Full

TEST REPORT

No. I17D00058-RFA

For

Client :	**Lenovo (Shanghai) Electronics Technology Co., Ltd**
Production :	**Portable Tablet Computer**
Model Name :	**TB-X704V**
FCC ID:	**O57TBX704V**
IC ID	**10407A-TBX704V**
Brand	**Lenovo**
Hardware Version:	**Lenovo Tablet TB-X704V**
Software Version:	**TB-X704V_RF01_20170301**
Issued date:	**2017-06-22**

Note:

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of ECIT Shanghai.

Test Laboratory:

ECIT Shanghai, East China Institute of Telecommunications

Add: 7-8F, G Area, No.668, Beijing East Road, Huangpu District, Shanghai, P. R. China

Tel: (+86)-021-63843300, E-Mail: welcome@ecit.org.cn

Revision Version

Report Number	Revision	Date	Memo
I17D00058-RFA	00	2017-06-06	Initial creation of test report
I17D00058-RFA	01	2017-06-22	Second creation of test report

CONTENTS

1. TEST LABORATORY 5
1.1. TESTING LOCATION 5
1.2. TESTING ENVIRONMENT 5
1.3. PROJECT DATA 5
1.4. SIGNATURE 5
2. CLIENT INFORMATION 6
2.1. APPLICANT INFORMATION 6
2.2. MANUFACTURER INFORMATION 6
3. EQUIPMENT UNDER TEST (EUT) AND ANCILLARY EQUIPMENT (AE) 7
3.1. ABOUT EUT 7
3.2. INTERNAL IDENTIFICATION OF EUT USED DURING THE TEST 7
3.3. INTERNAL IDENTIFICATION OF AE USED DURING THE TEST 7
3.4. STATEMENTS 7
4. REFERENCE DOCUMENTS 8
4.1. REFERENCE DOCUMENTS FOR TESTING 8
5. SUMMARY OF TEST RESULTS 9
6. TEST EQUIPMENT UTILIZED 10
7. TEST ENVIRONMENT 12
ANNEX A. MEASUREMENT RESULTS 13
ANNEX A.1. OUTPUT POWER 13
ANNEX A.2. PEAK-TO-AVERAGE POWER RATIO 14
ANNEX A.3. OCCUPIED BANDWIDTH 15
ANNEX A.4. -26DB EMISSION BANDWIDTH 20
ANNEX A.5. BAND EDGE AT ANTENNA TERMINALS 25
ANNEX A.6. FREQUENCY STABILITY 28

ANNEX A.7. CONDUCTED SPURIOUS EMISSION 31

ANNEX A.8. RADIATED 38

ANNEX B. DEVIATIONS FROM PRESCRIBED TEST METHODS 46

1. Test Laboratory

1.1. Testing Location

Company Name:	ECIT Shanghai, East China Institute of Telecommunications
Address:	7-8F, G Area, No. 668, Beijing East Road, Huangpu District, Shanghai, P. R. China
Postal Code:	200001
Telephone:	(+86)-021-63843300
Fax:	(+86)-021-63843301
FCC Registration NO.:	489729
IC OAT S Test Site Registration Number	10766A-1

1.2. Testing Environment

Normal Temperature:	15-35℃
Extreme Temperature:	0/+45℃
Relative Humidity:	20-75%

1.3. Project data

Project Leader:	Chen Minfei
Testing Start Date:	2017-04-01
Testing End Date:	2017-05-25

1.4. Signature

Zhang Shiyu
(Prepared this test report)

Ding Li
(Reviewed this test report)

Zheng Zhongbin
Director of the laboratory
(Approved this test report)

2. Client Information

2.1. Applicant Information

Company Name:	Lenovo (Shanghai) Electronics Technology Co., Ltd
Address:	NO.68 BUILDING, 199 FENJU RD, Pilot Free Trade Zone, Shanghai, 200131, China
Contact:	Spring Zhou
Telephone:	13776306969

2.2. Manufacturer Information

Company Name:	Lenovo PC HK Limited
Address:	23/F, Lincoln House, Taikoo Place 979 King's Road, Quarry Bay, Hong Kong
Contact:	Spring Zhou
Telephone:	13776306969

3. Equipment Under Test (EUT) and Ancillary Equipment (AE)

3.1. About EUT

EUT Description	Portable Tablet Computer
Model name	TB-X704V
FCC ID	O57TBX704V
IC ID	10407A-TBX704V
Frequency	WCDMA Band II /V
Extreme Temperature	0/+45℃
Nominal Voltage	4.0V
Extreme High Voltage	4.35V
Extreme Low Voltage	3.6V

Note: Photographs of EUT are shown in ANNEX A of this test report.

3.2. Internal Identification of EUT used during the test

EUT ID*	SN or IMEI	HW Version	SW Version	Date of receipt
N09	863923030004443	Lenovo Tablet TB-X704V	TB-X704V_RF01_20170301	2017-03-17

*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	SN
AE1	RF cable	---
AE2	Dummy Battery	---

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

3.4. Statements

The product name TB-X704V, supporting WCDMA/WLAN/BT/BLE, manufactured by Lenovo PC HK Limited, is a new product for testing.

ECIT has verified that the compliance of the tested device specified in section 5 of this test report is successfully evaluated according to the procedure and test methods as defined in type certification requirement listed in section 5 of this test report.

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	2014
FCC Part 22	PUBLIC MOBILE SERVICES	2014
ANSI-TIA-603-D	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards	2010
ANSI C63.4	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz	2014
RSS-132	Cellular Telephone Systems Operating in the Bands 824-849 MHz and 869-894 MHz	2013
RSS-133	2 GHz Personal Communications Services	2013

5. SUMMARY OF TEST RESULTS

Item	Test items	FCC rules	IC rules	result
1	Output Power	2.1046/22.913(a)/ 24.232(c)	RSS-132 5.4/ RSS-133 6.4	Pass
2	Peak-to-Average Ratio	24.232(d)	RSS-132 5.4/ RSS-133 6.4	Pass
3	99%Occupied Bandwidth	2.1049(h)(i)/ 22.917(b)	RSS-Gen 4.6	Pass
4	-26dB Emission Bandwidth	22.917(b)/ §24.238(b)	RSS-Gen 4.6	Pass
5	Band Edge at antenna terminals	22.917(a)/ 24.238(a)	RSS-132 5.5/ RSS-133 6.5	Pass
6	Frequency stability	2.1055/ 24.235	RSS-132 5.3/ RSS-133 6.3	Pass
7	Conducted Spurious mission	2.1053/22.917(a)/ 24.238(a)	RSS-132 5.5/ RSS-133 6.5	Pass
8	Emission Limit	2.1051/22.917/ 24.238/22.913/24.232	RSS-132 5.5/ RSS-133 6.5	Pass

6. Test Equipment Utilized

Climate chamber

No.	Equipment	Model	Serial Number	Manufacturer	Calibration date	Cal.interval
1	Climate chamber	SH-641	92012011	ESPEC	2016-01-06	2 Year

Radiated emission test system

The test equipment and ancillaries used are as follows.

No.	Equipment	Model	Serial Number	Manufacturer	Calibration date	Cal.interval
1	Universal Radio Communication Tester	CMU200	123101	R&S	2017-05-11	1 Year
2	Test Receiver	ESU40	100307	R&S	2017-05-11	1 Year
3	Trilog Antenna	VULB9163	VULB9163-515	Schwarzbeck	2014-11-05	3 Year
4	Double Ridged Guide Antenna	ETS-3117	135890	ETS	2017-01-11	3 Year
5	2-Line V-Network	ENV216	101380	R&S	2017-05-11	1 Year
6	Substitution Antenna	ETS-3117	00135890	ETS	2017-01-11	3 Year
7	RF Signal Generator	SMF100A	102314	R&S	2017-05-11	1 Year
8	Substitution Antenna	VUBA9117	9117-266	Schwarzbeck	2014-08-19	3 Year
9	Amplifier	SCU03	10009	R&S	2017-01-05	1 Year

10	Amplifier	NTWPA-008610F	12023024	Rflight	2017-01-05	1 Year
11	Attenuators	BW-N3W5+	/	MCL	2017-01-05	1 Year

Conducted test system

No.	Name	Type	SN	Manufacture	Cal. Due Date	Cal.interval
1	Spectrum Analyzer	FSQ26	101096	R&S	2017-05-11	1 Year
2	Universal Radio Communication Tester	CMU200	123102	R&S	2017-05-11	1 Year
3	DC Power Supply	ZUP60-14	LOC-220Z006-0007	TDL-Lambda	2017-05-11	1 Year

7. Test Environment

Shielding Room1 (6.0 meters×3.0 meters×2.7 meters) did not exceed following limits along the conducted RF performance testing:

Temperature	Min. = 15 ℃, Max. = 35 ℃
Relative humidity	Min. = 25 %, Max. = 75 %
Shielding effectiveness	> 110 dB
Ground system resistance	< 0.5 Ω

Control room did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ℃, Max. = 35 ℃
Relative humidity	Min. =25 %, Max. = 75 %
Shielding effectiveness	> 110 dB
Electrical insulation	> 10 kΩ
Ground system resistance	< 0.5 Ω

Fully-anechoic chamber1 (6.9 meters×10.9 meters×5.4 meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ℃, Max. = 35 ℃
Relative humidity	Min. = 25 %, Max. = 75 %
Shielding effectiveness	> 100 dB
Electrical insulation	> 10 kΩ
Ground system resistance	< 0.5 Ω
VSWR	Between 0 and 6 dB, from 1GHz to 18GHz
Site Attenuation Deviation	Between -4 and 4 dB,30MHz to 1GHz
Uniformity of field strength	Between 0 and 6 dB, from 80MHz to 3000 MHz

ANNEX A. MEASUREMENT RESULTS

ANNEX A.1. OUTPUT POWER

A.1.1. Summary

During the process of testing, the EUT was controlled Rhode & Schwarz Digital Radio. Communication tester (CMU-200) 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

Method of measurements please refer to KDB971168 D01 v02r02 clause 5.
The EUT was set up for the max output power with pseudo random data modulation.
The power was measured with Rhode & Schwarz Spectrum Analyzer FSQ(peak).
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. (bottom, middle and top of operational frequency range).

