

APPLICATION CERTIFICATION FCC Part 22&24
On Behalf of
Shenzhen Mingzong Technology Co., Ltd

Digital Video Recorders
Model No.: MS-580, MS-588

FCC ID: 2AOPG-MS-580

Prepared for : Shenzhen Mingzong Technology Co., Ltd
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Report No. : ATE20172473
Date of Test : January 1- January 6, 2018
Date of Report : January 13, 2018

TABLE OF CONTENTS

Description	Page
Test Report Certification	
1. GENERAL INFORMATION	5
1.1. Description of Device (EUT).....	5
1.2. Description of Test Facility	6
1.3. Measurement Uncertainty	6
2. MEASURING DEVICE AND TEST EQUIPMENT	7
3. SYSTEM TEST CONFIGURATION	8
3.1. Justification.....	8
3.2. Configuration of Test Setup.....	8
3.3. Block Diagram of Test Setup.....	8
4. TEST PROCEDURES AND RESULTS	9
5. BANDWIDTH MEASUREMENT	10
5.1. Block Diagram of Test Setup.....	10
5.2. Applicable Standard.....	10
5.3. Operating Condition of EUT	10
5.4. Test Procedure	10
5.5. Test Result	11
6. RF OUTPUT POWER.....	22
6.1. Block Diagram of Test Setup.....	22
6.2. The Requirement For FCC Section §2.1046 and §22.913 (a) & §24.232 (C).....	23
6.3. Operating Condition of EUT	23
6.4. Test Procedure	23
6.5. Test Result	24
7. SPURIOUS EMISSIONS AT ANTENNA TERMINALS.....	27
7.1. Block Diagram of Test Setup.....	27
7.2. Applicable Standard.....	27
7.3. EUT Configuration on Measurement	27
7.4. Operating Condition of EUT	27
7.5. Test Procedure	27
7.6. Test Result	28
8. BAND EDGE COMPLIANCE TEST	35
8.1. Block Diagram of Test Setup.....	35
8.2. The Requirement For Section § 22.917(a), §24.238(a)	35
8.3. Operating Condition of EUT	35
8.4. Test Procedure	35
8.5. Test Result	36
9. RADIATED SPURIOUS EMISSION TEST	39
9.1. Block Diagram of Test Setup.....	39
9.2. Applicable Standard.....	40
9.3. Restricted bands of operation	41
9.4. Configuration of EUT on Measurement	41
9.5. Operating Condition of EUT	42
9.6. Test Procedure	42

9.7.	The Field Strength of Radiation Emission Measurement Results	43
10.	PEAK-TO-AVERAGE RATIO (PAR)	46
10.1.	Block Diagram of Test Setup.....	46
10.2.	The Requirement For Section FCC §22.913(d) and §24.232(d)	46
10.3.	EUT Configuration on Measurement	46
10.4.	Operating Condition of EUT	46
10.5.	Test Procedure	46
10.6.	Test Result	47
11.	FREQUENCY STABILITY	48
11.1.	Block Diagram of Test Setup.....	48
11.2.	The Requirement For Section CFR47 § 2.1055 (a), § 2.1055 (d), §22.355, §24.235	48
11.3.	Operating Condition of EUT	48
11.4.	Test Procedure	49
11.5.	Test Result	49
12.	ANTENNA REQUIREMENT.....	51
12.1.	The Requirement	51
12.2.	Antenna Construction	51

Test Report Certification

Applicant : Shenzhen Mingzong Technology Co., Ltd
Address : 3rd Yangwu Road, Liantangmian, Huinan Avenue, Huiyang
Economic Development Zone, Huizhou, Guangdong Province,
China

Manufacturer : Huizhou Miangshang Technology Co., Ltd
Address : 3rd Yangwu Road, Liantangmian, Huinan Avenue, Huiyang
Economic Development Zone, Huizhou, Guangdong Province,
China

Product : Digital Video Recorders
Model No. : MS-580, MS-588
Trade name : MINGSHANG

Measurement Procedure Used:

FCC Rules and Regulations Part 22 Subpart H - Public Mobile Services
Part 24 Subpart E - Personal Communication Services
FCC part 2
ANSI/TIA/EIA-603-D
KDB 971168 D01 Power Meas License Digital Systems v02r02

The device described above is tested by Shenzhen Accurate Technology Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 22H&24E limits. The measurement results are contained in this test report and Shenzhen Accurate Technology Co., Ltd. is assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the Equipment Under Test (EUT) is to be technically compliant with the FCC requirements.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of Shenzhen Accurate Technology Co., Ltd.

Date of Test : January 1- January 6, 2018
Date of Report : January 13, 2018

Prepared by :

St. Yang

(St. Yang, Engineer)

Approved & Authorized Signer :

Sean Liu
(Sean Liu, Manager)

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT	:	Digital Video Recorders
Model Number	:	MS-580, MS-588
		(Note: We hereby state that these models are identical in interior structure, electrical circuits and components, Just Model name is different. Therefore only model MS-580 is for tests.)
Number of channels	:	FDD V: 826.4-846.6 MHz 278 Channels FDD II : 1852.4-1907.6 MHz 103 Channels
Frequency	:	UMTS FDD Bands:II/V, HSDPA, HSUPA
Antenna Gain	:	3dBi
Type of Antenna	:	External Antenna
Power Supply	:	DC 7-36V
HW VERSION	:	V4.1
SW VERSION	:	V4.1

1.2. Description of Test Facility

EMC Lab	:	Recognition of accreditation by Federal Communications Commission (FCC) The Designation Number is CN1189 The Registration Number is 708358
		Listed by Innovation, Science and Economic Development Canada (ISED) The Registration Number is 5077A-2
		Accredited by China National Accreditation Service for Conformity Assessment (CNAS) The Registration Number is CNAS L3193
		Accredited by American Association for Laboratory Accreditation (A2LA) The Certificate Number is 4297.01
Name of Firm	:	Shenzhen Accurate Technology Co., Ltd.
Site Location	:	1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China

1.3. Measurement Uncertainty

Conducted Emission Expanded Uncertainty	=	2.23dB, k=2
Radiated emission expanded uncertainty (9kHz-30MHz)	=	3.08dB, k=2
Radiated emission expanded uncertainty (30MHz-1000MHz)	=	4.42dB, k=2
Radiated emission expanded uncertainty (Above 1GHz)	=	4.06dB, k=2

2. MEASURING DEVICE AND TEST EQUIPMENT

Table 1: List of Test and Measurement Equipment

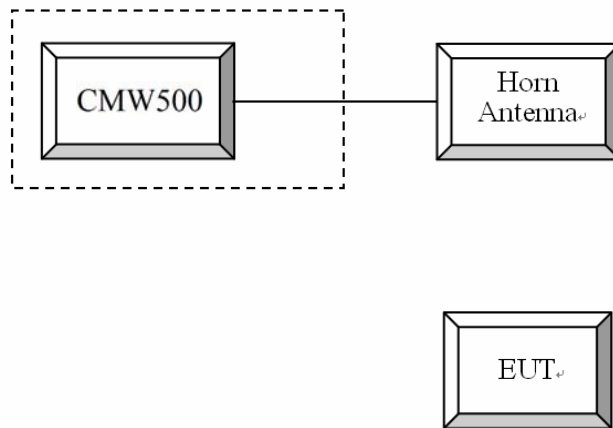
Kind of equipment	Manufacturer	Type	S/N	Calibrated dates	Calibrated until
EMI Test Receiver	Rohde&Schwarz	ESCS30	100307	Jan. 07, 2017	Jan. 06, 2018
EMI Test Receiver	Rohde&Schwarz	ESPI3	101526/003	Jan. 07, 2017	Jan. 06, 2018
Spectrum Analyzer	Agilent	E7405A	MY45115511	Jan. 07, 2017	Jan. 06, 2018
Pre-Amplifier	Rohde&Schwarz	CBLU118354 0-01	3791	Jan. 07, 2017	Jan. 06, 2018
Loop Antenna	Schwarzbeck	FMZB1516	1516131	Jan. 13, 2017	Jan. 12, 2018
Bilog Antenna	Schwarzbeck	VULB9163	9163-194	Jan. 13, 2017	Jan. 12, 2018
Bilog Antenna	Schwarzbeck	VULB9163	9163-323	Jan. 13, 2017	Jan. 12, 2018
Horn Antenna	Schwarzbeck	BBHA9120D	9120D-655	Jan. 13, 2017	Jan. 12, 2018
Horn Antenna	Schwarzbeck	BBHA9170	9170-359	Jan. 13, 2017	Jan. 12, 2018
LISN	Rohde&Schwarz	ESH3-Z5	100305	Jan. 07, 2017	Jan. 06, 2018
LISN	Schwarzbeck	NSLK8126	8126431	Jan. 07, 2017	Jan. 06, 2018
Highpass Filter	Wainwright Instruments	WHKX3.6/18 G-10SS	N/A	Jan. 07, 2017	Jan. 06, 2018
Band Reject Filter	Wainwright Instruments	WRCG2400/2 485-2375/2510 -60/11SS	N/A	Jan. 07, 2017	Jan. 06, 2018
Wideband Radio Communication Tester	Rohde&Schwarz	CMW500	154606	Jan. 07, 2017	Jan. 06, 2018

3. SYSTEM TEST CONFIGURATION

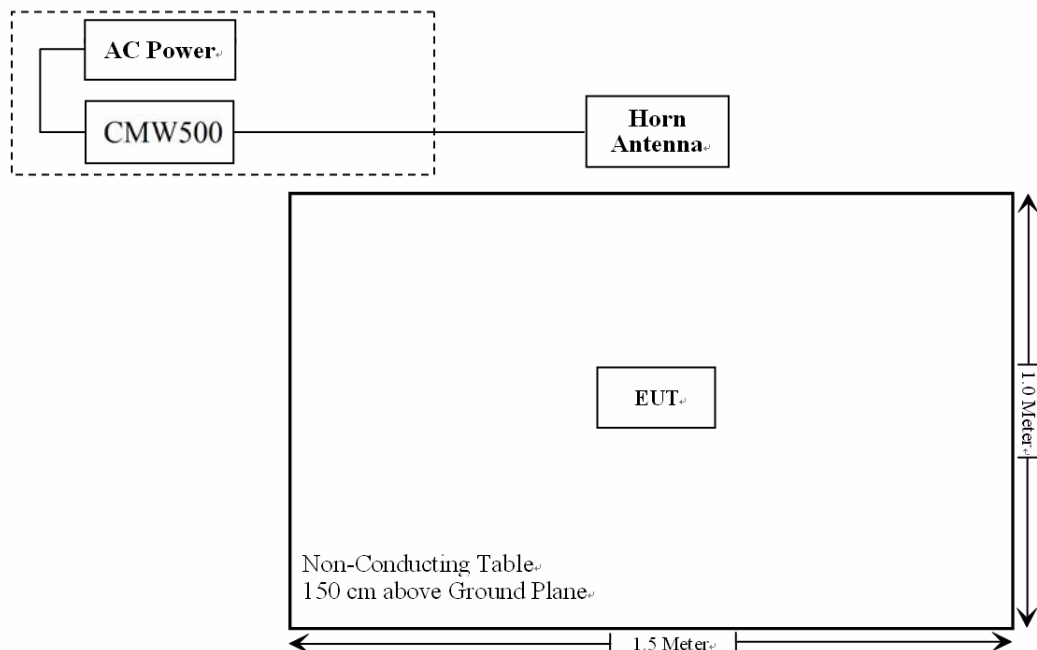
3.1.Justification

The EUT was configured for testing according to TIA/EIA-603-D.
The final qualification test was performed with the EUT operating at normal mode.

3.2.Configuration of Test Setup



3.3.Block Diagram of Test Setup



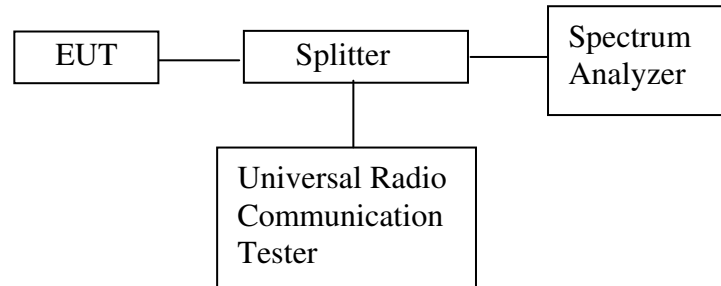
4. TEST PROCEDURES AND RESULTS

FCC Rules	Description of Test	Result
Section 15.207	Power Line Conducted Emission	N/A
§ 2.1046; § 22.913 (a); § 24.232 (c)	RF Output Power	Compliant
§ 2.1047	Modulation Characteristics	N/A
§ 2.1049; § 22.905 § 22.917; § 24.238	99% & -26 dB Occupied Bandwidth	Compliant
§ 2.1051, § 22.917 (a); § 24.238 (a)	Spurious Emissions at Antenna Terminal	Compliant
§ 2.1053 § 22.917 (a); § 24.238 (a)	Field Strength of Spurious Radiation	Compliant
§ 22.917 (a); § 24.238 (a)	Out of band emission, Band Edge	Compliant
§ 22.913(d); § 24.232(d) KDB 971168 D01(5.7)	Peak-to-Average Ratio (PAR)	Compliant
§ 2.1055 § 22.355; § 24.235	Frequency stability vs. temperature Frequency stability vs. voltage	Compliant
Section 15.203	Antenna Requirement	Compliant

Note: The power supply mode of the EUT is DC 7-36V(Harness port), According to the FCC standard requirements, conducted emission is not applicable.

5. BANDWIDTH MEASUREMENT

5.1. Block Diagram of Test Setup



5.2. Applicable Standard

FCC § 2.1049, § 22.917, § 22.905 and § 24.238.

5.3. Operating Condition of EUT

5.3.1. Setup the EUT and simulator as shown as Section 5.1.

5.3.2. Turn on the power of all equipment.

5.3.3. Let the EUT work in TX modes measure it. The transmit frequency are 826.4-846.6MHz and 1852.4-1907.6MHz. We select 826.4MHz, 836.6MHz, 846.6MHz and 1852.4MHz, 1880.0MHz, 1907.6MHz TX frequency to transmit.

5.4. Test Procedure

99% occupied bandwidth & -26dB occupied bandwidth test:

1. Set resolution bandwidth (RBW) = 50 kHz.
2. Set the video bandwidth (VBW) = 100 kHz.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measurements are to be performed with the EUT set to the low, middle and high channel of each frequency band.

