REPORT No.: SZ19050098W01

TEST REPORT

APPLICANT	:	dormakaba EAD GmbH
PRODUCT NAME	:	data collection terminal
MODEL NAME	:	9600-K6 BLE 3G
BRAND NAME	:	dormakaba
FCC ID	:	NVI-KT9600K6B3G
STANDARD(S)	:	47 CFR Part 22 Subpart H 47 CFR Part 24 Subpart E
RECEIPT DATE	:	2017-08-30
TEST DATE	:	2017-08-31 to 2017-09-09
ISSUE DATE	:	2019-07-08

Edited by: Zhao Zetian
ZhaoZetian (Rapporteur)

Approved by: Peng Huarui
Peng Huarui (Supervisor)

NOTE: This document is issued by MORLAB, the test report shall not be reproduced except in full without prior written permission of the company. The test results apply only to the particular sample(s) tested and to the specific tests carried out which is available on request for validation and information confirmed at our website.

MORLAB
SHENZHEN MORLAB COMMUNICATIONS TECHNOLOGY Co., Ltd.
FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road,
Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China
Tel: 86-755-36698555 Fax: 86-755-36698525
Http://www.morlab.cn E-mail: service@morlab.cn

DIRECTORY

1. Technical Information 4
1.1. Applicant and Manufacturer Information 4
1.2. Equipment Under Test (EUT) Description 4
1.3. Maximum ERP/EIRP and Emission Designator 6
1.4. Test Standards and Results 7
1.5. Environmental Conditions 8
2. 47 CFR Part 2, Part 22H , 24E Requirements 9
2.1. Conducted RF Output Power 9
2.2. Peak to Average Ratio 12
2.3. 99% Occupied Bandwidth 16
2.4. Frequency Stability 21
2.5. Conducted Out of Band Emissions 25
2.6. Band Edge 32
2.7. Transmitter Radiated Power (EIRP/ERP) 36
2.8. Radiated Out of Band Emissions 41
Annex A Test Uncertainty 62
Annex B Testing Laboratory Information 63

Change History		
Version	**Date**	**Reason for change**
1.0	2019-07-08	Initail Version

1. Technical Information

Note: Provide by applicant.

1.1. Applicant and Manufacturer Information

Applicant:	dormakaba EAD GmbH
Applicant Address:	Albertistr. 3, 78056 Villingen-Schwenningen, Germany
Manufacturer:	In-Tech Electronics Ltd
ManufacturerAddress:	Unit A,13/F, Wing Tai Centre,12 Hing Yip Street, Kwun Tong, Kowloon, Hong Kong

1.2. Equipment Under Test (EUT) Description

Product Name:	data collection terminal
Serial No:	(N/A, marked #1 by test site)
Hardware Version:	02
Software Version:	V5
Product Type:	Production unit
Modulation Type:	GPRS Mode with GMSK Modulation EDGE Mode with 8PSK Modulation WCDMA Mode with QPSK Modulation HSDPA Mode with QPSK Modulation HSUPA Mode with QPSK Modulation HSPA+ Mode with QPSK Modulation
Operating Frequency Range:	**GSM 850MHz:** Tx: 824.20 - 848.80MHz Rx: 869.20 - 893.80MHz **GSM 1900MHz:** Tx: 1850.20 - 1909.80MHz Rx: 1930.20 - 1989.80MHz **WCDMA Band V** Tx: 826.4 - 846.6MHz Rx: 871.4 - 891.6MHz **WCDMA Band II** Tx: 1852.4 - 1907.6MHz Rx: 1932.4 - 1987.6MHz
Antenna Type:	FPC Antenna

Antenna Gain:	GSM 850:	5.1 dBi
	GSM1900:	3.9 dBi
	WCDMA Band V:	5.1 dBi
	WCDMA Band II:	3.9 dBi
Accessory Information:	Battery	
	Brand Name:	Renata
	Model No.:	CR2450N
	Serial No.:	(N/A, marked #1 by test site)
	Capacity:	540mAh
	Rated Voltage:	3.0V

Note 1: The transmitter (Tx) frequency arrangement of the Cellular 850MHz band used by the EUT can be represented with the formula F(n)=824.2+0.2*(n-128), 128<=n<=251; the lowest, middle, highest channel numbers (ARFCHs) used and tested in this report are separately 128 (824.2MHz), 190(836.6MHz) and 251 (848.8MHz).

Note 2: The transmitter (Tx) frequency arrangement of the PCS 1900MHz band used by the EUT can be represented with the formula F(n)=1850.2+0.2*(n-512), 512<=n<=810; the lowest, middle and highest channel numbers (ARFCHs) used and tested in this report are separately 512 (1850.2MHz), 661 (1880.0MHz) and 810 (1909.8MHz).

Note 3: The transmitter (Tx) frequency arrangement of the WCDMA Band V used by the EUT can be represented with the formula F(n)=826.4+0.2*(n-4132), 4132<=n<=4233; the lowest, middle and highest channel numbers (ARFCHs) used and tested in this report are separately 4132 (826.4MHz), 4182(836.4MHz) and 4233 (846.6MHz).

Note 4: The transmitter (Tx) frequency arrangement of the WCDMA Band II used by the EUT can be represented with the formula F(n)=1852.4+0.2*(n-9262), 9262<=n<=9538; the lowest, middle and highest channel numbers (ARFCHs) used and tested in this report are separately 9262 (1852.4MHz), 9400 (1880MHz) and 9538 (1907.6MHz).

Note 5: All modes and data rates were considered and evaluated respectively by performing full test. Test modes are chosen to be reported as the worst case below:
GPRS mode and EDGE mode for GSM 850;
GPRS mode and EDGE mode for GSM 1900;
WCDMA mode for WCDMA band V;
WCDMA mode for WCDMA band II;

Note 6: For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

1.3. Maximum ERP/EIRP and Emission Designator

System	Maximum ERP/EIRP (W)	Emission Designator
GPRS850	2.39	248KGXW
EDGE850	2.32	249KG7W
GPRS1900	1.18	250KGXW
EDGE1900	1.22	245KG7W
WCDMA Band V	0.67	4M15F9W
WCDMA Band II	0.53	4M17F9W

1.4. Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 2, Part 22, Part 24for the EUT FCC ID Certification:

No	Identity	Document Title
1	47 CFR Part 2(10-1-12 Edition)	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
2	47 CFR Part 22(10-1-12 Edition)	Public Mobile Services
3	47 CFR Part 24(10-1-12 Edition)	Personal Communications Services

Test detailed items/section required by FCC rules and results are as below:

No.	Section	Description	Test Date	Test Engineer	Result
1	2.1046	Conducted RF Output Power	Sep 01, 2017	Gao Mingzhou	PASS
2	24.232(d)	Peak -Average Ratio	Sep 01, 2017	Gao Mingzhou	PASS
3	2.1049	99% Occupied Bandwidth	Aug 31& Sep 01,2017	Gao Mingzhou	PASS
4	2.1055,22.355, 24.235	Frequency Stability	Sep 01,2017	Gao Mingzhou	PASS
5	2.1051,22.917(a),24.238(a)	Conducted Out of Band Emissions	Aug 31& Sep 01,2017	Gao Mingzhou	PASS
6	2.1051,22.917(a),24.238(a)	Band Edge	Aug 31& Sep 01,2017	Gao Mingzhou	PASS
7	22.913(a),24.232(a)	Transmitter Radiated Power (EIPR/ERP)	Sep 05-07,2017	Wang Dalong	PASS
8	2.1051,22.917(a),24.238(a)	Radiated Out of Band Emissions	Sep 07,2017	Wang Dalong	PASS

Note 1: The tests were performed according to the method of measurements prescribed in KDB 971168 D01 V03R01 (Oct 27, 2017)andANSI C63.26 2015 section 5.2.5.5.

Note 2: The path loss during the RF test is calibrated to correct the results by the offset setting in the test equipments. The ref offset 26.5dB contains two parts that cable loss 16.5dB and Attenuator 10dB.

1.5. Environmental Conditions

During the measurement, the environmental conditions were within the listed ranges:

Temperature (°C):	15 - 35
Relative Humidity (%):	30 -60
Atmospheric Pressure (kPa):	86-106

2. 47 CFR Part 2, Part 22H , 24ERequirements

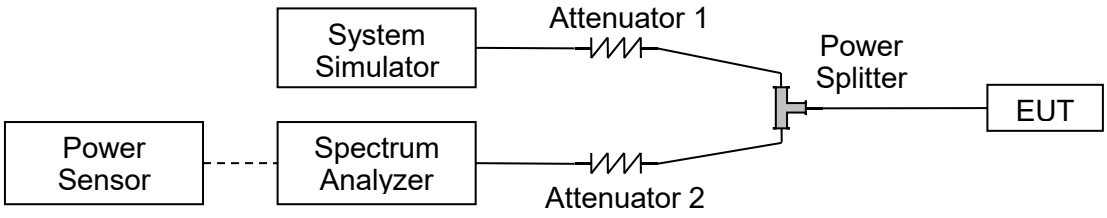
2.1. Conducted RF Output Power

2.1.1. Requirement

According to FCC section 2.1046(a), for transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in FCC section 2.1033(c)(8).

