

FCC Report (GSM&WCDMA)

Applicant: Netronix Group.INC
Address of Applicant: 3401 Greys Ferry Avenue Philadelphia, PA 19146
Manufacturer: Shenzhen Hampoo Science & Technology Co., Ltd.
Address of Manufacturer: 21F, Block A, Building 11, the interchange between Keji South Road and Gaoxin South 9th Road, Shenzhen Bay Eco-Technology Park, Nanshan District, Shenzhen, China

Equipment Under Test (EUT)

Product Name: Thiamis
Model No.: 1000
Trade mark: N/A
FCC ID: 2AN9Q-1000
Applicable standards: FCC CFR Title 47 Part 2
FCC CFR Title 47 Part22 Subpart H
FCC CFR Title 47 Part24 Subpart E
Date of sample receipt: October 28, 2018
Date of Test: October 28- December 07, 2018
Date of report issued: December 07, 2018
Test Result : PASS *

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:



Robinson Lo

Laboratory Manager

This results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

1 Version

Version No.	Date	Description
00	December 07, 2018	Original

Prepared By:

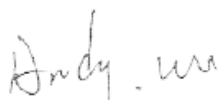


Date:

December 07, 2018

Project Engineer

Check By:



Date:

December 07, 2018

Reviewer

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3 Test Summary

Test Item	Section in CFR 47	Result
RF Exposure (SAR)	Part 1.1307 Part 2.1093	Pass* (Please refer to SAR Report)
RF Output Power	Part 2.1046 Part 22.913 (a)(2) Part 24.232 (c)	Pass
Peak-to-Average Ratio	Part 2.1046 Part 24.232 (d)	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

Pass: The EUT complies with the essential requirements in the standard.

4 General Information

4.1 General Description of EUT

Product Name:	Thiamis
Model No.:	1000
Serial No.:	1018453
Test sample(s) ID:	GTS201807000100-1
Sample(s) Status	Engineer sample
Hardware version:	HV1.0
Software version:	SV1.0
Support Networks:	GPRS, EGPRS, WCDMA
Support Bands:	GSM850, PCS1900, WCDMA Band V
TX Frequency:	GSM850: 824.20MHz-848.80MHz PCS1900: 1850.20MHz-1909.80MHz WCDMA Band V: 826.40MHz -846.60MHz
GPRS Class:	10
EGPRS Class	12
Release	R99
Modulation type:	GPRS: GMSK EGPRS: GMSK/8PSK WCDMA Band V: QPSK
Antenna type:	Integral antenna
Antenna gain:	0dBi
Power supply:	DC12V

Operation Frequency List:

GSM 850		PCS1900		WCDMA Band V	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
128	824.20	512	1850.20	4132	826.40
129	824.40	513	1850.40	4133	826.60
· ∴	· ∴	· ∴	· ∴	· ∴	· ∴
189	836.40	660	1879.80	4181	836.20
190	836.60	661	1880.00	4182	836.40
191	836.80	662	1880.20	4183	836.60
· ∴	· ∴	· ∴	· ∴	· ∴	· ∴
250	848.60	809	1909.60	4232	846.40
251	848.80	810	1909.80	4233	846.60

Regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Final test channel:

GSM 850		PCS1900		WCDMA Band V	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
128	824.20	512	1850.20	4132	826.40
190	836.60	661	1880.00	4183	836.60
251	848.80	810	1909.80	4233	846.60

4.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is filing to comply with Section Part 22 subpart H and Part 24 subpart E of the FCC CFR 47 Rules.

4.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures document on TIA/EIA 603 and FCC CFR 47.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055 and 2.1057

4.4 Test Facility

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

- **FCC —Registration No.: 381383**

Global United Technology Services Co., Ltd., Shenzhen 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 files. Registration 381383, January 08, 2018.

- **Industry Canada (IC) —Registration No.: 9079A-2**

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 9079A-2, August 15, 2016.

4.5 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.

Address: No. 301-309, 3/F., Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102

Tel: 0755-27798480

Fax: 0755-27798960

5 Test Instruments list

Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	July. 03 2015	July. 02 2020
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	June 28 2017	June 27 2019
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June 28 2017	June 27 2019
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	9120D-829	GTS208	June 28 2017	June 27 2019
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	June 28 2017	June 27 2019
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
8	Coaxial Cable	GTS	N/A	GTS213	June 28 2017	June 27 2019
9	Coaxial Cable	GTS	N/A	GTS211	June 28 2017	June 27 2019
10	Coaxial cable	GTS	N/A	GTS210	June 28 2017	June 27 2019
11	Coaxial Cable	GTS	N/A	GTS212	June 28 2017	June 27 2019
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June 28 2017	June 27 2019
13	Amplifier(2GHz-20GHz)	HP	8349B	GTS206	June 28 2017	June 27 2019
14	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June 28 2017	June 27 2019
15	Band filter	Amindeon	82346	GTS219	June 28 2017	June 27 2019
16	Universal radio communication tester	Rohde & Schwarz	CMU200	GTS235	June 28 2017	June 27 2019
17	Signal Generator	Rohde & Schwarz	SML03	GTS236	June 28 2017	June 27 2019
18	Temp. Humidity/ Barometer	Oregon Scientific	BA-888	GTS248	June 28 2017	June 27 2019
19	D.C. Power Supply	Instek	PS-3030	GTS232	NA	NA
20	Splitter	Agilent	11636B	GTS237	June 28 2017	June 27 2019
21	Power meter	Rohde & Schwarz	NRVS	GTS238	June 28 2017	June 27 2019
22	Spectrum Analyzer	Agilent	E4440A	GTS533	June 28 2017	June 27 2019
23	Temp.&Humidity chamber	Chuang wei	GDS-225	GTS005-1	June 28 2017	June 27 2019
24	Highpass filter	Micro-Tronics	HPM50108	GTS549	June 28 2017	June 27 2019
25	Highpass filter	Micro-Tronics	HPM50111	GTS550	June 28 2017	June 27 2019
26	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS588	May 07 2017	May 06 2019

6 System test configuration

6.1 Test mode

During all testing, EUT is in link mode with base station emulator at maximum power level. The spurious emission measurements were carried out in semi-anechoic chamber with 3-meter test range, and EUT is rotated on three test planes to find out the worst emission.

Test modes		
Band	Radiated	Conducted
GSM 850	■ GSM link ■ GPRS 1 link ■ EPRS 1 link	■ GSM link ■ GPRS 1 link ■ EGPRS 1 link
PCS 1900	■ GSM link ■ GPRS 1 link ■ EGPRS 1 link	■ GSM link ■ GPRS 1 link ■ EGPRS 1 link
WCDMA Band V	■ RMC 12.2Kbps link	■ RMC 12.2Kbps link

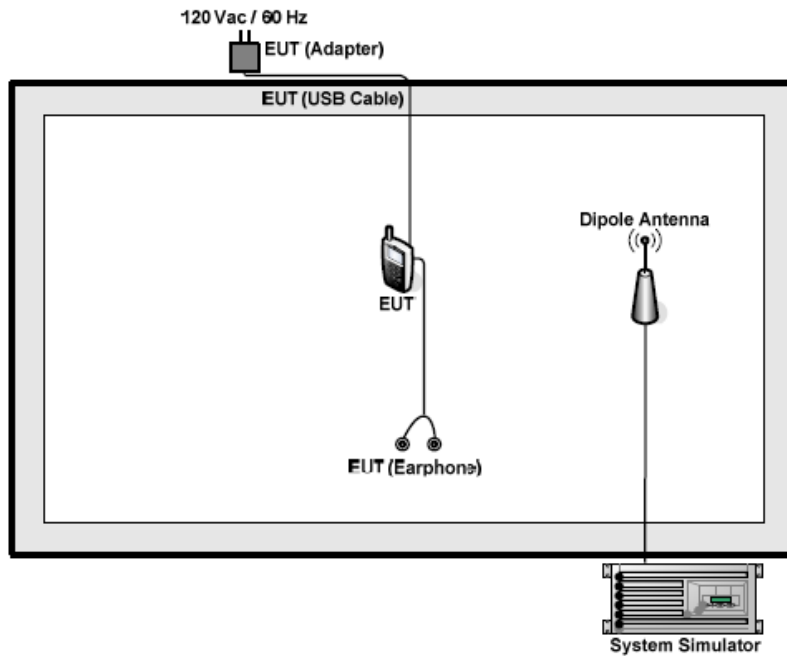
Note: The maximum power levels are GSM mode for GMSK link, GPRS multi-slot class 10 mode for GMSK link, EGPRS multi-slot class 12 mode for 8PSK link, RMC12.2Kbps mode for WCDMA Band V/II. only these modes were used for all tests.

The conducted power tables are as follows:

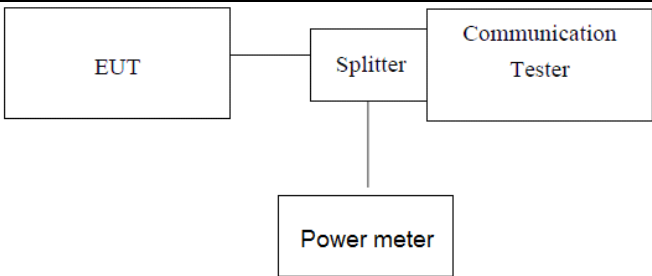
Conducted Power (dBm)						
Band	GSM850			PCS1900		
Channel	128	190	251	512	661	810
Frequency	824.20	836.60	848.80	1850.20	1880.00	1909.80
GPRS (GMSK, 1 TX slot)	33.11	32.72	33.50	28.11	28.96	28.81
GPRS (GMSK, 2 TX slot)	31.08	31.73	31.47	28.12	28.86	28.83
GPRS (GMSK, 3 TX slot)	31.42	31.60	31.88	27.76	27.92	27.69
GPRS (GMSK, 4 TX slot)	28.45	28.19	28.82	26.65	26.74	26.17
EGPRS (8PSK, 1 TX slot)	27.41	26.77	27.46	24.99	24.38	24.54
EGPRS (8PSK, 2 TX slot)	27.26	26.74	27.12	23.17	23.15	22.84
EGPRS (8PSK, 3 TX slot)	25.98	24.98	25.73	22.17	22.41	22.29
EGPRS (8PSK, 4 TX slot)	24.41	24.85	24.08	21.10	21.51	20.58

Conducted Power (dBm)			
Band	WCDMA Band V		
Channel	4132	4183	4233
Frequency	826.4	836.6	846.6
RMC 12.2Kbps	22.57	22.42	22.55
HSDPA Subtest-1	22.04	22.17	22.47
HSDPA Subtest-2	22.41	22.38	22.86
HSDPA Subtest-3	21.78	21.92	21.12
HSDPA Subtest-4	22.25	21.49	21.10
HSUPA Subtest-1	22.42	22.12	22.32
HSUPA Subtest-2	23.41	22.86	21.27
HSUPA Subtest-3	23.48	22.91	22.51
HSUPA Subtest-4	23.46	22.74	21.94
HSUPA Subtest-5	22.51	22.48	22.67
AMR	22.62	21.78	22.55

6.2 Configuration of Tested System



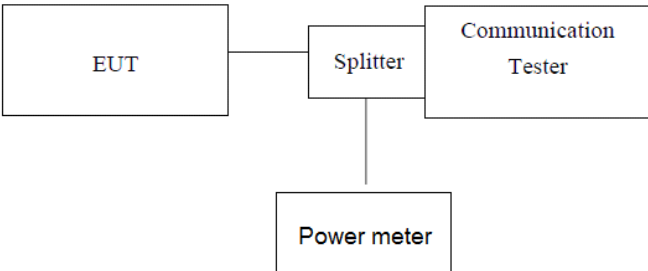
6.3 Conducted Peak Output Power

Test Requirement:	FCC part22.913(a) and FCC part24.232(b)
Test Method:	FCC part2.1046
Limit:	GSM850, WCDMA Band V: 7W PCS1900, WCDMA Band II: 2W
Test setup:	 <i>Note: Measurement setup for testing on Antenna connector</i>
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 peak power.
Test Instruments:	Refer to section 5.0 for details
Test mode:	Refer to section 6.1 for details
Test results:	Pass

Measurement Data

EUT Mode	Channel	Frequency (MHz)	PK power (dBm)	Limit (dBm)	Result
GSM 850 (GPRS 1 link)	128	824.20	35.94	38.45	Pass
	190	836.60	35.44		
	251	848.80	34.97		
GSM 850 (EGPRS 1 link)	128	824.20	31.88	38.45	Pass
	190	836.60	31.25		
	251	848.80	30.26		
PCS 1900 (GSM link)	512	1850.20	32.37	33.01	Pass
	661	1880.00	32.24		
	810	1909.80	32.39		
PCS 1900 (GPRS 1 link)	512	1850.20	32.35	33.01	Pass
	661	1880.00	32.28		
	810	1909.80	32.62		
PCS 1900 (EGPRS 1 link)	512	1850.20	28.51	33.01	Pass
	661	1880.00	28.96		
	810	1909.80	28.16		
WCDMA Band V (RMC 12.2Kbps link)	4132	826.40	26.14	38.45	Pass
	4183	836.60	26.39		
	4233	846.60	26.05		

