FCC/IC Test Report

FOR

Intel Corporation

Model Name: CZ120

FCC ID: O2Z-CZ120
IC ID: 1000W-CZ120

47 CFR Part 2, 22, 24, 27

RSS-132 Issue 3

RSS-133 Issue 6

RSS-139 Issue 2

TEST REPORT #: EMC_INTEL-032-13001_WWAN_Rev1
DATE: 2013-09-17

FCC listed:
A2LA Accredited

IC recognized #
3462B-1

***CETECOM* Inc.**
411 Dixon Landing Road ◆ Milpitas, CA 95035 ◆ U.S.A.
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CETECOM Inc. is a Delaware Corporation with Corporation number: 2905571

Table of Contents

1 Assessment

The following device was tested against the applicable criteria specified in FCC rules Parts 2, 22, 24, and 27of Title 47 of the Code of Federal Regulations and Industry Canada Standards RSS-132, RSS-133, and RSS-139 and no deviations were ascertained during the course of the tests performed.

Company	Description	Model #
Intel Corporation	HSPA+ Smart Phone	CZ120

Responsible for Testing Laboratory:

Date	Section	Name	Signature
2013-09-17	Compliance	Tunji Yusuf (Test Lab Manager)	

Responsible for the Report:

Date	Section	Name	Signature
2013-09-17	Compliance	Josie Sabado (Test Lab Manager)	

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Address:	411 Dixon Landing Road Milpitas, CA 95035 U.S.A.
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
Test Lab Manager:	Tunji Yusuf
Responsible Project Leader:	Josie Sabado

2.2 Identification of the Client

Applicant's Name:	Intel Corporation
Street Address:	2200 Mission College Blvd
City/Zip Code	Santa Clara, 95054
Country	United States
Contact Person:	Christine Ryan
Phone No.	+1 (408) 300 2167
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	

2.4 Environmental conditions during Test:

The following environmental conditions were maintained during the course of testing:
Ambient Temperature: 20-25°C
Relative humidity: 40-60%

2.5 Dates of Testing:

Apr. 22, 2013-Jul 1, 2013.

3 Equipment under Test (EUT)

3.1 Specification of the Equipment under Test

Model No:	CZ120
Product Description:	HSPA+ Smart Phone
Hardware Version :	PR 2.0
Software Version :	RHB JB r42-85
FCC-ID:	O2Z-CZ120
IC-ID :	1000W-CZ120
Frequency:	GSM: 850/900/1800/1900 UTMS FDD Bands: I/II/IV/V/VIII
Type(s) of Modulation:	GSM/GPRS/EGPRS: GSMK and 8PSK respectively UMTS: WCDMA
Number of channels:	GSM 850: 824.2 – 848.8 MHz; 125 Channels GSM 1900: 1850.2-1909.8 MHz; 300 Channels FDD II: 1852.4 – 1907.6 MHz; 103 Channels FDD IV: 1712.4 – 1752.5 MHz; 203 Channels FDD V: 826.4 – 846.6 MHz; 278 Channels
Antenna Info:	Monopole antenna Manufacturer stated antenna Gain: -4.84 dBi for 850 MHz band of operation -2.80 dBi for 1900 MHz band of operation 0.63 dBi for FDD IV (1700 MHz) band of operation
Rated Operating Voltage (V DC):	3.6V (Low) / 3.8V (Nominal) / 4.2V (Max)
Rated Operating Temperature Range:	–10°C ~ +55°C
Prototype / Production unit:	Production

3.2 Identification of the Equipment Under Test (EUT)

EUT #	Serial Number	HW Version	SW Version	Notes
1	RHBEC2244302235	PR2.0	JB ENG R42-36	Radiated Test Sample
2	RHBEB243501588	PR2.0	JB ENG R42-2	Radiated Test Sample
3	RHBEC244302182	PR2.0	JB ENG R42-77	FCC 27 Test Sample
4	RHBEC245500069	PR 2.0	JB ENG R42-77	Conducted Test Sample

3.3 Identification of Accessory equipment

AE #	Type	Manufacturer	Model	Serial Number
1	AC Power Adapter	Saicomp	SC1402	1237400330319

4 Subject of Investigation

The objective of the measurements done by Cetecom Inc. was to measure the performance of the EUT as specified by requirements listed in the following test standards:

- 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-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: Advanced Wireless Services Equipment Operating in the Bands 1710-1755 MHz and 2110-2155 MHz

This test report is to support a request for new equipment authorization under the FCC ID: **O2Z-CZ120** and IC ID: **1000W-CZ120.**
All testing was performed on the product referred to in Section 3 as EUT.

5 Summary of Measurement Results

850 MHz Band:

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §22.913 (a) RSS-132 5.4	RF Output Power	Nominal	GSM 850	■	☐	☐	☐	Complies
			UMTS Band V	■	☐	☐	☐	Complies
RSS-132 6.4	Peak-to-Average Ratio	Nominal	GSM 850	■	☐	☐	☐	Complies
			UMTS Band V	■	☐	☐	☐	Complies
§2.1055 §22.355 RSS-132 5.3	Frequency Stability	Nominal	GSM 850	■	☐	☐	☐	Complies
			UMTS Band V	■	☐	☐	☐	Complies
§2.1049 §22.917(b) RSS-GEN 4.6	Occupied Bandwidth	Nominal	GSM 850	■	☐	☐	☐	Complies
			UMTS Band V	■	☐	☐	☐	Complies
§2.1051 §22.917 RSS-132 5.5.1	Band Edge Compliance	Nominal	GSM 850	■	☐	☐	☐	Complies
			UMTS Band V	■	☐	☐	☐	Complies
§2.1051 §22.917 RSS-132 5.5	Conducted Spurious Emissions	Nominal	GSM 850	■	☐	☐	☐	Complies
			UMTS Band V	■	☐	☐	☐	Complies
§2.1053 §22.917 RSS-132 5.5	Radiated Spurious Emissions	Nominal	GSM 850	■	☐	☐	☐	Complies
			UMTS Band V	■	☐	☐	☐	Complies
§15.207 RSS Gen	Line Conducted Emissions	Nominal	GSM 850	■	☐	☐	☐	Complies
			UMTS Band V	■	☐	☐	☐	Complies

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

1900 MHz Band:

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §24.232 (a) RSS-133 6.4	RF Output Power	Nominal	GSM 1900	■	☐	☐	☐	Complies
			UMTS Band II	■	☐	☐	☐	Complies
§24.232 (d) RSS-133 6.4	Peak-to-Average Ratio	Nominal	GSM 1900	■	☐	☐	☐	Complies
			UMTS Band II	■	☐	☐	☐	Complies
§2.1055 §24.235 RSS-133 6.3	Frequency Stability	Nominal	GSM 1900	■	☐	☐	☐	Complies
			UMTS Band II	■	☐	☐	☐	Complies
§2.1049 §24.238(b) RSS-GEN 4.6	Occupied Bandwidth	Nominal	GSM 1900	■	☐	☐	☐	Complies
			UMTS Band II	■	☐	☐	☐	Complies
§2.1051 §24.238 RSS-133 6.5.1	Band Edge Compliance	Nominal	GSM 1900	■	☐	☐	☐	Complies
			UMTS Band II	■	☐	☐	☐	Complies
§2.1051 §24.238 RSS-133 6.5	Conducted Spurious Emissions	Nominal	GSM 1900	■	☐	☐	☐	Complies
			UMTS Band II	■	☐	☐	☐	Complies
§2.1053 §24.238 RSS-133 6.5	Radiated Spurious Emissions	Nominal	GSM 1900	■	☐	☐	☐	Complies
			UMTS Band II	■	☐	☐	☐	Complies
§15.207 RSS Gen	Line conducted Emissions	Nominal	GSM 1900	■	☐	☐	☐	Complies
			UMTS Band II	■	☐	☐	☐	Complies

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

1700 MHz Band:

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §27.50(d)(4) RSS-139 6.4	RF Output Power	Nominal	UMTS Band IV	■	☐	☐	☐	Complies
§27.50(d)(5) RSS-139 6.4	Peak-to-Average Ratio	Nominal	UMTS Band IV	■	☐	☐	☐	Complies
§2.1055 §27.54 RSS-139 6.3	Frequency Stability	Nominal	UMTS Band IV	■	☐	☐	☐	Complies
§2.1049 §27.53(h) RSS Gen 4.6	Occupied Bandwidth	Nominal	UMTS Band IV	■	☐	☐	☐	Complies
§2.1051 §27.53(h) RSS-139 6.5.1	Band Edge Compliance	Nominal	UMTS Band IV	■	☐	☐	☐	Complies
§2.1051 §27.53(h) RSS-139 6.5	Conducted Spurious Emissions	Nominal	UMTS Band IV	■	☐	☐	☐	Complies
§2.1053 §27.53(h) RSS-139 6.5	Radiated Spurious Emissions	Nominal	UMTS Band IV	■	☐	☐	☐	Complies

6 Measurements

6.1 RF Power Output

6.1.1 References

FCC: CFR Part 2.1046, CFR Part 22.913, CFR Part 24.232, CFR Part 27.50
IC: RSS Gen Section 4.8; RSS-132 Section 5.4; RSS-133 Section 6.4; RSS-139 Section 6.4
Measurement requirements:

6.1.2 Measurement requirements:

6.1.2.1 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.

6.1.2.2 RSS-Gen 4.8: RF power output.

Transmitter output power measurements shall be carried out before the unwanted emissions test. The transmitter output power value, obtained from this test, serves as the reference level used to determine the unwanted emissions.

6.1.3 Limits:

6.1.3.1 FCC 22.913 (a) Effective radiated power limits.

The effective radiated power (ERP) of mobile transmitters must not exceed 7 Watts.

6.1.3.2 FCC 24.232 (b)(c) Power limits.

(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.

6.1.3.3 FCC 27.50(d)(4) Power limits.

Fixed, mobile and portable (handheld devices) operating in the 1710-1755 MHz band are limited to 1 watt EIRP

6.1.3.4 RSS-132 Section 5.4

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. In addition, the peak-to-average power ratio (PAPR) of the transmitter 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.

6.1.3.5 RSS-133 Section 6.4

The average equivalent isotropically radiated power (e.i.r.p.) for transmitters shall not exceed the limits given in SRSP-510.
SRSP-510: Mobile stations and hand-held portables are limited to 2 watts maximum e.i.r.p. In addition, when the transmitter power is measured in terms of average value, the peak-to-average power ratio of the power shall not exceed 13 dB.

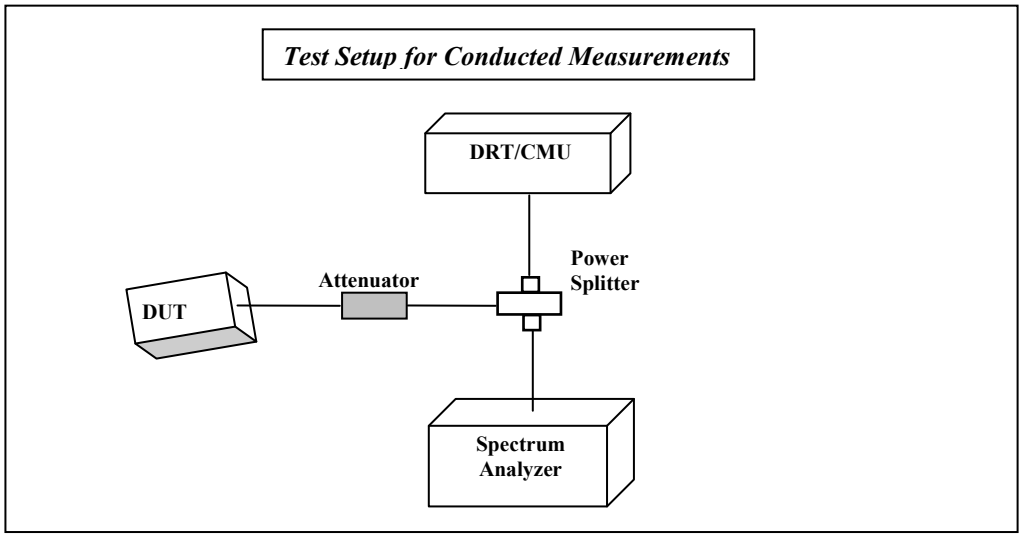
6.1.3.6 RSS-139 Section 6.4

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.
In addition, when the transmitter power is measured in terms of average value, the peak-to-average ratio of the power shall not exceed 13dB.

6.1.4 Conducted Output Power Measurement

Measurement Procedure:

Ref: TIA-603C 2004 2.2.1



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.
    a. GMSK mode measurements are performed in GSM 1 uplink slot configuration.
    b. UMTS mode measurements are performed in RMC 12.2K configuration

6.1.4.1 Measurement Uncertainty

± 0.5 dB

6.1.4.2 Test Conditions:

Tnom: 22^{o}C; Vnom: 3.8 V

6.1.4.3 Measurement Results:

850 MHz Band:

GSM Cellular 850 (GMSK Mode)		
Frequency (MHz)	Conducted Output Power Peak	Conducted Output Power Average
	(dBm)	(dBm)
824.2	32.5	32.1
836.6	32.7	32.3
848.8	32.3	32.0

GSM Cellular 850 (8PSK Mode)		
Frequency (MHz)	Conducted Output Power Peak	Conducted Output Power Average
	(dBm)	(dBm)
824.2	29.6	26.4
836.6	29.5	26.4
848.8	29.6	26.4

UMTS FDD V (WCDMA Mode)	
Frequency (MHz)	Conducted Output Power Peak
	(dBm)
826.2	27.5
836.6	27.1
846.6	27.0

1900 MHz Band:

GSM PCS 1900 (GMSK Mode)		
Frequency (MHz)	**Conducted Output Power Peak**	**Conducted Output Power Average**
	(dBm)	**(dBm)**
1850.2	29.6	29.3
1880	29.7	29.4
1909.8	29.0	28.7

GSM PCS 1900 (8PSK Mode)		
Frequency (MHz)	**Conducted Output Power Peak**	**Conducted Output Power Average**
	(dBm)	**(dBm)**
1850.2	28.7	25.5
1880	28.6	25.4
1909.8	28.6	25.4

UMTS FDD II (WCDMA Mode)	
Frequency (MHz)	**Conducted Output Power Peak**
	(dBm)
1852.4	26.9
1880	26.9
1907.6	26.4

1700 MHz Band:

UMTS FDD IV (WCDMA Mode)	
Frequency (MHz)	**Conducted Output Power Peak**
	(dBm)
1712.4	20.2
1732.6	20.4
1752.6	21.0

6.1.5 Peak-toAverage Power Ratio (PAPR)

A PAPR measurement is performed at the conducted port of the EUT. For CDMA signals, 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.

6.1.5.1 Limits:

FCC CFR 47 §24.232 (D)
RSS-132(5.4); RSS-133(6.4); RSS-139 (6.4)
The PAPR of the transmission shall not exceed 13 dB.

6.1.5.2 Test Procedure:

For GSM/ EGPRS: PAPR is calculated as the difference between the measured peak output power and measured average output power.

For UMTS Mode: PAPR is measured with a CCDF measurement function on the Spectrum Analyzer according to KDB 971168 v01.

6.1.5.3 Test Results:

PAPR in 850 MHz band of operation (dB)			
Channel	**GMSK**	**8PSK**	**UMTS**
Low	0.4	3.2	3.53
Mid	0.4	3.1	3.30
High	0.3	3.2	3.24

PAPR in 1900 MHz band of operation (dB)			
Channel	**GMSK**	**8PSK**	**UMTS**
Low	0.3	3.2	3.37
Mid	0.3	3.2	3.08
High	0.3	3.2	3.27

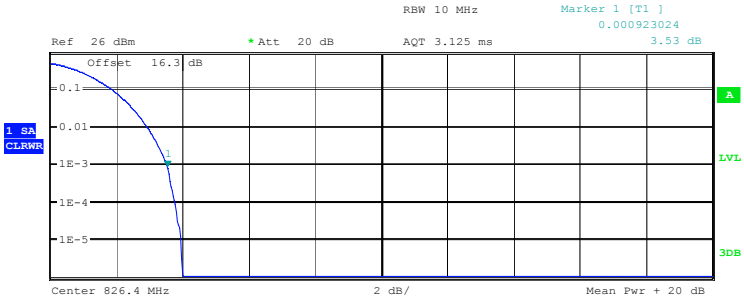
PAPR in 1700 MHz band of operation (dB)	
Channel	**UMTS**
Low	3.14
Mid	3.17
High	3.37

6.1.5.4 Test Verdict:

Pass

6.1.5.5 Test Data:

PAPR (UMTS FDD V: WCDMA mode) Low Channel



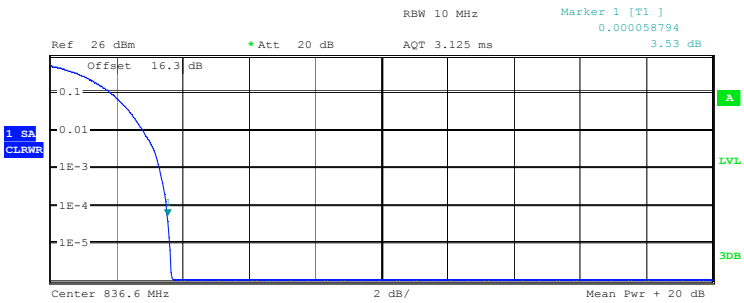
Complementary Cumulative Distribution Function (100000 samples)

	Trace 1
Mean	23.14 dBm
Peak	27.12 dBm
Crest	3.98 dB
10 %	1.86 dB
1 %	2.92 dB
.1 %	3.53 dB
.01 %	3.75 dB

low

Date: 1.MAY.2013 20:05:42

PAPR (UMTS FDD V: WCDMA mode) Mid Channel



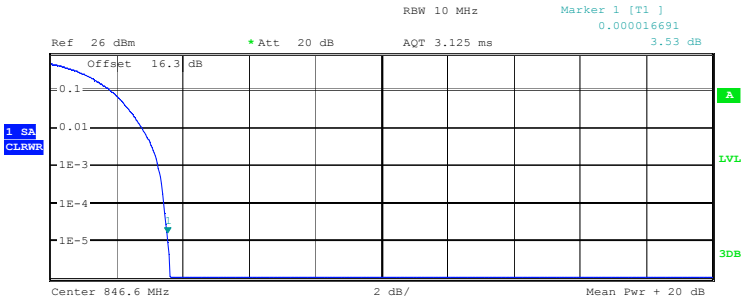
Complementary Cumulative Distribution Function (100000 samples)

	Trace 1
Mean	23.32 dBm
Peak	26.98 dBm
Crest	3.66 dB
10 %	1.79 dB
1 %	2.79 dB
.1 %	3.30 dB
.01 %	3.49 dB

low

Date: 1.MAY.2013 20:07:47

PAPR (UMTS FDD V: WCDMA mode) High Channel



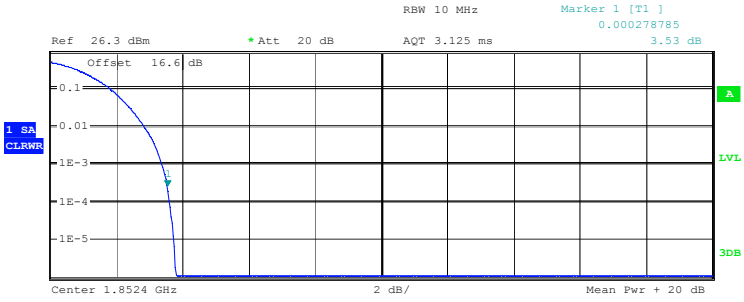
Complementary Cumulative Distribution Function (100000 samples)

	Trace 1
Mean	23.29 dBm
Peak	26.91 dBm
Crest	3.61 dB
10 %	1.79 dB
1 %	2.76 dB
.1 %	3.24 dB
.01 %	3.43 dB

low

Date: 1.MAY.2013 20:08:45

PAPR (UMTS FDD II: WCDMA mode) Low Channel



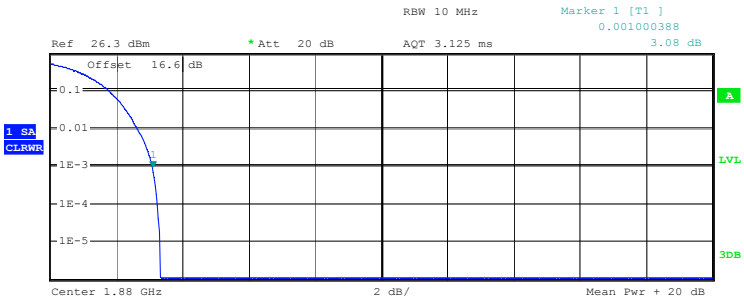
Complementary Cumulative Distribution Function (100000 samples)

	Trace 1
Mean	23.14 dBm
Peak	26.93 dBm
Crest	3.79 dB
10 %	1.79 dB
1 %	2.82 dB
.1 %	3.37 dB
.01 %	3.59 dB

low

Date: 1.MAY.2013 20:12:51

PAPR (UMTS FDD II: WCDMA mode) Low Channel



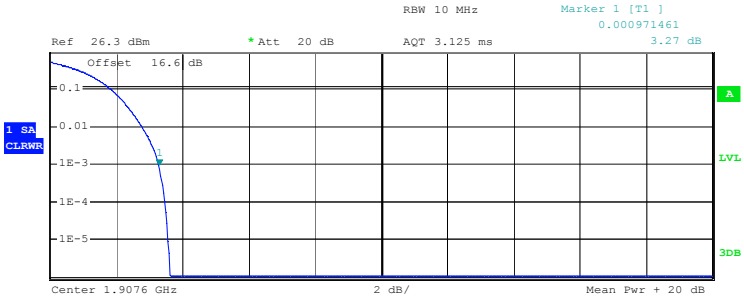
Complementary Cumulative Distribution Function (100000 samples)

	Trace 1
Mean	23.53 dBm
Peak	26.86 dBm
Crest	3.32 dB
10 %	1.76 dB
1 %	2.63 dB
.1 %	3.08 dB
.01 %	3.24 dB

low

Date: 1.MAY.2013 20:13:34

PAPR (UMTS FDD II: WCDMA mode) High Channel



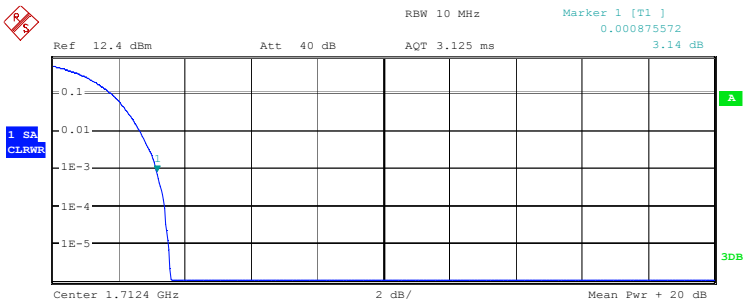
Complementary Cumulative Distribution Function (100000 samples)

	Trace 1
Mean	22.54 dBm
Peak	26.15 dBm
Crest	3.61 dB
10 %	1.83 dB
1 %	2.76 dB
.1 %	3.27 dB
.01 %	3.46 dB

low

Date: 1.MAY.2013 20:14:08

PAPR (UMTS FDD IV: WCDMA mode) Low Channel



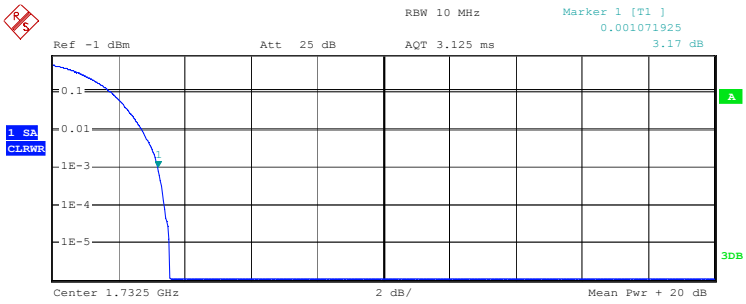
Complementary Cumulative Distribution Function (100000 samples)

	Trace 1
Mean	-9.87 dBm
Peak	-6.30 dBm
Crest	3.57 dB
10 %	1.76 dB
1 %	2.63 dB
.1 %	3.14 dB
.01 %	3.40 dB

low

Date: 1.JUL.2013 18:14:44

PAPR (UMTS FDD IV: WCDMA mode) Mid Channel



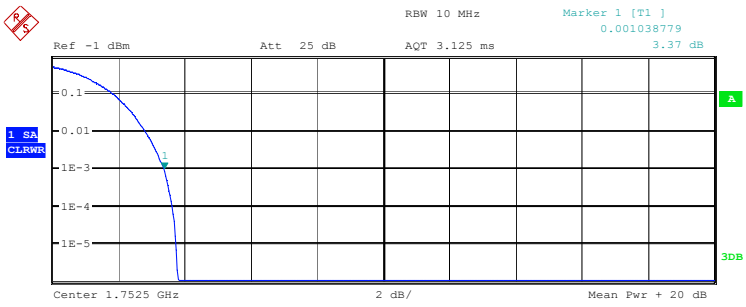
Complementary Cumulative Distribution Function (100000 samples)

	Trace 1
Mean	-9.66 dBm
Peak	-6.11 dBm
Crest	3.55 dB
10 %	1.76 dB
1 %	2.69 dB
.1 %	3.17 dB
.01 %	3.37 dB

low

Date: 1.JUL.2013 18:27:06

PAPR (UMTS FDD IV: WCDMA mode) High Channel



Complementary Cumulative Distribution Function (100000 samples)

	Trace 1
Mean	-9.34 dBm
Peak	-5.55 dBm
Crest	3.79 dB
10 %	1.83 dB
1 %	2.79 dB
.1 %	3.37 dB
.01 %	3.62 dB

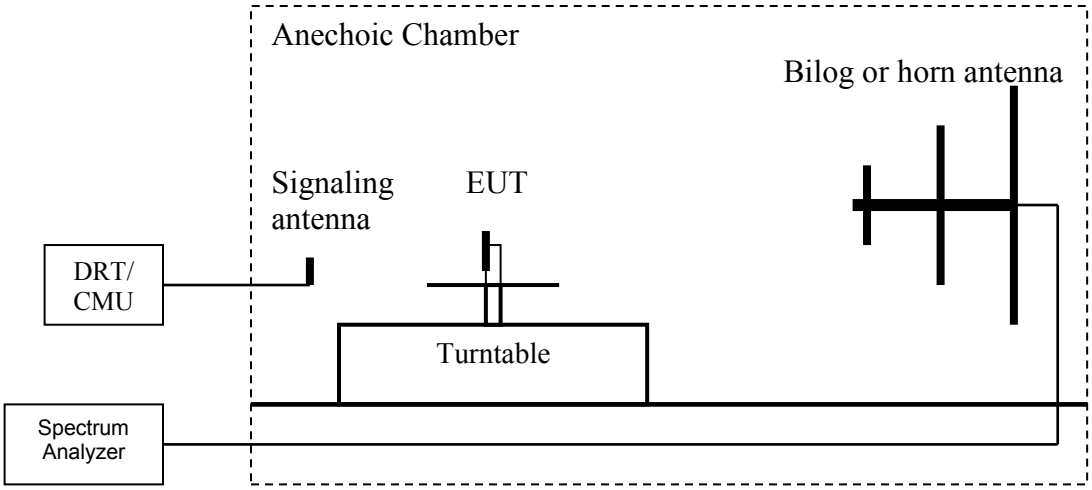
low

Date: 1.JUL.2013 18:28:39

6.1.6 Radiated Output Power Measurement

6.1.6.1 Radiated Output Power Measurement Procedure:

Ref: TIA-603C 2004 -2.2.17.2 Effective Radiated Power (ERP) or Effective Isotropic Radiated Power (EIRP)



1. Connect the equipment as shown in the above diagram with the EUT's antenna in center of the turn table.
2. Adjust the settings of the Digital Radio Communication Tester (DRT) to set the EUT to its maximum power at the required channel.
3. Set the spectrum analyzer to the channel frequency. Set the analyzer to measure peak hold with the required settings.
4. Place the measurement antenna in a horizontal orientation. Rotate the EUT 360 degree. Raise the measurement antenna up to 4 meters in 1 meters increments and rotate the EUT 360 degree at each height to maximize all emissions. Measure and record all spurious emission peak levels in dBm (LVL) up to the tenth harmonic of the carrier frequency.
5. Rotate the EUT 360°. Record the peak level in dBm (**LVL**).
6. Replace the EUT with a vertically 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.
7. Connect the antenna to a signal generator with known output power and record the path loss in dB (**LOSS)**. **LOSS** = Generator Output Power (dBm) + Antenna Gain(dBd/dBi) – Analyzer reading (dBm).
8. Determine the ERP using the following equation:
   ERP (dBm) = **LVL** (dBm) + **LOSS** (dB)
9. Determine the EIRP using the following equation:
   EIRP (dBm) = **ERP** (dBm) + 2.14 (dB)
10. Measurements are to be performed with the EUT set to the low, middle and high channel of each frequency band.
11. Measurement instrument: RBW ≥ OBW; VBW ≥ RBW.

6.1.6.2 Measurement Uncertainty

± 3.0 dB

6.1.6.3 Test Conditions:

Tnom: 22°C; Vnom: 3.8 V
All measuements made with the following spectrum analyzer settings:
RBW = VBW = 5MHz

6.1.6.4 Test Results:

6.1.6.4.1 RF Power Output 850MHz band

Limit:

FCC: Nominal Peak Output Power < 38.45 dBm (7W)

IC: Nominal Peak Output Power < 40.60 dBm (11.5W)

GSM 850: GMSK Mode			
Frequency (MHz)	Conducted Power	Radiated Power	resulting antenna gain (dBi)
	Peak Power (dBm)	ERP (dBm)	
824.2	32.5	22.67	-7.68
836.6	32.7	21.91	-8.64
848.8	32.3	21.825	-8.32

GSM 850: 8PSK Mode			
Frequency (MHz)	Conducted Power	Radiated Power	Resulting antenna gain
	Peak Power (dBm)	ERP (dBm)	
824.2	29.6	19.03	-8.42
836.6	29.5	18.79	-8.56
848.8	29.6	19.09	-8.36

UMTS FDD V: WCDMA Mode			
Frequency (MHz)	**Conducted Power**	**Radiated Power**	**Resulting antenna gain**
	Peak Power (dBm)	**ERP (dBm)**	
826.4	27.5	17.3	-8.05
836.6	27.1	17.0	-7.95
846.6	27.0	16.5	-8.35

6.1.6.4.2 RF Power Output 1900MHz band

Limit:

FCC Nominal Peak Output Power < 33 dBm (2W)

IC Nominal Peak Output Power < 33 dBm (2W)

GSM 1900: GMSK Mode			
Frequency (MHz)	**Conducted Power**	**Radiated Power**	**Resulting antenna gain**
	Peak Power (dBm)	**EIRP (dBm)**	
1850.2	29.6	29.1	-0.5
1880.0	29.7	29.4	-0.3
1909.8	29.0	28.4	-0.6

GSM 1900: 8PSK Mode			
Frequency (MHz)	**Conducted Power**	**Radiated Power**	**Resulting antenna gain**
	Peak Power (dBm)	**EIRP (dBm)**	
1850.2	28.7	28.3	-0.4
1880.0	28.6	28.2	-0.4
1909.8	28.6	27.8	-0.8

UMTS FDD II: WCDMA Mode			
Frequency (MHz)	**Conducted Power**	**Radiated Power**	**Resulting antenna gain**
	Peak Power (dBm)	**EIRP (dBm)**	
1852.4	26.9	24.8	-2.1
1880	26.9	25.2	-1.7
1907.6	26.4	24.3	-2.1

6.1.6.4.3 RF Power Output 1700MHz band

Limit:

FCC: Nominal Peak Output Power < 30 dBm (1W)

IC: Nominal Average Output Power < 30 dBm (1W)

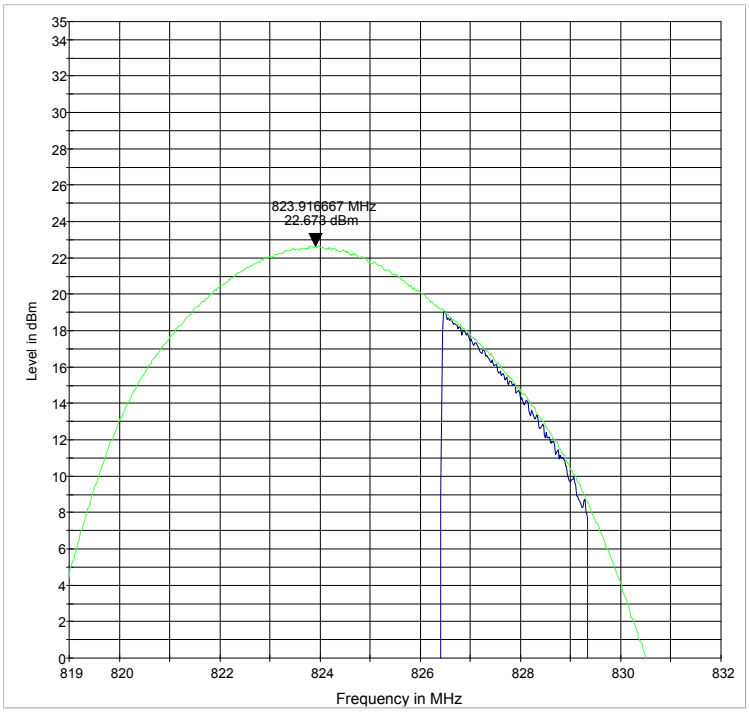
UMTS FDD IV: WCDMA Mode			
Frequency (MHz)	**Conducted Power**	**Radiated Power**	**Resulting antenna gain**
	Peak Power (dBm)	**EIRP (dBm)**	
1712.4	20.2	18.1	-2.1
1732.6	20.4	17.7	-2.7
1752.6	21.0	16.5	-4.5

6.1.6.5 Test Verdict Radiated Output Power

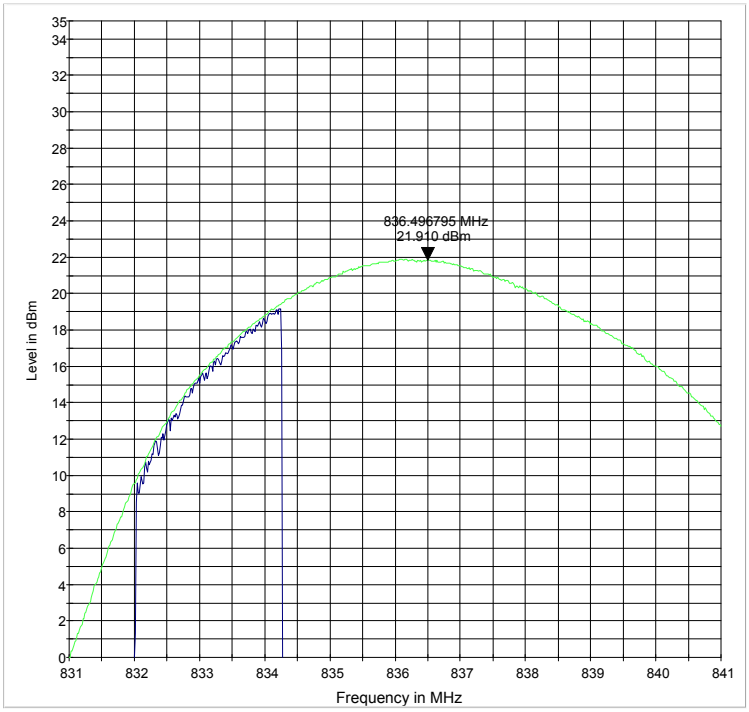
Pass.

6.1.6.6 Plots:

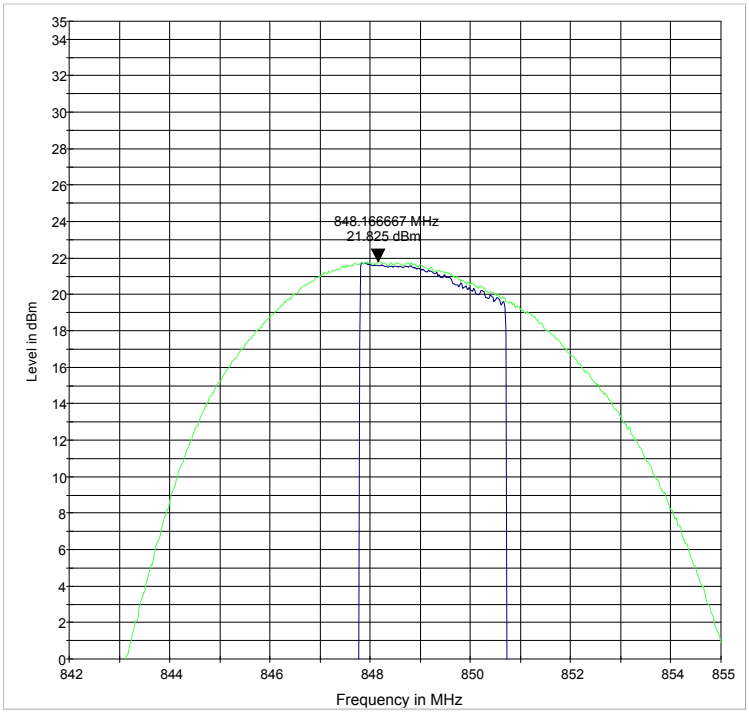
ERP GSM 850: GMSK Mode CHANNEL 123



ERP GSM 850: GMSK Mode CHANNEL 190



ERP GSM 850: GMSK Mode CHANNEL 251



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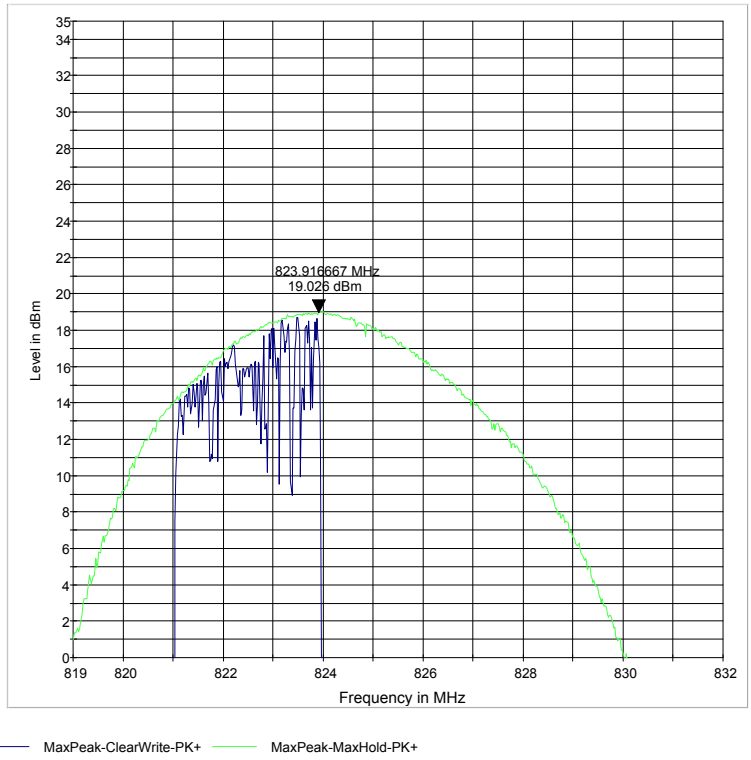

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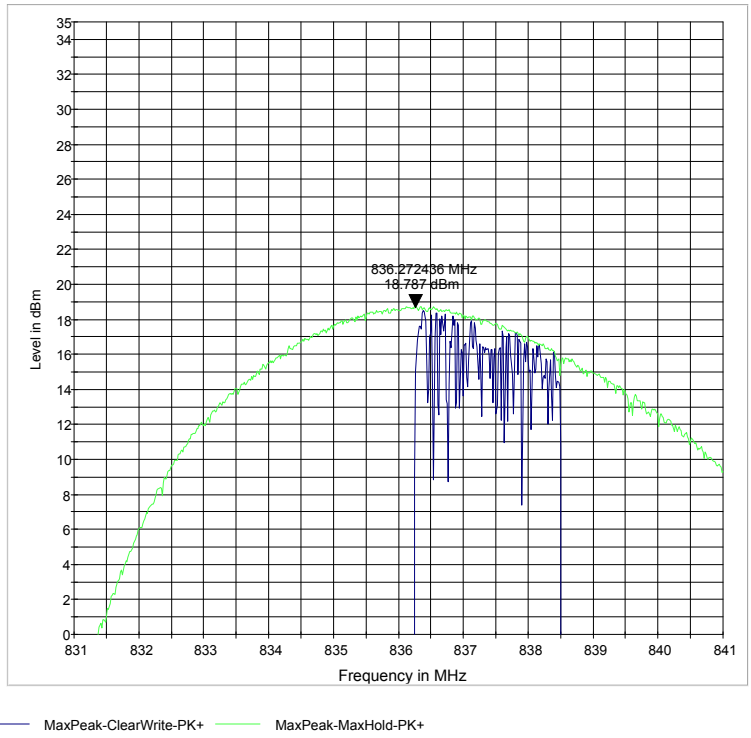

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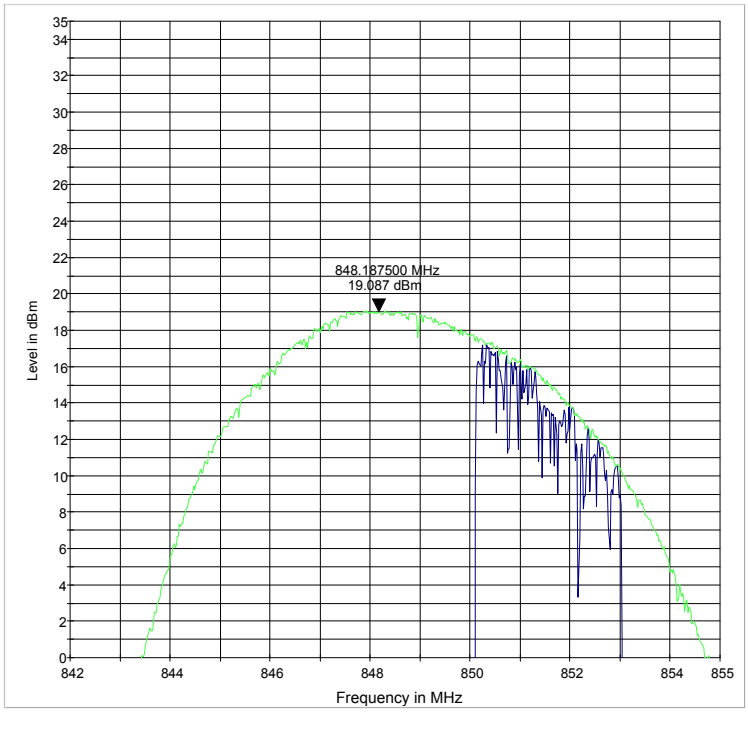
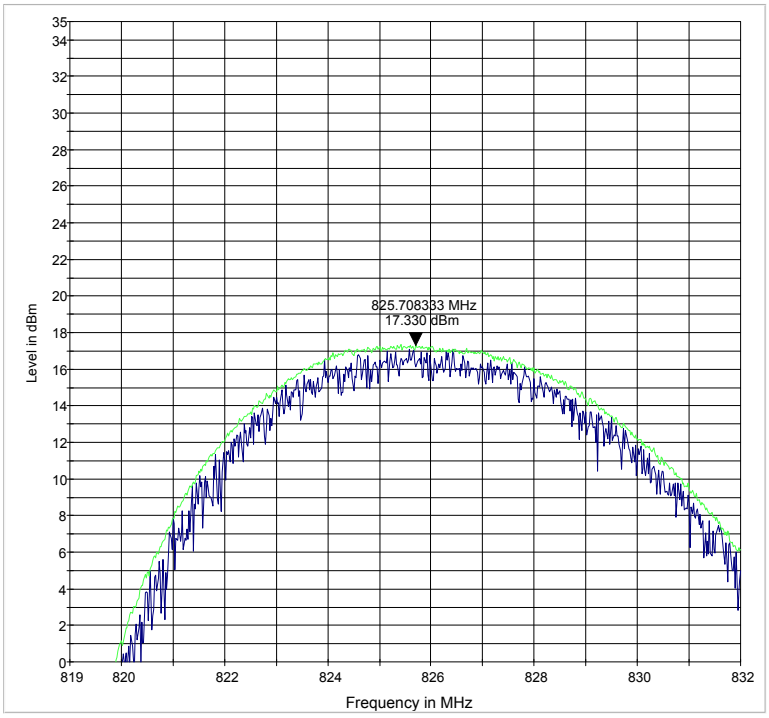
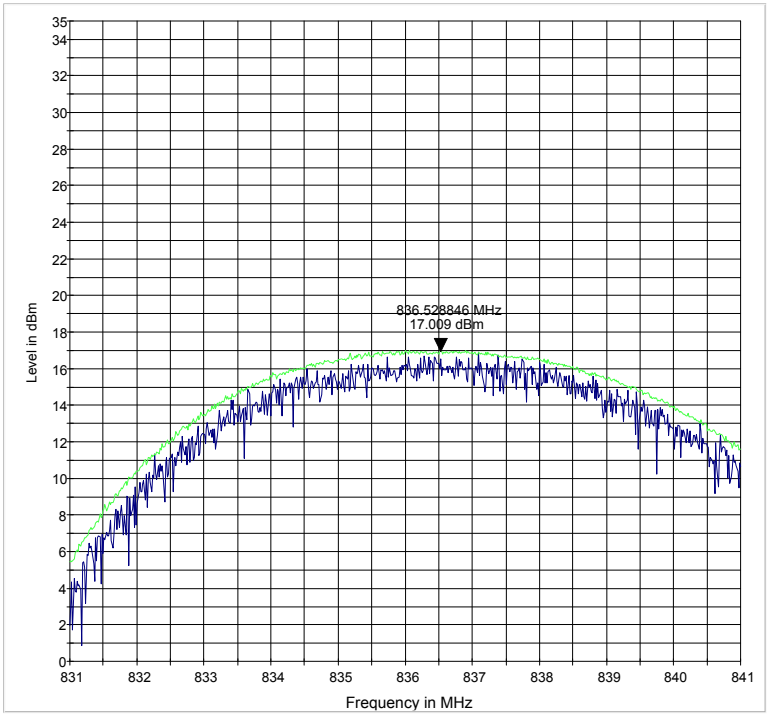


