

RF TEST REPORT



Report No.: 14070617-FCC-R1

Supersede Report No.: N/A

Applicant	Verykool USA Inc	
Product Name	Mobile Phone	
Model No.	s5015	
Test Standard	FCC Part 22(H). FCC Part 24(E), FCC Part 27: 2013; ANSI/TIA C63-D: 2010	
Test Date	December 02 to December 18, 2014	
Issue Date	December 18, 2014	
Test Result	☒ Pass ☐ Fail	
Equipment complied with the specification ☒		
Equipment did not comply with the specification ☐		
		
Herith Shi Test Engineer	Alex Liu Checked By	
This test report may be reproduced in full only Test result presented in this test report is applicable to the tested sample only		

Issued by:

SIEMIC (SHENZHEN-CHINA) LABORATORIES

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Laboratories Introduction

SIEMIC, headquartered in the heart of Silicon Valley, with superior facilities in US and Asia, is one of the leading independent testing and certification facilities providing customers with one-stop shop services for Compliance Testing and Global Certifications.



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Accreditations for Conformity Assessment

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

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1. Report Revision History

Report No.	Report Version	Description	Issue Date
14070617-FCC-R1	NONE	Original	December 18, 2014

2. Customer information

Applicant Name	Verykool USA Inc
Applicant Add	3636 Nobel Drive, Suite 325, San Diego, CA 92122
Manufacturer	Sprocomm Technologies CO.,LTD
Manufacturer Add	5D-506 F1.6 Block,Tianfa Building,Tianan Chegongmiao Industrial park,Futian Dist,Shenzhen, P.R China

3. Test site information

Lab performing tests	SIEMIC (Shenzhen-China) LABORATORIES
Lab Address	Zone A, Floor 1, Building 2 Wan Ye Long Technology Park South Side of Zhoushi Road, Bao' an District, Shenzhen, Guangdong China 518108
FCC Test Site No.	718246
IC Test Site No.	4842E-1
Test Software	LabView of SIEMIC version 2.0

4. Equipment under Test (EUT) Information

Description of EUT: Mobile Phone

Main Model: s5015

Serial Model: N/A

Date EUT received: November 26, 2014

Test Date(s): December 02 to December 18, 2014

Equipment Category : PCE

Antenna Gain:

- UMTS-FDD Band V/GSM850: 0.8 dBi
- UMTS-FDD Band II: 1.7 dBi
- UMTS-FDD Band IV: 1.7 dBi
- PCS1900: 1.2 dBi
- Bluetooth/BLE: 2.3 dBi
- WIFI: 2.3 dBi

Type of Modulation:

- GSM / GPRS: GMSK
- EGPRS: GMSK, 8PSK
- UMTS-FDD: QPSK
- 802.11b/g/n: DSSS, OFDM
- Bluetooth: GFSK, π /4DQPSK, 8DPSK
- BLE: GFSK

RF Operating Frequency (ies):

- GSM850 TX: 824.2 ~ 848.8 MHz; RX: 869.2 ~ 893.8 MHz
- PCS1900 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
- UMTS-FDD Band IV TX : 1712.4 ~ 1752.6 MHz;
- RX : 2112.4 ~ 2152.6 MHz
- WIFI: 802.11b/g/n(20M): 2412-2462 MHz
- WIFI: 802.11n(40M): 2422-2452 MHz
- Bluetooth& BLE: 2402-2480 MHz

Maximum Conducted AV Power to Antenna:	GSM850: 33.17 dBm PCS1900: 29.29 dBm UMTS-FDD Band V : 22.58 dBm UMTS-FDD Band II : 22.23 dBm UMTS-FDD Band IV: 24.86 dBm
ERP/EIRP:	GSM850: 26.76 dBm / ERP PCS1900: 23.92 dBm / EIRP UMTS-FDD Band V : 19.29 dBm / ERP UMTS-FDD Band II : 18.78 dBm / EIRP UMTS-FDD Band IV: 18.93 dBm / EIRP
Number of Channels:	GSM 850: 124CH PCS1900: 299CH UMTS-FDD Band V : 102CH UMTS-FDD Band II : 277CH UMTS-FDD Band IV: 202CH WIFI :802.11b/g/n(20M): 11CH WIFI :802.11n(40M): 7CH Bluetooth: 79CH BLE: 40CH
Port:	Power Port, Earphone Port, USB Port
Input Power:	Battery: Model: X5021 Spec: 3.8V 2100mAh 7.98Wh Limited charger voltage: 4.35V Adapter: Model: SC050100-US Input: AC 100-240V; 50/60Hz 0.4A Output: DC 5.0V; 1000mA
Trade Name :	verykool
GPRS/EGPRS Multi-slot class	8/10/12
FCC ID:	WA6S5015

5. Test Summary

The product was tested in accordance with the following specifications.

All testing has been performed according to below product classification:

FCC Rules	Description of Test	Result
§ 1.1307; § 2.1093	RF Exposure (SAR)	Compliance
§2.1046; § 22.913(a); § 24.232(c); § 27.50(c.10); § 27.50(d.4)	RF Output Power	Compliance
§ 24.232 (d); § 27.50(d)	Peak-Average Ratio	Compliance
§ 2.1047	Modulation Characteristics	Compliance
§ 2.1049; § 22.905; § 22.917; § 24.238; § 27.53(a.5)	99% & -26 dB Occupied Bandwidth	Compliance
§ 2.1051; § 22.917(a); § 24.238(a); § 27.53(h)	Spurious Emissions at Antenna Terminal	Compliance
§ 2.1053; § 22.917(a); § 24.238(a); § 27.53(h)	Field Strength of Spurious Radiation	Compliance
§ 22.917(a); § 24.238(a); § 27.53(h)	Out of band emission, Band Edge	Compliance
§ 2.1055; § 22.355; § 24.235; § 27.5(h); § 27.54	Frequency stability vs. temperature Frequency stability vs. voltage	Compliance

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

Measurement Uncertainty

Emissions		
Test Item	Description	Uncertainty
Band Edge and Radiated Spurious Emissions	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	+5.6dB/-4.5dB

6. MEASUREMENTS, EXAMINATION AND DERIVED RESULTS

6.1 RF Exposure (SAR)

Test Result: Pass

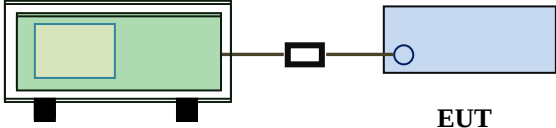
The EUT is a portable device, thus requires SAR evaluation;
Please refer to RF Exposure Evaluation Report: 14070617-FCC-H.

6.2 RF Output Power

Temperature	25°C
Relative Humidity	55%
Atmospheric Pressure	1006mbar
Test date :	December 06, 2014
Tested By :	Herith Shi

Requirement(s):

Spec	Item	Requirement	Applicable
§22.913 (a)	a)	ERP:38.45dBm	☒
§24.232 (c)	b)	EIRP:33dBm	☒
§27.50 (c)	c)	EIRP: 30dBm	☒

Test Setup	 Base Station EUT
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Test Procedure	For Conducted Power: - The transmitter output port was connected to base station. - Set EUT at maximum power through base station. - Select lowest, middle, and highest channels for each band and different test mode. For ERP/EIRP: - The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable. - 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. - The frequency range up to tenth harmonic of the fundamental frequency was investigated. - Remove the EUT and replace it with substitution antenna. A signal
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	generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution. - Spurious emissions in dB = $10 \log (\text{TX power in Watts}/0.001)$ – the absolute level - Spurious attenuation limit in dB = $43 + 10 \text{ Log}_{10} (\text{power out in Watts})$.
Remark	
Result	☒ Pass ☐ Fail

Test Data ☒ Yes ☐ N/A

Test Plot ☐ Yes (See below) ☒ N/A

Conducted Power

GSM Mode:

Burst Average Power (dBm);								
Band	GSM850				GSM1900			
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	/
GSM Voice (1 uplink),GMSK	33.04	33.06	33.17	33±1	29.29	28.25	28.08	29±1
GPRS Multi-Slot Class 8 (1 uplink),GMSK	32.96	32.98	33.12	33±1	29.26	28.24	27.95	28.5±1
GPRS Multi-Slot Class 10 (2 uplink) GMSK	32.18	32.19	32.29	32±1	28.48	27.44	27.26	28±1
GPRS Multi-Slot Class 12 (4 uplink) GMSK (4 uplink),GMSK	29.79	29.77	29.83	30±1	25.83	24.87	24.77	25±1
EGPRS Multi-Slot Class 8 (1 uplink) GMSK MCS1	33.11	33.10	33.03	33±1	29.16	29.19	29.13	29±1
EGPRS Multi-Slot Class 10 (2 uplink) GMSK MCS1	32.26	32.39	32.48	32±1	28.51	28.74	28.72	28±1
EGPRS Multi-Slot Class 12 (4 uplink) GMSK MCS1	29.89	30.01	30.12	30±1	25.57	25.59	25.66	25±1
EGPRS Multi-Slot Class 8 (1 uplink) 8PSK MCS5	33.04	33.08	33.09	33±1	28.95	28.75	28.59	28±1
EGPRS Multi-Slot Class 10 (2 uplink) 8PSK MCS5	33.09	33.07	33.04	33±1	27.5	27.04	27.72	27±1
EGPRS Multi-Slot Class 12 (4 uplink) 8PSK MCS5	32.92	32.85	32.76	32±1	25.83	25.37	25.71	25±0.9

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Remark :

GPRS, CS1 coding scheme.

EGPRS, MCS1 coding scheme.

EGPRS, MCS5 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

Note: Since GSM mode has higher power, so the test items below were not performed to GPRS and EGPRS mode.

UMTS Mode:

UMTS-FDD Band V

Band/ Time Slot configuration	Channel	Frequency	Average power (dBm)
RMC 12.2kbps	4132	826.4	22.58
	4175	835.0	22.45
	4233	846.6	22.51
HSDPA Subtest1	4132	826.4	22.52
	4175	835.0	22.43
	4233	846.6	22.49
HSDPA Subtest2	4132	826.4	22.31
	4175	835.0	22.27
	4233	846.6	22.15
HSDPA Subtest3	4132	826.4	21.83
	4175	835.0	21.96
	4233	846.6	21.91
HSDPA Subtest4	4132	826.4	21.63
	4175	835.0	21.74
	4233	846.6	21.59
HSUPA Subtest1	4132	826.4	22.05
	4175	835.0	22.19
	4233	846.6	22.10
HSUPA Subtest2	4132	826.4	21.15
	4175	835.0	21.26
	4233	846.6	21.13
HSUPA Subtest3	4132	826.4	21.71
	4175	835.0	21.89
	4233	846.6	21.70
HSUPA Subtest4	4132	826.4	22.25
	4175	835.0	22.37
	4233	846.6	22.23
HSUPA Subtest5	4132	826.4	22.14
	4175	835.0	22.28
	4233	846.6	22.18

UMTS-FDD Band II

Band/ Time Slot configuration	Channel	Frequency	Average power (dBm)
RMC 12.2kbps	9262	1852.4	22.23
	9400	1880.0	22.18
	9538	1907.6	22.15
HSDPA Subtest1	9262	1852.4	22.06
	9400	1880.0	22.13
	9538	1907.6	22.01
HSDPA Subtest2	9262	1852.4	22.02
	9400	1880.0	22.11
	9538	1907.6	22.08
HSDPA Subtest3	9262	1852.4	22.01
	9400	1880.0	22.10
	9538	1907.6	22.05
HSDPA Subtest4	9262	1852.4	22.04
	9400	1880.0	22.09
	9538	1907.6	22.01
HSUPA Subtest1	9262	1852.4	21.95
	9400	1880.0	21.92
	9538	1907.6	21.88
HSUPA Subtest2	9262	1852.4	21.97
	9400	1880.0	21.90
	9538	1907.6	21.73
HSUPA Subtest3	9262	1852.4	21.80
	9400	1880.0	21.54
	9538	1907.6	21.76
HSUPA Subtest4	9262	1852.4	21.77
	9400	1880.0	21.63
	9538	1907.6	21.72
HSUPA Subtest5	9262	1852.4	21.66
	9400	1880.0	21.81
	9538	1907.6	21.75

