

FCC TEST REPORT

For

Shanghai Rising Digital Co., Ltd.

Display screen

Model No.: SECD-5I0A-03, SECD-5I0A-03(S), SECD-5I0B-03,
SECD-5I0B-03(S), SECD-7I0A-03, SECD-7I0A-35

Prepared For : Shanghai Rising Digital Co., Ltd.

Address : No 318, Chuanda Road, Pudong New District, Shanghai China

Prepared By : Shenzhen Anbotek Compliance Laboratory Limited

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Report Number : R0217050061W2

Date of Test : Sept. 10~30, 2017

Date of Report : Sept. 30, 2017

Contents

1. General Information.....	5
1.1. Client Information.....	5
1.2. Description of Device (EUT).....	5
1.3. Auxiliary Equipment Used During Test.....	6
1.4. Description of Test Modes.....	6
1.5. Description Of Test Setup.....	7
1.6. Test Equipment List.....	9
1.7. Measurement Uncertainty.....	10
1.8. Description of Test Facility.....	10
2. Summary of Test.....	11
2.1. Summary of test result.....	11
2.2. Test mode.....	11
3. RF Output Power Test.....	13
3.1. Test Standard and Limit.....	13
3.2. Test Setup.....	13
3.3. Test Procedure.....	13
3.4. Test Data.....	13
4. Peak-Average Ratio.....	20
4.1. Test Standard and Limit.....	20
4.2. Test Setup.....	20
4.3. Test Procedure.....	20
4.4. Test Data.....	20
5. Modulation Characteristic.....	22
6. Occupied Bandwidth.....	23
6.1. Test Standard and Limit.....	23
6.2. Test Setup.....	23
6.3. Test Procedure.....	23
6.4. Test Data.....	23
7. Spurious Emissions at Antenna Terminals.....	27
7.1. Test Standard and Limit.....	27
7.2. Test Setup.....	27
7.3. Test Procedure.....	27
7.4. Test Data.....	27
8. Spurious Radiated Emissions.....	35
8.1. Test Standard and Limit.....	35
8.2. Test Setup.....	35
8.3. Test Procedure.....	35
8.4. Test Data.....	35
9. Band Edge Compliance.....	41
9.1. Test Standard and Limit.....	41
9.2. Test Setup.....	41
9.3. Test Procedure.....	41

9.4. Test Data.....	41
10. Frequency Stability.....	48
10.1. Test Standard and Limit.....	48
10.2. Test Setup.....	48
10.3. Test Procedure.....	48
10.4. Test Data.....	48
APPENDIX I -- TEST SETUP PHOTOGRAPH.....	52
APPENDIX II -- PHOTOGRAPH.....	53

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TEST REPORT

Applicant : Shanghai Rising Digital Co., Ltd.
Manufacturer : Shanghai Rising Digital Co., Ltd.
Product Name : Display screen
Model No. : SECD-510A-03, SECD-510A-03(S), SECD-510B-03, SECD-510B-03(S),
SECD-710A-03, SECD-710A-35
Trade Mark :  **RISING**
Rating(s) : Input: DC 8-36V, 250mA
Output: DC 24V, 500mA

Test Standard(s) : FCC PART 2, FCC Part 22(H), FCC Part 24(E), FCC Part 27(H):2016

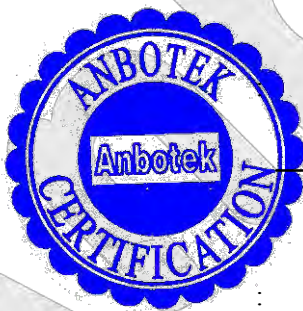
Test Method(s) : ANSI/TIAC603 D: 2010

The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the FCC Part 15 Subpart C requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotek Compliance Laboratory Limited.

Date of Test : Sept. 10~30, 2017

Prepared by :



Winkey Wang

(Tested Engineer / Winkey Wang)

Reviewer :

Tangcy. T.

(Project Manager / Tangcy. T)

Approved & Authorized Signer :

Tom Chen

(Manager / Tom Chen)

1. General Information

1.1. Client Information

Applicant	:	Shanghai Rising Digital Co., Ltd.
Address	:	No 318, Chuanda Road, Pudong New District, Shanghai China
Manufacturer	:	Shanghai Rising Digital Co., Ltd.
Address	:	No 318, Chuanda Road, Pudong New District, Shanghai China

1.2. Description of Device (EUT)

Product Name	:	Display screen
Model No.	:	SECD-5I0A-03, SECD-5I0A-03(S), SECD-5I0B-03, SECD-5I0B-03(S), SECD-7I0A-03, SECD-7I0A-35 (Note: All samples are the same except the model number and colour, so we prepare "SECD-5I0A-03" for test only.)
Trade Mark	:	 RISING
Test Power Supply	:	DC 12V from lead acid battery
Product Description	:	Operation Frequency: 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 5 TX: 826.4 ~ 846.6 MHz; RX: 871.4 ~ 891.6 MHz UMTS-FDD Band 2 TX:1852.4~1907.6 MHz; RX: 1932.4~1987.6 MHz UMTS-FDD Band 4 TX :1712.4~1752.6 MHz; RX: 2112.4~2152.6 MHz
	:	Modulation Type: GPRS: GMSK UMTS-FDD: QPSK
	:	Antenna Type: PIFA Antenna
	:	Antenna Gain(Peak): 1 dBi
	:	
Remark: 1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual. 2) This report is for WCDMA.		

1.3. Auxiliary Equipment Used During Test

N/A	:	N/A
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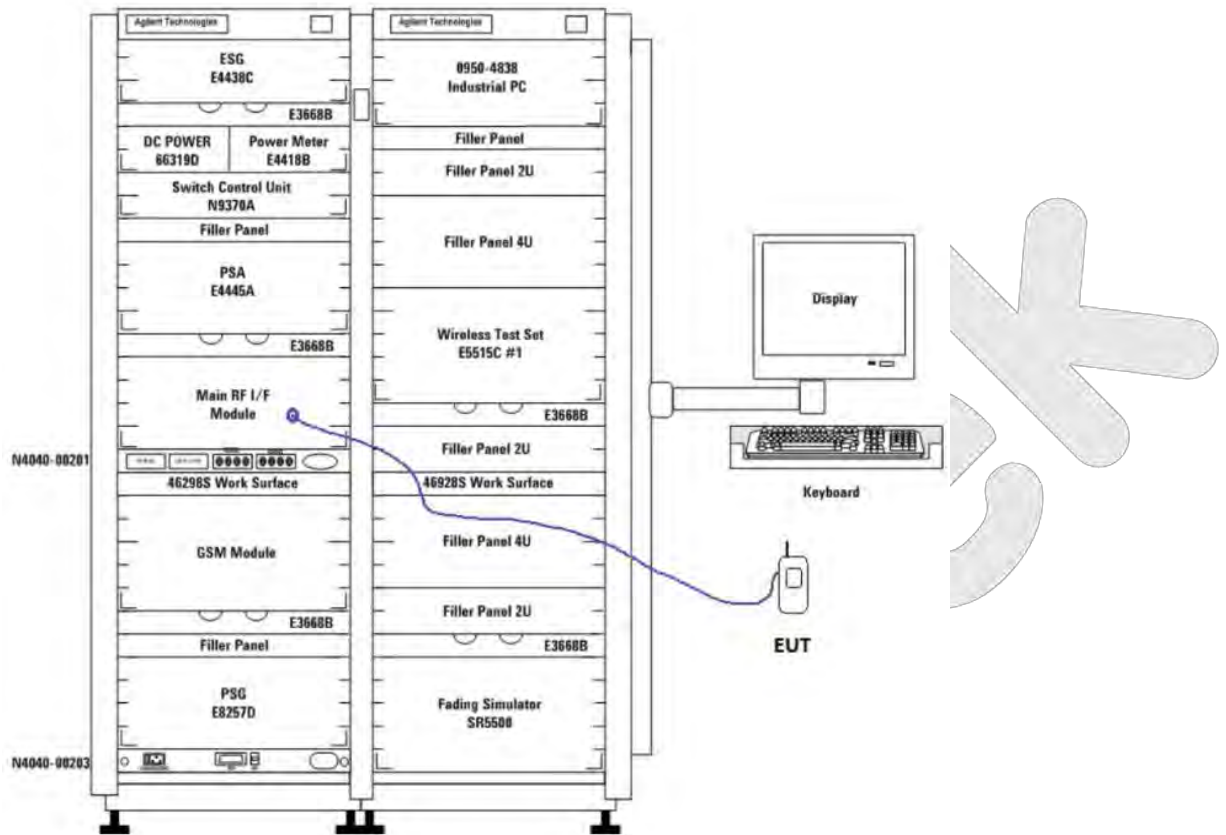
1.4. Description of Test Modes

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

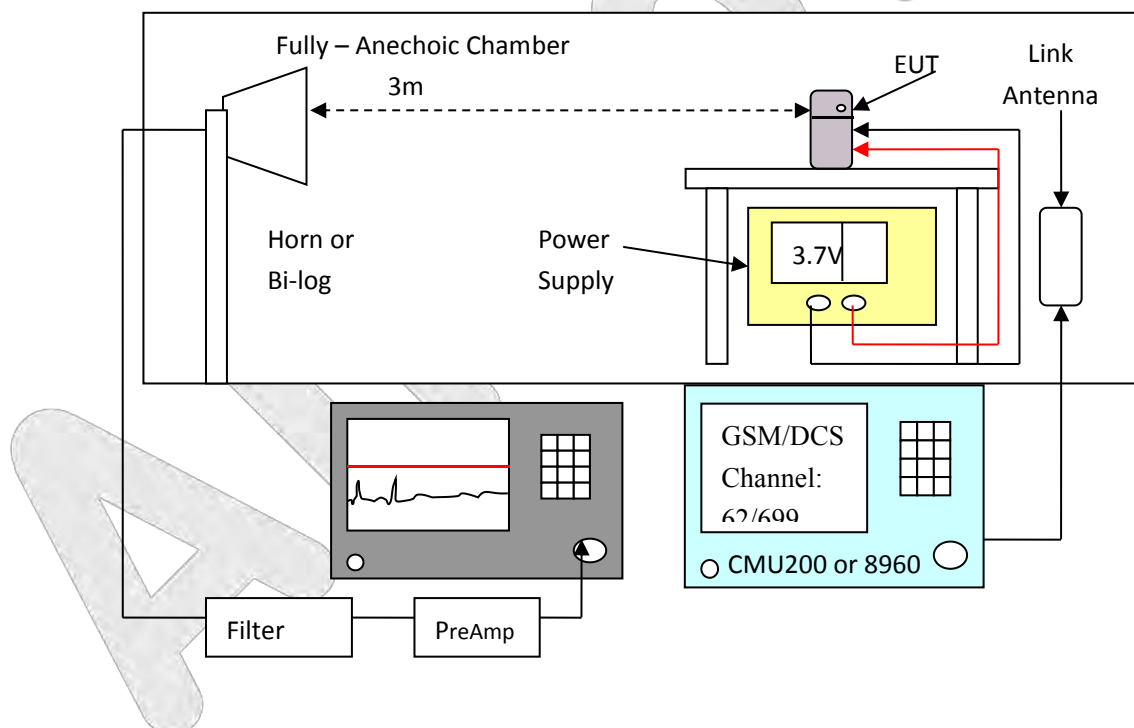
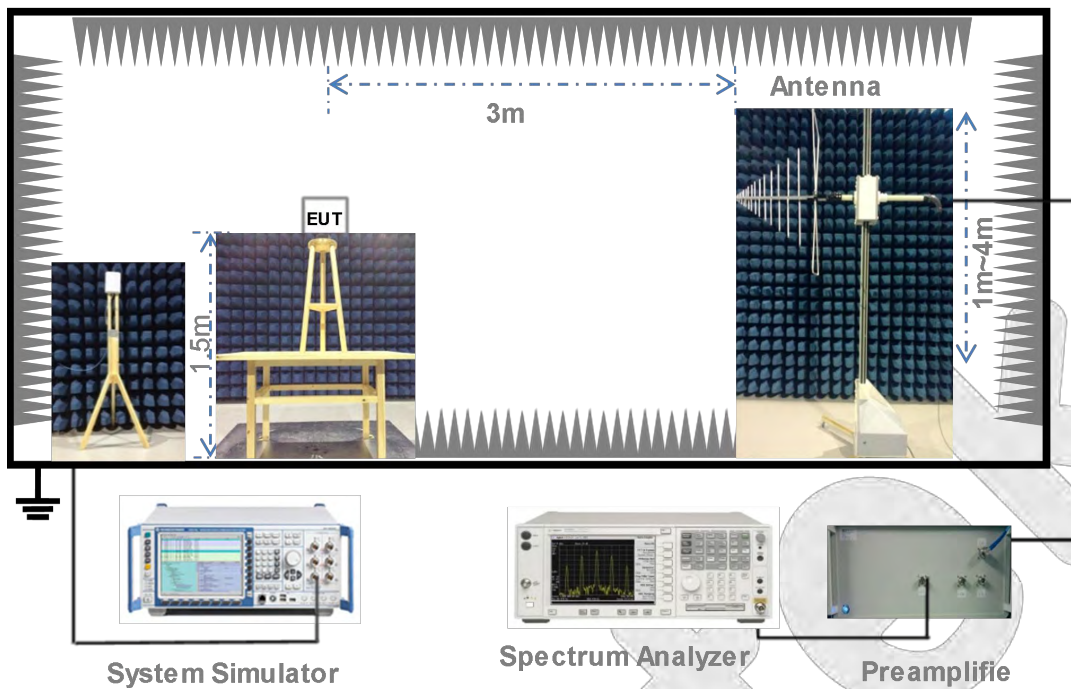
Test	Description Of Operation
Emissions Testing	The EUT was communicating with base station and set to work at maximum output power.
Others Testing	The EUT was communicating with base station and set to work at maximum output power.