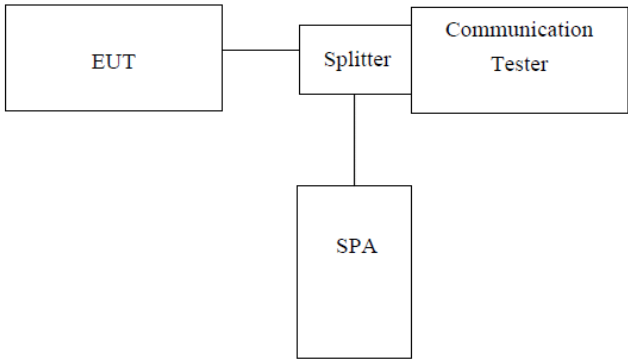
6.4 Peak-to-Average Ratio

Test Requirement:	FCC part24.232(d)
Test Method:	FCC part2.1046
Limit:	13db
Test setup:	 <i>Note: Measurement setup for testing on Antenna connector</i>
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. 6. Record the maximum peak-to-average ratio value.
Test Instruments:	Refer to section 5.0 for details
Test mode:	Refer to section 6.1 for details
Test results:	Pass

Measurement data

Test mode	Peak to Average Ratio (dB)			Limit (dB)	Result
	Low Ch.	Middle Ch.	High Ch.		
WCDMA	5.17	5.29	5.36	13	PASS
GPRS	0.85	0.71	0.77	13	PASS

6.5 Occupy Bandwidth

Test Requirement:	FCC part22.913(a) and FCC part24.232(b)
Test Method:	FCC part2.1049
Test setup:	 <i>Note: Measurement setup for testing on Antenna connector</i>
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 Instruments:	Refer to section 5.0 for details
Test mode:	Refer to section 6.1 for details
Test results:	Pass

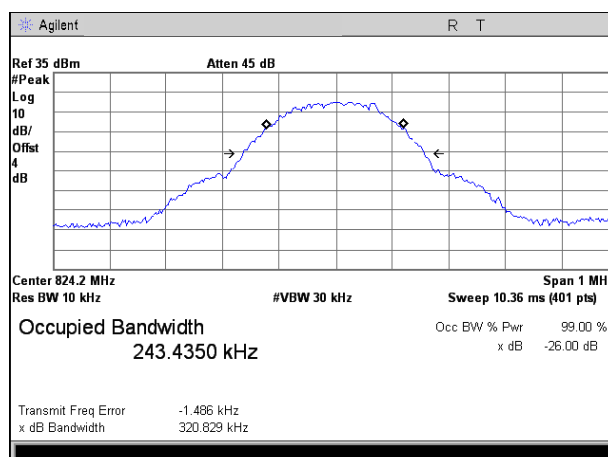
Measurement Data

EUT Mode	Channel	Frequency (MHz)	99% Occupy bandwidth (KHz)	-26dB bandwidth (KHz)
GSM 850 (GPRS 1 link)	128	824.20	243.435	320.829
	190	836.60	244.238	318.408
	251	848.80	245.565	318.404
GSM 850 (EGPRS 1 link)	128	824.20	248.632	324.102
	190	836.60	241.858	320.675
	251	848.80	249.164	318.182
PCS 1900 (GPRS 1 link)	512	1850.20	246.639	324.536
	661	1880.00	245.427	319.614
	810	1909.80	245.843	317.283
PCS 1900 (EGPRS 1 link)	512	1850.20	246.626	322.447
	661	1880.00	247.350	322.804
	810	1909.80	247.192	320.172
WCDMA Band V (RMC 12.2Kbps link)	4132	826.40	4163.7	4695.0
	4183	836.60	4171.5	4696.0
	4233	846.60	4172.5	4697.0

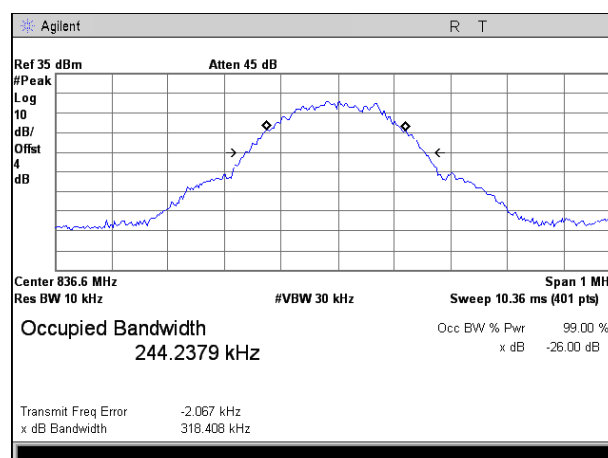
Test plot as follows:

Test band:	GSM 850 (GPRS 1 link)
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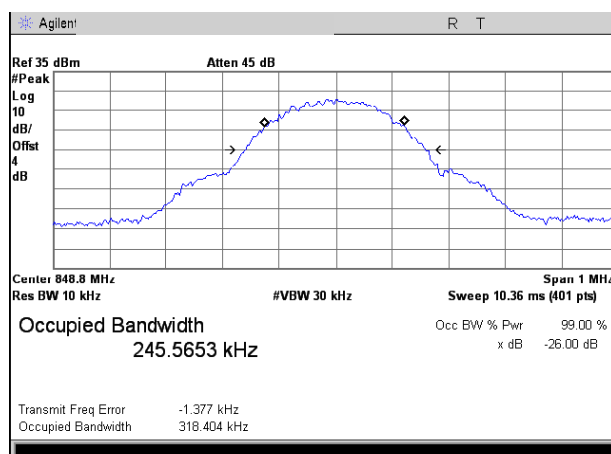
Lowest channel



Middle channel

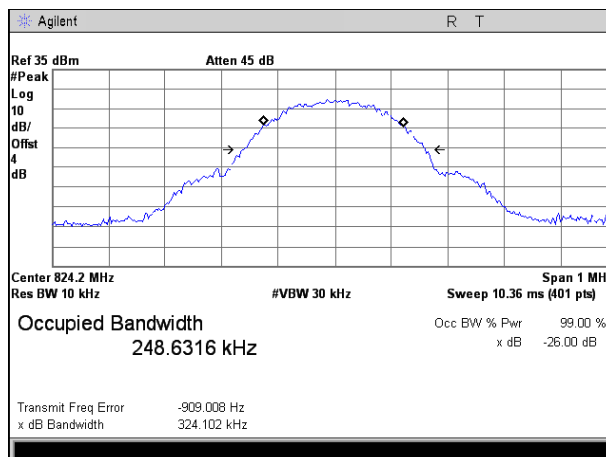


Highest channel

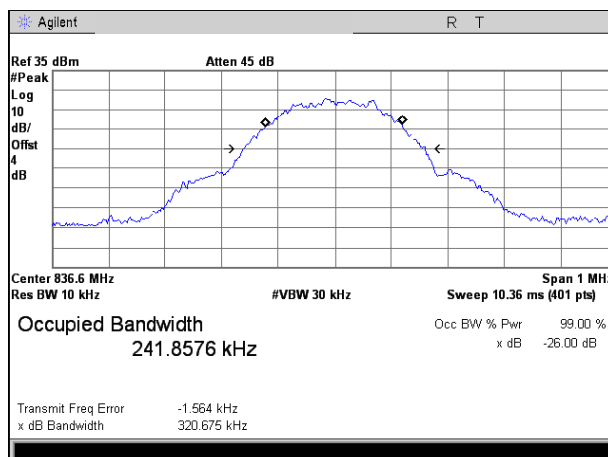


Test band:	GSM 850 (EGPRS 1 link)
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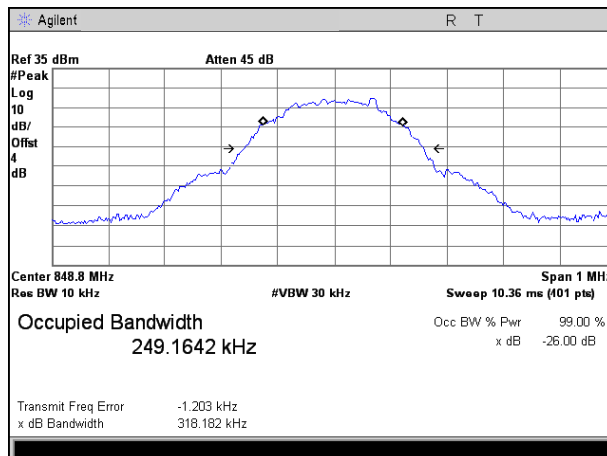
Lowest channel



Middle channel

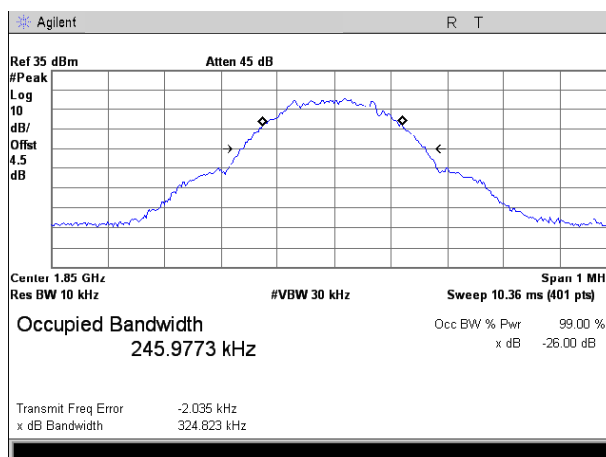


Highest channel

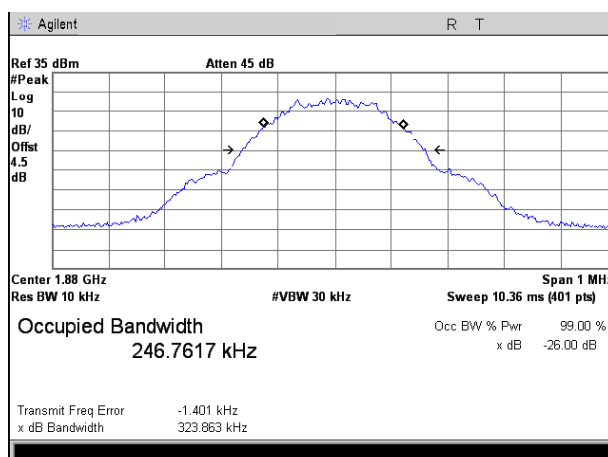


Test band:	PCS 1900 (GSM link)
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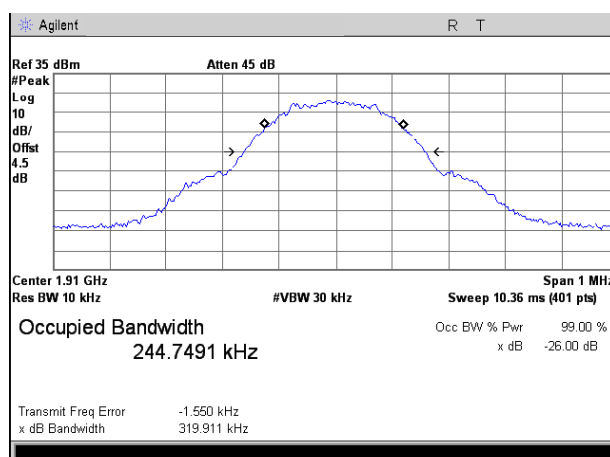
Lowest channel



Middle channel

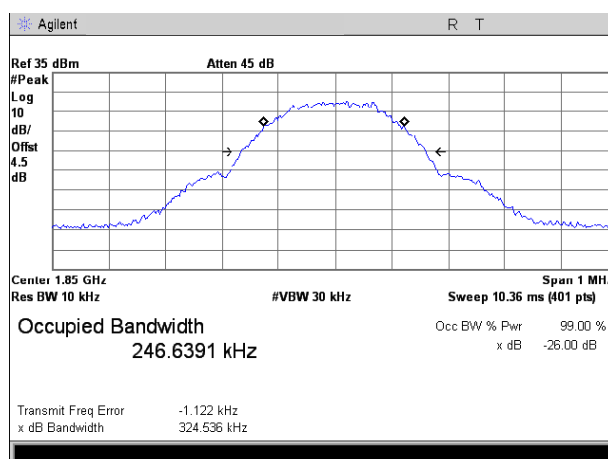


Highest channel

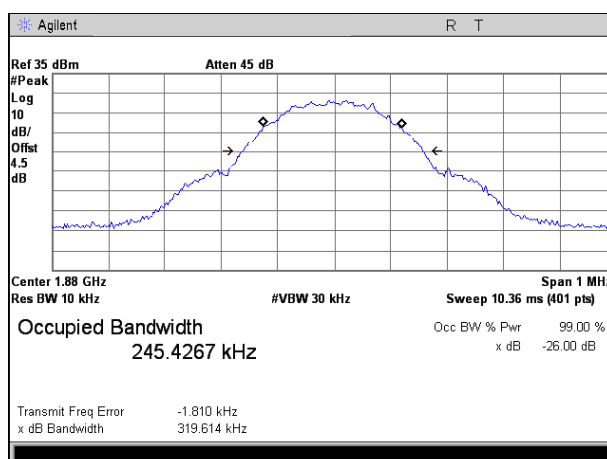


Test band:	PCS 1900 (GPRS 1 link)
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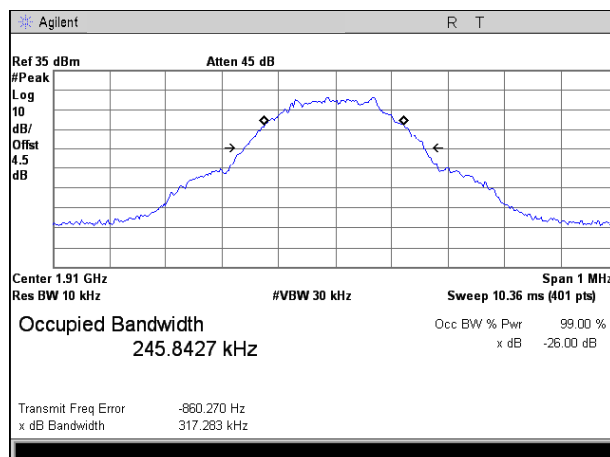
Lowest channel