5.5. Test Result

WCDMA BAND V		
Frequency (MHz)	99% Occupied Bandwidth (MHz)	-26 dBc Bandwidth (MHz)
826.4	4.1147	4.613
836.6	4.1233	4.622
846.6	4.1307	4.627

WCDMA BAND II		
Frequency (MHz)	99% Occupied Bandwidth (MHz)	-26 dBc Bandwidth (MHz)
1852.4	4.1563	4.637
1880.0	4.1370	4.618
1907.6	4.1280	4.606

WCDMA BAND V HSDPA		
Frequency (MHz)	99% Occupied Bandwidth (MHz)	-26 dBc Bandwidth (MHz)
826.4	4.1242	4.633
836.6	4.1228	4.624
846.6	4.1319	4.628

WCDMA BAND II HSDPA		
Frequency (MHz)	99% Occupied Bandwidth (MHz)	-26 dBc Bandwidth (MHz)
1852.4	4.1549	4.648
1880.0	4.1582	4.641
1907.6	4.1351	4.630

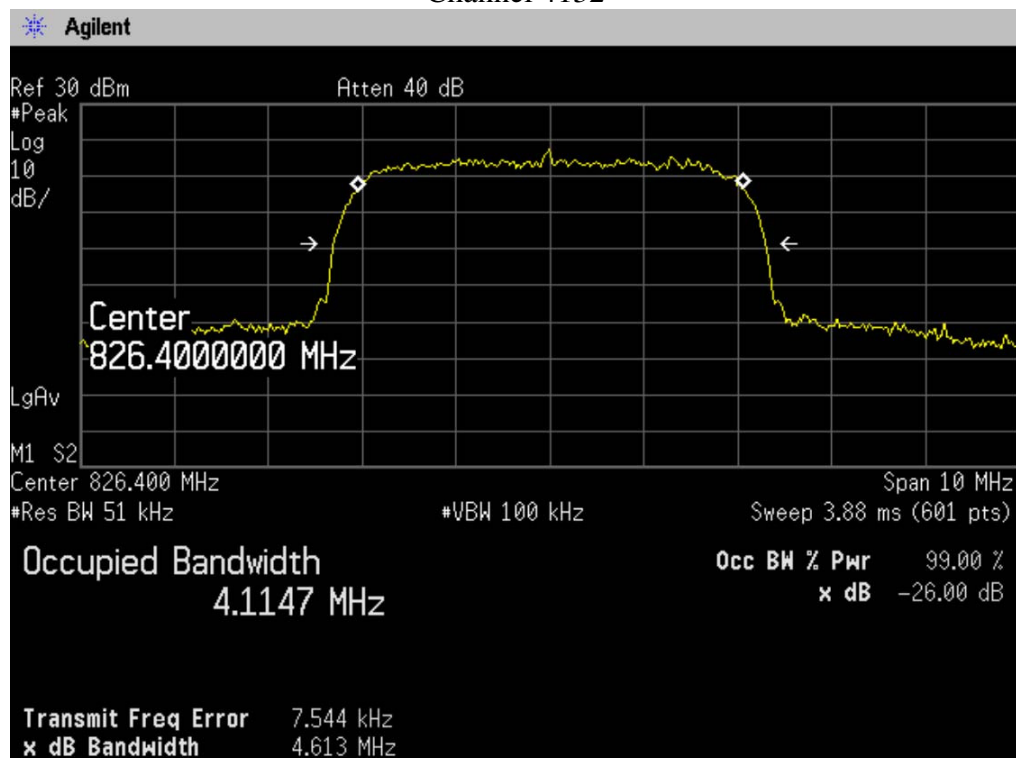
WCDMA BAND V HSUPA		
Frequency (MHz)	99% Occupied Bandwidth (MHz)	-26 dBc Bandwidth (MHz)
826.4	4.1206	4.614
836.6	4.1211	4.627
846.6	4.1353	4.637

WCDMA BAND II HSUPA		
Frequency (MHz)	99% Occupied Bandwidth (MHz)	-26 dBc Bandwidth (MHz)
1852.4	4.1492	4.640
1880.0	4.1489	4.657
1907.6	4.1405	4.650

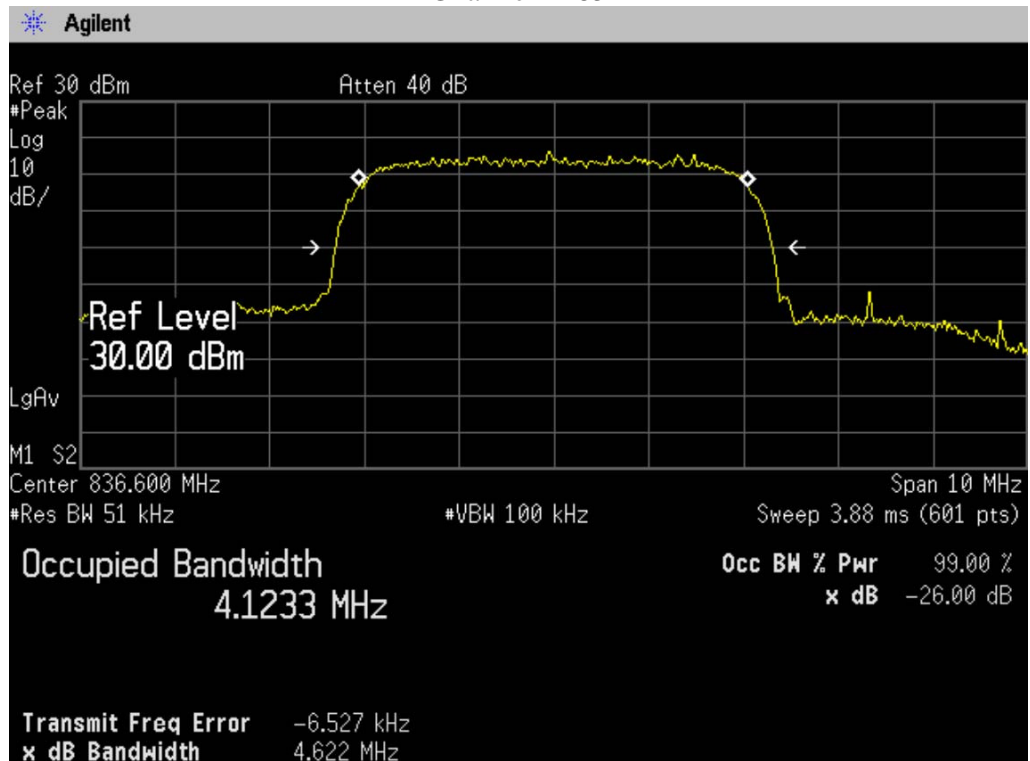
The spectrum analyzer plots are attached as below.