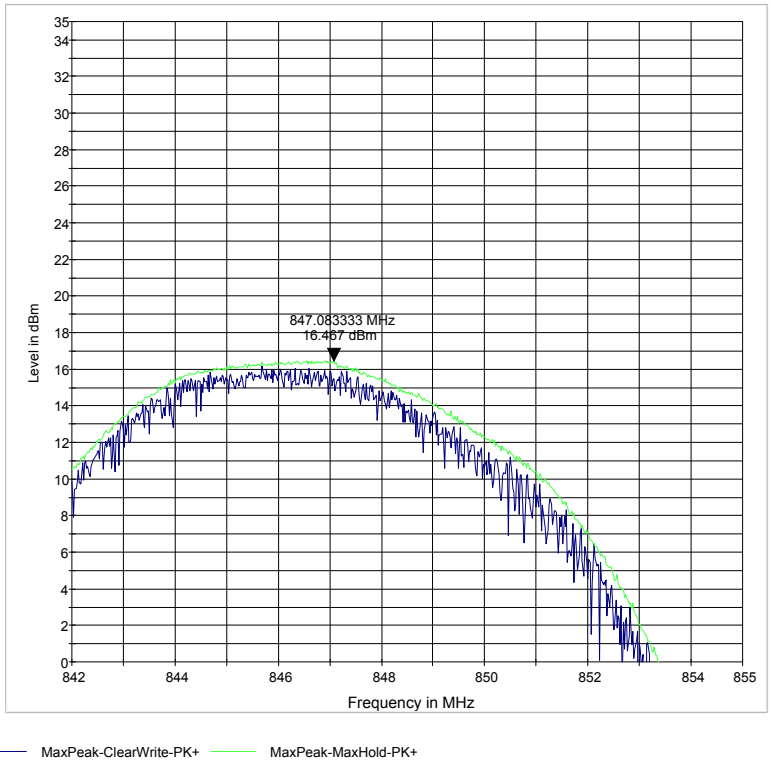
ERP UMTS FDD V: WCDMA Mode CHANNEL 4132



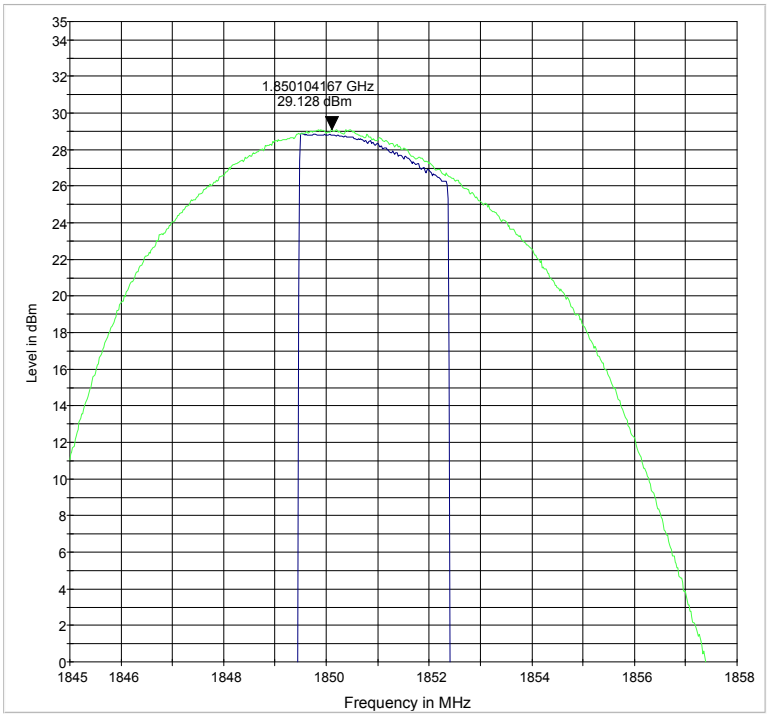
ERP UMTS FDD V: WCDMA Mode CHANNEL 4183



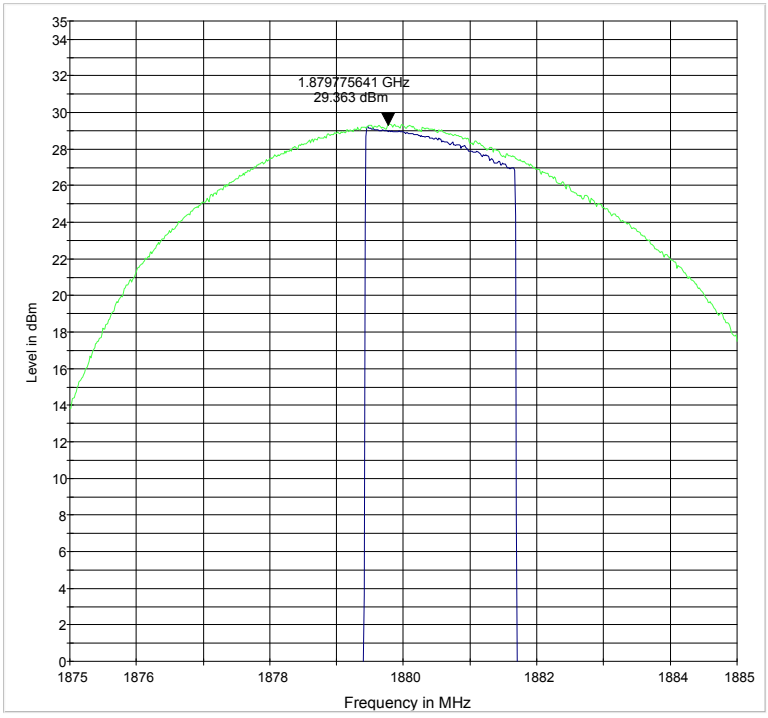
ERP UMTS FDD V: WCDMA Mode CHANNEL 4233



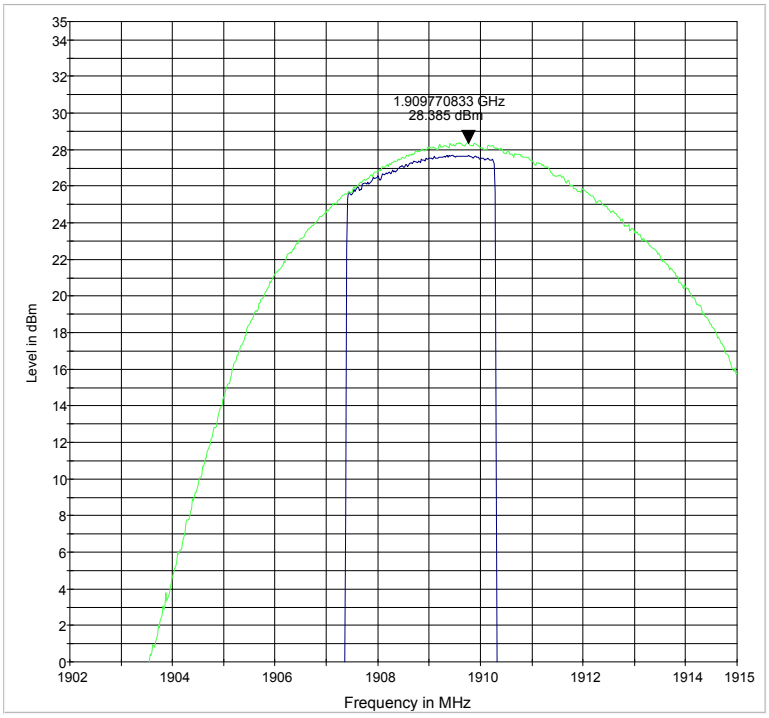
EIRP GSM 1900: GMSK Mode CHANNEL 512



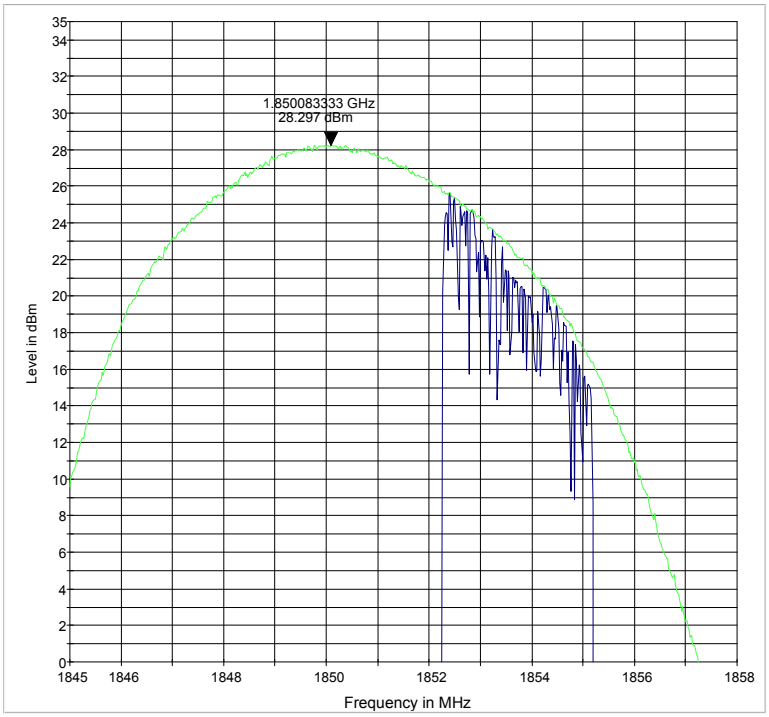
EIRP GSM 1900: GMSK Mode CHANNEL 661



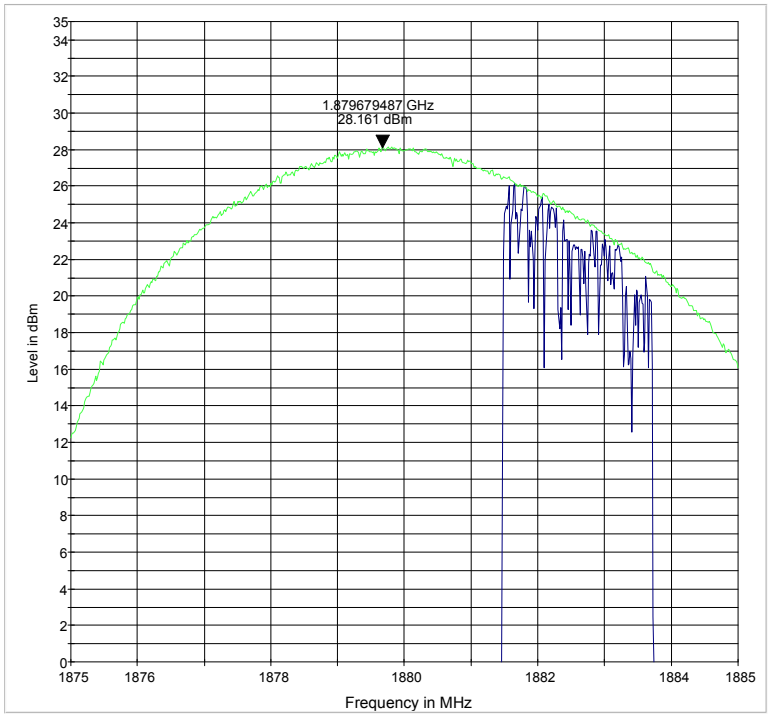
EIRP GSM 1900: GMSK Mode CHANNEL 810



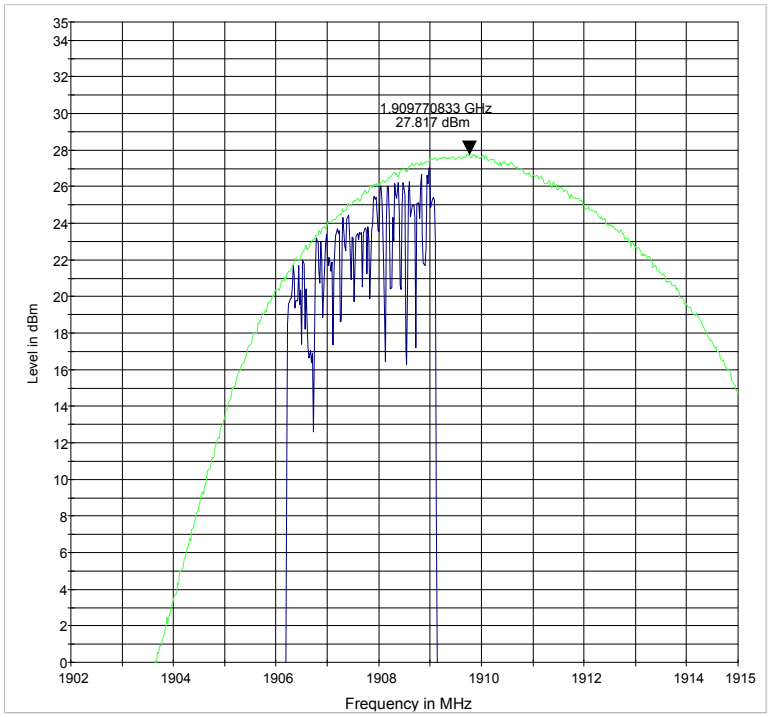
EIRP GSM 1900: 8PSK Mode CHANNEL 512



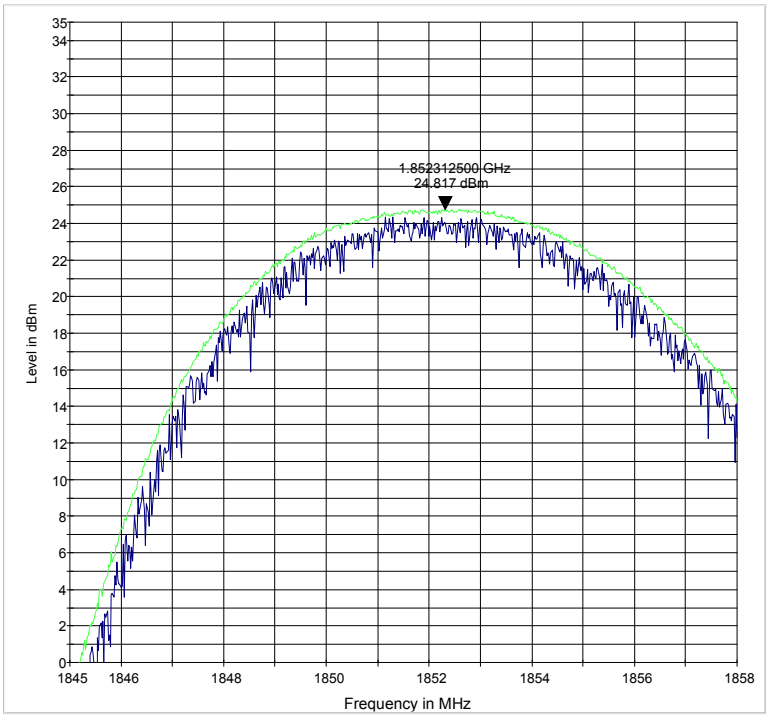
EIRP GSM 1900: 8PSK Mode CHANNEL 661



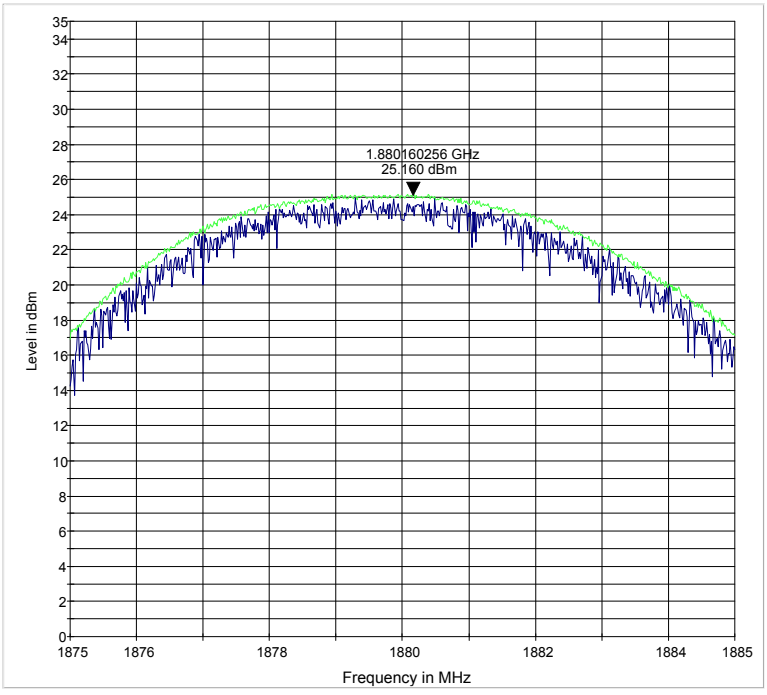
EIRP GSM 1900: 8PSK Mode CHANNEL 810



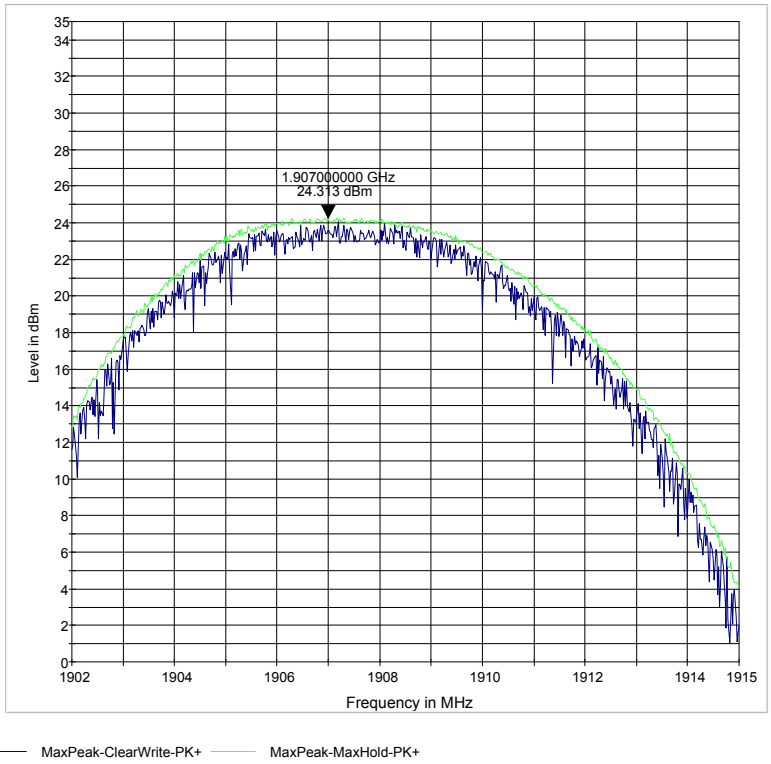
EIRP UMTS FDD II: WCDMA Mode CHANNEL 9262



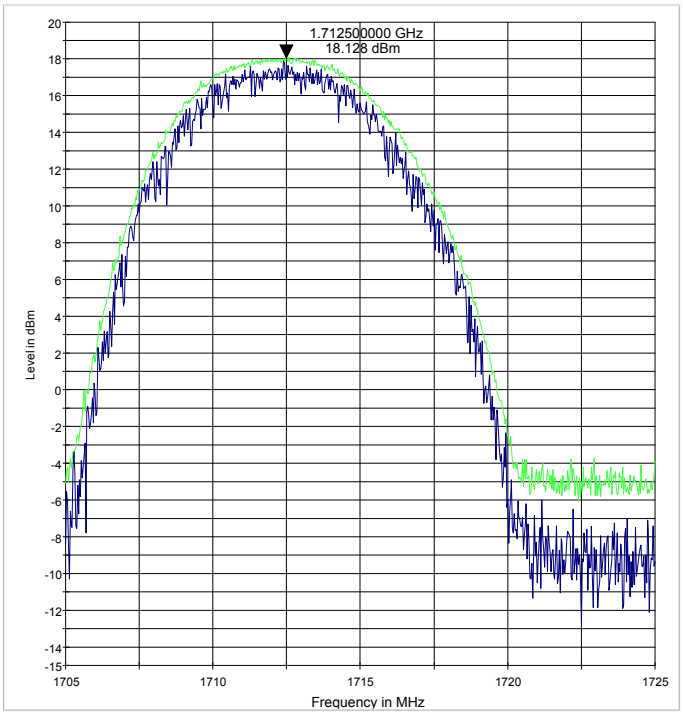
EIRP UMTS FDDII: WCDMA Mode CHANNEL 9400



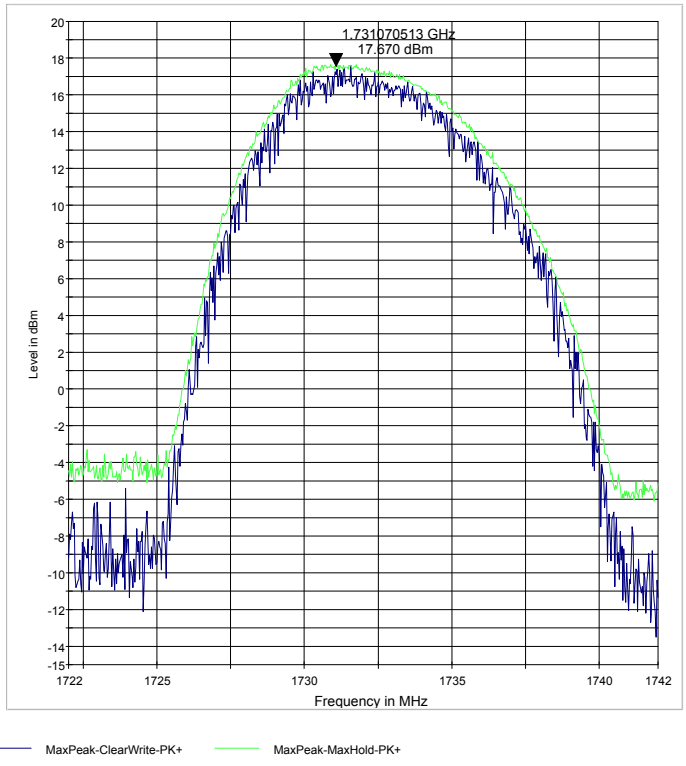
EIRP UMTS FDDII: WCDMA Mode CHANNEL 9538



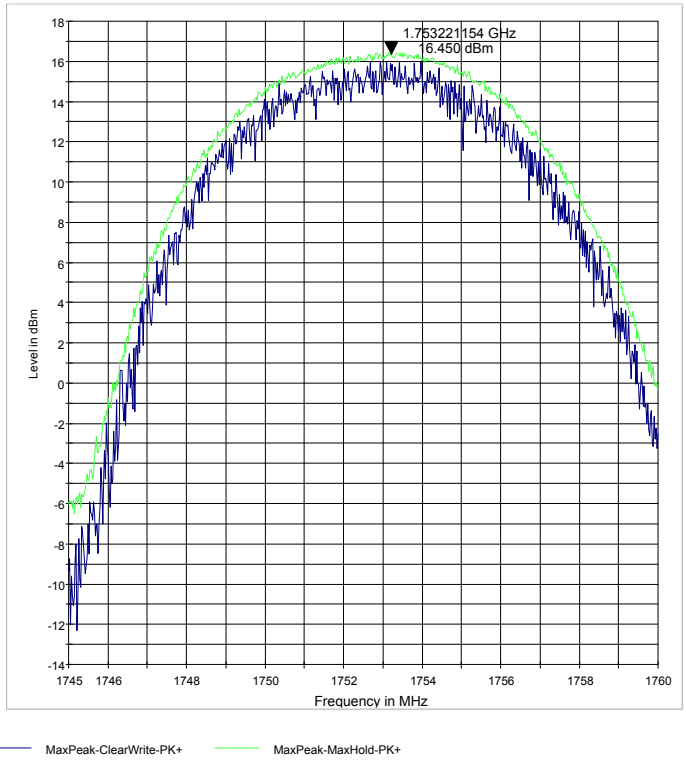
EIRP UMTS FDD IV: WCDMA Mode CHANNEL 1312



EIRP UMTS FDDIV: WCDMA Mode CHANNEL 1413



EIRP UMTS FDDIV: WCDMA Mode CHANNEL 1513



6.2 Occupied Bandwidth/Emission Bandwidth

6.2.1 References

FCC: CFR Part 2.1049, CFR Part 22.917, CFR Part 24.238
IC: RSS-Gen Section 4.6

6.2.2 Measurement requirements:

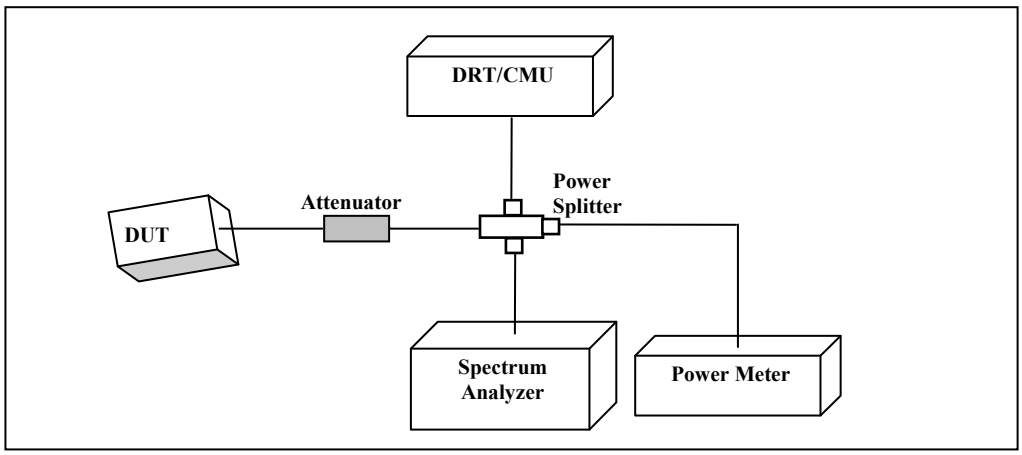
6.2.2.1 FCC 2.1049: Occupied bandwidth

The occupied 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 shall be measured under the following conditions as applicable.
(h) Transmitters employing digital modulation techniques-when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated.

6.2.2.2 RSS-Gen 4.6: Occupied bandwidth

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99 percent emission bandwidth, as calculated or measured. The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

6.2.3 Occupied / Emission bandwidth measurement procedure



1. Connect the equipment as shown in the above diagram.
2. Adjust the settings of the Digital RadioCommunication Tester (DRT) to set the EUT to its maximum power at the required channel.
3. Set the spectrum analyzer to measure the 99% (-20 dB) occupied bandwidth.
4. Set the spectrum analyzer to measure the -26 dB emission bandwidth.
5. Measurements are to be performed with the EUT set to the low, middle and high channel of each frequency band.

6.2.4 Test Conditions:

Tnom: 22°C; Vnom: 3.8 V

6.2.5 Test Verdict

Pass.

6.2.6 Test Results

6.2.6.1 Occupied/Emission Bandwidth- 850 MHz band

GSM 850: GMSK Mode		
Frequency (MHz)	**99% Occupied Bandwidth (kHz)**	**-26dBc Bandwidth (kHz)**
824.2	246.8	317.3
836.6	245.2	317.3
848.8	246.8	315.7

GSM 850: 8PSK Mode		
Frequency (MHz)	**99% Occupied Bandwidth (kHz)**	**-26dBc Bandwidth (kHz)**
824.2	250	309.3
836.6	250	310.9
848.8	246.8	302.9

UMTS FDD V: WCDMA Mode		
Frequency (MHz)	**99% Occupied Bandwidth (MHz)**	**-26dBc Bandwidth (MHz)**
826.4	4.1	4.6
836.6	4.1	4.6
846.6	4.1	4.6

6.2.6.2 Occupied/Emission Bandwidth- 1900 MHz band

GSM 1900: GMSK Mode		
Frequency (MHz)	**99% Occupied Bandwidth (kHz)**	**-26dBc Bandwidth (kHz)**
1850.2	242.0	315.7
1880.0	242.0	312.5
1909.8	245.2	310.1

GSM 1900: 8PSK Mode		
Frequency (MHz)	**99% Occupied Bandwidth (kHz)**	**-26dBc Bandwidth (kHz)**
1850.2	251.6	306.0
1880.0	246.8	314.1
1909.8	245.2	306.0

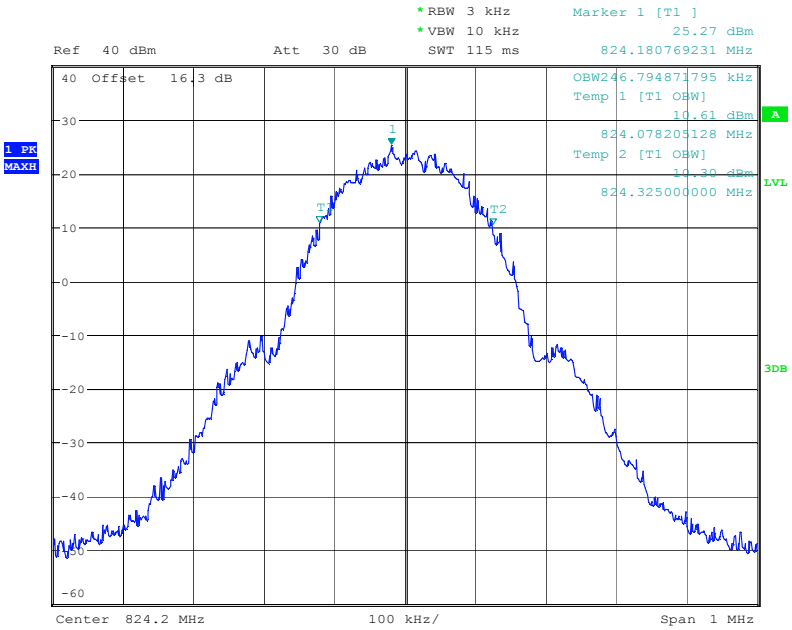
UMTS FDD II: WCDMA Mode		
Frequency (MHz)	**99% Occupied Bandwidth (kHz)**	**-26dBc Bandwidth (kHz)**
1852.4	4.1	4.6
1880	4.1	4.6
1907.6	4.1	4.6

6.2.6.3 Occupied/Emission Bandwidth- 1700 MHz band

UMTS FDD IV: WCDMA Mode		
Frequency (MHz)	**99% Occupied Bandwidth (kHz)**	**-26dBc Bandwidth (kHz)**
1712.4	4.1	4.6
1732.6	4.1	4.6
1752.6	4.1	4.6

6.2.6.4 Plots:

Occupied Bandwidth GSM 850: GMSK Mode Channel 123



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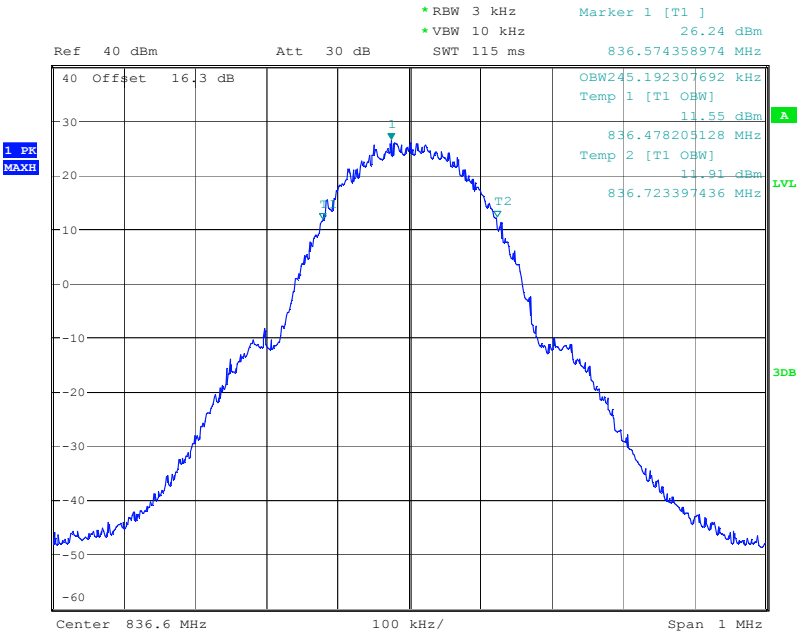
Date: 2.MAY.2013 00:21:36

Occupied Bandwidth GSM 850: GMSK Mode Channel 190



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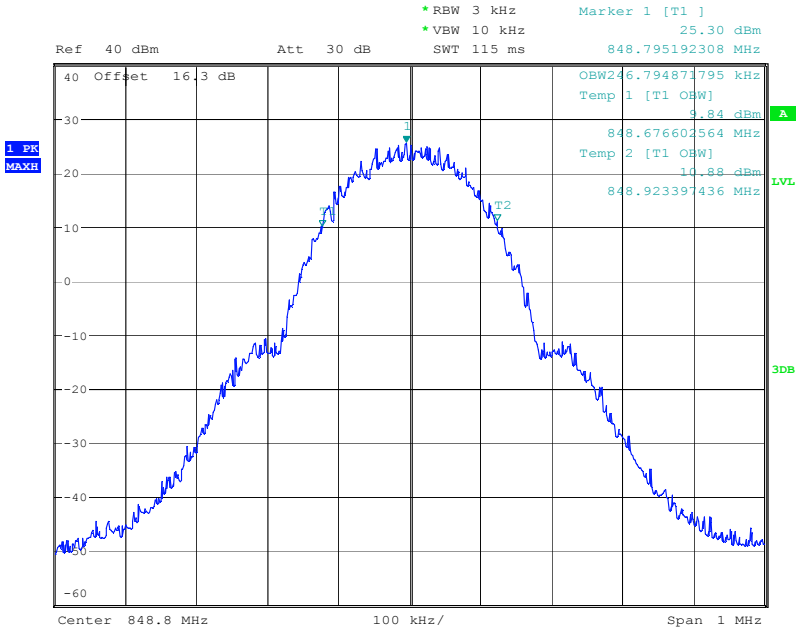
Date: 2.MAY.2013 00:19:56

Occupied Bandwidth GSM 850: GMSK Mode Channel 251



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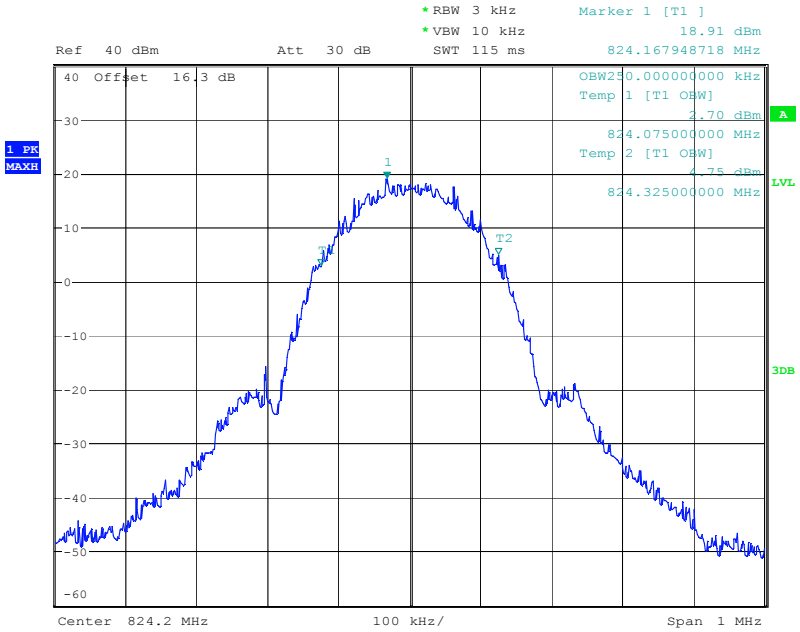
Date: 2.MAY.2013 00:11:00

Occupied Bandwidth GSM 850: 8PSK Mode Channel 123



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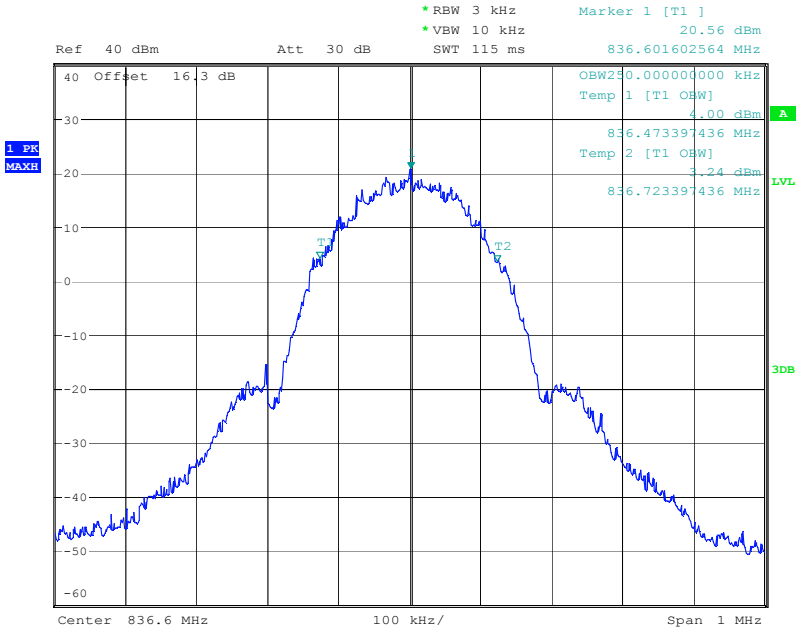

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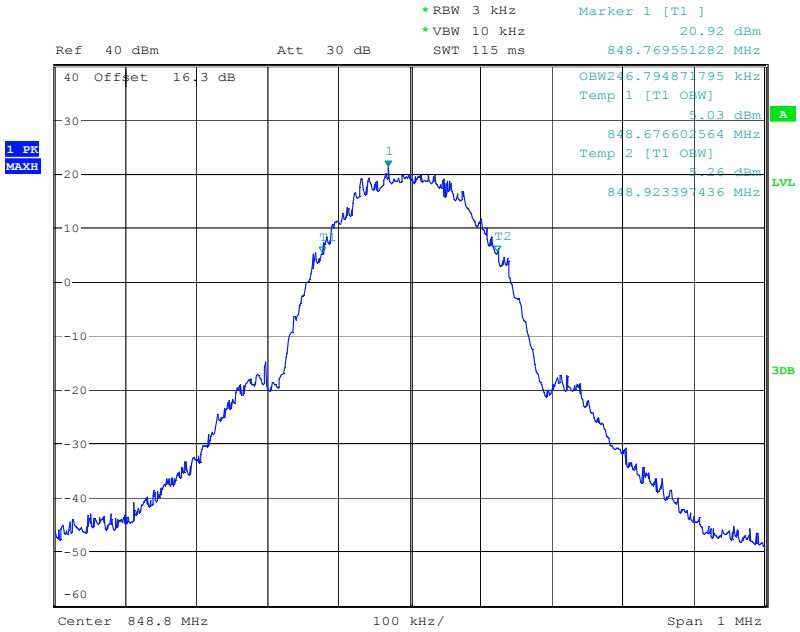
Date: 2.MAY.2013 00:57:40

Occupied Bandwidth GSM 850: 8PSK Mode Channel 251



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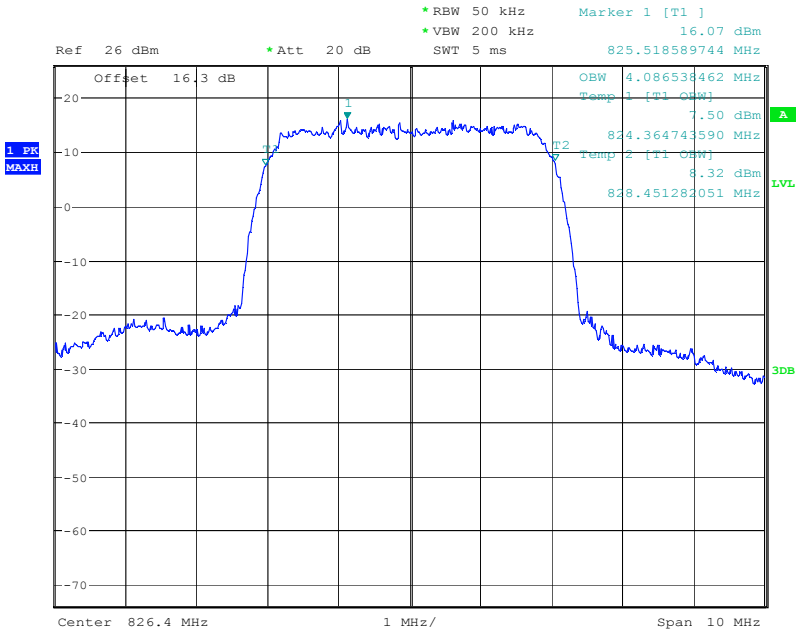
Occupied Bandwidth UMTS FDD V: WCDMA Mode Channel 4132



