Shenzhen Huatongwei International Inspection Co., Ltd.
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Phone:86-755-26748019 Fax:86-755-26748089 http://www.szhtw.com.cn

FCC REPORT

Report Reference No. ..... :	**TRE1510017501**	R/C……..: 95558
FCC ID ..... :	**WA6S3502**	
Applicant's name ..... :	**Verykool USA Inc**	
Address.....:	3636 Nobel Drive, Suite 325, San Diego, CA92122 USA	
Manufacturer.....:	HUIZHOU QIAOXING ELECTRONICS TECHNOLOGY CO.,LTD	
Address.....:	Room 1906 of VIA Building, No.9966 Shennan Avenue, Yuehai Street in Nanshan District, Shenzhen ,China	
Test item description ..... :	Mobile Phone	
Trade Mark .....:	verykool	
Model/Type reference.....:	s3502	
Listed Model(s) .....:	--	
Standard ..... :	**FCC Part 22: PUBLIC MOBILE SERVICES** **FCC Part 24: PERSONAL COMMUNICATIONS SERVICES**	
Date of receipt of test sample……..:	Oct 28,2015	
Date of testing……:	Oct 29,2015- Nov 17,2015	
Date of issue……...:	Nov 18,2015	
Result..... ……..:	**Pass**	

Compiled by (position+printed name+signature)..:	File administrators Candy Liu	Candy Liu
Supervised by (position+printed name+signature)..:	Project Engineer Lion Cai	Lion Cai
Approved by (position+printed name+signature)..:	Manager Hans Hu	Hans Hu

Testing Laboratory Name ..... :	**Shenzhen Huatongwei International Inspection Co., Ltd**
Address.....:	1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China

Contents

1. TEST STANDARDS AND TEST DESCRIPTION

1.1. Test Standards

The tests were performed according to following standards:

FCC Part 22 (10-1-13 Edition): PRIVATE LAND MOBILE RADIO SERVICES.
FCC Part 24(10-1-13 Edition): PUBLIC MOBILE SERVICES
TIA/EIA 603 D June 2010: Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.
47 CFR FCC Part 15 Subpart B: - Unintentional Radiators
FCC Part 2: FREQUENCY ALLOCA-TIONS AND RADIO TREATY MAT-TERS; GENERAL RULES AND REG-ULATIONS
KDB971168 D01:2013-06-07 Procedures for Compliance Measurement of the Fundamental Emission Power of Licensed Wideband (> 1 MHz) Digital Transmission Systems
ANSI C63.4:2009 Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

1.2. Test Description

Test Item	Section in CFR 47	Result
AC Power Conducted Emission	Part 15.207	Pass
RF Output Power	Part 2.1046 Part 22.913 (a)(2) Part 24.232 (c)	Pass
Modulation Characteristics	Part 2.1047	Pass
99% & -26 dB Occupied Bandwidth	Part 2.1049 Part 22.917 Part 24.238	Pass
Spurious Emissions at Antenna Terminal	Part 2.1051 Part 22.917 (a) Part 24.238 (a)	Pass
Field Strength of Spurious Radiation	Part 2.1053 Part 22.917 (a) Part 24.238 (a)	Pass
Out of band emission, Band Edge	Part 22.917 (a) Part 24.238 (a)	Pass
Frequency stability vs. temperature	Part 2.1055(a)(1)(b)	Pass
Frequency stability vs. voltage	Part 2.1055(d)(1)(2)	Pass

Remark: The measurement uncertainty is not included in the test result.

2. SUMMARY

2.1. Client Information

Applicant:	Verykool USA Inc
Address:	3636 Nobel Drive, Suite 325, San Diego, CA92122 USA
Manufacturer:	HUIZHOU QIAOXING ELECTRONICS TECHNOLOGY CO.,LTD
Address:	Room 1906 of VIA Building, No.9966 Shennan Avenue, Yuehai Street in Nanshan District, Shenzhen ,China

2.2. Product Description

Name of EUT	Mobile Phone
Trade Mark:	verykool
Model No.:	s3502
Listed Model(s):	--
Power supply:	DC 3.8V From internal battery
Adapter information:	Model:Q350 Input:AC 100-240V 50/60Hz 0.15A Output:5Vd.c., 700mA
2G:	
Support Network:	GSM, GPRS,EGPRS
Support Band:	GSM850, DCS1900
Modulation:	GSM/GPRS/EGPRS: GMSK
Transmit Frequency:	GSM850: 824.20MHz-848.80MHz PCS1900: 1850.20MHz-1909.80MHz
Receive Frequency:	GSM850: 869.20MHz-893.80MHz PCS1900: 1930.20MHz-1989.80MHz
GPRS Class:	12
EGPRS Class:	12
Antenna type:	Intergal Antenna
Antenna gain:	GSM850:1dBi PCS1900:1dBi
Hardware version:	s3502_VK_Generic_Dual_HW_1.0
Software version:	s3502_VK_Generic_Dual_SW_1.3

Test Frequency:

GSM 850		PCS1900	
Channel	Frequency (MHz)	Channel	Frequency (MHz)
128	824.20	512	1850.20
190	836.60	661	1880.00
251	848.80	810	1909.80

2.3. EUT operation mode

The EUT has been tested under typical operating condition. The Applicant provides software to control the EUT for staying in continous transmitting and receiving mode for testing.

2.4. EUT configuration

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

● - supplied by the manufacturer

○ - supplied by the lab

○	Power Cable	Length (m) :	/
		Shield :	/
		Detachable :	/
○	Multimeter	Manufacturer :	/
		Model No. :	/

2.5. Modifications

No modifications were implemented to meet testing criteria.

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

Laboratory:Shenzhen Huatongwei International Inspection Co., Ltd.
Address: 1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China
Phone: 86-755-26748019 Fax: 86-755-26748089

3.2. Test Facility

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

CNAS-Lab Code: L1225
Shenzhen Huatongwei International Inspection Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories, Date of Registration: February 28, 2015. Valid time is until February 27, 2018.

A2LA-Lab Cert. No. 3902.01
Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing. Valid time is until December 31, 2016.

FCC-Registration No.: 317478
Shenzhen Huatongwei International Inspection Co., Ltd. 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 317478, Renewal date Jul. 18, 2014, valid time is until Jul. 18, 2017.

IC-Registration No.: 5377A&5377B
The 3m Alternate Test Site of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 5377A on Dec. 31, 2013, valid time is until Dec. 31, 2016.
Two 3m Alternate Test Site of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 5377B on Dec.03, 2014, valid time is until Dec.03, 2017.

ACA
Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our A2LA accreditation.

VCCI
The 3m Semi-anechoic chamber (12.2m×7.95m×6.7m) of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-2484. Date of Registration: Dec. 20, 2012. Valid time is until Dec. 29, 2015.
Radiated disturbance above 1GHz measurement of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-292. Date of Registration: Dec. 24, 2013. Valid time is until Dec. 23, 2016.
Main Ports Conducted Interference Measurement of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: C-2726. Date of Registration: Dec. 20, 2012. Valid time is until Dec. 19, 2015.
Telecommunication Ports Conducted Interference Measurement of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: T-1837. Date of Registration: May 07, 2013. Valid time is until May 06, 2016.

DNV
Shenzhen Huatongwei International Inspection Co., Ltd. has been found to comply with the requirements of DNV towards subcontractor of EMC and safety testing services in conjunction with the EMC and Low voltage Directives and in the voluntary field. The acceptance is based on a formal quality Audit and follow-ups according to relevant parts of ISO/IEC Guide 17025 (2005), in accordance with the requirements of the DNV Laboratory Quality Manual towards subcontractors. Valid time is until Aug. 24, 2016.

3.3. Environmental conditions

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

Normal Temperature/Tnor:	15~35°C
lative Humidity	30~60 %
Air Pressure	950-1050 hPa

3.4. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01" Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics;Part 1" and TR-100028-02 "Electromagnetic compatibilityand Radio spectrum Matters (ERM);Uncertainties in the measurementof mobile radio equipment characteristics;Part 2 " and is documented in the Shenzhen Huatongwei International Inspection Co., Ltd quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen Huatongwei laboratory is reported:

Test Items	Measurement Uncertainty	Notes
Frequency stability	25 Hz	(1)
Transmitter power conducted	0.57 dB	(1)
Transmitter power Radiated	2.20 dB	(1)
Conducted spurious emission 9KHz-12.75 GHz	1.60 dB	(1)
Conducted Emission 9KHz-30MHz	3.39 dB	(1)
Radiated Emission 30~1000MHz	4.24 dB	(1)
Radiated Emissio 1~18GHz	5.16 dB	(1)
Radiated Emissio 18-40GHz	5.54 dB	(1)
Occupied Bandwidth	---------	(1)
Emission Mask	---------	(1)
Modulation Characteristic	---------	(1)
Transmitter Frequency Behavior	---------	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

3.5. Equipments Used during the Test

AC Power Conducted Emission					
No.	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Artificial Mains	Rohde&Schwarz	ESH2-Z5	100028	2015/11/2
2	EMI Test Receiver	Rohde&Schwarz	ESCS 30	100038	2015/11/2
3	Pulse Limiter	Rohde&Schwarz	ESHSZ2	100044	2015/11/2
4	EMI Test Software	Rohde&Schwarz	ES-K1 V1.71	N/A	N/
5	UNIVERSAL RADIO COMMUNICATION	Rohde&Schwarz	CMU200	112012	2015/11/2

Output Power(Conducted) & Occupied Bandwidth & Emission Bandwidth & Band Edge Compliance & Conducted Spurious Emission					
No.	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	UNIVERSAL RADIO COMMUNICATION	Rohde&Schwarz	CMU200	112012	2015/11/2
2	Spectrum Analyzer	Rohde&Schwarz	FSU26	201141	2015/11/2
3	Splitter	Mini-Circuit	ZAPD-4	400059	2015/11/2

Frequency Stability					
No.	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	UNIVERSAL RADIO COMMUNICATION	Rohde&Schwarz	CMU200	112012	2015/11/2
2	Spectrum Analyzer	Rohde&Schwarz	FSU26	201141	2015/11/2
3	Climate Chamber	ESPEC	EL-10KA	05107008	2015/11/2
4	Splitter	Mini-Circuit	ZAPD-4	400059	2015/11/2

Output Power (Radiated) & Radiated Spurious Emission					
No.	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	UNIVERSAL RADIO COMMUNICATION	Rohde&Schwarz	CMU200	112012	2015/11/2
2	Spectrum Analyzer	Rohde&Schwarz	FSU26	201141	2015/11/2
3	HORN ANTENNA	ShwarzBeck	9120D	1012	2015/11/2
4	HORN ANTENNA	ShwarzBeck	9120D	1011	2015/11/2
5	Ultra-Broadband Antenna	ShwarzBeck	VULB9163	538	2015/11/2
6	Ultra-Broadband Antenna	ShwarzBeck	VULB9163	539	2015/11/2
7	TURNTABLE	MATURO	TT2.0	----	N/A
8	ANTENNA MAST	MATURO	TAM-4.0-P	----	N/A
9	EMI Test Software	Audix	E3	N/A	N/A
10	EMI Test Receiver	Rohde&Schwarz	ESIB 26	100009	2015/11/2
11	RF Test Panel	Rohde&Schwarz	TS / RSP	335015/ 0017	2015/11/2
12	High pass filter	Compliance Direction systems	BSU-6	34202	2015/11/2
13	Splitter	Mini-Circuit	ZAPD-4	400059	2015/11/2
14	Horn Antenna	SCHWARZBECK	BBHA9170	25841	2015/11/2
15	Horn Antenna	SCHWARZBECK	BBHA9170	25842	2015/11/2
16	Preamplifier	ShwarzBeck	BBV 9718	BBV 9718	2015/11/2
17	Broadband Preamplifier	ShwarzBeck	BBV743	9743-0079	2015/11/2
18	Signal Generator	Rohde&Schwarz	SMF100A	101932	2015/11/2
19	Amplifer	Compliance Direction systems	PAP1-4060	120	2015/11/2
20	TURNTABLE	ETS	2088	2149	2015/11/2
21	ANTENNA MAST	ETS	2075	2346	2015/11/2
22	HORN ANTENNA	Rohde&Schwarz	HF906	100068	2015/11/2
23	HORN ANTENNA	Rohde&Schwarz	HF906	100039	2015/11/2

The calibration interval was one year.

4. TEST CONDITIONS AND RESULTS

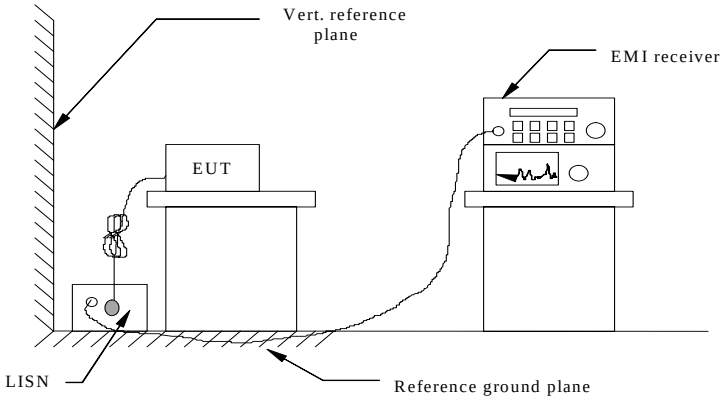
4.1. Conducted Emissions Test

LIMIT:

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreasing linearly with the logarithm of the frequency

TEST CONFIGURATION



TEST PROCEDURE

1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system; a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.4-2009.
2 Support equipment, if needed, was placed as per ANSI C63.4-2009.
3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4-2009.
4 If a EUT received DC power from the adapter, the adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5 All support equipments received AC power from a second LISN, if any.
6 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8 During the above scans, the emissions were maximized by cable manipulation.

