FCC PART 22/24 TEST REPORT
FCC Part 22

Report Reference No.:	UNIA2018050831-1FR-01
FCC ID:	2AQP8-C50
Compiled by (position+printed name+signature) . :	File administrators Kahn yang
Supervised by (position+printed name+signature) . :	Technique principal Sherwin Qian
Approved by (position+printed name+signature) . :	Manager Liuze
Date of issue ..... :	Aug.02, 2018
Testing Laboratory Name ..... :	**Shenzhen United Testing Technology Co., Ltd.**
Address..... :	2F, Annex Bldg, Jiahuangyuan Tech Park, #365 Baotian 1 Rd, Tiegang Community, Xixiang Str, Bao'an District, Shenzhen, China
Applicant's name ..... :	**Shenzhen JOAN Technology Co., Ltd.**
Address..... :	Rm 201, No. 22.1 Area, 5th Industrial Zone, Shangfen, Minzhi, Longhua District, Shenzhen,China
Test specification ..... :	
Standard ..... :	**FCC Part 22: PUBLIC MOBILE SERVICES**

Test item description .....:	Bar code Hand Terminal
Trade Mark ..... :	/
Manufacturer ..... :	**Shenzhen JOAN Technology Co., Ltd.**
Model/Type reference..... :	C50
Listed Models ..... :	C40,C43,C60,C70,C80,C90,R30,R40,R50,R60,R70,R80,R90,MS8288W,MS8288F,MS8588
Ratings..... :	DC 3.8V From Battery;
Modulation ..... :	GMSK
GPRS	Supported
Hardware version ..... :	V1.0
Software version ..... :	V1.0
Frequency.....	GSM 850MHz
Result ..... :	**PASS**

TEST REPORT

Test Report No. :	UNIA2018050831-1FR-01	Aug.02, 2018 Date of issue

Equipment under Test	:	Bar code Hand Terminal
Model /Type	:	C50
Listed Models	:	C40,C43,C60,C70,C80,C90,R30,R40,R50,R60,R70,R80, R90,MS8288W,MS8288F,MS8588
Applicant	:	**Shenzhen JOAN Technology Co., Ltd.**
Address	:	Rm 201, No. 22.1 Area, 5th Industrial Zone, Shangfen, Minzhi, Longhua District, Shenzhen,China
Manufacturer	:	**Shenzhen JOAN Technology Co., Ltd.**
Address	:	Rm 201, No. 22.1 Area, 5th Industrial Zone, Shangfen, Minzhi, Longhua District, Shenzhen,China

Test Result:	**PASS**

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Revison History

Revision	Issue Date	Revisions	Revised By
V1.0	2018-08-02	Initial Issue	Jason Zhou

Contents

1 TEST STANDARDS

The tests were performed according to following standards:

FCC Part 22 (10-1-12 Edition): PRIVATE LAND MOBILE RADIO SERVICES.

TIA/EIA 603 D June 2010: Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.

2 SUMMARY

2.1 General Remarks

Date of receipt of test sample	:	July 02, 2018
Testing commenced on	:	July 02, 2018
Testing concluded on	:	Aug. 02, 2018

2.2 Product Description

Product Name:	Bar code Hand Terminal
Model/Type reference:	C50
List Model:	C40,C43,C60,C70,C80,C90,R30,R40,R50,R60,R70,R80,R90, MS8288W,MS8288F,MS8588
Power supply:	DC 3.80V
Adapter Information	M/N: P12USB050200 Input: AC 100-240V, 50/60Hz, 0.3A Output: DC 5.0V, 2.0A
Modilation Type	GMSK
Antenna Type	Internal antenna
GSM/EDGE/GPRS	Supported GSM/GPRS
GSM/GPRS Power Class	GSM850:Power Class 4
GSM/GPRS Operation Frequency	GSM850 :824.2MHz-848.8MHz
GPRS Operation Frequency Band	GPRS850
GPRS Multislot Class	Multi-slot Class 12
EGPRS Multislot Class	/
Extreme temp. Tolerance	-30°C to +50°C
GPRS operation mode	Class B
Antenna gain:	GSM850: -0.68dbi

2.3 Equipment under Test

Power supply system utilised

Power supply voltage	:	○	120V / 60 Hz	○	230V / 50Hz
		○	12 V DC	○	24 V DC
		●	Other (specified in blank below)		

DC 3.8V From Battery;

Test frequency list

Test Mode	TX/RX	RF Channel		
		Low(L)	Middle (M)	High (H)
GSM 850	TX	Channel 128	Channel 190	Channel 251
		824.2 MHz	836.6 MHz	848.8 MHz
	RX	Channel 128	Channel 190	Channel 251
		869.2 MHz	881.6 MHz	893.8 MHz

2.4 Short description of the Equipment under Test (EUT)

This is a Bar code Hand Terminal.
For more details, refer to the user's manual of the EUT.

2.5 EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

● - supplied by the manufacturer

○ - supplied by the lab

○	/	M/N :	/
		Manufacturer:	/

2.6 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: 2AQP8-C50** filing to comply with FCC Part 22

2.7 Modifications

No modifications were implemented to meet testing criteria.

2.8 General Test Conditions/Configurations

2.8.1 Test Modes

NOTE: The test mode(s) are selected according to relevant radio technology specifications.

Test Mode 1	GSM
Test Mode 2	GPRS

2.8.2 Test Environment

Environment Parameter	Selected Values During Tests	
Relative Humidity	Ambient	
Temperature	TN	Ambient
Voltage	VL	3.40V
	VN	3.80V
	VH	4.20V

NOTE: VL=lower extreme test voltage VN=nominal voltage
VH=upper extreme test voltage TN=normal temperature

2.9 Modifications

No modifications were implemented to meet testing criteria.

3 TEST ENVIRONMENT

3.1 Address of the test laboratory

Shenzhen HUAK Testing Technology Co., Ltd.
1F, B2 Building, Junfeng Zhongcheng Zhizao Innovation Park,Heping Community, Fuhai Street, Bao'an District, Shenzhen, China

3.2 Environmental conditions

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

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	950-1050mbar

3.3 Test Description

3.3.1 Cellular Band (824-849MHz paired with 869-894MHz)

Test Item	FCC Rule No.	Requirements	Verdict
Effective(Isotropic) Radiated Output Power	§2.1046, §22.913	FCC: ERP ≤ 7W.	Pass
Modulation Characteristics	§2.1047	Digital modulation	N/A
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Pass
Band Edges Compliance	§2.1051, §22.917	≤-13dBm/1%*EBW, in 1MHz bands immediately outside and adjacent to The frequency block.	Pass
Spurious Emission at Antenna Terminals	§2.1051, §22.917	FCC: ≤ -13dBm/100kHz, from 9kHz to 10th harmonics but outside authorized operating frequency ranges.	Pass
Field Strength of Spurious Radiation	§2.1053, §22.917	FCC: ≤ -13dBm/100kHz.	Pass
Frequency Stability	§2.1055, §22.355	≤ ±2.5ppm.	Pass
NOTE 1: For the verdict, the "N/A" denotes "not applicable", the "N/T" de notes "not tested".			

3.4 Equipments Used during the Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	Horn Antenna	Sunol	DRH-118	A101415	2018.9.29
2	BicoNlLog Antenna	Sunol	JB1 Antenna	A090215	2018.9.29
3	PREAMP	HP	8449B	3008A00160	2018.9.9
4	PREAMP	HP	8447D	2944A07999	2018.9.9
5	EMI TEST RECEIVER	Rohde&Schwarz	ESR3	101891	2018.9.9
6	VECTOR Signal Generator	Rohde&Schwarz	SMU200A	101521	2018.9.28
7	Signal Generator	Agilent	E4421B	MY4335105	2018.9.28
8	MXA Signal Analyzer	Agilent	N9020A	MY50510140	2018.9.28
9	MXA Signal Analyzer	Agilent	N9020A	MY51110104	2018.9.9
10	ANT Tower&Turn table Controller	Champro	EM 1000	60764	2018.9.28
11	Anechoic Chamber	Taihe Maorui	9m*6m*6m	966A0001	2018.9.9
12	Shielding Room	Taihe Maorui	6.4m*4m*3m	643A0001	2018.9.9
13	RF Power sensor	DARE	RPR3006W	15I00041SNO88	2019.3.14
14	RF Power sensor	DARE	RPR3006W	15I00041SNO89	2019.3.14
15	RF power divider	Anritsu	K241B	992289	2018.9.28
16	Wideband radio communication tester	Rohde&Schwarz	CMW500	154987	2018.9.28
17	Biconical antenna	Schwarzbeck	VHA 9103	91032360	2018.9.8
18	Biconical antenna	Schwarzbeck	VHA 9103	91032361	2018.9.8
19	Broadband Hybrid Antennas	Schwarzbeck	VULB9163	VULB9163#958	2018.9.8
20	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1680	2019.1.12
21	Active Receive Loop Antenna	Schwarzbeck	FMZB 1919B	00023	2018.11.02
22	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170651	2019.03.14
23	Microwave Broadband Preamplifier	Schwarzbeck	BBV 9721	100472	2018.10.24
24	Active Loop Antenna	Com-Power	AL-130R	10160009	2019.05.10
25	Power Meter	KEYSIGHT	N1911A	MY50520168	2019.05.10
26	Frequency Meter	VICTOR	VC2000	997406086	2019.05.10
27	DC Power Source	HYELEC	HY5020E	055161818	2019.05.10
28	Spectrum Analyzer	Rohde&Schwarz	FSP40	174986	2019.05.10