1.5. Description Of Test Setup

1.5.1 Conducted Test Setup



1.5.2 Radiated Test Setup



1.6. Test Equipment List

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	L.I.S.N. Artificial Mains Network	Rohde & Schwarz	ENV216	100055	May 27, 2017	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	May 27, 2017	1 Year
3.	RF Switching Unit	Compliance Direction	RSU-M2	38303	May 27, 2017	1 Year
4.	Spectrum Analysis	Agilent	E4407B	US39390582	May 27, 2017	1 Year
5.	Preamplifier	SKET Electronic	BK1G18G30 D	KD17503	May 27, 2017	1 Year
6.	EMI Test Receiver	Rohde & Schwarz	ESPI	101604	May 27, 2017	1 Year
7.	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	May 31, 2017	1 Year
8.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	May 31, 2017	1 Year
9.	Loop Antenna	Schwarzbeck	HFH2-Z2	100047	Apr. 03, 2017	1 Year
10.	Pre-amplifier	SONOMA	310N	186860	May 27, 2017	1 Year
11.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A
12.	Power Sensor	DAER	RPR3006W	15100041SN045	May 27, 2017	1 Year
13.	Power Sensor	DAER	RPR3006W	15100041SN046	May 27, 2017	1 Year
14.	MXA Spectrum Analysis	Agilent	N9020A	MY51170037	May 27, 2017	1 Year
15.	MXG RF Vector Signal Generator	Agilent	N5182A	MY48180656	May 27, 2017	1 Year
16.	Signal Generator	Agilent	E4421B	MY41000743	May 27, 2017	1 Year
17.	DC Power supply	IVYTECH	IV6003	1601D6030007	May 26, 2017	1 Year
18.	TEMP&HUMI PROGRAMMABLE CHAMBER	Sertep	ZJ-HWHS80 B	ZJ-17042804	Mar. 03, 2017	1 Year
19.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	May 31, 2017	1 Year

1.7. Measurement Uncertainty

Maximum measurement uncertainty

Parameter	Uncertainty
Occupied Channel Bandwidth	$\pm 5 \%$
RF output power, conducted	$\pm 1,5 \text{ dB}$
Power Spectral Density, conducted	$\pm 3 \text{ dB}$
Unwanted Emissions, conducted	$\pm 3 \text{ dB}$
All emissions, radiated	$\pm 6 \text{ dB}$
Temperature	$\pm 1 \text{ }^{\circ}\text{C}$
Humidity	$\pm 5 \%$
DC and low frequency voltages	$\pm 3 \%$
Time	$\pm 5 \%$
Duty Cycle	$\pm 5 \%$

1.8. Description of Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

FCC-Registration No.: 184111

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No. 184111, July 31, 2017.

ISED-Registration No.: 8058A-1

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (ISED) Innovation, Science and Economic Development Canada. The acceptance letter from the ISED is maintained in our files. Registration 8058A-1, June 13, 2016.

Test Location

All Emissions tests were performed at

Shenzhen Anbotek Compliance Laboratory Limited.

at 1/F., Building 1, SEC Industrial Park, No.0409 Qianhai Road, Nanshan District, Shenzhen, Guangdong, China

2. Summary of Test

2.1. Summary of test result

FCC Rules	Description of Test	Result
§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

2.2. Test mode

During all testing, EUT is in link mode with base station emulator at maximum power level in each test mode and channel as below:

Temperature range	21-25°C
Humidity range	40-75%
Pressure range	86-106kPa

Mode	Channel	Frequency(MHz)
UMTS BAND V	4132	824.2
	4182	836.6
	4233	846.6
UMTS BAND II	9262	1852.4
	9400	1880.0
	9538	1907.6
UMTS BAND IV	1313	1712.4
	1413	1732.6
	1512	1752.6

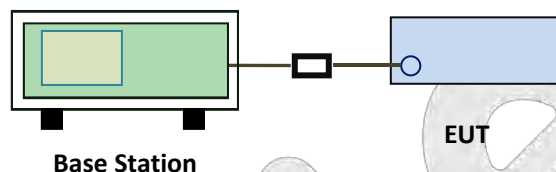
Mode	Channel	Frequency(MHz)
GSM 850	128	824.2
	190	836.6
	251	848.8
PCS 1900	512	1850.2
	661	1880.0
	810	1909.8

3. RF Output Power Test

3.1. Test Standard and Limit

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

3.2. Test Setup



3.3. 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 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 (TX power in Watts/0.001) – the absolute level

Spurious attenuation limit in dB = 43 + 10 Log10 (power out in Watts).

3.4. Test Data

Please to see the following pages

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	/
GPRS Multi-Slot Class 8 (1 uplink),GMSK	31.34	31.31	31.32	31±1	29.32	29.28	29.34	29±1
GPRS Multi-Slot Class 10 (2 uplink) GMSK	31.31	31.27	31.31	31±1	29.21	29.14	29.18	29±1
GPRS Multi-Slot Class 12 (4 uplink) GMSK (4 uplink),GMSK	29.66	29.54	29.46	29±1	27.42	27.43	27.56	27±1
Remark: GPRS, CS1 coding scheme.								

UMTS Mode:

UMTS-FDD Band V

Band/ Time Slot configuration	Channel	Frequency	Average power (dBm)
RMC 12.2kbps	4132	826.4	22.67
	4183	836.6	22.72
	4233	846.6	22.66
HSDPA Subtest1	4132	826.4	21.87
	4183	836.6	21.95
	4233	846.6	21.57
HSDPA Subtest2	4132	826.4	21.79
	4183	836.6	21.61
	4233	846.6	21.58
HSDPA Subtest3	4132	826.4	22.31
	4183	836.6	22.23
	4233	846.6	22.15
HSDPA Subtest4	4132	826.4	22.10
	4183	836.6	22.18
	4233	846.6	22.02
HSUPA Subtest1	4132	826.4	21.72
	4183	836.6	21.63
	4233	846.6	21.58
HSUPA Subtest2	4132	826.4	19.74
	4183	836.6	19.56
	4233	846.6	19.75
HSUPA Subtest3	4132	826.4	20.67
	4183	836.6	20.76
	4233	846.6	20.65
HSUPA Subtest4	4132	826.4	19.73
	4183	836.6	19.24
	4233	846.6	19.65
HSUPA Subtest5	4132	826.4	21.54
	4183	836.6	21.65
	4233	846.6	21.64

UMTS-FDD Band II

Band/ Time Slot configuration	Channel	Frequency	Average power (dBm)
RMC 12.2kbps	9262	1852.4	21.45
	9400	1880.0	23.16
	9538	1907.6	22.22
HSDPA Subtest1	9262	1852.4	20.82
	9400	1880.0	22.32
	9538	1907.6	21.34
HSDPA Subtest2	9262	1852.4	20.57
	9400	1880.0	22.39
	9538	1907.6	21.26
HSDPA Subtest3	9262	1852.4	20.37
	9400	1880.0	21.85
	9538	1907.6	21.61
HSDPA Subtest4	9262	1852.4	20.26
	9400	1880.0	21.75
	9538	1907.6	21.64
HSUPA Subtest1	9262	1852.4	20.75
	9400	1880.0	22.43
	9538	1907.6	21.39
HSUPA Subtest2	9262	1852.4	18.82
	9400	1880.0	20.46
	9538	1907.6	19.39
HSUPA Subtest3	9262	1852.4	19.68
	9400	1880.0	21.46
	9538	1907.6	20.25
HSUPA Subtest4	9262	1852.4	18.74
	9400	1880.0	20.46
	9538	1907.6	19.31
HSUPA Subtest5	9262	1852.4	20.72
	9400	1880.0	22.45
	9538	1907.6	21.45

UMTS-FDD Band IV

Band/ Time Slot configuration	Channel	Frequency	Average power (dBm)
RMC 12.2kbps	1313	1712.6	21.21
	1413	1732.6	21.79
	1512	1752.4	21.25
HSDPA Subtest1	1313	1712.6	21.22
	1413	1732.6	21.78
	1512	1752.4	21.24
HSDPA Subtest2	1313	1712.6	21.22
	1413	1732.6	21.77
	1512	1752.4	21.24
HSDPA Subtest3	1313	1712.6	21.25
	1413	1732.6	21.74
	1512	1752.4	21.26
HSDPA Subtest4	1313	1712.6	21.25
	1413	1732.6	21.79
	1512	1752.4	21.25
HSUPA Subtest1	1313	1712.6	21.21
	1413	1732.6	21.79
	1512	1752.4	21.25
HSUPA Subtest2	1313	1712.6	21.21
	1413	1732.6	21.79
	1512	1752.4	21.25
HSUPA Subtest3	1313	1712.6	21.21
	1413	1732.6	21.79
	1512	1752.4	21.25
HSUPA Subtest4	1313	1712.6	21.21
	1413	1732.6	21.79
	1512	1752.4	21.25
HSUPA Subtest5	1313	1712.6	21.21
	1413	1732.6	21.79
	1512	1752.4	21.25

Radiated Output power

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	10.92	V	7.88	0.85	17.95	33
1852.4	11.45	H	7.88	0.85	18.48	33
1880	11.04	V	7.88	0.85	18.07	33
1880	11.76	H	7.88	0.85	18.69	33
1907.6	10.98	V	7.86	0.85	17.99	33
1907.6	11.52	H	7.86	0.85	18.53	33

ERP & EIRP

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	12.55	V	6.8	0.53	18.82	38.45
826.4	12.69	H	6.8	0.53	18.96	38.45
836.6	12.69	V	6.8	0.53	18.96	38.45
836.6	12.85	H	6.8	0.53	19.12	38.45
846.6	12.79	V	6.9	0.53	19.16	38.45
846.6	12.73	H	6.9	0.53	19.10	38.45

