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Report On

Application for Grant of Equipment Authorization of the
Panasonic Avionics Corporation
4G Cell Modem$_f$

FCC CFR 47 Part 2, Part 22 and Part 24: 2014
RSS-132 issue 3: 2013 and RSS-133 issue 6: 2013

Report No. SD72110645-1015A Rev2.0 **March 2016**

REPORT ON	Radio Testing of the Panasonic Avionics Corporation 4G Cell Modem RD-AA8110-02
TEST REPORT NUMBER	SD72110645-1015A Rev2.0
PREPARED FOR	Panasonic Avionics Corporation 26200 Enterprise Way Lake Forest, CA 92630
CONTACT PERSON	Florencio Carlos GCS - Product Management (949) 462-1211 florencio.carlos@panasonic.aero
PREPARED BY	Xiaoying Zhang **Name** Authorized Signatory Title: EMC/Wireless Test Engineer
APPROVED BY	Juan Manuel Gonzalez **Name** Authorized Signatory Title:Commercial/Wireless EMC Lab Manager
DATED	March 23, 2016

Revision History

SD72110645-1015A Rev2.0 Panasonic Avionics Corporation 4G Cell Modem RD-AA8110-02					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
01/22/2016	Initial Release				Juan Manuel Gonzalez
03/17/2016	Initial Release	Rev 1	Add LTE B5		Juan Manuel Gonzalez
03/23/2016	Rev 1	Rev 2	Correct typo in section 2.8	P106, 107	Juan Manuel Gonzalez

CONTENTS

SECTION 1

REPORT SUMMARY

Radio Testing of the
Panasonic Avionics Corporation
4G Cell Modem

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Panasonic Avionics Corporation RD-AA8110-02 to the requirements of the following:

FCC CFR 47 Part 2, Part 22 and Part 24: 2014
RSS-132 issue 3: 2013 and RSS-133 issue 6: 2013

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	Panasonic Avionics Corporation
Model Name	4G Cell Modem
Model Number(s)	RD-AA8110-02
FCC ID Number	U6Y-RDAA8110
IC Number	216P-RDAA8110
Serial Number(s)	442964, CM0015
Number of Samples Tested	1
Test Specification/Issue/Date	• FCC CFR 47 Part 2, Part 22 and Part 24: 2014 • RSS-132 issue 3: 2013; (Cellular Telephone Systems Operating in the Bands 824-849 MHz and 869-894 MHz) • RSS-133 issue 6: 2013; (2 GHz Personal Communications Services) • RSS-GEN issue 4 November 2014; (General Requirements for Compliance of Radio Apparatus)
Start of Test	October 26, 2015
Finish of Test	March 09, 2016
Name of Engineer(s)	Xiaoying Zhang
Related Document(s)	• 971168 D01 Power Meas License Digital Systems v02r02: October 17 2014; (Measurement guidance for certification of licensed digital transmitters • Supporting documents for EUT certification are separate exhibits.

1.2 BRIEF SUMMARY OF RESULTS

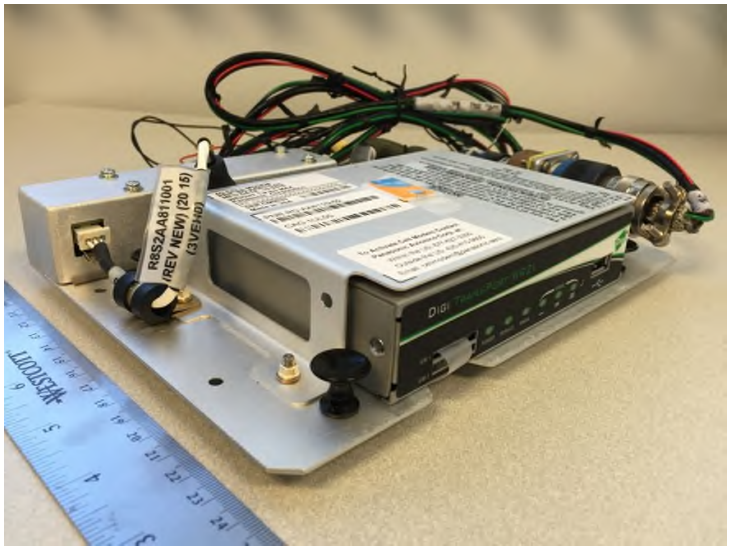
A brief summary of the tests carried out in accordance with FCC CFR 47 Part 2, Part 22 and Part 24: 2014 and RSS-132 issue 3: 2013 and RSS-133 issue 6: 2013 standard is shown below.

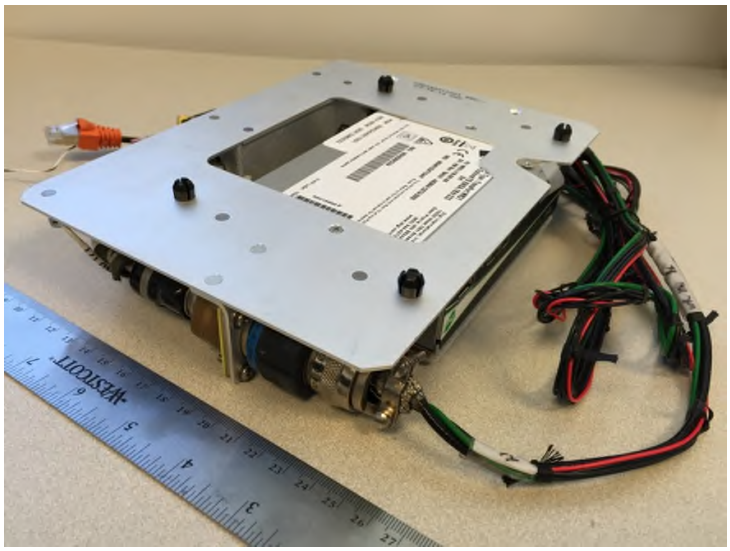
Section	FCC Part Sections(s)	Industry Canada Sections	Test Description	Result
2.1	2.1046	RSS-132: 5.4, RSS-133: 6.4	Transmitter Conducted Output Power	Compliant
2.2	2.1046, 22.913(a)(2)	-	Effective Radiated Power	Compliant
2.3	2.1046, 24.232(c)	RSS-132: 5.4 RSS-133: 6.4	Equivalent Isotropic Radiated Power	Compliant
2.4	24.232(d)	RSS-132: 5.4, RSS-133: 6.4	Peak-Average Ratio	Compliant
2.5	2.1049, 22.917(b), 24.238(b)	RSS-GEN 4.6.1	Occupied Bandwidth	Compliant
2.6	2.1051, 22.917(a), 24.238(a)	RSS-132: 5.5, RSS-133: 6.5	Band Edge	Compliant
2.7	2.1051, 22.917(a), 24.238(a)	RSS-132: 5.5, RSS-133: 6.5	Conducted Spurious Emissions	Compliant
2.8	2.1053, 22.917(a), 24.238(a)	RSS-132: 5.5, RSS-133: 6.5	Field Strength Of Spurious Radiation	Compliant
2.9	2.1055, 22.355, 24.235	RSS-132: 5.3, RSS-133: 6.3	Frequency Stability	Compliant

1.3 PRODUCT INFORMATION

1.3.1 EUT General Description

The Equipment Under Test (EUT) was a Panasonic Avionics Corporation 4G Cell Modem as shown in the photograph below. The 4G Cell Modem (CM) is a component of Panasonic IFEC (In-Flight Entertainment and Connectivity) Systems which is provided to airline customers that make use of PAC IFEC services. The UMTS Band II and V, GSM 850 and 1900, and LTE Band II and V functions were verified in this test report.





Equipment Under Test

1.3.2 EUT General Description

EUT Description	Panasonic Avionics Corporation 4G Cell Modem
Model Name	4G Cell Modem
Model Number(s)	RD-AA8110-02
FCC Classification	Mobile Transmitter
Rated Voltage	28.0VDC (Nominal)
Mode Verified	GSM850/1900, WCDMA Band 2 and Band 5, LTE Band 2 and Band 5
Capability	GSM850/1900, WCDMA Band 2 and Band 5, LTE Band 2 and Band 5
Primary Unit (EUT)	☒ Production ☐ Pre-Production ☐ Engineering
Frequency Tolerance	±0.00025% (2.5ppm)
Antenna Type	Multiband Portable Omnidirctional Blade Antenna
Manufacturer	PCTEL
Maximum Antenna Gain	2.5 dBi

1.3.3 Transmit Frequency Table

Technology / Mode	Tx Frequency (MHz)	Emission Designator	ERP (Part 22)	EIRP (RSS-132 and Part 24/RSS-133)
			Max. Power (dBm)	Max. Power (dBm)
GSM850 (GPRS) Cell Band (BC0)	824-849	245KGXW	33.27	35.42
GSM850 (EGPRS) Cell Band (BC0)	824-849	246KG7W	33.26	35.41
GSM1900 (GPRS) PCS Band (BC1)	1850-1910	243KGXW	-	31.68
GSM1900 (EGPRS) PCS Band (BC1)	1850-1910	248KG7W	-	31.66
WCDMA Cell Band 5	824-849	4M20F9W	22.42	24.57
WCDMA PCS Band 2	1850-1910	4M20F9W	-	24.40

Technology / Mode	Modulation	Bandwidth (MHz)	Tx Frequency (MHz)	Emission Designator	ERP (Part 22)	EIRP (RSS-132 and Part 24/RSS-133)
					Max. Power (dBm)	Max. Power (dBm)
LTE Band 2	QPSK	1.4	1850-1910	1M10G7D	-	26.05
		3	1850-1910	2M69G7D	-	25.97
		5	1850-1910	4M49G7D	-	25.97
		10	1850-1910	8M96G7D	-	25.94
		15	1850-1910	13M5G7D	-	26.67
		20	1850-1910	17M9G7D	-	26.02
	16QAM	1.4	1850-1910	1M09W7D	-	25.03
		3	1850-1910	2M68W7D	-	25.78
		5	1850-1910	4M49W7D	-	25.69
		10	1850-1910	8M94W7D	-	25.86
		15	1850-1910	13M4W7D	-	25.56
		20	1850-1910	17M9W7D	-	25.97
LTE Band 5	QPSK	1.4	824-849	1M08G7D	21.46	23.61
		3	824-849	2M68G7D	21.39	23.54
		5	824-849	4M48G7D	21.38	23.53
		10	824-849	8M94G7D	21.15	23.30

1.4 EUT TEST CONFIGURATION

1.4.1 Test Configuration Description

Test Configuration	Description
A	Conducted antenna port measurement.
B	Raidated test setup. EUT antenna port terminated with a 50Ω load

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
Protek	Laboratory DC Power Supply	M/N 35010M S/N D102007S
-	Host Interface cable	0.8 meter, shielded EUT powered via 5 pins wire connected
Rhode & Schwarz	Support Wideband Radio Communication Tester	M/N CMW500 S/N 1201.0002k50/103829

1.4.4 Worst Case Configuration

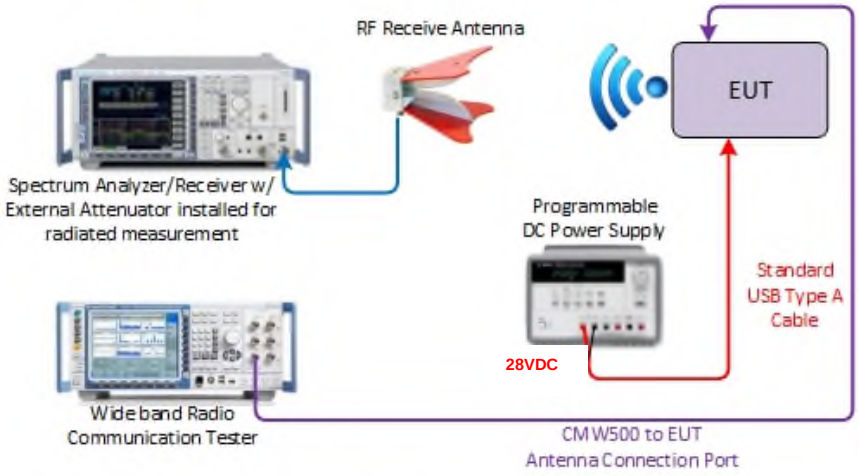
Worst-case configuration used in this test report:

Technology	Band
GSM850 / GSM1900 (GPRS)	Cell
	PCS
WCDMA	Cell (Band 5)
	PCS (Band 2)

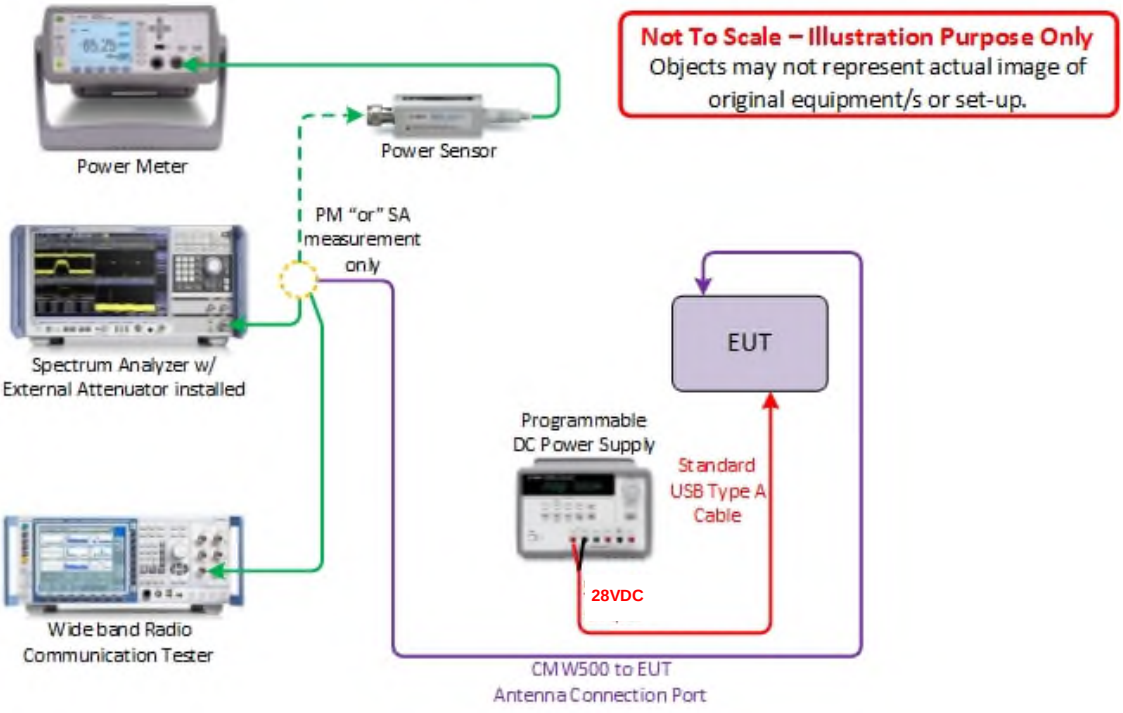
Technology / Band	Modulation
LTE / Band 2	QPSK
LTE / Band 5	QPSK

1.4.5 Simplified Test Configuration Diagram

Radiated/Conducted Emission Test Configuration via Conducted Port



Conducted (Antenna Port) Test Configuration



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 442964, CM0015		
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 C63.4-2014, 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 C63.4-2014. 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)

16530 Via Esprillo, San Diego, CA 92127-1708 (33.018644,-117.092409). Phone: 858 678 1400 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 §2.498 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 TUV SUD America Inc. (San Diego) has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No. 3067A.

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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 = Combination (Audio/Data)

1.10.5 LTE Emission Designator (16QAM)

Emission Designator = 4M52W7D
W = Frequency Modulation
7= Quantized/Digital Info
D = Combination (Audio/Data

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	-12.6
	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			**11.8**

1.10.7 Spurious Radiated Emission – Substitution Method

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

The field strength reading of 84dBµV/m @ 1413 MHz (2nd Harmonic of 706.5 MHz) is the maximized measurement when the EUT is on the turntable measured at 3 meters. The gain of the substituted antenna is 7.8dBi while the transmit cable loss is 1.0 dB (cable between signal generator and the substituted antenna). The signal generator level is adjusted until the 84dBµV/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 -18dBm, then we have the following for both EIRP and ERP as required:

P_{EIRP} = -18 dBm + 7.8 dBi – 1dB
= 11.2 dBm
P_{ERP} = P_{EIRP} – 2.15 dB
= 11.2 dBm – 2.15 dB
= 9.05 dBm

SECTION 2

TEST DETAILS

Radio Testing of the
Panasonic Avionics Corporation
4G Cell Modem

2.1 TRANSMITTER CONDUCTED POWER MEASUREMENTS

2.1.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1046
RSS-132, Clause 5.4
RSS-133, Clause 6.4

2.1.2 Standard Applicable

The conducted power mesurements were made in accordance to FCC Part 2 Clasue 2.1046 and RSS-132 Clause 5.4 and RSS-133 Clause 6.4.

2.1.3 Equipment Under Test and Modification State

Serial No: 442964 and CM0015 / Test Configuration A

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

Ocotober 27, 2015 and March 07, 2016/ XYZ

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 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	23.2 - 23.6°C
Relative Humidity	43.3 – 50.9%
ATM Pressure	98.2 - 98.8 kPa

2.1.7 Additional Observations

- This is a conducted test using a peak/average power meter.
- The path loss for Cell Band (GSM850), PCS Band (GSM1900), WCDMA and LTE Band 2 and 5 was measured and entered as a level offset.
- Only worst case of RB size and RB offset presented and recorded in this test report.

2.1.8 Test Results

GSM850 / GSM1900 (GPRS)			
Band	**Channel**	**Frequency (MHz)**	**Max Power Average (dBm)**
Cell	**128**	**824.2**	**32.92**
	190	836.6	32.66
	251	848.8	32.23
PCS	**512**	**1850.2**	**29.18**
	661	1880.0	28.91
	810	1909.8	28.82

GSM850 / GSM1900 (EGPRS)			
Band	**Channel**	**Frequency (MHz)**	**Max Power Average (dBm)**
Cell	**128**	**824.2**	**32.91**
	190	836.6	32.66
	251	848.8	32.20
PCS	**512**	**1850.2**	**29.16**
	661	1880.0	28.84
	810	1909.8	29.01

WCDMA			
Band	**Channel**	**Frequency (MHz)**	**Max Power Average (dBm)**
Cell Band 5	**4132**	**826.4**	**22.07**
	4183	836.6	22.01
	4233	846.6	22.06
PCS Band 2	9262	1852.4	21.60
	9400	1880.0	21.82
	9538	**1907.6**	**21.90**

LTE Band 2					
Modulation	**Bandwidth**	**Channels**	**Frequency**	**Tx Average (dBm)**	**Tx Peak (dBm)**
QPSK	1.4 MHz	18607	1850.7	23.30	29.51
		18900	1880.0	23.55	29.74
		19193	1909.3	23.04	29.02
	3 MHz	18615	1851.5	23.09	29.71
		18900	1880.0	23.47	29.67
		19185	1908.5	23.17	29.42
	5 MHz	18625	1852.5	22.97	29.68
		18900	1880.0	23.47	29.94
		19175	1907.5	22.06	28.31
	10 MHz	18650	1855.0	23.44	29.68
		18900	1880.0	23.39	29.64
		19150	1905.0	23.15	29.54
	15 MHz	**18675**	**1857.5**	**24.17**	**30.51**
		18900	1880.0	23.36	29.69
		19125	1902.5	23.15	29.54
	20 MHz	18700	1860.0	23.52	30.13
		18900	1880.0	23.44	29.64
		19100	1900.0	23.36	29.76

LTE Band 2					
Modulation	**Bandwidth**	**Channels**	**Frequency**	**Tx Average (dBm)**	**Tx Peak (dBm)**
16QAM	1.4 MHz	18607	1850.7	22.39	29.72
		18900	1880.0	22.53	29.79
		19193	1909.3	22.12	29.25
	3 MHz	18615	1851.5	22.38	29.35
		18900	1880.0	23.28	30.52
		19185	1908.5	22.21	29.21
	5 MHz	18625	1852.5	21.92	29.49
		18900	1880.0	23.19	30.37
		19175	1907.5	21.16	28.17
	10 MHz	18650	1855.0	23.36	29.62
		18900	1880.0	23.21	30.84
		19150	1905.0	22.27	29.54
	15 MHz	18675	1857.5	22.50	29.59
		18900	1880.0	23.06	29.68
		19125	1902.5	22.25	29.58
	20 MHz	**18700**	**1860.0**	**23.47**	**29.99**
		18900	1880.0	23.09	30.13
		19100	1900.0	22.44	29.61

LTE Band 5					
Modulation	**Bandwidth**	**Channels**	**Frequency**	**Tx Average (dBm)**	**Tx Peak (dBm)**
QPSK	1.4 MHz	20407	824.7	21.01	27.42
		20525	**836.5**	**21.11**	**28.02**
		20643	848.3	20.73	27.95
	3 MHz	20415	825.5	21.04	27.26
		20525	836.5	20.97	27.78
		20635	847.5	20.68	28.08
	5 MHz	20425	826.5	21.03	27.72
		20525	836.5	20.75	27.72
		20625	846.5	20.69	27.41
	10 MHz	20450	829.0	20.80	27.25
		20525	836.5	20.75	27.58
		20600	844.0	20.70	27.66