4 TEST CONDITIONS AND RESULTS

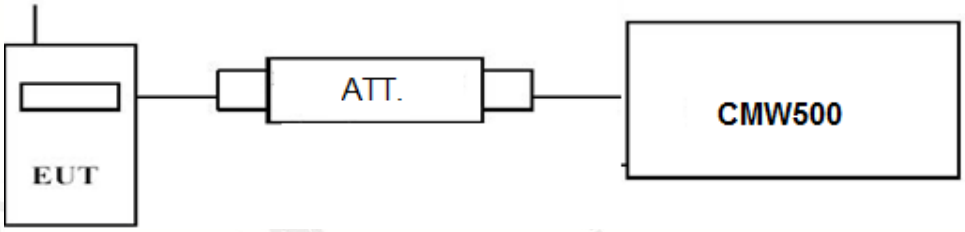
4.1 Output Power

TEST APPLICABLE

During the process of testing, the EUT was controlled via R&S Digital Radio Communication tester (CMW500) to ensure max power transmission and proper modulation. This result contains output power and EIRP measurements for the EUT. In all cases, output power is within the specified limits.

4.1.1 Conducted Output Power

TEST CONFIGURATION



TEST PROCEDURE

Conducted Power Measurement:

a) Place the EUT on a bench and set it in transmitting mode.
b) Connect a low loss RF cable from the antenna port to a CMW500 by an Att.
c) EUT Communicate with CMW500 then selects a channel for testing.
d) Add a correction factor to the display CMW500, and then test.

GSM850				
Function	**Power step**	**Nominal output power (dBm)**	**Power &Multislot class**	**Operation class**
GSM	5	33dBm(2W)	4	/
GPRS	3	33dBm(2W)	12	B

TEST RESULTS

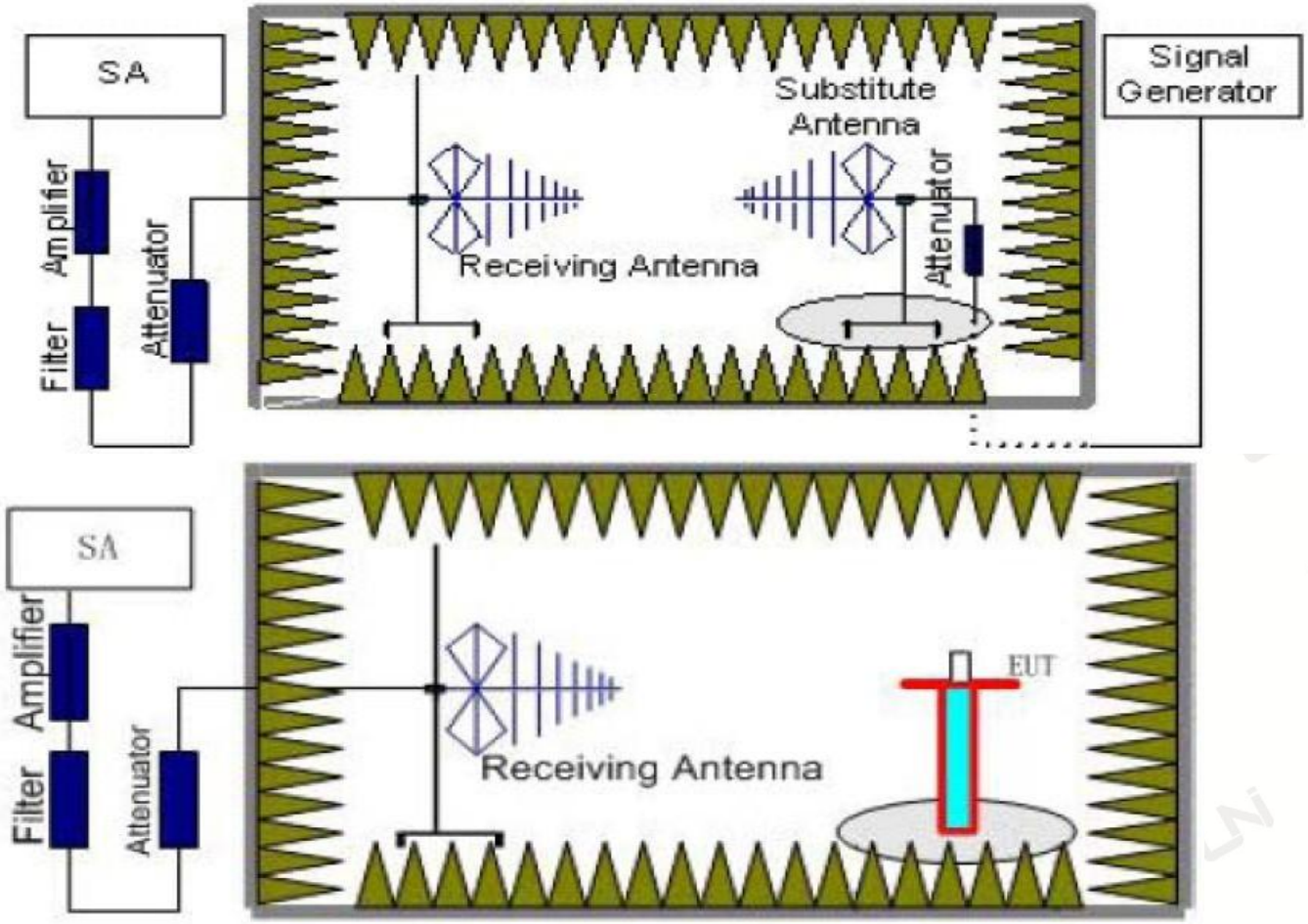
GSM 850		Burst Average Conducted power (dBm)		
		Channel/Frequency(MHz)		
		128/824.2	**190/836.6**	**251/848.8**
GSM		30.52	30.89	30.97
GPRS (GMSK)	1TX slot	30.68	30.88	30.91
	2TX slot	28.04	28.37	28.44
	3TX slot	26.56	26.84	27.00
	4TX slot	25.21	25.50	25.71

4.1.2 Radiated Output Power

TEST DESCRIPTION

This is the test for the maximum radiated power from the EUT.
Rule Part 22.913(a) specifies " The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts." specifies that "Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage.

TEST CONFIGURATION



TEST PROCEDURE

1. EUT was placed on a 0.80 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 0.80m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.
2. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
3. The EUT is then put into continuously transmitting mode at its maximum power level during the test.Set Test Receiver or Spectrum RBW=1MHz,VBW=3MHz, And the maximum value of the receiver should be recorded as (P_r).
4. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the

5. substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
6. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (P_{cl}) ,the Substitution Antenna Gain (G_a) and the Amplifier Gain (P_{Ag}) should be recorded after test.
   The measurement results are obtained as described below:
   $Power(EIRP)=P_{Mea}- P_{Ag} - P_{cl} + G_a$
   We used SMF100A micowave signal generator which signal level can up to 33dBm,so we not used power Amplifier for substituation test; The measurement results are amend as described below:
   $Power(EIRP)=P_{Mea}- P_{cl} + G_a$
7. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
8. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP-2.15dBi.

TEST LIMIT

Note: We test the H direction and V direction, V direction is worse.

According to 22.913(a) and 24.232(c), the ERP should be not exceed following table limits:

GSM850(GPRS850)		
Function	**Power Step**	**Burst Peak ERP (dBm)**
GSM	5	≤38.45dBm (7W)
GPRS	3	≤38.45dBm (7W)

TEST RESULTS

Remark:
1. We were tested all Configuration refer 3GPP TS151 010.
2. $EIRP=P_{Mea}(dBm)-P_{cl}(dB)+P_{Ag}(dB)+G_a(dBi)$
3. ERP = EIRP – 2.15dBi as EIRP by subtracting the gain of the dipole.