A.1.2.2 Test procedures:

1. The transmitter output port was connected to base station.
2. Set the EUT at maximum power through base station.
3. Select lowest, middle, and highest channels for each band and different modulation.
4. Measure the maximum burst average power for GSM and maximum average power for other modulation signal.

A.1.2.3 Limit:

22.913(a) Mobile stations are limited to 7watts.
24.232(c) Mobile and portable stations are limited to 2 watts.

A.1.2.4 Test Procedure:

The transmitter output power was connected to calibrated attenuator, the other end of which was connected to signal analyzer. Transmitter output power was read off the power in dBm. The power outputs at the transmitter antenna port was determined by adding the value of attenuator to the signal analyzer reading.

A.1.2.5 WCDMA Test Condition:

RBW	VBW	Sweep time	Span
10MHz	10MHz	800ms	50MHz

A.1.2.6 Measurement results:

WCDMA BAND II	
Channel/fc(MHz)	Peak power (dBm)
Mid 9400/1880	26.947
Low 9262/1852.4	27.813
High 9538/1907.6	27.389

WCDMA BAND V	
Channel/fc(MHz)	Peak power (dBm)
Mid 4183/836.6	28.237
Low 4132/826.4	28.176
High 4233/846.6	28.517

measurement uncertainty for this test item is 0.83 Hz, $k = 2$.

Conclusion: PASS

ANNEX A.2. Peak-to-Average Power Ratio

Method of test measurements please refer to KDB971168 D01 v02r02 clause 5.7.

A.2.1 PAPR Limit

The peak-to-average power ratio (PAPR) of the transmission may not exceed 13dB

A.2.2 Test procedures

1. The EUT was connected to the spectrum analyzer and system simulator via a power divider.
2.
   1) Select the spectrum analyzer CCDF function.
   2) Set RBW⩾signal's occupied bandwidth.
   3) Set the number of counts to a value that stabilizes the measured CCDF cure;
   4) Sweep time ⩾ 1s.
3. Record the maximum PAPR level associated with a probability of 0.1%.

A.2.3 Test results:

WCDMA BAND II			
Modes	WCDMA BAND II		
Channel	9262	9400	9538

Frequency (MHz)	1852.4	1880	1907.6
PAPR(dB)	4.13	3.69	3.91
WCDMA BAND V			
Modes	WCDMA BAND V		
Channel	4132	4183	4233
Frequency (MHz)	826.4	836.4	846.6
PAPR(dB)	3.81	4.07	3.75

Conclusion: PASS

ANNEX A.3. Occupied Bandwidth

Method of test please refer to KDB971168 D01 v02r02 clause 4.0.

A.3.1. Occupied Bandwidth

Similar to conducted emissions; 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 WCDMA BANDII and WCDMA BANDV.

A.3.2 Test Procedure:

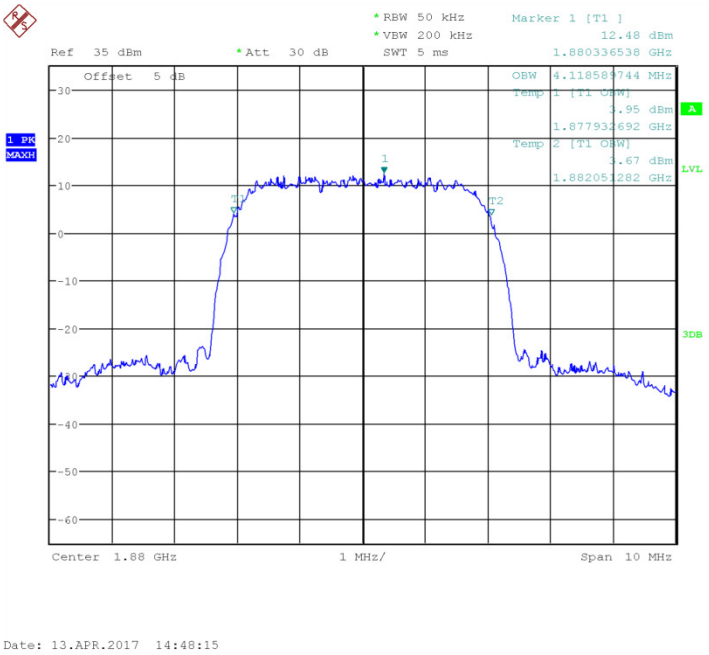
1. The EUT output RF connector was connected with a short cable to the signal analyzer.
2. RBW was set to about 1% of emission BW, VBW >= 3 times RBW,.
3. 99% bandwidth were measured, the occupied bandwidth is delta frequency between the two points where the display line intersects the signal trace.

A.3.3 Test result:

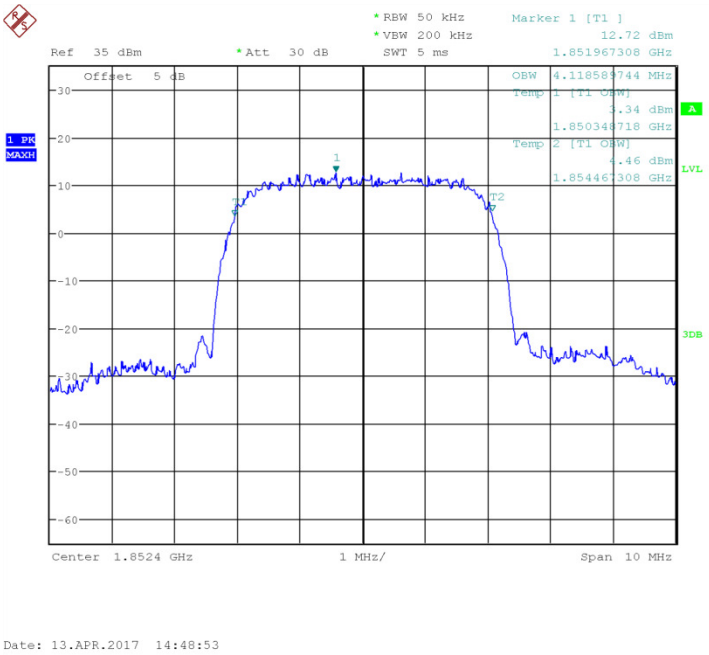
WCDMA BAND II		
Test channel	Frequency (MHz)	99% Occupied Bandwidth(KHz)
Mid 9400	1880	4118.59
Low 9262	1852.4	4118.59
High 9538	1907.6	4118.59

Conclusion: PASS

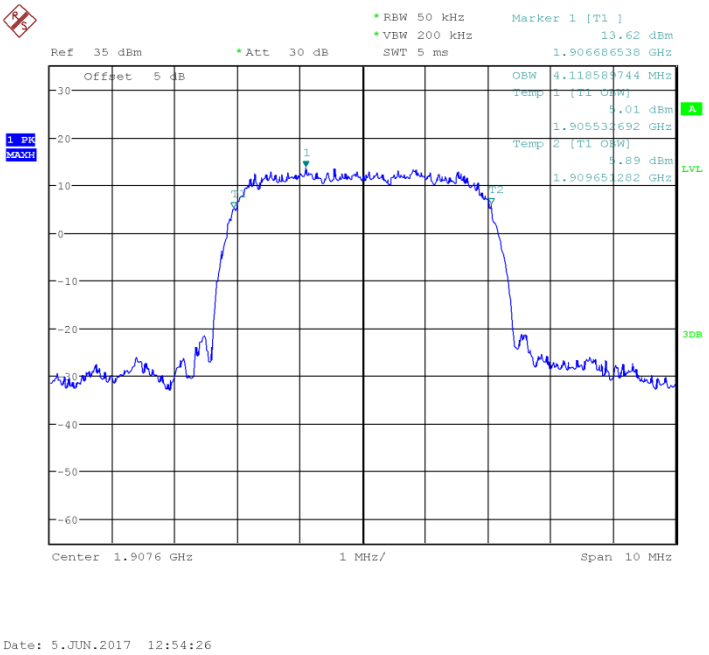
WCDMA BAND II



Channel 9400-Occupied Bandwidth (99%)



Channel 1852-Occupied Bandwidth (99%)

