

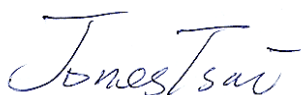
FCC RF Test Report

APPLICANT : Samsung Electronics Co., Ltd.
EQUIPMENT : Mobile Phone
BRAND NAME : SAMSUNG
MODEL NAME : SM-G3559
FCC ID : A3LSMG3559
STANDARD : FCC 47 CFR Part 2, 24(E)
CLASSIFICATION : PCS Licensed Transmitter Held to Ear (PCE)

The product testing was completed on Apr. 29, 2014. We, SPORTON INTERNATIONAL (SHENZHEN) INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures given in ANSI / TIA / EIA-603-C-2004 and the testing has shown the tested sample to be in compliance with the applicable technical standards. The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL (SHENZHEN) INC., the test report shall not be reproduced except in full.



Reviewed by: Joseph Lin / Supervisor



Approved by: Jones Tsai / Manager



SPORTON INTERNATIONAL (SHENZHEN) INC.

No. 3 Building, the third floor of south, Shahe River west, Fengzeyuan warehouse, Nanshan District, Shenzhen, Guangdong, P.R.C.

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SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	§2.1046	Conducted Output Power	N/A	PASS	-
3.2	§24.232(d)	Peak-to-Average Ratio	<13 dB	PASS	-
3.3	§24.232(c)	Equivalent Isotropic Radiated Power	< 2 Watts	PASS	-
3.4	§2.1049 §24.238(b)	Occupied Bandwidth	N/A	PASS	-
3.5	§2.1051 §24.238(a)	Band Edge Measurement	$< 43 + 10\log_{10}(P[\text{Watts}])$	PASS	-
3.6	§2.1051 §24.238(a)	Conducted Spurious Emission	$< 43 + 10\log_{10}(P[\text{Watts}])$	PASS	-
3.7	§2.1053 §24.238(a)	Field Strength of Spurious Radiation	$< 43 + 10\log_{10}(P[\text{Watts}])$	PASS	Under limit 34.43 dB at 9399.000 MHz
3.8	§2.1055 §24.235	Frequency Stability for Temperature & Voltage	< 2.5 ppm	PASS	-

1 General Description

1.1 Applicant

Samsung Electronics Co., Ltd.

A3 Building, No. 185 Kexue Avenue, Science City, Guang Zhou, PRC

1.2 Manufacturer

Samsung Electronics Co., Ltd.

129, Samsung-ro, Yeongtong-gu, Suwon-city, Gyeonggi-do, 443-742, Korea

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Mobile Phone
Brand Name	SAMSUNG
Model Name	SM-G3559
FCC ID	A3LSMG3559
GSM Operating Band(s)	GSM900/1800/1900MHz
GPRS/EGPRS Multislot Class	GPRS Class 10, EGPRS Class 10
WCDMA Operating Band(s)	FDD Band I / VIII
Wi-Fi Specification	2.4GHz 802.11b/g/n HT20
Bluetooth Version	Bluetooth v3.0 + EDR, Bluetooth v4.0 LE
HW Version	G3559.01
SW Version	G3559KEUANC1
EUT Stage	Pre-Production

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.4 Product Specification subjective to this standard

Product Specification subjective to this standard	
Tx Frequency	GSM1900: 1850.2 MHz ~ 1909.8MHz
Rx Frequency	GSM1900: 1930.2 MHz ~ 1989.8MHz
Maximum Output Power to Antenna	GSM1900 : 28.10 dBm
Antenna Type	SUS Antenna
Type of Modulation	GSM: GMSK GPRS: GMSK EDGE: GMSK / 8PSK

1.5 Modification of EUT

No modifications are made to the EUT during all test items.

1.6 Maximum EIRP Power, Frequency Tolerance, and Emission Designator

FCC Rule	System	Type of Modulation	Maximum EIRP (W)	Frequency Tolerance (ppm)	Emission Designator
Part 24	GSM1900 GSM	GMSK	1.00	0.01 ppm	246KGXW
Part 24	GSM1900 EDGE class 8	8PSK	0.67	0.01 ppm	245KG7W

1.7 Testing Location

Test Site	SPORTON INTERNATIONAL (SHENZHEN) INC.		
Test Site Location	No. 3 Building, the third floor of south, Shahe River west, Fengzeyuan warehouse, Nanshan District, Shenzhen, Guangdong, P.R.C. TEL: +86-755- 3320-2398		
Test Site No.	Sporton Site No.		FCC Registration No.
	TH01-SZ	03CH01-SZ	831040

Test Site	SPORTON INTERNATIONAL (KUNSHAN) INC.		
Test Site Location	No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P.R.C. TEL: +86-0512-5790-0158 FAX: +86-0512-5790-0958		
Test Site No.	Sporton Site No.		FCC Registration No.
	03CH01-KS		149928

1.8 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ FCC 47 CFR Part 2, 24(E)
- ♦ ANSI / TIA / EIA-603-C-2004
- ♦ FCC KDB 971168 D01 Power Meas. License Digital Systems v02r01

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

2 Test Configuration of Equipment Under Test

2.1 Test Mode

Antenna port conducted and radiated test items were performed according to KDB 971168 D01 Power Meas. License Digital Systems v02r01 with maximum output power.

Radiated measurements were performed with rotating EUT in different three orthogonal test planes to find the maximum emission.

Frequency range investigated for radiated emission: 30MHz to 10th harmonic.

Test Modes		
Band	Radiated TCs	Conducted TCs
GSM 1900	■ GSM Link ■ EDGE class 8 Link	■ GSM Link ■ EDGE class 8 Link

Note:

The maximum power levels are chosen to test as the worst case configuration as follows:

GSM mode for GMSK modulation,

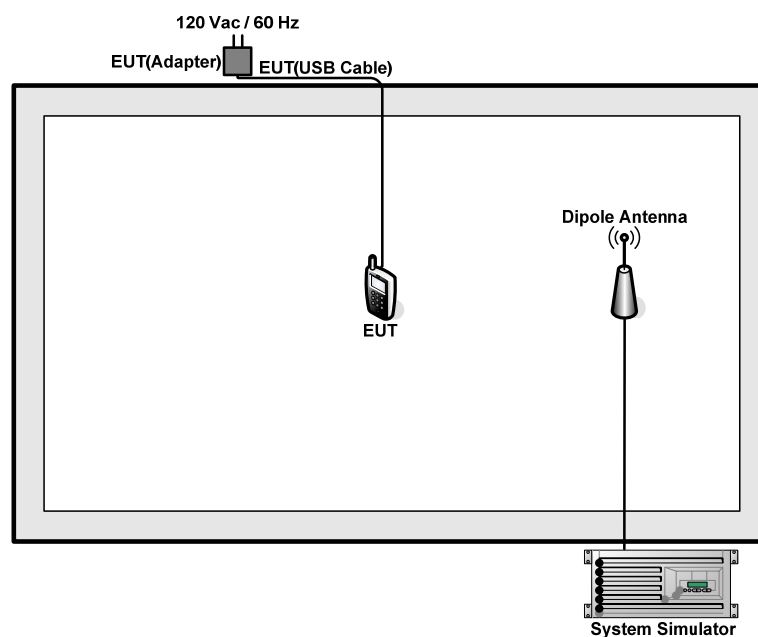
EDGE multi-slot class 8 mode for 8PSK modulation,

only these modes were used for all tests.

Conducted Power Measurement Results:

Conducted Power (*Unit: dBm)			
Band	GSM1900		
Channel	512	661	810
Frequency	1850.2	1880.0	1909.8
GSM	28.05	28.10	28.02
GPRS class 8	28.04	28.08	28.07
GPRS class 10	26.92	26.96	26.92
EGPRS class 8	26.63	26.72	26.67
EGPRS class 10	26.54	26.52	26.49

2.2 Connection Diagram of Test System



2.3 Support Unit used in test configuration

Item	Equipment	Trade Name	Model No.	FCC ID	Data Cable	Power Cord
1.	System Simulator	R&S	CMU 200	N/A	N/A	Unshielded, 1.8 m
2.	DC Power Supply	TOPWORD	3303DR	N/A	N/A	Unshielded, 1.8 m

2.4 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between RF conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level will be exactly the RF output level.

