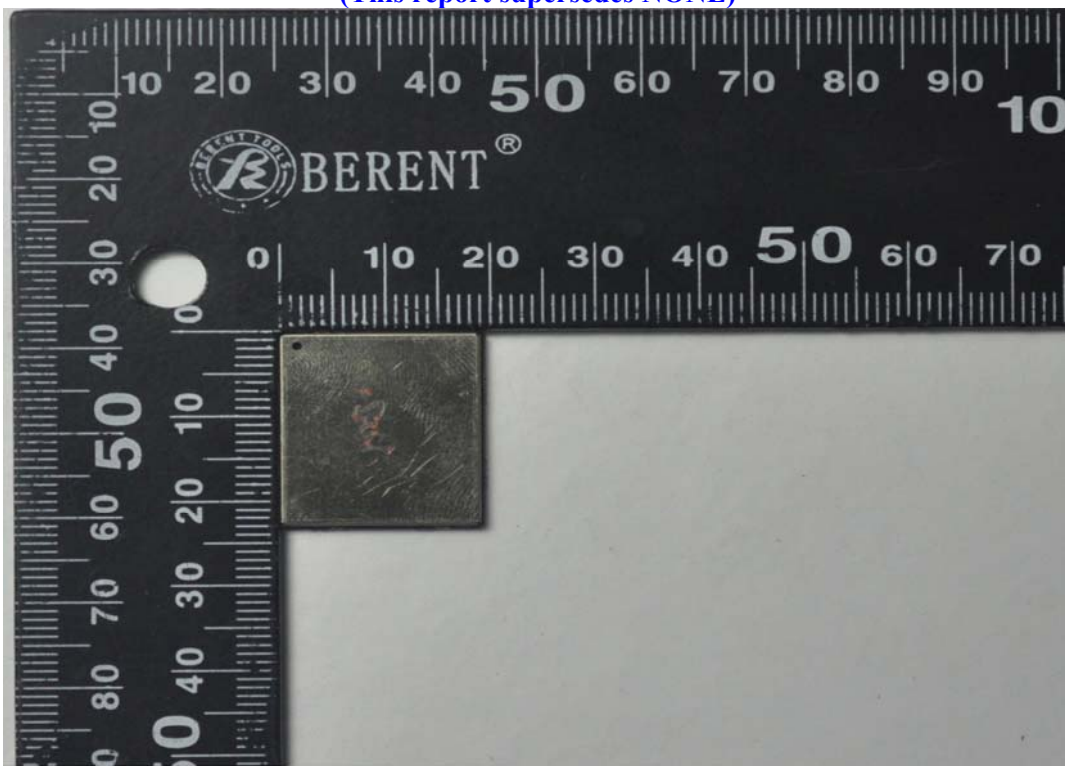
Quectel Wireless Solutions Co., Ltd.

UMTS/HSPA Module

Main Model:UG95
Serial Model: N/A

September 16, 2014

Report No.: 14050052-FCC-R1
(This report supersedes NONE)



Modifications made to the product : None

This Test Report is Issued Under the Authority of:		
Herith shi	Alex Liu	
Herith Shi **Compliance Engineer**	**Alex Liu** **Technical Manager**	

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Test result presented in this test report is applicable to the representative sample only.

RF Test Report

To: FCC Part 22(H) & FCC Part 24(E): 2013

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Laboratory Introduction

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Country/Region	Scope
USA	EMC , RF/Wireless , Telecom
Canada	EMC, RF/Wireless , Telecom
Taiwan	EMC, RF, Telecom , Safety
Hong Kong	RF/Wireless ,Telecom
Australia	EMC, RF, Telecom , Safety
Korea	EMI, EMS, RF , Telecom, Safety
Japan	EMI, RF/Wireless, Telecom
Singapore	EMC , RF , Telecom
Europe	EMC, RF, Telecom , Safety

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1. EXECUTIVE SUMMARY & EUT INFORMATION

The purpose of this test programmed was to demonstrate compliance of the Quectel Wireless Solutions Co., Ltd., UMTS/HSPA Module and model: UG95 against the current Stipulated Standards. The UMTS/HSPA Module has demonstrated compliance with the FCC Part 22(H) & FCC Part 24(E): 2013.

EUT Information		
EUT Description	:	**UMTS/HSPA Module**
Main Model	:	**UG95**
Serial Model		**N/A**
Antenna Gain	:	**UMTS-FDD Band V:1dBi** **UMTS-FDD Band II:1dBi**
Input Power	:	**UMTS/HSPA Module:** **Model: UG95** **Input: DC 3.8V; 550mA**
Maximum Conducted AV Power to Antenna	:	**UMTS-FDD Band Ⅴ: 21.84 dBm** **UMTS-FDD Band Ⅱ: 21.92 dBm**
Maximum Radiated ERP/EIRP	:	**UMTS-FDD Band Ⅴ: 21.22 dBm / ERP** **UMTS-FDD Band Ⅱ: 20.89 dBm / EIRP**
Classification Per Stipulated Test Standard	:	**FCC Part 22(H) & FCC Part 24(E): 2013**

2. TECHNICAL DETAILS

Purpose	**Compliance testing of UMTS/HSPA Module with stipulated standard**
Applicant / Client	**Quectel Wireless Solutions Co., Ltd. Room 501, Building 13, No. 99 TianZhouRoud, Xuhui District, Shanghai**
Manufacturer	**Quectel Wireless Solutions Co., Ltd. Room 501, Building 13, No. 99 TianZhou Roud, Xuhui District, Shanghai**
Laboratory performing the tests	**SIEMIC (Shenzhen - China) Laboratories Zone A, Floor 1, Building 2, Wan Ye Long Technology Park, South Side of Zhoushi Road, Bao'an District, Shenzhen, Guangdong, China Tel: +86-0755-2601 4629 / 2601 4953 Fax: +86-0755-2601 4953-810 Email: China@siemic.com.cn**
Test report reference number	**14050052-FCC-R1**
Date EUT received	**August 22, 2014**
Standard applied	**FCC Part 22(H) & FCC Part 24(E): 2013**
Dates of test	**August 25 to September 16, 2014**
No of Units	**#1**
Equipment Category	**PCB**
Trade Name	**Quectel**
RF Operating Frequency (ies)	**UMTS-FDD Band Ⅴ TX : 826.4 ~ 846.6 MHz; RX : 871.4 ~ 891.6 MHz UMTS-FDD Band Ⅱ TX :1852.4 ~ 1907.6 MHz; RX : 1932.4 ~ 1987.6 MHz**
Number of Channels	**UMTS-FDD Band Ⅴ: 102CH UMTS-FDD Band Ⅱ: 277CH**
Modulation	**UMTS-FDD: QPSK**
GPRS Multi-slot class	**N/A**
FCC ID	**XMR201408UG95**

3 MODIFICATION

NONE

3. TEST SUMMARY

The product was tested in accordance with the following specifications.
All testing has been performed according to below product classification:

PCE

Test Results Summary

Test Standard	Description	Product Class	Pass / Fail
§2.1046; § 22.913 (a); § 24.232 (c)	RF Output Power	See Above	Pass
§ 2.1047	Modulation Characteristics	See Above	N/A
§ 2.1049; § 22.905 § 22.917; § 24.238	99% & -26 dB Occupied Bandwidth	See Above	Pass
§ 2.1051, § 22.917 (a); § 24.238 (a)	Spurious Emissions at Antenna Terminal	See Above	Pass
§ 2.1053 § 22.917 (a); § 24.238 (a)	Field Strength of Spurious Radiation	See Above	Pass
§ 22.917 (a); § 24.238 (a)	Out of band emission, Band Edge	See Above	Pass
§ 2.1055 § 22.355; § 24.235	Frequency stability vs. temperature Frequency stability vs. voltage	See Above	Pass

Note: Testing was performed by configuring EUT to maximum output power status, the declared output power class for different.

4. MEASUREMENTS, EXAMINATION AND DERIVED RESULTS

5.1 §2.1046; §22.913 (a); §24.232 (c) - RF Output Power

1. Conducted Measurement
   EUT was set for low, mid, high channel with modulated mode and highest RF output power.
   The spectrum analyzer was connected to the antenna terminal.
2. Conducted Emissions Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is ±1.5dB.
3. Environmental Conditions

Temperature	23°C
Relative Humidity	56%
Atmospheric Pressure	1006mbar

4. Test date : August 25, 2014
   Tested By : Herith Shi

Procedures: (According with KDB 971168)

For Conducted Power:

1. The transmitter output port was connected to base station.
2. Set EUT at maximum power through base station.
3. Select lowest, middle, and highest channels for each band and different test mode.
4. The EUT is considered to transmit continuously if it can be configured to transmit at a burst duty cycle of greater than or equal to 98% throughout the duration of the measurement. If this condition can be achieved, then the following procedure can be used to measure the average output power of the EUT.
   a) Set span to at least 1.5 times the OBW.
   b) Set RBW = 1-5% of the OBW, not to exceed 1 MHz.
   c) Set VBW ⩾ 3 x RBW.
   d) Set number of points in sweep ⩾ 2 × span / RBW.
   e) Sweep time = auto-couple.
   f) Detector = RMS (power averaging).
   g) If the EUT can be configured to transmit continuously (i.e., burst duty cycle ⩾ 98%), then set the trigger to free run.
   h) If the EUT cannot be configured to transmit continuously (i.e., burst duty cycle < 98 %), then use a sweep trigger with the level set to enable triggering only on full power bursts and configure the EUT to transmit at full power for the entire duration of each sweep. Ensure that the sweep time is less than or equal to the transmission burst duration.
   i) Trace average at least 100 traces in power averaging (i.e., RMS) mode.
   j) Compute the power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function, with the band limits set equal to the OBW band edges. If the instrument does not have a band power function, then sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.

For ERP/EIRP: (According with TIA 603D)

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. 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.

Sample Calculation:

EUT Field Strength (dBm) = Reading (Signal generator) + Antenna Gain (substitution antenna) - Cable loss (From Signal Generator to substitution antenna)

Test Result: Pass

Remark: Conducted Burst Average power for reporting purposes only

Conducted Power

UMTS Mode:

UMTS-FDD Band V

Band/ Time Slot configuration	Channel	Frequency	Average power (dBm)
RMC 12.2kbps	4132	826.4	21.79
	4175	835.0	**21.84**
	4233	846.6	21.58
HSDPA Subtest1	4132	826.4	21.15
	4175	835.0	21.19
	4233	846.6	21.08
HSDPA Subtest2	4132	826.4	20.35
	4175	835.0	20.62
	4233	846.6	20.29
HSDPA Subtest3	4132	826.4	21.48
	4175	835.0	21.66
	4233	846.6	21.31
HSDPA Subtest4	4132	826.4	21.25
	4175	835.0	21.39
	4233	846.6	21.16
HSUPA Subtest1	4132	826.4	21.08
	4175	835.0	21.11
	4233	846.6	21.01
HSUPA Subtest2	4132	826.4	20.62
	4175	835.0	20.88
	4233	846.6	20.52
HSUPA Subtest3	4132	826.4	20.46
	4175	835.0	20.59
	4233	846.6	20.32
HSUPA Subtest4	4132	826.4	20.08
	4175	835.0	20.12
	4233	846.6	20.01
HSUPA Subtest5	4132	826.4	21.52
	4175	835.0	21.70
	4233	846.6	21.47

UMTS-FDD Band Ⅱ

Band/ Time Slot configuration	Channel	Frequency	Average power (dBm)
RMC 12.2kbps	9262	1852.4	21.55
	9400	1880.0	21.51
	9538	1907.6	**21.92**
HSDPA Subtest1	9262	1852.4	21.12
	9400	1880.0	21.13
	9538	1907.6	21.29
HSDPA Subtest2	9262	1852.4	21.25
	9400	1880.0	21.21
	9538	1907.6	21.34
HSDPA Subtest3	9262	1852.4	21.12
	9400	1880.0	21.05
	9538	1907.6	21.19
HSDPA Subtest4	9262	1852.4	20.29
	9400	1880.0	20.35
	9538	1907.6	20.40
HSUPA Subtest1	9262	1852.4	20.74
	9400	1880.0	20.70
	9538	1907.6	20.87
HSUPA Subtest2	9262	1852.4	21.18
	9400	1880.0	21.21
	9538	1907.6	21.32
HSUPA Subtest3	9262	1852.4	21.30
	9400	1880.0	21.26
	9538	1907.6	21.40
HSUPA Subtest4	9262	1852.4	21.05
	9400	1880.0	21.02
	9538	1907.6	21.10
HSUPA Subtest5	9262	1852.4	21.31
	9400	1880.0	21.30
	9538	1907.6	21.37

ERP for UMTS-FDD Band Ⅴ (Part 22H)

Frequency (MHz)	Substituted level (dBm)	Antenna Polarization	Antenna Gain correction (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)
826.4	14.95	V	6.8	0.53	**21.22**	38.45
826.4	14.06	H	6.8	0.53	20.33	38.45
835	14.77	V	6.8	0.53	21.04	38.45
835	14.01	H	6.8	0.53	20.28	38.45
846.6	14.83	V	6.9	0.53	21.20	38.45
846.6	13.86	H	6.9	0.53	20.23	38.45