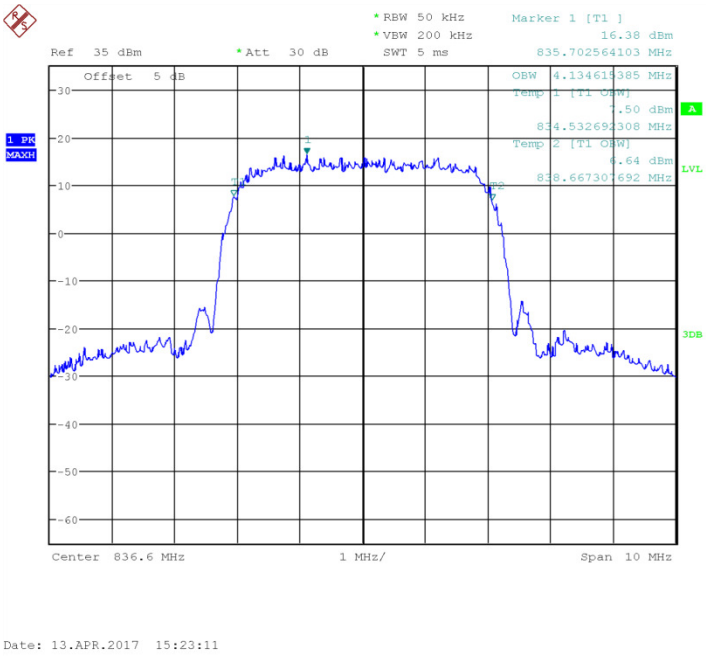


Channel 1907-Occupied Bandwidth (99%)

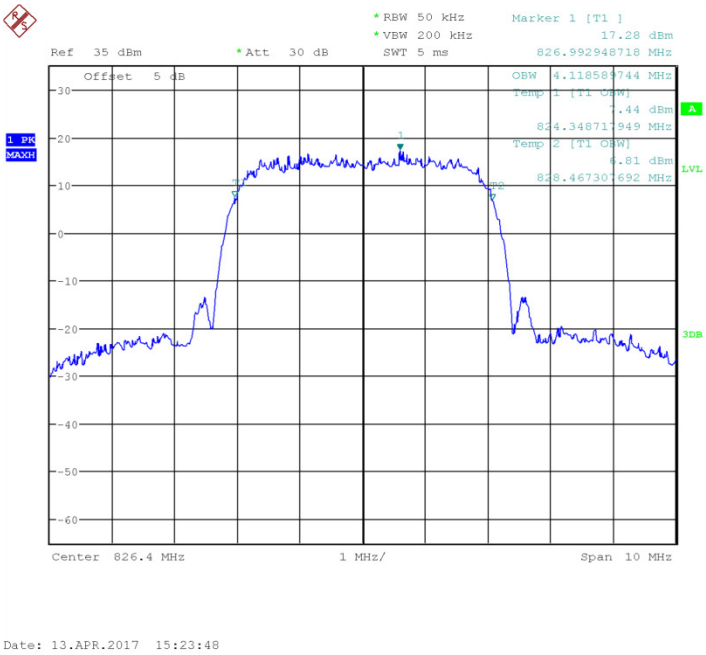
WCDMA BAND V		
Test channel	Frequency (MHz)	99% Occupied Bandwidth(KHz)
Mid 4183	836.6	4134.62
Low 4132	826.4	4118.59
High 4233	846.6	4118.59

Conclusion: PASS

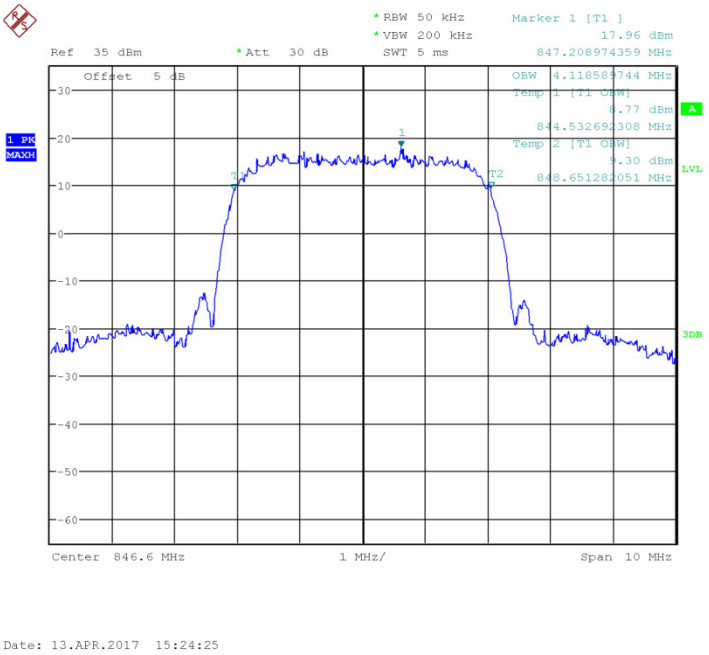
WCDMA BAND V



Channel 4183-Occupied Bandwidth (99%)



Channel 4132-Occupied Bandwidth (99%)



Channel 4233-Occupied Bandwidth (99%)

measurement uncertainty for this test item is 60.80 Hz, k = 2.

ANNEX A.4. -26dB Emission Bandwidth

Method of test please refer to KDB971168 D01 v02r02 clause 4.0.

A.4.1. -26dB Emission Bandwidth

Similar to conducted emissions; 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 WCDMA BANDII and WCDMA BANDV.

A.4.2 Test Procedure:

1. The EUT output RF connector was connected with a short cable to the signal analyzer.
2. RBW was set to about 1% of emission BW, VBW >= 3 times RBW,.
3. 26dB bandwidth were measured, the occupied bandwidth is delta frequency between the two points where the display line intersects the signal trace.

A.4.3 Measurement methods:

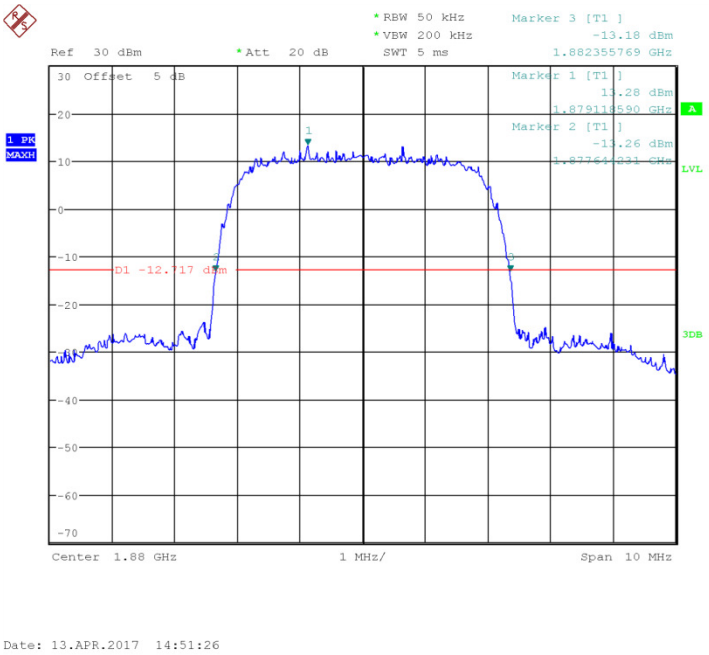
For WCDMA: signal analyzer setting as: RBW=50KHZ;VBW=20KHZ;Span=10MHz.

A.4.4 Test results:

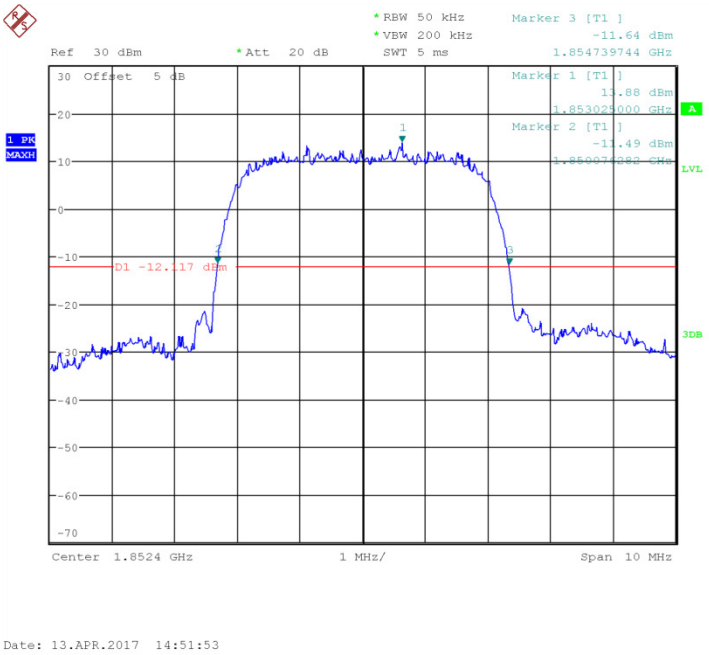
WCDMA BAND II		
Test channel	Frequency (MHz)	–26dBc Emission Bandwidth(KHz)
Mid 9400	1800	4711.538
Low 9262	1852.4	4663.462
High 9538	1907.6	4711.538

