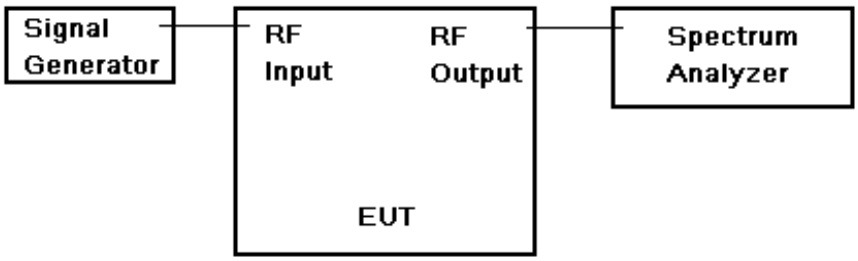



Figure.1 RF Output Power and gain test configuration

Test Procedure: 1.For measure the maximum power:

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; *e.g.*, 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 ($P_{in}$).
g) Measure the output power ($P_{out}$) with the spectrum analyzer as follows.
h) Set RBW = 100 kHz for AWGN signal type and 300 kHz for CW or GSM signal type
i) Set VBW ≥ 3X RBW
j) 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).
k) Select the RMS (power averaging) detector.
l) Ensure that the number of measurement points per sweep ≥ (2 x span)/RBW (Note: This requirement does not apply for BURST power measurement mode).
m) Set sweep time = auto couple, or as necessary (but no less than auto couple value).
n) Trace average at least 100 traces in power averaging (i.e., RMS) mode.
o) 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.
p) Repeat the procedure for each operational uplink and downlink frequency band supported by the booster.

2.For measure the gain:

a) Compute 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 $P_{IN}$ value 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.

Test limit: 1.Maximum output power:

1)17-30dBm for Uplink

2)17dBm for downlink

2Maximum gain:23dB

**Remarks:it belongs to 23 dB when using direct contact coupling (e.g., cradle-type boosters).**

**7.2.2.1 Measurement Record:** **Uncertainty: ± 2dB**

**1.Maximum output power:**

For downlink:

| Frequency band and Modulation | | Input level (dBm) | Maximum Output power(EIRP) | Maximum gain(dB) | Limit | |
|---|---|---|---|---|---|---|
| | | | | | Output power(dBm) | Gain(dB) |
| 869MHz to 894MHz | GSM | -20 | -0.43dBm (0.906mW) (0.001W) | 19.57 | -1±1 | ≤23 |
| | AWGN | -20.1 | -0.57dBm | 19.53 | | |
| 1930MHz to 1990MHz | GSM | -10 | -0.08dBm (0.982mW) (0.001W) | 9.92 | | |
| | AWGN | -10.1 | -0.15dBm | 9.95 | | |

For uplink:

| Frequency band and Modulation | | Input level (dBm) | Maximum Output power (dBm)(EIRP) | Maximum gain(dB) | Limit | |
|---|---|---|---|---|---|---|
| | | | | | Output power(dBm) | Gain(dB) |
| 824MHz to 849MHz | GSM | -4 | 17.70dBm (58.884mw) (0.058W) | 21.70 | 17±1 | ≤23 |
| | AWGN | -4.1 | 17.32 dBm | 21.22 | | |
| 1850MHz to 1910MHz | GSM | -3.3 | 17.78dBm (59.979mw) (0.060W) | 21.08 | | |
| | AWGN | -3.4 | 17.62dBm | 21.02 | | |

Remark:

1)Scan all operating frequency band,finally marker the Maximum output power point,and record in the above table.

2)Gain=outpower-inputpower

3) the limit of maximum output power in downlink bands is -1dBm±1dB., the limit of maximum output power in uplink bands is 17dBm±1dB.

## 2. EIRP test data

For downlink:

| Frequency band and Modulation | | Maximum Output power(EIRP) | EIRP limit | result |
|---|---|---|---|---|
| 869MHz to 894MHz | GSM | -0.43dBm | ≤17dBm | Pass |
| | AWGN | -0.57dBm | | |
| 1930MHz to 1990MHz | GSM | -0.08dBm | | |
| | AWGN | -0.15dBm | | |

For uplink:

| Frequency band and Modulation | | Maximum Output power (dBm)(EIRP) | EIRP limit | result |
|---|---|---|---|---|
| 824MHz to 849MHz | GSM | 17.70dBm | ≤30dBm | Pass |
| | AWGN | 17.32 dBm | | |
| 1850MHz to 1910MHz | GSM | 17.78dBm | | |
| | AWGN | 17.62dBm | | |

### 7.2.3 Intermodulation

Test Date:

Test Requirement: FCC Part20.21(e)(8)(i)(F)

(F) Intermodulation Limits. The transmitted intermodulation products of a consumer booster at its uplink and downlink ports shall not exceed the power level of –19 dBm for the supported bands of operation. Compliance with intermodulation limits will use boosters operating at maximum gain and maximum rated output power, with two continuous wave (CW) input signals spaced 600 kHz apart and centered in the pass band of the booster, and with a 3 kHz measurement bandwidth.

Test Method: KDB 935210 D03 v02r01 Section7.4

EUT Operation:

Status: Drive the EUT to maximum output power.

Conditions: Normal conditions

Application: Cellular Band RF output ports

Test Configuration:

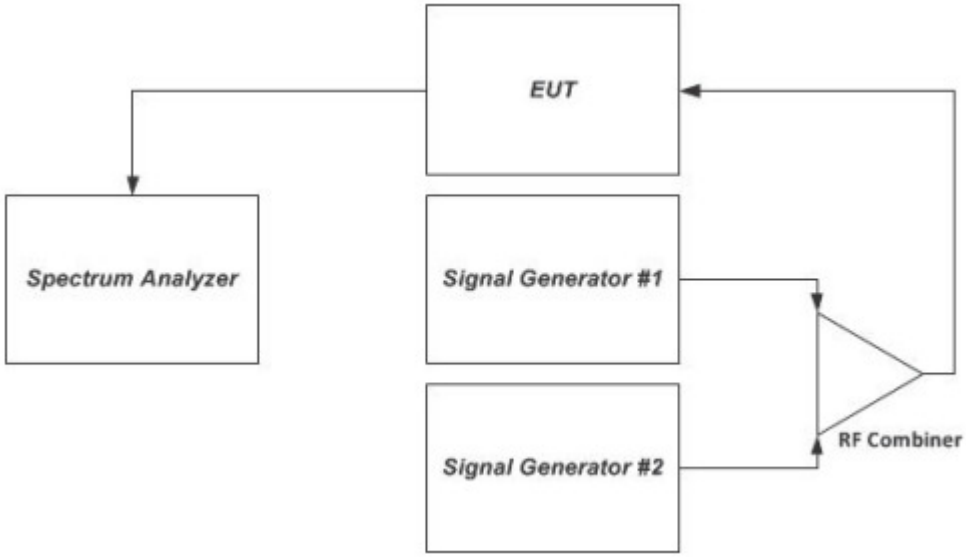



Figure 2:Intermodulation product instrumentation test setup

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 (*i.e.*, −19 dBm).

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 X the 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.
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 and turn on the RF output.
i) Increase the signal generators amplitudes equally until just before the EUT begins AGC and ensure 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 steps 7.4e) to 7.4l) for all uplink and downlink operational bands.
**Note:** *If using a single signal generator with dual outputs, ensure 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 5.4, to ensure that the EUT maintains compliance with the intermodulation limit.

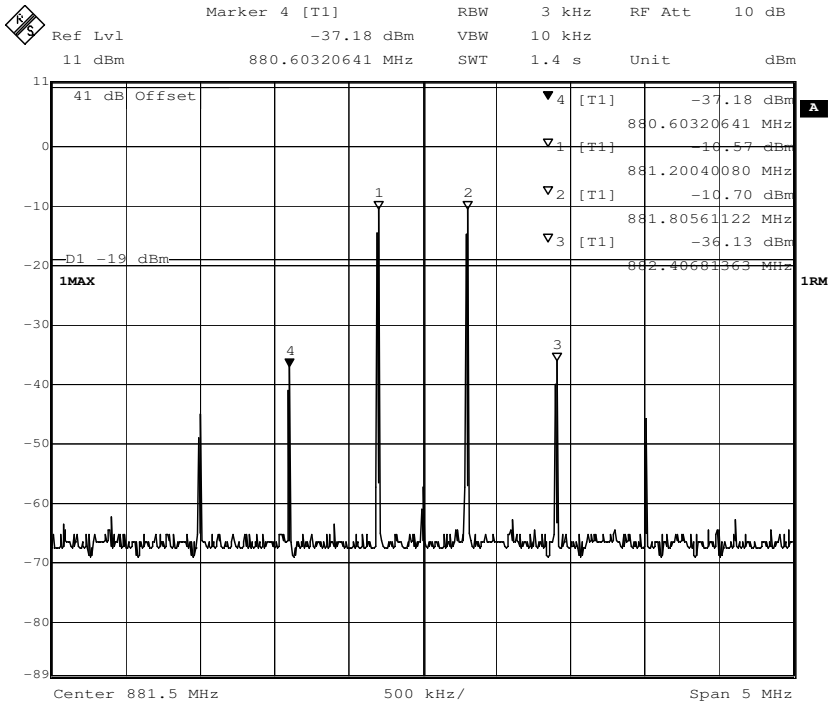
Test limit -19dBm in a 3kHz RBW

### 7.2.3.1 Measurement Record:

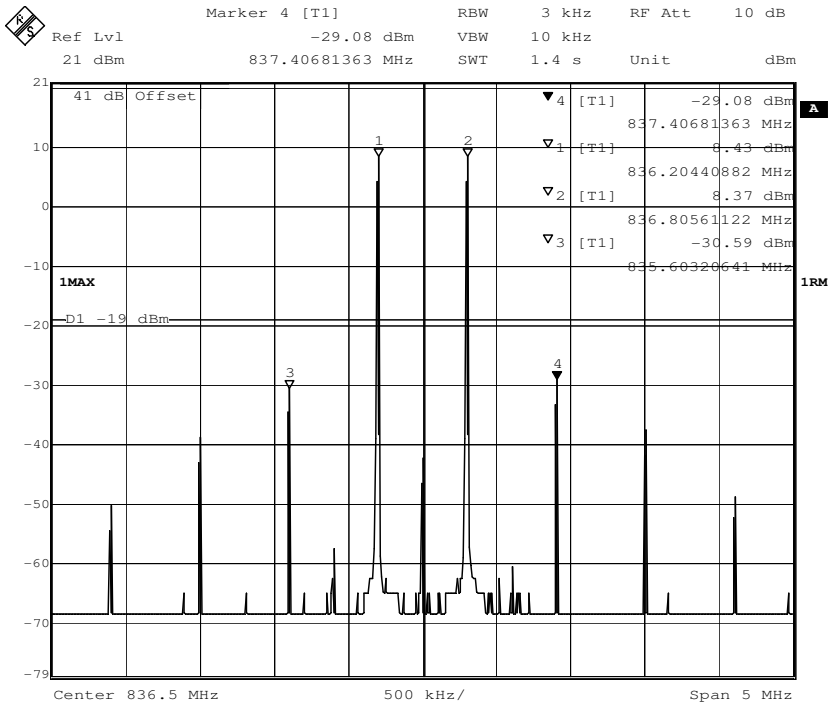
**For the Band1:**

Set the center frequency of the operating band,other frequency offset 600kHz from the center frequency

1)test in the downlink:



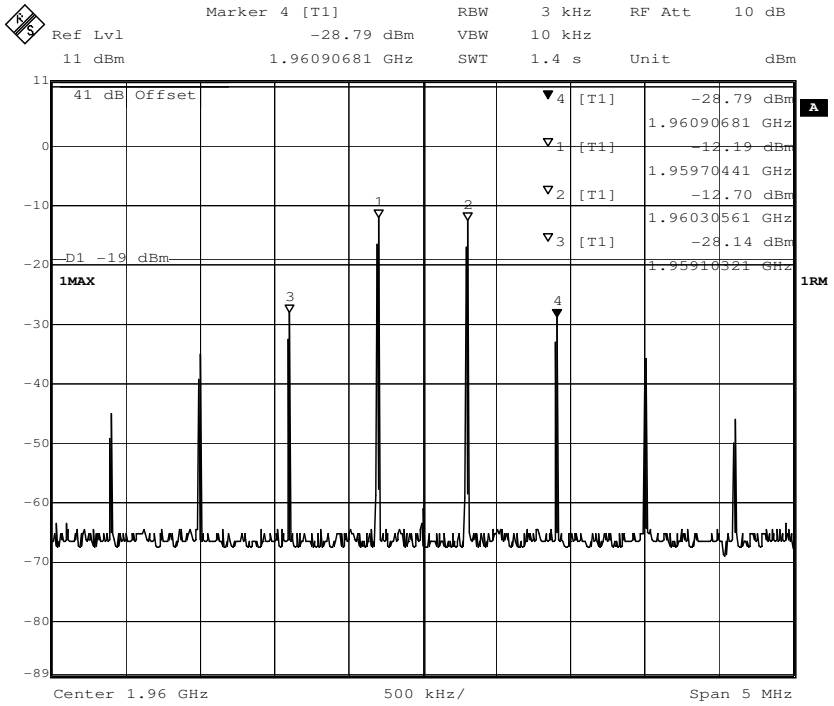

2)test in the uplink:



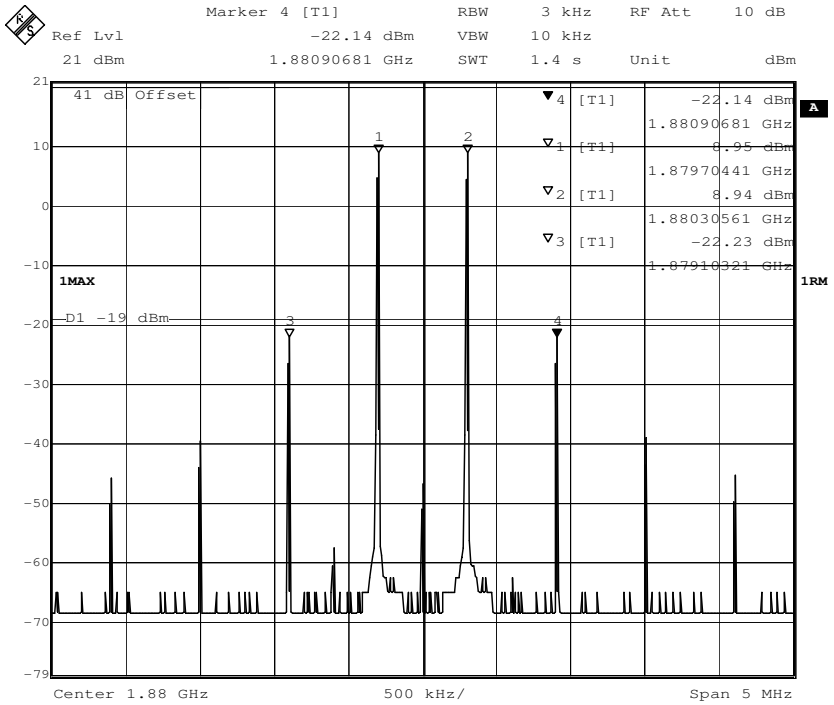

**For the Band2:**

Set the center frequency of the operating band,other frequency offset 600kHz from the center frequency

1)test in the downlink:




2)test in the uplink:



**Downlink Test Results**

| measure frequency | Intermodulation Level (dBm) | Limit (dBm) | **Over Limit(dB)** |
|---|---|---|---|
| 869-894MHz | -36.1 | -19 | -17.4 |
| 1930-1990MHz | -28.1 | -19 | -9.1 |

**Uplink Test Results**

| measure frequency | Intermodulation Level (dBm) | Limit (dBm) | **Over Limit(dB)** |
|---|---|---|---|
| 824-849MHz | -29.1 | -19 | -10.1 |
| 1850-1910MHz | -22.1 | -19 | -3.1 |

## 7.2.4 Out-of-Band Emissions

Test Date:

Test Requirement: FCC Part20.21(e)(8)(i)(E)

(E) Out of Band Emission Limits. Booster out of band emissions (OOBE) shall be at least 6 dB below the FCC's mobile emission limits for the supported bands of operation. Compliance to OOBE limits will utilize high peak-to-average CMRS signal types.

Test Method: KDB 935210 D03 v02r01 Section7.5

EUT Operation:

Status: Drive the EUT to maximum output power.

Conditions: Normal conditions

Application: Cellular Band RF output ports

Test Configuration:

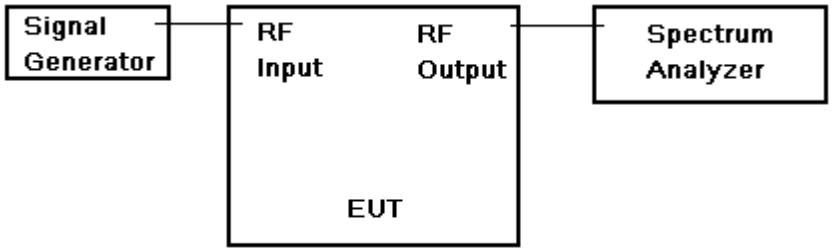



Figure1 Out-of –band emissions

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) Configure the signal generator for the appropriate operation for all uplink and downlink bands:
   i) GSM: 0.2 MHz from upper and lower band edge
   ii) LTE (5 MHz): 2.5 MHz from upper and lower band edge
   iii) CDMA: 1.25 MHz from upper and lower band edge, except for cellular 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:** *AWGN is the measured 99% occupied bandwidth.*

c) Set the signal generator amplitude to the maximum power level prior to AGC similar to the procedures in 7.2d) to 7.2f) 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 X 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 100 kHz or 1 MHz, per applicable rule part.
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 5.4 is reached. Ensure that the EUT maintains compliance with the OOBE limits.
m) Reset the analyzer start frequency to the lower band/block edge frequency minus 100 kHz or 1 MHz, as per applicable rule part, and the stop frequency to the lower band/block edge frequency and repeat steps 7.5j) to 7.5l).
n) Repeat steps 7.5b) through 7.5m) for each uplink and downlink operational band.

Test limit: P1-6-(43 + 10 log(P2))=-19dBm

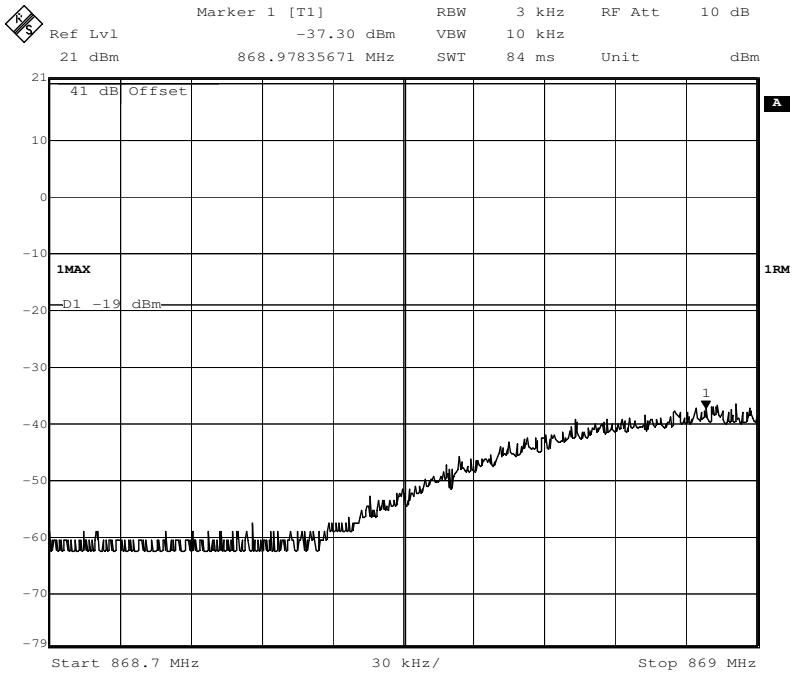
P1=power in dBm,P2=power in Watts

Measurement Record:

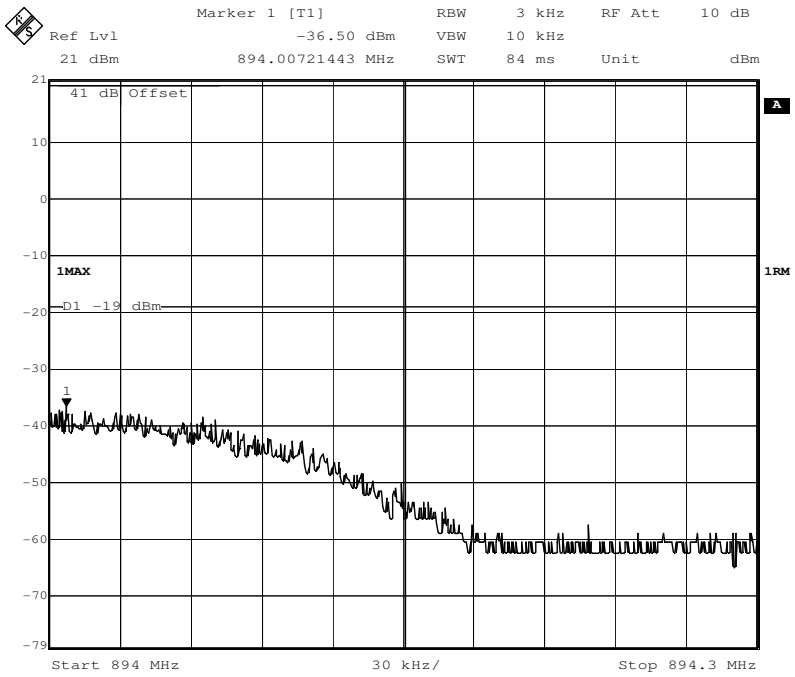
**1)Downlink: 869MHz to 894MHz**

1.1 GSM Mode:

1.1.1 one signal input —Lower Edge

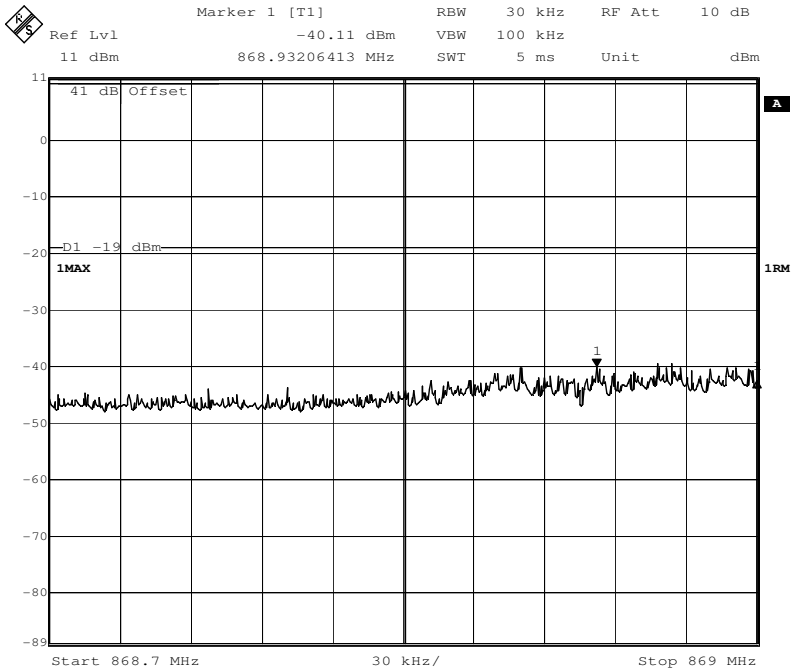



1.1.2 one signal input — Upper Edge

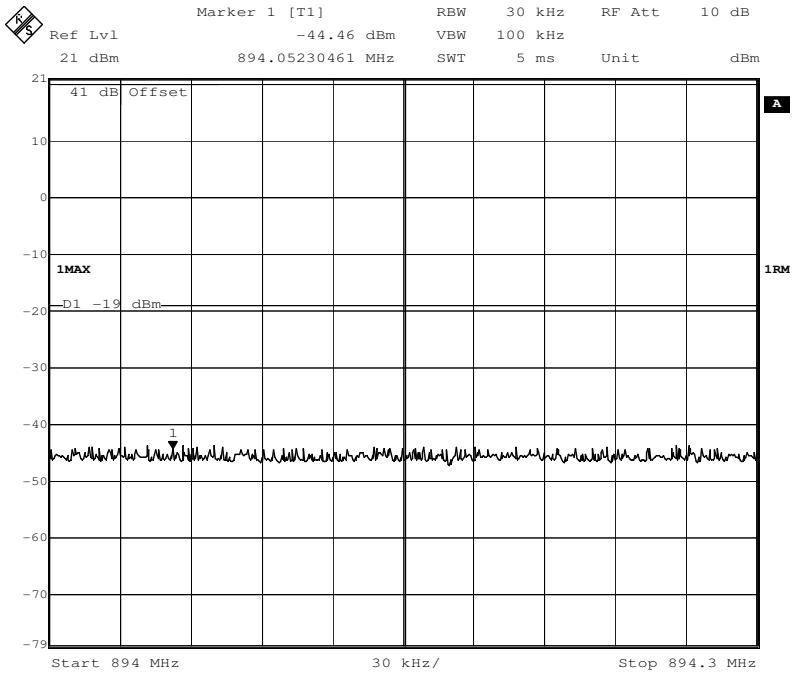


1.2 CDMA Mode:

1.2.1 one signal input —Lower Edge

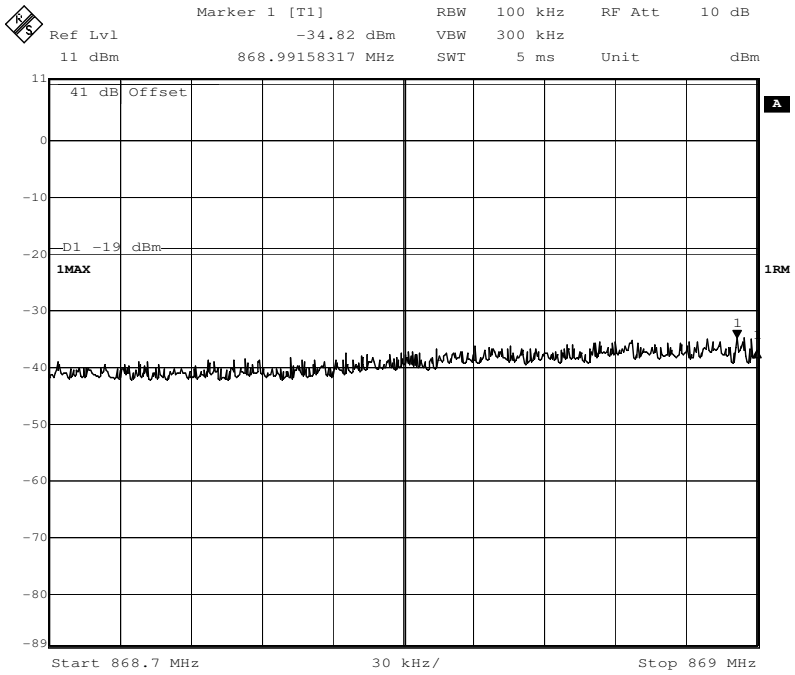



1.2.2 one signal input — Upper Edge

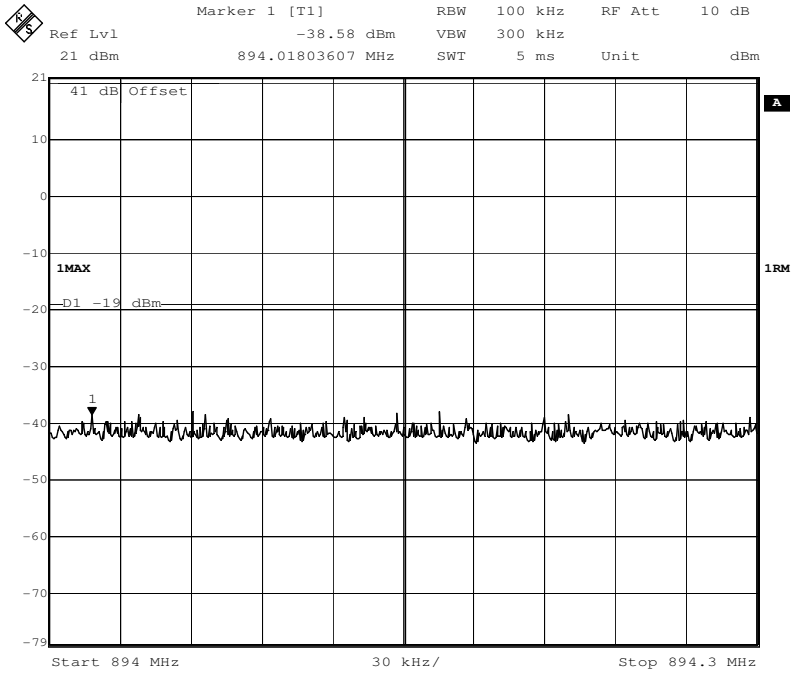


1.3 WCDMA Mode:

1.3.1 one signal input —Lower Edge



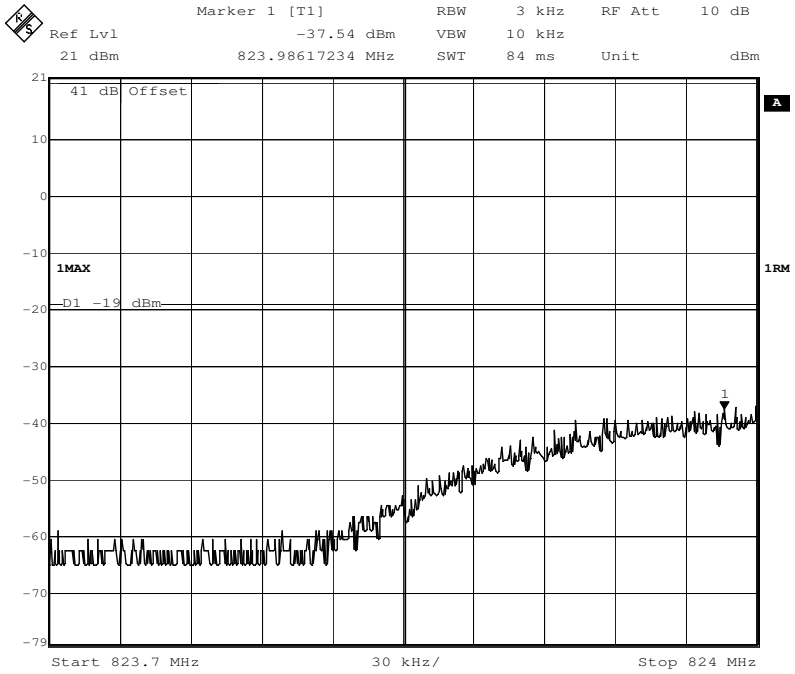

1.3.2 one signal input — Upper Edge



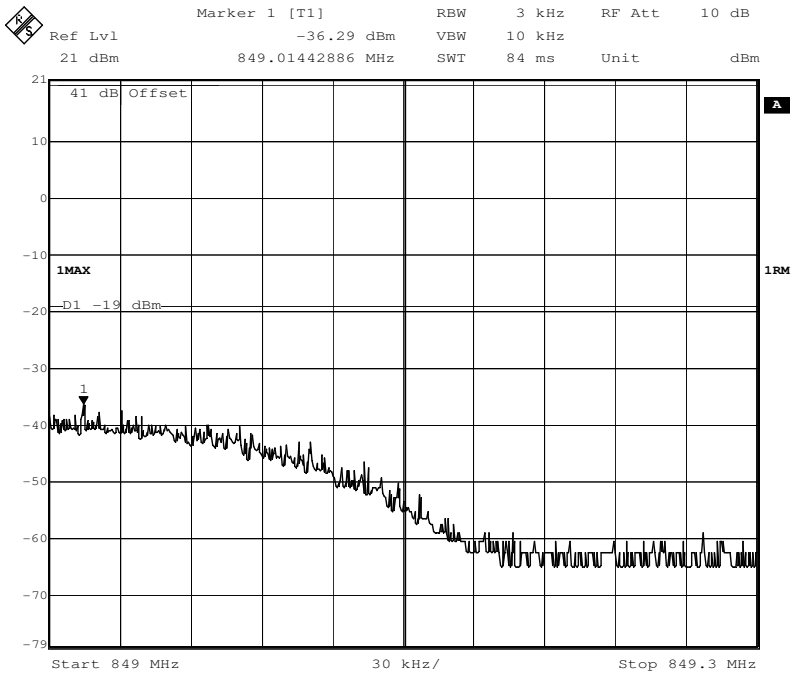
**2)Uplink: 824MHz to 849MHz**

1.1 GSM Mode:

1.1.1 one signal input —Lower Edge

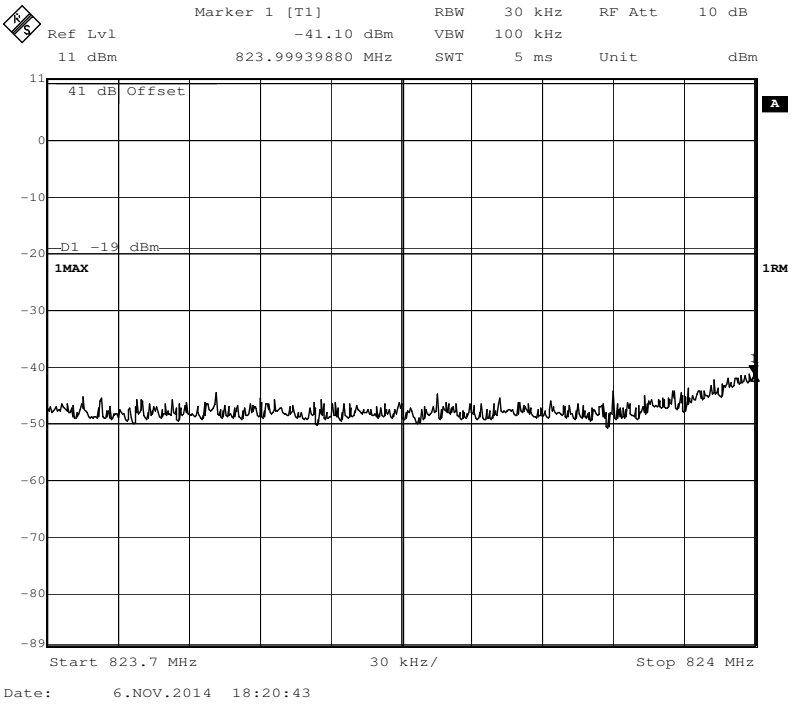



1.1.2 one signal input — Upper Edge

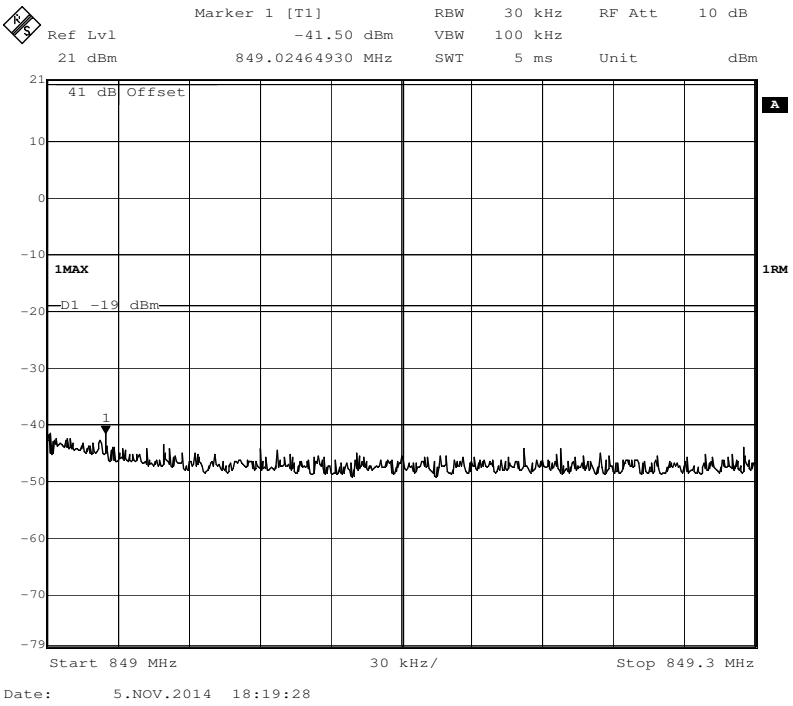


1.2 CDMA Mode:

1.2.1 one signal input —Lower Edge

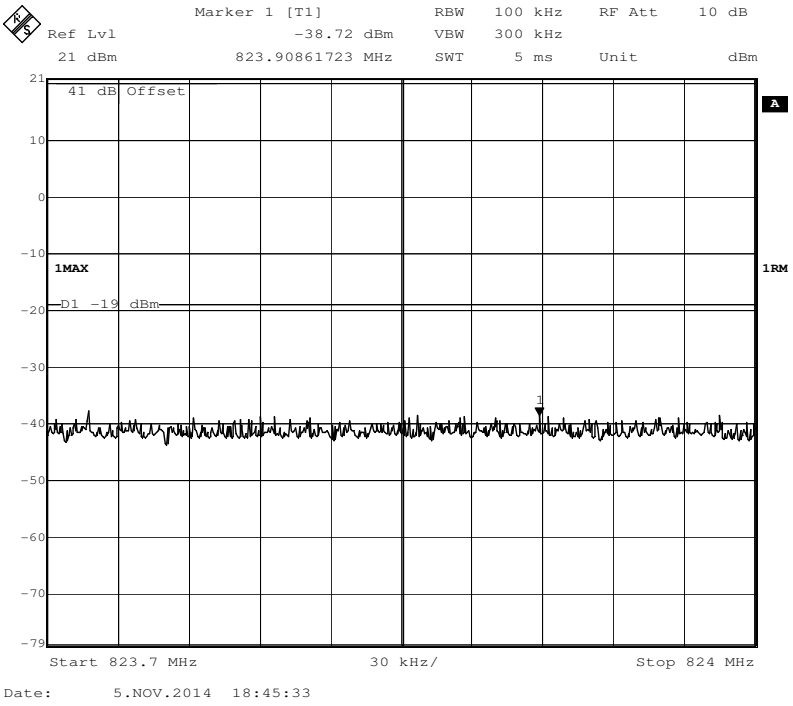



1.2.2 one signal input — Upper Edge

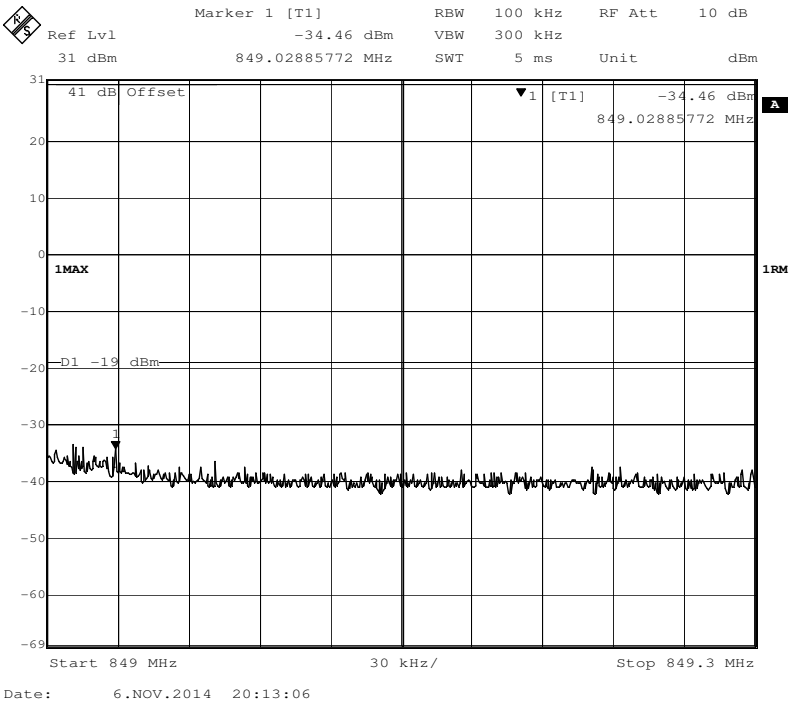


1.3 WCDMA Mode:

1.3.1 one signal input —Lower Edge



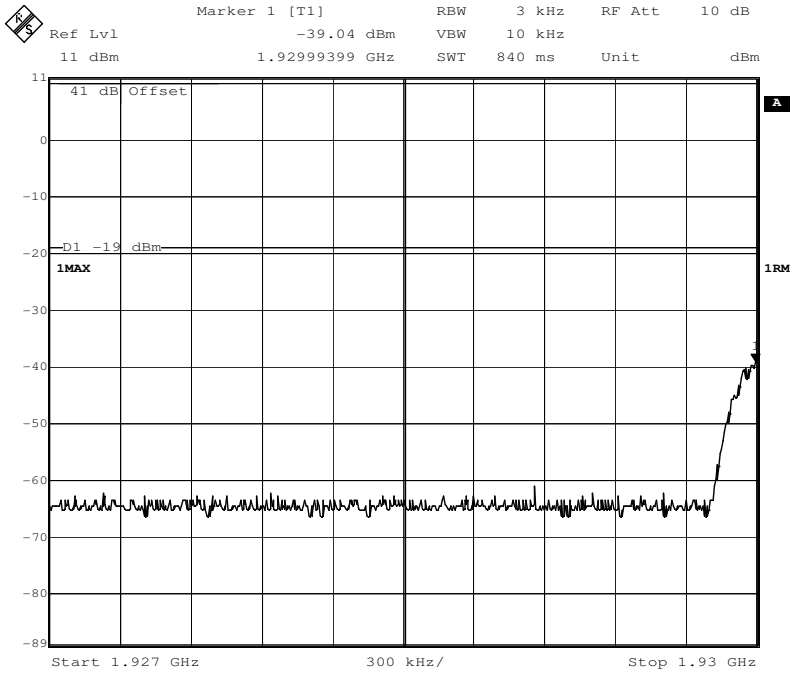

1.3.2 one signal input — Upper Edge



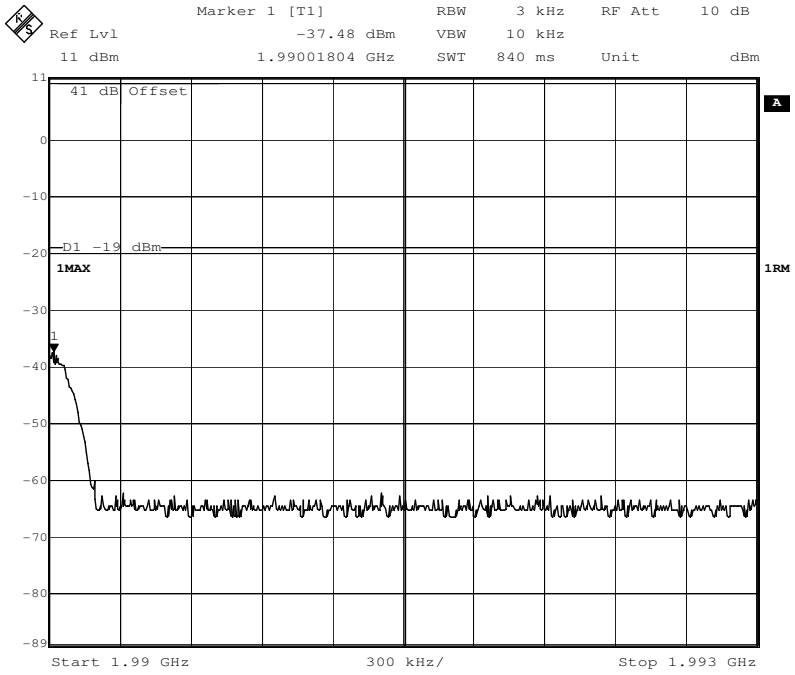
**3)Downlink: 1930MHz to 1990MHz**

1.1 GSM Mode:

1.1.1 one signal input —Lower Edge

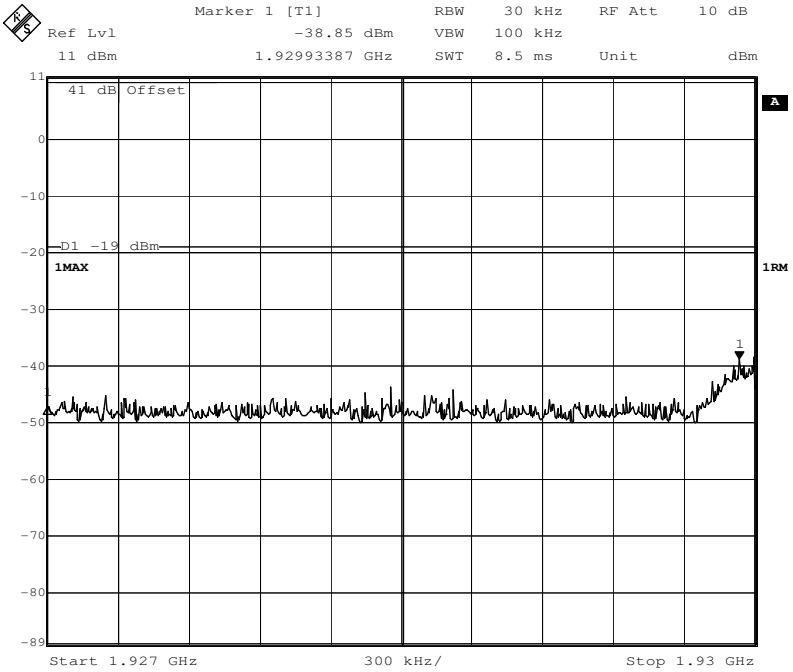



1.1.2 one signal input — Upper Edge

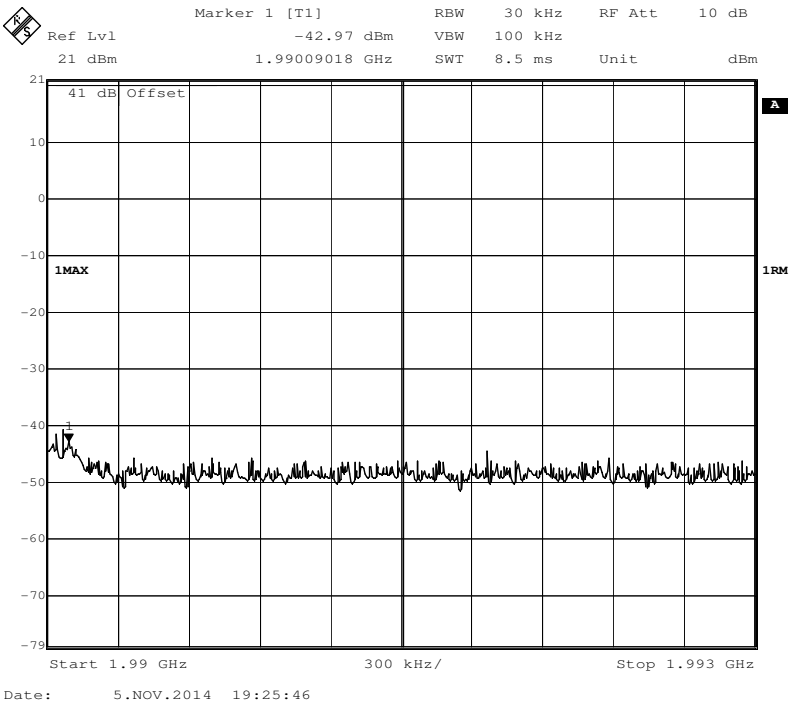


1.2 CDMA Mode:

1.2.1 one signal input —Lower Edge

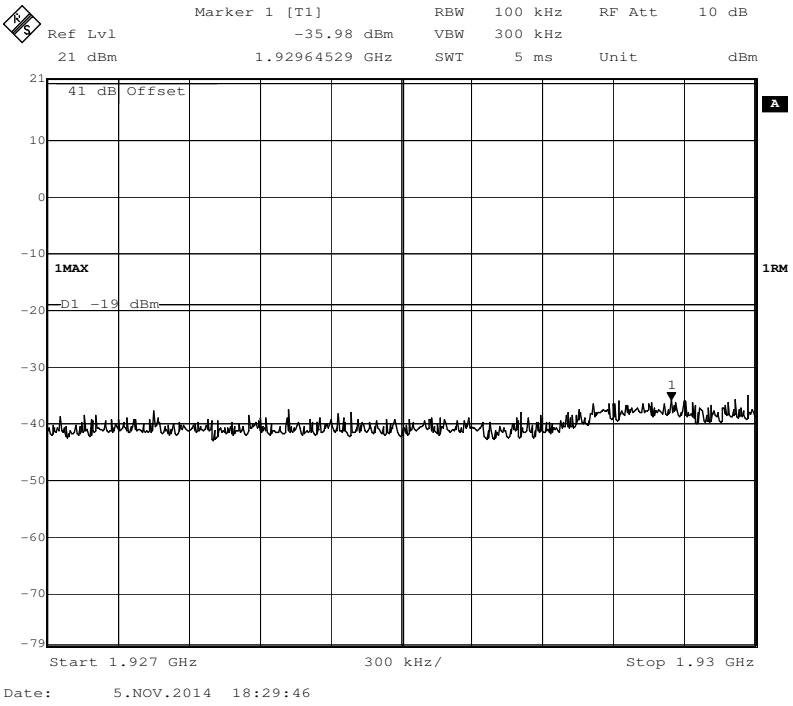



1.2.2 one signal input — Upper Edge

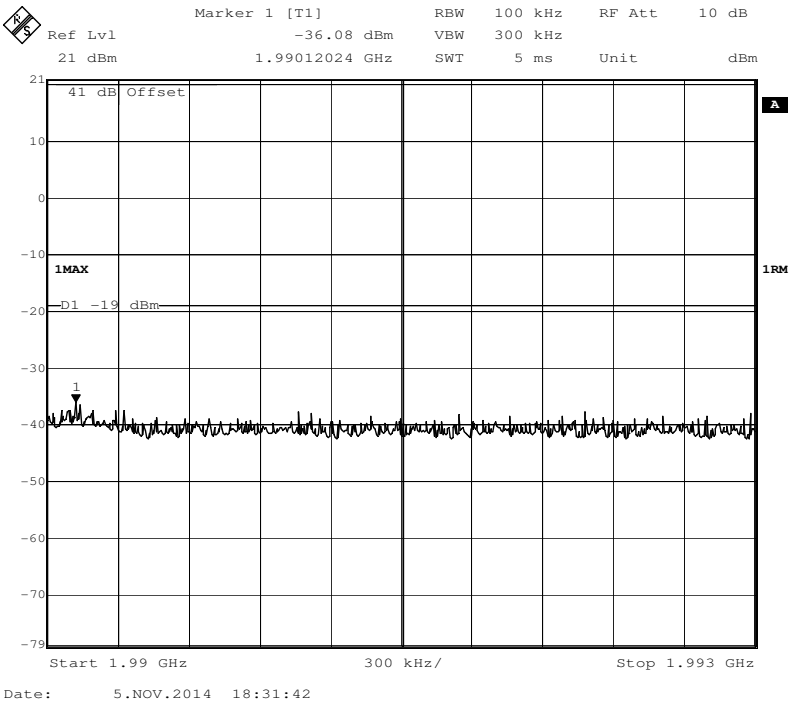


1.3 WCDMA Mode:

1.3.1 one signal input —Lower Edge



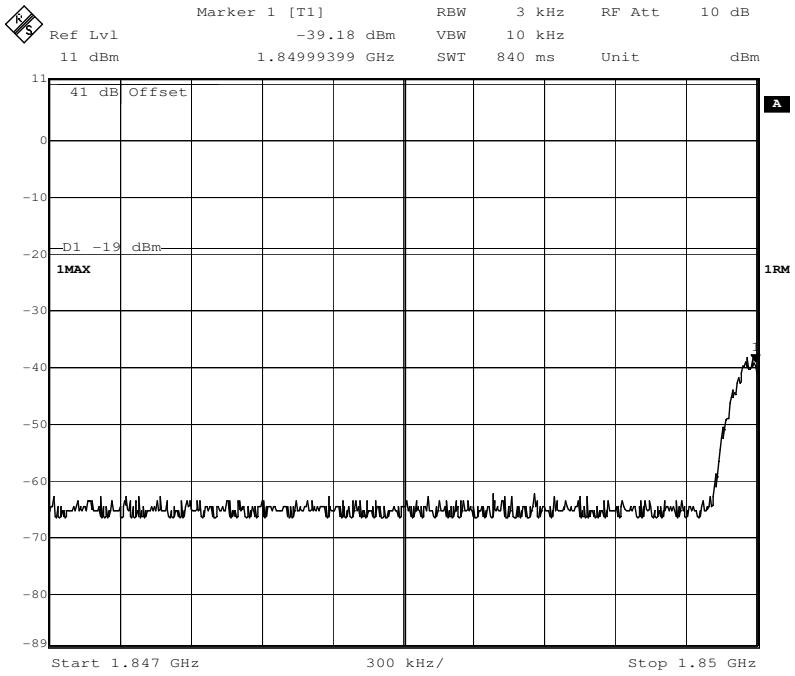

1.3.2 one signal input — Upper Edge



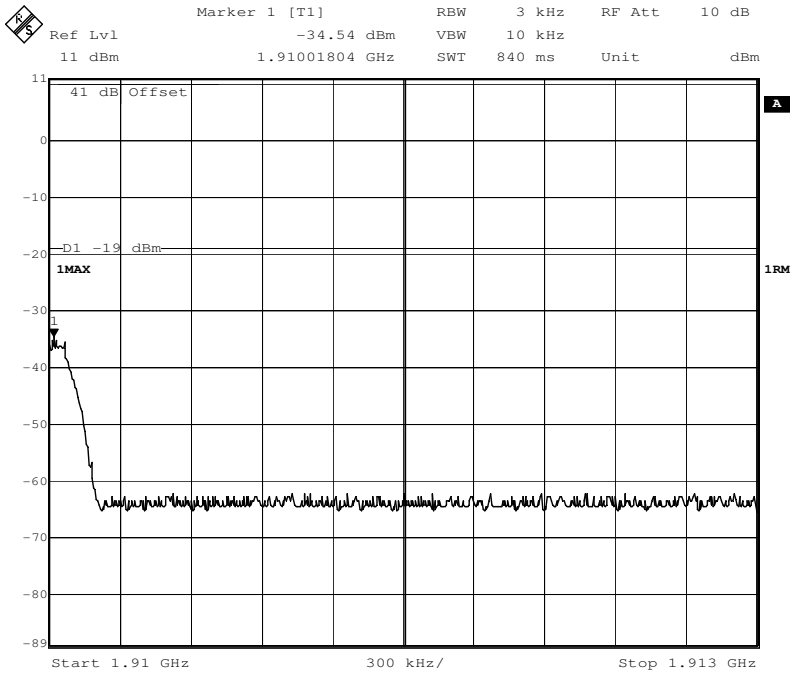
**4) Uplink: 1850MHz to 1910MHz**

1.1 GSM Mode:

1.1.1 one signal input —Lower Edge

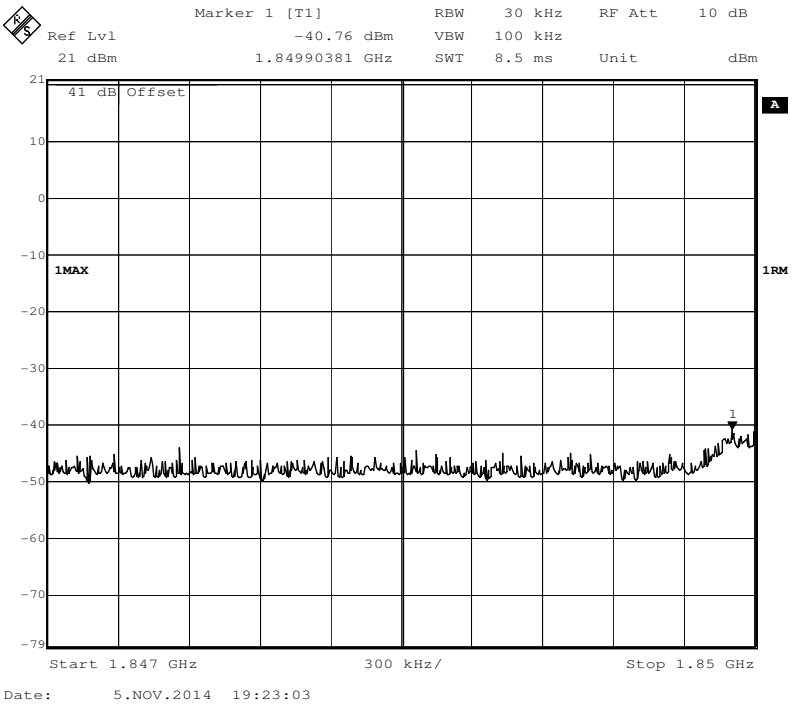



1.2.1 one signal input — Upper Edge

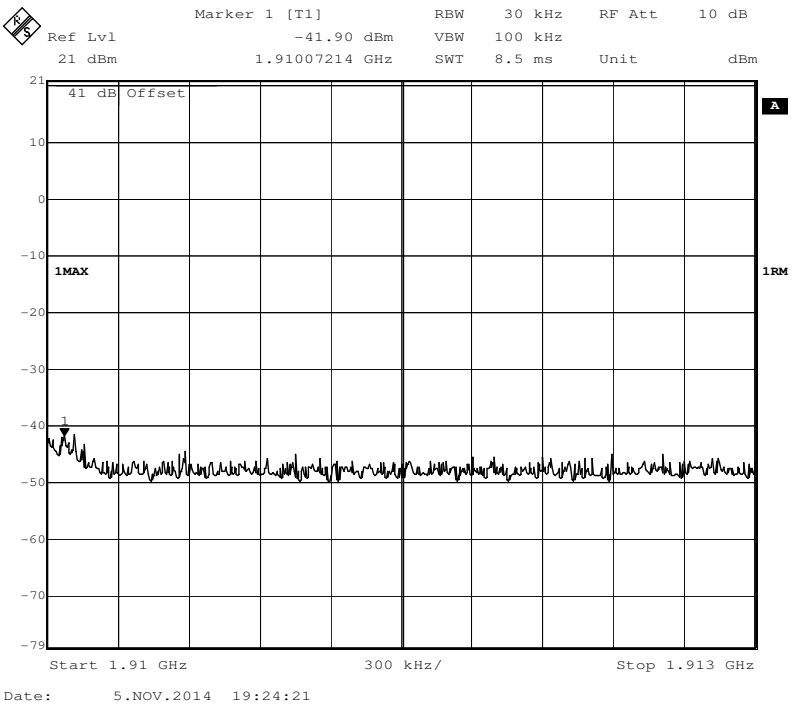


1.2 CDMA Mode:

1.2.1 one signal input —Lower Edge

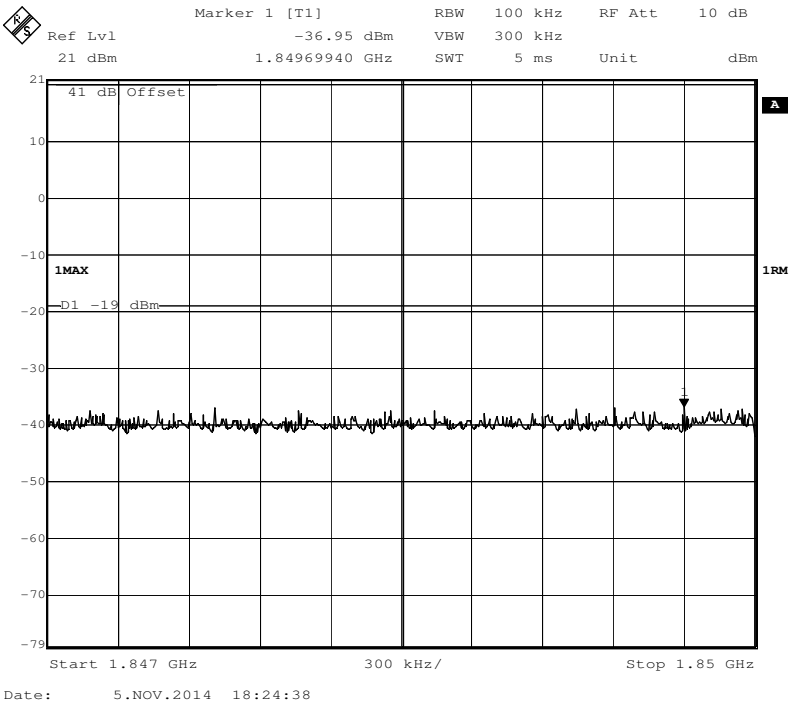



1.2.2 one signal input — Upper Edge

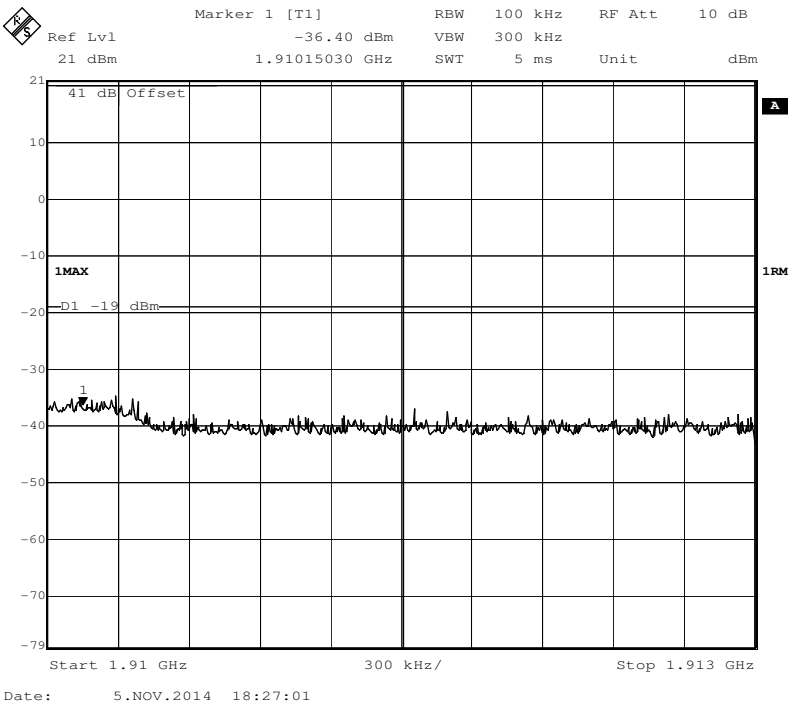


1.3 WCDMA Mode:

1.3.1 one signal input —Lower Edge




1.3.2 one signal input — Upper Edge



**1、Test Results of downlink of Band**

**1.1 For GSM mode:**

| measure frequency | Band Edge | product Value (dBm) | Limit (dBm) | Over Limit(dB) |
|---|---|---|---|---|
| 869-894 | Lower:869MHz | -37.3 | -19dBm | -18.3 |
| | Higher:894MHz | -36.5 | | -17.5 |
| 1930-1990 | Lower:1930MHz | -39.0 | -19dBm | -20 |
| | Higher:1990MHz | -37.5 | | -18.5 |

**1.2 For CDMA mode:**

| measure frequency | Band Edge | product Value (dBm) | Limit (dBm) | Over Limit(dB) |
|---|---|---|---|---|
| 869-894 | Lower:869MHz | -40.1 | -19dBm | -21.1 |
| | Higher:894MHz | -44.5 | | -25.5 |
| 1930-1990 | Lower:1930MHz | -38.9 | -19dBm | -19.9 |
| | Higher:1990MHz | -42.9 | | -23.9 |

**1.3 For WCDMA mode:**

| measure frequency | Band Edge | product Value (dBm) | Limit (dBm) | Over Limit(dB) |
|---|---|---|---|---|
| 869-894 | Lower:869MHz | -34.8 | -19dBm | -15.8 |
| | Higher:894MHz | -38.6 | | -19.6 |
| 1930-1990 | Lower:1930MHz | -36.0 | -19dBm | -17 |
| | Higher:1990MHz | -36.1 | | -17.1 |

**2、Test Results of uplink of Band**

**2.1 For GSM mode:**

| measure frequency | Band Edge | product Value (dBm) | Limit (dBm) | Over Limit(dB) |
|---|---|---|---|---|
| 824-849 | Lower:824MHz | -37.5 | -19dBm | -18.5 |
| | Higher:849MHz | -36.2 | | -17.2 |
| 1850-1910 | Lower:1850MHz | -39.2 | -19dBm | -20.2 |
| | Higher:1910MHz | -34.5 | | -15.5 |

**2.2 For CDMA mode:**

| measure frequency | Band Edge | product Value (dBm) | Limit (dBm) | Over Limit(dB) |
|---|---|---|---|---|
| 824-849 | Lower:824MHz | -41.1 | -19dBm | -22.1 |
| | Higher:849MHz | -41.5 | | -22.5 |
| 1850-1910 | Lower:1850MHz | -40.8 | -19dBm | -21.8 |
| | Higher:1910MHz | -41.9 | | -22.9 |

**2.3 For WCDMA mode:**

| measure frequency | Band Edge | product Value (dBm) | Limit (dBm) | Over Limit(dB) |
|---|---|---|---|---|
| 824-849 | Lower:824MHz | -38.7 | -19dBm | -19.7 |
| | Higher:849MHz | -34.5 | | -15.5 |
| 1850-1910 | Lower:1850MHz | -37.0 | -19dBm | -18 |
| | Higher:1910MHz | -36.4 | | -17.4 |

### 7.2.5 Conducted Spurious Emissions

Test Date:

Test Requirement: FCC Part22.917(a),FCC Part24.238(a)

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 Method: FCC part 2.1051 & KDB 935210 D03 v02r01 Section7.6

EUT Operation:

Status: Drive the EUT to maximum output power.

Conditions: Normal conditions

Application: Enclosure

Test Configuration:

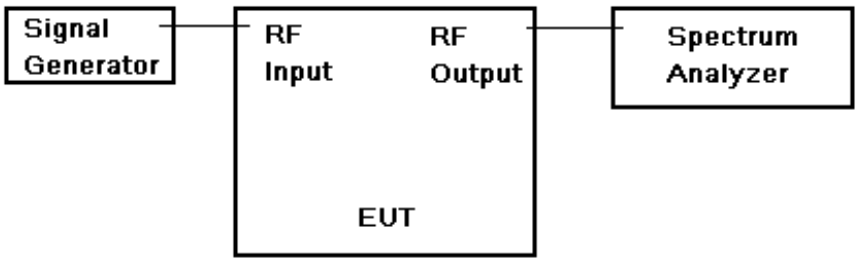



Figure1 Conducted Spurious emissions

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 operation 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.
e) 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.
f) Set VBW = 3 X RBW.
g) Select the power averaging (RMS) detector. (See above note regarding the use of a peak detector for preliminary measurements.)
h) Sweep time = auto-couple.
i) Set the analyzer start frequency to the lowest radio frequency signal generated in the equipment, without going below 9 kHz, and the stop frequency to the lower band/block edge frequency minus 100 kHz or 1 MHz, as specified in the applicable rule part. Note that the number of measurement points in each sweep must be ≥ (2 X 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.

j) 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.
k) Reset the analyzer start frequency to the upper band/block edge frequency plus 100 kHz or 1 MHz, as specified in the applicable rule part, and the analyzer stop frequency to 10 times the highest frequency of the fundamental emission. Note that the number of measurement points in each sweep must be ≥ (2 X 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.
l) 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.
m) Repeat steps 7.6b) through 7.6l) for each supported frequency band of operation.

Test limit: P1-(43 + 10 log(P2))=-13dBm

P1=power in dBm,P2=power in Watts

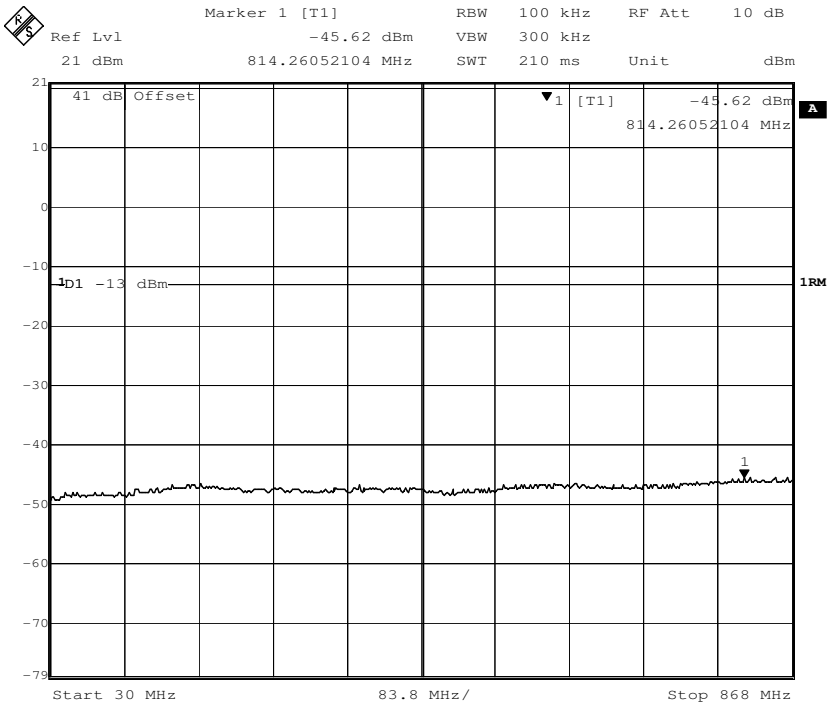
Measurement Record:

Input the AWGN with a 99% occupied bandwidth of 4.1MHz operation with a center frequency corresponding to the center of the CMRS band under test.

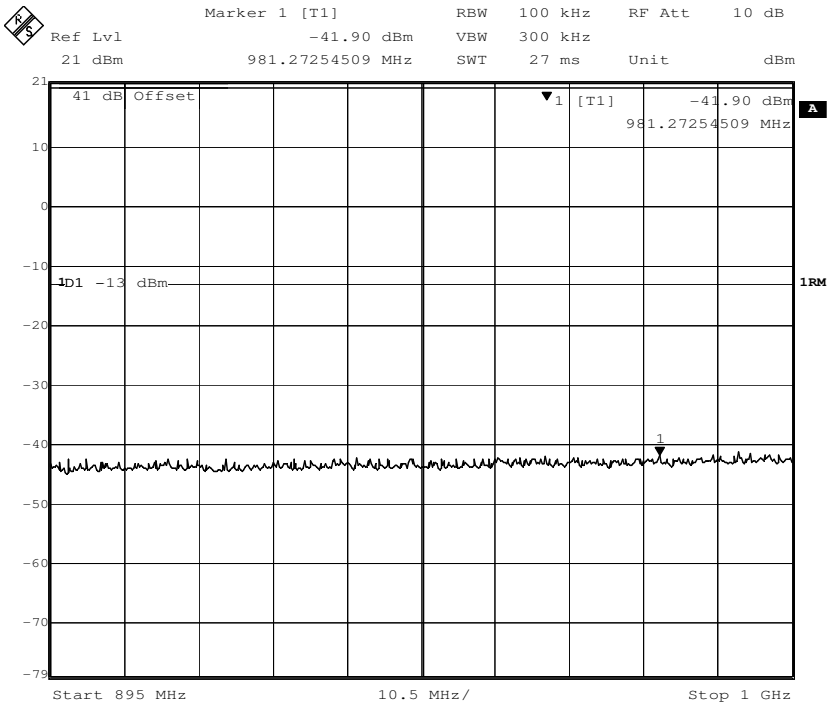
1.For the Band1:

1.1 test in the downlink:

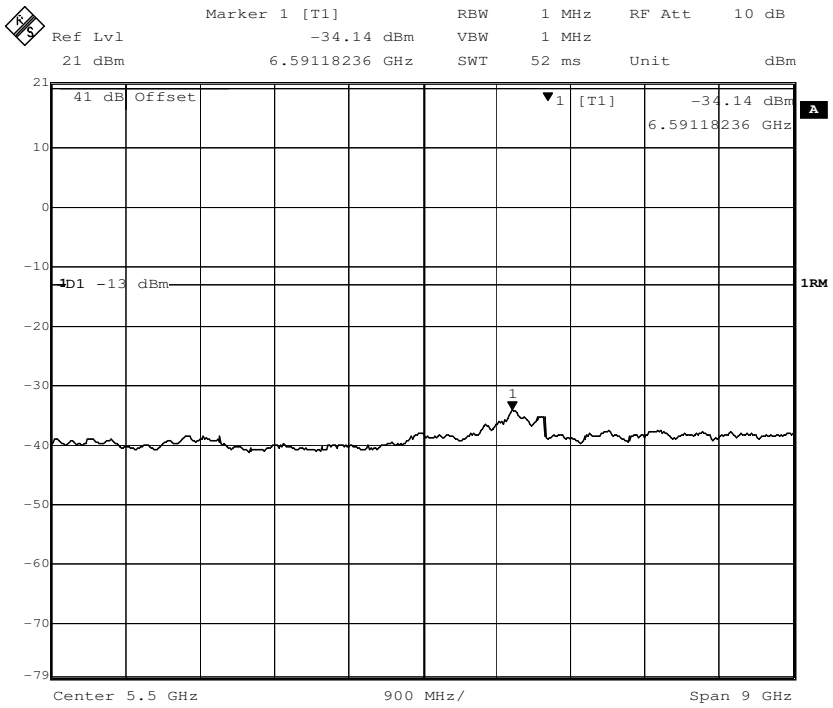
30MHz to 868MHz




895MHz to 1GHz

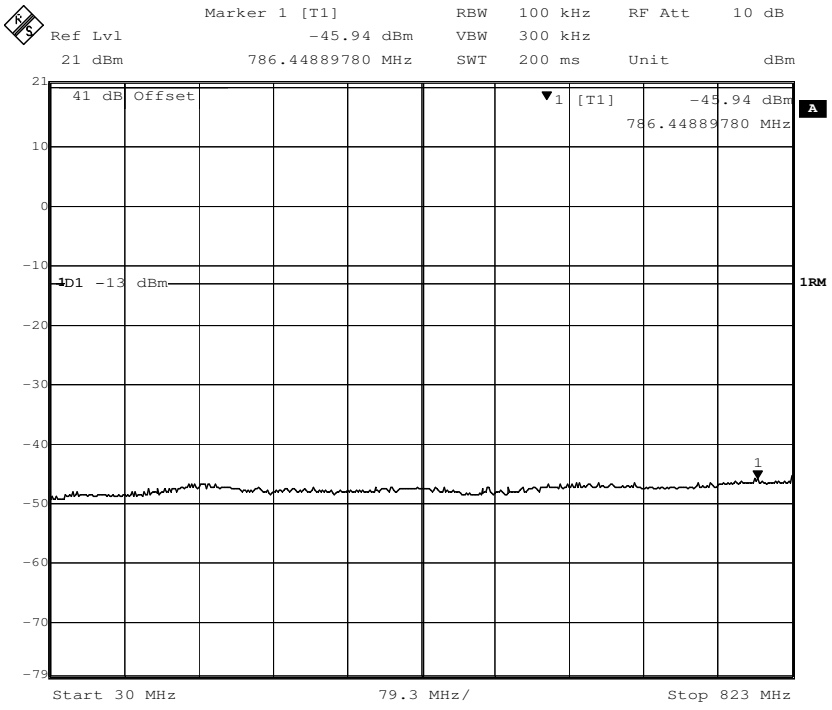


1GHz to 10GHz

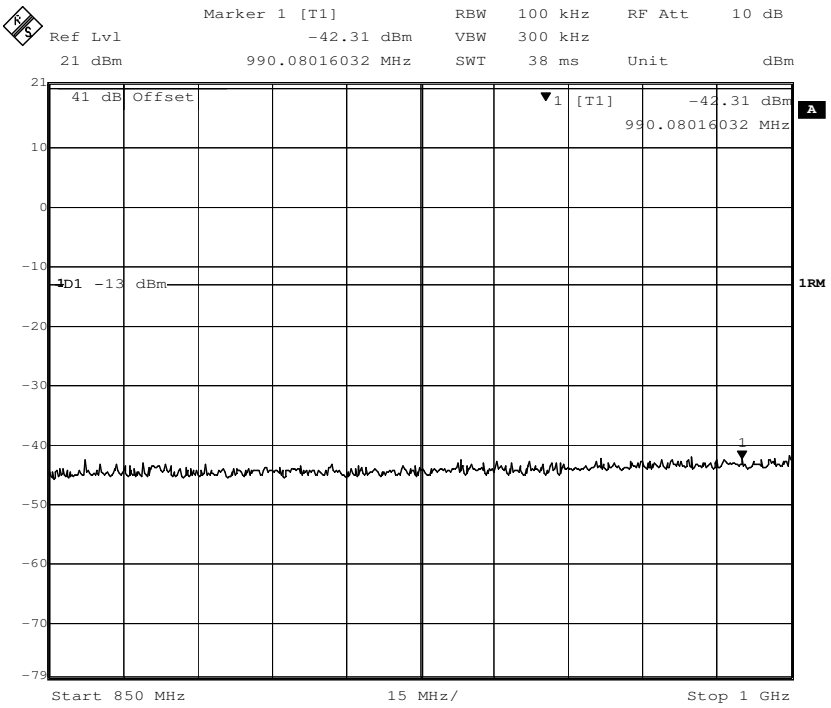



1.2 test in the uplink:

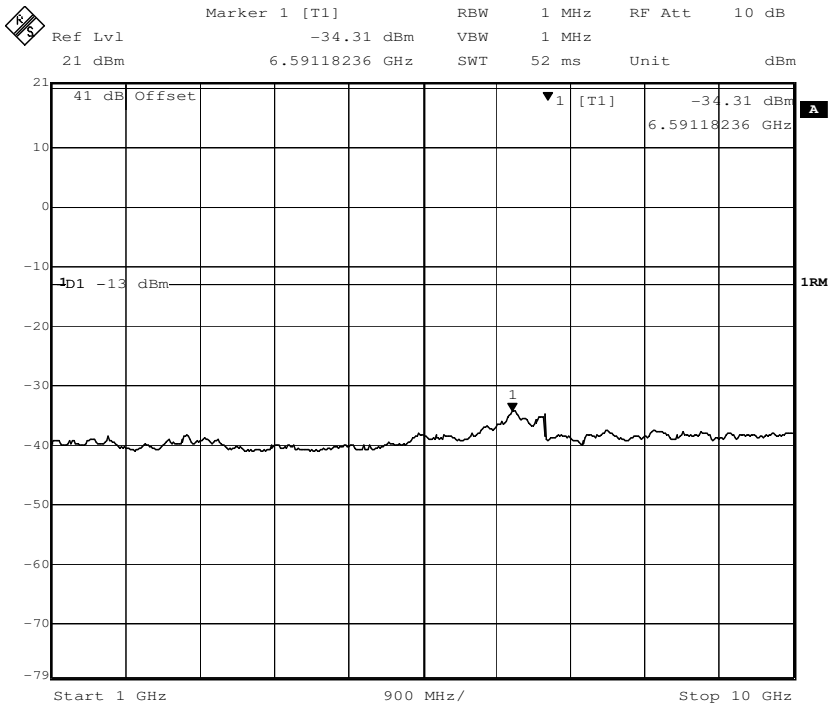
30MHz to 823MHz



850MHz to 1GHz



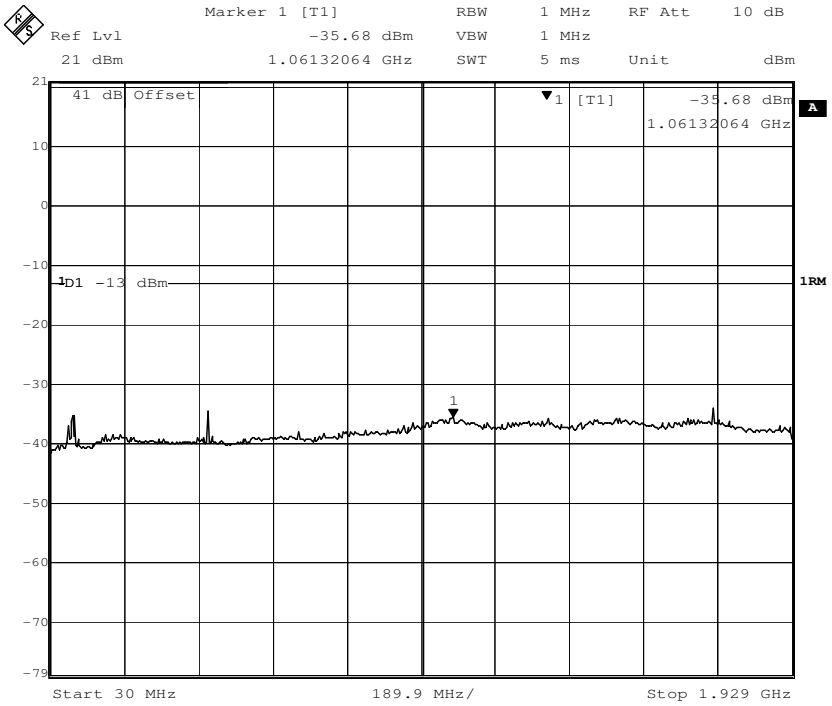

1GHz to 10GHz



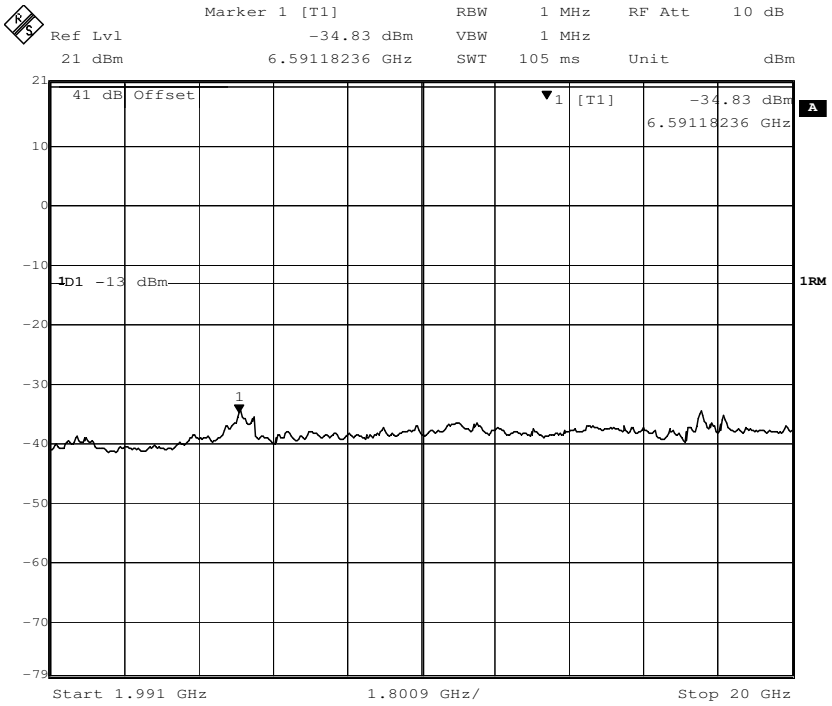
2.For the Band2:

1.1 test in the downlink:

30MHz to 1929MHz

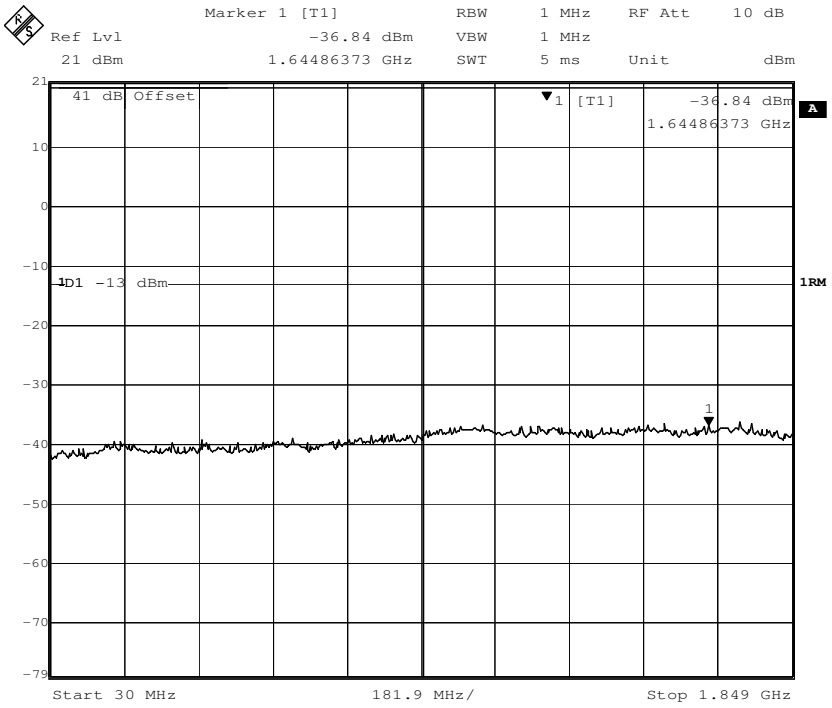



1991MHz to 20GHz

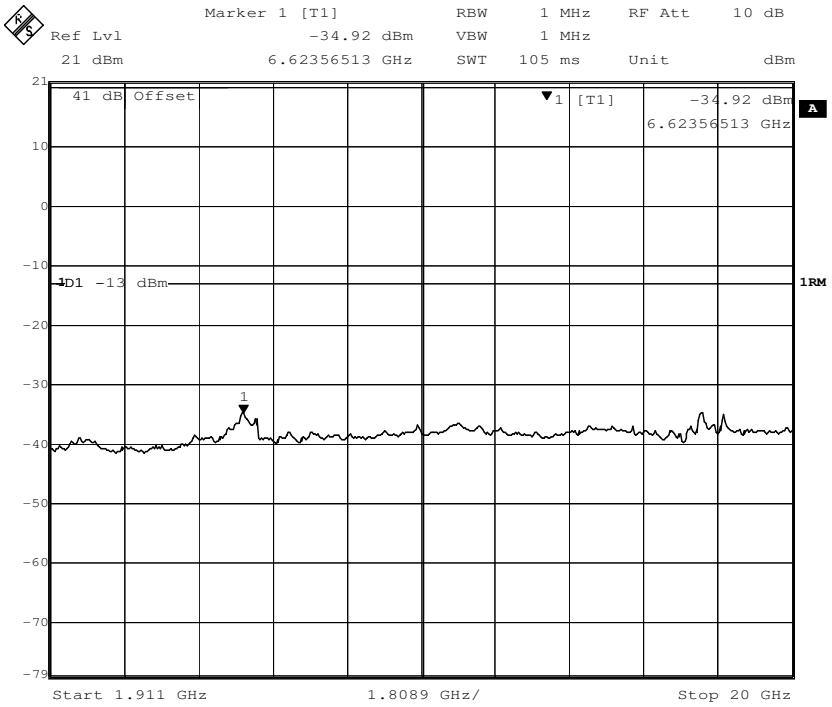


1.2 test in the uplink:

30MHz to 1849MHz




1911MHz to 20GHz



### 7.2.6 Noise Limits

Test Date:

Test Requirement:

(A) FCC Part20.21(e)(8)

(i)(A) &20.21(e)8(l)

20.21(e)(8)(i)(A) (1)Noise Limit

20.21(e)(8)(i)(A) (2)(i) Maximum Noise Limit:Fixed

20.21(e)(8)(i)(H) Tranmit Power Off Limit,Transmit Power Off timing.

(B) Noise Limits. (1) The transmitted noise power in dBm/MHz of consumer boosters at their uplink and downlink ports shall not exceed –103 dBm/MHz—RSSI.

(i) Transmit Power Off Mode. When the consumer booster cannot otherwise meet the noise and gain limits defined herein it must operate in “Transmit Power OFF Mode.” In this mode of operation, the uplink and downlink noise power shall not exceed –70 dBm/MHz and uplink gain shall not exceed the lesser of 23 dB or MSCL.

(2)The transmitted maxmum noise power in dBm/MHz of consumer boosters at their uplink and downlinks ports shall not exceed the following limits:

(i)Fixed booster maximum noise power shall not exceed -102.5dBm/MHz+20log10(Frequency),where Frequency is the uplink

Mid-band frequency of the supported spectrum bands in MHz.

(ii) Mobile booster maximum noise power shall not exceed -59 dBm/MHz

Test Method: KDB 935210 D03 v02r01 Section7.7

EUT Operation:

Status: Uplink and Downlink Maximum Noise Power

Conditions: Normal conditions

Application: Cellular Band RF output ports

Test Configuration:

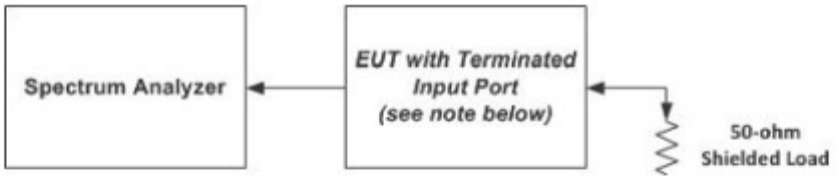



Figure 3 Noise limit instrumentation test setup

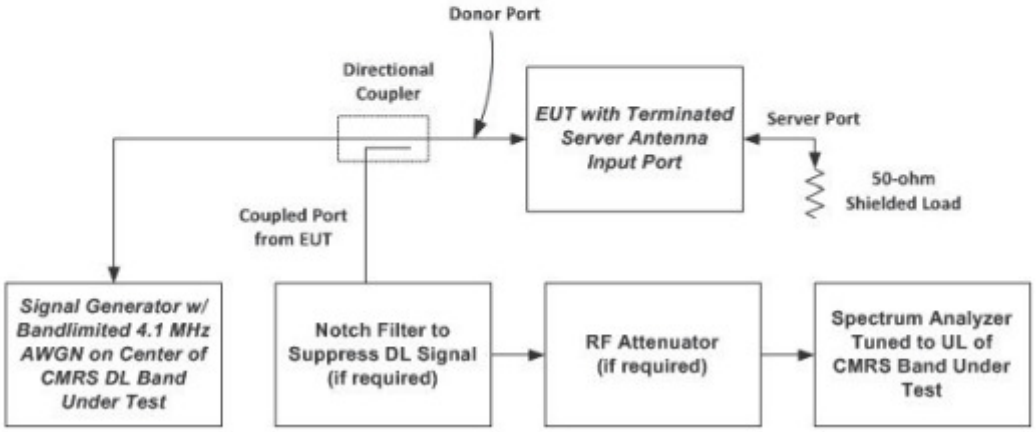



Figure 4 Test setup for uplink noise power measurement in the presence of a downlink signal

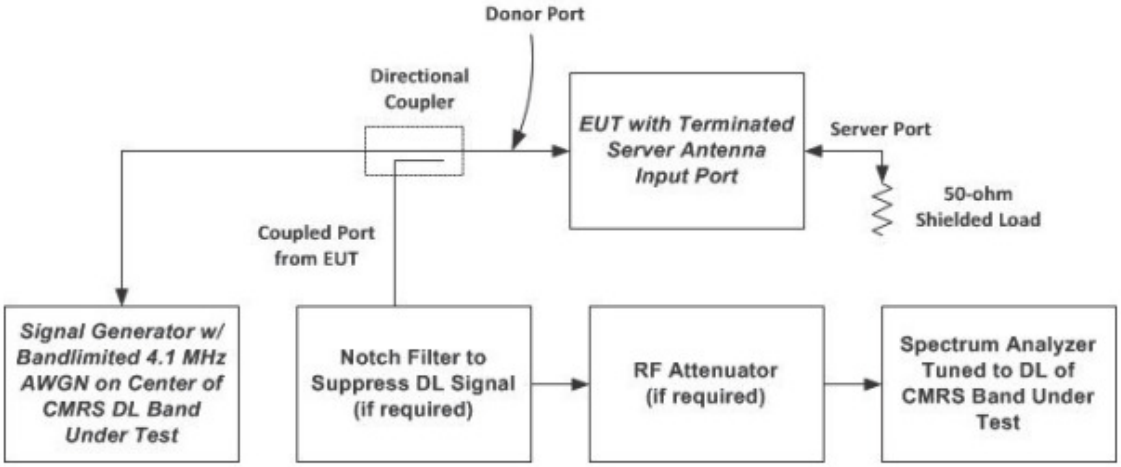



Figure 5 Test setup for downlink noise power measurement in the presence of a downlink signal

Test Procedure:

a) Connect the EUT to the test equipment as shown in **Figure 3**. Begin with the uplink output connected 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 and **Figure 5** for downlink. Ensure the coupled path of the RF coupler is connected to the spectrum analyzer.
i) Configure the signal generator for 4.1 MHz AWGN operation for uplink test and 200 kHz 99% OBW AWGN for downlink test.
j) Set the spectrum analyzer RBW for 1 MHz with the VBW ≥ 3 × RBW with an RMS AVERAGE 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). i) 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.
ii) For downlink noise measurements, set the spectrum analyzer to the center of the downlink band and tune the signal generator to the upper or lower band-edge of the same band, ensuring that the maximum noise power is being measured.

l) Measure the maximum transmitter noise power level when varying the downlink signal generator output level from –90 dBm to –20 dBm in 1 dB steps within the RSSI dependent region and 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.
m) Repeat 7.7h) through 7.7l) for all operational uplink and downlink bands.
n) Variable uplink noise timing is to be measured as follows.
o) Set the spectrum analyzer to the uplink frequency to be measured.
p) Set the span to 0 Hz with a sweep time of 10 seconds.
q) Set the power level of the signal generator to the lowest level of the RSSI dependent noise.
r) Select MAX HOLD and increase the power level of the signal generator by 10 dB for mobile boosters and 20 dB for fixed boosters.
s) Ensure that the uplink noise decreases to the specified level within 1 second for mobile devices and 3 seconds for fixed devices.9F10
t) Repeat 7.7n) to 7.7s) for all operational uplink and downlink bands.
u) Include plots and summary table in test report.
p) Set the span to 0 Hz with a sweep time of 10 seconds.
q) Set the power level of the signal generator to the lowest level of the RSSI dependent noise.
r) Select MAX HOLD and increase the power level of the signal generator by 10 dB for mobile boosters and 20 dB for fixed boosters.
s) Ensure that the uplink noise decreases to the specified level within 1 second for mobile devices and 3 seconds for fixed devices.9F10
t) Repeat 7.7n) to 7.7s) for all operational uplink and downlink bands.
u) Include plots and summary table in test report.

Test limit:

Due to the low gain nature of the design,the maximum noise power never exceeds the power off limit.This number is recorded and plotted against the injected DL power(RSSI).At RSSI of -40dBm,the device goes into by pass mode .Since the noise power in the uplink and downlink path was below the noise limit of -70dBm/MHz.

**Noise Power =-102.5+LOG10(Band Center Frequency)*20**

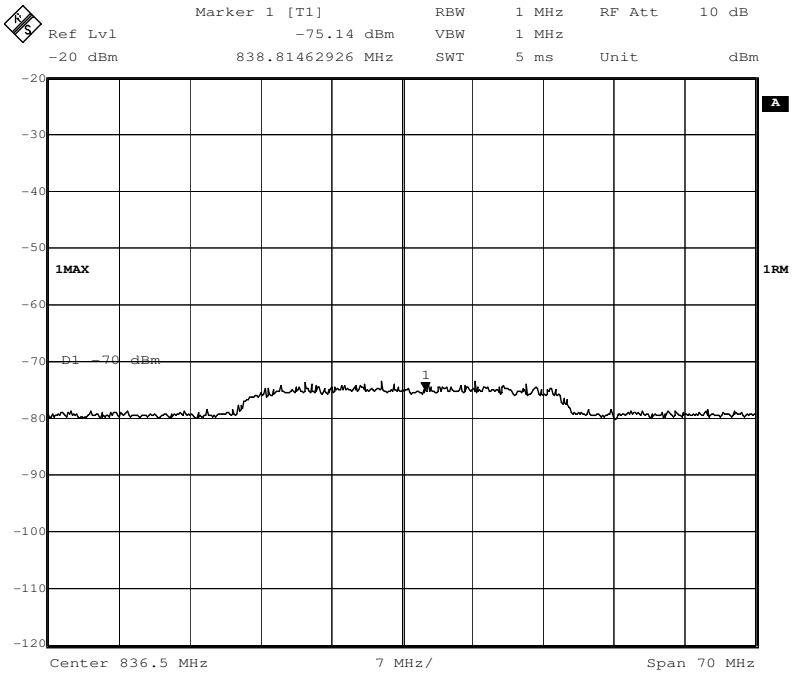
**Variable Noise =-103 dBm/MHz-RSSI**

**(ii) Mobile booster maximum noise power shall not exceed -59 dBm/MHz**

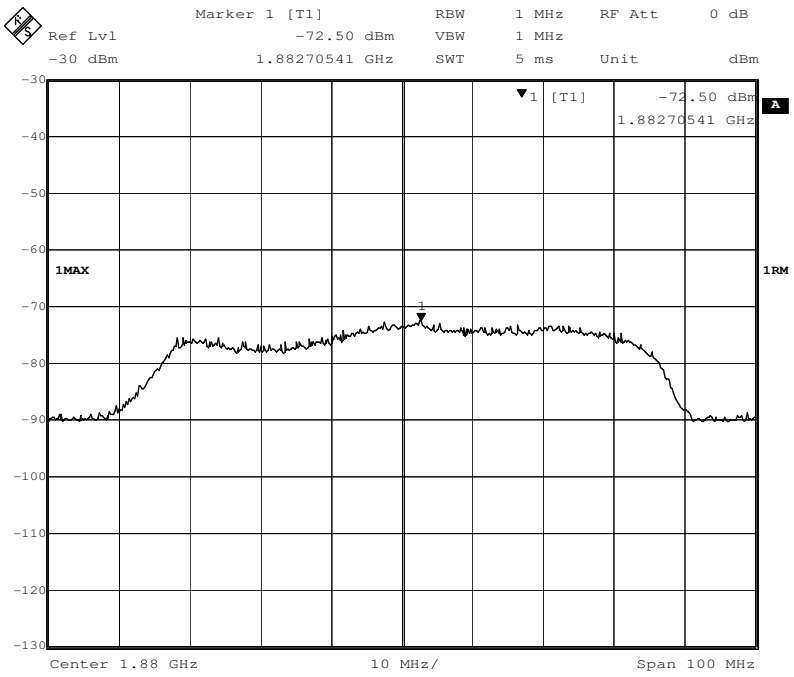
### 7.2.6.1 Measurement Record:

1.1 Maximum Uplink Noise Test

824MHz to 849MHz

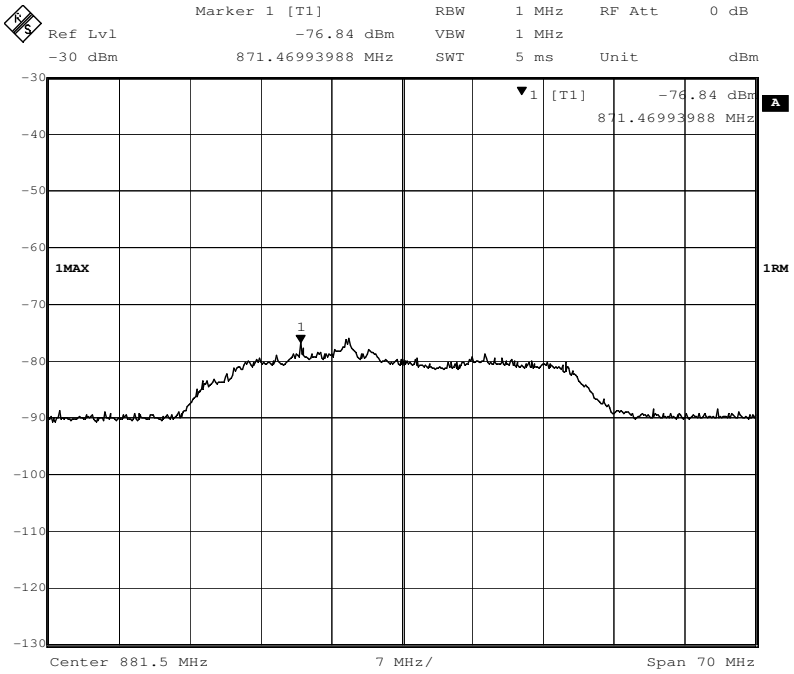



1850MHz to 1910MHz

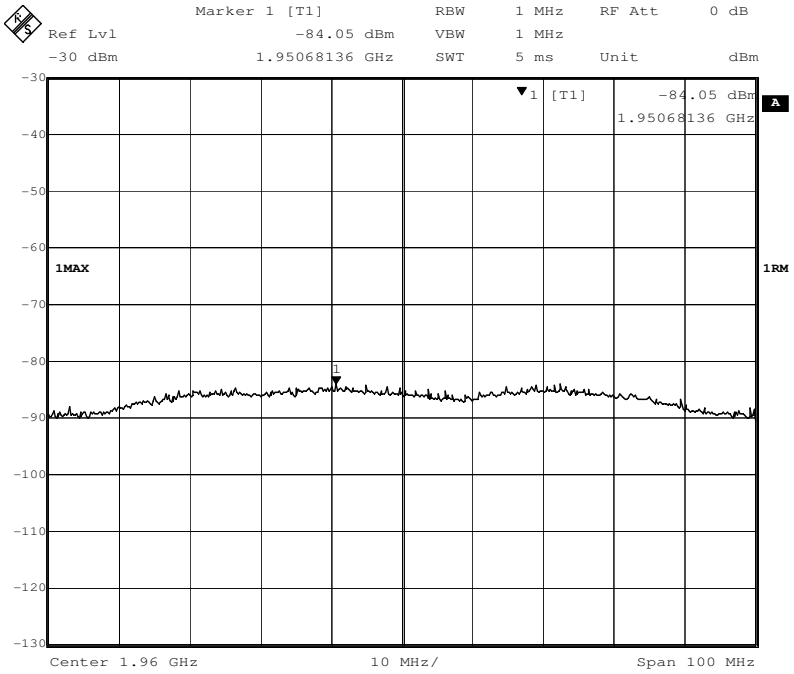


## 1.2 Maximum Downlink Noise Test

869MHz to 894MHz



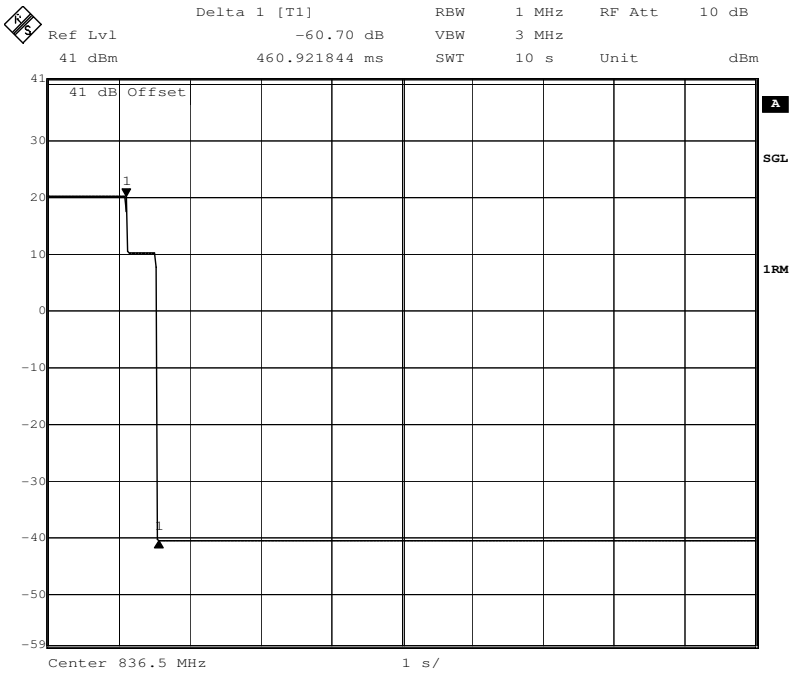

1930MHz to 1990MHz



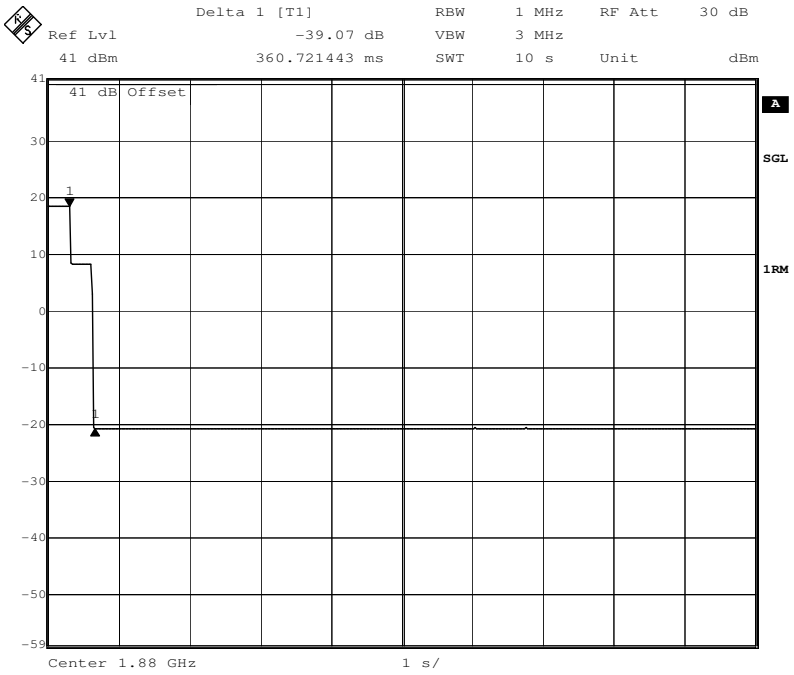
**Booster Noise Timing:**

1.3 Noise limit Variable

824MHz to 849MHz




1850MHz to 1910MHz



## 2、Maximum Noise Test Results

2.1 Test in the downlink

| Frequency band (MHz) | Measured Noise (dBm) | Limit (dBm) | Over limit (dB) | Result |
|---|---|---|---|---|
| 869-894MHz(band1) | -76.2 | ≤-59 | -17.2 | Pass |
| 1930-1990MHz(band2) | -84.1 | ≤-59 | -25.1 | Pass |

2.2 Test in the uplink

| Frequency band(MHz) | Measured Noise (dBm) | Limit (dBm) | Over limit (dB) | Result |
|---|---|---|---|---|
| 824-849MHz(band1) | -75.1 | ≤-59 | -16.1 | Pass |
| 1850-1910MHz(band2) | -72.5 | ≤-59 | -13.5 | Pass |

## 3、Variable Noise Limit test Results （Six Values Closest To Limit）

3.1 824-849MHz(uplink)

| RSSI(dBm) | Noise Limit (dBm/MHz) | Measured Noise (dBm) | Over Limit (dB) |
|---|---|---|---|
| -60 | -59 | -74.5 | -15.5 |
| -48 | -59 | -74.6 | -15.6 |
| -46 | -59 | -73.9 | -14.9 |
| -45 | -59 | -74.8 | -15.8 |
| -44 | -59 | -74.9 | -15.9 |
| -33 | -59 | -80.5 | -21.5 |

## 3.2 1850-1910MHz(uplink)

| RSSI(dBm) | Noise Limit (dBm/MHz) | Measured Noise (dBm) | Over Limit (dB) |
|---|---|---|---|
| -58 | -59 | -72.5 | -13.5 |
| -50 | -59 | -72.3 | -13.3 |
| -47 | -59 | -72.4 | -13.4 |
| -46 | -59 | -72.2 | -13.2 |
| -34 | -59 | -72.5 | -13.5 |
| -33 | -59 | -80.7 | -21.7 |

## 3.3 869-894MHz(downlink)

| RSSI(dBm) | Noise Limit (dBm/MHz) | Measured Noise (dBm) | Over Limit (dB) |
|---|---|---|---|
| -53 | -59 | -76.8 | -17.8 |
| -50 | -59 | -76.5 | -17.5 |
| -47 | -59 | -76.6 | -17.6 |
| -43 | -59 | -76.4 | -17.4 |
| -34 | -59 | -80.5 | -21.5 |
| -33 | -59 | -80.2 | -21.2 |

## 3.4 1930-1990MHz(downlink)

| RSSI(dBm) | Noise Limit (dBm/MHz) | Measured Noise (dBm) | Over Limit (dB) |
|---|---|---|---|
| -50 | -59 | -82.3 | -23.3 |
| -48 | -59 | -81.5 | -22.5 |
| -46 | -59 | -82.9 | -23.9 |
| -42 | -59 | -84.1 | -25.1 |
| -34 | -59 | -83.5 | -24.5 |
| -33 | -59 | -83.7 | -24.7 |

## Summary:

Booster Noise limit:

As demonstrated in the Booster Noise limit plot,the measured noise power is under the Maximum noise power limit for Fixed and Mobile operation,hence meeting the requirement for Fixed and Mobile.

**Booster Noise Timing:**

| Frequency band (MHz) | Limit (sec) | Measure Noise Timing | Over limit (dB) |
|---|---|---|---|
| 824-849MHz | 3 | 0.461 | Pass |
| 1850-1915MHz | 3 | 0.361 | Pass |

Uplink Inactivity

Test Date:

| | |
|---|---|
| Test Requirement: | FCC Part20.21(e)(8)(i)(I)<br>(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 Method: | KDB 935210 D03 v02r01 Section7.8 |
| Remark: | If noise is less than -70dBm/MHz(“Transmit power OFF mode” then EUT will not shut off,therefore this test can skip) |

### 7.2.7 Variable Gain

Test Date:

Test Requirement: FCC Part20.21(e)(8)(i)(C)(1) & (C)(H)

(C) Booster Gain Limits. (1) The uplink gain in dB of a consumer booster referenced to its input and output ports shall not exceed –34 dB—RSSI + MSCL

Test Method: KDB 935210 D03 v02r01 Section7.9

EUT Operation:

Status: Drive the EUT to maximum output power. .

Conditions: Normal conditions

Application: Cellular Band RF output ports

Test Configuration:

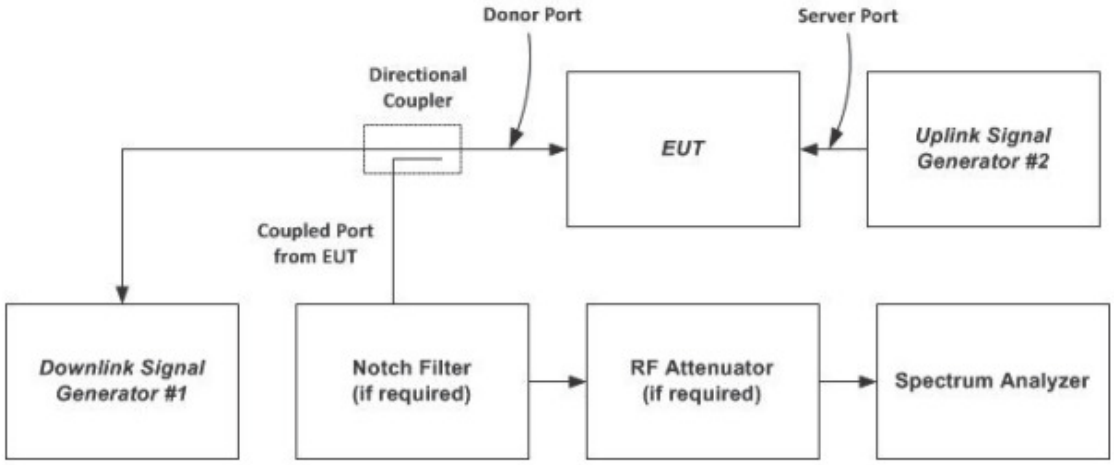



Figure 6 Variable gain instrumentation test setup

Test Procedure:

a) Connect the EUT to the test equipment as shown in **Figure 6** with the uplink output connected to signal generator 1. Ensure the coupled path of the RF coupler is connected to the spectrum analyzer.
b) Configure downlink signal generator 1 for AWGN operation with an 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 tool.
g) Select the RMS (power averaging) detector.
h) Ensure that the number of measurement points per sweep ≥ (2 X 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 to a level from −90 dBm to −20 dBm in 1 dB steps within 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 charts in Annex D.
l) Repeat 7.9c) to 7.9k) for all operational uplink bands.
m) Variable Uplink gain timing is to be measured as follows.
n) Set the spectrum analyzer to the uplink frequency to be measured.
o) Set the span to 0 Hz with a sweep time of 10 seconds.
p) Set the power level of signal generator 1 to the lowest level of the RSSI dependent gain.
q) Select MAX HOLD and increase the power level of signal generator 1 by 10 dB for mobile booster and 20 dB for fixed indoor boosters. Signal generator 2 remains same, as described in 7.9c).
r) Ensure that the uplink gain decrease to the specified levels within 1 second for mobile devices and 3 seconds for fixed devices.
s) Repeat 7.9m) to 7.9r) for all operational uplink bands.

Test Limit: –34 dB—RSSI + MSCL

### 7.2.7.1 Measurement Record:

1.Test in the Uplink(824-849MHz)

| RSSI(dBm) | MSCL (dB) | Gain Limit (dB) | P(in) (dBm) | P(out) (dBm) | Gain (dB) | Over Limit (dB) |
|---|---|---|---|---|---|---|
| -48 | 6.9 | 20.9 | -9 | 9.5 | 18.5 | -2.4 |
| -47 | 6.9 | 19.9 | -9 | 8.5 | 17.5 | -2.4 |
| -46 | 6.9 | 18.9 | -9 | 7.5 | 16.5 | -2.4 |
| -45 | 6.9 | 17.9 | -9 | 6.5 | 15.5 | -2.4 |
| -44 | 6.9 | 16.9 | -9 | 5 | 14 | -2.9 |
| -43 | 6.9 | 15.9 | -9 | 4 | 13 | -2.9 |

2.Test in the Uplink(1850-1910MHz)

| RSSI(dBm) | MSCL (dB) | Gain Limit (dB) | P(in) (dBm) | P(out) (dBm) | Gain (dB) | Over Limit (dB) |
|---|---|---|---|---|---|---|
| -47 | 9.2 | 22.2 | -8.5 | 8.5 | 17 | -5.2 |
| -46 | 9.2 | 21.2 | -8.5 | 7.3 | 15.8 | -5.4 |
| -45 | 9.2 | 20.2 | -8.5 | 6.2 | 14.7 | -5.5 |
| -44 | 9.2 | 19.2 | -8.5 | 5.0 | 13.5 | -5.7 |
| -43 | 9.2 | 18.2 | -8.5 | 4.1 | 12.6 | -5.6 |
| -42 | 9.2 | 17.2 | -8.5 | 2.6 | 11.1 | -6.1 |

3.Variable uplink Gain timing test results

| Frequency band (MHz) | Measured Timing (Seconds) | Limit (Seconds) | Over limit |
|---|---|---|---|
| 824-849MHz | 0.1 | 3.0 | Pass |
| 1850-1915MHz | 0.1 | 3.0 | Pass |

**Remark:The MSCL values supplied by the manufacturer, as follows :**

**This device utilizes a direct contact (inductive cradle) for the server antenna input. Mobil station coupling loss is 6.93dB at 836MHz and 9.21dB at 1880MHz.** The free space loss model does not apply to the capacitive/inductive (CL) universal handset cradle specified as the server input for the DA4600 bidirectional amplifier. A FSPL calculation is used for guesstimating far field signal diffusion.

The CL cradle provides both capacitive and inductive coupling within the very first part of the first wavelength of the near field. Minimum coupling distance becomes the thickness of the PCB antenna surface and its protective cover totaling .075" (1.9mm). This is roughly .05% into the first wavelength at 850MHz, or 1.2% into the 1900MHz frequency.

The critical coupling area for near wave lies within the first $1/8^{th}$ wavelength which in either case is a full 12% of the wavelength. The coupling efficiency may be further reduced (greater loss) dependent on the position of the antenna within the handset when placed in the CL cradle. At any of the used frequencies in the 850 or 1900MHz bands, there is a greater than 60dB loss at quarter wave separation distance between handset and CL pickup.

The MSCL for the DA4600 is a measured value obtained by placing two CL pickups face to face and adjusting their relative positions to provide minimum coupling loss on a spectrum analyzer output to input. Based upon the premise that transmit and receive functions of the CL pickup are equivalent, the loss obtained in this test is divided by two to give the typical loss of a single CL coupling.

10 measurements were made and averaged using 20 randomly chosen CL pickups; the typical unit loss for the CL pickup at the following center band frequencies is. **836MHz = 6.93dB, 881MHz = 7.08dB, 1880Mhz = 9.21dB, 1960MHz = 9.33dB.** These results were rounded to the nearest whole number for clarity in the instruction manual. These losses include cable loss for 6 feet of RG174 cable.

### 7.2.8 Occupied Bandwidth

Test Date:

Test Requirement: FCC Part2.1049

Test Method: FCC part 2.1049

The spectral shape of the output should look similar to input for all modulations.

EUT Operation:

Status: Drive the EUT to maximum output power. .