Example:

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

The following shows an offset computation example with RF cable loss 8.5 dB and a 10dB attenuator.

$$\begin{aligned}\text{Offset (dB)} &= \text{RF cable loss (dB)} + \text{attenuator factor (dB)} \\ &= 8.5 + 10 = 18.5 \text{ (dB)}\end{aligned}$$

3 Test Result

3.1 Conducted Output Power Measurement

3.1.1 Description of the Conducted Output Power Measurement

A system simulator was used to establish communication with the EUT. Its parameters were set to enforce EUT transmitting at the maximum power. The measured power in the radio frequency on the transmitter output terminals shall be reported.

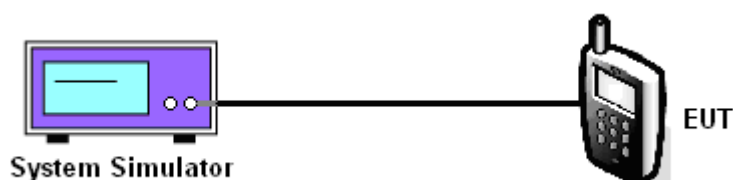
3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.1.3 Test Procedures

1. The transmitter output port was connected to the system simulator.
2. Set EUT at maximum power through system simulator.
3. Select lowest, middle, and highest channels for each band and different modulation.
4. Measure the maximum burst average power for GSM and maximum average power for other modulation signal.

3.1.4 Test Setup



3.1.5 Test Result of Conducted Output Power

PCS Band						
Modes	GSM1900 (GSM)			GSM1900 (EDGE class 8)		
Channel	512 (Low)	661 (Mid)	810 (High)	512 (Low)	661 (Mid)	810 (High)
Frequency (MHz)	1850.2	1880	1909.8	1850.2	1880	1909.8
Conducted Power (dBm)	28.05	28.10	28.02	26.63	26.72	26.67
Conducted Power (Watts)	0.64	0.65	0.63	0.46	0.47	0.46

Note: Maximum burst average power for GSM.

3.2 Peak-to-Average Ratio

3.2.1 Description of the PAR Measurement

The peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

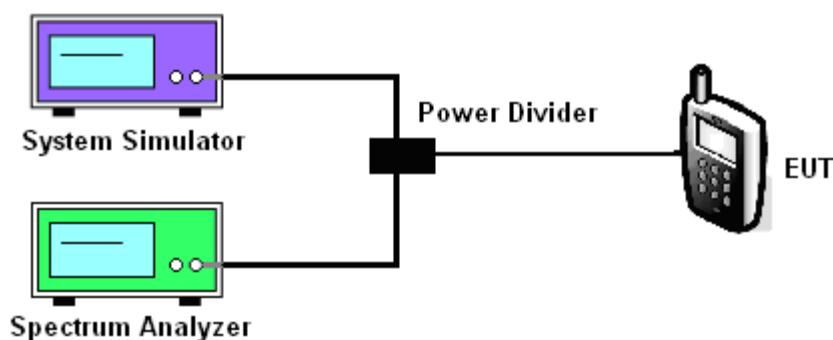
3.2.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.2.3 Test Procedures

1. The EUT was connected to the spectrum analyzer and system simulator via a power divider.
2. For GSM/EGPRS operating modes:
 - a. Set EUT in maximum power output.
 - b. Set the RBW = 1MHz, VBW = 3MHz, Peak detector on spectrum analyzer for first trace.
 - c. Set the RBW = 1MHz, VBW = 3MHz, RMS detector on spectrum analyzer for second trace.
 - d. The wanted burst signal is triggered by spectrum analyzer, and measured respectively the peak level and Mean level without burst-off time, after system simulator has synchronized with the spectrum analyzer.
3. Record the deviation as Peak to Average Ratio.

3.2.4 Test Setup



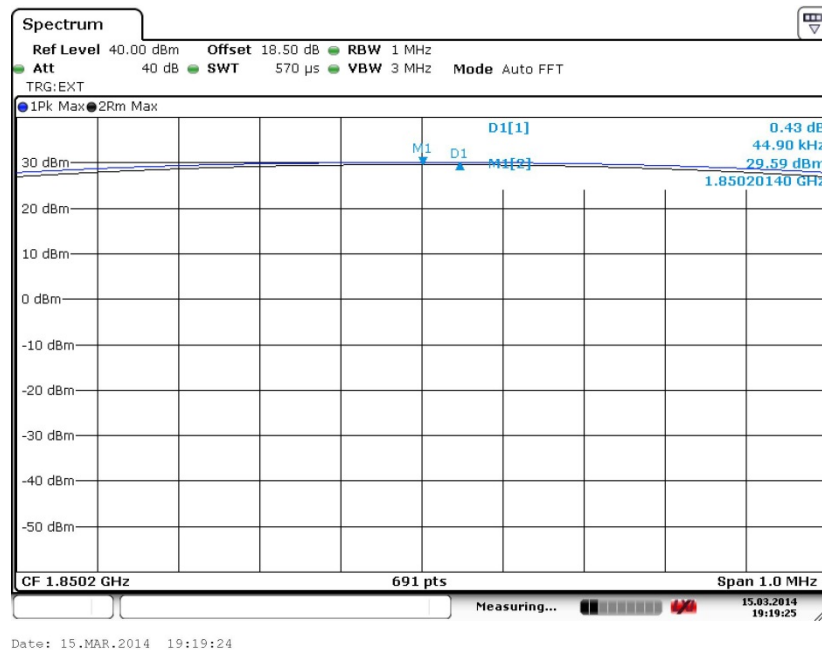
3.2.5 Test Result of Peak-to-Average Ratio

PCS Band						
Modes	GSM1900 (GSM)			GSM1900 (EDGE class 8)		
Channel	512 (Low)	661 (Mid)	810 (High)	512 (Low)	661 (Mid)	810 (High)
Frequency (MHz)	1850.2	1880	1909.8	1850.2	1880	1909.8
Peak-to-Average Ratio (dB)	0.43	0.44	0.46	2.85	2.90	2.74

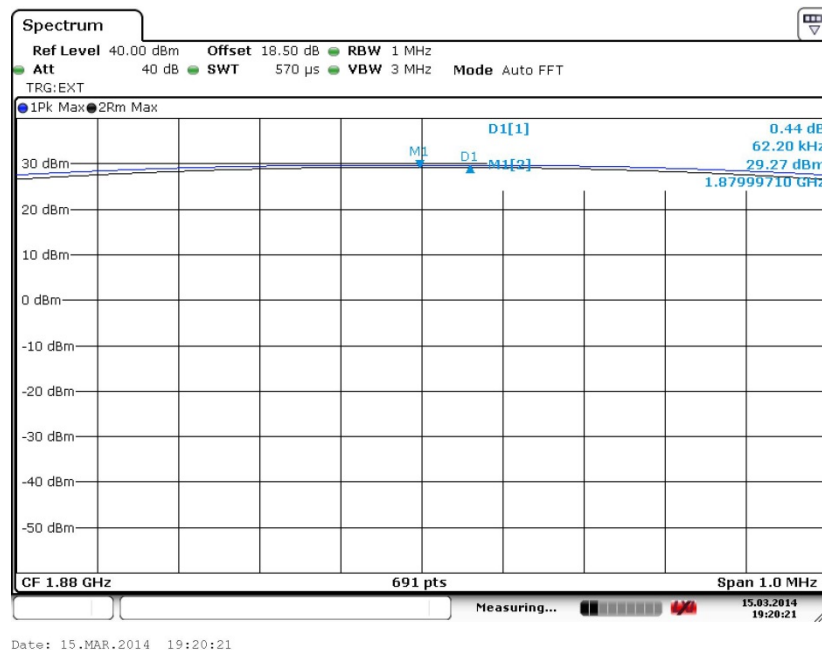
3.2.6 Test Result (Plots) of Peak-to-Average Ratio

