



*Full*

# TEST REPORT

**No. I17D00249-SRD05**

*For*

**Client : Shanghai Simcom Ltd.**

**Production : LTE-FDD/HSPA MODULE**

**Model Name : SIM7600A-H**

**FCC ID: UDV-201710**

**Hardware Version: V1.02**

**Software Version: B02V01**

**Issued date: 2017-12-15**

**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](mailto:welcome@ecit.org.cn)

**Revision Version**

Report Number	Revision	Date	Memo
I17D00249-SRD05	00	2017-12-08	Initial creation of test report
I17D00249-SRD05	01	2017-12-15	Second creation of test report

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## 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

### 1.2. Testing Environment

Normal Temperature:	15-35°C
Extreme Temperature:	-10/+55°C
Relative Humidity:	20-75%

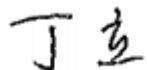
### 1.3. Project data

Project Leader:	Wang Yaqiong
Testing Start Date:	2016-06-03(N06 For QPSK)
Testing End Date:	2016-08-05(N06 For QPSK)
Project Leader:	Zhou Yan
Testing Start Date:	2017-06-21 (N06 for 16QAM)
Testing End Date:	2017-06-28 (N06 for 16QAM)

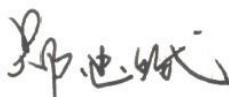
### 1.4. Signature



Wu Jiashen  
(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: Shanghai Simcom Ltd.  
Address: SIM Technology Building.,No.633, Jinzhong Rd,Changning District, Shanghai, P.R.China  
Postcode: /  
Telephone: 021-32523134

### 2.2. Manufacturer Information

Company Name: Shanghai Simcom Ltd.  
Address: SIM Technology Building.,No.633, Jinzhong Rd,Changning District, Shanghai, P.R.China  
Postcode: /  
Telephone: 021-32523134

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

#### 3.1. About EUT

EUT Description	LTE-FDD/HSPA MODULE
Model name	SIM7600A-H
FCC ID	UDV-201710
Frequency	WCDMA Band II/V
Extreme Temperature	-10/+55°C
Nominal Voltage	3.8V
Extreme High Voltage	4.2V
Extreme Low Voltage	3.4V

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

EUT ID*	SN or IMEI	HW Version	SW Version	Date of receipt
N06(For QPSK)	861475030000931	V1.02	SIM7500A_V1.0	2016-06-02
N06(For 16QAM)	861475030055224	V1.02	B02V01	2017-06-11

\*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 SIM7600A-H, supporting WCDMA/HSDPA/HSUPA/DC-HSDPA, manufactured by Shanghai Simcom Ltd., which is a variant product for testing. The QPSK modulation test cases please refer to the report No: I16D00113-RFA\_V2 except Output power, The 16QAM modulation test cases please refer to the report No: I17D00219-SRD05-V1.

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-E	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards	2016
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

## 5. SUMMARY OF TEST RESULTS

Note: The output power test results is in RXA1711-0374RF01\_SIM7600A-H FCC Part22 and RXA1711-0374RF02\_SIM7600A-H FCC Part24

Item	Test items	FCC rules	result
1	Output Power	2.1046/22.913(a)/24.232(c)	NA
2	Peak-to-Average Ratio	24.232(d)	Pass
3	99%Occupied Bandwidth	2.1049(h)(i)/ 22.917(b)	Pass
4	-26dB Emission Bandwidth	22.917(b)/§24.238(b)	Pass
5	Band Edge at antenna terminals	22.917(a)/24.238(a)	Pass
6	Frequency stability	2.1055/24.235	Pass
7	Conducted Spurious mission	2.1053/22.917(a)/24.238(a)	Pass
8	Emission Limit	2.1051/22.917/24.238/22.913/24.232	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	123123	R&S	2017-05-11	1 Year
2	EMI Test Receiver	ESU40	100307	R&S	2017-05-11	1 Year
3	TRILOG Broadband Antenna	VULB9163-163	VULB9163-515	Schwarzbeck	2017-02-25	3 Year
4	Double-ridged Waveguide Antenna	ETS-3117	00135890	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	2017-10-21	3 Year
9	Amplifier	SCU03	10009	R&S	2017-01-05	1 Year

10	Amplifier	NTWPA -008610 F	12023024	Rflight	2017-01-05	1 Year
11	Attenuators	BW-N3 W5+	/	MCL	2017-01-05	1 Year

**Conducted test system**

No.	Name	Type	SN	Manufacture	Calibration 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 °C, Max. = 35 °C
Relative humidity	Min. = 20 %, Max. = 75 %
Shielding effectiveness	> 100 dB
Ground system resistance	< 0.5 Ω

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

Temperature	Min. = 15 °C, Max. = 35 °C
Relative humidity	Min. = 25 %, Max. = 75 %
Shielding effectiveness	> 100 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 °C, Max. = 35 °C
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. Peak-to-Average Power Ratio

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

#### A.1.1 PAPR Limit

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

#### A.1.2 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  $\geq$  signal's occupied bandwidth.
  - 3) Set the number of counts to a value that stabilizes the measured CCDF curve;
  - 4) Sweep time  $\geq$  1s.
3. Record the maximum PAPR level associated with a probability of 0.1%.

#### A.1.3 Test results:

**Note:** The peak-to-average power ratio of QPSK modulation test result please refer to the report No: I16D00113-RFA\_V2 A. section A.2.3

The peak-to-average power ratio of 16QAM modulation test result please refer to the report No: I17D00219-SRD05-V1 A. section A.2.3

<b>WCDMA Band II</b>			
Channel	9262	9400	9538
Frequency (MHz)	1852.4	1880	1907.6
PAPR(dB)	3.04	3.08	3.08
<b>WCDMA Band V</b>			
Channel	4132	4183	4233
Frequency (MHz)	826.4	836.4	846.6
PAPR(dB)	8.46	8.33	8.46

<b>16QAM Band II</b>			
Channel	9262	9400	9538
Frequency (MHz)	1852.4	1880	1907.6

PAPR(dB)	3.43	3.43	3.37
<b>16QAM Band V</b>			
Channel	4132	4183	4233
Frequency (MHz)	826.4	836.4	846.6
PAPR(dB)	3.30	3.21	3.27

**Conclusion: PASS**

## **ANNEX A.2. Occupied Bandwidth**

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

### **A.2.1. 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、WCDMA BANDV.

### **A.2.2 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  $\geq$  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.

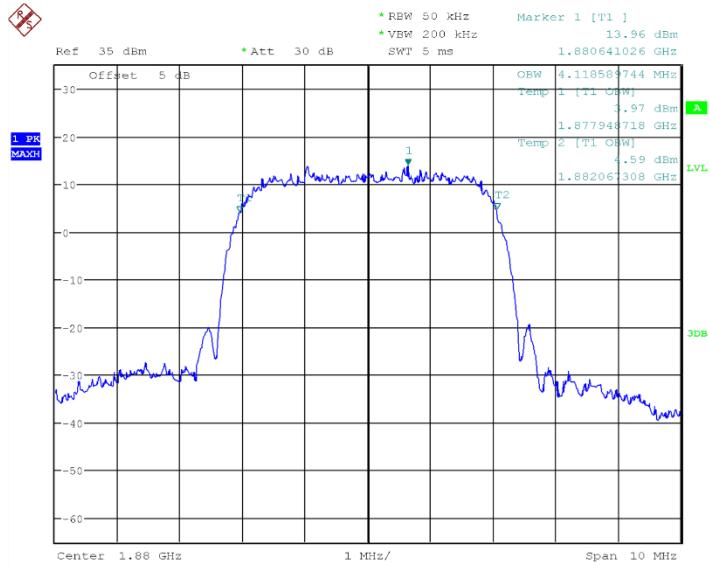
### **A.2.3 Test result:**

**Note:** The Occupied Bandwidth of QPSK modulation test result please refer to the report No: I16D00113-RFA\_V2 A. section A.3.3

The Occupied Bandwidth of 16QAM modulation test result please refer to the report No: I17D00219-SRD05-V1 A. section A.3.3

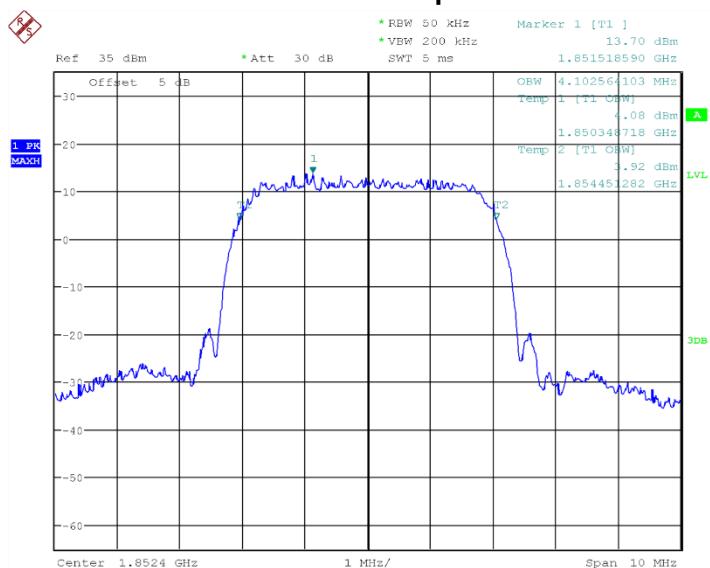
### **WCDMA BAND II**

WCDMA BAND II		
Test channel	Frequency (MHz)	99% Occupied Bandwidth(MHz)
Mid 9400	1880	4.12
Low 9262	1852.4	4.10
High 9538	1907.6	4.12



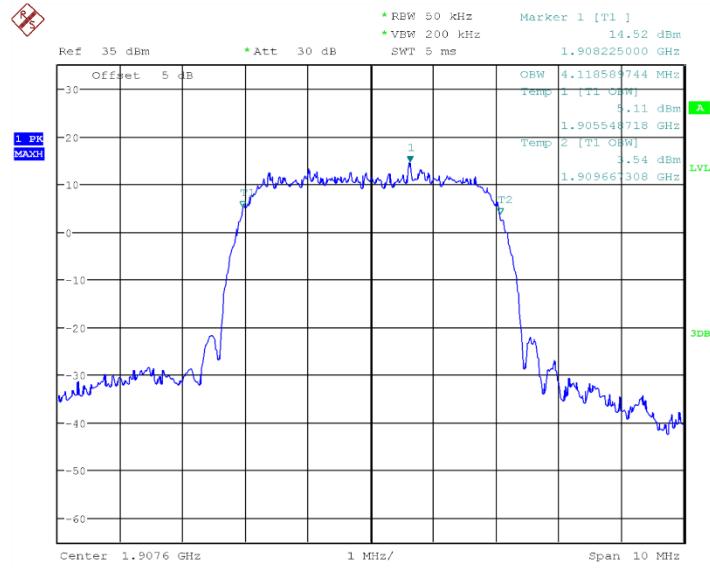
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### Channel 9400-Occupied Bandwidth



Date: 6.JUN.2016 20:05:25

### Channel 9262-Occupied Bandwidth

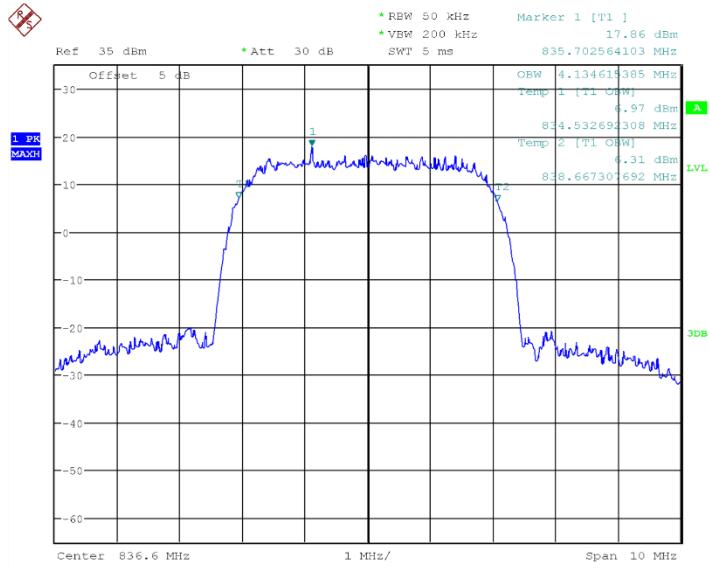


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**Channel 9538-Occupied Bandwidth**

