Launch Tech Co., Ltd.

golo^3

Main Model: golo^3
Serial Model: N/A

December 24, 2013
Report No.: 13070593-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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SIEMIC (Shenzhen - China) Laboratories Accreditations for Conformity Assessment

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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CONTENTS

1. EXECUTIVE SUMMARY & EUT INFORMATION

The purpose of this test programmed was to demonstrate compliance of the Launch Tech Co., Ltd., golo^3 and model: golo^3 against the current Stipulated Standards. The golo^3 has demonstrated compliance with the FCC Part 22(H) & FCC Part 24(E): 2013.

EUT Information

EUT Description	:	**golo^3**
Main Model	:	**golo^3**
Serial Model		**N/A**
Antenna Gain	:	**UMTS-FDD Band V/GPRS850: -4.95dBi** **UMTS-FDD Band II/GPRS1900: 2.15dBi** **Bluetooth: -1.2dBi** **WIFI: -1.2dBi**
Input Power	:	**Input: DC 12V**
Maximum Conducted AV Power to Antenna	:	**GPRS 850: 31.91dBm** **GPRS 1900: 29.62dBm** **UMTS-FDD Band Ⅴ: 22.7dBm** **UMTS-FDD Band Ⅱ: 22.58dBm**
Maximum Radiated ERP/EIRP	:	**GPRS 850: 28.35dBm / ERP** **GPRS 1900:24.28dBm / EIRP** **UMTS-FDD Band Ⅴ: 22.32dBm / ERP** **UMTS-FDD Band Ⅱ: 22.01dBm / EIRP**
Classification Per Stipulated Test Standard	:	**FCC Part 22(H) & FCC Part 24(E): 2013**

2. TECHNICAL DETAILS

Purpose	**Compliance testing of golo3 with stipulated standard**
Applicant / Client	**Launch Tech Co., Ltd. Launch Industrial Park, North of Wuhe Rd., Banxuegang, Longgang, Shenzhen, China**
Manufacturer	**Launch Tech Co., Ltd. Launch Industrial Park, North of Wuhe Rd., Banxuegang, Longgang, Shenzhen, China**
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	**13070593-FCC-R1**
Date EUT received	**December 06, 2013**
Standard applied	**FCC Part 22(H) & FCC Part 24(E): 2013**
Dates of test	**December 09 to December 19, 2013**
No of Units	**#1**
Equipment Category	**PCE**
Trade Name	**LAUNCH**
RF Operating Frequency (ies)	**GPRS850 TX : 824.2 ~ 848.8 MHz; RX : 869.2 ~ 893.8 MHz GPRS1900 TX : 1850.2 ~ 1909.8 MHz; RX : 1930.2 ~ 1989.8 MHz 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 802.11b/g/n: 2412-2462 MHz Bluetooth: 2402-2480 MHz**
Number of Channels	**299CH (GPRS1900) and 124CH (GPRS850) UMTS-FDD Band Ⅴ: 102CH UMTS-FDD Band Ⅱ: 277CH Bluetooth: 79CH 802.11b/g/n: 11CH**
Modulation	**GPRS: GMSK UMTS-FDD: QPSK 802.11b/g/n: DSSS/OFDM Bluetooth: GFSK& π /4DQPSK&8DPSK**
GPRS Multi-slot class	**8/10/12**
FCC ID	**XUJRCUL**

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
§ 1.1307, § 2.1091	RF Exposure (MPE)	See Above	Pass
§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.
Note: This device is not support voice mode, so all the test items were operated in GPRS mode.

4. MEASUREMENTS, EXAMINATION AND DERIVED RESULTS

5.1 §1.1307, §2.1091- RF Exposure (MPE)

Test Result: Pass

Please refer to MPE report 13070593-FCC-H2.

5.2 § 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	22°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar

4. Test date : December 13, 2013
   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 instrument must have an available measurement/resolution bandwidth that is equal to or exceeds the OBW. If this capability is available, then the following procedure can be used to determine the total peak output power.
   a) Set the RBW ⩾ OBW.
   b) Set VBW ⩾ 3 × RBW.
   c) Set span ⩾ 2 x RBW
   d) Sweep time = auto couple.
   e) Detector = peak.
   f) Ensure that the number of measurement points ⩾ span/RBW.
   g) Trace mode = max hold.
   h) Allow trace to fully stabilize.
   1) Use the peak marker function to determine the peak amplitude level.

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

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

GPRS Mode:

Burst Average Power (dBm);								
Band	GPRS850				GPRS1900			
Channel	128	190	251	Tune up Power tolerant	512	661	810	Tune up Power tolerant
Frequency (MHz)	824.2	836.6	848.8	/	1850.2	1880	1909.8	/
GPRS Multi-Slot Class 8 (1 uplink),GMSK	31.82	31.89	**31.91**	32±1	**29.62**	29.53	29.61	29±1
GPRS Multi-Slot Class 10 (2 uplink),GMSK	29.26	29.47	29.49	30±1	26.77	26.76	26.87	27±1
GPRS Multi-Slot Class 12 (4 uplink),GMSK	26.45	26.55	26.53	27±1	24.22	24.25	24.29	25±1
Remark : GPRS, CS1 coding scheme. Multi-Slot Class 8 , Support Max 4 downlink, 1 uplink , 5 working link Multi-Slot Class 10 , Support Max 4 downlink, 2 uplink , 5 working link Multi-Slot Class 12 , Support Max 4 downlink, 4 uplink , 5 working link								

UMTS Mode:

UMTS-FDD Band V

Band/ Time Slot configuration	Channel	Frequency	Average power (dBm)
RMC 12.2kbps	4132	826.4	**22.70**
	4175	835.0	22.33
	4233	846.6	22.46
HSDPA Subtest1	4132	826.4	22.70
	4175	835.0	22.32
	4233	846.6	22.45
HSDPA Subtest2	4132	826.4	22.70
	4175	835.0	22.33
	4233	846.6	22.44
HSDPA Subtest3	4132	826.4	22.69
	4175	835.0	22.31
	4233	846.6	22.45
HSDPA Subtest4	4132	826.4	22.70
	4175	835.0	22.32
	4233	846.6	22.45
HSUPA Subtest1	4132	826.4	22.70
	4175	835.0	22.32
	4233	846.6	22.44
HSUPA Subtest2	4132	826.4	22.70
	4175	835.0	22.31
	4233	846.6	22.45
HSUPA Subtest3	4132	826.4	22.70
	4175	835.0	22.33
	4233	846.6	22.46
HSUPA Subtest4	4132	826.4	22.69
	4175	835.0	22.33
	4233	846.6	22.45
HSUPA Subtest5	4132	826.4	22.69
	4175	835.0	22.32
	4233	846.6	22.45

UMTS-FDD Band Ⅱ

Band/ Time Slot configuration	Channel	Frequency	Average power (dBm)
RMC 12.2kbps	9262	1852.4	22.47
	9400	1880.0	**22.58**
	9538	1907.6	22.40
HSDPA Subtest1	9262	1852.4	22.47
	9400	1880.0	22.57
	9538	1907.6	22.39
HSDPA Subtest2	9262	1852.4	22.47
	9400	1880.0	22.57
	9538	1907.6	22.39
HSDPA Subtest3	9262	1852.4	22.47
	9400	1880.0	22.56
	9538	1907.6	22.38
HSDPA Subtest4	9262	1852.4	22.47
	9400	1880.0	22.57
	9538	1907.6	22.39
HSUPA Subtest1	9262	1852.4	22.46
	9400	1880.0	22.56
	9538	1907.6	22.40
HSUPA Subtest2	9262	1852.4	22.47
	9400	1880.0	22.58
	9538	1907.6	22.40
HSUPA Subtest3	9262	1852.4	22.47
	9400	1880.0	22.58
	9538	1907.6	22.38
HSUPA Subtest4	9262	1852.4	22.43
	9400	1880.0	22.58
	9538	1907.6	22.40
HSUPA Subtest5	9262	1852.4	22.45
	9400	1880.0	22.57
	9538	1907.6	22.38

ERP & EIRP (worst case)

ERP for Cellular Band (Part 22H)

Frequency (MHz)	Substituted level (dBm)	Antenna Polarization	Antenna Gain correction (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)
824.2	21.82	V	6.8	0.53	28.09	38.45
824.2	20.94	H	6.8	0.53	27.21	38.45
836.6	21.84	V	6.8	0.53	28.11	38.45
836.6	20.89	H	6.8	0.53	27.16	38.45
848.8	21.98	V	6.9	0.53	**28.35**	38.45
848.8	20.96	H	6.9	0.53	27.33	38.45

EIRP for PCS Band (Part 24E)

Frequency (MHz)	Substituted level (dBm)	Antenna Polarization	Antenna Gain correction (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)
1850.2	17.25	V	7.88	0.85	**24.28**	33
1850.2	15.96	H	7.88	0.85	22.99	33
1880	17.23	V	7.88	0.85	24.26	33
1880	15.98	H	7.88	0.85	23.01	33
1909.8	17.26	V	7.86	0.85	24.27	33
1909.8	15.99	H	7.86	0.85	23	33

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)
826.40	15.91	V	6.8	0.53	22.18	33
826.40	14.12	H	6.8	0.53	20.39	33
835.00	15.94	V	6.8	0.53	22.21	33
835.00	14.11	H	6.8	0.53	20.38	33
846.60	15.95	V	6.9	0.53	**22.32**	33
846.60	14.17	H	6.9	0.53	20.54	33

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)
1852.40	14.98	V	7.88	0.85	**22.01**	33
1852.40	13.37	H	7.88	0.85	20.4	33
1880.00	14.94	V	7.88	0.85	21.97	33
1880.00	13.30	H	7.88	0.85	20.33	33
1907.60	14.89	V	7.86	0.85	21.9	33
1907.60	13.34	H	7.86	0.85	20.35	33

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	50%
Atmospheric Pressure	1018mbar

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 : December 11, 2013
   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

Cellular Band (Part 22H)

Channel	Frequency (MHz)	99% Occupied Bandwidth (kHz)	26 dB Bandwidth (kHz)
128	824.2	244.6021	313.133
190	836.6	244.1215	314.270
251	848.8	246.0225	317.320

PCS Band (Part 24E)

Channel	Frequency (MHz)	99% Occupied Bandwidth (kHz)	26 dB Bandwidth (kHz)
512	1850.2	244.4725	317.830
661	1880.0	246.2802	317.389
810	1909.8	244.8651	317.026

UMTS-FDD Band Ⅴ (Part 22H)

Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB Bandwidth (MHz)
4132	826.4	4.1640	4.724
4175	835.0	4.1593	4.707
4233	846.6	4.1487	4.752

UMTS-FDD BandⅡ (Part 24E)

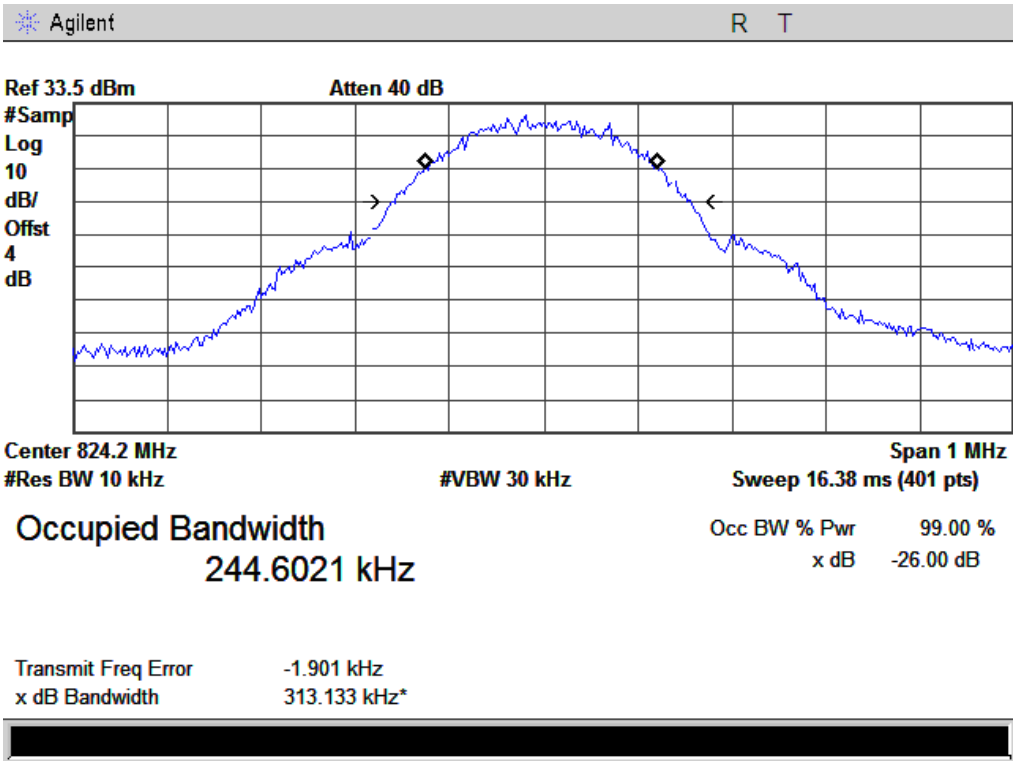
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB Bandwidth (MHz)
9262	1852.4	4.1928	4.732
9400	1880.0	4.2752	4.962
9538	1907.6	4.2429	4.883

Please refer to the following plots.

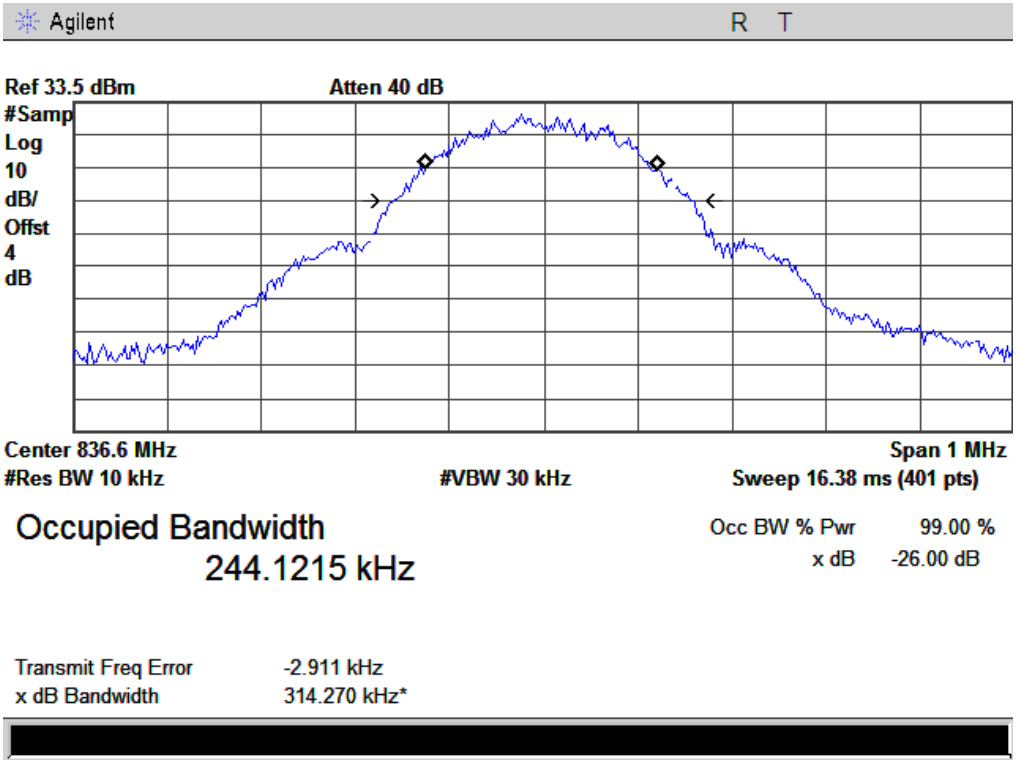
Cellular Band (Part 22H)

