RF TEST REPORT

Application No.	:	LH-230702312134
Applicant	:	Shenzhen Cheyang Technology Co., Ltd.
Equipment Under Test (EUT)		
EUT Name	:	Car radio
Model No.	:	Z0625
Serial No.	:	See page 4
Brand Name	:	N/A
Receipt Date	:	2023-07-21
Test Date	:	2023-07-21 to 2023-08-02
Issue Date	:	2023-08-02
Standards	:	ETSI EN 301 511 V12.5.5
Conclusions	:	**PASS**
		In the configuration tested, the EUT complied with the standards specified above

Test/Witness Engineer : York xia

Approved & Authorized Jack su

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in the report.

TABLE OF CONTENTS

1 General Information

1.1 Client Information

Applicant	:	Shenzhen Cheyang Technology Co., Ltd.
Address	:	369 Bulong Road, Ma'antang Community, Bantian Street, Longgang District, Shenzhen
Manufacturer	:	Shenzhen Cheyang Technology Co., Ltd.
Address	:	369 Bulong Road, Ma'antang Community, Bantian Street, Longgang District, Shenzhen

1.2 General Description of EUT (Equipment Under Test)

EUT Name	:	Car radio	
Model No.	:	Z0625	
Serial No.	:	Z0625C1, Q3366, Q3371, Q3161, Q3221KT, A2618KT, Q3461, A2769, Q3336, Q3203, K0129, A2516KT, Q3162KT, A2308KT, Q3217KT, AP019, Q3150, A2628KT, K0126, A2818, A2065, A2718, N3000KT, N2052, A2749, A2420F3, A2422F3, A2424F3, A2426F3, A2428F3, CY-1001, A3018, N2042, A3012, A3019, A3013, A3107, A2319, A2798, A3061, A2795, A2181, A2222, Q3570, A2905, A2799, Q3516, M1520, A2742, A3040, A3041, A3011, A2797, A2748, A3032, Q3300, A2772, A3017, A3091, A3056, A3195, Q3508, Z2085, A3215, A3080, A2666, A2915, A2743, A3039, A2796, A3049, A2773, A2893, Q3184, A2207, A3196, A3194, A2761, A3037, A2071, A2747, A2950, A2184, A3067, A3021, A3048, A2787, A3197, A2794, A2762, A3054, A2638, A3216, A3079, A3066, A3047, A3100, A2112, W5087, Q3306, A2900, A3082, A3038, A2882, A3084, A2740, A2806, Q3196, A3110, Q3521, A3065	
Model difference	:	The different models are identical in schematic and critical component, the only different is the appearance.	
Product Description	:	Operation Frequency:	E-GSM 900MHz: Transmit: 880 MHz to 915 MHz Receive: 925MHz to 960 MHz GSM 1800MHz Transmit: 1710 MHz to 1785 MHz Receive: 1805 MHz to 1880 MHz UMTS Band Ⅰ: Transmit :1920 MHz to 1980 MHz Receive :2110 MHz to2170 MHz
		Transmit Power:	E-GSM 900MHz: 33 dBm GSM 1800MHz: 30 dBm UMTS Band Ⅰ: 24 dBm
		Modulation Type:	E-GSM 900 MHz: GMSK 8-PSK GSM 1800 MHz: GMSK 8-PSK UMTS Band Ⅰ: QPSK/16QAM

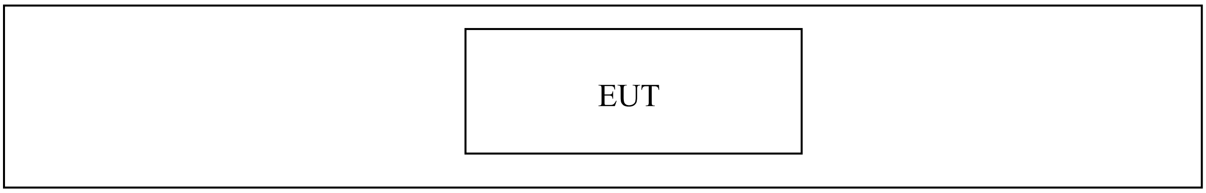
		Date Rate:	GPRS:9.6 kbps UMTS Band Ⅰ: PS 384kbps UL/DL CS 64kbps DL/CS
Power Rating	:	DC 12V, 1A	
Connecting I/O Port(S)		Please refer to the User's Manual	

Note:

(1) For a more detailed features description, please refer to the manufacturer’s specifications or the User’s Manual.

