# TEST REPORT

## No. I19Z62089-WMD02

**for**

**TCL Communication Ltd.**

**HSUPA/HSDPA/UMTS Tri Band/GSM Quad Band/LTE 8 Band Mobile Phone**

**Model Name: 4052O**

**FCC ID: 2ACCJN035**

**with**

**Hardware Version: 04**

**Software Version: ZZX1**

**Issued Date: 2019-12-10**

**Note:**

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

**Test Laboratory:**

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## REPORT HISTORY

| Report Number | Revision | Description | Issue Date |
|---|---|---|---|
| I19Z62089-WMD03 | Rev.0 | 1st edition | 2019-12-10 |

Note: the latest revision of the test report supersedes all previous version.

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# 1. Test Laboratory

## 1.1. Introduction & Accreditation

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2005 accredited test laboratory under NATIONAL VOLUNTARY LABORATORY ACCREDITATION PROGRAM (NVLAP) with lab code 600118-0 and is also an FCC accredited test laboratory (CN5017), and ISED accredited test laboratory (CN0066). The detail accreditation scope can be found on NVLAP website.

## 1.2. Testing Location

Location 1: CTTL (huayuan North Road)

Address: No. 52, Huayuan North Road, Haidian District, Beijing, P. R. China 100191

Location 2: CTTL (Shouxiang)

Address: No. 51 Shouxiang Science Building, Xueyuan Road, Haidian District, Beijing, P. R. China 100191

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## 1.3. Testing Environment

Normal Temperature: 15-35℃

Relative Humidity: 20-75%

## 1.4. Project data

Testing Start Date: 2019-05-10

Testing End Date: 2019-12-09

## 1.5. Signature

**Dong Yuan**

**(Prepared this test report)**

**Zhou Yu**

**(Reviewed this test report)**

**Zhao Hui Lin**

**Deputy Director of the laboratory**

**(Approved this test report)**

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# 2. Client Information

## 2.1. Applicant Information

| | |
|---|---|
| Company Name: | TCL Communication Ltd. |
| Address /Post: | 7/F, Block F4, TCL International E City, Zhong Shan Yuan Road, Nanshan District, Shenzhen, Guangdong, P.R. China 518052 |
| Contact: | Gong Zhizhou |
| Email: | zhizhou.gong@tcl.com |
| Telephone: | 0086-755-36611722 |
| Fax: | 0086-755-36612000-81722 |

## 2.2. Manufacturer Information

| | |
|---|---|
| Company Name: | TCL Communication Ltd. |
| Address /Post: | 7/F, Block F4, TCL International E City, Zhong Shan Yuan Road, Nanshan District, Shenzhen, Guangdong, P.R. China 518052 |
| Contact: | Gong Zhizhou |
| Email: | zhizhou.gong@tcl.com |
| Telephone: | 0086-755-36611722 |
| Fax: | 0086-755-36612000-81722 |

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# 3. Equipment UnderTest (EUT) and Ancillary Equipment (AE)

## 3.1. About EUT

| | |
|---|---|
| Description | HSUPA/HSDPA/UMTS Tri Band/GSM Quad Band/LTE 8 Band Mobile Phone |
| Model Name | 4052O |
| FCC ID | 2ACCJN035 |
| Antenna | Embedded |
| Output power | 23.92dBm maximum EIRP measured for WCDMA Band II |
| Extreme vol. Limits | 3.5VDC to 4.2VDC (nominal: 3.7VDC) |
| Extreme temp. Tolerance | -10°C to +55°C |

Note: Components list, please refer to documents of the manufacturer; it is also included in the original test record of CTTL.

## 3.2. Internal Identification of EUT used during the test

| EUT ID* | IMEI | HW Version | SW Version | Date of receipt |
|---|---|---|---|---|
| UT15a | 015635000000204 | 04 | ZZX1 | 2019-11-18 |
| UT32a | 015635000001319 | 04 | ZZX1 | 2019-11-18 |

*EUT ID: is used to identify the test sample in the lab internally.

## 3.3. Internal Identification of AE used during the test

| AE ID* | Description |
|---|---|
| AE1 | Battery |

AE1

| | |
|---|---|
| Model | TLi013C1 |
| Manufacturer | BYD |
| Capacitance | 1350mAh |

*AE ID: is used to identify the test sample in the lab internally.

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# 4. Reference Documents

## 4.1. Reference Documents for testing

The following documents listed in this section are referred for testing.

| Reference | Title | Version |
|---|---|---|
| FCC Part 24 | PERSONAL COMMUNICATIONS SERVICES | 10-1-18 Edition |
| FCC Part 22 | PUBLIC MOBILE SERVICES | 10-1-18 Edition |
| FCC Part 27 | MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES | 10-1-18 Edition |
| ANSI/TIA-603-E | Land Mobile FM or PM Communications Equipment Measurement and Performance Standards | 2016 |
| ANSI/TIA-102.CAAA -E | DIGITAL C4FMCQPSK TRANSCEIVER MEASUREMENT METHODS | 2016 |
| ANSI C63.26 | American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services | 2015 |
| KDB 971168 D01 | MEASUREMENT GUIDANCE FOR CERTIFICATION OF LICENSED DIGITAL TRANSMITTERS | v03r01 |

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## 5. LABORATORY ENVIRONMENT

**Semi-anechoic chamber SAC-1** (23 meters×17meters×10meters) did not exceed following limits along the EMC testing:

| | |
|---|---|
| Temperature | Min. = 15 ˚C, Max. = 35 ˚C |
| Relative humidity | Min. = 15 %, Max. = 75 % |
| Shielding effectiveness | 0.014MHz - 1MHz, >60dB;<br>1MHz - 1000MHz, >90dB. |
| Electrical insulation | > 2 MΩ |
| Ground system resistance | < 4 Ω |
| Normalised site attenuation (NSA) | < ± 4 dB, 3m distance, from 30 to 1000 MHz |
| Site voltage standing-wave ratio ($S_{VSWR}$) | Between 0 and 6 dB, from 1GHz to 18GHz |
| Uniformity of field strength | Between 0 and 6 dB, from 80 to 3000 MHz |

**Fully-anechoic chamber FAC-3** (9 meters×6.5 meters×4 meters) did not exceed following limits along the EMC testing**:**

| | |
|---|---|
| Temperature | Min. = 15 ˚C**,** Max. = 35 ˚C |
| Relative humidity | Min. = 15 %**,** Max. = 75 % |
| Shielding effectiveness | 0.014MHz - 1MHz, >60dB;<br>1MHz - 1000MHz, >90dB. |
| Electrical insulation | > 2 MΩ |
| Ground system resistance | < 4 Ω |
| Site voltage standing-wave ratio ($S_{VSWR}$) | Between 0 and 6 dB, from 1GHz to 18GHz |
| Uniformity of field strength | Between 0 and 6 dB, from 80 to 4000 MHz |

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# 6. SUMMARY OF TEST RESULT

## 6.1. Summary of test results

**WCDMA Band II**

| Items | Test Name | Clause in FCC rules | Verdict |
|---|---|---|---|
| 1 | Output Power | 24.232 | BR |
| 2 | Emission Limit | 24.238 | BR |
| 3 | Frequency Stability | 2.1055 | P |
| 4 | Occupied Bandwidth | 2.1049 | BR |
| 5 | Emission Bandwidth | 24.238 | BR |
| 6 | Band Edge Compliance | 24.238 | P |
| 7 | Conducted Spurious Emission | 24.238 | P |
| 8 | Peak-to-Average Power Ratio | 24.232 | BR |

**WCDMA Band V**

| Items | Test Name | Clause in FCC rules | Verdict |
|---|---|---|---|
| 1 | Output Power | 22.913 | BR |
| 2 | Emission Limit | 22.917 | BR |
| 3 | Frequency Stability | 2.1055 | P |
| 4 | Occupied Bandwidth | 2.1049 | BR |
| 5 | Emission Bandwidth | 22.917 | BR |
| 6 | Band Edge Compliance | 22.917 | P |
| 7 | Conducted Spurious Emission | 22.917 | P |

**WCDMA Band IV**

| Items | Test Name | Clause in FCC rules | Verdict |
|---|---|---|---|
| 1 | Output Power | 27.50 | BR |
| 2 | Emission Limit | 27.53 | P |
| 3 | Frequency Stability | 2.1055 | P |
| 4 | Occupied Bandwidth | 2.1049 | BR |
| 5 | Emission Bandwidth | 27.53 | BR |
| 6 | Band Edge Compliance | 27.53 | P |
| 7 | Conducted Spurious Emission | 27.53 | P |
| 8 | Peak-to-Average Power Ratio | 27.50 | BR |

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Terms used in Verdict column

| | |
|---|---|
| P | Pass. The EUT complies with the essential requirements in the standard. |
| NP | Not Performed. The test was not performed by CTTL. |
| NA | Not Applicable. The test was not applicable. |
| BR | Re-use test data from basic model report. |
| F | Fail. The EUT does not comply with the essential requirements in the standard. |

## 6.2. Explanation of re-use of test data

The Equipment Under Test (EUT) model 4052O (FCC ID: 2ACCJN035) is a variant product of 4052R(FCC ID: 2ACCJN031), according to the declaration of changes provided by the applicant and FCC KDB publication 484596 D01, spot check measurements were performed on this device, Frequency stability, band edge compliance, conducted spurious emission of all bands were tested, other test results are derived from test report No.I19Z60716-WMD02. Please refer Annex A for detail spot check verification data and reference data. The spot check test results are consistent with basic model.

For detail differences between two models please refer the Declaration of Changes document.

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## 7. Test Equipment Utilized

| NO. | Description | TYPE | series number | MANUFACTURE | CAL DUE DATE | Calibration interval |
|---|---|---|---|---|---|---|
| 1 | EMI Antenna | VULB9163 | 9163-235 | Schwarzbeck | 2020-11-20 | 1 year |
| 2 | EMI Antenna | 3117 | 00058889 | ETS-Lindgren | 2020-01-12 | 1 years |
| 3 | EMI Antenna | 3117 | 00119024 | ETS-Lindgren | 2020-01-21 | 1 years |
| 4 | Universal Radio Communication Tester | CMU200 | 108646 | R&S | 2020-01-03 | 1 year |
| 5 | Spectrum Analyzer | FSU26 | 200030 | R&S | 2020-06-03 | 1 year |
| 6 | EMI Antenna | 9117 | 177 | Schwarzbeck | 2021-08-21 | 1 year |
| 7 | Signal Generator | N5183A | MY49060052 | Agilent | 2020-03-31 | 1 year |
| 8 | Climate chamber | SH-242 | 93008556 | ESPEC | 2019-12-21 | 2 year |
| 9 | Test Receiver | E4440A | MY48250642 | Agilent | 2020-03-31 | 1 year |
| 10 | Universal Radio Communication Tester | CMW500 | 143008 | R&S | 2020-11-26 | 1 year |
| 11 | Power Amplifier | 5S1G4 | 0341863 | AR | / | |

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# ANNEX A: MEASUREMENT RESULTS

## A.1 OUTPUT POWER

### A.1.1 Summary

During the process of testing, the EUT was controlled via communication tester to ensure max power transmission and proper modulation.

This result contains peak output power and EIRP measurements for the EUT. In all cases, output power is within the specified limits.

### A.1.2 Conducted

#### A.1.2.1 Method of Measurements

The EUT was set up for the max output power with pseudo random data modulation.

These measurements were done at 3 frequencies, 1852.4 MHz, 1880.0MHz and 1907.6MHz for WCDMA Band II; 826.4MHz, 836.6MHz and 846.6MHz for WCDMA Band V; 1712.4MHz, 1732.4MHz and 1752.6MHz for WCDMA Band IV (bottom, middle and top of operational frequency range).

**WCDMA Band II**

**Measurement result-QPSK**

| | CH | Frequency(MHz) | output power(dBm) |
|---|---|---|---|
| WCDMA (Band II) | 9262 | 1852.4 | 23.10 |
| | 9400 | 1880.0 | 23.23 |
| | 9538 | 1907.6 | 23.22 |

**WCDMA Band V**

**Measurement result-QPSK**

| | CH | Frequency(MHz) | output power(dBm) |
|---|---|---|---|
| WCDMA (Band V) | 4132 | 826.4 | 23.05 |
| | 4183 | 836.6 | 23.06 |
| | 4233 | 846.6 | 22.91 |

**WCDMA Band IV**

**Measurement result-QPSK**

| | CH | Frequency(MHz) | output power(dBm) |
|---|---|---|---|
| WCDMA (Band IV) | 1312 | 1712.4 | 23.34 |
| | 1412 | 1732.4 | 23.27 |
| | 1513 | 1752.6 | 23.31 |

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### A.1.3 Radiated

#### A.1.3.1 Description

This is the test for the maximum radiated power from the EUT.

