ETSI EN 301 511 V9.0.2 (2003-03)

MEASUREMENT AND TEST REPORT

For

Shenzhen Wulian Electronic Co., Limited

Floor 2, Building 3, Masha Industrial Zone, No. 49,
Jiaoyu Road North, Pingdi, Longgang, Shenzhen, China

Model:	**SeeThe Certificate Annex**

May 14, 2019

This Report Concerns: ☒ Original Report	**Equipment Type:** **Alarm System**
Test By:	Angell Liu/
Report Number:	**CTE19ER-513E-4**
Test Date:	May 06-14, 2019
Reviewed By:	Jason Chen /
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1. General Information

1.1 Client Information

Applicant	:	**Shenzhen Wulian Electronic Co., Ltd.**
Address	:	Floor 2nd, Building 3, Masha Industrial Zone, No.49, Jiaoyu Road, Pingdi, Longgang District, Shenzhen, China
Manufacturer	:	**Shenzhen Wulian Electronic Co., Ltd.**
Address	:	Floor 2nd, Building 3, Masha Industrial Zone, No.49, Jiaoyu Road, Pingdi, Longgang District, Shenzhen, China

1.2 General Description of EUT (Equipment Under Test)

EUT : Alarm System

Model Number : **WG5**

Series No. : **SeeThe Certificate Annex**

Operating Frequency Product Description

For 2G Band ☒ GSM 900 (EU-Band) ☒ DCS 1800 (EU-Band) GSM 850 ☒ (U.S.-Band) ☒ PCS 1900 (U.S.-Band)

Release Ver. : R99

GPRS Class : Class 12

Uplink : GSM 900: 880MHz ~ 915MHz
DCS 1800: 1710MHz ~ 1785MHz

Downlink : GSM 900: 925MHz ~ 960MHz
DCS 1800: 1805MHz ~ 1875MHz

Type Of Modulation : GMSK for GSM/GPRS Antenna : Integral Antenna, 2.0dBi(Max.)

For 433MHz Band : Receiving Frequency: 433.92MHz Antenna : Integral Antenna, 0dBi(Max.) Power Supply: DC 9V by Adapter
Adapter Parameters: Input AC 100~240V, 50/60Hz
Output DC 9V/1A

WG5 Integral PIR

Operating Frequency : 433.92MHz

Channel Number : 1

Modulation Type : ASK

Antenna : Integral Antenna, 0dBi(Max.)

Power Supply : DC 9V by 3*AAA Batteries

WG5 Door Sensor

Operating Frequency : 433.92MHz

Channel Number : 1

Modulation Type : ASK

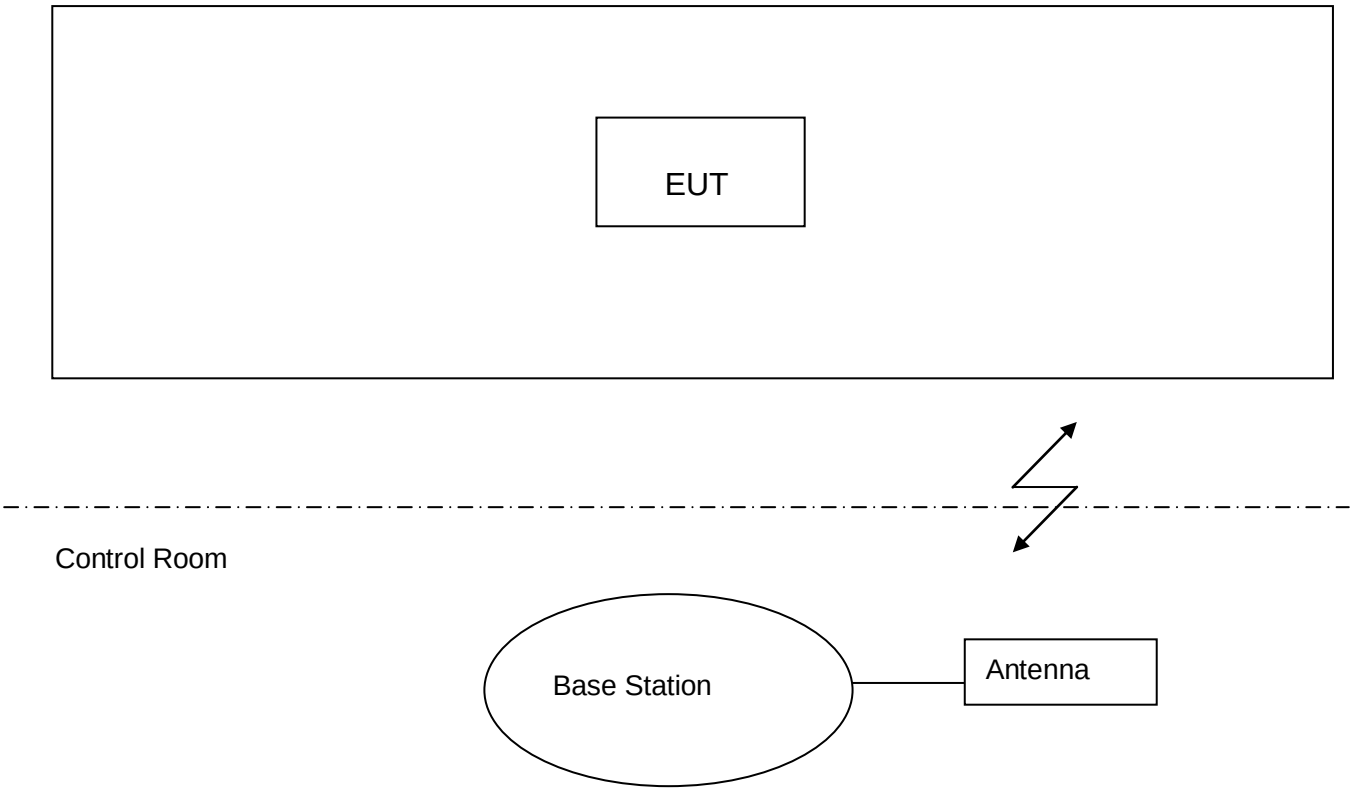
Antenna : Integral Antenna, 0dBi(Max.)

Power Supply : DC 9V by one ALARM BATTERY

WG5 Remote Control Operating Frequency : 433.92MHz Channel Number: 1

Modulation Type	: ASK
Antenna	: Integral Antenna, 1.0dBi(Max.)
Power Supply	: DC 9V by two CR2016 LITHIUM BATTERY
WG5 Integral PIR	
Operating Frequency	: 433.92MHz
Channel Number	: 1
Modulation Type	: ASK
Antenna	: Integral Antenna, 0dBi(Max.)
Power Supply	: DC 9V by 2*AAA Batteries **Chime Box**
Receiving Frequency	: 433.92MHz
Antenna	: Integral Antenna, 0dBi(Max.) Power Supply : DC 9V by 3*AAA Batteries

1.3 Block Diagram Showing the Configuration of System Tested



1.4 Description of Support Units

Name	Model	S/N	Manufacturer	Used " √ "
Base Station	CMU200	1100.864.02	Rohde& Schwarz	√

1.5 Description of Operating Mode

Operating modes of EUT during test	
Traffic Mode	A communication link is set up with a System Simulator (ss). The Absolute Radio Frequency Channel Number is allocated to the lowest, middle and highest channel during the test for all working frequency bands. The EUT is commanded to operate at maximum transmitting power. A call has been established.
Idle Mode	The EUT is synchronized to SS, and able to respond to paging messages and incoming call. An established call has been released.

1.6 Test Environment/Conditions

Normal Temperature(NT):	+15 °C to +30 °C
Relative Humidity:	25% to 75%
Air Pressure:	980-1020 hPa
Extreme Temperature	Low Temperature (LT)= -20°C High Temperature (HT)= +55°C
Normal Voltage of EUT (NV):	3.70Vdc
Extreme Voltage of the EUT	Low Voltage(LV)= 3.145Vdc High Voltage(HV)= 4.255Vdc

Note:
The UE should fulfill all the requirements in the full voltage range, i.e. the voltage range between the extreme voltages.
The supplier should declare the lower and higher extreme voltages and the approximate shutdown voltage.
For the equipment that can be operated from one or more of the power sources listed below, the lower extreme voltage should not be higher, and the higher extreme voltage should not be lower than that specified in table as follows:

Power Sources

Power source	Lower extreme voltage	Higher extreme voltage	Normal conditions voltage
AC mains	0.9 × nominal	1.1 × nominal	Nominal
Regulated lead acid battery	0.9 × nominal	1.3 × nominal	1.1 × nominal
Non regulated batteries: Leclanché/lithium Mercury/nickel and cadmium	 0.85 × nominal 0.9 × nominal	 nominal nominal	 nominal nominal

2 Test Results Summary

ETSI EN 301 511 V 9.0.2 (2003-03)	Requirement Conditionality	Result
Section 4.2.1	Transmitter-Frequency error and Phase error	Compliant
Section 4.2.2	Transmitter – Frequency error under multi path and interference conditions	Compliant
Section 4.2.3	Transmitter – Frequency error and Phase Error in HSCSD Multi slot Configuration	N/A
Section 4.2.4	Frequency error and phase error in GPRS multi slot configuration	Compliant
Section 4.2.5	Transmitter output power and burst timing	Compliant
Section 4.2.6	Transmitter – Output RF spectrum	Compliant
Section 4.2.7	Transmitter output power and burst timing in HSCSD multi slot configuration	N/A
Section 4.2.8	Transmitter – Output RF spectrum in HSCSD multi slot configuration	N/A
Section 4.2.9	Transmitter – Output RF spectrum for MS supporting the R-GSM frequency band	N/A
Section 4.2.10	Transmitter output power in GPRS multi slot configuration	Compliant
Section 4.2.11	Output RF spectrum in GPRS multi slot configuration	Compliant
Section 4.2.12	Conducted spurious emissions – MS allocated a channel	Compliant
Section 4.2.13	Conducted spurious emission – MS in idle mode	Compliant
Section 4.2.14	Conducted spurious emissions for MS supporting the R-GSM frequency band – MS allocated a channel	N/A
Section 4.2.15	Conducted spurious emissions for MS supporting the R-GSM frequency band – MS in idle mode	N/A
Section 4.2.16	Radiated spurious emissions – MS allocated a channel	Compliant
Section 4.2.17	Radiated spurious emissions – MS in idle mode	Compliant
Section 4.2.18	Radiated spurious emissions for MS supporting the R-GSM frequency band – MS allocated a channel	N/A
Section 4.2.19	Radiated spurious emissions for MS supporting the R-GSM frequency band – MS in idle mode	N/A
Section 4.2.20	Receiver blocking and spurious responses – speech channels	Compliant
Section 4.2.21	Receiver blocking and spurious response – speech channels for MS supporting the R-GSM frequency band	N/A

3 Frequency Error and Phase Error

3.1 Measurement Definition

3.1.1 Test Standard

EN 301 511 V 9.0.2: 2003 section 4.2.1

3.1.2 Definition

The MS carrier frequency shall be accurate to within 0.1 ppm, or accurate to within 0.1 ppm compared to signals received from the BS. The RMS phase error for each burst shall not be greater than 5 degrees. The maximum peak deviation during the useful part of each burst shall not be greater than 20 degrees.

3.2 Test Procedure

a) For one transmitted burst, the SS captures the signal as a series of phase samples over the period of the burst. These samples are evenly distributed over the duration of the burst with a minimum sampling rate of 2/T, where T is the modulation symbol period. The received phase trajectory is then represented by this array of at least 294 samples.

b) The SS then calculates, from the known bit pattern and the formal definition of the modulator contained in 3GPP TS 05.04, the expected phase trajectory.

c) From a) and b) the phase trajectory error is calculated, and a linear regression line computed through this phase trajectory error. The slope of this regression line is the frequency error of the mobile transmitter relative to the simulator reference. The difference between the regression line and the individual sample points is the phase error of that point.

c.1) The sampled array of at least 294 phase measurements is represented by the vector:

$$\varnothing_m = \varnothing_m(0)...\varnothing_m(n)$$

where the number of samples in the array n+1 >= 294.

c.2) The calculated array, at the corresponding sampling instants, is represented by the vector:

$$\varnothing_c = \varnothing_c(0)...\varnothing_c(n).$$

c.3) The error array is represented by the vector:

$$\varnothing_e = \{\varnothing_m(0) - \varnothing_c(0)\}.....\{\varnothing_m(n) - \varnothing_c(n)\} = \varnothing_e(0)...\varnothing_e(n).$$

c.4) The corresponding sample numbers form a vector t = t(0)...t(n).

c.5) By regression theory the slope of the samples with respect to t is k where:

$$k = \frac{\sum_{j=0}^{j=n} t(j) * \varnothing_e(j)}{\sum_{j=0}^{j=n} t(j)^2}$$

c.6) The frequency error is given by k/(360 *), where is the sampling interval in s and all phase samples are measured in degrees.

c.7) The individual phase errors from the regression line are given by:

$$\varnothing_e(j) - k*t(j).$$

c.8) The RMS value of the phase errors is given by:

$$\varnothing_e(RMS) = \left[\frac{\sum_{j=0}^{j=n} \{\varnothing_e(j) - k*t(j)\}^2}{n+1} \right]^{1/2}$$

d) Steps a) to c) are repeated for 20 bursts, not necessarily contiguous.

e) The SS instructs the MS to its maximum power control level, all other conditions remaining constant. Steps a) to d) are repeated.

f) The SS instructs the MS to the minimum power control level, all other conditions remaining constant. Steps a) to d) are repeated.

g) The MS is hard mounted on a vibration table and vibrated at the frequency/amplitudes specified in annex 1, TC4. During the vibration steps a) to f) are repeated.

NOTE 1: If the call is terminated when mounting the MS to the vibration table, it will be necessary to establish the initial conditions again before repeating steps a) to f).

3.3 Test Equipment Used

Description	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due Date
Temperature & Humidity Chamber	WUHUAN	HTP204	20050364	2016-3-22	2017-3-21
Universal Radio Communication Tester	Rohde & Schwarz	CMU200	1100.0002.06	2016-3-22	2017-3-21

3.4 Test Data

The Results: PASS

Frequency error and Phase error

GSM 900

0.1ppm means 90.2Hz for frequency 902.0MHz

(1) MS under maximum power control level

GSM 900	Test Condition	Frequency Error (Hz)	Limit (Hz)	Result	Phase Error (deg.)		Limit (deg.)	Result
Reference Frequency 902.0(MHz)	Normal	5	90.2	Pass	RMS	0.6	5	Pass
					Peak	1.1	20	Pass
	L.V. L.T.	-4	90.2	Pass	RMS	0.8	5	Pass
					Peak	1.7	20	Pass
	L.V. H.T.	8	90.2	Pass	RMS	0.7	5	Pass
					Peak	2.3	20	Pass
	H.V L.T	-6	90.2	Pass	RMS	1.5	5	Pass
					Peak	2.8	20	Pass
	H.V. H.T	7	90.2	Pass	RMS	0.7	5	Pass
					Peak	2.4	20	Pass
	Vibration	11	90.2	Pass	RMS	1.1	5	Pass
					Peak	3.8	20	Pass

(2) MS under minimum power control level

GSM 900	Test Condition	Frequency Error (Hz)	Limit (Hz)	Result	Phase Error (deg.)		Limit (deg.)	Result
Reference Frequency 902.0(MHz)	Normal	6	90.2	Pass	RMS	0.7	5	Pass
					Peak	2.1	20	Pass
	L.V. L.T.	-7	90.2	Pass	RMS	1.2	5	Pass
					Peak	2.2	20	Pass
	L.V. H.T.	9	90.2	Pass	RMS	0.8	5	Pass
					Peak	2.5	20	Pass
	H.V L.T	10	90.2	Pass	RMS	0.9	5	Pass
					Peak	3.1	20	Pass
	H.V. H.T	-8	90.2	Pass	RMS	0.8	5	Pass
					Peak	3.5	20	Pass
	Vibration	15	90.2	Pass	RMS	2.2	5	Pass
					Peak	6.4	20	Pass

DCS1800

0.1ppm means 174.78Hz for frequency 1747.8MHz

(1) MS under maximum power control level

DCS1800	Test Condition	Frequency Error (Hz)	Limit (Hz)	Result	Phase Error (deg.)		Limit (deg.)	Result
Reference Frequency 1747.8(MHz)	Normal	-6	174.78	Pass	RMS	0.6	5	Pass
					Peak	3.6	20	Pass
	L.V. L.T.	7	174.78	Pass	RMS	0.8	5	Pass
					Peak	4.6	20	Pass
	L.V. H.T.	-5	174.78	Pass	RMS	1.1	5	Pass
					Peak	4.1	20	Pass
	H.V L.T	8	174.78	Pass	RMS	0.9	5	Pass
					Peak	3.5	20	Pass
	H.V. H.T	11	174.78	Pass	RMS	1.3	5	Pass
					Peak	4.1	20	Pass
	Vibration	15	174.78	Pass	RMS	1.7	5	Pass
					Peak	4.9	20	Pass

(2) MS under minimum power control level

DCS 1800	Test Condition	Frequency Error (Hz)	Limit (Hz)	Result	Phase error (deg)		Limit (deg)	Result
Reference Frequency 1747.8(MHz)	Normal	3	174.78	Pass	RMS	0.7	5	Pass
					Peak	2.3	20	Pass
	L.V. L.T.	5	174.78	Pass	RMS	1.1	5	Pass
					Peak	2.8	20	Pass
	L.V. H.T.	-7	174.78	Pass	RMS	1.5	5	Pass
					Peak	4.0	20	Pass
	H.V L.T	5	174.78	Pass	RMS	0.8	5	Pass
					Peak	2.5	20	Pass
	H.V. H.T	6	174.78	Pass	RMS	0.8	5	Pass
					Peak	3.1	20	Pass
	Vibration	15	174.78	Pass	RMS	1.7	5	Pass
					Peak	3.5	20	Pass

4 Transmitter-Frequency Error Under Multipath and Interference Conditions

4.1 Test Standard and Limit

4.1.1 Test Standard

EN 301 511 V9.0.2:2003 clause 4.2.2

4.1.2 Limits

The maxim the MS carrier frequency error for each burst shall be accurate to within 0.1 ppm, or 0.1 ppm compared to signals received from the BS for signal levels down to 3 dB below reference sensitivity level under normal condition and extreme conditions. The MS carrier frequency error for each burst shall be accurate to within 0.1 ppm, or 0.1 ppm compared to signals received from the BS for 3 dB less carrier to interference ratio than the reference interference ratios.

4.2 Test Procedure

a) The level of the serving cell BCCH is set to 10 dB above the reference sensitivity level( ) and the Fading function set to RA. The SS waits 30 s for the MS to stabilize to these conditions. The SS is set up to capture the first burst transmitted by the MS during call establishment. A call is initiated by the SS on a channel in the mid ARFCN range as described for the generic call set up procedure but to a TCH at level 10 dB above the reference sensitivity level( ) and fading function set to RA.

b) The SS calculates the frequency accuracy of the captured burst as described in test 13.1.

c) The SS sets the serving cell BCCH and TCH to the reference sensitivity level( ) applicable to the type of MS, still with the fading function set to RA and then waits 30 s for the MS to stabilize to these conditions.

d) The SS shall capture subsequent bursts from the traffic channel in the manner described in test 13.1.

NOTE: Due to the very low signal level at the MS receiver input the MS receiver is liable to error. The "looped back" bits are therefore also liable to error, and hence the SS does not know the expected bit sequence. The SS will have to demodulate the received signal to derive (error free) the transmitter burst bit pattern. Using this bit pattern the SS can calculate the expected phase trajectory according to the definition within 3GPP TS 05.04.

e) The SS calculates the frequency accuracy of the captured burst as described in test 13.1.

f) Steps d) and e) are repeated for 5 traffic channel bursts spaced over a period of not less than 20 s.

g) The initial conditions are established again and steps a) to f) are repeated but with the fading function set to HT100 (HT200 for GSM 400, HT120 for GSM 700).

h) The initial conditions are established again and steps a) to f) are repeated but with the fading function set toTU50 (TU100 for GSM 400, TU 60 for GSM 700).

i) The initial conditions are established again and steps a) and b) are repeated but with the following differences:

- the levels of the BCCH and TCH are set to 18 dB above reference sensitivity level( ).

-two further independent interfering signals are sent on the same nominal carrier frequency as the BCCH and TCH and at a level 10 dB below the level of the TCH and modulated with random data, including

the mid amble.

- the fading function for all channels is set to TU low.

j) The SS waits 100 s for the MS to stabilize to these conditions.

k) Repeat steps d) to f), except that at step f) the measurement period must be extended to 200 s and the number of measurements increased to 20.

l) The initial conditions are established again and steps a) to k) are repeated for ARFCN in the Low ARFCN range.

m) The initial conditions are established again and steps a) to k) are repeated for ARFCN in the High ARFCN range.

n) Repeat step h) under extreme test conditions.

Test Requirements:

The frequency error, with reference to the SS carrier frequency as measured in repeats of step e), for each measured burst shall be less than the values shown in the table hereinafter:

Table: Requirements for frequency error under multi path, Doppler shift and interference conditions

GSM 850 and GSM 900		DCS 1800	
Propagation condition	**Permitted frequency error**	**Propagation condition**	**Permitted frequency error**
RA250 HT100 TU50 TU3	±300 Hz ±180 Hz ±160 Hz ±230 Hz	RA130 HT100 TU50 TU1.5	±400 Hz ±350 Hz ±260 Hz ±320 Hz

4.3 Test Equipment Used

Description	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Date
Universal Radio Communication Tester	Rohde & Schwarz	CMU200	1100.864.02	2016-3-22	2017-3-21
Spectrum Analyzer	Rohde & Schwarz	FSEM30	849621/019	2016-3-22	2017-3-21

4.4 Environmental Conditions

Temperature:	25 ° C
Relative Humidity:	56%
ATM Pressure:	100.2 kPa

4.5 Test Data

The Results: Pass

GSM 900

(1) MS under maximum power control level

	Test Condition		Frequency error (Hz)	Limit (Hz)	Result
GSM 900 Ref. Freq. 902.0(MHz)	**Normal**	RA250	+22	±300	Pass
		HT100	+18	±180	Pass
		TU50	+20	±160	Pass
		TU3	+19	±230	Pass
	L.V. L.T.	RA250	-4	±300	Pass
		HT100	-2	±180	Pass
		TU50	-3	±160	Pass
		TU3	-1	±230	Pass
	L.V. H.T.	RA250	+6	±300	Pass
		HT100	+5	±180	Pass
		TU50	+3	±160	Pass
		TU3	+4	±230	Pass
	H.V. L.T.	RA250	-2	±300	Pass
		HT100	-3	±180	Pass
		TU50	-3	±160	Pass
		TU3	-1	±230	Pass
	H.V. H.T.	RA250	+6	±300	Pass
		HT100	+5	±180	Pass
		TU50	+6	±160	Pass
		TU3	+6	±230	Pass

(2) MS under minimum power control level

	Test Condition		Frequency error (Hz)	Limit (Hz)	Result
EGSM 900 Ref. Freq. 902.0(MHz)	**Normal**	RA250	+19	±300	Pass
		HT100	+18	±180	Pass
		TU50	+19	±160	Pass
		TU3	+17	±230	Pass
	L.V. L.T.	RA250	-6	±300	Pass
		HT100	-6	±180	Pass
		TU50	-5	±160	Pass
		TU3	-4	±230	Pass
	L.V. H.T.	RA250	+6	±300	Pass
		HT100	+7	±180	Pass
		TU50	+5	±160	Pass
		TU3	+6	±230	Pass
	H.V. L.T.	RA250	-7	±300	Pass
		HT100	-6	±180	Pass
		TU50	-5	±160	Pass
		TU3	-6	±230	Pass
	H.V. H.T.	RA250	+7	±300	Pass
		HT100	+8	±180	Pass
		TU50	+7	±160	Pass
		TU3	+9	±230	Pass

DCS 1800

(1)MS under maximum power control level

	Test Condition		Frequency error (Hz)	Limit (Hz)	Result
DCS 1800 Ref. Freq. 1747.8(MHz)	Normal	RA130	+22	±400	Pass
		HT100	+19	±350	Pass
		TU50	+18	±260	Pass
		TU1.5	+16	±320	Pass
	L.V. L.T.	RA130	+23	±400	Pass
		HT100	+20	±350	Pass
		TU50	+21	±260	Pass
		TU1.5	+18	±320	Pass
	L.V. H.T.	RA130	+11	±400	Pass
		HT100	+9	±350	Pass
		TU50	+6	±260	Pass
		TU1.5	+7	±320	Pass
	H.V. L.T.	RA130	+25	±400	Pass
		HT100	+21	±350	Pass
		TU50	+20	±260	Pass
		TU1.5	+19	±320	Pass
	H.V. H.T.	RA130	+12	±400	Pass
		HT100	+11	±350	Pass
		TU50	+8	±260	Pass
		TU1.5	+8	±320	Pass

(2)MS under minimum power control level

	Test Condition		Frequency error (Hz)	Limit (Hz)	Result
DCS 1800 Ref. Freq. 1747.8(MHz)	Normal	RA130	+30	±400	Pass
		HT100	+20	±350	Pass
		TU50	+22	±260	Pass
		TU1.5	+24	±320	Pass
	L.V. L.T.	RA130	+26	±400	Pass
		HT100	+24	±350	Pass
		TU50	+22	±260	Pass
		TU1.5	+21	±320	Pass
	L.V. H.T.	RA130	+12	±400	Pass
		HT100	+14	±350	Pass
		TU50	+12	±260	Pass
		TU1.5	+13	±320	Pass
	H.V. L.T.	RA130	+27	±400	Pass
		HT100	+26	±350	Pass
		TU50	+25	±260	Pass
		TU1.5	+23	±320	Pass
	H.V. H.T.	RA130	+11	±400	Pass
		HT100	+16	±350	Pass
		TU50	+13	±260	Pass
		TU1.5	+16	±320	Pass

5 Frequency Error and Phase Error In GPRS Multislot Configuration

5.1 Test Standard and Limit

5.1.1 Test Standard

EN 301 511 V9.0.2:2003 clause 4.2.4

5.1.2 Limits

The MS carrier frequency shall be accurate to within 0,1 ppm compared to signals received from the BS. The RMS phase error (difference between the phase error trajectory and its linear regression on the active part of the time slot) for each burst shall not be greater than 5 degrees. The maximum peak deviation during the useful part of each burst shall not be greater than 20 degrees.

The frequency error is the difference in frequency, after adjustment for the effect of the modulation and phase error, between the RF transmission from the MS and either:

- the RF transmission from the BS, or
- the nominal frequency for the ARFCN used.

The phase error is the difference in phase, after adjustment for the effect of the frequency error, between the RF transmission from the MS and the theoretical transmission according to the intended modulation.

The requirements and this test apply to GSM900 and DCS1800 MS which are capable of GPRS multislot operation on the uplink.Since this requirement applies to GPRS configurations with more than one uplink channel and the EUT as GPRS class 4 device provides only one uplink channel, this clause is not applicable to EUT and is therefore not tested.

5.2 Test Procedure

For one transmitted burst on the last slot of the multislot configuration, the SS captures the signal as a series of phase samples over the period of the burst. These samples are evenly distributed over the duration of the burst with a minimum sampling rate of 2/T, where T is the modulation symbol period. The received phase trajectory is then represented by this array of at least 294 samples.

The SS then calculates, from the known bit pattern and the formal definition of the modulator contained in 3GPP TS 05.04, the expected phase trajectory.

From a) and b) the phase trajectory error is calculated, and a linear regression line computed through this phase trajectory error. The slope of this regression line is the frequency error of the mobile transmitter relative to the simulator reference. The difference between the regression line and the individual sample points is the phase error of that point.

c.1) The sampled array of at least 294 phase measurements is represented by the vector:

$$\Phi m = \Phi m(0) \ldots \Phi m(n)$$

Where the number of samples in the array n+1≥294

c.2) The calculated array, at the corresponding sampling instants, is represented by the vector:

$$\Phi c = \Phi c(0) \ldots \Phi c(n)$$

c.3) The error array is represented by the vector:

$$\Phi e=\{\Phi m(0)-\Phi c(0)\}.....\{\Phi m(n)-\Phi c(n)\}=\Phi e(0)...\Phi(n).$$

c.4) The corresponding sample numbers form a vector $t=t(0)...t(n)$.

c.5) By regression theory the slope of the samples with respect to t is k where:

$$k=\frac{\sum_{j=0}^{j=n} t(j)*\Phi e(j)}{\sum_{j=1}^{j=n} t(j)*t(j)}$$

c.6) The frequency error is given by K/(360*g), where g is the sampling interval in s and all phase samples are measured in degrees.

c.7) The individual phase errors from the regression line are given by :

$$\Phi e(j)-k*t(j).$$

c.8) The RMS value Φe of the phase errors is given by:

$$\Phi e(RMS)=\left[\frac{\sum_{j=0}^{j=n}\{\Phi e(j)-k*t(j)^2\}}{n+1}\right]^{\frac{1}{2}}$$

1 Steps a) to c) are repeated for 20 bursts, not necessarily contiguous.

2 The SS instructs the MS to its maximum power control level by setting the power control parameter ALPHA (α) to 0 and GAMMA_TN (ΓCH) for each timeslot to the desired power level in the Packet Uplink Assignment message (Closed Loop Control, see 3GPP TS 05.08, clause B.2), all other conditions remaining constant. Steps a) to d) are repeated.

3 The SS instructs the MS to the minimum power control level, all other conditions remaining constant. Steps a) to d) are repeated.

4 The MS is hard mounted on a vibration table and vibrated at the frequency/amplitudes specified in annex 1, TC4. During the vibration steps a) to f) are repeated.

NOTE: If the call is terminated when mounting the MS to the vibration table, it will be necessary to establish the initial conditions again before repeating steps a) to f).

5 The MS is re-positioned on the vibration table in the two orthogonal planes to the plane used in step g). For each of the orthogonal planes step g) is repeated.

i) Steps a) to f) are repeated under extreme test conditions (see annex 1, TC2.2).