WCDMA BAND V

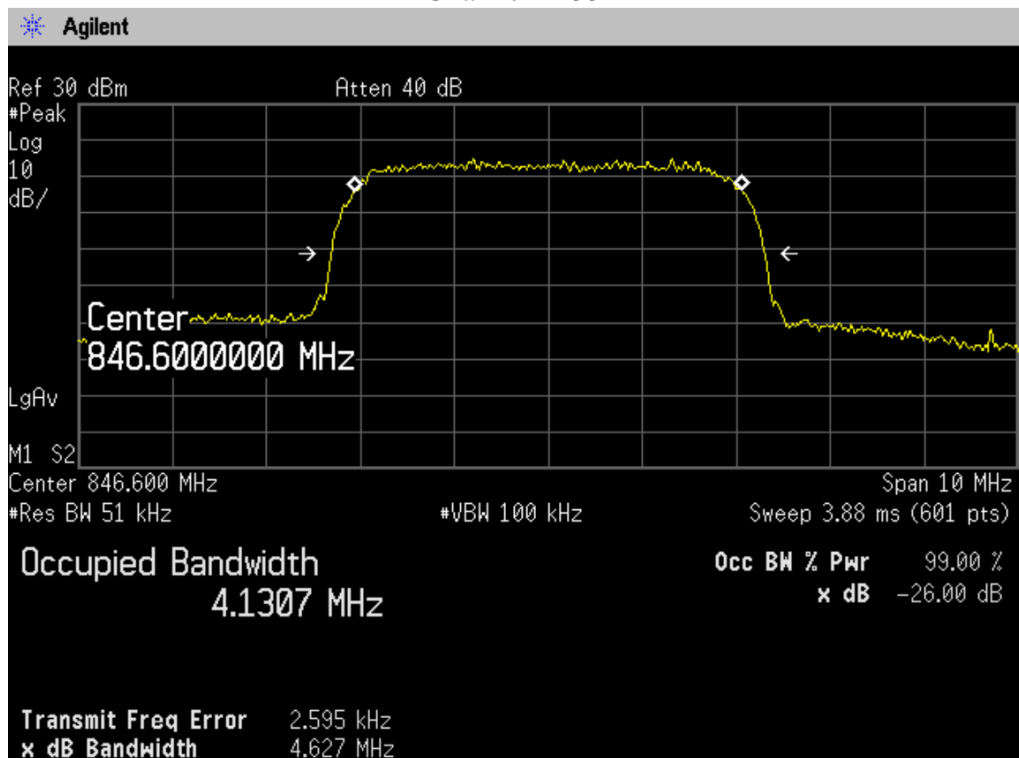
Channel 4132



Channel 4183

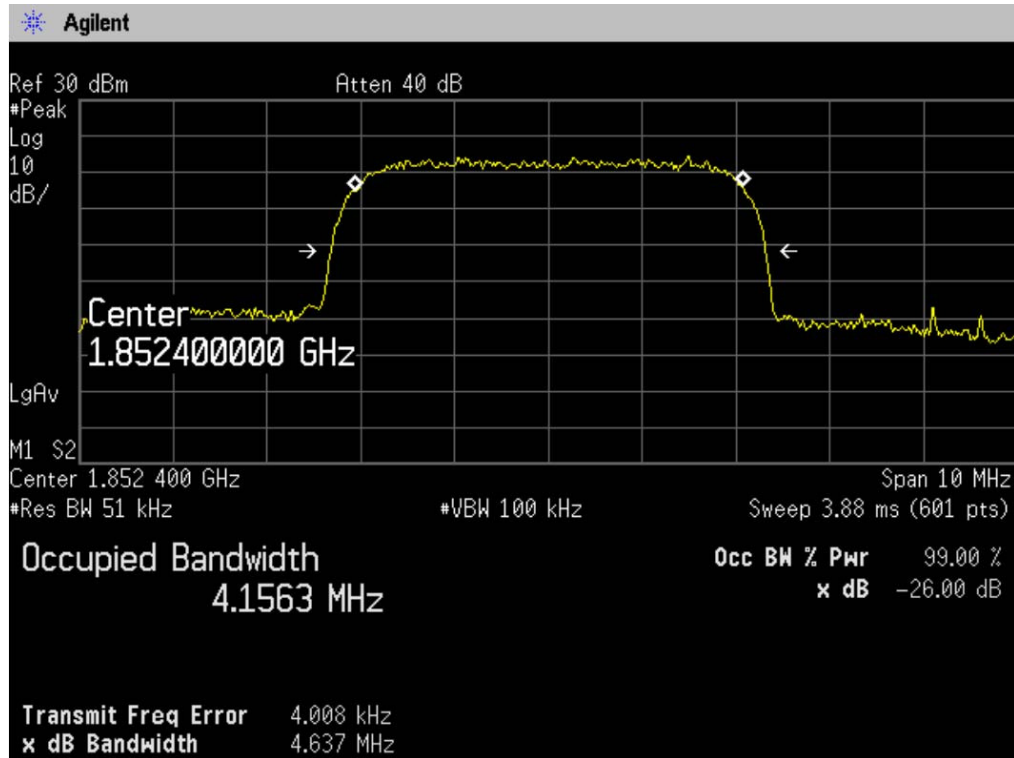


Channel 4233

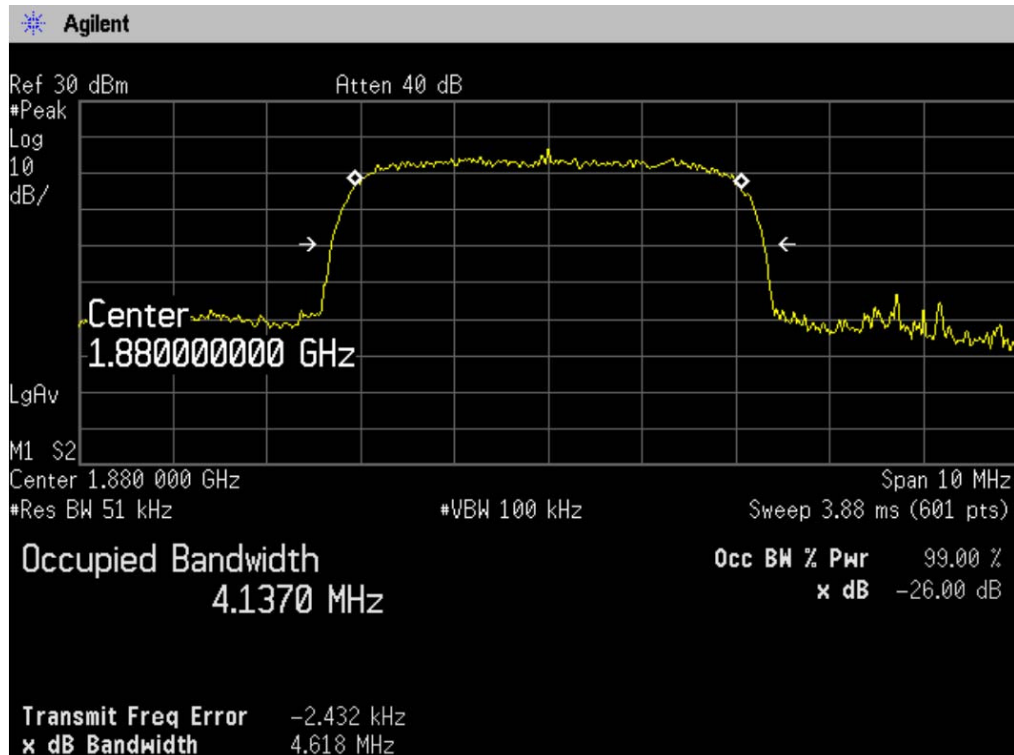


WCDMA BAND II

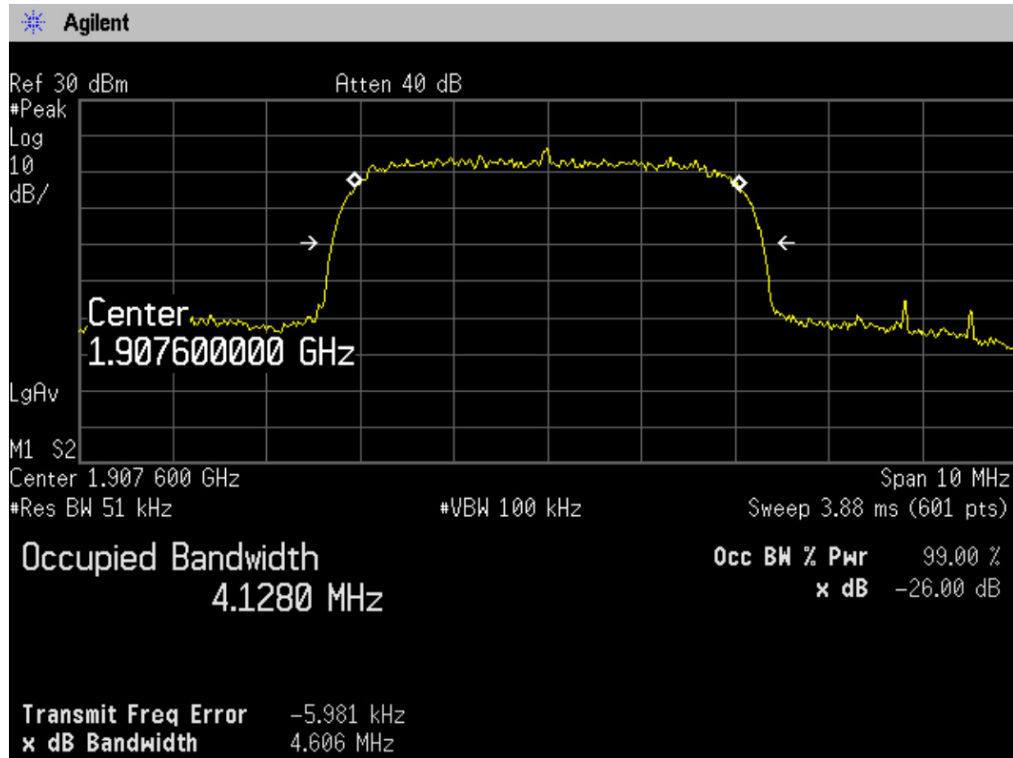
Channel 9262



Channel 9400

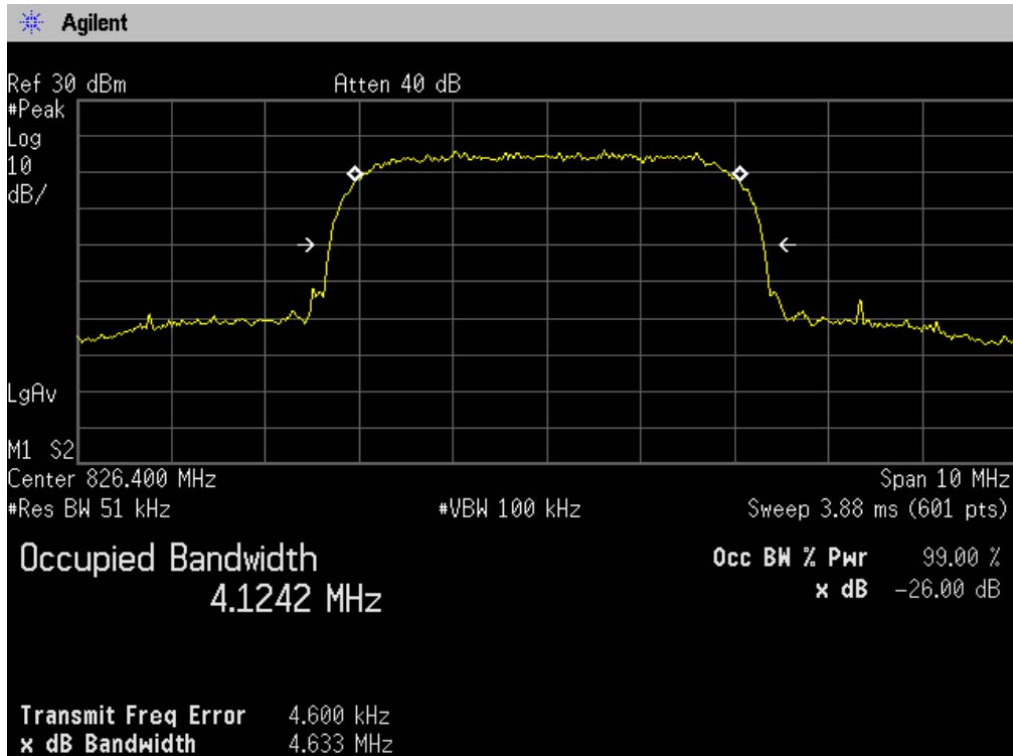


Channel 9538

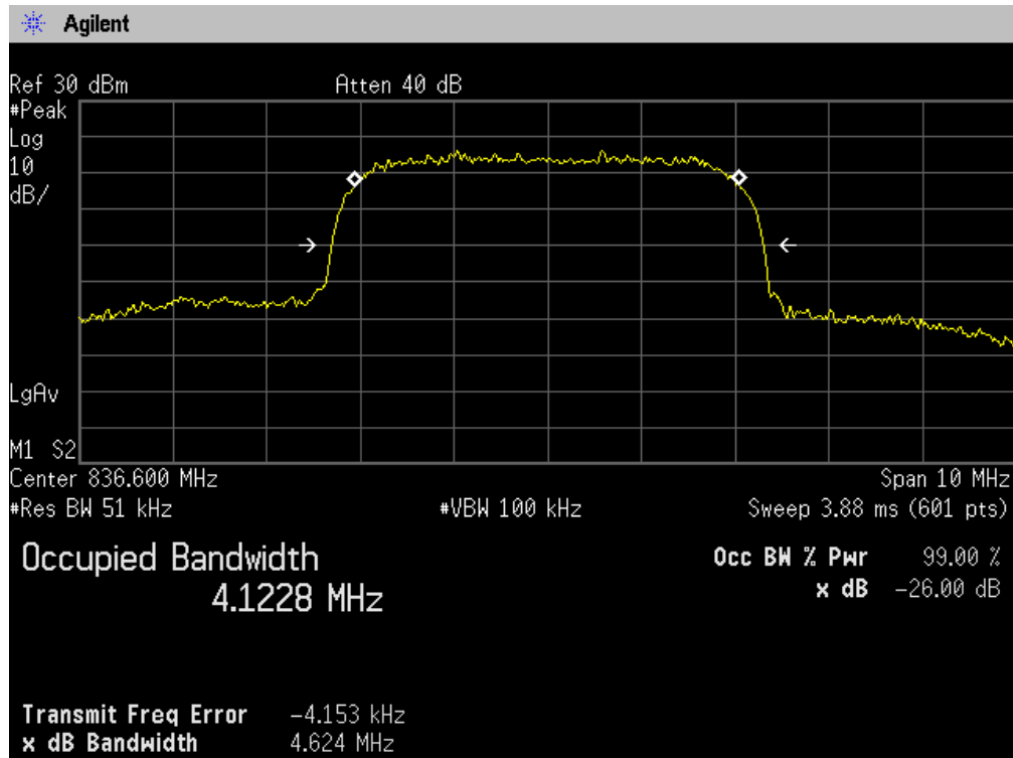


WCDMA BAND V HSDPA

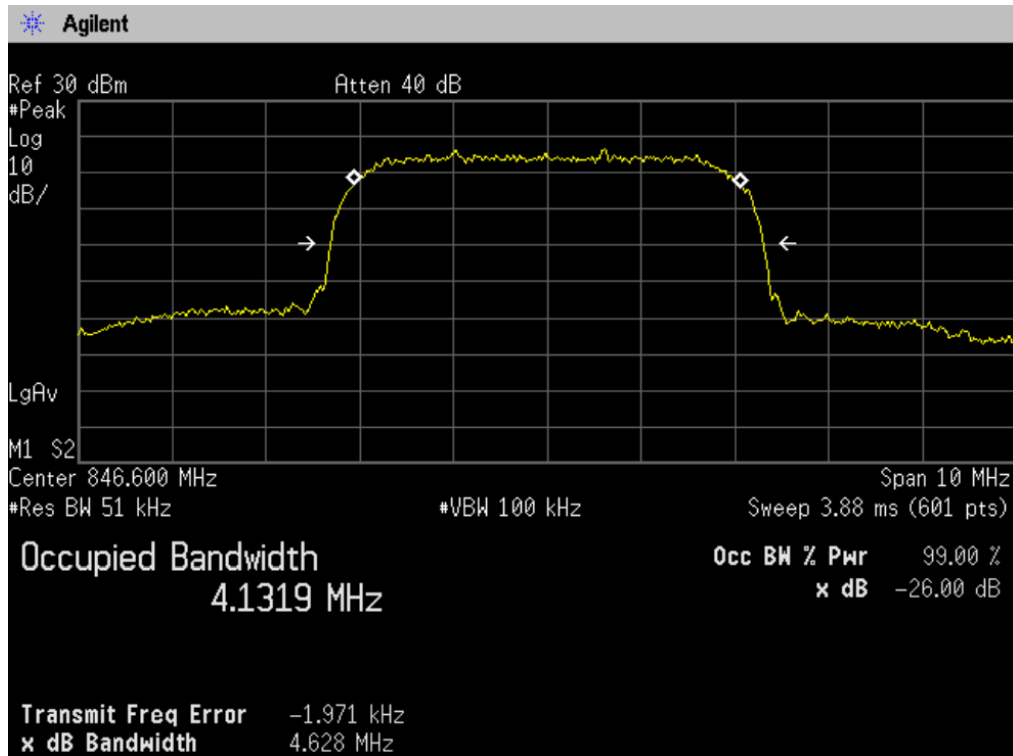
Channel 4132



Channel 4183

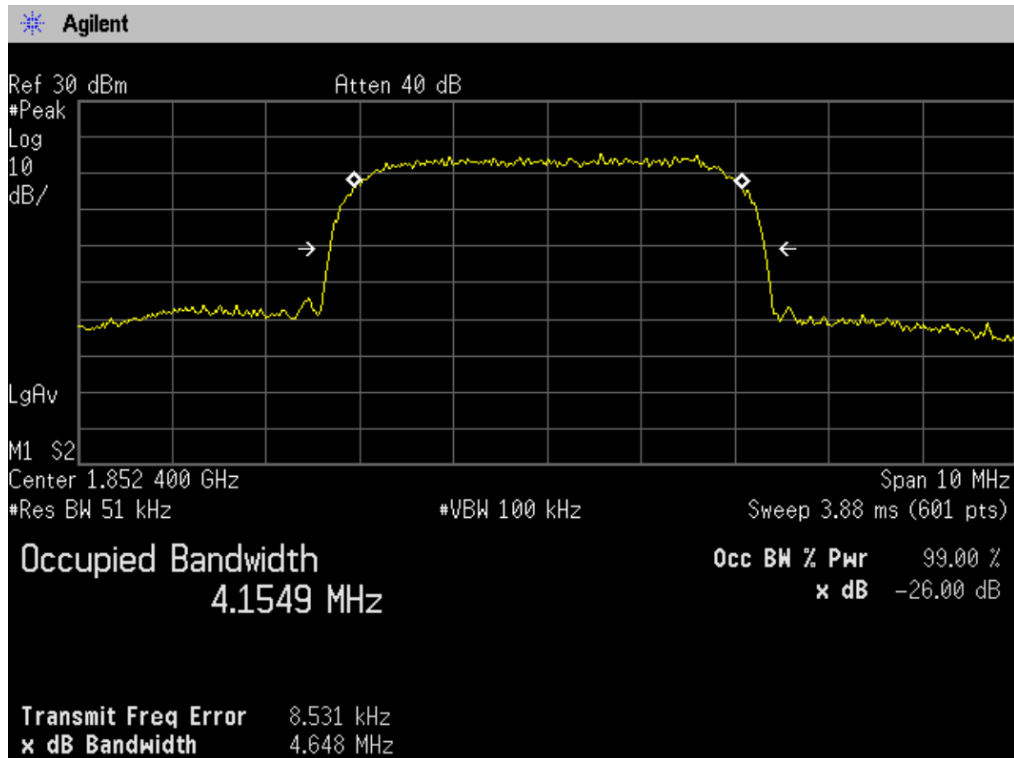


Channel 4233

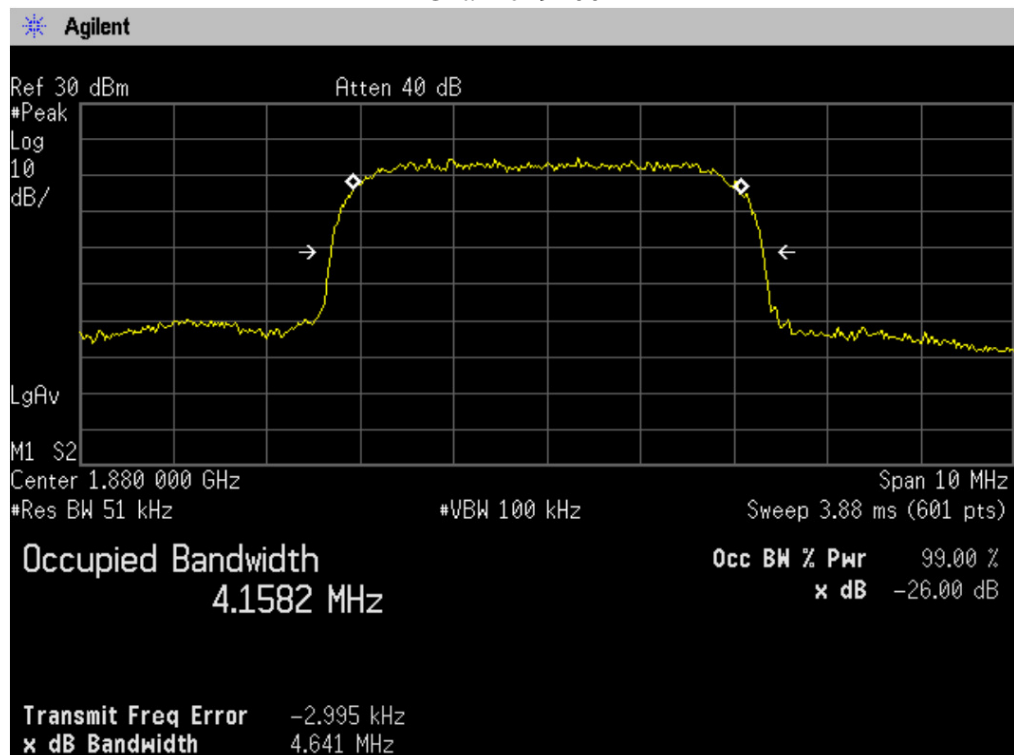


WCDMA BAND II HSDPA

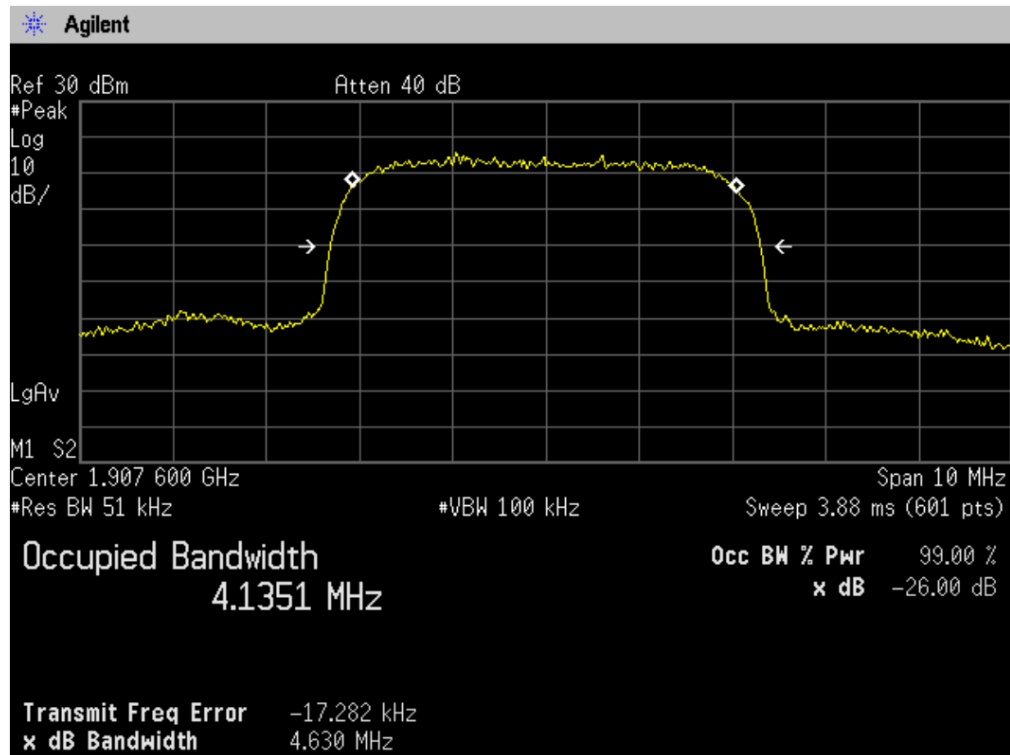
Channel 9262



Channel 9400

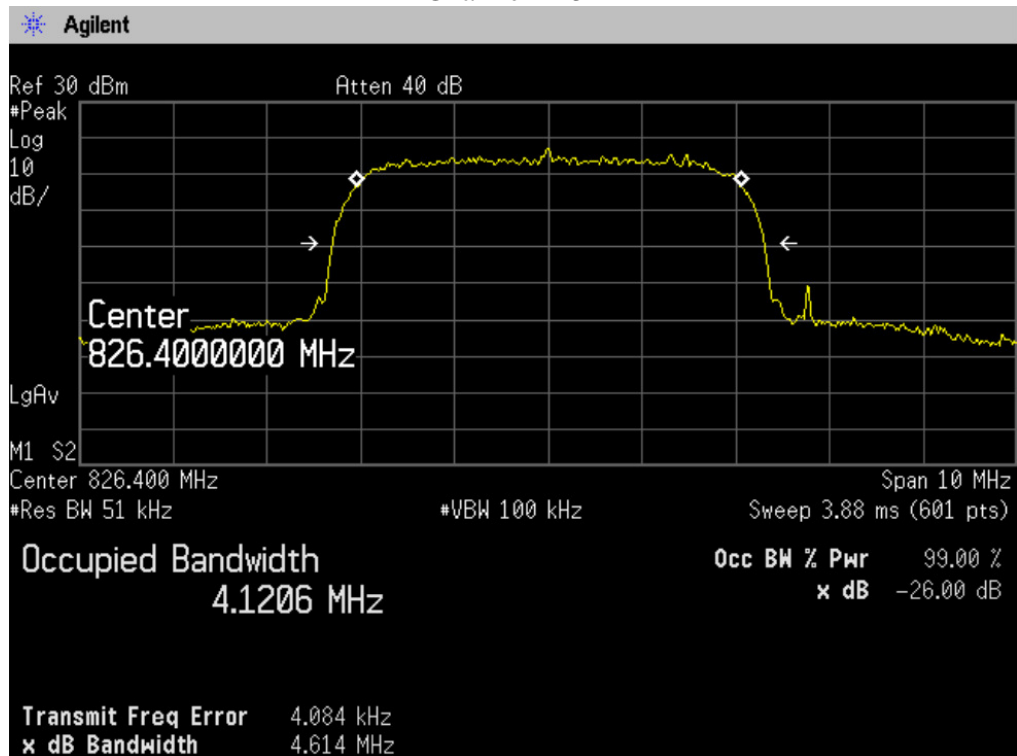


Channel 9538

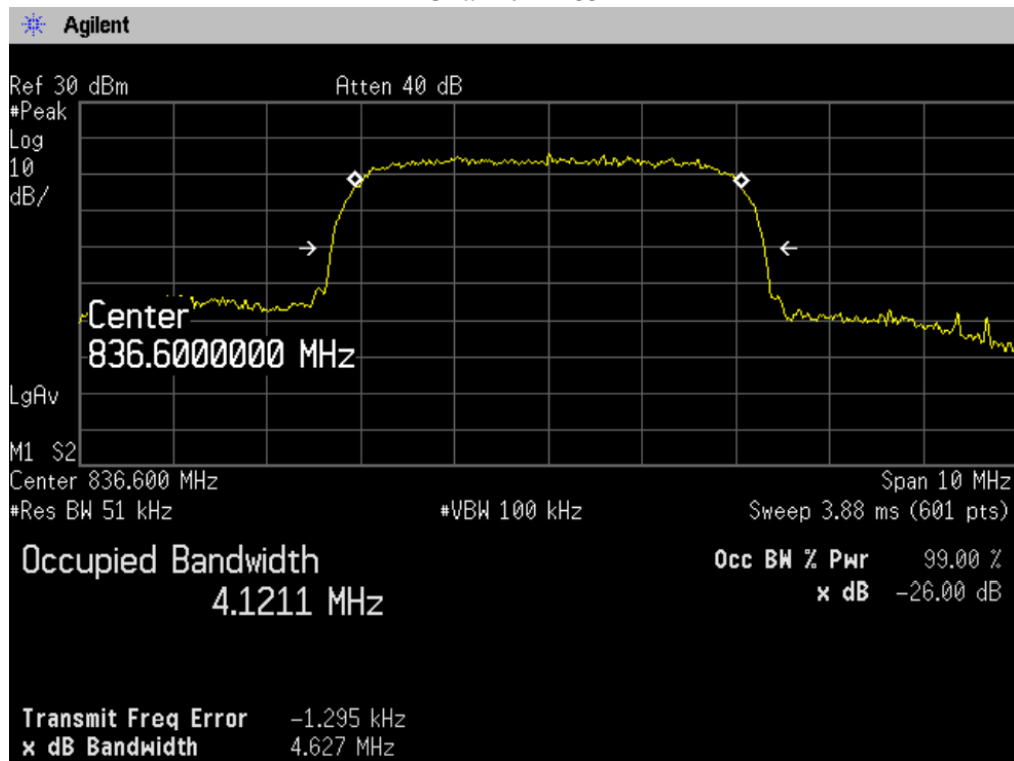


WCDMA BAND V HSUPA

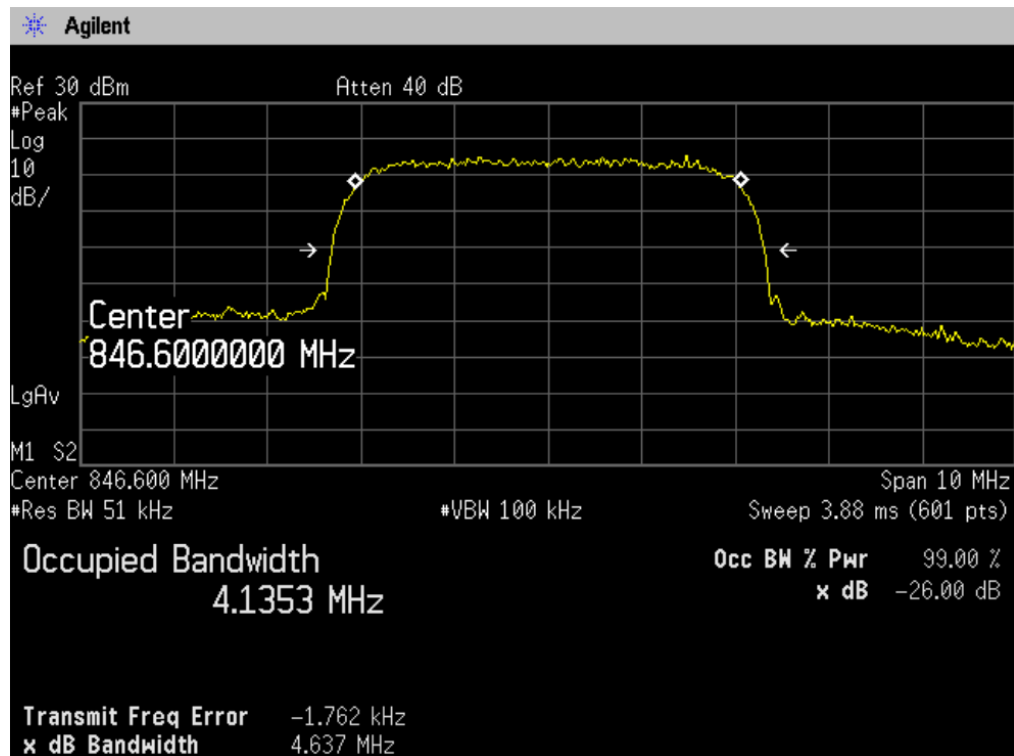
Channel 4132



Channel 4183

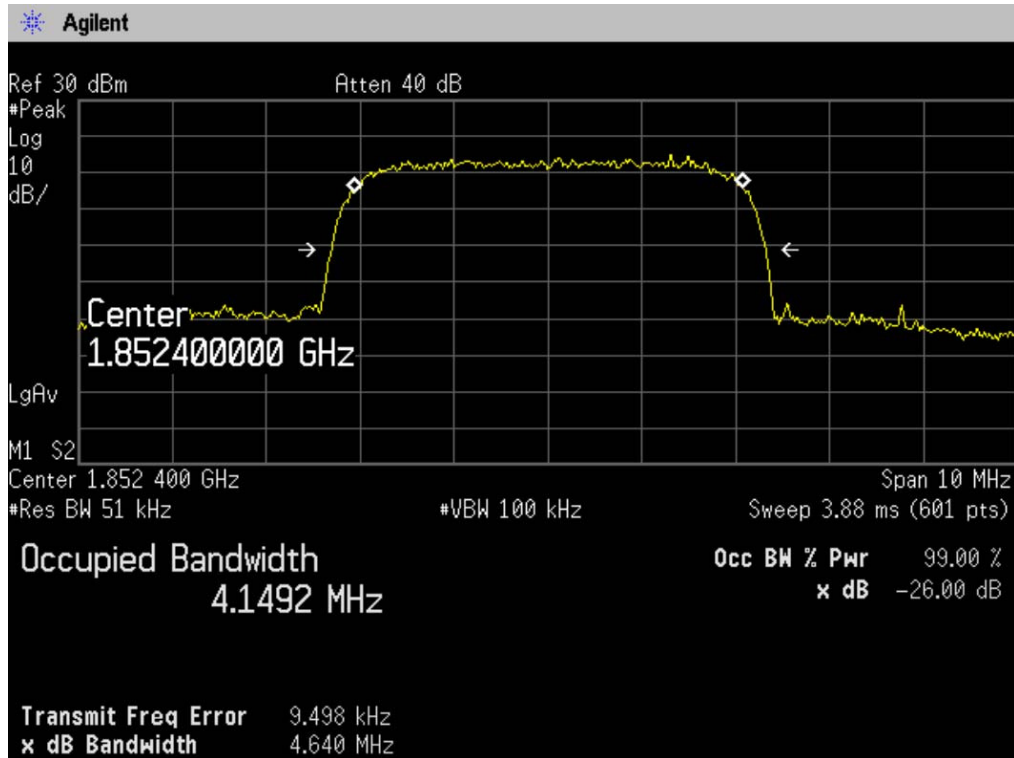


Channel 4233

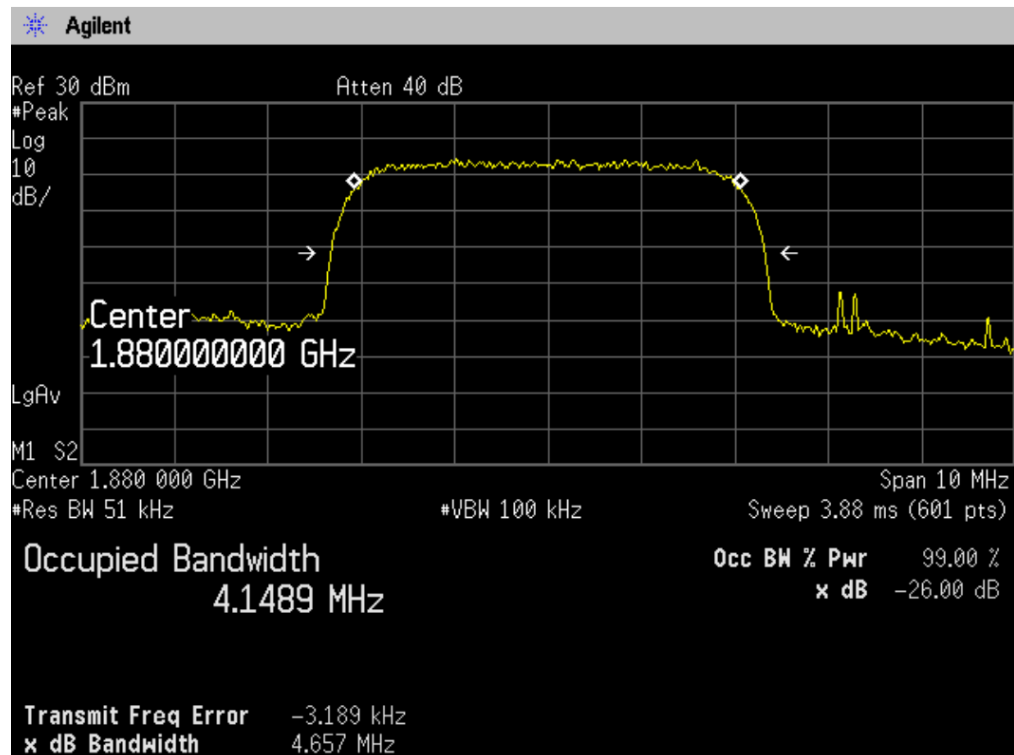


WCDMA BAND II HSUPA

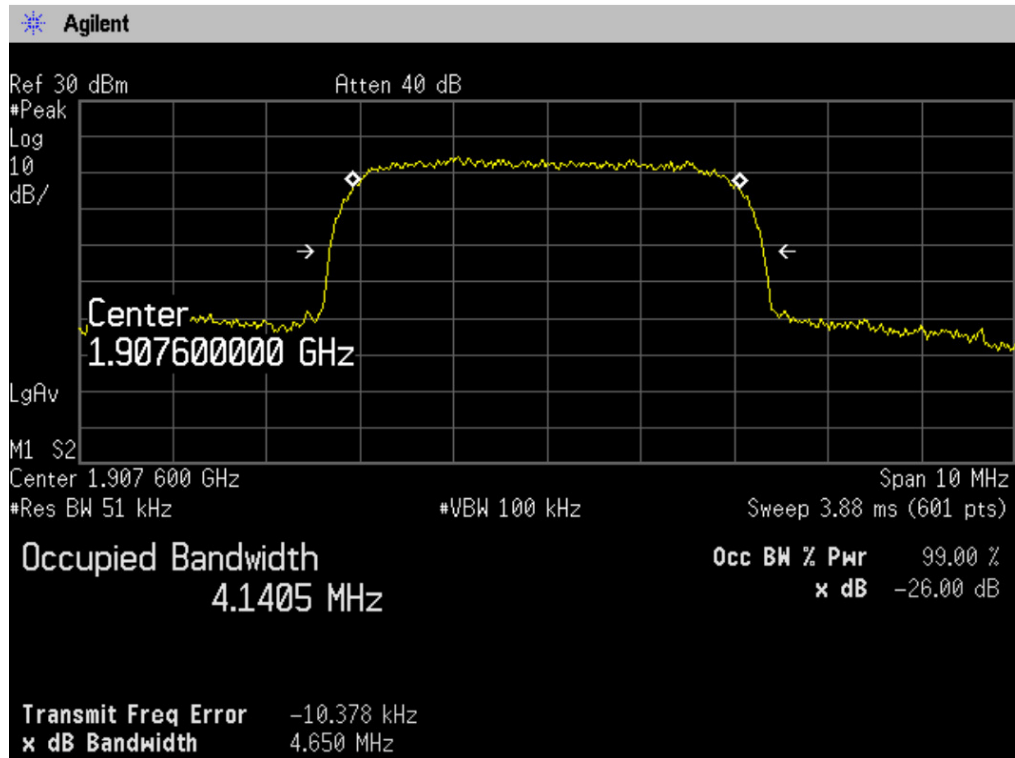
Channel 9262



Channel 9400



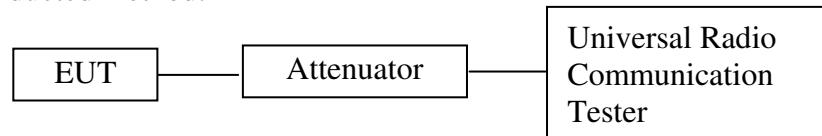
Channel 9538



