



TEST REPORT

REPORT NUMBER: I21W00047-WWAN_Rev1

ON

Type of Equipment: GSM module
Type of Designation: R800C
Brand Name: SIMCom
Manufacturer: SIMCom Wireless Solutions Limited
FCC ID: 2AJYU-8SF0001

ACCORDING TO

FCC CFR Part 2, FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS;
GENERAL RULES AND REGULATIONS, e-CFR, 2019
PART 22, PUBLIC MOBILE SERVICES, e-CFR, 2019
PART 24, PERSONAL COMMUNICATIONS SERVICES, e-CFR, 2019
ANSI C63.26-2015

Chongqing Academy of Information and Communications Technology

Month date, year

Dec, 28, 2021

Signature

Xiang Luoyong

Director

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 Chongqing Academy of Information and Communications Technology.



Report No.: I21W00047-WWAN_Rev1

Revision Version

Report Number	Revision	Date	Memo
I21W00047-WWAN	00	2021-12-08	Initial creation of test report
I21W00047-WWAN_Rev1	01	2021-12-28	Second creation of test report

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1. Test Laboratory

1.1. Testing Location

Name:	Chongqing Academy of Information and Communications Technology
FCC Registration Number:	CN1239
Address:	Building C, Technology Innovation Center, No.8, Yuma Road, Chayuan New Area, Nan'an District, Chongqing, People's Republic of China
Postal Code:	401336
Telephone:	0086-23-88069965
Fax:	0086-23-88608777

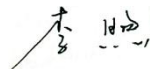
1.2. Testing Environment

Normal Temperature:	15-35°C
Relative Humidity:	30-60%

1.3. Project data

Testing Start Date:	2021-12-01
Testing End Date:	2021-12-04

1.4. Signature



2021-12-28

LiXu
(Prepared this test report)

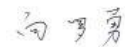
Date



2021-12-28

ChenWen
(Reviewed this test report)

Date



2021-12-28

XiangLuoYong
Director of the laboratory
(Approved this test report)

Date

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2. Client Information

2.1. Applicant Information

Company Name:	SIMCom Wireless Solutions Limited
Address /Post:	6F,BuildingB,SIMTechnologyBuilding,No.633JinzhongRoad,Changning District,Shanghai,P.R.China
City:	Shanghai
Country:	China
Telephone:	86 21 3157 5182
Fax:	--
Email:	YongshengLi@simcom.com
Contact Person:	Yongsheng Li

2.2. Manufacturer Information

Company Name:	--
Address /Post:	--
City:	--
Country:	--
Telephone:	--
Fax:	--
Email:	--
Contact Person:	--

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

3.1. About EUT

EUT Description	GSM module
Model name	R800C
Brand name	SIMCom
GSM Frequency Band	850/1900
Type of modulation	GMSK
Extreme Temperature	-10/+55°C
Nominal Voltage	3.8
Extreme High Voltage	4.2
Extreme Low Voltage	3.4

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

Note: High and low voltage values in extreme condition test are given by manufacturer.

3.2. Internal Identification of EUT used during the test

EUT ID*	SN or IMEI	HW Version	SW Version	Date of receipt
S3	863070040113705	R800C	R800C R1850	2021-11-30
S1	863070040111295	R800C	R800C R1850	2021-11-30

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

3.3. Outline of Equipment under Test

Technology	Band	UL Freq.(MHz)	DL Freq.(MHz)	Note
GSM	GSM850	824 – 849	869 – 894	--
	PCS1900	1850 – 1910	1930 – 1990	--

3.4. Internal Identification of AE used during the test

AE ID*	Description	*
AE1	RF cable	--
AE2	Antenna gain	GSM850: 0.91dBi
		PCS1900:1.87dBi

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

*: is provided customer.

4. Reference Documents

4.1. Documents supplied by applicant

PICS/PIXIT, referring to Annex B for detailed information, is supplied by the client or manufacturer, which is the basis of testing.

4.2. Reference Documents for testing

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

Reference	Title	Version
FCC CFR Part 2	FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS, e-CFR	2019
PART 22	PUBLIC MOBILE SERVICES	2019
PART 24 , 2019	PERSONAL COMMUNICATIONS SERVICES, e-CFR	2019
ANSI C63.26-2015	--	2015

5. Test Equipments Utilized

5.1. RF Test System

No.	Equipment	Model	SN	HW Version	SW Version	Manufacture	Cal.Due Date
1	spectrum analyzer	FSQ 26	201137/026	--	--	R&S	2022-06-11
2	DC Power Supply	N6705B	MY50000919	--	--	Agilent	2022-06-11
3	Universal Radio Communication Tester	CMW500	152395	--	--	R&S	2022-06-11

5.2. RSE Test System

No.	Equipment	Model	SN	HW Version	SW Version	Manufacture	Cal.Due Date
1	Test Receiver	ESU40	100350	01	4.43 SP3	R&S	2022-06-11
2	Trilog Antenna	VULB9163	00995	--	--	Schwarzbeck	2023-03-04
3	Double-Ridged Horn Antenna	9120D	1083	--	--	Schwarzbeck	2022-06-11
5	Trilog super broadBand test antenna	VULB 9163	9163-586	--	--	Schwarzbeck	2023-04-02
6	Double-Ridged Horn Antenna	9120D	1103	--	--	Schwarzbeck	2022-06-11

5.3. Climate Chamber

No.	Name	Type	SN	Manufacture	Cal.Due Date
1	Climate chamber	SH-242	93017025	ESPEC	2022-10-13
2	Fully anechoic chamber	FAC-5	--	TDK	2024-08-30

5.4. Vibration table

No.	Name	Type	SN	Manufacture	Cal.Due Date
--	--	--	--	--	--

Anechoic chamber

Fully anechoic chamber by TDK.

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5.5. Test software

No.	Name	version	SN	Manufacture
1	EMC32	V 9.26.01	--	R&S

6. Test Results

6.1. Summary of Test Results

A brief summary of the tests carried out is shown as following.

FCC Rules	Name of Test	Result
2.1046,22.913(a),24.232(c)	Conducted RF Power Output	Pass
2.1046,22.913(a),24.232(c)	ERP and EIRP	Pass
2.1049,22.917(b), 24.238(b)	Occupied Bandwidth	*Note 1
2.1051,24.238,2.1053,22.917	Conducted spurious emissions	Pass
2.1051,24.238,2.1053,22.917	Radiated Spurious Emission	Pass
2.1051,24.238, 2.1053, 22.917	Band Edge	Pass
2.1055, 22.355, 24.235	Frequency Stability over Temperature Variation	Pass
2.1055, 22.355, 24.235	Frequency Stability over Voltage Variation	Pass
24.232	Peak to Average Ratio	Pass
Note 1: No applicable performance criteria.		

6.2. Conducted RF Power Output

Specifications:	FCC Part 2.1046, 22.913(a), 24.232(c)
DUT Serial Number:	863070040113705
Test conditions:	Ambient Temperature:15°C-35°C Relative Humidity:30%-60% Air pressure: 86-106kPa
Test Results:	Pass

Limit Level Construction:

According to Part 22.913(a), the ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

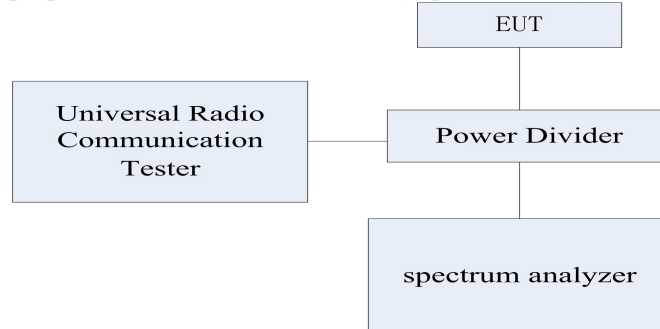
According to Part 24.232(c), mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

Measurement Uncertainty:

Item	Uncertainty
Expanded Uncertainty	0.62 dB (k=2)

Test Setup:

During the test, the EUT was controlled via the Wireless Telecommunications Test Set to ensure max power transmission and proper modulation and measured by spectrum analyzer.



Test Method:

- 1) The EUT was coupled to the spectrum analyzer and the Wireless Telecommunications Test Set through a power divider. The loss of the RF cables of the test system is calibrated to correct the readings.
- 2) For RMS power test, the spectrum analyzer was set to RMS Detector function and Maximum hold mode.
- 3) For Peak power test, the spectrum analyzer was set to Maxpeak Detector function and Maximum hold mode.
- 4) The resolution Bandwidth of the spectrum analyzer was comparable to the emission Bandwidth.

Note: --

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6.1.1 GSM850 Conducted RF Power Output Results

GPRS Mode:

Channel No.	Maximum output power(pk) [dBm]			
	1TS	2TS	3TS	4TS
128 (824.2MHz)	32.0	31.1	28.9	26.8
190 (836.6MHz)	32.2	31.0	28.8	26.8
251 (848.8MHz)	32.5	31.1	29.0	26.9

GPRS Mode:

Channel No.	Maximum output power(avg) [dBm]			
	1TS	2TS	3TS	4TS
128 (824.2MHz)	31.8	31.0	28.7	26.6
190 (836.6MHz)	32.0	29.8	28.6	26.6
251 (848.8MHz)	32.3	31.0	28.9	26.7

6.1.2 PCS1900 Conducted RF Power Output Results

GPRS Mode:

Channel No.	Maximum output power(pk) [dBm]			
	1TS	2TS	3TS	4TS
512 (1850.2MHz)	29.1	28.1	25.6	23.5
661 (1880.0MHz)	29.3	28.0	26.0	23.8
810 (1909.8MHz)	29.3	28.1	26.2	24.1

GPRS Mode:

Channel No.	Maximum output power(avg) [dBm]			
	1TS	2TS	3TS	4TS
512 (1850.2MHz)	29.0	28.0	25.4	23.3
661 (1880.0MHz)	29.7	27.8	25.9	23.7
810 (1909.8MHz)	29.2	28.0	26.0	24.0

6.3. ERP and EIRP

Specifications:	FCC Part 22.913(a), 24.232(b)
DUT Serial Number:	863070040111295
Test conditions:	Ambient Temperature:15°C-35°C Relative Humidity:30%-60% Air pressure: 86-106kPa
Test Results:	Pass

Limit Level Construction:

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

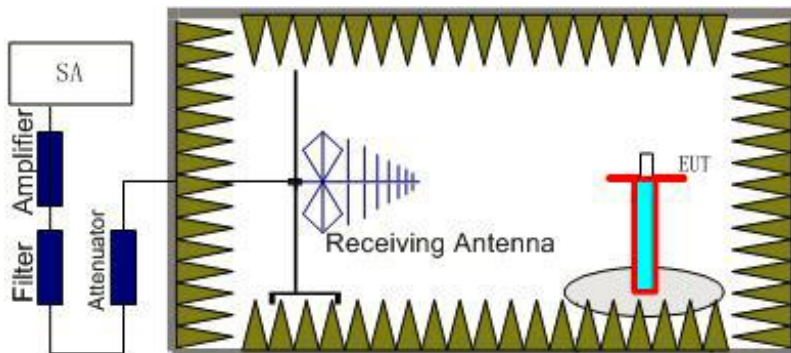
According to Part 24.232(c), "Mobile/portable stations are limited to 2 watts e.i.r.p. Peak power" and 24.232(c) specifies that "Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage."

According to 22.913(a), The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts."