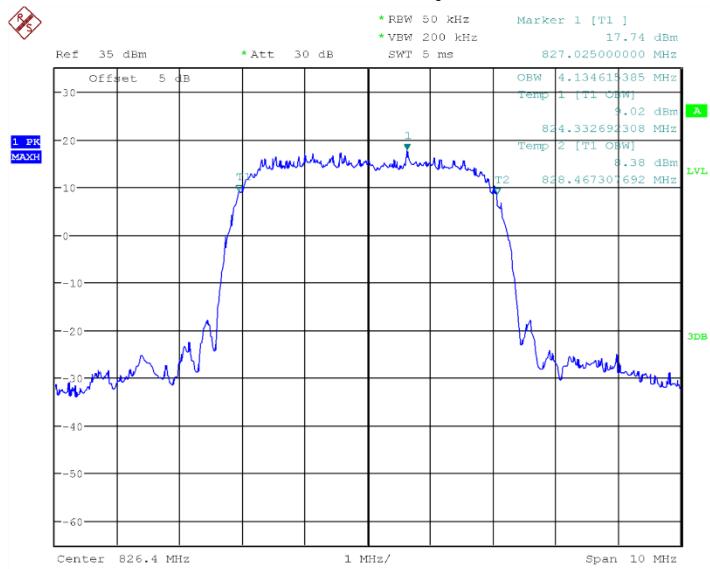
WCDMA BAND V		
Test channel	Frequency (MHz)	99% Occupied Bandwidth(MHz)
Mid 4183	836.6	4.13
Low 4132	826.4	4.13
High 4233	846.6	4.15

**Conclusion: PASS****WCDMA BAND V**



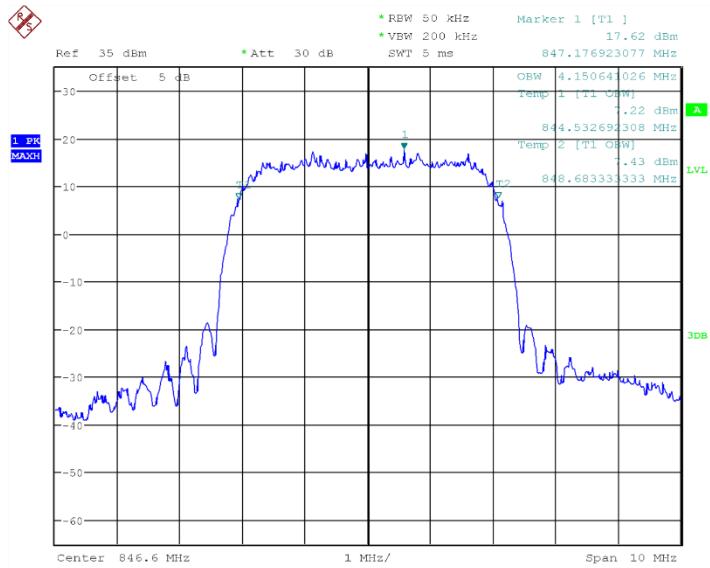
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### Channel 4183-Occupied Bandwidth



Date: 6.JUN.2016 20:07:32

### Channel 4132-Occupied Bandwidth



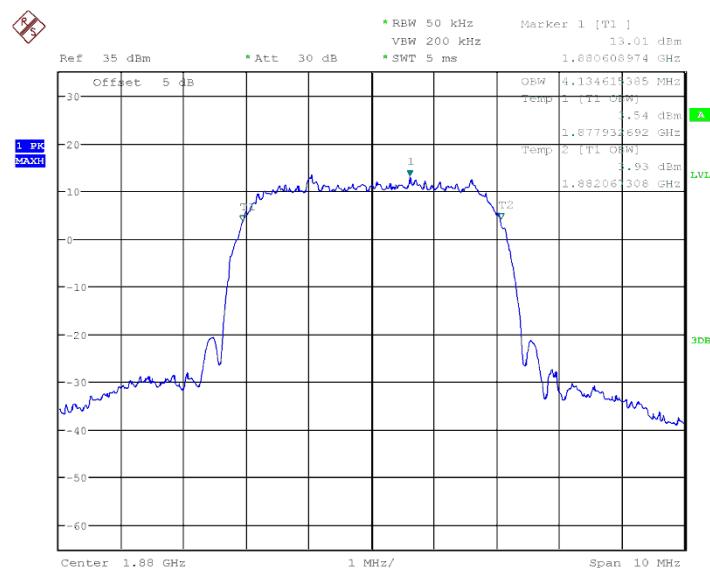
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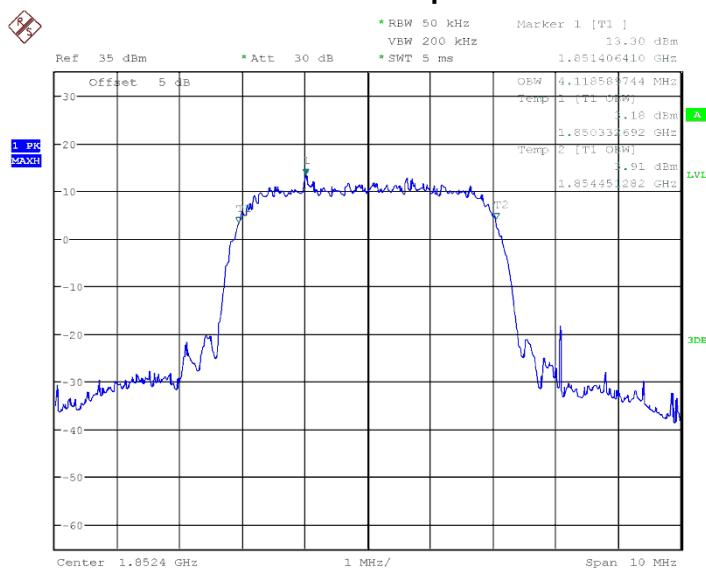
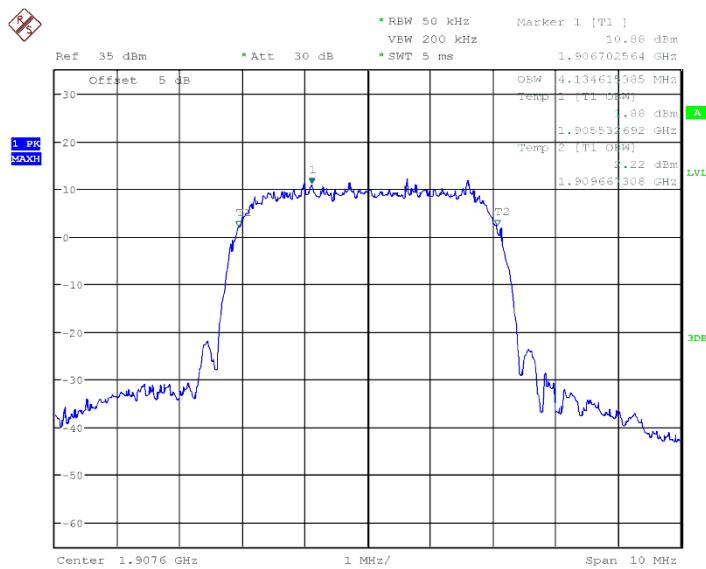
### Channel 4233-Occupied Bandwidth

16QAM BAND II		
Test channel	Frequency (MHz)	99% Occupied Bandwidth(MHz)
Mid 9400	1880	4.13
Low 9262	1852.4	4.11
High 9538	1907.6	4.13

**Conclusion: PASS**

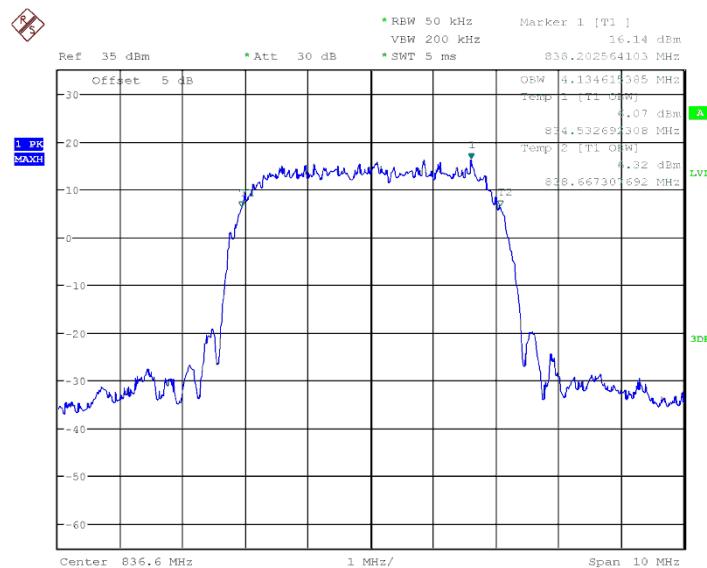
### 16QAM BAND II



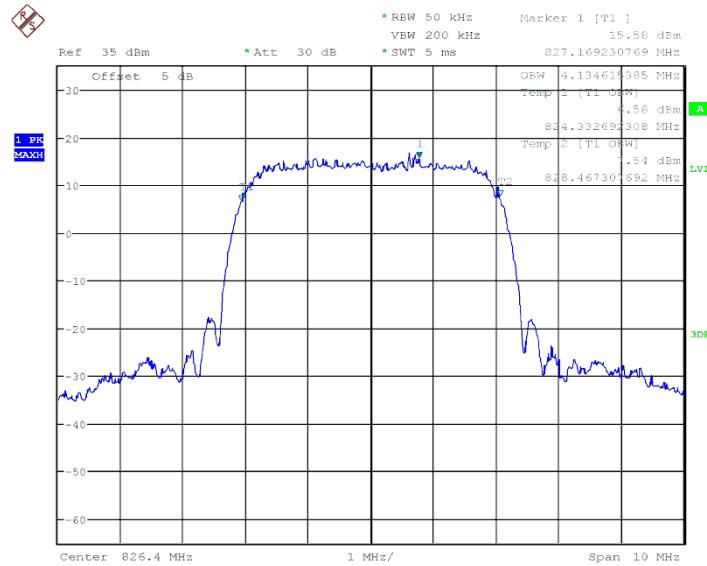
**Channel9400-Occupied Bandwidth**

**Channel9262-Occupied Bandwidth**

**Channel9538-Occupied Bandwidth**

16QAM BAND V		
Test channel	Frequency (MHz)	99% Occupied Bandwidth(MHz)
Mid 4183	836.6	4.13
Low 4132	826.4	4.13

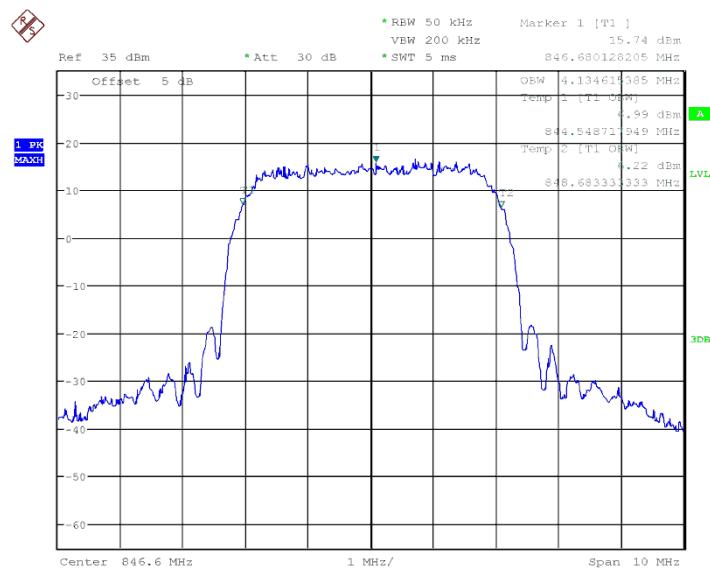
High 4233	846.6	4.13
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**Conclusion: PASS**
**16QAM BAND V**


### Channel4183-Occupied Bandwidth



### Channel4132-Occupied Bandwidth

**Channel4233-Occupied Bandwidth**

**ANNEX A.3. -26dB Emission Bandwidth**

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

**A.3.1. -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.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  $\geq$  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.3.3 Measurement methods:**

For WCDMA: signal analyzer setting as: RBW=50KHz;VBW=200KHz;Span=10MHz.

