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## Report On

Application for Grant of Equipment Authorization of the  
Novatel Wireless Inc.

MiFi 6620L Wireless Hotspot Modem

FCC CFR 47 Part 2, Part 22 and Part 24

Report No. SC1403560C Rev.1

July 2014



**REPORT ON** Radio Testing of the  
Novatel Wireless Inc.  
MiFi6620L Wireless Hotspot Modem

**TEST REPORT NUMBER** SC1403560C Rev.1

**PREPARED FOR** Novatel Wireless Inc.  
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Title: EMC/ Wireless Test Engineer

**DATED** July 15, 2014



**Revision History**

SC1403560C Rev.1 Novatel Wireless Inc. Jetpack MiFi 6620L Wireless Hotspot Modem					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
07/15/2014	Initial Release				Juan M. Gonzalez
07/18/2014	Initial Release	Rev. 1	Model name change from MiFi6620L to MiFi 6620L	2, 3, 6 and 8	Ferdinand Custodio



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## **SECTION 1**

### **REPORT SUMMARY**

Radio Testing of the  
Novatel Wireless Inc.  
MiFi 6620L Wireless Hotspot Modem



## 1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Novatel Wireless Inc. Wireless Hotspot Modem to the requirements of the following:  
FCC CFR 47 Part 2, Part 22 and Part 24

Objective To perform Radio Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.

Manufacturer Novatel Wireless Inc.

Model Number(s) MiFi 6620L

FCC ID Number PKRNVWMIFI6620

IC Number N/A

Serial Number(s) SS220414800535

Number of Samples Tested 1

Test Specification/Issue/Date

- FCC CFR 47 Part 2, Part 22 and Part 24 (October 1, 2011).

Start of Test June 03, 2014

Finish of Test July 09, 2014

Name of Engineer(s) Alex Chang

Related Document(s)

- RF Exposure Lab Certificate of Compliance SAR Evaluation Test Report Number: SAR.20140601 Revision D.
- Supporting documents for EUT certification are separate exhibits.



## 1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC CFR 47 Part 2, Part 22 and Part 24 standard is shown below.

Section	FCC Part Sections(s)	Test Description	Result
2.1	2.1046	Transmitter Conducted Output Power	Compliant
2.2	22.913(a)(2), 2.1046	Effective Radiated Power	Compliant
2.3	24.232(c),2.1046	Equivalent Isotropic Radiated Power	Compliant
2.4	2.1049,22.917(b), 24.238(b)	Occupied Bandwidth	Compliant
2.5	24.232(d)	Peak-Average Ratio	Compliant
2.6	2.1051,22.917(a), 24.238(a)	Band Edge/Conducted Spurious Emissions	Compliant
2.7	2.1053,22.917(a), 24.238(a)	Field Strength Of Spurious Radiation	Compliant
2.8	2.1055,22.355,24.235	Frequency Stability	Compliant



### 1.3 PRODUCT INFORMATION

#### 1.3.1 EUT General Description

The Equipment Under Test (EUT) was a Novatel Wireless Inc. MiFi 6620L Wireless Hotspot Modem. The EUT creates a personal Wi-Fi cloud, capable of sharing high speed 4G LTE and 3G Mobile Broadband Internet connectivity with up to 15 Wi-Fi-enable devices simultaneously. The EUT comes with an AC power adaptor Novatel Wirelss, model: SSW-2597.

#### 1.3.2 EUT General Description

EUT Description	Wireless Hotspot Modem
Model Number(s)	MiFi 6620L
FCC Classification	Portable Transmitter
Rated Voltage	Nominal 3.8VDC Li-Ion Battery AC Power Adaptor: Input: 100-240VAC/0.3A/50-60Hz Output: 5.0 VDC/2.0A
Mode Verified	GSM850/1900, CDMA2000 1xRTT, 1xEV-DO Release 0 and A, WCDMA850/1900, LTE Band 2
Capability	GSM850/1900, CDMA2000 1xRTT, 1xEV-DO Release 0 and A, WCDMA850/1900, LTE Band 2, 4, and 13. WLAN 802.11 a/b/g/n





Internal Antennas Details  
(Client declaration, max. antenna gain covered under this test report)

**WWAN Antenna – CDMA/GPRS/EDGE/WCDMA/LTE**

Manufacturer: NVTL  
Part Number: NVTL DA-01020345  
Type: Monopole  
Antenna Gain:

- CDMA BC0 – 850MHz: -3.46 dBi
- CDMA BC1 – 1900MHz: -0.97 dBi
- GSM850 – 850MHz: -2.0 dBi
- GSM1900 – 1900MHz: -1.64 dBi
- WCDMA Band 5 – 850MHz: -2.0 dBi
- WCDMA Band 2 – 1900MHz: -1.64 dBi
- LTE Band 2 – 1900MHz: -1.64 dBi
- LTE Band 4 – 1700MHz: 0.83 dBi
- LTE Band 13 – 700MHz: -1.09 dBi

**WLAN – Antenna: 802.11 a/b/g/n**

Manufacturer: NVTL  
Part Number: NVTL 12023203  
Type: CERAMIC CHIP  
Antenna Tx0 Gain:

- 802.11 b/g/n 2.4MHz : -0.94 dBi
- 802.11 a/n 5GHz: 1.72 dBi

Antenna Tx1 Gain:

- 802.11 b/g/n 2.4MHz : -0.94 dBi
- 802.11 a/n 5GHz: 1.72 dBi



**1.3.3 Transmit Frequency Table**

Technology / Mode	Tx Frequency (MHz)	Emission Designator	ERP (Part 22) / EIRP (Part 24)	
			Max. Power (dBm)	Max. Power (W)
CDMA2000 – 1xRTT Cell Band (BC0)	824-849	1M28F9W	18.81	0.0760
CDMA2000 – 1xRTT PCS Band (BC1)	1850-1910	1M28F9W	23.53	0.2254
CDMA2000 – 1xEV-DO Release 0 Cell Band (BC0)	824-849	1M28F9W	18.79	0.0757
CDMA2000 – 1xEV-DO Release 0 PCS Band (BC1)	1850-1910	1M29F9W	23.44	0.2208
CDMA2000 – 1xEV-DO Release A Cell Band (BC0)	824-849	1M28F9W	18.85	0.0767
CDMA2000 – 1xEV-DO Release A PCS Band (BC1)	1850-1910	1M29F9W	23.47	0.2223
GSM850 (GPRS) Cell Band (BC0)	824-849	248KGXW	28.35	0.6839
GSM1900 (GPRS) PCS Band (BC1)	1850-1910	245KGXW	27.86	0.6109
GSM850 (EGPRS) Cell Band (BC0)	824-849	246KG7W	22.53	0.1791
GSM1900 (EGPRS) PCS Band (BC1)	1850-1910	245KG7W	23.98	0.2500
WCDMA (3GPP Release Version 99) Cell Band 5	824-849	4M17F9W	19.84	0.0964
WCDMA (3GPP Release Version 99) Cell Band 2	1850-1910	4M18F9W	22.31	0.1702

Technology / Mode	Modulation	Bandwidth (MHz)	Tx Frequency (MHz)	Emission Designator	EIRP (Part 24)	
					Max. Power (dBm)	Max. Power (W)
LTE Band 2	QPSK	1.4	1850-1910	1M10G7D	22.36	0.1722
		3	1850-1910	2M70G7D	22.36	0.1722
		5	1850-1910	4M52G7D	22.34	0.1714
		10	1850-1910	9M00G7D	22.36	0.1722
		15	1850-1910	13M42G7D	22.36	0.1722
		20	1850-1910	17M84G7D	21.86	0.1535
	16QAM	1.4	1850-1910	1M11W7D	20.50	0.1122
		3	1850-1910	2M70W7D	21.28	0.1343
		5	1850-1910	4M51W7D	21.15	0.1303
		10	1850-1910	9M03W7D	21.32	0.1355
		15	1850-1910	13M42W7D	21.15	0.1303
		20	1850-1910	17M88W7D	21.04	0.1271



## 1.4 EUT TEST CONFIGURATION

### 1.4.1 Test Configuration Description

Test Configuration	Description
A	Conducted antenna port measurement. EUT Tx at a max power and connected to a programmable DC power supply via dummy battery pack.
B	Raidated test setup. EUT Tx through integral antenna and connected to supplied AC-DC power adaptor.

### 1.4.2 EUT Exercise Software

EUT is controlled by a CMW 500 Wideband Radio Communication Tester. There are no other test software used during verification.

### 1.4.3 Support Equipment and I/O cables

Manufacturer	Equipment/Cable	Description
Novatel Wireless	USB Cable	Micro USB Type B to Standard USB Type B

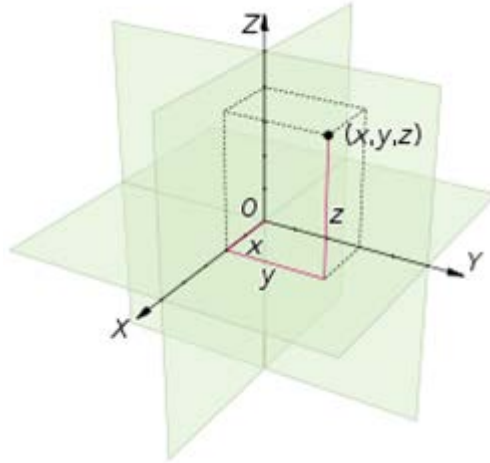
### 1.4.4 Worst Case Configuration

Technology	Band	Channel	Freq (MHz)
CDMA 2000 – 1xRTT	Cell (BC0)	777	848.31
	PCS (BC1)	1175	1908.75
CDMA 2000 – 1xEV-DO Release 0	Cell (BC0)	777	848.31
	PCS (BC1)	1175	1908.75
CDMA 2000 – 1xEV-DO Release A	Cell (BC0)	1013	824.7
	PCS (BC1)	600	1880.0
GSM850 / GSM1900 (GPRS)	Cell	128	824.2
	PCS	810	1909.8
GSM850 / GSM1900 (EGPRS)	Cell	251	848.8
	PCS	512	1850.2
WCDMA (3GPP Release Version 99)	Cell (Band 5)	4233	846.6
	PCS (Band 2)	9538	1907.6

Band	Channel Bandwidth	Modulation	Channel	Freq (MHz)
LTE Band 2	1.4 MHz	QPSK	18900	1880.0

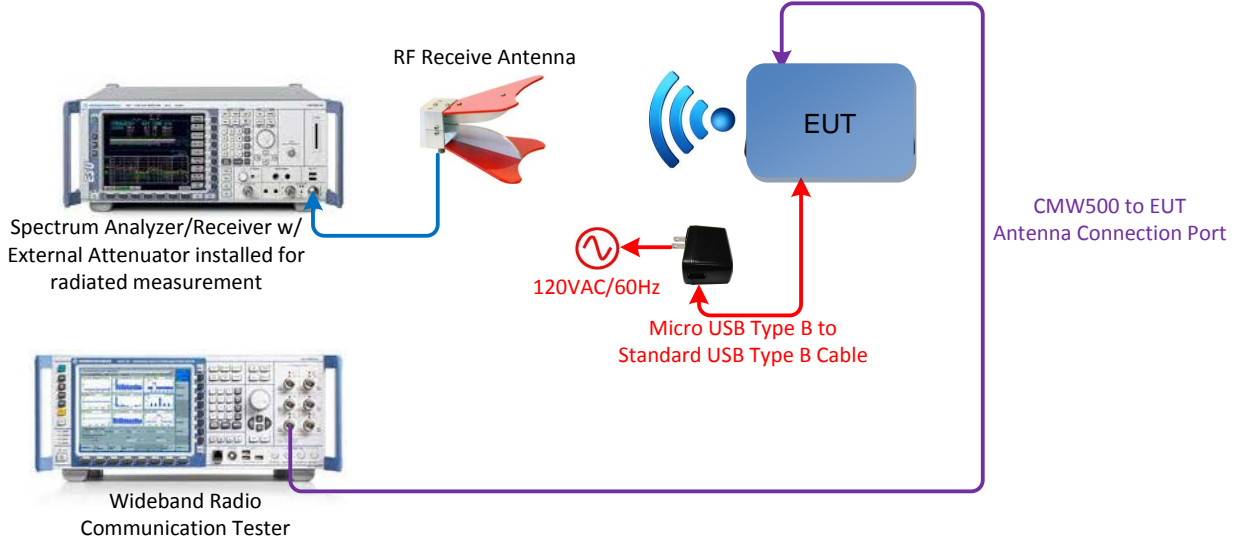


For radiated measurements X, Y, and Z orientations were verified. The verification was determined “Y” as worst case configuration.

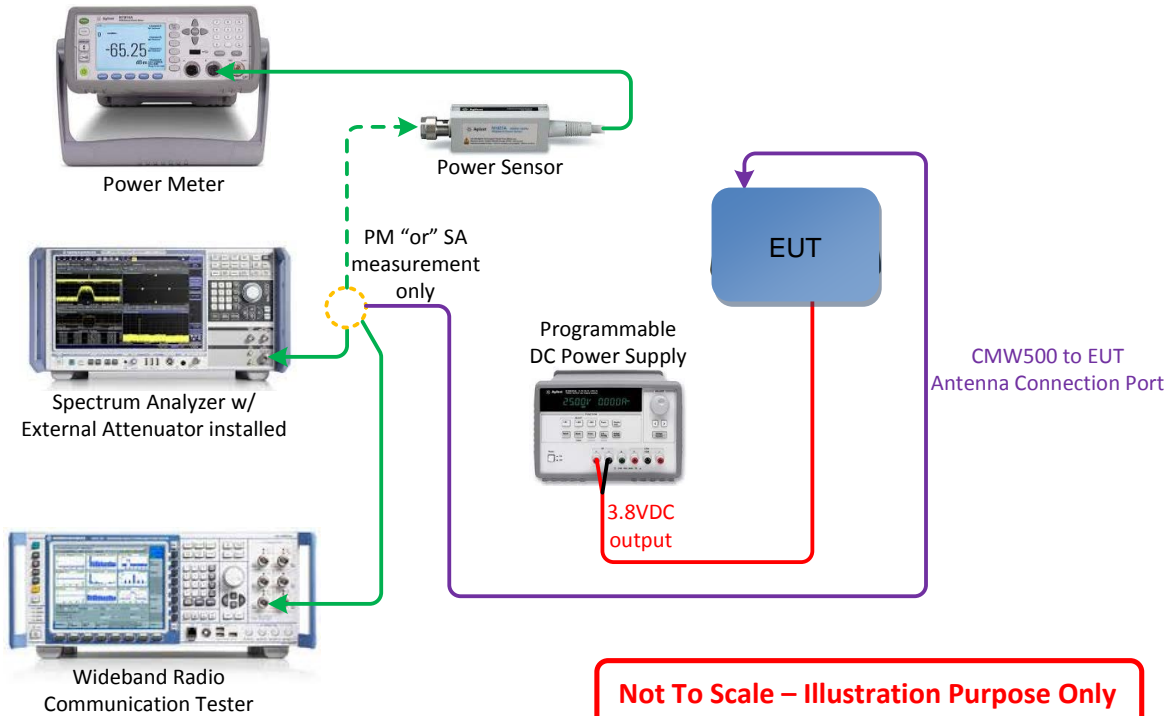


1.4.5 Simplified Test Configuration Diagram

**Radiated/Conducted Emission Test Configuration via Conducted Port**



**Conducted (Antenna Port) Test Configuration**



**Not To Scale – Illustration Purpose Only**  
 Objects may not represent actual image of original equipment/s or set-up.