TEST RESULTS

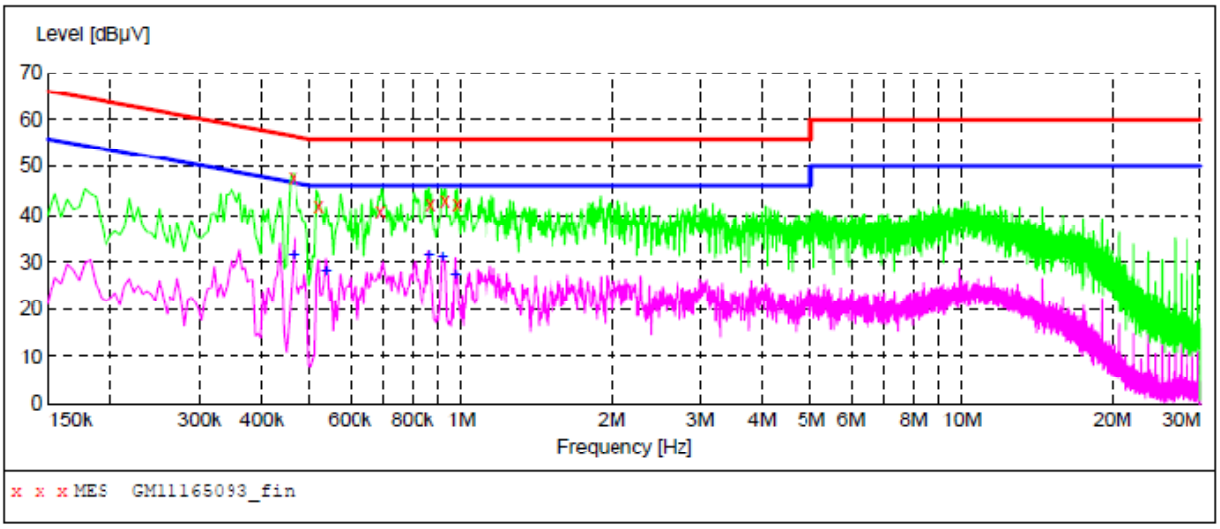
Note: We tested all modes and recorded the worst case at GSM900

GSM850

Test mode:	*GSM850*	*Polarization*	*L*

SCAN TABLE: "Voltage (9K-30M) FIN"

Short Description: 150K 30M Voltage



MEASUREMENT RESULT: "GM11165093_fin"

11/17/2015 5:27PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.460500	47.70	10.2	57	9.0	QP	L1	GND
0.519000	41.70	10.2	56	14.3	QP	L1	GND
0.690000	40.80	10.2	56	15.2	QP	L1	GND
0.870000	42.20	10.2	56	13.8	QP	L1	GND
0.928500	43.00	10.2	56	13.0	QP	L1	GND
0.982500	42.20	10.2	56	13.8	QP	L1	GND

MEASUREMENT RESULT: "GM11165093_fin2"

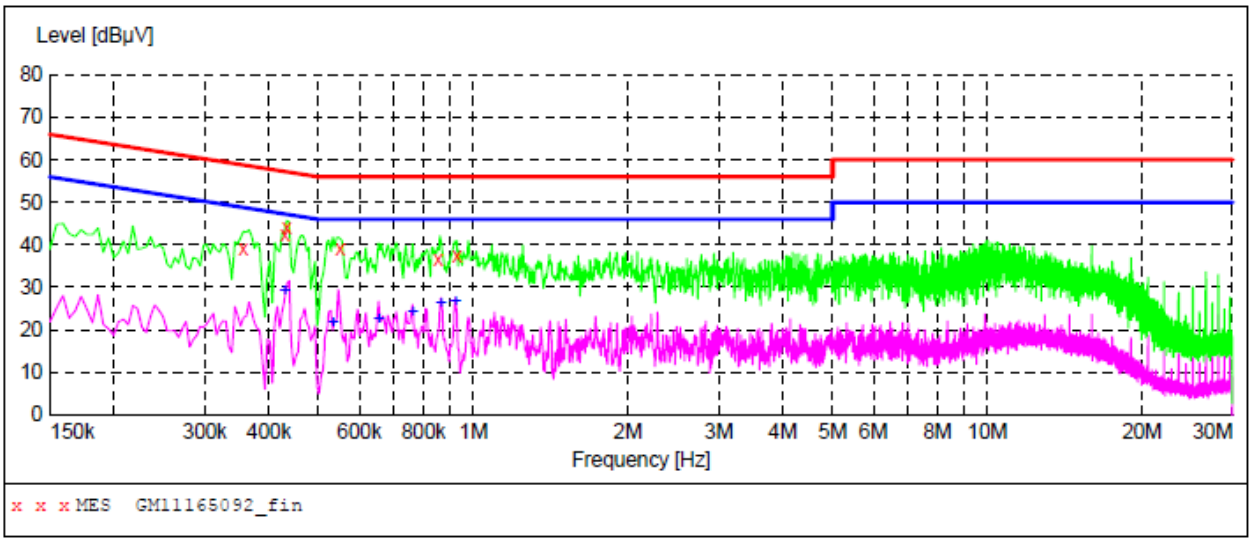
11/17/2015 5:27PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.460500	31.20	10.2	47	15.5	AV	L1	GND
0.465000	31.30	10.2	47	15.3	AV	L1	GND
0.537000	27.90	10.2	46	18.1	AV	L1	GND
0.865500	31.20	10.2	46	14.8	AV	L1	GND
0.919500	30.80	10.2	46	15.2	AV	L1	GND
0.973500	27.30	10.2	46	10.7	AV	L1	GND

Test mode:	GSM850	Polarization	N

SCAN TABLE: "Voltage (9K-30M) FIN"

Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "GM11165092_fin"

11/17/2015 5:24PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.357000	39.10	10.2	59	19.7	QP	N	GND
0.429000	42.30	10.2	57	15.0	QP	N	GND
0.433500	44.00	10.2	57	13.2	QP	N	GND
0.550500	39.10	10.2	56	16.9	QP	N	GND
0.852000	36.50	10.2	56	19.5	QP	N	GND
0.928500	37.30	10.2	56	18.7	QP	N	GND

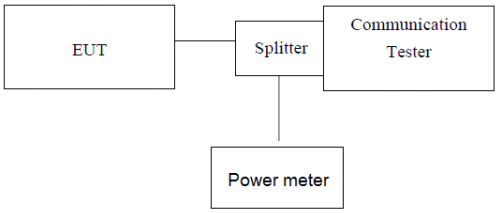
MEASUREMENT RESULT: "GM11165092_fin2"

11/17/2015 5:24PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.429000	29.10	10.2	47	18.2	AV	N	GND
0.532500	21.80	10.2	46	24.2	AV	N	GND
0.654000	22.50	10.2	46	23.5	AV	N	GND
0.762000	24.10	10.2	46	21.9	AV	N	GND
0.865500	26.10	10.2	46	19.9	AV	N	GND
0.924000	26.80	10.2	46	19.2	AV	N	GND

4.2. Conducted Peak Output Power

TEST CONFIGURATION



Note: Measurement setup for testing on Antenna connector

TEST PROCEDURE

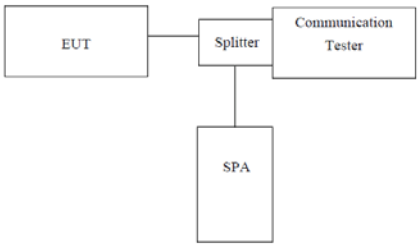
1. The transmitter output port was connected to base station.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator, the path loss was compensated to the results for each measurement.
3. Set EUT at maximum power through base station.
4. Select lowest, middle, and highest channels for each band and different modulation.
5. Measure the maximum burst average power.

TEST RESULTS

EUT Mode	Channel	Frequency (MHz)	Power (dBm)
GSM 850 (GMSK)	128	824.20	32.32
	190	836.60	32.08
	251	848.80	**32.26**
GPRS850 (GMSK,1Slot)	128	824.20	31.94
	190	836.60	31.95
	251	848.80	**32.34**
EGPRS850 (GMSK,1Slot)	128	824.20	31.97
	190	836.60	31.95
	251	848.80	**32.86**
PCS1900 (GMSK)	512	1850.20	29.16
	661	1880.00	29.38
	810	1909.80	**29.57**
GPRS1900 (GMSK,1Slot)	512	1850.20	29.19
	661	1880.00	29.54
	810	1909.80	**29.68**
EGPRS1900 (GMSK,1Slot)	512	1850.20	29.32
	661	1880.00	29.25
	810	1909.80	**29.43**

4.3. Occupy Bandwidth

TEST CONFIGURATION



Note: Measurement setup for testing on Antenna connector

TEST PROCEDURE

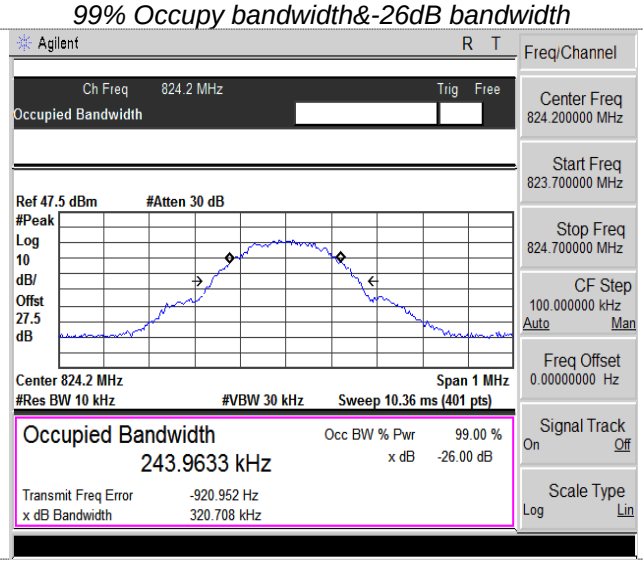
1. The EUT's output RF connector was connected with a short cable to the spectrum analyzer
2. RBW was set to about 1% of emission BW, VBW= 3 times RBW.
3. -26dBc display line was placed on the screen (or 99% bandwidth), the occupied bandwidth is the delta frequency between the two points where the display line intersects the signal trace.

TEST RESULTS

EUT Mode	Channel	Frequency (MHz)	99% Occupy bandwidth (KHz)	-26dB bandwidth (KHz)
GSM 850 (GMSK)	128	824.20	243.96	320.70
	190	836.60	248.41	324.14
	251	848.80	248.20	311.36
GPRS850 (GMSK,1Slot)	128	824.20	250.40	321.37
	190	836.60	242.40	315.28
	251	848.80	249.23	320.50
EGPRS850 (GMSK,1Slot)	128	824.20	251.28	316.07
	190	836.60	247.75	318.82
	251	848.80	250.75	320.50
PCS1900 (GMSK)	512	1850.20	248.70	308.31
	661	1880.00	242.65	314.15
	810	1909.80	246.51	319.16
GPRS1900 (GMSK,1Slot)	512	1850.20	247.60	315.48
	661	1880.00	243.55	317.49
	810	1909.80	246.16	319.16
EGPRS1900 (GMSK,1Slot)	512	1850.20	245.72	316.40
	661	1880.00	243.38	321.05
	810	1909.80	247.03	319.16

