(GSM / UMTS)
FCC / IC Test Report

FOR:

Intel Corporation

Model Name: EP110

Product Description: Smartphone with GSM/GPRS/EDGE, UMTS/HSPA+/LTE, Wi-Fi, BT and GPS Radios

FCC ID: O2Z-EP110
IC ID: 1000W – EP110

47 CFR Part 2, 22, 24, 27

RSS-GEN Issue 4, RSS-132 Issue 3, RSS-133 Issue 6, RSS-139 Issue 2

TEST REPORT #: EMC_INTEL_039_14001_FCC22_24_27_WWAN

DATE: 2014-12-15

FCC:
A2LA Accredited

IC recognized #
3462E

***CETECOM* Inc.**
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CETECOM Inc. is a Delaware Corporation with Corporation number: 2113686

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1 Assessment

The following device was evaluated against the applicable criteria specified in FCC rules parts 2, 22, 24 and 27 of Title 47 of the Code of Federal Regulations and Industry Canada Standards RSS-Gen, RSS-132, RSS-133 and RSS -139.
No deviations were ascertained.

Company	Description	Model #
Intel Corporation	Smartphone with GSM/GPRS/EDGE, UMTS/HSPA+/LTE, Wi-Fi, BT and GPS Radios	EP110

Responsible for Testing Laboratory:

Date	Section	Name	Signature
2014-12-15	Compliance	Milton Deleon (Lab Manager)	Milton Ponce de Leon Digitally signed by Milton Ponce de Leon DN: cn=Milton Ponce de Leon, c=US, o=Cetecom Inc., ou=OTA, email=milton.deleon@cetecom.com Date: 2014.12.15 15:23:44 -08'00'

Responsible for the Report:

Date	Section	Name	Signature
2014-12-15	Compliance	Muhammad Umair Anees (EMC Engineer)	Muhammad Umair Anees Digitally signed by Muhammad Umair Anees DN: cn=Muhammad Umair Anees, c=US, o=EMC, ou=Compliance, email=Muhammad.Anees@cetecom.com Date: 2014.12.15 15:11:36 -08'00'

The test results of this test report relate exclusively to the test item specified in Section3.
CETECOM Inc. USA does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CETECOM Inc. USA.

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Address:	6370 Nancy Ridge Drive #101 San Diego, CA 92121 U.S.A.
Telephone:	+1 (858) 362-2400
Fax:	+1 (858) 587-4809
Compliance Manager:	Milton Deleon
Responsible Project Leader:	Muhammad Anees

2.2 Identification of the Client

Applicant's Name:	Intel Corporation
Street Address:	2200 Mission College Blvd
City/Zip Code	Santa Clara / 95054
Country	USA
Contact Person:	Christine Ryan
Phone No.	408 300 2167
Fax:	408-765-2336
e-mail:	Christine.m.ryan@intel.com

2.3 Identification of the Manufacturer

Manufacturer's Name:	Same as client.
Manufacturers Address:	
City/Zip Code	
Country	

3 Equipment under Test (EUT)

3.1 Specification of the Equipment under Test

Marketing Name:	Intel 4.7-inch Smartphone
Model Number:	EP110
FCC-ID :	O2Z-EP110
IC ID:	1000W-EP110
Product Description:	Smartphone with GSM/GPRS/EDGE, UMTS/HSPA+/LTE, Wi-Fi, BT and GPS Radios
Technology / Type(s) of Modulation:	Intel XMM 7260 Radio Module: GSM 850/900/1800/1900MHz GPRS / EDGE multi-slot class 33 operation modulation: GSM&GPRS&EDGE(MCS-1-4): GMSK; EDGE&EPGRS(MCS-5-8): 8PSK; WCDMA / HSPA+ 850/900/1700/1900/2100 MHz HSDPA Category 14 data rate - 21 Mbps; HSUPA Category 6 data rate - 5.76 Mbps; LTE 700/800/850/1700/1900/2500 modulation: all QPSK, QAM (EMC testing of the LTE portion is documented in a separate test report)
Operating Frequency Ranges (MHz) / Channels (for US/CAN bands only):	GSM 850: 824.2-848.8; 125 channels GSM 1900: 1850.2-1909.8; 300 channels FDD II: 826.4 - 846.6; 278 channels FDD IV: 1712.4 -1752.5; 203 channels FDD V: 1852.4 -1907.6; 103 channels
Antenna Information as declared:	Internal Monopole, 850MHz: 1.64 dBi 1900MHz: -0.73 dBi 1700 MHz: -0.87 dBi
Power Supply/ Rated Operating Voltage Range:	AA lithium battery pack (dedicated) Vmin: 3.6V dc/ Vnom: 3.8V dc / Vmax: 4.2V dc
Rated Operating Temperature Range:	–10°C ~ +55°C
Test Sample Status:	Prototype
Other Radios included in the device:	Wi-Fi (2.4 GHz and 5GHz), BT Basic/EDR and BT LE (2.4 GHz), GPS 1575.42 MHz

3.2 Identification of the Equipment under Test (EUT)

EUT #	Serial Number	Sample	HW/SW Version
1	INV141400226	Radiated/Conducted	PR2 Vol D/4.4.4 KTU84P main engineering 53181-dev-keys
2	INV141400717	Radiated/Conducted	PR2 Vol D/4.4.4 KTU84P main engineering 53181-dev-keys
3	INV141401015	BT/WIFI/GPS Radiated/Conducted	PR2 Vol D/4.4.4 KTU84P main engineering 53181-dev-keys

3.3 Identification of Accessory equipment

AE #	Type	Manufacturer	Model	Serial Number
1	AC adapter	Salcomp	SC1402	1309500144736

3.4 Environmental conditions during Test

The following environmental conditions were maintained during the course of testing:

Ambient Temperature: 20-25°C
Relative Humidity: 40-60%

3.5 Dates of Testing

08/06/2014 – 09/18/2014

4 Subject of Investigation

The objective of the measurements applied by CETECOM Inc. was to establish compliance of the EUT as described under Ch. 3 of this Test Report, with the applicable criteria specified in

- 47 CFR Part 2: Title 47 of the Code of Federal Regulations: Chapter I-Federal Communications Commission Frequency allocations and radio treaty matters; general rules and regulations.
- 47 CFR Part 22: Title 47 of the Code of Federal Regulations: Chapter I-Federal Communications Commission subchapter B- common carrier services; Part 22- Public mobile services
- 47 CFR Part 24: Title 47 of the Code of Federal Regulations: Chapter I-Federal Communications Commission subchapter B- common carrier services; Part 24- Personal communication services
- 47 CFR Part 27: Title 47 of the Code of Federal Regulations: Chapter I-Federal Communications Commission subchapter B- common carrier services; Part 27-Miscellaneous wireless communication services
- RSS-GEN- Issue 4: General Requirements and Information for the Certification of Radio Apparatus
- RSS-132- Issue 3: Spectrum management and telecommunication policy- Radio Standards Specifications Cellular telephones employing new technologies operating in the bands 824-849MHz and 869-894MHz
- RSS-133- Issue 6: Spectrum management and telecommunication policy- Radio Standards Specifications- 2GHz personal communication services
- RSS-139- Issue 2: Spectrum management and telecommunication policy- Radio Standards Specifications- Advance wireless services equipment operating in the bands 1710-1755MHz and 2110-2155MHz

This test report is to support a request for new equipment authorization as single modular approval under the FCC ID: **O2Z-EP110** and IC ID **1000W-EP110.**

5 Summary of Measurement Results

GSM and UMTS 850 MHz Band:

Specifications	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §22.913 (b) RSS-GEN, 6.12 RSS-132, 5.4	RF Output Power	Nominal	GSM 850	■	☐	☐	☐	Complies
			UMTS Band V	■	☐	☐	☐	Complies
RSS-1RSS-132(5.4)	Peak-to-average Ratio	Nominal	GSM 1900	■	☐	☐	☐	Complies
§2.1055 §22.355 RSS-GEN, 6.11 RSS-132 5.3	Frequency Stability	Extreme	GSM 850	■	☐	☐	☐	Complies
			UMTS Band V	■	☐	☐	☐	Complies
§2.1049 §22.917(b) RSS-GEN, 6.6	Occupied Bandwidth	Nominal	GSM 850	■	☐	☐	☐	Complies
			UMTS Band V	■	☐	☐	☐	Complies
§2.1051 §22.917 RSS-GEN, 6.13 RSS-132, 5.5	Band Edge Compliance	Nominal	GSM 850	■	☐	☐	☐	Complies
			UMTS Band V	■	☐	☐	☐	Complies
§2.1053 §22.917 RSS-GEN, 6.1 RSS-132, 5.5	Unwanted Emissions	Nominal	GSM 850	■	☐	☐	☐	Complies
			UMTS Band V	■	☐	☐	☐	Complies

Note: NA= Not Applicable; NP= Not Performed.

GSM and UMTS 1900 MHz Band:

Specifications	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §24.232 (c)(d) RSS-GEN, 6.12 RSS-133, 6.4	RF Output Power	Nominal	GSM 1900	■	☐	☐	☐	Complies
			UMTS Band II	■	☐	☐	☐	Complies
§24.232 (d) RSS-1RSS-133(6.4)	Peak-to-average Ratio	Nominal	GSM 1900	■	☐	☐	☐	Complies
			UMTS Band II	■	☐	☐	☐	Complies
§2.1055 §24.235 RSS-GEN, 6.11 RSS-133, 6.3	Frequency Stability	Extreme	GSM 1900	■	☐	☐	☐	Complies
			UMTS Band II	■	☐	☐	☐	Complies
§2.1049 RSS-GEN, 6.6	Occupied Bandwidth	Nominal	GSM 1900	■	☐	☐	☐	Complies
			UMTS Band II	■	☐	☐	☐	Complies
§2.1051 §24.238 RSS-GEN, 6.13 RSS-133, 6.5	Band Edge Compliance	Nominal	GSM 1900	■	☐	☐	☐	Complies
			UMTS Band II	■	☐	☐	☐	Complies
§2.1053 §24.238 RSS-GEN, 6.13 RSS-133, 6.5	Unwanted Emissions	Nominal	GSM 1900	■	☐	☐	☐	Complies
			UMTS Band II	■	☐	☐	☐	Complies

Note: NA= Not Applicable; NP= Not Performed.

UMTS 1700 MHz Band:

Specifications	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §27.50(d)(4) RSS-GEN, 6.12 RSS-1RSS-139(6.4)	RF Output Power	Nominal	UMTS Band IV	■	☐	☐	☐	Complies
§27.50(d)(5) RSS-1RSS-139(6.4)	Peak-to-average Ratio	Nominal	UMTS Band IV	■	☐	☐	☐	Complies
§2.1055 §27.54 RSS-GEN, 6.11 RSS-139(6.3)	Frequency Stability	Extreme	UMTS Band IV	■	☐	☐	☐	Complies
§2.1049 §27.53(h) RSS-Gen, 6.6	Occupied Bandwidth	Nominal	UMTS Band IV	■	☐	☐	☐	Complies
§2.1051 §27.53(h) RSS-GEN, 6.13 RSS-139 6.5	Band Edge Compliance	Nominal	UMTS Band IV	■	☐	☐	☐	Complies
§2.1053 §27.53(h) RSS-GEN, 6.13 RSS-139 6.5	Unwanted Emissions	Nominal	UMTS Band IV	■	☐	☐	☐	Complies

Note: NA= Not Applicable; NP= Not Performed.

6 Measurements

6.1 RF Power Output and Effective Radiated Power / Effective Isotropic Radiated Power

FCC 2.1046: RF power output

Power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on circuit elements as specified. The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.

6.1.2 References

FCC: CFR Part 2.1046, CFR Part 22.913, CFR Part 24.232, CFR Part 27.50
IC: RSS-Gen Section 6.12; RSS-132 Section 5.4; RSS-133 Section 6.4, RSS-139 Section 6.4

6.1.3 Limits:

ERP/EIRP (850 MHz Band)

FCC Part 22.913 (a) & RSS-132 Section 5.4

FCC: Peak ERP < 38.45 dBm (7W)
The effective radiated power (ERP) of mobile transmitters must not exceed 7 Watts.

IC: Average EIRP < 40.60 dBm (11.5W)
The transmitter output power shall be measured in terms of average power. The equivalent isotropically radiated power (e.i.r.p.) for mobile equipment shall not exceed 11.5 watts.

EIRP (1900 MHz Band)

FCC Part 24.232 (c) (e) & RSS-133 Section 6.4/SRSP-510 Section 5.1.2

FCC: Peak EIRP < 33 dBm (2W)
(b) Mobile/portable stations are limited to 2 Watts effective isotropic radiated power (EIRP).
(c) Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms equivalent voltage. The measurement results shall be properly adjusted for any limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement over the full bandwidth of the channel.

IC: Average EIRP < 33 dBm (2W)
The transmitter output power shall be measured in terms of average power. The equivalent isotropically radiated power (e.i.r.p.) for mobile equipment shall not exceed 2 watts.

EIRP (1700 MHz Band)

FCC Part 27.50 (d) (4) (6) & RSS-139 Section 6.4

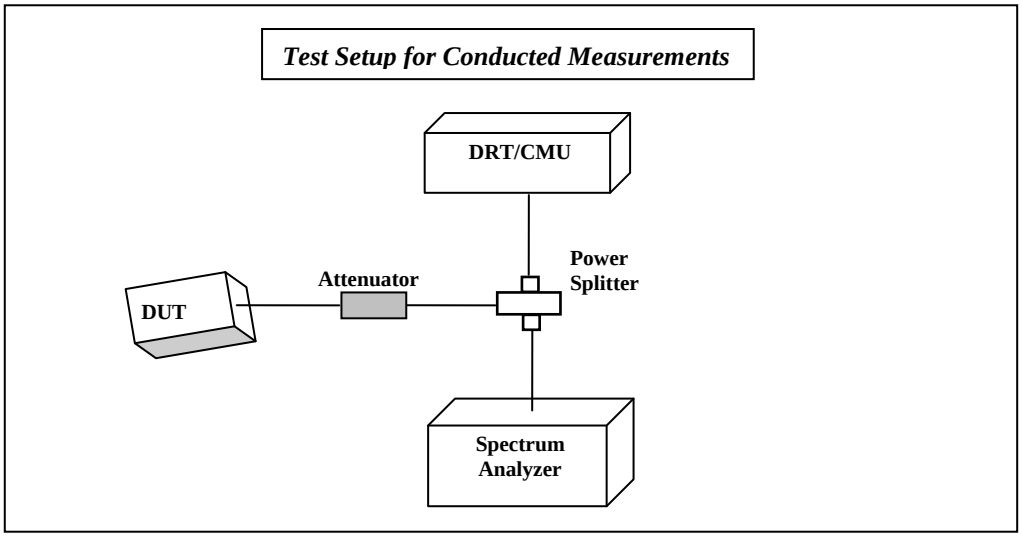
FCC: Peak EIRP < 30 dBm (1W)
Fixed, mobile and portable (handheld stations) operating in the 1710-1755 MHz band are limited to 1 watt EIRP

Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, *etc.*, so as to obtain a true peak measurement for the emission in question over the full bandwidth of the channel

IC: Average EIRP < 30 dBm (1W)
The average equivalent isotropically radiated power (e.i.r.p.) for fixed, mobile and portable transmitters in the 1710-1755 MHz shall not exceed 1 watt.

6.1.4 Measurement Procedure:

Measurement according to KDB 971168 D01v02r02 (Measurement guidance for certification of Licensed Digital Transmitters)
Section 5.1.1 for peak power
Section 5.2.2 for average power



1. Connect the equipment as shown in the above diagram. A Digital Radio Communication Tester (DRT: R&S CMU200 here) is used to enable the EUT to transmit and to measure the output power.
2. Adjust the settings of the CMU200 to set the EUT to its maximum power at the required channel.
3. Record the Peak and Average Output power level measured by the CMU200.
4. Correct the measured level for all losses in the RF path.
5. Measurements are to be performed with the EUT set to the low, middle and high channel of each frequency band and for all types of modulation schemes.
6. GMSK mode measurements are performed in GSM 1 uplink slot configuration.
7. UMTS mode measurements are performed in RMC 12.2K configuration

Measurement Uncertainty

+/- 0.5 dB

Test Conditions:

Tnom: 22°C; Vnom: 3.8 V

6.1.5 Test Results:

ERP/EIRP 850 MHz band

GPRS 850: GMSK Mode Antenna Gain = 1.64 dBi

FCC: Peak ERP < 38.45 dBm (7W) IC: Average EIRP < 40.60 dBm (11.5W)					
Frequency	**PEAK Conducted Output Power**	**Average Conducted Output Power**	**Calculated Peak EIRP** EIRP = Conducted + gain	**Calculated Peak ERP** (ERP = EIRP - 2.15 dB)	**Calculated Average EIRP** Avg EIRP = Conducted + gain
(MHz)	**(dBm)**	**(dBm)**	**(dBm)**	**(dBm)**	**(dBm)**
824.2(128)	33	32.5	34.64	32.49	34.14
836.6(190)	33	32.5	34.64	32.49	34.14
848.8(251)	32.9	32.5	34.54	32.49	34.14

EGPRS 850: 8PSK Mode **Antenna Gain = 1.64 dBi** FCC: Peak ERP < 38.45 dBm (7W) IC: Average EIRP < 40.60 dBm (11.5W)					
Frequency	**PEAK Conducted Output Power**	**Average Conducted Output Power**	**Calculated Peak EIRP**	**Calculated Peak ERP** (ERP = EIRP - 2.15 dB)	**Calculated Average EIRP**
(MHz)	**(dBm)**	**(dBm)**	**(dBm)**	**(dBm)**	**(dBm)**
824.2	30.2	27.3	31.84	29.69	28.94
836.6	30.0	27.2	31.64	29.49	28.84
848.8	30.1	27.2	31.74	29.59	28.84

FDD V UMTS 850: QPSK Mode **Antenna Gain = 1.64 dBi** FCC: Peak ERP < 38.45 dBm (7W) IC: Average EIRP < 40.60 dBm (11.5W)					
Frequency	**PEAK Conducted Output Power**	**Average Conducted Output Power**	**Calculated Peak EIRP**	**Calculated Peak ERP** (ERP = EIRP - 2.15 dB)	**Calculated Average EIRP**
(MHz)	**(dBm)**	**(dBm)**	**(dBm)**	**(dBm)**	**(dBm)**
826.4	27.45	23.87	29.09	26.94	25.51
836.6	27.36	23.77	29.00	26.85	25.41
846.6	27.61	23.78	29.25	27.10	25.42

EIRP 1900 MHz band

GPRS 1900: GMSK Mode **Antenna Gain = -0.73 dBi** FCC: Peak EIRP < 38.45 dBm (7W)

IC: Average EIRP < 40.60 dBm (11.5W)				
Frequency (MHz)	**PEAK Conducted Output Power (dBm)**	**Average Conducted Output Power (dBm)**	**Calculated Peak EIRP (dBm)**	**Calculated Average EIRP (dBm)**
1850.2 (512)	30	29.7	29.27	28.97
1880 (660)	30.1	29.7	29.37	28.97
1909.8 (810)	30.3	30.0	29.57	29.27

EGPRS 1900: 8PSK Mode **Antenna Gain = -0.73 dBi** FCC: Peak EIRP < 38.45 dBm (7W) IC: Average EIRP < 40.60 dBm (11.5W)				
Frequency (MHz)	**PEAK Conducted Output Power (dBm)**	**Average Conducted Output Power (dBm)**	**Calculated Peak EIRP (dBm)**	**Calculated Average EIRP (dBm)**
1850.2	29.0	26.4	28.27	25.67
1880	29.1	26.4	28.37	25.67
1909.8	29.1	26.5	28.37	25.77

FDD II UMTS 1900: QPSK Mode **Antenna Gain = -0.73 dBi** FCC: Peak EIRP < 38.45 dBm (7W) IC: Average EIRP < 40.60 dBm (11.5W)				
Frequency (MHz)	**PEAK Conducted Output Power (dBm)**	**Average Conducted Output Power (dBm)**	**Calculated Peak EIRP (dBm)**	**Calculated Average EIRP (dBm)**
1852.4	27.59	23.87	26.86	23.14
1880	27.61	24.09	26.88	23.36
1907.6	27.64	24.35	26.91	23.62

EIRP 1700 MHz band

FDD IV UMTS 1700: QPSK Mode **Antenna Gain = -0.87 dBi** FCC: Peak EIRP < 30 dBm (1W)

IC: Average EIRP < 30 dBm (1W)				
Frequency (MHz)	**PEAK Conducted Output Power (dBm)**	**Average Conducted Output Power (dBm)**	**Calculated Peak EIRP (dBm)**	**Calculated Average EIRP (dBm)**
1712.4	27.62	24.09	26.75	23.22
1732.6	27.51	24.11	26.64	23.24
1752.6	27.35	24.15	26.48	23.28

6.2 PEAK-AVERAGE Ratio

A Peak to average ratio measurement is performed at the conducted port of the EUT. The spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signal spends at or above the level defines the probability for that particular power level.

6.2.1 References

FCC CFR 47 §24.232 (d); FCC CFR 47 §27.50 (d) (5);
RSS-132(5.4); RSS-133(6.4);RSS-139 (6.4)

6.2.2 Limits:

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.**

6.2.3 Measurement Procedure:

Measurement according to KDB 971168 D01 v02r02

- Section 5.7.2 for GSM/EGPRS
- Section 5.7.1 for UMTS

(GSM/ EGPRS modes) = Measured Peak output power - Measured Average Output power
(UMTS Mode)= based on CCDF measurement on Spectrum Analyzer
Set the resolution/measurement BW ≥ signal's occupied BW
Use the power statistic/CCDF function of the spectrum analyzer to measure the PAR
Record the maximum PAPR level associated with a probability of 0.1%.

6.2.4 Test Results

Peak-Average Ratio in GSM 850 MHz band		
Frequency (MHz)	**GMSK (dB)**	**8PSK (dB)**

824.2	.5	2.9
836.6	.5	2.8
848.8	.4	2.9

Peak-Average Ratio in UMTS 850 MHz band (FDD V)	
Frequency (MHz)	**QPSK (dB)**
826.4	3.21
836.6	3.24
846.6	3.46

Peak-Average Ratio in GSM 1900 MHz band		
Frequency (MHz)	**GMSK (dB)**	**8PSK (dB)**
1850.2	.3	2.6
1880	.4	2.7
1909.8	.3	2.6

Peak-Average Ratio in UMTS 1900 MHz band (FDD II)	
Frequency (MHz)	**QPSK (dB)**
1852.4	3.33
1880	3.29
1907.6	3.14

Peak-Average Ratio in UMTS 1700 MHz band (FDD IV)	
Frequency (MHz)	**QPSK (dB)**
1712.4	3.14
1732.6	3.24

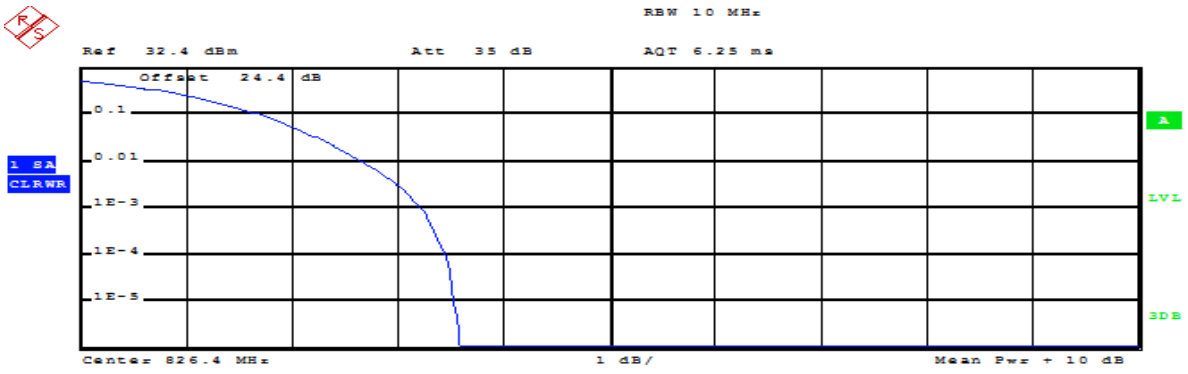
1752.6	3.00

Test Verdict:

Pass

6.2.5 Measurement Plots:

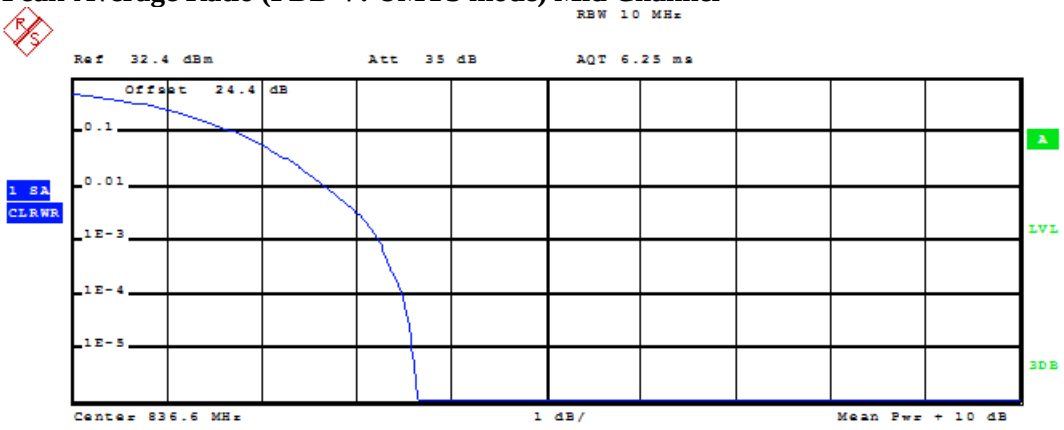
Peak-Average Ratio (FDD V: UMTS mode) Low Channel



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 11.2MHz

	Trace 1
Mean	23.57 dBm
Peak	27.15 dBm
Crest	3.58 dB
10 %	1.70 dB
1 %	2.64 dB
.1 %	3.21 dB
.01 %	3.45 dB

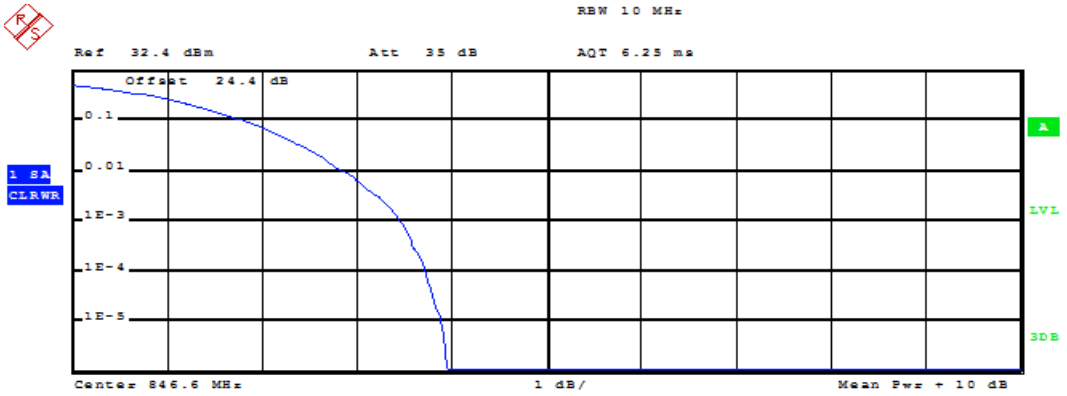
Peak-Average Ratio (FDD V: UMTS mode) Mid Channel



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 11.2MHz

	Trace 1
Mean	23.45 dBm
Peak	27.10 dBm
Crest	3.65 dB
10 %	1.73 dB
1 %	2.66 dB
.1 %	3.24 dB
.01 %	3.48 dB

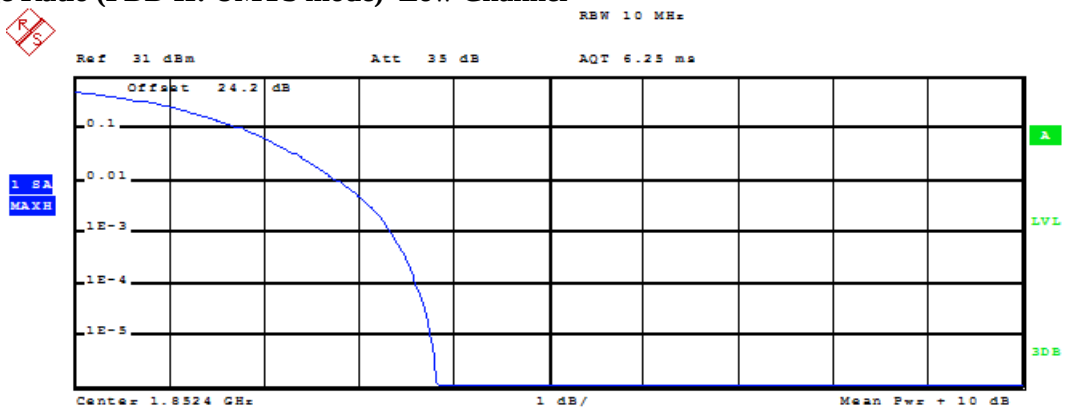
Peak-Average Ratio (FDD V: UMTS mode) High Channel