**1.5 DEVIATIONS FROM THE STANDARD**

No deviations from the applicable test standards or test plan were made during testing.

**1.6 MODIFICATION RECORD**

Description of Modification	Modification Fitted By	Date Modification Fitted
Serial Number SS220414800535		
N/A	-	-

The table above details modifications made to the EUT during the test programme. The modifications incorporated during each test (if relevant) are recorded on the appropriate test pages.

**1.7 TEST METHODOLOGY**

All measurements contained in this report were conducted with ANSI C63.4-2009, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. Effective Radiated Power (ERP) and Equivalent Isotropic Radiated Power (EIRP) measurements by Substitution method were conducted according to ANSI/TIA/EIA-603-C-2004, August 17,2004. Land Mobile FM or PM -Communications Equipment -Measurement and Performance Standards. For conducted and radiated emissions the equipment under test (EUT) was configured to measure its highest possible emission level. This level was based on the maximized cable configuration from exploratory testing per ANSI C63.4-2009. The test modes were adapted according to the Operating Instructions provided by the manufacturer/client.

**1.8 TEST FACILITY LOCATION**

**1.8.1 TÜV SÜD America Inc. (Mira Mesa)**

10040 Mesa Rim Road, San Diego, CA 92121-2912 (32.901268,-117.177681). Phone: 858 678 1400 FAX: 858-546 0364

**1.8.2 TÜV SÜD America Inc. (Rancho Bernardo)**

Sony Electronics Inc., Building #8 16530 Via Esprillo, San Diego, CA 92127-1708 (33.018644,-117.092409). Phone: 858 942 5542 FAX: 858-546 0364

**1.9 TEST FACILITY REGISTRATION**

**1.9.1 FCC – Registration No.: US1146**

TUV SUD America Inc. (San Diego), is an accredited test facility with the site description report on file and has met all the requirements specified in §2.948 of the FCC rules. The acceptance letter from the FCC is maintained in our files and the Registration is US1146.



**1.9.2 Industry Canada (IC) Registration No.: 3067A**

The 10m Semi-anechoic chamber of TÜV SÜD America Inc. (San Diego) has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No. 3067A.



**1.10 SAMPLE CALCULATIONS**

**1.10.1 GSM Emission Designator**

Emission Designator = 250KGXW  
 GSM BW = 250 kHz  
 G = Phase Modulation  
 X = Cases not otherwise covered  
 W = Combination (Audio/Data)

**1.10.2 WCDMA Emission Designator**

Emission Designator = 4M15F9W  
 WCDMA BW = 4.15 MHz  
 F = Frequency Modulation  
 9= Composite Digital Info  
 W = Combination (Audio/Data)

**1.10.3 CDMA Emission Designator**

Emission Designator = 1M30F9W  
 F = Frequency Modulation  
 9= Composite Digital Info  
 W = Combination (Audio/Data)

**1.10.4 LTE Emission Designator (QPSK)**

Emission Designator = 4M51G7D  
 G = Phase Modulation  
 7= Quantized/Digital Info  
 D = Data Transmission, telemetry, telecommand

**1.10.5 LTE Emission Designator (16QAM)**

Emission Designator = 4M52W7D  
 W = Frequency Modulation  
 7= Quantized/Digital Info  
 D = Data Transmission, telemetry, telecommand

**1.10.6 Spurious Radiated Emission (below 1GHz)**

Measuring equipment raw measurement (dBµV/m) @ 30 MHz		24.4
Correction Factor (dB)	Asset# 1066 (cable)	0.3
	Asset# 1172 (cable)	0.3
	Asset# 1016 (preamplifier)	-30.7
	Asset# 1175(cable)	0.3
	Asset# 1002 (antenna)	17.2
Reported QuasiPeak Final Measurement (dBµV/m) @ 30MHz		<b>11.8</b>

**1.10.7 Spurious Radiated Emission – Substitution Method**

Example = 84dBµV/m @ 1413 MHz (numerical sample only)





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The field strength reading of  $84\text{dB}\mu\text{V}/\text{m}$  @  $1413\text{ MHz}$  ( $2^{\text{nd}}$  Harmonic of  $706.5\text{ MHz}$ ) is the maximized measurement when the EUT is on the turntable measured at 3 meters. The gain of the substituted antenna is  $7.8\text{dBi}$  while the transmit cable loss is  $1.0\text{ dB}$  (cable between signal generator and the substituted antenna). The signal generator level is adjusted until the  $84\text{dB}\mu\text{V}/\text{m}$  level at the receiving end is replicated (identical test setup, i.e. same antenna, cable/s and preamp). If the adjusted signal generator level is  $-18\text{dBm}$ , then we have the following for both EIRP and ERP as required:

$$\begin{aligned} P_{\text{EIRP}} &= -18\text{ dBm} + 7.8\text{ dBi} - 1\text{dB} \\ &= 11.2\text{ dBm} \\ P_{\text{ERP}} &= P_{\text{EIRP}} - 2.15\text{ dB} \\ &= 11.2\text{ dBm} - 2.15\text{ dB} \\ &= 9.05\text{ dBm} \end{aligned}$$



## **SECTION 2**

### **TEST DETAILS**

Radio Testing of the  
Novatel Wireless Inc.  
MiFi6620L Wireless Hotspot Modem



## **2.1 TRANSMITTER CONDUCTED POWER MEASUREMENTS**

### **2.1.1 Specification Reference**

Part 2.1046

### **2.1.2 Standard Applicable**

The conducted power measurements were made in accordance to FCC Part 2.1046

### **2.1.3 Equipment Under Test and Modification State**

Serial No: SS220414800535 / Test Configuration A

### **2.1.4 Date of Test/Initial of test personnel who performed the test**

\*May 30, 2014 / AC

\*The tables presented on this test report are from SAR Evaluation Test Report Number: SAR.20140601 Revision D ; TÜV performed Verification on random channels and worst case conditions and did not find any significant differences.

### **2.1.5 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

### **2.1.6 Additional Observations**

- These are the Conducted port measurement provided by the RF exposure SAR laboratory. The data was used and help in determining worst case testing conditions for the remainder of the report.
- This is a conducted test using a peak/average power meter.
- The 27.38dB Cell Band (CDMA/EV-DO/GSM850) and WCDMA Band 5; 27.93dB PCS Band (CDMA/EV-DO/GSM1900) and WCDMA Band 2; 27.75dB (LTE Band 2) offset on the power meter was used for the power splitter, external attenuator and cable used.
- TÜV performed verification checks and compared the measurements to the data provided by RF Exposure Labs (SAR.20140601 Revision D) and the results were found to be similar and are used to show compliance in this test report.
- Only worst case of SO/RC, RTAP, RETAP, RB size and RB offset presented and recorded in this test report.
- The worst case for each mode (marked bold and italic) will be verified for each test throughout this test report.

### **2.1.7 Test Results**

See attached table.



CDMA 2000 – 1xRTT				
Band	Channel	Frequency (MHz)	Max Power Average (dBm)	Service Option (SO) / (RC)
Cell (BC0)	1013	824.70	24.40	32 / 3
	384	836.52	24.36	32 / 3
	<b>777</b>	<b>848.31</b>	<b>24.42</b>	<b>32 / 3</b>
PCS (BC1)	25	1851.25	24.50	32 / 3
	600	1880.00	24.49	32 / 3
	<b>1175</b>	<b>1908.75</b>	<b>24.50</b>	<b>32 / 3</b>

CDMA 2000 – 1xEV-DO Release 0				
Band	Channel	Frequency (MHz)	Max Power Average (dBm)	RTAP Data Rate (kbps)
Cell (BC0)	1013	824.70	24.40	153.6
	384	836.52	24.35	153.6
	<b>777</b>	<b>848.31</b>	<b>24.40</b>	<b>153.6</b>
PCS (BC1)	25	1851.25	24.30	153.6
	600	1880.00	24.40	153.6
	<b>1175</b>	<b>1908.75</b>	<b>24.41</b>	<b>153.6</b>

CDMA 2000 – 1xEV-DO Release A				
Band	Channel	Frequency (MHz)	Max Power Average (dBm)	RETAP Data Rate (kbps)
Cell (BC0)	<b>1013</b>	<b>824.70</b>	<b>24.46</b>	<b>4096</b>
	384	836.52	24.40	4096
	777	848.31	24.45	4096
PCS (BC1)	25	1851.25	24.38	4096
	<b>600</b>	<b>1880.00</b>	<b>24.44</b>	<b>4096</b>
	1175	1908.75	24.43	4096

GSM850 / GSM1900 (GPRS)			
Band	Channel	Frequency (MHz)	Max Power Average (dBm)
Cell	<b>128</b>	<b>824.2</b>	<b>32.50</b>
	190	836.6	32.45
	251	848.8	32.44
PCS	512	1850.2	29.45
	661	1880.0	29.20
	<b>810</b>	<b>1909.8</b>	<b>29.50</b>



GSM850 / GSM1900 (EGPRS)			
Band	Channel	Frequency (MHz)	Max Power Average (dBm)
Cell	128	824.2	26.59
	190	836.6	26.53
	<b>251</b>	<b>848.8</b>	<b>26.68</b>
PCS	<b>512</b>	<b>1850.2</b>	<b>25.62</b>
	661	1880.0	25.46
	810	1909.8	25.55

WCDMA (3GPP Release Version 99)			
Band	Channel	Frequency (MHz)	Max Power Average (dBm)
Cell Band 5	4132	826.4	23.99
	4183	836.6	23.98
	<b>4233</b>	<b>846.6</b>	<b>23.99</b>
PCS Band 2	9262	1852.4	23.88
	9400	1880.0	23.90
	<b>9538</b>	<b>1907.6</b>	<b>23.95</b>



LTE Band 2								
Modulation	Bandwidth	RB Size	RB Offset	Channels	Frequency	Tx Average (dBm)	Tx Peak (dBm)	
QPSK	1.4 MHz	6	0	18607	1850.7	22.95	27.77	
		<b>3</b>	<b>1</b>			<b>24.00</b>	<b>27.97</b>	
		1	0			24.00	27.94	
			1	5			23.99	27.89
			6	0	18900	1880.0	23.20	28.31
			<b>3</b>	<b>1</b>			<b>24.00</b>	<b>28.47</b>
			1	0			23.61	28.43
			1	5			24.00	28.39
			6	0	19193	1909.3	22.19	27.61
			3	1			23.70	27.21
			1	0			23.85	27.19
			<b>1</b>	<b>5</b>			<b>23.99</b>	<b>27.10</b>
		3 MHz	15	0	18615	1851.5	23.01	27.88
			8	3			22.95	27.80
			<b>1</b>	<b>0</b>			<b>24.00</b>	<b>27.91</b>
			1	14			23.99	27.89
			15	0	18900	1880.0	23.11	28.28
			8	3			23.05	28.20
			<b>1</b>	<b>0</b>			<b>23.74</b>	<b>28.32</b>
			1	14			23.73	28.28
			15	0	19185	1908.5	22.91	27.16
			8	3			22.81	27.15
			1	0			23.99	27.38
			<b>1</b>	<b>14</b>			<b>24.00</b>	<b>27.12</b>
		5 MHz	25	0	18625	1852.5	22.93	27.70
			12	6			22.83	27.67
			<b>1</b>	<b>0</b>			<b>23.95</b>	<b>27.91</b>
			1	24			23.45	27.85
			25	0	18900	1880.0	22.98	28.08
			12	6			23.13	28.23
			<b>1</b>	<b>0</b>			<b>23.56</b>	<b>28.34</b>
			1	24			23.36	28.30
			25	0	19175	1907.5	22.92	27.28
	12		6	22.88			27.21	
	1		0	23.32			27.66	
	<b>1</b>		<b>24</b>	<b>23.98</b>			<b>27.19</b>	



LTE Band 2							
Modulation	Bandwidth	RB Size	RB Offset	Channels	Frequency	Tx Average (dBm)	Tx Peak (dBm)
QPSK	10 MHz	50	0	18650	1855.0	22.52	27.67
		25	12			22.30	27.51
		<b>1</b>	<b>0</b>			<b>23.95</b>	<b>27.97</b>
		1	24			23.46	27.83
		50	0	18900	1880.0	22.55	28.01
		25	12			22.95	28.10
		1	0			23.30	28.30
		<b>1</b>	<b>24</b>			<b>24.00</b>	<b>28.46</b>
		50	0	19150	1905.0	22.57	27.70
		25	12			22.42	27.45
		1	0			23.23	28.10
		<b>1</b>	<b>24</b>			<b>23.35</b>	<b>27.69</b>
	15 MHz	18675	1857.5	75	0	22.38	27.64
				36	19	22.16	27.56
				<b>1</b>	<b>0</b>	<b>23.89</b>	<b>27.83</b>
				1	74	23.48	28.18
		18900	1880.0	75	0	22.51	27.77
				36	19	22.86	27.99
				<b>1</b>	<b>0</b>	<b>23.38</b>	<b>28.20</b>
				1	74	23.31	28.10
		19125	1902.5	75	0	22.46	27.86
				36	19	22.31	27.58
				1	0	23.42	28.11
				<b>1</b>	<b>74</b>	<b>24.00</b>	<b>27.18</b>
	20 MHz	18700	1860.0	100	0	22.50	27.81
				50	25	22.39	27.68
				<b>1</b>	<b>0</b>	<b>23.48</b>	<b>27.79</b>
				1	99	23.33	28.21
		18900	1880.0	100	0	22.52	27.73
				50	25	22.61	27.96
<b>1</b>				<b>0</b>	<b>23.50</b>	<b>28.24</b>	
1				99	23.35	28.12	
19100		1900.0	100	0	22.40	27.99	
			50	25	22.22	27.80	
			1	0	23.34	28.12	
			<b>1</b>	<b>99</b>	<b>23.43</b>	<b>27.14</b>	