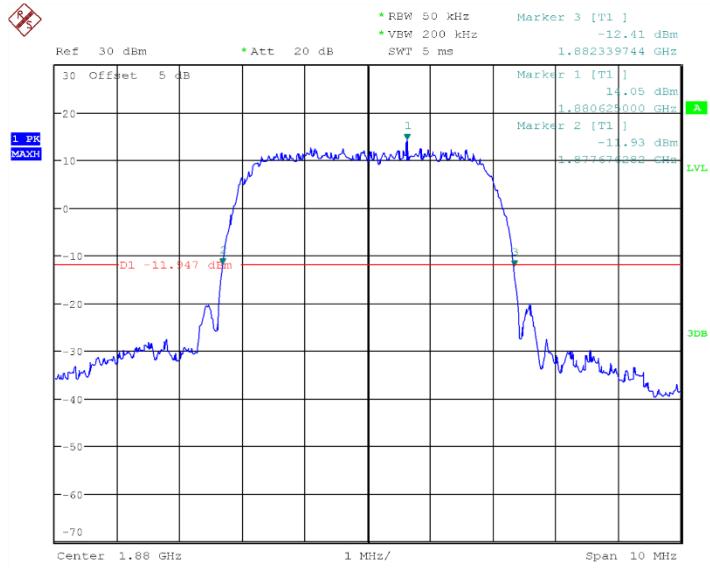
**A.3.4 Test results:**

**Note:** The -26dB Emission Bandwidth of QPSK modulation test result please refer to the report No: I16D00113-RFA\_V2 A. section A.4.4

The -26dB Emission Bandwidth of 16QAM modulation test result please refer to the report No: I17D00219-SRD05-V1 A. section A.4.4

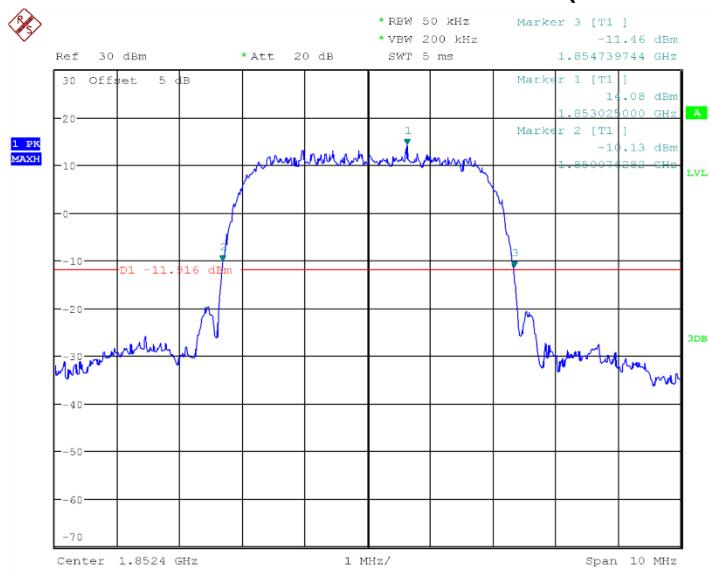
**WCDMA BAND II**

WCDMA BAND II		
Test channel	Frequency (MHz)	-26dBc Emission Bandwidth(MHz)
Mid 9400	1880	4.66
Low 9262	1852.4	4.66
High 9538	1907.6	4.68



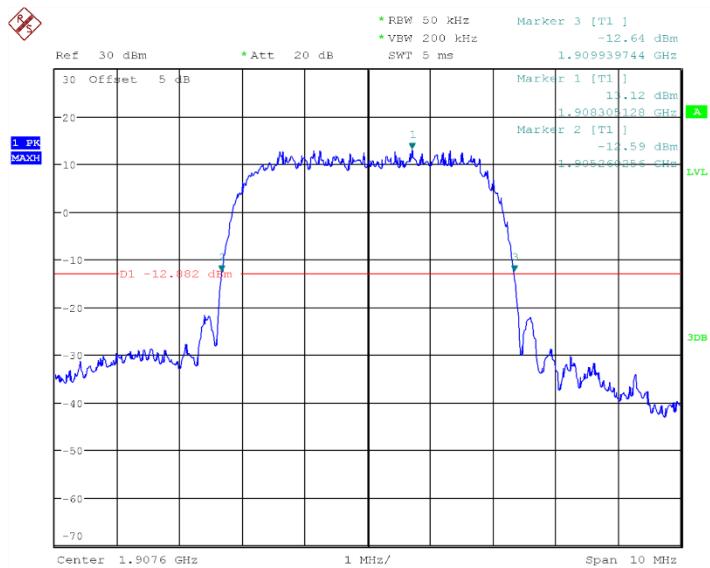
Date: 6.JUN.2016 19:28:33

### Channel 9400- Emission Bandwidth (-26dBc BW)



Date: 6.JUN.2016 19:28:57

### Channel 9262- Emission Bandwidth (-26dBc BW)

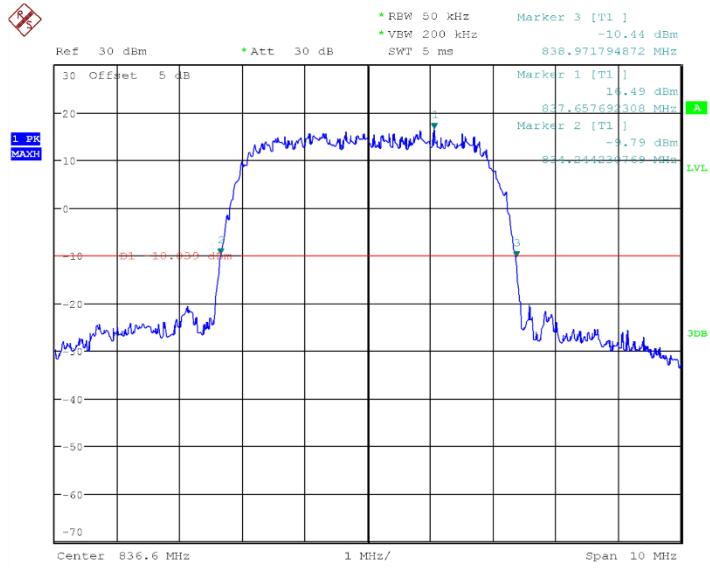


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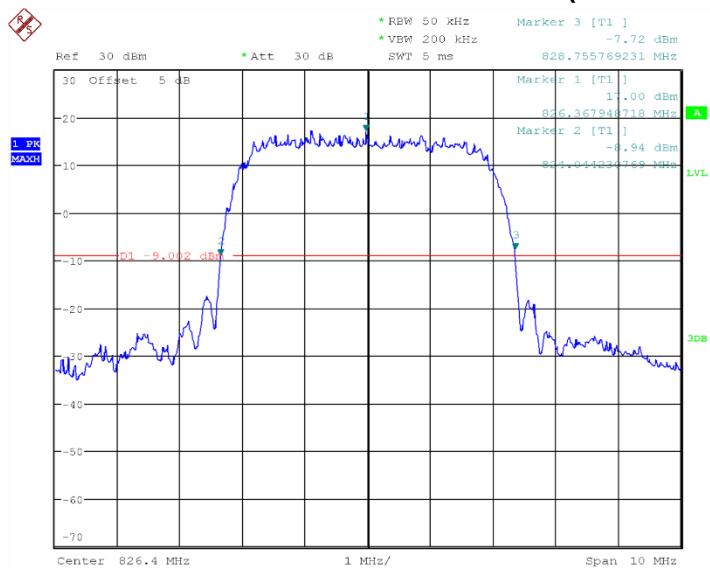
**Channel 9538- Emission Bandwidth (-26dBc BW)**

WCDMA BAND V		
Test channel	Frequency (MHz)	-26dBc Emission Bandwidth(MHz)
Mid 4183	836.6	4.73
Low 4132	826.4	4.71
High 4233	846.6	4.70

**Conclusion: PASS****WCDMA BAND V**

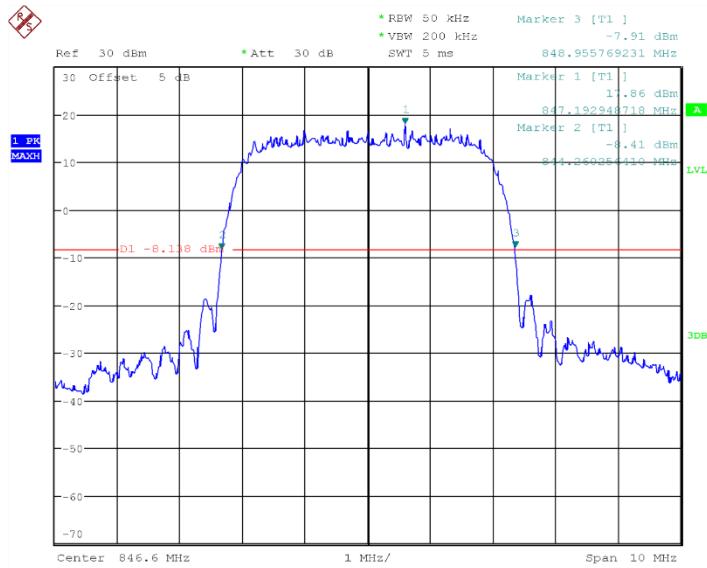


Date: 6.JUN.2016 19:30:09

**Channel 4183- Emission Bandwidth (-26dBc BW)**


Date: 6.JUN.2016 19:30:33

**Channel4132- Emission Bandwidth (-26dBc BW)**

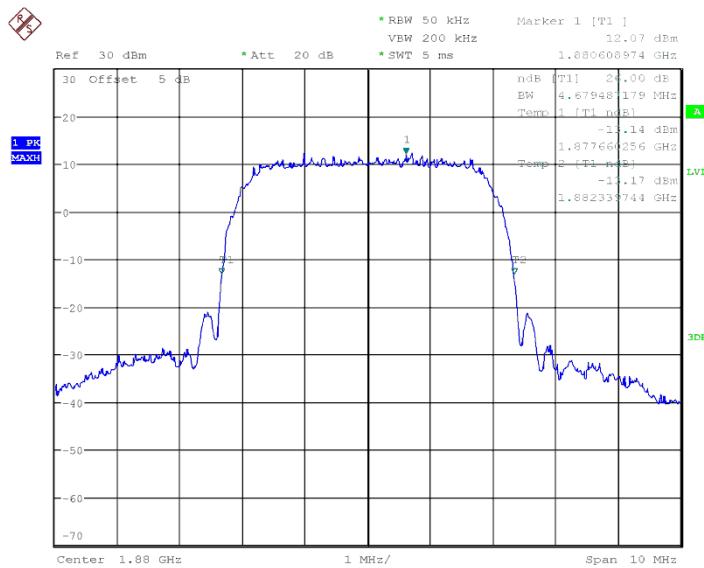


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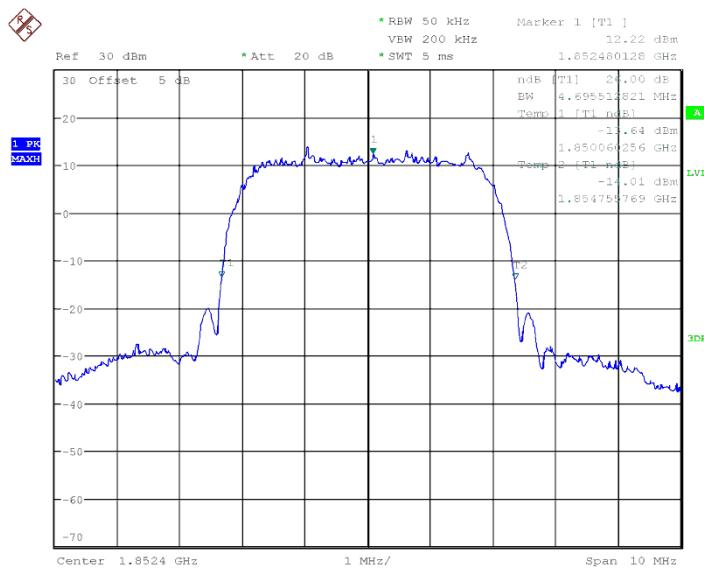
**Channel 4233- Emission Bandwidth (-26dBc BW)**