2.1.2. Test Description

Test Setup:



The EUTis coupled to the Spectrum Analyzer (SA) and the System Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. The EUT is commanded by the SS to operate at the maximum output power i.e. Power Control Level (PCL) = 5 and Power Class = 4. A call is established between the EUT and the SS.

2.1.3. Test Results

GSM850	Average Power (dBm)		
TX Channel	**128**	**190**	**251**
Frequency (MHz)	**824.2**	**836.6**	**848.8**
GPRS 1 Tx slot	32.51	32.75	32.89
GPRS 2 Tx slots	29.99	30.00	30.10
GPRS 3 Tx slots	28.02	28.05	28.16
GPRS 4 Tx slots	25.96	26.02	26.18
EDGE 1 Tx slot	25.50	25.54	25.49
EDGE 2 Tx slots	25.08	25.13	25.31
EDGE 3 Tx slots	24.02	23.98	23.92
EDGE 4 Tx slots	21.15	21.28	21.30

GSM1900	Average Power (dBm)		
TX Channel	**512**	**661**	**810**
Frequency (MHz)	**1850.2**	**1880**	**1909.8**
GPRS 1 Tx slot	29.33	29.26	28.97
GPRS 2 Tx slots	26.41	25.74	25.74
GPRS 3 Tx slots	24.89	24.66	24.23
GPRS 4 Tx slots	22.83	22.62	22.19
EDGE 1 Tx slot	24.79	24.63	24.28
EDGE 2 Tx slots	24.93	24.77	24.39
EDGE 3 Tx slots	23.88	23.58	23.81
EDGE 4 Tx slots	22.96	23.28	22.86

WCDMA Band V		Average Power (dBm)		
TX Channel		4132	4182	4233
Frequency (MHz)		826.4	836.4	846.6
3GPP Rel 99	RMR 12.2Kbps	23.59	23.64	23.35
3GPP Rel 6	HSDPA Subtest-1	23.37	23.50	23.12
3GPP Rel 6	HSDPA Subtest-2	23.36	23.58	23.16
3GPP Rel 6	HSDPA Subtest-3	23.37	23.53	23.18
3GPP Rel 6	HSDPA Subtest-4	22.87	23.00	22.62
3GPP Rel 6	HSUPA Subtest-1	23.45	24.07	23.89
3GPP Rel 6	HSUPA Subtest-2	21.45	22.07	21.89
3GPP Rel 6	HSUPA Subtest-3	22.45	23.07	22.89
3GPP Rel 6	HSUPA Subtest-4	21.25	21.87	21.69
3GPP Rel 6	HSUPA Subtest-5	23.41	23.91	23.86
3GPP Rel 6	HSPA+ Subtest-1	23.08	23.63	24.05

WCDMA Band II		Average Power (dBm)		
TX Channel		9262	9400	9538
Frequency (MHz)		1852.4	1880.0	1907.6
3GPP Rel 99	RMR 12.2Kbps	22.98	22.87	23.02
3GPP Rel 6	HSDPA Subtest-1	22.74	22.70	22.76
3GPP Rel 6	HSDPA Subtest-2	22.71	22.74	22.71
3GPP Rel 6	HSDPA Subtest-3	22.79	22.76	22.73
3GPP Rel 6	HSDPA Subtest-4	22.24	22.2	22.26
3GPP Rel 6	HSUPA Subtest-1	23.27	22.93	23.25
3GPP Rel 6	HSUPA Subtest-2	21.27	20.93	21.25
3GPP Rel 6	HSUPA Subtest-3	22.27	21.93	22.25
3GPP Rel 6	HSUPA Subtest-4	21.07	20.73	21.05
3GPP Rel 6	HSUPA Subtest-5	23.26	23.01	23.21
3GPP Rel 6	HSPA+ Subtest-1	22.98	22.72	22.72

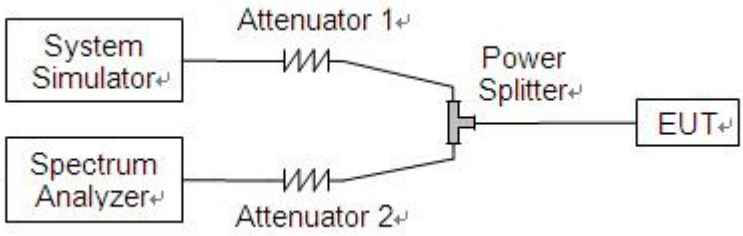
2.2. Peak to Average Ratio

2.2.1. Requirement

According to FCC 24.232(d) the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

2.2.2. Test Description

Test Setup:



The EUTis coupled to the Spectrum Analyzer (SA) and the System Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. The EUT is commanded by the SS to operate at the maximum output power i.e. Power Control Level (PCL) = 5 and Power Class = 4. A call is established between the EUT and the SS.

2.2.3. Test procedure

1 .For GSM/EDGE operating mode:

a. Set RBW=1MHz, VBW=3MHz, peak detector in spectrum analyzer.
b. Set EUT in maximum output power, and triggered the bust signal.
c. Measured respectively the peak level and mean level, and the deviation was recorded as Peak to Average ratio.

2.For UMTS operating mode:

a. Set the CCDF (Complementary Cumulative Distribution Function) option in spectrum analyzer.
b. The highest RF powers were measured and recorded the maximum PAPR level associated with a probability of 0.1%.

2.2.4. Test Result

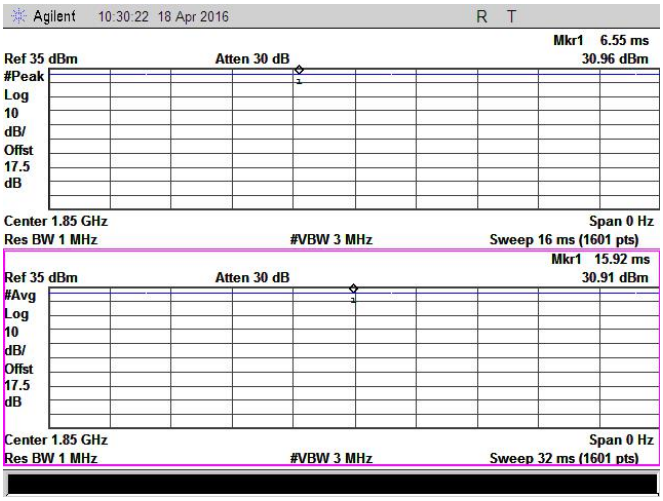
The lowest, middle and highest channels are selected to perform testing to verify the conducted RF output peak power of the Module.

A. Test Verdict:

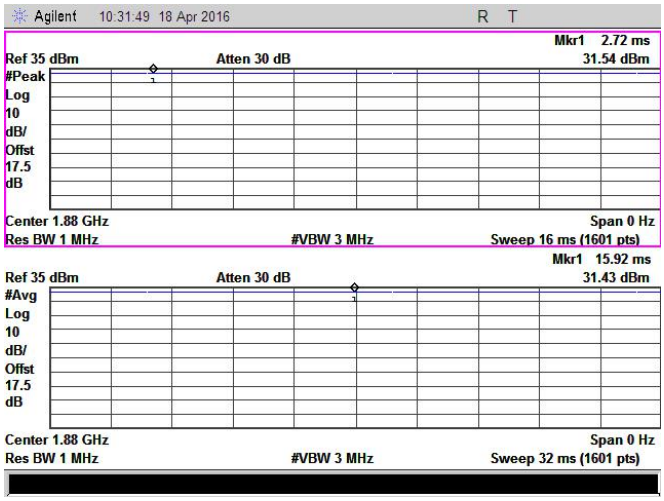
Band	Channel	Frequency (MHz)	Peak to Average ratio	Limit	Verdict
			dB	dB	
GPRS 1900MHz	512	1850.2	0.05		PASS
	661	1880.0	0.11		PASS
	810	1909.8	0.12		PASS
EDGE 1900MHz	512	1850.2	0.11		PASS
	661	1880.0	0.06		PASS
	810	1909.8	0.17		PASS

Band	Channel	Frequency (MHz)	Peak to Average ratio	Limit	Verdict
			dB		
WCDMA Band II	9262	1852.4	5.83	dB	PASS
	9400	1880.0	8.42		PASS
	9538	1907.6	8.46		PASS