99% Occupied Bandwidth & 26 dB Bandwidth

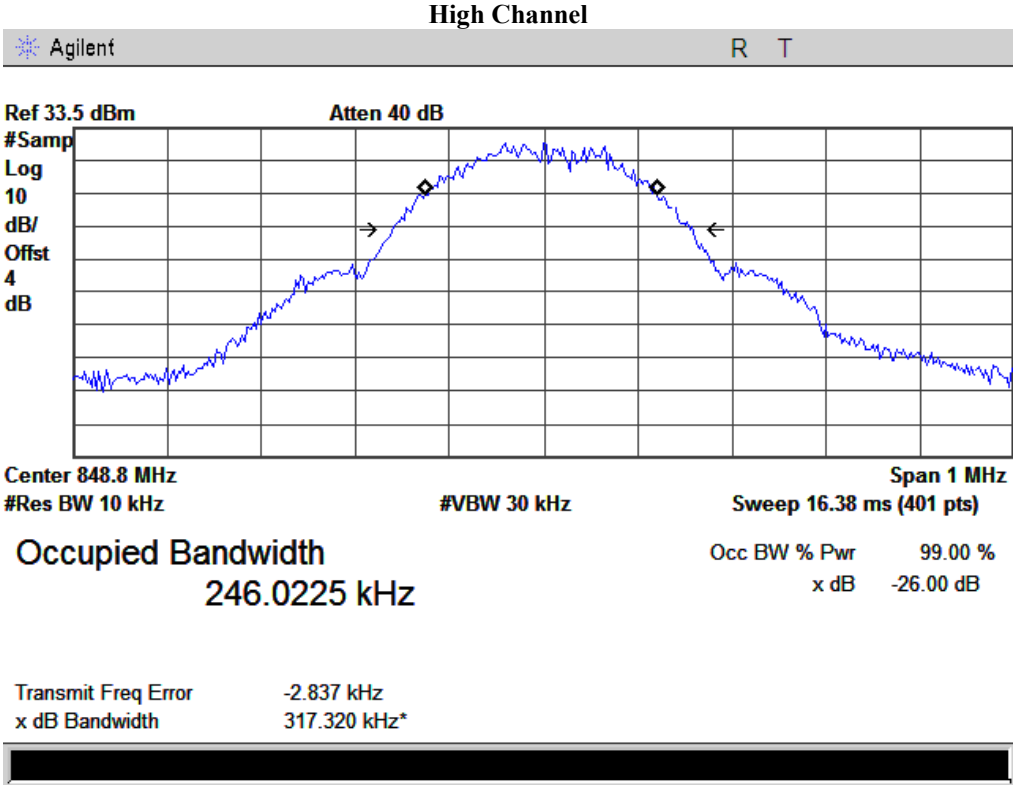
Low Channel



Middle Channel

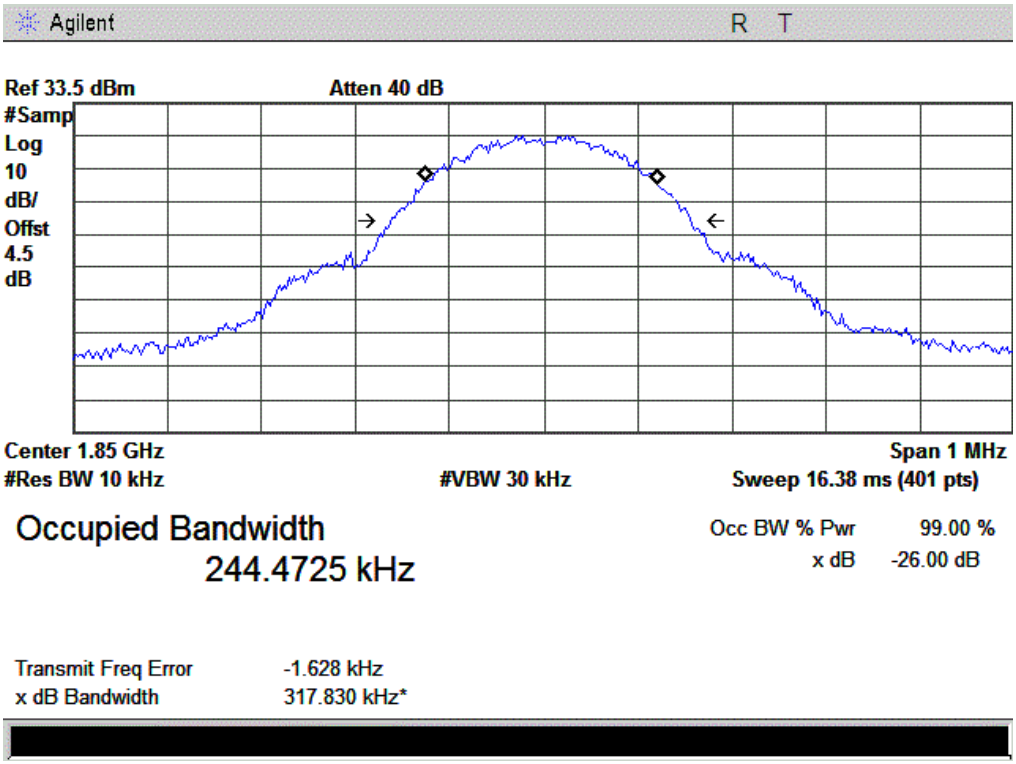


High Channel

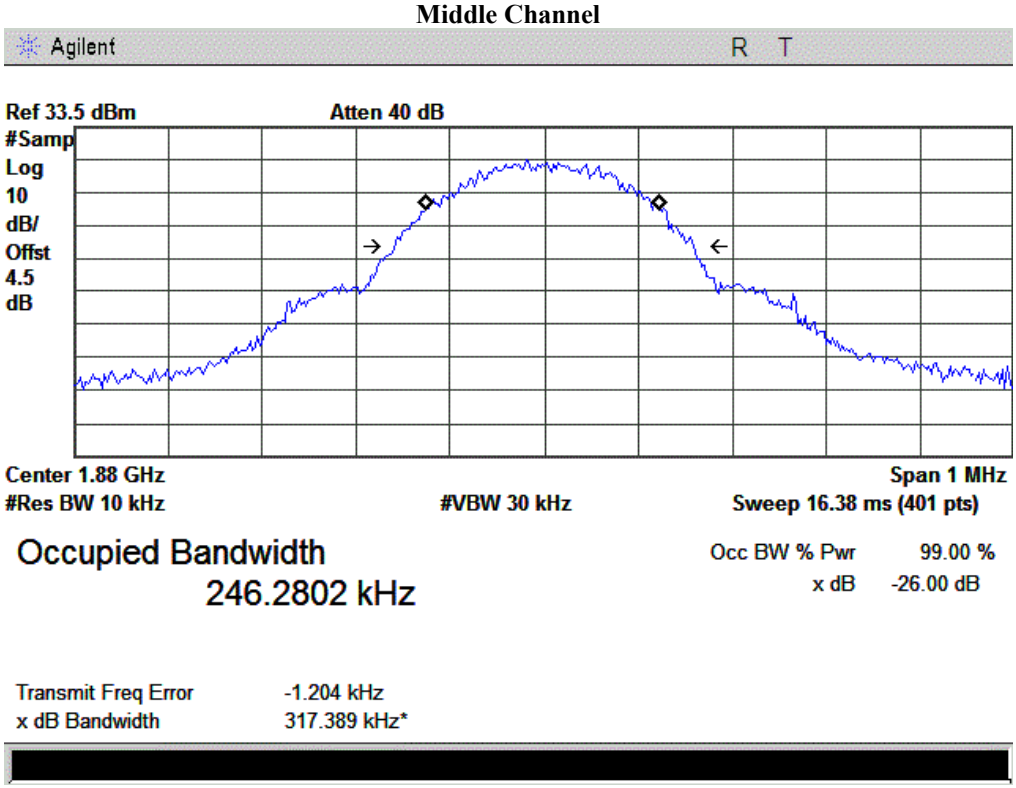


PCS Band (Part 24E)

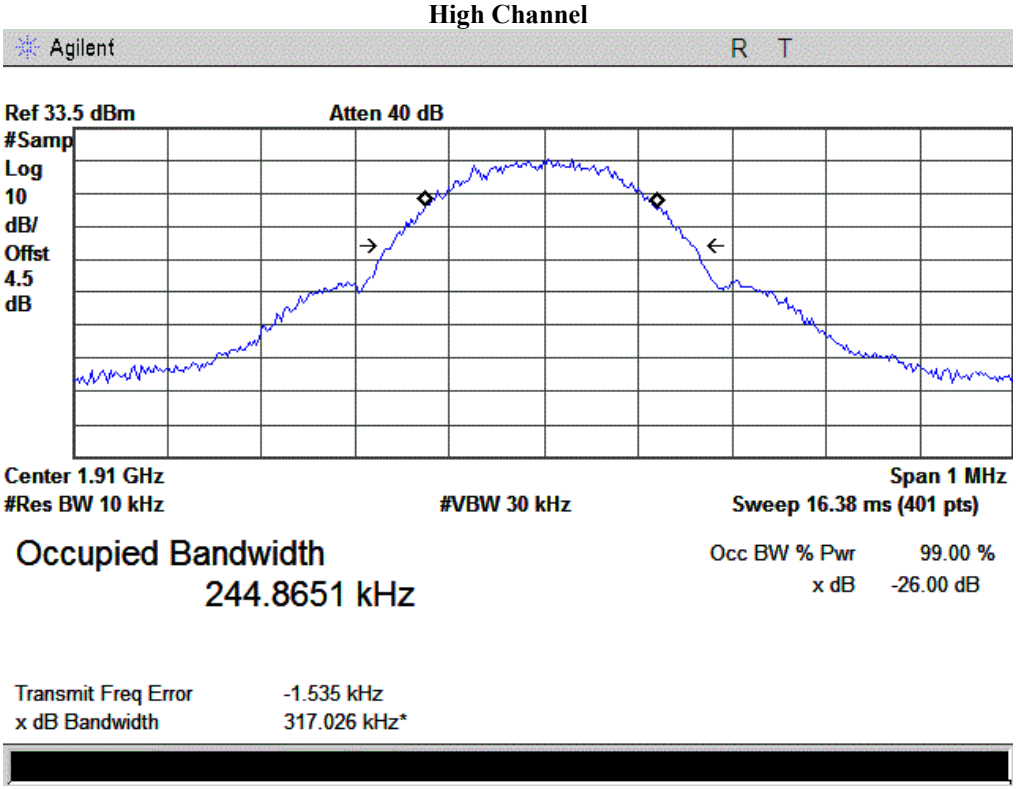
99% Occupied Bandwidth & 26 dB Bandwidth
Low Channel



Middle Channel



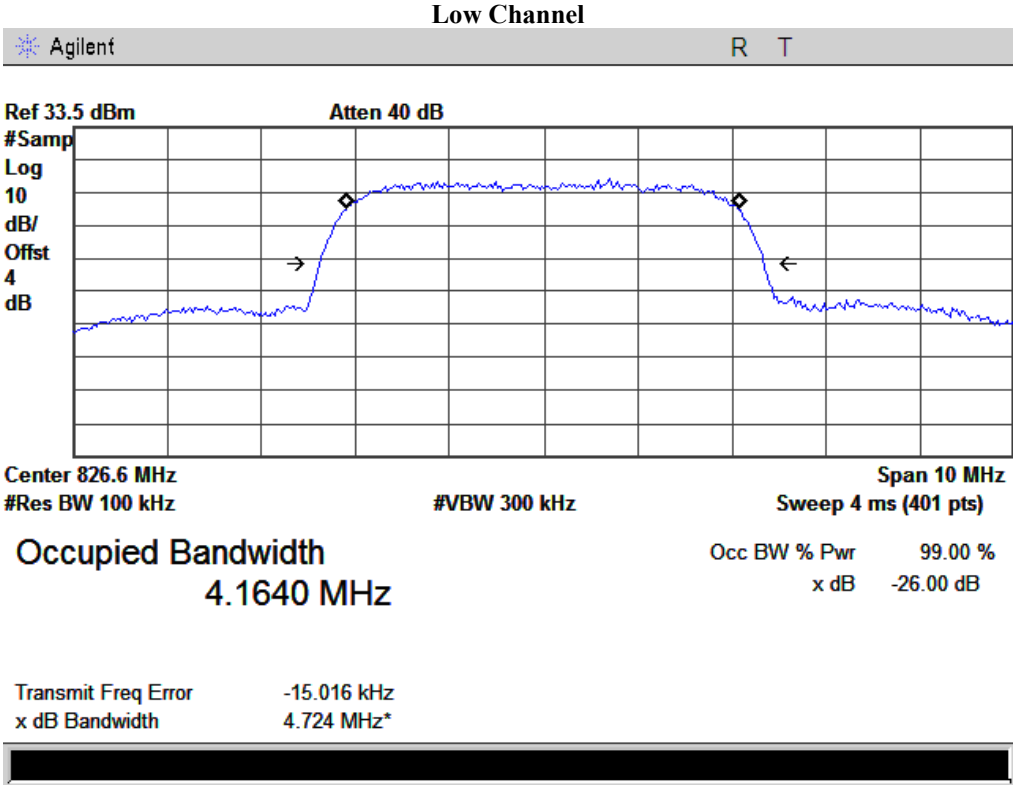
High Channel



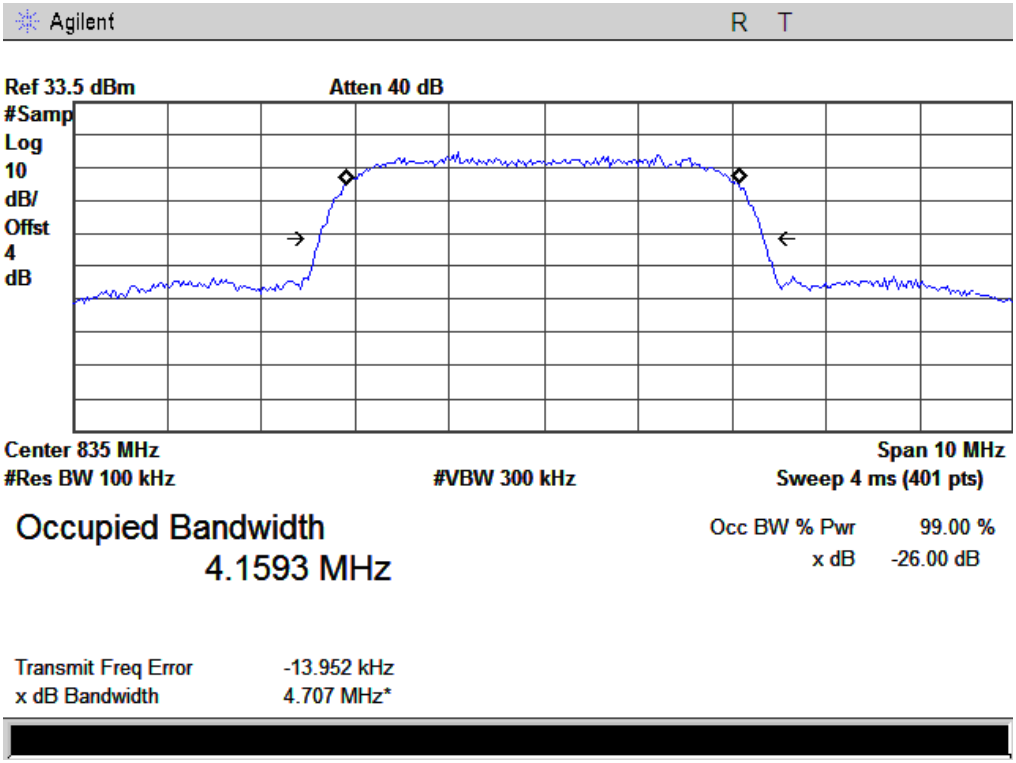
UMTS-FDD Band Ⅴ (Part 22H)