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Date: 1.MAY.2013 19:24:32

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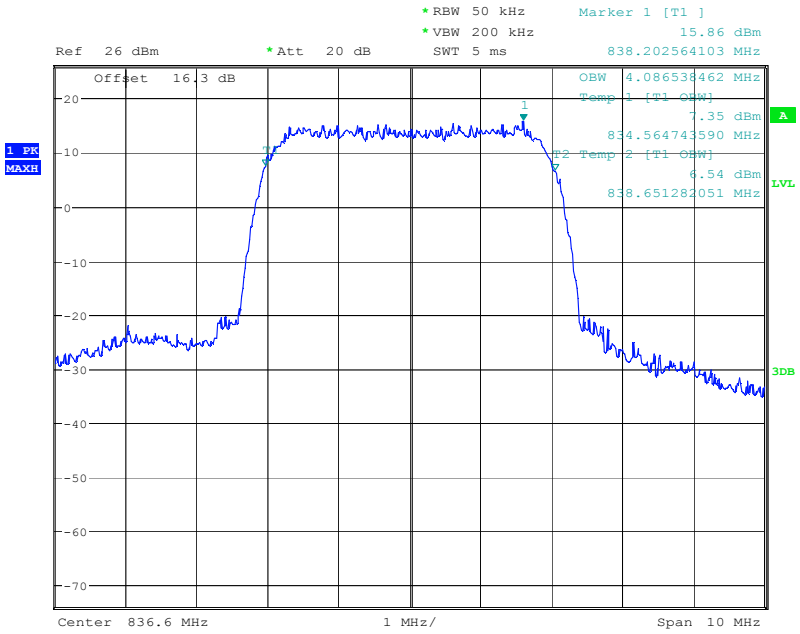

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Date: 1.MAY.2013 19:27:30

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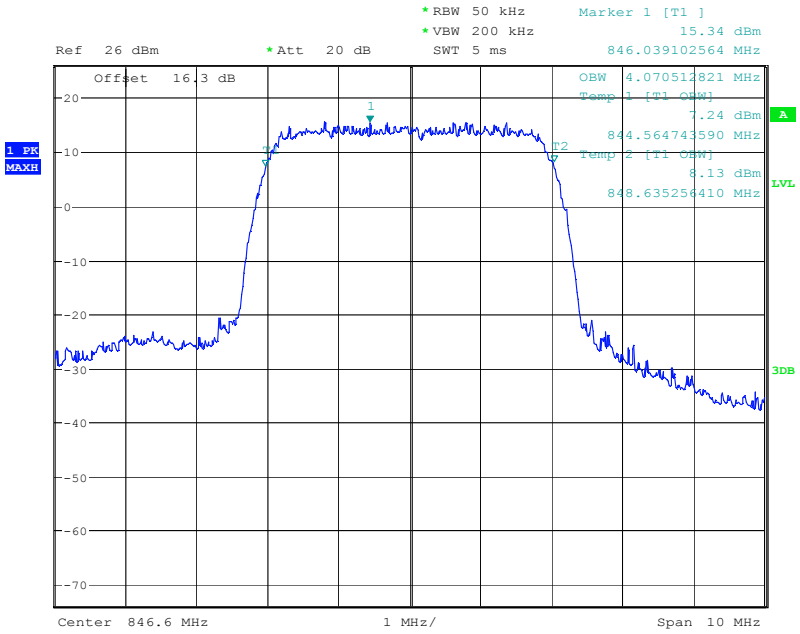

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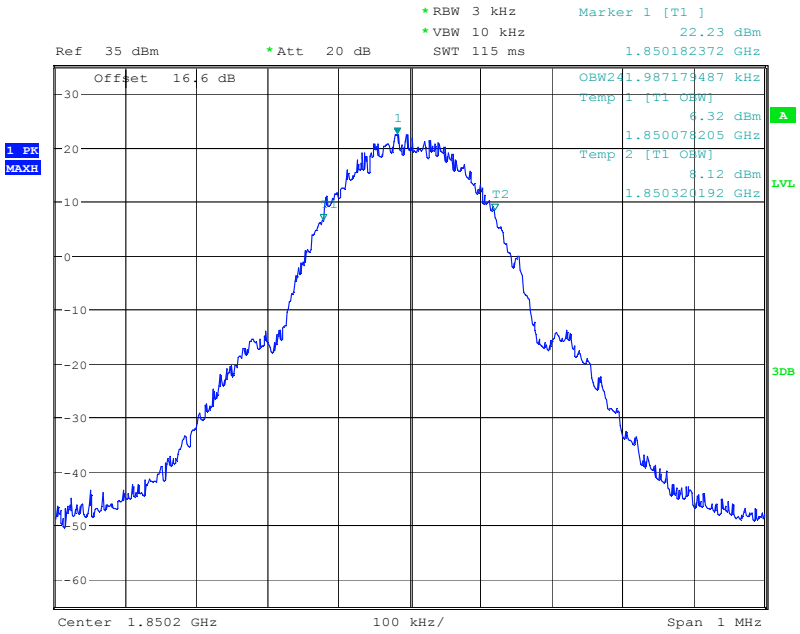
Date: 1.MAY.2013 19:28:37

Occupied Bandwidth GSM 1900: GMSK Mode Channel 512



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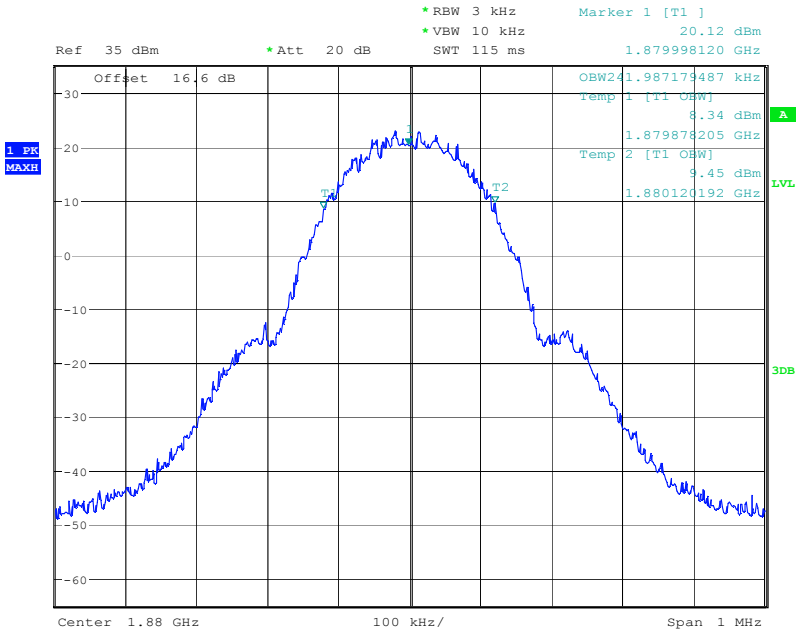
Date: 1.MAY.2013 22:11:34

Occupied Bandwidth GSM 1900: GMSK Mode Channel 661



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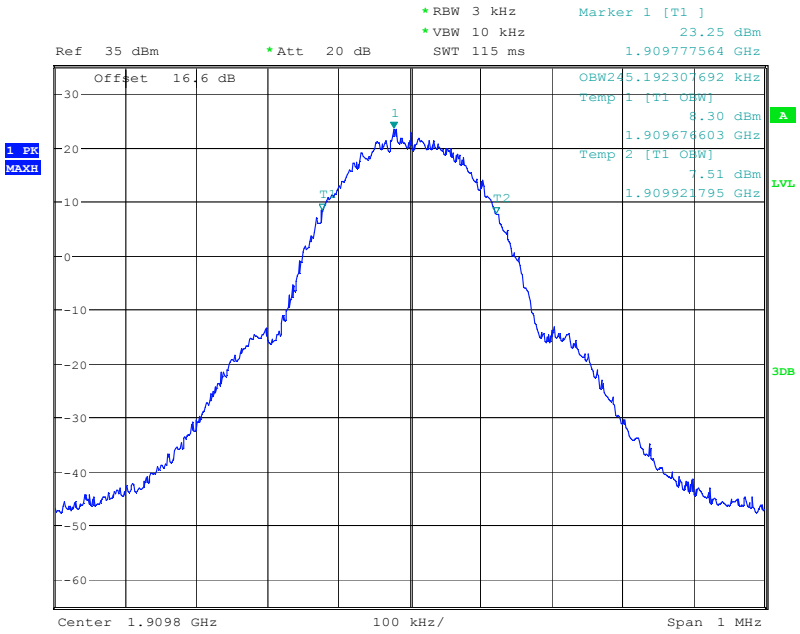
Date: 1.MAY.2013 22:29:45

Occupied Bandwidth GSM 1900: GMSK Mode Channel 810



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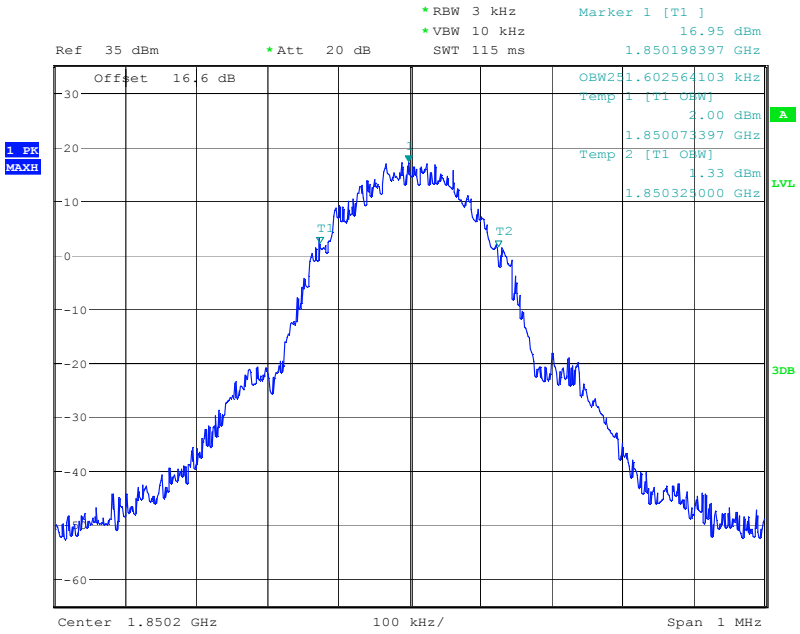

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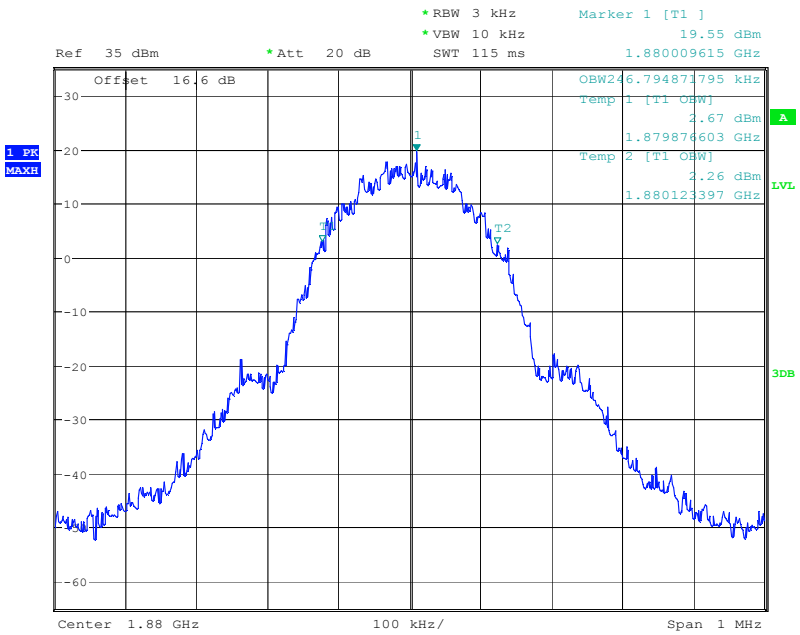

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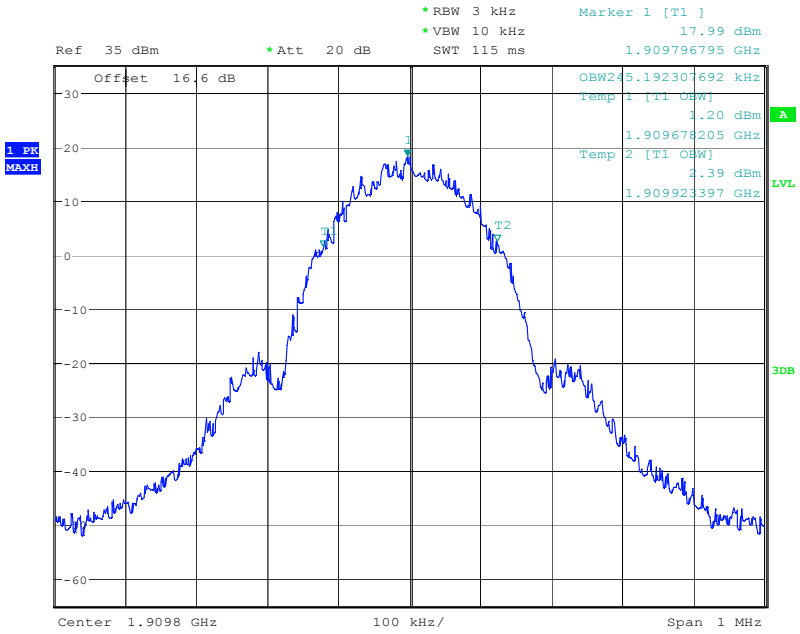

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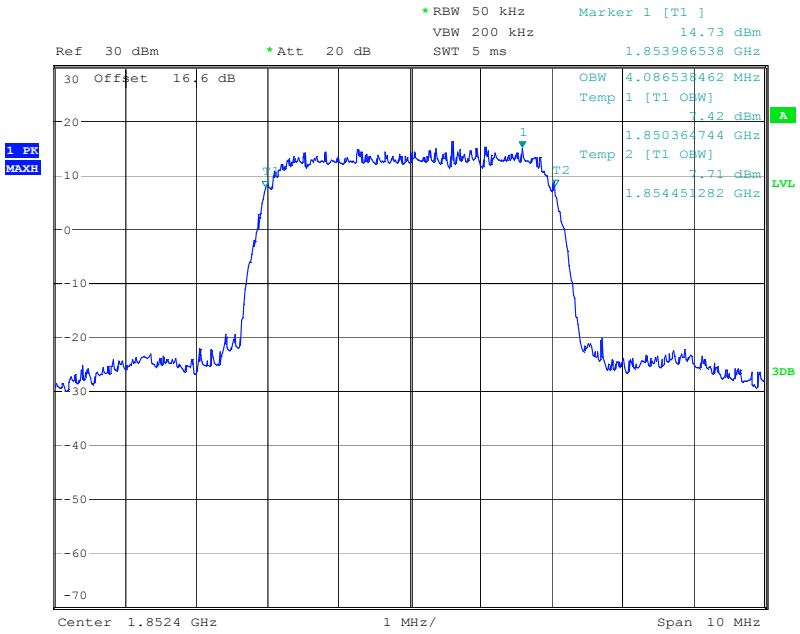
Date: 1.MAY.2013 22:53:57

Occupied Bandwidth UMTS FDD II: WCDMA Mode Channel 9262



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Date: 1.MAY.2013 21:42:57

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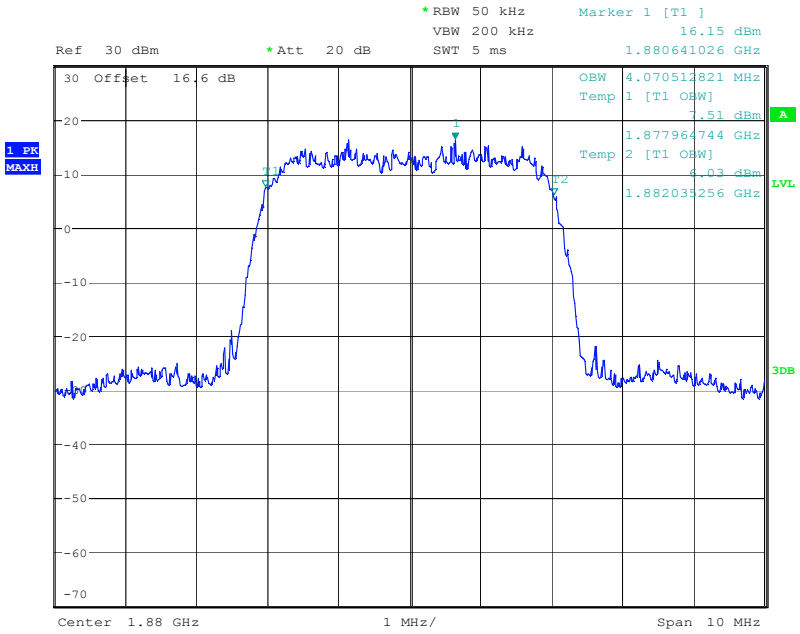

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Date: 1.MAY.2013 21:43:29

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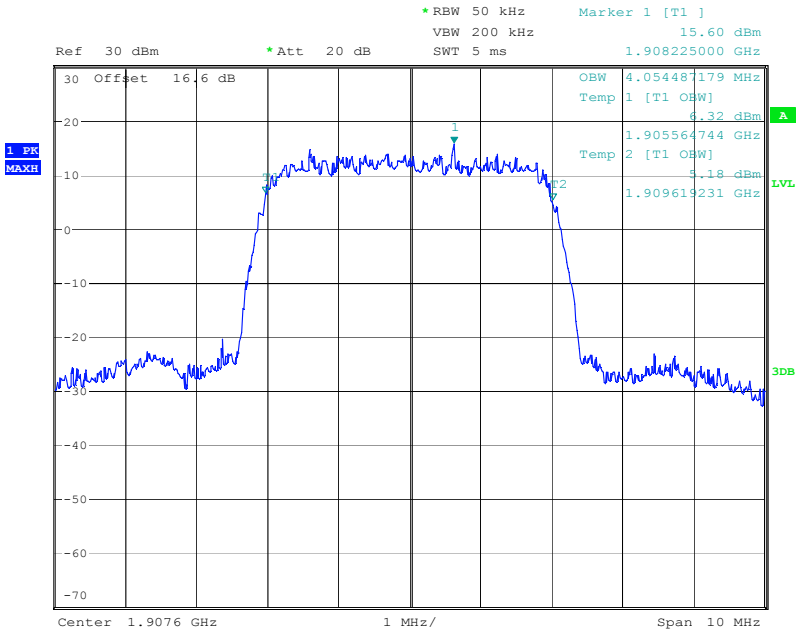

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Date: 1.MAY.2013 21:43:47

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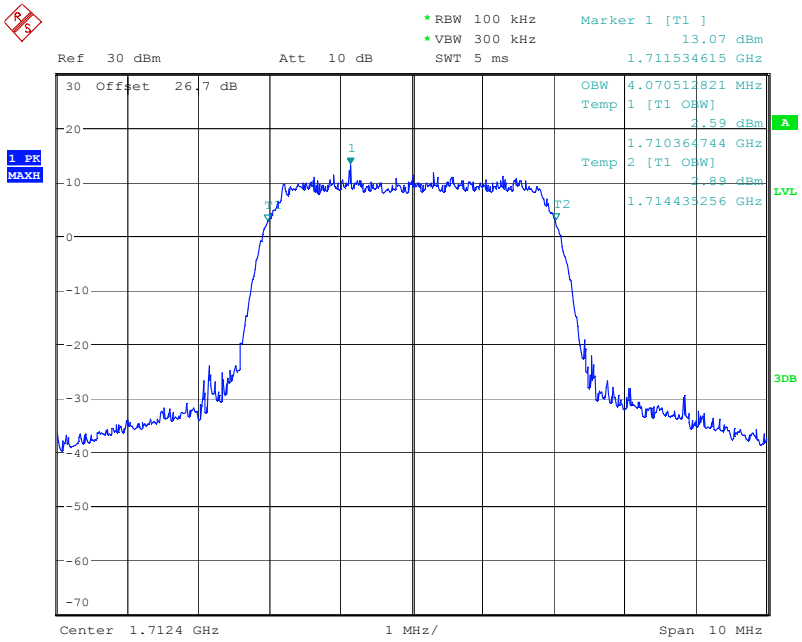

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Date: 1.JUL.2013 18:40:01

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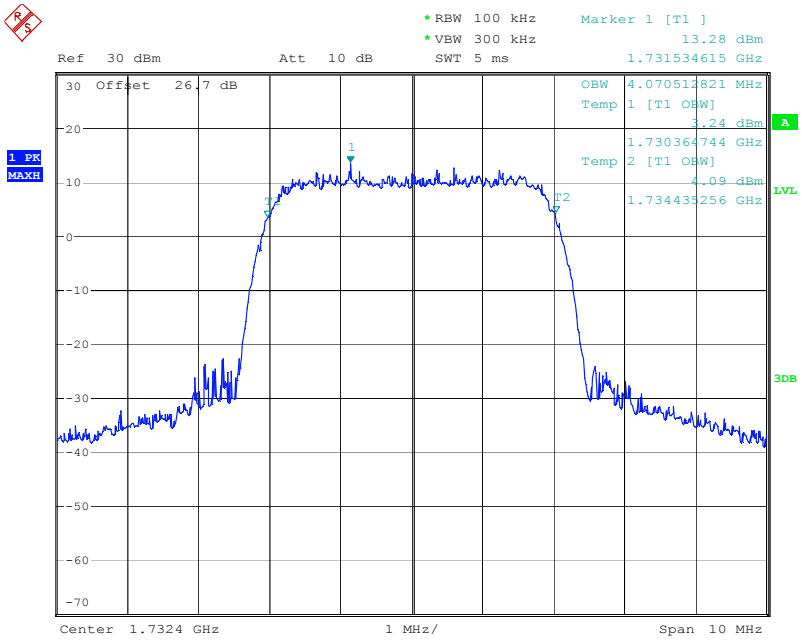

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Date: 1.JUL.2013 18:39:02

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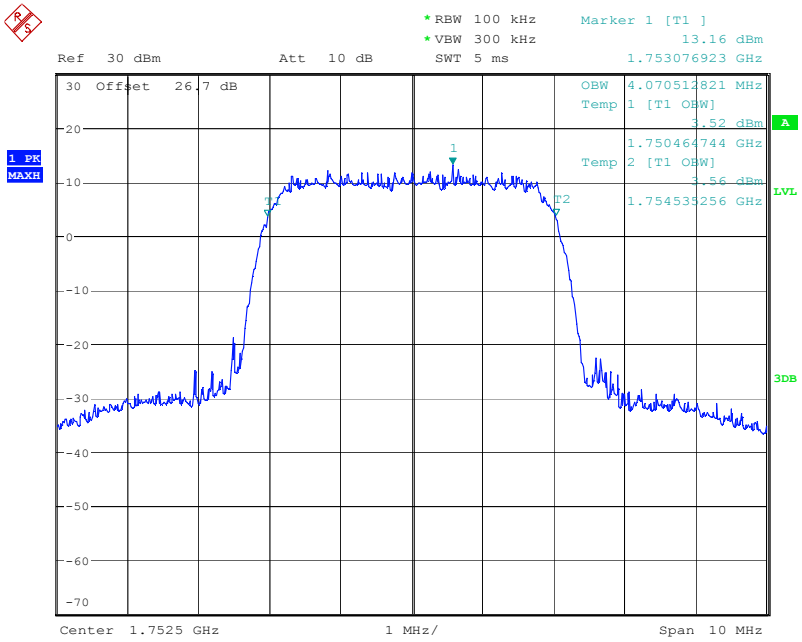

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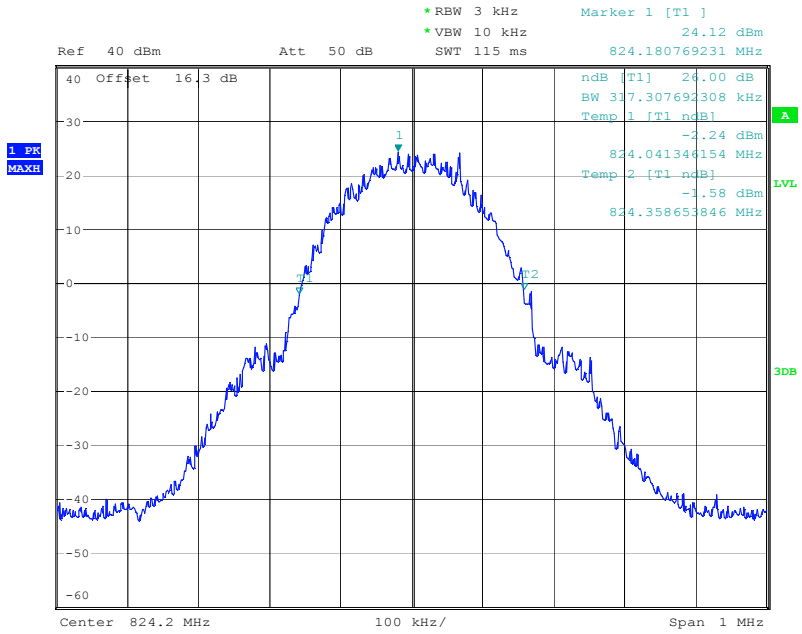
Date: 1.JUL.2013 18:37:36

Emission Bandwidth GSM 850: GMSK Mode Channel 123



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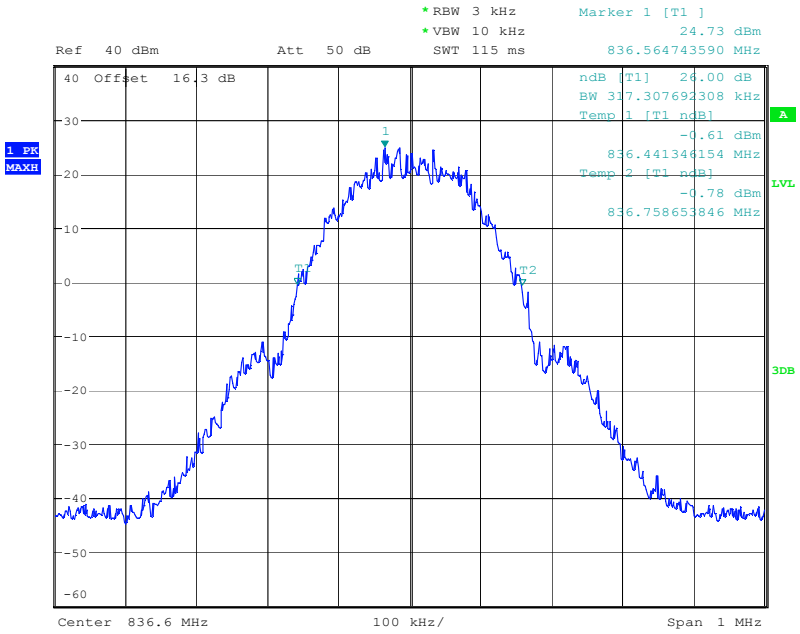
Date: 2.MAY.2013 00:22:19

Emission Bandwidth GSM 850: GMSK Mode Channel 190



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Date: 2.MAY.2013 00:23:10

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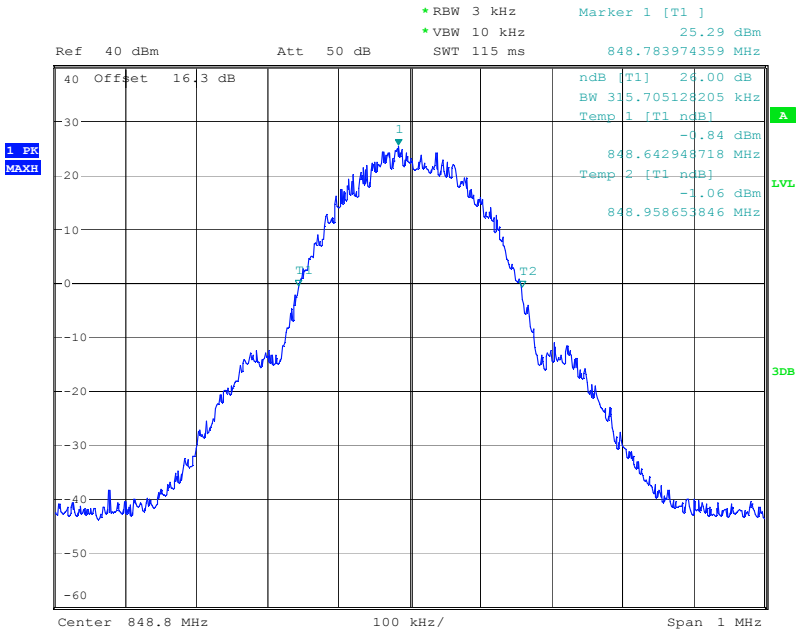

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Date: 2.MAY.2013 00:24:05

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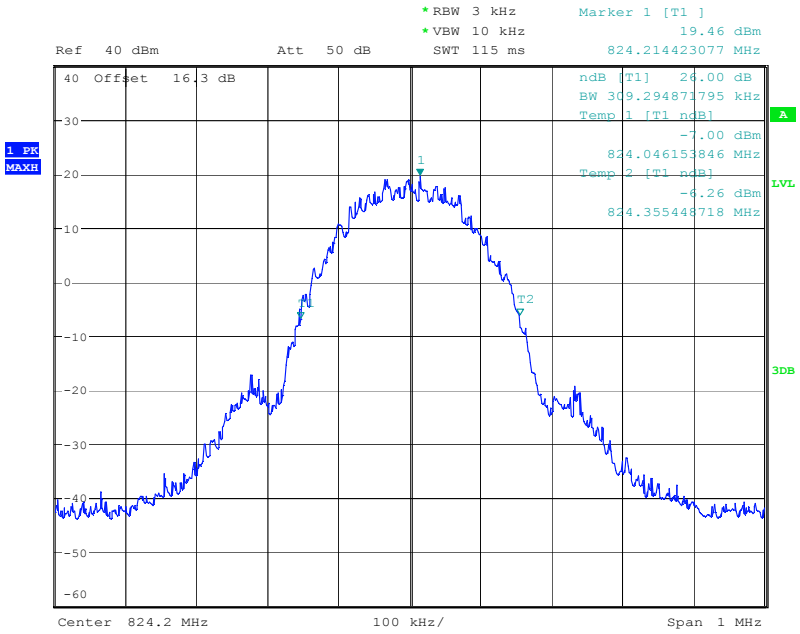

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Date: 2.MAY.2013 00:31:12

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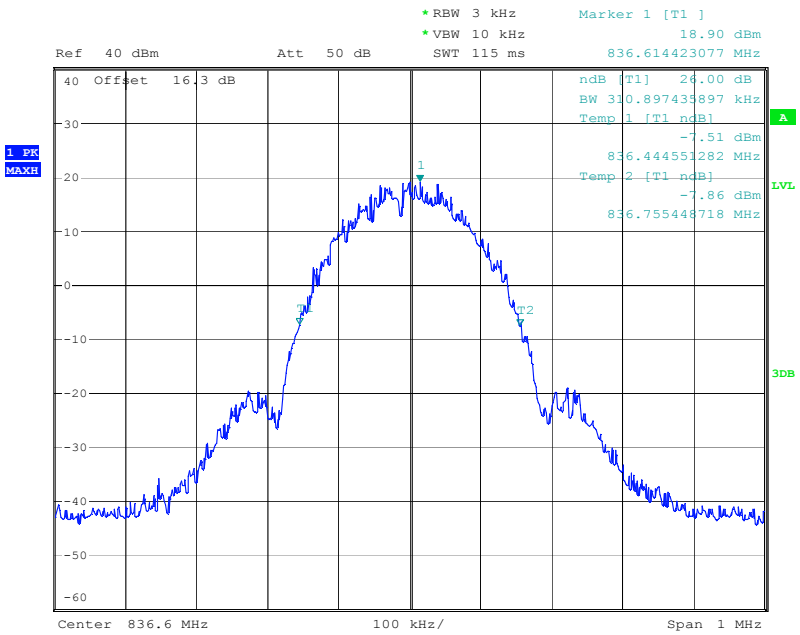

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Date: 2.MAY.2013 00:29:03

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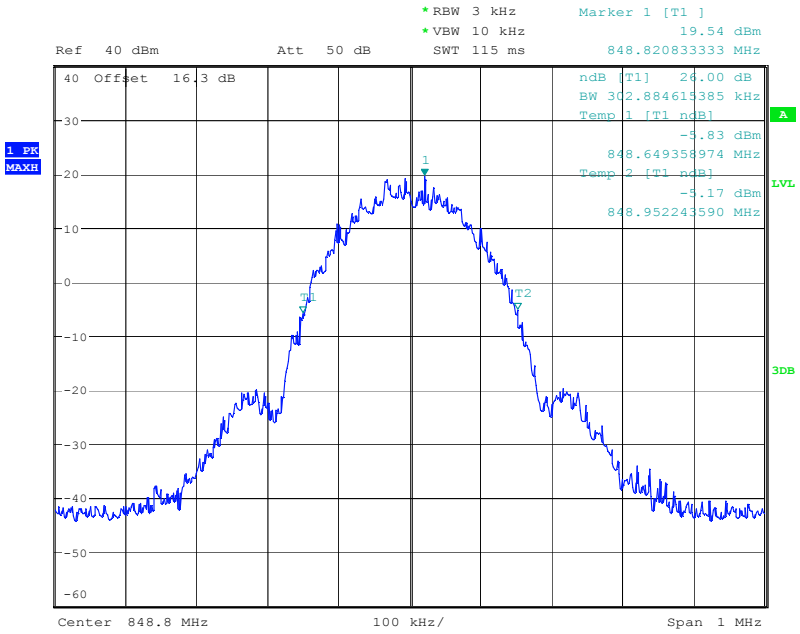

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Date: 2.MAY.2013 01:00:09

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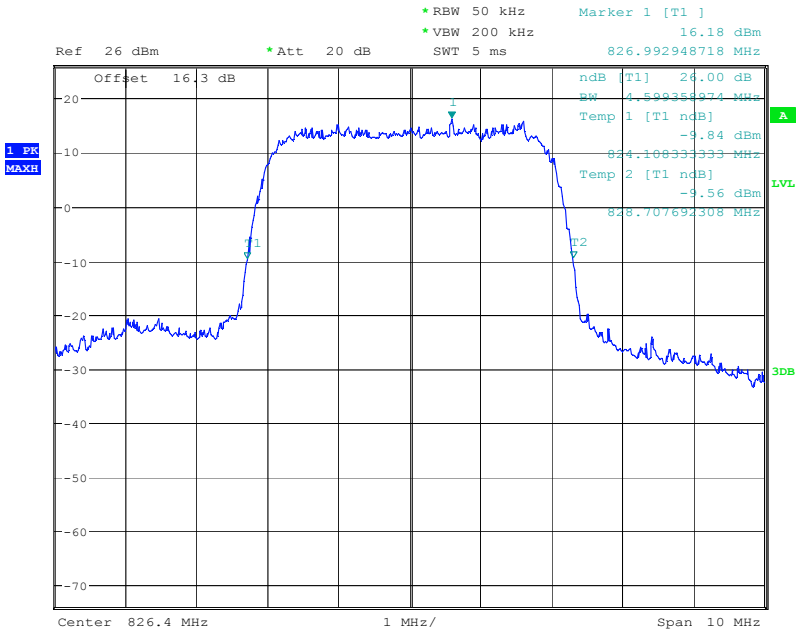

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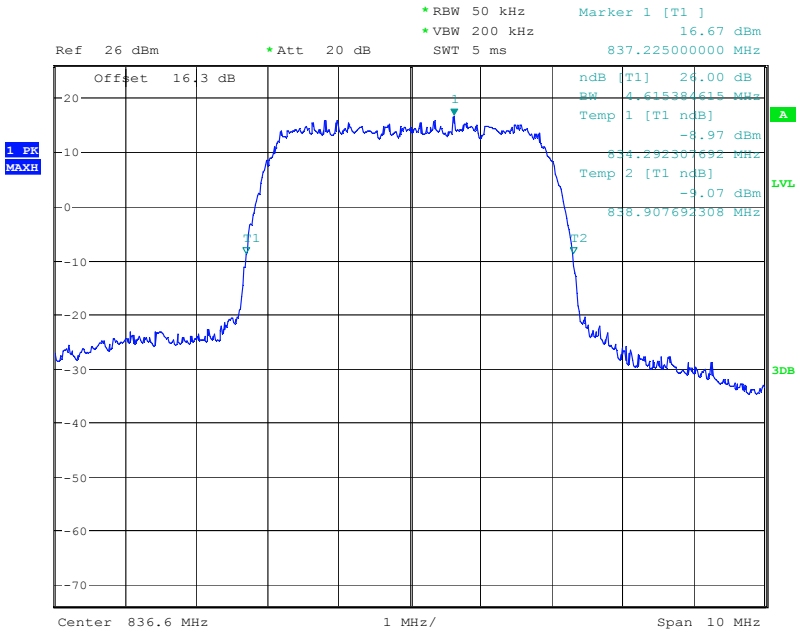
Date: 1.MAY.2013 19:33:02

Emission Bandwidth UMTS FDD V: WCDMA Mode Channel 4183



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Date: 1.MAY.2013 19:32:00

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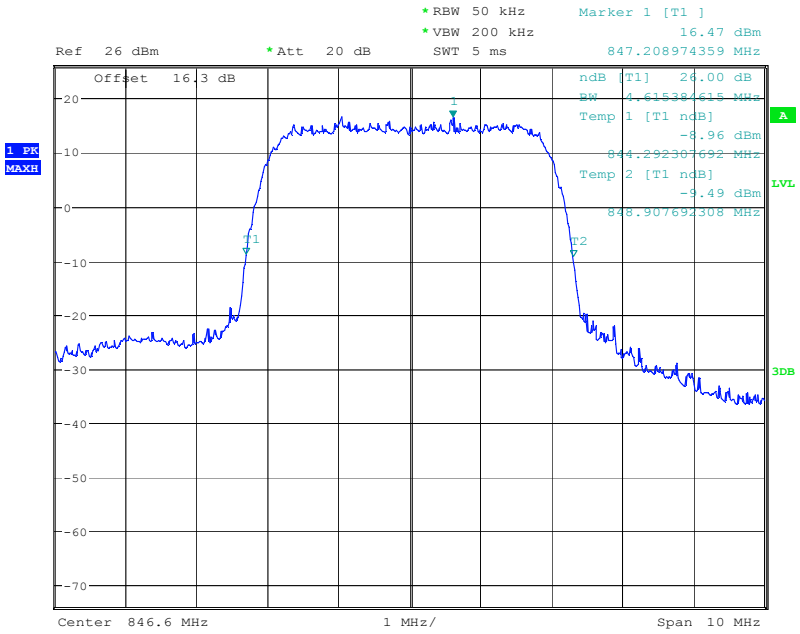

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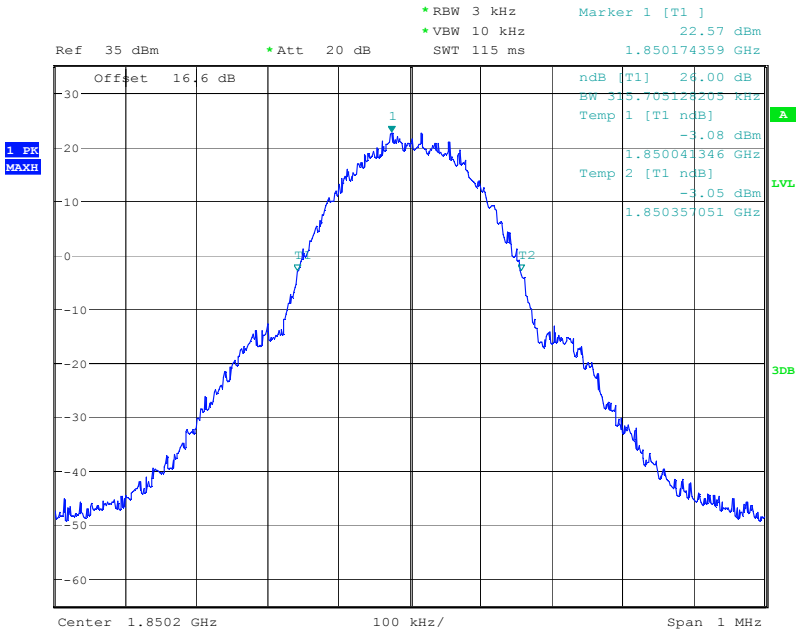
Date: 1.MAY.2013 19:30:45

Emission Bandwidth GSM 1900: GMSK Mode Channel 512



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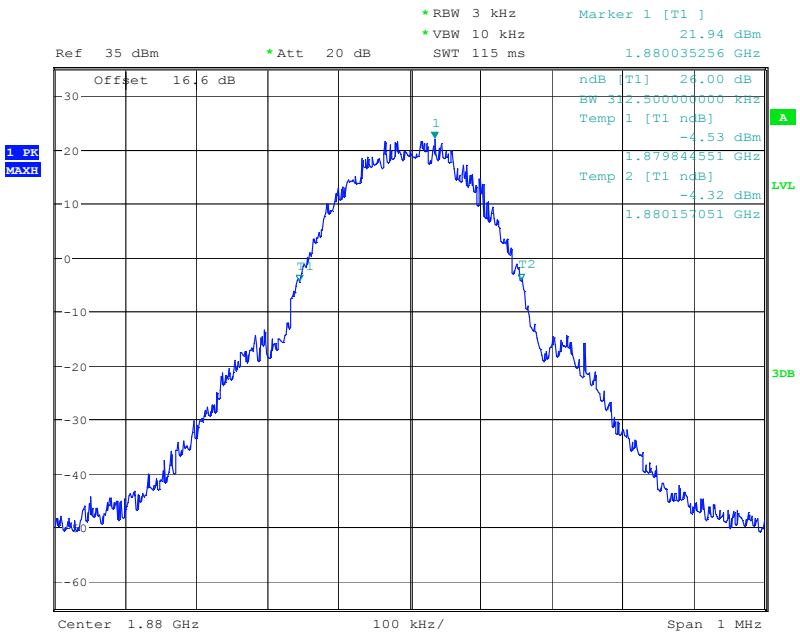
Date: 1.MAY.2013 22:35:17

Emission Bandwidth GSM 1900: GMSK Mode Channel 661



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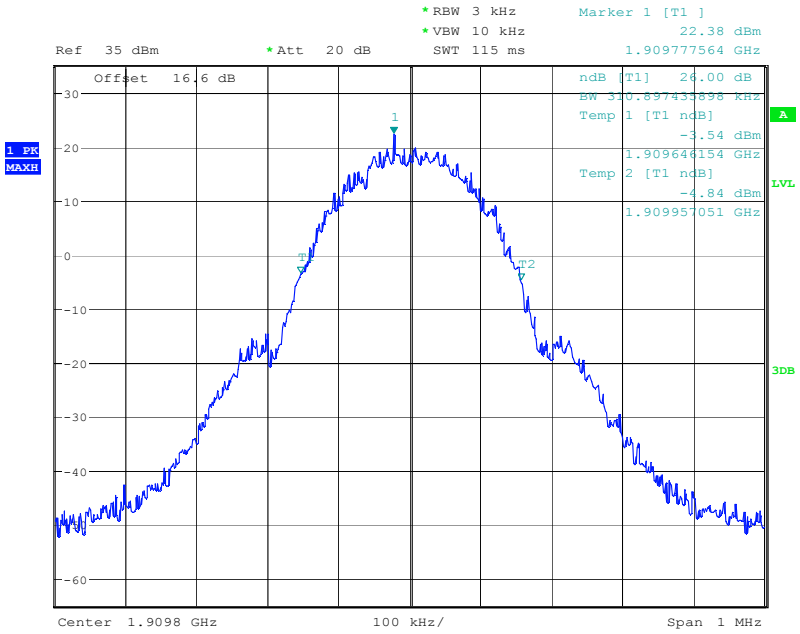
Date: 1.MAY.2013 22:31:55