5.3 Test Equipment Used

Description	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Date
Universal Radio Communication Tester	Rohde&Schwarz	CMU200	1100.864.02	2016-3-22	2017-3-21
Temperature& Humidity Chamber	Wuhuan	HTP206	200611212	2016-3-22	2017-3-21

5.4 Test Data

Environmental Conditions:

Temperature:	25 ° C
Relative Humidity:	56%
ATM Pressure:	100.2 kPa

Test Results: PASS

GSM 900

0.1ppm means 90.2Hz for frequency 902.0MHz

(1) MS under maximum power control level

GSM 900 (GPRS)	Test Condition	Frequency Error (Hz)	Limit (Hz)	Result	Phase Error (deg.)		Limit (deg.)	Result
Reference Frequency 902.0 (MHz)	Normal	4	90.2	Pass	RMS	1.4	5	Pass
					Peak	4.0	20	Pass
	L.V. L.T.	-7	90.2	Pass	RMS	1.4	5	Pass
					Peak	4.3	20	Pass
	L.V. H.T.	3	90.2	Pass	RMS	1.4	5	Pass
					Peak	4.3	20	Pass
	H.V L.T	-6	90.2	Pass	RMS	1.5	5	Pass
					Peak	4.6	20	Pass
	H.V. H.T	-7	90.2	Pass	RMS	1.1	5	Pass
					Peak	3.3	20	Pass
	Vibration	18	90.2	Pass	RMS	1.2	5	Pass
					Peak	4.1	20	Pass

(2) MS under minimum power control level

GSM 900 (GPRS)	Test Condition	Frequency Error (Hz)	Limit (Hz)	Result	Phase error (deg.)		Limit (deg.)	Result
Reference Frequency 902.0 (MHz)	Normal	6	90.2	Pass	RMS	1.0	5	Pass
					Peak	2.8	20	Pass
	L.V. L.T.	-9	90.2	Pass	RMS	1.0	5	Pass
					Peak	2.8	20	Pass
	L.V. H.T.	7	90.2	Pass	RMS	1.0	5	Pass
					Peak	2.8	20	Pass
	H.V L.T	4	90.2	Pass	RMS	1.0	5	Pass
					Peak	2.8	20	Pass
	H.V. H.T	-8	90.2	Pass	RMS	1.1	5	Pass
					Peak	2.5	20	Pass
	Vibration	-15	90.2	Pass	RMS	1.0	5	Pass
					Peak	2.7	20	Pass

GSM 1800

0.1ppm means 174.78Hz for frequency 1747.8 MHz

(1) MS under maximum power control level

GSM 1800 (GPRS)	Test Condition	Frequency Error (Hz)	Limit (Hz)	Result	Phase Error (deg.)		Limit (deg.)	Result
Reference Frequency 1747.80 (MHz)	Normal	6	1478.78	Pass	RMS	1.7	5	Pass
					Peak	5.4	20	Pass
	L.V. L.T.	7	1478.78	Pass	RMS	1.6	5	Pass
					Peak	5.4	20	Pass
	L.V. H.T.	-3	1478.78	Pass	RMS	1.7	5	Pass
					Peak	5.4	20	Pass
	H.V L.T	4	1478.78	Pass	RMS	1.6	5	Pass
					Peak	1.1	20	Pass
	H.V. H.T	-8	1478.78	Pass	RMS	1.7	5	Pass
					Peak	5.3	20	Pass
	Vibration	16	1478.78	Pass	RMS	1.6	5	Pass
					Peak	5.3	20	Pass

(2) MS under minimum power control level

GSM 900 (GPRS)	Test Condition	Frequency Error (Hz)	Limit (Hz)	Result	Phase error (deg.)		Limit (deg.)	Result
Reference Frequency 1747.80 (MHz)	Normal	7	1478.78	Pass	RMS	1.3	5	Pass
					Peak	3.8	20	Pass
	L.V. L.T.	-9	1478.78	Pass	RMS	1.6	5	Pass
					Peak	4.5	20	Pass
	L.V. H.T.	11	1478.78	Pass	RMS	1.3	5	Pass
					Peak	3.9	20	Pass
	H.V L.T	-6	1478.78	Pass	RMS	1.6	5	Pass
					Peak	4.6	20	Pass
	H.V. H.T	5	1478.78	Pass	RMS	1.3	5	Pass
					Peak	3.8	20	Pass
	Vibration	21	1478.78	Pass	RMS	1.5	5	Pass
					Peak	4.4	20	Pass

6 Transmitter Output Power and Burst Timing

6.1 Test Standard and Limit

6.1.1 Test Standard

EN 301 511 V9.0.2:2003 clause 4.2.5

6.1.2 Limits

1. The MS maximum output power shall be as defined in 3GPP TS 05.05, sub clause 4.1.1, table for GMSK modulation, according to its power class, with a tolerance of ±2 dB under normal conditions; 3GPP TS 05.05, sub clause 4.1.1, table for GMSK modulation.
2. The MS maximum output power shall be as defined in 3GPP TS 05.05, sub clause 4.1.1, table for GMSK modulation, according to its power class, with a tolerance of ±2,5 dB under extreme conditions; 3GPP TS 05.05, sub clause 4.1.1, table for GMSK modulation; 3GPP TS 05.05 annex D in subclasses D.2.1 and D.2.2.
3. The power control levels shall have the nominal output power levels as defined in 3GPP TS 05.05, sub clause 4.1.1, from the lowest power control level up to the maximum output power corresponding to the class of the MS (for tolerance on maximum output power see conformance requirements 1), with a tolerance of ±3 dB, ±4 dB or ±5 dB under normal conditions; 3GPP TS 05.05, sub clause 4.1.1.
4. The power control levels shall have the nominal output power levels as defined in 3GPP TS 05.05, 4.1.1, from the lowest power control level up to the maximum output power corresponding to the class of the MS (for tolerance on maximum output power see conformance requirements 2), with a tolerance of ±4 dB, ±5 dB or ±6 dB under extreme conditions; 3GPP TS 05.05, sub clause 4.1.1; 3GPP TS 05.05 annex D subclasses D.2.1and D.2.2.
5. The output power actually transmitted by the MS at consecutive power control levels shall form a monotonic sequence and the interval between power control levels shall be 2 ± 1,5 dB (1 ± 1dB between power control level 30 and 31 for PCS 1 900); 3GPP TS 05.05, sub clause 4.1.1.
6. The transmitted power level relative to time for a normal burst shall be within the power/time template given in 3GPP TS 05.05, annex B in figure B.1:
   6.1 Under normal conditions; 3GPP TS 05.05, sub clause 4.5.2.
   6.2 Under extreme conditions; 3GPP TS 05.05, sub clause 4.5.2, 3GPP TS 05.05 annex D in sub clauses D.2.1 and D.2.2.
7. When accessing a cell on the RACH and before receiving the first power command during a communication on a DCCH or TCH (after an IMMEDIATE ASSIGNMENT), all GSM, class 1 and class 2 DCS 1 800 and PCS 1 900 MS shall use the power control level defined by the MS_TXPWR_MAX_CCH parameter broadcast on the BCCH of the cell, or if MS_TXPWR_MAX_CCH corresponds to a power control level not supported by the MS as defined by its power class, the MS shall act as though the closest supported power control level had been broadcast. A Class 3 DCS 1 800 MS shall use the POWER_OFFSET parameter.
8. The transmissions from the MS to the BS, measured at the MS antenna, shall be 468,75 - TA bit periods behind the transmissions received from the BS, where TA is the last timing advance received from the current serving BS. The tolerance on these timings shall be ±1 bit period:
   8.1 Under normal conditions; 3GPP TS 05.10, sub clause 6.4.

8.2 Under extreme conditions; 3GPP TS 05.10, sub clause 6.4, 3GPP TS 05.05 annex D in sub clauses D.2.1 and D.2.2.

9. The transmitted power level relative to time for a random access burst shall be within the power/time template given in 3GPP TS 05.05, annex B in figure B.3:

9.1 Under normal conditions; 3GPP TS 05.05, sub clause 4.5.2.

9.2 Under extreme conditions; 3GPP TS 05.05, sub clause 4.5.2, 3GPP TS 05.05 annex D in sub clause D.2.1 and D.2.2.

10 The MS shall use a TA value of 0 for the Random Access burst sent:

10.1 Under normal conditions; 3GPP TS 05.10, sub clause 6.6.

10.2 Under extreme conditions; 3GPP TS 05.10, sub clause 6.6, 3GPP TS 05.05 annex D in sub clause D.2.1 and D.2.2.

6.2 Test Procedure

a) Measurement of normal burst transmitter output power.

-The SS takes power measurement samples evenly distributed over the duration of one burst with a sampling rate of at least 2/T, where T is the bit duration. The samples are identified in time with respect to the modulation on the burst. The SS identifies the centre of the useful 147 transmitted bits, i.e. the transition from bit 13 to bit 14 of the mid amble, as the timing reference.

- The transmitter output power is calculated as the average of the samples over the 147 useful bits. This is also used as the 0 dB reference for the power/time template.

b) Measurement of normal burst timing delay.

- The burst timing delay is the difference in time between the timing reference identified in a) and the corresponding transition in the burst received by the MS immediately prior to the MS transmit burst sampled.

c) Measurement of normal burst power/time relationship.

- The array of power samples measured in a) are referenced in time to the centre of the useful transmitted bits and in power to the 0 dB reference, both identified in a).

d) Steps a) to c) are repeated with the MS commanded to operate on each of the power control levels defined, even those not supported by the MS.

e) The SS commands the MS to the maximum power control level supported by the MS and steps a) to c) are repeated for ARFCN in the Low and High ranges.

f) Measurement of access burst transmitter output power.

- The SS causes the MS to generate an Access Burst on an ARFCN in the Mid ARFCN range, this could be either by a handover procedure or a new request for radio resource. In the case of a handover procedure the Power Level indicated in the HANDOVER COMMAND message is the maximum power control level supported by the MS. In the case of an Access Burst the MS shall use the Power Level indicated in the MS_TXPWR_MAX_CCH parameter. If the power class of the MS is DCS 1 800 Class 3, the MS shall also use the POWER_OFFSET parameter.

- The SS takes power measurement samples evenly distributed over the duration of the access burst as described in a). However, in this case the SS identifies the centre of the useful bits of the burst by identifying the transition from the last bit of the synch sequence. The centre of the burst is then five data bits prior to this point and is used as the timing reference.

- The transmitter output power is calculated as the average of the samples over the 87 useful bits of the

burst. This is also used as the 0 dB reference for the power/time template.

g) Measurement of access burst timing delay.

- The burst timing delay is the difference in time between the timing reference identified in f) and the MS received data on the common control channel.

h) Measurement of access burst power/time relationship.

- The array of power samples measured in f) are referenced in time to the centre of the useful transmitted bits and in power to the 0 dB reference, both identified in f).

i) Depending on the method used in step f) to cause the MS to send an Access Burst, the SS sends either a HANDOVER COMMAND with power control level set to 10 or it changes the System Information elements MS_TXPWR_MAX_CCH and for DCS 1 800 the POWER_OFFSET on the serving cell BCCH in order to limit the MS transmit power on the Access Burst to power control level 10 (+23 dBm for GSM 400, GSM 700, GSM 850, and GSM 900 or +10 dBm for DCS 1 800 and PCS 1 900) and then steps f) to h) are repeated.

j) Steps a) to i) are repeated under extreme test conditions (annex 1, TC2.2) except that the repeats at step d) are only performed for power control level 10 and the minimum power control level of the MS.

6.3 Test Equipment Used

Description	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Date
Universal Radio Communication Tester	Rohde& Schwarz	CMU200	1100.864.02	2016-3-22	2017-3-21
Temperature& Humidity Chamber	Wuhuan	HTP206	200611212	2016-3-22	2017-3-21

6.4 Test Data

Environmental Conditions:

Temperature:	25 ° C
Relative Humidity:	56%
ATM Pressure:	100.2 kPa

Test Results: PASS

GSM900 Output power

High Channel (914.8MHz) Output Power

High Channel F = 914.8 MHz						
Power Control Level	Output Power (dBm)					Result
	Normal	L.T. L.V.	H.T. L.V.	L.T. H.V.	H.T. H.V.	
5	31.48	33.21	32.13	33.54	32.21	Pass
6	30.74	32.25	31.48	32.45	31.54	
7	28.44	29.98	29.23	30.07	29.30	
8	26.68	28.16	27.35	28.14	27.45	
9	24.49	25.98	25.32	26.04	25.36	
10	22.62	24.15	23.43	24.27	23.54	
11	20.71	22.03	21.52	22.08	21.58	
12	18.30	19.65	19.18	19.72	19.25	
13	16.70	17.97	17.53	18.04	17.59	
14	14.91	16.127	15.78	16.26	15.85	
15	13.07	14.30	13.92	14.40	13.98	
16	11.13	12.31	11.93	12.43	12.02	
17	9.02	10.21	9.78	10.36	9.88	
18	7.46	8.64	8.15	8.82	8.28	
19	5.31	6.69	5.97	6.92	6.16	

Middle Channel (902.0MHz) Output Power

Middle Channel F = 902.0 MHz						
Power Control Level	Output Power (dBm)					Result
	Normal	L.T. L.V.	H.T. L.V.	L.T. H.V.	H.T. H.V.	
5	31.38	32.47	31.65	32.68	31.76	Pass
6	30.05	31.71	30.88	31.83	30.95	
7	28.11	29.33	28.54	29.40	28.56	
8	26.21	27.40	26.67	27.48	26.73	
9	24.13	25.28	24.61	25.35	24.65	
10	22.25	23.42	22.76	23.48	22.82	
11	20.24	21.42	20.76	21.47	20.82	
12	17.85	18.98	18.44	19.06	18.50	
13	16.18	17.20	16.74	17.33	16.82	
14	14.45	15.43	14.98	15.53	15.08	
15	12.53	13.55	13.13	13.67	13.23	
16	10.55	11.56	11.15	11.71	11.26	
17	8.56	9.48	8.98	9.66	9.13	
18	6.89	7.92	7.28	8.12	7.44	
19	4.78	5.95	5.08	6.15	5.35	

Low Channel (880.2MHz) Out Power

Low Channel F = 880.2 MHz						
Power Control Level	Output Power (dBm)					Result
	Normal	L.T. L.V.	H.T. L.V.	L.T. H.V.	H.T. H.V.	
5	31.65	33.13	32.34	33.25	33.24	Pass
6	30.65	32.07	31.35	32.18	31.76	
7	28.45	29.76	29.15	29.58	29.42	
8	26.73	27.8	27.23	27.89	27.28	
9	24.48	25.63	25.12	25.74	25.16	
10	22.61	23.73	23.24	23.89	23.28	
11	21.08	22.18	21.76	22.61	21.77	
12	18.79	19.81	19.45	19.95	19.50	
13	17.18	18.12	17.78	18.26	17.85	
14	15.41	16.29	16.01	16.45	16.08	
15	13.58	14.45	14.17	14.60	14.27	
16	11.64	12.45	12.19	12.64	12.28	
17	9.59	10.37	10.05	10.57	10.16	
18	7.99	8.79	8.36	9.04	8.50	
19	5.88	6.80	6.23	7.25	6.41	

DCS1800 output power

High Channel (1784.8MHz) Output Power

High Channel F = 1784.8 MHz						
Power Control Level	Output Power (dBm)					Result
	Normal	L.T. L.V.	H.T. L.V.	L.T. H.V.	H.T. H.V.	
0	28.96	29.71	28.84	29.81	28.92	Pass
1	26.62	27.35	26.69	27.42	26.76	
2	25.06	25.74	25.12	25.81	25.18	
3	22.28	22.91	22.42	22.99	22.48	
4	20.34	20.94	20.45	20.98	20.50	
5	18.43	18.94	18.48	19.02	18.58	
6	16.30	16.76	16.40	16.83	16.46	
7	14.14	14.44	14.23	14.54	14.30	
8	12.30	12.53	12.41	12.66	12.48	
9	10.95	10.18	11.08	11.26	11.18	
10	9.14	9.26	9.26	9.39	9.36	
11	7.28	7.38	7.39	7.50	7.54	
12	5.20	5.26	5.23	5.42	5.41	
13	2.80	2.93	2.74	3.09	2.96	
14	1.28	1.55	1.14	1.74	1.37	
15	0.13	0.52	-0.15	0.73	0.12	

Middle Channel (1747.8MHz) Output Power

Middle Channel F = 1747.8 MHz						
Power Control Level	Output Power (dBm)					Result
	Normal	L.T. L.V.	H.T. L.V.	L.T. H.V.	H.T. H.V.	
0	28.69	30.37	29.50	30.43	29.55	Pass
1	26.45	27.91	27.30	27.95	27.36	
2	24.92	26.30	25.78	26.34	25.81	
3	22.17	23.50	2305	23.53	23.09	
4	20.15	21.54	21.14	21.56	21.17	
5	18.13	19.58	19.23	19.61	19.28	
6	16.09	17.45	17.14	17.43	17.18	
7	13.56	14.80	14.65	14.86	14.73	
8	11.78	12.94	12.88	12.99	12.94	
9	10.49	11.53	11.51	11.59	11.62	
10	8.58	9.65	9.72	9.74	9.80	
11	6.75	7.79	7.88	7.91	7.97	
12	4.49	5.54	5.58	5.68	5.72	
13	2.18	3.26	3.08	3.41	3.29	
14	1.54	1.88	1.46	2.06	1.68	
15	0.54	0.88	0.19	1.06	0.42	

Low Channel (1710.2MHz) Output Power

Low Channel F = 1710.2 MHz						
Power Control Level	Output Power (dBm)					Result
	Normal	L.T. L.V.	H.T. L.V.	L.T. H.V.	H.T. H.V.	
0	29.95	30.23	29.40	30.33	29.44	Pass
1	27.7	27.92	27.25	27.98	27.26	
2	26.1	26.34	25.68	26.39	25.72	
3	23.4	23.51	22.92	23.56	22.97	
4	21.3	21.56	21.02	21.60	21.07	
5	19.4	19.55	19.06	19.61	19.10	
6	17.2	17.36	16.69	17.41	17.02	
7	15.1	15.18	14.89	15.22	14.96	
8	13.3	13.25	13.02	13.31	13.13	
9	11.9	10.84	11.69	10.89	11.77	
10	10.0	9.85	9.78	9.97	9.90	
11	8.1	7.88	7.87	7.99	7.97	
12	6.0	5.87	5.81	6.01	5.96	
13	3.7	3.45	3.28	3.60	3.51	
14	2.0	1.93	1.50	2.10	1.72	
15	0.9	0.75	0.11	1.01	0.35	

7 Transmitter –Output RF Spectrum

7.1 Test Standard and Limit

7.1.1 Test Standard

EN 301 511 V9.0.2:2003 clause 4.2.6

7.1.2 Limits

The level of the output RF spectrum due to modulation shall be no more than that given in 3GPP TS 05.05, sub clause 4.2.1, table a1) for GSM 900, with -36 dBm below 600 kHz offset from the carrier; the level of the output RF spectrum due to switching transients shall be no more than given in 3GPP TS 05.05, sub clause 4.2.2, table “a) Mobil Station”.

When allocated a channel, the power emitted by a GSM 400, GSM 900 and DCS 1 800 MS, in the band 935 MHz to 960 MHz shall be no more than -79 dBm, in the band 925 MHz to 935 MHz shall be no more than -67 dBm and in the band 1 805 MHz to 1 880 MHz shall be no more than -71 dBm except in five measurements in each of the bands 925 MHz to 960 MHz and 1 805 MHz to 1 880 MHz where exceptions at up to -36 dBm are permitted. For GSM 400 MS, in addition, the power emitted by MS, in the bands of 460,4 MHz to 467,6 MHz and 488,8 MHz to 496 MHz shall be no more than -67 dBm except in three measurements in each of the bands 460,4 MHz to 467,6 MHz and 488,8 MHz to 496 MHz where exceptions at up to -36 dBm are permitted. For GSM 700, GSM 850 and PCS 1 900 MS, the power emitted by MS, in the band of 747 MHz to 757 MHz shall be no more than -79 dBm, in the band of 757 MHz to 762 MHz shall be no more than -73 dBm, in the band 869 MHz to 894 MHz shall be no more than -79 dBm, in the band 1 930 MHz to 1 990 MHz shall be no more than -71 dBm except in five measurements in each of the bands 747 MHz to 762 MHz, 869 MHz to 894 MHz and 1 930 MHz to 1 990 MHz where exceptions at up to -36 dBm are permitted. Under normal conditions; 3GPP TS 05.05, sub clause 4.3.3.

7.2 Test Procedure

a) In steps b) to h) the FT is equal to the hop pattern ARFCN in the Mid ARFCN range.

b) The other settings of the spectrum analyzer are set as follows:

- Zero frequency scan;
- Resolution bandwidth: 30 kHz;
- Video bandwidth: 30 kHz;
- Video averaging: may be used, depending on the implementation of the test.

The video signal of the spectrum analyzer is "gated" such that the spectrum generated by at least 40 of the bits 87 to 132 of the burst is the only spectrum measured. This gating may be analogue or numerical, dependent upon the design of the spectrum analyzer. Only measurements during transmitted bursts on the nominal carrier of the measurement are included. The spectrum analyzer averages over the gated period and over 200 or 50 such bursts, using numerical and/or video averaging.

The MS is commanded to its maximum power control level.

c) By tuning the spectrum analyzer centre frequency to the measurement frequencies the power level

is measured over 50 bursts at all multiples of 30 kHz offset from FT to < 1 800 kHz.

d) The resolution and video bandwidth on the spectrum analyzer are adjusted to 100 kHz and the measurements are made at the following frequencies:

- on every ARFCN from 1 800 kHz offset from the carrier to the edge of the relevant transmit band for each measurement over 50 bursts;
- at 200 kHz intervals over the 2 MHz either side of the relevant transmit band for each measurement over
50 bursts.

e) The MS is commanded to its minimum power control level. The spectrum analyzer is set again as in b).

f) By tuning the spectrum analyzer centre frequency to the measurement frequencies the power level is measured over 200 bursts at the following frequencies:

FT;
FT + 100 kHz FT - 100 kHz;
FT + 200 kHz FT - 200 kHz;
FT + 250 kHz FT - 250 kHz;
FT + 200 kHz * N FT - 200 kHz * N;
where N = 2, 3, 4, 5, 6, 7, and 8; and FT = RF channel nominal centre frequency.

g) The spectrum analyzer settings are adjusted to:

- Zero frequency scan;
- Resolution bandwidth: 30 kHz;
- Video bandwidth: 100 kHz;
- Peak hold.

The spectrum analyzer gating of the signal is switched off.
The MS is commanded to its maximum power control level.

h) By tuning the spectrum analyzer centre frequency to the measurement frequencies the power level is measured at the following frequencies:

FT + 400 kHz FT - 400 kHz;
FT + 600 kHz FT - 600 kHz;
FT + 1,2 MHz FT - 1,2 MHz;
FT + 1,8 MHz FT - 1,8 MHz;
where FT = RF channel nominal centre frequency.
The duration of each measurement (at each frequency) will be such as to cover at least 10 burst transmissions at FT.

i) Step h) is repeated for power control levels 7 and 11.

j) Steps b), f), g) and h) are repeated with FT equal to the hop pattern ARFCN in the Low ARFCN range except that in step g) the MS is commanded to power control level 11 rather than maximum power.

k) Steps b), f), g) and h) are repeated with FT equal to the hop pattern ARFCN in the High ARFCN range except that in step g) the MS is commanded to power control level 11 rather than maximum power.

l) Steps a) b) f) g) and h) are repeated under extreme test conditions (annex 1, TC2.2). except that at step g) the MS is commanded to power control level 11.

7.3 Test Equipment Used

Description	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Date
Temperature& Humidity Chamber	Wuhuan	HTP206	200611212	2016-3-22	2017-3-21
Universal Radio Communication Tester	Rohde & Schwarz	CMU200	1100.864.02	2016-3-22	2017-3-21

7.4 Test Data

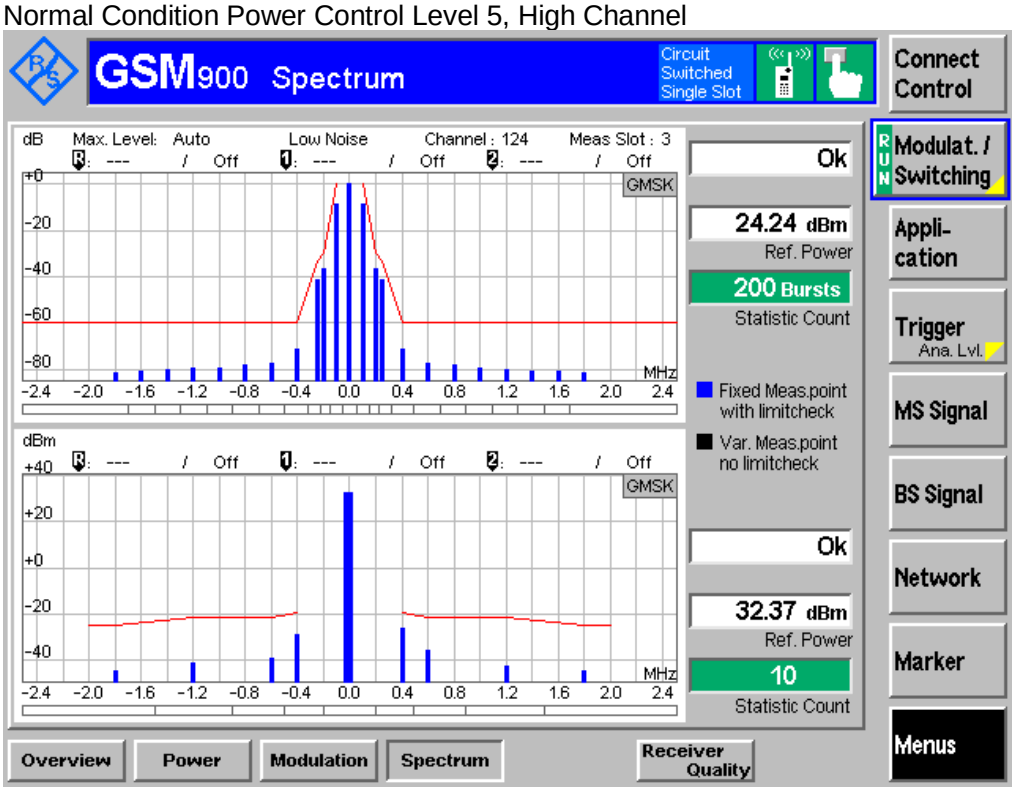
Environmental Conditions:

Temperature:	25 ° C
Relative Humidity:	56%
ATM Pressure:	100.2 kPa

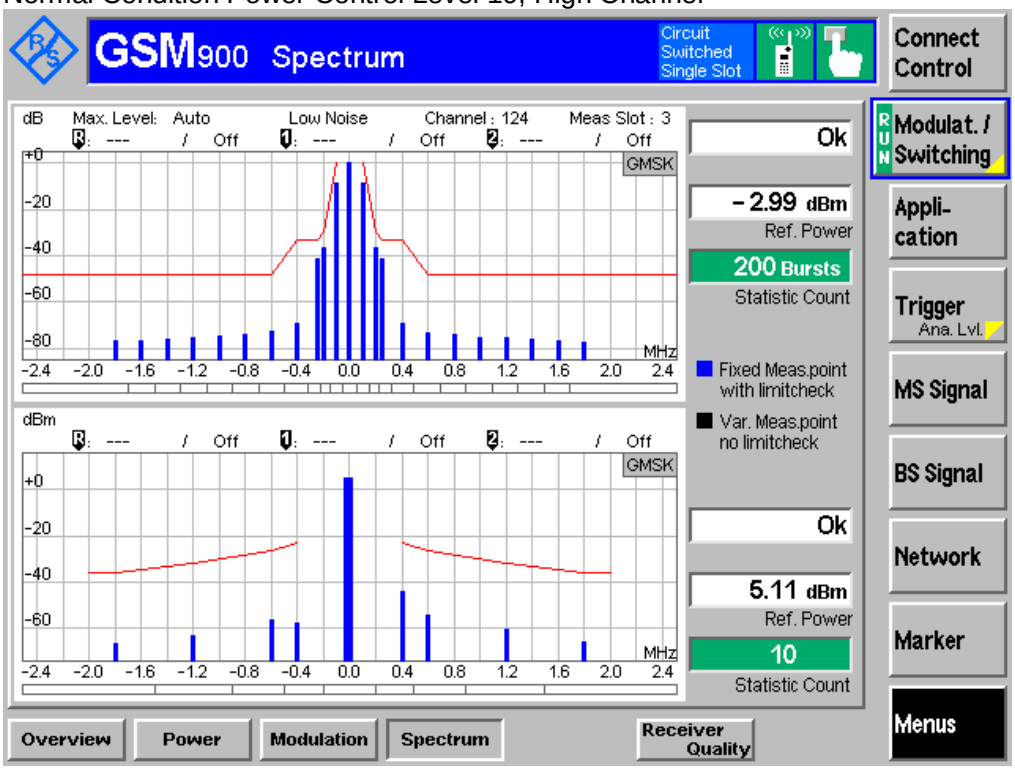
Test Results: PASS

GSM900

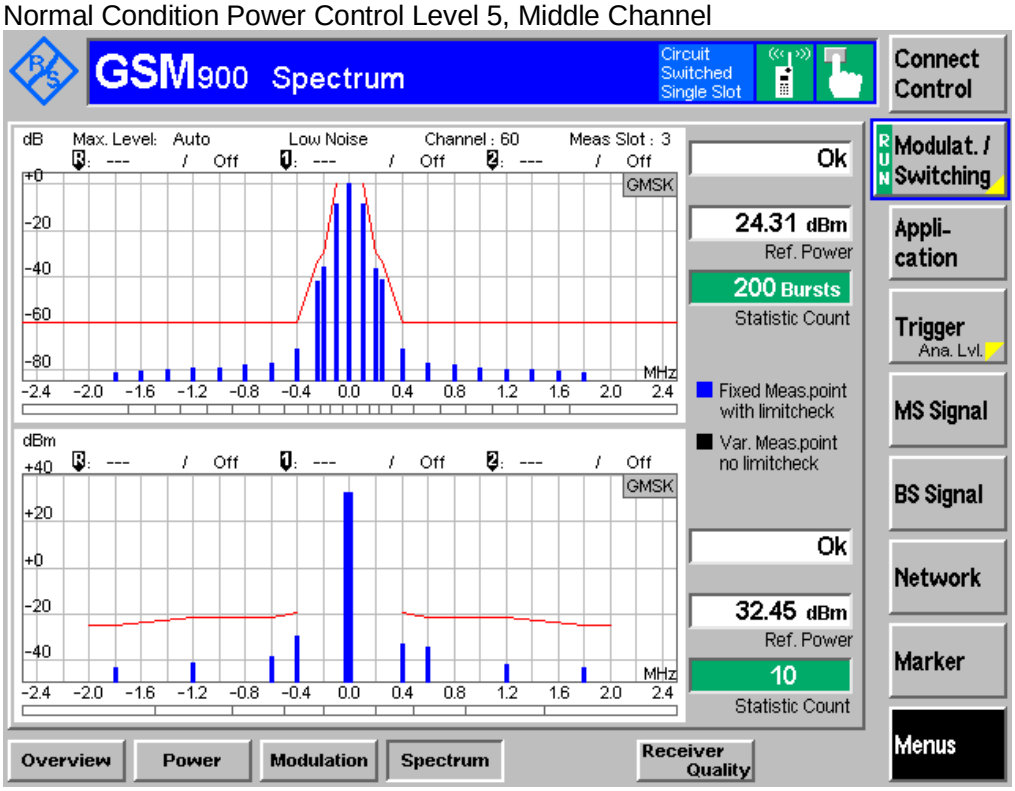
Normal Condition Power Control Level 5, High Channel



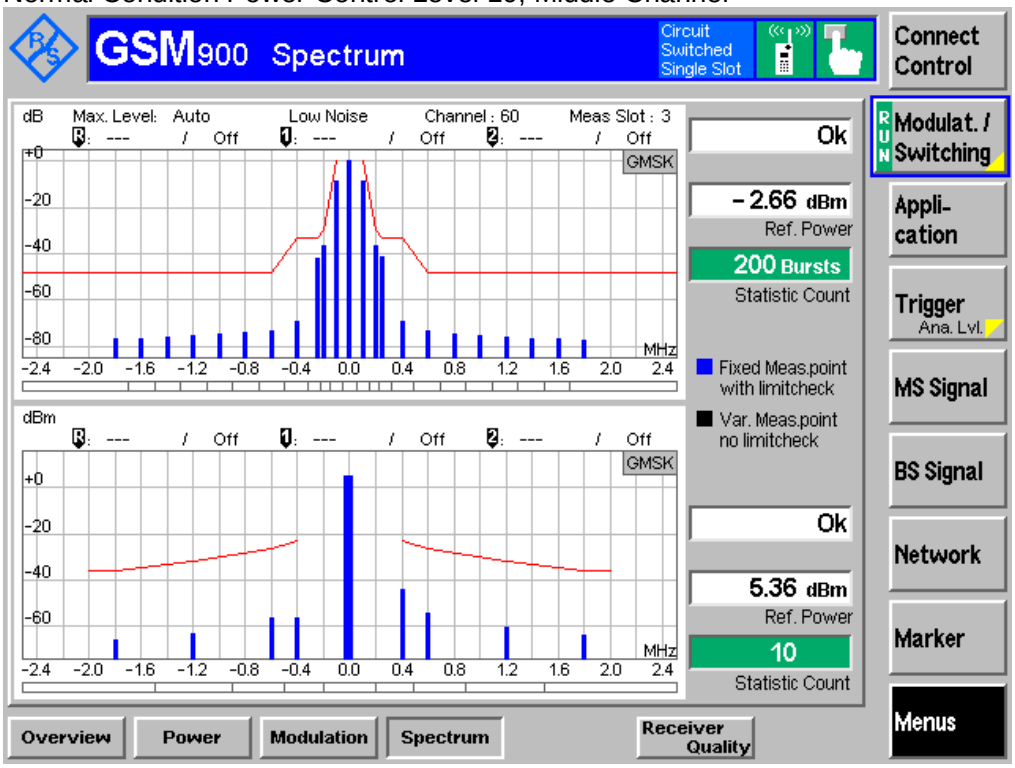
Normal Condition Power Control Level 19, High Channel