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	12.23	V	7.76	0.82	19.17	30
1712.4	11.58	H	7.76	0.82	18.52	30
1740	10.74	V	7.76	0.82	17.68	30
1740	11.62	H	7.76	0.82	18.56	30
1752.6	11.23	V	7.74	0.82	18.15	30
1752.6	10.59	H	7.74	0.82	17.51	30

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	19.49	V	6.8	0.53	25.76	38.45
824.2	19.26	H	6.8	0.53	25.53	38.45
836.6	19.64	V	6.8	0.53	25.91	38.45
836.6	19.78	H	6.8	0.53	26.05	38.45
848.8	19.17	V	6.9	0.53	25.54	38.45
848.8	19.56	H	6.9	0.53	25.93	38.45

EIRP for PCS Band (Part 24E)

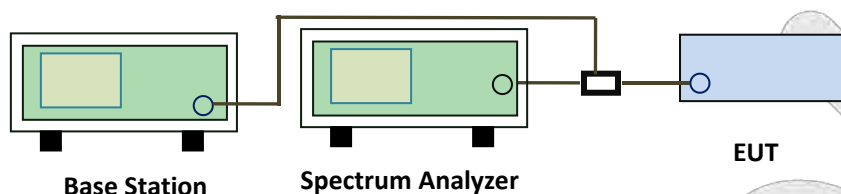
Frequency (MHz)	Substituted level (dBm)	Antenna Polarization	Antenna Gain correction (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)
1850.2	14.36	V	7.88	0.85	21.39	33
1850.2	15.27	H	7.88	0.85	22.30	33
1880	14.54	V	7.88	0.85	21.57	33
1880	15.25	H	7.88	0.85	22.28	33
1909.8	14.33	V	7.86	0.85	21.34	33
1909.8	15.47	H	7.86	0.85	22.48	33

4. Peak-Average Ratio

4.1. Test Standard and Limit

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

4.2. Test Setup



4.3. 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

4.4. Test Data

PCS1900

Frequency (MHz)	Peak-Average Ratio(PAR)
1850.2	3.12
1880.0	2.29
1909.8	3.90

WCDMA1700

Frequency (MHz)	Peak-Average Ratio(PAR)
1712.6	2.26
1732.6	1.90
1752.4	2.00

WCDMA1900

Frequency (MHz)	Peak-Average Ratio(PAR)
1852.4	2.03
1880.0	2.04
1907.6	2.06

5. 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.

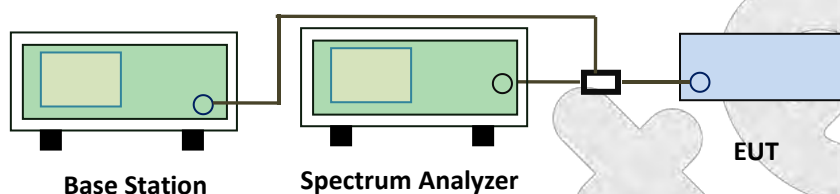
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6. Occupied Bandwidth

6.1. Test Standard and Limit

Spec	Item	Requirement
§2.1049, §22.917, §22.905 §24.238 §27.53(a)	a)	99% Occupied Bandwidth(kHz)
	b)	26 dB Bandwidth(kHz)

6.2. Test Setup



6.3. 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.

6.4. Test Data

Cellular Band (Part 22H) result

Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB Bandwidth (MHz)
128	824.2	248.68	315.80
190	836.6	248.85	316.20
251	848.8	246.69	319.40

PCS Band (Part 24E) result

Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB Bandwidth (MHz)
512	1850.2	247.17	322.80
661	1880.0	249.81	322.60
810	1909.8	244.37	320.00

UMTS-FDD Band V (Part 22H)

Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB Bandwidth (MHz)
4132	826.4	4.2016	4.851
4175	836.6	4.2210	4.951
4233	846.6	4.2132	4.937

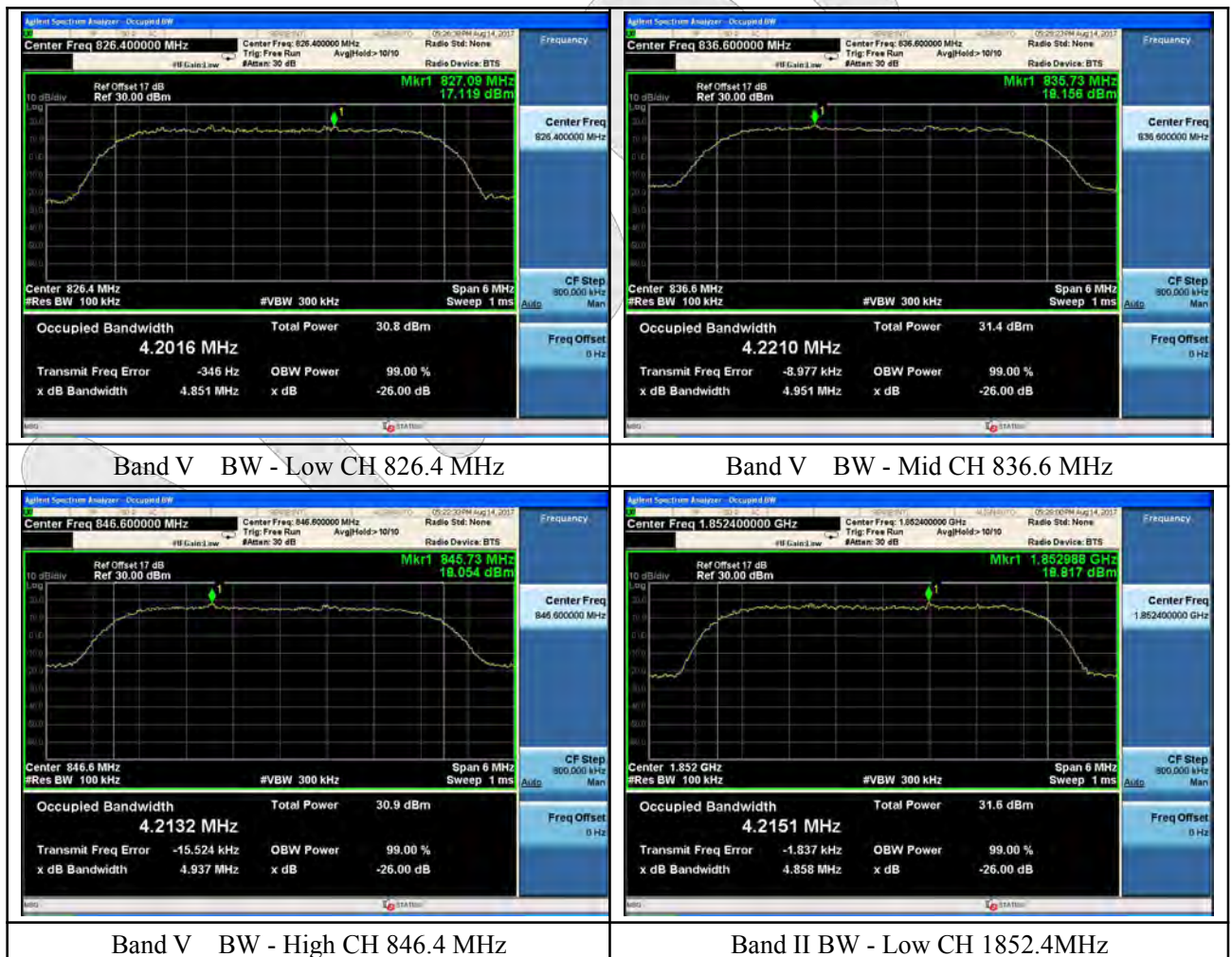
UMTS-FDD Band II (Part 24E)

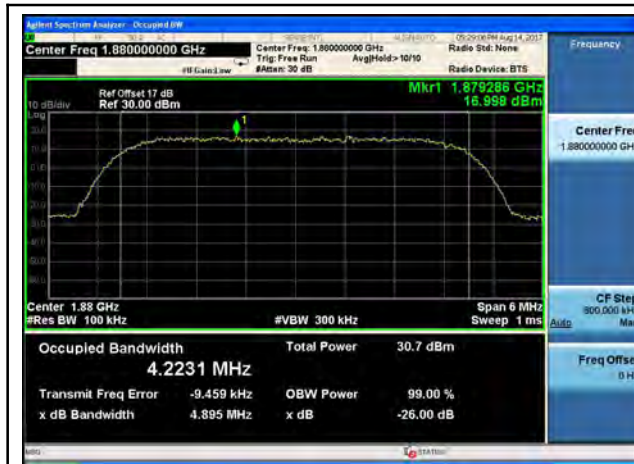
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB Bandwidth (MHz)
9262	1852.4	4.2151	4.858
9400	1880.0	4.2231	4.895
9538	1907.6	4.2208	4.870

UMTS-FDD Band IV (Part 27)

Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB Bandwidth (MHz)
1313	1712.4	4.1616	4.744
1413	1732.6	4.1548	4.719
1512	1752.6	4.1762	4.728