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 11.2MHz

	Trace 1
Mean	23.45 dBm
Peak	27.40 dBm
Crest	3.95 dB
10 %	1.79 dB
1 %	2.84 dB
.1 %	3.46 dB
.01 %	3.72 dB

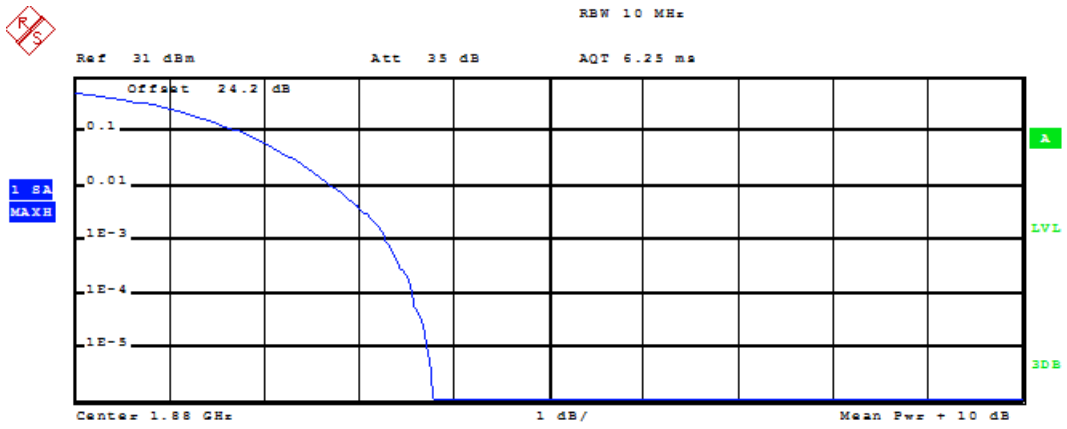
Peak-Average Ratio (FDD II: UMTS mode) Low Channel



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 11.2MHz

	Trace 1
Mean	22.11 dBm
Peak	25.93 dBm
Crest	3.82 dB
10 %	1.76 dB
1 %	2.77 dB
.1 %	3.33 dB
.01 %	3.61 dB

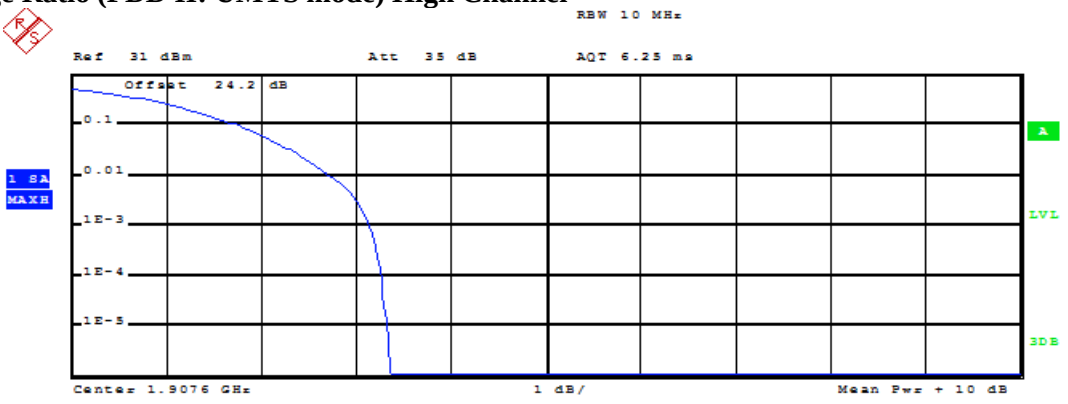
Peak-Average Ratio (FDD II: UMTS mode) Mid Channel



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 11.2MHz

	Trace 1
Mean	22.30 dBm
Peak	26.08 dBm
Crest	3.78 dB
10 %	1.75 dB
1 %	2.71 dB
.1 %	3.29 dB
.01 %	3.56 dB

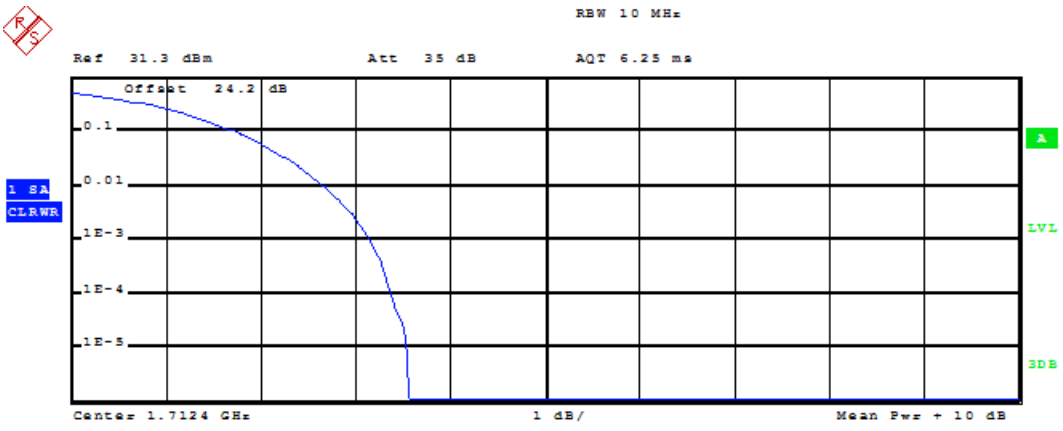
Peak-Average Ratio (FDD II: UMTS mode) High Channel



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 11.2MHz

	Trace 1
Mean	22.43 dBm
Peak	25.79 dBm
Crest	3.36 dB
10 %	1.73 dB
1 %	2.71 dB
.1 %	3.14 dB
.01 %	3.27 dB

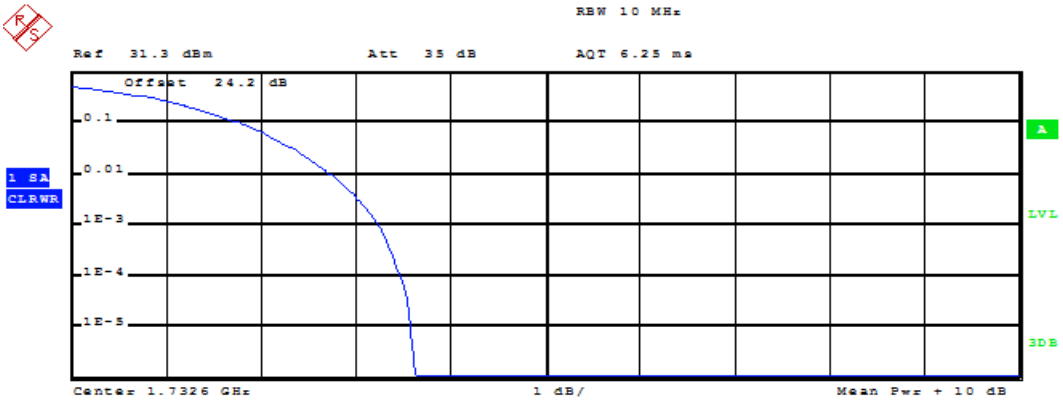
Peak-Average Ratio (FDD IV: UMTS mode) low Channel



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 11.2MHz

	Trace 1
Mean	22.66 dBm
Peak	26.21 dBm
Crest	3.55 dB
10 %	1.73 dB
1 %	2.64 dB
.1 %	3.14 dB
.01 %	3.38 dB

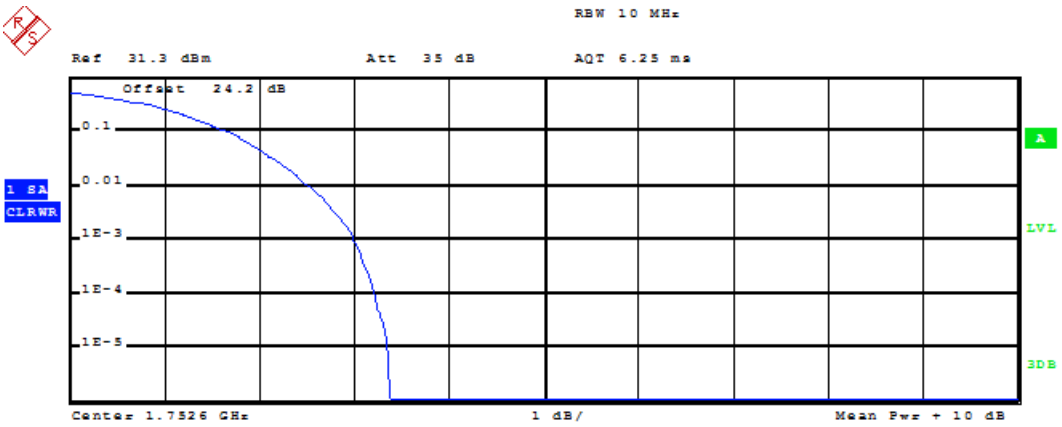
Peak-Average Ratio (FDD IV: UMTS mode) mid Channel



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 11.2MHz

	Trace 1
Mean	22.66 dBm
Peak	26.29 dBm
Crest	3.63 dB
10 %	1.78 dB
1 %	2.72 dB
.1 %	3.24 dB
.01 %	3.48 dB

Peak-Average Ratio (FDD IV: UMTS mode) high Channel



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 11.2MHz

	Trace 1
Mean	22.53 dBm
Peak	25.91 dBm
Crest	3.37 dB
10 %	1.65 dB
1 %	2.50 dB
.1 %	3.00 dB
.01 %	3.21 dB

6.3 Occupied Bandwidth

6.3.1 References

FCC: CFR Part 2.1053, CFR Part 22.917, CFR Part 24.238 (b), CFR Part 27.53 (g)
IC: RSS-Gen Section 6.6; RSS-132 Section 4.5.1; RSS-133 Section 2.6, RSS-139 Section 6.5

The occupied bandwidth in lieu of 99% bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission.

The 26 dB bandwidth is the width of the emission signal between 2 points, one below the carrier center frequency and one above the carrier frequency, outside of which all emissions are attenuated by 26 dB below the transmitter power.

6.3.2 Measurement Procedure:

Measurement according to KDB 971168 D01v02r02
Section 4.1 for 26 dB BW

ANALYZER SETTINGS:

For GSM modulation (modulation = approximately 250 kHz)
RBW: 3 kHz or as close as possible to 1% of the modulation BW being measured
VBW = 3xRBW
SPAN: Enough to show modulation signal (1 MHz)
Detector: Peak
Use the analyzer built-in 99% bandwidth function for 99% BW measurement
Use delta marker between 2 points, one below the carrier center frequency and one above the carrier frequency, at the 26 dB below the transmitter power.

For UMTS modulation (modulation = approximately 5 MHz)
RBW: 50 kHz or as close as possible to 1% of the modulation BW being measured
VBW: 200 kHz
SPAN: Enough to show modulation signal (10 MHz)
Detector: Peak
Use the analyzer built-in 99% bandwidth function for 99% BW measurement
Use delta marker between 2 points, one below the carrier center frequency and one above the carrier frequency, at the 26 dB below the transmitter power.

6.3.3 Limits

For reference only

6.3.4 Test Results

GSM 850

-26 dB BW			
Channel No.	**Frequency (MHz)**	**GSM/GMSK (kHz)**	**EGPRS/8PSK (kHz)**
128	824.2	317.3	317.3
190	836.6	322.1	320.5
251	848.8	325.3	325.3

99% BW			
Channel No.	**Frequency (MHz)**	**GSM/GMSK (kHz)**	**EGPRS/8PSK (kHz)**
128	824.2	245.1	245.2
190	836.6	243.8	243.5
251	848.8	245.2	245.2

GSM 1900

-26 dB BW			
Channel No.	**Frequency (MHz)**	**GSM/GMSK (kHz)**	**EGPRS/8PSK (kHz)**
512	1850.2	320.3	347.7
661	1880	318.5	347.8
810	1909.8	320.5	320.5

99% BW			
Channel No.	**Frequency (MHz)**	**GSM/GMSK (kHz)**	**EGPRS/8PSK (kHz)**
512	1850.2	243.58	243.58
661	1880	246.79	258.01
810	1909.8	245.19	264.42

UMTS 850

-26 dB BW		
Channel No.	**Frequency (MHz)**	**QPSK (MHz)**
4132	826.4	4.65
4183	836.6	4.63
4233	846.6	4.63

99% BW		
Channel No.	**Frequency (MHz)**	**QPSK (MHz)**
4132	826.4	4.07
4183	836.6	4.07
4233	846.6	4.08

UMTS 1900

-26 dB BW		
Channel No.	**Frequency (MHz)**	**QPSK (MHz)**
9262	1852.4	4.65
9400	1880	4.62
9538	1907.6	4.66

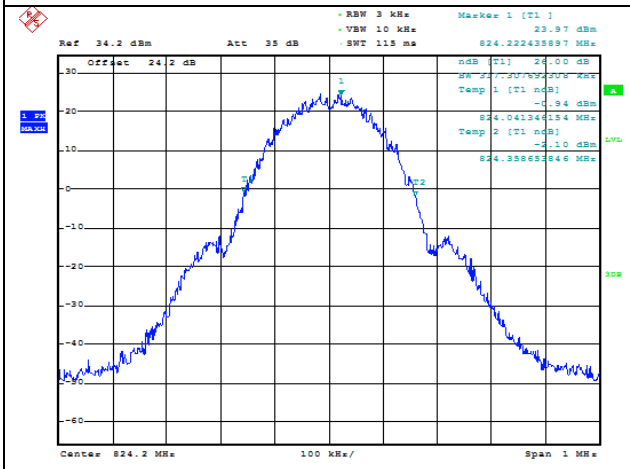
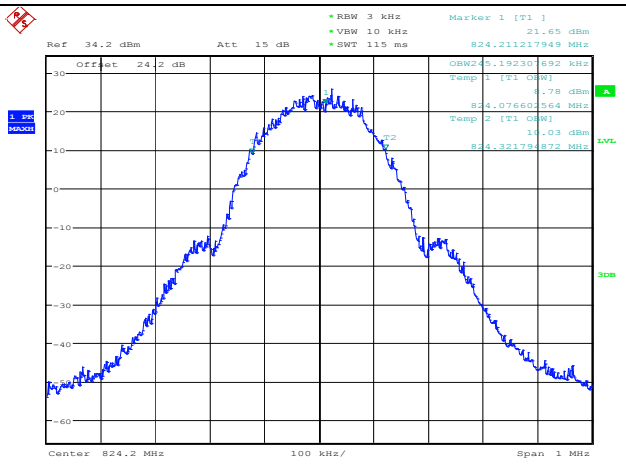
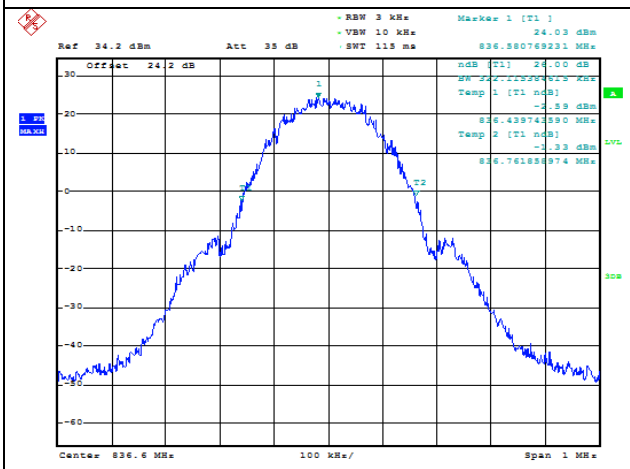
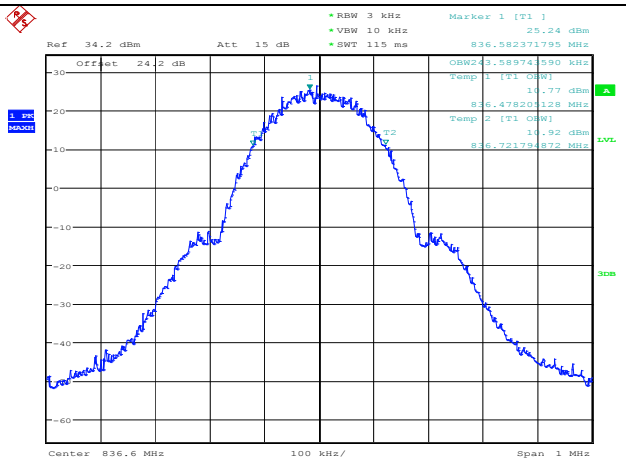
99% BW		
Channel No.	**Frequency (MHz)**	**QPSK (MHz)**
9262	1852.4	4.07
9400	1880	4.07
9538	1907.6	4.07

UMTS 1700

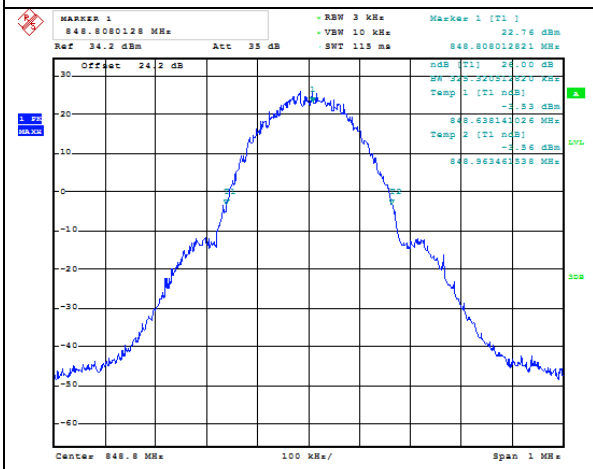
-26 dB BW		
Channel No.	**Frequency (MHz)**	**QPSK (MHz)**
1312	1712.4	4.65
1413	1732.6	4.62
1513	1752.6	4.65

99% BW		
Channel No.	**Frequency (MHz)**	**QPSK (MHz)**
1312	1712.4	4.08
1413	1732.6	4.07
1513	1752.6	4.08

6.3.5 Measurement Plots:

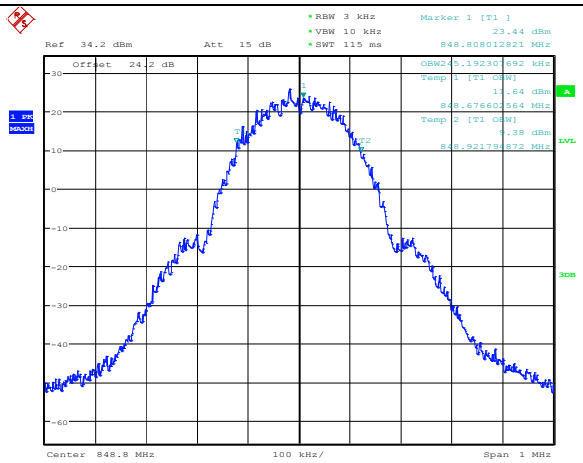
26dB BW GSM 850 –GMSK -Ch 128 (824.2MHz)	99% BW GSM 850 –GMSK -Ch 128 (824.2MHz)
	
26dB BW GSM 850 –GMSK -Ch 190 (836.6MHz)	**99% BW GSM 850 –GMSK -Ch 190 (836.6MHz)**
	

26dB BW GSM 850 –GMSK -Ch 251 (848.8MHz)



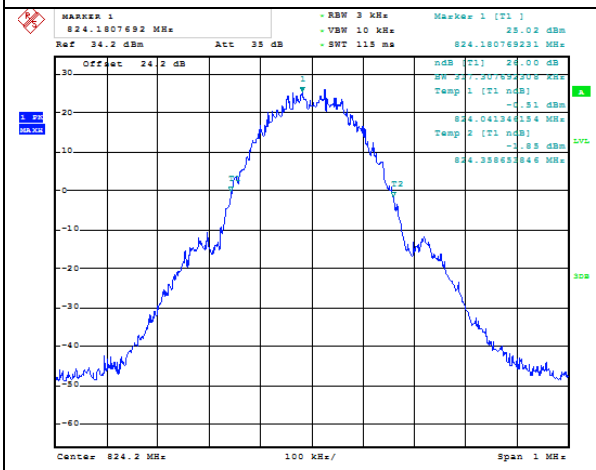
Date: 6.AUG.2014 18:00:25

99%BW GSM 850 –GMSK -Ch 251 (848.8MHz)



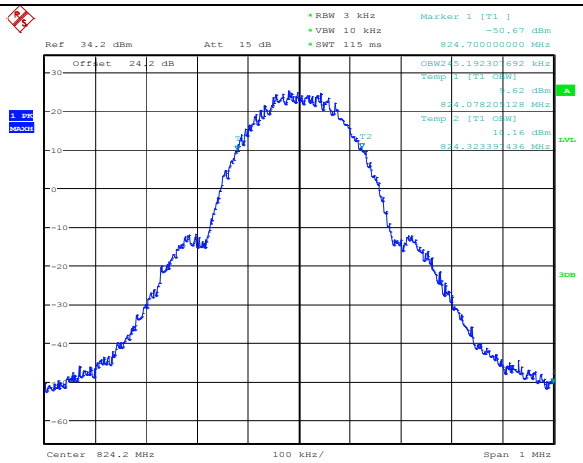
Date: 6.AUG.2014 17:57:31

26dB BW GSM 850 –8PSK -Ch 128 (824.2MHz)



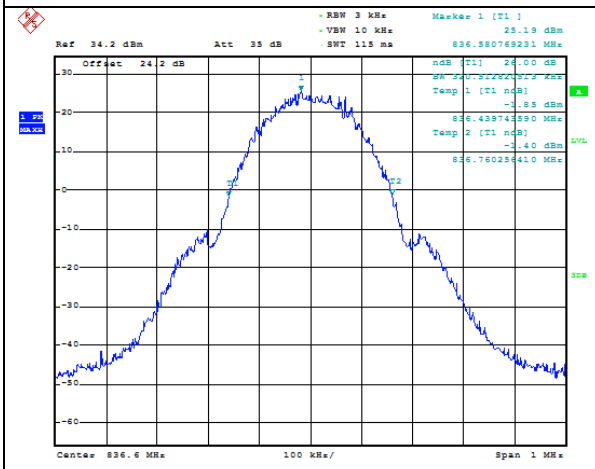
Date: 6.AUG.2014 18:11:10

99% BW GSM 850 –8PSK -Ch 128 (824.2MHz)



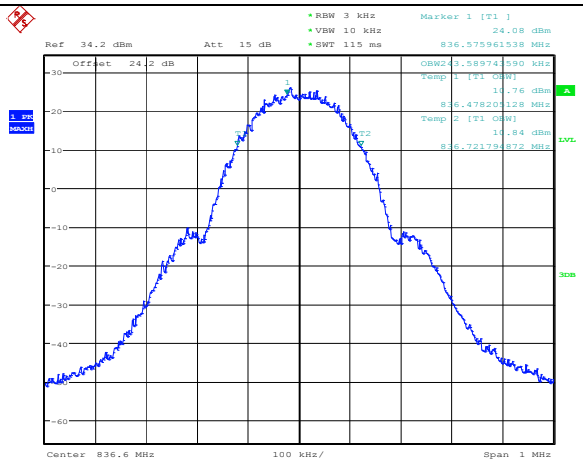
Date: 6.AUG.2014 18:09:43

26dB BW GSM 850 –8PSK -Ch 190 (836.6MHz)



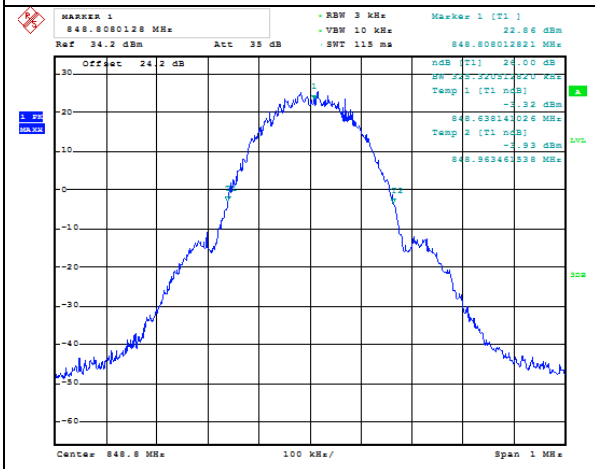
Date: 6.AUG.2014 17:37:42

99% BW GSM 850 –8PSK -Ch 190 (836.6MHz)



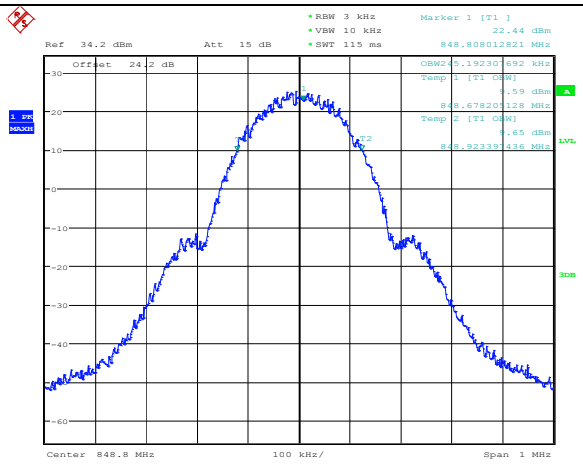
Date: 6.AUG.2014 17:31:33

26dB BW GSM 850 –8PSK -Ch 251 (848.8MHz)

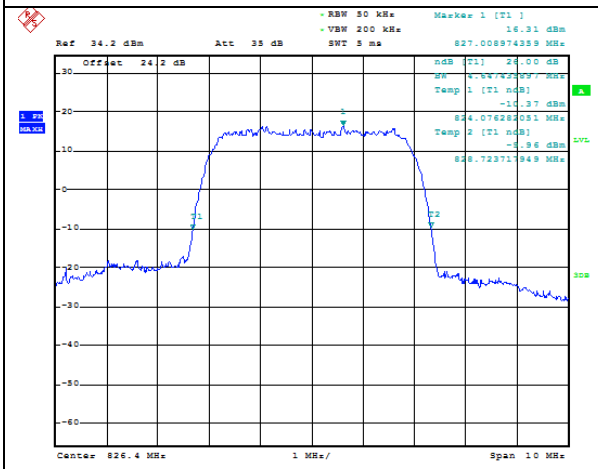
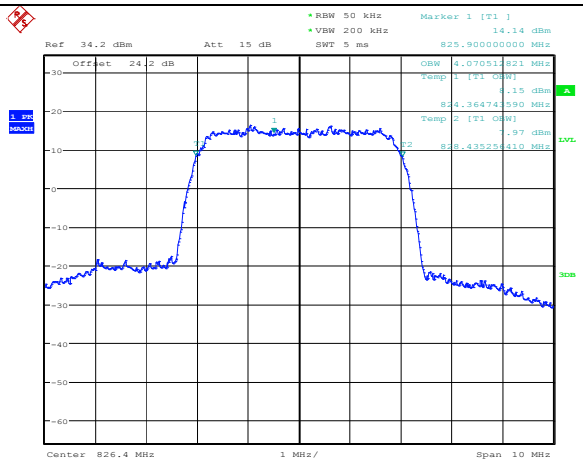
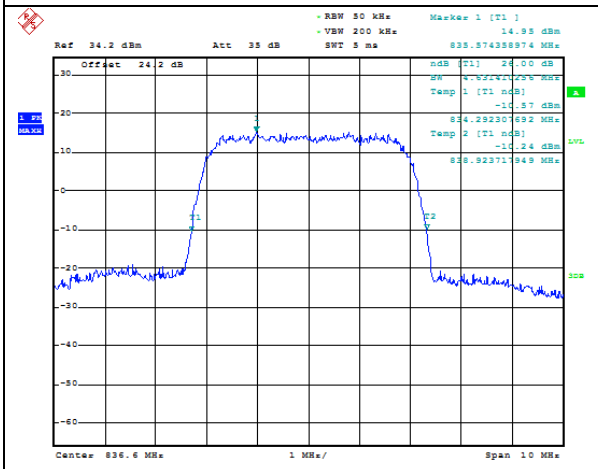
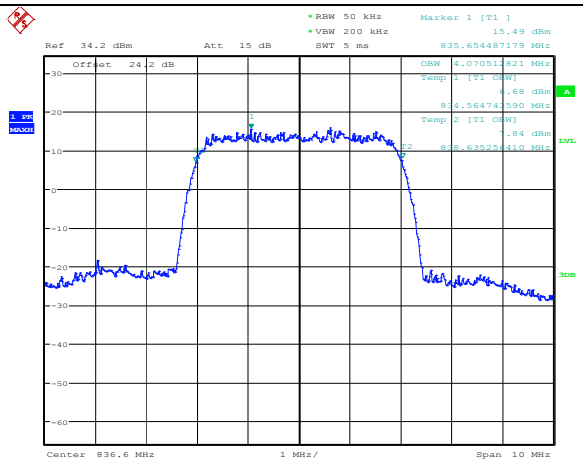