6. RF OUTPUT POWER

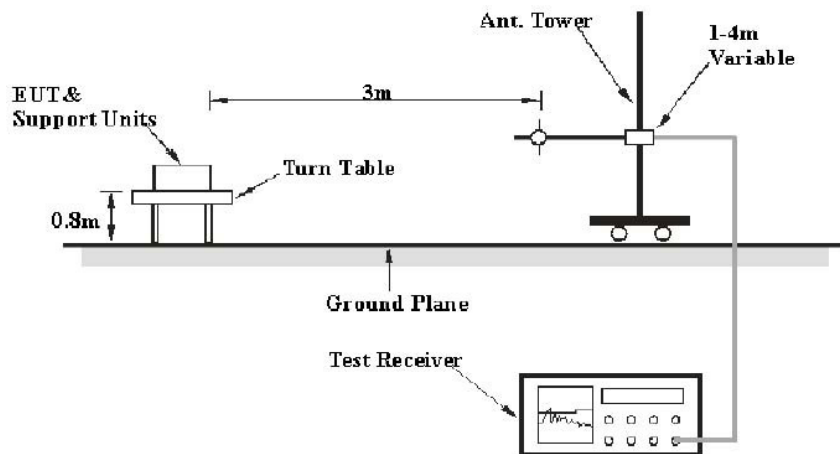
6.1. Block Diagram of Test Setup

Conducted method:

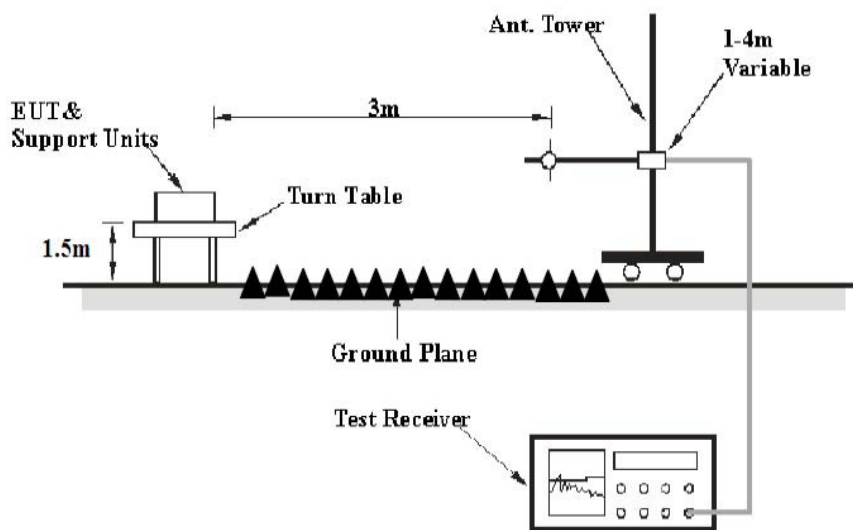


Radiated method:

(B) Radiated Emission Test Set-Up, Frequency 30MHz-1GHz



(C) Radiated Emission Test Set-Up, Frequency above 1GHz



6.2.The Requirement For FCC Section §2.1046 and §22.913 (a) & §24.232 (C)

According to FCC §2.1046 and §22.913 (a), the ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

According to FCC §2.1046 and §24.232 (C), mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

6.3.Operating Condition of EUT

6.3.1.Setup the EUT and simulator as shown as Section 6.1.

6.3.2.Turn on the power of all equipment.

6.3.3.Let the EUT work in TX modes measure it. The transmit frequency are 826.4-846.6MHz and 1852.4-1907.6MHz. We select 826.4MHz, 836.6MHz, 846.6MHz and 1852.4MHz, 1880.0MHz, 1907.6MHz TX frequency to transmit.

6.4.Test Procedure

Conducted method:

The RF output of the transmitter was connected to the wireless test set and the spectrum analyzer through sufficient attenuation.