Method of Measurement

The measurements procedures in TIA-603E-2016 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.

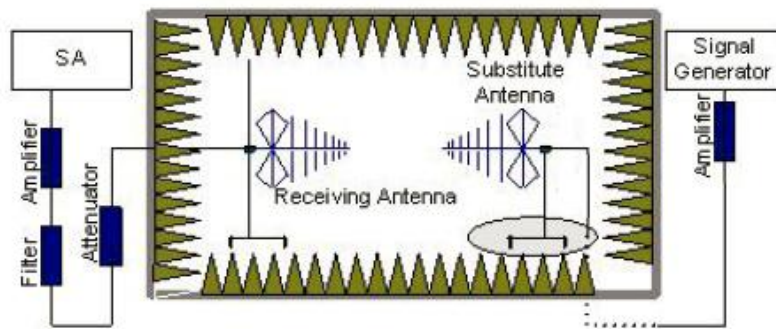


2. The EUT is then put into continuously transmitting mode at its maximum power level during the test. And the maximum value of the receiver should be recorded as (Pr).

3. The EUT shall be replaced by a substitution antenna. The test setup refers to figure below.

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In the chamber, an substitution antenna for the frequency band of interest is placed at thereference point of the chamber. An RF Signal source for the frequency band of interest isconnected to the substitution antenna with a cable that has been constructed to not interferewith the radiation pattern of the antenna. A power (PMea) is applied to the input of thesubstitution antenna, and adjust the level of the signal generator output until the value of thereceiver reach the previously recorded (Pr). The power of signal source (PMea) is recorded. Thetest should be performed by rotating the test item and adjusting the receiving antennapolarization.

4. A amplifier should be connected to the Signal Source output port. And the cable should beconnect between the Amplifier and the Substitution Antenna.

The cable loss (Pcl) ,the Substitution Antenna Gain (Ga) and the Amplifier Gain (PAg) should berecorded after test.

The measurement results are obtained as described below:

$$\text{Power(EIRP)} = \text{PMea} + \text{PAg} - \text{Pcl} + \text{Ga}$$

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,

$$\text{ERP} = \text{S.G output(dBM)} - \text{cable loss (dB)} + \text{antenna gain (dBd)}$$

$$\text{EIRP} = \text{S.G output(dBM)} - \text{cable loss (dB)} + \text{antenna gain (dBi)}$$

6.3.1 GSM 850 Measurement result

GPRS GMSK Mode

Frequency [MHz]	Generator output power(P _g) [dBm]	Cable loss [dB]	Antenna Gain [dB]	ERP [dBm]	Antenna Polarization [H/V]
824.2	32.0	3.4	8.0	36.6	V
836.6	34.1	3.4	6.6	37.3	V

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848.8	33.5	3.4	7.2	37.3	V
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6.3.2 PCS 1900 Measurement result

GPRS GMSK Mode

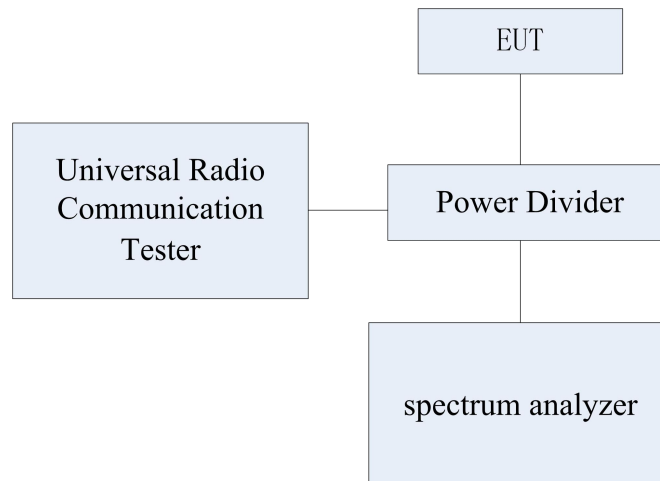
Frequency [MHz]	Generator output power(P_g) [dBm]	Cable loss [dB]	Antenna Gain [dB]	EIRP [dBm]	Antenna Polarization [H/V]
1850.2	29.6	5.0	7.2	31.8	V
1880.0	30.3	5.0	7.2	32.5	V
1909.8	30.7	5.1	6.8	32.4	V

6.4. Occupied Bandwidth

Specifications:	FCC Part 2.1049, 22.917(b), 24.238(b)
DUT Serial Number:	863070040113705
Test conditions:	Ambient Temperature:15°C-35°C Relative Humidity:30%-60% Air pressure: 86-106kPa
Test Results:	--

Test Setup

During the test, the EUT was controlled via the Wireless Communications Test Set to ensure max power transmission and proper modulation and measured by spectrum analyzer.



Measurement Uncertainty:

Item	Uncertainty
Expanded Uncertainty	500 kHz (k=2)

Test Method

The 99% occupied Bandwidth was calculated from the spectrum analyzer. Markers in the spectrum analyzer were then placed between the calculated frequencies to show the calculated 99% power Band. The 26dB Bandwidth was also measured and recorded.

Note: --

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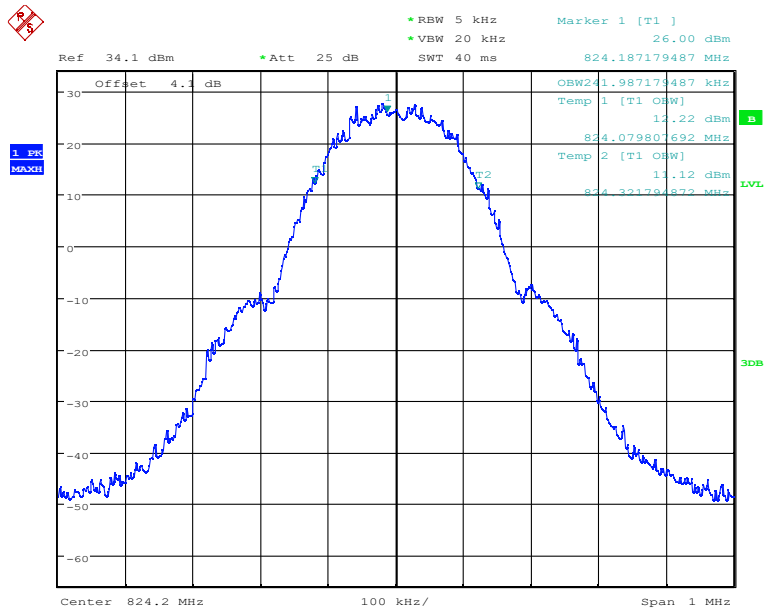
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6.4.1 GSM Mode Occupied Bandwidth Results

Band	EUT channel No.	Mode	99% OBW (MHz)	-26dBc OBW (MHz)
GSM850	128	GMSK	0.24	0.31
	190	GMSK	0.24	0.31
	251	GMSK	0.24	0.31
PCS1900	512	GMSK	0.23	0.31
	661	GMSK	0.24	0.31
	810	GMSK	.0.23	0.31

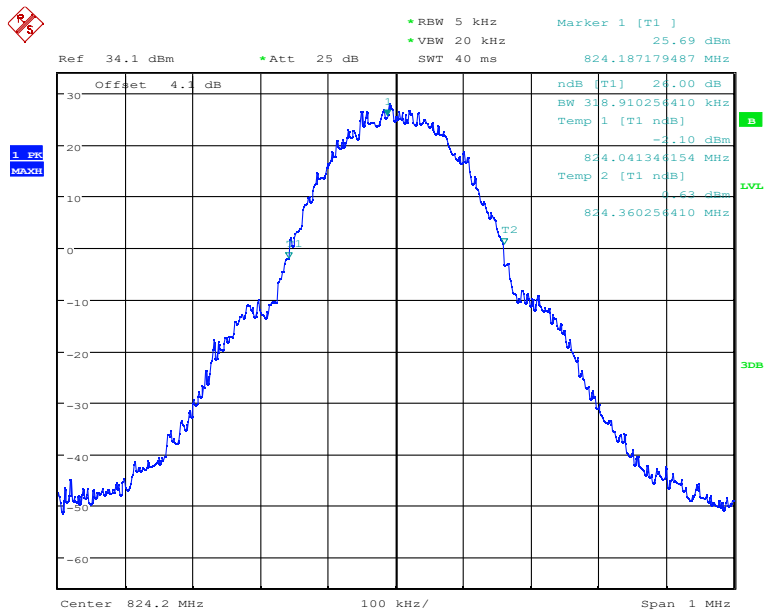


Graphical results for GSM850:



Date: 4.DEC.2021 17:22:41

GMSK 99% Channel 128



Date: 4.DEC.2021 17:23:17

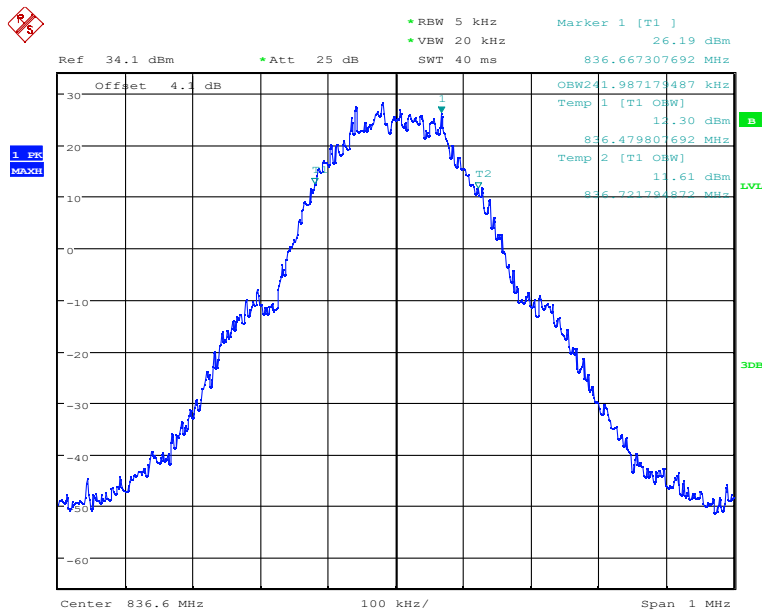
GMSK -26dBc Channel 128

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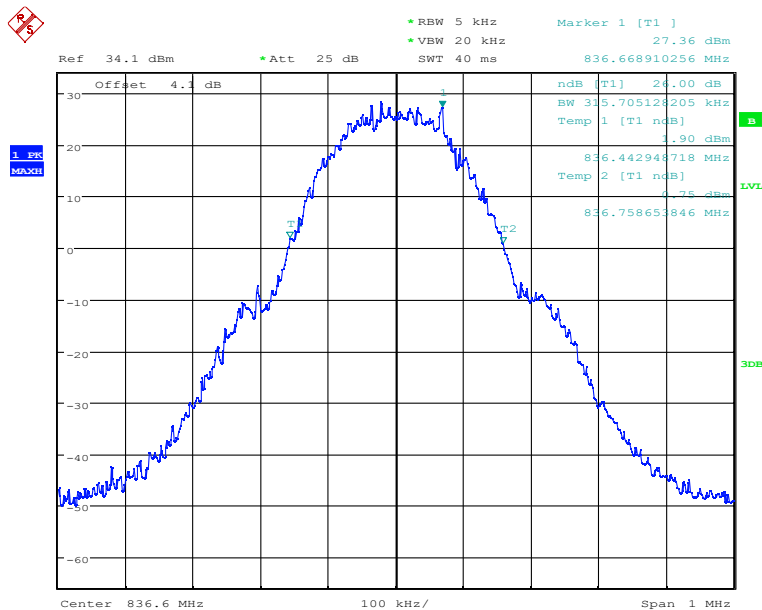