Conditions: Normal conditions

Application: Cellular Band RF output ports

Test Configuration:

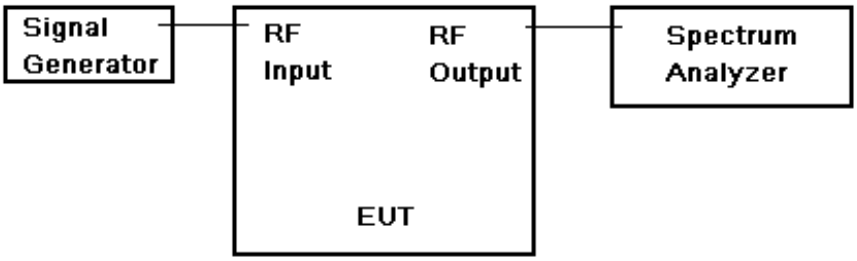



Fig.1. Conducted Spurious Emissions test configuration

Test Procedure:

a) Set the spectrum analyzer RBW 300 Hz or >1%&<2% emission bandwidth of carrier.

b) Capture the trace of input signal;

c) Connect the equipment as illustrated;

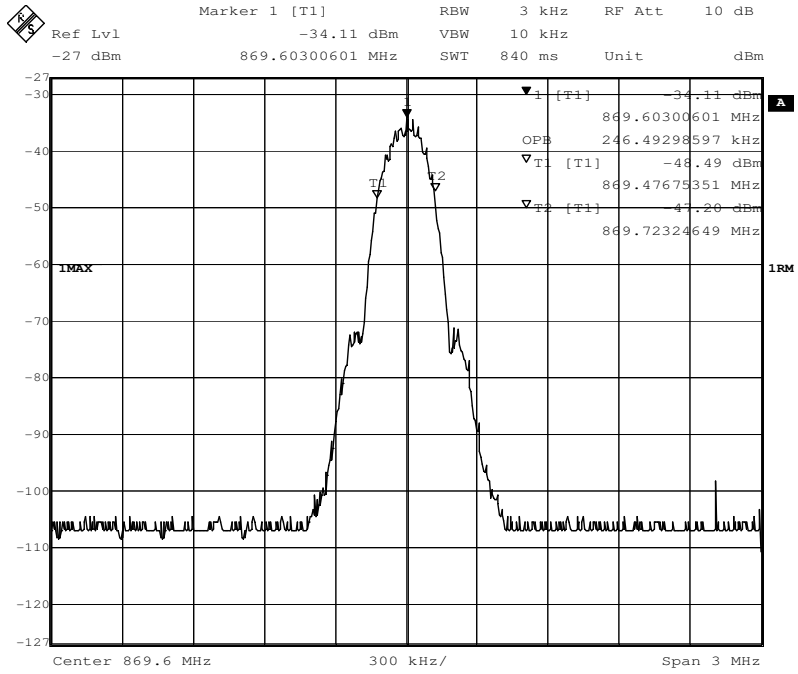
d) Capture the trace of output signal;