Radiated method(For ERP&EIRP):

1. The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.
2. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.
3. The frequency range up to tenth harmonic of the fundamental frequency was investigated.
4. Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

6.5. Test Result

PASS

Conducted Power

WCDMA Band V:

Mode	Channel	Frequency (MHz)	Peak Power (dBm)	AVG Power (dBm)
WCDMA 850 RMC	4132	826.4	24.32	22.15
	4183	836.6	24.62	22.56
	4233	846.6	24.03	22.13
HSDPA(sub-test 1)	4132	826.4	24.11	22.62
	4183	836.6	24.36	22.43
	4233	846.6	24.25	22.34
HSDPA(sub-test 2)	4132	826.4	24.11	22.12
	4183	836.6	24.59	22.31
	4233	846.6	24.02	22.12
HSDPA(sub-test 3)	4132	826.4	24.62	22.33
	4183	836.6	24.11	22.15
	4233	846.6	24.36	22.45
HSDPA(sub-test 4)	4132	826.4	24.82	22.51
	4183	836.6	24.04	22.42
	4233	846.6	24.09	22.36

HSUPA(sub-test 1)	4132	826.4	24.22	22.16
	4183	836.6	24.65	22.48
	4233	846.6	24.17	22.03
HSUPA(sub-test 2)	4132	826.4	24.29	22.13
	4183	836.6	24.15	22.36
	4233	846.6	24.20	22.44
HSUPA(sub-test 3)	4132	826.4	24.39	22.17
	4183	836.6	24.00	22.02
	4233	846.6	24.35	22.06
HSUPA(sub-test 4)	4132	826.4	24.14	22.15
	4183	836.6	24.32	22.32
	4233	846.6	24.02	22.09
HSUPA(sub-test 5)	4132	826.4	24.22	22.18
	4183	836.6	24.46	22.69
	4233	846.6	24.55	22.15

WCDMA Band II:

Mode	Channel	Frequency (MHz)	Peak Power (dBm)	AVG Power (dBm)
WCDMA 1900 RMC	9262	1852.4	24.15	22.13
	9400	1880.0	24.39	22.12
	9538	1907.6	24.59	22.38
HSDPA(sub-test 1)	9262	1852.4	24.11	22.14
	9400	1880.0	24.52	22.56
	9538	1907.6	24.08	22.41
HSDPA(sub-test 2)	9262	1852.4	24.07	22.33
	9400	1880.0	24.33	22.50
	9538	1907.6	24.17	22.16
HSDPA(sub-test 3)	9262	1852.4	24.57	22.31
	9400	1880.0	24.44	22.70
	9538	1907.6	24.12	22.25
HSDPA(sub-test 4)	9262	1852.4	24.25	22.87
	9400	1880.0	24.02	22.02
	9538	1907.6	24.14	22.15

HSUPA(sub-test 1)	9262	1852.4	24.69	22.45
	9400	1880.0	24.33	22.02
	9538	1907.6	24.21	22.36
HSUPA(sub-test 2)	9262	1852.4	24.08	22.88
	9400	1880.0	24.16	22.04
	9538	1907.6	24.25	22.41
HSUPA(sub-test 3)	9262	1852.4	24.13	22.30
	9400	1880.0	24.56	22.05
	9538	1907.6	24.25	22.16
HSUPA(sub-test 4)	9262	1852.4	24.12	22.39
	9400	1880.0	24.32	22.07
	9538	1907.6	24.11	22.14
HSUPA(sub-test 5)	9262	1852.4	24.14	22.22
	9400	1880.0	24.52	22.32
	9538	1907.6	24.32	22.07

Radiated Power

ERP for UMTS FDD V(WCDMA)

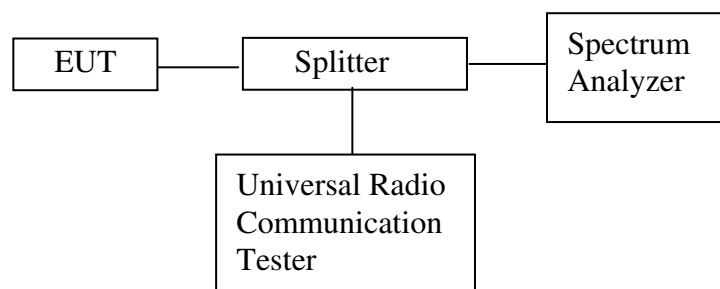
Indicated		Table Angle Degree	Test Antenna		Substituted			Antenna Gain Correctio n (dBi)	Cabl e Loss (dB)	Absolut e Level (dBm)	Part 27
Frequen cy (MHz)	S.A. Reading (dBμ V/ m)		Heigh t (m)	Polar (H/V)	Frequen cy (MHz)	S.G. Level (dBm)	Polar (H/V)				Limit (dBm)
Low Channel											
826.4	92.06	220	1.0	V	826.4	24.1	V	3.5	0.9	23.2	38.45
826.4	80.53	207	1.5	H	826.4	16.2	H	3.5	0.9	15.3	38.45
Middle Channel											
836.6	92.23	50	1.2	V	836.6	24.0	V	3.5	0.9	23.1	38.45
836.6	80.01	358	1.3	H	836.6	15.8	H	3.5	0.9	14.9	38.45
High Channel											
846.6	91.75	16	1.0	V	846.6	23.9	V	3.5	0.9	23.0	38.45
846.6	79.86	109	1.2	H	846.6	15.6	H	3.5	0.9	14.7	38.45

EIRP for UMTS FDD II(WCDMA)

Indicated		Table Angle Degree	Test Antenna		Substituted			Antenna Gain Correction (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Part 27
Frequency (MHz)	S.A. Reading (dBμV/m)		Height (m)	Polar (H/V)	Frequency (MHz)	S.G. Level (dBm)	Polar (H/V)				Limit (dBm)
Low Channel											
1852.4	89.29	154	1.0	V	1852.4	18.0	V	6.2	1.1	23.1	33
1852.4	80.89	275	1.3	H	1852.4	12.1	H	6.2	1.1	17.2	33
Middle Channel											
1880.0	88.34	25	1.5	V	1880.0	17.2	V	6.2	1.1	22.3	33
1880.0	80.37	147	1.3	H	1880.0	11.6	H	6.2	1.1	16.7	33
High Channel											
1907.6	89.40	275	1.4	V	1907.6	18.2	V	6.2	1.1	23.3	33
1907.6	80.52	180	1.2	H	1907.6	12.3	H	6.2	1.1	17.4	33

7. SPURIOUS EMISSIONS AT ANTENNA TERMINALS

7.1. Block Diagram of Test Setup



7.2. Applicable Standard

FCC §2.1051, §22.917, §24.238.

7.3. EUT Configuration on Measurement

The equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

7.4. Operating Condition of EUT

7.4.1. Setup the EUT and simulator as shown as Section 7.1.

7.4.2. Turn on the power of all equipment.

7.4.3. Let the EUT work in TX modes measure it. The transmit frequency are 826.4-846.6MHz and 1852.4-1907.6MHz. We select 826.4MHz, 836.6MHz, 846.6MHz and 1852.4MHz, 1880.0MHz, 1907.6MHz TX frequency to transmit.

7.5. Test Procedure

7.5.1. Set the EUT to its maximum power at the required channel.

7.5.2. Measurements are to be performed with the EUT set to the low, middle and high channel of each frequency band. Measure and record all spurious emissions up to the tenth harmonic of the carrier frequency.

7.5.3. Set the RBW=100 kHz , VBW=300 kHz below 1GHz and the RBW=1MHz , VBW=3MHz above 1GHz.

7.5.4. Detector = peak-Max hold.

7.5.5. Sweep time = auto.

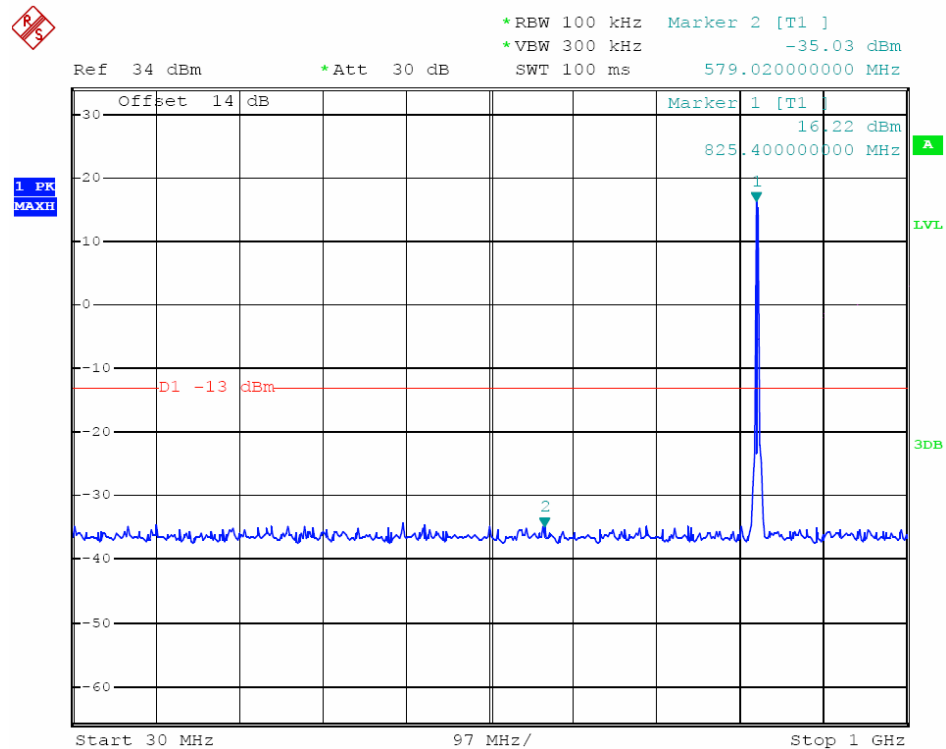
7.5.6. Allow trace to fully stabilize.

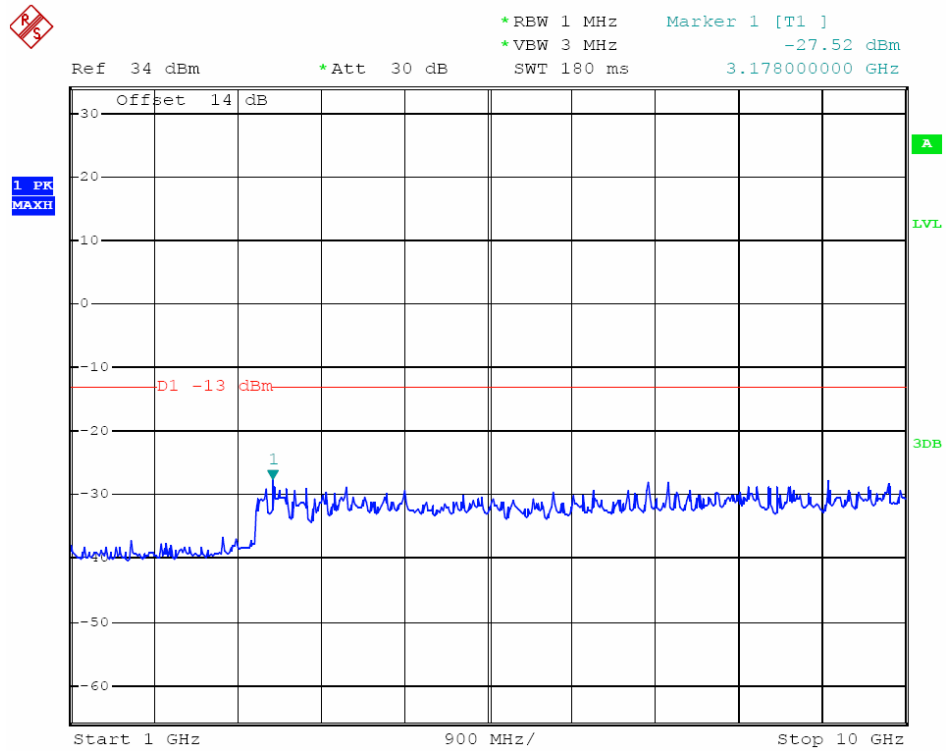
7.6. Test Result

The spectrum analyzer plots are attached as below.

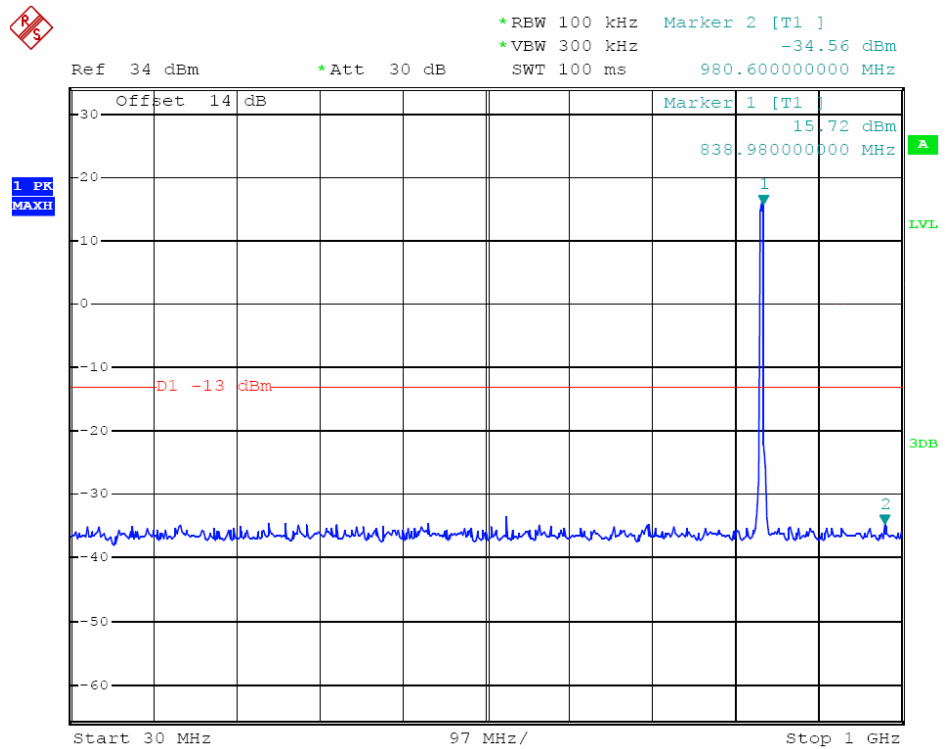
UMTS FDD V

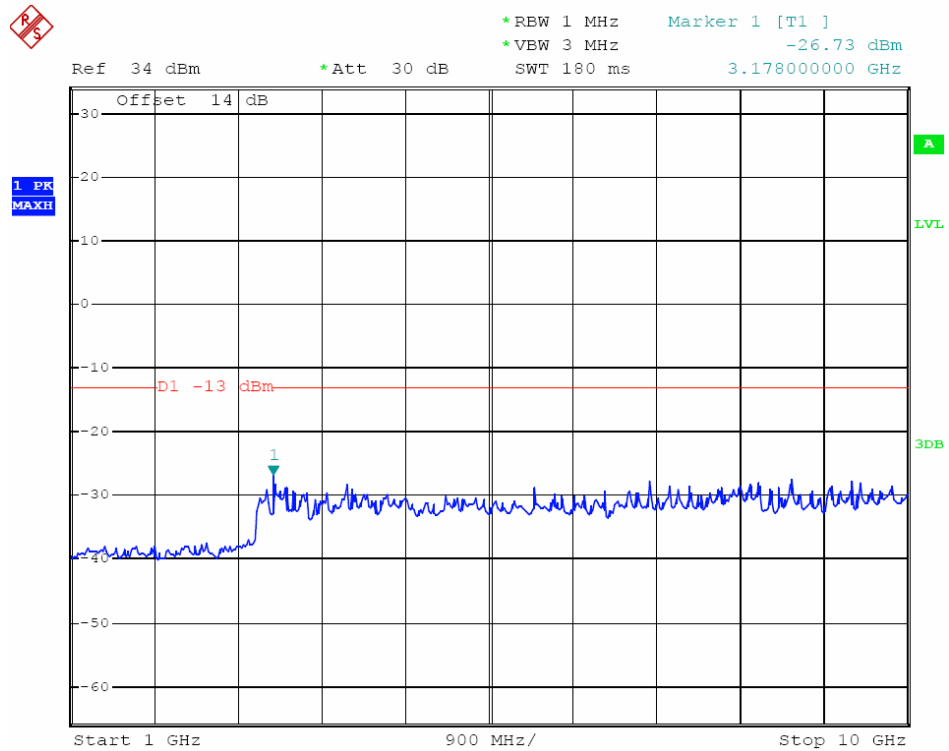
30MHz – 9GHz (Channel 4132)