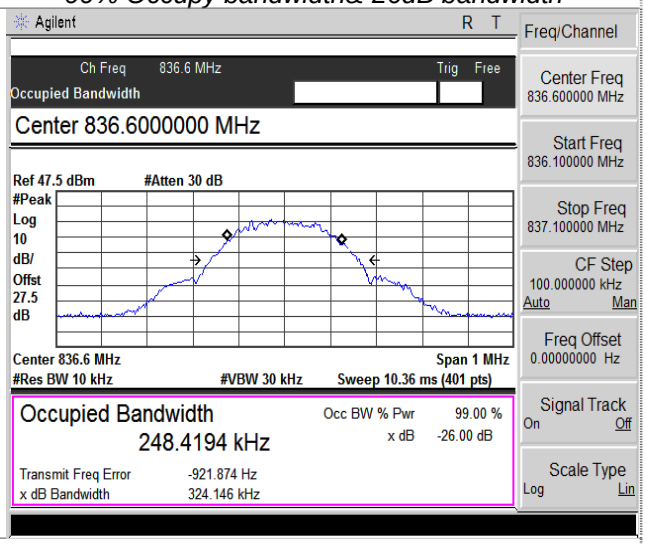
GSM850 For GMSK Moudlation

99% Occupy bandwidth&-26dB bandwidth

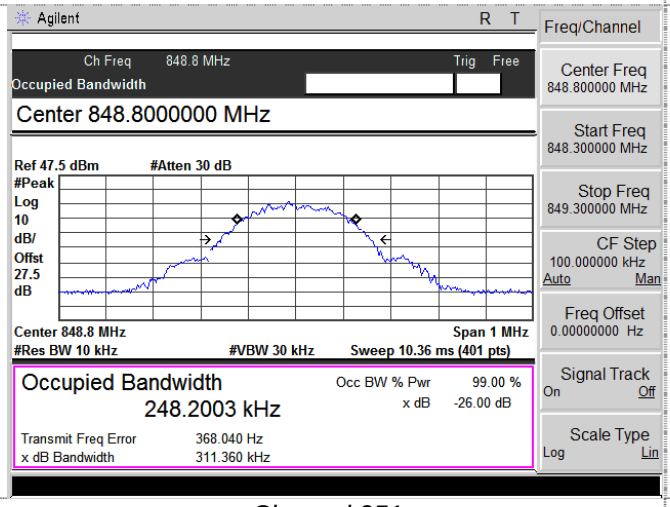


Channel 128

99% Occupy bandwidth&-26dB bandwidth



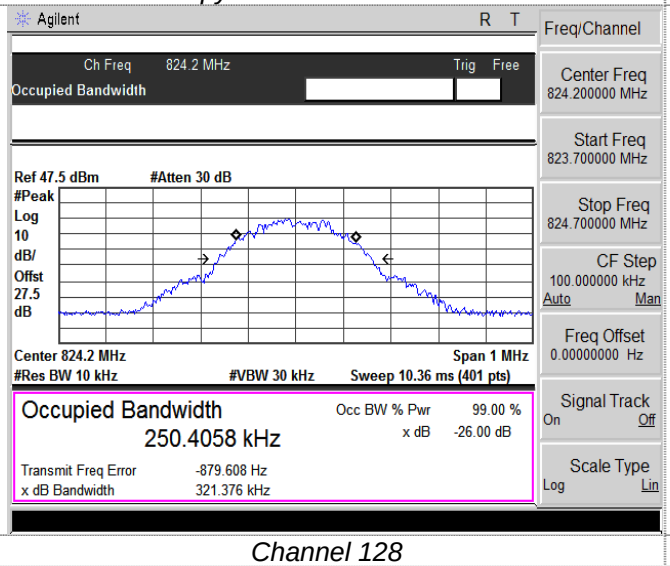
Channel 190



Channel 251

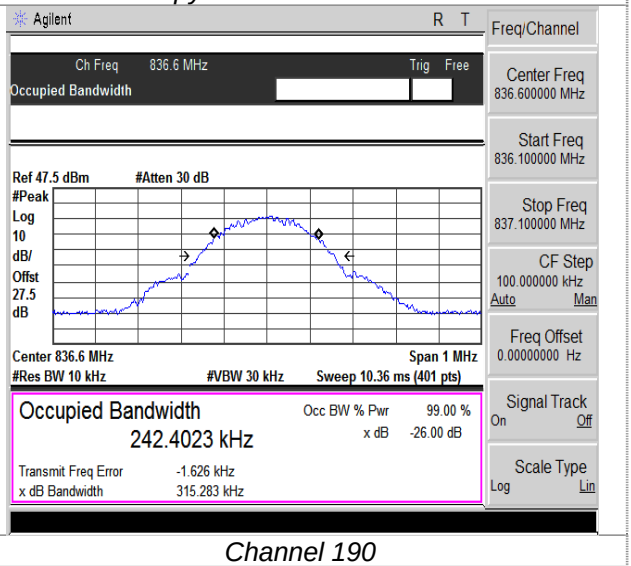
GPRS850 For GMSK Moudlation

99% Occupy bandwidth&-26dB bandwidth



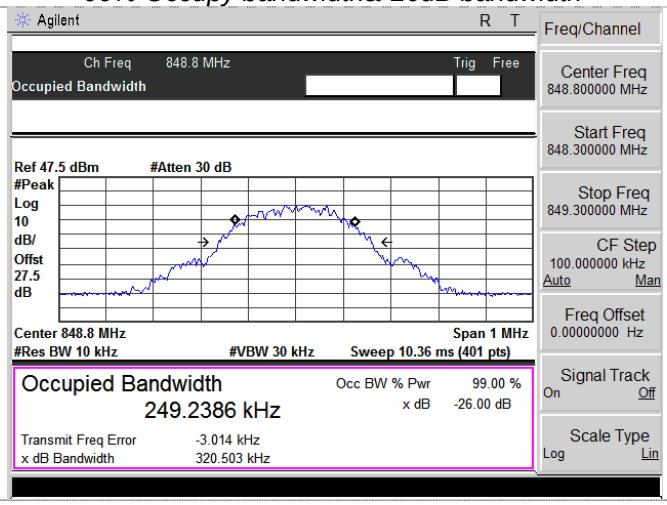
Channel 128

99% Occupy bandwidth&-26dB bandwidth



Channel 190

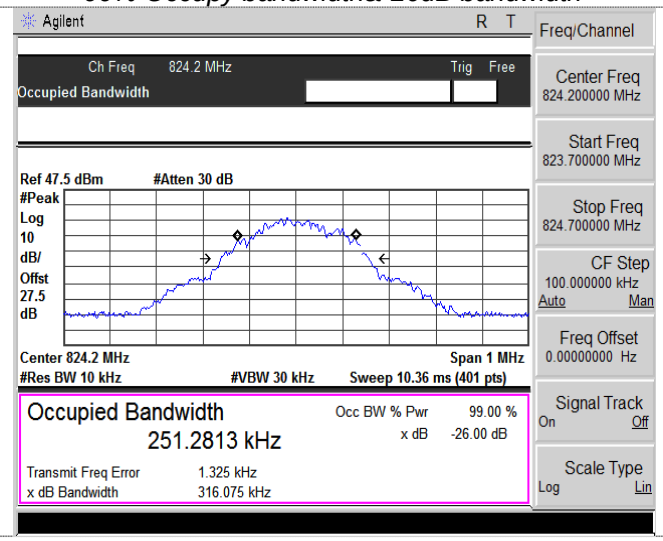
99% Occupy bandwidth&-26dB bandwidth



Channel 251

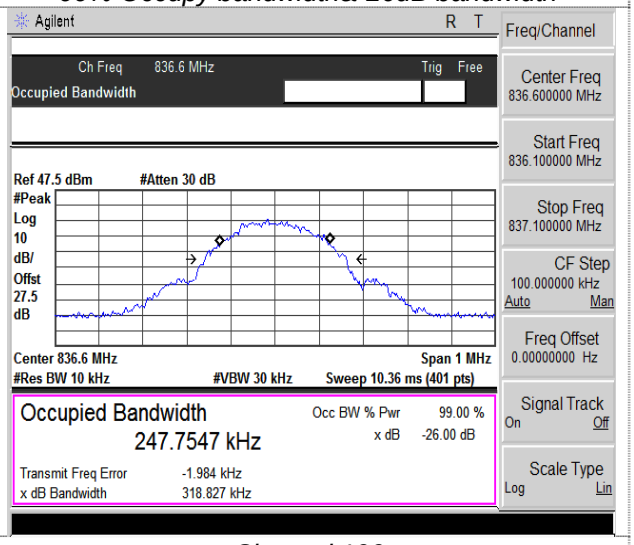
EGPRS850 For GMSK Moudlation

99% Occupy bandwidth&-26dB bandwidth

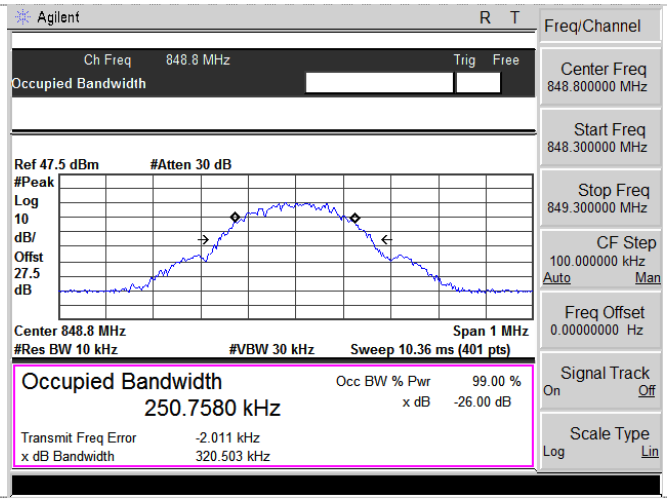


Channel 128

99% Occupy bandwidth&-26dB bandwidth



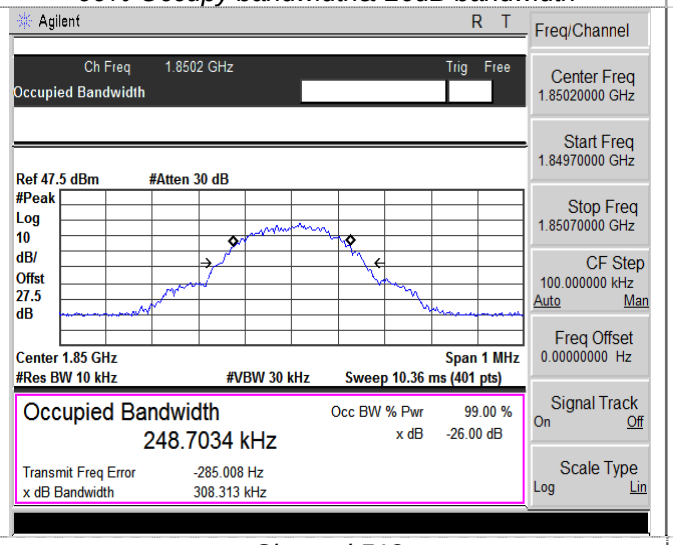
Channel 190



Channel 251

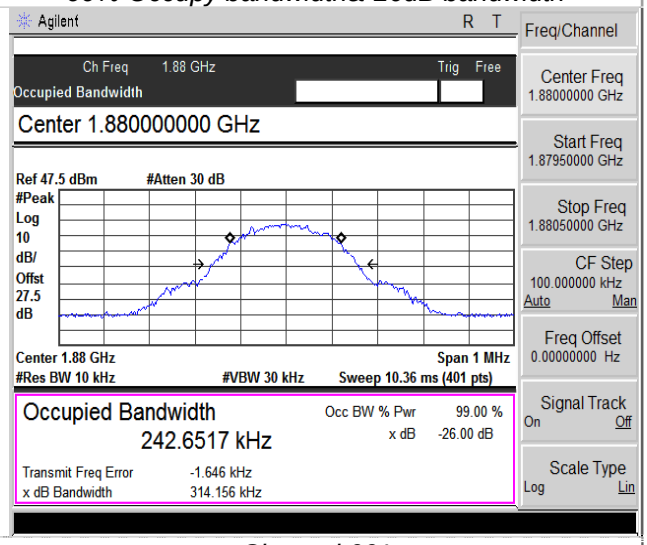
PCS1900 For GMSK Moudlation

99% Occupy bandwidth&-26dB bandwidth

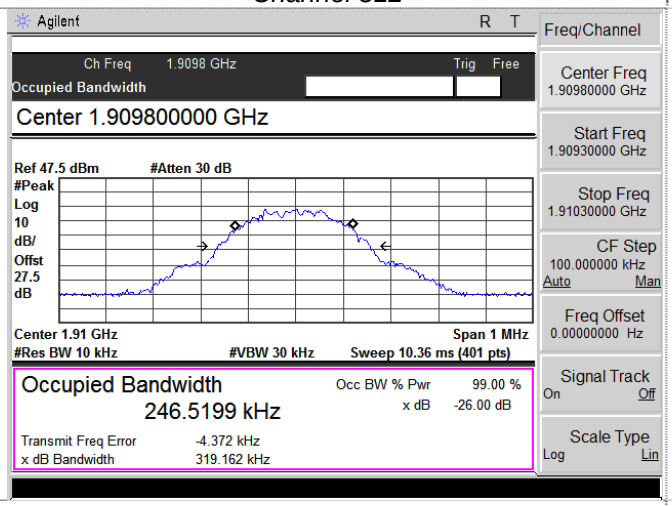


Channel 512

99% Occupy bandwidth&-26dB bandwidth



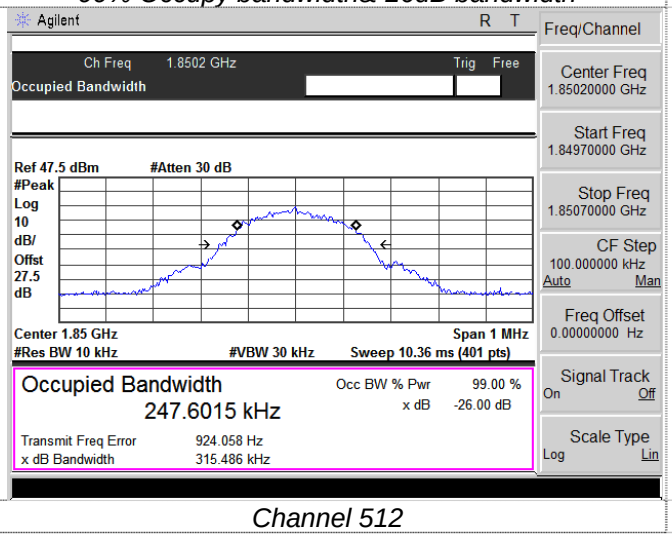
Channel 661



Channel 810

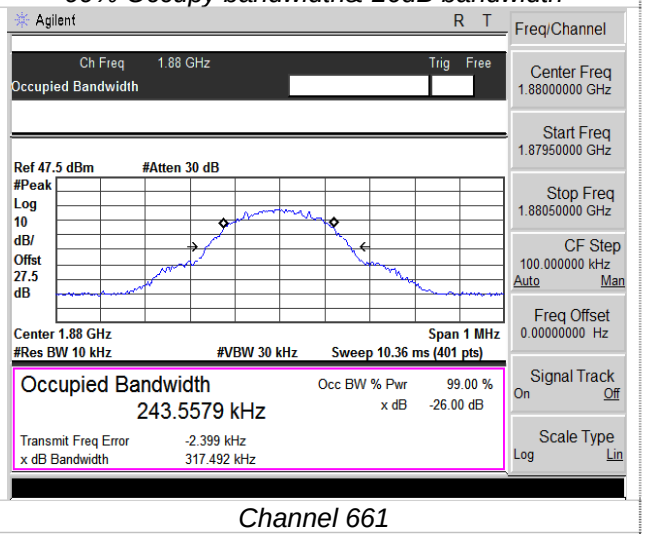
GPRS1900 For GMSK Moudlation

99% Occupy bandwidth&-26dB bandwidth



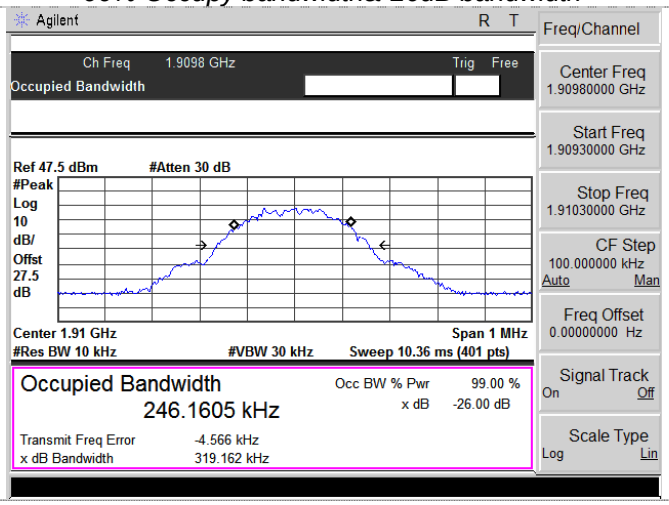
Channel 512

99% Occupy bandwidth&-26dB bandwidth



Channel 661

99% Occupy bandwidth&-26dB bandwidth

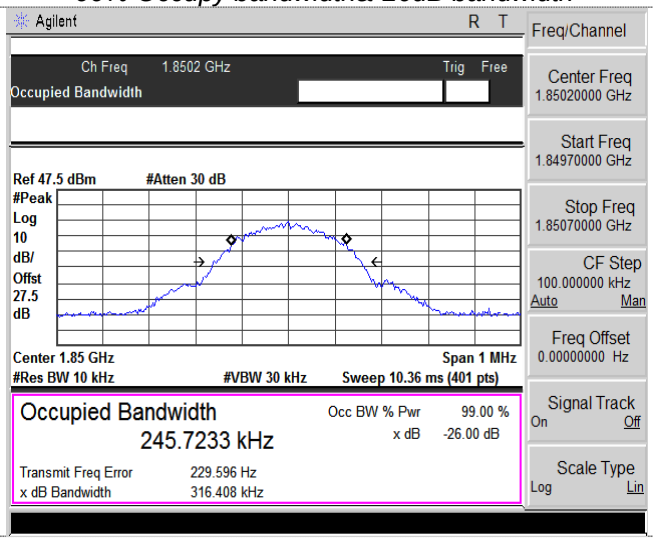


Channel 810

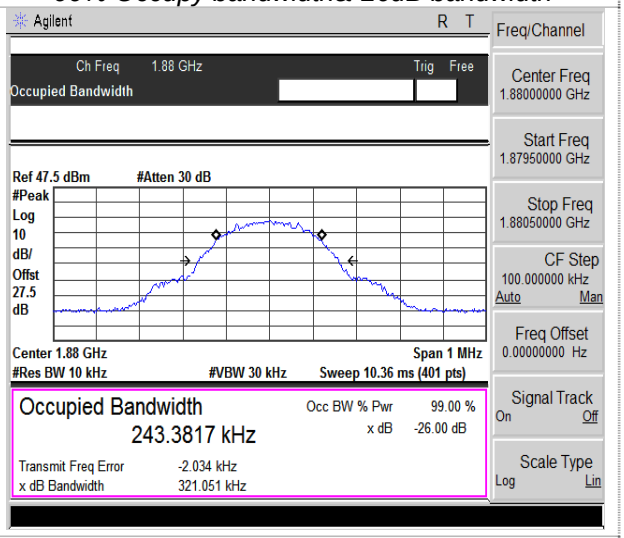
99% Occupy bandwidth&-26dB bandwidth

EGPRS1900 For GMSK Moudlation

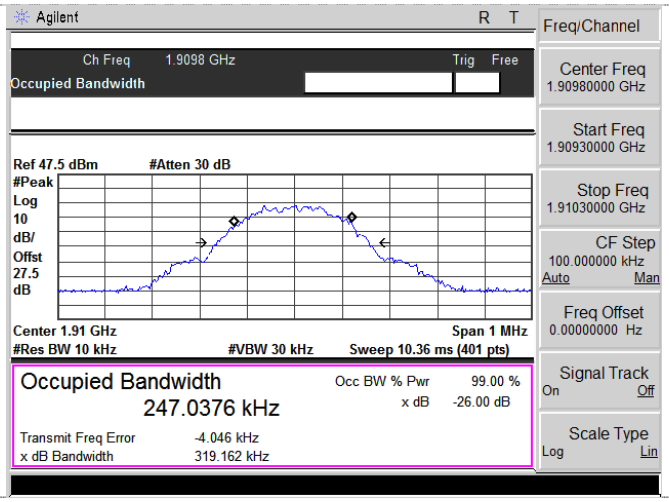
99% Occupy bandwidth&-26dB bandwidth



Channel 512



Channel 661



Channel 810

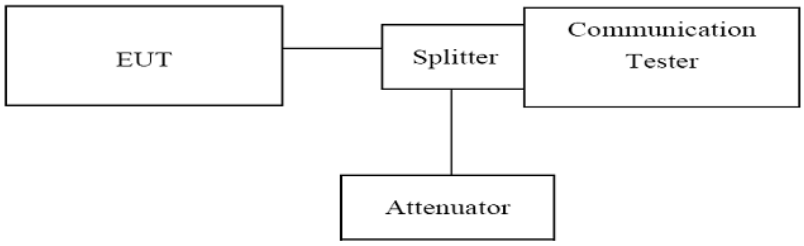
4.4. Out of band emission at antenna terminals