(2) The EUT was a wireless router that can establish the connection between various net work systems. It used GSM with GPRS in the E-GSM 900 MHz, GSM 1800 MHz and PCS, and used UMTS operation in the 900 MHz Band Ⅷ and 2100 MHz Band Ⅰ.
Not all of the frequency bands are available for use within Europe and the device was only evaluated over the bands available for use in Europe.

1.3 Block Diagram Showing the Configuration of System Tested



1.4 Description of Support Units

The EUT has been tested as an independent unit.

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.

E-GSM 900	
Lowest Channel	CH975: 880.2MHz
Middle Channel	CH38: 897.4MHz
Highest Channel	CH124:914.8MHz

DCS 1800	
Lowest Channel	CH512: 1710.2MHz
Middle Channel	CH700: 1710.4MHz
Highest Channel	CH885:1784.8MHz

WCDMA Band Ⅰ	
Lowest Channenl	CH9612:1922.4MHz
Middle Channel	CH9750:1950.0MHz
Highest Channel	CH9888:1977.6MHz

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)= -10°C High Temperature (HT)= +55°C
Normal Voltage of EUT (NV):	AC 230V/50Hz
Extreme Voltage of the EUT	Low Voltage(LV)= 207V High Voltage(HV)= 253V

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

1.7 Test Facility

The testing report were performed by the Shenzhen LH Testing Technology Co., Ltd., in their facilities located at 106 and 107, building B15, Yintian Industrial Zone, Yantian community, Xixiang street, Bao'an District, Shenzhen

2 Test Results Summary

ETSI EN 301 511 V12.5.5: 2018	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	N/A
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 Transmitter-Frequency Error and Phase Error

3.1 Measurement Definition

3.1.1 Test Standard

ETSI EN 301 511 V12.5.5: 2018 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:

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

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:

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

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

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

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.	Last Cal.	Cal. Interval
WUHUAN	Temperature & Humidity Chamber	HTP204	20050364	2022-12-29	1 Year
Rohde & Schwarz	Universal Radio Communication Tester	CMU200	1100.0002.0	2022-12-29	1 Year

3.4 Test Test Data

Environmental Conditions:

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

GSM 900

0.1ppm means 89.8Hz for frequency 898.0MHz

MS under maximum power control level

GSM 900	Test Condition	Frequency Error (Hz)	Limit (Hz)	Result	Phase Error (deg)		Limit (deg)	Reult
Reference Frequency 898.0 (MHz)	Normal	2	89.8	Pass	RMS	1.1	5	Pass
					Peak	3.4	20	Pass
	L.V. L.T.	-1	89.8	Pass	RMS	1.1	5	Pass
					Peak	3.9	20	Pass
	L.V. H.T.	-6	89.8	Pass	RMS	0.9	5	Pass
					Peak	2.4	20	Pass
	H.V L.T	0	89.8	Pass	RMS	1.3	5	Pass
					Peak	4.0	20	Pass
	H.V. H.T	-20	89.8	Pass	RMS	1.0	5	Pass
					Peak	2.9	20	Pass
	Vibration	15	89.8	Pass	RMS	1.3	5	Pass
					Peak	2.8	20	Pass

MS under minimum power control level

GSM 900	Test Condition	Frequency Error (Hz)	Limit (Hz)	Result	Phase Error (deg)		Limit (deg)	Reult
Reference Frequency 898.0 (MHz)	Normal	5	89.8	Pass	RMS	1.0	5	Pass
					Peak	2.7	20	Pass
	L.V. L.T.	13	89.8	Pass	RMS	1.0	5	Pass
					Peak	2.8	20	Pass
	L.V. H.T.	-22	89.8	Pass	RMS	1.0	5	Pass
					Peak	3.0	20	Pass
	H.V L.T	12	89.8	Pass	RMS	1.1	5	Pass
					Peak	2.9	20	Pass
	H.V. H.T	-7	89.8	Pass	RMS	0.9	5	Pass
					Peak	2.5	20	Pass
	Vibration	13	89.8	Pass	RMS	1.7	5	Pass
					Peak	2.5	20	Pass