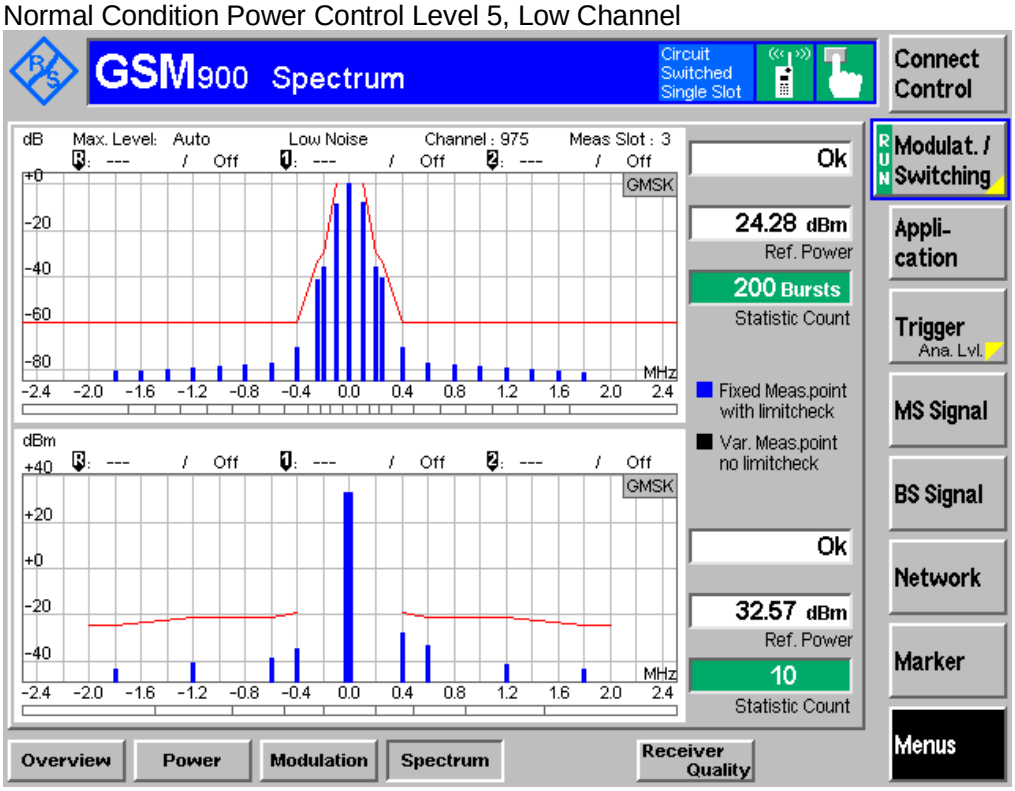
Normal Condition Power Control Level 5, Middle Channel



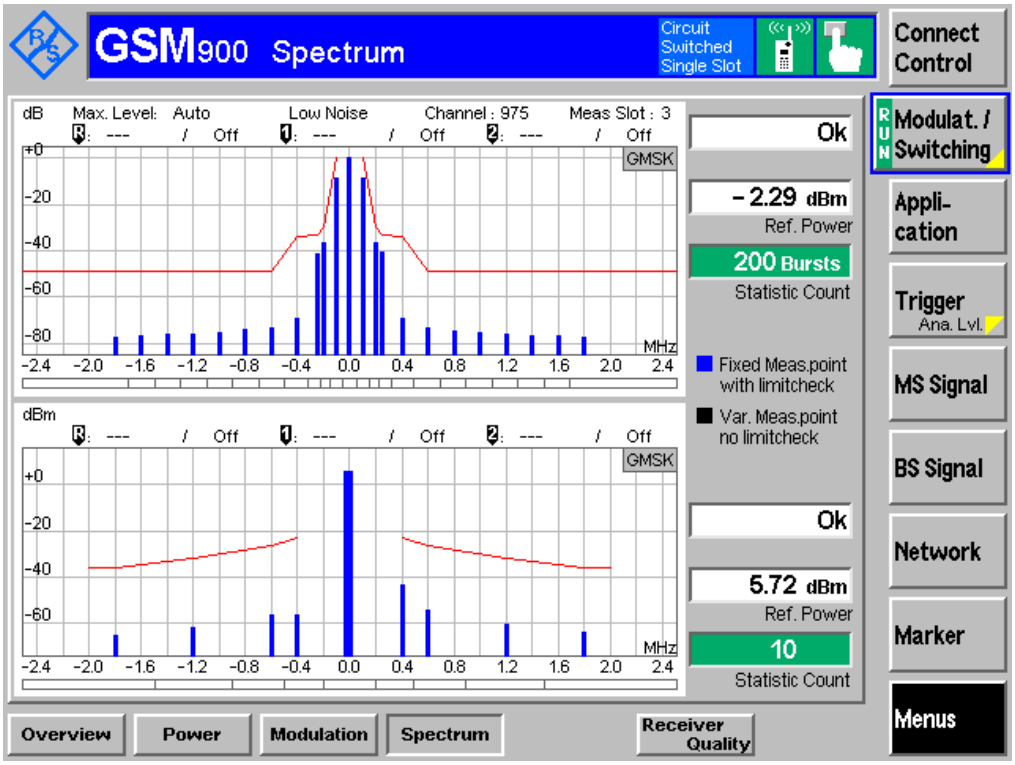
Normal Condition Power Control Level 19, Middle Channel



Normal Condition Power Control Level 5, Low Channel

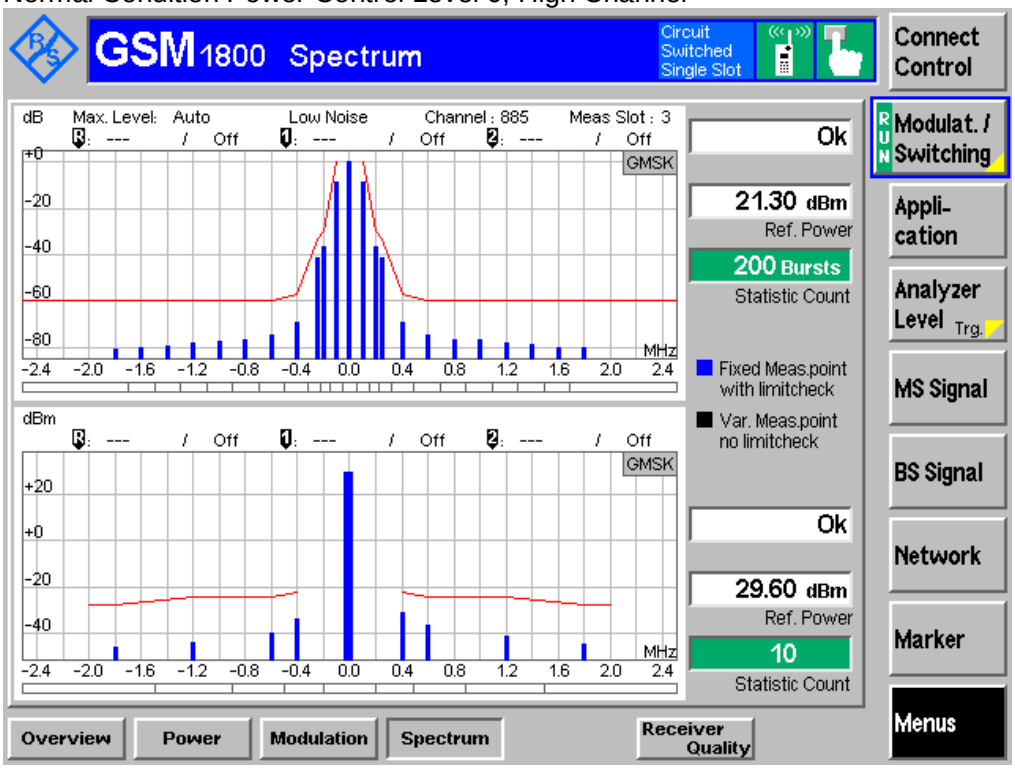


Normal Condition Power Control Level 19, Low Channel

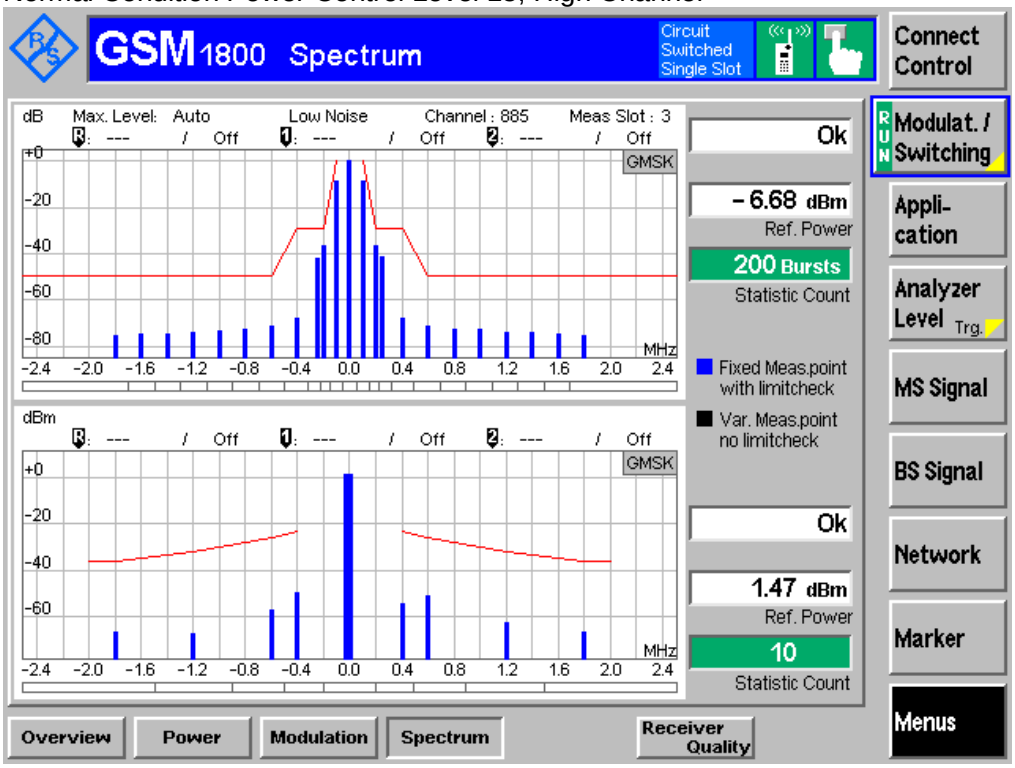

GSM900 Spectrum
Circuit Switched Single Slot
Connect Control
Modulat. / Switching
Appli-cation
Trigger
Ana. Lvl.
MS Signal
BS Signal
Network
Marker
Menus
dB
Max. Level: Auto
Low Noise
Channel : 975
Meas Slot : 3
GMSK
MHz
Ok
-2.29 dBm
Ref. Power
200 Bursts
Statistic Count
Fixed Meas.point with limitcheck
Var. Meas.point no limitcheck
dBm
Ok
5.72 dBm
Ref. Power
10
Statistic Count
Overview
Power
Modulation
Spectrum
Receiver Quality

DCS1800

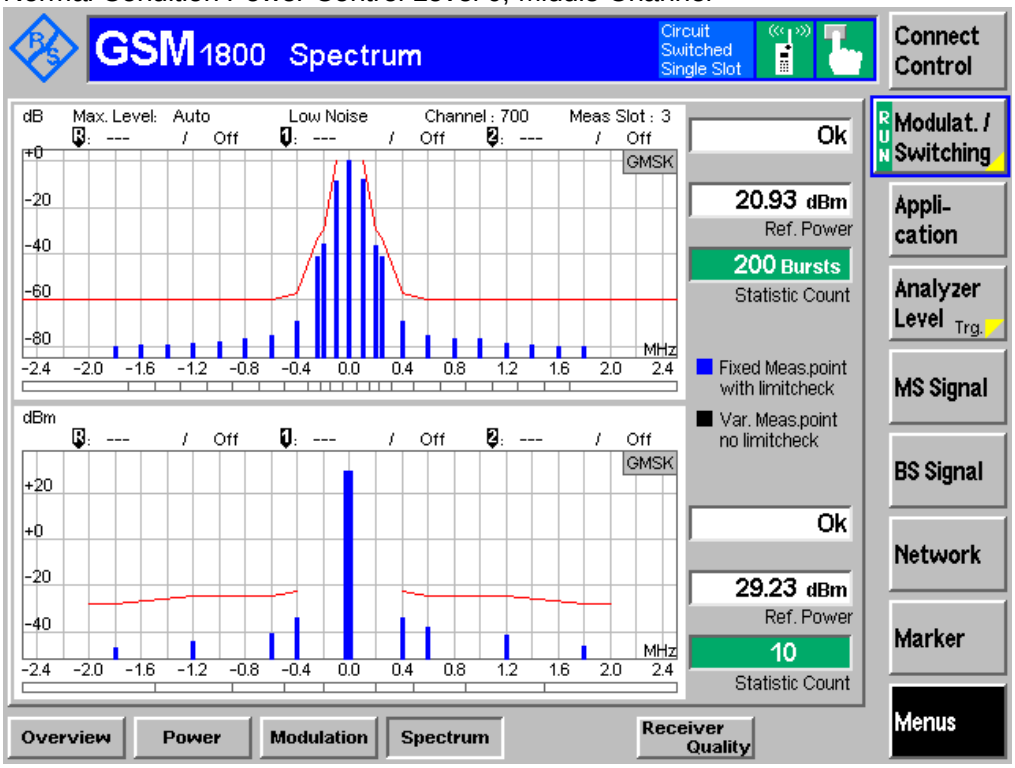
Normal Condition Power Control Level 0, High Channel



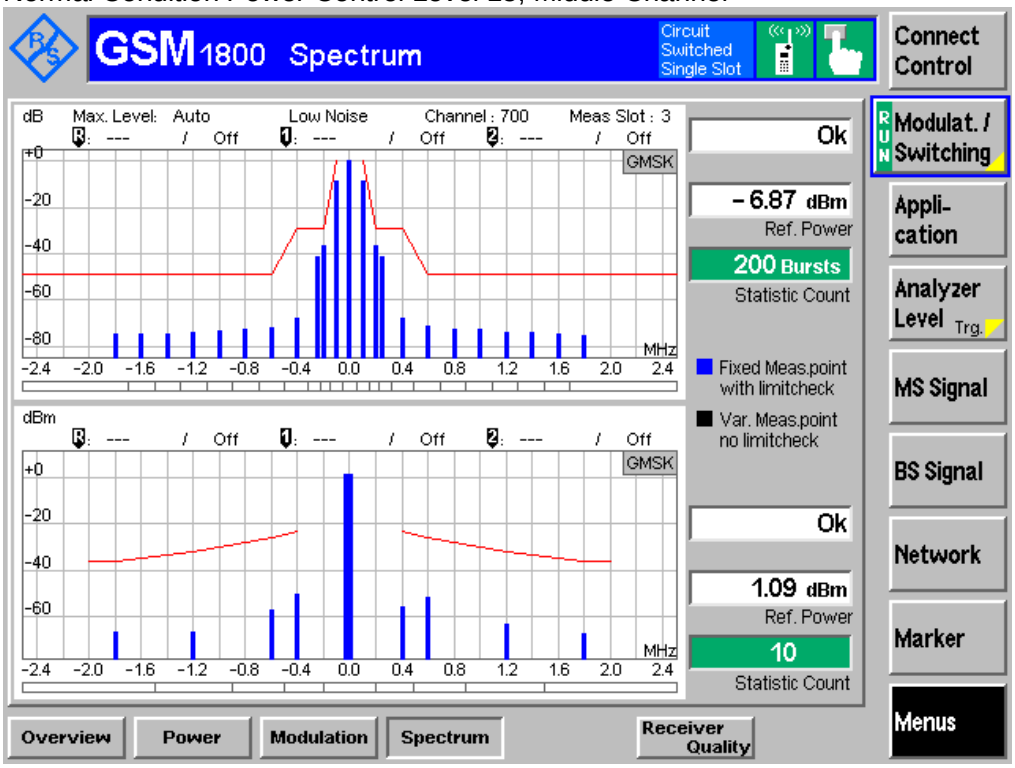
Normal Condition Power Control Level 15, High Channel



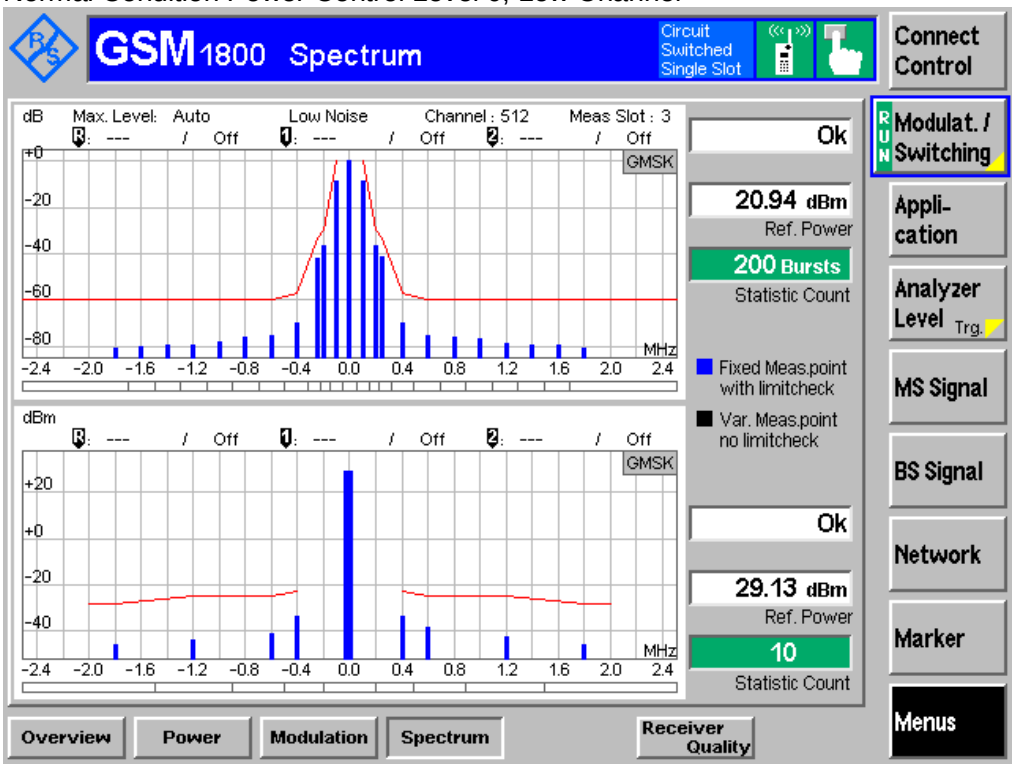
Normal Condition Power Control Level 0, Middle Channel



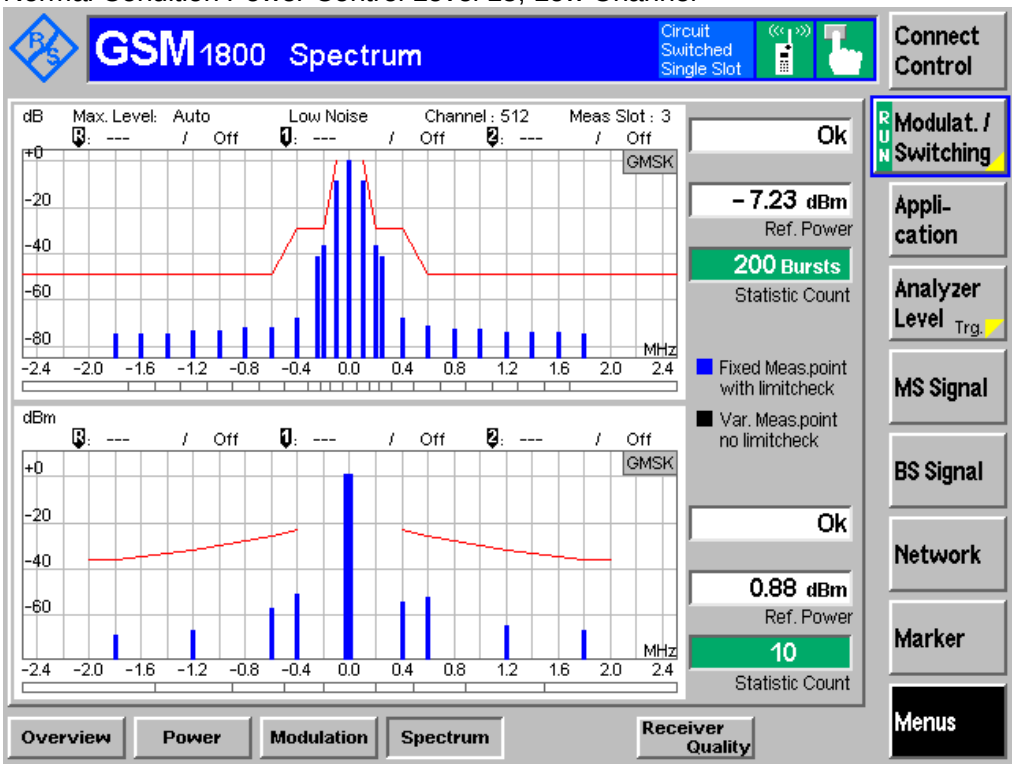
Normal Condition Power Control Level 15, Middle Channel



Normal Condition Power Control Level 0, Low Channel



Normal Condition Power Control Level 15, Low Channel



8 Transmitter Output Power In GPRS Multislot Configuration

8.1 Test Standard and Limit

8.1.1 Test Standard

EN 301 511 V9.0.2:2003clause 4.2.10

8.1.2 Definition

1. The MS maximum output power shall be as defined in 3GPP TS 05.05, subclause 4.1.1, first table, according to its power class, with a tolerance of ±2 dB under normal conditions; 3GPP TS 05.05, subclause 4.1.1, first table.

2. The MS maximum output power shall be as defined in 3GPP TS 05.05, subclause 4.1.1, first table, according to its power class, with a tolerance of ±2,5 dB under extreme conditions; 3GPP TS 05.05, subclause 4.1.1, first table; 3GPP TS 05.05 annex D subclauses D.2.1 and D.2.2.

3. The power control levels shall have the nominal output power levels as defined in 3GPP TS 05.05, subclause 4.1.1, third table (for GSM 400, GSM 700, GSM 850 and GSM 900), fourth table (for DCS 1 800) or fifth table (for PCS 1 900), from the lowest power control level up to the maximum output power corresponding to the class of the MS (for tolerance on maximum output power see conformance requirements 1), with a tolerance of ±3 dB, ±4 dB or ±5 dB under normal conditions; 3GPP TS 05.05, subclause 4.1.1, third, fourth or fifth table.

4. The power control levels shall have the nominal output power levels as defined in 3GPP TS 05.05, Subclause 4.1.1, third table (for GSM 400, GSM 700, GSM 850 and GSM 900), fourth table (for DCS 1 800) or fifth table (for PCS 1 900), from the lowest power control level up to the maximum output power corresponding to the class of the MS (for tolerance on maximum output power see conformance requirements 2), with a tolerance of ±4 dB, ±5 dB or ±6 dB under extreme conditions; 3GPP TS 05.05, subclause 4.1.1, third, fourth or fifth table; 3GPP TS 05.05 annex D subclauses D.2.1 and D.2.2.

5. The output power actually transmitted by the MS at consecutive power control levels shall form a monotonic sequence and the interval between power control levels shall be 2 ± 1,5 dB (1 ± 1dB between power control level 30 and 31 for PCS 1 900); 3GPP TS 05.05, subclause 4.1.1.

6. The transmitted power level relative to time for a normal burst shall be within the power/time template given in 3GPP TS 05.05, annex B figure B1. In multislot configurations where the burstsin two or more consecutive time slots are actually transmitted at the same frequency the template of annex B shall respected during the useful part of each burst and at the beginning and the end of the series of consecutive bursts. The output power during the guard period between every two consecutive active timeslots shall not exceed the level allowed for the useful part of the first timeslot or the level allowed for the useful part of the second timeslot plus 3 dB, whichever is the highest:

> Under normal conditions; 3GPP TS 05.05, subclause 4.5.2.

> Under extreme conditions; 3GPP TS 05.05, subclause 4.5.2, 3GPP TS 05.05 annex D subclauses

D.2.1 and D.2.2.

7. When accessing a cell on the PRACH or RACH and before receiving the first power control parameters during packet transfer on PDCH, all GSM and class 1 and class 2 DCS 1 800 and PCS1 900 MS shall use the power control level defined by the GPRS_MS_TXPWR_MAX_CCH parameter broadcast on the PBCCH or MS_TXPWR_MAX_CCH parameter broadcast on the BCCH of the cell. When MS_TXPWR_MAX_CCH is received on the BCCH, a class 3 DCS 1800

   MS shall add to it the value POWER_OFFSET broadcast on the BCCH. If MS_XPWR_MAX_CCH or the sum defined by: MS_TXPWR_MAX_CCH plus POWER_OFFSET corresponds to a power control level not supported by the MS as defined by its power class, the MS shall act as though the closest supported power control level had been broadcast.

8. The transmitted power level relative to time for a Random Access burst shall be within the power/time template given in 3GPP TS 05.05, annex B figure B.3:
   > Under normal conditions; 3GPP TS 05.05, subclause 4.5.2.
   > Under extreme conditions; 3GPP TS 05.05, subclause 4.5.2, 3GPP TS 05.05 annex D subclauses D.2.1 and D.2.2.

8.2 Test Procedure

1) Measurement of normal burst transmitter output power. The SS takes power measurement samples evenly distributed over the duration of one burst with a Sampling rate of at least 2/T, where T is the bit duration. The samples are identified in time with respect to the modulation on the burst. The SS identifies the centre of the useful 147 transmitted bits, i.e. the transition from bit 13 to bit 14 of the midamble, as the timing reference.
   The transmitter output power is calculated as the average of the samples over the 147 useful bits. This is also used as the 0 dB reference for the power/time template.

2) Measurement of normal burst power/time relationship
   The array of power samples measured in a) are referenced in time to the centre of the useful transmitted bits and in power to the 0 dB reference, both identified in a).

3) Steps a) to b) are repeated on each timeslot within the multislot configuration with the MS commanded to operate on each of the power control levels defined, even those not supported by the MS.

4) The SS commands the MS to the maximum power control level supported by the MS and steps a) to b) are repeated on each timeslot within the multislot configuration for ARFCN in the Low and High ranges.

5) The SS commands the MS to the maximum power control level in the first timeslot allocated within the multislot configuration and to the minimum power control level in the second timeslot allocated. Any further timeslots allocated are to be set to the maximum power control level. Steps to b) and corresponding measurements on each timeslot within the multislot configuration are repeated.

6) Measurement of access burst transmitter output power
   The SS causes the MS to generate an Access Burst on an ARFCN in the Mid ARFCN range, this could be either by a cell re-selection or a new request for radio resource. In the case of a cell re-selection

procedure the Power Level indicated in the PSI3 message is the maximum power control level supported by the MS. In the case of an Access Burst the MS shall use the Power Level indicated in the GPRS_MS_TXPWR_MAX_CCH parameter. If the power class of the MS is DCS1 800 Class 3 and the Power Level is indicated by the MS_TXPWR_MAX_CCH parameter, the MS shall also use the POWER_OFFSET parameter.
The SS takes power measurement samples evenly distributed over the duration of the access burst as described in a). However, in this case the SS identifies the centre of the useful bits of the burst by identifying the transition from the last bit of the synch sequence. The centre of the burst is then five data bits prior to this point and is used as the timing reference.
The transmitter output power is calculated as the average of the samples over the 87 useful bits of the burst. This is also used as the 0 dB reference for the power/time template.

7) Measurement of access burst power/time relationship
The array of power samples measured in f) are referenced in time to the centre of the useful transmitted bits and in power to the 0 dB reference, both identified in f).

8) Depending on the method used in step f) to cause the MS to send an Access Burst, the SS sends either a PACKET CELL CHANGE ORDER along with power control level set to 10 in PSI3 parameter GPRS_MS_TXPWR_MAX_CCH or it changes the (Packet) System Information elements (GPRS_)MS_TXPWR_MAX_CCH and for DCS 1 800 the POWER_OFFSET on the serving cell PBCCH/BCCH in order to limit the MS transmit power on the Access Burst to power control level 10 (+23 dBm for GSM 400, GSM 700, GSM 850 and GSM 900 or +10 dBm for DCS 1 800 and PCS 1 900) and then steps f) to g) are repeated.

9) Steps a) to h) are repeated under extreme test conditions (annex 1, TC2.2) except that the repeats at step d) are only performed for power control level 10 and the minimum power control level of the MS.