### 7.2.8.1 Measurement Record:

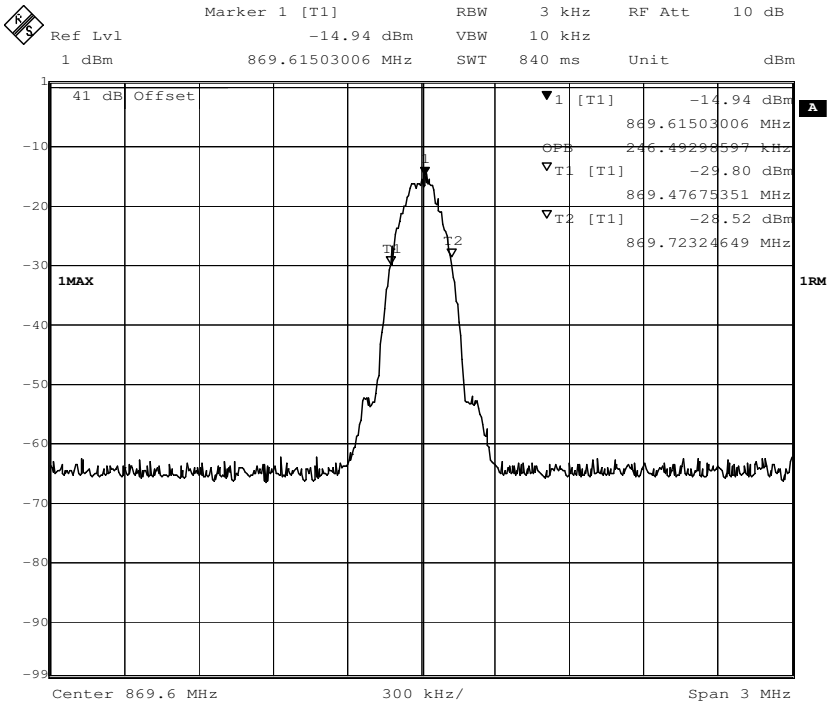
**1) Downlink: 869MHz to 894MHz**

1.1 GSM Mode:

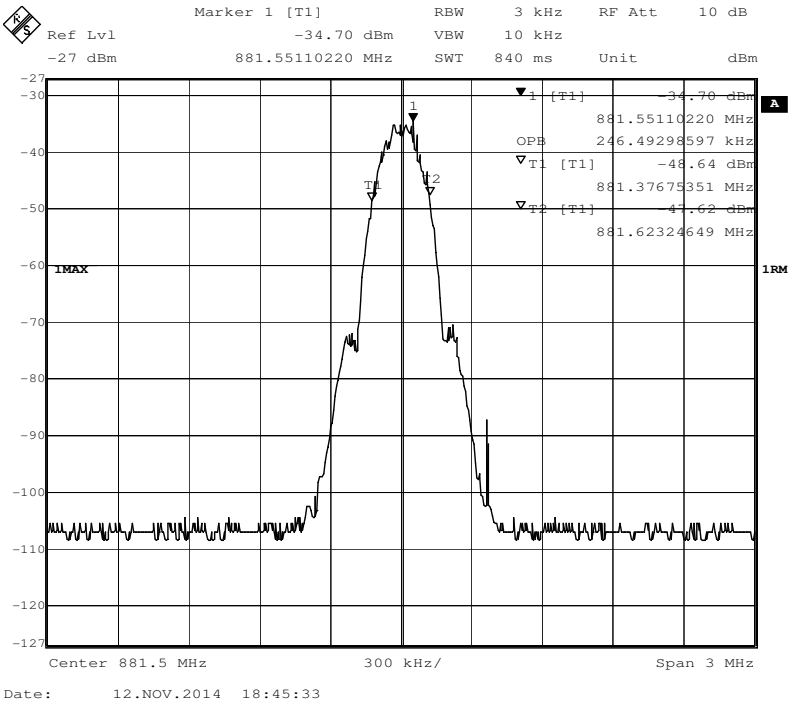
1.1.1 lowest frequency– Input



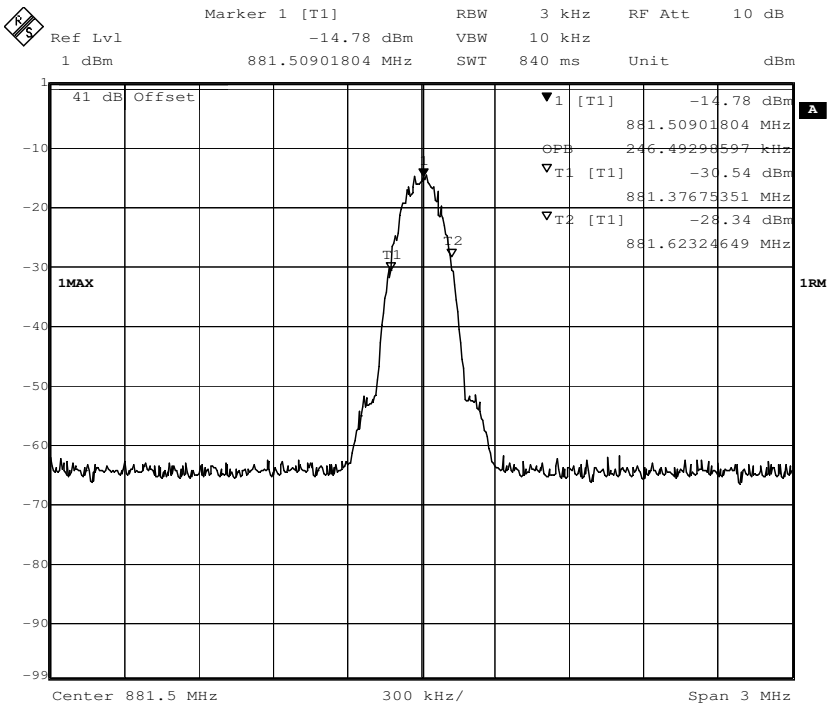

1.1.2 lowest frequency-- Output



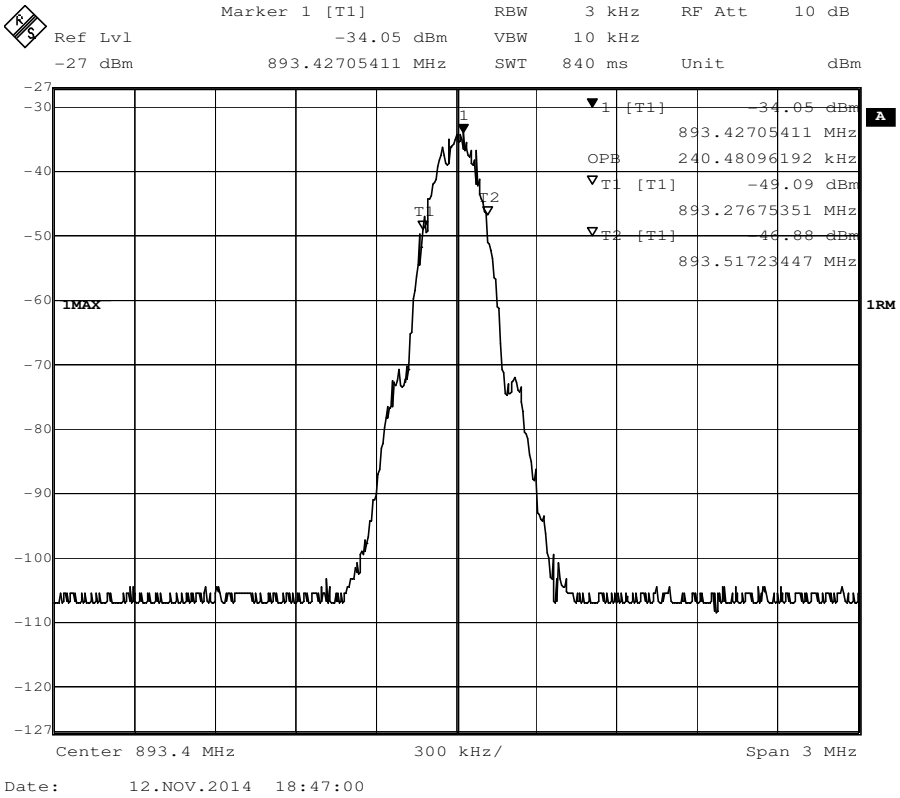
1.1.3 middle frequency-- Input



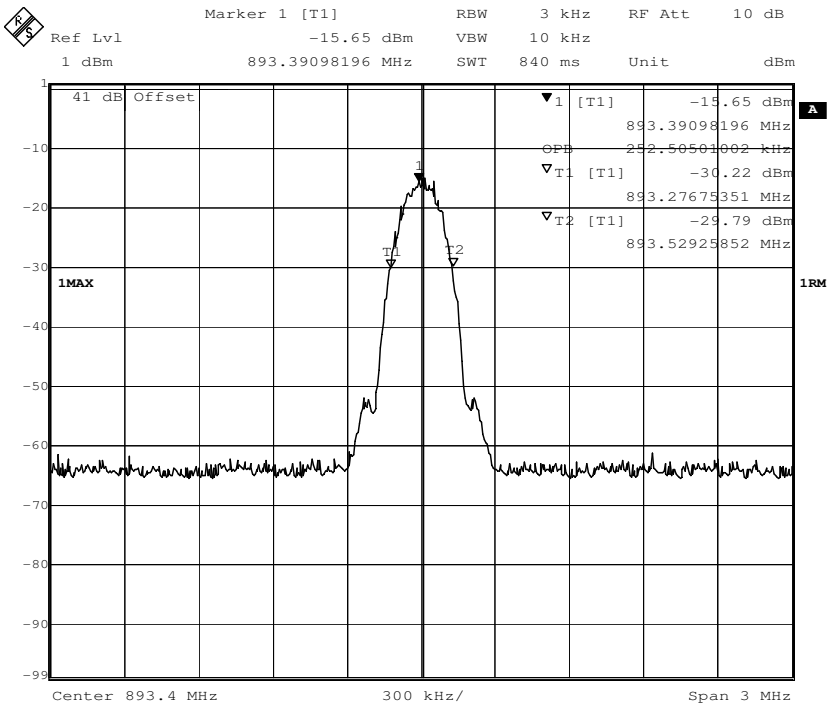

1.1.4 middle frequency-- Output



1.1.5 highest frequency—Input

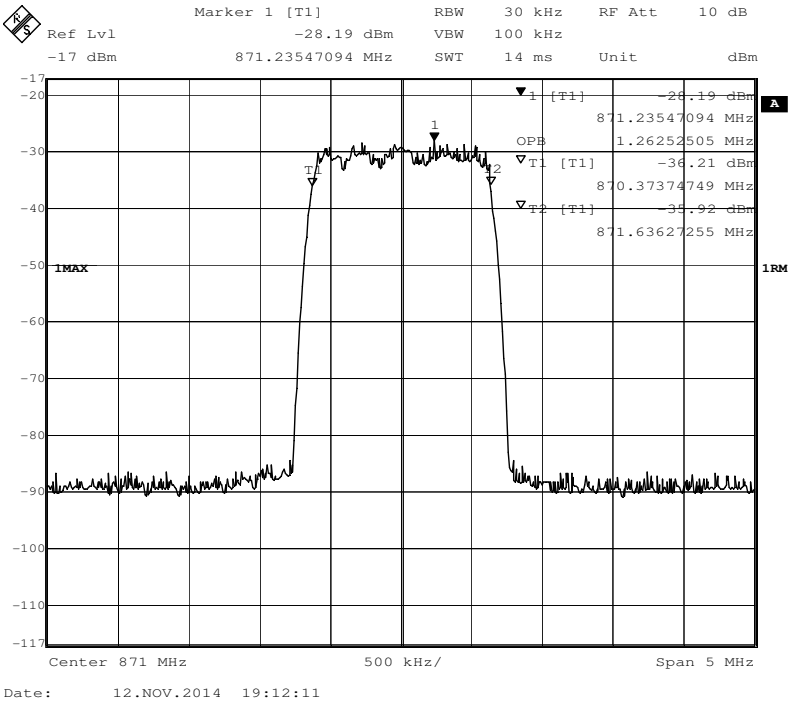



1.1.6 highest frequency--Output

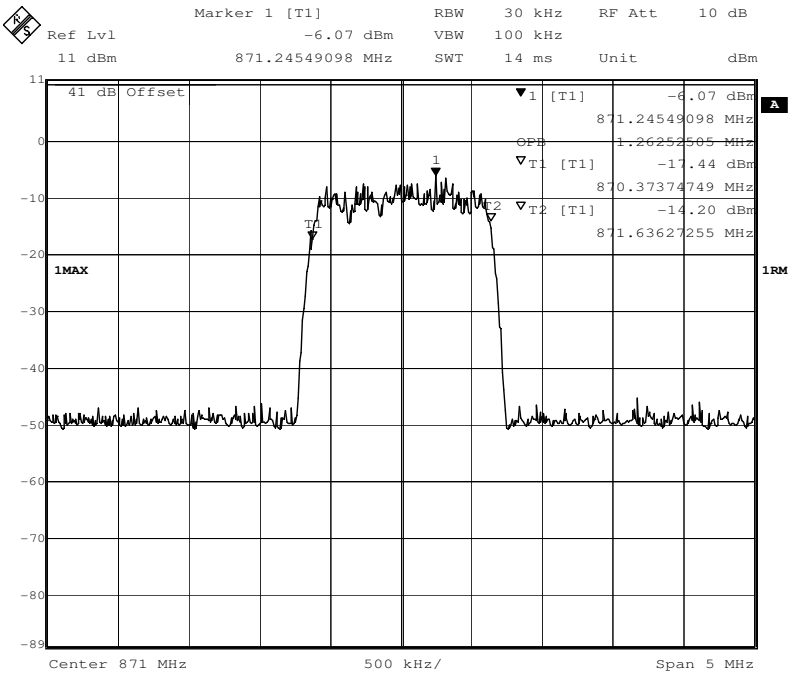


1.2 CDMA Mode:

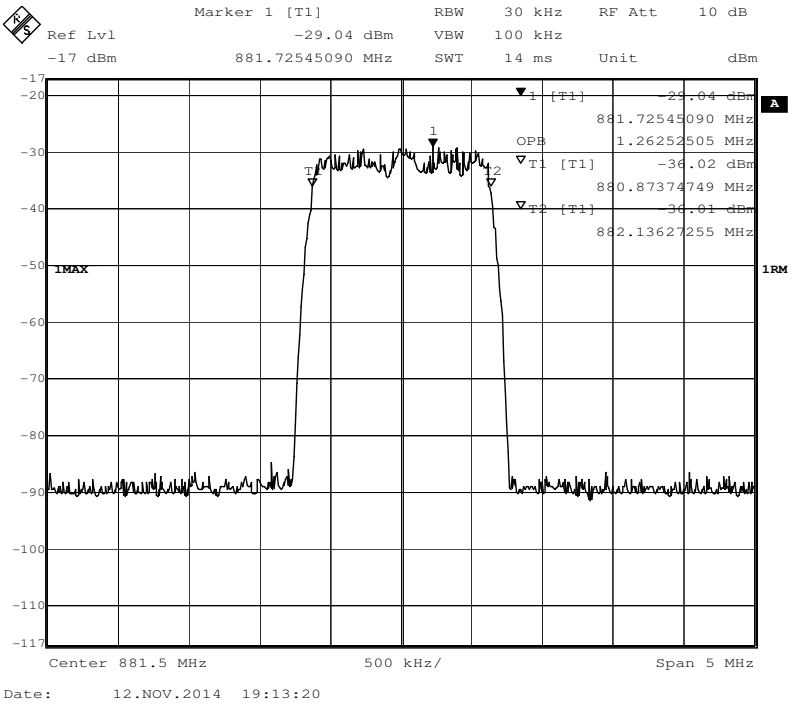
1.2.1 lowest frequency– Input



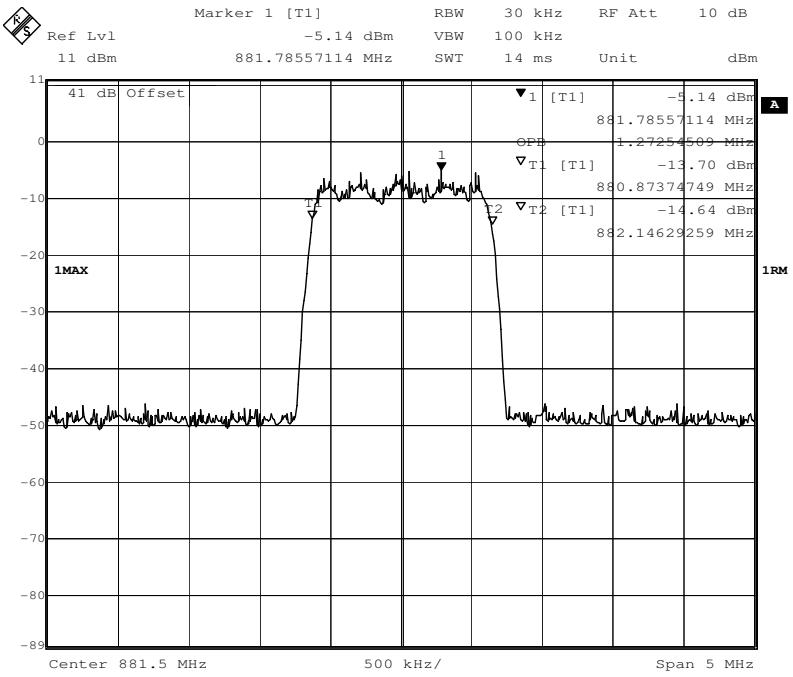

1.2.2 lowest frequency-- Output



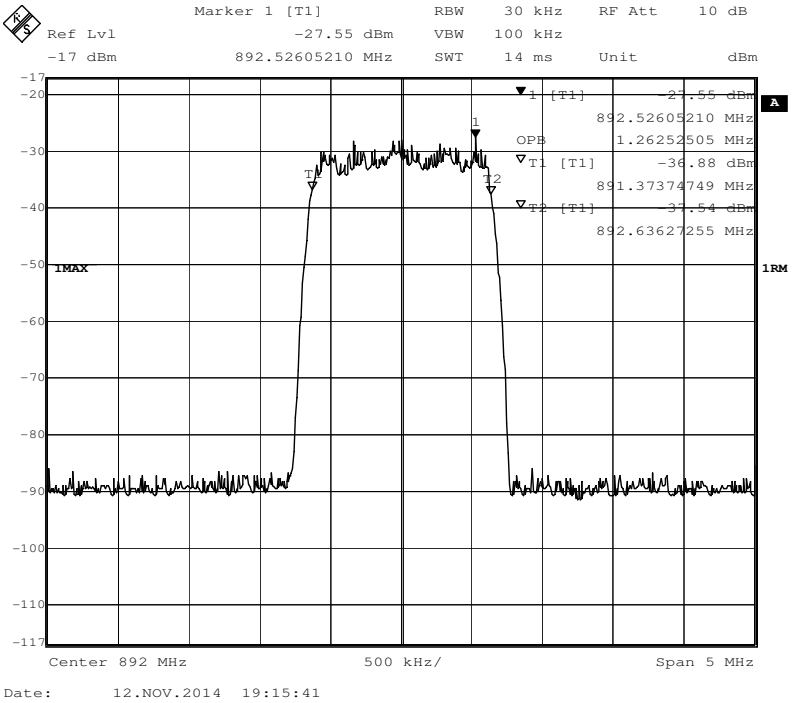
1.2.3 middle frequency-- Input



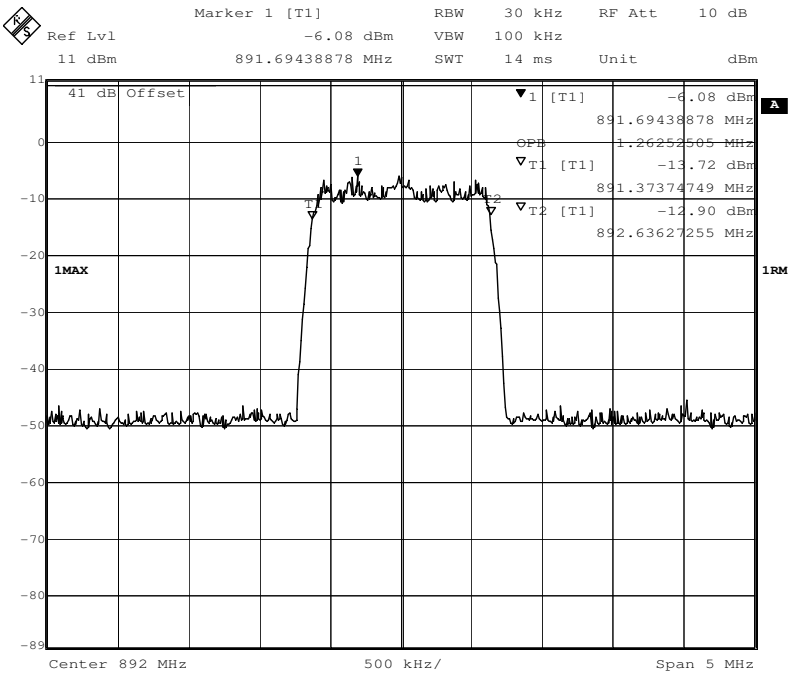

1.2.4 middle frequency-- Output



1.2.5 highest frequency—Input

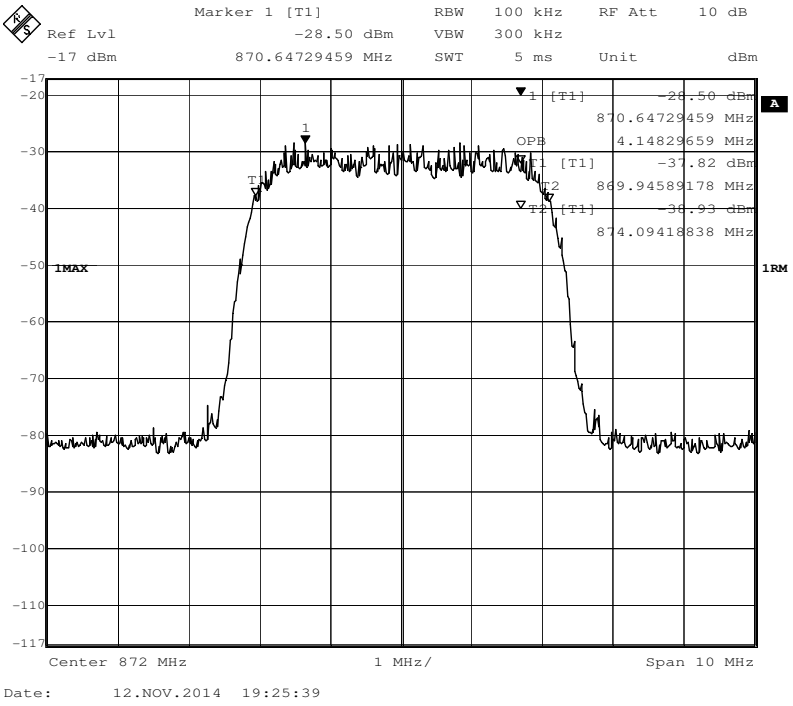



1.2.6 highest frequency--Output

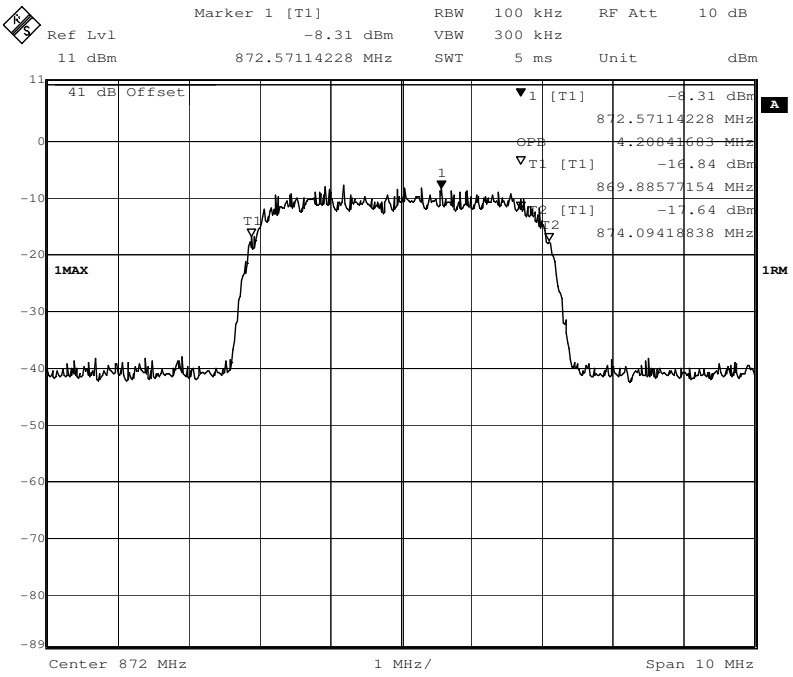


1.3 WCDMA Mode:

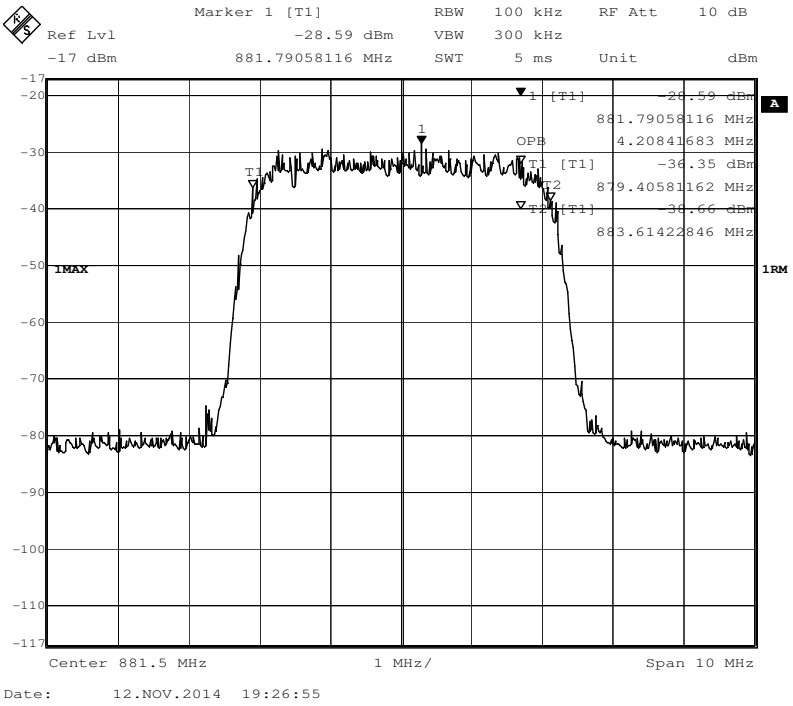
1.3.1 lowest frequency– Input



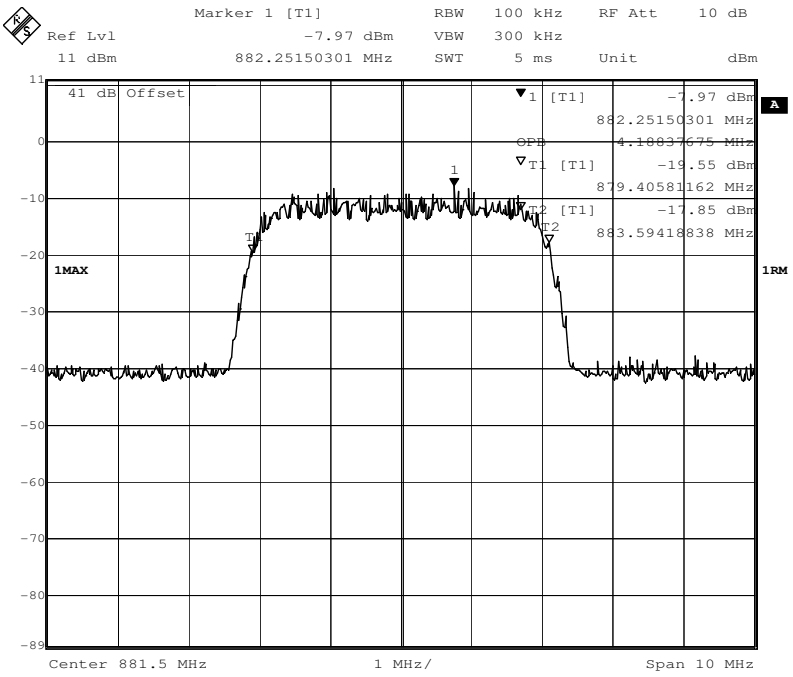

1.3.2 lowest frequency-- Output



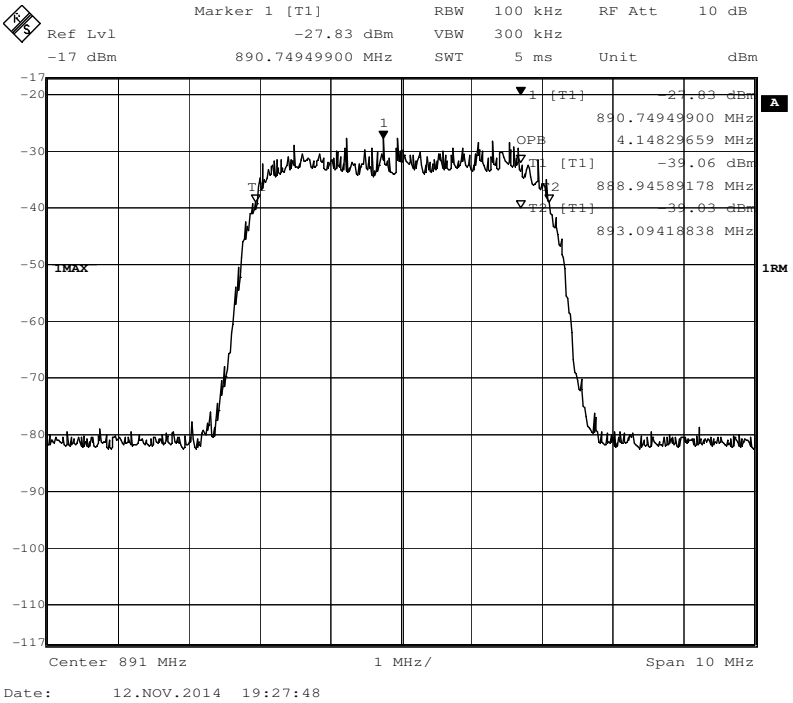
1.3.3 middle frequency-- Input




1.3.4 middle frequency-- Output

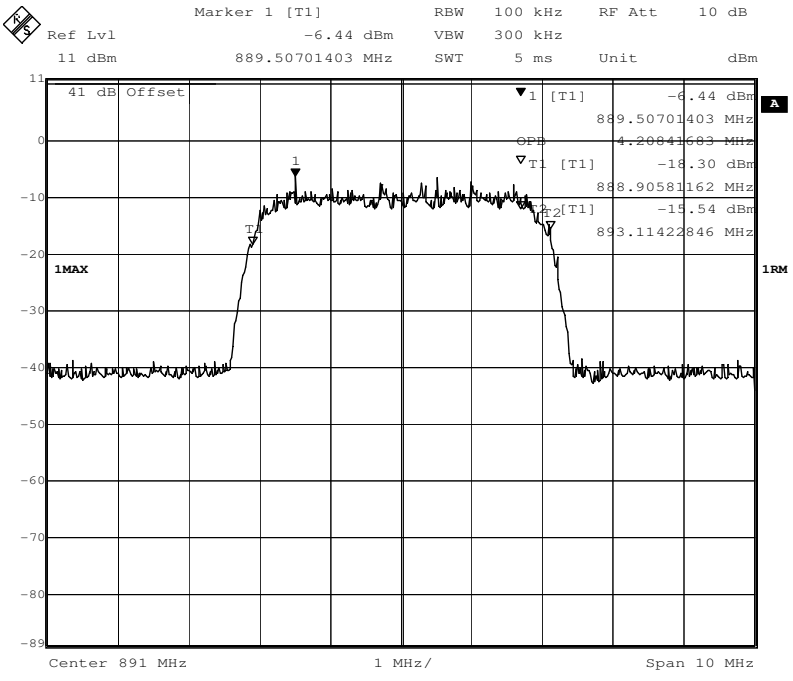


1.3.5 highest frequency—Input




Date: 12.NOV.2014 19:27:48

1.3.6 highest frequency--Output

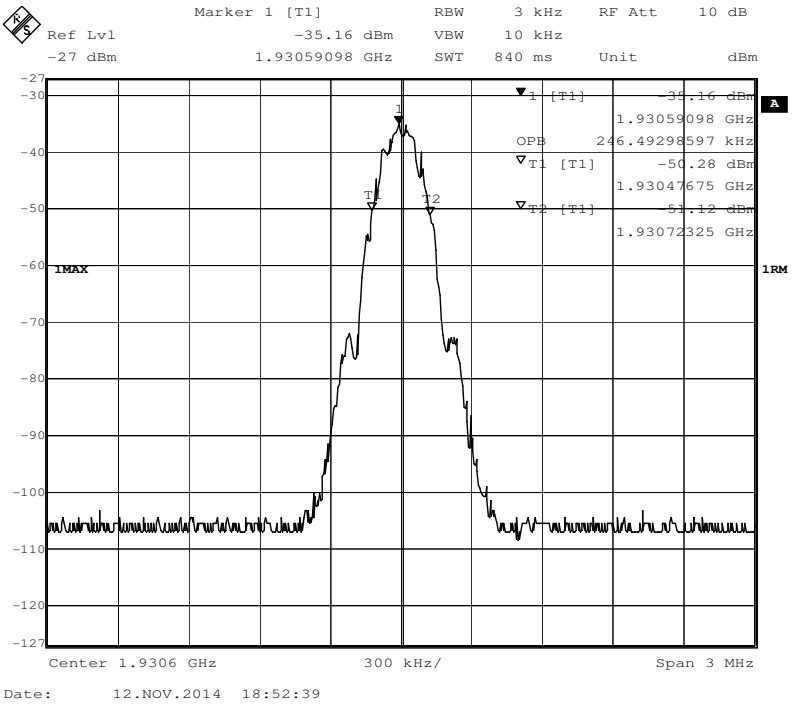



Date: 6.NOV.2014 19:00:34

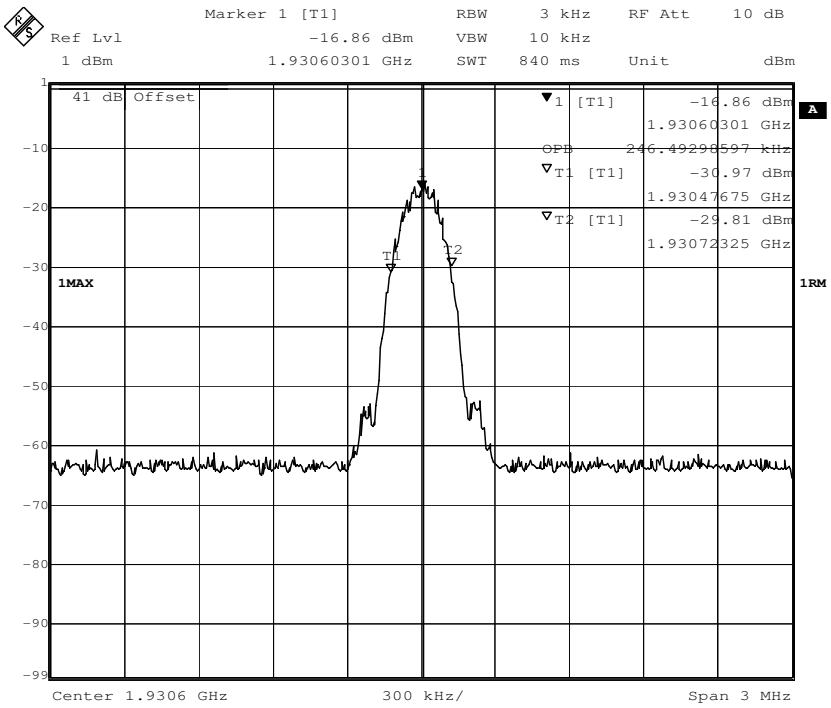
## 2) Downlink: 1930MHz to 1990MHz

1.1 GSM Mode:

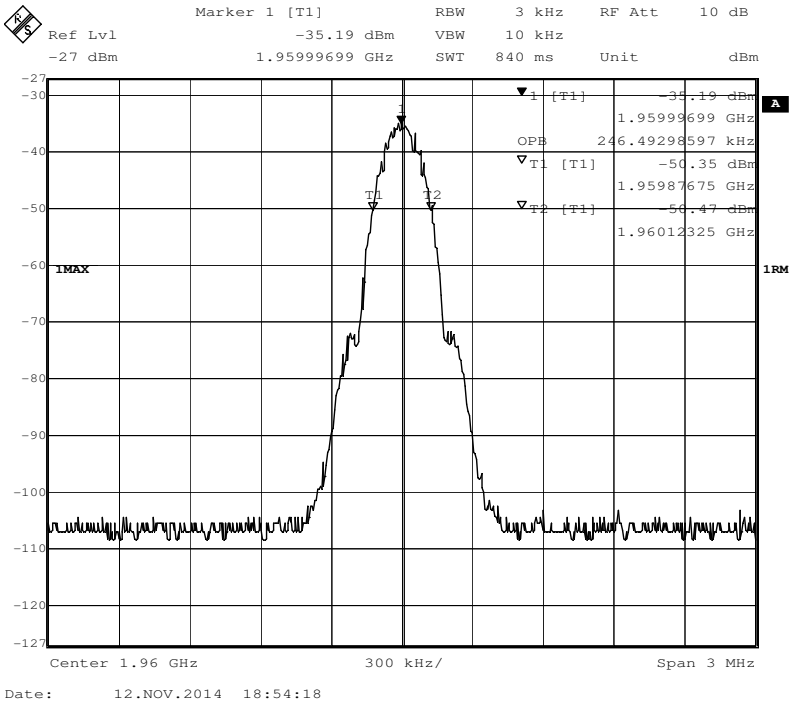
1.1.1 lowest frequency– Input



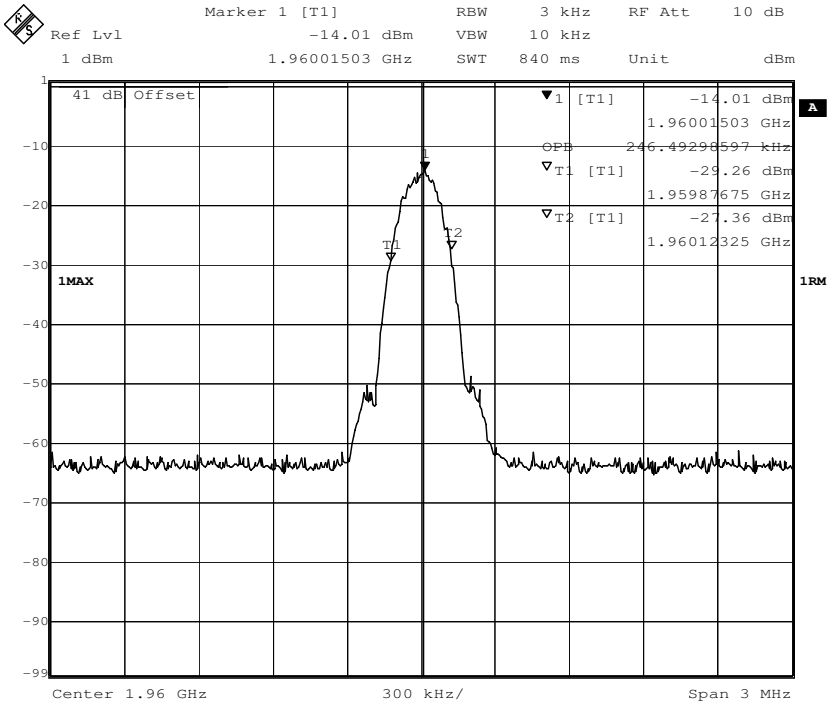

1.1.2 lowest frequency-- Output



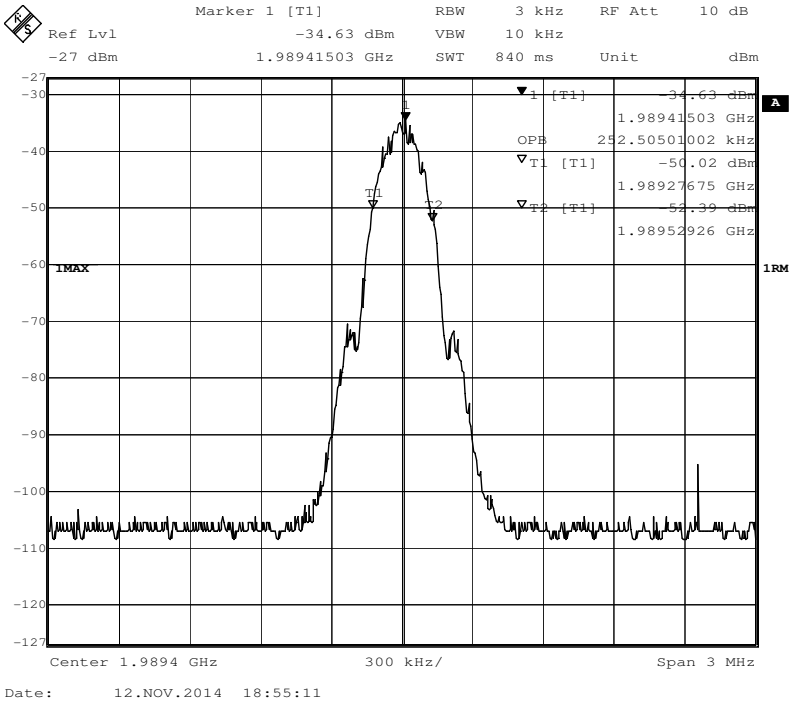
1.1.3 middle frequency-- Input



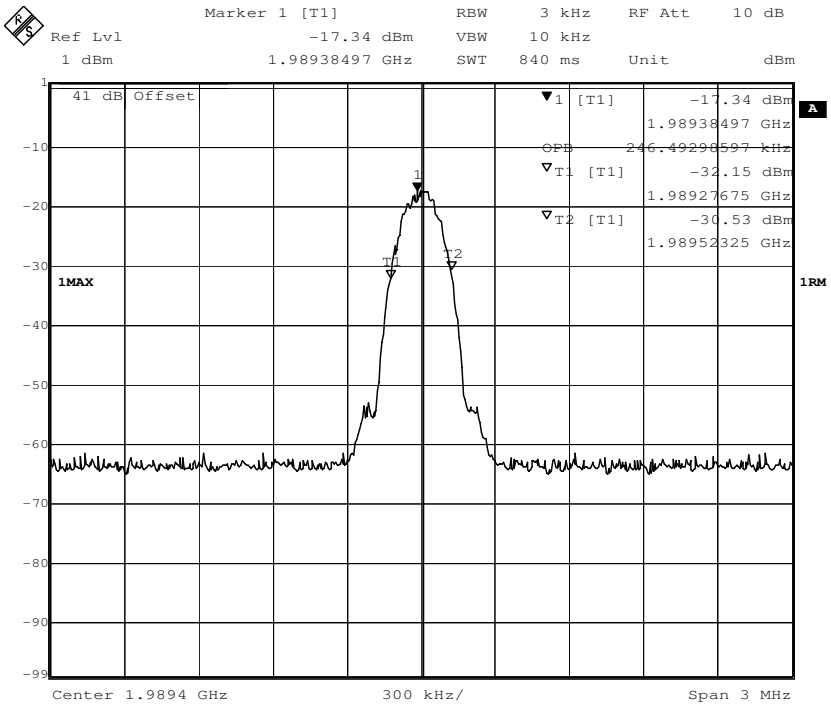

1.1.4 middle frequency-- Output



1.1.5 highest frequency—Input

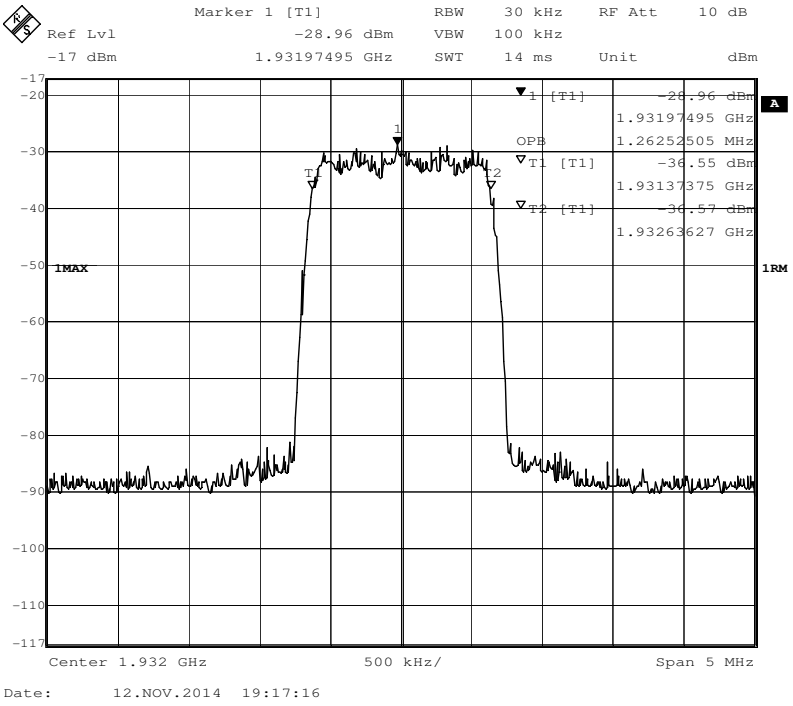



1.1.6 highest frequency--Output

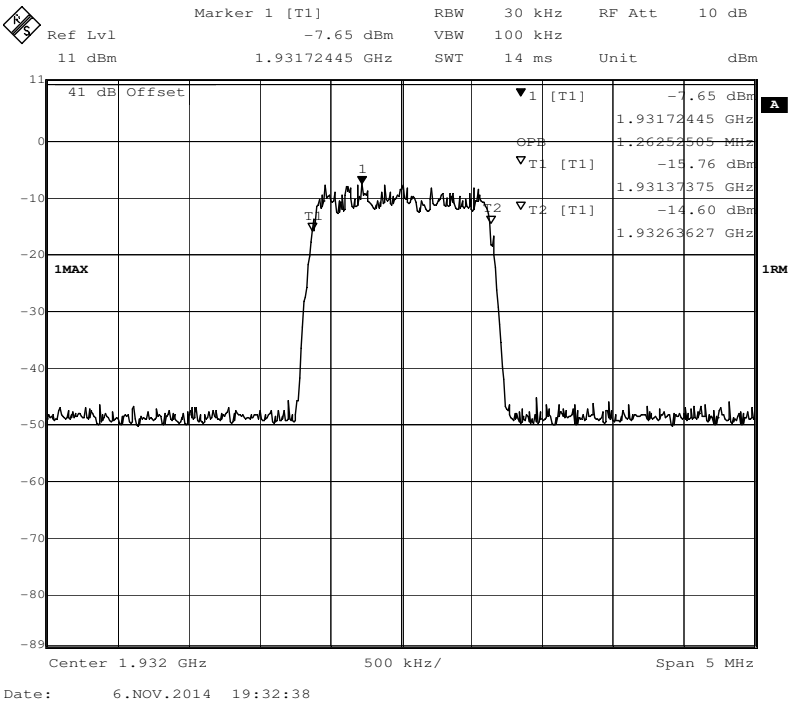


2.1 CDMA Mode:

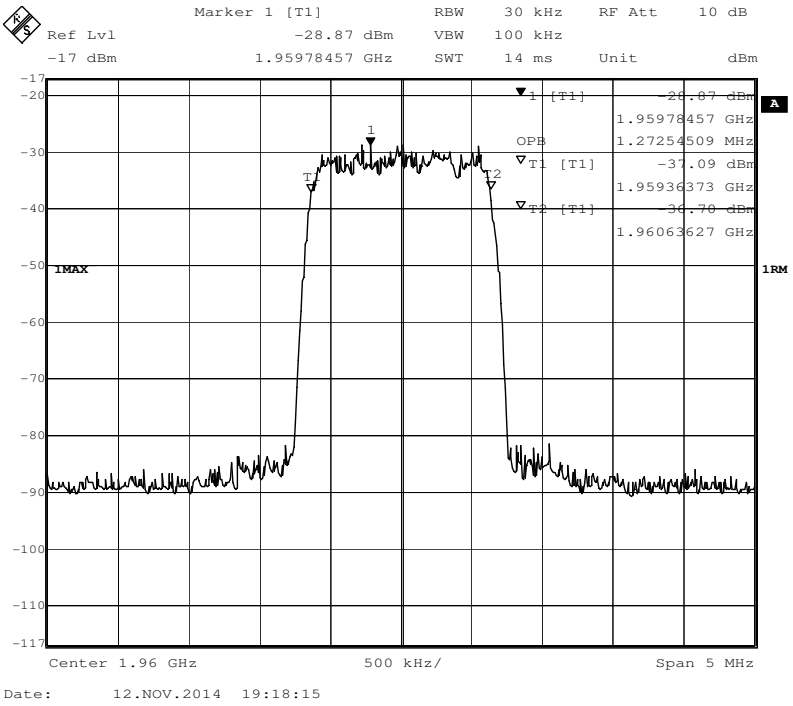
2.1.1 lowest frequency– Input



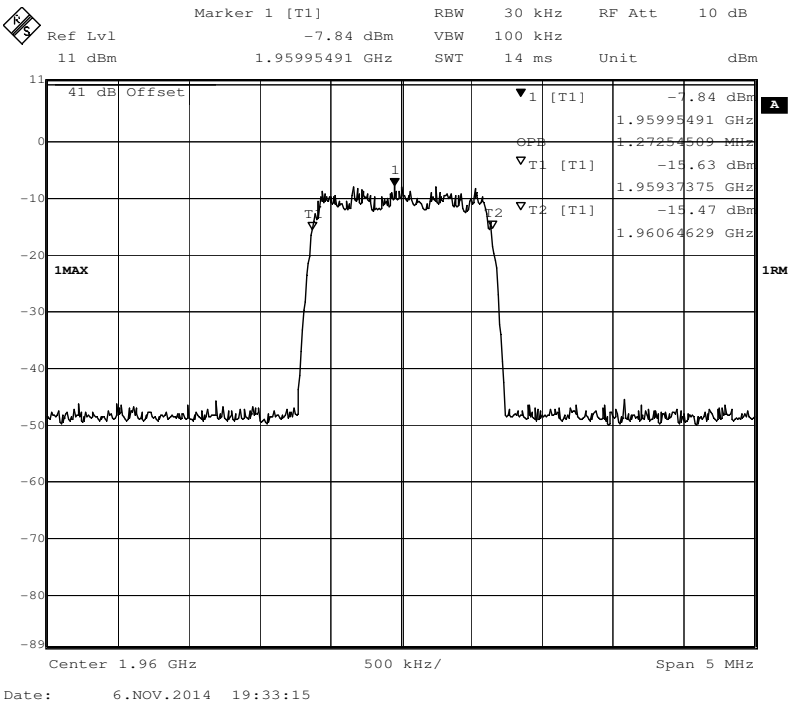

2.1.2 lowest frequency-- Output



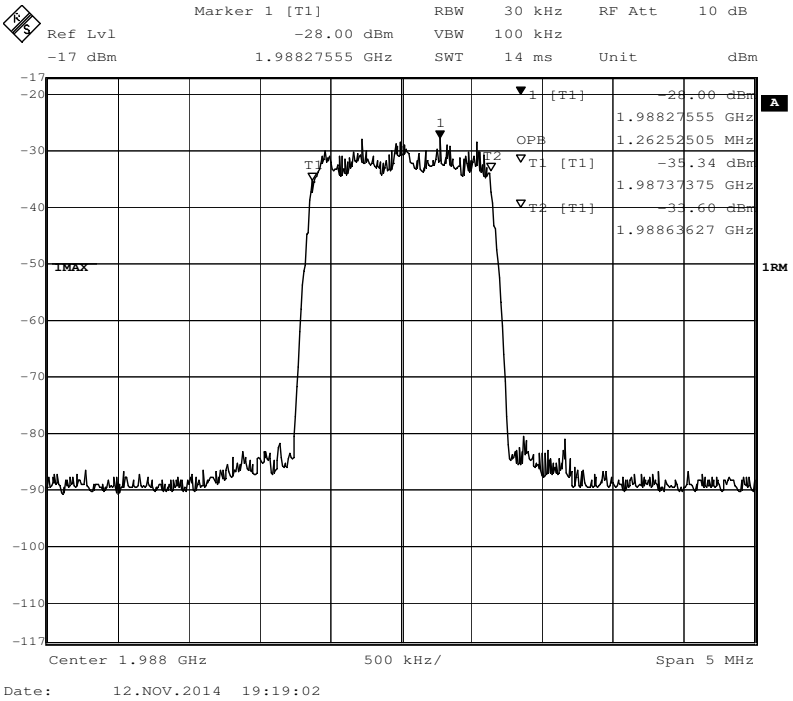
2.1.3 middle frequency-- Input




2.1.4 middle frequency-- Output

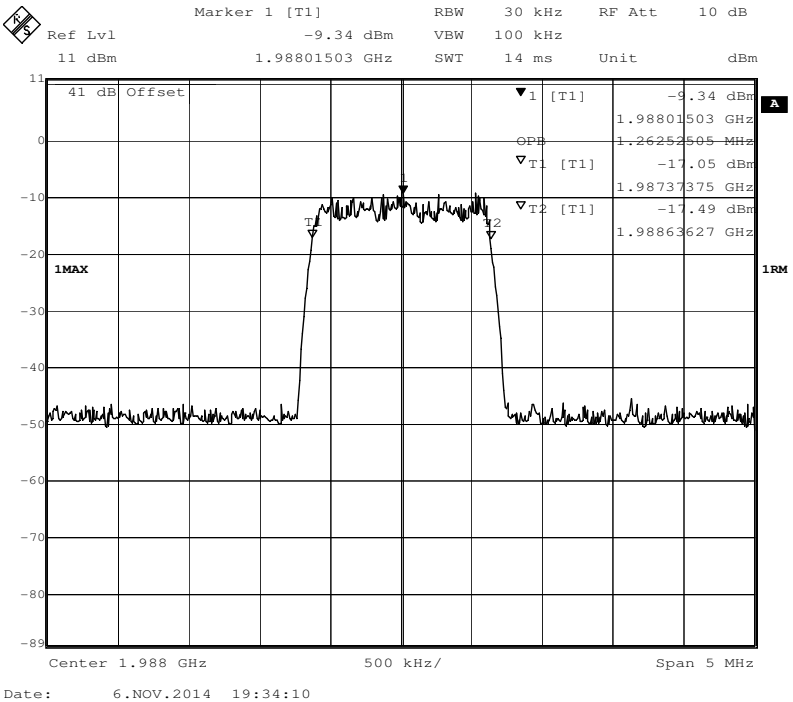


2.1.5 highest frequency—Input




Date: 12.NOV.2014 19:19:02

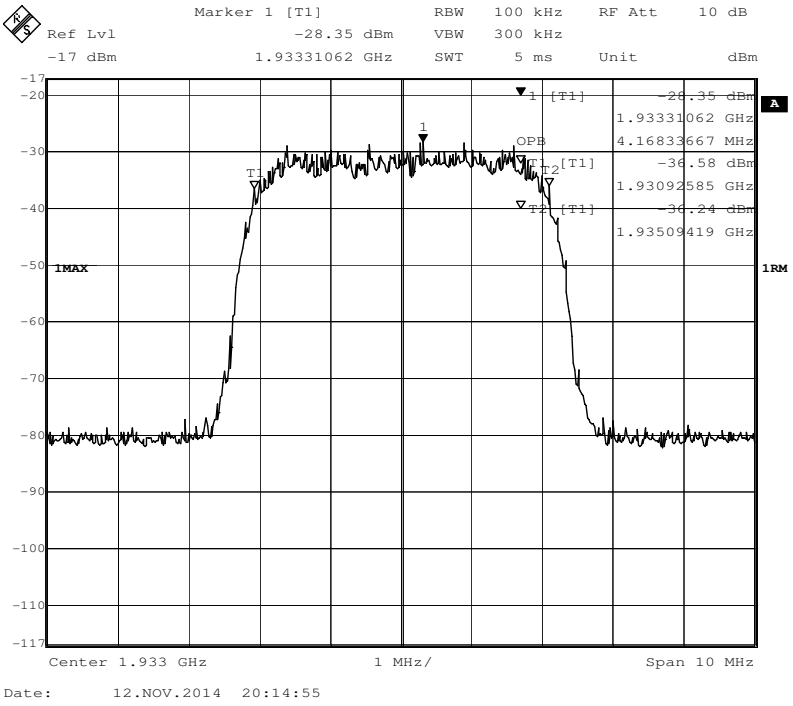
2.1.6 highest frequency--Output



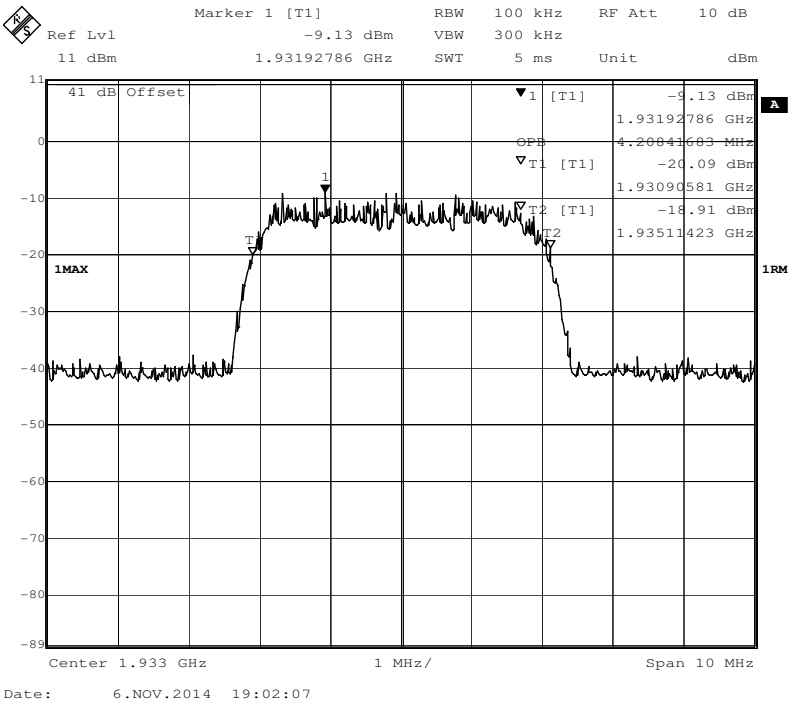

Date: 6.NOV.2014 19:34:10

3.1 WCDMA Mode:

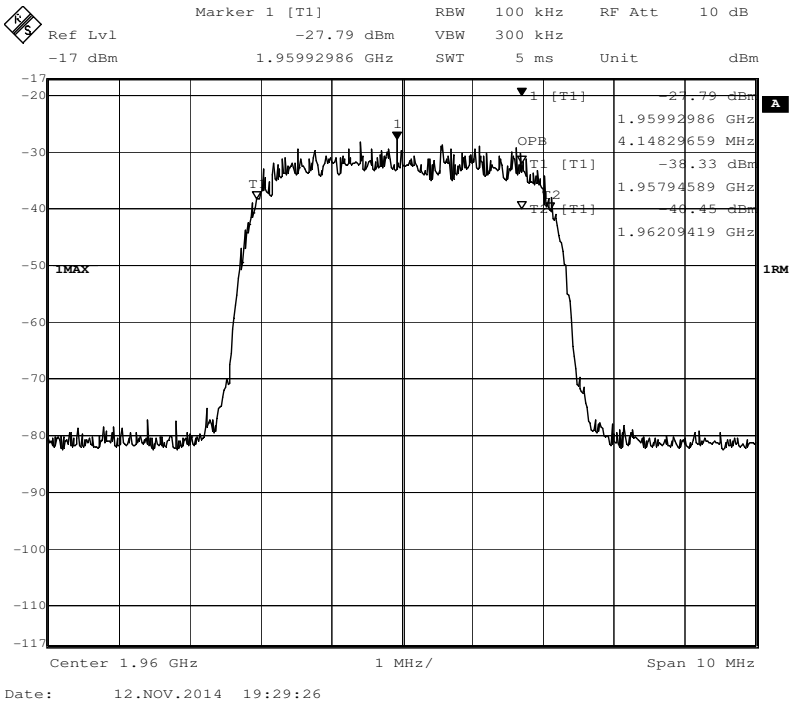
3.1.1 lowest frequency– Input



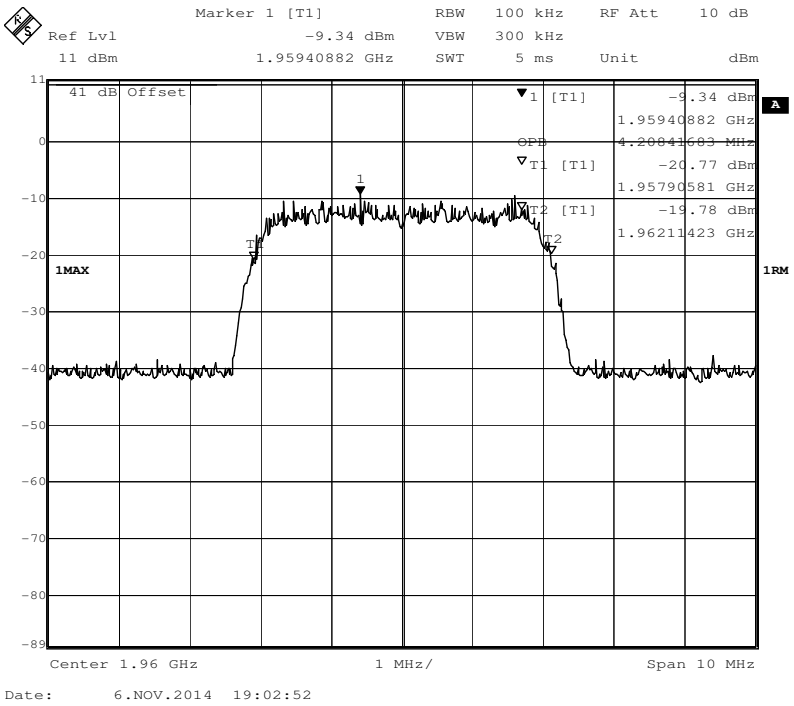

3.1.2 lowest frequency-- Output



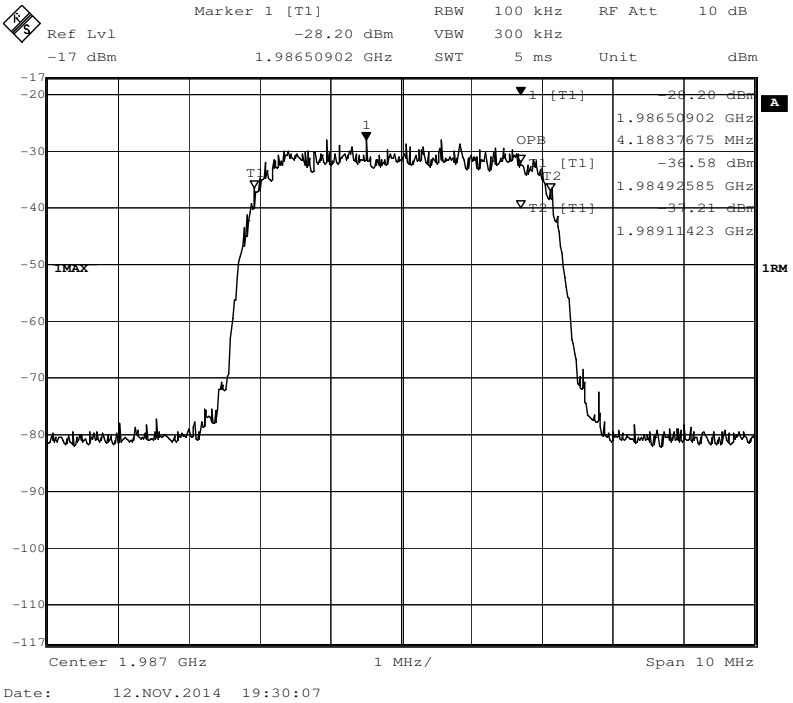
3.1.3 middle frequency-- Input



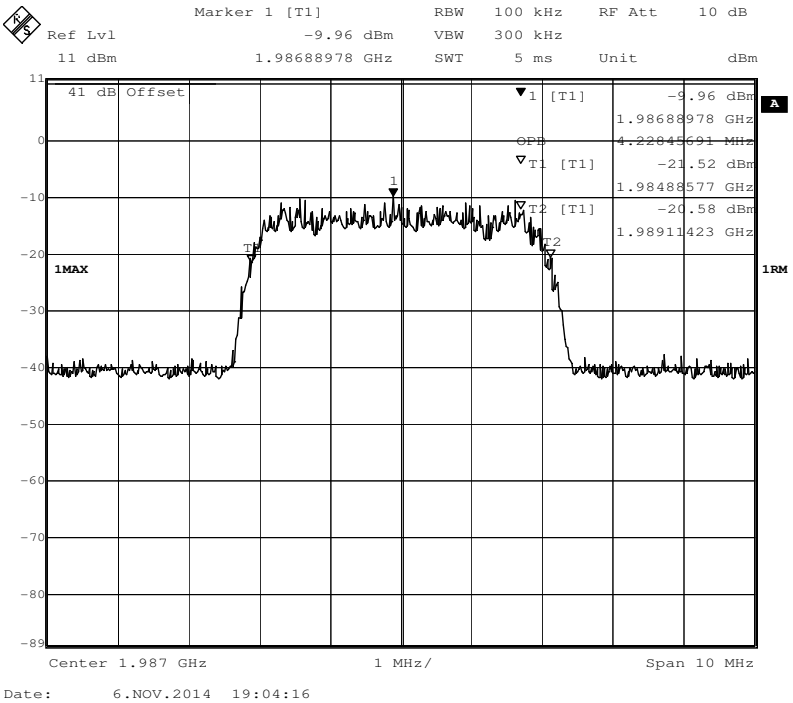

3.1.4 middle frequency-- Output



3.1.5 highest frequency—Input



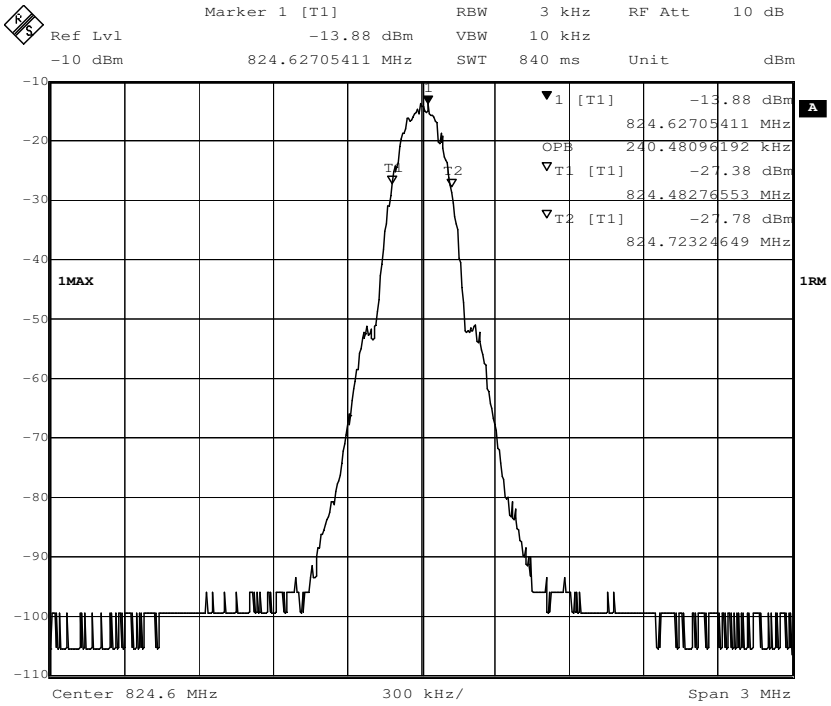

3.1.6 highest frequency--Output



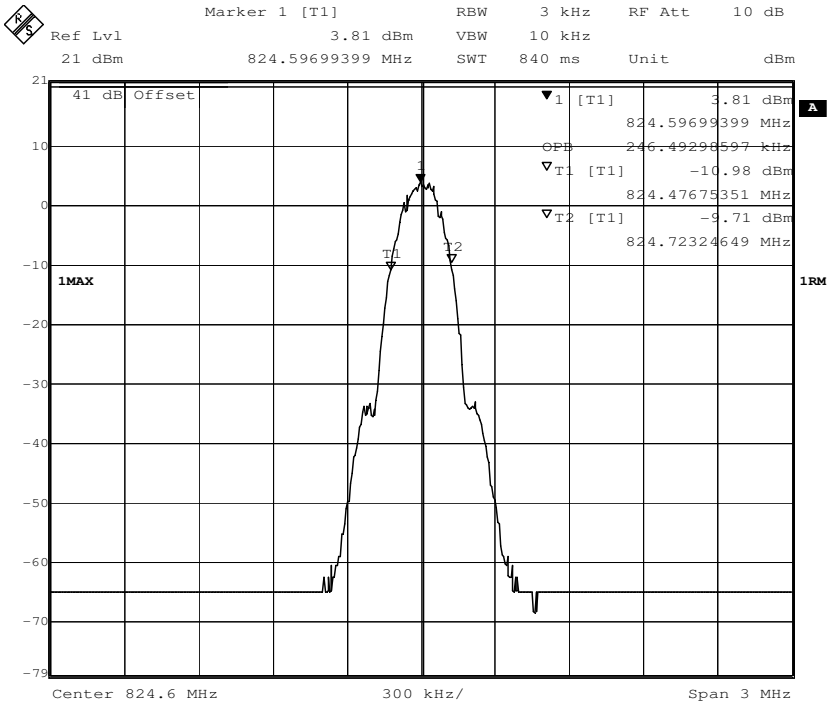
3)**uplink: 824MHz to 849MHz**

1.1 GSM Mode:

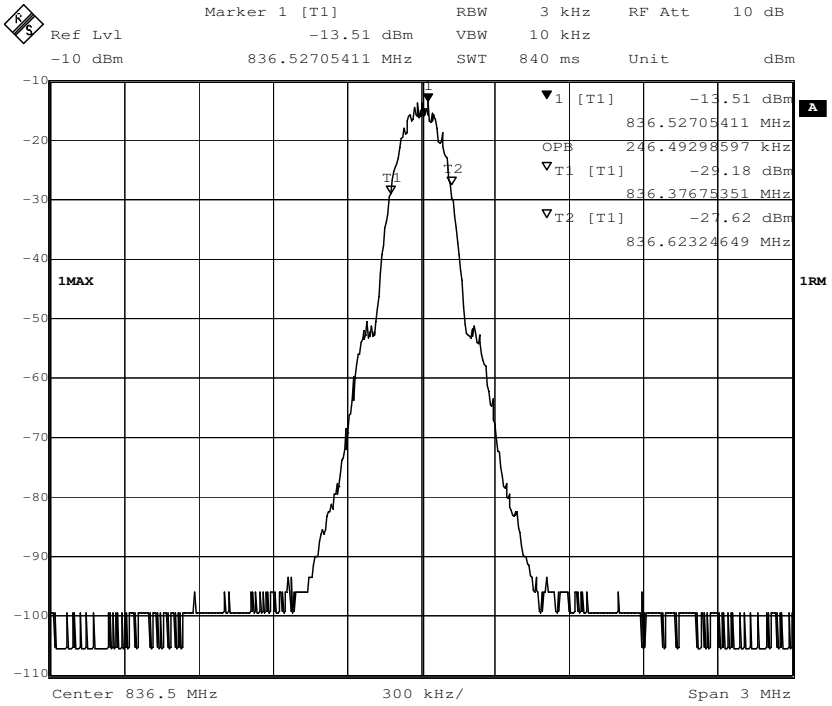
1.1.1 lowest frequency– Input



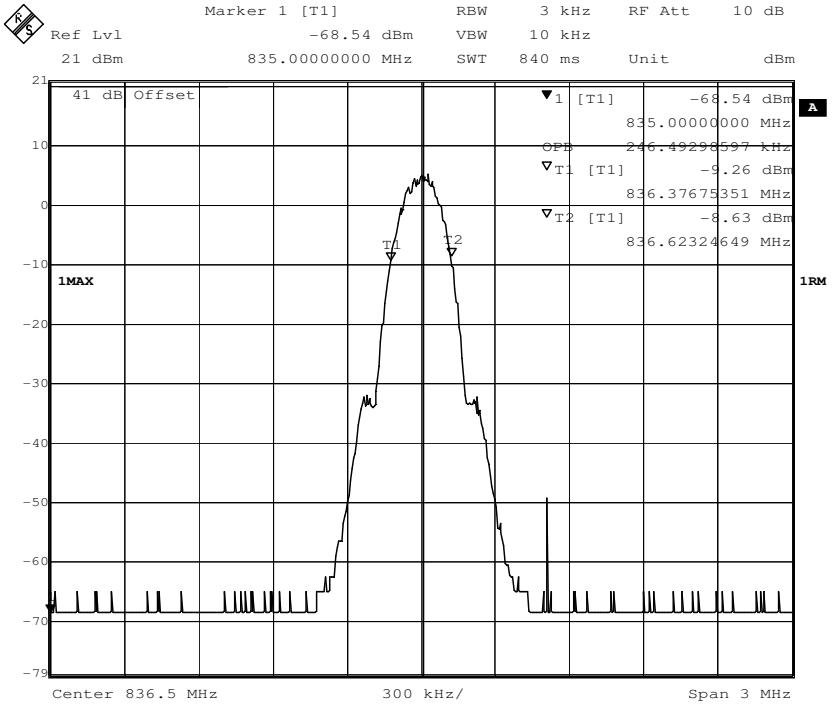

1.1.2 lowest frequency-- Output



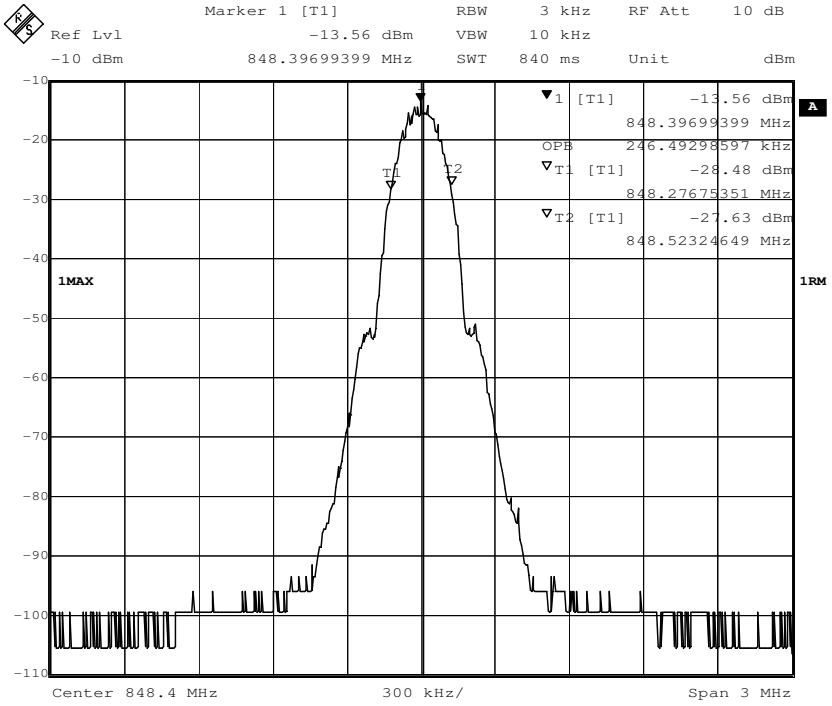
1.1.3 middle frequency-- Input



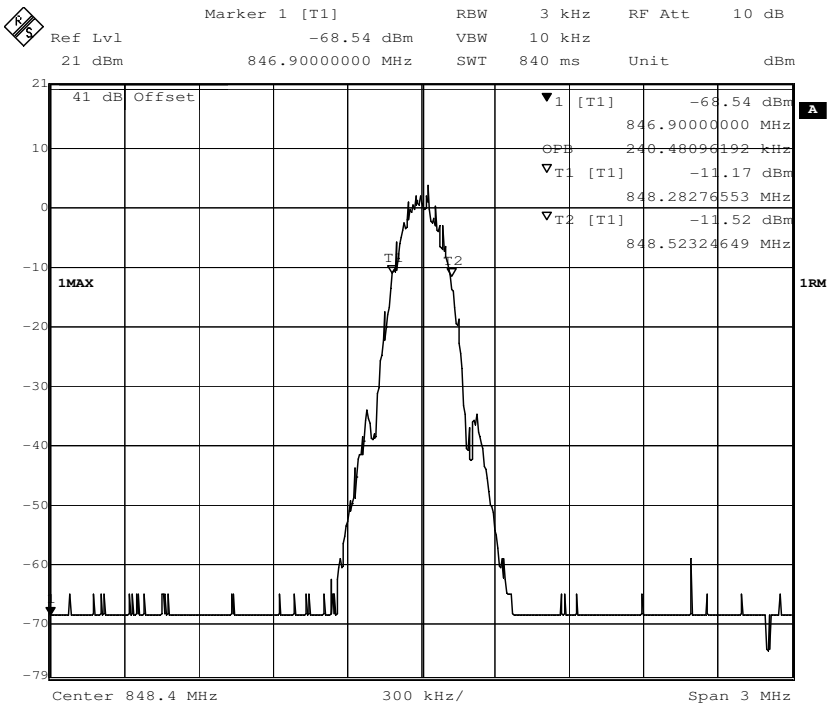

1.1.4 middle frequency-- Output