UMTS-FDD Band IV

Band/ Time Slot configuration	Channel	Frequency	Average power (dBm)
RMC 12.2kbps	1313	1712.6	24.60
	1413	1732.6	24.53
	1512	1752.4	24.86
HSDPA Subtest1	1313	1712.6	24.56
	1413	1732.6	24.76
	1512	1752.4	24.68
HSDPA Subtest2	1313	1712.6	24.58
	1413	1732.6	24.67
	1512	1752.4	24.52
HSDPA Subtest3	1313	1712.6	24.61
	1413	1732.6	24.76
	1512	1752.4	24.62
HSDPA Subtest4	1313	1712.6	24.59
	1413	1732.6	24.65
	1512	1752.4	24.78
HSUPA Subtest1	1313	1712.6	24.62
	1413	1732.6	24.54
	1512	1752.4	24.69
HSUPA Subtest2	1313	1712.6	24.75
	1413	1732.6	24.54
	1512	1752.4	24.58
HSUPA Subtest3	1313	1712.6	24.56
	1413	1732.6	24.72
	1512	1752.4	24.67
HSUPA Subtest4	1313	1712.6	24.73
	1413	1732.6	24.51
	1512	1752.4	24.76
HSUPA Subtest5	1313	1712.6	24.52
	1413	1732.6	24.68
	1512	1752.4	24.75

ERP & EIRP

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	20.23	V	6.8	0.53	26.50	38.45
824.2	19.42	H	6.8	0.53	25.69	38.45
836.6	20.49	V	6.8	0.53	26.76	38.45
836.6	19.36	H	6.8	0.53	25.63	38.45
848.8	20.35	V	6.9	0.53	26.72	38.45
848.8	19.52	H	6.9	0.53	25.89	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	16.03	V	7.88	0.85	23.06	33
1850.2	16.89	H	7.88	0.85	23.92	33
1880	15.92	V	7.88	0.85	22.95	33
1880	16.62	H	7.88	0.85	23.65	33
1909.8	15.86	V	7.86	0.85	22.87	33
1909.8	16.47	H	7.86	0.85	23.48	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)
826.4	12.5	V	6.8	0.53	18.77	38.45
826.4	12.63	H	6.8	0.53	18.90	38.45
835	12.41	V	6.8	0.53	18.68	38.45
835	12.94	H	6.8	0.53	19.21	38.45
846.6	12.6	V	6.9	0.53	18.97	38.45
846.6	12.92	H	6.9	0.53	19.29	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	10.56	V	7.88	0.85	17.59	33
1852.4	11.03	H	7.88	0.85	18.06	33
1880	10.86	V	7.88	0.85	17.89	33
1880	11.75	H	7.88	0.85	18.78	33
1907.6	10.92	V	7.86	0.85	17.93	33
1907.6	11.44	H	7.86	0.85	18.45	33

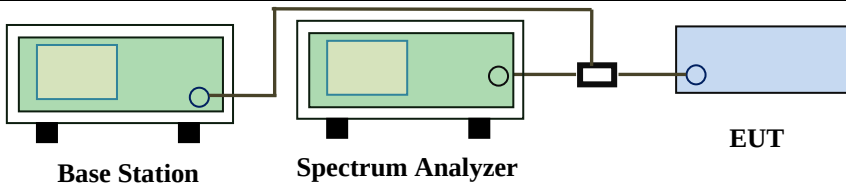
EIRP for UMTS-FDD Band IV (Part 27)

Frequency (MHz)	Substituted level (dBm)	Antenna Polarization	Antenna Gain correction (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)
1712.4	11.95	V	7.76	0.82	18.89	30
1712.4	11.82	H	7.76	0.82	18.76	30
1740	11.69	V	7.76	0.82	18.63	30
1740	11.77	H	7.76	0.82	18.71	30
1752.6	12.01	V	7.74	0.82	18.93	30
1752.6	11.86	H	7.74	0.82	18.78	30

6.3 Peak-Average Ratio

Temperature	25°C
Relative Humidity	55%
Atmospheric Pressure	1006mbar
Test date :	December 06, 2014
Tested By :	Herith Shi

Requirement(s):

Spec	Item	Requirement	Applicable
§24.232(d) § 27.50(d)	a)	The peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.	☒
Test Setup	 Base Station Spectrum Analyzer EUT		
Test Procedure	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		
Remark			
Result	☒ Pass ☐ Fail		

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

WCDMA1900

Frequency (MHz)	Conducted power(dBm)		Peak-Average Ratio(PAR)
	Peak	Average	
1852.4	26.30	22.69	3.61
1880.0	26.12	22.60	3.52
1907.6	25.59	22.40	3.19

PCS1900

Frequency (MHz)	Conducted power(dBm)		Peak-Average Ratio(PAR)
	Peak	Average	
1850.2	30.50	30.40	0.1
1880.0	30.60	30.50	0.1
1909.8	30.70	30.60	0.1

WCDMA1700

Frequency (MHz)	Conducted power(dBm)		Peak-Average Ratio(PAR)
	Peak	Average	
1313	27.78	24.69	3.09
1413	27.59	24.62	2.97
1512	27.86	24.92	2.94

6.4 Modulation Characteristic

According to FCC § 2.1047(d), Part 22H, 24E& Part 27 there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

6.5 Occupied Bandwidth

Temperature	21°C
Relative Humidity	58%
Atmospheric Pressure	1010mbar
Test date :	December 09, 2014
Tested By :	Herith Shi

Requirement(s):

Spec	Item	Requirement	Applicable
§2.1049, §22.917, §22.905 §24.238 §27.53(a)	a)	99% Occupied Bandwidth(kHz)	☒
	b)	26 dB Bandwidth(kHz)	☒
Test Setup	Base Station Spectrum Analyzer EUT		
Test Procedure	- The EUT was connected to Spectrum Analyzer and Base Station via power divider. - The 99% and 26 dB occupied bandwidth (BW) of the middle channel for the highest RF powers.		
Remark			
Result	☒ Pass ☐ Fail		

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Cellular Band (Part 22H) result

Channel	Frequency (MHz)	99% Occupied Bandwidth (kHz)	26 dB Bandwidth (kHz)
128	824.2	246.3920	322.082
190	836.6	245.4442	318.566
251	848.8	242.6242	318.304

PCS Band (Part 24E) result

Channel	Frequency (MHz)	99% Occupied Bandwidth (kHz)	26 dB Bandwidth (kHz)
512	1850.2	244.4786	319.534
661	1880.0	244.7892	317.431
810	1909.8	245.2527	322.372

UMTS-FDD Band V (Part 22H)

Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB Bandwidth (MHz)
4132	826.4	4.1606	4.713
4175	835.0	4.1661	4.713
4233	846.6	4.1574	4.713

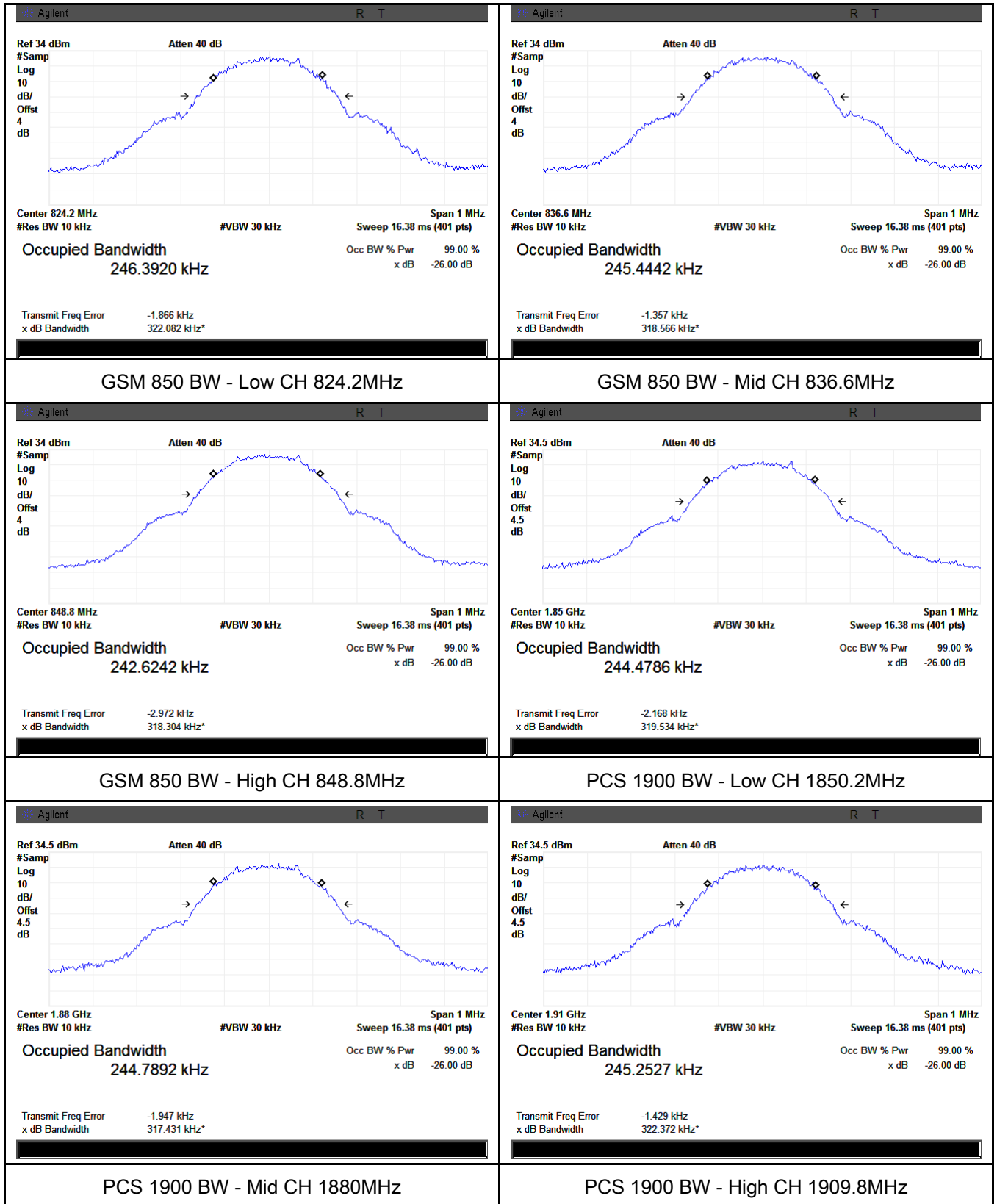
UMTS-FDD Band II (Part 24E)

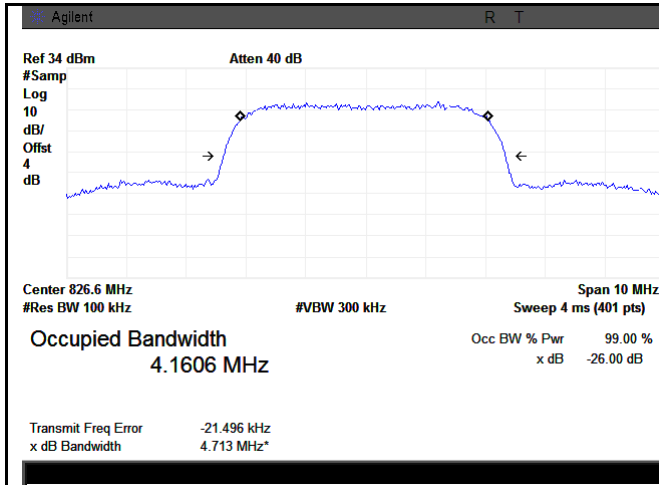
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB Bandwidth (MHz)
9262	1852.4	4.1570	4.689
9400	1880.0	4.1574	4.722
9538	1907.6	4.1772	4.732

UMTS-FDD Band IV (Part 27)

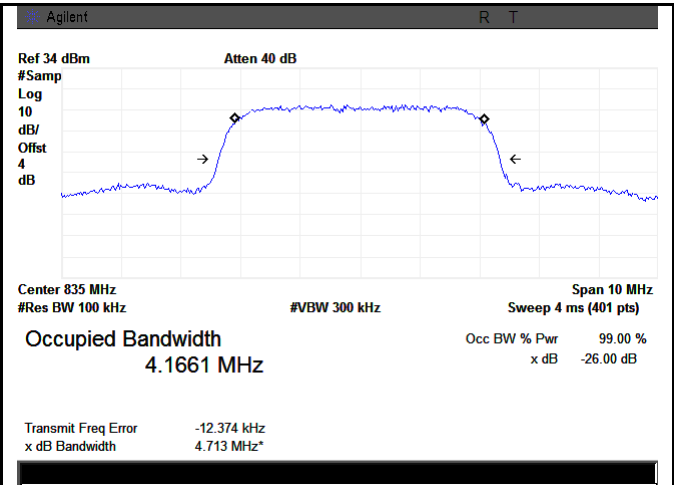
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB Bandwidth (MHz)
1313	1712.4	4.1544	4.677
1413	1732.6	4.1671	4.719
1512	1752.6	4.1593	4.689