16QAM BAND II		
Test channel	Frequency (MHz)	-26dBc Emission Bandwidth(MHz)
Mid 9400	1880	4.68
Low 9262	1852.4	4.69
High 9538	1907.6	4.68

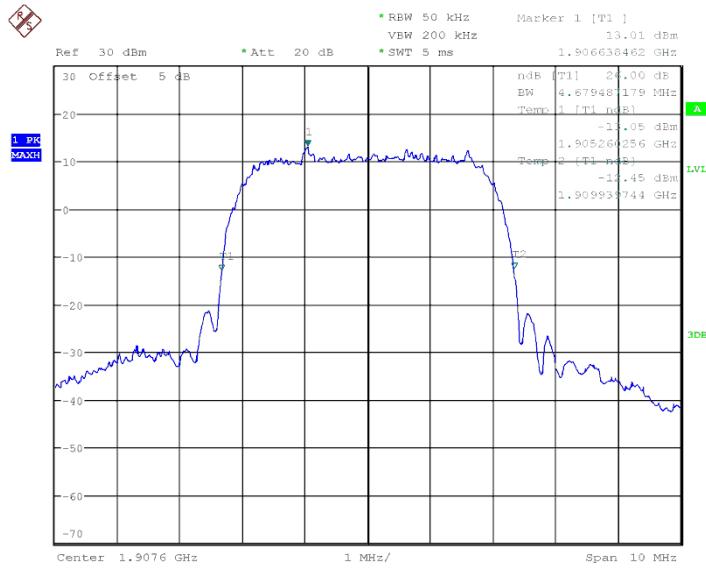
**Conclusion: PASS**
**16QAM BAND II**



### Channel9400- Emission Bandwidth (-26dBc BW)



### Channel9262- Emission Bandwidth (-26dBc BW)

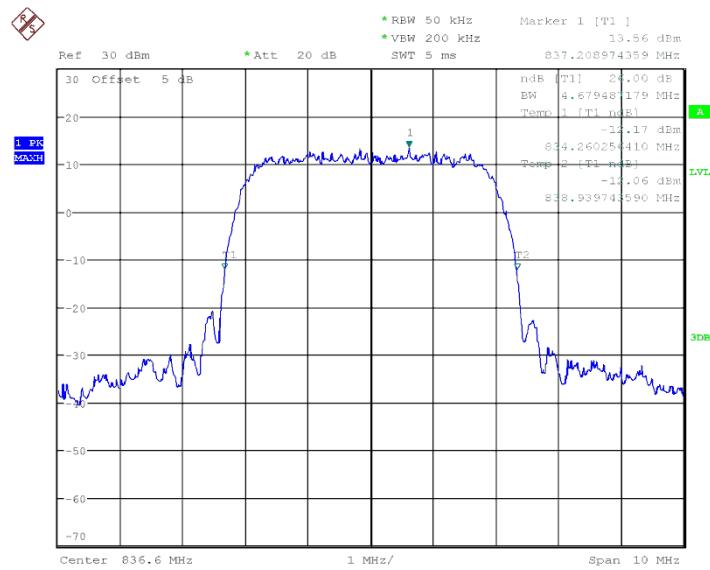


### Channel9538- Emission Bandwidth (-26dBc BW)

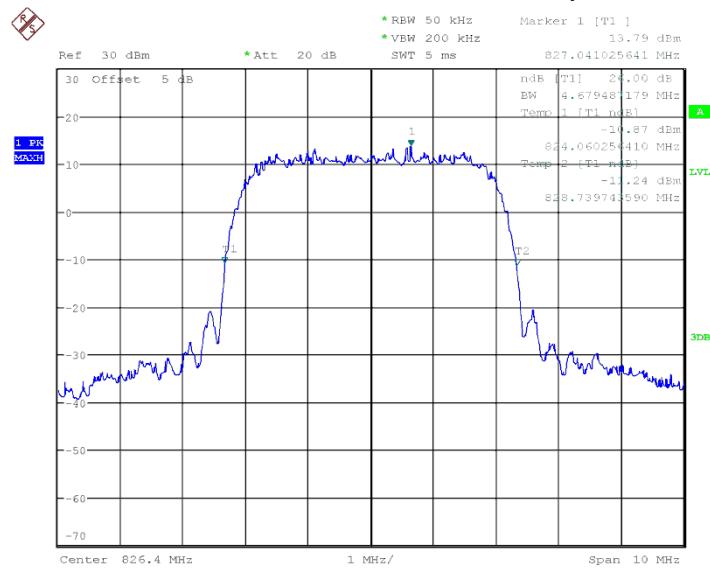
16QAM BAND V		
Test channel	Frequency (MHz)	-26dBc Emission Bandwidth(MHz)
Mid 4183	836.6	4.68
Low 4132	826.4	4.68
High 4233	846.6	4.69

**Conclusion: PASS**

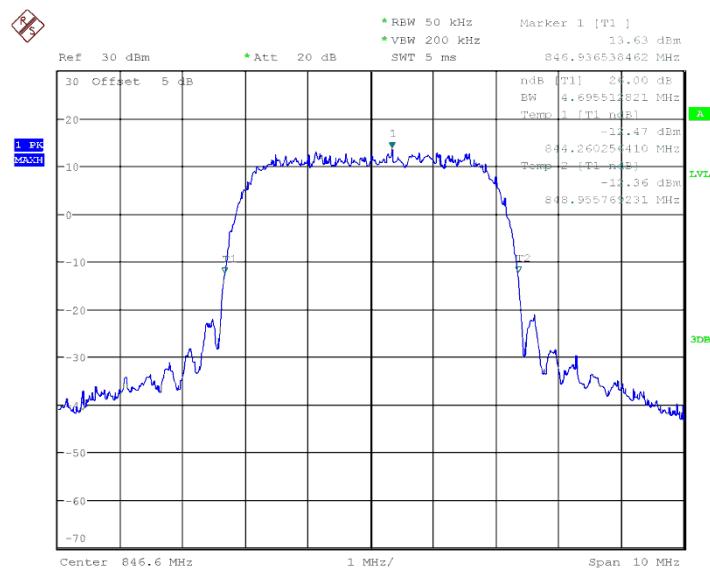
**16QAM BAND V**



### Channel4183- Emission Bandwidth (-26dBc BW)



### Channel4132- Emission Bandwidth (-26dBc BW)

**Channel4233- Emission Bandwidth (-26dBc BW)**

**ANNEX A.4. Band Edge at antenna terminals**

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

**A.4.1 Limit:**

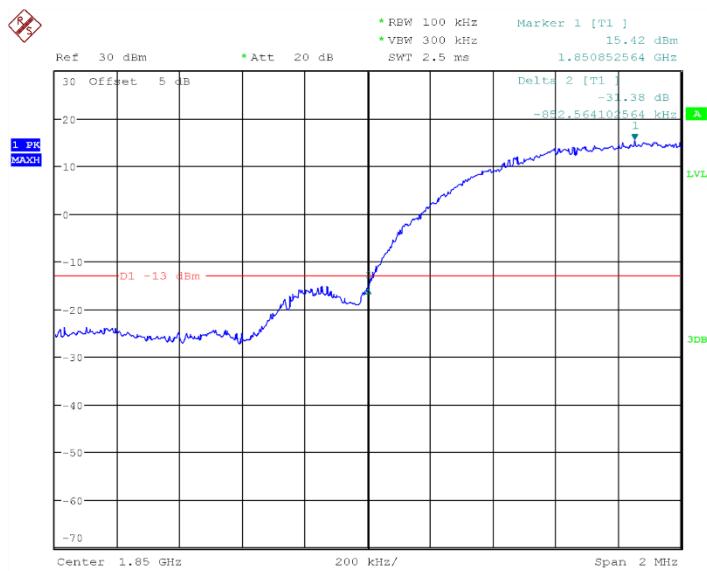
The magnitude of each spurious and harmonic emission that can be detected when the equipment is operated under the conditions specification in the instruction manual and/or alignment procedure, shall not be less than  $43+10\log(P)$  (Mean power in watts) dBc below the mean power output outside a license's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

**A.4.2 Test procedure:**

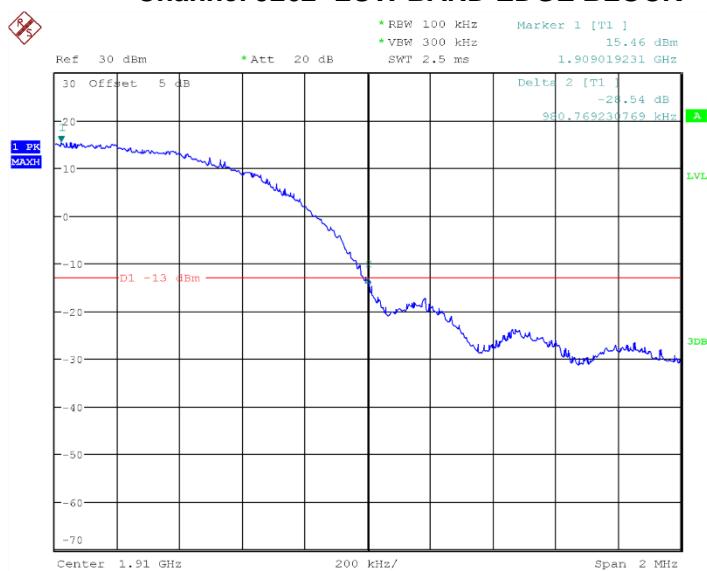
1. The RF output of the transceiver was connected to a signal analyzer through appropriate attenuation.
2. In the 1MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter 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  $43+10\log(P)$  Db below the transmitter power P(Watts)  
 $=P(W)-[43+10\log(P)](Db)$   
 $=[30+10\log(P)](dBm)-[43+10\log(P)](Db)$   
 $=-13dBm$

**Note:** The Band Edge at antenna terminals of QPSK modulation test result please refer to the report No: I16D00113-RFA\_V2 A. section A.5.2

The Band Edge at antenna terminals of 16QAM modulation test result please refer to the report No: I17D00219-SRD05-V1 A. section A.5.2

