

Report No.SH16030055W12

FCC RF TESTREPORT

Issued to

TRIMBLE EUROPE B.V.

For

Rugged Smart Phone

Model Name : MobileMapper50_4G
Trade Name : Spectra Precision
Brand Name : Spectra Precision
Standard : 47 CFR Part 2,
47 CFR Part 22 Subpart H
47 CFR Part 24 Subpart E
RSS-132 issue 3
RSS-133 issue 6
FCC ID : NZI-10900300
IC ID : 9288A-10900300
Test date : Apr.27,2016 to May.4,2016
Issue date : Jul.12,2016

by

Shanghai Skylabs Co., Ltd.

Tested by Wn Hongfei



Approved by Guo Jie

Review by Leonard Bao

The report refers only to the sample tested and does not apply to the bulk. This report is issued in confidence to the client and it will be strictly treated as such by the Shanghai Skylabs Co., Ltd. It may not be reproduced rather in its entirety or in part and it may not be used for adverting. The client to whom the report is issued may, however, show or send it, or a certified copy thereof prepared by the Shanghai Skylabs Co., Ltd to his customer. Supplier or others persons directly concerned. Shanghai Skylabs Co., Ltd will not, without the consent of the client enter into any discussion of correspondence with any third party concerning the contents of the report. In the event of the improper use of the report, Shanghai Skylabs Co., Ltd reserves the rights to withdraw it and to adopt any other remedies which may be appropriate.



DIRECTORY

1.	General Information	4
1.1	Applicant	4
1.2	Manufacturer	4
1.3	Description of EUT	4
2.	Facilities and Accreditations	6
2.1	Test Facility	6
2.2	Environmental Conditions	6
2.3	List of Equipments Used	7
3.	Test Standards and Results	8
4.	Test Result	9
4.1	Conducted Output Power	9
4.2	99%/-26dB Occupied Bandwidth	11
4.3	Frequency Stability	18
4.4	Peak-to-Average Ratio	21
4.5	Conducted Out of Band Emissions	28
4.6	Band Edge	35
4.7	Transmitter Radiated Power (EIRP/ERP)	40
4.8	Radiated Out of Band Emissions	43
	Photos of the EUT	48

**Change History**

Issue	Date	Reason for change
1.0	May.5,2016	First edition
2.0	Jul.12,2016	Second edition



1. General Information

1.1 Applicant

TRIMBLE EUROPE B.V.

European Regional Fulfilment Centre
Meerheide, 45
5521DZ Eersel
THE NETHERLANDS

1.2 Manufacturer

TRIMBLE EUROPE B.V.

European Regional Fulfilment Centre
Meerheide, 45
5521DZ Eersel
THE NETHERLANDS

1.3 Description of EUT

EUT Type: Rugged Smart Phone
Brand Name.....: MobileMapper50_4G
Trade Name: Spectra Precision
Model Name: Spectra Precision
Hardware Version: MM50.4G_V1.0
Software Version: MM50.4G.16.22.39
Antenna type.....: ABS Frame and FPC antenna
Antenna gain.....: GSM 850: -2.56 dBi
GSM 1900: 1.03 dBi
Frequency Range..... GSM 850MHz:
Tx: 824.20-848.80 MHz (at intervals of 200kHz);
Rx: 869.20-893.80 MHz (at intervals of 200kHz)
GSM 1900MHz
Tx: 1850.20-1909.80 MHz (at intervals of 200kHz);
Rx: 1930.20-1989.80 MHz (at intervals of 200kHz)
Modulation Type.....: GPRS/GSM mode with GMSK modulation
EGPRS mode with 8PSK modulation
Battery.....: 3.8V

NOTE:

(1) The transmitter (Tx) frequency arrangement of the cellular 850MHz used by the EUT can be represented with the formula $F(n)=824.2+0.2*(n-128)$, $128 \leq n \leq 251$; the lowest, middle, highest channel numbers (ARFCHs) used and tested in this report are separately 128 (824.2MHz), 190(836.6MHz) and 251 (848.8MHz); the PCS 1900MHz used by the EUT can be represented with the formula $F(n)=1850.2+0.2*(n-512)$, $512 \leq n \leq 810$; the lowest, middle, highest channel numbers



(ARFCHs) used and tested in this report are separately 512 (1850.2MHz), 661(1880.0MHz) and 810 (1909.8MHz).

(2) For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.



2. Facilities and Accreditations

2.1 Test Facility

Shanghai Skylabs Co., Ltd. Skylabs Laboratory is a third party testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L6644. A 9*6*6(m) fully anechoic chamber was used for the radiated spurious emissions test.

2.2 Environmental Conditions

Ambient temperature: 20~25°C

Relative humidity: 40~60%

Atmosphere pressure: 86-102kPa



2.3 List of Equipments Used

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
System Simulator	Agilent	E5515C	GB46040102	2015.9.22	1year
Spectrum Analyzer	Rohde&Schwarz	FSU26	200880	2016.2.25	1year
Power Splitter	Weinschel	1506A	NW521	(n.a.)	(n.a.)
Power Splitter	Mini-Circuits	ZFRSC-183-S+	765001016	(n.a.)	(n.a.)
Attenuator 1	Mini-Circuits	10dB	(n.a.)	(n.a.)	(n.a.)
Attenuator 2	Resnet	10dB	(n.a.)	(n.a.)	(n.a.)
Attenuator 3	Resnet	3dB	(n.a.)	(n.a.)	(n.a.)
DC Power Supply	Good Will	GPS-3030DD	EF920938	2015.10.12	2year
Temperature Chamber	YinHe Experimental Equip.	HL4003T	(n.a.)	2015.9.20	1year
Full/Half-Anechoic Chamber	CHENGYU	9.2×6.25×6.15m	SAR	2015.9.14	3year
Singal Generator	Rohde&Schwarz	SMF100A	101935	2015.9.22	1year
Broadband Trilog Antenna	Schwarzbeck	VULB 9163	9163-561	2015.9.25	1year
Substitution Broadband Trilog Antenna	Schwarzbeck	VULB 9163	9163-572	2015.9.25	1year
Broadband Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-1033	2015.7.25	1year
Substitution Broadband Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-1034	2015.7.25	1year
Broadband Horn Antenna	Schwarzbeck	BBHA 9170	BBHA91970171	2015.9.22	1year
Substitution Broadband Horn Antenna	Schwarzbeck	BBHA 9170	BBHA91970208	2015.9.22	1year
Test Antenna-Loop	Rohde&Schwarz	HFH2-Z2	860004/001	2015.9.22	1year
Temporary Antenna Connector	Farpu	SMA-K	(n.a.)	(n.a.)	(n.a.)
RF Cable	(n.a.)	(n.a.)	(n.a.)	(n.a.)	(n.a.)

NOTE:

Equipments listed above have been calibrated and are in the period of validation.



3. Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 2, Part 22 and part 24 for the EUT FCC ID Certification:

No.	Identity	Document Title
1	47 CFR Part 2	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
2	47 CFR Part 22	Public Mobile Services
3	47 CFR Part 24	Personal Communications Services
4	RSS-132 issue 3	Cellular Telephone Systems Operating in the Bands 824-849 MHz and 869-894 MHz
5	RSS-133 issue 6	2 GHz Personal Communications Services

Test detailed items/section required by FCC rules& IC rules and results are as below:

No.	FCC Rules	IC Rules	Description	Result
1	2.1046	RSS-132 (5.4) RSS-133 (6.4)	Conducted Output Power	PASS
2	2.1049	RSS-GEN (6.6)	99%/-26dBOccupied Bandwidth	PASS
3	2.1055 22.355 24.235	RSS-132 (5.3) RSS-133 (6.3)	Frequency Stability	PASS
4	24.232	RSS-133 (6.4)	Peak-to-Average Ratio	PASS
5	2.1051 2.1057 22.917 24.238	RSS-132 (5.5) RSS-133 (6.5)	Conducted Out of Band Emissions	PASS
6	2.1051 2.1057 22.917 24.238	RSS-GEN (6.6)	Band Edge	PASS
7	22.913 24.232	RSS-132(5.4) RSS-133 (6.4)	Transmitter Radiated Power (EIPR/ERP)	PASS
8	2.1053 2.1057 22.917 24.238	RSS-132 (5.5) RSS-133 (6.5)	Radiated Out of Band Emissions	PASS

NOTE: Measurement method according to TIA/EIA 603.D-2010



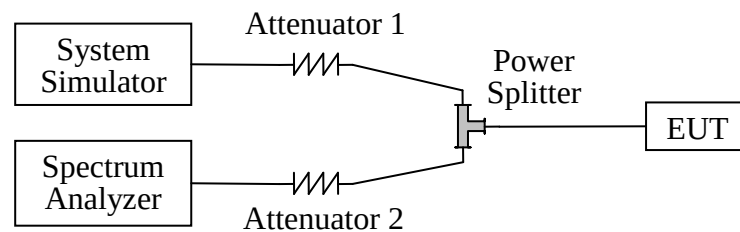
4. Test Result

4.1 Conducted Output Power

4.1.1 Requirement

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

4.1.2 Test Description



The EUT, which is powered by the DC Power Supply, is coupled to the Spectrum Analyzer (SA) and the System Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50 Ohm; the path loss as the factor is calibrated to correct the reading. The EUT is commanded by the SS to operate at the maximum output power i.e. Power Control Level (PCL) = 5 and Power Class = 4. A call is established between the EUT and the SS.



4.1.3 Test Result

Here the lowest, middle and highest channels are selected to perform testing to verify the conducted RF output power of the EUT.

Band	Channel	Frequency (MHz)	Measured Output Power(dBm)	Limited (dBm)	Verdict
GSM 850MHz	128	824.2	32.13	38.5	PASS
	190	836.6	32.25	38.5	PASS
	251	848.8	32.31	38.5	PASS
GSM 1900MHz	512	1850.2	28.87	33.0	PASS
	661	1880	28.99	33.0	PASS
	810	1909.8	28.73	33.0	PASS
GPRS 850MHz	128	824.2	32.15	38.5	PASS
	190	836.6	32.28	38.5	PASS
	251	848.8	32.34	38.5	PASS
GPRS 1900MHz	512	1850.2	28.85	33.0	PASS
	661	1880	28.99	33.0	PASS
	810	1909.8	28.72	33.0	PASS
EGPRS 850MHz	128	824.2	27.15	38.5	PASS
	190	836.6	27.28	38.5	PASS
	251	848.8	27.36	38.5	PASS
EGPRS 1900MHz	512	1850.2	27.76	33.0	PASS
	661	1880	27.77	33.0	PASS
	810	1909.8	27.78	33.0	PASS

Note:

(1) Maximum burst average power for GSM.

(2) For the GPRS and EGPRS model, all the slots were tested and just the worst data was record in this report.



4.2 99%/-26dB Occupied Bandwidth

4.2.1 Definition

According to FCC section 2.1049, the occupied bandwidth 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.

Occupied bandwidth is also known as the 99% emission bandwidth.

4.2.2 Test Description

See section 4.1.1 of this report.

4.2.3 Test Results

Here the lowest, middle and highest channels are tested to record the 99% occupied bandwidth, it's about 300kHz.

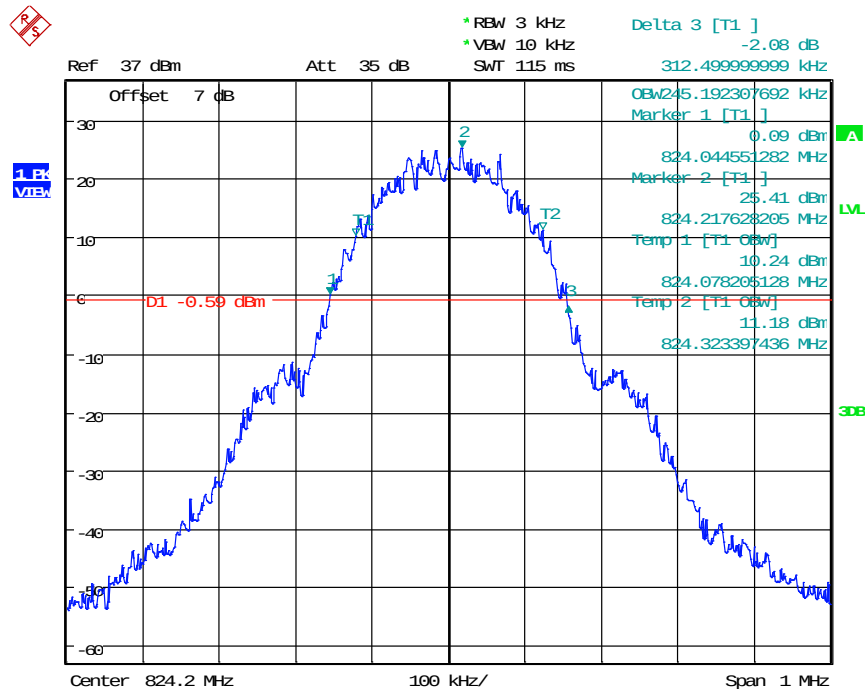
Band	Channel	Frequency (MHz)	99% Occupied Bandwidth (kHz)	-26dB Occupied Bandwidth (kHz)	Refer to Plot
GSM/GPRS 850MHz	128	824.2	245.192	312.499	A1
	189	836.4	241.987	314.102	A2
	251	848.8	243.589	312.499	A3
GSM/GPRS 1900MHz	512	1850.2	248.397	315.705	B1
	661	1880	245.192	315.705	B2
	810	1909.8	246.794	314.102	B3
EGPRS 850MHz	128	824.2	245.192	302.884	C1
	189	836.4	245.192	307.692	C2
	251	848.8	243.589	312.499	C3
EGPRS 1900MHz	512	1850.2	246.794	302.884	D1
	661	1880	241.987	309.294	D2
	810	1909.8	245.192	341.423	D3

Note :

1) Both GSM/GPRS mode was tested and the worst data was record.