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Date: 4.DEC.2021 17:24:00

GMSK 99% Channel 190

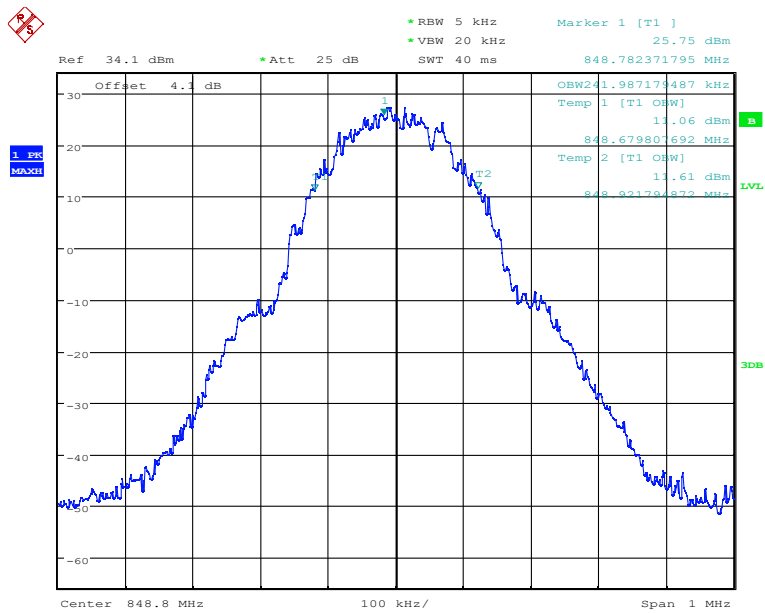


Date: 4.DEC.2021 17:24:46

GMSK -26dBc Channel 190

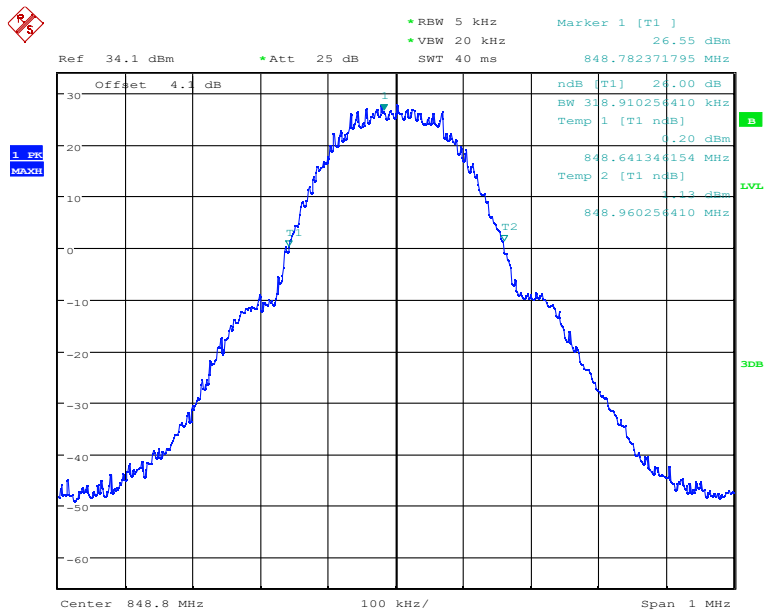
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Date: 4.DEC.2021 17:25:53

GMSK 99% Channel 251



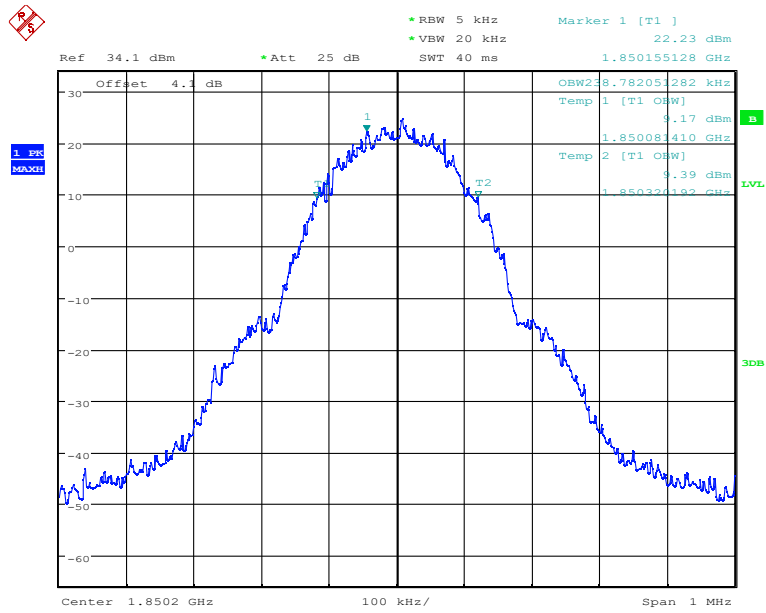
Date: 4.DEC.2021 17:25:40

GMSK -26dBc Channel 251

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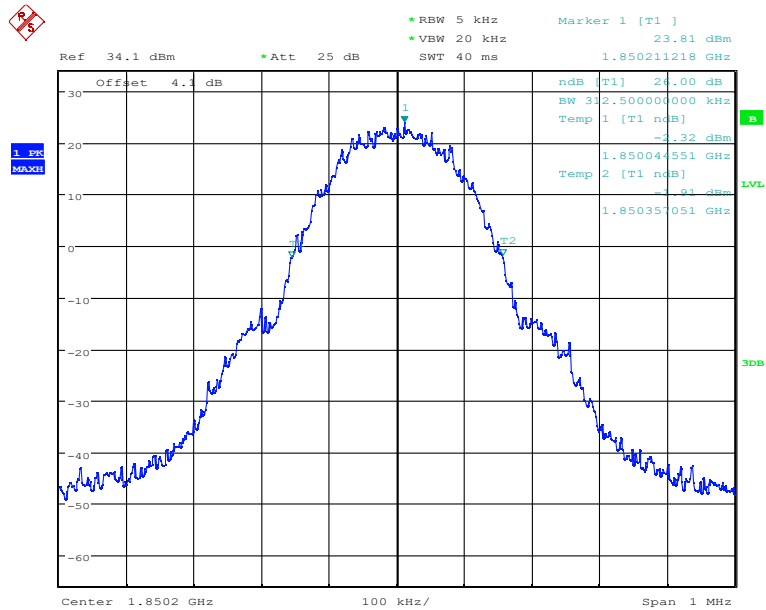
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Graphical results for GSM1900:



Date: 4.DEC.2021 17:27:00

GMSK 99% Channel 512

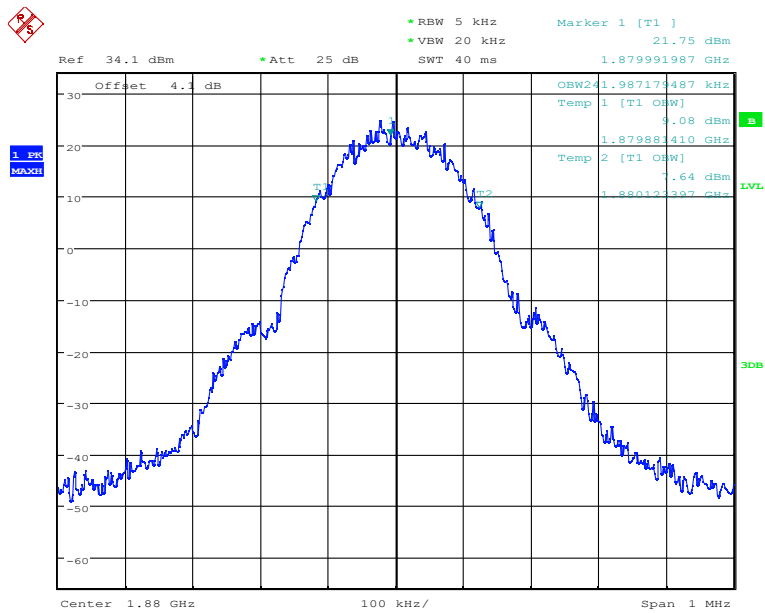


Date: 4.DEC.2021 17:27:21

GMSK -26dBc Channel 512

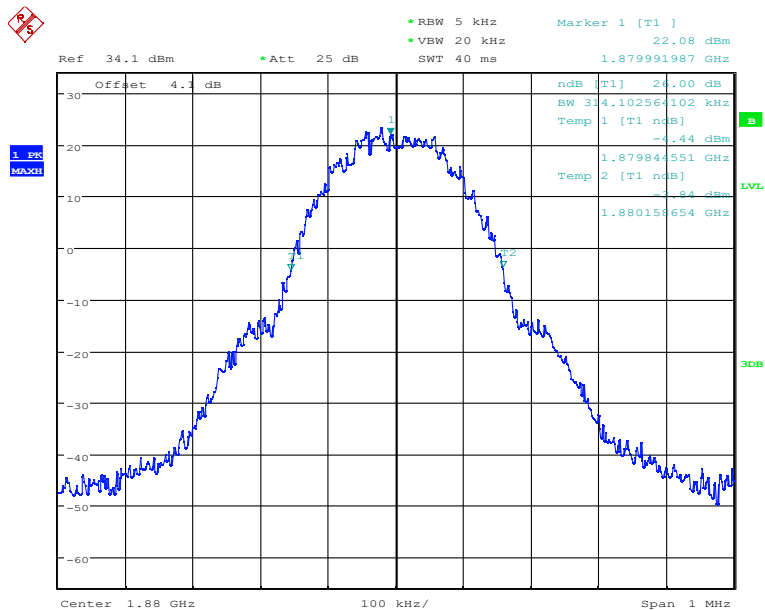
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Date: 4.DEC.2021 17:27:55

