FCC REPORT

(GSM & WCDMA)

Applicant:	Shenzhen Topwell Wireless Communication Co Ltd
Address of Applicant:	5F, 10Building,Changyuan New Material Port, No.2, Middle Road 1, High Tech Park, Nanshan District, Shenzhen, China

Equipment Under Test (EUT)

Product Name:	Smart Phone
Model No.:	PH4002
FCC ID:	2AHDDPCDPH4002
Applicable standards:	FCC CFR Title 47 Part 2 FCC CFR Title 47 Part22 Subpart H FCC CFR Title 47 Part24 Subpart E FCC CFR Title 47 Part 27 Subpart L
Date of sample receipt:	26 May, 2016
Date of Test:	26 May, to 17 Jun., 2016
Date of report issued:	17 Jun., 2016
Test Result:	PASS*

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

Authorized Signature:

Bruce Zhang
Laboratory Manager

2. Version

Version No.	Date	Description
00	*17 Jun., 2016*	*Original*

Tested by: Steven Liu ***Date:*** *17 Jun., 2016*

Test Engineer

Reviewed by: Wimer Zhang ***Date:*** *17 Jun., 2016*

Project Engineer

3. Contents

Page

4. 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) Part 27.50 (d)(4)	Pass
Peak-to-Average Power Ratio	Part 24.232 (d)	Pass
Modulation Characteristics	Part 2.1047	Pass
99% & -26 dB Occupied Bandwidth	Part 2.1049 Part 22.917(b) Part 24.238(b) Part 27.53(h)	Pass
Spurious Emissions at Antenna Terminal	Part 2.1051 Part 22.917 (a) Part 24.238 (a) Part 27.53 (h)	Pass
Field Strength of Spurious Radiation	Part 2.1053 Part 22.917 (a) Part 24.238 (a) Part 27.53 (h)	Pass
Out of band emission, Band Edge	Part 22.917 (a) Part 24.238 (a) Part 27.53 (h)	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.

5. General Information

5.1 Client Information

Applicant:	Shenzhen Topwell Wireless Communication Co Ltd
Address of Applicant:	5F, 10Building,Changyuan New Material Port, No.2, Middle Road 1, High Tech Park, Nanshan District, Shenzhen, China
Manufacturer/ Factory:	Shenzhen Topwell Wireless Communication Co Ltd
Address of Manufacturer/ Factory:	5F, 10Building,Changyuan New Material Port, No.2, Middle Road 1, High Tech Park, Nanshan District, Shenzhen, China

5.2 General Description of E.U.T.

Product Name:	Smart Phone
Model No.:	PH4002
Operation Frequency range:	GSM 850: 824.20MHz-848.80MHz PCS1900: 1850.20MHz-1909.80MHz WCDMA Band V:826.4MHz-846.6MHz WCDMA Band II:1852.4 MHz -1907.6 MHz WCDMA Band IV:1712.4 MHz -1752.6 MHz
Modulation type:	GSM/GPRS:GMSK, UMTS:QPSK
Antenna type:	Internal Antenna
Antenna gain:	GSM850:0.5dBi PCS1900:0.5dBi WCDMA Band V:0.79dBi WCDMA Band II:0.79dBi WCDMA Band IV: 0.79dBi
Power supply:	Rechargeable Li-ion Battery DC3.7V-1300mAh
AC adapter:	Model: Q3 Input: AC100-240V 50/60Hz 0.15A Output: DC 5.0V, 0.5A

Operation Frequency List:

GSM 850	
Channel:	Frequency (MHz)
128	824.20
129	824.40
….	….
189	836.40
190	836.60
191	836.80
…	…
250	848.60
251	848.80

PCS1900	
Channel:	Frequency (MHz)
512	1850.20
513	1850.40
….	….
660	1879.80
661	1880.00
662	1880.20
…	…
809	1909.60
810	1909.80

WCDMA Band V	
Channel:	Frequency (MHz)
4132	826.40
4133	826.60
….	….
4182	836.40
4183	836.60
4184	836.80
…	…
4232	846.40
4233	846.60

WCDMA Band II	
Channel:	Frequency (MHz)
9262	1852.40
9263	1852.60
….	….
9399	1879.80
9400	1880.00
9401	1880.20
…	…
9537	1907.40
9538	1907.60

WCDMA Band IV	
Channel:	Frequency (MHz)
1312	1712.40
1313	1712.60
….	….
1412	1732.40
1413	1732.60
1414	1732.80
…	…
1512	1752.40
1513	1752.60

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:

GSM850		
Channel		Frequency(MHz)
Lowest channel	128	824.20
Middle channel	190	836.60
Highest channel	251	848.80

PCS1900		
Channel		Frequency(MHz)
Lowest channel	512	1850.20
Middle channel	661	1880.00
Highest channel	810	1909.80

WCDMA Band V		
Channel		Frequency(MHz)
Lowest channel	4132	826.40
Middle channel	4183	836.60
Highest channel	4233	846.60

WCDMA Band II		
Channel		Frequency(MHz)
Lowest channel	9262	1852.40
Middle channel	9400	1880.00
Highest channel	9538	1907.60

WCDMA Band IV		
Channel		Frequency(MHz)
Lowest channel	1312	1712.40
Middle channel	1413	1732.60
Highest channel	1513	1752.60

5.3 Test modes

Voice mode	Keep the EUT in voice mode on GSM850 and PCS 1900 respectively.
Data mode (GPRS)	Keep the EUT in GPRS mode on GSM850 and PCS 1900 respectively.
Voice mode (AMR 12.2 kbps)	Keep the EUT in voice mode on WCDMA Band II, IV and V respectively.
Data mode (RMC 12.2kbps)	Keep the EUT in RMC on WCDMA Band II, IV and V respectively.
Data mode (HSDPA Subtest 1~4)	Keep the EUT in HSDPA mode on WCDMA Band II, IV and V respectively.
Data mode (HSUPA Subtest 1~5)	Keep the EUT in HSUPA mode on WCDMA Band II, IV and V respectively.
Remark:	Just the worst case mode shown in report.

5.4 Measurement Uncertainty

Items	Expanded Uncertainty (Confidence of 95%)
Conducted Emission (9kHz ~ 30MHz)	2.14 dB (k=2)
Radiated Emission (9kHz ~ 30MHz)	4.24 dB (k=2)
Radiated Emission (30MHz ~ 1000MHz)	4.35 dB (k=2)
Radiated Emission (1GHz ~ 18GHz)	4.44 dB (k=2)
Radiated Emission (18GHz ~ 26.5GHz)	4.56 dB (k=2)

5.5 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 and Part 27 subpart L of the FCC CFR 47 Rules.

5.6 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

5.7 Laboratory Facility

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

● **FCC - Registration No.: 817957**

Shenzhen Zhongjian Nanfang Testing 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 out files. Registration 817957, February 27, 2012.

● **IC - Registration No.: 10106A-1**

The 3m Semi-anechoic chamber of Shenzhen Zhongjian Nanfang Testing Co., Ltd. has been Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 10106A-1.

● **CNAS - Registration No.: CNAS L6048**

Shenzhen Zhongjian Nanfang Testing Co., Ltd. is accredited to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration laboratories for the competence of testing. The Registration No. is CNAS L6048.

5.8 Laboratory Location

Shenzhen Zhongjian Nanfang Testing Co., Ltd.
Address: No.B-C, 1/F., Building 2, Laodong No.2 Industrial Park, Xixiang Road,
Bao'an District, Shenzhen, Guangdong, China
Tel: +86-755-23118282
Fax: +86-755-23116366

5.9 Test Instruments list

Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
3m Semi- Anechoic Chamber	SAEMC	9(L)*6(W)* 6(H)	CCIS0001	08-23-2014	08-22-2017
BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	CCIS0005	03-25-2016	03-25-2017
Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA9120D	CCIS0006	03-25-2016	03-25-2017
EMI Test Software	AUDIX	E3	N/A	N/A	N/A
Amplifier (10kHz-1.3GHz)	HP	8447D	CCIS0003	04-01-2016	03-31-2017
Amplifier (1GHz-18GHz)	Compliance Direction Systems Inc.	PAP-1G18	CCIS0011	04-01-2016	03-31-2017
Pre-amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	04-01-2016	03-31-2017
Horn Antenna	ETS-LINDGREN	3160	GTS217	04-01-2016	03-31-2017
Printer	HP	HP LaserJet P1007	N/A	N/A	N/A
Positioning Controller	UC	UC3000	CCIS0015	N/A	N/A
Spectrum analyzer 9k-30GHz	Rohde & Schwarz	FSP 30	CCIS0023	03-28-2016	03-28-2017
EMI Test Receiver	Rohde & Schwarz	ESPI	CCIS0022	03-28-2016	03-28-2017
EMI Test Receiver	Rohde & Schwarz	ESRP7	CCIS0167	03-24-2016	03-24-2017
Loop antenna	Laplace instrument	RF300	EMC0701	04-01-2016	03-31-2017
Universal radio communication tester	Rhode&Schwarz	CMU200	CCIS0069	03-28-2016	03-28-2017
Signal Analyzer	Rohde & Schwarz	FSIQ3	CCIS0088	04-08-2016	04-08-2017
DC Power Supply	Shenzhen XinNuoEr Technologies Co., Ltd.	WYK-10020K	CCIS0201	10-31-2015	10-30-2016
Temperature Humidity Chamber	Fo Shan HengPu Electronics Co., Ltd.	HPGDS-500	CCIS0240	11-18-2015	11-27-2016

6. System test configuration

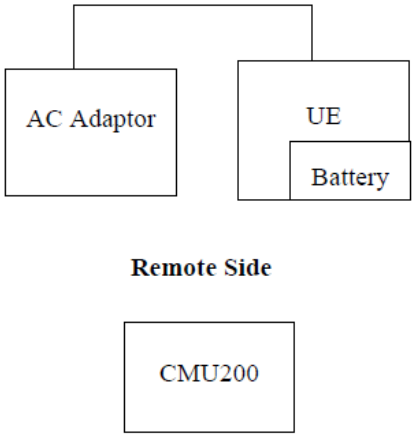
6.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the commission's requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

6.2 EUT Exercise

The EUT (Transmitter) was operated in the engineering mode to fix the Tx frequency which was for the purpose of the measurements.

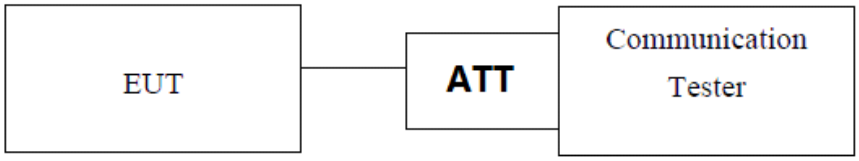
6.3 Configuration of Tested System



6.4 Description of Test Modes

The EUT has been tested under operating condition.
EUT staying in continuous transmitting mode. Channel Low, Mid and High for each type band with rated data rate were chosen for full testing.
The field strength of spurious radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for three modes (GSM850, PCS1900, WCDMA Band V, WCDMA Band IV and WCDMA Band II) with power adaptor, earphone and Data cable. The worst-case H mode for GSM850, PCS1900, WCDMA Band V, WCDMA Band IV and WCDMA Band II.

6.5 Conducted Output Power

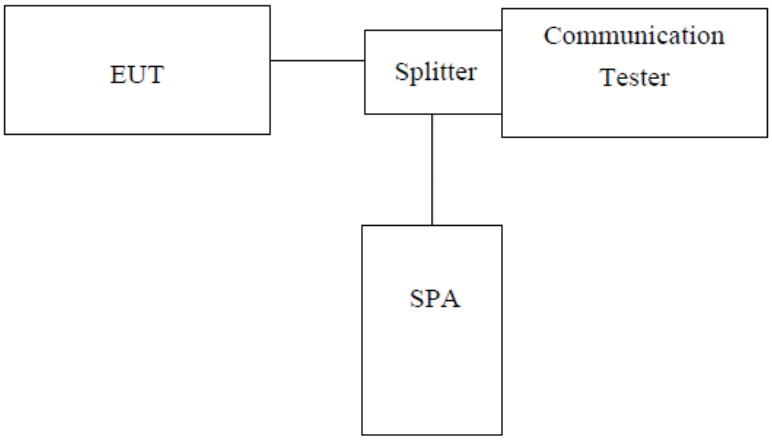
Test Requirement:	FCC part22.913(a), FCC part24.232(b), Part 27.50 (d)
Test Method:	FCC part2.1046
Limit:	GSM850: 7W PCS1900: 2W WCDMA Band V: 7W WCDMA Band II: 2W WCDMA Band IV: 1W
Test setup:	 ***Note:*** *Measurement setup for testing on Antenna connector*
Test Procedure:	The transmitter output was connected to a calibrated attenuator, the other end of which was connected to the simulated station. Transmitter output power was read off in dBm.
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Measurement Data:

EUT Mode	Burst Average power (dBm)			Limit(dBm)
	128	190	251	
	824.20MHz	836.60MHz	848.80MHz	
GSM 850	32.32	32.27	32.15	38.45
GPRS 850 (1 Uplink slot)	32.31	32.25	32.14	
GPRS 850 (2 Uplink slot)	31.43	31.36	31.26	
GPRS 850 (3 Uplink slot)	29.41	29.35	29.23	
GPRS 850 (4 Uplink slot)	28.25	28.21	28.10	
EUT Mode	Burst Average power (dBm)			Limit(dBm)
	512	661	810	
	1850.20MHz	1880.00MHz	1909.80MHz	
PCS 1900	29.03	29.02	28.96	33.00
GPRS 1900 (1 Uplink slot)	29.12	29.09	28.98	
GPRS 1900 (2 Uplink slot)	28.18	28.17	28.15	
GPRS 1900 (3 Uplink slot)	26.12	26.13	26.17	
GPRS 1900 (4 Uplink slot)	24.97	25.02	25.04	