Middle channel

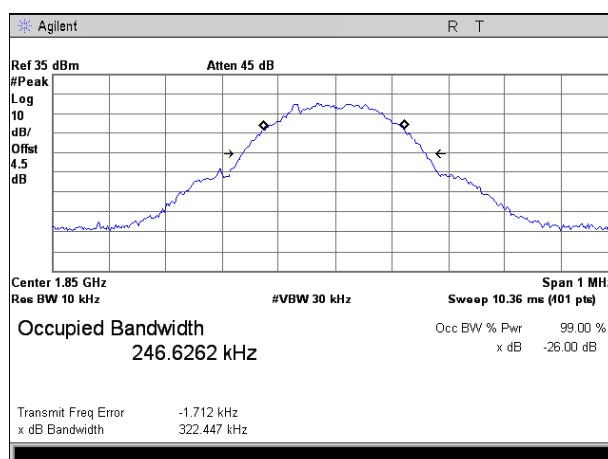


Highest channel

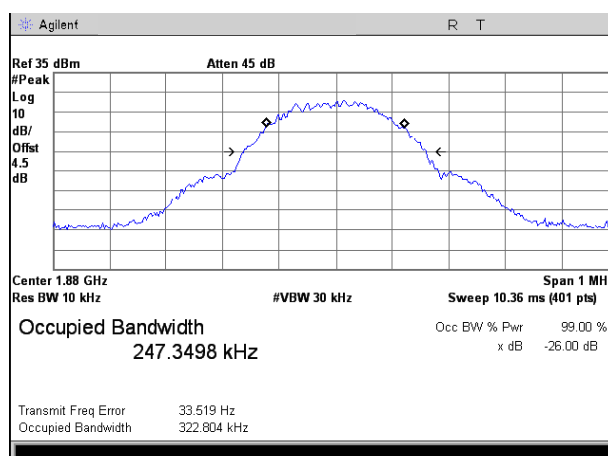


Test band:	PCS 1900 (EGPRS 1 link)
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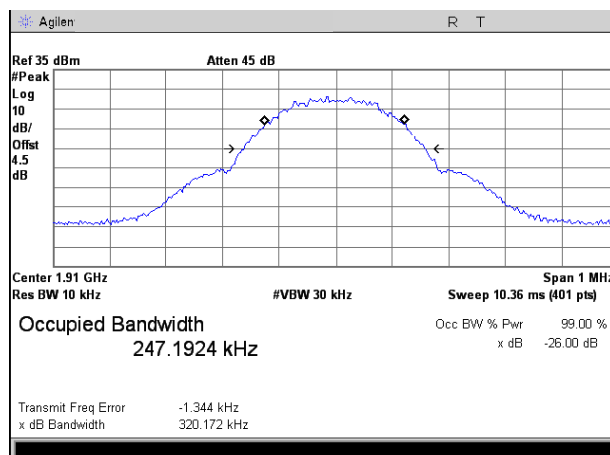
Lowest channel



Middle channel

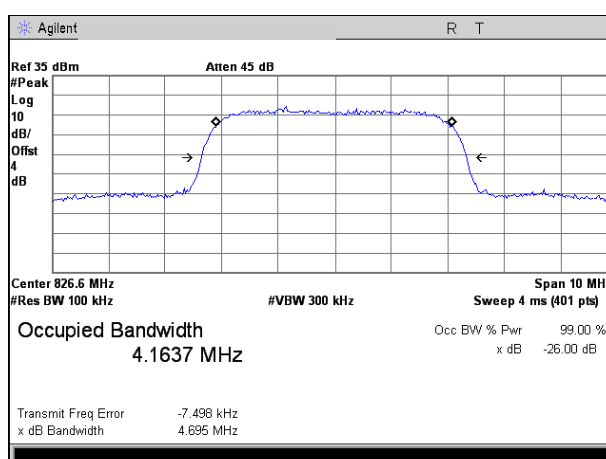


Highest channel

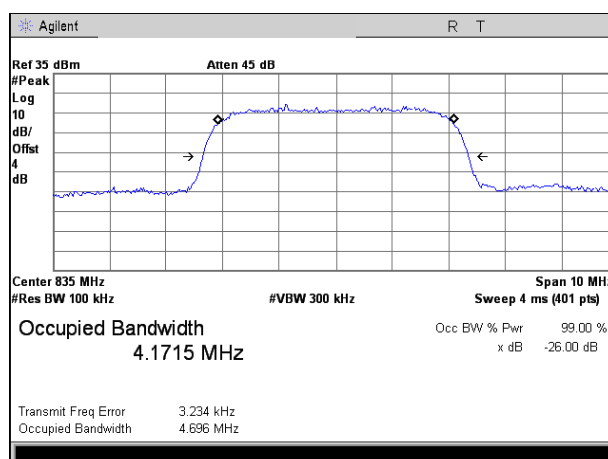


Test band:	WCDMA Band V (RMC 12.2Kbps link)
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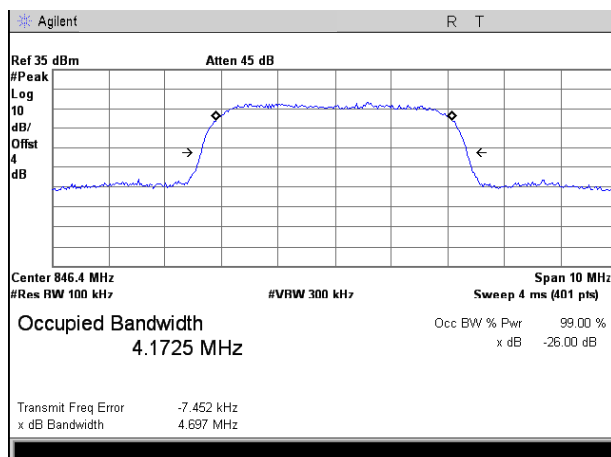
Lowest channel



Middle channel



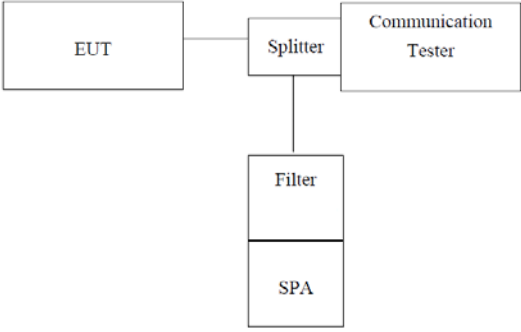
Highest channel



6.6 MODULATION CHARACTERISTIC

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

6.7 Out of band emission at antenna terminals

Test Requirement:	FCC part22.917(a) and FCC part24.238(a)
Test Method:	FCC part2.1051
Limit:	-13dBm
Test setup:	 <i>Note: Measurement setup for testing on Antenna connector</i>
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, VBW = 1MHz, Start=30MHz, Stop= 10th harmonic. 4 Band Edge Requirements: In the 1 MHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 1 percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to measure the out of band Emissions.
Test Instruments:	Refer to section 5.0 for details
Test mode:	Refer to section 6.1 for details
Test results:	Pass

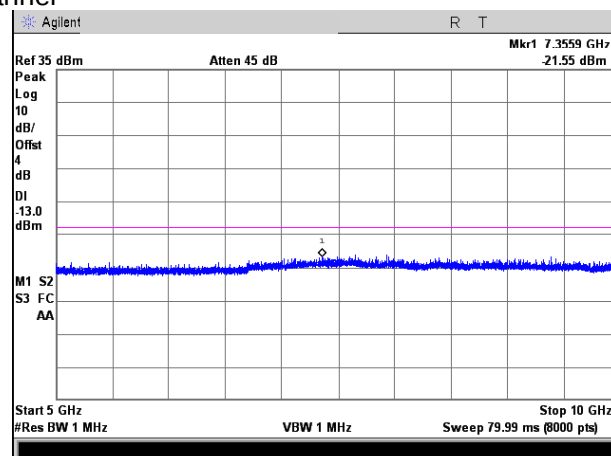
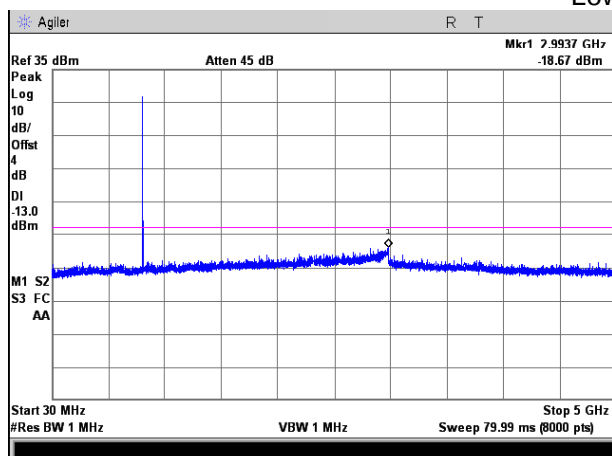
Test plot as follows:

Note: During the conducted spurious emission test, a band filter was used. The information of the filter is reported at section 6.0 (refer to item 24, 25).

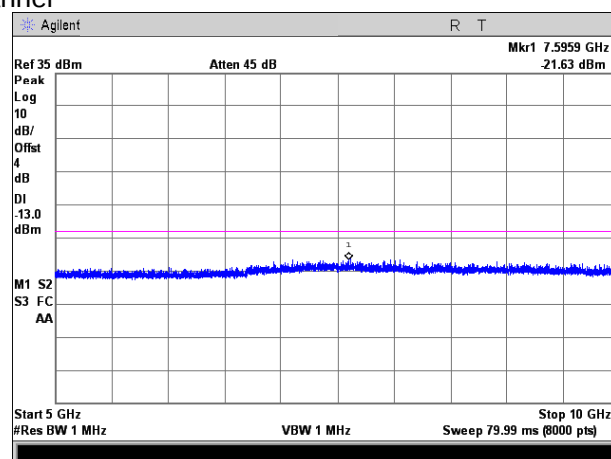
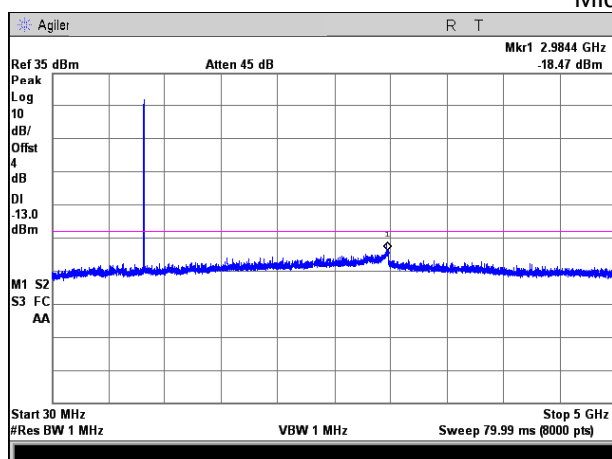
Test Mode: Traffic mode

GSM 850 (GPRS 1 link)

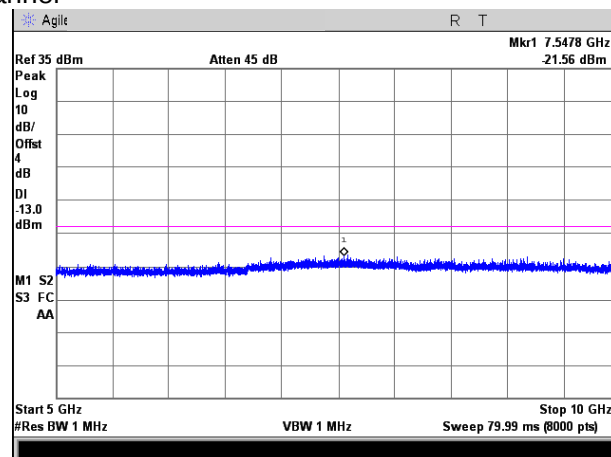
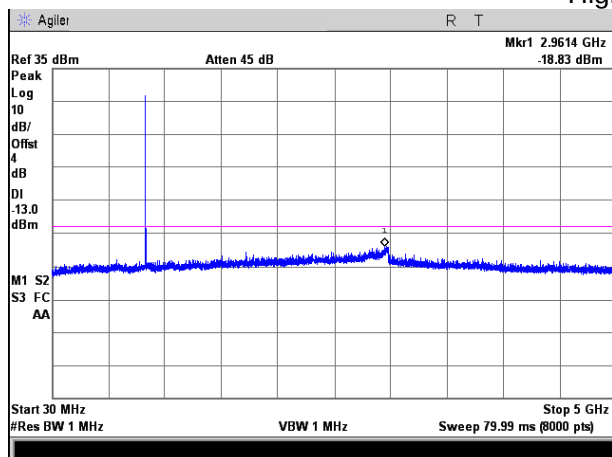
Lowest channel