Conclusion: PASS

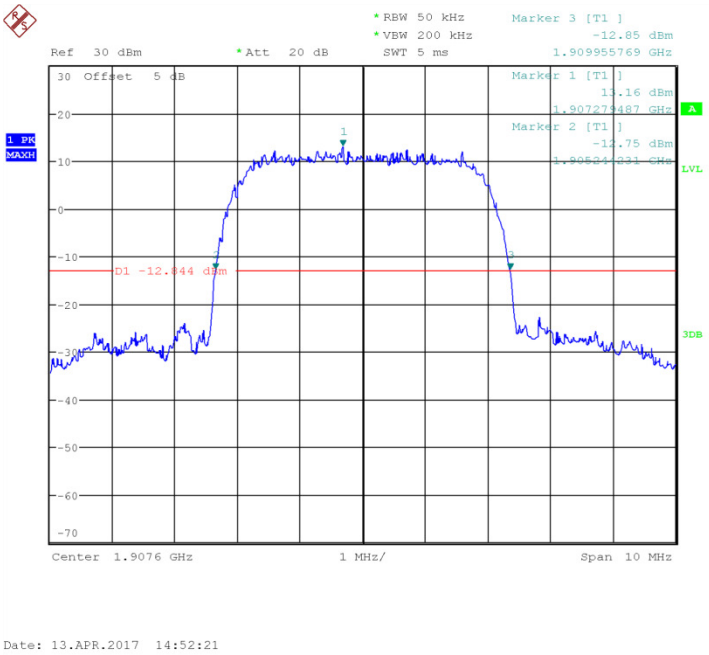
WCDMA BAND II



Channel 9400- Emission Bandwidth (-26dBc BW)



Channel 9262- Emission Bandwidth (-26dBc BW)

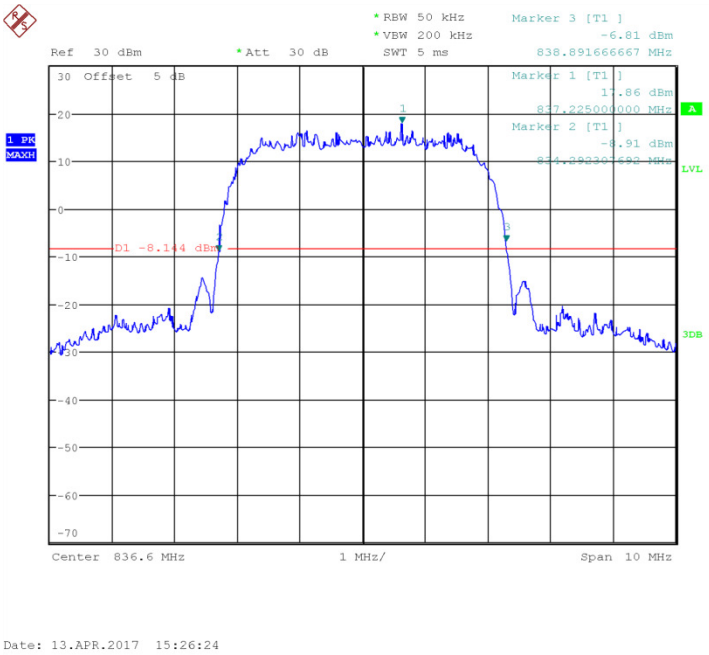


Channel 9538- Emission Bandwidth (-26dBc BW)

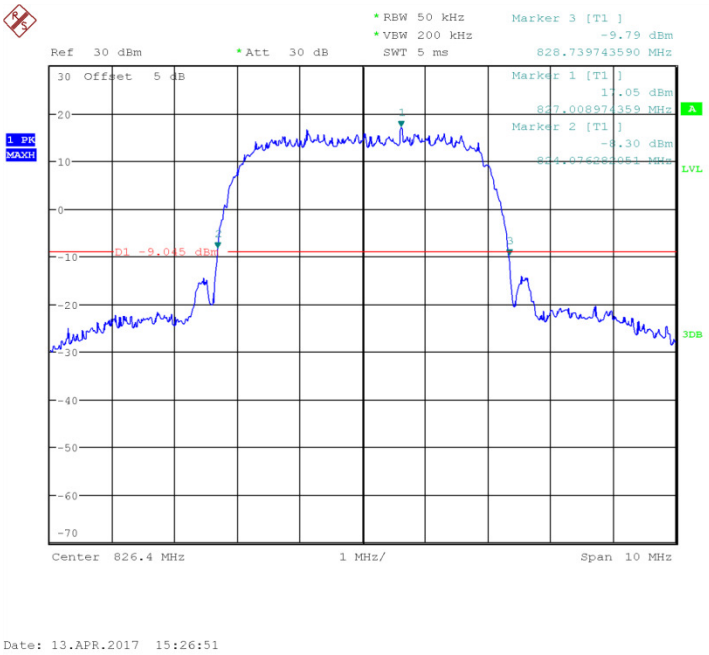
WCDMA BAND V		
Test channel	Frequency (MHz)	–26dBc Emission Bandwidth(KHz)
Mid 4183	836.6	4599.359
Low 4132	826.4	4663.462
High 4233	846.6	4663.462

Conclusion: PASS

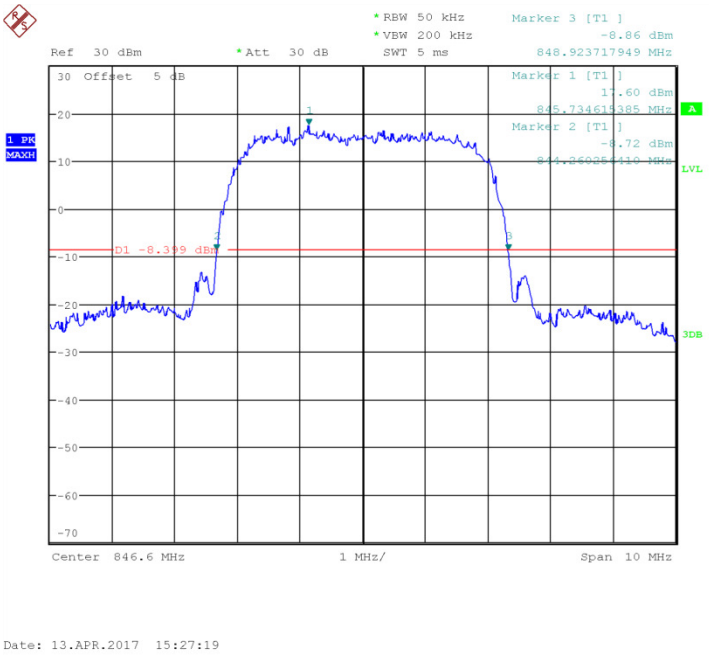
WCDMA BAND V



Channel 4183- Emission Bandwidth (-26dBc BW)



Channel 4132- Emission Bandwidth (-26dBc BW)



Channel 4233- Emission Bandwidth (-26dBc BW)

Note: measurement uncertainty for this test item is 60.80Hz, k = 2.

ANNEX A.5. Band Edge at antenna terminals

Method of test measurements please refer to KDB971168 D01 v02r02 clause 3.5

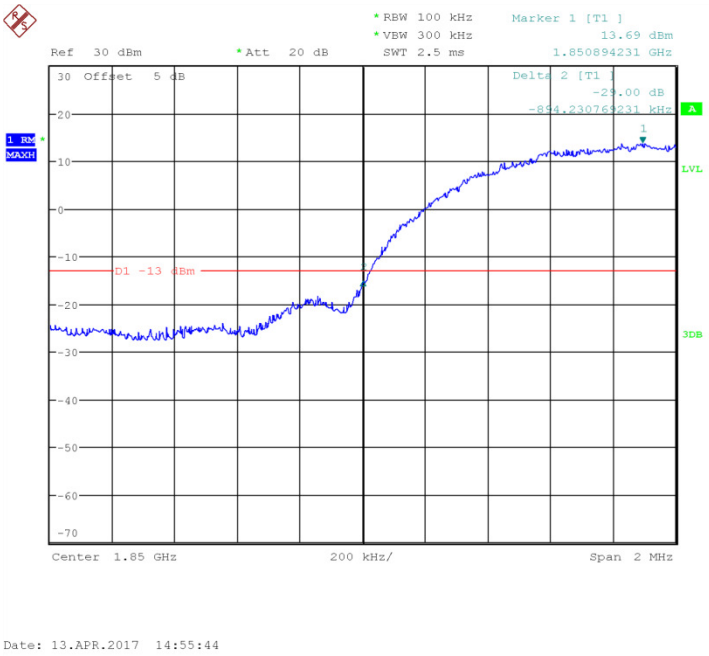
A.5.1 Limit:

The magnitude of each spurious and harmonic emission that can be detected when the equipment is operated under the conditions specification in the instruction manual and/or alignment procedure, shall not be less than 43+10log (Mean power in watts) dBc below the mean power output outside a license's frequency block(-13dBm).

