

FCC TEST REPORT (WWAN part, 2G & 3G) No. 150801628SHA-001

Applicant : Haier Telecom (Qingdao) Co., Ltd.
No1. Haier Road , Hi-tech Zone, Qingdao, 266101, China

Manufacturer : Haier Telecom (Qingdao) Co., Ltd.
No1. Haier Road , Hi-tech Zone, Qingdao, 266101, China

Product Name : Mobile Phone

Type/Model : L51

Classification : PCS Licensed Transmitter Held to Ear (PCE)

TEST RESULT : PASS

SUMMARY

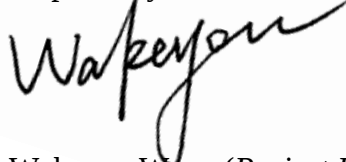
The equipment complies with the requirements according to the following standard(s):

FCC 47CFR Part 22 PUBLIC MOBILE SERVICES (Subpart H)

FCC 47CFR Part 24 PERSONAL COMMUNICATIONS SERVICES (Subpart E)

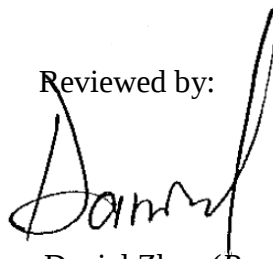
Date of issue: Aug 24, 2015

Prepared by:



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Reviewed by:



Daniel Zhao (*Reviewer*)



Description of Test Facility

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IC Assigned Code: 2402B-1

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1. General Information

1.1 Applicant Information

Applicant : Haier Telecom (Qingdao) Co., Ltd.
No1. Haier Road , Hi-tech Zone, Qingdao, 266101, China

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Manufacturer : Haier Telecom (Qingdao) Co., Ltd.
No1. Haier Road , Hi-tech Zone, Qingdao, 266101, China

1.2 Identification of the EUT

Product Name : Mobile Phone

Type/model : L51

Hardware version : MP

Software version : HL-L51-H01-S01

IMEI : 867747020003024

FCC ID : SG71507L51

Sample received date : June 20, 2015

Date of test : June 20, 2015 ~ Aug 10, 2015

1.3 Technical specification

Tested	Mode	Intervals / Bandwidth (MHz)	TX & RX frequency (MHz)
☒	GSM/GPRS/EDGE 850	Intervals 0.2	Tx: 824.20 - 848.80 Rx: 869.20 - 893.80
☒	GSM/GPRS/EDGE 1900	Intervals 0.2	Tx: 1850.20 - 1909.80 Rx: 1930.20 - 1989.80
☒	WCDMA/HSDPA/HSUPA/ HSPA+ (Downlink Only) 850	Intervals 0.2	Tx: 826.40 - 846.60MHz Rx: 871.40 - 891.60MHz
☒	WCDMA/HSDPA/HSUPA/ HSPA+ (Downlink Only) 1900	Intervals 0.2	Tx: 1852.40 - 1907.60MHz Rx: 1932.40 - 1987.60MHz
☐	LTE 2	Bandwidth 1.4/3/5/10/15/20	Tx: 1850.7 MHz - 1909.3 Rx:1930.7 MHz - 1989.3
☐	LTE 4	Bandwidth 1.4/3/5/10/15/20	Tx: 1710.7 MHz - 1754.3 Rx:2110.7 MHz - 2154.3
☐	LTE 7	Bandwidth 5/10/15/20	Tx: 2502.5 MHz -2567.5 Rx:2622.5MHz - 2687.5
☐	LTE 17	Bandwidth 5/10	Tx: 706.5 MHz - 713.5 Rx:736.5 MHz - 743.5
☐	WLAN 802.11b / g /n20	/	/
☐	Bluetooth V4.0 LE / EDR	/	/

Antenna : Internal, un-detachable
main, 1.82dBi max;
Diversity, 1.62dBi max;
Wi-Fi & Bluetooth, 1.85dBi max;
aGPS, 1.51dBi max;

Rating : Normal voltage, 4.2V;
Extreme low voltage, 3.7V;
Extreme high voltage, 5V;
AC/DC adapter, 100-240V, 50/60Hz input, 5V DC output

1.4 Technical Specification for Mode tested in this report

Multislot Class	:	GSM: Multislot Class12 EDGE: Multislot Class12
Maximum Output Power to Antenna	:	GSM 850: 33.45dBm GSM 1900: 29.42dBm EDGE 850: 27.18dBm EDGE 1900: 24.96dBm WCDMA 850: 24.45dBm WCDMA 1900: 22.71dBm
Type of Modulation	:	GSM / GPRS:GMSK EDGE:GMSK / 8PSK WCDMA: QPSK(Uplink) HSDPA:QPSK(Uplink) HSUPA:QPSK(Uplink) HSPA+:16QAM(Downlink Only)

System	Modulation	Emission Designator	Freq Tolerance (ppm)	Maximum ERP/EIRP (dBm)	Maximum ERP/EIRP (W)
GSM850	GMSK	248KGXW	0.0081	31.60	1.445
GSM1900	GMSK	260KGXW	0.0024	28.70	0.741
EDGE 850	8PSK	247KG7W	0.0078	26.00	0.398
EDGE 1900	8PSK	247KG7W	0.0025	24.30	0.269
WCDMA 850 RMC 12.2Kbps	QPSK	4M15F9W	0.0083	22.40	0.174
WCDMA 1900 RMC 12.2Kbps	QPSK	4M17F9W	0.0028	21.60	0.145

2. Test Specification

2.1 Standards or specification

FCC 47CFR Part 22 H
FCC 47CFR Part 24 E
TIA-603 Version D
971168 D01 Power Meas License Digital Systems v02r02

2.2 Mode of operation during the test

While testing transmitting mode of EUT, the internal modulation and continuously transmission was applied.

2.3 Test software list

Test Items	Software	Manufacturer	Version
Conducted emission	ESxS-K1	R&S	V2.1.0
Radiated emission	ES-K1	R&S	V1.71

2.4 Test peripherals list

Item No.	Name	Band and Model	Description
1	PC	HP ProBook 6450b	/

2.5 Instrument list

Equipment	Type	Manu.	Internal no.	Cal. Date	Due date
Test Receiver	ESCS 30	R&S	EC 2107	2014-10-21	2015-10-20
Test Receiver	ESIB 26	R&S	EC 3045	2014-10-20	2015-10-19
Test Receiver	ESCI 7	R&S	EC4501	2014-12-25	2015-12-24
Semi-anechoic chamber	-	Albatross project	EC 3048	2015-5-11	2016-5-10
High Pass Filter	WHKX 1.0/15G-10SS	Wainwright	EC4297-1	2015-1-8	2016-1-7
High Pass Filter	WHKX 2.8/18G-12SS	Wainwright	EC4297-2	2015-1-8	2016-1-7
High Pass Filter	WHKX 7.0/1.8G-8SS	Wainwright	EC4297-3	2015-1-8	2016-1-7
Band Reject Filter	WRCGV 2400/2483-2390/2493-35/10SS	Wainwright	EC4297-4	2015-1-8	2016-1-7
RF cable	SUCOFLEX 104	HUBER+SUHNER	/	2015-2-13	2016-2-12
Bilog Antenna	CBL 6112D	TESEQ	EC 4206	2015-4-27	2016-4-26
Horn antenna	HF 906	R&S	EC 3049	2015-4-27	2016-4-26
Pre-amplifier	Pre-amp 18	R&S	EC 3222	2015-4-20	2016-4-19
Spectrum analyzer	E7402A	Agilent	EC2254	2014-08-16	2015-08-15
Climate Chamber	SETH-Z-102U	ESPEC	EC4315	2015-4-9	2016-4-8
PXA Signal Analyzer	N9030A	Agilent	EC5338	2015-5-15	2016-4-14
Handset Tester	CMW500	R&S	/	2015-5-15	2016-4-14

2.6 Test Summary

This report applies to tested sample only. This report shall not be reproduced in part without written approval of Intertek Testing Service Shanghai Limited.

Test Items	FCC Section	Results	Details see section
RF Output Power	2.1046	Pass	3.1
ERP / EIRP	22.913 24.232	Pass	3.2
Occupied Bandwidth	2.1049	Pass	3.3
Conducted Out of Band Emissions	2.1051 2.1057 22.917 24.238	Pass	3.4
Radiated Spurious Emission	2.1053 2.1057 22.917 24.238	Pass	3.5
Band Edge Emission	22.917 24.238	Pass	3.6
Peak-to-Average Ratio	24.232	Pass	3.7
Frequency Stability	2.1055 22.355 24.235	Pass	3.8

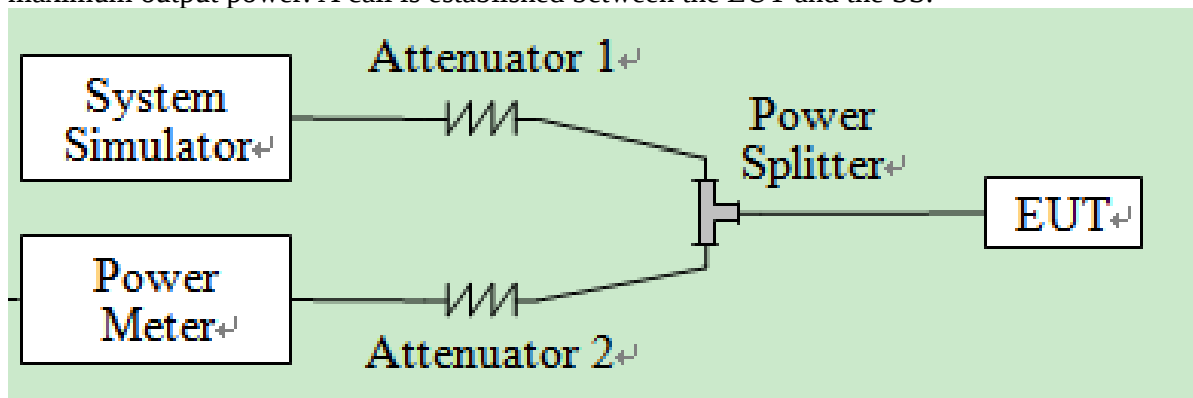
3. Test Result

3.1 RF Power Output (FCC Part 2.1046) { tc \l 2 "4.2 RF Power Output (FCC Part 2.1046, 22.913 & 24.232)" }

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

Test Procedures:

The EUT is coupled to the Power Meter and the System Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. The EUT is commanded by the SS to operate at the maximum output power. A call is established between the EUT and the SS.



Test results:

Band	CH	Frequency (MHz)	Measured output power (dBm)
GSM850MHz	128	824.2	33.45
GSM850MHz	189	836.4	33.14
GSM850MHz	251	848.8	33.40
EDGE 850MHz	128	824.2	27.18
EDGE 850MHz	189	836.4	26.93
EDGE 850MHz	251	848.8	27.09
WCDMA 850MHz	4132	826.4	24.30
WCDMA 850MHz	4182	836.4	24.03
WCDMA 850MHz	4233	846.6	24.45

Band	CH	Frequency (MHz)	Measured output power (dBm)
GSM1900MHz	512	1850.2	29.14
GSM1900MHz	661	1880	29.15
GSM1900MHz	810	1909.8	29.42
EDGE 1900MHz	512	1850.2	24.96
EDGE 1900MHz	661	1880	24.60
EDGE 1900MHz	810	1909.8	24.83
WCDMA 1900MHz	9262	1852.4	22.24
WCDMA 1900MHz	9400	1880	22.56
WCDMA 1900MHz	9538	1907.6	22.71

3.2 ERP / EIRP (FCC Part 22.913 & 24.232) { tc \ 2 "4.2 RF Power Output (FCC Part 2.1046, 22.913 & 24.232)" }

The limit is as follows:

Part 22.913 (for 850MHz band):

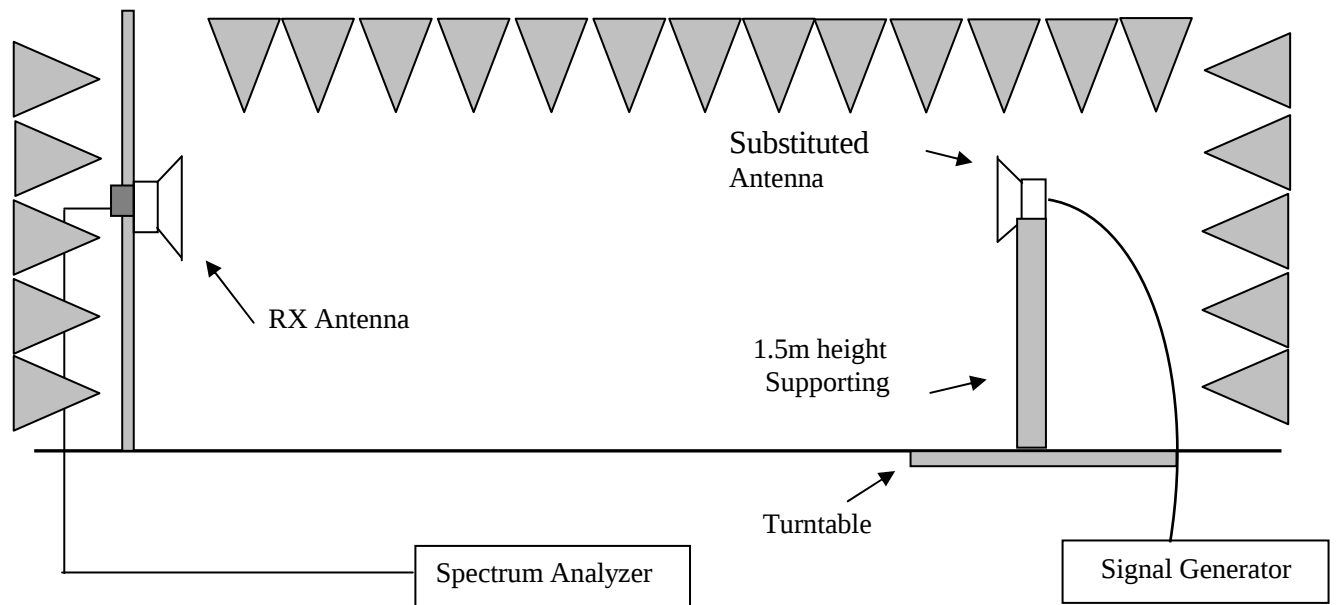
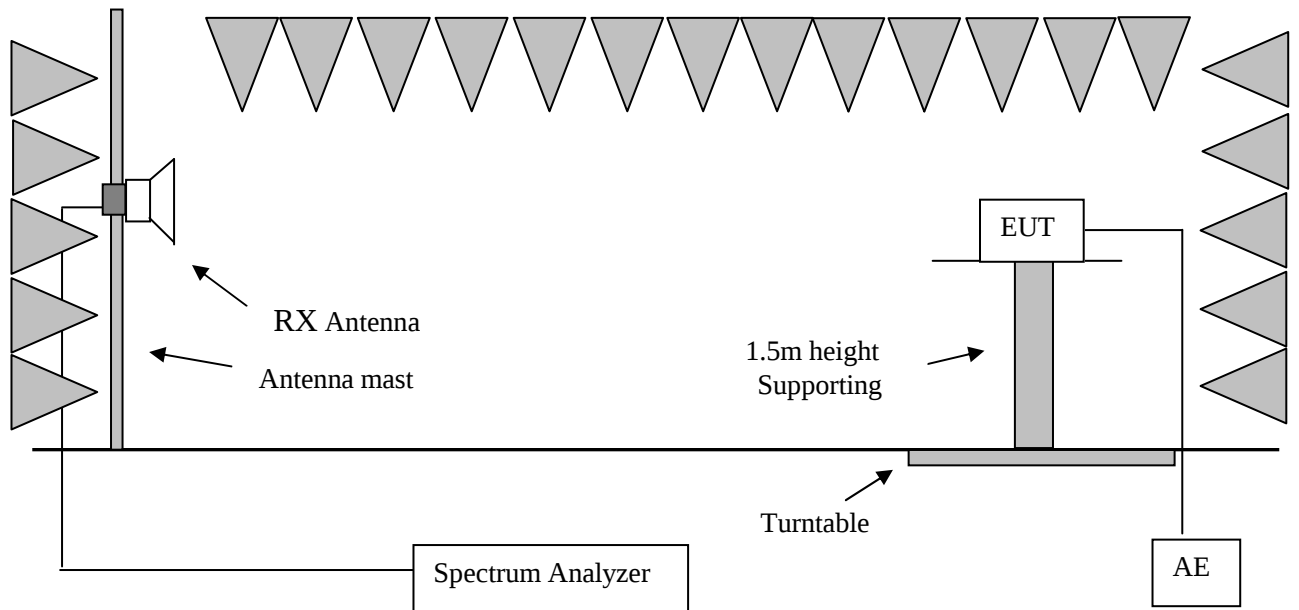
- ☐ $\leq 500\text{W ERP (57dBm)}$ for base stations and cellular repeaters
- ☒ $\leq 7\text{W ERP (38.5dBm)}$ for mobile and auxiliary test transmitters

Part 24.232 (for 1900MHz band):

- ☐ $\leq 1640\text{W e.i.r.p. (62.1dBm)}$ for base stations up to 300m HAAT;
- ☒ $\leq 2\text{W e.i.r.p. (33dBm)}$ peak output power for portable mobile

Test Procedures:

1. The EUT was placed on a turntable with 1.5 meter height in a fully anechoic chamber.
2. The EUT was set at 3 meters from the receiving antenna, which was mounted on the antenna tower.
3. The radiated emission at the fundamental frequency was measured at 3 m with a test antenna and a spectrum analyzer which used a channel power option across EUT's signal bandwidth.
4. The table was rotated 360 degrees to determine the position of the highest radiated power.
5. The height of the receiving antenna is adjusted to look for the maximum ERP/EIRP.
6. Taking the record of maximum ERP/EIRP.
7. A substituted antenna was substituted in place of the EUT and was driven by a signal generator.
8. The conducted power at the terminal of the dipole antenna is measured.
9. Repeat step 3 to step 5 to get the maximum ERP/EIRP of the substitution antenna.
10. $\text{ERP/EIRP} = P_s + E_t - E_s + G_s = P_s + R_t - R_s + G_s$
 P_s (dBm): Input power to substitution antenna.
 G_s (dBi or dBd): Substitution antenna Gain.
 $E_t = R_t + \text{AF}$
 $E_s = R_s + \text{AF}$
 AF (dB/m): Receive antenna factor
 R_t : The highest received signal in spectrum analyzer for EUT.
 R_s : The highest received signal in spectrum analyzer for substitution antenna.



Test results:

Band	CH	Frequency (MHz)	ERP (dBm)	Limit (dBm)	H/V
GSM850MHz	128	824.2	31.60	38.5	V
GSM850MHz	189	836.4	31.30	38.5	V
GSM850MHz	251	848.8	31.50	38.5	V
EDGE 850MHz	128	824.2	26.00	38.5	H
EDGE 850MHz	189	836.4	25.30	38.5	V
EDGE 850MHz	251	848.8	25.80	38.5	V
WCDMA 850MHz	4132	826.4	22.20	38.5	V
WCDMA 850MHz	4182	836.4	21.90	38.5	V
WCDMA 850MHz	4233	846.6	22.40	38.5	V

Band	CH	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	H/V
GSM1900MHz	512	1850.2	28.50	33.0	V
GSM1900MHz	661	1880	28.10	33.0	V
GSM1900MHz	810	1909.8	28.70	33.0	V
EDGE 1900MHz	512	1850.2	24.30	33.0	V
EDGE 1900MHz	661	1880	23.90	33.0	V
EDGE 1900MHz	810	1909.8	24.20	33.0	V
WCDMA 1900MHz	9262	1852.4	21.50	33.0	V
WCDMA 1900MHz	9400	1880	21.40	33.0	V
WCDMA 1900MHz	9538	1907.6	21.60	33.0	V

Note: the worst data is listed here.

Example: At frequency of 824.2MHz, $P_s = 10\text{dBm}$, $R_t = 0.1\text{dBm}$, $R_s = -22.3\text{dBm}$, $G_s = 1.3\text{dBi}$; $ERP = P_s + R_t - R_s + G_s = 10\text{dBm} + 0.1\text{dBm} + 22.3\text{dBm} + 1.3\text{Bi} - 2.15 = 31.6\text{dBm}$

3.3 Occupied Bandwidth (FCC Part 2.1049) { tc \l 2 "4.3 Occupied Bandwidth (FCC Part 2.1049)" }

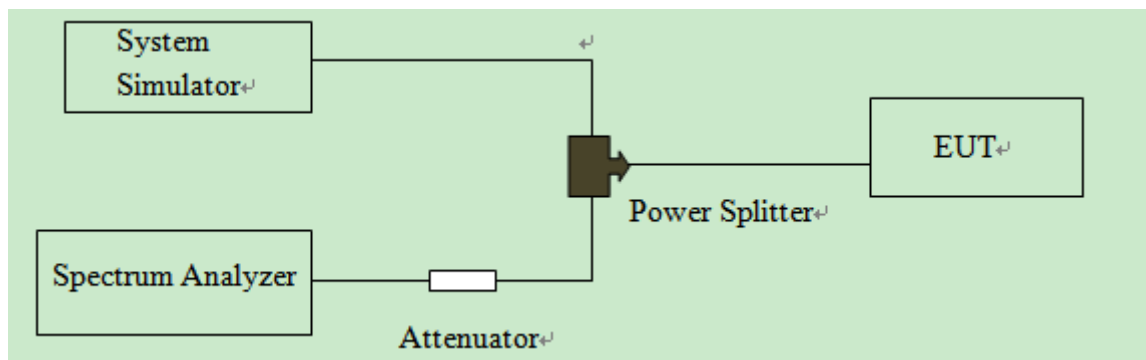
The limit is as follows:

From 2.1049, occupied bandwidth is defined as the measured spectral width of an emission. The measurement determines occupied bandwidth as the difference between upper and lower frequencies where 0.5% of the emission power is above the upper frequency and 0.5% of the emission power is below the lower frequency.

The 26dB bandwidth is the emission bandwidth is defined as the width of the signal between two points, located at the 2 sides of the carrier frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

Test Procedures:

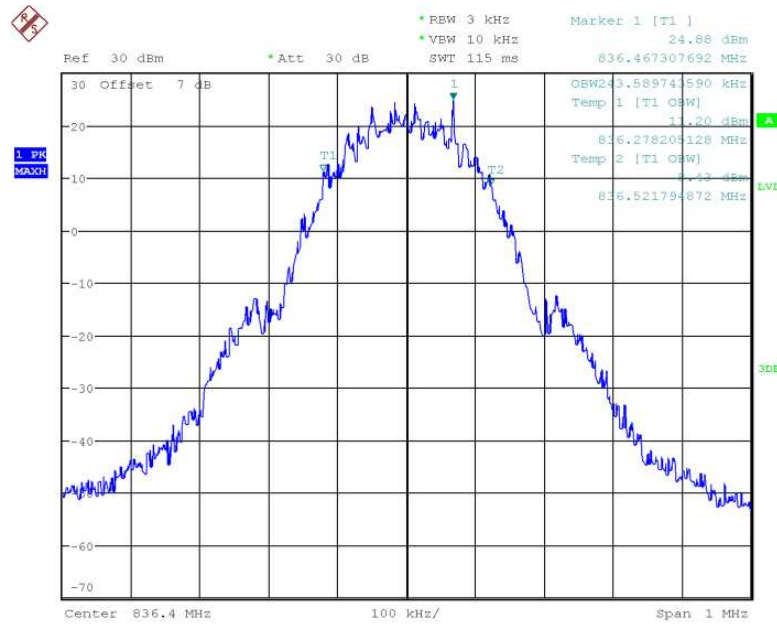
1. The EUT was connected to Spectrum Analyzer and Base Station via power divider.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. The 99% occupied bandwidth and 26 dB bandwidth of the middle channel for the highest RF powers were measured.