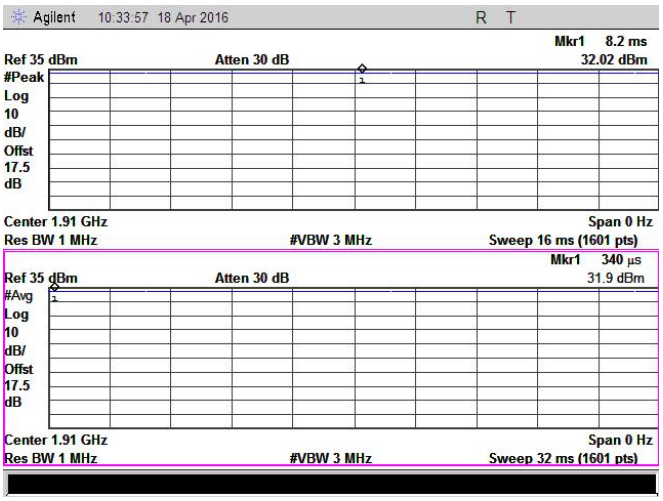
GPRS 1900MHz CH512 1850.2MHz



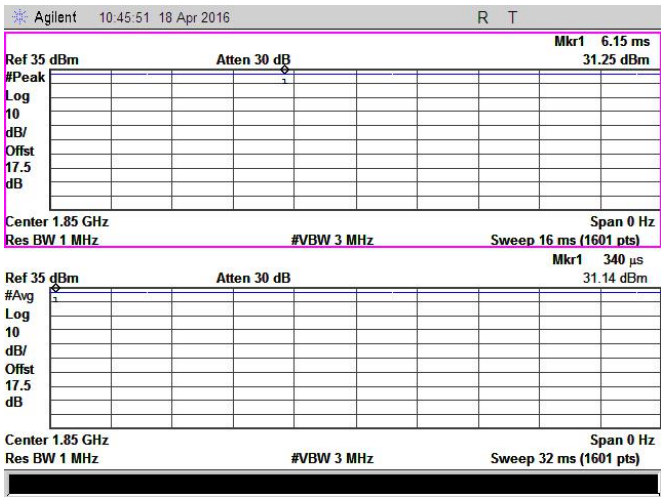
GPRS 1900MHz CH661 1880.0MHz



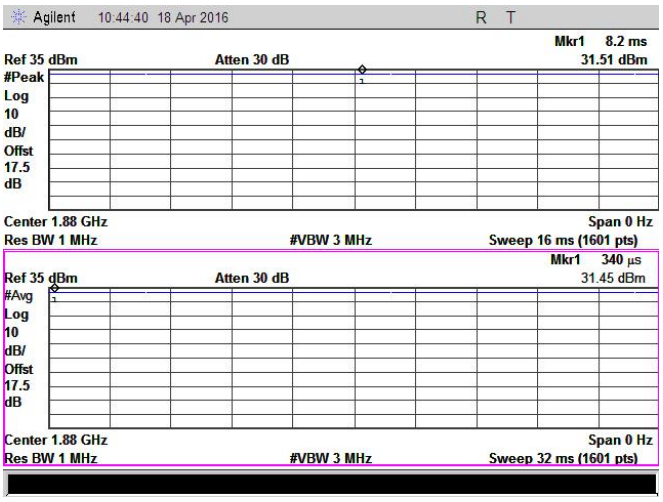
GPRS 1900MHz CH810 1909.8MHz



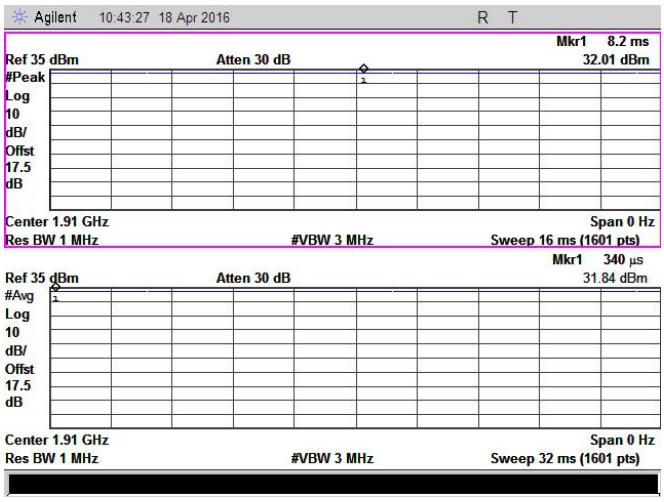
EDGE 1900MHz CH512 1850.2MHz



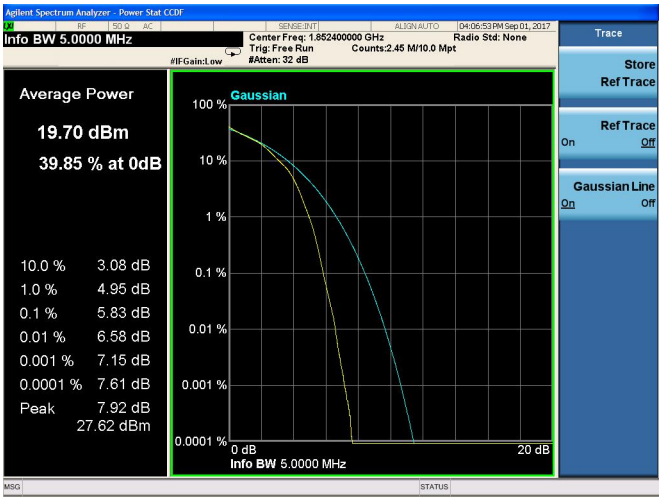
EDGE 1900MHz CH661 1880.0MHz



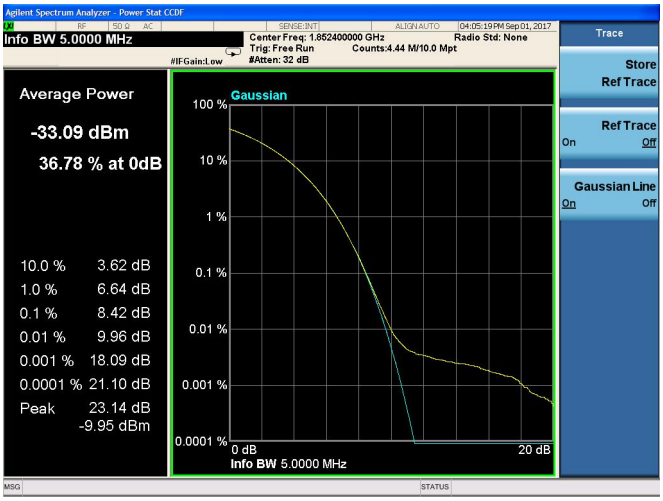
EDGE 1900MHz CH810 1909.8MHz



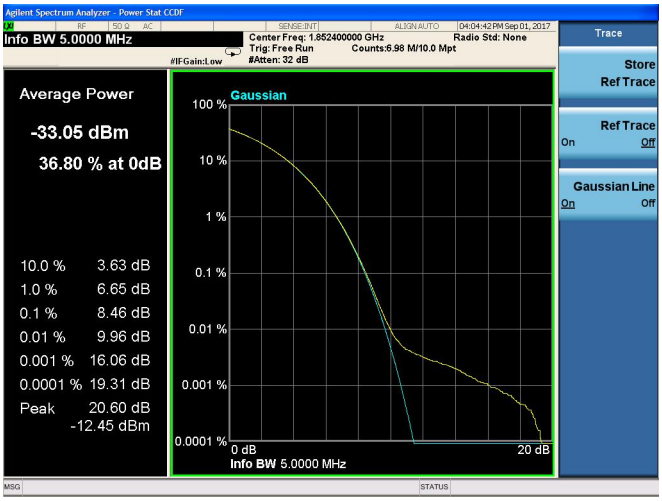
WCDMA Band II CH9262 1852.4MHz



WCDMA Band II CH9400 1880.0MHz



WCDMA Band II CH9538 1907.6MHz



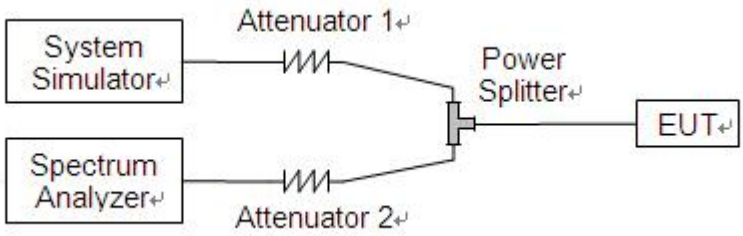
2.3. 99% Occupied Bandwidth

2.3.1. Requirement

According to FCC section 2.1049, the occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission.Occupied bandwidth is also known as the 99% emission bandwidth.

2.3.2. Test Description

Test Setup:



The EUTis coupled to the Spectrum Analyzer (SA) and the System Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. The EUT is commanded by the SS to operate at the maximum output power i.e. Power Control Level (PCL) = 5 and Power Class = 4. A call is established between the EUT and the SS.

2.3.3. Test Result

The lowest, middle and highest channels are selected to perform testing to record the 99% occupied bandwidth.