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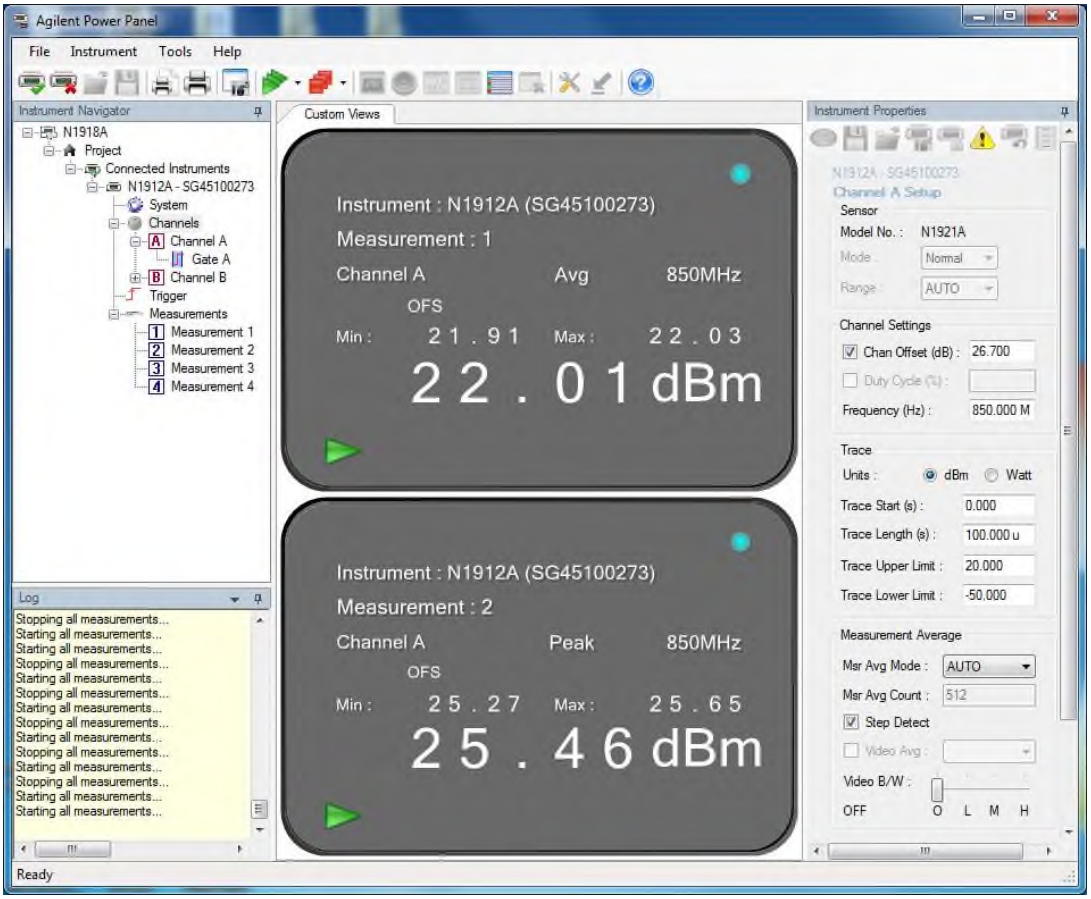
2.1.9 Sample Test Measurement Screen



2.2 EFFECTIVE RADIATED POWER

2.2.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1046
FCC 47 CFR Part 22, Clause 22.913(a)(2)

2.2.2 Standard Applicable

FCC Part 22:
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: 442964 and CM0015 / Test Configuration (N/A, calculation only)

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

Ocotober 27, 2015 and March 07, 2016 / XYZ

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 v01r01).
- Calculation formula in logarithmic terms:

$$\mathbf{ERP = P_T + G_T - L_C - 2.15dB}$$

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

GSM850 (GPRS) Cell Band						
Frequency (MHz)	Max Power Average (dBm)	Antenna Gain (dBi)	ERP			
			(dBm)	(W)	ERP Limit (dBm)	Margin (dB)
824.2	32.92	2.50	33.27	2.12	38.45	5.18
836.6	32.66	2.50	33.01	2.00	38.45	5.44
848.8	32.23	2.50	32.58	1.81	38.45	5.87

GSM850 (EGPRS) Cell Band						
Frequency (MHz)	Max Power Average (dBm)	Antenna Gain (dBi)	ERP			
			(dBm)	(W)	ERP Limit (dBm)	Margin (dB)
824.2	32.91	2.50	33.26	2.11	38.45	5.19
836.6	32.66	2.50	33.01	2.00	38.45	5.44
848.8	32.20	2.50	32.55	1.80	38.45	5.90

WCDMA Cell Band 5						
Frequency (MHz)	Max Power Average (dBm)	Antenna Gain (dBi)	ERP			
			(dBm)	(W)	ERP Limit (dBm)	Margin (dB)
826.4	22.07	2.50	22.42	0.17	38.45	16.03
836.6	22.01	2.50	22.36	0.17	38.45	16.09
846.6	22.06	2.50	22.41	0.17	38.45	16.04

LTE Band 5								
Modulation	**Bandwidth (MHz)**	**Channels**	***Frequency (MHz)***	***Tx Average Power (dBm)***	**Antenna Gain (dBi)**	**ERP (dBm)**	**Limit (dBm)**	**Margin (dBm)**
QPSK	1.4	20407	824.7	21.01	2.50	21.36	38.45	17.09
		20525	836.5	21.11	2.50	21.46	38.45	16.99
		20643	848.3	20.73	2.50	21.08	38.45	17.37
	3	20415	825.5	21.04	2.50	21.39	38.45	17.06
		20525	836.5	20.97	2.50	21.32	38.45	17.13
		20635	847.5	20.68	2.50	21.03	38.45	17.42
	5	20425	826.5	21.03	2.50	21.38	38.45	17.07
		20525	836.5	20.75	2.50	21.10	38.45	17.35
		20625	846.5	20.69	2.50	21.04	38.45	17.41
	10	20450	829.0	20.80	2.50	21.15	38.45	17.3
		20525	836.5	20.75	2.50	21.1	38.45	17.35
		20600	844.0	20.70	2.50	21.05	38.45	17.40

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2.3 EQUIVALENT ISOTROPIC RADIATED POWER

2.3.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1046
RSS-132, Clause 5.4
FCC 47 CFR Part 24, Clause 24.232 (c)
RSS-133, Clause 6.4

2.3.2 Standard Applicable

IC RSS-132:
The EIRP for mobile equipment shall not exceed 11.5 watts

FCC Part 24:
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.

IC RSS-133:
The equivalent isotropically radiated power (e.i.r.p.) for Mobile stations and hand-held portables are limited to 2 watts maximum e.i.r.p.

2.3.3 Equipment Under Test and Modification State

Serial No: 442964 and CM0015 / Test Configuration (N/A, calculation only)

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

October 27, 2015 and March 06, 2016 / XYZ

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:

$$EIRP = P_T + G_T - L_C$$

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 posees an internal Antenna. The loss between the EUT and the antenna port is considered negligible).

2.3.7 Test Results

GSM850 (GPRS) Cell Band						
Frequency (MHz)	Max Power Average (dBm)	Antenna Gain (dBi)	EIRP			
			(dBm)	(W)	EIRP Limit (dBm)	Margin (dB)
824.2	**32.92**	**2.50**	**35.42**	**3.48**	**40.61**	**5.19**
836.6	32.66	2.50	35.16	3.28	40.61	5.45
848.8	32.23	2.50	34.73	2.97	40.61	5.87

GSM850 (EGPRS) Cell Band						
Frequency (MHz)	Max Power Average (dBm)	Antenna Gain (dBi)	EIRP			
			(dBm)	(W)	EIRP Limit (dBm)	Margin (dB)
824.2	**32.91**	**2.50**	**35.41**	**3.47**	**40.61**	**5.20**
836.6	32.66	2.50	35.16	3.28	40.61	5.45
848.8	32.20	2.50	34.70	2.95	40.61	5.91

GSM1900 (GPRS) PCS Band						
Frequency (MHz)	Max Power Average (dBm)	Antenna Gain (dBi)	EIRP			
			(dBm)	(W)	Limit (dBm)	Margin (dB)
1850.2	**29.18**	**2.50**	**31.68**	**1.47**	**33**	**1.32**
1880.0	28.91	2.50	31.41	1.38	33	1.59
1909.8	28.82	2.50	31.32	1.36	33	1.68

GSM1900 (EGPRS) PCS Band						
Frequency (MHz)	Max Power Average (dBm)	Antenna Gain (dBi)	EIRP			
			(dBm)	(W)	Limit (dBm)	Margin (dB)
1850.2	**29.16**	**2.50**	**31.66**	**1.47**	**33**	**1.34**
1880.0	28.84	2.50	31.34	1.36	33	1.66
1909.8	29.01	2.50	31.51	1.42	33	1.49

WCDMA Cell Band 5						
Frequency (MHz)	Max Power Average (dBm)	Antenna Gain (dBi)	EIRP			
			(dBm)	(W)	EIRP Limit (dBm)	Margin (dB)
826.4	**22.07**	**2.50**	**24.57**	**0.29**	**40.61**	**16.04**
836.6	22.01	2.50	24.51	0.28	40.61	16.10
846.6	22.06	2.50	24.56	0.29	40.61	16.05

WCDMA PCS Band 2						
Frequency (MHz)	Max Power Average (dBm)	Antenna Gain (dBi)	EIRP			
			(dBm)	(W)	Limit (dBm)	Margin (dB)
1852.4	21.60	2.50	24.10	0.26	33	8.90
1880.0	21.82	2.50	24.32	0.27	33	8.68
1907.6	**21.90**	**2.50**	**24.40**	**0.28**	**33**	**8.60**

LTE Band 2								
Modulation	**Bandwidth (MHz)**	**Channels**	***Frequency (MHz)***	***Tx Average Power (dBm)***	**Antenna Gain (dBi)**	**EIRP (dBm)**	**Limit (dBm)**	**Margin (dBm)**
QPSK	1.4	18607	1850.7	23.30	2.50	25.80	33	7.2
		18900	1880.0	23.55	2.50	26.05	33	6.95
		19193	1909.3	23.04	2.50	25.54	33	7.46
	3	18615	1851.5	23.09	2.50	25.59	33	7.41
		18900	1880.0	23.47	2.50	25.97	33	7.03
		19185	1908.5	23.17	2.50	25.67	33	7.33
	5	18625	1852.5	22.97	2.50	25.47	33	7.53
		18900	1880.0	23.47	2.50	25.97	33	7.03
		19175	1907.5	22.06	2.50	24.56	33	8.44
	10	18650	1855.0	23.44	2.50	25.94	33	7.06
		18900	1880.0	23.39	2.50	25.89	33	7.11
		19150	1905.0	23.15	2.50	25.65	33	7.35
	15	**18675**	**1857.5**	**24.17**	**2.50**	**26.67**	**33**	**6.33**
		18900	1880.0	23.36	2.50	25.86	33	7.14
		19125	1902.5	23.15	2.50	25.65	33	7.35
	20	18700	1860.0	23.52	2.50	26.02	33	6.98
		18900	1880.0	23.44	2.50	25.94	33	7.06
		19100	1900.0	23.36	2.50	25.86	33	7.14

LTE Band 2								
Modulation	**Bandwidth (MHz)**	**Channels**	***Frequency (MHz)***	***Tx Average Power (dBm)***	**Antenna Gain (dBi)**	**EIRP (dBm)**	**Limit (dBm)**	**Margin (dBm)**
16QAM	1.4	18607	1850.7	22.39	2.50	24.89	33	8.11
		18900	1880.0	22.53	2.50	25.03	33	7.97
		19193	1909.3	22.12	2.50	24.89	33	8.38
	3	18615	1851.5	22.38	2.50	24.88	33	8.12
		18900	1880.0	23.28	2.50	25.78	33	7.22
		19185	1908.5	22.21	2.50	24.71	33	8.29
	5	18625	1852.5	21.92	2.50	24.42	33	8.58
		18900	1880.0	23.19	2.50	25.69	33	7.31
		19175	1907.5	21.16	2.50	23.66	33	9.34
	10	18650	1855.0	23.36	2.50	25.86	33	7.14
		18900	1880.0	23.21	2.50	25.71	33	7.29
		19150	1905.0	22.27	2.50	24.77	33	8.23
	15	18675	1857.5	22.50	2.50	25.00	33	8.00
		18900	1880.0	23.06	2.50	25.56	33	7.44
		19125	1902.5	22.25	2.50	24.75	33	8.25
	20	**18700**	**1860.0**	**23.47**	**2.50**	**25.97**	**33**	**7.03**
		18900	1880.0	23.09	2.50	25.59	33	7.41
		19100	1900.0	22.44	2.50	24.94	33	8.06

LTE Band 5								
Modulation	**Bandwidth (MHz)**	**Channels**	***Frequency (MHz)***	***Tx Average Power (dBm)***	**Antenna Gain (dBi)**	**EIRP (dBm)**	**Limit (dBm)**	**Margin (dBm)**
QPSK	1.4	20407	824.7	21.01	2.50	23.51	40.61	17.1
		20525	**836.5**	**21.11**	**2.50**	**23.61**	**40.61**	**17.0**
		20643	848.3	20.73	2.50	23.23	40.61	17.38
	3	20415	825.5	21.04	2.50	23.54	40.61	17.07
		20525	836.5	20.97	2.50	23.47	40.61	17.14
		20635	847.5	20.68	2.50	23.18	40.61	17.43
	5	20425	826.5	21.03	2.50	23.53	40.61	17.08
		20525	836.5	20.75	2.50	23.25	40.61	17.36
		20625	846.5	20.69	2.50	23.19	40.61	17.42
	10	20450	829.0	20.80	2.50	23.3	40.61	17.31
		20525	836.5	20.75	2.50	23.25	40.61	17.36
		20600	844.0	20.70	2.50	23.2	40.61	17.41

2.4 PEAK-AVERAGE RATIO

2.4.1 Specification Reference

FCC 47 CFR Part 24, Clause 24.2329 (d)
RSS-133, Clause 6.4
RSS-132, Clause 5.4

2.4.2 Standard Applicable

FCC Part 24:
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 13dB

IC RSS-132 and RSS-133:
The transmitter's peak-to-average power ratio (PAPR) shall not exceed 13 dB for more than 0.1% of the time using a signal corresponding to the highest PAPR during periods of continuous transmission.

2.4.3 Equipment Under Test and Modification State

Serial No: 442964 and CM0015 / Test Configuration A

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

October 28 and 29, 2015 and March 06, 2016 / XYZ

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

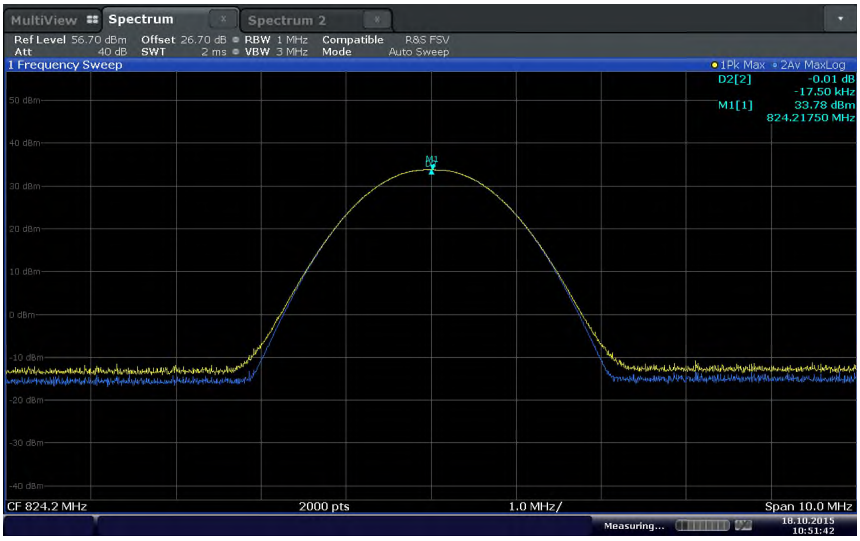
Ambient Temperature	23.4 – 23.6°C
Relative Humidity	43.3 - 50.9 %
ATM Pressure	98.2 - 98.8 kPa

2.4.7 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 path loss for Cell Band (GSM850), PCS Band (GSM1900), WCDMA and LTE Band 2 and 5 was measured and entered as a level offset.
- There are no measured PAPR levels greater than 13dB. EUT complies.