8.3 Test Equipment Used

Description	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Date
Universal Radio Communication Tester	Rohde & Schwarz	CMU200	1100.864.02	2016-3-22	2017-3-21
Temperature & Humidity Chamber	WUHUAN	HTP206	200611212	N/A	N/A

8.4 Test Data

Environmental Conditions:

Temperature:	25 ° C
Relative Humidity:	56%
ATM Pressure:	100.2 kPa

GSM900 output power in GPRS

High Channel (914.8MHz) Output Power

High Channel F = 914.8 MHz						
Power Control Level （σ=）	OUTPUT POWER (dBm)					Result
	Normal	L.T. L.V.	H.T. L.V.	L.T. H.V.	H.T. H.V.	
3	31.38	32.42	30.33	32.57	31.75	Pass
4	30.58	31.67	29.39	31.64	30.95	
5	28.24	29.33	27.04	29.25	28.64	
6	26.35	27.49	26.75	27.34	26.82	
7	24.26	25.35	24.73	25.28	24.74	
8	22.45	23.44	22.85	23.43	22.86	
9	20.47	21.46	20.86	21.45	20.86	
10	18.15	19.02	18.55	19.11	18.43	
11	16.45	17.27	16.86	17.25	16.85	
12	14.64	15.46	15.15	15.51	15.13	
13	12.82	13.56	13.34	13.73	13.21	
14	10.84	11.58	11.36	11.74	11.32	
15	8.75	9.51	9.25	9.64	9.19	
16	7.17	7.93	7.56	8.11	7.48	
17	5.10	5.92	5.52	6.19	5.40	

Middle Channel (902.0MHz) Out Power

Middle Channel F = 902.0 MHz						
Power Control Level （σ=）	OUTPUT POWER (dBm)					Result
	Normal	L.T. L.V.	H.T. L.V.	L.T. H.V.	H.T. H.V.	
3	31.57	32.68	31.24	33.25	32.41	Pass
4	30.73	32.15	30.35	32.24	31.51	
5	28.45	29.58	29.45	30.01	29.36	
6	26.62	27.99	27.55	28.25	27.47	
7	24.51	25.85	25.56	26.03	25.42	
8	22.73	24.03	23.65	24.20	23.58	
9	20.74	21.97	21.75	22.08	21.65	
10	18.43	19.65	19.40	19.77	19.31	
11	16.80	17.97	17.75	18.12	17.65	
12	15.00	16.20	15.97	16.32	15.93	
13	13.18	14.32	14.13	14.47	14.07	
14	11.23	12.37	12.20	12.51	12.09	
15	9.18	10.29	10.08	10.41	9.95	
16	7.60	8.73	8.51	8.91	8.33	

17	5.56	6.77	6.44	6.93	6.21	

Low Channel (880.2 MHz) Output Power

Low Channel F = 880.2 MHz						
Power Control Level （σ=）	OUTPUT POWER (dBm)					Result
	Normal	L.T. L.V.	H.T. L.V.	L.T. H.V.	H.T. H.V.	
3	31.69	33.04	30.83	33.04	32.43	Pass
4	30.90	32.10	29.83	32.13	31.56	
5	28.54	29.67	27.38	29.67	29.18	
6	26.69	27.72	25.56	27.78	27.32	
7	24.55	25.55	23.54	25.63	25.20	
8	22.67	23.68	21.68	23.74	23.33	
9	21.15	22.12	20.14	22.19	21.78	
10	18.87	19.77	19.60	19.86	19.54	
11	17.25	18.12	17.96	18.23	17.94	
12	15.51	16.33	16.20	16.40	16.14	
13	13.7	14.5	14.36	14.57	14.31	
14	11.75	12.56	12.41	12.62	12.33	
15	9.7	10.5	10.32	10.57	10.23	
16	8.13	8.94	8.72	9.00	8.59	
17	6.17	6.99	6.65	7.08	6.48	

DCS1800 output power in GPRS

High Channel (1784.8MHz) Output Power

High Channel F = 1784.8 MHz						
Power Control Level （σ=）	OUTPUT POWER (dBm)					Result
	Normal	L.T. L.V.	H.T. L.V.	L.T. H.V.	H.T. H.V.	
3	28.70	30.21	29.60	30.15	29.63	Pass
4	26.42	27.86	27.36	27.76	27.38	
5	24.88	26.27	25.81	26.20	25.84	
6	22.10	23.47	23.10	23.40	23.11	
7	20.23	21.52	21.15	21.49	21.18	
8	18.30	19.60	19.26	19.58	19.28	
9	16.17	17.44	17.16	17.46	17.20	
10	13.70	14.88	14.68	14.89	14.72	
11	11.88	13.04	12.92	13.09	12.95	
12	10.49	11.63	11.56	11.74	11.60	
13	8.70	9.78	9.78	9.88	9.82	
14	6.88	7.93	7.95	8.04	7.99	
15	4.64	5.71	5.70	5.84	5.75	
16	2.25	3.41	3.25	3.50	3.32	
17	0.75	2.04	1.68	2.09	1.77	
18	0.34	0.97	0.46	0.99	0.57	

Middle Channel (1747.8MHz) Output Power

Middle Channel F = 1747.8 MHz						
Power Control Level （σ=）	OUTPUT POWER (dBm)					Result
	Normal	L.T. L.V.	H.T. L.V.	L.T. H.V.	H.T. H.V.	
3	28.92	29.65	29.08	29.49	29.12	Pass
4	26.63	27.37	26.89	27.23	26.95	
5	25.10	25.76	25.30	25.62	25.35	
6	22.33	22.96	22.60	22.82	22.63	
7	20.34	21.03	20.64	20.86	20.67	
8	22.33	19.04	18.73	18.92	18.76	
9	16.27	16.87	16.61	16.71	16.66	
10	14.09	14.60	14.42	14.55	14.64	
11	12.30	12.70	12.64	12.72	12.71	
12	10.97	11.30	11.28	11.32	11.33	
13	9.10	9.43	9.45	9.47	9.52	
14	7.32	7.55	7.62	7.62	7.71	
15	5.36	5.45	5.51	5.53	5.60	
16	3.00	3.14	3.06	3.19	3.16	
17	1.53	1.72	1.48	1.76	1.62	
18	1.07	0.68	0.26	0.66	0.34	

Low Channel (1710.2MHz) Output Power

Low Channel F = 1710.2 MHz						
Power Control Level （σ=）	OUTPUT POWER (dBm)					Result
	Normal	L.T. L.V.	H.T. L.V.	L.T. H.V.	H.T. H.V.	
3	28.93	30.05	29.45	29.95	29.49	Pass
4	27.68	27.75	27.27	27.69	27.30	
5	26.11	26.15	25.72	26.07	25.74	
6	23.33	23.37	22.98	23.26	23.00	
7	21.44	21.44	21.04	21.35	21.08	
8	19.46	19.43	19.08	19.35	19.12	
9	17.35	17.28	17.02	17.22	17.05	
10	15.26	15.12	14.94	15.10	14.96	
11	12.05	13.22	13.11	13.25	13.14	
12	13.43	11.82	11.75	11.86	11.78	
13	10.15	9.89	9.86	9.93	9.92	
14	8.20	7.93	7.93	8.00	8.00	
15	6.21	5.93	5.92	6.04	6.00	
16	3.91	3.49	3.36	3.58	3.46	
17	2.20	1.95	1.71	2.04	1.81	
18	0.66	0.78	0.37	0.87	0.50	

9 Output RF Spectrum In GPRS Multislot Configuration

9.1 Test Standard and Limit

9.1.1 Test Standard

EN 301 511 V9.0.2:2003 clause 4.2.11

9.1.2 Limits

1. The level of the output RF spectrum due to modulation shall be no more than that given in 3GPP TS 05.05, subclause 4.2.1, table a) for GSM 400, GSM 700, GSM 850 and GSM 900, table b) for DCS 1800 or table c) for PCS 1900, with the following lowest measurement limits:
   1.1 36 dBm below 600 kHz offset from the carrier;
   1.2 -51 dBm for GSM 400, GSM 700, GSM 850 and GSM 900 or -56 dBm for DCS 1 800 and PCS 1 900 from 600 kHz out to less than 1 800 kHz offset from the carrier;
   1.3 -46 dBm for GSM 400, GSM 700, GSM 850 and GSM 900 or -51 dBm for DCS 1800 and PCS 1 900 at and beyond 1 800 kHz offset from the carrier; but with the following exceptions at up to -36 dBm:
   1.4 up to three bands of 200 kHz width centred on a frequency which is an integer multiple of 200 kHz in the combined range 600 kHz to 6 000 kHz above and below the carrier;
   1.5 up to 12 bands of 200 kHz width centred on a frequency which is an integer multiple of 200 kHz at more than 6 000 kHz offset from the carrier.
      a. Under normal conditions; 3GPP TS 05.05, subclause 4.2.1.
      b. Under extreme conditions; 3GPP TS 05.05, subclause 4.2.1; 3GPP TS 05.05, annex D subclauses D.2.1 and D.2.2.

2. The level of the output RF spectrum due to switching transients shall be no more than given in 3GPP TS 05.05, subclause 4.2.2, table "a) Mobile Station".
   2.1 Under normal conditions; 3GPP TS 05.05, subclause 4.2.2.
   2.2 Under extreme conditions; 3GPP TS 05.05, subclause 4.2.2; 3GPP TS 05.05 annex D subclause D.2.1 and D.2.2.
3. When allocated a channel, the power emitted by a GSM 400, GSM 900 and DCS 1 800 MS, in the band 935 MHz to 960 MHz shall be no more than -79 dBm, in the band 925 MHz to 935 MHz shall be no more than -67 dBm and in the band 1 805 MHz to 1 880 MHz shall be no more than -71 dBm except in five measurements in each of the bands 925 MHz to 960 MHz and 1 805 MHz to 1 880 MHz where exceptions at up to -36 dBm are permitted. For GSM 400 MS, in addition, the power emitted by MS, in the bands of 460,4 MHz to 467,6 MHz and 488,8 MHz to 496 MHz shall be no more than -67 dBm except in three measurements in each of the bands 460,4 MHz to 467,6 MHz and 488,8 MHz to 496 MHz where exceptions at up to -36 dBm are permitted. For GSM 700 and GSM 850, the power emitted by MS, in the band of 747 MHz to 757 MHz shall be no more than -79 dBm, in the band of 757 MHz to 762 MHz shall be no more than –73 dBm, in the band 869 MHz to 894 MHz shall be no more than -79 dBm, in the band 1 930 MHz to 1 990 MHz shall be no more than – 71 dBm except in five measurements in each of the bands 747 MHz to 762 MHz, 869 MHz to 894 MHz and 1 930 MHz to 1 990 MHz where exceptions at up to -36 dBm are permitted. For PCS 1 900 MS, the power emitted by

MS, in the band 869 MHz to 894 MHz shall be no more than -79 dBm, in the band 1 930 MHz to 1 990 MHz shall be no more than -71 dBm except in five measurements in each of the bands 869 MHz to 894 MHz and 1 930 MHz to 1 990 MHz where exceptions at up to -36 dBm are permitted. Under normal conditions; 3GPP TS 05.05, subclause 4.3.3.

9.2 Test Procedure

NOTE: When averaging is in use during frequency hopping mode, the averaging only includes bursts transmitted when the hopping carrier corresponds to the nominal carrier of the measurement.

a) In steps b) to h) the FT is equal to the hop pattern ARFCN in the Mid ARFCN range.

b) The other settings of the spectrum analyzer are set as follows:

- Zero frequency scan;
- Resolution bandwidth: 30 kHz;
- Video bandwidth: 30 kHz;
- Video averaging: may be used, depending on the implementation of the test.

The video signal of the spectrum analyzer is "gated" such that the spectrum generated by at least 40 of the bits 87 to 132 of the burst in one of the active time slots is the only spectrum measured. This gating may be analogue or numerical, dependent upon the design of the spectrum analyzer. Only measurements during transmitted bursts on the nominal carrier of the measurement are included. The spectrum analyzer averages over the gated period and over 200 or 50 such bursts, using numerical and/or video averaging.

The MS is commanded to its maximum power control level in every transmitted time slot.

c) By tuning the spectrum analyzer centre frequency to the measurement frequencies the power level is measured over 50 bursts at all multiples of 30 kHz offset from FT to < 1 800 kHz.

d) The resolution and video bandwidth on the spectrum analyzer are adjusted to 100 kHz and the measurements are made at the following frequencies:

- on every ARFCN from 1 800 kHz offset from the carrier to the edge of the relevant transmit band for each measurement over 50 bursts.
- at 200 kHz intervals over the 2 MHz either side of the relevant transmit band for each measurement over 50 bursts.

For GSM 400, GSM 900 and DCS 1800:

- at 200 kHz intervals over the band 925 MHz to 960 MHz for each measurement over 50 bursts.
- at 200 kHz intervals over the band 1 805 MHz to 1 880 MHz for each measurement over 50 bursts.

e) The MS is commanded to its minimum power control level. The spectrum analyzer is set again as in b).

f) By tuning the spectrum analyzer centre frequency to the measurement frequencies the power level is measured over 200 bursts at the following frequencies:

FT;
FT + 100 kHz FT - 100 kHz;
FT + 200 kHz FT - 200 kHz;
FT + 250 kHz FT - 250 kHz;
FT + 200 kHz * N FT - 200 kHz * N;

where N = 2, 3, 4, 5, 6, 7, and 8;
and FT = RF channel nominal centre frequency.

g) Steps a) to f) is repeated except that in step a) the spectrum analyzer is gated so that the burst of the next active time slot is measured.

h) The spectrum analyzer settings are adjusted to:
- Zero frequency scan;
- Resolution bandwidth: 30 kHz;
- Video bandwidth: 100 kHz;
- Peak hold.

The spectrum analyzer gating of the signal is switched off.
The MS is commanded to its maximum power control level in every transmitted time slot.

i) By tuning the spectrum analyzer centre frequency to the measurement frequencies the power level is measured at the following frequencies:

FT + 400 kHz FT - 400 kHz;
FT + 600 kHz FT - 600 kHz;
FT + 1,2 MHz FT - 1,2 MHz;
FT + 1,8 MHz FT - 1,8 MHz;

where FT = RF channel nominal centre frequency.
The duration of each measurement (at each frequency) will be such as to cover at least 10 burst transmissions at FT.

j) Step i) is repeated for power control levels 7 and 11.

k) Steps b), f), h) and i) are repeated with FT equal to the hop pattern ARFCN in the Low ARFCN range except that in step h) the MS is commanded to power control level 11 rather than maximum power.

l) Steps b), f), h) and i) are repeated with FT equal to the hop pattern ARFCN in the High ARFCN range except that in step h) the MS is commanded to power control level 11 rather than maximum power.

m) Steps a) b) f) h), and i) are repeated under extreme test conditions (annex 1, TC2.2). except that at step h) the MS is commanded to power control level 11.

9.3 Test Equipment Used

Description	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Date
Universal Radio Communication Tester	Rohde & Schwarz	CMU200	1100.864.02	2016-3-22	2017-3-21
Temperature& Humidity Chamber	Wuhuan	HTP206	200611212	2016-3-22	2017-3-21

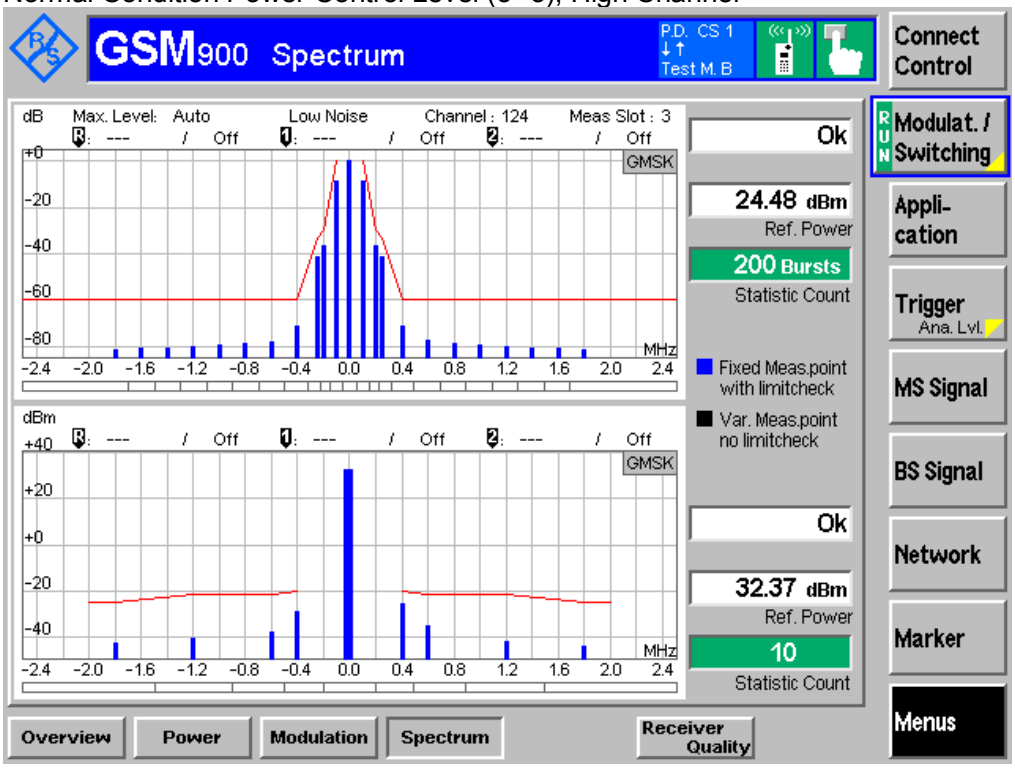
9.4 Test Data

Environmental Conditions:

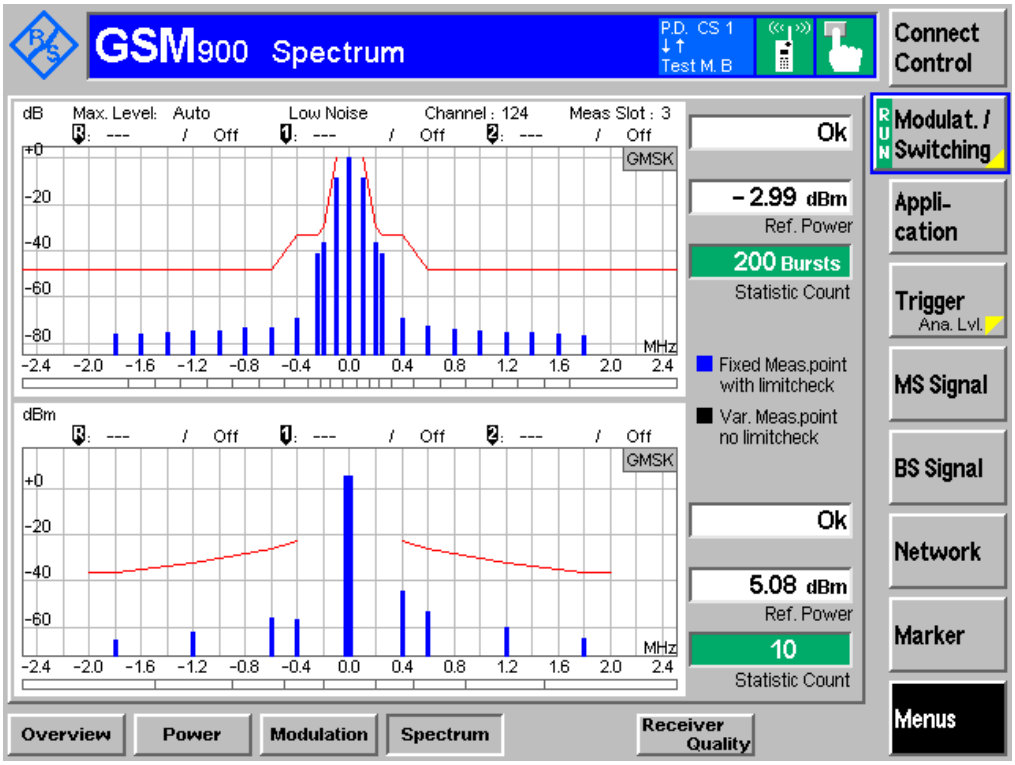
Temperature:	25 ° C
Relative Humidity:	56%
ATM Pressure:	100.2 kPa

GSM900

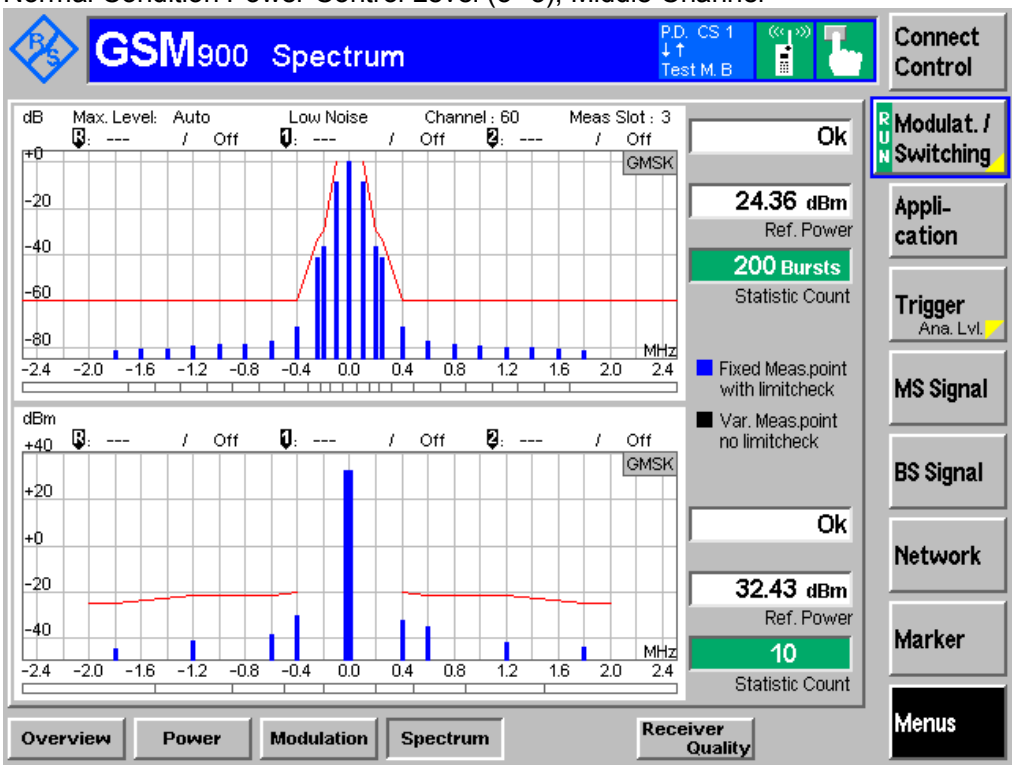
Normal Condition Power Control Level (σ=3), High Channel



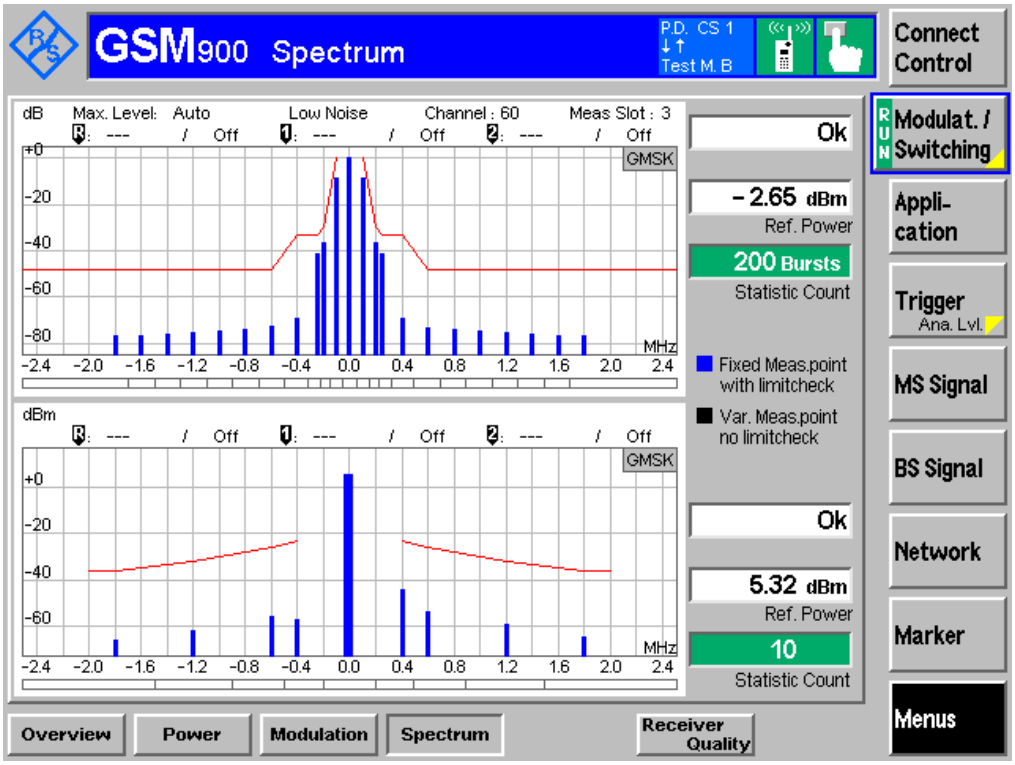
Normal Condition Power Control Level (σ=17), High Channel



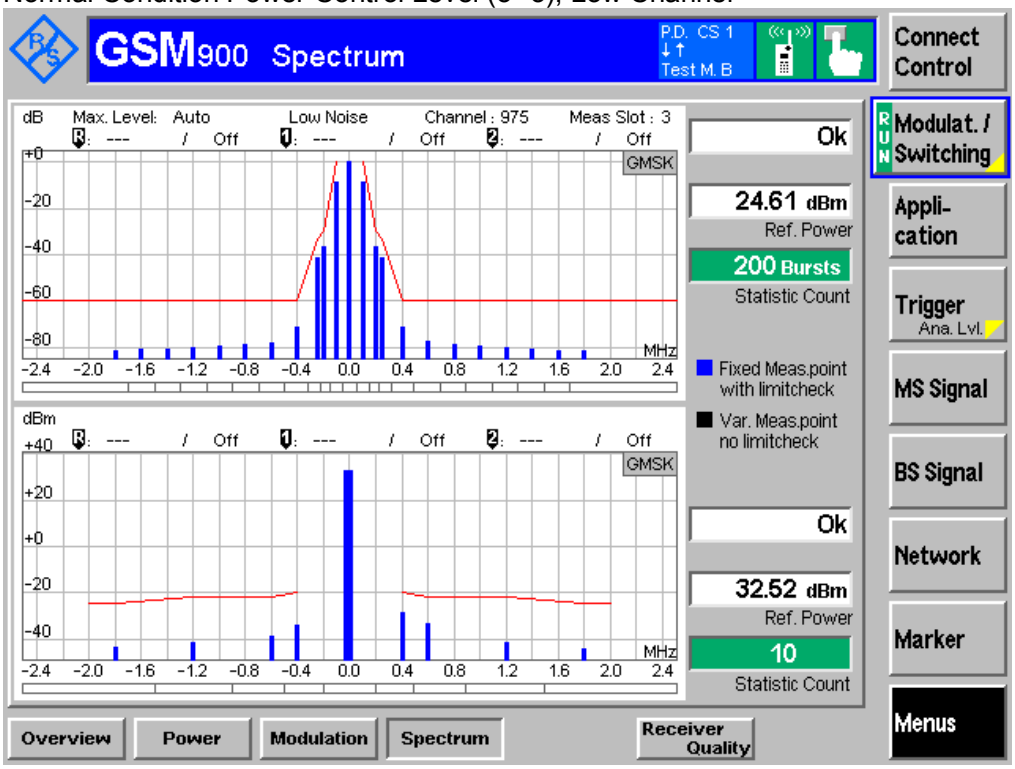
Normal Condition Power Control Level (σ=3), Middle Channel



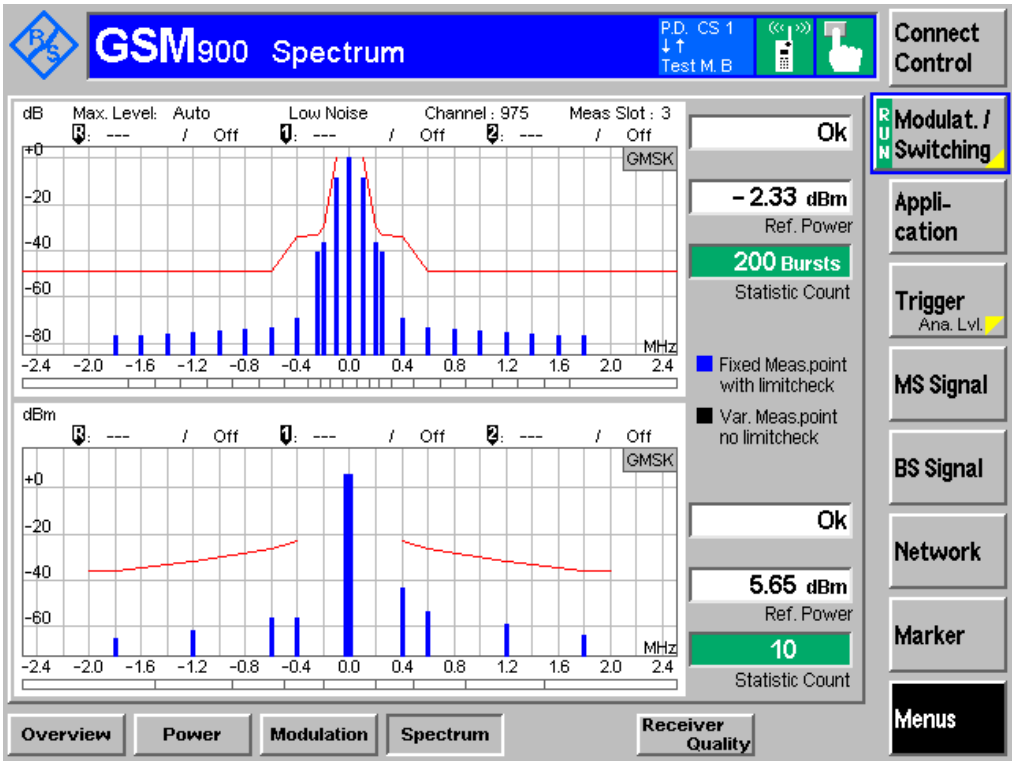
Normal Condition Power Control Level (σ=17), Middle Channel



Normal Condition Power Control Level (σ=3), Low Channel

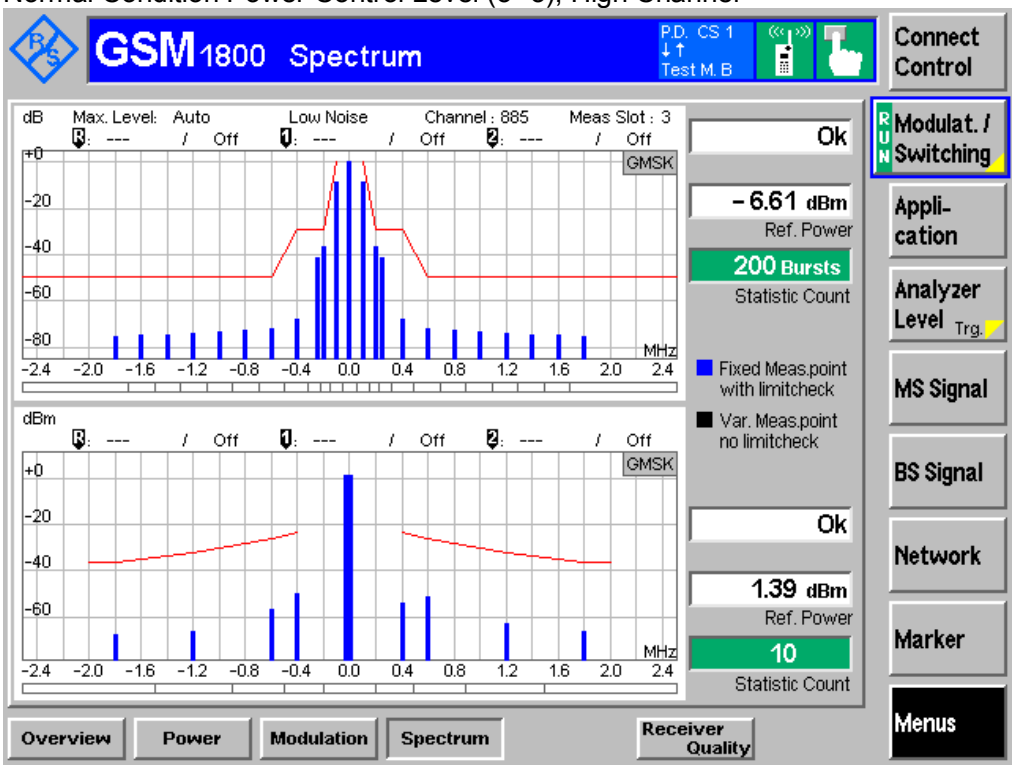


Normal Condition Power Control Level (σ=17), Low Channel

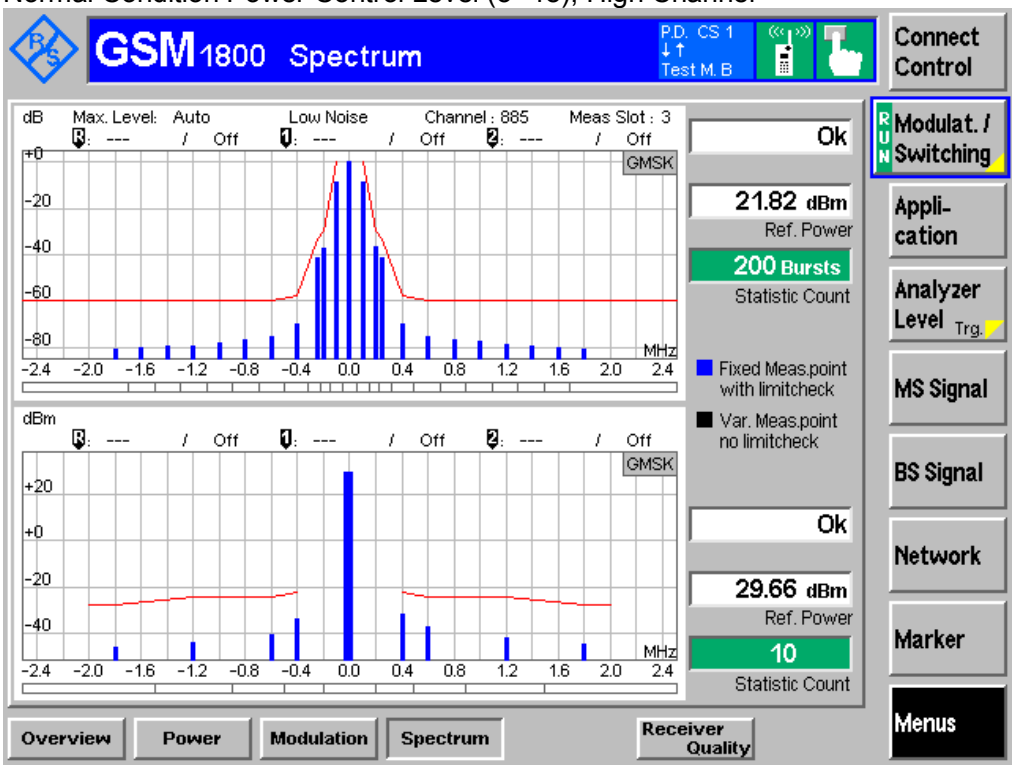

GSM900 Spectrum
P.D. CS 1
Test M. B
Connect Control
dB
Max. Level: Auto
Low Noise
Channel : 975
Meas Slot : 3
GMSK
MHz
Ok
-2.33 dBm
Ref. Power
200 Bursts
Statistic Count
Fixed Meas.point with limitcheck
Var. Meas.point no limitcheck
dBm
Ok
5.65 dBm
Ref. Power
10
Statistic Count
RUN Modulat. / Switching
Appli-cation
Trigger
Ana. Lvl.
MS Signal
BS Signal
Network
Marker
Menus
Overview
Power
Modulation
Spectrum
Receiver Quality