Note: We tesed Horizontal and Vertical,and Recorded the worst data at the Vertical

GSM 850

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	Correction (dB)	P_{Ag} (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
824.20	-11.92	2.42	8.45	2.15	36.82	28.78	38.45	9.67	V
836.60	-11.43	2.46	8.45	2.15	36.82	29.23	38.45	9.22	V
848.80	-11.91	2.53	8.36	2.15	36.82	28.59	38.45	9.86	V

GPRS 850

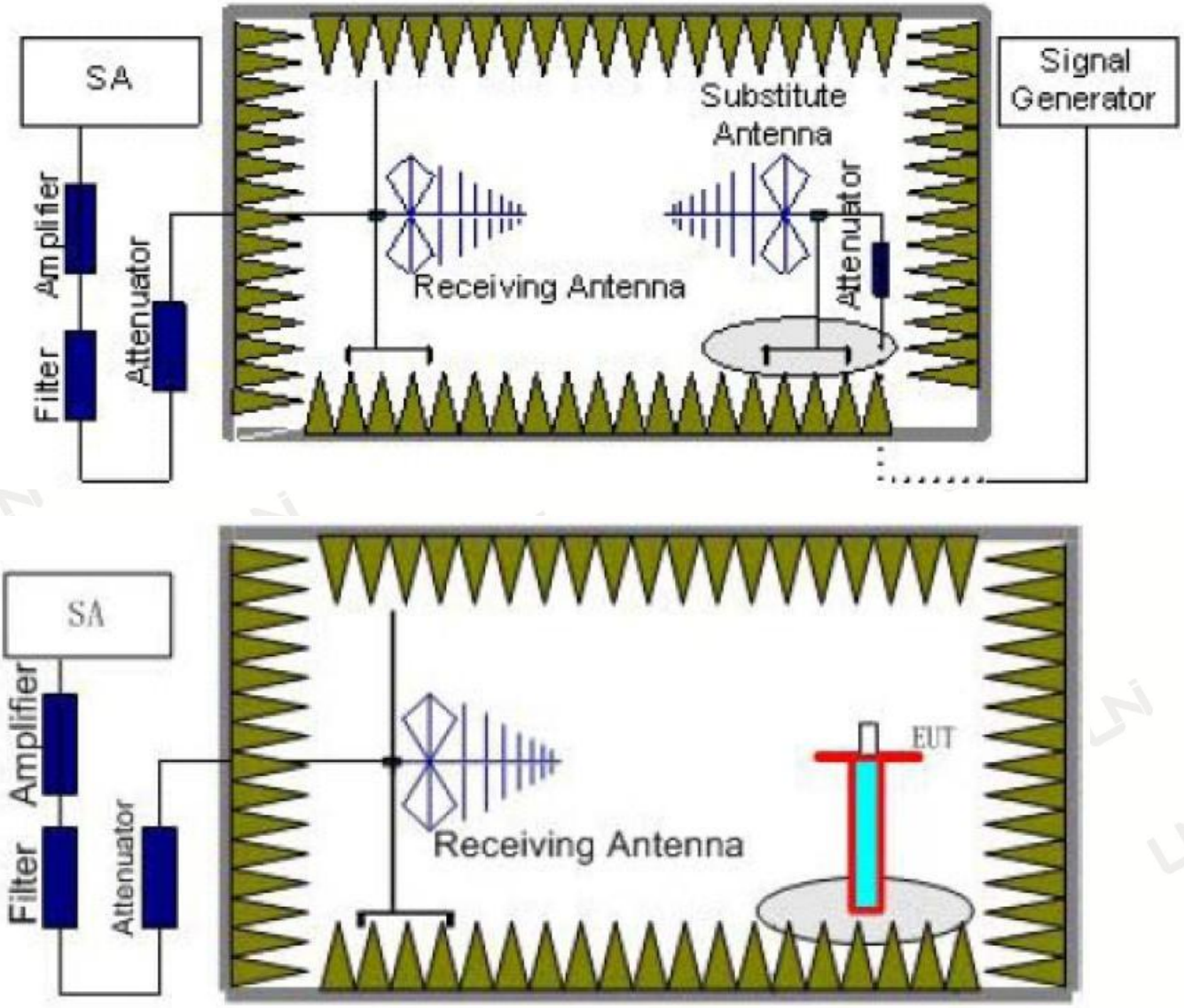
Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	Correction (dB)	P_{Ag} (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
824.20	-11.68	2.42	8.45	2.15	36.82	29.02	38.45	9.43	V
836.60	-11.36	2.46	8.45	2.15	36.82	29.30	38.45	9.15	V
848.80	-11.75	2.53	8.36	2.15	36.82	28.75	38.45	9.70	V

4.2 Radiated Spurious Emssion

TEST APPLICABLE

According to the TIA/EIA 603D:2010 test method, The Receiver or Spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 1910 MHz. The resolution bandwidth is set as outlined in Part 24.238 and Part 22.917. The spectrum is scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of PCS1900 and GSM850.

TEST CONFIGURATION



TEST PROCEDURE

1. EUT was placed on a 0.80 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 0.80m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.
2. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated

through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.

3. The EUT is then put into continuously transmitting mode at its maximum power level during the test.Set Test Receiver or Spectrum RBW=1MHz,VBW=3MHz, And the maximum value of the receiver should be recorded as (P_r).
4. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
5. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (P_{cl}) ,the Substitution Antenna Gain (G_a) and the Amplifier Gain (P_{Ag}) should be recorded after test.
   The measurement results are obtained as described below:
   Power(EIRP)=P_{Mea}- P_{Ag} - P_{cl} + G_a
6. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
7. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.15dBi.
8. In order to make sure test results more clearly,we set frequency range and sweep time for difference frequency range as follows table:

Working Frequency	Subrange (GHz)	RBW	VBW	Sweep time (s)
GSM 850	0.00009~0.15	1KHz	3KHz	30
	0.00015~0.03	10KHz	30KHz	10
	0.03~1	100KHz	300KHz	10
	1~2	1 MHz	3 MHz	2
	2~5	1 MHz	3 MHz	3
	5~8	1 MHz	3 MHz	3
	8~10	1 MHz	3 MHz	3

TEST LIMITS

According to 22.917 specify that 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.
The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

Frequency	Channel	Frequency Range	Verdict
GSM 850	Low	9KHz-10GHz	PASS
	Middle	9KHz -10GHz	PASS
	High	9KHz -10GHz	PASS

TEST RESULTS

Remark:

1. We were tested all refer 3GPP TS151 010.
2. EIRP=P_{Mea}(dBm)-P_{cl}(dB) +G_a(dBi)
3. We were not recorded other points as values lower than limits.
4. Margin = Limit - EIRP

Note :We tested GSM and GPRS Mode,and recorded the worst case at the GSM Mode

GSM 850_ Low Channel

Frequency (MHz)	P_{Mea} (dBm)	Pcl (dB)	Diatance	Ga Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1648.4	-30.49	3.00	3.00	9.58	-23.91	-13.00	10.91	H
2472.6	-36.03	3.03	3.00	10.72	-28.34	-13.00	15.34	H
1648.4	-32.43	3.00	3.00	9.68	-25.75	-13.00	12.75	V
2472.6	-37.83	3.03	3.00	10.72	-30.14	-13.00	17.14	V

GSM 850_ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	Pcl (dB)	Diatance	Ga Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1673.2	-29.47	3.00	3.00	9.58	-22.89	-13.00	9.89	H
2509.8	-37.78	3.03	3.00	10.72	-30.09	-13.00	17.09	H
1673.2	-30.74	3.00	3.00	9.68	-24.06	-13.00	11.06	V
2509.8	-37.46	3.03	3.00	10.72	-29.77	-13.00	16.77	V

