Full

TEST REPORT

No. I17D00062-SRD05

For

Client : Mobiwire SAS

Production : 3G Feature Phone

Model Name : MobiWire Sakari

FCC ID: QPN-SAKARI

Hardware Version: V01

Software Version: Vodafone_Sakari_SKU3_L_V03_170509_MP

Issued date: 2017-06-10

Note:

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of ECIT Shanghai.

Test Laboratory:

ECIT Shanghai, East China Institute of Telecommunications

Add: 7-8F, G Area, No.668, Beijing East Road, Huangpu District, Shanghai, P. R. China

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Revision Version

Report Number	Revision	Date	Memo
I17D00062-SRD05	00	2017-05-24	Initial creation of test report
I17D00062-SRD05	01	2017-06-07	Second creation of test report
I17D00062-SRD05	02	2017-06-10	Third creation of test report

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1. Test Laboratory

1.1. Testing Location

Company Name:	ECIT Shanghai, East China Institute of Telecommunications
Address:	7-8F, G Area, No. 668, Beijing East Road, Huangpu District, Shanghai, P. R. China
Postal Code:	200001
Telephone:	(+86)-021-63843300
Fax:	(+86)-021-63843301
FCC Registration NO.:	489729

1.2. Testing Environment

Normal Temperature:	15-35℃
Extreme Temperature:	-10/+55℃
Relative Humidity:	20-75%

1.3. Project data

Project Leader:	Yu Anlu
Testing Start Date:	2017-04-15
Testing End Date:	2017-05-22

1.4. Signature

Zhang Shiyu
(Prepared this test report)

Ding Li
(Reviewed this test report)

Zheng Zhongbin
Director of the laboratory
(Approved this test report)

2. Client Information

2.1. Applicant Information

Company Name:	Mobiwire SAS
Address:	79 AVENUE FRANCOIS ARAGO 92017 NANTERRE CEDEX France.
Telephone:	+33 1 78 14 09 58
Email:	nour.shabou@mobiwire.com

2.2. Manufacturer Information

Company Name:	MOBIWIRE MOBILES (NINGBO) CO.,LTD
Address:	No.999,Dacheng East Road,FenghuaCity,ZhejiangProvince,China
Telephone:	0574 59555707
Email:	Leander.xu@mobiwire.com.cn

3. Equipment Under Test (EUT) and Ancillary Equipment (AE)

3.1. About EUT

EUT Description	3G Feature Phone
Model name	MobiWire Sakari
FCC ID	QPN-SAKARI
Frequency	GSM850/900/1800/1900; WCDMA Band I /VIII
Extreme Temperature	-10/+55 ℃
Nominal Voltage	3.7V
Extreme High Voltage	4.2V
Extreme Low Voltage	3.6V

Note: Photographs of EUT are shown in ANNEX A of this test report.

3.2. Internal Identification of EUT used during the test

EUT ID*	SN or IMEI	HW Version	SW Version	Date of receipt
N02	357695089999987	V01	Vodafone_Sakari_SKU3_L_V03_170509_MP	2017-03-24

*EUT ID: is used to identify the test sample in the lab internally.

3.3. Internal Identification of AE used during the test

AE ID*	Description	SN
AE1	RF cable	---
AE2	Dummy Battery	---

*AE ID: is used to identify the test sample in the lab internally.

3.4. Statements

The product name MobiWire Sakari, supporting GSM/GPRS/WCDMA/HSDPA/HSUPA/HSPA+/WLAN/BT/BLE/GPS, manufactured by MOBIWIRE MOBILES (NINGBO) CO.,LTD is a new product for testing.

ECIT has verified that the compliance of the tested device specified in section 5 of this test report is successfully evaluated according to the procedure and test methods as defined in type certification requirement listed in section 5 of this test report.

4. Reference Documents

4.1. Reference Documents for testing

The following documents listed in this section are referred for testing.

Reference	Title	Version
FCC Part 24	PERSONAL COMMUNICATIONS SERVICES	2014
FCC Part 22	PUBLIC MOBILE SERVICES	2014
ANSI-TIA-603-D	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards	2010
ANSI C63.4	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz	2014

5. SUMMARY OF TEST RESULTS

Item	Test items	FCC rules	result
1	Output Power	2.1046/22.913(a)/24.232(c)	Pass
2	Peak-to-Average Ratio	24.232(d)	Pass
3	99%Occupied Bandwidth	2.1049(h)(i)/ 22.917(b)	Pass
4	-26dB Emission Bandwidth	22.917(b)/§24.238(b)	Pass
5	Band Edge at antenna terminals	22.917(a)/24.238(a)	Pass
6	Frequency stability	2.1055/24.235	Pass
7	Conducted Spurious mission	2.1053/22.917(a)/24.238(a)	Pass
8	Emission Limit	2.1051/22.917/24.238/22.913/24.232	Pass

6. Test Equipment Utilized

Climate chamber

No.	Equipment	Model	Serial Number	Manufacturer	Calibration date	Cal.interval
1	Climate chamber	SH-641	92012011	ESPEC	2016-01-06	2 Year

Radiated emission test system

The test equipment and ancillaries used are as follows.

No.	Equipment	Model	Serial Number	Manufacturer	Calibration date	Cal.interval
1	Universal Radio Communication Tester	CMU200	123101	R&S	2017-05-11	1 Year
2	Test Receiver	ESU40	100307	R&S	2017-05-11	1 Year
3	Trilog Antenna	VULB9163	VULB9163-515	Schwarzbeck	2014-11-05	3 Year
4	Double Ridged Guide Antenna	ETS-3117	00135890	ETS	2017-01-11	3 Year
5	2-Line V-Network	ENV216	101380	R&S	2017-05-11	1 Year
6	Substitution Antenna	ETS-3117	00135890	ETS	2017-01-11	3 Year
7	RF Signal Generator	SMF100A	102314	R&S	2017-05-11	1 Year
8	Substitution Antenna	VUBA9117	9117-266	Schwarzbeck	2014-08-19	3 Year
9	Amplifier	SCU03	10009	R&S	2017-01-05	1 Year
10	Amplifier	NTWPA-008610F	12023024	Rflight	2017-01-05	1 Year

11	Attenuators	BW-N3 W5+	/	MCL	2017-01-05	1 Year

Conducted test system

No.	Name	Type	SN	Manufacture	Cal. Due Date	Cal.interva
1	Spectrum Analyzer	FSQ26	101096	R&S	2017-05-11	1 Year
2	Universal Radio Communica	CMU200	123102	R&S	2017-05-11	1 Year
3	DC Power Supply	ZUP60-14	LOC-220Z006 -0007	TDL-Lambda	2017-05-11	1 Year
4	Weinschel power spliter	1870A	10264	Weinschel	2017-05-11	1 Year

7. Test Environment

Shielding Room1 (6.0 meters×3.0 meters×2.7 meters) did not exceed following limits along the conducted RF performance testing:

Temperature	Min. = 15 ℃, Max. = 35 ℃
Relative humidity	Min. = 25 %, Max. = 75 %
Shielding effectiveness	> 110 dB
Ground system resistance	< 0.5 Ω

Control room did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ℃, Max. = 35 ℃
Relative humidity	Min. =25 %, Max. = 75 %
Shielding effectiveness	> 110 dB
Electrical insulation	> 10 kΩ
Ground system resistance	< 0.5 Ω

Fully-anechoic chamber1 (6.9 meters×10.9 meters×5.4 meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ℃, Max. = 35 ℃
Relative humidity	Min. = 25 %, Max. = 75 %
Shielding effectiveness	> 100 dB
Electrical insulation	> 10 kΩ
Ground system resistance	< 0.5 Ω
VSWR	Between 0 and 6 dB, from 1GHz to 18GHz
Site Attenuation Deviation	Between -4 and 4 dB,30MHz to 1GHz
Uniformity of field strength	Between 0 and 6 dB, from 80MHz to 3000 MHz

ANNEX A. MEASUREMENT RESULTS

ANNEX A.1. OUTPUT POWER

A.1.1. Summary

During the process of testing, the EUT was controlled Rhode & Schwarz Digital Radio. Communication tester (CMU-200) to ensure max power transmission and proper modulation. This result contains peak output power and EIRP measurements for the EUT. In all cases, output power is within the specified limits.

A.1.2. Conducted

A.1.2.1. Method of Measurements

Method of measurements please refer to KDB971168 D01 v02r02 clause 5. The EUT was set up for the max output power with pseudo random data modulation. The power was measured with Rhode & Schwarz Spectrum Analyzer FSQ(peak). These measurements were done at 3 frequencies, 1850.2 MHz, 1880.0MHz and 1909.8MHz for PCS1900 band; 824.2MHz, 836.6MHz and 848.8MHz for GSM850 band. (bottom, middle and top of operational frequency range). These measurements were done at 3 frequencies, 1852.4 MHz, 1880.0MHz. (bottom, middle and top of operational frequency range).

A.1.2.2 Test procedures:

1. The transmitter output port was connected to base station.
2. Set the EUT at maximum power through base station.
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.

A.1.2.3 GSM Limit:

22.913(a) Mobile stations are limited to 7watts.
24.232(c) Mobile and portable stations are limited to 2 watts.

A.1.2.5 Test Procedure:

The transmitter output power was connected to calibrated attenuator, the other end of which was connected to signal analyzer. Transmitter output power was read off the power in dBm. The power outputs at the transmitter antenna port was determined by adding the value of attenuator to the signal analyzer reading.

A.1.2.6 GSM Test Condition:

RBW	VBW	Sweep time	Span
1MHz	1MHz	300ms	10MHz

A.1.2.8 Measurement results:

GSM 850 (GMSK)	
Channel/fc(MHz)	Peak power (dBm)
Mid 189/836.4	30.652
Low 128/824.2	30.494
High 251/848.8	30.504
GPRS 850 (GMSK 1 Slot)	
Channel/fc(MHz)	Peak power (dBm)
Mid 189/836.4	30.671
Low 128/824.2	30.489
High 251/848.8	30.468

GSM 1900(GMSK)	
Channel/fc(MHz)	Peak power (dBm)
Mid 661/1880	31.066
Low 512/1850.2	31.025
High 810/1909.8	31.133
GPRS 1900 (GMSK 1 Slot)	
Channel/fc(MHz)	Peak power (dBm)
Mid 661/1880	30.453
Low 512/1850.2	30.469
High 810/1909.8	30.474

Conclusion: PASS

ANNEX A.2. Peak-to-Average Power Ratio

Method of test measurements please refer to KDB971168 D01 v02r02 clause 5.7.

A.2.1 PAPR Limit

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

A.2.2 Test procedures

1. The EUT was connected to the spectrum analyzer and system simulator via a power divider.
2.
   1) Select the spectrum analyzer CCDF function.
   2) Set RBW≥signal's occupied bandwidth.
   3) Set the number of counts to a value that stabilizes the measured CCDF cure;
   4) Sweep time ≥ 1s.
3. Record the maximum PAPR level associated with a probability of 0.1%.

A.2.3 Test results:

GSM850			
Modes	GPRS850		
Channel	512	661	810
Frequency (MHz)	824.2	836.4	848.8
PAPR(dB)	10.67	10.67	10.71
GPRS850			
Modes	EDGE850		
Channel	512	661	810
Frequency (MHz)	824.2	836.4	848.8
PAPR(dB)	7.72	10.67	7.69

GSM1900			
Modes	GPRS1900		
Channel	512	661	810
Frequency (MHz)	1850.2	1880	1909.8
PAPR(dB)	10.71	10.71	10.71
GPRS1900			
Modes	EDGE1900		
Channel	512	661	810
Frequency (MHz)	1850.2	1880	1909.8

PAPR(dB)	10.67	8.33	10.71

Conclusion: PASS

ANNEX A.3. Occupied Bandwidth

Method of test please refer to KDB971168 D01 v02r02 clause 4.0.

A.3.1. Occupied Bandwidth

Similar to conducted emissions; occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of GSM850, PCS1900,.

A.3.2 Test Procedure:

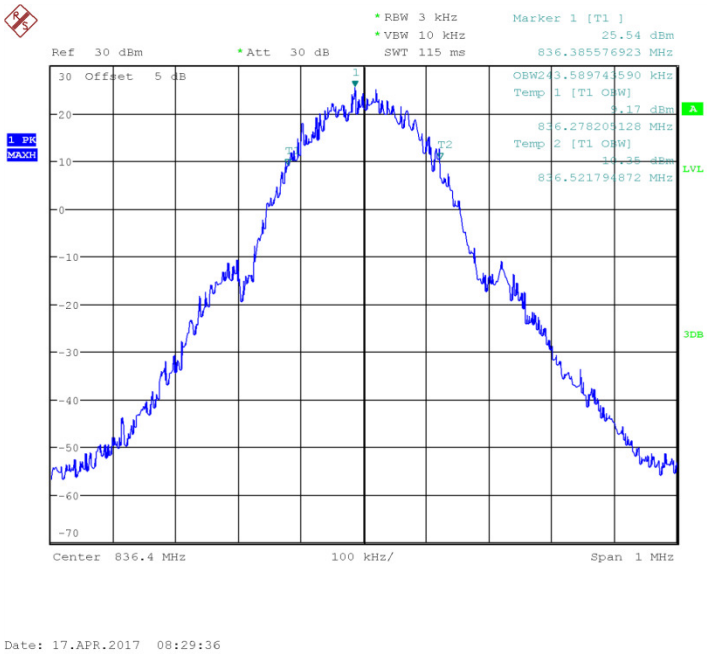
1. The EUT output RF connector was connected with a short cable to the signal analyzer.
2. RBW was set to about 1% of emission BW, VBW >= 3 times RBW,.
3. 99% bandwidth were measured, the occupied bandwidth is delta frequency between the two points where the display line intersects the signal trace.