LTE Band 2							
Modulation	Bandwidth	RB Size	RB Offset	Channels	Frequency	Tx Average (dBm)	Tx Peak (dBm)
16QAM	1.4 MHz	<b>6</b>	<b>0</b>	18607	1850.7	<b>21.96</b>	<b>27.90</b>
		3	1			21.95	27.87
		1	0			21.94	27.82
		1	5			21.91	27.81
		6	0	18900	1880.0	22.11	28.29
		<b>3</b>	<b>1</b>			<b>22.14</b>	<b>28.25</b>
		1	0			22.12	28.20
		1	5			22.10	28.18
		6	0	19193	1909.3	21.92	27.12
		3	1			21.88	27.13
		1	0			21.91	27.10
		<b>1</b>	<b>5</b>			<b>21.93</b>	<b>27.09</b>
	3 MHz	18615	1851.5	15	0	21.98	27.73
				8	3	21.76	27.60
				<b>1</b>	<b>0</b>	<b>22.92</b>	<b>27.98</b>
				1	14	22.69	27.91
		18900	1880.0	15	0	22.14	28.19
				8	3	22.10	28.10
				<b>1</b>	<b>0</b>	<b>22.63</b>	<b>28.45</b>
				1	14	22.39	28.43
		19185	1908.5	15	0	21.92	27.10
				8	3	21.82	27.05
				<b>1</b>	<b>0</b>	<b>22.75</b>	<b>27.46</b>
				1	14	22.74	27.17
	5 MHz	18625	1852.5	25	0	22.01	27.69
				12	6	21.84	27.70
				<b>1</b>	<b>0</b>	<b>22.79</b>	<b>27.99</b>
				1	24	22.21	27.89
		18900	1880.0	25	0	21.96	28.15
				12	6	22.21	28.30
				<b>1</b>	<b>0</b>	<b>22.44</b>	<b>28.42</b>
				1	24	22.07	28.33
		19175	1907.5	25	0	22.01	27.27
				12	6	21.88	27.28
				1	0	22.37	28.42
				<b>1</b>	<b>24</b>	<b>22.75</b>	<b>27.26</b>





LTE Band 2								
Modulation	Bandwidth	RB Size	RB Offset	Channels	Frequency	Tx Average (dBm)	Tx Peak (dBm)	
16QAM	10 MHz	50	0	18650	1855.0	21.30	27.52	
		25	12			21.17	27.40	
		<b>1</b>	<b>0</b>			<b>22.77</b>	<b>27.98</b>	
		1	24			22.24	27.86	
		50	0	18900	1880.0	21.62	28.00	
		25	12			21.81	28.05	
		1	0			22.19	28.31	
		<b>1</b>	<b>24</b>			<b>22.96</b>	<b>28.45</b>	
		50	0	19150	1905.0	21.53	27.97	
		25	12			21.42	27.39	
		1	0			22.07	28.11	
		<b>1</b>	<b>24</b>			<b>22.25</b>	<b>27.75</b>	
	15 MHz	75	0	18675	1857.5	21.35	27.66	
			36			19	21.17	27.65
			<b>1</b>			<b>0</b>	<b>22.79</b>	<b>27.95</b>
			1			74	22.13	28.25
		75	0	18900	1880.0	21.25	27.74	
			36			19	21.64	28.03
			<b>1</b>			<b>0</b>	<b>22.07</b>	<b>28.30</b>
			1			74	21.96	28.20
		75	0	19125	1902.5	21.46	27.89	
			36			19	21.23	27.59
			1			0	22.21	28.24
			<b>1</b>			<b>74</b>	<b>22.76</b>	<b>27.24</b>
	20 MHz	100	0	18700	1860.0	21.54	27.82	
			50			25	21.39	27.66
			<b>1</b>			<b>0</b>	<b>22.68</b>	<b>27.92</b>
			1			99	22.01	28.39
		100	0	18900	1880.0	21.50	27.71	
			50			25	21.54	27.89
<b>1</b>			<b>0</b>			<b>22.38</b>	<b>28.44</b>	
1			99			21.71	28.29	
100		0	19100	1900.0	21.32	27.99		
		50			25	21.16	27.72	
		1			0	21.74	28.29	
		<b>1</b>			<b>99</b>	<b>22.68</b>	<b>27.34</b>	



## **2.2 EFFECTIVE RADIATED POWER**

### **2.2.1 Specification Reference**

Part 22 Subpart H §22.913(a)(2)

### **2.2.2 Standard Applicable**

The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

### **2.2.3 Equipment Under Test and Modification State**

Serial No: SS220414800535 / Test Configuration (N/A, calculation only)

### **2.2.4 Date of Test/Initial of test personnel who performed the test**

July 08, 2014 / AC

### **2.2.5 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

### **2.2.6 Additional Observations**

- ERP was calculated as per Section 1.3.2 of KDB412172 D01 (Determining ERP and EIRP v01).
- Calculation formula in logarithmic terms:

$$\text{ERP} = P_T + G_T - L_c - 2.15\text{dB}$$

Where:

$P_T$  = transmitter conducted output power dBm (Section 2.1 of this test report)  
 $G_T$  = gain of the transmitting antenna, in dBi (EIRP: the -2.15 in the formula is to convert EIRP to ERP);  
 $L_c$  = signal attenuation in the connecting cable between the transmitter and antenna, in dB (EUT configuration during verification is mounted on an interface board with short direct connection to the antenna port. The loss between the EUT and the antenna port is considered negligible).

### **2.2.7 Test Results**

See attached table.



CDMA2000 – 1xRTT Cell Band (BC0)						
Frequency (MHz)	Max Power Average (dBm)	Antenna Gain-2.15 (-3.46-2.15=-5.61) (dBi)	ERP			
			(dBm)	(W)	Limit (dBm)	Margin (dB)
824.70	24.40	-5.61	18.79	0.0757	38.45	19.66
836.52	24.36	-5.61	18.75	0.0750	38.45	19.70
848.31	24.42	-5.61	18.81	0.0760	38.45	19.64

CDMA2000 – 1xEV-DO Release 0 Cell Band (BC0)						
Frequency (MHz)	Max Power Average (dBm)	Antenna Gain-2.15 (-3.46-2.15=-5.61) (dBi)	ERP			
			(dBm)	(W)	Limit (dBm)	Margin (dB)
824.70	24.40	-5.61	18.79	0.0757	38.45	19.66
836.52	24.35	-5.61	18.74	0.0748	38.45	19.71
848.31	24.40	-5.61	18.79	0.0757	38.45	19.66

CDMA2000 – 1xEV-DO Release A Cell Band (BC0)						
Frequency (MHz)	Max Power Average (dBm)	Antenna Gain-2.15 (-3.46-2.15=-5.61) (dBi)	ERP			
			(dBm)	(W)	Limit (dBm)	Margin (dB)
824.70	24.46	-5.61	18.85	0.0767	38.45	19.60
836.52	24.40	-5.61	18.79	0.0757	38.45	19.66
848.31	24.45	-5.61	18.84	0.0766	38.45	19.61

GSM850 / GSM1900 (GPRS) Cell Band						
Frequency (MHz)	Max Power Average (dBm)	Antenna Gain-2.15 (-2.0-2.15=-4.15) (dBi)	ERP			
			(dBm)	(W)	Limit (dBm)	Margin (dB)
824.2	32.50	-4.15	28.35	0.6839	38.45	10.10
836.6	32.45	-4.15	28.30	0.6761	38.45	10.15
848.8	32.44	-4.15	28.29	0.6745	38.45	10.16

GSM850 / GSM1900 (EGPRS) Cell Band						
Frequency (MHz)	Max Power Average (dBm)	Antenna Gain-2.15 (-2.0-2.15=-4.15) (dBi)	ERP			
			(dBm)	(W)	Limit (dBm)	Margin (dB)
824.2	26.59	-4.15	22.44	0.1754	38.45	16.01
836.6	26.53	-4.15	22.38	0.1729	38.45	16.07
848.8	26.68	-4.15	22.53	0.1791	38.45	15.92



WCDMA (3GPP Release Version 99) Cell Band 5						
Frequency (MHz)	Max Power Average (dBm)	Antenna Gain-2.15 (-2.0-2.15=-4.15) (dBi)	ERP			
			(dBm)	(W)	Limit (dBm)	Margin (dB)
826.4	23.99	-4.15	19.84	0.0964	38.45	18.61
836.6	23.98	-4.15	19.83	0.0962	38.45	18.62
846.6	23.99	-4.15	19.84	0.0964	38.45	18.61



## **2.3 EQUIVALENT ISOTROPIC RADIATED POWER**

### **2.3.1 Specification Reference**

Part 24 Subpart E §24.234(c)

### **2.3.2 Standard Applicable**

Mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

### **2.3.3 Equipment Under Test and Modification State**

Serial No: SS220414800535 / Test Configuration (N/A, calculation only)

### **2.3.4 Date of Test/Initial of test personnel who performed the test**

July 08, 2014 / AC

### **2.3.5 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

### **2.3.6 Additional Observations**

- EIRP was calculated as per Section 1.3.2 of KDB412172 D01 (Determining ERP and EIRP v01).
- Calculation formula in logarithmic terms:

$$\text{EIRP} = P_T + G_T - L_C$$

Where:

$P_T$  = transmitter conducted output power dBm (Section 2.1 of this test report)

$G_T$  = gain of the transmitting antenna, in dBi (EIRP);

$L_C$  = signal attenuation in the connecting cable between the transmitter and antenna, in dB (EUT poses an internal Antenna. The loss between the EUT and the antenna port is considered negligible).

### **2.3.7 Test Results**

See attached table.



CDMA2000 – 1xRTT PCS Band (BC1)						
Frequency (MHz)	Max Power Average (dBm)	Antenna Gain (dBi)	EIRP			
			(dBm)	(W)	Limit (W)	Margin (W)
1851.25	24.50	-0.97	23.53	0.2254	2	1.77
1880.00	24.49	-0.97	23.52	0.2249	2	1.78
1908.75	24.50	-0.97	23.53	0.2254	2	1.77

CDMA2000 – 1xEV-DO Release 0 PCS Band (BC1)						
Frequency (MHz)	Max Power Average (dBm)	Antenna Gain (dBi)	EIRP			
			(dBm)	(W)	Limit (W)	Margin (W)
1851.25	24.30	-0.97	23.33	0.2153	2	1.78
1880.00	24.40	-0.97	23.43	0.2203	2	1.78
1908.75	24.41	-0.97	23.44	0.2208	2	1.78

CDMA2000 – 1xEV-DO Release A PCS Band (BC1)						
Frequency (MHz)	Max Power Average (dBm)	Antenna Gain (dBi)	EIRP			
			(dBm)	(W)	Limit (W)	Margin (W)
1851.25	24.38	-0.97	23.41	0.2193	2	1.78
1880.00	24.44	-0.97	23.47	0.2223	2	1.78
1908.75	24.43	-0.97	23.46	0.2218	2	1.78

GSM850 / GSM1900 (GPRS) PCS Band						
Frequency (MHz)	Max Power Average (dBm)	Antenna Gain (dBi)	EIRP			
			(dBm)	(W)	Limit (W)	Margin (W)
1850.2	29.45	-1.64	27.81	0.6039	2	1.40
1880.0	29.20	-1.64	27.56	0.5702	2	1.43
1909.8	29.50	-1.64	27.86	0.6109	2	1.39

GSM850 / GSM1900 (EGPRS) PCS Band						
Frequency (MHz)	Max Power Average (dBm)	Antenna Gain (dBi)	EIRP			
			(dBm)	(W)	Limit (W)	Margin (W)
1850.2	25.62	-1.64	23.98	0.2500	2	1.75
1880.0	25.46	-1.64	23.82	0.2410	2	1.76
1909.8	25.55	-1.64	23.91	0.2460	2	1.75



WCDMA (3GPP Release Version 99) PCS Band 2						
Frequency (MHz)	Max Power Average (dBm)	Antenna Gain (dBi)	EIRP			
			(dBm)	(W)	Limit (W)	Margin (W)
1852.4	23.88	-1.64	22.24	0.1675	2	1.83
1880.0	23.90	-1.64	22.26	0.1683	2	1.83
1907.6	23.95	-1.64	22.31	0.1702	2	1.83



LTE Band 2									
Modulation	Bandwidth (MHz)	RB Size/Offset	Channels	Frequency (MHz)	Tx Average Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dBm)
QPSK	1.4	3 / 1	18607	1850.7	24.00	-1.64	22.36	30.00	7.64
		3 / 1	18900	1880.0	24.00	-1.64	22.36	30.00	7.64
		1 / 5	19193	1909.3	23.99	-1.64	22.35	30.00	7.65
	3	1 / 0	18615	1851.5	24.00	-1.64	22.36	30.00	7.64
		1 / 0	18900	1880.0	23.74	-1.64	22.10	30.00	7.9
		1 / 14	19185	1908.5	24.00	-1.64	22.36	30.00	7.64
	5	1 / 0	18625	1852.5	23.95	-1.64	22.31	30.00	7.69
		1 / 0	18900	1880.0	23.56	-1.64	21.92	30.00	8.08
		1 / 24	19175	1907.5	23.98	-1.64	22.34	30.00	7.66
	10	1 / 0	18650	1855.0	23.95	-1.64	22.31	30.00	7.69
		1 / 24	18900	1880.0	24.00	-1.64	22.36	30.00	7.64
		1 / 24	19150	1905.0	23.35	-1.64	21.71	30.00	8.29
	15	1 / 0	18675	1857.5	23.89	-1.64	22.25	30.00	7.75
		1 / 0	18900	1880.0	23.38	-1.64	21.74	30.00	8.26
		1 / 74	19125	1902.5	24.00	-1.64	22.36	30.00	7.64
	20	1 / 0	18700	1860.0	23.48	-1.64	21.84	30.00	8.16
		1 / 0	18900	1880.0	23.50	-1.64	21.86	30.00	8.14
		1 / 99	19100	1900.0	23.43	-1.64	21.79	30.00	8.21