99% Occupied Bandwidth & 26 dB Bandwidth

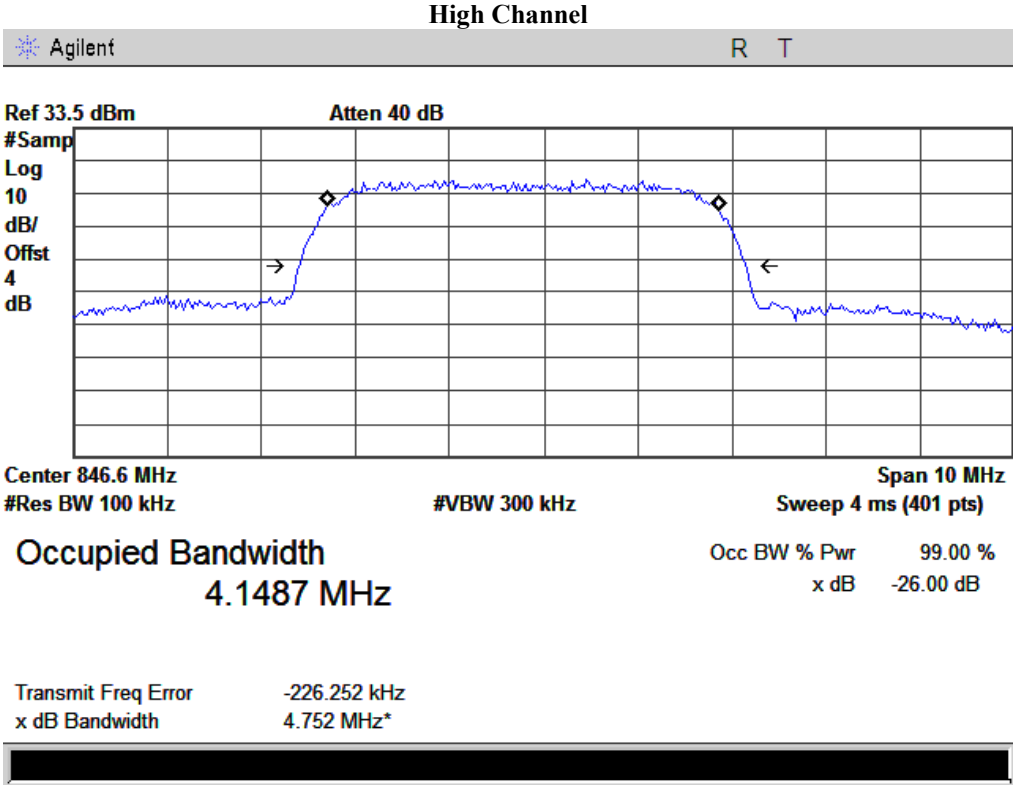
Low Channel



Middle Channel



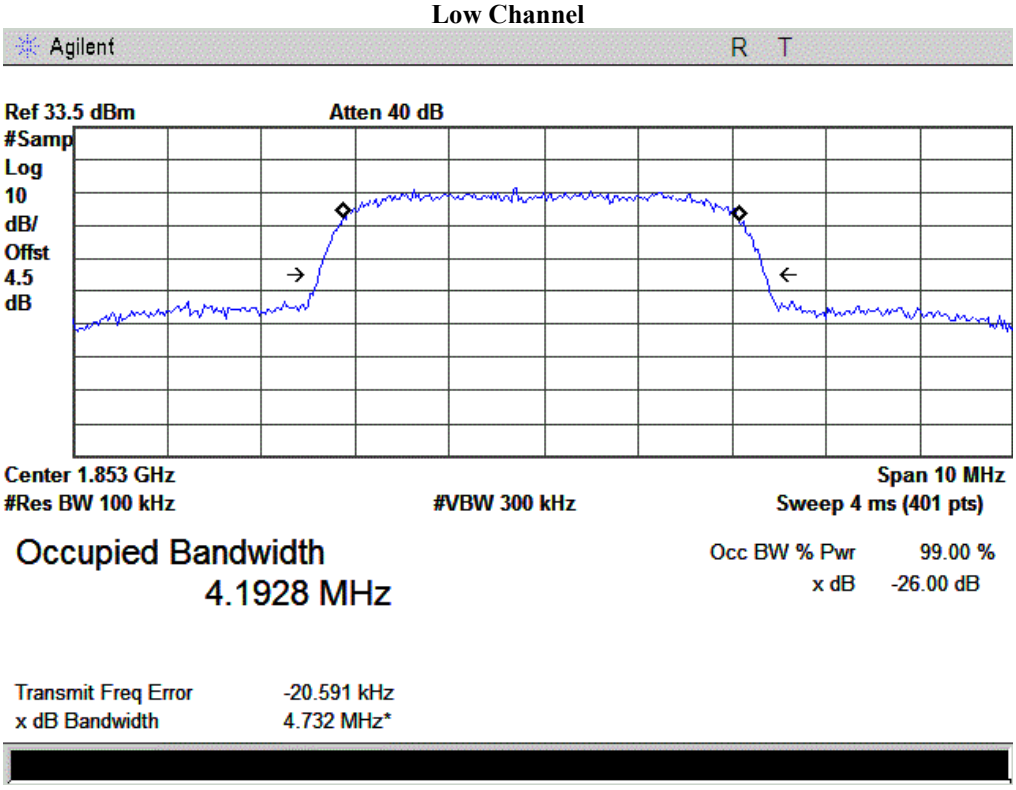
High Channel



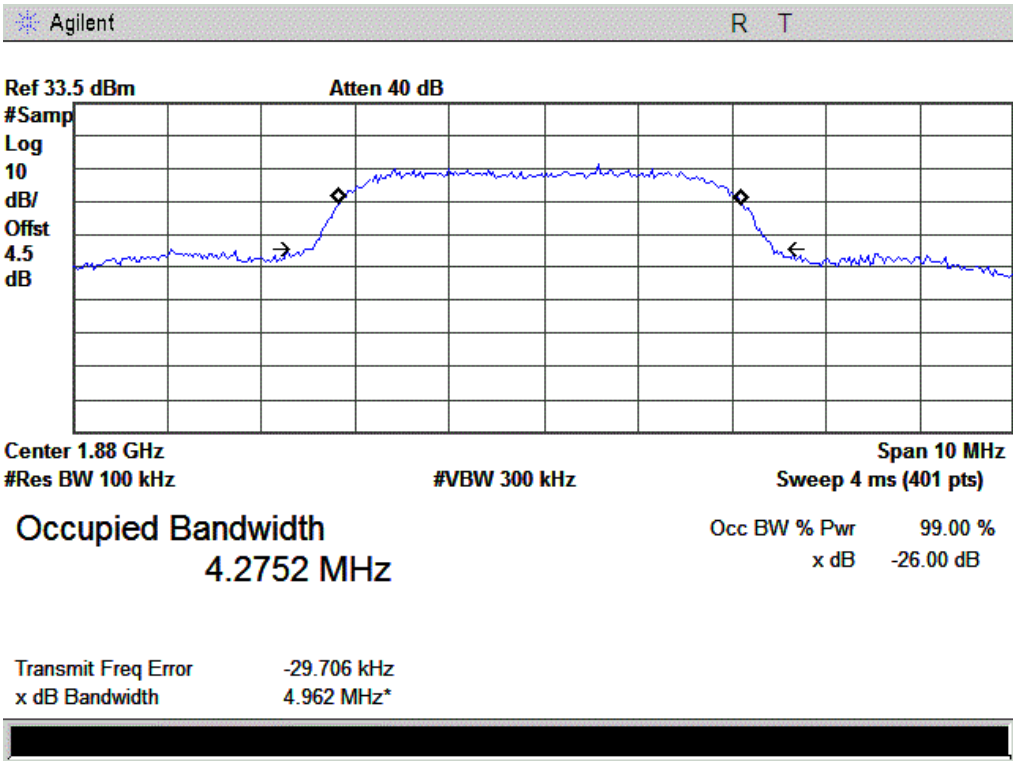
UMTS-FDD Band Ⅱ (Part 24E)

99% Occupied Bandwidth & 26 dB Bandwidth

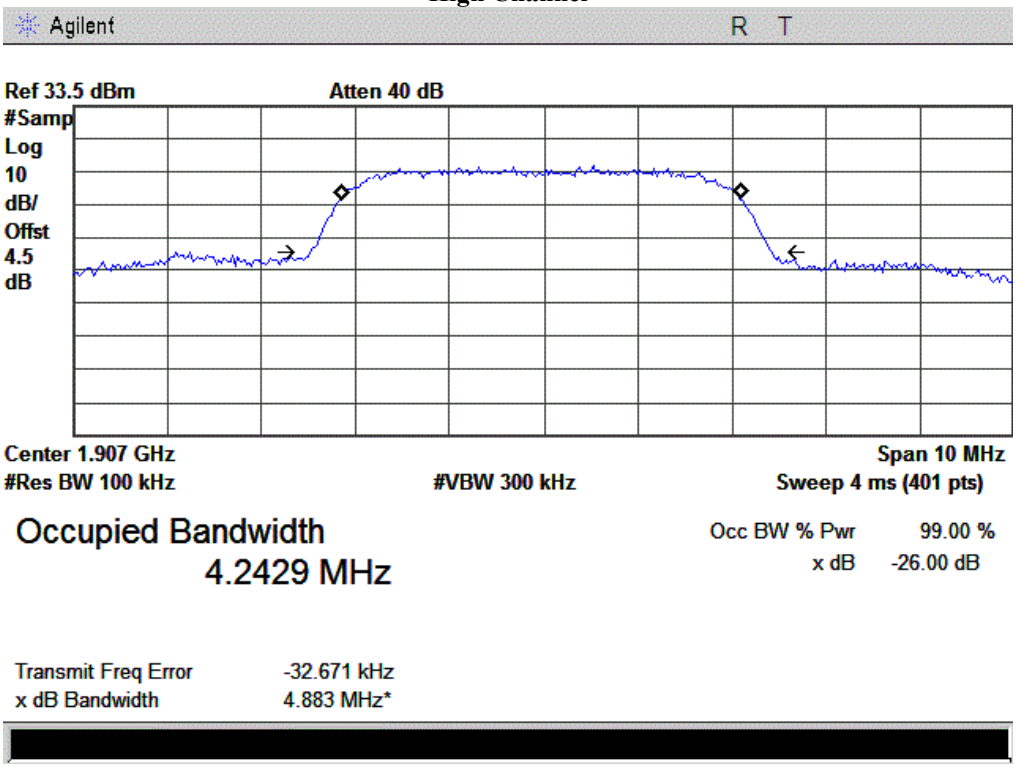
Low Channel



Middle Channel



High Channel



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	21°C
Relative Humidity	48%
Atmospheric Pressure	1010mbar

4. Test date : December 16, 2013
   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.

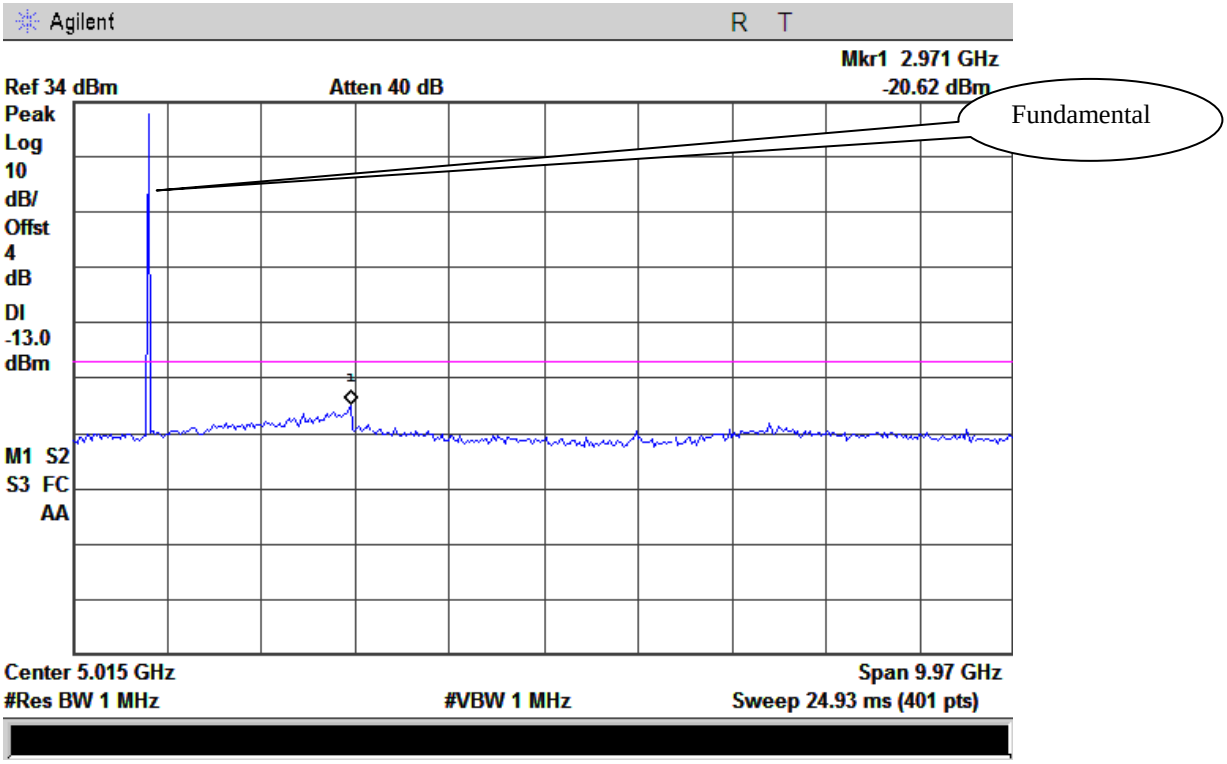
Test Result: Pass

Refer to the attached plots.

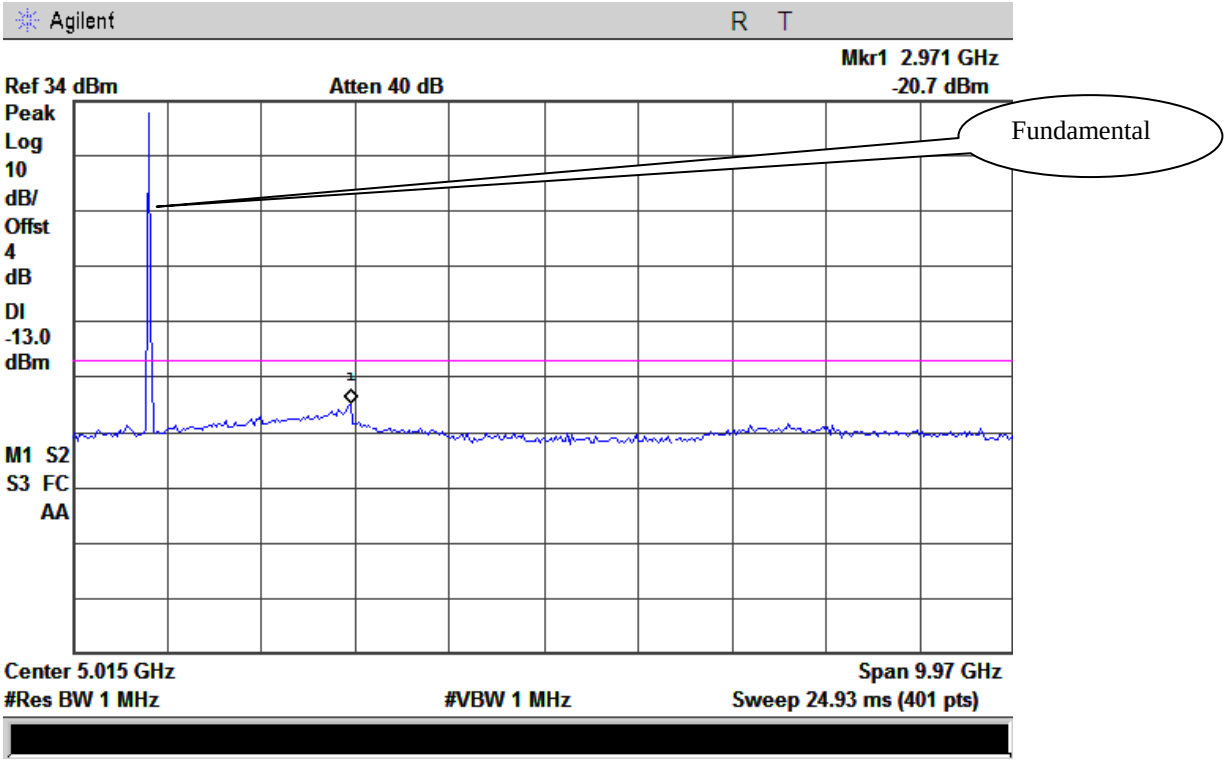
Cellular Band (Part 22H)

30MHz -10G – GSM850

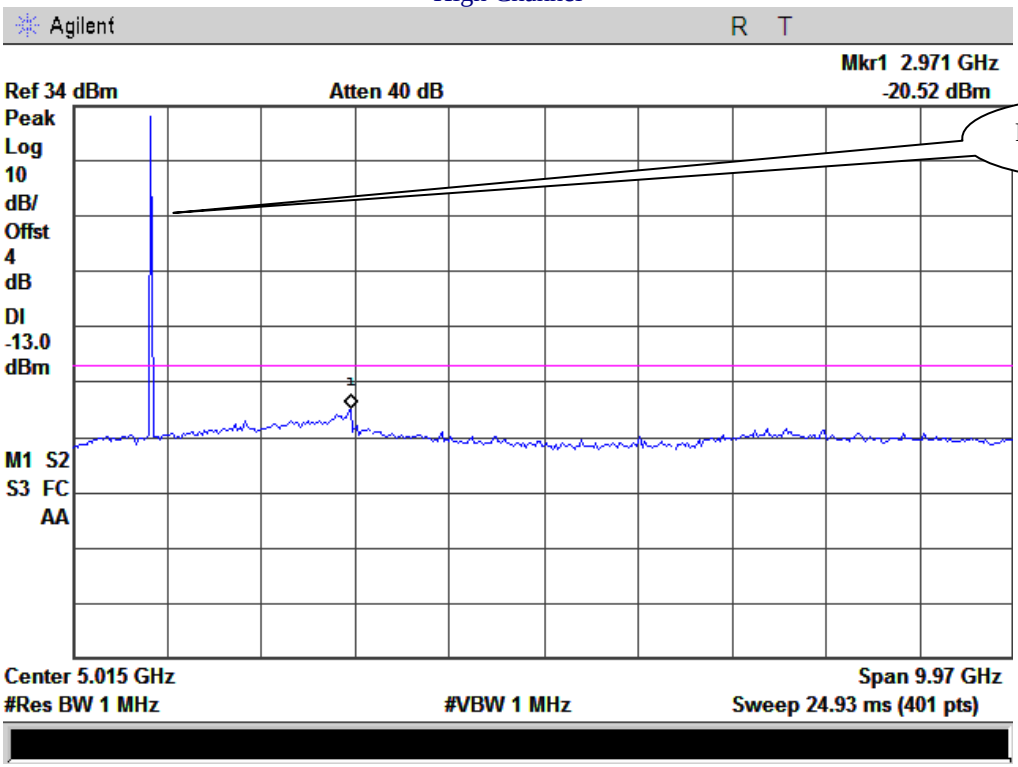
Low Channel



Middle Channel



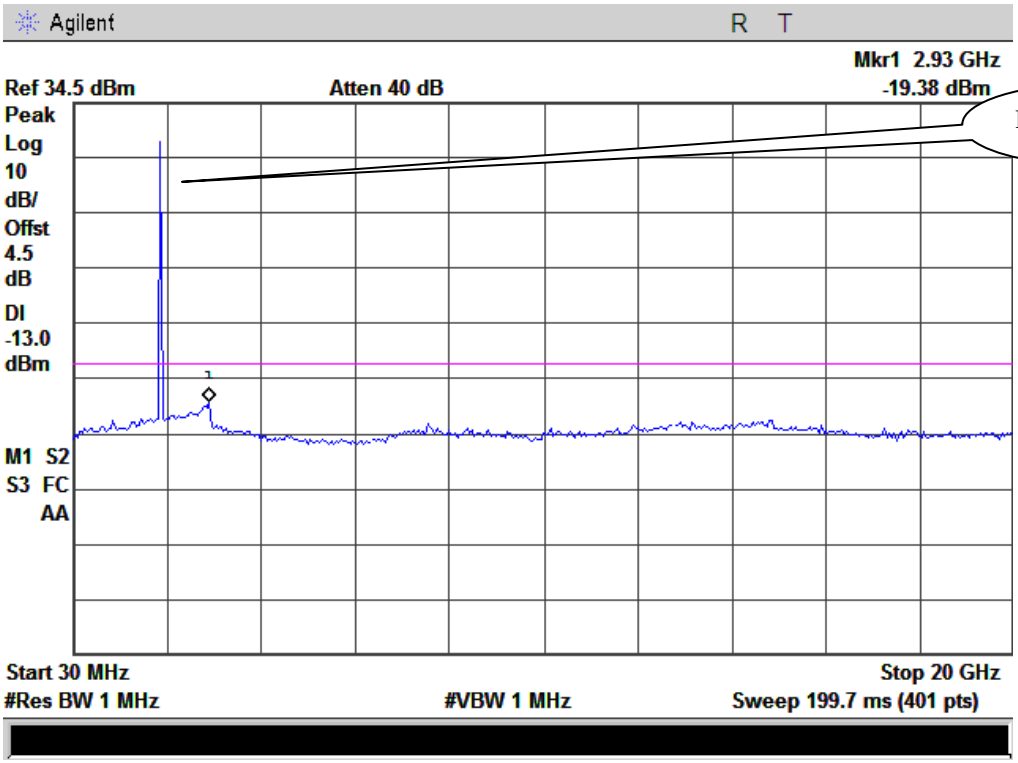
High Channel



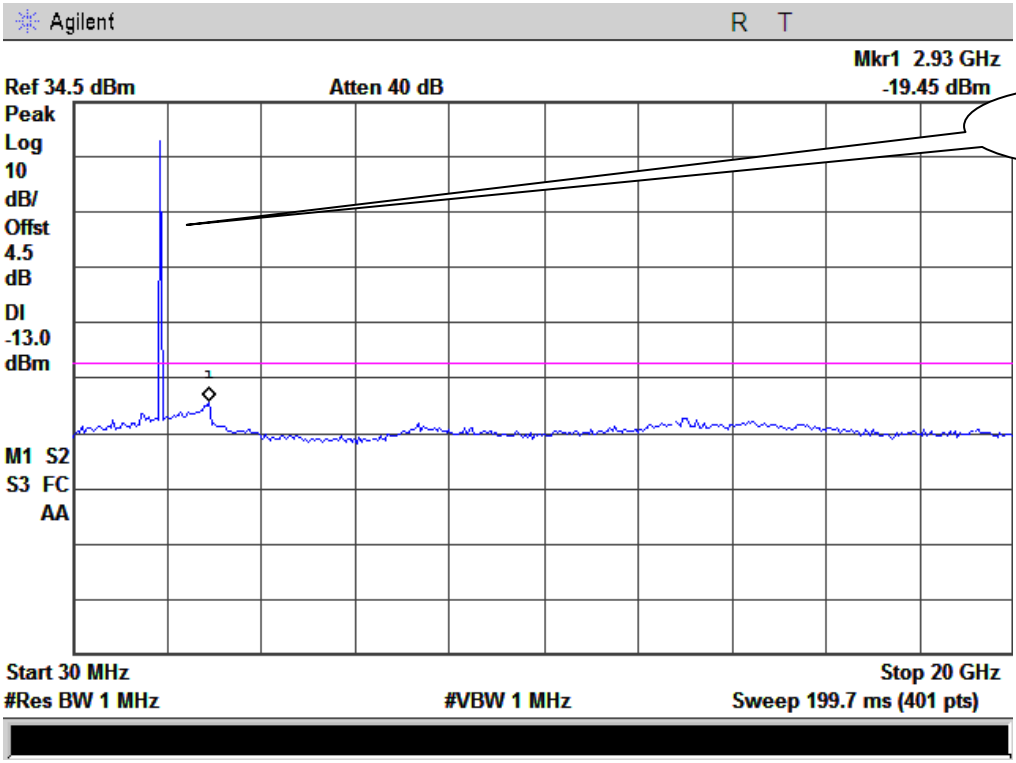
PCS Band (Part24E)