Test Plots

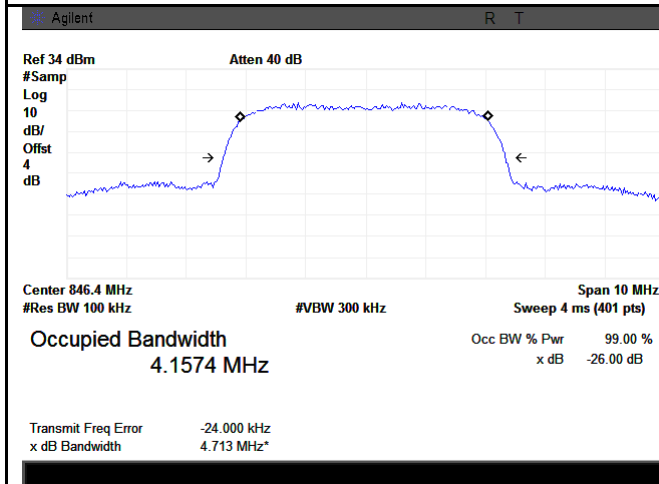




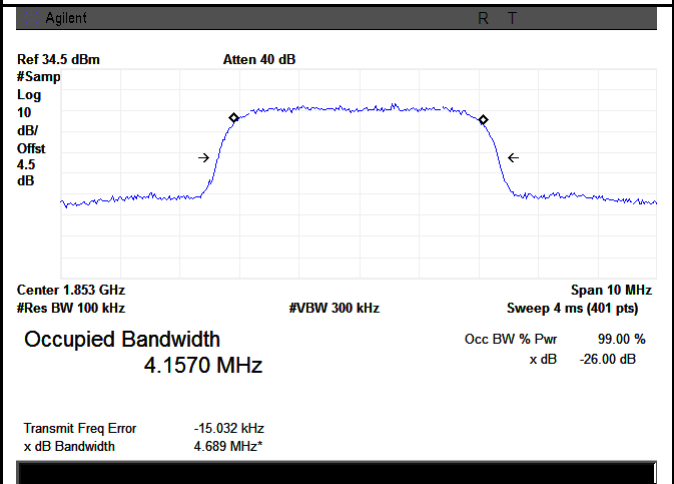
Band V BW - Low CH 826.6 MHz



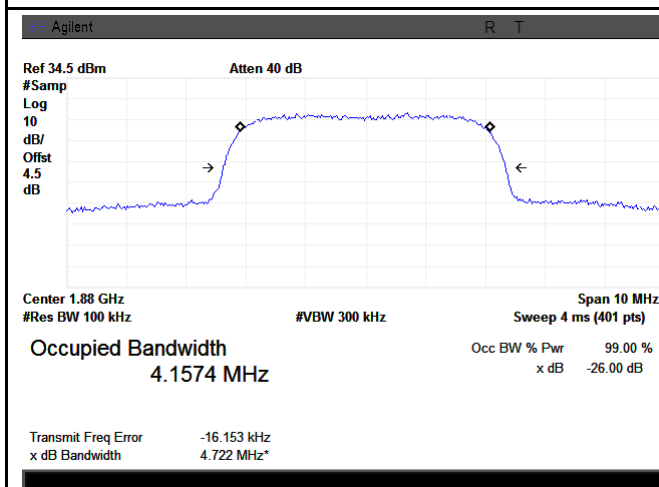
Band V BW - Mid CH 835.0 MHz



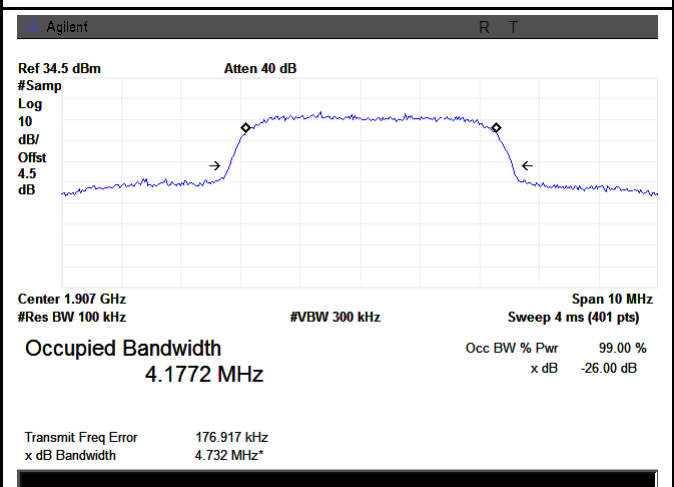
Band V BW - High CH 846.4 MHz



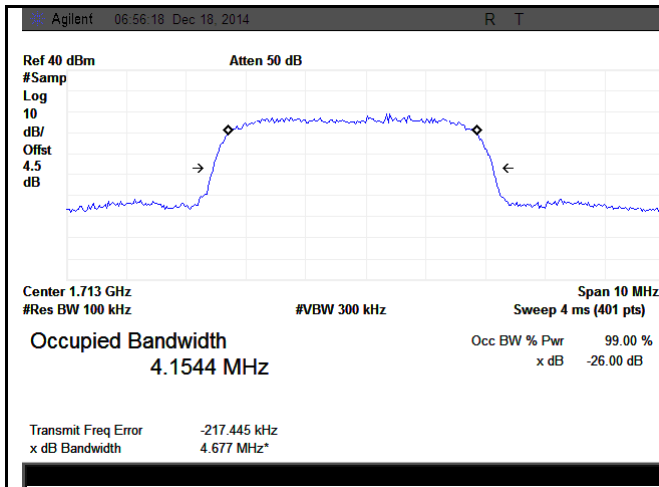
Band II BW - Low CH 1852.4 MHz



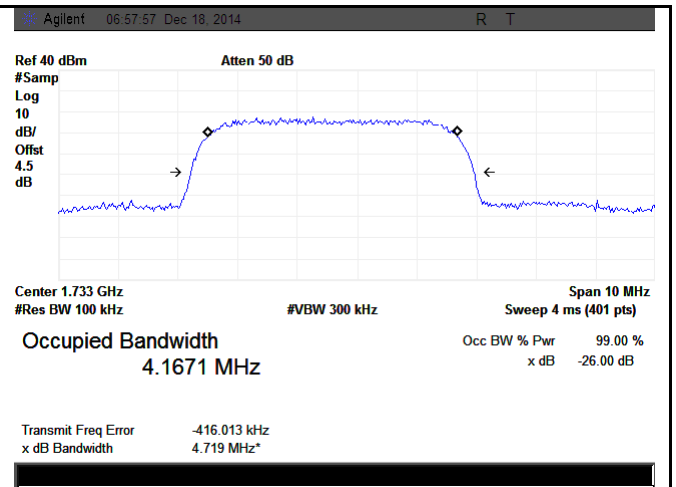
Band II BW - Mid CH 1880 MHz



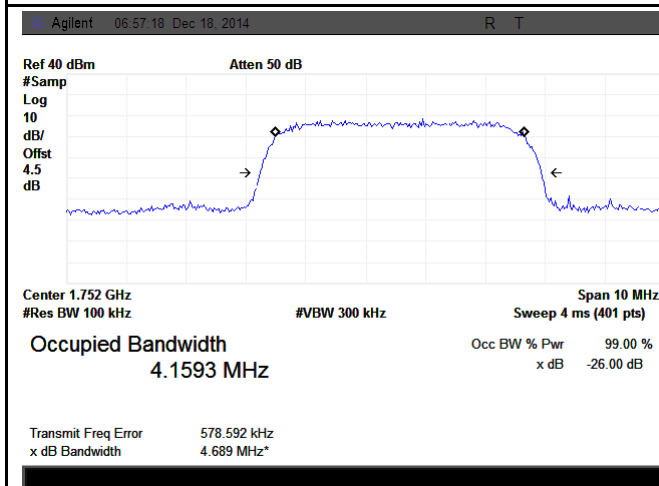
Band II BW - High CH 1907.6 MHz



Band IV BW - Low CH 1712.6 MHz



Band IV BW - Mid CH 1740.0 MHz

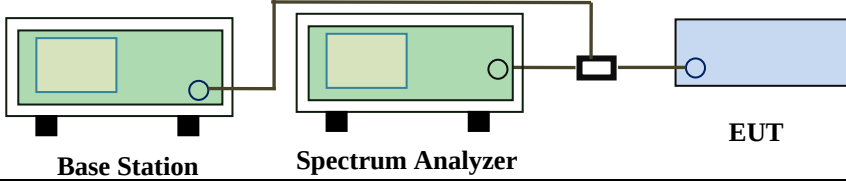


Band IV BW - High CH 1752.4 MHz

6.6 Spurious Emissions at Antenna Terminals

Temperature	23°C
Relative Humidity	51%
Atmospheric Pressure	1012mbar
Test date :	December 11, 2014
Tested By :	Herith Shi

Requirement(s):

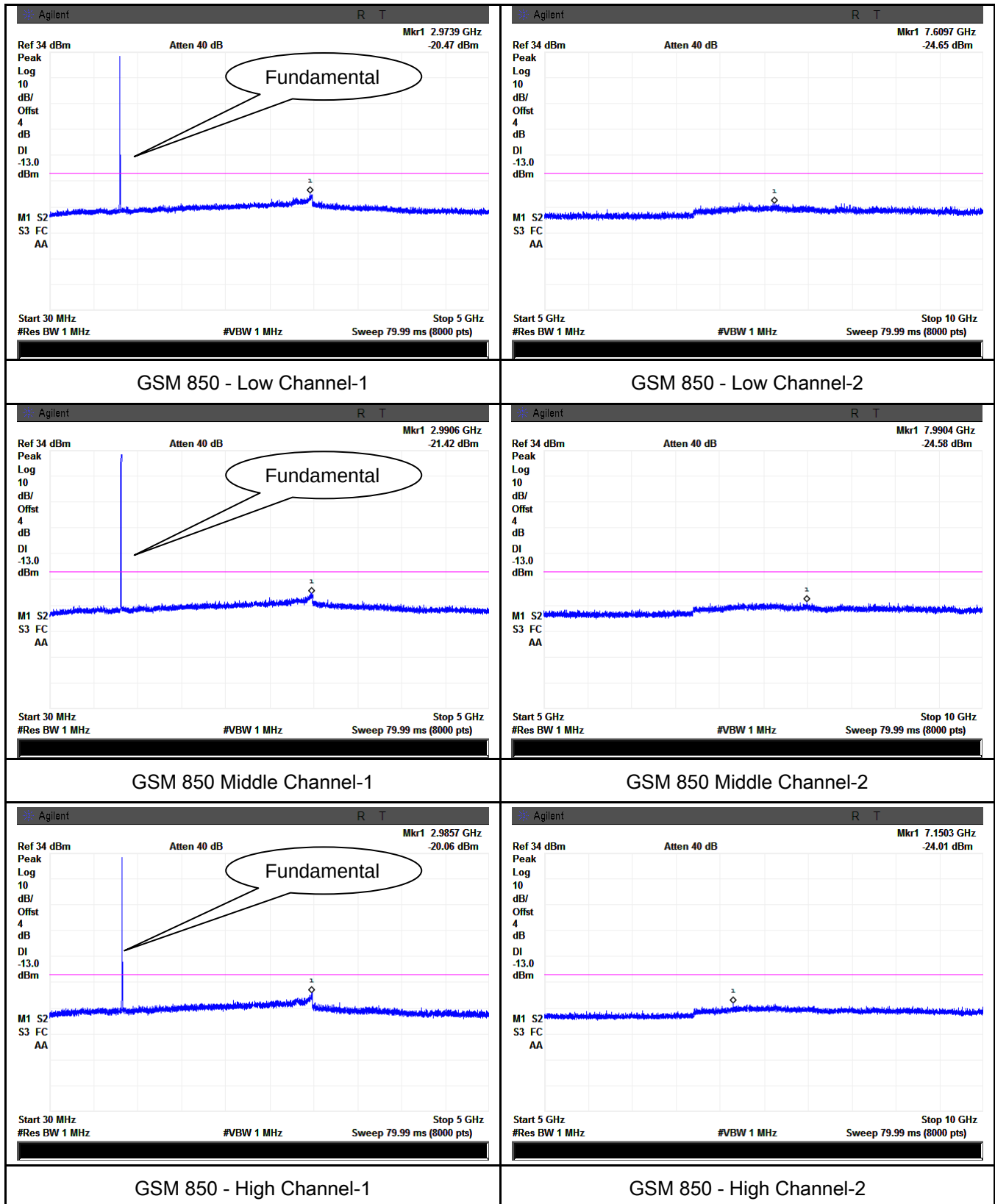
Spec	Item	Requirement	Applicable
§2.1051, §22.917(a)& §24.238(a) § 27.53(h)	a)	The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB	☒
Test Setup	 Base Station Spectrum Analyzer EUT		
Test Procedure	- The EUT was connected to Spectrum Analyzer and Base Station via power divider. - The Band Edges of low and high channels for the highest RF powers were measured. - Setting RBW as roughly BW/100.		
Remark			
Result	☒ Pass ☐ Fail		