LTE Band 2									
Modulation	Bandwidth (MHz)	RB Size/Offset	Channels	Frequency (MHz)	Tx Average Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dBm)
16QAM	1.4	6 / 0	18607	1850.7	21.96	-1.64	20.32	30.00	9.68
		3 / 1	18900	1880.0	22.14	-1.64	20.50	30.00	9.5
		1 / 5	19193	1909.3	21.93	-1.64	20.29	30.00	9.71
	3	1 / 0	18615	1851.5	22.92	-1.64	21.28	30.00	8.72
		1 / 0	18900	1880.0	22.63	-1.64	20.99	30.00	9.01
		1 / 0	19185	1908.5	22.75	-1.64	21.11	30.00	8.89
	5	1 / 0	18625	1852.5	22.79	-1.64	21.15	30.00	8.85
		1 / 0	18900	1880.0	22.44	-1.64	20.80	30.00	9.2
		1 / 24	19175	1907.5	22.75	-1.64	21.11	30.00	8.89
	10	1 / 0	18650	1855.0	22.77	-1.64	21.13	30.00	8.87
		1 / 24	18900	1880.0	22.96	-1.64	21.32	30.00	8.68
		1 / 24	19150	1905.0	22.25	-1.64	20.61	30.00	9.39
	15	1 / 0	18675	1857.5	22.79	-1.64	21.15	30.00	8.85
		1 / 0	18900	1880.0	22.07	-1.64	20.43	30.00	9.57
		1 / 74	19125	1902.5	22.76	-1.64	21.12	30.00	8.88
	20	1 / 0	18700	1860.0	22.68	-1.64	21.04	30.00	8.96
		1 / 0	18900	1880.0	22.38	-1.64	20.74	30.00	9.26
		1 / 99	19100	1900.0	22.68	-1.64	21.04	30.00	8.96



## **2.4 OCCUPIED BANDWIDTH**

### **2.4.1 Specification Reference**

Part 22 Subpart H §22.917(b) and Part 24 Subpart E §24.238(b)

### **2.4.2 Standard Applicable**

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

### **2.4.3 Equipment Under Test and Modification State**

Serial No: SS220414800535 / Test Configuration A

### **2.4.4 Date of Test/Initial of test personnel who performed the test**

June 04, 2014 / AC

### **2.4.5 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

### **2.4.6 Environmental Conditions/ Test Location**

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	25.4°C
Relative Humidity	51.7%
ATM Pressure	98.7 kPa

### **2.4.7 Additional Observations**

- This is a conducted test. Both 26dB bandwidth and 99% bandwidth presented.
- All channels for emission bandwidth verification verified.
- The 27.38dB Cell Band (CDMA/EV-DO/GSM850) and WCDMA Band 5; 27.93dB PCS Band (CDMA/EV-DO/GSM1900) and WCDMA Band 2; 27.75dB (LTE Band 2) offset on the power meter was used for the power splitter, external attenuator and cable used.
- For 26 dB bandwidth, the span was set to encompass the whole emission.
- The RBW is set to 1% of the span while the VBW is 3X RBW.
- The highest level is recorded and 26dBc is drawn from this level.
- The bandwidth where the fundamental emission intersected this line is the 26dB bandwidth.
- For 99% BW, the SA built-in emission bandwidth measurement feature is utilized. The power level setting is set to 99%.



**2.4.8 Test Results**

See attached plots.



CDMA 2000 – 1xRTT					
Band	Service Option (SO) / (RC)	Channel	Frequency	99% OBW (MHz)	26dB BW (MHz)
Cell (BC0)	32 / 3	777	848.31	1.28	1.43
PCS (BC1)	32 / 3	1175	1908.75	1.28	1.45

CDMA 2000 – 1xEV-DO Release 0					
Band	RTAP Data Rate	Channel	Frequency	99% OBW (MHz)	26dB BW (MHz)
Cell (BC0)	153.6	777	848.31	1.28	1.43
PCS (BC1)	153.6	1175	1908.75	1.29	1.46

CDMA 2000 – 1xEV-DO Release A					
Band	RETAP Data Rate	Channel	Frequency	99% OBW (MHz)	26dB BW (MHz)
Cell (BC0)	4096	1013	824.7	1.28	1.44
PCS (BC1)	4096	600	1880.0	1.29	1.44

GSM850 / GSM1900 (GPRS)				
Band	Channel	Frequency	99% OBW (kHz)	26dB BW (kHz)
Cell	128	824.2	247.47	324.20
PCS	810	1909.8	244.57	325.60

GSM850 / GSM1900 (EGPRS)				
Band	Channel	Frequency	99% OBW (kHz)	26dB BW (kHz)
Cell	251	848.8	246.02	324.20
PCS	512	1850.2	244.57	324.20

WCDMA (3GPP Release Version 99)				
Band	Channel	Frequency	99% OBW (MHz)	26dB BW (MHz)
Cell Band 5	4233	846.6	4.17	4.69
PCS Band 2	9538	1907.6	4.18	4.69

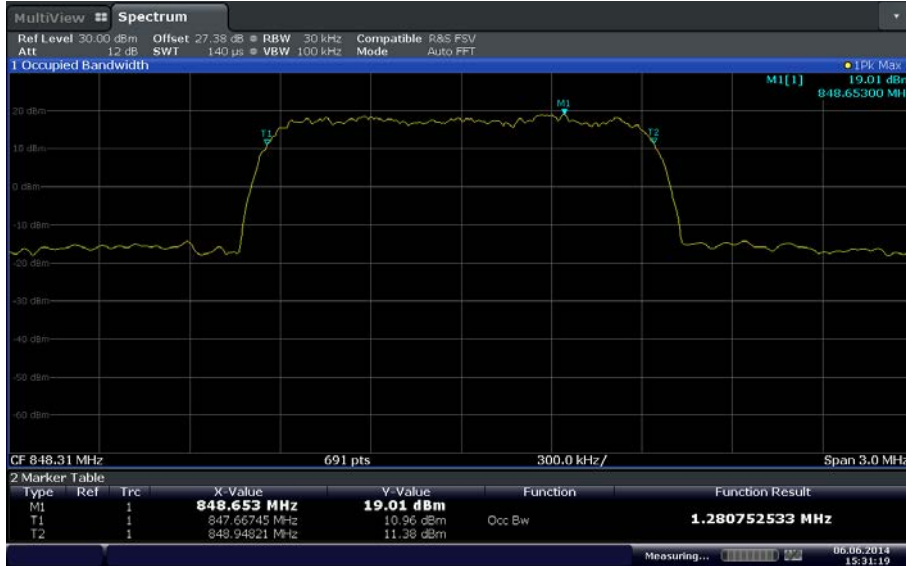


LTE Band 2							
Modulation	BW	RB Size	RB Offset	Channel	Frequency	99% OBW (MHz)	26dB BW (MHz)
QPSK	1.4 MHz	3	1	18900	1880.0	1.10	1.30
	3 MHz	1	0	18615	1851.5	2.70	3.00
	5 MHz	1	24	19175	1907.5	4.52	5.05
	10 MHz	1	24	18900	1880.0	9.00	10.01
	15 MHz	1	74	19125	1902.5	13.42	14.70
	20 MHz	1	0	18900	1880.0	17.84	19.23

LTE Band 2							
Modulation	BW	RB Size	RB Offset	Channel	Frequency	99% OBW (MHz)	26dB BW (MHz)
16QAM	1.4 MHz	3	1	18900	1880.0	1.11	1.33
	3 MHz	1	0	18615	1851.5	2.70	3.00
	5 MHz	1	0	18625	1852.5	4.51	5.07
	10 MHz	1	24	18900	1880.0	9.03	9.93
	15 MHz	1	0	18675	1857.5	13.42	14.59
	20 MHz	1	0	18700	1860.0	17.88	19.36

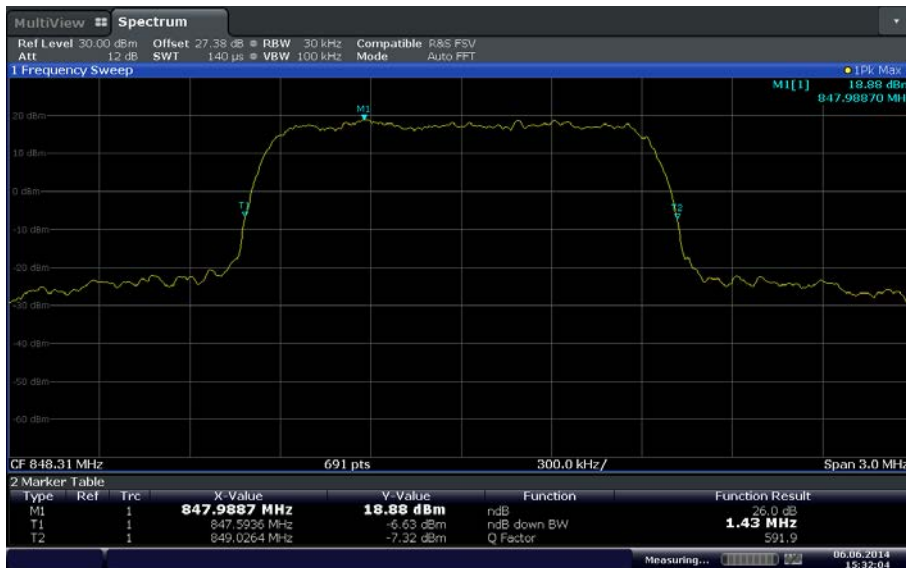


**CDMA 2000 – 1xRTT (Cell-BC0)/Channel 777/99%OBW**



Date: 6 JUN 2014 15:31:19

**CDMA 2000 – 1xRTT (Cell-BC0)/Channel 777/26dB BW**



Date: 6 JUN 2014 15:32:04



**CDMA 2000 – 1xRTT (PCS-BC1)/Channel 1175/99%OBW**



Date: 6 JUN 2014 15:28:56

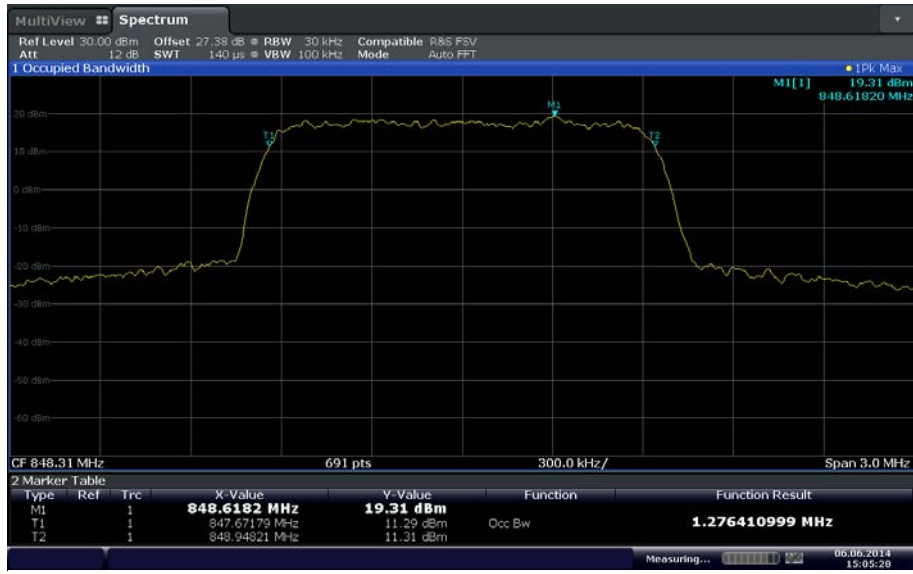
**CDMA 2000 – 1xRTT (PCS-BC1)/Channel 1175/26dB BW**



Date: 6 JUN 2014 15:29:33



**CDMA 2000 – 1xEV-DO Release 0 (Cell-BC0)/Channel 777/RTAP/99%OBW**



Date: 6 JUN 2014 15:05:28

**CDMA 2000 – 1xEV-DO Release 0 (Cell-BC0)/Channel 777/RTAP/26dB BW**



Date: 6 JUN 2014 15:04:33





**CDMA 2000 – 1xEV-DO Release 0 (PCS-BC1)/Channel 1175/RTAP/99%OBW**



Date: 9 JUL 2014 11:23:59

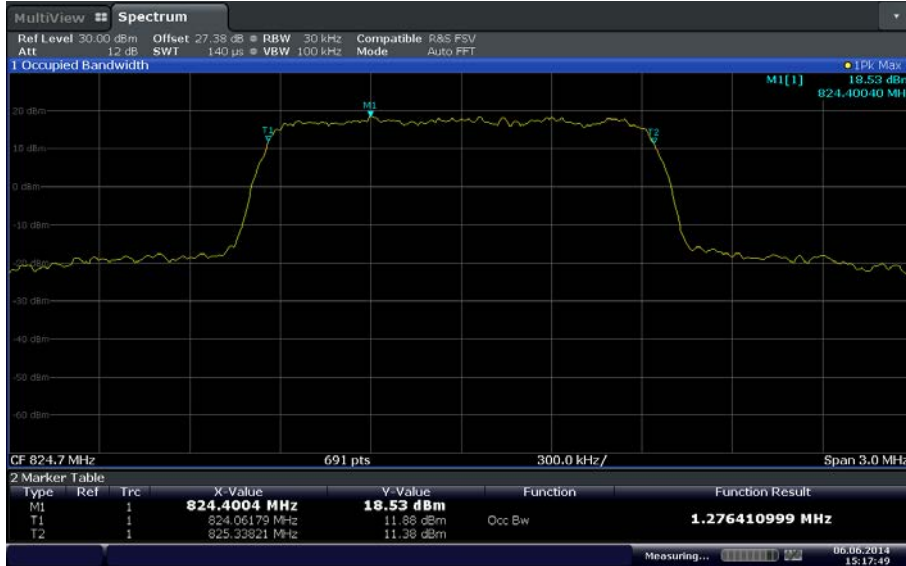
**CDMA 2000 – 1xEV-DO Release 0 (PCS-BC1)/Channel 1175/RTAP/26dB BW**