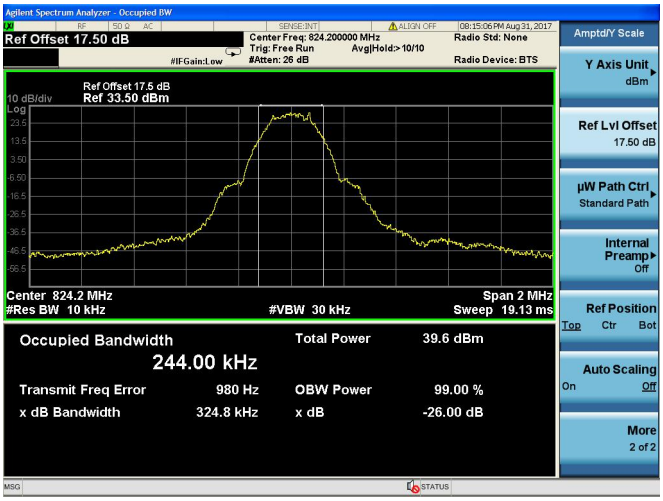
GSM Test Verdict:

Band	Channel	Frequency (MHz)	99% Occupied Bandwidth (kHz)	26dB Bandwidth (kHz)
GPRS 850MHz	128	824.2	244.0	324.8
	190	836.6	241.0	317.1
	251	848.8	247.5	317.5
GPRS 1900MHz	512	1850.2	244.8	313.9
	661	1880.0	246.4	316.3
	810	1909.8	250.2	317.4
EDGE 850MHz	128	824.2	245.6	320.7
	190	836.6	245.8	313.4
	251	848.8	249.3	323.9
EDGE 1900MHz	512	1850.2	244.8	310.5
	661	1880.0	241.9	309.5
	810	1909.8	244.9	323.8

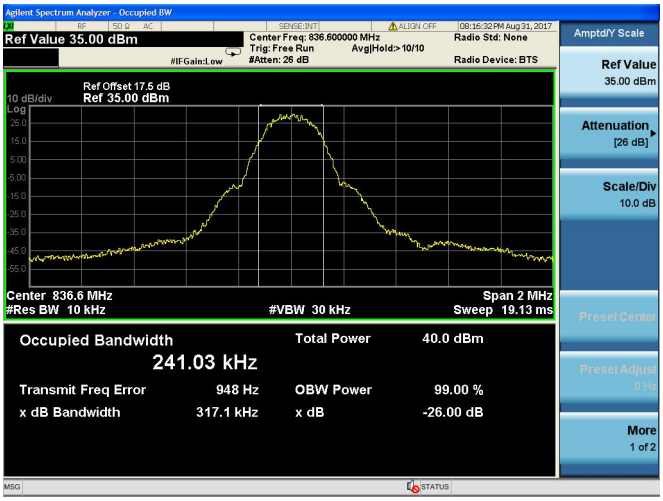
WCDMA Test Verdict:

Band	Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26dB Bandwidth (MHz)
WCDMA Band V	4132	826.4	4.128	4.606
	4182	836.4	4.147	4.617
	4233	846.6	4.143	4.619
WCDMA Band II	9262	1852.4	4.143	4.600
	9400	1880.0	4.138	4.604
	9538	1907.6	4.146	4.619