Test results:

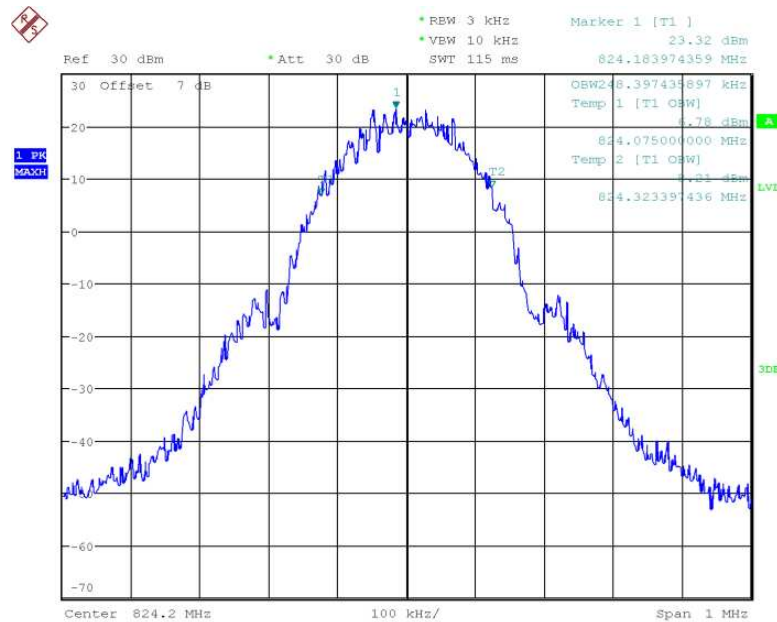
Band	ARFCN	Frequency (MHz)	99% Bandwidth (kHz)	26dB Bandwidth (kHz)
GSM850MHz	128	824.2	248.397	306.090
GSM850MHz	189	836.4	245.192	310.897
GSM850MHz	251	848.8	245.192	317.308
EDGE 850MHz	128	824.2	245.192	315.705
EDGE 850MHz	189	836.4	246.795	306.09
EDGE 850MHz	251	848.8	246.795	315.705
GSM1900MHz	512	1850.2	259.615	312.500
GSM1900MHz	661	1880	243.590	307.692
GSM1900MHz	810	1909.8	248.397	326.923
EDGE 1900MHz	512	1850.2	246.795	309.295
EDGE 1900MHz	661	1880	237.179	310.897
EDGE 1900MHz	810	1909.8	238.782	310.897
WCDMA 850MHz	4132	826.4	4150.641	4679.487
WCDMA 850MHz	4182	836.4	4150.641	4711.538
WCDMA 850MHz	4233	846.6	4150.641	4711.538
WCDMA 1900MHz	9262	1852.4	4150.641	4711.538
WCDMA 1900MHz	9400	1880	4166.667	4679.487
WCDMA 1900MHz	9538	1907.6	4150.641	4711.538

OccupiedBandwidth-GSM850MS_Sig GSM Mid 189/836.4



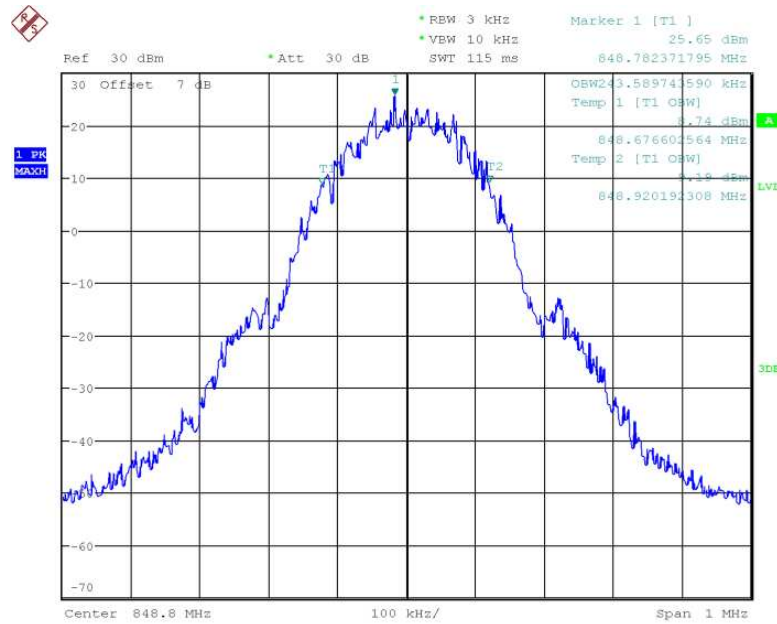
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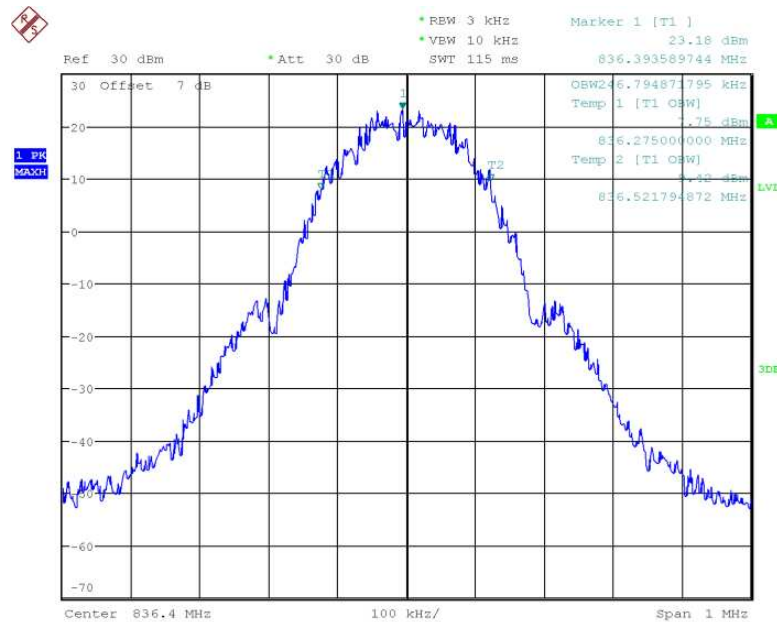
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OccupiedBandwidth-GSM850MS_Sig GSM High 251/848.8



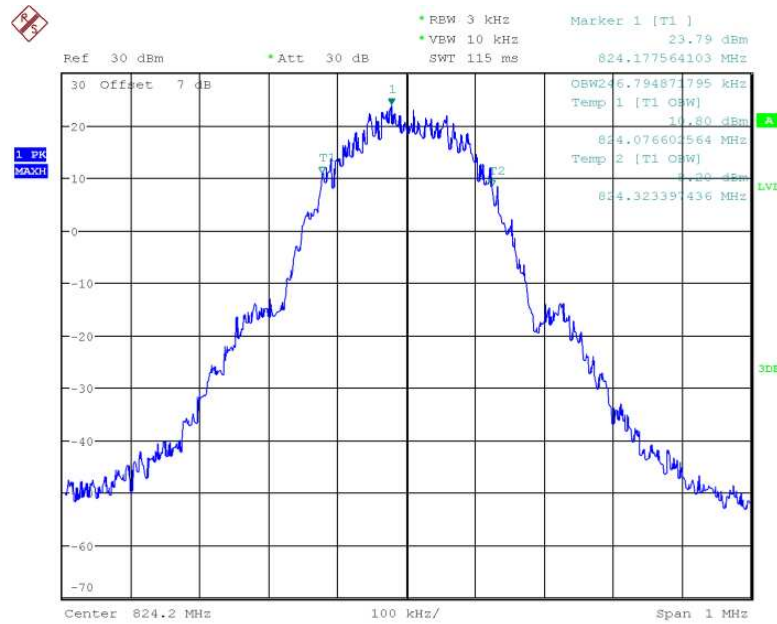
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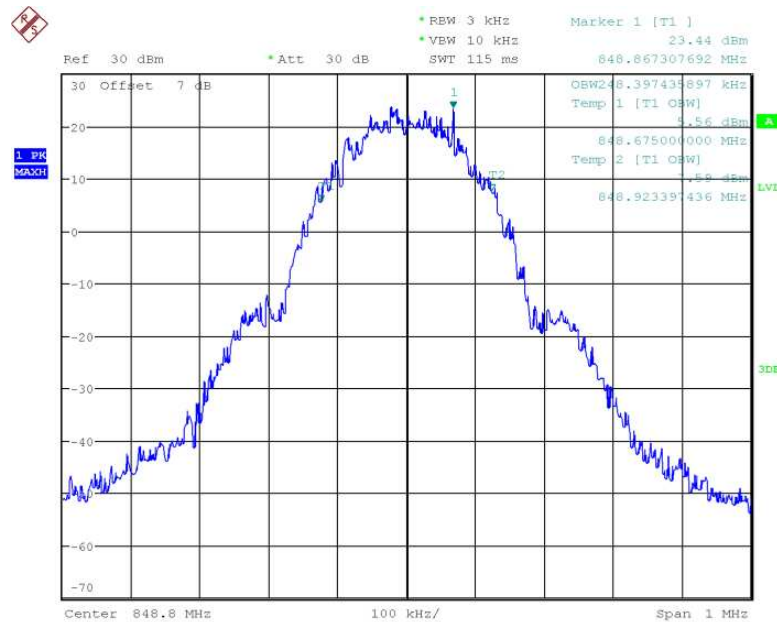
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OccupiedBandwidth-GSM850MS_Sig GGPR Low 128/824.2



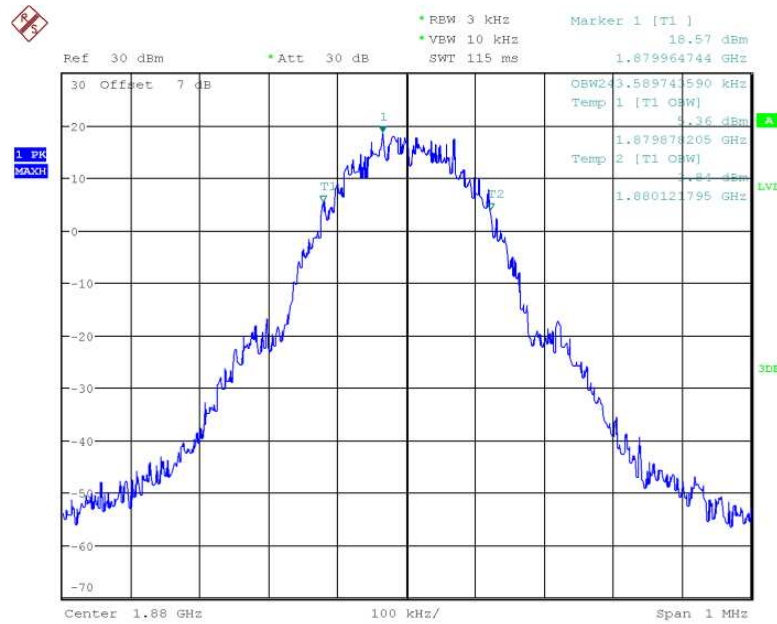
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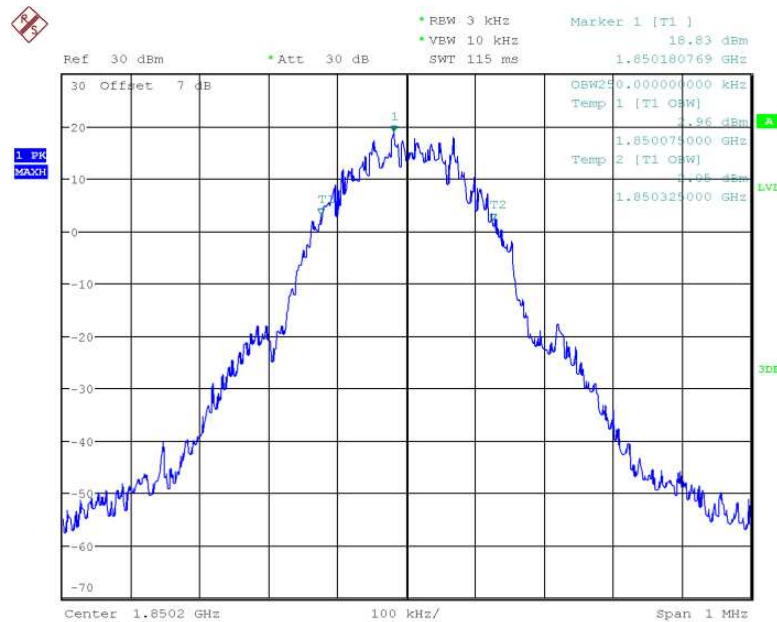
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OccupiedBandwidth-GSM1900MS_Sig GSM Mid 661/1880



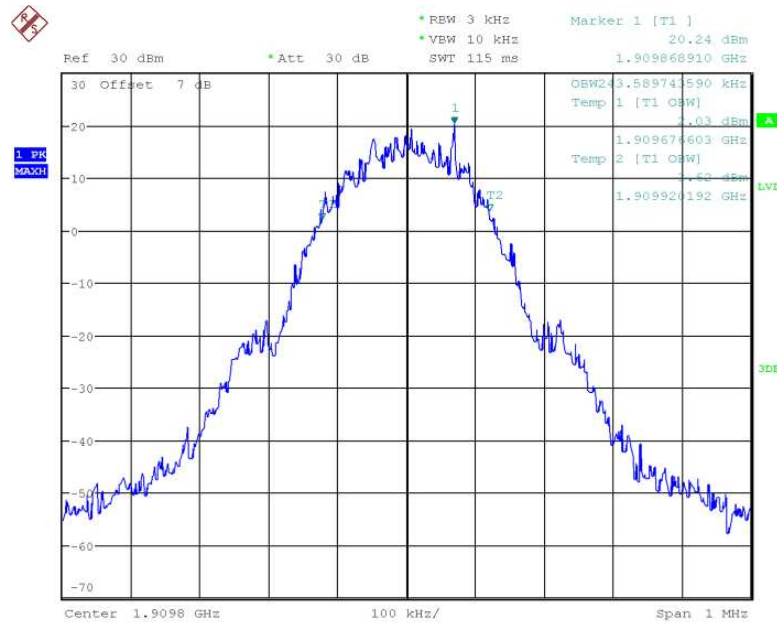
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OccupiedBandwidth-GSM1900MS_Sig GSM Low 512/1850.2



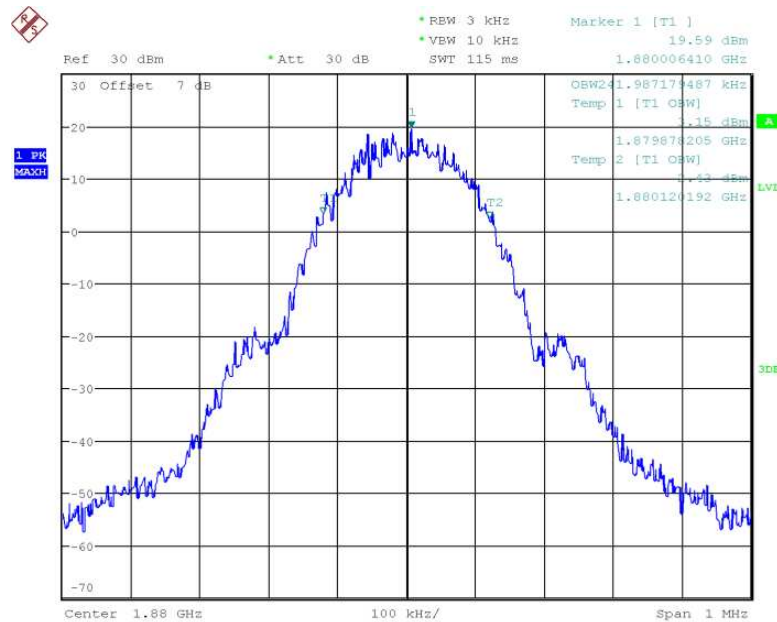
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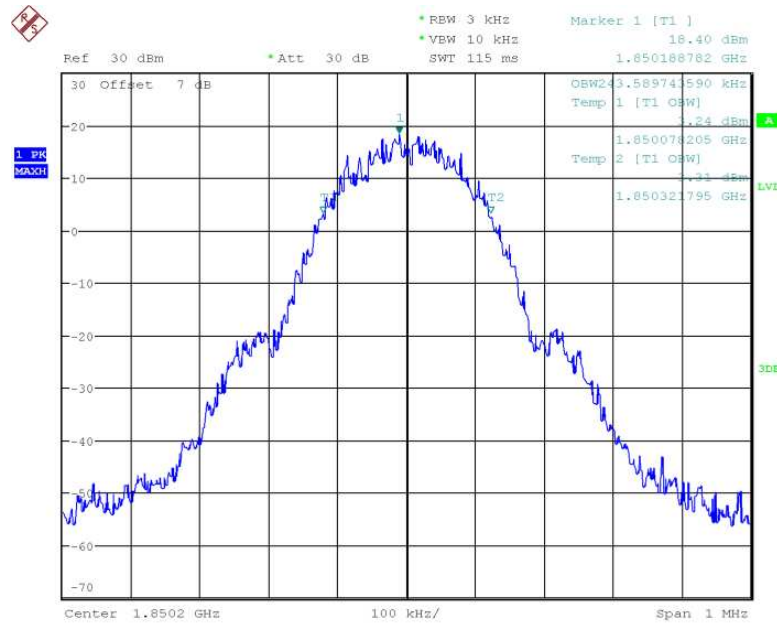
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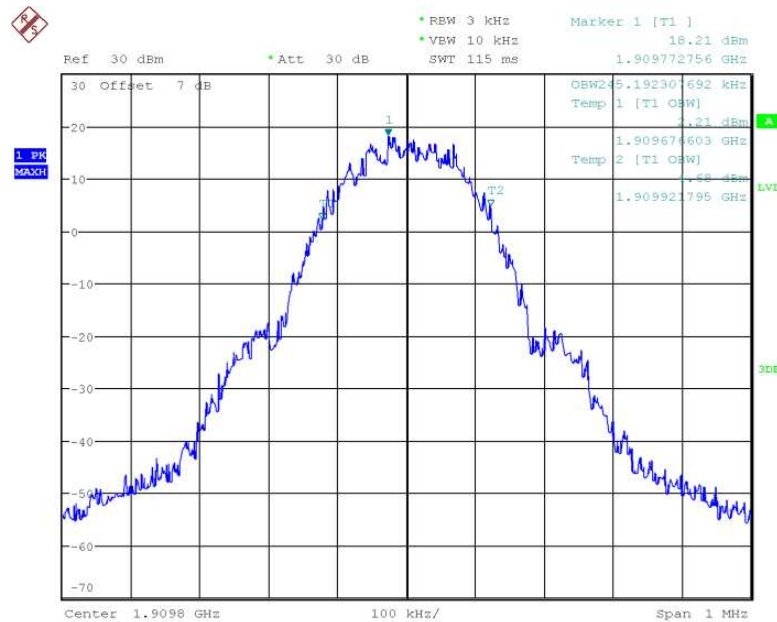
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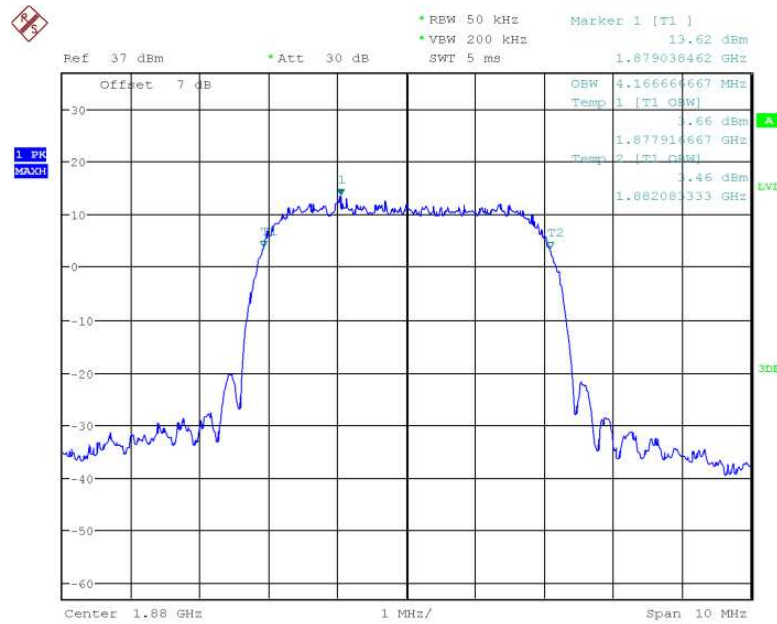
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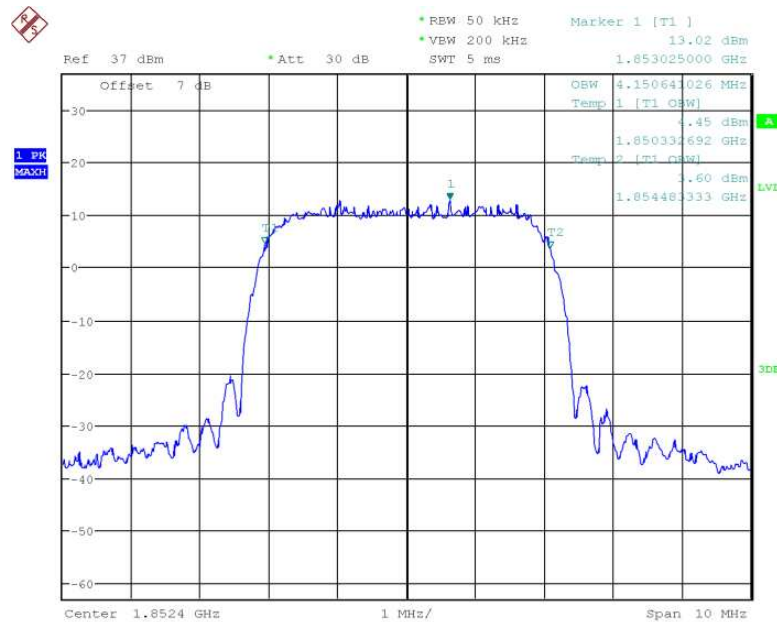
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OccupiedBandwidth(WCDMA)-OB2 Mid 9400/1880



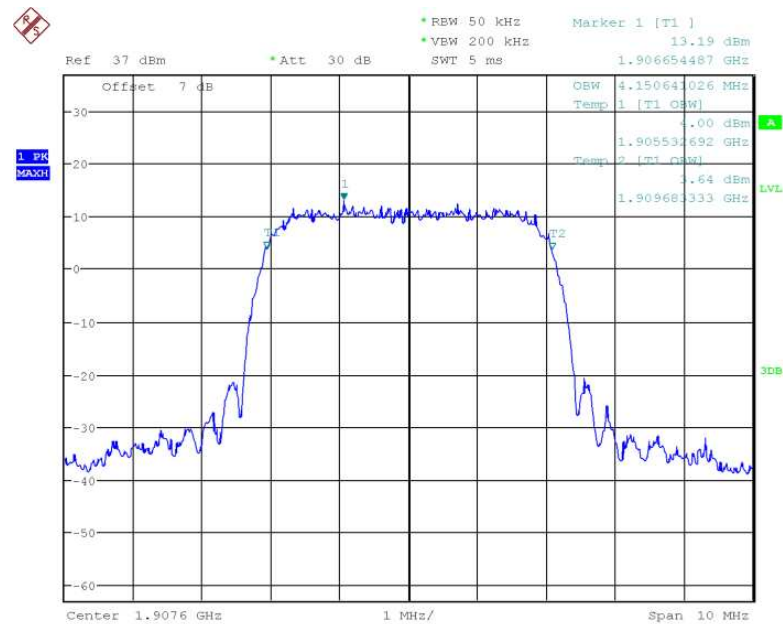
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OccupiedBandwidth(WCDMA)-OB2 Low 9262/1852.4