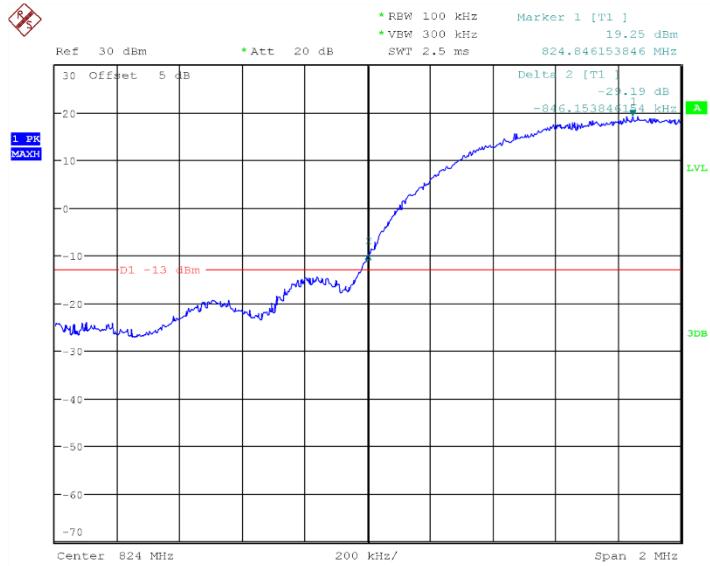
**WCDMA BAND II**


Date: 6.JUN.2016 19:33:45

**Channel 9262- LOW BAND EDGE BLOCK**


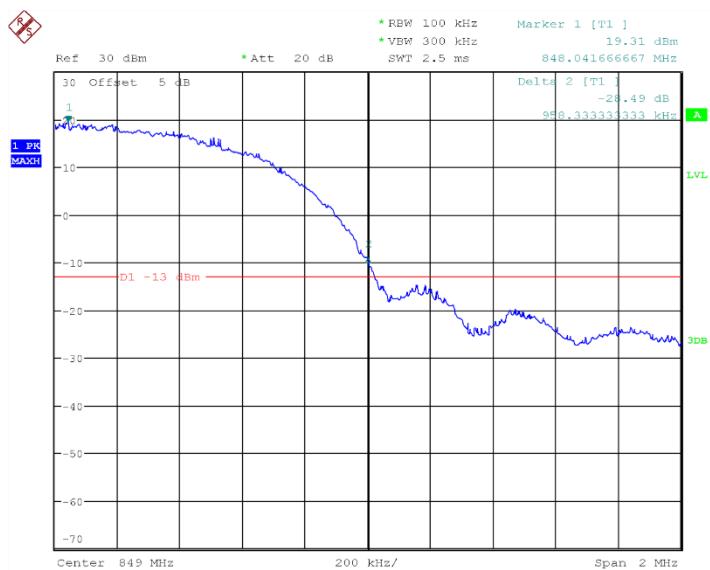
Date: 6.JUN.2016 19:34:36

**Channel 9538- HIGH BAND EDGE BLOCK**
**Conclusion: PASS**
**WCDMA BAND V**



Date: 6.JUN.2016 19:35:49

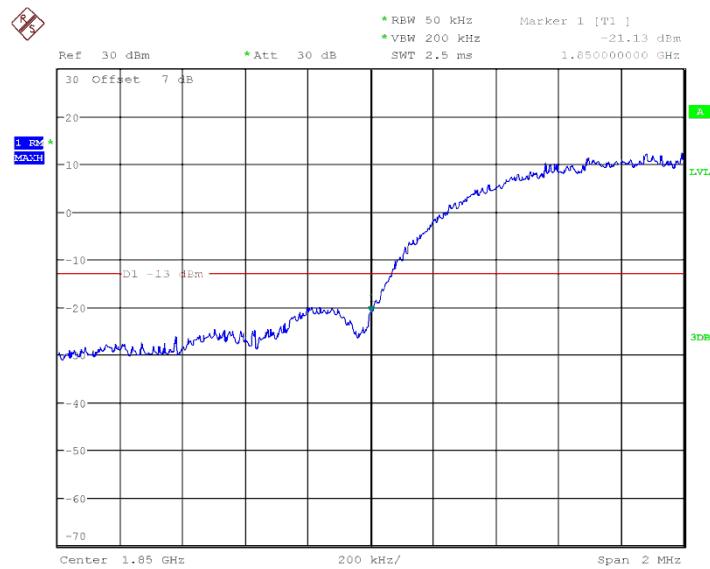
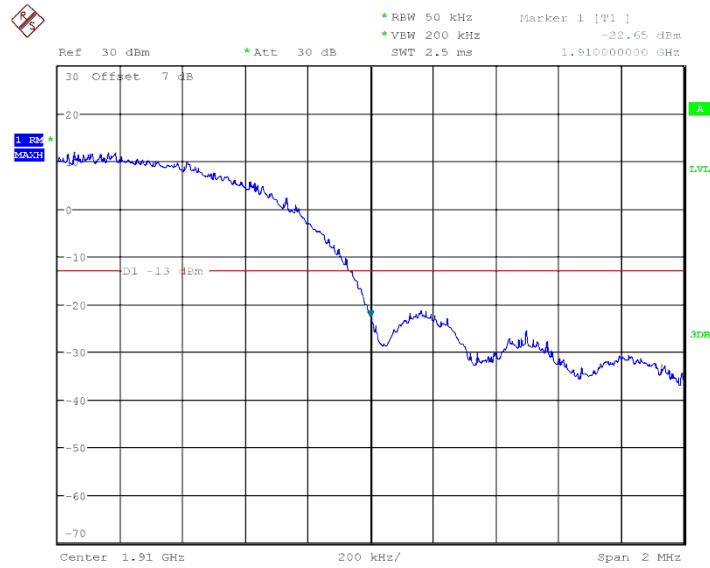
### Channel 4132- LOW BAND EDGE BLOCK

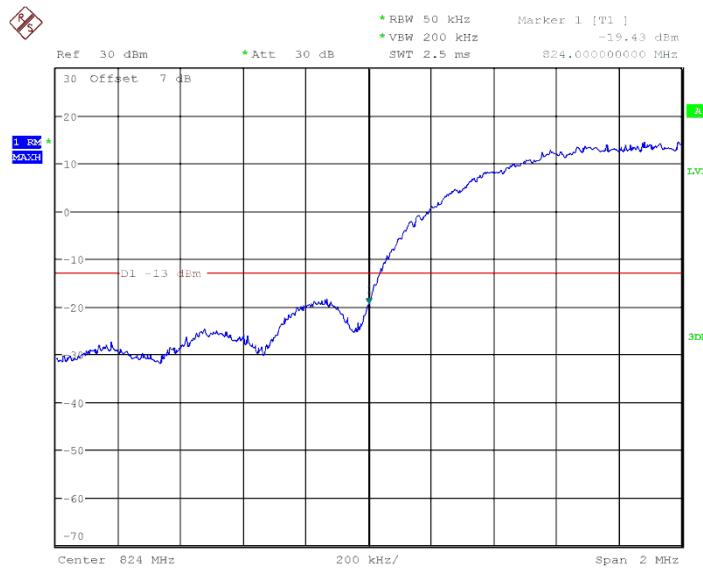
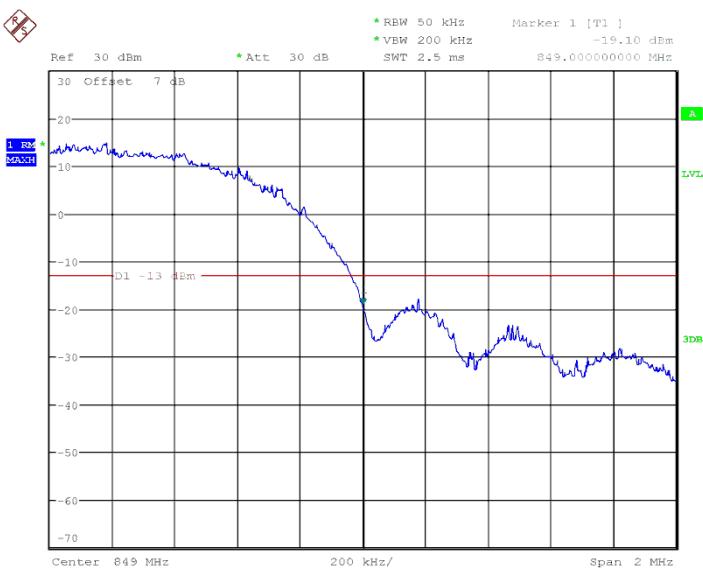


Date: 6.JUN.2016 19:36:39

### Channel 4233- HIGH BAND EDGE BLOCK

**Conclusion: PASS**

**16QAM BANDII**

**16QAM-Channel 9262- LOW BAND EDGE**

**16QAM-Channel 9538- HIGH BAND EDGE**
**Conclusion: PASS**
**16QAM BAND V**


**16QAM-Channel 4132- LOW BAND EDGE**

**16QAM-Channel 4233- HIGH BAND EDGE**

**Conclusion: PASS**

## ANNEX A.5. 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°C.
3. With the EUT, powered via nominal voltage, connected to the CMU200 and in a simulated call on mid channel of WCDMA BANDII, 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°C increments from -30°C to +50°C. 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°C.
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 +50°C to -30°C. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
9. At all temperature levels hold the temperature to +/- 0.5°C 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 WCDMA frequency stability of the carrier shall be accurate to within 2.5ppm of the received frequency from the base station. 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 3.4VDC and 4.2VDC, with a nominal voltage of 3.8VDC. 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 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**

**Note:** The FREQUENCY STABILITY of QPSK modulation test result please refer to the report No: I16D00113-RFA\_V2 A. section A.6

The FREQUENCY STABILITY of 16QAM modulation test result please refer to the report No: I17D00219-SRD05-V1 A. section A.5.3

**WCDMA BAND II Mid Channel/fc(MHz) 9400 /1880****Frequency Error VS Temperature**

Power Supply (VDc)	Environment Temperature(°C)	Frequency error(Hz)	Limit (Hz)
3.8	-30	8	4700
3.8	-20	6	4700
3.8	-10	-6	4700
3.8	0	5	4700
3.8	10	-7	4700
3.8	20	7	4700
3.8	30	6	4700
3.8	40	7	4700
3.8	50	6	4700

**Frequency Error VS Voltage**

Power Supply (VDc)	Environment Temperature(°C)	Frequency error(Hz)	Limit (Hz)
3.4	25	-7	4700
3.8	25	-5	4700
4.2	25	6	4700

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

**Frequency Error VS Temperature**

Power Supply (VDc)	Environment Temperature(°C)	Frequency error(Hz)	Limit (Hz)
3.8	-30	10	2091.5
3.8	-20	-11	2091.5
3.8	-10	-12	2091.5
3.8	0	11	2091.5
3.8	10	-10	2091.5
3.8	20	10	2091.5
3.8	30	9	2091.5
3.8	40	11	2091.5
3.8	50	-10	2091.5

**Frequency Error VS Voltage**

Power Supply (VDc)	Environment Temperature(°C)	Frequency error(Hz)	Limit (Hz)
3.4	25	-10	2091.5
3.8	25	10	2091.5
4.2	25	12	2091.5

**Conclusion: PASS**

**16QAM BANDII Mid Channel/fc(MHz) 9400 /1880****Frequency Error VS Temperature**

Power Supply (VDc)	Environment Temperature(°C)	Frequency error(Hz)	Limit (Hz)
3.8	-30	-3.45	4700
3.8	-20	-2.56	4700
3.8	-10	-9.45	4700
3.8	0	-6.75	4700
3.8	10	-4.26	4700
3.8	20	-6.17	4700
3.8	30	-3.99	4700
3.8	40	-6.34	4700
3.8	50	-10.45	4700

**Frequency Error VS Voltage**

Power Supply (VDc)	Environment Temperature(°C)	Frequency error(Hz)	Limit (Hz)
3.4	25	2.33	4700
3.8	25	6.12	4700
4.2	25	5.42	4700

**16QAM BANDV Mid Channel/fc(MHz) 4183/836.6****Frequency Error VS Temperature**

Power Supply (VDc)	Environment Temperature(°C)	Frequency error(Hz)	Limit (Hz)
3.8	-30	-0.03	2091.5
3.8	-20	1.05	2091.5
3.8	-10	-0.22	2091.5
3.8	0	1.12	2091.5
3.8	10	0.56	2091.5
3.8	20	-1.12	2091.5

3.8	30	0.21	2091.5
3.8	40	-1.09	2091.5
3.8	50	-1.45	2091.5

**Frequency Error VS Voltage**

Power Supply (VDc)	Environment Temperature(°C)	Frequency error(Hz)	Limit (Hz)
3.4	25	1.42	2091.5
3.8	25	-1.57	2091.5
4.2	25	4.32	2091.5

**Conclusion: PASS****ANNEX A.6. CONDUCTED SPURIOUS EMISSION****A6.1. 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 V, data taken from 30 MHz to 10GHz.
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 an 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 MaxHold 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	1852.40
9400	1880.00