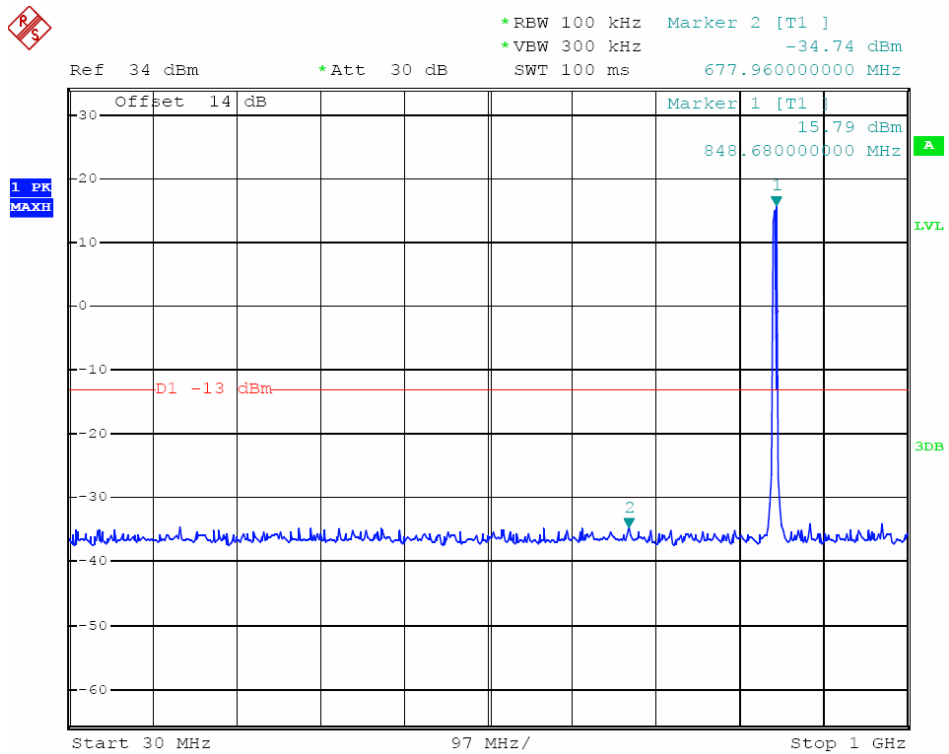


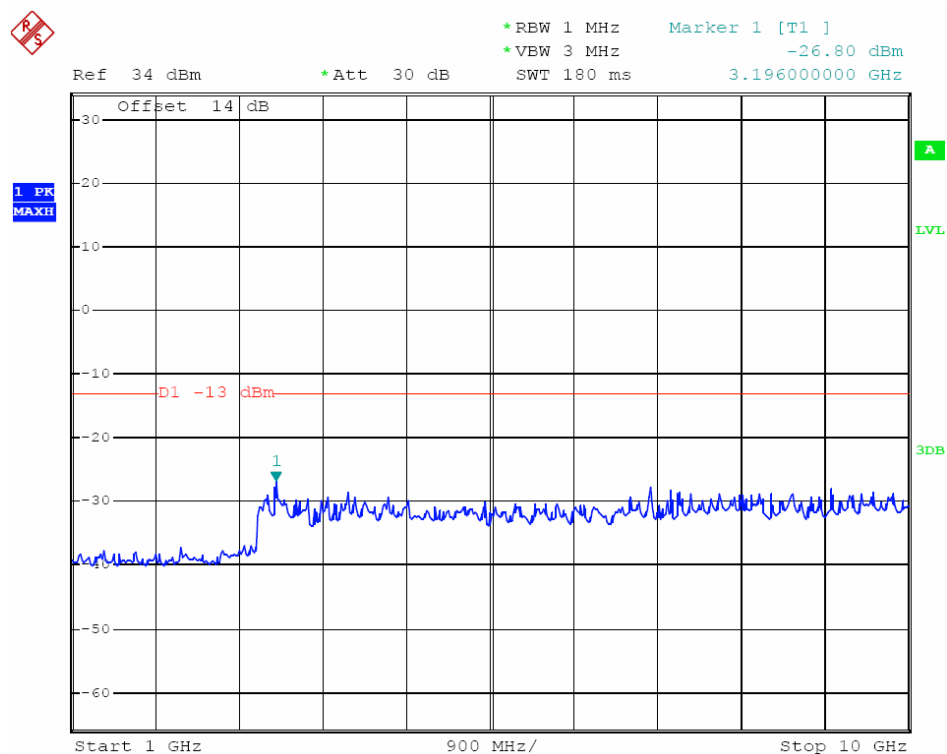
30MHz – 9GHz (Channel 4183)





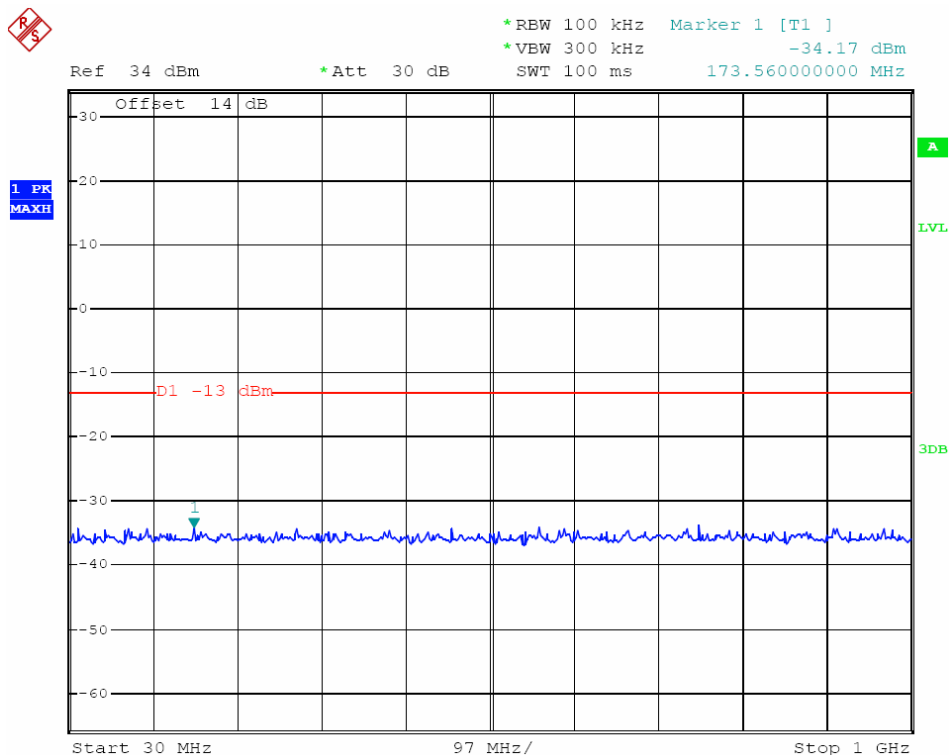
30MHz – 9GHz (Channel 4233)

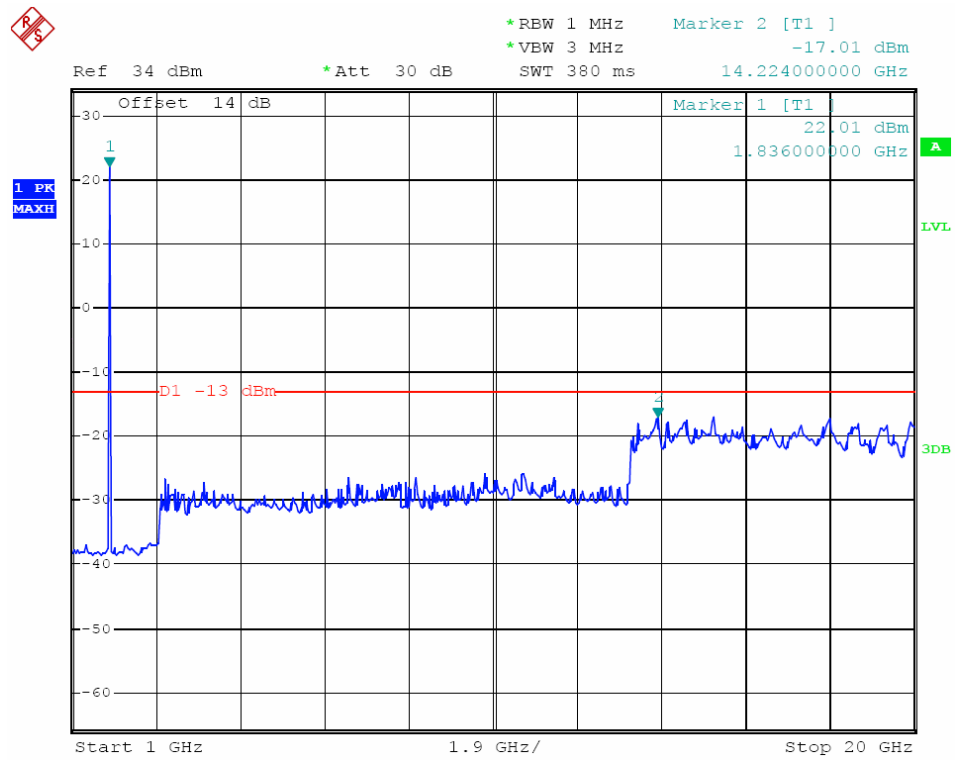




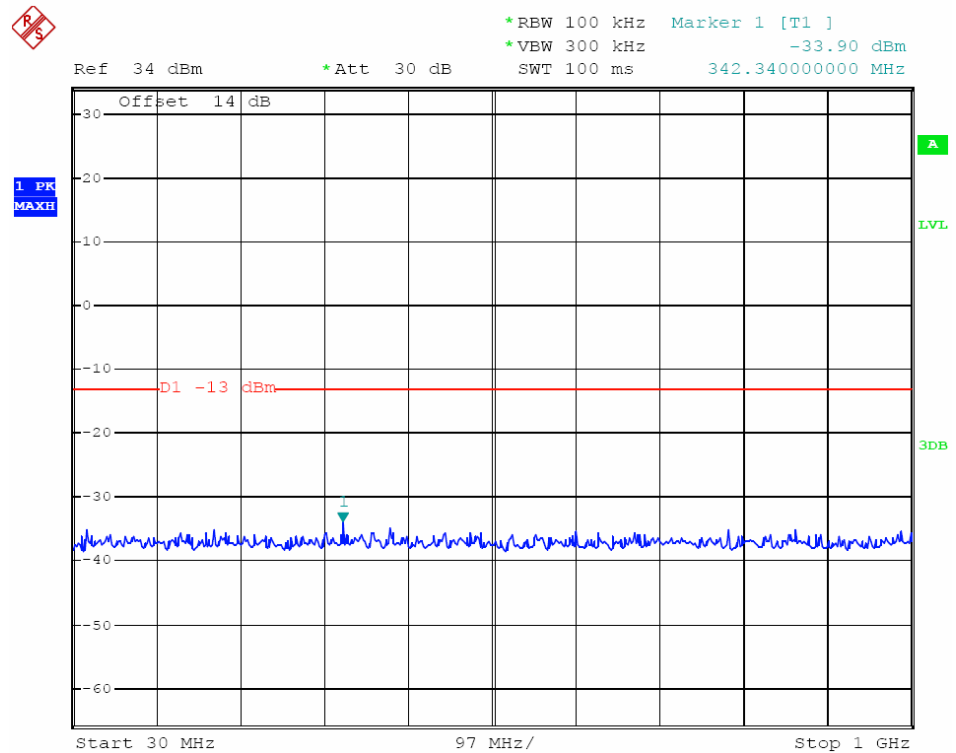
UMTS FDD II

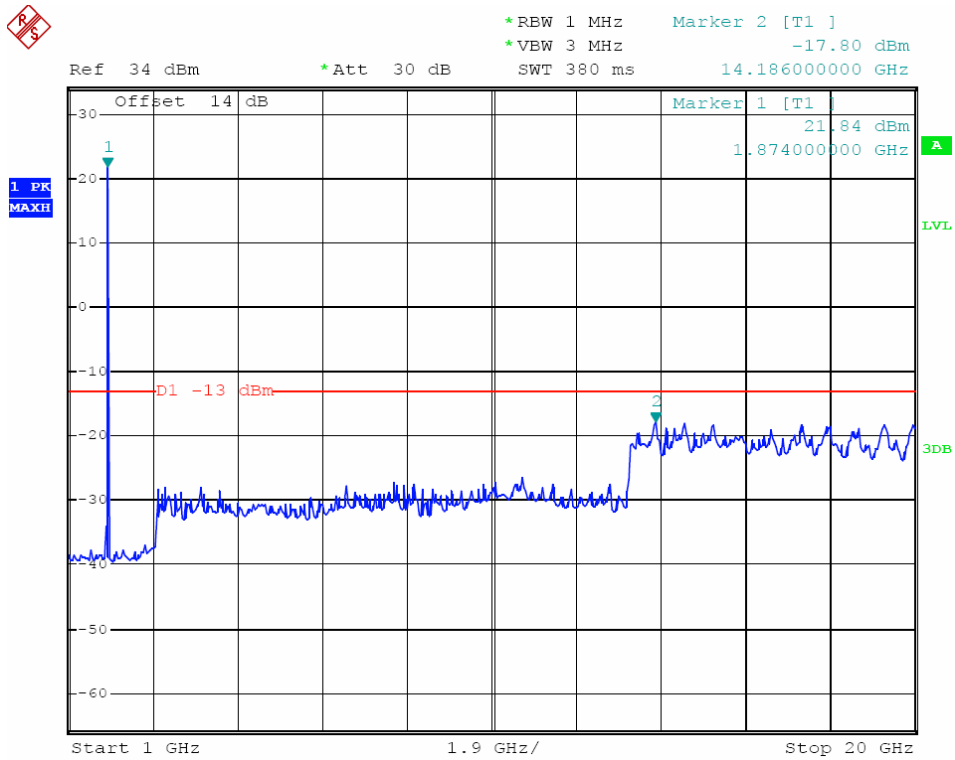
30MHz – 20GHz (Low Channel)



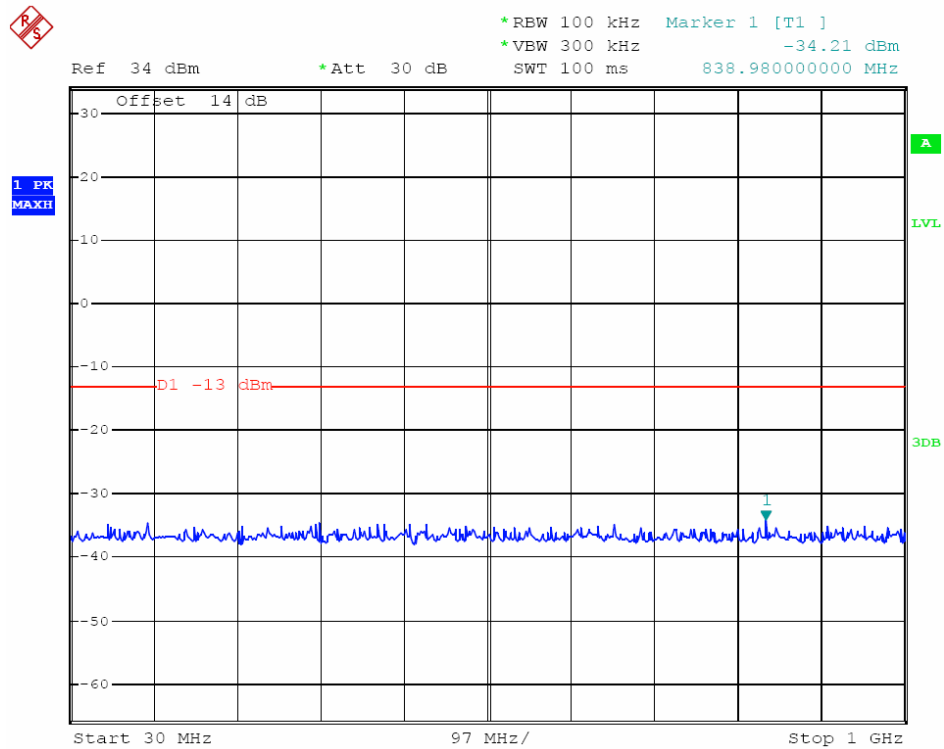


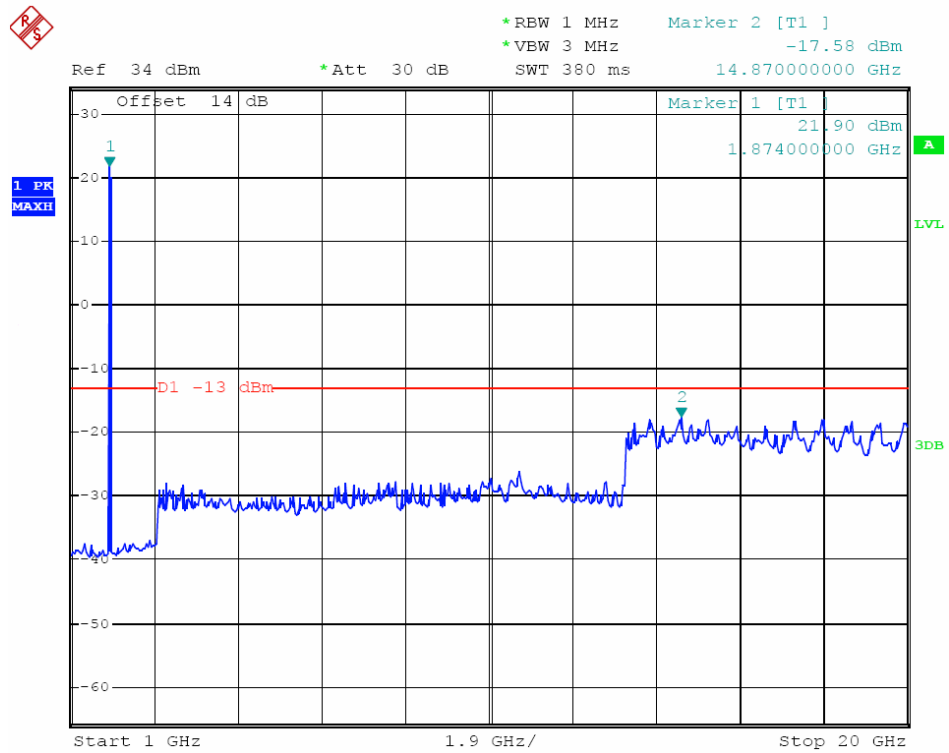
30MHz – 20GHz (Middle Channel)





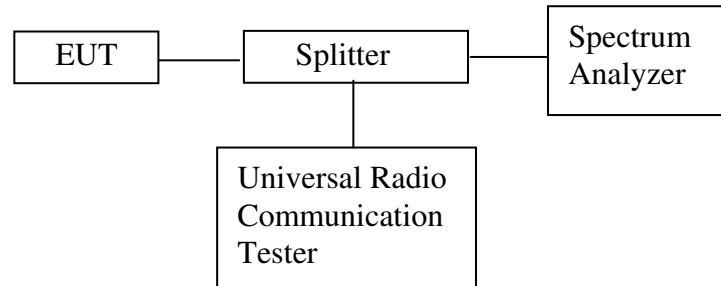
30MHz – 20GHz (High Channel)





8. BAND EDGE COMPLIANCE TEST

8.1. Block Diagram of Test Setup



8.2. The Requirement For Section § 22.917(a), §24.238(a)

According to § 22.917(a), the power of any emissions 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.