Emission Bandwidth GSM 1900: GMSK Mode Channel 810



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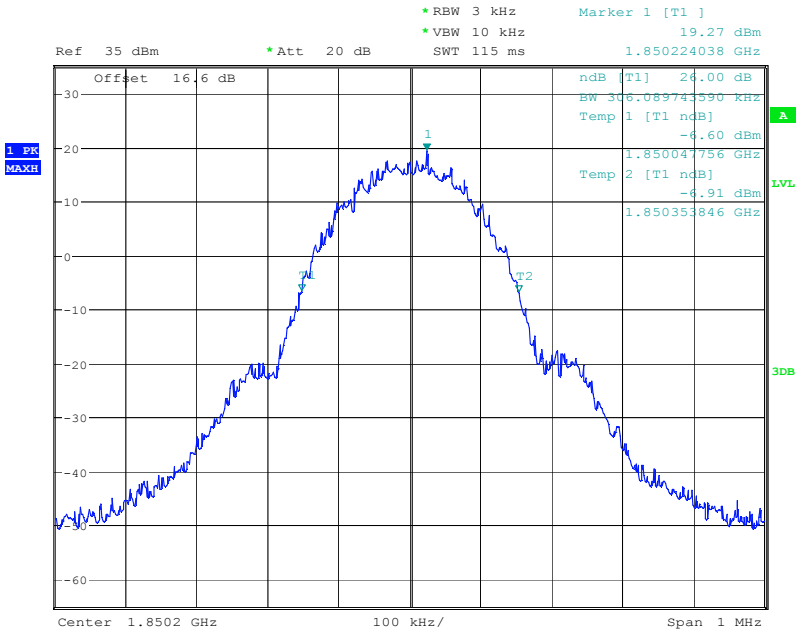
Date: 1.MAY.2013 22:36:04

Emission Bandwidth GSM 1900: 8PSK Mode Channel 512



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Date: 1.MAY.2013 22:42:30

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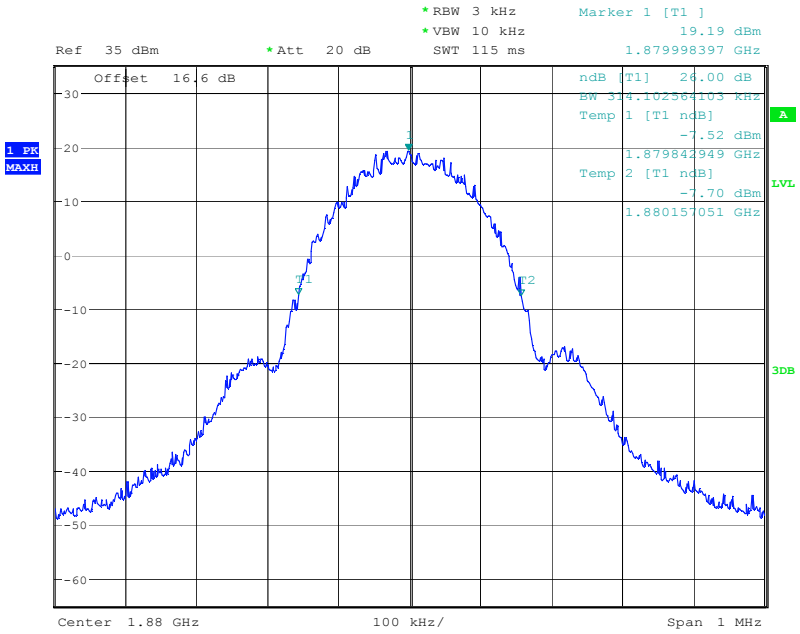

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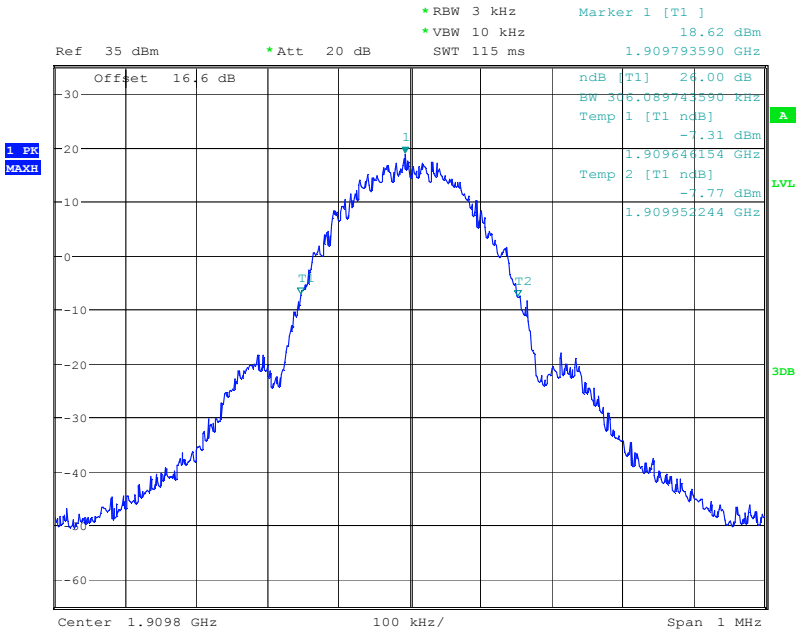
Date: 1.MAY.2013 22:50:31

Emission Bandwidth GSM 1900: 8PSK Mode Channel 810



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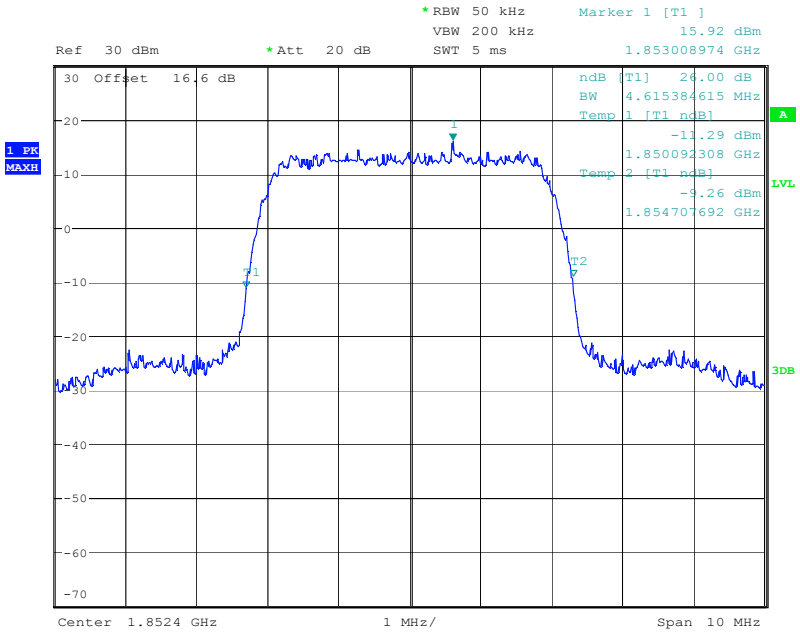
Date: 1.MAY.2013 22:51:45

Emission Bandwidth UMTS FDD II: WCDMA Mode Channel 9262



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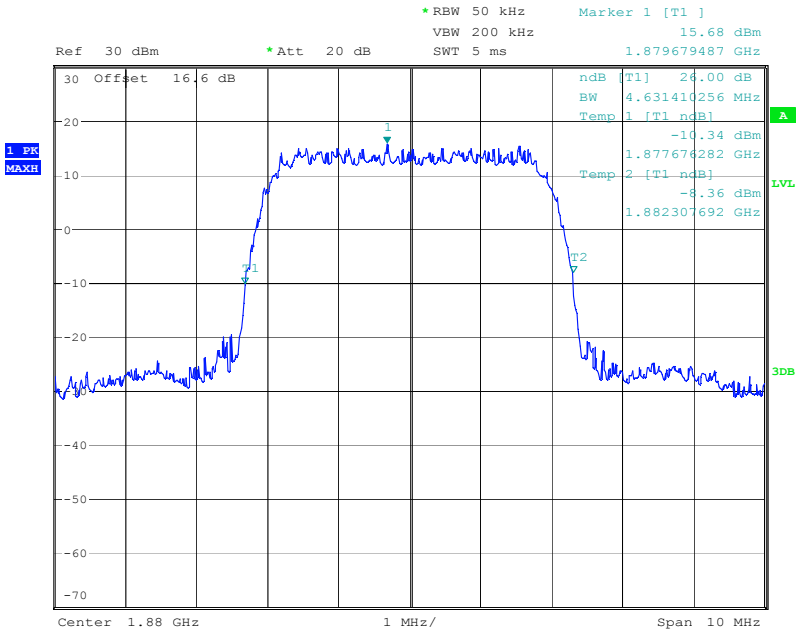
Date: 1.MAY.2013 21:45:47

Emission Bandwidth UMTS FDD II: WCDMA Mode Channel 9400



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Date: 1.MAY.2013 21:45:27

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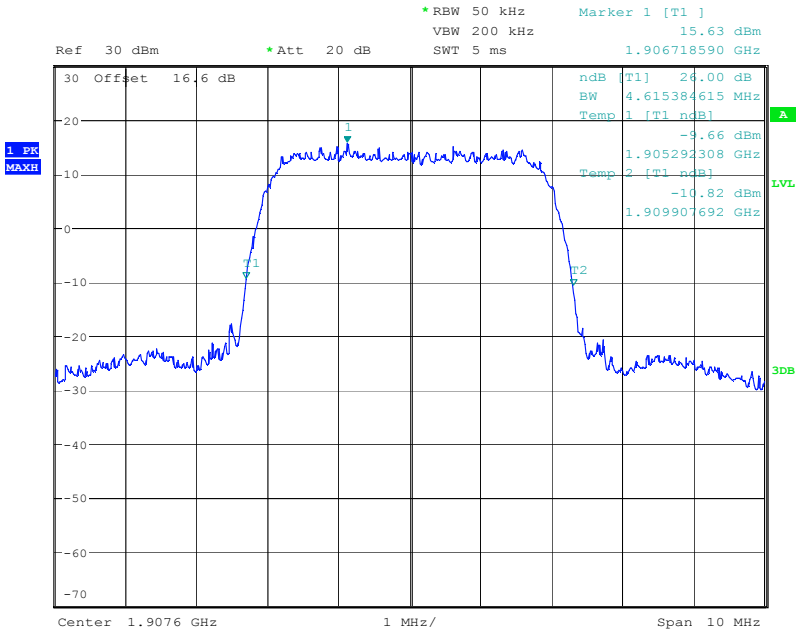

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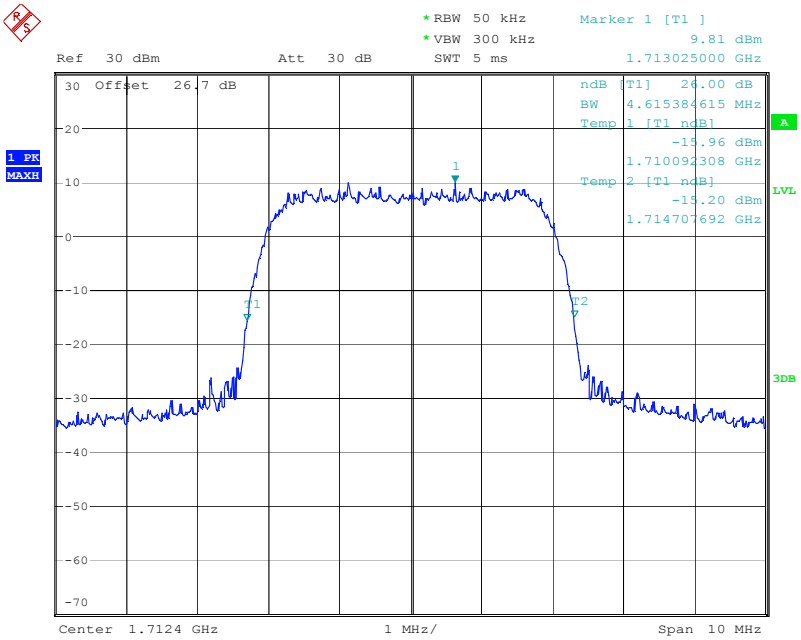
Date: 1.MAY.2013 21:45:06

Emission Bandwidth UMTS FDD IV: WCDMA Mode Channel 1312



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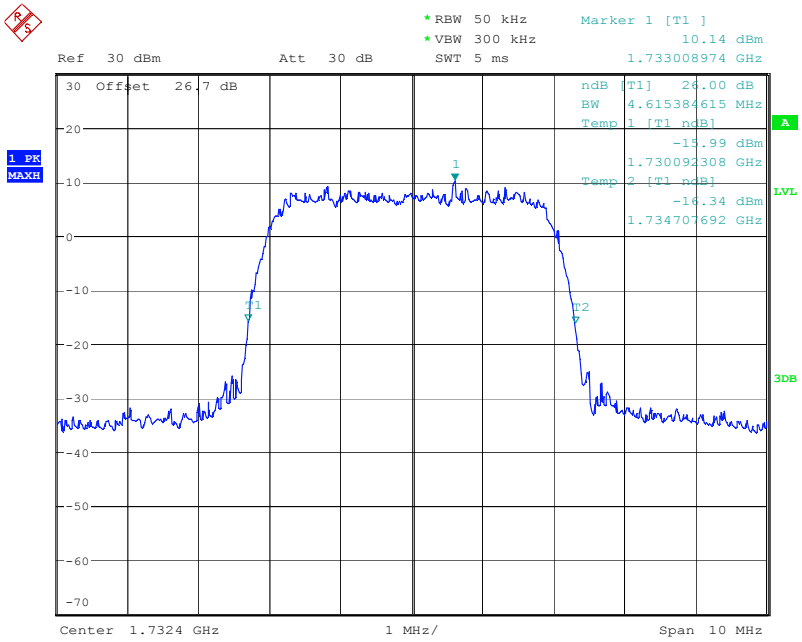
Date: 1.JUL.2013 18:43:04

Emission Bandwidth UMTS FDD IV: WCDMA Mode Channel 1413



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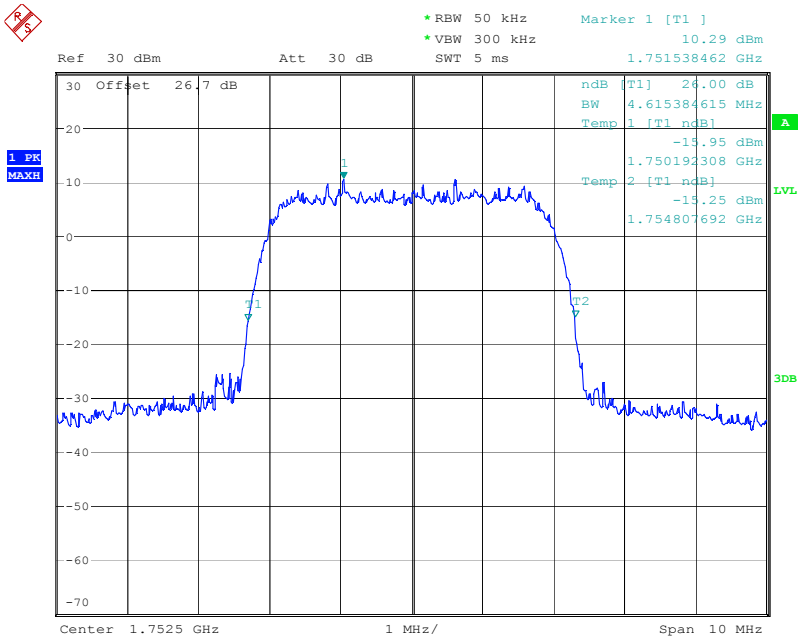
Date: 1.JUL.2013 18:44:08

Emission Bandwidth UMTS FDD IV: WCDMA Mode Channel 1513



low

Date: 1.JUL.2013 18:45:06

6.3 Frequency Stability

6.3.1 References

FCC: CFR Part 2.1055, CFR Part 22.355, CFR Part 24.235
IC: RSS Gen Section 4.7; RSS-132 Section 5.3; RSS-133 Section 6.3; RSS-139 Section 6.3

6.3.2 Measurement requirements:

6.3.2.1 Frequency Stability

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.
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.

6.3.3 Limits

6.3.3.1 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 3.4VDC 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 –10% and +10%. For the purposes of measuring frequency stability these voltage limits are to be used.

6.3.3.2 For equipment powered by primary supply voltage:

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.
For this EUT section 2.1055(d)(1) applies. This requires to vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

6.3.3.3 RSS-132 Section 5.3 and RSS-133 Section 6.3

The carrier frequency shall not depart from the reference frequency in excess of ±2.5 ppm for mobile stations.

6.3.4 Method of Measurement:

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the EUT in a "call mode". This is accomplished with the use of R&S CMU 200 Universal Radio Communication Tester.

1. Measure the carrier frequency at room temperature.
2. Subject the EUT to overnight soak at -30 C.
3. With the EUT, powered via nominal voltage, connected to the CMU 200 and in a simulated call on mid channel, measure the carrier frequency. These measurements should be made within 2 minutes of powering up the EUT, to prevent significant self-warming.
4. Repeat the above measurements at 10 C increments from -30 C to +50 C. Allow at least 1 1/2 hours at each temperature, un-powered, before making measurements.
5. Re-measure carrier frequency at room temperature with nominal voltage. Re-measure carrier frequency at low and high voltage. Pause at nominal voltage for 1 1/2 hours un-powered, to allow any self-heating to stabilize, before continuing.
6. Subject the EUT to overnight soak at +50 C.
7. With the EUT, powered via nominal voltage, connected to the CMU 200 and in a simulated call on mid channel, measure the carrier frequency. These measurements should be made within 2 minutes of powering up the EUT, to prevent significant self-warming.
8. Repeat the above measurements at 10 C increments from +50 C to -30 C. Allow at least 1 1/2 hours at each temperature, un-powered, before making measurements.
9. At all temperature levels hold the temperature to +/- 0.5 C during the measurement procedure.

Measurement Uncertainty: ±0.5 dB

6.3.5 Test Conditions:

Tnom: 22°C; Vnom: 3.8 V (normal conditions)

6.3.6 Test Verdict:

Pass.

6.3.7 Test Results

6.3.7.1 Test Results Frequency Stability GSM-850: Channel 190 (836.6 MHz)

Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
Low V: 3.23	19	0.02
High V: 4.37	23	0.03

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

Temperature (^{o}C)	Frequency Error (Hz)	Frequency Error (ppm)
-30	31	0.04
-20	27	0.03
-10	23	0.03
0	22	0.03
+10	18	0.02
+20	18	0.02
+30	11	0.01
+40	16	0.02
+50	17	0.02

§2.1055 (b)(2) Battery end point

Battery End Point (V DC)	Frequency Error (Hz)	Frequency Error (ppm)
2.4	26	0.03

6.3.7.2 Test Results Frequency Stability UMTS FDD V: Channel 4183 (836.6 MHz)

Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
Low V: 3.23	-14	0.02
High V: 4.37	-16	0.02

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

Temperature (^{o}C)	Frequency Error (Hz)	Frequency Error (ppm)
-30	9	0.01
-20	-10	0.01
-10	-8	0.01
0	-12	0.01
+10	-12	0.01
+20	-10	0.01
+30	-15	0.02
+40	-9	0.01
+50	-14	0.02

§2.1055 (b)(2) Battery end point

Battery End Point (V DC)	Frequency Error (Hz)	Frequency Error (ppm)
2.4	-8	0.01

6.3.7.3 Test Results Frequency Stability GSM-1900: Channel 661 (1880.0 MHz)

Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
Low V: 3.23	19	0.01
High V: 4.37	27	0.01

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

Temperature (^{o}C)	Frequency Error (Hz)	Frequency Error (ppm)
-30	39	0.02
-20	41	0.02
-10	40	0.02
0	26	0.01
+10	29	0.02
+20	26	0.01
+30	33	0.02
+40	22	0.01
+50	28	0.01

§2.1055 (b)(2) Battery end point

Battery End Point (V DC)	Frequency Error (Hz)	Frequency Error (ppm)
2.4	21	0.01

6.3.7.4 Test Results Frequency Stability UMTS FDD II: Channel 9400 (1880.0 MHz)

Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
Low V: 3.23	-22	0.01
High V: 4.37	-26	0.01

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

Temperature (^{o}C)	Frequency Error (Hz)	Frequency Error (ppm)
-30	15	0.01
-20	-16	0.01
-10	16	0.01
0	-24	0.01
+10	-16	0.01
+20	-21	0.01
+30	-19	0.01
+40	-20	0.01
+50	-17	0.01

§2.1055 (b)(2) Battery end point

Battery End Point (V DC)	Frequency Error (Hz)	Frequency Error (ppm)
2.4	-24	0.01

6.3.7.5 Test Results Frequency Stability UMTS FDD IV: Channel 1413 (1732.6 MHz)

Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
Low V: 3.23	-21	0.01
High V: 4.37	-11	0.01

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

Temperature (^{o}C)	Frequency Error (Hz)	Frequency Error (ppm)
-30	-13	0.01
-20	-17	0.01
-10	-19	0.01
0	-21	0.01
+10	-16	0.01
+20	-13	0.01
+30	-14	0.01
+40	-23	0.01
+50	-18	0.01

§2.1055 (b)(2) Battery end point

Battery End Point (V DC)	Frequency Error (Hz)	Frequency Error (ppm)
2.4	-19	0.01

6.4 Conducted Out of Band Emissions (and Band Edge Compliance)

6.4.1 References

FCC: CFR Part 2.1051, CFR Part 22.917, CFR Part 24.238, CFR Part 27.53
IC: RSS-Gen Section 4.9; RSS-132 Section 5.5; RSS-133 Section 6.5, RSS-139 Section 6.5

6.4.2 Measurement requirements:

6.4.2.1 FCC 2.1051: Spurious emissions at antenna terminals.

The radio frequency voltage or power generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in FCC 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

6.4.2.2 RSS-Gen 4.9: Transmitter unwanted spurious emissions

The same parameter, peak power or average power, used for the transmitter output power measurement shall be used for unwanted emission measurements.
The search for unwanted emissions shall be from the lowest frequency internally generated or used in the device (local oscillator, intermediate or carrier frequency), or from 30 MHz, whichever is the lower, to the 5th harmonic of the highest frequency generated without exceeding 40 GHz.

6.4.3 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.

6.4.3.1 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 (824MHz – 849MHz), 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.

6.4.3.2 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 (1815MHz – 1910MHz), 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.

6.4.3.3 FCC 27.53 Emission Limits for Miscellaneous Wireless Communication

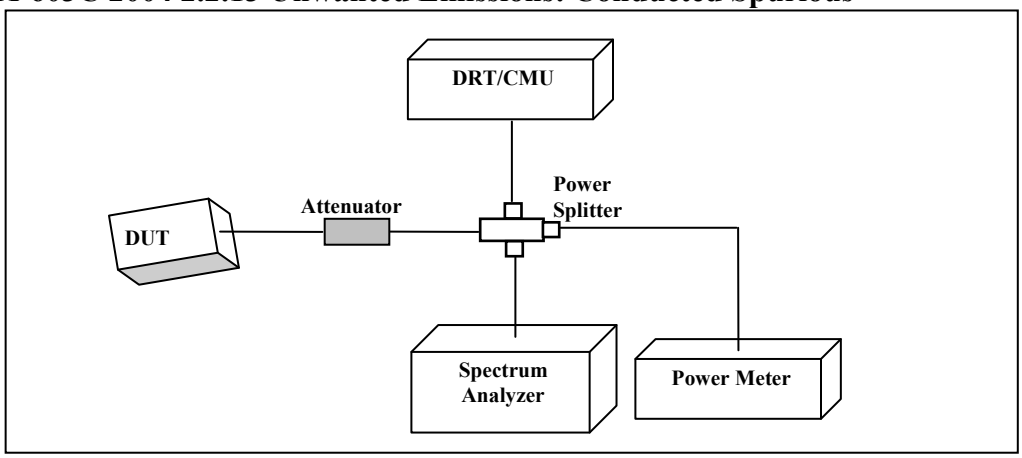
For operations in the 1710-1755 MHz, 2110-2155 MHz, 2000-2020 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 log10 (P) dB

6.4.3.4 RSS-132 Section 5.5.1.1, RSS-133 Section 6.5. and RSS-139 Section 6.5.

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 1.0 MHz, the power of emissions shall be attenuated below the transmitter output power by at least $43 + 10 \log_{10}(P)$, dB, in any MHz of bandwidth.

6.4.4 Conducted Out of band Emissions measurement procedure

Ref: TIA-603C 2004 2.2.13 Unwanted Emissions: Conducted Spurious



1. Connect the equipment as shown in the above diagram.
2. Set the spectrum analyzer to measure peak hold with the required settings.
3. Set the signal generator to a known output power and record the path loss in dB (**LOSS)** for frequencies up to the tenth harmonic of the EUT's carrier frequency.
   LOSS = Generator Output Power (dBm) – Analyzer reading (dBm).
4. Replace the signal generator with the EUT.
5. Adjust the settings of the Digital Radio Communication Tester (DRT) to set the EUT to its maximum power at the required channel.
6. Set the spectrum analyzer to measure peak hold with the required settings (see below). Offset the spectrum analyzer reference level by the path loss measured above.
7. Measure and record all spurious emissions up to the tenth harmonic of the carrier frequency.
8. Measurements are to be performed with the EUT set to the low, middle and high channel of each frequency band.

6.4.4.1 Measurement settings:

Conducted spurious emissions:
RBW/VBW=1MHz; Span=to cover 10th harmonic; Detector: Peak- Max Hold.
Band edge emissions:
RBW/VBW=1% of Emission BW; Sweep time= Auto; Detector: Peak – Max Hold
GSM: 1% of EBW ~3kHz
UMTS: 1% of EBW ~ 50kHz

6.4.5 Test Conditions:

Tnom: 22^{o}C; Vnom: 3.8 V

6.4.6 Test Verdict:

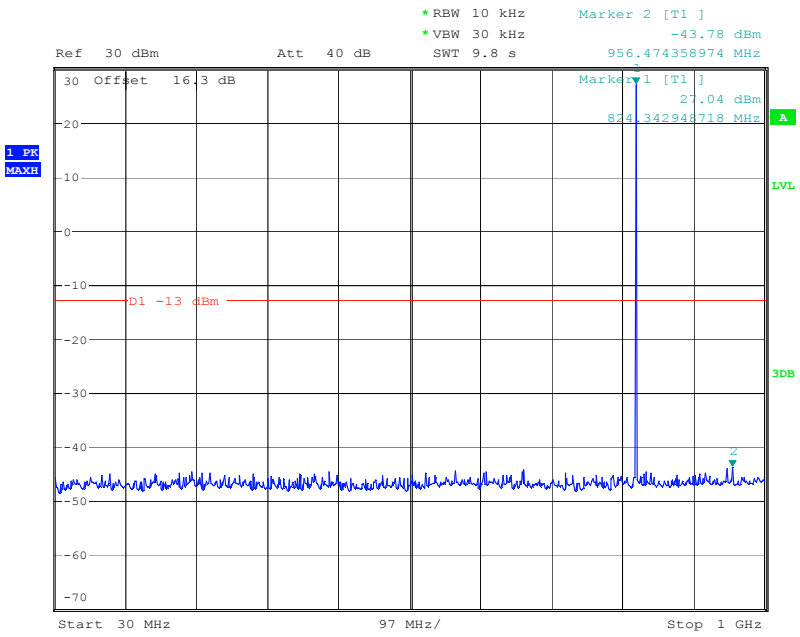
Pass.

6.4.7 Test Results:

No measurable spurious emissions observed which are within 3dB from the limit line.
Emission peaks above the limit line in the plots is from the EUT TCH signal.

6.4.7.1 Plots from conducted spurious measurements:

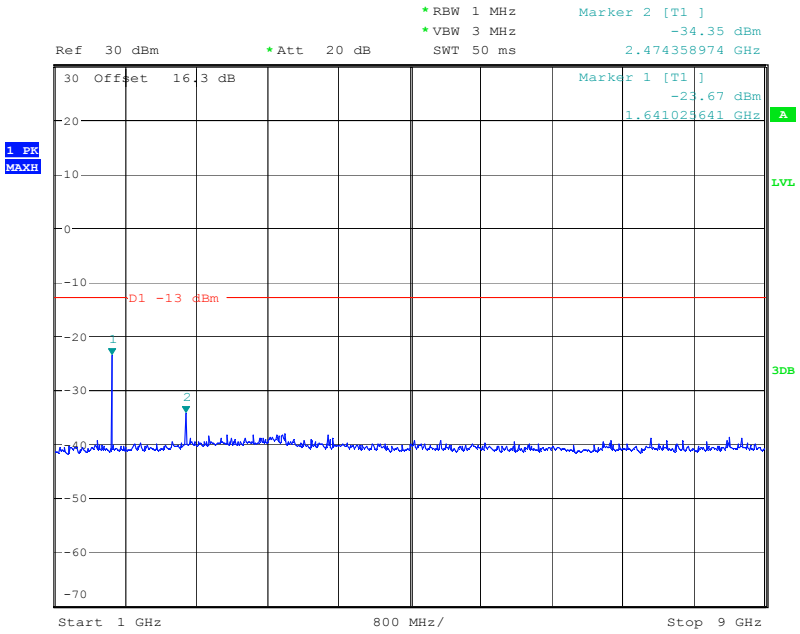
Conducted Out of Band Emission; GSM 850; Channel 128; 30 MHz – 1000 MHz



low

Date: 2.MAY.2013 00:03:19

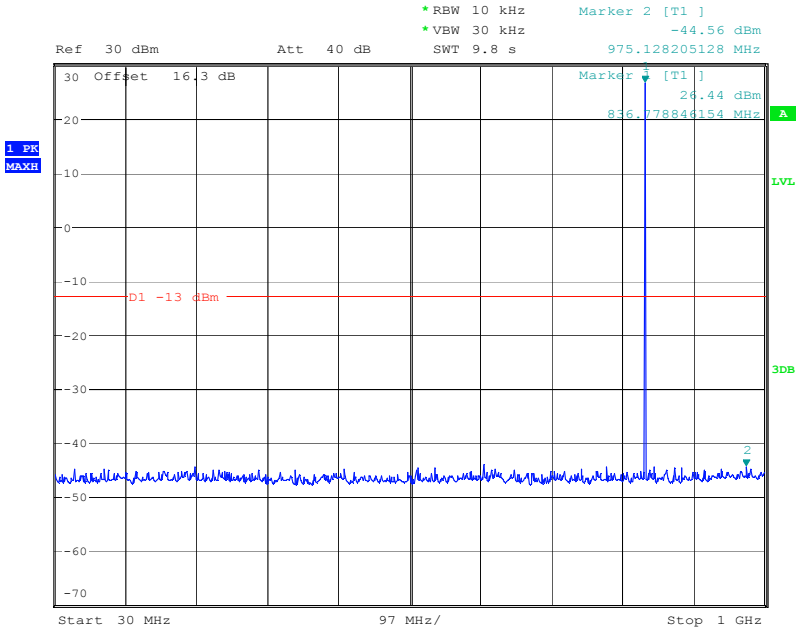
Conducted Out of Band Emission; GSM 850; Channel 128; 1 GHz – 9 GHz



low

Date: 2.MAY.2013 00:01:15

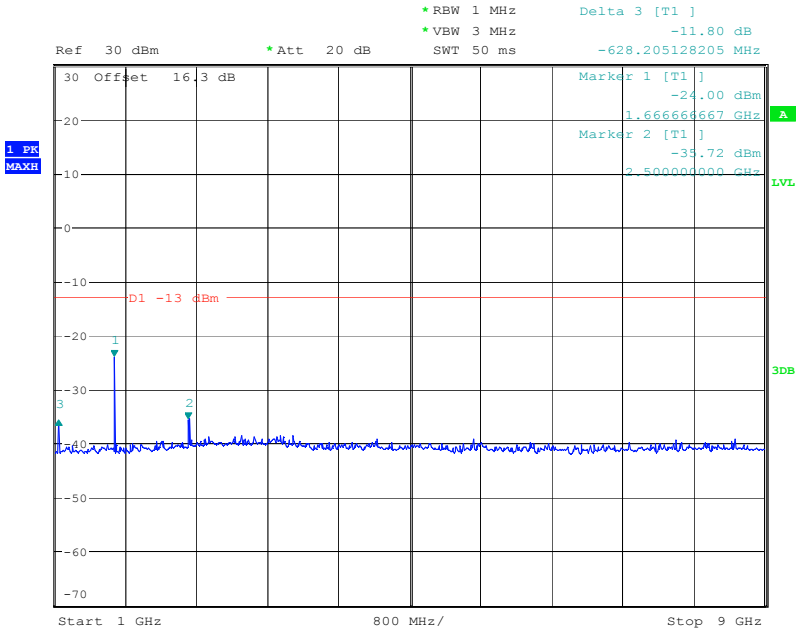
Conducted Out of Band Emission; GSM 850; Channel 190; 30 MHz – 1000 MHz



low

Date: 2.MAY.2013 00:05:26

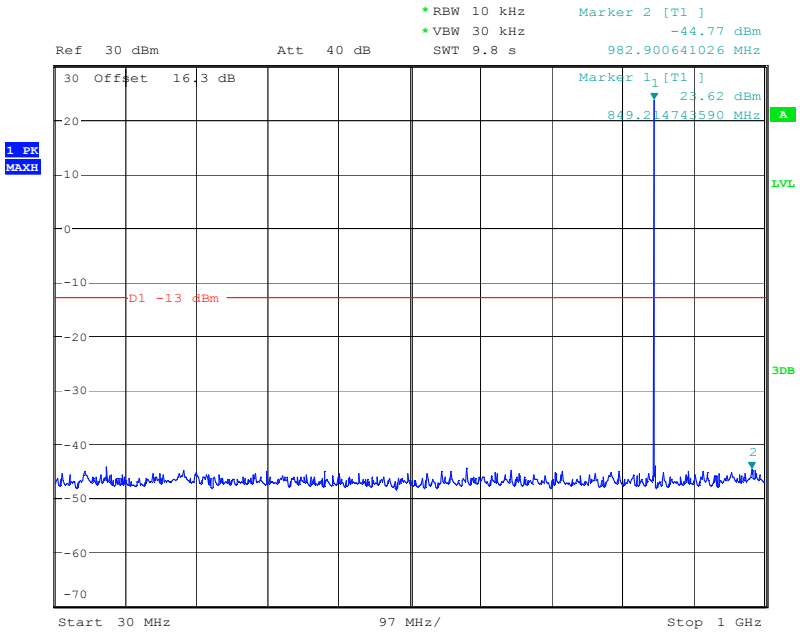
Conducted Out of Band Emission; GSM 850; Channel 190; 1 GHz – 9 GHz



low

Date: 1.MAY.2013 23:59:57

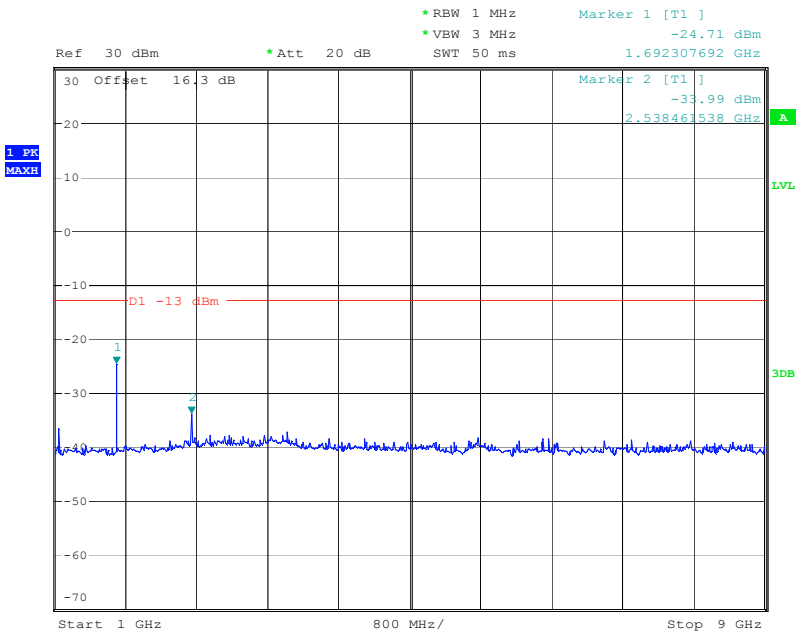
Conducted Out of Band Emission; GSM 850; Channel 251; 30 MHz – 1000 MHz



low

Date: 2.MAY.2013 00:06:43

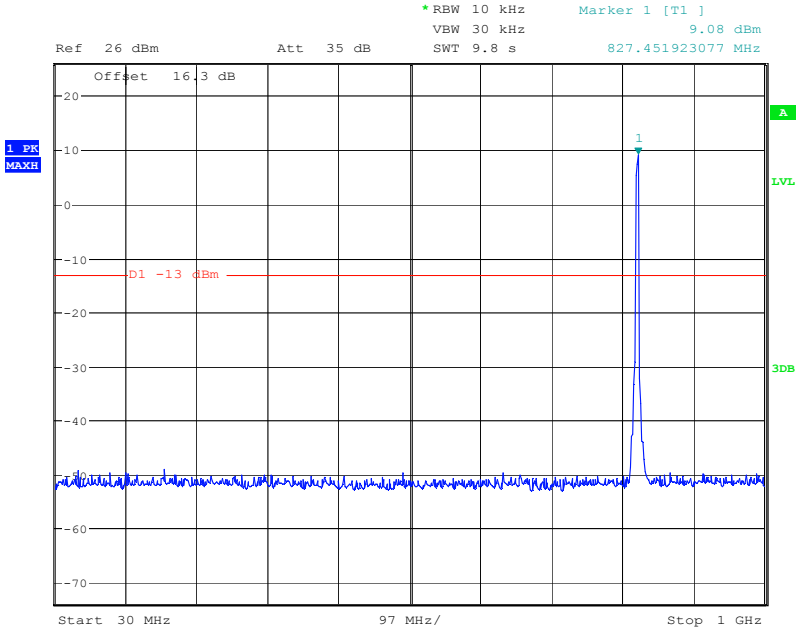
Conducted Out of Band Emission; GSM 850; Channel 251; 1 GHz – 9 GHz



low

Date: 1.MAY.2013 23:58:45

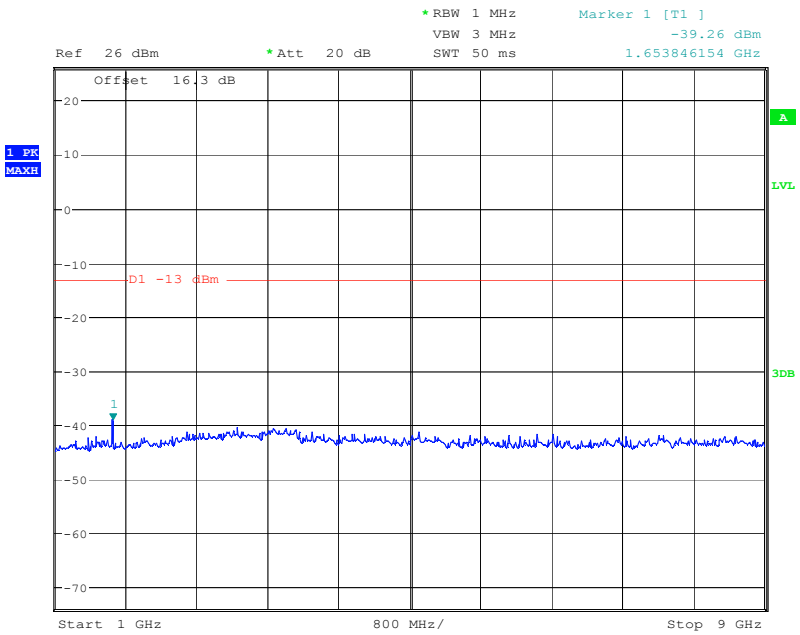
Conducted Out of Band Emission; UMTS FDD V; Channel 4132; 30 MHz – 1000 MHz



low

Date: 1.MAY.2013 19:14:40

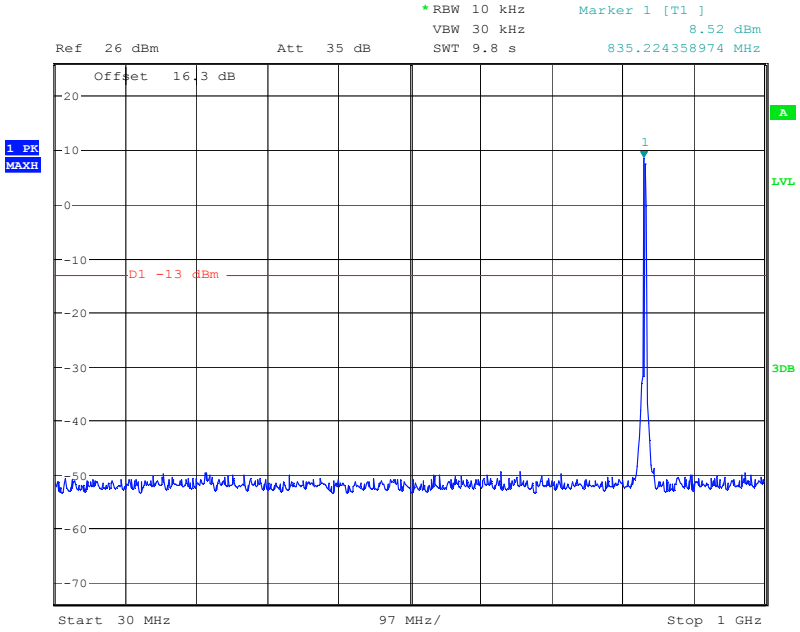
Conducted Out of Band Emission; UMTS FDD V; Channel 4132; 1 GHz – 9 GHz



low

Date: 1.MAY.2013 19:19:39

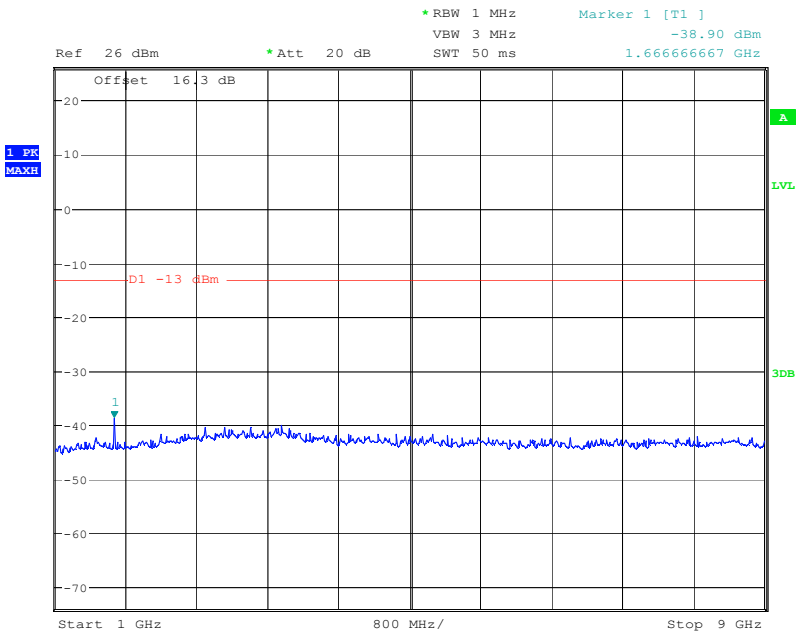
Conducted Out of Band Emission; UMTS FDD V; Channel 4183; 30 MHz – 1000 MHz



low

Date: 1.MAY.2013 19:16:46

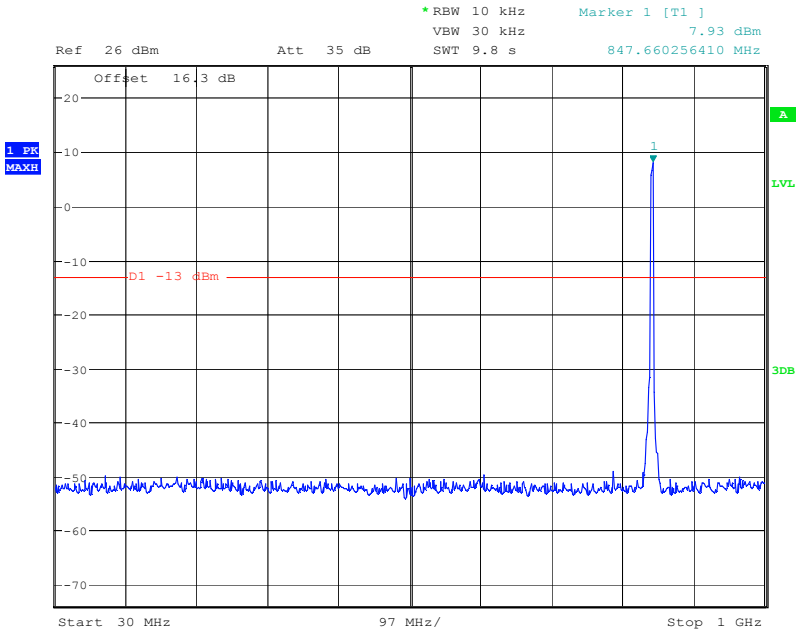
Conducted Out of Band Emission; UMTS FDD V; Channel 4183; 1 GHz – 9 GHz