DCS 1800

0.1ppm means 174.78Hz for frequency 174.7.8MHz

MS under maximum power control level

DCS 1800	Test Condition	Frequency Error (Hz)	Limit (Hz)	Result	Phase Error (deg)		Limit (deg)	Reult
Reference Frequency 1747.8 (MHz)	Normal	-13.54	174.78	Pass	RMS	2.77	5	Pass
					Peak	6.44	20	Pass
	L.V. L.T.	-16.93	174.78.	Pass	RMS	2.53	5	Pass
					Peak	6.15	20	Pass
	L.V. H.T.	-25.21	174.78	Pass	RMS	2.51	5	Pass
					Peak	6.07	20	Pass
	H.V L.T	-20.01	174.78	Pass	RMS	2.48	5	Pass
					Peak	5.96	20	Pass
	H.V. H.T	-16.75	174.78	Pass	RMS	2.70	5	Pass
					Peak	6.54	20	Pass
	Vibration	-17.12	174.78	Pass	RMS	2.54	5	Pass
					Peak	6.43	20	Pass

MS under minimum power control level

GSM 900	Test Condition	Frequency Error (Hz)	Limit (Hz)	Result	Phase Error (deg)		Limit (deg)	Reult
Reference Frequency 898.0 (MHz)	Normal	5	89.8	Pass	RMS	1.0	5	Pass
					Peak	2.7	20	Pass
	L.V. L.T.	13	89.8	Pass	RMS	1.0	5	Pass
					Peak	2.8	20	Pass
	L.V. H.T.	-22	89.8	Pass	RMS	1.0	5	Pass
					Peak	3.0	20	Pass
	H.V L.T	12	89.8	Pass	RMS	1.1	5	Pass
					Peak	2.9	20	Pass
	H.V. H.T	-7	89.8	Pass	RMS	0.9	5	Pass
					Peak	2.5	20	Pass
	Vibration	13	89.8	Pass	RMS	1.7	5	Pass
					Peak	2.5	20	Pass

4 Transmitter-Frequency Error Under Multipath and Interference Conditions

4.1 Test Standard and Limit

4.1.1 Test Standard

ETSI EN 301 511 V12.5.5: 2018 clause 4.2.2

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.	Last Cal.	Cal. Interval
Universal Radio Communication Tester	Rohde&Schwarz	CMU200	1100.864.02	2022-12-29	1 Year
Spectrum Analyzer	Rohde&Schwarz	FSEM30	849621/019	2022-12-29	1 Year

Environmental Conditions:

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

4.4 Test Data

E-GSM 900

1) MS under maximum power control level:

	Test Condition		Frequency error (Hz)	Limit (Hz)	Result
EGSM 900 Ref. Freq. 898(MHz)	**Normal**	RA250	+21	±300	Pass
		HT100	+19	±180	Pass
		TU50	+20	±160	Pass
		TU3	+19	±230	Pass
	L.V. L.T.	RA250	-3	±300	Pass
		HT100	-2	±180	Pass
		TU50	-3	±160	Pass
		TU3	-2	±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. 898(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

3) MS under maximum power control level:

	Test Condition		Frequency error (Hz)	Limit (Hz)	Result
DCS 1800 Ref. Freq. 1800(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

4) MS under minimum power control level:

	Test Condition		Frequency error (Hz)	Limit (Hz)	Result
DCS 1800 Ref. Freq. 1800(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

ETSI EN 301 511 V12.5.5: 2018 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.

5.2 Test Procedure

a) 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.

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:

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

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:

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

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

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:

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

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 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.