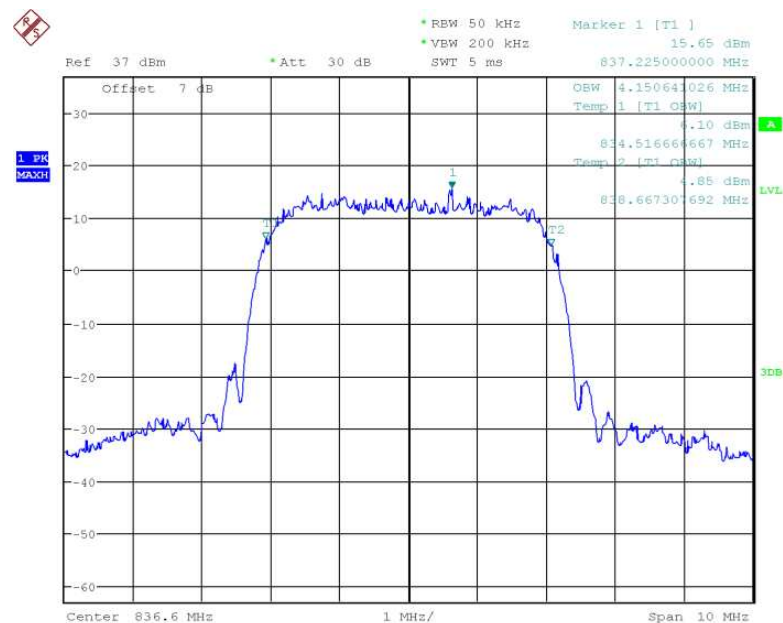
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OccupiedBandwidth(WCDMA)-OB2 High 9538/1907.6



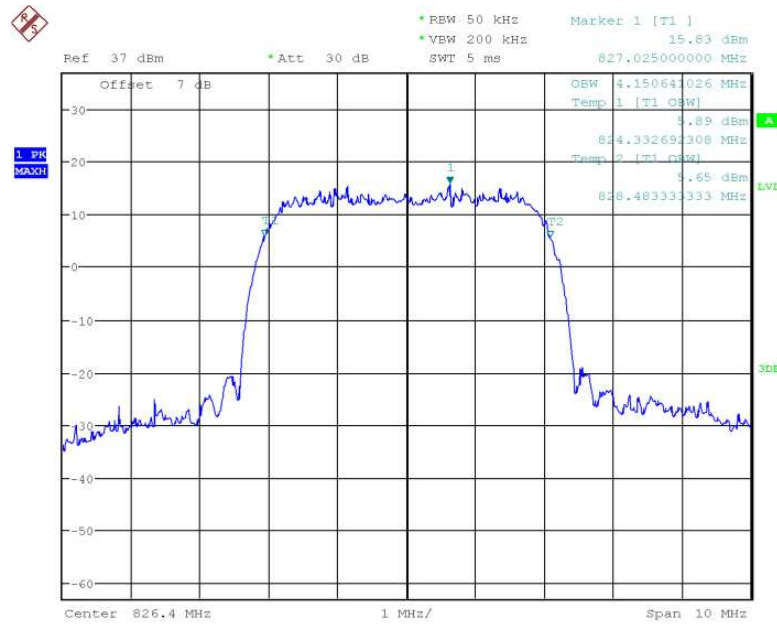
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OccupiedBandwidth(WCDMA)-OB5 Mid 4183/836.6



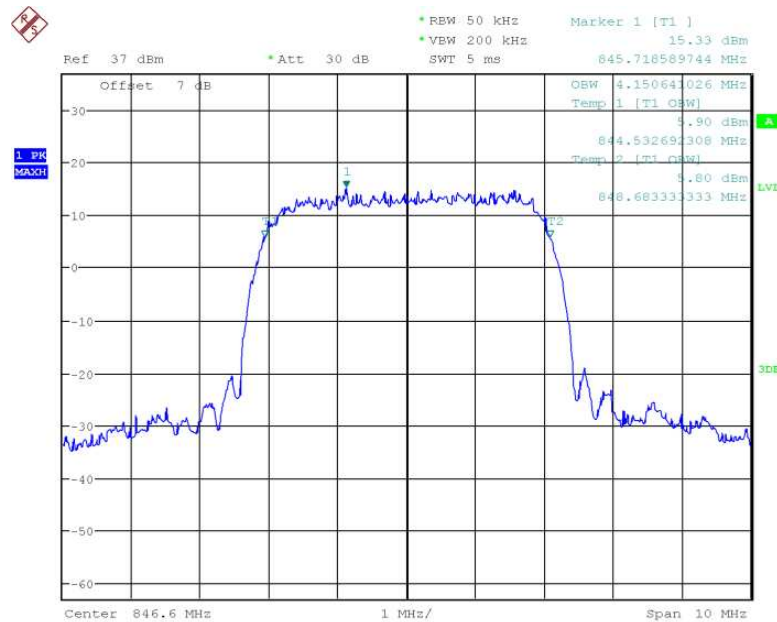
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OccupiedBandwidth(WCDMA)-OB5 Low 4132/826.4



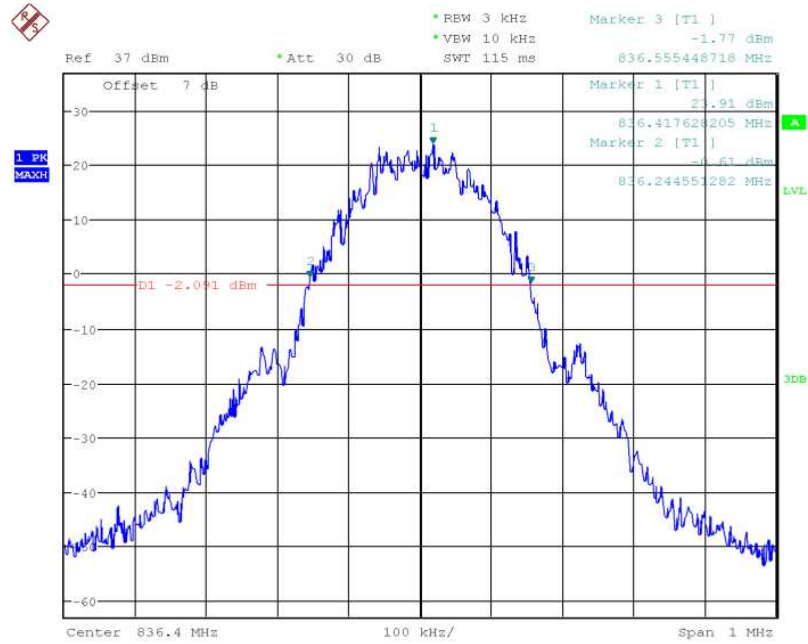
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OccupiedBandwidth(WCDMA)-OB5 High 4233/846.6