GMSK 99% Channel 661



Date: 4.DEC.2021 17:27:39

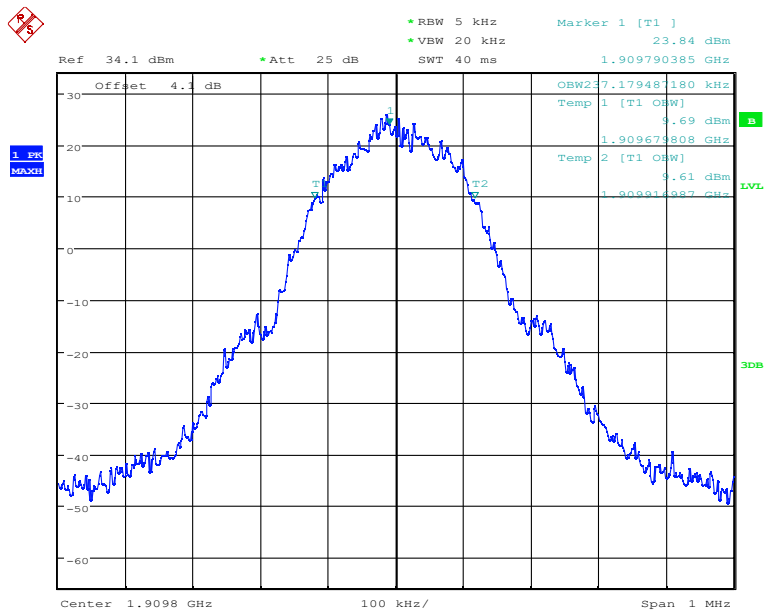
GMSK -26dBc Channel 661

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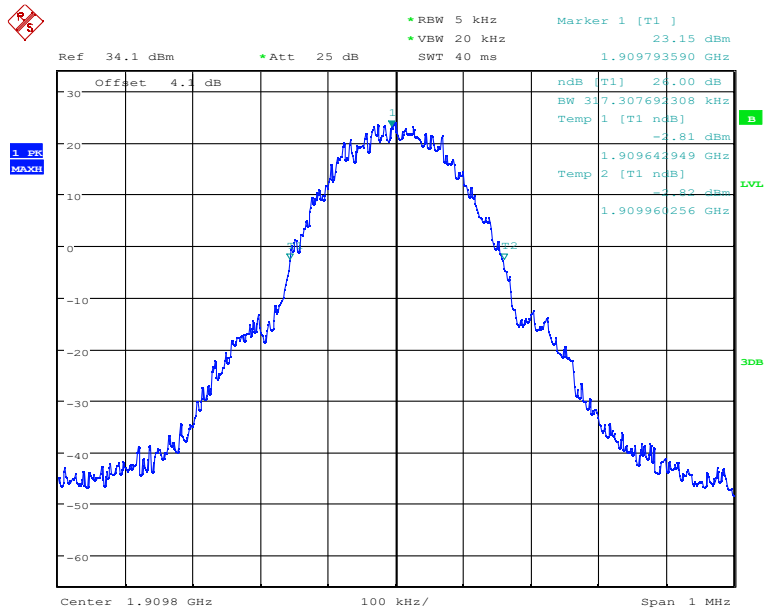


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GMSK 99% Channel 810



Date: 4.DEC.2021 17:28:49

GMSK -26dBc Channel 810

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6.5. Conducted spurious emissions

Specifications:	FCC Part 2.1051, 24.238, 2.1053, 22.917
DUT Serial Number:	863070040113705
Test conditions:	Ambient Temperature:15°C-35°C Relative Humidity:30%-60% Air pressure: 86-106kPa
Test Results:	Pass

Limit Level Construction:

According to Part 22.917 (a), i.e., Out of Band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

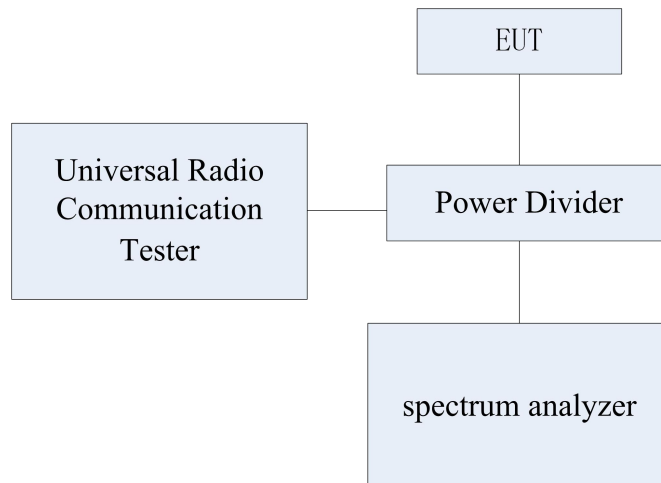
According to Part 24.238 (a), i.e., Out of Band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB, so the limit level is: $P(\text{dBm}) - (43 + 10 \log(P)) \text{ dB} = -13\text{dBm}$.

Measurement Uncertainty:

Item	Uncertainty	
Expanded Uncertainty	$9\text{kHz} < f \leq 4\text{GHz}$	0.71 dB (k=2)
	$4\text{GHz} \leq f < 12.75\text{GHz}$	0.74 dB (k=2)
	$12.75\text{GHz} \leq f < 26\text{GHz}$	2.70 dB (k=2)

Test Setup:

During the test, the EUT was controlled via the Wireless Communications Test Set to ensure max power transmission and proper modulation and measured by spectrum analyzer.



Test Method:

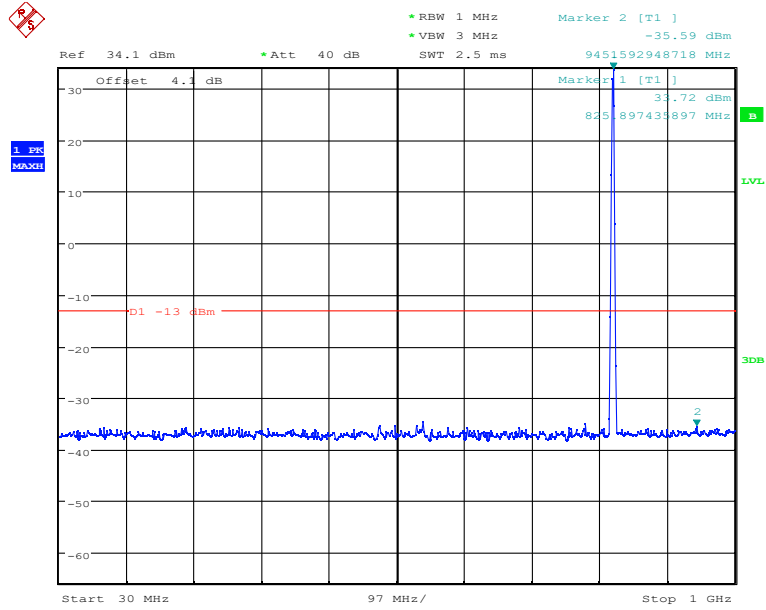
The measurement was performed accordance with section 2.2.13 of ANSI/TIA-603-D: Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.

The measurement was performed accordance with section 2.2.13 of ANSI/TIA-603-D-2010: Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.

The RF output of the transmitter was connected to a spectrum analyzer through a calibrated coaxial cable. Sufficient scans were taken to show the out-of-Band emissions, if any, up to 10th harmonic. The EUT was scanned for spurious emissions from 30MHz to 20GHz with sufficient Bandwidth and video resolution. The spectrum analyzer was set to Maximum hold mode to ensure that the worst-case emissions were captured.

Note: --

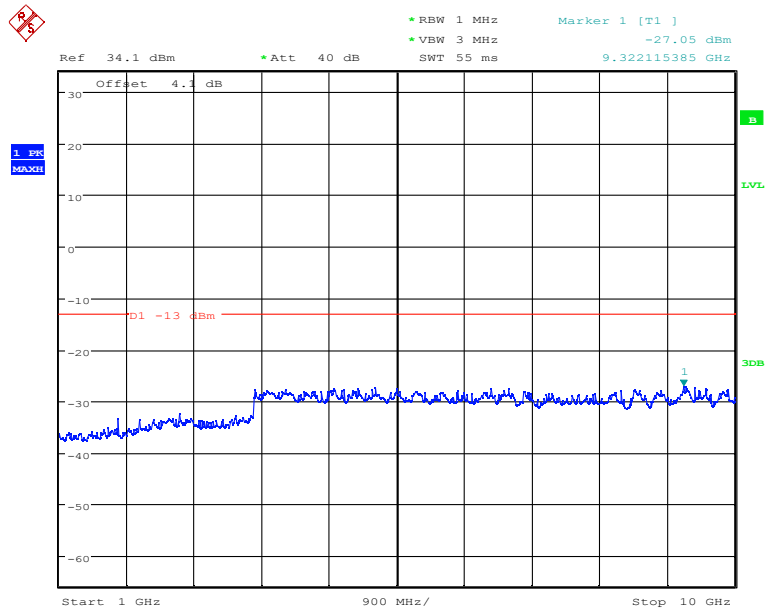
6.5.1 GSM850 Conducted Spurious Emission Results



Date: 4.DEC.2021 18:10:11

GMSK, Low channel, 824.200 MHz, 30MHz to 1GHz

Note: The strong emission shown in each case is the carrier signal.

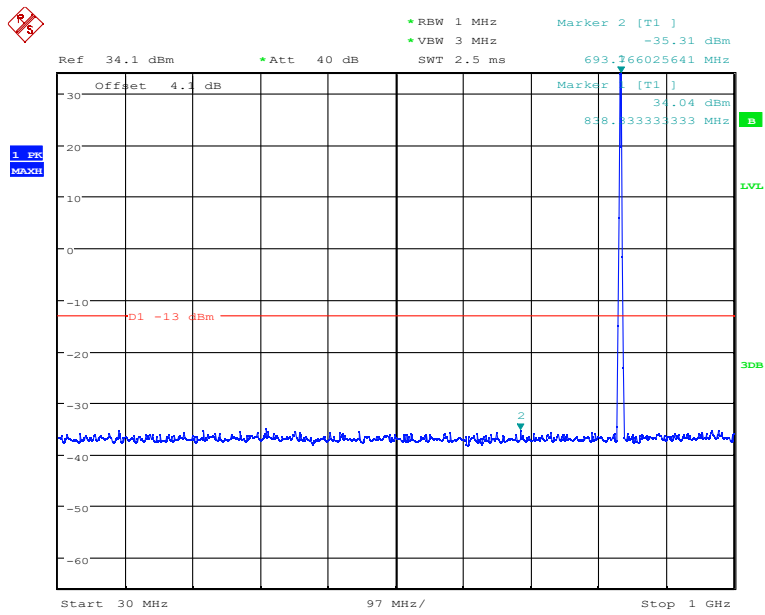


Date: 4.DEC.2021 18:09:48

GMSK, Low channel, 824.200 MHz, 1GHz to 10GHz

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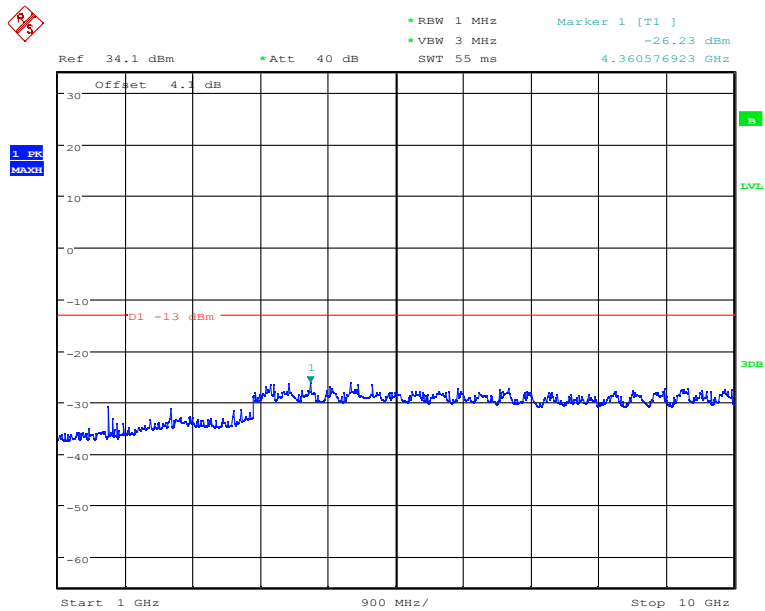
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 Tel: 0086-23-88069965 FAX: 0086-23-88608777



Date: 4.DEC.2021 18:10:45

GMSK, Mid Channel, 836.6 MHz, 30MHz to 1GHz

Note: The strong emission shown in each case is the carrier signal.