Rule Part 24.232(b) specifies, "Mobile/portable stations are limited to 2 watts e.i.r.p. Peak power" and 24.232(c) specifies that "Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage."

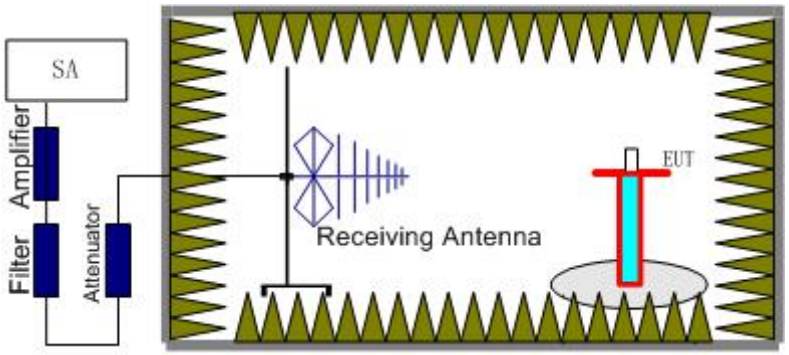
Rule Part 22.913(a) specifies "The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts."

Rule Part 27.50(d)(2) specifies, "Fixed, mobile, and portable (handheld)stations operating in the 1710–1755MHz band are limited to a peak EIRP of 1 watt."

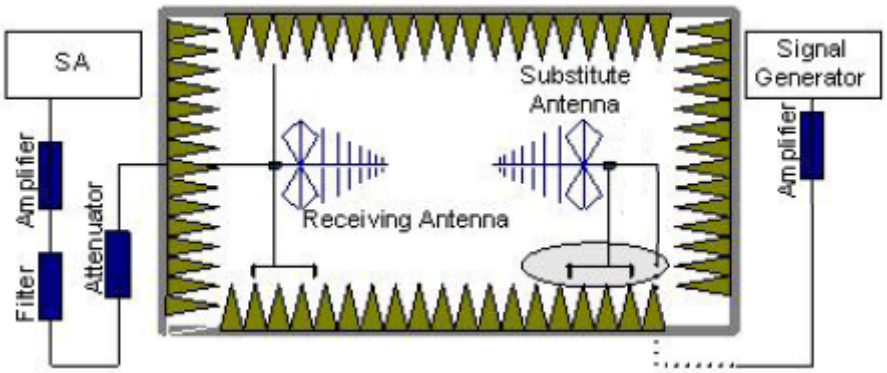
#### A.1.3.2 Method of Measurement

The measurements procedures in TIA-603E-2016 are used.

1. EUT was placed on a 1.5-meter-high non-conductive stand at a 3-meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.5m. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.




2. The EUT is then put into continuously transmitting mode at its maximum power level during the test and the maximum value of the receiver should be recorded as (Pr).
3. The EUT shall be replaced by a substitution antenna. The test setup refers to figure below.

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In the chamber, a substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power ($P_{Mea}$) is applied to the input of the substitution antenna and adjust the level of the signal generator output until the value of the receiver reach the previously recorded ($P_r$). The power of signal source ($P_{Mea}$) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

4. An amplifier should be connected to the Signal Source output port. And the cable should be connected between the Amplifier and the Substitution Antenna.
   The cable loss ($P_{cl}$), the Substitution Antenna Gain ($G_a$) and the Amplifier Gain ($P_{Ag}$) should be recorded after test.
   The measurement results are obtained as described below:
   Power (EIRP) = $P_{Mea}$ - $P_{Ag}$ - $P_{cl}$ - $G_a$
5. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
6. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.15dBi.

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**Spot Check Measurement Results:**

**WCDMA Band IV-EIRP**

**Limits**

| | Burst Peak EIRP (dBm) |
|---|---|
| WCDMA Band IV | 30dBm (1W) |

**Measurement result-QPSK**

| Frequency (MHz) | $P_{Mea}$ (dBm) | $P_{cl}$ (dB) | $P_{Ag}$ (dB) | $G_a$ (dBi) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 1712.40 | -23.06 | 3.66 | 44.10 | 5.12 | 22.50 | 30.00 | 7.50 | V |
| 1732.40 | -22.65 | 3.31 | 44.13 | 5.08 | 23.26 | 30.00 | 6.74 | V |
| 1752.60 | -22.07 | 3.85 | 44.14 | 5.05 | 23.27 | 30.00 | 6.73 | H |

**ANALYZER SETTINGS: RBW = VBW = 5MHz**

Frequency: 1752.60MHz

Peak EIRP (dBm)=$P_{Mea}$(-22.07)-$P_{cl}$(3.85dB)-$P_{Ag}$(-44.14dB)-$G_a$ (-5.05dB) = 23.27 dBm

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**Reference Measurement Results from basic model:**

**WCDMA Band II-EIRP**

**Limits**

| | Burst Peak EIRP (dBm) |
|---|---|
| WCDMA Band II | ≤33dBm (2W) |

**Measurement result-QPSK**

| Frequency(MHz) | $P_{Mea}$(dBm) | $P_{cl}$(dB) | $P_{Ag}$(dB) | $G_a$ (dBi) | EIRP(dBm) | Limit(dBm) | Margin(dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 1852.40 | -22.34 | 2.84 | 43.75 | 4.87 | 23.44 | 33.00 | 9.56 | H |
| 1880.00 | -22.24 | 2.85 | 43.75 | 4.82 | 23.48 | 33.00 | 9.52 | V |
| 1907.60 | -21.74 | 2.88 | 43.77 | 4.77 | 23.92 | 33.00 | 9.08 | H |

**ANALYZER SETTINGS: RBW = VBW = 5MHz**

Frequency: 1907.60MHz

Peak EIRP(dBm)=$P_{Mea}$(-21.74)-$P_{cl}$(2.88dB)-$P_{Ag}$(-43.77dB)-$G_a$ (-4.77dB)= 23.92dBm

**WCDMA Band V-ERP**

**Limits**

| | Burst Peak ERP (dBm) |
|---|---|
| WCDMA Band V | ≤38.45dBm |

**Measurement result-QPSK**

| Frequency(MHz) | $P_{Mea}$(dBm) | $P_{cl}$(dB) | $P_{Ag}$(dB) | $G_a$ (dBi) | Correction (dB) | ERP(dBm) | Limit(dBm) | Margin(dB) | Polarization |
|---|---|---|---|---|---|---|---|---|---|
| 826.40 | -21.05 | 2.25 | 45.76 | 0.93 | 2.15 | 21.24 | 38.45 | 17.21 | H |
| 836.60 | -21.32 | 2.26 | 45.66 | 0.82 | 2.15 | 20.75 | 38.45 | 17.70 | H |
| 846.60 | -22.31 | 2.26 | 45.56 | 0.81 | 2.15 | 19.65 | 38.45 | 18.80 | H |

**ANALYZER SETTINGS: RBW = VBW = 5MHz**

Frequency:826.40MHz

Peak ERP(dBm)=$P_{Mea}$(-21.05dBm)-$P_{cl}$(2.25dB)-$P_{Ag}$(-45.76dB)-$G_a$ (-0.93dB)-2.15dB= 21.24dBm

**WCDMA Band IV-EIRP**

**Limits**

| | Burst Peak EIRP (dBm) |
|---|---|
| WCDMA Band IV | 30dBm (1W) |

**Measurement result-QPSK**

| Frequency(MHz) | $P_{Mea}$(dBm) | $P_{cl}$(dB) | $P_{Ag}$(dB) | $G_a$ (dBi) | EIRP(dBm) | Limit(dBm) | Margin(dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 1712.40 | -23.36 | 3.66 | 44.10 | 5.12 | 22.20 | 30.00 | 7.80 | H |
| 1732.40 | -23.04 | 3.31 | 44.13 | 5.08 | 22.87 | 30.00 | 7.13 | H |
| 1752.60 | -21.59 | 3.85 | 44.14 | 5.05 | 23.75 | 30.00 | 6.25 | H |

**ANALYZER SETTINGS: RBW = VBW = 5MHz**

Frequency: 1752.60MHz

Peak EIRP (dBm)=$P_{Mea}$(-21.59dBm)-$P_{cl}$(3.85dB)-$P_{Ag}$(-44.14dB)-$G_a$ (-5.05dB)= 23.75dBm

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## A.2 EMISSION LIMIT

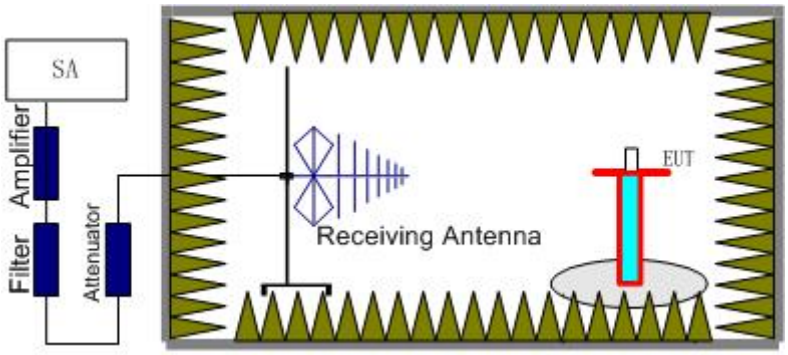
### A.2.1 Measurement Method

The measurements procedures in TIA-603E-2016 are used.

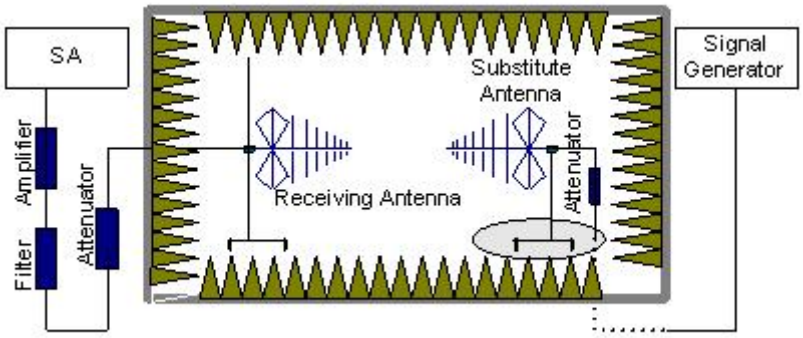
The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment. The resolution bandwidth is set as outlined in Part 24.238, Part 22.917, Part 27.53. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of WCDMA Band II, WCDMA Band V and WCDMA Band IV.

**The procedure of radiated spurious emissions is as follows:**

1. EUT was placed on a 1.5-meter-high non-conductive stand at a 3-meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.5m. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all non-harmonic and harmonics of the transmit frequency through the 10th harmonic were measured with peak detector.




2. The EUT is then put into continuously transmitting mode at its maximum power level during the test. And the maximum value of the receiver should be recorded as (Pr).
3. The EUT shall be replaced by a substitution antenna. The test setup refers to figure below.




In the chamber, a substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power ($P_{Mea}$) is applied to the input of the

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substitution antenna and adjust the level of the signal generator output until the value of the receiver reach the previously recorded ($P_r$). The power of signal source ($P_{Mea}$) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

4. The Path loss ($P_{pl}$) between the Signal Source with the Substitution Antenna and the Substitution Antenna Gain ($G_a$) should be recorded after test.
   A amplifier should be connected in for the test.
   The Path loss ($P_{pl}$) is the summation of the cable loss and the gain of the amplifier.
   The measurement results are obtained as described below:
   Power (EIRP) = $P_{Mea}$ - $P_{pl}$ - $G_a$
5. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
6. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP - 2.15dBi.

### A.2.2 Measurement Limit

Part 24.238, Part 22.917 and Part 27.53 specify that 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 + 10log(P) dB.

The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

### A.2.3 Measurement Results

Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of WCDMA Band II (1852.4 MHz, 1880.0MHz and 1907.6MHz),WCDMA Band V(826.4MHz, 836.6MHz and 846.6MHz) and WCDMA Band IV(1712.4MHz, 1732.4MHz and 1752.6MHz). It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the WCDMA Band II, WCDMA Band V and WCDMA Band IV into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.