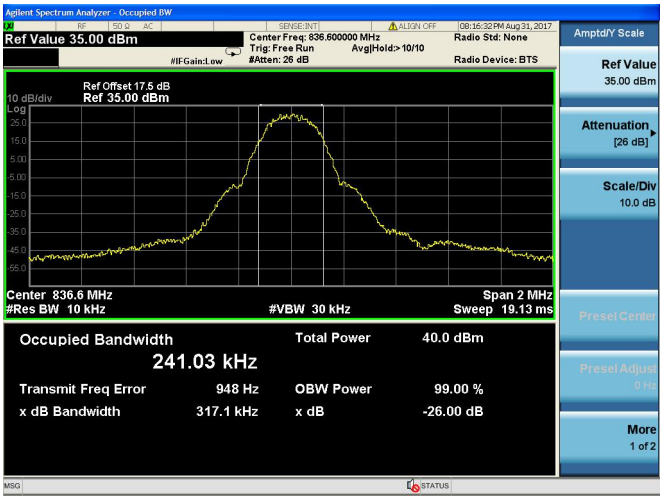
GPRS 850MHz CH128 824.2MHz



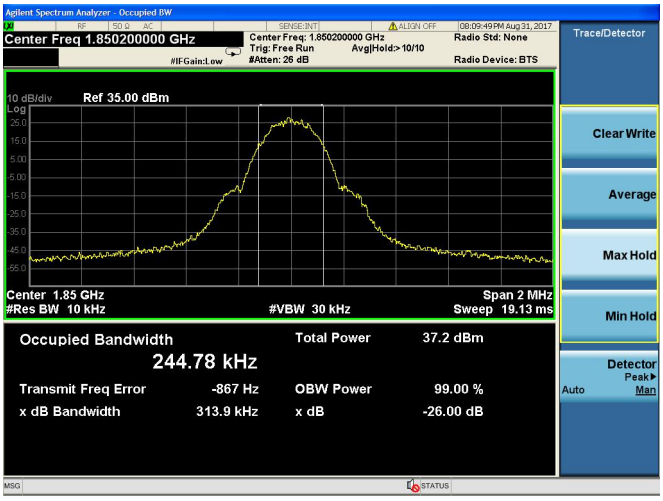
GPRS 850MHz CH190 836.6MHz



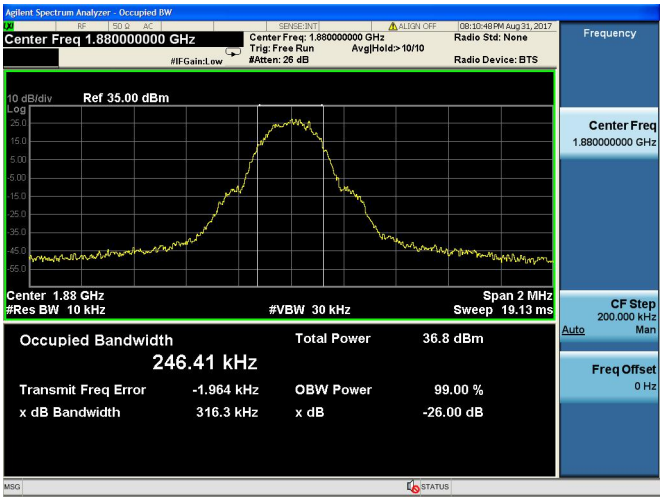
GPRS 850MHz CH251 848.8MHz



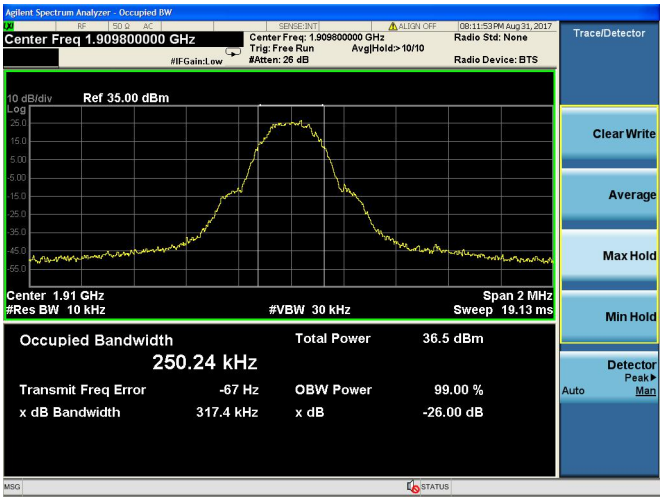
GPRS 1900MHz CH512 1850.2MHz



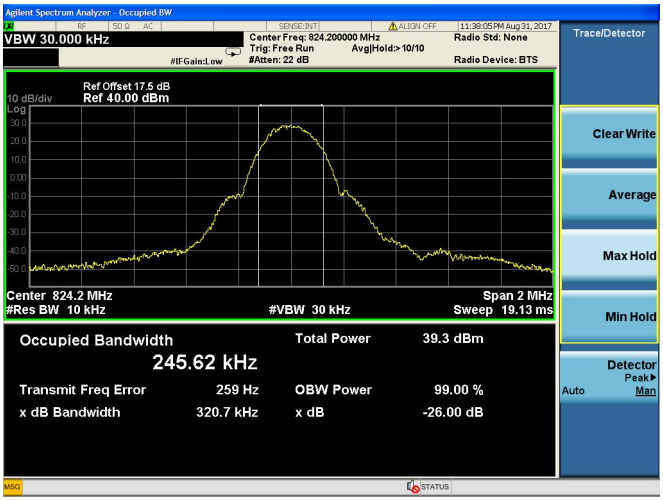
GPRS 1900MHz CH661 1880.0MHz



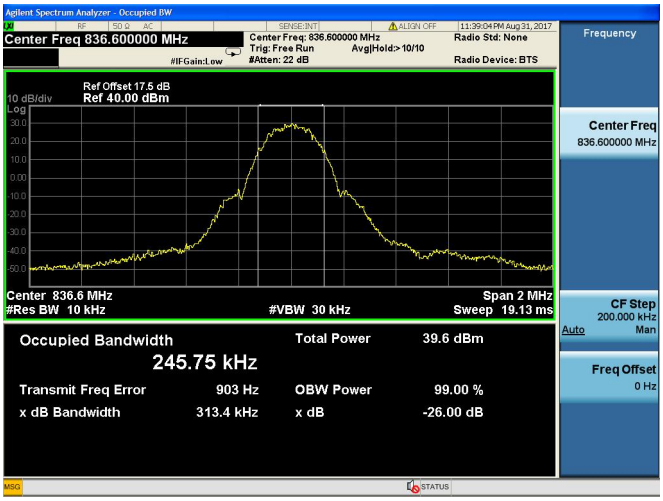
GPRS 1900MHz CH810 1909.8MHz



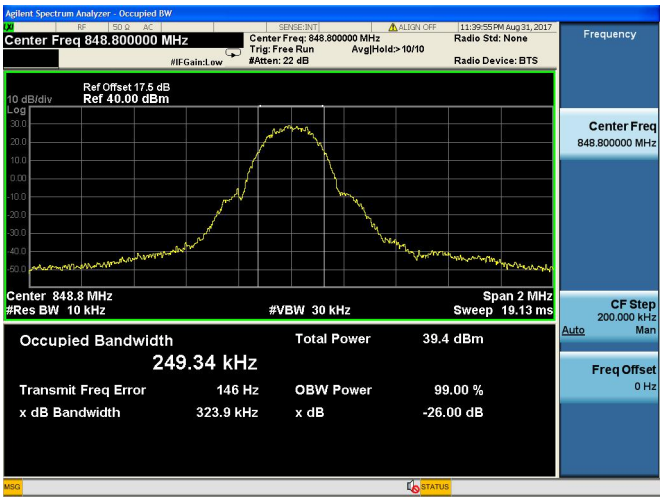
EDGE 850MHz CH128 824.2MHz



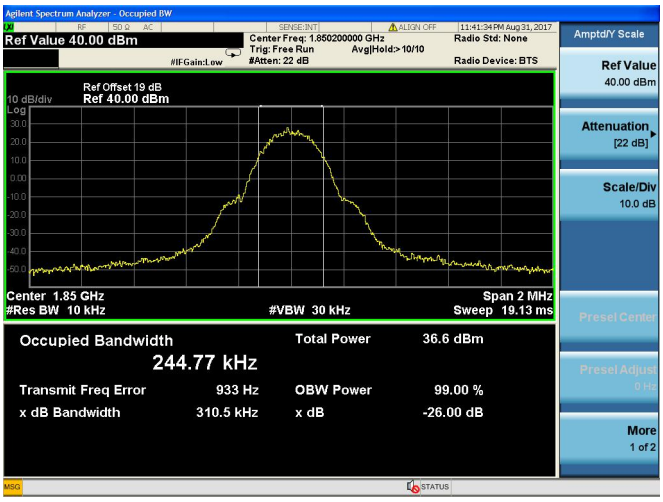
EDGE 850MHz CH190 836.6MHz



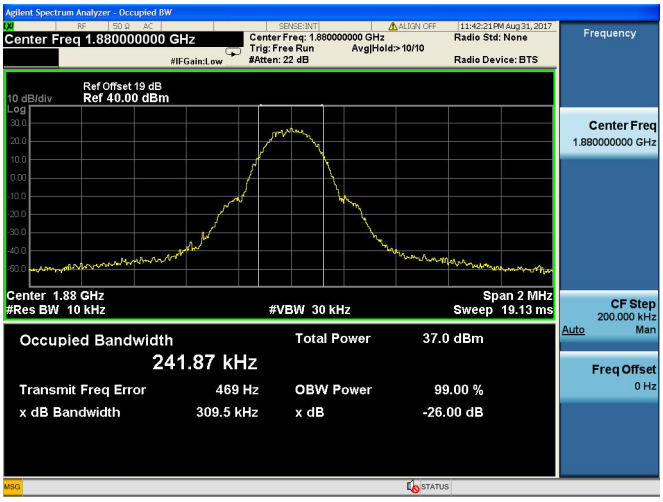
EDGE 850MHz CH251 848.8MHz



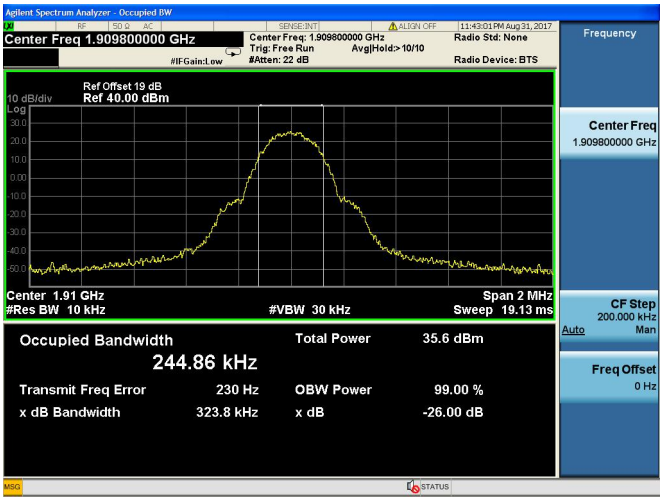
EDGE 1900MHz CH512 1850.2MHz



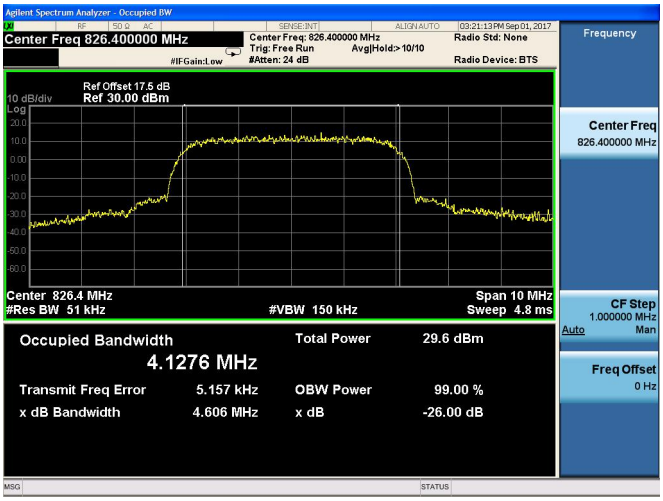
EDGE 1900MHzCH661 1880.0MHz



EDGE 1900MHzCH810 1909.8MHz



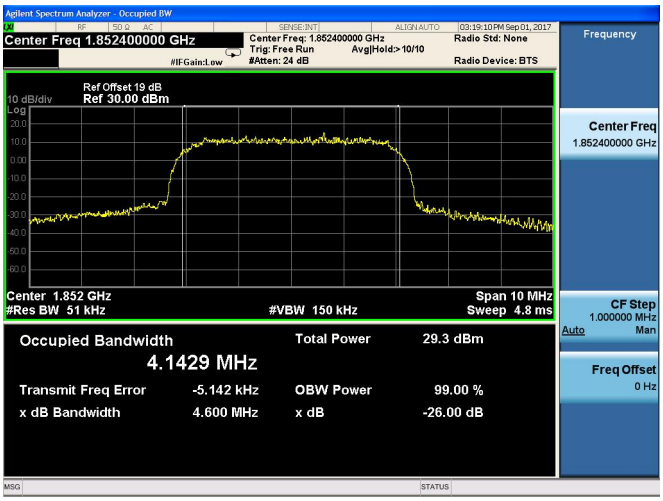
WCDMA Band V CH4132 826.4MHz



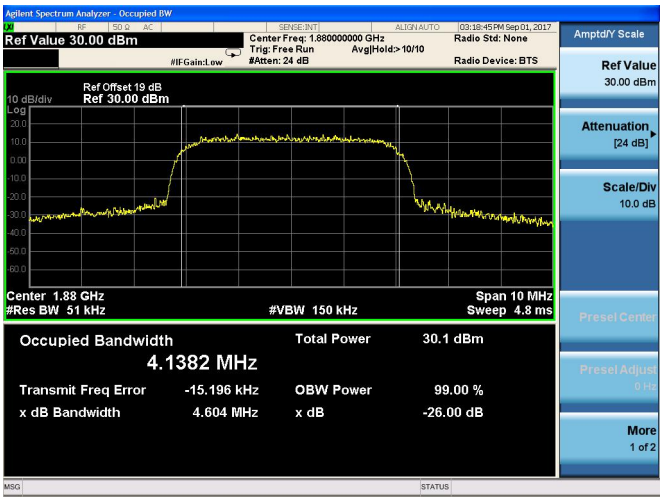
WCDMA Band V CH4182 836.4MHz

WCDMA Band V CH4233 846.6MHz

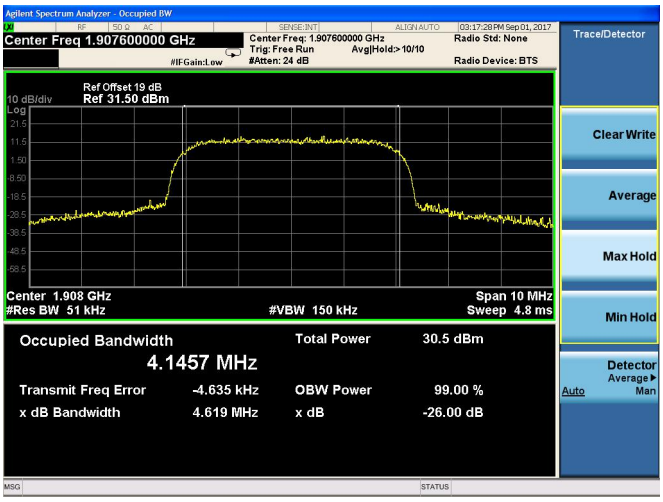
WCDMA Band II CH9262 1852.4MHz



WCDMA Band II CH9400 1880.0MHz



WCDMA Band II CH9538 1907.6MHz



2.4. Frequency Stability

2.4.1. Requirement

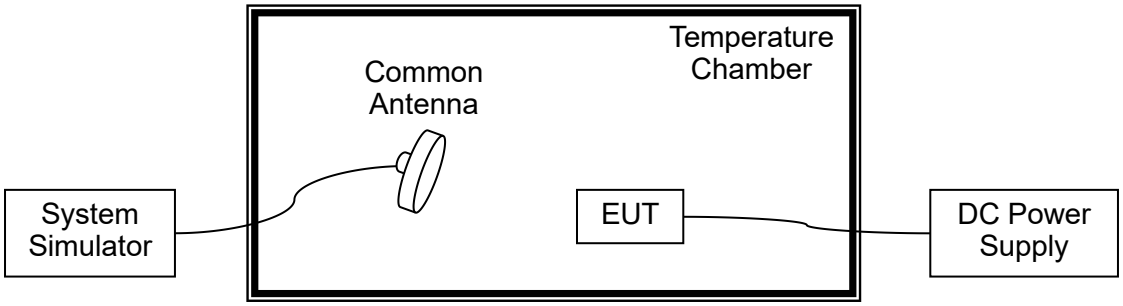
According to FCC section 22.355, 24.235 and 27.54 the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. According to FCC section 2.1055, the test conditions are:

(a) The temperature is varied from -25°C to +55°C at intervals of not more than 10°C.

(b) For hand carried battery powered equipment, the primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacture. The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided.

2.4.2. Test Description

Test Setup:



The EUT, which is powered by the DC Power Supply directly, is located in the Temperature Chamber. The EUT is commanded by the System Simulator (SS) to operate at the maximum output power i.e. Power Control Level (PCL) = 5 and Power Class = 4. A call is established between the EUT and the SS via a Common Antenna.

2.4.3. Test Result

A. Test Verdict:

GPRS 850MHz, Channel 190, Frequency 836.6MHz Limit =±2.5ppm					
Voltage(%)	**Power(VDC)**	**Temp(°C)**	**Fre. Dev. (Hz)**	**Deviation (ppm)**	**Result**
100	48	+20(Ref)	9.01	0.011	PASS
100		-30	7.89	0.009	
100		-20	7.97	0.010	
100		-10	12.09	0.014	
100		0	5.11	0.006	
100		+10	11.43	0.014	
100		+20	-0.89	-0.001	
100		+30	1.24	0.001	
100		+40	11.31	0.014	
100		+50	12.88	0.015	
100		+60	13.00	0.016	
115	57	+20	15.11	0.018	
85	44	+20	9.64	0.012	

GPRS 1900MHz, Channel 661, Frequency 1880.0MHz Limit =Within Authorized Band					