Date: 4.DEC.2021 18:11:01

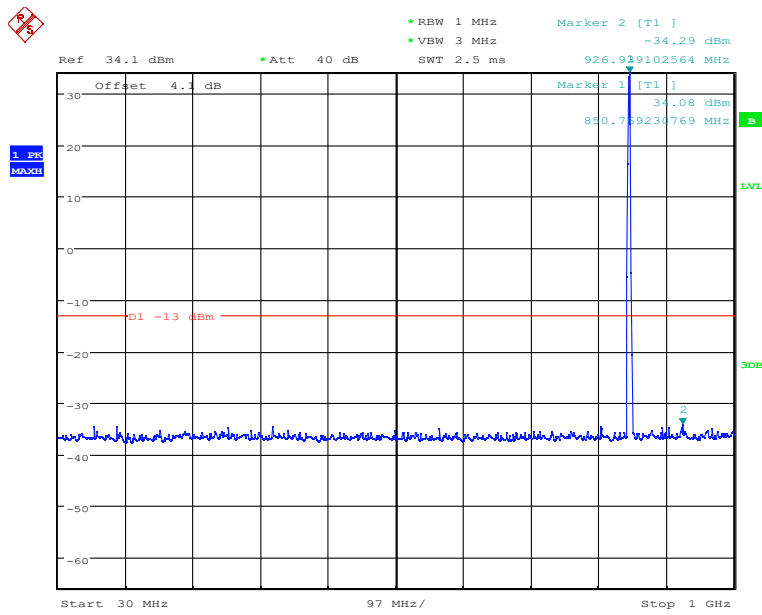
GMSK, Mid Channel, 836.6 MHz, 1GHz to 10GHz

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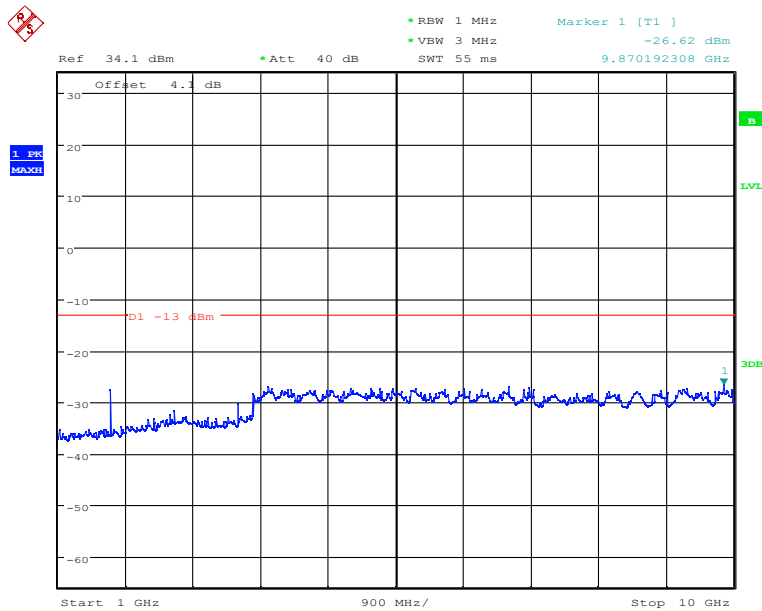
Report No.: I21W00047-WWAN_Rev1



Date: 4.DEC.2021 18:09:05

GMSK, High Channel, 848.8 MHz, 30MHz to 1GHz

Note: The strong emission shown in each case is the carrier signal.



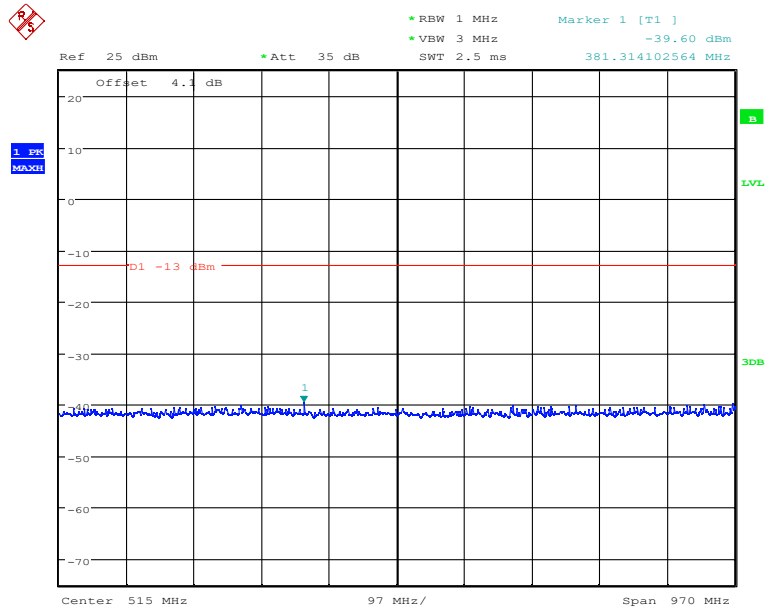
Date: 4.DEC.2021 18:09:24

GMSK, High Channel, 848.8 MHz, 1GHz to 10GHz

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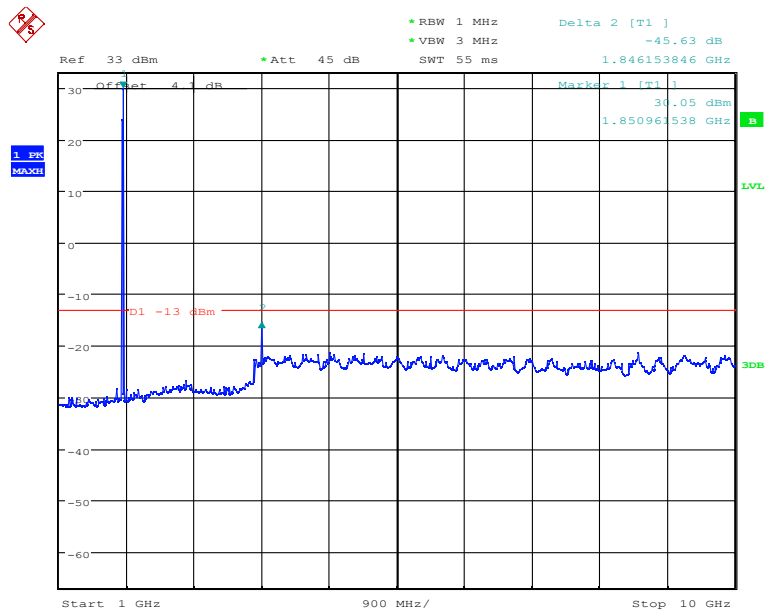
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6.5.2 PCS1900 Conducted Spurious Emission Results



Date: 4.DEC.2021 18:02:55

GMSK, Low channel, 1850.2 MHz, 30MHz to 1GHz



Date: 4.DEC.2021 18:04:20

GMSK, Low channel, 1850.2 MHz, 1GHz to 10GHz

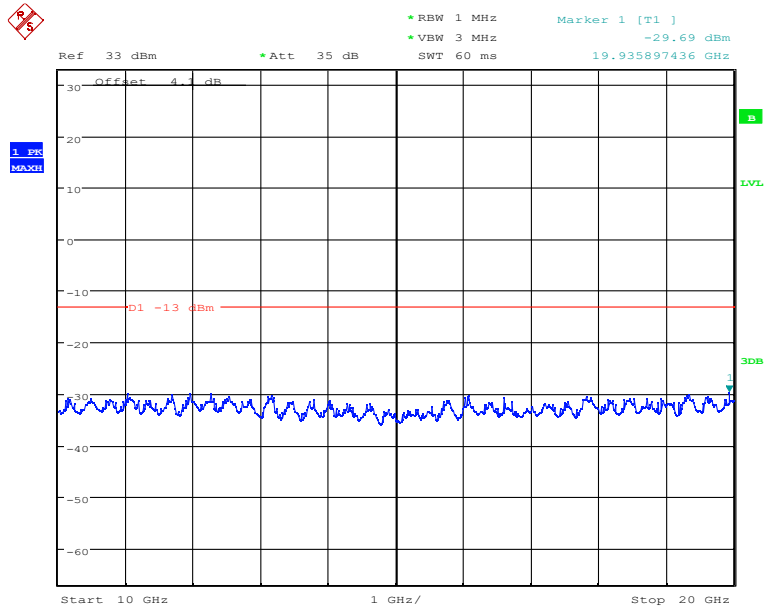
Note: The strong emission shown is the carrier signal.

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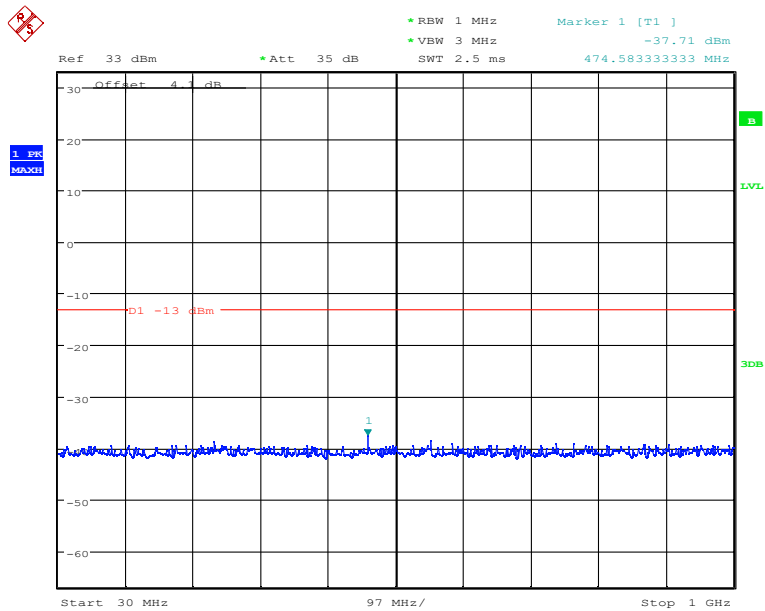