DCS1800

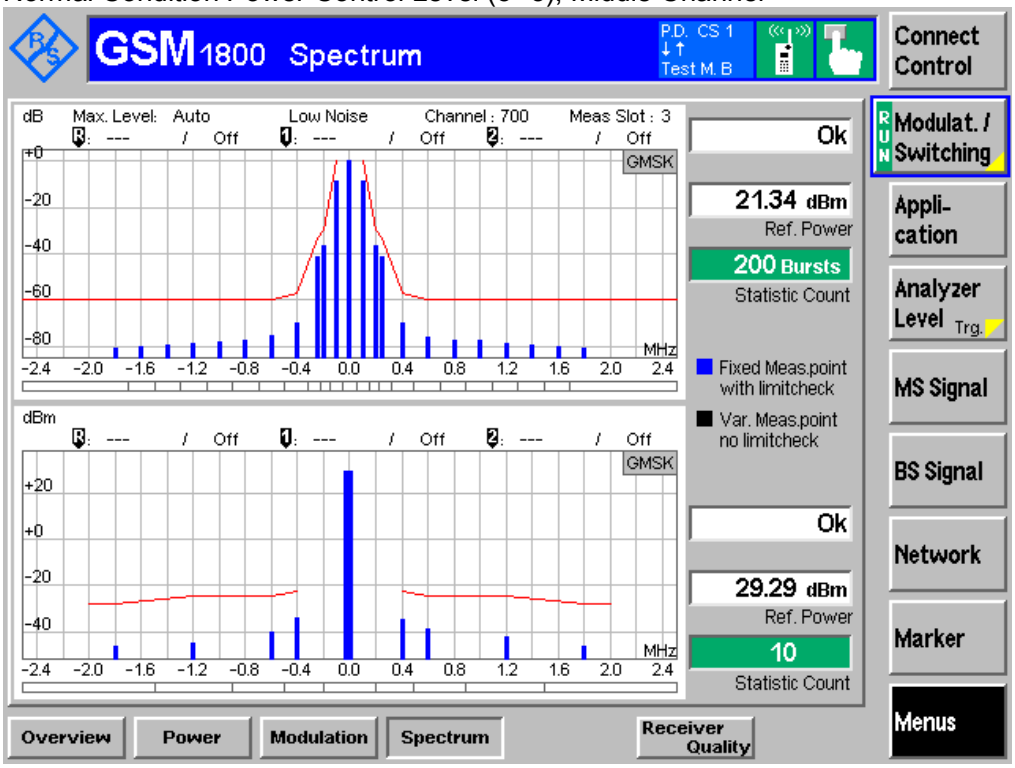
Normal Condition Power Control Level (σ=3), High Channel



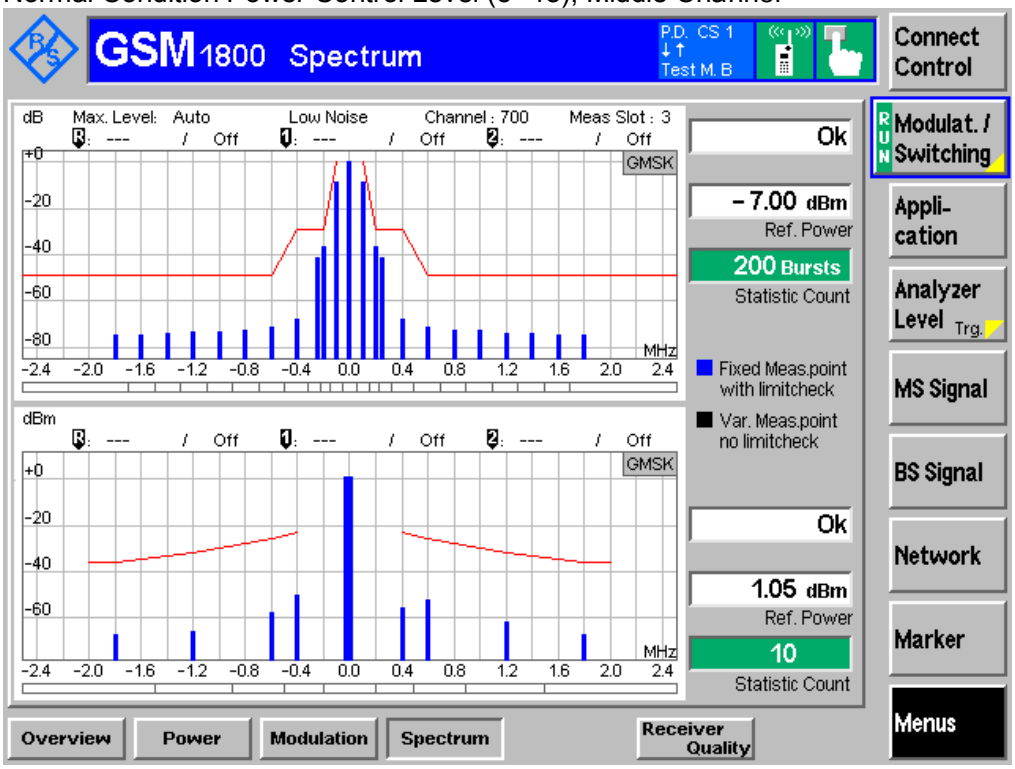
Normal Condition Power Control Level (σ=18), High Channel



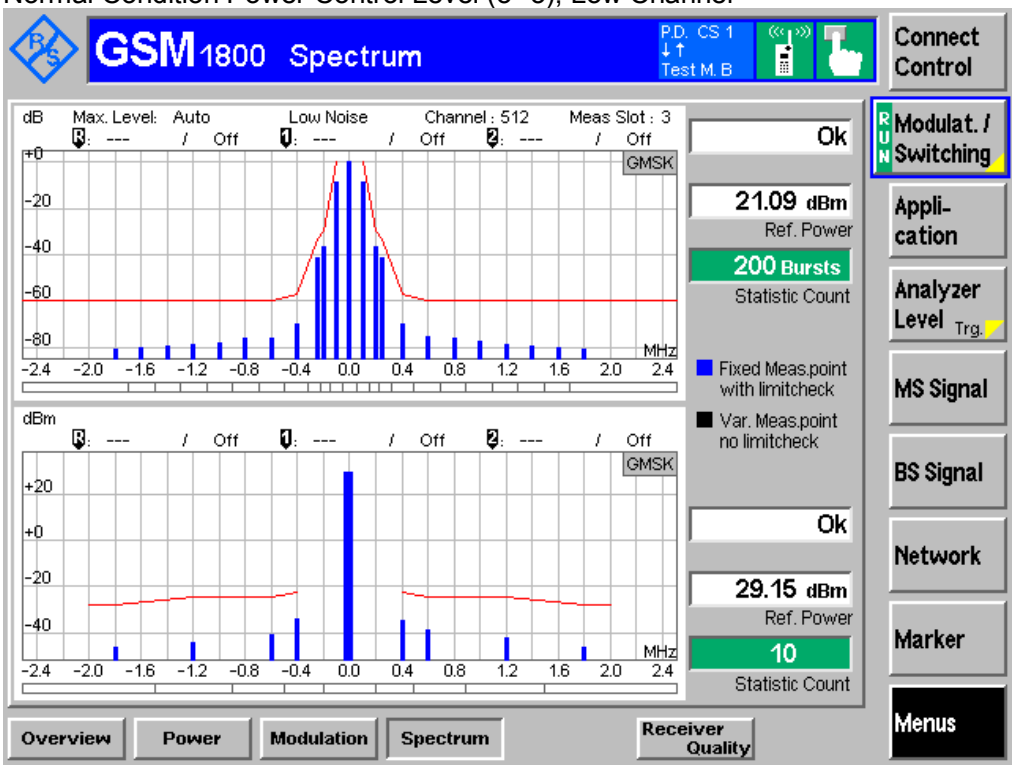
Normal Condition Power Control Level (σ=3), Middle Channel



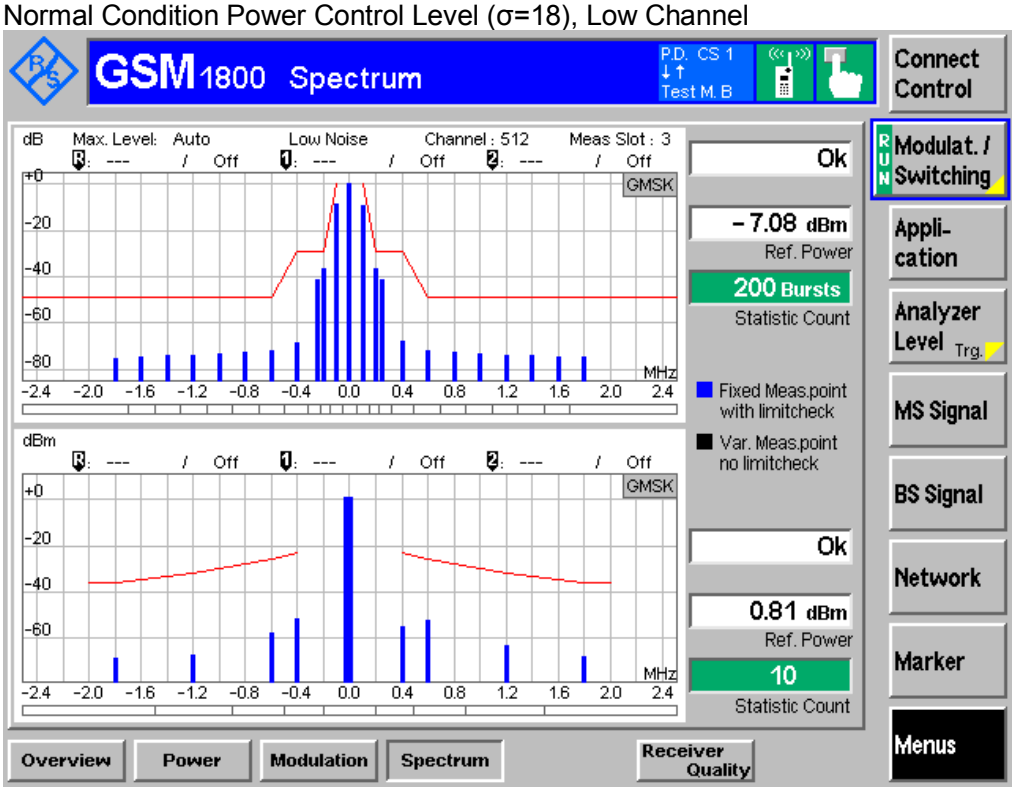
Normal Condition Power Control Level (σ=18), Middle Channel



Normal Condition Power Control Level (σ=3), Low Channel



Normal Condition Power Control Level (σ=18), Low Channel



10 Conducted Spurious Emissions-MS Allocated A Channel

10.1 Test Standard and Limit

10.1.1 Test Standard

EN 301 511 V9.0.2:2003 clause 4.2.12

10.1.2 Limits

Requirements: According to EN 301 511, section 4.2.12, the conducted spurious power emitted by the MS, when allocated a channel, shall be no more than the levels in following table:

Frequency Range	Power Level (dBm)		
	GSM 400 GSM 700 GSM 850 GSM 900	DCS 1800	PCS 1900
9 kHz to 1 GHz	-36	-36	-36
1GHz to 12.75 GHz	-30		-30
1GHz to 1710 MHz		-30	
1710 MHz to 1785 MHz		-36	
1785 MHz to 12.75 GHz		-30	

10.2 Test Procedure

a) Measurements are made in the frequency range 100 kHz to 12,75 GHz. Spurious emissions are measured at the connector of the transceiver, as the power level of any discrete signal, higher than the requirement in table 1 minus 6 dB, delivered into a 50 Ω load.

The measurement bandwidth based on a 5 pole synchronously tuned filter is according to table 2. The power indication is the peak power detected by the measuring system.

The measurement on any frequency shall be performed for at least one TDMA frame period with the exception of the idle frame.

NOTE: This ensures that both the active times (MS transmitting) and the quiet times are measured.

b) The test is repeated under extreme voltage test conditions ([annex 1, TC2.2 and TC3]).

Frequency range	Frequency offset	Filter bandwidth	Approx video bandwidth
100 kHz to 50 MHz	-	10 kHz	30 kHz
50 MHz to 500 MHz excl. relevant TX band GSM 450:450.4 MHz to 457.6 MHz GSM 480: 478.8 MHz to 486 MHz, and the RX bands: For GSM 400 MS: 460.4 MHz to 467.6 MHz; 488.8 MHz to 496 MHz.	-	100 kHz	300 kHz
500 MHz to 12.75 GHz excl. relevant TX band: GSM 750: 777 MHz to 792 MHz GSM 850: 824 MHz to 849 MHz; P-GSM: 890 MHz to 915 MHz; DCS: 1710 MHz to 1785 MHz, PCS 1900: 1850 MHz to 1910 MHz; and the RX bands: For GSM 400 MS, GSM 900 MS and DCS 1800 MS: 925 MHz to 960 MHz; 1805 MHz to 1880 MHz. For GSM 700 MS, GSM 850 MS and PCS 1900 MS: 747 MHz to 762 MHz; 869 MHz to 894 MHz; 1930 MHz to 1990 MHz	0 to 10 MHz >=10 MHz >=20 MHz >=30 MHz (offset from edge of relevant TX band)	100 kHz 300 kHz 1 MHz 3 MHz	300 kHz 1 MHz 3 MHz 3 MHz
relevant TX band: GSM 450: 450.4 MHz to 457.6 MHz GSM 480: 478.8 MHz to 486 MHz GSM 750: 777 MHz to 792 MHz GSM 850: 824 MHz to 849 MHz P-GSM: 890 MHz to 915 MHz E-GSM: 880 MHz to 915 MHz DCS: 1710 MHz to 1785 MHz PCS 1900: 1850 MHz to 1910 MHz	1.8 to 6.0 MHz >6.0 MHz (offset from carrier)	30 kHz 100 kHz	100 kHz 300 kHz
NOTE 1: The excluded RX bands are tested in subclause 13.4(TS 151 01001 V4.9.0) NOTE 2: The filter and video bandwidths, and frequency offsets are only correct for measurements on an MS transmitting on a channel in the Mid ARFCN range.			

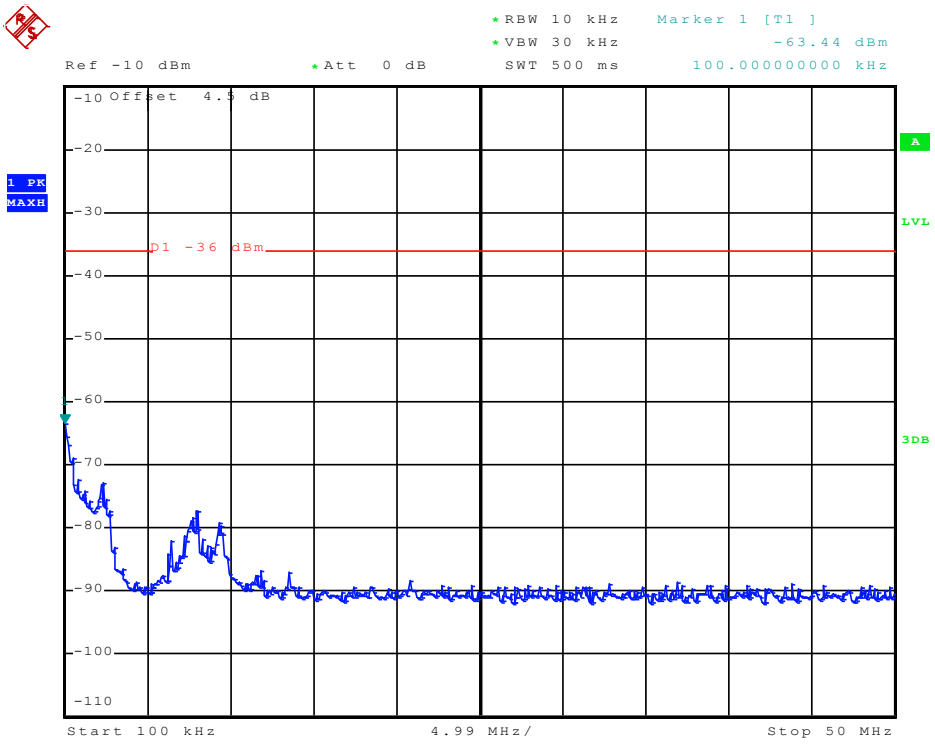
NOTE 3: Due to practical implementation, the video bandwidth is restricted to a maximum of 3 MHz.

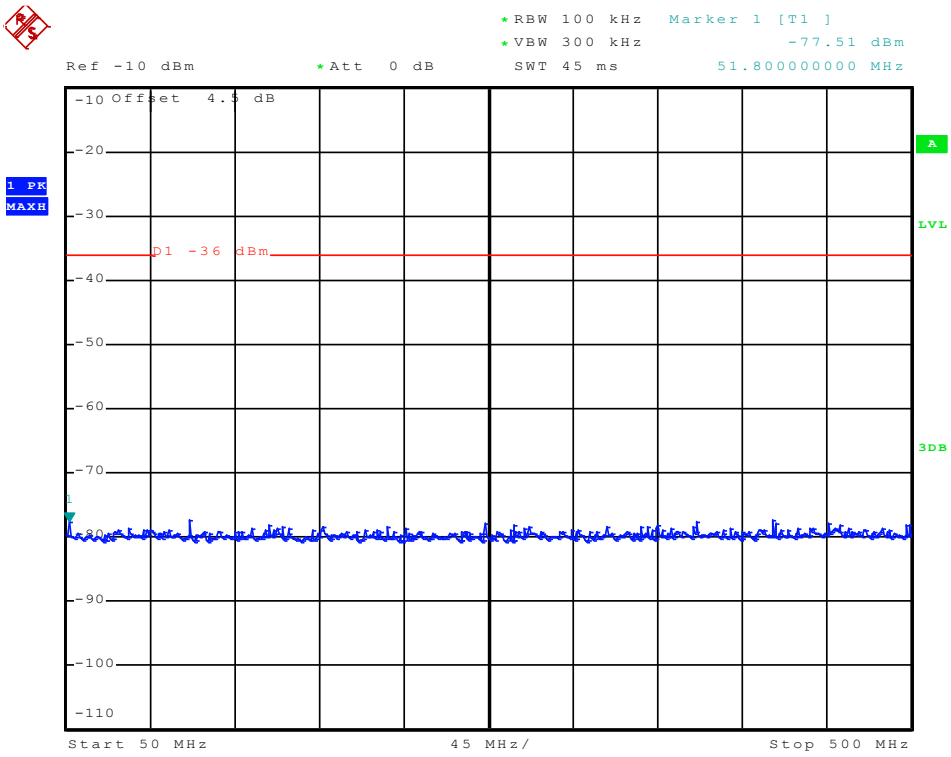
10.3 Test Equipment Used

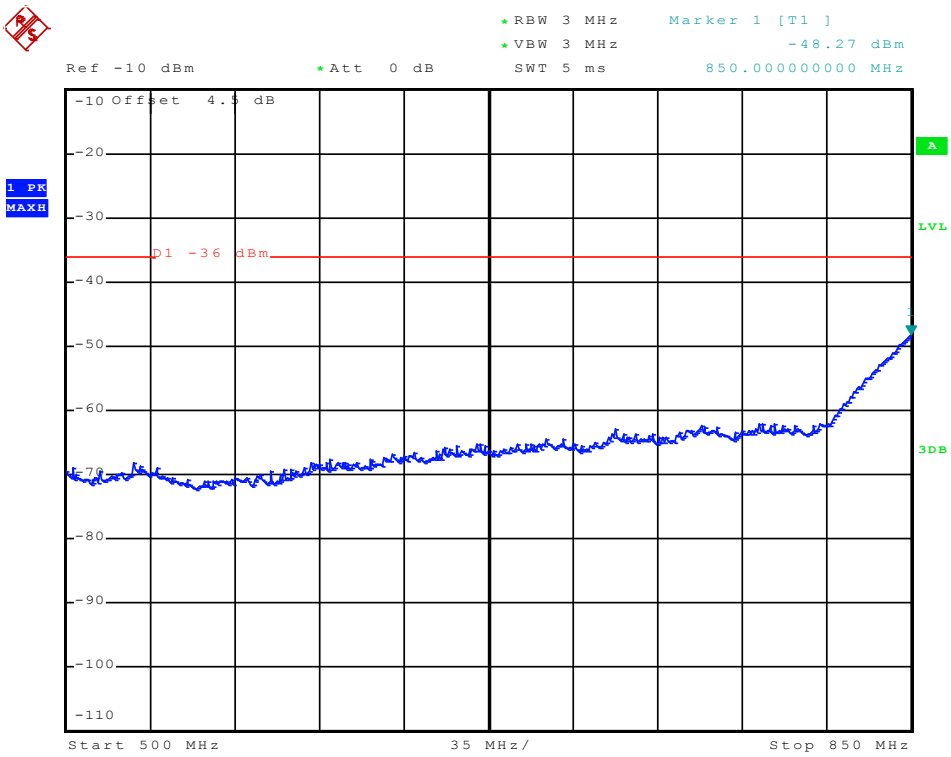
Description	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Date
Universal Radio Communication Tester	Rohde & Schwarz	CMU200	1100.864.02	2016-3-22	2017-3-21
Spectrum Analyzer	Rohde & Schwarz	FSL	MY4509214	2016-3-22	2017-3-21

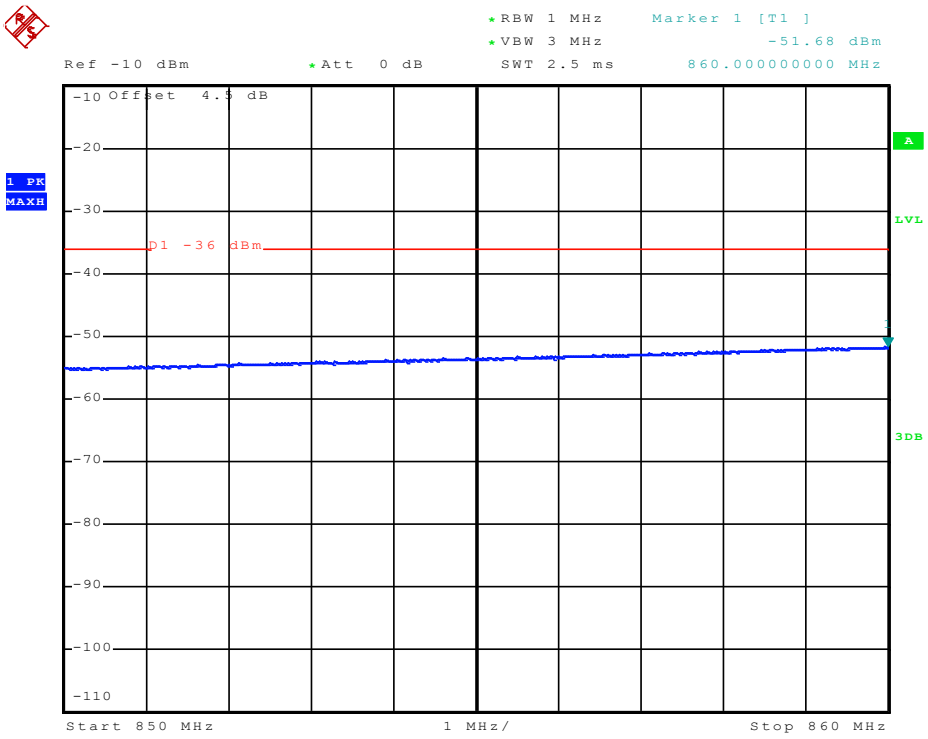
10.4 Test Data

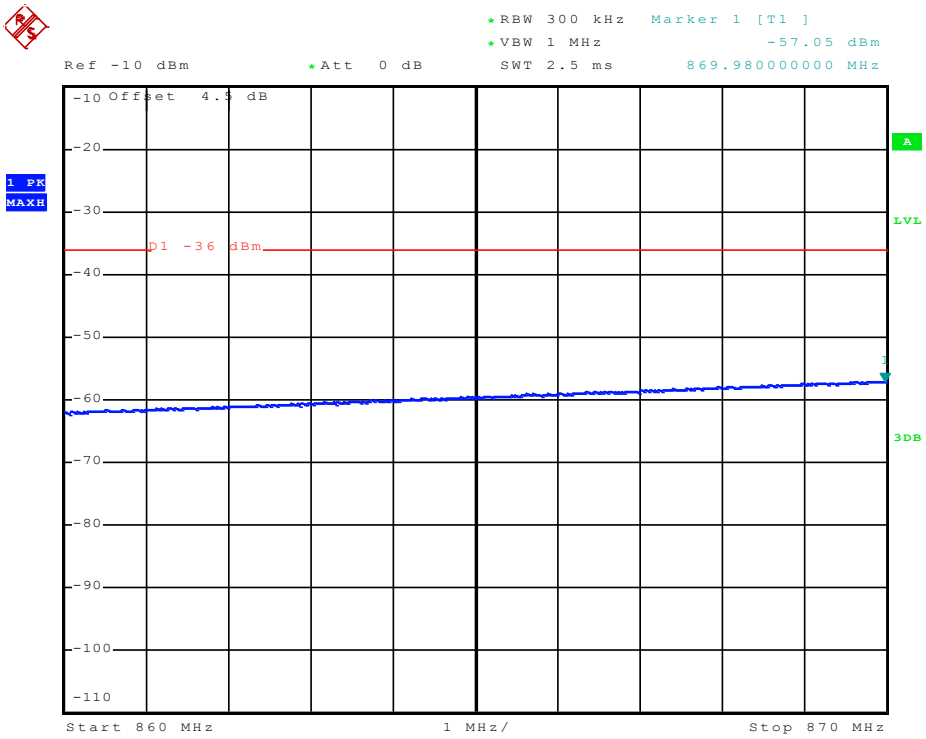
GSM 900（Normal Condition）

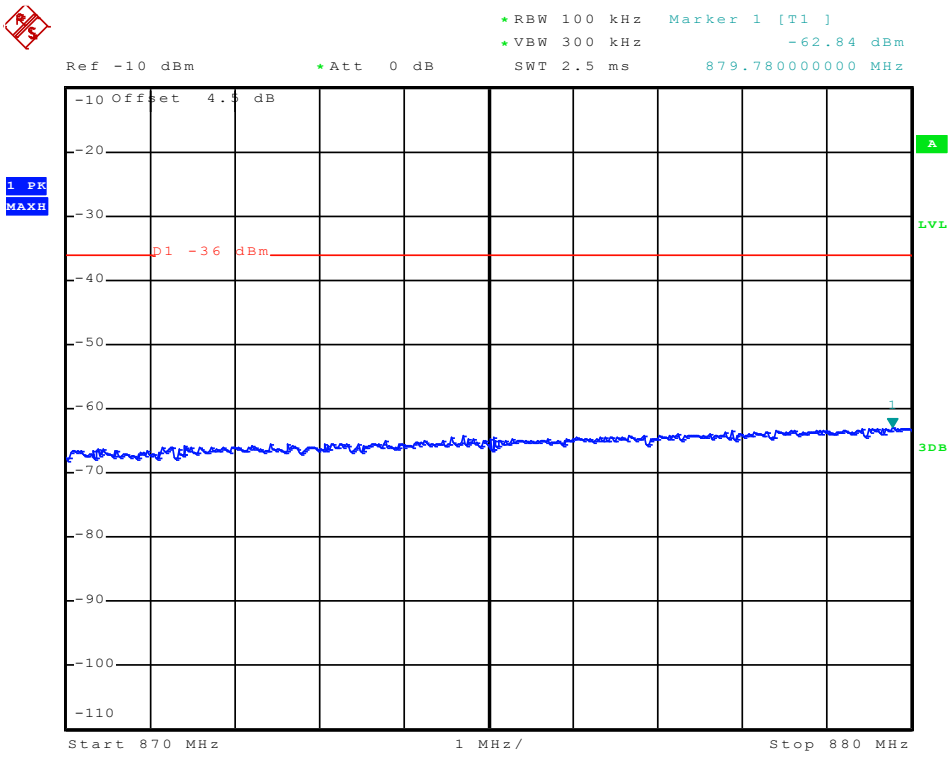


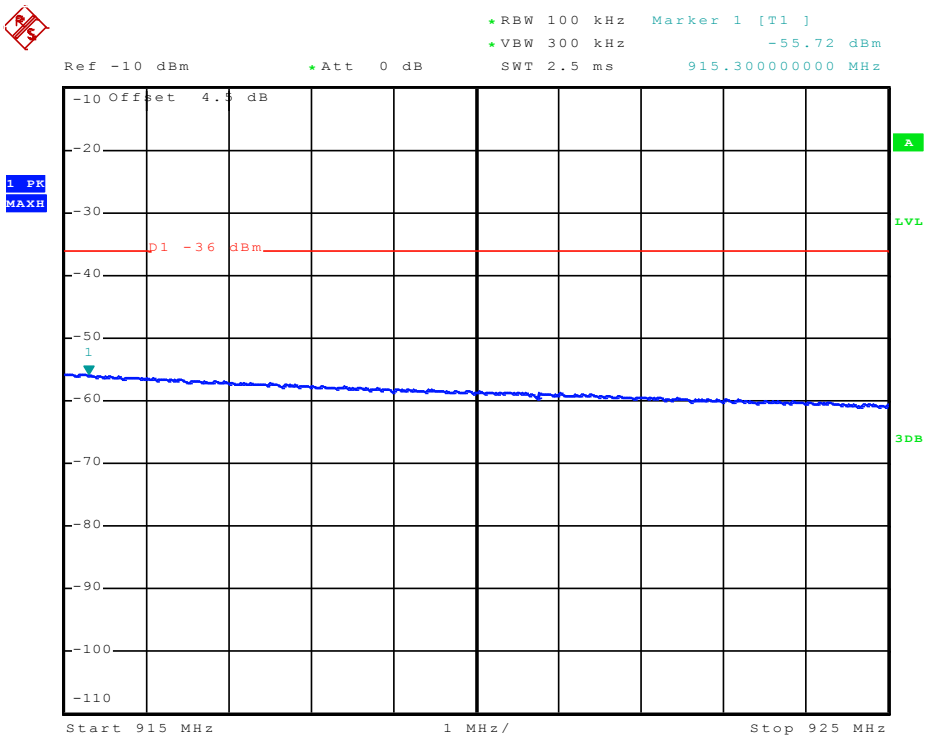

RBW 100 kHz
VBW 300 kHz
SWT 45 ms
Marker 1 [T1]
-77.51 dBm
51.800000000 MHz
Ref -10 dBm
Att 0 dB
Offset 4.5 dB
1 PK
MAXH
D1 -36 dBm
A
LVL
3DB
Start 50 MHz
45 MHz/
Stop 500 MHz