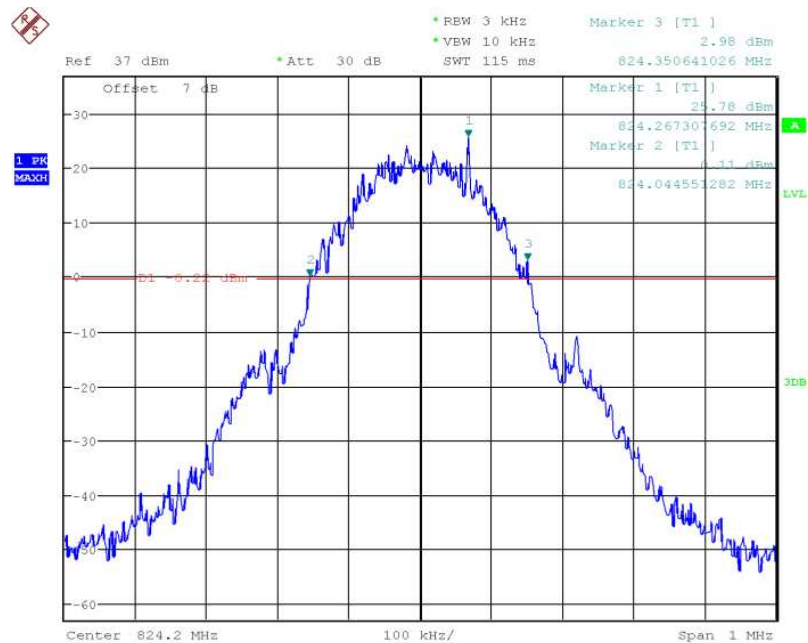
Date: 22.JUL.2015 13:51:19

EmissionBandwidth- GPRS850MS_Sig GSM Mid 189/836.4



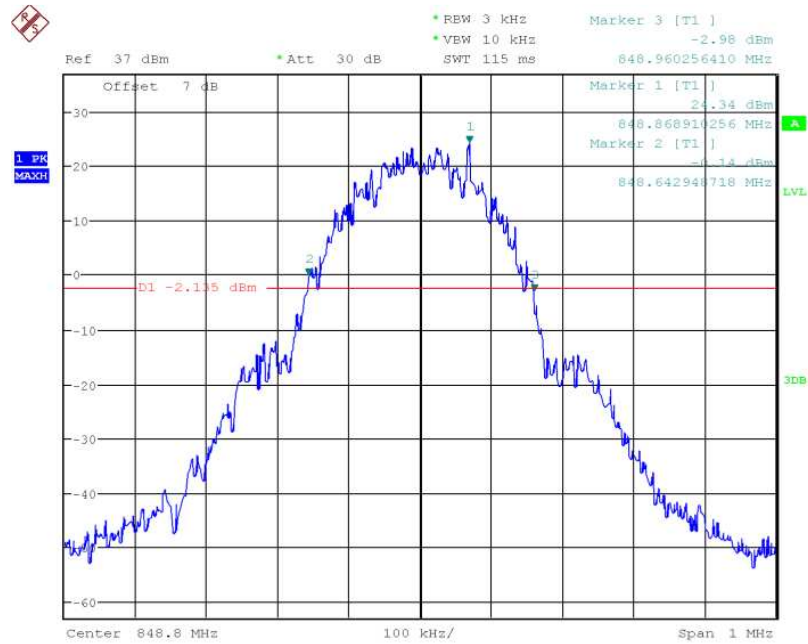
Date: 23.JUL.2015 10:17:24

EmissionBandwidth- GPRS850MS_Sig GSM Low 128/824.2



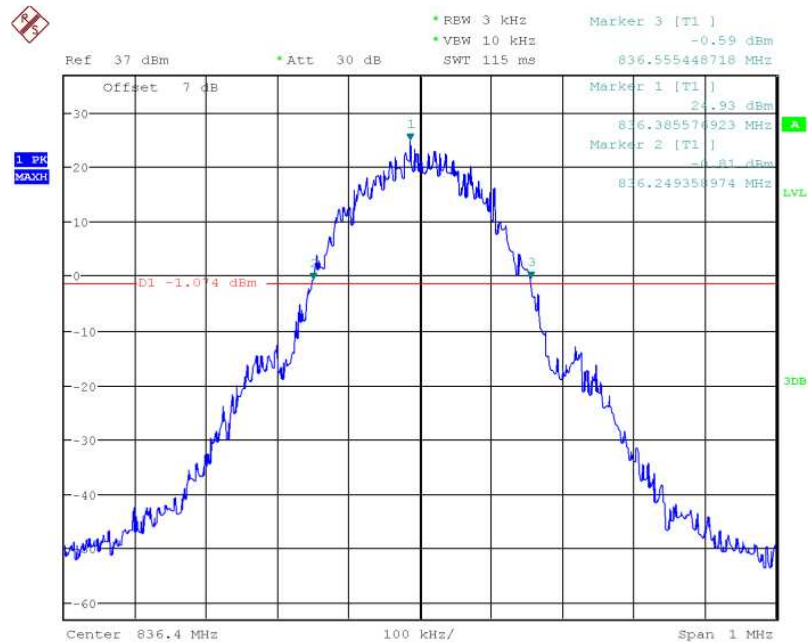
Date: 23.JUL.2015 10:17:51

EmissionBandwidth- GPRS850MS_Sig GSM High 251/848.8



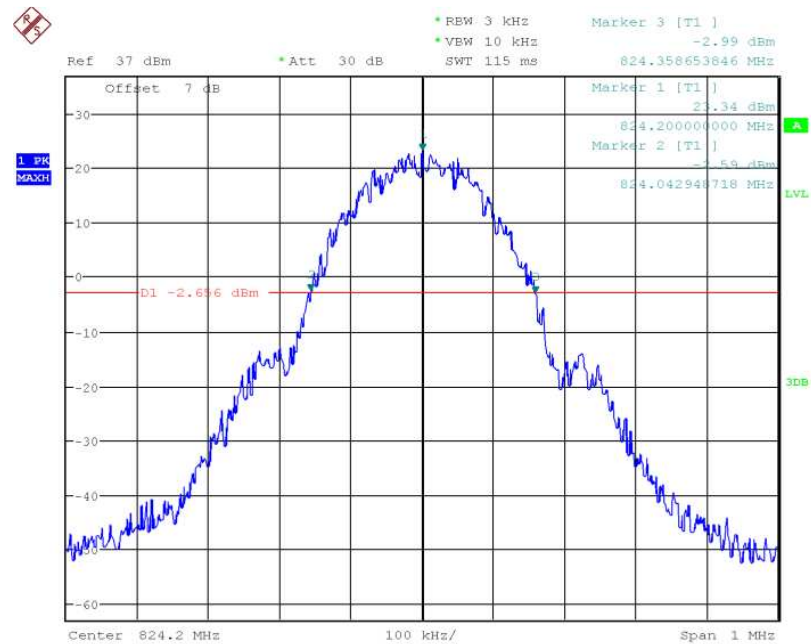
Date: 23.JUL.2015 10:18:18

EmissionBandwidth-EDGE850MS_Sig GGPR Mid 189/836.4



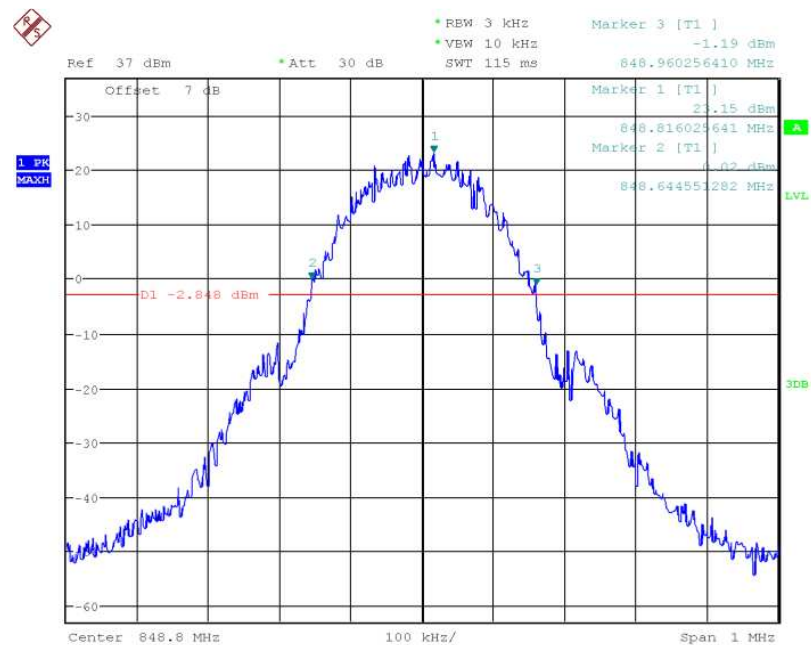
Date: 23.JUL.2015 10:19:58

EmissionBandwidth- EDGE850MS_Sig GPRS Low 128/824.2



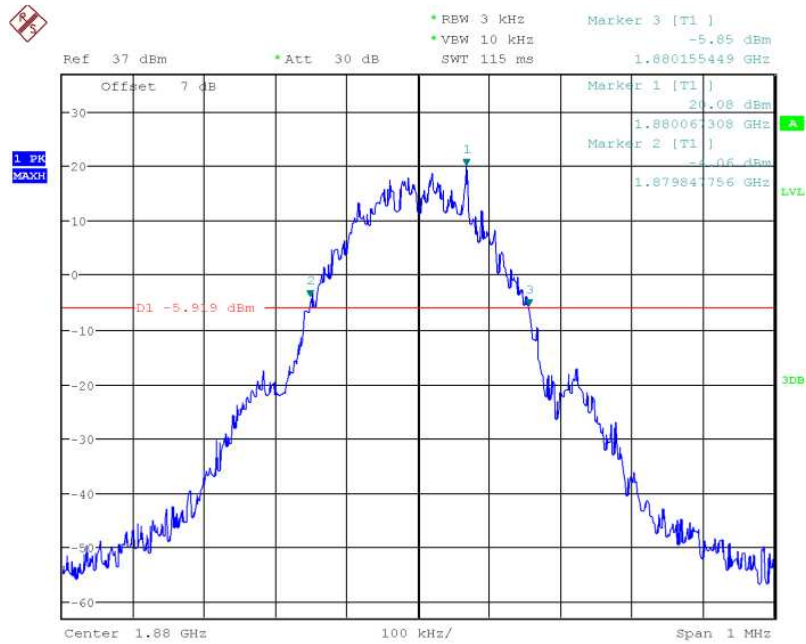
Date: 23.JUL.2015 10:20:22

EmissionBandwidth- EDGE850MS_Sig GPRS High 251/848.8



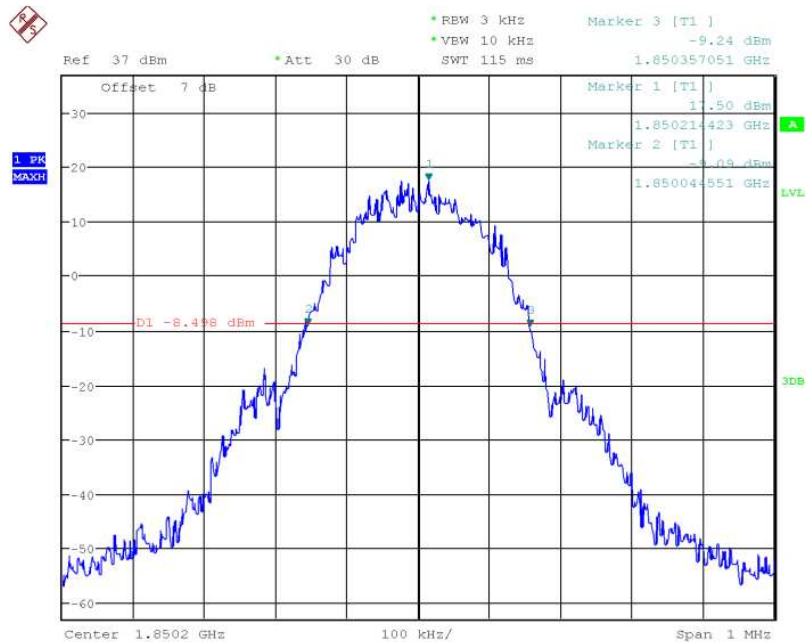
Date: 23.JUL.2015 10:20:47

EmissionBandwidth-GPRS1900MS_Sig GSM Mid 661/1880



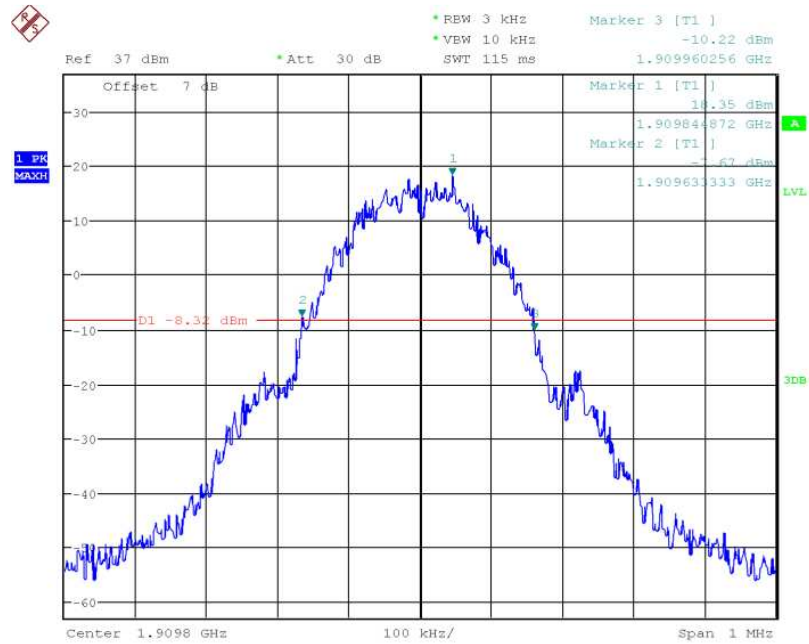
Date: 23.JUL.2015 10:25:22

EmissionBandwidth-GPRS1900MS_Sig GSM Low 512/1850.2



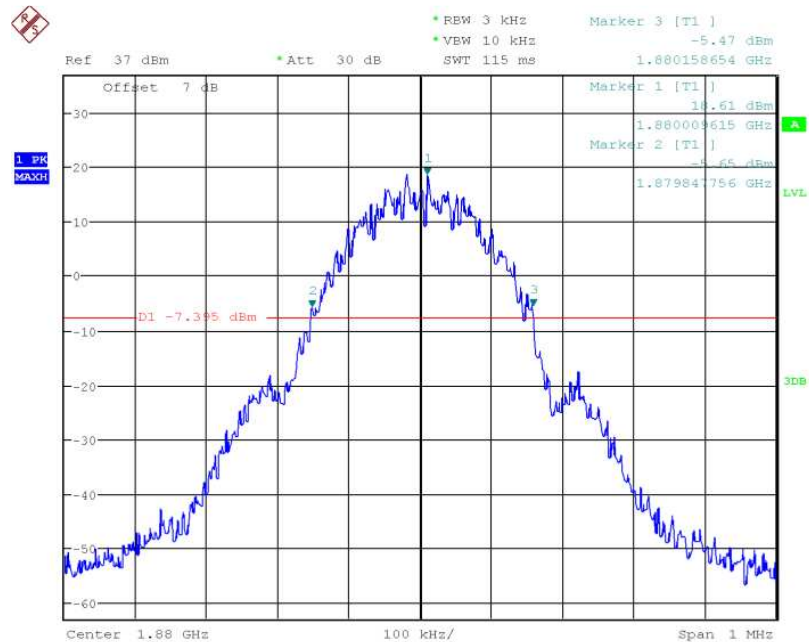
Date: 23.JUL.2015 10:25:48

EmissionBandwidth-GPRS1900MS_Sig GSM High 810/1909.8



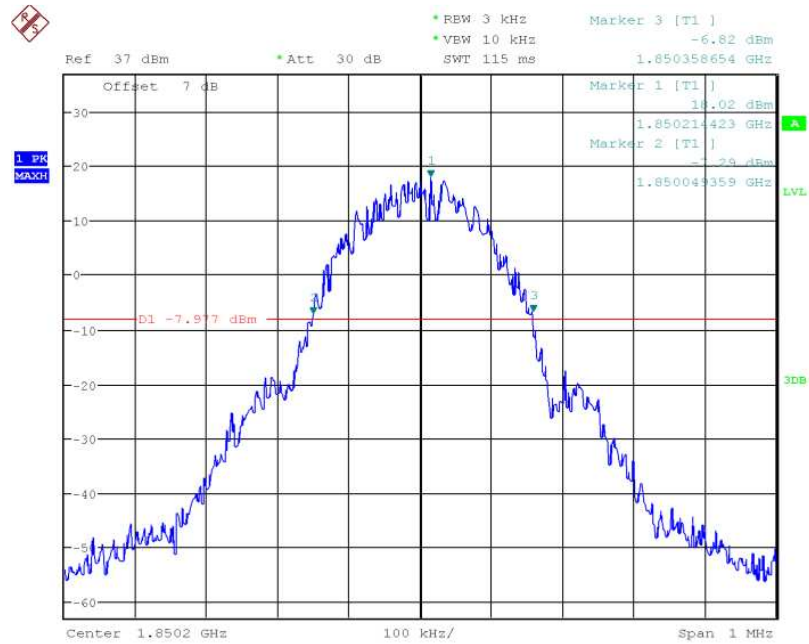
Date: 23.JUL.2015 10:26:13

EmissionBandwidth- EDGE1900MS_Sig GGPR Mid 661/1880



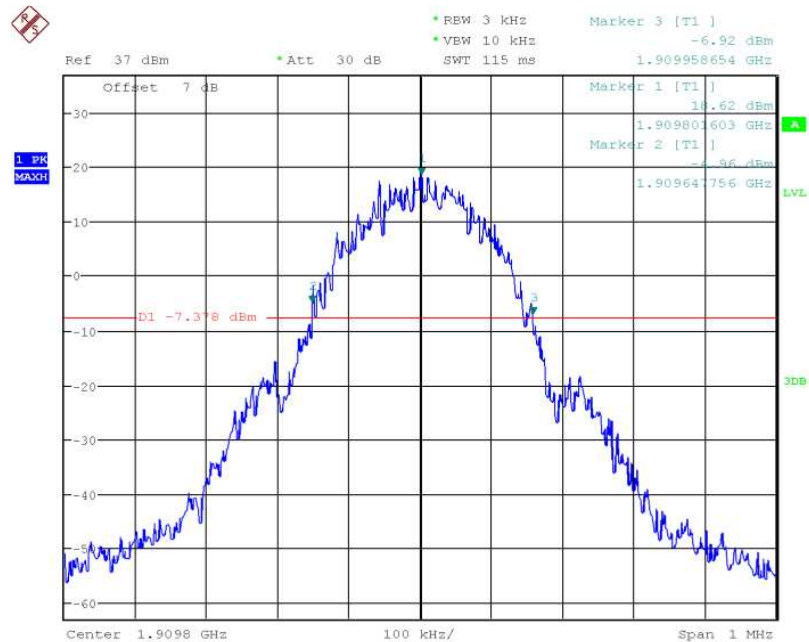
Date: 23.JUL.2015 10:27:52

EmissionBandwidth- EDGE1900MS_Sig GGPR Low 512/1850.2



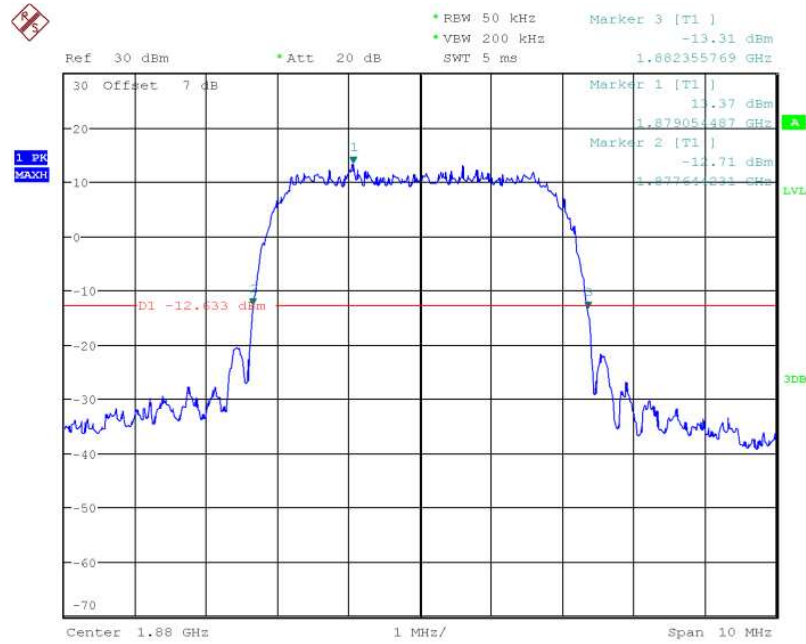
Date: 23.JUL.2015 10:28:16

EmissionBandwidth- EDGE1900MS_Sig GGPR High 810/1909.8



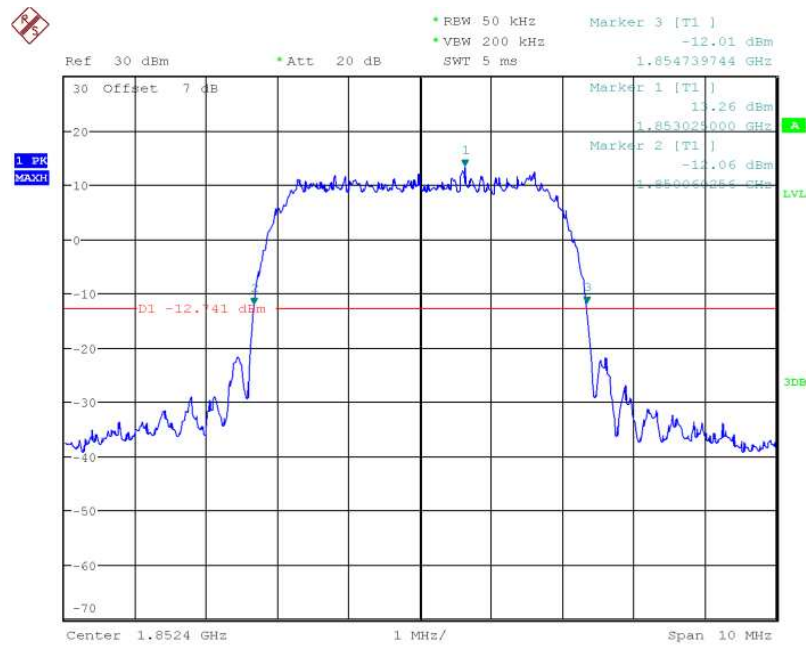
Date: 23.JUL.2015 10:28:39

EmissionBandwidth(WCDMA)-OB2 Mid 9400/1880



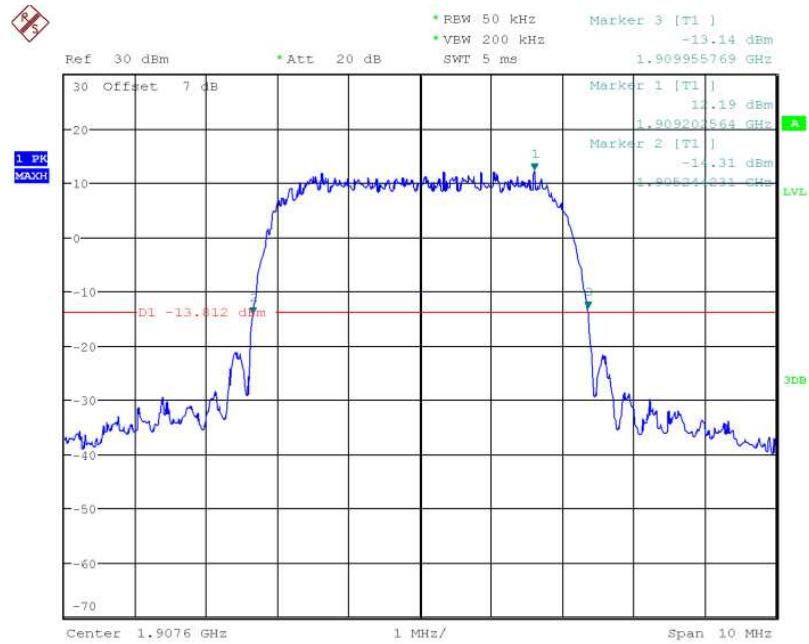
Date: 22.JUL.2015 14:22:24

EmissionBandwidth(WCDMA)-OB2 Low 9262/1852.4



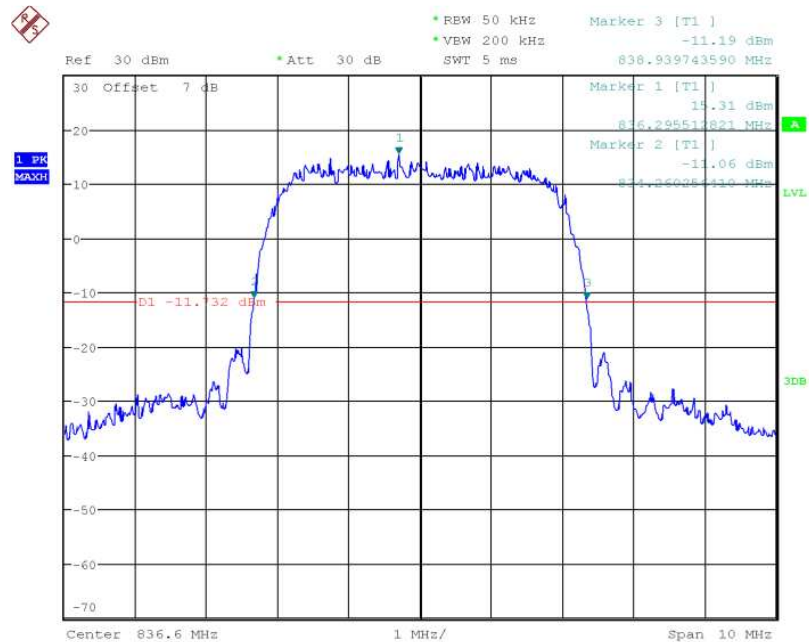
Date: 22.JUL.2015 14:22:50

EmissionBandwidth(WCDMA)-OB2 High 9538/1907.6



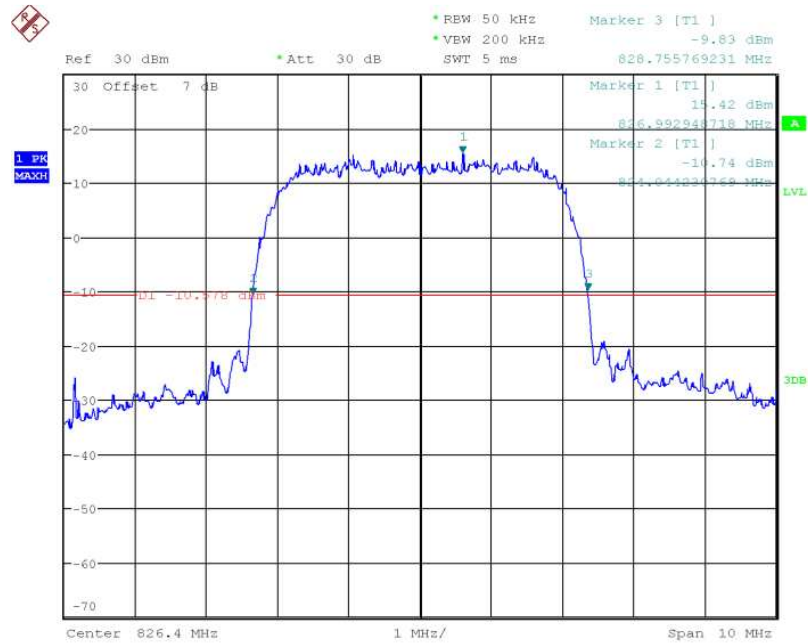
Date: 22.JUL.2015 14:23:15

EmissionBandwidth(WCDMA)-OB5 Mid 4183/836.6



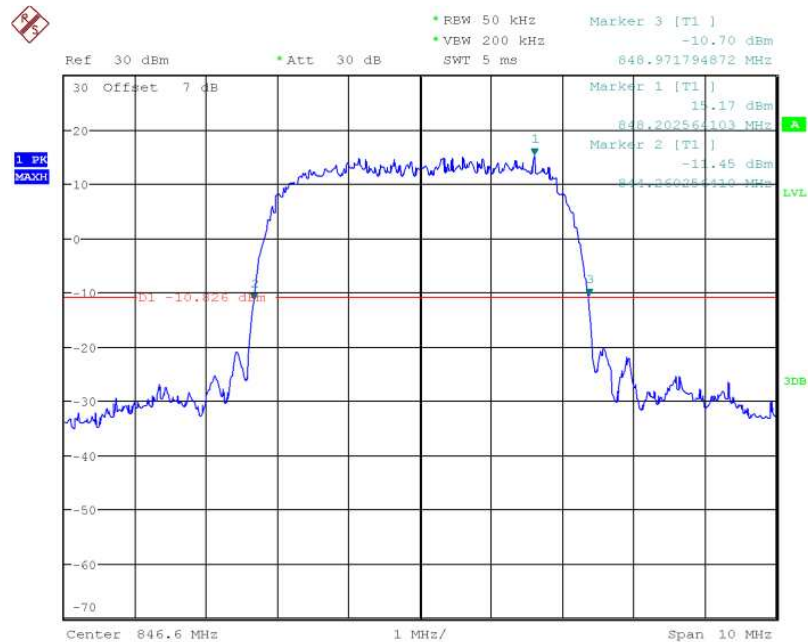
Date: 22.JUL.2015 14:24:03

EmissionBandwidth(WCDMA)-OB5 Low 4132/826.4



Date: 22.JUL.2015 14:24:29

EmissionBandwidth(WCDMA)-OB5 High 4233/846.6



Date: 22.JUL.2015 14:24:54

3.4 Conducted Spurious Emission (FCC Part 22.1051, 2.1057, 22.917, 24.238){ tc \l 2 "4.4 Spurious Emissions at Antenna Terminals (FCC Part 2.1051, 2.1057, 22.917, 24.238)" }

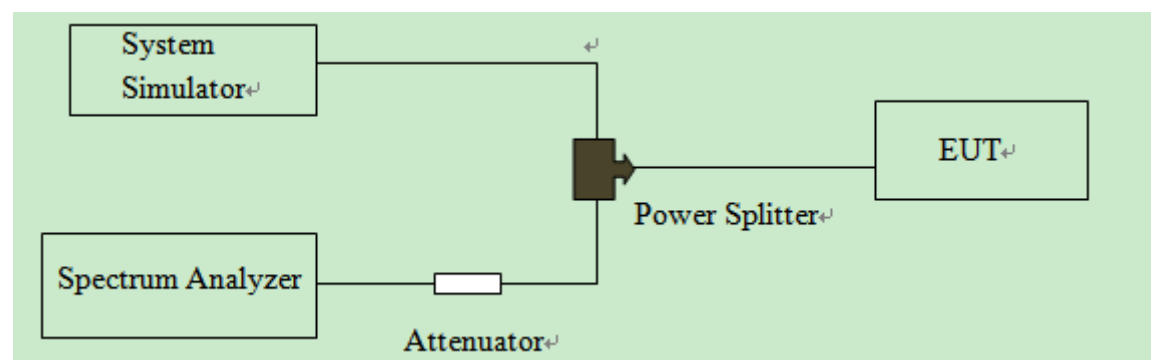
The limit is as follows:

The conducted spurious emissions are measured from 9kHz up to the 10th harmonic of fundamental emission.

According to 22.917 and 24.238, the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10\log(P)$ dB, i.e. at or below -13dBm.

Test Procedures:

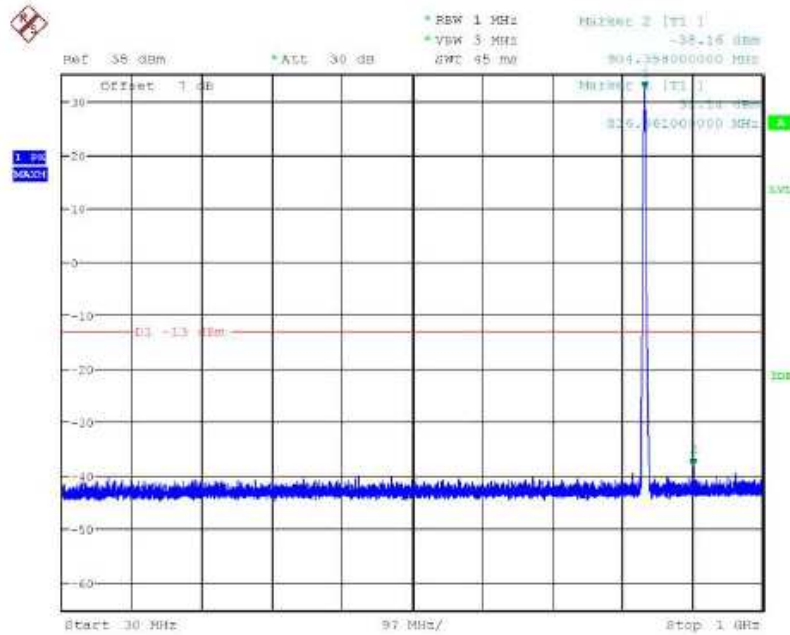
1. The EUT was connected to spectrum analyzer and base station via power divider.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. The middle channel for the highest RF power within the transmitting frequency was measured.
4. The conducted spurious emission for the whole frequency range was taken.
5. The RF fundamental frequency should be excluded against the limit line in the Operating frequency band.
6. The limit line is derived from $43 + 10\log(P)$ dB below the transmitter power P(Watts)
 $= P(W) - [43 + 10\log(P)] \text{ (dB)}$
 $= [30 + 10\log(P)] \text{ (dBm)} - [43 + 10\log(P)] \text{ (dB)}$
 $= -13\text{dBm}.$



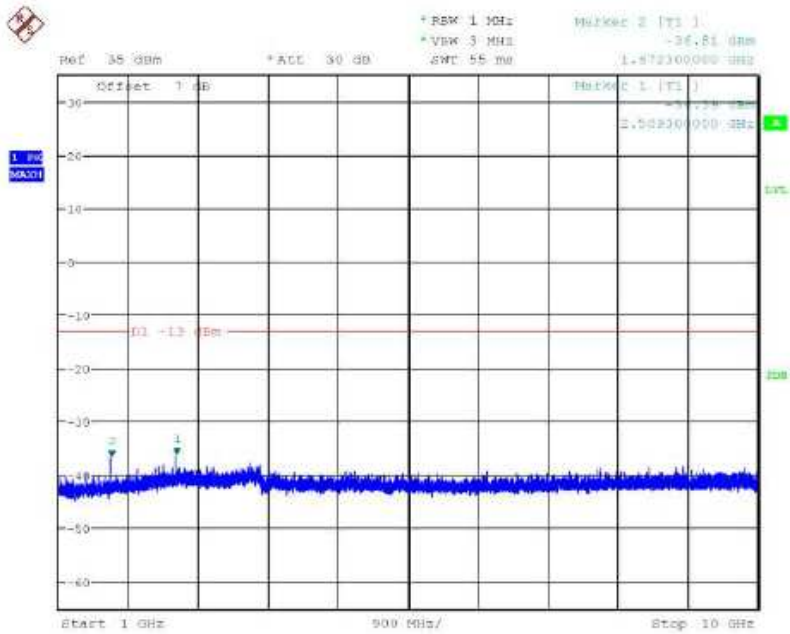
Test results:

Band	ARFCN	Frequency (MHz)	Verdict
GSM850MHz	128	824.2	Pass
GSM850MHz	189	836.4	Pass
GSM850MHz	251	848.8	Pass
EDGE 850MHz	128	824.2	Pass
EDGE 850MHz	189	836.4	Pass
EDGE 850MHz	251	848.8	Pass
GSM1900MHz	512	1850.2	Pass
GSM1900MHz	661	1880	Pass
GSM1900MHz	810	1909.8	Pass
EDGE 1900MHz	512	1850.2	Pass
EDGE 1900MHz	661	1880	Pass
EDGE 1900MHz	810	1909.8	Pass
WCDMA 850MHz	4132	826.4	Pass
WCDMA 850MHz	4182	836.4	Pass
WCDMA 850MHz	4233	846.6	Pass
WCDMA 1900MHz	9262	1852.4	Pass
WCDMA 1900MHz	9400	1880	Pass
WCDMA 1900MHz	9538	1907.6	Pass