Test Data ☒ Yes ☐ N/A

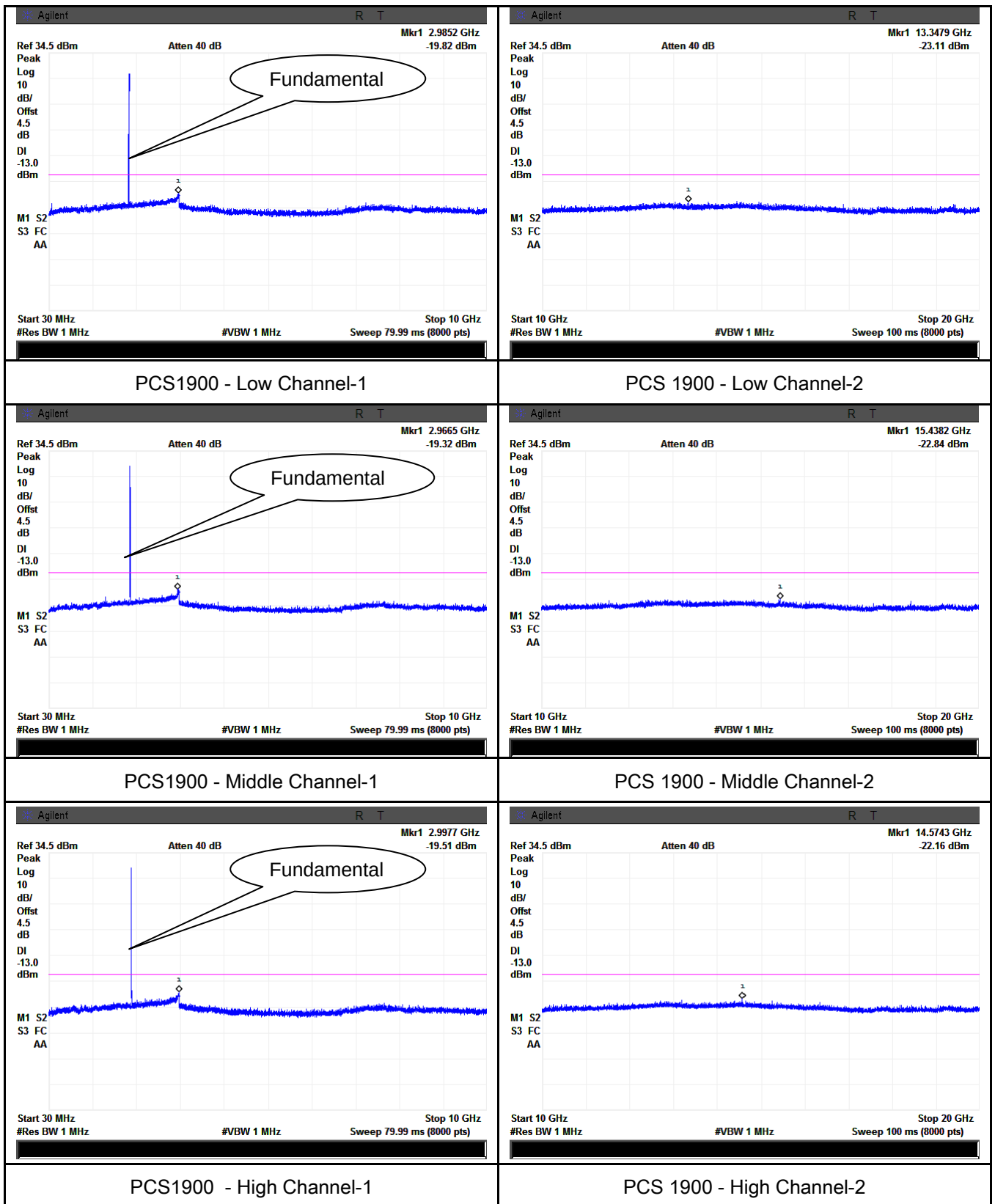
Test Plot ☒ Yes (See below) ☐ N/A

Test Plots

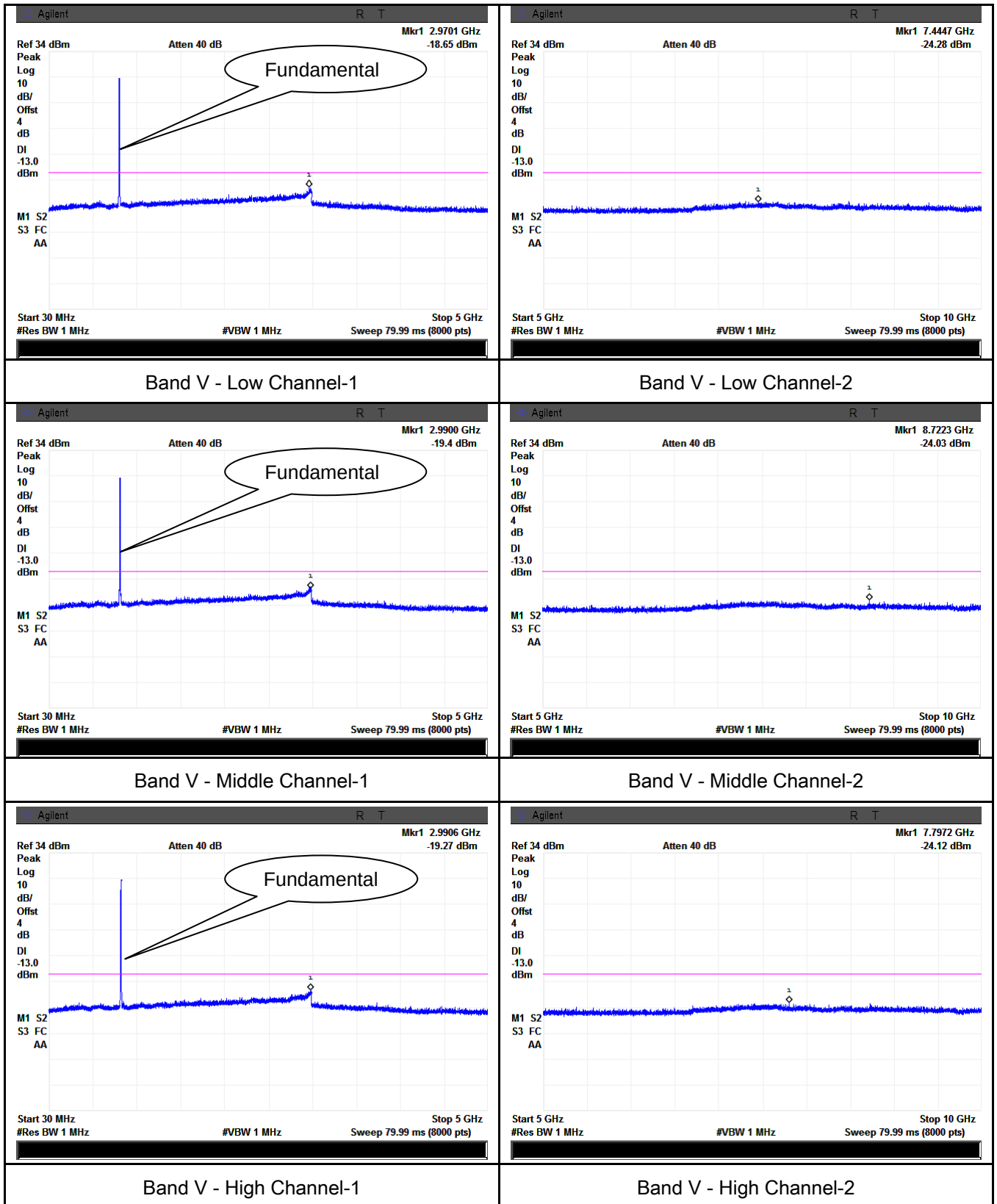
Cellular Band (Part 22H) result



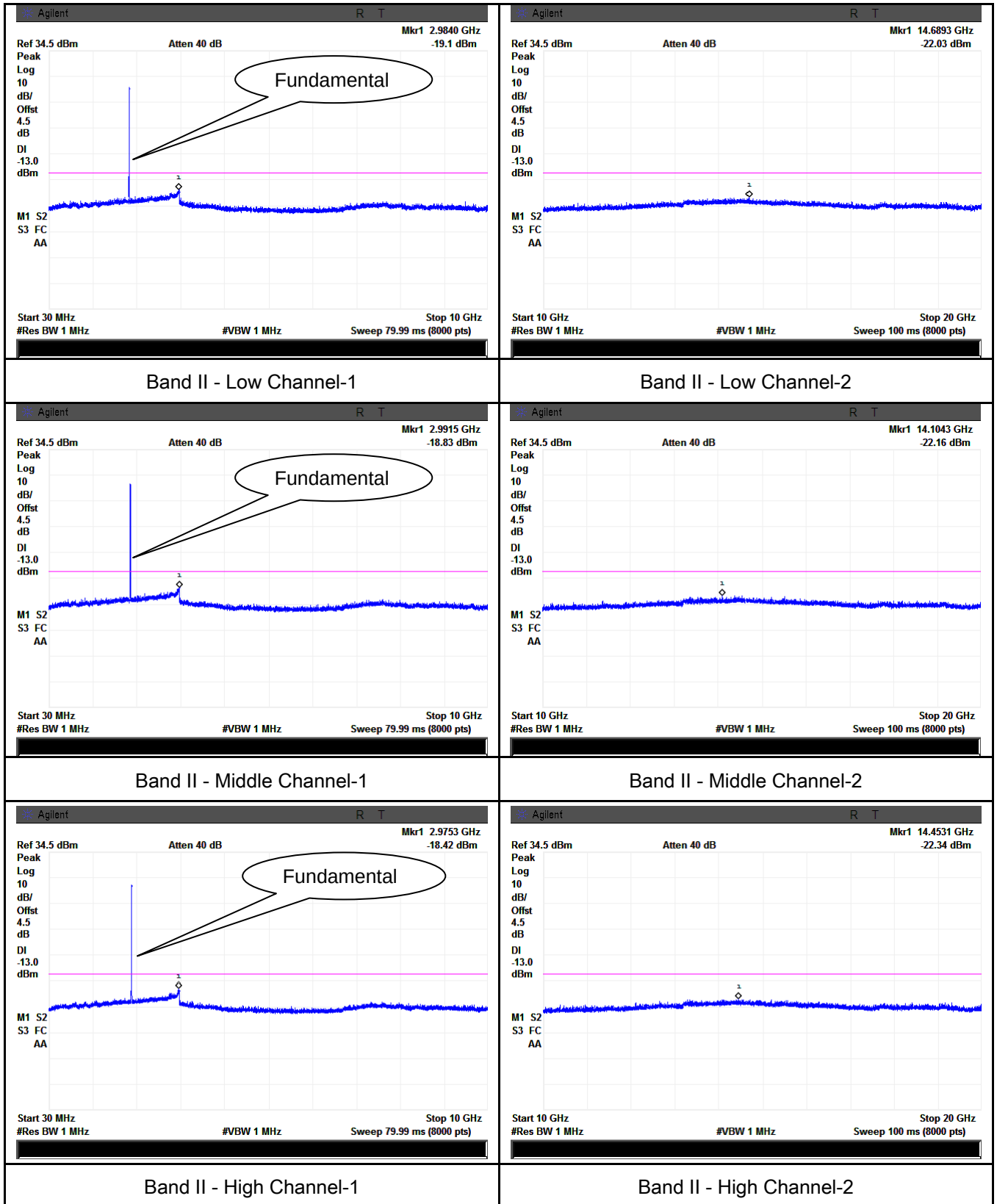
PCS Band (Part24E) result



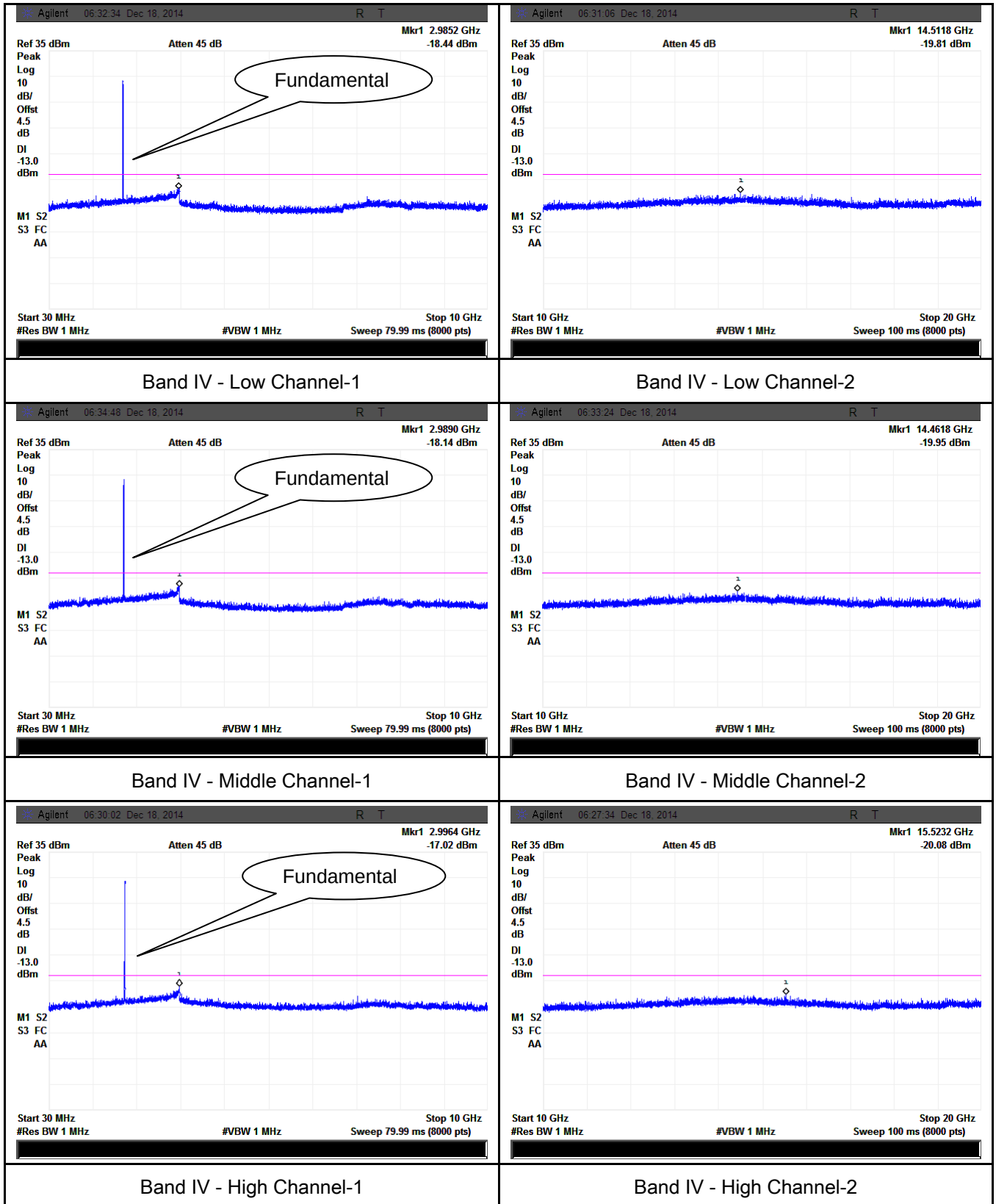
UMTS-FDD Band V (Part 22H)



UMTS-FDD Band II (Part 24E)



UMTS-FDD Band IV (Part 27)



6.7 Spurious Radiated Emissions

Temperature	21°C
Relative Humidity	51%
Atmospheric Pressure	1002mbar
Test date :	December 02, 2014
Tested By :	Herith Shi

Requirement(s):

Spec	Item	Requirement	Applicable
§2.1053, §22.917 & §24.238 § 27.53(h)	a)	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.	☒

Test setup	
------------	--

Test Procedure	- The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable. - 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. - 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 = Raw Amplitude (dBμV/m) – Amplifier Gain (dB) + Antenna Factor (dB) + Cable Loss (dB) + Filter Attenuation (dB, if used)
----------------	---

Remark	
Result	☒ Pass ☐ Fail

Test Data ☒ Yes ☐ N/A

Test Plot ☐ Yes (See below) ☒ N/A

Cellular Band (Part 22H) result

Low channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
1648.4	-45.76	V	7.95	0.78	-38.59	-13	-25.59
1648.4	-44.18	H	7.95	0.78	-37.01	-13	-24.01
352.6	-54.15	V	6.50	0.27	-47.92	-13	-34.92
710.1	-51.22	H	6.80	0.40	-44.82	-13	-31.82

Middle channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
1673.2	-45.92	V	7.95	0.78	-38.75	-13	-25.75
1673.2	-43.87	H	7.95	0.78	-36.70	-13	-23.70
353.5	-54.76	V	6.50	0.27	-48.53	-13	-35.53
711.7	-52.01	H	6.80	0.40	-45.61	-13	-32.61

High channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
1697.6	-45.81	V	7.95	0.78	-38.64	-13	-25.64
1697.6	-43.45	H	7.95	0.78	-36.28	-13	-23.28
351.9	-54.16	V	6.50	0.27	-47.93	-13	-34.93
710.5	-51.08	H	6.80	0.40	-44.68	-13	-31.68

PCS Band (Part24E) result

Low channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3700.4	-47.58	V	10.25	2.73	-40.06	-13	-27.06
3700.4	-50.05	H	10.25	2.73	-42.53	-13	-29.53
352.8	-51.23	V	6.50	0.27	-45	-13	-32
711.3	-54.56	H	6.80	0.40	-48.16	-13	-35.16

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	-48.23	V	10.25	2.73	-40.71	-13	-27.71
3760	-50.12	H	10.25	2.73	-42.60	-13	-29.60
354.7	-51.84	V	6.50	0.27	-45.61	-13	-32.61
713.4	-55.18	H	6.80	0.40	-48.78	-13	-35.78

High channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3819.6	-47.75	V	10.36	2.73	-40.12	-13	-27.12
3819.6	-49.92	H	10.36	2.73	-42.29	-13	-29.29
353.2	-52.07	V	6.50	0.27	-45.84	-13	-32.84
712.9	-54.93	H	6.80	0.40	-48.53	-13	-35.53

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	-45.08	V	7.95	0.78	-37.91	-13	-24.91
1652.8	-40.86	H	7.95	0.78	-33.69	-13	-20.69
357.4	-55.64	V	6.60	0.27	-49.31	-13	-36.31
716.3	-51.57	H	6.80	0.40	-45.17	-13	-32.17