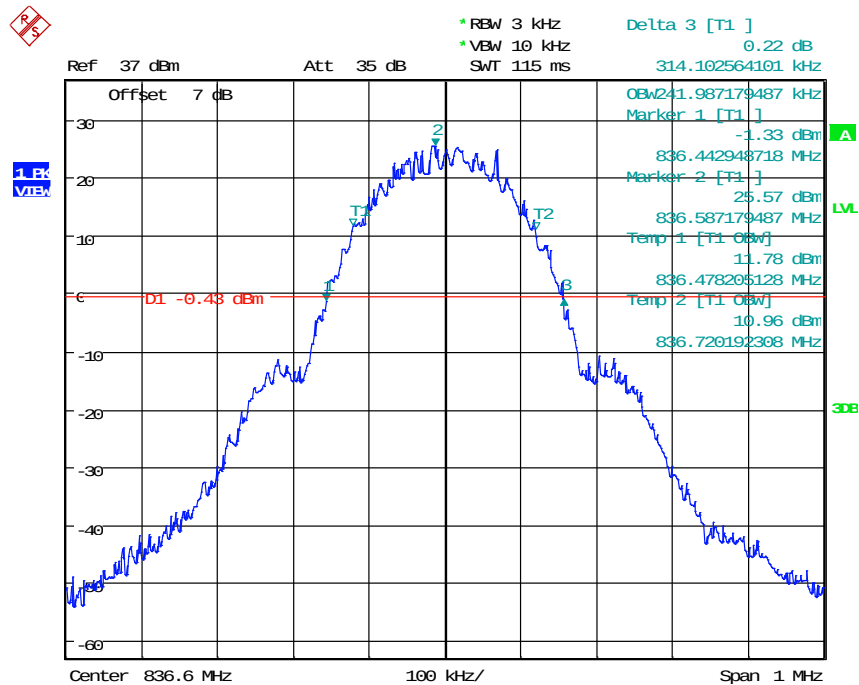


Test Plots:



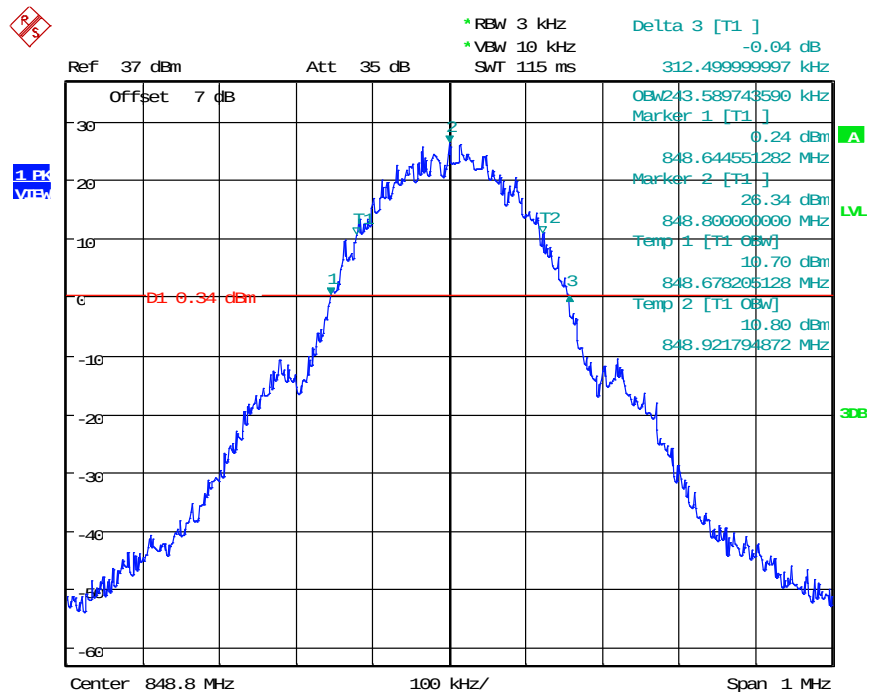
Date: 27.APR.2016 19:01:16

(Plot A1: GSM 850MHz, Channel = 128)



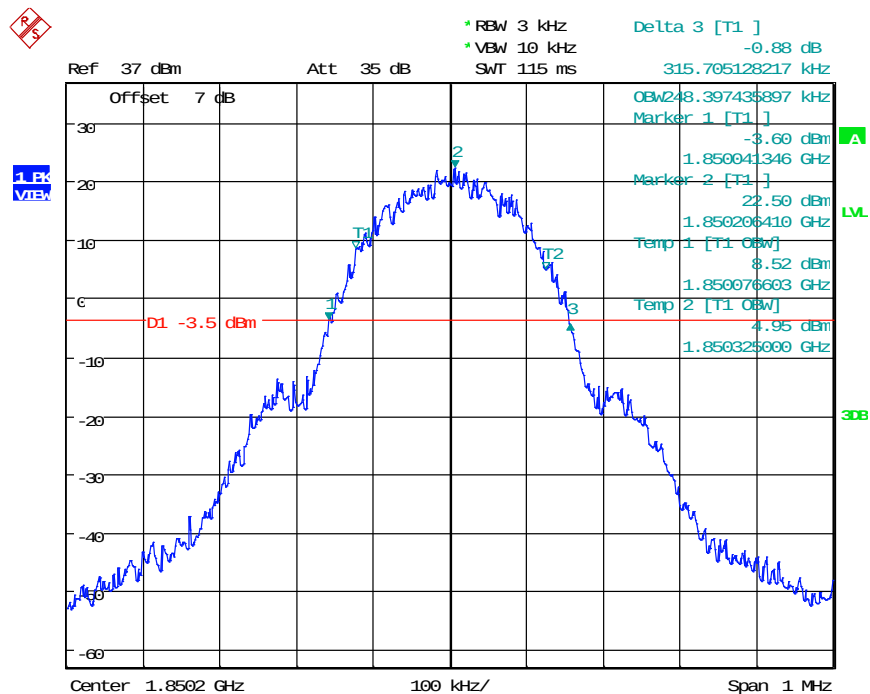
Date: 27.APR.2016 19:04:13

(Plot A2: GSM 850MHz, Channel = 189)



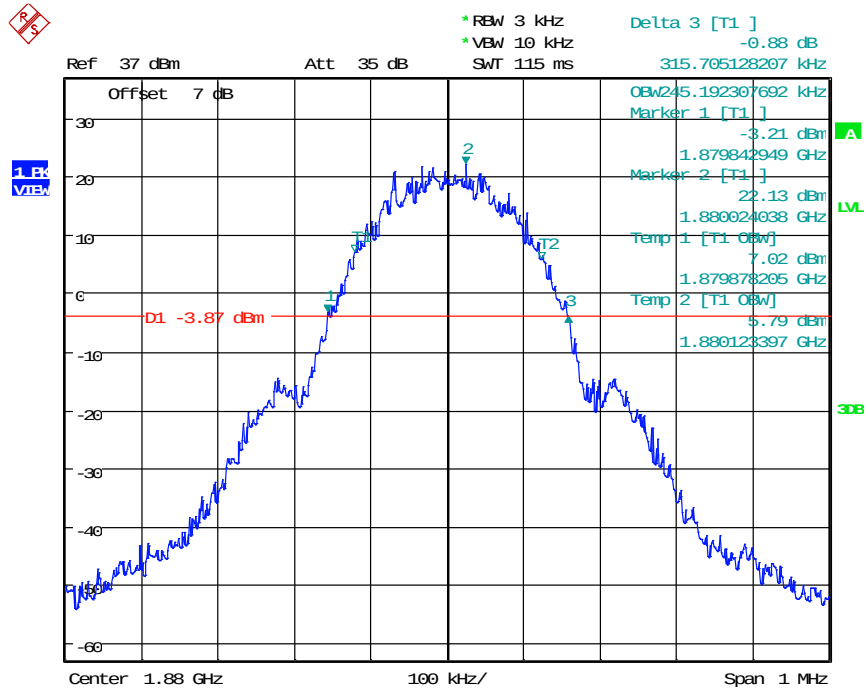
Date: 27.APR.2016 19:05:39

(Plot A3: GSM 850MHz, Channel = 251)



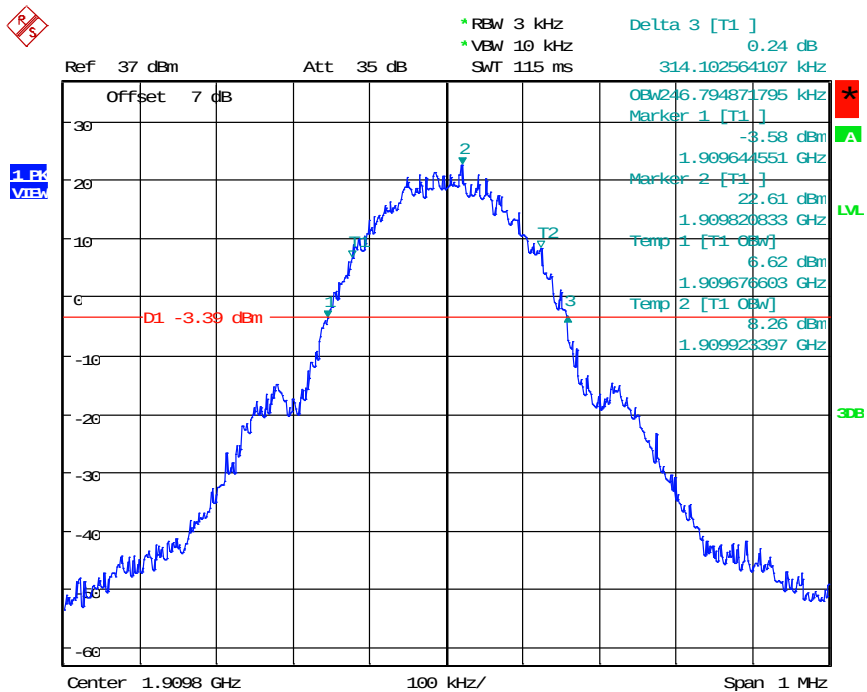
Date: 27.APR.2016 18:56:08

(Plot B1: GSM 1900MHz, Channel = 512)



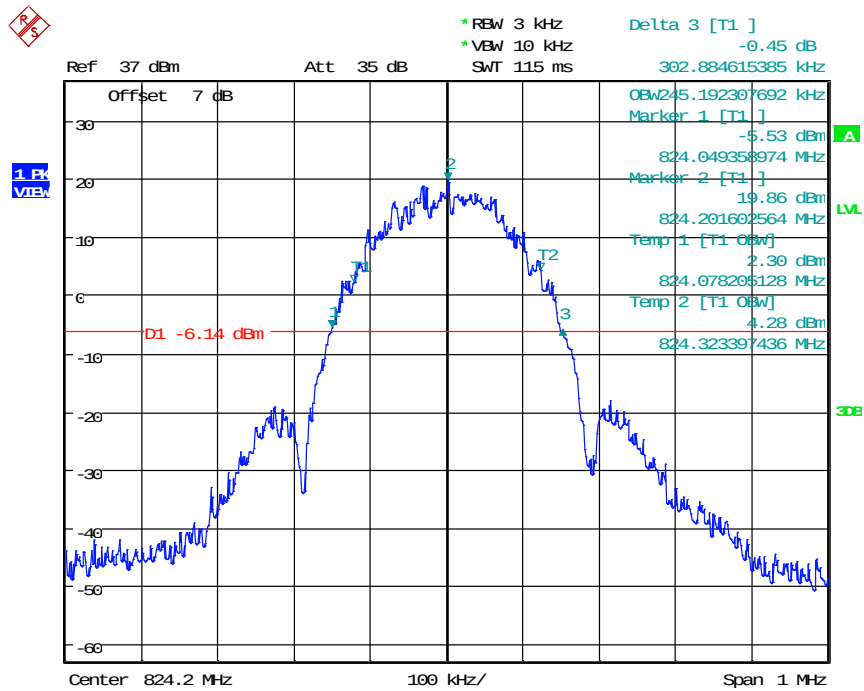
Date: 27.APR.2016 18:57:39

(Plot B2: GSM 1900MHz, Channel =661)



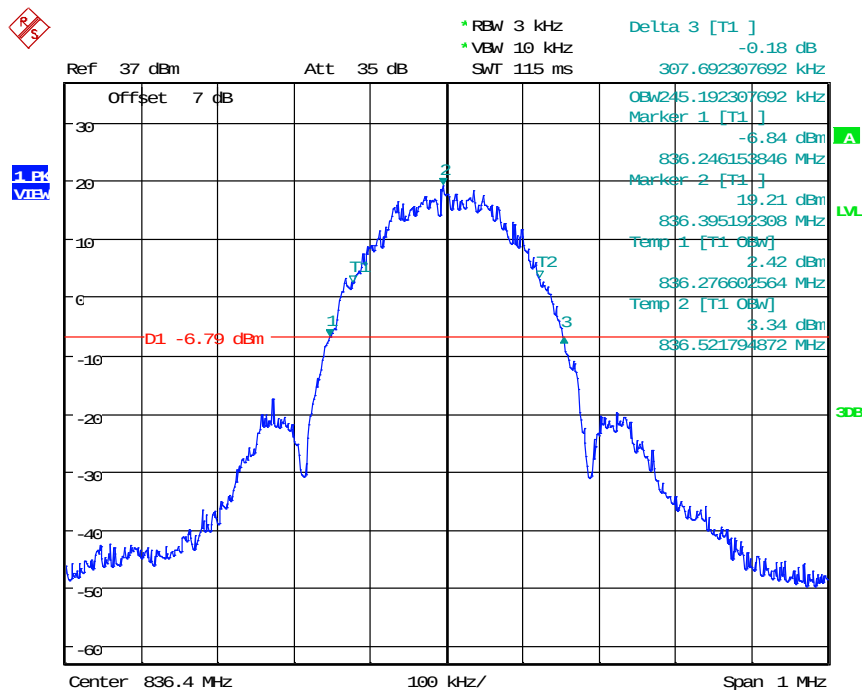
Date: 27.APR.2016 18:59:10

(Plot B3:GSM 1900MHz, Channel =810)



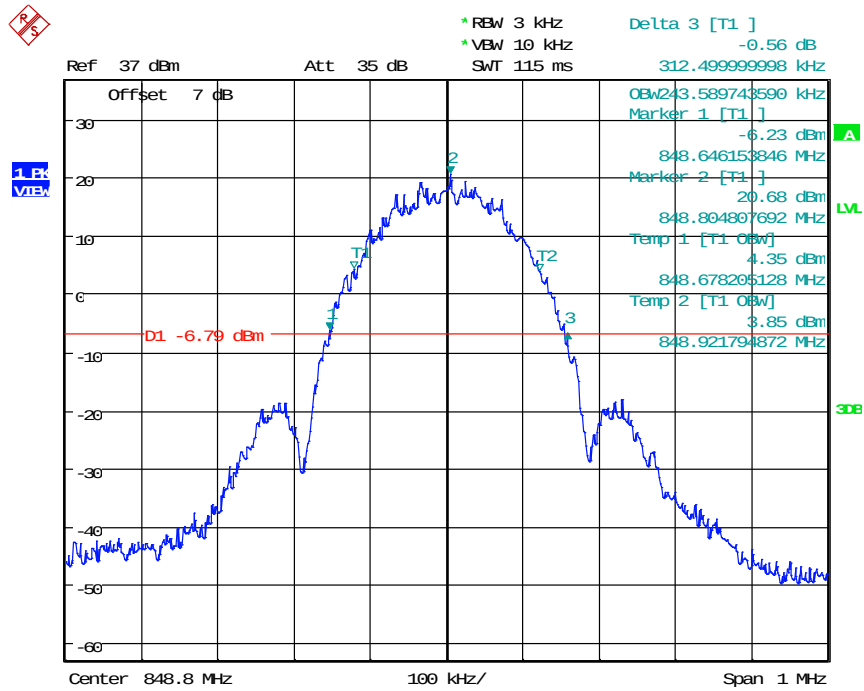
Date: 27.APR.2016 19:13:27

(Plot C1: EGPRS 850MHz, Channel = 128)



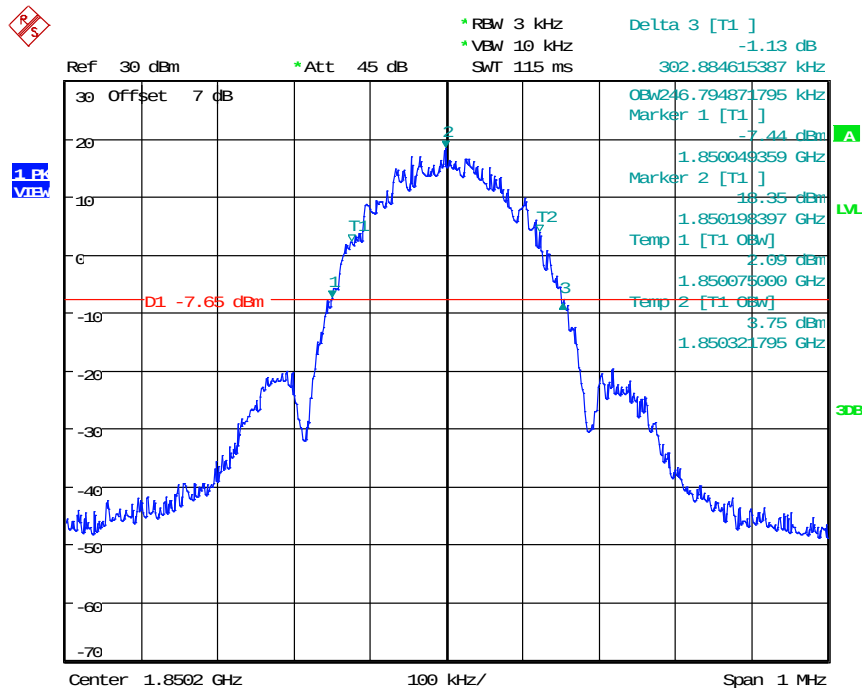
Date: 27.APR.2016 19:15:04

(Plot C2: EGPRS 850MHz, Channel = 189)