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### A.2.4 Measurement Results Table

| Frequency | Channel | Frequency Range | Result |
|---|---|---|---|
| WCDMA Band V | Low | 30MHz-10GHz | Pass |
| | Middle | 30MHz-10GHz | Pass |
| | High | 30MHz-10GHz | Pass |
| WCDMA Band II | Low | 30MHz-20GHz | Pass |
| | Middle | 30MHz-20GHz | Pass |
| | High | 30MHz-20GHz | Pass |
| WCDMA Band IV | Low | 30MHz-20GHz | Pass |
| | Middle | 30MHz-20GHz | Pass |
| | High | 30MHz-20GHz | Pass |

### A.2.5 Sweep Table

| Working Frequency | Subrange (GHz) | RBW | VBW | Sweep time (s) |
|---|---|---|---|---|
| WCDMA Band V | 0.03~1 | 100kHz | 300kHz | 10 |
| | 1-2 | 1 MHz | 3 MHz | 2 |
| | 2~5 | 1 MHz | 3 MHz | 3 |
| | 5~8 | 1 MHz | 3 MHz | 3 |
| | 8~10 | 1 MHz | 3 MHz | 3 |
| WCDMA Band II | 0.03~1 | 100kHz | 300kHz | 10 |
| | 1-2 | 1 MHz | 3 MHz | 2 |
| | 2~5 | 1 MHz | 3 MHz | 3 |
| | 5~8 | 1 MHz | 3 MHz | 3 |
| | 8~11 | 1 MHz | 3 MHz | 3 |
| | 11~14 | 1 MHz | 3 MHz | 3 |
| | 14~18 | 1 MHz | 3 MHz | 3 |
| | 18~20 | 1 MHz | 3 MHz | 2 |
| WCDMA Band IV | 0.03~1 | 100kHz | 300kHz | 10 |
| | 1-2 | 1 MHz | 3 MHz | 2 |
| | 2~5 | 1 MHz | 3 MHz | 3 |
| | 5~8 | 1 MHz | 3 MHz | 3 |
| | 8~11 | 1 MHz | 3 MHz | 3 |
| | 11~14 | 1 MHz | 3 MHz | 3 |
| | 14~18 | 1 MHz | 3 MHz | 3 |
| | 18~20 | 1 MHz | 3 MHz | 2 |

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**Spot Check Measurement Results:**

**WCDMA BAND IV Mode Channel 1312/1712.4MHz**

| Frequency(MHz) | $P_{Mea}$(dBm) | Path Loss(dB) | Antenna Gain(dBi) | Peak EIRP(dBm) | Limit(dBm) | Margin(dB) | Polarization |
|---|---|---|---|---|---|---|---|
| 8702.01 | -55.48 | 8.37 | 13.04 | -50.81 | -13.00 | 37.81 | H |
| 10454.01 | -51.48 | 9.72 | 13.08 | -48.12 | -13.00 | 35.12 | H |
| 12191.01 | -49.73 | 10.08 | 13.08 | -46.73 | -13.00 | 33.73 | V |
| 13933.01 | -47.55 | 10.82 | 14.46 | -43.91 | -13.00 | 30.91 | V |
| 15652.00 | -45.38 | 11.55 | 13.70 | -43.23 | -13.00 | 30.23 | V |
| 17401.00 | -42.83 | 12.50 | 14.68 | -40.65 | -13.00 | 27.65 | V |

**WCDMA BAND IV Mode Channel 1412/1732.4MHz**

| Frequency(MHz) | $P_{Mea}$(dBm) | Path Loss(dB) | Antenna Gain(dBi) | Peak EIRP(dBm) | Limit(dBm) | Margin(dB) | Polarization |
|---|---|---|---|---|---|---|---|
| 8666.01 | -54.71 | 8.40 | 13.03 | -50.08 | -13.00 | 37.08 | H |
| 10383.01 | -51.75 | 9.77 | 13.05 | -48.47 | -13.00 | 35.47 | H |
| 12132.01 | -49.35 | 10.25 | 13.05 | -46.55 | -13.00 | 33.55 | H |
| 13876.01 | -47.96 | 10.76 | 14.43 | -44.29 | -13.00 | 31.29 | V |
| 15574.00 | -45.85 | 11.50 | 13.70 | -43.65 | -13.00 | 30.65 | H |
| 17315.00 | -42.91 | 12.39 | 14.49 | -40.81 | -13.00 | 27.81 | H |

**WCDMA BAND IV Mode Channel 1513/1752.6MHz**

| Frequency(MHz) | $P_{Mea}$(dBm) | Path Loss(dB) | Antenna Gain(dBi) | Peak EIRP(dBm) | Limit(dBm) | Margin(dB) | Polarization |
|---|---|---|---|---|---|---|---|
| 8697.01 | -55.37 | 8.36 | 13.04 | -50.69 | -13.00 | 37.69 | H |
| 10424.01 | -51.97 | 9.77 | 13.07 | -48.67 | -13.00 | 35.67 | H |
| 12164.01 | -49.82 | 10.16 | 13.07 | -46.91 | -13.00 | 33.91 | H |
| 13927.01 | -48.16 | 10.82 | 14.46 | -44.52 | -13.00 | 31.52 | V |
| 15653.00 | -45.71 | 11.55 | 13.70 | -43.56 | -13.00 | 30.56 | V |
| 17414.00 | -43.37 | 12.53 | 14.71 | -41.19 | -13.00 | 28.19 | V |

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**Reference Measurement Results from basic model:**

**WCDMA BAND II Mode Channel 9262/1852.4MHz**

| Frequency(MHz) | $P_{Mea}$(dBm) | Path Loss(dB) | Antenna Gain(dBi) | Peak EIRP(dBm) | Limit(dBm) | Margin(dB) | Polarization |
|---|---|---|---|---|---|---|---|
| 7414.01 | -55.01 | 8.16 | 12.10 | -51.07 | -13.00 | 38.07 | V |
| 9266.01 | -53.82 | 9.08 | 13.26 | -49.64 | -13.00 | 36.64 | H |
| 11105.01 | -51.27 | 9.81 | 13.18 | -47.90 | -13.00 | 34.90 | V |
| 12980.01 | -49.69 | 10.47 | 13.49 | -46.67 | -13.00 | 33.67 | V |
| 14813.00 | -45.93 | 11.13 | 14.15 | -42.91 | -13.00 | 29.91 | V |
| 16649.00 | -43.18 | 11.88 | 13.66 | -41.40 | -13.00 | 28.40 | V |

**WCDMA BAND II Mode Channel 9400/1880MHz**

| Frequency(MHz) | $P_{Mea}$(dBm) | Path Loss(dB) | Antenna Gain(dBi) | Peak EIRP(dBm) | Limit(dBm) | Margin(dB) | Polarization |
|---|---|---|---|---|---|---|---|
| 7529.01 | -54.51 | 8.27 | 12.22 | -50.56 | -13.00 | 37.56 | V |
| 9424.01 | -54.78 | 9.16 | 13.35 | -50.59 | -13.00 | 37.59 | V |
| 11293.01 | -50.91 | 9.95 | 13.14 | -47.72 | -13.00 | 34.72 | V |
| 13172.01 | -48.36 | 10.62 | 13.74 | -45.24 | -13.00 | 32.24 | H |
| 15038.00 | -45.21 | 11.27 | 13.98 | -42.50 | -13.00 | 29.50 | H |
| 16942.00 | -42.96 | 12.15 | 13.78 | -41.33 | -13.00 | 28.33 | V |

**WCDMA BAND II Mode Channel 9538/1907.6MHz**

| Frequency(MHz) | $P_{Mea}$(dBm) | Path Loss(dB) | Antenna Gain(dBi) | Peak EIRP(dBm) | Limit(dBm) | Margin(dB) | Polarization |
|---|---|---|---|---|---|---|---|
| 7633.01 | -53.82 | 8.12 | 12.31 | -49.63 | -13.00 | 36.63 | H |
| 9566.01 | -54.09 | 9.30 | 13.33 | -50.06 | -13.00 | 37.06 | H |
| 11467.01 | -50.90 | 9.90 | 13.11 | -47.69 | -13.00 | 34.69 | V |
| 13359.01 | -47.85 | 10.57 | 14.00 | -44.42 | -13.00 | 31.42 | V |
| 15257.00 | -45.43 | 11.33 | 13.85 | -42.91 | -13.00 | 29.91 | V |
| 17205.00 | -43.31 | 12.35 | 14.25 | -41.41 | -13.00 | 28.41 | H |

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**WCDMA BAND V Mode Channel 4132/826.4MHz**

| Frequency(MHz) | $P_{Mea}$(dBm) | Path Loss(dB) | Antenna Gain(dBi) | Correction (dB) | Peak ERP(dBm) | Limit (dBm) | Margin(dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 1650.01 | -55.87 | 3.57 | 5.23 | 2.15 | -56.36 | -13.00 | 43.36 | V |
| 2482.00 | -49.70 | 4.61 | 6.05 | 2.15 | -50.41 | -13.00 | 37.41 | H |
| 3300.02 | -54.51 | 5.29 | 7.72 | 2.15 | -54.23 | -13.00 | 41.23 | V |
| 4107.02 | -55.93 | 6.04 | 9.01 | 2.15 | -55.11 | -13.00 | 42.11 | V |
| 4963.01 | -55.46 | 6.67 | 9.86 | 2.15 | -54.42 | -13.00 | 41.42 | H |
| 5780.01 | -54.49 | 7.22 | 10.54 | 2.15 | -53.32 | -13.00 | 40.32 | H |

**WCDMA BAND V Mode Channel 4183/836.6MHz**

| Frequency(MHz) | $P_{Mea}$(dBm) | Path Loss(dB) | Antenna Gain(dBi) | Correction (dB) | Peak ERP(dBm) | Limit (dBm) | Margin(dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 1672.01 | -56.61 | 3.58 | 5.19 | 2.15 | -57.15 | -13.00 | 44.15 | V |
| 2521.00 | -53.45 | 4.65 | 6.14 | 2.15 | -54.11 | -13.00 | 41.11 | H |
| 3355.02 | -54.34 | 5.32 | 7.85 | 2.15 | -53.96 | -13.00 | 40.96 | H |
| 4165.02 | -55.25 | 6.13 | 9.07 | 2.15 | -54.46 | -13.00 | 41.46 | V |
| 5005.01 | -55.80 | 6.59 | 9.91 | 2.15 | -54.63 | -13.00 | 41.63 | V |
| 5855.01 | -53.79 | 7.25 | 10.53 | 2.15 | -52.66 | -13.00 | 39.66 | V |

**WCDMA BAND V Mode Channel 4233/846.6MHz**

| Frequency(MHz) | $P_{Mea}$(dBm) | Path Loss(dB) | Antenna Gain(dBi) | Correction (dB) | Peak ERP(dBm) | Limit (dBm) | Margin(dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 1692.01 | -54.95 | 3.59 | 5.15 | 2.15 | -55.54 | -13.00 | 42.54 | H |
| 2540.00 | -52.92 | 4.66 | 6.17 | 2.15 | -53.56 | -13.00 | 40.56 | H |
| 3402.02 | -54.88 | 5.36 | 7.96 | 2.15 | -54.43 | -13.00 | 41.43 | V |
| 4247.02 | -55.38 | 6.24 | 9.15 | 2.15 | -54.62 | -13.00 | 41.62 | H |
| 5094.01 | -54.82 | 6.76 | 10.03 | 2.15 | -53.70 | -13.00 | 40.70 | H |
| 5955.01 | -53.53 | 7.47 | 10.51 | 2.15 | -52.64 | -13.00 | 39.64 | H |

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**WCDMA BAND IV Mode Channel 1312/1712.4MHz**

| Frequency(MHz) | $P_{Mea}$(dBm) | Path Loss(dB) | Antenna Gain(dBi) | Peak EIRP(dBm) | Limit(dBm) | Margin(dB) | Polarization |
|---|---|---|---|---|---|---|---|
| 8711.01 | -54.79 | 8.39 | 13.04 | -50.14 | -13.00 | 37.14 | H |
| 10420.01 | -51.51 | 9.77 | 13.07 | -48.21 | -13.00 | 35.21 | H |
| 12169.01 | -49.40 | 10.15 | 13.07 | -46.48 | -13.00 | 33.48 | H |
| 13937.01 | -47.88 | 10.82 | 14.46 | -44.24 | -13.00 | 31.24 | H |
| 15663.00 | -45.06 | 11.56 | 13.70 | -42.92 | -13.00 | 29.92 | H |
| 17386.00 | -43.24 | 12.48 | 14.65 | -41.07 | -13.00 | 28.07 | V |

**WCDMA BAND IV Mode Channel 1412/1732.4MHz**

| Frequency(MHz) | $P_{Mea}$(dBm) | Path Loss(dB) | Antenna Gain(dBi) | Peak EIRP(dBm) | Limit(dBm) | Margin(dB) | Polarization |
|---|---|---|---|---|---|---|---|
| 5200.02 | -50.13 | 6.96 | 10.18 | -46.91 | -13.00 | 33.91 | H |
| 10393.01 | -51.69 | 9.79 | 13.06 | -48.42 | -13.00 | 35.42 | H |
| 12118.01 | -49.17 | 10.30 | 13.05 | -46.42 | -13.00 | 33.42 | H |
| 13876.01 | -48.14 | 10.76 | 14.43 | -44.47 | -13.00 | 31.47 | H |
| 15584.00 | -45.72 | 11.49 | 13.70 | -43.51 | -13.00 | 30.51 | H |
| 17327.00 | -43.28 | 12.41 | 14.52 | -41.17 | -13.00 | 28.17 | H |

**WCDMA BAND IV Mode Channel 1513/1752.6MHz**

| Frequency(MHz) | $P_{Mea}$(dBm) | Path Loss(dB) | Antenna Gain(dBi) | Peak EIRP(dBm) | Limit(dBm) | Margin(dB) | Polarization |
|---|---|---|---|---|---|---|---|
| 8699.01 | -54.66 | 8.36 | 13.04 | -49.98 | -13.00 | 36.98 | H |
| 10442.01 | -51.94 | 9.74 | 13.08 | -48.60 | -13.00 | 35.60 | H |
| 12179.01 | -50.04 | 10.12 | 13.07 | -47.09 | -13.00 | 34.09 | V |
| 13931.01 | -47.86 | 10.82 | 14.46 | -44.22 | -13.00 | 31.22 | H |
| 15650.00 | -45.80 | 11.55 | 13.70 | -43.65 | -13.00 | 30.65 | V |
| 17381.00 | -43.16 | 12.47 | 14.64 | -40.99 | -13.00 | 27.99 | V |

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## A.3 FREQUENCY STABILITY

### A.3.1 Method of Measurement

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the EUT in a “call mode”. This is accomplished with the use of R&S CMU200 DIGITAL RADIO COMMUNICATION TESTER.