Middle channel



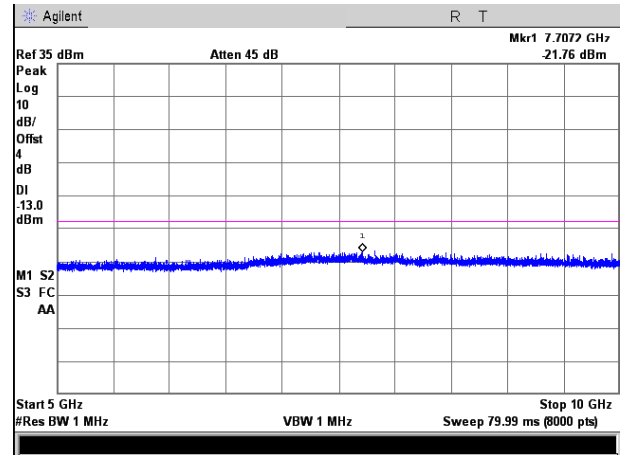
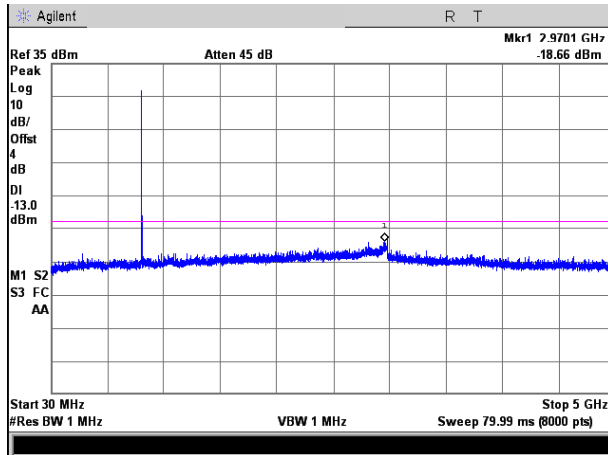
Highest channel



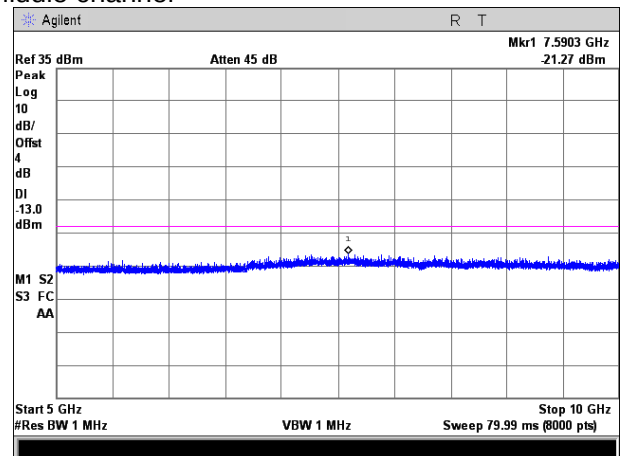
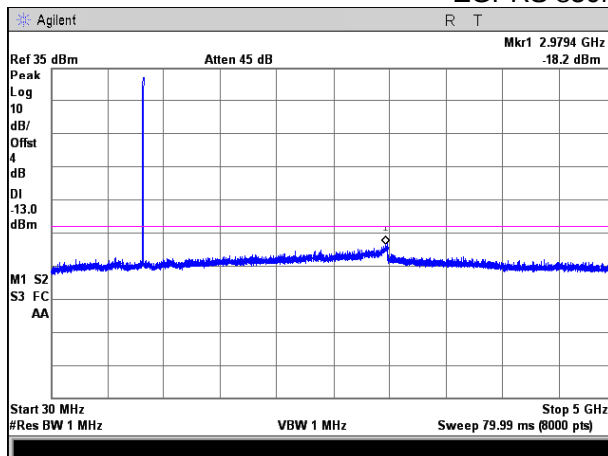
Test Mode: Traffic mode

GSM 850 (EGPRS 1 link)

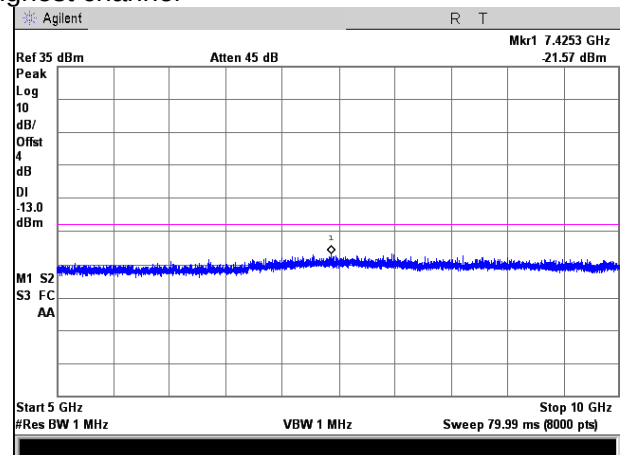
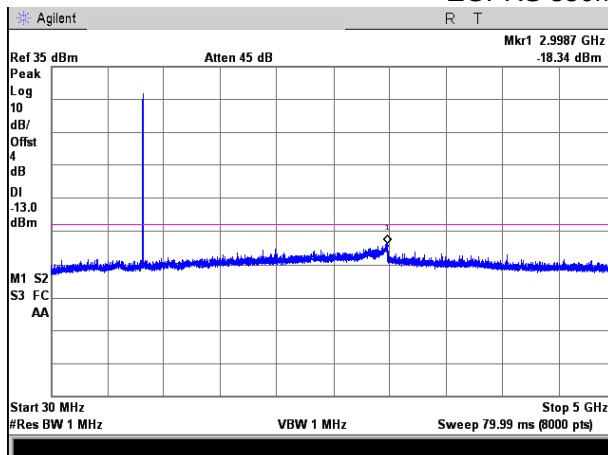
Lowest channel



EGPRS 850MHz Middle channel



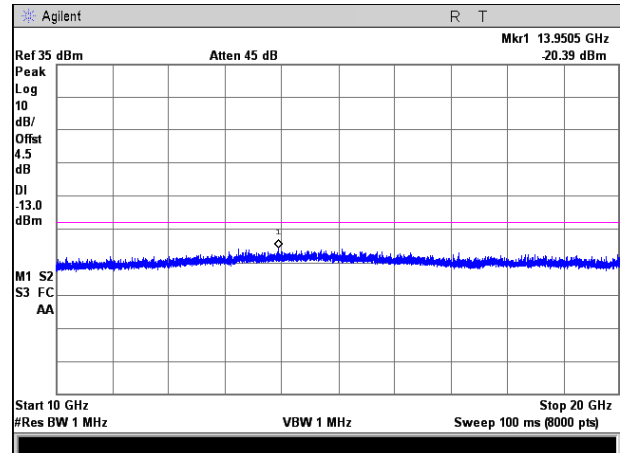
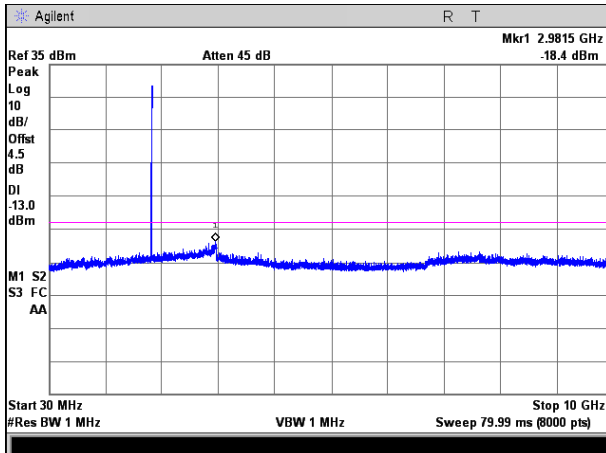
EGPRS 850MHz Highest channel



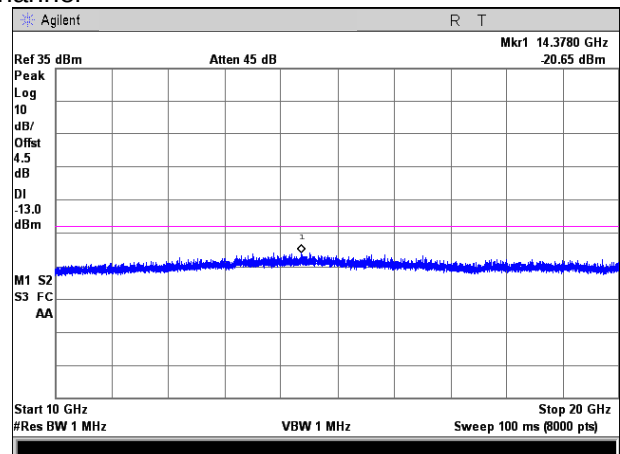
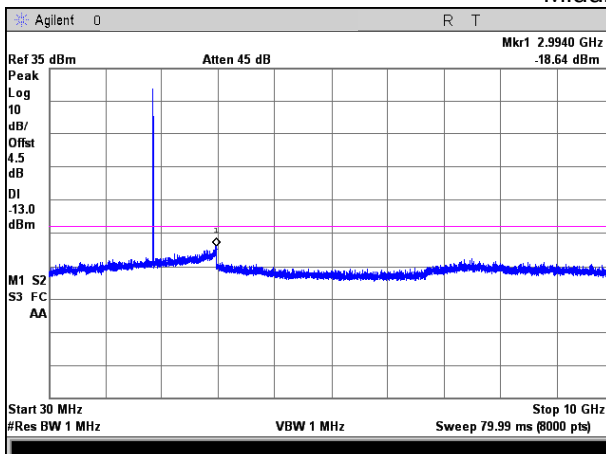
Test Mode: Traffic mode

PCS1900 (GSM link)

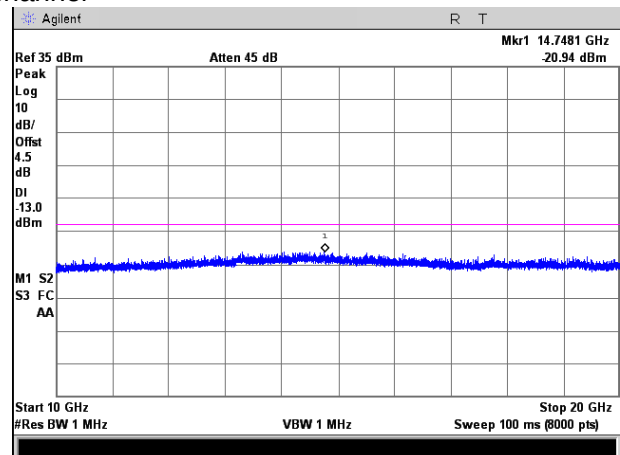
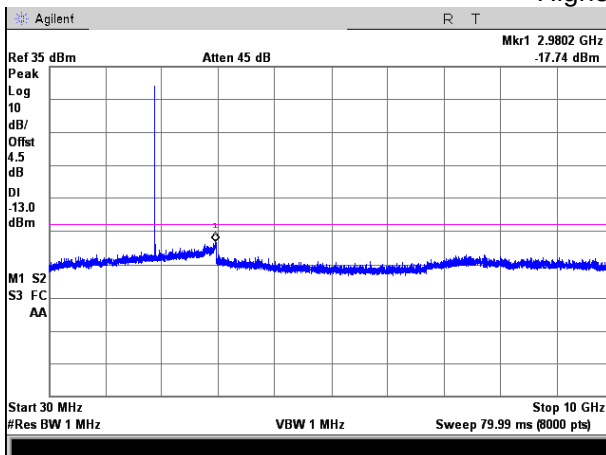
Lowest channel



Middle channel



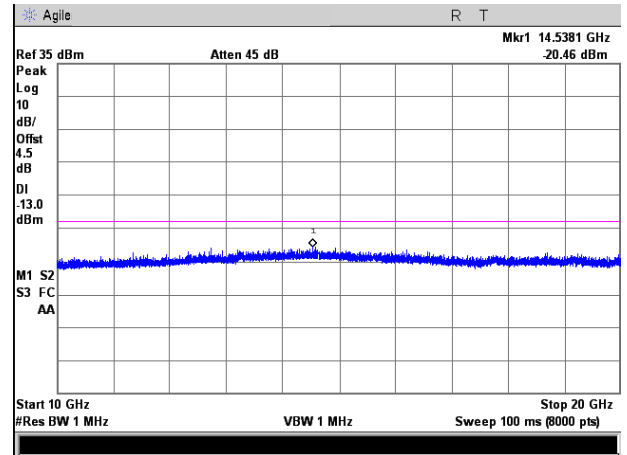
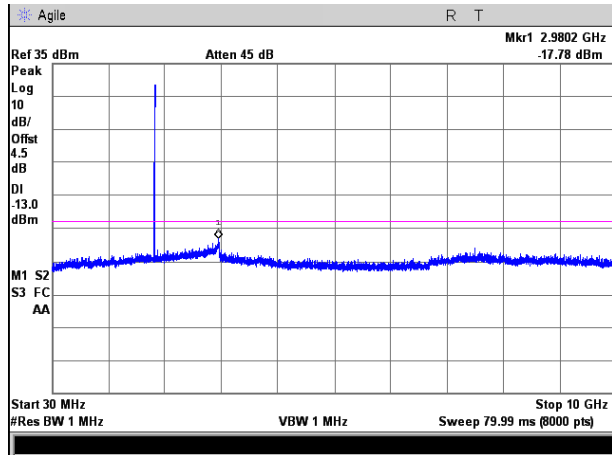
Highest channel