Date: 6.AUG.2014 18:06:40

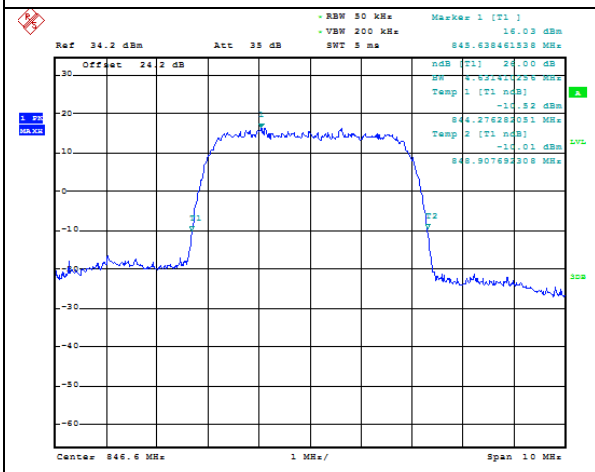
99% BW GSM 850 –8PSK -Ch 251 (848.8MHz)



Date: 6.AUG.2014 18:04:24

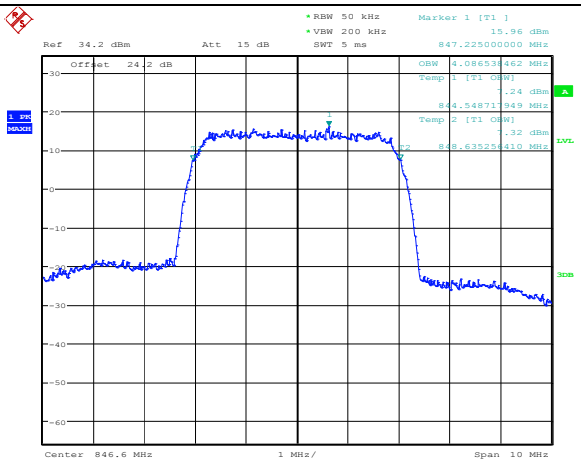
26 dB BW UMTS 850 (Band 5) –QPSK -Ch 4132 (826.4MHz)	**99% dB BW UMTS 850 (Band 5) –QPSK -Ch 4132 (826.4MHz)**
	
26 dB BW UMTS 850 (Band 5) –QPSK -Ch 4183 (836.6MHz)	**99% dB BW UMTS 850 (Band 5) –QPSK -Ch 4183 (836.6MHz)**
	

26 dB BW UMTS 850 (Band 5) –QPSK -Ch 4233 (846.6MHz)



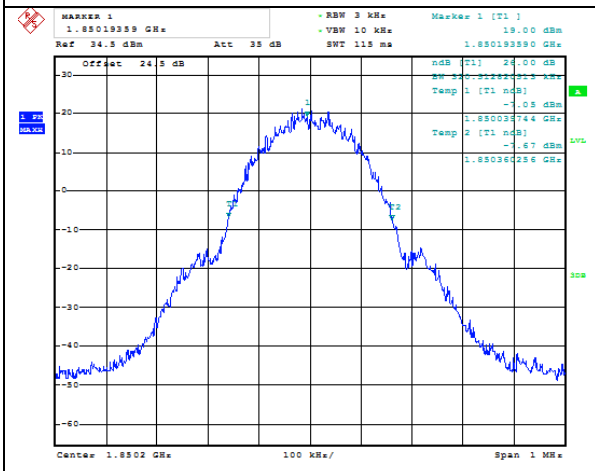
Date: 7.AUG.2014 15:18:41

99% dB BW UMTS 850 (Band 5) –QPSK -Ch 4233 (846.6MHz)



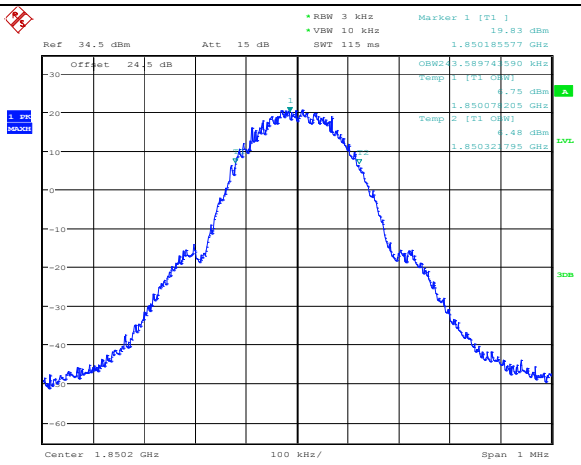
Date: 7.AUG.2014 15:13:54

26 dB BW GSM 1900 –GMSK -Ch 512 (1850.2 MHz)



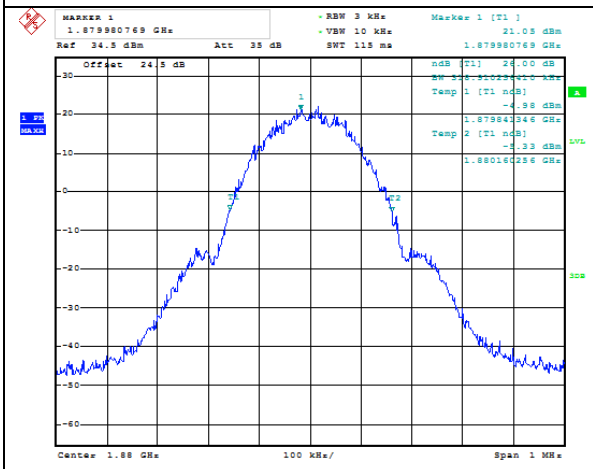
Date: 17.SEP.2014 16:55:19

99% dB BW GSM 1900 –GMSK -Ch 512 (1850.2 MHz)



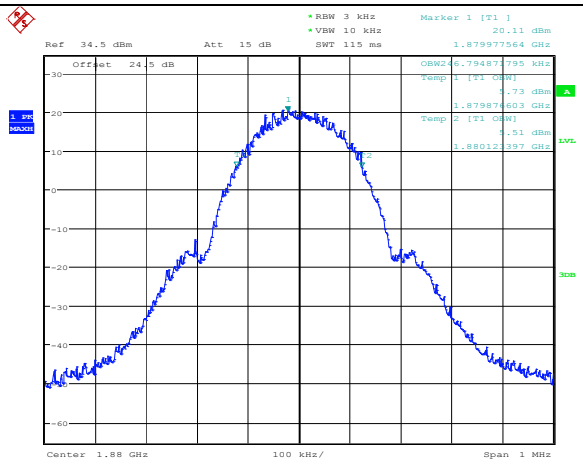
Date: 17.SEP.2014 16:54:01

26 dB BW GSM 1900 –GMSK -Ch 661 (1880 MHz)



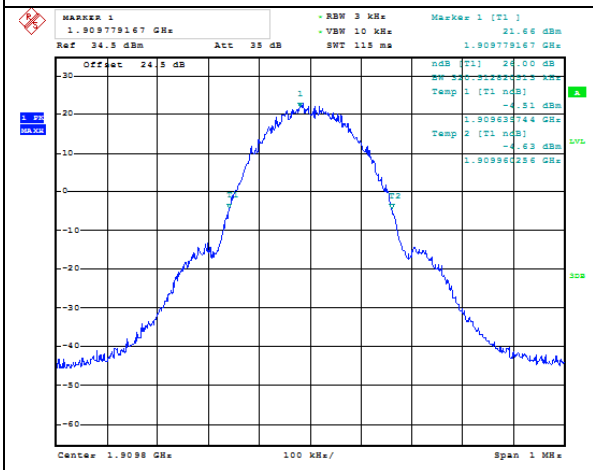
Date: 17.SEP.2014 16:58:25

99% dB BW GSM 1900 –GMSK -Ch 661 (1880 MHz)



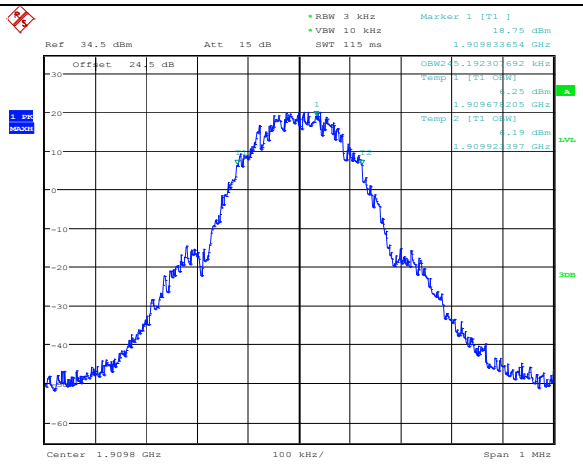
Date: 17.SEP.2014 16:47:27

26 dB BW GSM 1900 –GMSK -Ch 810 (1909.8 MHz)

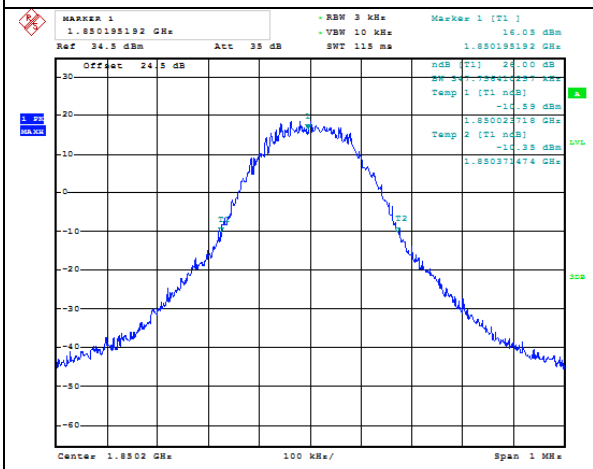
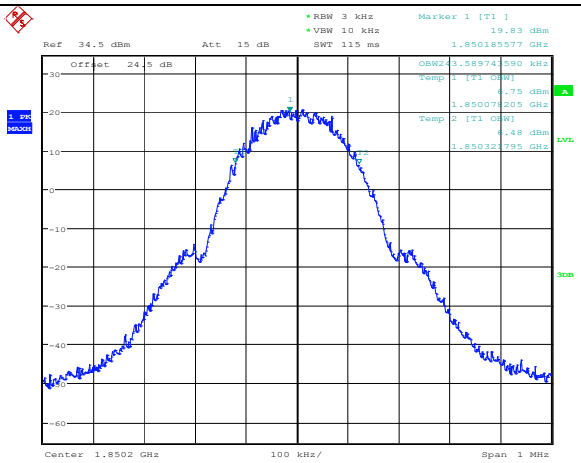
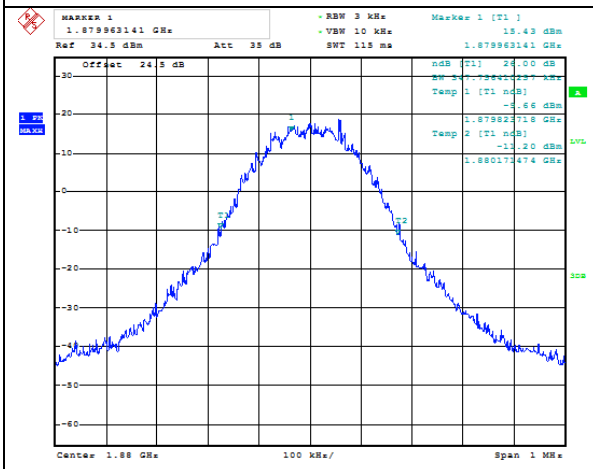
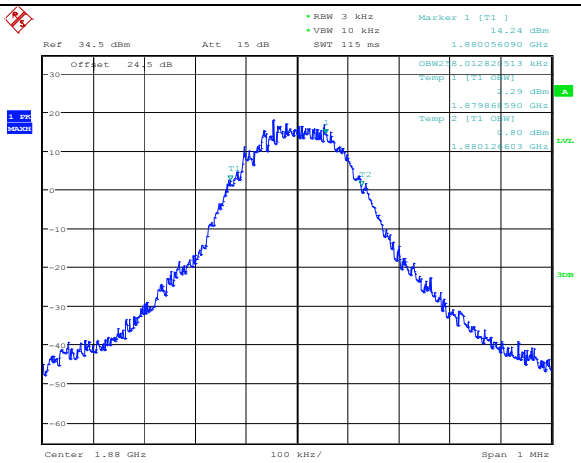


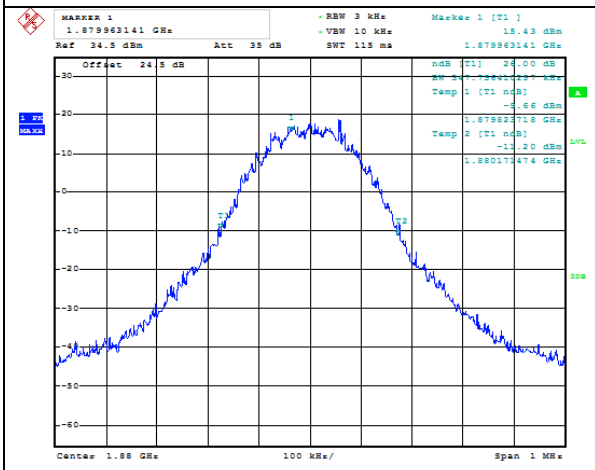
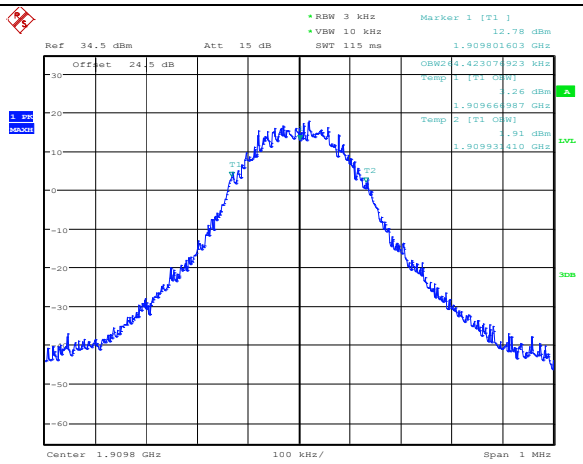
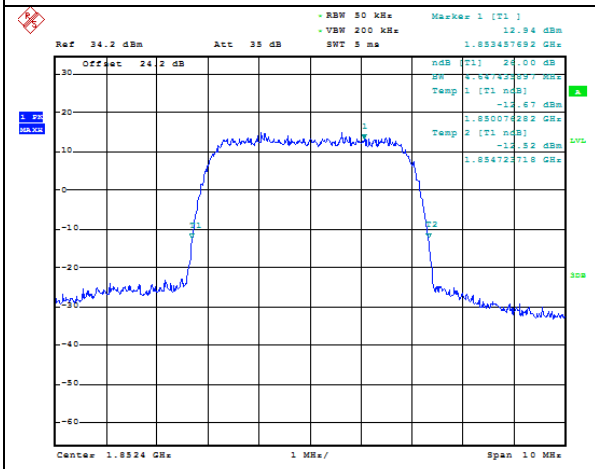
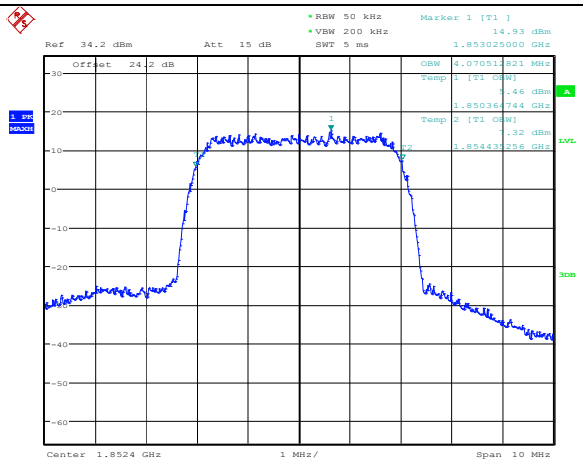
Date: 17.SEP.2014 17:17:40

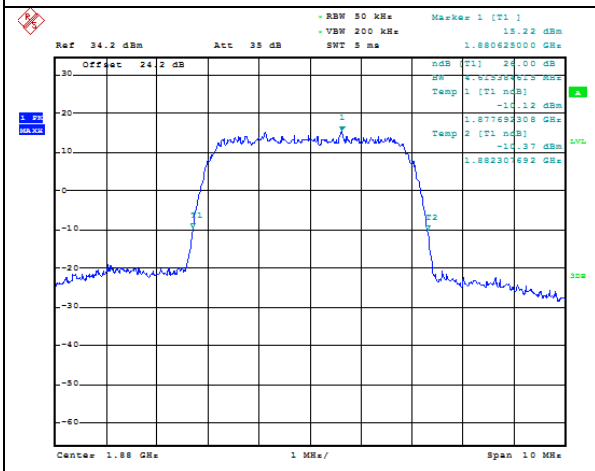
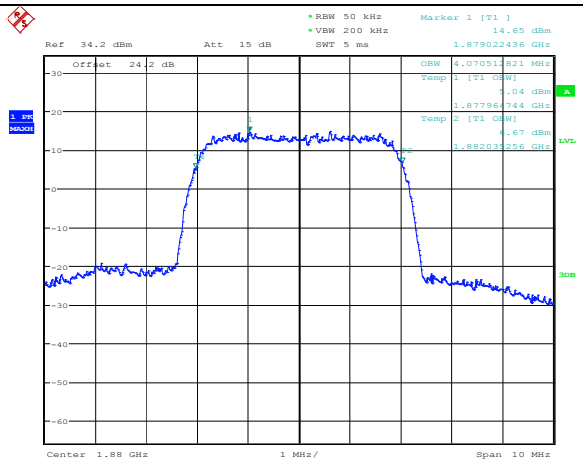
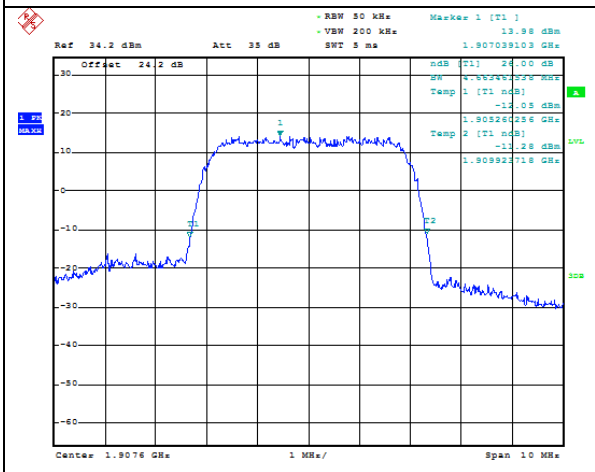
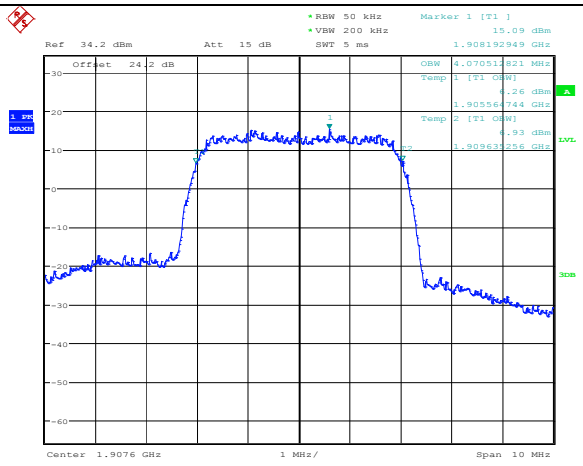
99% dB BW GSM 1900 –GMSK -Ch 810 (1909.8 MHz)

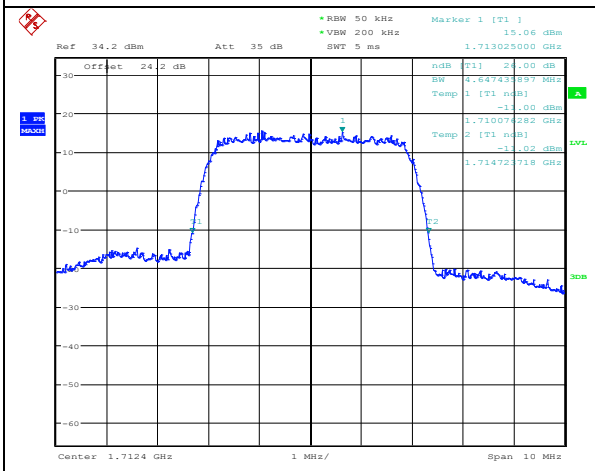
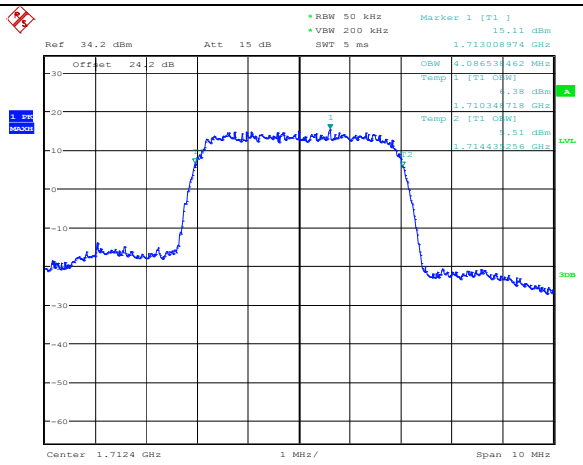
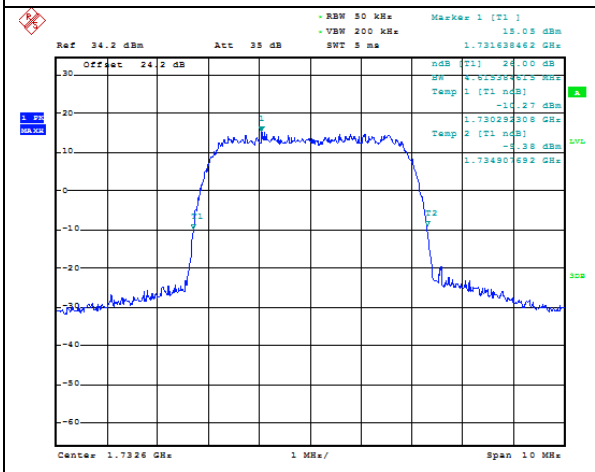
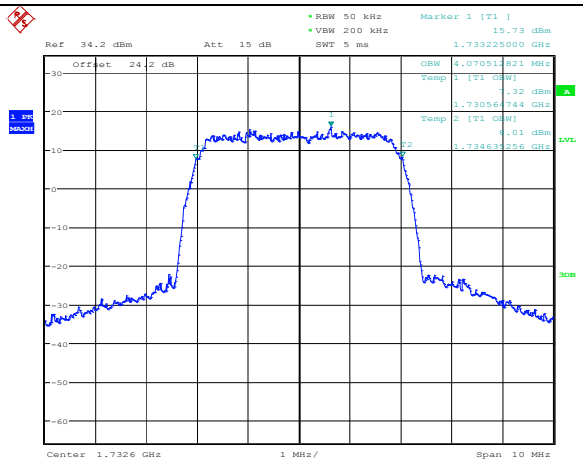


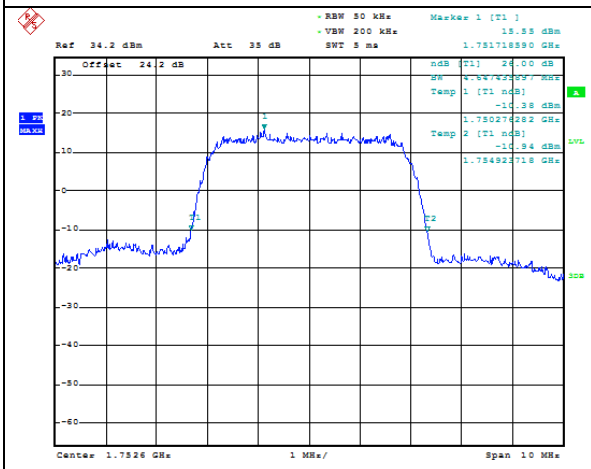
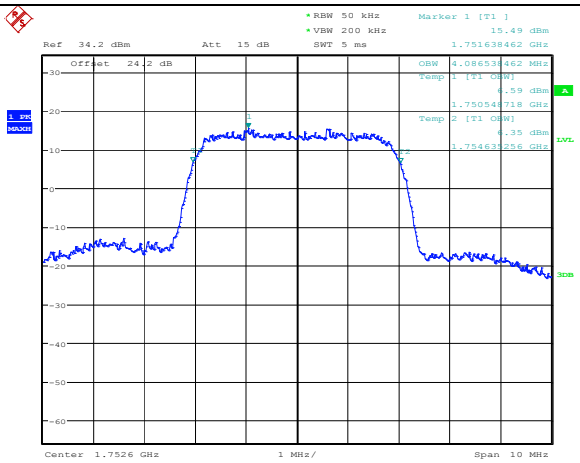
Date: 17.SEP.2014 17:05:56

26 dB BW GSM 1900 –8PSK -Ch 512 (1850.2 MHz)	**99% BW GSM 1900 –8PSK -Ch 512 (1850.2 MHz)**
 Date: 17.SEP.2014 17:37:54	 Date: 17.SEP.2014 16:54:01
26 dB BW GSM 1900 –8PSK -Ch 661 (1880 MHz)	**99% BW GSM 1900 –8PSK -Ch 661 (1880 MHz)**
 Date: 17.SEP.2014 17:46:10	 Date: 17.SEP.2014 17:48:09

26 dB BW GSM 1900 –8PSK -Ch 810 (1850.2MHz)	**99% BW GSM 1900 –8PSK -Ch 810 (1850.2 MHz)**
	
26dB BW UMTS 1900 (Band 2) – QPSK -Ch 9262 (1852.4 MHz)	**99% BW UMTS 1900 (Band 2) – QPSK -Ch 9262 (1852.4 MHz)**
	

26dB BW UMTS 1900 (Band 2) – QPSK -Ch 9400 (1880 MHz)	**99% BW UMTS 1900 (Band 2) – QPSK -Ch 9400 (1880 MHz)**
	
26dB BW UMTS 1900 (Band 2) – QPSK -Ch 9538 (1907.6 MHz)	**99% BW UMTS 1900 (Band 2) – QPSK -Ch 9538 (1907.6 MHz)**
	

26 dB BW UMTS 1700 (Band 4) – QPSK -Ch 1312 (1712.4 MHz)	**99%BW UMTS 1700 (Band 4) – QPSK -Ch 1312 (1712.4 MHz)**
 Date: 7.AUG.2014 15:51:33	 Date: 7.AUG.2014 15:50:14
26 dB BW UMTS 1700 (Band 4) – QPSK -Ch 1413 (1732.6 MHz)	**99% BW UMTS 1700 (Band 4) – QPSK -Ch 1413 (1732.6 MHz)**
 Date: 7.AUG.2014 15:56:07	 Date: 7.AUG.2014 15:54:23

26 dB BW UMTS 1700 (Band 4) – QPSK -Ch 1513 (1752.6 MHz)	99%BW UMTS 1700 (Band 4) – QPSK -Ch 1513 (1752.6 MHz)
	

6.4 Frequency Stability

For Hand carried battery powered equipment:

According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235/22.355 Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

As this transceiver is considered "Hand carried, battery powered equipment" Section 2.1055(d)(2) applies. This requires that the lower voltage for frequency stability testing be specified by the manufacturer. This transceiver is specified to operate with an input voltage of between 3.6VDC and 4.2VDC, with a nominal voltage of 3.8VDC. Operation above or below these voltage limits is prohibited by transceiver software in order to prevent improper operation as well as to protect components from overstress. These voltages represent a tolerance of –5.0% and +10.5%. For the purposes of measuring frequency stability these voltage limits are to be used.

6.4.1 References

FCC: CFR Part 2.1055, CFR Part 22.355, CFR Part 24.235, CFR Part 27.54
IC: RSS-Gen Section 6.11; RSS 132 Section 5.3; RSS 133 Section 6.3, RSS-139 Section 6.3

6.4.2 Limits

NOTE: Freq. Error (ppm) = MCF (MHz) / ACF (MHz)

Limit is +/- 1.5ppm for base stations
Limit is +/- 2.5ppm for mobile devices

6.4.3 Measurement Requirements and Procedure:

Measurement according to TIA-603-C: 2004 section 2.2.2

Frequency stability is a measure of frequency drift due to temperature and supply voltage variations with reference to the frequency measured at an appropriate reference temperature and the rated supply voltage.

The frequency stability of the transmitter shall be measured while varying the ambient temperatures and supply voltages over the ranges specified in the references section 6.4.1 above or declared by the equipment manufacturer. The PPM error shall be calculated by using the following formula.

$$\text{Freq. error (ppm)} = \left(\frac{MCF(MHz)}{ACF(MHz)} - 1 \right) x\ 10^6$$

A hand-held device that is only capable of operating using internal batteries shall be tested using a new battery without any further requirement to vary the supply voltage. Alternatively, an external supply voltage can be used and set at the battery nominal voltage, and again at the battery operating end point voltage which shall be specified by the equipment manufacturer.