LIMIT

Part 24.238 and 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 CONFIGURATION

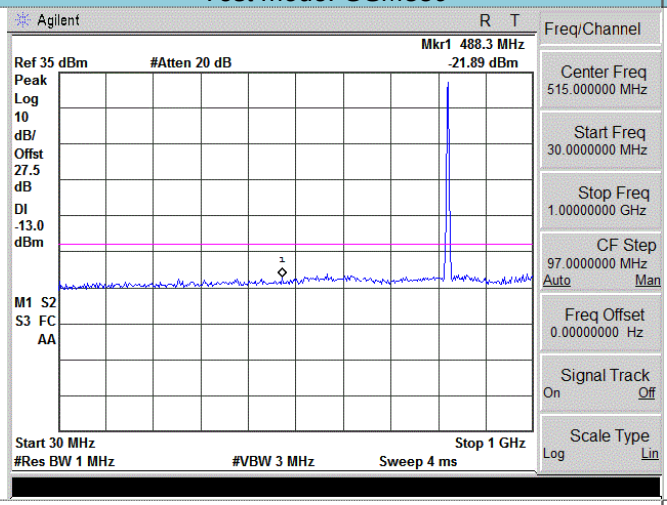


TEST PROCEDURE

1. The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation.
2. The resolution bandwidth of the spectrum analyzer was set at 1MHz, sufficient scans were taken to show the out of band Emissions if any up to 10th harmonic.
3. For the out of band: Set the RBW= 1MHz, VBW = 3MHz, Start=30MHz, Stop= 10th harmonic.