Date: 6 JUN 2014 15:01:59



**CDMA 2000 – 1xEV-DO Release A (Cell-BC0)/Channel 1013/RETAP/99%OBW**



Date: 6 JUN 2014 15:17:49

**CDMA 2000 – 1xEV-DO Release A (Cell-BC0)/Channel 1013/RETAP/26dB BW**



Date: 9 JUL 2014 11:26:33



**CDMA 2000 – 1xEV-DO Release A (PCS-BC1)/Channel 600/RETAP/99%OBW**



Date: 6 JUN 2014 15:14:26

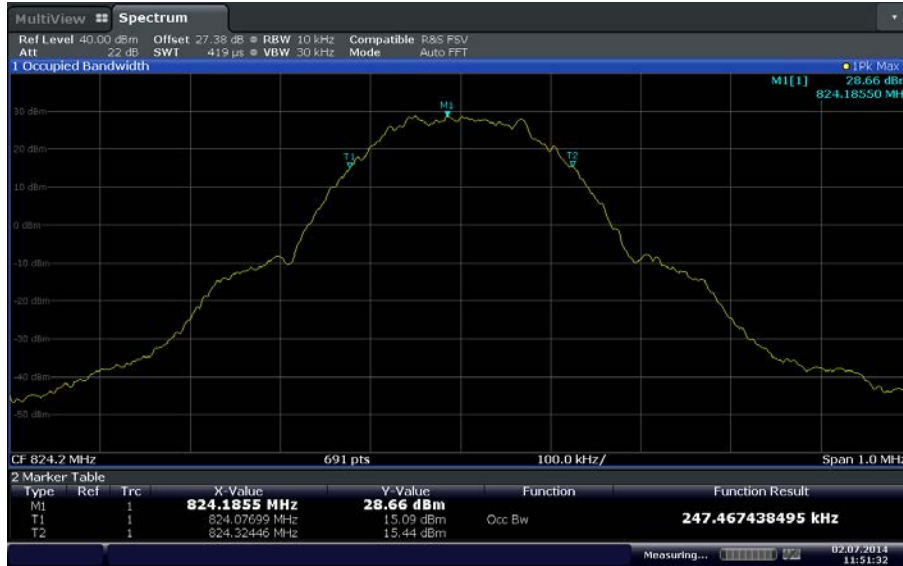
**CDMA 2000 – 1xEV-DO Release A (PCS-BC1)/Channel 600/RETAP/26dB BW**



Date: 6 JUN 2014 15:15:25

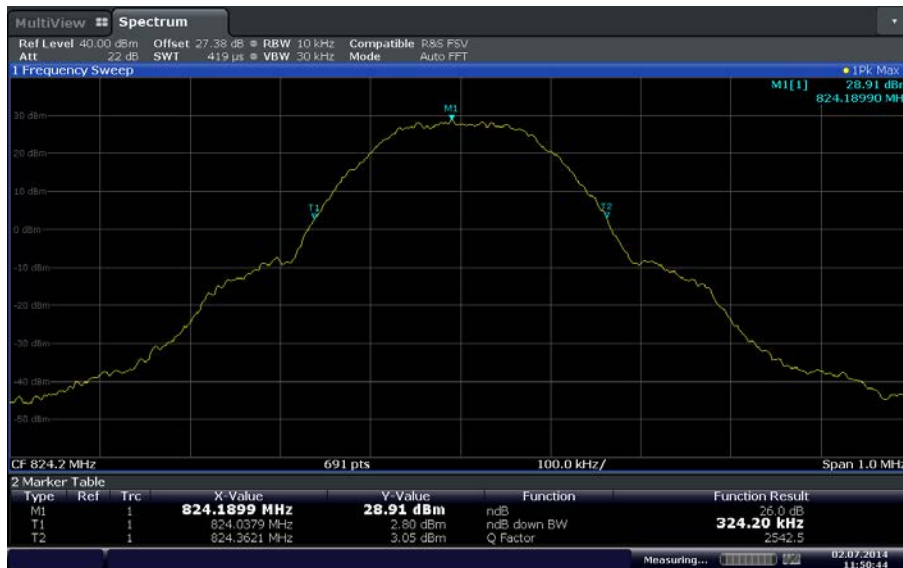


**GSM850 (GPRS)/Cell/Channel 128/99%OBW**



Date: 2 JUL 2014 11:51:32

**GSM850 (GPRS)/Cell/Channel 128/26dB BW**



Date: 2 JUL 2014 11:50:45



**GSM1900 (GPRS)/PCS/Channel 810/99%OBW**



Date: 2 JUL 2014 12:07:16

**GSM1900 (GPRS)/PCS/Channel 810/26dB BW**



Date: 2 JUL 2014 12:08:00



**GSM850 (EGPRS)/Cell/Channel 251/99%OBW**



Date: 2 JUL 2014 12:17:40

**GSM850 (EGPRS)/Cell/Channel 251/26dB BW**



Date: 2 JUL 2014 12:18:19

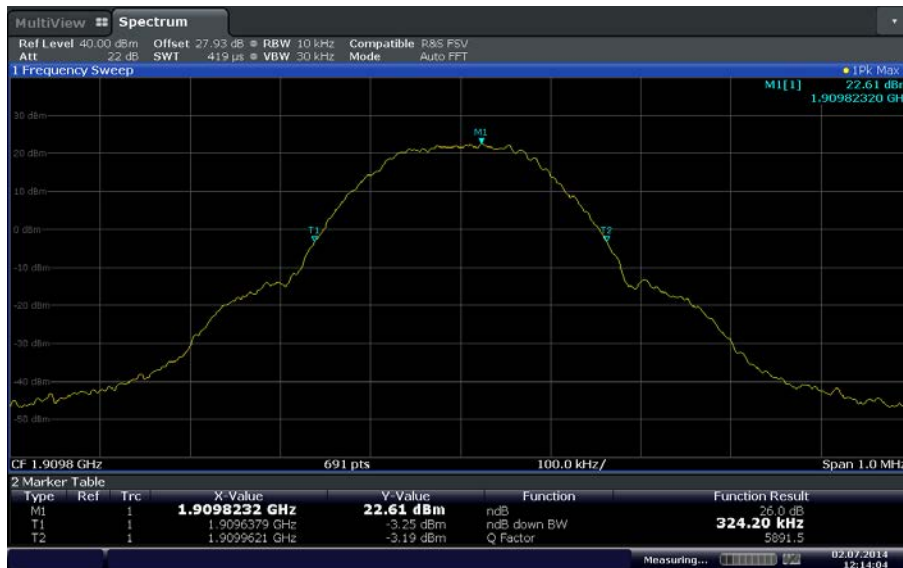


**GSM1900 (EGPRS)/PCS/Channel 810/99%OBW**



Date: 2 JUL 2014 12:14:48

**GSM1900 (EGPRS)/PCS/Channel 810/26dB BW**

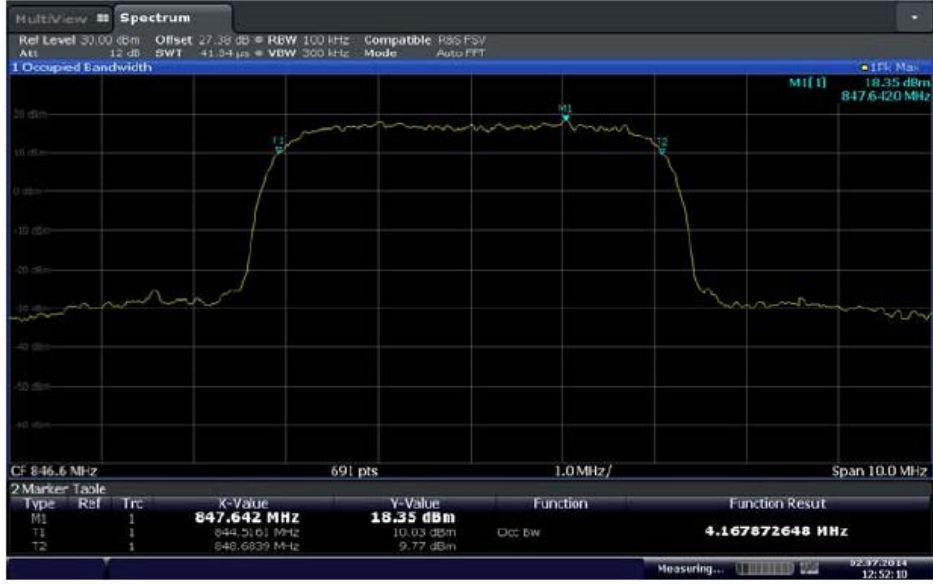


Date: 2 JUL 2014 12:14:04



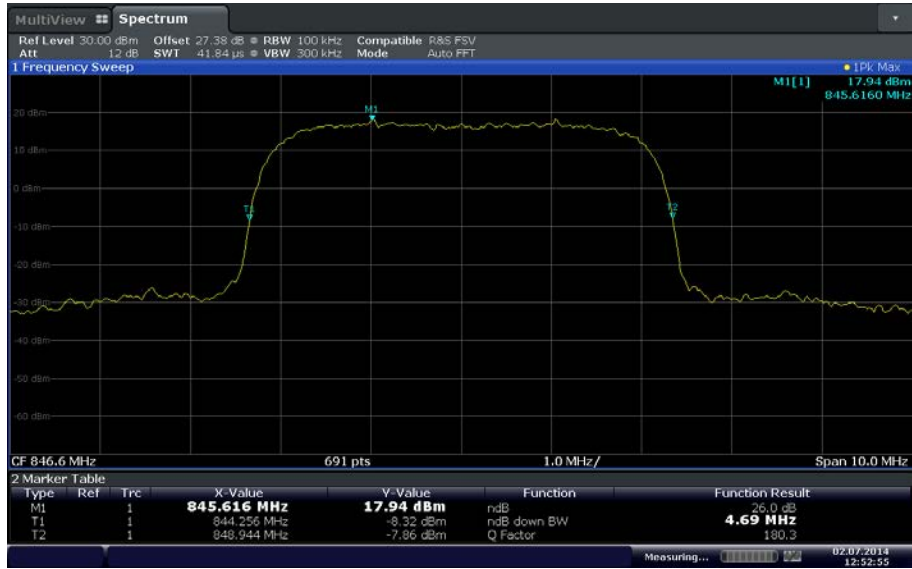


**WCDMA (3GPP Release Version 99)/Cell/Channel 4233/99%OBW**



Date: 2 JUL 2014 12:52:00

**WCDMA (3GPP Release Version 99)/Cell/Channel 4233/26dB BW**

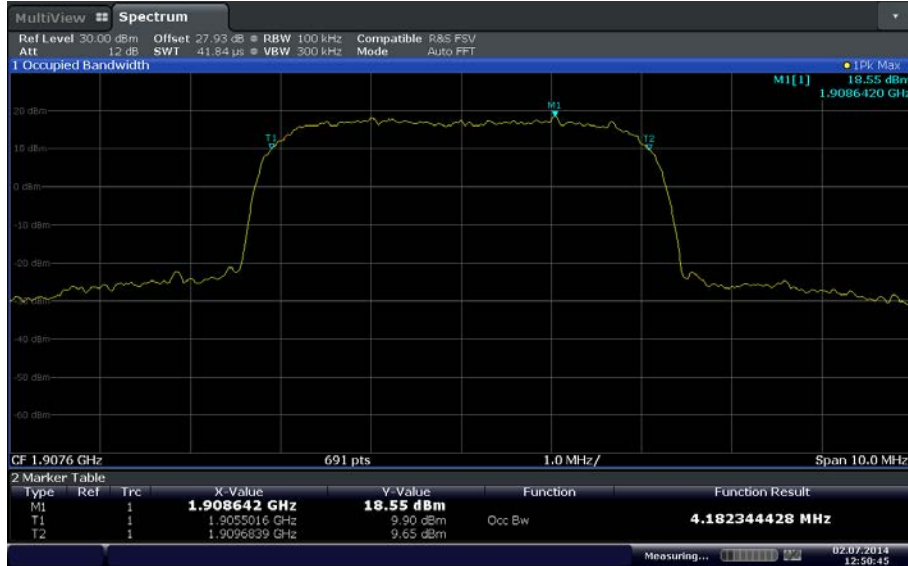


Date: 2 JUL 2014 12:52:55



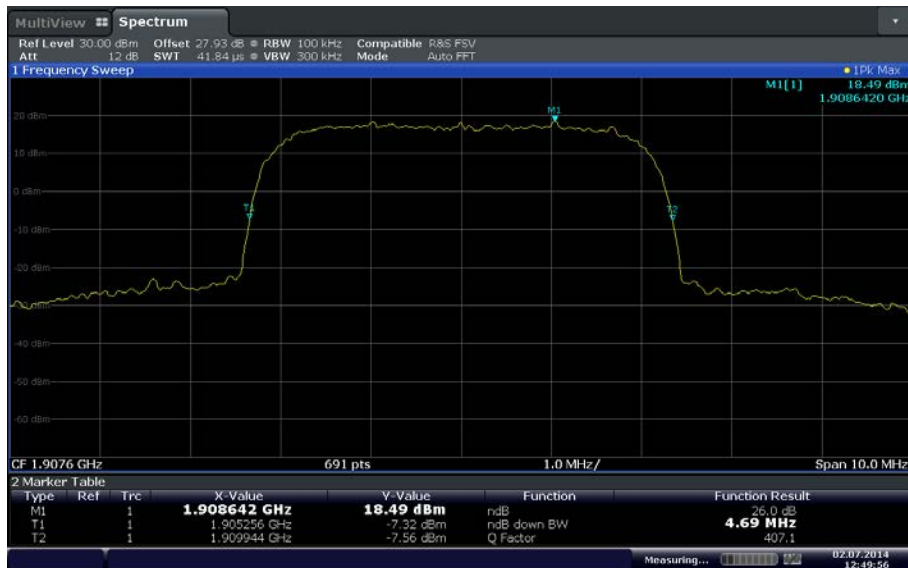


**WCDMA (3GPP Release Version 99)/PCS/Channel 9538/99%OBW**



Date: 2 JUL 2014 12:50:45

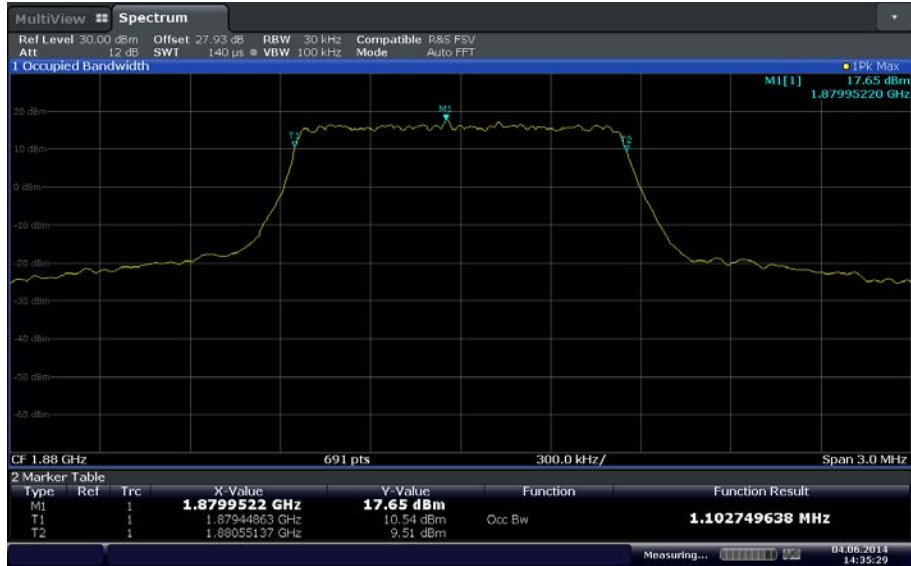
**WCDMA (3GPP Release Version 99)/PCS/Channel 9538/26dB BW**