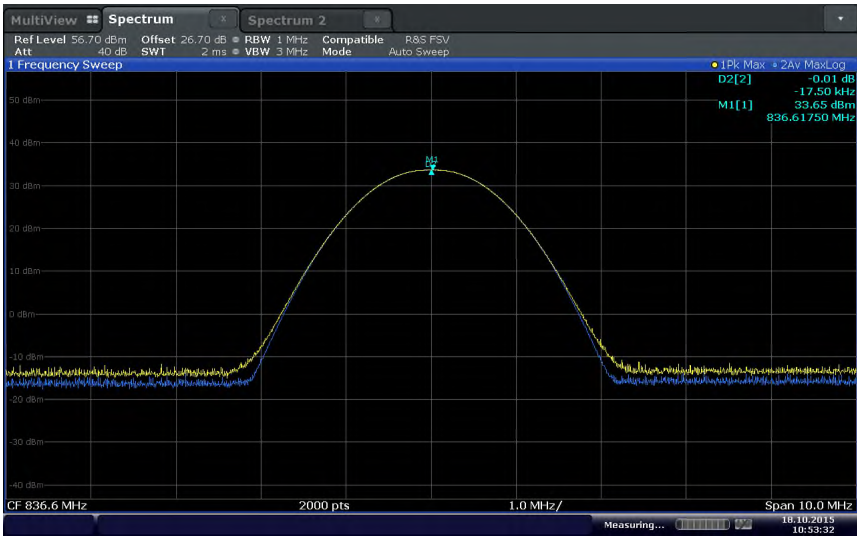
2.4.8 Test Results

GSM850/GPRS (Cell-BC0)/824.2MHz



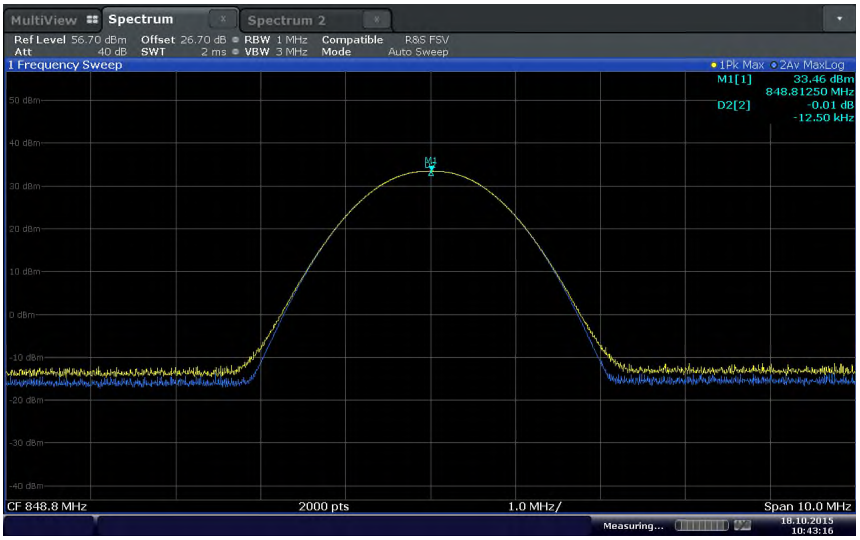
Date: 18.OCT.2015 10:51:42

GSM850/GPRS (Cell-BC0)/836.6MHz

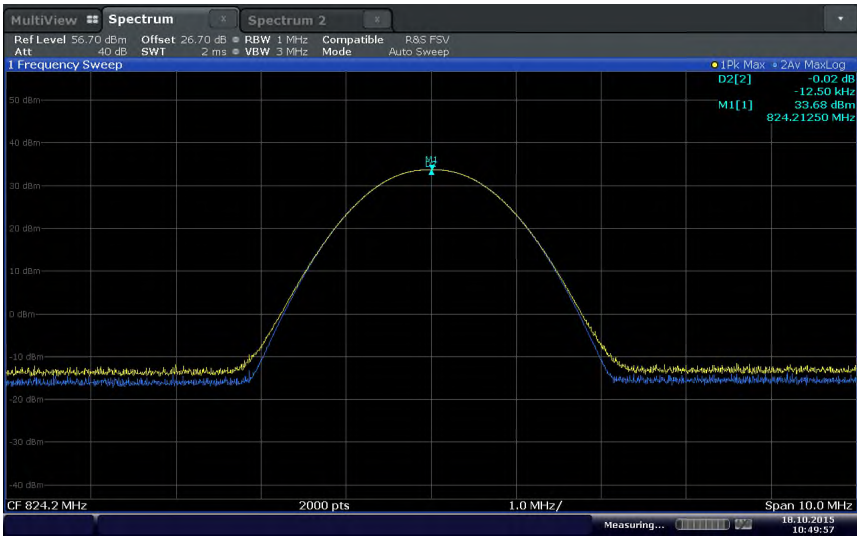


Date: 18.OCT.2015 10:53:33

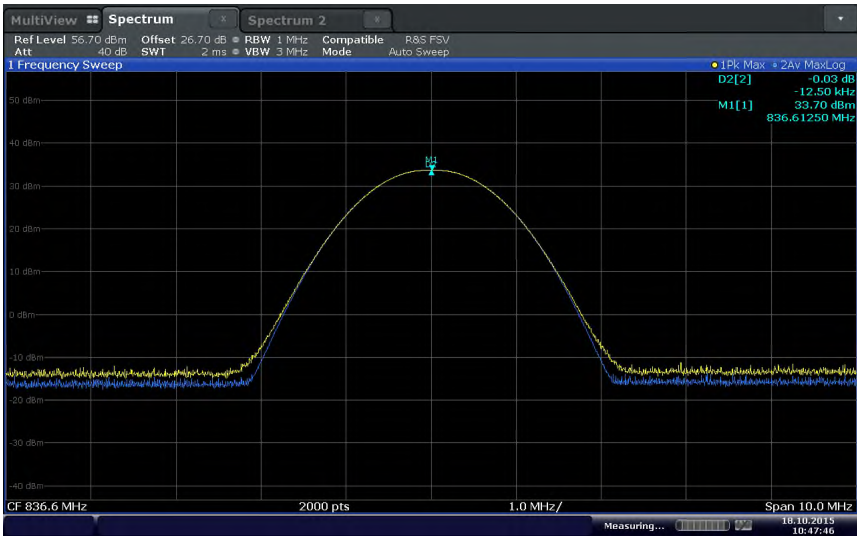
GSM850/GPRS (Cell-BC0)/848.8MHz



Date: 18.OCT.2015 10:43:16

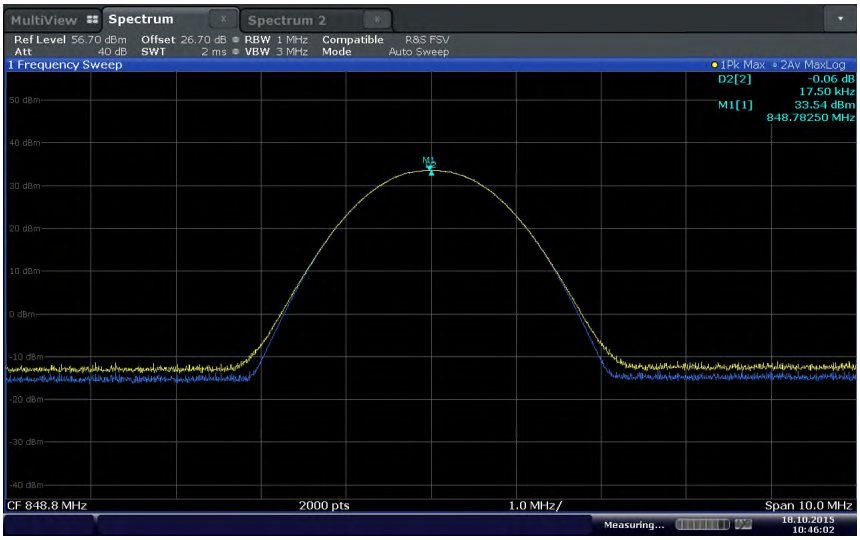
GSM850/EGPRS (Cell-BC0)/824.2MHz


Date: 18.OCT.2015 10:49:58

GSM850/EGPRS (Cell-BC0)/836.6MHz


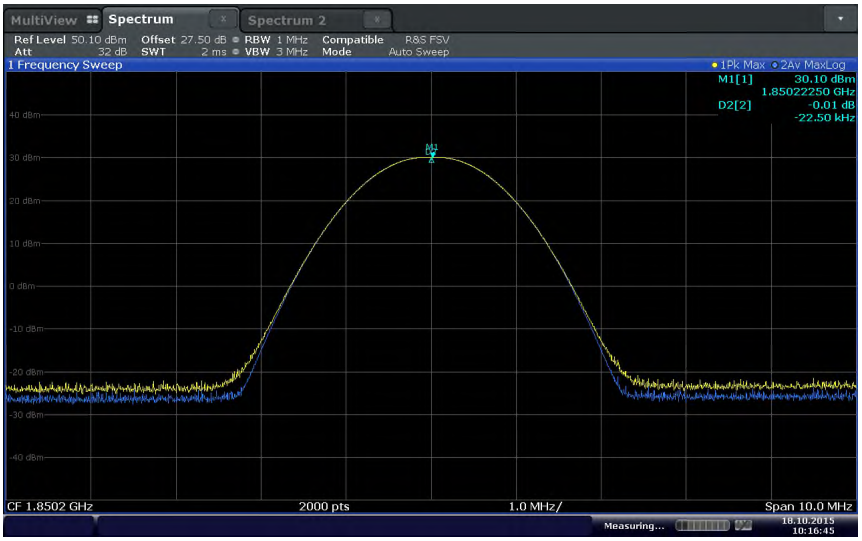
Date: 18.OCT.2015 10:47:46

GSM850/EGPRS (Cell-BC0)/848.8MHz

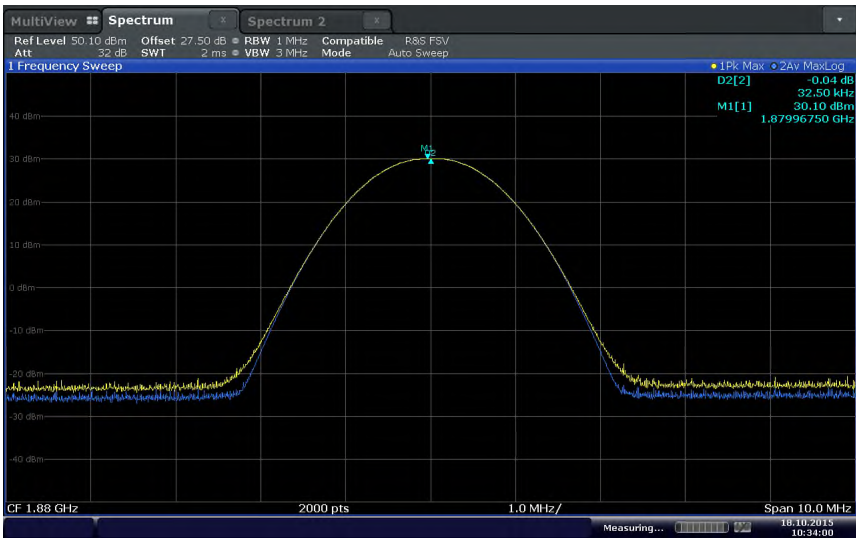


Date: 18.OCT.2015 10:46:03

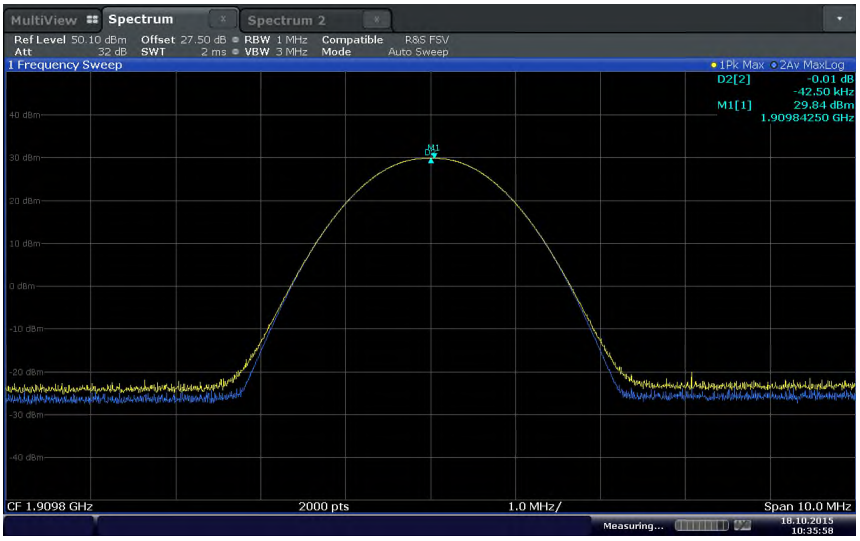
GSM1900/GPRS (PCS BC1)/1850.2MHz



Date: 18.OCT.2015 10:16:45

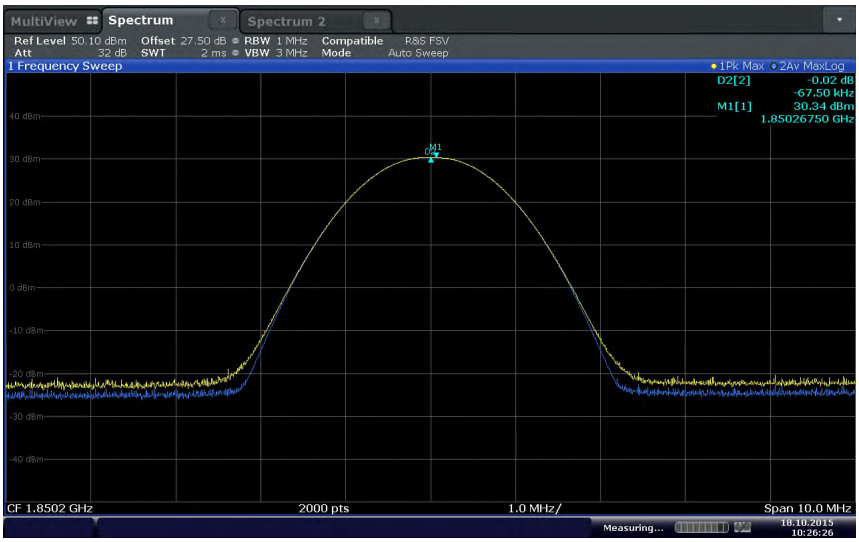
GSM1900/GPRS (PCS BC1)/1880.0MHz


Date: 18.OCT.2015 10:34:00

GSM1900/GPRS (PCS BC1)/1909.8MHz


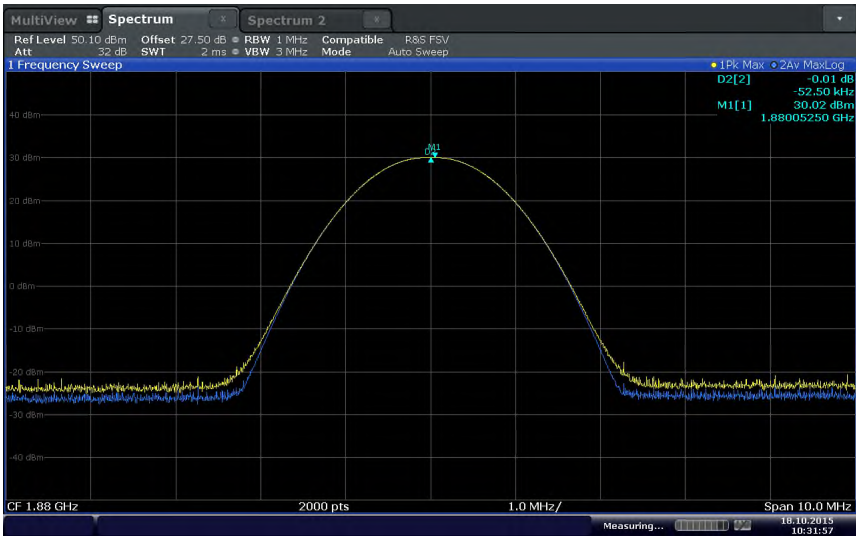
Date: 18.OCT.2015 10:35:58

GSM1900/EGPRS (PCS BC1)/1850.2MHz



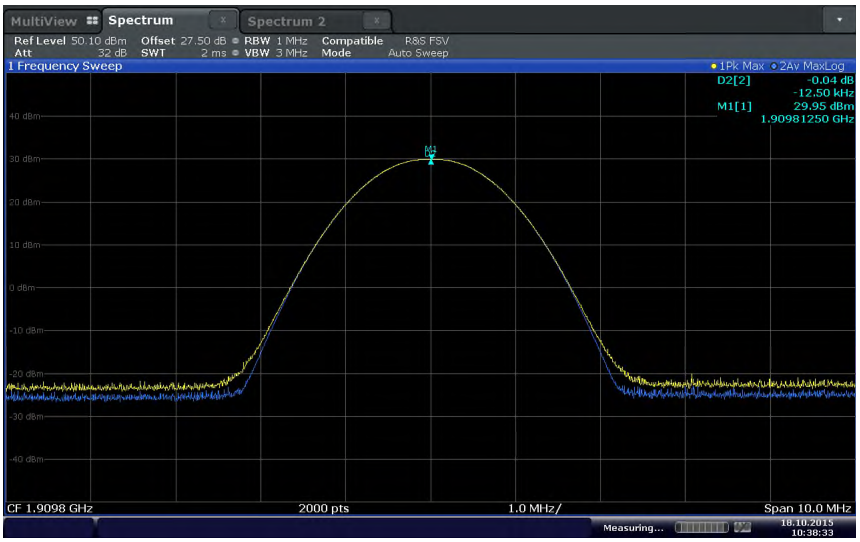
Date: 18.OCT.2015 10:26:26

GSM1900/EGPRS (PCS BC1)/1880.0MHz



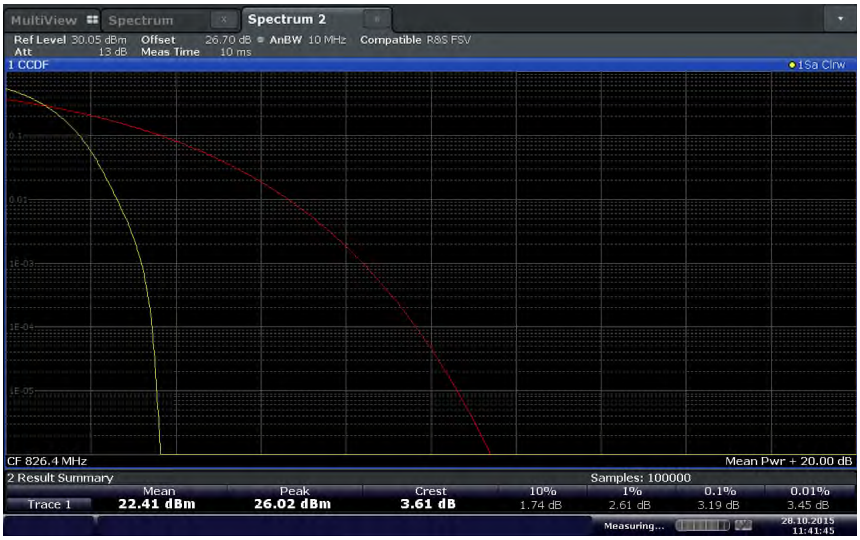
Date: 18.OCT.2015 10:31:57

GSM1900/EGPRS (PCS BC1)/1909.8MHz



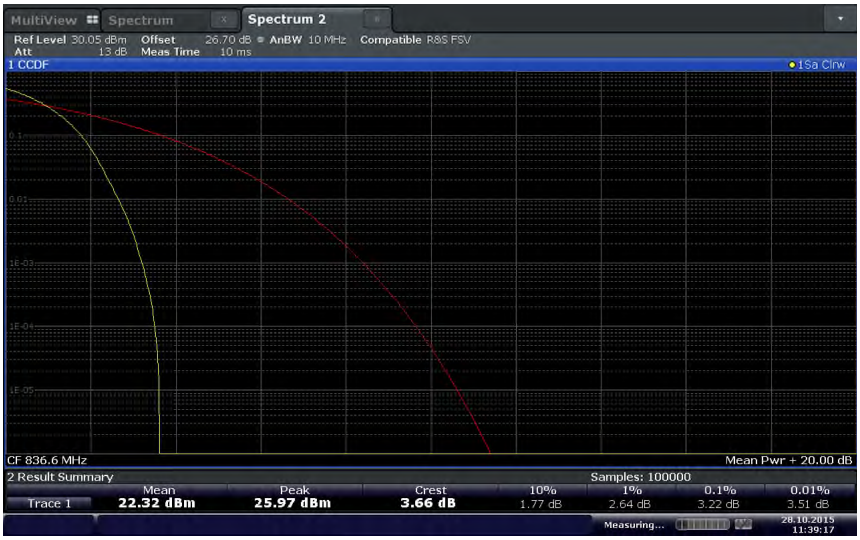
Date: 18.OCT.2015 10:38:33

WCDMA/Band 5/826.4MHz



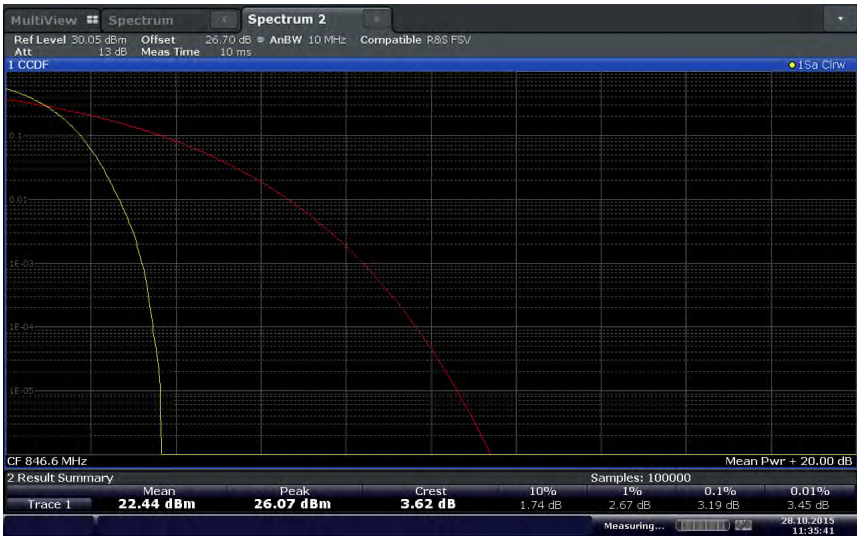
Date: 28.OCT.2015 11:41:45

WCDMA/Band 5/836.6MHz



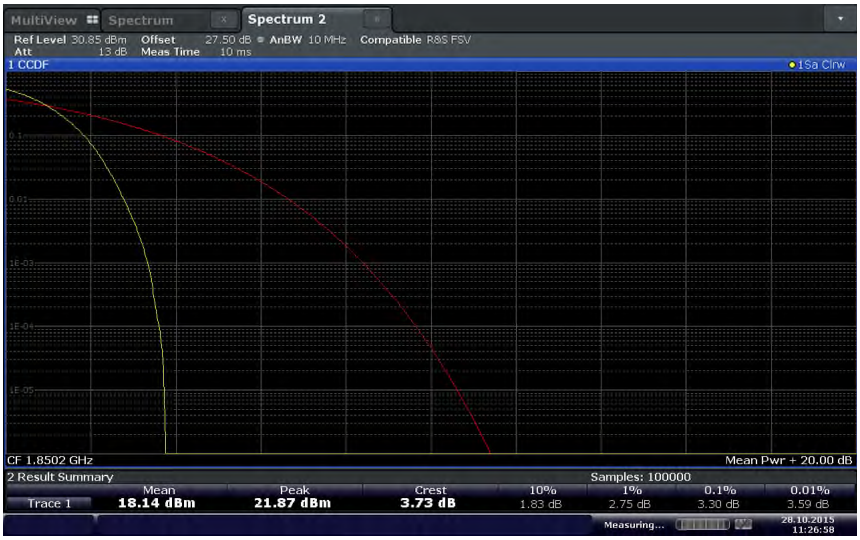
Date: 28.OCT.2015 11:39:18

WCDMA/Band 5/846.6 MHz



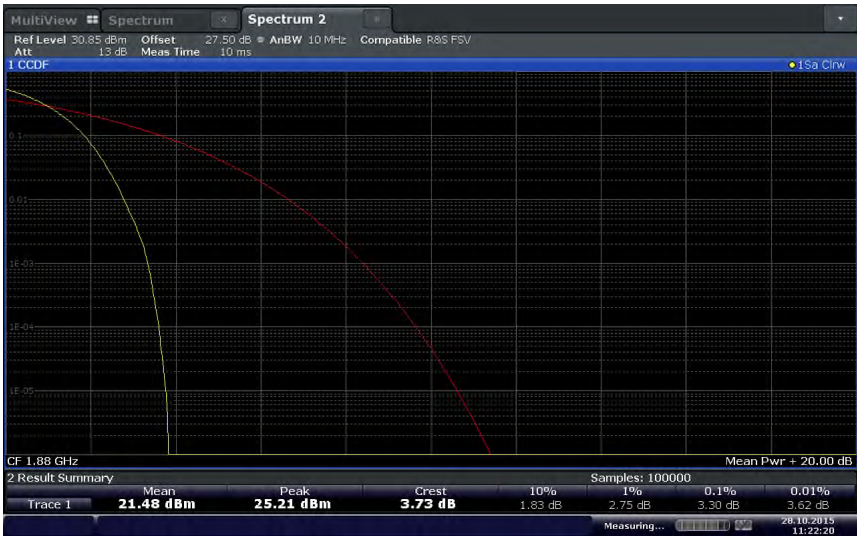
Date: 28.OCT.2015 11:35:42

WCDMA/Band 2/1852.4MHz



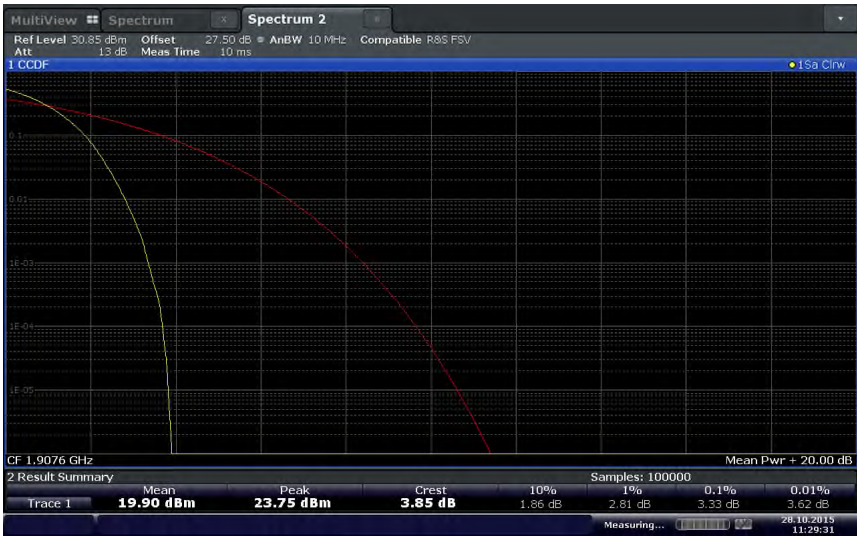
Date: 28.OCT.2015 11:26:58

WCDMA/Band 2/1880 MHz



Date: 28.OCT.2015 11:22:21

WCDMA/Band 2/1907.6 MHz



Date: 28.OCT.2015 11:29:32

LTE Band 2 (1.4 MHz BW)/1850.7 MHz/QPSK

Date: 29.OCT.2015 16:29:40

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

Date: 29.OCT.2015 14:57:12

LTE Band 2 (1.4 MHz BW)/1909.3 MHz/QPSK

Date: 29.OCT.2015 16:27:53

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

Date: 29.OCT.2015 16:25:15

LTE Band 2 (3 MHz BW)/1880 MHz/QPSK

Date: 29.OCT.2015 15:31:34

LTE Band 2 (3 MHz BW)/1908.5 MHz/QPSK

Date: 29.OCT.2015 16:19:33

LTE Band 2 (5 MHz BW)/1852.5 MHz/QPSK

Date: 29.OCT.2015 16:15:04

LTE Band 2 (5 MHz BW)/1880 MHz/QPSK

Date: 29.OCT.2015 15:34:08

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

Date: 29.OCT.2015 16:10:31

LTE Band 2 (10 MHz BW)/1855 MHz/QPSK

Date: 29.OCT.2015 16:08:45

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

Date: 29.OCT.2015 15:35:20

LTE Band 2 (10 MHz BW)/1905 MHz/QPSK

Date: 29.OCT.2015 16:04:59

LTE Band 2 (15 MHz BW)/1857.5 MHz/QPSK

Date: 29.OCT.2015 16:03:06

LTE Band 2 (15 MHz BW)/1880 MHz/QPSK

Date: 29.OCT.2015 15:38:17

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

Date: 29.OCT.2015 15:57:17

LTE Band 2 (20 MHz BW)/1860 MHz/QPSK


Date: 29.OCT.2015 15:52:23

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


Date: 29.OCT.2015 15:39:48

LTE Band 2 (20 MHz BW)/1900 MHz/QPSK

Date: 29.OCT.2015 15:55:48

LTE Band 5 (1.4 MHz BW)/824.7 MHz/QPSK

Date: 7.MAR.2016 15:15:37

LTE Band 5 (1.4 MHz BW)/836.5 MHz/QPSK

Date: 7.MAR.2016 15:29:35

LTE Band 5 (1.4 MHz BW)/848.3 MHz/QPSK

Date: 7.MAR.2016 15:26:42

LTE Band 5 (3 MHz BW)/825.5 MHz/QPSK

Date: 7.MAR.2016 15:53:10

LTE Band 5 (3 MHz BW)/836.5 MHz/QPSK

Date: 7.MAR.2016 15:33:28

LTE Band 5 (3 MHz BW)/847.5 MHz/QPSK

Date: 7.MAR.2016 15:52:11

LTE Band 5 (5 MHz BW)/826.5 MHz/QPSK

Date: 7.MAR.2016 15:46:10

LTE Band 5 (5 MHz BW)/836.5 MHz/QPSK

Date: 7.MAR.2016 15:36:54

LTE Band 5 (5 MHz BW)/846.5 MHz/QPSK

Date: 7.MAR.2016 15:49:29

LTE Band 5 (10 MHz BW)/829.0 MHz/QPSK

Date: 7.MAR.2016 15:44:03

LTE Band 5 (10 MHz BW)/836.5 MHz/QPSK

Date: 7.MAR.2016 15:39:13

LTE Band 5 (10 MHz BW)/844.0 MHz/QPSK

2.5 OCCUPIED BANDWIDTH

2.5.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1049
FCC 47 CFR Part 22, Clause 22.917(b)
FCC 47 CFR Part 24, Clause 24.238(b)
RSS-GEN 4.6.1

2.5.2 Standard Applicable

The transmitted signal bandwidth shall be reported as the 99% emission bandwidth, that is the frequency bandwidth suuch that, below its lower and above its upper frequency limits, the mean powers radiated are eqch equal to 0.5 percent of the total mean power radiated by a give emission.