GSM850MHz, Mid 189/836.4

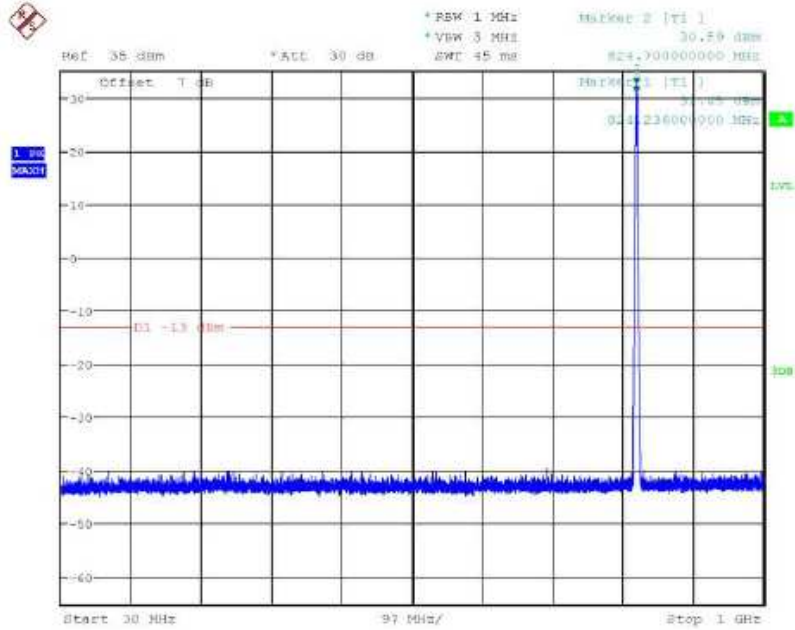


Date: 23.JUL.2015 15:26:02

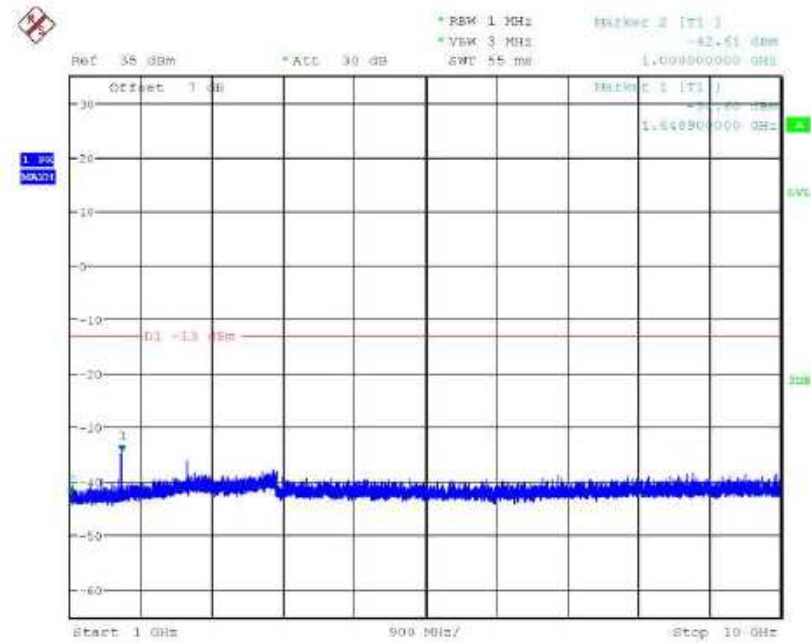


Date: 23.JUL.2015 16:40:06

GSM850MHz, Low 128/824.2

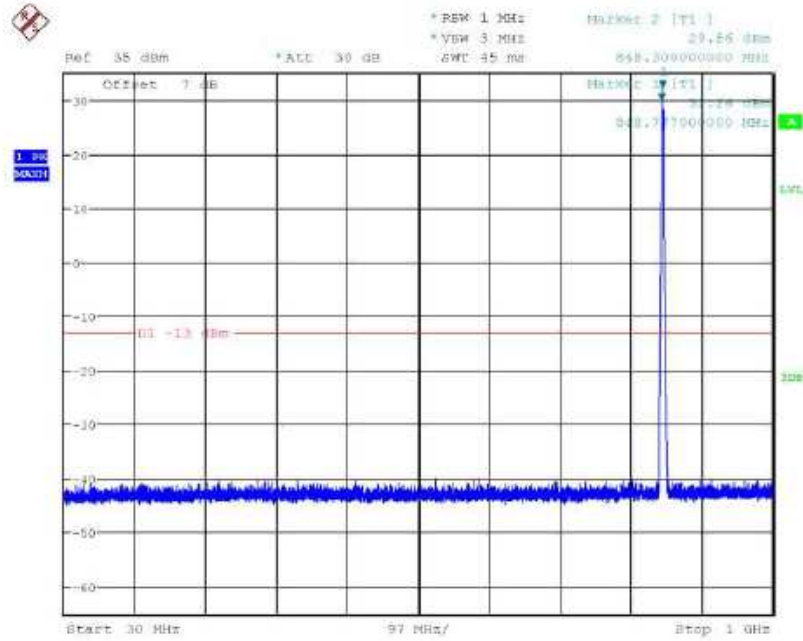


Date: 23.JUL.2015 15:26:40

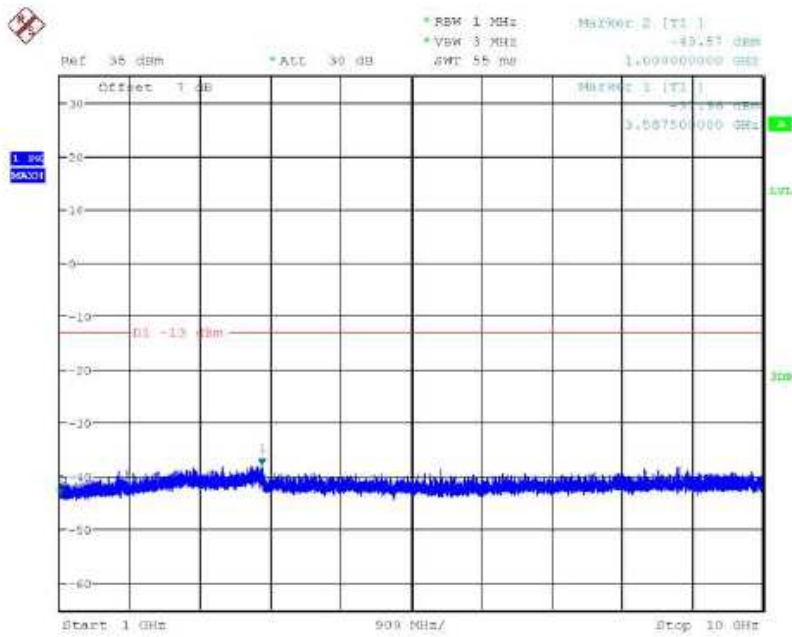


Date: 23.JUL.2015 16:40:44

GSM850MHz, High 251/848.8

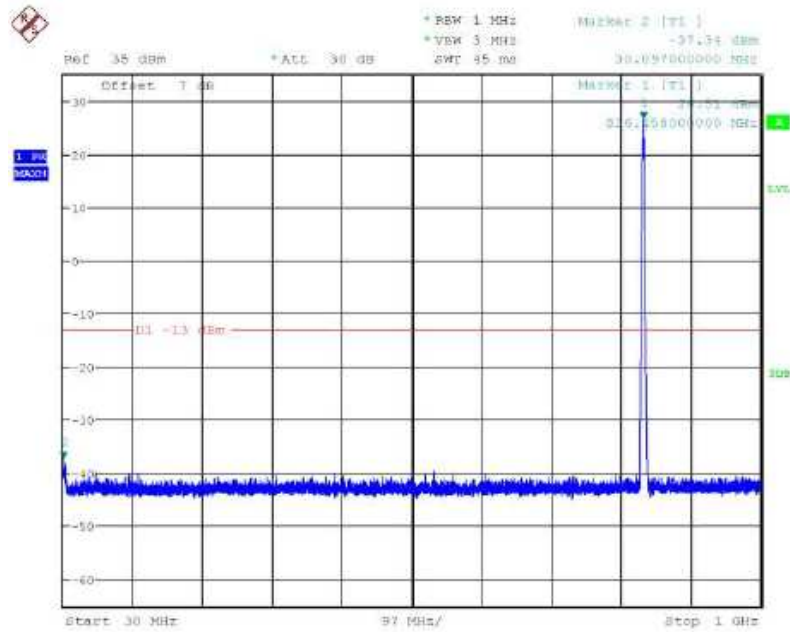


Date: 23.JUL.2015 15:27:18

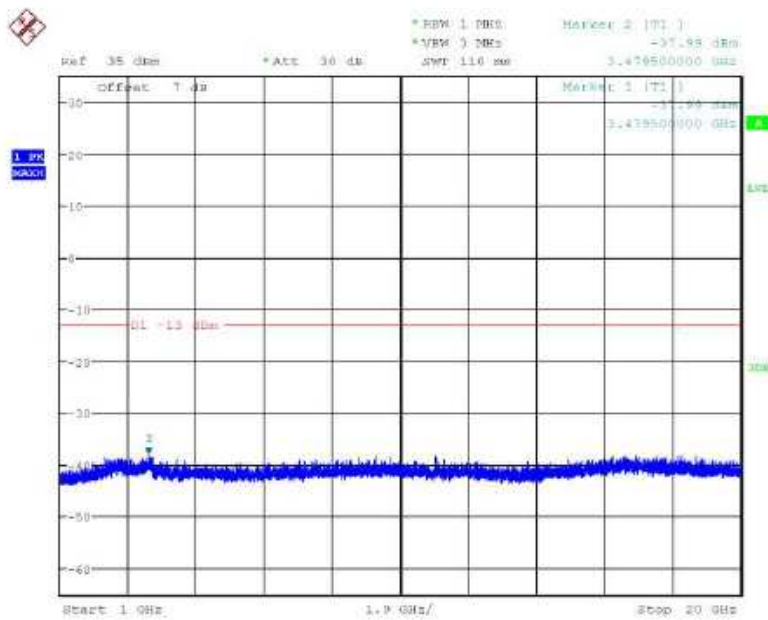


Date: 23.JUL.2015 16:41:21

EDGE 850MHz, Mid 189/836.4

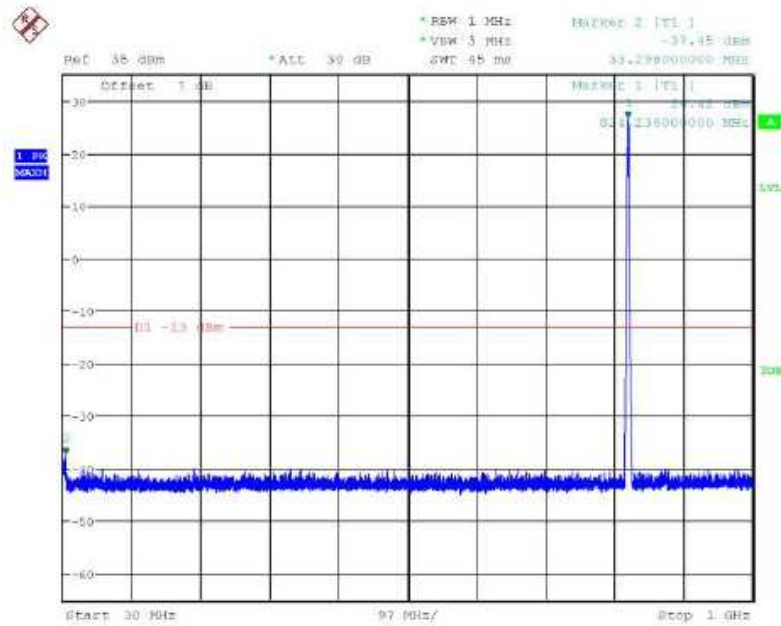


Date: 24.JUL.2015 10:21:29

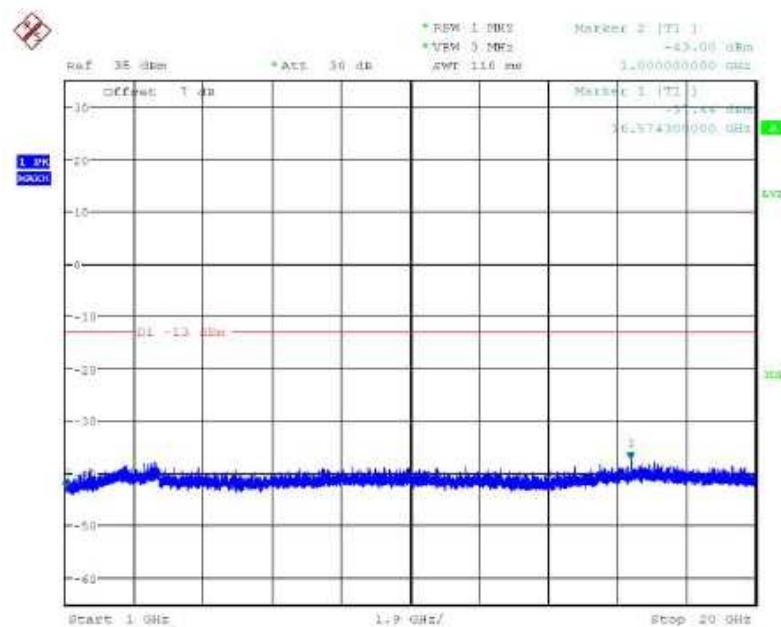


Date: 24.JUL.2015 12:39:30

EDGE 850MHz, Low 128/824.2

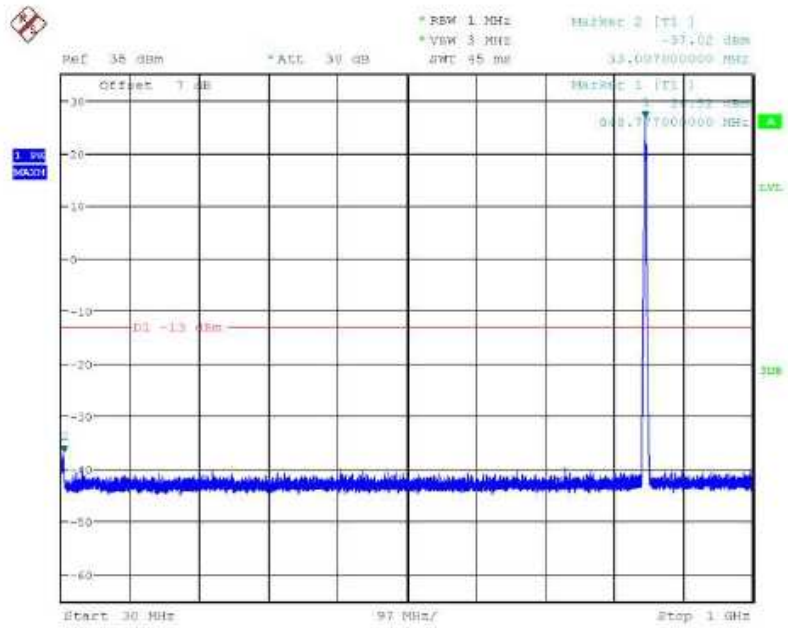


Date: 24.JUL.2015 10:22:04

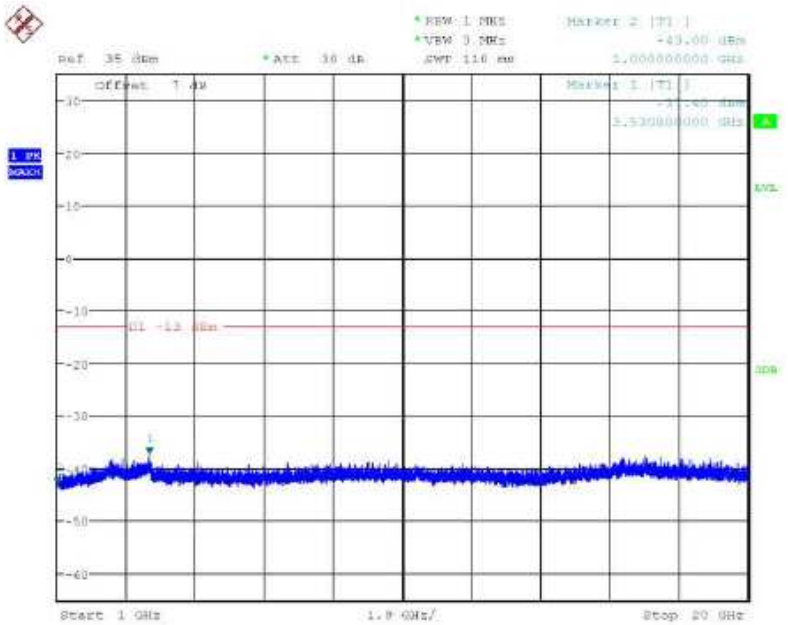


Date: 24.JUL.2015 12:49:04

EDGE 850MHz, High 251/848.8

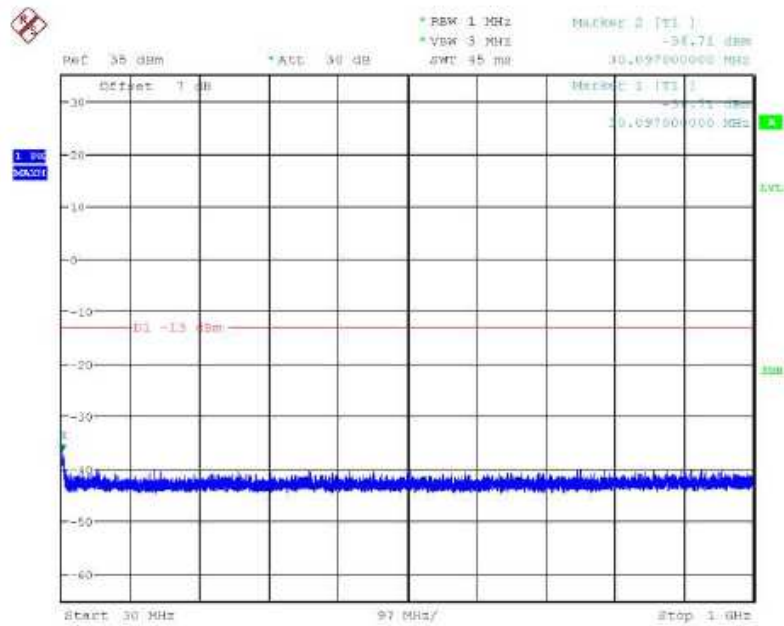


Date: 24.JUL.2015 10:22:38

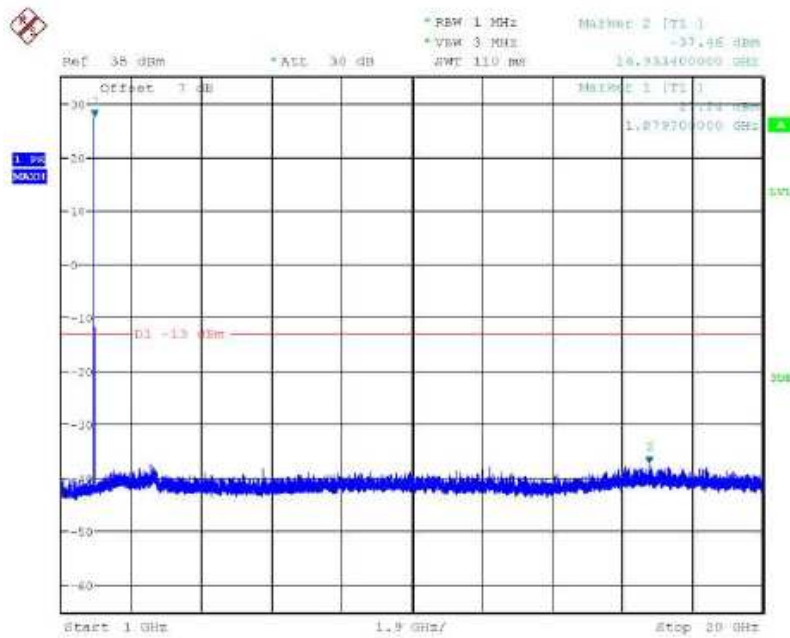


Date: 24.JUL.2015 12:40:38

GSM1900MHz, Mid 661/1880

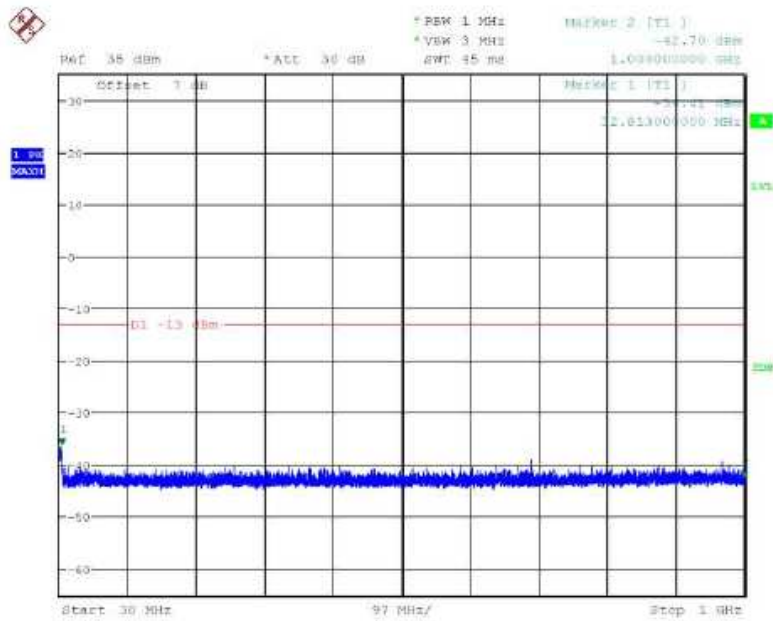


Date: 24.JUL.2015 10:27:10

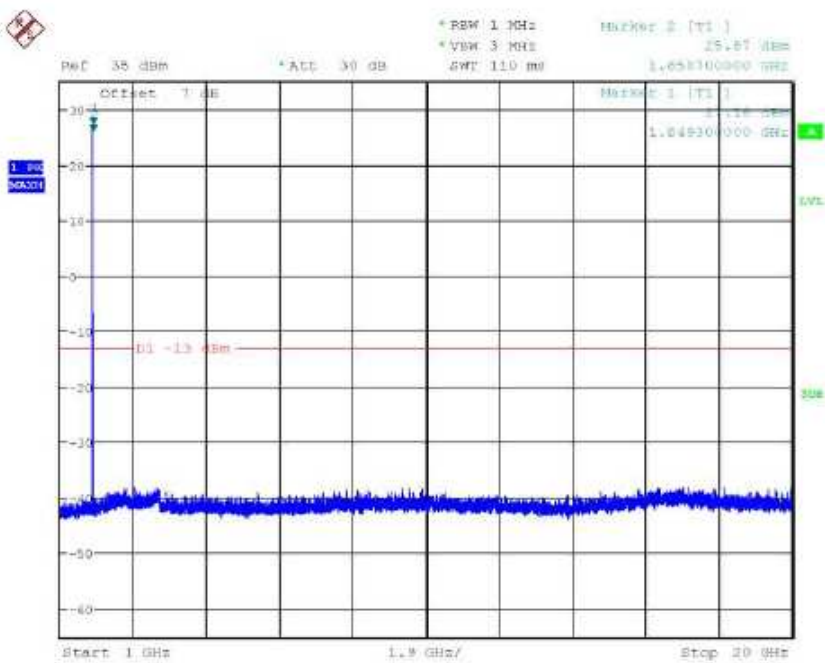


Date: 27.JUL.2015 16:49:53

GSM1900MHz, Low 512/1850.2

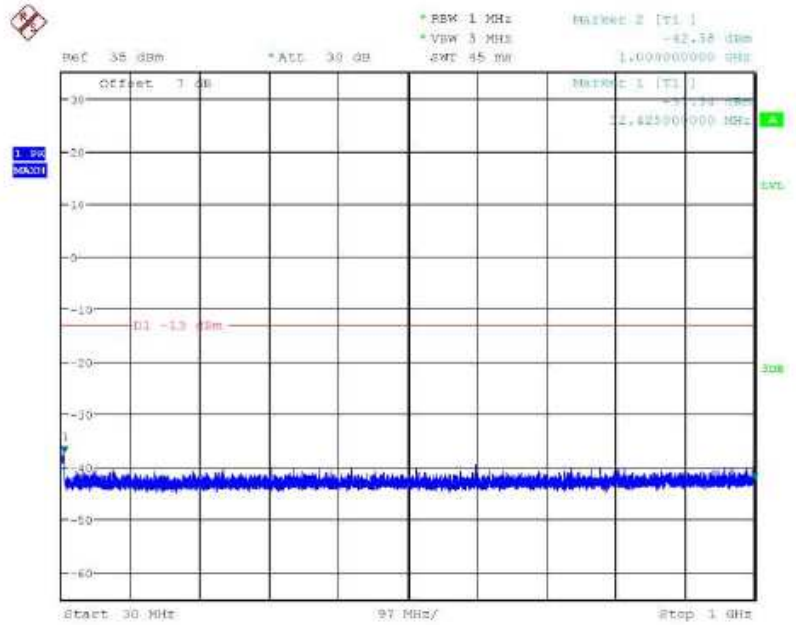


Date: 24.JUL.2015 10:27:44

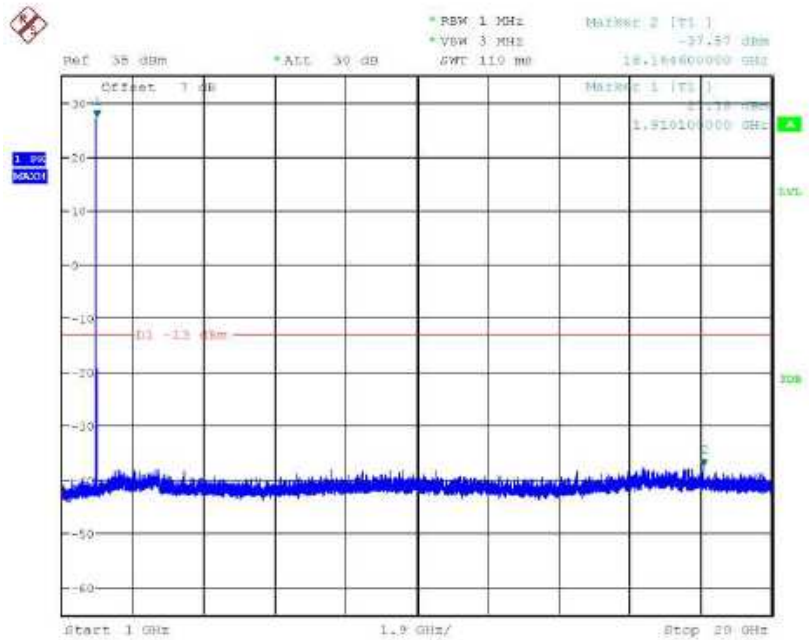


Date: 27.JUL.2015 16:50:30

GSM1900MHz, High 810/1909.8

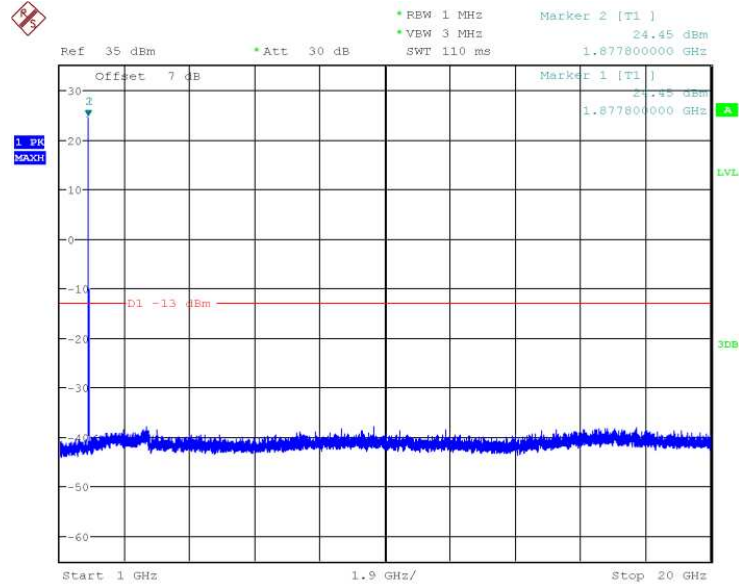


Date: 24.JUL.2015 10:28:19

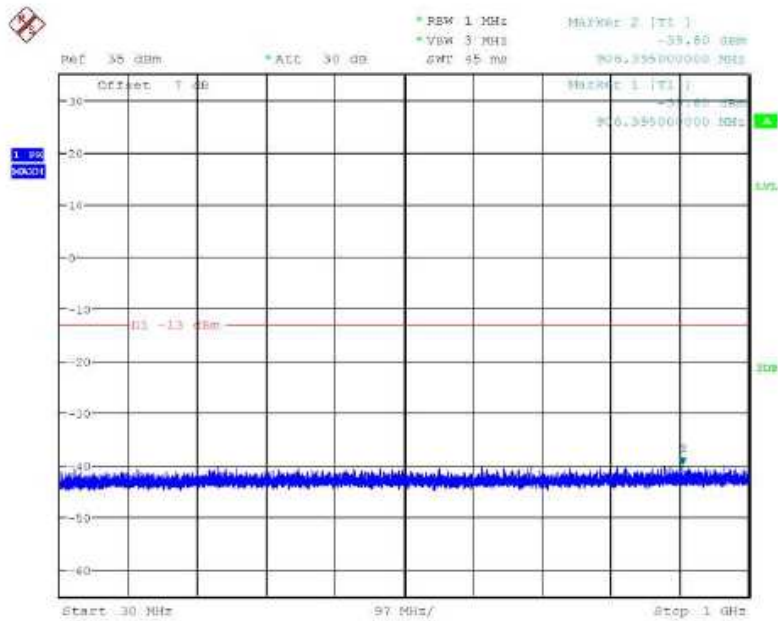


Date: 27.JUL.2015 16:51:08

EDGE 1900MHz, Mid 661/1880

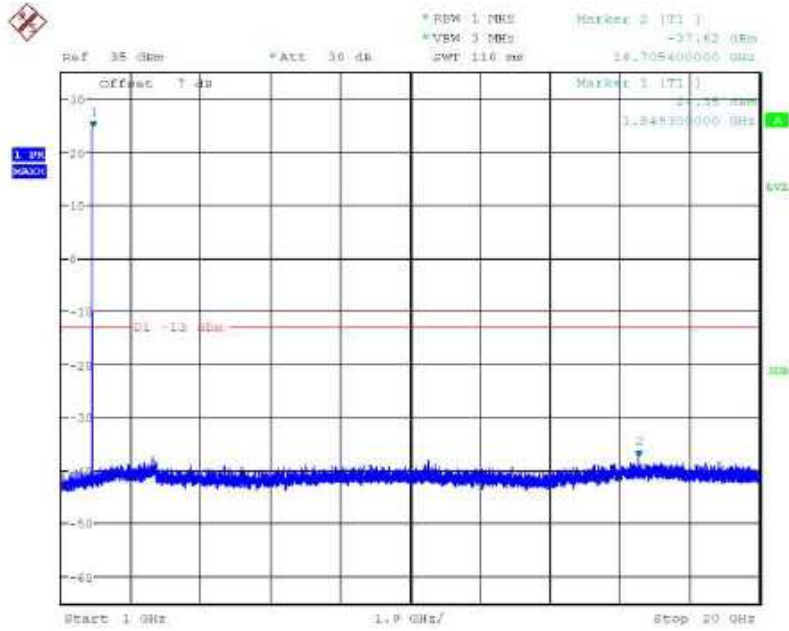