EUT Mode		Burst Average power (dBm)			Limit(dBm)
		4132	4183	4233	
		826.40MHz	836.60MHz	846.60MHz	
UMTS 850 HSDPA	Subtest 1	21.10	20.99	20.85	38.45
	Subtest 2	20.72	20.45	20.44	
	Subtest 3	19.11	18.73	18.89	
	Subtest 4	19.31	18.64	18.89	
UMTS 850 HSUPA	Subtest 1	21.04	20.80	20.81	
	Subtest 2	21.06	20.89	20.84	
	Subtest 3	19.23	18.65	18.80	
	Subtest 4	21.10	20.84	20.97	
	Subtest 5	20.23	19.67	19.95	
UMTS 850 RMC	12.2kbps	22.06	21.94	21.85	
UMTS 850 AMR	12.2kbps	22.08	21.87	21.75	
EUT Mode		Burst Average power (dBm)			Limit(dBm)
		9262	9400	9538	
		1852.40MHz	1880.00MHz	1907.60MHz	
UMTS 1900 HSDPA	Subtest 1	20.42	20.23	20.24	33.00
	Subtest 2	19.90	19.76	19.70	
	Subtest 3	18.29	18.09	18.01	
	Subtest 4	18.28	18.29	17.97	
UMTS 1900 HSUPA	Subtest 1	20.25	20.20	20.18	
	Subtest 2	20.38	20.25	20.24	
	Subtest 3	18.28	18.33	18.09	
	Subtest 4	20.43	20.25	20.28	
	Subtest 5	19.38	19.29	19.24	
UMTS 1900 RMC	12.2kbps	21.41	21.19	21.14	
UMTS 1900 AMR	12.2kbps	21.42	21.22	21.09	
EUT Mode		Burst Average power (dBm)			Limit(dBm)
		1312.00	1412.00	1513.00	
		1712.40MHz	1732.40MHz	1752.60MHz	
UMTS 1700 HSDPA	Subtest 1	20.30	20.29	20.58	30.00
	Subtest 2	19.98	20.05	20.17	
	Subtest 3	19.12	19.02	19.33	
	Subtest 4	19.03	18.91	19.11	
UMTS 1700 HSUPA	Subtest 1	19.82	19.71	20.18	
	Subtest 2	19.80	19.97	19.84	
	Subtest 3	18.64	18.79	18.93	
	Subtest 4	19.82	19.54	19.78	
	Subtest 5	19.40	19.36	19.42	
UMTS 1700 RMC	12.2kbps	21.15	21.16	21.47	
UMTS 1700 AMR	12.2kbps	21.19	21.20	21.47	

6.6 Occupy Bandwidth

Test Requirement:	FCC part 22.917(b), FCC part 24.232(b), Part 27.53(h)
Test Method:	FCC part 2.1049
Test setup:	 *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 Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Measurement Data:

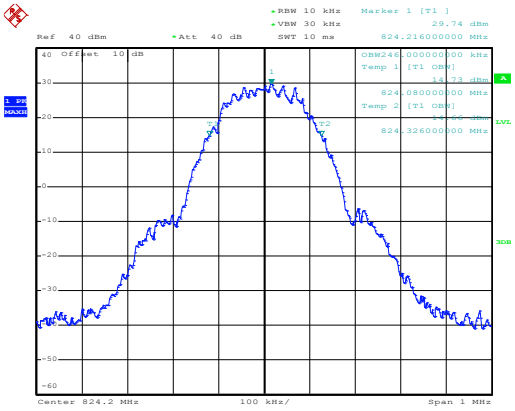
EUT Mode	Channel	Frequency (MHz)	99% Occupy bandwidth (kHz)	-26dB bandwidth (kHz)
GSM 850	128	824.2	246	316
	190	836.6	248	322
	251	848.8	244	322
PCS 1900	512	1850.2	244	316
	661	1880.0	248	318
	810	1909.8	242	320
WCDMA BAND V 12.2k RMC	4132	826.4	4160	4680
	4183	836.6	4180	4700
	4233	846.6	4180	4720
WCDMA BAND II 12.2k RMC	9262	1852.4	4160	4680
	9400	1880.0	4160	4720
	9538	1907.6	4180	4700
WCDMA BAND IV 12.2k RMC	1312	1712.40	4160	4720
	1413	1732.60	4180	4720
	1513	1752.60	4160	4680

Note: GSM & GPRS use the same modulation technical (GMSK), and with the same channels, so the 99% OBW and the -26dB of GPRS not performed.

Test plot as follows:

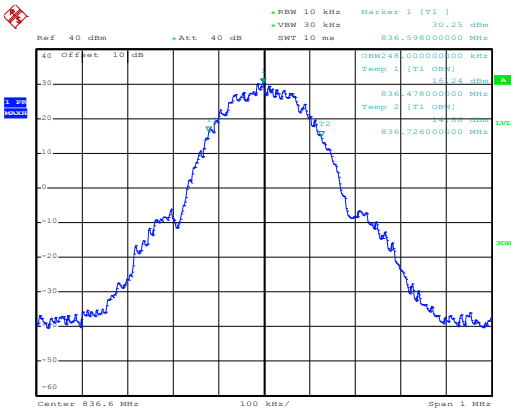
99% Occupy bandwidth

GSM850



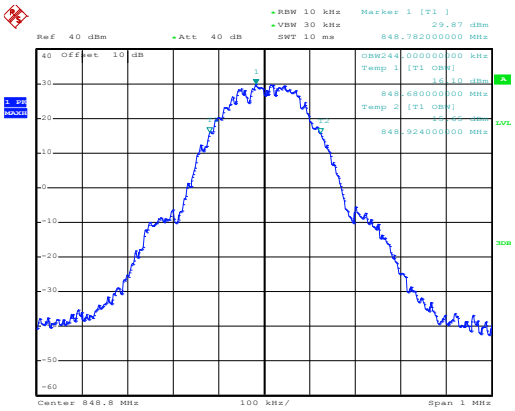
Date: 5.JUN.2016 13:45:35

Lowest channel



Date: 5.JUN.2016 13:46:35

Middle channel

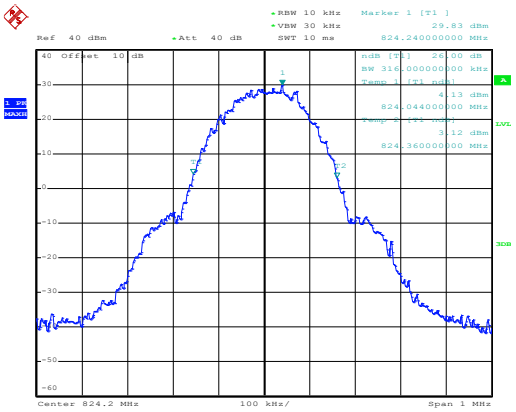


Date: 5.JUN.2016 13:47:00

Highest channel

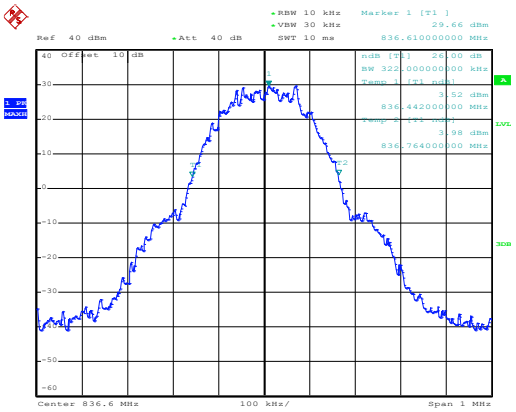
26dB Emission Bandwidth

GSM850



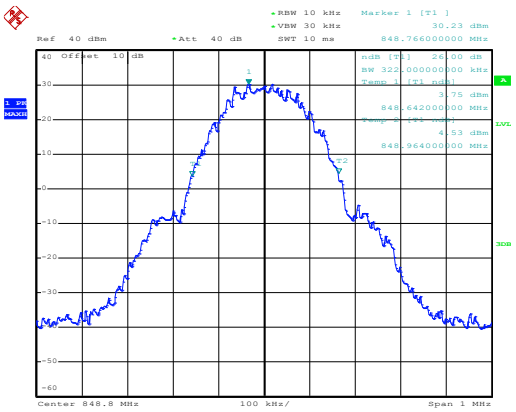
Date: 5.JUN.2016 13:45:53

Lowest channel



Date: 5.JUN.2016 13:46:13

Middle channel

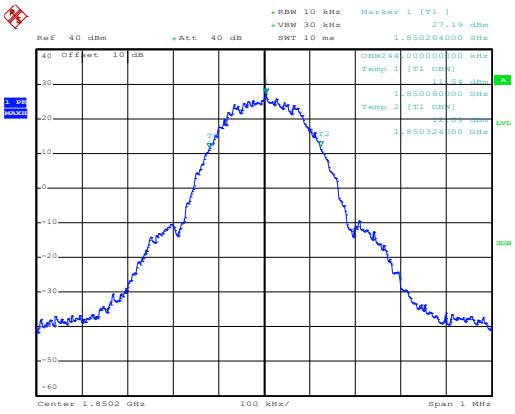


Date: 5.JUN.2016 13:47:18

Highest channel

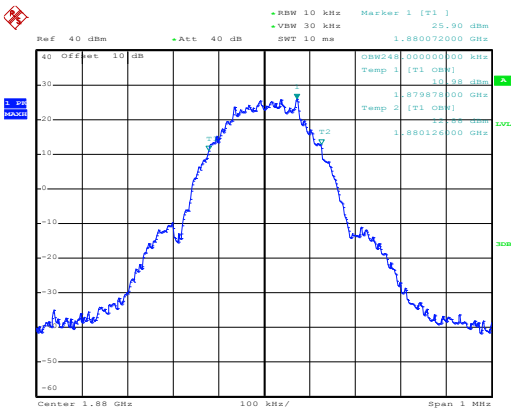
99% Occupy bandwidth

PCS 1900



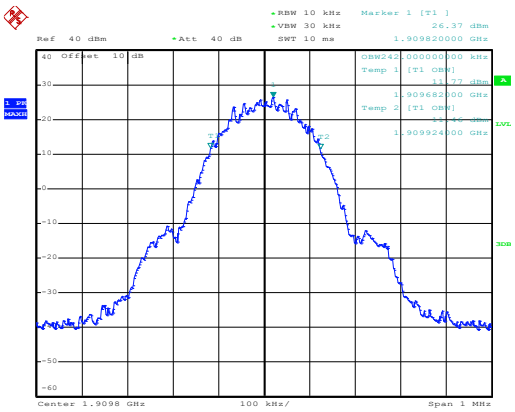
Date: 5.JUN.2016 13:28:37

Lowest channel



Date: 5.JUN.2016 13:30:00

Middle channel

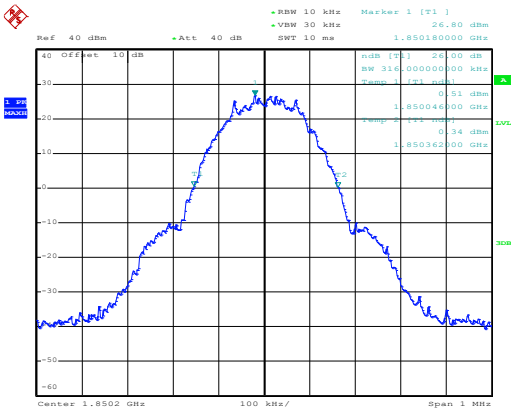


Date: 5.JUN.2016 13:30:36

Highest channel

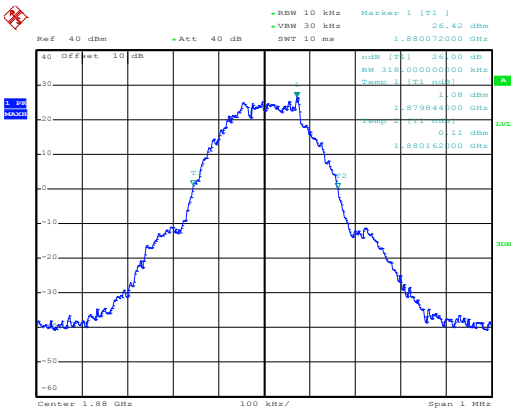
26dB Emission Bandwidth

PCS 1900



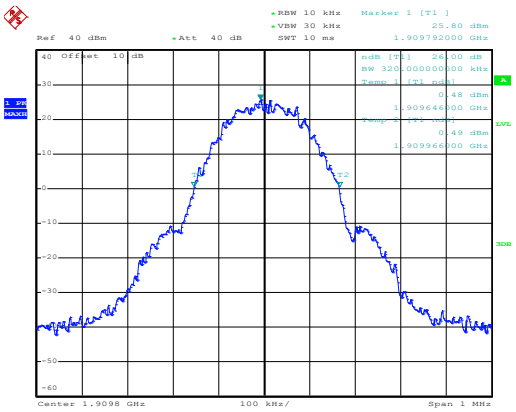
Date: 5.JUN.2016 13:29:18

Lowest channel



Date: 5.JUN.2016 13:29:44

Middle channel

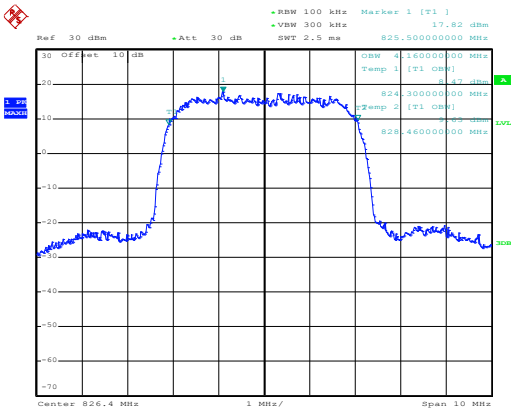


Date: 5.JUN.2016 13:30:50

Highest channel

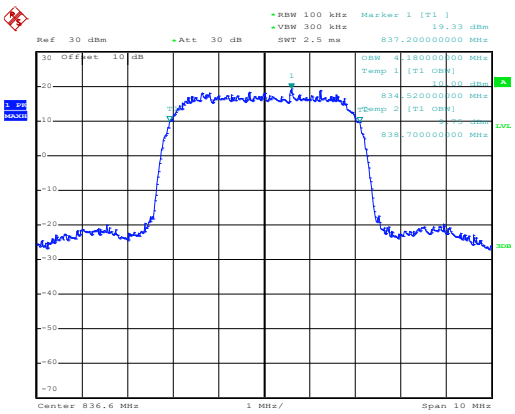
99% Occupy bandwidth

UMTS 850 12.2k RMC



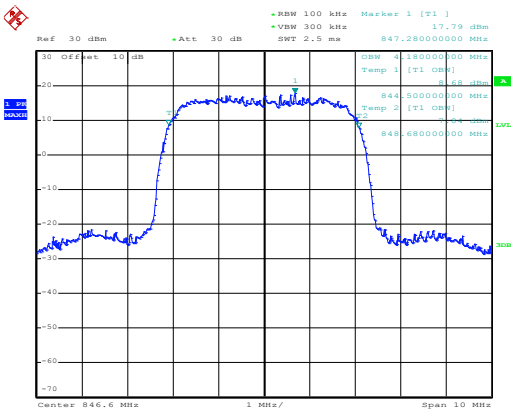
Date: 5.JUN.2016 14:43:22

Lowest channel



Date: 5.JUN.2016 14:43:49

Middle channel

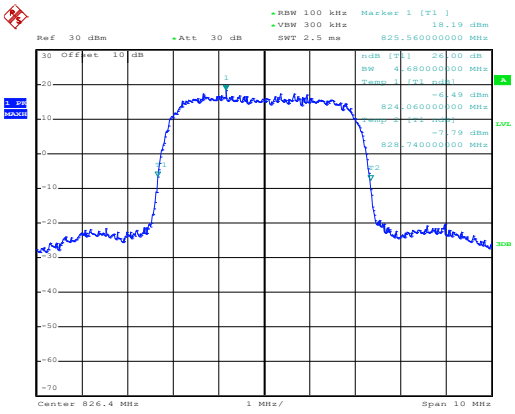


Date: 5.JUN.2016 14:45:59

Highest channel

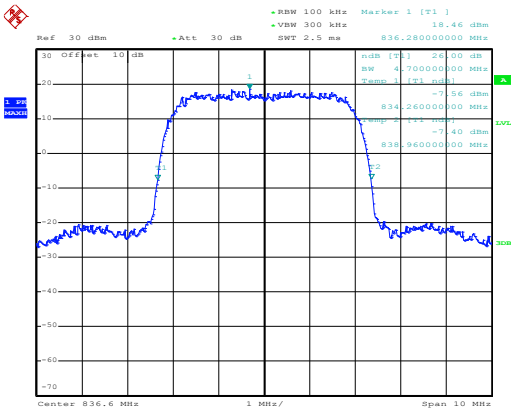
26dB Emission Bandwidth

UMTS 850 12.2k RMC



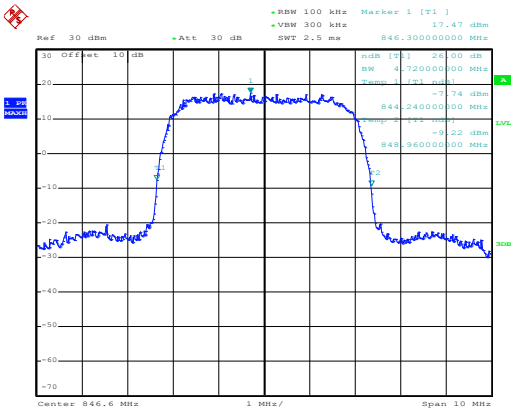
Date: 5.JUN.2016 14:43:01

Lowest channel



Date: 5.JUN.2016 14:44:02

Middle channel

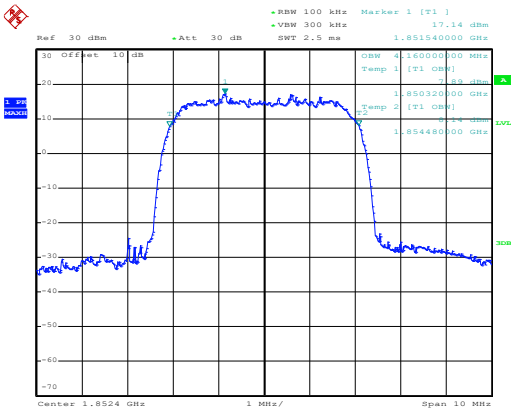


Date: 5.JUN.2016 14:44:35

Highest channel

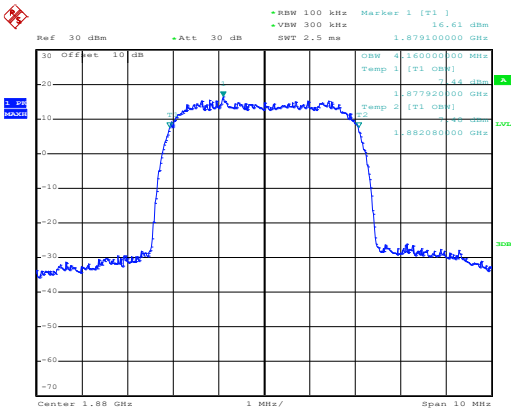
99% Occupy bandwidth

UMTS 1900 12.2k RMC



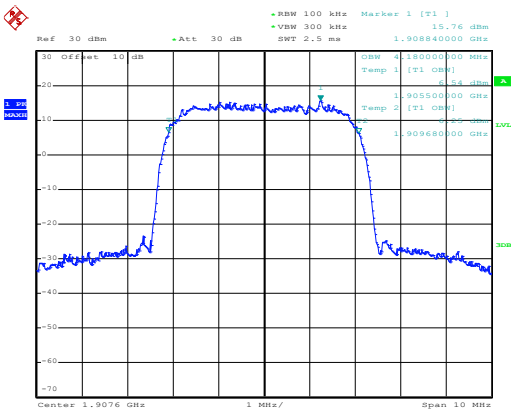
Date: 5.JUN.2016 14:16:35

Lowest channel



Date: 5.JUN.2016 14:17:33

Middle channel

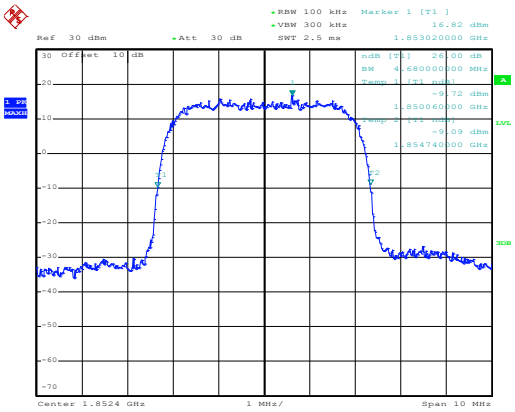


Date: 5.JUN.2016 14:18:02

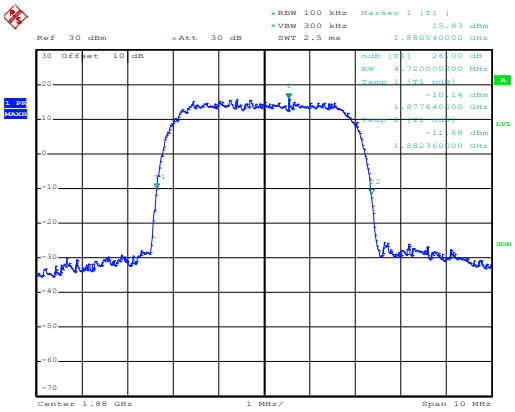
Highest channel

26dB Emission Bandwidth

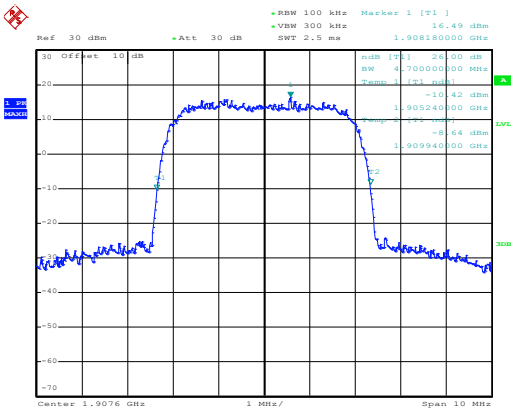
UMTS 1900 12.2k RMC



Lowest channel



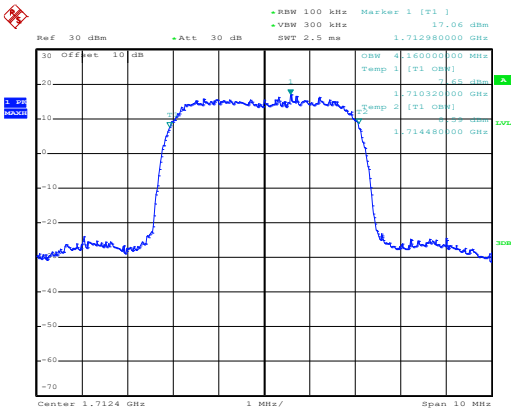
Middle channel



Highest channel

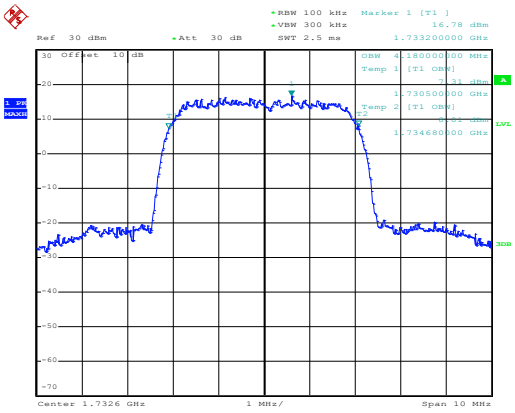
99% Occupy bandwidth

UMTS 1700 12.2k RMC



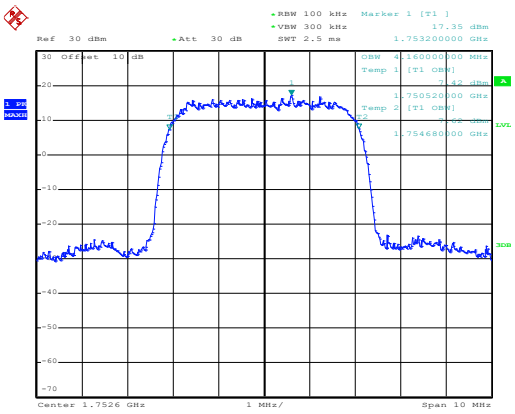
Date: 5.JUN.2016 15:40:39

Lowest channel



Date: 5.JUN.2016 15:41:33

Middle channel

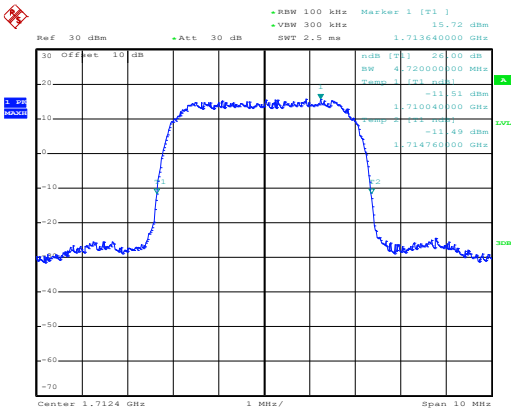


Date: 5.JUN.2016 15:41:55

Highest channel

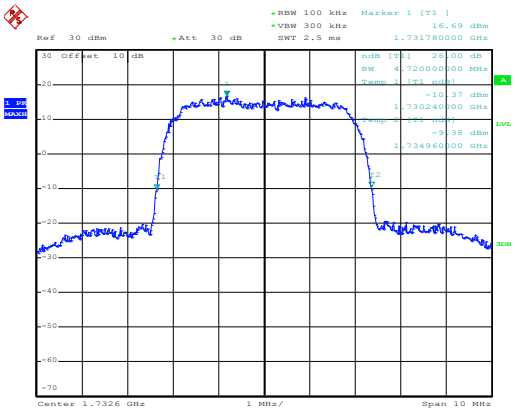
26dB Emission Bandwidth

UMTS 1700 12.2k RMC



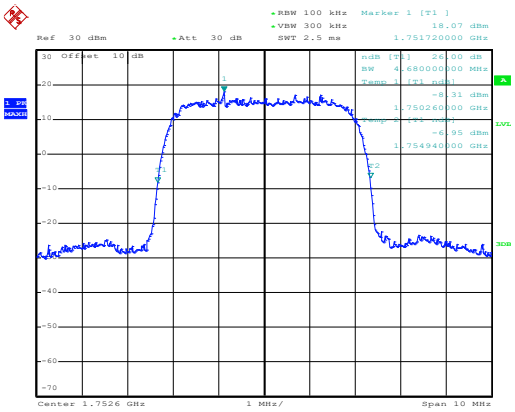
Date: 5.JUN.2016 15:40:54

Lowest channel



Date: 5.JUN.2016 15:41:21

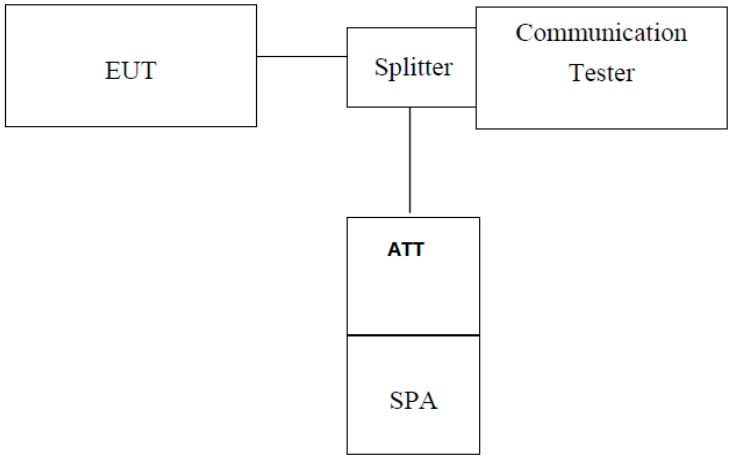
Middle channel