A.3.3 Test result:

GSM850		
Test channel	Frequency (MHz)	99% Occupied Bandwidth(KHz)
Mid 189	836.4	243.59
Low 128	824.2	246.795
High 251	848.8	245.192
GPRS850		
Test channel	Frequency (MHz)	99% Occupied Bandwidth(KHz)
Mid 189	836.4	245.192
Low 128	824.2	246.795
High 251	848.8	245.192

Conclusion: PASS

GSM 850



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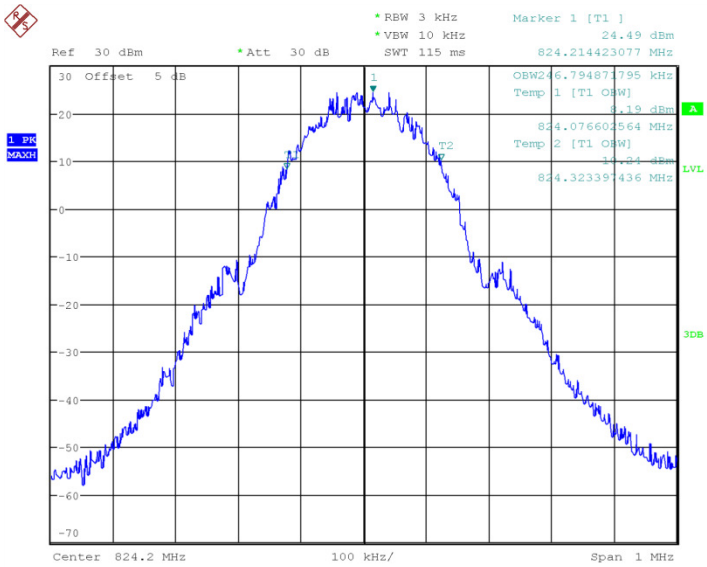
Channel 189-Occupied Bandwidth (99%)



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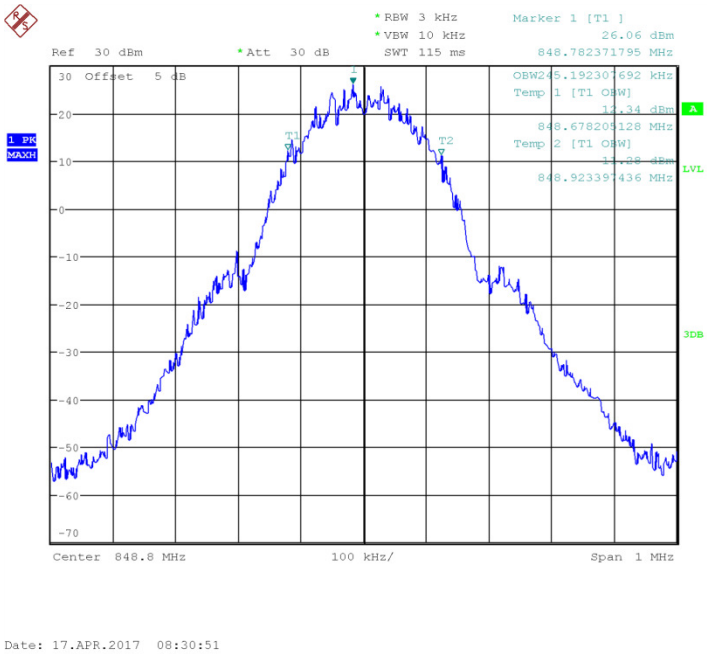
Channel 128-Occupied Bandwidth (99%)



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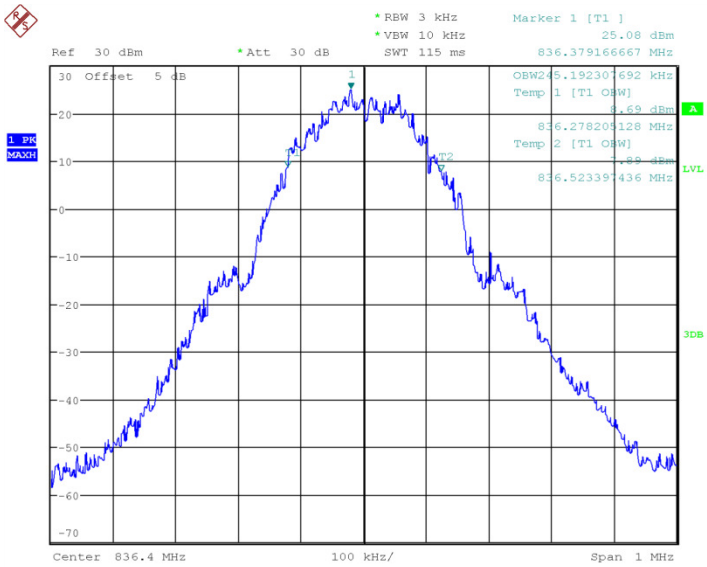
Channel 251-Occupied Bandwidth (99%)

GPRS 850



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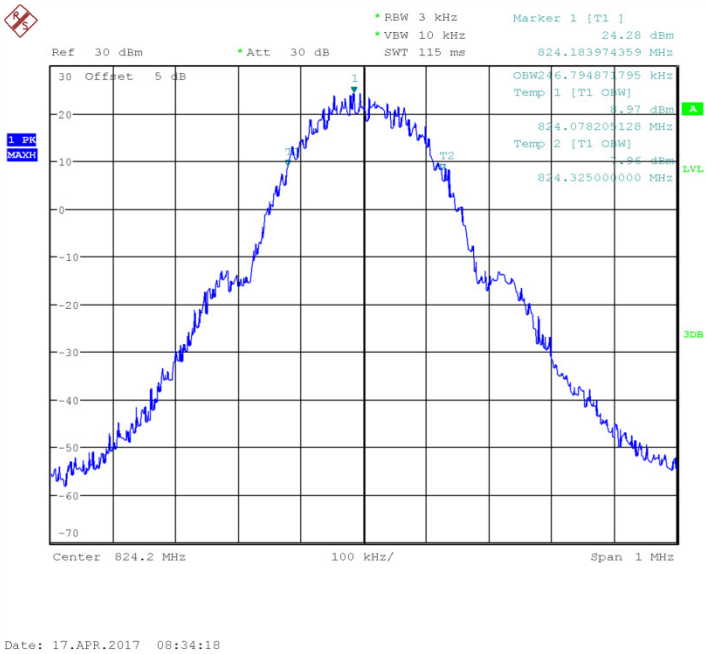
Channel 189-Occupied Bandwidth (99%)



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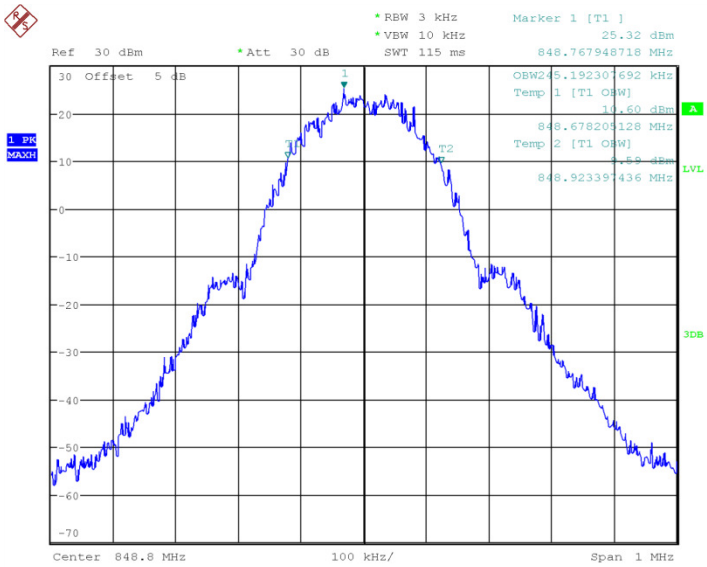
Channel 128-Occupied Bandwidth (99%)



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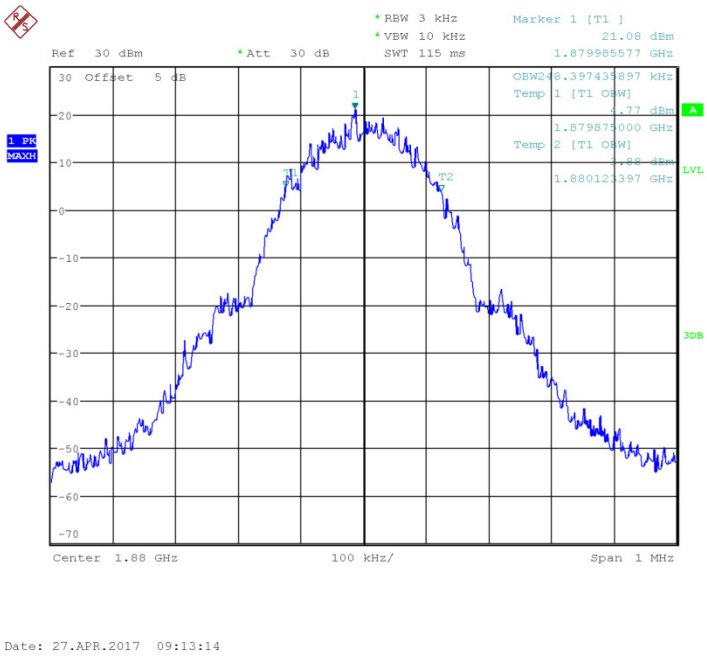
Channel 251-Occupied Bandwidth (99%)

GSM 1900		
Test channel	Frequency (MHz)	99% Occupied Bandwidth(KHz)
Mid 661	1880	248.397
Low 512	1850.2	246.795
High 810	1909.8	254.192
GPRS1900		

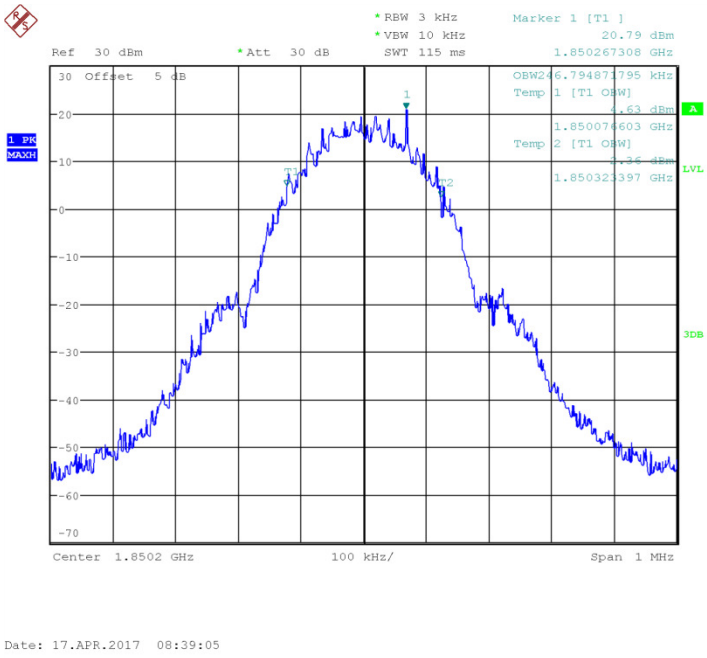
Test channel	Frequency (MHz)	99% Occupied Bandwidth(KHz)
Mid 661	1880	245.192
Low 512	1850.2	243.59
High 810	1909.8	248.397