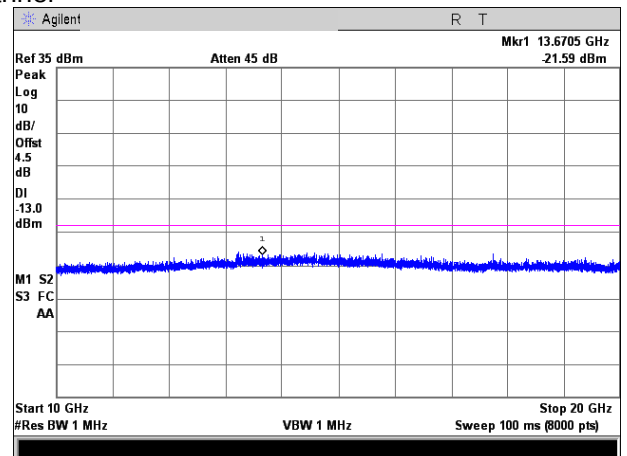
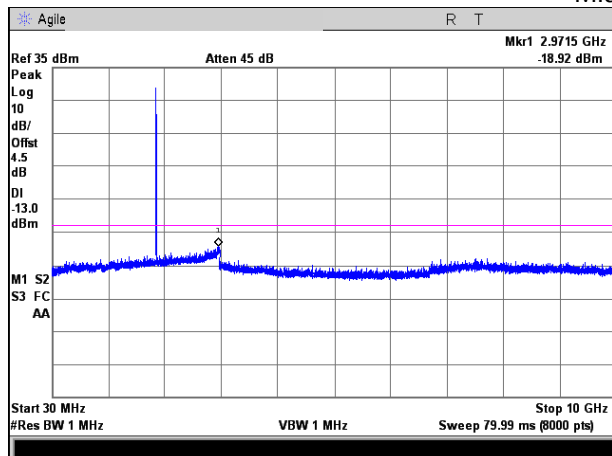
Test Mode: Traffic mode

PCS1900 (GPRS 1 link)

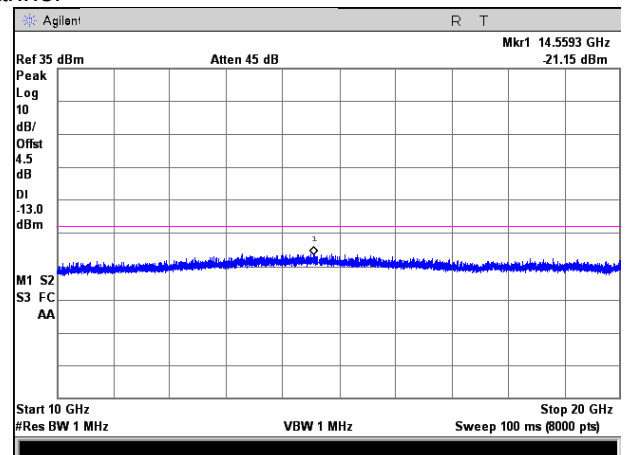
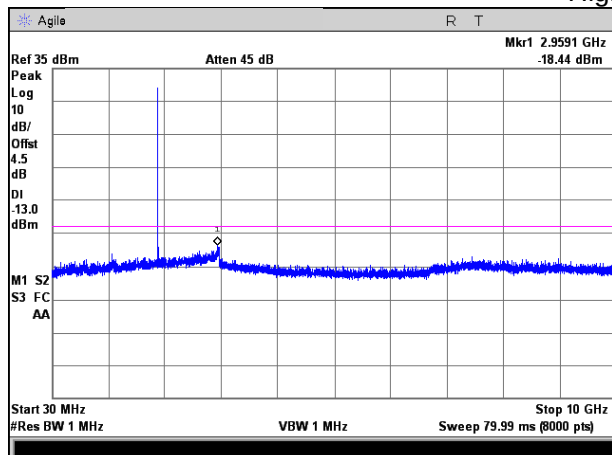
Lowest channel



Middle channel



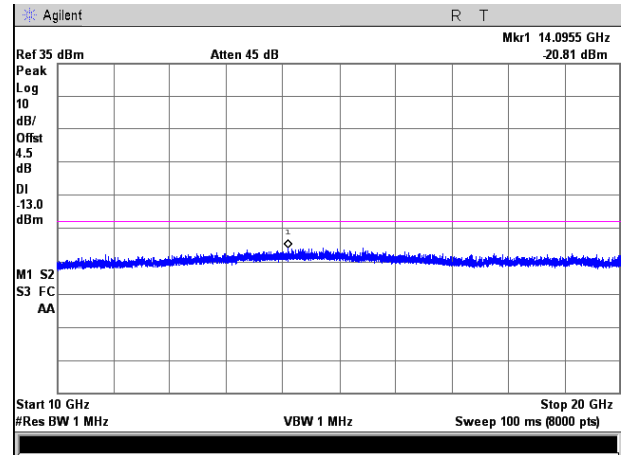
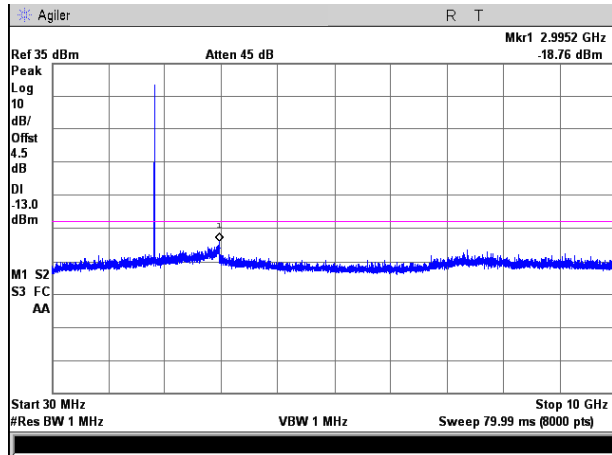
Highest channel



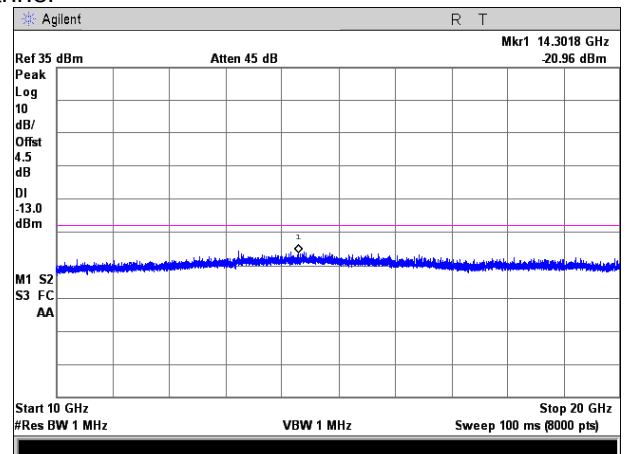
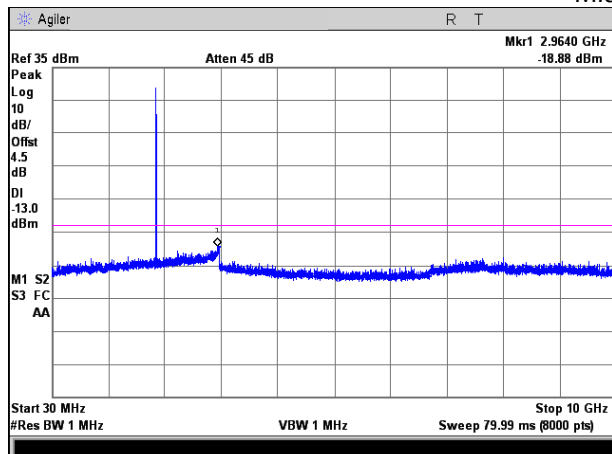
Test Mode: Traffic mode

PCS1900 (EGPRS 1 link)

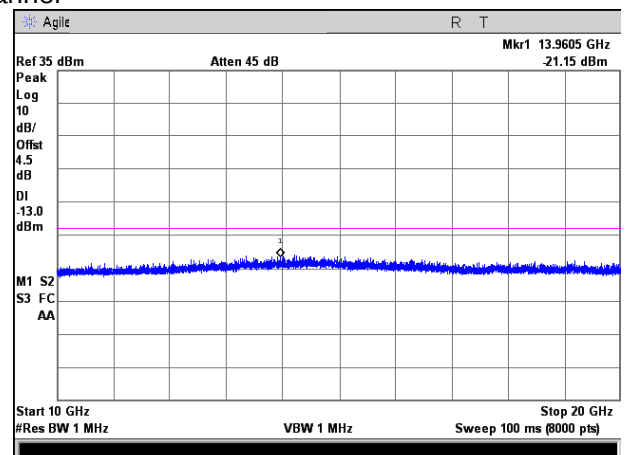
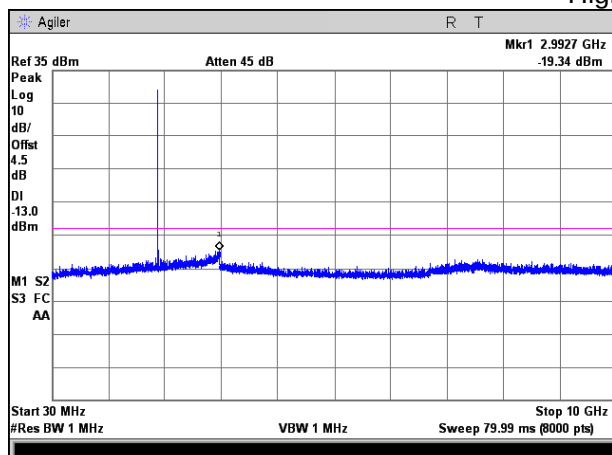
Lowest channel



Middle channel



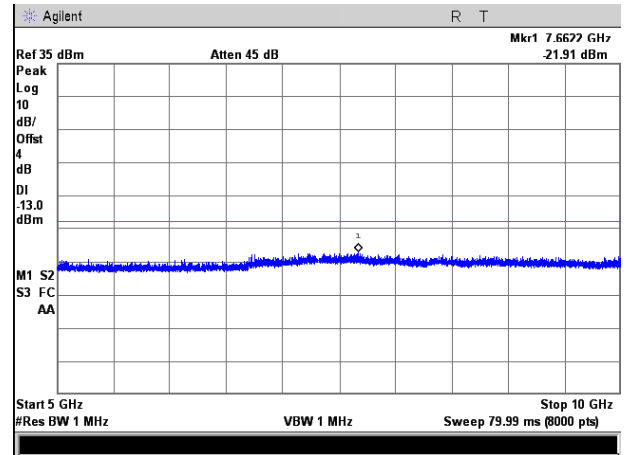
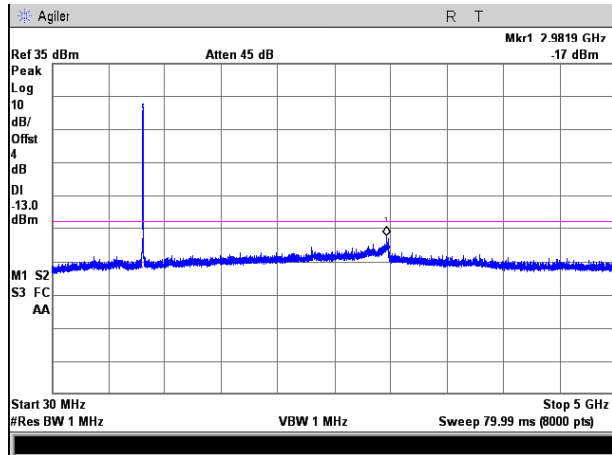
Highest channel



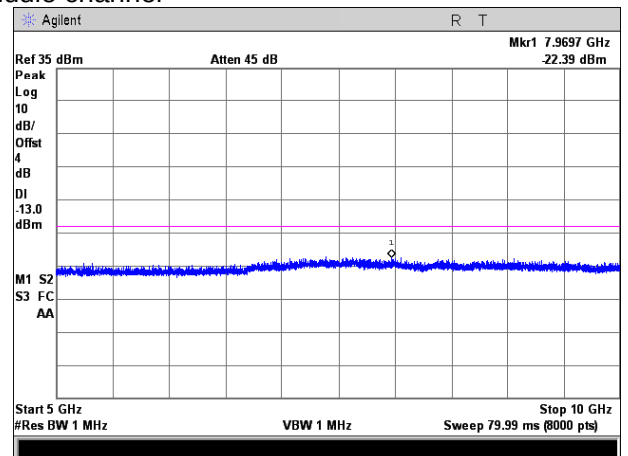
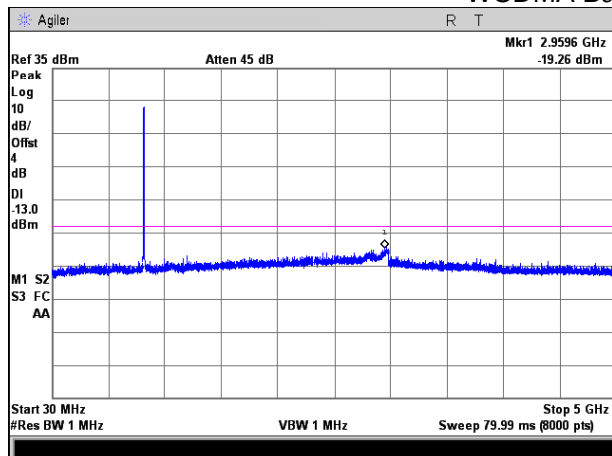
Test Mode: Traffic mode