low

Date: 1.MAY.2013 19:20:42

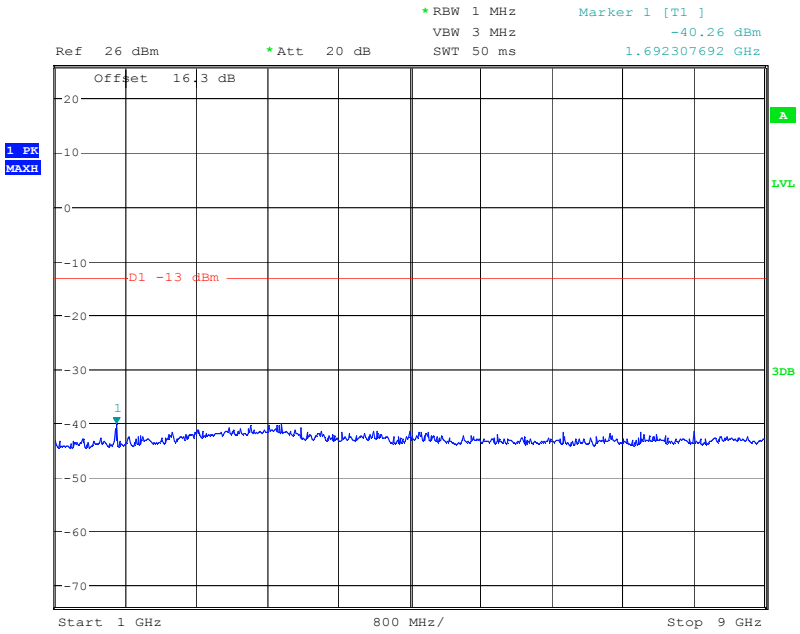
Conducted Out of Band Emission; UMTS FDD V; Channel 4233; 30 MHz – 1000 MHz



low

Date: 1.MAY.2013 19:17:46

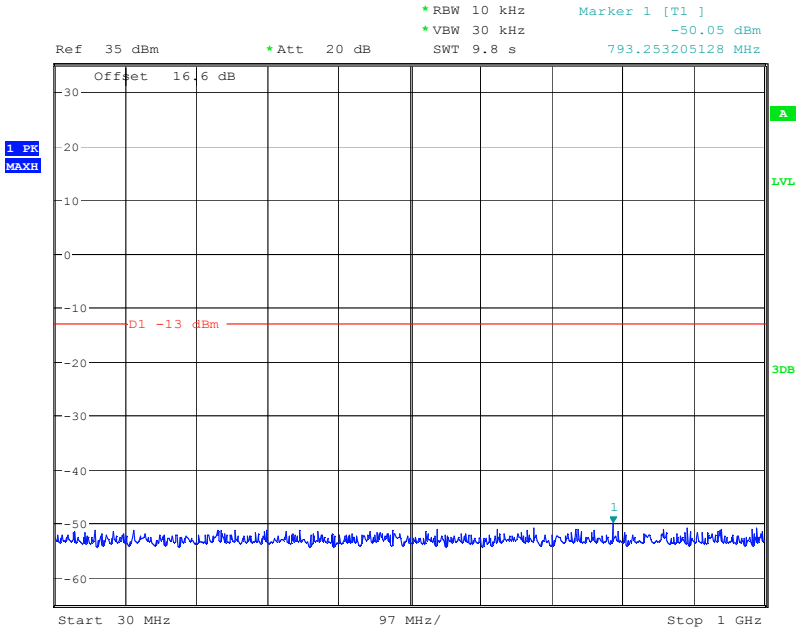
Conducted Out of Band Emission; UMTS FDD V; Channel 4233; 1 GHz – 9 GHz



low

Date: 1.MAY.2013 19:22:00

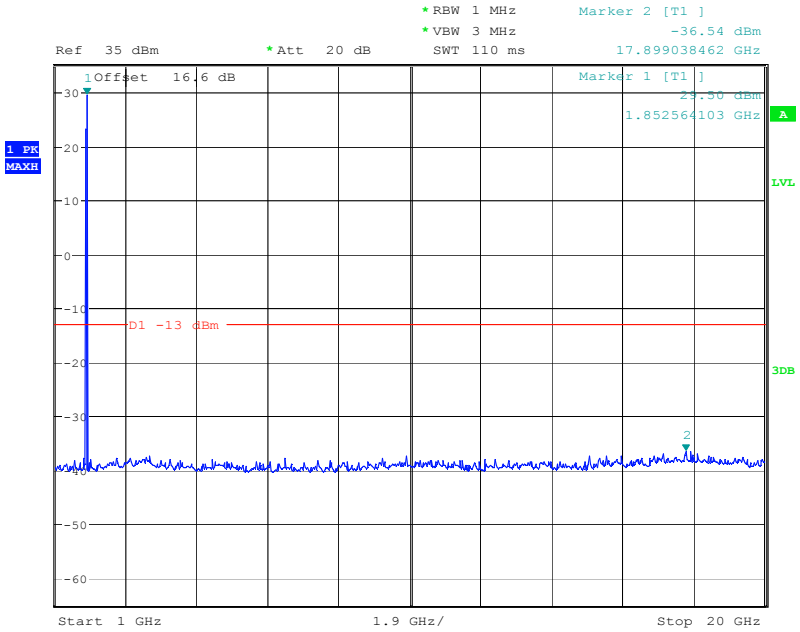
Conducted Out of Band Emission; GSM 1900; Channel 512; 30 MHz – 1000 MHz



low

Date: 1.MAY.2013 22:02:38

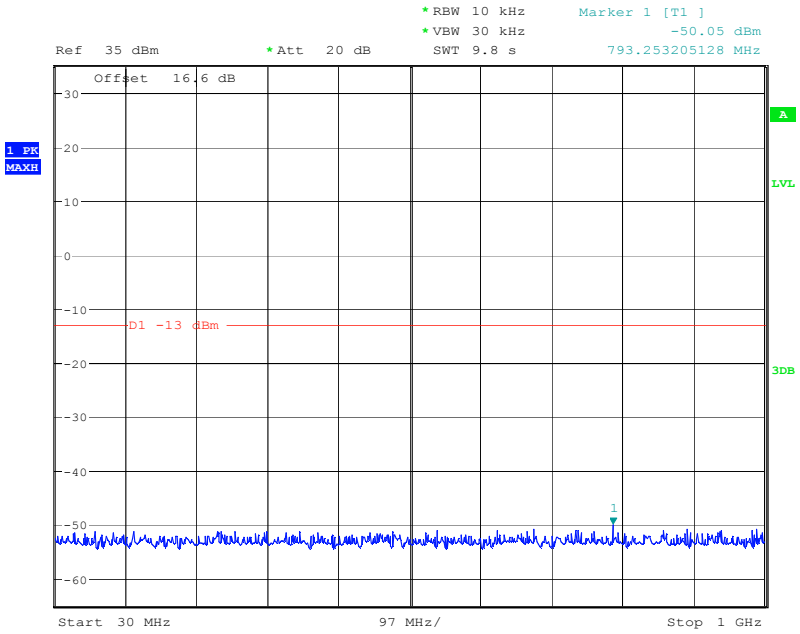
Conducted Out of Band Emission; GSM 1900; Channel 512; 1 GHz – 20 GHz



low

Date: 1.MAY.2013 22:09:11

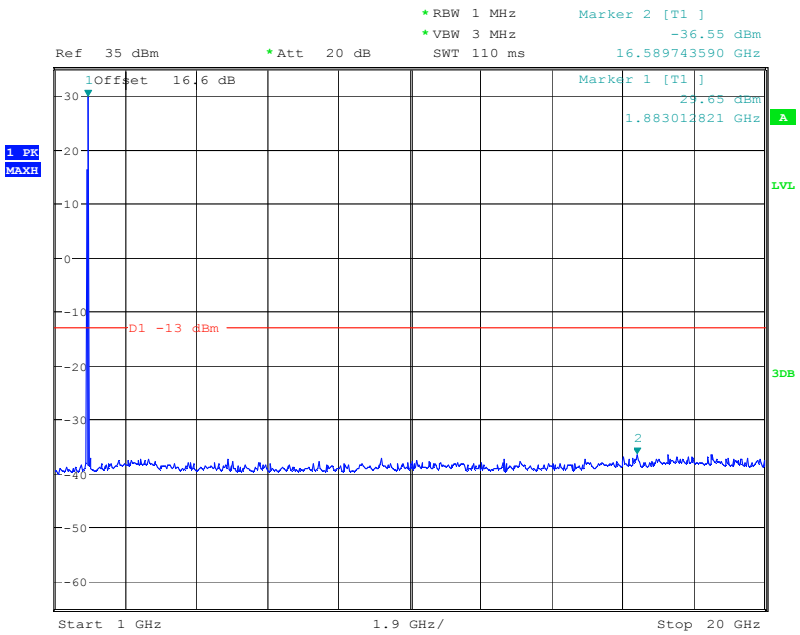
Conducted Out of Band Emission; GSM 1900; Channel 661; 30 MHz – 1000 MHz



low

Date: 1.MAY.2013 22:02:38

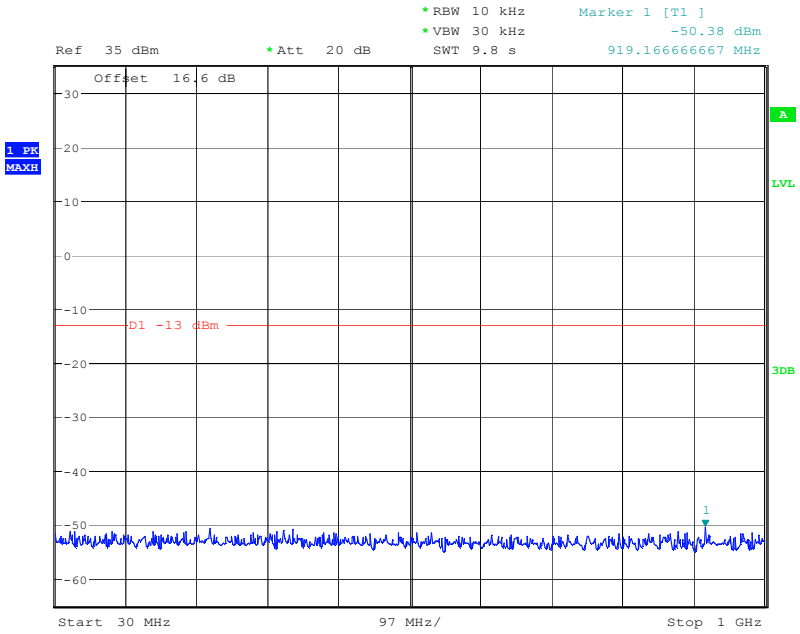
Conducted Out of Band Emission; GSM 1900; Channel 661; 1 GHz – 20 GHz



low

Date: 1.MAY.2013 22:08:38

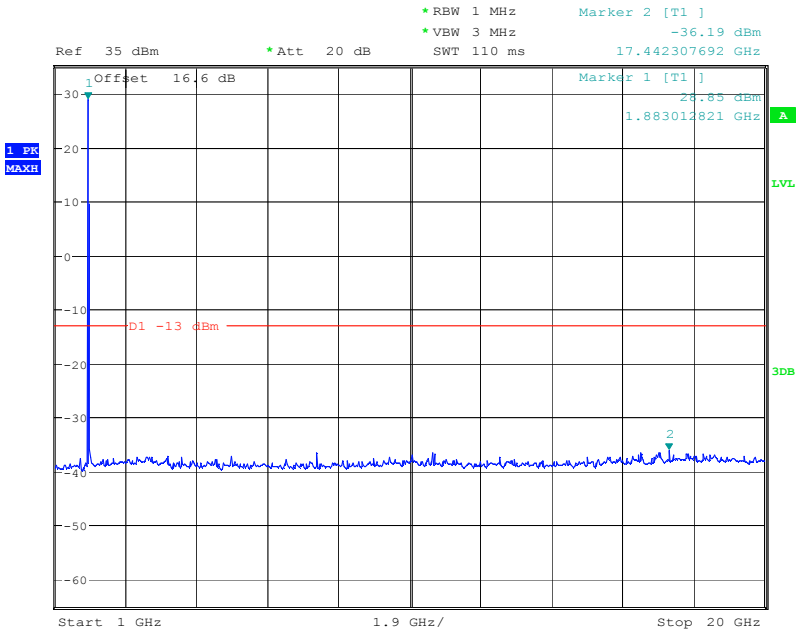
Conducted Out of Band Emission; GSM 1900; Channel 810; 30 MHz – 1000 MHz



low

Date: 1.MAY.2013 22:05:09

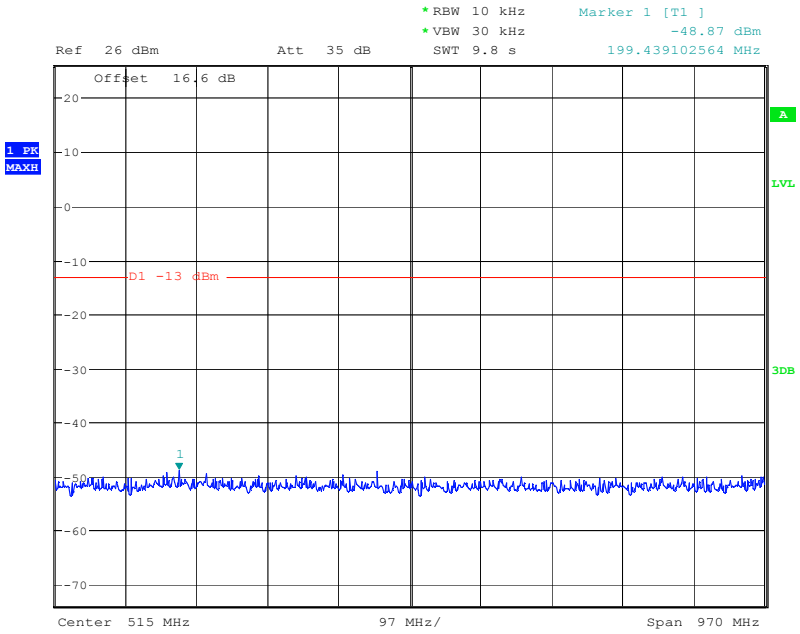
Conducted Out of Band Emission; GSM 1900; Channel 810; 1 GHz – 20 GHz



low

Date: 1.MAY.2013 22:06:47

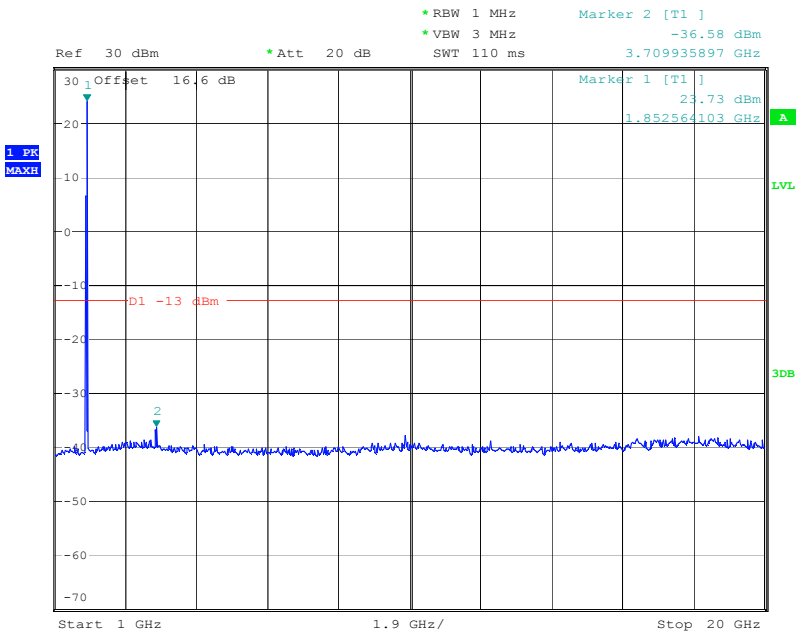
Conducted Out of Band Emission; UMTS FDD II; Channel 9262; 30 MHz – 1000 MHz



low

Date: 1.MAY.2013 20:24:55

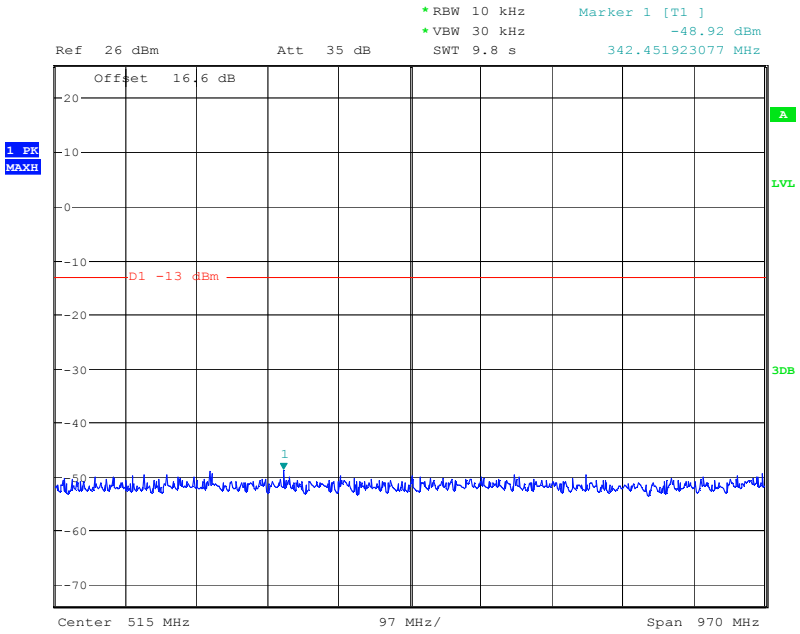
Conducted Out of Band Emission; UMTS FDD II; Channel 9262; 1 GHz – 20 GHz



low

Date: 1.MAY.2013 21:41:42

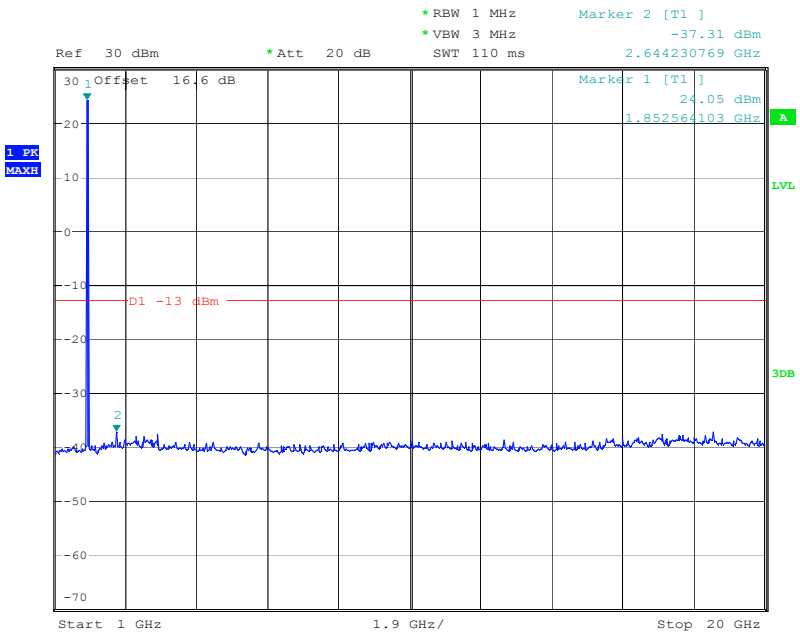
Conducted Out of Band Emission; UMTS FDD II; Channel 9400; 30 MHz – 1000 MHz



low

Date: 1.MAY.2013 20:19:17

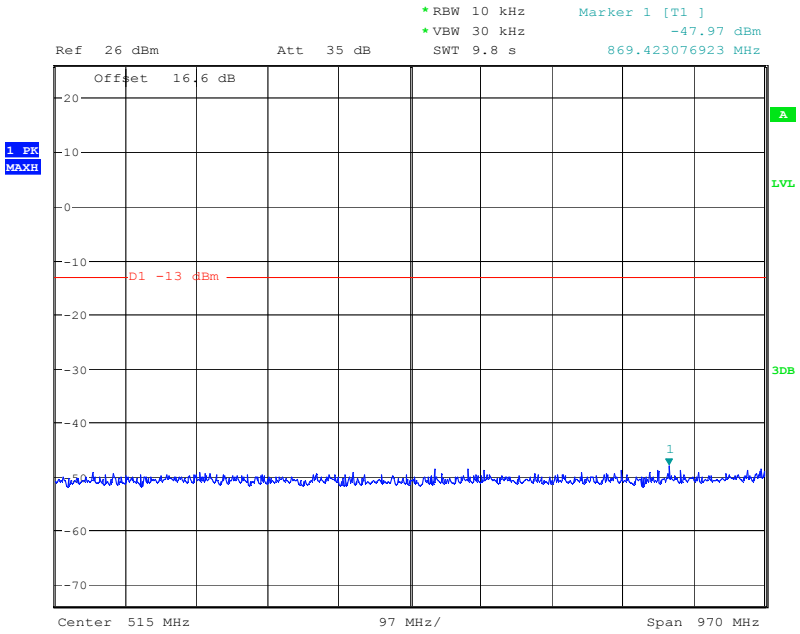
Conducted Out of Band Emission; UMTS FDD II; Channel 9400; 1 GHz – 20 GHz



low

Date: 1.MAY.2013 21:40:51

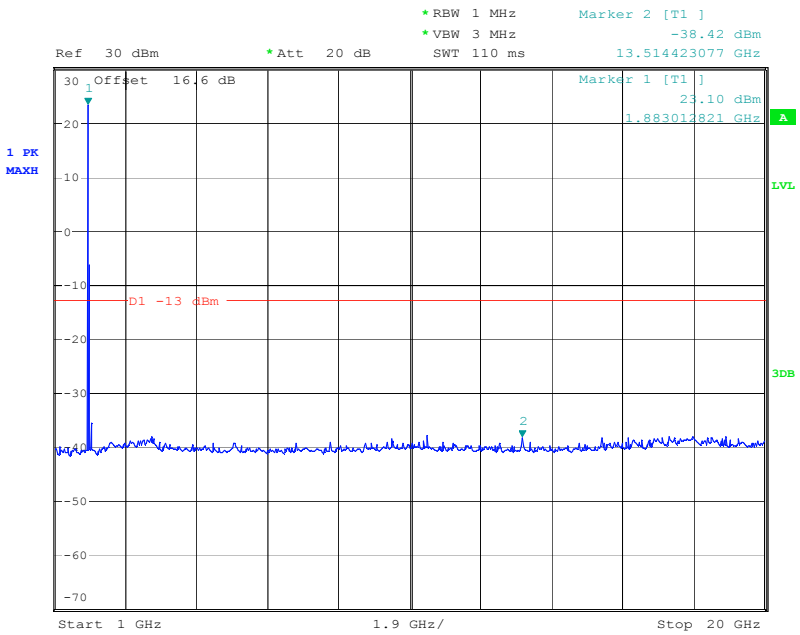
Conducted Out of Band Emission; UMTS FDD II; Channel 9538; 30 MHz – 1000 MHz



low

Date: 1.MAY.2013 20:23:19

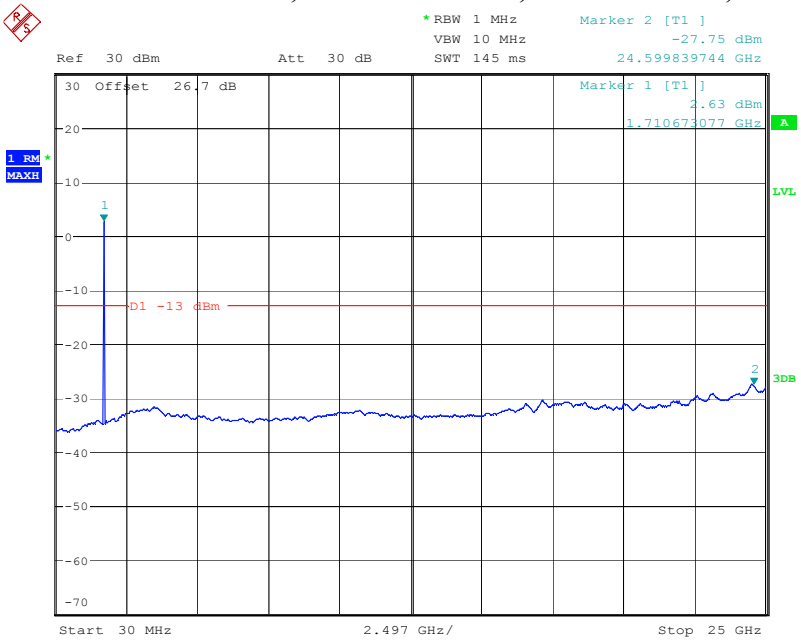
Conducted Out of Band Emission; UMTS FDD II; Channel 9538; 1 GHz – 20 GHz



low

Date: 1.MAY.2013 20:31:43

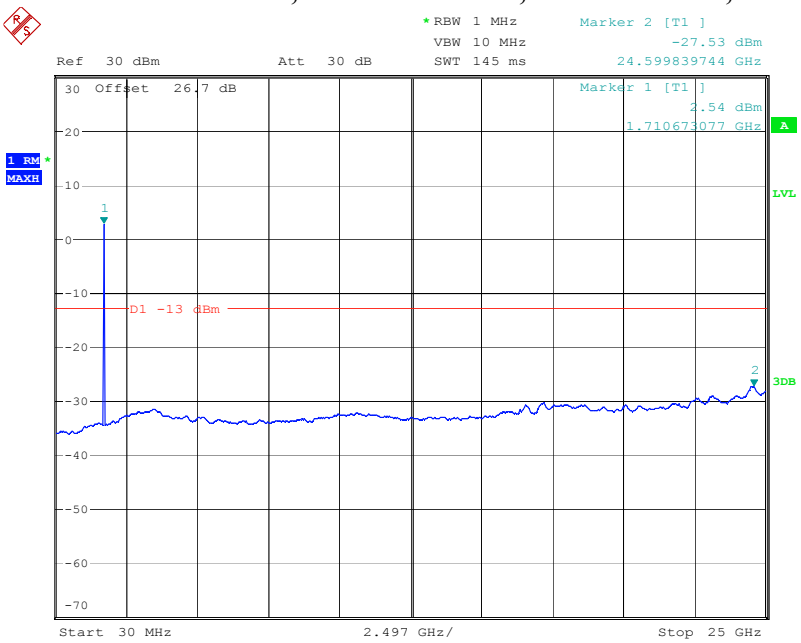
Conducted Out of Band Emission; UMTS FDD IV; Channel 1312; 30 MHz – 25 GHz



low

Date: 1.JUL.2013 19:03:29

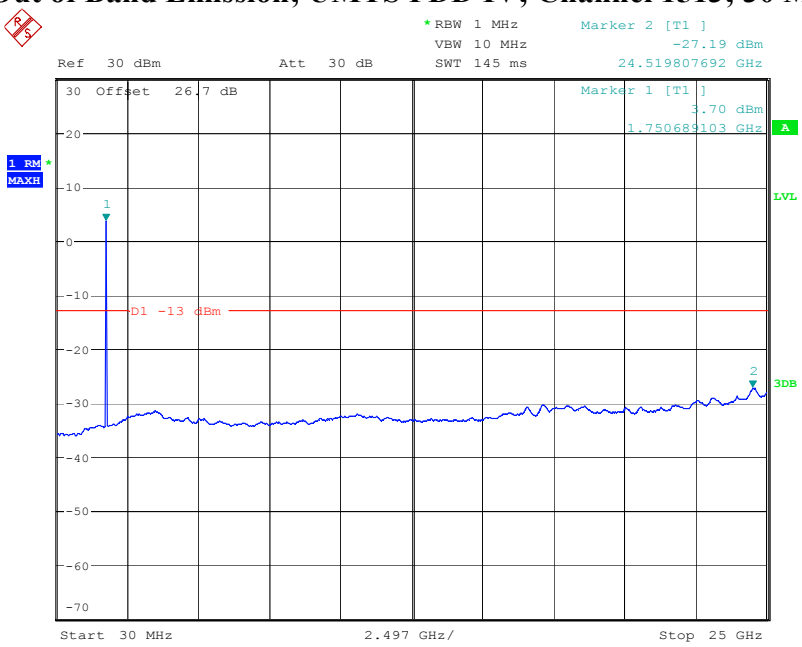
Conducted Out of Band Emission; UMTS FDD IV; Channel 1413; 30 MHz – 25 GHz



low

Date: 1.JUL.2013 19:02:55

Conducted Out of Band Emission; UMTS FDD IV; Channel 1513; 30 MHz – 25 GHz

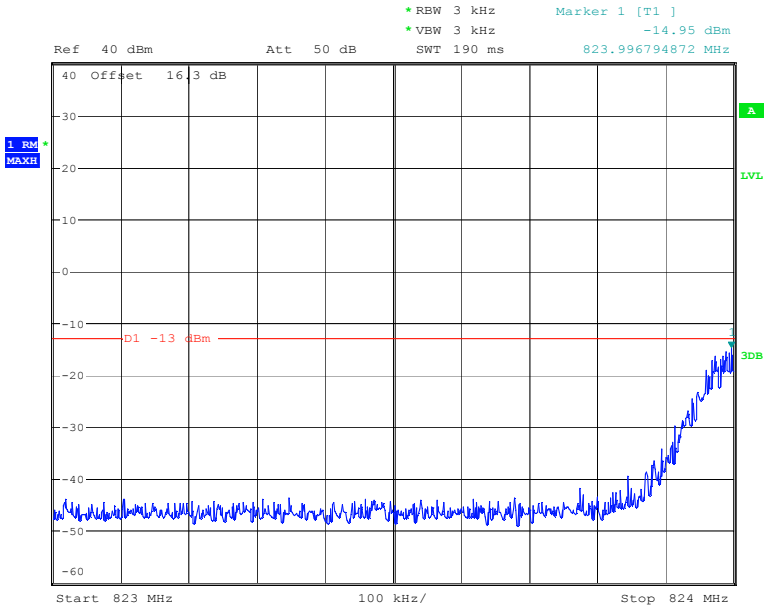


low

Date: 1.JUL.2013 19:02:27

6.4.7.2 Plots from band edge measurement:

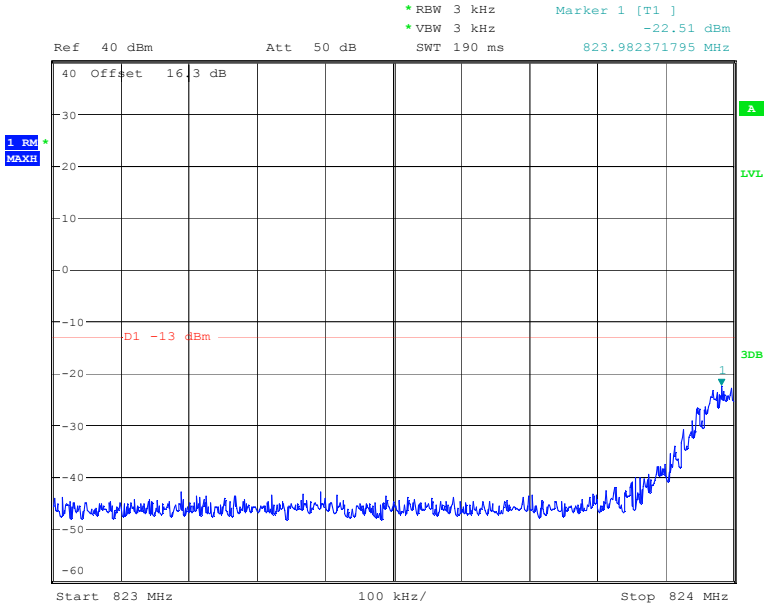
Conducted Band Edge; GSM 850; Channel 128; GMSK



low

Date: 2.MAY.2013 01:10:41

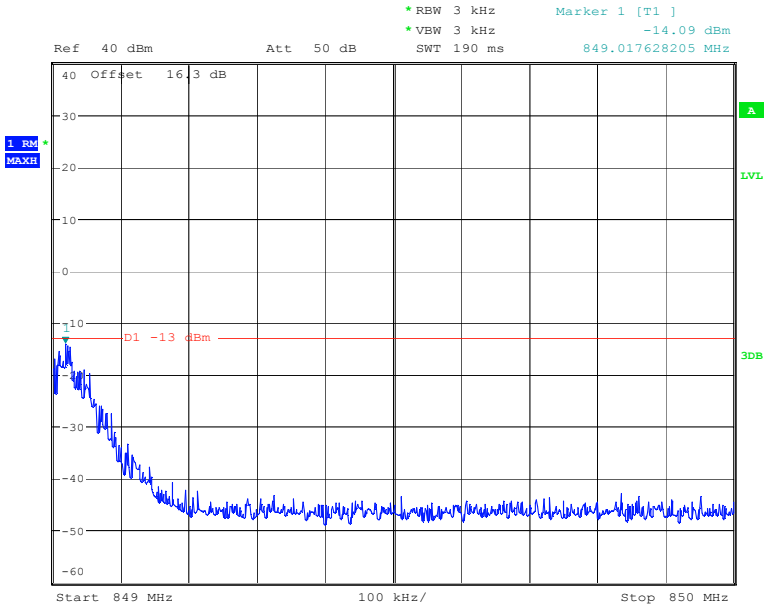
Conducted Band Edge; GSM 850; Channel 128; 8PSK



low

Date: 2.MAY.2013 01:16:11

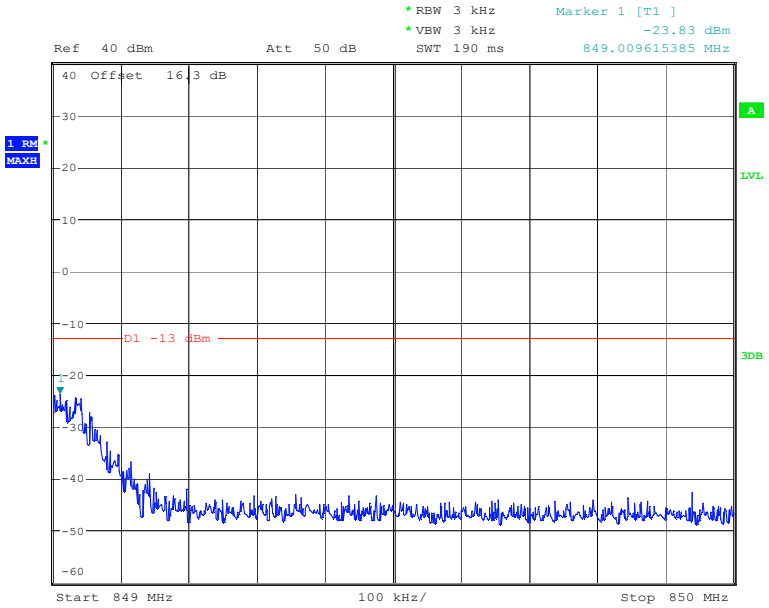
Conducted Band Edge; GSM 850; Channel 251; GMSK



low

Date: 2.MAY.2013 01:11:23

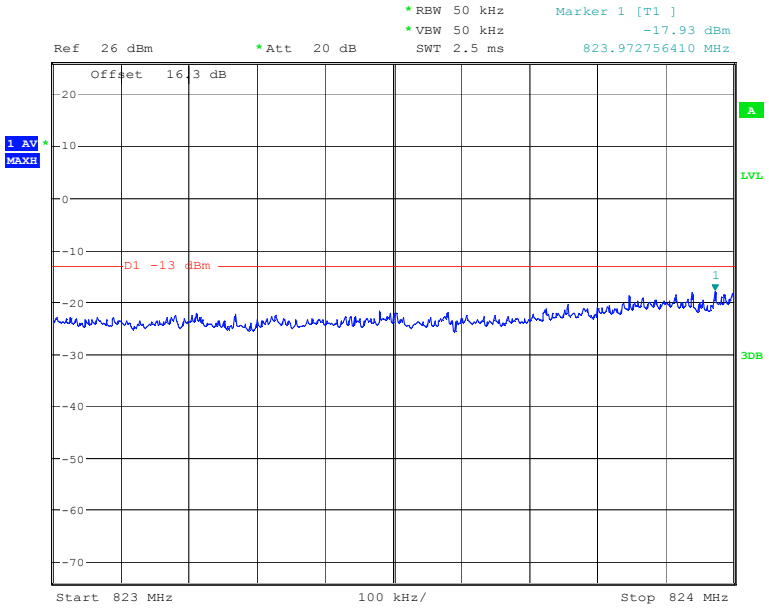
Conducted Band Edge; GSM 850; Channel 251; 8PSK



low

Date: 2.MAY.2013 01:15:33

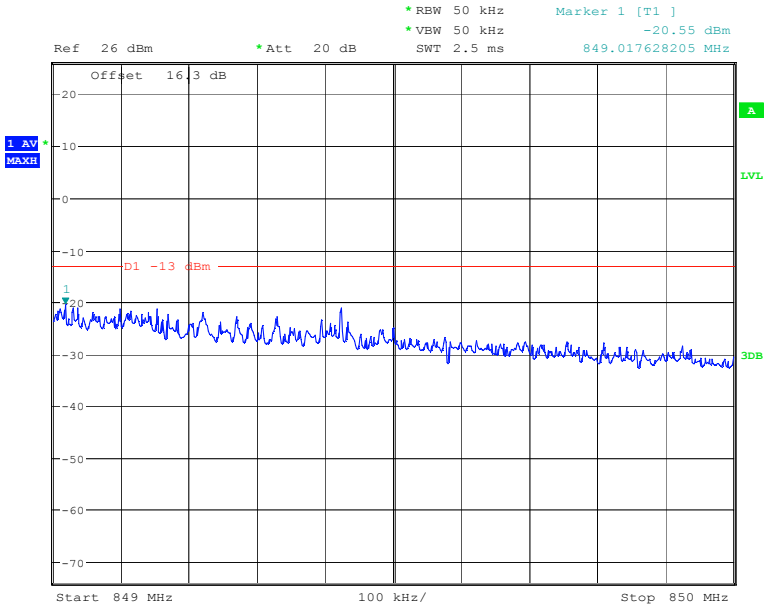
Conducted Band Edge; UMTS FDD V; Channel 4132



low

Date: 1.MAY.2013 19:37:17

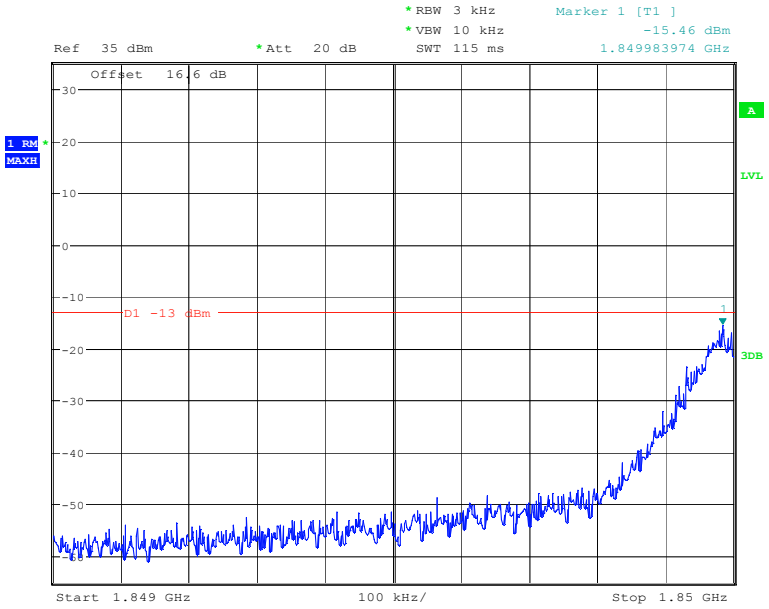
Conducted Band Edge; UMTS FDD V; Channel 4233



low

Date: 1.MAY.2013 19:39:25

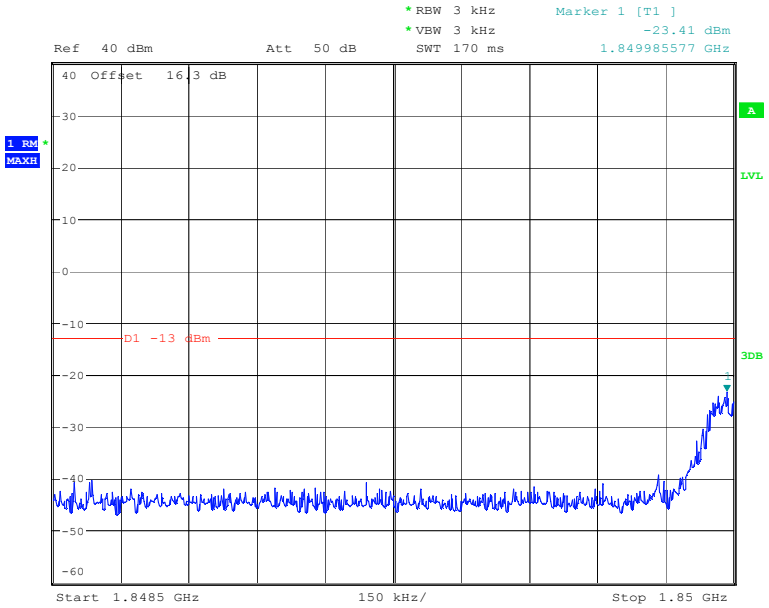
Conducted Band Edge; GSM 1900; Channel 512; GMSK



low

Date: 1.MAY.2013 23:12:57

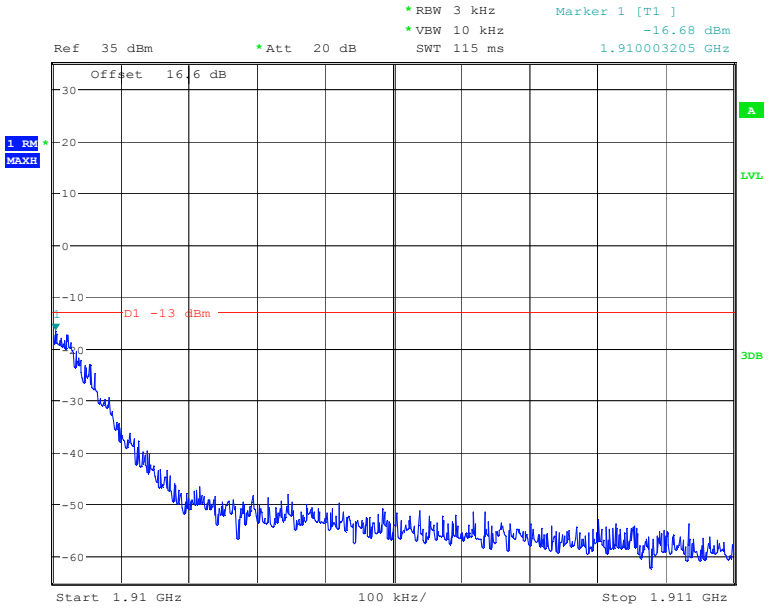
Conducted Band Edge; GSM 1900; Channel 512; 8PSK