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: 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).

h) 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.**	**Last Cal.**	**Cal. Interval**
Universal Radio Communication Tester	Rohde& Schwarz	CMU200	1100.864.02	2022-12-29	1 Year
Temperature& Humidity Chamber	Wuhuan	HTP206	200611212	2022-12-29	1 Year

5.4 Test Data

Environmental Conditions:

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

0.1 ppm means 89.8Hz for frequency 898.0 MHz

MS under maximum power control level

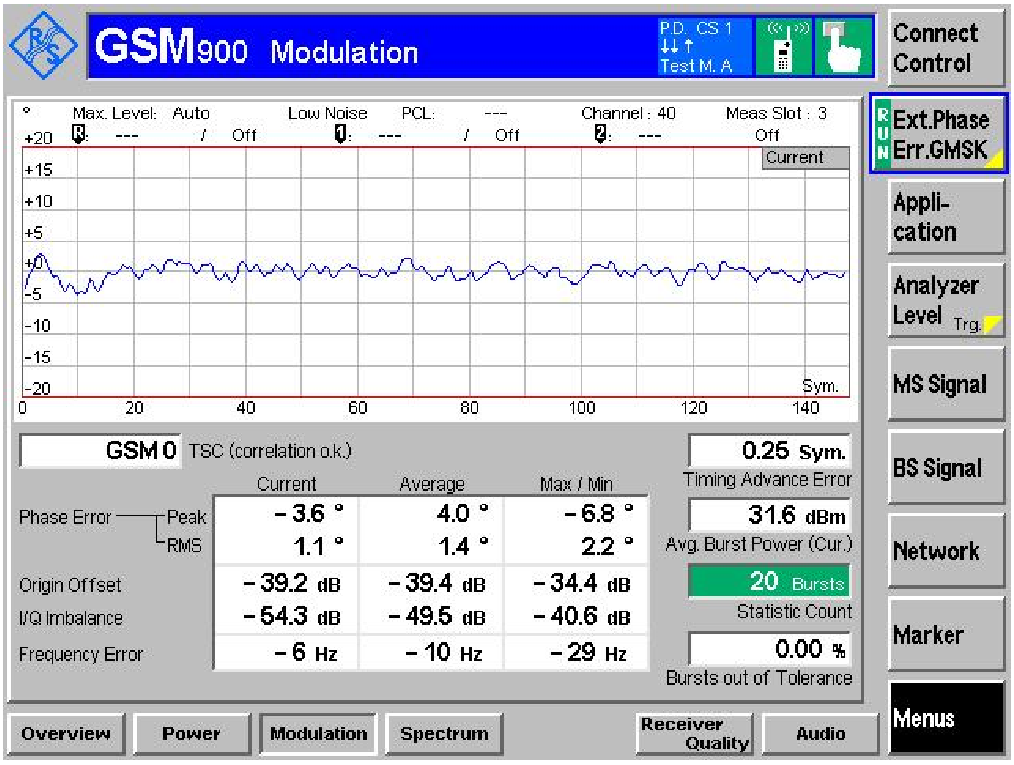
GSM 900 (GPRS)	Test Condition	Frequency Error (Hz)	Limit (Hz)	Result	Phase Error (degree)		Limit (degree)	Result
Reference Frequency 898.0 (MHz)	Normal	-10	89.8	Pass	RMS	1.4	5	Pass
					Peak	4.0	20	Pass
	L.V. L.T.	-12	89.8	Pass	RMS	1.4	5	Pass
					Peak	4.3	20	Pass
	L.V. H.T.	-6	89.8	Pass	RMS	1.4	5	Pass
					Peak	4.3	20	Pass
	H.V L.T	-6	89.8	Pass	RMS	1.5	5	Pass
					Peak	4.6	20	Pass
	H.V. H.T	-11	89.8	Pass	RMS	1.1	5	Pass
					Peak	3.3	20	Pass
	Vibration	-10	89.8	Pass	RMS	1.2	5	Pass
					Peak	4.1	20	Pass