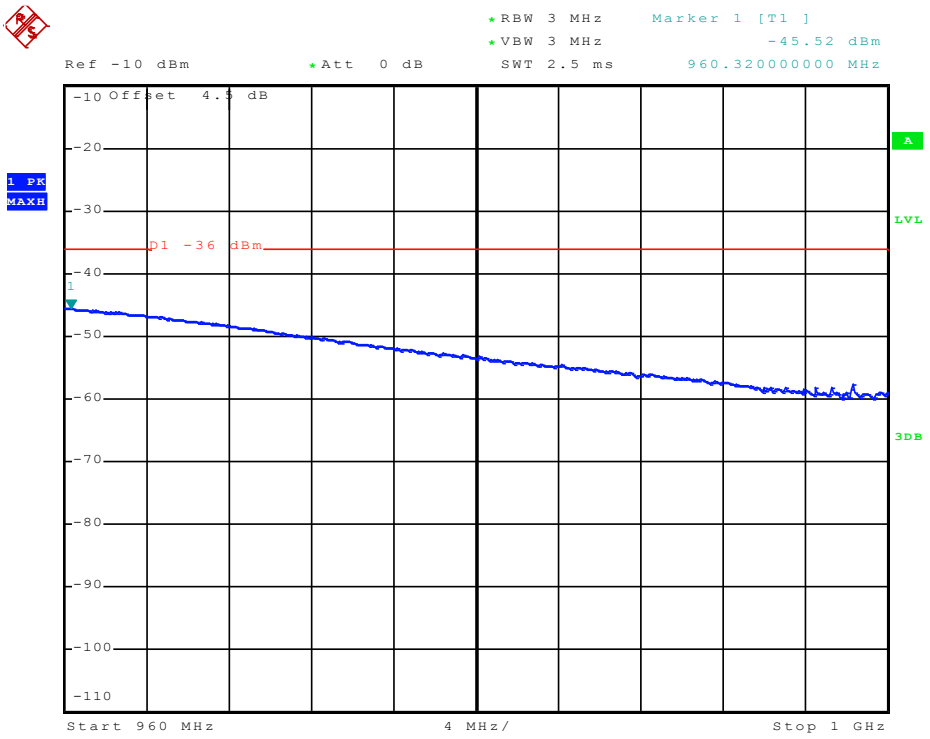

RBW 3 MHz
VBW 3 MHz
SWT 5 ms
Marker 1 [T1]
-48.27 dBm
850.000000000 MHz
Ref -10 dBm
Att 0 dB
Offset 4.5 dB
1 PK
MAXH
D1 -36 dBm
A
LVL
3DB
Start 500 MHz
35 MHz/
Stop 850 MHz

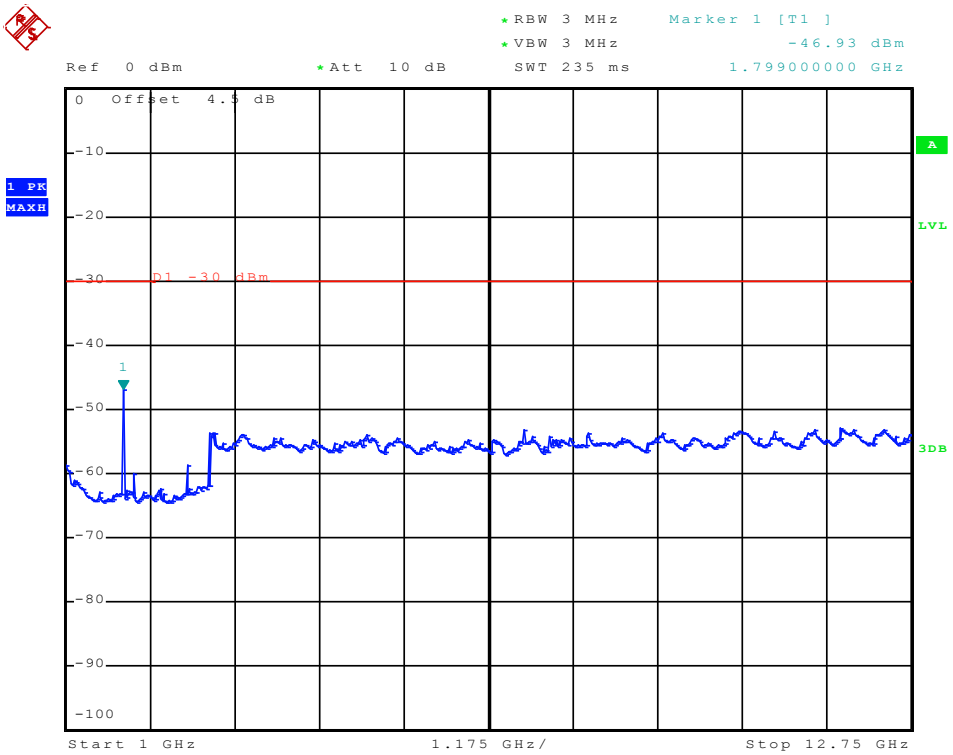

RBW 1 MHz
VBW 3 MHz
SWT 2.5 ms
Marker 1 [T1]
-51.68 dBm
860.000000000 MHz
Ref -10 dBm
Att 0 dB
Offset 4.5 dB
1 PK
MAXH
D1 -36 dBm
A
LVL
3DB
Start 850 MHz
1 MHz/
Stop 860 MHz


RBW 300 kHz
VBW 1 MHz
SWT 2.5 ms
Marker 1 [T1]
-57.05 dBm
869.980000000 MHz
Ref -10 dBm
Att 0 dB
Offset 4.5 dB
1 PK
MAXH
D1 -36 dBm
A
LVL
3DB
Start 860 MHz
1 MHz/
Stop 870 MHz

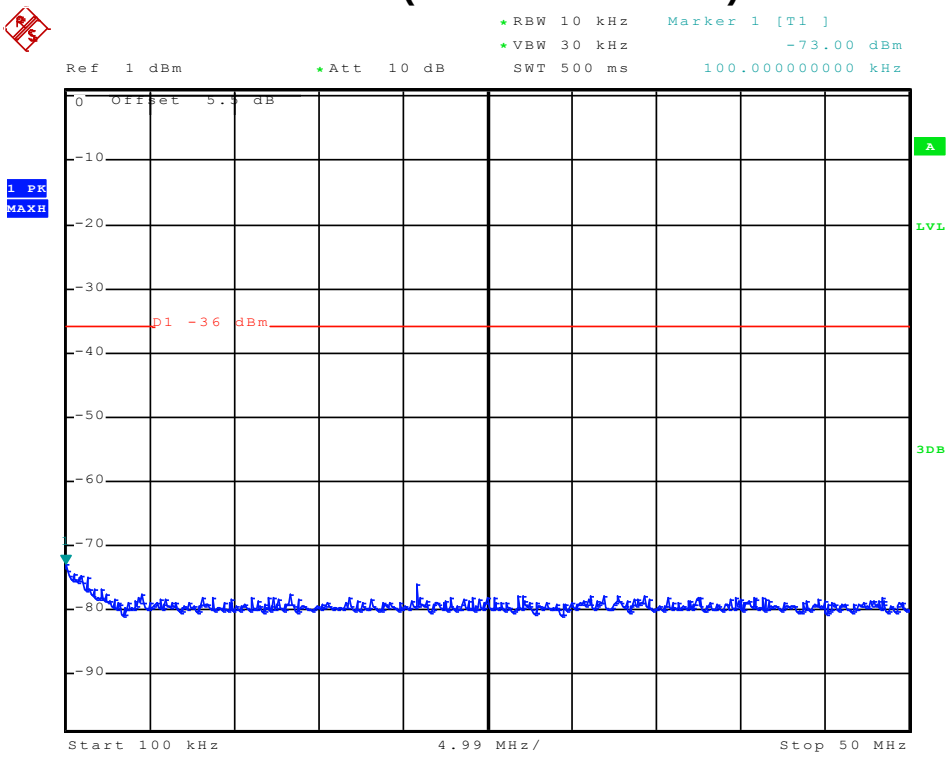

RBW 100 kHz
VBW 300 kHz
SWT 2.5 ms
Marker 1 [T1]
-62.84 dBm
879.780000000 MHz
Ref -10 dBm
Att 0 dB
Offset 4.5 dB
1 PK
MAXH
D1 -36 dBm
A
LVL
3DB
Start 870 MHz
1 MHz/
Stop 880 MHz

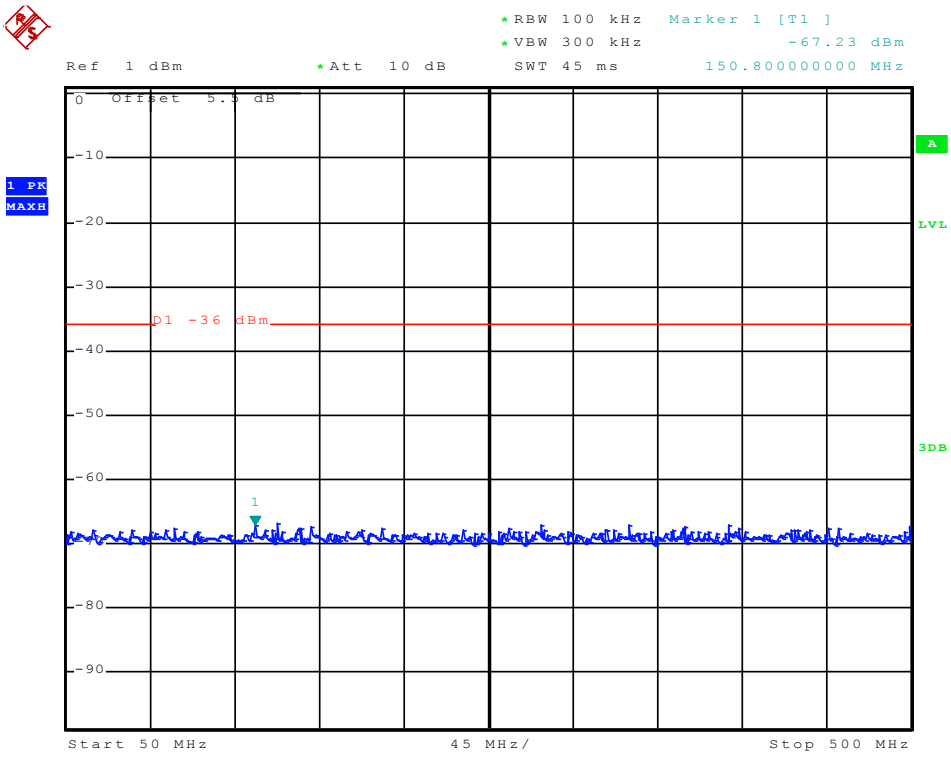

RBW 100 kHz
VBW 300 kHz
SWT 2.5 ms
Marker 1 [T1]
-55.72 dBm
915.300000000 MHz
Ref -10 dBm
Att 0 dB
Offset 4.5 dB
1 PK
MAXH
D1 -36 dBm
A
LVL
3DB
Start 915 MHz
1 MHz/
Stop 925 MHz

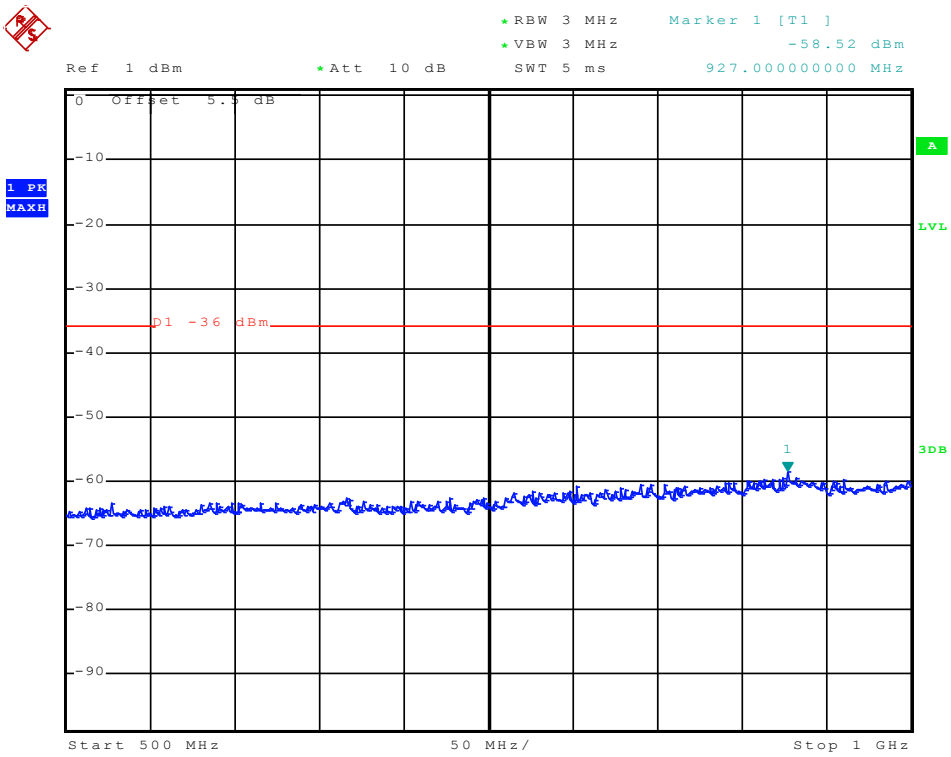

RBW 3 MHz
VBW 3 MHz
SWT 2.5 ms
Marker 1 [T1]
-45.52 dBm
960.320000000 MHz
Ref -10 dBm
Att 0 dB
Offset 4.5 dB
1 PK
MAXH
D1 -36 dBm
A
LVL
3DB
Start 960 MHz
4 MHz/
Stop 1 GHz

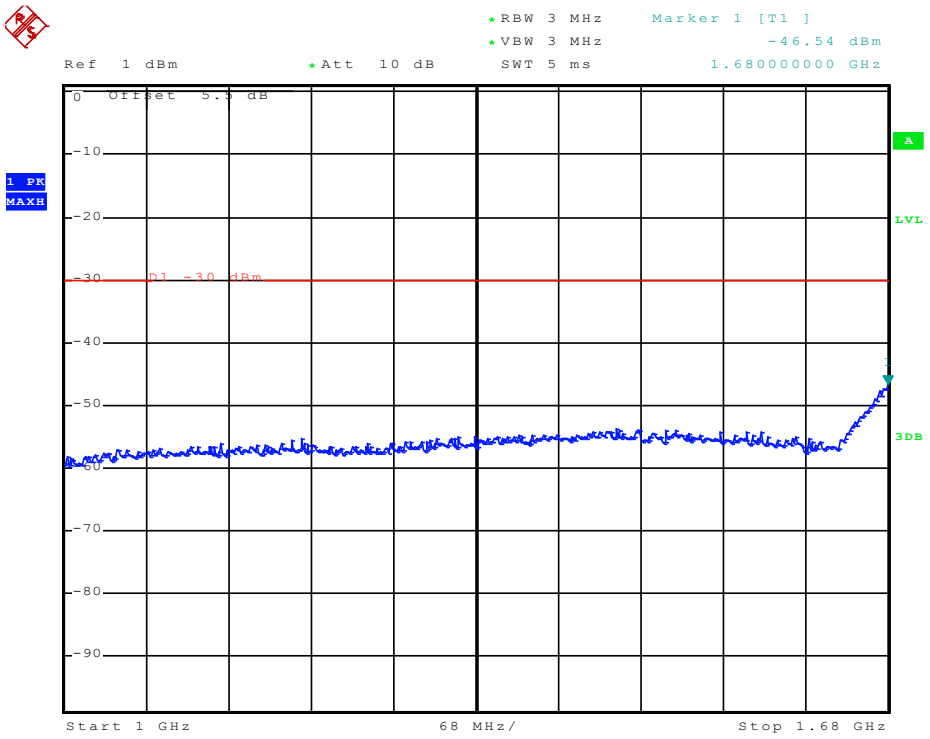

RBW 3 MHz
VBW 3 MHz
SWT 235 ms
Marker 1 [T1]
-46.93 dBm
1.799000000 GHz
Ref 0 dBm
Att 10 dB
Offset 4.5 dB
1 PK
MAXH
D1 -30 dBm
A
LVL
3DB
Start 1 GHz
1.175 GHz/
Stop 12.75 GHz

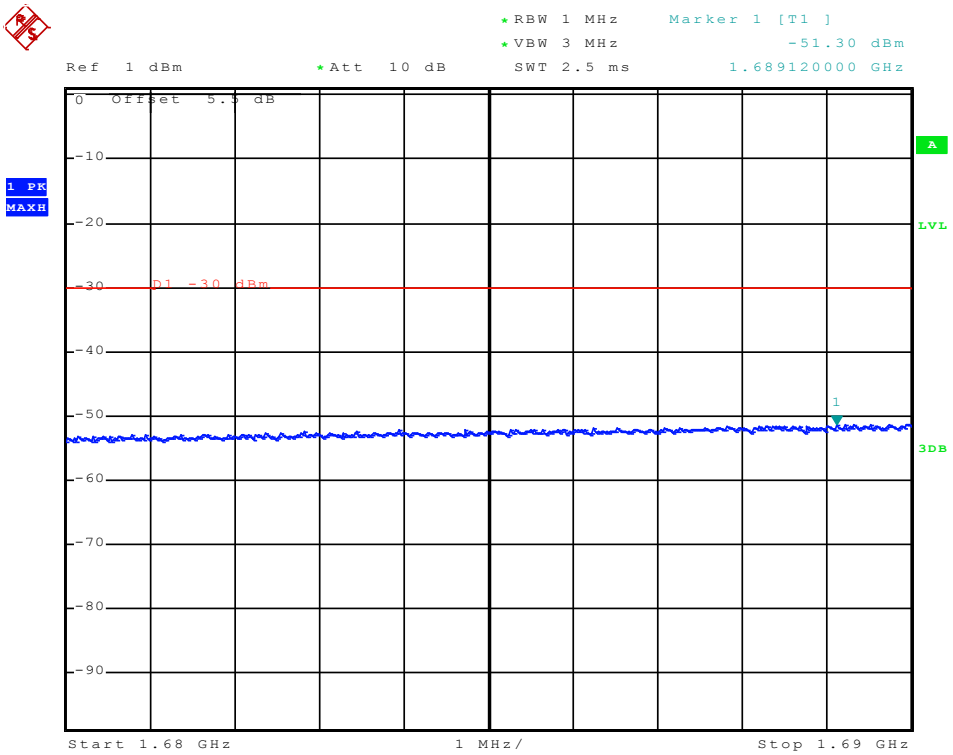
DCS 1800 (Normal Condition)

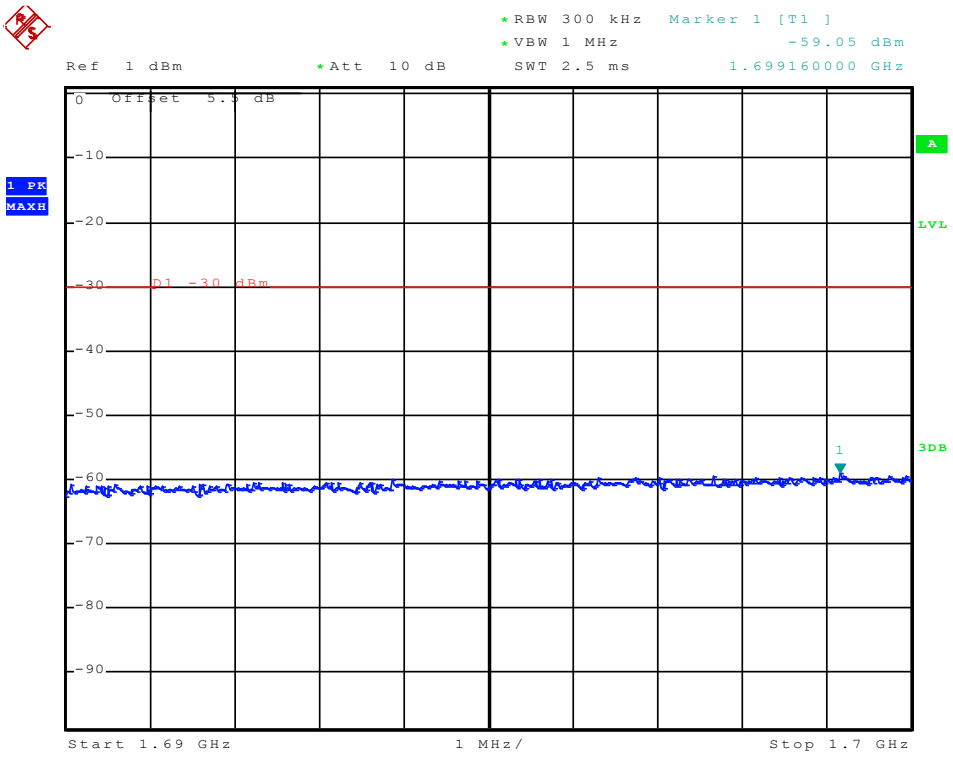


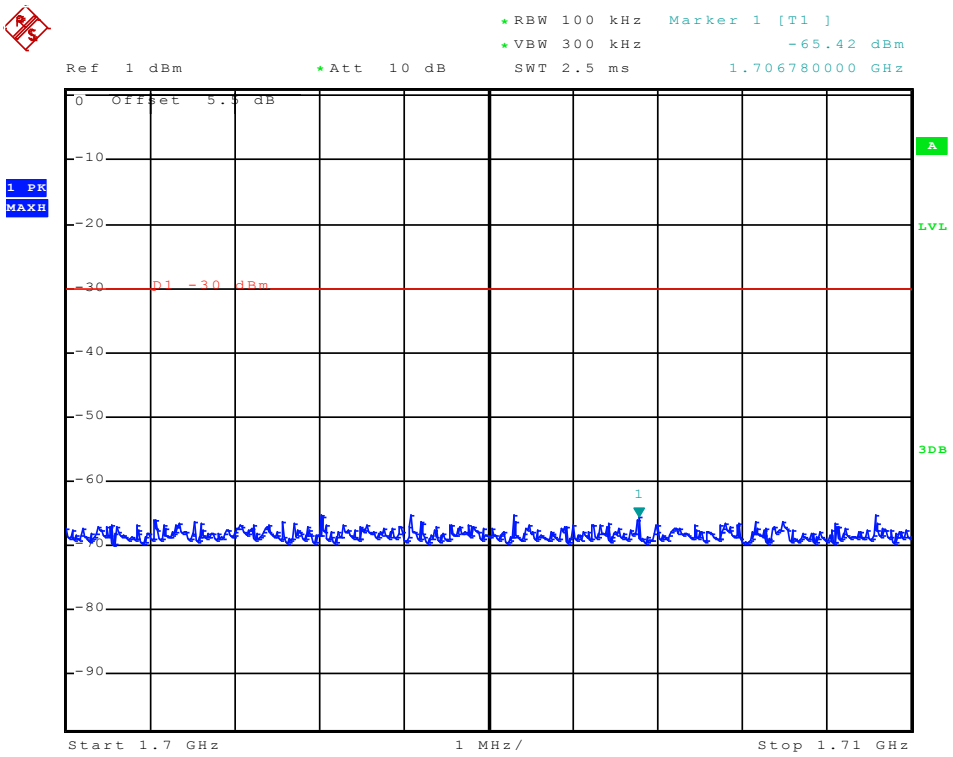

RBW 100 kHz
VBW 300 kHz
SWT 45 ms
Marker 1 [T1]
-67.23 dBm
150.800000000 MHz
Ref 1 dBm
Att 10 dB
Offset 5.5 dB
1 PK
MAXH
D1 -36 dBm
A
LVL
3DB
Start 50 MHz
45 MHz/
Stop 500 MHz

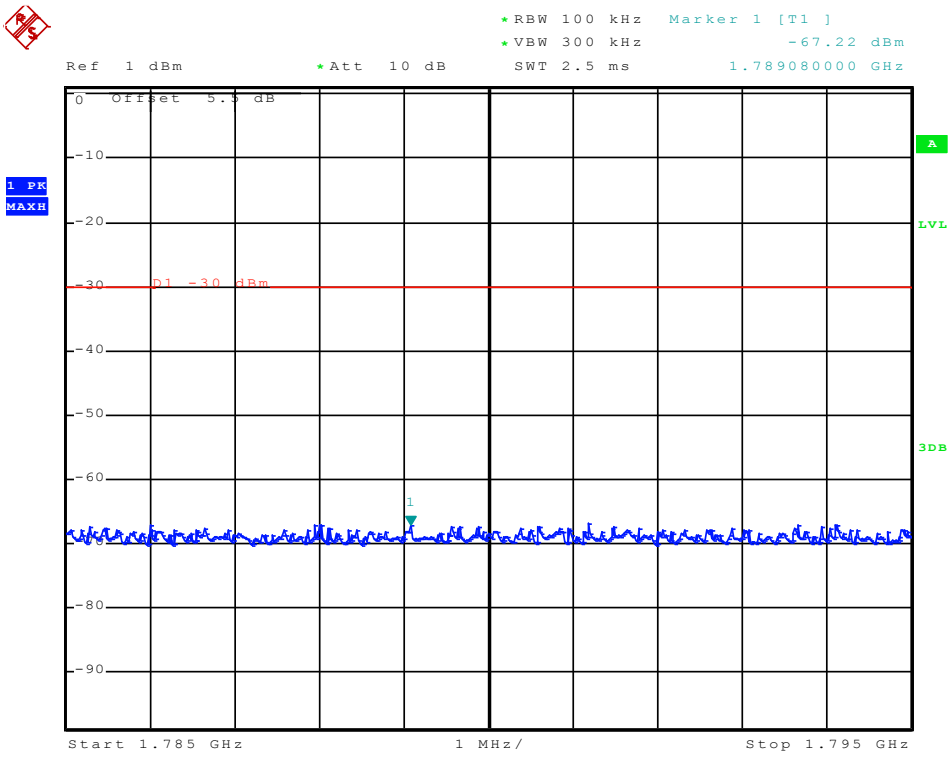

RBW 3 MHz
VBW 3 MHz
SWT 5 ms
Marker 1 [T1]
-58.52 dBm
927.000000000 MHz
Ref 1 dBm
Att 10 dB
Offset 5.5 dB
1 PK
MAXH
D1 -36 dBm
A
LVL
3DB
Start 500 MHz
50 MHz/
Stop 1 GHz

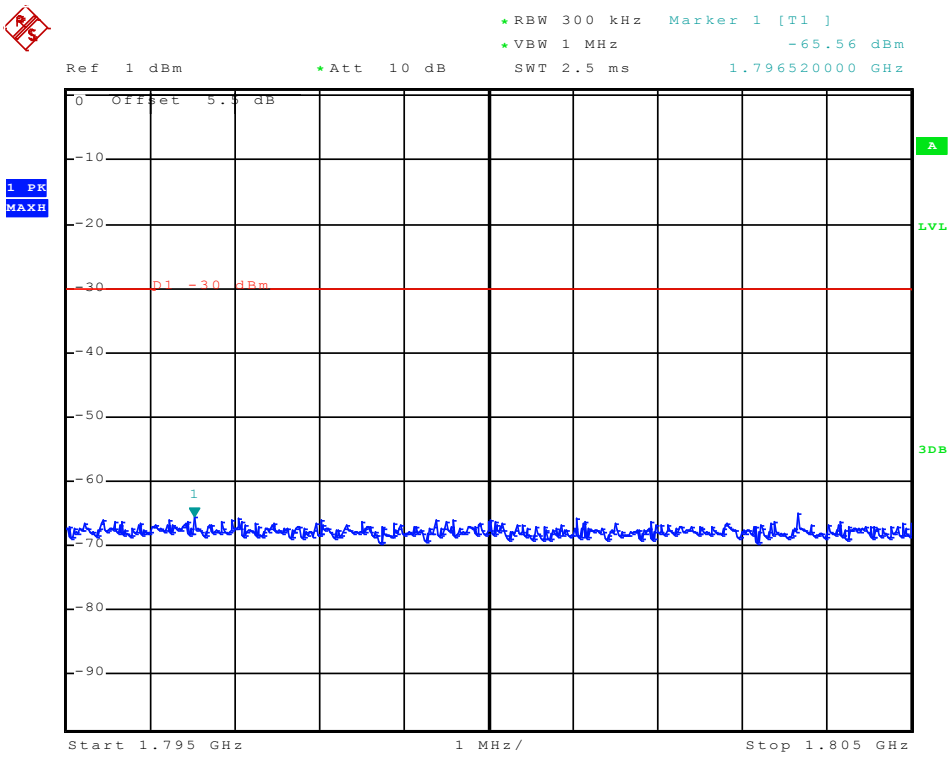

RBW 3 MHz
VBW 3 MHz
SWT 5 ms
Marker 1 [T1]
-46.54 dBm
1.680000000 GHz
Ref 1 dBm
Att 10 dB
Offset 5.5 dB
1 PK
MAXH
D1 -30 dBm
A
LVL
3DB
Start 1 GHz
68 MHz/
Stop 1.68 GHz

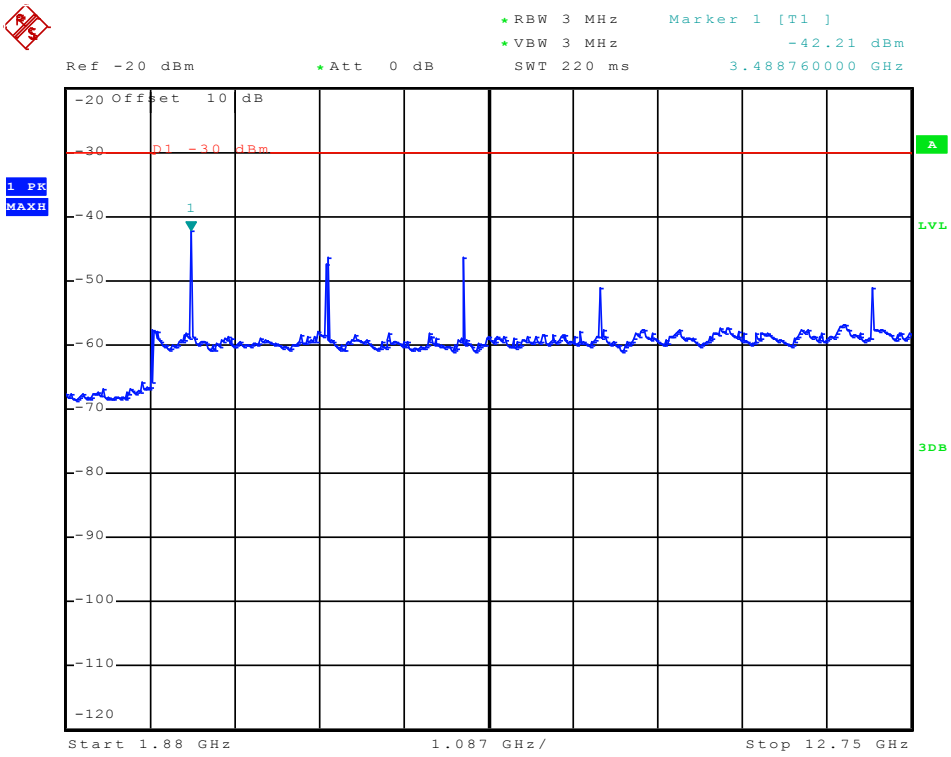

RBW 1 MHz
VBW 3 MHz
SWT 2.5 ms
Marker 1 [T1]
-51.30 dBm
1.689120000 GHz
Ref 1 dBm
Att 10 dB
Offset 5.5 dB
1 PK
MAXH
D1 -30 dBm
A
LVL
3DB
Start 1.68 GHz
1 MHz/
Stop 1.69 GHz


RBW 300 kHz
VBW 1 MHz
SWT 2.5 ms
Marker 1 [T1]
-59.05 dBm
1.699160000 GHz
Ref 1 dBm
Att 10 dB
Offset 5.5 dB
D1 -30 dBm
1 PK
MAXH
A
LVL
3DB
Start 1.69 GHz
1 MHz/
Stop 1.7 GHz


RBW 100 kHz
VBW 300 kHz
SWT 2.5 ms
Marker 1 [T1]
-65.42 dBm
1.706780000 GHz
Ref 1 dBm
Att 10 dB
Offset 5.5 dB
D1 -30 dBm
1 PK
MAXH
A
LVL
3DB
Start 1.7 GHz
1 MHz/
Stop 1.71 GHz


RBW 100 kHz
VBW 300 kHz
SWT 2.5 ms
Marker 1 [T1]
-67.22 dBm
1.789080000 GHz
Ref 1 dBm
Att 10 dB
Offset 5.5 dB
1 PK
MAXH
D1 -30 dBm
A
LVL
3DB
Start 1.785 GHz
1 MHz/
Stop 1.795 GHz


RBW 300 kHz
VBW 1 MHz
SWT 2.5 ms
Marker 1 [T1]
-65.56 dBm
1.796520000 GHz
Ref 1 dBm
Att 10 dB
Offset 5.5 dB
1 PK
MAXH
D1 -30 dBm
A
LVL
3DB
Start 1.795 GHz
1 MHz/
Stop 1.805 GHz


RBW 3 MHz
VBW 3 MHz
SWT 220 ms
Marker 1 [T1]
-42.21 dBm
3.488760000 GHz
Ref -20 dBm
Att 0 dB
Offset 10 dB
D1 -30 dBm
1 PK
MAXH
A
LVL
3DB
Start 1.88 GHz
1.087 GHz/
Stop 12.75 GHz

11 Conducted Spurious Emissions – MS In Idle Mode

11.1 Test Standard and Limit

11.1.1 Test Standard

EN 301 511V9.0.2:2003 clause 4.2.13

11.1.2 Limits

Requirements: According to EN 301 511, section 4.2.13, the conducted spurious power emitted by the MS, when in idle mode, shall be no more than the levels in following table:

Frequency range		Power level (dBm)	
		GSM 400, GSM 900, DCS 1800	GSM 700, GSM 850, PCS 1900
9 kHz to	880 MHz	-57	-57
880 MHz to	915 MHz	-59	-57
915 MHz to	1000 MHz	-57	-57
1 GHz to	1710 MHz	-47	
1710 MHz	1785 MHz	-53	
1785 MHz to	12.75 GHz	-47	
1 GHz to	1850 MHz		-47
1850 MHz to	1910 MHz		-53
1910 MHz to	12.75 GHz		-47

11.2 Test Procedure

a) Measurements are made in the frequency range 100 kHz to 12,75 GHz. Spurious emissions are measured as the power level of any discrete signal, higher than the requirement in table 12.4 minus 6 dB, delivered into a 50 Ω load.