Date: 2 JUL 2014 12:49:57



**LTE Band 2 (1.4 MHz BW)/1880.0 MHz/QPSK/99%OBW**

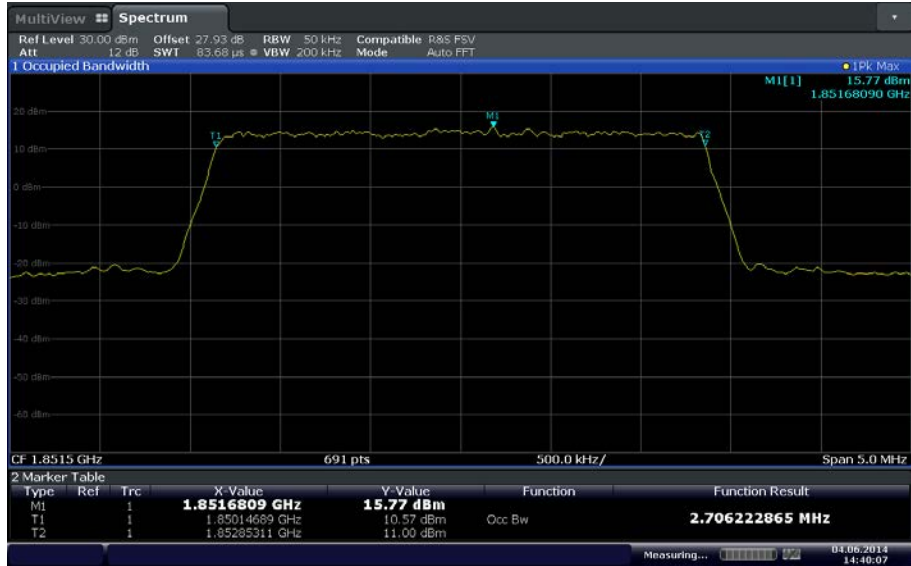


**LTE Band 2 (1.4 MHz BW)/1880.0 MHz/QPSK/26dB BW**

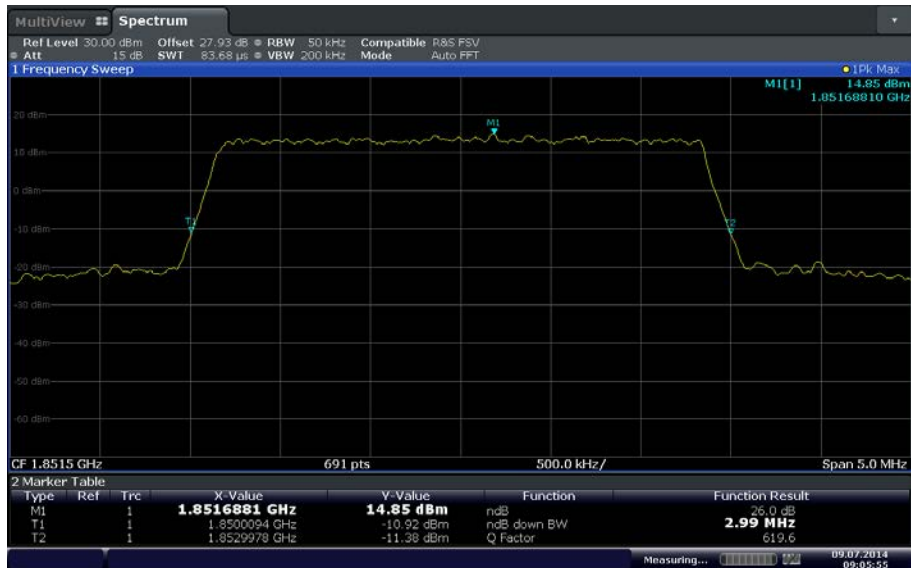




**LTE Band 2 (3 MHz BW)/1851.5 MHz/QPSK/99%OBW**

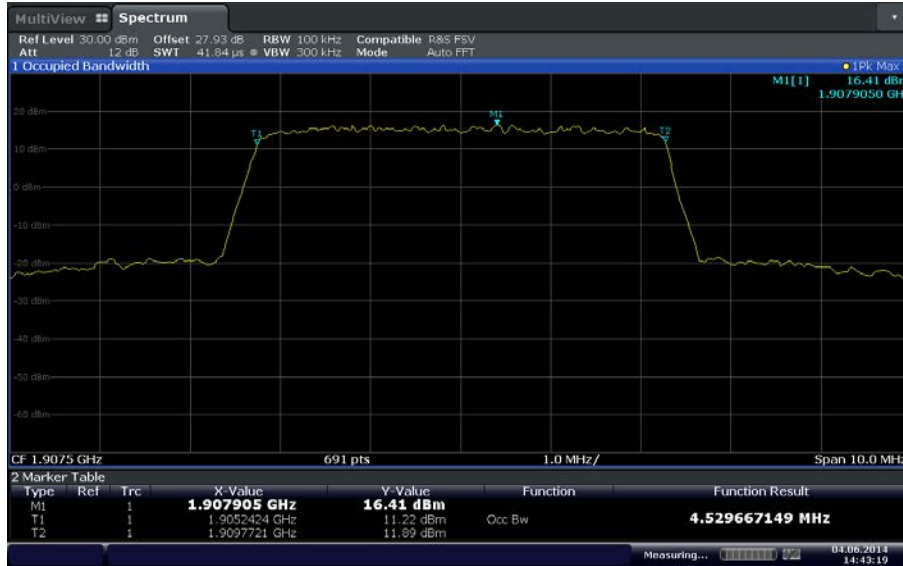


**LTE Band 2 (3 MHz BW)/1851.5 MHz/QPSK/26dB BW**





**LTE Band 2 (5 MHz BW)/1907.5MHz/QPSK/99%OBW**



Date: 4 JUN 2014 14:43:20

**LTE Band 2 (5 MHz BW)/1907.5 MHz/QPSK/26dB BW**



Date: 4 JUN 2014 14:44:08

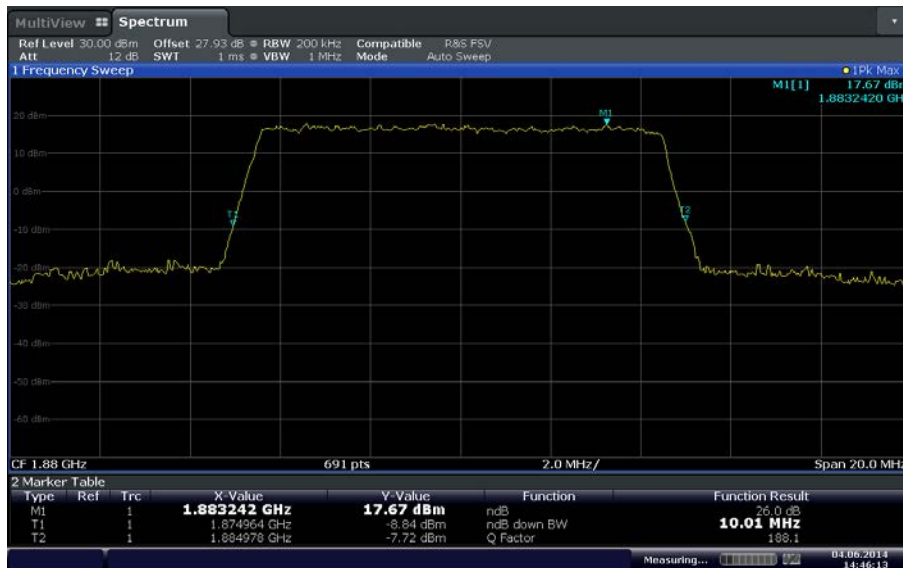


**LTE Band 2 (10 MHz BW)/1880 MHz/QPSK/99%OBW**



Date: 4 JUN 2014 14:47:03

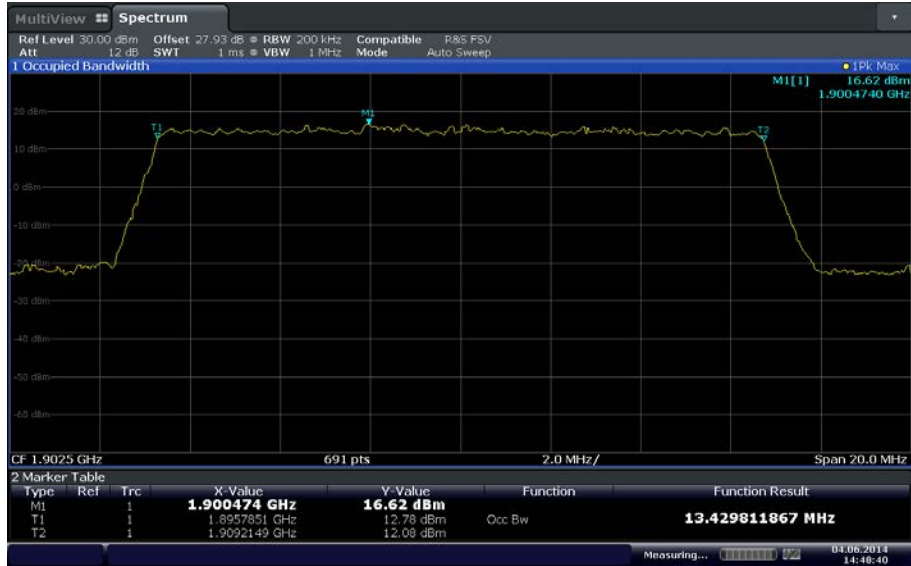
**LTE Band 2 (10 MHz BW)/1880 MHz/QPSK/26dB BW**