Voltage(%)	**Power(VDC)**	**Temp(°C)**	**Fre. Dev. (Hz)**	**Deviation (ppm)**	**Result**
100	48	+20(Ref)	8.89	0.005	PASS
100		-30	18.68	0.010	
100		-20	-17.66	-0.009	
100		-10	-16.29	-0.009	
100		0	32.88	0.017	
100		+10	-10.64	-0.006	
100		+20	-16.25	-0.009	
100		+30	12.08	0.006	
100		+40	19.22	0.010	
100		+50	-26.7	-0.014	
100		+60	52.05	0.028	
115	57	+20	8.69	0.005	
85	44	+20	8.64	0.005	

EDGE 850MHz, Channel 190, Frequency 836.6MHz Limit =±2.5ppm					
Voltage(%)	**Power(VDC)**	**Temp(°C)**	**Fre. Dev. (Hz)**	**Deviation (ppm)**	**Result**
100	48	+20(Ref)	-22.18	-0.027	PASS
100		-30	23.99	0.029	
100		-20	40.01	0.048	
100		-10	-21.42	-0.026	
100		0	6.88	0.008	
100		+10	2.6	0.003	
100		+20	24.9	0.030	
100		+30	15.19	0.018	
100		+40	18.16	0.022	
100		+50	22.76	0.027	
100		+60	23.06	0.027	
115	57	+20	14.9	0.018	
85	44	+20	-23.54	-0.028	

EDGE 1900MHz, Channel 661, Frequency 1880.0MHz Limit =Within Authorized Band					
Voltage(%)	**Power(VDC)**	**Temp(°C)**	**Fre. Dev. (Hz)**	**Deviation (ppm)**	**Result**
100	48	+20(Ref)	14.38	0.008	PASS
100		-30	-15.4	-0.008	
100		-20	40.25	0.021	
100		-10	-19.91	-0.011	
100		0	-13.96	-0.007	
100		+10	19.91	0.011	
100		+20	17.79	0.009	
100		+30	19.48	0.010	
100		+40	-15.4	-0.008	
100		+50	-14.56	-0.008	
100		+60	57.06	0.030	
115	57	+20	-13.55	-0.007	
85	44	+20	13.34	0.007	

WCDMA Band V, Channel 4182, Frequency 836.4MHz Limit =±2.5ppm					
Voltage(%)	**Power(V DC)**	**Temp(°C)**	**Fre. Dev. (Hz)**	**Deviation (ppm)**	**Result**
100	48	+20(Ref)	30.64	0.037	PASS
100		-30	26.2	0.031	
100		-20	5.69	0.007	
100		-10	0.38	0.000	
100		0	-6.66	-0.008	
100		+10	14.29	0.017	
100		+20	-3.48	-0.004	
100		+30	21.23	0.025	
100		+40	11.86	0.014	
100		+50	-9.01	-0.011	
100		+60	26.14	0.031	
115	57	+20	19.65	0.023	
85	44	+20	15.24	0.018	

WCDMA Band II, Channel 9400, Frequency 1880.0MHz Limit =Within Authorized Band					
Voltage(%)	**Power(V DC)**	**Temp(°C)**	**Fre. Dev. (Hz)**	**Deviation (ppm)**	**Result**
100	48	+20(Ref)	9.32	0.005	PASS
100		-30	23.19	0.012	
100		-20	31.78	0.017	
100		-10	-12.55	-0.007	
100		0	-10.14	-0.005	
100		+10	16.12	0.009	
100		+20	-11.17	-0.006	
100		+30	8.55	0.005	
100		+40	23.22	0.012	
100		+50	23.88	0.013	
100		+60	65	0.035	
115	57	+20	-11.48	-0.006	
85	44	+20	16.74	0.009	

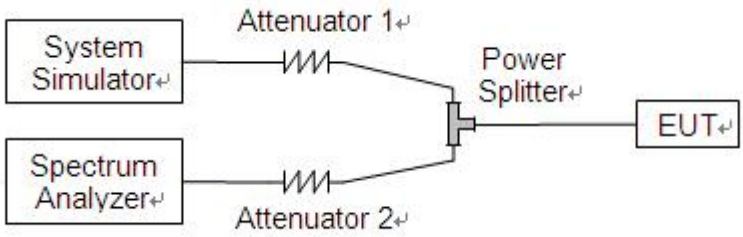
2.5. Conducted Out of Band Emissions

2.5.1. Requirement

According to FCC section 22.917(a), 24.238(a) the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43+10*log(P)dB. This calculated to be -13dBm.