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	-45.19	V	7.95	0.78	-38.02	-13	-25.02
1670	-42.02	H	7.95	0.78	-34.85	-13	-21.85
355.8	-54.97	V	6.60	0.27	-48.64	-13	-35.64
714.7	-52.02	H	6.80	0.40	-45.62	-13	-32.62

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	-44.92	V	7.95	0.78	-37.75	-13	-24.75
1693.2	-41.34	H	7.95	0.78	-34.17	-13	-21.17
354.9	-55.47	V	6.50	0.27	-49.24	-13	-36.24
717.1	-52.18	H	6.80	0.40	-45.78	-13	-32.78

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	-48.02	V	10.25	2.73	-40.5	-13	-27.5
3704.8	-49.66	H	10.25	2.73	-42.14	-13	-29.14
356.5	-55.79	V	6.60	0.27	-49.46	-13	-36.46
718.4	-51.75	H	6.80	0.40	-45.35	-13	-32.35

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	-48.29	V	10.25	2.73	-40.77	-13	-27.77
3760	-50.05	H	10.25	2.73	-42.53	-13	-29.53
358.2	-54.97	V	6.60	0.27	-48.64	-13	-35.64
717.7	-51.63	H	6.80	0.40	-45.23	-13	-32.23

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	-47.96	V	10.36	2.73	-40.33	-13	-27.33
3815.2	-50.23	H	10.36	2.73	-42.60	-13	-29.60
359.7	-55.49	V	6.60	0.27	-49.16	-13	-36.16
716.8	-52.28	H	6.80	0.40	-45.88	-13	-32.88

UMTS-FDD Band IV (Part 27)

Low channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3424.8	-46.22	V	10.07	2.52	-38.67	-13	-25.67
3424.8	-45.05	H	10.07	2.52	-37.50	-13	-24.50
351.9	-55.27	V	6.50	0.27	-49.04	-13	-36.04
711.8	-50.86	H	6.80	0.40	-44.46	-13	-31.46

Middle channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3480	-47.16	V	10.09	2.52	-39.59	-13	-26.59
3480	-46.24	H	10.09	2.52	-38.67	-13	-25.67
353.2	-53.84	V	6.50	0.27	-47.61	-13	-34.61
709.8	-50.43	H	6.80	0.40	-44.03	-13	-31.03

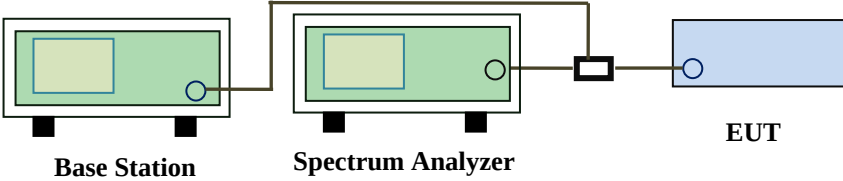
High channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3505.2	-46.16	V	10.09	2.52	-38.59	-13	-25.59
3505.2	-47.24	H	10.09	2.52	-39.67	-13	-26.67
352.8	-54.22	V	6.50	0.27	-47.99	-13	-34.99
709.4	-50.82	H	6.80	0.40	-44.42	-13	-31.42

6.8 Band Edge

Temperature	23°C
Relative Humidity	58%
Atmospheric Pressure	1019mbar
Test date :	December 18, 2014
Tested By :	Herith Shi

Requirement(s):

Spec	Item	Requirement	Applicable
§22.917(a) §24.238(a) § 27.53(h)	a)	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.	☒
Test setup	 Base Station Spectrum Analyzer EUT		
Procedure	- The EUT was connected to Spectrum Analyzer and Base Station via power divider. - The Band Edges of low and high channels for the highest RF powers were measured. Setting RBW as roughly BW/100.		
Remark			
Result	☒ Pass ☐ Fail		

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Cellular Band (Part 22H) result

Frequency (MHz)	Emission (dBm)	Limit (dBm)
823.9775	-13.14	-13
849.0200	-13.39	-13

PCS Band (Part24E) result

Frequency (MHz)	Emission (dBm)	Limit (dBm)
1850.0000	-14.65	-13
1910.0200	-14.21	-13

UMTS-FDD Band V (Part 22H)

Frequency (MHz)	Emission (dBm)	Limit (dBm)
823.9775	-20.06	-13
849.0200	-23.11	-13