Date: 4 JUN 2014 14:46:13



**LTE Band 2 (15 MHz BW)/1902.5 MHz/QPSK/99%OBW**



Date: 4 JUN 2014 14:48:40

**LTE Band 2 (15 MHz BW)/1902.5 MHz/QPSK/26dB BW**



Date: 9 JUL 2014 09:07:52



**LTE Band 2 (20 MHz BW)/1880 MHz/QPSK/99%OBW**



Date: 4 JUN 2014 14:51:12

**LTE Band 2 (20 MHz BW)/1880 MHz/QPSK/26dB BW**



Date: 4 JUN 2014 14:51:45





**LTE Band 2 (1.4 MHz BW)/1880.0 MHz/16QAM/99%OBW**



Date: 9\_JUL\_2014 09:10:18

**LTE Band 2 (1.4 MHz BW)/1880.0 MHz/16QAM/26dB BW**

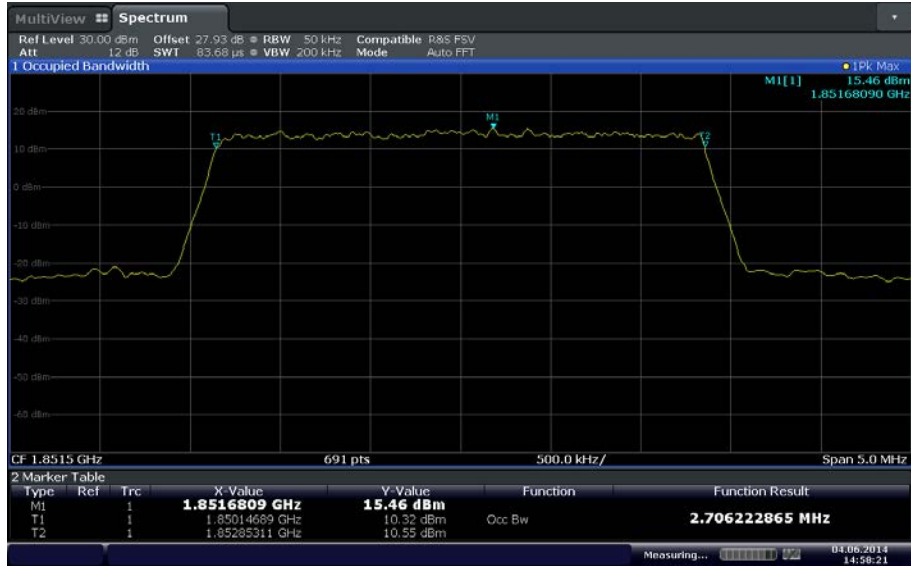


Date: 9\_JUL\_2014 09:09:45



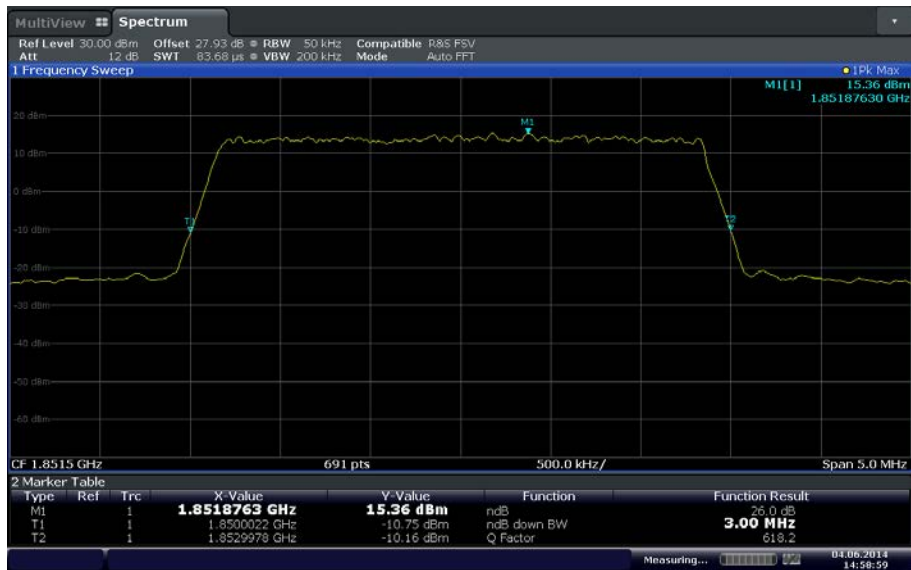


**LTE Band 2 (3 MHz BW)/1851.5 MHz/16QAM/99%OBW**



Date: 4 JUN 2014 14:58:21

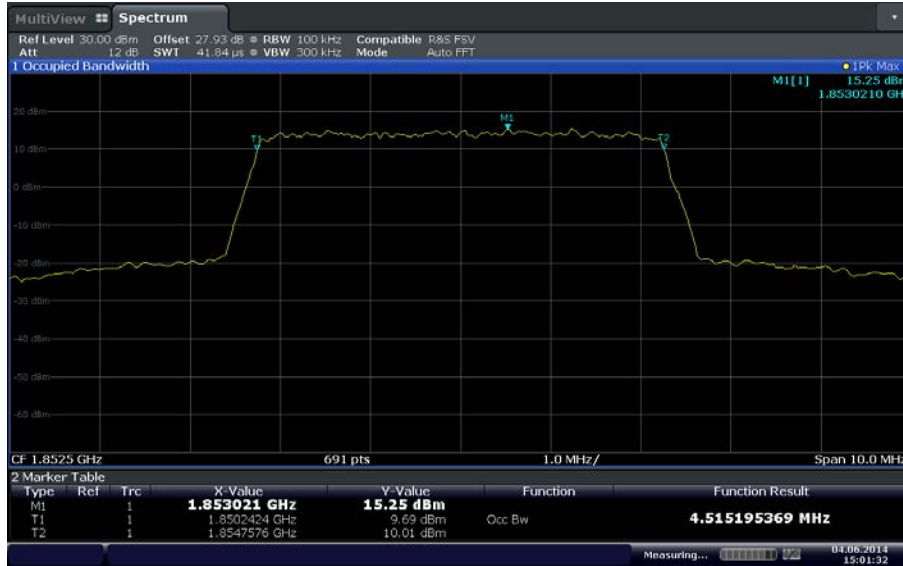
**LTE Band 2 (3 MHz BW)/1851.5 MHz/16QAM/26dB BW**



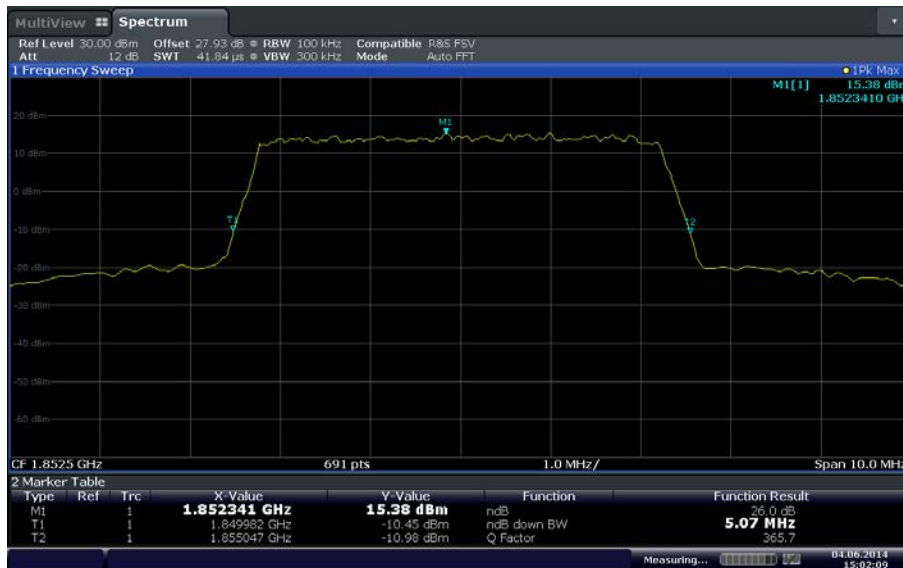
Date: 4 JUN 2014 14:58:59



**LTE Band 2 (5 MHz BW)/1852.5 MHz/16QAM/99%OBW**

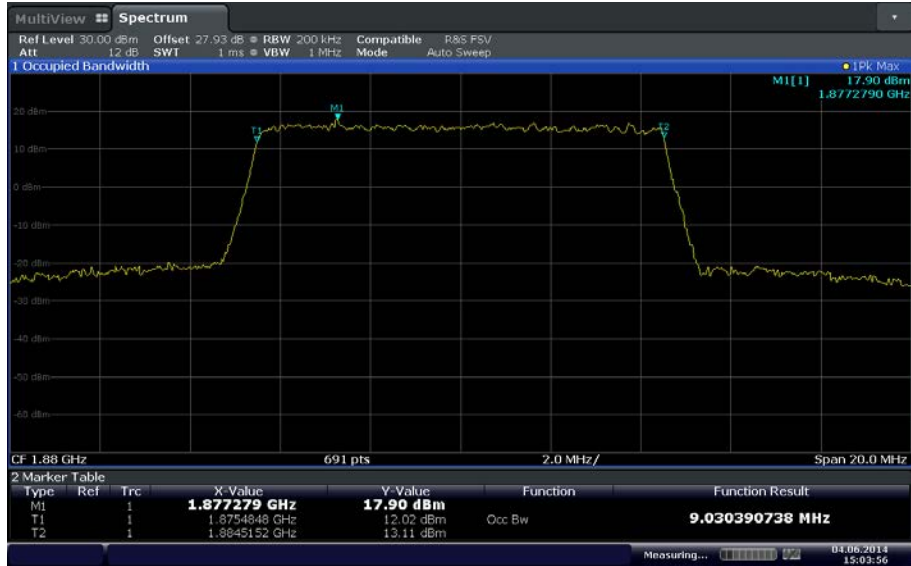


**LTE Band 2 (5 MHz BW)/1852.5 MHz/16QAM/26dB BW**





**LTE Band 2 (10 MHz BW)/1880 MHz/16QAM/99%OBW**



Date: 4 JUN 2014 15:03:56

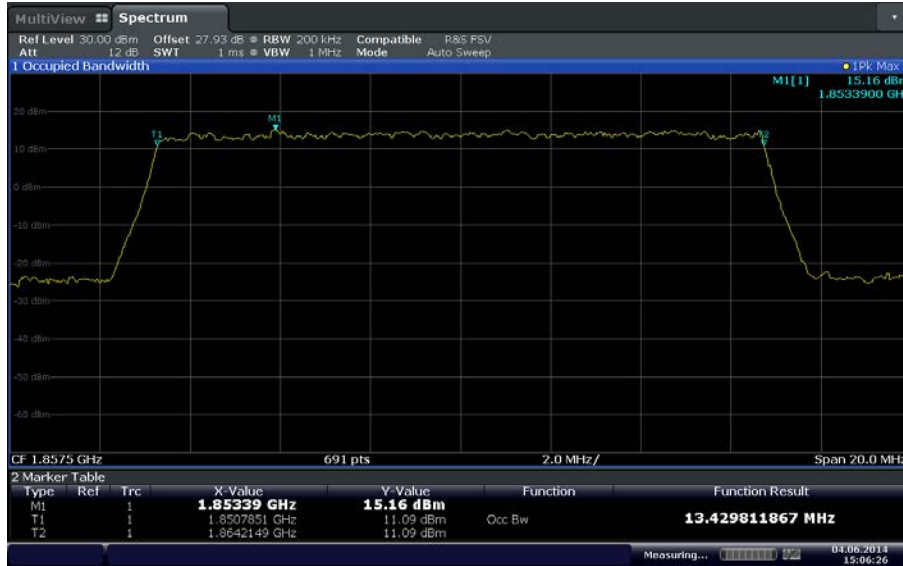
**LTE Band 2 (10 MHz BW)/1880 MHz/16QAM/26dB BW**



Date: 4 JUN 2014 15:04:38



**LTE Band 2 (15 MHz BW)/1857.5 MHz/16QAM/99%OBW**



Date: 4 JUN 2014 15:06:27

**LTE Band 2 (15 MHz BW)/1857.5 MHz/16QAM/26dB BW**



Date: 4 JUN 2014 15:07:03



**LTE Band 2 (20 MHz BW)/1860 MHz/16QAM/99%OBW**



Date: 4 JUN 2014 15:08:37

**LTE Band 2 (20 MHz BW)/1860 MHz/16QAM/26dB BW**



Date: 4 JUN 2014 15:09:17



## **2.5 PEAK-AVERAGE RATIO**

### **2.5.1 Specification Reference**

Part 24 Subpart E §24.232(d)

### **2.5.2 Standard Applicable**

Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (e) of this section. In both instances, equipment employed must be authorized in accordance with the provisions of §24.51. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB

### **2.5.3 Equipment Under Test and Modification State**

Serial No: SS220414800535 / Test Configuration A

### **2.5.4 Date of Test/Initial of test personnel who performed the test**

July 06, 2014 / AC

### **2.5.5 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

### **2.5.6 Environmental Conditions/ Test Location**

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	25.4°C
Relative Humidity	51.7%
ATM Pressure	98.7 kPa

### **2.5.7 Additional Observations**

- This is a conducted test. Test procedure is per Section 3.0 of KDB971168 (D01 Power Meas License Digital Systems v01).
- Measurement was done using the Spectrum Analyzer's Complementary Cumulative Distribution Function (CCDF) measurement profile. The built-in function is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth (crest factor or peak-to-average ratio) The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signals spends at or above the level defines the probability for that particular power level. For GSM signals, an average and a peak trace are used to determine the largest deviation between the average and the peak power of the EUT in a bandwidth greater than the emission bandwidth.



- All channels based from worst case configuration were verified. Only the worst channel and configuration presented.
- The 27.38dB Cell Band (CDMA/EV-DO/GSM850) and WCDMA Band 5; 27.93dB PCS Band (CDMA/EV-DO/GSM1900) and WCDMA Band 2; 27.75dB (LTE Band 2) offset on the power meter was used for the power splitter, external attenuator and cable used.
- There are no measured PAPR levels greater than 13dB. EUT complies.

### **2.5.8 Test Results**

The worst-case measured PARP level was performed each band (Cell and PCS).

See attached plots.





**CDMA 2000 – 1xRTT (Cell-BC0)/848.31 MHz**



Date: 6 JUN 2014 15:03:44

**CDMA 2000 – 1xRTT (PCS-BC1)/1908.75 MHz**



Date: 6 JUN 2014 15:05:18





**CDMA 2000 – 1xEV-DO Release 0 (Cell-BC0)/RTAP/848.31 MHz**



Date: 6 JUN 2014 15:42:45

**CDMA 2000 – 1xEV-DO Release 0 (PCS-BC1)/RTAP/1908.75 MHz**



Date: 6 JUN 2014 15:45:49



**CDMA 2000 – 1xEV-DO Release A (Cell-BC0)/RETAP/824.7 MHz**



Date: 9 JUL 2014 11:37:41

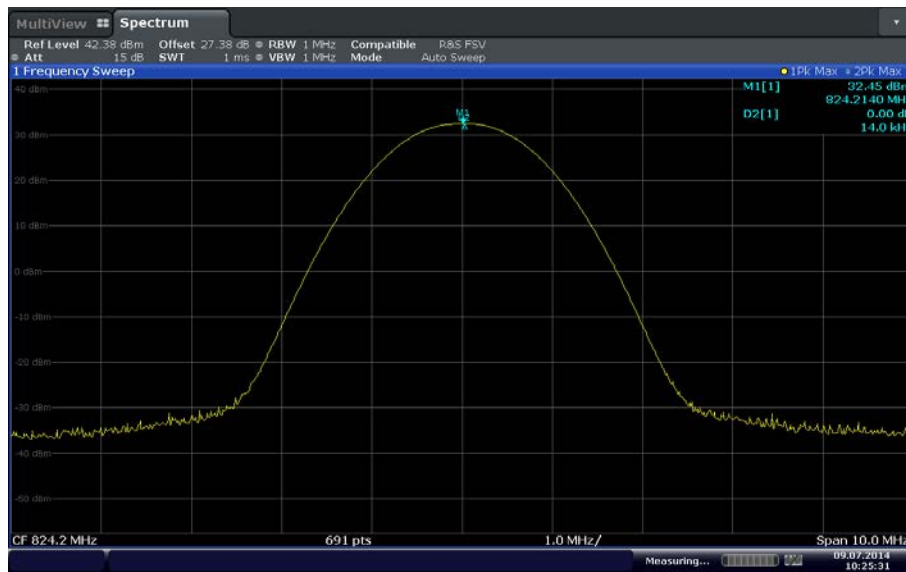
**CDMA 2000 – 1xEV-DO Release A (PCS-BC1)/RETAP/1880 MHz**