MS under minimum power control level

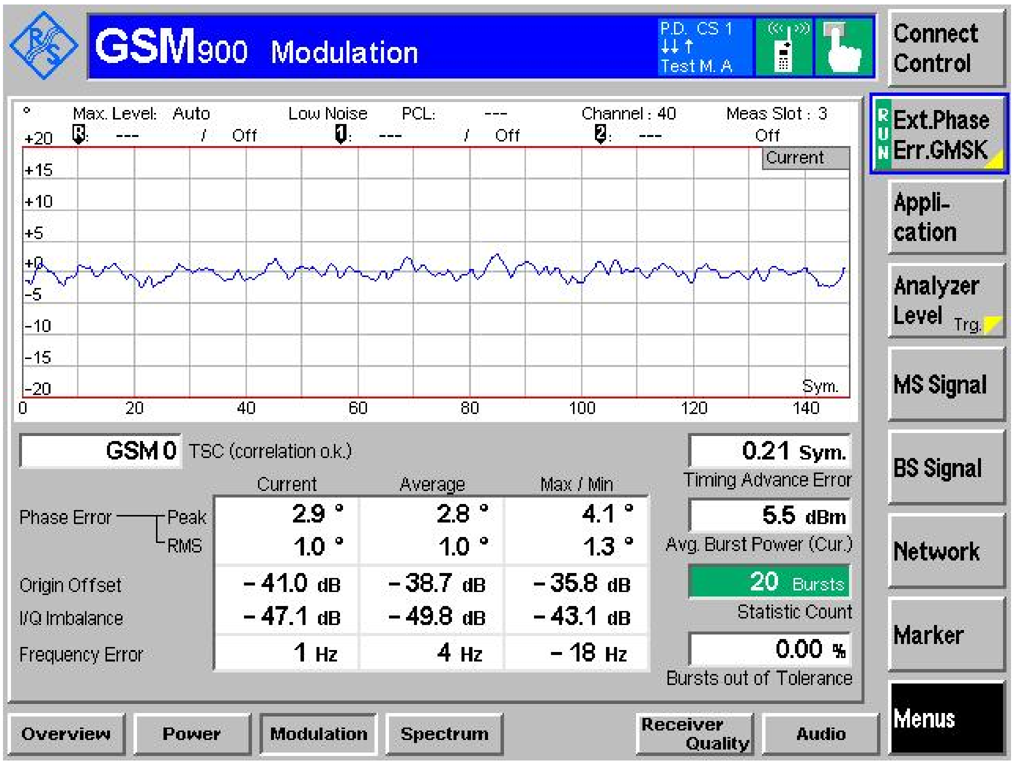
GSM 900 (GPRS)	Test Condition	Frequency Error (Hz)	Limit (Hz)	Result	Phase error (deg)		Limit (deg)	Result
Reference Frequency 898.0 (MHz)	Normal	4	89.8	Pass	RMS	1.0	5	Pass
					Peak	2.8	20	Pass
	L.V. L.T.	5	89.8	Pass	RMS	1.0	5	Pass
					Peak	2.8	20	Pass
	L.V. H.T.	4	89.8	Pass	RMS	1.0	5	Pass
					Peak	2.8	20	Pass
	H.V L.T	0	89.8	Pass	RMS	1.0	5	Pass
					Peak	2.8	20	Pass
	H.V. H.T	-4	89.8	Pass	RMS	1.1	5	Pass
					Peak	2.5	20	Pass
	Vibration	-6	89.8	Pass	RMS	1.0	5	Pass
					Peak	2.7	20	Pass

Normal Condition:

Maximum Power Control Level (Middle Channel)



Minimum Power Control Level (Middle Channel)