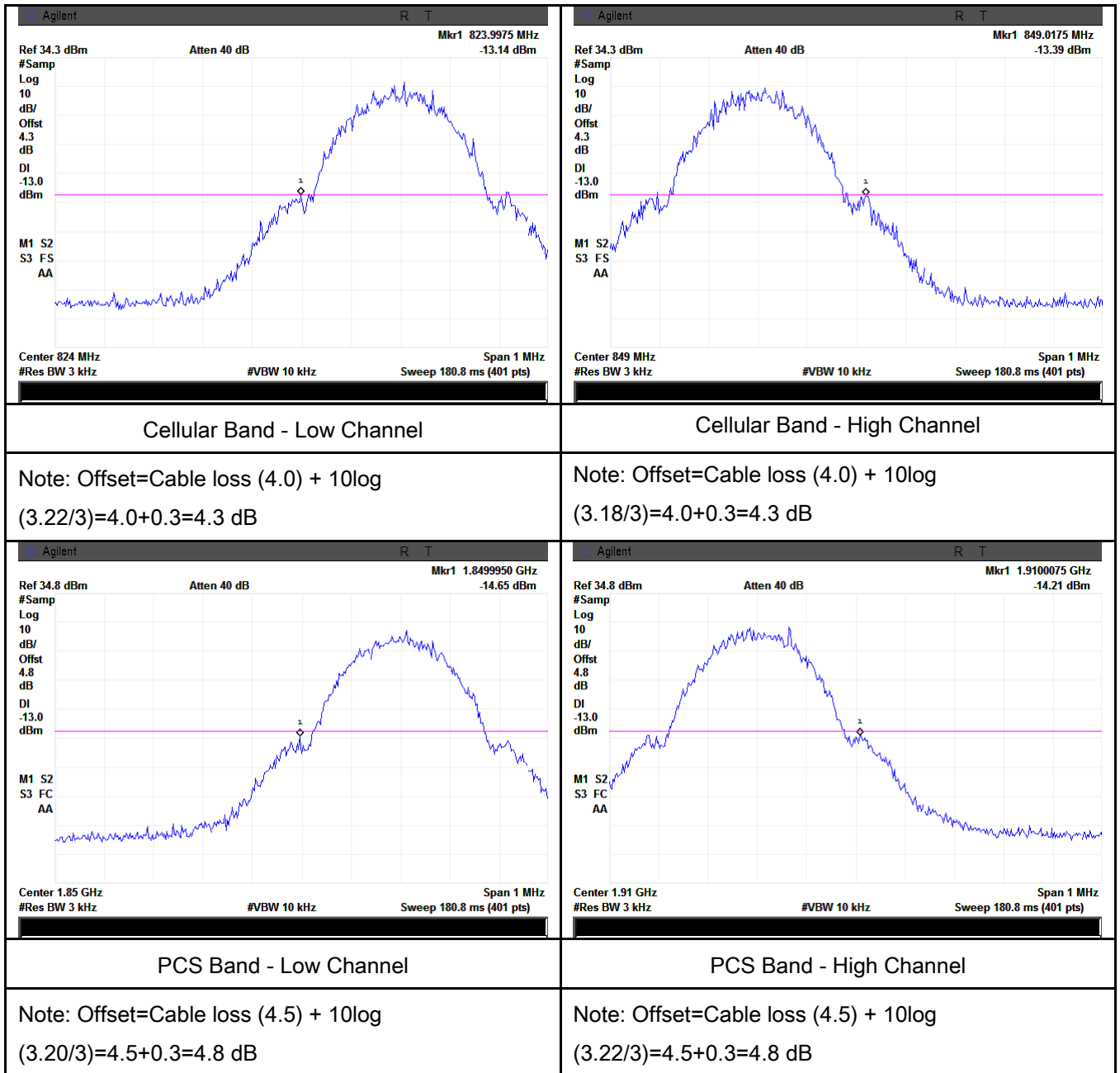
UMTS-FDD Band II (Part 24E)

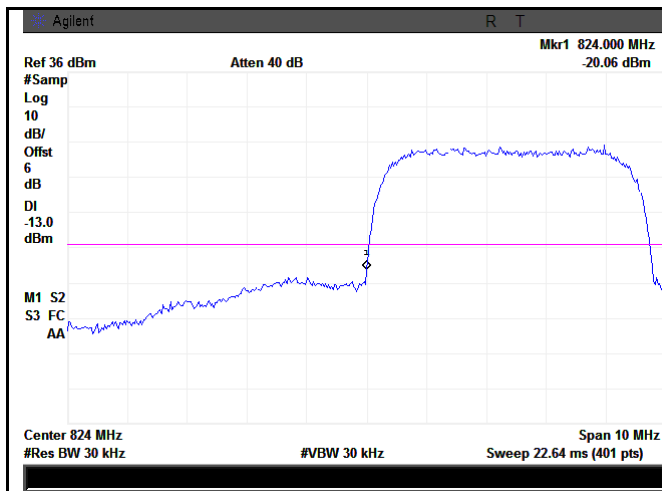
Frequency (MHz)	Emission (dBm)	Limit (dBm)
1850.0000	-24.17	-13
1910.0200	-16.28	-13

UMTS-FDD Band IV (Part 27)

Frequency (MHz)	Emission (dBm)	Limit (dBm)
1710.0000	-21.53	-13
1500.0000	-22.64	-13

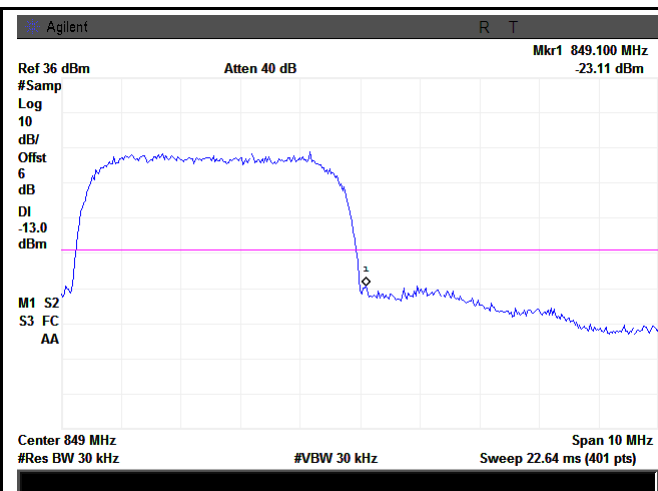
Test Plots





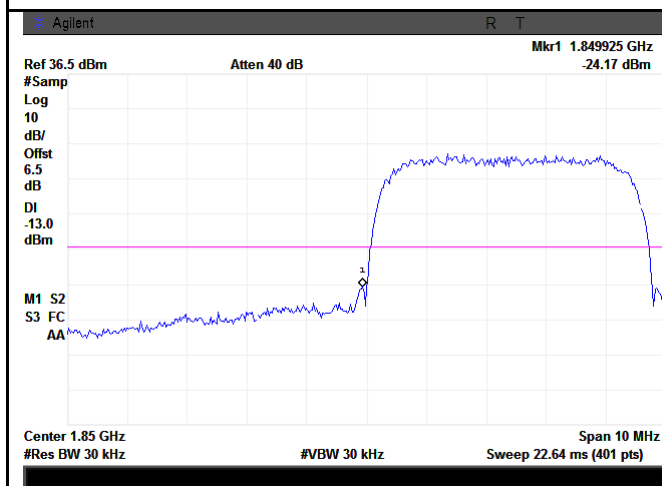
UMTS-FDD Band V - Low Channel

Note: Offset=Cable loss (4.0) + 10log
(47.13/3)=4.0+2.0=6 dB



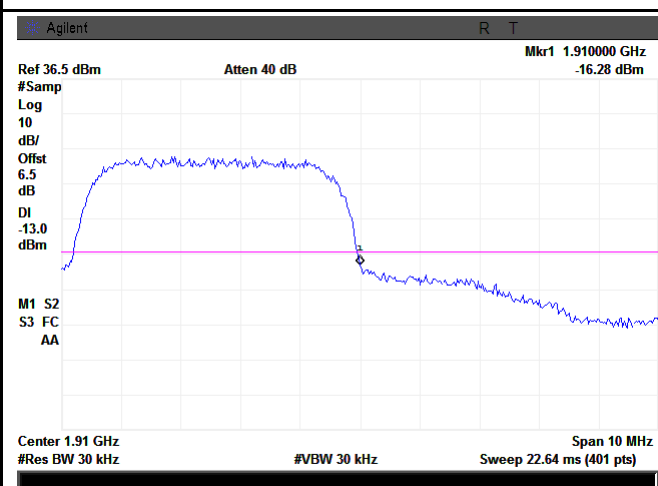
UMTS-FDD Band V - High Channel

Note: Offset=Cable loss (4.0) + 10log
(47.13/3)=4.0+2.0=6 dB



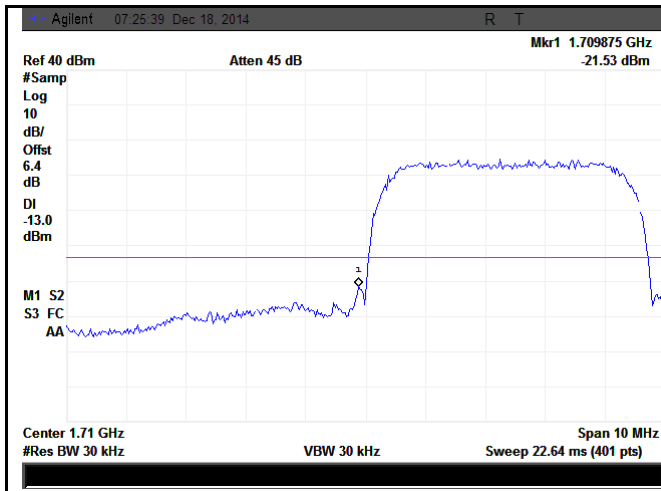
UMTS-FDD Band II - Low Channel

Note: Offset=Cable loss (4.5) + 10log
(46.77/3)=4.5+1.9=6.4 dB



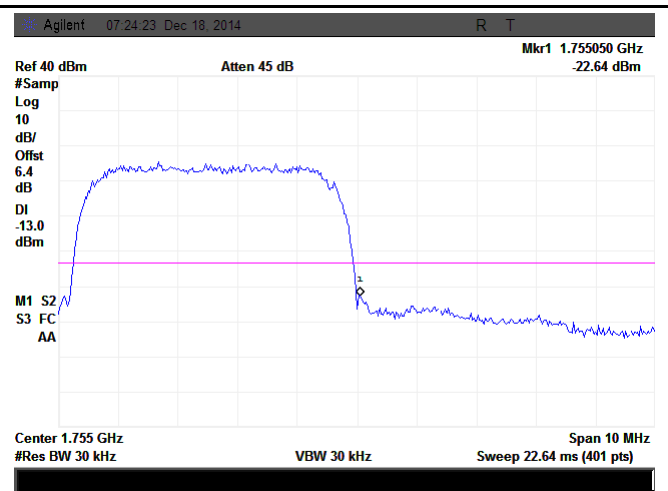
UMTS-FDD Band II - High Channel

Note: Offset=Cable loss (4.5) + 10log
(46.89/3)=4.5+1.9=6.4 dB



UMTS-FDD Band IV - Low Channel

Note: Offset=Cable loss (4.5) + 10log
(46.77/3)=4.5+2.0=6.4 dB



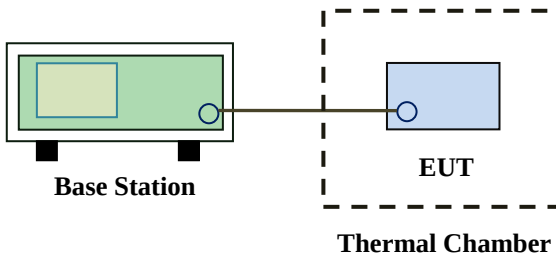
UMTS-FDD Band IV - High Channel

Note: Offset=Cable loss (4.5) + 10log
(46.89/3)=4.5+2.0=6.4 dB

6.9 Frequency Stability

Temperature	24°C
Relative Humidity	52%
Atmospheric Pressure	1013mbar
Test date :	December 12, 2014
Tested By :	Herith Shi

Requirement(s):

Spec	Item	Requirement	Applicable																																
§2.1055, §22.355 & §24.235 § 27.5(h); § 27.54	a)	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 <table border="1"> <thead> <tr> <th>Frequency Range (MHz)</th><th>Base, fixed (ppm)</th><th>Mobile ≤ 3 watts (ppm)</th><th>Mobile ≤ 3 watts (ppm)</th></tr> </thead> <tbody> <tr> <td>25 to 50</td><td>20.0</td><td>20.0</td><td>50.0</td></tr> <tr> <td>50 to 450</td><td>5.0</td><td>5.0</td><td>50.0</td></tr> <tr> <td>450 to 512</td><td>2.5</td><td>5.0</td><td>5.0</td></tr> <tr> <td>821 to 896</td><td>1.5</td><td>2.5</td><td>2.5</td></tr> <tr> <td>928 to 929.</td><td>.0</td><td>N/A</td><td>N/A</td></tr> <tr> <td>929 to 960.</td><td>1.5</td><td>N/A</td><td>N/A</td></tr> <tr> <td>2110 to 2220</td><td>10.0</td><td>N/A</td><td>N/A</td></tr> </tbody> </table> According to §24.235, the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized frequency block.	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.	.0	N/A	N/A	929 to 960.	1.5	N/A	N/A	2110 to 2220	10.0	N/A	N/A	☒
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.	.0	N/A	N/A																																
929 to 960.	1.5	N/A	N/A																																
2110 to 2220	10.0	N/A	N/A																																
Test setup	 The diagram illustrates the test setup. On the left, a green rectangular box represents the 'Base Station'. A horizontal line connects it to a blue rectangular box labeled 'EUT' (Equipment Under Test). The 'EUT' is enclosed within a dashed-line rectangular box labeled 'Thermal Chamber'.																																		