26dB 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 by at least 26 dB below the transmitter power.

2.5.3 Equipment Under Test and Modification State

Serial No: 442964 and CM0015 / Test Configuration A

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

October 28 and 29, 2015 and March 07, 2016 / XYZ

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	23.4 – 23.6°C
Relative Humidity	43.3 – 50.9%
ATM Pressure	98.2 – 98.8 kPa

2.5.7 Additional Observations

- This is a conducted test. Both 26dB bandwidth and 99% bandwidth presented.
- Using the occupied bandwidth meansurement function in the spectrum analyzer, the 99% occupied bandwith was measured.
- The 26dB bandwidth was measured in accorance with FCC KDB 971168 D01 V0202 Clause 4.1 using the ndB measurement function in the spectrum analyzer.
- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

- The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.
- The resolution bandwidth (RBW) shall be in the range of 1% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be at least 3x RBW.
- Low, Mid and High channels for all bandwidths and modulations were verified. Test results of Mid channel were presented as representative.

2.5.8 Test Results

GSM850 / GSM1900 (GPRS)				
Band	**Channel**	**Frequency**	**99% OBW (kHz)**	**26dB BW (kHz)**
Cell	190	836.6	244.6	331.4
PCS	661	1880.0	243.1	316.9

GSM850 / GSM1900 (EGPRS)				
Band	**Channel**	**Frequency**	**99% OBW (kHz)**	**26dB BW (kHz)**
Cell	190	836.6	246.0	327.1
PCS	661	1880.0	247.5	321.3

WCDMA				
Band	**Channel**	**Frequency**	**99% OBW (MHz)**	**26dB BW (MHz)**
Cell Band 5	4183	836.6	4.20	4.66
PCS Band 2	9400	1880.0	4.20	4.66

LTE (QPSK)					
Band	**Bandwidth (MHz)**	**Channel**	**Frequency**	**99% OBW (MHz)**	**26dB BW (MHz)**
2	1.4	661	1880.0	1.10	1.35
	3			2.69	3.05
	5			4.49	5.05
	10			8.96	9.88
	15			13.47	14.78
	20			17.88	19.51

LTE (16QAM)					
Band	**Bandwidth (MHz)**	**Channel**	**Frequency**	**99% OBW (MHz)**	**26dB BW (MHz)**
2	1.4	661	1880.0	1.09	1.35
	3			2.68	3.05
	5			4.49	5.07
	10			8.94	9.81
	15			13.44	14.87
	20			17.88	19.51

LTE (QPSK)					
Band	**Bandwidth (MHz)**	**Channel**	**Frequency**	**99% OBW (MHz)**	**26dB BW (MHz)**
5	1.4	20525	836.5	1.08	1.28
	3			2.68	2.99
	5			4.48	4.98
	10			8.94	9.80

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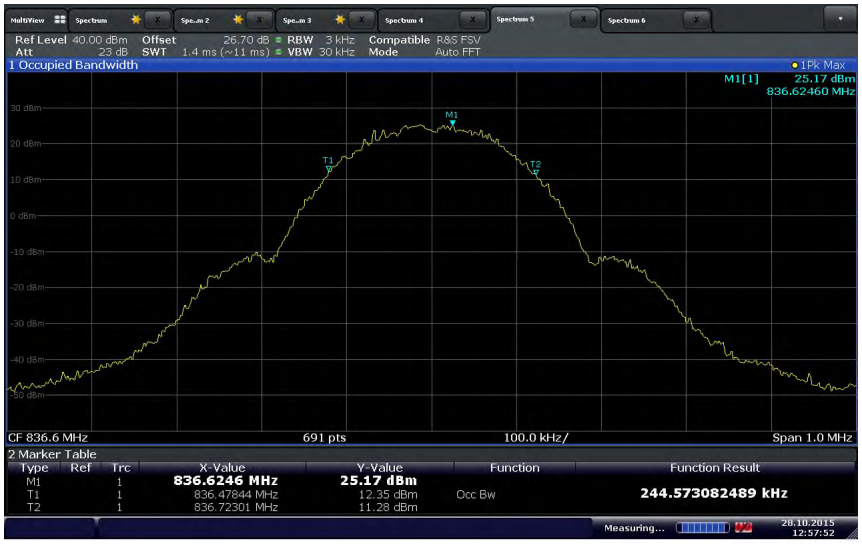
2.5.9 Example Test Plots

GSM850 (GPRS)/Cell/Channel 190/99% OBW



Date: 28.OCT.2015 12:57:51

GSM850 (GPRS)/Cell/Channel 190/26dB BW

Date: 28.OCT.2015 12:59:11

GSM850 (EGPRS)/Cell/Channel 190/99% OBW

Date: 28.OCT.2015 13:02:33

GSM850 (EGPRS)/Cell/Channel 190/26dB BW

Date: 28.OCT.2015 13:01:29

GSM1900 (GPRS)/PCS/Channel 661/99% OBW

Date: 28.OCT.2015 13:14:26

GSM1900 (GPRS)/PCS/Channel 661/26dB BW

Date: 28.OCT.2015 13:14:46

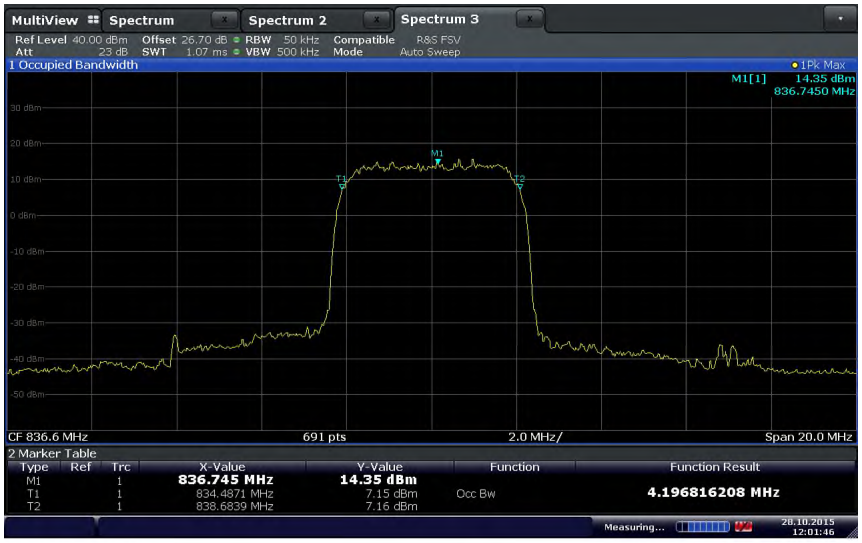
GSM1900 (EGPRS)/PCS/Channel 661/99% OBW

Date: 28.OCT.2015 13:10:34

GSM1900 (EGPRS)/PCS/Channel 661/26dB BW

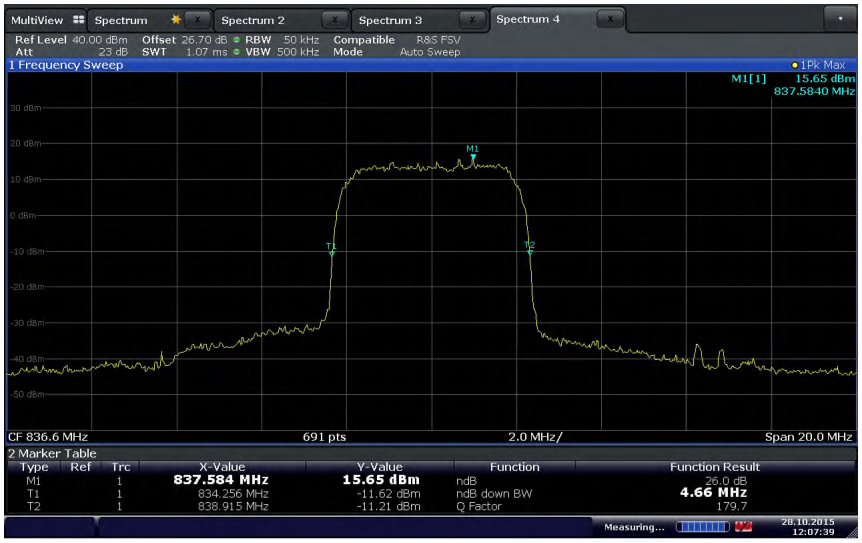
Date: 28.OCT.2015 13:10:10

WCDMA /Cell/Channel 4183/99% OBW



Date: 28.OCT.2015 12:01:46

WCDMA /Cell/Channel 4183/26dB BW



Date: 28.OCT.2015 12:07:39

WCDMA /PCS/Channel 9400/99% OBW

Date: 28.OCT.2015 12:17:29

WCDMA /PCS/Channel 9400/26dB BW

Date: 28.OCT.2015 12:14:57

LTE Band 2 (1.4 MHz BW)/ Channel 18900/QPSK/99% OBW

Date: 29.OCT.2015 14:39:10

LTE Band 2 (1.4 MHz BW)/ Channel 18900/QPSK/26dB BW

Date: 29.OCT.2015 14:39:41

LTE Band 2 (3 MHz BW)/ Channel 18900/QPSK/99% OBW

Date: 29.OCT.2015 14:33:26

LTE Band 2 (3 MHz BW)/ Channel 18900/QPSK/26dB BW

Date: 29.OCT.2015 14:32:04

LTE Band 2 (5 MHz BW)/ Channel 18900/QPSK/99% OBW

Date: 29.OCT.2015 14:28:27

LTE Band 2 (5 MHz BW)/ Channel 18900/QPSK/26dB BW

Date: 29.OCT.2015 14:27:52

LTE Band 2 (10 MHz BW)/ Channel 18900/QPSK/99% OBW

Date: 29.OCT.2015 14:03:07

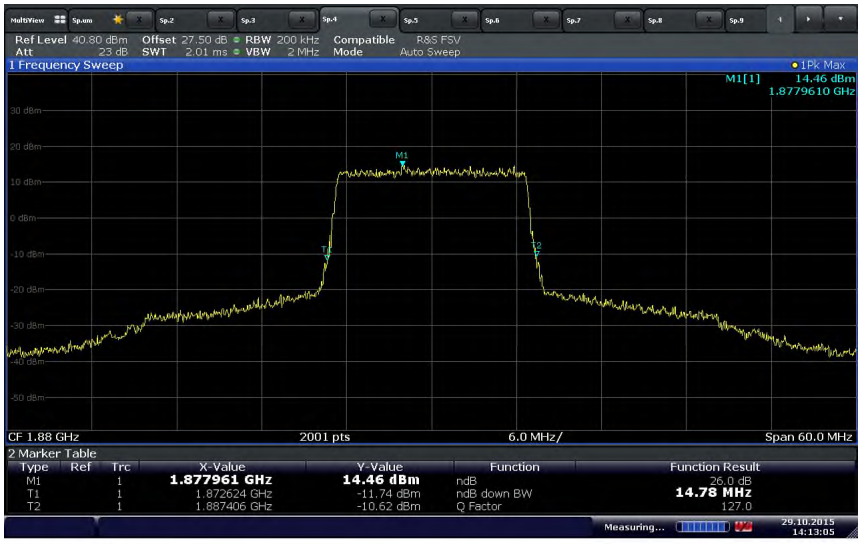
LTE Band 2 (10 MHz BW)/ Channel 18900/QPSK/26dB BW

Date: 29.OCT.2015 14:47:56

LTE Band 2 (15 MHz BW)/ Channel 18900/QPSK/99% OBW

Date: 29.OCT.2015 14:15:04

LTE Band 2 (15 MHz BW)/ Channel 18900/QPSK/26dB BW



Date: 29.OCT.2015 14:13:06

LTE Band 2 (20 MHz BW)/ Channel 18900/QPSK/99% OBW

Date: 29.OCT.2015 14:21:57

LTE Band 2 (20 MHz BW)/ Channel 18900/QPSK/26dB BW

Date: 29.OCT.2015 14:20:01

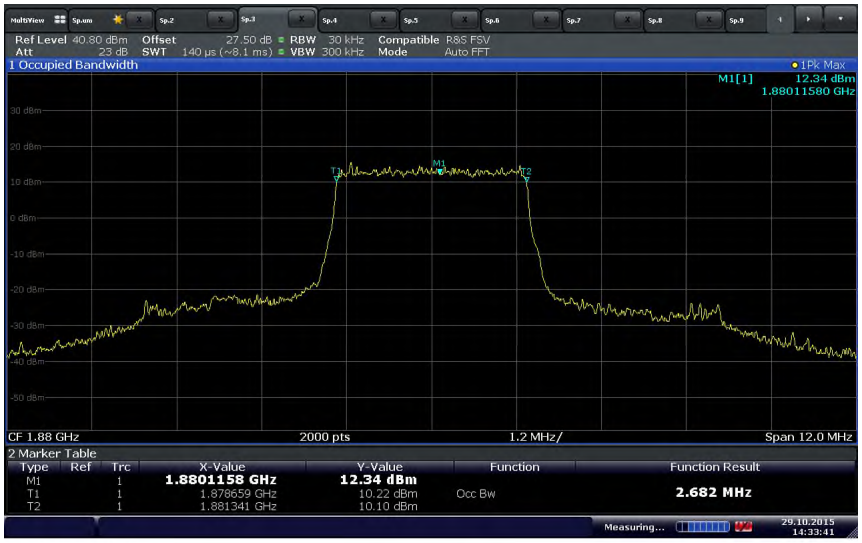
LTE Band 2 (1.4 MHz BW)/ Channel 18900/16QAM/99% OBW

Date: 29.OCT.2015 14:38:30

LTE Band 2 (1.4 MHz BW)/ Channel 18900/16QAM/26dB BW

Date: 29.OCT.2015 14:39:53

LTE Band 2 (3 MHz BW)/ Channel 18900/16QAM/99% OBW



Date: 29.OCT.2015 14:33:40

LTE Band 2 (3 MHz BW)/ Channel 18900/16QAM/26dB BW

Date: 29.OCT.2015 14:32:24

LTE Band 2 (5 MHz BW)/ Channel 18900/16QAM/99% OBW

Date: 29.OCT.2015 14:28:45

LTE Band 2 (5 MHz BW)/ Channel 18900/16QAM/26dB BW

Date: 29.OCT.2015 14:28:05

LTE Band 2 (10 MHz BW)/ Channel 18900/16QAM/99% OBW

Date: 29.OCT.2015 14:03:15

LTE Band 2 (10 MHz BW)/ Channel 18900/16QAM/26dB BW

Date: 29.OCT.2015 14:48:54

LTE Band 2 (15 MHz BW)/ Channel 18900/16QAM/99% OBW

Date: 29.OCT.2015 14:15:11

LTE Band 2 (15 MHz BW)/ Channel 18900/16QAM/26dB BW

Date: 29.OCT.2015 14:13:18

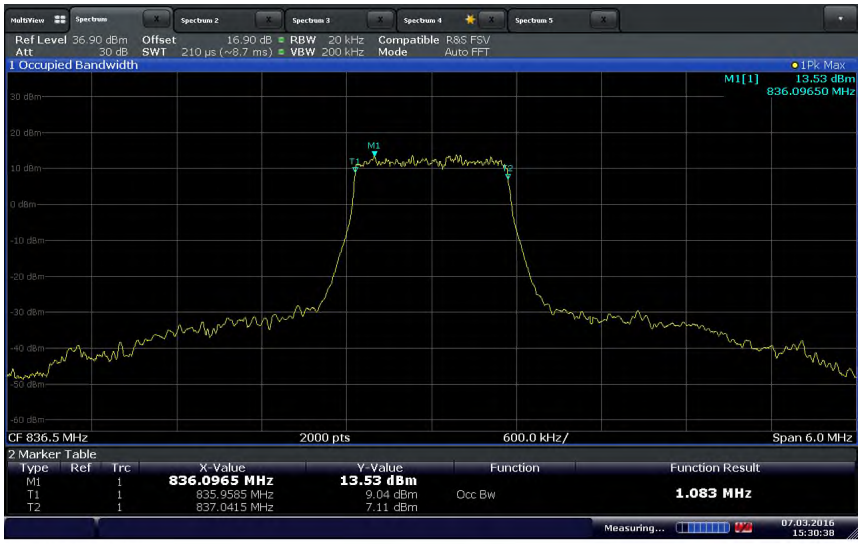
LTE Band 2 (20 MHz BW)/ Channel 18900/16QAM/99% OBW

Date: 29.OCT.2015 14:22:10

LTE Band 2 (20 MHz BW)/ Channel 18900/16QAM/26dB BW

Date: 29.OCT.2015 14:20:14

LTE Band 5 (1.4 MHz BW)/ Channel 20525/QPSK/99% OBW



Date: 7.MAR.2016 15:30:39

LTE Band 5 (1.4 MHz BW)/ Channel 20525/QPSK/26dB BW

Date: 7.MAR.2016 15:30:04

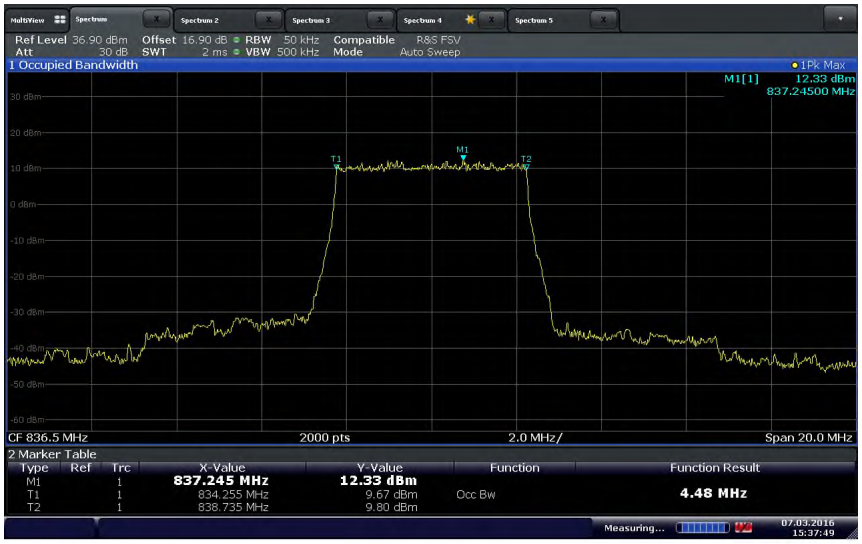
LTE Band 5 (3 MHz BW)/ Channel 20525/QPSK/99% OBW

Date: 7.MAR.2016 15:34:32

LTE Band 5 (3 MHz BW)/ Channel 20525/QPSK/26dB BW

Date: 7.MAR.2016 15:34:03

LTE Band 5 (5 MHz BW)/ Channel 20525/QPSK/99% OBW

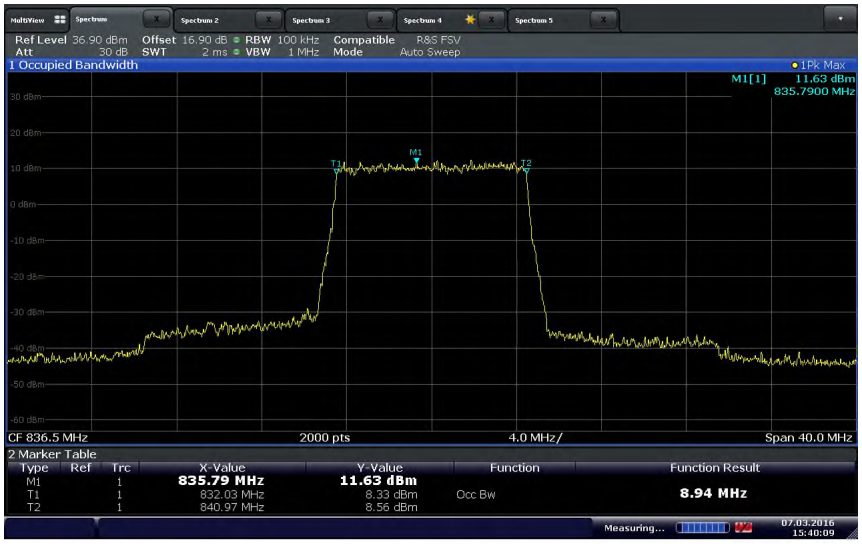


Date: 7.MAR.2016 15:37:50

LTE Band 5 (5 MHz BW)/ Channel 20525/QPSK/26dB BW

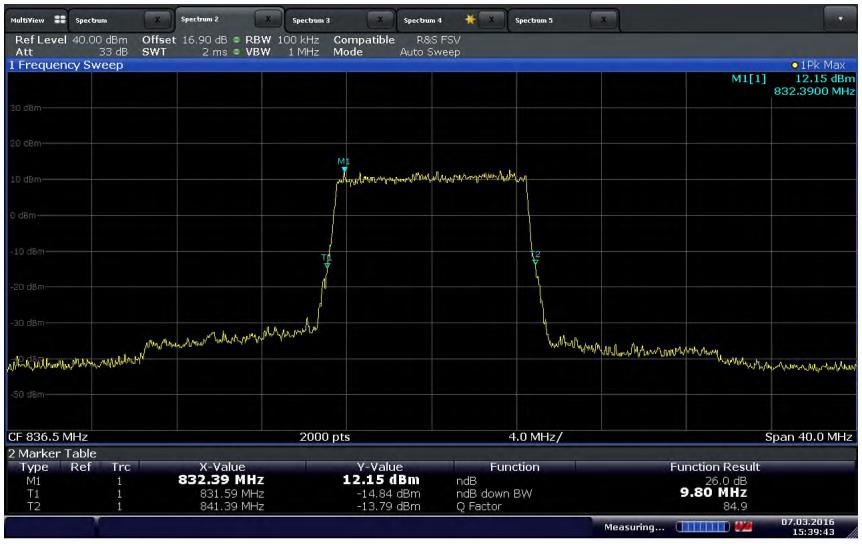
Date: 7.MAR.2016 15:37:24

LTE Band 5 (10 MHz BW)/ Channel 20525/QPSK/99% OBW



Date: 7.MAR.2016 15:40:09

LTE Band 5 (10 MHz BW)/ Channel 20525/QPSK/26dB BW



Date: 7.MAR.2016 15:39:43

2.6 SPURIOUS EMISSION AT BAND EDGE

2.6.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1051
FCC 47 CFR Part 22, Clause 22.917(a)
FCC 47 CFR Part 24, Clause 24.238(a)
RSS-132, Clause 5.5
RSS-133, Clause 6.5

2.6.2 Standard Applicable

In the 1.0 MHz bands immediately outside and adjacent to the equipment's operating frequency block, the emission power per any 1% of the emission bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 log10 p(watts).