According to §24.238(a), the power of any emissions 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.

8.3. Operating Condition of EUT

8.3.1. Setup the EUT and simulator as shown as Section 8.1.

8.3.2. Turn on the power of all equipment.

8.3.3. Let the EUT work in TX modes measure it. The transmit frequency are 826.4-846.6MHz and 1852.4-1907.6MHz. We select 826.4MHz, 846.6MHz and 1852.4MHz, 1907.6MHz TX frequency to transmit.

8.4. Test Procedure

Conducted Band Edge:

The EUT was connected to Spectrum Analyzer and Base Station Simulator via power Splitter. The band edge of the lowest and highest channels were measured. RBW is set to 51kHz, VBW is set to 160kHz for WCDMA.

Spectrum analyzer plots are included on the following pages.

8.5. Test Result

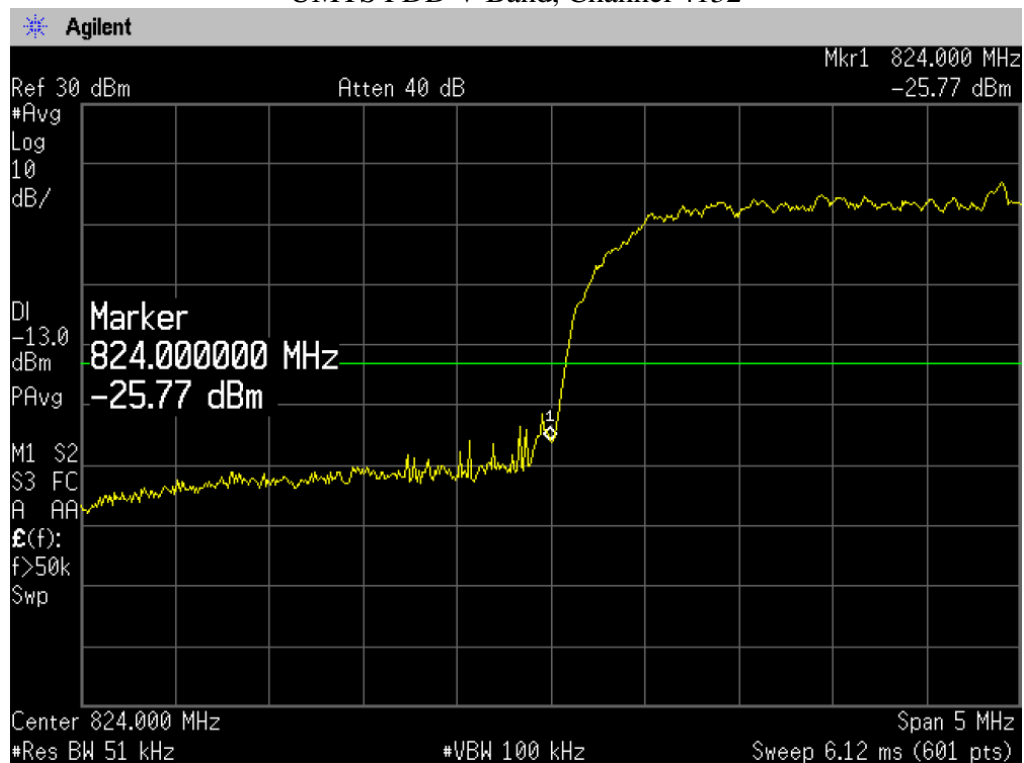
UMTS FDD V

Frequency (MHz)	Emission (dBm)	Limit (dBm)
824.00	-25.77	-13
849.00	-20.15	-13

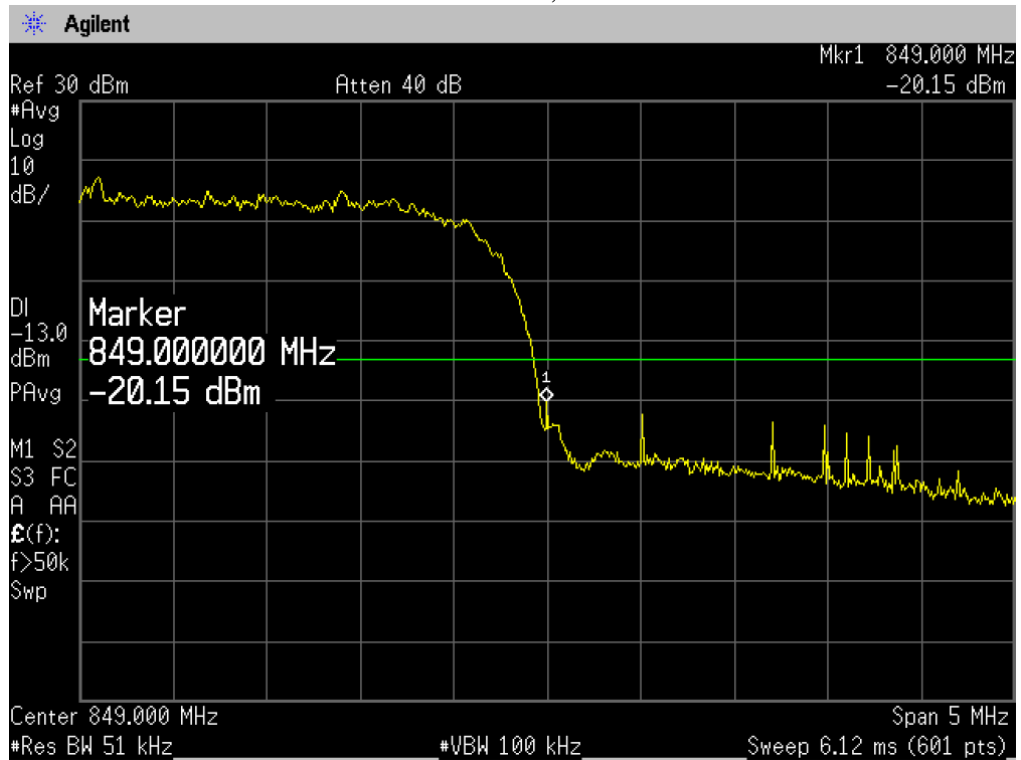
UMTS FDD II

Frequency (MHz)	Emission (dBm)	Limit (dBm)
1850.00	-25.36	-13
1910.00	-28.07	-13

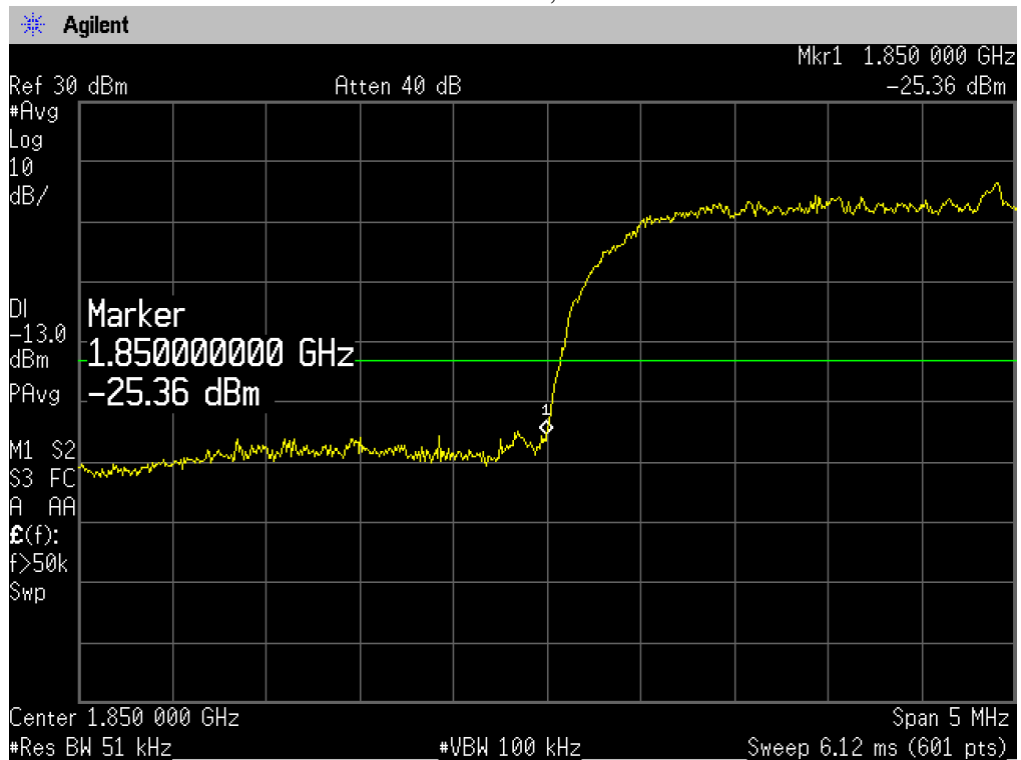
UMTS FDD V Band, Channel 4132



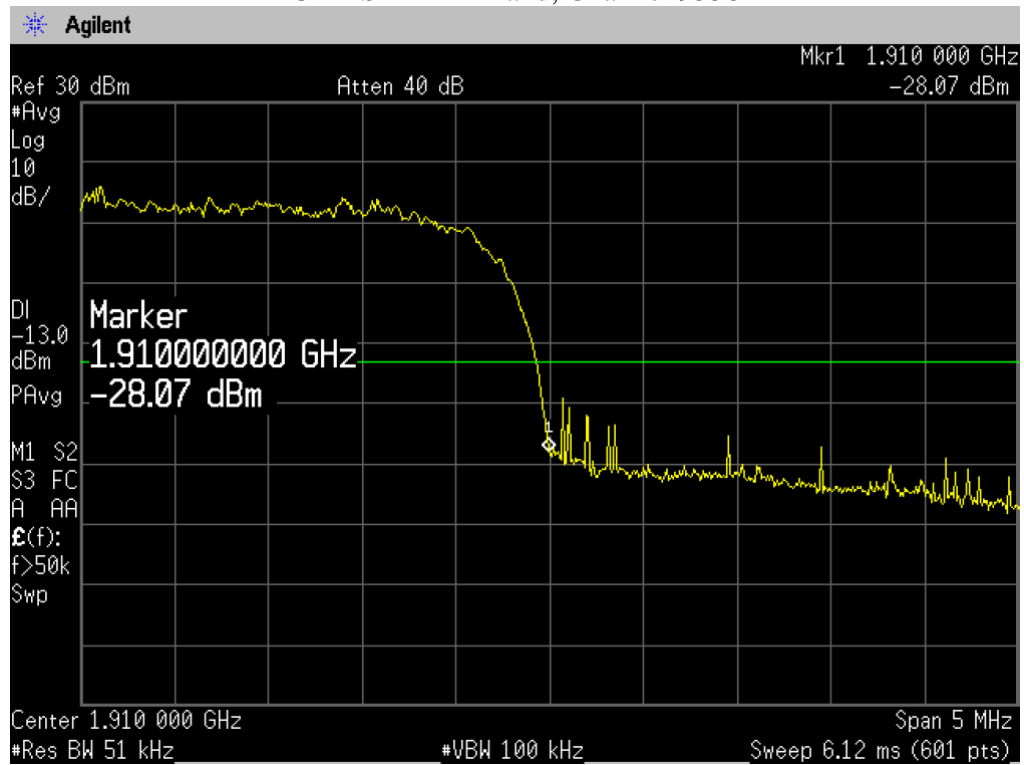
UMTS FDD V Band, Channel 4233



UMTS FDD II Band, Channel 9262

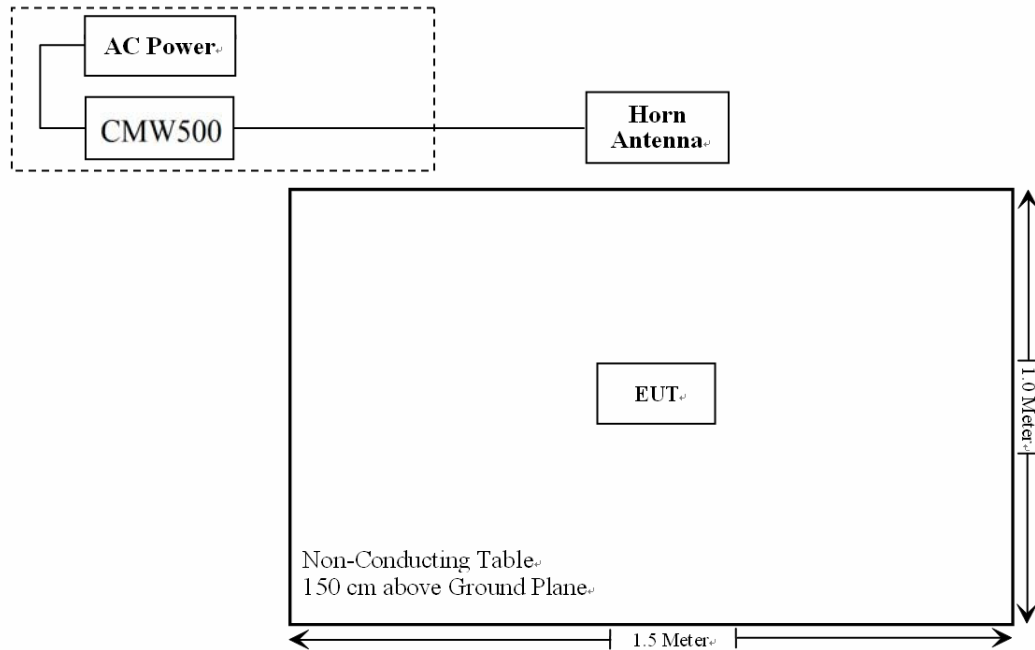


UMTS FDD II Band, Channel 9538



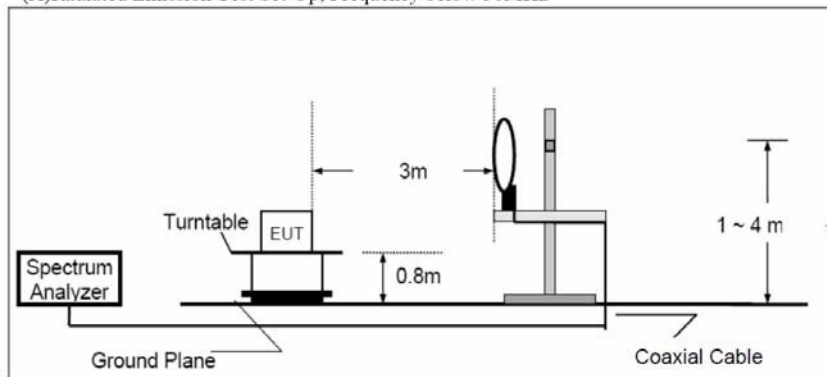
9. RADIATED SPURIOUS EMISSION TEST

9.1. Block Diagram of Test Setup

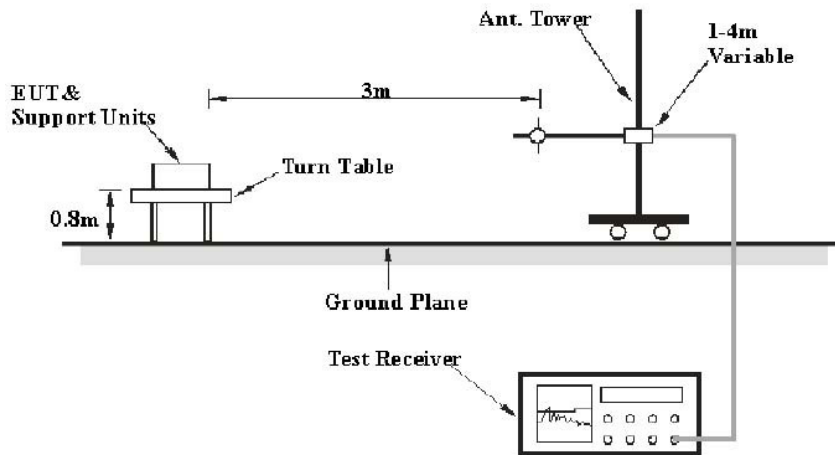


9.1.1. Semi-Anechoic Chamber Test Setup Diagram

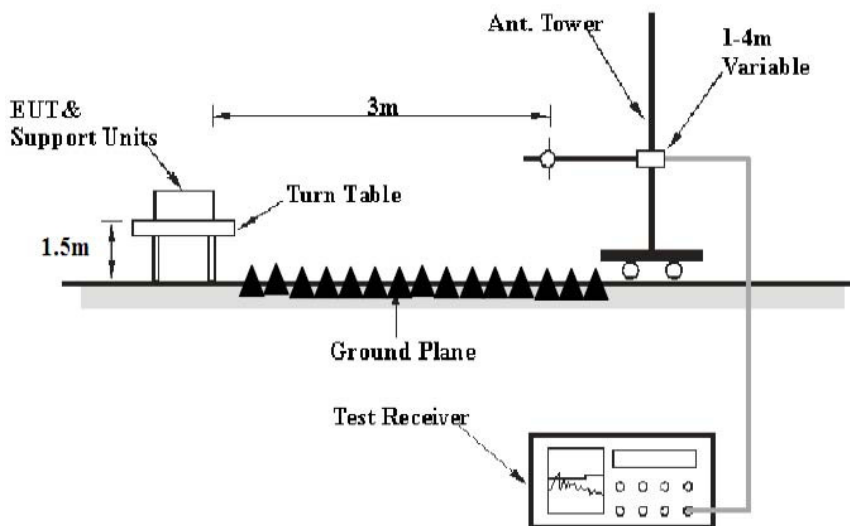
(A) Radiated Emission Test Set-Up, Frequency below 30MHz



(B) Radiated Emission Test Set-Up, Frequency 30MHz-1GHz



(C) Radiated Emission Test Set-Up, Frequency above 1GHz



9.2.Applicable Standard

FCC §2.1053, §22.917(a) , §24.238(a)

9.3.Restricted bands of operation

9.3.1.FCC Part 15.205 Restricted bands of operation

(a) Except as shown in paragraph (d) of this section, Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
¹ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(²)
13.36-13.41			

¹Until February 1, 1999, this restricted band shall be 0.490-0.510

²Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emission appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000MHz, Compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

9.4.Configuration of EUT on Measurement

The equipment are installed on Radiated Emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

9.5. Operating Condition of EUT

9.5.1. Setup the EUT and simulator as shown as Section 9.1.

9.5.2. Turn on the power of all equipment.

9.5.3. Let the EUT work in TX modes measure it. The transmit frequency are 826.4-846.6MHz and 1852.4-1907.6MHz. We select 826.4MHz, 836.6MHz, 846.6MHz and 1852.4MHz, 1880.0MHz, 1907.6MHz TX frequency to transmit.