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Procedure	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 $\pm 0.00025\%$ ($\pm 2.5\text{ppm}$) of the center frequency.
Remark	
Result	☒ Pass ☐ Fail

Test Data ☒ Yes ☐ N/A

Test Plot ☐ Yes (See below) ☒ N/A

Cellular Band (Part 22H) result

Middle Channel, $f_0 = 836.6$ MHz				
Temperature (°C)	Power Supplied (V _{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-10	3.7	25	0.0299	2.5
0		19	0.0227	2.5
10		18	0.0215	2.5
20		10	0.0120	2.5
30		14	0.0167	2.5
40		21	0.0251	2.5
50		23	0.0275	2.5
55		28	0.0335	2.5
25	4.2	15	0.0179	2.5
	3.5	16	0.0191	2.5

PCS Band (Part 22H) result

Middle Channel, $f_0 = 1880$ MHz				
Temperature (°C)	Power Supplied (V _{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-10	3.7	29	0.0154	2.5
0		27	0.0144	2.5
10		22	0.0117	2.5
20		12	0.0064	2.5
30		15	0.0080	2.5
40		21	0.0112	2.5
50		23	0.0122	2.5
55		26	0.0138	2.5
25	4.2	16	0.0085	2.5
	3.5	18	0.0096	2.5

UMTS-FDD Band V (Part 22H)

Middle Channel, $f_0 = 835$ MHz				
Temperature (°C)	Power Supplied (V _{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-10	3.7	29	0.0347	2.5
0		24	0.0287	2.5
10		21	0.0251	2.5
20		18	0.0216	2.5
30		19	0.0228	2.5
40		22	0.0263	2.5
50		28	0.0335	2.5
55		31	0.0371	2.5
25	4.2	20	0.0240	2.5
	3.5	22	0.0263	2.5

UMTS-FDD Band II (Part 24E)

Middle Channel, $f_0 = 1880$ MHz				
Temperature (°C)	Power Supplied (V _{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-10	3.7	29	0.0154	2.5
0		27	0.0144	2.5
10		24	0.0128	2.5
20		17	0.0090	2.5
30		16	0.0085	2.5
40		22	0.0117	2.5
50		25	0.0133	2.5
55		29	0.0154	2.5
25	4.2	18	0.0096	2.5
	3.5	20	0.0106	2.5

UMTS-FDD Band IV (Part 27)

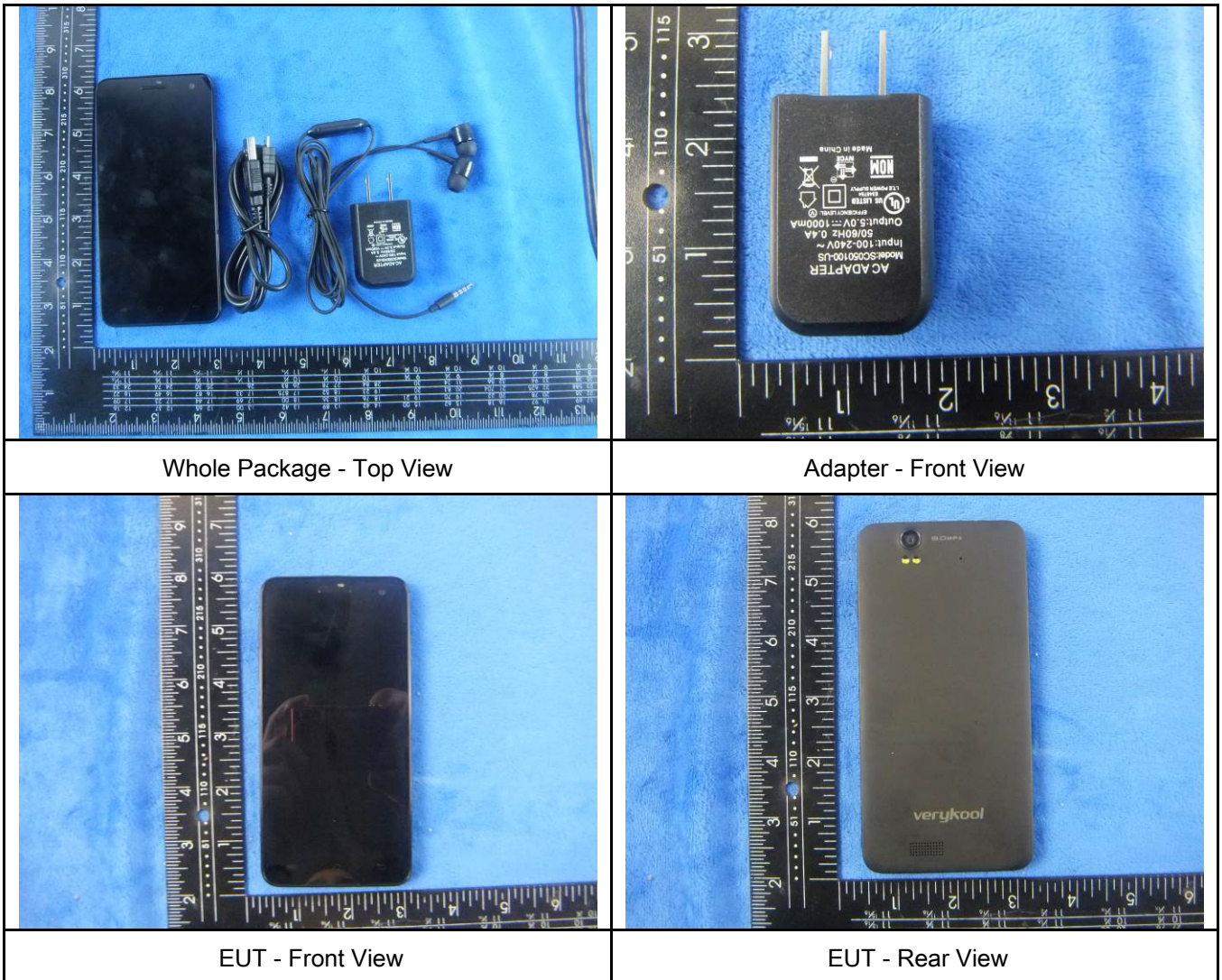
Middle Channel, $f_0 = 1880$ MHz				
Temperature (°C)	Power Supplied (V _{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-10	3.7	11	0.0059	2.5
0		8	0.0043	2.5
10		6	0.0032	2.5
20		4	0.0021	2.5
30		5	0.0027	2.5
40		7	0.0037	2.5
50		9	0.0048	2.5
55		12	0.0064	2.5
25	4.2	14	0.0074	2.5
	3.5	15	0.0080	2.5

Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Due	In use
RF Conducted Test					
Agilent ESA-E SERIES SPECTRUM ANALYZER	E4407B	MY45108319	09/17/2014	09/16/2015	☒
Power Splitter	1#	1#	09/02/2014	09/01/2015	☒
Universal Radio Communication Tester	CMU200	121393	09/26/2014	09/25/2015	☒
Temperature/Humidity Chamber	UHL-270	001	10/10/2014	10/09/2015	☒
DC Power Supply	E3640A	MY40004013	09/18/2014	09/17/2015	☒
Radiated Emissions					
EMI test receiver	ESL6	100262	09/18/2014	09/17/2015	☒
OPT 010 AMPLIFIER (0.1-1300MHz)	8447E	2727A02430	09/02/2014	09/01/2015	☒
Microwave Preamplifier (0.5 ~ 18GHz)	PAM-118	443008	09/02/2014	09/01/2015	☒
Bilog Antenna (30MHz~6GHz)	JB6	A110712	09/22/2014	09/21/2015	☒
Bilog Antenna (30MHz~2GHz)	JB1	A112017	09/22/2014	09/21/2015	☒
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71259	09/25/2014	09/24/2015	☒
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/25/2014	09/24/2015	☒
SYNTHESIZED SIGNAL GENERATOR	8665B	3744A01293	09/18/2014	09/17/2015	☒
Tunable Notch Filter	3NF-800/1000-S	AA4	09/02/2014	09/01/2015	☒
Tunable Notch Filter	3NF-1000/2000-S	AM 4	09/02/2014	09/01/2015	☒

Annex B. EUT And Test Setup Photographs

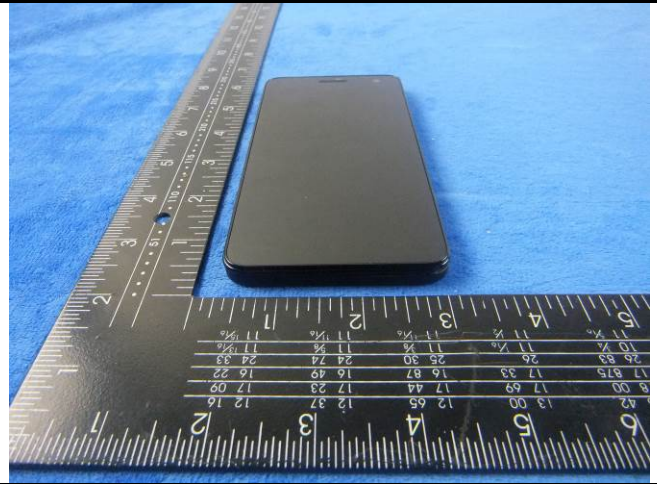
Annex B.i. Photograph: EUT External Photo



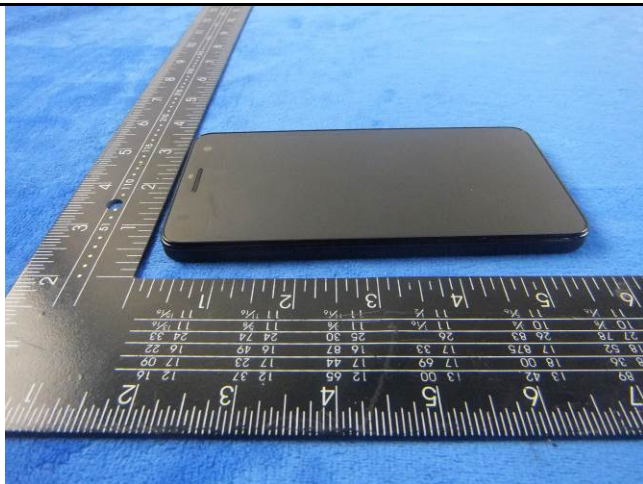
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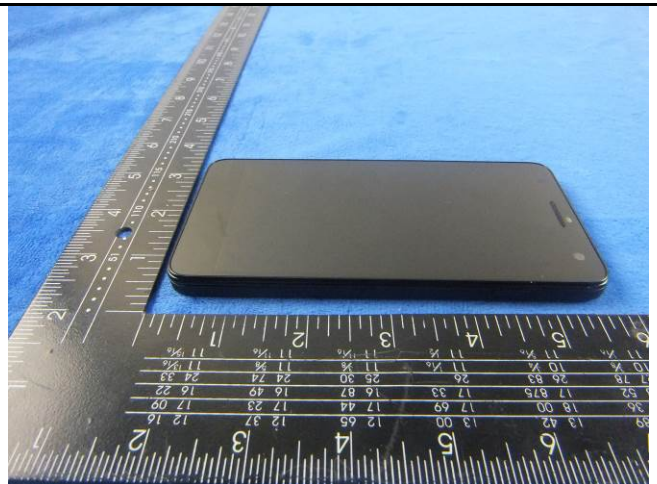
EUT - Top View



EUT - Bottom View



EUT - Left View



EUT - Right View

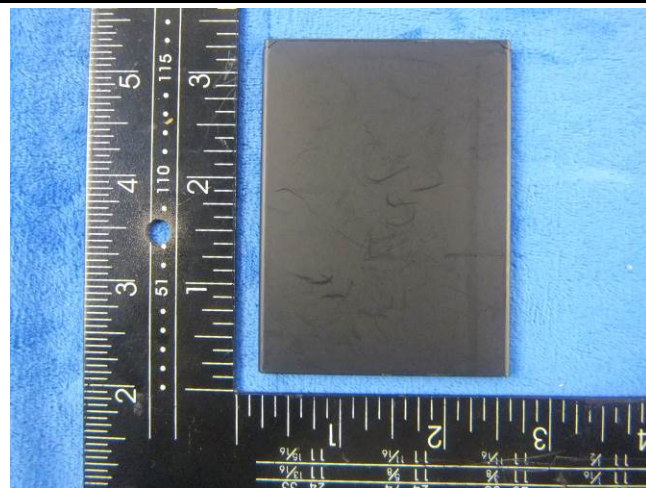
Annex B.ii. Photograph: EUT Internal Photo