Test Plots

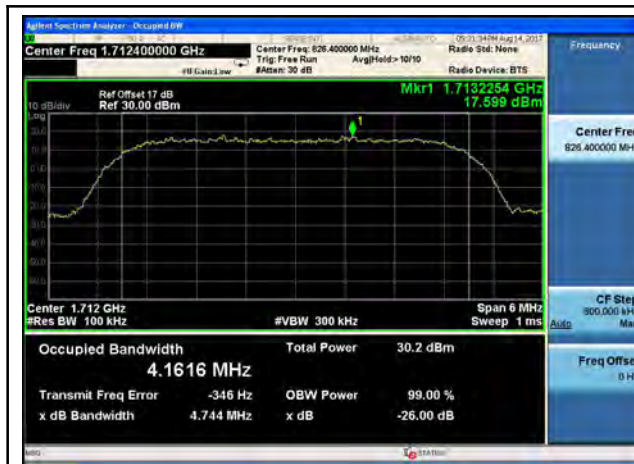




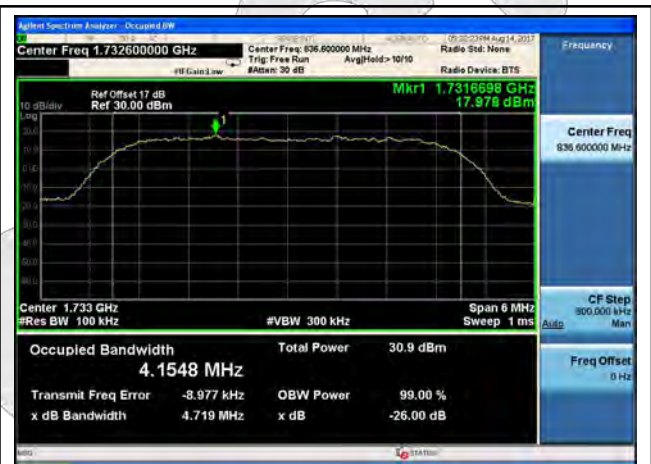
Band II BW - Mid CH 1880MHz



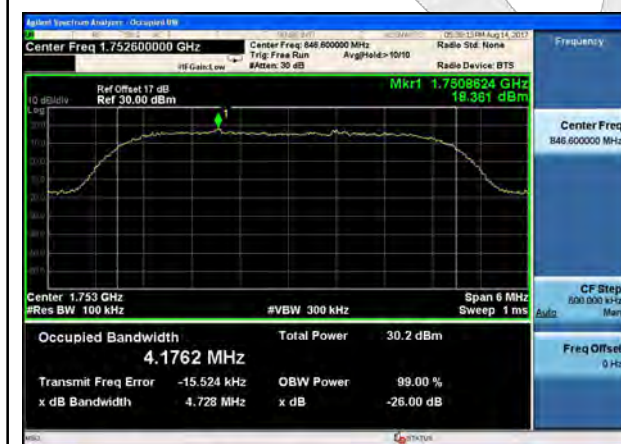
Band II BW - High CH 1907.6MHz



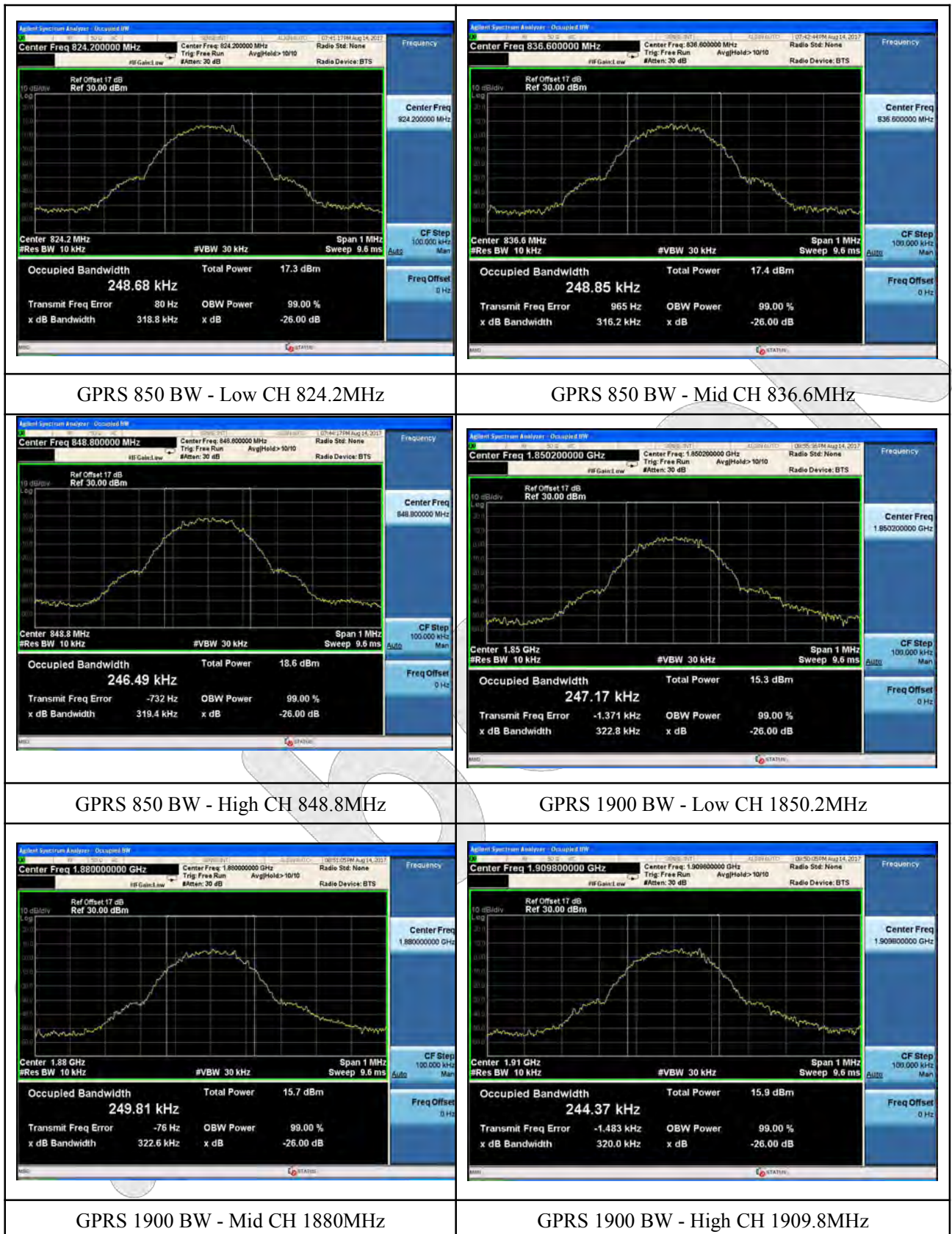
Band IV BW - Low CH 1712.4 MHz



Band IV BW - Mid CH 1732.6 MHz



Band IV BW - High CH 1752.6MHz

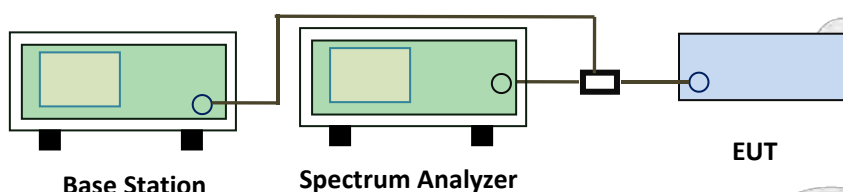


7. Spurious Emissions at Antenna Terminals

7.1. Test Standard and Limit

The mean power of emissions must be attenuated below the mean power of the unmodulated carrier (P) on any frequency outside the frequency band by at least $(43 + 10 \log P)$ dB, in this case, -13dBm.

7.2. Test Setup



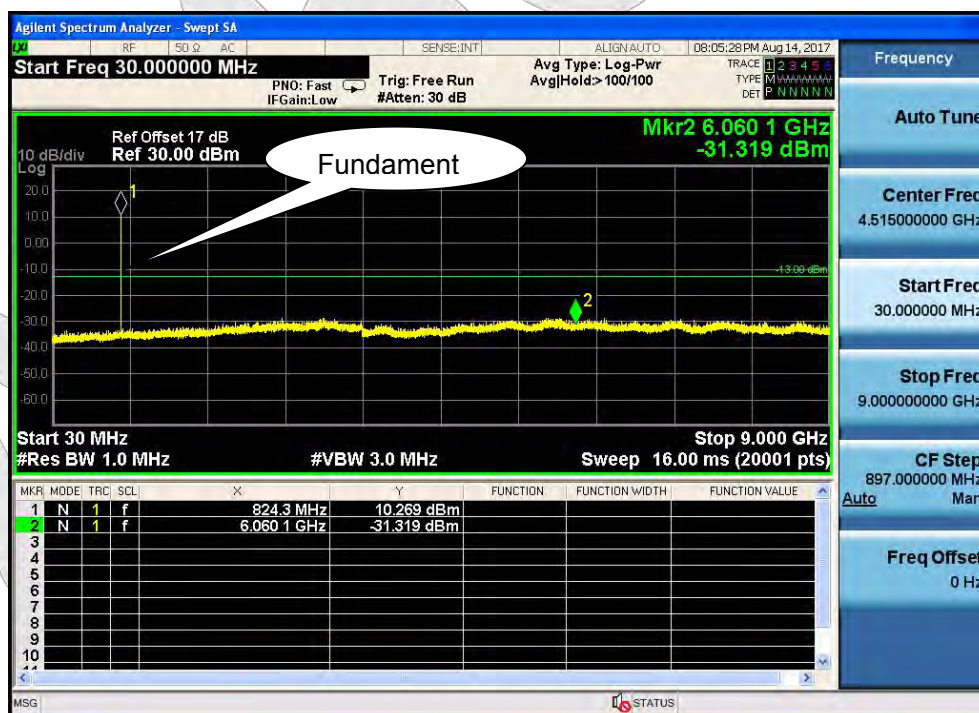
7.3. Test Procedure

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.

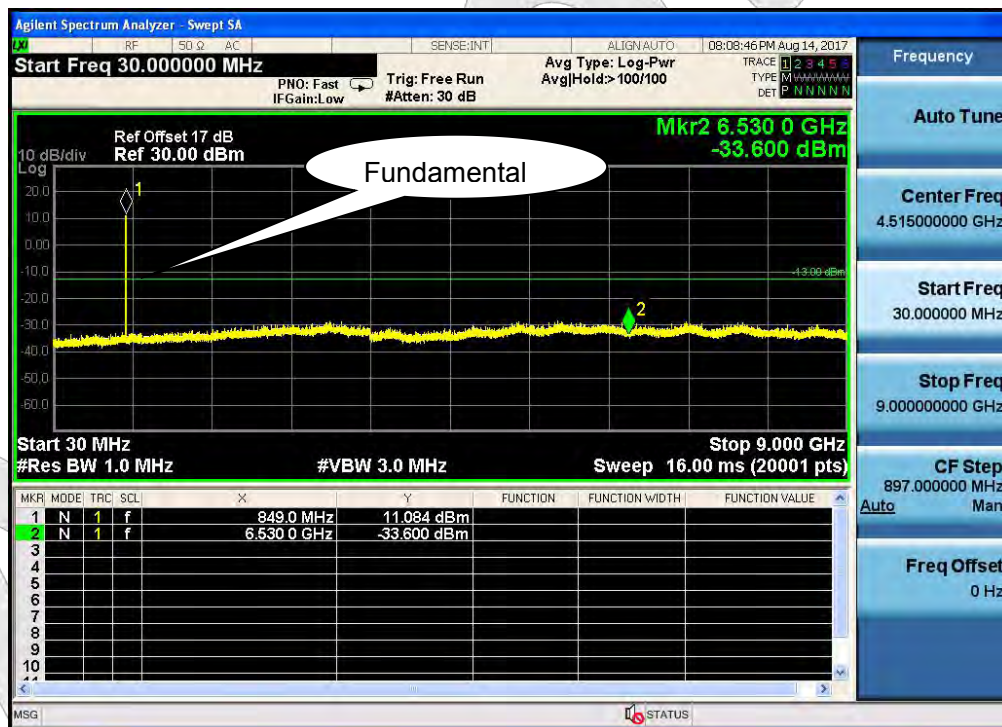
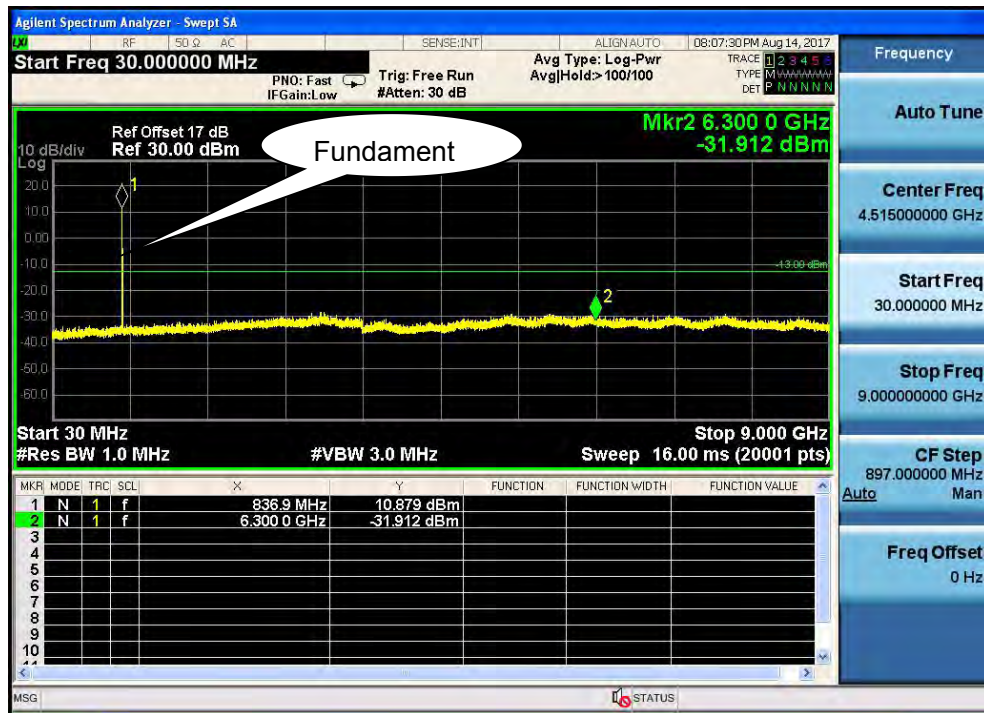
7.4. Test Data