1. Measure the carrier frequency at room temperature.
2. Subject the EUT to overnight soak at -30℃.
3. With the EUT, powered via nominal voltage, connected to the CMU200 and in a simulated call on mid channel of WCDMA Band II, WCDMA Band IV and WCDMA Band V, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
4. Repeat the above measurements at 10℃ increments from -30℃ to +50℃. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.
5. Remeasure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments remeasuring carrier frequency at each voltage. Pause at nominal voltage for 1 1/2 hours unpowered, to allow any self-heating to stabilize, before continuing.
6. Subject the EUT to overnight soak at +50℃.
7. With the EUT, powered via nominal voltage, connected to the CMU200 and in a simulated call on the centre channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
8. Repeat the above measurements at 10℃ increments from -30℃ to +50℃. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.
9. At all temperature levels hold the temperature to +/- 0.5℃ during the measurement procedure.

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. As this transceiver is considered "Hand carried, battery powered equipment" Section 2.1055(d)(2) applies. This requires that the lower voltage for frequency stability testing be specified by the manufacturer. This transceiver is specified to operate with an input voltage of between 3.5VDC and 4.2VDC, with a nominal voltage of 3.7VDC. Operation above or below these voltage limits is prohibited by transceiver software in order to prevent improper operation as well as to protect components from overstress.

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### A.3.2 Measurement results

**WCDMA Band II**

**Frequency Error vs Voltage-QPSK**

| Voltage (V) | Temperature (℃) | Frequency error (Hz) | Frequency error (ppm) |
|---|---|---|---|
| 3.5 | 20 | -3.97 | 0.0021 |
| 3.7 | | 3.45 | 0.0018 |
| 4.2 | | -4.29 | 0.0023 |

**Frequency Error vs Temperature-QPSK**

| Temperature (℃) | Voltage (V) | Frequency error (Hz) | Frequency error (ppm) |
|---|---|---|---|
| -30 | 3.7 | 3.69 | 0.0020 |
| -20 | | -3.36 | 0.0018 |
| -10 | | -2.76 | 0.0015 |
| 0 | | 2.23 | 0.0012 |
| 10 | | -4.73 | 0.0025 |
| 20 | | -2.32 | 0.0012 |
| 30 | | -2.78 | 0.0015 |
| 40 | | -2.67 | 0.0014 |
| 50 | | -3.77 | 0.0020 |

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**WCDMA Band V**

**Frequency Error vs Voltage-QPSK**

| Voltage (V) | Temperature (℃) | Frequency error (Hz) | Frequency error (ppm) |
|---|---|---|---|
| 3.5 | 20 | -2.49 | 0.0030 |
| 3.7 | | 2.64 | 0.0032 |
| 4.2 | | 2.91 | 0.0035 |

**Frequency Error vs Temperature-QPSK**

| Temperature (℃) | Voltage (V) | Frequency error (Hz) | Frequency error (ppm) |
|---|---|---|---|
| -30 | 3.7 | -1.62 | 0.0019 |
| -20 | | -3.36 | 0.0040 |
| -10 | | 2.21 | 0.0026 |
| 0 | | 1.65 | 0.0020 |
| 10 | | -2.23 | 0.0027 |
| 20 | | -3.51 | 0.0042 |
| 30 | | 3.20 | 0.0038 |
| 40 | | 2.98 | 0.0036 |
| 50 | | -2.15 | 0.0026 |

**WCDMA Band IV**

**Frequency Error vs Voltage-QPSK**

| Voltage (V) | Temperature (℃) | Frequency error (Hz) | Frequency error (ppm) |
|---|---|---|---|
| 3.5 | 20 | -2.96 | 0.0017 |
| 3.7 | | -3.52 | 0.0020 |
| 4.2 | | -5.08 | 0.0029 |

**Frequency Error vs Temperature-QPSK**

| Temperature (℃) | Voltage (V) | Frequency error (Hz) | Frequency error (ppm) |
|---|---|---|---|
| -30 | 3.7 | -2.90 | 0.0017 |
| -20 | | -4.12 | 0.0024 |
| -10 | | -2.30 | 0.0013 |
| 0 | | -3.81 | 0.0022 |
| 10 | | -3.98 | 0.0023 |
| 20 | | -5.02 | 0.0029 |
| 30 | | -3.16 | 0.0018 |
| 40 | | -3.23 | 0.0019 |
| 50 | | -3.72 | 0.0021 |

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## A.4 OCCUPIED BANDWIDTH

### A.4.1 Occupied Bandwidth Results

Occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the US Cellular/PCS frequency bands. The table below lists the measured 99% BW. Spectrum analyzer plots are included on the following pages.

The measurement method is from ANSI C63.26:

a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts.

b) The nominal IF filter 3 dB bandwidth (RBW) shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set ≥ 3 × RBW.

c) Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation.

d) Set the detection mode to peak, and the trace mode to max-hold.

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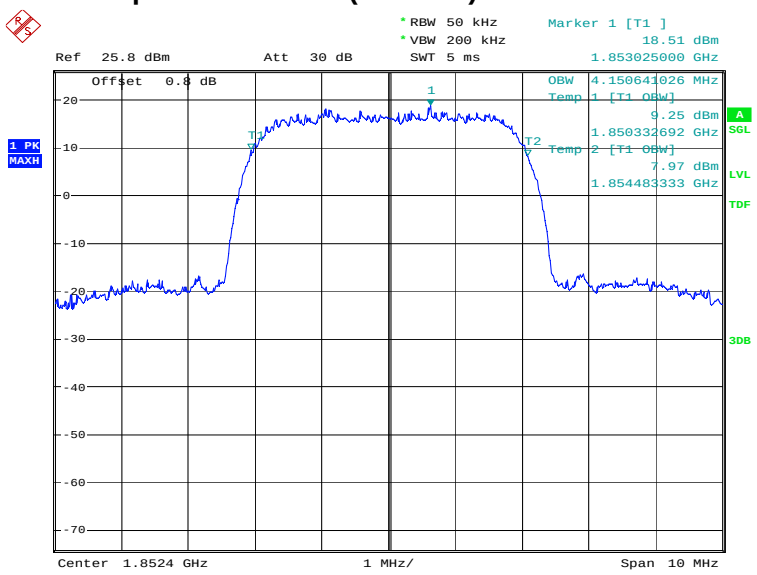
**WCDMA Band II (99% BW)-QPSK**

| Frequency(MHz) | Occupied Bandwidth (99% BW)( KHz) |
|---|---|
| 1852.4 | 4150.64 |
| 1880.0 | 4150.64 |
| 1907.6 | 4134.62 |

**WCDMA Band II**

**Channel 9262-Occupied Bandwidth (99% BW)**




Date: 17.MAY.2019 11:18:16

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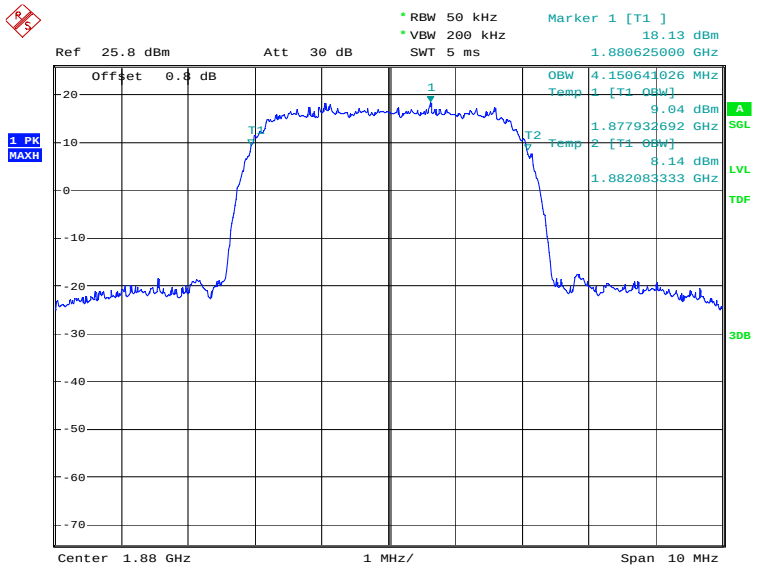
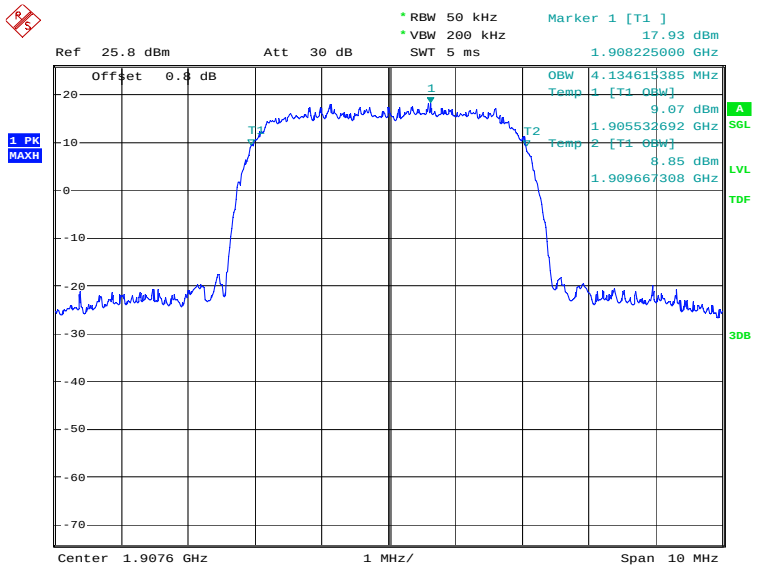
## Channel 9400-Occupied Bandwidth (99% BW)




Date: 17.MAY.2019 11:19:27

## Channel 9538-Occupied Bandwidth (99% BW)




Date: 17.MAY.2019 11:20:39

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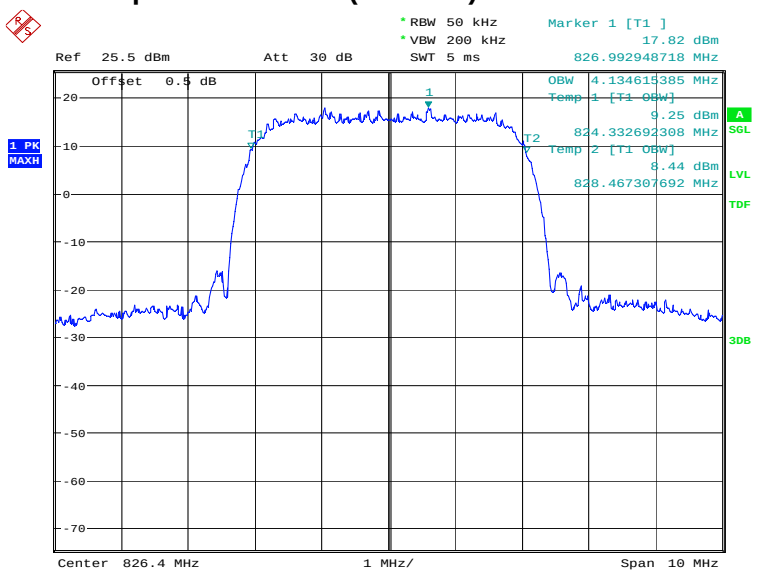
**WCDMA Band V(99% BW)-QPSK**

| Frequency(MHz) | Occupied Bandwidth (99% BW)( KHz) |
|---|---|
| 826.4 | 4134.62 |
| 836.6 | 4150.64 |
| 846.6 | 4134.62 |