2.6.3 Equipment Under Test and Modification State

Serial No: 442964 and CM0015 / Test Configuration A

2.6.4 Date of Test/Initial of test personnel who performed the test

October 30 and November 02, 2015 and March 08/ XYZ

2.6.5 Test Equipment Used

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

2.6.6 Environmental Conditions/ Test Location

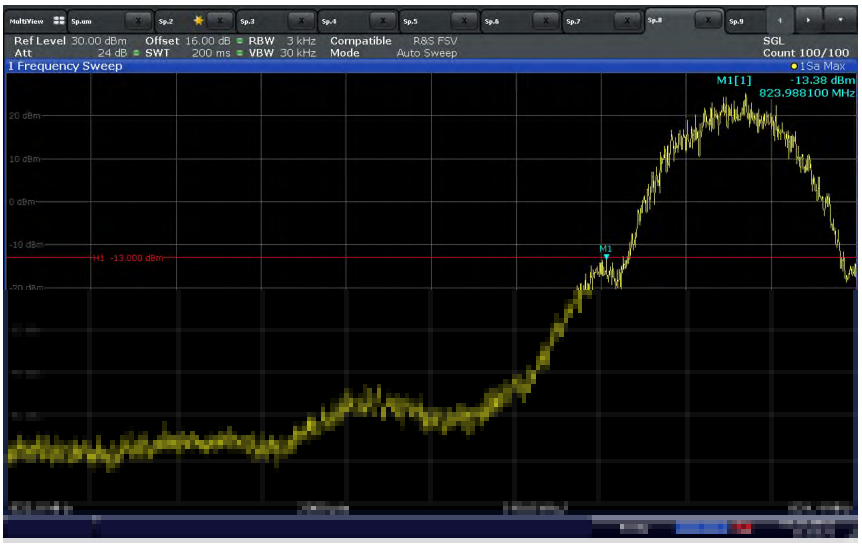
Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

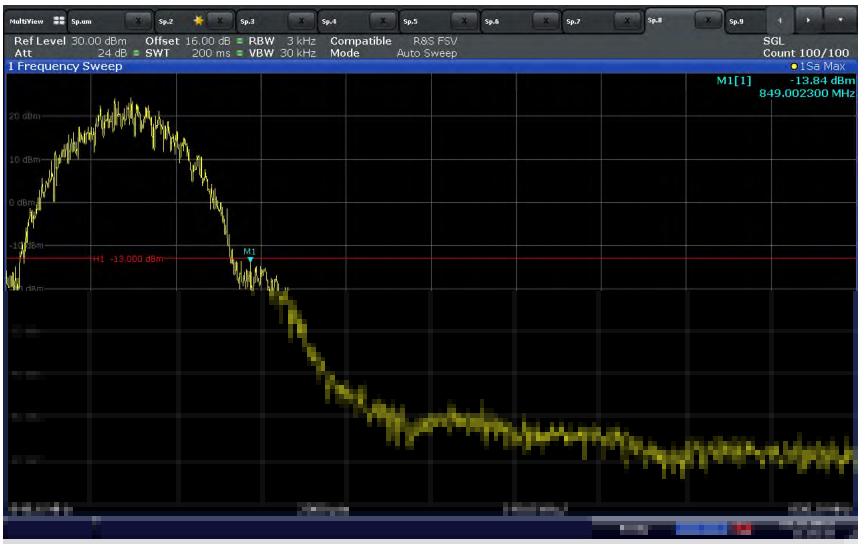
Ambient Temperature	23.2 - 23.9°C
Relative Humidity	36.5 - 45.7%
ATM Pressure	98.4 - 98.9 kPa

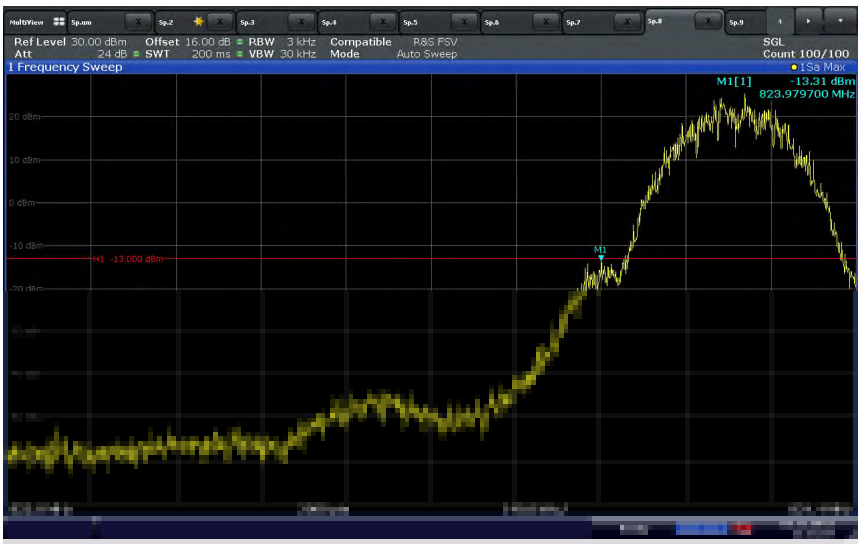
2.6.7 Additional Observations

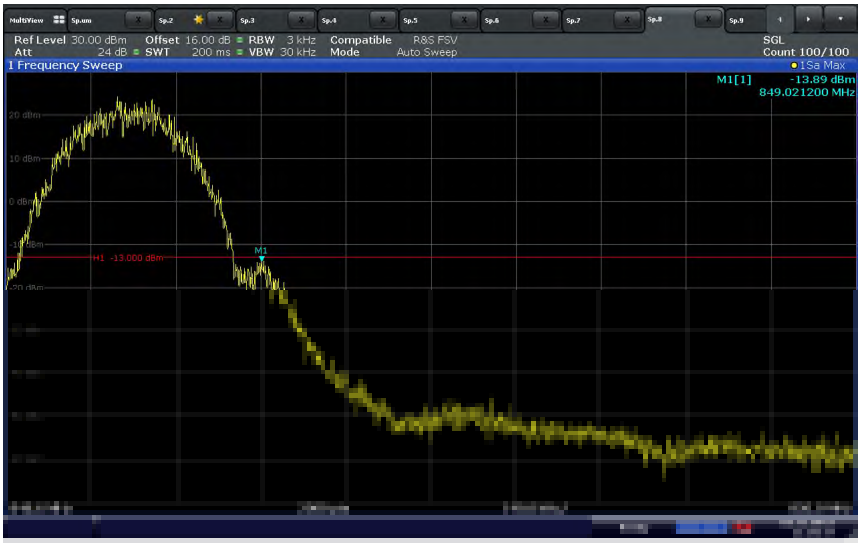
- This is a conducted test.
- The path loss for Cell Band (GSM850), PCS Band (GSM1900), WCDMA and LTE Band 2 and 5 was measured and entered as a level offset.
- RBW is set to minimum 1% of EBW and VBW is set to >3 x RBW in the 1 MHz band immediately outside and adjacent to the channel edge.
- Only worst case configuration for all technologies presented in this test report.

2.6.8 Test Results

GSM850/GPRS/Low Channel (128)/Cell BC0 Band Edge @ 824 MHz


GSM850/GPRS/High Channel (251)/Cell BC0 Band Edge @ 849 MHz


GSM850/EGPRS/Low Channel (128)/Cell BC0 Band Edge @ 824 MHz


GSM850/EGPRS/High Channel (251)/Cell BC0 Band Edge @ 849 MHz


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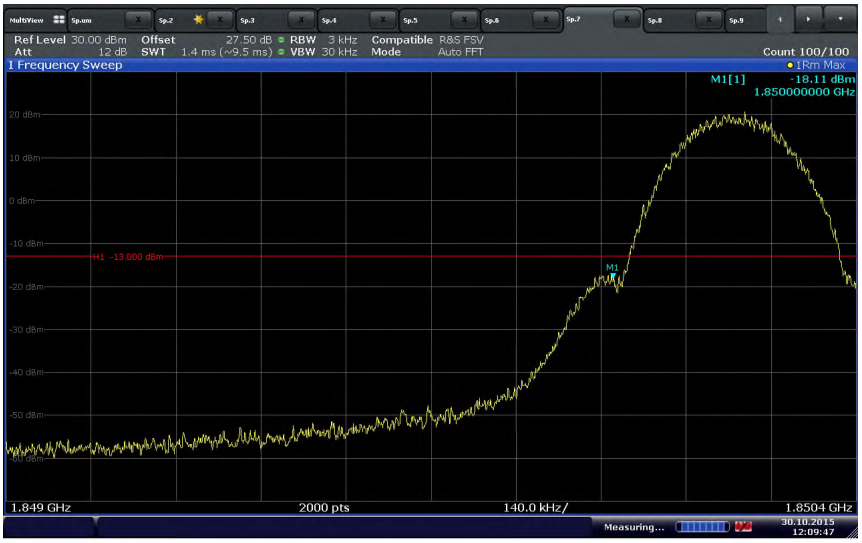
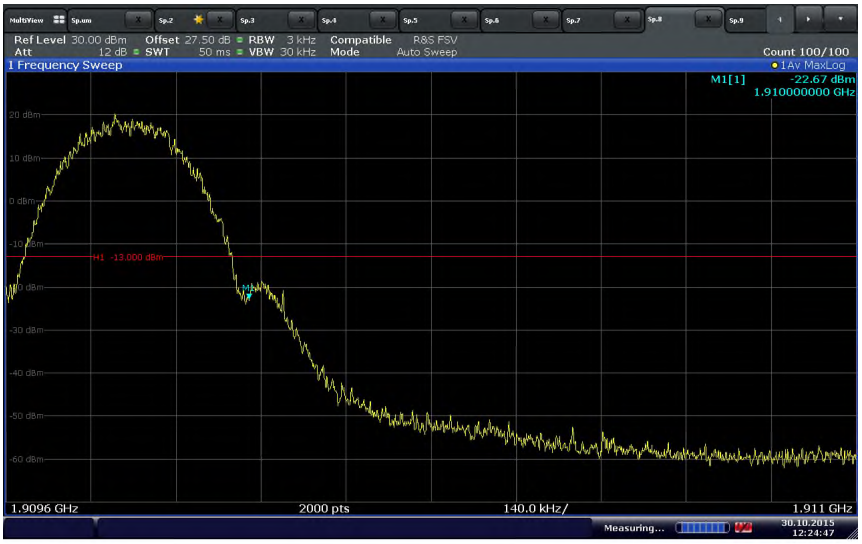
GSM1900/GPRS/Low Channel (512)/PCS BC1 Band Edge @ 1850 MHz



Date: 30.OCT.2015 12:09:47

GSM1900/GPRS/High Channel (810)/PCS BC1 Band Edge @ 1910 MHz

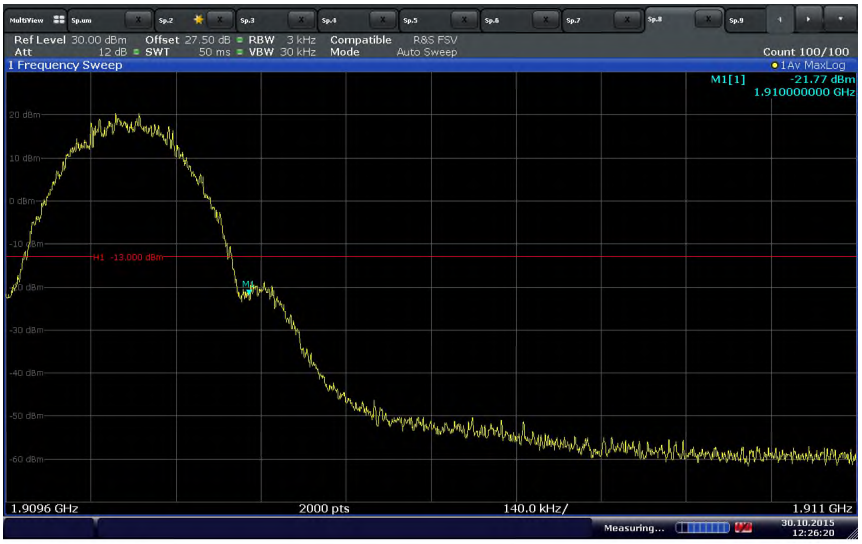


Date: 30.OCT.2015 12:24:48

GSM1900/EGPRS/Low Channel (512)/PCS BC1 Band Edge @ 1850 MHz

Date: 30.OCT.2015 12:07:53

GSM1900/EGPRS/High Channel (810)/PCS BC1 Band Edge @ 1910 MHz



Date: 30.OCT.2015 12:26:20

WCDMA/Low Channel (4132)/Cell Band 5 Band Edge @ 824 MHz

Date: 28.OCT.2015 14:55:19

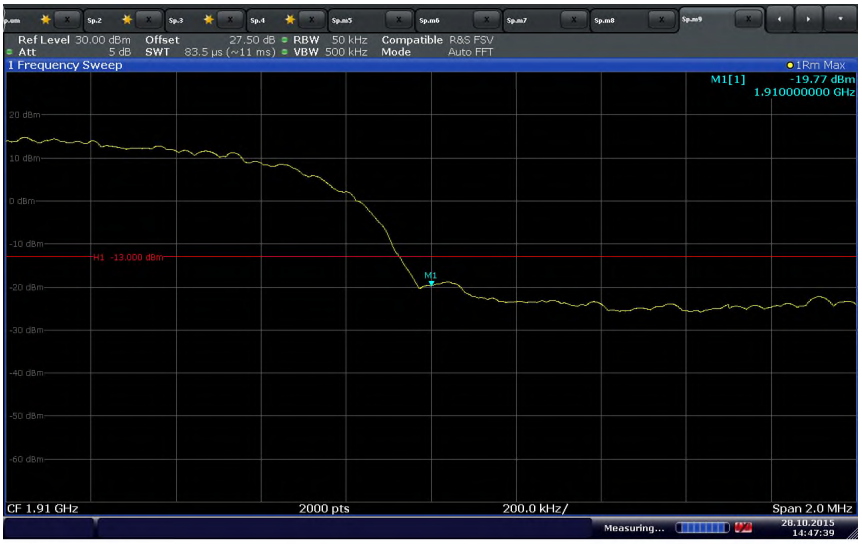
WCDMA/High Channel (4233)/Cell Band 5 Band Edge @ 849 MHz

Date: 28.OCT.2015 15:01:30

WCDMA/Low Channel (9262)/PCS Band 2 Band Edge @ 1850 MHz

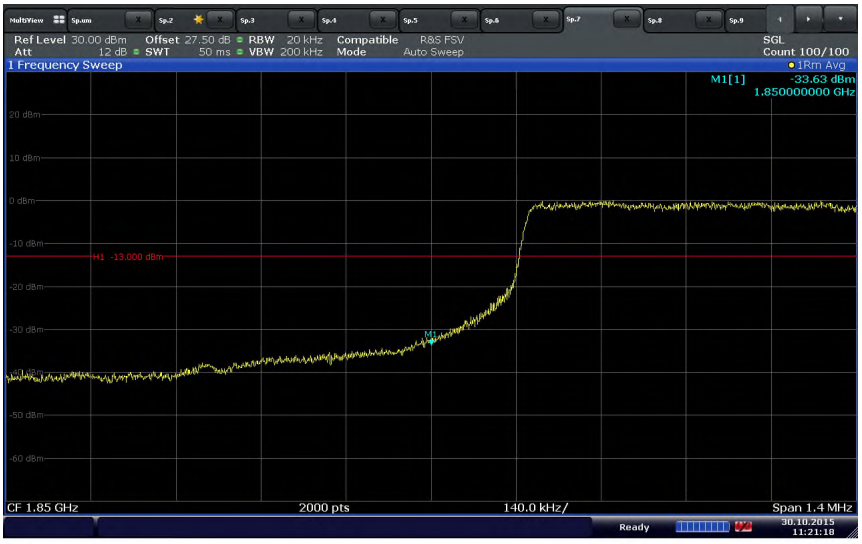
Date: 28.OCT.2015 14:33:06

WCDMA/High Channel (9538)/PCS Band 2 Band Edge @ 1910 MHz



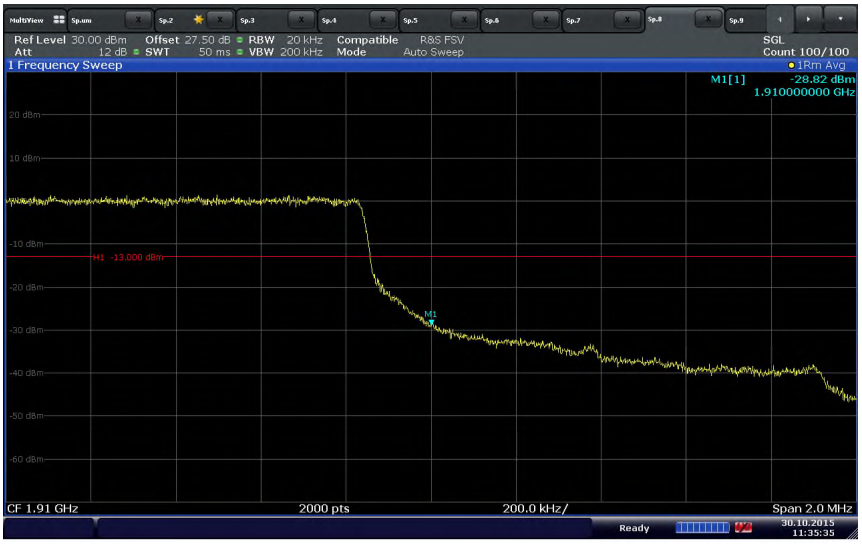
Date: 28.OCT.2015 14:47:38

LTE Band 2 (1.4 MHz BW)/QPSK/Low Channel (18607) Band Edge @ 1850 MHz



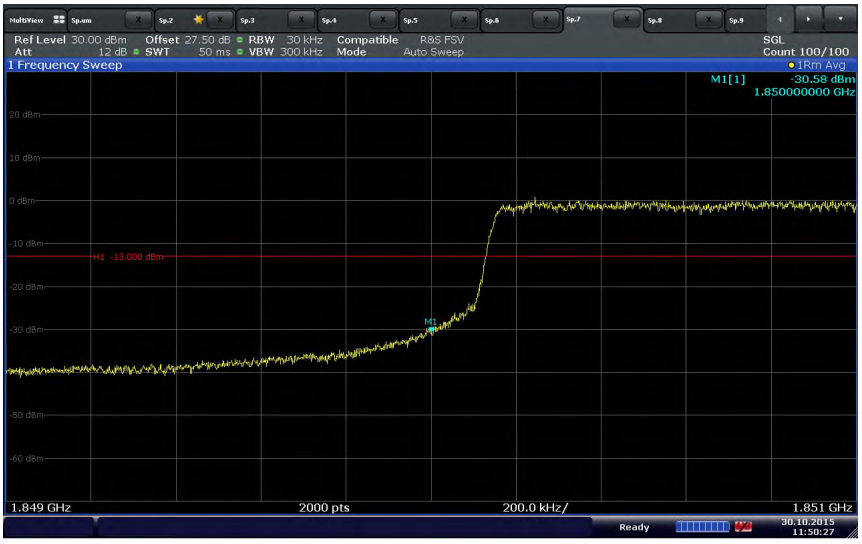
Date: 30.OCT.2015 11:21:18

LTE Band 2 (1.4 MHz BW)/QPSK/High Channel (19193) Band Edge @ 1910 MHz



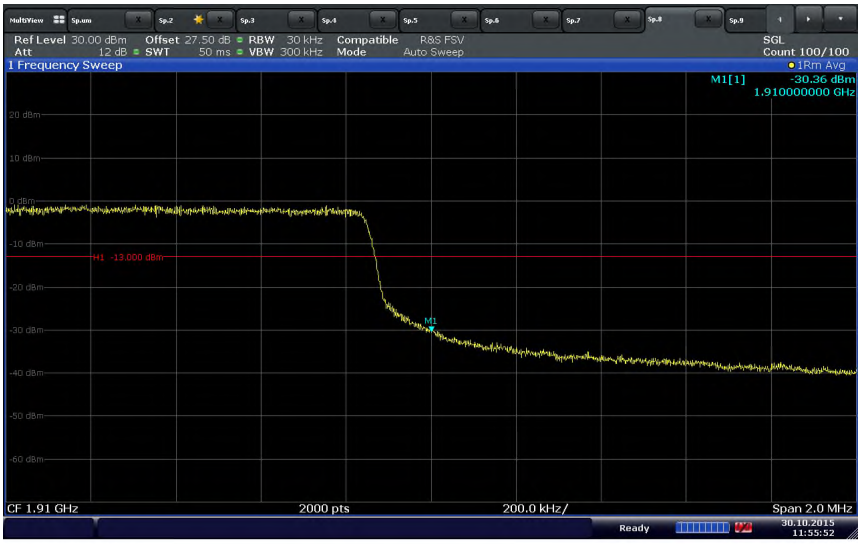
Date: 30.OCT.2015 11:35:34

LTE Band 2 (3 MHz BW)/QPSK/Low Channel (18615) Band Edge @ 1850 MHz



Date: 30.OCT.2015 11:50:27

LTE Band 2 (3 MHz BW)/QPSK/High Channel (19185) Band Edge @ 1910 MHz



Date: 30.OCT.2015 11:55:53

LTE Band 5 (1.4 MHz BW)/QPSK/Low Channel (20407) Band Edge @ 824 MHz

Date: 8.MAR.2016 13:00:31

LTE Band 5 (1.4 MHz BW)/QPSK/High Channel (20643) Band Edge @ 849 MHz

Date: 8.MAR.2016 12:59:27

LTE Band 5 (3 MHz BW)/QPSK/Low Channel (20415) Band Edge @ 824 MHz

Date: 8.MAR.2016 12:36:40

LTE Band 5 (3 MHz BW)/QPSK/High Channel (20635) Band Edge @ 849 MHz

Date: 8.MAR.2016 12:59:27

2.7 CONDUCTED SPURIOUS EMISSIONS

2.7.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1051
FCC 47 CFR Part 22, Clause 22.917(a)
FCC 47 CFR Part 24, Clause 24.238(a)
RSS-132, Clause 5.5
RSS-133, Clause 6.5

2.7.2 Standard Applicable

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 + 10log(P) dB.