Test Plots

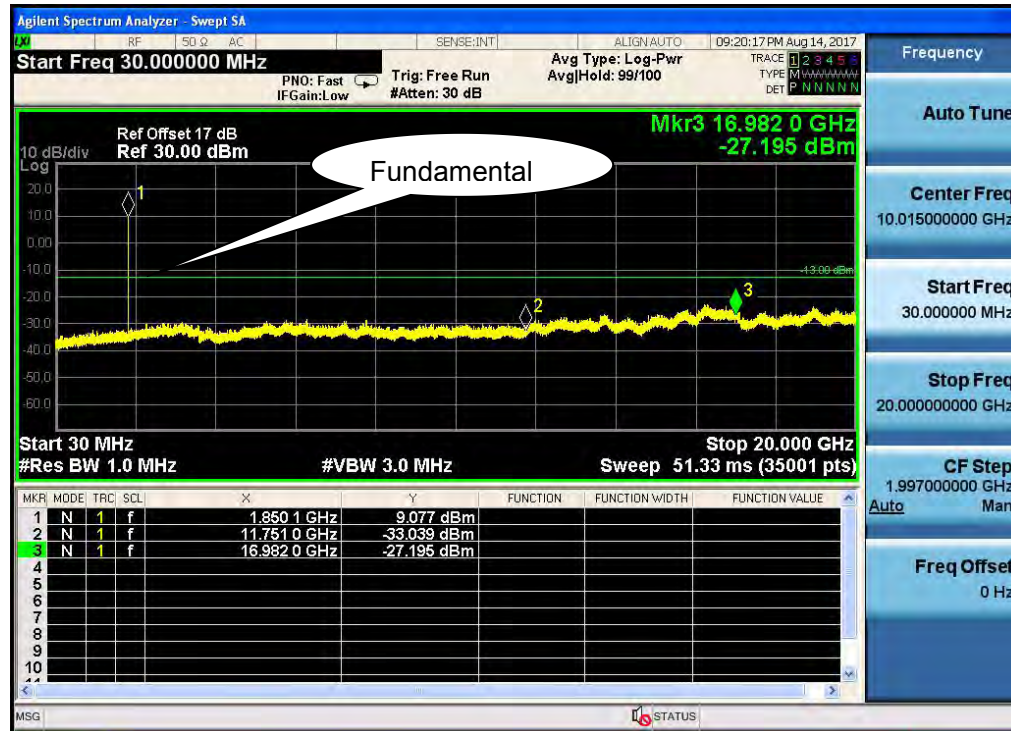
Cellular Band (Part 22H) result



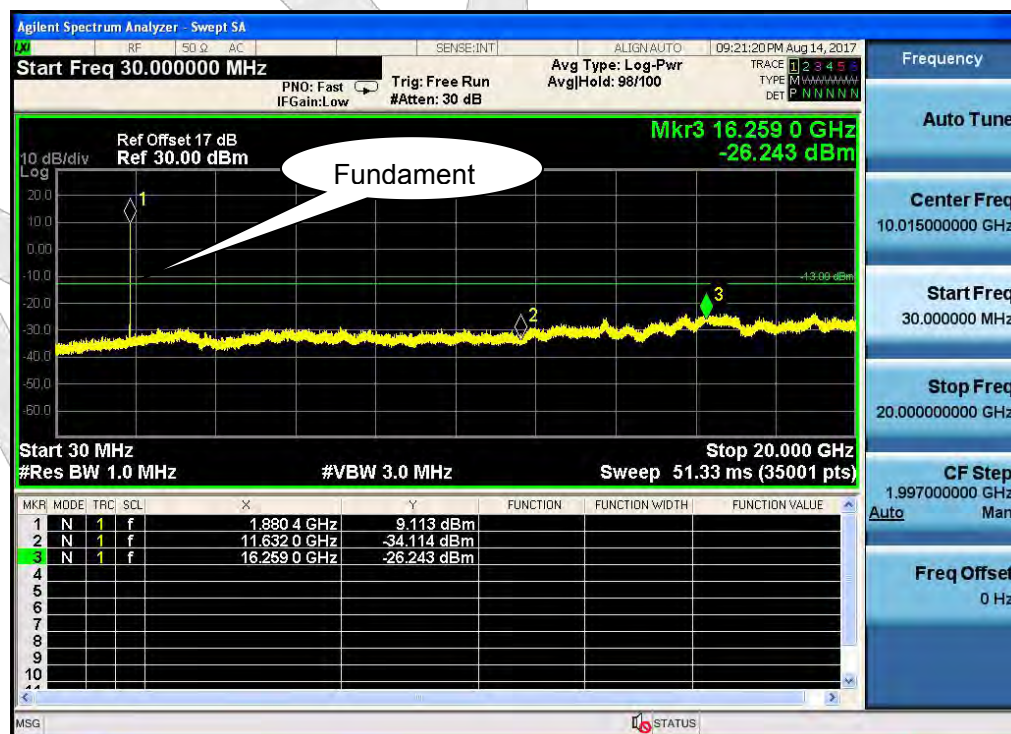
Test Mode:GSM 850 - Low Channel



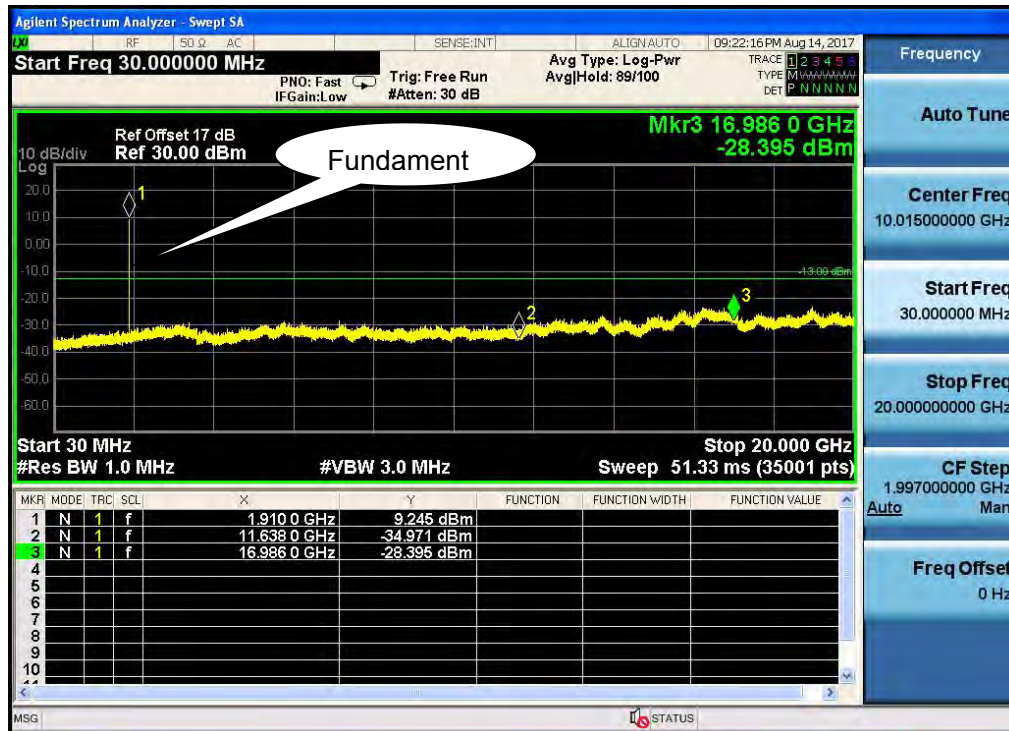
PCS Band (Part24E) result



Test Mode:PCS1900 - Low Channel

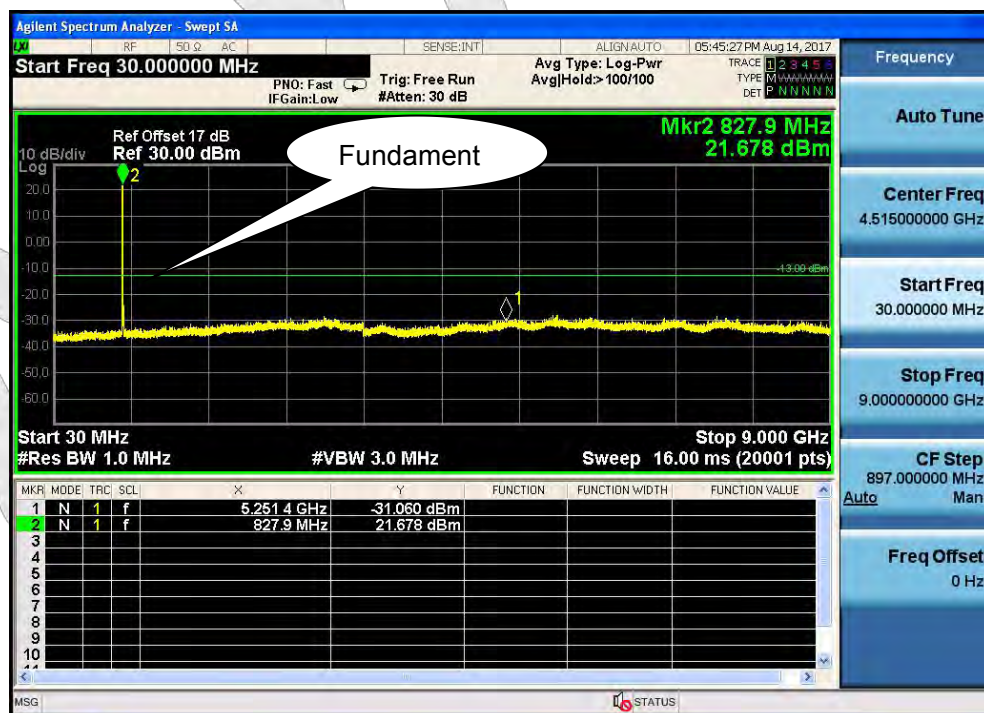


Test Mode:PCS1900 - Middle Channel



Test Mode:PCS1900 - High Channel

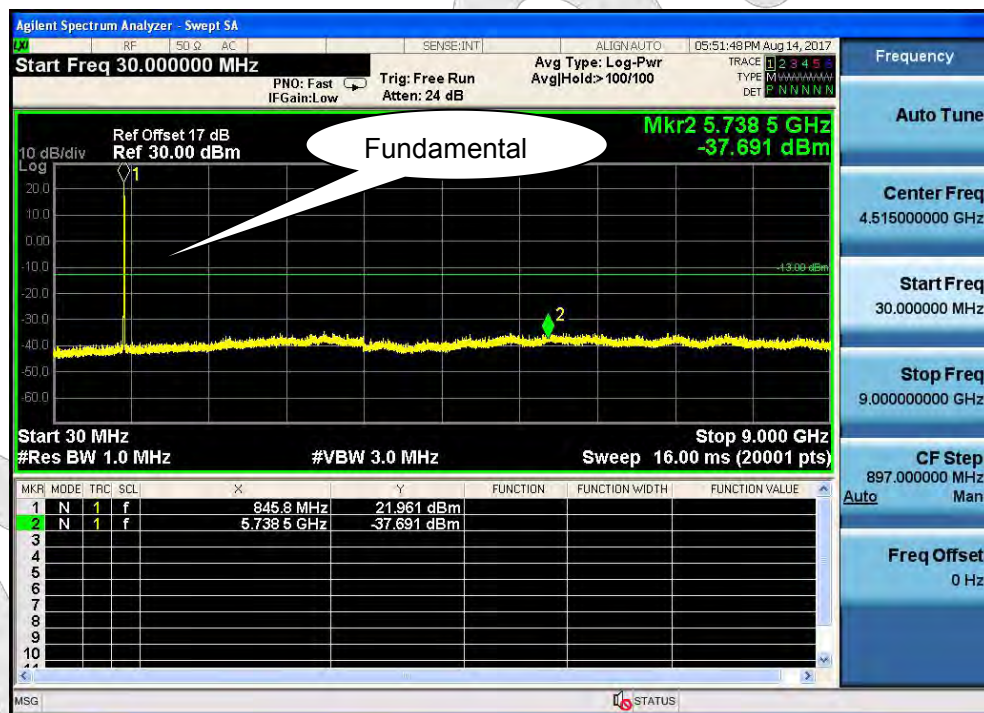
UMTS-FDD Band V (Part 22H)