2.5.2. Test Description

Test Setup:

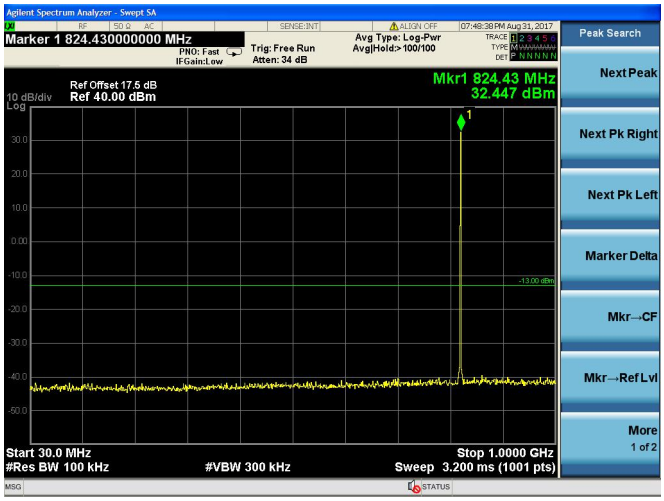


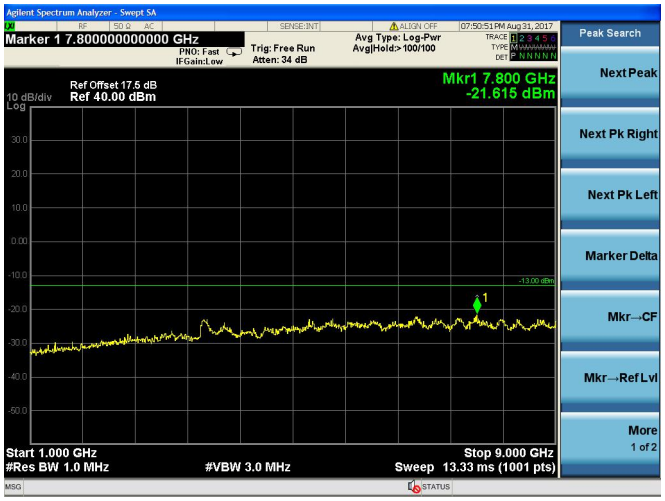
The EUTis coupled to the Spectrum Analyzer (SA) and the System Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. The EUT is commanded by the SS to operate at the maximum output power i.e. Power Control Level (PCL) = 5 and Power Class = 4. A call is established between the EUT and the SS.

2.5.3. Test Result

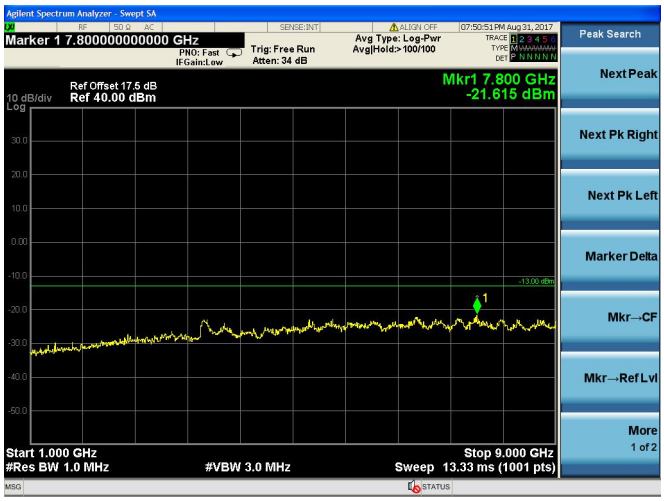
The measurement frequency range is from 30MHz to the 10^{th} harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the out of band emissions.