Date: 5.JUN.2016 15:42:12

Highest channel

6.7 Peak-to-Average Power Ratio

Test Requirement:	FCC part 24.232(d)
Limit:	The peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.
Test setup:	 *Note: Measurement setup for testing on Antenna connector*
Test Procedure:	1 The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. 2 Set the CCDF option in spectrum analyzer, RBW ≥ OBW, 3 Set the EUT working in highest power level, measured and recorded the 0.1% as PAPR level. 4 Repeat step 1~3 at other frequency and modulations.
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

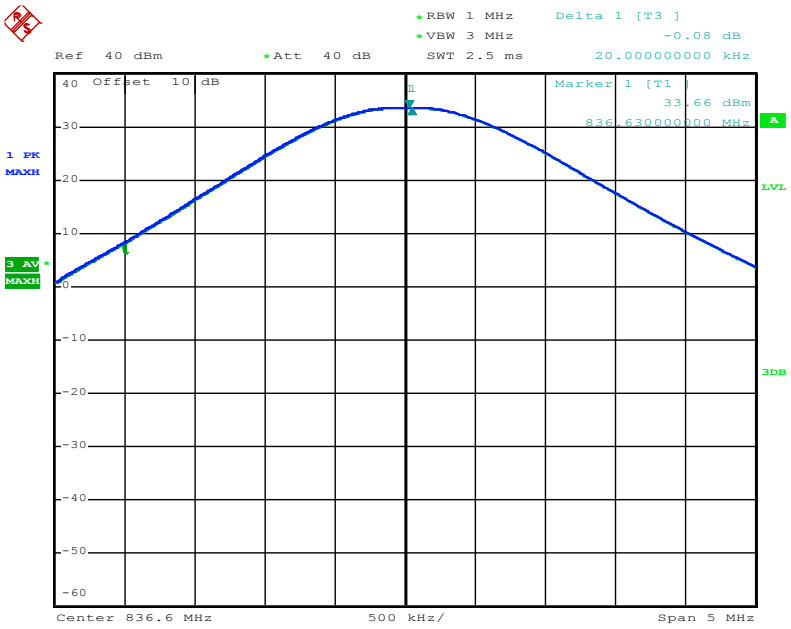
Measurement Data (worst case):

Modulation	Test channel	PAPR
GSM 850	190	0.08
PCS 1900	661	0.07
UMTS 850 RMC	4183	3.08
UMTS 1900 RMC	9400	2.80
UMTS 1700 RMC	1413	2.52

Test plots as below:

Middle channel

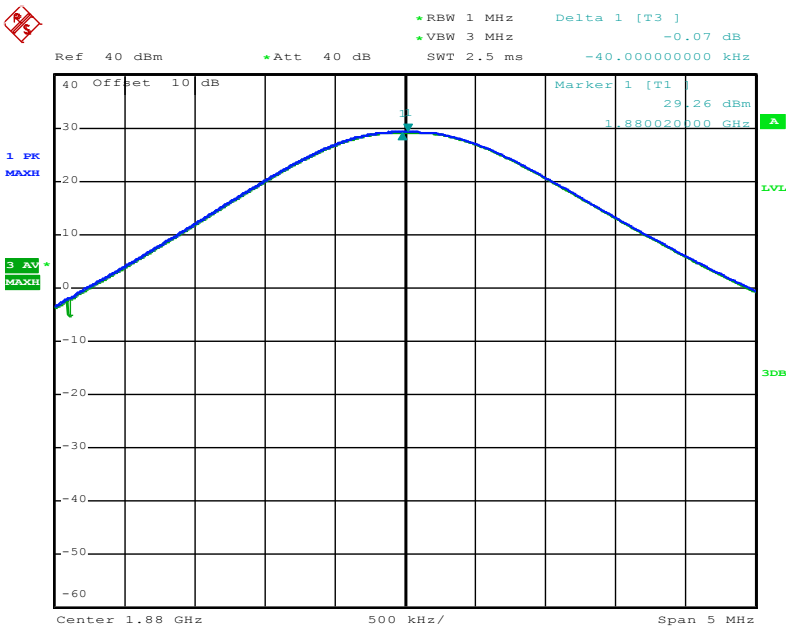
Modulation: GSM 850



Date: 5.JUN.2016 14:01:18

Middle channel

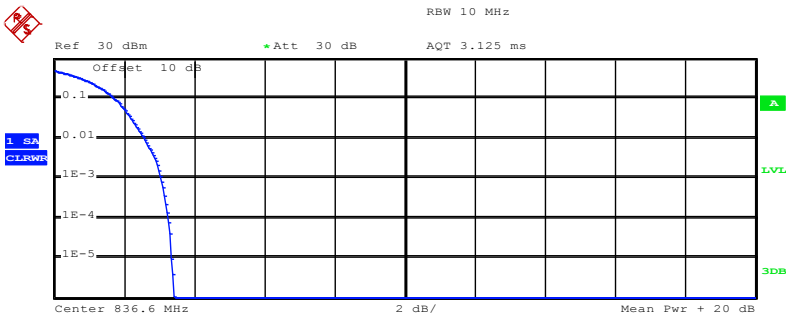
Modulation:PCS 1900



Date: 5.JUN.2016 13:43:55

Middle channel

Modulation:WCDMA Band VRMC



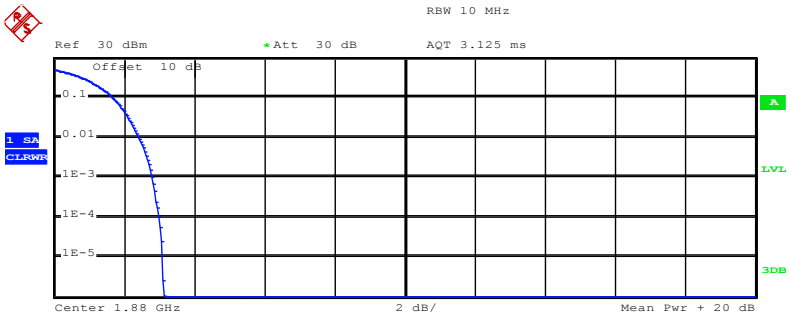
Complementary Cumulative Distribution Function (100000 samples)

	Trace 1
Mean	23.82 dBm
Peak	27.25 dBm
Crest	3.42 dB
10 %	1.72 dB
1 %	2.60 dB
.1 %	3.08 dB
.01 %	3.28 dB

Date: 5.JUN.2016 14:55:53

Middle channel

Modulation:WCDMA BAND IIRMC



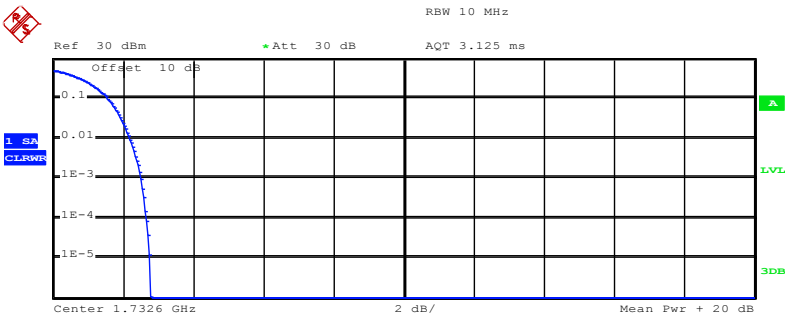
Complementary Cumulative Distribution Function (100000 samples)

	Trace 1
Mean	21.17 dBm
Peak	24.28 dBm
Crest	3.12 dB
10 %	1.68 dB
1 %	2.44 dB
.1 %	2.80 dB
.01 %	3.00 dB

Date: 5.JUN.2016 16:09:50

Middle channel

Modulation:WCDMA BAND IV RMC



Complementary Cumulative Distribution Function (100000 samples)

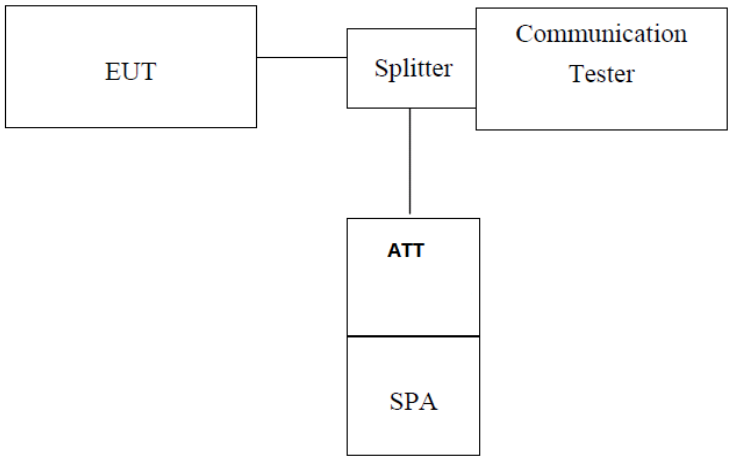
	Trace 1
Mean	21.58 dBm
Peak	24.36 dBm
Crest	2.77 dB
10 %	1.56 dB
1 %	2.20 dB
.1 %	2.52 dB
.01 %	2.68 dB

Date: 5.JUN.2016 15:57:48

6.8 Modulation Characteristic

According to FCC § 2.1047(d), Part 22H & 24E& 27L there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

6.9 Out of band emission at antenna terminals

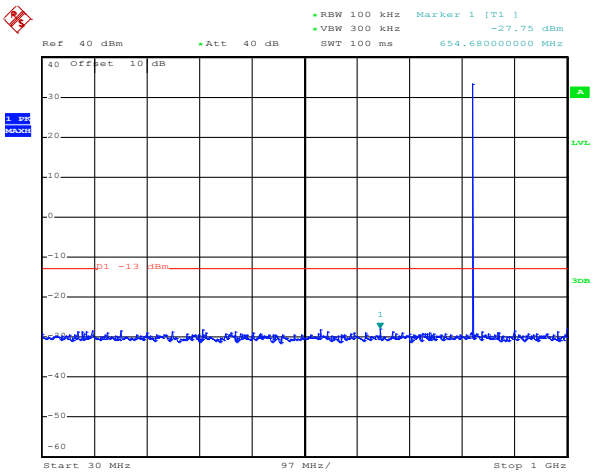
Test Requirement:	FCC part22.917(a), FCC part24.238(a), Part 27.53(h)
Test Method:	FCC part2.1051
Limit:	-13dBm
Test setup:	 *Note: Measurement setup for testing on Antenna connector*
Test Procedure:	5 The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. 6 The resolution bandwidth of the spectrum analyzer was set at 100 kHz when below 1GHz, 1MHz when above 1 GHz; sufficient scans were taken to show the out of band Emissions if any up to 10th harmonic. 7 For the out of band: Set the RBW=100 kHz, VBW=300 kHz when below 1 GHz, RBW =1 MHz, VBW=3 MHz when above 1 GHz, Start=30MHz, Stop= 10th harmonic. 8 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 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Test plots as follows:

Spurious emission:

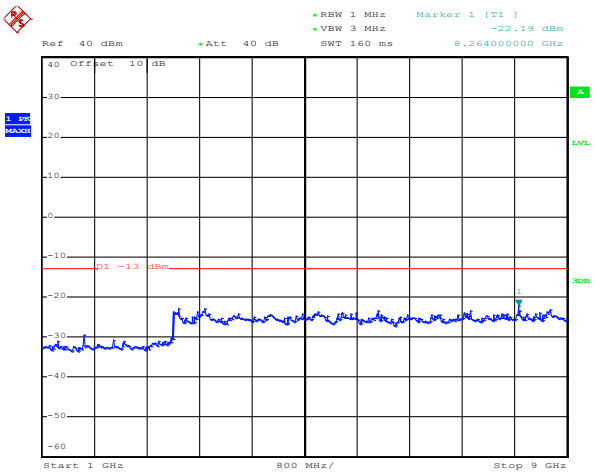
GSM 850

Lowest Channel



Date: 5.JUN.2016 13:49:19

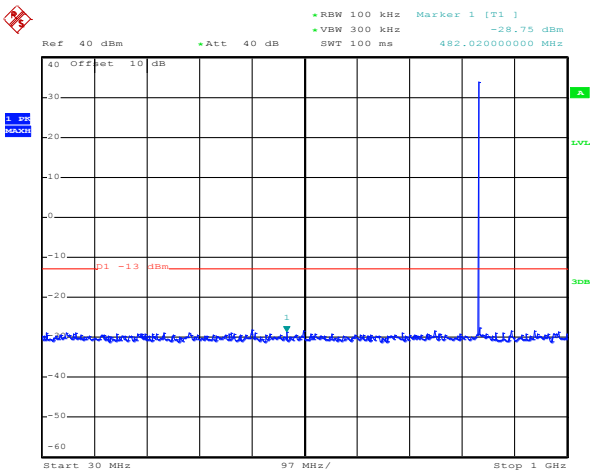
30MHz~1GHz



Date: 5.JUN.2016 13:51:41

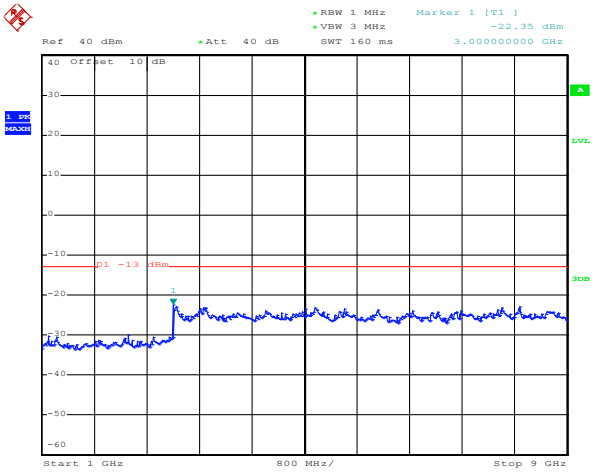
1GHz~9GHz

Middle channel



Date: 5.JUN.2016 13:50:06

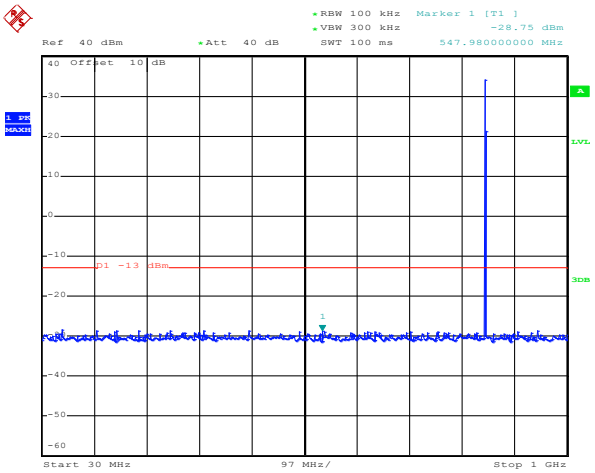
30MHz~1GHz



Date: 5.JUN.2016 13:52:22

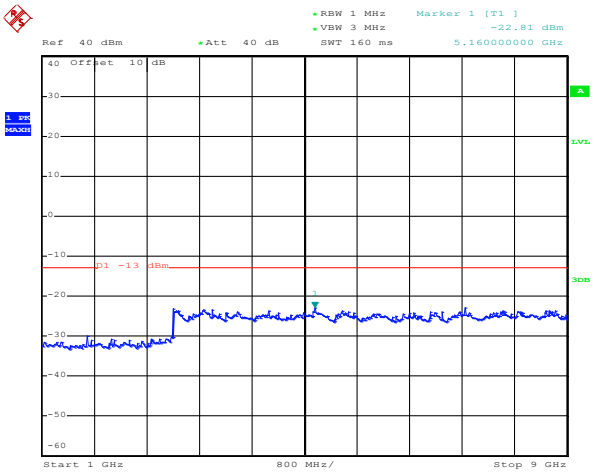
1GHz~9GHz

Highest Channel



Date: 5.JUN.2016 13:50:44

30MHz~1GHz

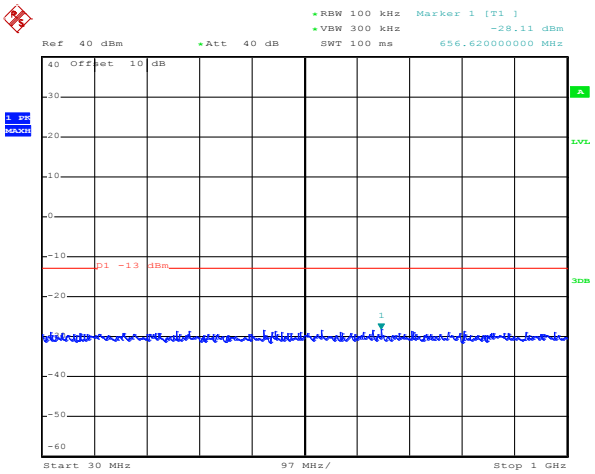


Date: 5.JUN.2016 13:53:17

1GHz~9GHz

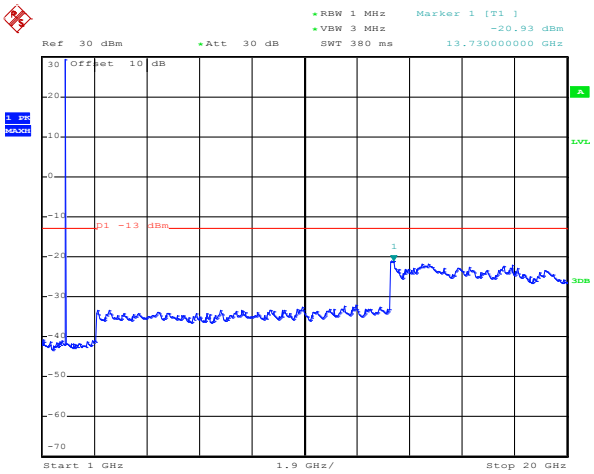
PCS 1900

Lowest Channel



Date: 5.JUN.2016 13:35:37

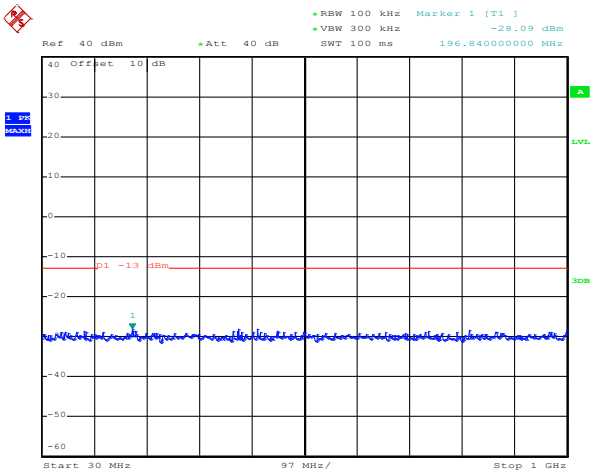
30MHz~1GHz



Date: 5.JUN.2016 13:37:38

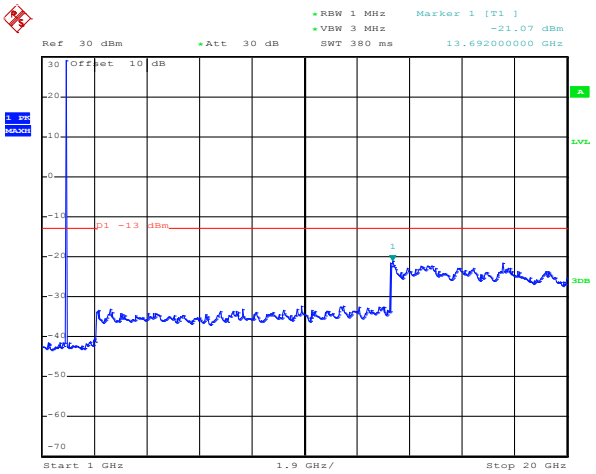
1GHz~20GHz

Middle Channel



Date: 5.JUN.2016 13:34:59

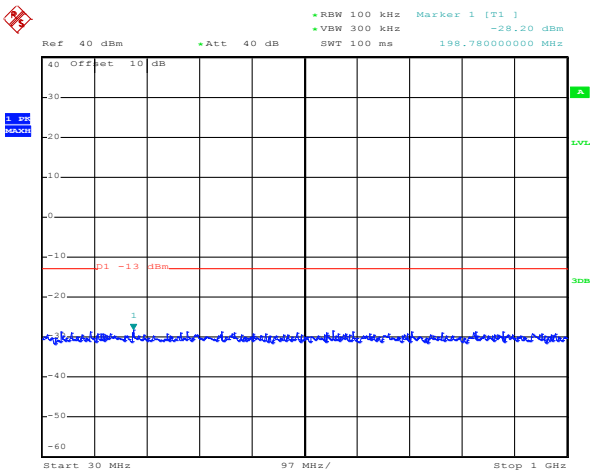
30MHz~1GHz



Date: 5.JUN.2016 13:38:07

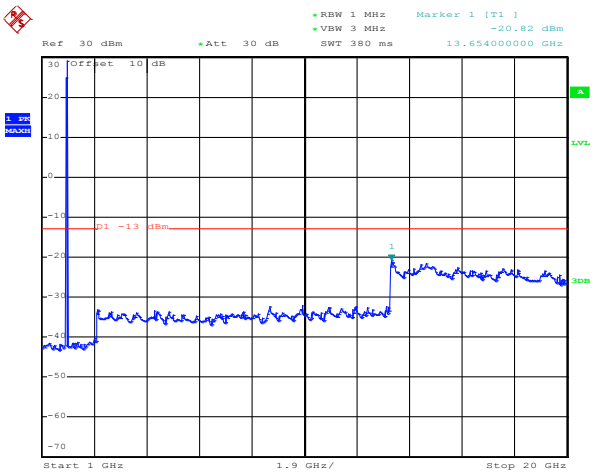
1GHz~20GHz

Highest Channel



Date: 5.JUN.2016 13:36:12

30MHz~1GHz

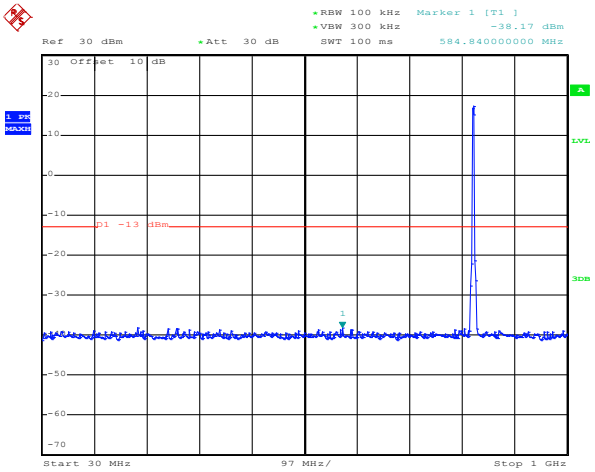


Date: 5.JUN.2016 13:39:02

1GHz~20GHz

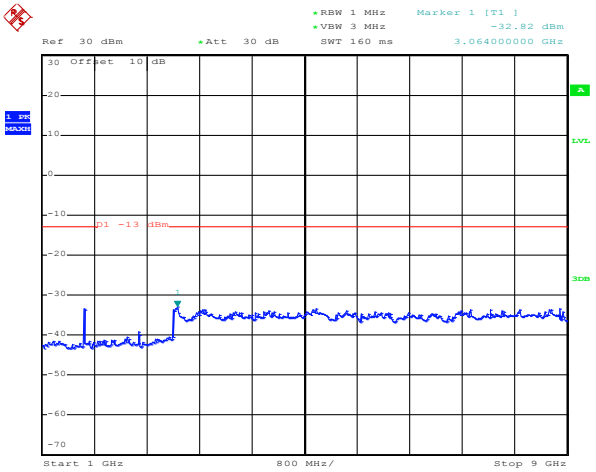
WCDMA Band V 12.2k RMC

Lowest Channel



Date: 5.JUN.2016 14:49:25

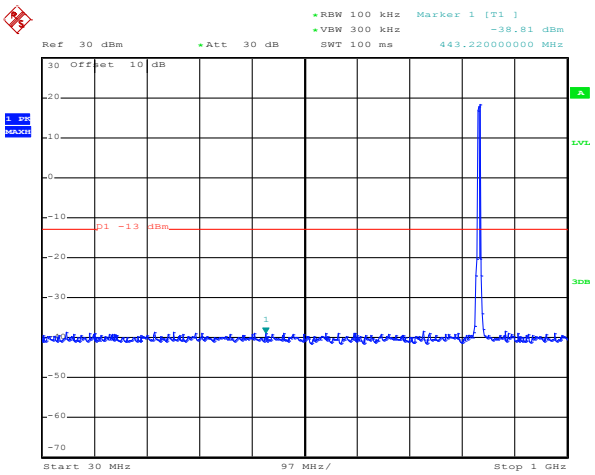
30MHz~1GHz



Date: 5.JUN.2016 14:53:00

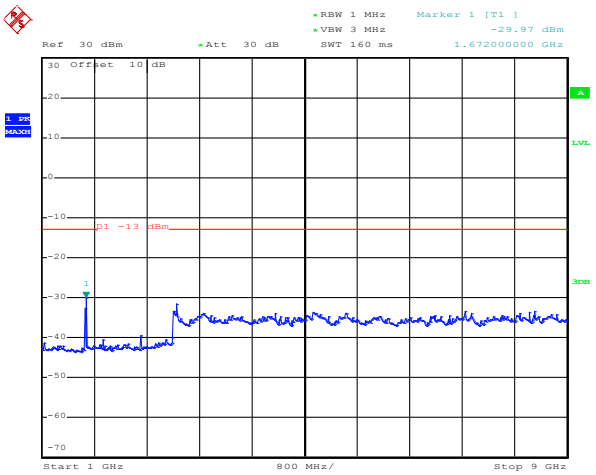
1GHz~9GHz

Middle Channel



Date: 5.JUN.2016 14:50:35

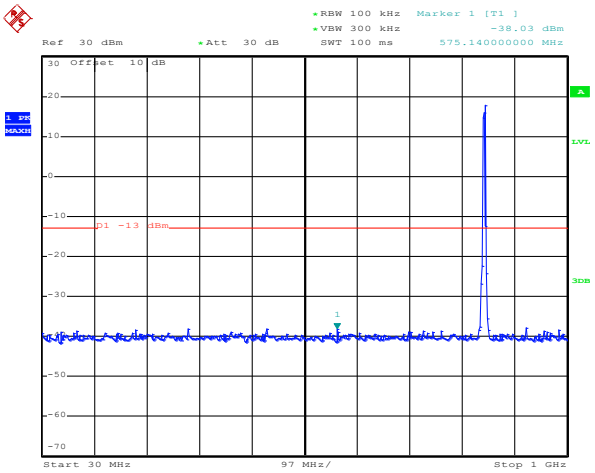
30MHz~1GHz



Date: 5.JUN.2016 14:53:26

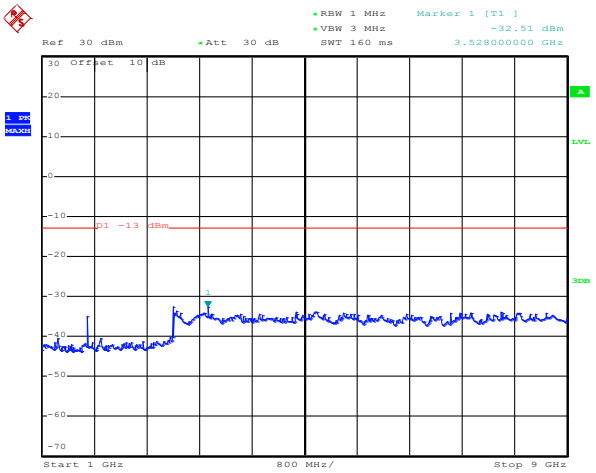