EIRP for UMTS-FDD Band Ⅱ (Part 24E)

Frequency (MHz)	Substituted level (dBm)	Antenna Polarization	Antenna Gain correction (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)
1852.4	13.86	V	7.88	0.85	**20.89**	33
1852.4	13.23	H	7.88	0.85	20.26	33
1880	13.79	V	7.88	0.85	20.82	33
1880	12.95	H	7.88	0.85	19.98	33
1907.6	13.82	V	7.86	0.85	20.83	33
1907.6	13.06	H	7.86	0.85	20.07	33

5.2 § 24. 232(d)- Peak-Average Ratio

1. Conducted Measurement
   EUT was set for low, mid, high channel with modulated mode and highest RF output power.
   The spectrum analyzer was connected to the antenna terminal.
2. Conducted Emissions Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is ±1.5dB.
3. Environmental Conditions

Temperature	21°C
Relative Humidity	56%
Atmospheric Pressure	1017mbar

4. Test date : September 16, 2014
   Tested By : Herith Shi

Procedures: (According with KDB 971168)

1. The signal analyzer's CCDF measurement profile is enabled

2. Frequency = carrier center frequency

3. Measurement BW > Emission bandwidth of signal

4. The signal analyzer was set to collect one million samples to generate the CCDF curve

5. The measurement interval was set depending on the type of signal analyzed. For continuous signals (>98% duty cycle), the measurement interval was set to 1ms. For burst transmissions, the spectrum analyzer is set to use an internal "RF Burst" trigger that is synced with an incoming pulse and the measurement interval is set to less than the duration of the "on time" of one burst to ensure that energy is only captured during a time in which the transmitter is operating at maximum power

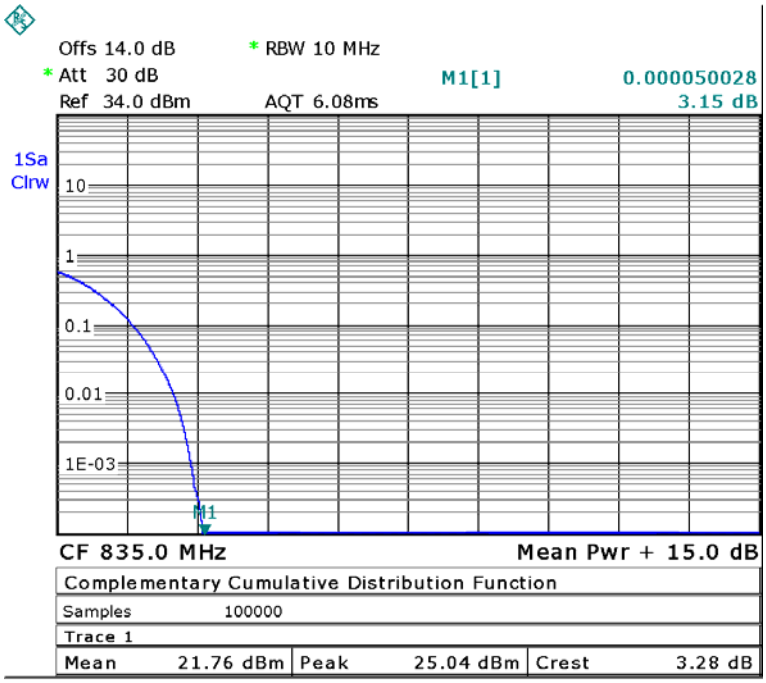
Test Result: Pass

WCDMA 850

Frequency (MHz)	Conducted power(dBm)		Peak-Average Ratio(PAR)
	Peak	Average	
826.4	25.41	21.64	3.77
835.0	25.04	21.76	3.28
846.6	24.85	21.45	3.4

WCDMA1900

Frequency (MHz)	Conducted power(dBm)		Peak-Average Ratio(PAR)
	Peak	Average	
1852.4	25.88	21.90	3.98
1880.0	25.52	21.62	3.90
1907.6	25.54	21.52	4.02



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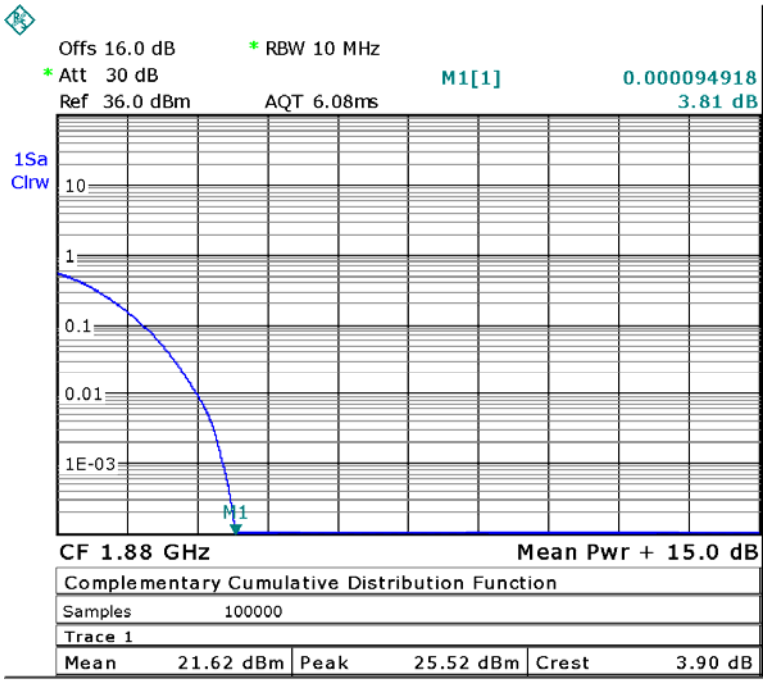
W850 835M M



Date: 16.SEP.2014 11:31:36

W1900 1880M M

5.3 §2.1047 - Modulation Characteristic

According to FCC § 2.1047(d), Part 22H & 24E there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

5.4 §2.1049, §22.917, §22.905 & §24.238 - Occupied Bandwidth

1. Conducted Measurement
   EUT was set for low, mid, high channel with modulated mode and highest RF output power.
   The spectrum analyser was connected to the antenna terminal.
2. Environmental Conditions

Temperature	24°C
Relative Humidity	57%
Atmospheric Pressure	1007mbar

3. Conducted Emissions Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is ±1.5dB.
4. Test date : August 26, 2014
   Tested By : Herith Shi

Procedures:

1. The EUT was connected to Spectrum Analyzer and Base Station via power divider.

2. The 99% and 26 dB occupied bandwidth (BW) of the middle channel for the highest RF powers.

3. Details according with KDB 971168 section 4.1 & 4.2.

Test Results: Pass

UMTS-FDD Band Ⅴ (Part 22H)

Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB Bandwidth (MHz)
4132	826.4	4.0630	4.633
4175	835.0	4.0822	4.707
4233	846.6	4.0728	4.664

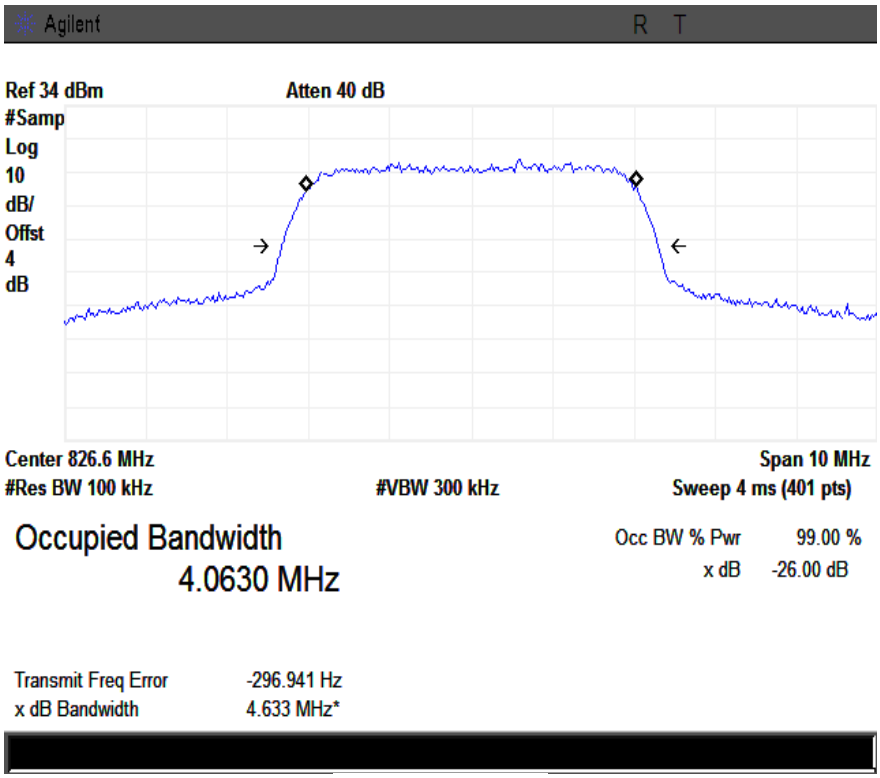
UMTS-FDD Band Ⅱ (Part 24E)

Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB Bandwidth (MHz)
9262	1852.4	4.0586	4.618
9400	1880.0	4.0593	4.613
9538	1907.6	4.0557	4.662

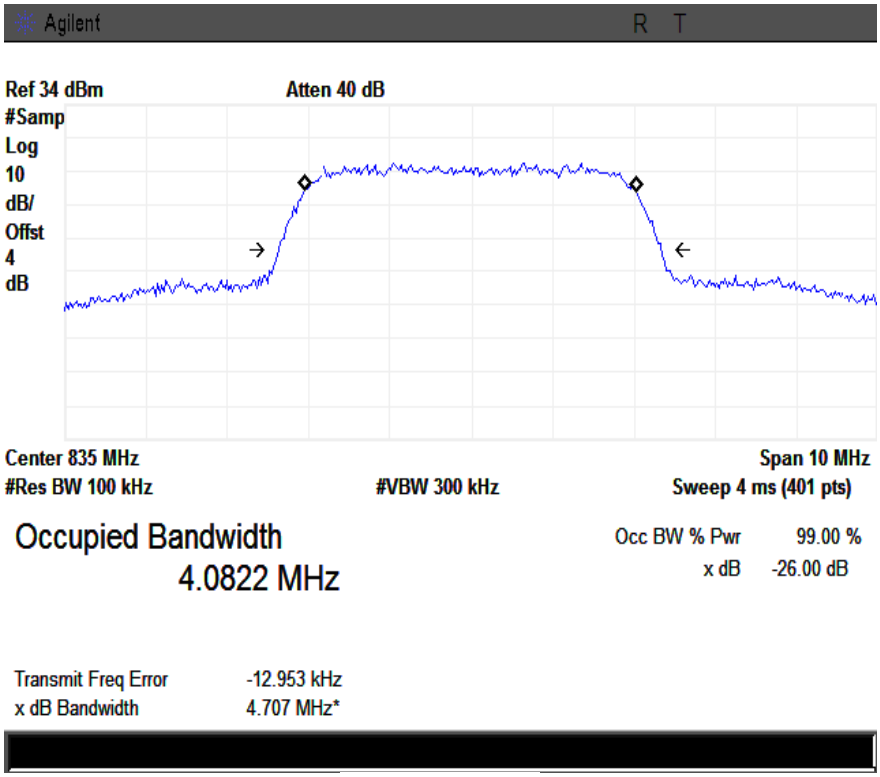
Please refer to the following plots.