30MHz -20G – PCS1900

Low Channel

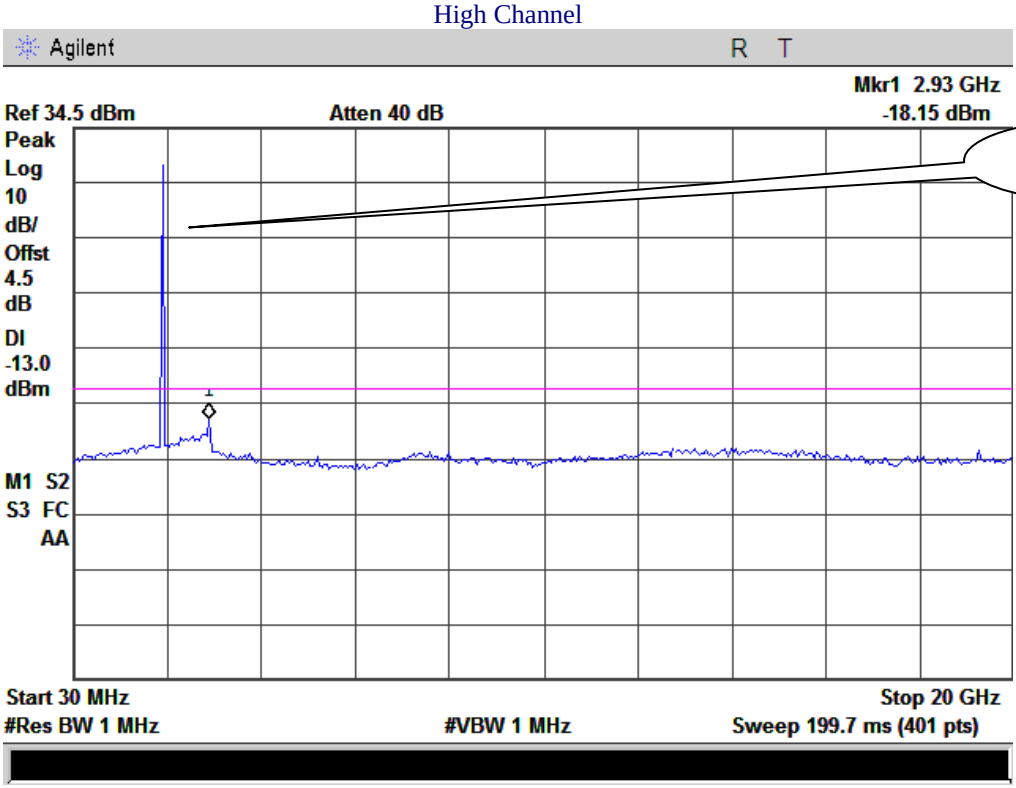


Middle Channel



Fundamental

High Channel

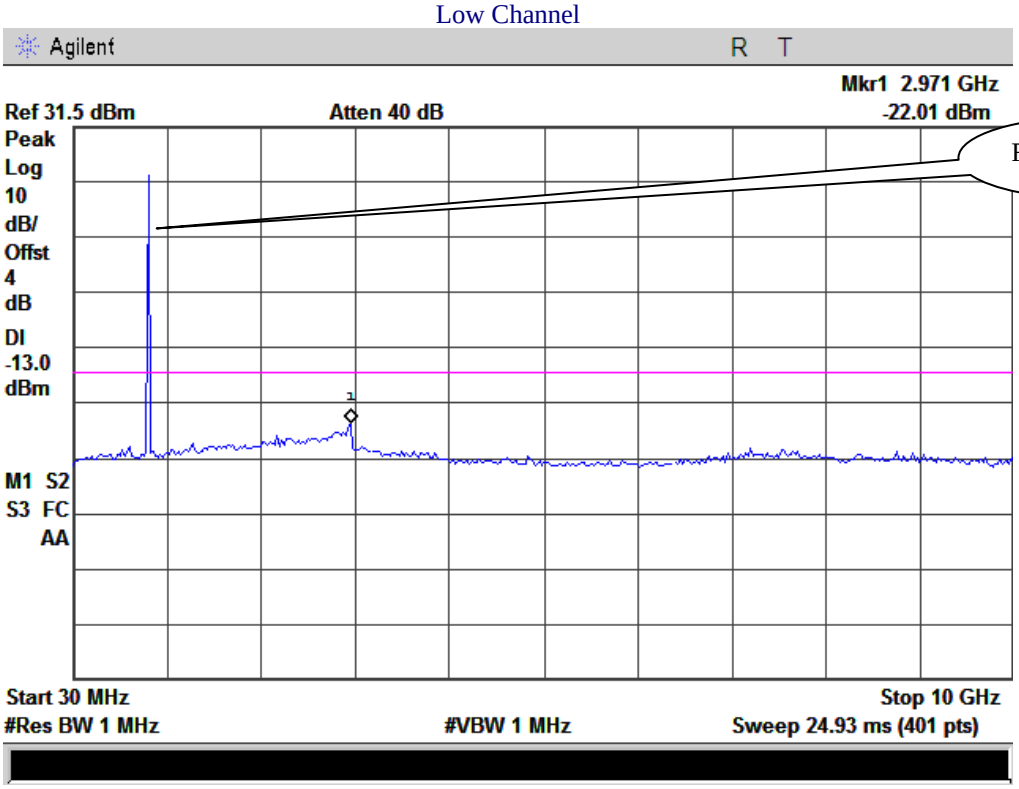


Fundamental

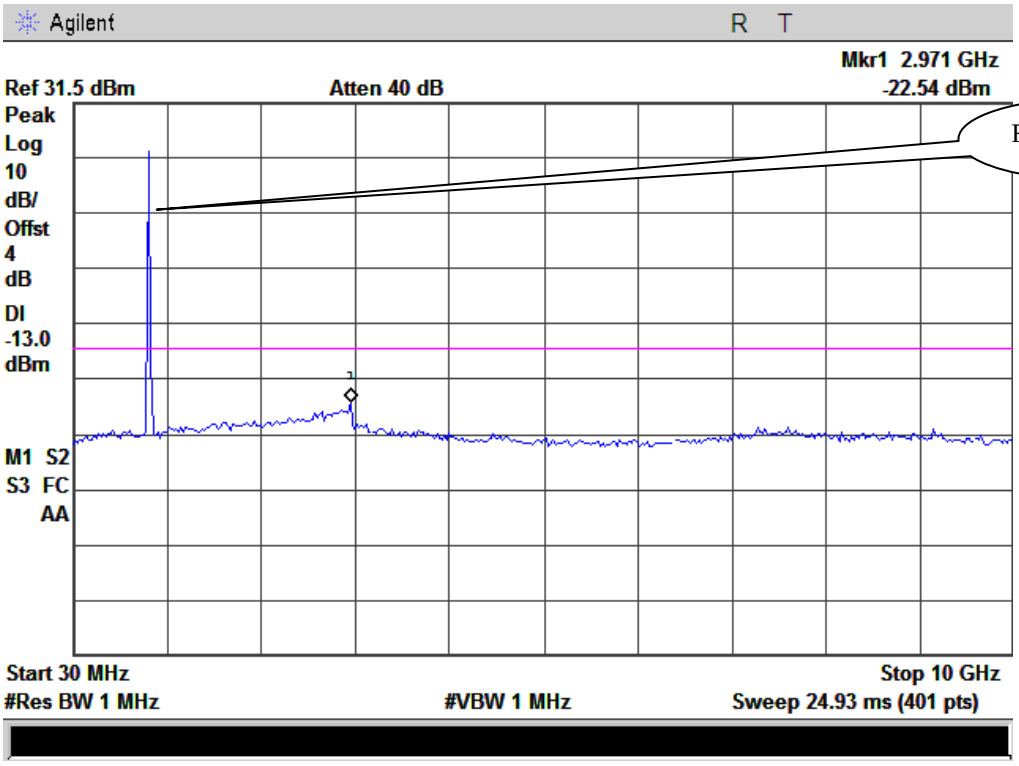
UMTS-FDD Band Ⅴ (Part 22H)

30MHz -10G – WCDMA 850

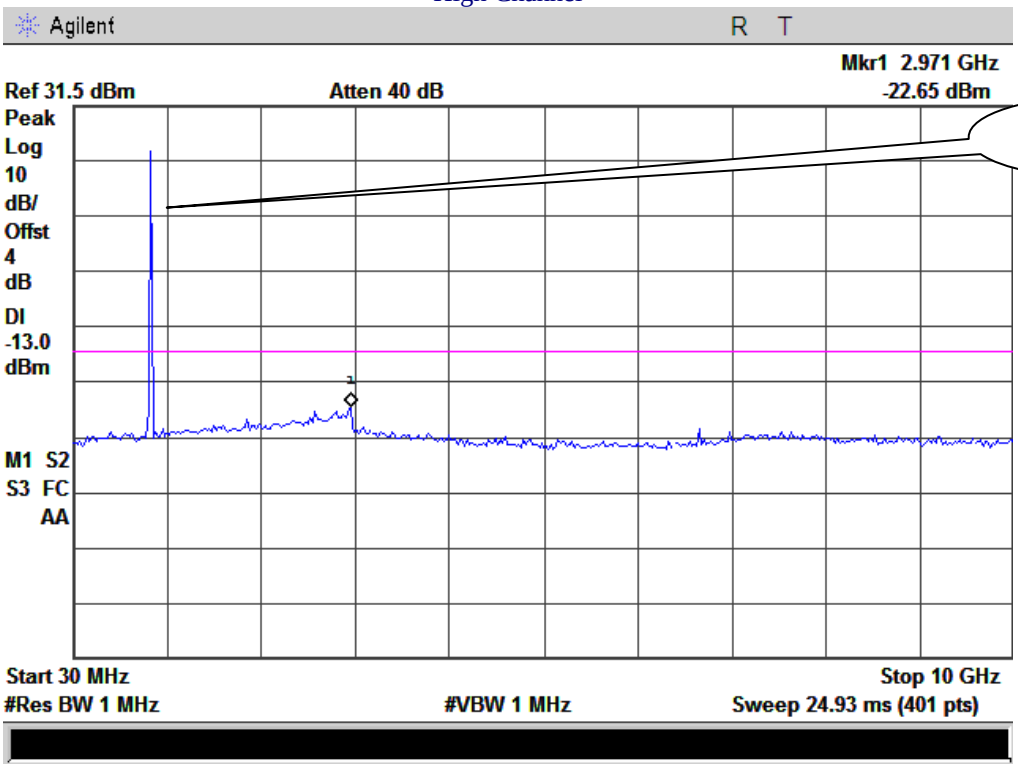
Low Channel



Middle Channel



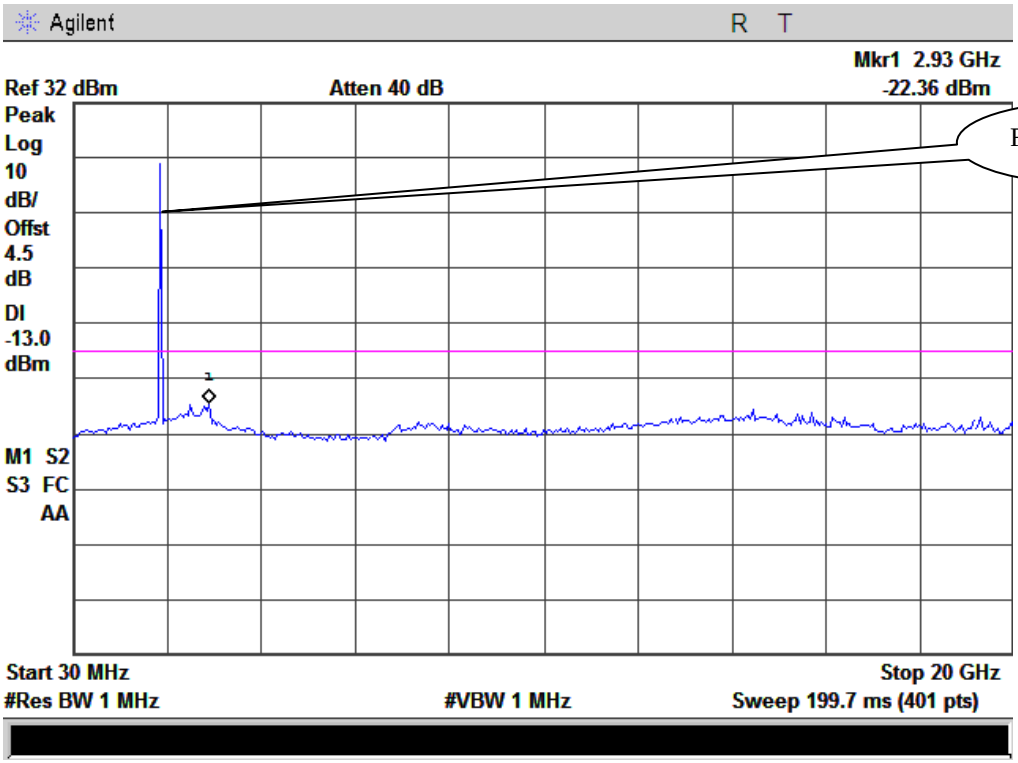
High Channel



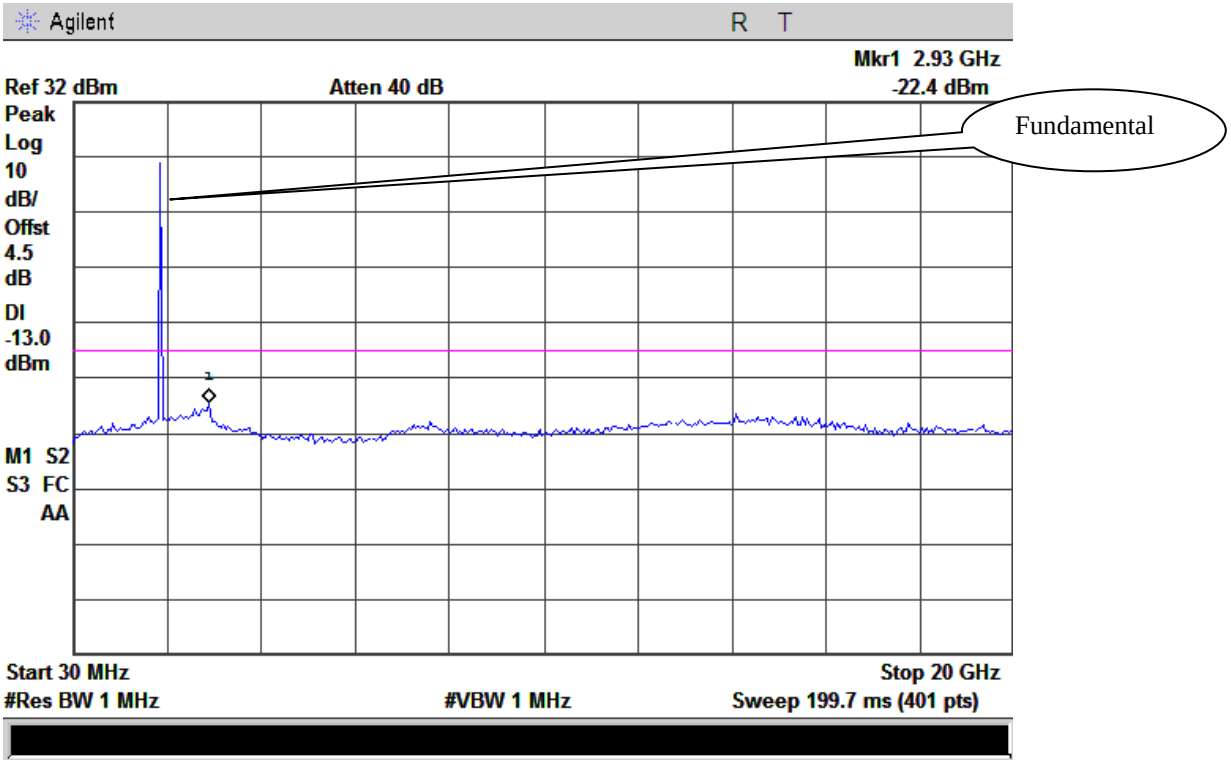
UMTS-FDD Band Ⅱ (Part24E)