Conclusion: PASS

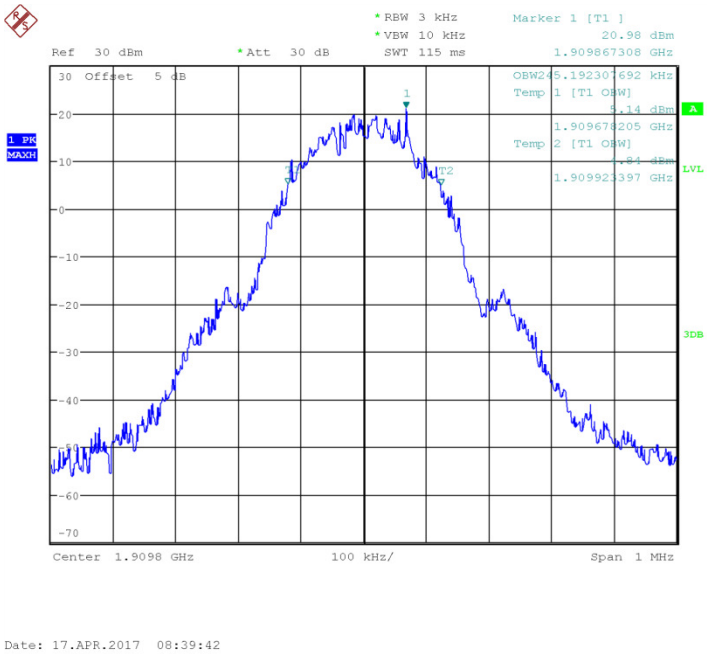
GSM 1900



Channel 661-Occupied Bandwidth



Channel512-Occupied Bandwidth



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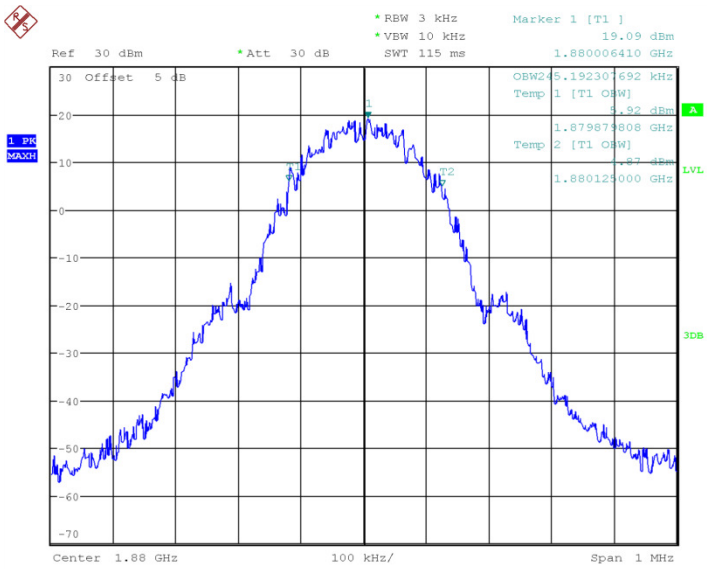
Channel 810-Occupied Bandwidth

GPRS 1900



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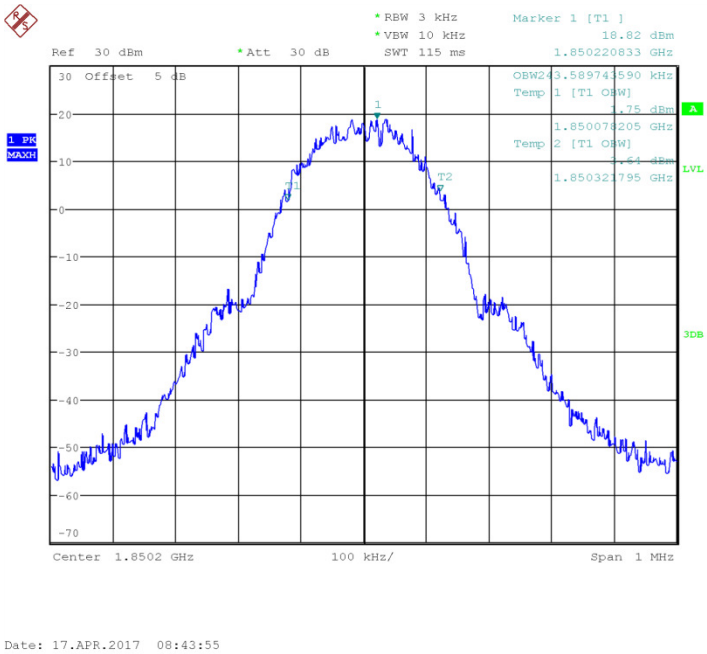
Channel 661-Occupied Bandwidth



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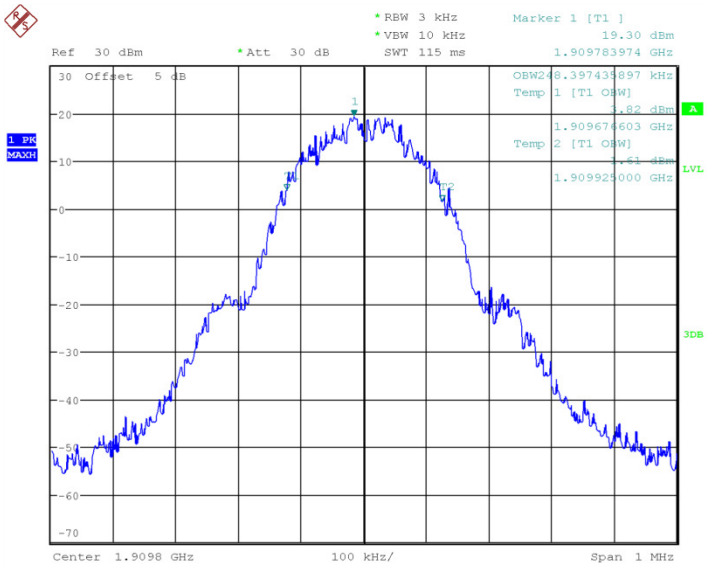
Channel512-Occupied Bandwidth



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Channel 810-Occupied Bandwidth

ANNEX A.4. -26dB Emission Bandwidth

Method of test please refer to KDB971168 D01 v02r02 clause 4.0.

A.4.1. -26dB Emission Bandwidth

Similar to conducted emissions; occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of GSM850, PCS1900.

A.4.2 Test Procedure:

1. The EUT output RF connector was connected with a short cable to the signal analyzer.
2. RBW was set to about 1% of emission BW, VBW >= 3 times RBW,.
3. 26dB bandwidth were measured, the occupied bandwidth is delta frequency between the two points where the display line intersects the signal trace.

A.4.3 Measurement methods:

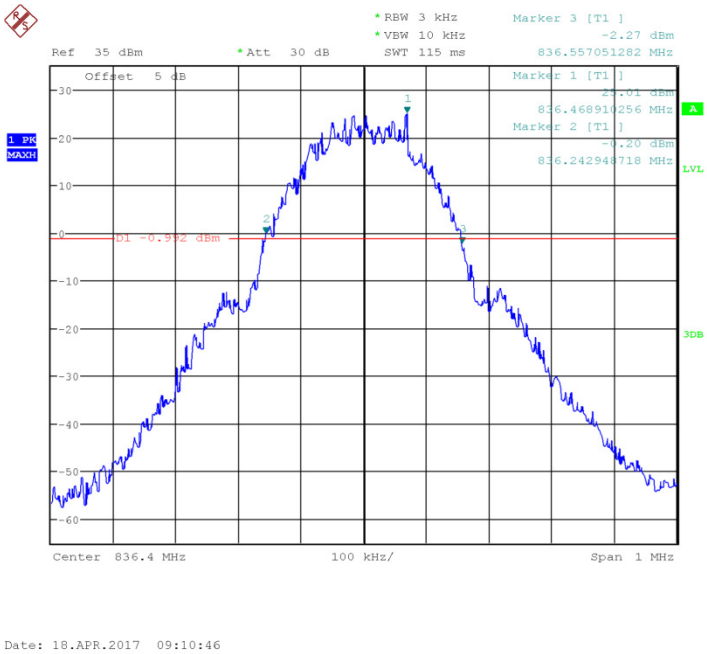
For GSM: signal analyzer setting as: RBW=3KHz;VBW=10KHz;Span=1MHz.

A.4.4 Test results:

GSM 850		
Test channel	Frequency (MHz)	–26dBc Emission Bandwidth(KHz)
Mid 189	836.4	314.103
Low 128	824.2	309.295
High 251	848.8	307.692
GPRS850		
Test channel	Frequency (MHz)	–26dBc Emission Bandwidth(KHz)
Mid 189	836.4	309.295
Low 128	824.2	317.308
High 251	848.8	312.5

Conclusion: PASS

GSM 850



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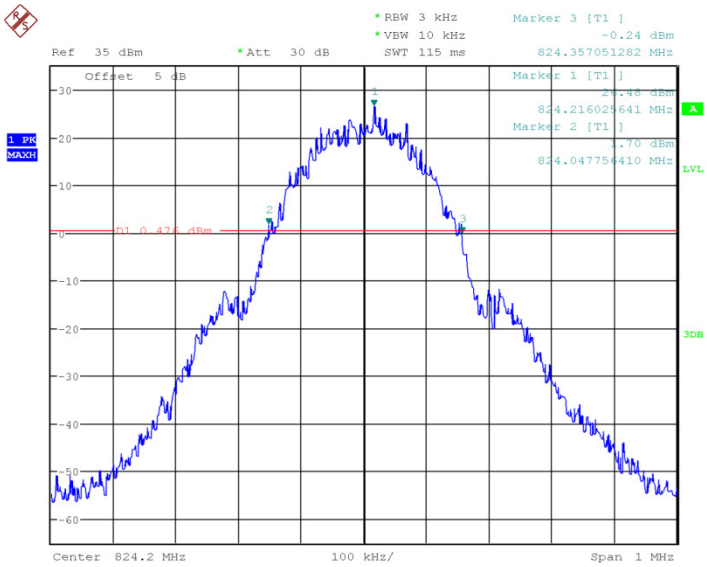
Channel 189- Emission Bandwidth (-26dBc BW)



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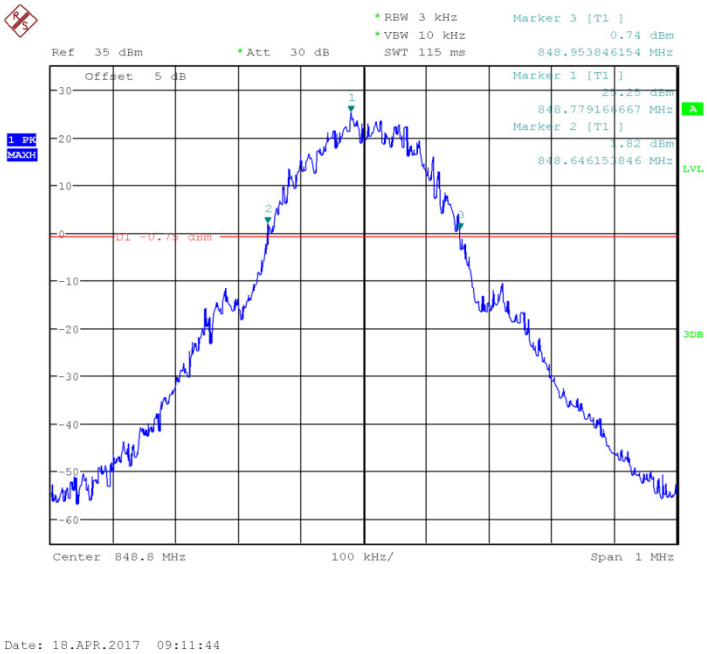
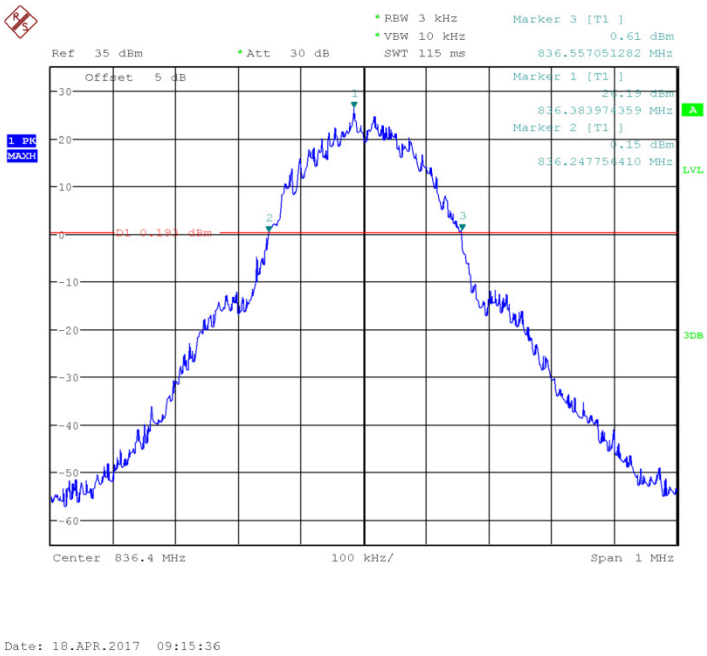
Channel 128- Emission Bandwidth (-26dBc BW)