**WCDMA Band V**

**Channel 4132-Occupied Bandwidth (99% BW)**




Date: 17.MAY.2019 11:26:39

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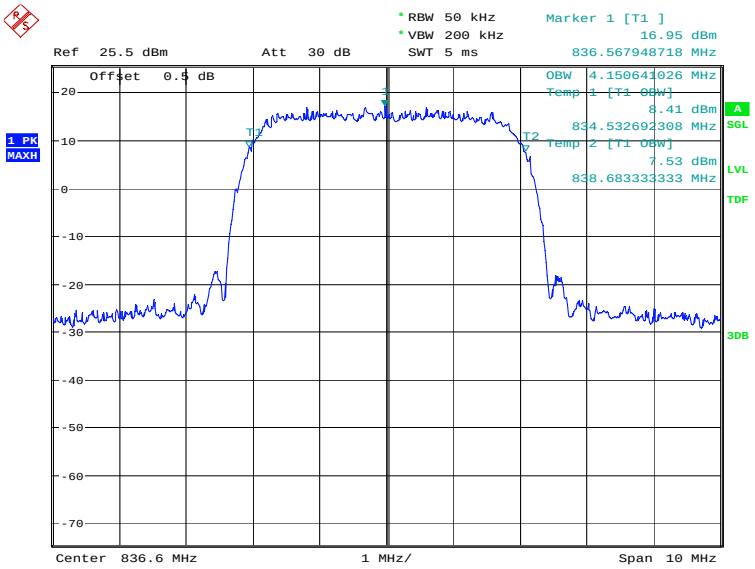
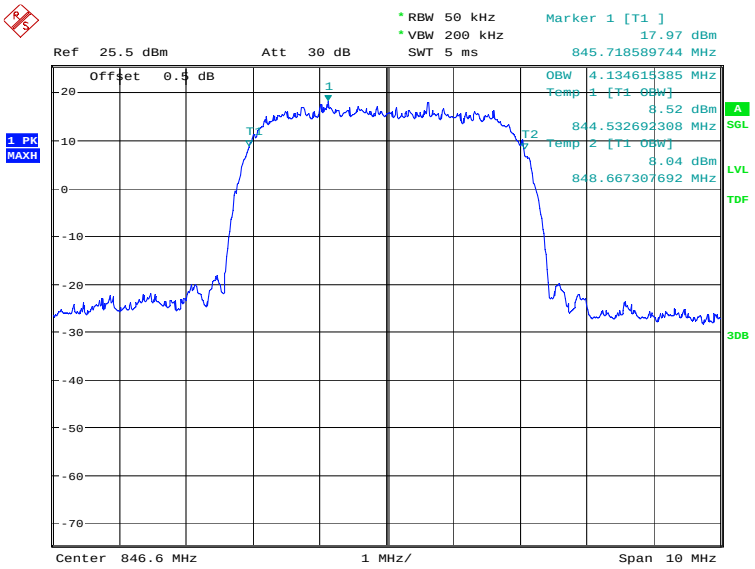
## Channel 4183-Occupied Bandwidth (99% BW)




Date: 17.MAY.2019 11:27:51

## Channel 4233-Occupied Bandwidth (99% BW)




Date: 17.MAY.2019 11:29:02

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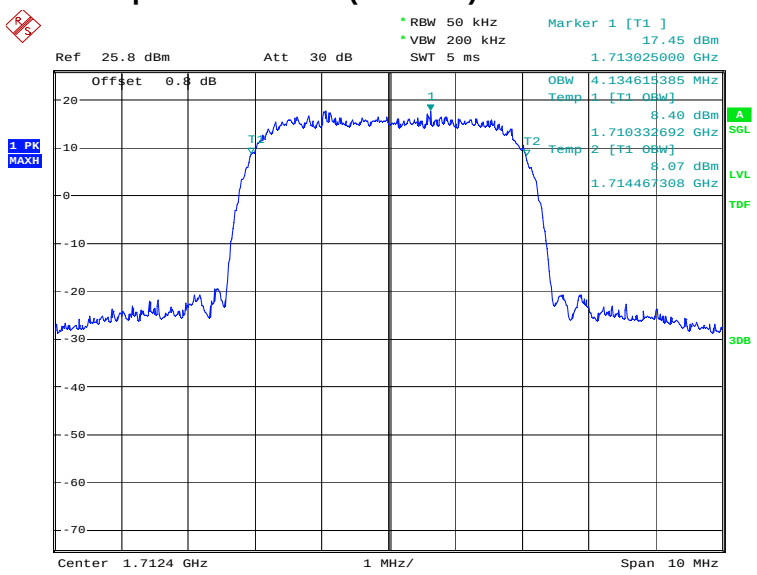
**WCDMA Band IV(99% BW)-QPSK**

| Frequency(MHz) | Occupied Bandwidth (99% BW)( KHz) |
|---|---|
| 1712.4 | 4134.62 |
| 1732.4 | 4134.62 |
| 1752.6 | 4134.62 |

**WCDMA Band IV**

**Channel 1312-Occupied Bandwidth (99% BW)**




Date: 17.MAY.2019 11:22:28

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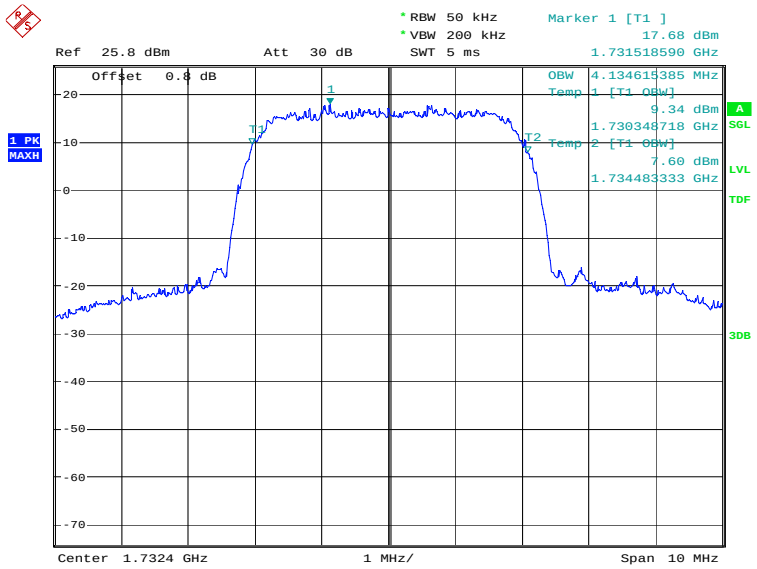
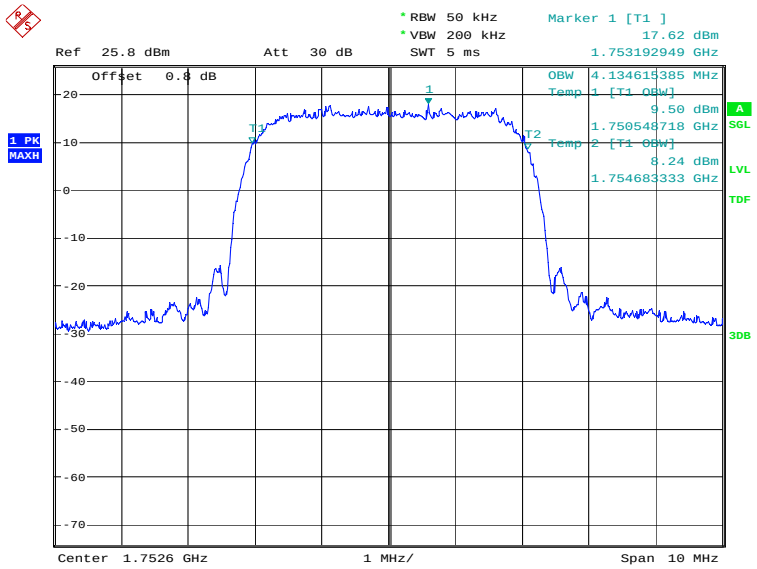
## Channel 1412-Occupied Bandwidth (99% BW)




Date: 17.MAY.2019 11:23:39

## Channel 1513-Occupied Bandwidth (99% BW)




Date: 17.MAY.2019 11:24:50

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## A.5 EMISSION BANDWIDTH

### A.5.1Emission Bandwidth Results

The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

The measurement method is from ANSI C63.26:

a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be wide enough to see sufficient roll off of the signal to make the measurement.

b) The nominal RBW shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set ≥ 3 × RBW.

c) Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation.

d) The dynamic range of the spectrum analyzer at the selected RBW shall be more than 10 dB below the target "−X dB" requirement, i.e., if the requirement calls for measuring the −26 dB OBW, the spectrum analyzer noise floor at the selected RBW shall be at least 36 dB below the reference level.

e) Set spectrum analyzer detection mode to peak, and the trace mode to max hold.

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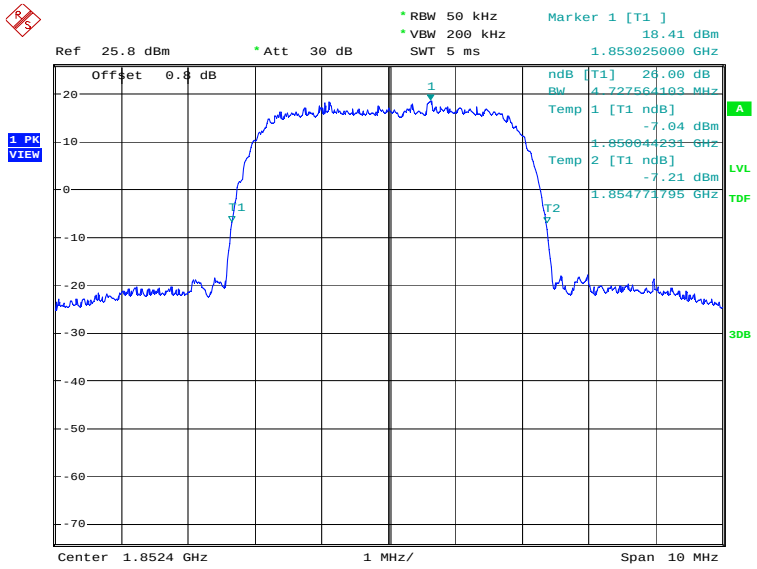
## WCDMA Band II-QPSK

| Frequency(MHz) | Emission Bandwidth ( KHz) |
|---|---|
| 1852.4 | 4727.56 |
| 1880.0 | 4743.59 |
| 1907.6 | 4711.54 |

## WCDMA Band II

## Channel 9262-Emission Bandwidth




Date: 17.MAY.2019 11:31:03

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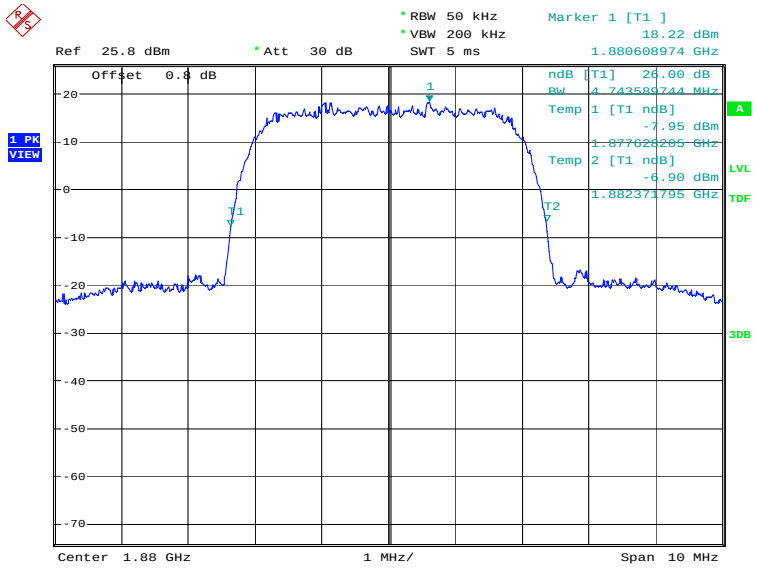
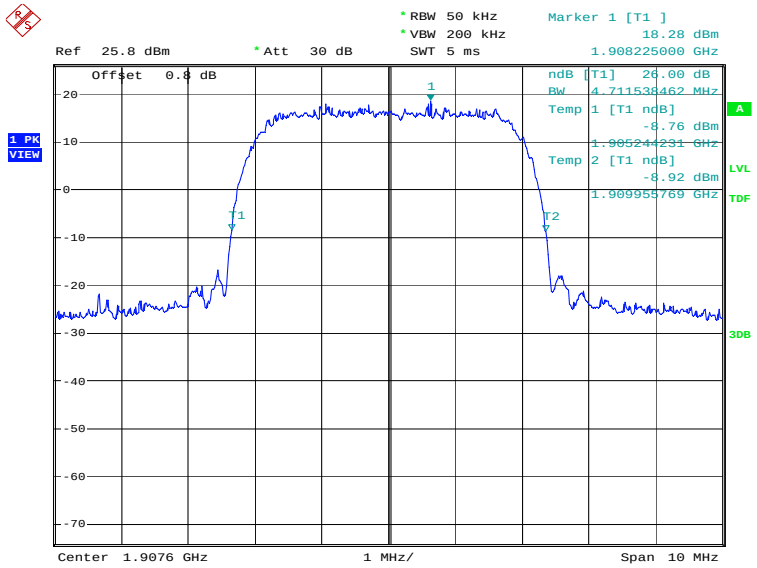
## Channel 9400-Emission Bandwidth