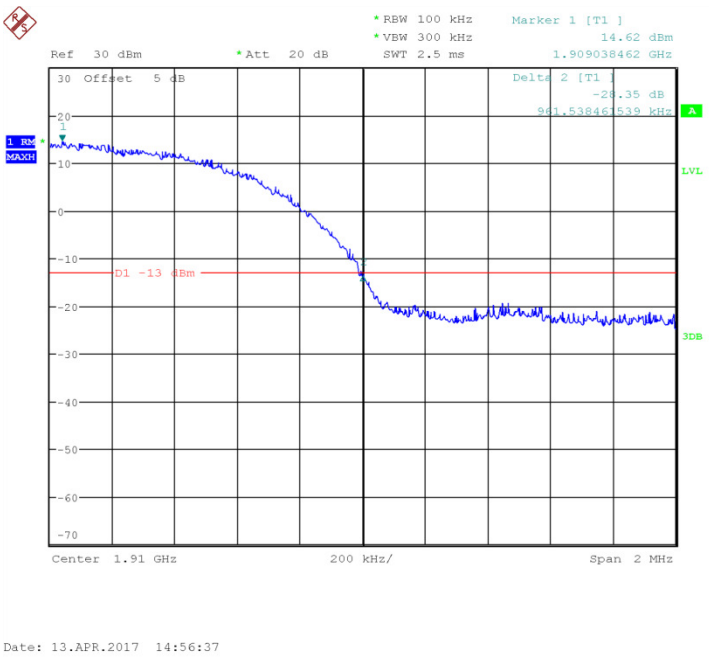
A.5.2 Test procedure:

1. The RF output of the transceiver was connected to a signal analyzer through appropriate attenuation.
2. In the 1MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.
3. The RF fundamental frequency should be excluded against the limit line in the operating frequency band
4. The limit line is derived from 43+10log(P) Db below the transmitter power P(Watts)
   =P(W)-[43+10log(P)](Db)
   =[30+10log(P)](dBm)-[43+10log(P)](Db)
   =-13dBm

WCDMA BAND II



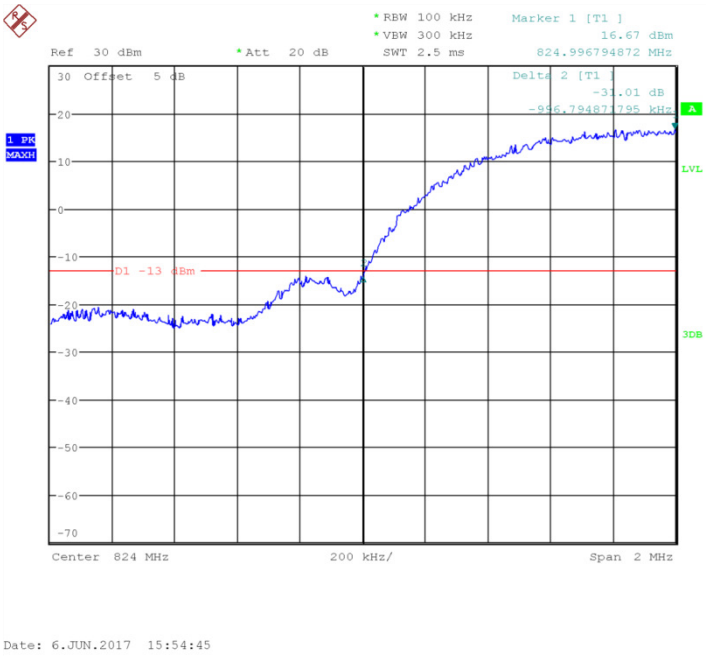
Channel 9262- LOW BAND EDGE BLOCK



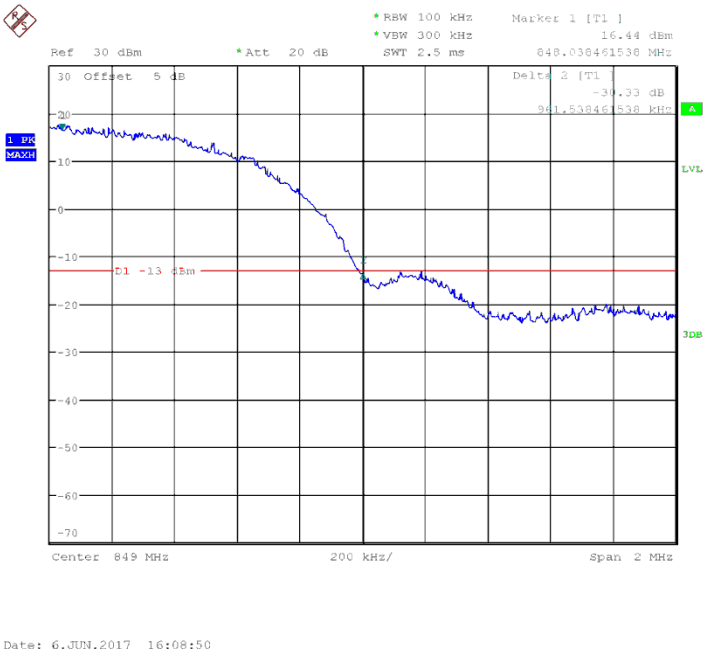
Channel 9262- HIGH BAND EDGE BLOCK

Conclusion :PASS

WCDMA BAND V



Channel 4132- LOW BAND EDGE BLOCK



Channel 4233- HIGH BAND EDGE BLOCK

Conclusion :PASS

NOTE: measurement uncertainty for this test item is U = 0.75 dB, k = 2

ANNEX A.6. FREQUENCY STABILITY

Method of test measurements please refer to KDB971168 D01 v02r02 clause 3.8

A.5.1.Method of Measurement and test procedures

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 BANDII and WCDMA BANDV, 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 0℃ to +45℃ Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.
5. Re-measure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments re-measuring 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 C increments from +45to 0℃. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
9. At all temperature levels hold the temperature to +/- 0.5℃ during the measurement procedure.

A.5.2. Measurement Limit

A.5.2.1. For Hand carried battery powered equipment

According to the JTC standard the GSM frequency stability of the carrier shall be accurate to within 0.1ppm of the received frequency from the base station. And the WCDMA is 2.5ppm. This accuracy is sufficient to meet Sec.24.235, Frequency Stability. 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 3.6VDC and 4.35VDC, with a nominal voltage of 4.0VDC. 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. These voltages was varied from 85% to 115%.

A.5.2.2. For equipment powered by primary supply voltage

According to the JTC standard the GSM frequency stability of the carrier shall be accurate to within 0.1ppm of the received frequency from the base station. And the WCDMA is 2.5ppm. This accuracy is sufficient to meet Sec.24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. For this EUT section 2.1055(d)(1) applies. This requires varying primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

A.5.3 Test results

WCDMA BAND II Mid Channel/fc(MHz) 9400 /1880

Frequency Error VS Temperature

Power Supply (VDc)	Environment Temperature(℃)	Frequency error(Hz)	Limit (Hz)
4.0	0	14	4700
4.0	10	24	4700
4.0	20	33	4700
4.0	30	-7	4700
4.0	40	-29	4700
4.0	45	13	4700

Frequency Error VS Voltage

Power Supply (VDc)	Environment Temperature(℃)	Frequency error(Hz)	Limit (Hz)
3.6	25	-7	4700
4.0	25	-34	4700
4.35	25	23	4700

WCDMA BAND V Mid Channel/fc(MHz) 4183/836.6

Frequency Error VS Temperature

Power Supply (VDc)	Environment Temperature(℃)	Frequency error(Hz)	Limit (Hz)
4.0	0	-22	2091.5
4.0	10	7	2091.5
4.0	20	-17	2091.5
4.0	30	35	2091.5
4.0	40	4	2091.5
4.0	45	-48	2091.5

Frequency Error VS Voltage

Power Supply (VDc)	Environment Temperature(℃)	Frequency error(Hz)	Limit (Hz)
3.6	25	-16	2091.5
4.0	25	11	2091.5
4.35	25	-4	2091.5

ANNEX A.7. CONDUCTED SPURIOUS EMISSION

A.7.1. WCDMA Measurement Method and test procedures

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 equipment of WCDMA BAND II, this equates to a frequency range of 30 MHz to 19.1 GHz, data taken from 30 MHz to 20 GHz. For WCDMA BAND II,data taken from 30 MHz to 10 GHz.
2. The sweep time is set automatically by instrument itself. That should be the optimal sweep time for the span and the RBW. If the sweep time is too short, that is sweep is too fast, the sweep result is not accurate; If the sweep time is too long, that is sweep is too low, some frequency components may be lost. The instrument will give a optimal sweep time according the selected span and RBW.
3. The procedure to get the conducted spurious emission is as follows:
The trace mode is set to Max Hold to get the highest signal at each frequency;
Wait 25 seconds ;Get the result.
4. Determine EUT transmit frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

WCDMA BAND II Transmitter

Channel	Frequency(MHz)
9262	1852.4
9400	1880.0
9538	1907.6

WCDMA BAND V Transmitter

Channel	Frequency(MHz)
4132	826.4
4183	836.6
4233	846.6

A.7.1.1. Measurement Limit

Part 24.238 and Part 22.917 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.

Measurement Uncertainty:

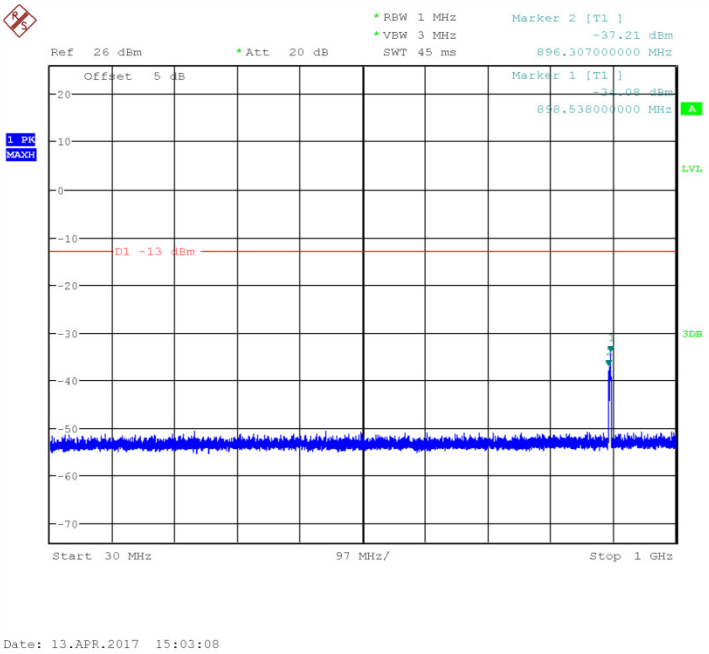
Frequency Range	Uncertainty
30MHz≤ f ≤2GHz	0.63
2GHz≤ f ≤3.6GHz	0.82
3.6GHz≤ f ≤8GHz	1.55
8GHz≤ f ≤20GHz	1.86
20GHz≤ f ≤22GHz	1.90
22GHz≤ f ≤26GHz	2.20