Band :	GSM 1900	Test Mode :	GSM Link (GMSK)
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Peak-to-Average Ratio on Channel 512 (1850.2 MHz)

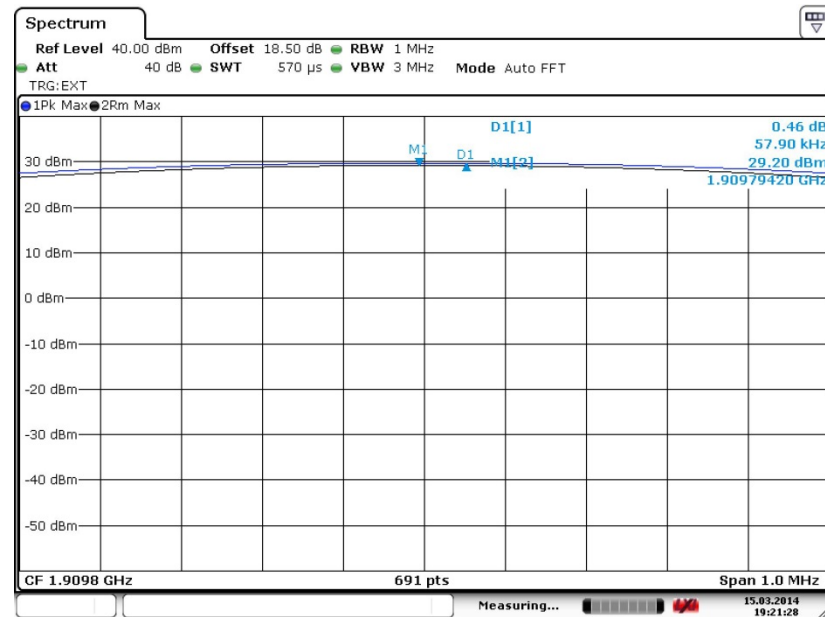


Peak-to-Average Ratio on Channel 661 (1880.0 MHz)





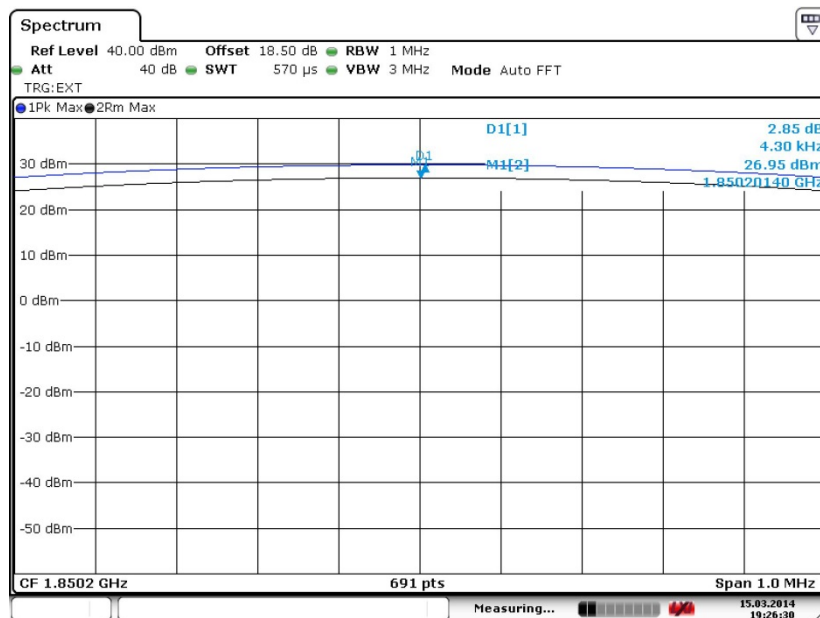
Peak-to-Average Ratio on Channel 810 (1909.8 MHz)



Date: 15.MAR.2014 19:21:28

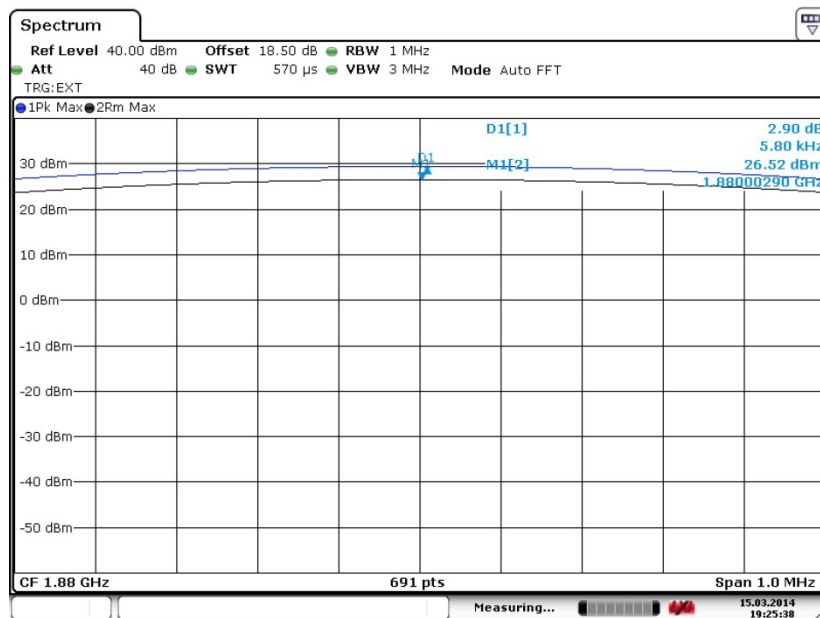
Band :	GSM 1900	Test Mode :	EDGE class 8 Link (8PSK)
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Peak-to-Average Ratio on Channel 512 (1850.2 MHz)



Date: 15.MAR.2014 19:26:30

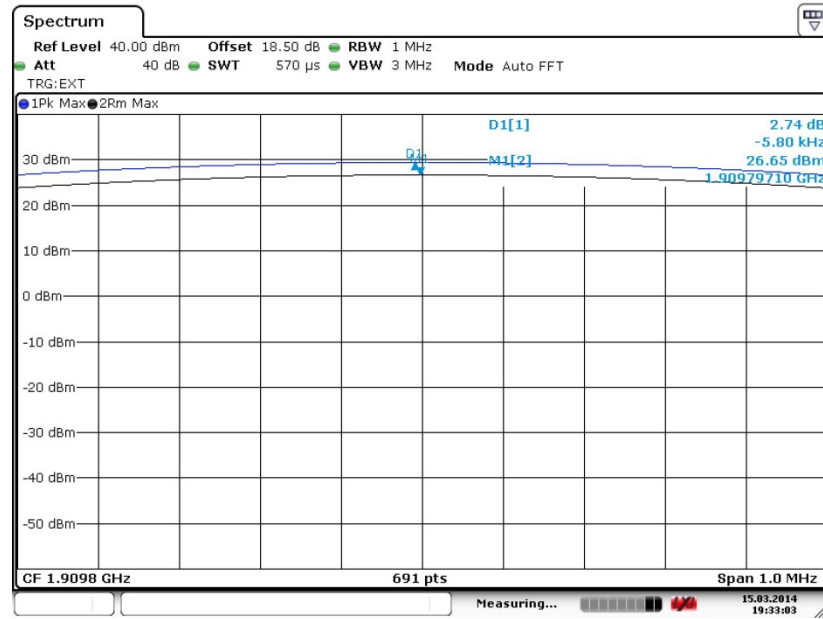
Peak-to-Average Ratio on Channel 661 (1880.0 MHz)



Date: 15.MAR.2014 19:25:38



Peak-to-Average Ratio on Channel 810 (1909.8 MHz)



Date: 15.MAR.2014 19:33:02

3.3 Effective Isotropic Radiated Power Measurement

3.3.1 Description of the EIRP Measurement

The substitution method, in ANSI / TIA / EIA-603-C-2004, was used for EIRP measurement, and the spectrum analyzer configuration follows KDB 971168 D01 Power Meas. License Digital Systems v02r01. The EIRP of mobile transmitters are limited to 2 Watts.