1.1.5 highest frequency—Input

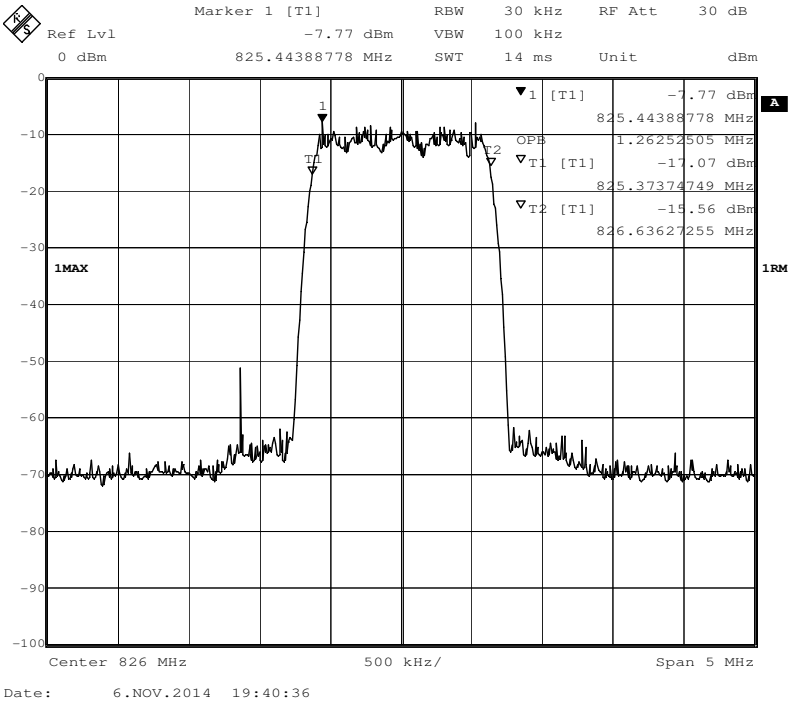



1.1.6 highest frequency--Output

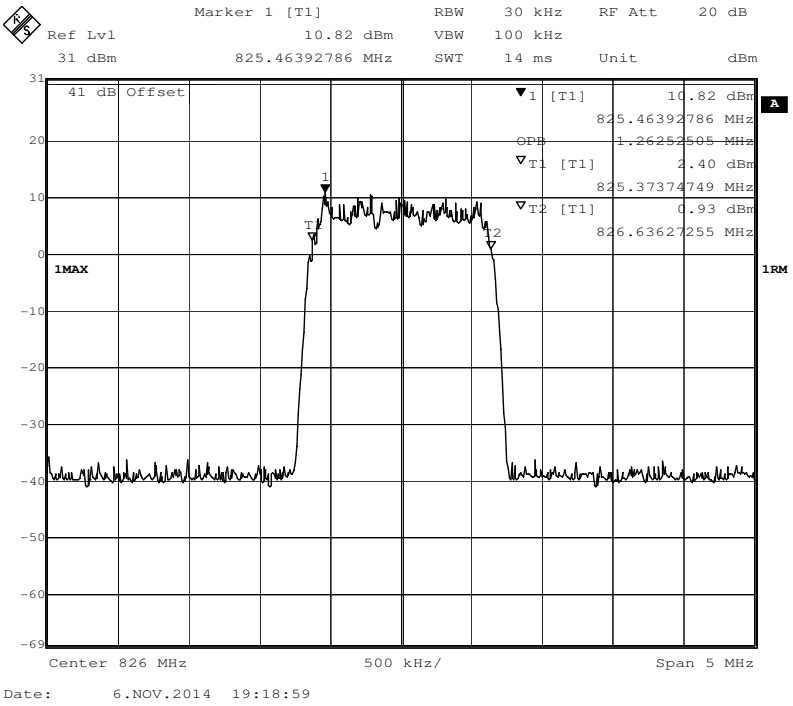


2.1 CDMA Mode:

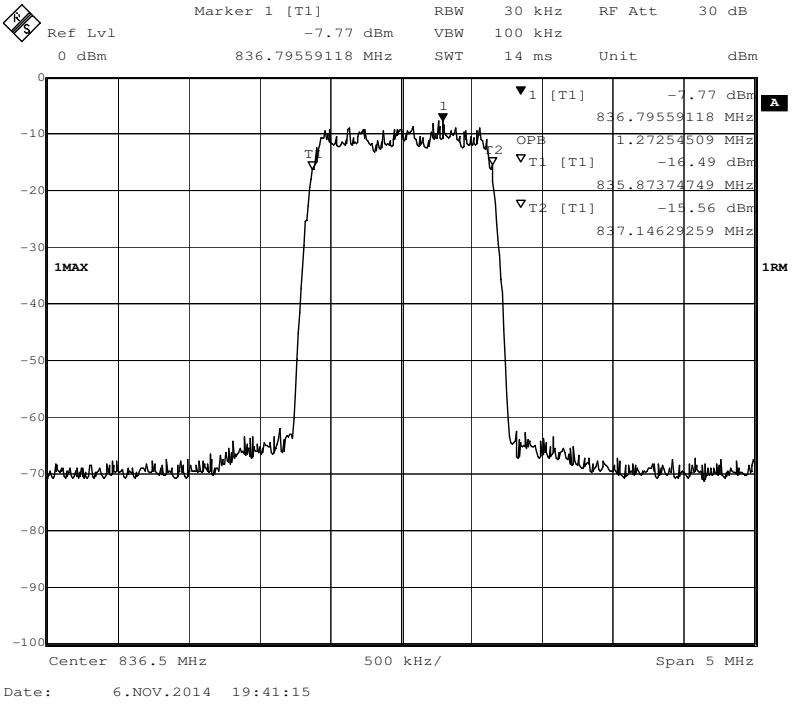
2.1.1 lowest frequency– Input



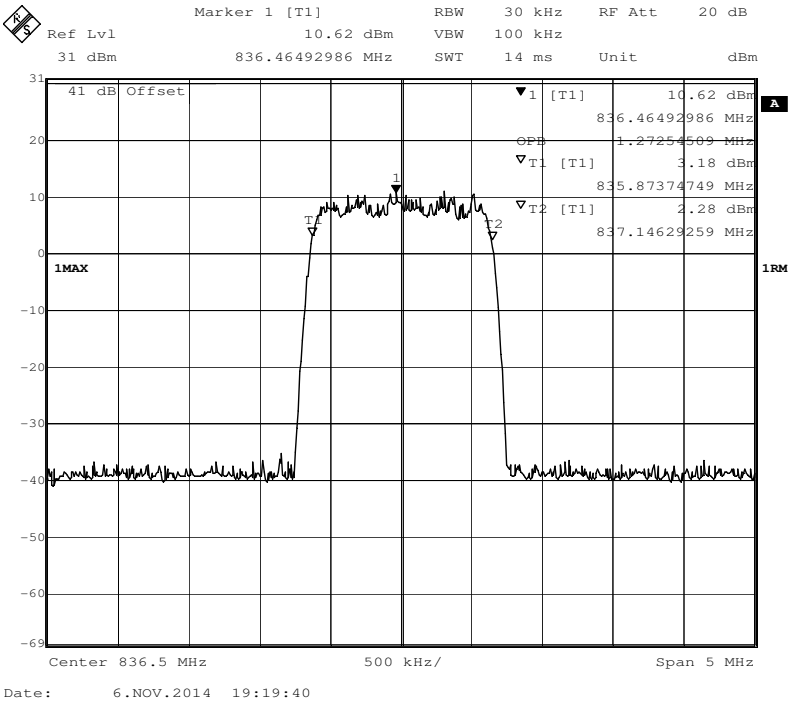

2.1.2 lowest frequency-- Output



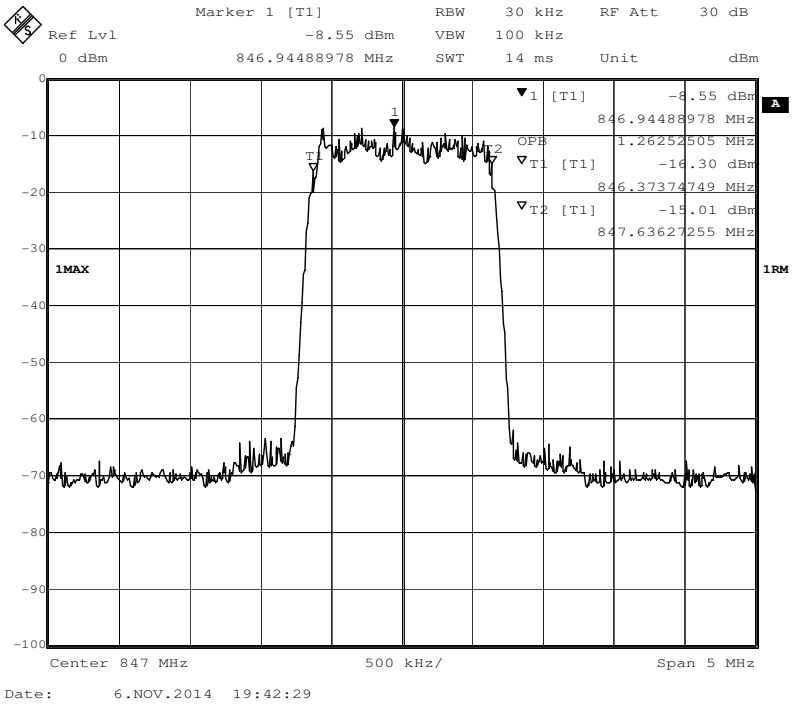
2.1.3 middle frequency-- Input



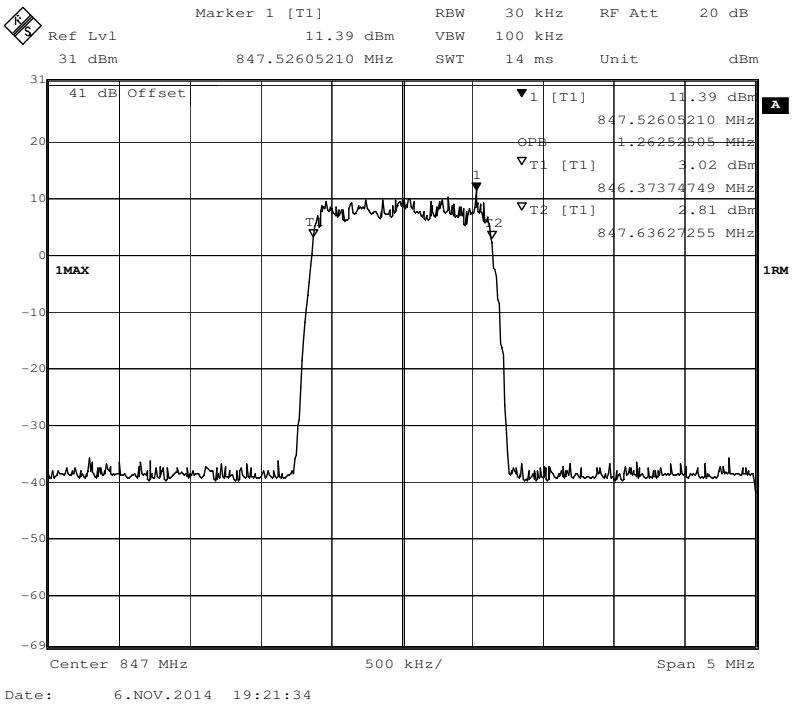

2.1.4 middle frequency-- Output



2.1.5 highest frequency—Input

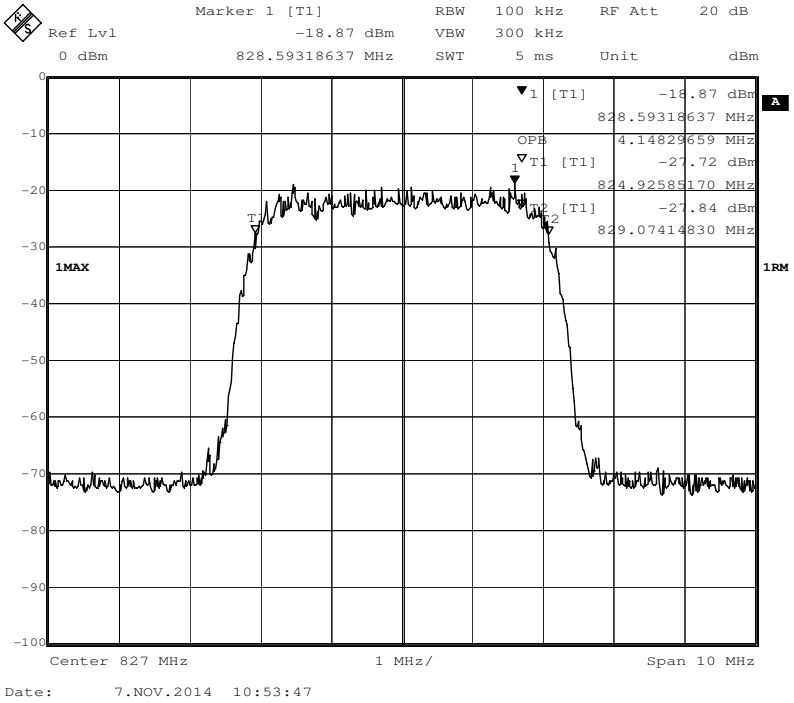



2.1.6 highest frequency--Output

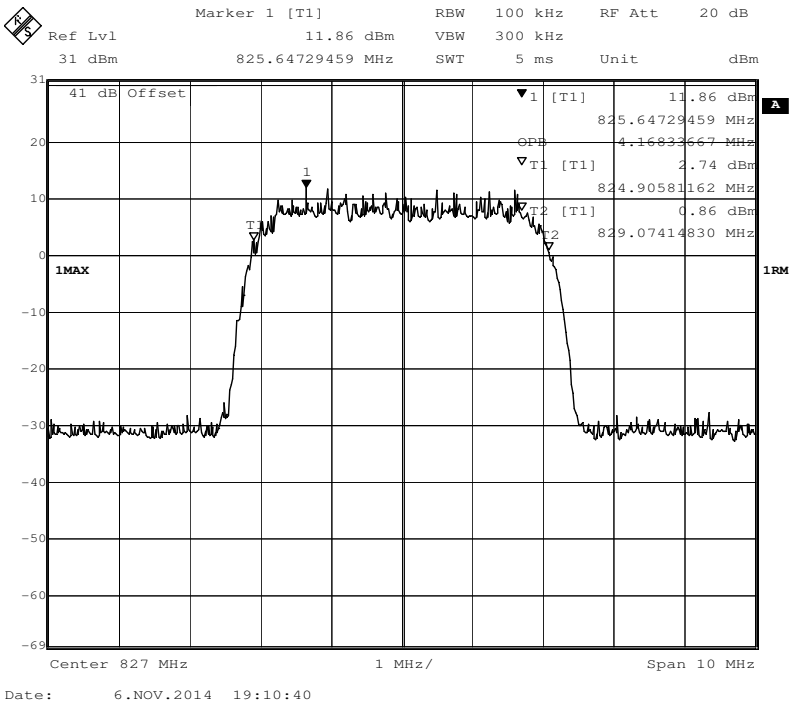


3.1 WCDMA Mode:

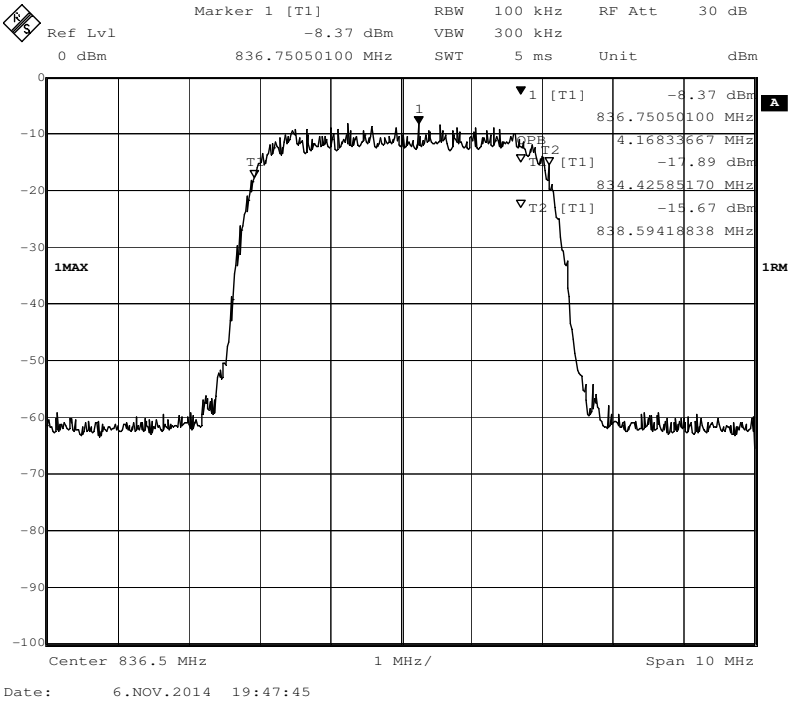
3.1.1 lowest frequency– Input



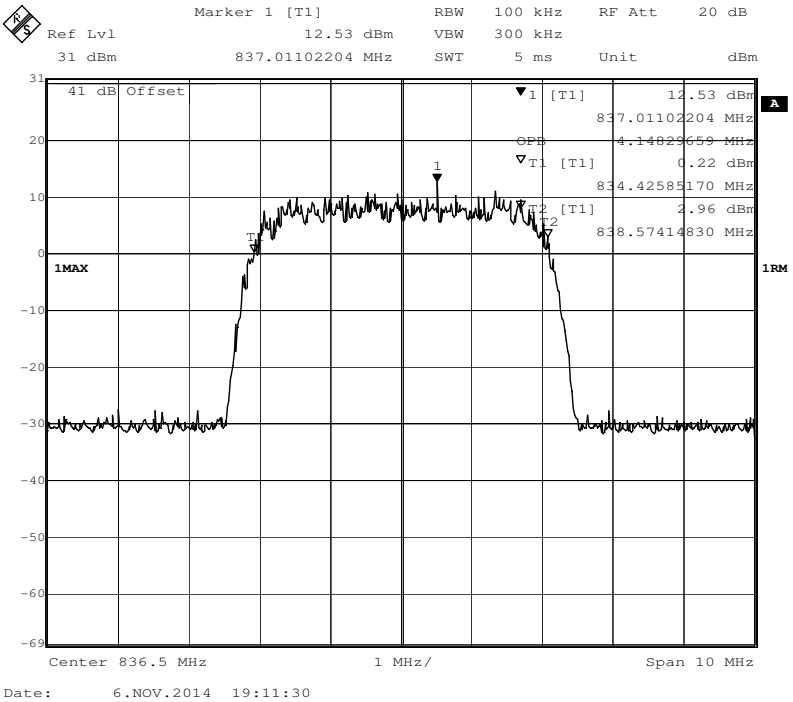

3.1.2 lowest frequency-- Output



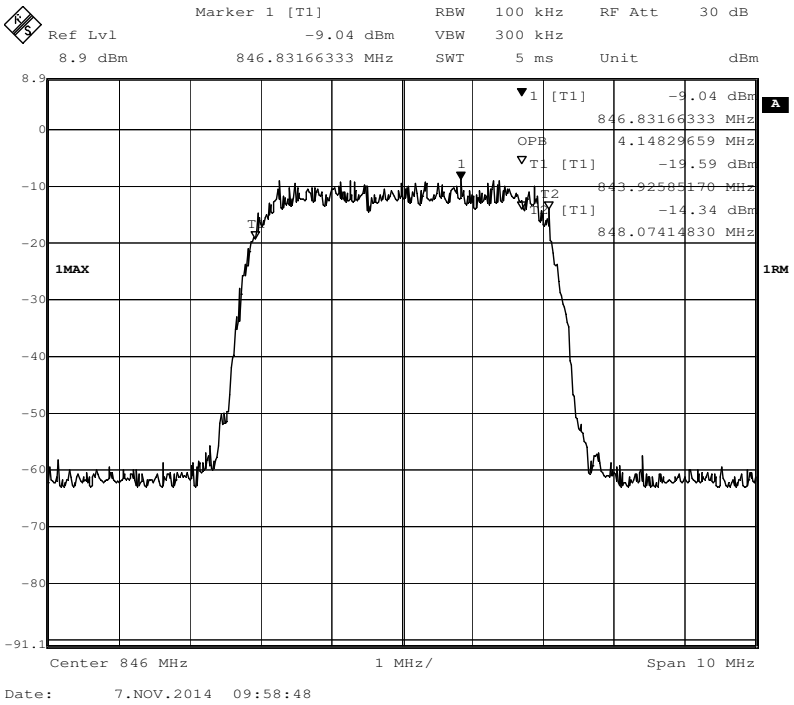
3.1.3 middle frequency-- Input



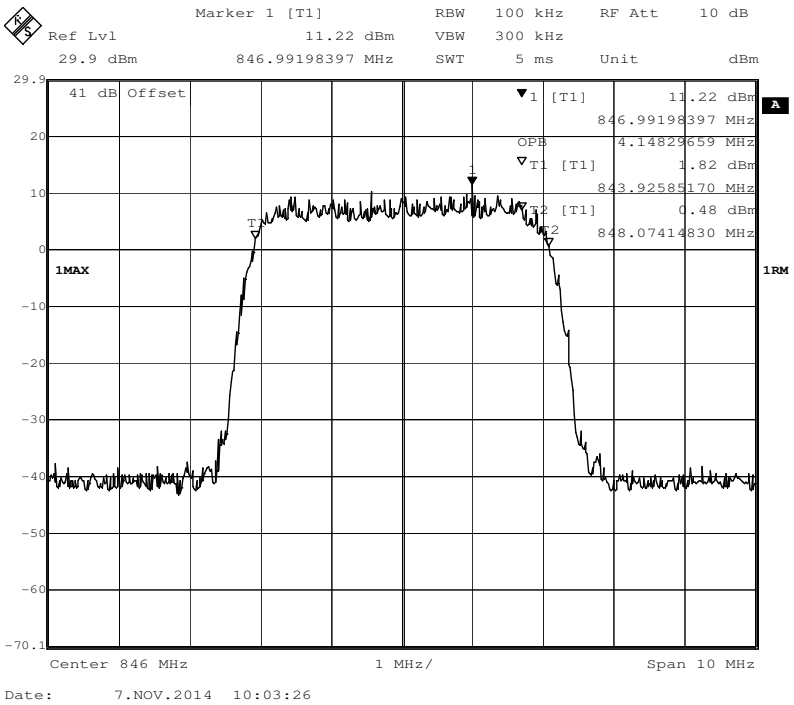

3.1.4 middle frequency-- Output



3.1.5 highest frequency—Input



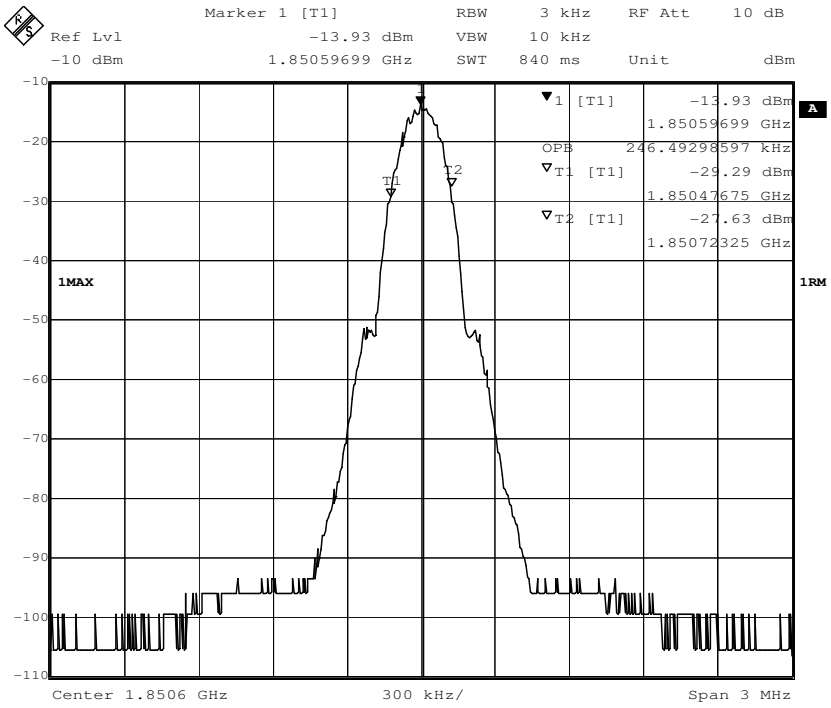

3.1.6 highest frequency--Output



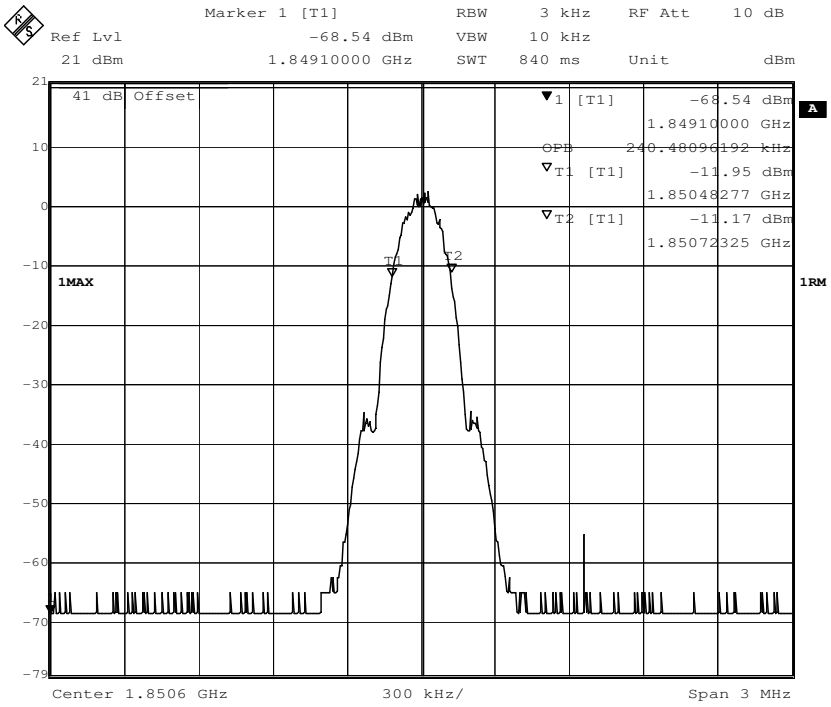
**4) uplink: 1850MHz to 1910MHz**

1.1 GSM Mode:

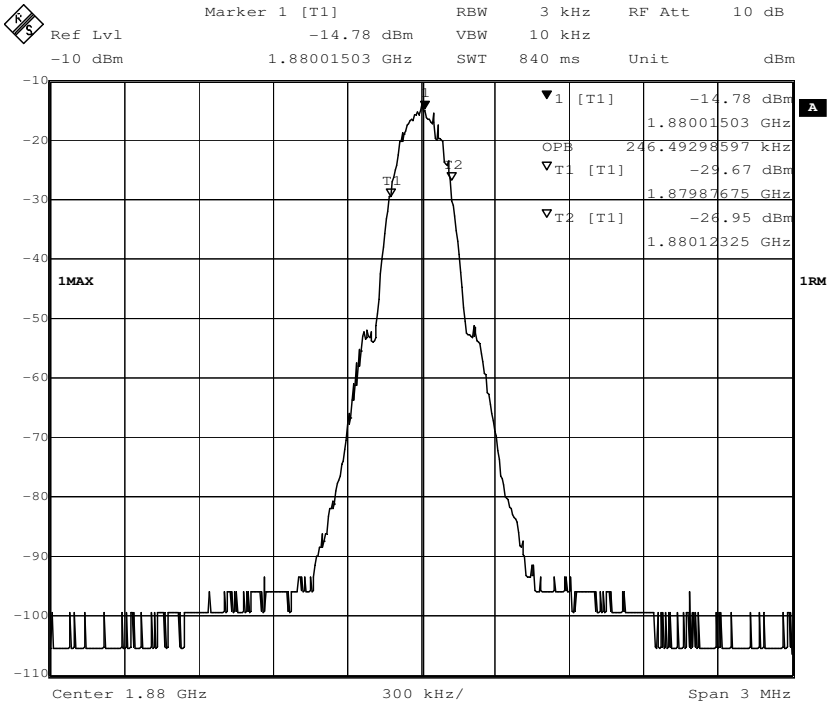
1.1.1 lowest frequency– Input



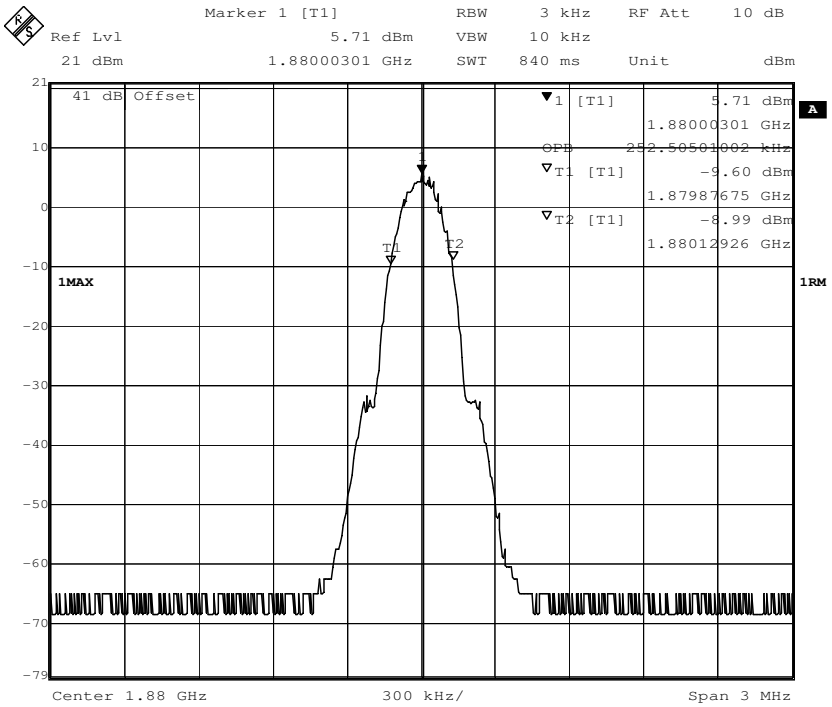

1.1.2 lowest frequency-- Output



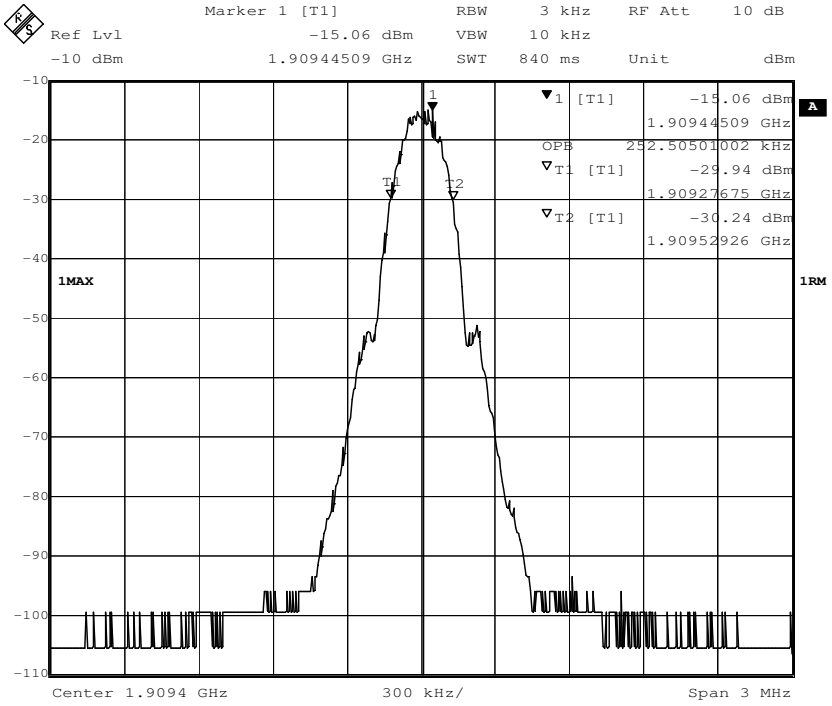
1.1.3 middle frequency-- Input



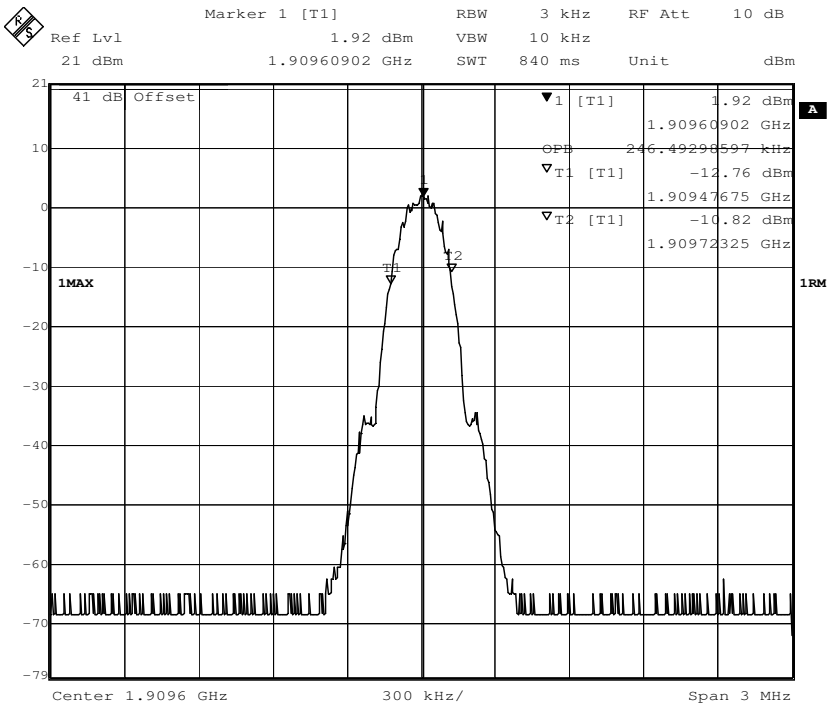

1.1.4 middle frequency-- Output



1.1.5 highest frequency—Input

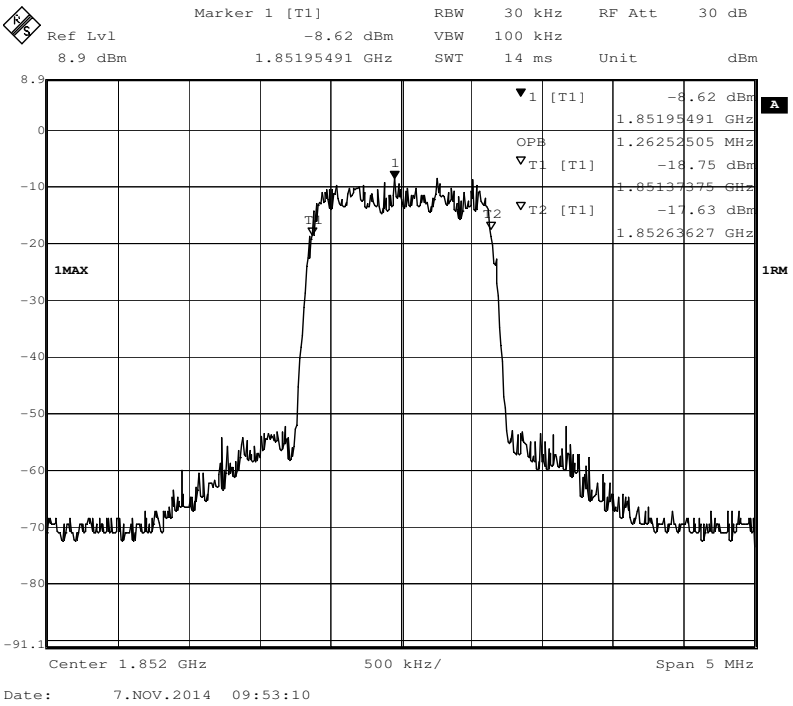



1.1.6 highest frequency--Output

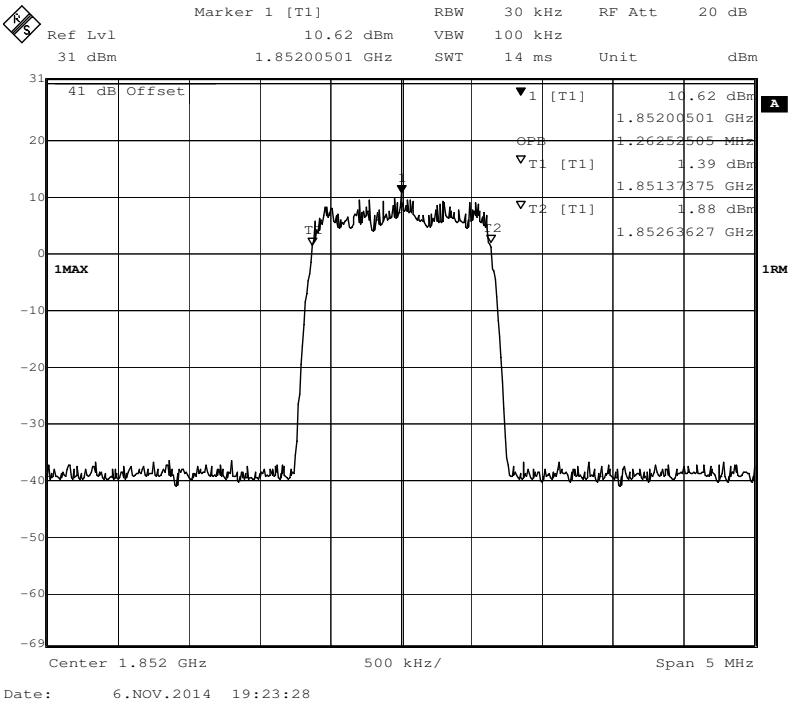


2.1 CDMA Mode:

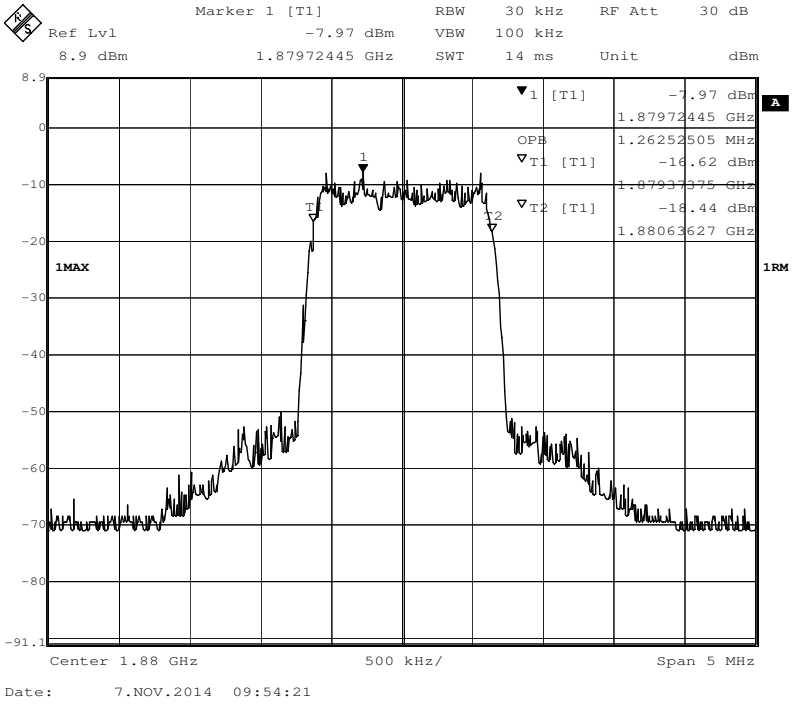
2.1.1 lowest frequency– Input



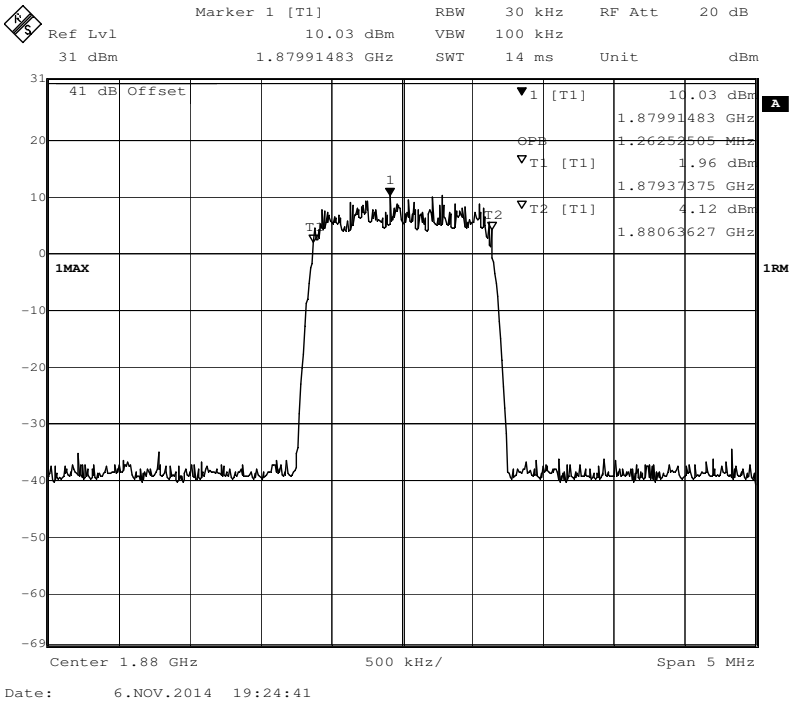

2.1.2 lowest frequency-- Output



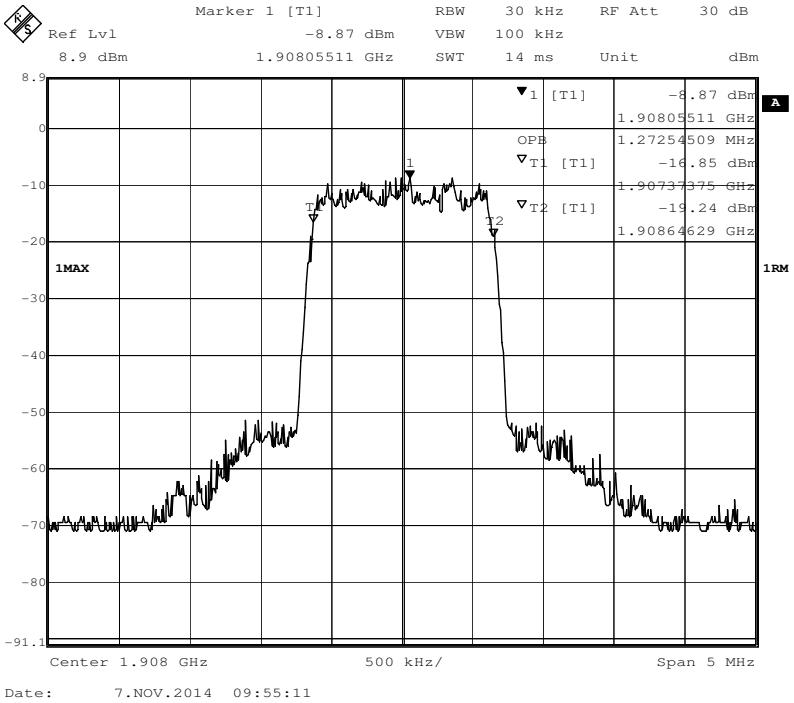
2.1.3 middle frequency-- Input



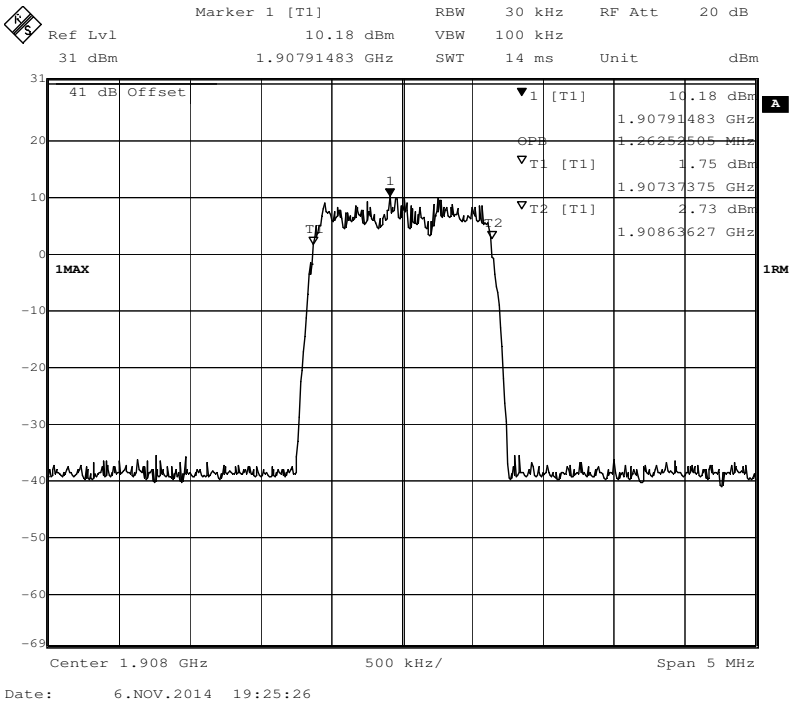

2.1.4 middle frequency-- Output



2.1.5 highest frequency—Input

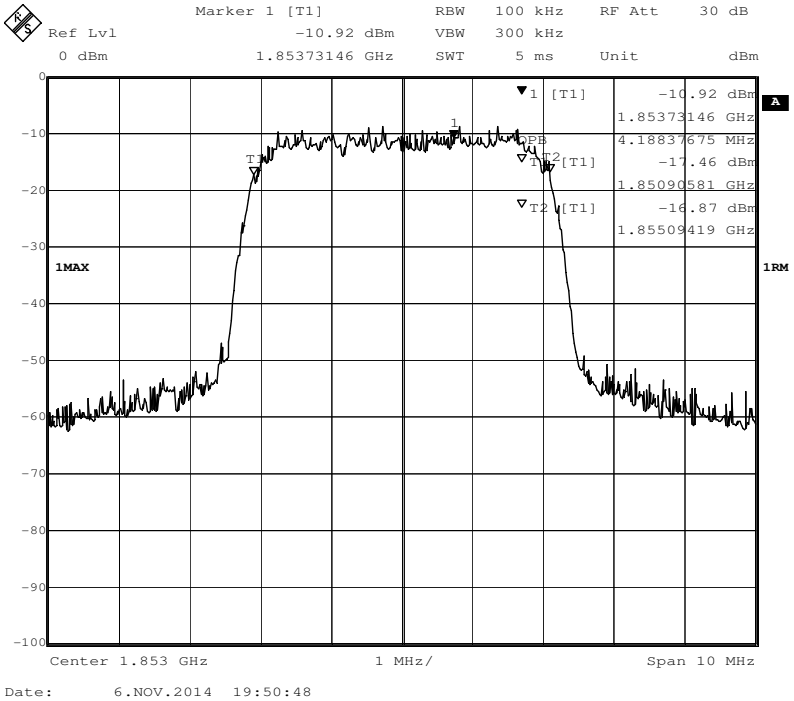



2.1.6 highest frequency--Output

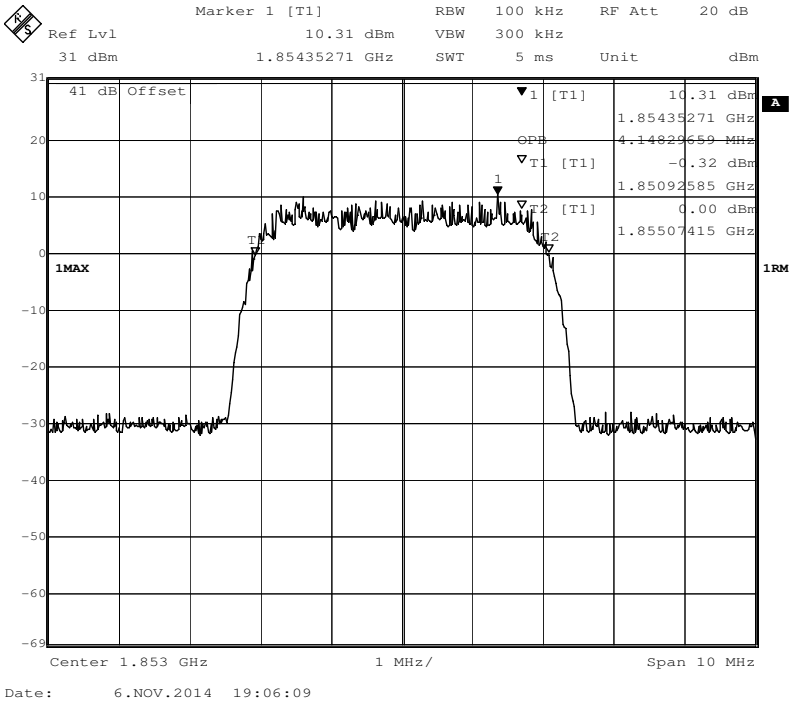


3.1 WCDMA Mode:

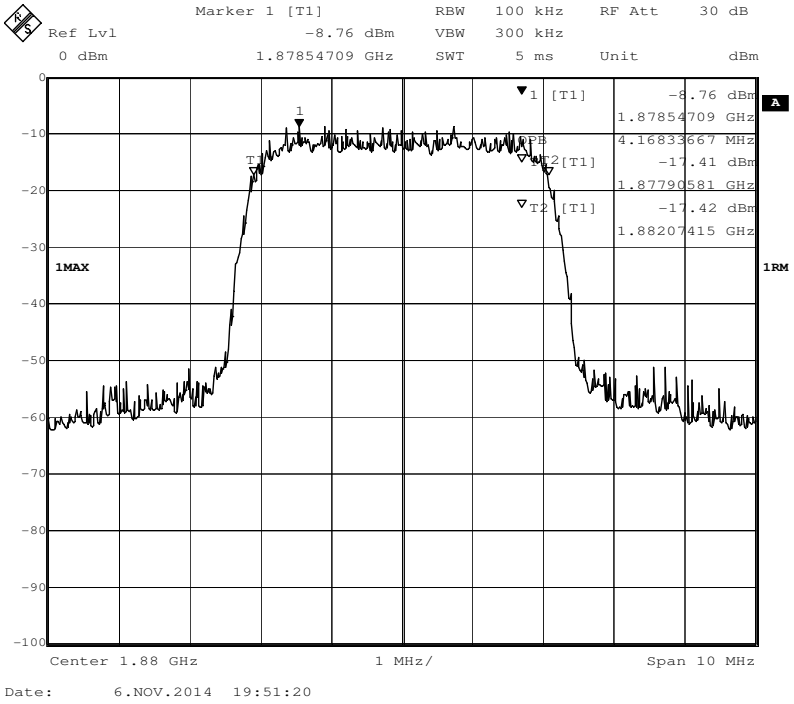
3.1.1 lowest frequency– Input



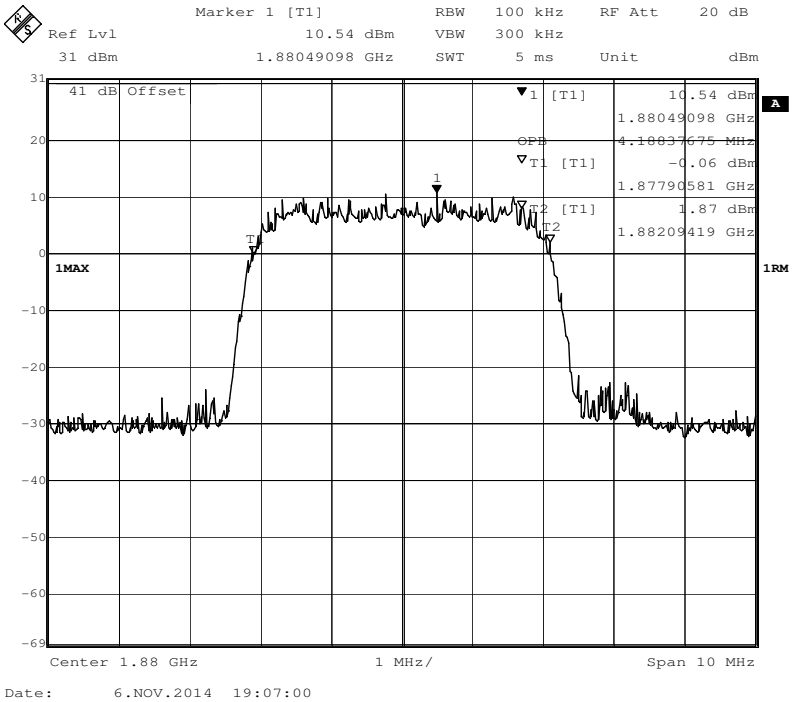

3.1.2 lowest frequency-- Output



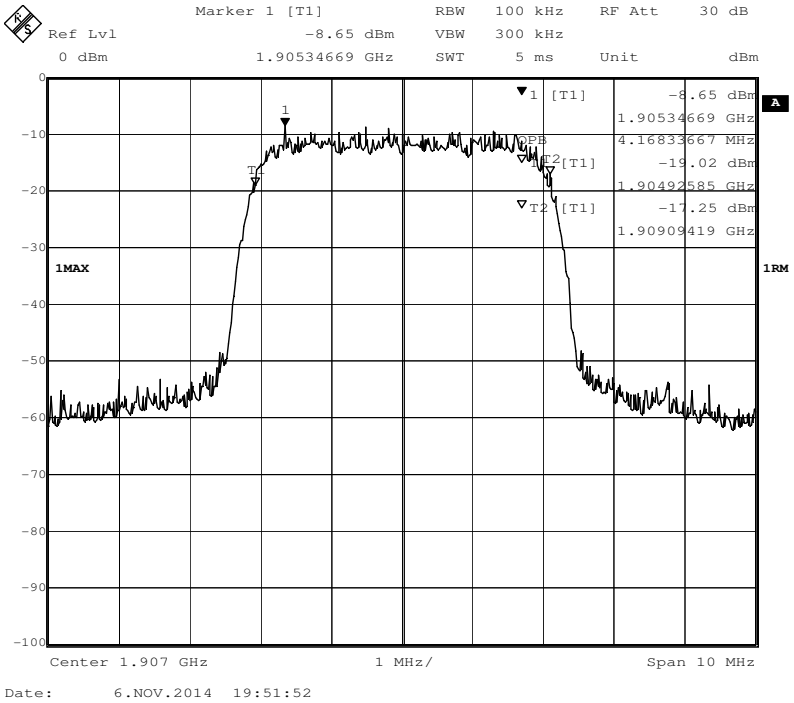
3.1.3 middle frequency-- Input



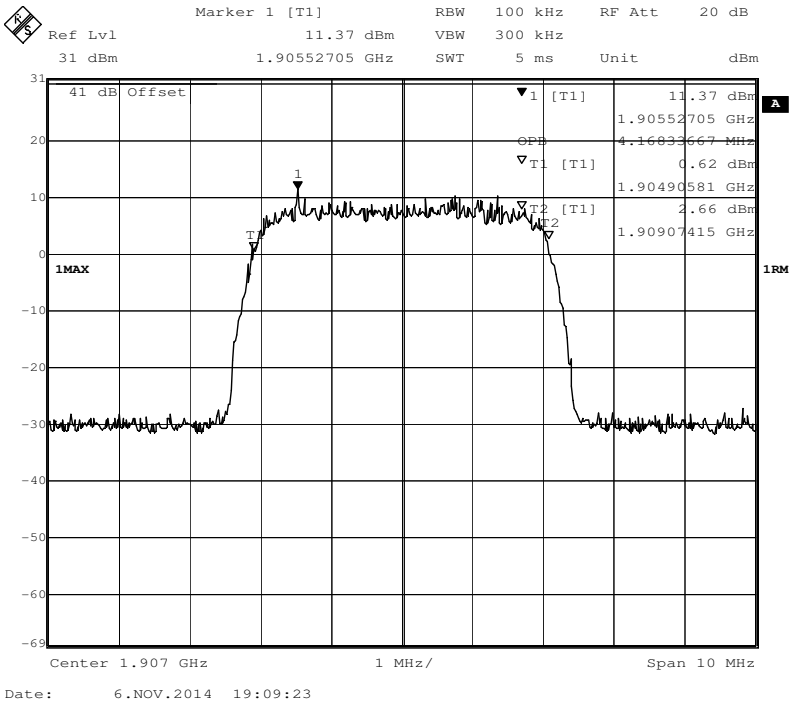

3.1.4 middle frequency-- Output



3.1.5 highest frequency—Input




3.1.6 highest frequency--Output



### 7.2.9 Oscillation Detection

Test Date:

Test Requirement: FCC Part20.21(e)(8)(ii)(A)

(A) Anti-Oscillation. 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. After five such restarts, the booster must not resume operation until manually reset.

Test Method: KDB 935210 D03 v02r01 Section7.11

EUT Operation:

Status: Test the EUT uplink and downlink were fed back up

Conditions: Normal conditions

Application: Cellular Band RF output ports

Test Configuration:

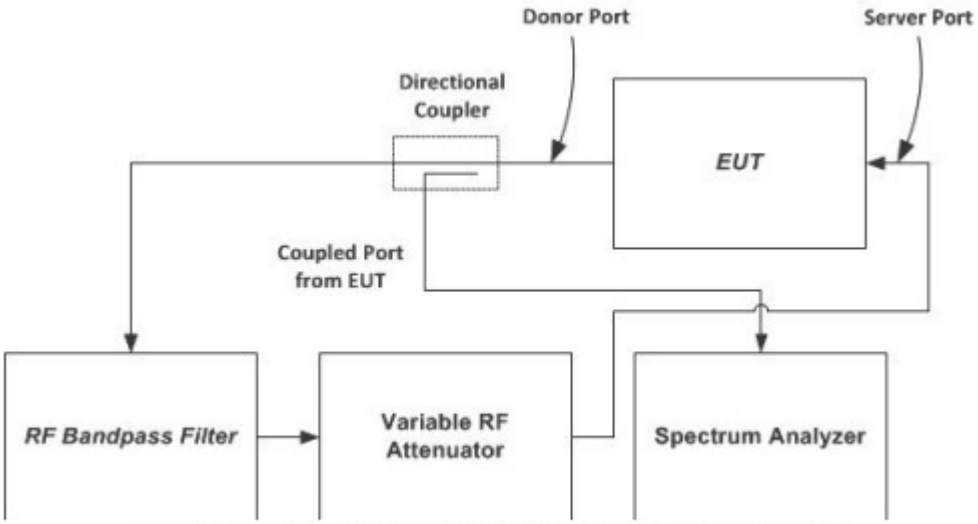



Figure 8 Oscillation detection instrumentation test setup

Test Procedure:

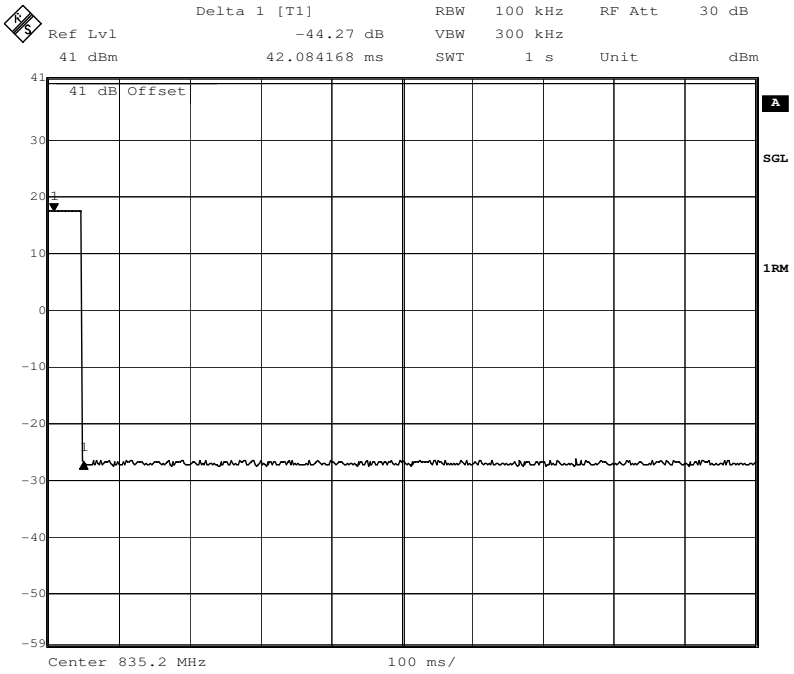
a) Connect the EUT set for normal operation to the test equipment as shown in **Figure 8** beginning with the spectrum analyzer on the uplink output side of the RF path. Ensure that the RF coupled path is connected to the spectrum analyzer.
*Note: The band pass filter shall provide sufficient out-of-band rejection to prevent oscillations from occurring in bands not under test.*