Report No.: I21W00047-WWAN_Rev1



Date: 4.DEC.2021 18:04:47

GMSK, Low channel, 1850.2 MHz, 10GHz to 20GHz

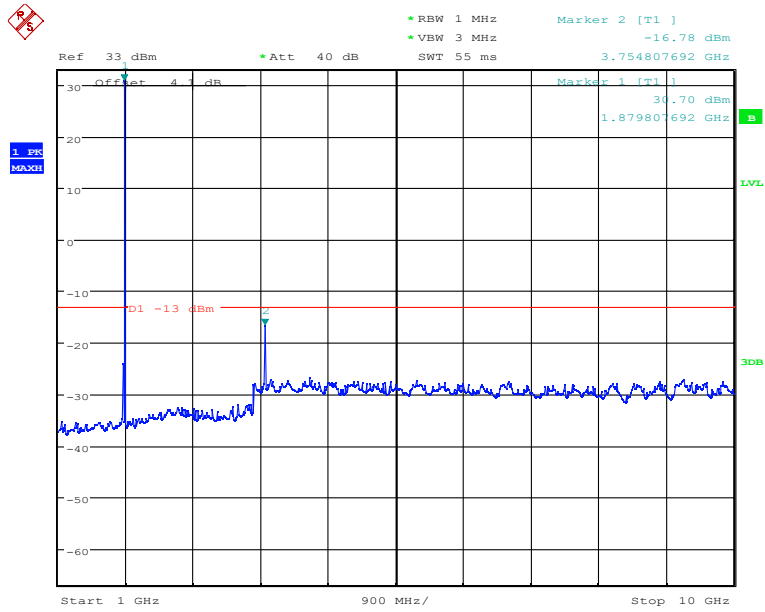


Date: 4.DEC.2021 18:05:32

GMSK, Middle channel, 1880.0 MHz, 30MHz to 1GHz

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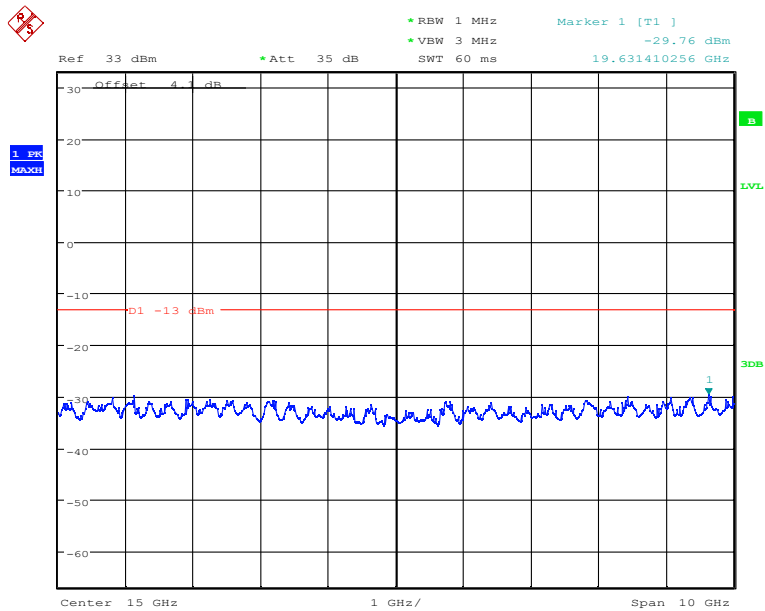
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Date: 4.DEC.2021 18:06:13

GMSK, Middle channel, 1880.0 MHz, 1GHz to 10GHz

Note: The strong emission shown is the carrier signal.

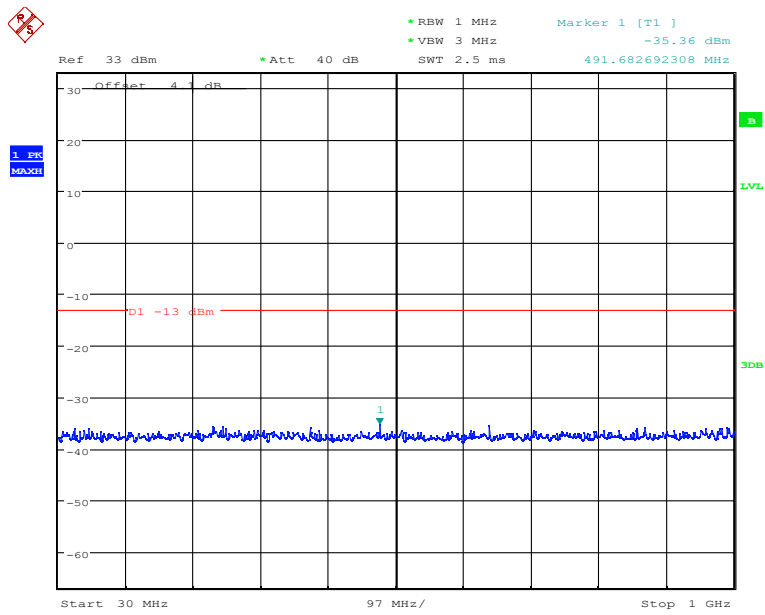


Date: 4.DEC.2021 18:05:07

GMSK, Middle channel, 1880.0 MHz, 10GHz to 20GHz

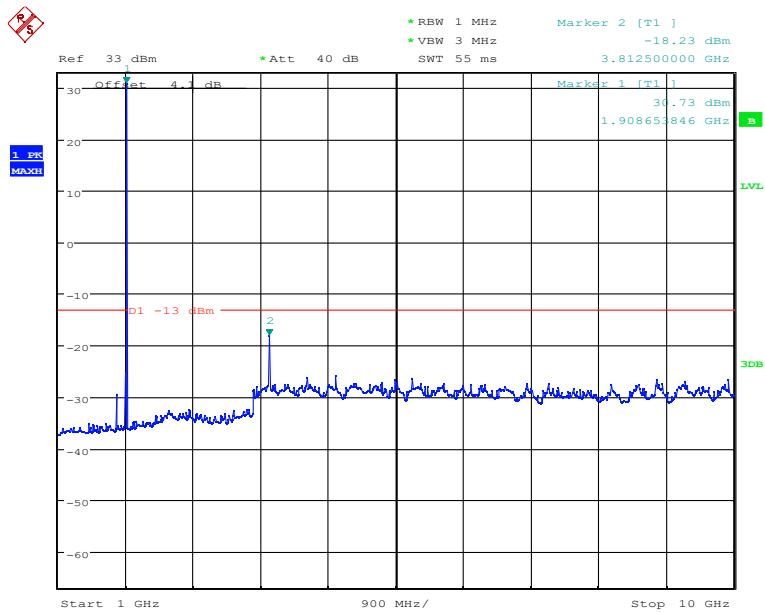
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Date: 4.DEC.2021 18:06:58

GMSK, High channel, 1909.8 MHz, 30MHz to 1GHz



Date: 4.DEC.2021 18:06:45

GMSK, High channel, 1909.8 MHz, 1GHz to 10GHz

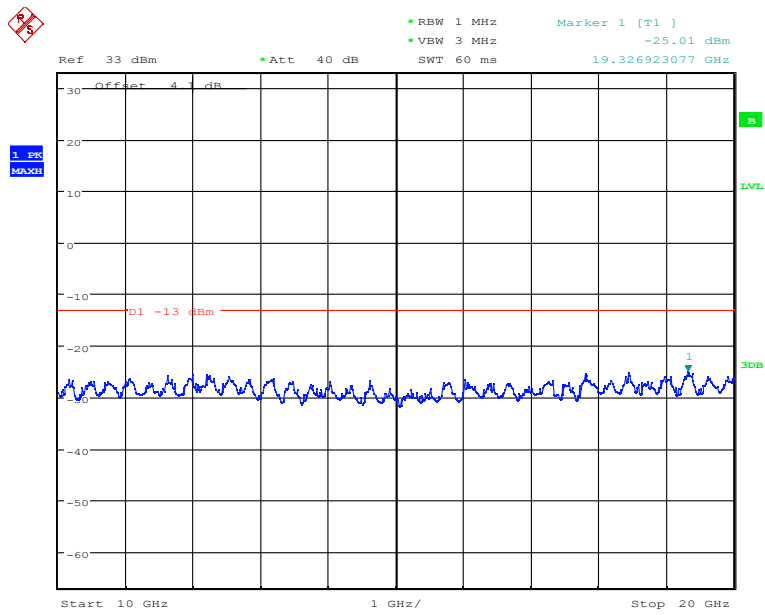
Note: The strong emission shown is the carrier signal.

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Report No.: I21W00047-WWAN_Rev1



Date: 4.DEC.2021 18:07:22

GMSK, High channel, 1909.8 MHz, 10GHz to 20GHz

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6.6. Radiated Spurious Emission

Specifications:	FCC Part 2.1051, 2.1053, 24.238, 22.917
DUT Serial Number:	863070040111295
Test conditions:	Ambient Temperature:15°C-35°C Relative Humidity:30%-60% Air pressure: 86-106kPa
Test Results:	Pass

Limit Level Construction:

According to Part 22.917 (a), i.e., Out of Band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

According to Part 24.238 (a), i.e., Out of Band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB, so the limit level is: $P(\text{dBm}) - (43 + 10 \log(P)) \text{ dB} = -13\text{dBm}$.

Limits for Radiated spurious emissions(UE)	
Frequency range	Limit Level /Resolution Bandwidth
30 MHz to 20000 MHz	-13dBm/1MHz

Measurement Uncertainty:

Item	Uncertainty
Expanded Uncertainty (30MHz-150MHz)	5.15 dB (k=2)
Expanded Uncertainty (150MHz-1GHz)	4.09dB (k=2)
Expanded Uncertainty (1GHz-3GHz)	2.92dB (k=2)
Expanded Uncertainty (3GHz-6GHz)	2.93dB (k=2)
Expanded Uncertainty (3GHz-12.75GHz)	2.69dB (k=2)

Test Setup:

The EUT was placed in an anechoic chamber. The Wireless Communications Test Set was used to set the TX channel and power level and modulate the TX signal with different bit patterns.

Test Method:

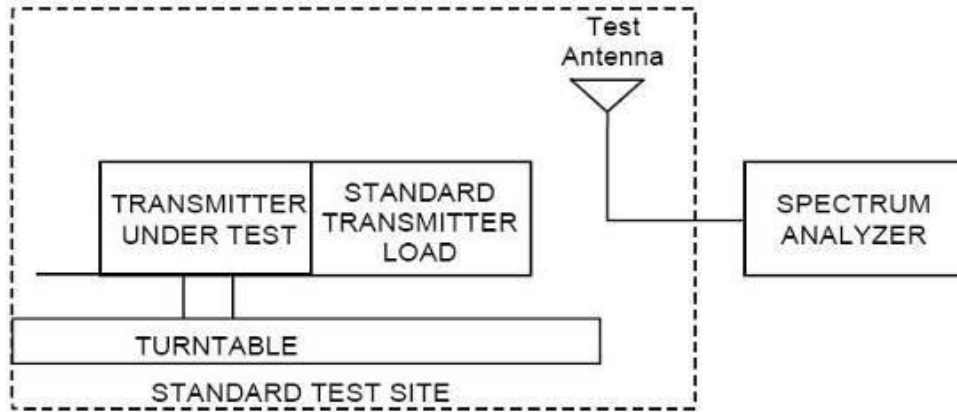
The measurement method is substitution method accordance with section 2.2.12 of ANSI/TIA-603-E: Land

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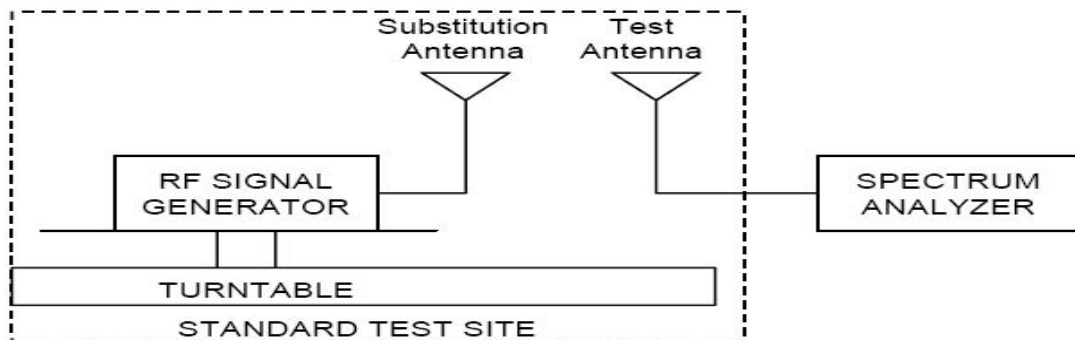
Address: No. 8,Yuma Road, Chayuan New City, Nan'an District, Chongqing, P. R. China,401336
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Mobile FM or PM Communications Equipment Measurement and Performance Standards.