9538	1907.60
------	---------

**WCDMA Band V Transmitter**

Channel	Frequency (MHz)
4132	826.40
4183	836.60
4233	846.60

**A 6.1.1. 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.

**A 6.1.2. Measurement result**

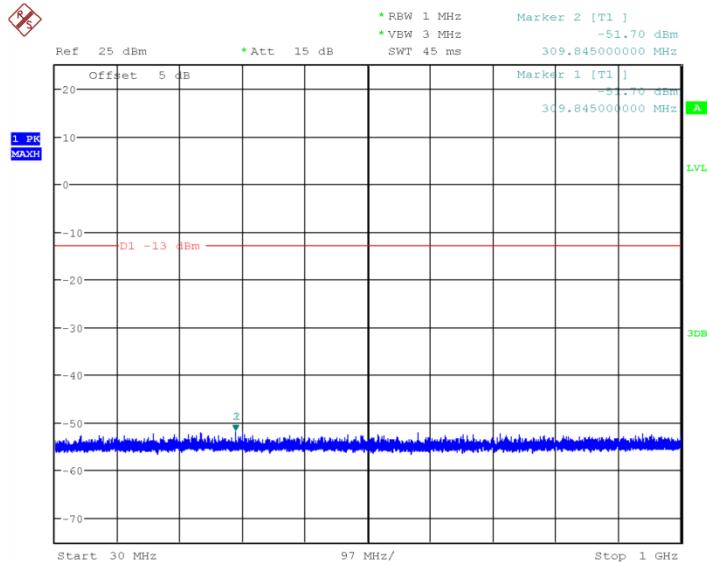
**Note:** The CONDUCTED SPURIOUS EMISSION of QPSK modulation test result please refer to the report No: I16D00113-RFA\_V2 A. section A.7.1.2

The CONDUCTED SPURIOUS EMISSION of 16QAM modulation test result please refer to the report No: I17D00219-SRD05-V1 A. section A.7.2.2

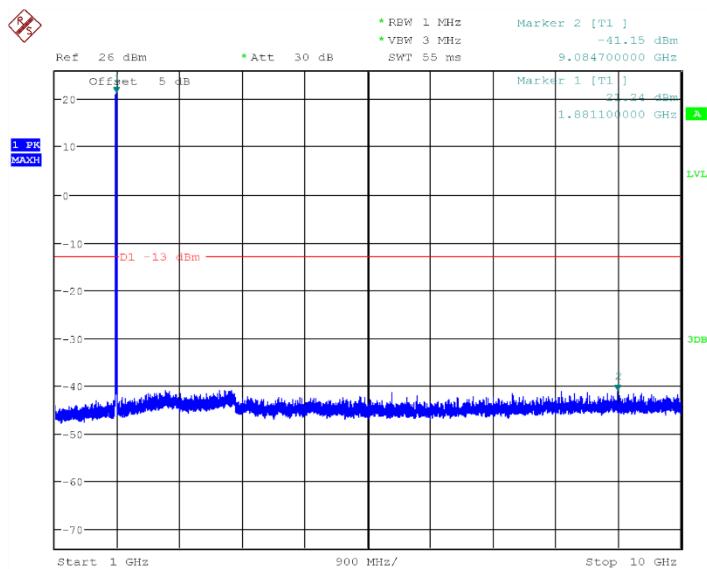
**Spurious emission limit -13dBm.**

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

**A 6.1.2.1. WCDMA Band II**

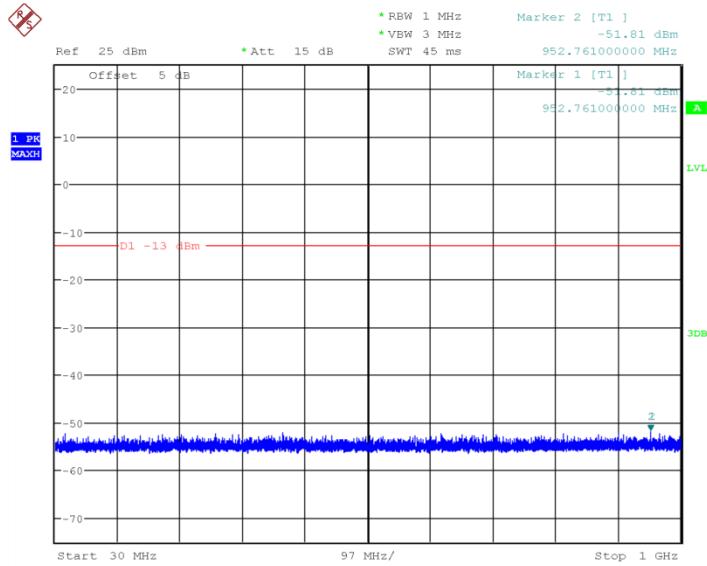


Date: 13.JUN.2016 16:42:04

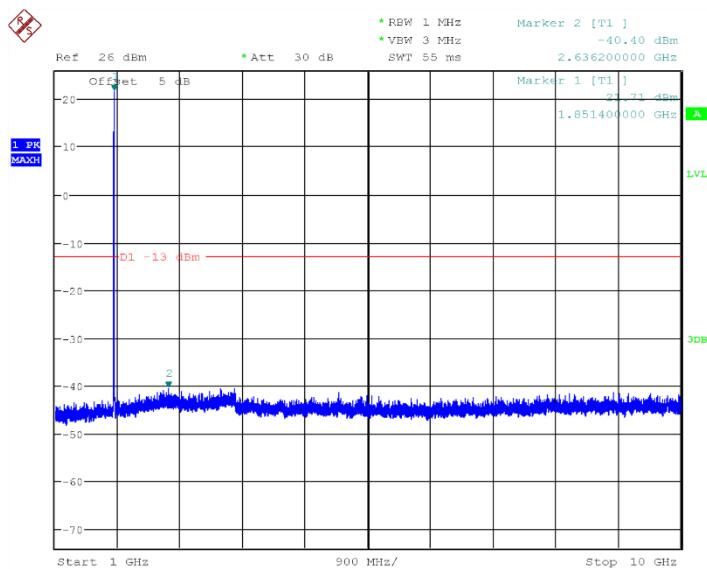


Date: 6.JUN.2016 19:39:24

### Channel 9262: 30MHz~20GHz

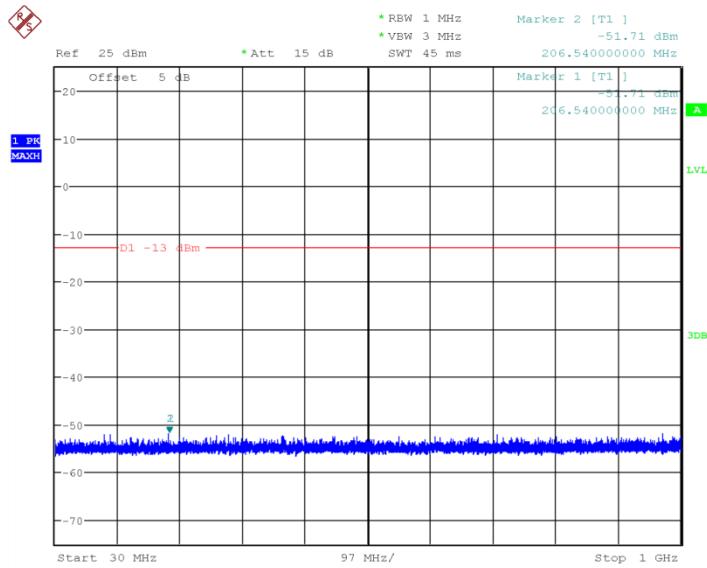


Date: 13.JUN.2016 16:42:41

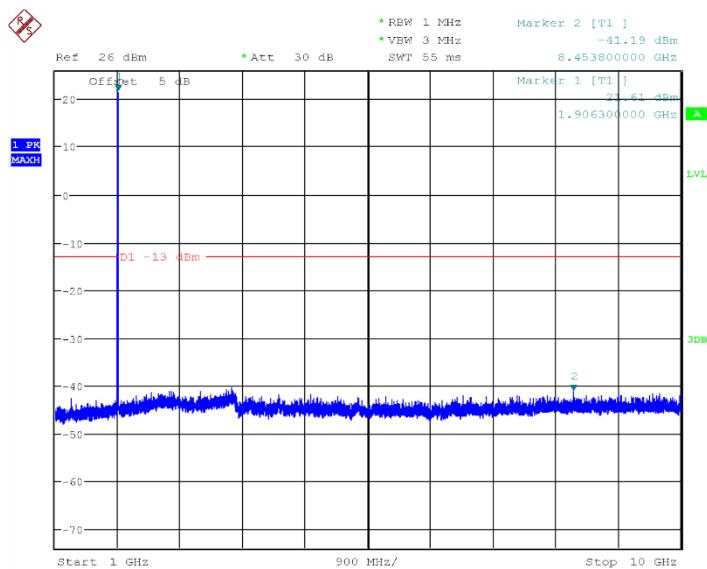


Date: 6.JUN.2016 19:40:00

### Channel 9400: 30MHz~20GHz



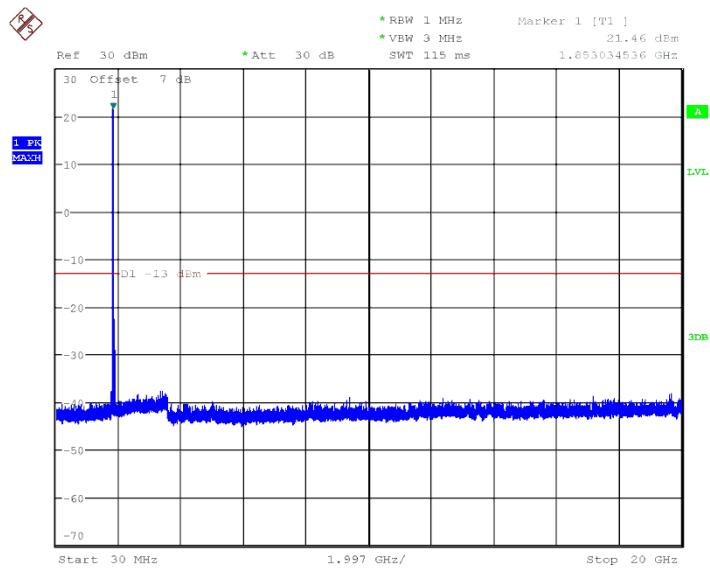
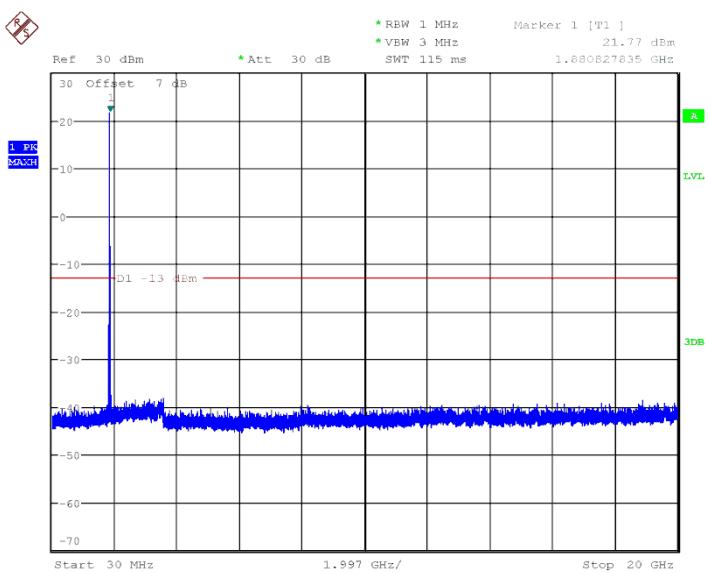
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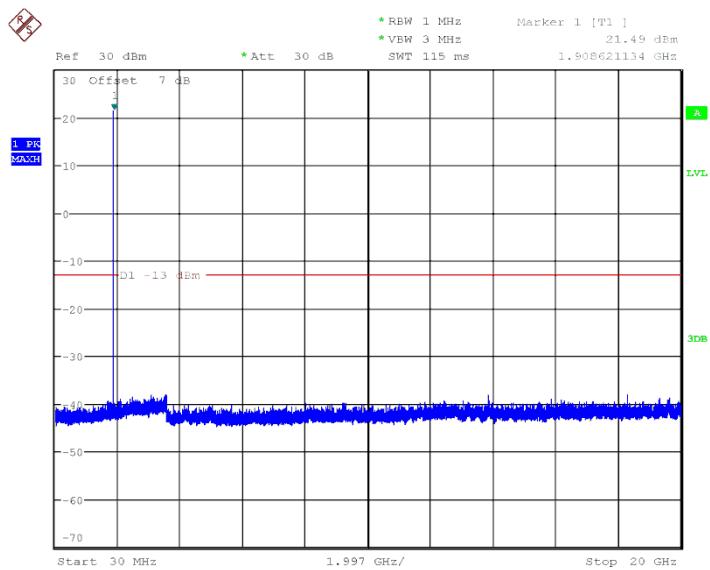