low

Date: 2.MAY.2013 01:18:56

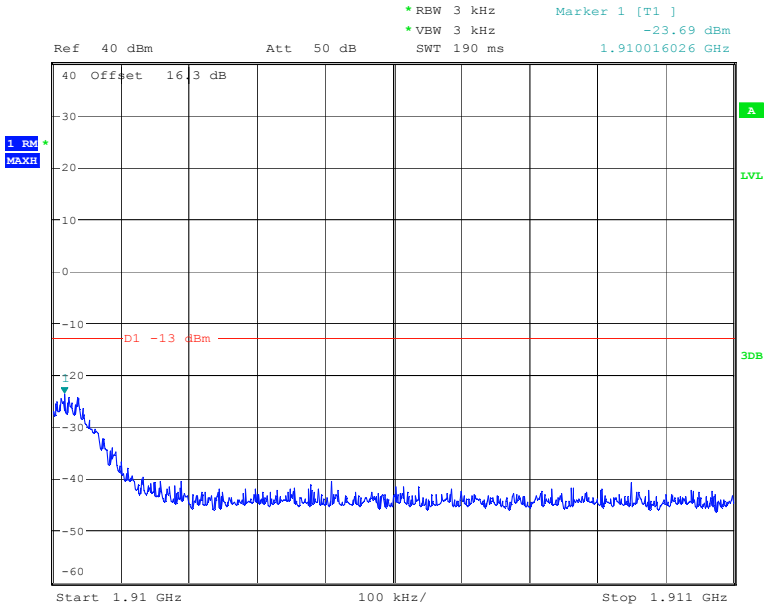
Conducted Band Edge; GSM 1900; Channel 810; GMSK



low

Date: 1.MAY.2013 23:14:04

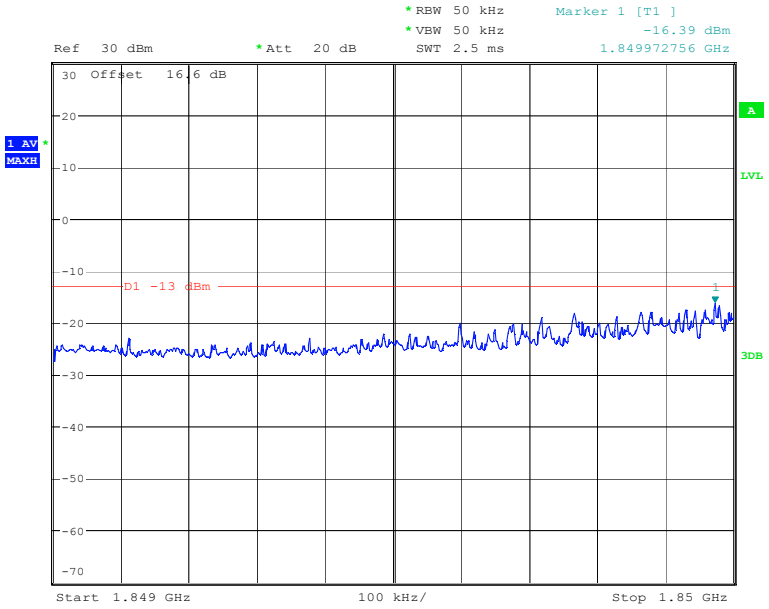
Conducted Band Edge; GSM 1900; Channel 810; 8PSK



low

Date: 2.MAY.2013 01:19:52

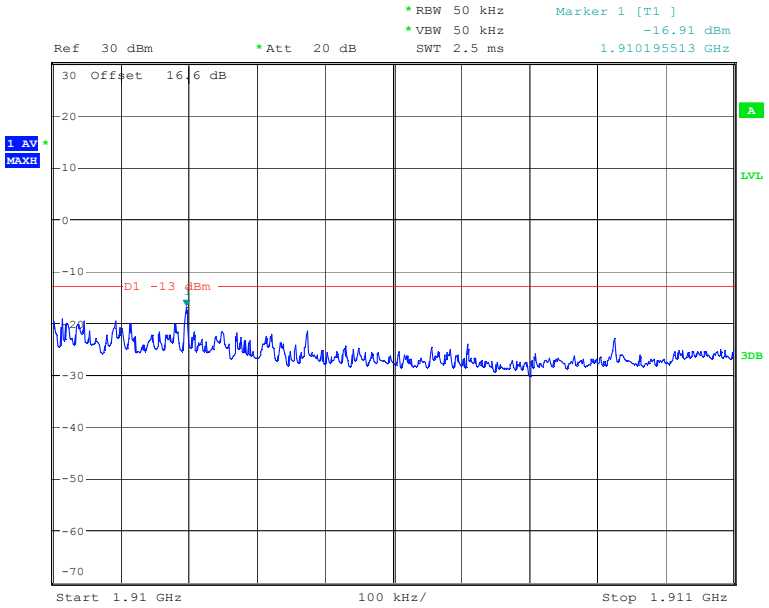
Conducted Band Edge; UMTS FDD II; Channel 9262



low

Date: 1.MAY.2013 21:50:11

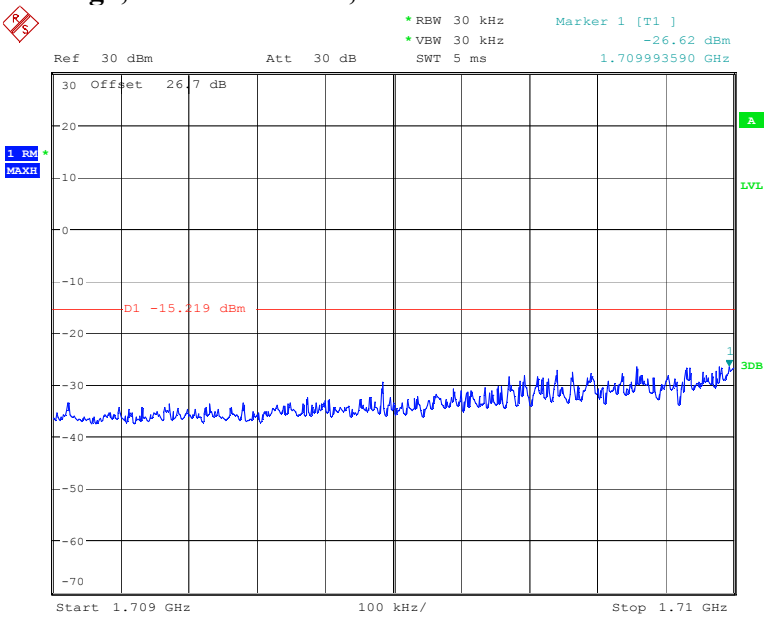
Conducted Band Edge; UMTS FDD II; Channel 9538



low

Date: 1.MAY.2013 21:51:12

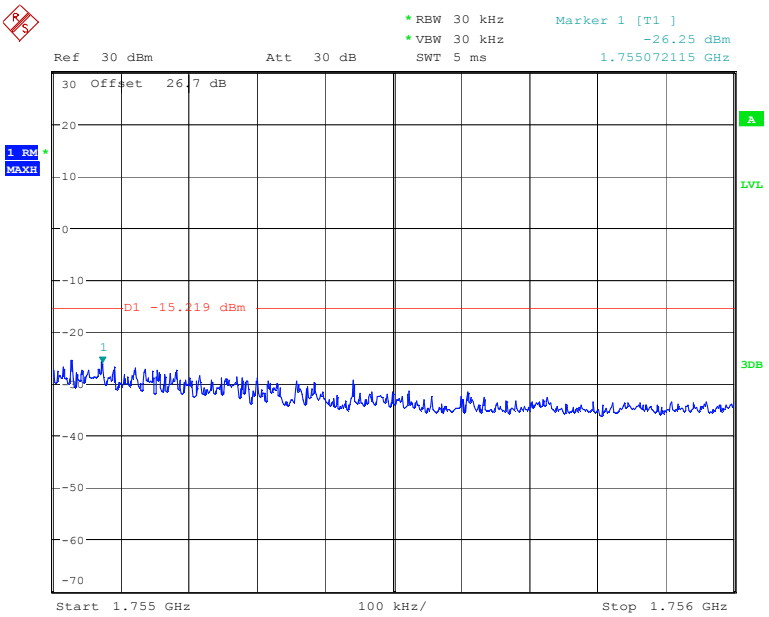
Conducted Band Edge; UMTS FDD IV; Channel 1312



low

Date: 1.JUL.2013 18:50:13

Conducted Band Edge; UMTS FDD IV; Channel 1513



low

Date: 1.JUL.2013 18:48:34

6.5 Spurious Emissions Radiated

6.5.1 References

FCC: CFR Part 2.1053, CFR Part 22.917, CFR Part 24.238, CFR 27.53
IC: RSS-Gen Section 4.9; RSS 132 Section 5.5; RSS 133 Section 6.5, RSS 139 Section 6.5

6.5.2 Measurement requirements:

6.5.2.1 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.

6.5.2.2 RSS-Gen 4.9: Transmitter unwanted spurious emissions

The same parameter, peak power or average power, used for the transmitter output power measurement shall be used for unwanted emission measurements.
The search for unwanted emissions shall be from the lowest frequency internally generated or used in the device (local oscillator, intermediate or carrier frequency), or from 30 MHz, whichever is the lower, to the 5th harmonic of the highest frequency generated without exceeding 40 GHz.

6.5.3 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.

6.5.3.1 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.

6.5.3.2 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.

6.5.3.3 FCC 27.53 Emission Limits for Miscellaneous Wireless Communication

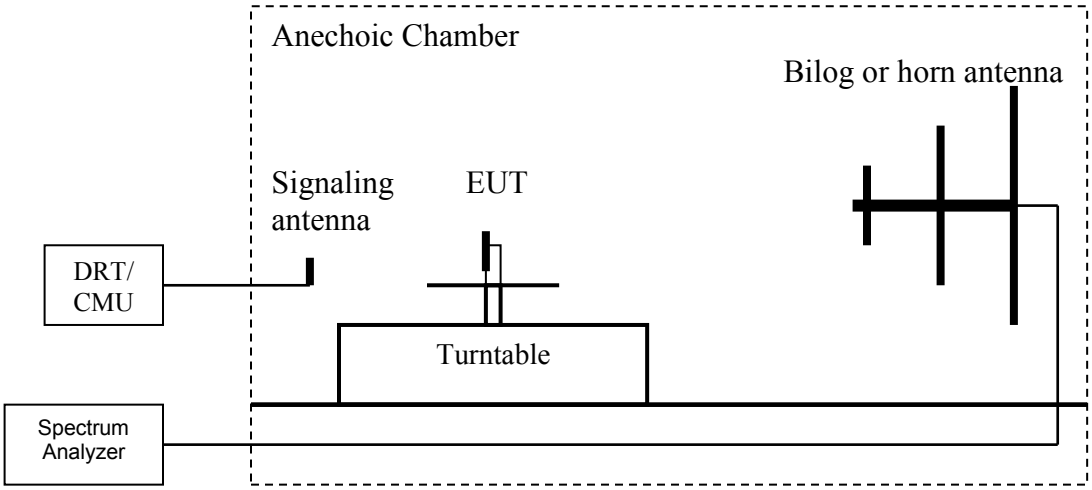
For operations in the 1710-1755 MHz, 2110-2155 MHz, 2000-2020 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 log10 (P) dB

6.5.3.4 RSS-132 Section 5.5, RSS-133 Section 6.5 and RSS-139 Section 6.5

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.

6.5.4 Radiated out of band measurement procedure:

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



1. Connect the equipment as shown in the above diagram with the EUT's antenna in a horizontal orientation.
2. Adjust the settings of the Digital RadioCommunication Tester (DRT) to set the EUT to its maximum power at the required channel.
3. Set the spectrum analyzer to measure peak hold with the required settings.
4. 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.
5. 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.
6. 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).
7. Determine the level of spurious emissions using the following equation: **Spurious** (dBm) = **LVL** (dBm) + **LOSS** (dB):
8. Repeat steps 4, 5 and 6 with all antennas vertically polarized.
9. Determine the level of spurious emissions using the following equation: **Spurious** (dBm) = **LVL** (dBm) + **LOSS** (dB):
10. 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.)

Spectrum analyzer settings: RBW=VBW=1MHz

6.5.5 Sample Calculations for Radiated Measurements

6.5.5.1 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)
Eg:

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

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 30MHz 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 & 1900 bands. 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 850 & 1900 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.

All measurements are done in horizontal and vertical antenna polarization; and on three orientations of the EUT. The plots show the worst case where it is not indicated otherwise. Unless mentioned otherwise, the peaks in the plots are from the carrier frequency.

6.5.6 Test Conditions:

Tnom: 22°C; Vnom: 3.8 V

6.5.7 Test Verdict:

Pass.

6.5.8 Test Results:

6.5.8.1 Test Results Transmitter Spurious Emission GSM 850:

Harmonic	Tx ch-1013 Freq. (MHz)	Level (dBm)	Tx ch-384 Freq. (MHz)	Level (dBm)	Tx ch-777 Freq. (MHz)	Level (dBm)
1	824.7	-	836.52	-	848.31	-
2	1649.4	NF	1673.04	NF	1696.62	NF
3	2474.1	NF	2509.56	NF	2544.93	NF
4	3298.8	NF	3346.08	NF	3393.24	NF
5	4123.5	NF	4182.6	NF	4241.55	NF
6	4948.2	NF	5019.12	NF	5089.86	NF
7	5772.9	NF	5855.64	NF	5938.17	NF
8	6597.6	NF	6692.16	NF	6786.48	NF
9	7422.3	NF	7528.68	NF	7634.79	NF
10	8247	NF	8365.2	NF	8483.1	NF
NF = Noise Floor Measurement Uncertainty: ±3dB						

Legend for the plots:

-13dBm.LimitLine
Preview Result
Data Reduction Result
Final Measurement Result

6.5.8.2 Test Results Transmitter Spurious Emission GSM 1900:

Harmonic	Tx ch-25 Freq.(MHz)	Level (dBm)	Tx ch-600 Freq. (MHz)	Level (dBm)	Tx ch-1175 Freq. (MHz)	Level (dBm)
1	**1851.25**	-	**1880.0**	-	**1908.75**	-
2	**3702.5**	NF	**3760**	NF	**3817.5**	NF
3	**5553.75**	NF	**5640**	NF	**5726.25**	NF
4	**7405**	NF	**7520**	NF	**7635**	NF
5	**9256.25**	NF	**9400**	NF	**9543.75**	NF
6	**11107.5**	NF	**11280**	NF	**11452.5**	NF
7	**12958.75**	NF	**13160**	NF	**13361.25**	NF
8	**14810**	NF	**15040**	NF	**15270**	NF
9	**16661.25**	NF	**16920**	NF	**17178.75**	NF
10	**18512.5**	NF	**18800**	NF	**19087.5**	NF
NF = Noise Floor Measurement Uncertainty: ±3dB						

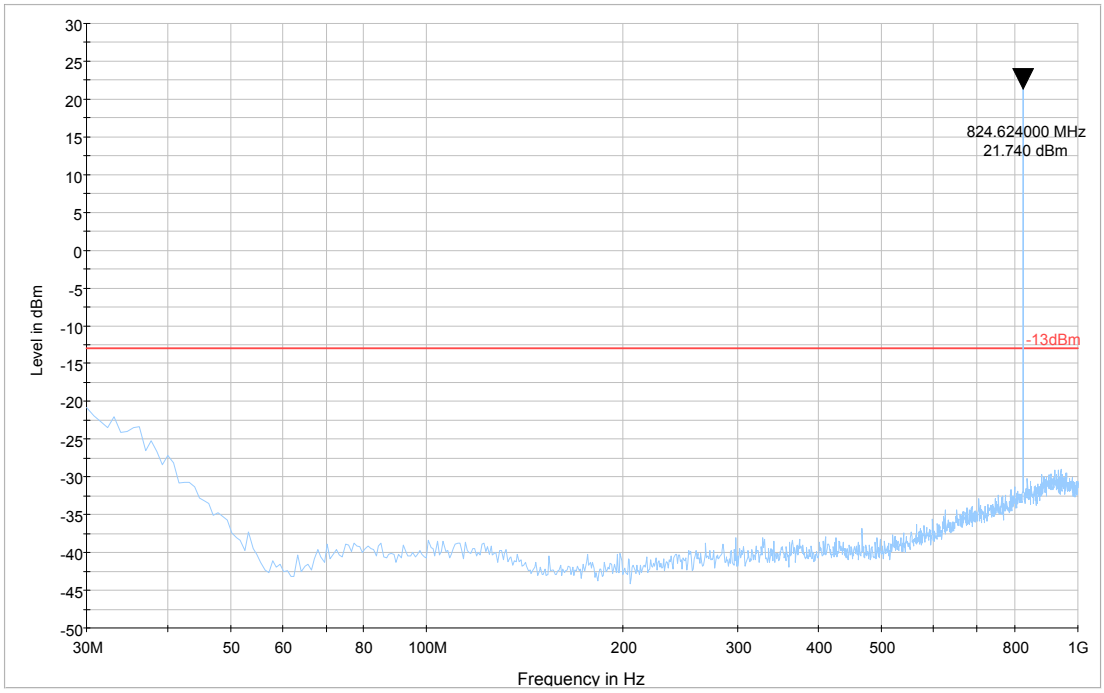
Legend for the plots:

-13dBm.LimitLine
Preview Result
Data Reduction Result
Final Measurement Result

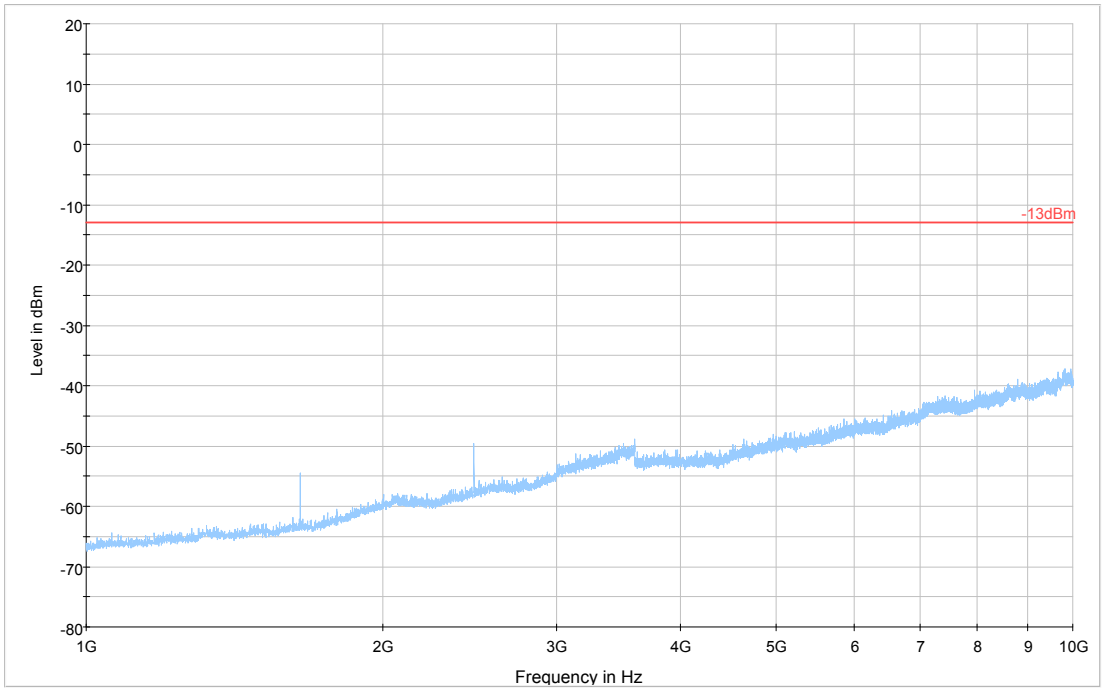
6.5.8.3 Plots:

Radiated Spurious Emissions GSM 850 Tx: Low Channel

30MHz-1GHz

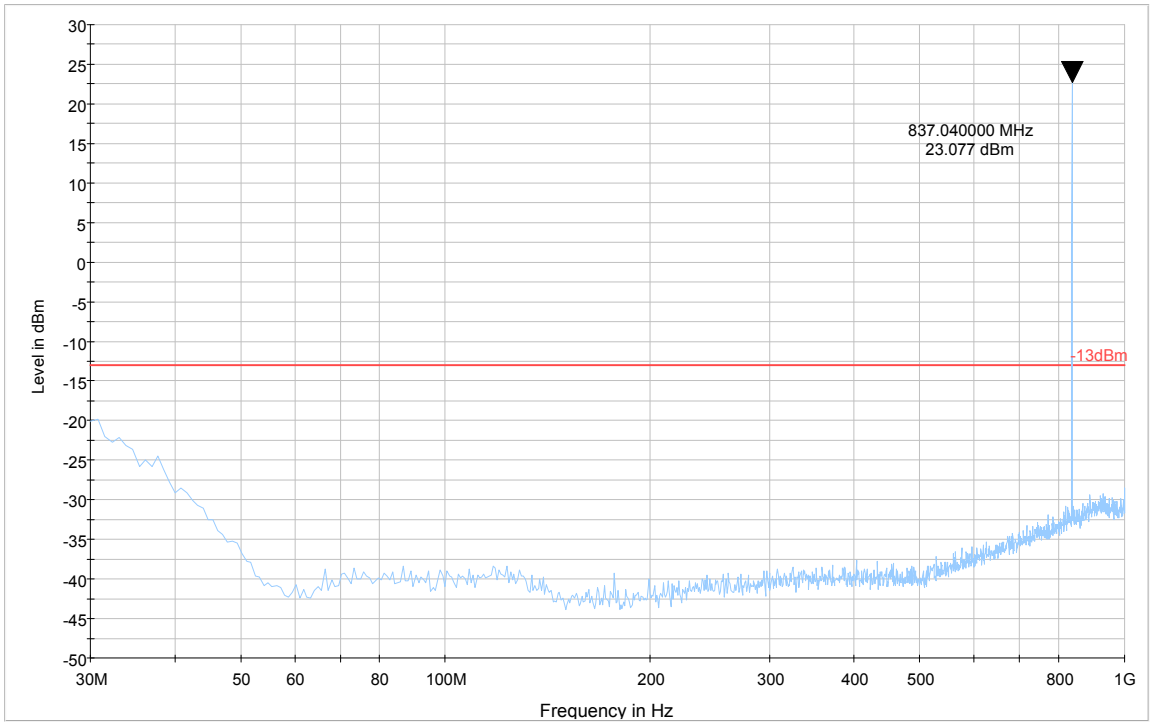


1GHz-10GHz

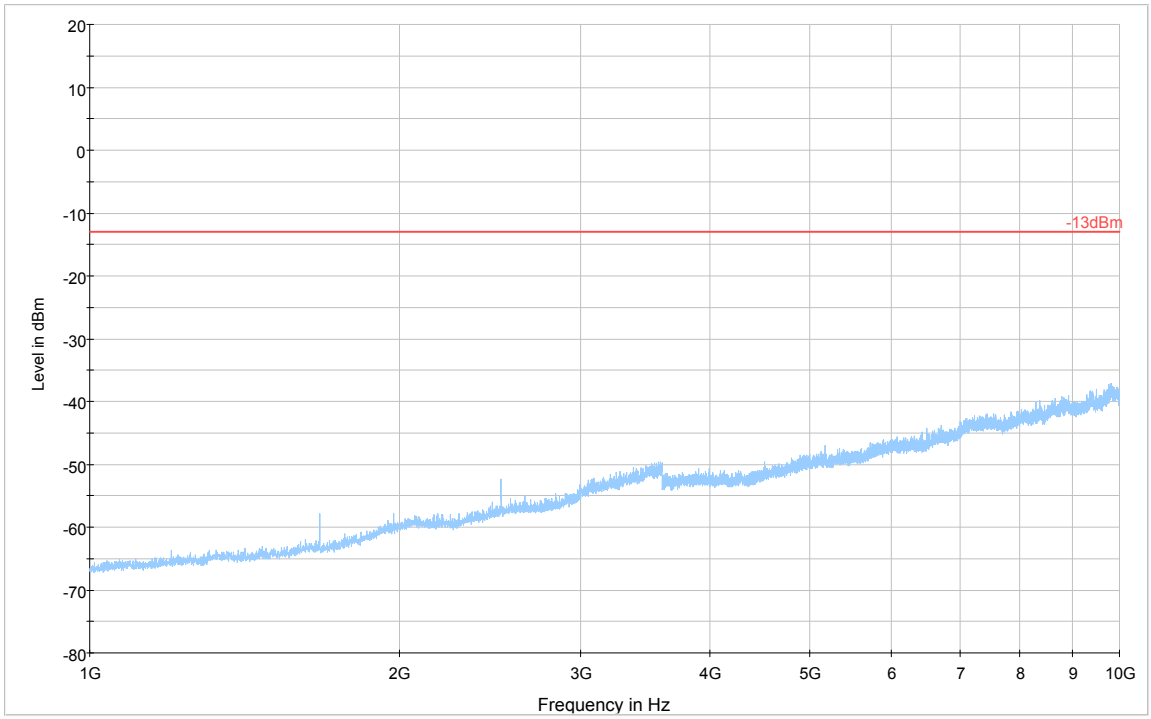


Radiated Spurious Emissions GSM 850 Tx: Mid Channel

30MHz-1GHz

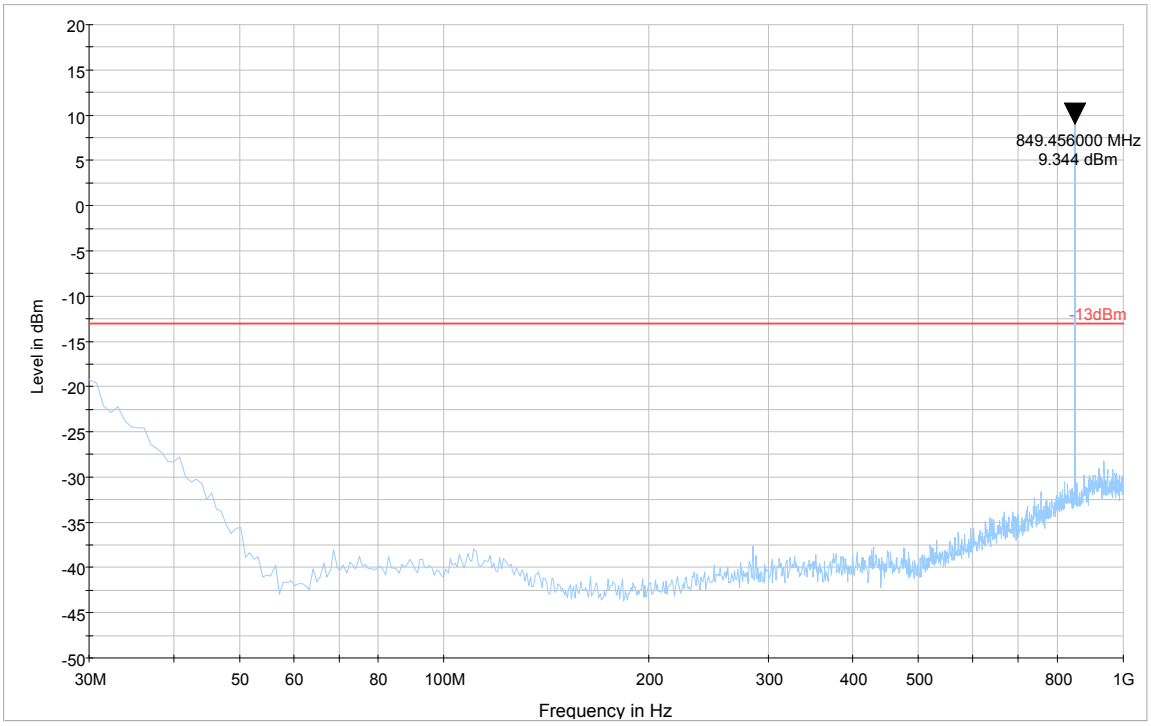


1GHz-10GHz

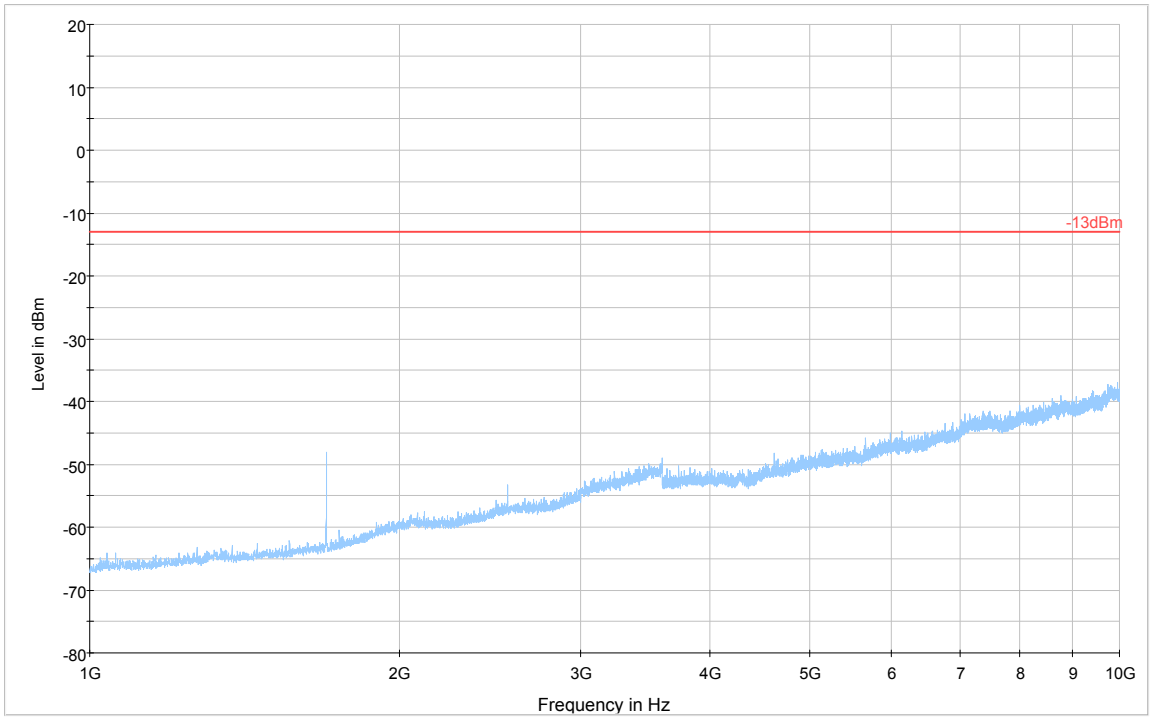


Radiated Spurious Emissions GSM 850 Tx: High Channel

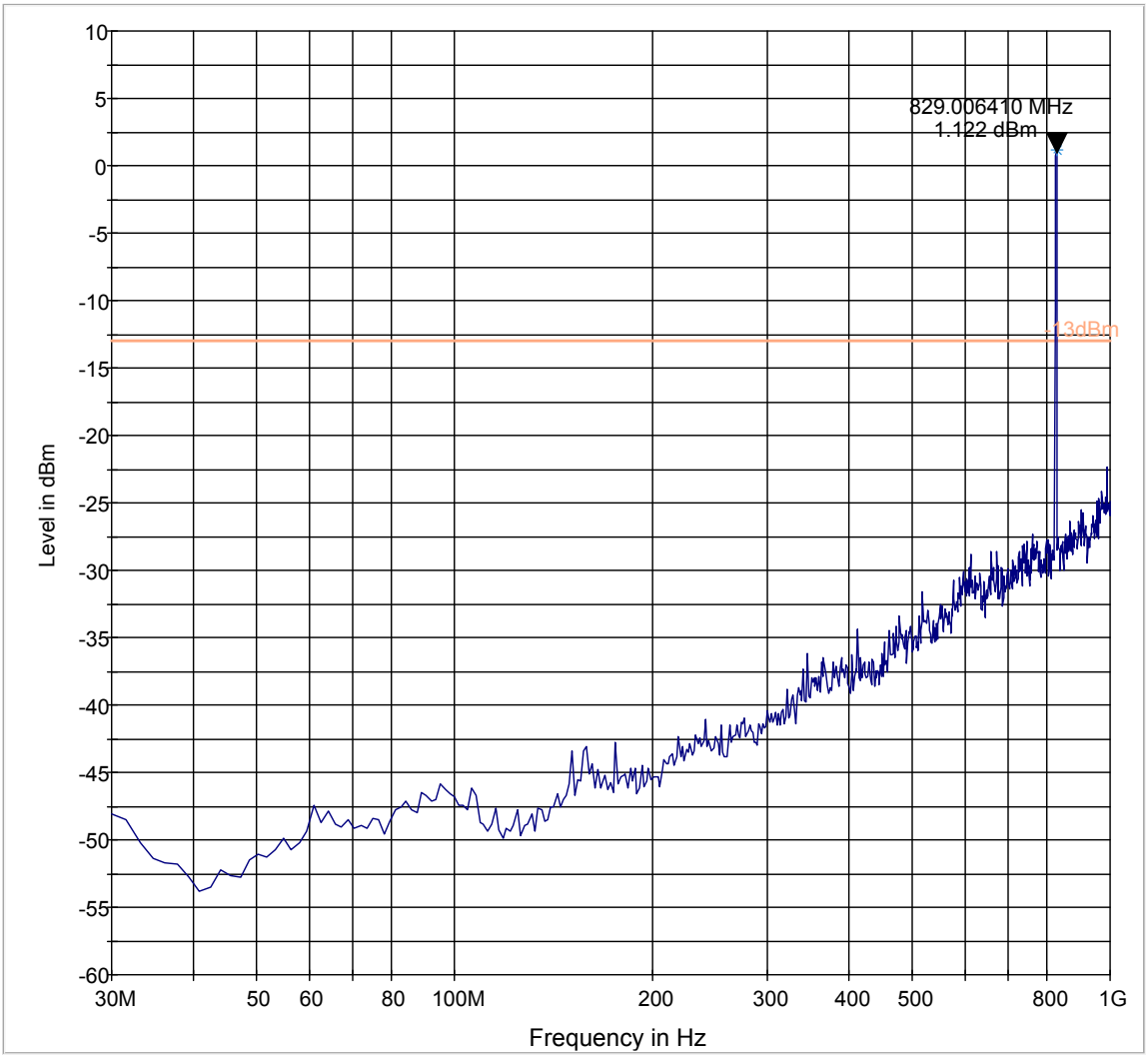
30MHz-1GHz



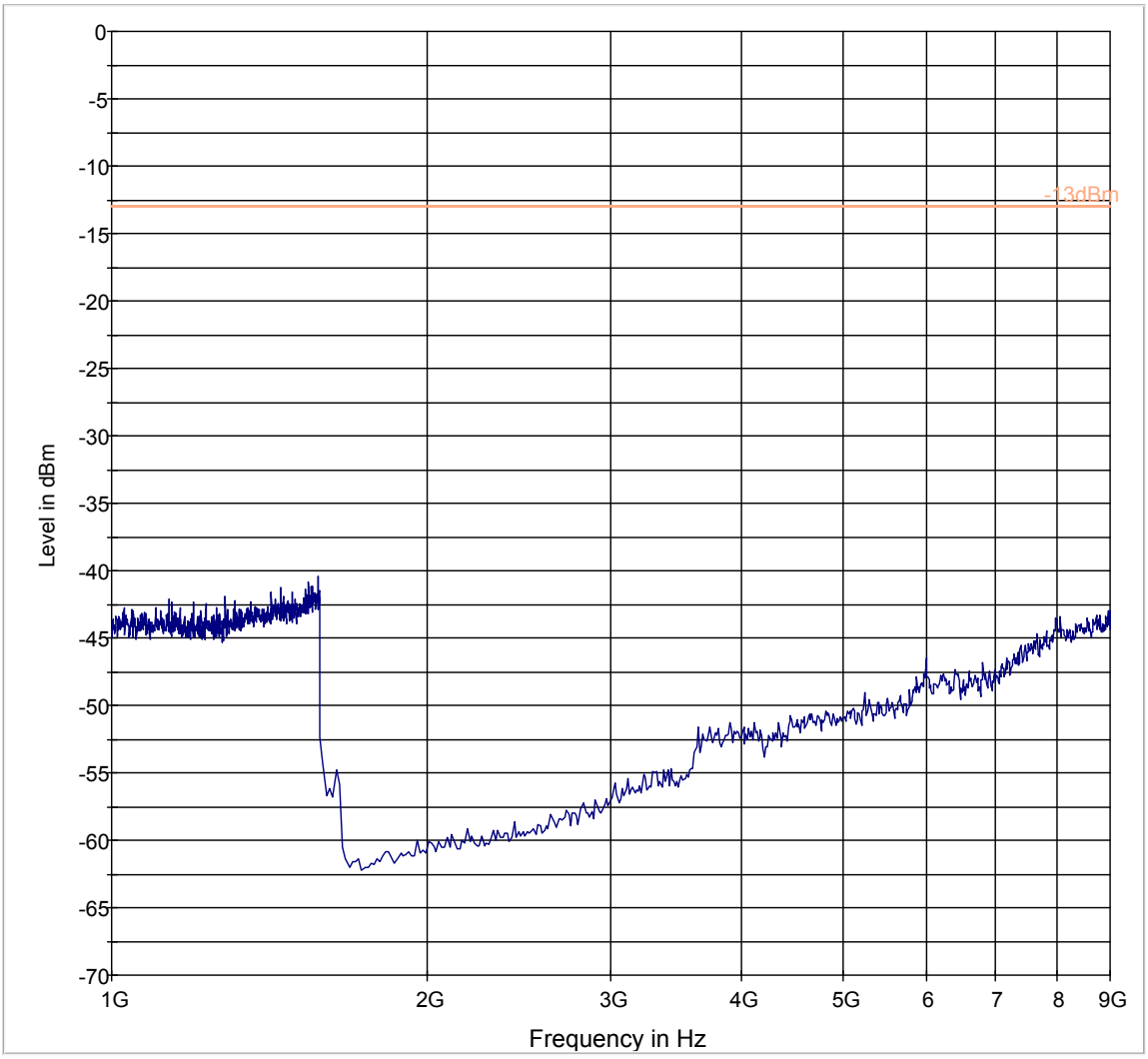
1GHz-10GHz



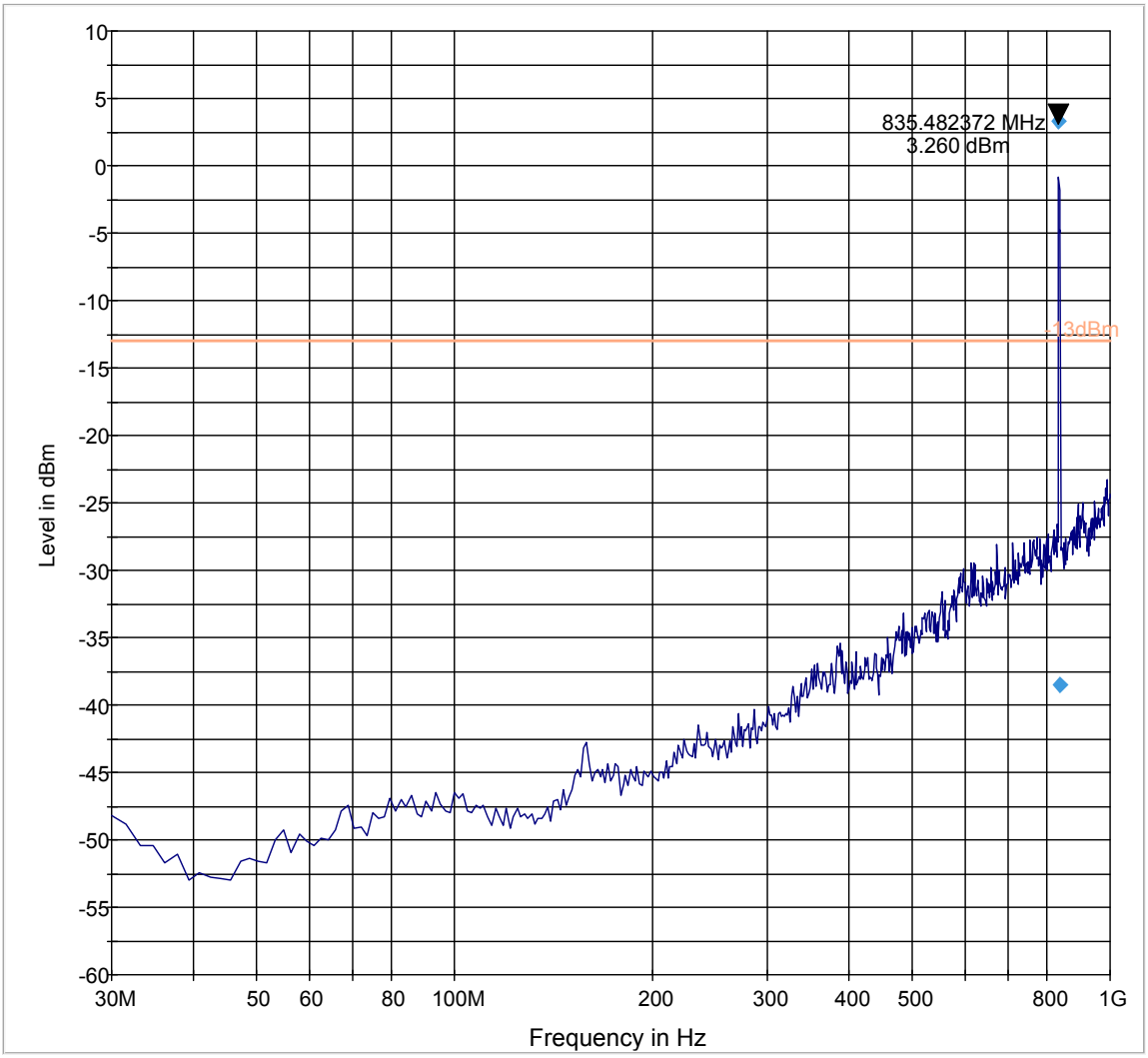
Radiated Spurious Emissions UMTS FDD V Tx: Low Channel
30MHz-1GHz