2.7.3 Equipment Under Test and Modification State

Serial No: 442964 and CM0015 / Test Configuration A

2.7.4 Date of Test/Initial of test personnel who performed the test

October 28 and 29, 2015 and March 08, 2016 / XYZ

2.7.5 Test Equipment Used

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

2.7.6 Environmental Conditions/ Test Location

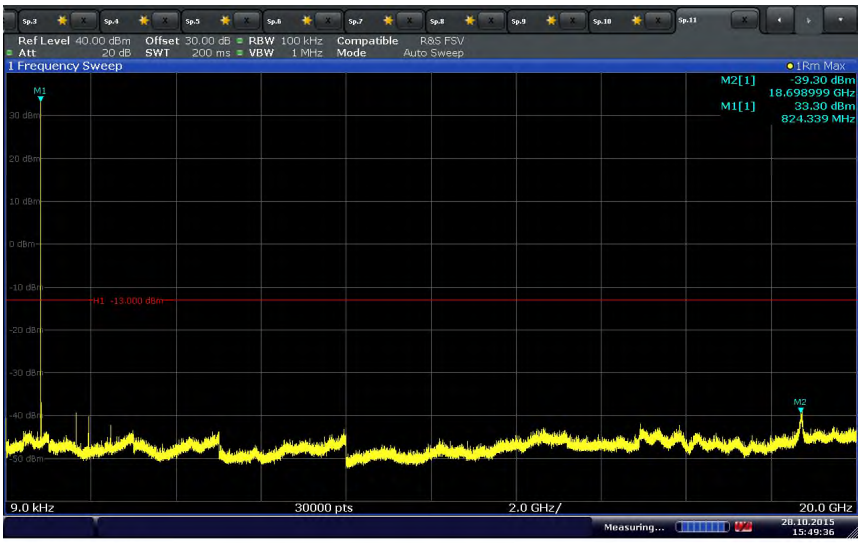
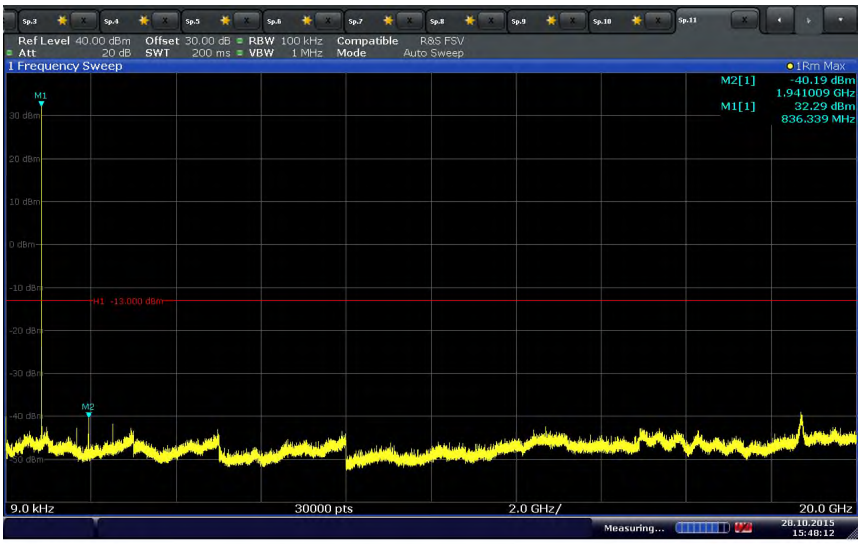
Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	23.4 - 25.7°C
Relative Humidity	45.7 - 41.5%
ATM Pressure	98.7 - 99.8 kPa

2.7.7 Additional Observations

- This is a conducted test.
- The spectrum was searched from 9 kHz to the 10th harmonic.
- The path loss was measured and entered as a level offset.
- For Cell Band GSM850, WCDMA Band 5, LTE B5, RBW was set to 100 kHz.
- For PCS Band GSM1900, WCDMA and LTE Band 2, RBW was set to 1MHz.
- Only worst case configuration for all technologies presented in this test report.

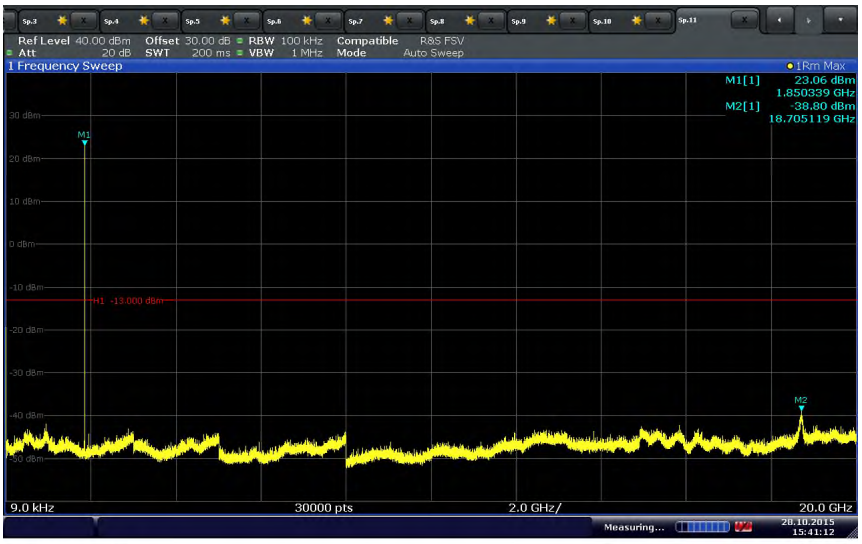
2.7.8 Test Results

GSM850/GPRS/Low Channel (128)/Cell BC0 @ 824.2 MHz
 Date: 28.OCT.2015 15:49:36
GSM850/GPRS/Mid Channel (190)/Cell BC0 @ 836.6 MHz
 Date: 28.OCT.2015 15:48:12

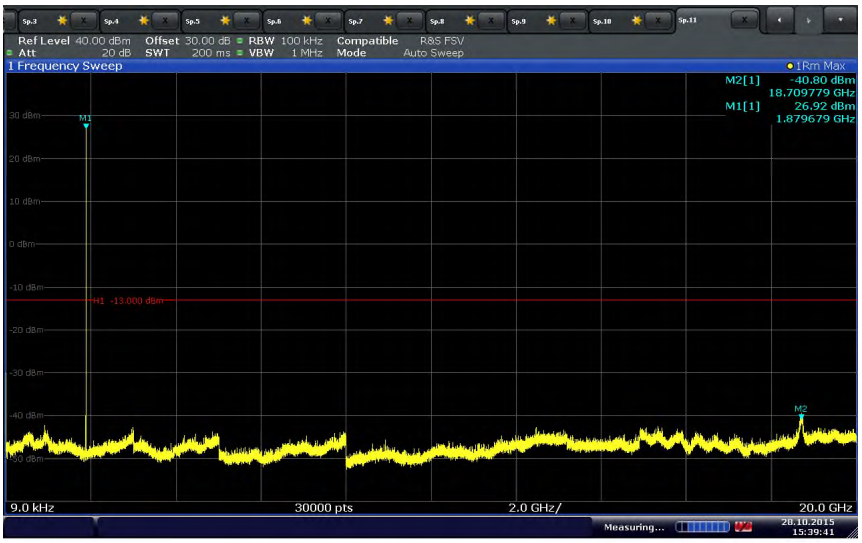
GSM850/GPRS/High Channel (251)/Cell BC0 @ 848.8 MHz

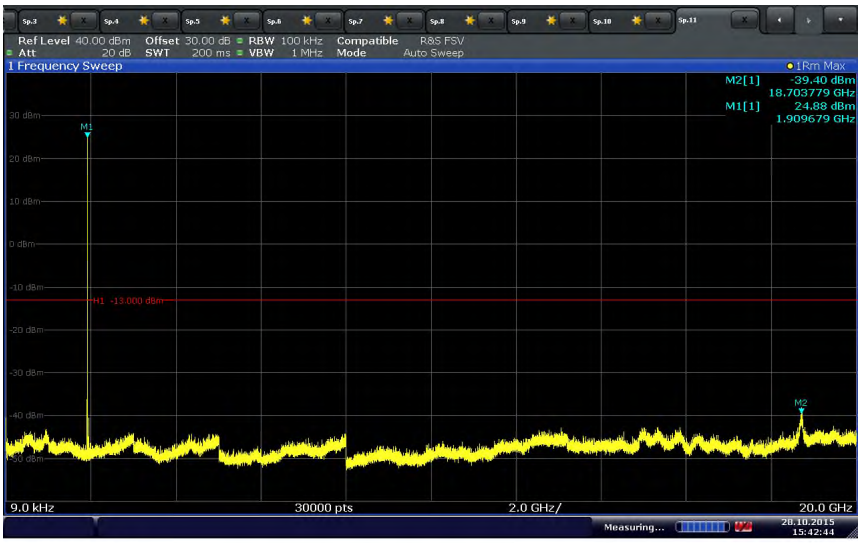
Date: 28.OCT.2015 15:46:36

GSM1900/GPRS/Low Channel (512)/PCS BC1 @ 1850.2 MHz



Date: 28.OCT.2015 15:41:12

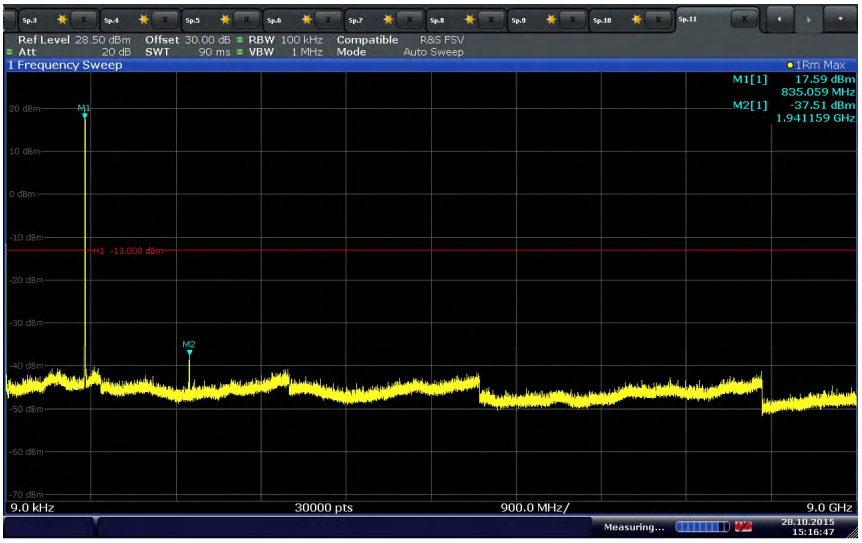
GSM1900/GPRS/Mid Channel (661)/PCS BC1 @ 1880.0 MHz
 Date: 28.OCT.2015 15:39:41

GSM1900/GPRS/High Channel (810)/PCS BC1 @ 1909.8 MHz
 Date: 28.OCT.2015 15:42:44

WCDMA/Low Channel (4132)/Cell Band 5 @ 826.4 MHz

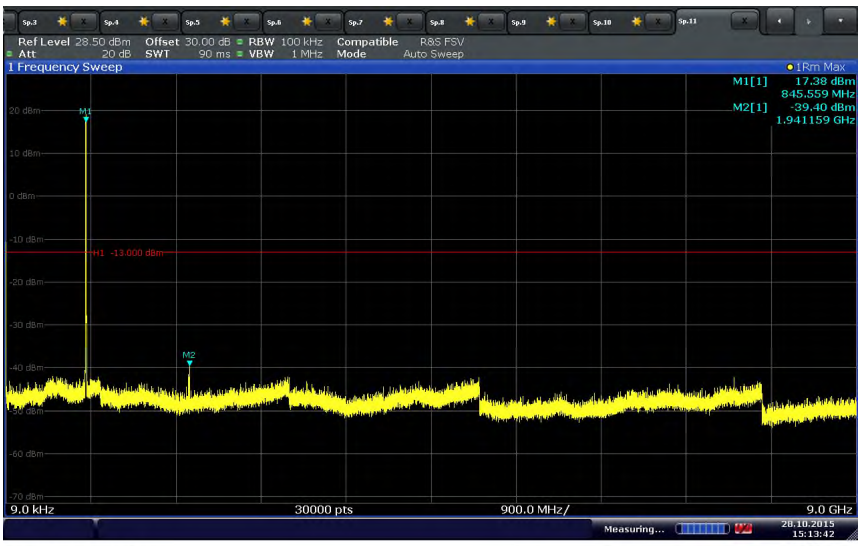
Date: 28.OCT.2015 15:25:40

WCDMA/Mid Channel (4183)/Cell Band 5 @ 836.6 MHz



Date: 28.OCT.2015 15:16:47

WCDMA/High Channel (4233)/Cell Band 5 @ 846.6 MHz

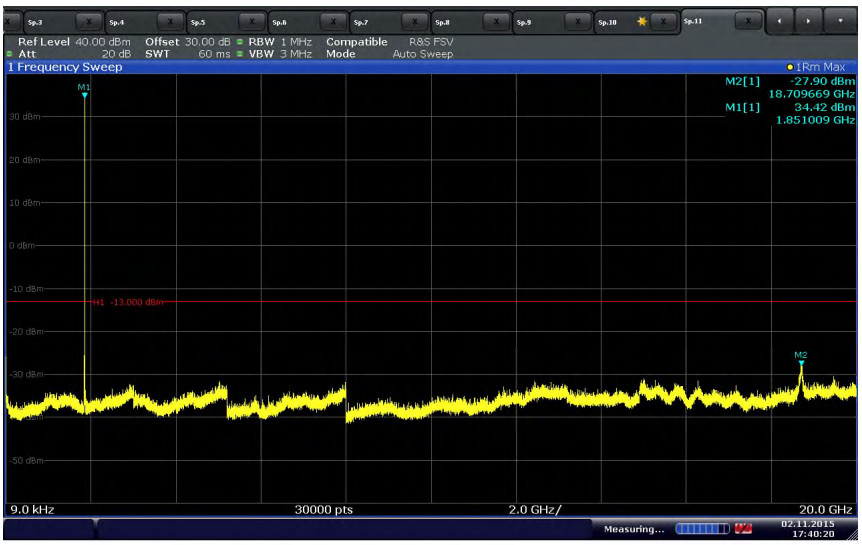


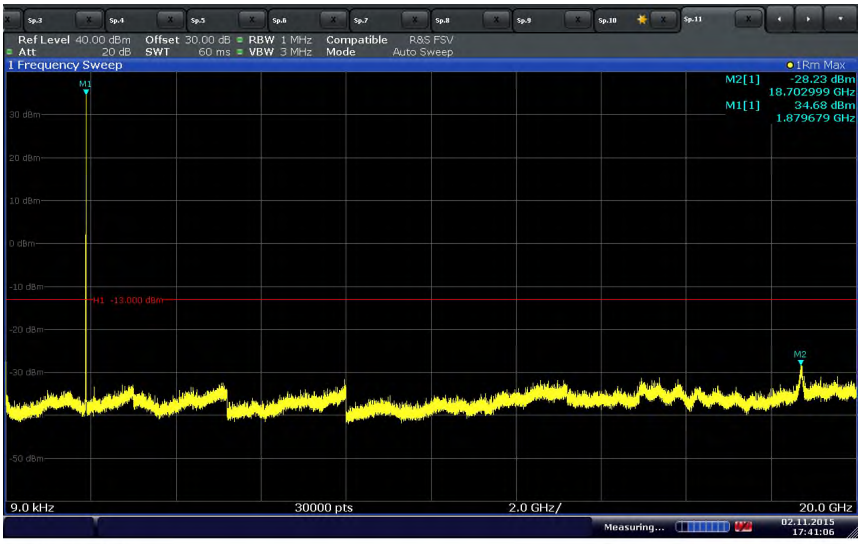
Date: 28.OCT.2015 15:13:42

WCDMA/Low Channel (9262)/PCS Band 2 @ 1852.4 MHz

Date: 28.OCT.2015 15:32:42

WCDMA/Mid Channel (9400)/PCS Band 2 @ 1880.0 MHz
 Date: 28.OCT.2015 15:29:50
WCDMA/High Channel (9538)/PCS Band 2 @ 1907.6 MHz
 Date: 28.OCT.2015 15:35:53

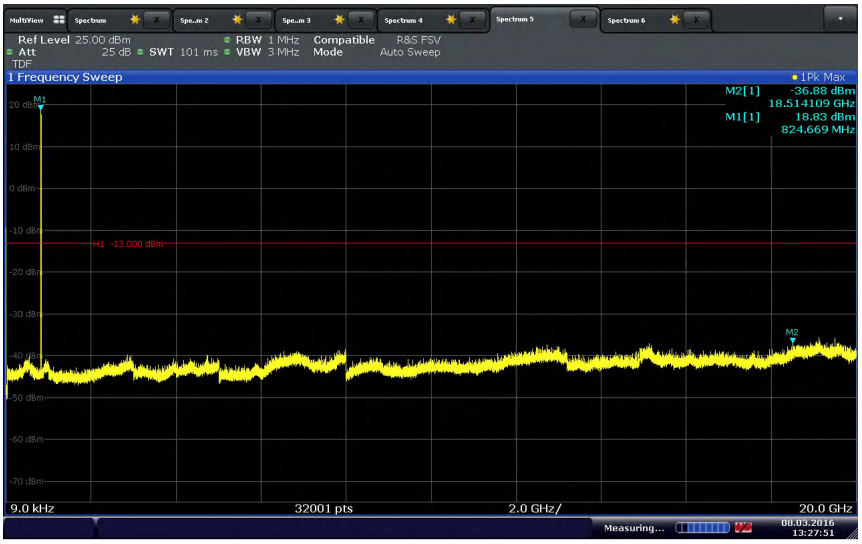
LTE Band 2 (1.4 MHz BW)/QPSK/Low Channel (18607) @ 1850.7 MHz
 Date: 2.NOV.2015 17:40:20

LTE Band 2 (1.4 MHz BW)/QPSK/Mid Channel (18900) @ 1880.0 MHz
 Date: 2.NOV.2015 17:41:06

LTE Band 2 (1.4 MHz BW)/QPSK/High Channel (19193) @ 1909.3 MHz

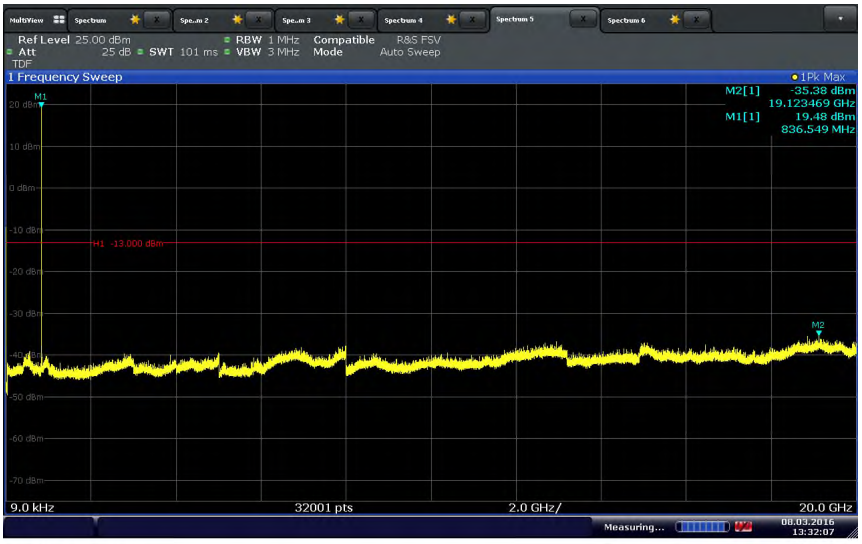
Date: 2.NOV.2015 17:42:15

LTE Band 5 (1.4 MHz BW)/QPSK/Low Channel (20407) @ 824.7 MHz



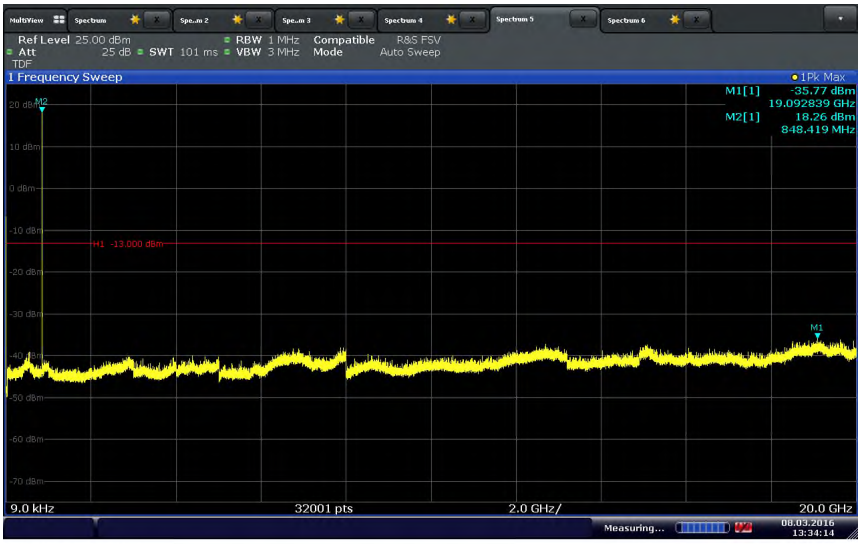
Date: 8.MAR.2016 13:27:51

LTE Band 5 (1.4 MHz BW)/QPSK/Mid Channel (20525) @ 836.5 MHz



Date: 8.MAR.2016 13:32:08

LTE Band 5 (1.4 MHz BW)/QPSK/High Channel (20643) @ 848.3 MHz



Date: 8.MAR.2016 13:34:14

2.8 FIELD STRENGTH OF SPURIOUS RADIATION

2.8.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1053
FCC 47 CFR Part 22, Clause 22.917(a)
FCC 47 CFR Part 24, Clause 24.238(a)
RSS-132, Clause 5.5
RSS-133, Clause 6.5

2.8.2 Standard Applicable

Out of band emissions. 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.