Note:
W850: UMTS-FDD Band Ⅴ
W1900: UMTS-FDD Band Ⅱ

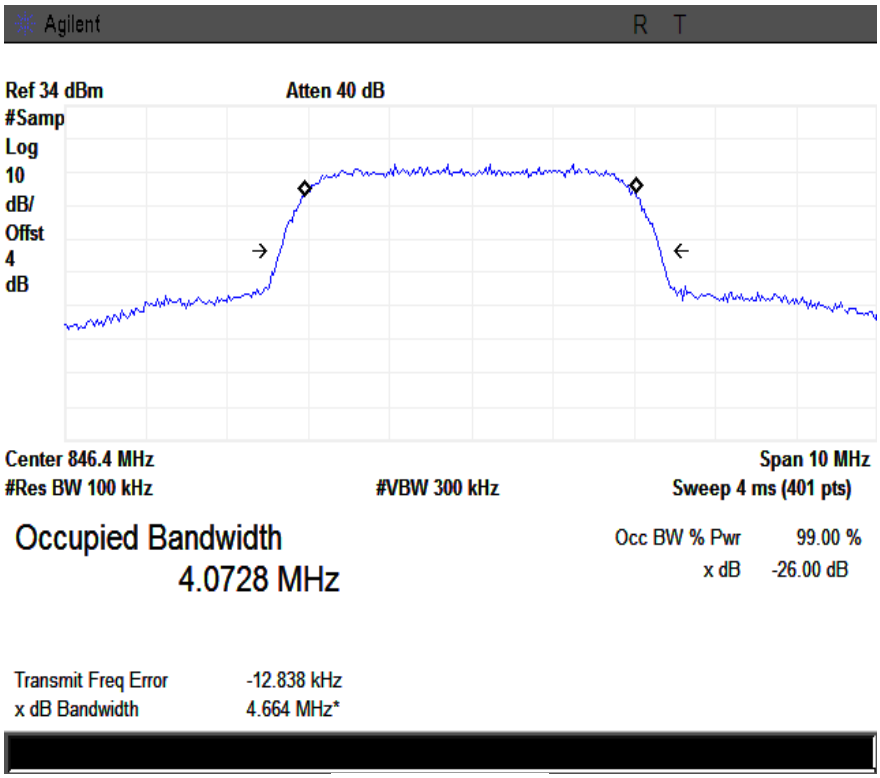
L: Low Channel
M: Middle Channel
H: High Channel



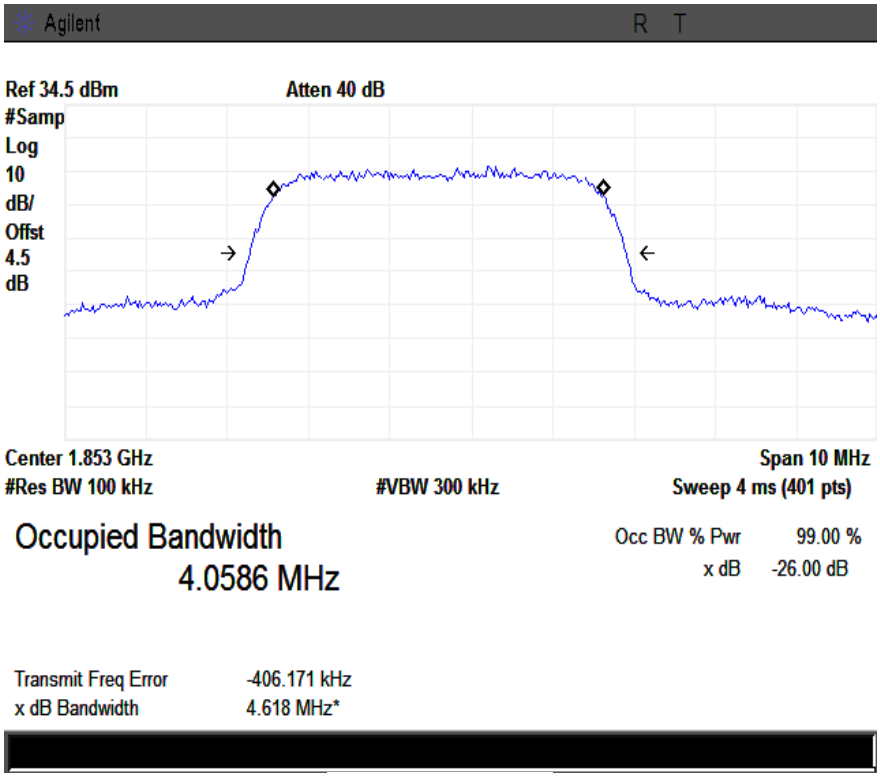
W850 826.6M L



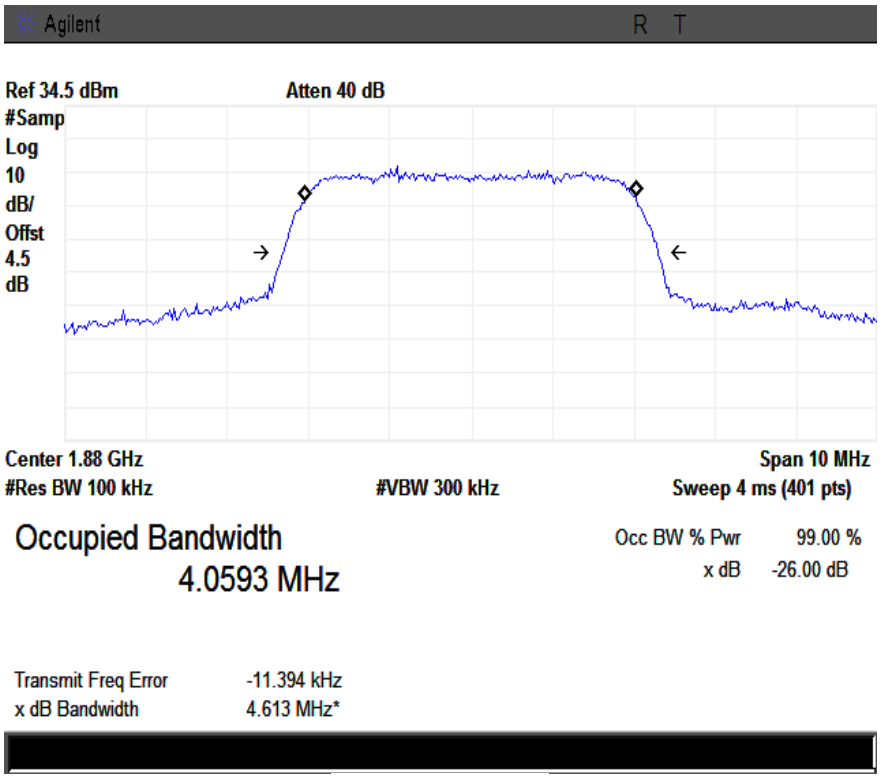
W850 835M M



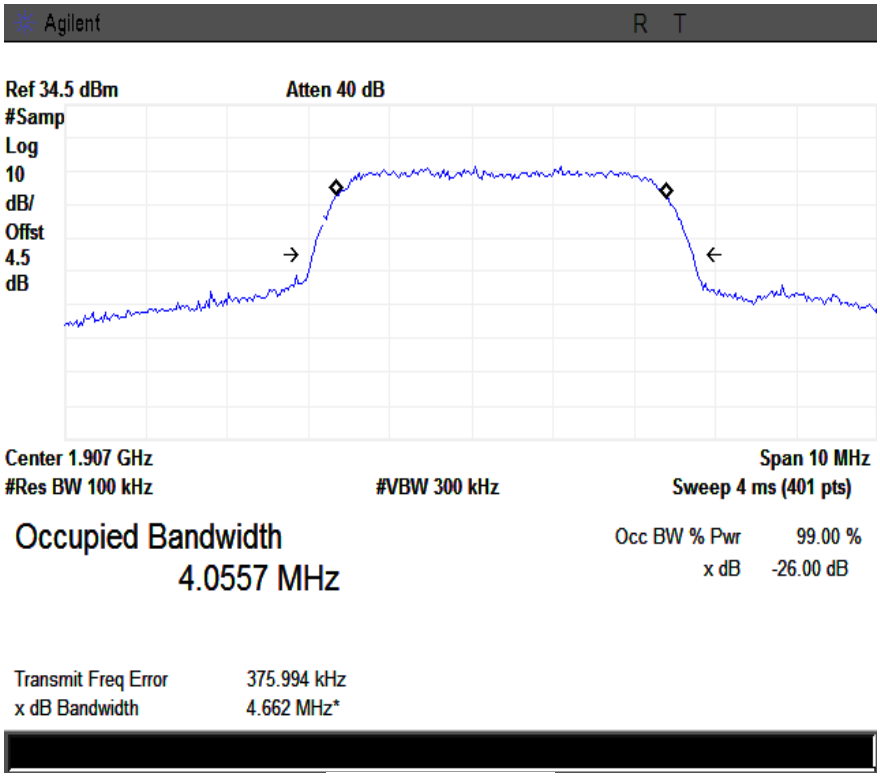
W850 846.4M H



W1900 1.852G L



W1900 1.88G M



W1900 1.908G H

5.5 §2.1051, §22.917(a) & §24.238(a) - Spurious Emissions at Antenna Terminals

1. Conducted Measurement
   EUT was set for low, mid, high channel with modulated mode and highest RF output power.
   The spectrum analyzer was connected to the antenna terminal.
2. Conducted Emissions Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is ±1.5dB.
3. Environmental Conditions

Temperature	24°C
Relative Humidity	57%
Atmospheric Pressure	1007mbar

4. Test date : August 26, 2014
   Tested By : Herith Shi

Standard Requirement:

The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least 43 + 10 log (P) dB.

Procedures:

1. The EUT was connected to Spectrum Analyzer and Base Station via power divider.
2. The Band Edges of low and high channels for the highest RF powers were measured. Setting RBW as roughly BW/100.
3. Details according with KDB 971168 section 6.0.

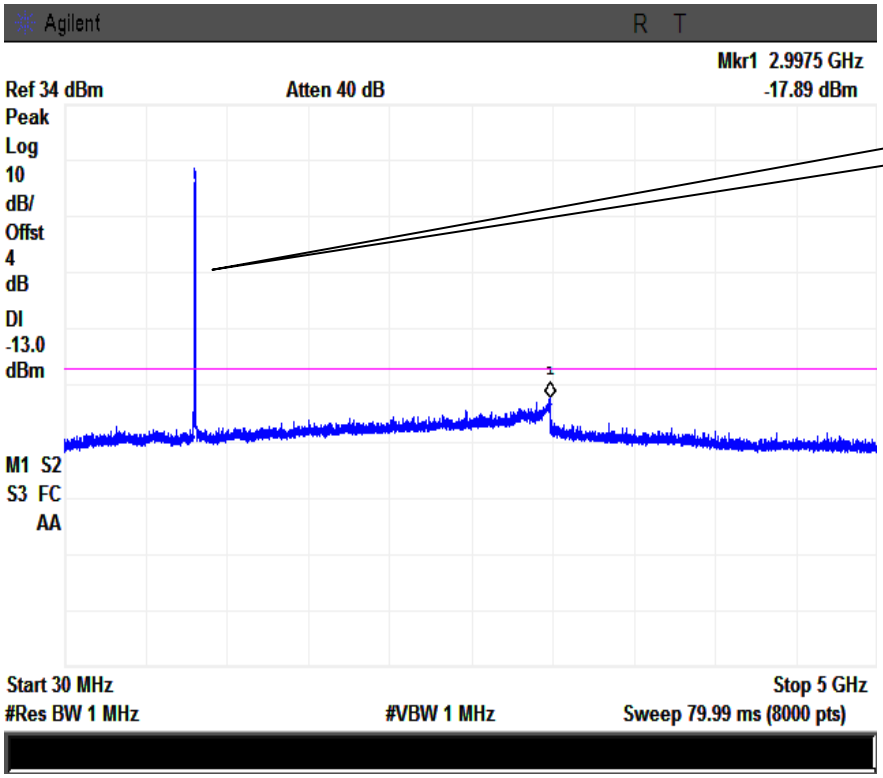
Test Result: Pass

Refer to the attached plots.

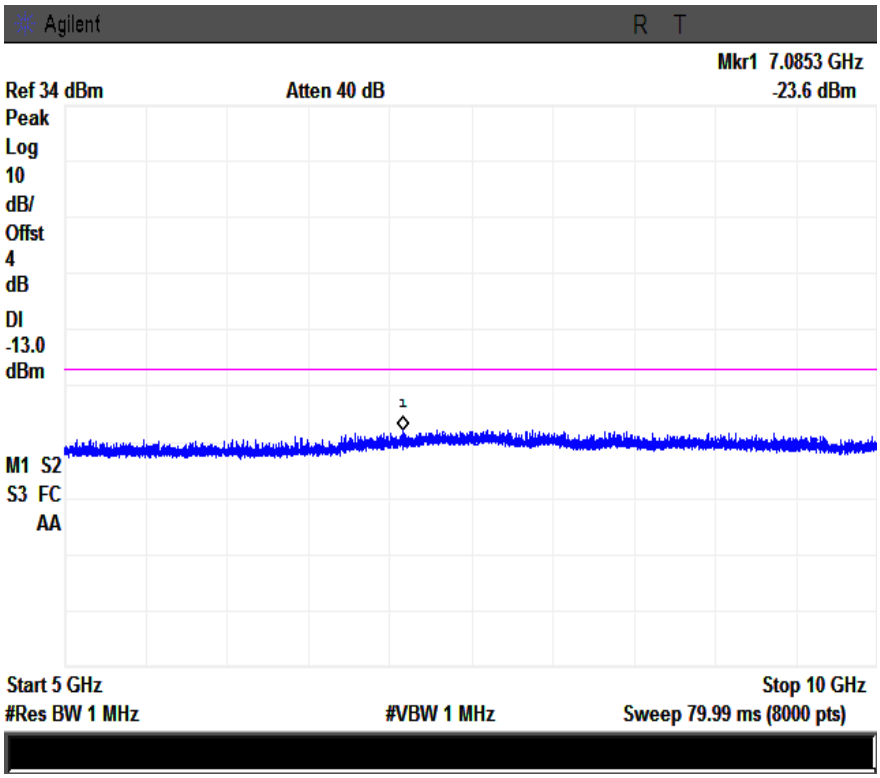
UMTS-FDD Band Ⅴ (Part 22H)