Date: 17.MAY.2019 11:32:15

## Channel 9538-Emission Bandwidth




Date: 17.MAY.2019 11:33:26

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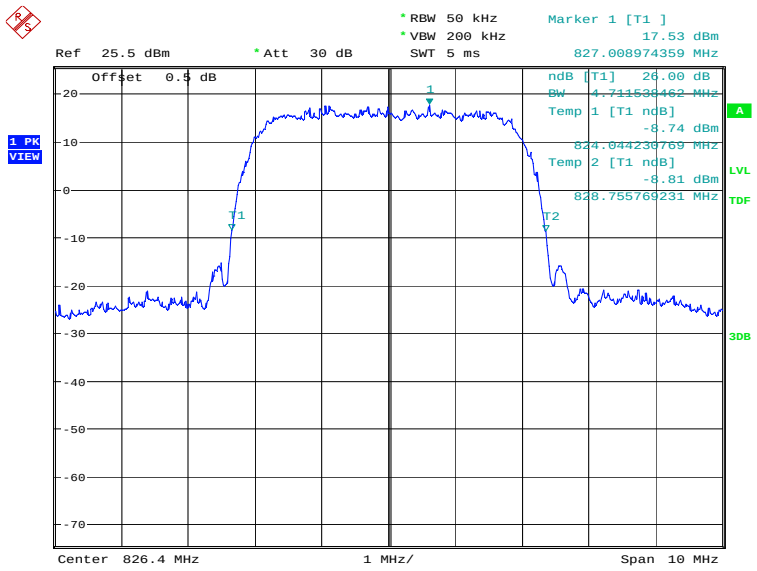
**WCDMA Band V-QPSK**

| Frequency(MHz) | Emission Bandwidth ( KHz) |
|---|---|
| 826.40 | 4711.54 |
| 836.60 | 4695.51 |
| 846.60 | 4711.54 |

**WCDMA Band V**

**Channel 4132-Emission Bandwidth**




Date: 17.MAY.2019 11:39:28

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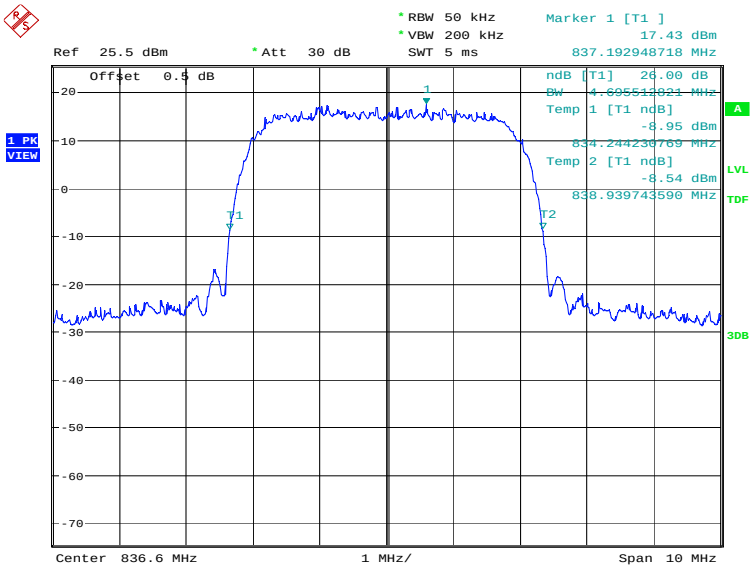
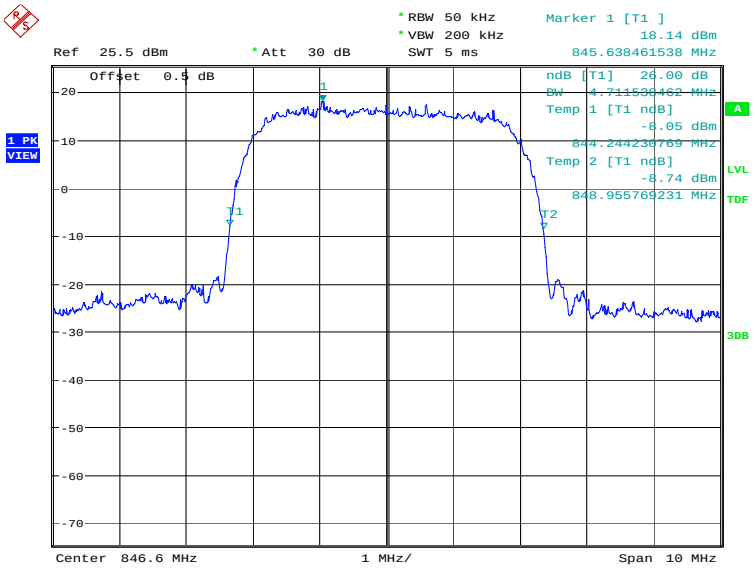
## Channel 4183-Emission Bandwidth




Date: 17.MAY.2019 11:40:40

## Channel 4233-Emission Bandwidth




Date: 17.MAY.2019 11:41:51

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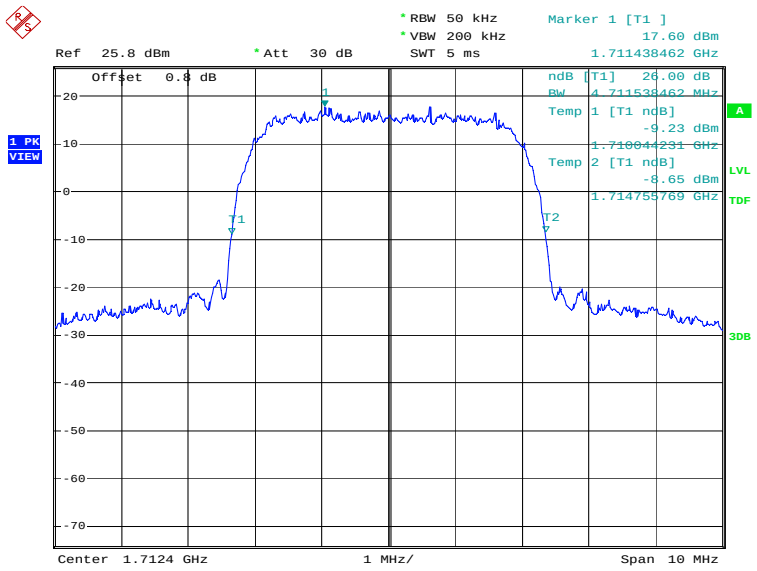
## WCDMA Band IV-QPSK

| Frequency(MHz) | Emission Bandwidth ( KHz) |
|---|---|
| 1712.4 | 4711.54 |
| 1732.4 | 4727.56 |
| 1752.6 | 4695.51 |

## WCDMA Band IV

## Channel 1312-Emission Bandwidth




Date: 17.MAY.2019 11:35:15

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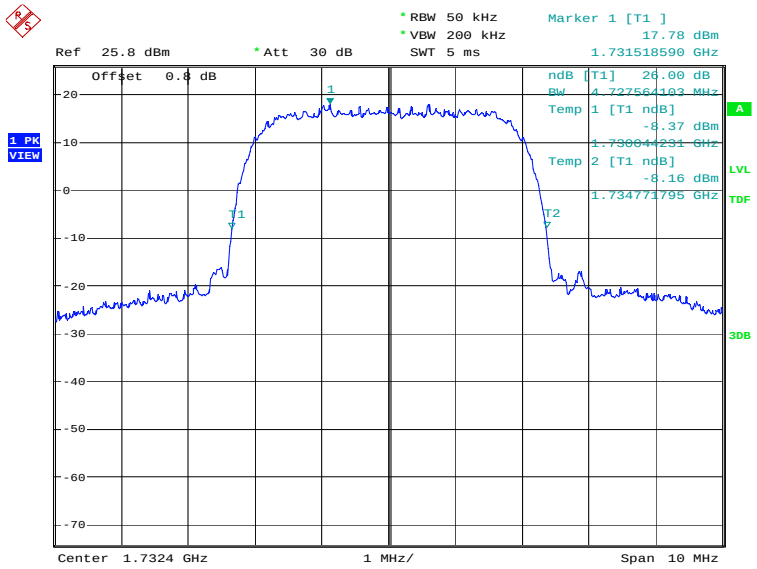
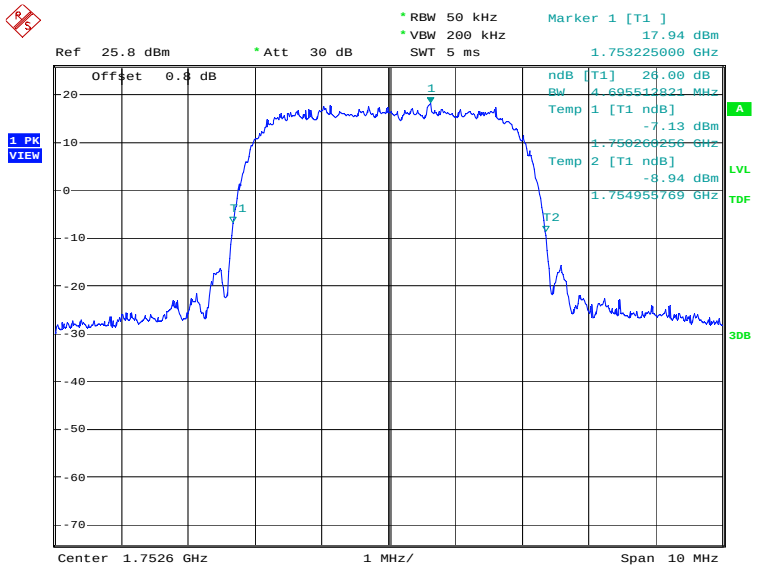
## Channel 1412-Emission Bandwidth




Date: 17.MAY.2019 11:36:27

## Channel 1513-Emission Bandwidth




Date: 17.MAY.2019 11:37:39

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## A.6 BAND EDGE COMPLIANCE

### A.6.1 Measurement limit

On any frequency outside frequency band of the US Cellular/PCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least 43+10Log (P) dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm. According to KDB 971168, a relaxation of the reference bandwidth is often provided for measurements within a specified frequency range at the edge of the authorized frequency block/band. This is often implemented by permitting the use of a narrower RBW (typically limited to a minimum RBW of 1% of the OBW) for measuring the out-of-band emissions without a requirement to integrate the result over the full reference bandwidth.

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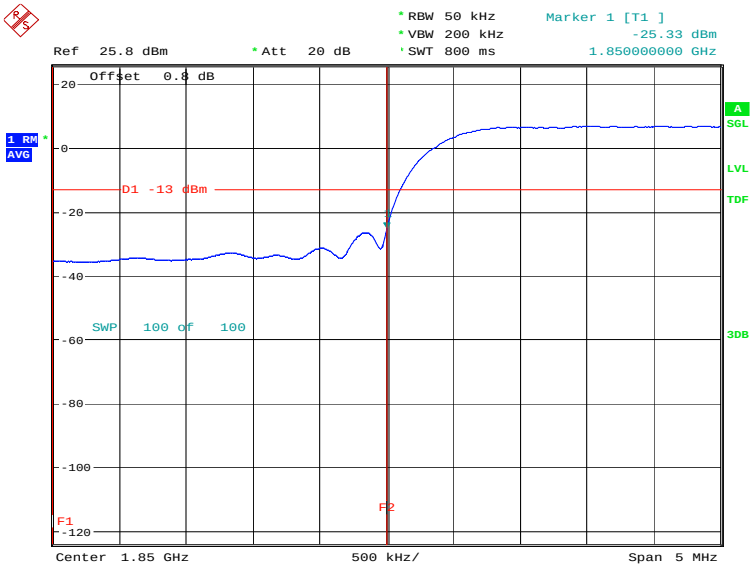
## A.6.2 Measurement result