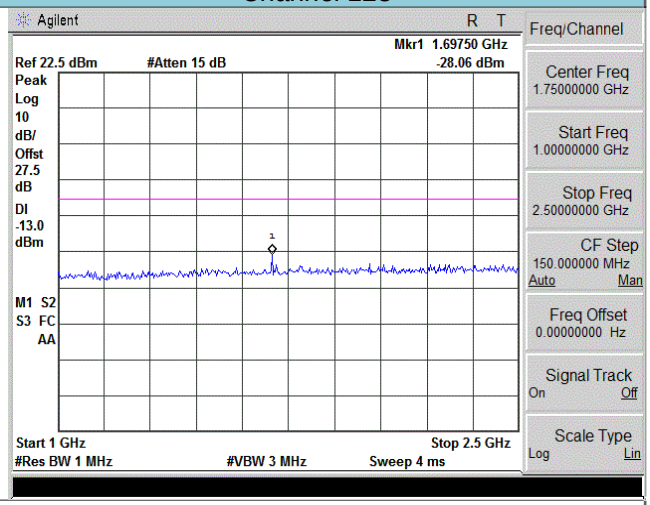
TEST RESULTS

Test mode: GSM850

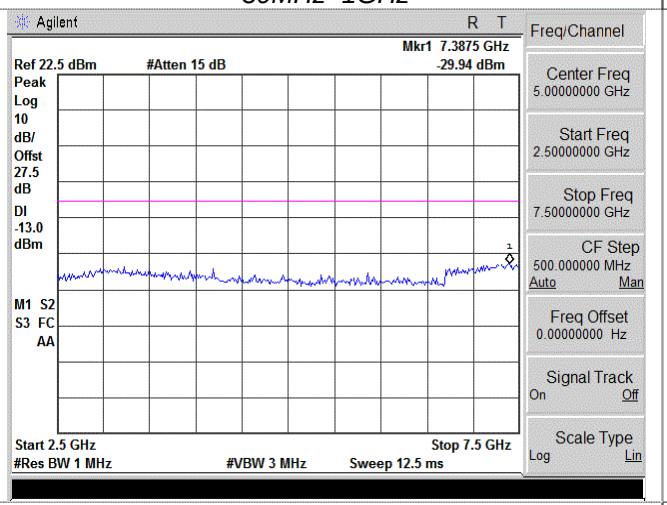


30MHz~1GHz

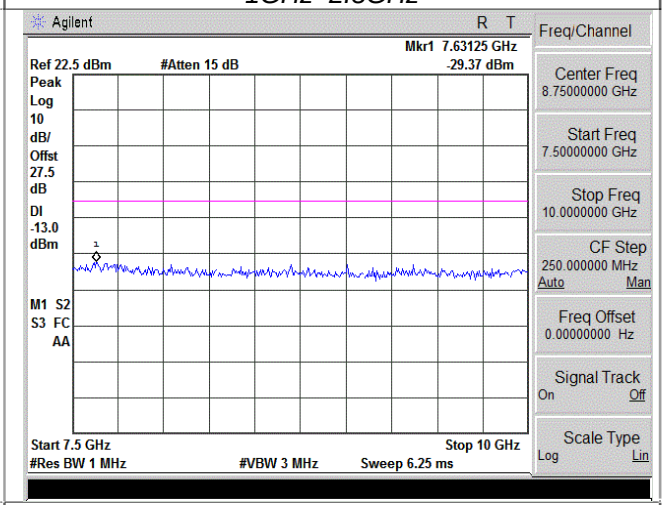
Channel 128



1GHz~2.5GHz

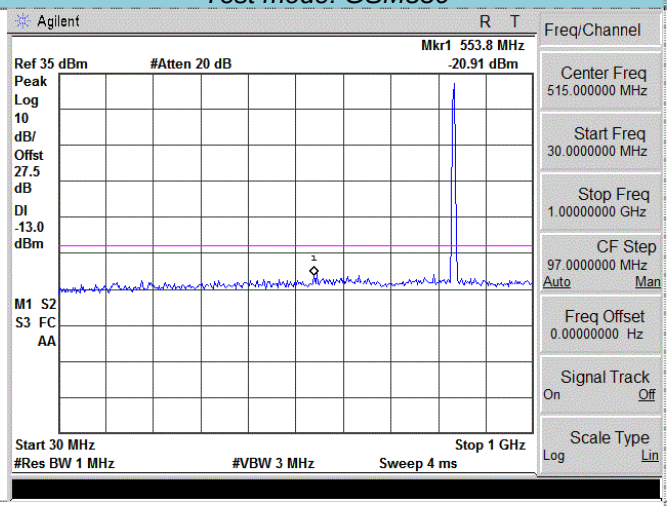


2.5GHz~7.5GHz



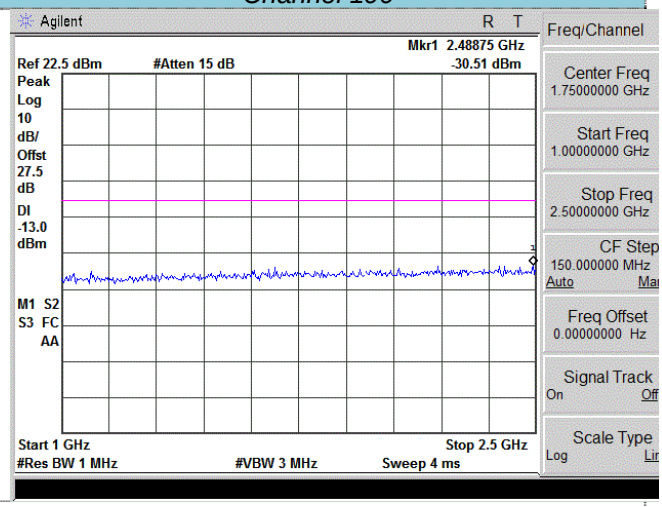
7.5GHz~10GHz

Test mode: GSM850

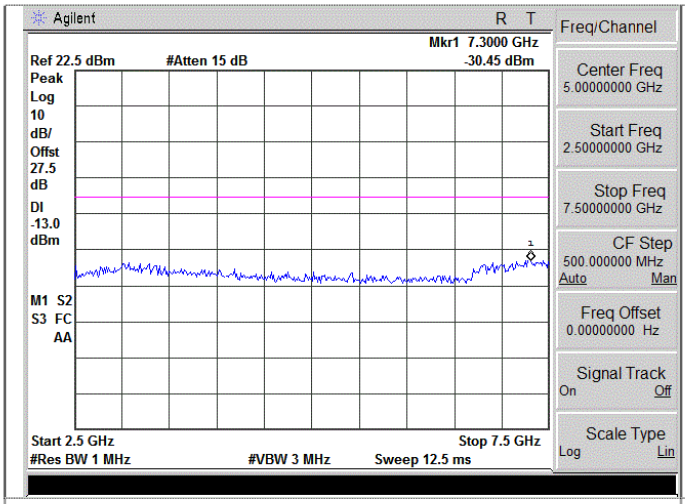


30MHz~1GHz

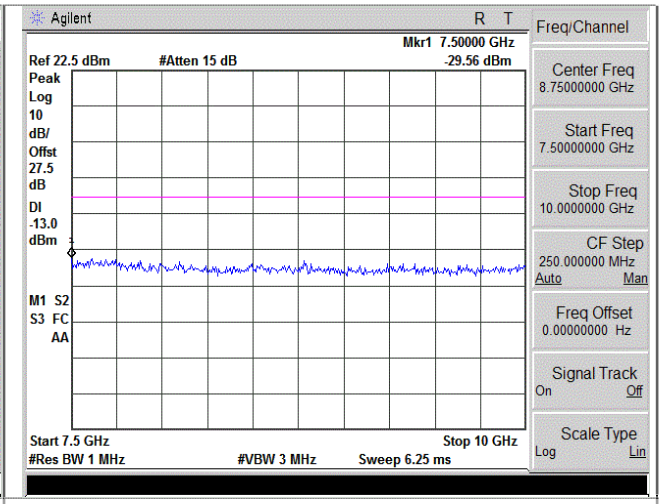
Channel 190



1GHz~2.5GHz

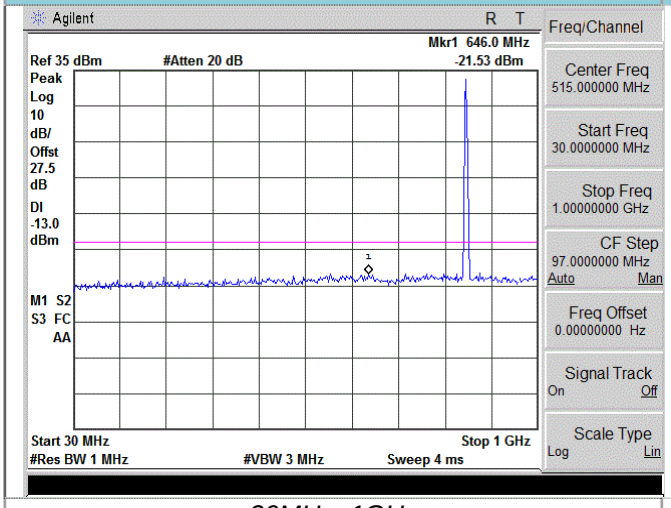


2.5GHz~7.5GHz

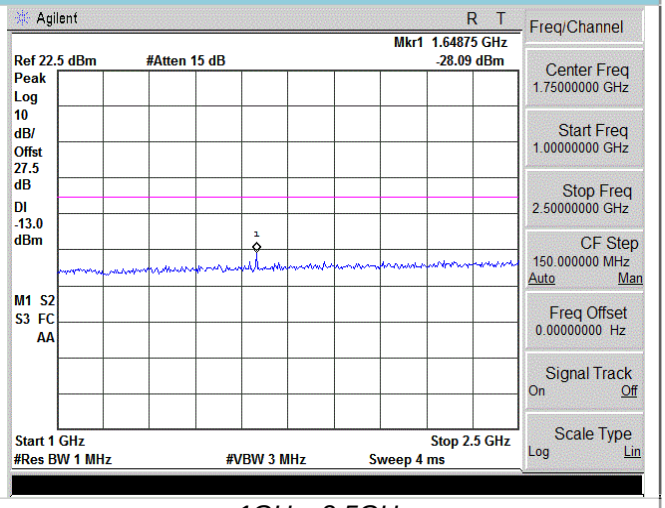


7.5GHz~10GHz

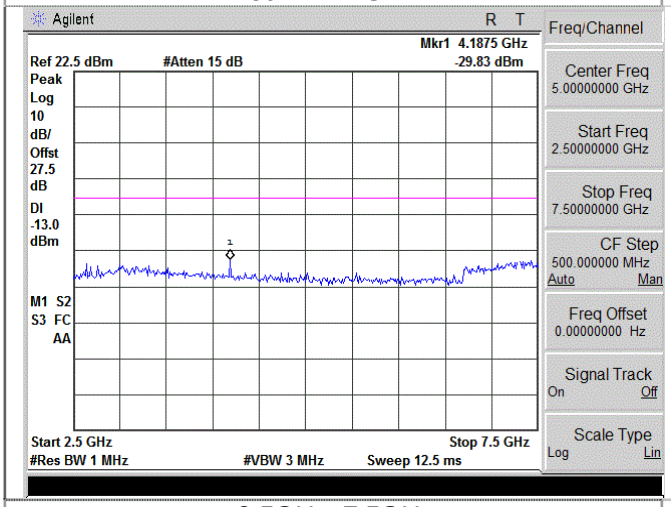
Test mode: GSM850 *Channel 251*



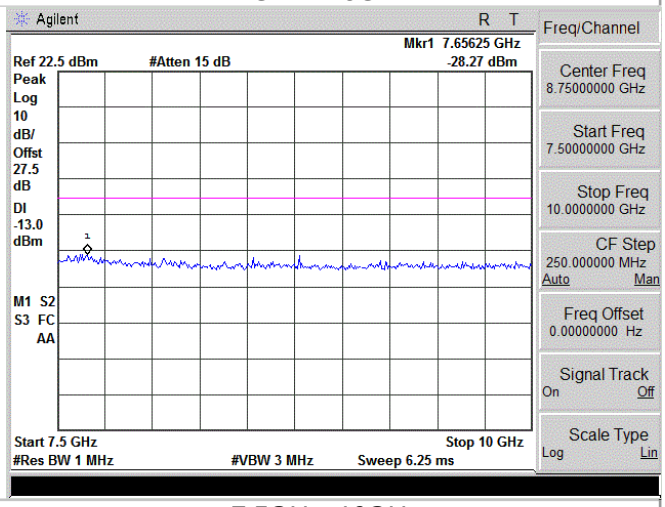
30MHz~1GHz



1GHz~2.5GHz

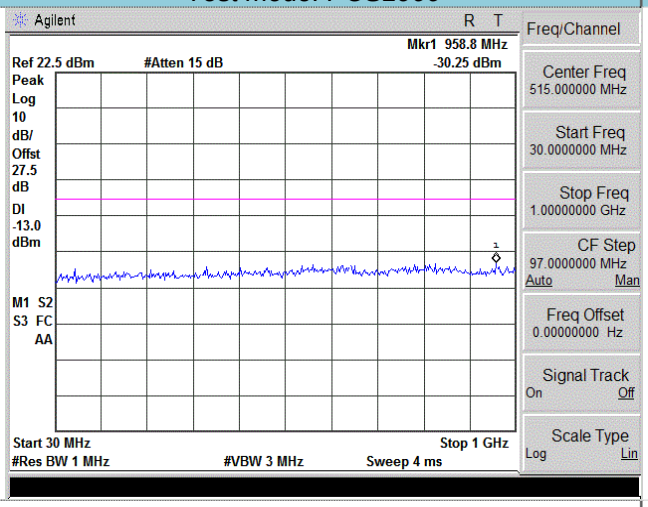


2.5GHz~7.5GHz

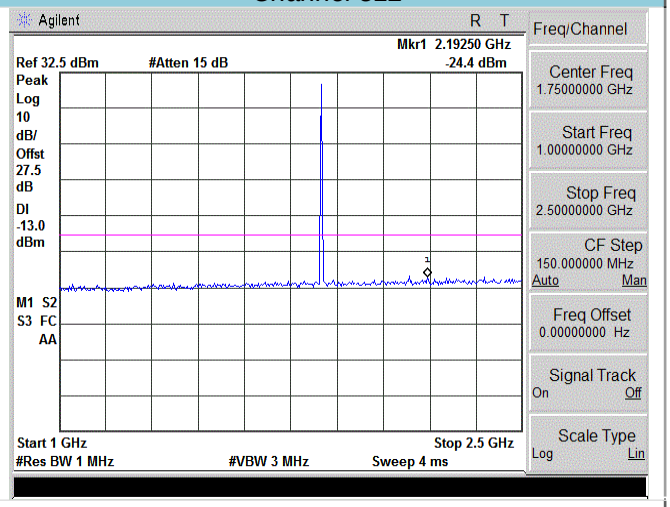


7.5GHz~10GHz

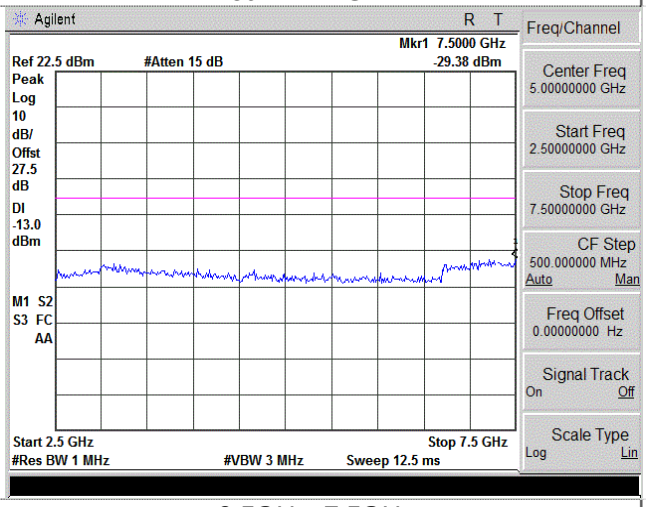
Test mode: PCS1900	Channel 512



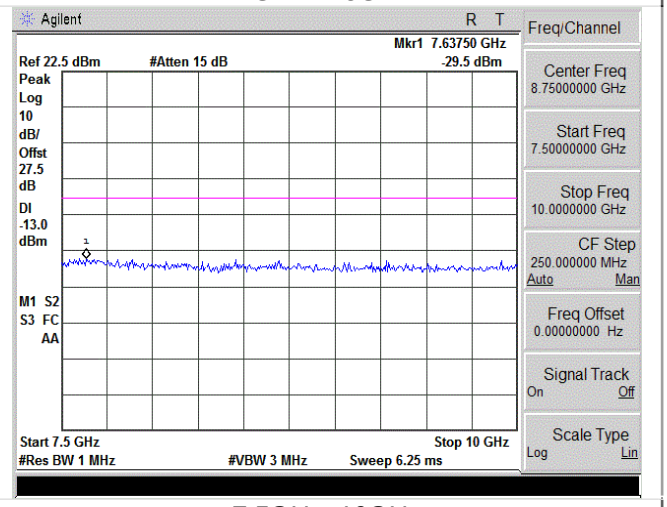
30MHz~1GHz



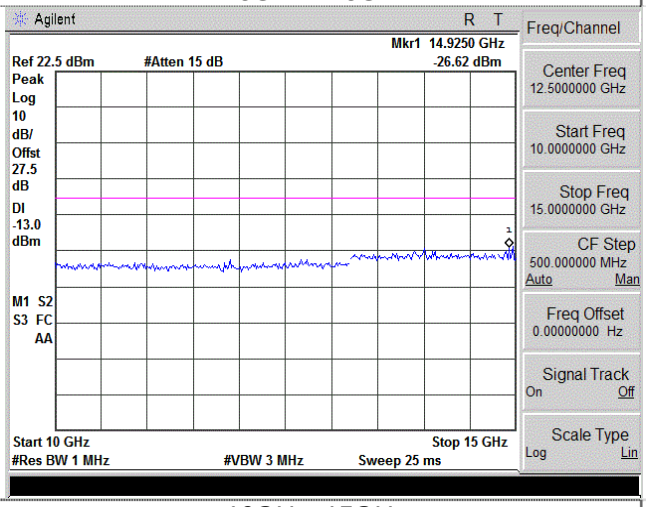
1GHz~2.5GHz



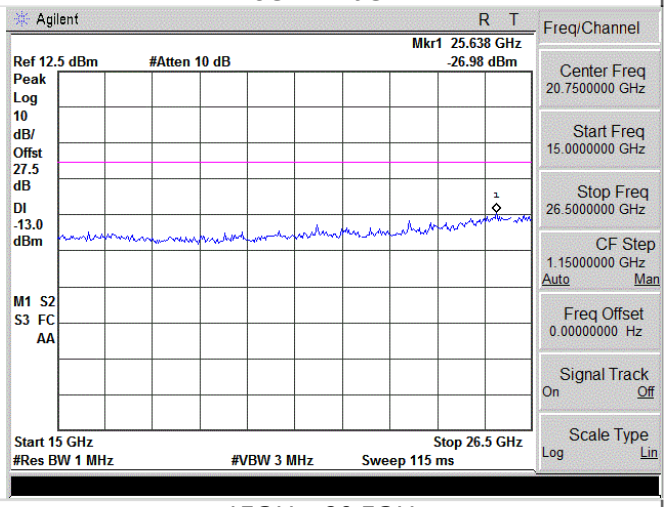
2.5GHz~7.5GHz



7.5GHz~10GHz

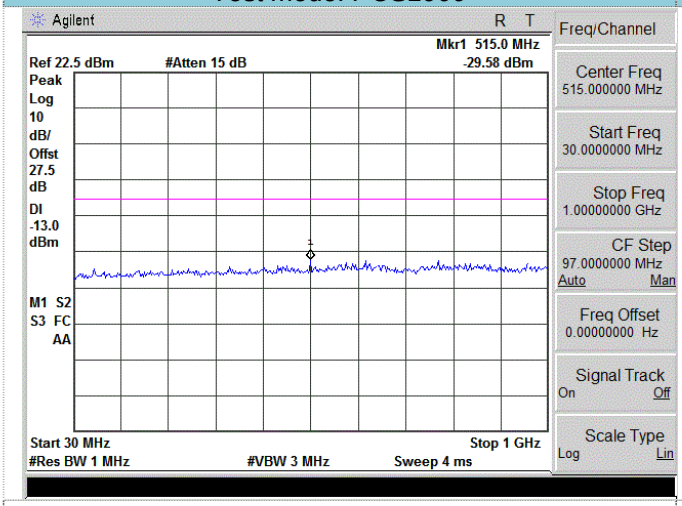


10GHz~15GHz

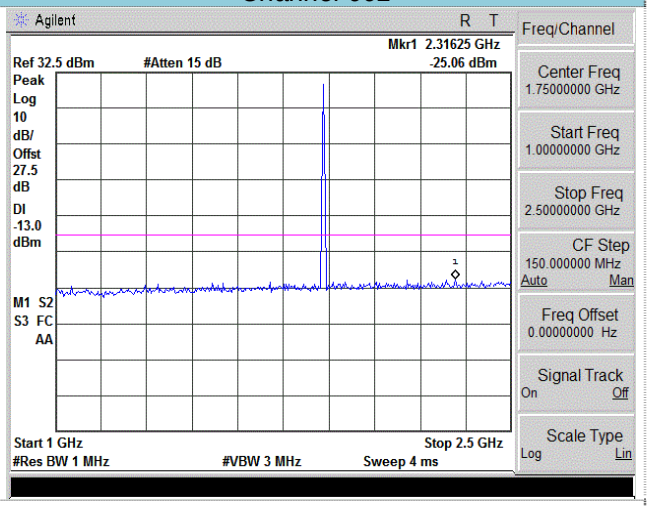


15GHz~26.5GHz

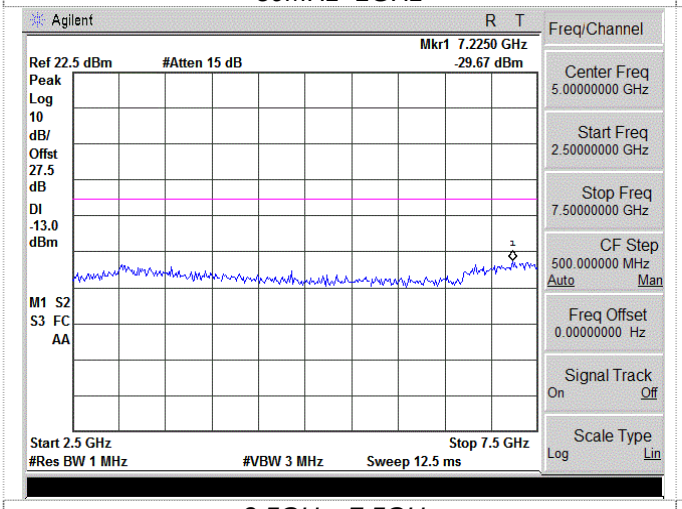
Test mode: PCS1900	Channel 661



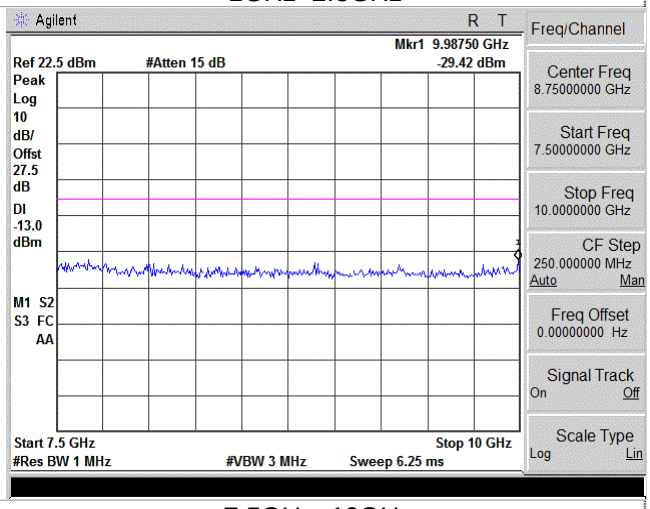
30MHz~1GHz



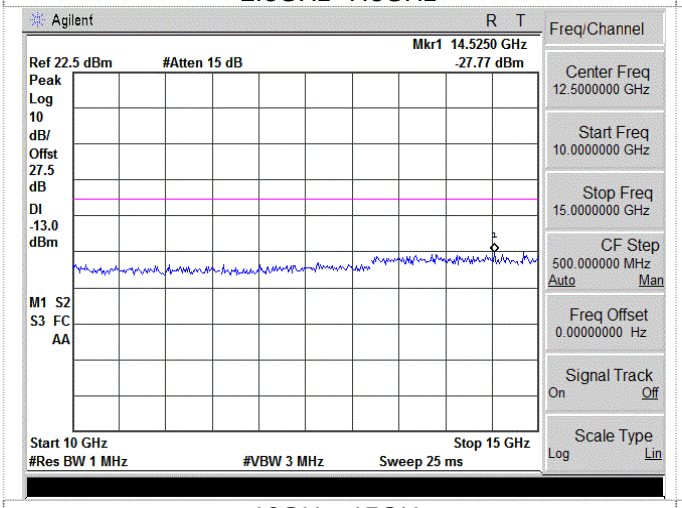
1GHz~2.5GHz



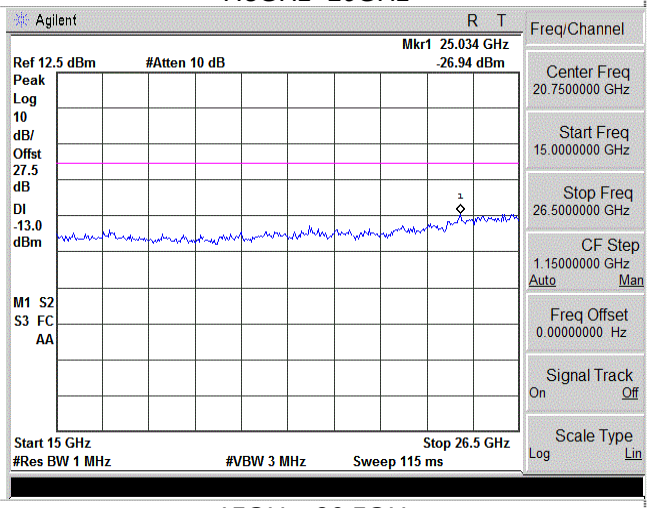
2.5GHz~7.5GHz



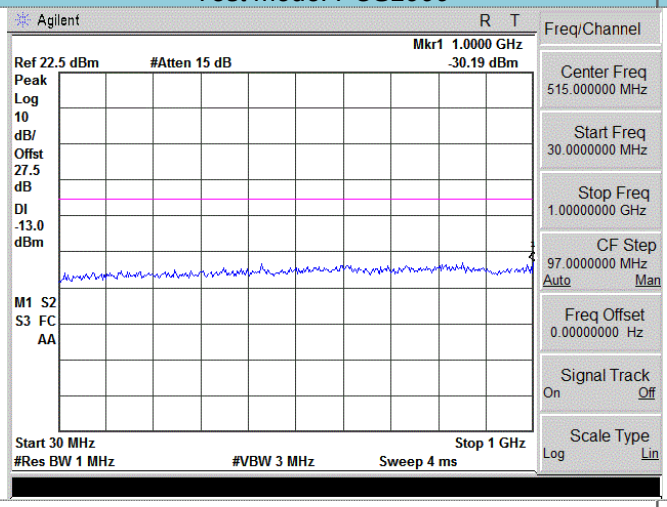
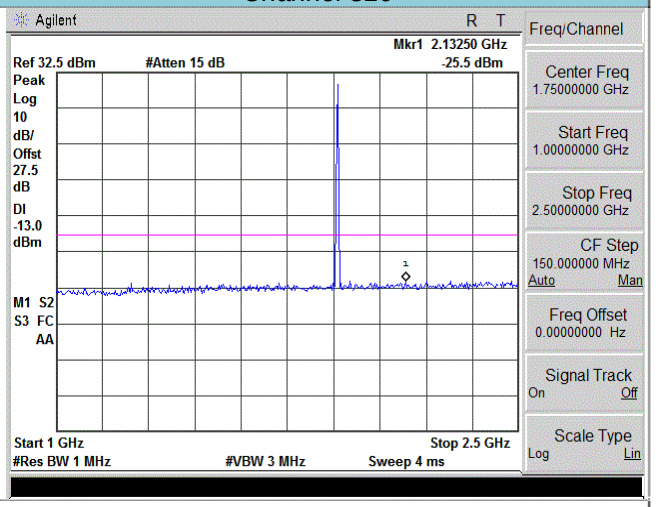
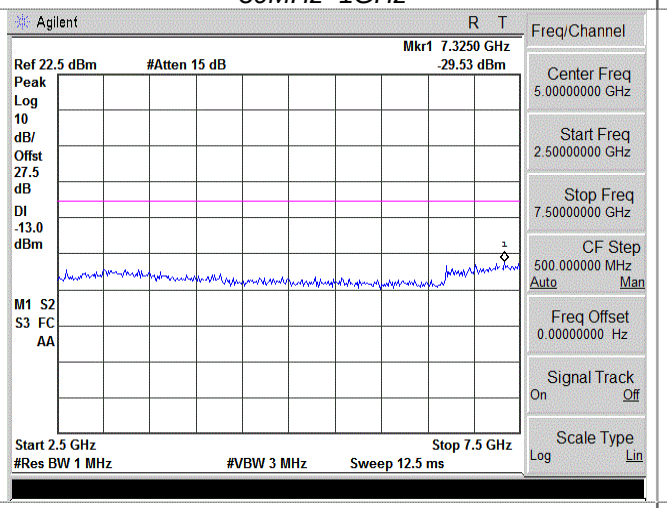
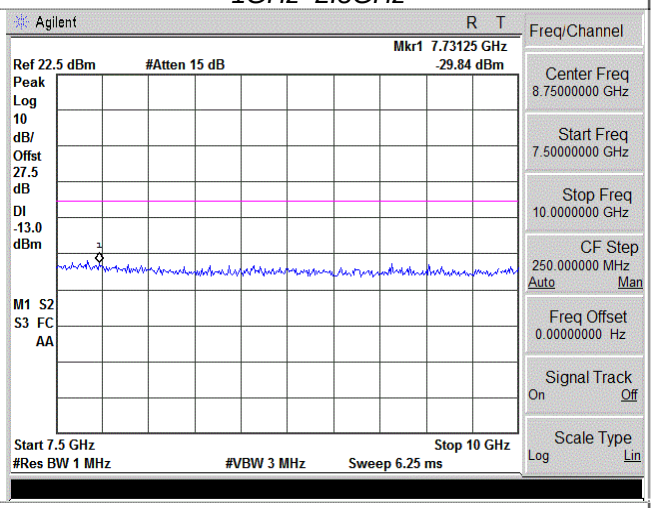
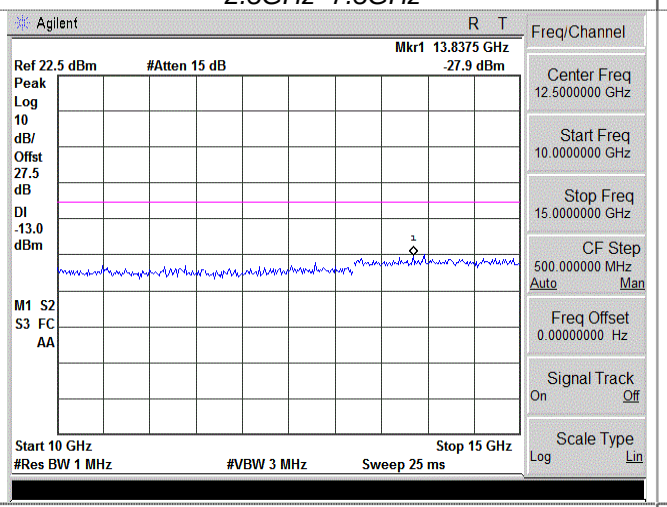
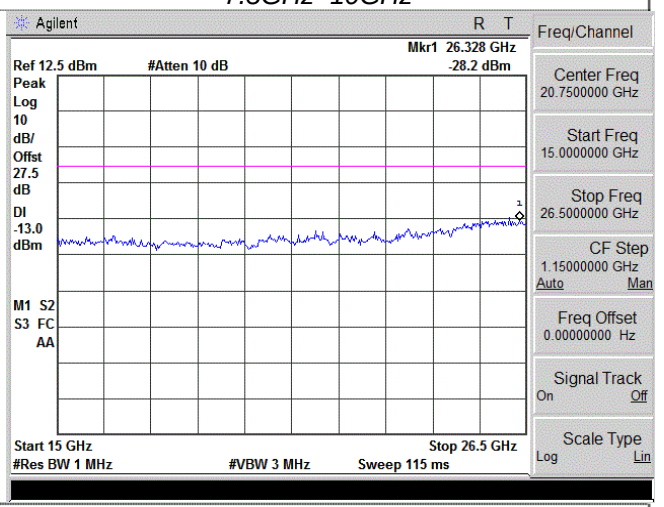
7.5GHz~10GHz



10GHz~15GHz



15GHz~26.5GHz

Test mode: PCS1900	Channel 810
	