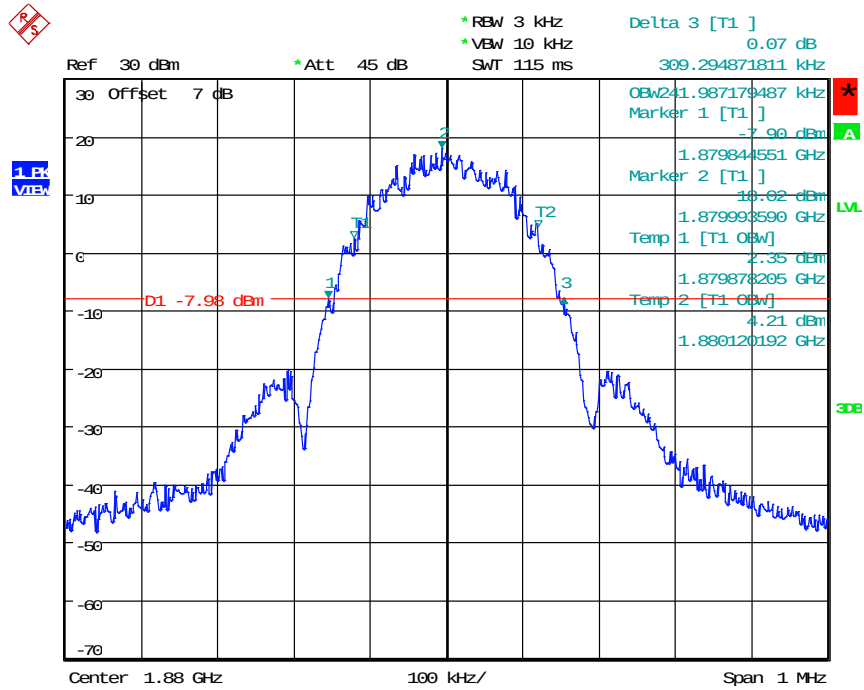
Date: 27.APR.2016 19:16:43

(Plot C3: EGPRS 850MHz, Channel = 251)



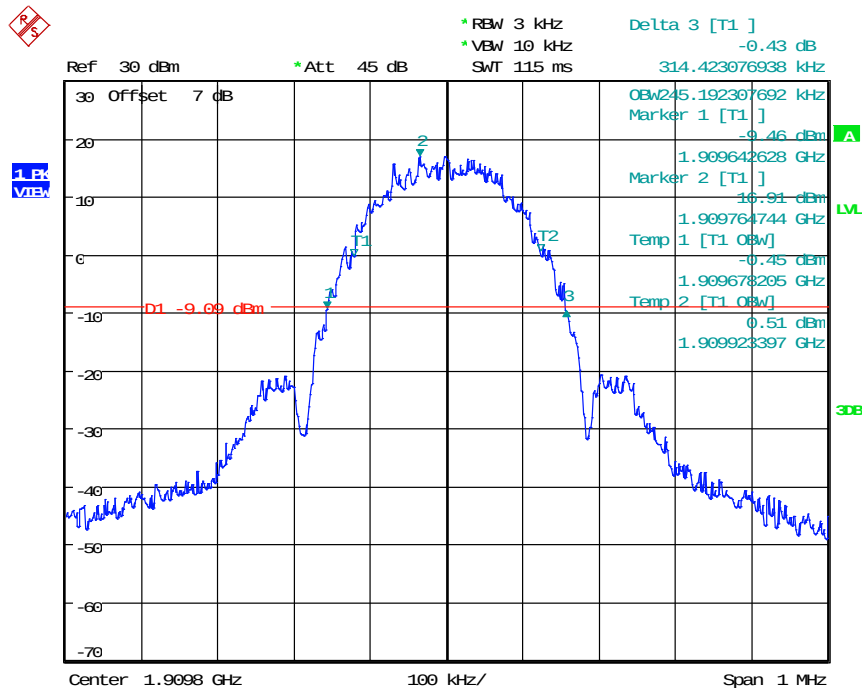
Date: 27.APR.2016 19:23:29

(Plot D1: EGPRS 1900MHz, Channel =512)



Date: 27.APR.2016 19:21:52

(Plot D2: EGPRS 1900MHz, Channel =661)



Date: 27.APR.2016 19:19:16

(Plot D3: EGPRS 1900MHz, Channel =810)



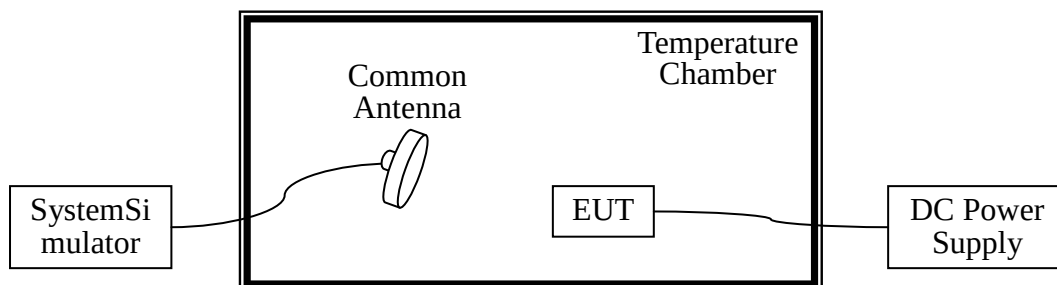
4.3 Frequency Stability

4.3.1 Requirement

According to FCC section 22.355 and FCC section 24.235, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. According to FCC section 2.1055, the test conditions are:

- (a) The temperature is varied from -30°C to $+50^{\circ}\text{C}$ at intervals of not more than 10°C .
- (b) For hand carried battery powered equipment, the primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacture. The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided.

4.3.2 Test Description



4.3.3 Test Setup

The EUT, which is powered by the DC Power Supply directly, is located in the Temperature Chamber. The EUT is commanded by the System Simulator (SS) to operate at the maximum output power i.e. Power Control Level (PCL) = 5 and Power Class = 4. A call is established between the EUT and the SS via a Common Antenna.



4.3.4 Test Results

For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer; the normal temperature here used is 25°C. The frequency deviation limit is ± 2.5 ppm.

GSM/GPRS mode

Band	Test Conditions		Frequency Deviation						Limit/Verdict
	Power (VDC)	Temp (°C)	Low Channel		Middle Channel		High Channel		±2.5ppm 850 ±1ppm 1900
			Dev. Freq. Hz	Deviation (ppm)	Dev. Freq. Hz	Deviation (ppm)	Dev. Freq. Hz	Deviation (ppm)	
850 MHz GSM/ GPRS	3.8	-30	---	---	---	---	---	---	PASS
		-20	17	0.021	-13	-0.015	-16	-0.019	
		-10	-4	-0.004	0	0.001	1	0.002	
		0	10	0.012	-9	-0.011	-9	-0.010	
		10	-5	-0.006	9	0.010	-4	-0.004	
		20	18	0.022	-13	-0.016	0	0.000	
		30	-14	-0.017	3	0.003	8	0.009	
		40	-4	-0.005	6	0.007	-16	-0.019	
		50	17	0.021	18	0.022	-1	-0.001	
		60	11	0.013	19	0.022	8	0.010	
		70	---	---	---	---	---	---	
	4.2	25	-9	-0.011	-8	-0.009	19	0.022	
	3.6	25	-6	-0.007	-13	-0.016	-4	-0.005	
1900 MHz GSM/ GPRS	3.8	-30	---	---	---	---	---	---	PASS
		-20	13	0.007	13	0.007	8	0.004	
		-10	8	0.004	2	0.002	-7	-0.004	
		0	-16	-0.009	-3	-0.004	1	0.000	
		10	14	0.008	16	0.019	10	0.005	
		20	14	0.008	-10	-0.012	9	0.005	
		30	-11	-0.006	-15	-0.018	-11	-0.006	
		40	1	0.000	-16	-0.019	-18	-0.010	
		50	14	0.007	-1	-0.001	11	0.006	
		60	-15	-0.008	-4	-0.005	15	0.008	
		70	---	---	---	---	---	---	
	4.2	25	2	0.001	2	0.002	-6	-0.003	
	3.6	25	-8	-0.004	4	0.004	-5	-0.002	



EGPRS mode

Band	Test Conditions		Frequency Deviation						Limit/Verdict
	Power (VDC)	Temp (°C)	Low Channel		Middle Channel		High Channel		±2.5ppm 850 ±1ppm 1900
			Dev. Freq. Hz	Deviation (ppm)	Dev. Freq. Hz	Deviation (ppm)	Dev. Freq. Hz	Deviation (ppm)	
850 MHz EGPRS	3.8	-30	---	---	---	---	---	---	PASS
		-20	-8	-0.010	-6	-0.007	11	0.013	
		-10	-17	-0.021	-7	-0.008	-2	-0.003	
		0	16	0.019	-8	-0.010	14	0.016	
		10	9	0.011	-7	-0.008	15	0.017	
		20	18	0.021	-18	-0.022	9	0.011	
		30	-3	-0.003	2	0.002	-12	-0.015	
		40	12	0.015	13	0.015	-15	-0.017	
		50	16	0.019	16	0.020	1	0.001	
		60	-9	-0.011	11	0.013	0	0.000	
		70	---	---	---	---	---	---	
	4.2	25	7	0.009	17	0.020	-14	-0.016	
	3.6	25	19	0.022	-1	-0.001	1	0.001	
1900 MHz EGPRS	3.8	-30	---	---	---	---	---	---	PASS
		-20	11	0.006	17	0.009	-15	-0.008	
		-10	-8	-0.004	10	0.012	-15	-0.008	
		0	-11	-0.006	4	0.005	4	0.002	
		10	-14	-0.007	10	0.012	-7	-0.004	
		20	15	0.008	-1	-0.002	2	0.001	
		30	3	0.002	13	0.015	1	0.000	
		40	1	0.001	-2	-0.003	11	0.006	
		50	13	0.007	15	0.018	16	0.009	
		60	-17	-0.009	8	0.010	12	0.006	
		70	---	---	---	---	---	---	
	4.2	25	0	0.000	-11	-0.013	15	0.008	
	3.6	25	4	0.002	-3	-0.003	15	0.008	

NOTE:

(1) The EUT stops transmitting at temperatures -30°C, 70°C

(2) The manufacturer declared that the EUT could work properly between temperatures -20°C~60°C.

(3) Normal Voltage = 3.8V; Max Voltage= 4.2V; Min Voltage=3.6V.

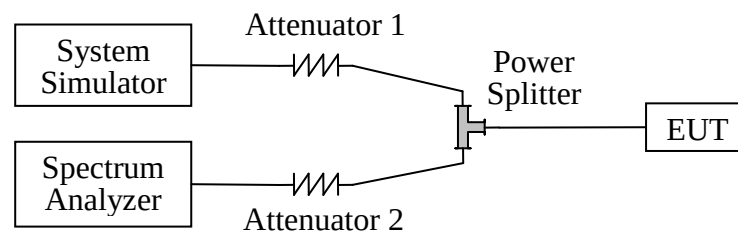


4.4 Peak-to-Average Ratio

4.4.1 Requirement

According to FCC section 24.232(d), power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (e) of this section. In both instances, equipment employed must be authorized in accordance with the provisions of §24.51. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

4.4.2 Test Description

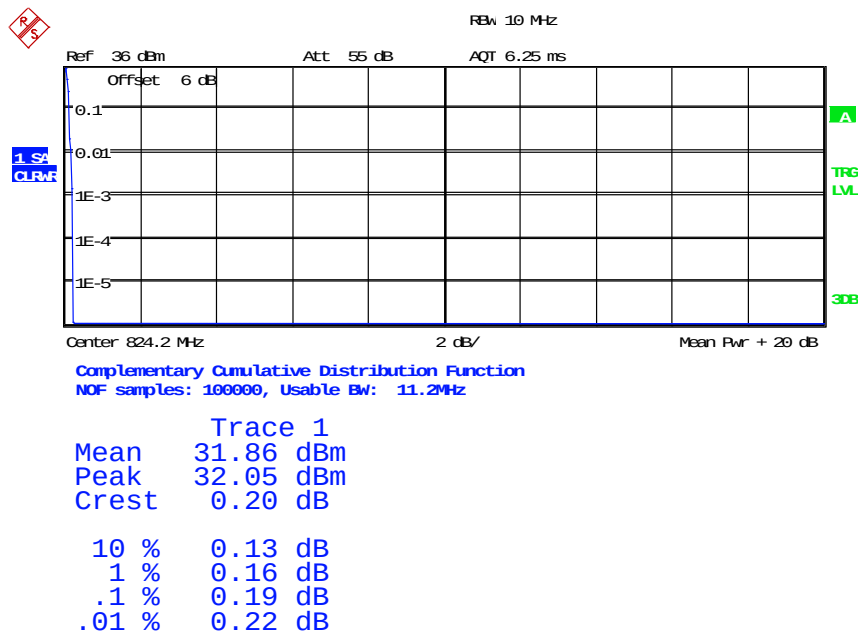


4.4.3 Test Result

Band	Channel	Frequency (MHz)	Peak-to-Average Ratio (dB)	Refer to Plot
GSM/GPRS 850MHz	128	824.2	0.22	A1
	189	836.4	0.22	A2
	251	848.8	0.26	A3
GSM/GPRS 1900MHz	512	1850.2	0.29	B1
	661	1880	0.29	B2
	810	1909.8	0.26	B3
EGPRS 850MHz	128	824.2	3.27	C1
	189	836.4	3.27	C2
	251	848.8	3.40	C3
EGPRS 1900MHz	512	1850.2	3.37	D1
	661	1880	3.62	D2
	810	1909.8	3.56	D3

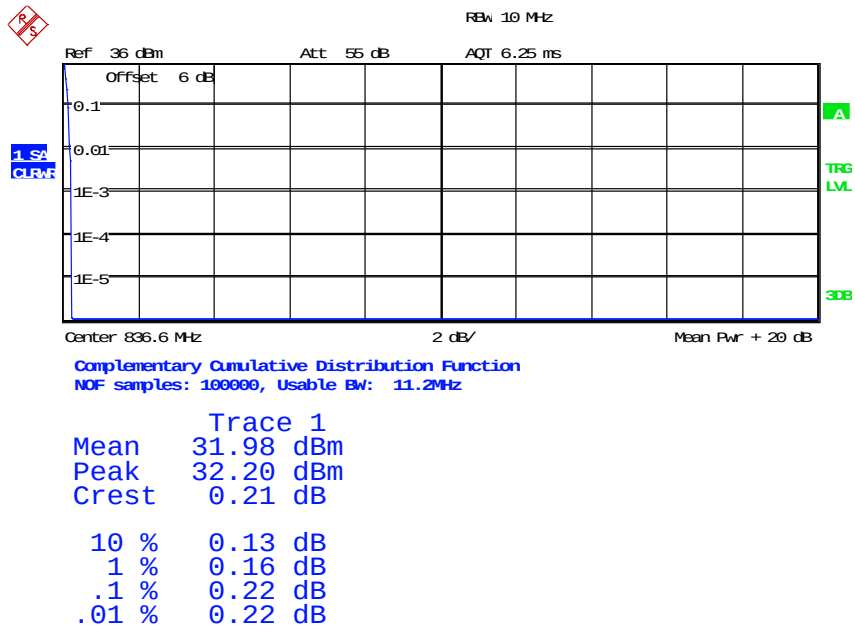


Test Plots:



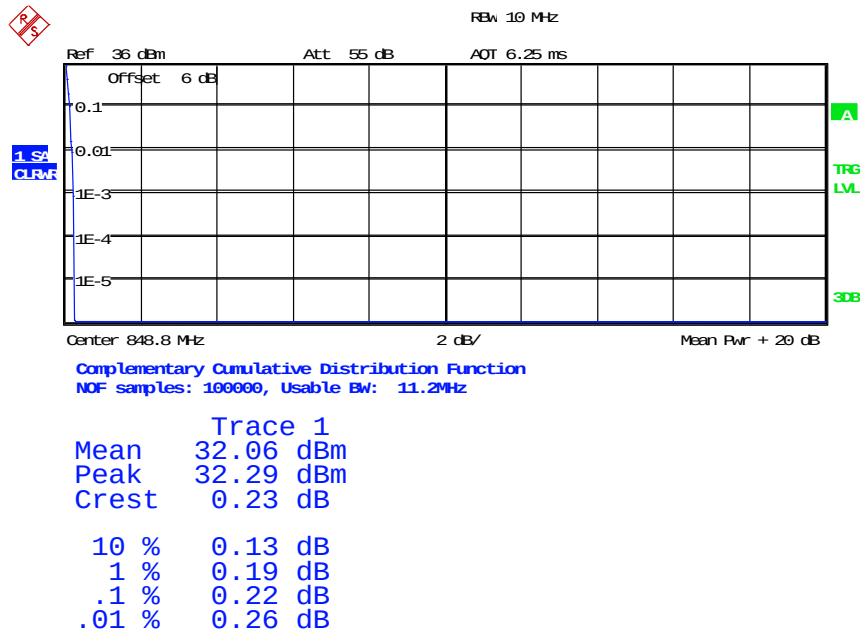
Date: 28.APR.2016 13:30:26

(Plot A1: GSM 850MHz, Channel =128)



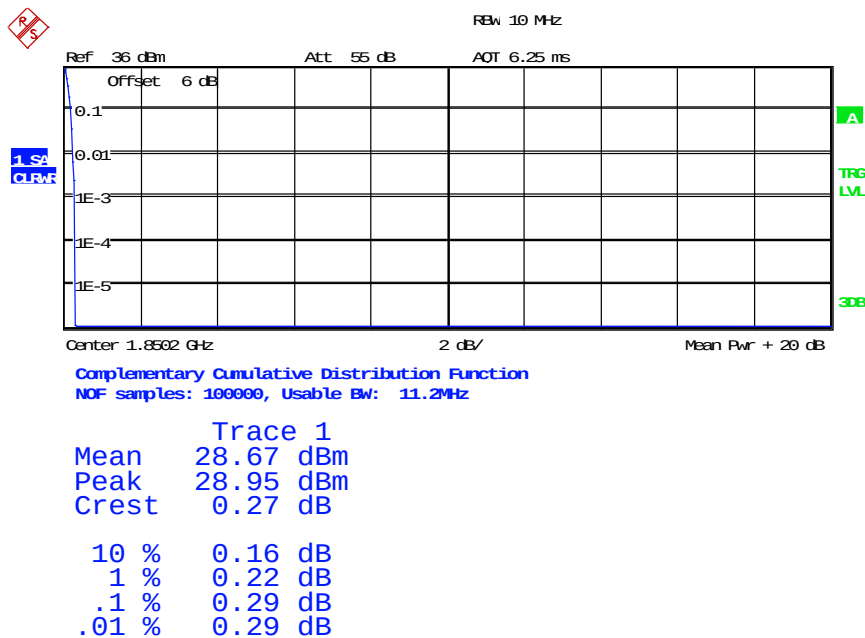
Date: 28.APR.2016 13:30:58

(Plot A2: GSM 850MHz, Channel =189)



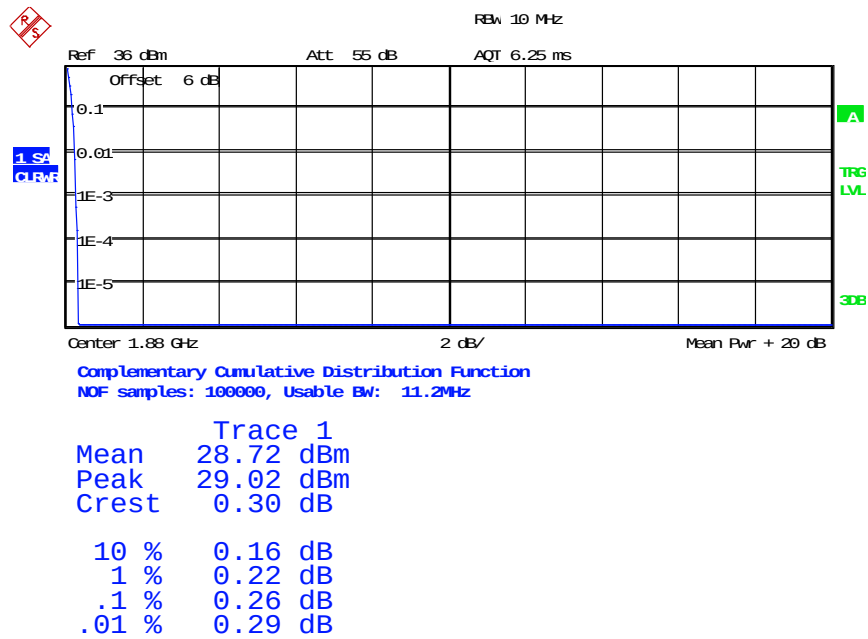
Date: 28.APR.2016 13:31:52

(Plot A3: GSM 850MHz, Channel =251)



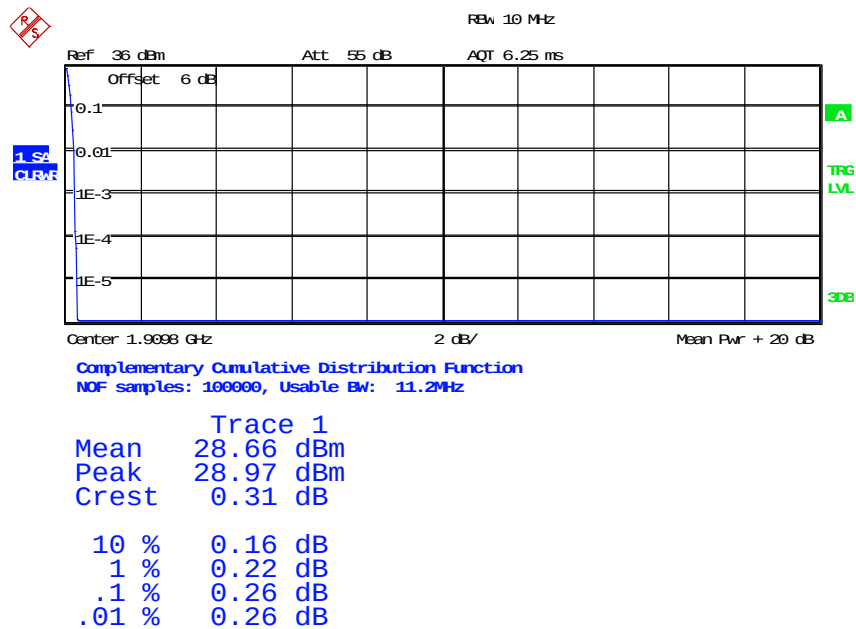
Date: 28.APR.2016 13:16:28

(Plot B1: GSM 1900MHz, Channel =512)



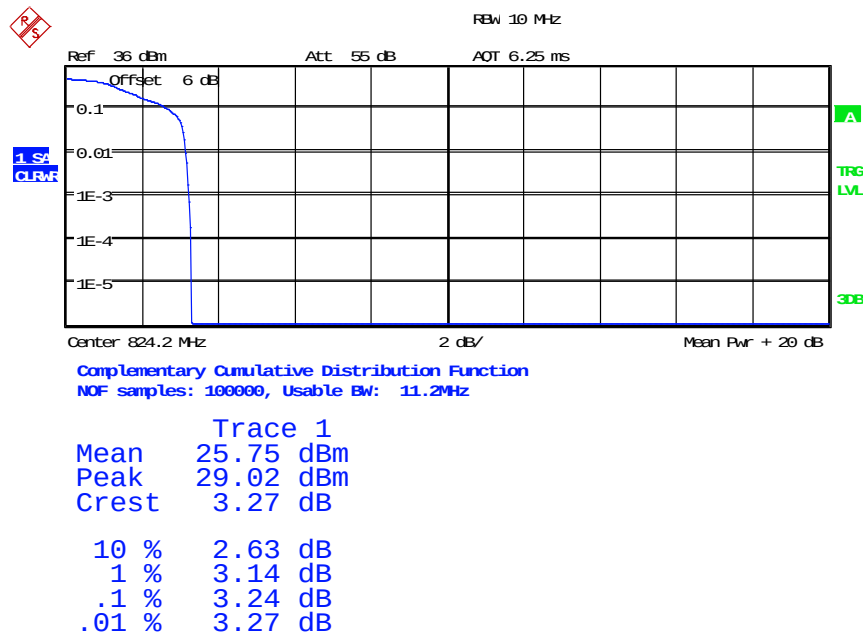
Date: 28.APR.2016 13:17:01

(Plot B2: GSM 1900MHz, Channel =661)



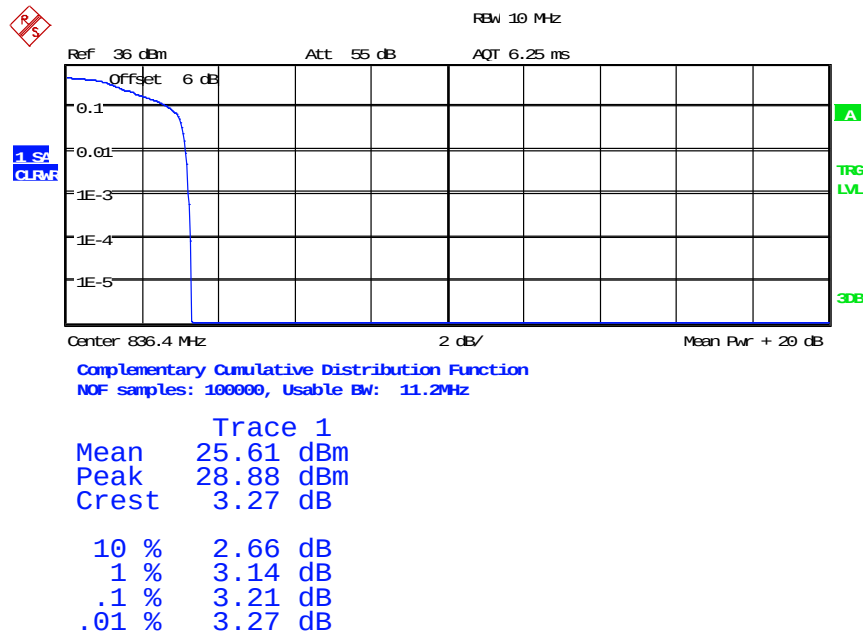
Date: 28.APR.2016 13:17:54

(Plot B3: GSM 1900MHz, Channel =810)



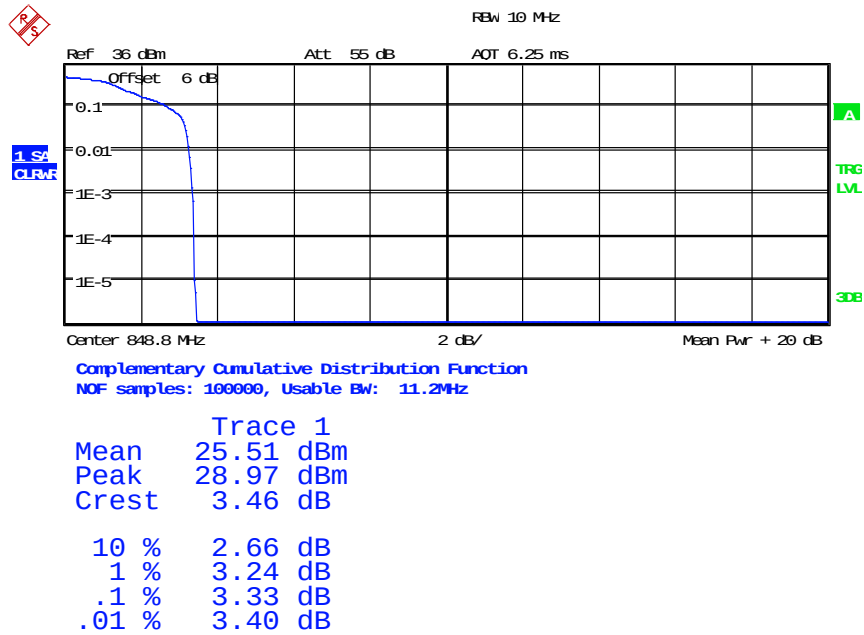
Date: 28.APR.2016 13:35:10

(Plot C1: EGPRS 850MHz, Channel =128)



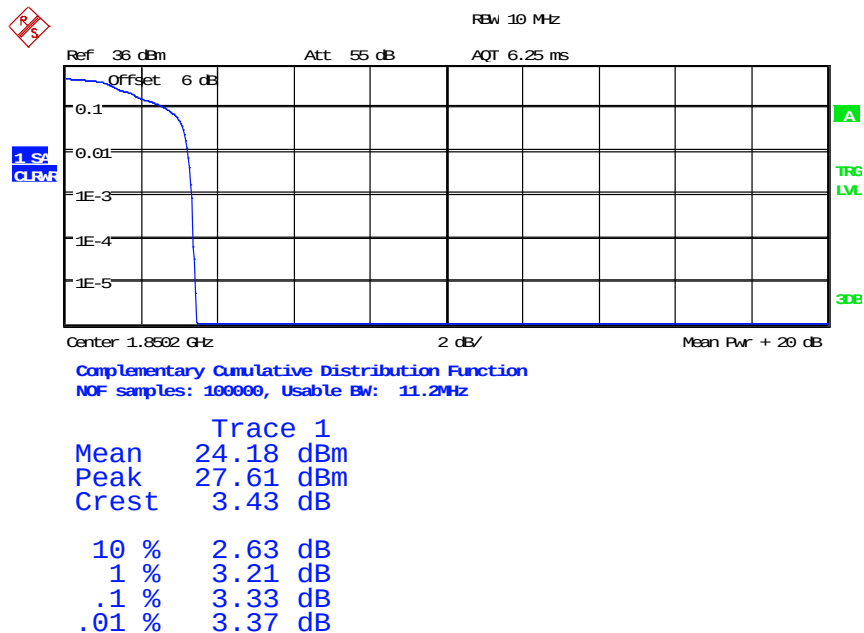
Date: 28.APR.2016 13:35:34

(Plot C2: EGPRS 850MHz, Channel =189)