1GHz~9GHz

Highest Channel



Date: 5.JUN.2016 14:51:28

30MHz~1GHz

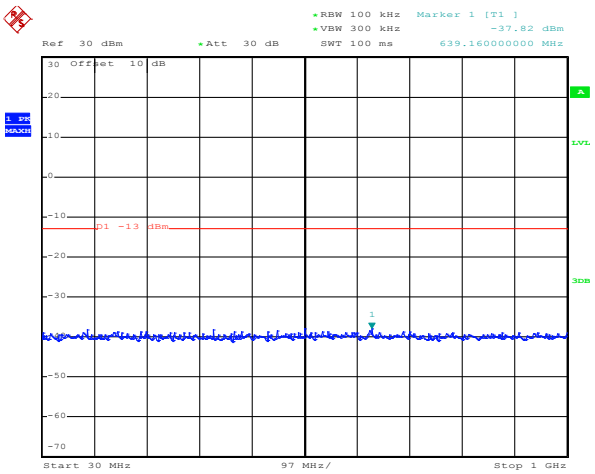


Date: 5.JUN.2016 14:53:55

1GHz~9GHz

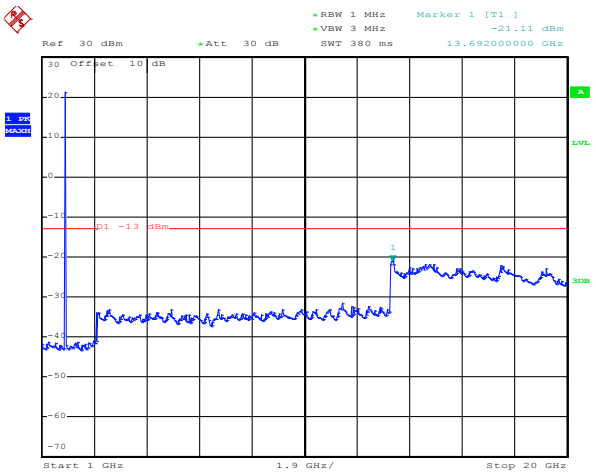
WCDMA Band II 12.2k RMC

Lowest Channel



Date: 5.JUN.2016 14:29:57

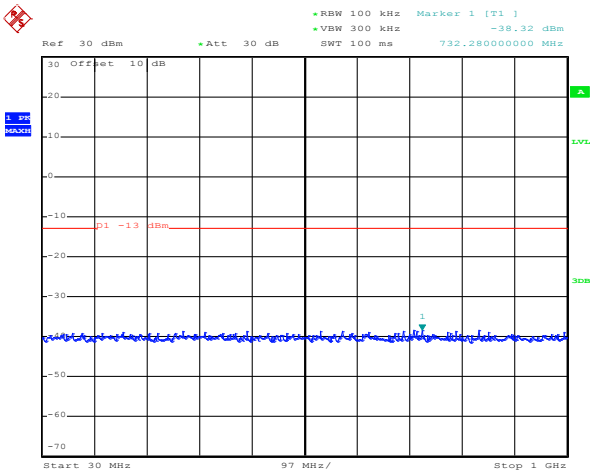
30MHz~1GHz



Date: 5.JUN.2016 14:32:19

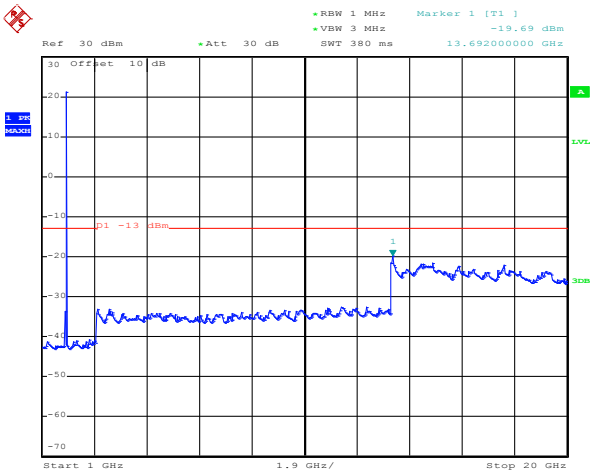
1GHz~20GHz

Middle Channel



Date: 5.JUN.2016 14:30:38

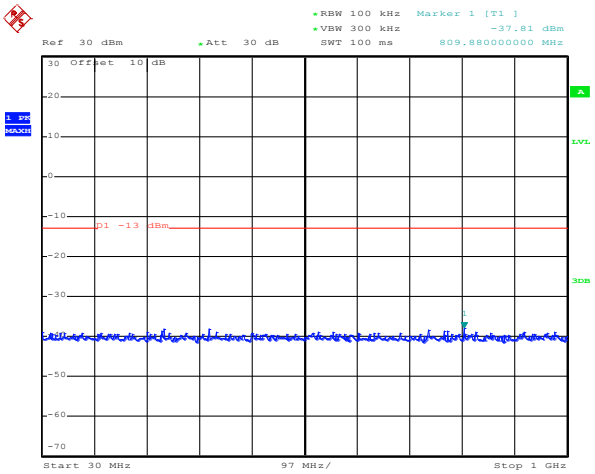
30MHz~1GHz



Date: 5.JUN.2016 14:32:59

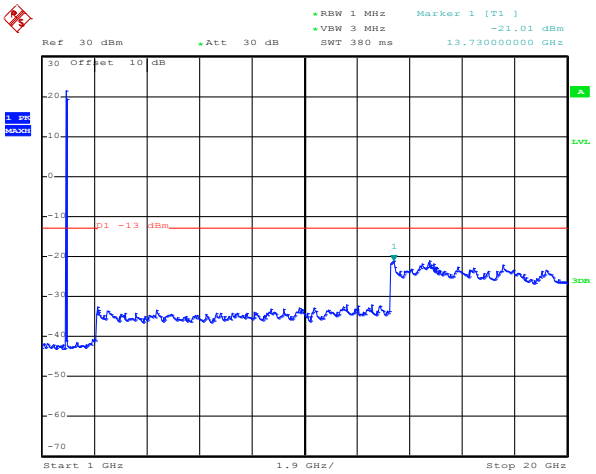
1GHz~20GHz

Highest Channel



Date: 5.JUN.2016 14:31:19

30MHz~1GHz

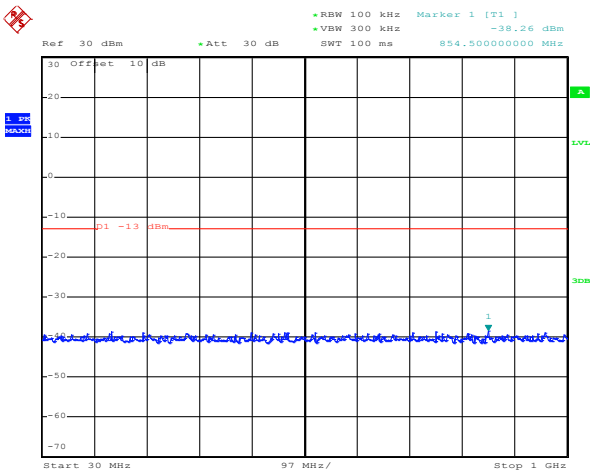


Date: 5.JUN.2016 14:33:40

1GHz~20GHz

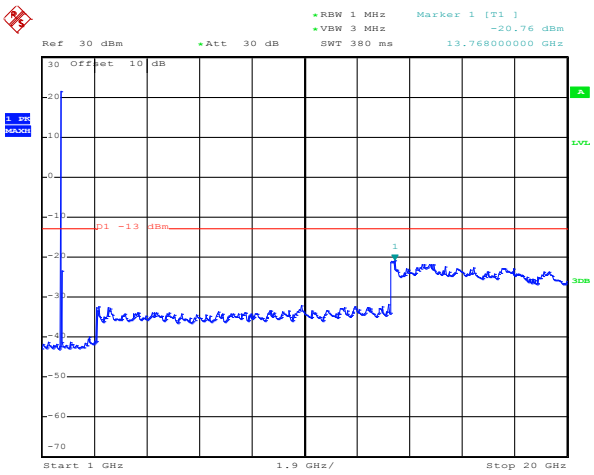
WCDMA Band IV 12.2k RMC

Lowest Channel



Date: 5.JUN.2016 15:52:13

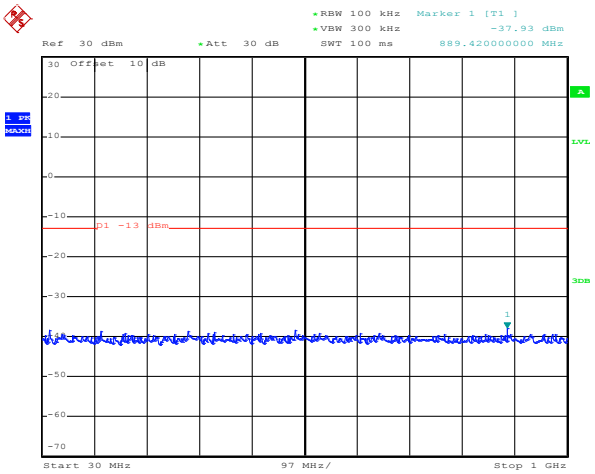
30MHz~1GHz



Date: 5.JUN.2016 16:05:02

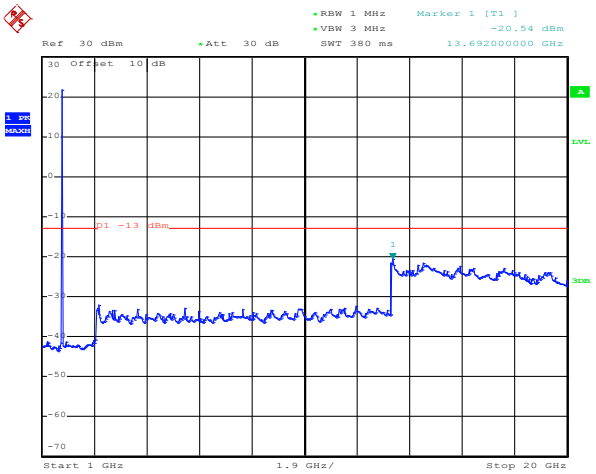
1GHz~20GHz

Middle Channel



Date: 5.JUN.2016 15:52:39

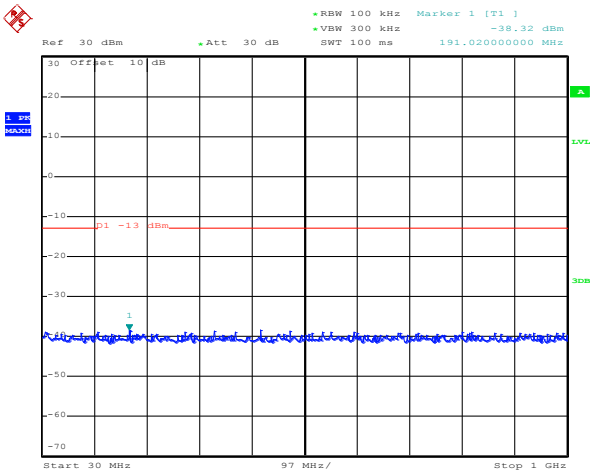
30MHz~1GHz



Date: 5.JUN.2016 16:05:31

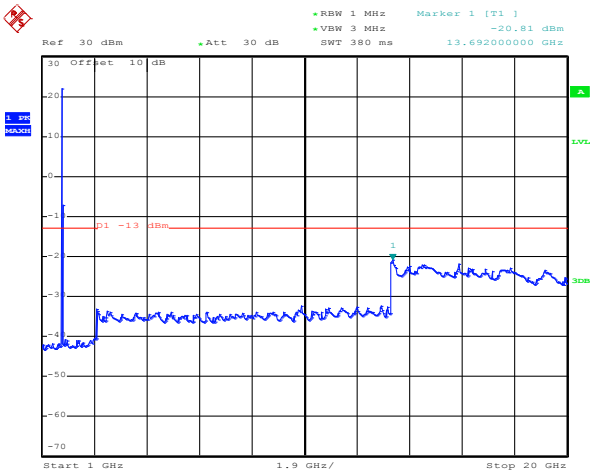
1GHz~20GHz

Highest Channel



Date: 5.JUN.2016 15:53:10

30MHz~1GHz

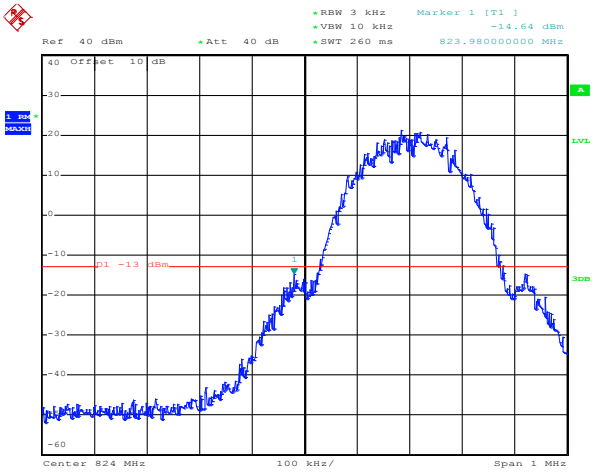


Date: 5.JUN.2016 16:06:09

1GHz~20GHz

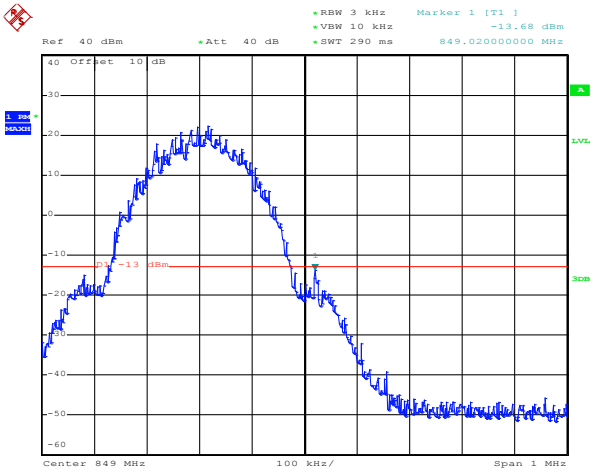
Band edge emission:

GSM850



Date: 5.JUN.2016 13:56:48

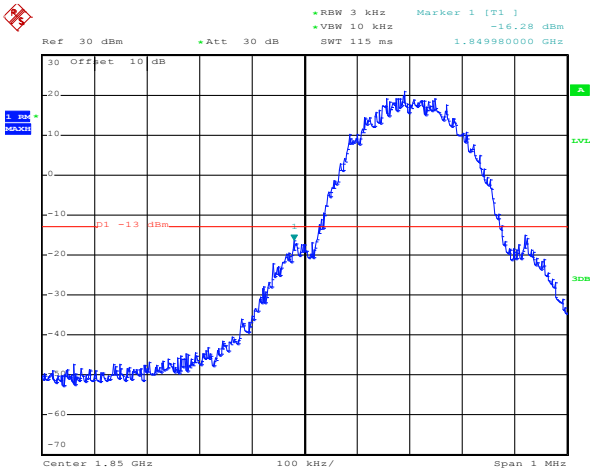
Lowest channel



Date: 5.JUN.2016 13:58:46

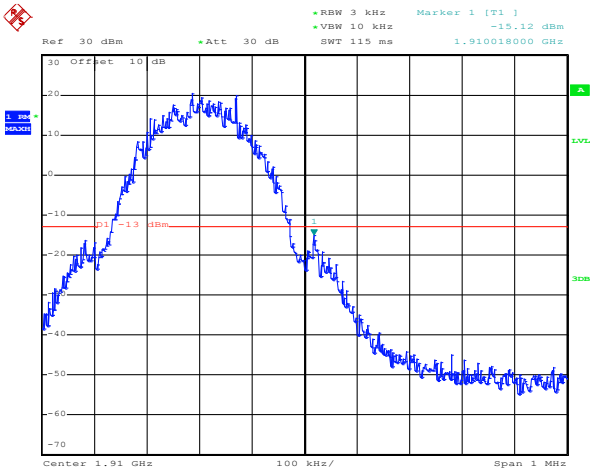