Test Mode: Band V - Low Channel

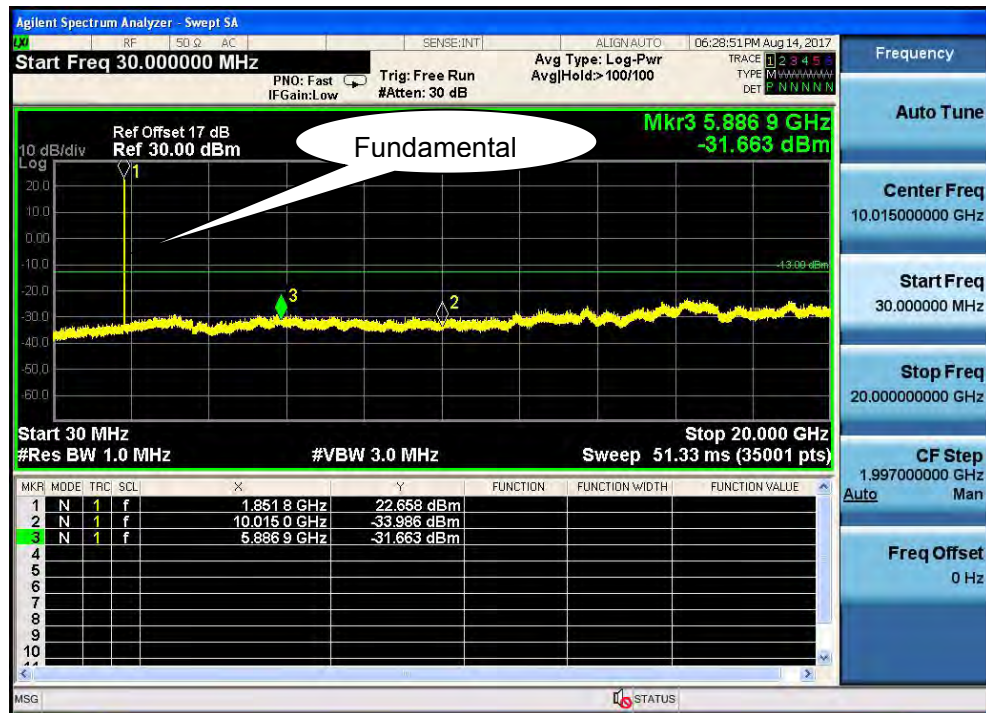


Test Mode: Band V – Middle Channel

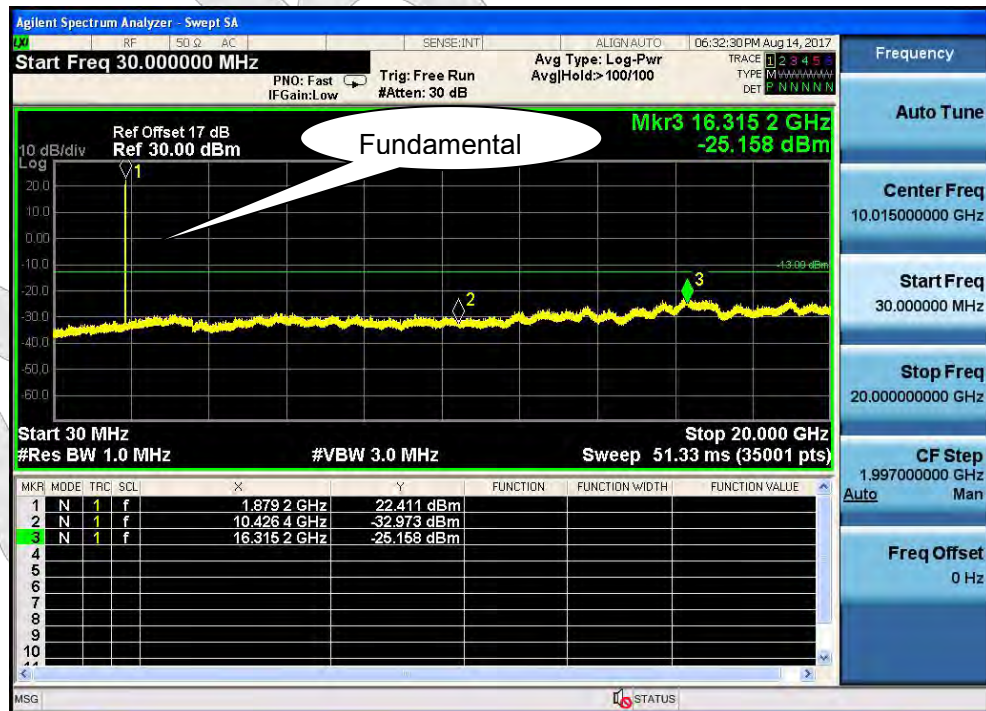


Test Mode: Band V - High Channel

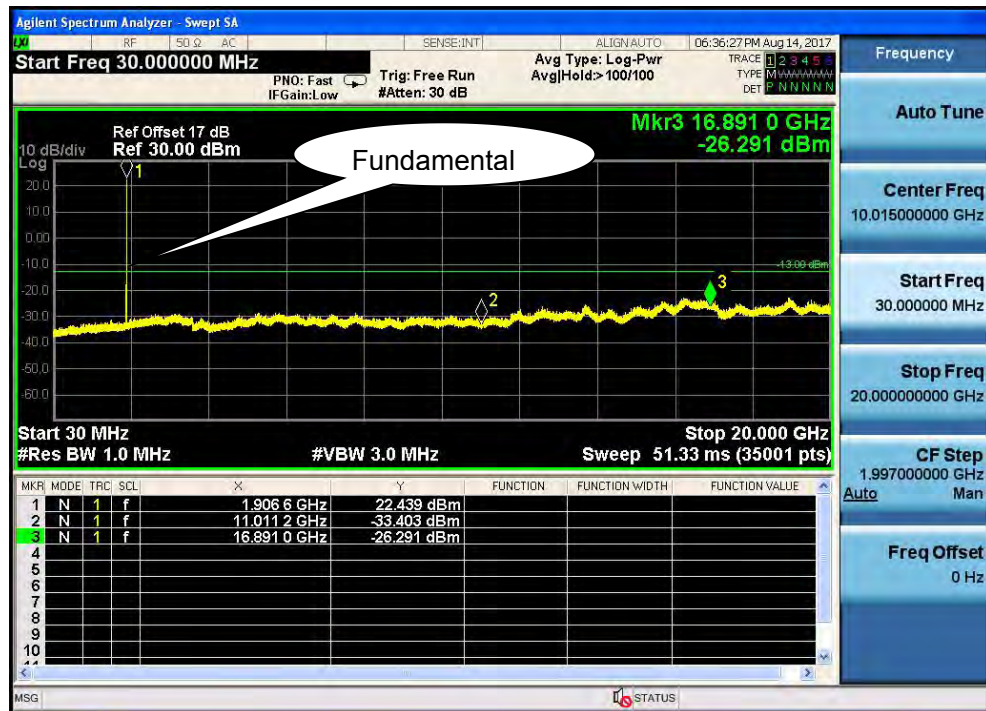
UMTS-FDD Band II (Part 24E)