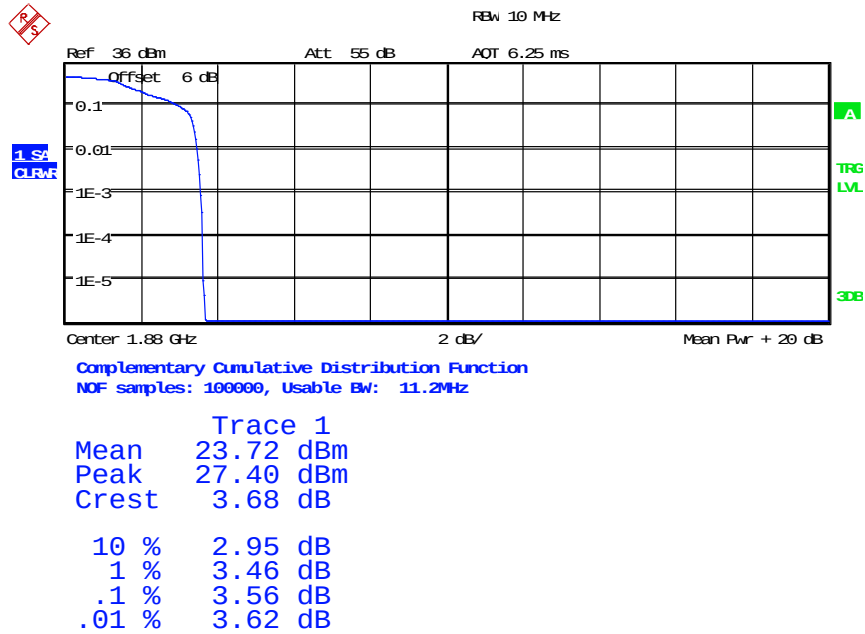
Date: 28.APR.2016 13:36:02

(Plot C3: EGPRS 850MHz, Channel =251)



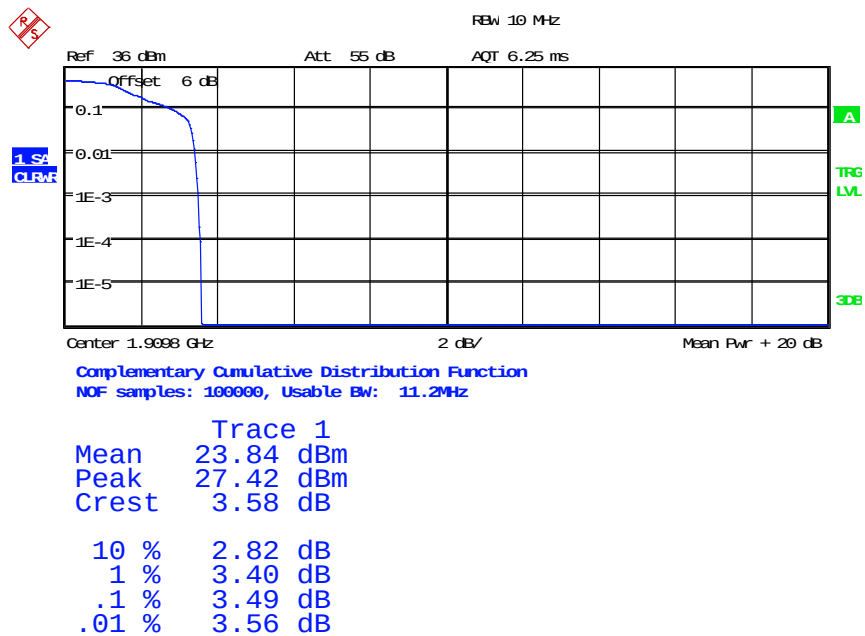
Date: 28.APR.2016 13:22:25

(Plot D1: EGPRS 1900MHz, Channel =512)



Date: 28.APR.2016 13:28:06

(Plot D2: EGPRS 1900MHz, Channel =661)



Date: 28.APR.2016 13:28:31

(Plot D3: EGPRS 1900MHz, Channel =810)



4.5 Conducted Out of Band Emissions

4.5.1 Requirement

According to FCC section 22.917(a) and FCC section 24.238(a), 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 $43 + 10 \cdot \log(P)$ dB. This calculated to be -13 dBm.

4.5.2 Test Description

See section 4.2.1 of this report.

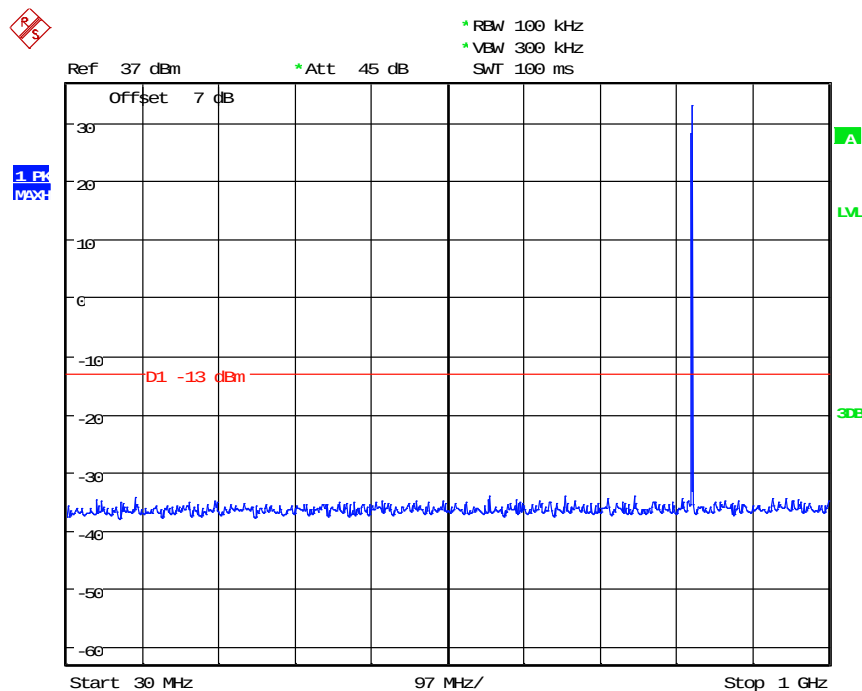
4.5.3 Test Results

The measurement frequency range is from 30 MHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the out of band emissions.

Test Plots:

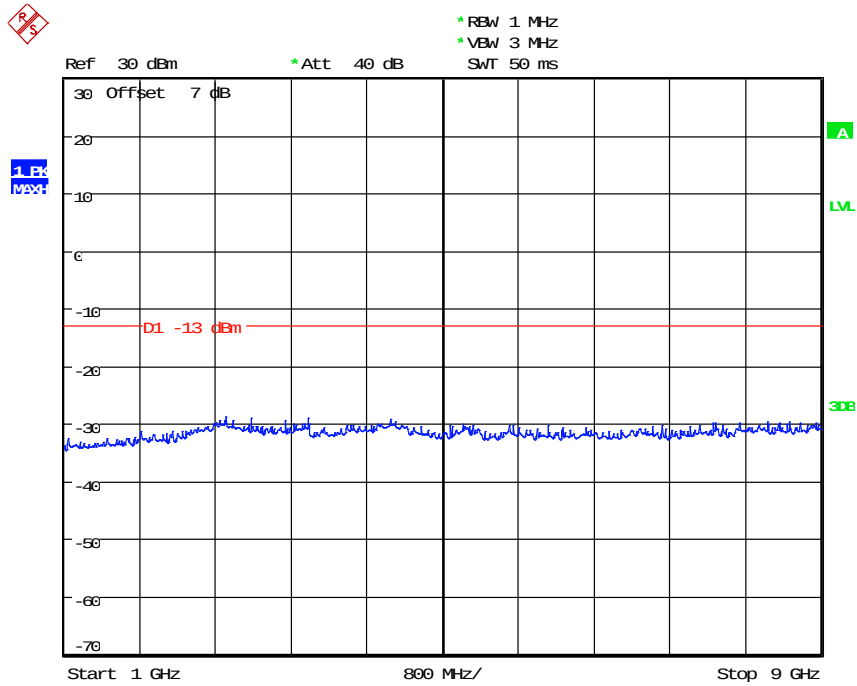
NOTE:

The power of the EUT transmitting frequency should be ignored.



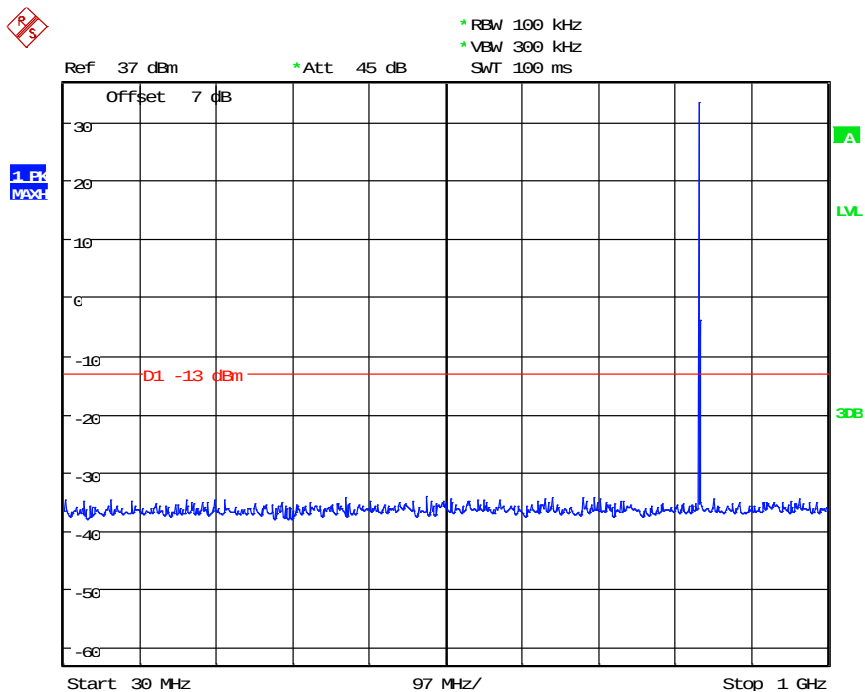
Date: 27.APR.2016 19:39:11

(GSM 850MHz, Channel = 128, 30MHz to 1GHz)



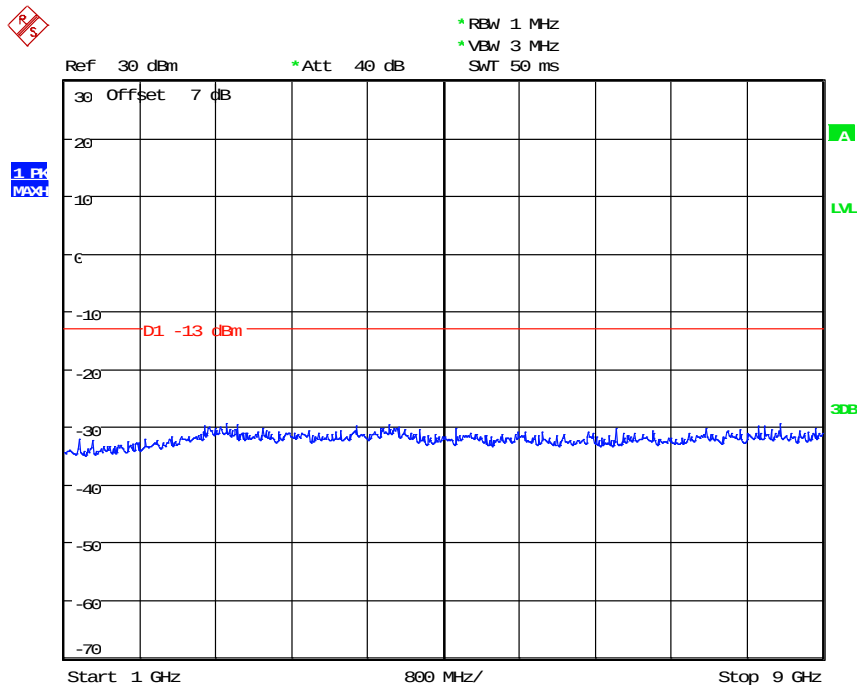
Date: 4.MAY.2016 19:05:59

(GSM 850MHz, Channel = 128, 1GHz to 9GHz)



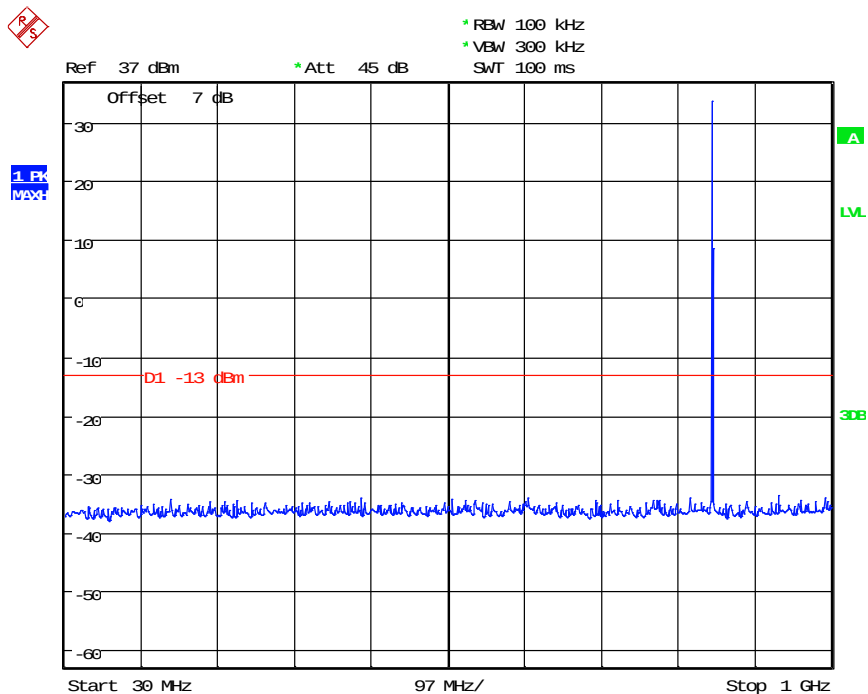
Date: 27.APR.2016 19:38:46

(GSM 850MHz, Channel = 190, 30MHz to 1GHz)



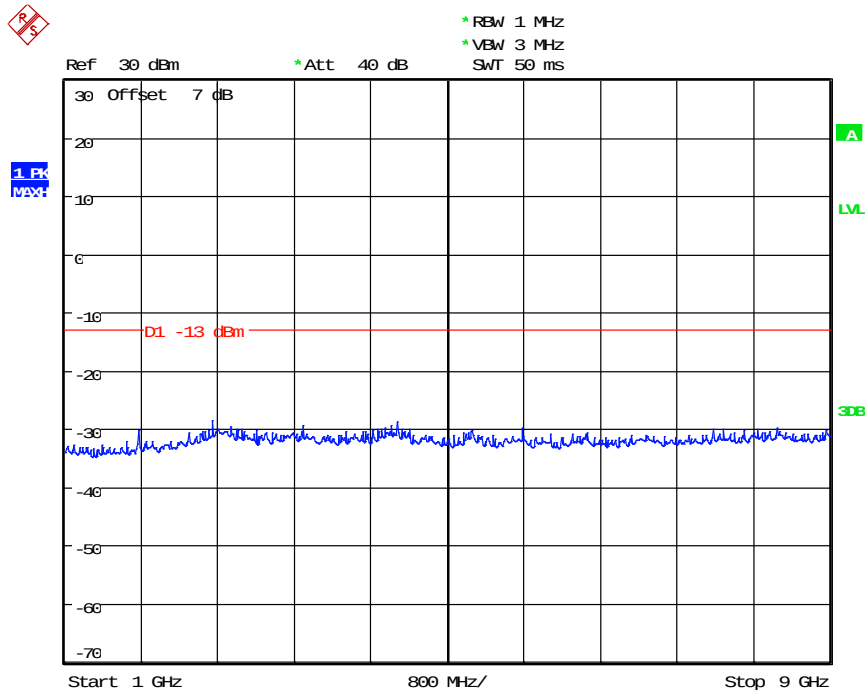
Date: 4.MAY.2016 19:06:09

(GSM 850MHz, Channel = 190, 1GHz to 9GHz)