Highest channel

PCS1900



Date: 5.JUN.2016 13:40:38

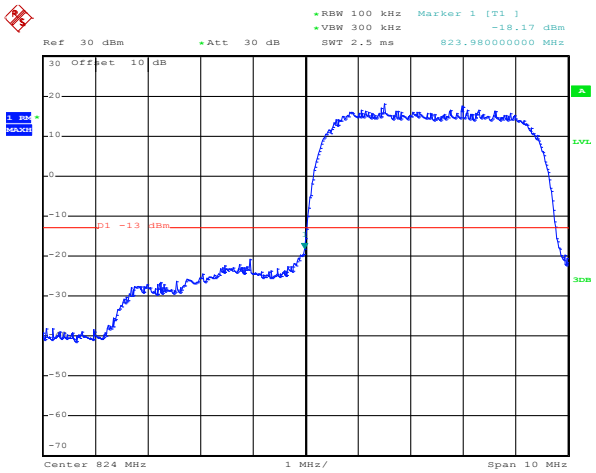
Lowest channel



Date: 5.JUN.2016 13:41:14

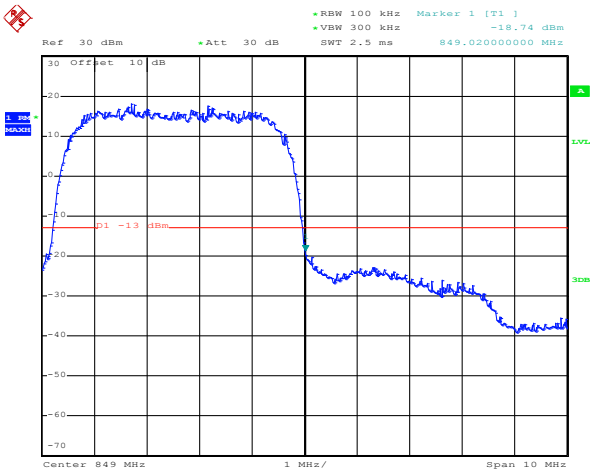
Highest channel

WCDMA BAND V RMC 12.2kbps



Date: 5.JUN.2016 14:47:15

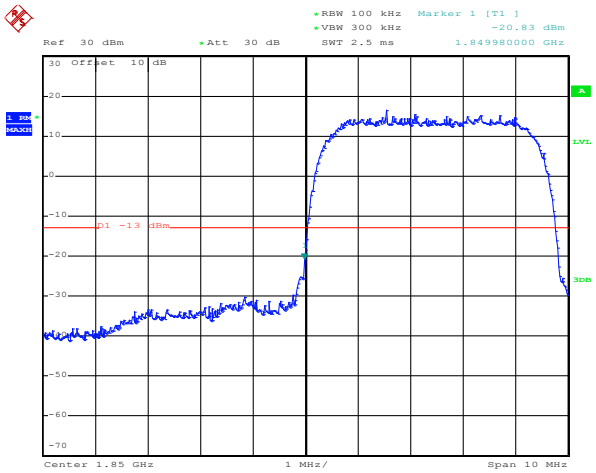
Lowest channel



Date: 5.JUN.2016 14:47:54

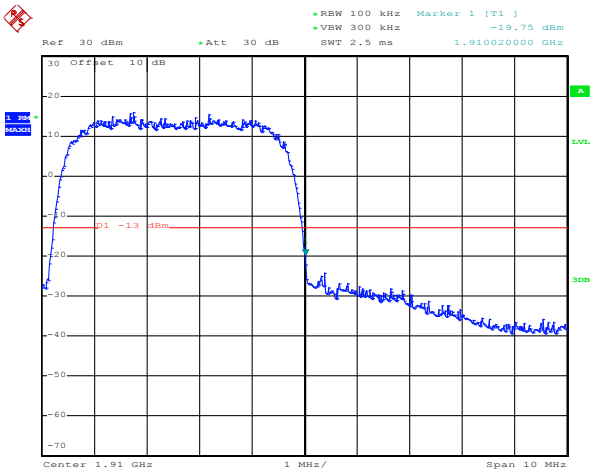
Highest channel

WCDMA Band IIRMC 12.2kbps



Date: 5.JUN.2016 14:27:56

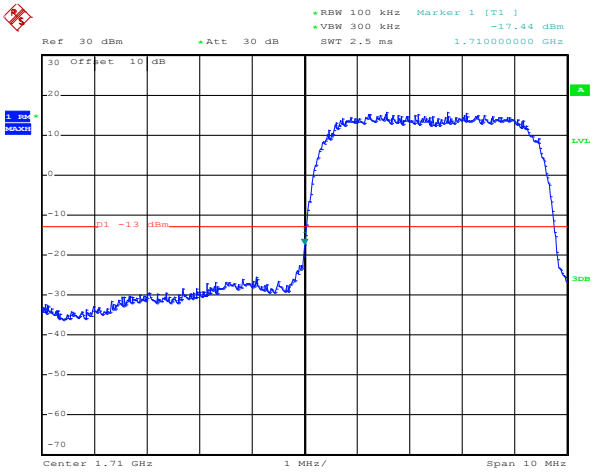
Lowest channel



Date: 5.JUN.2016 14:27:16

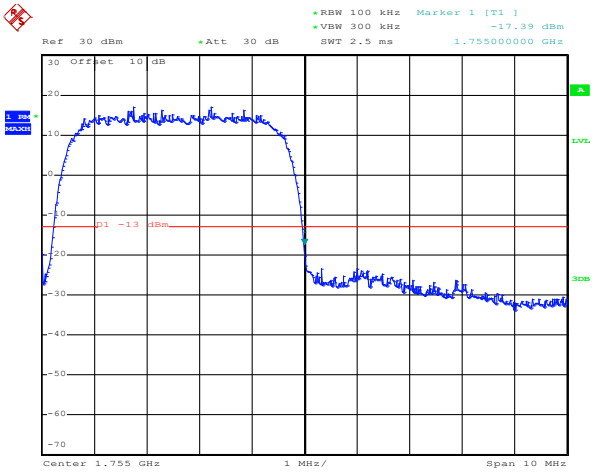
Highest channel

WCDMA Band IV RMC 12.2kbps



Date: 5.JUN.2016 15:48:57

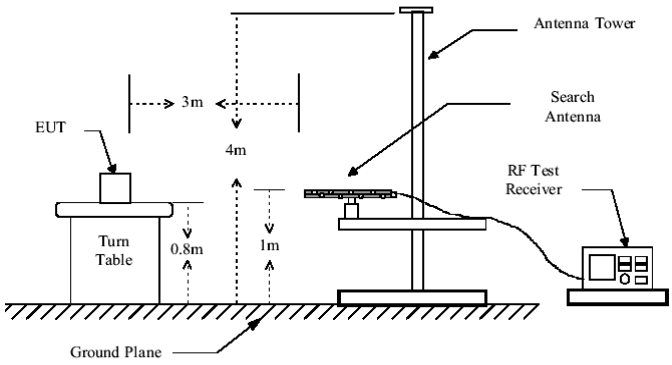
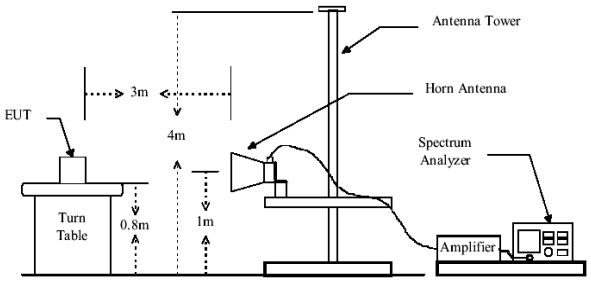
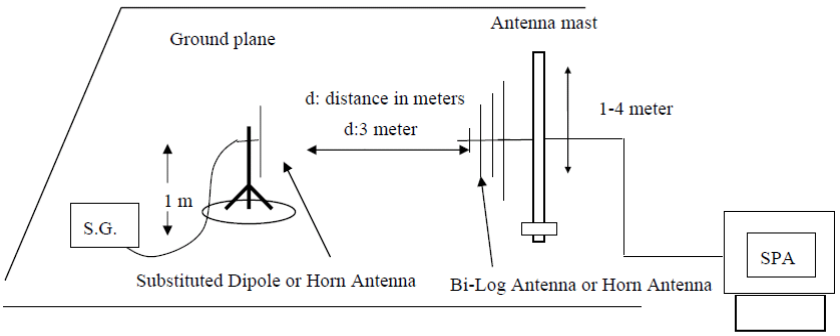
Lowest channel



Date: 5.JUN.2016 15:49:23

Highest channel

6.10 ERP, EIRP Measurement

Test Requirement:	FCC part22.913(a), FCC part24.232(b), FCC part 27.50(d)
Test Method:	FCC part2.1046
Limit:	GSM850 7W: ERP PCS1900 2W: EIRP WCDMA Band V: 7W ERP WCDMA Band II: 2W EIRP WCDMA Band IV: 1W EIRP
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 asfollows: ERP = S.G. output (dBm) + Antenna Gain (dBd) – 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: EIRP = S.G. output (dBm) + Antenna Gain (dBi) – Cable Loss (dB) 5. The worse case was relating to the conducted output power.
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed (All three channels were tested, and just the worst case data were shown in the report.)