30MHz~1GHz	*1GHz~2.5GHz*
	
2.5GHz~7.5GHz	*7.5GHz~10GHz*
	
10GHz~15GHz	*15GHz~26.5GHz*

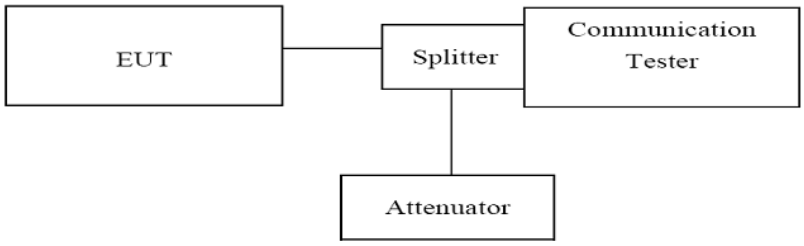
4.5. Band Edge compliance

LIMIT

Part 24.238 and 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 CONFIGURATION



TEST PROCEDURE

1. The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation.
2. For the bandedge: 2G:Set the RBW=10KHz, VBW = 30KHz, Sweep time= Auto

   3G: Set the RBW=100KHz, VBW = 300KHz, Sweep time= Auto
3. Accoding to KDB 971168 section 6.0.
4.

TEST RESULTS

GSM850					
Channel Number	Frequency (MHz)	Measurement Results		Limit (dBm)	Verdict
		Frequency (MHz)	Values (dBm)		
128	824.20	823.98	-15.36	-13.00	Pass
251	848.80	849.01	-14.02	-13.00	Pass

GPRS850					
Channel Number	Frequency (MHz)	Measurement Results		Limit (dBm)	Verdict
		Frequency (MHz)	Values (dBm)		
128	824.20	823.98	-13.89	-13.00	Pass
251	848.80	849.02	-15.46	-13.00	Pass

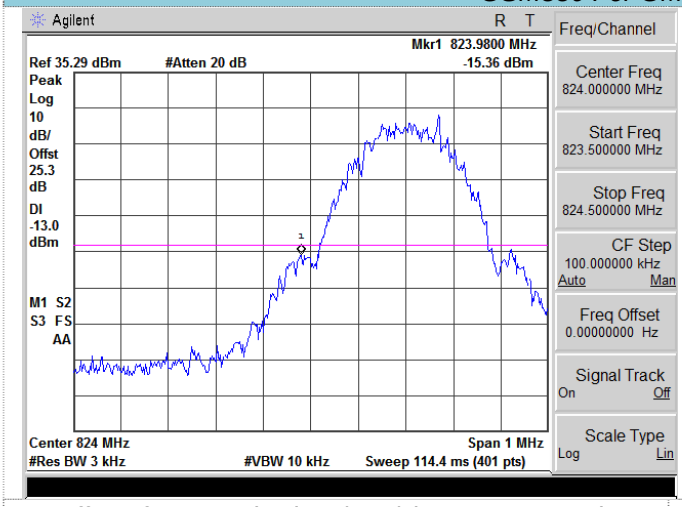
EGPRS850					
Channel Number	Frequency (MHz)	Measurement Results		Limit (dBm)	Verdict
		Frequency (MHz)	Values (dBm)		
128	824.20	823.99	-14.96	-13.00	Pass
251	848.80	849.01	-14.29	-13.00	Pass

PCS1900					
Channel Number	Frequency (MHz)	Measurement Results		Limit (dBm)	Verdict
		Frequency (MHz)	Values (dBm)		
512	1850.20	1850.00	-17.19	-13.00	Pass
810	1909.80	1910.00	-18.14	-13.00	Pass

EGPRS1900					
Channel Number	Frequency (MHz)	Measurement Results		Limit (dBm)	Verdict
		Frequency (MHz)	Values (dBm)		
512	1850.20	1850.00	-17.13	-13.00	Pass
810	1909.80	1910.00	-18.67	-13.00	Pass

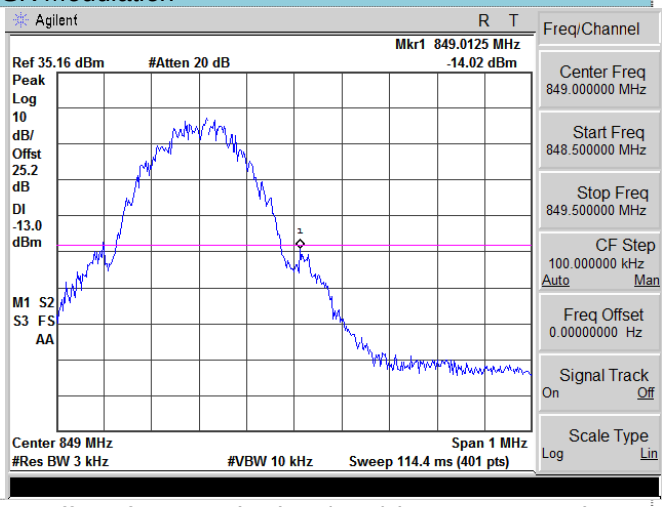
GPRS1900					
Channel Number	Frequency (MHz)	Measurement Results		Limit (dBm)	Verdict
		Frequency (MHz)	Values (dBm)		
512	1850.20	1850.00	-15.52	-13.00	Pass
810	1909.80	1910.00	-18.27	-13.00	Pass