30MHz -25G – WCDMA1900

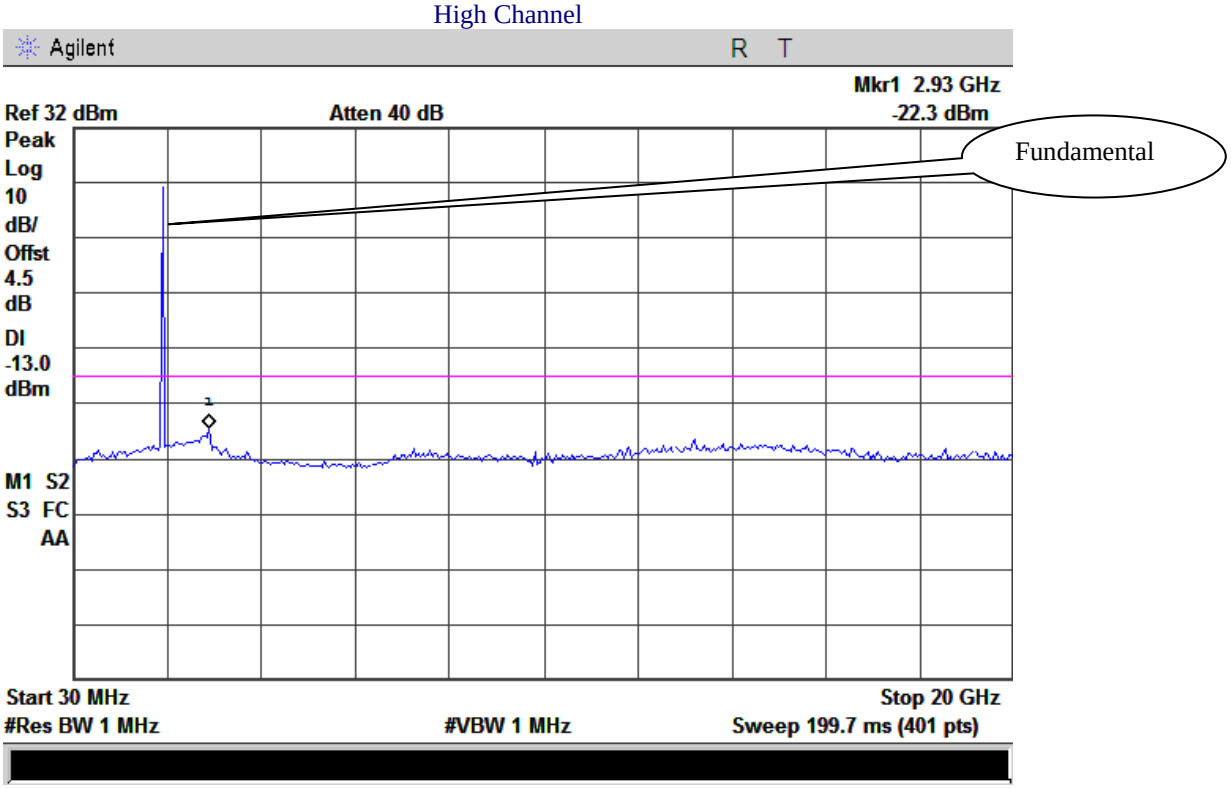
Low Channel



Middle Channel



High Channel



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	22°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar

5. Test date : December 13, 2013
   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 603B)

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

Cellular Band (Part 22H)

Low channel

Frequency (MHz)	Substituted level (dBm)	Direction (degree)	Height (cm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Amplifier (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
1648.4	-53.3	230	100	V	7.95	0.78	0	-46.13	-13	-33.13
1648.4	-52.2	271	100	H	7.95	0.78	0	-45.03	-13	-32.03
191.82	-62.42	278	120	V	4.9	0.19	0	-57.71	-13	-44.71
161.54	-61.17	275	100	H	1.9	0.18	0	-59.45	-13	-46.45

Middle channel

Frequency (MHz)	Substituted level (dBm)	Direction (degree)	Height (cm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Amplifier (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
1673.2	-52.89	226	100	V	7.95	0.78	0	-45.72	-13	-32.72
1673.2	-52.11	262	100	H	7.95	0.78	0	-44.94	-13	-31.94
191.74	-61.49	270	120	V	4.9	0.19	0	-56.78	-13	-43.78
95.42	-62.26	255	100	H	0.6	0.13	0	-61.79	-13	-48.79

High channel

Frequency (MHz)	Substituted level (dBm)	Direction (degree)	Height (cm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Amplifier (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
1697.6	-52.42	279	110	V	7.95	0.78	0	-45.25	-13	-32.25
1697.6	-51.79	261	120	H	7.95	0.78	0	-44.62	-13	-31.62
96.03	-63.41	210	120	V	0.6	0.13	0	-62.94	-13	-49.94
161.17	-62.09	277	100	H	1.9	0.18	0	-60.37	-13	-47.37

PCS Band (Part 24E)

Low channel

Frequency (MHz)	Substituted level (dBm)	Direction (degree)	Height (cm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Amplifier (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3700.4	-55.81	261	100	V	10.25	2.73	0	-48.29	-13	-35.29
3700.4	-56.21	279	100	H	10.25	2.73	0	-48.69	-13	-35.69
191.74	-62.49	231	120	V	1.1	0.19	0	-61.58	-13	-48.58
161.37	-63.54	275	100	H	1.1	0.18	0	-62.62	-13	-49.62

Middle channel

Frequency (MHz)	Substituted level (dBm)	Direction (degree)	Height (cm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Amplifier (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3760	-55.35	263	100	V	10.25	2.73	0	-47.83	-13	-34.83
3760	-55.49	269	100	H	10.25	2.73	0	-47.97	-13	-34.97
95.14	-62.12	279	100	V	0.9	0.13	0	-61.35	-13	-48.35
96.25	-62.35	284	100	H	0.9	0.13	0	-61.58	-13	-48.58

High channel

Frequency (MHz)	Substituted level (dBm)	Direction (degree)	Height (cm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Amplifier (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3819.6	-55.69	208	110	V	10.36	2.73	0	-48.06	-13	-35.06
3819.6	-55.54	249	110	H	10.36	2.73	0	-47.91	-13	-34.91
191.82	-63.02	215	100	V	4.9	0.19	0	-58.31	-13	-45.31
161.92	-63.12	261	100	H	1.9	0.18	0	-61.4	-13	-48.4

UMTS-FDD Band Ⅴ (Part 22H)

Low channel

Frequency (MHz)	Substituted level (dBm)	Direction (degree)	Height (cm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Amplifier (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
1652.8	-55.23	265	100	V	7.95	0.78	0	-48.06	-13	-35.06
1652.8	-55.47	285	100	H	7.95	0.78	0	-48.3	-13	-35.3
191.24	-62.82	251	100	V	4.9	0.19	0	-58.11	-13	-45.11
95.28	-63.07	230	110	H	0.6	0.13	0	-62.6	-13	-49.6

Middle channel

Frequency (MHz)	Substituted level (dBm)	Direction (degree)	Height (cm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Amplifier (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
1670	-55.31	246	100	V	7.95	0.78	0	-48.14	-13	-35.14
1670	-54.26	188	100	H	7.95	0.78	0	-47.09	-13	-34.09
161.22	-63.31	221	100	V	1.9	0.18	0	-61.59	-13	-48.59
191.05	-63.25	212	110	H	4.9	0.19	0	-58.54	-13	-45.54

High channel

Frequency (MHz)	Substituted level (dBm)	Direction (degree)	Height (cm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Amplifier (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
1693.2	-52.25	261	110	V	7.95	0.78	0	-45.08	-13	-32.08
1693.2	-53.40	259	120	H	7.95	0.78	0	-46.23	-13	-33.23
95.84	-63.26	221	100	V	0.6	0.13	0	-62.79	-13	-49.79
161.33	-62.41	213	110	H	1.9	0.18	0	-60.69	-13	-47.69

UMTS-FDD Band Ⅱ (Part 24E)

Low channel

Frequency (MHz)	Substituted level (dBm)	Direction (degree)	Height (cm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Amplifier (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3704.8	-55.20	256	130	V	10.25	2.73	0	-47.68	-13	-34.68
3704.8	-55.77	179	120	H	10.25	2.73	0	-48.25	-13	-35.25
161.22	-63.14	19	110	V	1.9	0.18	0	-61.42	-13	-48.42
192.07	-62.88	26	110	H	4.6	0.19	0	-58.47	-13	-45.47

Middle channel

Frequency (MHz)	Substituted level (dBm)	Direction (degree)	Height (cm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Amplifier (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3760	-55.41	222	120	V	10.25	2.73	0	-47.89	-13	-34.89
3760	-55.62	255	110	H	10.25	2.73	0	-48.10	-13	-35.10
95.22	-62.91	245	110	V	0.6	0.13	0	-62.44	-13	-49.44
162.52	-63.16	211	110	H	1.9	0.18	0	-61.44	-13	-48.44

High channel

Frequency (MHz)	Substituted level (dBm)	Direction (degree)	Height (cm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Amplifier (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3815.2	-55.46	235	100	V	10.36	2.73	0	-47.83	-13	-34.83
3815.2	-55.36	264	120	H	10.36	2.73	0	-47.73	-13	-34.73
161.30	-63.12	231	110	V	1.9	0.18	0	-61.40	-13	-48.40
96.21	-62.90	217	120	H	0.6	0.13	0	-62.43	-13	-49.43

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	21°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar

4. Test date : December 19, 2013
   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.

Cellular Band (Part 22H)

Frequency (MHz)	Emission (dBm)	Limit (dBm)
823.9800	-13.39	-13
849.0150	-13.66	-13

PCS Band (Part 24E)

Frequency (MHz)	Emission (dBm)	Limit (dBm)
1849.9775	-18.02	-13
1910.0200	-19.10	-13

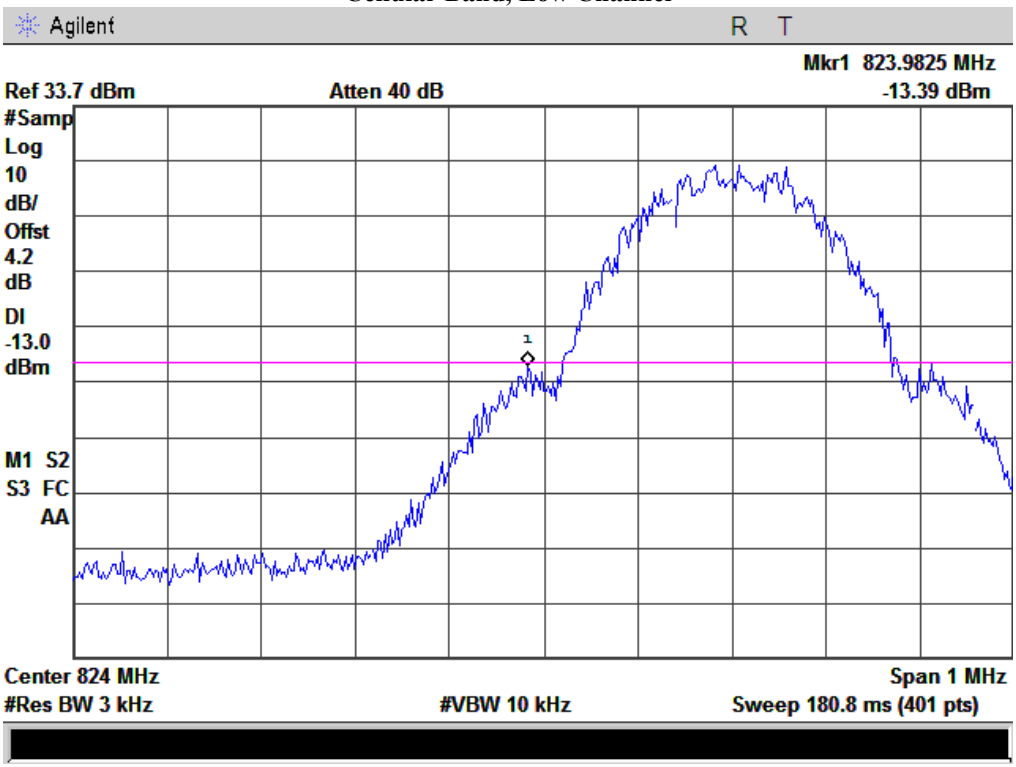
UMTS-FDD Band Ⅴ (Part 22H)

Frequency (MHz)	Emission (dBm)	Limit (dBm)
824.000	-23.21	-13
849.000	-22.72	-13

UMTS-FDD Band Ⅱ (Part 24E)

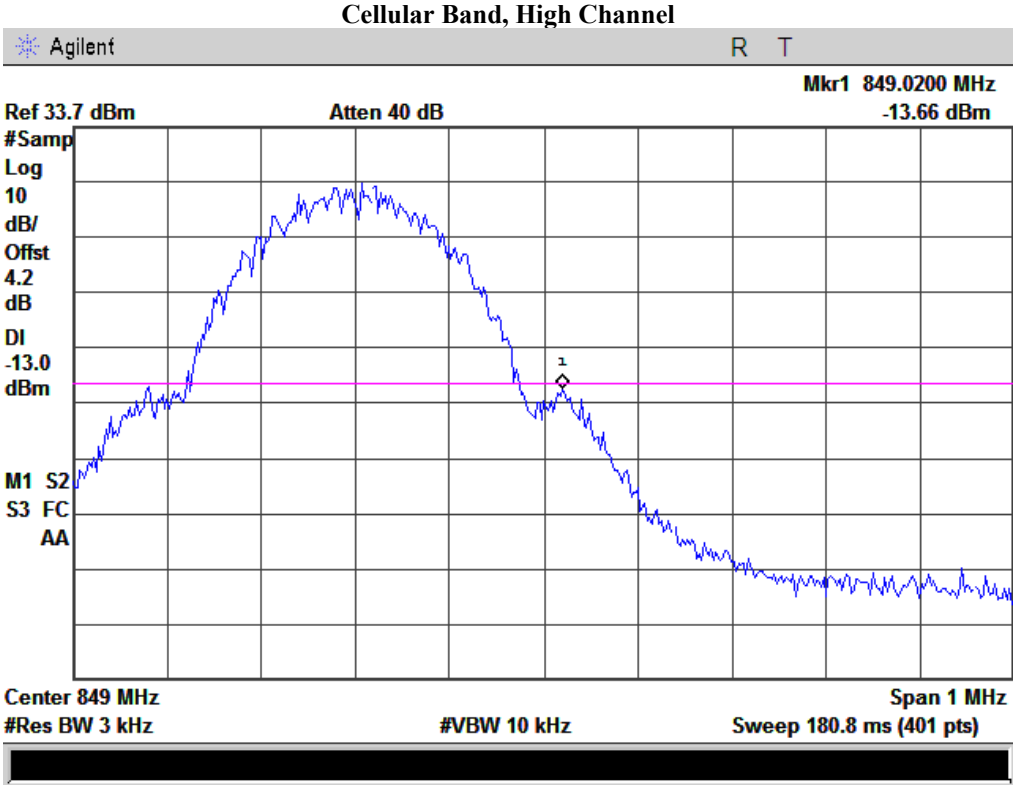
Frequency (MHz)	Emission (dBm)	Limit (dBm)
1850.000	-22.28	-13
1910.000	-15.77	-13

Cellular Band, Low Channel



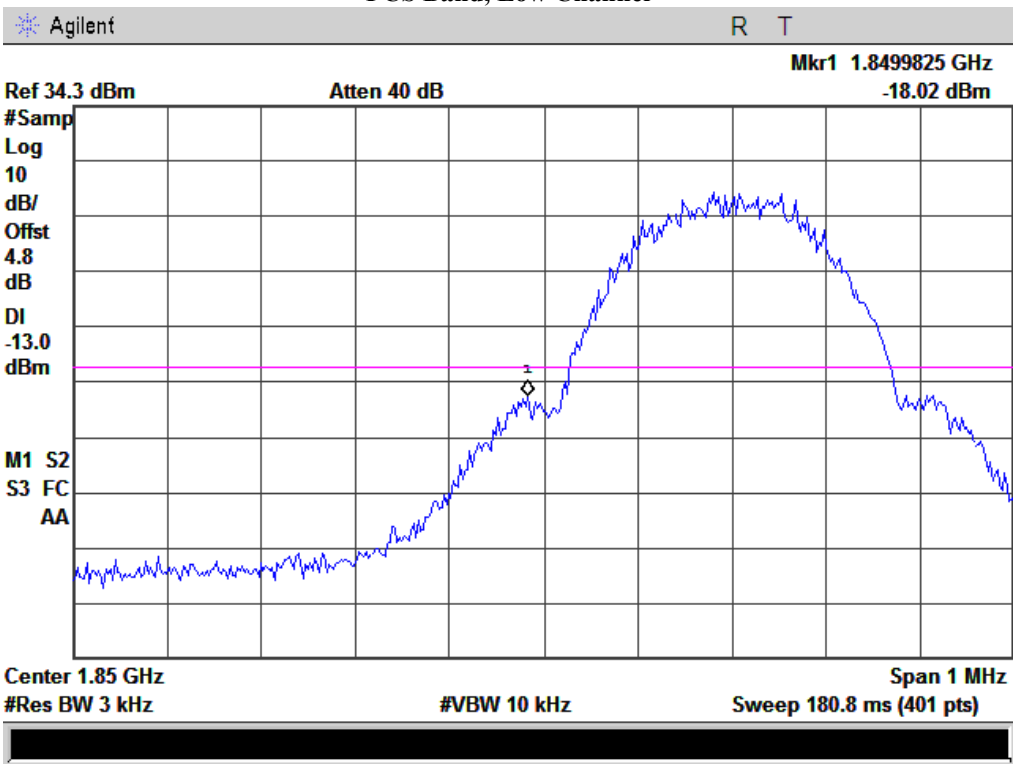
Note: Offset=Cable loss (4.0) + 10log (3.13/3)=4.0+0.2=4.2 dB