Date: 6.JUN.2016 19:40:36

### Channel 9538: 30MHz~20GHz

#### 16QAM Band II

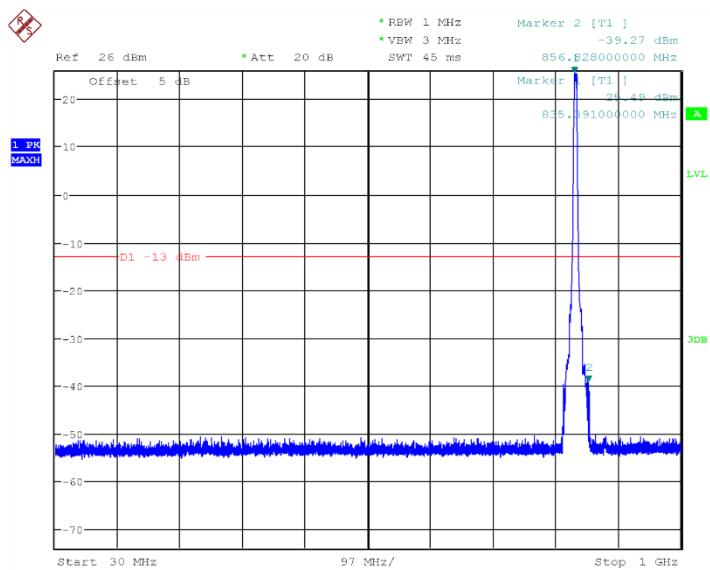
**Channel 9262: 30MHz~20GHz****Channel 9400: 30MHz~20GHz**



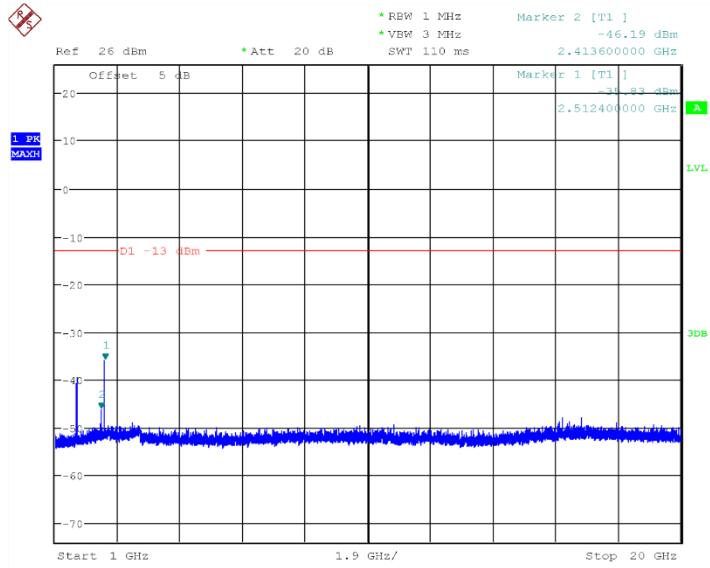
### Channel 9538: 30MHz~20GHz

**Conclusion: PASS**

#### A 6.1.2.2. WCDMA Band V

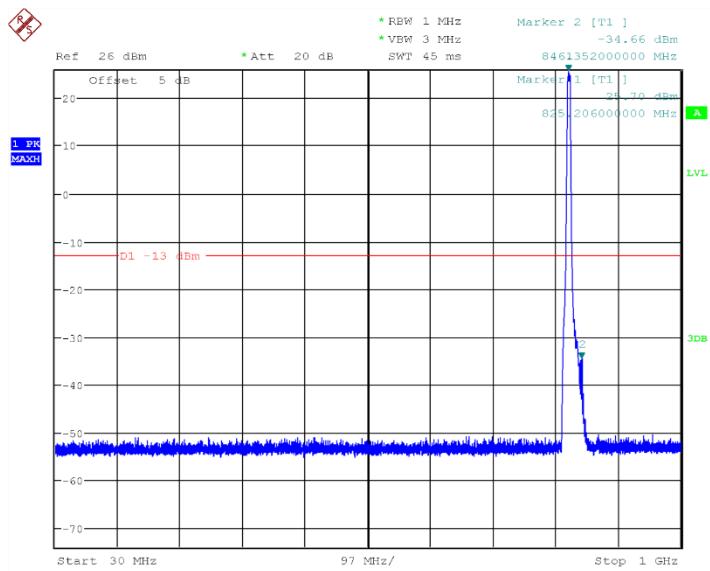


Date: 7.JUN.2016 08:34:00

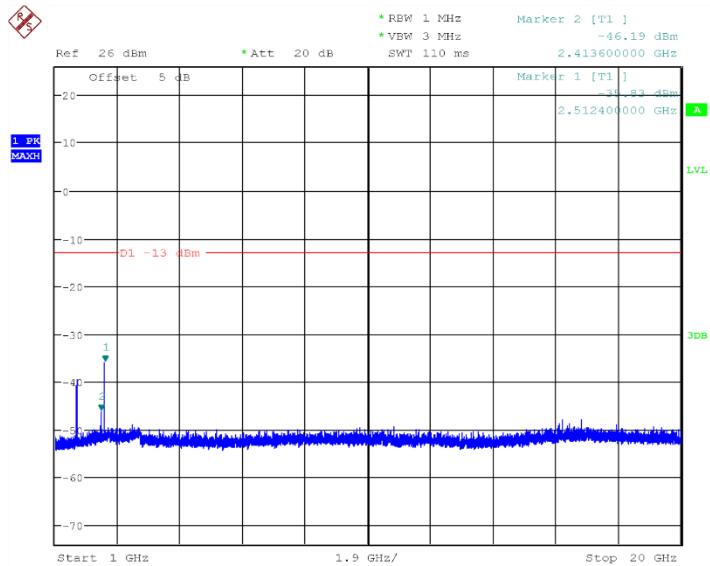


Date: 7.JUN.2016 08:40:37

### Channel 4132: 30MHz~20GHz

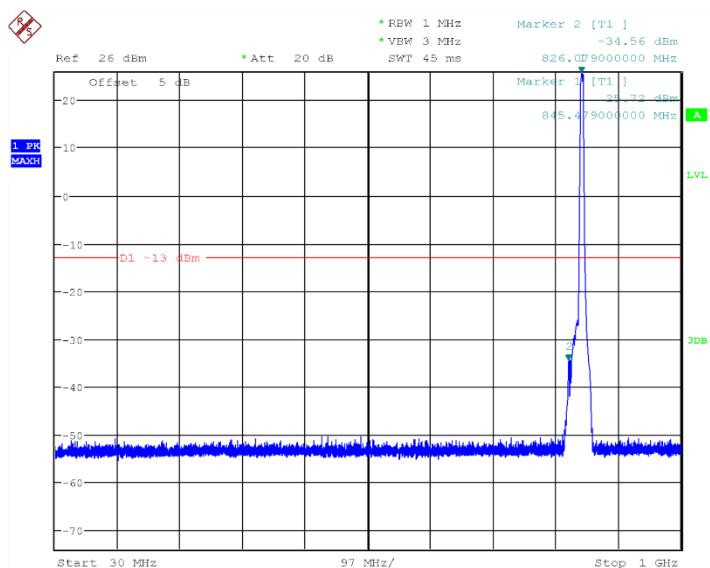


Date: 7.JUN.2016 08:34:37

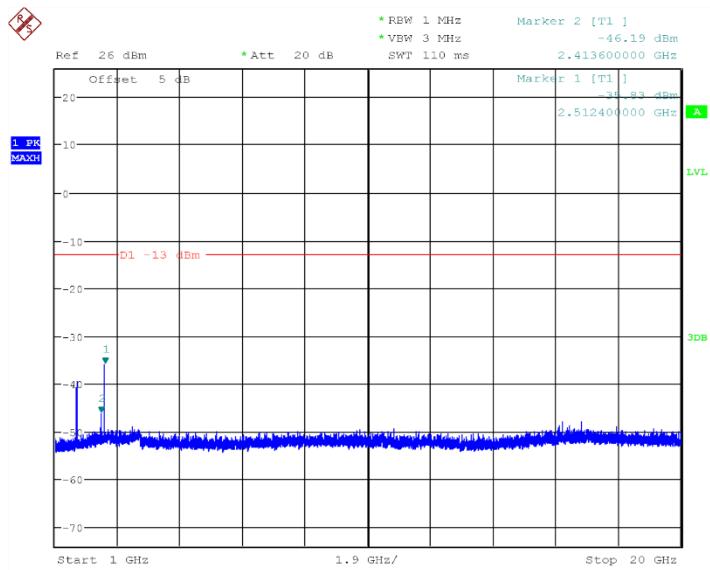


Date: 7.JUN.2016 08:40:37

### Channel 4183: 30MHz~20GHz



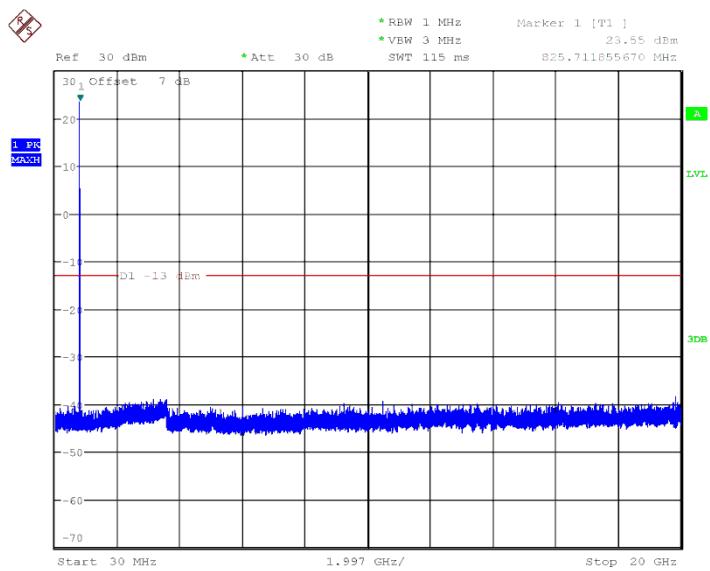
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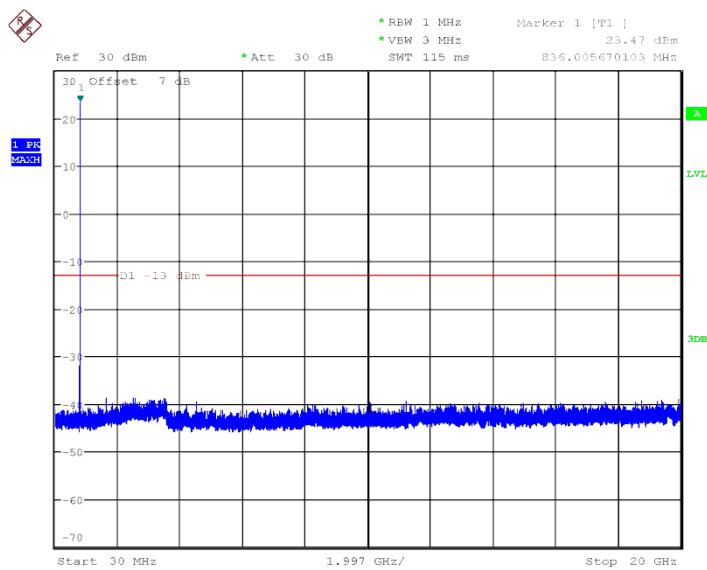
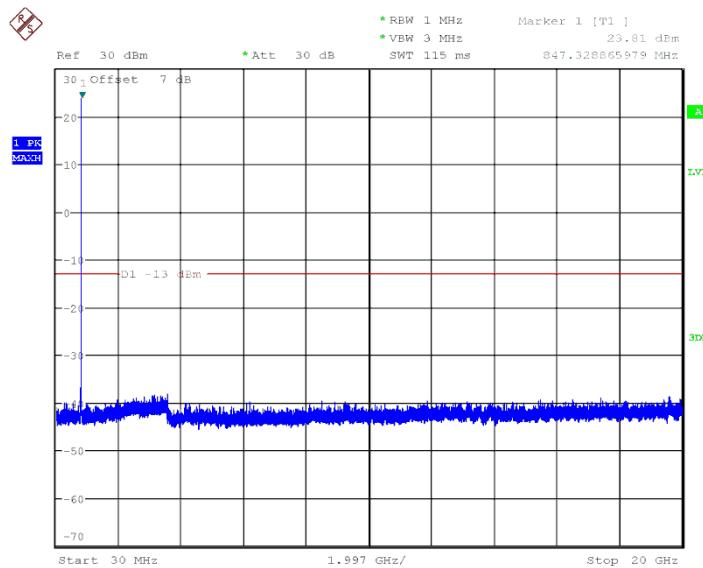
Date: 7.JUN.2016 08:40:37