A7.1.2. Measurement result

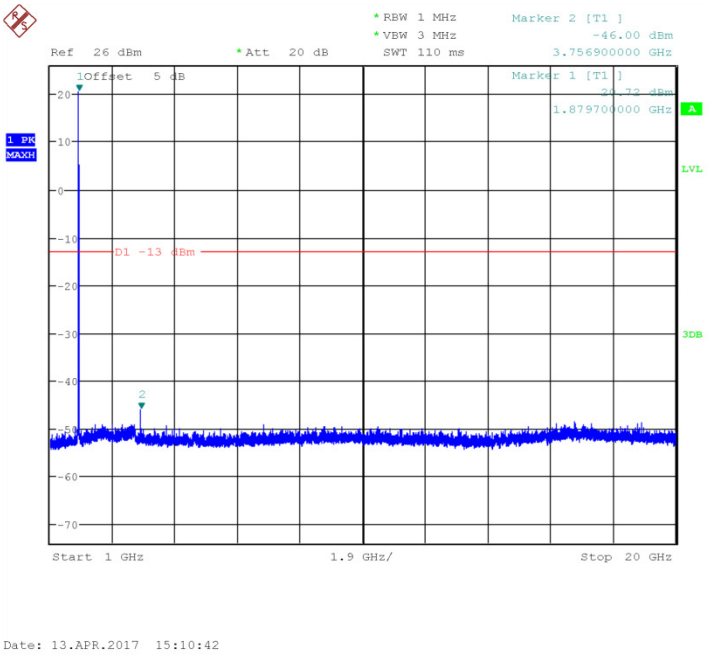
Spurious emission limit -13dBm.

Note: peak above the limit line is the carrier frequency.