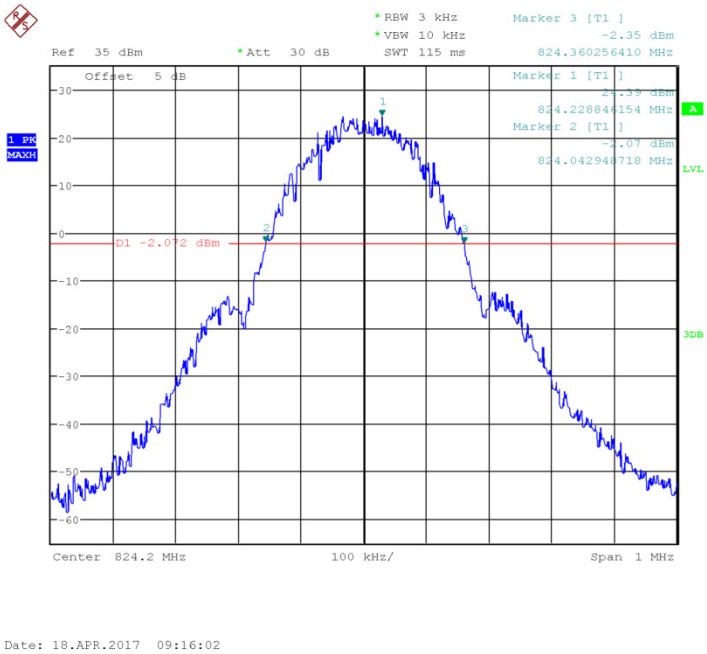


Channel 251- Emission Bandwidth (-26dBc BW)

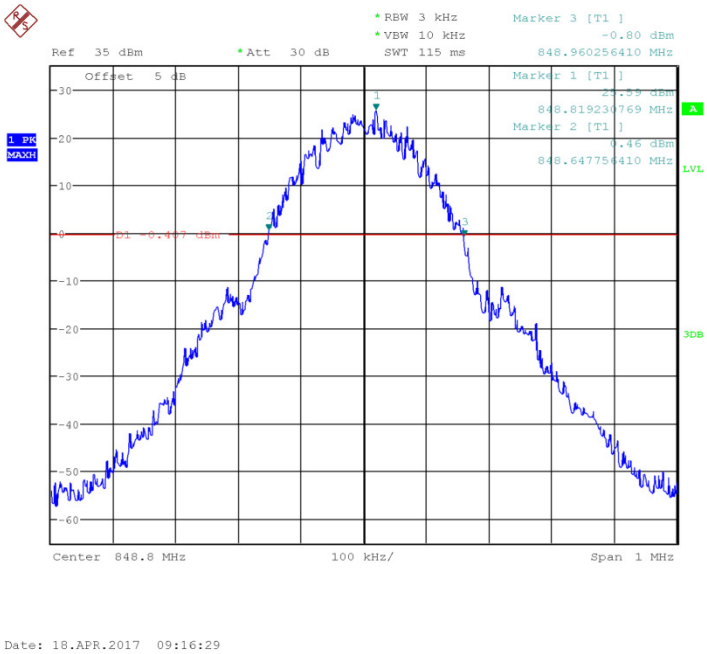
GPRS 850



Channel 189- Emission Bandwidth (-26dBc BW)



Channel 128- Emission Bandwidth (-26dBc BW)



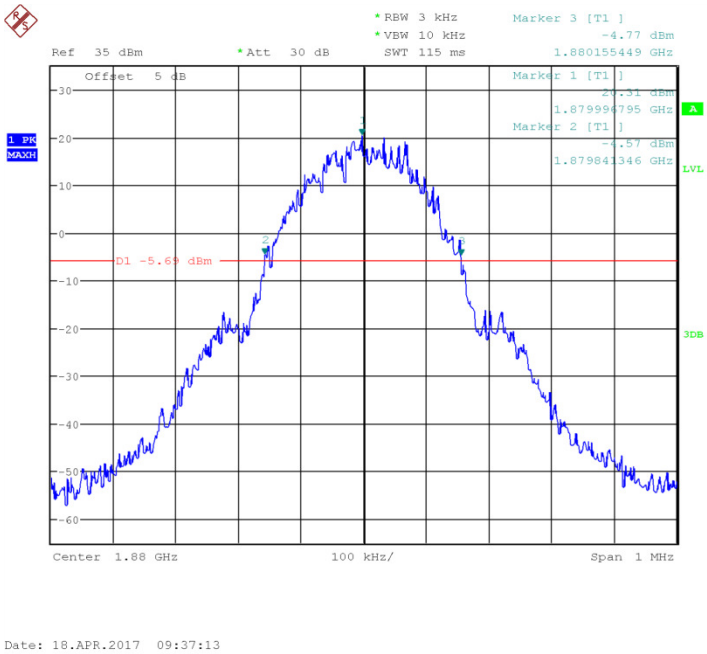
Channel 251- Emission Bandwidth (-26dBc BW)

GSM1900		
Test channel	Frequency (MHz)	–26dBc Emission Bandwidth(KHz)
Mid 661	1880	314.103
Low 512	1850.2	310.897
High 810	1909.8	312.5

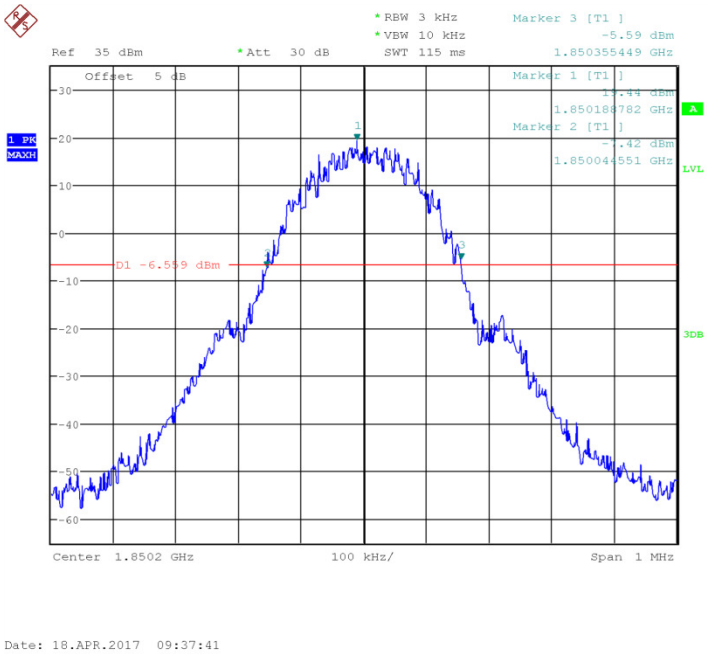
GPRS1900		
Test channel	Frequency (MHz)	–26dBc Emission Bandwidth(KHz)
Mid 661	1880	310.897
Low 512	1850.2	310.897
High 810	1909.8	310.897

Conclusion: PASS

GSM 1900

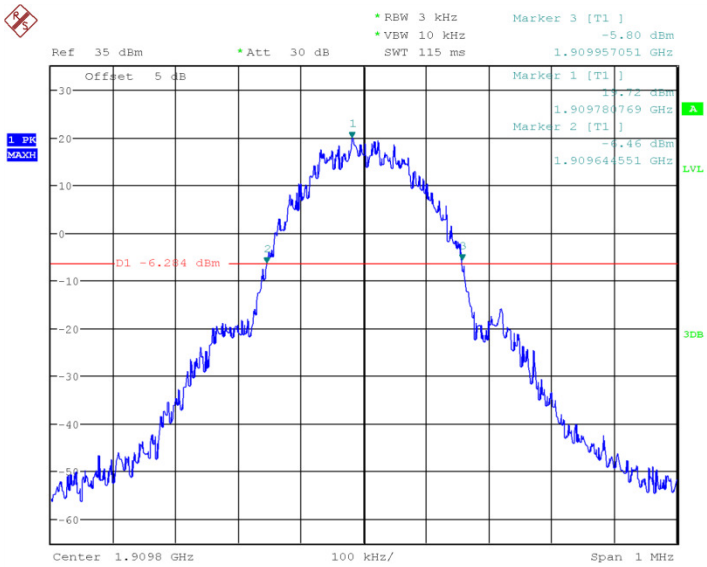


Channel 661- Emission Bandwidth (-26dBc BW)



Date: 18.APR.2017 09:37:41

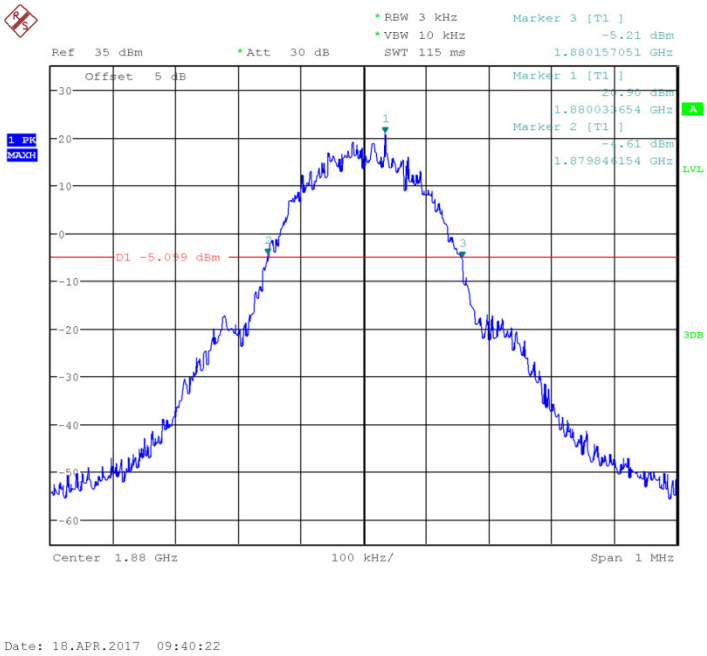
Channel512- Emission Bandwidth (-26dBc BW)



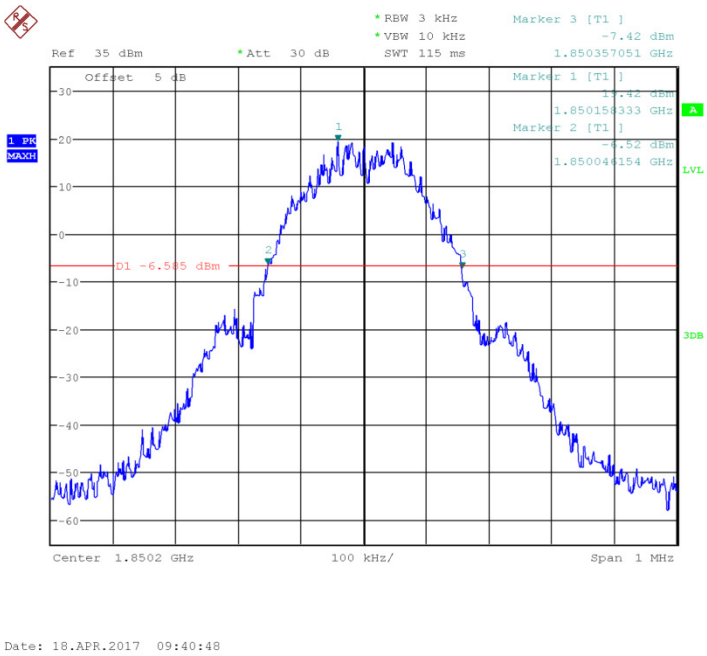
Date: 18.APR.2017 09:38:09

Channel 810- Emission Bandwidth (-26dBc BW)

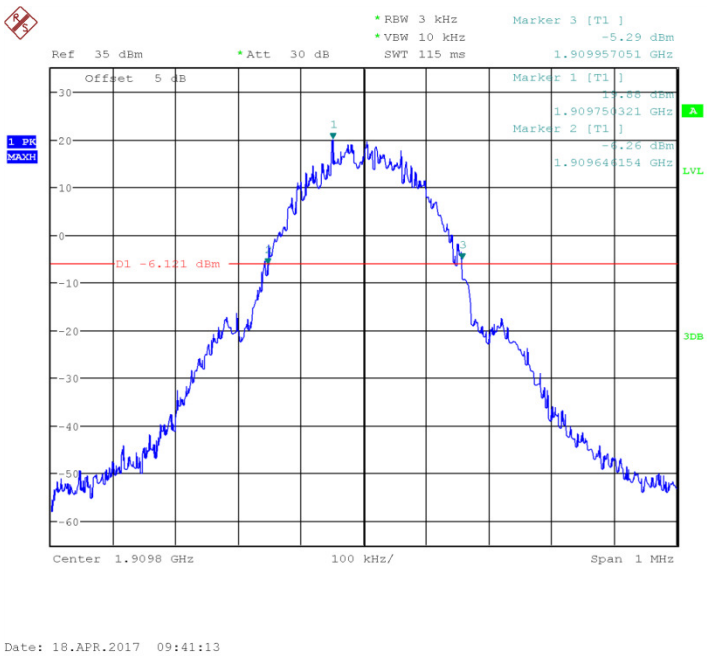
GPRS 1900



Channel 661- Emission Bandwidth (-26dBc BW)



Channel512- Emission Bandwidth (-26dBc BW)



Channel 810- Emission Bandwidth (-26dBc BW)

ANNEX A.5. Band Edge at antenna terminals

Method of test measurements please refer to KDB971168 D01 v02r02 clause 3.5

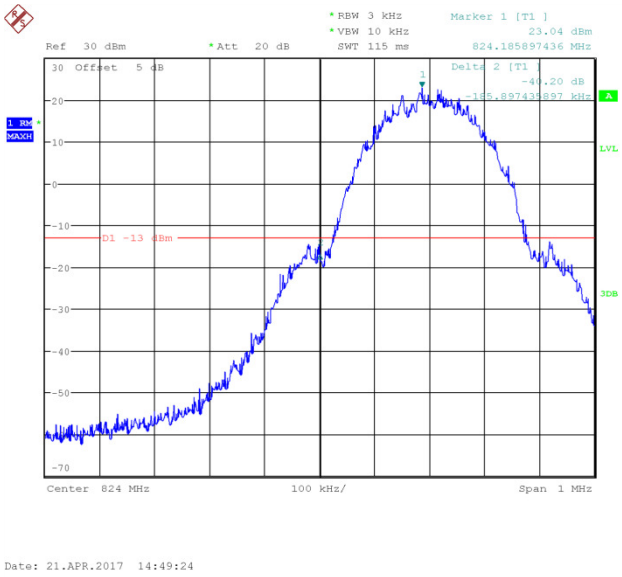
A.5.1 Limit:

The magnitude of each spurious and harmonic emission that can be detected when the equipment is operated under the conditions specification in the instruction manual and/or alignment procedure, shall not be less than 43+10log (Mean power in watts) dBc below the mean power output outside a license's frequency block(-13dBm).