30MHz -10G – WCDMA 850

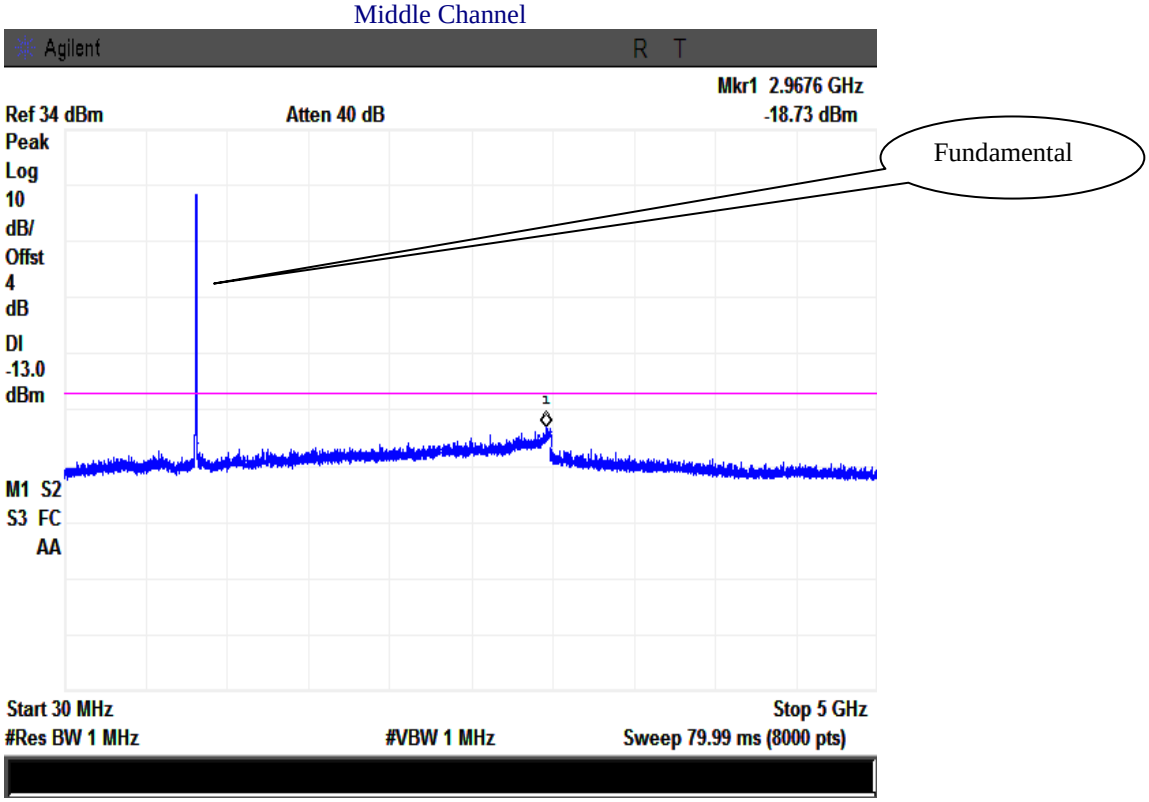
Low Channel

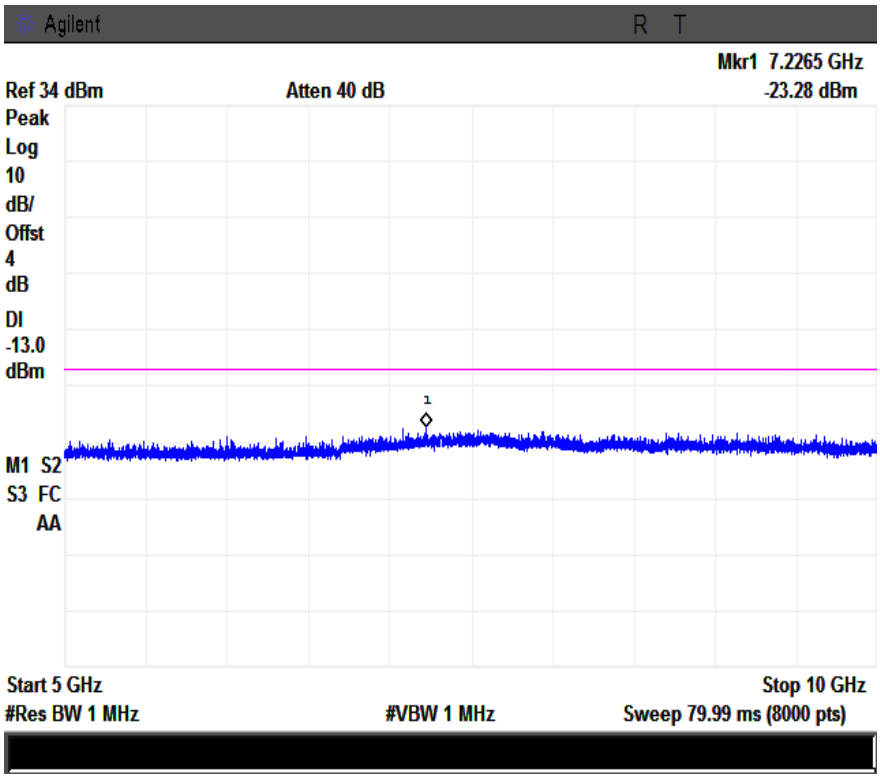


Fundamental

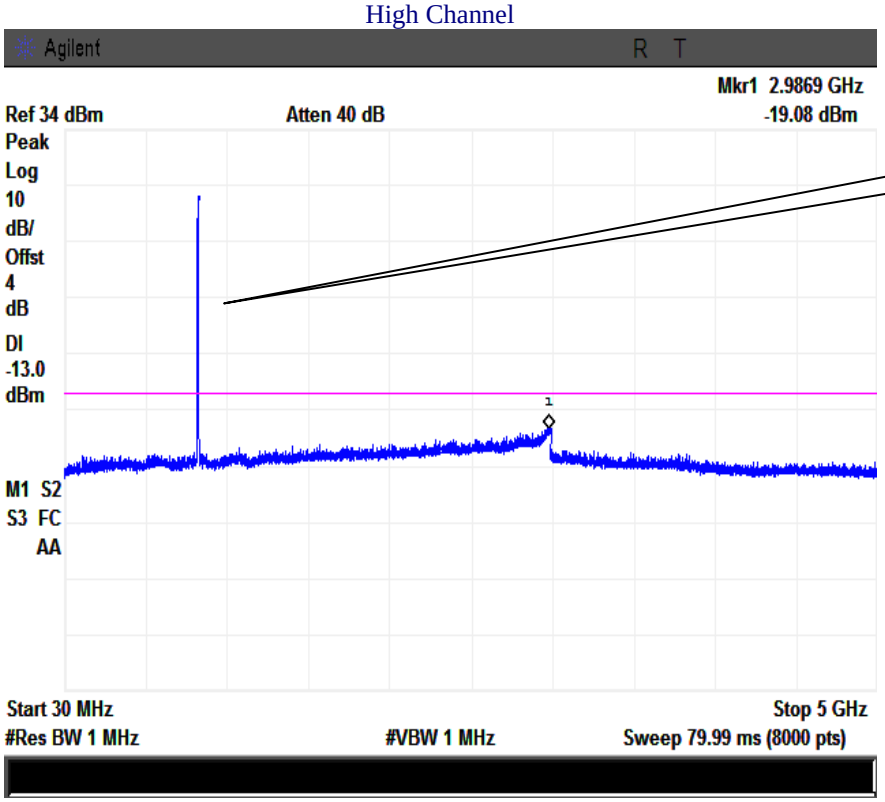


Middle Channel

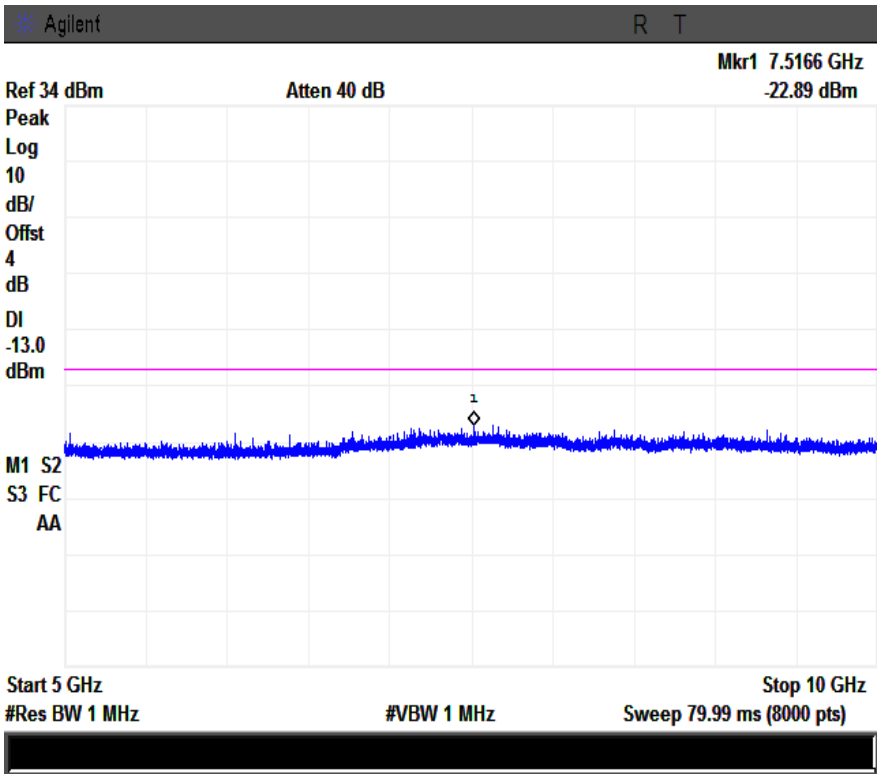




High Channel



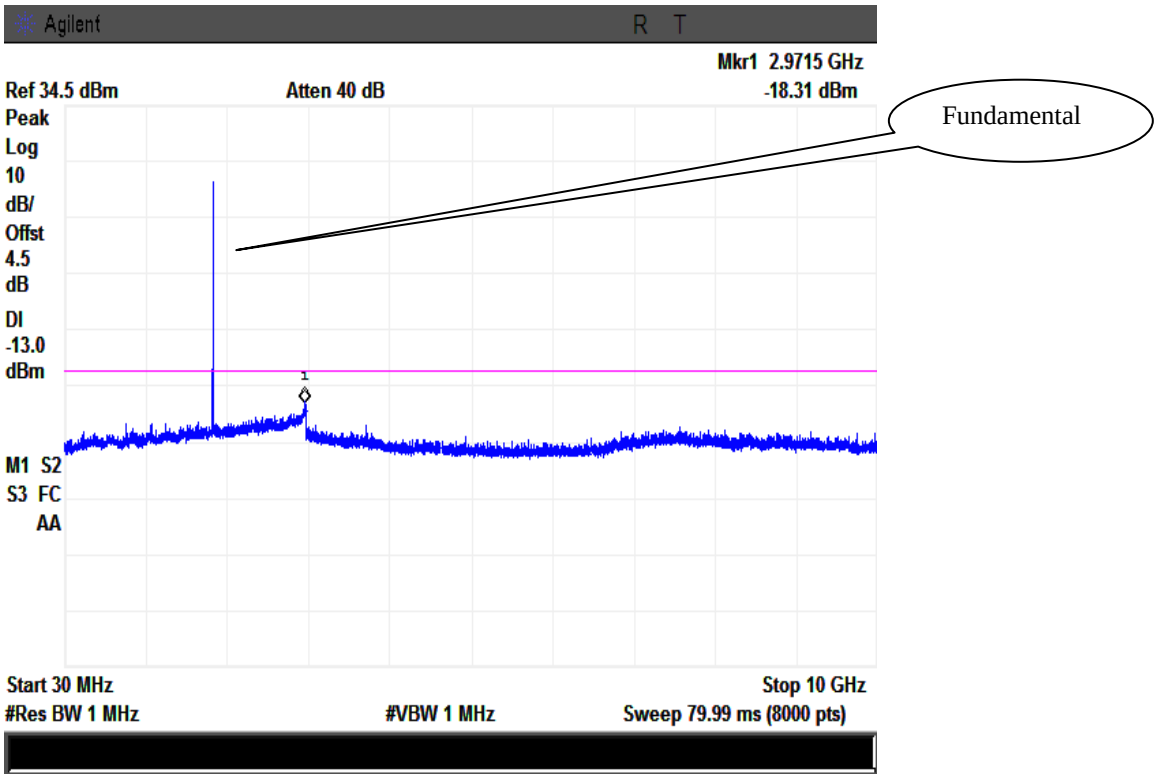
Fundamental

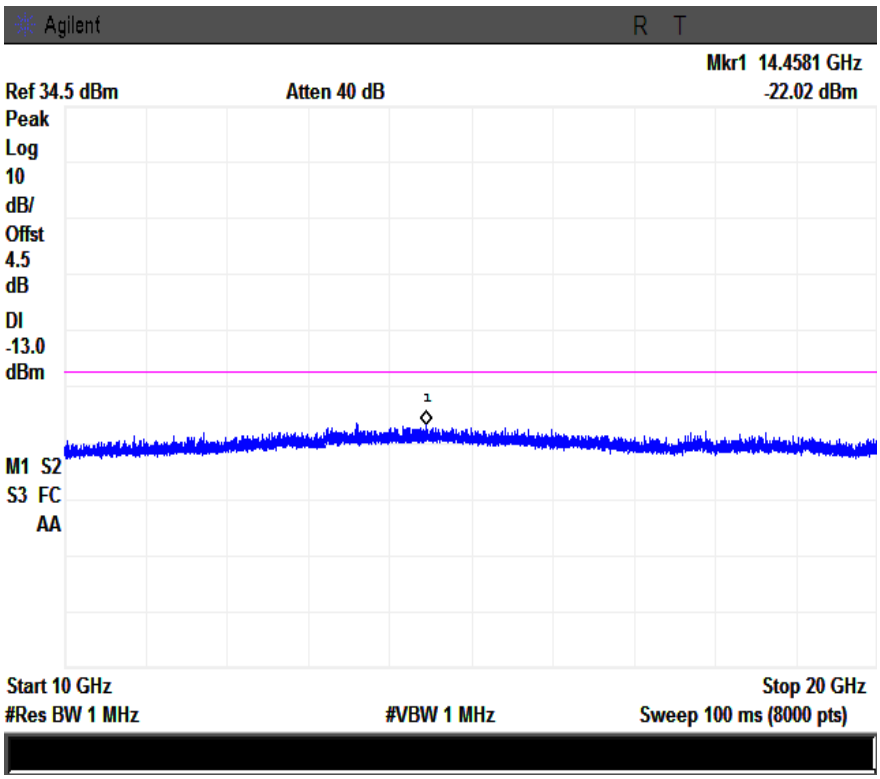


UMTS-FDD Band Ⅱ (Part24E)