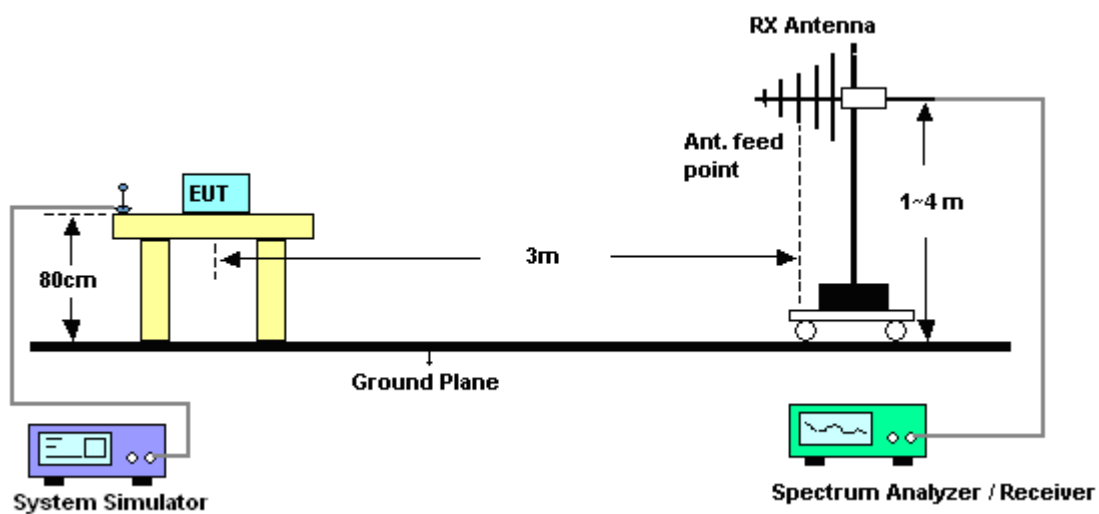
3.3.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.3.3 Test Procedures

1. The EUT was placed on a non-conductive rotating platform 0.8 meters high in a semi-anechoic chamber. The radiated emission at the fundamental frequency was measured at 3 m with a test antenna and a spectrum analyzer with RMS detector per section 5. of KDB 971168 D01.
2. During the measurement, the system simulator parameters were set to force the EUT transmitting at maximum output power. The maximum emission was recorded from analyzer power level (LVL) from the 360 degrees rotation of the turntable and the test antenna raised and lowered over a range from 1 to 4 meters in both horizontally and vertically polarized orientations.
3. Effective Isotropic Radiated Power (EIRP) was measured by substitution method according to TIA/EIA-603-C. The EUT was replaced by dipole antenna (substitution antenna) at the same location, and then a known power from S.G. was applied into the dipole antenna through a Tx cable, and then recorded the maximum Analyzer reading through raised and lowered the test antenna. The correction factor (in dB) = S.G. - Tx Cable loss + Substitution antenna gain - Analyzer reading. Then the EUT's EIRP was calculated with the correction factor, $EIRP = LVL + \text{Correction factor}$.

3.3.4 Test Setup



3.3.5 Test Result of EIRP

GSM1900 (GSM) Radiated Power EIRP				
Horizontal Polarization				
Frequency (MHz)	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (W)
1850.2	-16.03	46.02	29.99	1.00
1880.0	-15.44	44.73	29.29	0.85
1909.8	-17.29	45.20	27.91	0.62
Vertical Polarization				
Frequency (MHz)	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (W)
1850.2	-17.60	45.58	27.98	0.63
1880.0	-17.27	45.75	28.48	0.70
1909.8	-17.70	47.21	29.51	0.89

* EIRP = LVL (dBm) + Correction Factor (dB)

GSM1900 (EDGE class 8) Radiated Power EIRP				
Horizontal Polarization				
Frequency (MHz)	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (W)
1850.2	-17.73	46.02	28.29	0.67
1880.0	-18.46	44.73	26.27	0.42
1909.8	-19.75	45.20	25.45	0.35
Vertical Polarization				
Frequency (MHz)	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (W)
1850.2	-20.68	45.58	24.90	0.31
1880.0	-20.34	45.75	25.41	0.35
1909.8	-20.06	47.21	27.15	0.52

* EIRP = LVL (dBm) + Correction Factor (dB)

3.4 99% Occupied Bandwidth and 26dB Bandwidth Measurement

3.4.1 Description of 99% Occupied Bandwidth and 26dB Bandwidth Measurement

The 99% occupied bandwidth is the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5% of the total mean transmitted power.

The emission bandwidth is defined as the width of the signal between two points, located at the 2 sides of the carrier frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

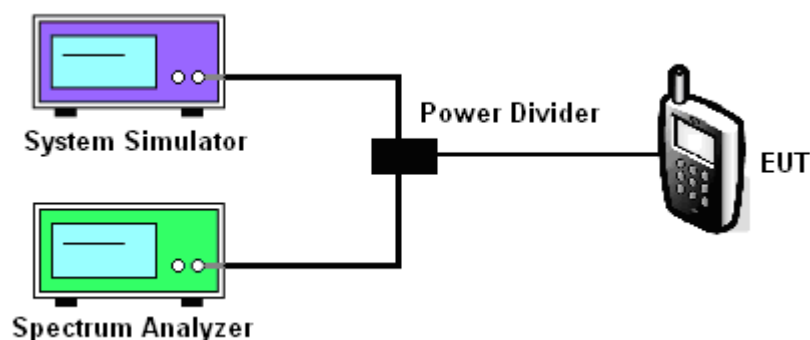
3.4.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.4.3 Test Procedures

1. The EUT was connected to the spectrum analyzer and system simulator via a power divider.
2. The RF output of the EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. The 99% occupied bandwidth were measured, set RBW= 1% of span, VBW= 3*RBW, sample detector, trace maximum hold.
4. The 26dB bandwidth were measured, set RBW= 1% of EBW, VBW= 3*RBW, peak detector, trace maximum hold.

3.4.4 Test Setup



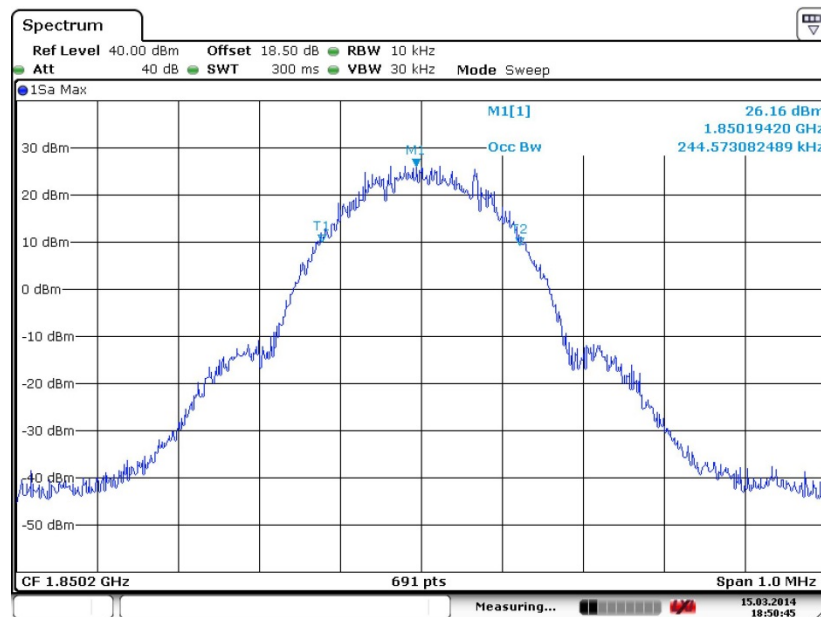
3.4.5 Test Result of 99% Occupied Bandwidth and 26dB Bandwidth