The measurement bandwidth based on a 5 pole synchronously tuned filter is set according to table 4. The power indication is the peak power detected by the measuring system.

The measurement time on any frequency shall be such that it includes the time during which the MS receives a TDMA frame containing the paging channel.

Frequency range	Filter bandwidth	Video bandwidth
100 kHz to 500MHz	**10 kHz**	**30 kHz**
50 MHz to 12.75 GHz	**100 kHz**	**300 kHz**

11.3 Test Equipment Used

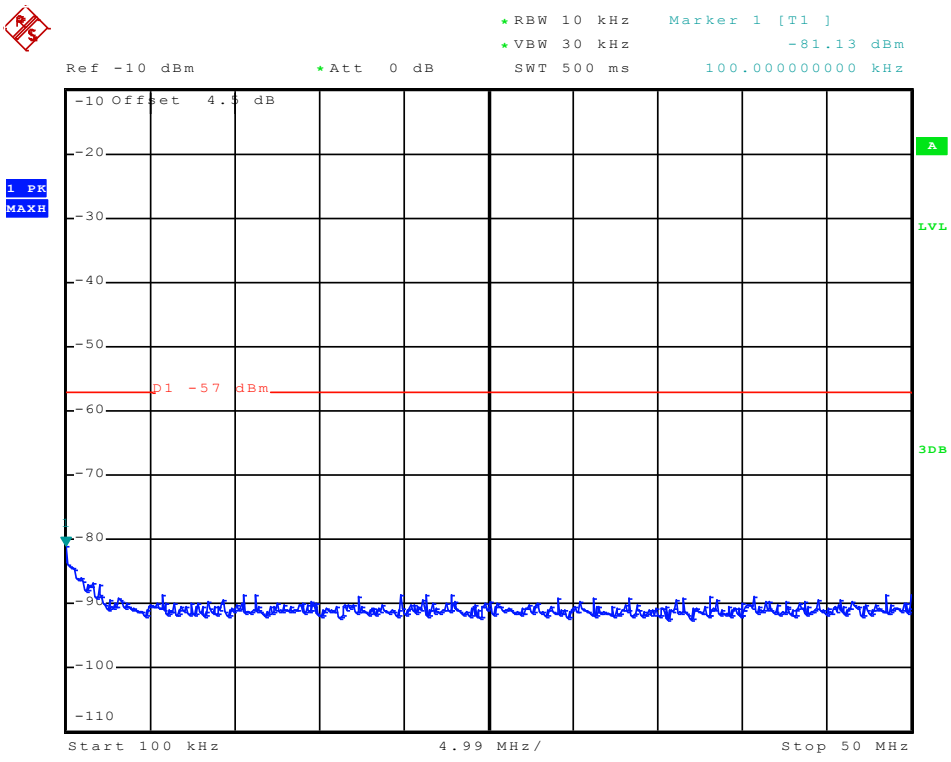
Description	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Date
Universal Radio Communication Tester	Rohde & Schwarz	CMU200	1100.864.02	2016-3-22	2017-3-21
Spectrum Analyzer	Rohde & Schwarz	FSL	MY4509214	2016-3-22	2017-3-21

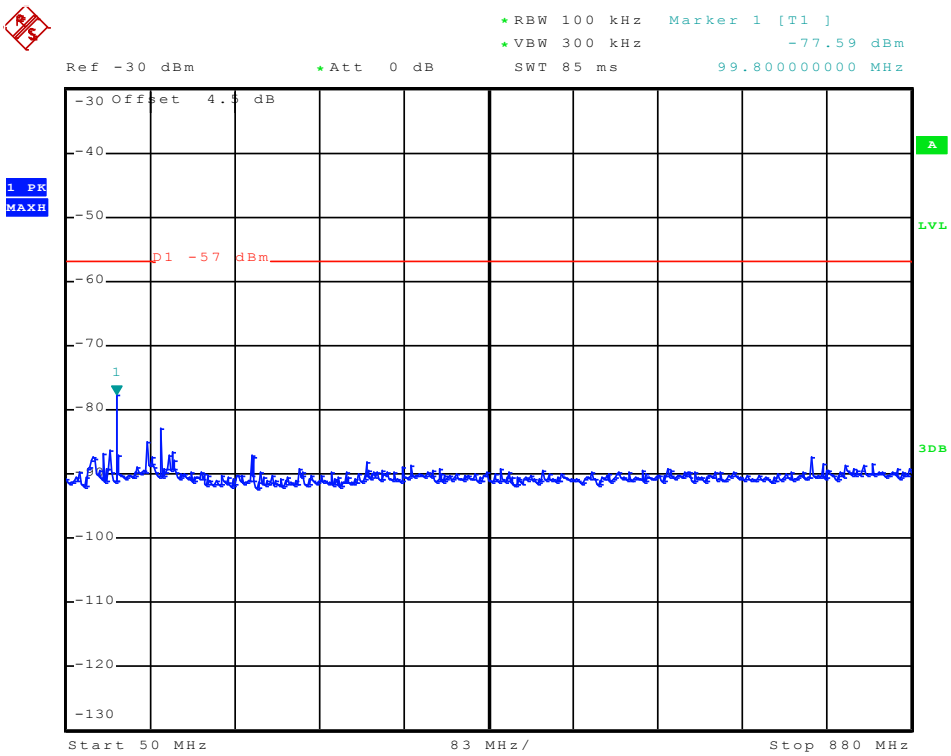
11.4 Test Data

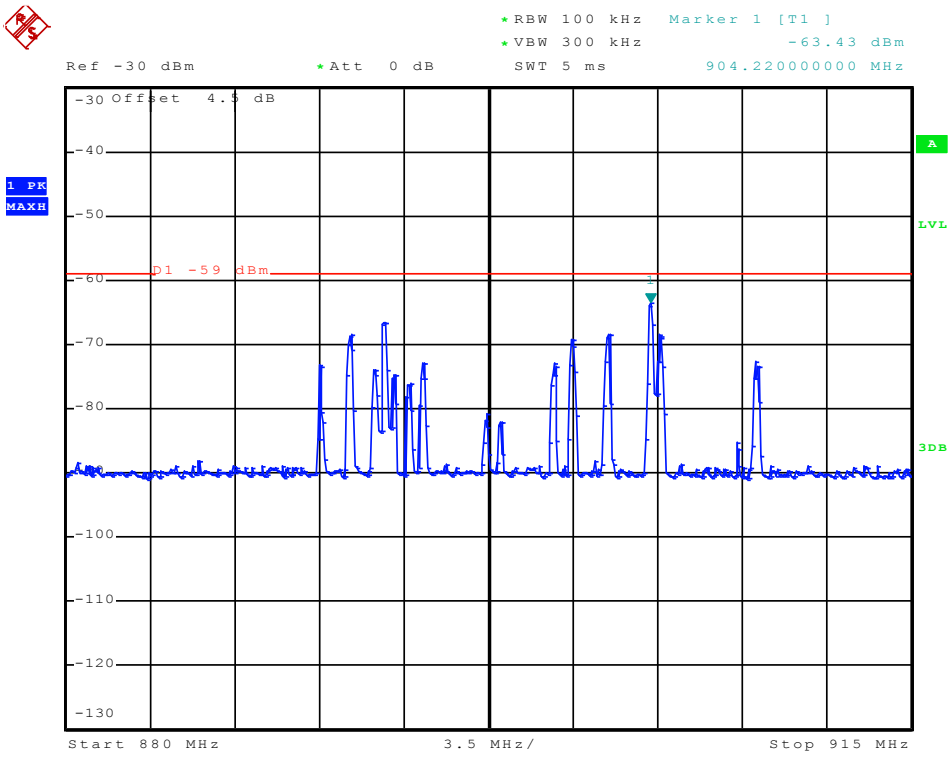
Environmental Conditions:

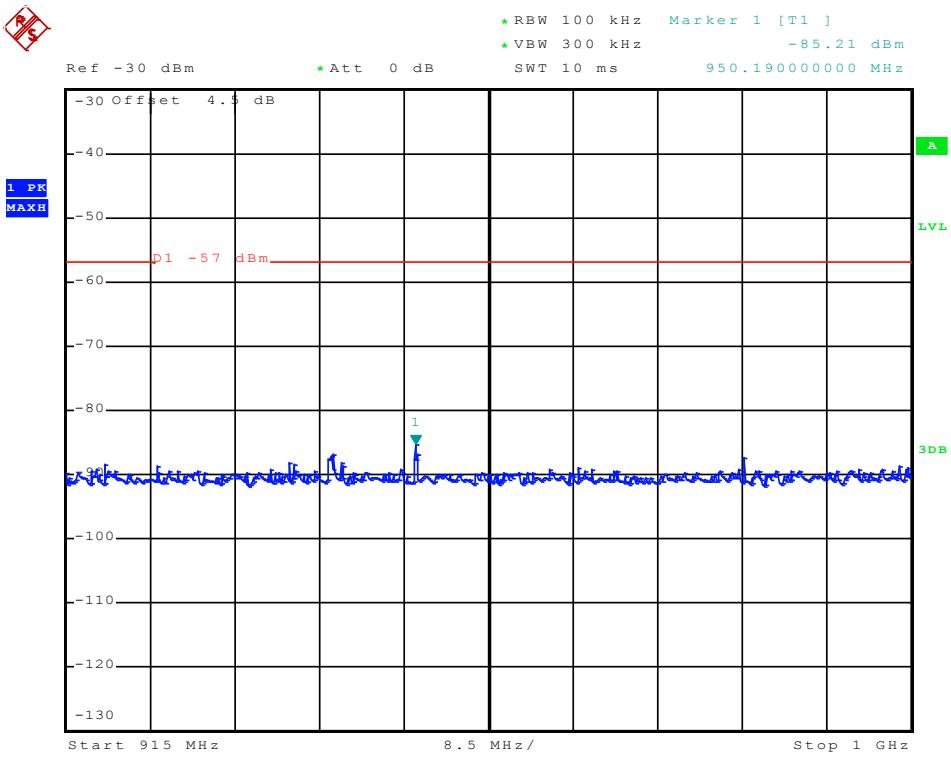
Temperature:	25 ° C
Relative Humidity:	56%
ATM Pressure:	100.2 kPa

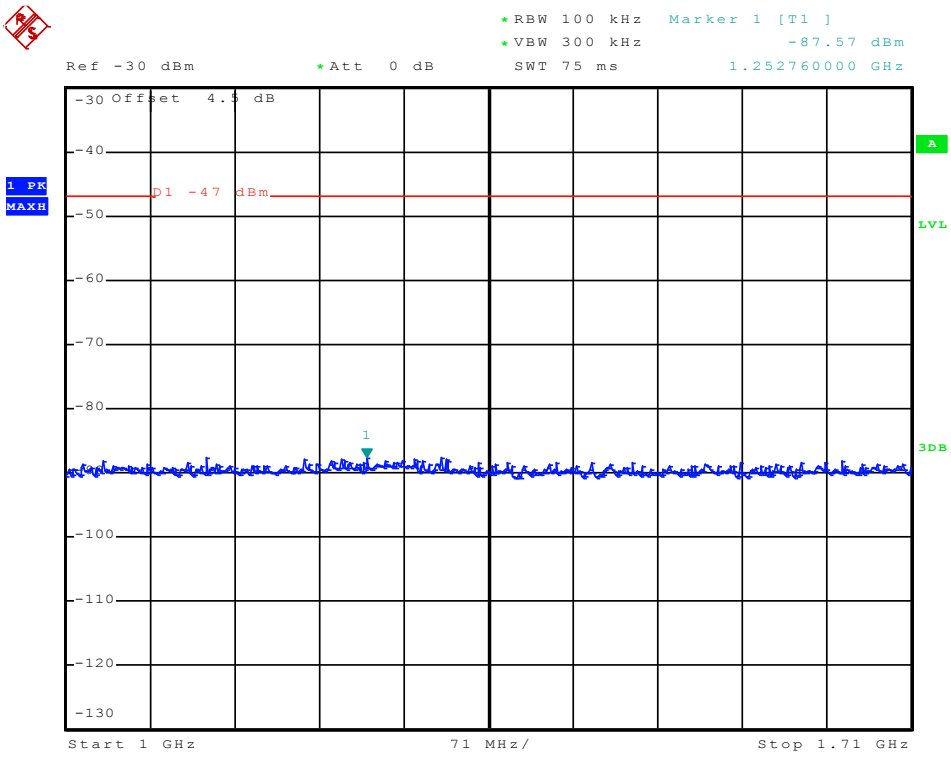
GSM 900

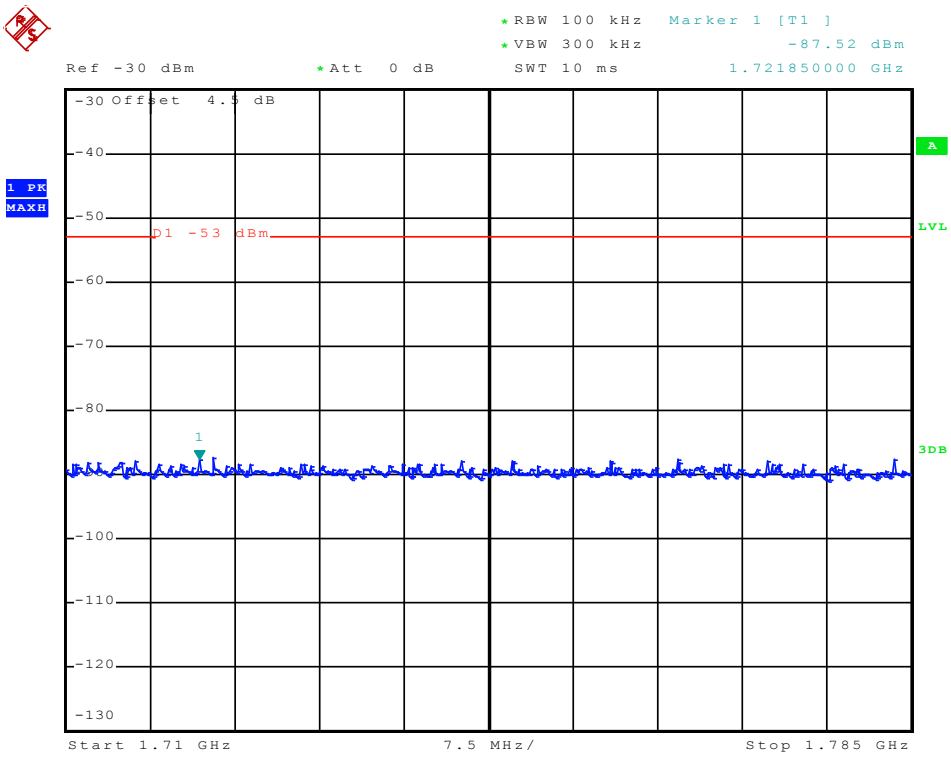

RBW 10 kHz
VBW 30 kHz
SWT 500 ms
Marker 1 [T1]
-81.13 dBm
100.000000000 kHz
Ref -10 dBm
Att 0 dB
Offset 4.5 dB
1 PK
MAXH
A
LVL
3DB
D1 -57 dBm
Start 100 kHz
4.99 MHz/
Stop 50 MHz

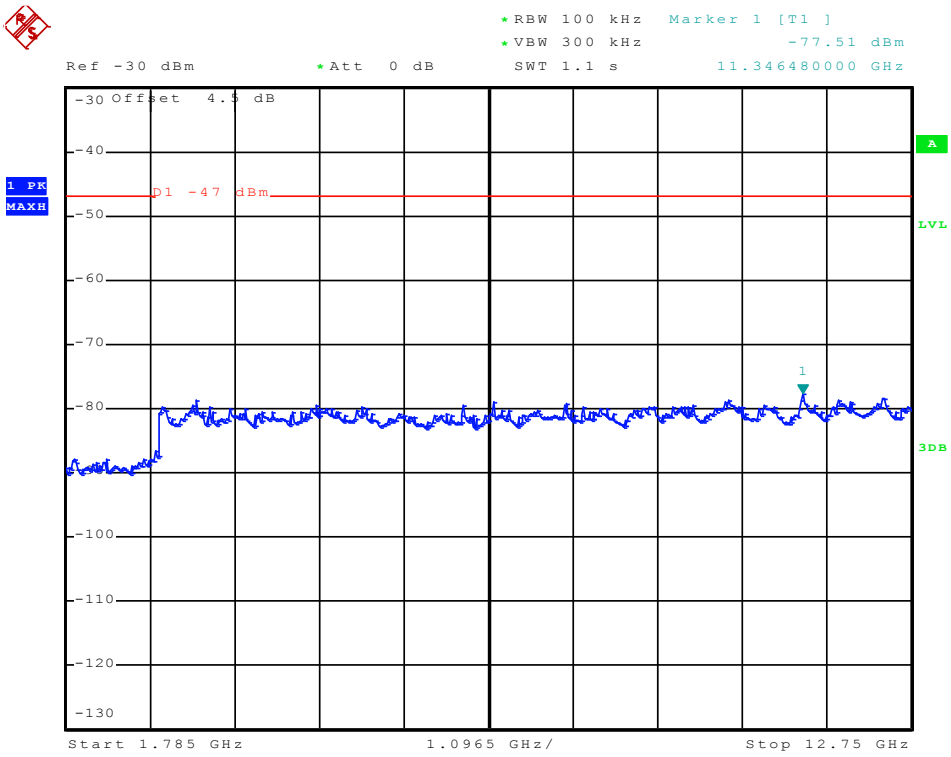

RBW 100 kHz
VBW 300 kHz
SWT 85 ms
Marker 1 [T1]
-77.59 dBm
99.800000000 MHz
Ref -30 dBm
Att 0 dB
Offset 4.5 dB
1 PK
MAXH
A
LVL
3DB
D1 -57 dBm
Start 50 MHz
83 MHz/
Stop 880 MHz


RBW 100 kHz
VBW 300 kHz
SWT 5 ms
Marker 1 [T1]
-63.43 dBm
904.220000000 MHz
Ref -30 dBm
Att 0 dB
Offset 4.5 dB
1 PK
MAXH
D1 -59 dBm
A
LVL
3DB
Start 880 MHz
3.5 MHz/
Stop 915 MHz

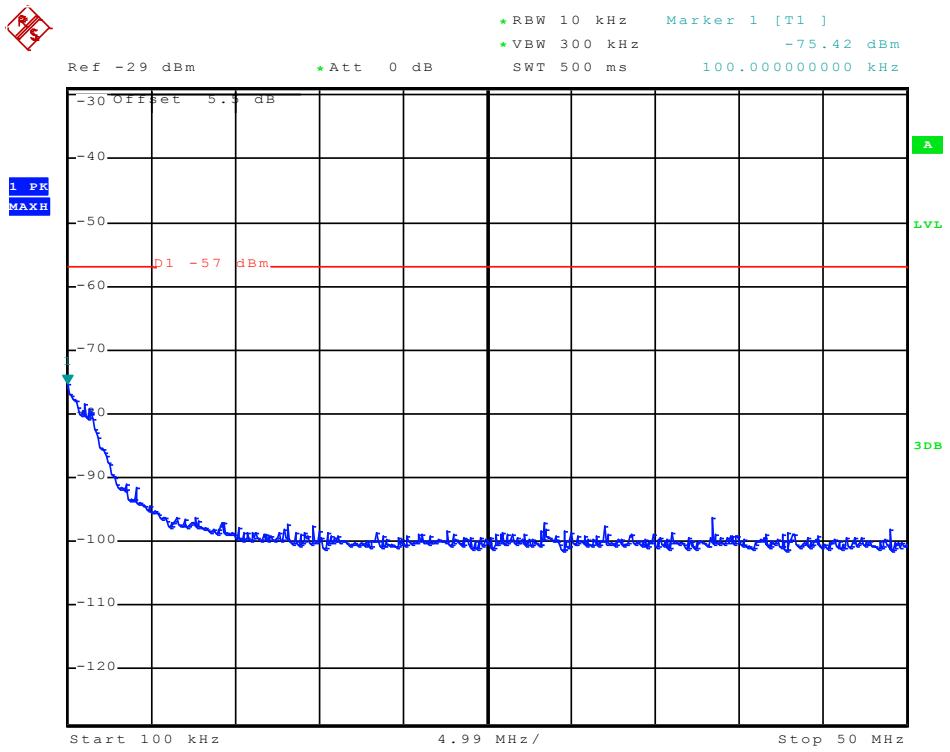

RBW 100 kHz
VBW 300 kHz
SWT 10 ms
Marker 1 [T1]
-85.21 dBm
950.190000000 MHz
Ref -30 dBm
Att 0 dB
Offset 4.5 dB
1 PK
MAXH
D1 -57 dBm
A
LVL
3DB
Start 915 MHz
8.5 MHz/
Stop 1 GHz

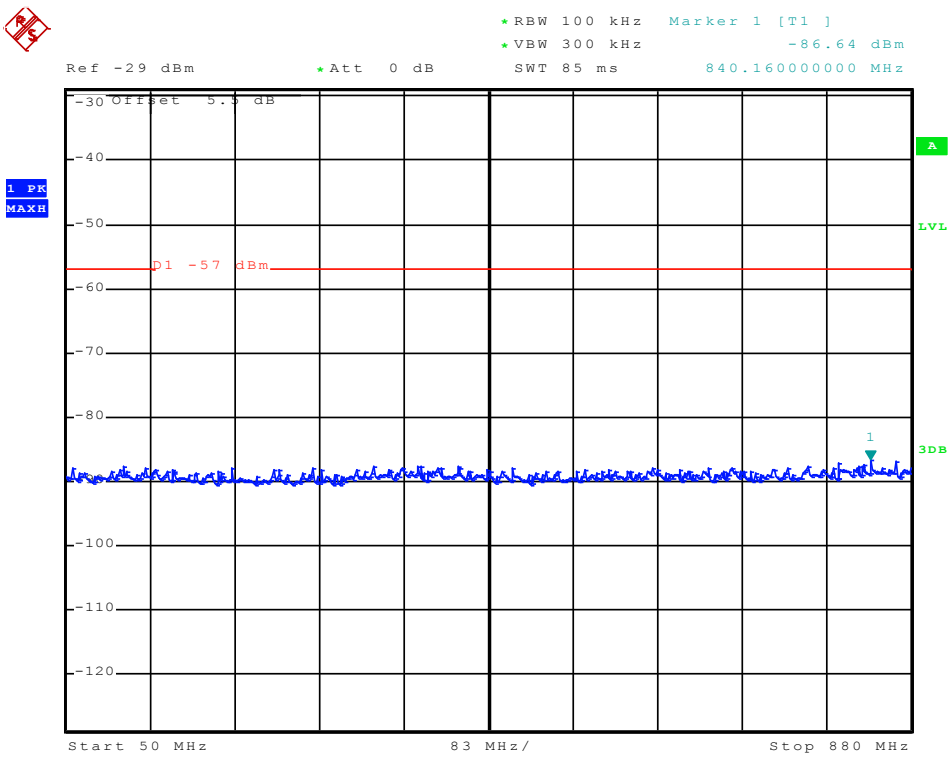

RBW 100 kHz
VBW 300 kHz
SWT 75 ms
Marker 1 [T1]
-87.57 dBm
1.252760000 GHz
Ref -30 dBm
Att 0 dB
Offset 4.5 dB
D1 -47 dBm
1 PK
MAXH
A
LVL
3DB
Start 1 GHz
71 MHz/
Stop 1.71 GHz

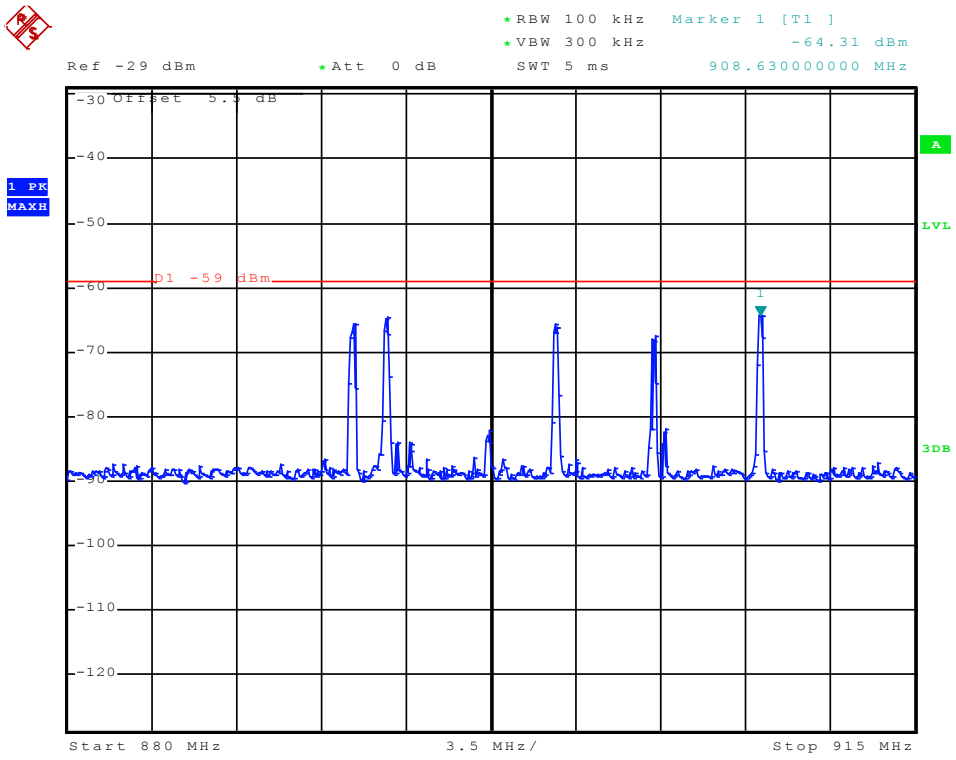

RBW 100 kHz
VBW 300 kHz
SWT 10 ms
Marker 1 [T1]
-87.52 dBm
1.721850000 GHz
Ref -30 dBm
Att 0 dB
Offset 4.5 dB
D1 -53 dBm
1 PK
MAXH
A
LVL
3DB
Start 1.71 GHz
7.5 MHz/
Stop 1.785 GHz

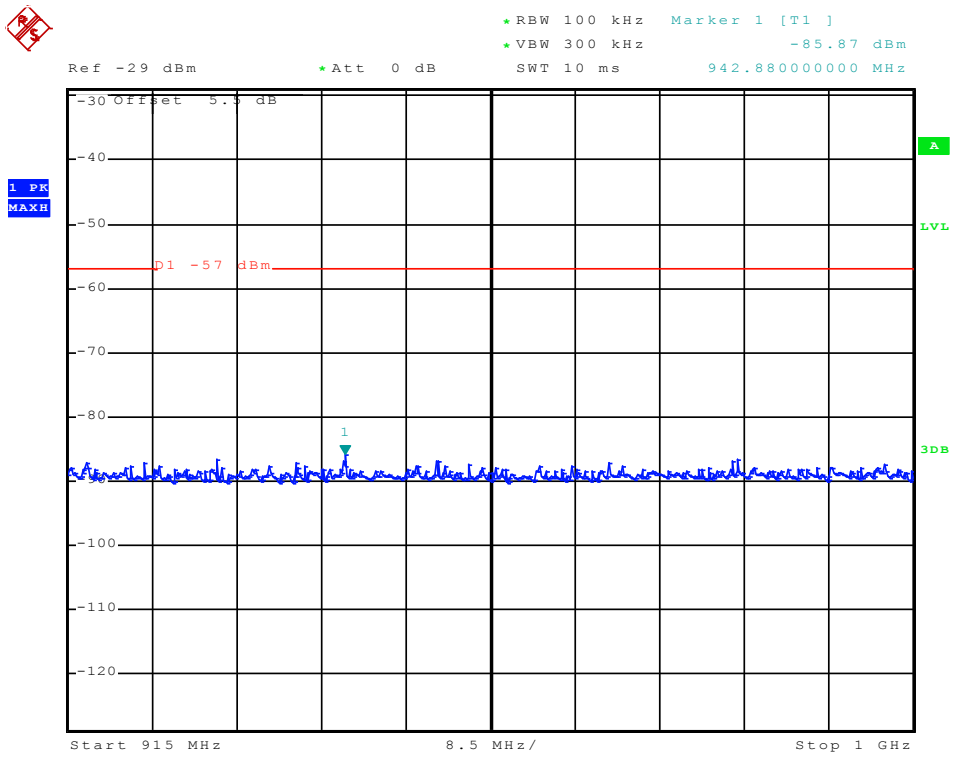

RBW 100 kHz
VBW 300 kHz
SWT 1.1 s
Marker 1 [T1]
-77.51 dBm
11.346480000 GHz
Ref -30 dBm
Att 0 dB
Offset 4.5 dB
1 PK
MAXH
D1 -47 dBm
A
LVL
3DB
Start 1.785 GHz
1.0965 GHz/
Stop 12.75 GHz