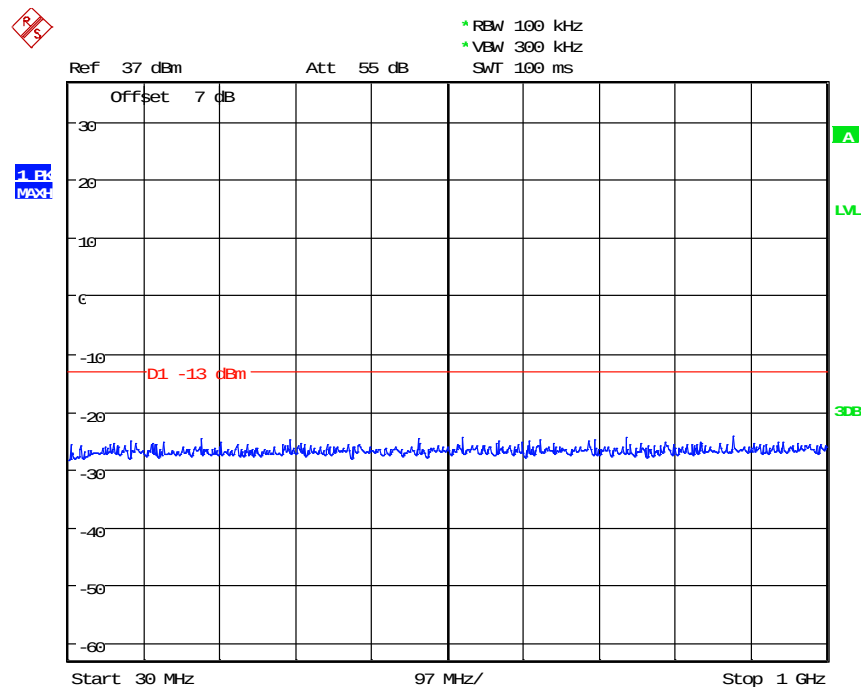
Date: 27.APR.2016 19:38:21

(GSM 850MHz, Channel = 251, 30MHz to 1GHz)



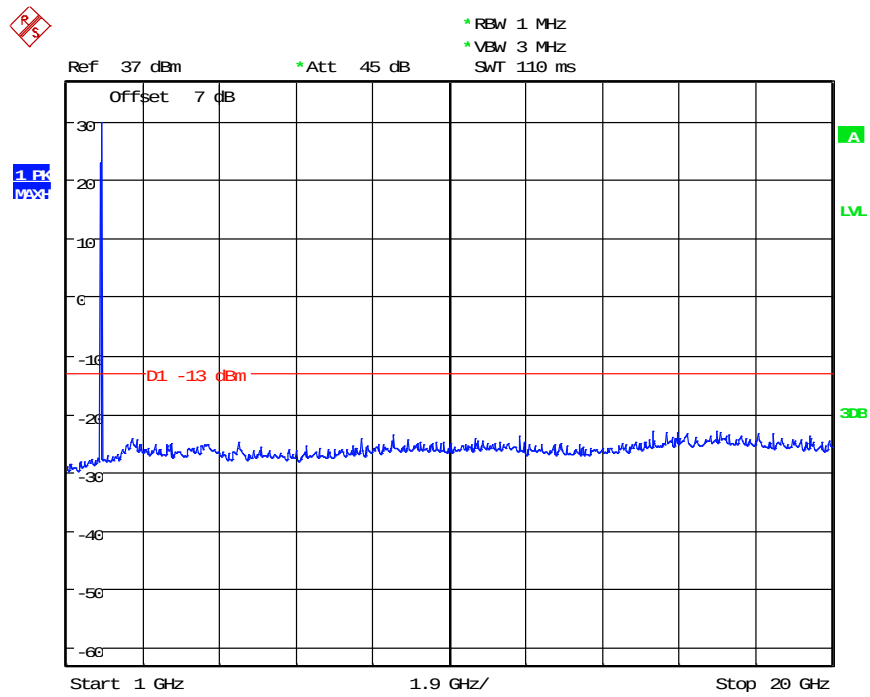
Date: 4.MAY.2016 19:06:19

(GSM 850MHz, Channel = 251, 1GHz to 9GHz)



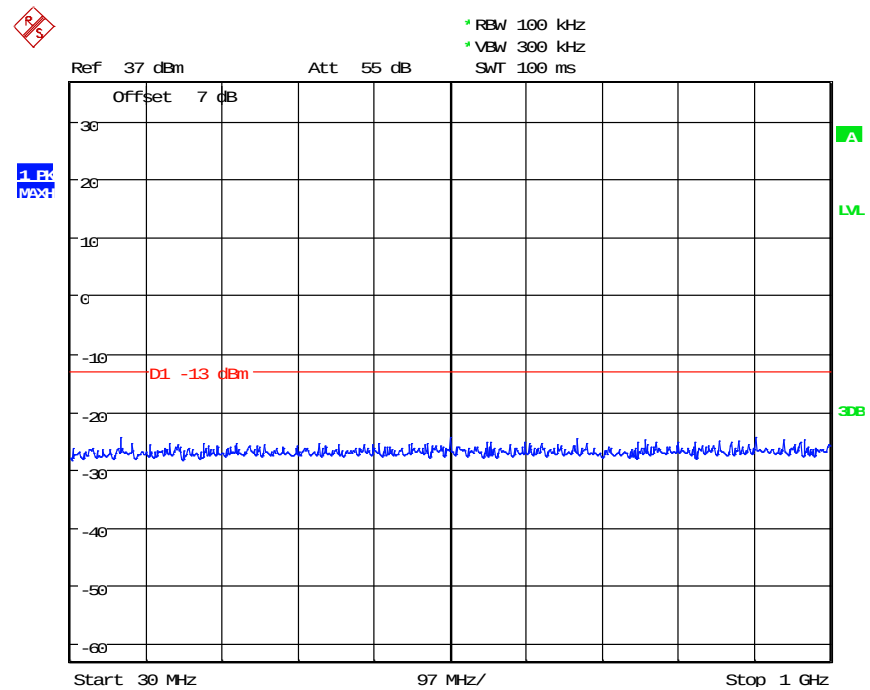
Date: 27.APR.2016 19:30:52

(GSM 1900MHz, Channel = 512, 30MHz to 1GHz)



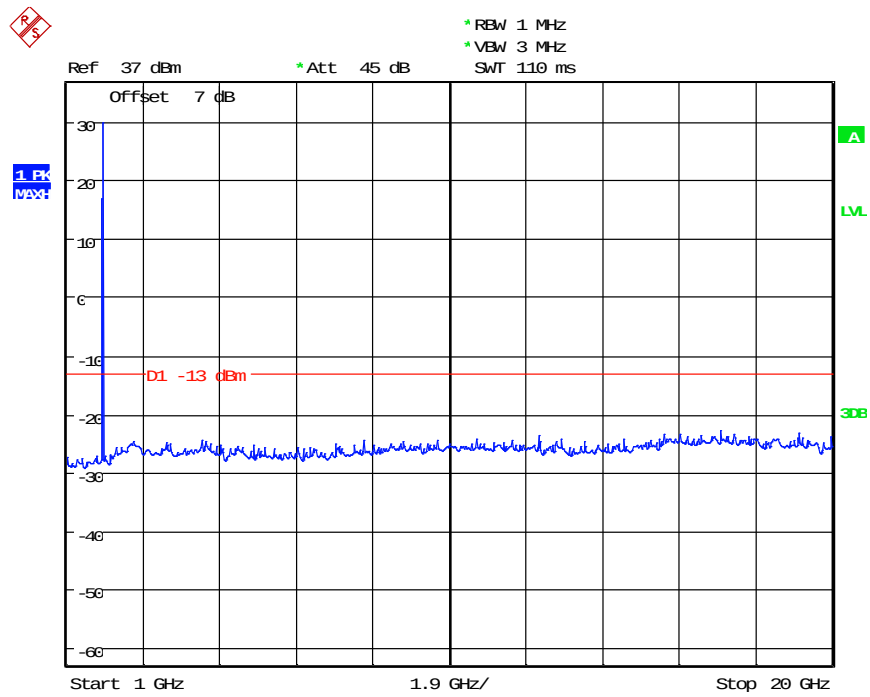
Date: 27.APR.2016 19:35:46

(GSM 1900MHz, Channel = 512, 1GHz to 20GHz)



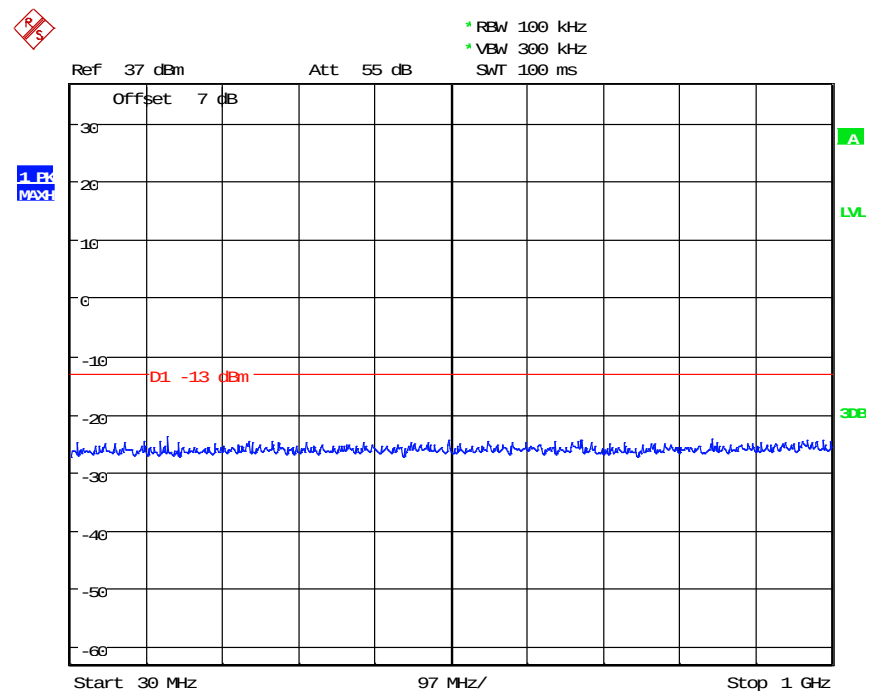
Date: 27.APR.2016 19:30:36

(GSM 1900MHz, Channel = 661, 30MHz to 1GHz)



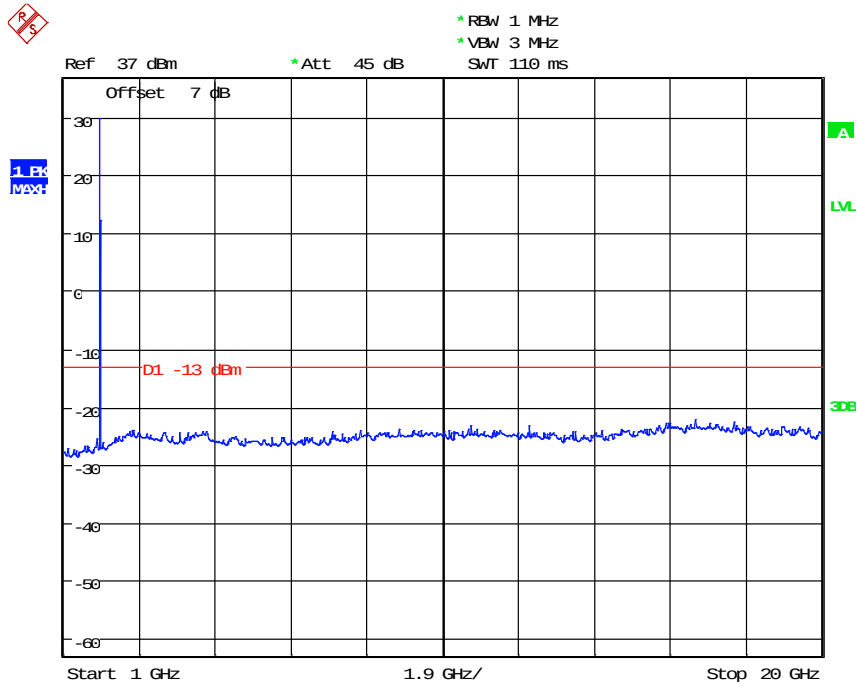
Date: 27.APR.2016 19:35:27

(GSM 1900MHz, Channel = 661, 1GHz to 20GHz)



Date: 27.APR.2016 19:30:17

(GSM 1900MHz, Channel = 810, 30MHz to 1GHz)



Date: 27.APR.2016 19:35:05

(GSM 1900MHz, Channel = 810, 1GHz to 20GHz)

NOTE:

(1) GSM/GPRS/EGRPS was tested and the worst result was reported.



4.6 Band Edge

4.6.1 Requirement

According to FCC section 22.917(b) and FCC section 24.238(b), in the 1MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth (26dB emission bandwidth) of the fundamental emission of the transmitter may be employed.

4.6.2 Test Description

See section 4.2.1 of this report.

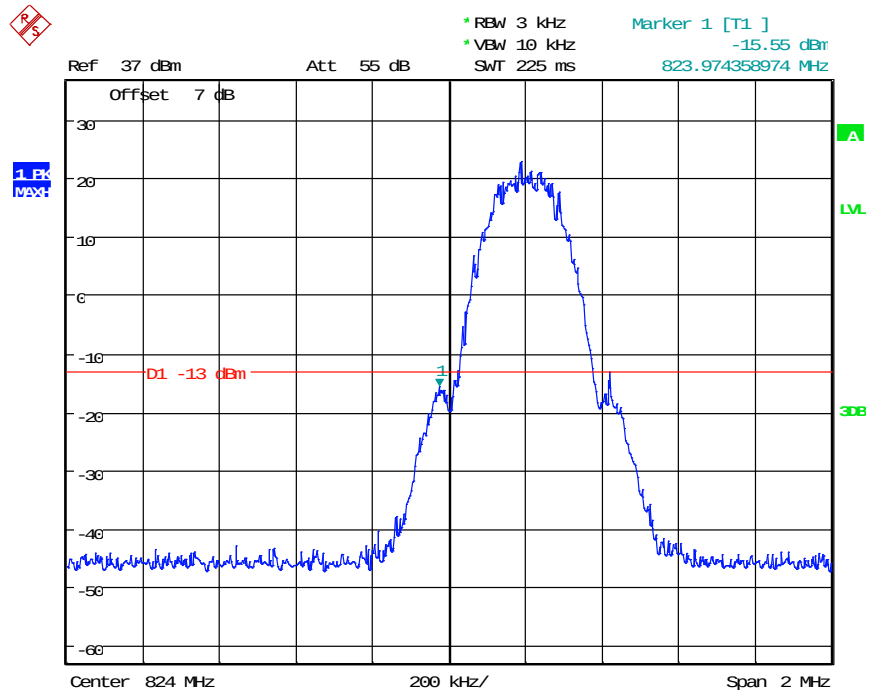
4.6.3 Test Results

The lowest and highest channels are tested to verify the band edge emissions.