9.6. Test Procedure

The EUT and its simulators are placed on a turntable, which is 0.8 meter high above ground (Below 1GHz). The EUT and its simulators are placed on a turntable, which is 1.5 meter high above ground (Above 1GHz). The EUT and its simulators are placed on a turntable, which is 1.5 meter high above ground (Above 1GHz). The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3.0 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated bilog antenna) is used as receiving antenna. Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission levels, all of the interface cables must be manipulated according to TIA 603-D on radiated emission measurement. This EUT was tested in 3 orthogonal positions and the worst case position data was reported.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

The bandwidth of test receiver is set at 9kHz in below 30MHz. and set at 120kHz in 30-1000MHz, and 1MHz in above 1000MHz.

The frequency range from 9kHz to 20GHz is checked.

The final measurement in band 9-90kHz, 110-490kHz and above 1000MHz is performed with Average detector. Except those frequency bands mention above, the final measurement for frequencies below 1000MHz is performed with Quasi Peak detector.

Spurious emissions in dB = $10 \log(\text{TXpwr in Watts}/0.001)$ – the absolute level
Spurious attenuation limit in dB = $43 + 10 \log_{10}(\text{power out in Watts})$

9.7.The Field Strength of Radiation Emission Measurement Results

PASS

- Note: 1. Emissions attenuated more than 20 dB below the permissible value are not reported.
2. The EUT is tested radiation emission at each test mode in three axes. The worst emissions are reported in all test mode and channels.
3. Absolute Level=SG Level- Cable loss + Antenna Gain
Margin=Limit- Absolute Level
2. The EUT is tested radiation emission at each test mode in three axes. The worst emissions are reported in all test mode and channels.

UMTS FDD V Band (WCDMA850)

Indicated		Table Angle Degree	Test Antenna		Substituted				Absolute Level (dBm)	Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Reading (dBμV/m)		Height (m)	Polar (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain (dBi)	Cable Loss (dB)			
Low Channel(826.4MHz)											
1652.2	52.06	109	1.4	V	1652.2	-46.0	9.4	0.95	-37.55	-13	24.55
1652.2	47.33	25	1.5	H	1652.2	-56.2	9.4	0.95	-47.75	-13	34.75
3305.8	44.91	123	1.6	V	3305.8	-48.6	10.1	2.08	-40.58	-13	27.58
3305.8	41.36	305	1.7	H	3305.8	-53.1	10.1	2.08	-45.08	-13	32.08
78.14	45.45	108	1.0	V	78.14	-50.1	0	0.32	-50.42	-13	37.42
170.19	48.06	102	1.0	H	170.19	-46.9	0	0.53	-47.43	-13	34.43

UMTS FDD V Band (WCDMA850)

Indicated		Table Angle Degree	Test Antenna		Substituted				Absolute Level (dBm)	Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Reading (dBμV/m)		Height (m)	Polar (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain (dBi)	Cable Loss (dB)			
Middle Channel (836.6MHz)											
1673.2	52.63	18	1.5	V	1673.2	-49.4	9.4	0.98	-40.98	-13	27.98
1673.2	43.90	256	1.4	H	1673.2	-59.6	9.4	0.98	-51.18	-13	38.18
3346.8	45.48	203	1.7	V	3346.8	-48.0	10.2	2.10	-39.90	-13	26.90
3346.8	41.93	109	1.8	H	3346.8	-52.5	10.2	2.10	-44.40	-13	31.40
78.14	46.02	213	1.0	V	78.14	-49.5	0	0.32	-49.82	-13	36.82
170.19	48.63	307	1.0	H	170.19	-46.3	0	0.53	-46.83	-13	33.83

UMTS FDD V Band (WCDMA850)

Indicated		Table Angle Degree	Test Antenna		Substituted				Absolute Level (dBm)	Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Reading (dBμV/m)		Height (m)	Polar (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain (dBi)	Cable Loss (dB)			
High Channel(846.6MHz)											
1693.2	54.79	10	1.3	V	1693.2	-47.3	9.4	1.00	-38.90	-13	25.90
1693.2	46.06	226	1.4	H	1693.2	-57.5	9.4	1.00	-49.10	-13	36.10
3386.4	43.64	329	1.5	V	3386.4	-49.9	10.2	2.10	-41.80	-13	28.80
3386.4	40.09	155	1.6	H	3386.4	-54.4	10.2	2.10	-46.30	-13	33.30
78.14	44.18	237	1.0	V	78.14	-51.4	0	0.32	-51.72	-13	38.72
170.19	46.79	289	1.0	H	170.19	-48.2	0	0.53	-48.73	-13	35.73

UMTS FDD II Band (WCDMA1900)

Indicated		Table Angle Degree	Test Antenna		Substituted				Absolute Level (dBm)	Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Reading (dBμV/m)		Height (m)	Polar (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain (dBi)	Cable Loss (dB)			
Low Channel(1852.4MHz)											
3704.8	51.55	167	1.9	V	3704.8	-44.96	10.3	2.58	-37.24	-13	24.24
3704.8	46.69	201	1.4	H	3704.8	-50.56	10.3	2.58	-42.84	-13	29.84
5557.2	39.02	65	1.5	V	5557.2	-52.16	11.6	3.93	-44.49	-13	31.49
5557.2	39.34	73	1.6	H	5557.2	-53.06	11.6	3.93	-45.39	-13	32.39
78.14	44.96	286	1.0	V	78.14	-50.56	0	0.32	-50.88	-13	37.88
170.19	47.05	102	1.0	H	170.19	-48.36	0	0.53	-48.89	-13	35.89

UMTS FDD II Band (WCDMA1900)

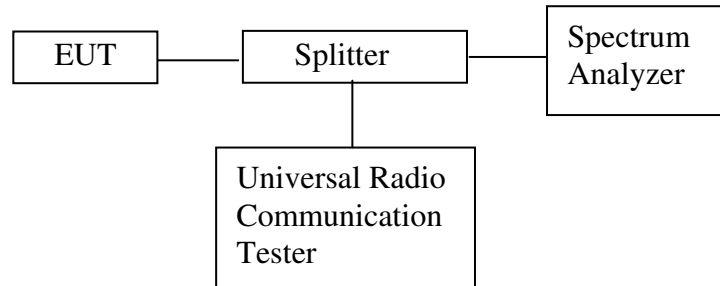
Indicated		Table Angle Degree	Test Antenna		Substituted				Absolute Level (dBm)	Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Reading (dBμV/m)		Height (m)	Polar (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain (dBi)	Cable Loss (dB)			
Middle Channel(1880.0MHz)											
3760	50.98	64	1.9	V	3760	-45.53	10.3	2.59	-37.72	-13	24.72
3760	46.12	258	1.8	H	3760	-51.13	10.3	2.59	-43.32	-13	30.32
5640	38.45	169	1.3	V	5640	-52.73	11.7	3.94	-44.97	-13	31.97
5640	38.77	275	1.6	H	5640	-53.63	11.7	3.94	-45.87	-13	32.87
78.14	44.39	86	1.0	V	78.14	-51.13	0	0.32	-50.81	-13	37.81
170.19	46.48	303	1.0	H	170.19	-48.93	0	0.53	-49.46	-13	36.46

UMTS FDD II Band (WCDMA1900)

Indicated		Table Angle Degree	Test Antenna		Substituted				Absolute Level (dBm)	Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Reading (dBμV/m)		Height (m)	Polar (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain (dBi)	Cable Loss (dB)			
High Channel(1907.6MHz)											
3815.2	49.71	267	2.0	V	3815.2	-46.80	10.4	2.60	-39.00	-13	26.00
3815.2	44.85	101	1.6	H	3815.2	-52.40	10.4	2.60	-44.60	-13	31.6
5722.8	37.18	305	1.3	V	5722.8	-54.00	11.8	3.95	-46.15	-13	33.15
5722.8	37.50	173	1.8	H	5722.8	-54.90	11.8	3.95	-47.05	-13	34.05
78.14	43.12	189	1.0	V	78.14	-52.40	0	0.32	-52.72	-13	39.72
170.19	45.21	202	1.0	H	170.19	-50.20	0	0.53	-50.73	-13	37.73

10. PEAK-TO-AVERAGE RATIO (PAR)

10.1. Block Diagram of Test Setup



10.2. The Requirement For Section FCC §22.913(d) and §24.232(d)

Limits:

According to the Sec. 22.913(d), The peak-to-average ratio (PAR) of the transmission must not exceed 13 dB.

In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB in 24.232(d).

10.3. EUT Configuration on Measurement

The equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

10.4. Operating Condition of EUT

10.4.1. Setup the EUT and simulator as shown as Section 10.1.

10.4.2. Turn on the power of all equipment.

10.4.3. Let the EUT work in TX modes measure it. The transmit frequency are 826.4-846.6MHz and 1852.4-1907.6MHz. We select 826.4MHz, 836.6MHz, 846.6MHz and 1852.4MHz, 1880.0MHz, 1907.6MHz TX frequency to transmit.

10.5. Test Procedure

Measure the total peak power and record as P_{Pk} . And measure the total average power and record as P_{Avg} . Both the peak and average power levels must be expressed in the same logarithmic units (e.g., dBm). Determine the PAR from:

$$PAR (dB) = P_{Pk} (dBm) - P_{Avg} (dBm).$$

10.6.Test Result

PASS.

WCDMA Band V:

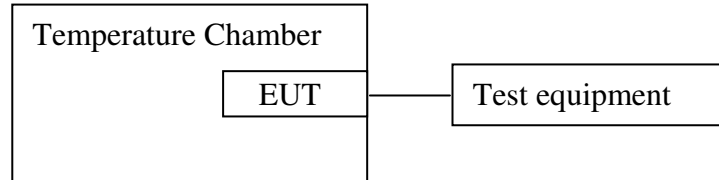
Mode	Frequency (MHz)	Peak Power (dBm)	AVG Power (dBm)	PAR (dB)	Limit (dBm)
WCDMA 850 RMC	826.4	24.32	22.15	2.17	≤13
	836.6	24.62	22.56	2.06	≤13
	846.6	24.03	22.13	1.90	≤13
HSDPA	826.4	24.82	22.51	2.31	≤13
	836.6	24.59	22.31	2.28	≤13
	846.6	24.36	22.45	1.91	≤13
HSUPA	826.4	24.39	22.17	2.22	≤13
	836.6	24.65	22.48	2.17	≤13
	846.6	24.32	22.32	2.00	≤13

WCDMA Band II:

Mode	Frequency (MHz)	Peak Power (dBm)	AVG Power (dBm)	PAR (dB)	Limit (dBm)
WCDMA 1900 RMC	1852.4	24.15	22.13	2.02	≤13
	1880.0	24.39	22.12	2.27	≤13
	1907.6	24.59	22.38	2.21	≤13
HSDPA	1852.4	24.57	22.31	2.26	≤13
	1880.0	24.52	22.56	1.96	≤13
	1907.6	24.25	22.87	1.38	≤13
HSUPA	1852.4	24.69	22.45	2.24	≤13
	1880.0	24.56	22.05	2.51	≤13
	1907.6	24.32	22.07	2.25	≤13

11.FREQUENCY STABILITY

11.1.Block Diagram of Test Setup



11.2.The Requirement For Section CFR47 § 2.1055 (a), § 2.1055 (d), §22.355,

§24.235

According to §22.355, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table below:

Frequency Tolerance for Transmitters in the Public Mobile Services

Frequency Range (MHz)	Base, fixed (ppm)	Mobile ≤ 3 watts (ppm)	Mobile ≤ 3 watts (ppm)
25 to 50	20.0	20.0	50.0
50 to 450	5.0	5.0	50.0
450 to 512	2.5	5.0	5.0
821 to 896	1.5	2.5	2.5
928 to 929.	5.0	N/A	N/A
929 to 960.	1.5	N/A	N/A
2110 to 2220	10.0	N/A	N/A

According to §24.235, the frequency stability shall be sufficient to ensure that the fundamental emissions stays within the authorized frequency block.

11.3.Operating Condition of EUT

11.3.1.Setup the EUT and simulator as shown as Section 11.1.

11.3.2.Turn on the power of all equipment.

11.3.3.Let the EUT work in Test modes measure it. The test frequency are 836.6MHz and 1880MHz.

11.4. Test Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to communication test set via feed-through attenuators. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the communication test set.

Frequency Stability vs. Voltage: Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment. The output frequency was recorded for each voltage

11.5. Test Result

Pass.

Note: Under normal conditions, we tested the data of two voltages(7V and 36V DC) and recorded the worst mode values.

UMTS FDD V Band Middle Channel, $f_0 = 836.6$ MHz

Temperature (OC)	Power Supplied (VDC)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-30	36	5	0.005	2.5
-20		-7	0.008	2.5
-10		-8	0.009	2.5
0		-6	0.007	2.5
10		-1	0.002	2.5
20		-7	0.009	2.5
30		14	0.017	2.5
40		-5	0.006	2.5
50		-7	0.009	2.5
25	5.95	-6	0.007	2.5
	41.4	3	0.003	2.5

UMTS FDD II Band Middle Channel, $f_0 = 1880$ MHz

Temperature (OC)	Power Supplied (VDC)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-30	36	-2	-0.001	2.5
-20		-1	-0.001	2.5
-10		3	0.002	2.5
0		0	0.000	2.5
10		2	0.001	2.5
20		0	0.000	2.5
30		1	0.001	2.5
40		1	0.001	2.5
50		3	0.002	2.5
25	5.95	-1	-0.001	2.5
	41.4	2	0.001	2.5

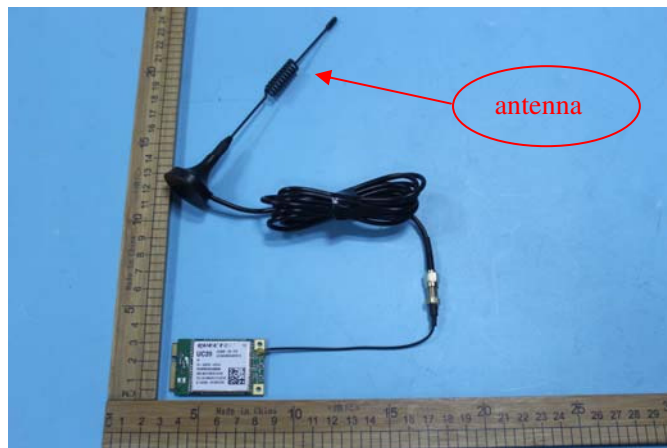
12.ANTENNA REQUIREMENT

12.1.The Requirement

According to Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the Device.

12.2.Antenna Construction

The antenna use a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. The antenna jack of EUT correspond to the standard. The Antenna gain of EUT is 3dBi. Therefore, the equipment complies with the antenna requirement of Section 15.203.



----- THE END OF TEST REPORT -----