2.8.3 Equipment Under Test and Modification State

Serial No: 442964 and CM0015 / Test Configuration B

2.8.4 Date of Test/Initial of test personnel who performed the test

November 04 to 14 , 2015 and March 09, 2016 / XYZ

2.8.5 Test Equipment Used

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

2.8.6 Environmental Conditions/ Test Location

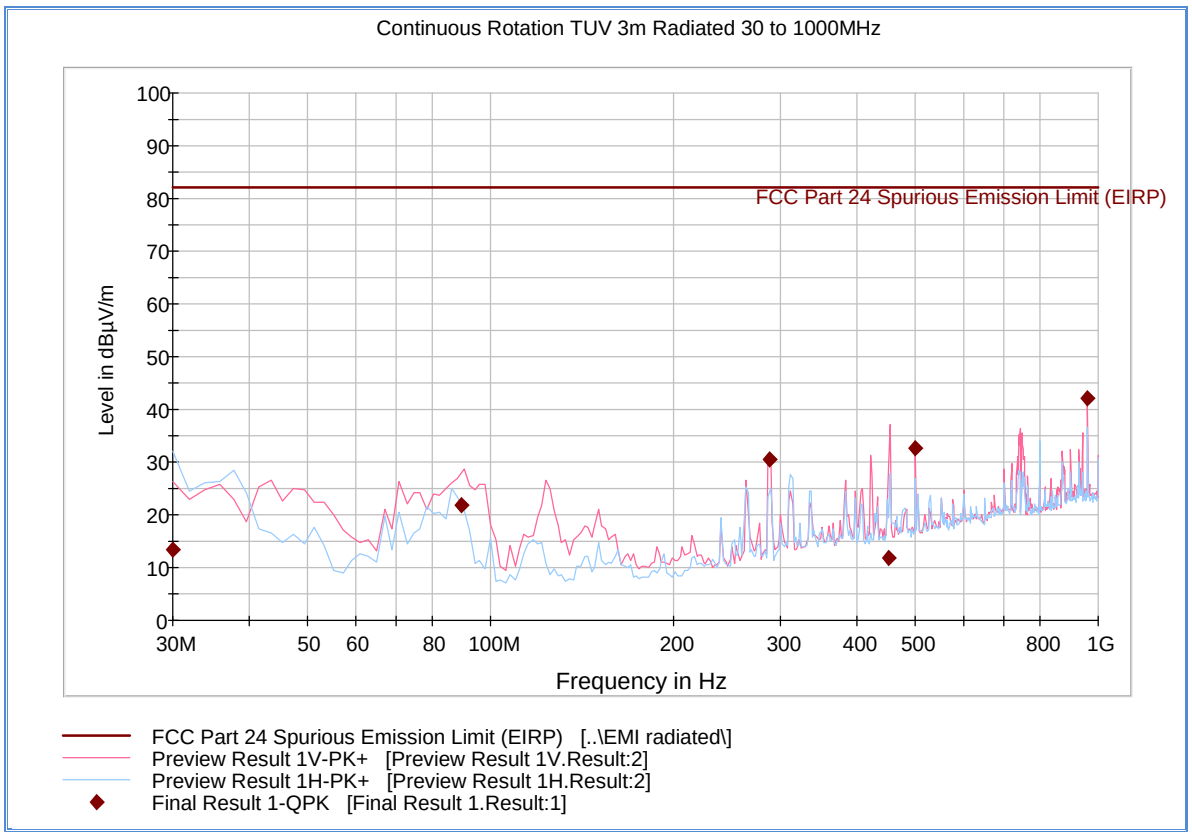
Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	23.1 - 24.6°C
Relative Humidity	34.12 - 37.8%
ATM Pressure	98.7 - 99.4 kPa

2.8.7 Additional Observations

- This is a radiated test using substitution method as per Unwanted Emissions: Radiated Spurious method of measurement of ANSI/TIA/EIA-603-C 2004, August 17, 2004.
- Only the worst case configuration presented in this test report.
- Only noise floor measurements observed above 18GHz.
- Measurement was done using EMC32 V8.52 automated software. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only.

2.8.8 Test Results Below 1GHz_Worst Case Configuration_WCDMA Band 2_High Channel (9538)

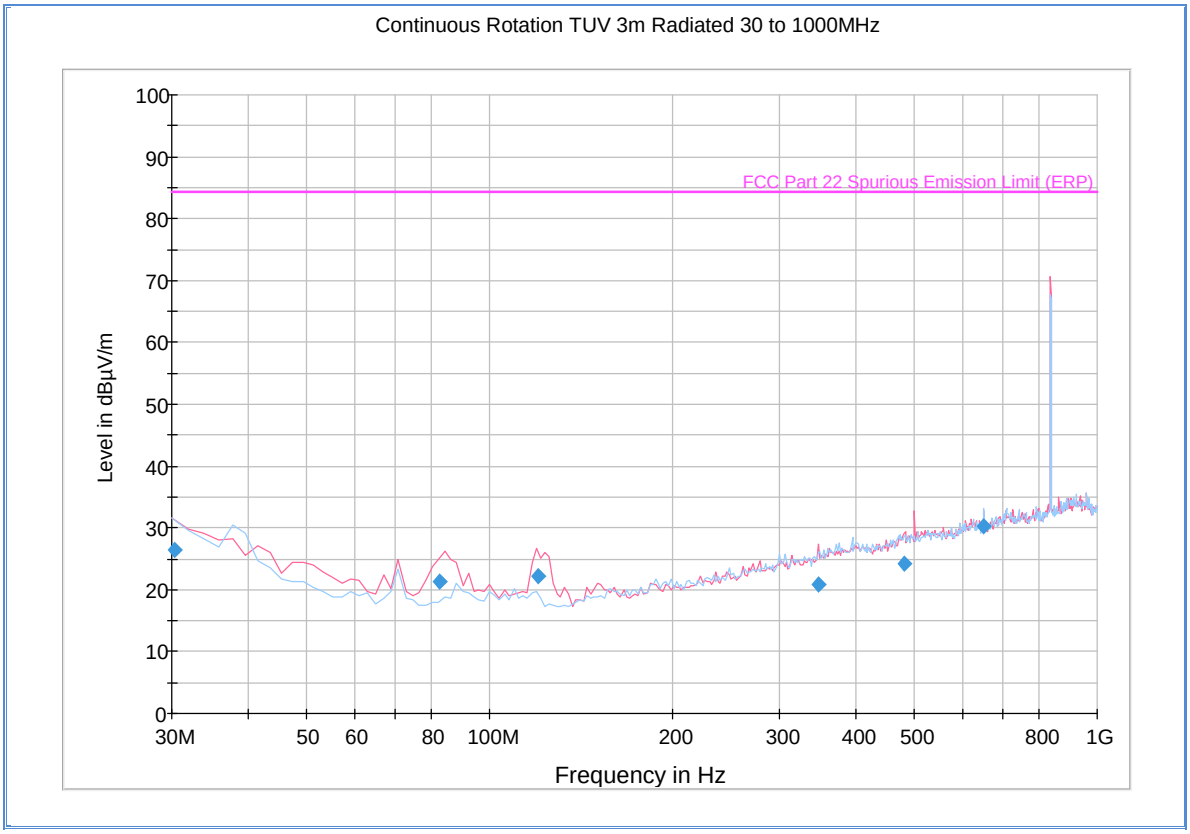


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
30.040000	13.5	1000.0	120.000	253.0	H	12.0	-11.6	68.8	82.2
89.460521	21.8	1000.0	120.000	100.0	V	4.0	-20.9	60.4	82.2
287.537074	30.5	1000.0	120.000	103.0	V	155.0	-13.4	51.7	82.2
452.727535	11.9	1000.0	120.000	219.0	V	331.0	-8.1	70.3	82.2
500.020842	32.6	1000.0	120.000	112.0	V	-2.0	-7.1	49.7	82.2
960.082244	42.0	1000.0	120.000	103.0	V	294.0	1.4	40.2	82.2

Test Notes: Only worst case presented for spurious emissions below 1GHz.

2.8.9 Test Results Below 1GHz_Worst Case Configuration_LTE Band 5_1.4MHz Bandwidth_Middle Channel (20525)

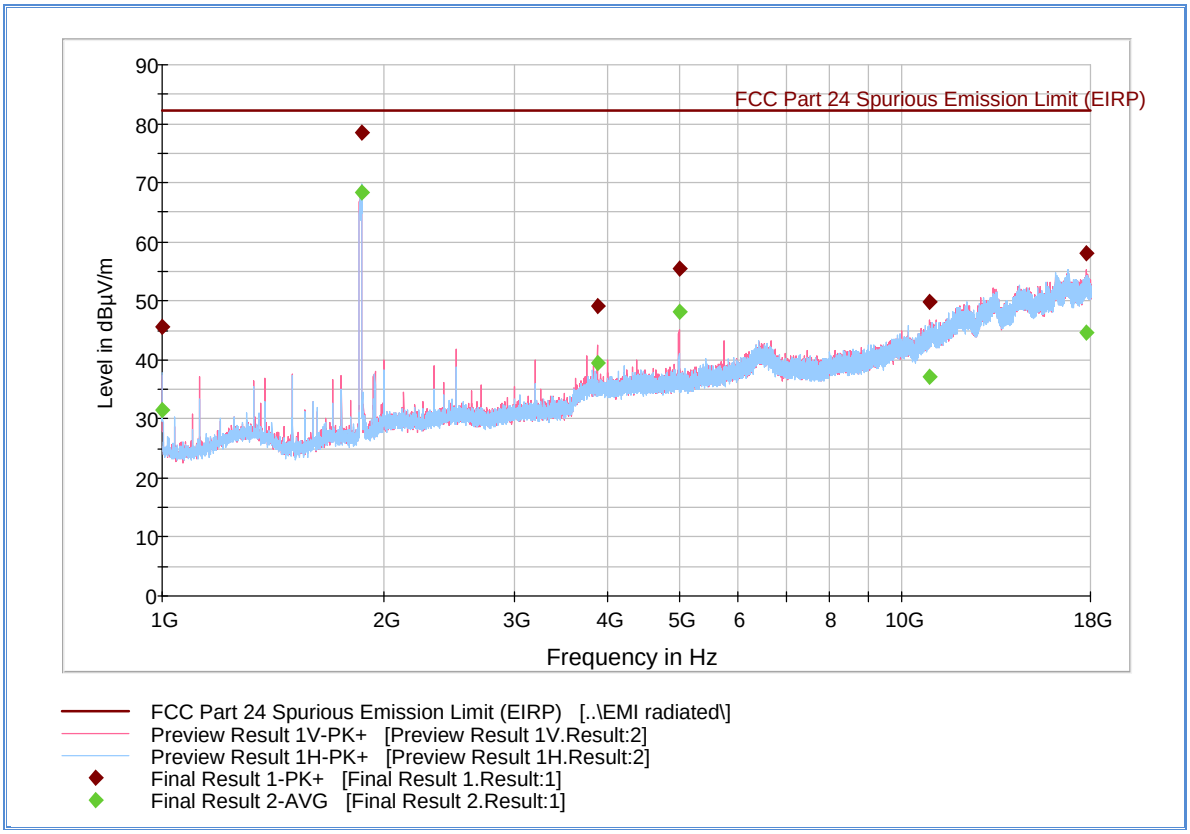


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
30.360000	26.4	1000.0	120.000	100.0	V	19.0	-5.7	58.0	84.4
82.668858	21.3	1000.0	120.000	100.0	V	13.0	-16.1	63.0	84.4
120.018838	22.2	1000.0	120.000	100.0	V	15.0	-15.1	62.2	84.4
346.773707	20.9	1000.0	120.000	314.0	V	-8.0	-5.5	63.5	84.4
481.565852	24.3	1000.0	120.000	140.0	V	55.0	-1.4	60.1	84.4
650.020200	30.2	1000.0	120.000	100.0	H	128.0	1.3	54.2	84.4

Test Notes: Only worst case for LTE B5 presented for spurious emissions below 1GHz.

2.8.10 Test Results Above 1GHz_Worst Case Configuration_LTE B2_QPSK_15MHz OBW_Low Channel (18675)



Peak Data

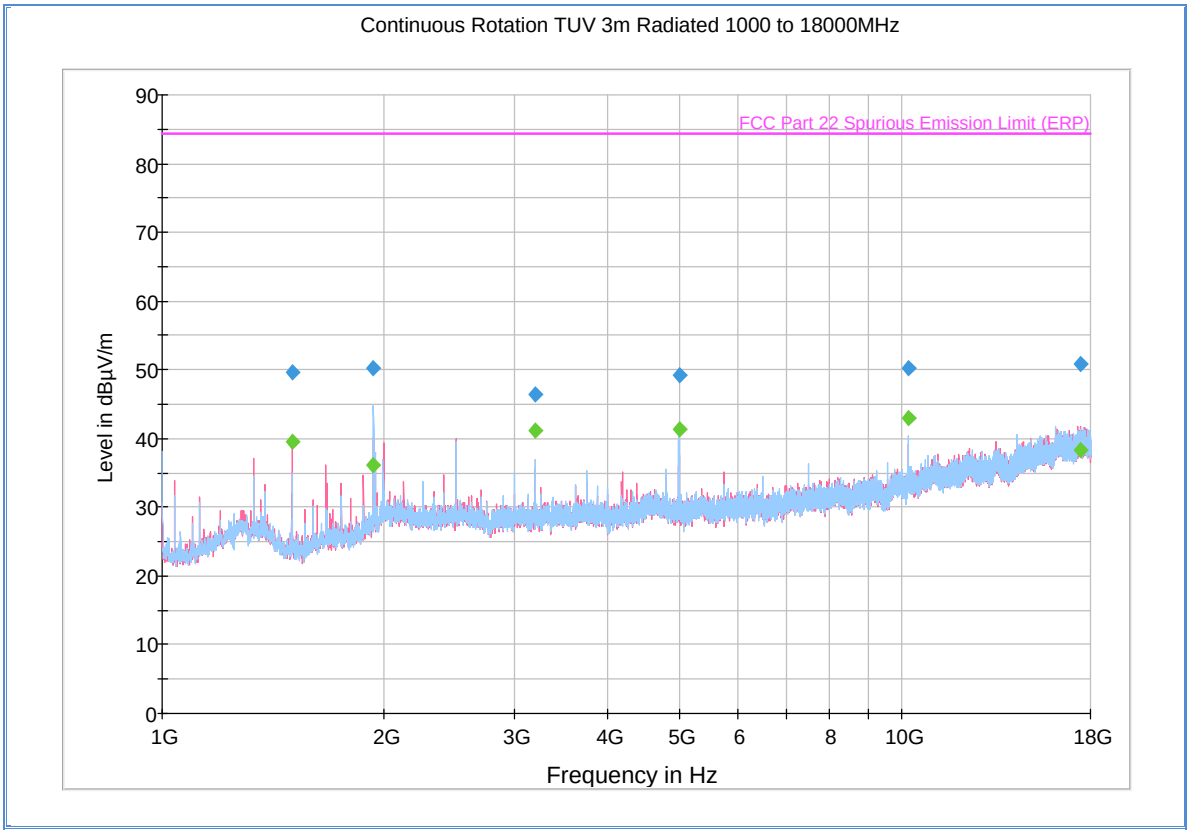
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.400000	45.7	1000.0	1000.000	237.4	H	123.0	-7.2	36.6	82.2
1863.600000	78.4	1000.0	1000.000	215.5	H	308.0	-3.0	3.8	82.2
3874.900000	49.2	1000.0	1000.000	99.7	V	-2.0	5.1	33.1	82.2
4999.900000	55.5	1000.0	1000.000	144.7	V	335.0	6.6	26.7	82.2
10922.13333	49.8	1000.0	1000.000	405.6	V	226.0	15.2	32.5	82.2
17769.33333	58.1	1000.0	1000.000	278.3	V	259.0	24.0	24.1	82.2

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.400000	31.4	1000.0	1000.000	237.4	H	123.0	-7.2	50.8	82.2
1863.600000	68.5	1000.0	1000.000	215.5	H	308.0	-3.0	13.7	82.2
3874.900000	39.4	1000.0	1000.000	99.7	V	-2.0	5.1	42.8	82.2
4999.900000	48.2	1000.0	1000.000	144.7	V	335.0	6.6	34.0	82.2
10922.13333	37.2	1000.0	1000.000	405.6	V	226.0	15.2	45.0	82.2
17769.33333	44.6	1000.0	1000.000	278.3	V	259.0	24.0	37.6	82.2

Test Notes: Only worst case modulation/bandwidth presented for spurious emissions above 1GHz.

2.8.11 Test Results Above 1GHz_Worst Case Configuration_LTE B5_QPSK_1.4MHz OBW_Middle Channel (20525)



Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1500.000000	49.7	1000.0	1000.000	219.4	V	179.0	-6.3	34.7	84.4
1932.366667	50.3	1000.0	1000.000	344.1	H	69.0	-1.6	34.1	84.4
3200.000000	46.4	1000.0	1000.000	174.6	H	71.0	0.2	37.9	84.4
5000.300000	49.3	1000.0	1000.000	189.5	H	100.0	2.8	35.1	84.4
10200.03333	50.2	1000.0	1000.000	181.6	H	45.0	9.9	34.2	84.4
17476.96666	50.8	1000.0	1000.000	132.7	V	-16.0	18.0	33.6	84.4

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1500.000000	39.6	1000.0	1000.000	219.4	V	179.0	-6.3	44.8	84.4
1932.366667	36.0	1000.0	1000.000	344.1	H	69.0	-1.6	48.4	84.4
3200.000000	41.1	1000.0	1000.000	174.6	H	71.0	0.2	43.2	84.4
5000.300000	41.4	1000.0	1000.000	189.5	H	100.0	2.8	43.0	84.4
10200.03333	43.0	1000.0	1000.000	181.6	H	45.0	9.9	41.4	84.4
17476.96666	38.3	1000.0	1000.000	132.7	V	-16.0	18.0	46.1	84.4

Test Notes: Only worst case modulation/bandwidth for LTE B5 presented for spurious emissions above 1GHz.

2.9 FREQUENCY STABILITY

2.9.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1055
FCC 47 CFR Part 22, Clause 22.355
FCC 47 CFR Part 24, Clause 24.235
RSS-132, Clause 5.3
RSS-133, Clause 6.3

2.9.2 Standard Applicable

FCC:
Part 22, Clause 22.355: Except as otherwise provided in this part, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table C–1 of this section.

Table C–1—Frequency Tolerance for Transmitters in the Public Mobile Services

Frequency range (MHz)	Mobile ≤3 watts (ppm)
821 to 896	2.5

Part 24, Clause 24.235: The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

IC:
RSS-132 Clause 5.3: The carrier frequency shall not depart from the reference frequency in excess of ±2.5 ppm for mobile stations.
RSS-133 Clasue 6.3: The carrier frequency shall not depart from the reference frequency, in excess of ±2.5 ppm for mobile stations.

2.9.3 Equipment Under Test and Modification State

Serial No: 442964 and CM0015 / Test Configuration A

2.9.4 Date of Test/Initial of test personnel who performed the test

November 02, 2015 and March 08, 2016 / XYZ

2.9.5 Test Equipment Used

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

2.9.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	23.2 - 23.7°C
Relative Humidity	37.1 - 45.7%
ATM Pressure	98.5 - 98.9kPa

2.9.7 Additional Observations

- This is a conducted test. The EUT was operated at 28VDC nominal voltage and was placed in the temperature chamber for this evaluation. The EUT was controlled by a CMW500 and the maximum frequency error was monitored through the Wideband Radio Communication Tester Frequency Error measurement function under Tx Measurement and verified by the spectrum analyzer.
- The EUT was tested over the temperature -30°C to +50°C in 10°C steps and allowed to sit for 1 hour to allow the equipment and chamber temperature to stabilize. The measurements were then performed.
- Voltage variation was also performed at 85% and 115% of the nominal voltage at 20°C.