WCDMA Band V (RMC 12.2Kbps link)

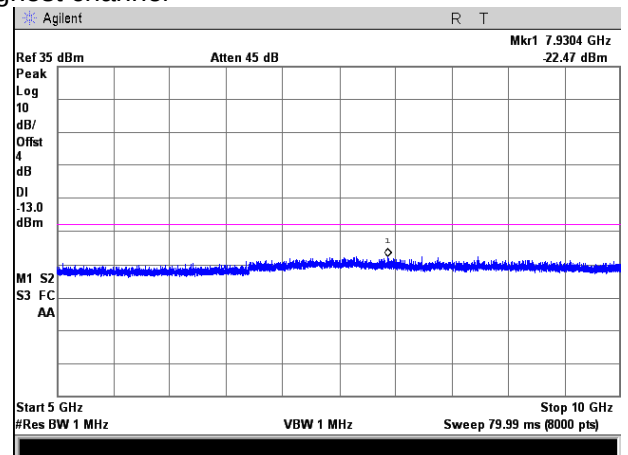
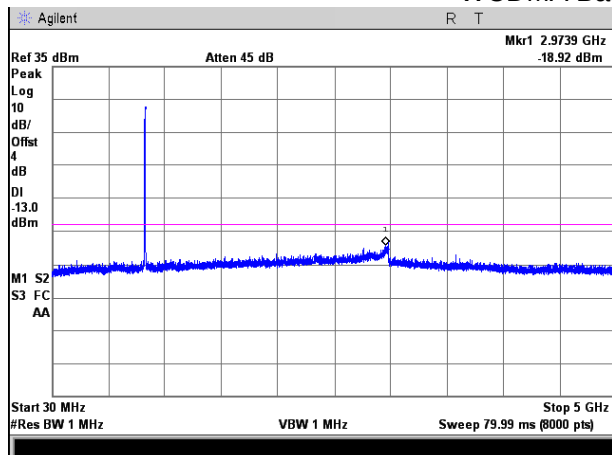
WCDMA Band V Lowest channel



WCDMA Band V Middle channel



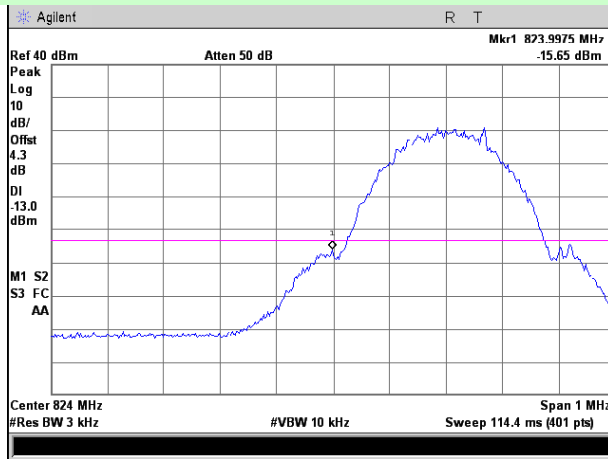
WCDMA Band V Highest channel



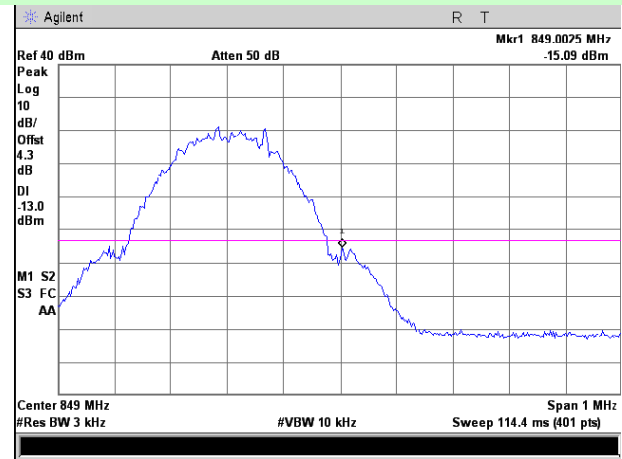
Band Edge:

Test Mode: Traffic mode

GSM850 (GSM link)



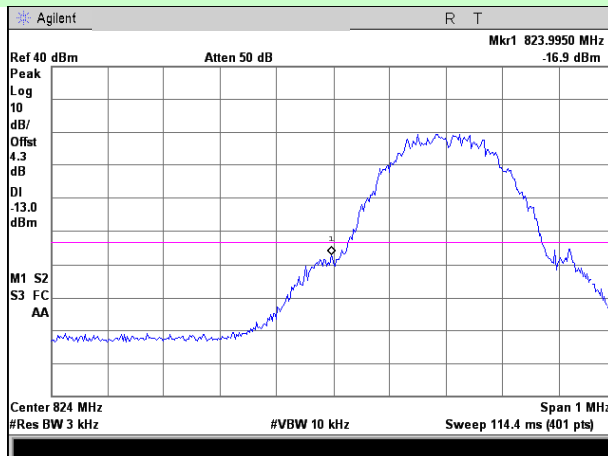
Lowest channel



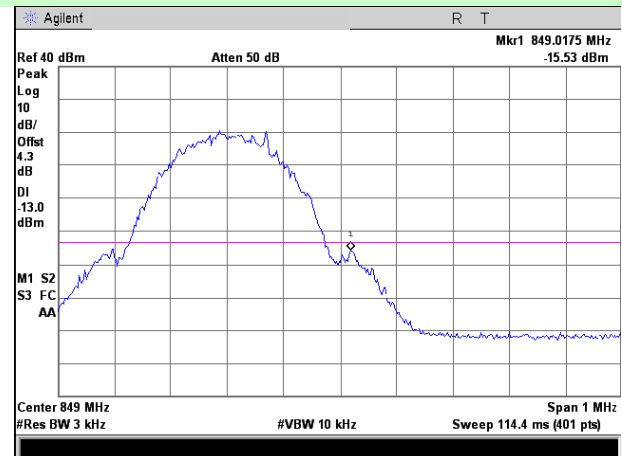
Highest channel

Test Mode: Traffic mode

GSM850 (GPRS 1 link)



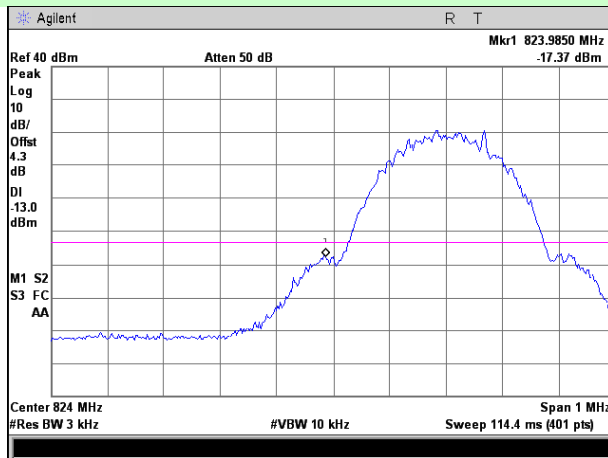
Lowest channel



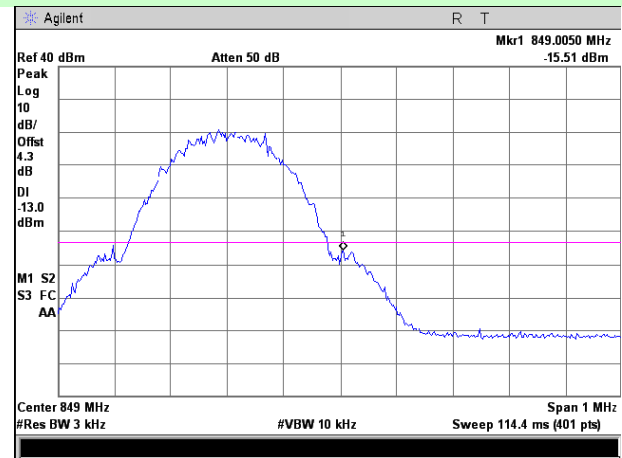
Highest channel

Test Mode: Traffic mode

GSM850 (EGPRS 1 link)



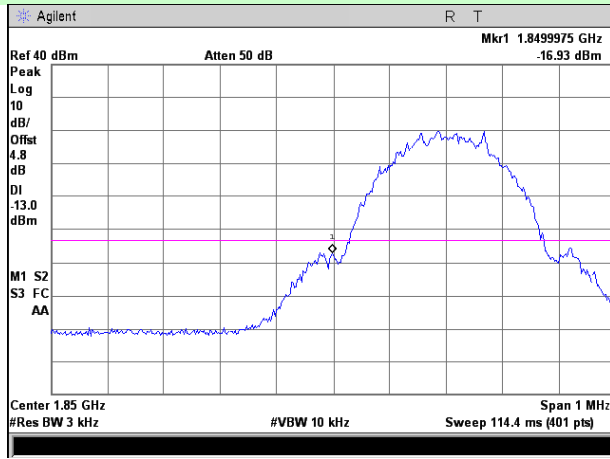
Lowest channel



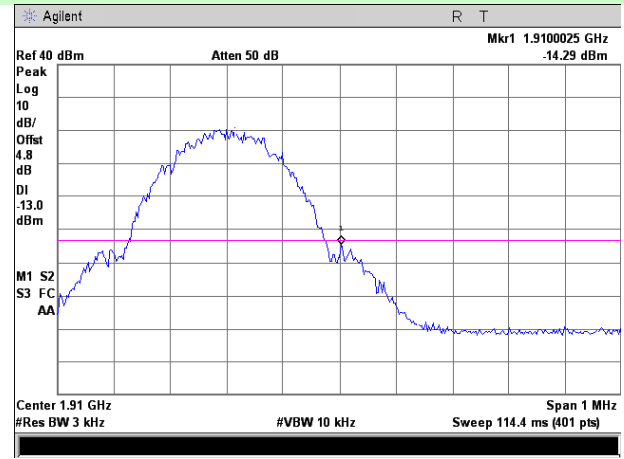
Highest channel

Test Mode: Traffic mode

PCS1900 (GSM link)



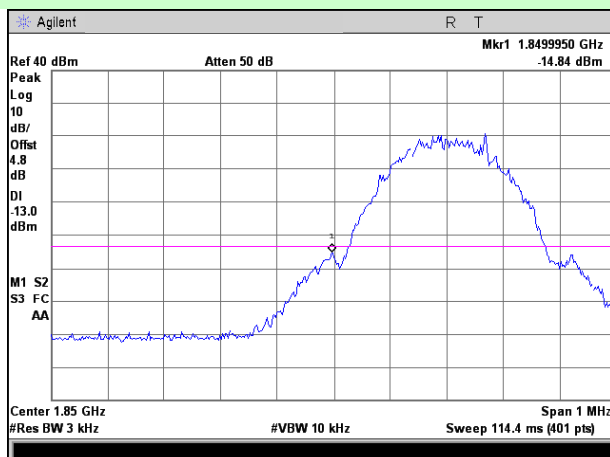
Lowest channel



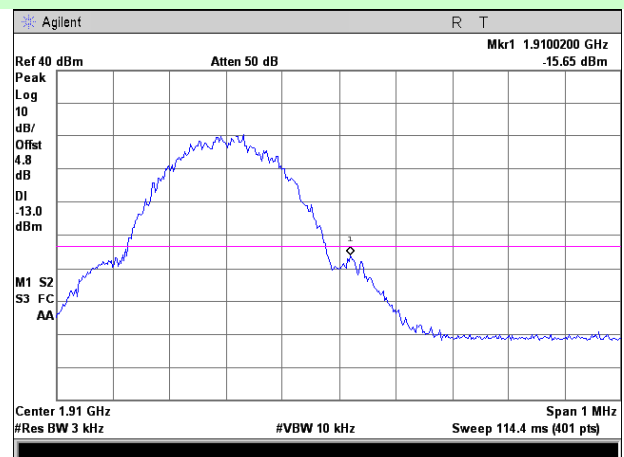
Highest channel

Test Mode: Traffic mode

PCS1900 (GPRS 1 link)



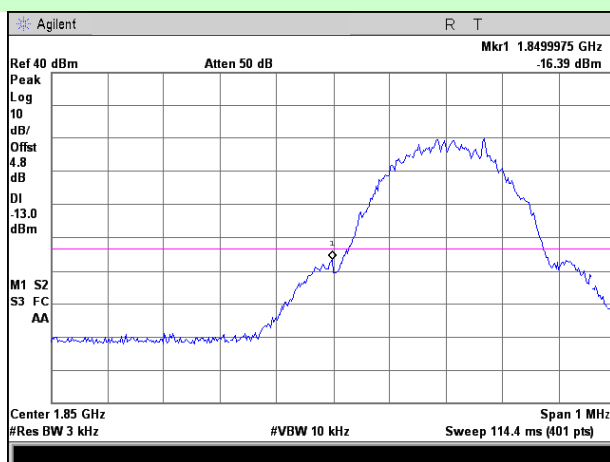
Lowest channel



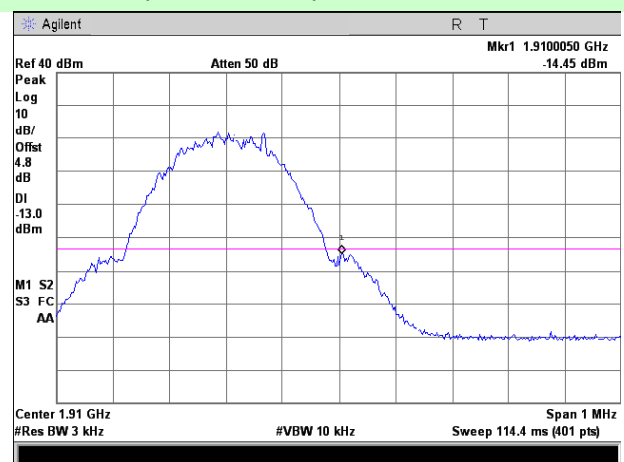
Highest channel

Test Mode: Traffic mode

PCS1900 (EGPRS 1 link)