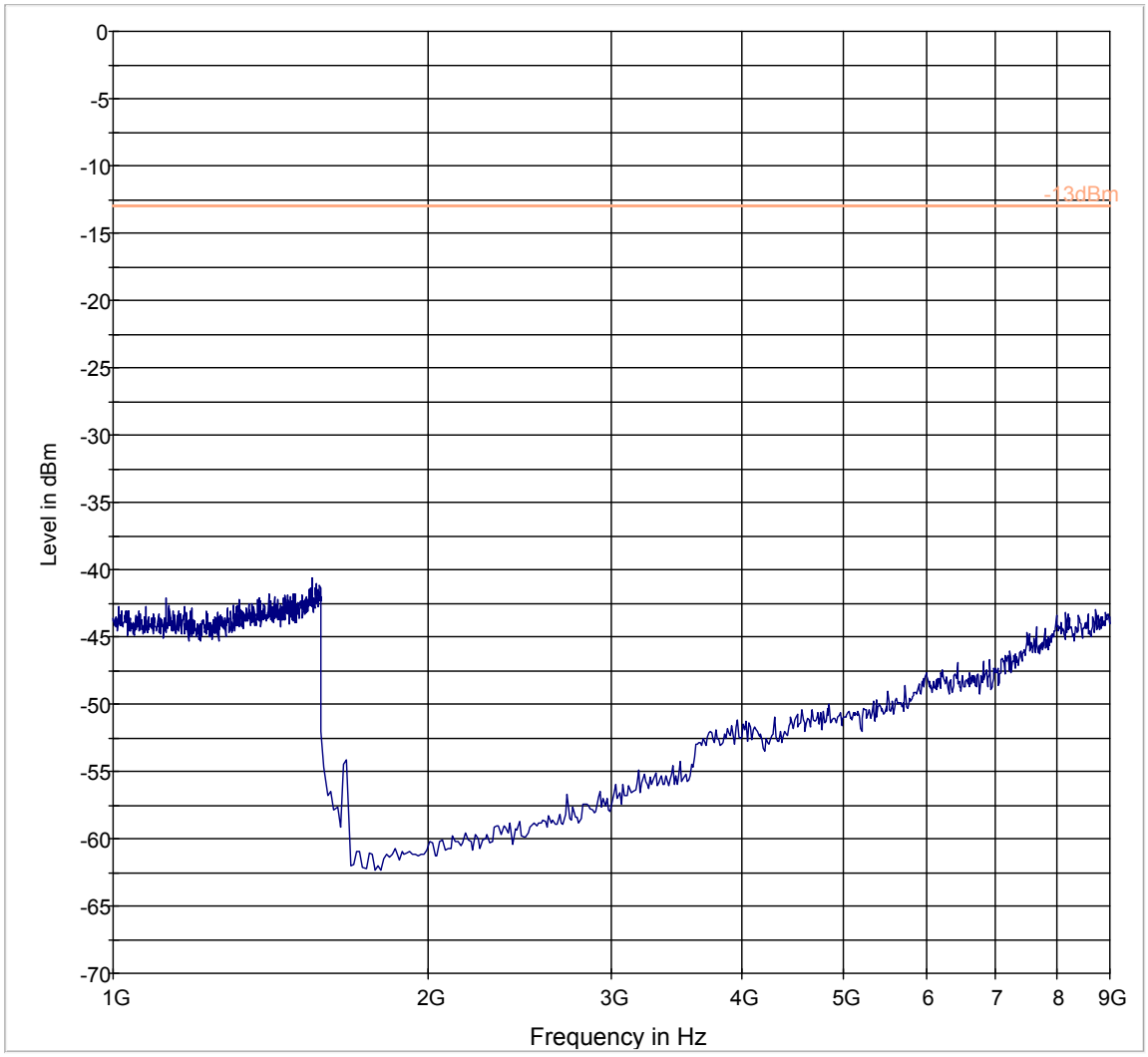
1GHz-9GHz


0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
-55
-60
-65
-70
Level in dBm
-13dBm
1G
2G
3G
4G
5G
6
7
8
9G
Frequency in Hz
-13dBm
Preview Result 1-PK+

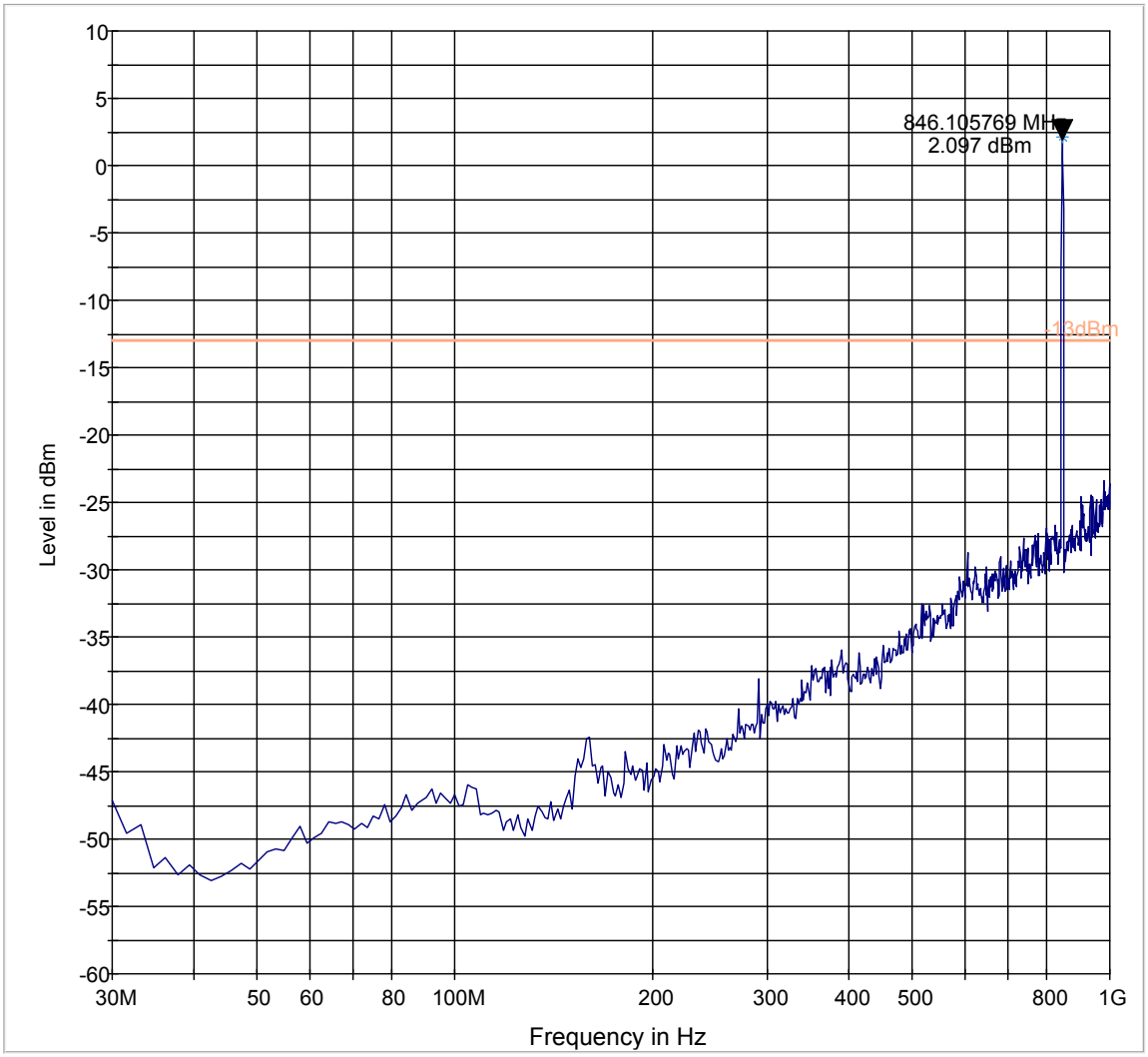
Radiated Spurious Emissions UMTS FDD V Tx: Mid Channel
30MHz-1GHz



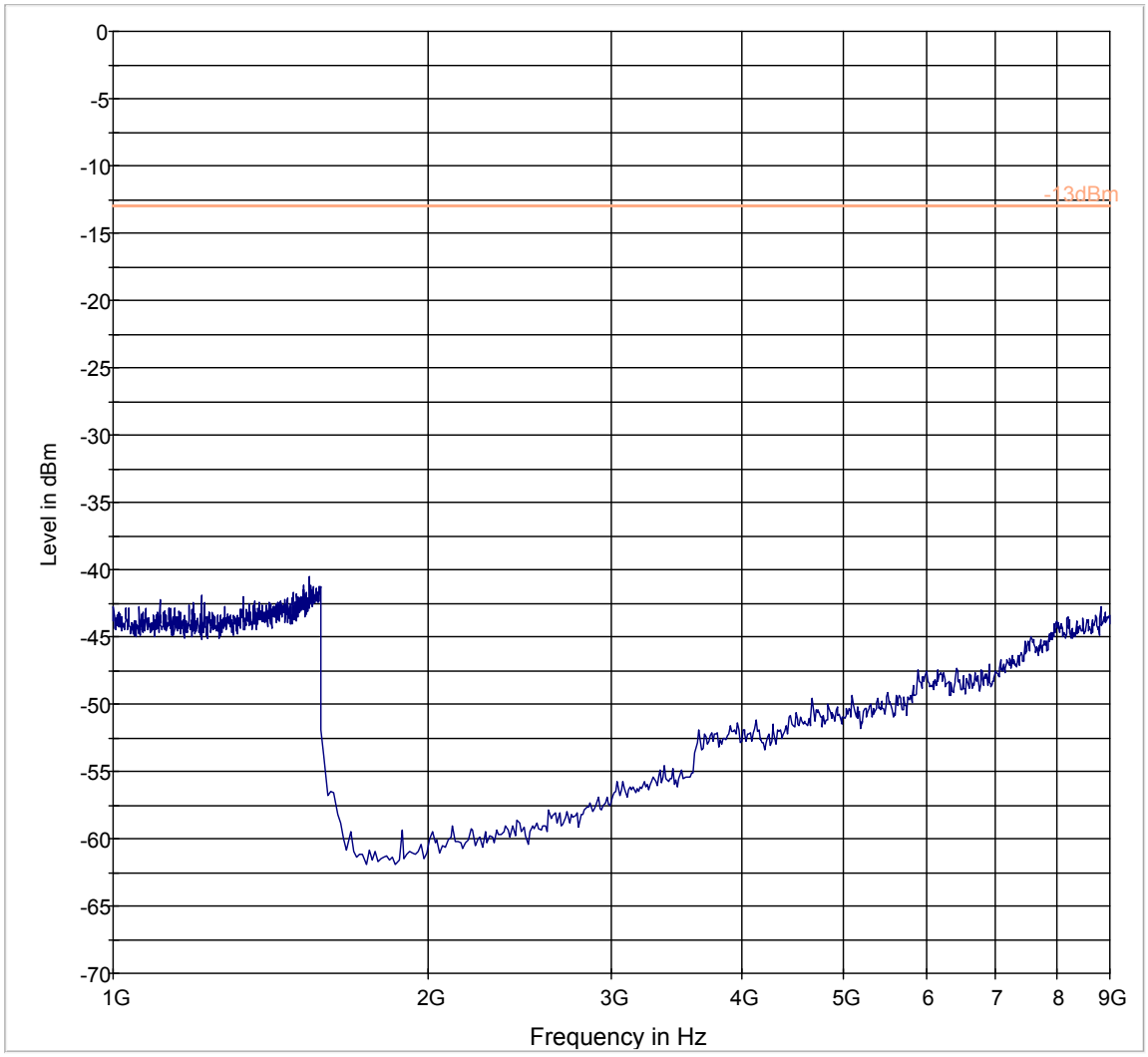
1GHz-9GHz


0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
-55
-60
-65
-70
Level in dBm
-13dBm
1G
2G
3G
4G
5G
6
7
8
9G
Frequency in Hz
-13dBm
Preview Result 1-PK+

Radiated Spurious Emissions UMTS FDD V Tx: High Channel
30MHz-1GHz

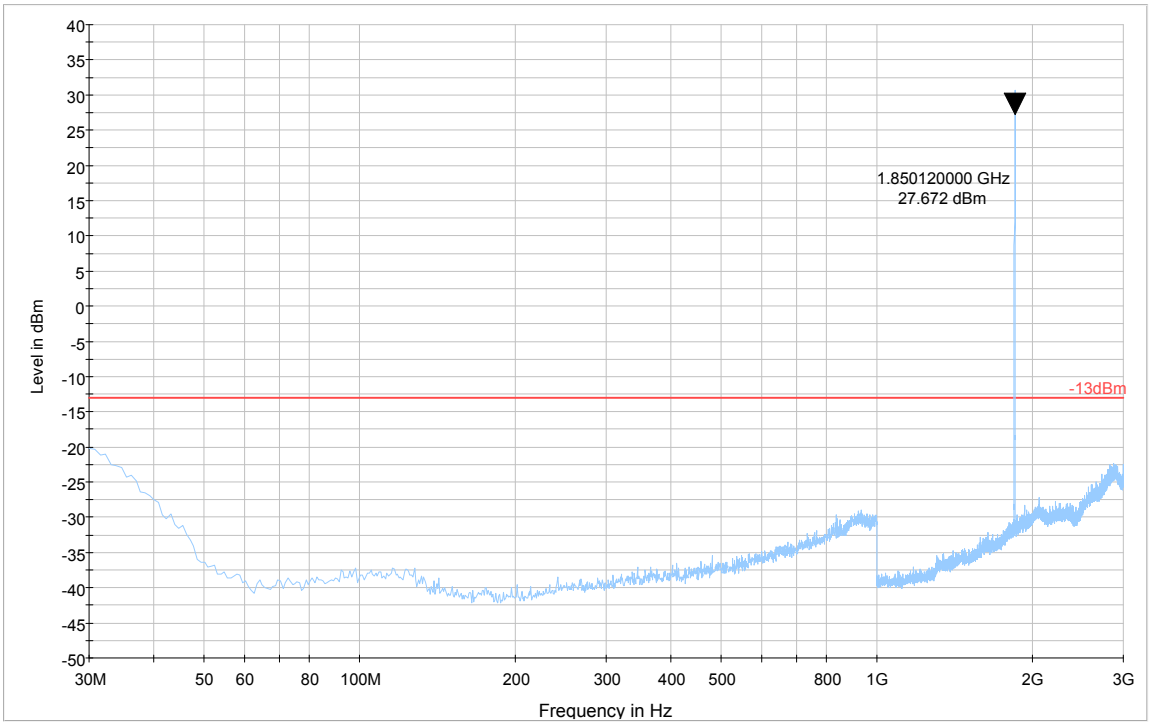


1GHz-9GHz

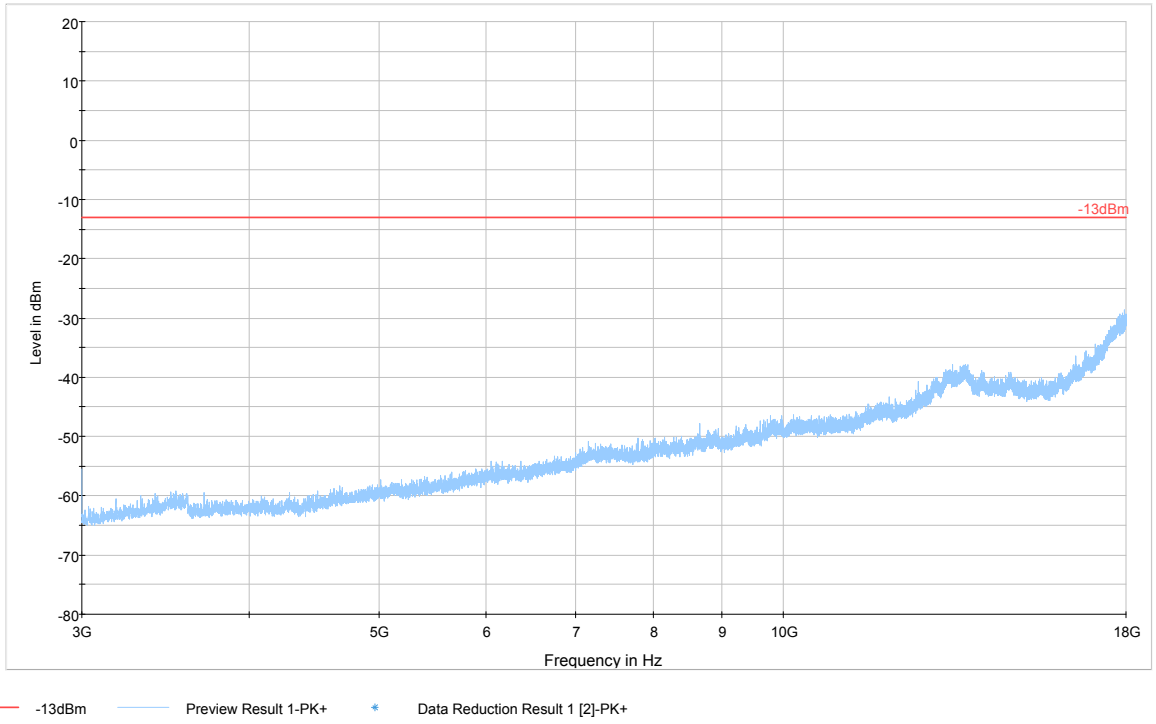

0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
-55
-60
-65
-70
Level in dBm
-13dBm
1G
2G
3G
4G
5G
6
7
8
9G
Frequency in Hz
-13dBm
Preview Result 1-PK+

Radiated Spurious Emissions GSM 1900 Tx: Low Channel

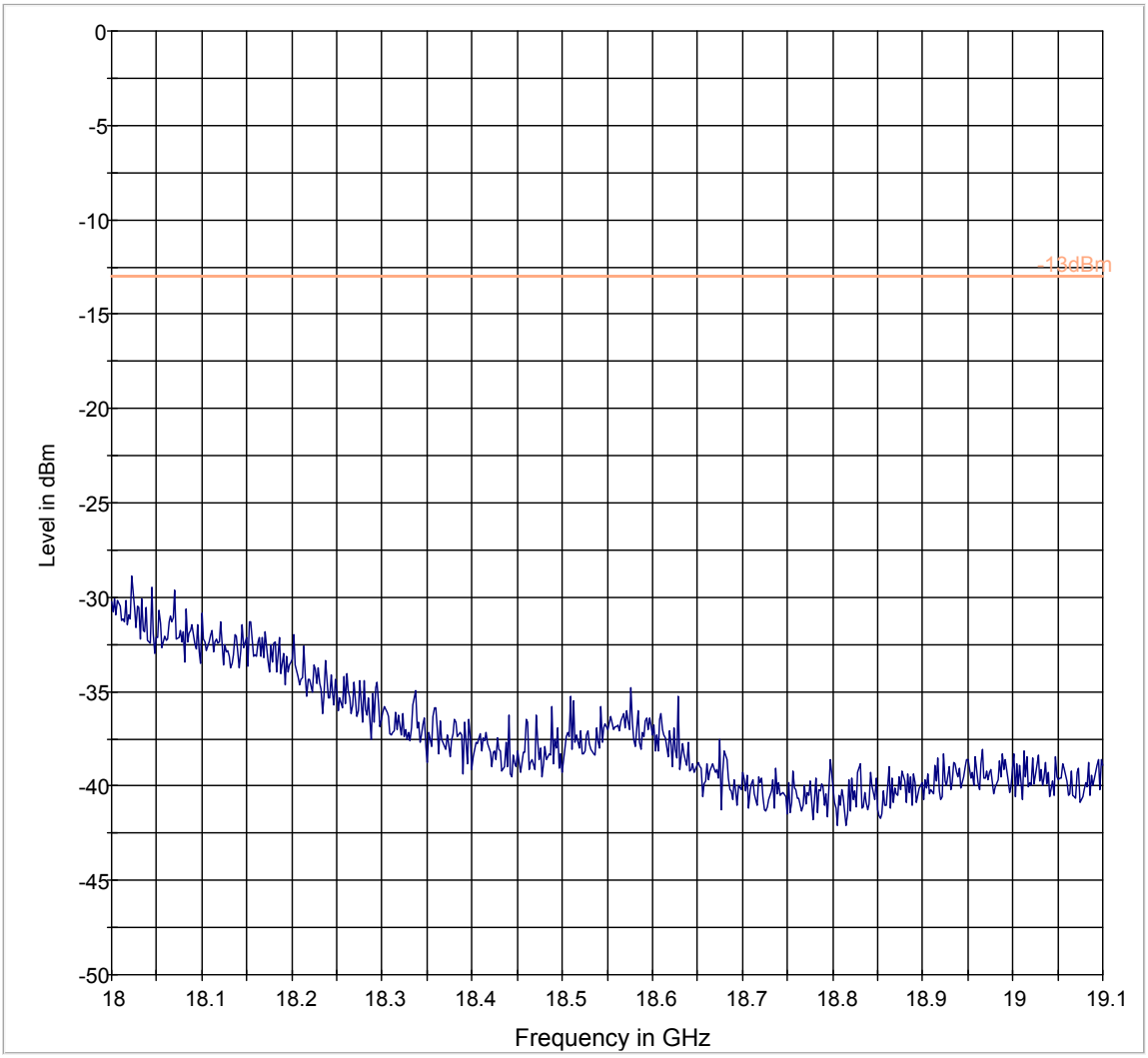
30MHz-3GHz



3GHz-18GHz

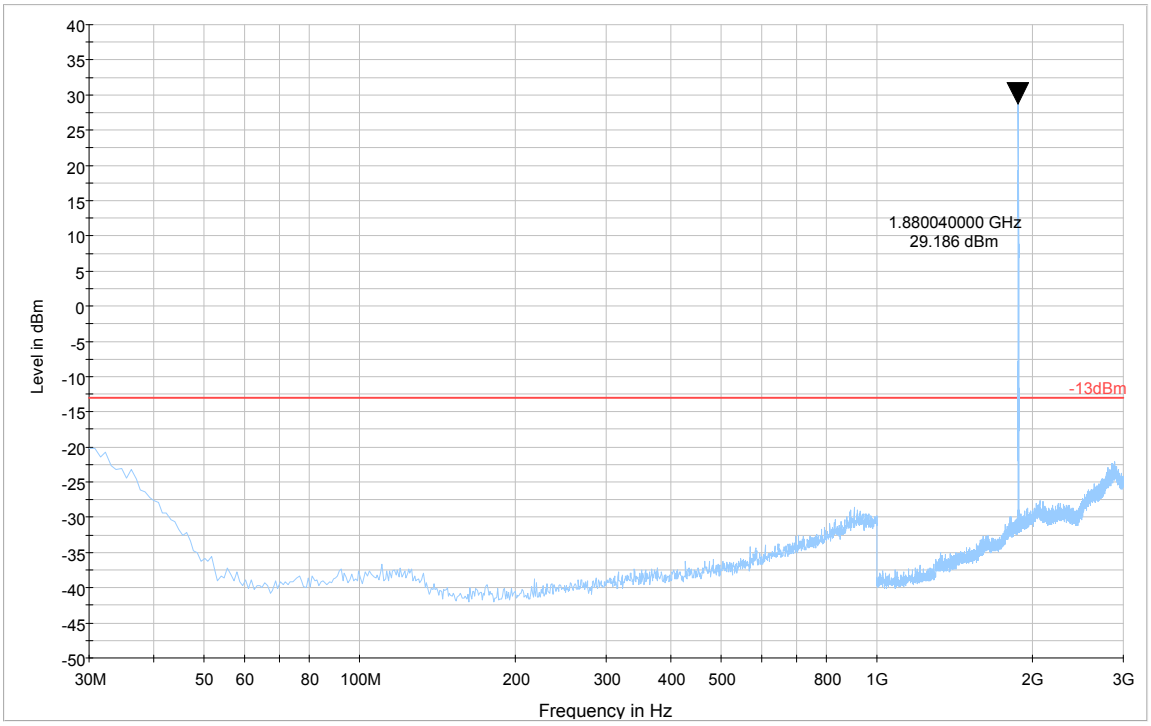


Test results 18GHz-19.1GHz
Note: Worst case representation of all channels

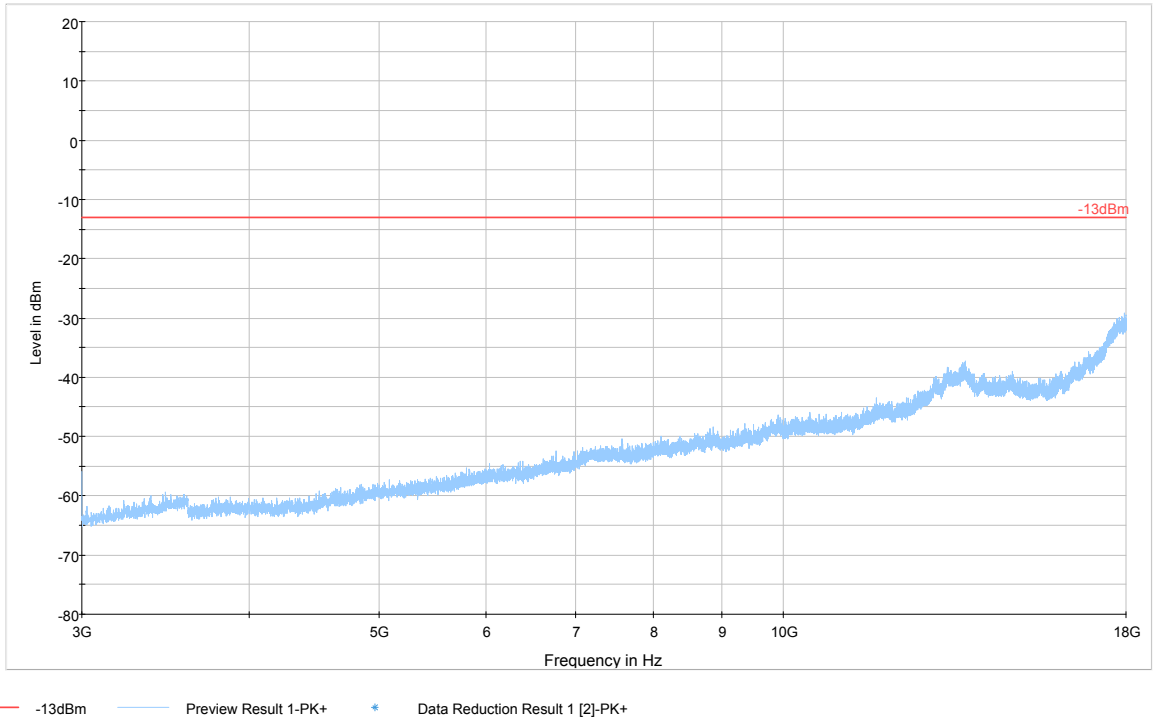


Radiated Spurious Emissions GSM 1900 Tx: Mid Channel

30MHz-3GHz

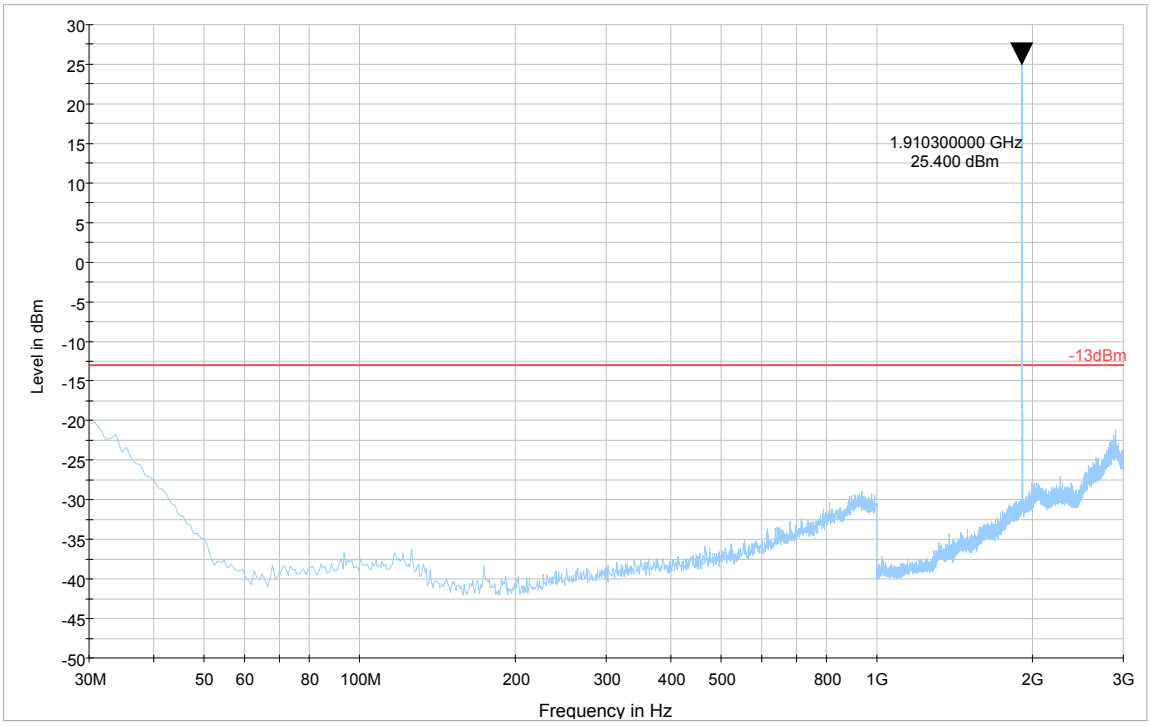


3GHz-18GHz

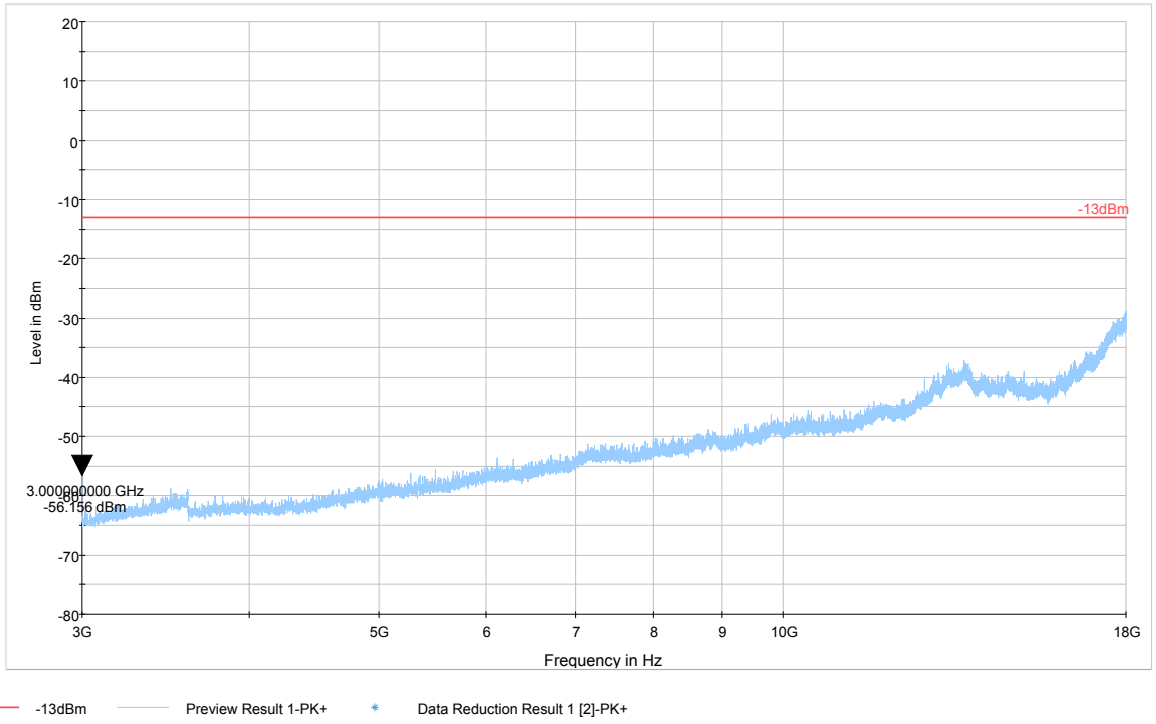


Radiated Spurious Emissions GSM 1900 Tx: High Channel

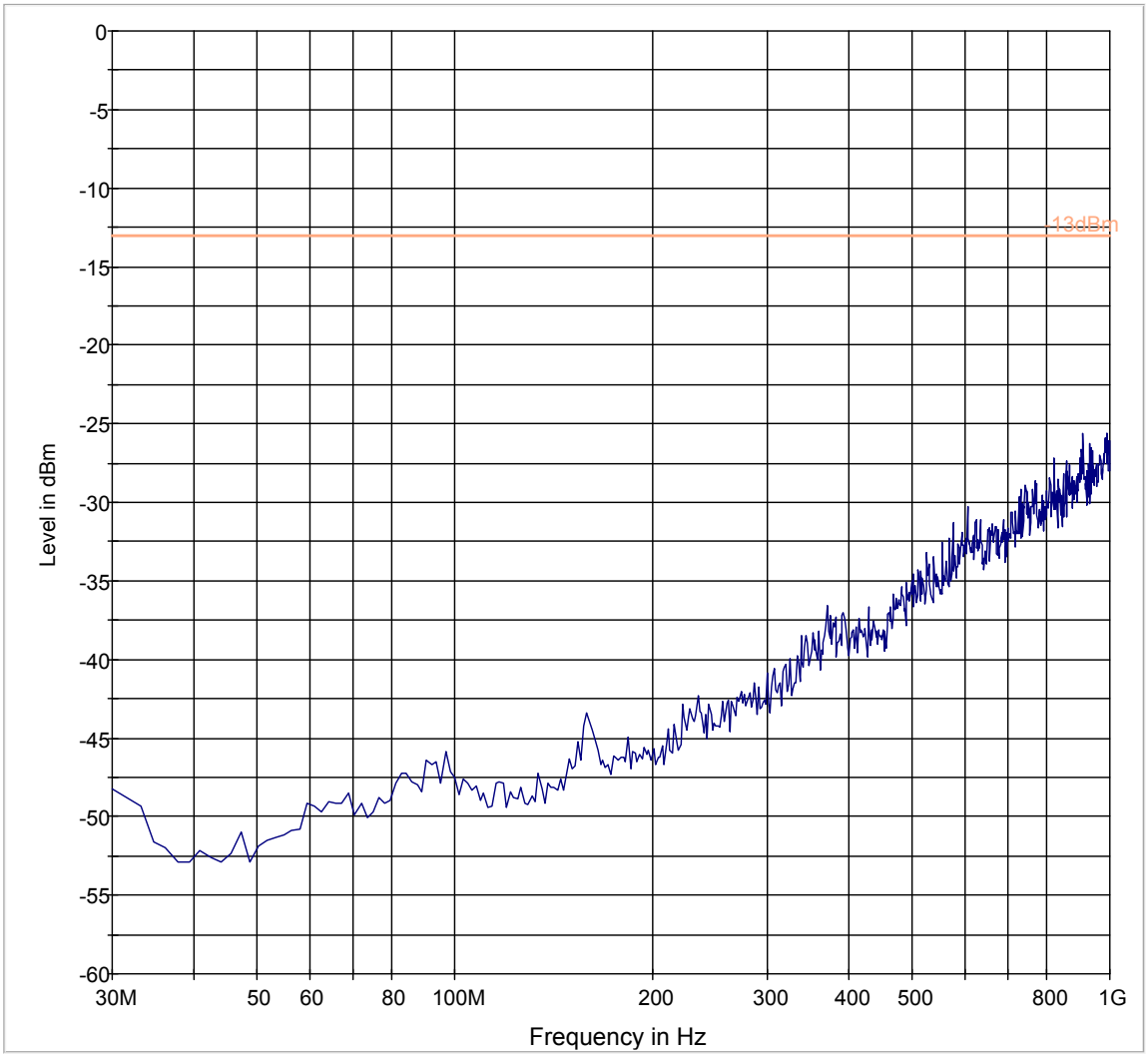
30MHz-3GHz



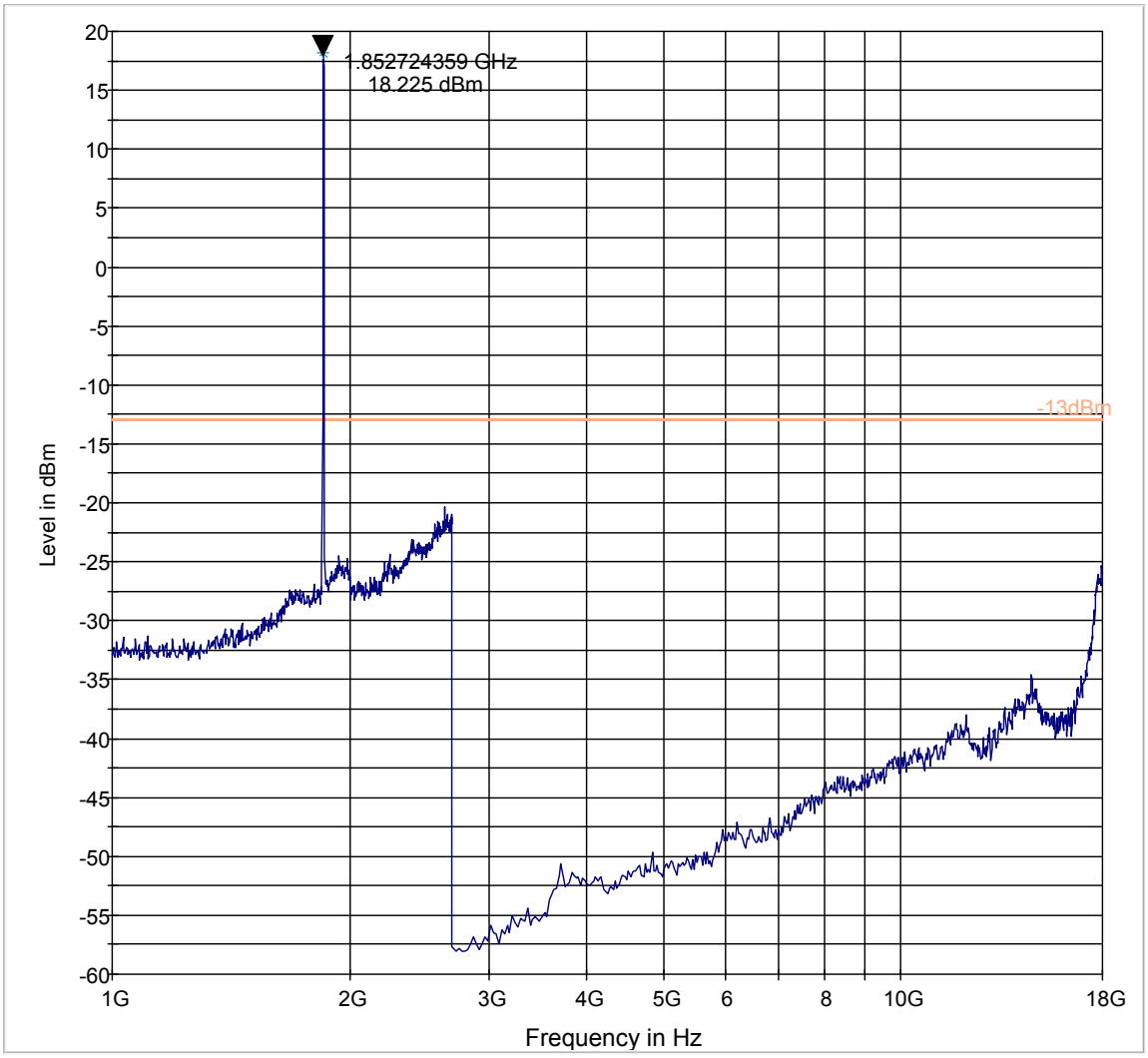
3GHz-18GHz



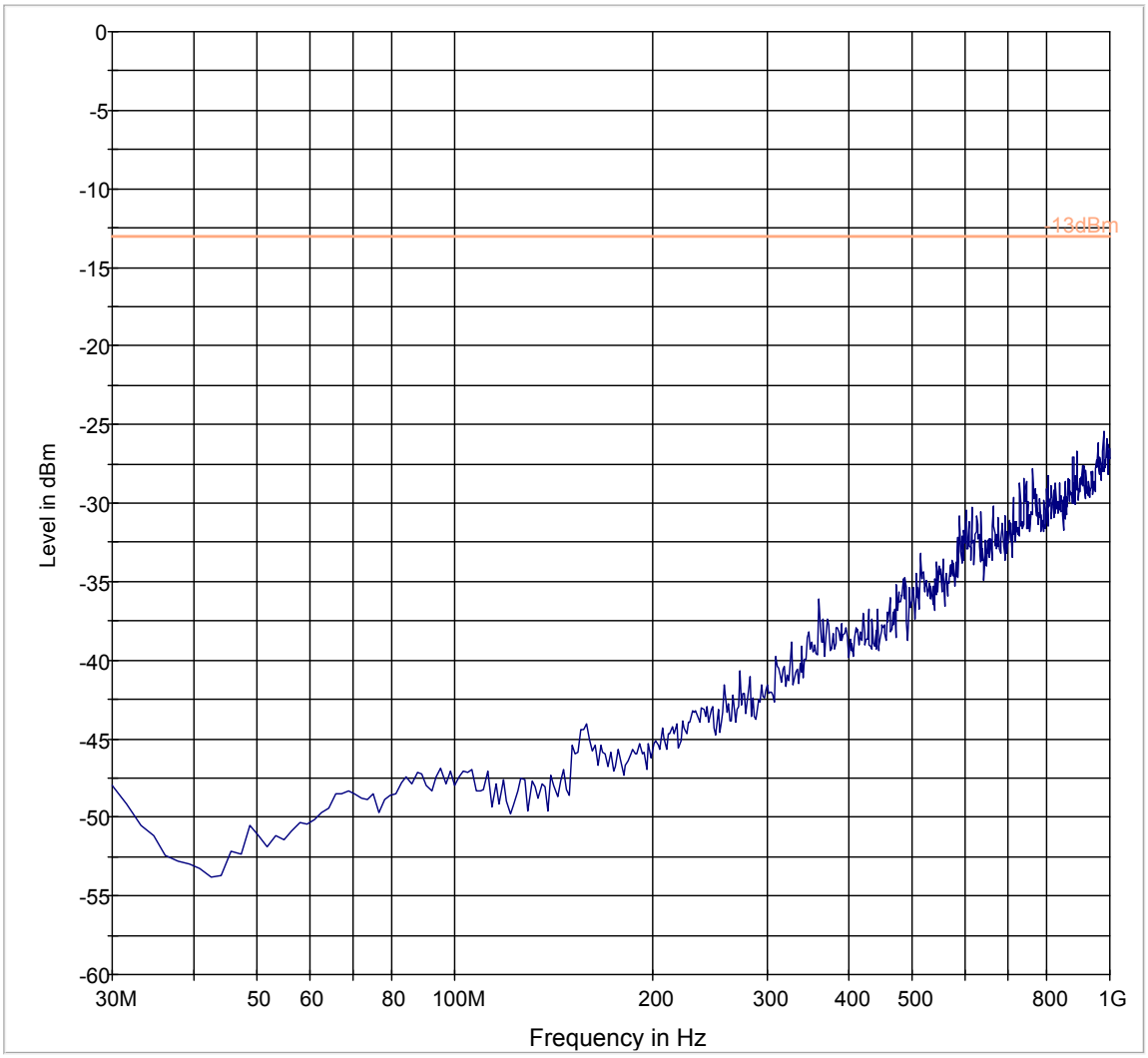
Radiated Spurious Emissions UTMS FDD II Tx: Low Channel
30MHz-1GHz