GSM850 For GMSK Moudlation



Offset=factor+10log(BW/100/3)=25+0.3=25.3dB

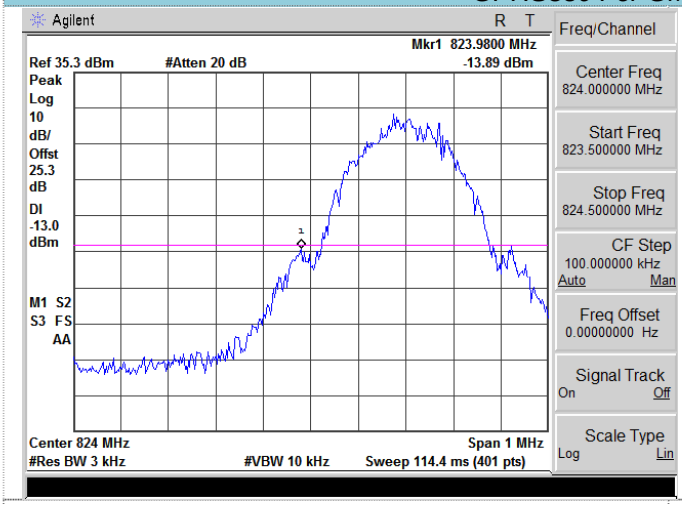
Channel 128



Offset=factor+10log(BW/100/3)=25+0.2=25.2dB

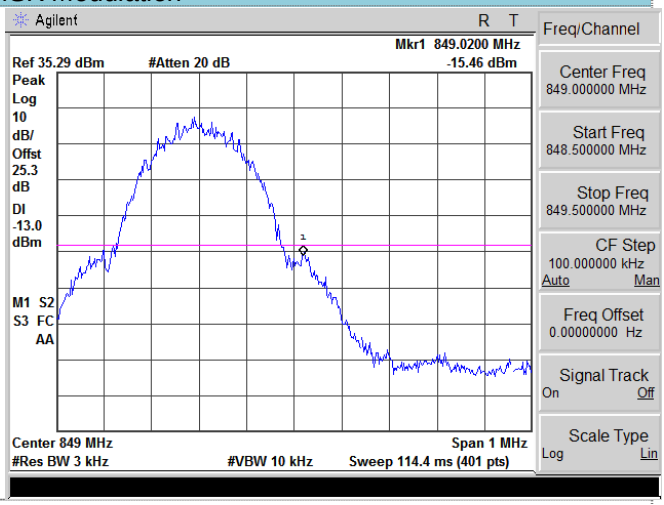
Channel 251

GPRS850 For GMSK Moudlation



Offset=factor+10log(BW/100/3)=25+0.3=25.3dB

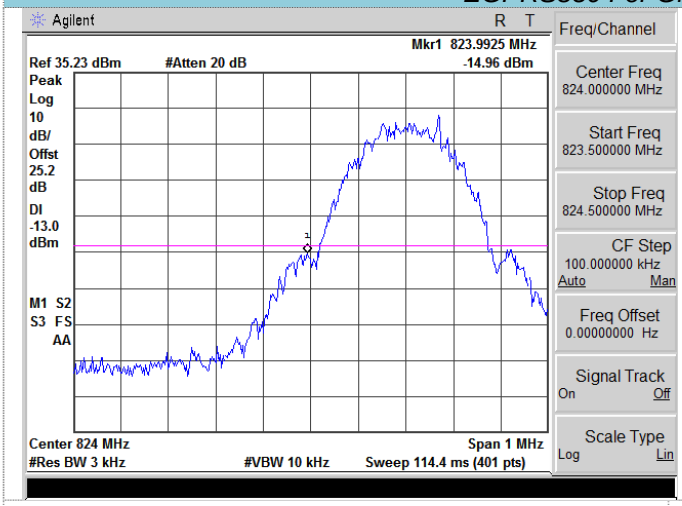
Channel 128



Offset=factor+10log(BW/100/3)=25+0.3=25.3dB

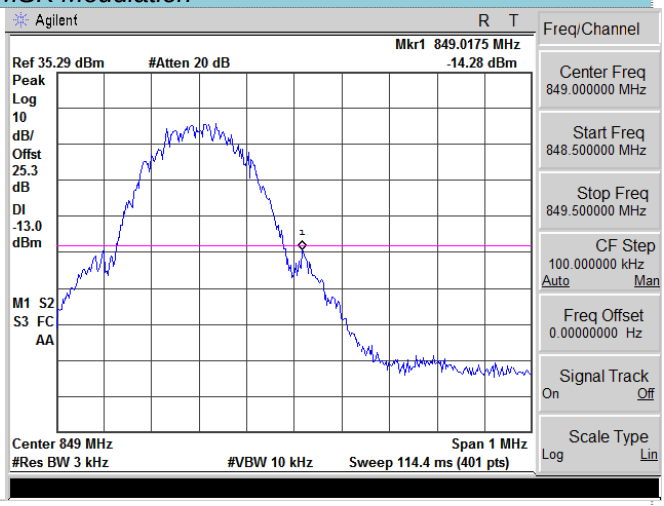
Channel 251

EGPRS850 For GMSK Moudlation



Offset=factor+10log(BW/100/3)=25+0.2=25.2dB

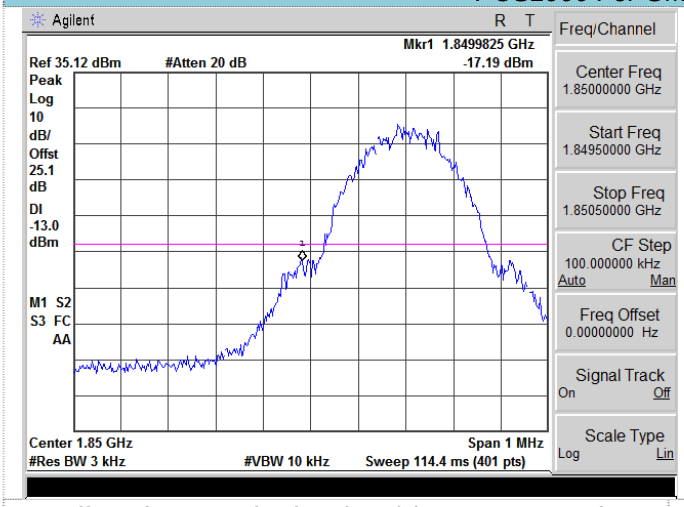
Channel 128



Offset=factor+10log(BW/100/3)=25+0.3=25.3dB

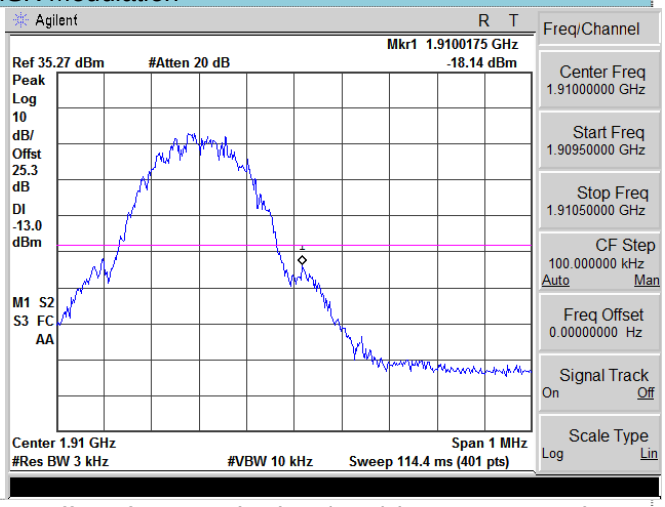
Channel 251

PCS1900 For GMSK Moudlation



Offset=factor+10log(BW/100/3)=25+0.1=25.1dB

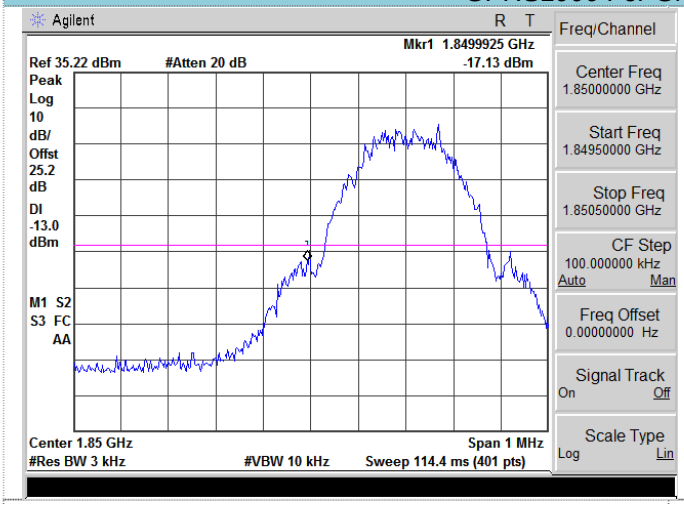
Channel 512



Offset=factor+10log(BW/100/3)=25+0.3=25.3dB

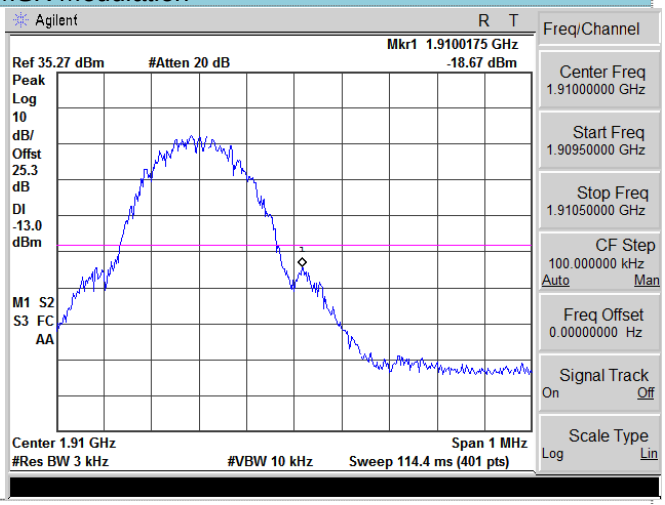
Channel 810

GPRS1900 For GMSK Moudlation



Offset=factor+10log(BW/100/3)=25+0.2=25.2dB

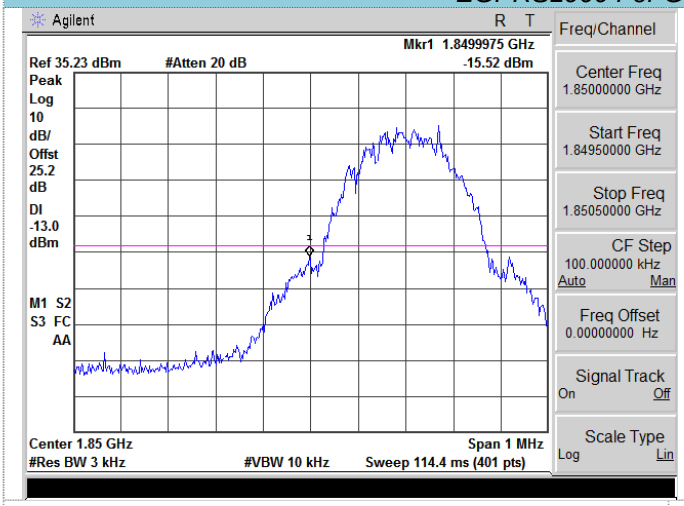
Channel 512



Offset=factor+10log(BW/100/3)=25+0.3=25.3dB

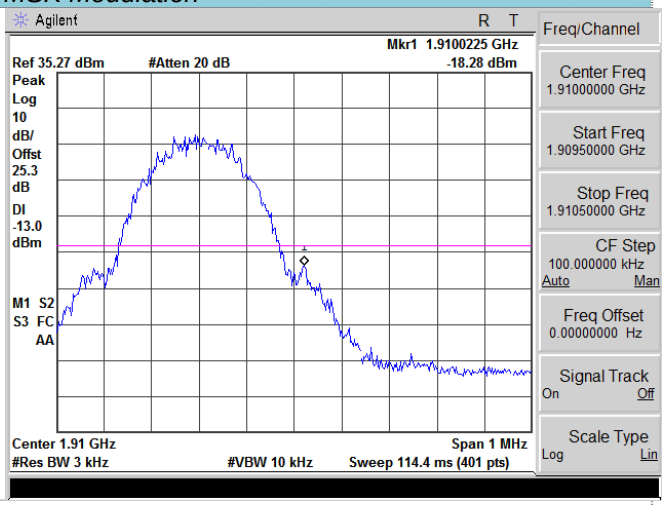
Channel 810

EGPRS1900 For GMSK Moudlation



Offset=factor+10log(BW/100/3)=25+0.2=25.2dB

Channel 512



Offset=factor+10log(BW/100/3)=25+0.3=25.3dB

Channel 810

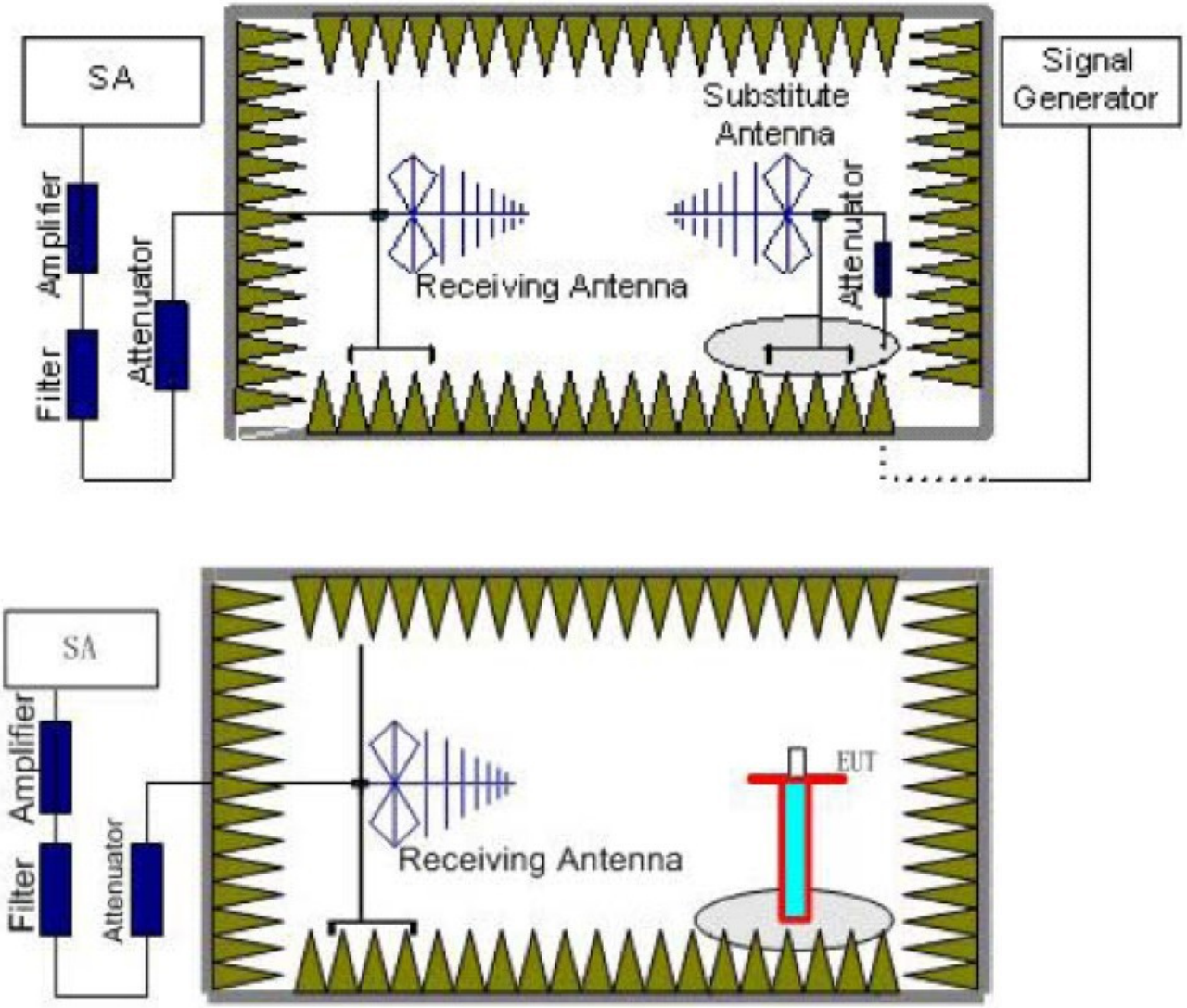
4.6. Radiated Power Measurement

LIMIT

GSM850/WCDMA Band V: 7W ERP

PCS1900/WCDMA Band II: 2W EIRP

TEST CONFIGURATION



TEST PROCEDURE

1. EUT was placed on a 1.50 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 1.50m. 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 (Pr).
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 (PMea) 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 (Pr). The power of signal source (PMea) 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 (Pcl) ,the Substitution Antenna Gain (Ga) and the Amplifier Gain (PAg) should be recorded after test.
6. The measurement results are obtained as described below:
   Power(EIRP)=PMea- PAg - Pcl + Ga
   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)=PMea- Pcl + Ga
7. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
   ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP-2.15dBi.