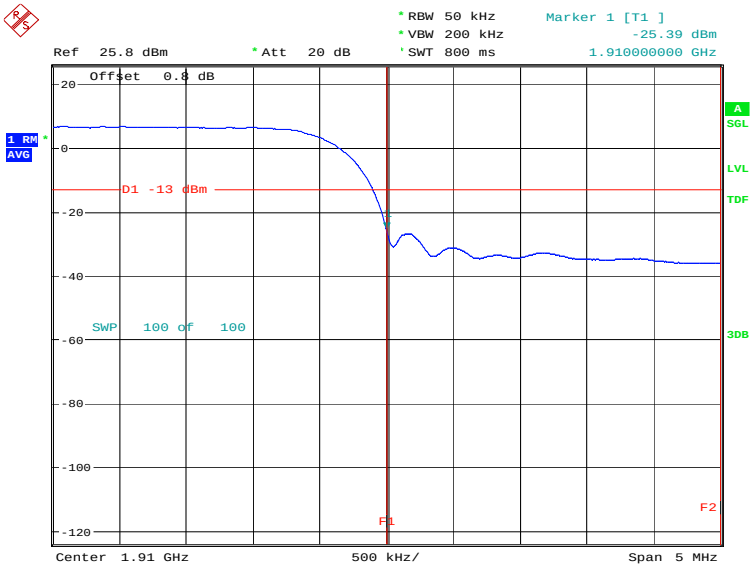
## WCDMA Band II-QPSK

## LOW BAND EDGE BLOCK-A (WCDMA Band Ⅱ)-Channel 9262




Date: 4.DEC.2019 11:19:55

## HIGH BAND EDGE BLOCK-C (WCDMA Band Ⅱ) –Channel 9538




Date: 4.DEC.2019 11:21:38

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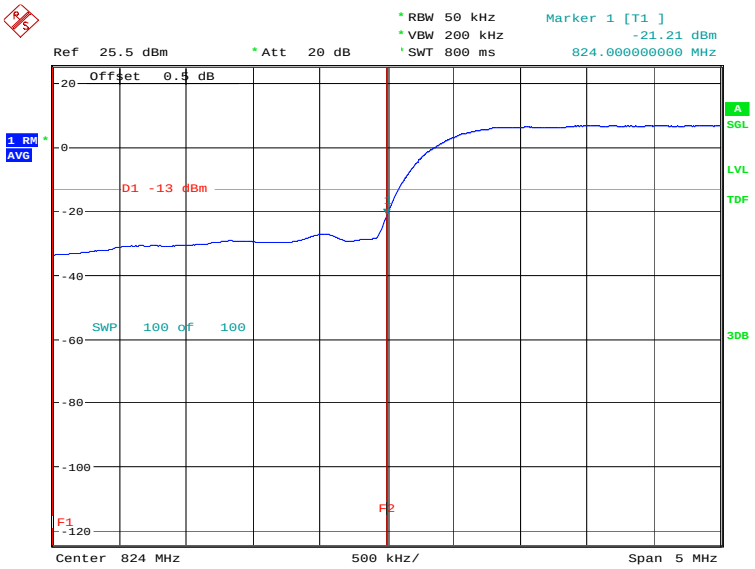
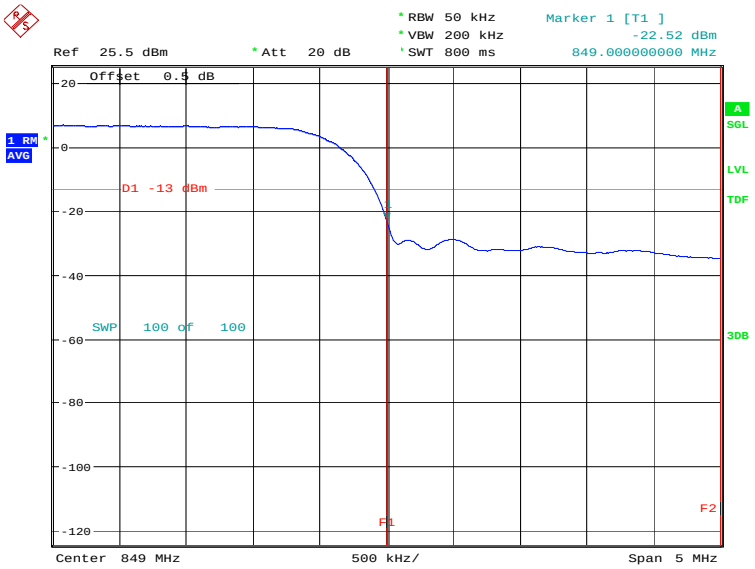
## WCDMA Band V-QPSK

## LOW BAND EDGE BLOCK-A (WCDMA Band Ⅴ)-Channel 4132




Date: 4.DEC.2019 12:01:08

## HIGH BAND EDGE BLOCK-C (WCDMA Band Ⅴ) –Channel 4233




Date: 4.DEC.2019 12:02:51

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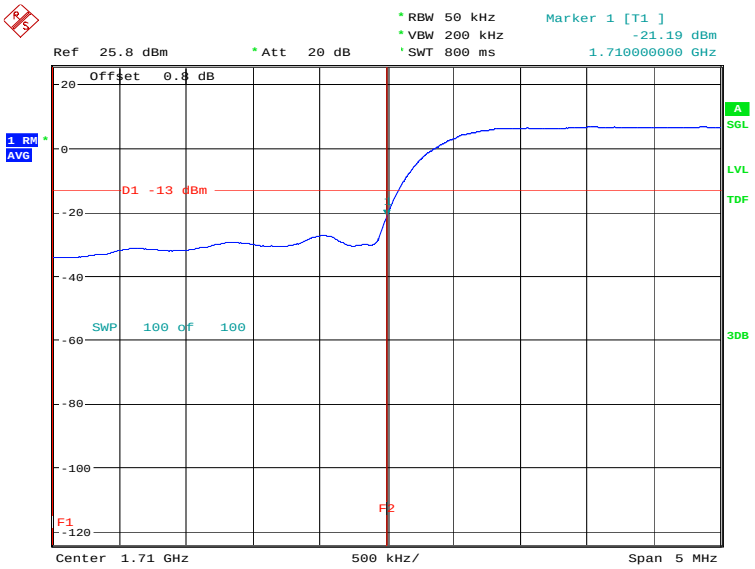
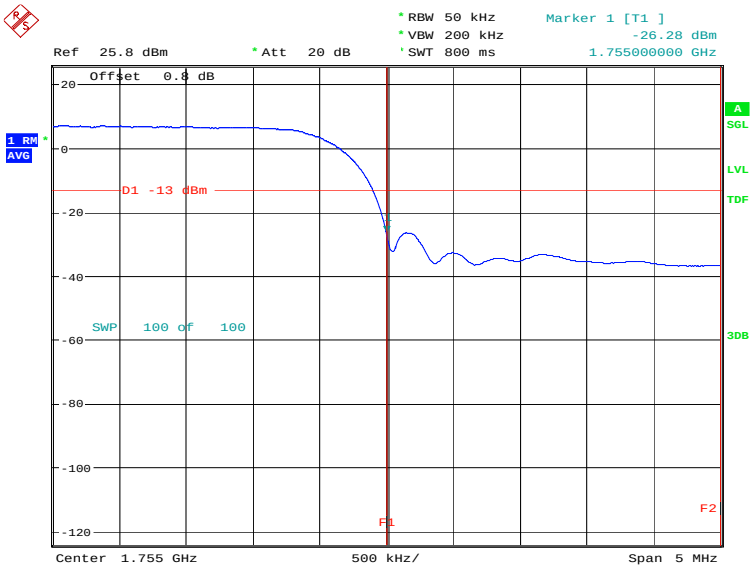
## WCDMA Band IV-QPSK

## LOW BAND EDGE BLOCK-A (WCDMA Band IV)-Channel 1312




Date: 4.DEC.2019 12:51:13

## HIGH BAND EDGE BLOCK-C (WCDMA Band IV) –Channel 1513




Date: 4.DEC.2019 12:52:56

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## A.7 CONDUCTED SPURIOUS EMISSION

### A.7.1 Measurement Method

The following steps outline the procedure used to measure the conducted emissions from the EUT.

1. Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency. For the mobile station equipment tested, this equates to a frequency range of 13 MHz to 9 GHz, data taken from 10 MHz to 25 GHz.
2. Determine EUT transmit frequencies below outlines the band edge frequencies pertinent to conducted emissions testing.
3. According to KDB 971168, the applicable rule part specifies the reference bandwidth for measuring unwanted emission levels (typically, 100 kHz if the authorized frequency band/block is at or below 1 GHz and 1 MHz if the authorized frequency band/block is above 1 GHz).

**WCDMA Band Ⅱ Transmitter**

| Channel | Frequency (MHz) |
|---|---|
| 9262 | 1852.40 |
| 9400 | 1880.00 |
| 9538 | 1907.60 |

**WCDMA Band IV Transmitter**

| Channel | Frequency (MHz) |
|---|---|
| 1312 | 1712.40 |
| 1412 | 1732.40 |
| 1513 | 1752.60 |

**WCDMA Band V Transmitter**

| Channel | Frequency (MHz) |
|---|---|
| 4132 | 826.40 |
| 4183 | 836.60 |
| 4233 | 846.60 |

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### A. 7.2 Measurement Limit

Part 24.238, Part 22.917 and Part 27.53(h) specify that 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.

The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

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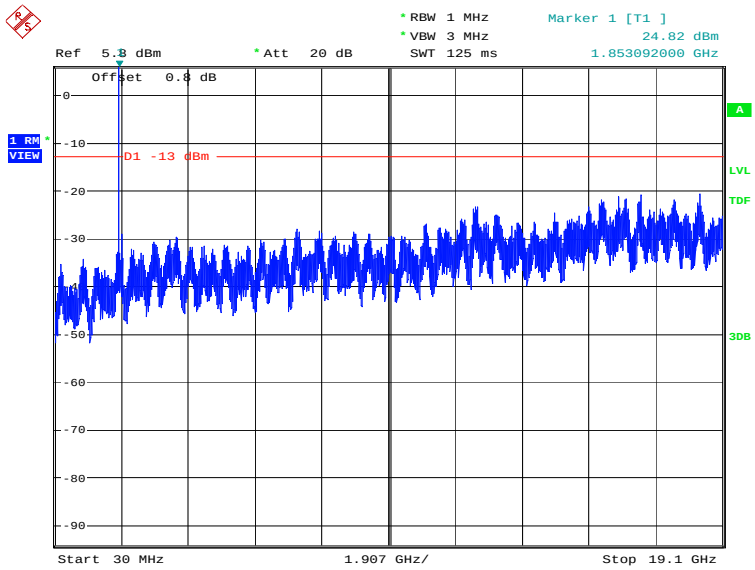
### A.7.3 Measurement result

**WCDMA Band II**

**Channel 9262: 30MHz – 19.10GHz**

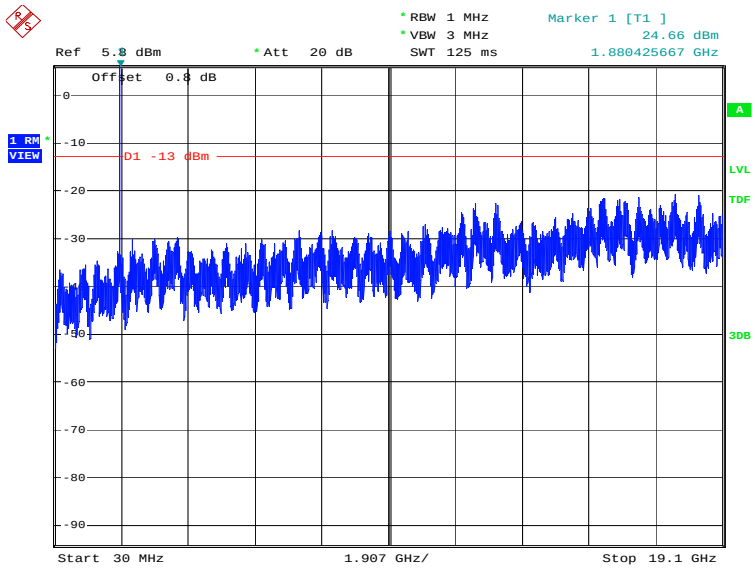
Spurious emission limit –13dBm.




Date: 4.DEC.2019 11:51:07

**Channel 9400: 30MHz – 19.10GHz**

Spurious emission limit –13dBm.




Date: 4.DEC.2019 11:51:23

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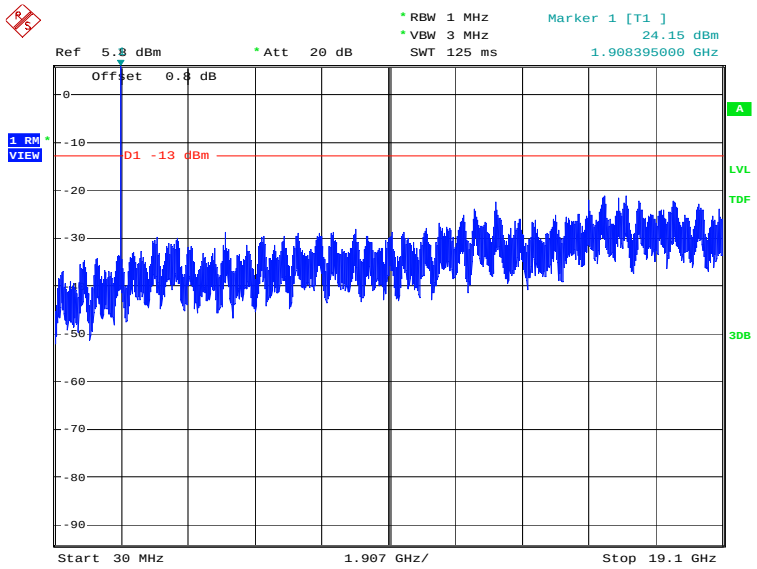
**Channel 9538: 30MHz –19.10GHz**

Spurious emission limit –13dBm.