6.4.4 Test Results / Plots

Mode: Mid Channel

Mode: GSM 850		
Channel No. 190	836.6	
Nom. Voltage (V): 3.8 Vdc	Freq. Error (Hz)	Freq. Error (ppm)
Min. voltage = 3.6 Vdc	19	0.02
Max. voltage = 4.2 Vdc	16	0.02
Battery End Point: = 3.4 Vdc		

AFC FREQ ERROR vs. TEMPERATURE

Channel No. 190	836.5	**Nom Vol: 3.8 Vdc**
Temperature (°C)	Freq. Error (Hz)	Freq. Error (ppm)
-10	14	0.02
0	16	0.02
+10	18	0.02
+20	15	0.02
+30	27	0.03
+40	22	0.03
+50	15	0.02

Mode: Mid Channel

Mode: GSM 1900		
Channel No. 512	1850.2	
Nom. Voltage (V): 3.8 Vdc	Freq. Error (Hz)	Freq. Error (ppm)
Min. voltage = 3.6 Vdc	31	0.03
Max. voltage = 4.2 Vdc	26	0.02
Battery End Point: = 3.4 Vdc		

AFC FREQ ERROR vs. TEMPERATURE

Channel No. 512	1850.2	**Nom Vol: 3.8 Vdc**
Temperature (°C)	Freq. Error (Hz)	Freq. Error (ppm)
-10	29	0.03
0	26	0.03
+10	30	0.03
+20	27	0.03
+30	33	0.04
+40	31	0.03
+50	27	0.03

Mode: Mid Channel

Mode: UMTS 850 (Band V)		
Channel No. 4183	836.6	
Nom. Voltage (V): 3.8 Vdc	Freq. Error (Hz)	Freq. Error (ppm)
Min. voltage = 3.6 Vdc	-7	-0.01
Max. voltage = 4.2 Vdc	-8	-0.01
Battery End Point: = 3.4 Vdc		

AFC FREQ ERROR vs. TEMPERATURE

Channel No. 4183	836.5	**Nom Vol: 3.8 Vdc**
Temperature (°C)	Freq. Error (Hz)	Freq. Error (ppm)
-10	7	0.01
0	-8	-0.01
+10	6	0.01
+20	6	0.01
+30	-8	-0.01
+40	-7	-0.01
+50	-8	-0.01

Mode: Mid Channel

Mode: UMTS 1900 (Band II)		
Channel No. 9262	1852.4	
Nom. Voltage (V): 3.8 Vdc	Freq. Error (Hz)	Freq. Error (ppm)
Min. voltage = 3.6 Vdc	-14	-0.01
Max. voltage = 4.2 Vdc	12	0.01
Battery End Point: = 3.4 Vdc		

§2.1055 (A)(1)
AFC FREQ ERROR vs. TEMPERATURE

Channel No. 9262	1852.4	**Nom Vol: 3.8 Vdc**
Temperature (°C)	Freq. Error (Hz)	Freq. Error (ppm)
-10	14	0.02
0	12	0.01
+10	13	0.01
+20	12	0.01
+30	12	0.01
+40	13	0.01
+50	13	0.01

Mode: Mid Channel

Mode: UMTS 1700 (Band IV)		
Channel No. 1413	1732.6	
Nom. Voltage (V): 3.8 Vdc	Freq. Error (Hz)	Freq. Error (ppm)
Min. voltage = 3.6 Vdc	-15	-0.01
Max. voltage = 4.2 Vdc	-12	-0.01
Battery End Point: = 3.4 Vdc		

AFC FREQ ERROR vs. TEMPERATURE

Channel No. 1413	1732.6	**Nom Vol: 3.8 Vdc**
Temperature (°C)	Freq. Error (Hz)	Freq. Error (ppm)
-10	-11	-0.01
0	-11	-0.01
+10	-11	-0.01
+20	-12	-0.01
+30	-12	-0.01
+40	-11	-0.01
+50	-11	-0.01

6.5 Band Edge (Conducted) / Out of band emissions

6.5.1 References

FCC: CFR Part 2.1053, CFR Part 22.917 (a) (b), CFR Part 24.238 (a) (b), CFR Part 27.53 (g)
IC: RSS-132 Section 4.5.1.1, RSS 133 Section 6.5, RSS 133 Section 6.5

6.5.2 Limits

FCC Limit: -13 dBm
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.

RSS Limit: -13 dBm
In the 1 MHz bands immediately outside and adjacent to the frequency block, the emission power per any 1% of the emission bandwidth shall be attennuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 log p(watts).

6.5.3 Measurement Procedure:

Measurement according to KDB 971168 D01v02r02 section 6 and section 5.4.2.2

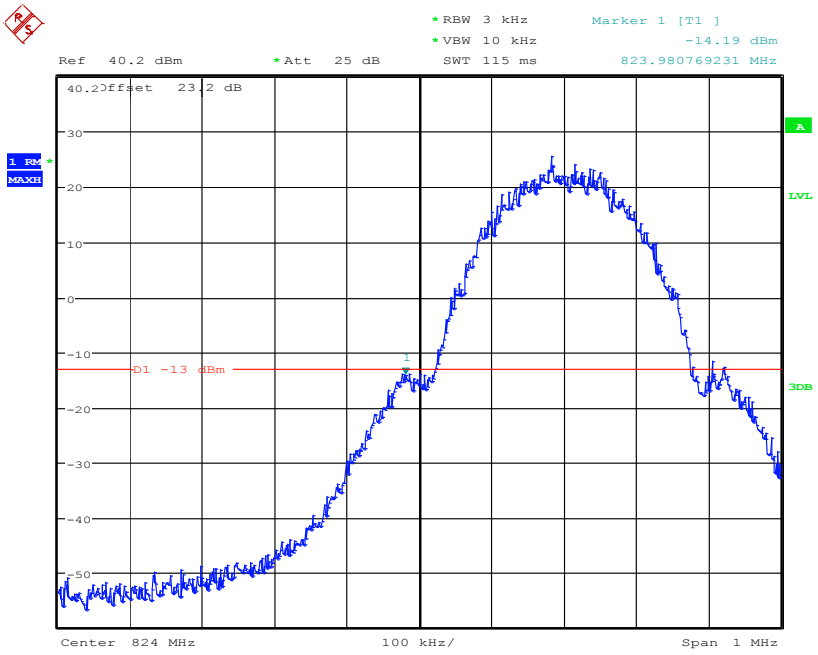
Lower Band Edge
RBW= 3 KHz or 1 % of the emission bandwidth
VBW ≥ 3 x RBW
Span = 2MHz
Center= lower band edge frequency
Detector= RMS; Trace= Max. Hold
SWT= Auto
Limit line: -13dBm

Put a marker at the center at band edge or the highest emission out of band.
Note down the reading.

Upper Band Edge
Center= upper band edge frequency.
Same procedure as above

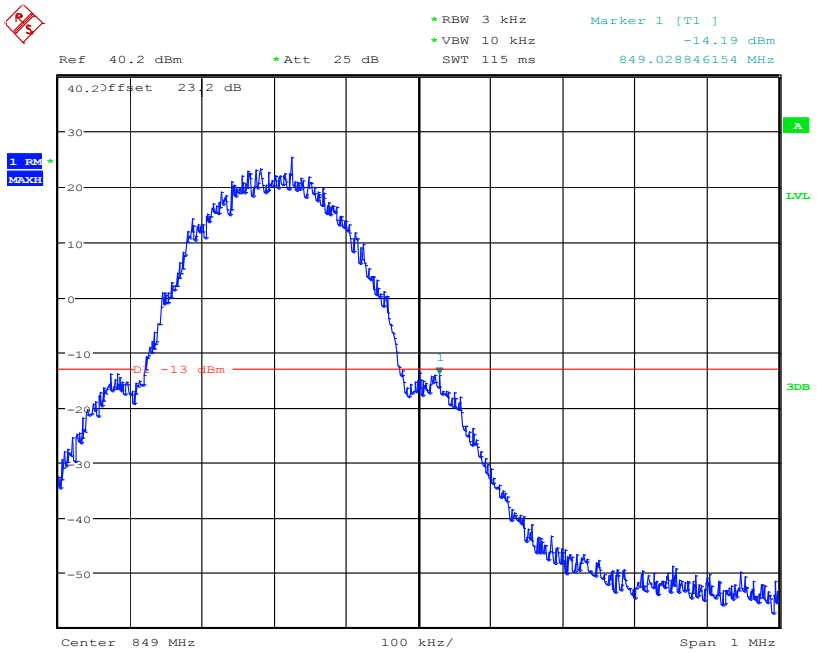
6.5.4 Test Results / Plots

Lower Band Edge GSM850 GSM



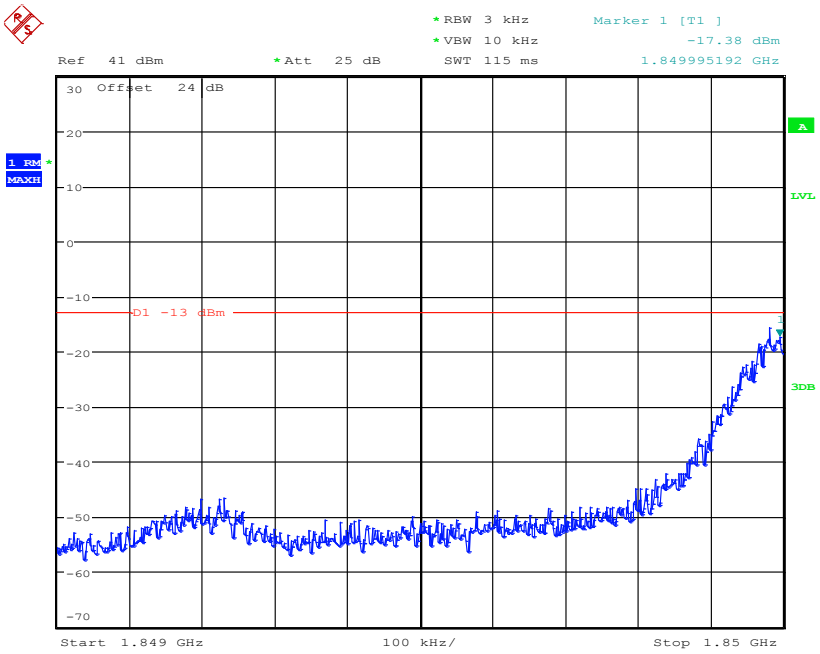
Date: 11.NOV.2014 12:04:26

Upper Band Edge GSM850 GSM



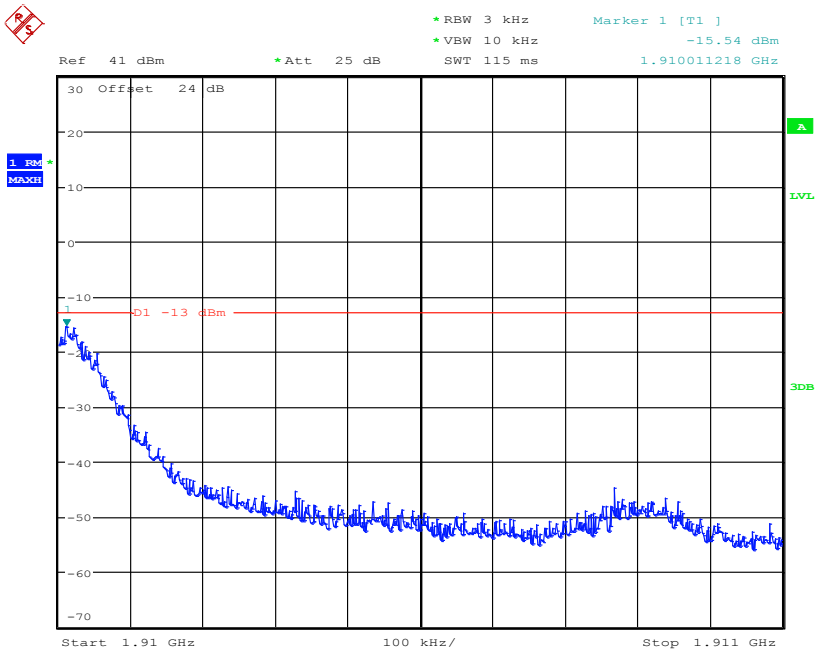
Date: 11.NOV.2014 12:08:55

Lower Band Edge GSM1900 GSM



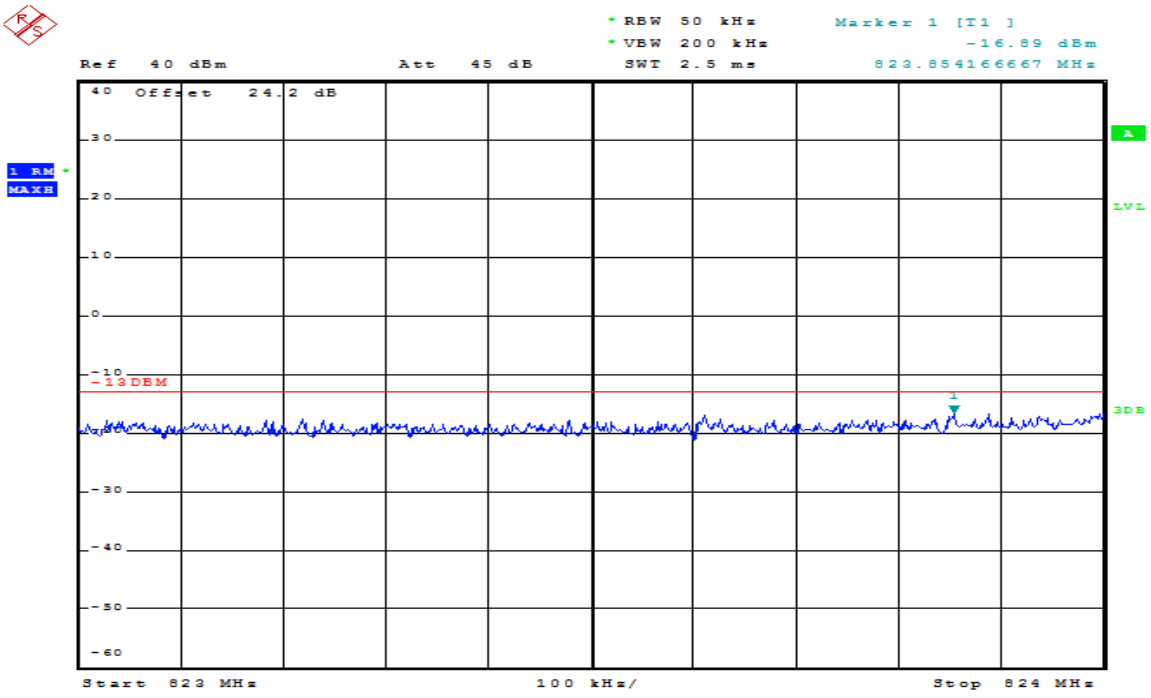
Date: 11.NOV.2014 14:49:13

Upper Band Edge GSM1900 GSM

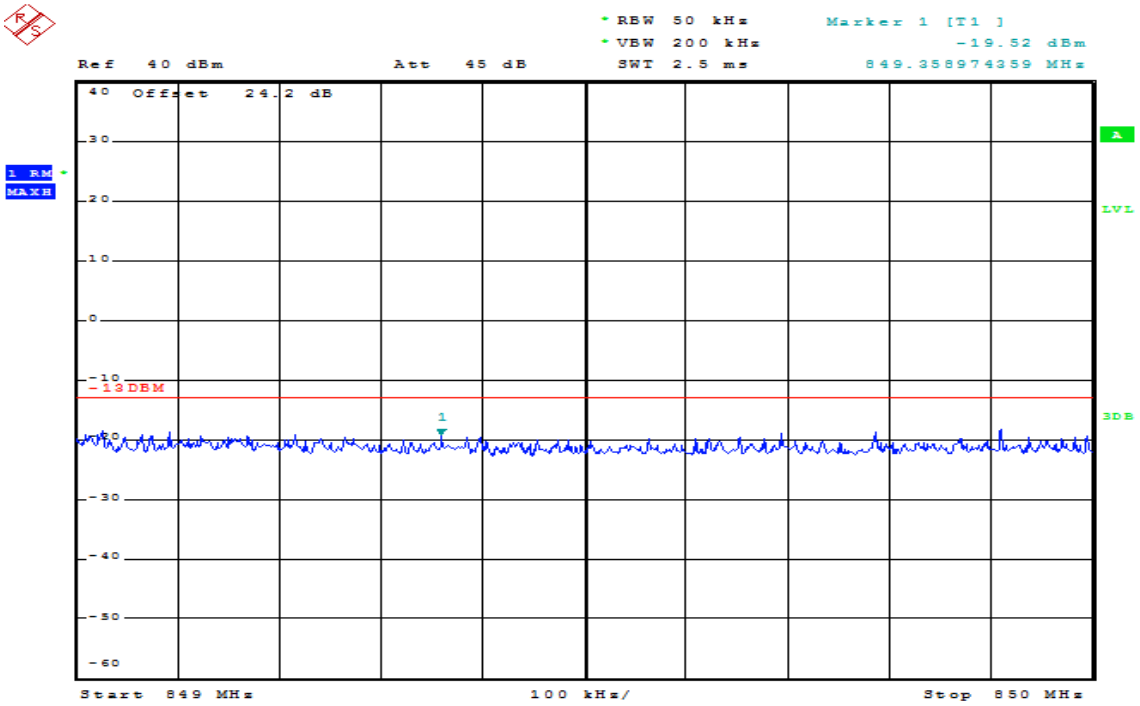


Date: 11.NOV.2014 14:47:17

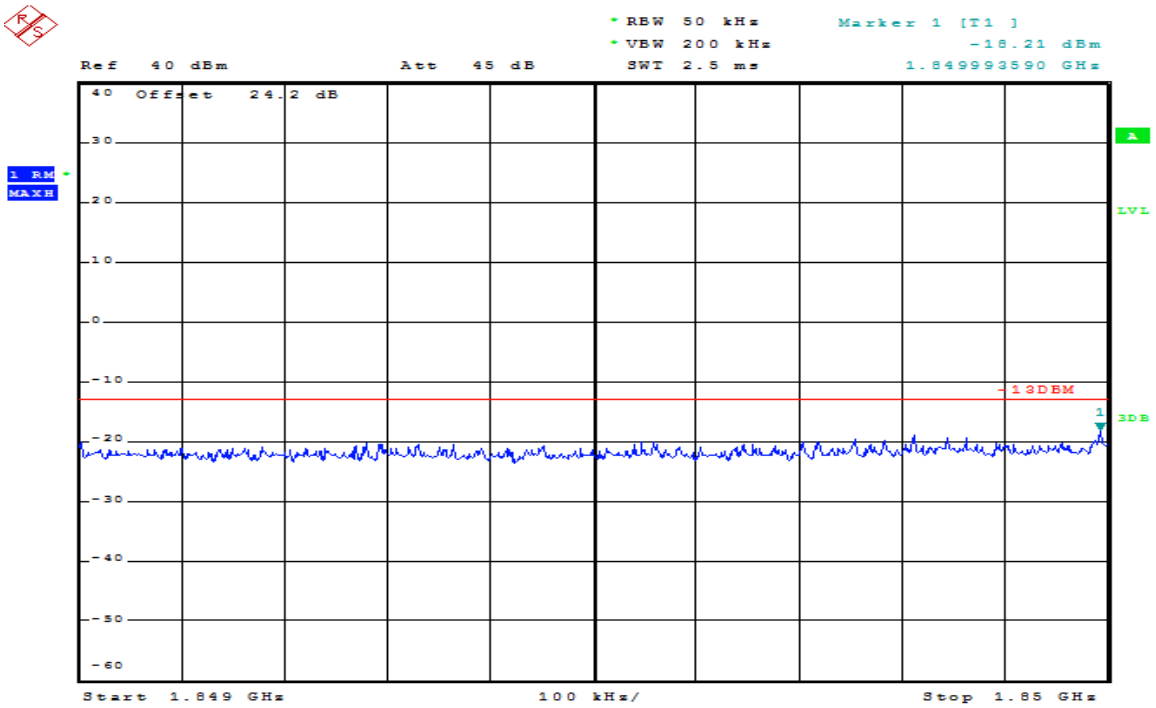
Lower Band Edge UMTS FDD5



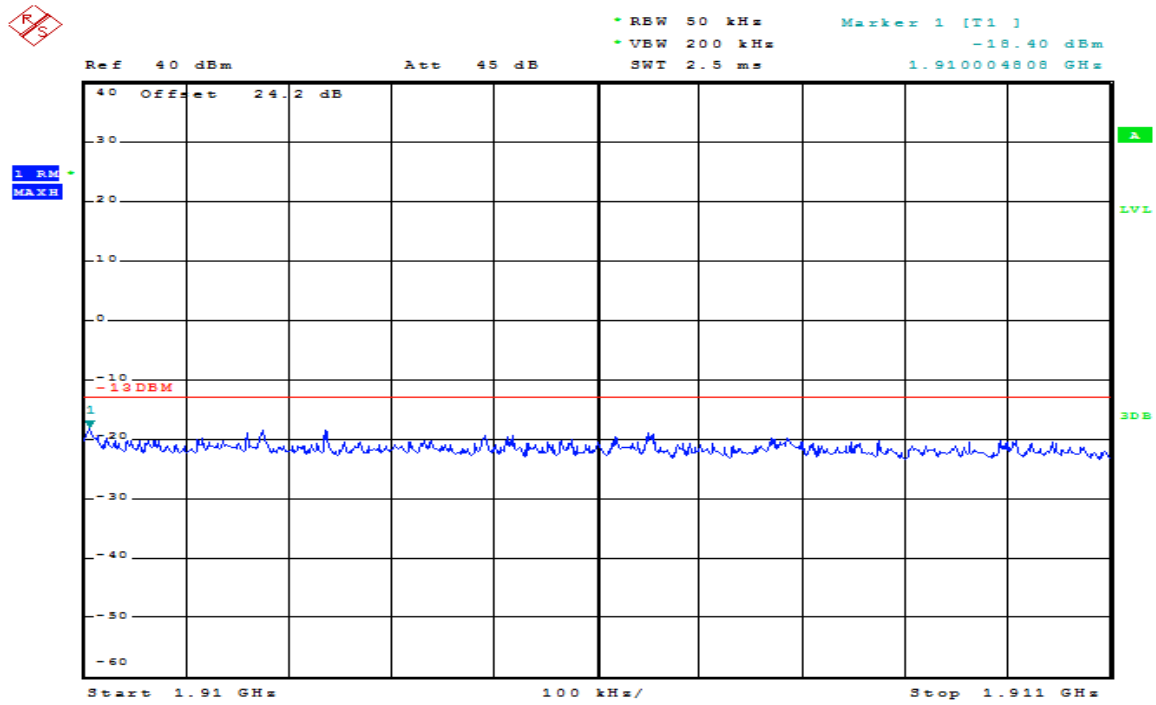
Upper Band Edge UMTS FDD5



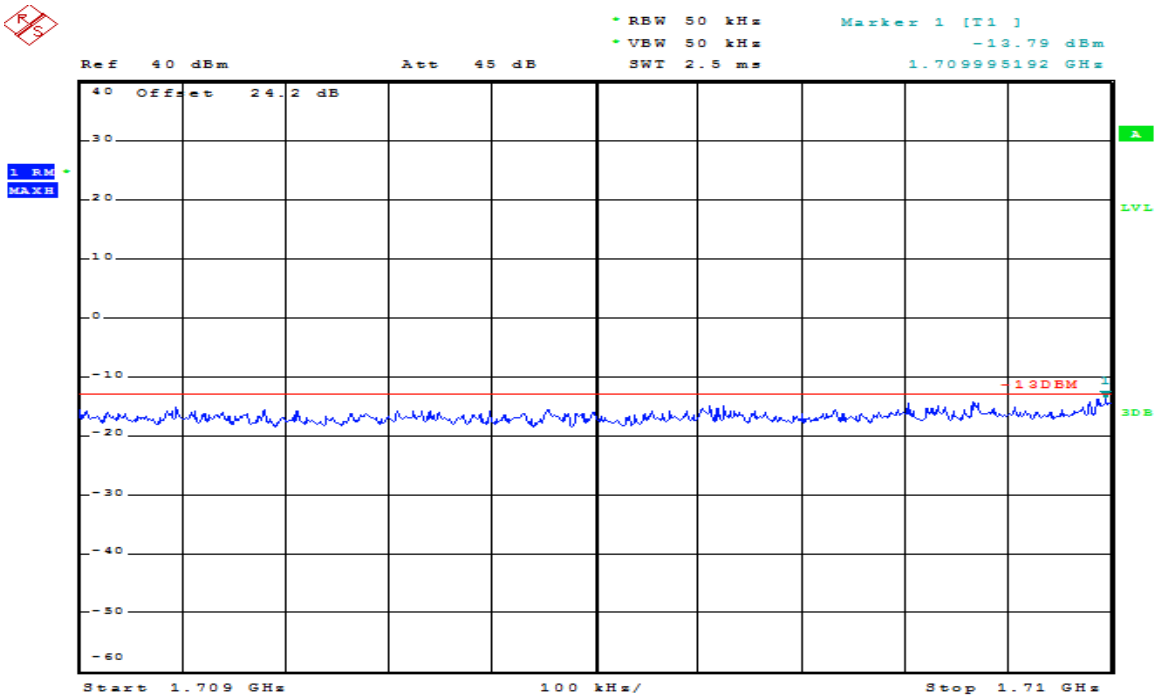
Lower Band Edge UMTS FDD2



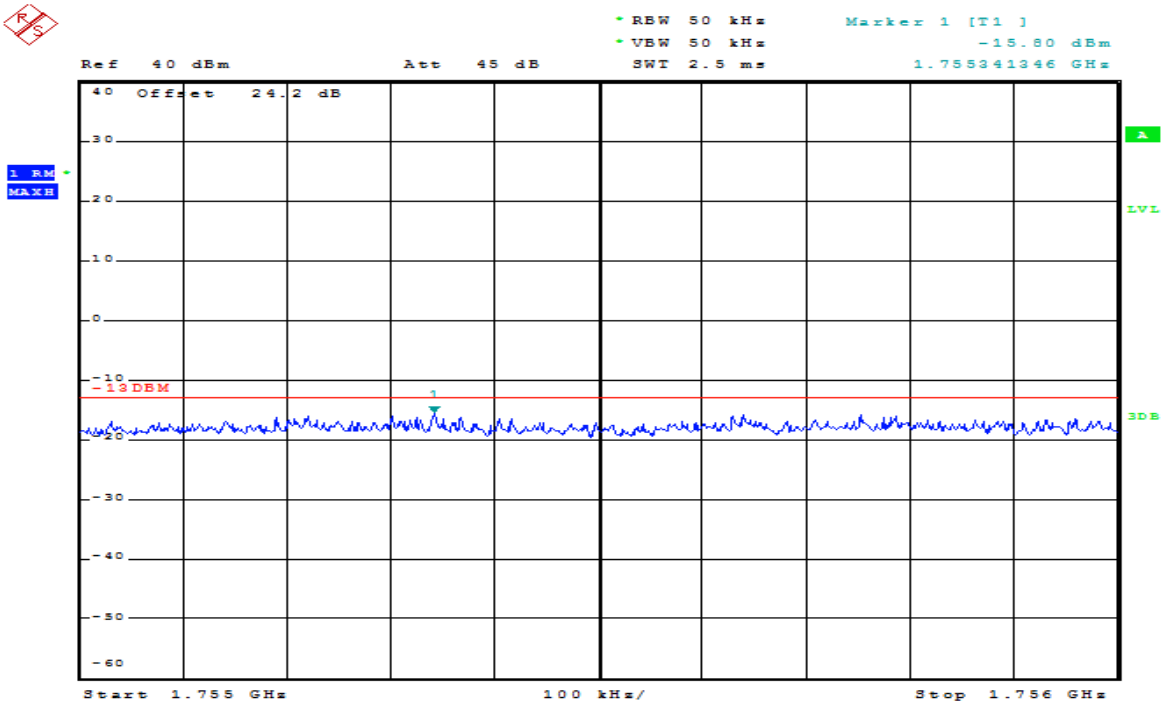
Upper Band Edge UMTS FDD2



Lower Band Edge UMTS FDD4



Upper Band Edge UMTS FDD4



6.6 Spurious Emissions Radiated

6.6.1 References

FCC: CFR Part 2.1053, CFR Part 22.917, CFR Part 24.238, CFR Part 27.53
IC: RSS-Gen Section 6.13; RSS-132 Section 5.5; RSS-133 Section 6.5, RSS-139 Section 6.5

6.6.2 Measurement requirements:

FCC 2.1053: Field strength of spurious radiation.

Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission.

RSS-Gen 6.13: Transmitter unwanted spurious emissions

The measurement method shall be described in the test report. When the applicable unwanted emissions limits are defined in relative terms, the same parameter, peak power or average power, used for the transmitter's output power measurement shall also be used for the unwanted emission measurements.

In measuring unwanted emissions, the spectrum shall be investigated from 30 MHz or the lowest radio frequency signal generated in the equipment, whichever is lower, without going below 9 kHz, up to at least the frequency given below:

(a) If the equipment operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
(b) If the equipment operates at or above 10 GHz: to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.

6.6.3 Limits:

(a) *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.
For all power levels +30dBm to 0dBm, this becomes a constant specification of -13dBm.

FCC 22.917 Emission limitations for cellular equipment.