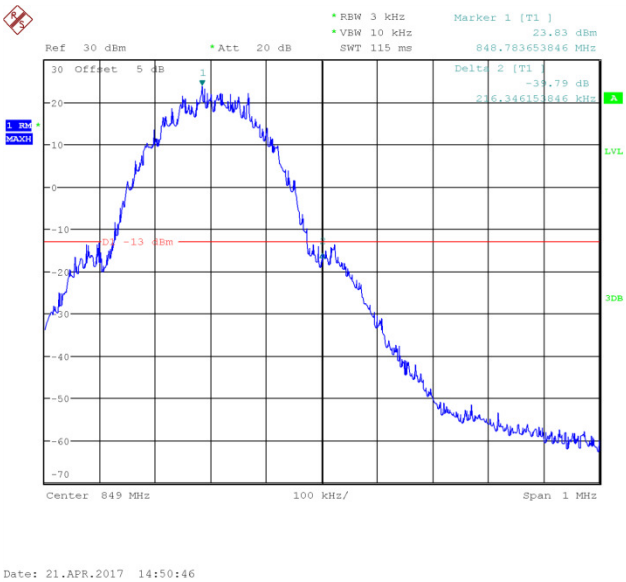
A.5.2 Test procedure:

1. The RF output of the transceiver was connected to a signal analyzer through appropriate attenuation.
2. In the 1MHz 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.
3. The RF fundamental frequency should be excluded against the limit line in the operating frequency band
4. The limit line is derived from 43+10log(P) Db below the transmitter power P(Watts)
   =P(W)-[43+10log(P)](Db)
   =[30+10log(P)](dBm)-[43+10log(P)](Db)
   =-13dBm

GSM 850

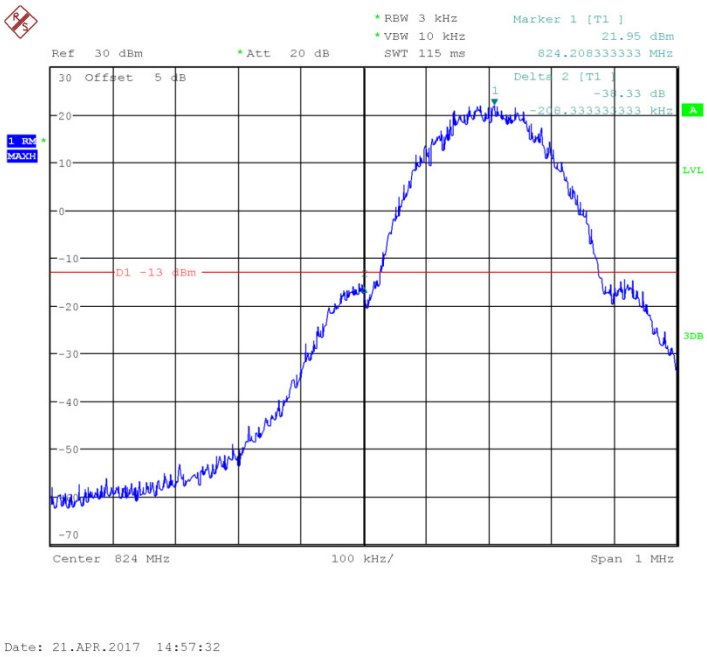


Channel 128- LOW BAND EDGE BLOCK

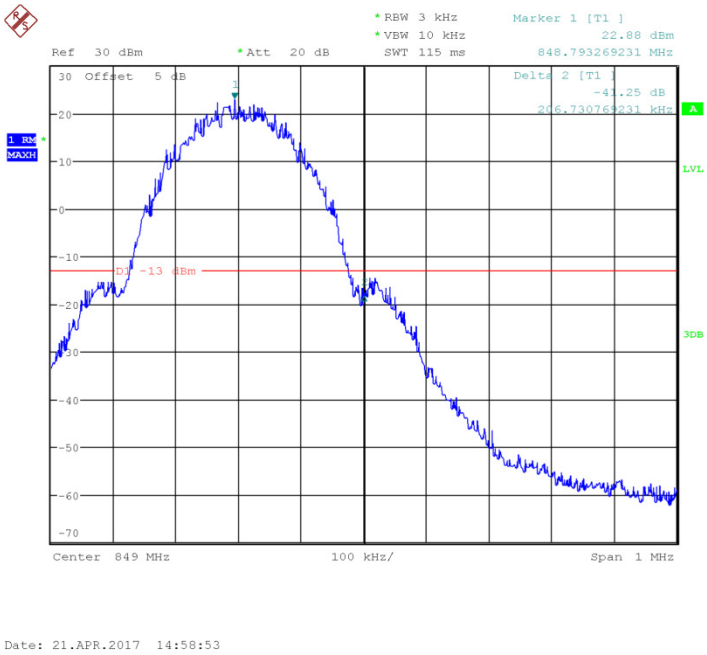


Channel 251- HIGH BAND EDGE BLOCK

GPRS 850

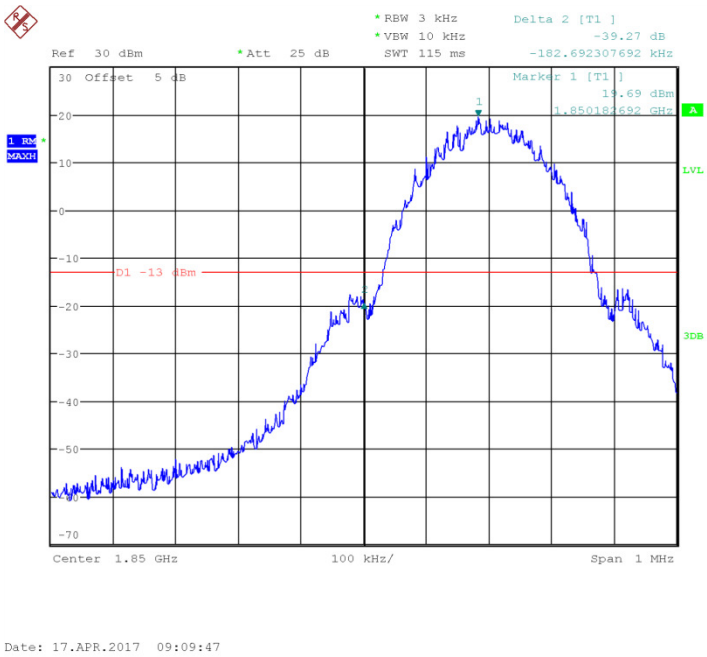


Channel 128- LOW BAND EDGE BLOCK

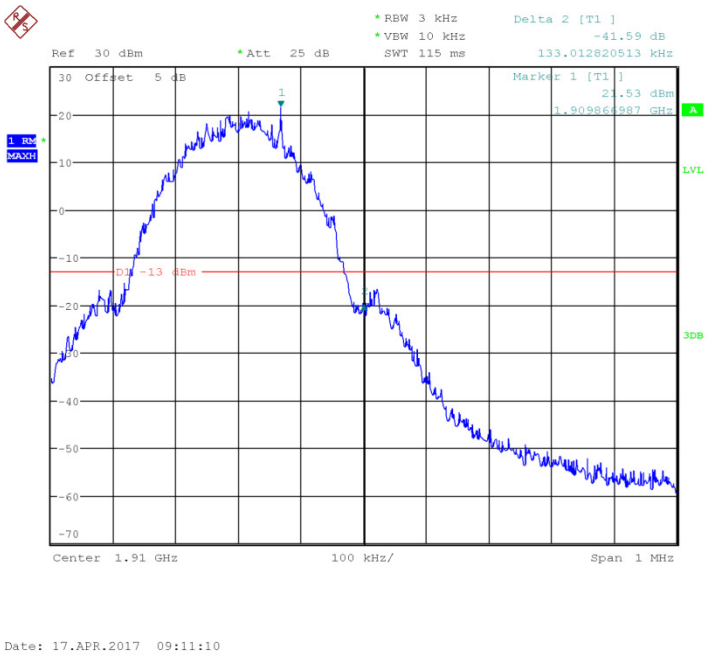


Channel 251- HIGH BAND EDGE BLOCK

GSM 1900

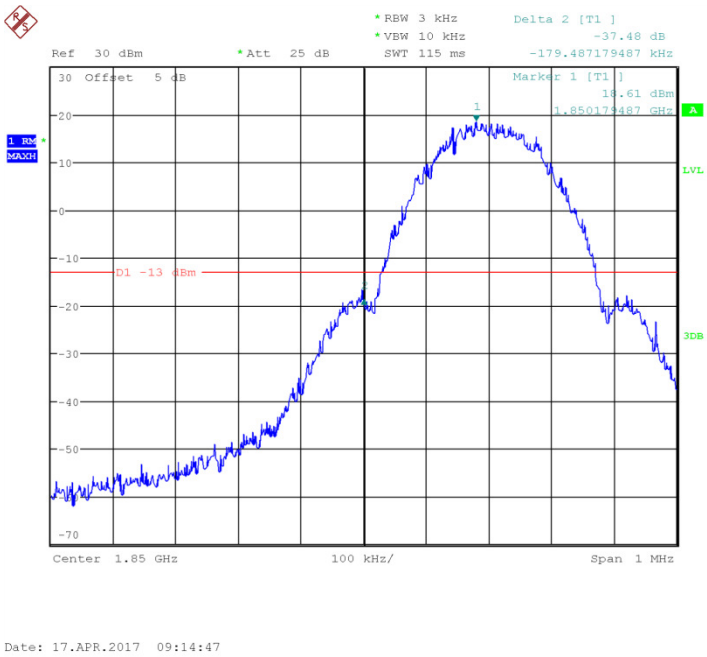


Channel 512- LOW BAND EDGE BLOCK

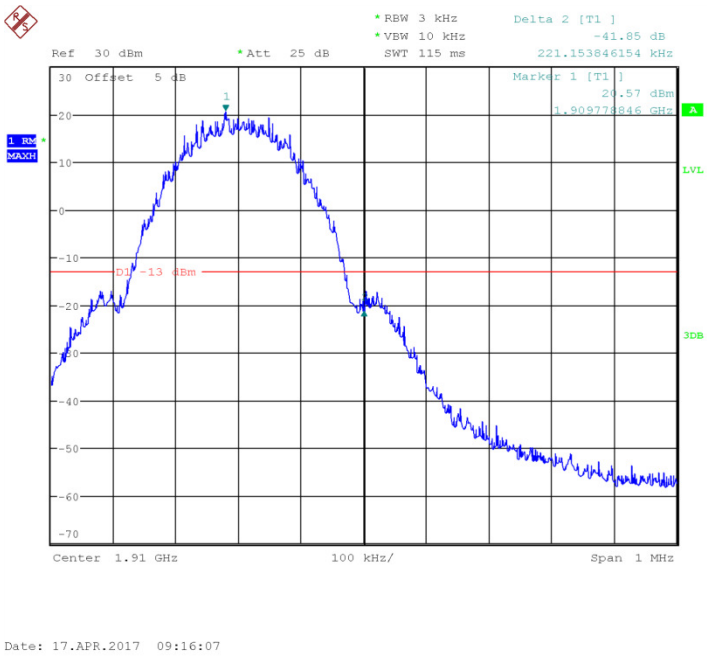


Channel 810- HIGH BAND EDGE BLOCK

GPRS 1900



Channel 512- LOW BAND EDGE BLOCK



Channel 810- HIGH BAND EDGE BLOCK

ANNEX A.6. FREQUENCY STABILITY

Method of test measurements please refer to KDB971168 D01 v02r02 clause 3.8

A.5.1.Method of Measurement and test procedures

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 CMU200 DIGITAL RADIO COMMUNICATION TESTER.