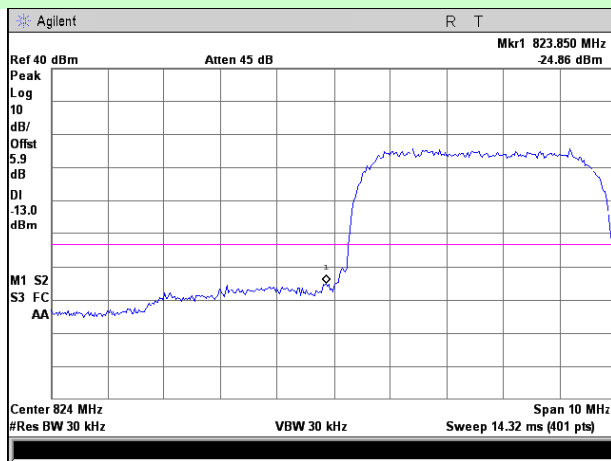
Lowest channel



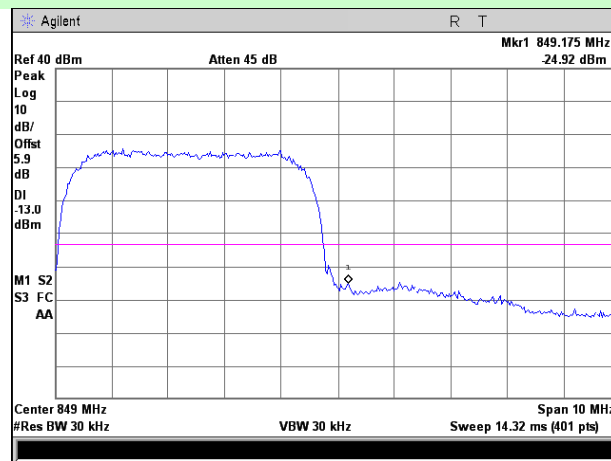
Highest channel

Test Mode: Traffic mode

WCDMA Band V (RMC 12.2Kbps link)

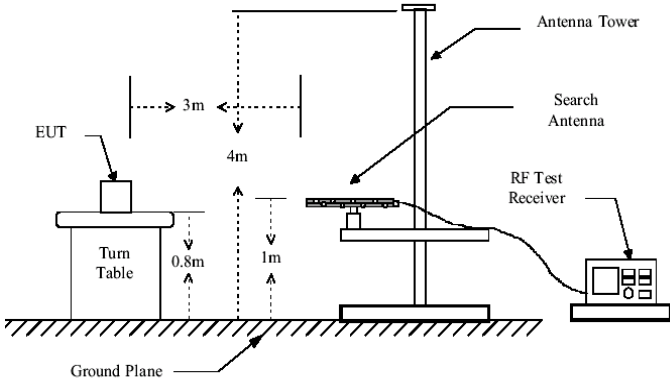
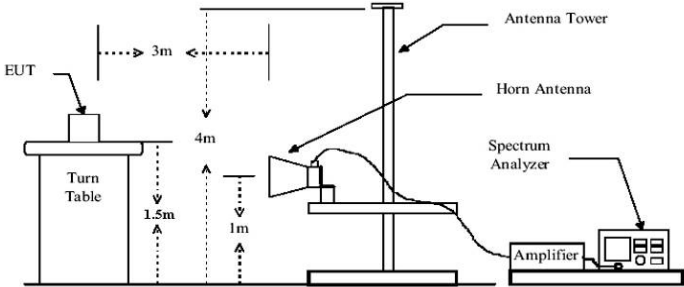
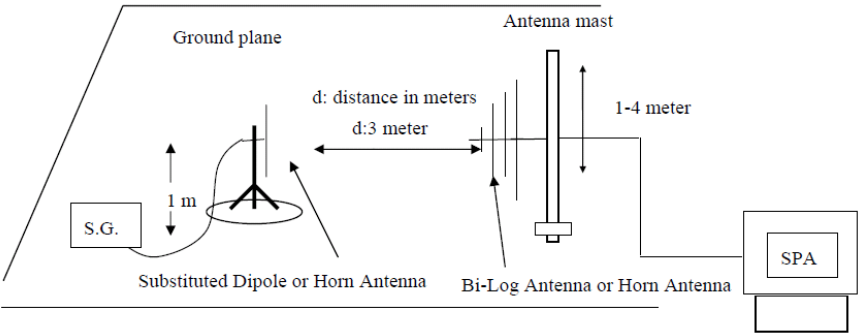


Lowest channel



Highest channel

6.8 ERP, EIRP Measurement

Test Requirement:	FCC part22.913(a) and FCC part24.232(b)
Test Method:	FCC part2.1046
Limit:	GSM850, WCDMA Band V: 7W PCS1900, WCDMA Band II: 2W WCDMA Band IV: 1W
Test setup:	Below 1GHz  Above 1GHz  Substituted method: 

Test Procedure:	1. The EUT was placed on an non-conductive turntable using a non-conductive support. The radiated emission at the fundamental frequency was measured at 3 m with a test antenna and EMI spectrum analyzer. 2. During the measurement, the EUT was communication with the station. The highest emission was recorded with the rotation of the turntable and the lowering of the test antenna from 4m to 1m. The reading was recorded and the field strength (E in dBuV/m) was calculated. 3. ERP in frequency band 824.2 –848.80.8MHz were measured using a substitution method. The EUT was replaced by dipole antenna connected, the S.G. output was recorded and ERP was calculated as follows: $\text{ERP} = \text{S.G. output (dBm)} + \text{Antenna Gain (dBd)} - \text{Cable Loss (dB)}$ 4. EIRP in frequency band 1850.2 –1909.8MHz were measured using a substitution method. The EUT was replaced by or horn antenna connected, the S.G. output was recorded and EIRP was calculated as follows: $\text{EIRP} = \text{S.G. output (dBm)} + \text{Antenna Gain (dBi)} - \text{Cable Loss (dB)}$
Test Instruments:	Refer to section 5.0 for details
Test mode:	Refer to section 6.1 for details
Test results:	Pass

Measurement Data

Remark: All conditions have been considered and test, only the worst case report.

EUT mode	Channel	EUT Pol.	Antenna Pol.	ERP(dBm)	Limit (dBm)	Result
GSM850 (GPRS 1 link)	Lowest	H	V	28.01	38.45	Pass
			H	28.65		
	Middle	H	V	28.76	38.45	Pass
			H	28.04		
	Highest	H	V	28.29	38.45	Pass
			H	28.10		

	S.G. output (dBm)		Antenna gain(dBi)	Cable loss(dB)
Lowest	V	31.56	1.0	4.55
	H	32.20		
Middle	V	32.36	1.0	4.6
	H	31.64		
Highest	V	31.94	1.0	4.65
	H	31.75		

EUT mode	Channel	EUT Pol.	Antenna Pol.	ERP(dBm)	Limit (dBm)	Result
GSM850 (EGPRS 1 link)	Lowest	H	V	26.42	38.45	Pass
			H	23.07		
	Middle	H	V	25.95	38.45	Pass
			H	22.83		
	Highest	H	V	26.17	38.45	Pass
			H	22.86		

	S.G. output (dBm)		Antenna gain(dBi)	Cable loss(dB)
Lowest	V	29.97	1.0	4.55
	H	26.62		
Middle	V	29.55	1.0	4.6
	H	26.43		
Highest	V	29.82	1.0	4.65
	H	26.51		

EUT mode	Channel	EUT Pol.	Antenna Pol.	EIRP (dBm)	Limit (dBm)	Result
PCS1900 (GPRS 1 link)	Lowest	H	V	26.85	33.01	Pass
			H	23.33		
	Middle	H	V	26.18	33.01	Pass
			H	23.52		
	Highest	H	V	26.52	33.01	Pass
			H	23.61		

	S.G. output (dBm)		Antenna gain(dBi)	Cable loss(dB)
Lowest	V	30.73	1.0	4.88
	H	27.21		
Middle	V	30.08	1.0	4.9
	H	27.42		
Highest	V	30.44	1.0	4.92
	H	27.53		

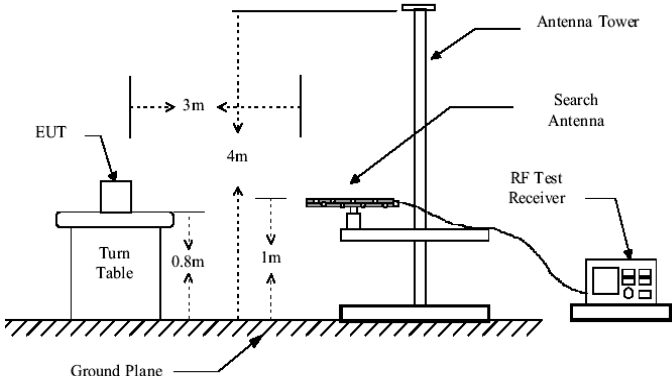
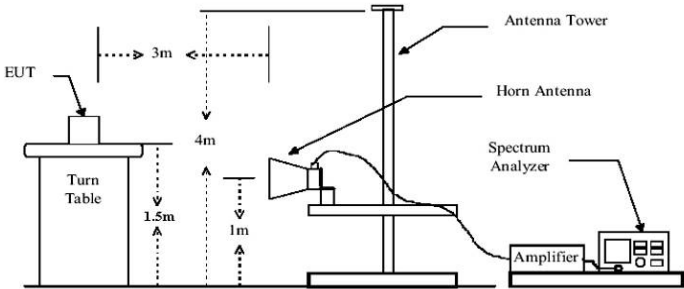
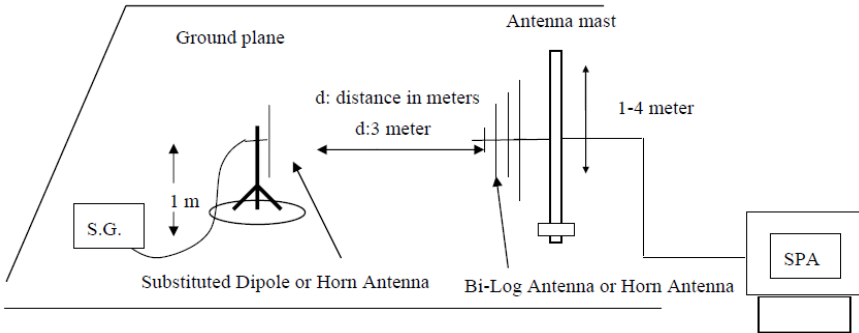
EUT mode	Channel	EUT Pol.	Antenna Pol.	EIRP (dBm)	Limit (dBm)	Result
PCS1900 (EGPRS 1 link)	Lowest	H	V	23.65	33.01	Pass
			H	18.46		
	Middle	H	V	22.78	33.01	Pass
			H	18.80		
	Highest	H	V	22.73	33.01	Pass
			H	18.55		

	S.G. output (dBm)		Antenna gain(dBi)	Cable loss(dB)
Lowest	V	27.53	1.0	4.88
	H	22.34		
Middle	V	26.68	1.0	4.9
	H	22.70		
Highest	V	26.65	1.0	4.92
	H	22.47		

EUT mode	Channel	EUT Pol.	Antenna Pol.	ERP(dBm)	Limit (dBm)	Result
WCDMA Band V	Lowest	H	V	21.16	38.45	Pass
			H	19.91		
	Middle	H	V	20.65	38.45	Pass
			H	19.72		
	Highest	H	V	20.93	38.45	Pass
			H	18.59		

	S.G. output (dBm)		Antenna gain(dBi)	Cable loss(dB)
Lowest	V	24.71	1.0	4.55
	H	23.46		
Middle	V	24.25	1.0	4.6
	H	23.32		
Highest	V	24.58	1.0	4.65
	H	22.24		

6.9 Field strength of spurious radiation measurement

Test Requirement:	FCC part22.917(a) and FCC part24.238(a)
Test Method:	FCC part2.1053
Limit:	-13dBm
Test setup:	Below 1GHz  Above 1GHz  Substituted method: 

Test Procedure:	1. The EUT was placed on an non-conductive turntable using a non-conductive support. The radiated emission at the fundamental frequency was measured at 3 m with a test antenna and EMI spectrum analyzer. 2. During the tests, the antenna height and the EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations. 3. The frequency range up to tenth harmonic was investigated for each of three fundamental frequency (low, middle and high channels). Once spurious emission was identified, the power of the emission was determined using the substitution method. 4. The spurious emissions attenuation was calculated as the difference between radiated power at the fundamental frequency and the spurious emissions frequency. $\text{ERP / EIRP} = \text{S.G. output (dBm)} + \text{Antenna Gain(dB/dBi)} - \text{Cable Loss (dB)}$
Test Instruments:	Refer to section 5.0 for details
Test mode:	Refer to section 6.1 for details
Test results:	Pass

Measurement Data

Test mode:	GSM850		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1648.40	Vertical	-56.16	-13.00	Pass
2472.60	V	-54.95		
3296.80	V	-53.27		
4121.00	V	-51.47		
4945.20	V	-49.59		
1648.40	Horizontal	-55.46	-13.00	Pass
2472.60	H	-54.21		
3296.80	H	-49.87		
4121.00	H	-51.51		
4945.20	H	-48.70		
Test mode:	GSM850		Test channel:	Middle
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1673.20	Vertical	-56.09	-13.00	Pass
2509.80	V	-54.33		
3346.40	V	-52.25		
4183.00	V	-54.04		
5019.60	V	-50.43		
1673.20	Horizontal	-55.47	-13.00	Pass
2509.80	H	-53.68		
3346.40	H	-50.92		
4183.00	H	-52.66		
5019.60	H	-50.05		
Test mode:	GSM850		Test channel:	Highest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1697.60	Vertical	-57.51	-13.00	Pass
2546.40	V	-55.42		
3395.20	V	-52.18		
4244.00	V	-50.79		
5092.80	V	-48.29		
1697.60	Horizontal	-56.38	-13.00	Pass
2546.40	H	-55.27		
3395.20	H	-50.32		
4244.00	H	-51.06		
5092.80	H	-48.92		

Remark :

1. The emission behaviour belongs to narrowband spurious emission.
2. The emission levels of below 1 GHz are very lower than the limit and not show in test report.