The rules in this section govern the spectral characteristics of emissions in the Cellular Radiotelephone Service.
(b) *Measurement procedure.* Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (*i.e.* 100 kHz of 1 percent of emission bandwidth, as specified). 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.

FCC 24.238 Emission limitations for Broadband PCS equipment.

The rules in this section govern the spectral characteristics of emissions in the Broadband Personal Communications Service.
(b) Measurement procedure. Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands

immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (*i.e.* 100 kHz of 1 percent of emission bandwidth, as specified). 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.

RSS-132 Section 5.5.1.1 and RSS-133 Section 6.5.1

In the first 1.0 MHz band immediately outside and adjacent to the licensee's frequency block, the power of emissions per any 1% of the emission bandwidth shall be attenuated below the transmitter output power P (in watts) by at least $43 + 10 \log_{10}(P)$, dB. After the first 1.0 MHz, the power of emissions shall be attenuated below the transmitter output power by at least $43 + 10 \log_{10}(P)$, dB, in any 100 kHz bandwidth.
After the first 1.5 MHz, the power of emissions shall be attenuated below the transmitter output power by at least $43 + 10 \log_{10}(P)$, dB, in any MHz of bandwidth.

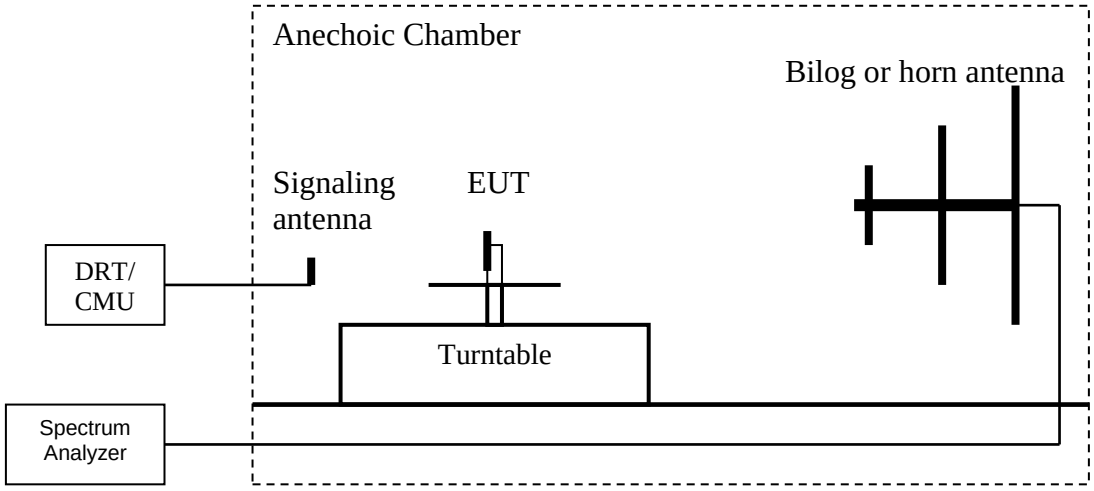
RSS-139 Section 6.5

In the first 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 below the transmitter output power P (in watts) by at least $43 + 10 \log_{10}(P)$, dB.

After the first 1.0 MHz outside the equipment's operating frequency block, the emission power in any 1 MHz bandwidth shall be attenuated below the transmitter output power P (in watts) by at least $43 + 10 \log_{10}(P)$, dB.

6.6.4 Radiated out of band measurement procedure:

Ref: TIA-603C 2004- 2.2.12 Unwanted emissions: Radiated Spurious



Connect the equipment as shown in the above diagram with the EUT's antenna in a horizontal orientation.

Adjust the settings of the Digital Radio Communication Tester (DRT) to set the EUT to its maximum power at the required channel.

Set the spectrum analyzer to measure peak hold with the required settings.

Place the measurement antenna in a horizontal orientation. Rotate the EUT 360°. Raise the measurement antenna up to 4 meters in 0.5 meters increments and rotate the EUT 360° at each height to maximize all emissions. Measure and record all spurious emissions (**LVL**) up to the tenth harmonic of the carrier frequency.

Replace the EUT with a horizontally polarized half wave dipole or known gain antenna. The center of the antenna should be at the same location as the center of the EUT's antenna.

Connect the antenna to a signal generator with known output power and record the path loss in dB (**LOSS)**. **LOSS** = Generator Output Power (dBm) – Analyzer reading (dBm).

Determine the level of spurious emissions using the following equation:

Spurious (dBm) = **LVL** (dBm) + **LOSS** (dB):

Repeat steps 4, 5 and 6 with all antennas vertically polarized.

Determine the level of spurious emissions using the following equation:

Spurious (dBm) = **LVL** (dBm) + **LOSS** (dB):

Measurements are to be performed with the EUT set to the low, middle and high channel of each frequency band.

(N**ote:** Steps 5 and 6 above are performed prior to testing and **LOSS** is recorded by test software. Steps 3, 4 and 7 above are performed with test software.)

6.6.5 Sample Calculations for Radiated Measurements

Power Measurements using Substitution Procedure:

The measurement on the Spectrum Analyzer is used as a basis for the Substitution procedure.
The EUT is replaced with a Signal Generator and an antenna. The setting on the Signal Generator is varied until the Spectrum Analyzer displays the original reading. EIRP is calculated as-

EIRP (dBm)= Signal Generator setting (dBm)- Cable Loss (dB)+ Antenna Gain (dBi)

Example:

Frequency (MHz)	Measured SA (dBµV)	Signal Generator setting (dBm)	Antenna Gain (dBi)	Dipole Gain (dBd)	Cable Loss (dB)	EIRP (dBm)
1000	95.5	24.5	6.5	0	3.5	27.5

6.6.6 Measurement Survey:

The site is constructed in accordance with ANSI C63.4 requirements and is recognized by the FCC to be in compliance for a 3m site. The spectrum is scanned from 9 kHz to the 10th harmonic of the highest frequency generated by the EUT.
Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the 850 MHz, 1700 MHz and 1900 MHz bands of operation.
It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the GSM-850 MHz and the PCS-1900 MHz band into any of the other blocks respectively. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.

Radiated emission measurements were made in GMSK (1 uplink slot) and UMTS RMC 12.2k modes. Additional spot checks in mid channel of operation for all modes were performed with the slimmer battery option of the device.

For radiated measurements, all data in this report shows the worst case emissions data between H/V antenna polarizations and for all 3 orthogonal orientations of the EUT.

Unless mentioned otherwise, the emission signals above the limit line in the plots are from the carrier.

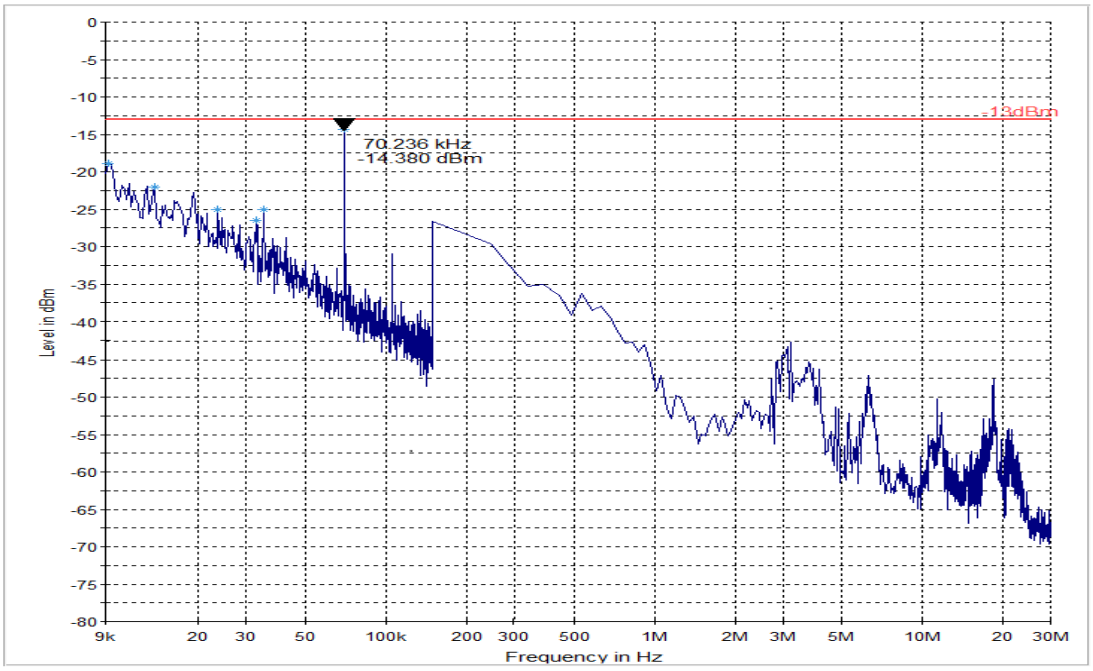
6.6.7 Test Conditions:

Tnom: 21^{o}C; Vnom: 3.8 V

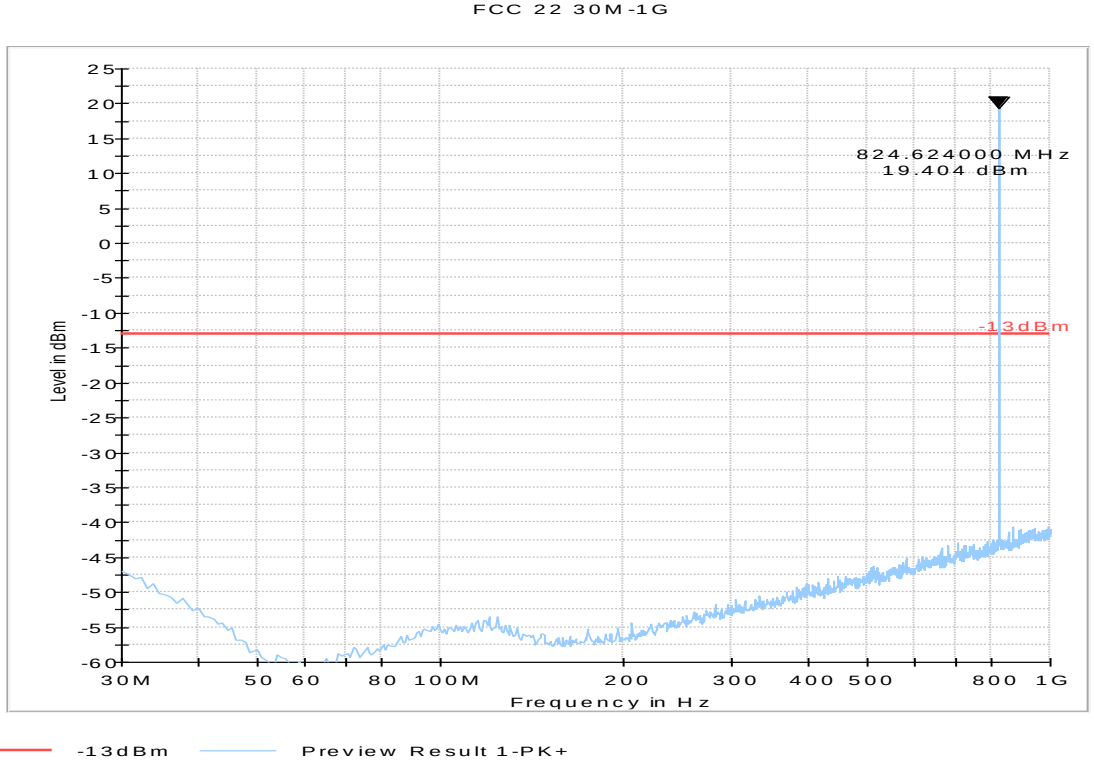
6.6.8 Test Results:

Radiated Spurious Emissions (GSM850) Tx:

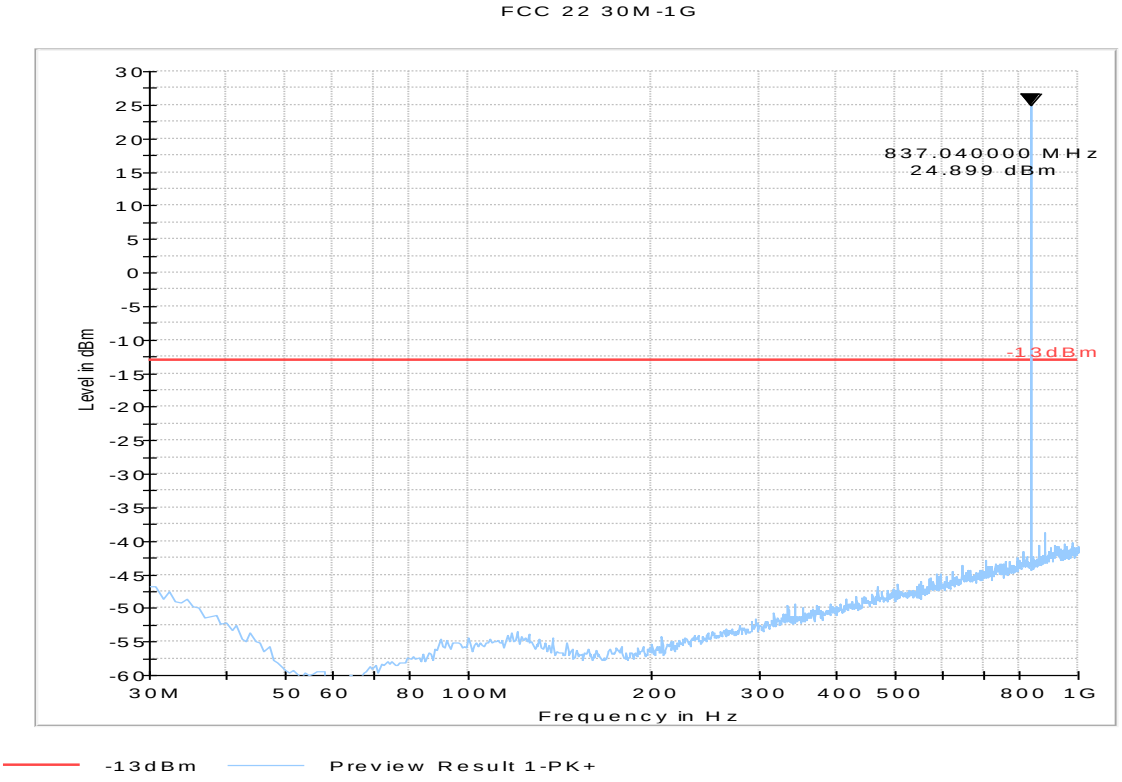
Test results 9 kHz- 30 MHz – Mid Channel (GSM850)



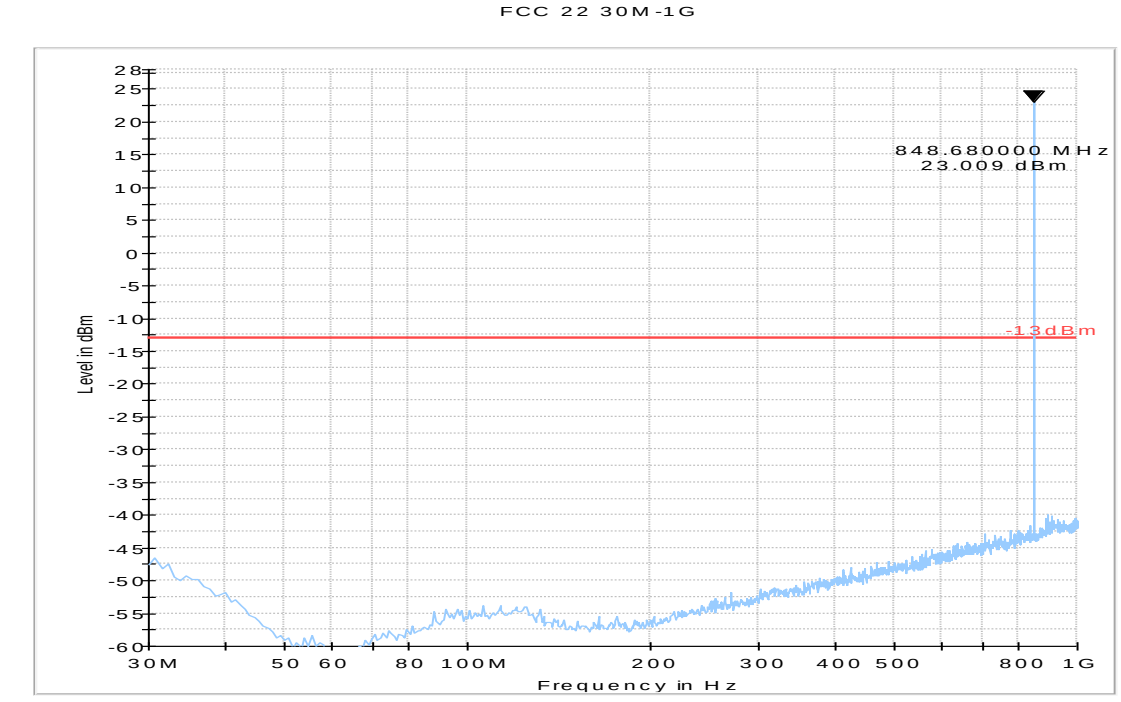
Test results - 30 MHz – 1GHz -Low Channel (GSM850)



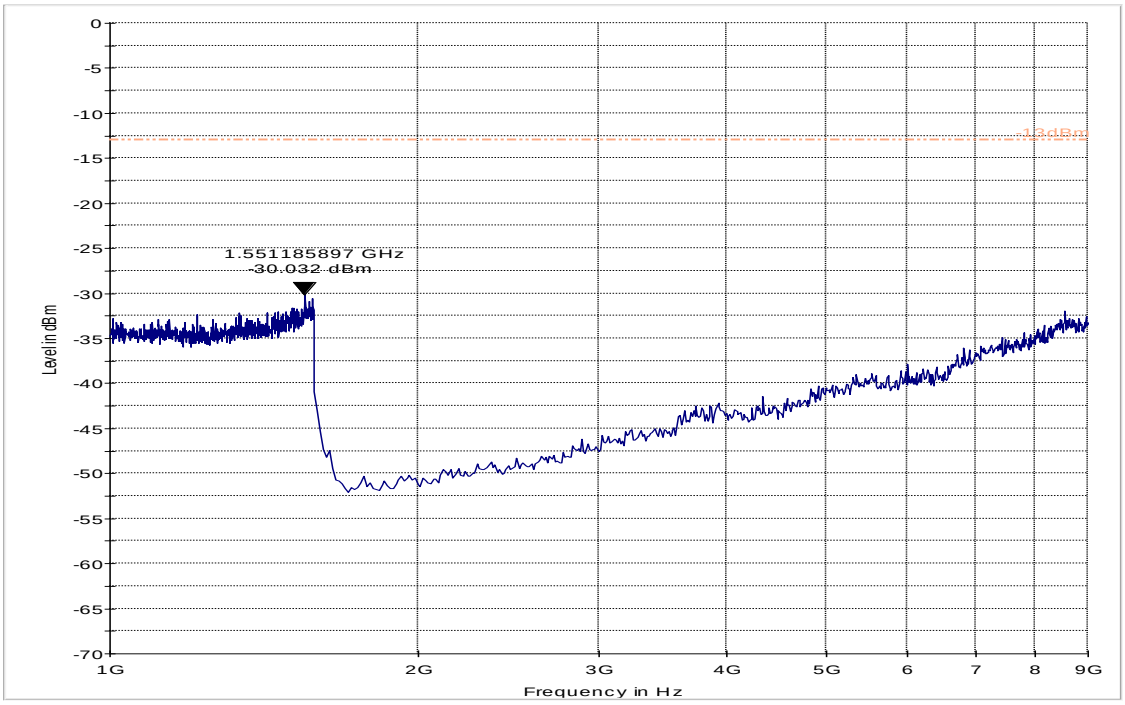
Test results - 30 MHz – 1GHz -Mid Channel (GSM850)



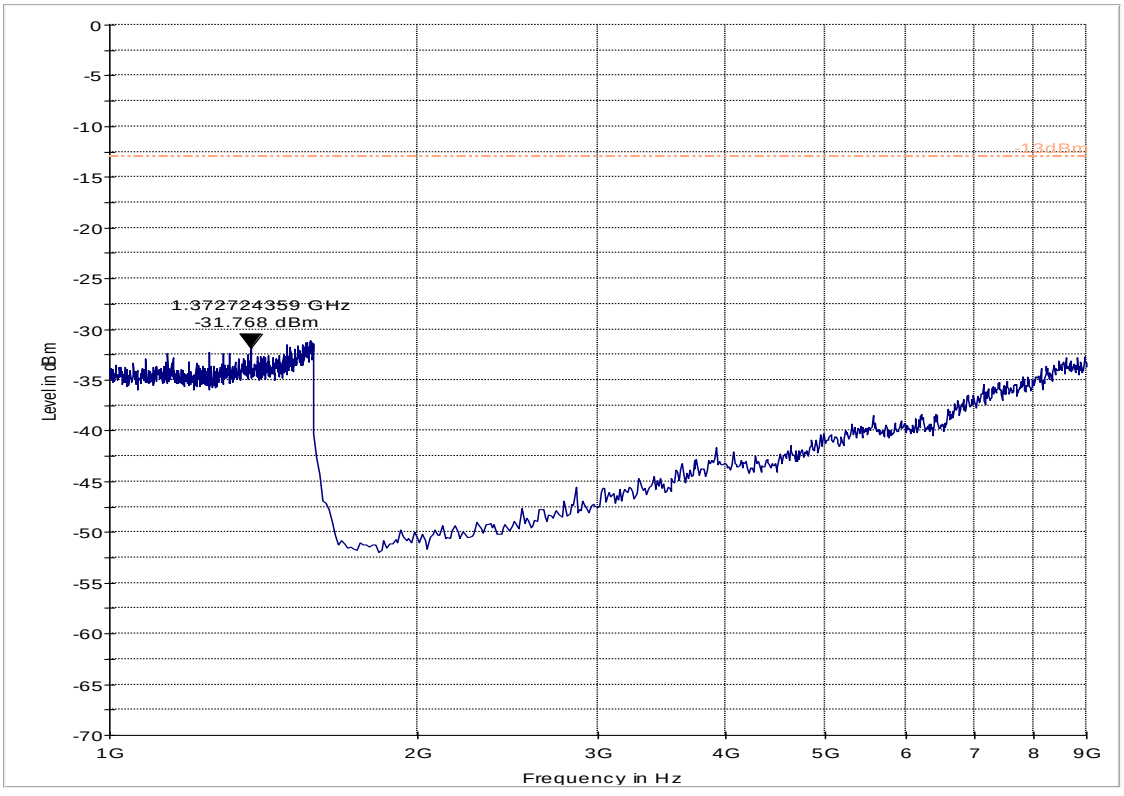
Test results - 30 MHz – 1GHz -High Channel (GSM850)



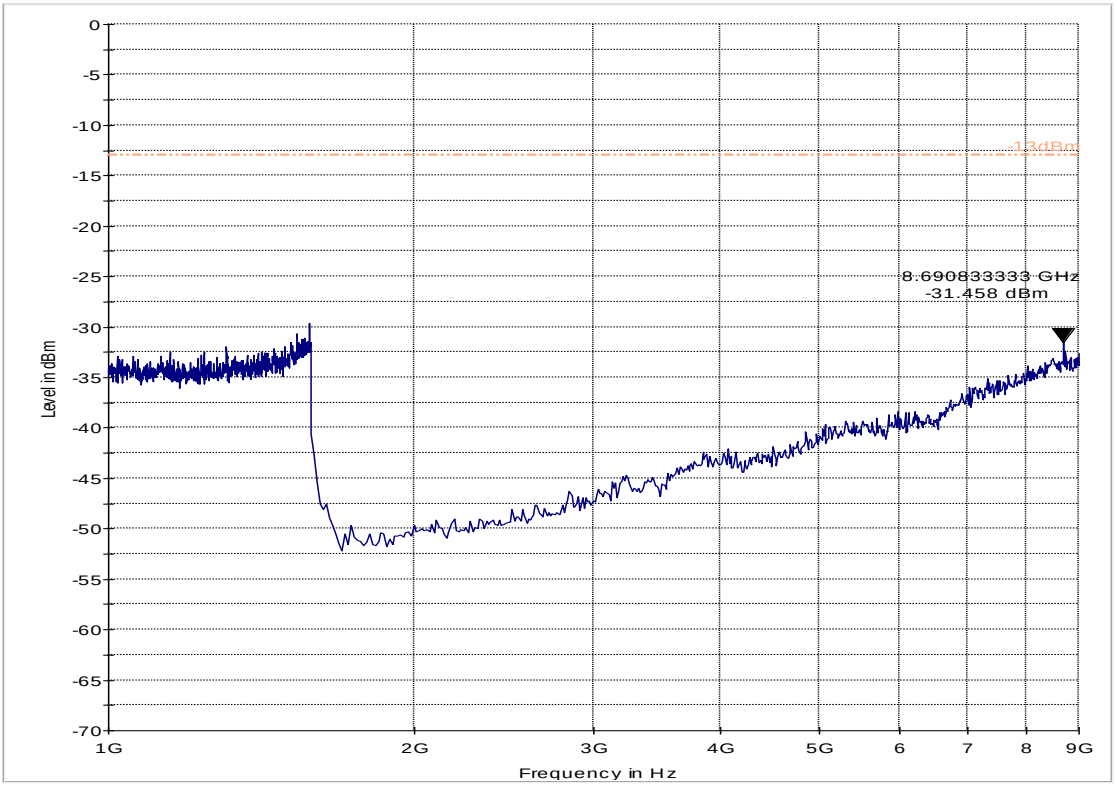
Test results - 1GHz – 9GHz -Low Channel (GSM850)



Test results - 1GHz – 9GHz -Mid Channel (GSM850)

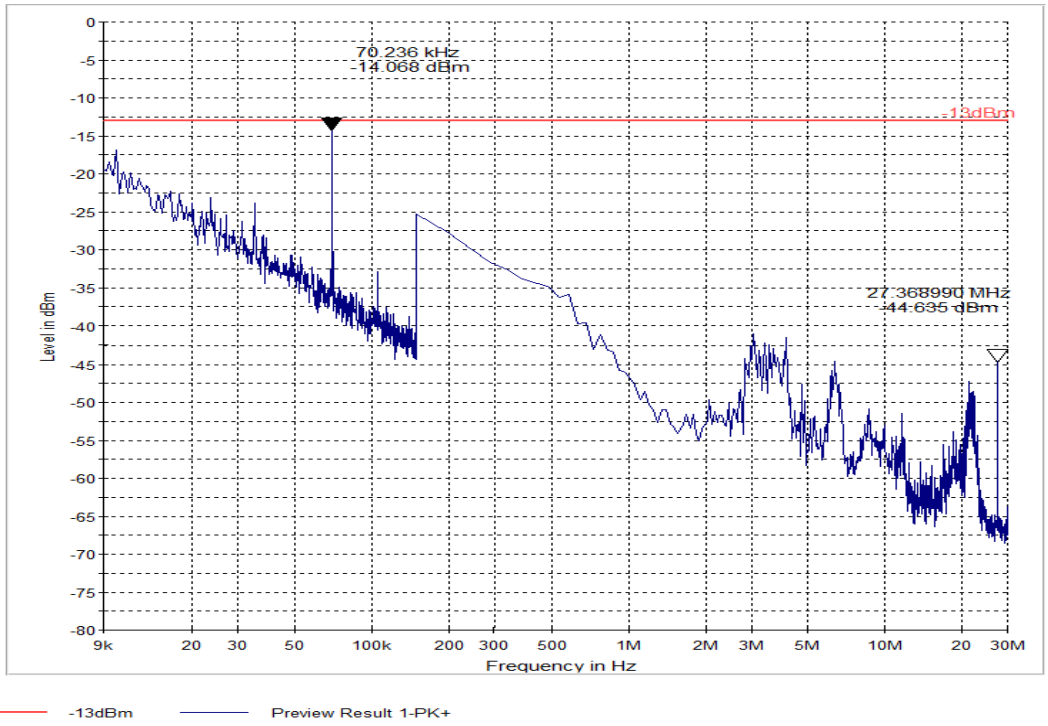


Test results - 1GHz – 9GHz -High Channel (GSM850)