2.9.8 Test Results

GSM850 (GPRS) Cell Band Mid Channel 190 @836.6 MHz		
Voltage (VDC)	***Temperature (°C)***	***Frequency Deviation (Hz/ppm)***
28.0	-30	13.20 / 0.016
	-20	14.43 / 0.017
	-10	9.27 / 0.011
	0	10.94 / 0.013
	+10	-12.20 / 0.015
	+20	11.82 / 0.014
	+30	-21.11 / 0.025
	+40	12.14 / 0.015
	+50	14.21 / 0.017

GSM850 (GPRS) Cell Band Mid Channel 190 @836.6 MHz		
Temperature (°C)	***Voltage (VDC)***	***Frequency Deviation (Hz/ppm)***
20	23.8	12.98 / 0.016
	32.2	13.11 / 0.016

GSM1900 (GPRS) PCS Band Mid Channel 661 @1880.0 MHz		
Voltage (VDC)	***Temperature (°C)***	***Frequency Deviation (Hz/ppm)***
28.0	-30	-65.83 / 0.037
	-20	-20.76 / 0.012
	-10	-19.73 / 0.011
	0	-20.99 / 0.012
	+10	-28.12 / 0.016
	+20	-22.73 / 0.013
	+30	-38.10 / 0.021
	+40	-20.11 / 0.011
	+50	-20.89 / 0.012

GSM1900 (GPRS) PCS Band Mid Channel 661 @1880.0 MHz		
Temperature (°C)	***Voltage (VDC)***	***Frequency Deviation (Hz/ppm)***
20	23.8	-24.73 / 0.014
	32.2	-24.60 / 0.014

WCDMA (3GPP Release Version 99) Band 5 Mid Channel 4183 @836.6 MHz		
Voltage (VDC)	***Temperature (°C)***	***Frequency Deviation (Hz/ppm)***
28.0	-30	-1.70 / 0.002
	-20	-2.37 / 0.003
	-10	2.24 / 0.003
	0	2.98 / 0.004
	+10	-2.93 / 0.004
	+20	-3.18 / 0.004
	+30	2.30 / 0.003
	+40	2.42 / 0.003
	+50	-2.83 / 0.003

WCDMA (3GPP Release Version 99) Band 5 Mid Channel 4183 @836.6 MHz		
Temperature (°C)	***Voltage (VDC)***	***Frequency Deviation (Hz/ppm)***
20	23.8	1.80 / 0.002
	32.2	-2.67 / 0.003

WCDMA (3GPP Release Version 99) Band 2 Mid Channel 9400 @1880.0 MHz		
Voltage (VDC)	***Temperature (°C)***	***Frequency Deviation (Hz/ppm)***
28.0	-30	-9.16 / 0.005
	-20	-10.96 / 0.006
	-10	-12.75 / 0.007
	0	-12.60 / 0.007
	+10	-7.40 / 0.004
	+20	-11.47 / 0.006
	+30	-12.2 / 0.006
	+40	-9.78 / 0.005
	+50	-9.40 / 0.005

WCDMA (3GPP Release Version 99) Band 2 Mid Channel 9400 @1880.0 MHz		
Temperature (°C)	***Voltage (VDC)***	***Frequency Deviation (Hz/ppm)***
20	23.8	-12.42 / 0.007
	32.2	-11.70 / 0.006

LTE Band 2–QPSK – 5MHz BW-Mid Channel 18900 @1880.0 MHz		
Voltage (VDC)	***Temperature (°C)***	***Frequency Deviation (Hz/ppm)***
28.0	-30	-12.17 / 0.006
	-20	-20.41 / 0.011
	-10	-24.50 / 0.013
	0	-19.24 / 0.010
	+10	-20.33 / 0.011
	+20	-21.62 / 0.006
	+30	-20.86 / 0.011
	+40	-26.88 / 0.014
	+50	-22.70 / 0.012

LTE Band 2–QPSK – 5MHz BW-Mid Channel 18900 @1880.0 MHz		
Temperature (°C)	***Voltage (VDC)***	***Frequency Deviation (Hz/ppm)***
20	23.8	-22.17 / 0.012
	32.2	-27.34 / 0.015

LTE Band 5–QPSK – 5MHz BW-Mid Channel 20525 @836.5 MHz		
Voltage (VDC)	***Temperature (°C)***	***Frequency Deviation (Hz/ppm)***
28.0	-30	5.38 / 0.006
	-20	6.01 / 0.007
	-10	-5.24 / 0.006
	0	5.21 / 0.006
	+10	-5.11 / 0.006
	+20	-6.29 / 0.007
	+30	6.52 / 0.008
	+40	7.31 / 0.009
	+50	-5.54 / 0.007

LTE Band 5–QPSK – 5MHz BW-Mid Channel 20525 @836.5 MHz		
Temperature (°C)	***Voltage (VDC)***	***Frequency Deviation (Hz/ppm)***
20	23.8	5.22 / 0.006
	32.2	5.24 / 0.006

SECTION 3

TEST EQUIPMENT USED

3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

ID Number (SDGE/SDRB)	Test Equipment	Type	Serial Number	Manufacturer	Cal Date	Cal Due Date
Conducted Port Setup						
7582	Signal/Spectrum Analyzer	FSW26	101614	Rhode & Schwarz	10/05/15	10/05/16
7604	P-Series Power Meter	N1911A	SG45100273	Agilent	05/27/15	05/27/16
7605	50MHz-18GHz Wideband Power Sensor	N1921A	MY51100054	Agilent	04/10/15	04/10/16
7608	Vector Signal Generator	SMBV100A	259021	Rhode & Schwarz	07/29/15	07/29/16
7562	Wideband Radio Communication Tester	CMW 500	1201.0002k50 /103829	Rhode & Schwarz	For signaling purpose and verified by 7582	
-	Power Divider/Splitter	1506A	RR003	Weinschel	Verified by 7604 and 7608	
8825	20dB Attenuator	46-20-34	BK5773	Weinschel Corp.	Verified by 7604 and 7608	
8773	10dB Attenuator	606-10-1F4/DR	-	Meca	Verified by 7604 and 7608	
Radiated Test Setup						
1033	Bilog Antenna	3142C	00044556	EMCO	09/25/15	09/25/16
1040	EMI Test Receiver	ESIB40	100292	Rhode & Schwarz	09/29/15	09/29/16
1016	Pre-amplifier	PAM-0202	187	PAM	12/15/15	12/15/16
7575	Double-ridged waveguide horn antenna	3117	155511	EMCO	04/27/15	04/27/16
1049	EMI Test Receiver	ESU 40	100133	Rhode & Schwarz	03/11/14	03/11/16
8628	Pre-amplifier	QLJ 01182835-JO	8986002	QuinStar Technologies Inc.	03/20/15	03/20/16
7562	Wideband Radio Communication Tester	CMW 500	1201.0002k50 /103829	Rhode & Schwarz	NCR (for signalling purpose only)	
8806	1800 to 2000 Notch	BRM50707	005	Micro-Tronics	-	
Miscellaneous						
	Test Software	EMC32	V8.53	Rhode & Schwarz	N/A	
1072	DC Power Supply	E3610A	KR51311519	Hewlett Packard	Verified by 6792	
6792	Multimeter	3478A	2911A70964	Hewlett Packard	08/14/15	08/14/16
7579	Temperature Chamber	115	151617	TestQuity	08/14/15	08/14/16
7560	Barometer/Temperature/Humidity Transmitter	iBTHX-W	1240476	Omega	10/19/15	10/19/16

3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:

3.2.1 Radiated Measurements (Below 1GHz)

	Contribution	Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.45	0.26	0.07
2	Cables	Rectangular	0.50	0.29	0.08
3	Preamp	Rectangular	0.50	0.29	0.08
4	Antenna	Rectangular	0.75	0.43	0.19
5	Site	Rectangular	2.70	1.56	2.43
6	EUT Setup	Rectangular	1.00	0.58	0.33
				Combined Uncertainty (u_c):	1.78
				Coverage Factor (k):	2
				Expanded Uncertainty:	3.57

3.2.2 Radiated Emission Measurements (Above 1GHz)

	Contribution	Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.57	0.33	0.11
2	Cables	Rectangular	0.70	0.40	0.16
3	Preamp	Rectangular	0.50	0.29	0.08
4	Antenna	Rectangular	0.37	0.21	0.05
5	Site	Rectangular	2.70	1.56	2.43
6	EUT Setup	Rectangular	1.00	0.58	0.33
				Combined Uncertainty (u_c):	1.78
				Coverage Factor (k):	2
				Expanded Uncertainty:	3.56

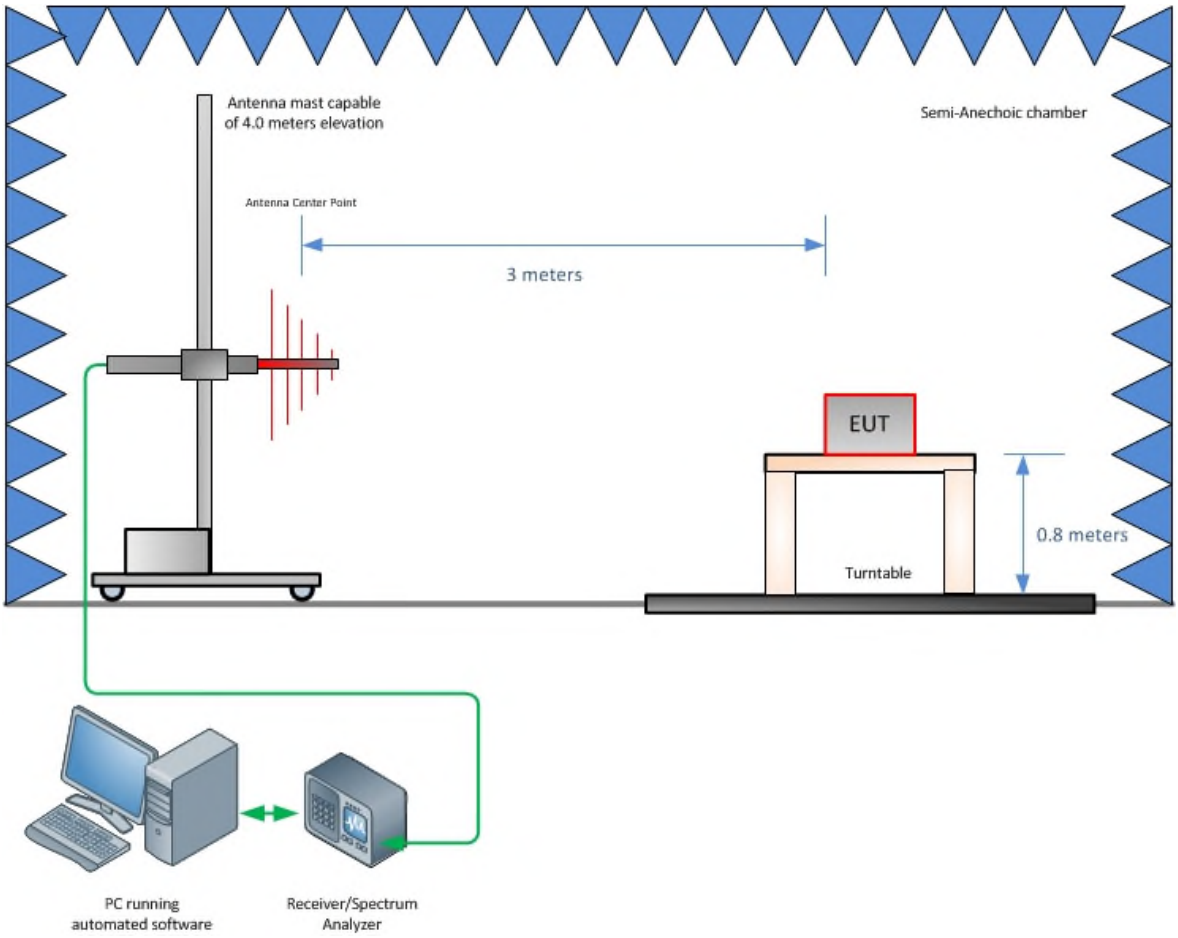
3.2.3 Conducted Antenna Port Measurement

	Contribution	Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.57	0.33	0.11
2	Cables	Rectangular	0.50	0.29	0.08
3	EUT Setup	Rectangular	1.00	0.58	0.33
				Combined Uncertainty (u_c):	0.72
				Coverage Factor (k):	2
				Expanded Uncertainty:	1.45

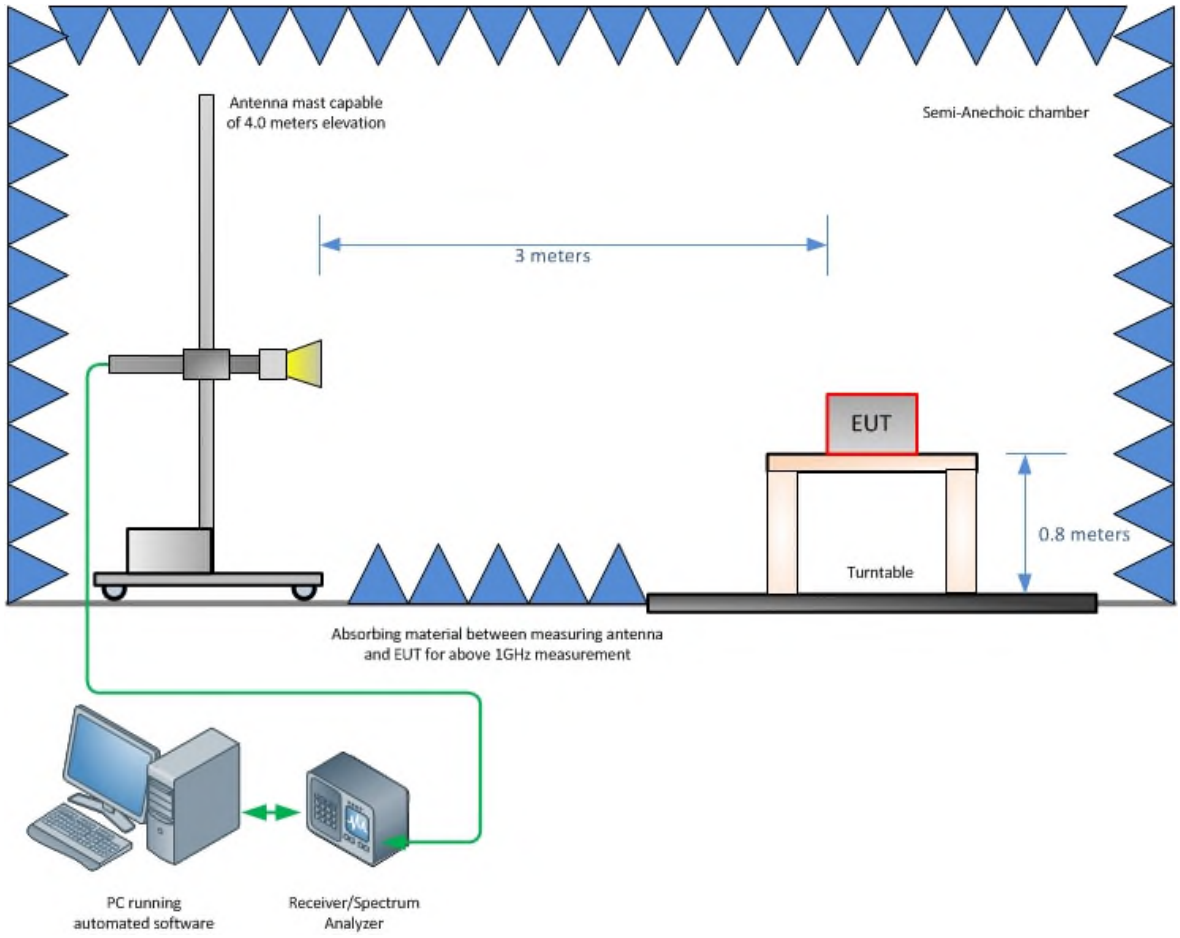
SECTION 4

DIAGRAM OF TEST SETUP

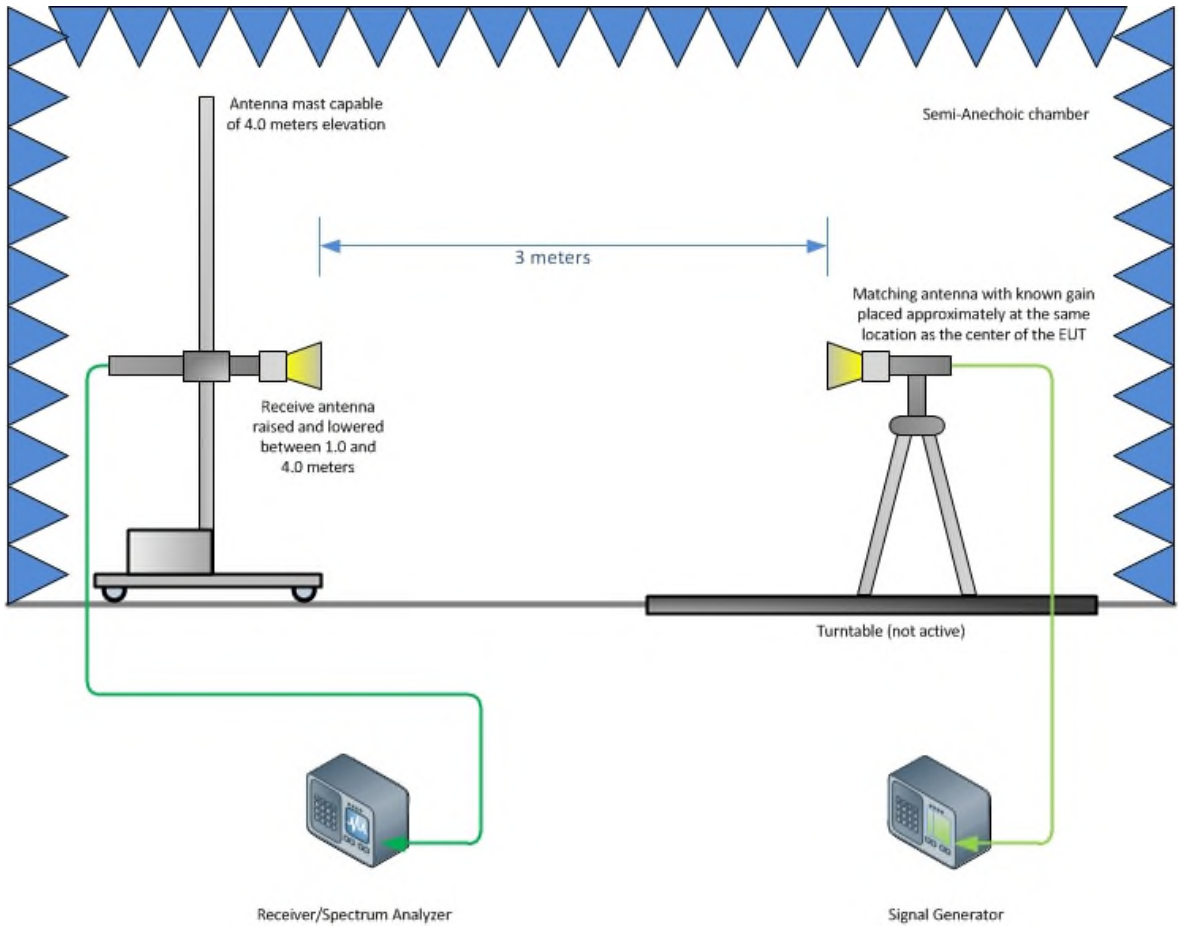
4.1 TEST SETUP DIAGRAM



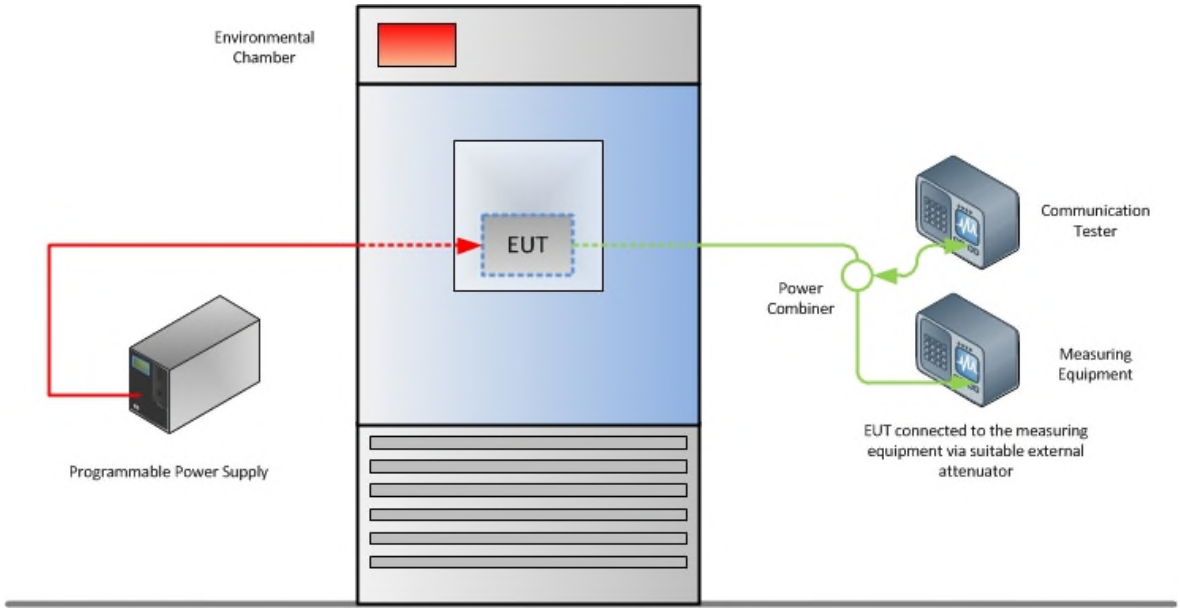
Radiated Emission Test Setup (Below 1GHz)



Radiated Emission Test Setup (Above 1GHz)



Substitution Test Method (Above 1GHz)



Frequency Stability Test Comfiguration

SECTION 5

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