GSM 850_ High Channel

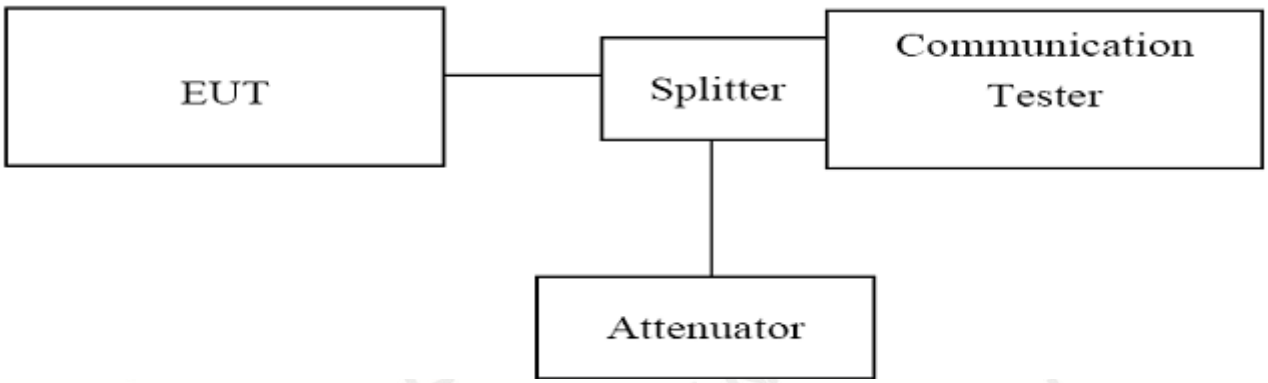
Frequency (MHz)	P_{Mea} (dBm)	Pcl (dB)	Diatance	Ga Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1697.6	-31.46	3.00	3.00	9.58	-24.88	-13.00	11.88	H
2546.4	-37.59	3.03	3.00	10.72	-29.90	-13.00	16.90	H
1697.6	-30.49	3.00	3.00	9.68	-23.81	-13.00	10.81	V
2546.4	-36.36	3.03	3.00	10.72	-28.67	-13.00	15.67	V

4.3 Occupied Bandwidth and Emission Bandwidth

TEST APPLICABLE

Similar to conducted emissions; occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of PCS1900 band and GSM850 band. The table below lists the measured 99% Bandwidth and -26dBc Bandwidth.

TEST CONFIGURATION



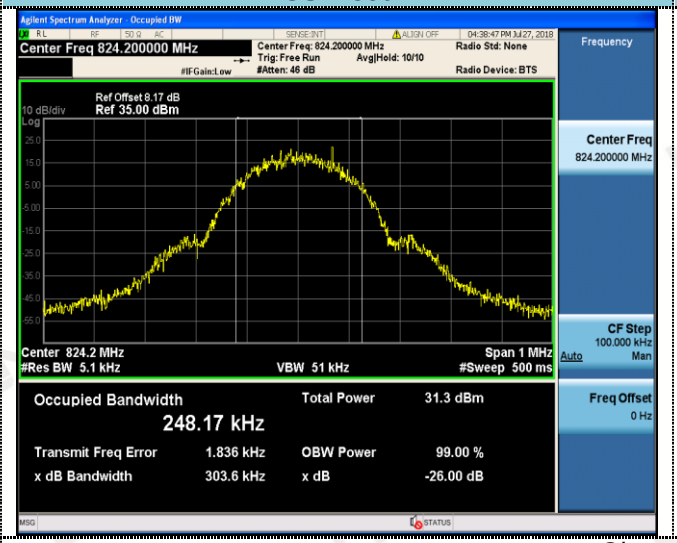
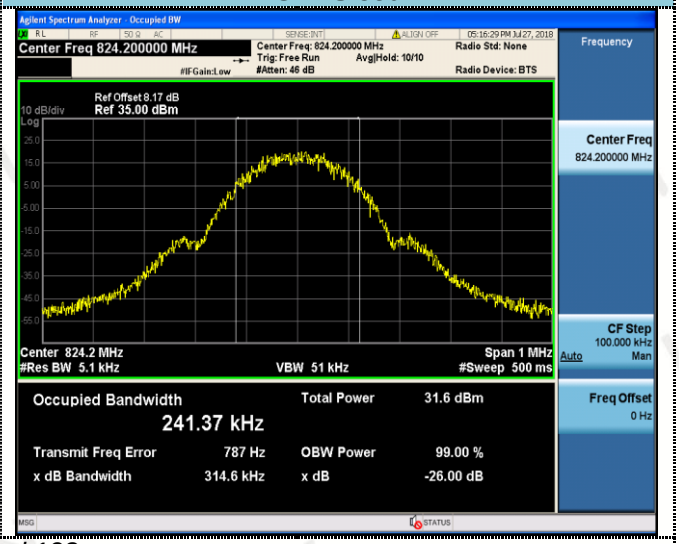
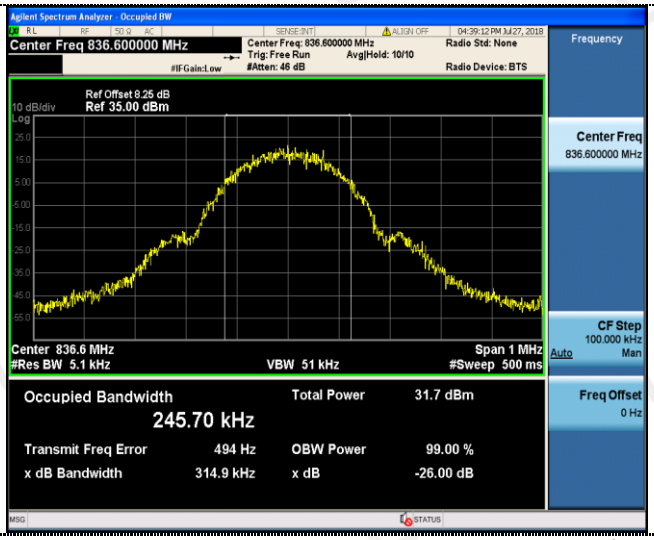
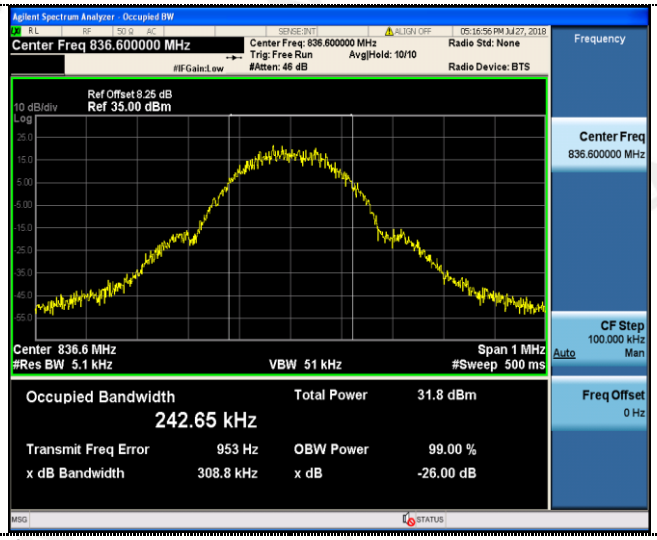
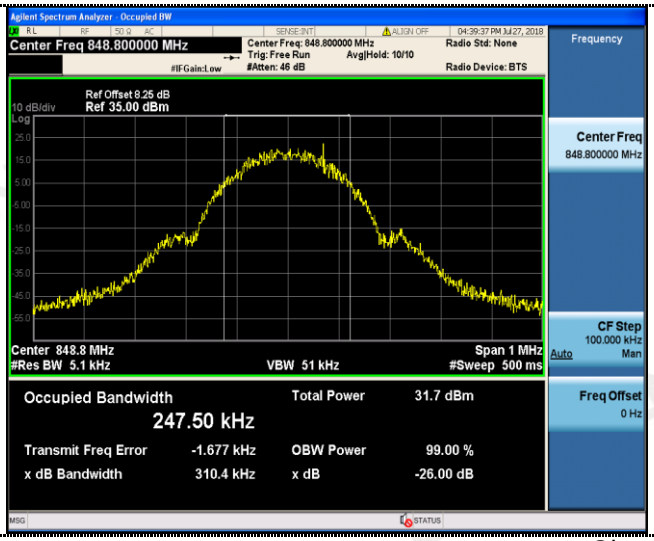
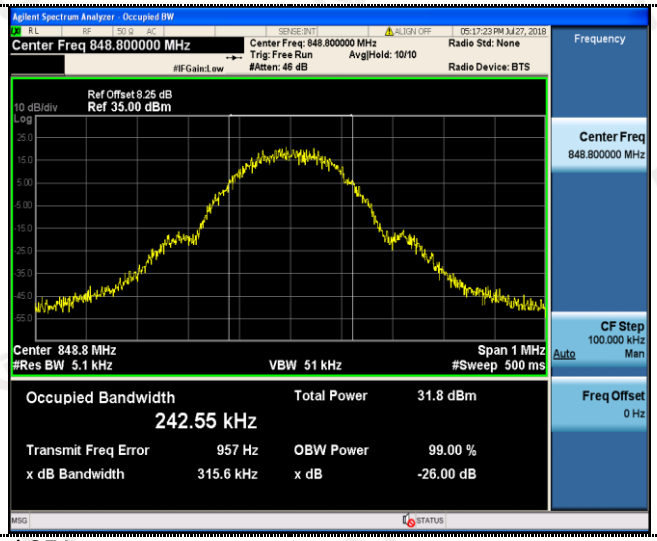
TEST PROCEDURE

1. The EUT was set up for the max output power with pseudo random data modulation;
2. The Occupied bandwidth and Emission Bandwidth were measured with Aglient Spectrum Analyzer N9020A (peak);
3. Set RBW=5.1KHz,VBW=51KHz,Span=1MHz,SWT=500ms;
4. Set SPA Max hold and View, Set 99% Occupied Bandwidth/ Set -26dBc Occupied Bandwidth
5. These measurements were done at 3 frequencies, 1850.20 MHz, 1880.00 MHz and 1909.80 MHz for PCS1900 band; 824.20MHz, 836.60 MHz and 848.80 MHz for GSM850 band. (Low, middle and high of operational frequency range).