Cover Off - Top View 1



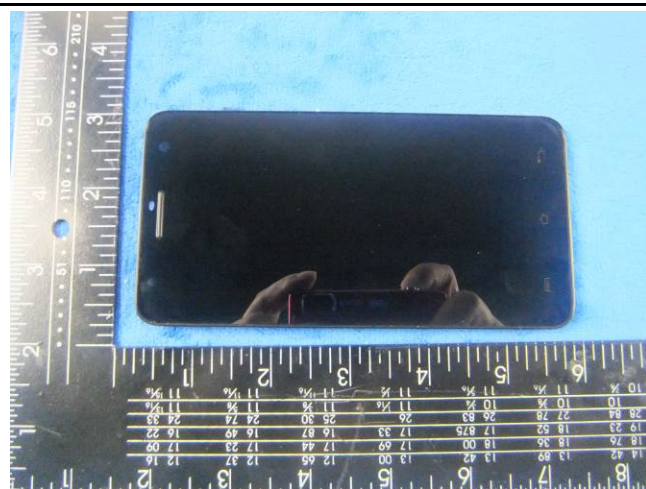
Cover Off - Top View 2



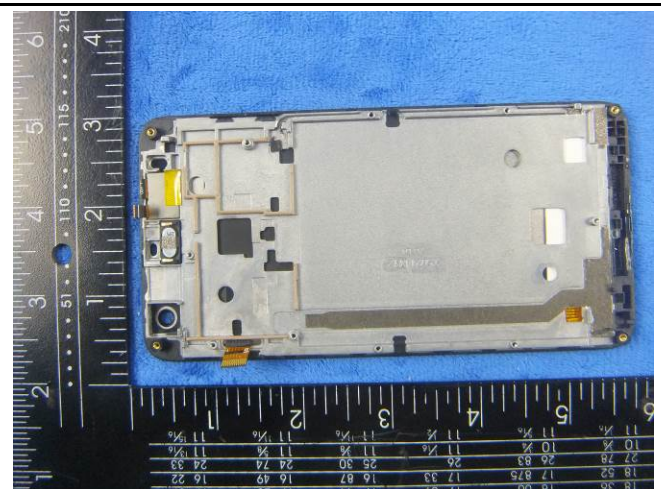
Battery - Top View



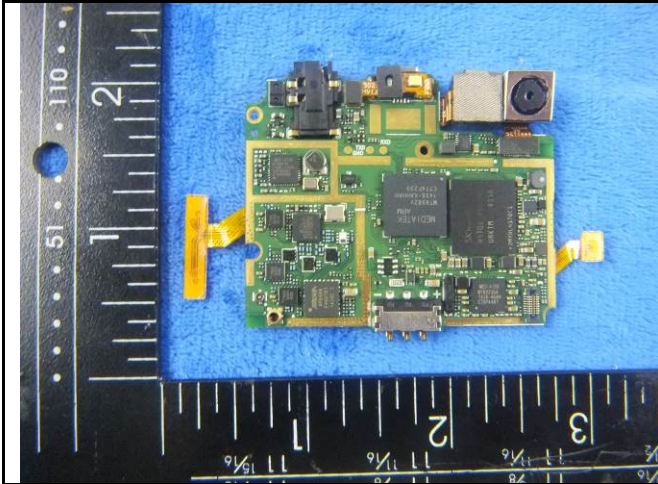
Battery - Bottom View



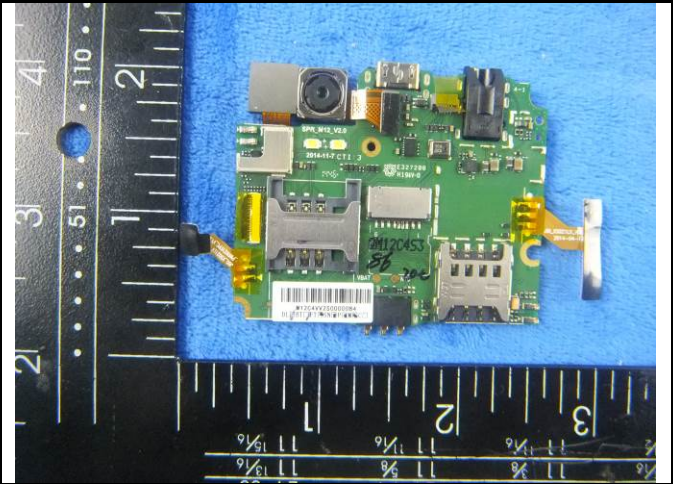
LCD - Front View



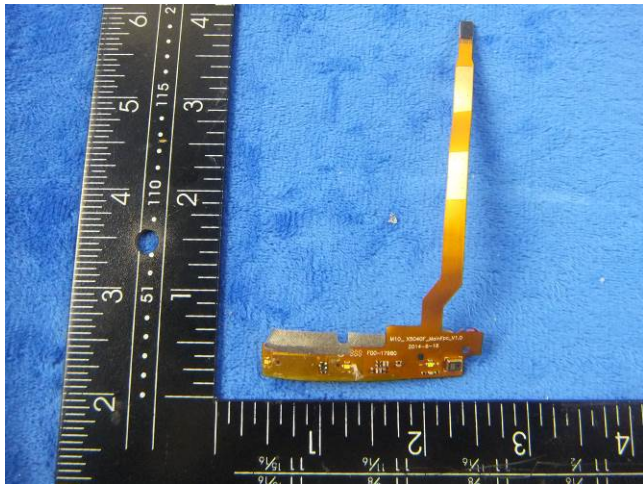
LCD - Rear View



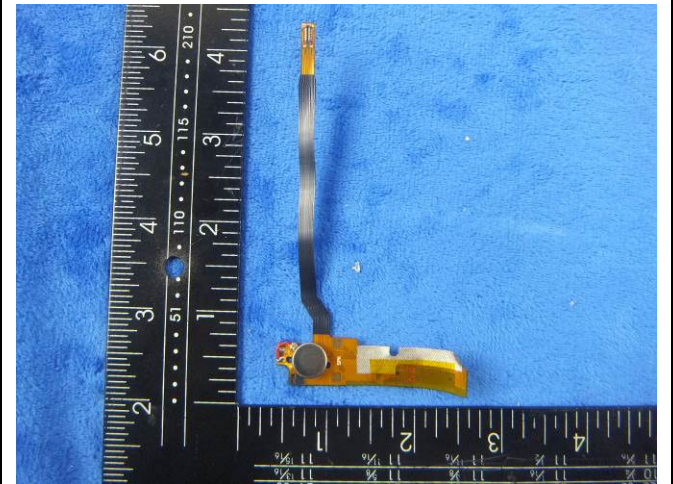
Mainboard With Shielding - Front View



Mainboard Without Shielding - Front View



Mainboard With Shielding - Front View



Mainboard Without Shielding - Rear View



BT/BLE/WIFI Antenna View

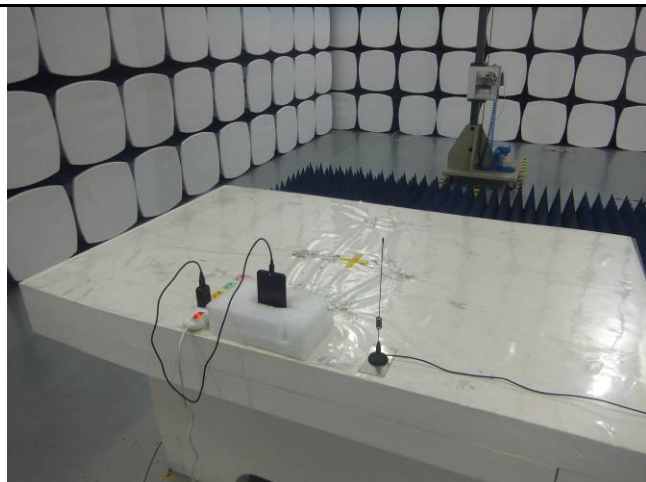


GSM/PCS/UMTS-FDD Antenna View

Annex B.iii. Photograph: Test Setup Photo



Radiated Spurious Emissions Test Setup Below 1GHz

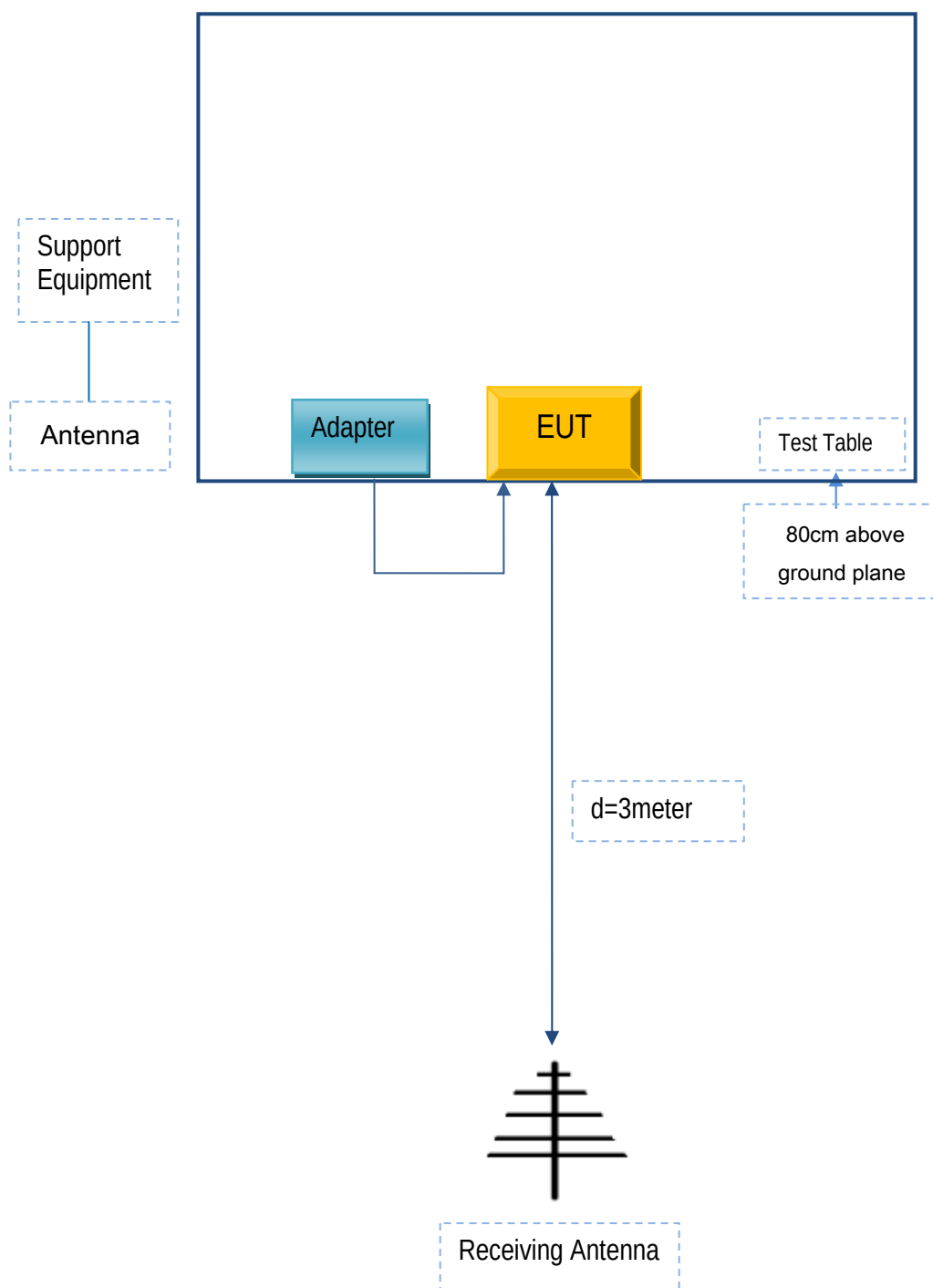


Radiated Spurious Emissions Test Setup Above
1GHz

Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

Annex C.ii. TEST SET UP BLOCK

Block Configuration Diagram for Radiated Emissions



Annex C. ii. SUPPORTING EQUIPMENT DESCRIPTION

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

Manufacturer	Equipment Description	Model	Calibration Date	Calibration Due Date
N/A	N/A	N/A	N/A	N/A

Annex C.ii. EUT OPERATING CONKITIONS

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.

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Annex D. User Manual / Block Diagram / Schematics / Partlist

Please see attachment

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Annex E. DECLARATION OF SIMILARITY

N/A