Date: 24.JUL.2015 12:47:27

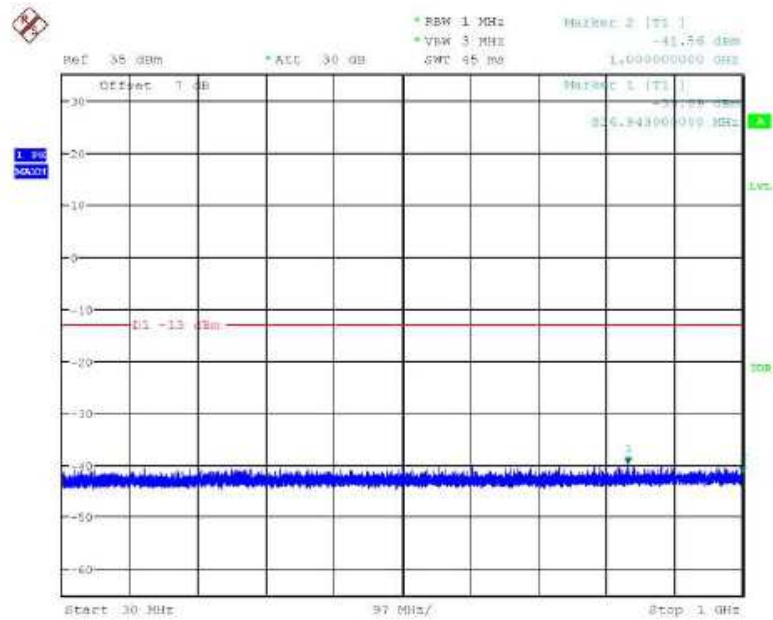


Date: 23.JUL.2015 15:39:43

EDGE 1900MHz, Low 512/1850.2

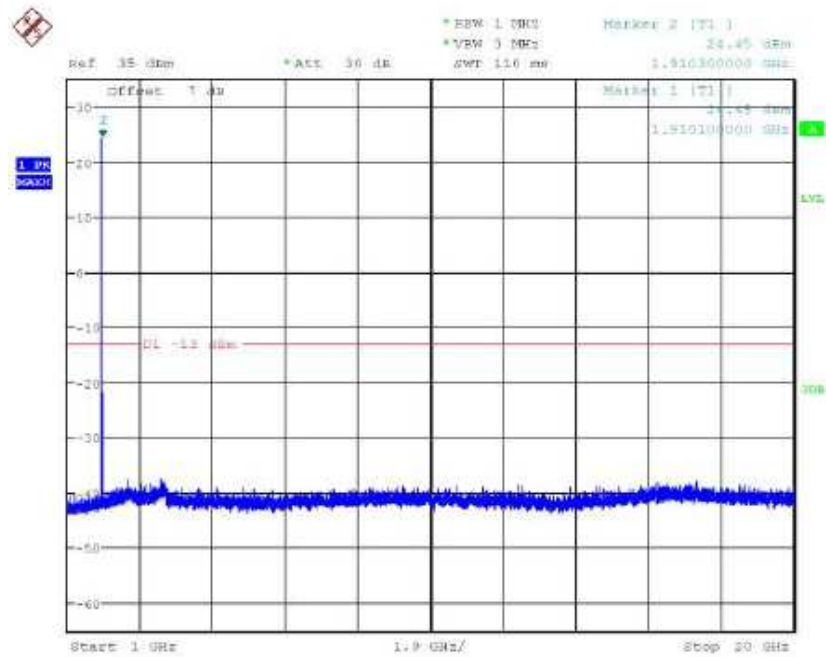


Date: 24.JUL.2015 12:48:02

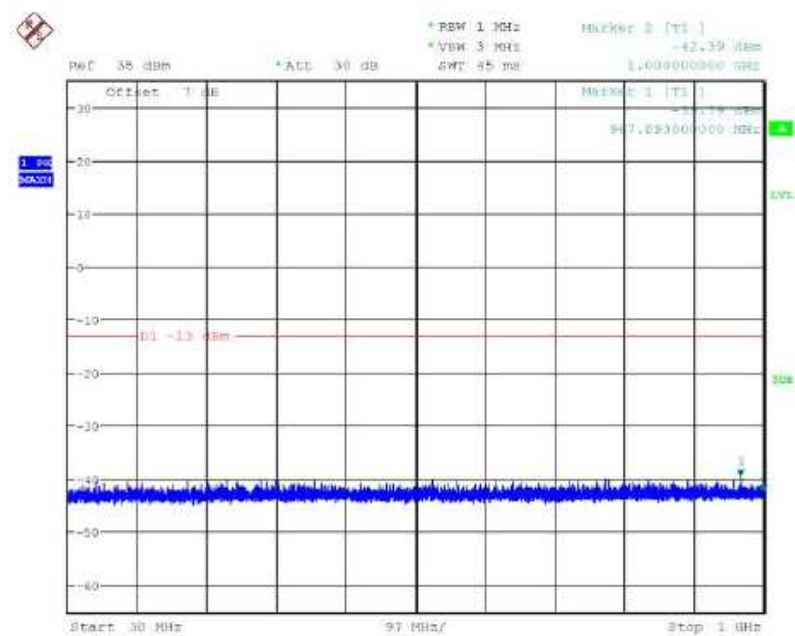


Date: 23.JUL.2015 15:31:21

EDGE 1900MHz, High 810/1909.8

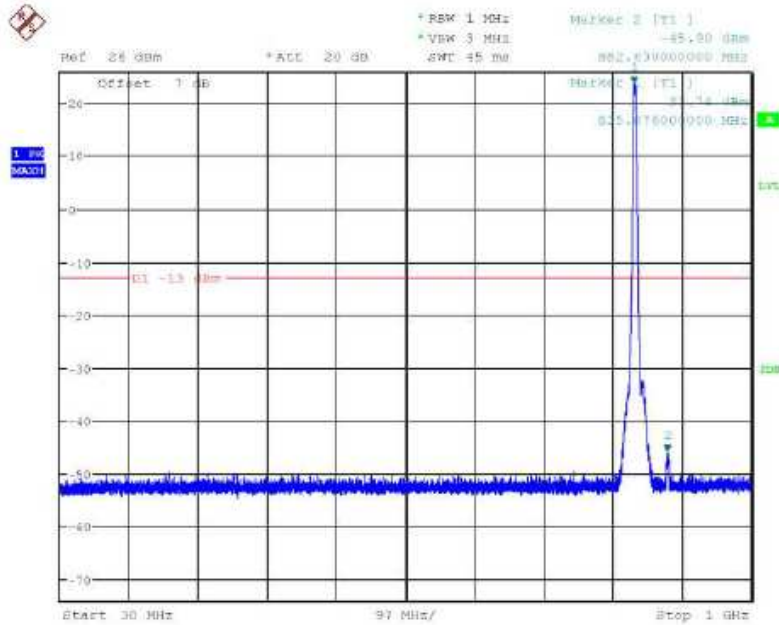


Date: 24.JUL.2015 12:45:36

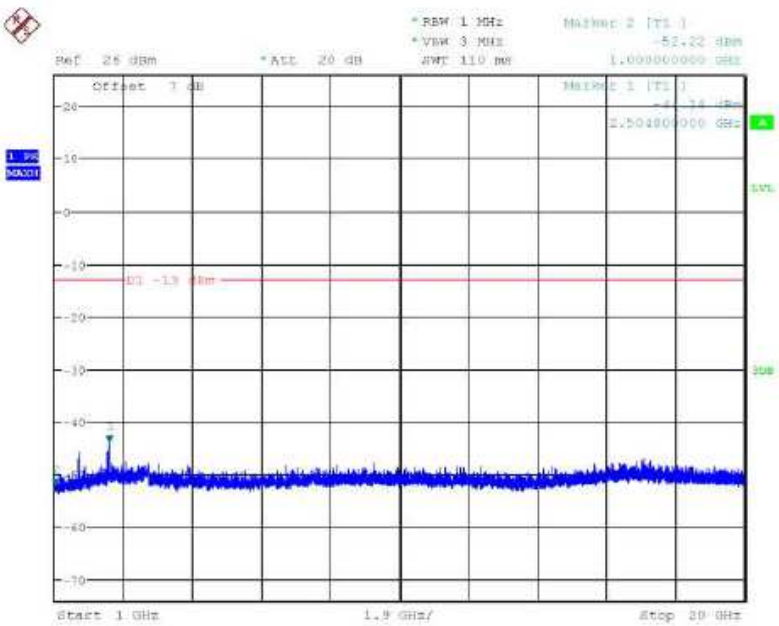


Date: 28.JUL.2015 15:31:59

WCDMA 850MHz, Mid 4183/836.6

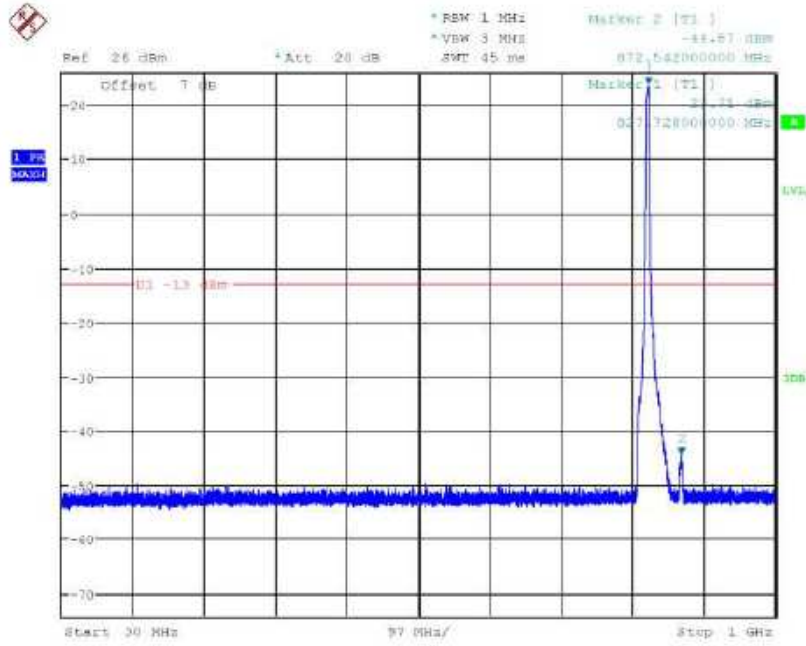


Date: 22.JUL.2015 14:51:49

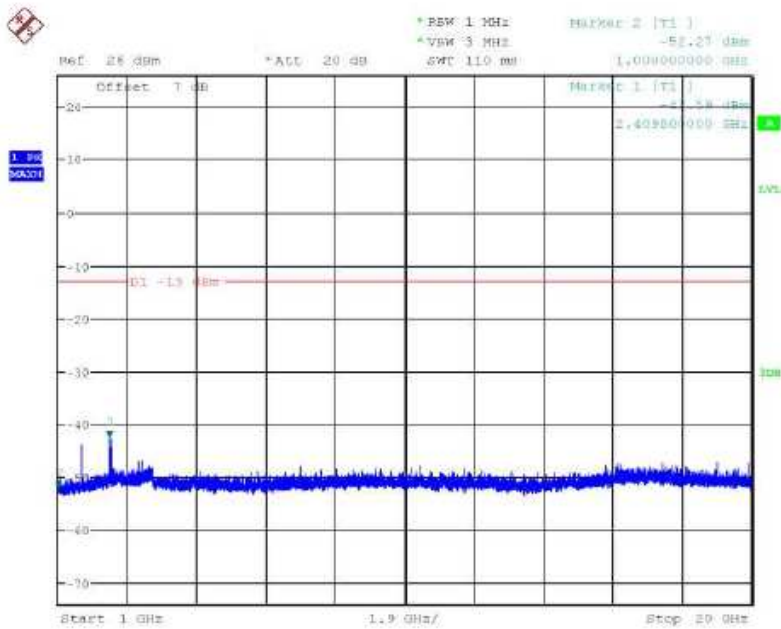


Date: 22.JUL.2015 14:59:51

WCDMA 850MHz, Low 4132/826.4

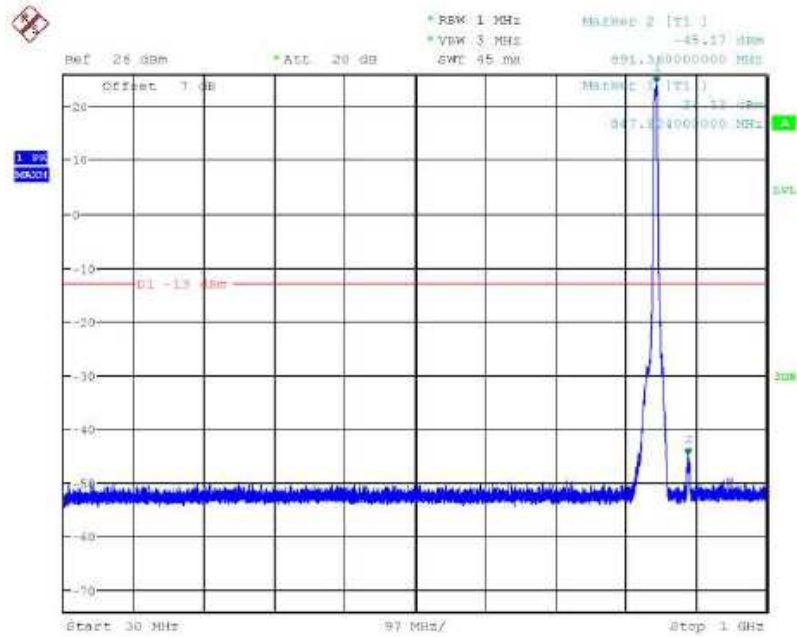


Date: 22.JUL.2015 14:52:27

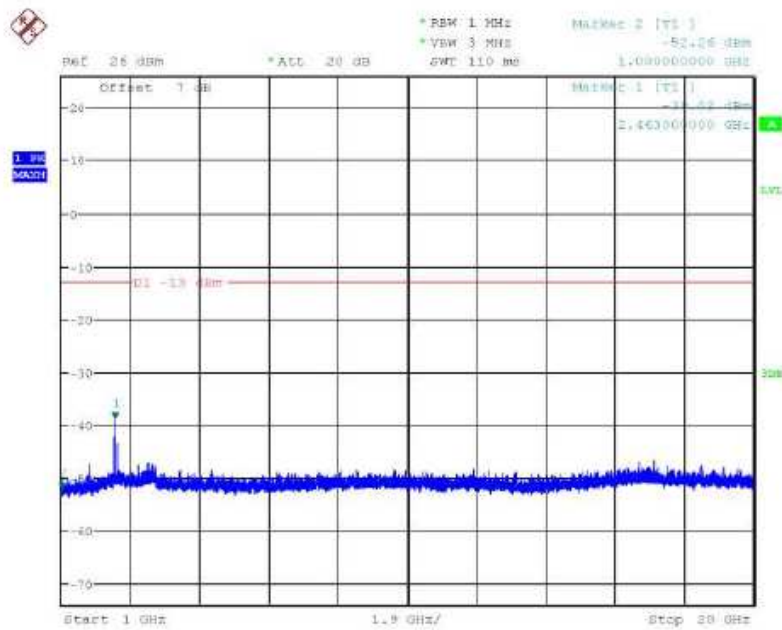


Date: 22.JUL.2015 15:00:28

WCDMA 850MHz, High 4233/846.6

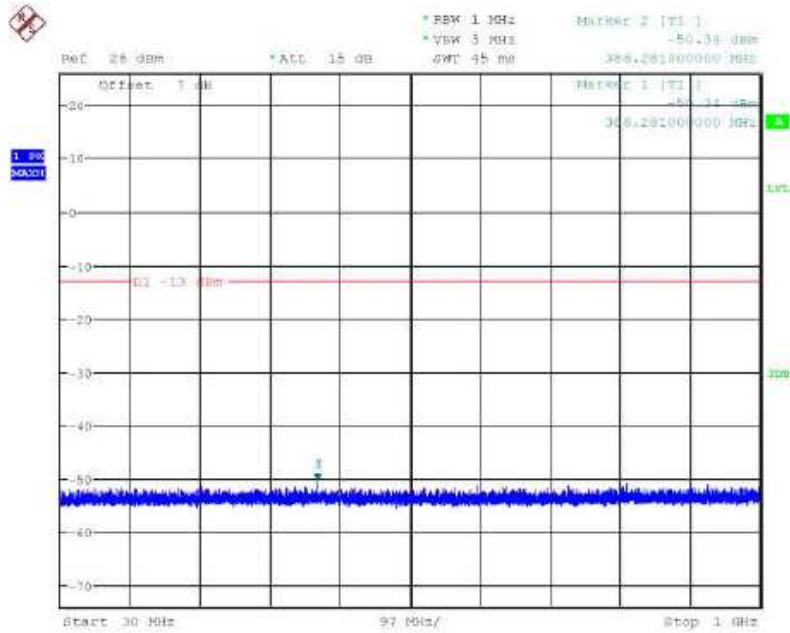


Date: 22.JUL.2015 14:53:04

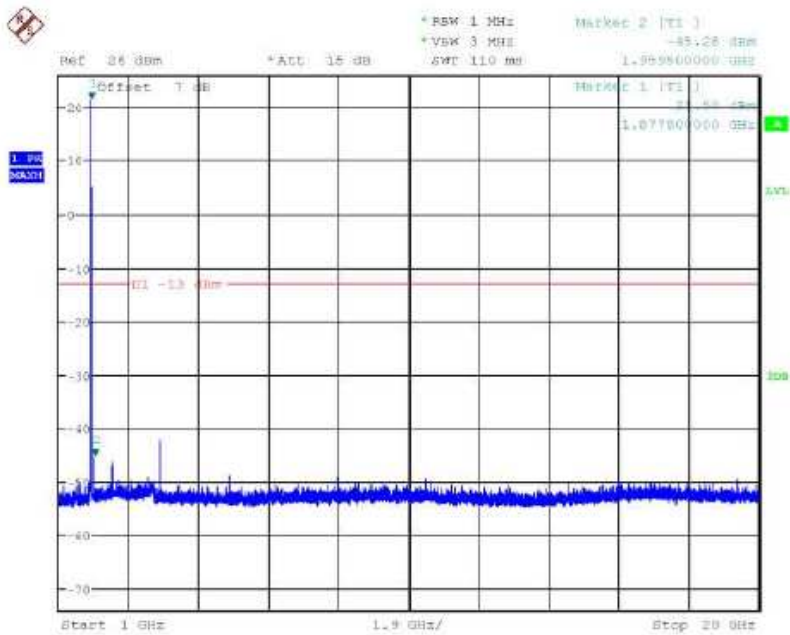


Date: 22.JUL.2015 15:01:05

WCDMA 1900MHz, Mid 9400/1880

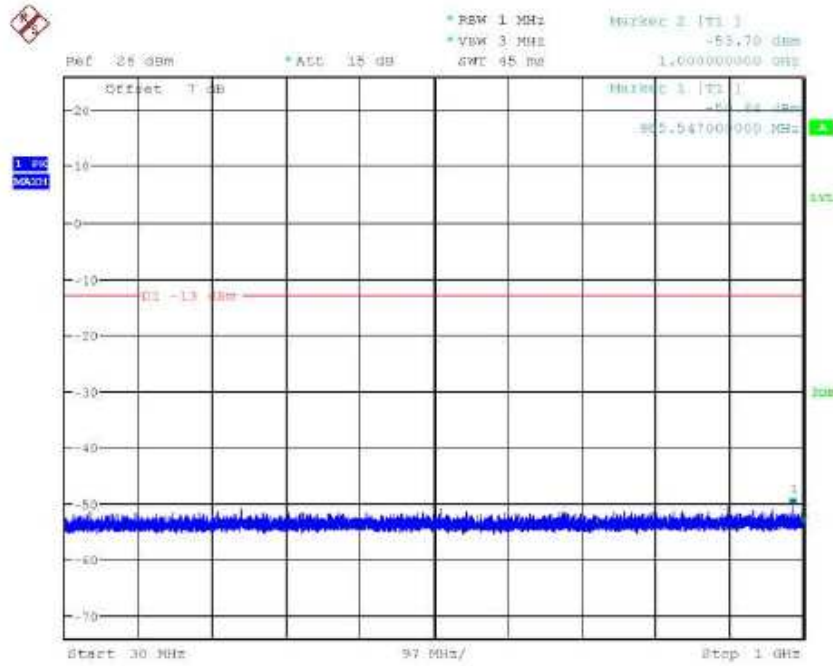


Date: 22.JUL.2015 14:49:31

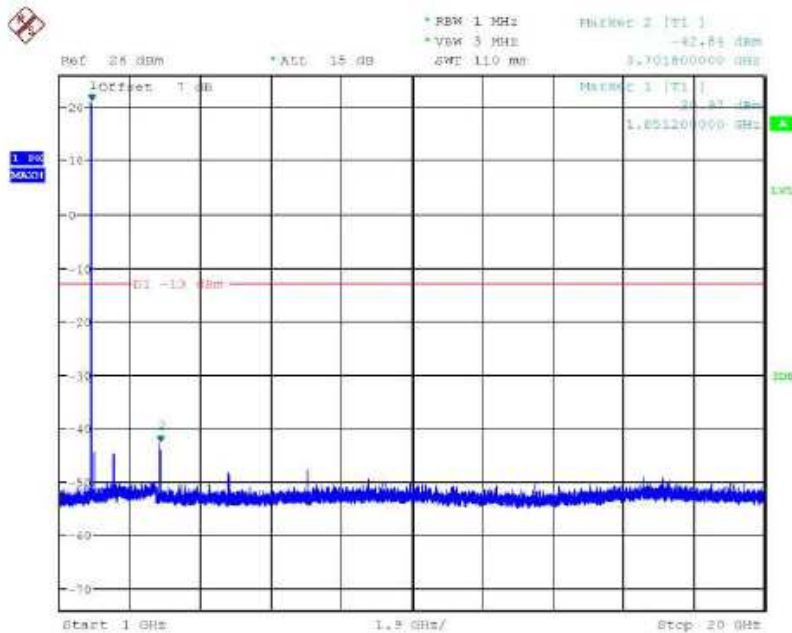


Date: 22.JUL.2015 14:57:33

WCDMA 1900MHz, Low 9262/1852.4

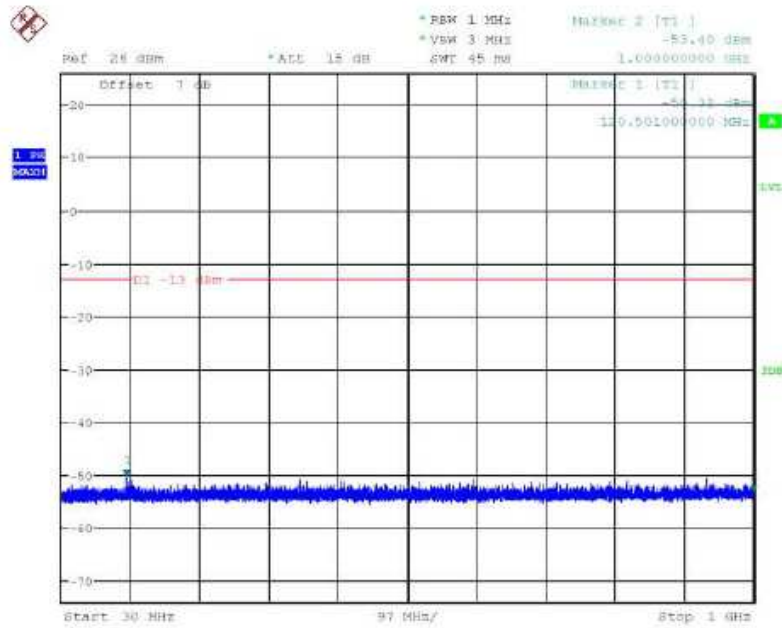


Date: 22.JUL.2015 14:50:09

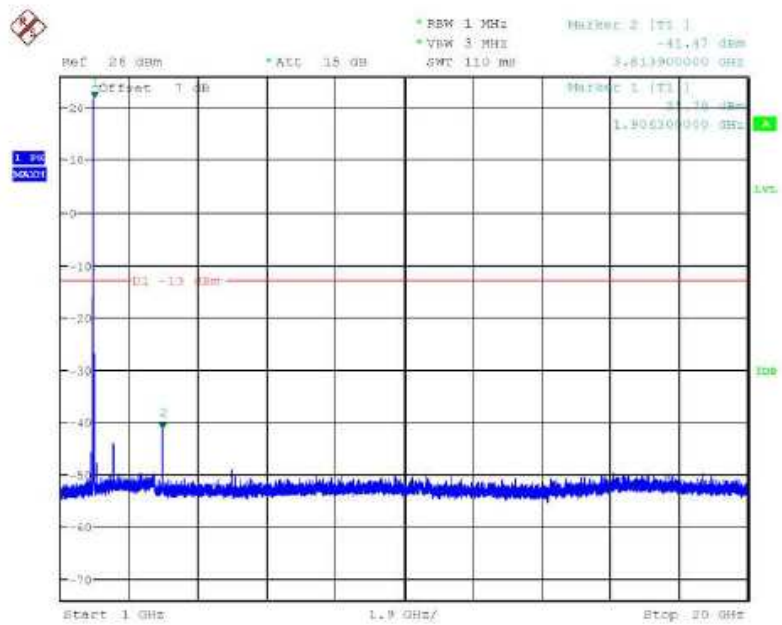


Date: 22.JUL.2015 14:56:10

WCDMA 1900MHz, High 9538/1907.6



Date: 22.JUL.2015 14:50:46



Date: 22.JUL.2015 14:58:48

3.5 Radiated Spurious Emissions (FCC Part 2.1053, 2.1057, 22.917, 24.238) { tc \l 2 "4.5 Power of Spurious Emissions (FCC Part 2.1053, 2.1057, 22.917, 24.238)" }