TEST RESULTS

GSM 850				
Channel Number	**Frequency (MHz)**	**Occupied Bandwidth (99% BW) (kHz)**	**Emission Bandwidth (26 dBc BW) (kHz)**	**Verdict**
128	824.20	248.17	303.6	PASS
190	836.60	245.70	314.90	PASS
251	848.80	247.50	310.4	PASS

GPRS 850				
Channel Number	**Frequency (MHz)**	**Occupied Bandwidth (99% BW) (kHz)**	**Emission Bandwidth (26 dBc BW) (kHz)**	**Verdict**
128	824.20	241.37	314.6	PASS
190	836.60	242.65	308.8	PASS
251	848.80	242.55	315.5	PASS

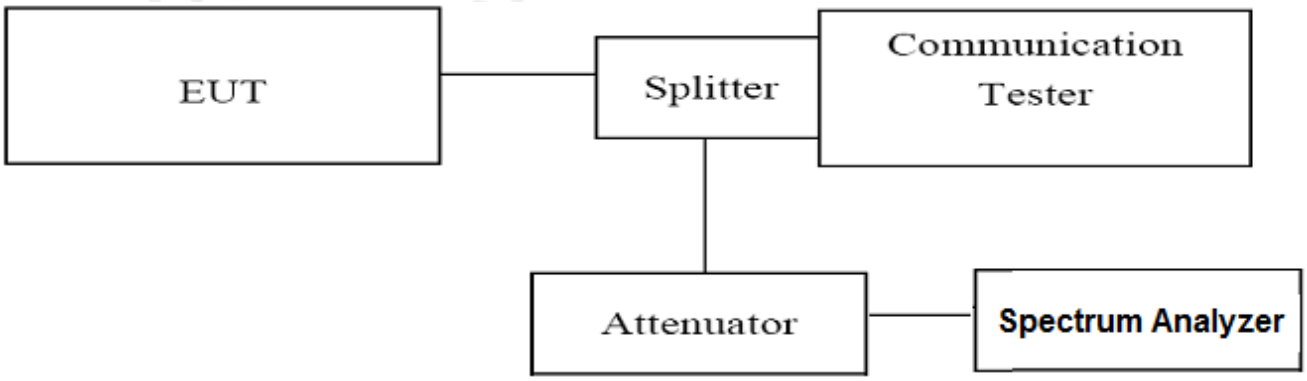
GSM 850	GPRS 850
	
Channel 128	
	
Channel 190	
	
Channel 251	

4.4 Band Edge Complicance

TEST APPLICABLE

During the process of testing, the EUT was controlled via Aglient Digital Radio Communication tester (CMW500) to ensure max power transmission and proper modulation.

TEST CONFIGURATION



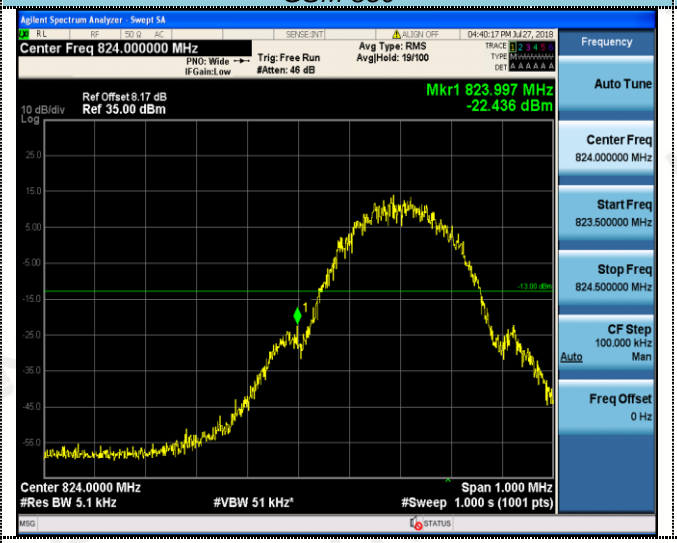
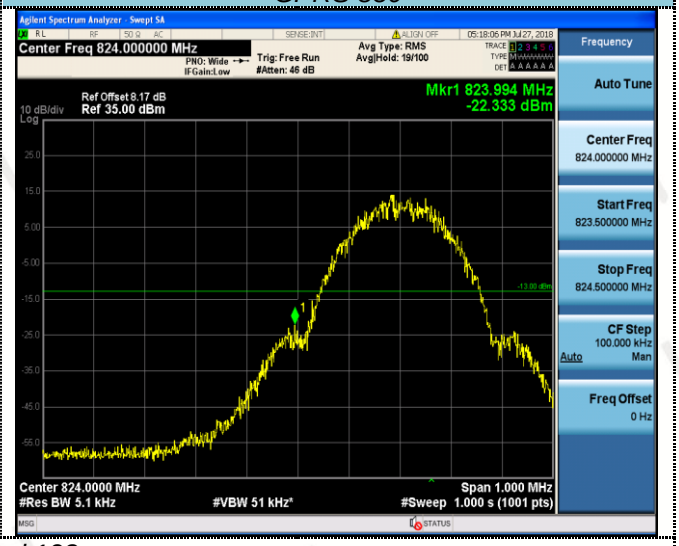
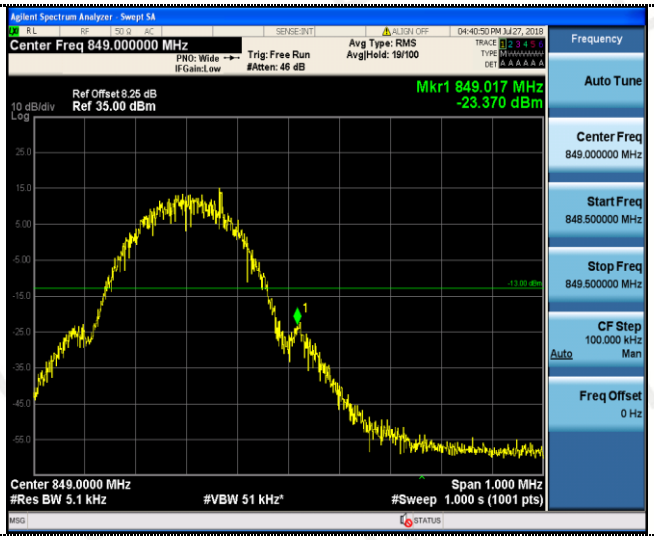
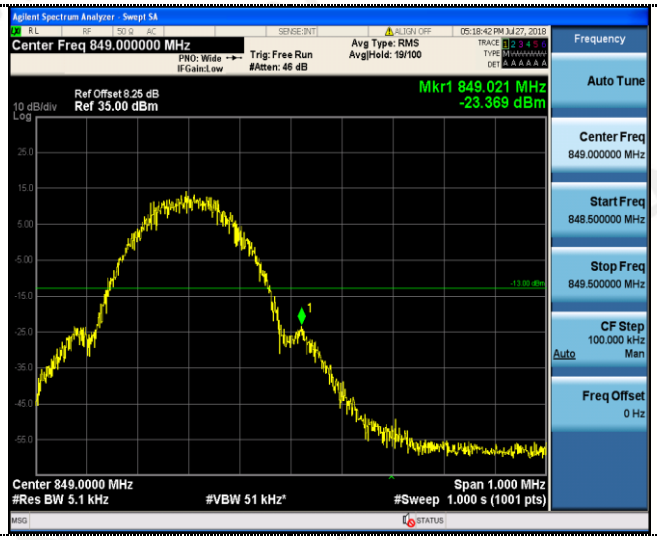
TEST PROCEDURE

1. The EUT was set up for the max output power with pseudo random data modulation;
2. The power was measured with Aglient Spectrum Analyzer N9020A;
3. Set RBW=5.1KHz,VBW=51KHz,Span=3MHz,SWT=300ms, Dector: RMS;
4. These measurements were done at 3 frequencies, 1850.20 MHz, 1880.00 MHz and 1909.80 MHz for PCS1900 band; 824.20 MHz, 836.60 MHz and 848.80 MHz for GSM850 band. (bottom, middle and top of operational frequency range).