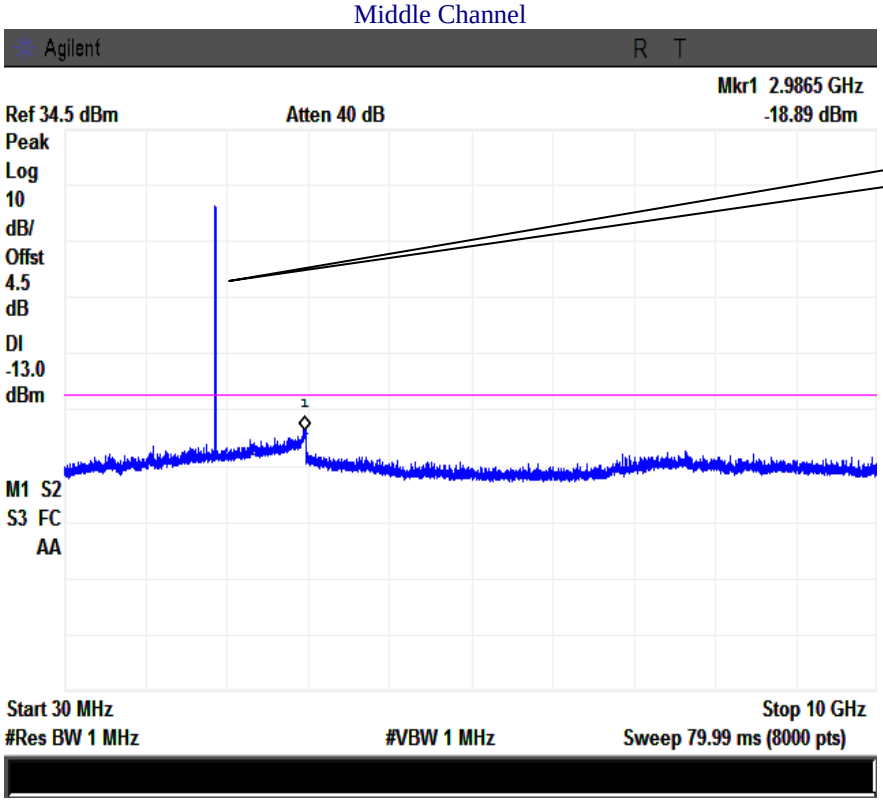
30MHz -25G – WCDMA1900

Low Channel

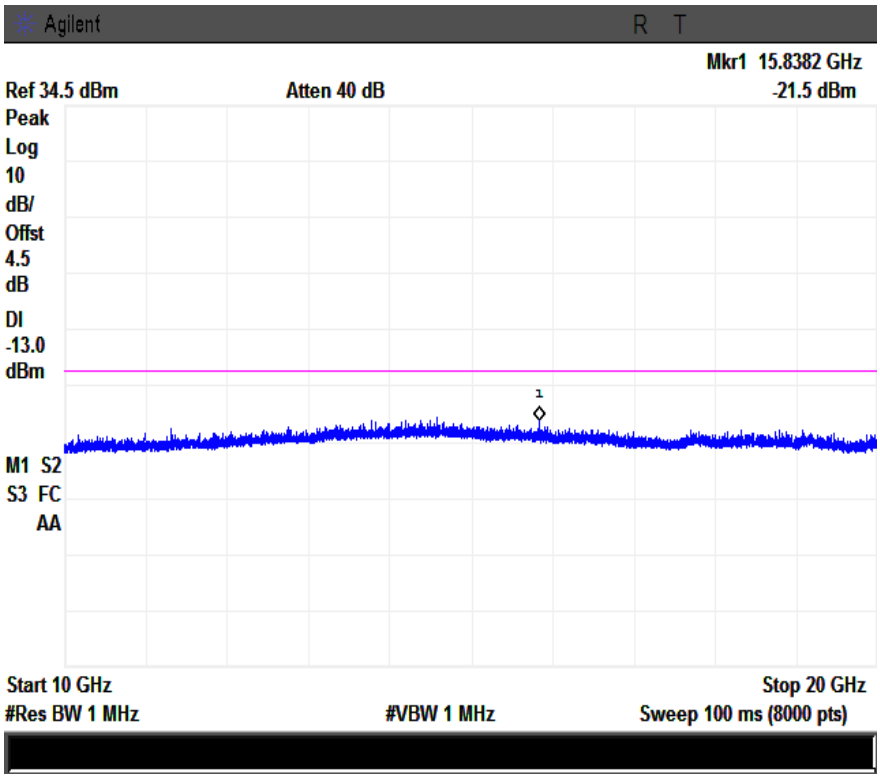




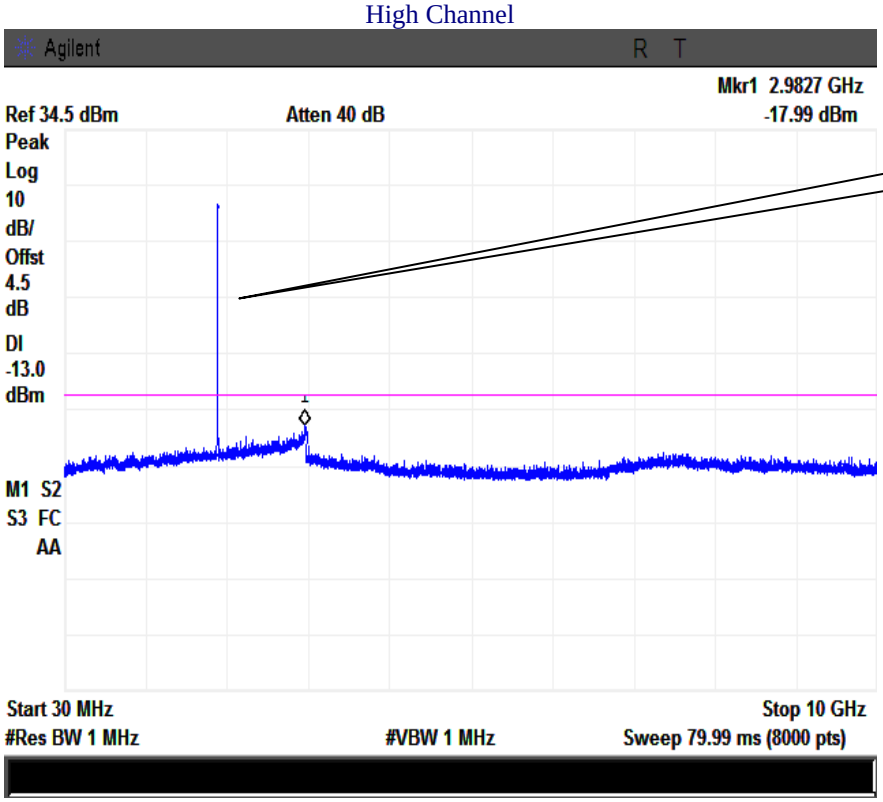
Middle Channel



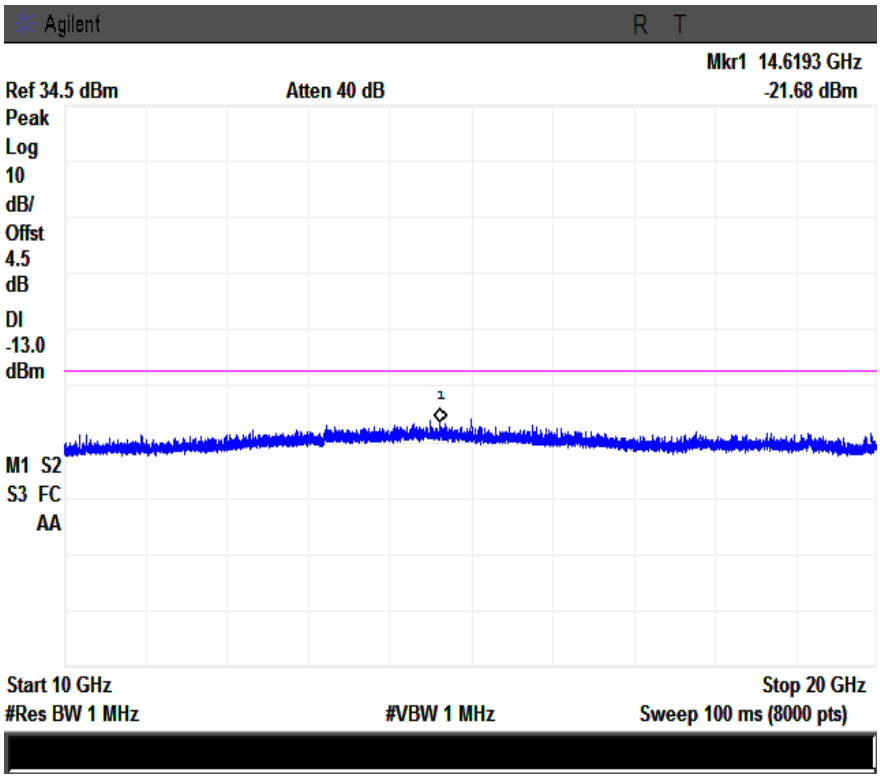
Fundamental



High Channel



Fundamental



5.6 §2.1053, §22.917 & §24.238 - Spurious Radiated Emissions

1. All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.
2. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. Radiated Emissions Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 1GHz – 40GH is ±6.0dB (for EUTs < 0.5m X 0.5m X 0.5m).
4. Environmental Conditions

Temperature	26°C
Relative Humidity	50%
Atmospheric Pressure	1009mbar

5. Test date : August 28, 2014
   Tested By : Herith Shi

Standard Requirement:

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least 43 + 10 log (P) dB. The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

Procedures: (According with TIA 603D)

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. 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.

Sample Calculation:

EUT Field Strength (dBm) = Reading (Signal generator) + Antenna Gain (substitution antenna) - Cable loss (From Signal Generator to substitution antenna)

Test Result: Pass

UMTS-FDD Band Ⅴ (Part 22H)

Low channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
1652.8	-43.62	V	7.95	0.78	-36.45	-13	-23.45
1652.8	-44.83	H	7.95	0.78	-37.66	-13	-24.66
315.2	-54.12	V	6.30	0.26	-48.08	-13	-35.08
722.4	-50.34	H	6.80	0.41	-43.95	-13	-30.95

Middle channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
1670	-43.71	V	7.95	0.78	-36.54	-13	-23.54
1670	-44.79	H	7.95	0.78	-37.62	-13	-24.62
314.5	-53.99	V	6.30	0.26	-47.95	-13	-34.95
721.2	-50.21	H	6.80	0.41	-43.82	-13	-30.82

High channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
1693.2	-43.77	V	7.95	0.78	-36.60	-13	-23.60
1693.2	-44.86	H	7.95	0.78	-37.69	-13	-24.69
313.3	-54.22	V	6.30	0.26	-48.18	-13	-35.18
720.8	-50.39	H	6.80	0.41	-44	-13	-31

UMTS-FDD Band Ⅱ (Part 24E)

Low channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3704.8	-45.26	V	10.25	2.73	-37.74	-13	-24.74
3704.8	-46.19	H	10.25	2.73	-38.67	-13	-25.67
313.9	-55.02	V	6.30	0.26	-48.98	-13	-35.98
723.1	-50.84	H	6.80	0.41	-44.45	-13	-31.45

Middle channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3760	-45.11	V	10.25	2.73	-37.59	-13	-24.59
3760	-45.82	H	10.25	2.73	-38.30	-13	-25.30
316.1	-54.77	V	6.30	0.26	-48.73	-13	-35.73
724.2	-51.07	H	6.80	0.41	-44.68	-13	-31.68

High channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3815.2	-45.33	V	10.36	2.73	-37.70	-13	-24.70
3815.2	-45.27	H	10.36	2.73	-37.64	-13	-24.64
314.9	-55.16	V	6.30	0.26	-49.12	-13	-36.12
721.5	-50.88	H	6.80	0.41	-44.49	-13	-31.49

5.7 §22.917(a) & §24.238(a) - Band Edge

1. Conducted Measurement
   EUT was set for low, mid, high channel with modulated mode and highest RF output power.
   The spectrum analyzer was connected to the antenna terminal.
2. Conducted Emissions Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is ±1.5dB.
3. Environmental Conditions

Temperature	26°C
Relative Humidity	50%
Atmospheric Pressure	1009mbar

4. Test date : August 28, 2014
   Tested By : Herith Shi

Standard Requirement:

The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least 43 + 10 log (P) dB.