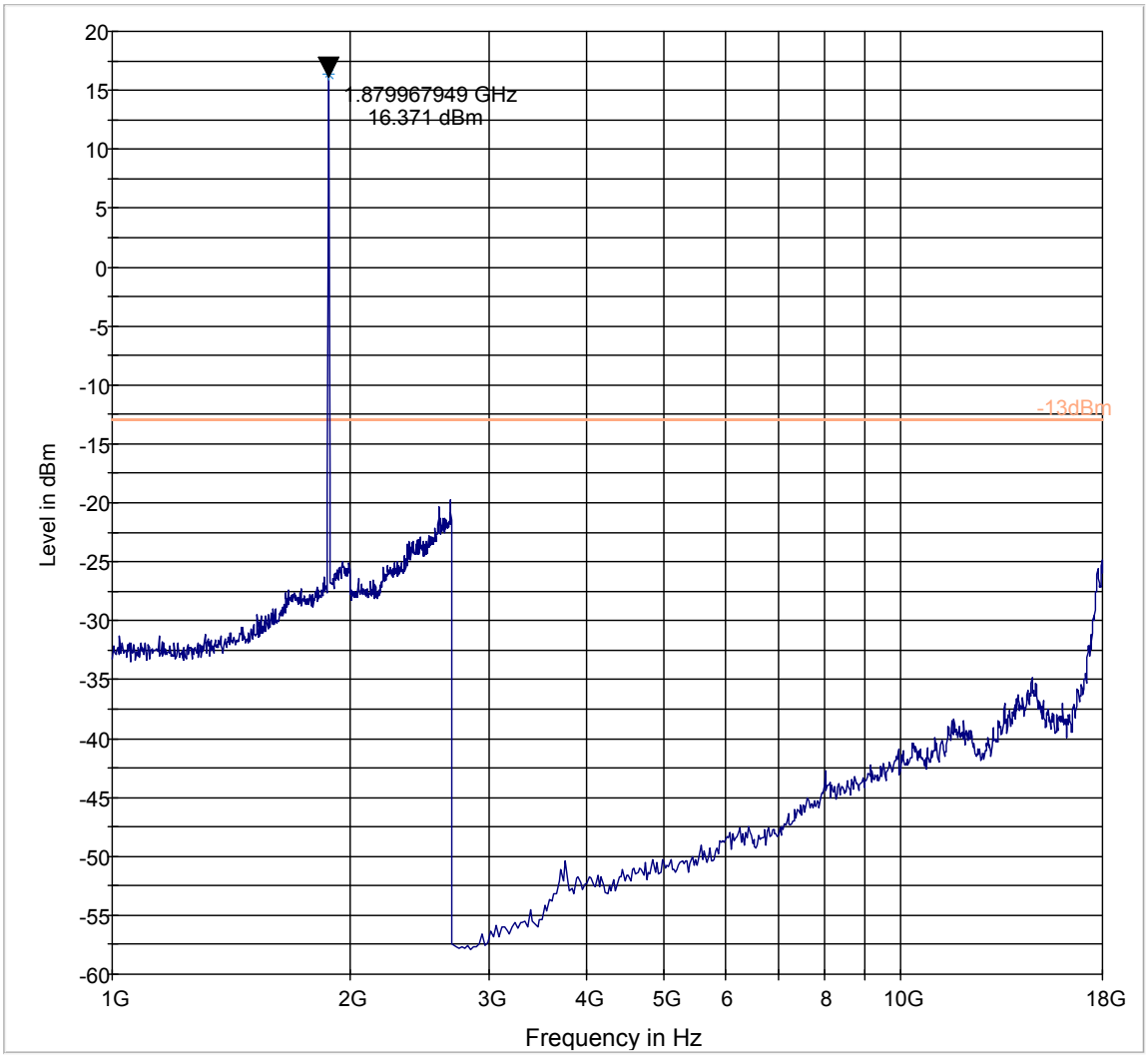
1GHz-18GHz


1.852724359 GHz
18.225 dBm
-13dBm
Level in dBm
Frequency in Hz
20
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
-55
-60
1G
2G
3G
4G
5G
6
8
10G
18G
-13dBm
Preview Result 1-PK+
Data Reduction Result 1 [2]-PK+

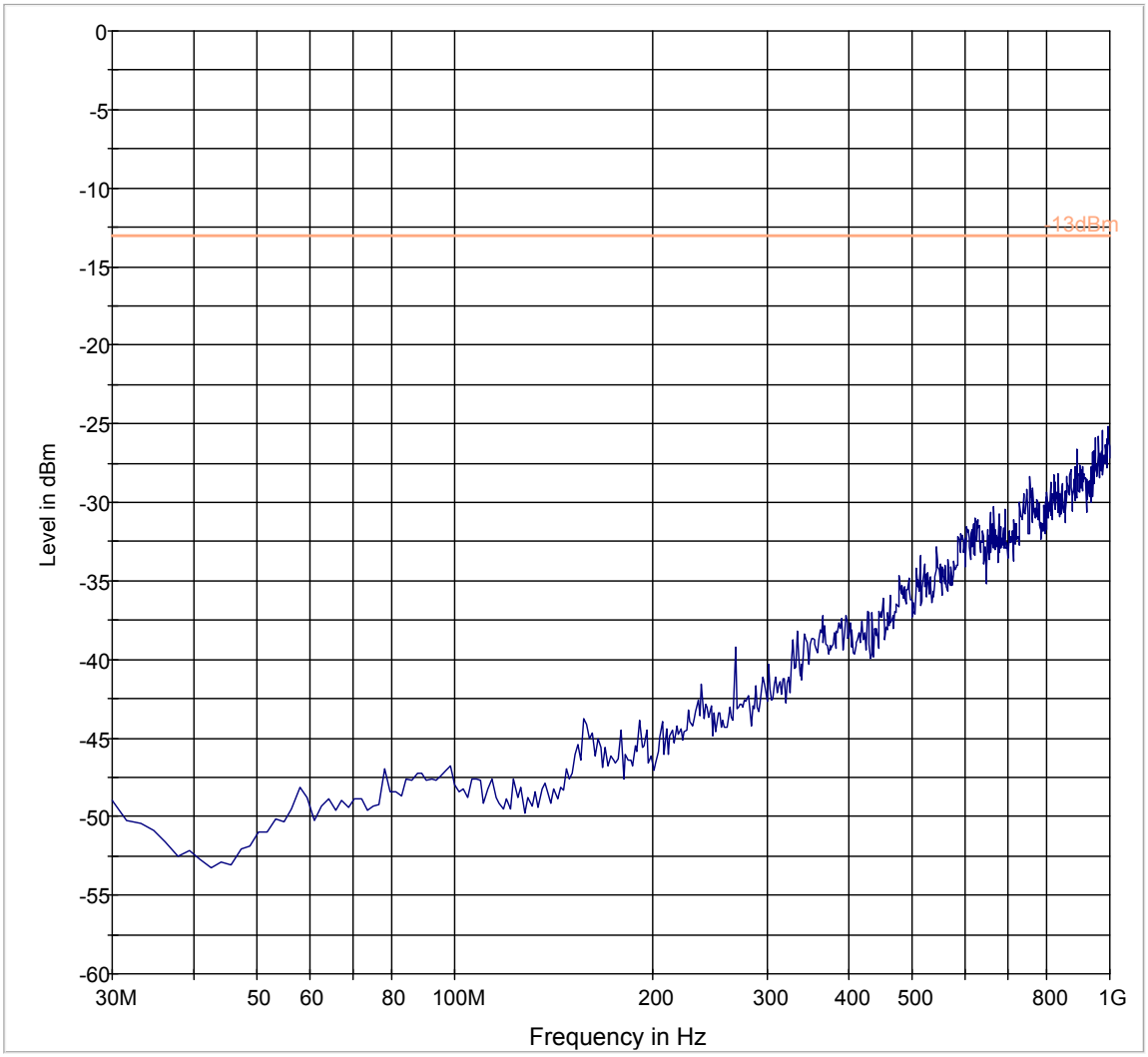
Radiated Spurious Emissions UTMS FDD II Tx: Mid Channel
30MHz-1GHz



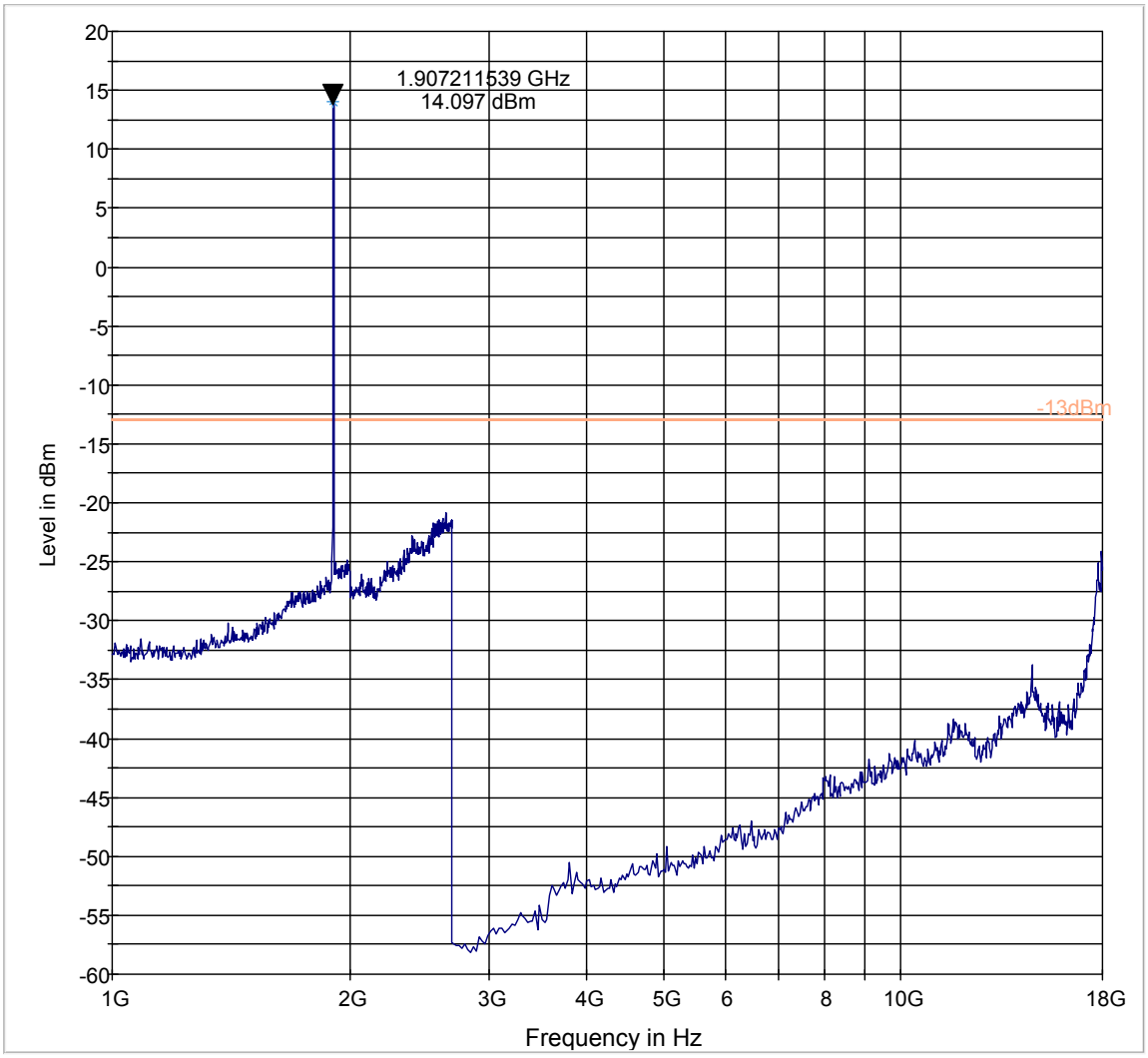
1GHz-18GHz


1.879967949 GHz
16.371 dBm
-13dBm
Level in dBm
Frequency in Hz
20
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
-55
-60
1G
2G
3G
4G
5G
6
8
10G
18G
-13dBm
Preview Result 1-PK+
Data Reduction Result 1 [2]-PK+

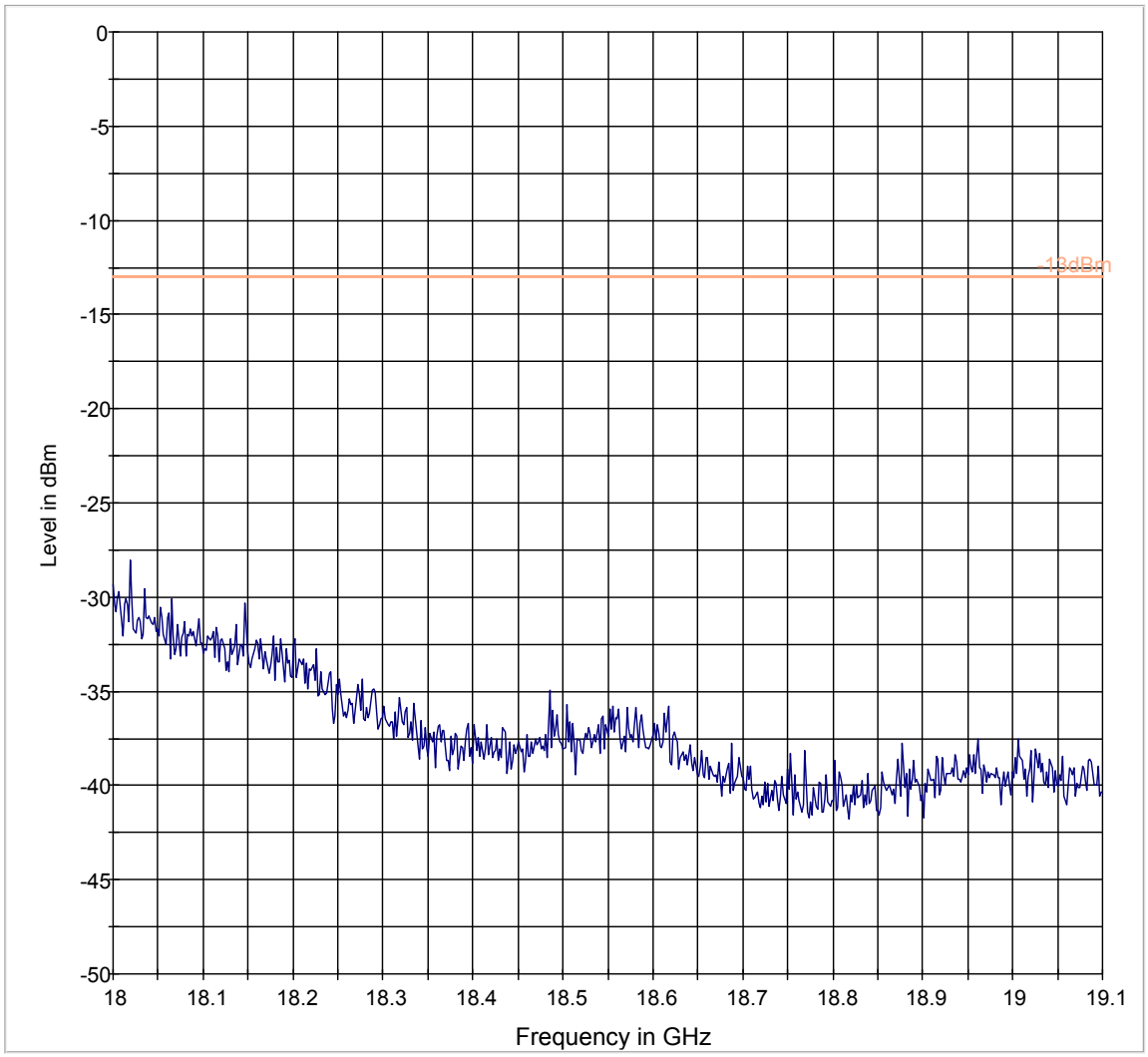
Radiated Spurious Emissions UTMS FDD II Tx: High Channel
30MHz-1GHz



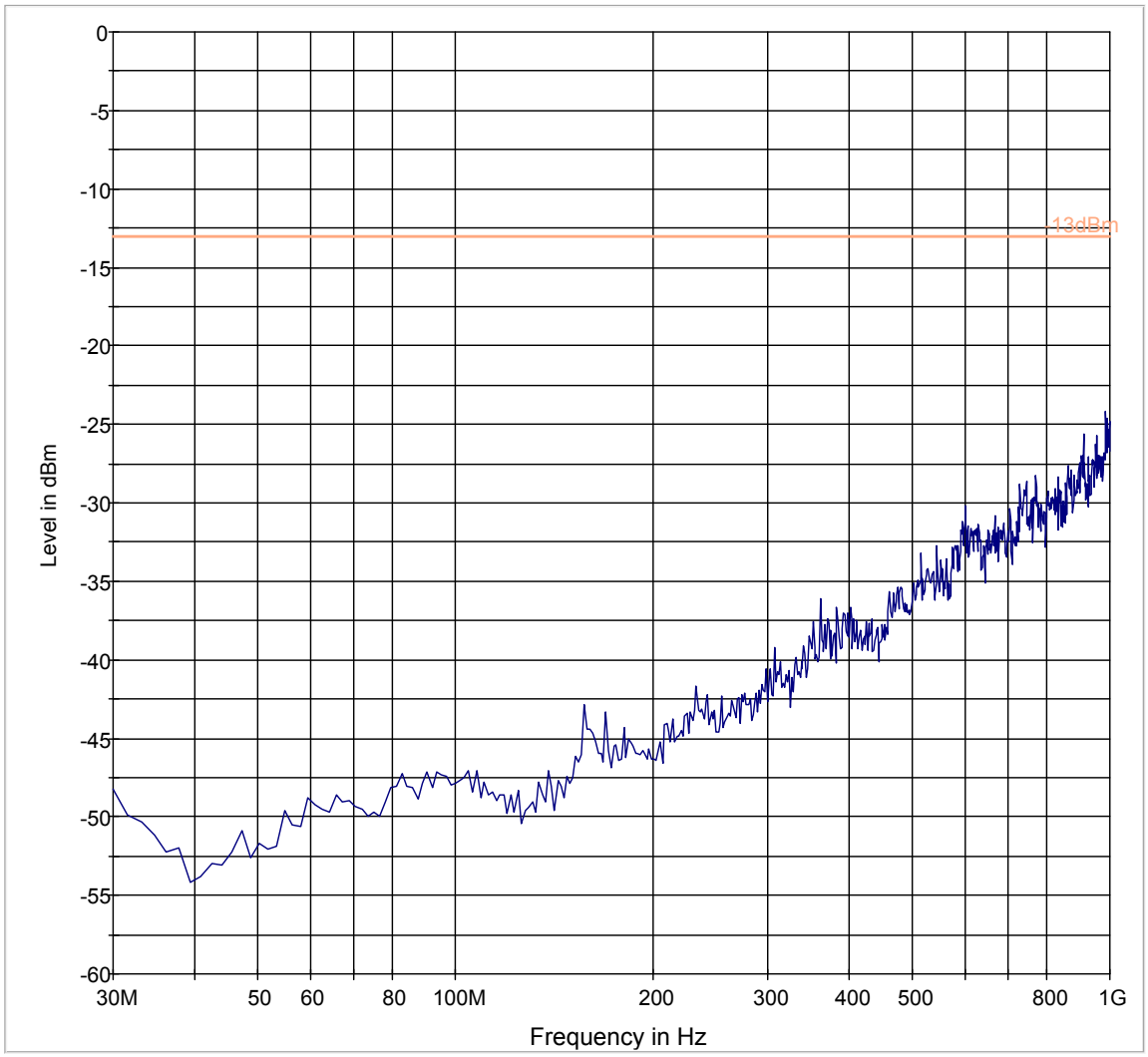
1GHz-18GHz


1.907211539 GHz
14.097 dBm
-13dBm
Level in dBm
Frequency in Hz
20
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
-55
-60
1G
2G
3G
4G
5G
6
8
10G
18G
-13dBm
Preview Result 1-PK+
Data Reduction Result 1 [2]-PK+

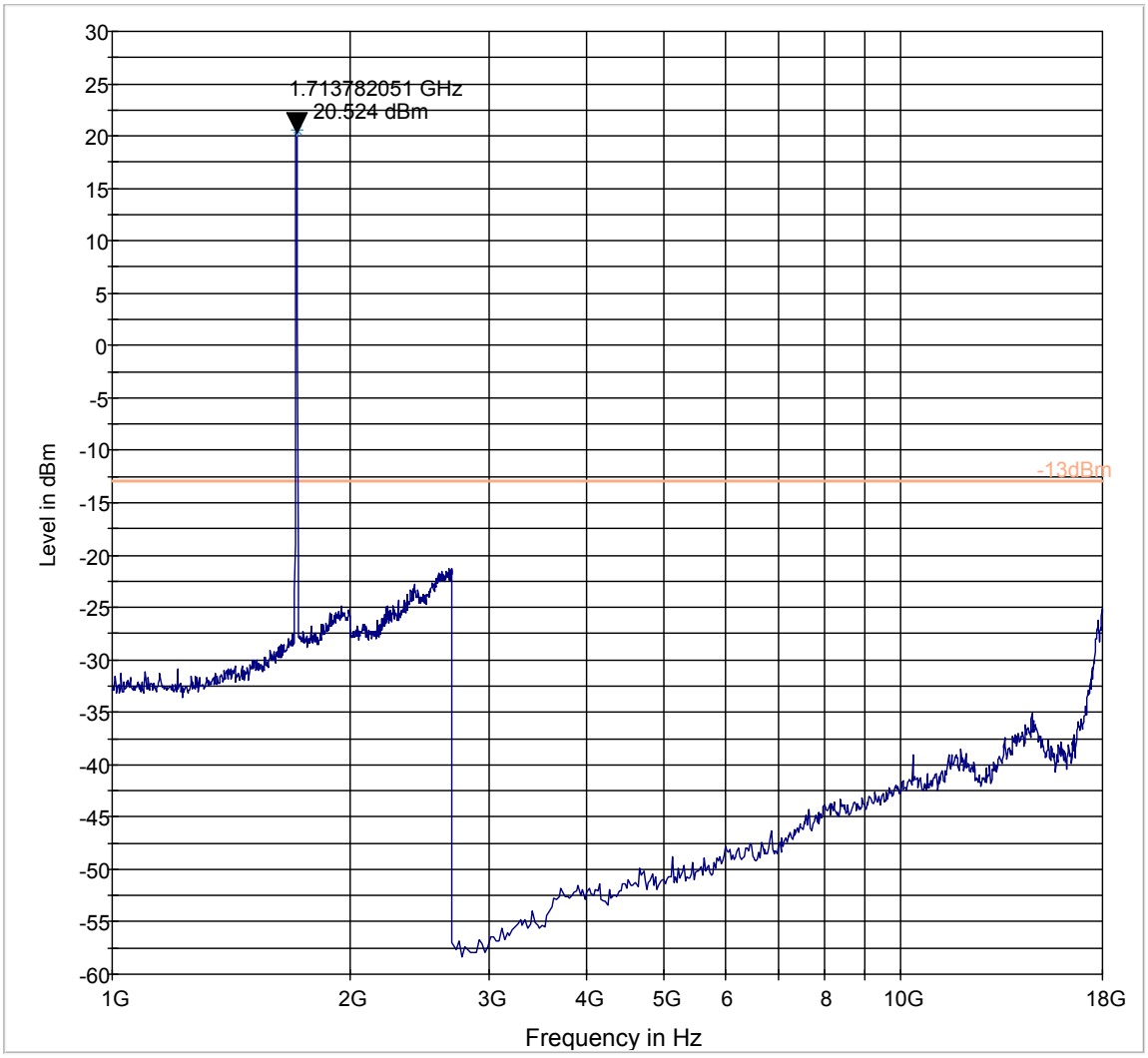
Test results 18GHz-19.1GHz
Note: Worst case representation of all channels



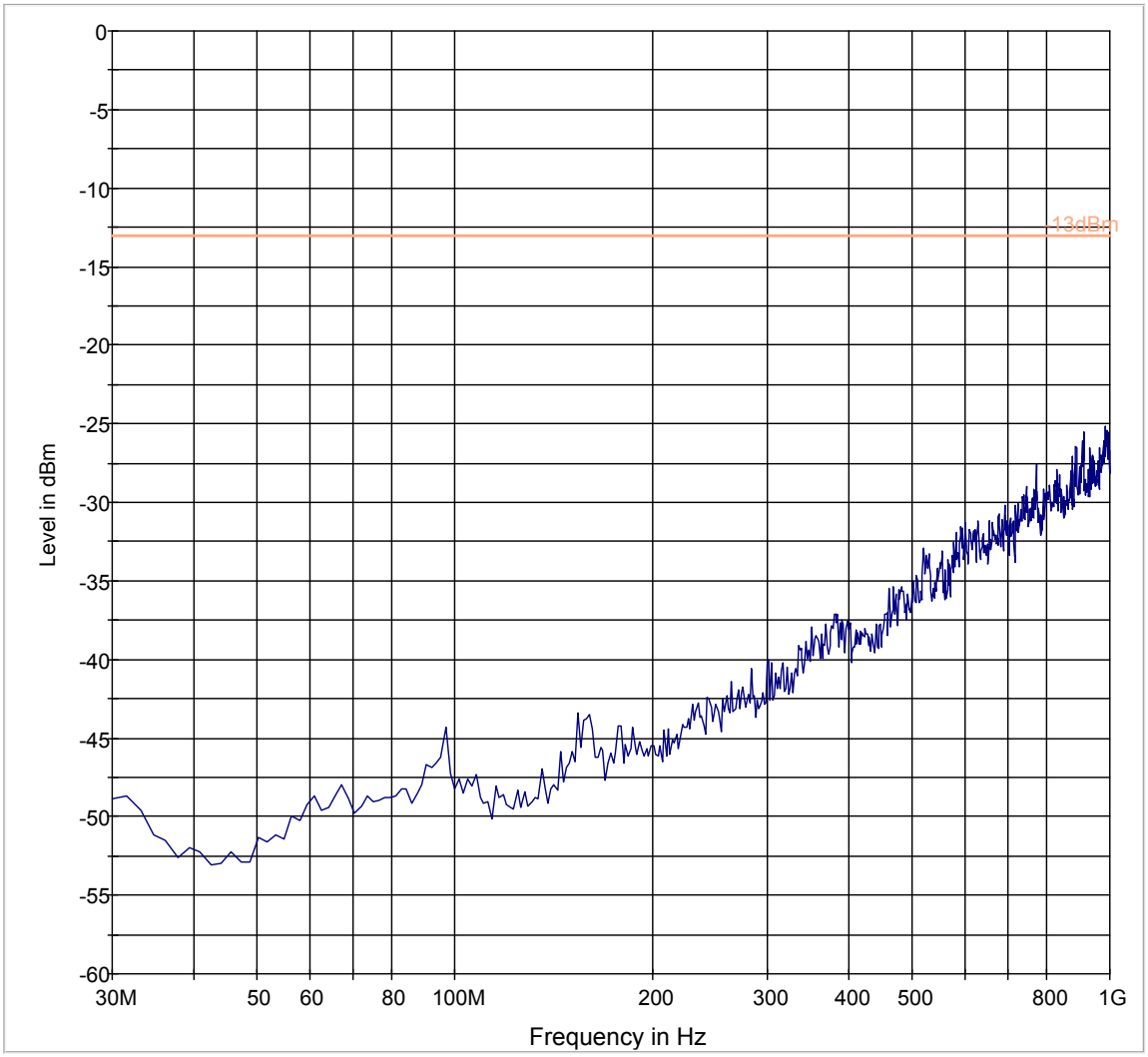
Radiated Spurious Emissions UTMS FDD IV Tx: Low Channel
30MHz-1GHz



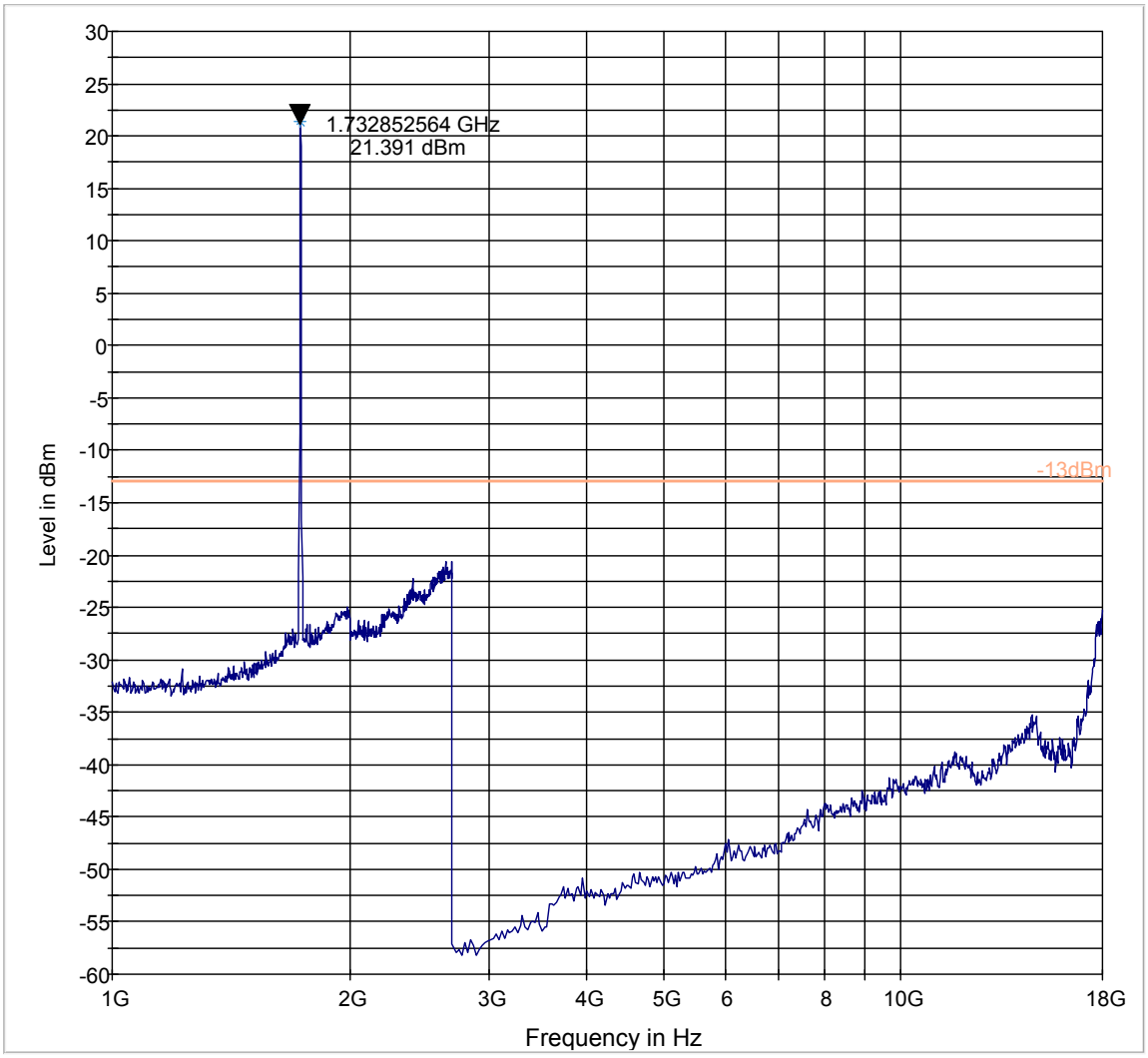
1GHz-18GHz


1.713782051 GHz
20.524 dBm
-13dBm
Level in dBm
Frequency in Hz
30
25
20
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
-55
-60
1G
2G
3G
4G
5G
6
8
10G
18G
-13dBm
Preview Result 1-PK+
Data Reduction Result 1 [2]-PK+

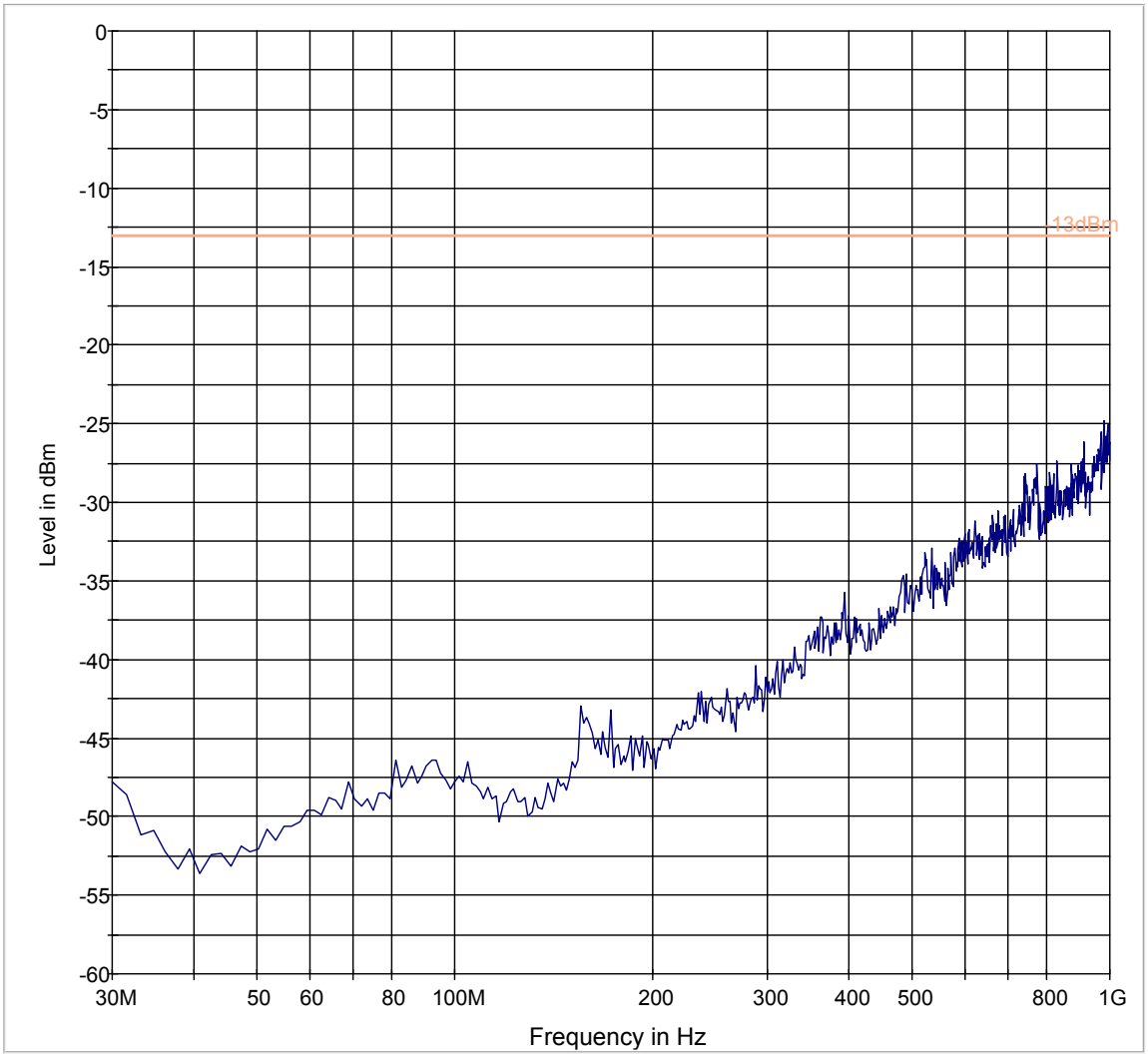
Radiated Spurious Emissions UTMS FDD IV Tx: Mid Channel
30MHz-1GHz



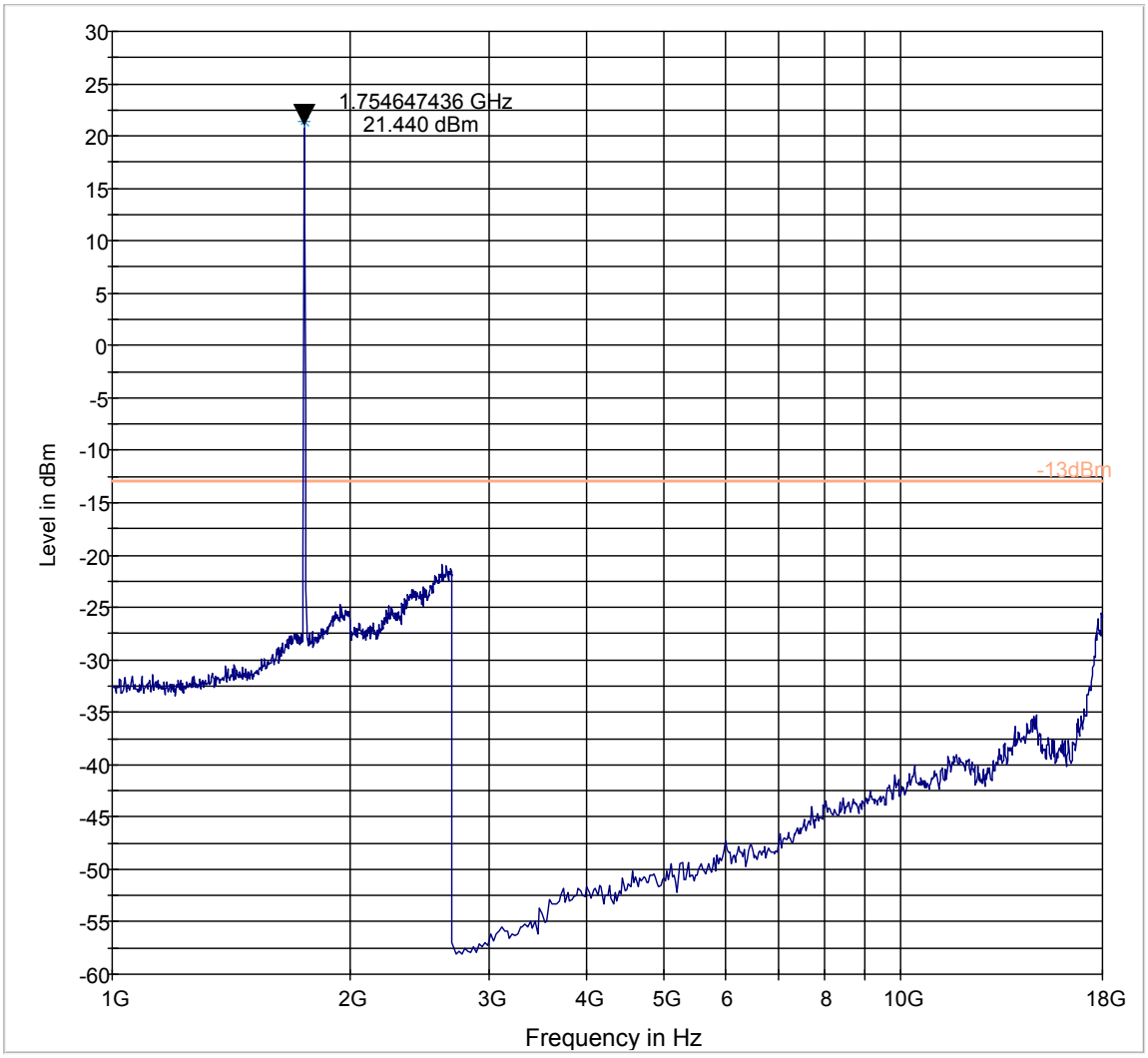
1GHz-18GHz


1.732852564 GHz
21.391 dBm
-13dBm
Level in dBm
Frequency in Hz
1G
2G
3G
4G
5G
6
8
10G
18G
-13dBm
Preview Result 1-PK+
Data Reduction Result 1 [2]-PK+

Radiated Spurious Emissions UTMS FDD IV Tx: High Channel
30MHz-1GHz



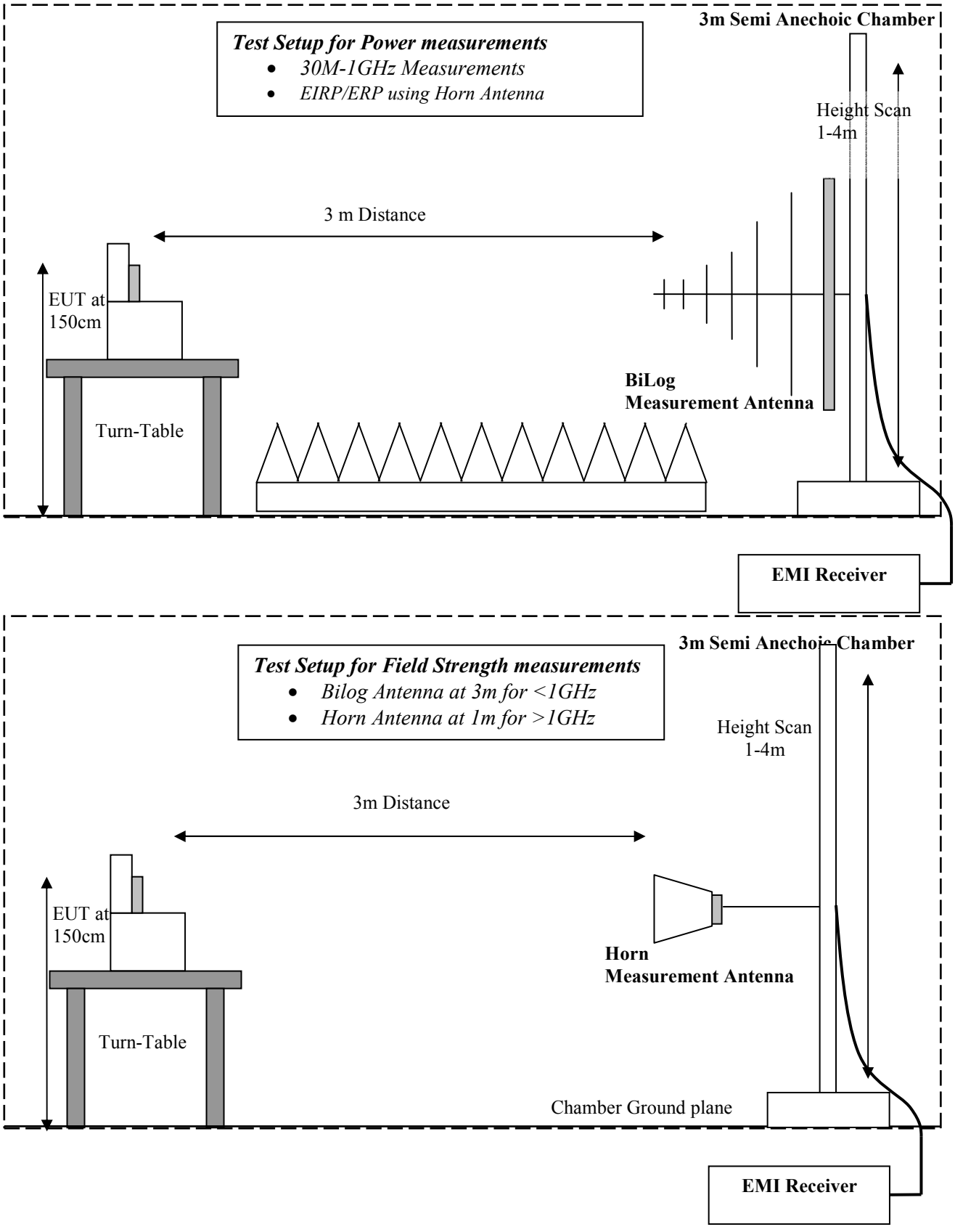
1GHz-18GHz


1.754647436 GHz
21.440 dBm
-13dBm
Level in dBm
Frequency in Hz
1G
2G
3G
4G
5G
6
8
10G
18G
-13dBm
Preview Result 1-PK+
Data Reduction Result 1 [2]-PK+

7 Test Equipment and Ancillaries used for tests

Instrument/Ancillary	Model	Manufacturer	Serial No.	Cal Date	Cal Interval
Radio Communication Tester	CMU 200	Rohde & Schwarz	109879	June 2013	2 Years
EMI Receiver/Analyzer	ESU 40	Rohde & Schwarz	100251	Aug 2012	2 Years
Spectrum Analyzer	FSU	Rohde & Schwarz	200302	June 2013	2 Years
Loop Antenna	6512	EMCO	00049838	Aug 2011	3 years
Biconilog Antenna	3141	EMCO	0005-1186	Apr 2012	3 years
Horn Antenna (1-18GHz)	3115	ETS	00035114	Mar 2012	3 years
Horn Antenna (18-40GHz)	3116	ETS	00070497	Aug 2011	3 years
Communication Antenna	IBP5-900/1940	Kathrein	n/a	n/a	n/a
High Pass Filter	5HC2700	Trilithic Inc.	9926013	Part of system calibration	
High Pass Filter	4HC1600	Trilithic Inc.	9922307	Part of system calibration	
6GHz High Pass Filter	HPM50106	Microtronics	001	Part of system calibration	
Pre-Amplifier	JS4-00102600	Miteq	00616	Part of system calibration	
Power Smart Sensor	R&S	NRP-Z81	100161	June 2013	2 Years
DC Power Supply	E3610A	Hewlett Packard	KR83021224	n/a	n/a
Multimeter	MM200	Klein	N/A	Apr 2011	2 Years
Temp Hum Logger	TM320	Dickson	03280063	Feb 2011	1 Year
Temp Hum Logger	TM325	Dickson	5285354	Feb 2011	1 Year

8 Block Diagrams



9 Revision History

Date	Report Name	Changes to report	Report prepared by
2013-08-29	EMC_INTEL-032-13001_WWAN	First Version	Daniel Salinas
2013-09-17	EMC_INTEL-032-13001_WWAN_Rev1	Updated: Section 5 summary Section 6.1.4, 6.1.6 measurement procedure. Added conducted bandedge plots	Tunji Yusuf