1. Measure the carrier frequency at room temperature.
2. Subject the EUT to overnight soak at -30℃.
3. With the EUT, powered via nominal voltage, connected to the CMU200 and in a simulated call on mid channel of GSM850, PCS1900, 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℃ increments from -30℃ to +50℃. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.
5. Re-measure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments re-measuring carrier frequency at each voltage. Pause at nominal voltage for 1 1/2 hours unpowered, to allow any self-heating to stabilize, before continuing.
6. Subject the EUT to overnight soak at +50℃.
7. With the EUT, powered via nominal voltage, connected to the CMU200 and in a simulated call on the centre 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℃ to -30℃. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
9. At all temperature levels hold the temperature to +/- 0.5℃ during the measurement procedure.

A.5.2. Measurement Limit

A.5.2.1. For Hand carried battery powered equipment

According to the JTC standard the GSM frequency stability of the carrier shall be accurate to within 0.1ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec.24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. As this transceiver is considered "Hand carried, battery powered equipment" Section 2.1055(d)(2) applies. This requires that the lower voltage for frequency stability testing be specified by the manufacturer. This transceiver is specified to operate with an input voltage of between 3.6VDC and 4.2VDC, with a nominal voltage of 3.7VDC. 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 was varied from 85% to 115%.

A.5.2.2. For equipment powered by primary supply voltage

According to the JTC standard the GSM frequency stability of the carrier shall be accurate to within 0.1ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec.24.235, 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 varying primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

A.5.3 Test results

GSM850Mid Channel/fc(MHz) 189/836.4

Frequency Error VS Temperature

Power Supply (VDc)	Environment Temperature(℃)	Frequency error(Hz)	Limit (Hz)
3.7	-30	11	2091
3.7	-20	1	2091
3.7	-10	-25	2091
3.7	0	48	2091
3.7	10	80	2091
3.7	20	-30	2091
3.7	30	44	2091
3.7	40	61	2091
3.7	50	-20	2091

Frequency Error VS Voltage

Power Supply (VDc)	Environment Temperature(℃)	Frequency error(Hz)	Limit (Hz)
3.6	25	12	2091
3.7	25	25	2091
4.2	25	31	2091

PCS1900 Mid Channel/fc(MHz) 661/1880

Frequency Error VS Temperature

Power Supply (VDc)	Environment Temperature(℃)	Frequency error(Hz)	Limit (Hz)
3.7	-30	24	4700
3.7	-20	32	4700
3.7	-10	14	4700
3.7	0	-92	4700
3.7	10	-24	4700
3.7	20	41	4700
3.7	30	-42	4700
3.7	40	-5	4700
3.7	50	38	4700

Frequency Error VS Voltage

Power Supply (VDc)	Environment Temperature(℃)	Frequency error(Hz)	Limit (Hz)
3.6	25	40	4700
3.7	25	35	4700
4.2	25	-29	4700

ANNEX A.7. CONDUCTED SPURIOUS EMISSION

A.7.1. GSM Measurement Method and test procedures

The following steps outline the procedure used to measure the conducted emissions from the EUT.

1. Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency. For the equipment of PCS1900 band, this equates to a frequency range of 30 MHz to 19.1 GHz, data taken from 30 MHz to 20 GHz. For GSM850,data taken from 30 MHz to 10 GHz.
2. The sweep time is set automatically by instrument itself. That should be the optimal sweep time for the span and the RBW. If the sweep time is too short, that is sweep is too fast, the sweep result is not accurate; If the sweep time is too long, that is sweep is too low, some frequency components may be lost. The instrument will give a optimal sweep time according the selected span and RBW.
3. The procedure to get the conducted spurious emission is as follows:
The trace mode is set to MaxHold to get the highest signal at each frequency;
Wait 25 seconds; Get the result.
4. Determine EUT transmit frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

PCS1900 Transmitter

Channel	Frequency(MHz)
512	1850.2
661	1880.0
810	1909.8

A.7.1.1. Measurement Limit

Part 24.238 and Part 22.917 specify that 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.

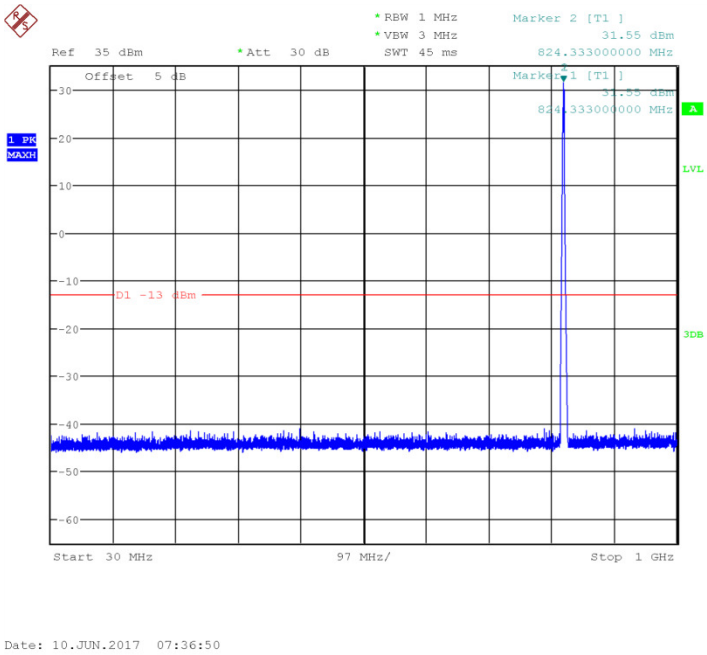
The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

A7.1.2. Measurement result

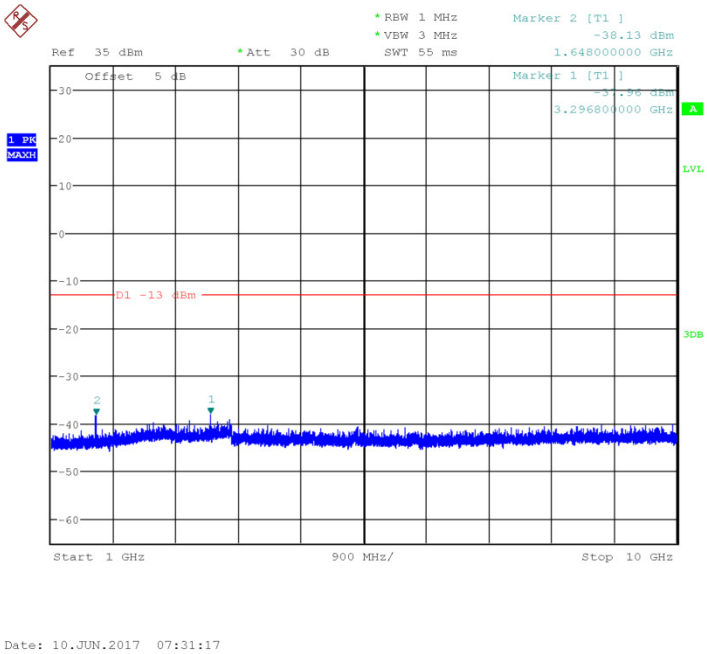
Spurious emission limit -13dBm.

Note: peak above the limit line is the carrier frequency.

A7.1.2.1. GSM850

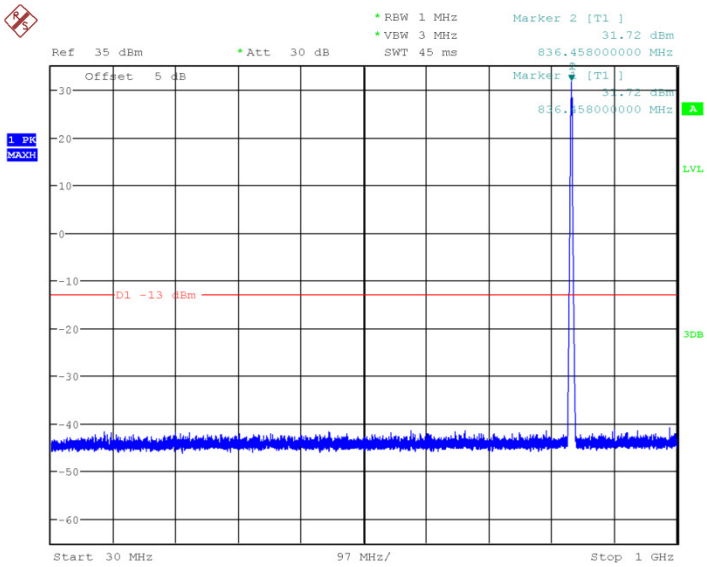


Channel 128: 30MHz~1GHz



Date: 10.JUN.2017 07:31:17

Channel 128: 1GHz~10GHz



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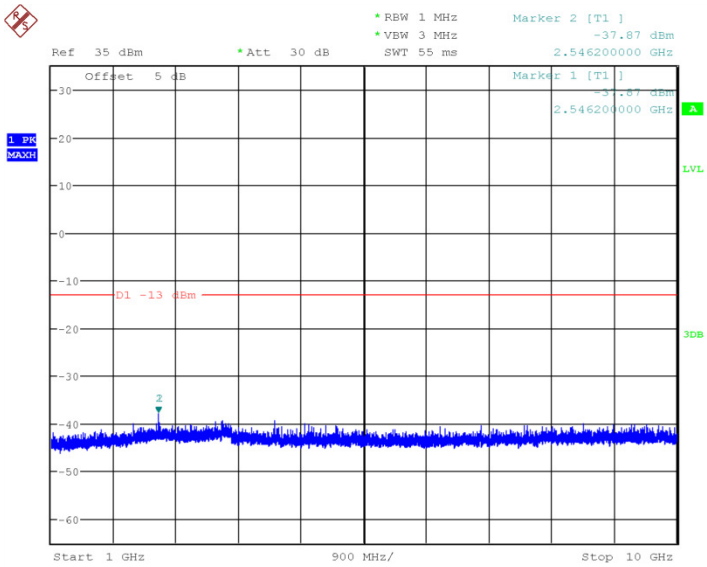
Channel 189: 30MHz~1GHz



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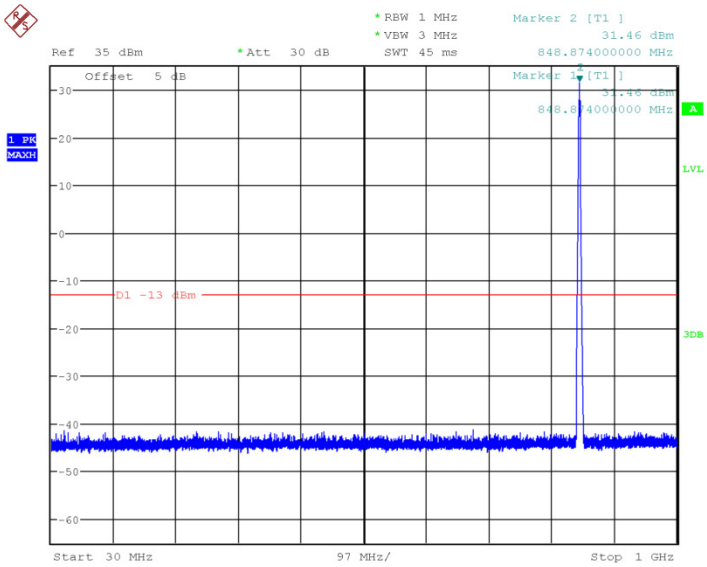
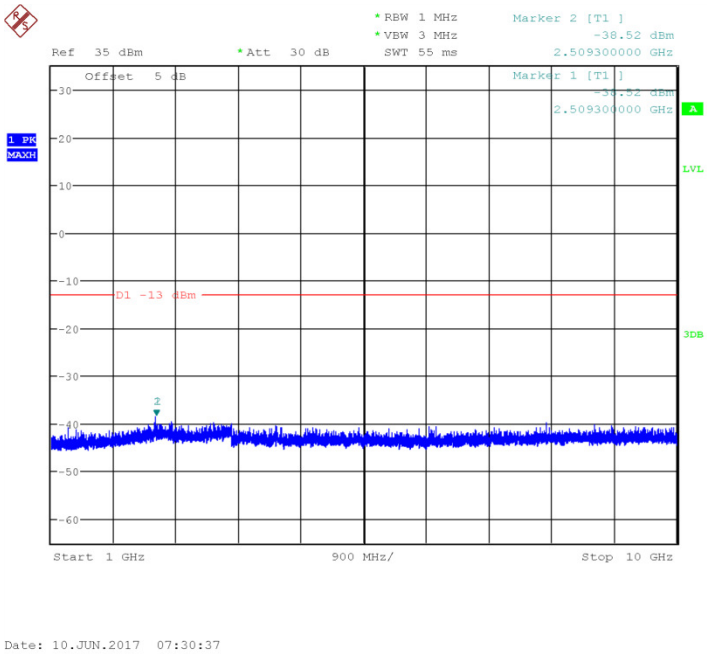
Channel 189: 1GHz~10GHz