Procedures:

1. The EUT was connected to Spectrum Analyzer and Base Station via power divider.
2. The Band Edges of low and high channels for the highest RF powers were measured. Setting RBW as roughly BW/100.
3. Details according with KDB 971168 section 6.0.

Test Result: Pass

Refer to the attached plots.

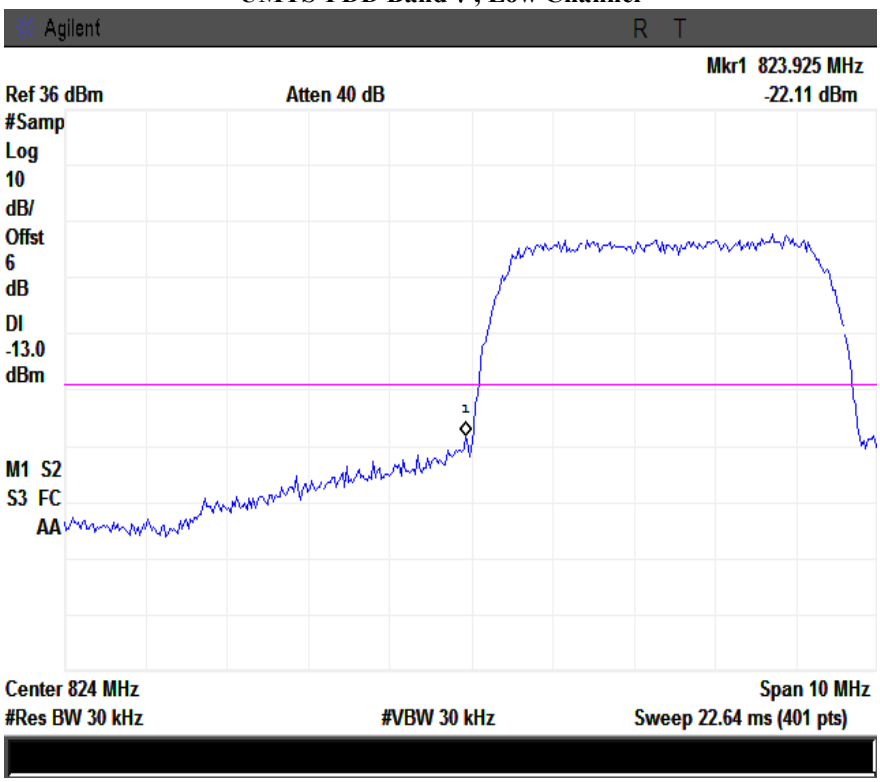
UMTS-FDD Band Ⅴ (Part 22H)

Frequency (MHz)	Emission (dBm)	Limit (dBm)
824.000	-22.11	-13
849.000	-20.70	-13

UMTS-FDD Band Ⅱ (Part 24E)

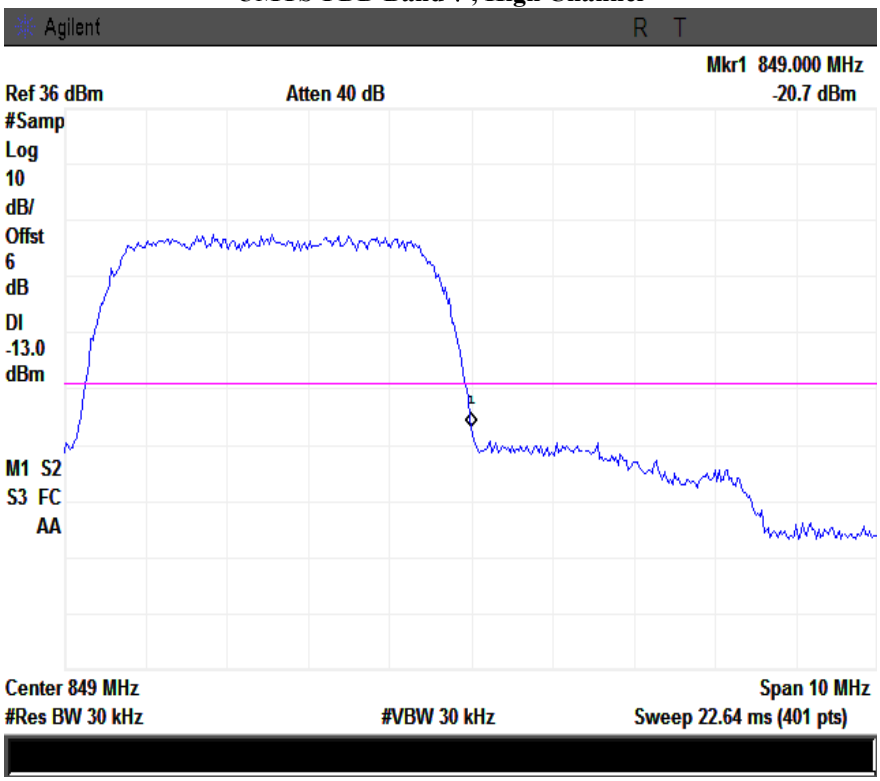
Frequency (MHz)	Emission (dBm)	Limit (dBm)
1850.000	-22.94	-13
1910.000	-22.66	-13

UMTS-FDD Band Ⅴ, Low Channel



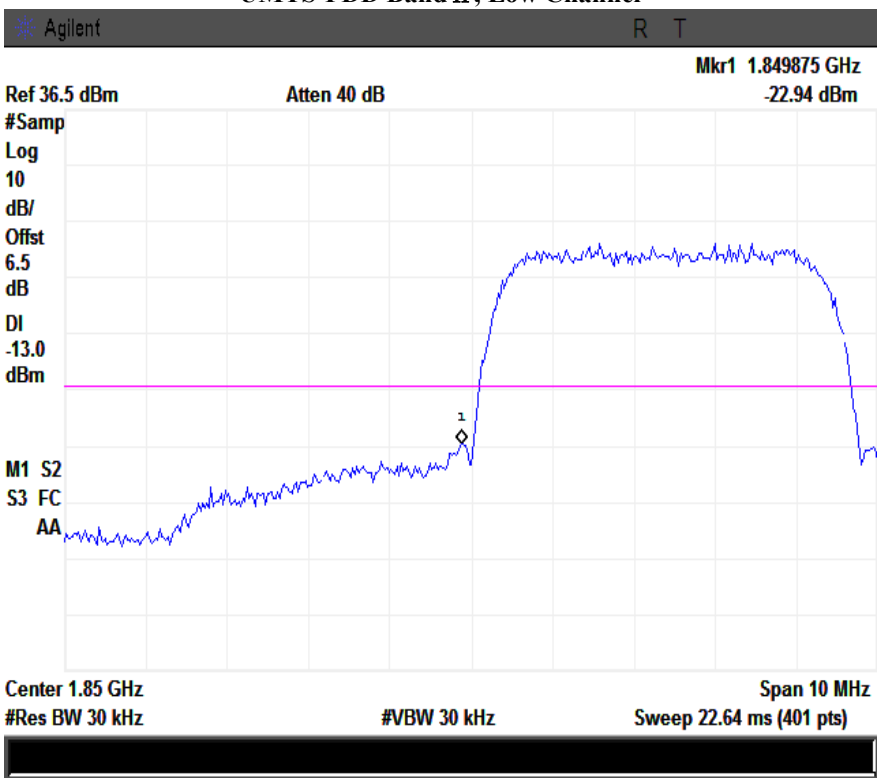
Note: Offset=Cable loss (4.0) + 10log (46.0/30) =4.0+2.0=6.0dB

UMTS-FDD Band Ⅴ, High Channel



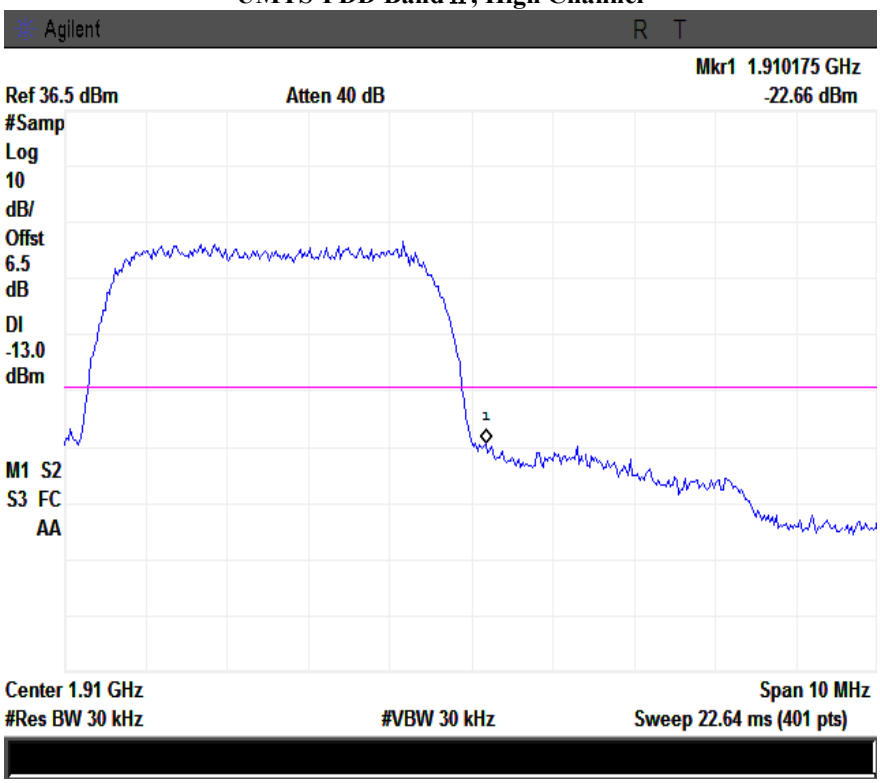
Note: Offset=Cable loss (4.0) + 10log (47.0/30)=4.0+2.0=6.0 dB

UMTS-FDD Band Ⅱ, Low Channel



Note: Offset=Cable loss (4.5) + 10log (46/30)=4.5+2.0=6.5dB

UMTS-FDD Band Ⅱ, High Channel



Note: Offset=Cable loss (4.5) + 10log (47.0/30)=4.5+2.0=6.5 dB

5.8 §2.1055, §22.355 & §24.235 - Frequency Stability

1.	Environmental Conditions	Temperature	20°C
		Relative Humidity	51%
		Atmospheric Pressure	1010mbar
2.	Test date : August 29, 2014		
	Tested By : Herith Shi		

Standard Requirement:

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 stay within the authorized frequency block.

Procedures:

A communication link was established between EUT and base station. The frequency error was monitored and measured by base station under variation of ambient temperature and variation of primary supply voltage.

Limit: The frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5ppm) of the center frequency.