TEST RESULTS

GSM 850					
Channel Number	Frequency (MHz)	Measurement Results		Limit (dBm)	Verdict
		Frequency (MHz)	Values (dBm)		
128	824.20	823.997	-22.44	-13.00	PASS
251	848.80	849.017	-23.37	-13.00	PASS

GPRS 850					
Channel Number	Frequency (MHz)	Measurement Results		Limit (dBm)	Verdict
		Frequency (MHz)	Values (dBm)		
128	824.20	823.994	-22.33	-13.00	PASS
251	848.80	849.021	-23.37	-13.00	PASS

GSM 850	GPRS 850
	
Channel 128	
	
Channel 251	

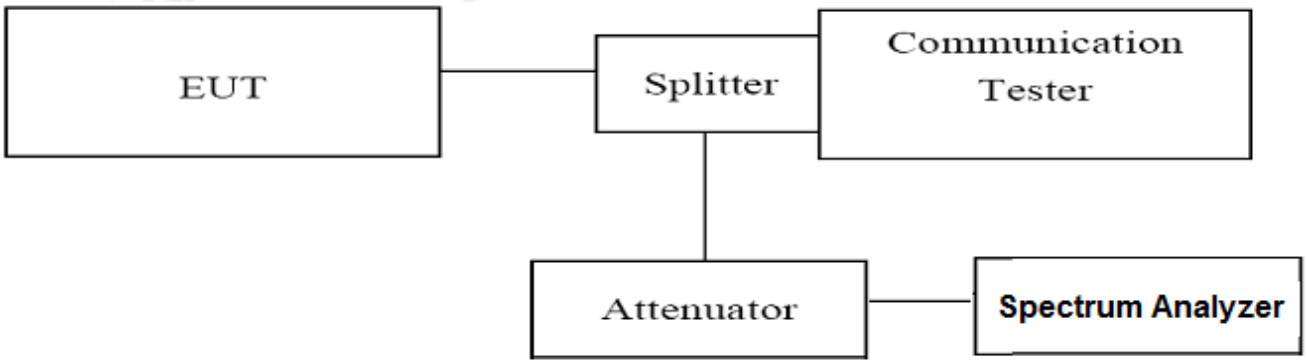
4.5 Spurious Emssion on Antenna Port

TEST APPLICABLE

The following steps outline the procedure used to measure the conducted emissions from the EUT.

1. Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency. For the equipment of PCS1900 band, this equates to a frequency range of 9 KHz to 19.1 GHz, data taken from 9 KHz to 25 GHz. For GSM850, data taken from 9 KHz to 9 GHz.
2. The sweep time is set automatically by instrument itself. That should be the optimal sweep time for the span and the RBW. If the sweep time is too short, that is sweep is too fast, the sweep result is not accurate; if the sweep time is too long, that is sweep is too low, some frequency components may be lost. The instrument will give an optimal sweep time according the selected span and RBW.
3. The procedure to get the conducted spurious emission is as follows:
   The trace mode is set to MaxHold to get the highest signal at each frequency;
   Wait 25 seconds;
   Get the result.
4. Determine EUT transmit frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

TEST CONFIGURATION



TEST PROCEDURE

1. The EUT was set up for the max output power with pseudo random data modulation;
2. The power was measured with Agilent Spectrum Analyzer N9020A (peak);
3. These measurements were done at 3 frequencies, 1850.20 MHz, 1880.00 MHz and 1909.80 MHz for PCS1900 band; 824.20 MHz, 836.60 MHz and 848.80 MHz for GSM850 band. (Low, middle and high of operational frequency range).

TEST LIMIT

Part 22.917 specify that 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.
The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

TEST RESULTS

Note:We tested GSM and GPRS mode and recorded the worst case at the GSM mode.

4.5.1 For GSM 850Test Results

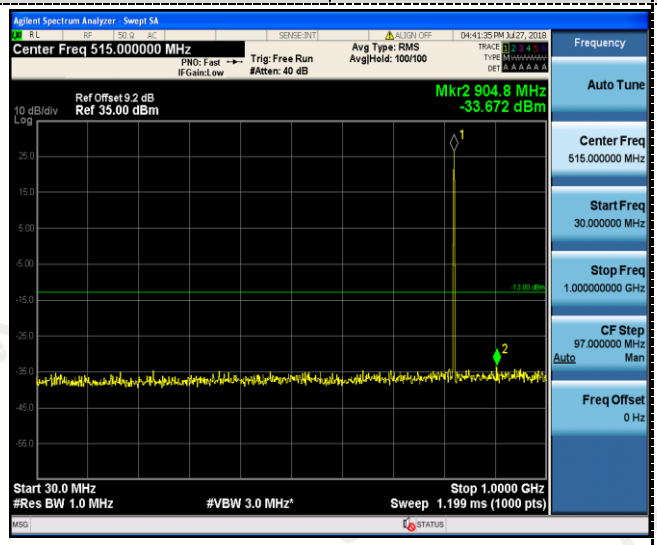
A. Test Verdict

Test Mode/ Channel	Frequency (MHz)	Frequency Range	Limit (dBm)	Verdict
GSM 850 /128	824.20	30MHz -1GHz	-13.00	PASS
		1GHz-9GHz	-13.00	PASS
GSM 850 /190	836.60	30MHz -1GHz	-13.00	PASS
		1GHz-9GHz	-13.00	PASS
GSM 850 /251	848.80	30MHz -1GHz	-13.00	PASS
		1GHz-9GHz	-13.00	PASS

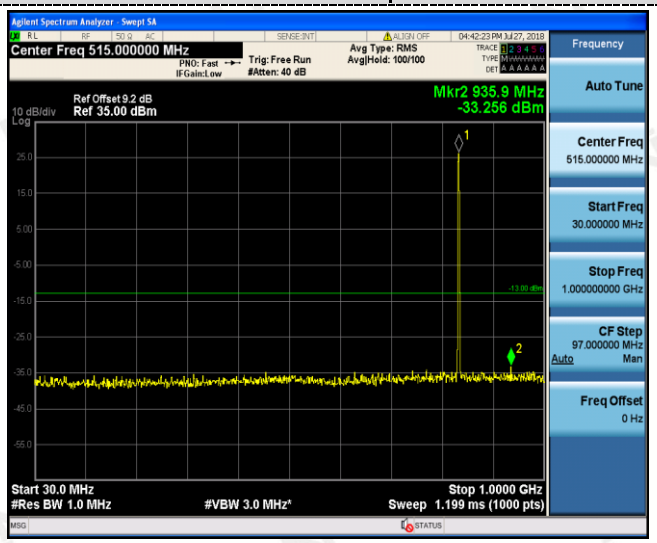
Note:
1. In general, the worse case attenuation requirement shown above was applied.
2.**"---"** means that the emission level is too low to be measured or at least 20 dB down than the limit.