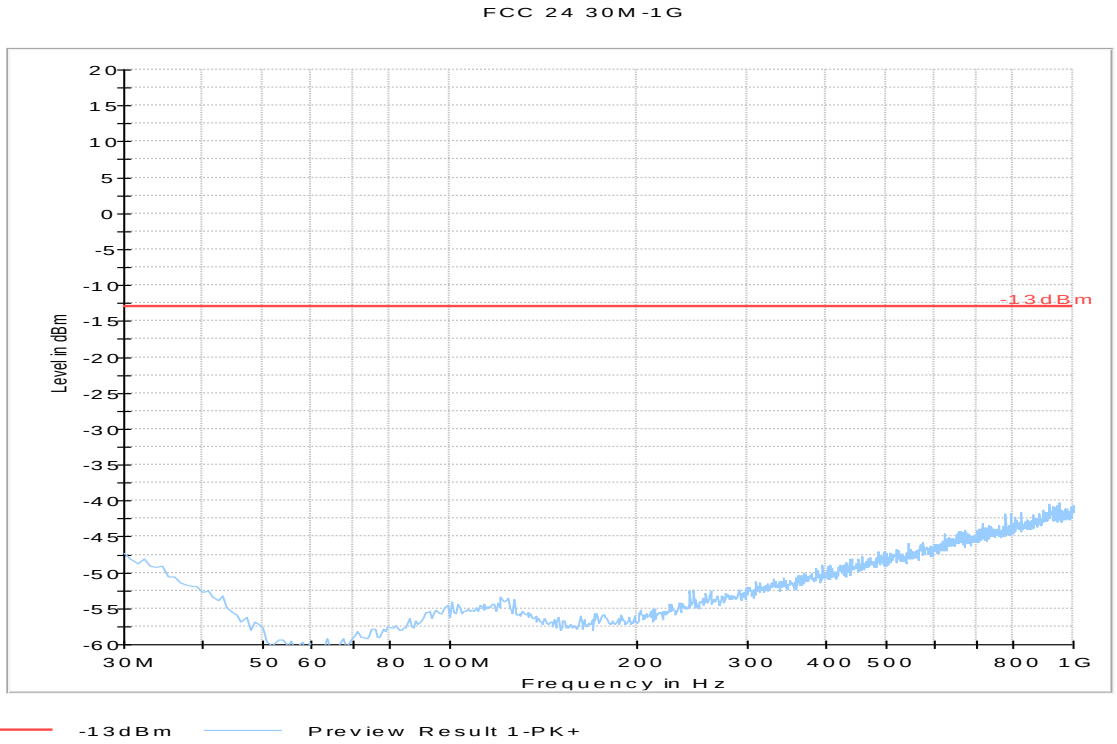


Radiated Spurious Emissions (GSM-1900) Tx:

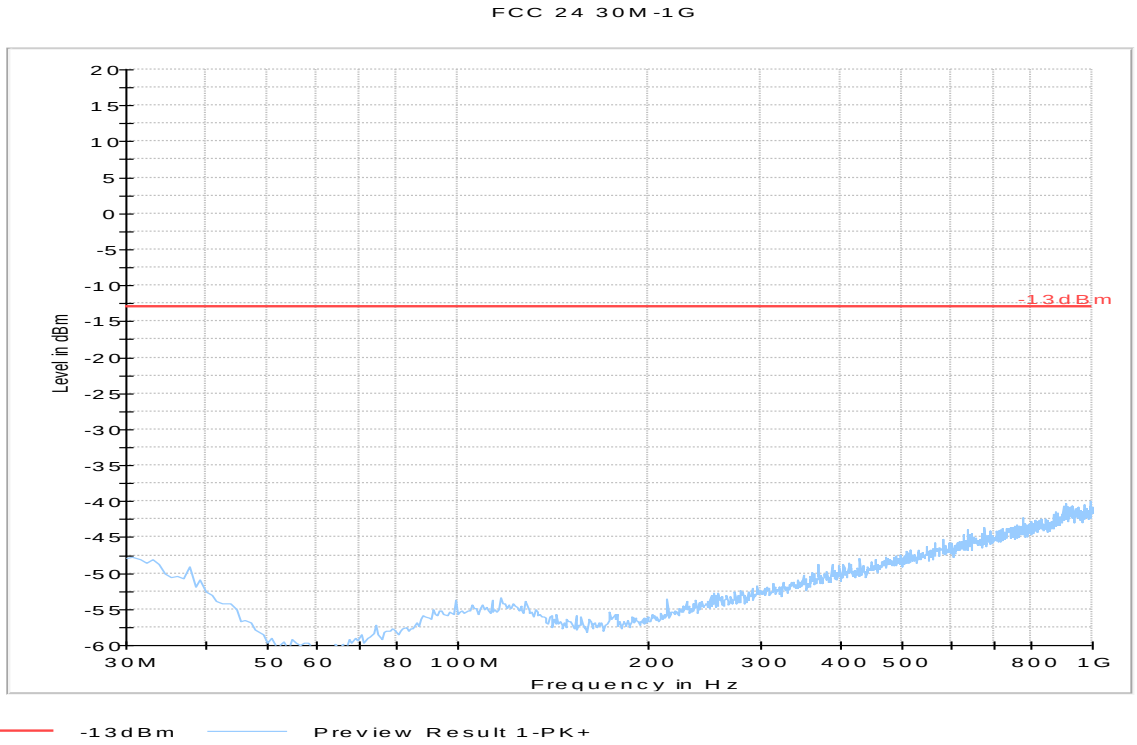
Test results 9 kHz- 30 MHz – Mid Channel (GSM-1900)



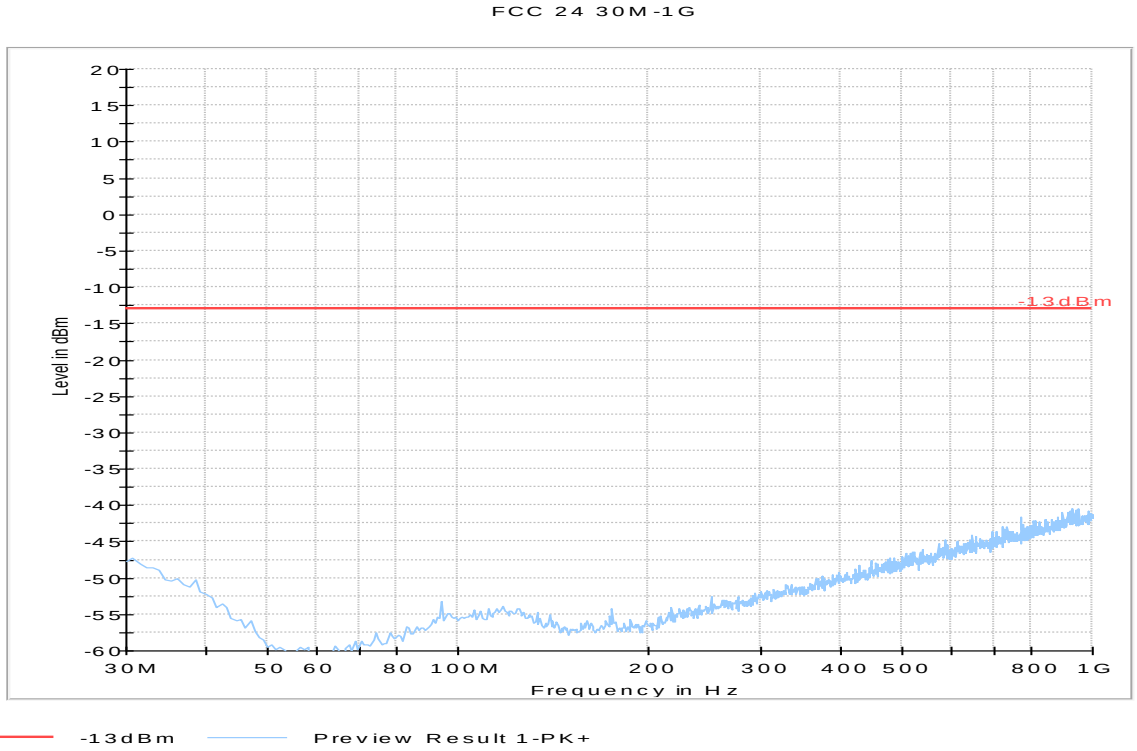
Test results 30MHz-1GHz – Low Channel (GSM-1900)



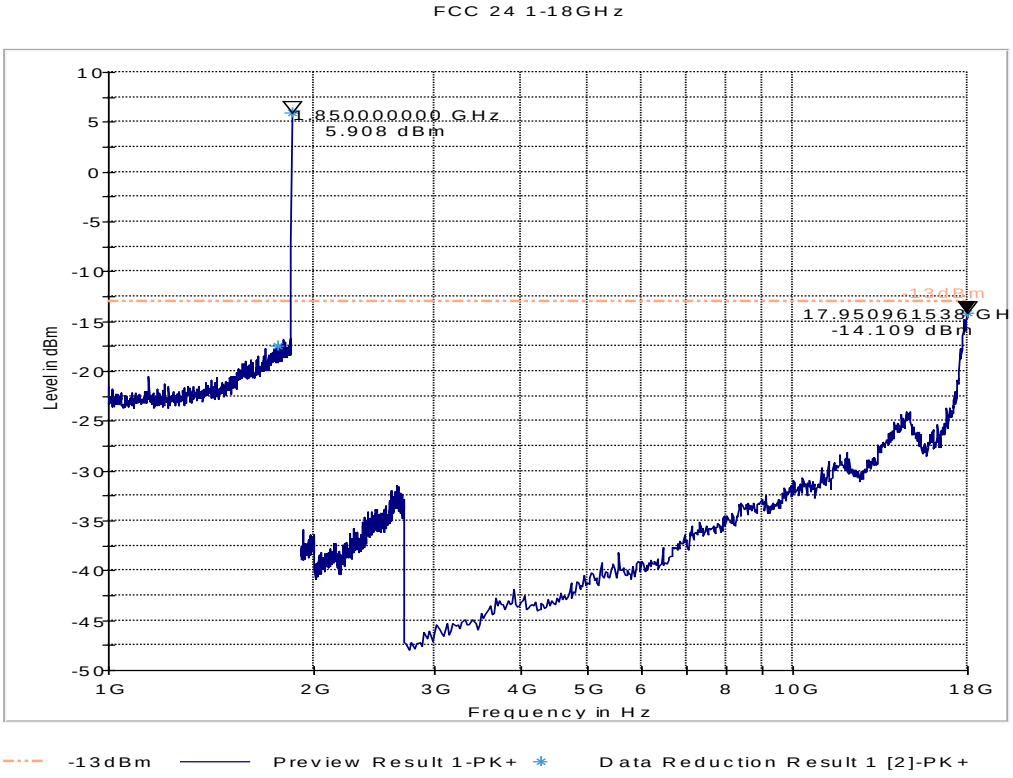
Test results 30MHz-1GHz – Mid Channel (GSM-1900)



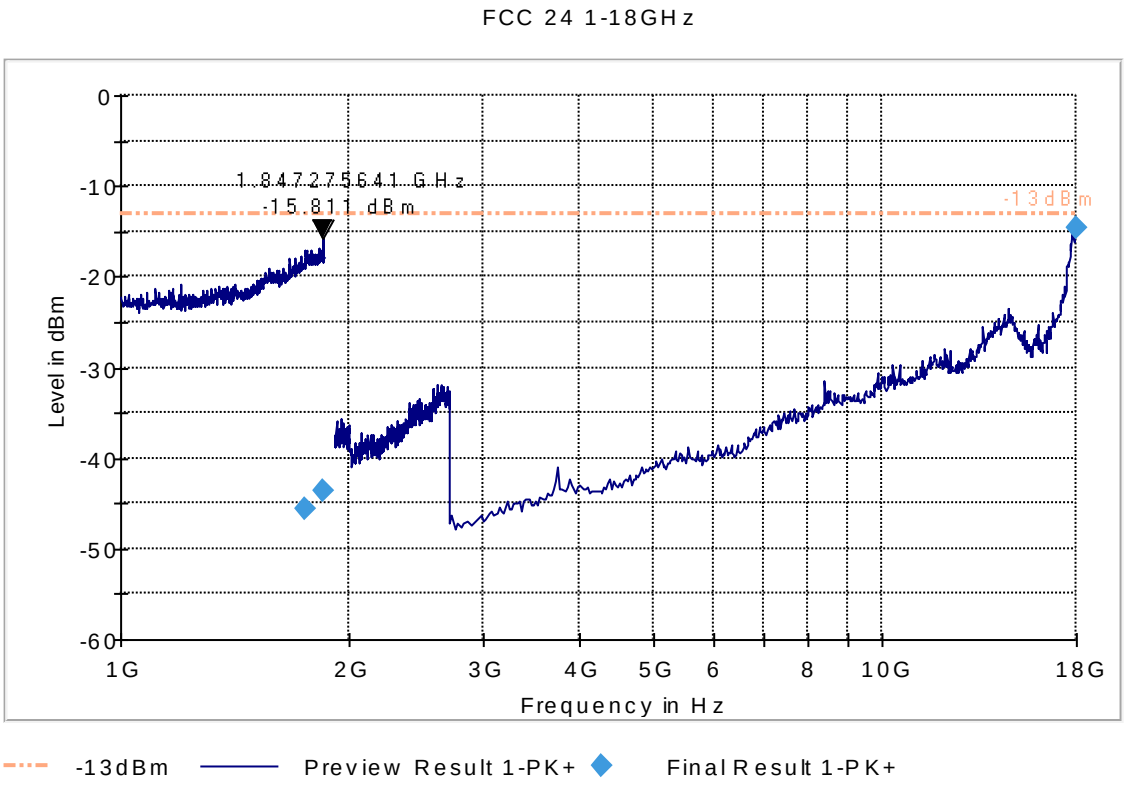
Test results 30MHz-1GHz – High Channel (GSM-1900)



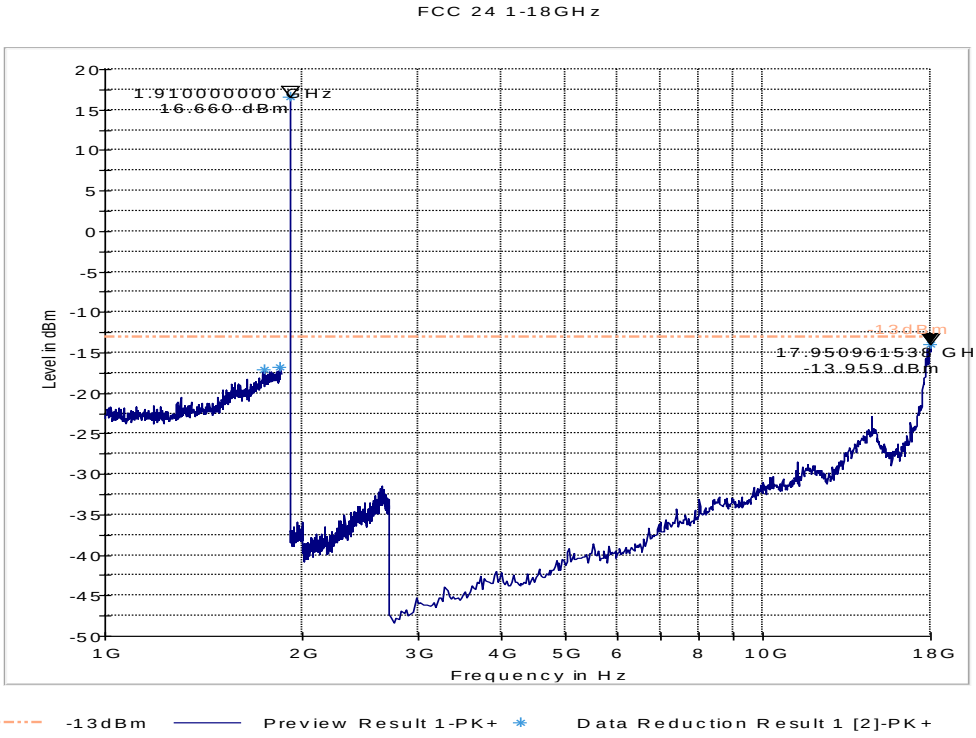
Test results 1 GHz-18 GHz – Low Channel (GSM-1900)



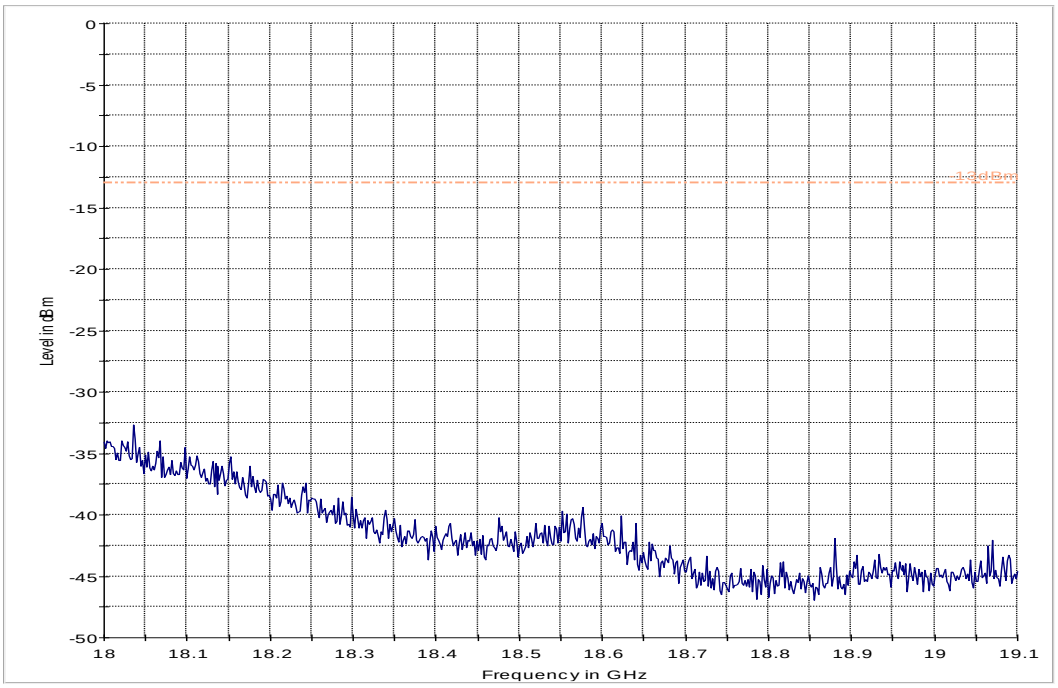
Test results 1 GHz-18 GHz – Mid Channel (GSM-1900)



Test results 1 GHz-18 GHz – High Channel (GSM-1900)

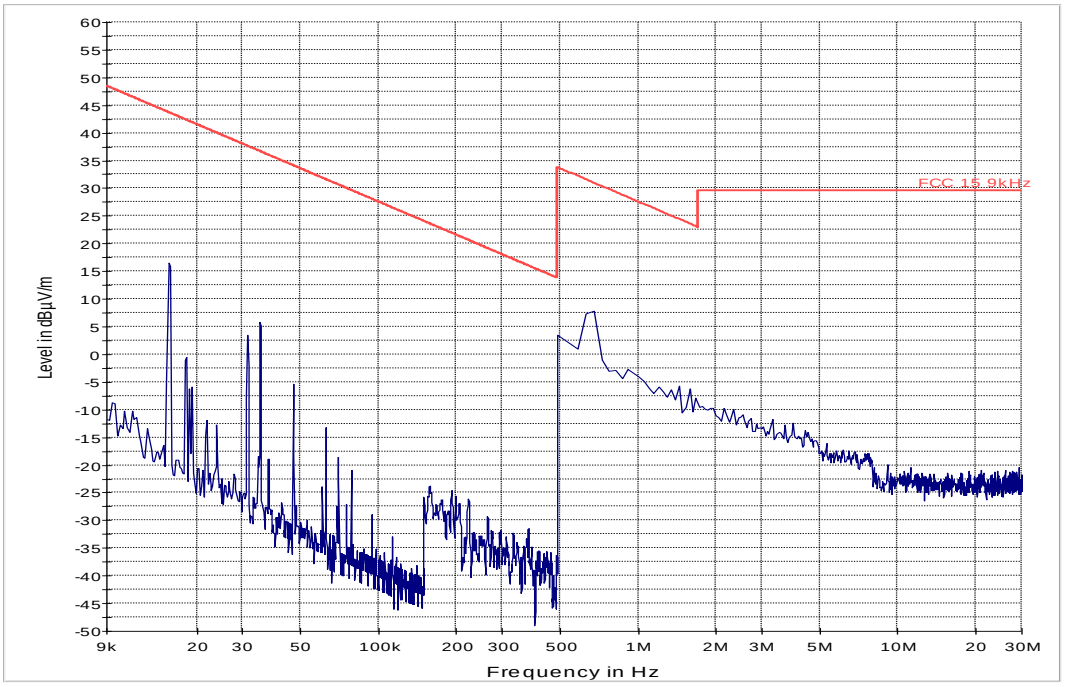


Test results 18 GHz- 19.1 GHz – Mid Channel (GSM-1900)

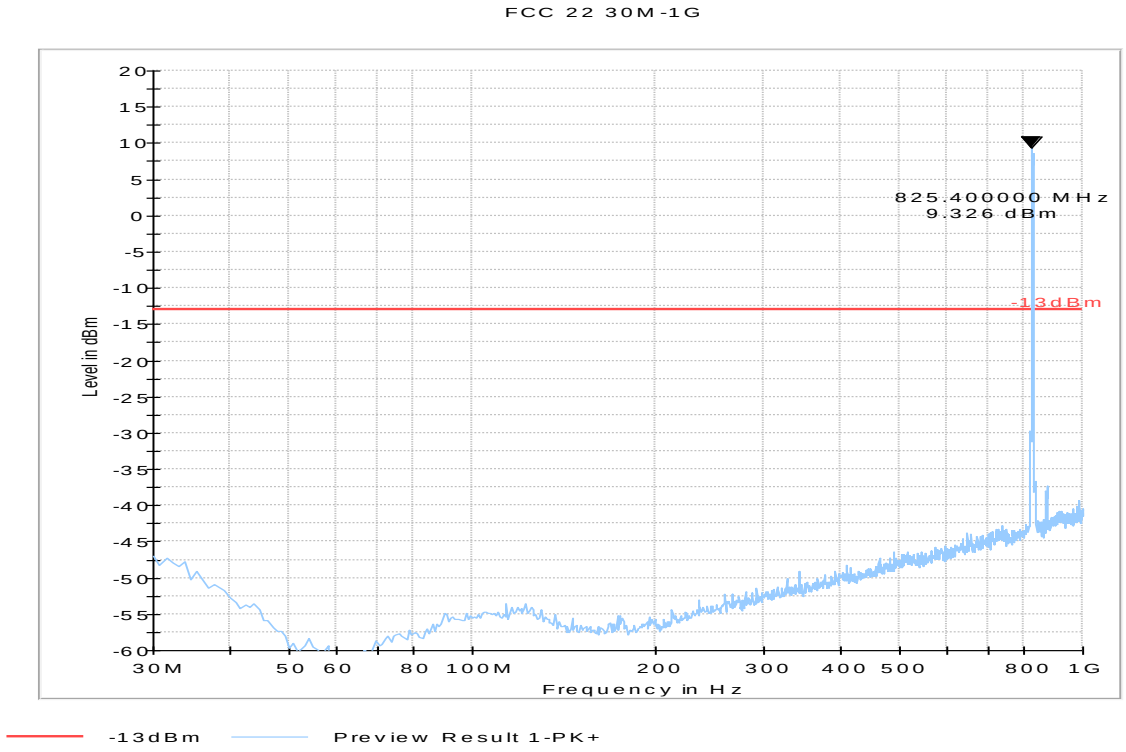


Radiated Spurious Emissions (UMTS Band 5) Tx:

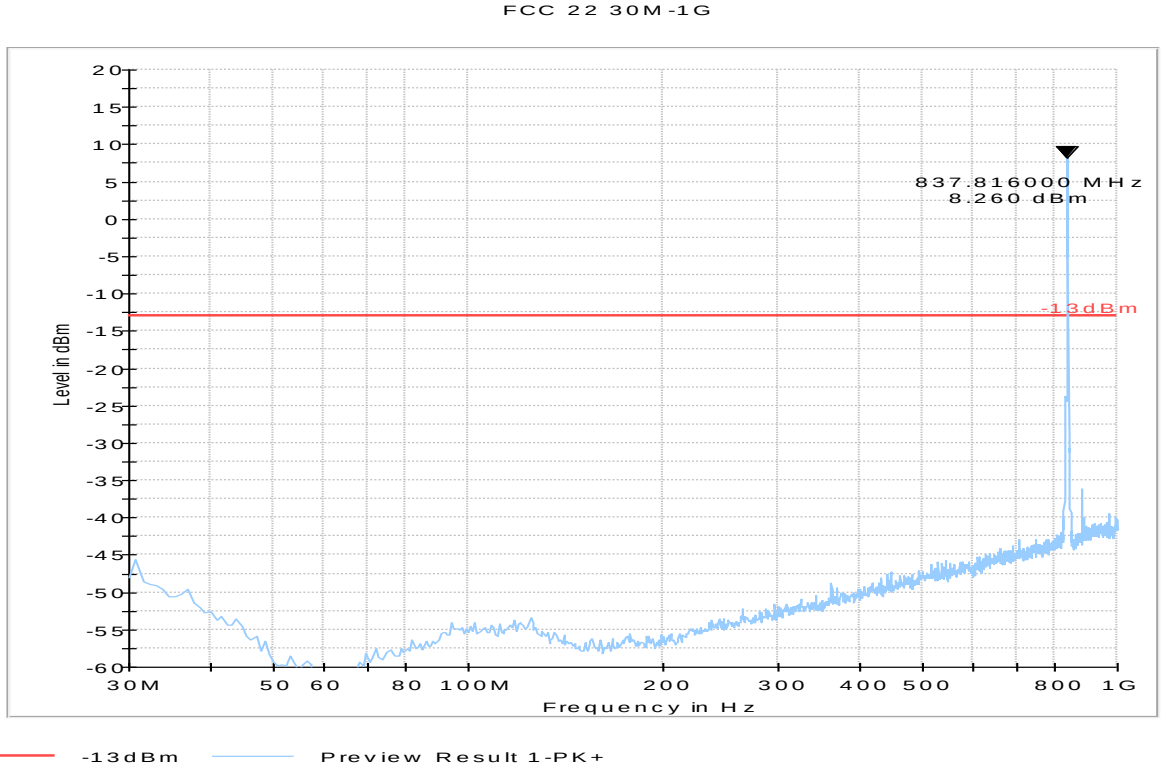
Test results 9 kHz- 30 MHz – Mid Channel (UMTS-Band 5)



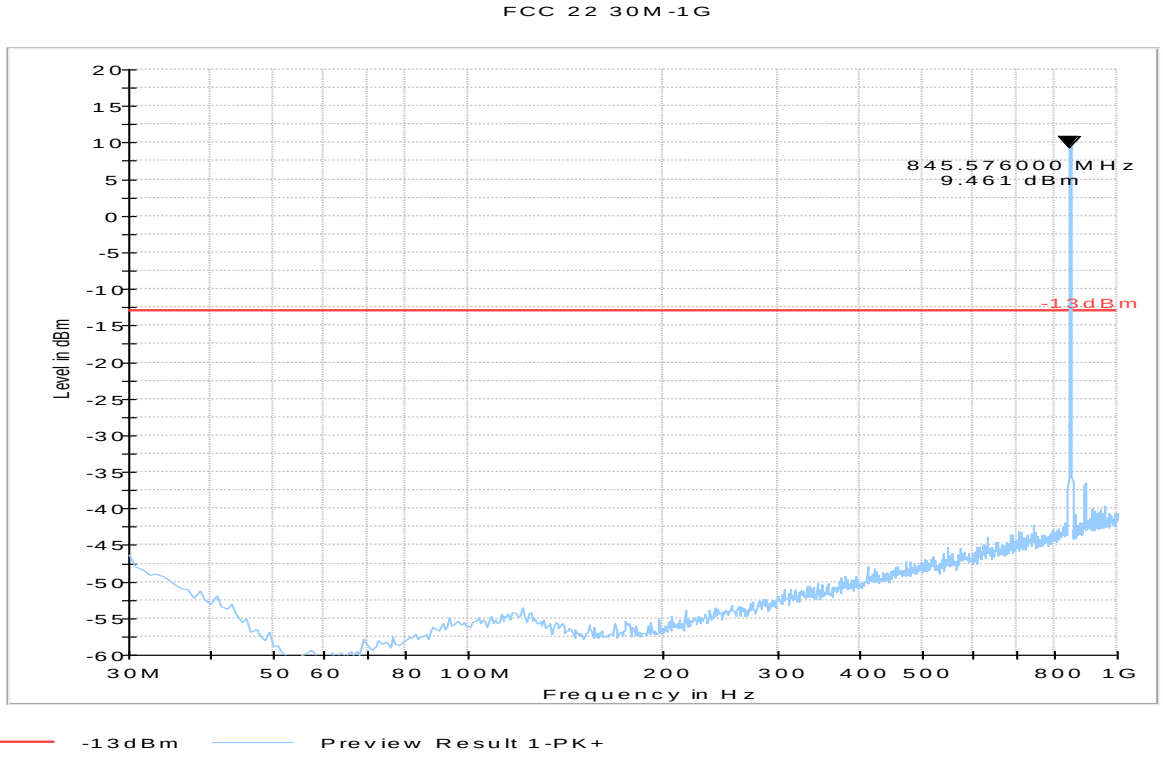
Test results 30MHz-1GHz – Low Channel (UMTS-Band 5)