Date: 4.DEC.2019 11:51:38

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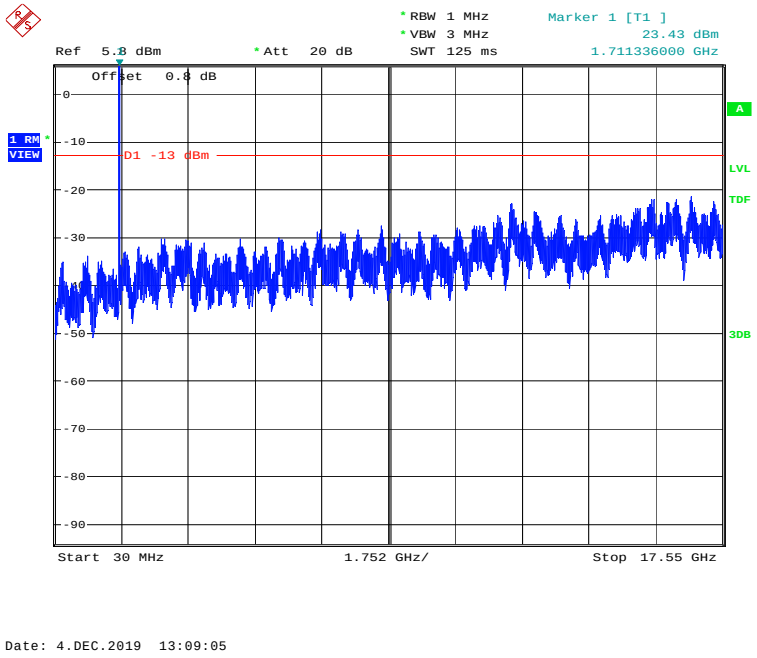
**WCDMA Band IV**

**Channel 1312: 30MHz –17.55GHz**

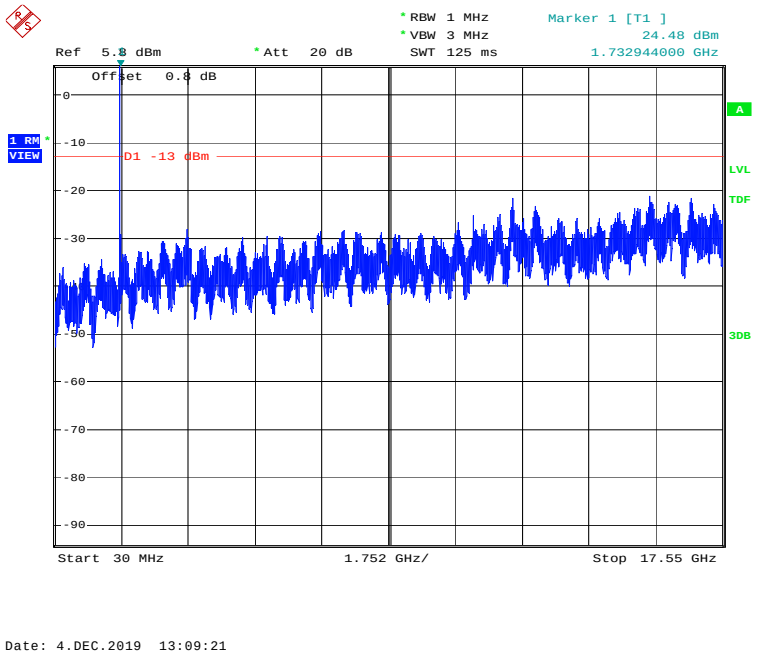
Spurious emission limit –13dBm.




**WCDMA Band IV**

**Channel 1412: 30MHz –17.55GHz**

Spurious emission limit –13dBm.

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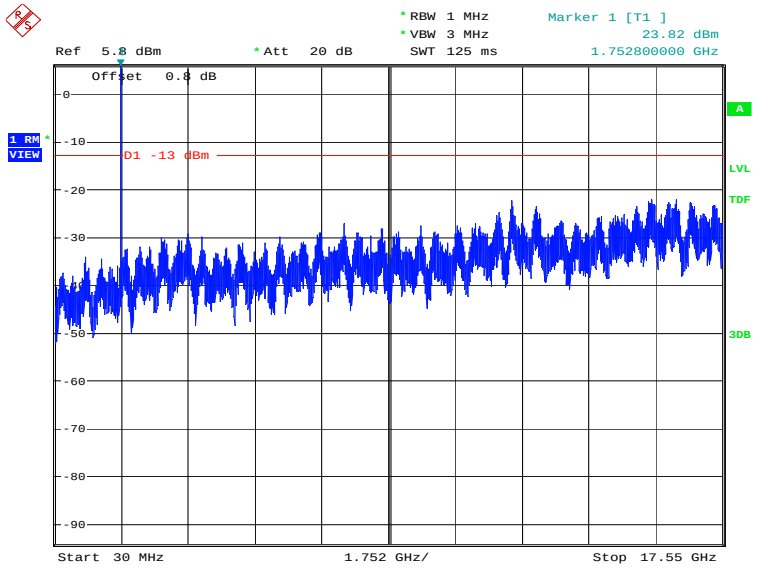
**WCDMA Band IV**

**Channel 1513: 30MHz –17.55GHz**

Spurious emission limit –13dBm.




Date: 4.DEC.2019 13:09:36

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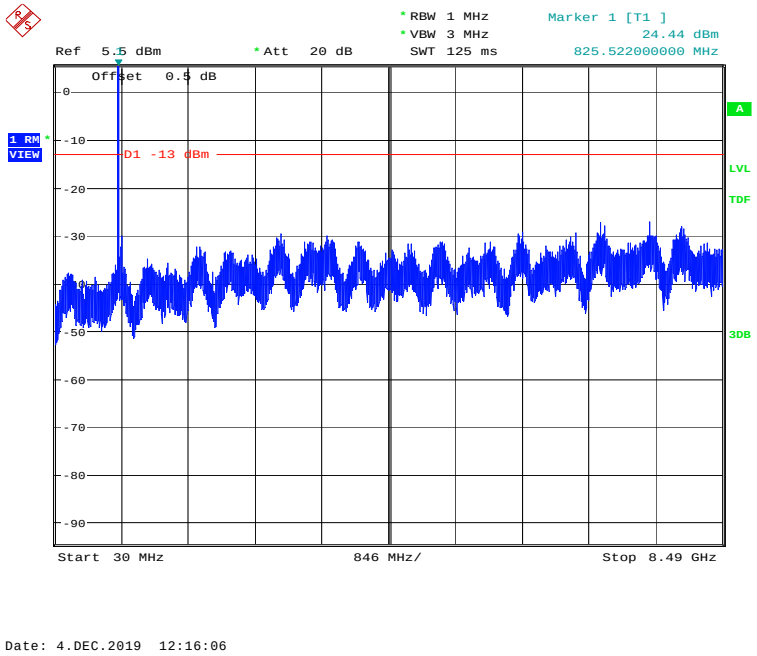
**WCDMA Band V**

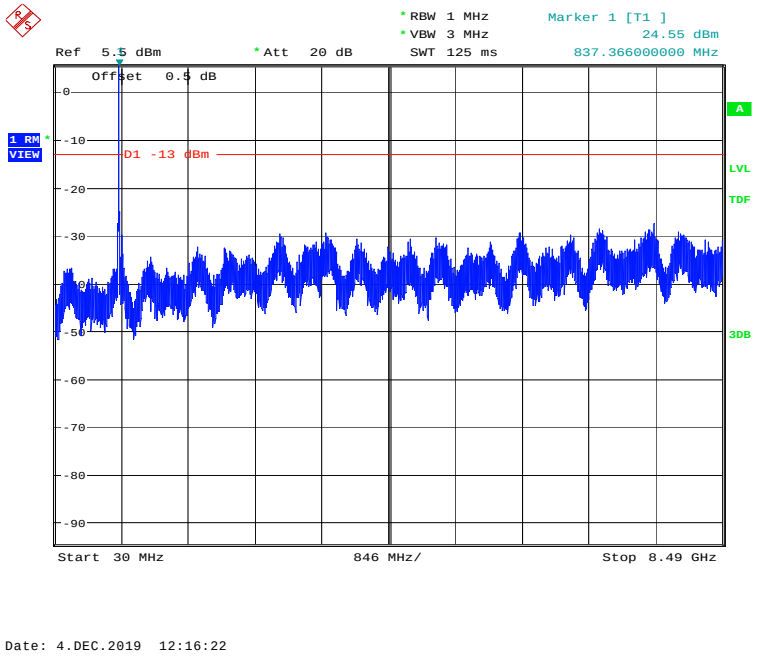
**Channel 4132: 30MHz –8.49GHz**

Spurious emission limit –13dBm.




**Channel 4183: 30MHz –8.49GHz**

Spurious emission limit –13dBm.

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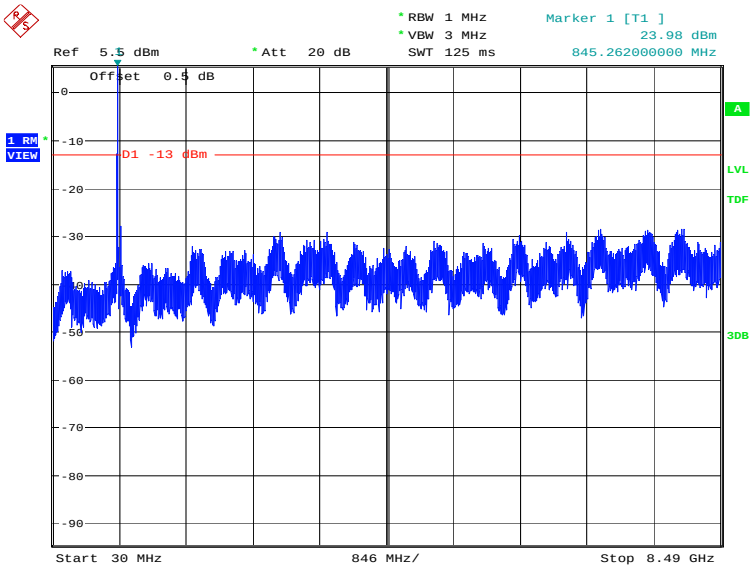
**Channel 4233: 30MHz –8.49GHz**

Spurious emission limit –13dBm.




Date: 4.DEC.2019 12:16:38

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## A.8 PEAK-TO-AVERAGE POWER RATIO

The peak-to-average power ratio (PAPR) of the transmitter output power must not exceed 13 dB. The PAPR measurements should be made using either an instrument with complementary cumulative distribution function (CCDF) capabilities to determine that PAPR will not exceed 13 dB for more than 0.1 percent of the time or other Commission approved procedure. The measurement must be performed using a signal corresponding to the highest PAPR expected during periods of continuous transmission.

According to KDB 971168:

a) Refer to instrument's analyzer instruction manual for details on how to use the power statistics/CCDF function;

b) Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;

c) Set the number of counts to a value that stabilizes the measured CCDF curve;

d) Set the measurement interval to 1ms;

e) Record the maximum PAPR level associated with a probability of 0.1%.

### A.8.1 Measurement limit

not exceed 13 dB

### A.8.2 Measurement results

**WCDMA Band II-QPSK**

**Measurement result**

| CH | Frequency(MHz) | PAPR(dB) |
|---|---|---|
| 9400 | 1880.0 | 3.53 |

**WCDMA Band IV-QPSK**

**Measurement result**

| CH | Frequency(MHz) | PAPR(dB) |
|---|---|---|
| 1412 | 1732.4 | 3.30 |

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## ANNEX B: Accreditation Certificate

**United States Department of Commerce**
**National Institute of Standards and Technology**

NVLAP®

# Certificate of Accreditation to ISO/IEC 17025:2005

**NVLAP LAB CODE: 600118-0**

**Telecommunication Technology Labs, CAICT**
Beijing
China

*is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:*

**Electromagnetic Compatibility & Telecommunications**

*This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).*

2019-09-26 through 2020-09-30
*Effective Dates*

DEPARTMENT OF COMMERCE · UNITED STATES OF AMERICA

*For the National Voluntary Laboratory Accreditation Program*

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

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