Band	Channel	Frequency (MHz)	Measured Max. Band Edge Emission (dBm)	Refer to Plot	Limit (dBm)	Verdict
GSM 850MHz	128	824.2	-15.55	Plat A1	-13	PASS
	251	848.8	-15.37	Plot A2		PASS
GSM 1900MHz	512	1850.2	-14.85	Plat B1		PASS
	810	1909.8	-16.13	Plot B2		PASS
EGPRS 850MHz	128	824.2	-19.87	Plat C1		PASS
	251	848.8	-19.43	Plot C2		PASS
EGPRS 1900MHz	512	1850.2	-20.12	Plat D1		PASS
	810	1909.8	-20.64	Plot D2		PASS

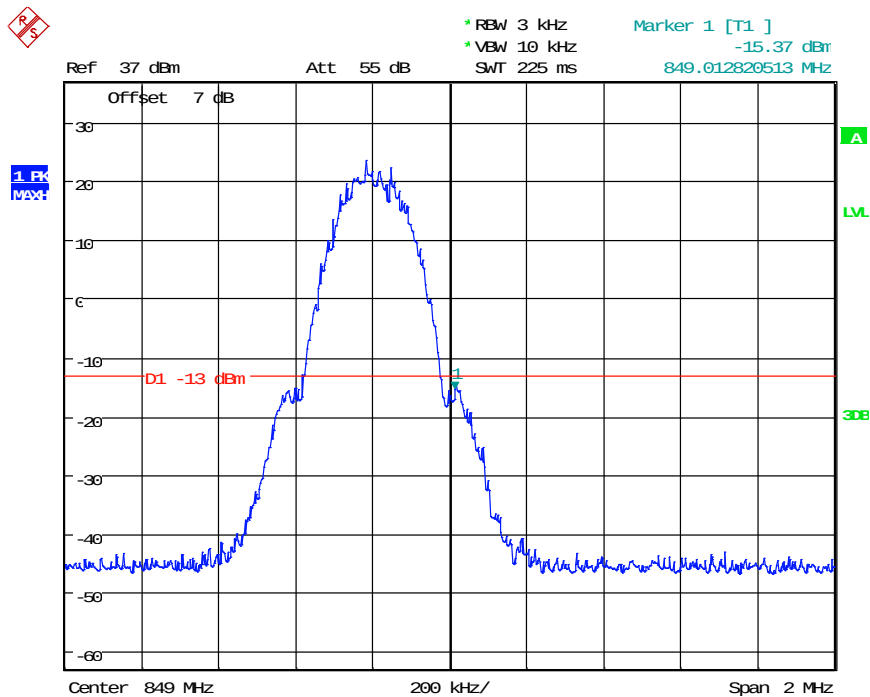


Test Plots:



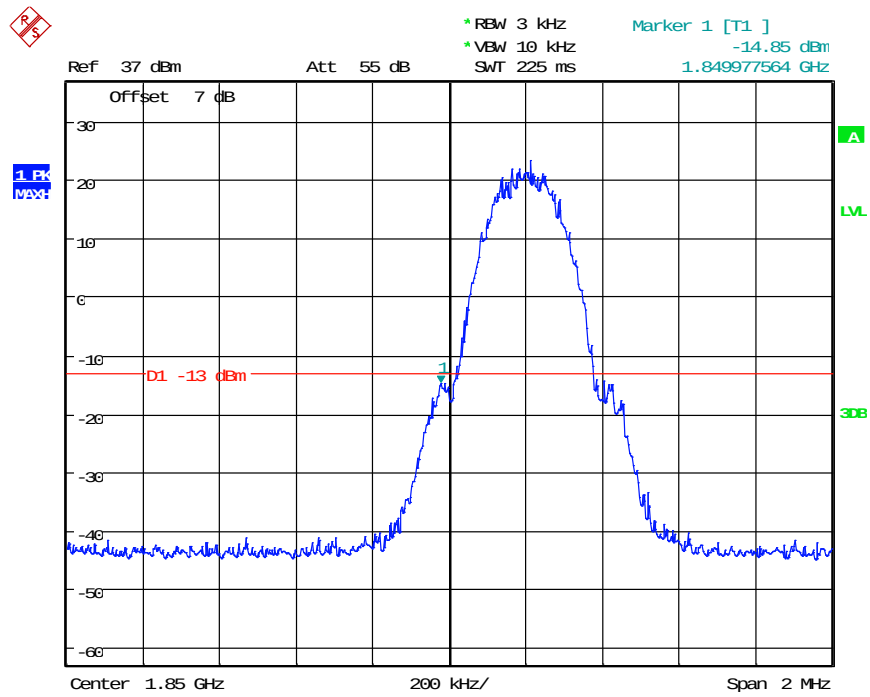
Date: 28.APR.2016 12:33:29

(Plot A1: GSM 850 Channel = 128)



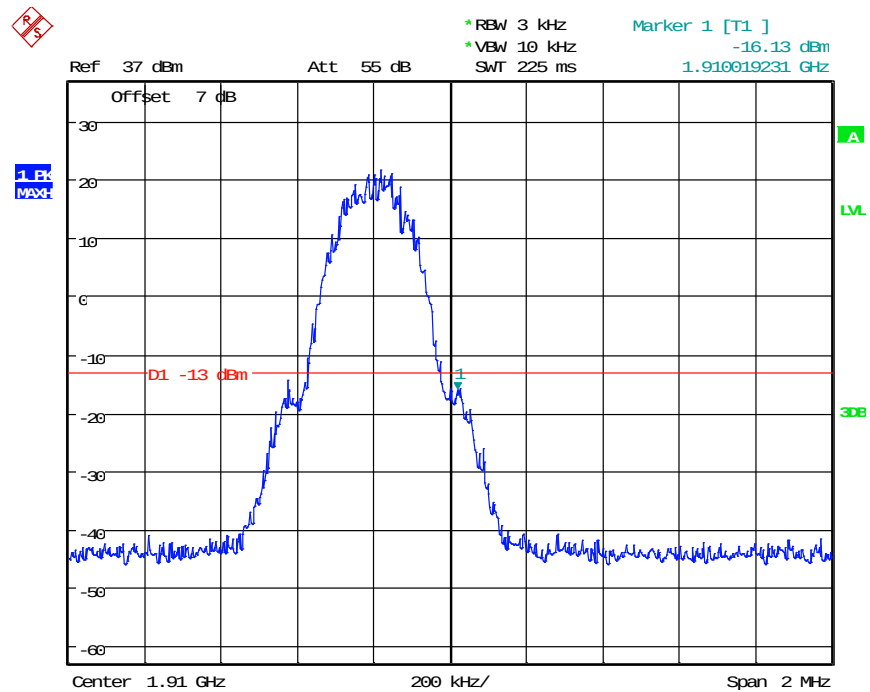
Date: 28.APR.2016 12:32:31

(Plot A2: GSM 850 Channel = 251)



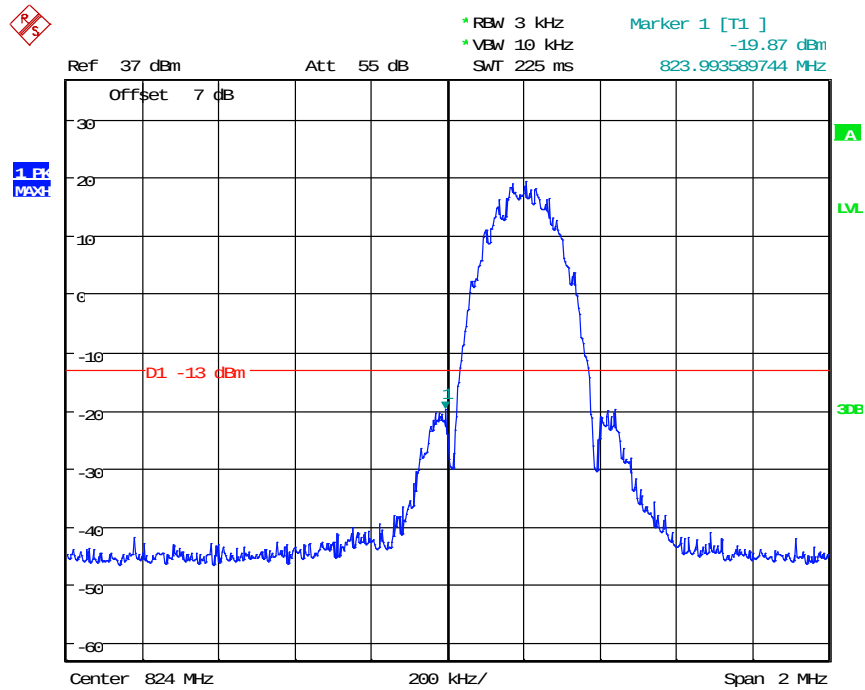
Date: 27.APR.2016 19:55:45

(Plot B1: GSM 1900 Channel = 512)



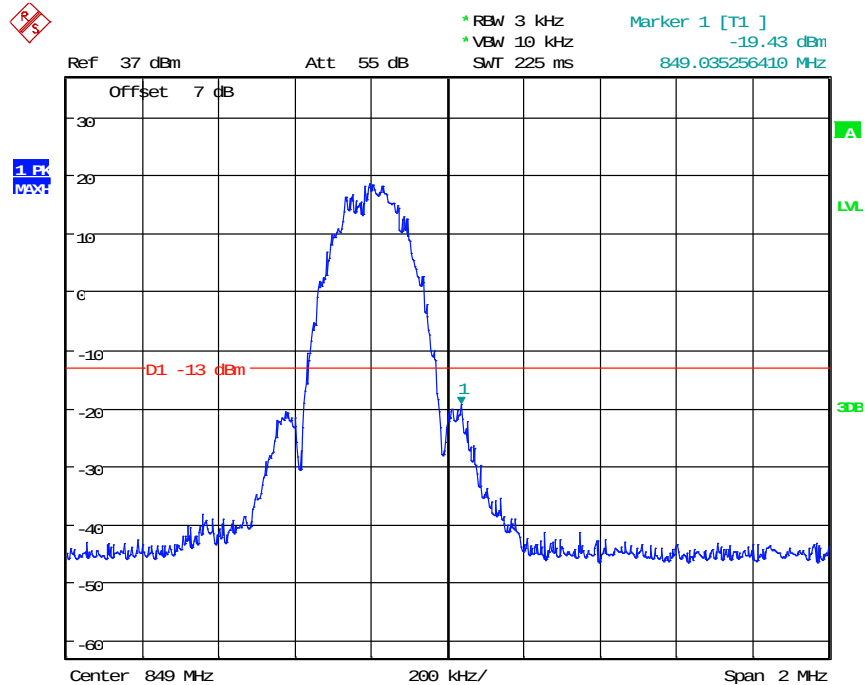
Date: 27.APR.2016 19:56:39

(Plot B2: GSM 1900 Channel = 810)



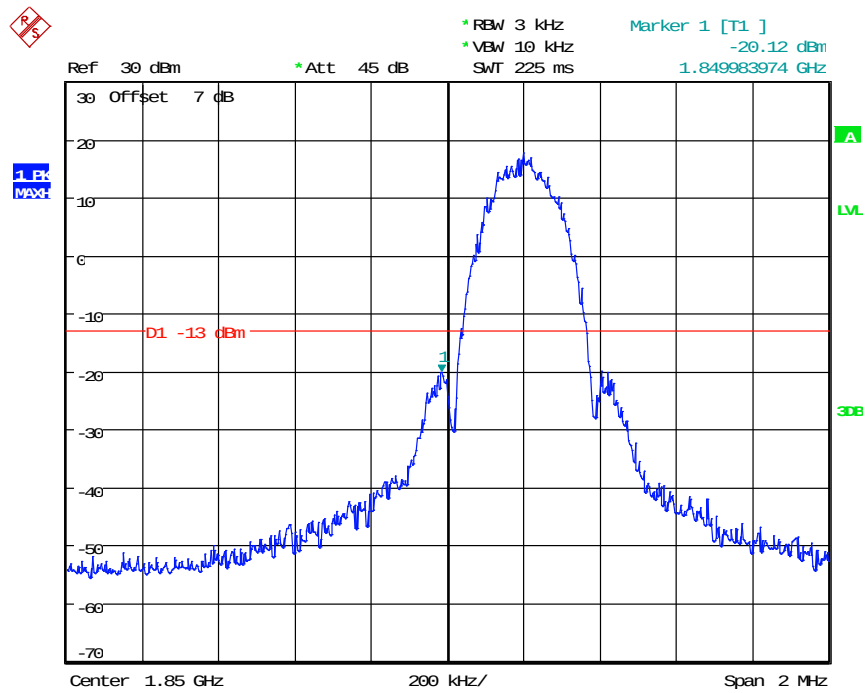
Date: 28.APR.2016 12:34:33

(Plot C1: EGPRS 850 Channel = 128)



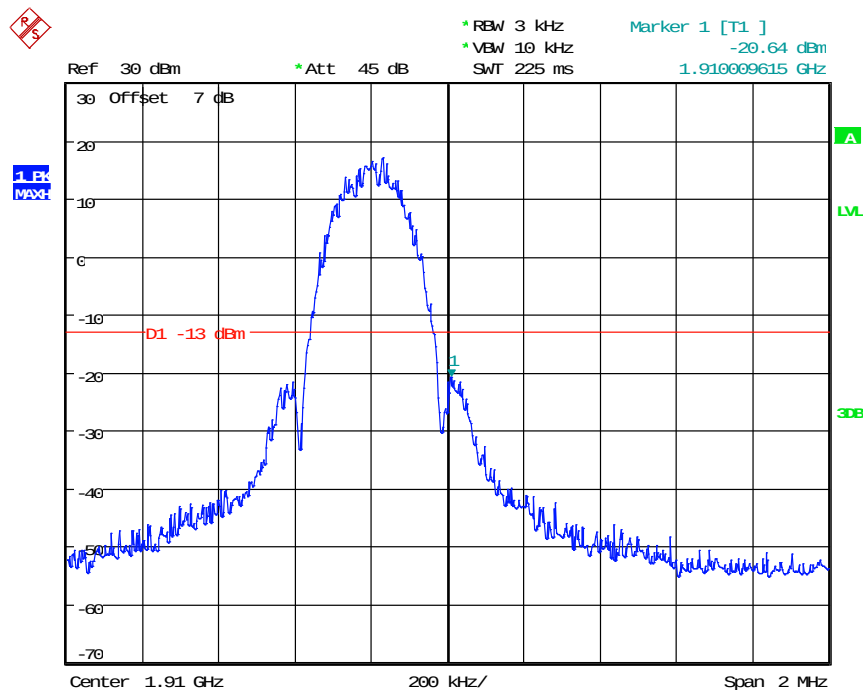
Date: 28.APR.2016 12:35:33

(Plot C2: EGPRS 850 Channel = 251)



Date: 27.APR.2016 19:59:14

(Plot D1: EGPRS 1900 Channel = 512)



Date: 27.APR.2016 19:58:19

(Plot D2: EGPRS 1900 Channel = 810)

NOTE:

(1)Both GSM/GPRS was tested and the worst result was reported.