B. Test Plots

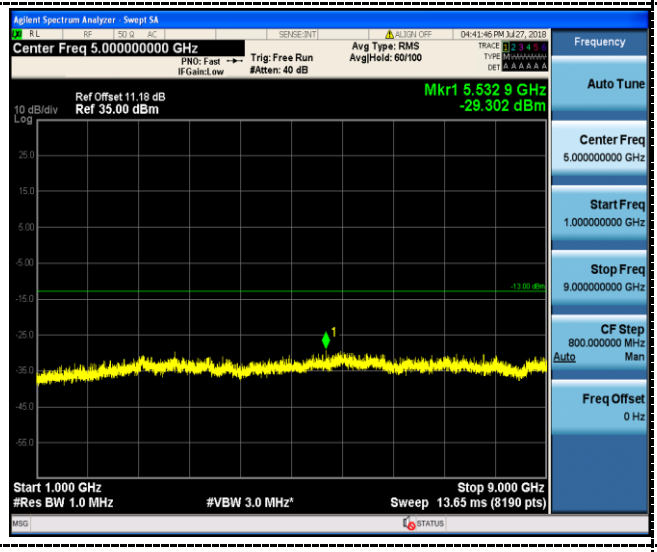
Test Mode: GSM	Test channel : 128	Test Mode: GSM	Test channel : 190



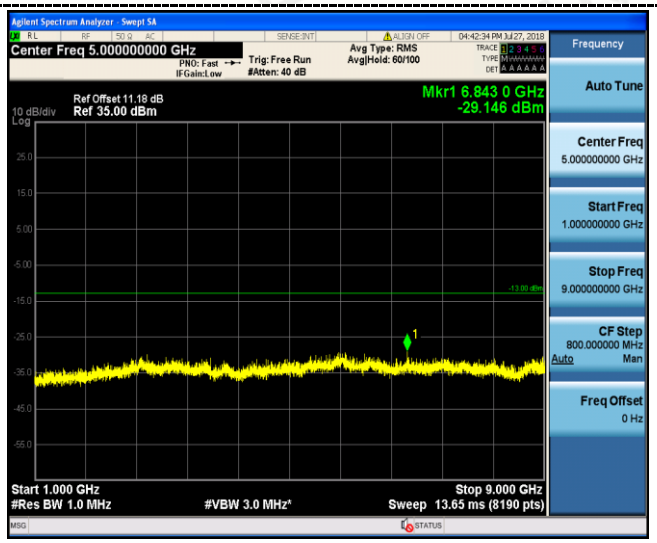
30MHz~1GHz



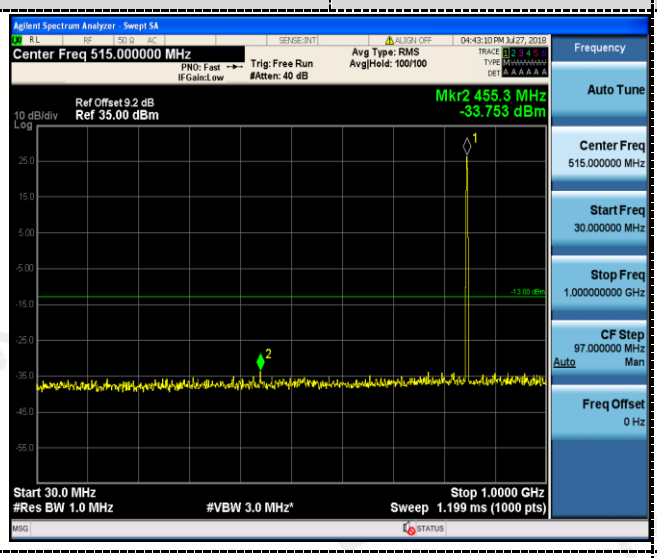
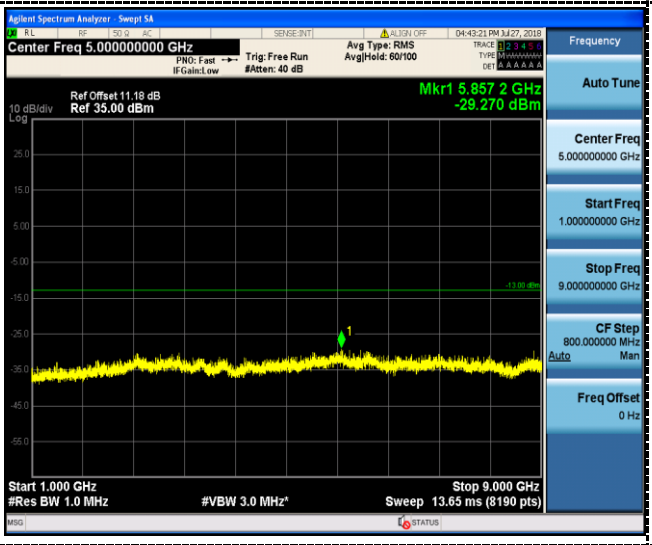
30MHz~3GHz



1GHz ~9GHz



3GHz ~9GHz

Test Mode: GSM	Test channel : 251		
			
30MHz~1GHz			
			
1GHz ~9GHz			

4.6 Frequency Stability Test

TEST APPLICABLE

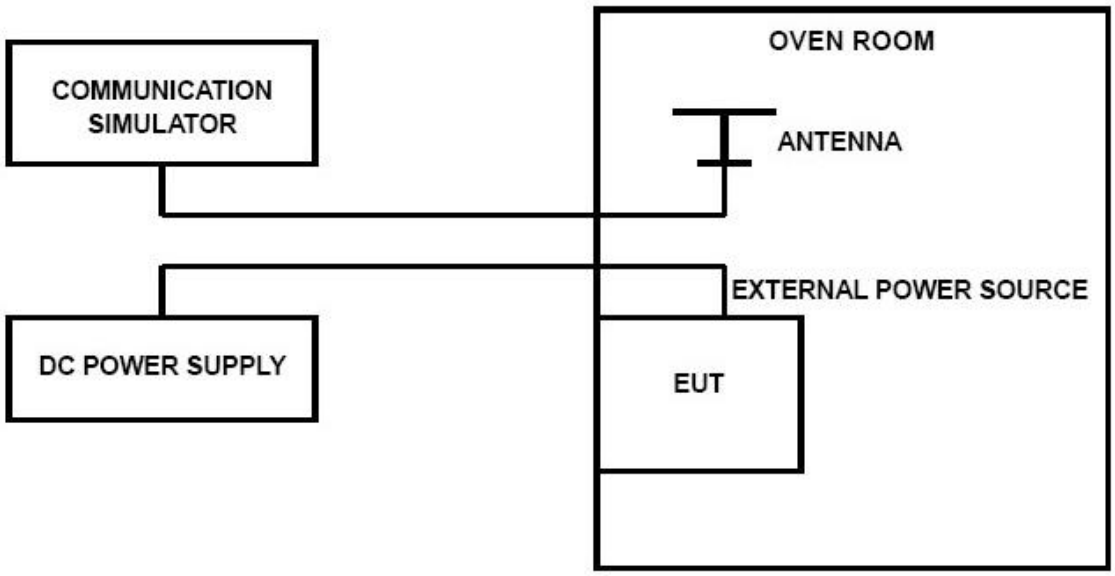
1. According to FCC Part 2 Section 2.1055 (a)(1), the frequency stability shall be measured with variation of ambient temperature from -30℃ to +50℃ centigrade.
2. According to FCC Part 2 Section 2.1055 (E) (2), for battery powered equipment, the frequency stability shall be measured with reducing primary supply voltage to the battery operating end point, which is specified by the manufacture.
3. Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried voltage equipment and the end voltage point was 10.8V.

TEST PROCEDURE

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the EUT in a “call mode”. This is accomplished with the use of R&S CMU200 DIGITAL RADIO COMMUNICATION TESTER.

1. Measure the carrier frequency at room temperature;
2. Subject the EUT to overnight soak at -30℃;
3. With the EUT, powered via nominal voltage, connected to the CMU200 and in a simulated call on middle channel of PCS 1900 and GSM850, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming;
4. Repeat the above measurements at 10℃ increments from -30℃ to +50℃. Allow at least 0.5 hours at each temperature, unpowered, before making measurements;
5. Remeasure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments remeasuring carrier frequency at each voltage. Pause at nominal voltage for 0.5 hours unpowered, to allow any self-heating to stabilize, before continuing;
6. Subject the EUT to overnight soak at +50℃;
7. With the EUT, powered via nominal voltage, connected to the CMU200 and in a simulated call on the centre channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming;
8. Repeat the above measurements at 10℃ increments from +50℃ to -30℃. Allow at least 0.5 hours at each temperature, unpowered, before making measurements;
9. At all temperature levels hold the temperature to +/- 0.5℃ during the measurement procedure;

TEST CONFIGURATION



TEST LIMITS

For Hand carried battery powered equipment

According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. As this transceiver is considered "Hand carried, battery powered equipment" Section 2.1055(d)(2) applies. This requires that the lower voltage for frequency stability testing be specified by the manufacturer. This transceiver is specified to operate with an input voltage of between 3.40VDC and 4.20VDC, with a nominal voltage of 3.80 DC. Operation above or below these voltage limits is prohibited by transceiver software in order to prevent improper operation as well as to protect components from overstress. For the purposes of measuring frequency stability these voltage limits are to be used.