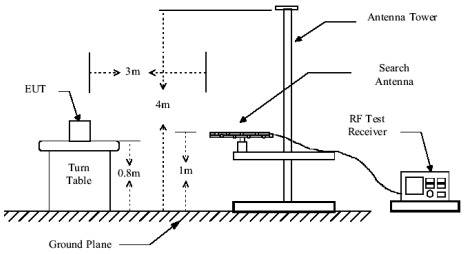
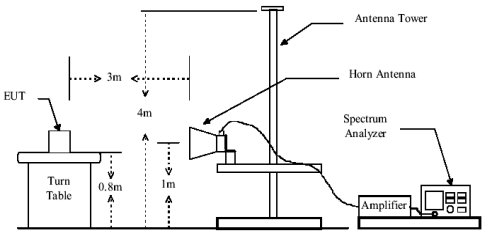
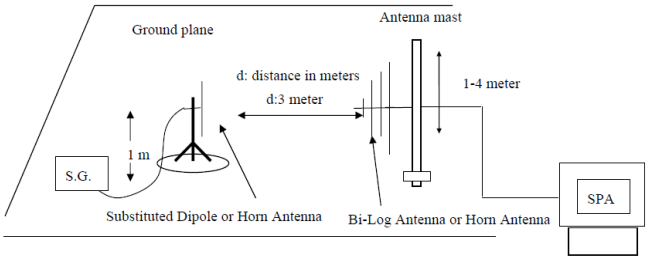
Measurement Data (worst case):

EUT mode	Channel	EUT Pol.	Antenna Pol.	ERP(dBm)	Limit (dBm)	Result
GSM850	128	H	V	33.48	38.45	Pass
			H	29.65		
UMTS 850 12.2k RMC	4132	H	V	26.39		
			H	18.57		

EUT mode	Channel	EUT Pol.	Antenna Pol.	EIRP(dBm)	Limit (dBm)	Result
PCS1900	512	H	V	26.16	33	Pass
			H	19.31		
UMTS 1900 12.2k RMC	9262	H	V	19.91		
			H	16.83		

EUT mode	Channel	EUT Pol.	Antenna Pol.	EIRP(dBm)	Limit (dBm)	Result
UMTS 1700 12.2k RMC	1513	H	V	22.17	30	Pass
			H	16.28		

6.11 Field strength of spurious radiation measurement

Test Requirement:	FCC part22.917(a), FCC part24.238(a), FCC part 27.53(h)
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. ERP / EIRP = S.G. output (dBm) + Antenna Gain(dB/dBi) – Cable Loss (dB)
Test Uncertainty:	± 4.88 dB
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details.
Test results:	Passed

Measurement Data (worst case):

Test mode:	GSM850		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1648.40	Vertical	-43.88	-13.00	Pass
2472.60	V	-38.72		
1648.40	Horizontal	-49.68	-13.00	Pass
2472.60	H	-42.65		
Test mode:	**GSM850**		**Test channel:**	**Middle**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1673.20	Vertical	-48.44	-13.00	Pass
2509.80	V	-39.19		
1673.20	Horizontal	-55.36	-13.00	Pass
2509.80	H	-46.05		
Test mode:	**GSM850**		**Test channel:**	**Highest**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1697.60	Vertical	-42.67	-13.00	Pass
1697.60	Horizontal	-50.73	-13.00	Pass
2546.40	H	-46.20		

Remark:

1. 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	-52.81	-13.00	Pass
5550.60	V	-36.23		
3700.40	Horizontal	-51.65	-13.00	Pass
5550.60	H	-29.32		
Test mode:	**PCS1900**		**Test channel:**	**Middle**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3760.00	Vertical	-50.59	-13.00	Pass
5640.00	V	-36.56		
3760.00	Horizontal	-50.89	-13.00	Pass
5640.00	H	-33.63		
Test mode:	**PCS1900**		**Test channel:**	**Highest**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3819.60	Vertical	-45.97	-13.00	Pass
5729.40	V	-38.68		
3819.60	Horizontal	-44.82	-13.00	Pass
5729.40	H	-38.52		

Remark:

1. The emission levels of below 1 GHz are very lower than the limit and not show in test report.

Test mode:	WCDMA BAND V 12.2k RMC		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1652.80	Vertical	-38.01	-13.00	Pass
2479.20	V	-40.49		
1652.80	Horizontal	-45.80	-13.00	Pass
2479.20	H	-44.05		
Test mode:	**WCDMA BAND V 12.2k RMC**		**Test channel:**	**Middle**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1673.20	Vertical	-40.51	-13.00	Pass
2509.80	V	-43.01		
1673.20	Horizontal	-46.16	-13.00	Pass
2509.80	H	-44.96		
Test mode:	**WCDMA BAND V 12.2k RMC**		**Test channel:**	**Highest**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1693.20	Vertical	-41.83	-13.00	Pass
2539.80	V	-40.51		
1693.20	Horizontal	-47.13	-13.00	Pass
2539.80	H	-46.36		

Remark:
1. The emission levels of below 1 GHz are very lower than the limit and not show in test report.

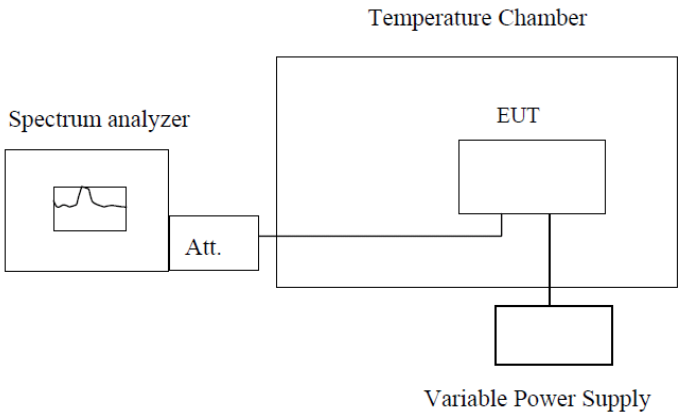
Test mode:	WCDMA Band II 12.2k RMC		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3704.80	Vertical	-52.90	-13.00	Pass
5557.20	V	-44.43		
3704.80	Horizontal	-52.68		
5557.20	H	-45.10		
Test mode:	**WCDMA Band II 12.2k RMC**		**Test channel:**	**Middle**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3760.00	Vertical	-50.55	-13.00	Pass
5640.00	V	-44.12		
3760.00	Horizontal	-50.63		
5640.00	H	-41.14		
Test mode:	**WCDMA Band II 12.2k RMC**		**Test channel:**	**Highest**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3815.20	Vertical	-51.11	-13.00	Pass
5722.80	V	-45.40		
3815.20	Horizontal	-49.00		
5722.80	H	-43.97		

Remark:
1. The emission levels of below 1 GHz are very lower than the limit and not show in test report.

Test mode:	WCDMA Band IV 12.2k RMC		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3424.40	Vertical	-50.23	-13.00	Pass
5136.60	V	-46.90		
3424.40	Horizontal	-49.19		
5136.60	H	-47.44		
Test mode:	**WCDMA Band IV 12.2k RMC**		**Test channel:**	**Middle**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3464.80	Vertical	-48.63	-13.00	Pass
5197.20	V	-47.07		
3464.80	Horizontal	-49.65		
5197.20	H	-47.95		
Test mode:	**WCDMA Band IV 12.2k RMC**		**Test channel:**	**Highest**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3505.20	Vertical	-48.06	-13.00	Pass
5257.80	V	-47.64		
3505.20	Horizontal	-47.69		
5257.80	H	-47.37		

Remark:
The emission levels of below 1 GHz are very lower than the limit and not show in test report.

6.12 Frequency stability V.S. Temperature measurement

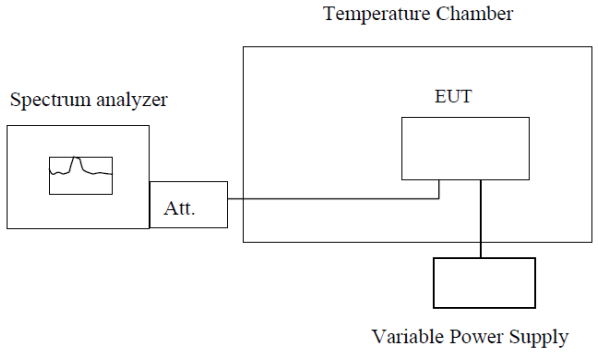
Test Requirement:	FCC Part2.1055(a)(1)(b)
Test Method:	FCC Part2.1055(a)(1)(b)
Limit:	±2.5ppm
Test setup:	 **Note :** Measurement setup for testing on Antenna connector
Test procedure:	1. The equipment under test was connected to an external DC power supply and input rated voltage. 2. RF output was connected 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℃ 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 Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed
Remark:	All three channels of all modulations have been tested, but only the worst channel and the worst modulation show in this test item.

Measurement Data (the worst channel):

Reference Frequency: GSM850 Middle channel=190 channel=836.6MHz					
Power supplied (Vdc)	Temperature (℃)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
3.70	-30	199	0.237868	±2.5	Pass
	-20	152	0.181688		
	-10	123	0.147024		
	0	164	0.196032		
	10	147	0.175711		
	20	121	0.144633		
	30	101	0.120727		
	40	117	0.139852		
	50	174	0.207985		
Reference Frequency: PCS1900 Middle channel=661 channel=1880MHz					
Power supplied (Vdc)	Temperature (℃)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
3.70	-30	187	0.099468	±2.5	Pass
	-20	164	0.087234		
	-10	123	0.065426		
	0	135	0.071809		
	10	104	0.055319		
	20	167	0.088830		
	30	140	0.074468		
	40	110	0.058511		
	50	129	0.068617		

Reference Frequency:WCDMA BAND V 12.2k RMC Middle channel=4183 channel=836.6MHz					
Power supplied (Vdc)	Temperature (℃)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
3.70	-30	185	0.221133	±2.5	Pass
	-20	123	0.147024		
	-10	165	0.197227		
	0	104	0.124313		
	10	112	0.133875		
	20	174	0.207985		
	30	180	0.215157		
	40	114	0.136266		
	50	140	0.167344		
Reference Frequency: WCDMA BAND II 12.2k RMC Middle channel=9400 channel=1880MHz					
Power supplied (Vdc)	Temperature (℃)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
3.70	-30	198	0.105319	±2.5	Pass
	-20	165	0.087766		
	-10	123	0.065426		
	0	177	0.094149		
	10	145	0.077128		
	20	180	0.095745		
	30	104	0.055319		
	40	114	0.060638		
	50	109	0.057979		
Reference Frequency: WCDMA BAND IV 12.2k RMC Middle channel=1413 channel=1732.6MHz					
Power supplied (Vdc)	Temperature (℃)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
3.70	-30	196	0.113125	±2.5	Pass
	-20	125	0.072146		
	-10	104	0.060025		
	0	114	0.065797		
	10	174	0.100427		
	20	123	0.070992		
	30	126	0.072723		
	40	158	0.091192		
	50	108	0.062334		

6.13 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℃. 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 specify extreme voltage variation (+/- 15%) and endpoint, record the maximum frequency change.
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details, and all channels have been tested, only shows the worst channel data in this report.
Test results:	Passed

Measurement Data (the worst channel):

Reference Frequency: GSM850 Middle channel=190 channel=836.6MHz					
Temperature (℃)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	4.25	96	0.114750	±2.5	Pass
	3.70	23	0.027492		
	3.14	85	0.101602		
Reference Frequency: PCS1900 Middle channel=661 channel=1880MHz					
Temperature (℃)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	4.25	74	0.039362	±2.5	Pass
	3.70	81	0.043085		
	3.14	90	0.047872		
Reference Frequency: UMTS 850 12.2k RMC Middle channel=4183 channel=836.6MHz					
Temperature (℃)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	4.25	66	0.078891	±2.5	Pass
	3.70	38	0.045422		
	3.14	97	0.115945		
Reference Frequency: UMTS 1900 12.2k RMC Middle channel=9400 channel=1880MHz					
Temperature (℃)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	4.25	55	0.029255	±2.5	Pass
	3.70	87	0.046277		
	3.14	94	0.050000		
Reference Frequency: UMTS 1700 12.2k RMC Middle channel=1413 channel=1732.6MHz					
Temperature (℃)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	4.25	74	0.042710	±2.5	Pass
	3.70	86	0.049636		
	3.14	95	0.054831		