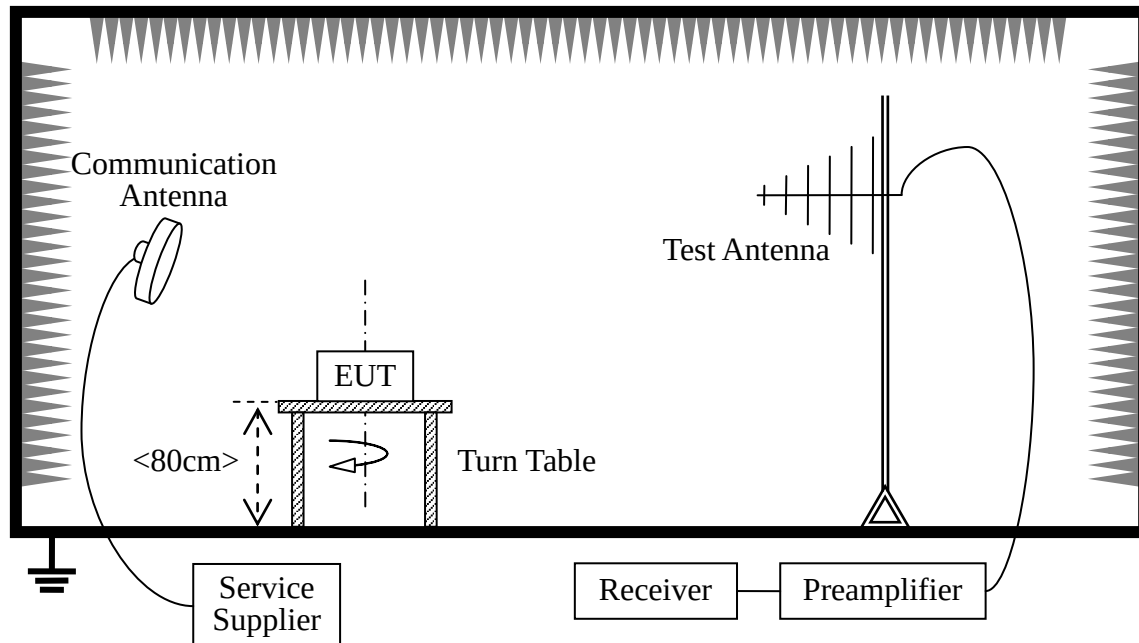


4.7 Transmitter Radiated Power (EIRP/ERP)

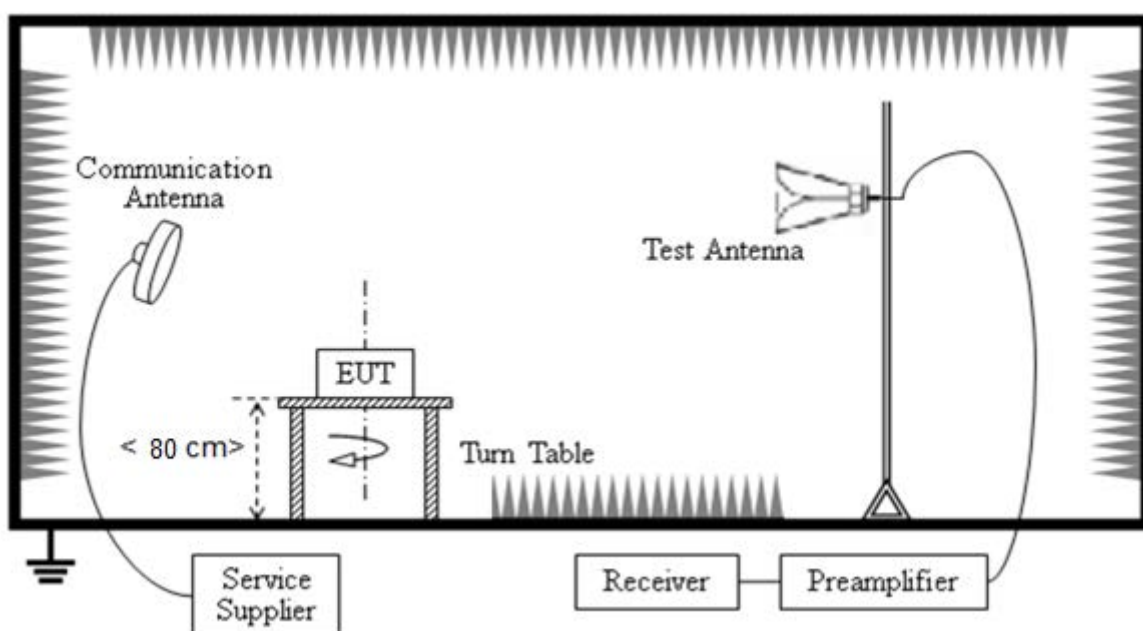
4.7.1 Requirement

According to FCC section 22.913, the Effective Radiated Power (ERP) of mobile transmitters and auxiliary test transmitters must not exceed 7Watts, and FCCsection24.232, the broadband PCS mobile station is limited to 2Watts e.i.r.p. peak power.

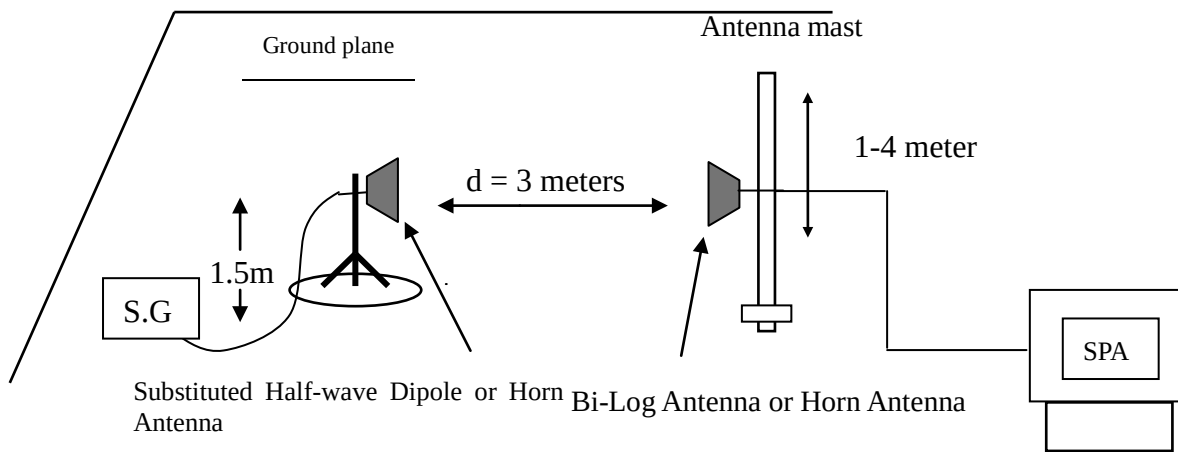
4.7.2 Test Description



Radiated Emissions 30-1000MHz



Radiated Emissions above 1000MHz



Substituted method

4.7.3 Test Procedure

The measurements procedures in TIA-603C-2004 are used.

1. EUT was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1-4m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.
2. The EUT is then put into continuously transmitting mode at its maximum power level during the test. And the maximum value of the receiver should be recorded as (P_r).
3. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
4. The cable loss (P_{cl}) between the Signal Source with the Substitution Antenna and the Substitution Antenna Gain (G_a) should be recorded after test. The measurement results are obtained as described below:
$$\text{Power(EIRP)} = P_{Mea} + P_{cl} + G_a$$
5. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15dBi) and known input power.
6. ERP can be calculated from EIRP by subtracting the gain of the dipole, $ERP = EIRP - 2.15\text{dBi}$.



4.7.4 Test Results

The Turn Table is actuated to turn from 0° to 360°, and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. The lowest, middle and highest channels are tested. All modes are tested.

Limits

Band	Burst Peak ERP (dBm)
GSM 850MHz	≤38.5dBm (7W)
GSM 1900MHz	≤33.0dBm (2W)

Measurement Result

Band	Channel	Peak ERP (dBm)	Limit (dBm)	Polarization
GSM 850	128	28.62	38.45	Horizontal
	190	27.43	38.45	Horizontal
	251	27.70	38.45	Horizontal
	128	26.37	38.45	Vertical
	190	27.03	38.45	Vertical
	251	26.50	38.45	Vertical
EGPRS 850	128	22.41	38.45	Horizontal
	190	22.31	38.45	Horizontal
	251	22.70	38.45	Horizontal
	128	20.14	38.45	Vertical
	190	21.03	38.45	Vertical
	251	21.04	38.45	Vertical

Band	Channel	Peak EIRP (dBm)	Limit (dBm)	Polarization
GSM 1900	512	29.67	33	Horizontal
	661	29.43	33	Horizontal
	810	29.74	33	Horizontal
	512	28.52	33	Vertical
	661	28.43	33	Vertical
	810	28.35	33	Vertical
EGPRS 1900	512	28.43	33	Horizontal
	661	28.96	33	Horizontal
	810	27.99	33	Horizontal
	512	25.73	33	Vertical
	661	26.59	33	Vertical
	810	26.27	33	Vertical

Remark: $ERP(dBm) = P_{Mea} + P_{cl} + G_a - 2.15$



4.8 Radiated Out of Band Emissions

4.8.1 Requirement

According to FCC section 22.917(a) and section 24.238(a), 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. This calculated to be -13dBm.

4.8.2 Test Description

See section 4.7.2 of this report.

4.8.3 Test Procedure

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



4.8.4 Test Results

Measured Max. Spurious Emission(dBm)						
Band	Channel	Polarization	Frequency	Level(dBm)	Limit(dBm)	Verdict
GSM 850MHz	128	V	1648.4	-29.4	-13	Pass
		V	2472.6	-39.1	-13	Pass
		V	3296.8	-46.0	-13	Pass
		V	4121.0	-45.5	-13	Pass
		V	4945.2	nf	-13	Pass
		H	1648.4	-48.3	-13	Pass
		H	2472.6	-38.3	-13	Pass
		H	3296.8	-48.7	-13	Pass
		H	4121.0	-49.1	-13	Pass
		H	4945.2	nf	-13	Pass
	190	V	1673.2	-29.3	-13	Pass
		V	2509.8	-43.4	-13	Pass
		V	3346.4	-46.4	-13	Pass
		V	4183.0	-45.0	-13	Pass
		V	5019.6	nf	-13	Pass
		H	1673.2	-50.3	-13	Pass
		H	2509.8	-43.2	-13	Pass
		H	3346.4	-47.6	-13	Pass
		H	4183.0	-45.7	-13	Pass
		H	5019.6	nf	-13	Pass
	251	V	1697.6	-43.2	-13	Pass
		V	2546.4	-46.3	-13	Pass
		V	3395.2	-48.6	-13	Pass
		V	4244.0	-49.2	-13	Pass
		V	5092.8	nf	-13	Pass
		H	1697.6	-52.3	-13	Pass
		H	2546.4	-42.6	-13	Pass
		H	3395.2	-47.2	-13	Pass
		H	4244.0	-45.1	-13	Pass
		H	5092.8	nf	-13	Pass



Measured Max. Spurious Emission(dBm)						
Band	Channel	Polarization	Frequency	Level(dBm)	Limit(dBm)	Verdict
GSM 1900MHz	512	V	3700.4	-52.9	-13	Pass
		V	5550.6	-46.7	-13	Pass
		V	7400.8	-44.2	-13	Pass
		V	9251.0	-39.9	-13	Pass
		V	11101.2	nf	-13	Pass
		H	3700.4	-49.5	-13	Pass
		H	5550.6	-46.6	-13	Pass
		H	7400.8	-44.2	-13	Pass
		H	9251.0	-40.7	-13	Pass
		H	11101.2	nf	-13	Pass
	661	V	3760.0	-48.2	-13	Pass
		V	5640.0	-47.0	-13	Pass
		V	7520.0	-43.7	-13	Pass
		V	9400.0	-40.3	-13	Pass
		V	11280.0	nf	-13	Pass
		H	3760.0	-48.3	-13	Pass
		H	5640.0	-46.4	-13	Pass
		H	7520.0	-44.0	-13	Pass
		H	9400.0	-40.6	-13	Pass
		H	11280.0	nf	-13	Pass
	810	V	3819.6	-49.7	-13	Pass
		V	5729.4	-47.3	-13	Pass
		V	7639.2	-43.9	-13	Pass
		V	9549.0	-42.5	-13	Pass
		V	11458.8	nf	-13	Pass
		H	3819.6	-48.3	-13	Pass
		H	5729.4	-47.9	-13	Pass
		H	7639.2	-43.8	-13	Pass
		H	9549.0	-40.9	-13	Pass
		H	11458.8	nf	-13	Pass



Measured Max. Spurious Emission(dBm)						
Band	Channel	Polarization	Frequency	Level(dBm)	Limit(dBm)	Verdict
EGPRS 850MHz	512	V	3700.4	-50.6	-13	Pass
		V	5550.6	-49.9	-13	Pass
		V	7400.8	-45.7	-13	Pass
		V	9251.0	-41.0	-13	Pass
		V	11101.2	nf	-13	Pass
		H	3700.4	-50.6	-13	Pass
		H	5550.6	-47.7	-13	Pass
		H	7400.8	-46.5	-13	Pass
		H	9251.0	-42.7	-13	Pass
		H	11101.2	nf	-13	Pass
	661	V	3760.0	-48.2	-13	Pass
		V	5640.0	-49.3	-13	Pass
		V	7520.0	-46.0	-13	Pass
		V	9400.0	-41.1	-13	Pass
		V	11280.0	nf	-13	Pass
		H	3760.0	-49.6	-13	Pass
		H	5640.0	-49.5	-13	Pass
		H	7520.0	-46.6	-13	Pass
		H	9400.0	-42.7	-13	Pass
		H	11280.0	nf	-13	Pass
	810	V	3819.6	-51.1	-13	Pass
		V	5729.4	-50.4	-13	Pass
		V	7639.2	-45.2	-13	Pass
		V	9549.0	-43.7	-13	Pass
		V	11458.8	nf	-13	Pass
		H	3819.6	-50.4	-13	Pass
		H	5729.4	-50.3	-13	Pass
		H	7639.2	-45.7	-13	Pass
		H	9549.0	-41.2	-13	Pass
		H	11458.8	nf	-13	Pass



Measured Max. Spurious Emission(dBm)						
Band	Channel	Polarization	Frequency	Level(dBm)	Limit(dBm)	Verdict
EGPRS 1900MHz	512	V	3700.4	-48.0	-13	Pass
		V	5550.6	-46.7	-13	Pass
		V	7400.8	-47.9	-13	Pass
		V	9251.0	-41.2	-13	Pass
		V	11101.2	nf	-13	Pass
		H	3700.4	-51.4	-13	Pass
		H	5550.6	-48.8	-13	Pass
		H	7400.8	-46.9	-13	Pass
		H	9251.0	-43.4	-13	Pass
		H	11101.2	nf	-13	Pass
	661	V	3760.0	-48.7	-13	Pass
		V	5640.0	-49.3	-13	Pass
		V	7520.0	-46.4	-13	Pass
		V	9400.0	-42.7	-13	Pass
		V	11280.0	nf	-13	Pass
		H	3760.0	-50.5	-13	Pass
		H	5640.0	-48.9	-13	Pass
		H	7520.0	-46.7	-13	Pass
		H	9400.0	-42.8	-13	Pass
		H	11280.0	nf	-13	Pass
	810	V	3819.6	-51.3	-13	Pass
		V	5729.4	-50.0	-13	Pass
		V	7639.2	-46.3	-13	Pass
		V	9549.0	-43.6	-13	Pass
		V	11458.8	nf	-13	Pass
		H	3819.6	-48.3	-13	Pass
		H	5729.4	-48.7	-13	Pass
		H	7639.2	-46.1	-13	Pass
		H	9549.0	-41.8	-13	Pass
		H	11458.8	nf	-13	Pass

NOTE:

- 1) the power of the EUT transmitting frequency should be ignored.
- 2) All spurious emission tests were performed in X,Y,Z axis direction and EUT was tested in GSM and GPRS mode, Only the worst axis test condition was recored in this test report.
- 3) 'nf' means that the emission level is too low to read out from the noise floor.
- 4) The emission levels of below 1 GHz are very lower than the limit(<-40dBm) and not show in this report.



Photos of the EUT



**** END OF REPORT ****