(a) Connect the equipment as illustrated and measure the spurious emissions as the method as above. The distance from the device to the antenna is 3 m .



(b) Reconnect the equipment as illustrated.



(c) Remove the transmitter and replace it with a substitution antenna. The center of the substitution antenna should be approximately at the same location as the center of the transmitter.

(d) Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a non-radiating cable. With the antennas at both ends horizontally polarized, and with the signal generator tuned to a particular spurious frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained. This should be done carefully repeating the adjustment of the test antenna and generator output.

(e) Repeat step d) with both antennas vertically polarized for each spurious frequency.

(f) Calculate power in dBm into a reference ideal half-wave dipole antenna by reducing the readings obtained in steps d) and e) by the power loss in the cable between the generator and the antenna, and further corrected for the gain of the substitution antenna used relative to an ideal half-wave dipole antenna by the following formula:

$$P_a(\text{dBm}) = P_g(\text{dBm}) - \text{cable loss (dB)} + \text{antenna gain (dB)}$$

where:

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Pd is the dipole equivalent power and Pg is the generator output power into the substitution antenna.

Note: The evaluation of radiated spurious emission under the simultaneous transmission of WWAN & WLAN.

6.6.1 GSM850 GMSK Radiated Spurious Emission Results

Test Data (GMSK Mode channel 128)

Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
1648.4	-52.8	4.8	7.3	-50.3	V
2472.6	-39.9	6.0	6.8	-39.1	V
3296.8	-59.4	6.7	8.9	-57.2	V
4121.0	-57.7	7.6	9.2	-56.1	V
4945.2	-55.2	7.7	9.9	-53.0	V
5769.4	-62.6	1.5	10.5	-53.6	V

Test Data (GMSK Mode channel 190)

Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
1672.8	-53.6	4.7	7.3	-51.0	V
2509.2	-42.9	5.9	6.7	-42.1	V
3345.6	-39.9	6.8	8.9	-37.8	V
4182.0	-57.2	7.8	9.2	-55.8	V
5018.4	-53.3	7.5	9.9	-50.9	V
5854.8	-62.5	1.1	10.5	-53.1	V

Test Data (GMSK Mode channel 251)

Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
1697.6	-54.4	4.8	8.0	-51.2	H

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2546.4	-43.1	5.9	6.9	-42.1	V
3395.2	-49.3	6.9	8.9	-47.3	V
4244.0	-57.6	7.8	9.2	-56.2	V
5092.8	-55.2	6.8	9.9	-52.1	V
5941.6	-63.1	1.4	10.9	-53.6	V

6.6.2 PCS1900 GMSK Radiated Spurious Emission Results

Test Data (GMSK Mode channel 512)

Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
3700.4	-56.7	7.2	8.9	-55.0	V
5550.6	-61.9	2.0	10.5	-53.4	V
7400.8	-61.0	0.9	11.9	-50.0	V
9251.0	-55.6	1.0	11.5	-45.1	V
121.0	-45.5	1.3	2.6	-44.2	V
230.2	-63.4	1.8	5.3	-59.9	V

Test Data (GMSK Mode channel 661)

Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
3760.0	-55.4	7.3	8.9	-53.8	V
5640.0	-62.4	1.8	10.5	-53.7	V
7520.0	-61.9	0.9	11.9	-50.9	V
9400.0	-56.1	0.8	11.8	-45.1	V
11280.0	-54.9	0.3	12.1	-43.1	V
13160.0	-55.6	0.4	12.4	-43.6	V

Test Data (GMSK Mode channel 810)

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Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
3819.6	-57.3	7.4	9.2	-55.5	V
5729.4	-62.4	1.5	10.5	-53.4	V
7639.2	-61.0	1.1	11.9	-50.2	V
9549.0	-56.4	0.9	11.8	-45.5	V
11458.8	-55.2	0.8	12.2	-43.8	V
13368.6	-55.6	0.4	12.4	-43.6	V

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6.7. Band Edge

Specifications:	FCC Part 2.1051, 24.238, 2.1053, 22.917
DUT Serial Number:	863070040113705
Test conditions:	Ambient Temperature:15°C-35°C Relative Humidity:30%-60% Air pressure: 86-106kPa
Test Results:	Pass

Limit Level Construction:

According to Part 22.917 (a), i.e., Out of Band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

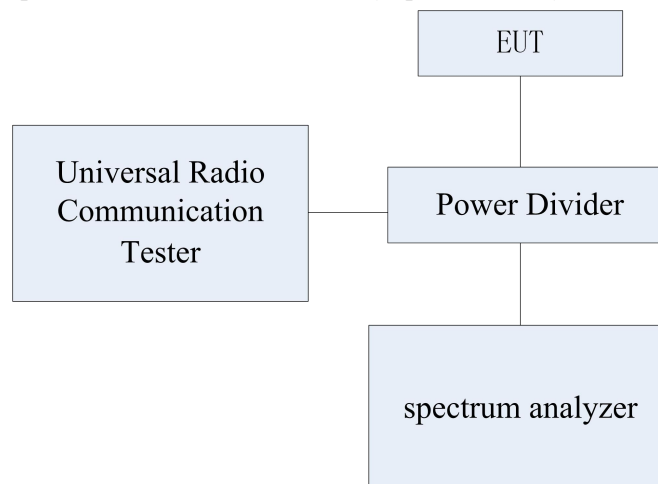
According to Part 24.238 (a), i.e., Out of Band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB, so the limit level is: $P(\text{dBm}) - (43 + 10 \log(P)) \text{ dB} = -13\text{dBm}$.

Measurement Uncertainty:

Item	Uncertainty	
Expanded Uncertainty	$9\text{kHz} < f \leq 4\text{GHz}$	0.71 dB (k=2)
	$4\text{GHz} \leq f < 12.75\text{GHz}$	0.74 dB (k=2)
	$12.75\text{GHz} \leq f < 26\text{GHz}$	2.70 dB (k=2)

Test Setup:

During the test, the EUT was controlled via the Wireless Communications Test Set to ensure max power transmission and proper modulation and measured by spectrum analyzer.



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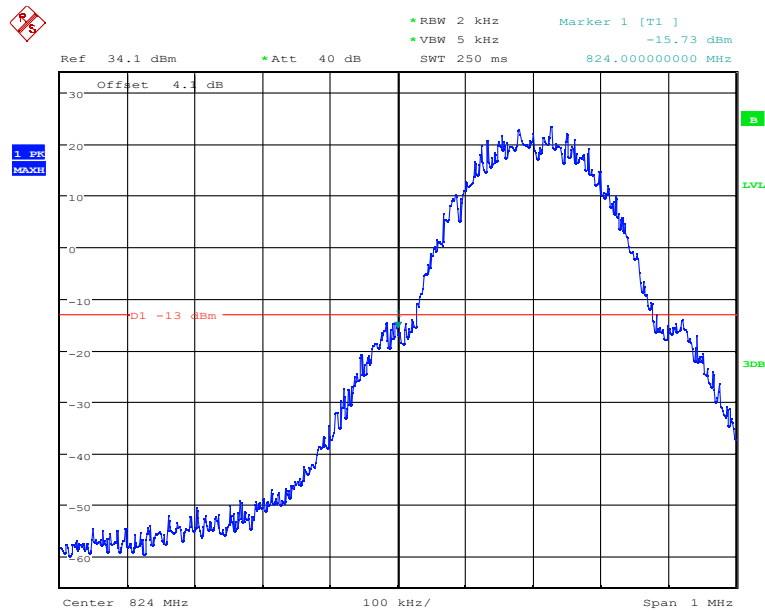


Test Method:

- 1) The EUT was coupled to the EMI test receiver analyzer mode and the base station simulator through a power divider. The loss of the cables the test system is calibrated to correct the readings.
- 2) The spectrum analyzer was set to Average Detector function and Maximum hold mode.
- 3) The resolution Bandwidth of the spectrum analyzer was a little greater than 1% of the 26dB emission Bandwidth.

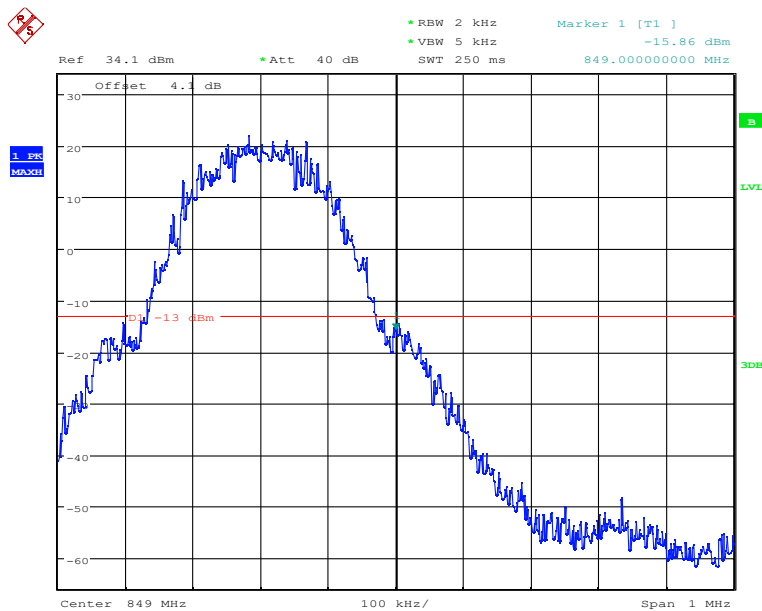
Note: --

6.7.1 GSM850 Band Edge Results



Date: 4.DEC.2021 18:12:54

GMSK; Cellular low channel, below 824 MHz



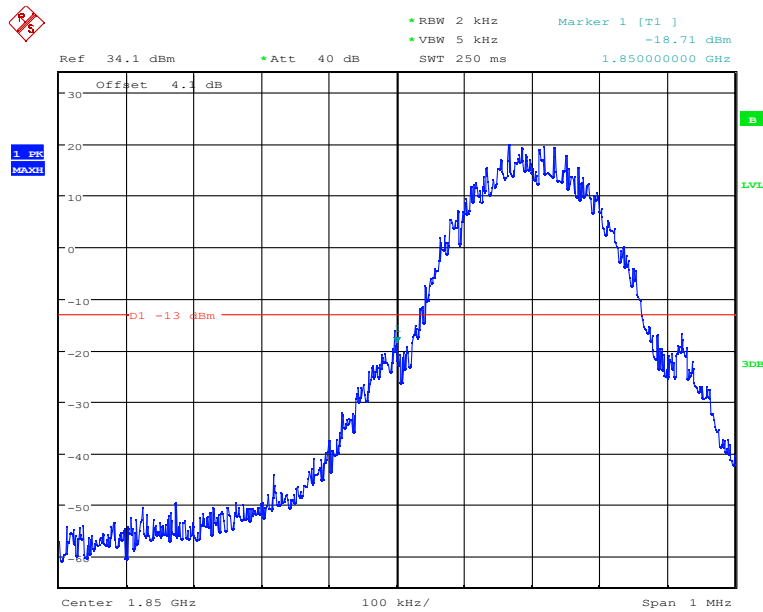
Date: 4.DEC.2021 18:13:38

GMSK; Cellular high channel, above 849 MHz

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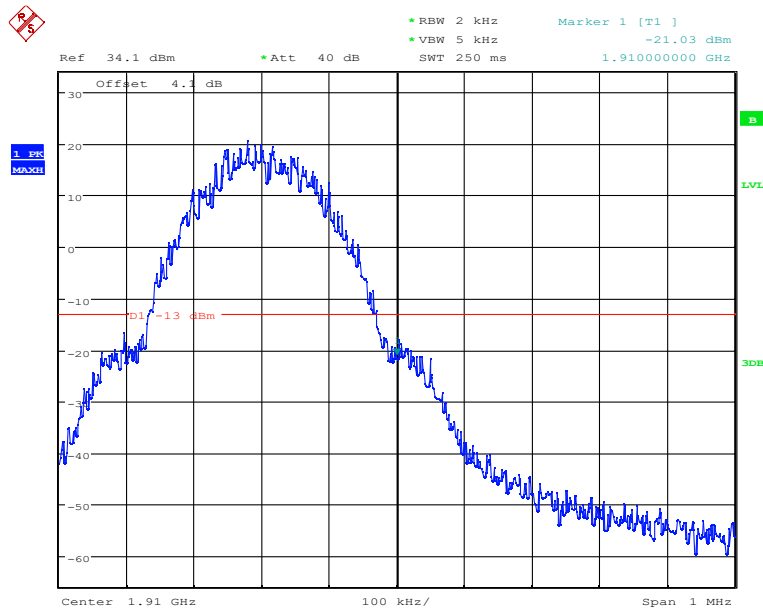
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6.7.2 PCS1900 Band Edge Results