Test Mode: Band II - Low Channel

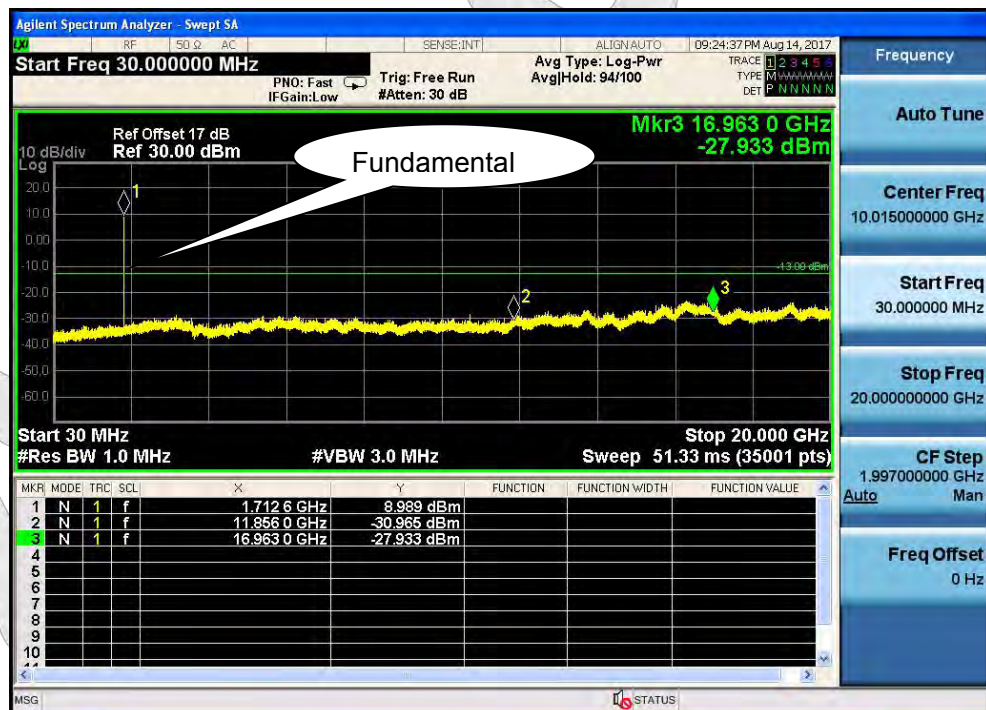


Test Mode: Band II - Middle Channel

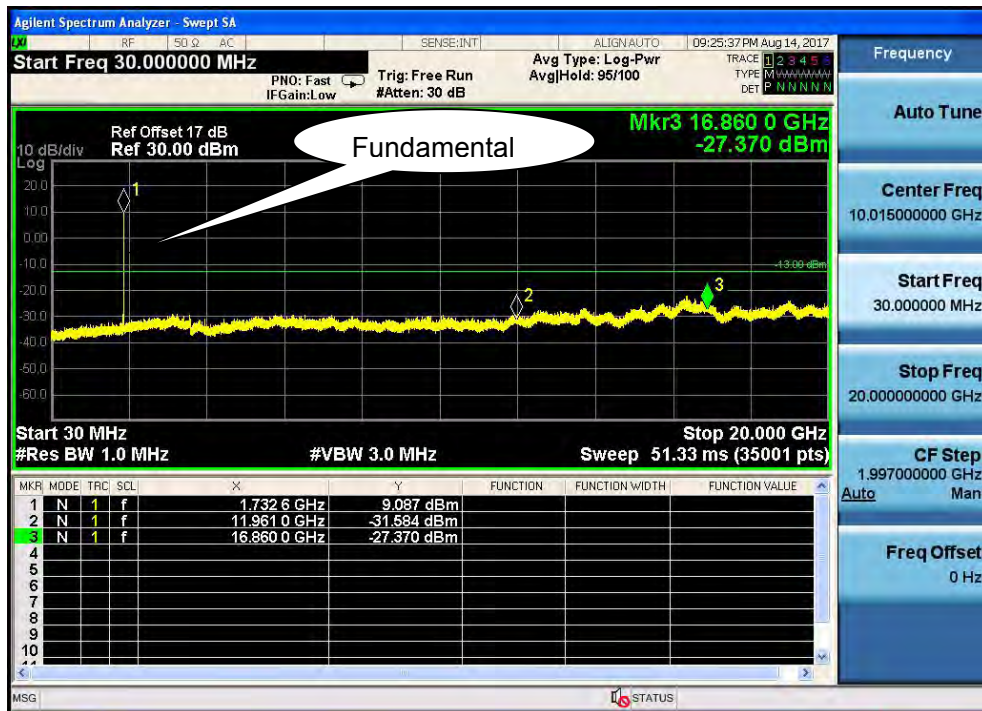


Test Mode: Band II - High Channel

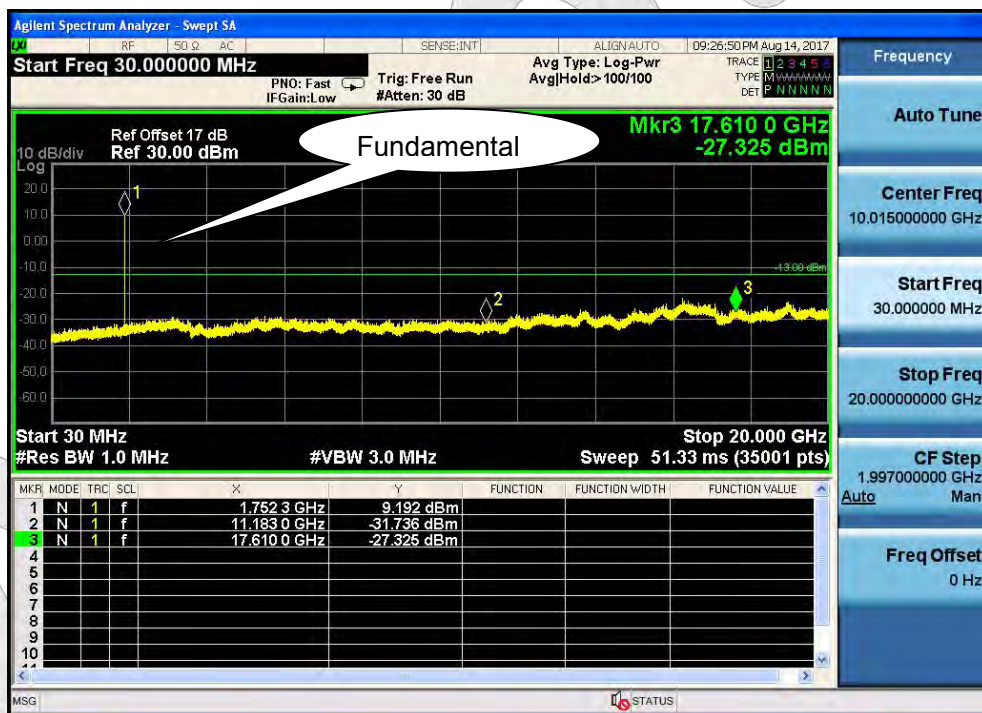
UMTS-FDD Band IV (Part 27)



Test Mode: Band IV - Low Channel



Test Mode: Band IV - Middle Channel



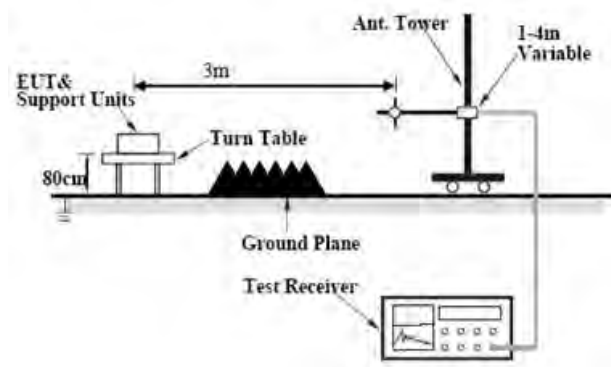
Test Mode: Band IV - High Channel

8. Spurious Radiated Emissions

8.1. Test Standard and Limit

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.

8.2. Test Setup



8.3. Test Procedure

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 = Raw Amplitude (dB μ V/m) – Amplifier Gain (dB) + Antenna Factor (dB) + Cable Loss (dB) + Filter Attenuation (dB, if used)

8.4. Test Data

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	-41.26	V	7.95	0.78	-34.09	-13	-21.09
1648.4	-41.63	H	7.95	0.78	-34.46	-13	-21.46
268.1	-51.14	V	5.40	0.24	-45.98	-13	-32.98
685.4	-50.74	H	7.00	0.39	-44.13	-13	-31.13

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	-41.59	V	7.95	0.78	-34.42	-13	-21.42
1673.2	-41.57	H	7.95	0.78	-34.40	-13	-21.40
269.3	-52.14	V	5.40	0.24	-46.98	-13	-33.98
686.2	-50.28	H	7.00	0.39	-43.67	-13	-30.67

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	-41.74	V	7.95	0.78	-34.57	-13	-21.57
1697.6	-41.16	H	7.95	0.78	-33.99	-13	-20.99
267.8	-53.82	V	5.40	0.24	-48.66	-13	-35.66
684.9	-50.41	H	7.00	0.39	-43.80	-13	-30.80

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)
1652.8	-46.75	V	7.95	0.78	-39.58	-13	-26.58
1652.8	-46.17	H	7.95	0.78	-39.00	-13	-26.00
268.5	-54.78	V	5.40	0.24	-49.62	-13	-36.62
689.2	-51.48	H	7.00	0.39	-44.87	-13	-31.87

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	-48.72	V	7.95	0.78	-41.55	-13	-28.55
1670	-47.26	H	7.95	0.78	-40.09	-13	-27.09
269.4	-54.57	V	5.40	0.24	-49.41	-13	-36.41
689.6	-51.67	H	7.00	0.39	-45.06	-13	-32.06

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	-48.73	V	7.95	0.78	-41.56	-13	-28.56
1693.2	-47.38	H	7.95	0.78	-40.21	-13	-27.21
267.2	-54.83	V	5.40	0.24	-49.67	-13	-36.67
684.4	-51.72	H	7.00	0.39	-45.11	-13	-32.11

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	-46.75	V	7.95	0.78	-39.58	-13	-26.58
1652.8	-46.17	H	7.95	0.78	-39	-13	-26
268.5	-54.78	V	5.40	0.24	-49.62	-13	-36.62
689.2	-51.48	H	7.00	0.39	-44.87	-13	-31.87

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	-48.72	V	7.95	0.78	-41.55	-13	-28.55
1670	-47.26	H	7.95	0.78	-40.09	-13	-27.09
269.4	-54.57	V	5.40	0.24	-49.41	-13	-36.41
689.6	-51.67	H	7.00	0.39	-45.06	-13	-32.06

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
1693.2	-48.73	V	7.95	0.78	-41.56	-13	-28.56
1693.2	-47.38	H	7.95	0.78	-40.21	-13	-27.21
267.2	-54.83	V	5.40	0.24	-49.67	-13	-36.67
684.4	-51.72	H	7.00	0.39	-45.11	-13	-32.11

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	-48.55	V	10.25	2.73	-41.03	-13	-28.03
3704.8	-50.02	H	10.25	2.73	-42.5	-13	-29.50
269.5	-54.19	V	5.40	0.24	-49.03	-13	-36.03
690.2	-51.62	H	7.00	0.39	-45.01	-13	-32.01

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	-48.66	V	10.25	2.73	-41.14	-13	-28.14
3760	-50.31	H	10.25	2.73	-42.79	-13	-29.79
270.6	-55.06	V	5.40	0.24	-49.9	-13	-36.90
690.3	-51.27	H	7.00	0.39	-44.66	-13	-31.66

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	-48.42	V	10.36	2.73	-40.79	-13	-27.79
3815.2	-49.72	H	10.36	2.73	-42.09	-13	-29.09
270.7	-55.64	V	5.40	0.24	-50.48	-13	-37.48
689.1	-49.21	H	7.00	0.39	-42.60	-13	-29.60

UMTS-FDD Band IV (Part 27)

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3424.8	-45.26	V	10.07	2.52	-37.71	-13	-24.71
3424.8	-44.81	H	10.07	2.52	-37.26	-13	-24.26
291.3	-54.28	V	6.00	0.25	-48.53	-13	-35.53
652.3	-51.46	H	6.70	0.39	-45.15	-13	-32.15

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	-48.59	V	10.09	2.52	-41.02	-13	-28.02
3480	-48.61	H	10.09	2.52	-41.04	-13	-28.04
292.6	-53.69	V	6.00	0.25	-47.94	-13	-34.94
653.4	-52.49	H	6.70	0.39	-46.18	-13	-33.18

High channel

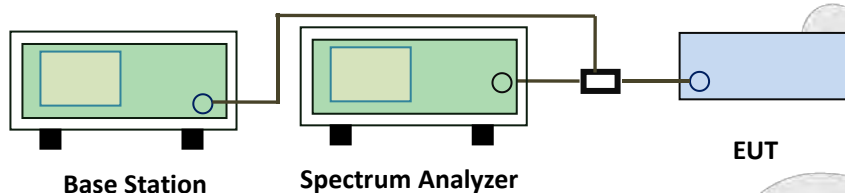
Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3505.2	-45.17	V	10.09	2.52	-37.6	-13	-24.6
3505.2	-46.82	H	10.09	2.52	-39.25	-13	-26.25
295.1	-53.67	V	6.00	0.25	-47.92	-13	-34.92
654.7	-51.73	H	6.70	0.39	-45.42	-13	-32.42

9. Band Edge Compliance

9.1. Test Standard and Limit

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.

9.2. Test Setup



9.3. Test Procedure

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.

9.4. Test Data

Cellular Band (Part 22H) result

Frequency (MHz)	Emission (dBm)	Limit (dBm)
824	-37.555	-13
849	-35.599	-13

PCS Band (Part 24E) result

Frequency (MHz)	Emission (dBm)	Limit (dBm)
1850	-39.238	-13
1910	-39.722	-13

UMTS-FDD Band V (Part 22H)

Frequency (MHz)	Emission (dBm)	Limit (dBm)
824	-19.058	-13
849	-21.016	-13

UMTS-FDD Band II (Part 24E)

Frequency (MHz)	Emission (dBm)	Limit (dBm)
1850	-24.646	-13
1910	-28.269	-13

UMTS-FDD Band IV (Part 27)