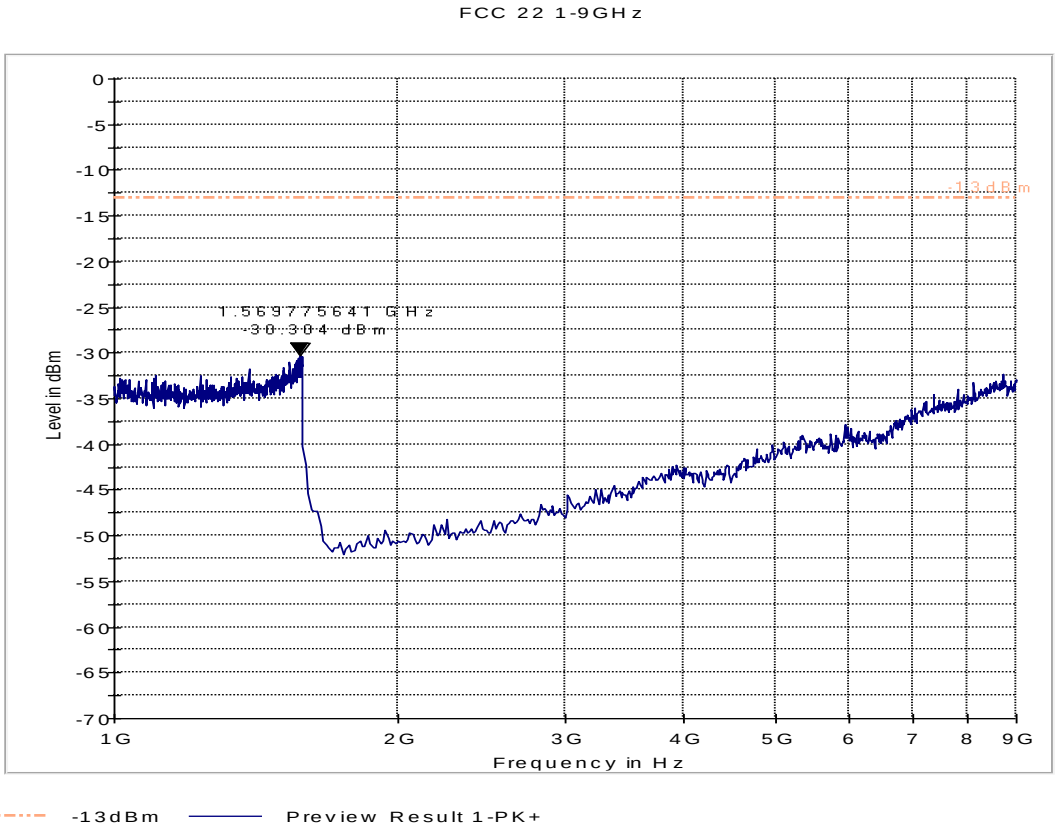
Test results 30 MHz-1GHz – Mid Channel (UMTS-Band 5)



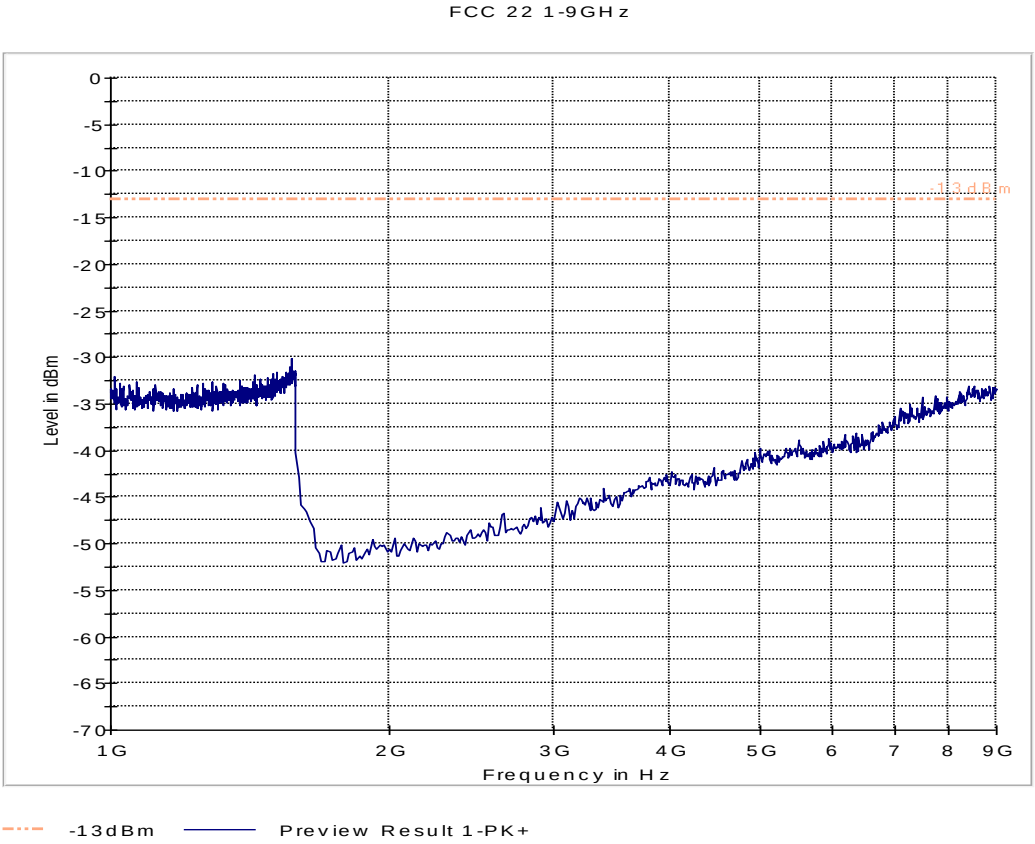
Test results 30MHz-1GHz – High Channel (UMTS-Band 5)



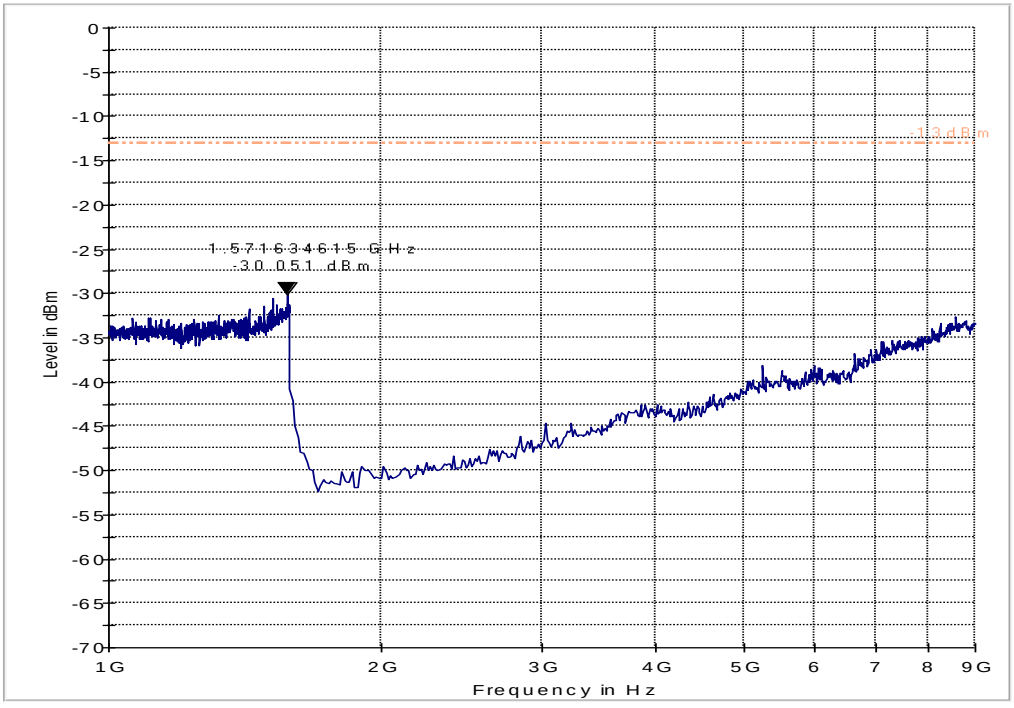
Test results 1GHz-9GHz – Low Channel (UMTS-Band 5)



Test results 1GHz-9GHz – Mid Channel (UMTS-Band 5)

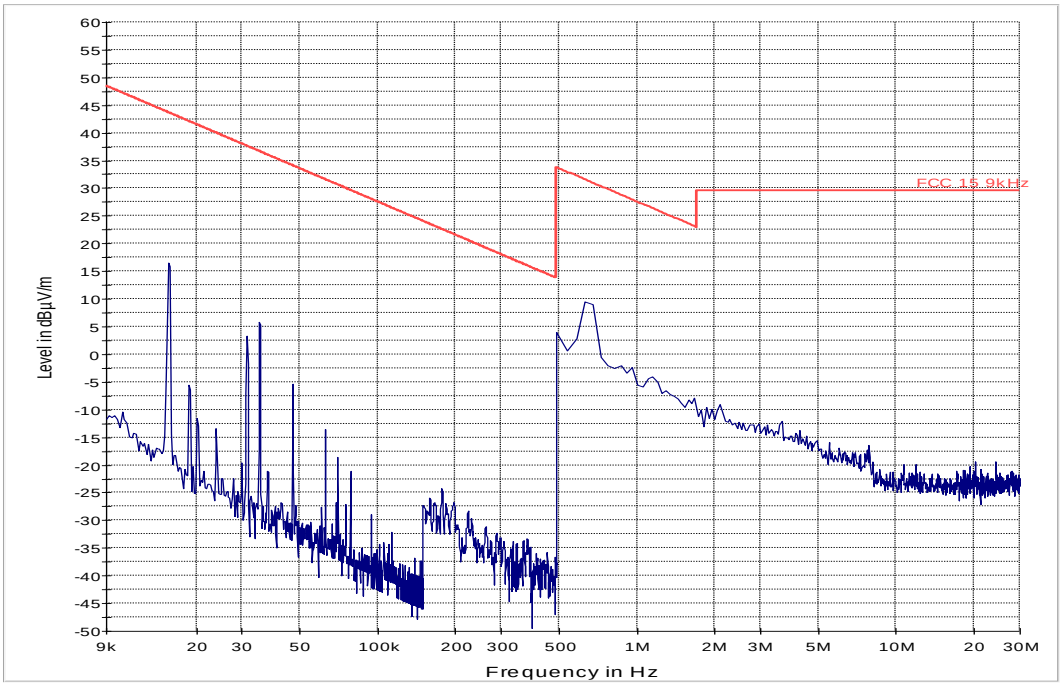


Test results 1GHz-9GHz – High Channel (UMTS-Band 5)

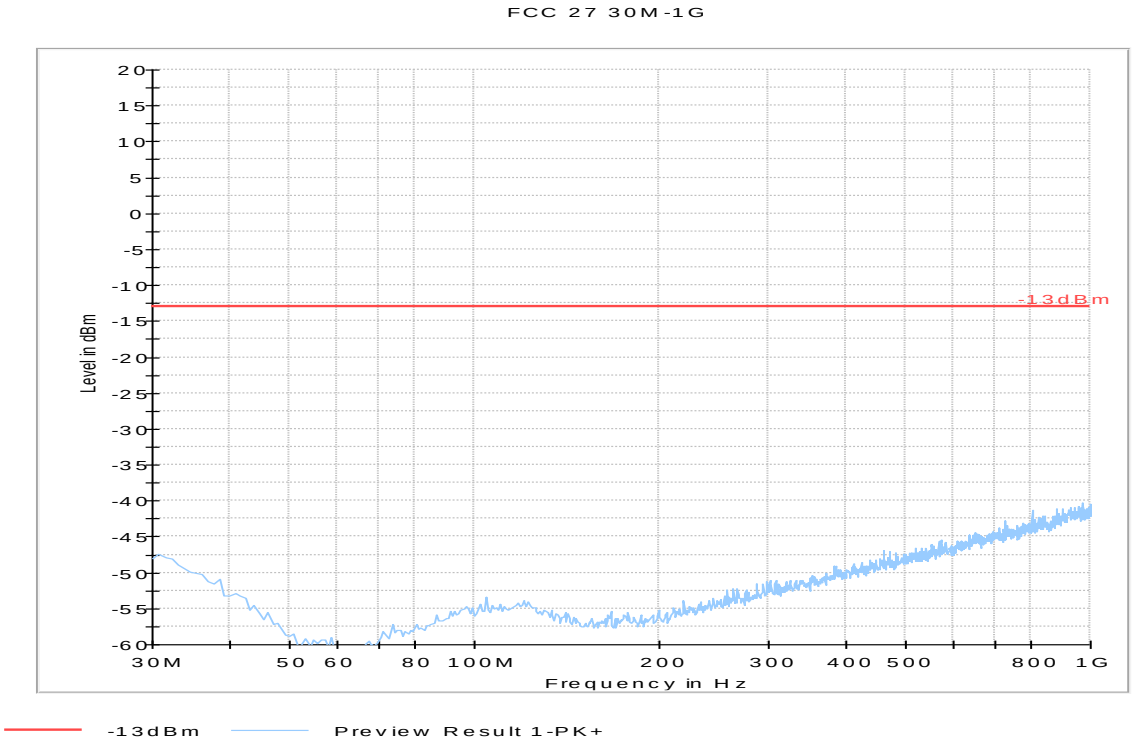


Radiated Spurious Emissions (UMTS Band 4) Tx:

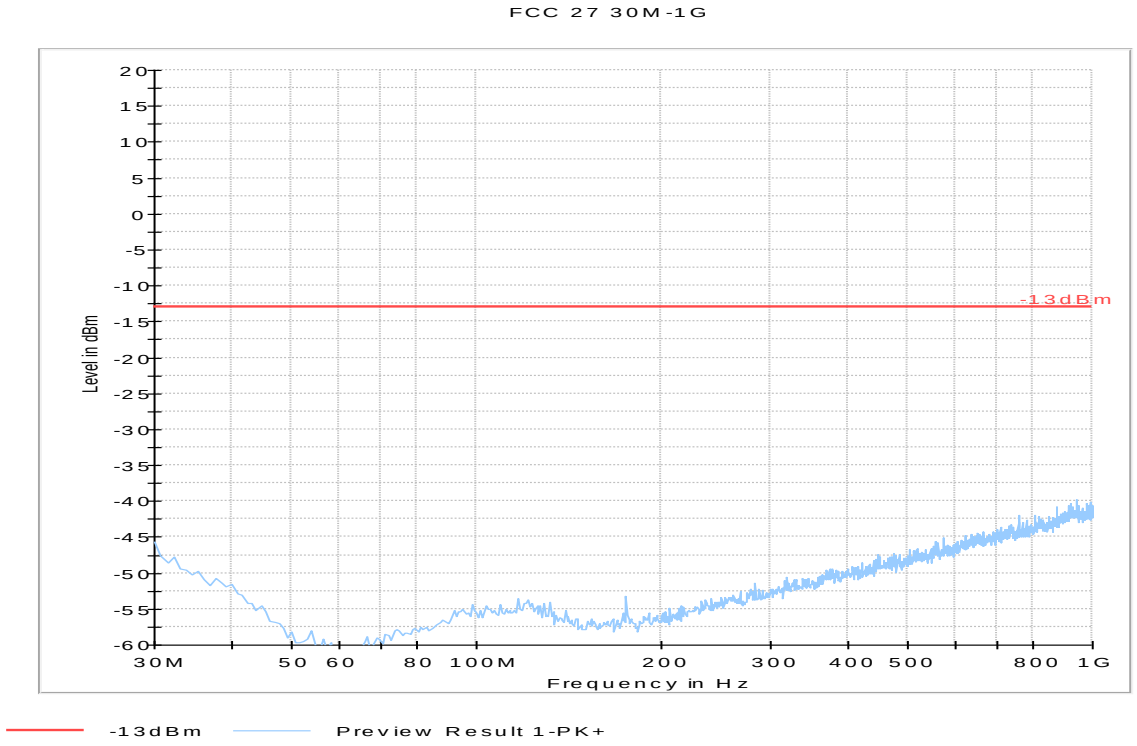
Test results 9 kHz-30 MHz – Mid Channel (UMTS-Band 4)



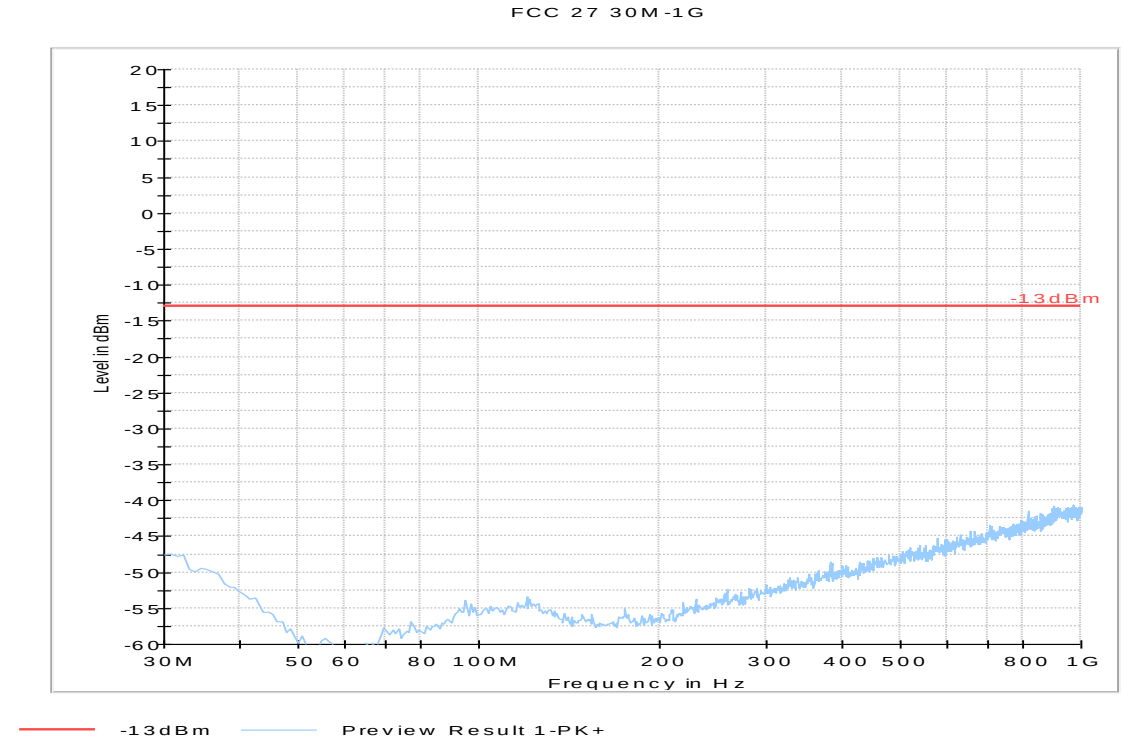
Test results 30MHz-1GHz– Low Channel (UMTS-Band 4)



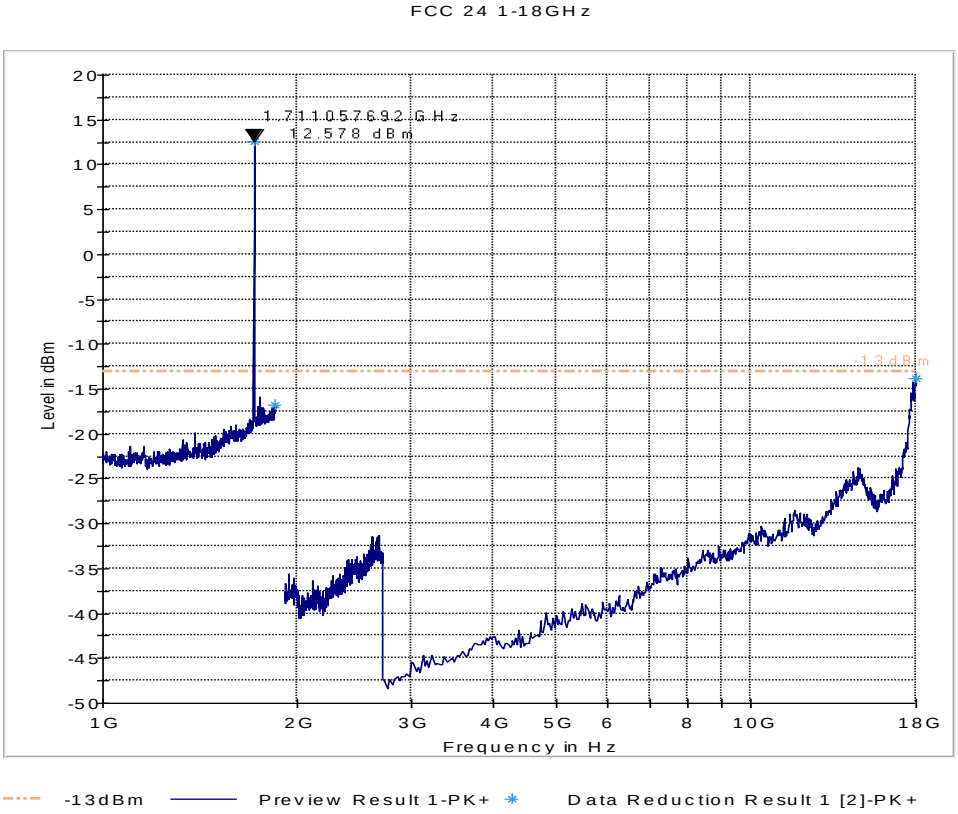
Test results 30 MHz-1GHz– Mid Channel (UMTS-Band 4)



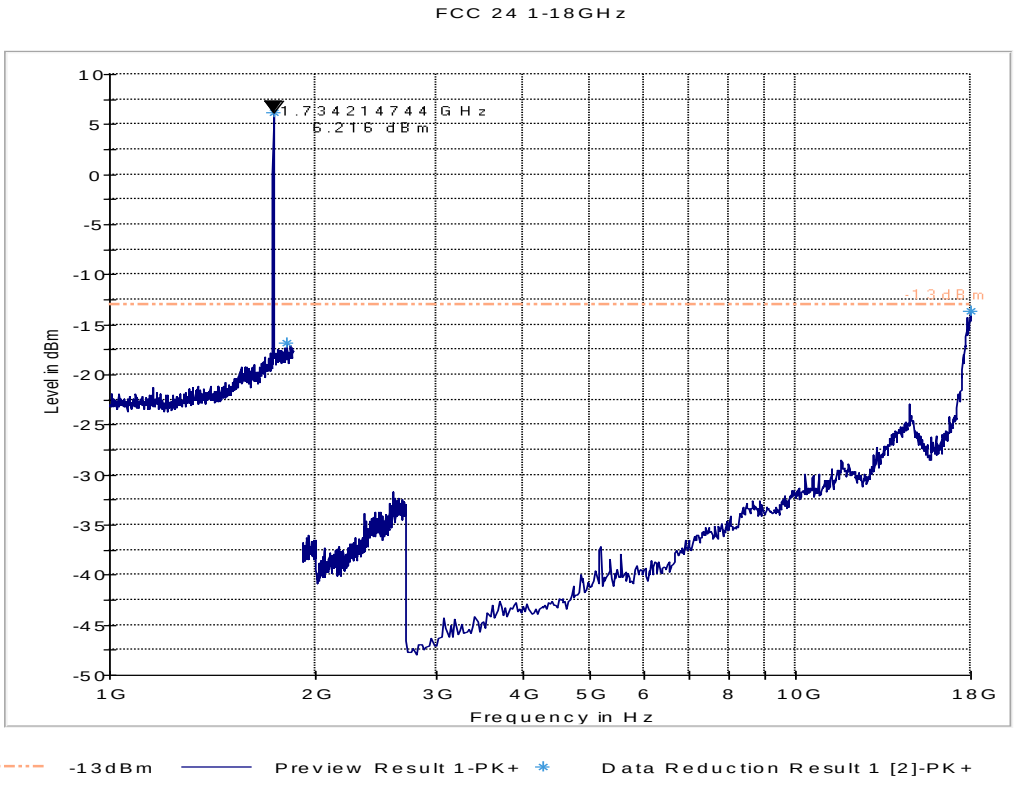
Test results 30MHz-1GHz– High Channel (UMTS-Band 4)



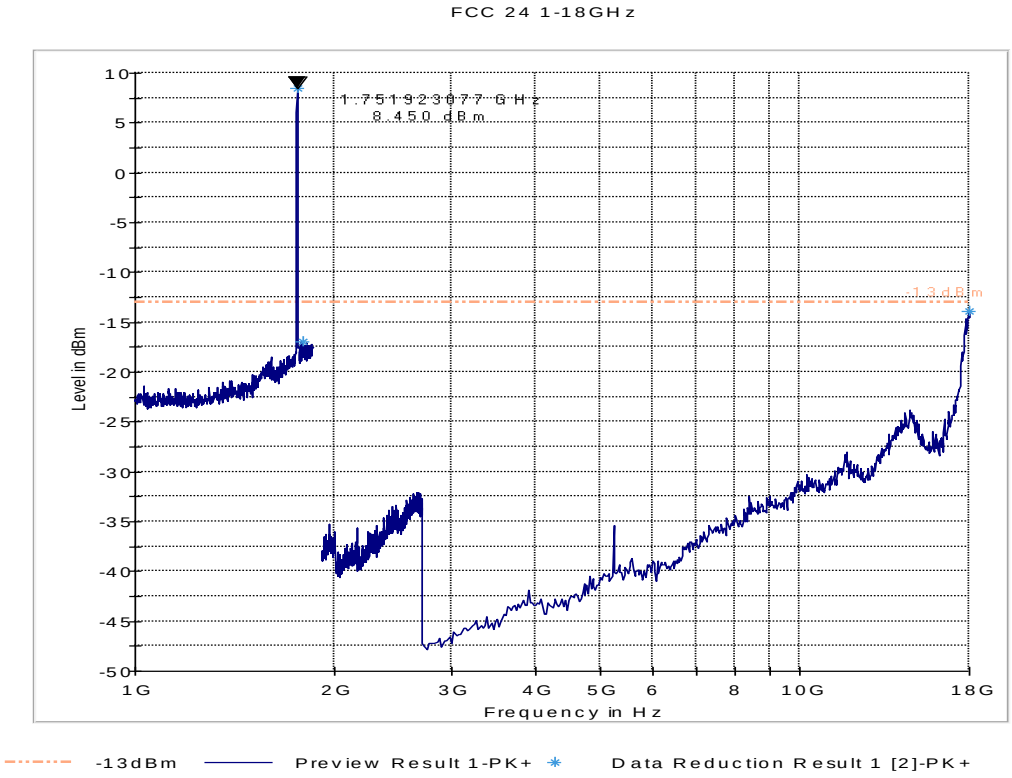
Test results 1GHz-18GHz– Low Channel (UMTS-Band 4)



Test results 1GHz-18GHz– Mid Channel (UMTS-Band 4)

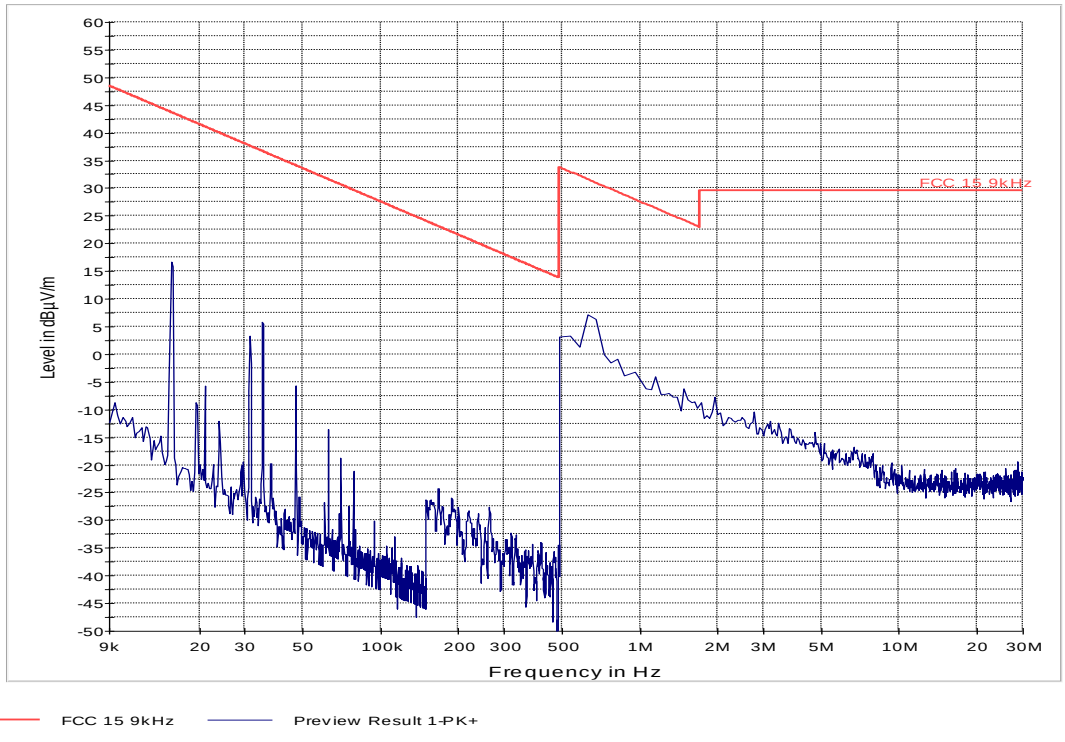


Test results 1GHz-18GHz– High Channel (UMTS-Band 4)