PCS Band						
Modes	GSM1900 (GSM)			GSM1900 (EDGE class 8)		
Channel	512 (Low)	661 (Mid)	810 (High)	512 (Low)	661 (Mid)	810 (High)
Frequency (MHz)	1850.2	1880	1909.8	1850.2	1880	1909.8
99% OBW (kHz)	244.57	246.02	244.57	244.57	241.68	241.68
26dB BW (kHz)	312.60	312.60	312.60	312.60	312.60	311.10

3.4.6 Test Result (Plots) of 99% Occupied Bandwidth and 26dB Bandwidth

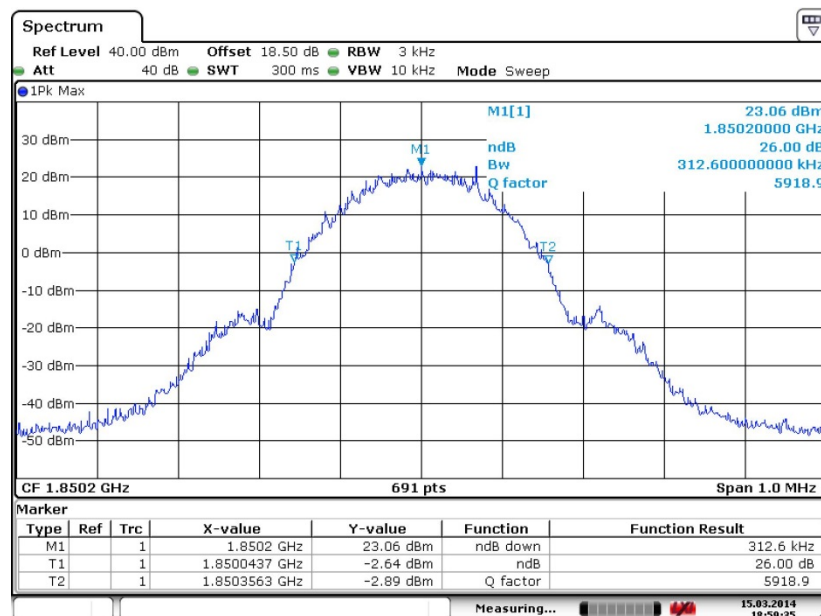
Band :	GSM 1900	Test Mode :	GSM Link (GMSK)
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99% Occupied Bandwidth Plot on Channel 512 (1850.2 MHz)



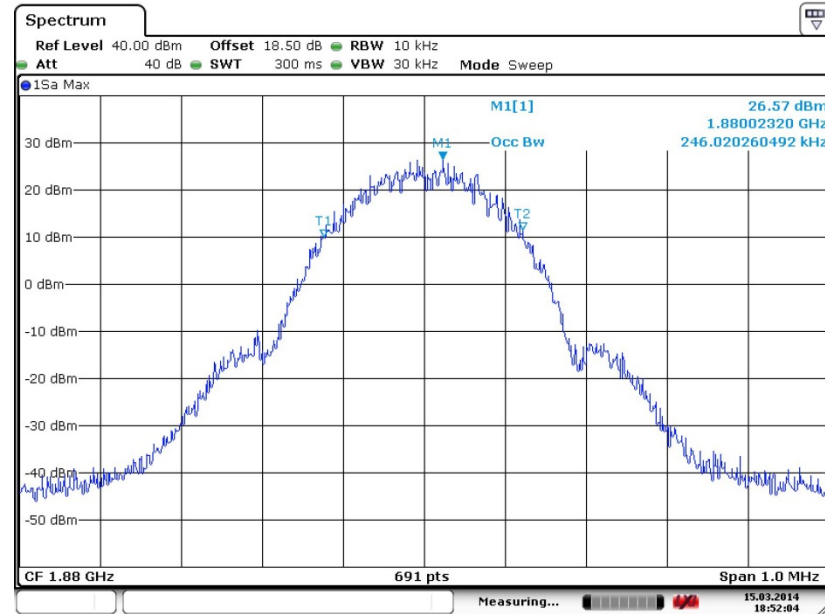
Date: 15.MAR.2014 18:50:43

26dB Bandwidth Plot on Channel 512 (1850.2 MHz)



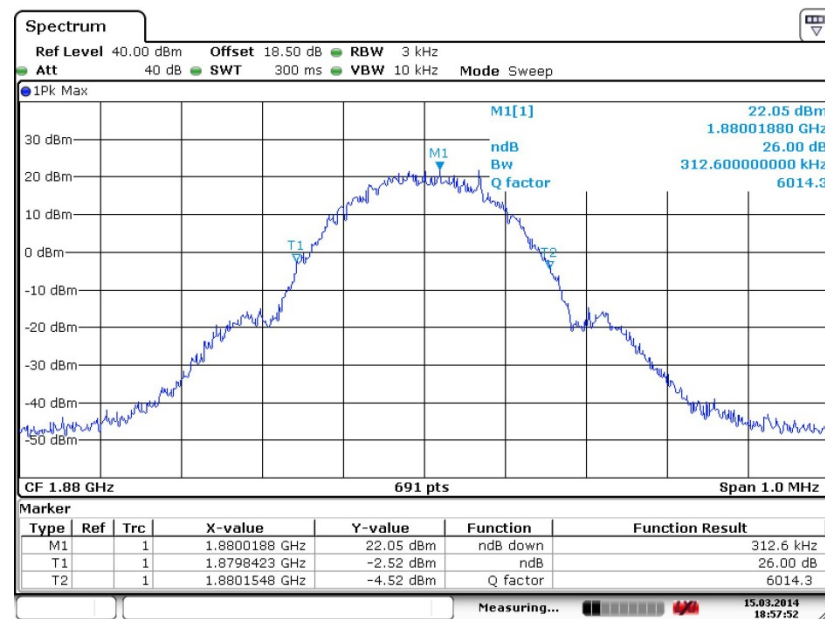
Date: 15.MAR.2014 18:59:33

99% Occupied Bandwidth Plot on Channel 661 (1880.0 MHz)



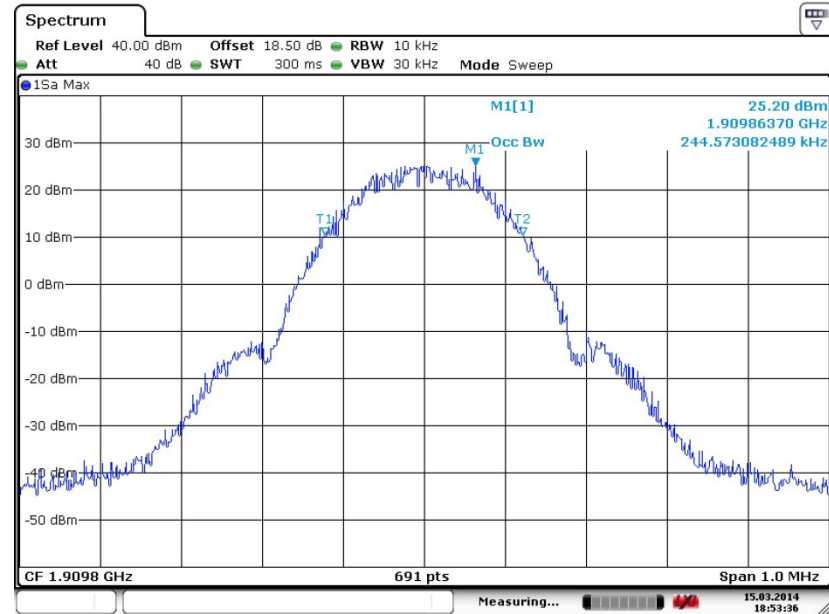
Date: 15.MAR.2014 18:52:02

26dB Bandwidth Plot on Channel 661 (1880.0 MHz)