A7.1.2.1. WCDMA BAND II

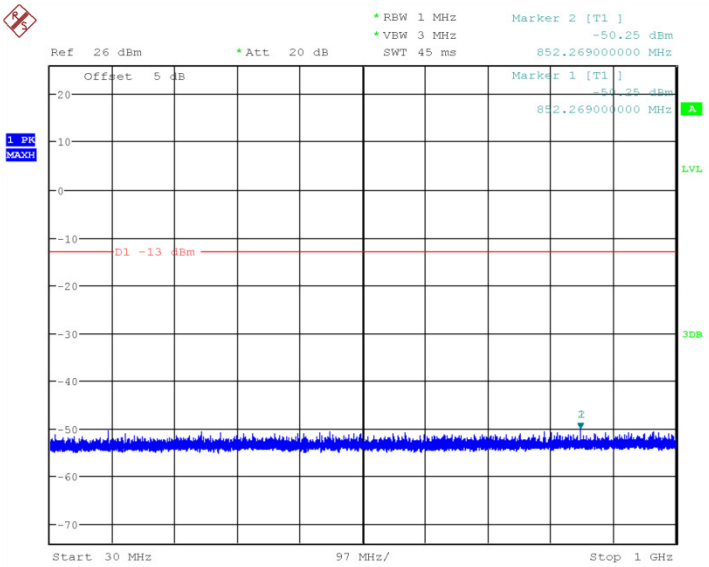


Channel 9262: 30MHz~1GHz



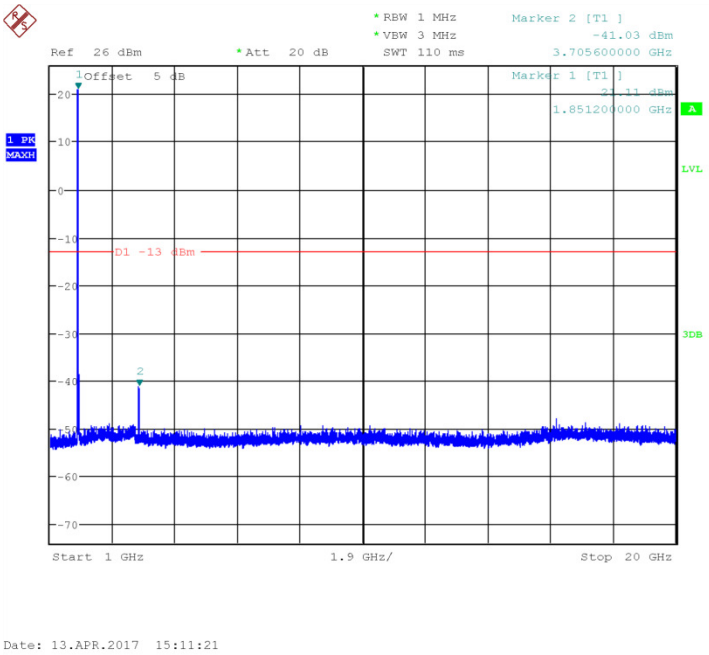
Date: 13.APR.2017 15:10:42

Channel 9262: 1GHz~10GHz

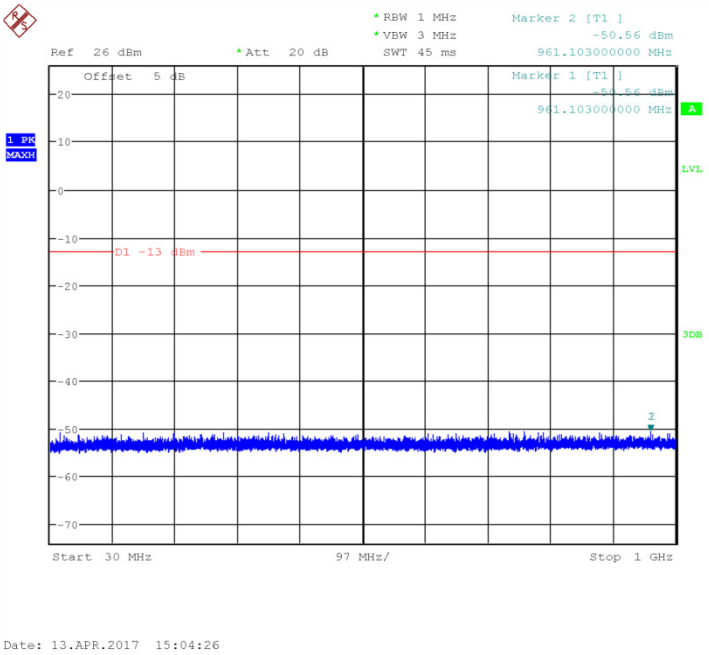


Date: 13.APR.2017 15:03:47

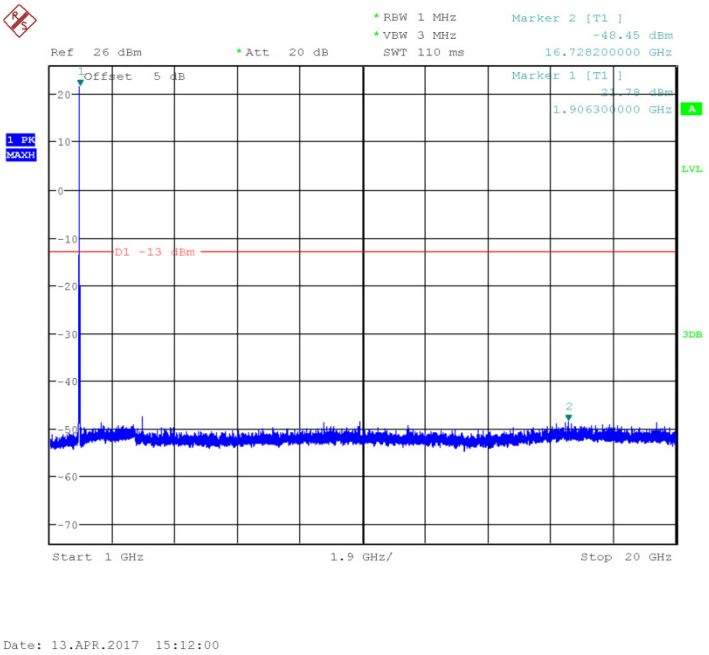
Channel 9400: 30MHz~1GHz



Channel 9400: 1GHz~10GHz



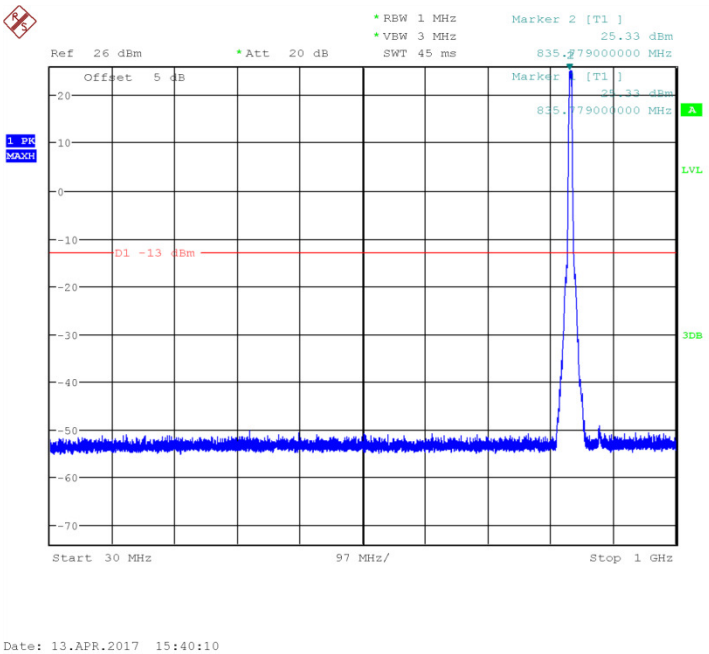
Channel 9538: 30MHz~1GHz



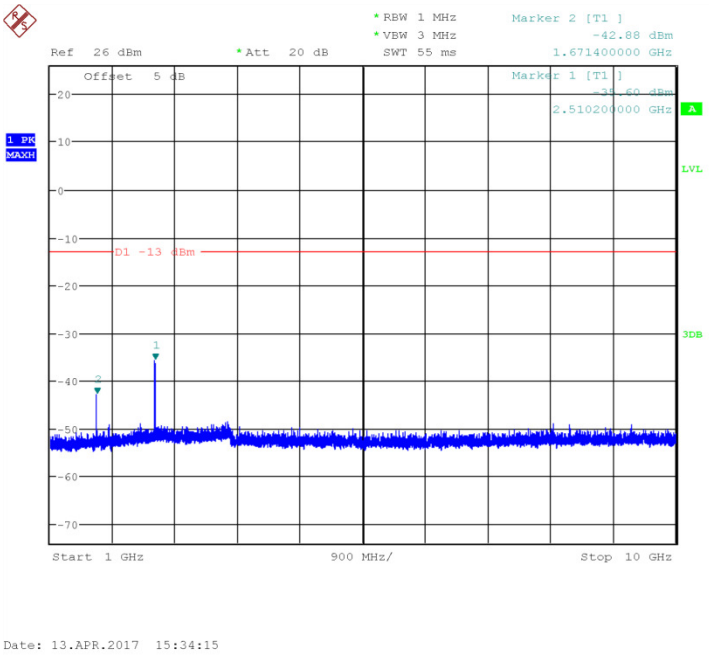
Channel 9538: 1GHz~10GHz

Conclusion: PASS

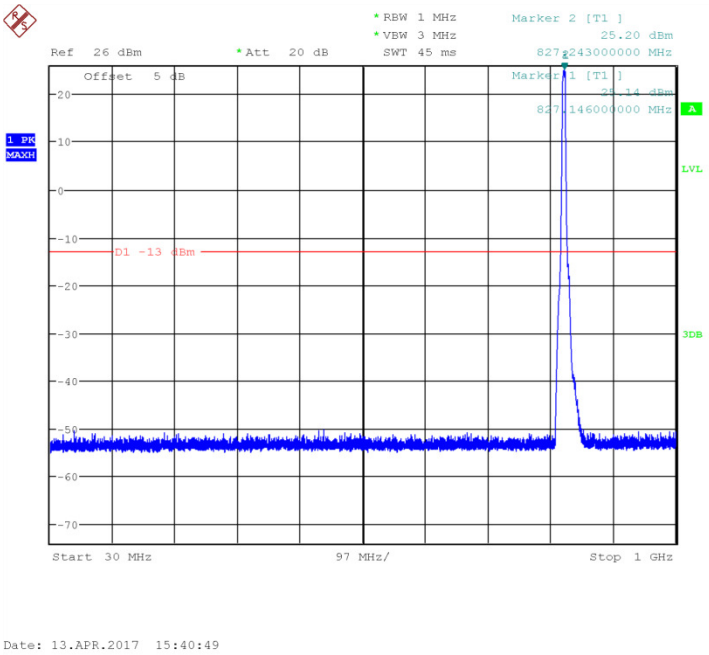
A7.1.2.2. WCDMA BAND V



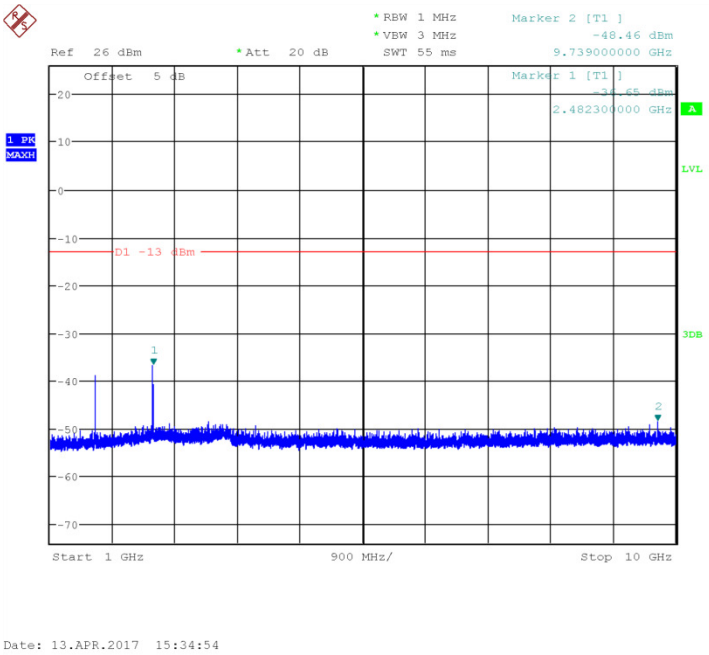
Channel 4132: 30MHz~1GHz



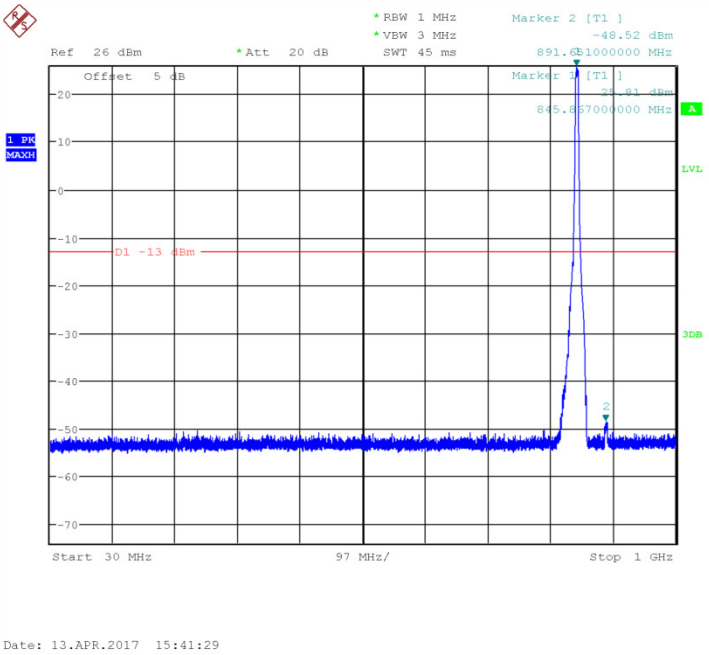
Channel 4132: 1GHz~10GHz



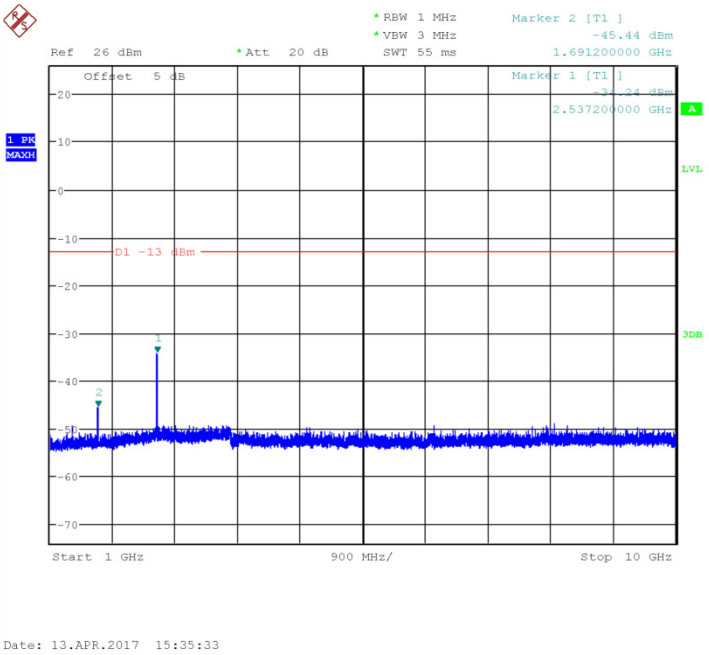
Channel 4183: 30MHz~1GHz



Channel 4183: 1GHz~10GHz



Channel 4233: 30MHz~1GHz



Channel 4233: 1GHz~10GHz

Conclusion: PASS

ANNEX A.8. RADIATED

A.8.1. ERP

A.8.1.1. WCDMA ERP

A.8.1.1.1. Description

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

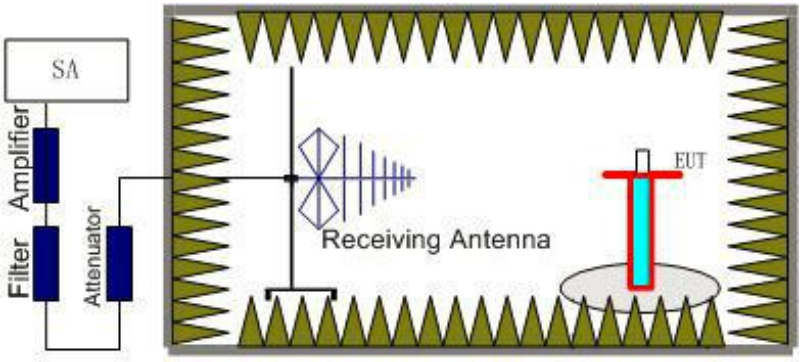
Rule Part 24.232(c) specifies, "Mobile/portable stations are limited to 2 watts e.i.r.p. Peak power" and 24.232(c) specifies that "Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage. "Rule Part 22.913(a) specifies ” The ERP of mobile transmitters and auxiliary test transmitters must

not exceed 7 Watts.”