Date: 6 JUN 2014 15:49:32

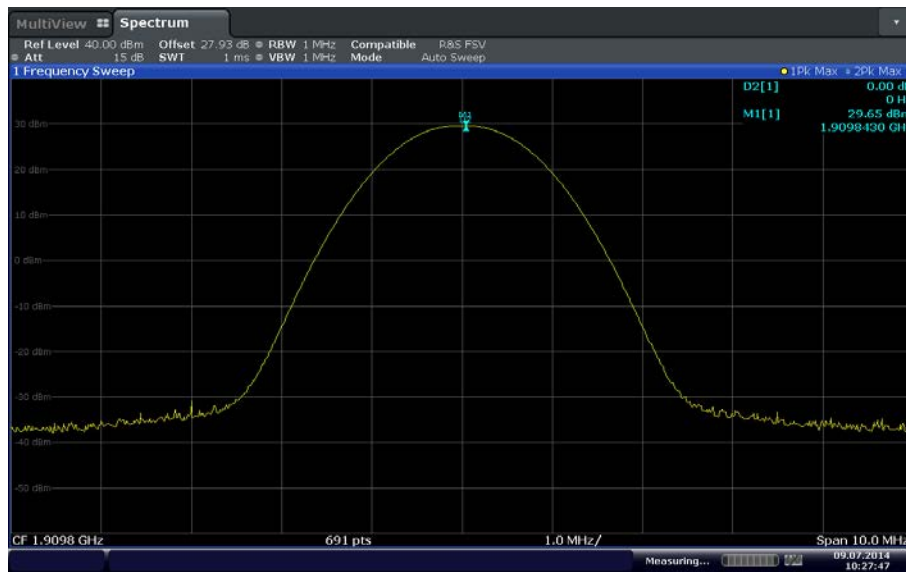


**GSM850/GPRS (Cell-BC0)/824.2MHz**



Date: 9 JUL 2014 10:25:31

**GSM1900/GPRS (PCS BC1)/1909.8MHz**

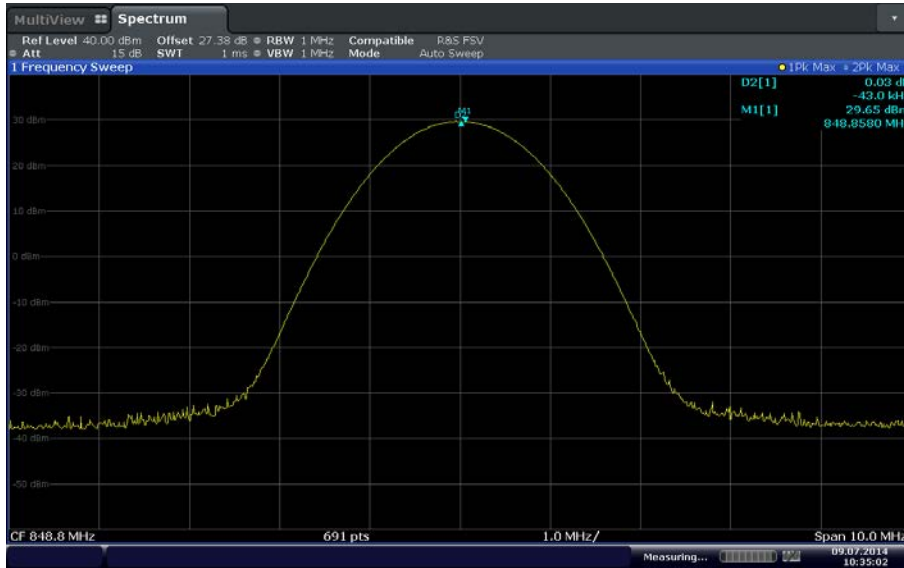


Date: 9 JUL 2014 10:27:47

- Note.- For GSM signals, an average and a peak trace are used to determine the largest deviation between the average and the peak power of the EUT.

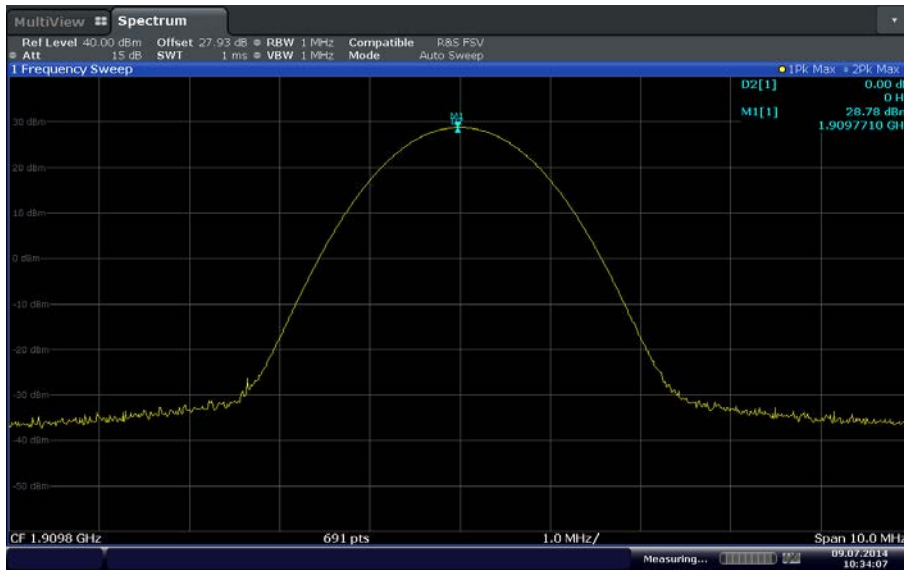


**GSM850/EGPRS (Cell-BC0)/848.8MHz**



Date: 9 JUL 2014 10:35:02

**GSM1900/EGPRS (PCS BC1)/1909.8MHz**



Date: 9 JUL 2014 10:34:07

- Note.- For GSM signals, an average and a peak trace are used to determine the largest deviation between the average and the peak power of the EUT.



**WCDMA/ Cell Band 5/846.6MHz**



Date: 2 JUL 2014 13:03:32

**WCDMA/ Cell Band 2/1907.6MHz**

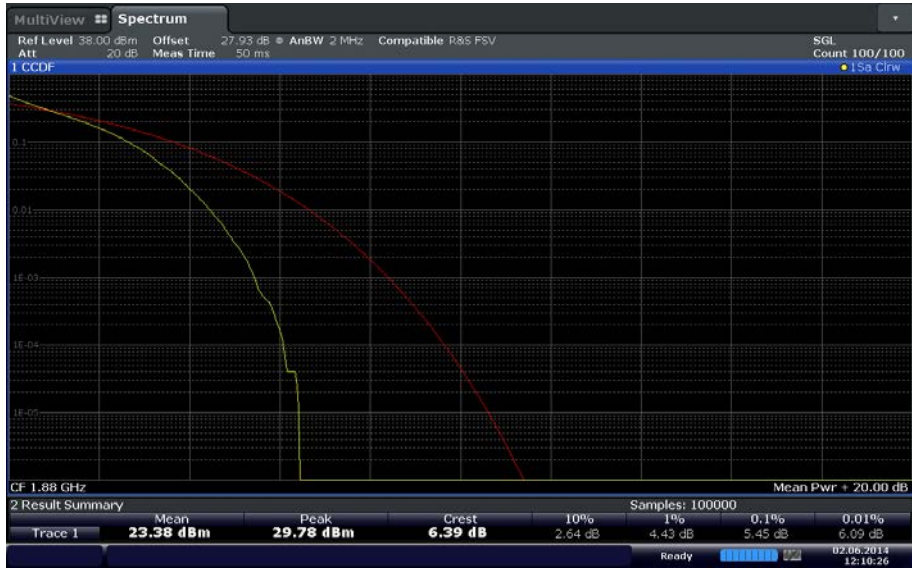


Date: 2 JUL 2014 13:04:26





**LTE Band 2 (1.4 MHz BW)/1880 MHz/QPSK**



Date: 2 JUN 2014 12:10:26

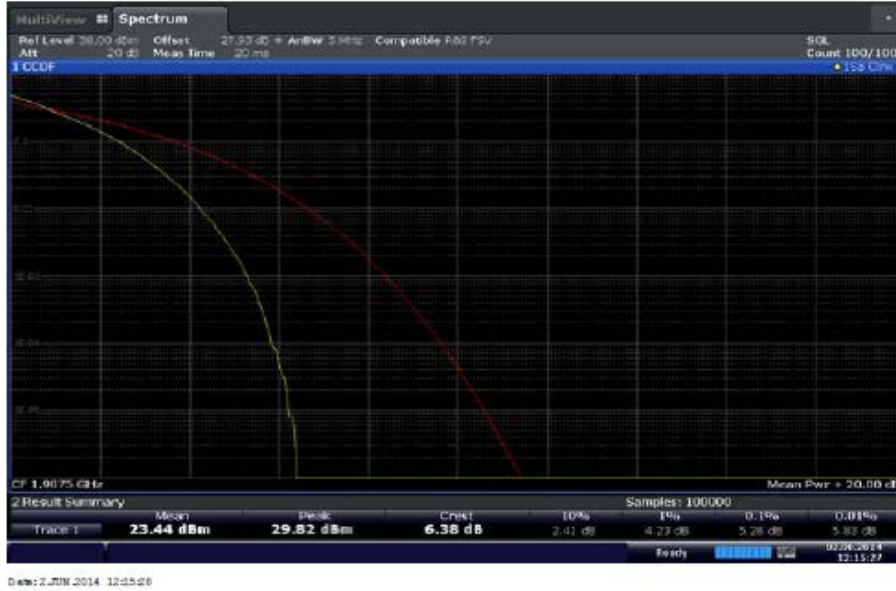
**LTE Band 2 (3 MHz BW)/1851.5 MHz/QPSK**



Date: 2 JUN 2014 12:13:23



**LTE Band 2 (5 MHz BW)/1907.5 MHz/QPSK**



**LTE Band 2 (10 MHz BW)/1880 MHz/QPSK**





**LTE Band 2 (15 MHz BW)/1902.5 MHz/QPSK**



Date: 2 JUN 2014 12:18:17

**LTE Band 2 (20 MHz BW)/1880 MHz/QPSK**



Date: 2 JUN 2014 12:19:02





**LTE Band 2 (1.4 MHz BW)/1880 MHz/16QAM**



Date: 2 JUN 2014 12:19:57

**LTE Band 2 (3 MHz BW)/1851.5 MHz/16QAM**



Date: 2 JUN 2014 12:20:57

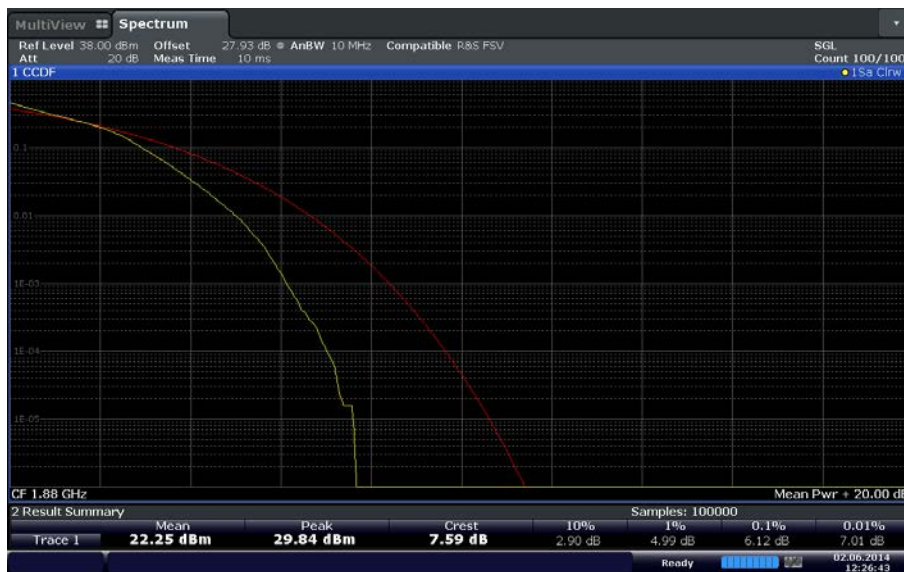


**LTE Band 2 (5 MHz BW)/1852.5 MHz/16QAM**



Date: 2 JUN 2014 12:26:01

**LTE Band 2 (10 MHz BW)/1880 MHz/16QAM**



Date: 2 JUN 2014 12:26:43

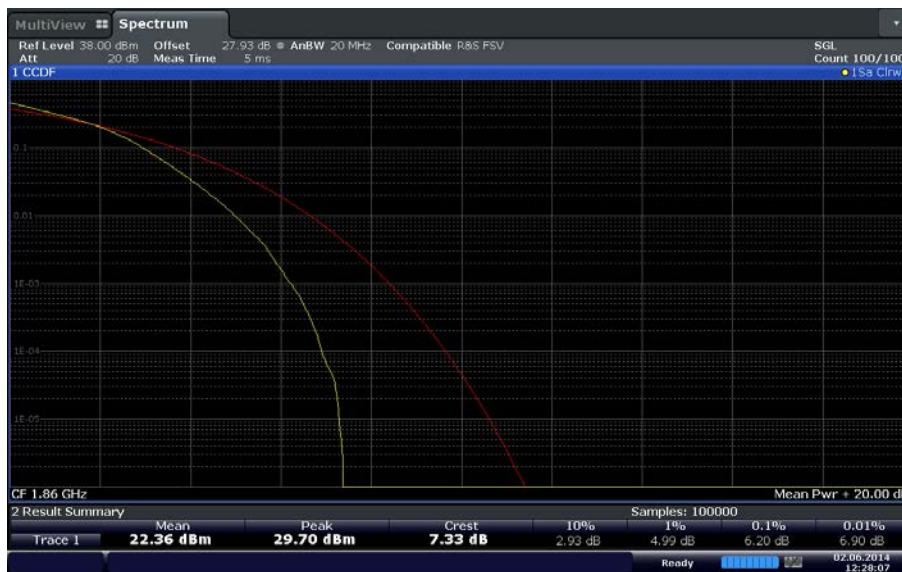


**LTE Band 2 (15 MHz BW)/1857.5 MHz/16QAM**



Date: 9 JUL 2014 09:12:35

**LTE Band 2 (20 MHz BW)/1860 MHz/16QAM**



Date: 2 JUN 2014 12:28:07