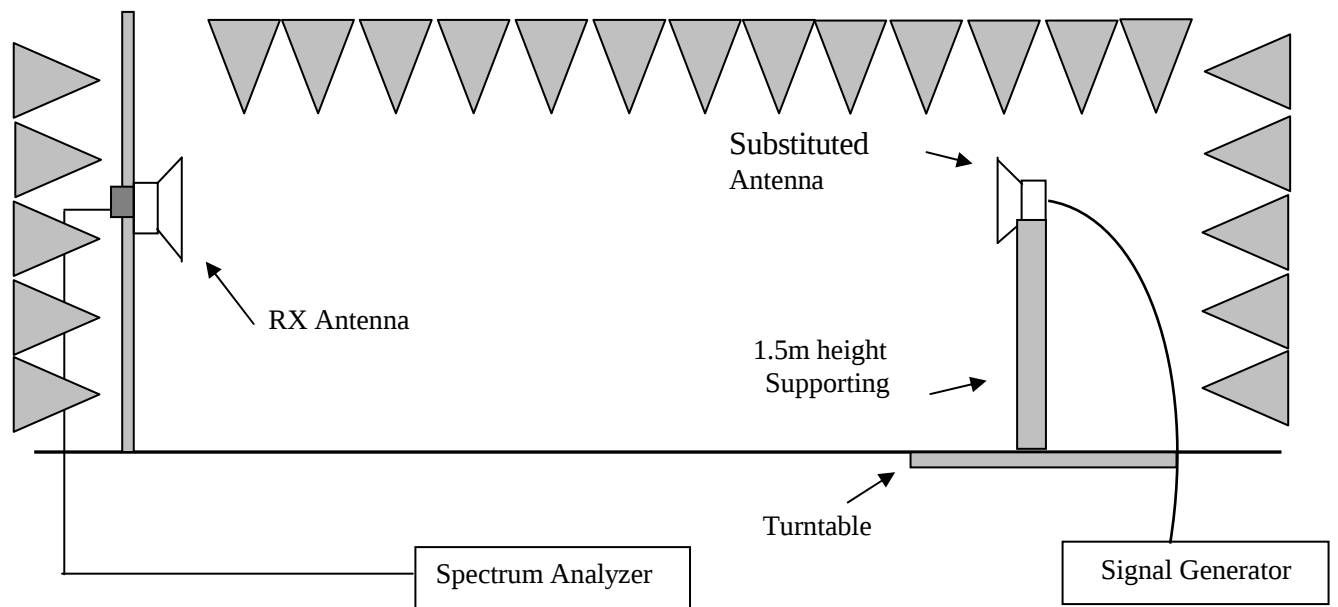
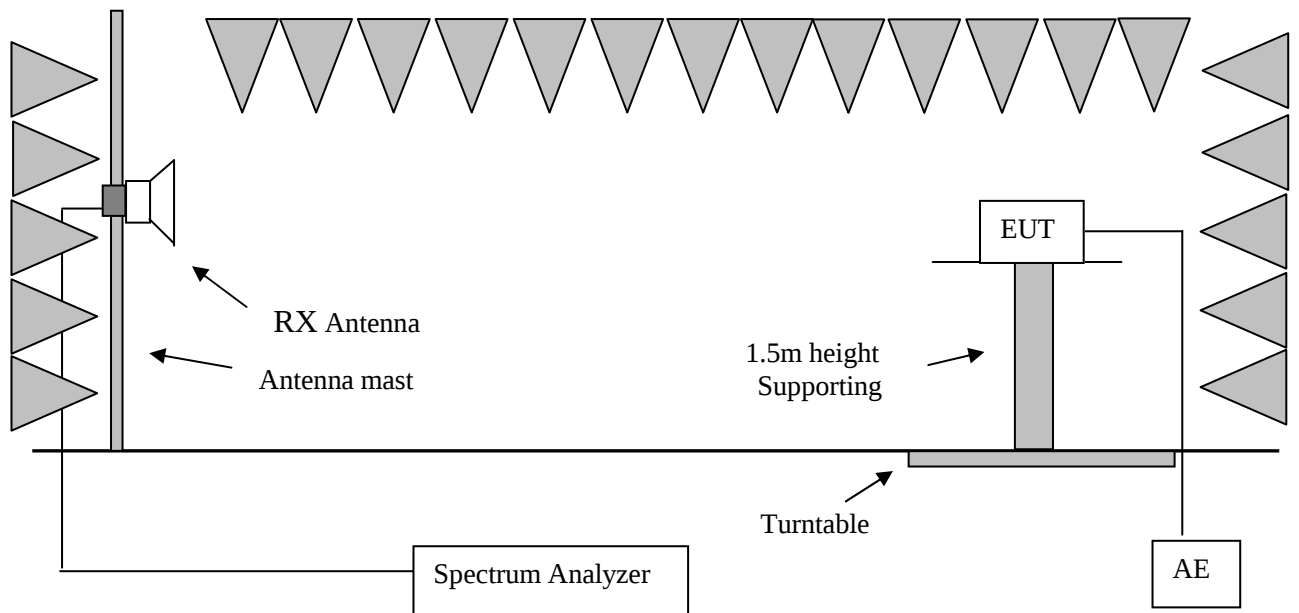
The limit is as follows:

The radiated spurious emissions are tested per TIA/EIA-603 using the Substitution Method and measured from 9kHz up to the 10th harmonic of fundamental emission. The simultaneous transmission has been considered when perform spurious radiation test.

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10\log(P)$ dB, i.e. at or below -13dBm. The RBW: 100kHz and VBW: 300KHz were used at the 850 band; The RBW: 1MHz and VBW: 3MHz were used at the 1900 band;

Test Procedures:

1. The EUT was placed on a rotatable wooden table with 0.8 meter above ground.
2. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest spurious emission.
4. The height of the receiving antenna is varied between one meter and four meters to search the maximum spurious emission for both horizontal and vertical polarizations.
5. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking the record of maximum spurious emission.
6. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
7. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
8. Taking the record of output power at antenna port.
9. Repeat step 7 to step 8 for another polarization.
10. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
11. The limit line is derived from $43 + 10\log(P)$ dB below the transmitter power P(Watts)
 $= P(W) - [43 + 10\log(P)] \text{ (dB)}$
 $= [30 + 10\log(P)] \text{ (dBm)} - [43 + 10\log(P)] \text{ (dB)}$
 $= -13\text{dBm}.$
12. $\text{EIRP (dBm)} = \text{S.G. Power} - \text{Tx Cable Loss} + \text{Tx Antenna Gain}$
13. $\text{ERP (dBm)} = \text{EIRP} - 2.15$



Test results:

GSM850MHz (ARFCN = 189, Channel frequency = 836.4MHz):

Polarization	Frequency (MHz)	Measured ERP (dBm)	Limit ERP (dBm)	Margin (dB)
V	2979.64	-35.02	-13	22.02

EDGE 850MHz (ARFCN = 189, Channel frequency = 836.4MHz):

Polarization	Frequency (MHz)	Measured ERP (dBm)	Limit ERP (dBm)	Margin (dB)
V	2979.64	-34.98	-13	21.98

GSM1900MHz (ARFCN = 661, Channel frequency = 1880.0MHz):

Polarization	Frequency (MHz)	Calculated EIRP (dBm)	Limit EIRP (dBm)	Margin (dB)
V	16824.00	-31.12	-13	18.12

EDGE 1900MHz (ARFCN = 661, Channel frequency = 1880.0MHz):

Polarization	Frequency (MHz)	Calculated EIRP (dBm)	Limit EIRP (dBm)	Margin (dB)
V	16824.00	-31.19	-13	18.19

WCDMA 850MHz (ARFCN = 4182, Channel frequency = 836.4MHz):

Polarization	Frequency (MHz)	Measured ERP (dBm)	Limit ERP (dBm)	Margin (dB)
V	2512.30	-47.82	-13	34.82

WCDMA 1900MHz (ARFCN = 9400, Channel frequency = 1880.0MHz):

Polarization	Frequency (MHz)	*Calculated EIRP (dBm)	Limit EIRP (dBm)	Margin (dB)
V	3758.40	-42.90	-13	29.90

Note: 1. The worst data is listed here.

2. *EIRP = ERP + 2.15dB

3. ERP/EIRP = Ps + Et – Es + Gs = Ps + Rt – Rs + Gs

Ps (dBm): Input power to substitution antenna;

Gs (dBi or dBd): Substitution antenna Gain;

Et is field strength reading for EUT emission = Rt + AF;

Es is field strength reading for substitution antenna emission = Rs + AF;

AF (dB/m): Receive antenna factor

Rt: The highest received signal in spectrum analyzer for EUT emission.

Rs: The highest received signal in spectrum analyzer for substitution antenna emission.

3.6 Band Edge Emission (FCC Part 22.917, 24.238) (tc 1 2 "4.6 Blockedge at Antenna Terminals (FCC Part 22.917, 24.238)" }

The limit is as follows:

In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter is employed. The 26dB emission bandwidth taken in section 4.4 is used for calculating the resolution bandwidth.

The power of any emission at the blockedge must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB, i.e. at or below -13dBm when using 1% emissions bandwidth.

According to the FCC KDB with Publication Number: 890810, measurements using narrower resolution bandwidths are acceptable and must sum the power from all contiguous reduced resolution bandwidths within the 1% resolution specified, an alternative is to add an additional correction factor of $10 \log(RBW1/RBW2)$ to the $43 + 10 \log(P)$ limit. RBW1 is the narrower measurement resolution bandwidth and RBW2 is the 1% emissions bandwidth.

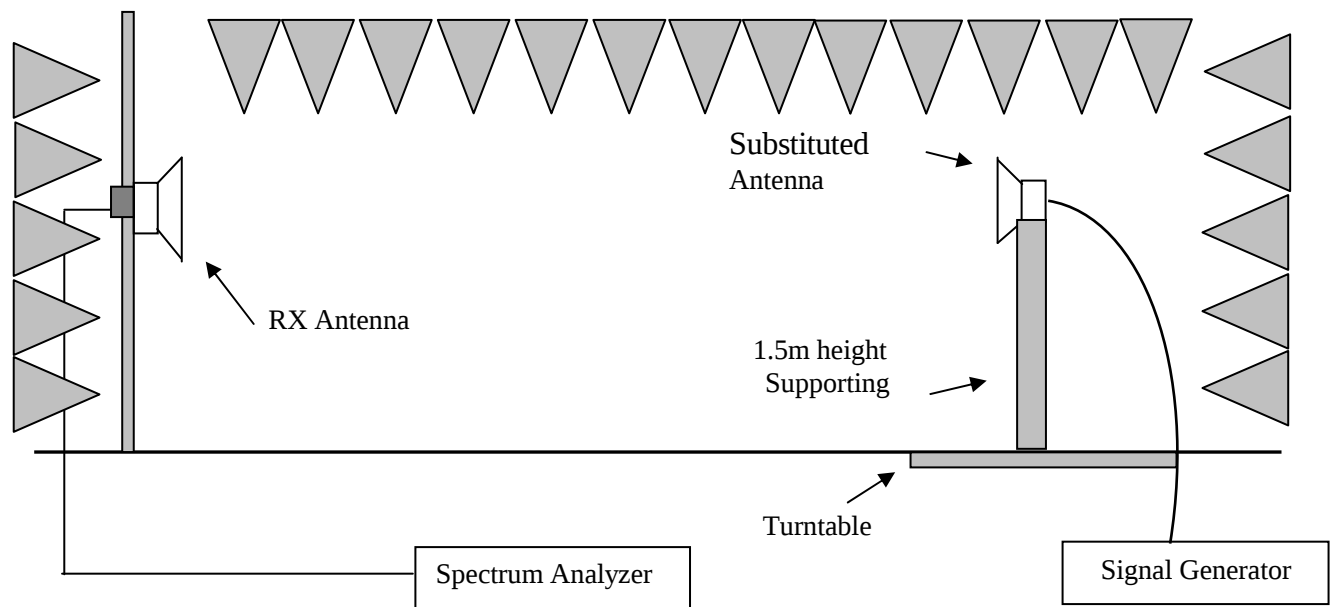
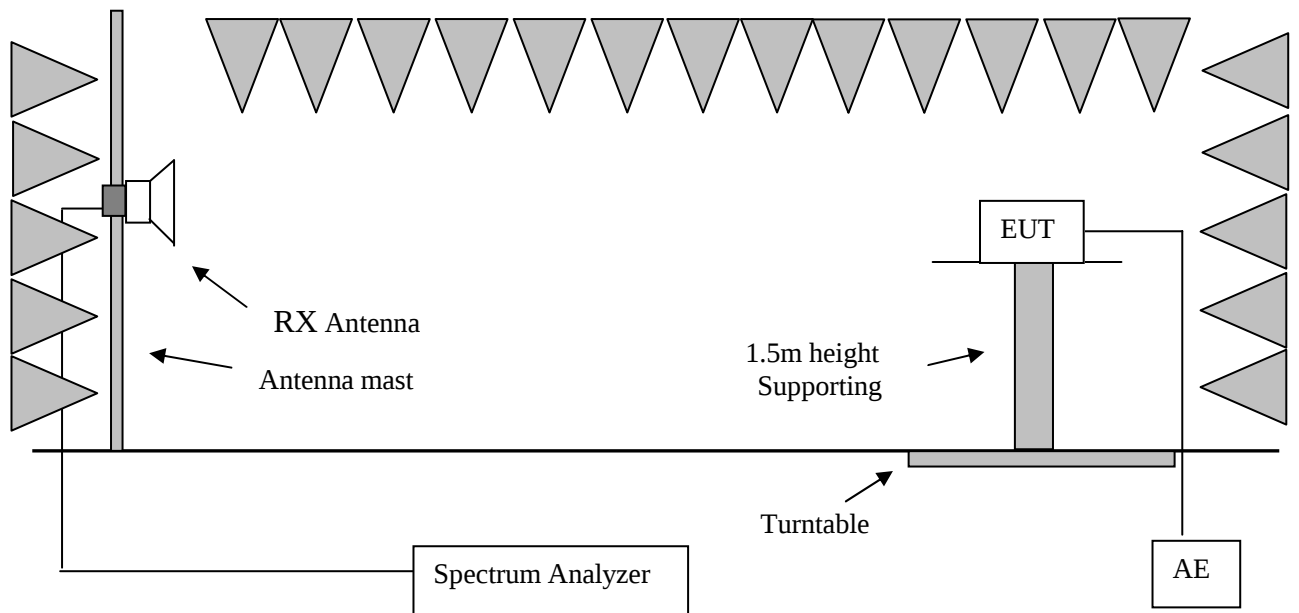
Test Procedures:

1. The EUT was connected to Spectrum Analyzer and Base Station via power divider.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator.
The path loss was compensated to the results for each measurement.
3. The band edges of low and high channels for the highest RF powers were measured.
4. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
5. The limit line is derived from $43 + 10 \log(P)$ dB below the transmitter power P(Watts)

$$= P(W) - [43 + 10 \log(P)] \text{ (dB)}$$

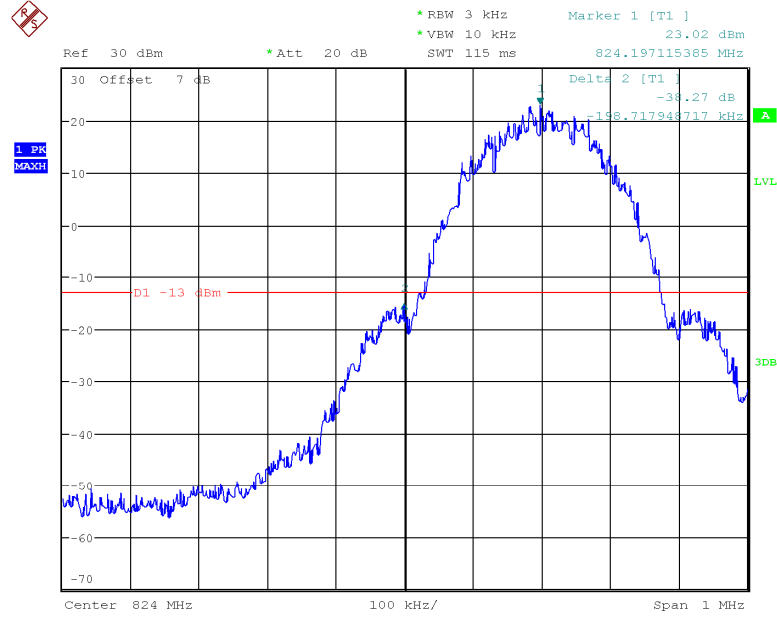
$$= [30 + 10 \log(P)] \text{ (dBm)} - [43 + 10 \log(P)] \text{ (dB)}$$

$$= -13 \text{ dBm.}$$



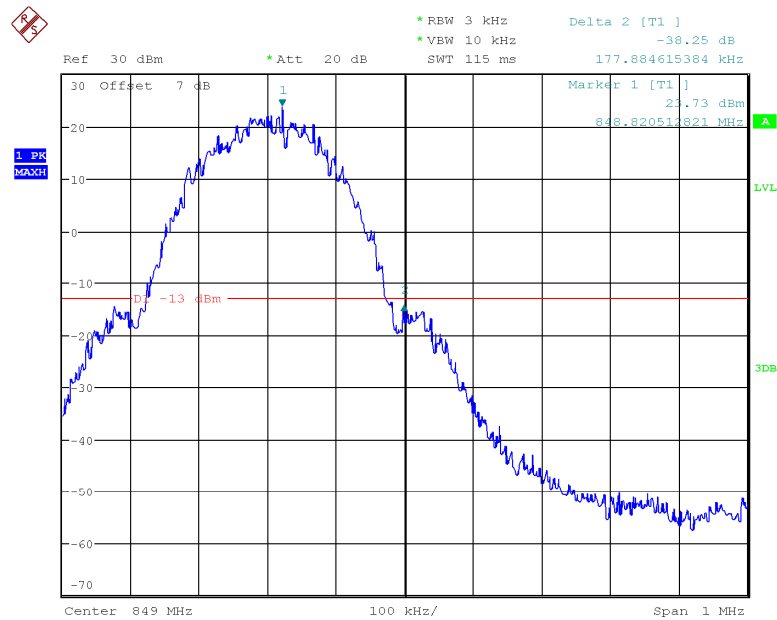
Band	ARFCN	Frequency (MHz)	Verdict
GSM850MHz	128	824.2	Pass
GSM850MHz	251	848.8	Pass
EDGE 850MHz	128	824.2	Pass
EDGE 850MHz	251	848.8	Pass
GSM1900MHz	512	1850.2	Pass
GSM1900MHz	810	1909.8	Pass
EDGE 1900MHz	512	1850.2	Pass
EDGE 1900MHz	810	1909.8	Pass
WCDMA 850MHz	4132	826.4	Pass
WCDMA 850MHz	4233	846.6	Pass
WCDMA 1900MHz	9262	1852.4	Pass
WCDMA 1900MHz	9538	1907.6	Pass