DCS1800

0.1ppm means 174.78Hz for frequency 1747.8MHz

MS under maximum power control level

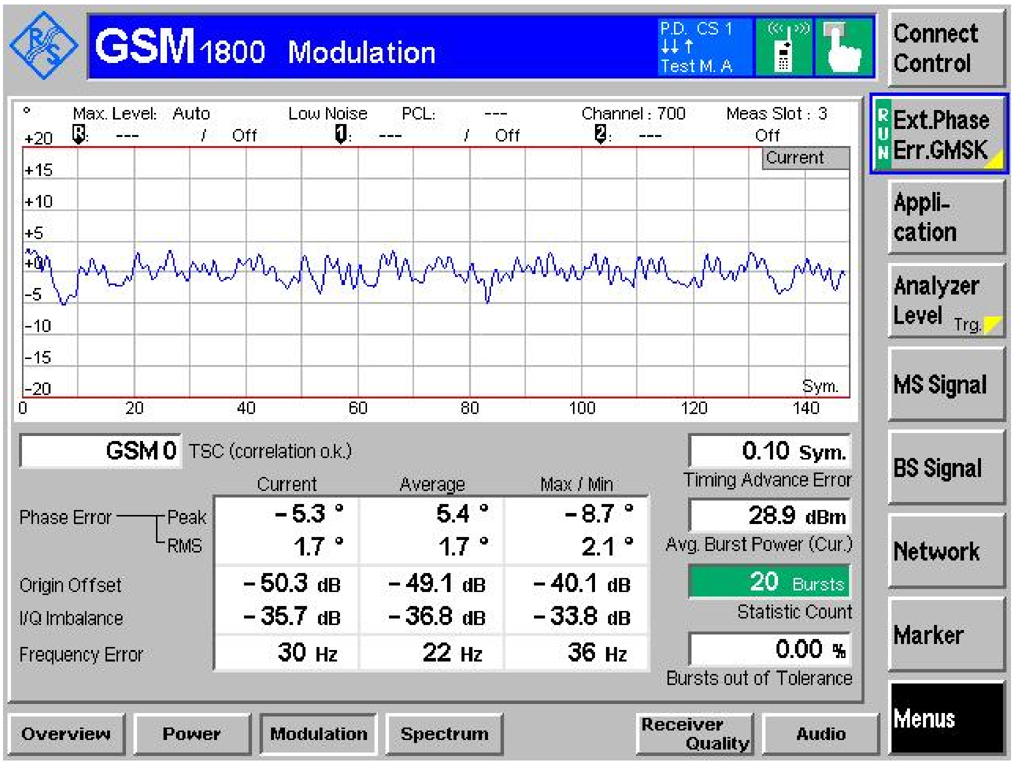
GSM1800 (GPRS)	Test Condition	Frequency Error (Hz)	Limit (Hz)	Result	Phase Error (degree)		Limit (degree)	Result
Reference Frequency 1747.8 (MHz)	Normal	22	174.78	Pass	RMS	1.7	5	Pass
					Peak	5.4	20	Pass
	L.V. L.T.	35	174.78	Pass	RMS	1.6	5	Pass
					Peak	5.4	20	Pass
	L.V. H.T.	25	174.78	Pass	RMS	1.7	5	Pass
					Peak	5.4	20	Pass
	H.V L.T	26	174.78	Pass	RMS	1.6	5	Pass
					Peak	1.1	20	Pass
	H.V. H.T	9	174.78	Pass	RMS	1.7	5	Pass
					Peak	5.3	20	Pass
	Vibration	27	174.78	Pass	RMS	1.6	5	Pass
					Peak	5.3	20	Pass