Test mode:	PCS1900		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3700.40	Vertical	-57.31	-13.00	Pass
5550.60	V	-53.78		
7400.80	V	-51.57		
9251.00	V	-53.54		
11101.20	V	-49.89		
3700.40	Horizontal	-54.69	-13.00	Pass
5550.60	H	-51.28		
7400.80	H	-52.12		
9251.00	H	-49.93		
11101.20	H	-48.50		
Test mode:	PCS1900		Test channel:	Middle
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3760.00	Vertical	-54.94	-13.00	Pass
5640.00	V	-57.29		
7520.00	V	-53.46		
9400.00	V	-51.37		
11280.00	V	-50.14		
3760.00	Horizontal	-55.61	-13.00	Pass
5640.00	H	-53.04		
7520.00	H	-52.56		
9400.00	H	-52.40		
11280.00	H	-49.23		
Test mode:	PCS1900		Test channel:	Highest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3819.60	Vertical	-56.86	-13.00	Pass
5729.40	V	-53.67		
7639.20	V	-54.22		
9549.00	V	-51.53		
11458.80	V	-47.91		
3819.60	Horizontal	-55.87	-13.00	Pass
5729.40	H	-55.53		
7639.20	H	-53.59		
9549.00	H	-49.46		
11458.80	H	-46.92		

Remark:

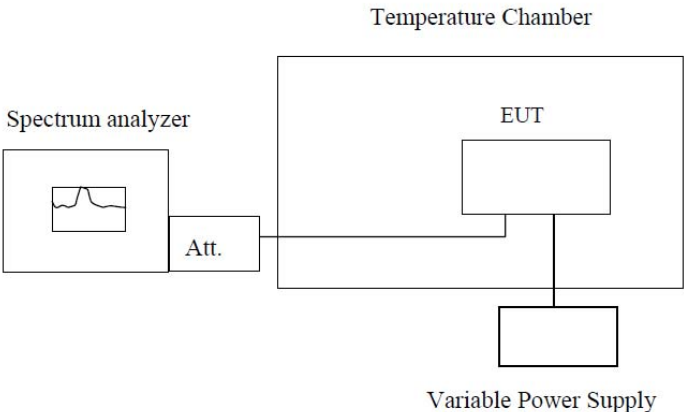
1. The emission behaviour belongs to narrowband spurious emission.
2. The emission levels of below 1 GHz are very lower than the limit and not show in test report.

Test mode:	WCDMA Band V		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1652.80	Vertical	-58.43	-13.00	Pass
2479.20	V	-56.28		
3305.60	V	-53.90		
4132.00	V	-51.76		
4958.40	V	-50.19		
1652.80	Horizontal	-55.15	-13.00	Pass
2479.20	H	-53.93		
3305.60	H	-51.76		
4132.00	H	-50.02		
4958.40	H	-48.12		
Test mode:	WCDMA Band V		Test channel:	Middle
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1672.80	Vertical	-56.68	-13.00	Pass
2509.20	V	-54.72		
3345.60	V	-54.51		
4182.00	V	-52.05		
5018.40	V	-50.86		
1672.80	Horizontal	-56.09	-13.00	Pass
2509.20	H	-52.78		
3345.60	H	-51.62		
4182.00	H	-51.08		
5018.40	H	-48.39		
Test mode:	WCDMA Band V		Test channel:	Highest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1693.20	Vertical	-57.16	-13.00	Pass
2539.80	V	-55.62		
3386.40	V	-53.76		
4233.00	V	-54.59		
5079.60	V	-47.44		
1693.20	Horizontal	-54.85	-13.00	Pass
2539.80	H	-53.92		
3386.40	H	-50.65		
4233.00	H	-51.53		
5079.60	H	-48.71		

Remark :

1. The emission behaviour belongs to narrowband spurious emission.
2. The emission levels of below 1 GHz are very lower than the limit and not show in test report.

6.10 Frequency stability V.S. Temperature measurement

Test Requirement:	FCC Part2.1055(a)(1)(b)
Test Method:	FCC Part2.1055(a)(1)(b)
Limit:	2.5ppm
Test setup:	 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°C operating frequency as reference frequency. 5. Turn EUT off and set the chamber temperature to –20°C. After the temperature stabilized for approximately 30 minutes recorded the frequency. 6. Repeat step measure with 10°C increased per stage until the highest temperature of +50°C reached.
Test Instruments:	Refer to section 5.0 for details
Test mode:	Refer to section 6.1 for details
Test results:	Pass

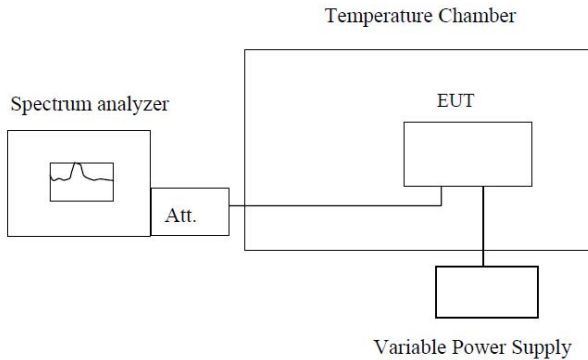
Measurement Data

Reference Frequency: GSM850 (GPRS 1 link) Middle channel=190 channel=836.6MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
12.0	-30	31	0.037	2.5	Pass
	-20	18	0.022		
	-10	26	0.031		
	0	35	0.042		
	10	37	0.044		
	20	28	0.033		
	30	19	0.023		
	40	43	0.051		
	50	26	0.031		
Reference Frequency: GSM850 (EGPRS 1 link) Middle channel=190 channel=836.6MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
12.0	-30	30	0.036	2.5	Pass
	-20	25	0.030		
	-10	36	0.043		
	0	29	0.035		
	10	37	0.044		
	20	22	0.026		
	30	34	0.041		
	40	39	0.047		
	50	43	0.067		

Reference Frequency: PCS1900 (GPRS 1 link) Middle channel=661 channel=1880MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error			Result
		Hz	ppm		
12.0	-30	28	0.015	2.5	Pass
	-20	31	0.017		
	-10	34	0.018		
	0	29	0.015		
	10	37	0.020		
	20	42	0.022		
	30	30	0.016		
	40	18	0.010		
	50	26	0.014		
Reference Frequency: PCS1900 (EGPRS 1 link) Middle channel=661 channel=1880MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error			Result
		Hz	ppm		
12.0	-30	74	0.039	2.5	Pass
	-20	68	0.036		
	-10	52	0.028		
	0	49	0.026		
	10	51	0.027		
	20	63	0.034		
	30	106	0.056		
	40	137	0.073		
	50	122	0.065		

Reference Frequency: WCDMA Band V Middle channel=4183 channel=836.6MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
12.0	-30	51	0.061	2.5	Pass
	-20	36	0.043		
	-10	57	0.068		
	0	48	0.057		
	10	39	0.047		
	20	52	0.062		
	30	27	0.032		
	40	40	0.048		
	50	47	0.056		

6.11 Frequency stability V.S. Voltage measurement

Test Requirement:	FCC Part2.1055(d)(1)(2)
Test Method:	FCC Part2.1055(d)(1)(2)
Limit:	2.5ppm
Test setup:	 Note : Measurement setup for testing on Antenna connector
Test procedure:	1. Set chamber temperature to 25°C. 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 Instruments:	Refer to section 5.0 for details
Test mode:	Refer to section 6.1 for details
Test results:	Pass

Measurement Data

Reference Frequency: GSM850 (GPRS 1 link) Middle channel=190 channel=836.6MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	13.2	27	0.032	2.5	Pass
	12.0	35	0.042		
	10.8	39	0.047		

Reference Frequency: GSM850 (EGPRS 1 link) Middle channel=190 channel=836.6MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	13.2	41	0.049	2.5	Pass
	12.0	36	0.043		
	10.8	38	0.045		

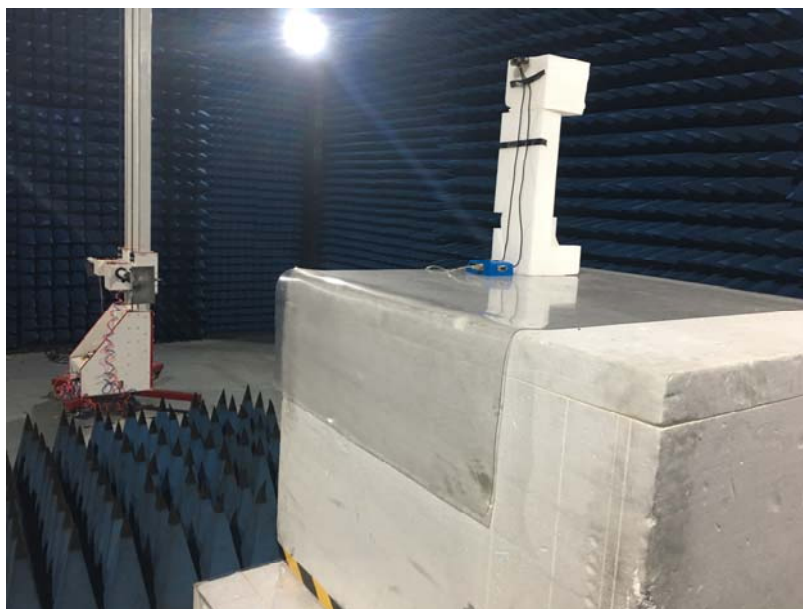
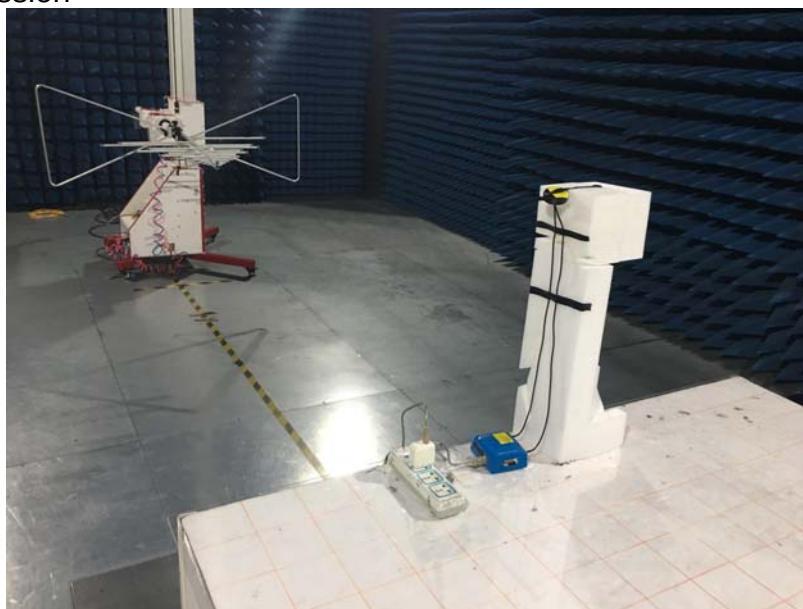
Reference Frequency: PCS1900 (GPRS 1 link) Middle channel=661 channel=1880MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	13.2	46	0.024	2.5	Pass
	12.0	35	0.019		
	10.8	33	0.018		

Reference Frequency: PCS1900 (EGPRS 1 link) Middle channel=661 channel=1880MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	13.2	52	0.028	2.5	Pass
	12.0	75	0.040		
	10.8	73	0.039		

Reference Frequency: WCDMA Band V Middle channel=4183 channel=836.6MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	13.2	58	0.069	2.5	Pass
	12.0	47	0.056		
	10.8	43	0.051		

7 Test Setup Photo

Radiated Emission



8 EUT Constructional Details

Reference to the test report No. GTS201812000044F03

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