GSM850MHz, Low 128/824.2



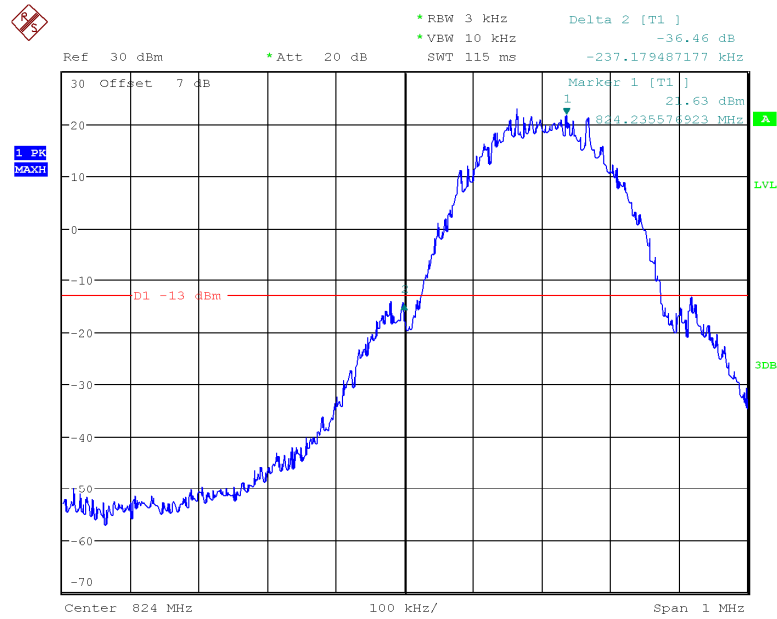
Date: 11.AUG.2015 12:54:00

GSM850MHz, High 251/848.8



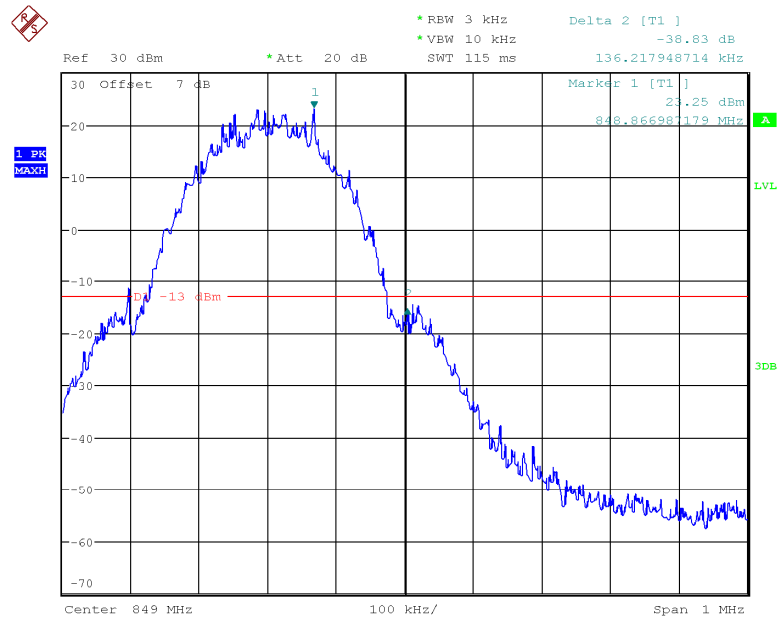
Date: 11.AUG.2015 12:55:25

EDGE 850MHz, Low 128/824.2



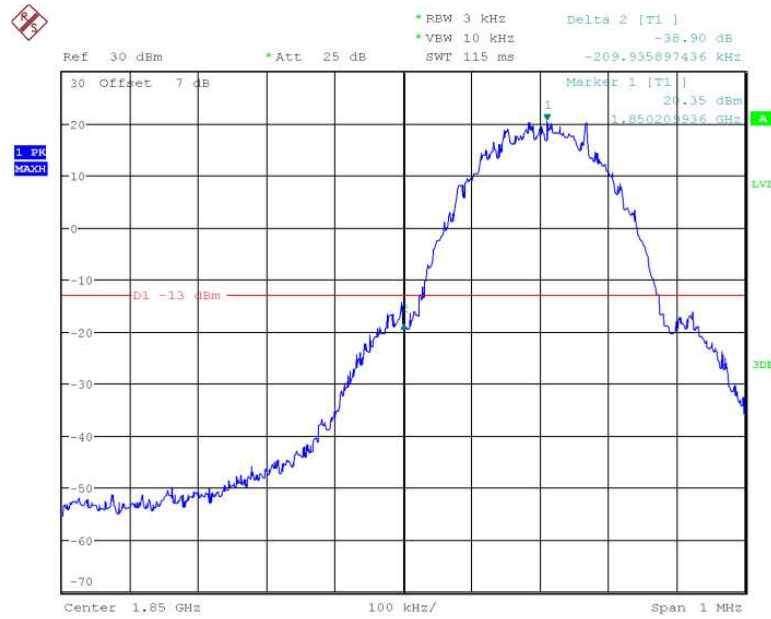
Date: 11.AUG.2015 13:00:21

EDGE 850MHz, High 251/848.8



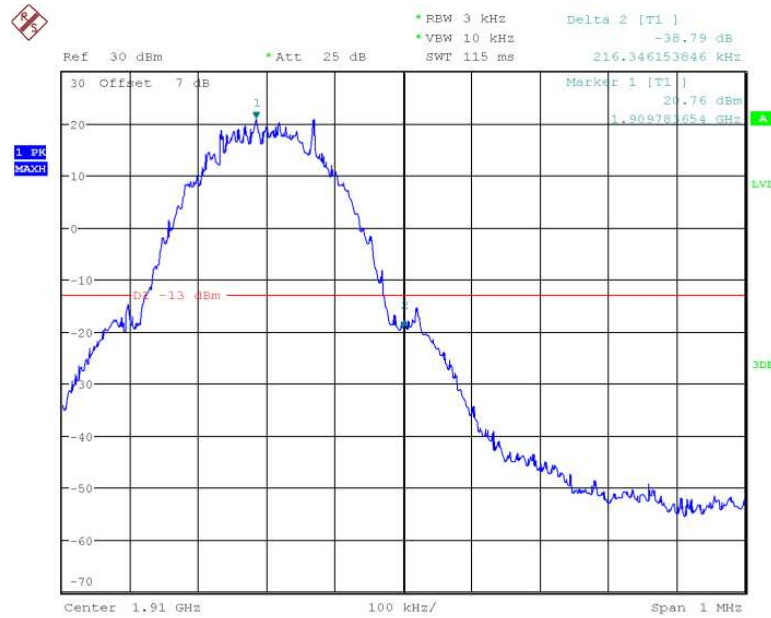
Date: 11.AUG.2015 12:57:41

GSM1900MHz, Low 512/1850.2



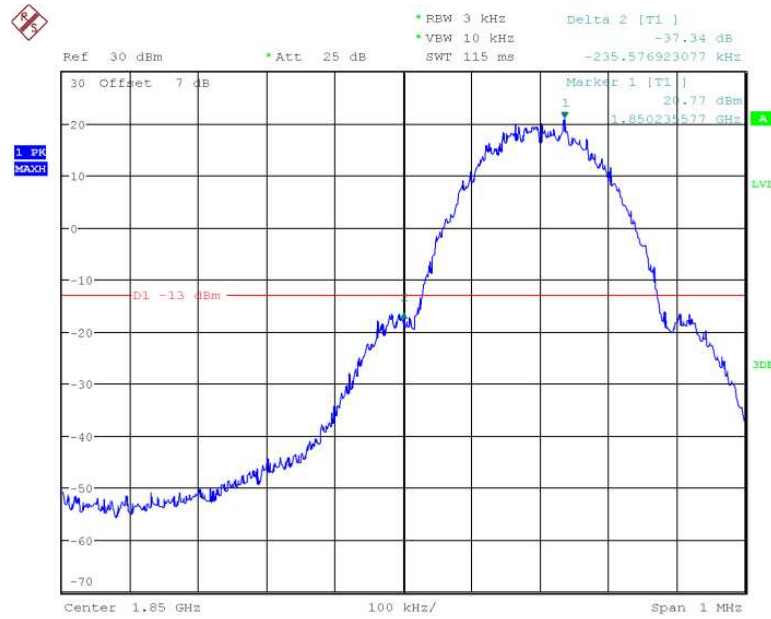
Date: 23.JUL.2015 15:08:14

GSM1900MHz, High 810/1909.8



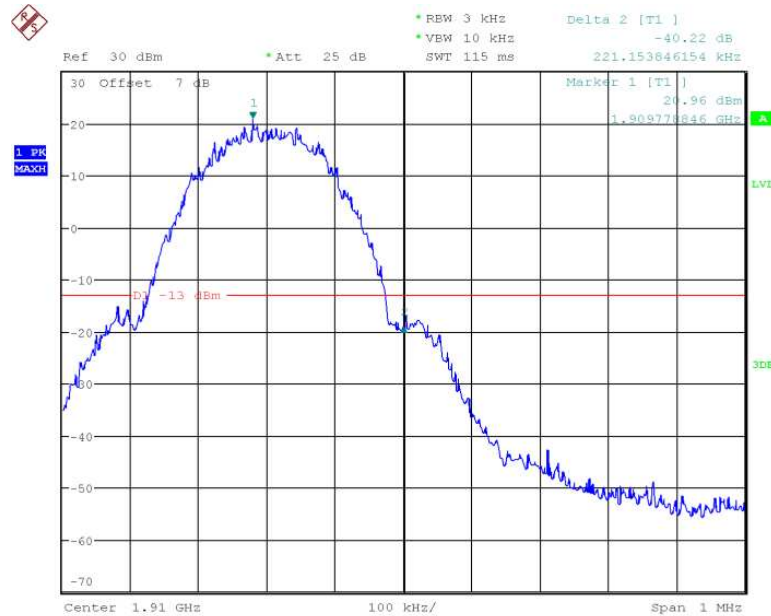
Date: 23.JUL.2015 15:10:35

EDGE 1900MHz, Low 512/1850.2



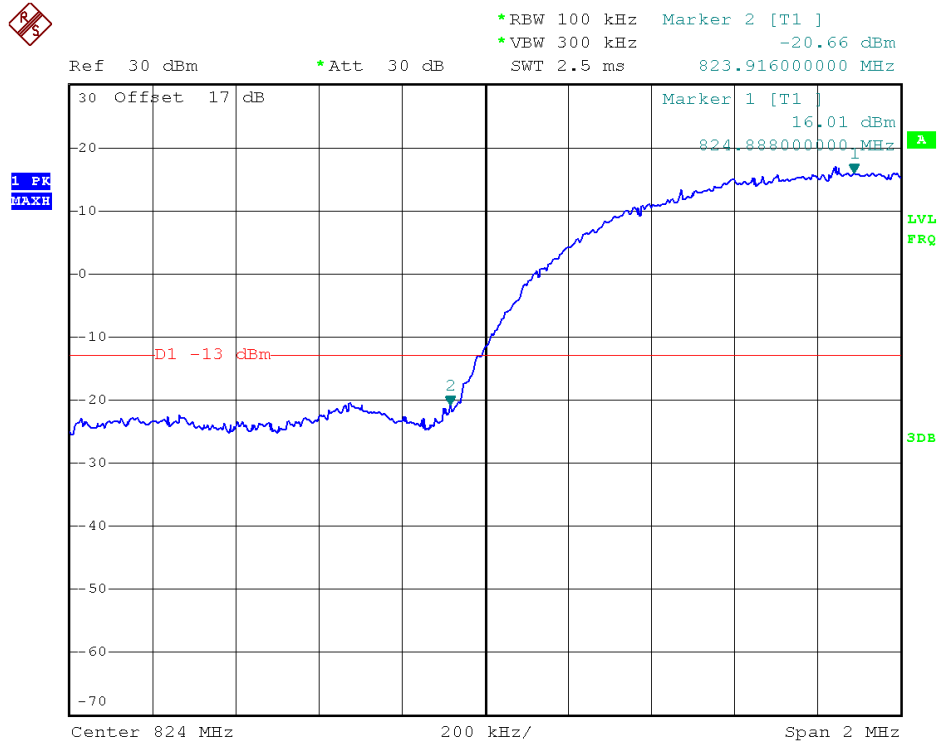
Date: 23.JUL.2015 15:13:56

EDGE 1900MHz, High 810/1909.8

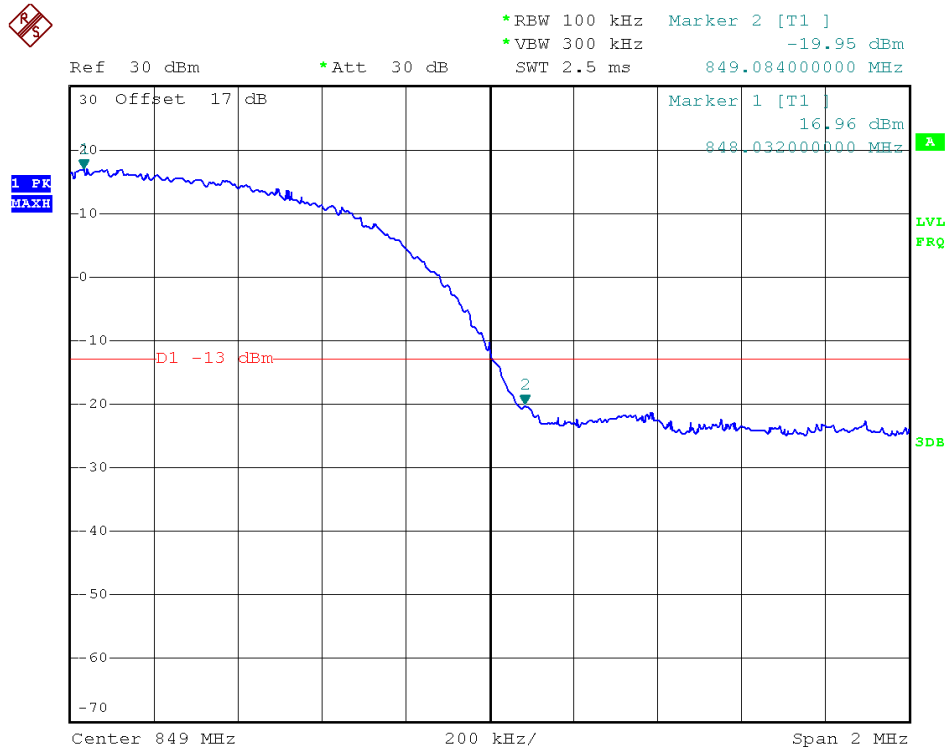


Date: 23.JUL.2015 15:16:15

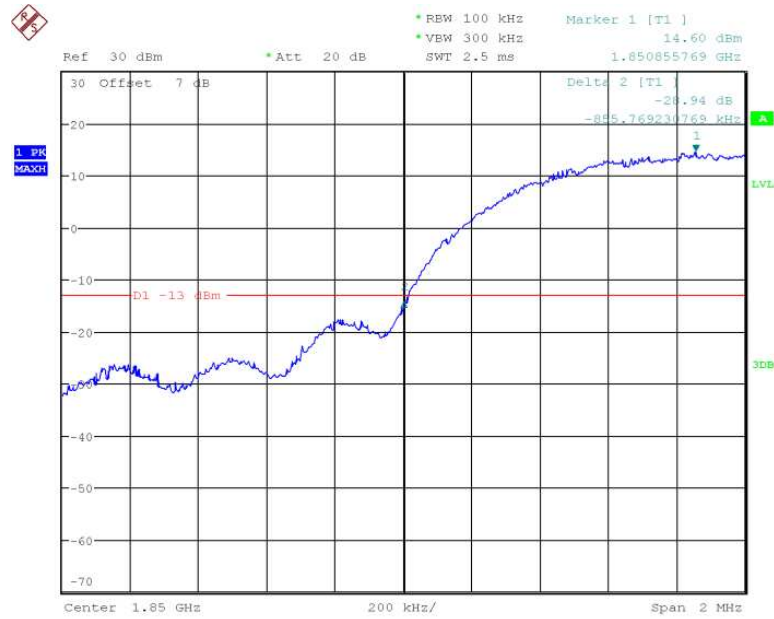
WCDMA 850, Low 4132/826.4



WCDMA 850, High 4233/846.6

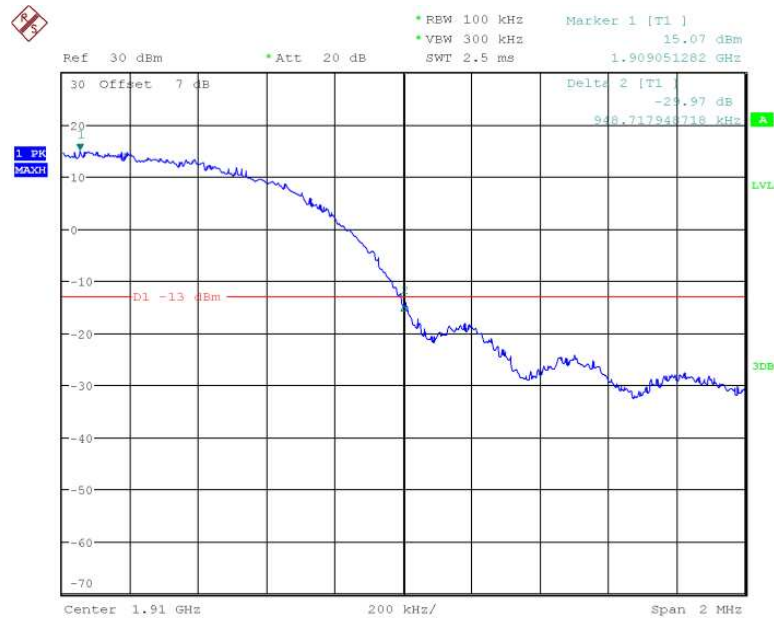


WCDMA 1900, Low 9262/1852.4



Date: 22.JUL.2015 14:28:28

WCDMA 1900, High 9538/1907.6



Date: 22.JUL.2015 14:29:19

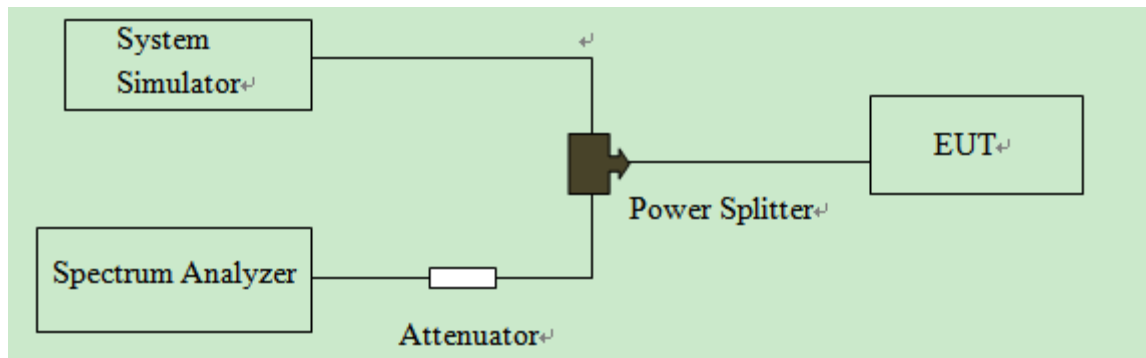
3.7 Peak-to-Average Ratio (FCC Part 24.232)

The limit is as follows:

The peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

Test Procedures:

1. The EUT was connected to Spectrum Analyzer and Base Station via power divider.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. For GSM/GPRS/EDGE operating modes:
 - a. Set the RBW = 1MHz, VBW = 1MHz, Peak detector in spectrum analyzer.
 - b. Set EUT in maximum power output, and triggered the burst signal.
 - c. Measured respectively the Peak level and Mean level, and the deviation was recorded as Peak to Average Ratio.
4. For UMTS operating modes:
 - a. Set the CCDF (Complementary Cumulative Distribution Function) option in spectrum analyzer.
 - b. The highest RF powers were measured and recorded the maximum PAPR level associated with a probability of 0.1 %.



Test Results:

Band	CH	Frequency (MHz)	PAPR
GSM850MHz	128	824.2	10.7
GSM850MHz	189	836.4	10.8
GSM850MHz	251	848.8	10.6
EDGE 850MHz	128	824.2	9.6
EDGE 850MHz	189	836.4	9.6
EDGE 850MHz	251	848.8	9.7
WCDMA 850MHz	4132	826.4	9.4
WCDMA 850MHz	4182	836.4	9.5
WCDMA 850MHz	4233	846.6	9.5

Band	CH	Frequency (MHz)	Measured output power (dBm)
GSM1900MHz	512	1850.2	10.3
GSM1900MHz	661	1880	10.1
GSM1900MHz	810	1909.8	10.3
EDGE 1900MHz	512	1850.2	9.7
EDGE 1900MHz	661	1880	9.6
EDGE 1900MHz	810	1909.8	9.8
WCDMA 1900MHz	9262	1852.4	9.4
WCDMA 1900MHz	9400	1880	9.3
WCDMA 1900MHz	9538	1907.6	9.3

3.8 Frequency Stability (FCC Part 2.1055, 22.355, 24.235) { tc \l 2 "4.7 Frequency Stability (FCC Part 2.1055, 22.355, 24.235)" }

The limit is as follows:

For the 850MHz band, according to 22.355, the stability requirements are: $\pm 1.5\text{ppm}$ for mobile units and $\pm 2.5\text{ppm}$ for portable units.

For the 1900MHz band, according to 24.235, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test Procedures:

1. Frequency Stability (Temperature Variation)

The temperature inside the climate chamber is varied from -30°C to $+50^{\circ}\text{C}$ in 10°C step size,

(1) With all power removed, the temperature was decreased to -30°C and permitted to stabilize for three hours.

(2) Measure the carrier frequency with the test equipment in a “call mode”. These measurements should be made within 1 minute of powering up the mobile station, to prevent significant self warming.

(3) Repeat the above measurements at 10°C increments from -30°C to $+50^{\circ}\text{C}$. Allow at least 1.5 hours at each temperature, un-powered, before making measurements.

2. Frequency Stability (Voltage Variation)

The frequency stability shall be measured with variation of primary supply voltage as follows:

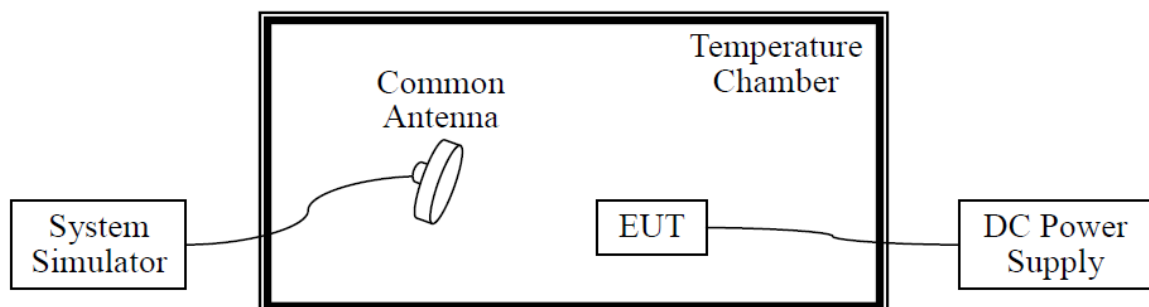
(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand

carried battery equipment.

(2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery-operating end point which shall be specified by the manufacturer.

[] AC nominal supply voltage: _____AC

[✓] Battery nominal voltage: 4.2VDC; lowest: 3.7VDC; highest: 5VDC



Test results:

Voltage (V)	Mode	Temperature (°C)	Frequency deviation (ppm)	Limit (ppm)
4.2	GSM850MHz (AFRCN = 189)	-30	0.0039	2.5
		-20	0.0050	
		-10	0.0017	
		0	0.0032	
		+10	0.0012	
		+20	0.0011	
		+30	0.0012	
		+40	0.0048	
		+50	0.0081	
	EDGE 850MHz (AFRCN = 189)	-30	0.0037	2.5
		-20	0.0049	
		-10	0.0020	
		0	0.0032	
		+10	0.0012	
		+20	0.0011	
		+30	0.0013	
		+40	0.0047	
		+50	0.0078	
	GSM1900MHz (AFRCN = 512)	-30	0.0024	within authorized band
		-20	0.0021	
		-10	0.0018	
		0	0.0013	
		+10	0.0015	
		+20	0.0012	
		+30	0.0012	
		+40	0.0007	
		+50	0.0019	
	EDGE 1900MHz (AFRCN = 512)	-30	0.0025	within authorized band
		-20	0.0020	
		-10	0.0017	
		0	0.0010	
		+10	0.0013	
		+20	0.0011	
		+30	0.0012	
		+40	0.0009	
		+50	0.0021	
	WCDMA 850MHz (AFRC = 4182)	-30	0.0038	2.5
		-20	0.0049	
		-10	0.0014	
		0	0.0035	
		+10	0.0013	

		+20	0.0012	
		+30	0.0012	
		+40	0.0047	
		+50	0.0083	
	WCDMA 1900MHz (AFRCN= 9400)	-30	0.0017	within authorized band
		-20	0.0028	
		-10	0.0023	
		0	0.0014	
		+10	0.0016	
		+20	0.0010	
		+30	0.0007	
		+40	0.0022	
		+50	0.0018	

Temperature (°C)	Mode	Voltage (V)	Frequency deviation (ppm)	Limit (ppm)
20	GSM850MHz (AFRCN = 189)	3.7	0.0014	2.5
		4.2	0.0011	
		5	0.0013	
	EDGE 850MHz (AFRCN = 189)	3.7	0.0014	2.5
		4.2	0.0011	
		5	0.0013	
	GSM1900MHz (AFRCN = 512)	3.7	0.0014	within authorized band
		4.2	0.0012	
		5	0.0012	
	EDGE 1900MHz (AFRCN = 512)	3.7	0.0013	within authorized band
		4.2	0.0011	
		5	0.0014	
	WCDMA 850MHz (AFRC = 4182)	3.7	0.0015	2.5
		4.2	0.0012	
		5	0.0014	
	WCDMA 1900MHz (AFRCN= 9400)	3.7	0.0011	within authorized band
		4.2	0.0010	
		5	0.0012	

END OF TEST REPORT