Test Results: Pass

UMTS-FDD Band Ⅴ (Part 22H)

Middle Channel, f_o = 835 MHz				
Temperature (℃)	Power Supplied (V_{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-10	3.7	5	0.0060	2.5
0		7	0.0084	2.5
10		8	0.0096	2.5
20		4	0.0048	2.5
30		10	0.0120	2.5
40		6	0.0072	2.5
50		7	0.0084	2.5
55		9	0.0108	2.5
25	4.2	4	0.0048	2.5
	3.5	9	0.0108	2.5

UMTS-FDD Band Ⅱ (Part 24E)

Middle Channel, f_o = 1880 MHz				
Temperature (℃)	Power Supplied (V_{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-10	3.7	2	0.0011	2.5
0		7	0.0037	2.5
10		4	0.0021	2.5
20		3	0.0016	2.5
30		5	0.0027	2.5
40		1	0.0005	2.5
50		6	0.0032	2.5
55		9	0.0048	2.5
25	4.2	8	0.0043	2.5
	3.5	7	0.0037	2.5

Annex A. TEST INSTRUMENT & METHOD

Annex A.i. TEST INSTRUMENTATION & GENERAL PROCEDURES

Instrument	Model	Serial #	Calibration Date	Calibration Due Date
RF conducted test				
Agilent ESA-E SERIES SPECTRUM ANALYZER	E4407B	MY45108319	09/17/2013	09/16/2014
Power Splitter	1#	1#	09/02/2013	09/01/2014
Universal Radio Communication Tester	CMU200	121393	09/17/2013	09/16/2014
Temperature/Humidity Chamber	UHL-270	001	10/22/2013	10/21/2014
EMI test receiver	ESL6	100262	11/23/2013	11/22/2014
DC Power Supply	E3640A	MY40004013	09/17/2013	09/16/2014
Radiated Emissions				
EMI test receiver	ESL6	100262	11/23/2013	11/22/2014
OPT 010 AMPLIFIER (0.1-1300MHz)	8447E	2727A02430	09/02/2013	09/01/2014
Microwave Preamplifier (0.5～18GHz)	PAM-118	443008	09/02/2013	09/01/2014
Bilog Antenna (30MHz~6GHz)	JB6	A110712	09/23/2013	09/22/2014
Bilog Antenna (30MHz~2GHz)	JB1	A112017	09/23/2013	09/22/2014
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71259	11/20/2013	11/19/2014
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	11/20/2013	11/19/2014
SYNTHESIZED SIGNAL GENERATOR	8665B	3744A01293	09/17/2013	09/16/2014
Tunable Notch Filter	3NF-800/1000-S	AA4	09/02/2013	09/01/2014
Tunable Notch Filter	3NF-1000/2000-S	AM 4	09/02/2013	09/01/2014

Annex A. ii. RADIATED EMISSIONS TEST DESCRIPTION

EUT Characterisation

EUT characterisation, over the frequency range from 30MHz to 1GHz (for FCC tests, until the 10th harmonic for operating frequencies ≥ 108MHz),, was done in order to minimise radiated emissions testing time while still maintaining high confidence in the test results.

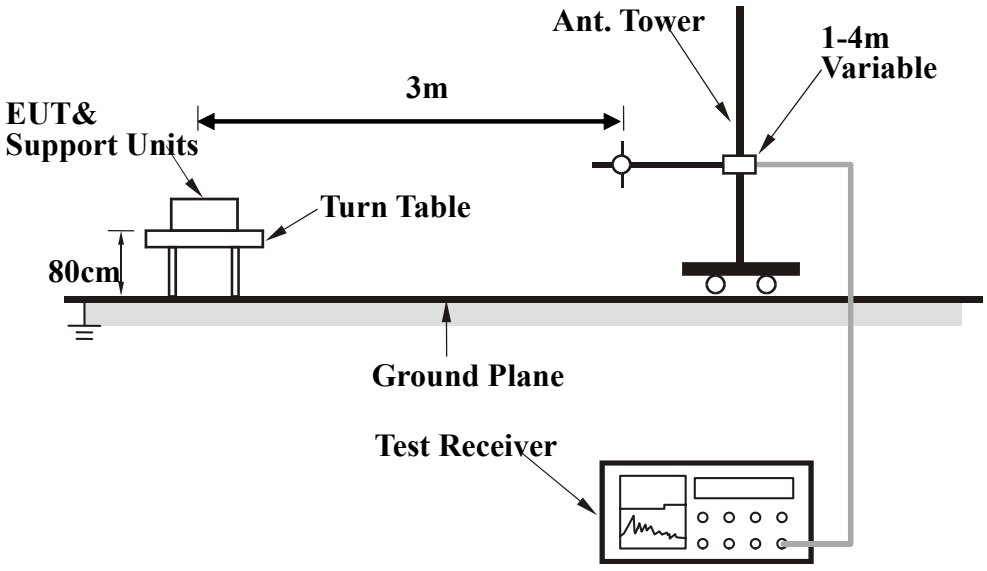
The EUT was placed in the chamber, at a height of about 0.8m on a turntable. Its radiated emissions frequency profile was observed, using a spectrum analyzer /receiver with the appropriate broadband antenna placed 3m or 10m away from the EUT. Radiated emissions from the EUT were maximised by rotating the turntable manually, changing the antenna polarisation and manipulating the EUT cables while observing the frequency profile on the spectrum analyzer / receiver. Frequency points at which maximum emissions occurred, clock frequencies and operating frequencies were then noted for the formal radiated emissions test at the Open Area Test Site (OATS) or EMC 3m chamber.

Test Set-up

1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m X 1.0m X 0.8m high, non-metallic table.

2. The filtered power supply for the EUT and supporting equipment were tapped from the appropriate power sockets located on the turntable.

3. The relevant broadband antenna was set at the required test distance away from the EUT and supporting equipment boundary.



Test Method

The following procedure was performed to determine the maximum emission axis of EUT:

1. With the receiving antenna is H polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
2. With the receiving antenna is V polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
3. Compare the results derived from above two steps. So, the axis of maximum emission from EUT was determined and the configuration was used to perform the final measurement.

Final Radiated Emission Measurement

1. Setup the configuration according to figure 1. Turn on EUT and make sure that it is in normal function.
2. For emission frequencies measured below 1 GHz, a pre-scan is performed in a shielded chamber to determine the accurate frequencies of higher emissions will be checked on a open test site or EMC 10m chamber. As the same purpose, for emission frequencies measured above 1 GHz, a pre-scan also be performed with a 1 meter measuring distance before final test.
3. For emission frequencies measured below and above 1 GHz, set the spectrum analyzer on a 100 kHz and 1 MHz resolution bandwidth respectively for each frequency measured in step 2.
4. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0 ◦ to 360 ◦ with a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading.
5. Repeat step 4 until all frequencies need to be measured were complete.
6. Repeat step 5 with search antenna in vertical polarized orientations.

During the radiated emission test, the Spectrum Analyzer was set with the following configurations:

Frequency Band (MHz)	Function	Resolution bandwidth	Video Bandwidth
30 to 1000	Peak	100 kHz	100 kHz
Above 1000	Peak	1 MHz	1 MHz
	Average	1 MHz	10 Hz

Description of Radiated Emission Program

This EMC Measurement software run LabView automation software and offers a common user interface for electromagnetic interference (EMI) measurements. This software is a modern and powerful tool for controlling and monitoring EMI test receivers and EMC test systems. It guarantees reliable collection, evaluation, and documentation of measurement results. Basically, this program will run a pre-scan measurement before it proceeds with the final measurement. The pre-scan routine will run the scan on four different antenna heights, 2 antenna polarity, and 360 degrees table rotation. For example, the program was set to run 30 MHz to 1 GHz scan; the program will first start from a meter antenna height and divide the 30 MHz to 1 GHz into 10 separate parts of maximum hold sweeps. Each parts of maximum hold sweep, the program will collect the data from 0 degree to 360 degrees table rotation. After the program complete the 1m scan, the antenna continues to rise to 2m and continue the scan. The step will repeated for all specified antenna height and polarity. This program will perform the Quasi Peak measurement after the signal maximization process and pre-scan routine. The final measurement will be base on the pre-scan data reduction result.

Sample Calculation Example

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. For the limit is employed average value, therefore the peak value can be transferred to average value by subtracting the duty factor. The basic equation with a sample calculation is as follows:

Peak = Reading + Corrected Factor

where

Corr. Factor = Antenna Factor + Cable Factor - Amplifier Gain (if any)

And the average value is

Average = Peak Value + Duty Factor or

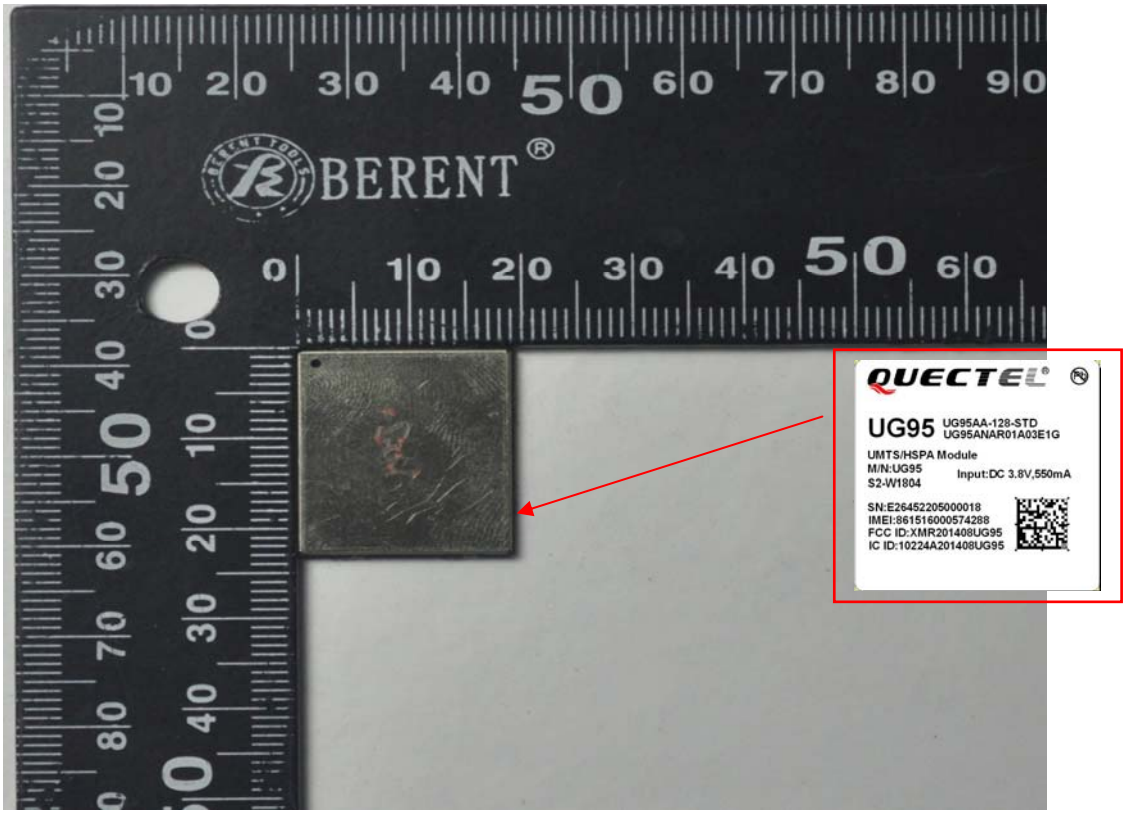
Set RBW = 1MHz, VBW = 10Hz.

Note:

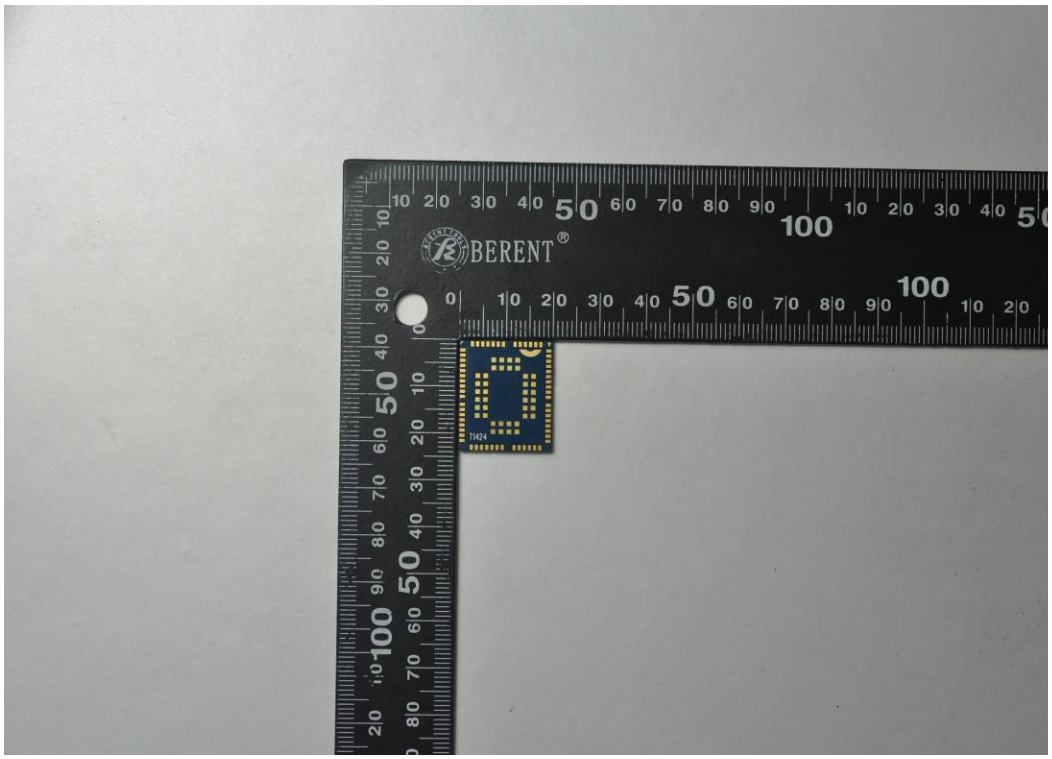
If the measured frequencies are fall in the restricted frequency band, the limit employed must be quasi peak value when frequencies are below or equal to 1 GHz. And the measuring instrument is set to quasi peak detector function.