### Channel 4233: 30MHz~20GHz

#### 16QAM Band V



### Channel 4132: 30MHz~20GHz


**Channel 4183: 30MHz~20GHz**

**Channel 4233: 30MHz~20GHz**
**Conclusion: PASS**

## ANNEX A.7. RADIATED

### A.7.1. ERP

#### A.7.1.1. WCDMA ERP

##### A.7.1.1.1. Description

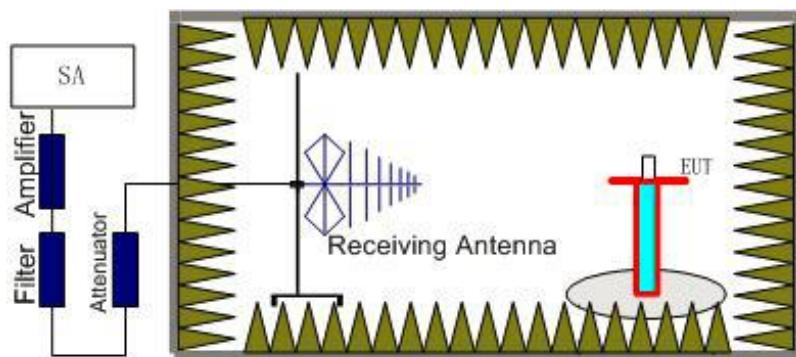
This is the test for the maximum radiated power from the EUT.

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."

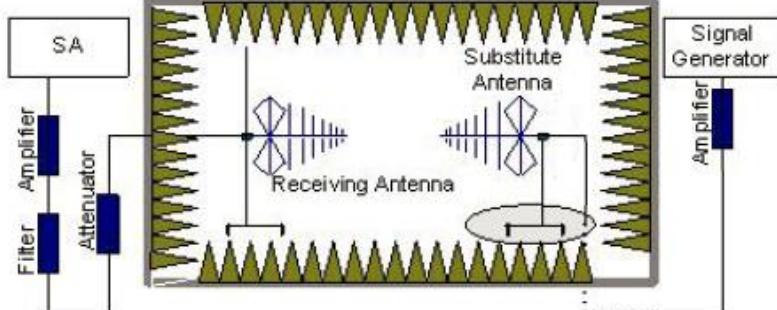
#### A.7.1.1.2. Method of Measurement

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 ( $P_r$ ).
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:

$$\text{Power(EIRP)} = P_{Mea} + P_{Ag} - P_{cl} + G_a$$

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,  $ERP = EIRP - 2.15\text{dBi}$ .

#### A.7.1.1.4 WCDMA Band II-EIRP

	Burst Peak EIRP (dBm)
WCDMA Band II	$\leq 33\text{dBm}$ (2W)

#### A.7.1.1.4.2 Measurement result

**Note:** The ERP of QPSK modulation test result please refer to the report No: I16D00113-RFA\_V2

A. section A.8.1.1

The ERP of 16QAM modulation test result please refer to the report No: I17D00219-SRD05-V1 A. section A.8.1

#### QPSK

Frequency (MHz)	$P_{Mea}$ (dBm)	$P_{cl}$ (dB)	$P_{Ag}$ (dB)	$G_a$ Antenna Gain(dBi)	PeakEIRP(dBm)	Polarization
1852.4	-13.04	4.6	36.0	4.7	23.06	V
1880.0	-11.99	4.6	35.6	4.7	23.71	H
1907.6	-12.79	4.7	35.9	4.5	22.91	H

#### 16QAM

Frequency (MHz)	$P_{Mea}$ (dBm)	$P_{cl}$ (dB)	$P_{Ag}$ (dB)	$G_a$ Antenna Gain(dBi)	PeakEIRP(dBm)	Polarization
1852.4	-18.71	3.54	43.8	2.9	24.45	V
1880.0	-19.23	3.54	43.8	2.9	23.93	H
1907.6	-20.11	3.54	43.8	2.9	23.05	V

**Frequency: 1907.6MHz**

$$\text{Peak EIRP(dBm)} = P_{Mea}(-20.11\text{dBm}) - P_{cl}(3.54\text{dB}) + P_{Ag}(43.8\text{dB}) + G_a(2.9\text{dBi}) = 23.05\text{dBm}$$

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

**A.7.1.2.4.1 WCDMA Band V-EIRP**

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

**A.7.1.2.4.2 Measurement result****QPSK**

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	P <sub>Ag</sub> (dB)	G <sub>a</sub> Antenna Gain(dBd)	PeakERP(dBm)	Polarization
826.4	-9.66	3.1	37	-3.11	21.13	V
836.6	-8.74	3.1	37	-3.11	22.05	V
846.6	-7.68	3.1	37	-3.11	23.11	H

**16QAM**

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	P <sub>Ag</sub> (dB)	G <sub>a</sub> Antenna Gain(dBd)	PeakERP(dBm)	Polarization
826.4	-13.58	3.2	37	2.9	23.12	H
836.6	-13.49	3.2	37	2.9	23.21	H
846.6	-12.32	3.2	37	2.9	24.38	H

**Frequency: 846.6 MHz****Peak ERP(dBm)= P<sub>Mea</sub>(-12.32dBm)- P<sub>cl</sub>(3.2dB)+P<sub>Ag</sub>(37dB)+G<sub>a</sub>(2.9dBd)=24.38dBm****ANALYZER SETTINGS: RBW = VBW = 5MHz****Note: the EUT was displayed in several different direction, the worst cases were shown.****A.7.2 EMISSION LIMIT (\$2.1051/\$22.917\$24.238)****A.7.2.1. WCDMA 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 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 II Band V.

**The procedure of radiated spurious emissions is the same like GSM.**

**A.7.2.2.1. 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.

#### **A.7.2.2.2. Measurement Results**

**Note:** The ERP of QPSK modulation test result please refer to the report No: I16D00113-RFA\_V2 A. section A.8.2.2.2

The ERP of 16QAM modulation test result please refer to the report No: I17D00219-SRD05-V1 A. section A.8.2.3

Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the WCDMA Band II and V. 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 V 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.8.2.2.3. Measurement Results Table**

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

Frequency	Channel	Frequency Range	Result
16QAM Band II	Low	30MHz~20GHz	P
	Middle	30MHz~20GHz	P
	High	30MHz~20GHz	P
16QAM 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
3706.400000	-55.59	6.6	7.9	-54.29	-13	V
5554.000000	-54.39	8.2	9.5	-53.09	-13	V
7406.000000	-55.54	9.7	11.06	-54.18	-13	H

**WCDMA BAND II Mode Channel 9400****Final result:**

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization
3758.800000	-52.86	6.6	7.9	-51.56	-13	H
5637.200000	-53.65	8.3	10.0	-51.95	-13	V
7524.400000	-56.28	9.7	11.7	-54.28	-13	H

**WCDMA BAND II Mode Channel 9538****Final result:**

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization
3816.400000	-52.22	6.7	8.2	-50.72	-13	H
5725.600000	-50	8.5	10.0	-48.50	-13	H
7633.600000	-55.76	9.7	11.7	-53.76	-13	H

**WCDMA BAND V Mode Channel 4132****Final result:**

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

1654.2857 14	-52.95	4.3	5.0	-52.25	-13	H
2482.3076 92	-53.26	5.3	5.3	-53.26	-13	H
3308.4000 00	-64.22	6.2	7.3	-63.12	-13	H

**WCDMA BAND V Mode Channel 4183**
**Final result:**

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarizatio n
1671.4285 71	-53.09	4.3	5.0	-52.39	-13	H
3349.6000 00	-58.21	6.2	7.2	-58.21	-13	H
4453.2000 00	-59.8	7.3	8.8	-58.70	-13	V

**WCDMA BAND V Mode Channel 4233**
**Final result:**

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarizatio n
1691.0714 29	-49.86	4.4	3.1	-51.82	-13	H
3375.2000 00	-52.65	6.2	7.2	-50.84	-13	H
4506.8000 00	-63.7	7.3	8.7	-57.35	-13	H

**16QAM BAND II Mode Channel 9262**
**Final result:**

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarizatio n
3706.4	-51.74	6.6	6.2	-52.14	-13	V
5555.2	-56.72	8.2	9.7	-55.22	-13	V
7389.6	-60.26	9.7	14.2	-55.76	-13	H
9293.6	-62.04	10.7	18.5	-54.24	-13	H

10911.2	-56.2	11.8	17.8	-50.2	-13	H
12611.75	-53.65	12.8	18.9	-47.55	-13	V

**16QAM BAND II Mode Channel 9400****Final result:**

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization
3769.2	-52.65	6.6	6.3	-52.95	-13	V
5650	-54.51	8.3	10.1	-52.71	-13	V
7544	-61.02	9.7	14.7	-56.02	-13	H
9670	-60.41	10.8	18.3	-52.91	-13	H
12350.3	-53.94	12.6	18	-48.54	-13	V
15768.75	-51.05	14.8	22	-43.85	-13	H

**16QAM BAND II Mode Channel 9538****Final result:**

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization
3816.8	-50.73	6.7	6.4	-51.03	-13	V
5720	-54.88	8.5	10.4	-52.98	-13	V
7601.6	-60.72	9.7	14.9	-55.52	-13	V
9760	-59.97	11	18.1	-52.87	-13	H
11808.85	-53.55	12.5	17.5	-48.55	-13	V
13351.65	-56.76	13.7	22.4	-48.06	-13	H

**16QAM BAND V Mode Channel 4132**

**Final result:**

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization
1654.2857 14	-54.89	4.3	3.1	-56.09	-13	V
2481.9230 77	-52.33	5.3	3.7	-53.93	-13	V
3308.4	-46.81	6.2	5.1	-47.91	-13	V
4540.4	-58.89	7.4	7.4	-58.89	-13	H
5685.2	-60.52	8.4	10.2	-58.72	-13	H
7869.4	-61.73	9.9	15.9	-55.73	-13	H

**16QAM BAND V Mode Channel 4183****Final result:**

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization
1671.4285 71	-57.85	4.3	3.1	-59.05	-13	V
2507.3076 92	-56.21	5.4	3.7	-57.91	-13	H
3346	-53.74	6.2	5.3	-54.64	-13	V
4120	-60.18	7	7.4	-59.78	-13	V
5557.2	-59.06	8.2	9.7	-57.56	-13	V
6584.8	-59.67	9.1	11.8	-56.97	-13	H

**16QAM BAND V Mode Channel 4233****Final result:**

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization
1695	-53.17	4.4	3	-54.57	-13	V
2542.6923 08	-50.76	5.4	3.8	-52.36	-13	V

3382.4	-52.13	6.3	5.5	-52.93	-13	V
4664.4	-58.34	7.5	7.7	-58.14	-13	H
6356.8	-60.28	8.8	11.1	-57.98	-13	H
7711.6	-60.99	9.8	15.2	-55.59	-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 OF REPORT\*\*\*\*\*