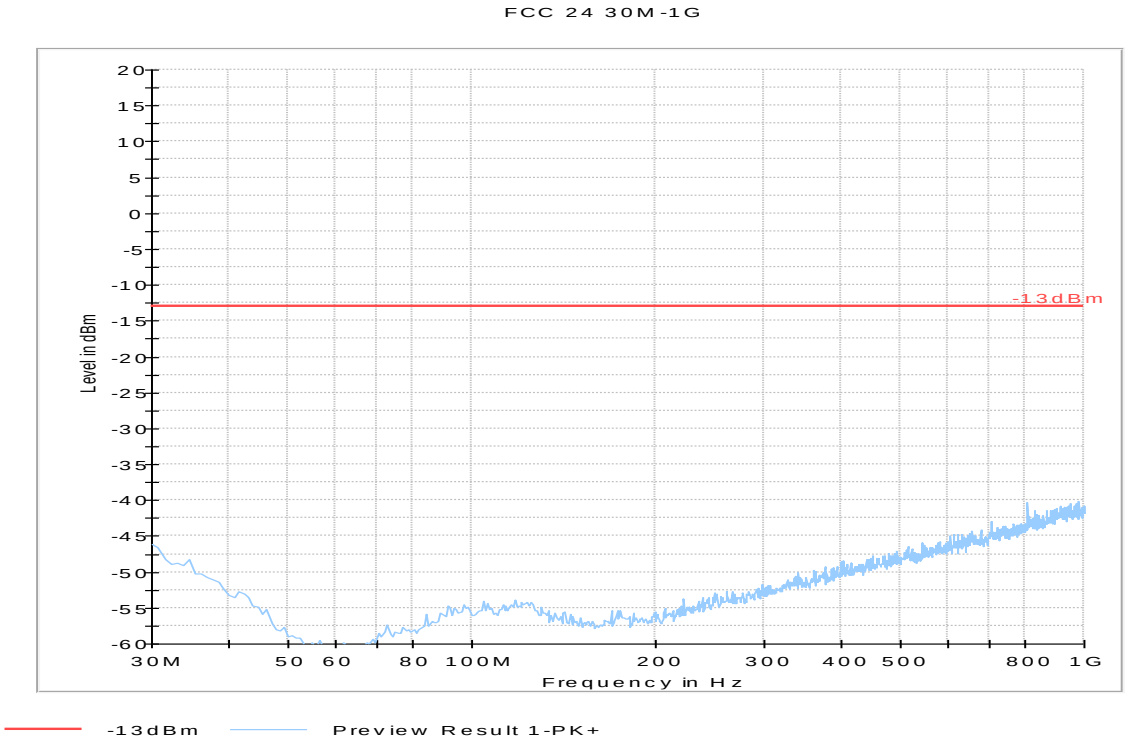


Radiated Spurious Emissions (UMTS Band 2) Tx:

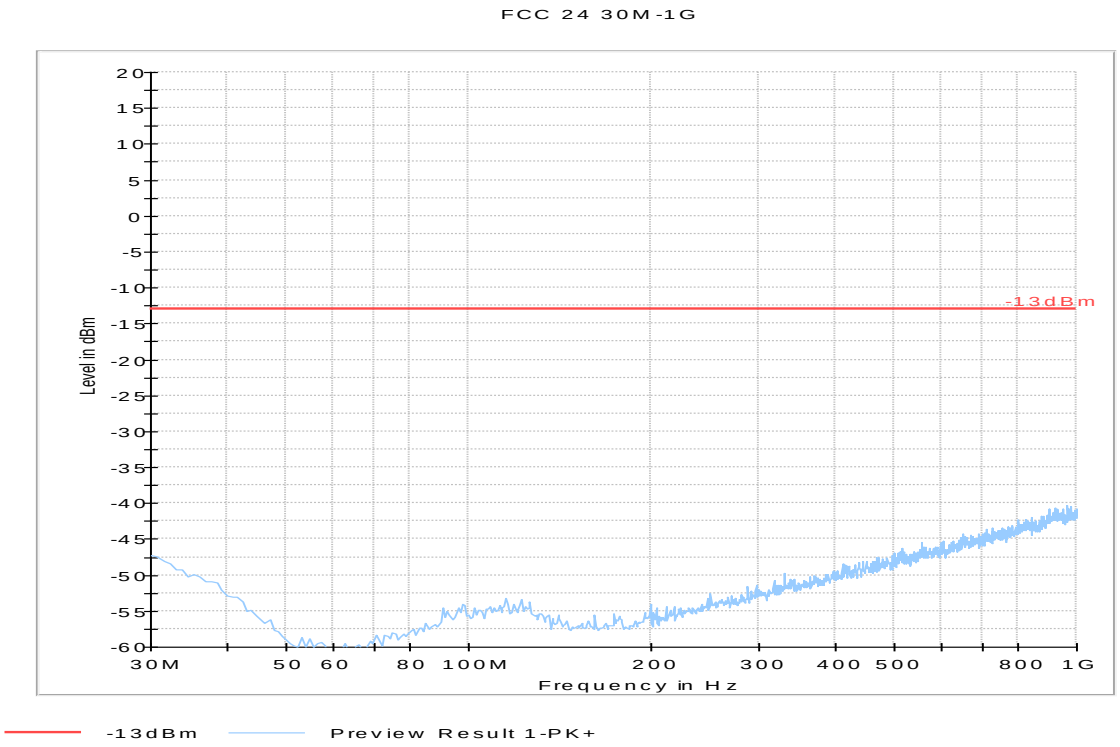
Test results 9 kHz-30 MHz – Mid Channel (UMTS-Band 2)



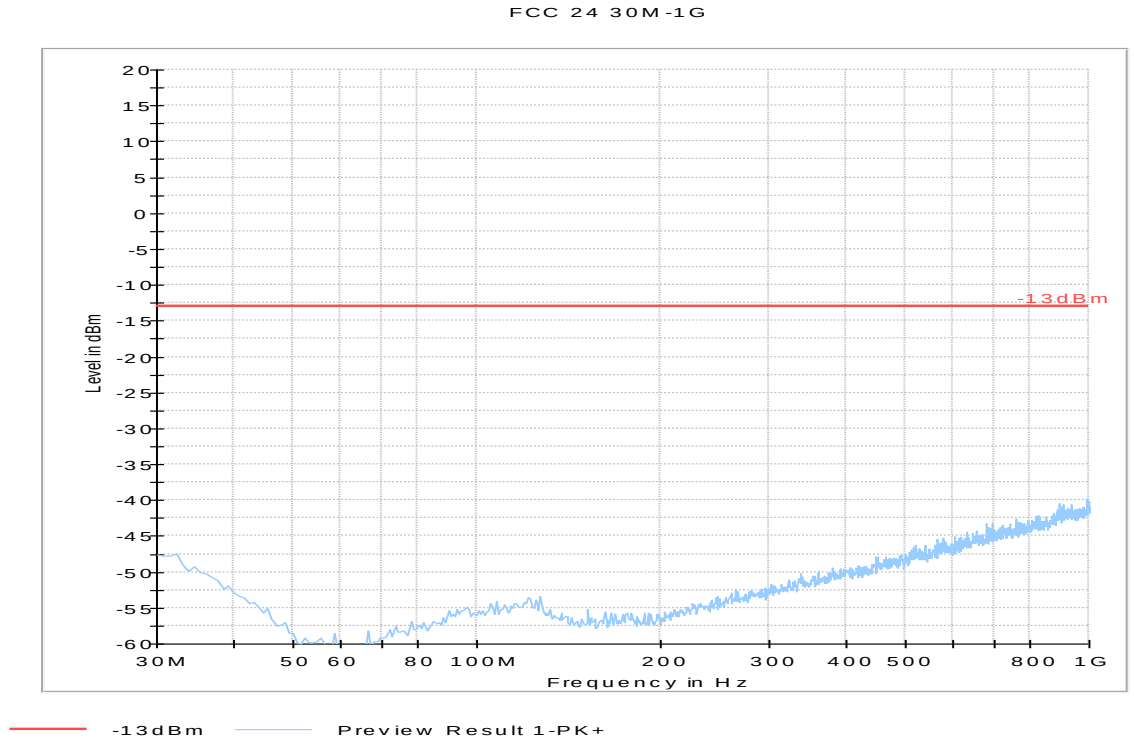
Test results 30 MHz-1GHz – Low Channel (UMTS-Band 2)



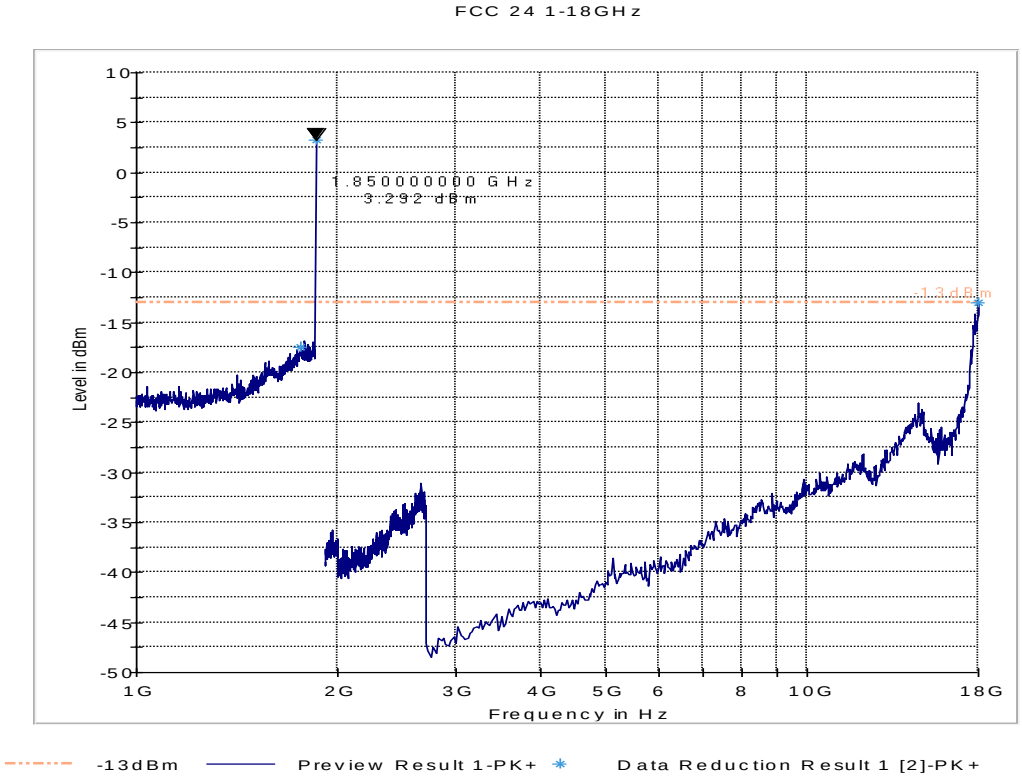
Test results 30 MHz-1GHz – Mid Channel (UMTS-Band 2)



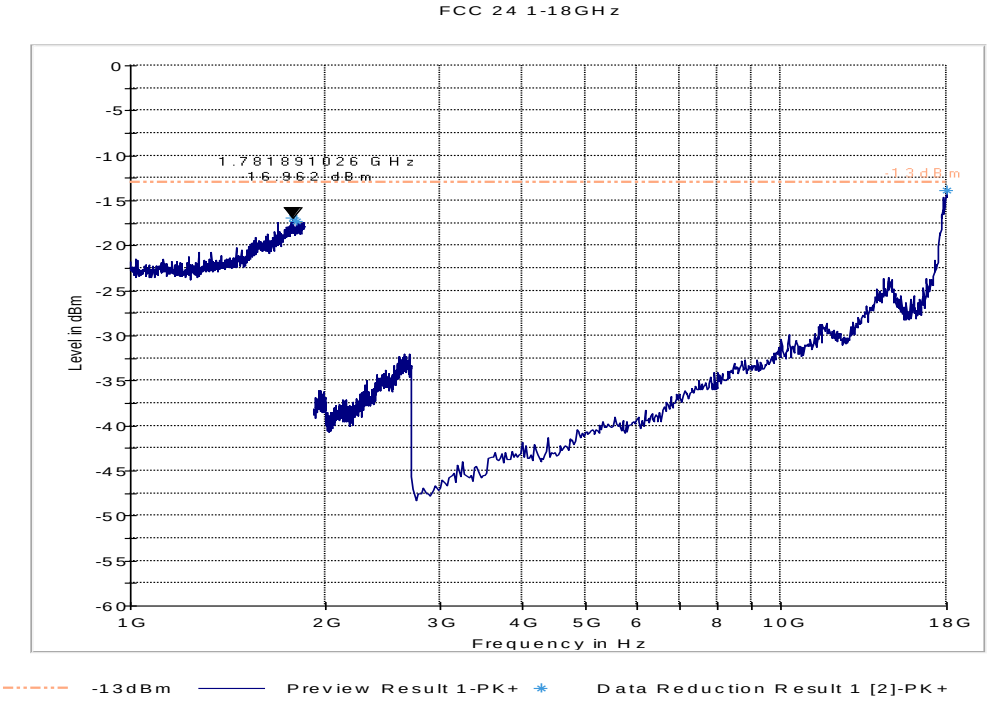
Test results 30 MHz-1GHz – High Channel (UMTS-Band 2)



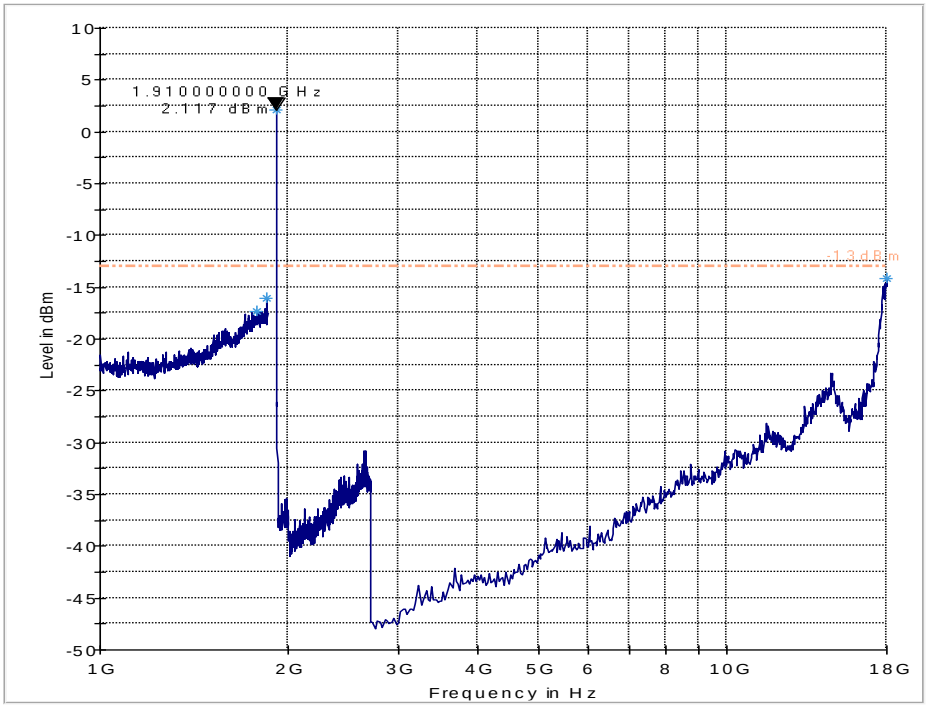
Test results 1 GHz-18 GHz – Low Channel (UMTS-Band 2)



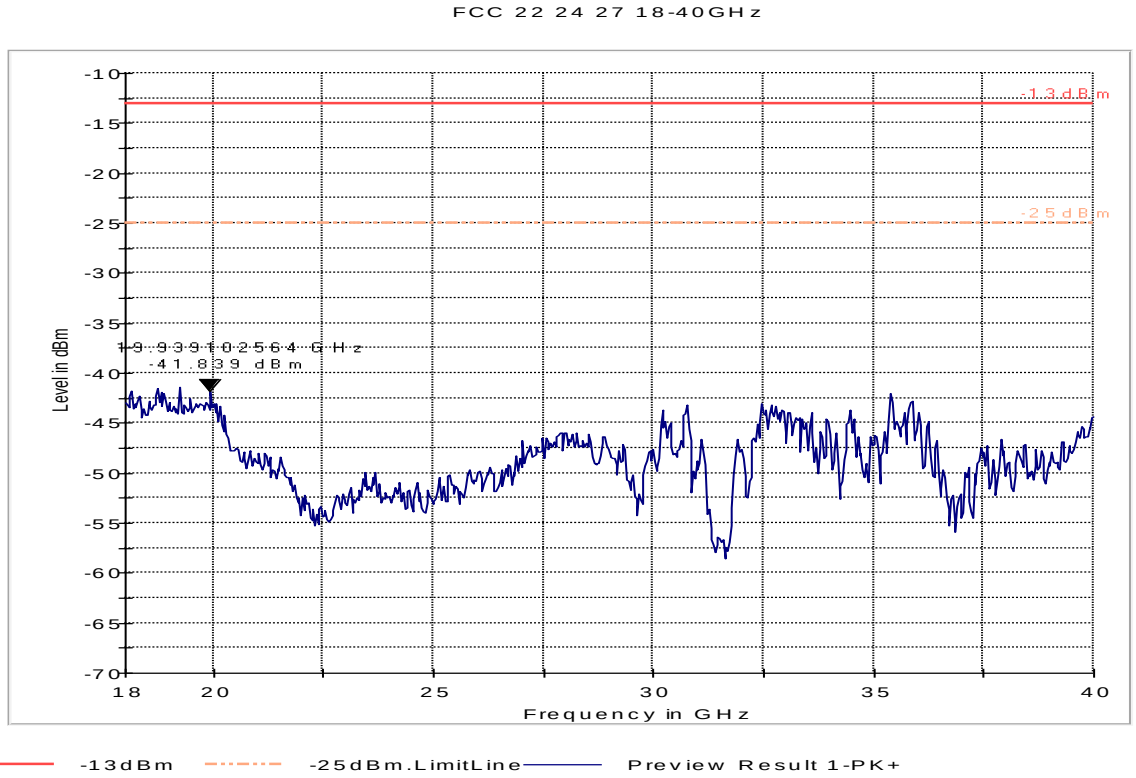
Test results 1 GHz-18GHz – Mid Channel (UMTS-Band 2)



Test results 1 GHz-18GHz – High Channel (UMTS-Band 2)



Test results 18 GHz-40 GHz– Mid Channel (UMTS-Band 2)



7 Test Equipment and Ancillaries used for tests

7.1.1 Milpitas EMC Lab

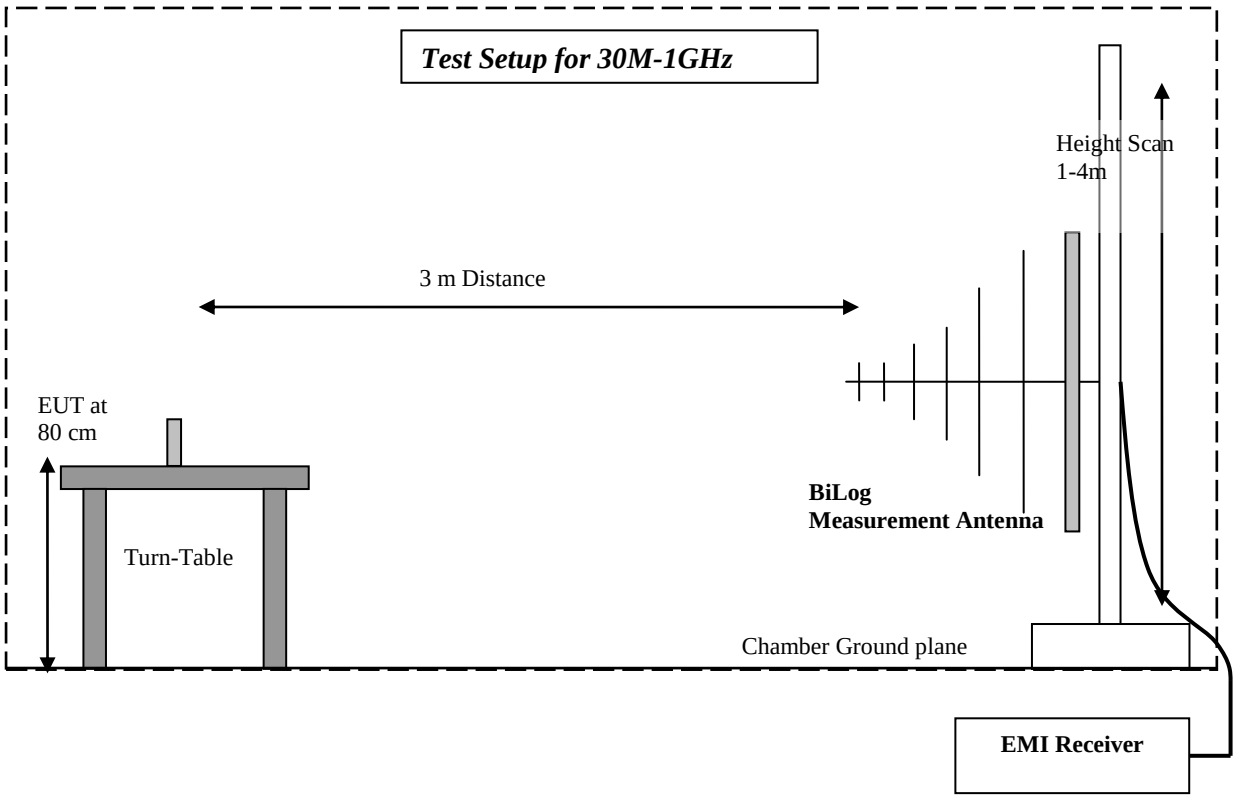
Equipment Name	Manufacturer	Type/Model	Serial No.	Cal Date	Cal Interval	Next cal date
3m Semi- Anechoic Chamber:						
Spectrum Analyzer	Rohde und Schwarz	FSU 26	200302	6/2013	2 years	6/2015
EMI Receiver/Analyzer	Rohde&Schwarz	ESU 40	100251	9/2013	2 Year	9/2015
LISN	Rohde und Schwarz	ESV 216	101129	1/2013	2 years	1/2015
Radiocommunication Tester	Rohde and Schwarz	CMU 200	121672	2/2012	2 years	2/2014
Horn Antenna	EMCO	3115	35114	3/2012	3 Years	3/2015
Binconilog Antenna	EMCO	3141	0005-1186	4/2012	3 Years	4/2015
Ultralog Antenna	Rohde and Schwarz	HL 562	100495	2/2012	2 year	2/2014
Open Switch Control Unit	Rohde and Schwarz	OPS 130	10085	n/a		
Extention Unit Open Switch Control Unit	Rohde and Schwarz	OSP 150	10086	n/a		
Signal Generator	Rohde and Schwarz	SMF 100A	101833	2/2012	2 years	2/2014
Turn Table TT	Maturo	1.5 SI	TT 1.5SI/204/6070910	n/a		
Compact antenna Mast	Maturo	CAM 4.0-P	CAM4.0-P/067/6000910	n/a		
Multiple Control Unit	Maturo	MCU	2140910	n/a		
Pre-Amplifier	Rohde and Schwarz	TS-PR 18	100072	Part of the system calibration		
High Pass Filter	Mini-Circuits	SHP-1200+	RUU11201224	Part of the system calibration		
High Pass Filter	Wainwright Instr.	WHKX 3.0/18	109	Part of the system calibration		
Ancillary equipment:						
Multimeter	Fluke	115 True RMS	21752138	3/2013	2 years	3/2015
DC Power Supply	GW Instek	GPS-1850D	EM845907	n/a		
Temperature Chamber	Test Equity	107	0700533	n/a		
Temperatuer Chamber	Test Equity	115	150300	n/a		
Thermometer	Fluke	5411B	17560031	12/2012	2 years	12/2014
Antenna	TECT Electronics	FPA3-0.8-6.0R/1329	408213-0001	n/a		

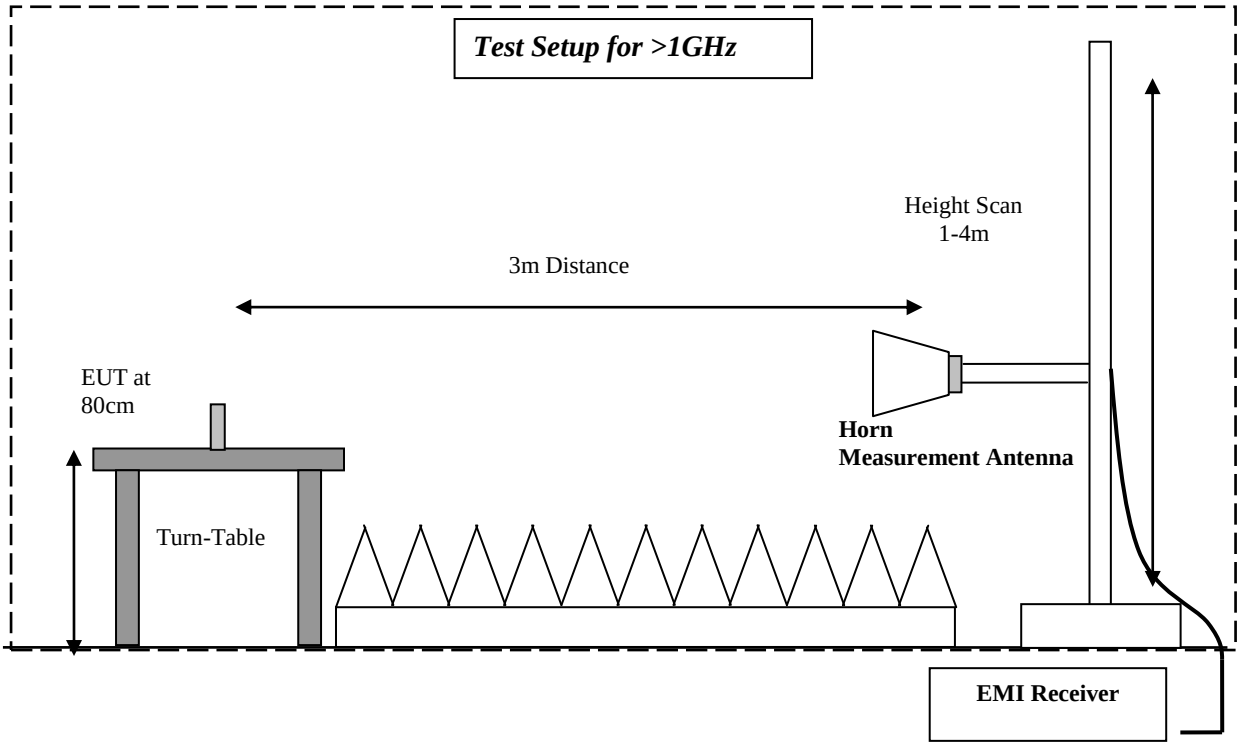
7.1.2 San Diego EMC Lab

Equipment Name	Manufacturer	Type/Model	Serial No.	Cal Date	Cal Interval	Next cal date
3m Semi- Anechoic Chamber:						
Spectrum Analyzer	Rohde und Schwarz	FSU 26	200302	6/2013	2 years	6/2015
Receiver	Rohde und Schwarz	ESR3	101663	2/2013	2 years	2/2015
LISN	Rohde und Schwarz	ESV 216	101129	1/2013	2 years	1/2015
Radiocommunication Tester	Rohde and Schwarz	CMU 200	121672	7/2013	2 years	7/2015
Log Periodic Antenna	Rohde and Schwarz	HL 050	100515	4/2013	3 year	4/2016
Ultralog Antenna	Rohde and Schwarz	HL 562	100495	2/2012	3 year	2/2015
Open Switch Control Unit	Rohde and Schwarz	OPS 130	10085	n/a		
Extention Unit Open Switch Control Unit	Rohde and Schwarz	OSP 150	10086	n/a		
Turn Table TT	Maturo	1.5 SI	TT 1.5SI/204/6070910	n/a		
Compact antenna Mast	Maturo	CAM 4.0-P	CAM4.0-P/067/6000910	n/a		
Multiple Control Unit	Maturo	MCU	2140910	n/a		
Pre-Amplifier	Rohde and Schwarz	TS-PR 18	100072	Part of the system calibration		
High Pass Filter	Mini-Circuits	SHP-1200+	RUU11201224	Part of the system calibration		
High Pass Filter	Wainwright Instr.	WHKX 3.0/18	109	Part of the system calibration		

Calibration status valid at the time of testing.
Equipment used meets the measurement uncertainty requirements as required per applicable standards for 95% confidence levels.
Calibration due dates, unless defined specifically, falls on the last day of the month.
Items indicated "N/A" for cal status either do not specifically require calibration or is internally characterized before use.

8 Test Setup Diagrams





9 Revision History

Date	Report Name	Changes to report	Report prepared by
09-22-2014	EMC_INTEL_054_14001_FCC22_24_27_WWAN	First version	Huey Lin
11-11-2014	EMC_INTEL_054_14001_FCC22_24_27_WWAN_rev1	GSM band edge measurements correction, minor formatting done.	M.Anees
12-15-2014	EMC_INTEL_054_14001_FCC22_24_27_WWAN_rev2	Updated IC references.	M.Anees