Date: 4.DEC.2021 18:15:12

GMSK; PCS low channel, below 1850 MHz



Date: 4.DEC.2021 18:14:46

GMSK; PCS high channel, above 1910 MHz

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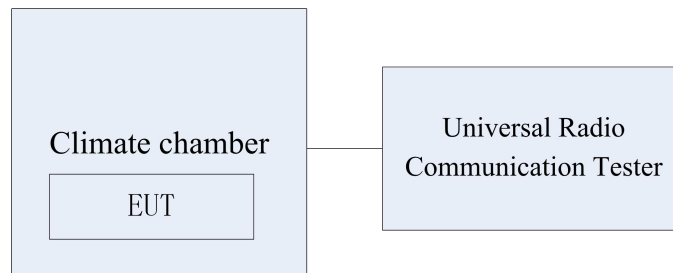
6.8. Frequency Stability over Temperature Variation

Specifications:	FCC Part 2.1055, 22.355, 24.235
DUT Serial Number:	863070040113705
Test conditions:	Ambient Temperature:15°C-35°C Relative Humidity:30%-60% Air pressure: 86-106kPa
Test Results:	Pass

Limit	
Frequency deviation [ppm]	±2.5

Test Setup

The EUT was placed in a temperature chamber, demonstrated as figure T. The Wireless Telecommunications Test Set was used to set the Tx channel and power level, modulate the TX signal with different bit patterns and measure the frequency of Tx.



Measurement Uncertainty:

Item	Uncertainty
Expanded Uncertainty	1.54 Hz (k=2)

Test Method

- 1、 The EUT was turned off and placed in the temperature chamber.
- 2、 The temperature of the chamber was set to -30°C and allowed to stabilize.
- 3、 The EUT temperature was allowed to stabilize for 45 minutes.
- 4、 The EUT was turned on and set to transmit with Wireless Telecommunications Test Set.
- 5、 The maximum transmit frequency deviation during one minute period was measured by Wireless Communications Test Set.
- 6、 The steps 3-5 were repeated for -30°C, -20°C, -10°C, 0°C, 10°C, 20°C, 30°C, 40°C and 50°C.

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6.8.1 GSM Band Frequency Stability over Temperature Variation Results

Band	Offset	Temperature[°C]								
		-30	-20	-10	0	10	20	30	40	50
GSM850 GMSK	Hz	3.21	2.17	2.22	2.36	3.82	2.69	4.02	3.57	2.08
	ppm	0.003	0.002	0.002	0.002	0.004	0.003	0.004	0.003	0.002
PCS1900 GMSK	Hz	1.38	2.01	1.69	1.77	1.98	2.16	2.23	2.47	2.03
	ppm	0.0007	0.001	0.008	0.0009	0.001	0.001	0.001	0.001	0.001

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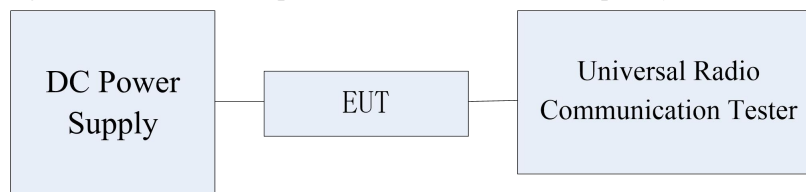
6.9. Frequency Stability over Voltage Variation

Specifications:	FCC Part 2.1055, 22.355, 24.235
DUT Serial Number:	863070040113705
Test conditions:	Ambient Temperature: 15°C-35°C Relative Humidity: 30%-60% Air pressure: 86-106kPa
Test Results:	Pass

Limit	
Frequency deviation [ppm]	±2.5

Test Setup

The EUT was placed in a shielding chamber and powered by an adjustable power supply, demonstrated as figure V. A Wireless Telecommunications Test Set was used to set the TX channel and power level, modulate the TX signal with different bit patterns and measure the frequency of TX.



Measurement Uncertainty:

Item	Uncertainty
Expanded Uncertainty	1.54Hz (k=2)

Test Method

The EUT was powered by the adjustable power supply. The frequency stability is measured by the Wireless Telecommunications Test Set.

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6.9.1 GSM Band Frequency Stability over Voltage Variation Results

Test data:

Band	Offset	Voltage (V)		
		3.50	3.80	4.20
GSM850 GMSK	Hz	2.70	1.62	2.52
	ppm	0.003	0.001	0.003
PCS1900 GMSK	Hz	1.77	1.72	1.85
	ppm	0.0009	0.0009	0.0009

6.10. Peak to Average Ratio

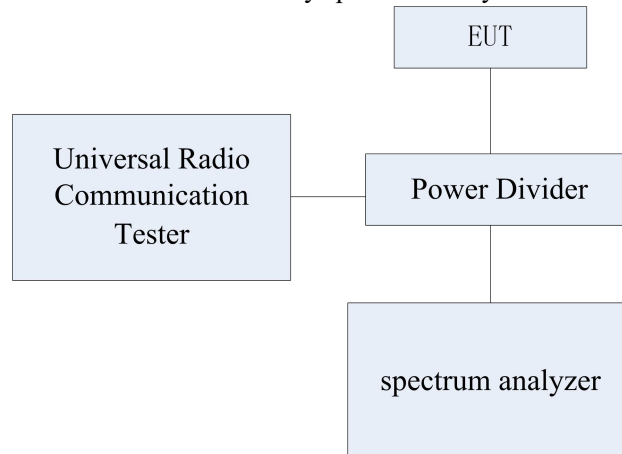
Specifications:	FCC Part 24.232
DUT Serial Number:	863070040113705
Test conditions:	Ambient Temperature:15 °C-35 °C Relative Humidity:30%-60% Air pressure: 86-106kPa
Test Results:	Pass

Limit

The EUT meets the requirement of having a peak to average ratio of less than 13dB.

Test Setup

During the test, the EUT was controlled via the Wireless Communications Test Set to ensure max power transmission and proper modulation and measured by spectrum analyzer.



Measurement Uncertainty:

Item	Uncertainty
Expanded Uncertainty	0.62 dB (k=2)

Test Method

The transmitter output was connected to a CMW500 through a coaxial RF cable and directional coupler, and configured to operate at maximum power. The peak to average ratio was measured at the required operating frequencies in each Band on the Spectrum Analyzer.

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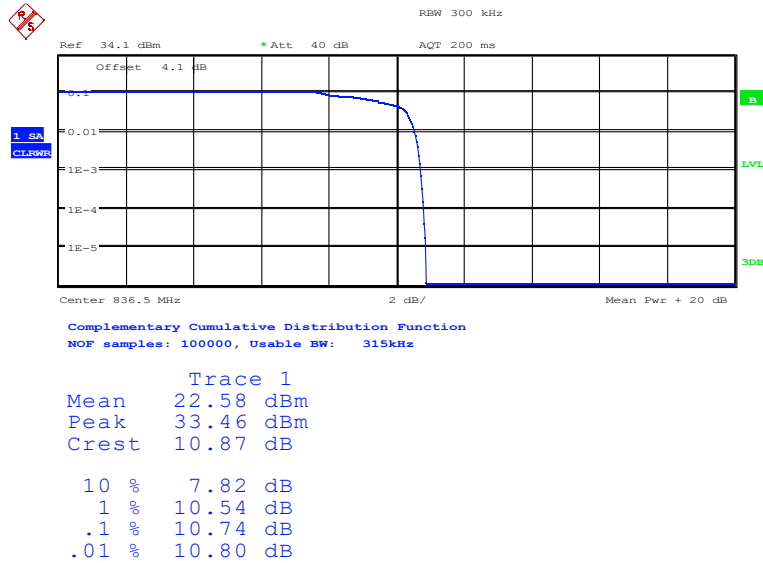
6.10.1 GSM850 Peak to Average Ratio Results

Frequency (MHz)	EUT channel No.	Modulation	Peak to Average Ratio
836.6	190	GMSK	10.87

6.10.2 GSM1900 Peak to Average Ratio Results

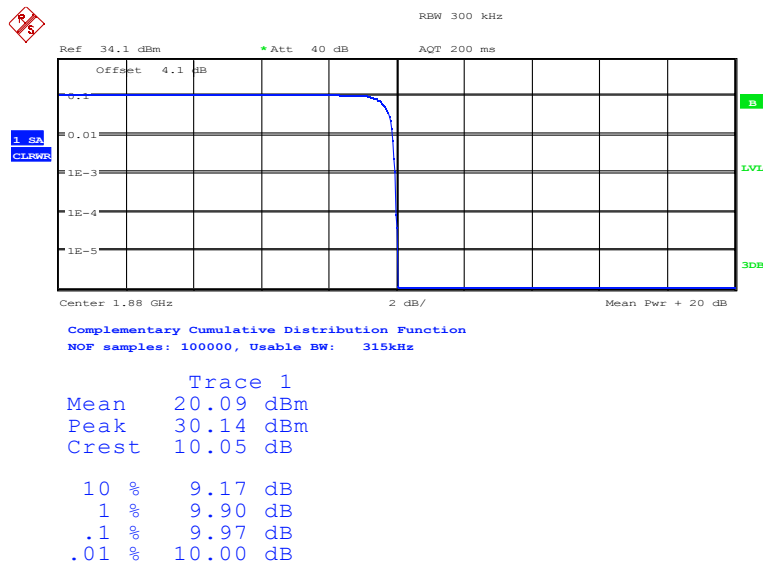
Frequency (MHz)	EUT channel No.	Modulation	Peak to Average Ratio
1880	661	GMSK	10.05

Graphical for Peak to Average Ratio Results



Date: 4.DEC.2021 18:18:40

GSM850, GMSK



Date: 4.DEC.2021 18:17:50

PCS1900, GMSK

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Annex A EUT Photos

See the document "R800C -External Photos".

See the document "R800C -Internal Photos".

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ANNEX B Deviations from Prescribed Test Methods

No deviation from Prescribed Test Methods.

*****END OF REPORT*****

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