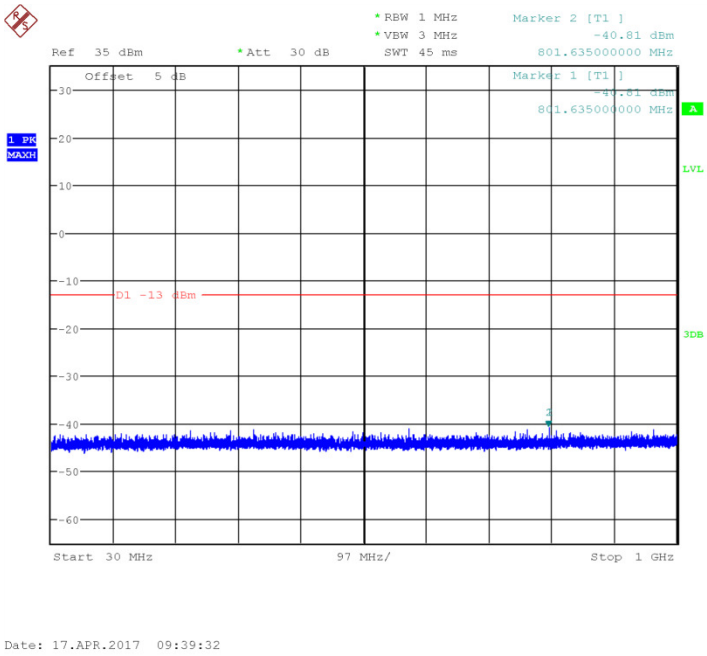
Date: 10.JUN.2017 07:37:30

Channel 251: 30MHz~1GHz

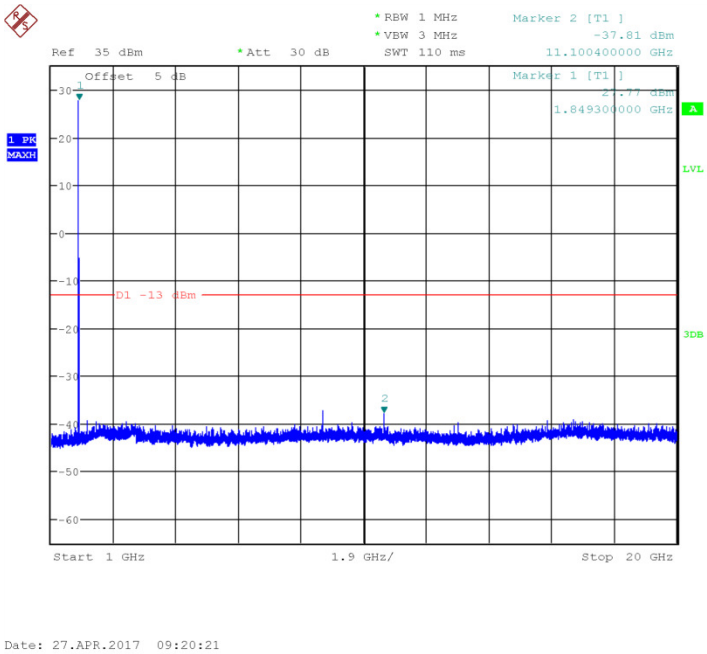


Channel 251: 1GHz~10GHz

A7.1.2.2. GSM1900

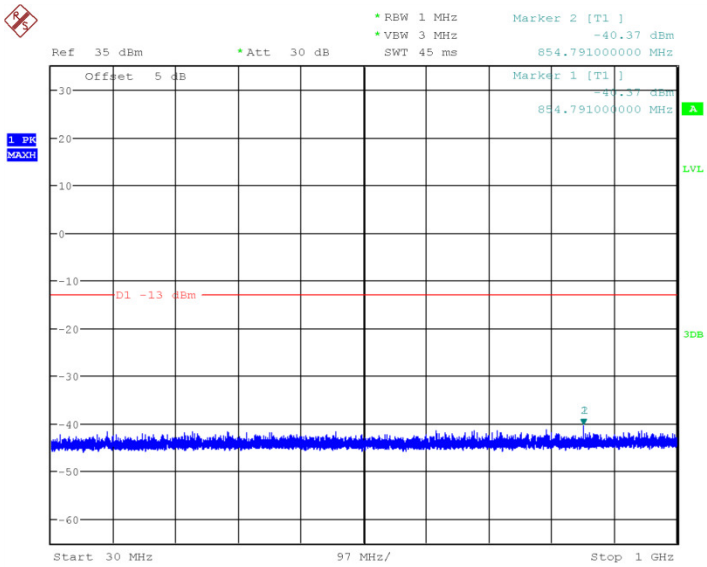


Channel 512: 30MHz~1GHz



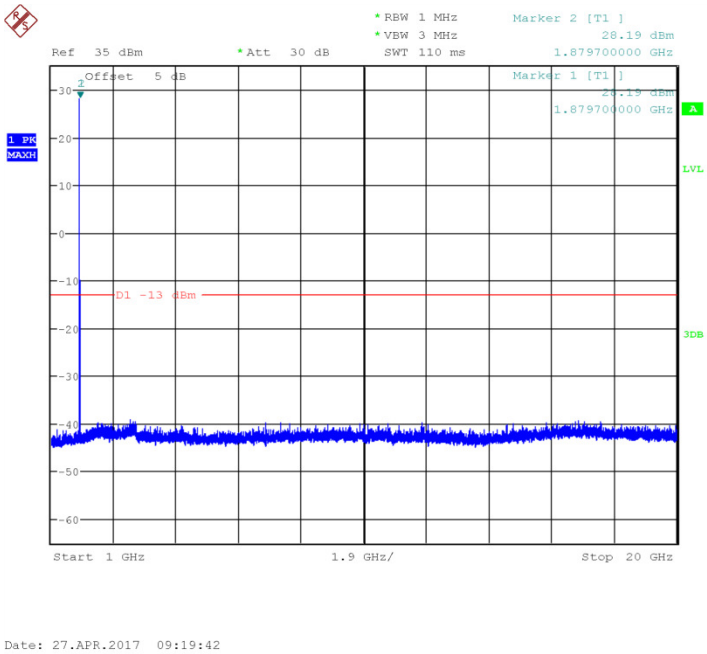
Date: 27.APR.2017 09:20:21

Channel 512: 1GHz~20GHz



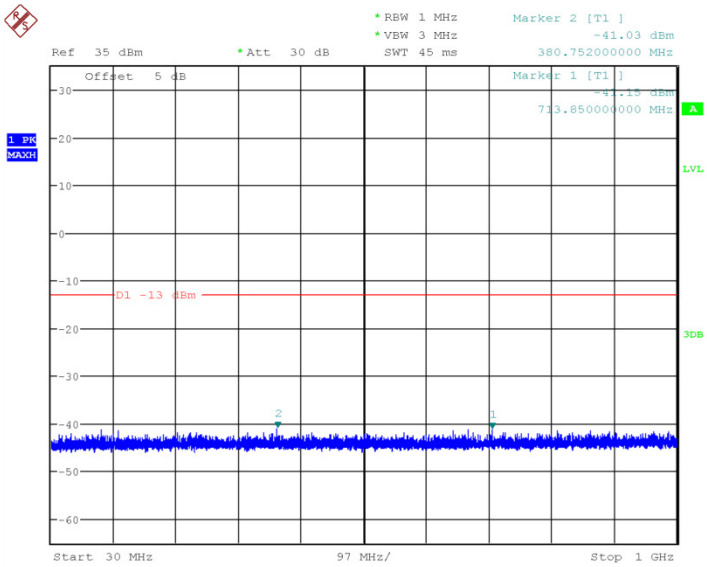
Date: 17.APR.2017 09:38:52

Channel 661: 30MHz~1GHz



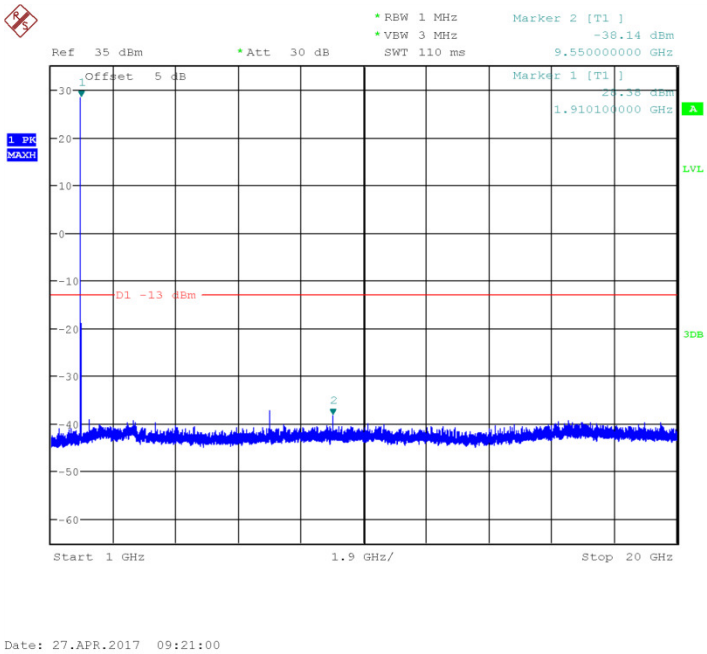
Date: 27.APR.2017 09:19:42

Channel 661: 1GHz~20GHz



Date: 17.APR.2017 09:40:11

Channel 810: 30MHz~1GHz



Channel 810: 1GHz~20GHz

Conclusion: PASS

ANNEX A.8. RADIATED

A.8.1. ERP

A.8.1.1. GSM ERP

A.8.1.1.1. Description

This is the test for the maximum radiated power from the EUT.

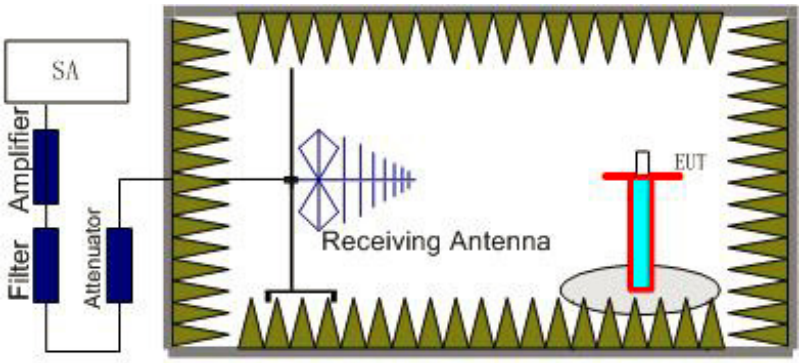
Rule Part 24.232(c) specifies, "Mobile/portable stations are limited to 2 watts e.i.r.p. Peak power" and 24.232(c) specifies that "Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage." Rule Part 22.913(a) specifies ” The ERP of mobile transmitters and auxiliary test transmitters must

not exceed 7 Watts.”

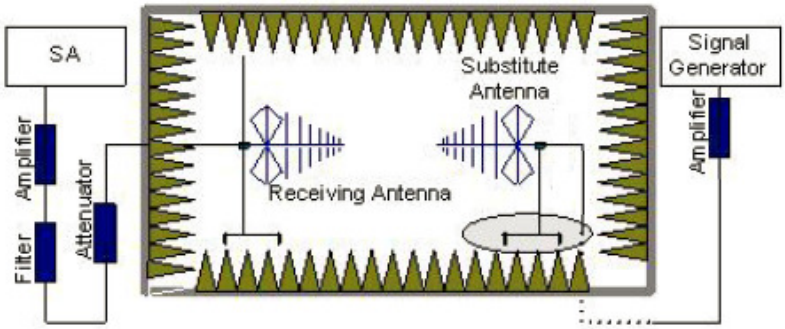
A.8.1.1.2. Method of Measurement

The measurements procedures in TIA-603D-2010 are used.

1. EUT was placed on a 1.5 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 1.5m. The test setup refers to figure below. 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 (Pr).
3. The EUT shall be replaced by a substitution antenna. The test setup refers to figure below.