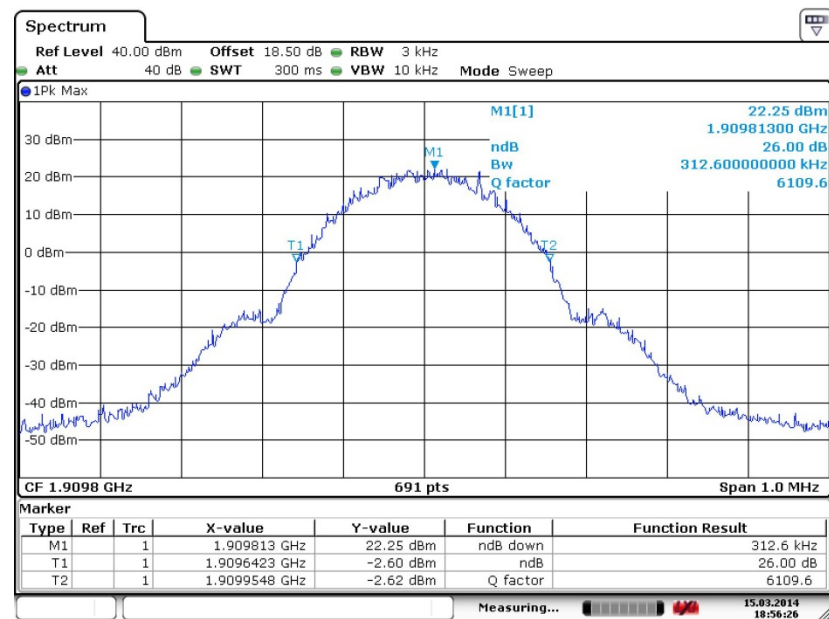
Date: 15.MAR.2014 18:57:50

99% Occupied Bandwidth Plot on Channel 810 (1909.8 MHz)



Date: 15.MAR.2014 18:53:34

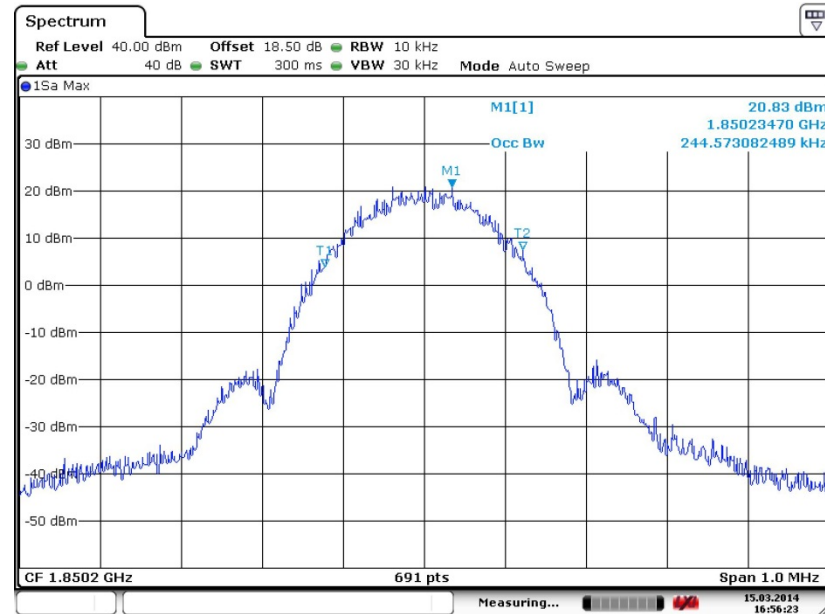
26dB Bandwidth Plot on Channel 810 (1909.8 MHz)



Date: 15.MAR.2014 18:56:24

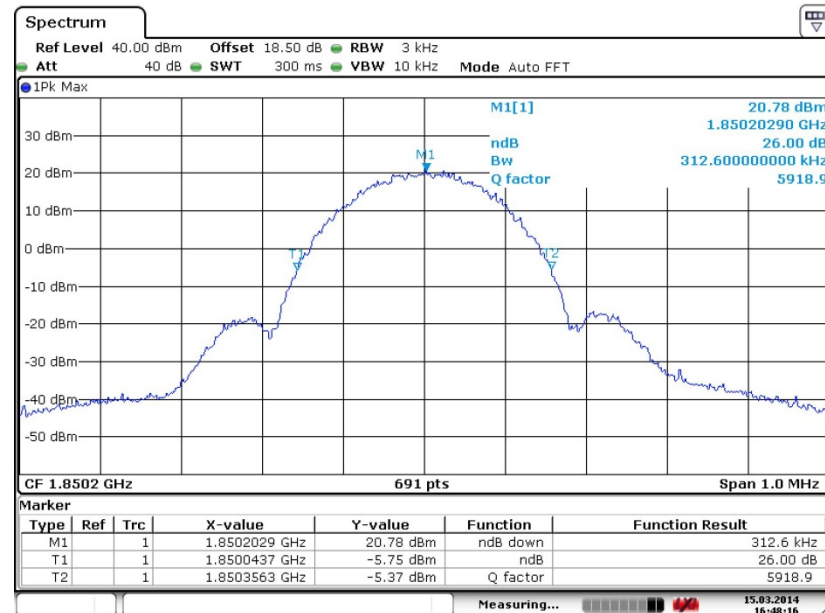
Band :	GSM 1900	Test Mode :	EDGE class 8 Link (8PSK)
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99% Occupied Bandwidth Plot on Channel 512 (1850.2 MHz)



Date: 15.MAR.2014 16:56:22

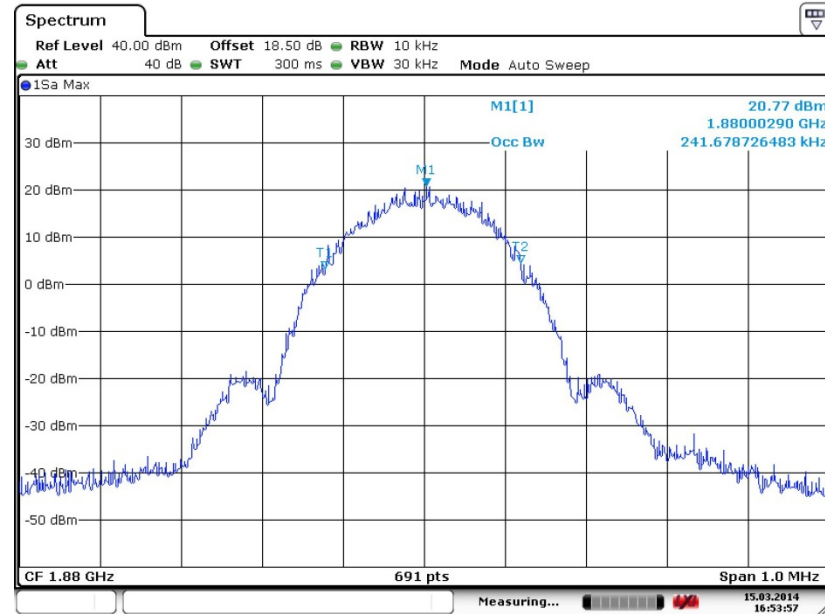
26dB Bandwidth Plot on Channel 512 (1850.2 MHz)