Frequency (MHz)	Emission (dBm)	Limit (dBm)
1710	-19.521	-13
1755	-21.016	-13

Test Plots

Cellular Band (Part 22H) result



Test Mode: GSM850 - Low Channel

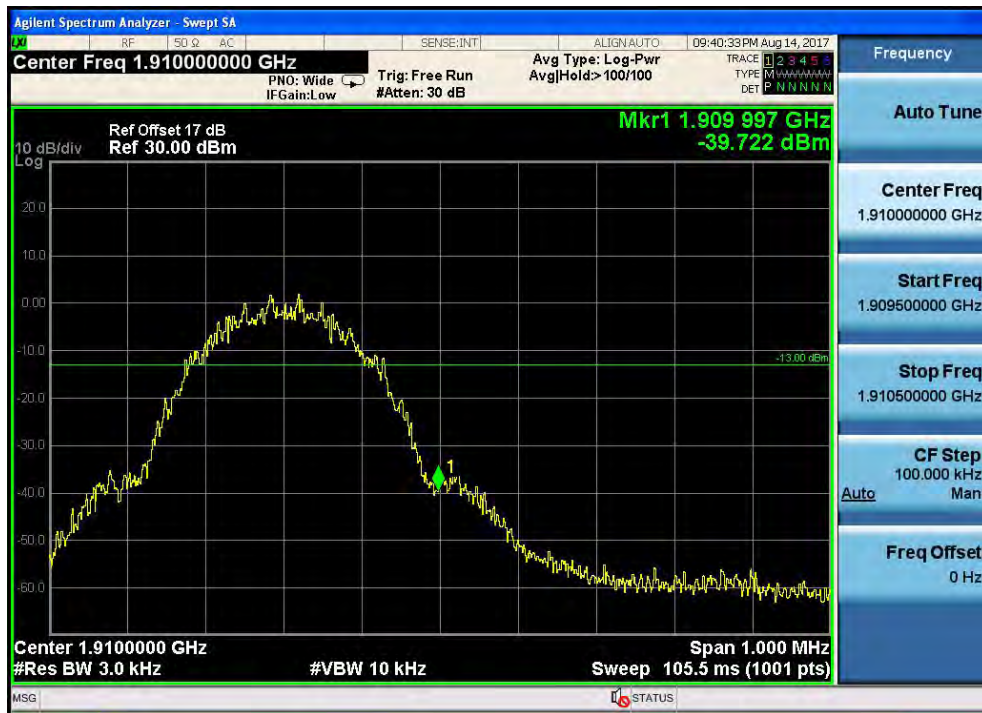


Test Mode: GSM850 - High Channel

PCS Band (Part24E) result

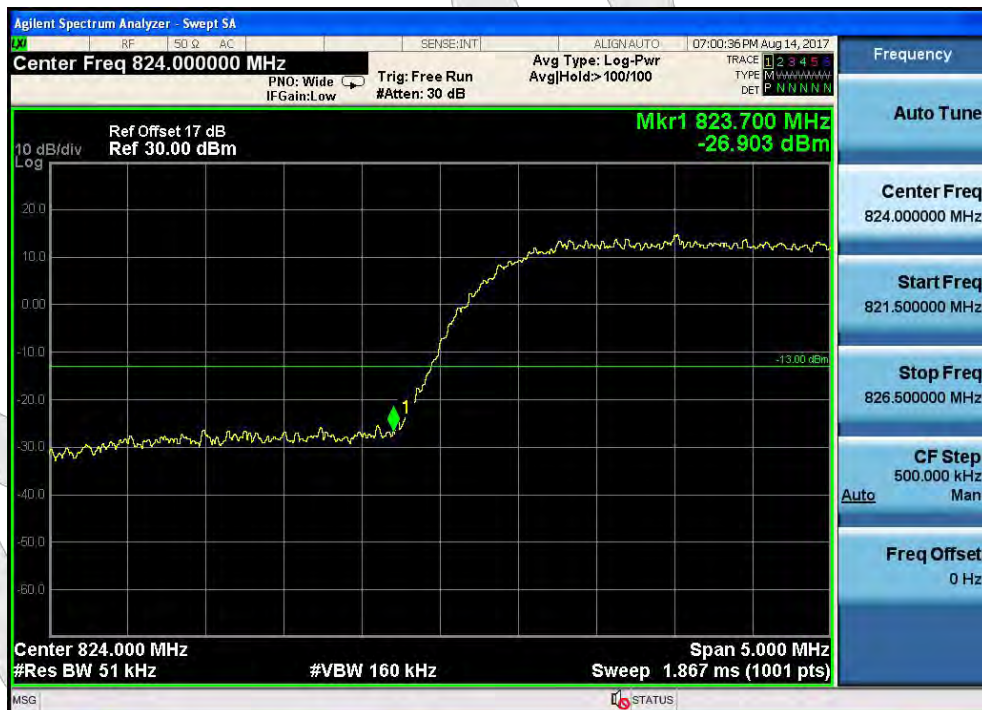


Test Mode: GSM1900 - Low Channel



Test Mode: GSM1900 - High Channel

UMTS-FDD Band V (Part 22H)



Test Mode: Band V - Low Channel



Test Mode: Band V - High Channel

UMTS-FDD Band II (Part 24E)



Test Mode: Band II - Low Channel



Test Mode: Band II - High Channel

UMTS-FDD Band IV (Part 27)



Test Mode: Band IV - Low Channel



Test Mode: Band IV - High Channel

10. Frequency Stability

10.1. Test Standard and Limit

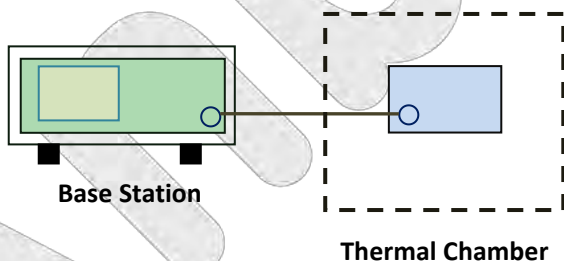
According to §22.355, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table below:

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 29.	.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.

10.2. Test Setup



10.3. Test 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.

10.4. Test Data

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	21	0.0251	2.5
0		20	0.0239	2.5
10		17	0.0203	2.5
20		12	0.0143	2.5
30		15	0.0179	2.5
40		20	0.0239	2.5
50		25	0.0299	2.5
55		32	0.0383	2.5
25	4.2	21	0.0251	2.5
	3.5	23	0.0275	2.5

PCS Band (Part 24E) 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		22	0.0117	2.5
10		19	0.0101	2.5
20		12	0.0064	2.5
30		18	0.0096	2.5
40		21	0.0112	2.5
50		23	0.0122	2.5
55		28	0.0149	2.5
25	4.2	22	0.0117	2.5
	3.5	25	0.0133	2.5

UMTS-FDD Band V (Part 22H)

Middle Channel, $f_0 = 836.6$ MHz				
Temperature (°C)	Power Supplied (V _{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-10	3.7	17	0.0204	2.5
0		15	0.0180	2.5
10		11	0.0132	2.5
20		10	0.0120	2.5
30		13	0.0156	2.5
40		15	0.0180	2.5
50		21	0.0251	2.5
55		23	0.0275	2.5
25	4.2	18	0.0216	2.5
	3.5	15	0.0180	2.5

UMTS-FDD Band II (Part 24E)

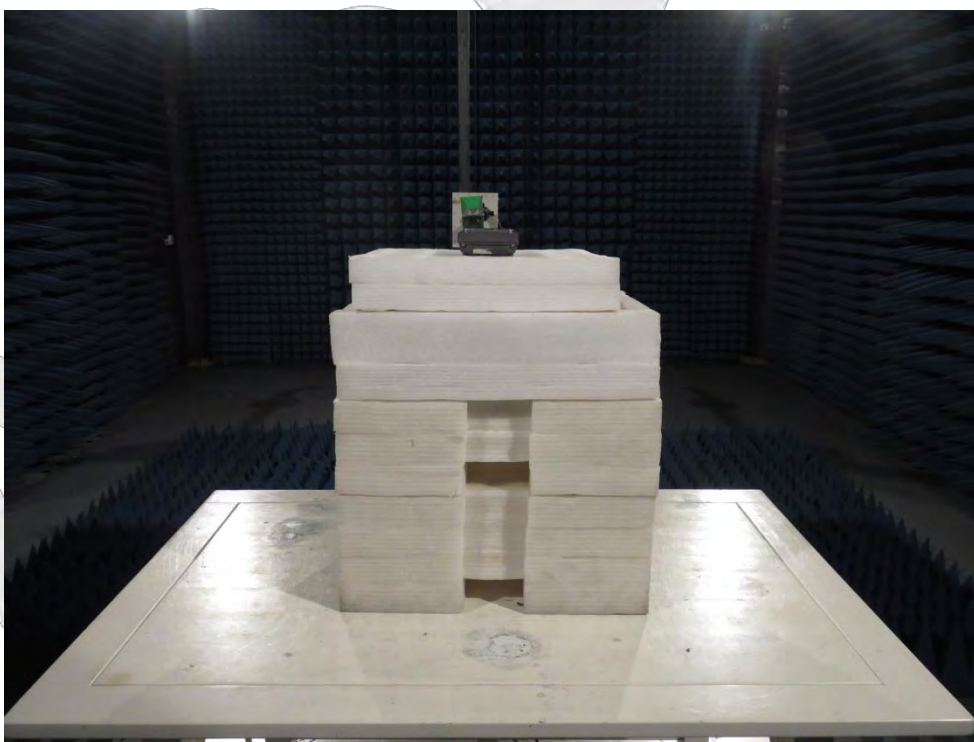
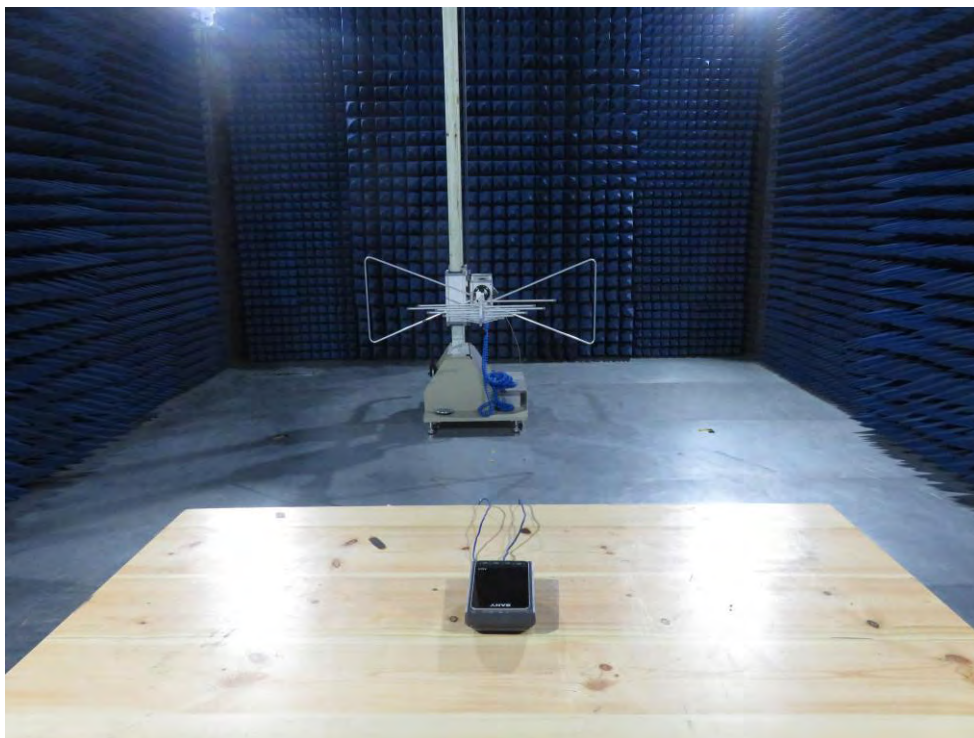
Middle Channel, $f_0 = 1880$ MHz				
Temperature (°C)	Power Supplied (V _{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-10	3.7	10	0.0053	2.5
0		8	0.0043	2.5
10		5	0.0027	2.5
20		4	0.0021	2.5
30		6	0.0032	2.5
40		7	0.0037	2.5
50		9	0.0048	2.5
55		15	0.0080	2.5
25	4.2	12	0.0064	2.5
	3.5	15	0.0080	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	15	0.0080	2.5
0		12	0.0064	2.5
10		8	0.0043	2.5
20		5	0.0027	2.5
30		7	0.0037	2.5
40		13	0.0069	2.5
50		15	0.0080	2.5
55		20	0.0106	2.5
25	4.2	9	0.0048	2.5
	3.5	11	0.0059	2.5

APPENDIX I -- TEST SETUP PHOTOGRAPH

Photo of Radiation Emission Test



APPENDIX II -- PHOTOGRAPH

Reference to the test report No. R0217050061W1

Anbotek