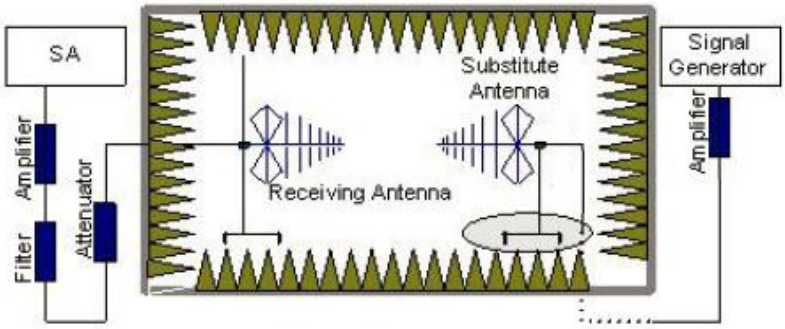
A.8.1.1.2. Method of Measurement

The measurements procedures in TIA-603D-2010 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.



In the chamber, an 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. A amplifier should be connected to the Signal Source output port. And the cable should be connect 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 (2.15dBi) and known input power.
6. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.15dBi.

A.8.1.1.3 WCDMA BAND II-EIRP

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

A.8.1.1.3.2 Measurement result

Frequency (MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_aAntenna Gain(dBd)	PeakEIRP(dBm)	Polarization
1852.4	-6.21	4.6	35.9	2.9	27.99	H
1880.0	-7	4.6	35.6	2.9	26.90	H
1907.6	-6.84	4.7	35.9	2.8	27.16	H

Frequency: 1852.4MHz

Peak EIRP(dBm)= P_{Mea}(-6.21dBm) - P_{cl}(4.6dB) +P_{Ag}(35.9dB) + G_a(2.9dBd)

= 27.99dBm

Note: ANALYZER SETTINGS: RBW = VBW = 5MHz

A.8.1.1.4 WCDMA BAND V-ERP

	Burst Peak ERP (dBm)
WCDMA Band V	≤38.45dBm (7W)

A.8.1.1.4.2 Measurement result

Frequency (MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_aAntenna Gain(dBd)	PeakERP(dBm)	Polarization
826.4	-8.13	3.1	36.9	-2.99	22.68	H
836.6	-7.45	3.1	37.1	-3.05	23.50	H
846.6	-6.46	3.1	36.9	-3.10	24.24	H

Frequency: 1852.4MHz

Peak ERP(dBm)= P_{Mea}(-8.13dBm) - P_{cl}(3.1dB) +P_{Ag}(36.9dB) + G_a(2.99dBd)

= 22.68dBm

Note: ANALYZER SETTINGS: RBW = VBW = 5MHz

A.8.2 EMISSION LIMIT (§2.1051/§22.917§24.238)

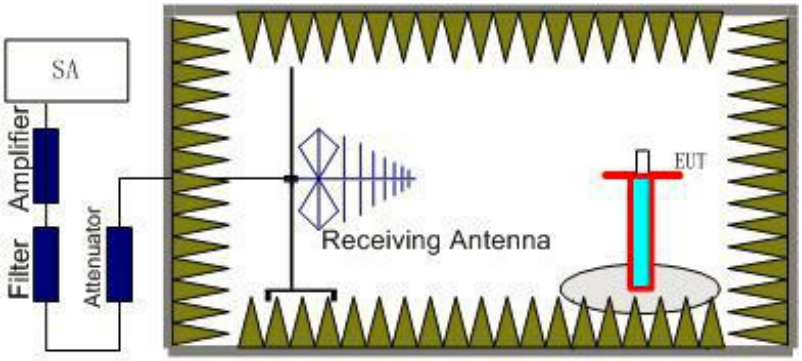
A.8.2.1 WCDMA Measurement Method

The measurements procedures in TIA-603D-2010 are used.

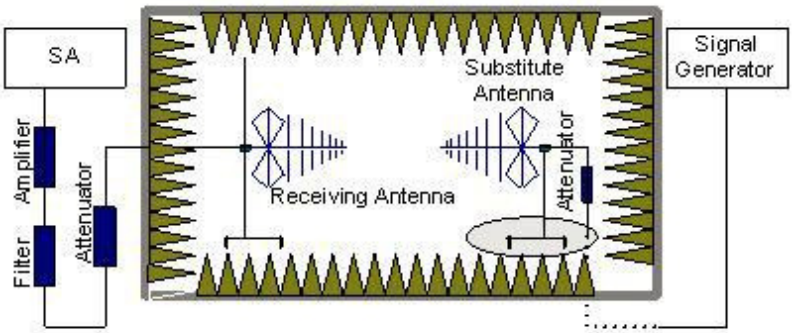
The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment. The resolution bandwidth is set as outlined in Part 24.238 and Part 24.917. The spectrum is scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of WCDMA Band II and WCDMA Band V.

A.8.2.2 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 10thharmonic 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, an 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. 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 .
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.8.2.3 Measurement Limit

Part 24.238 and Part 22.917 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.

A.8.2.4 Measurement Results

Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the PCS1900 band (1850.2 MHz, 1880 MHz and 1909.8 MHz) and GSM850 band (824.2MHz, 836.6MHz, 848.8MHz) . 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 PCS1900 ,GSM850 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.

A.8.2.5 Measurement Results

Measurements results:

Frequency	Channel	Frequency Range	Result
WCDMA Band II	Low	30MHz~20GHz	P
	Middle	30MHz~20GHz	P
	High	30MHz~20GHz	P
WCDMA Band V	Low	30MHz~20GHz	P
	Middle	30MHz~20GHz	P
	High	30MHz~20GHz	P

WCDMA BAND II Mode Channel 9262

Final result:

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit （dBm）	Polarization

3706.8	-44.37	6.6	6.2	-44.77	-13	V
5559.6	-58.53	8.2	9.6	-57.13	-13	H
10791.6	-50.1	11.7	11.4	-50.4	-13	H
14813.25	-55.47	14.3	23.6	-46.17	-13	V
15858	-51.26	14.9	21.9	-44.26	-13	V
16864.95	-47.96	15.8	20.4	-43.36	-13	H

WCDMA BAND II Mode Channel 9400

Final result:

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit （dBm）	Polarization
3762.4	-51.11	6.6	6.2	-51.51	-13	V
9810	-59.68	11	18	-52.68	-13	V
11639.45	-55.15	12.2	17.9	-49.45	-13	V
12720.6	-54.49	12.7	19.1	-48.09	-13	H
14425.8	-55.36	13.9	22.8	-46.46	-13	H
16269.6	-50.43	14.8	20.9	-44.33	-13	H

WCDMA BAND II Mode Channel 9538

Final result:

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit （dBm）	Polarization

3817.2	-52	6.7	6.5	-52.2	-13	V
5720.8	-58.42	8.5	10.4	-56.52	-13	H
7635.2	-57.76	9.7	14.8	-52.66	-13	V
12480.15	-52.16	12.7	18.6	-46.26	-13	V
14719.8	-54.57	14	23.2	-45.37	-13	V
17179.95	-47.84	16	20.6	-43.24	-13	H

WCDMA BAND V Mode Channel 4132

Final result:

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit （dBm）	Polarization
4515.2	-58.75	7.3	7.4	-58.85	-13	H
5635.2	-56.05	8.3	10.1	-57.85	-13	V
6542	-54.27	9	11.7	-56.97	-13	H
7663.6	-51.37	9.7	15.1	-56.77	-13	V
8861.8	-47.37	10.4	18.4	-55.37	-13	V
9787	-46.25	11	18	-53.25	-13	H

WCDMA BAND V Mode Channel 4183

Final result:

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit （dBm）	Polarization

2371.15	-56.95	5.2	3.4	-55.15	-13	V
3634.8	-61.6	6.6	6.1	-61.1	-13	V
5023.2	-57.44	7.8	9	-58.64	-13	H
6526.8	-54.5	9	11.6	-57.1	-13	V
8420.8	-48.58	10.2	18	-56.38	-13	V
9371.8	-46.74	10.7	18.5	-54.54	-13	V

WCDMA BAND V Mode Channel 4233

Final result:

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit（dBm）	Polarization
2404.61	-53.82	5.3	3.6	-55.52	-13	H
3180.8	-61.57	6.1	4.8	-62.87	-13	H
4117.2	-60.87	7	7.3	-60.57	-13	H
5794.4	-59.61	8.4	10.5	-57.51	-13	V
7548.4	-62.17	9.7	14.7	-57.17	-13	V
9355.6	-62.87	10.7	18.6	-54.97	-13	H

Conclusion: PASS

Note: the EUT was displayed in several different direction, the worst cases were shown.

ANNEX B. Deviations from Prescribed Test Methods

No deviation from Prescribed Test Methods.

**********End The Report**********