Date: 15.MAR.2014 16:48:16

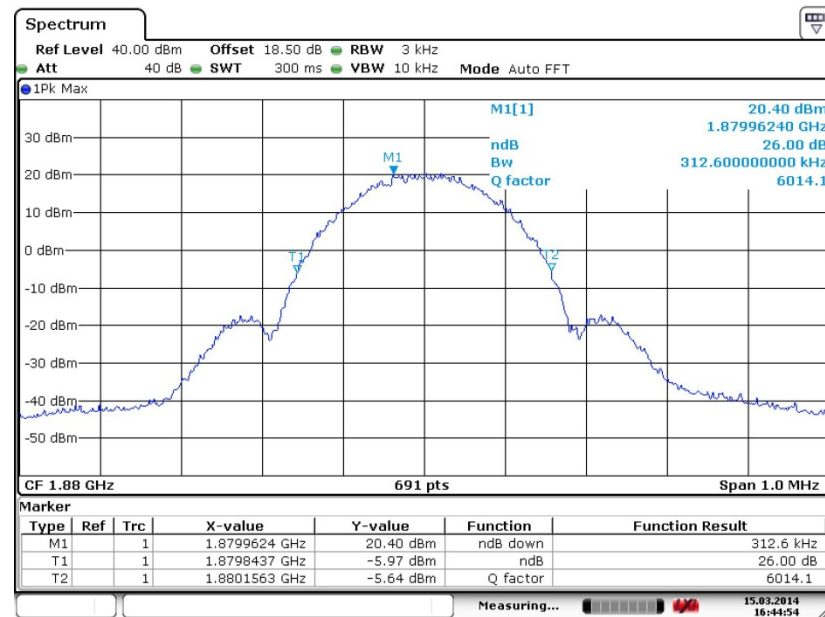


99% Occupied Bandwidth Plot on Channel 661 (1880.0 MHz)



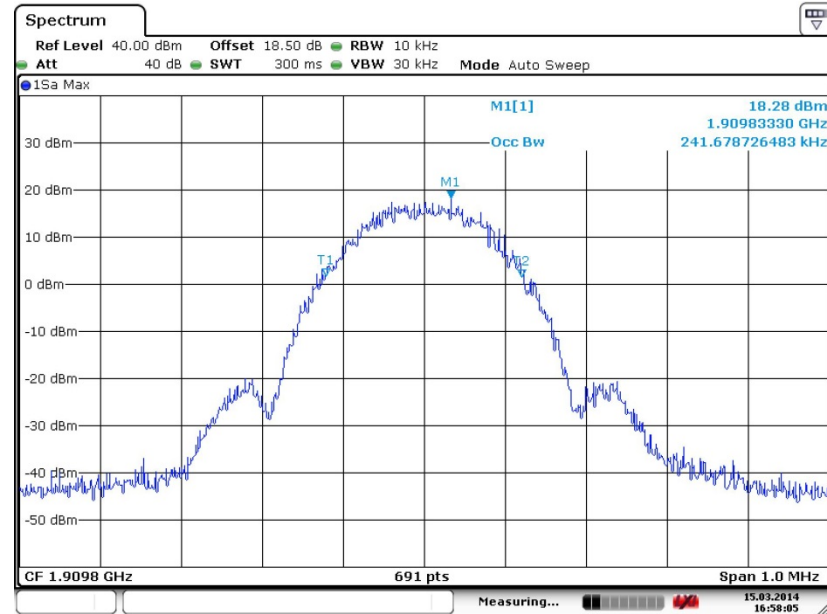
Date: 15.MAR.2014 16:53:56

26dB Bandwidth Plot on Channel 661 (1880.0 MHz)



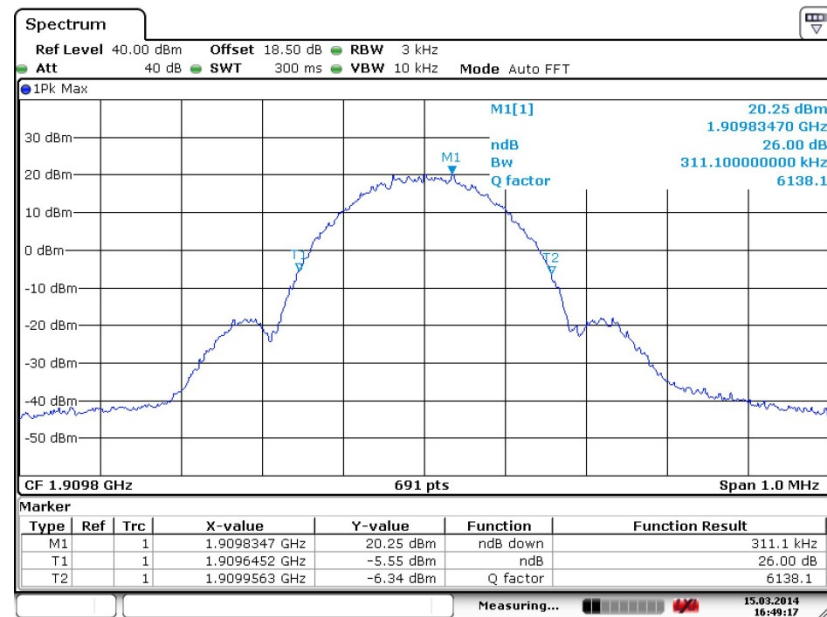
Date: 15.MAR.2014 16:44:54

99% Occupied Bandwidth Plot on Channel 810 (1909.8 MHz)



Date: 15.MAR.2014 16:58:04

26dB Bandwidth Plot on Channel 810 (1909.8 MHz)



Date: 15.MAR.2014 16:49:17

3.5 Band Edge Measurement

3.5.1 Description of Band Edge Measurement

The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB.

3.5.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.5.3 Test Procedures

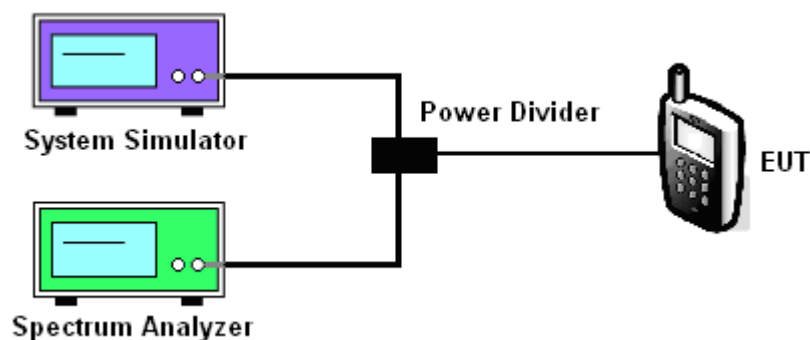
1. The EUT was connected to the spectrum analyzer and system simulator via a power divider.
2. The RF output of EUT was connected to the spectrum analyzer by an RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. The band edges of low and high channels for the highest RF powers were measured.
4. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
5. The limit line is derived from $43 + 10\log(P)$ dB below the transmitter power P(Watts)

$$= P(W) - [43 + 10\log(P)] \text{ (dB)}$$

$$= [30 + 10\log(P)] \text{ (dBm)} - [43 + 10\log(P)] \text{ (dB)}$$

$$= -13\text{dBm}.$$

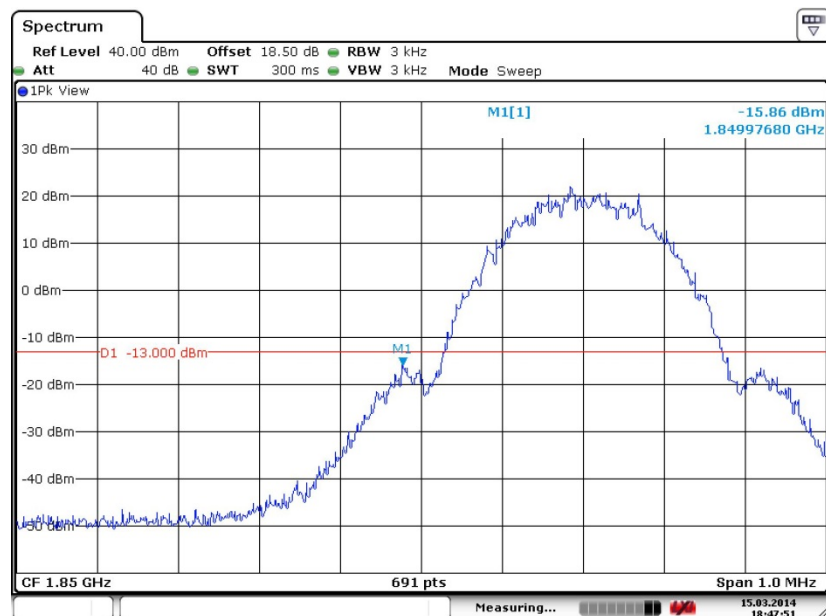
3.5.4 Test Setup



3.5.5 Test Result (Plots) of Conducted Band Edge

Band :	GSM1900	Test Mode :	GSM Link (GMSK)
Correction Factor :	0.18dB	Maximum 26dB Bandwidth :	0.313MHz
Band Edge :	-15.68dBm	Measurement Value :	-15.86dBm