For equipment powered by primary supply voltage

According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. For this EUT section 2.1055(d)(1) applies. This requires varying primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

TEST RESULTS

GSM 850 Middle channel=190 channel=836.6MHz					
DC Power	Temperature (℃)	Frequency error(Hz)	Frequency error(ppm)	Limit (ppm)	Verdict
3.40	25	6.33	0.0076	2.50	PASS
3.80	25	12.01	0.0144	2.50	PASS
4.20	25	5.81	0.0069	2.50	PASS
3.80	-30	7.68	0.0092	2.50	PASS
3.80	-20	14.92	0.0178	2.50	PASS
3.80	-10	9.88	0.0118	2.50	PASS
3.80	0	5.81	0.0069	2.50	PASS
3.80	10	9.43	0.0113	2.50	PASS
3.80	20	3.03	0.0036	2.50	PASS
3.80	30	3.75	0.0045	2.50	PASS
3.80	40	5.04	0.0060	2.50	PASS
3.80	50	4.39	0.0052	2.50	PASS

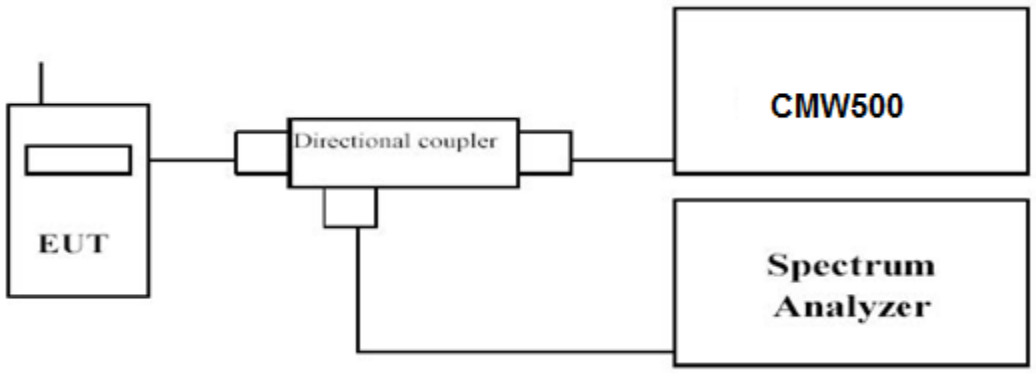
GPRS 850 Middle channel=190 channel=836.6MHz					
DC Power	Temperature (℃)	Frequency error(Hz)	Frequency error(ppm)	Limit (ppm)	Verdict
3.40	25	14.98	0.0179	2.50	PASS
3.80	25	12.20	0.0146	2.50	PASS
4.20	25	15.17	0.0181	2.50	PASS
3.80	-30	10.65	0.0127	2.50	PASS
3.80	-20	14.72	0.0176	2.50	PASS
3.80	-10	15.95	0.0191	2.50	PASS
3.80	0	12.59	0.0150	2.50	PASS
3.80	10	13.17	0.0157	2.50	PASS
3.80	20	13.11	0.0157	2.50	PASS
3.80	30	13.11	0.0157	2.50	PASS
3.80	40	13.24	0.0158	2.50	PASS
3.80	50	13.50	0.0161	2.50	PASS

4.7 Peak-to-Average Ratio (PAR)

LIMIT

The Peak-to-Average Ratio (PAR) of the transmission may not exceed 13 dB.

TEST CONFIGURATION

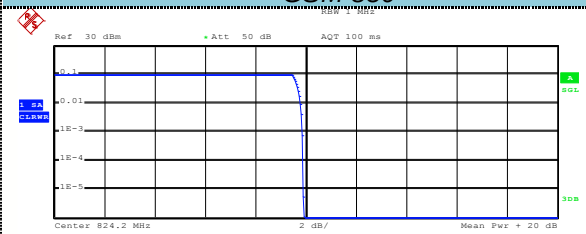
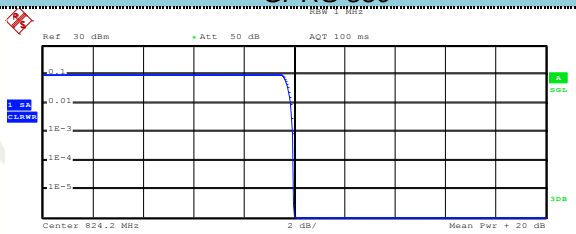
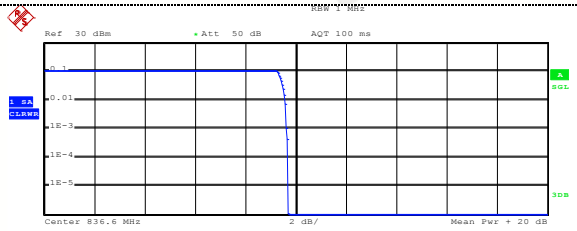
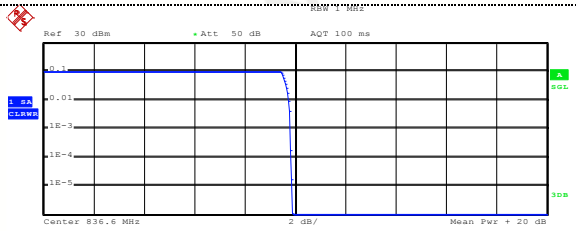
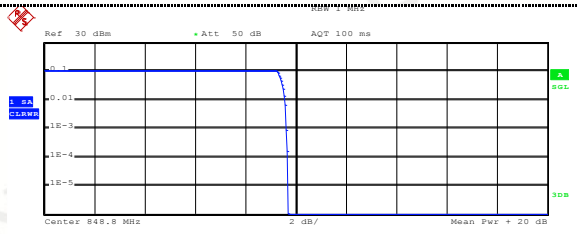
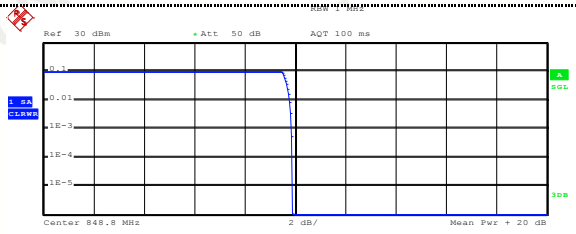


TEST PROCEDURE

Use spectrum to measure the total peak power and record as P_{Pk}. Use spectrum to measure the total average power and record as P_{Avg}. Both the peak and average power levels must be expressed in the same logarithmic units (e.g., dBm).
Determine the PAPR from:
PAPR (dB) = P_{Pk} (dBm) - P_{Avg} (dBm).

TEST RESULTS

	GSM 850	GPRS 850
Frequency (MHz)	Measured (dB)	Measured (dB)
824.20	9.88	9.96
836.60	9.64	9.84
848.80	9.64	9.88

GSM 850	GPRS 850
	
Complementary Cumulative Distribution Function (100000 samples) Trace 1 Mean 9.26 dBm Peak 19.20 dBm Crest 9.94 dB 10 % 9.48 dB 1 % 9.80 dB .1 % 9.88 dB .01 % 9.92 dB	Complementary Cumulative Distribution Function (100000 samples) Trace 1 Mean 9.15 dBm Peak 19.13 dBm Crest 9.98 dB 10 % 9.56 dB 1 % 9.88 dB .1 % 9.96 dB .01 % 10.00 dB
Channel 128	
	
Complementary Cumulative Distribution Function (100000 samples) Trace 1 Mean 9.58 dBm Peak 19.27 dBm Crest 9.69 dB 10 % 9.28 dB 1 % 9.60 dB .1 % 9.64 dB .01 % 9.72 dB	Complementary Cumulative Distribution Function (100000 samples) Trace 1 Mean 9.37 dBm Peak 19.27 dBm Crest 9.89 dB 10 % 9.44 dB 1 % 9.76 dB .1 % 9.84 dB .01 % 9.88 dB
Channel 190	
	
Complementary Cumulative Distribution Function (100000 samples) Trace 1 Mean 9.71 dBm Peak 19.41 dBm Crest 9.69 dB 10 % 9.28 dB 1 % 9.60 dB .1 % 9.64 dB .01 % 9.68 dB	Complementary Cumulative Distribution Function (100000 samples) Trace 1 Mean 9.40 dBm Peak 19.27 dBm Crest 9.87 dB 10 % 9.48 dB 1 % 9.80 dB .1 % 9.88 dB .01 % 9.92 dB
Channel 251	

5 Test Setup Photos of the EUT

Reference to the annex of Test Photos.

6 External and Internal Photos of the EUT

Reference to the annex of External Photos and Internal Photos.

.....End of Report.....