Cellular Band, High Channel



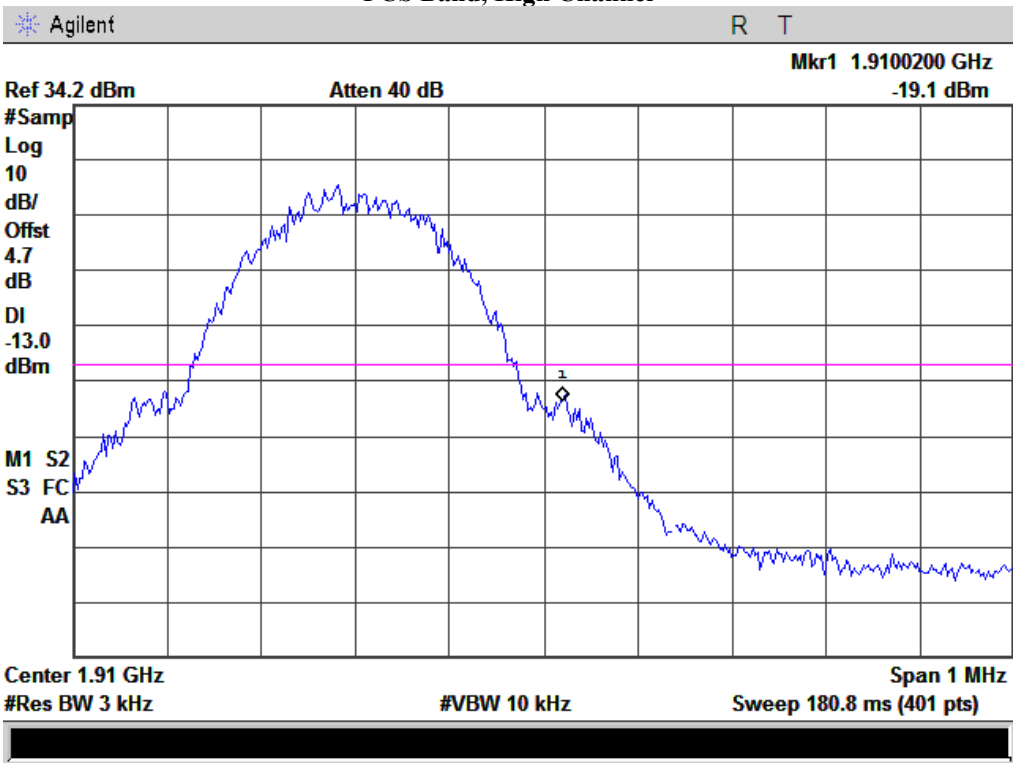
Note: Offset=Cable loss (4.0) + 10log (3.17/3)=4.0+0.2=4.2 dB

PCS Band, Low Channel



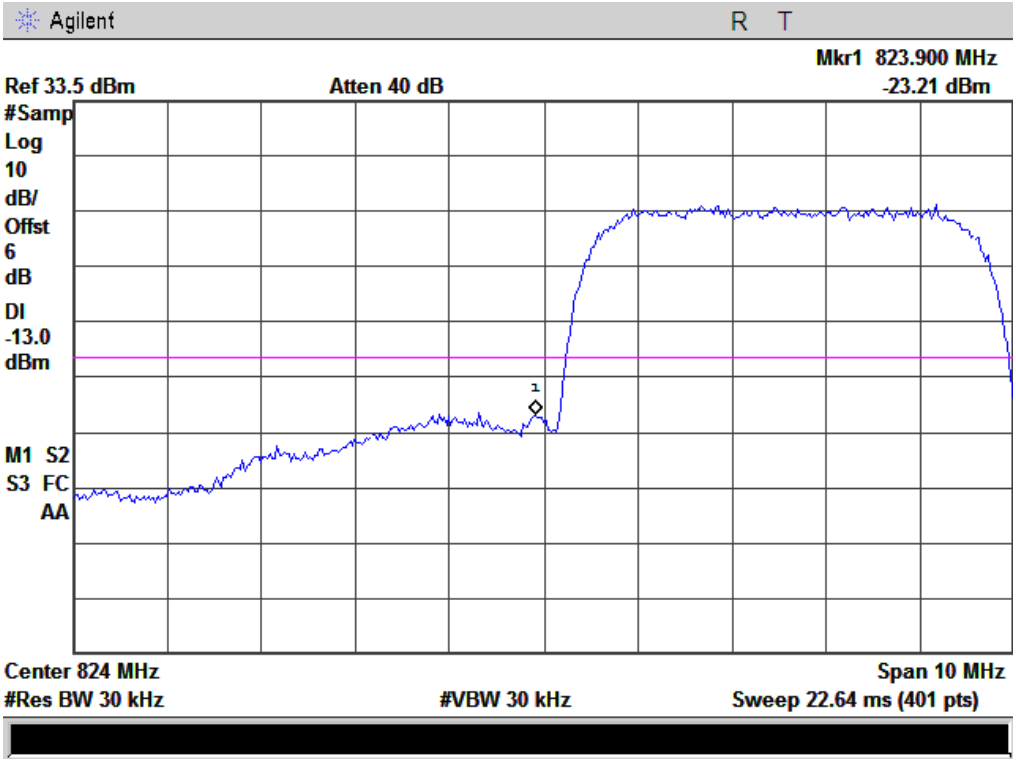
Note: Offset=Cable loss (4.5) + 10log (3.19/3)=4.5+0.3=4.8 dB

PCS Band, High Channel



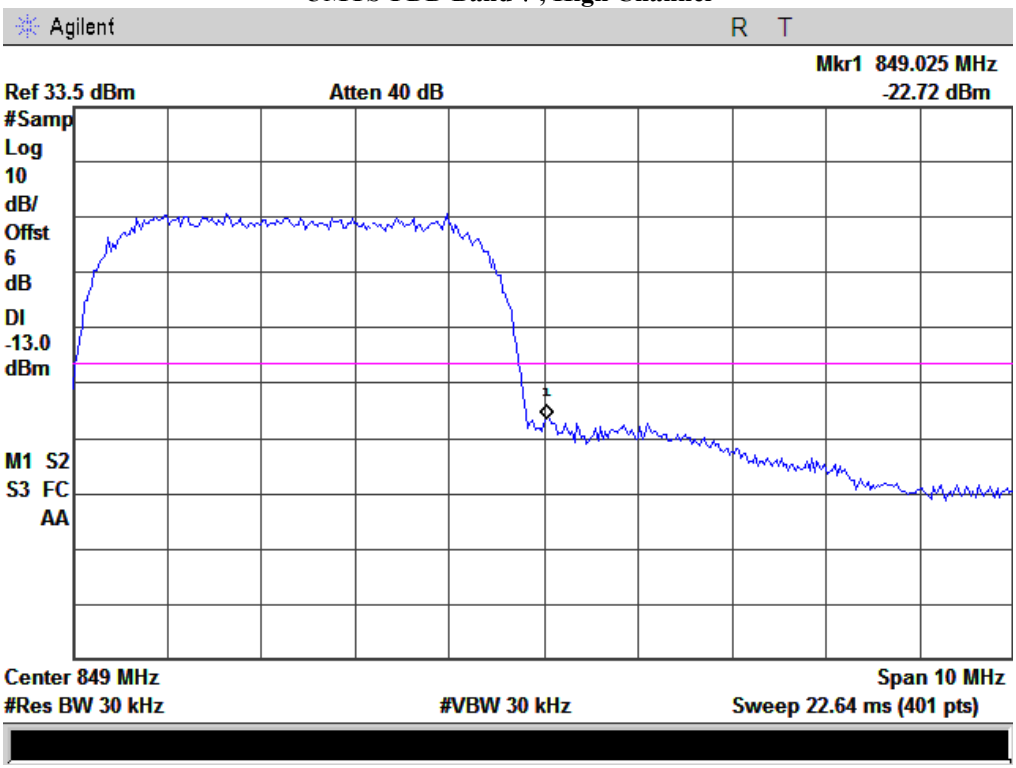
Note: Offset=Cable loss (4.5) + 10log (3.16/3)=4.5+0.2=4.7 dB

UMTS-FDD Band Ⅴ, Low Channel



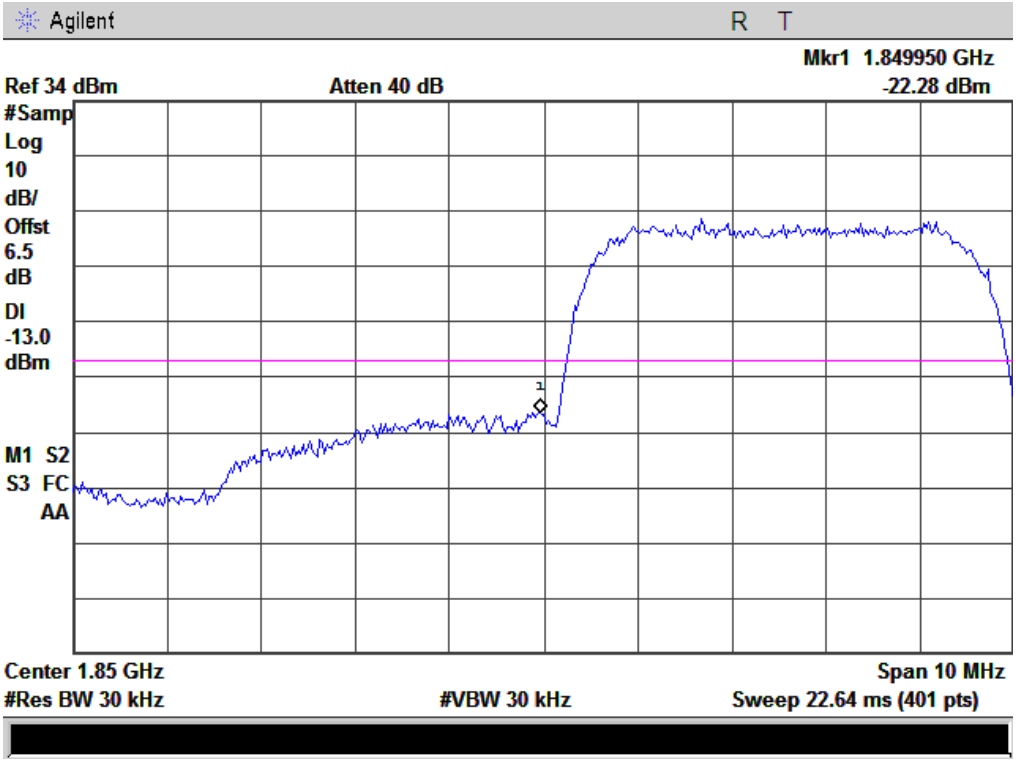
Note: Offset=Cable loss (4.0) + 10log (4.72/3)=4.0+2=6dB

UMTS-FDD Band Ⅴ, High Channel



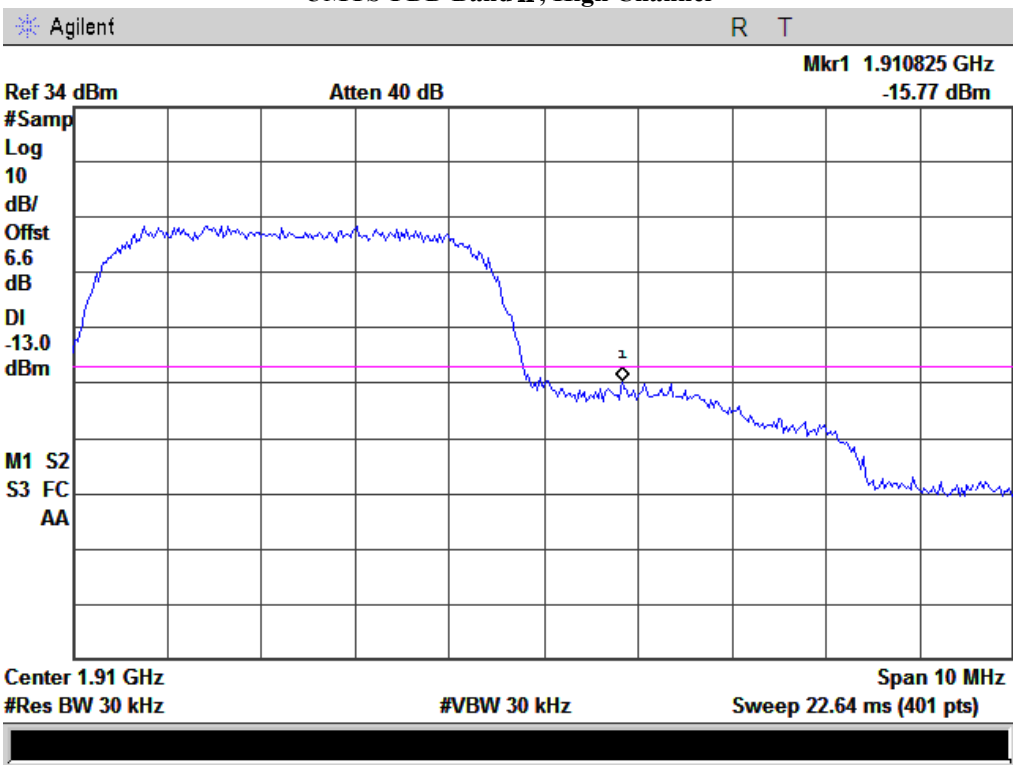
Note: Offset=Cable loss (4.0) + 10log (4.75/3)=4.0+2=6dB

UMTS-FDD Band Ⅱ, Low Channel



Note: Offset=Cable loss (4.5) + 10log (4.73/3)=4.5+2=6.5dB

UMTS-FDD Band Ⅱ, High Channel



Note: Offset=Cable loss (4.5) + 10log (4.88/3)=4.5+2.1=6.6dB

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

1.	Environmental Conditions	Temperature	21°C
		Relative Humidity	48%
		Atmospheric Pressure	1010mbar
2.	Test date : December 16, 2013		
	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

Frequency Stability versus Temperature: The Frequency tolerance of the carrier signal shall be maintained within 2.5ppm of the operating frequency over a temperature variation of -10ºC to +55ºC at normal supply voltage.

Cellular Band (Part 22H)

Middle Channel, f_o = 836.6 MHz				
Temperature (℃)	**Power Supplied (V_{DC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Limit (ppm)**
-10	3.7	15	0.018	2.5
0		14	0.017	2.5
10		21	0.025	2.5
20		22	0.026	2.5
30		24	0.029	2.5
40		22	0.026	2.5
50		23	0.027	2.5
55		27	0.032	2.5
25	4.2	20	0.024	2.5
	3.5	12	0.014	2.5

PCS Band (Part 24E)

Middle Channel, f_o = 1880 MHz				
Temperature (℃)	**Power Supplied (V_{DC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Limit (ppm)**
-10	3.7	14	0.007	2.5
0		22	0.012	2.5
10		30	0.016	2.5
20		27	0.014	2.5
30		31	0.016	2.5
40		31	0.016	2.5
50		25	0.013	2.5
55		15	0.008	2.5
25	4.2	14	0.007	2.5
	3.5	22	0.012	2.5

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	11	0.013	2.5
0		13	0.016	2.5
10		10	0.012	2.5
20		15	0.018	2.5
30		14	0.017	2.5
40		21	0.025	2.5
50		14	0.017	2.5
55		12	0.014	2.5
25	4.2	18	0.022	2.5
	3.5	15	0.018	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	4	0.002	2.5
0		-5	-0.003	2.5
10		8	0.004	2.5
20		-2	-0.001	2.5
30		10	0.005	2.5
40		5	0.003	2.5
50		7	0.004	2.5
55		5	0.003	2.5
25	4.2	8	0.004	2.5
	3.5	-5	-0.003	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	CFG038	10/25/2013	10/24/2014
Power Splitter	1#	1#	02/02/2013	02/01/2014
Universal Radio Communication Tester	CMU200	121393	09/17/2013	09/16/2014
Temperature/Humidity Chamber	1007H	N/A	01/07/2013	01/06/2014
DC Power Supply	E3640A	MY40004013	03/22/2013	03/21/2014
Radiated Emissions				
EMI test receiver	ESL6	100262	11/19/2013	11/19/2014
Positioning Controller	UC3000	MF780208282	11/19/2013	11/19/2014
OPT 010 AMPLIFIER(0.1-1300MHz)	8447E	2727A02430	11/19/2013	11/19/2014
Microwave Preamplifier(0.5～18GHz)	PAM-118	443008	11/08/2013	11/07/2014
Bilog Antenna (30MHz~6GHz)	JB6	A110712	01/27/2013	01/26/2014
Bilog Antenna (30MHz~2GHz)	JB1	A112107	02/09/2013	02/09/2014
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	071259	11/20/2013	11/19/2014
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	071283	11/20/2013	11/19/2014
SYNTHESIZED SIGNAL GENERATOR	8665B	3744A01293	04/22/2013	04/22/2014
Tunable Notch Filter	3NF-800/1000-S	AA4	12/14/2013	12/13/2014
Tunable Notch Filter	3NF-1000/2000-S	AM 4	03/01/2013	02/28/2014
Universal Radio Communication Tester	CMU200	121393	09/17/2013	09/16/2014

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.

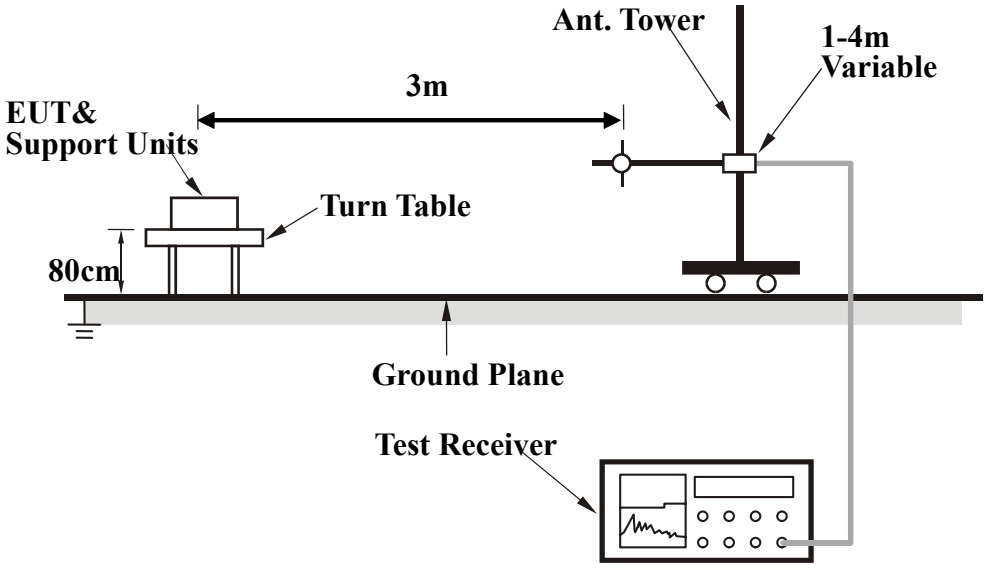
The EUT was placed in the chamber, at a height of about 0.8m on a turntable. Its radiated emissions frequency profile was observed, using a spectrum analyzer /receiver with the appropriate broadband antenna placed 3m or 10m away from the EUT. Radiated emissions from the EUT were maximised by rotating 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 Lab View 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.