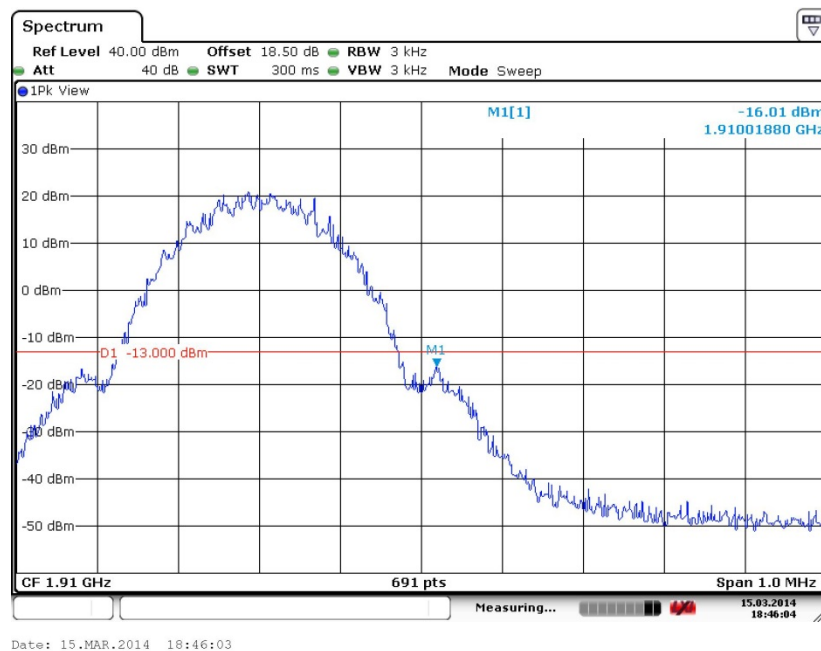
Lower Band Edge Plot on Channel 512 (1850.2 MHz)



Date: 15.MAR.2014 18:47:50

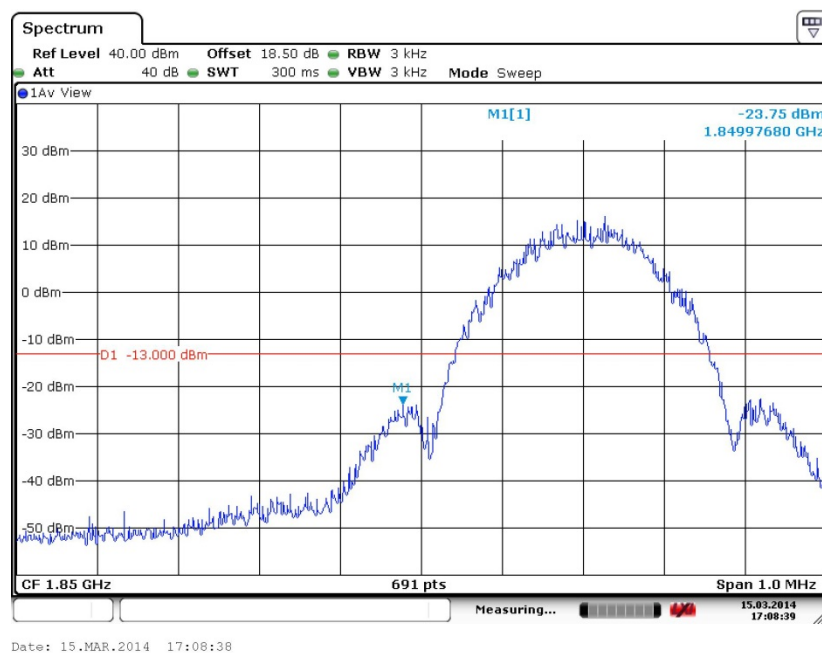
1. Correction Factor(dB)= $10\log(1\% \text{ Emission BW/RBW})$
2. Band Edge= Measurement Value + Correction Factor(dB)

Band :	GSM1900	Test Mode :	GSM Link (GMSK)
Correction Factor :	0.18dB	Maximum 26dB Bandwidth :	0.313MHz
Band Edge :	-15.83dBm	Measurement Value :	-16.01dBm

Higher Band Edge Plot on Channel 810 (1909.8 MHz)


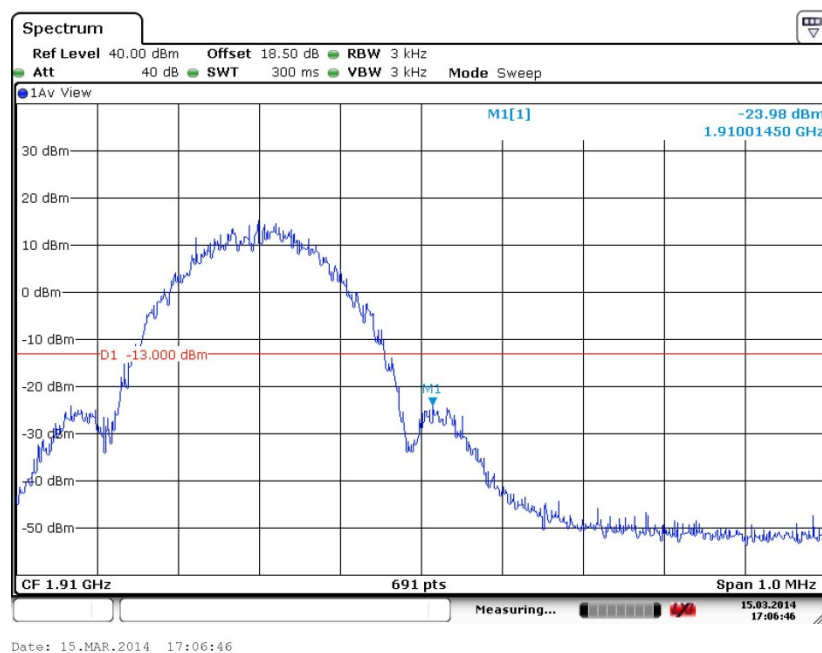
1. $\text{Correction Factor(dB)} = 10\log(1\% \text{ Emission BW/RBW})$
2. $\text{Band Edge} = \text{Measurement Value} + \text{Correction Factor(dB)}$

Band :	GSM1900	Test Mode :	EDGE class 8 Link (8PSK)
Correction Factor :	0.18dB	Maximum 26dB Bandwidth :	0.313MHz
Band Edge :	-23.57dBm	Measurement Value :	-23.75dBm

Lower Band Edge Plot on Channel 512 (1850.2 MHz)


1. $Correction\ Factor(dB) = 10\log(1\% \text{ Emission } BW/RBW)$
2. $Band\ Edge = Measurement\ Value + Correction\ Factor(dB)$

Band :	GSM1900	Test Mode :	EDGE class 8 Link (8PSK)
Correction Factor :	0.18dB	Maximum 26dB Bandwidth :	0.313MHz
Band Edge :	-23.80dBm	Measurement Value :	-23.98dBm

Higher Band Edge Plot on Channel 810 (1909.8 MHz)


1. $\text{Correction Factor(dB)} = 10\log(1\% \text{ Emission BW/RBW})$
2. $\text{Band Edge} = \text{Measurement Value} + \text{Correction Factor(dB)}$