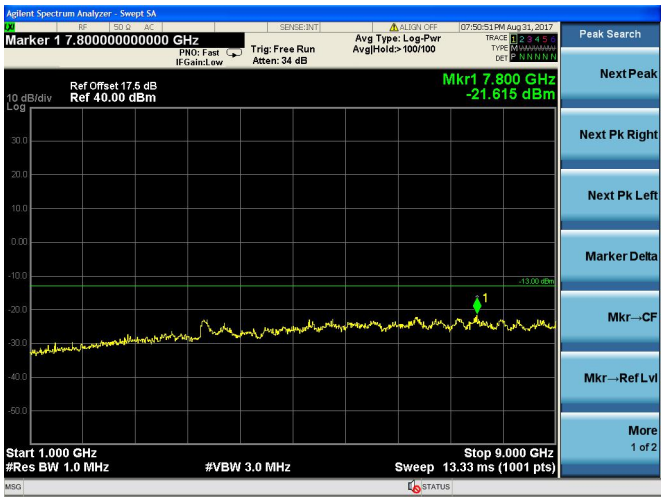
GPRS 850MHz CH128 824.2MHz



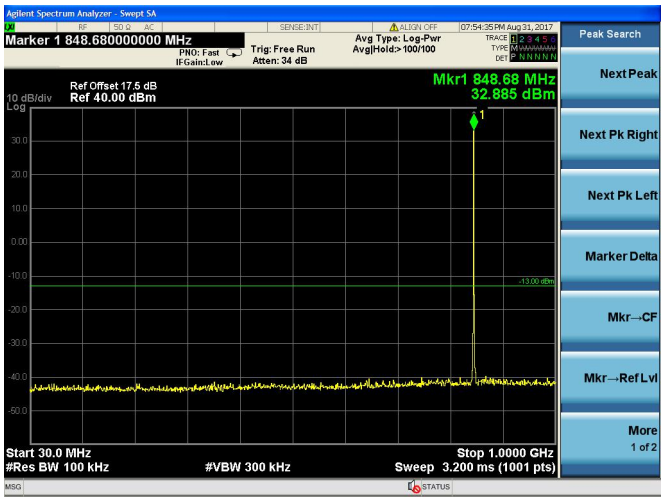


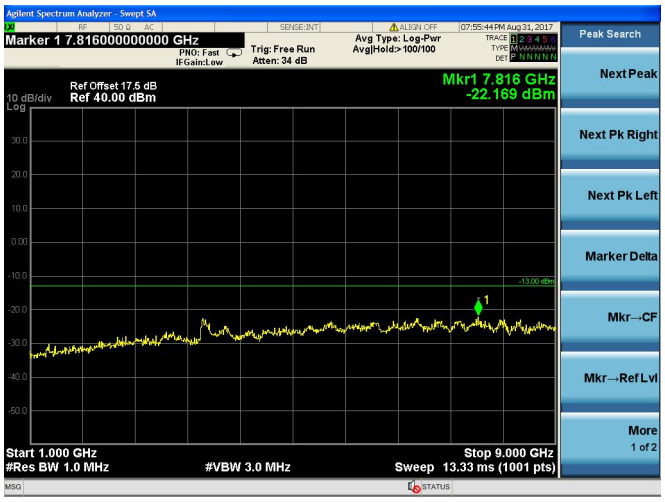
GRPS 850MHz CH190 836.6MHz



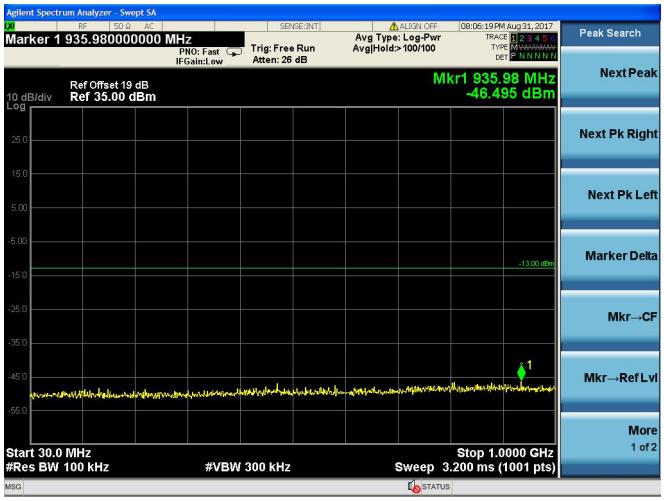


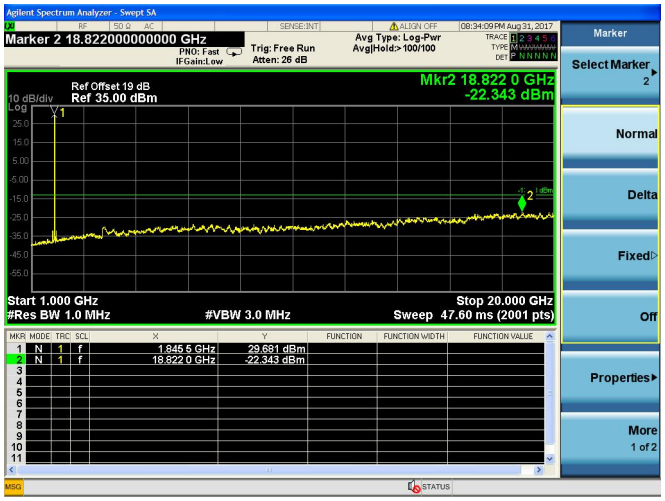
GRPS 850MHz CH251 848.8MHz



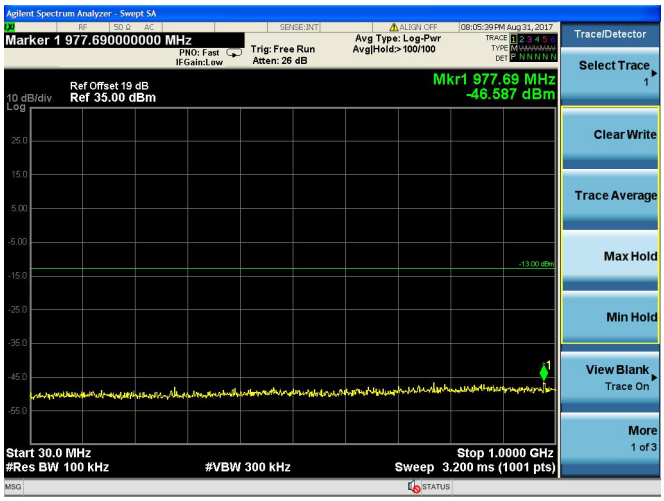


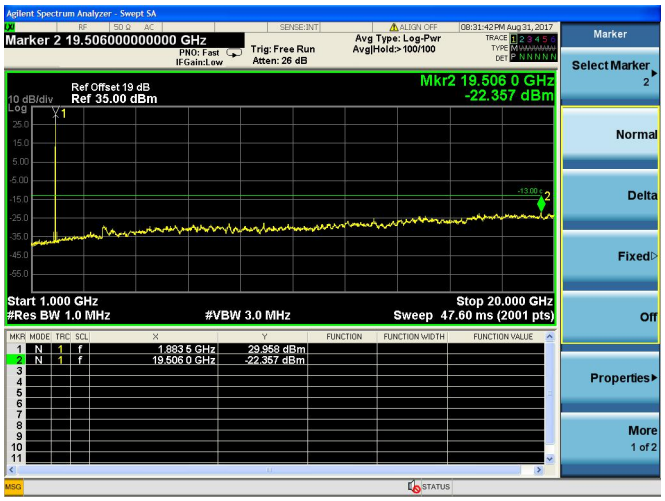
GRPS 1900MHz CH521 1850.2MHz



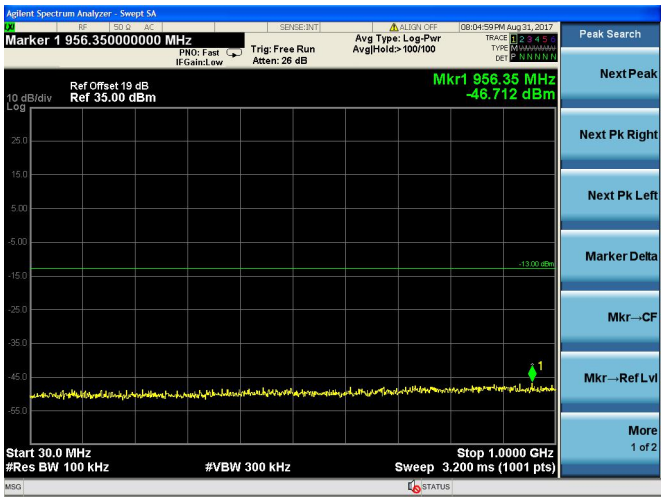


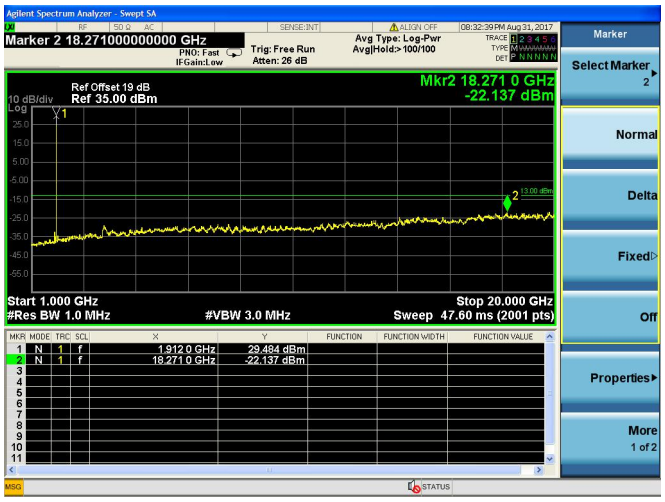
GRPS 1900MHz CH661 1880.0MHz



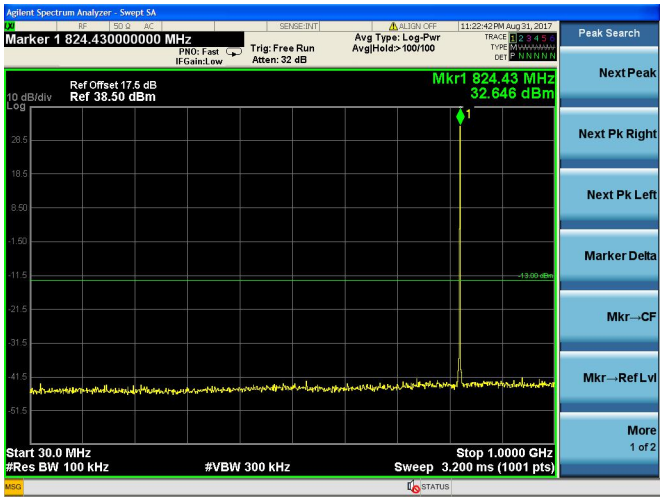


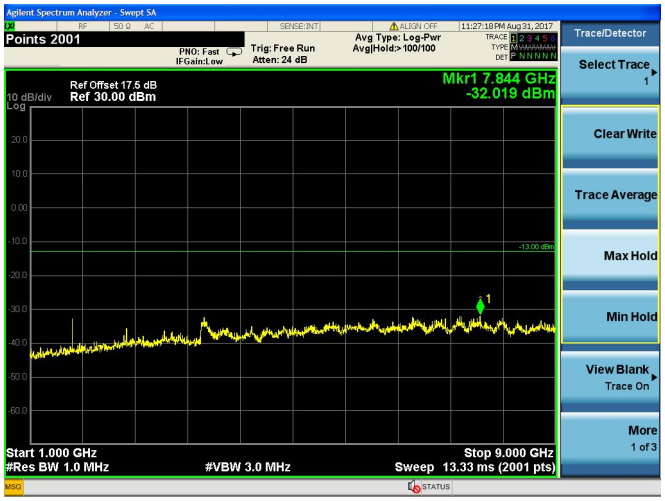
GRPS 1900MHz CH810 1909.8MHz



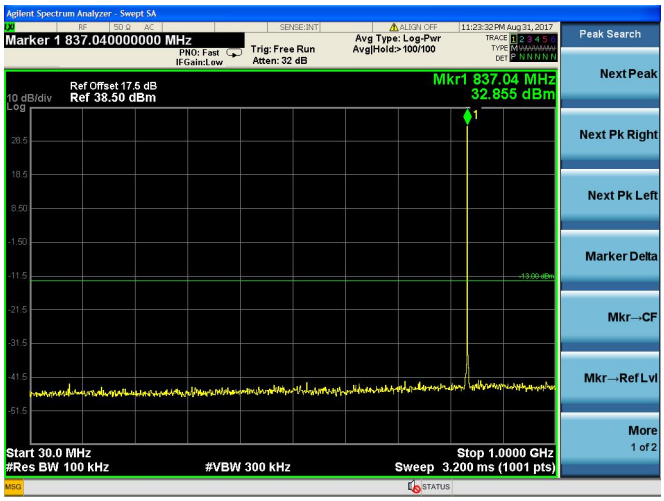


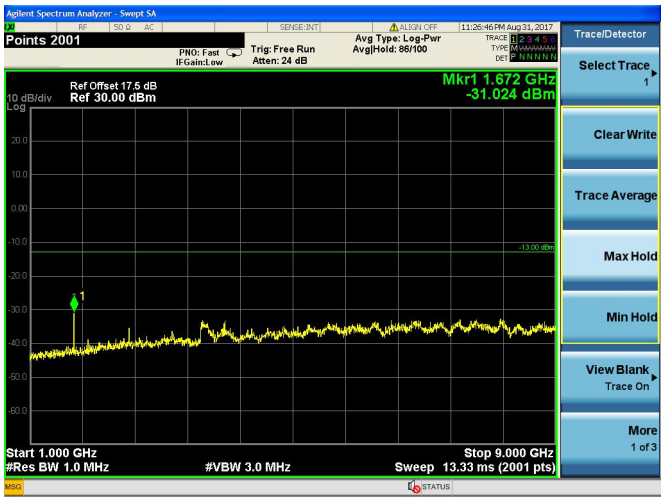
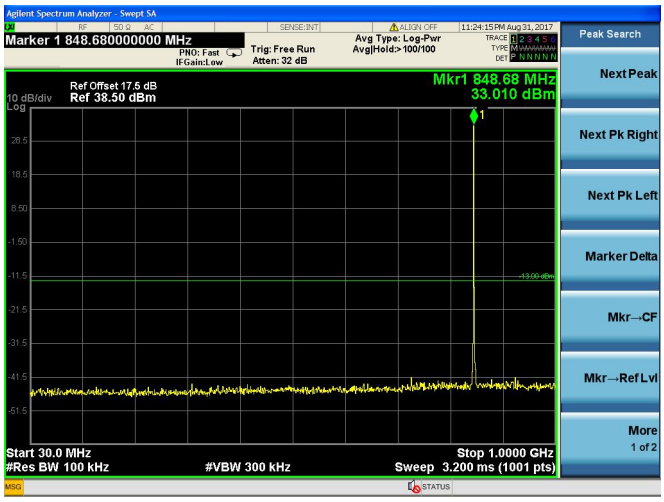
EDGE 850MHz CH128 824.2MHz





EDGE 850MHz CH190 836.6MHz





EDGE 850MHz CH251 848.8MHz