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. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna.
The cable loss (P_{cl}) ,the Substitution Antenna Gain (G_a) and the Amplifier Gain (P_{Ag}) should be recorded after test.
The measurement results are obtained as described below:
Power(EIRP)=P_{Mea}+ P_{Ag}- 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 -2.15dBi.

A.8.1.1.3 GSM 850-ERP 22.913(a)

A.8.1.1.3.1 Limits

	Power Step	Burst Peak ERP (dBm)
GSM	5	≤38.45dBm (7W)
GPRS	3	≤38.45dBm (7W)

A.8.1.1.3.2 Measurement result

GSM(GMSK)

Frequency (MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_aAntenna Gain(dBd)	PeakERP(dBm)	Polarization
824.2	-1.4	3.1	37	-2.87	29.63	V
836.6	-0.85	3.1	37	-3.11	29.94	V
848.8	-0.37	3.1	37	-3.11	30.42	V

GPRS(GMSK)

Frequency (MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_aAntenna Gain(dBd)	PeakERP(dBm)	Polarization
824.2	-1.35	3.1	37	-2.87	29.68	V
836.6	-0.79	3.1	37	-3.11	30.00	V
848.8	-0.28	3.1	37	-3.11	30.51	V

Frequency: 824.2MHz

Peak ERP(dBm)= P_{Mea}(-1.4dBm) - P_{cl}(3.1dB) +P_{Ag}(37dB) + G_a(-2.87dBd)

= 29.63dBm

Note: ANALYZER SETTINGS: RBW = VBW = 3MHz

A.8.1.1.4 PCS 1900-EIRP 24.232(c)

A.8.1.1.4.1 Limits

	Power Step	Burst Peak EIRP (dBm)
GSM	0	≤33dBm (2W)
GPRS	3	≤33dBm (2W)

A.8.1.1.4.2 Measurement result

GSM(GMSK)

Frequency (MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_aAntenna Gain(dBi)	PeakEIRP(dBm)	Polarization
1850.2	-7.64	4.6	36	4.7	28.46	V
1880.0	-6.08	4.6	35.6	4.7	29.62	V
1909.8	-5.51	4.7	35.9	4.5	30.19	V

GPRS(GMSK)

Frequency (MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_aAntenna Gain(dBi)	PeakEIRP(dBm)	Polarization
1850.2	-7.65	4.6	36	4.7	28.45	V
1880.0	-6.08	4.6	35.6	4.7	29.62	V
1909.8	-5.44	4.7	35.9	4.5	30.26	V

Frequency: 1850.2MHz

Peak EIRP(dBm)= P_{Mea}(-9.19dBm) - P_{cl}(4.6dB)+ P_{Ag}(36dB) +G_a(4.7dB)=26.91dBm

ANALYZER SETTINGS: RBW = VBW = 3MHz

A.8.2 EMISSION LIMIT (§2.1051/§22.917§24.238)

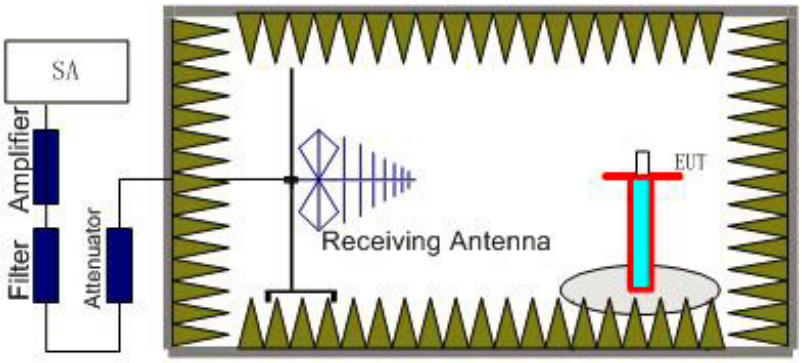
A.8.2.1 GSM Measurement Method

The measurement procedures in TIA-603D-2010are used.

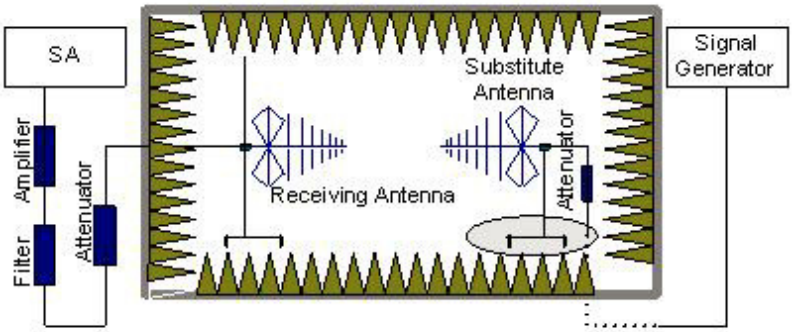
The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 1910 MHz. The resolution bandwidth is set as outlined in Part 24.238 and Part 22.917. The spectrum is scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of PCS1900 and GSM850.

A.8.2.2 The procedure of radiated spurious emissions is as follows:

1. EUT was placed on a 1.5 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 1.5m. The test setup refers to figure below. 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 non-harmonic and harmonics of the transmit frequency through the 10^{th}harmonic 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 (Pr).
3. The EUT shall be replaced by a substitution antenna. The test setup refers to figure below.



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 Path loss (P_{pl}) between the Signal Source with the Substitution Antenna and the Substitution Antenna Gain (G_a) should be recorded after test. An amplifier should be connected in for the test. The Path loss (P_{pl}) is the summation of the cable loss.
The measurement results are obtained as described below: Power(EIRP)=P_{Mea}- P_{pl}+ 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 -2.15dBi

A.8.2.3 Measurement Limit

Part 24.238 and Part 22.917 specify that 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.
The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes

a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

A.8.2.4 Measurement Results

Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the PCS1900 band (1850.2 MHz, 1880 MHz and 1909.8 MHz) and GSM850 band (824.2MHz, 836.6MHz, 848.8MHz) . 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 PCS1900 , GSM850 into any of the other blocks. 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.

A.8.2.5 Measurement Results

Measurements results:

Frequency	Channel	Frequency Range	Result
GSM850	Low	30MHz~10GHz	P
	Middle	30MHz~10GHz	P
	High	30MHz~10GHz	P
GSM1900	Low	30MHz~20GHz	P
	Middle	30MHz~20GHz	P
	High	30MHz~20GHz	P

GSM850

GSM Mode Channel 128

Final result:

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit （dBm）	Polarization
1647.857143	-36.92	4.3	3.1	-38.12	-13	H
2472.857143	-35.8	5.3	3.6	-37.50	-13	V
3296.538462	-37.05	6.2	5.0	-38.25	-13	V
4121.538462	-42.07	7.1	7.4	-41.77	-13	V

4945.384615	-45.63	7.7	8.9	-44.43	-13	V
8292.307692	-51.79	10.1	17.4	-44.49	-13	H

Note:

GSM850, CH128

Power(ERP)= Pmea-Pcl+Ga=-33.04-4.3+3.1=-34.24dbm

This method Applicable to the following table.

GSM Mode Channel 190

Final result:

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit（dBm）	Polarization
1673.571429	-36.53	4.3	3.2	-37.63	-13	H
3346.153846	-35.86	6.2	5.3	-36.76	-13	H
4182.692308	-41.89	7.0	7.4	-41.49	-13	V
5020.384615	-45.51	7.8	9.0	-44.31	-13	H
8635.384615	-51.2	10.3	18.3	-43.20	-13	V
9806.153846	-48.85	11.0	18.0	-41.85	-13	V

GSM Mode Channel 251

Final result:

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit（dBm）	Polarization
1697.142857	-39.19	4.4	3.0	-40.59	-13	H
2952.857143	-35.96	5.8	4.6	-37.16	-13	V
3393.461539	-41.66	6.3	5.8	-42.16	-13	H
4243.846154	-46.63	7.1	7.7	-46.03	-13	H
5805.000000	-48.85	8.4	10.5	-46.75	-13	V

9121.538462	-50.91	10.5	18.4	-43.01	-13	H

GPRS Mode Channel 128

Final result:

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit（dBm）	Polarization
1647.857143	-42.7	4.3	3.1	-43.90	-13	H
2472.857143	-36.35	5.3	3.6	-38.05	-13	V
2950.714286	-35.64	5.8	4.6	-36.84	-13	V
3297.692308	-38.41	6.2	5.1	-39.51	-13	V
4120.384615	-42.16	7.0	7.3	-41.86	-13	V
6630.769231	-48.82	9.1	11.8	-46.12	-13	V

Note:

GSM850, CH128

Power(ERP)= Pmea-Pcl+Ga=-42.7-4.3+3.1=-43.90dbm

This method Applicable to the following table.

GPRS Mode Channel 190

Final result:

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit（dBm）	Polarization
2986.071429	-35.63	5.8	4.6	-36.83	-13	V
3346.153846	-36.52	6.2	5.1	-37.62	-13	V
4182.692308	-41.82	7.0	7.3	-41.52	-13	V
5019.230769	-45.03	7.8	9.0	-43.83	-13	V
7169.230769	-49.08	9.5	13.3	-45.28	-13	H

8616.923077	-52.4	10.3	18.3	-44.40	-13	H

GPRS Mode Channel 251

Final result:

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit（dBm）	Polarization
1697.142857	-35.08	4.4	3.0	-36.48	-13	H
2961.428571	-35.11	5.8	4.6	-36.31	-13	V
3395.769231	-38.73	6.3	5.8	-39.23	-13	H
4243.846154	-43.7	7.1	7.7	-43.10	-13	V
5093.076923	-42.61	7.9	8.9	-41.61	-13	V
7120.000000	-49.81	9.4	13.3	-45.91	-13	V

GSM1900

GSM Mode Channel 512

Final result:

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit（dBm）	Polarization
3700.200000	-41.34	6.6	6.2	-41.74	-13	H
5551.200000	-34	8.2	9.7	-32.50	-13	V
11101.200000	-27.42	12.1	18.3	-21.22	-13	H
12951.600000	-38.62	13.1	20.0	-31.72	-13	V
14800.800000	-36.62	14.3	23.6	-27.32	-13	H
16652.400000	-36.48	14.9	20.1	-31.28	-13	V

GSM Mode Channel 661

Final result:

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit（dBm）	Polarization
3760.200000	-40.59	6.6	6.2	-40.99	-13	H
5641.200000	-39.55	8.3	10.1	-37.75	-13	V
7519.200000	-38.68	9.7	14.6	-33.78	-13	V
9399.600000	-40.66	10.7	18.5	-32.86	-13	V
11280.000000	-31.79	12.1	18.5	-25.39	-13	H
16921.200000	-34.64	16.3	20.8	-30.14	-13	V

GSM Mode Channel 810

Final result:

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit（dBm）	Polarization
3819.600000	-43.83	6.7	6.5	-44.03	-13	V
5730.000000	-37.23	8.5	10.4	-35.33	-13	V
9549.600000	-42.85	10.7	18.6	-34.95	-13	H
11458.800000	-33.91	12.2	18.1	-28.01	-13	H
13369.200000	-41.71	13.7	22.6	-32.81	-13	H
15278.400000	-43.77	14.4	25.1	-33.07	-13	H

Conclusion: PASS

Note: the EUT was displayed in several different direction, the worst cases were shown.

GPRS Mode Channel 512

Final result:

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit （dBm）	Polarization
7400.400000	-42.34	9.7	14.4	-37.64	-13	V
9250.800000	-46.15	10.6	18.5	-38.25	-13	H
11101.200000	-34.87	12.1	18.3	-28.67	-13	H
12950.400000	-40.4	13.1	20.1	-33.40	-13	H
14802.000000	-40.35	14.3	23.6	-31.05	-13	H
16651.200000	-33.38	15.9	20.0	-29.28	-13	V

GPRS Mode Channel 661

Final result:

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit （dBm）	Polarization
5640.000000	-40.84	8.3	10.1	-39.04	-13	V
9400.800000	-48.01	10.7	18.5	-40.21	-13	H
11280.000000	-36.74	12.1	18.5	-30.34	-13	H
13159.200000	-39.83	13.0	21.2	-31.63	-13	H
15039.600000	-41.1	14.4	24.4	-31.10	-13	H
16921.200000	-34.56	16.3	20.8	-30.06	-13	V

GPRS Mode Channel 810

Final result:

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit （dBm）	Polarization

7638.000000	-42.92	9.7	15.0	-37.62	-13	V
9549.600000	-44.84	10.7	18.6	-36.94	-13	H
11458.800000	-39.84	12.2	18.1	-33.94	-13	H
13369.200000	-41.87	13.7	22.6	-32.97	-13	H
15278.400000	-45.35	14.4	25.1	-34.65	-13	H
17187.600000	-37.47	16.0	20.5	-32.97	-13	V

Conclusion: PASS

Note: the EUT was displayed in several different direction, the worst cases were shown.

ANNEX B. Deviations from Prescribed Test Methods

No deviation from Prescribed Test Methods.

**********End The Report**********