TEST RESULTS

GSM:

Mode	Channel	Antenna Pol.	ERP	Limit (dBm)	Result
GSM850	128	V	31.47	38.45	Pass
		H	27.52		
	190	V	31.65		
		H	27.38		
	251	V	31.74		
		H	27.59		
GPRS850	128	V	31.42	38.45	Pass
		H	27.68		
	190	V	31.47		
		H	27.69		
	251	V	31.84		
		H	26.47		
EGPRS850	128	V	31.93	38.45	Pass
		H	28.02		
	190	V	31.06		
		H	27.24		
	251	V	31.47		
		H	27.86		

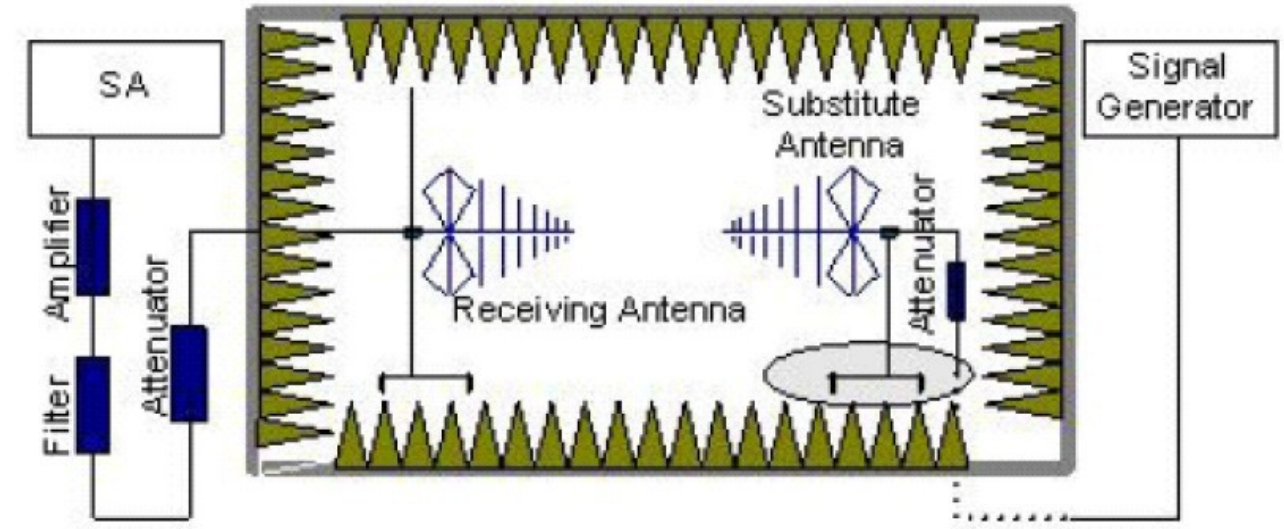
Mode	Channel	Antenna Pol.	EIRP	Limit (dBm)	Result
PCS1900	512	V	28.32	33.01	Pass
		H	25.74		
	661	V	28.97		
		H	25.69		
	810	V	28.36		
		H	25.79		
GPRS1900	512	V	28.69	33.01	Pass
		H	25.46		
	661	V	28.96		
		H	25.94		
	810	V	28.47		
		H	26.08		
EGPRS 1900	512	V	28.32	33.01	Pass
		H	25.47		
	661	V	28.63		
		H	25.44		
	810	V	28.96		
		H	25.08		

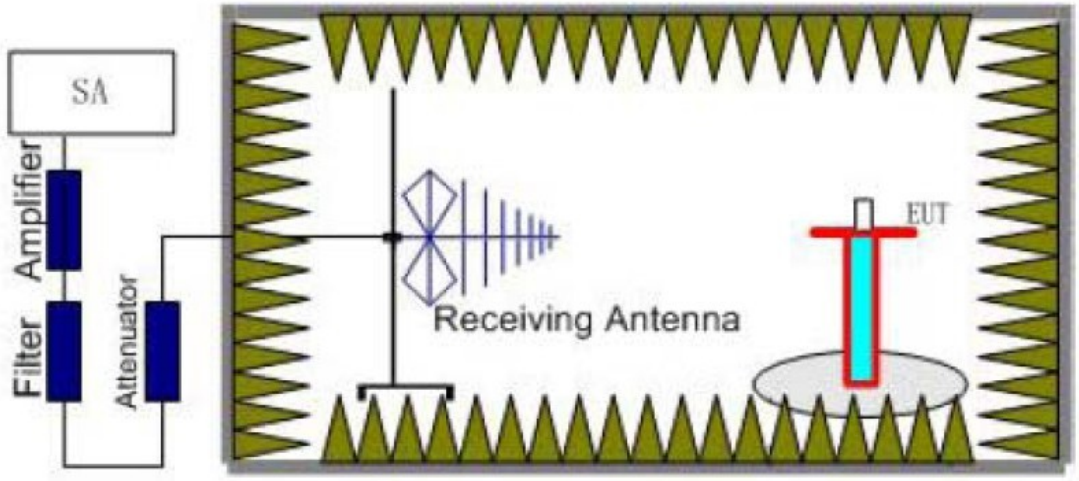
4.7. Radiated Spurious Emssion

LIMIT

-13dBm

TEST CONFIGURATION





TEST RESULTS

1. EUT was placed on a 1.50 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 1.50m. 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 (Pr).

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 (PMea) 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 (Pr). The power of signal source (PMea) 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 (Pcl) ,the Substitution Antenna Gain (Ga) and the Amplifier Gain (PAg) should be recorded after test.
6. The measurement results are obtained as described below:
   Power(EIRP)=PMea- PAg - Pcl + Ga
   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)=PMea- Pcl + Ga
7. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
   ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP-2.15dBi.

TEST RESULTS

GSM850					
Channel	Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
		Polarization	Level (dBm)		
128	1648.40	Vertical	-41.56	-13.00	Pass
	2472.60	V	-48.65		
	3296.80	V	-40.86		
	4121.00	V	-32.15		
	4945.20	V	---		
	1648.40	Horizontal	-40.52	-13.00	Pass
	2472.60	H	-46.78		
	3296.80	H	-38.52		
	4121.00	H	-46.38		
	4945.20	H	---		
190	1673.20	Vertical	-41.86	-13.00	Pass
	2509.80	V	-48.67		
	3346.40	V	-40.97		
	4183.00	V	-32.65		
	5019.60	V	---		
	1673.20	Horizontal	-40.86	-13.00	Pass
	2509.80	H	-46.74		
	3346.40	H	-38.32		
	4183.00	H	-45.08		
	5019.60	H	---		
251	1697.60	Vertical	-41.98	-13.00	Pass
	2546.40	V	-46.63		
	3395.20	V	-41.45		
	4244.00	V	-33.63		
	5092.80	V	---		
	1697.60	Horizontal	-41.56	-13.00	Pass
	2546.40	H	-46.86		
	3395.20	H	-38.74		
	4244.00	H	-44.35		
	5092.80	H	---		

Remark：

1. The emission behaviour belongs to narrowband spurious emission.
2. Remark”---“ means that the emission level is too low to be measured
3. The emission levels of below 1 GHz are very lower than the limit and not show in test report.

PCS1900					
Channel	Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
		Polarization	Level (dBm)		
512	3700.40	Vertical	-37.21	-13.00	Pass
	5550.60	V	-47.65		
	7400.80	V	-43.84		
	9251.00	V	-31.85		
	11101.20	V	---		
	3700.40	Horizontal	-47.87	-13.00	Pass
	5550.60	H	-44.25		
	7400.80	H	-48.36		
	9251.00	H	-45.86		
	11101.20	H	---		
661	3760.00	Vertical	-36.58	-13.00	Pass
	5640.00	V	-47.96		
	7520.00	V	-43.48		
	9400.00	V	-32.52		
	11280.00	V	---		
	3760.00	Horizontal	-48.74	-13.00	Pass
	5640.00	H	-43.53		
	7520.00	H	-47.63		
	9400.00	H	-46.87		
	11280.00	H	---		
810	3819.60	Vertical	-36.36	-13.00	Pass
	5729.40	V	-47.74		
	7639.20	V	-44.52		
	9549.00	V	-31.37		
	11458.80	V	---		
	3819.60	Horizontal	-47.25	-13.00	Pass
	5729.40	H	-43.06		
	7639.20	H	-48.36		
	9549.00	H	-46.86		
	11458.80	H	---		

Remark：

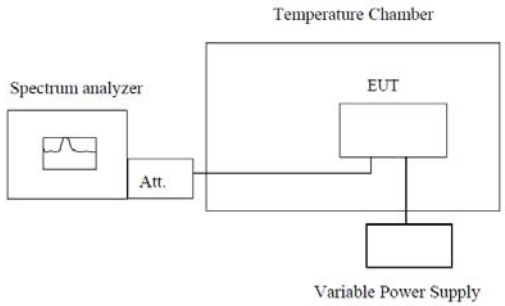
1. The emission behaviour belongs to narrowband spurious emission.
2. Remark”---“ means that the emission level is too low to be measured
3. The emission levels of below 1 GHz are very lower than the limit and not show in test report.

4.8. Frequency stability V.S. Temperature measurement

LIMIT

2.5ppm

TEST CONFIGURATION



Note : Measurement setup for testing on Antenna connector

TEST PROCEDURE

1. The equipment under test was connected to an external DC power supply and input rated voltage.
2. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators.
3. The EUT was placed inside the temperature chamber.
4. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 25℃ operating frequency as reference frequency.
5. Turn EUT off and set the chamber temperature to –30℃. After the temperature stabilized for approximately 30 minutes recorded the frequency.
6. Repeat step measure with 10℃ increased per stage until the highest temperature of +50℃ reached.

TEST RESULTS

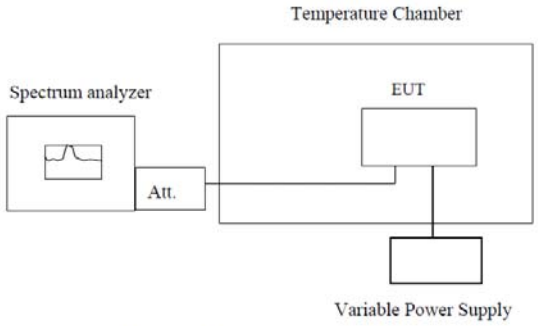
Reference Frequency: GSM850 Middle channel=190 channel=836.6MHz					
Power supplied (Vdc)	Temperature (℃)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
3.70	-30	19	0.023	2.5	Pass
	-20	26	0.031		
	-10	20	0.024		
	0	15	0.018		
	10	32	0.038		
	20	19	0.023		
	30	31	0.037		
	40	25	0.030		
	50	24	0.029		
Reference Frequency: PCS1900 Middle channel=661 channel=1880MHz					
Power supplied (Vdc)	Temperature (℃)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
3.70	-30	29	0.015	2.5	Pass
	-20	19	0.010		
	-10	22	0.012		
	0	26	0.014		
	10	21	0.011		
	20	28	0.015		
	30	27	0.014		
	40	32	0.017		
	50	25	0.013		

4.9. Frequency stability V.S. Temperature measurement

LIMIT

2.5ppm

TEST CONFIGURATION



Note : Measurement setup for testing on Antenna connector

TEST PROCEDURE

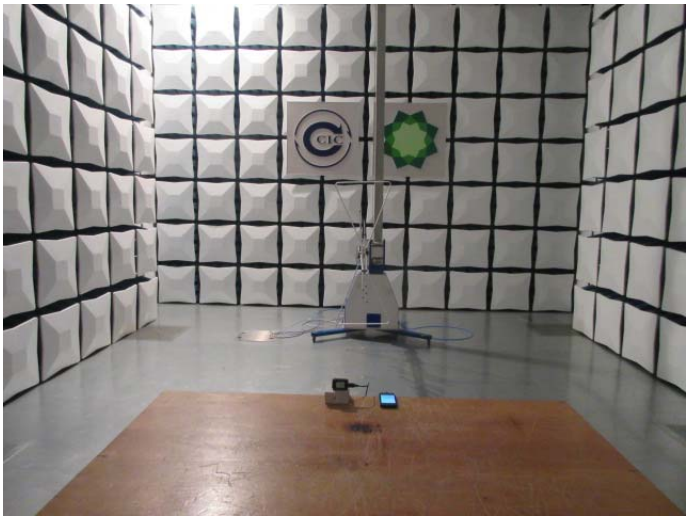
1. Set chamber temperature to 25℃. Use a variable DC power source to power the EUT and set the voltage to rated voltage.
2. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.
3. Reduce the input voltage to specified extreme voltage variation (+/- 15%) and endpoint, record the maximum frequency change.

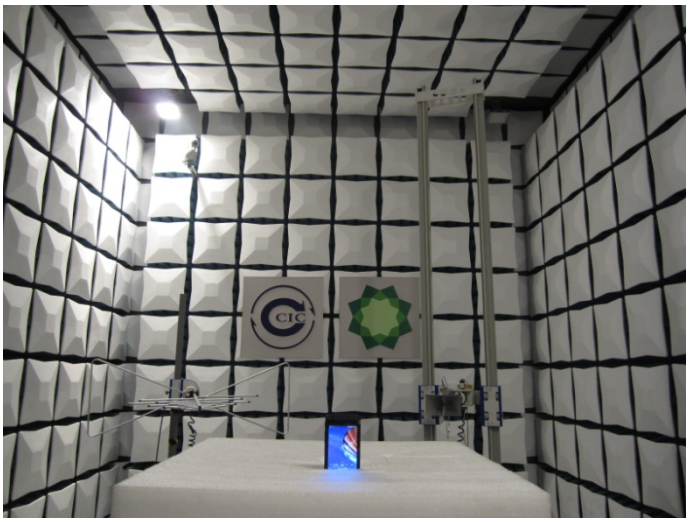
TEST RESULTS

Reference Frequency: GSM850 (GSM link) Middle channel=190 channel=836.6MHz					
Temperature (℃)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	4.25	18	0.022	2.5	Pass
	3.70	22	0.026		
	3.40	26	0.031		
Reference Frequency: PCS1900 (GSM link) Middle channel=661 channel=1880MHz					
Temperature (℃)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	4.25	29	0.015	2.5	Pass
	3.70	19	0.010		
	3.40	25	0.013		

5. Test Setup Photos of the EUT

Radiated emission:





Conducted emission:

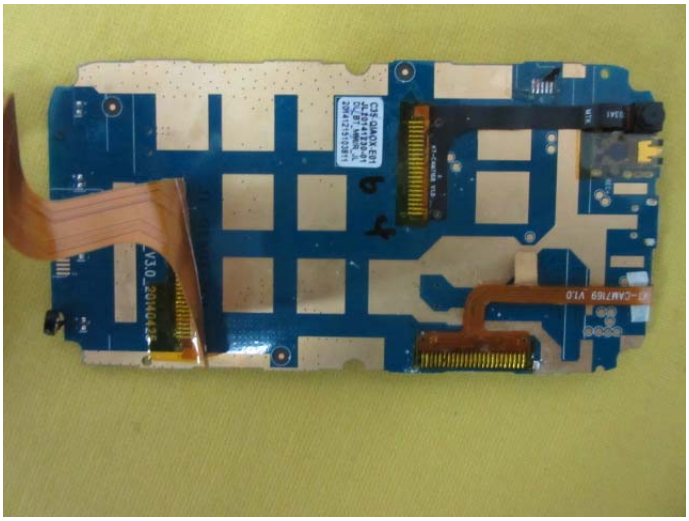
6. External and Internal Photos of the EUT

External photos of the EUT

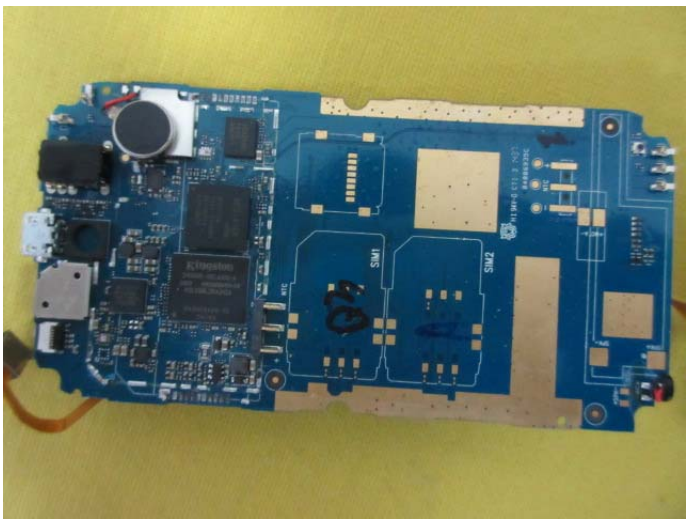

verykool

Internal photos of the EUT


verykool
T-FCARD
SIM2
SIM1
Model:s3502
FCC ID:WA6S3502
IMEI 1:353076071235843
IMEI 2:353076071235850
Made in China
www.verykool.net




verykool
T-FCARD
SIM2
SIM1
Model:s3502
FCC ID:WA6S3502
IMEI 1:353076071235843
IMEI 2:353076071235850
Made in China
www.verykool.net



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