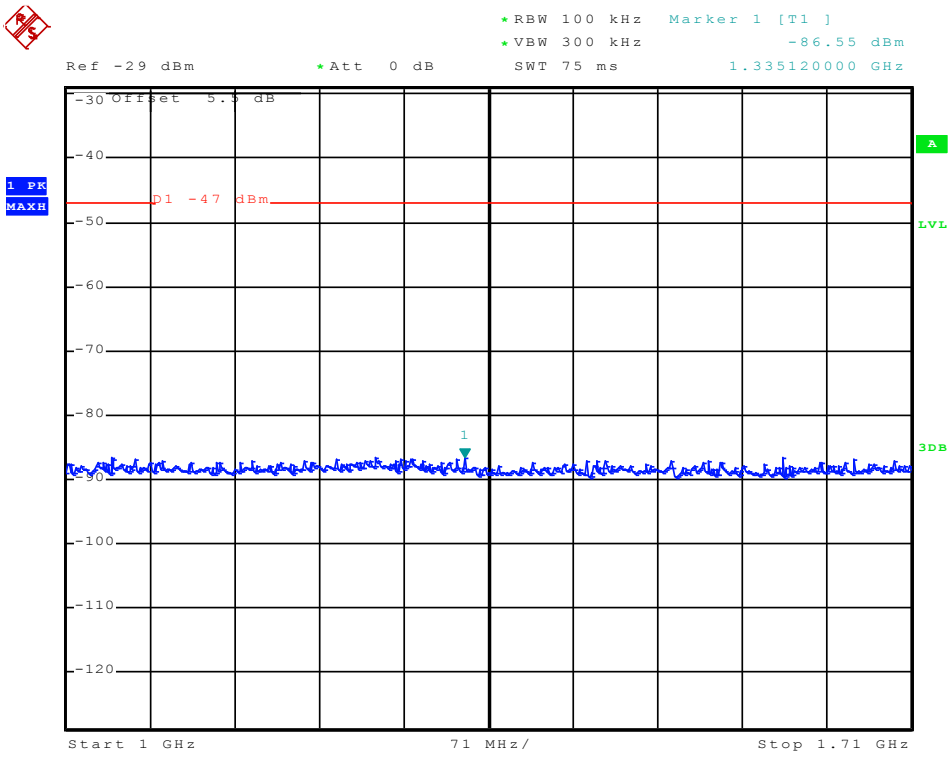
DCS 1800

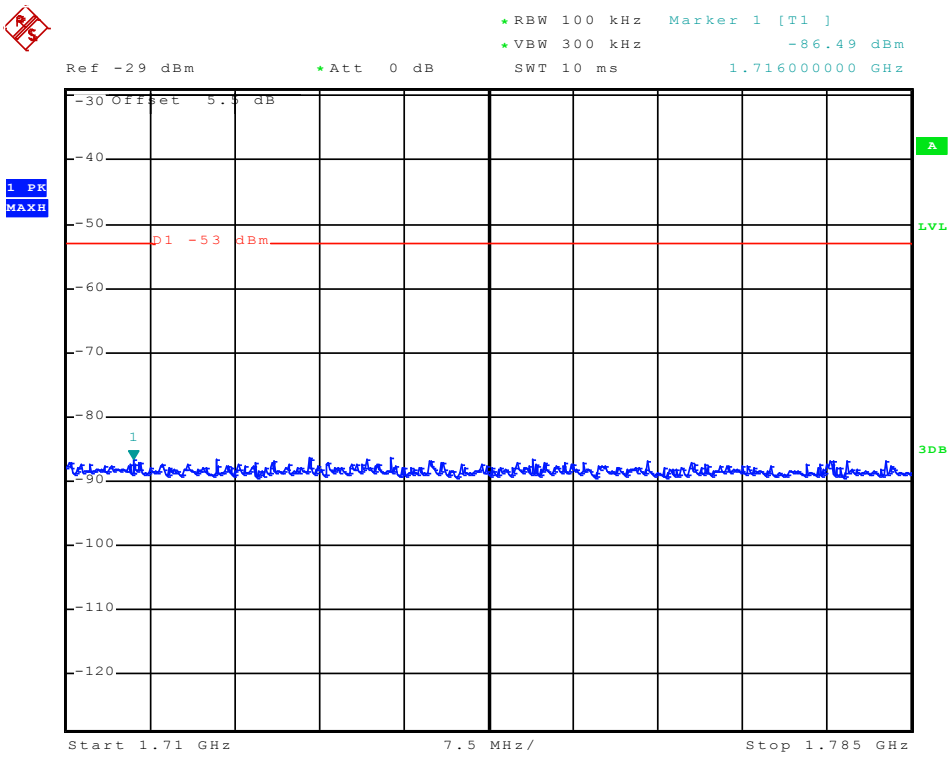

RBW 10 kHz
VBW 300 kHz
SWT 500 ms
Marker 1 [T1]
-75.42 dBm
100.000000000 kHz
Ref -29 dBm
Att 0 dB
Offset 5.5 dB
1 PK
MAXH
D1 -57 dBm
A
LVL
3DB
Start 100 kHz
4.99 MHz/
Stop 50 MHz

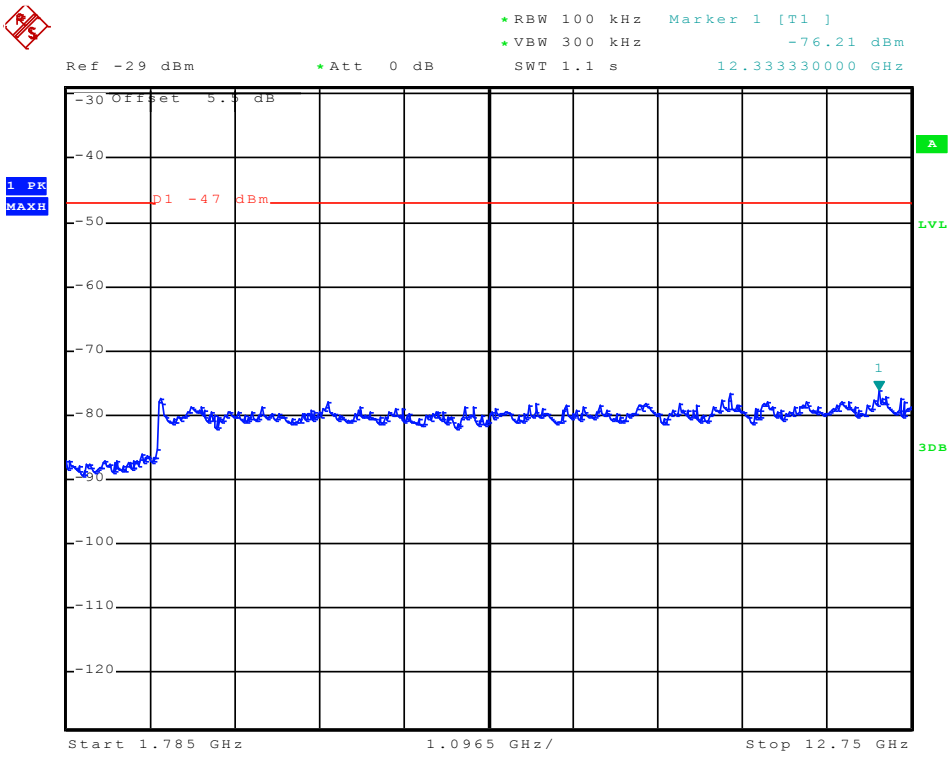

RBW 100 kHz
VBW 300 kHz
SWT 85 ms
Marker 1 [T1]
-86.64 dBm
840.160000000 MHz
Ref -29 dBm
Att 0 dB
Offset 5.5 dB
1 PK
MAXH
D1 -57 dBm
A
LVL
3DB
Start 50 MHz
83 MHz/
Stop 880 MHz


RBW 100 kHz
VBW 300 kHz
Marker 1 [T1]
-64.31 dBm
Ref -29 dBm
Att 0 dB
SWT 5 ms
908.630000000 MHz
Offset 5.5 dB
1 PK
MAXH
D1 -59 dBm
A
LVL
3DB
Start 880 MHz
3.5 MHz/
Stop 915 MHz


RBW 100 kHz
VBW 300 kHz
Marker 1 [T1]
-85.87 dBm
Ref -29 dBm
Att 0 dB
SWT 10 ms
942.880000000 MHz
Offset 5.5 dB
1 PK
MAXH
D1 -57 dBm
A
LVL
3DB
Start 915 MHz
8.5 MHz/
Stop 1 GHz


RBW 100 kHz
VBW 300 kHz
SWT 75 ms
Marker 1 [T1]
-86.55 dBm
1.335120000 GHz
Ref -29 dBm
Att 0 dB
Offset 5.5 dB
D1 -47 dBm
1 PK
MAXH
A
LVL
3DB
Start 1 GHz
71 MHz/
Stop 1.71 GHz


RBW 100 kHz
VBW 300 kHz
SWT 10 ms
Marker 1 [T1]
-86.49 dBm
1.716000000 GHz
Ref -29 dBm
Att 0 dB
Offset 5.5 dB
D1 -53 dBm
1 PK
MAXH
A
LVL
3DB
Start 1.71 GHz
7.5 MHz/
Stop 1.785 GHz


RBW 100 kHz
VBW 300 kHz
SWT 1.1 s
Marker 1 [T1]
-76.21 dBm
12.333330000 GHz
Ref -29 dBm
Att 0 dB
Offset 5.5 dB
D1 -47 dBm
1 PK
MAXH
A
LVL
3DB
Start 1.785 GHz
1.0965 GHz/
Stop 12.75 GHz

12 Radiated Spurious Emissions – MS Allocated A Channel

12.1 Test Standard and Limit

12.1.1 Test Standard

EN 301 511 V9.0.2: 2003 clause 4.2.16

12.1.2 Limits

Requirements: According to EN 301 511, section 4.2.16, the radiated spurious power emitted by the MS, when allocated channel, shall be no more than the levels in table 5 under normal and extreme voltage conditions.

Frequency range		Power level (dBm)		
		GSM 400 GSM 700 GSM 850 GSM 900	DCS 1800	PCS 1900
30 MHz to	1 GHz	-36	-36	-36
1 GHz to	4 GHz	-30		-30
1 GHz to	1710 MHz		-30	
1710 MHz to	1785 MHz		-36	
1785 MHz to	4 GHz		-30	

12.2 Test Procedure

a) Initially the test antenna is closely coupled to the MS and any spurious emission radiated by the MS is detected by the test antenna and receiver in the range 30 MHz to 4 GHz.

NOTE 1:This is a qualitative step to identify the frequency and presence of spurious emissions which are to be measured in subsequent steps.

b) The test antenna separation is set to the appropriate measurement distance and at each frequency at which an emission has been detected, the MS shall be rotated to obtain maximum response and the effective radiated power of the emission determined by a substitution measurement. In case of an anechoic shielded chamber pre-calibration may be used instead of a substitution measurement.

c) The measurement bandwidth, based on a 5 pole synchronously tuned filter, is set according to table 6. The power indication is the peak power detected by the measuring system.
The measurement on any frequency shall be performed for at least one TDMA frame period, with the exception of the idle frame.

NOTE 2: This ensures that both the active times (MS transmitting) and the quiet times are measured.

NOTE 3: For these filter bandwidths some difficulties may be experienced with noise floor above required measurement limit. This will depend on the gain of the test antenna, and adjustment of the measuring system bandwidth is permissible. Alternatively, for test

frequencies above 900 MHz, the test antenna separation from the MS may be reduced to 1 meter.

d) The measurements are repeated with the test antenna in the orthogonal polarization plane.
e) The test is repeated under extreme voltage test conditions (see [annex 1, TC2.2]).

Frequency range	Frequency offset	Filter bandwidth	Approx video bandwidth
30 MHz to 50 MHz	-	10 kHz	30 kHz
50 MHz to 500 MHz	-	100 kHz	300 kHz
excl. relevant TX band:			
GSM 450: 450.4 MHz to 457.6 MHz;			
GSM 480: 478.8 MHz to 486 MHz			
500 MHz to 4 GHz,	0 to 10 MHz	100 kHz	300 kHz
	>= 10 MHz	300 kHz	1 MHz
Excl. relevant TX band:	>= 20 MHz	1 MHz	3 MHz
GSM 750: 777 MHz to 792 MHz	>= 30 MHz	3 MHz	3 MHz
GSM 850: 824 MHz to 849 MHz			
P- GSM: 890 MHz to 915 MHz;	(offset from edge		
E-GSM: 880 MHz to 915 MHz;	of relevant TX band)		
DCS: 1710 MHz to 1785 MHz.			
PCS 1900: 1850 MHz to 1910 MHz			
Relevant TX band:			
GSM 450: 450.4 MHz to 457.6 MHz	1.8 MHz to 6.0 MHz	30 kHz	100 kHz
GSM 480: 478.8 MHz to 486 MHz	> 6.0 MHz	100 kHz	300 kHz
GSM 750: 777 MHz to 792 MHz			
GSM 850: 824 MHz to 849 MHz	(offset from carrier)		
P-GSM: 890 MHz to 915 MHz			
E-GSM: 880 MHz to 915 MHz			
DCS: 1710 MHz to 1785 MHz			
PCS 1900: 1850 MHz to 1910 MHz			
NOTE 1: The filter and video bandwidths, and frequency offsets are only correct for measurements on an MS transmitting on a channel in the Mid ARFCN range.			
NOTE 2: Due to practical implementation of a SS, the video bandwidth is restricted to a maximum of 3 MHz.			

12.3 Test Equipment Used

Description	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Date
Universal Radio Communication Tester	Rohde&Schwarz	CMU200	1100.864.02	2016-3-22	2017-3-21
Pre-Amplifier	Ducommun	85745A	99056-01	2016-3-22	2017-3-21
Pre-Amplifier	HP	84487B	314500	2016-3-22	2017-3-21
Signal Generator	HP	865220B	522144B	2016-3-22	2017-3-21
Horn Antenna	Sunol Sciences	DRH-336	A05554	2016-3-22	2017-3-21
Horn Antenna	A.R.A	DRG-198/A	1135	2016-3-22	2017-3-21
Spectrum Analyzer	Agilent	E4446A	US2547074	2016-3-22	2017-3-21

12.4 Test Data

Environmental Conditions:

Temperature:	18 °C ~ 22 °C
Relative Humidity:	45 % ~ 66 %
ATM Pressure:	101.1 kPa ~ 101.7 kPa

EUT：	Alarm System	**Model Name：**	WG5
Temperature：	26°C	**Relative Humidity：**	60%
Pressure：	1010 hPa	**Test Voltage：**	DC 9V
Test Mode ：	GSM 900 Middle Channel		

Scan 30 MHz~4 GHz, Middle Channel.

No.	Freq. (MHz)	Ant.Pol. H/V	Reading (dBm)	Factor (dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Detector
1	1785.00	H	-47.52	7.86	-39.48	-30	9.48	Peak
2	2721.00	H	-56.43	8.65	-46.22	-30	16.22	Peak
3	3591.00	H	-57.36	9.67	-47.69	-30	17.69	Peak
4	1785.00	V	-47.14	9.25	-37.89	-30	7.89	Peak
5	2721.00	V	-58.76	8.65	-50.11	-30	20.11	Peak
6	3591.00	V	-53.24	9.72	-44.04	-30	14.04	Peak

EUT：	Alarm System	**Model Name：**	WG5
Temperature：	26°C	**Relative Humidity：**	60%
Pressure：	1010 hPa	**Test Voltage：**	DC 9V
Test Mode ：	GSM 1800 Middle Channel		

Scan 30 MHz~4 GHz, Middle Channel.

No.	Freq. (MHz)	Ant.Pol. H/V	Reading (dBm)	Factor (dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Detector
1	3496.80	H	-46.14	8.13	36.01	-30	6.01	Peak
2	5244.60	H	-50.88	7.85	43.03	-30	13.03	Peak
3	6993.70	H	-48.11	7.72	40.39	-30	10.39	Peak
4	3496.80	V	-44.25	8.12	35.75	-30	5.75	Peak
5	5244.60	V	-50.76	7.83	42.87	-30	12.87	Peak
6	6993.70	V	-48.65	7.71	40.94	-30	10.94	Peak

13 Radiated Spurious Emissions – MS In Idle Mode

13.1 Test Standard and Limit

13.1.1 Test Standard

EN 301 511 V9.0.2:2003 clause 4.2.17

13.1.2 Limits

Requirements: According to EN 301 511, section 4.2.17, the radiated spurious power emitted by the MS, when in idle mode, shall be no more than the levels in table 7 under normal and extreme voltage conditions.

Frequency range	Power level (dBm)	
	GSM 400 GSM 900 DCS 1800	GSM 700 GSM 850 PCS 1900
30 MHz to 880MHz	-57	-57
880 MHz to 915 MHz	-59	-57
915 MHz to 1000 MHz	-57	-57
1 GHz to 1710 MHz	-47	-57
1710 MHz to 1785 MHz	-53	
1785 MHz to 4 GHz	-47	
1 GHz to 1850 MHz		-47
1850 MHz to 1910 MHz		-53
1910 MHz to 4 GHz		-47

13.2 Test Procedure

a) Initially the test antenna is closely coupled to the MS and any spurious emission radiated by the MS is detected by the test antenna and receiver in the range 30 MHz to 4 GHz.
NOTE 1: This is a qualitative step to identify the frequency and presence of spurious emissions which are to be measured in subsequent steps.

b) The test antenna separation is set to the appropriate measurement distance and at each frequency at which a spurious emission has been detected the MS is rotated to obtain a maximum response. The effective radiated power of the emission is determined by a substitution measurement. In case of an anechoic shielded chamber pre-calibration may be used instead of a substitution measurement.

c) The measurement bandwidth based on a 5 pole synchronously tuned filter shall be according to table 8. The power indication is the peak power detected by the measuring system.
The measurement time on any frequency shall be such that it includes the time during which the MS receives a TDMA frame containing the paging channel.
NOTE 2: For these filter bandwidths some difficulties may be experienced with noise floor above required measurement limit. This will depend on the gain of the test antenna, and adjustment of the measuring system bandwidth is permissible. Alternatively, for test frequencies above 900 MHz, the test antenna separation from the MS may be reduced to 1 meter.

Frequency range	Filter bandwidth	Video bandwidth
30 MHz to 50 MHz 50 MHz to 4 GHz	10 kHz 100 kHz	30 kHz 300 kHz

d) The measurements are repeated with the test antenna in the orthogonal polarization plane.
e) The test is repeated under extreme voltage test conditions (see [Annex 1, TC2.2]).

13.3 Test Equipment Used

Description	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Date
Universal Radio Communication Tester	Rohde & Schwarz	CMU200	1100.864.02	2016-3-22	2017-3-21
Pre-Amplifier	Ducommun	85745A	99056-01	2016-3-22	2017-3-21
Pre-Amplifier	HP	84487B	314500	2016-3-22	2017-3-21
Signal Generator	HP	865220B	522144B	2016-3-22	2017-3-21
Horn Antenna	Sunol Sciences	DRH-336	A05554	2016-3-22	2017-3-21
Horn Antenna	A.R.A	DRG-198/A	1135	2016-3-22	2017-3-21
Spectrum Analyzer	Agilent	E4446A	US2547074	2016-3-22	2017-3-21

13.4 Test Data

Environmental Conditions:

Temperature:	18 °C ~ 22 °C
Relative Humidity:	45 % ~ 66 %
ATM Pressure:	101.1 kPa ~ 101.7 kPa

EUT：	Alarm System	**Model Name：**	WG5
Temperature：	26°C	**Relative Humidity：**	60%
Pressure：	1010 hPa	**Test Voltage：**	DC9V
Test Mode ：	GSM 900 Idle Mode		

Scan 30 MHz~4 GHz, Idle Mode

No.	Freq. (MHz)	Ant.Pol. H/V	Reading (dBm)	Factor (dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Detector
1	118.90	H	-79.76	-0.27	-80.03	-57	23.03	Peak
2	624.02	H	-67.13	-0.49	-67.62	-57	10.62	Peak
3	857.70	H	-69.83	-0.63	-70.46	-57	13.46	Peak
4	943.07	H	-63.36	-0.69	-64.05	-57	7.05	Peak
5	118.90	V	-67.94	-0.27	-68.21	-57	11.21	Peak
6	624.02	V	-65.20	-0.49	-65.69	-57	8.69	Peak
7	857.70	V	-73.84	-0.63	-74.47	-57	17.47	Peak
8	943.07	V	-69.78	-0.69	-70.47	-57	13.47	Peak

EUT：	Alarm System	**Model Name：**	WG5
Temperature：	26°C	**Relative Humidity：**	60%
Pressure：	1010 hPa	**Test Voltage：**	DC9V
Test Mode ：	DCS 1800 Idle Mode		

Scan 30 MHz~4 GHz, Idle Mode

No.	Freq. (MHz)	Ant.Pol. H/V	Reading (dBm)	Factor (dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Detector
1	118.90	H	-80.33	-0.27	-80.60	-57	23.60	Peak
2	624.02	H	-67.70	-0.49	-68.19	-57	11.19	Peak
3	857.70	H	-69.46	-0.63	-70.09	-57	13.09	Peak
4	899.80	H	-70.10	-0.69	-70.79	-59	11.79	Peak
5	118.90	V	-69.42	-0.27	-69.69	-57	12.69	Peak
6	624.02	V	-63.47	-0.49	-63.96	-57	6.96	Peak
7	857.70	V	-74.16	-0.63	-74.79	-57	17.79	Peak
8	899.80	V	-73.85	-0.69	-74.54	-59	15.54	Peak

14 Receiver Blocking and Spurious Response-Speech Channels

14.1 Test Standard and Limit

14.1.1 Test Standard

EN 301 511 V9.0.2:2003 clause 4.2.20

14.1.2 Limits

Requirements: According to EN 301 511, section 4.2.20, refer to sub clause of EN 300 607-1 (GSM 11.10-1) 14.7.1

The error rate measured in this test shall not exceed the test limit error rate values given in table 8. This shall apply under normal test voltage and ambient temperature, and with the interfering signal at any frequency in the range specified.

Channel	Type of measurement	Test limit error rate (%)	Minimum number of samples
TCH/FS Class Ⅱ	RBER	2.439	8200

The following exceptions are allowed:

GSM 900: A maximum of six failures in the frequency band 915 MHz to 980 MHz (which, if grouped, shall not exceed three 200 kHz channels per group).

A maximum of 24 failures in the combined bands 100 kHz to 915 MHz and 980 MHz to 12.75 GHz(which, if below FR and grouped, shall not exceed three 200 kHz channels per group).

DCS 1800: A maximum of twelve failures in the band 1785 MHz to 1920 MHz(which, if grouped , shall not exceed three 200 kHz channels per group).

A maximum of 24 in the combined bands 100 kHz to 1785 MHz and 1920 MHz to 12.75 GHz(which, if below FR and grouped, shall not exceed three 200 kHz channels per group).

If the number of failures do not exceed the maximum allowed figures stated above, the test of Test Procedure is repeated at the frequencies at which the failures occurred. The level of the unwanted signal is set to 70 dBuV emf and the performance requirement is once again that stated in the table above.

The number Error rate measured in this test shall not exceed the test limit error rate values given in table 9.

No failures are allowed at this lower unwanted signal level.

14.2 Test Procedure

The SS produces a static wanted signal and a static interfering signal at the same time. The amplitude of the wanted signal is set to 4 dB above the reference sensitivity level.

b) The unwanted signal is a C.W. signal (Standard test signal IO) of frequency FB. It is applied in turn on the subset of frequencies calculated in step c) in the overall range 100 kHz to 12,75 GHz, where FB is an integer multiple of 200 kHz.

However, frequencies in the range FR ±600 kHz are excluded.

NOTE: Allowance must be made for possible spurious signals arising from the SS. These are particularly likely at sub harmonic frequencies nFB where n = 2, 3, 4, 5, etc.

c) The frequencies at which the test is performed (adjusted to an integer multiple of 200 kHz channels most closely approximating the absolute frequency of the calculated blocking signal frequency) are the combined frequencies from i), ii) and iii) below:

i) The total frequency range formed by:

E-GSM 900 the frequencies between F_{lo} + (IF_1 + IF_2 + ... + IF_n + 17,5 MHz) and F_{lo} - (IF_1 + IF_2 + ... + IF_n + 17,5 MHz).

And the frequencies +100 MHz and -100 MHz from the edge of the relevant receive band.

Measurements are made at 200 kHz intervals.

ii) The three frequencies IF_1, IF_1 + 200 kHz, IF_1 - 200 kHz.

iii) The frequencies:

mF_{lo} + IF_1;
mF_{lo} - IF_1;
mFR;
where m is all positive integers greater than or equal to 2 such that either sum lies in the range 100 kHz to
12,75 GHz.

The frequencies in step ii) and iii) lying in the range of frequencies defined by step i) above need not be
repeated.

Where:

F_{lo} - local oscillator applied to first receiver mixer
IF_1 ... IF_n - are the n intermediate frequencies
F_{lo}, IF_1, IF_2 ... IF_n - shall be declared by the manufacturer in the PIXIT statement 3GPP TS 51.010-1 annex 3.

d) The level of the unwanted signal is set according to following table.

Level of unwanted signals

	GSM 900		DCS 1800
	Small MS	Other MS	
FREQUENCY	LEVEL IN dBuV emf		
FR +/- 600 kHz to FR +/- 800 kHz	70	75	70
FR +/- 800 kHz to FR +/-1.6 MHz	70	80	70
FR +/- 1.6 MHz to FR +/-3 MHz	80	90	80
915 MHz to FR – 3 MHz	90	90	-
FR+3 MHz to 980 MHz	90	90	-
1785 MHz to FR- 3 MHz	-	-	87
FR + 3 MHz to 1920 MHz	-	-	87
835 MHz to <915 MHz	113	113	
>980 MHz to 1000 MHz	113	113	
100 kHz to < 835 MHz	90	90	
> 1000 MHz to 12.75 GHz	90	90	
100 kHz to 1705 MHz	-	-	113
> 1705 MHz to < 1785 MHz	-	-	101
> 1920 MHz to 1980 MHz	-	-	101
> 1980 MHz to 12.75 GHz	-	-	90

Note 1: These values differ from GSM 05.05 because of the practical generator limits in the SS.
Note 2: For an E-GSM 900 MS the level of the unwanted signal in the band 905 MHz to <915 MHz is relaxed to 108 dBuV emf.

e) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

The SS tests the RBER compliance for the bits of class Ⅱ, by examining sequences of at least the minimum number of samples of consecutive bits of class Ⅱ, where bits are taken only from those frames for which no bad frame indication was given. The number of error events is recorded.

If a failure is indicated it is noted and counted towards the allowed exemption totals.

In the case of failures discovered at the predicted frequencies at steps f ii), iii) or iv) the test is repeated on the adjacent channels +/- 200 kHz away. If either of these two frequencies fail then the next channel 200 kHz beyond is also tested. This process is repeated until all channels constituting the group of the failures is known.

14.3 Test Equipment Used

Description	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Date
Universal Radio Communication Tester	Rohde & Schwarz	CMU200	1100.864.02	2016-3-22	2017-3-21
Pre-Amplifier	Ducommun	85745A	99056-01	2016-3-22	2017-3-21
Pre-Amplifier	HP	84487B	314500	2016-3-22	2017-3-21

14.4 Test Data

Environmental Conditions:

Temperature:	18 °C ~ 22 °C
Relative Humidity:	45 % ~ 66 %
ATM Pressure:	101.1 kPa ~ 101.7 kPa

(1)EGSM 900 Band

Channel frequency(MHz)	FBER(%)	Number of test samples	Limit(%)	Result
880.2	<0.95	10000	2.439	pass
898.4	<0.89	10000	2.439	pass
914.8	<0.82	10000	2.439	pass

(2)DCS 1800 Band

Channel frequency(MHz)	FBER(%)	Number of test samples	Limit(%)	Result
1710.2	<0.56	10000	2.439	pass
1747.8	<0.58	10000	2.439	pass
1784.8	<0.68	10000	2.439	pass

15 Photographs - Constructional Details

Photo 1

Photo 2

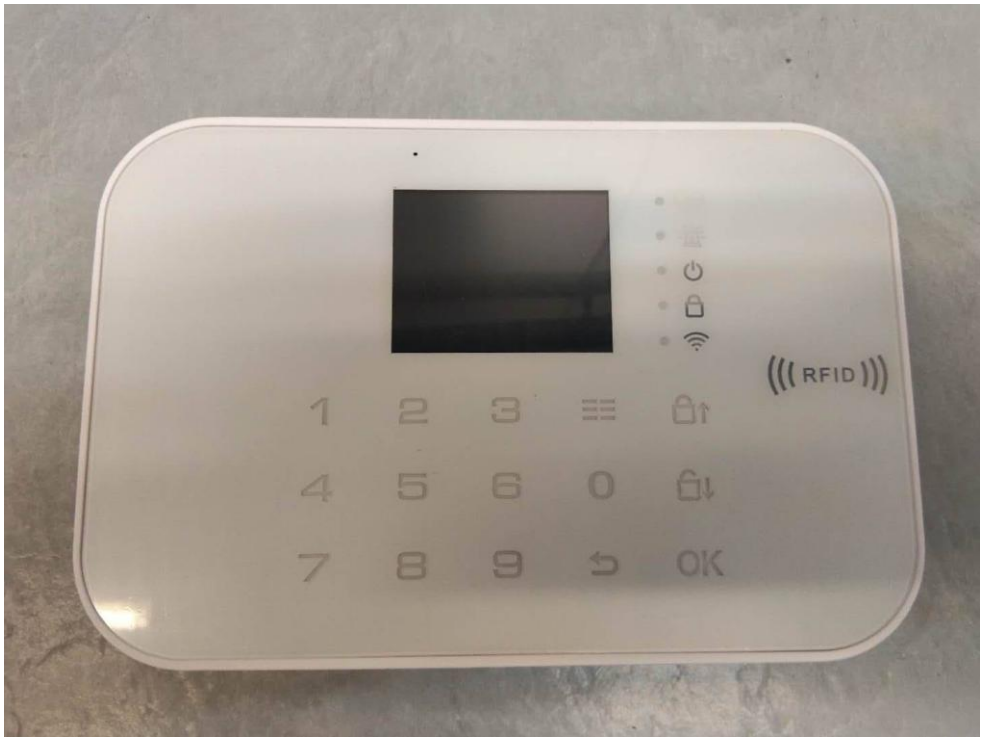


Photo 3

Photo 4