Annex B. EUT AND TEST SETUP PHOTOGRAPHS

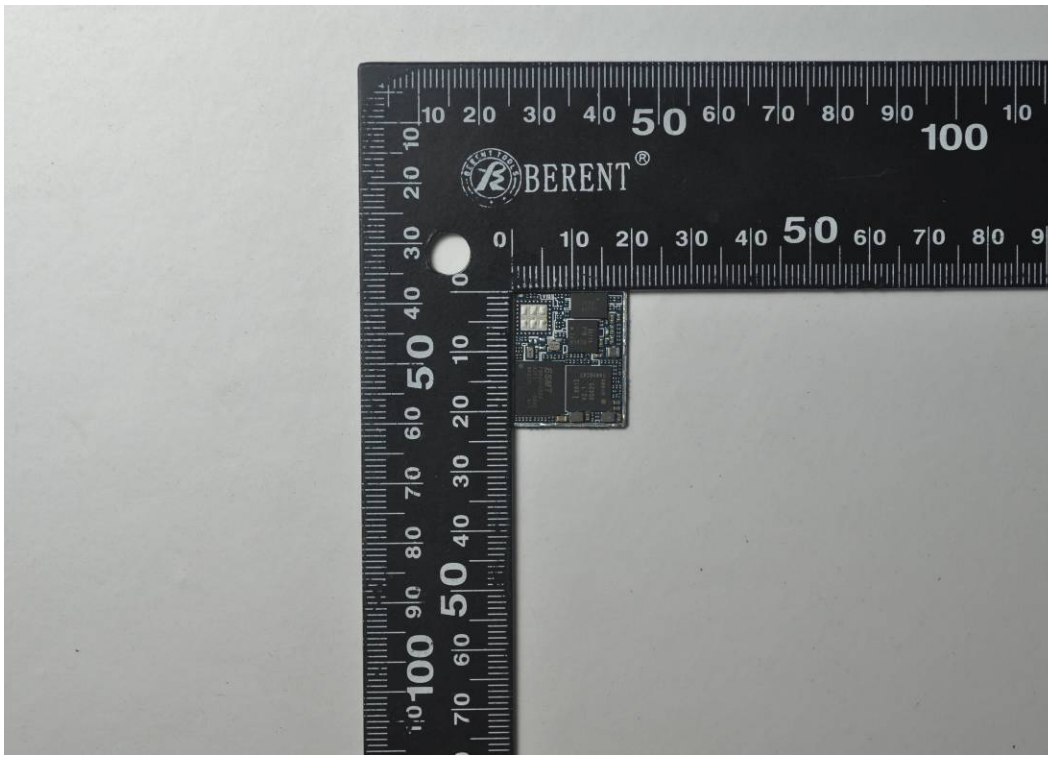
Annex B.i. Photograph 1: EUT Photo



EUT - Front View

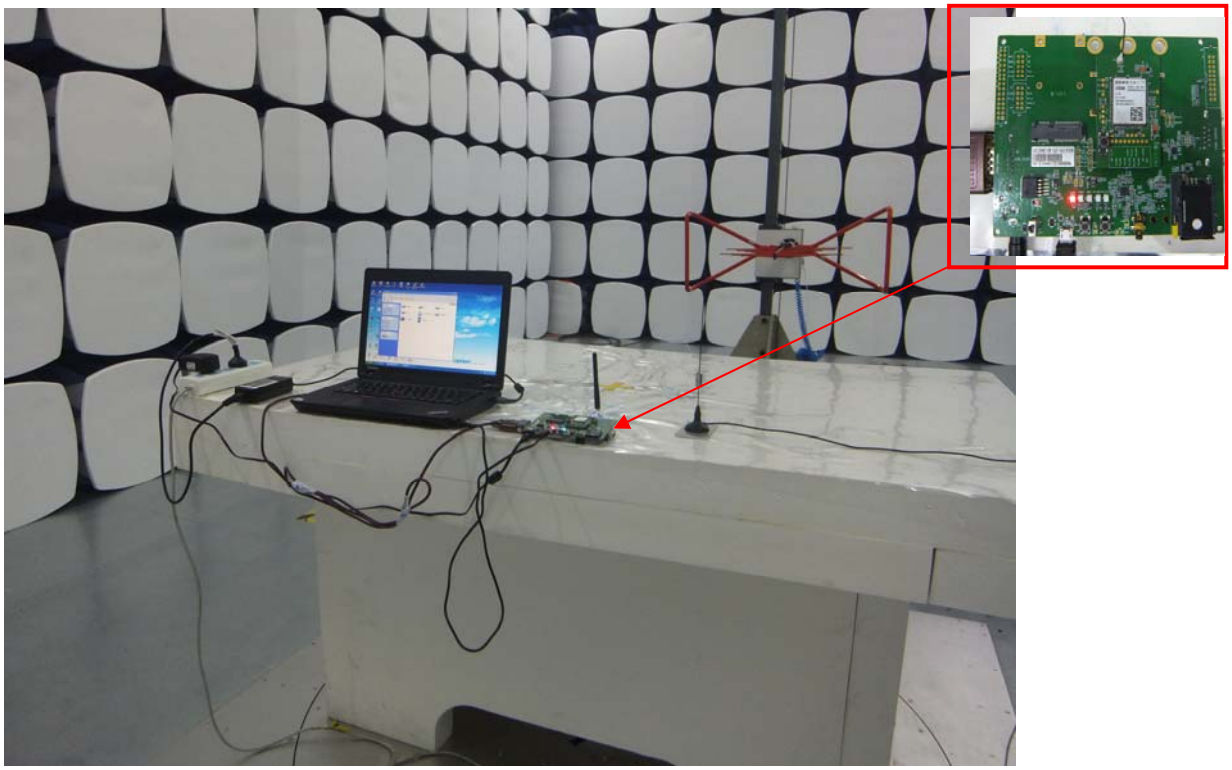


EUT - Rear View

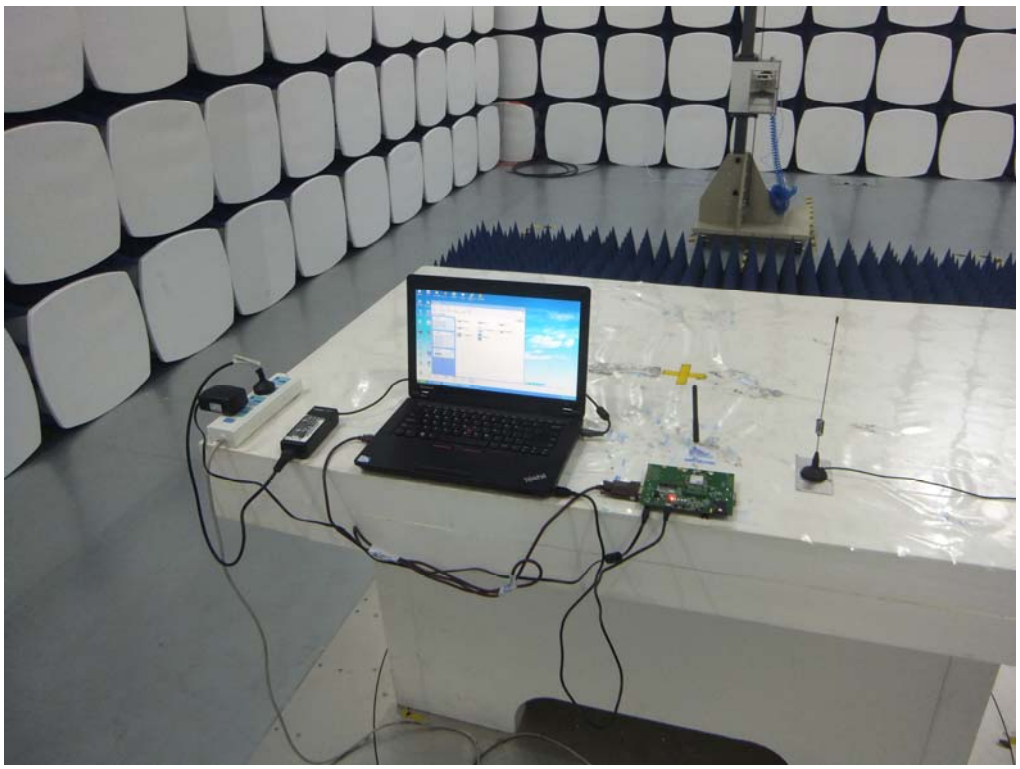


EUT Cover Off- Top View

Annex B.iii. Photograph 3: Test Setup Photo



Radiated Spurious Emissions Test Setup Below 1GHz - Front View



Radiated Spurious Emissions Test Setup Above 1GHz –Front View

Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

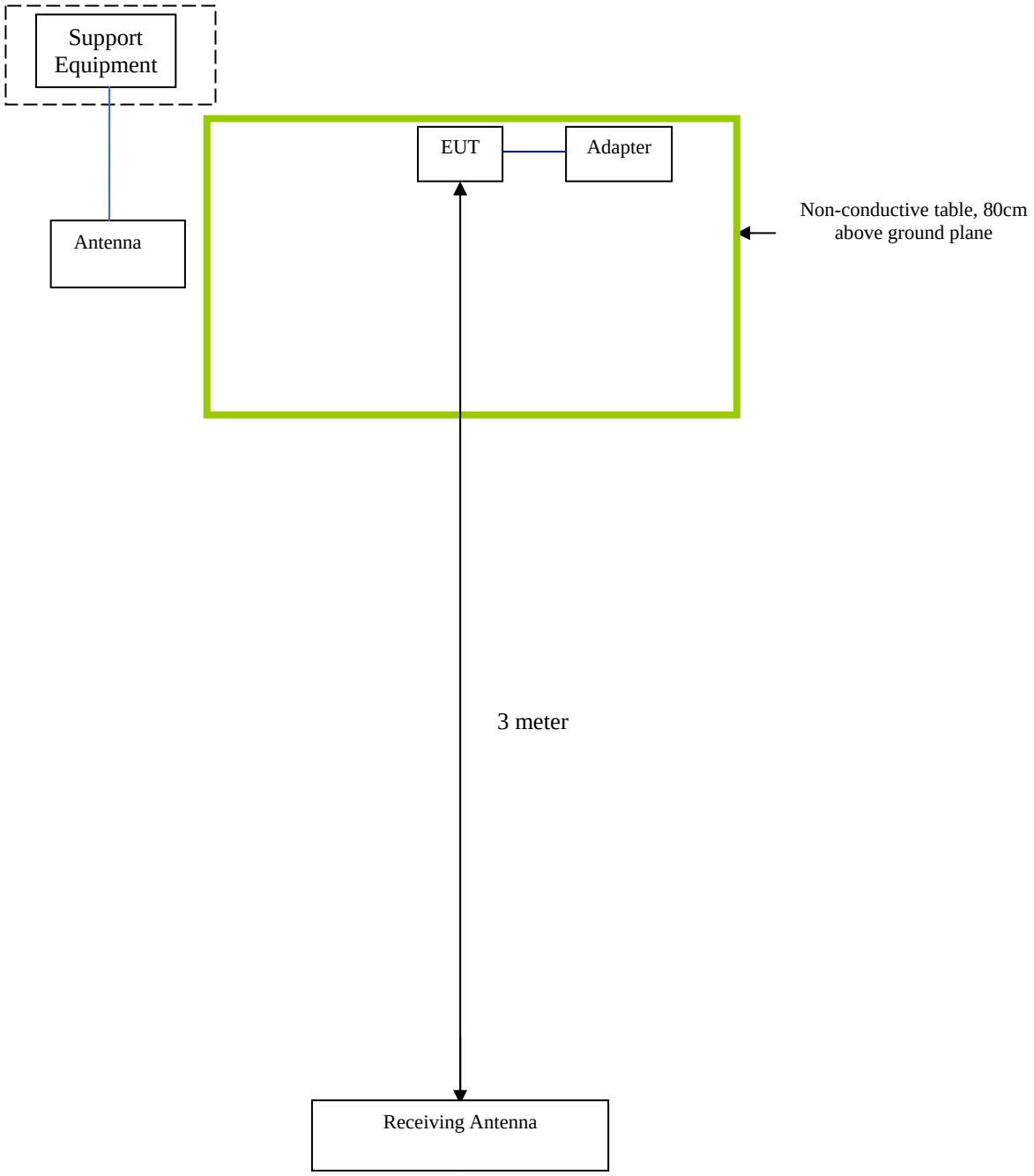
EUT TEST CONDITIONS

Annex C. i. SUPPORTING EQUIPMENT DESCRIPTION

The following is a description of supporting equipment and details of cables used with the EUT.

Manufacturer	Equipment Description (Including Brand Name)	Model	Calibration Date	Calibration Due Date
N/A	N/A	N/A	N/A	N/A

Block Configuration Diagram for Radiated Emissions



Annex C.ii. EUT OPERATING CONDITIONS

The following is the description of how the EUT is exercised during testing.

Test	Description Of Operation
Emissions Testing	The EUT was communicating with base station and set to work at maximum output power.
Others Testing	The EUT was communicating with base station and set to work at maximum output power.

Annex D.USER MANUAL / BLOCK DIAGRAM / SCHEMATICS / PART LIST

Please see attachment

Annex E. DECLARATION OF SIMILARITY

N/A