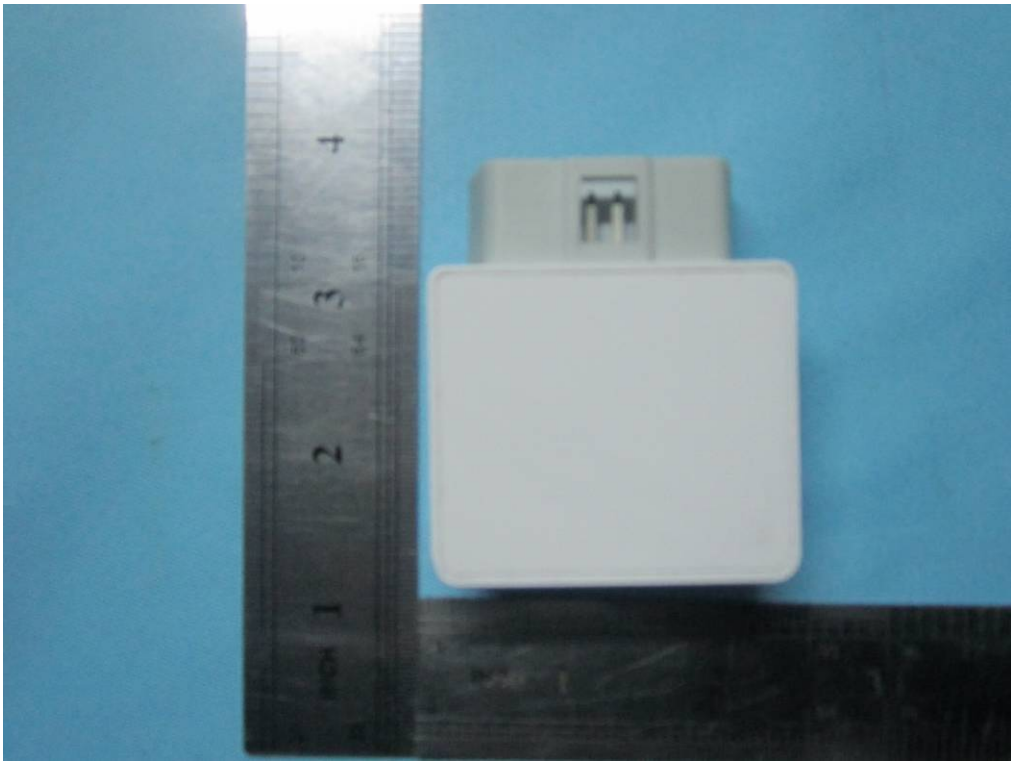
Note:

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.

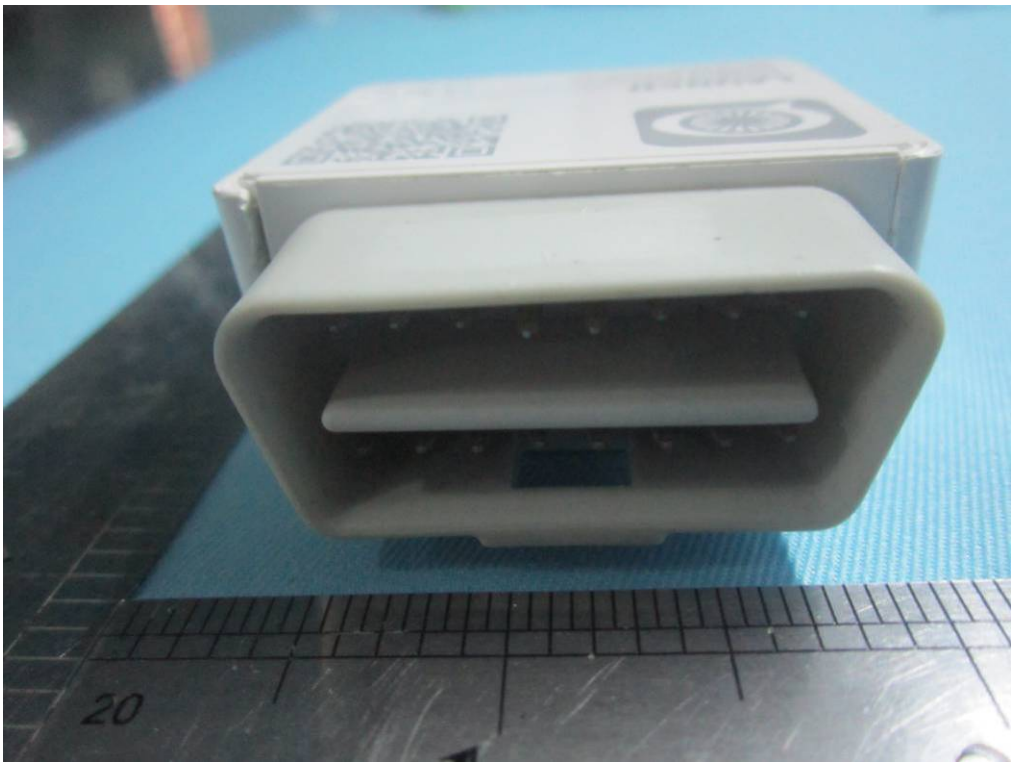
Annex B. EUT AND TEST SETUP PHOTOGRAPHS

Annex B. i. Photograph 1: EUT External Photo

EUT - Front View

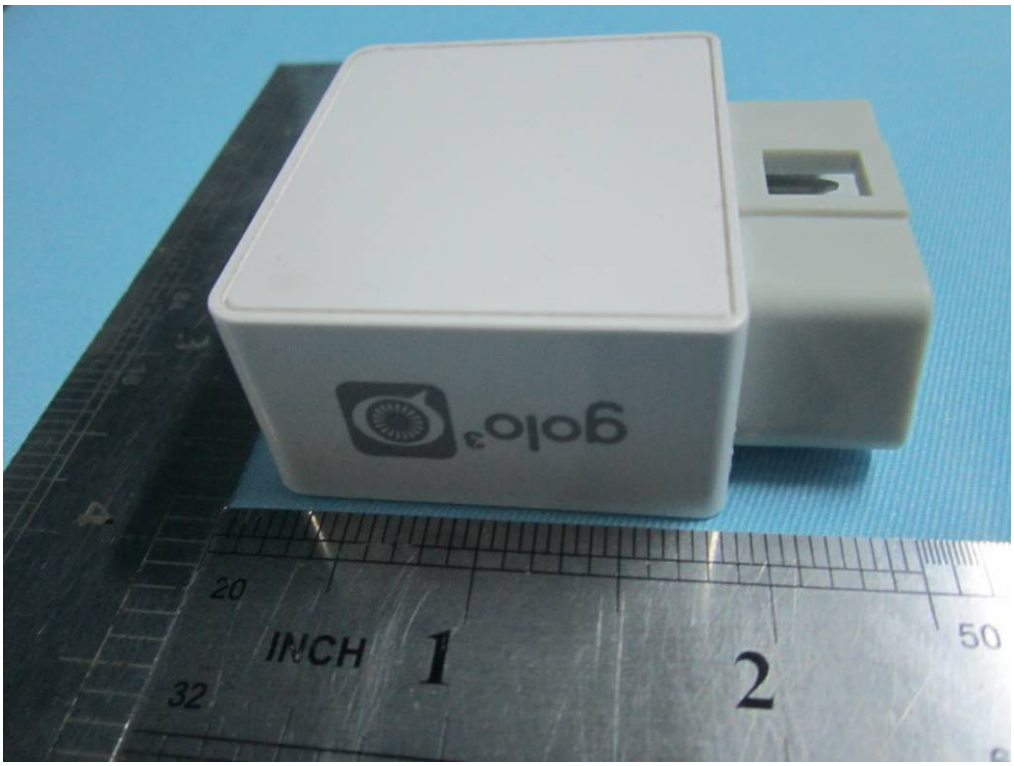


EUT - Rear View

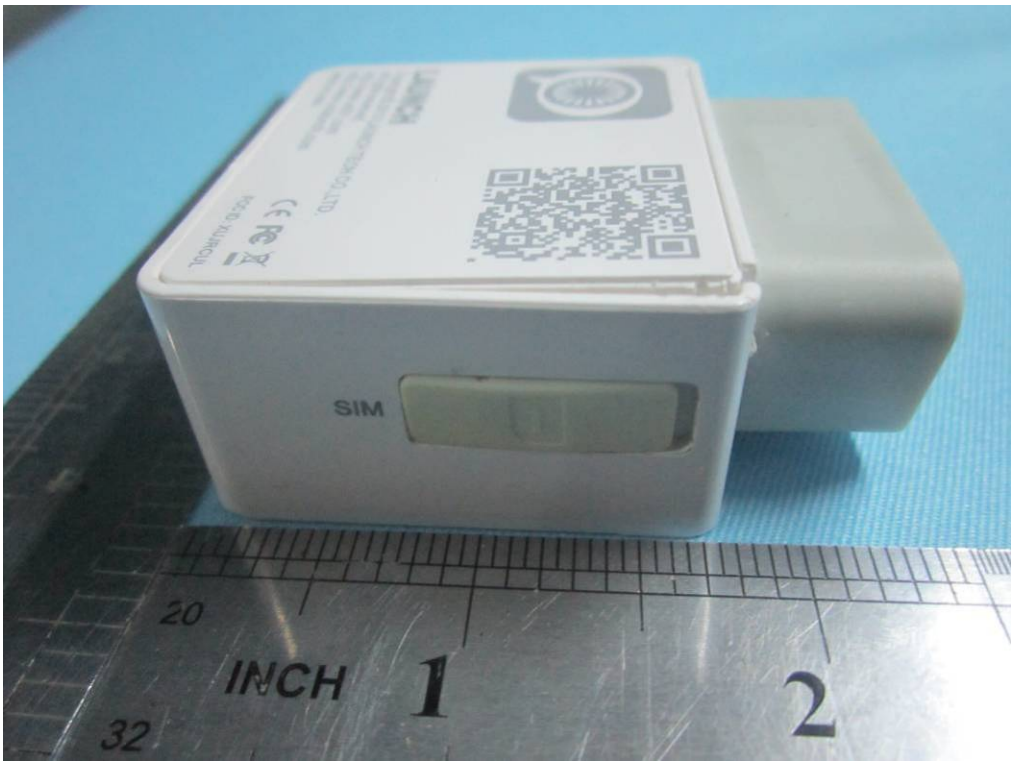


EUT - Top View

EUT - Bottom View



EUT - Left View

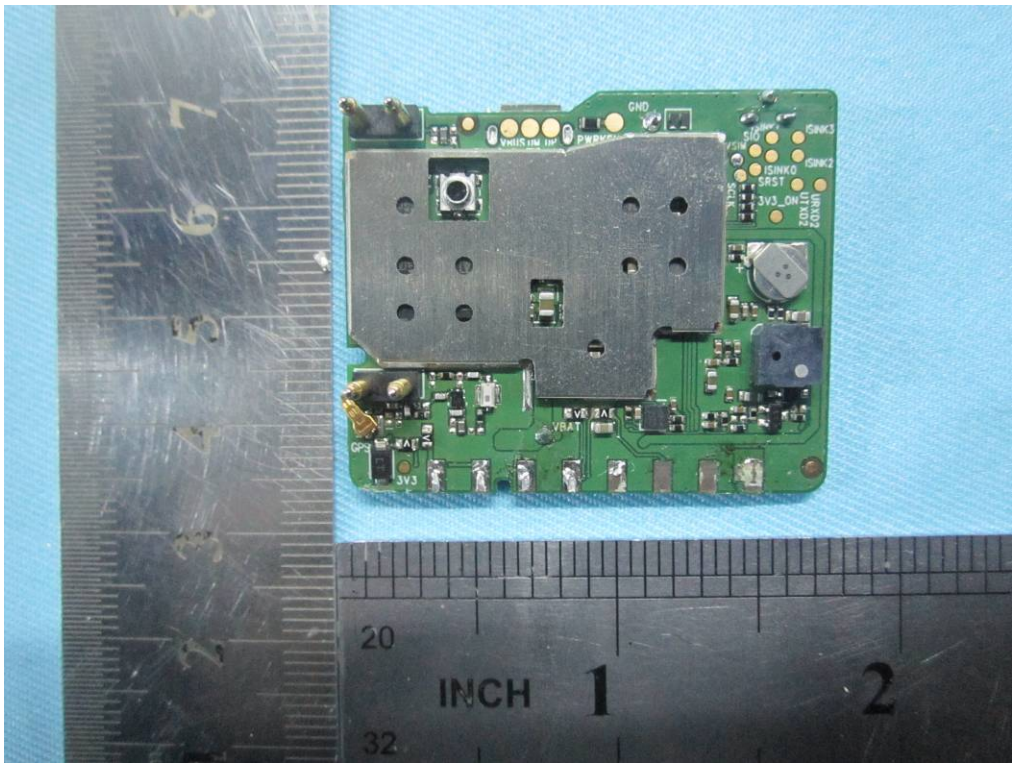


EUT - Right View

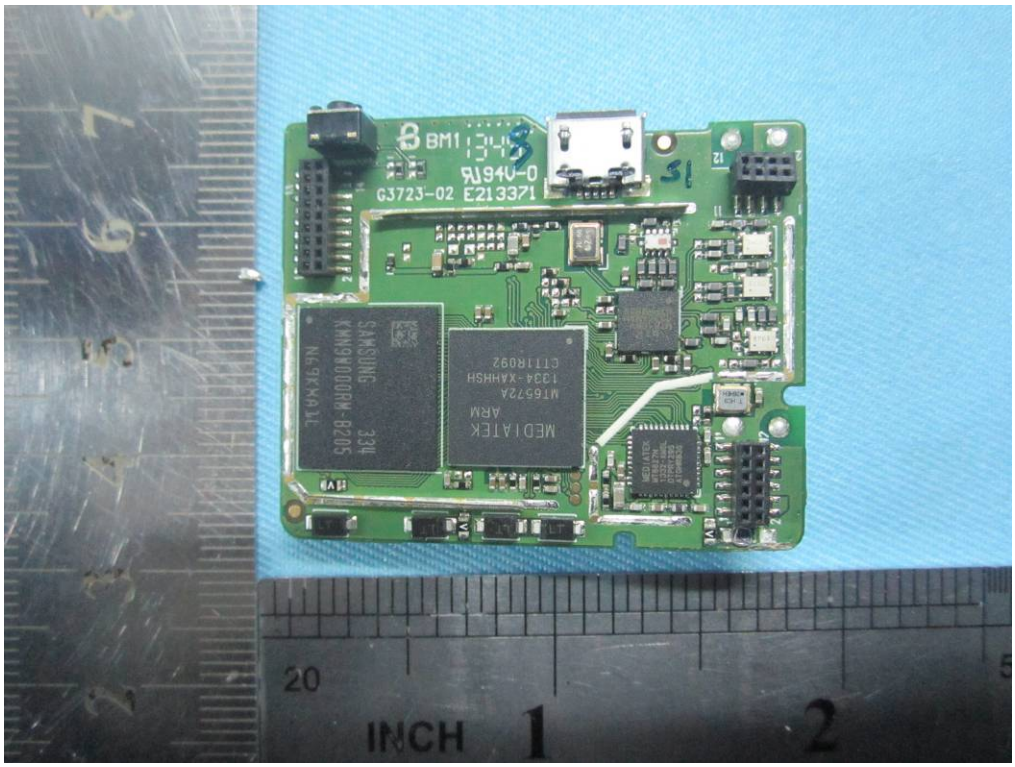
Annex B.ii. Photograph 2: EUT Internal Photo