b) Set the spectrum analyzer's center frequency to the center of the band under test. Set the spectrum analyzer's span to equal or slightly exceed the width of the band under test. Set the spectrum analyzer for a continuous sweep, max-hold. Set the spectrum analyzer's RBW to at least 1 MHz and the VBW to > 3 times RBW.
c) Decrease the variable attenuator until the spectrum analyzer displays a signal within the band under test. Using a marker, identify the approximate center frequency of this signal on the max-hold display, then increase the attenuation by 10 dB. Reset the EUT.
d) Repeat step 7.11c) twice to ensure that the center of the signal created by the booster remains within 250 kHz of the spectrum analyzer's center frequency. If the frequency of the signal is unstable, ensure that the spectrum analyzer is centered between the frequency extremes observed. If the signal is wider than 1 MHz, ensure that the spectrum analyzer is centered on the signal by increasing the resolution bandwidth. Reset the EUT after each oscillation event if necessary. Set the spectrum analyzer's sweep trigger level such that it's just below the peak amplitude of the displayed oscillation signal from the EUT.
e) Set the spectrum analyzer to zero-span with a sweep time of 5 seconds, single-sweep with max-hold. The spectrum analyzer's sweep trigger level in this and subsequent steps shall be the level identified in step 7.11d).
f) Decrease the variable attenuator until the spectrum analyzer's sweep is triggered, then increase the attenuation 10 dB. Reset the EUT.
g) Reset the zero-span trigger of the spectrum analyzer and repeat step 7.11f) twice to ensure that the spectrum analyzer is reliably triggered, resetting the EUT after each oscillation event if necessary.
h) Reset the zero-span sweep trigger of the spectrum analyzer and reset the EUT with a power cycle.
i) Force the EUT to oscillate by reducing the attenuation.
j) Use the Marker function of the spectrum analyzer to measure the time from the on-set of oscillation until the EUT turns off by setting Marker 1 on the leading edge of the oscillation signal and Marker 2 on the trailing edge. The spectrum analyzer's sweep time may be altered to improve the time resolution of these cursors.
k) Capture the spectrum analyzer's zero-span trace for inclusion in the test report.
l) Repeat steps 7.11b) to 7.11k) for all operational uplink and downlink bands.
m) Set the spectrum analyzer's zero-span sweep time for longer than 1 minute and measure the restart time for each operational uplink and downlink band.
n) Replace the normal operating EUT for the EUT set-up to support an anti-oscillation test mode.
o) Set the spectrum analyzer's zero-span time for a minimum of 120 seconds and a single sweep.
p) Manually trigger the spectrum analyzer's zero-span sweep and a manually force the booster into oscillation as in step 7.11i).
q) When the sweep is complete place cursors between the first two oscillation detections and save the plot for inclusion in the test report. The time between restarts must match the manufacturer's timing for the test mode and there can be no more than 5 restarts.
r) Repeat steps 7.11m) to 7.11q) for all operational uplink and downlink bands.

Test limit: within 0.3 seconds in the uplink band and within 1 second in the downlink band

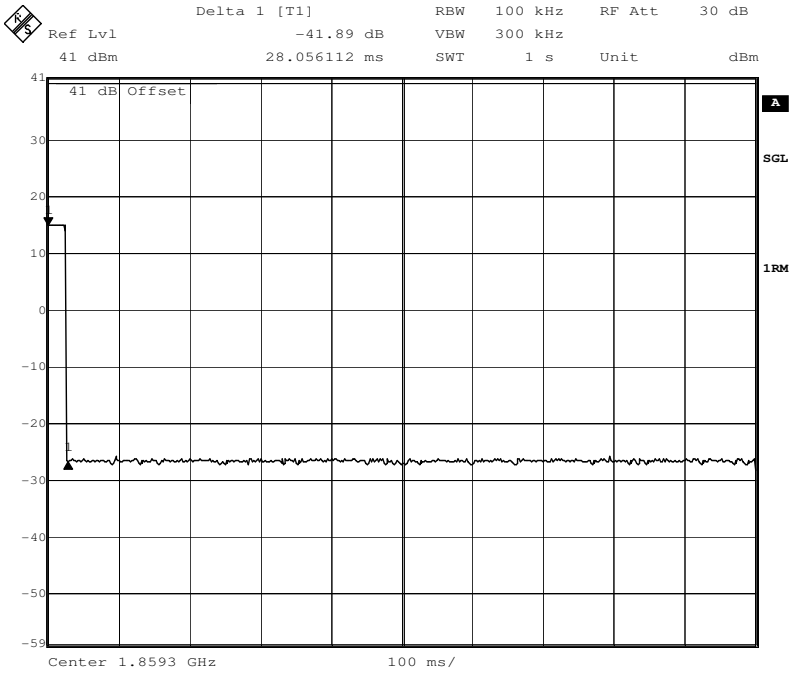
### 7.2.9.1 Measurement Record:

1.1 Uplink detection time test results

1.1.1 824-849MHz

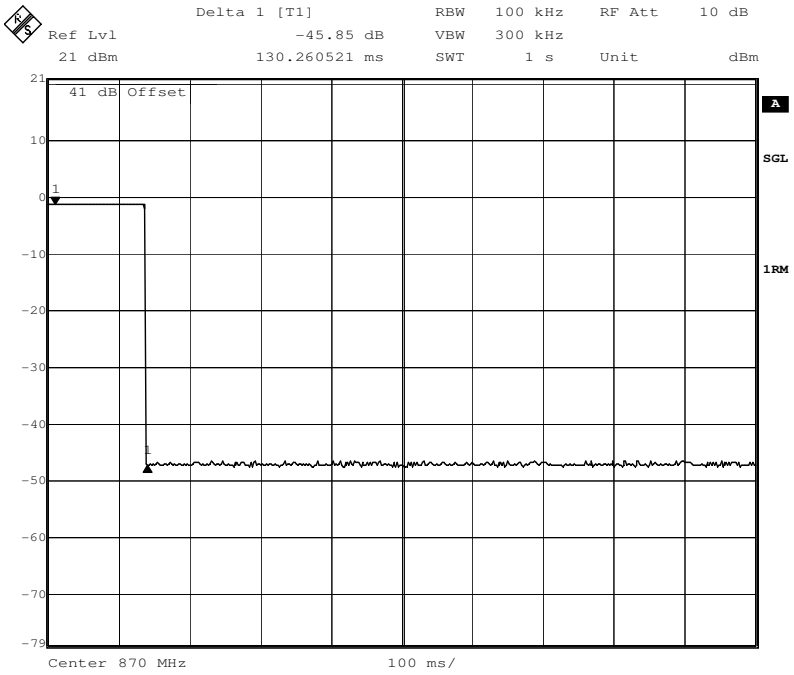



1.1.2 1850-1910MHz

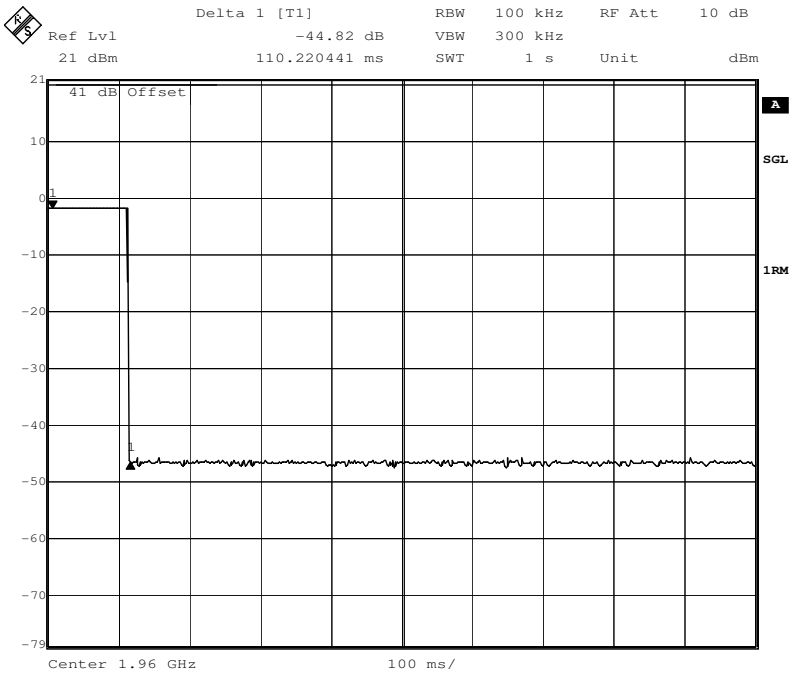


1.2 Downlink detection time test results

1.2.1 869-894MHz

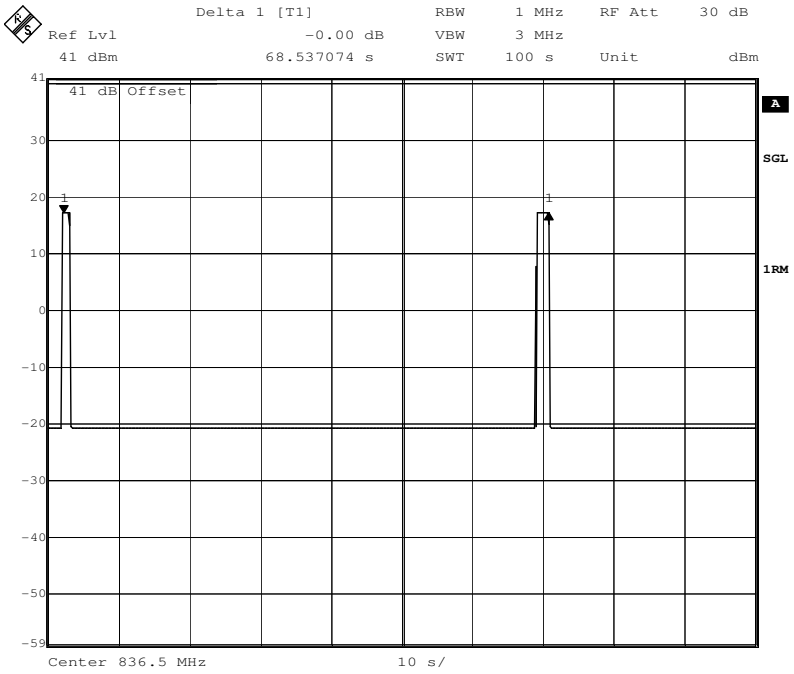



1.2.2 1930-1990MHz

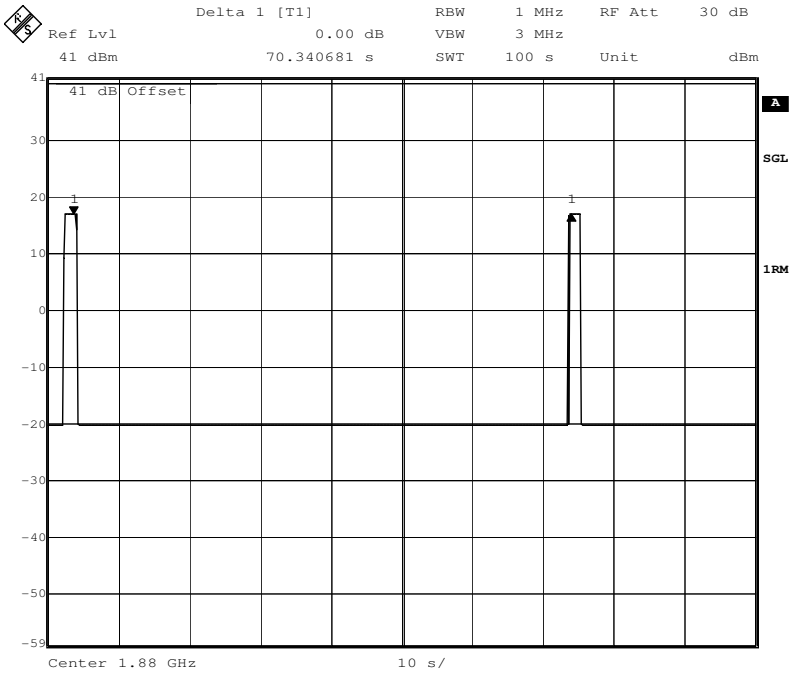


1.3 Uplink restart time test results

1.3.1 824-849MHz

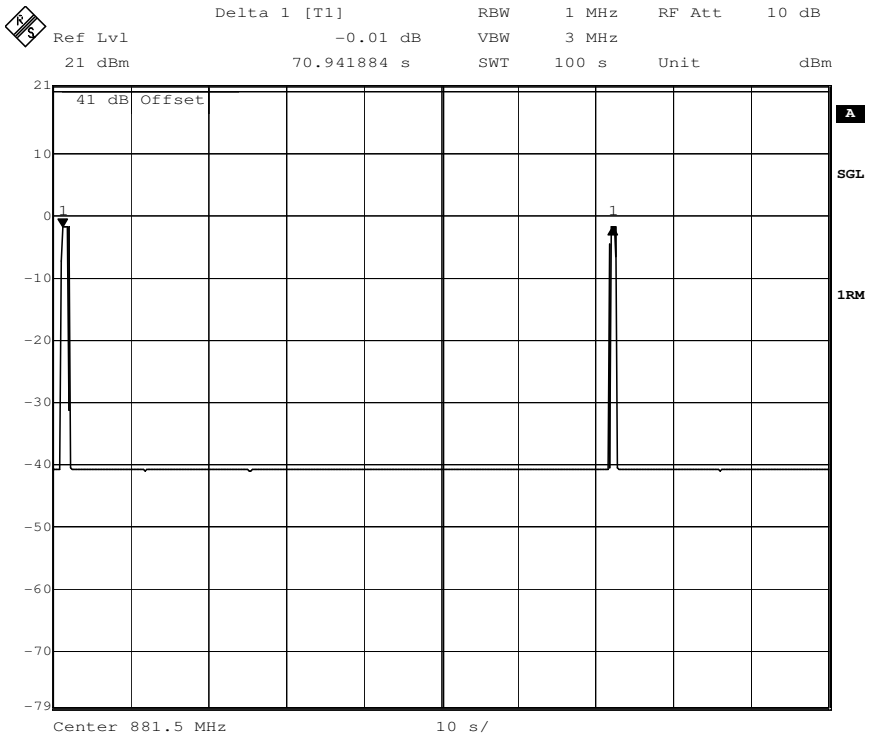



1.3.2 1850-1910MHz

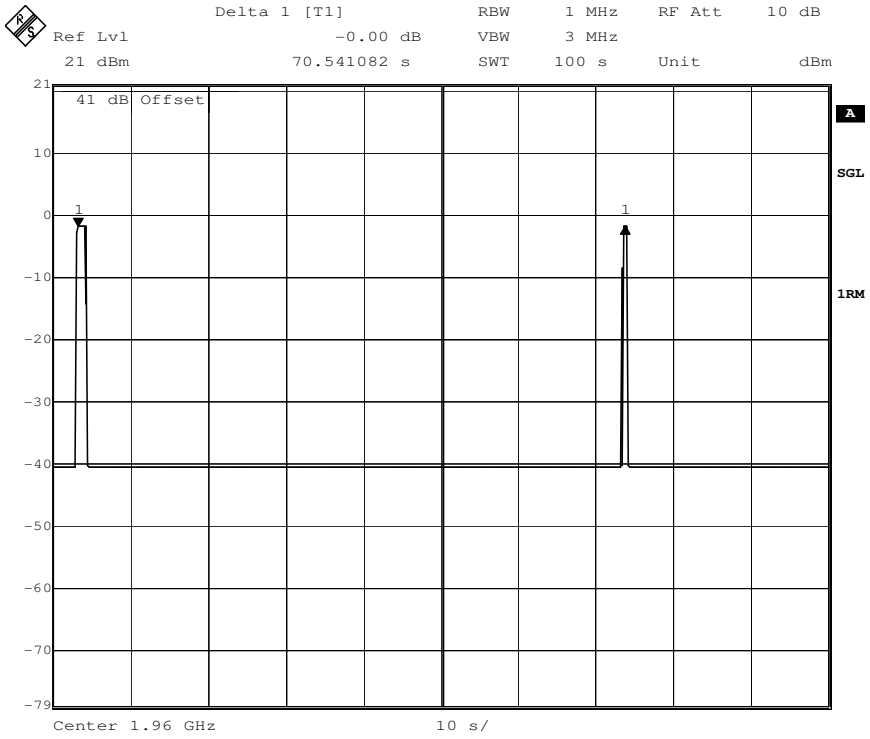


1.4 Downlink restart time test results

1.4.1 869-894MHz

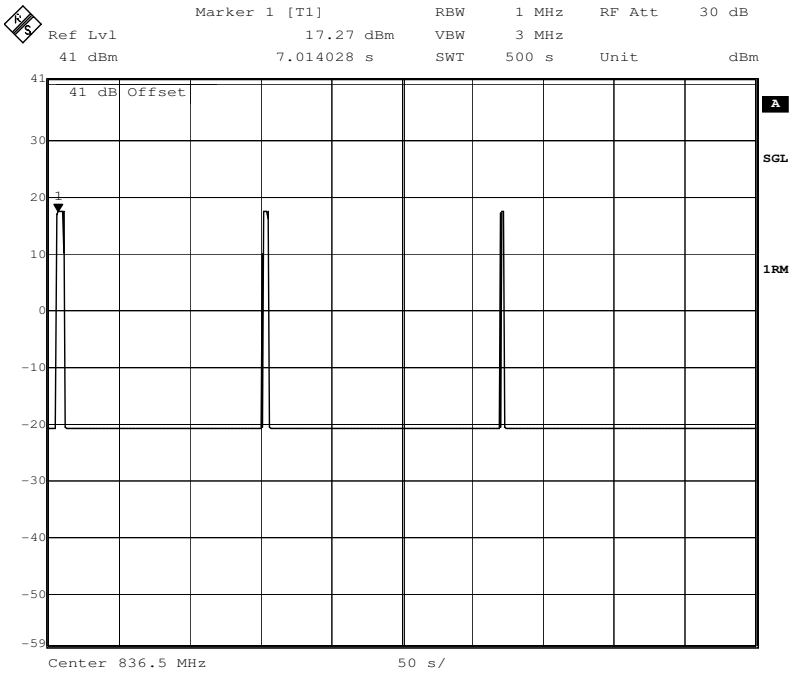



1.4.2 1930-1990MHz

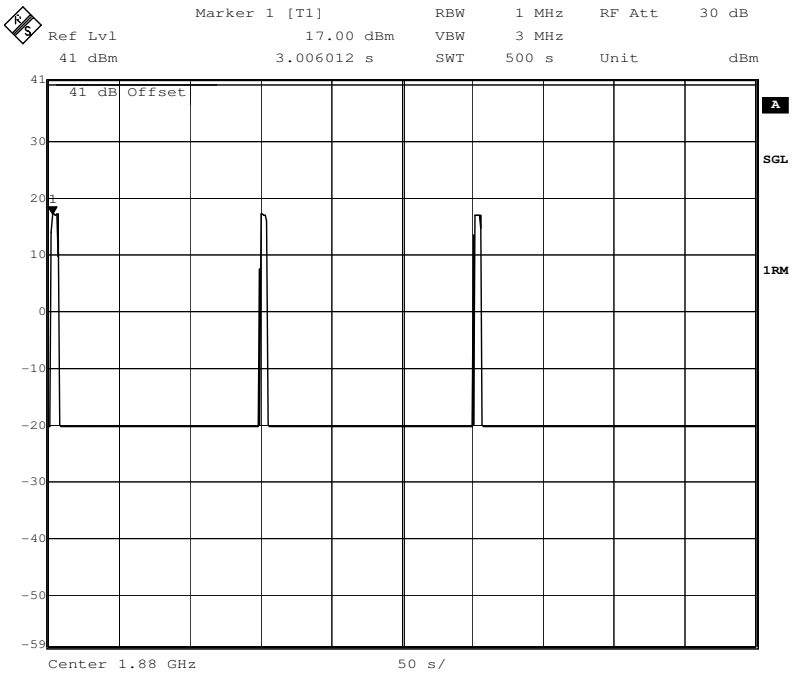


1.5Uplink restart Count test results

1.5.1 824-849MHz

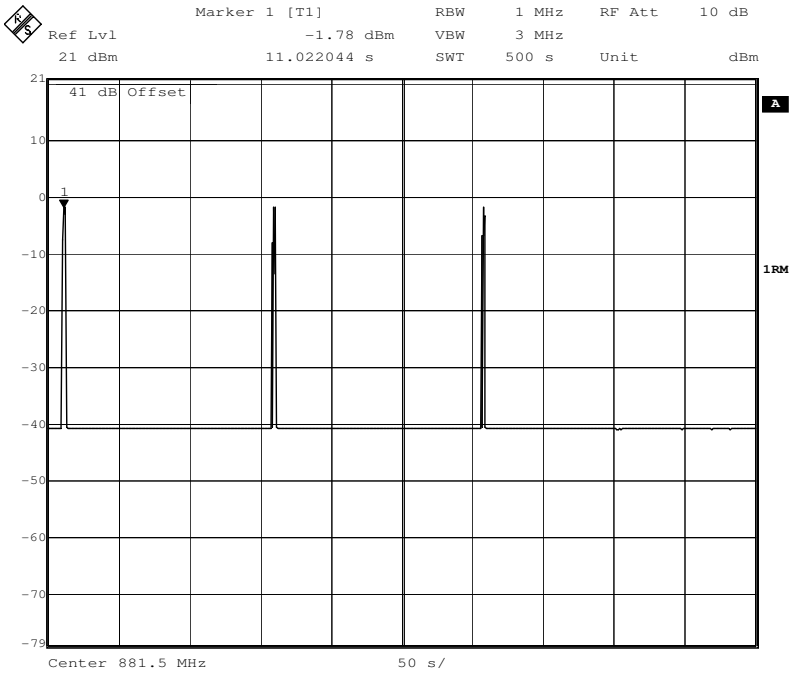



1.5.2 1850-1910MHz

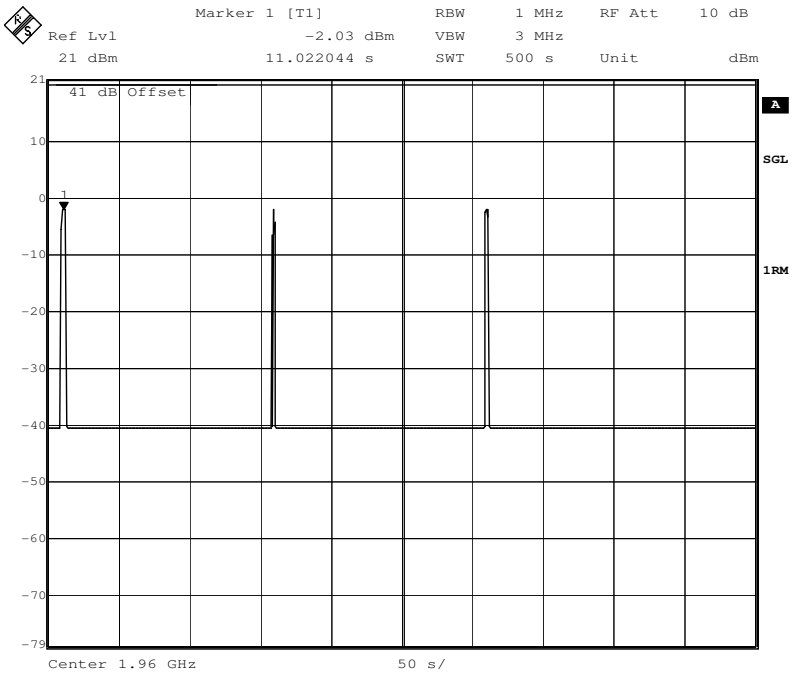


1.6 Downlink restart Count test results

1.6.1 869-894MHz




1.6.2 1930-1990MHz



1.Test in the uplink for detection time:

| Frequency band (MHz) | Measured Time (mS) | Limit (mS) | Results |
|---|---|---|---|
| 824-849MHz | 42.1 | 300 | Pass |
| 1850-1910MHz | 28.1 | 300 | Pass |

2.Test in the downlink for detection time:

| Frequency band (MHz) | Measured Time (mS) | Limit (mS) | Over limit |
|---|---|---|---|
| 869-894MHz | 130.2 | 1000 | Pass |
| 1930-1990MHz | 110.2 | 1000 | Pass |

3.Test in the uplink for restart time:

| Frequency band (MHz) | Measured Time (S) | Limit (S) | Over limit |
|---|---|---|---|
| 824-849MHz | 68.5 | ≥60 | Pass |
| 1850-1910MHz | 70.3 | ≥60 | Pass |

4.Test in the downlink for restart time:

| Frequency band (MHz) | Measured Time (S) | Limit (S) | Over limit |
|---|---|---|---|
| 869-894MHz | 70.9 | ≥60 | Pass |
| 1930-1990MHz | 70.5 | ≥60 | Pass |

5. Test in the uplink for restart count

| Frequency band (MHz) | Restart (S) | Limit (S) | Over limit |
|---|---|---|---|
| 869-894MHz | 3 | ＜5 | Pass |
| 1930-1990MHz | 3 | ＜5 | Pass |

6. Test in the downlink for restart count

| Frequency band (MHz) | Restart (S) | Limit (S) | Over limit |
|---|---|---|---|
| 869-894MHz | 3 | ＜5 | Pass |
| 1930-1990MHz | 3 | ＜5 | Pass |

## 7.2.10 Radiated Spurious Emissions

Test Date:

Test Requirement: FCC part 22.917(a) & FCC part 24.238(a)

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 Method: FCC part 2.1053

ANSI/TIA-603-C-2004

EUT Operation:

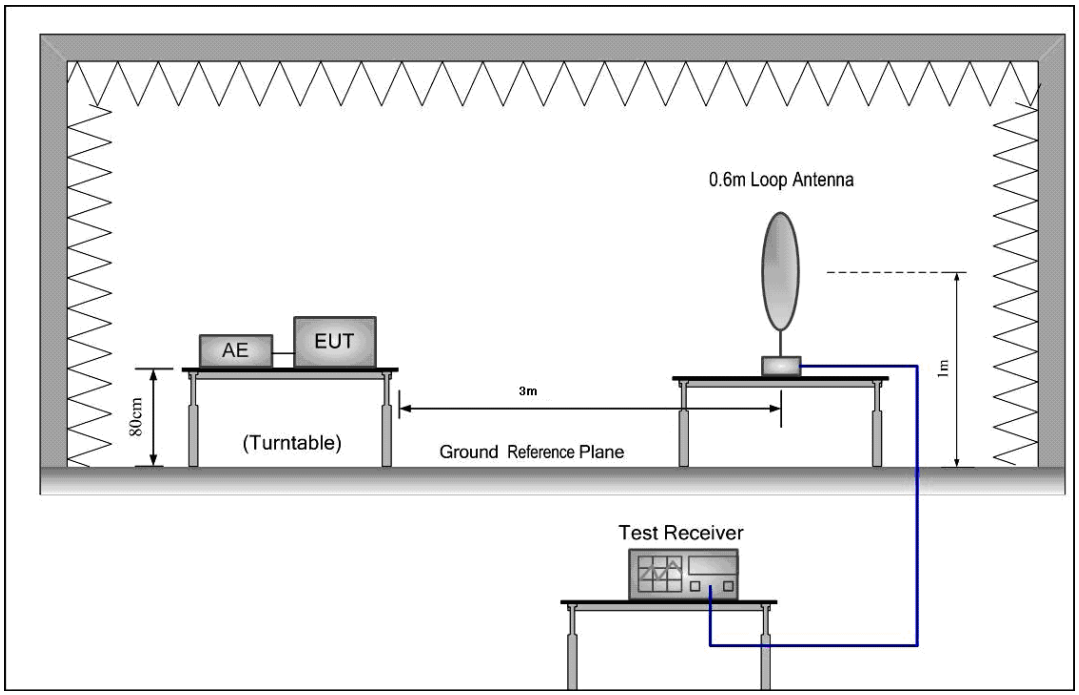
Status: Drive the EUT to maximum output power.

Conditions: Normal conditions

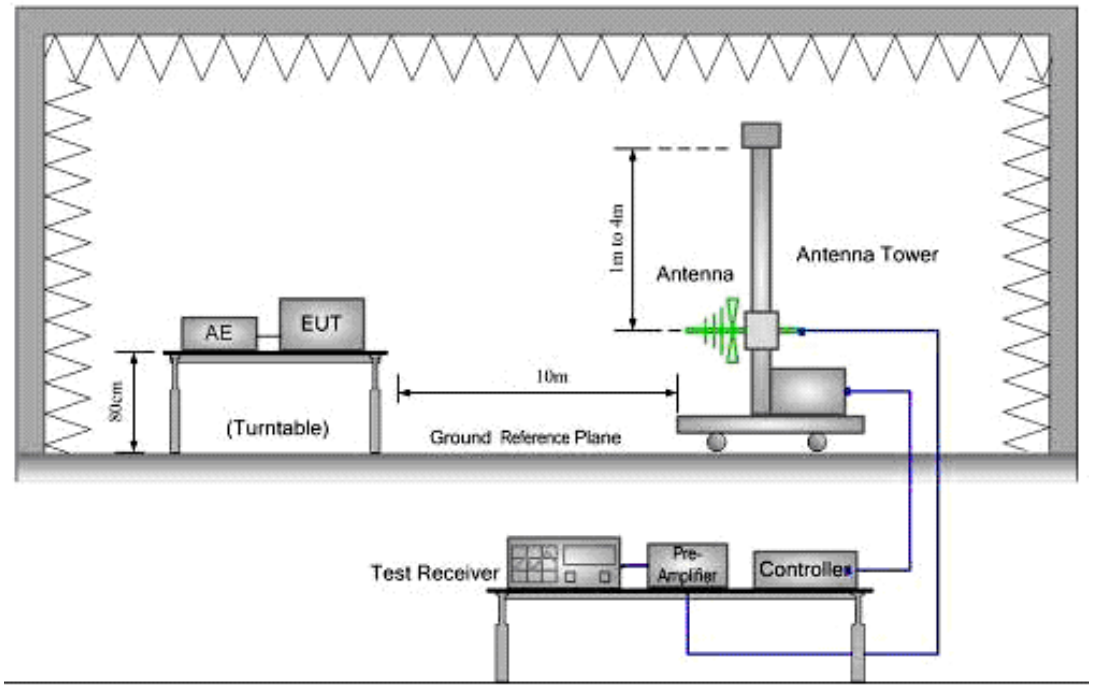
Application: Enclosure

Test Configuration:

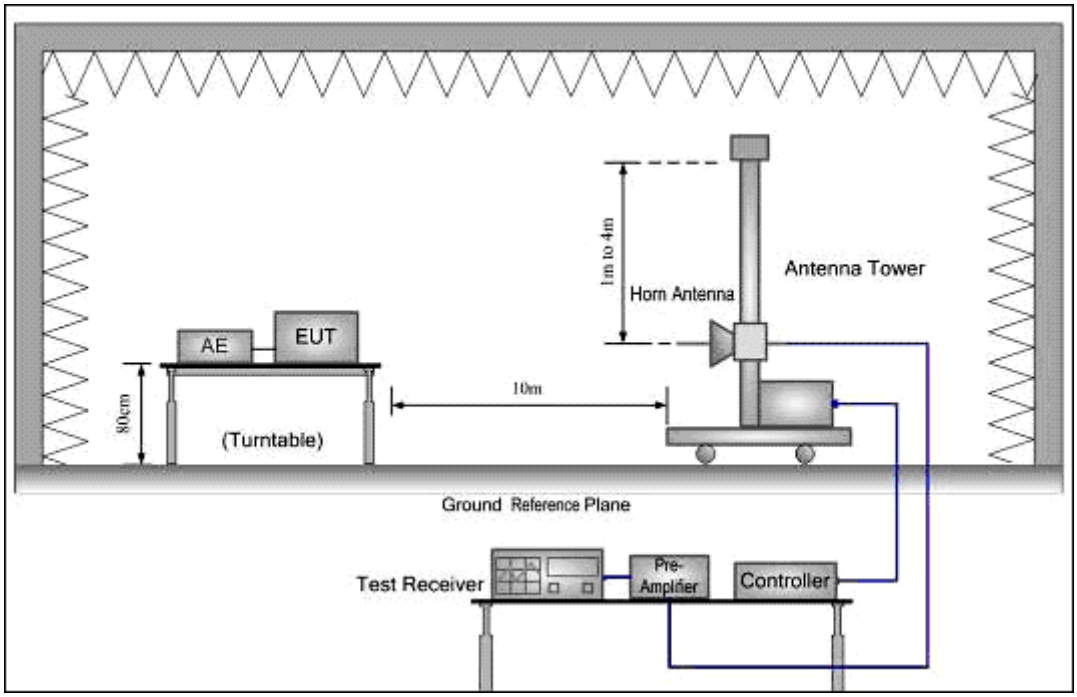
9 kHz to 30 MHz emissions:



30MHz to 1GHz emissions:



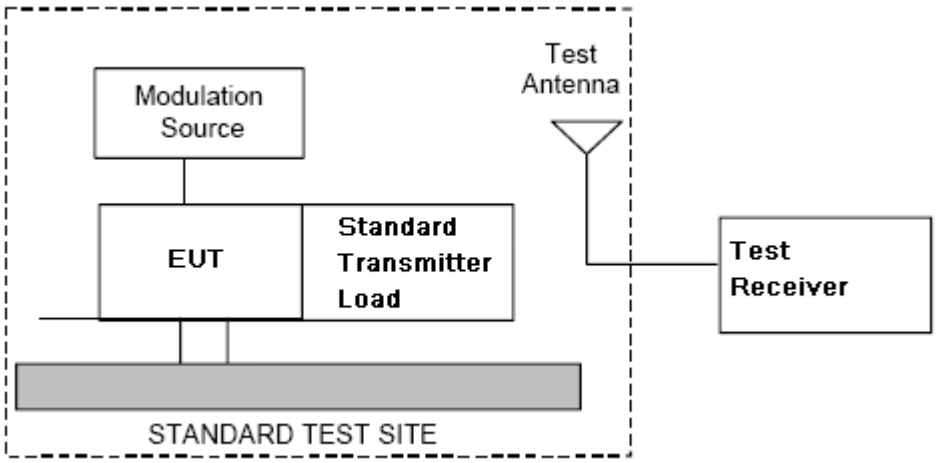

1GHz to 40GHz emissions:



Test Procedure:

1. Test the background noise level with all the test facilities;
2. Keep one transmitting path, all other connectors shall be connected by normal power or RF leads;
3. Select the suitable RF notch filter to avoid the test receiver or spectrum analyzer produce unwanted spurious emissions;
4. Keep the EUT continuously transmitting in max power;
5. Read the radiated emissioins of the EUT enclosure.

Radiated Emissions Test Procedure:




a) Connect the equipment as illustrated.

b) Adjust the spectrum analyzer for the following settings:

1) Resolution Bandwidth = 100 kHz for spurious emissions below 1 GHz, and 1 MHz for spurious emissions above 1GHz.

2) Video Bandwidth = 300 kHz for spurious emissions below 1 GHz, and 3 MHz for spurious emissions above 1 GHz.

3) Sweep Speed slow enough to maintain measurement calibration.

4) Detector Mode = Positive Peak.

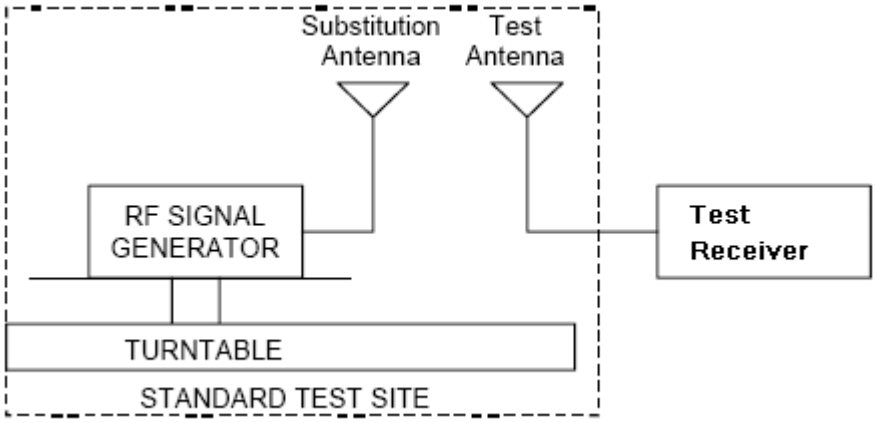
c) Place the transmitter to be tested on the turntable in the standard test site, The transmitter is transmitting into a nonradiating load that is placed on the turntable. The RF cable to this load should be of minimum length.

d) Measurements shall be made from30MHz to 10 tims of fundamental carrier, except for the region close to the carrier equal to ± the carrier bandwidth.

e) Key the transmitter without modulation or normal modulation base the standard.

f) For each spurious frequency, raise and lower the test antenna from 1 m to 4 m to obtain a maximum reading on the spectrum analyzer with the test antenna at horizontal polarity. Then the turntable should be rotated 360° to determine the maximum reading. Repeat this procedure to obtain the highest possible reading. Record this maximum reading.

g) Repeat step f) for each spurious frequency with the test antenna polarized vertically.




h) Reconnect the equipment as illustrated.

i) Keep the spectrum analyzer adjusted as in step b).

j) Remove the transmitter and replace it with a substitution antenna (the antenna should be half-wavelength for each frequency involved). The center of the substitution antenna should be approximately at the same location as the center of the transmitter. At the lower frequencies, where

the substitution antenna is very long, this will be impossible to achieve when the antenna is polarized vertically. In such case the lower end of the antenna should be 0.3 m above the ground.

k) Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a nonradiating cable. With the antennas at both ends horizontally polarized, and with the signal generator tuned to a particular spurious frequency, raise and lower the test antenna to

obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained. This should be done carefully repeating the adjustment of the test antenna and generator output.

l) Repeat step k) with both antennas vertically polarized for each spurious frequency.

m) Calculate power in dBm into a reference ideal half-wave dipole antenna by reducing the readings obtained in steps k) and l) by the power loss in the cable between the generator and the antenna, and further corrected for the gain of the substitution antenna used relative to an ideal half-wave dipole

antenna by the following formula:

*Pd*(dBm) = *Pg*(dBm) – *cable loss* (dB) + *antenna gain* (dB)

where:

*Pd* is the dipole equivalent power and

*Pg* is the generator output power into the substitution antenna.

NOTE: It is permissible to use other antennas provided they can be referenced to a dipole.

NOTE: Effective radiated power (e.r.p) refers to the radiation of a half wave tuned dipole instead of an isotropic antenna. There is a constant difference of 2.15 dB between e.i.r.p. and e.r.p.

e.r.p (dBm) = e.i.r.p. (dBm) – 2.15

**7.2.10.1Measurement Record:**

No emissions were detected within 20dB below the limit for the Downlink direction.

No emissions were detected within 20dB below the limit for the Uplink direction.

**Remark:**

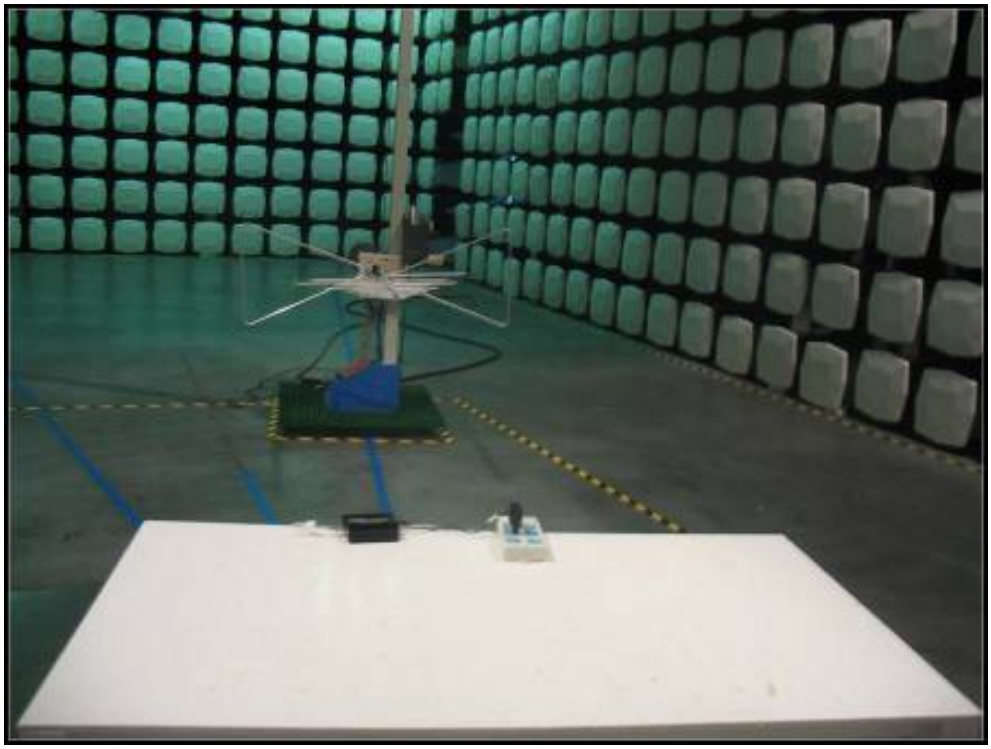
The cabinet radiation was measured with the equipment transmitting a CW signal into a non-radiating 50 Ohm load at maximum output power on a signal frequency .

Measured were performed in the lowest, middle and hightest frequency for : the Downlink & Uplink.

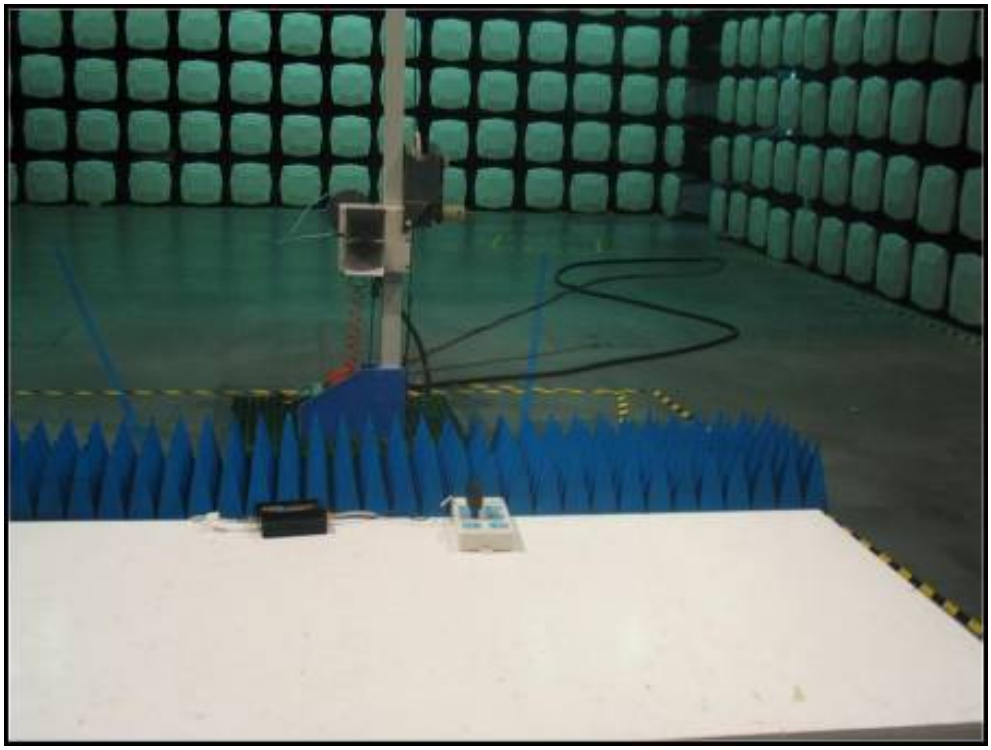
The spectrum was searched from 9KHz to 26GHz (10th Harmonic) for downlink & Uplink;

# 8 Photographs - Test Setup

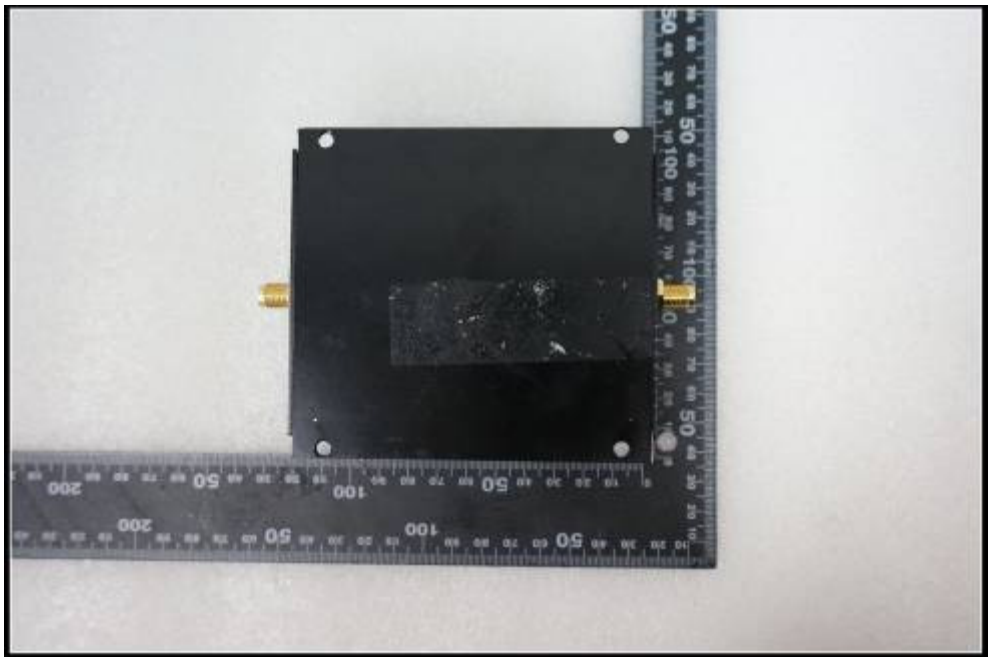
**30MHz ~ 1GHz Radiated Emission**

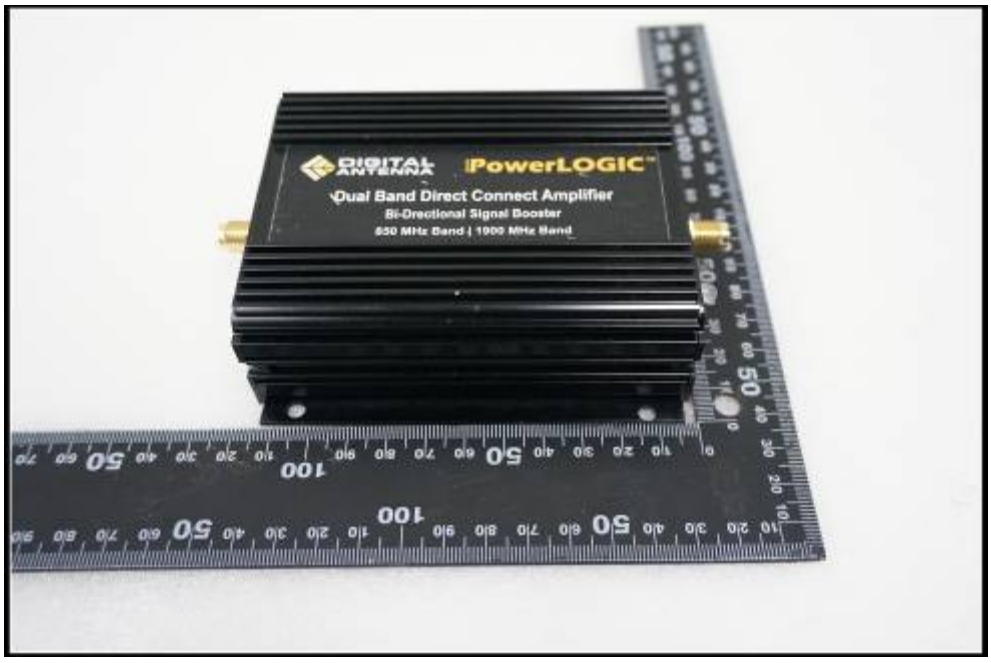


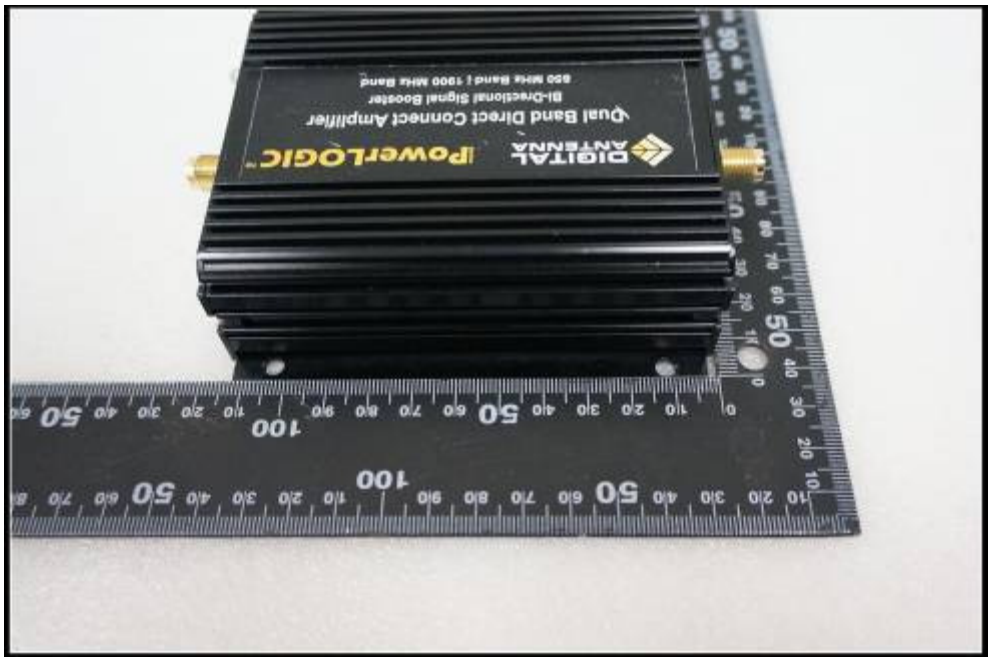
**Above 1GHz Radiated Emission**

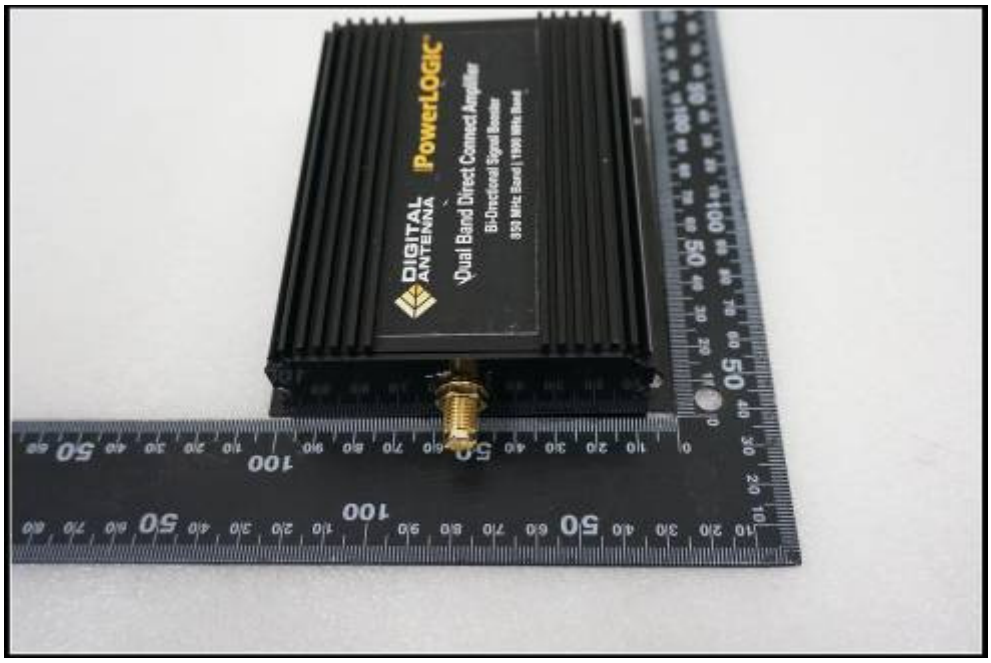


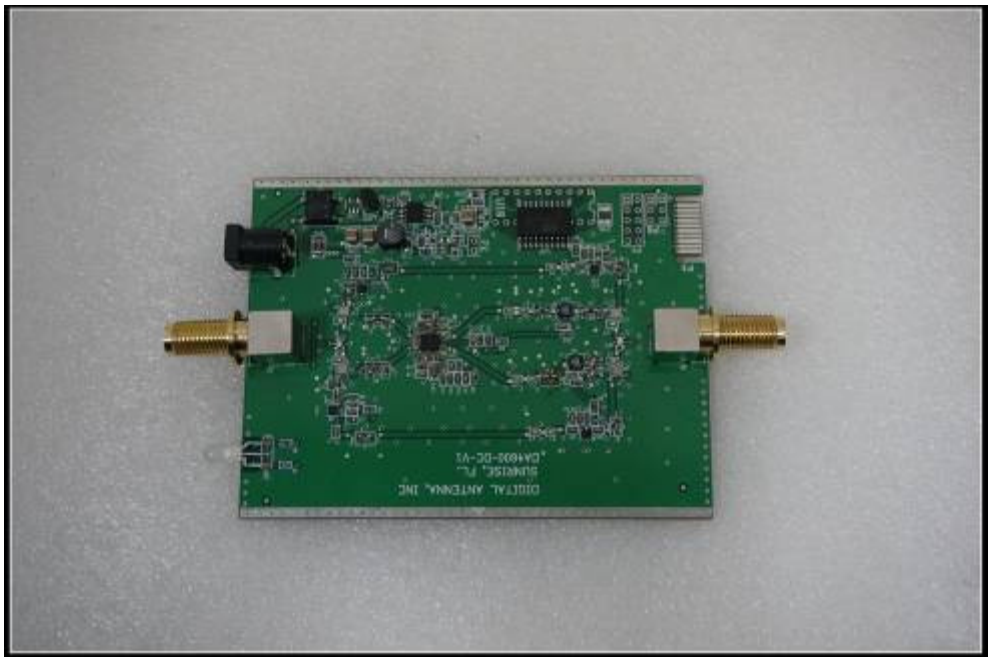
# 9 Photographs - EUT Constructional Details

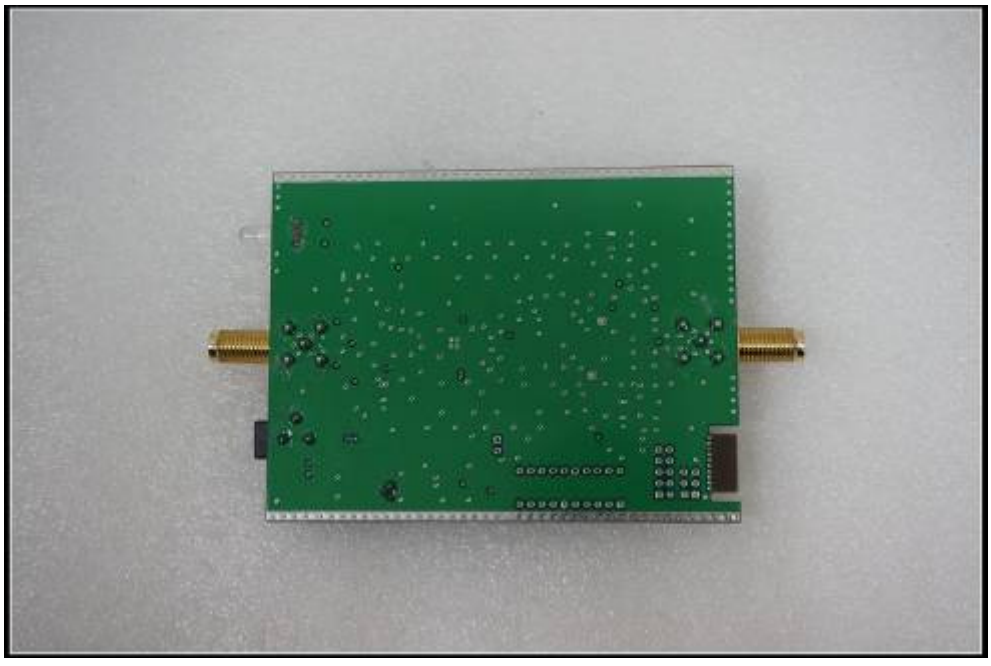









**--The End of Report--**