Cover Off - Front View

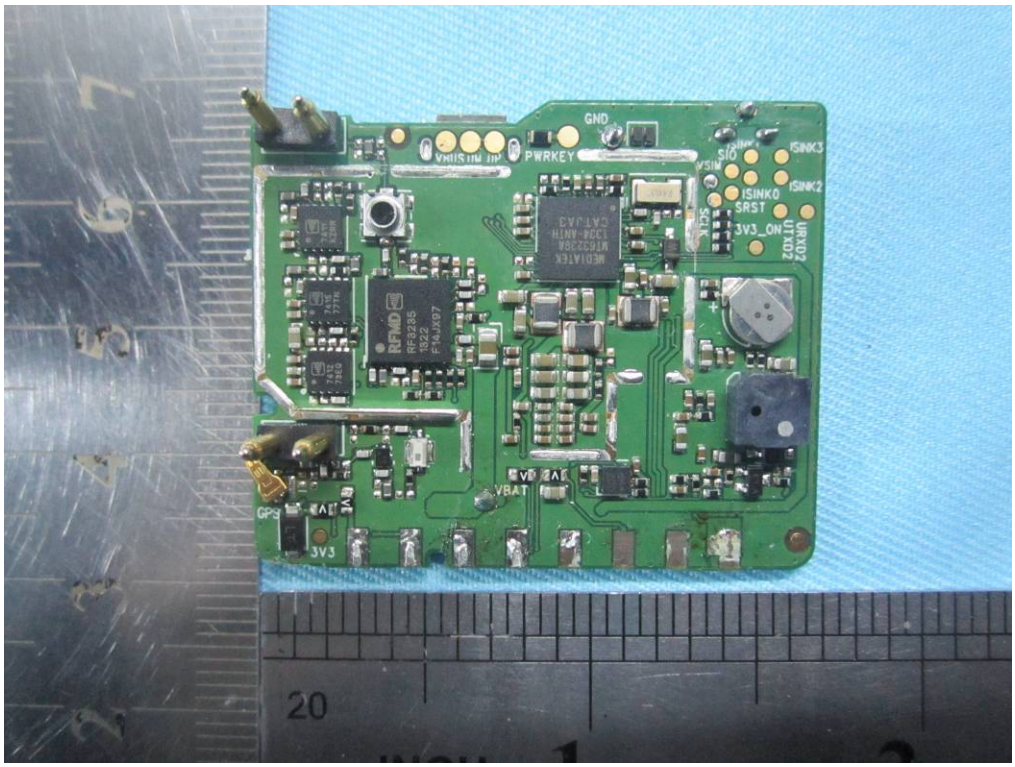
Main board With Shielding - Top View



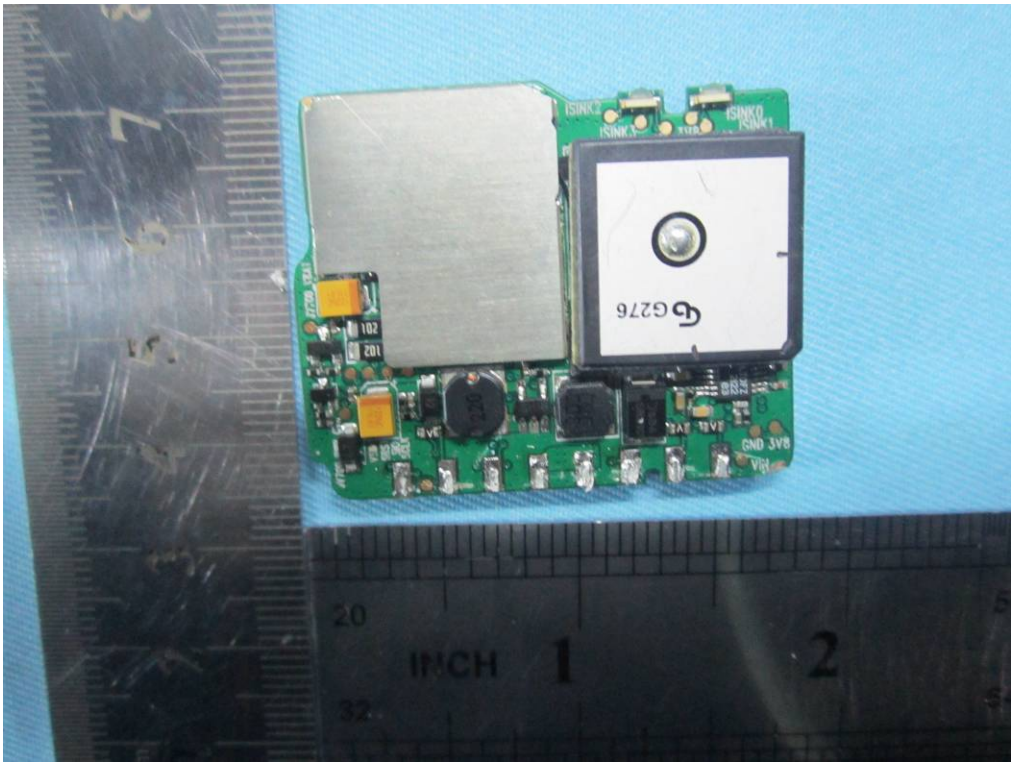
Main board With Shielding - Bottom View



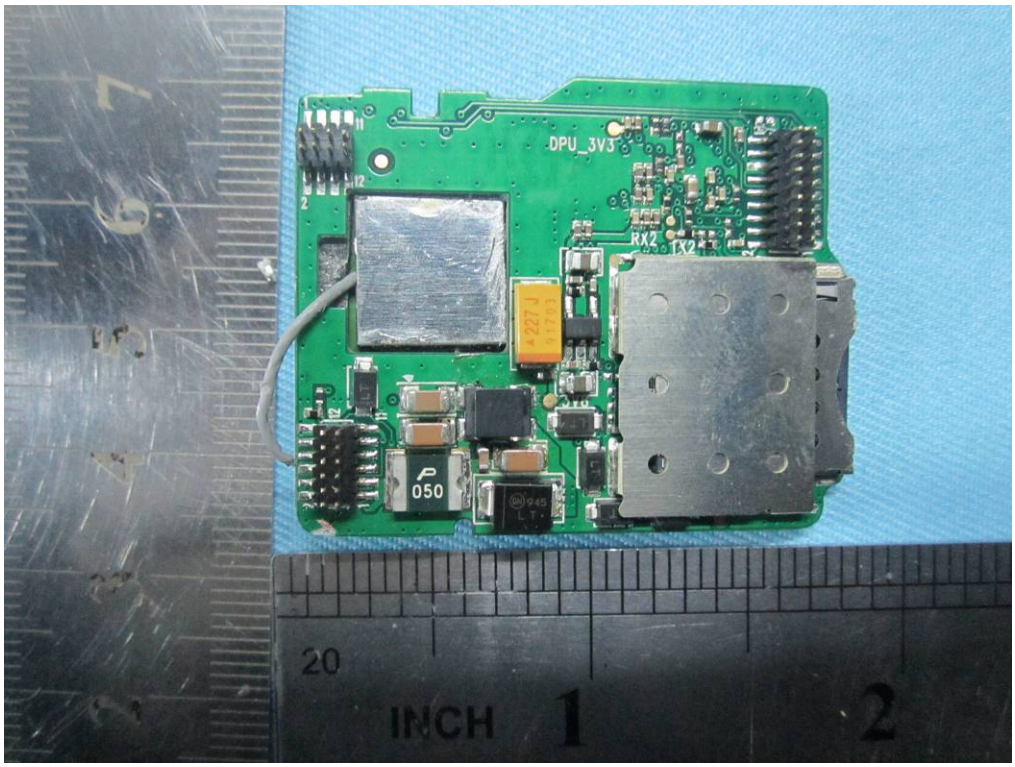
Main board Without Shielding - Top View



Main board Without Shielding - Bottom View

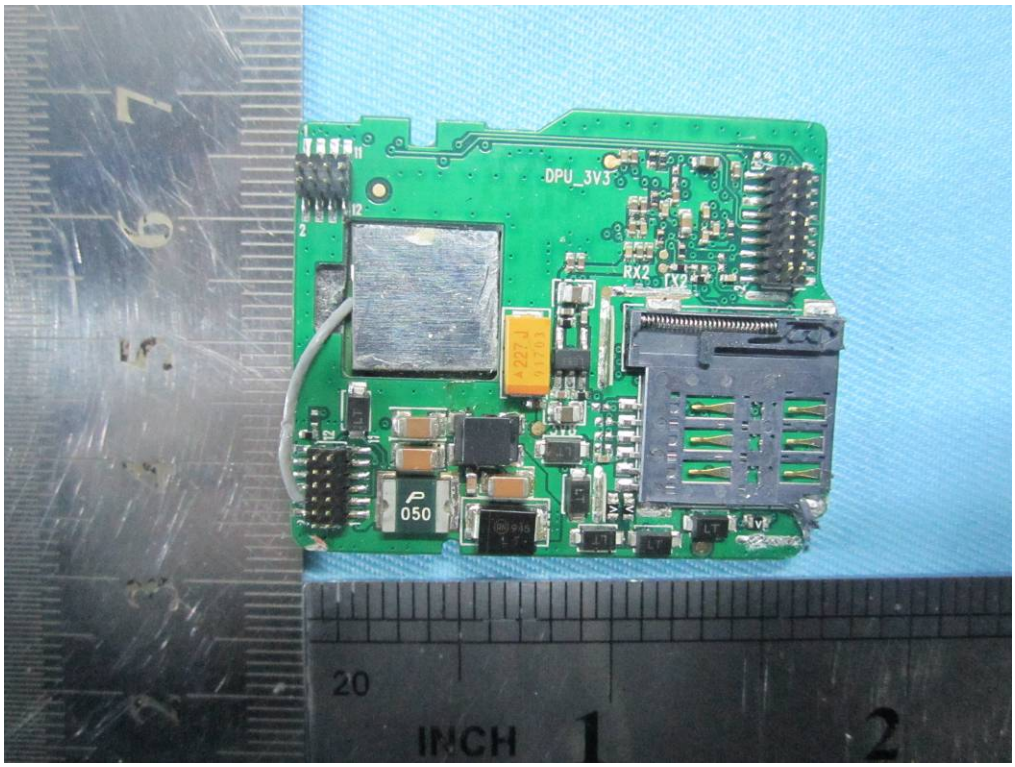


Data Collection board With Shielding – Top View

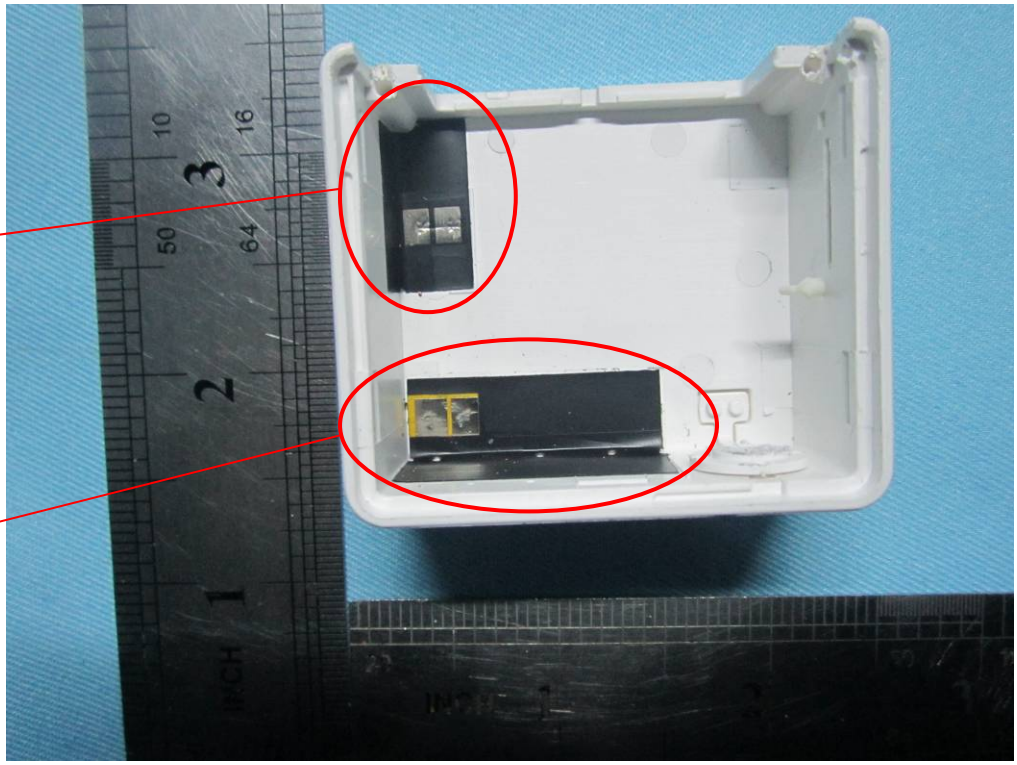


Data Collection board With Shielding – Bottom View

Data Collection board Without Shielding – Top View

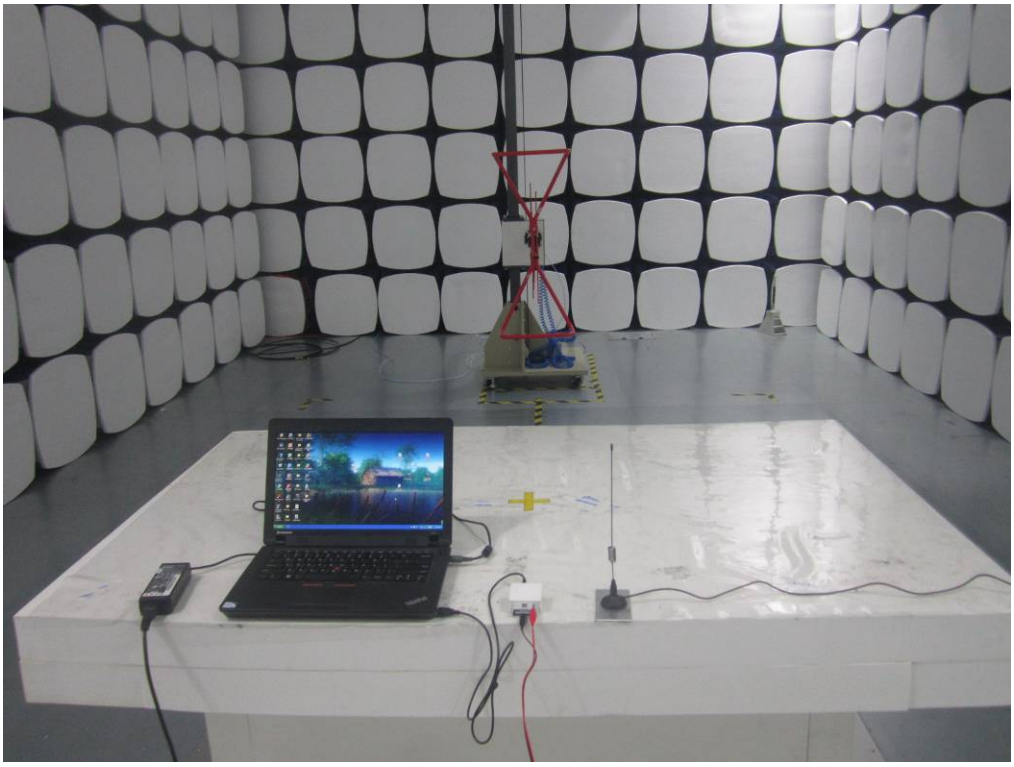


Data Collection board Without Shielding – Bottom View

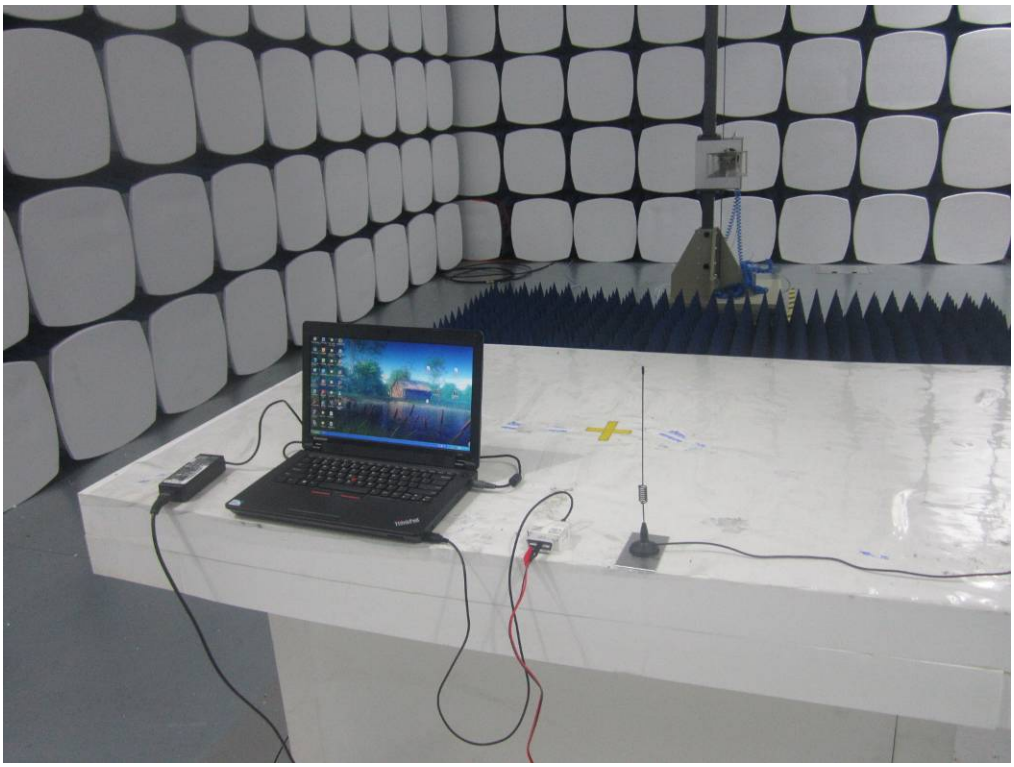


Antenna View

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

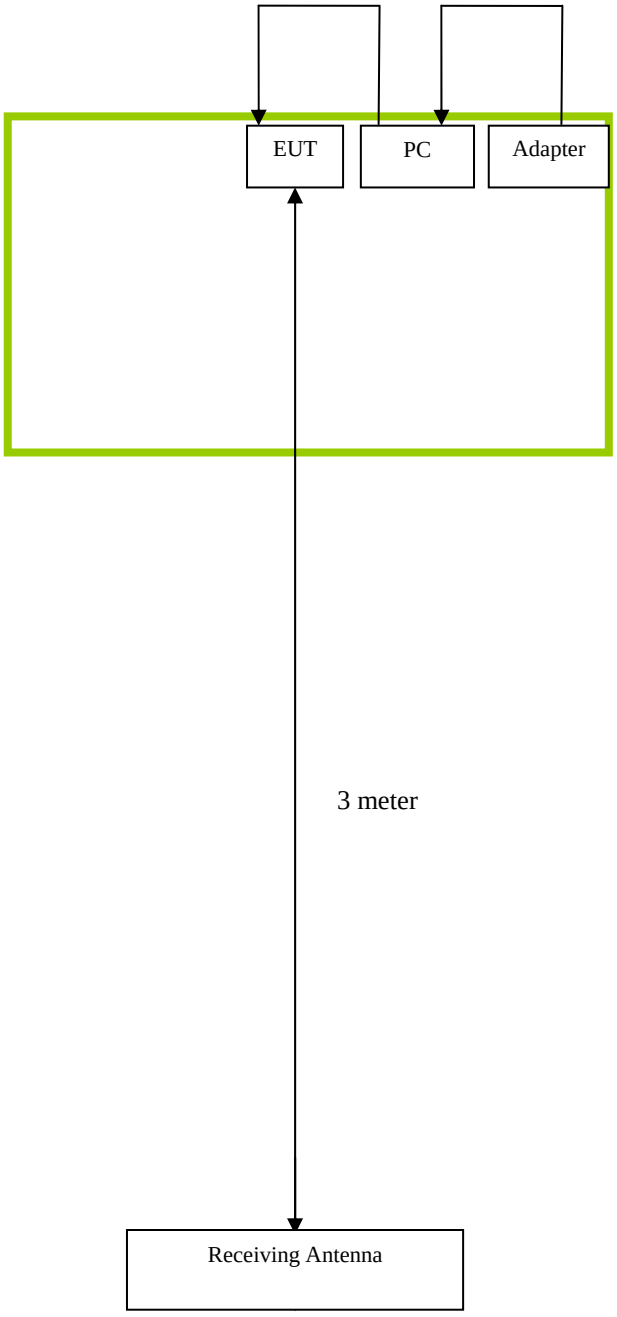
EUT TEST CONDITIONS

Annex C. i. SUPPORTING EQUIPMENT DESCRIPTION

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

Equipment Description (Including Brand Name)	Model & Serial Number	Cable Description (List Length, Type & Purpose)
Lenovo Laptop	E40& 0579A52	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