MS under minimum power control level

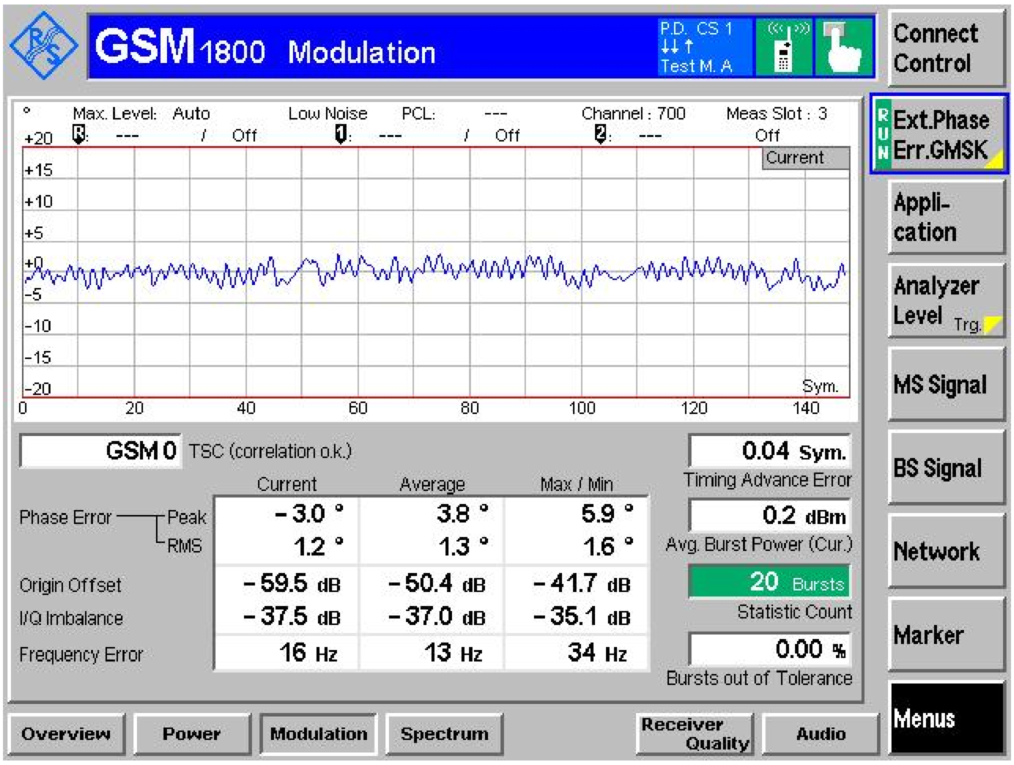
GSM1800 (GPRS)	Test Condition	Frequency Error (Hz)	Limit (Hz)	Result	Phase error (deg)		Limit (deg)	Result
Reference Frequency 1747.8 (MHz)	Normal	13	174.78	Pass	RMS	1.3	5	Pass
					Peak	3.8	20	Pass
	L.V. L.T.	30	174.78	Pass	RMS	1.6	5	Pass
					Peak	4.5	20	Pass
	L.V. H.T.	28	174.78	Pass	RMS	1.3	5	Pass
					Peak	3.9	20	Pass
	H.V L.T	23	174.78	Pass	RMS	1.6	5	Pass
					Peak	4.6	20	Pass
	H.V. H.T	26	174.78	Pass	RMS	1.3	5	Pass
					Peak	3.8	20	Pass
	Vibration	29	174.78	Pass	RMS	1.5	5	Pass
					Peak	4.4	20	Pass

Normal Condition:

Maximum Power Control Level (Middle Channel)



Minimum Power Control Level (Middle Channel)



6 Transmitter Output Power and Burst Timing

6.1 Test Standard and Limit

6.1.1 Test Standard

ETSI EN 301 511 V12.5.5: 2018 clause 4.2.4

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.	Last Cal.	Cal. Interval
Universal Radio Communication Tester	Rohde& Schwarz	CMU200	1100.864.02	2022-12-29	1 Year
Temperature& Humidity Chamber	Wuhuan	HTP206	200611212	2022-12-29	1 Year

6.4 Test Data

Environmental Conditions:

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

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	31.38	32.47	31.65	32.68	31.76	Pass
6	30.05	31.71	30.88	31.83	30.95	
7	28.1	29.33	28.54	29.40	28.56	
8	26.2	27.40	26.67	27.48	26.73	
9	24.1	25.28	24.61	25.35	24.65	
10	22.2	23.42	22.76	23.48	22.82	
11	20.2	21.42	20.76	21.47	20.82	
12	17.8	18.98	18.44	19.06	18.50	
13	16.1	17.20	16.74	17.33	16.82	
14	14.4	15.43	14.98	15.53	15.08	
15	12.5	13.55	13.13	13.67	13.23	
16	10.5	11.56	11.15	11.71	11.26	
17	8.5	9.48	8.98	9.66	9.13	
18	6.8	7.92	7.28	8.12	7.44	
19	4.78	5.95	5.08	6.15	5.35	

Middle Channel (898.0MHz) Out Power

Middle Channel F = 898.0 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	31.58	33.08	32.20	33.28	32.30	Pass
6	30.71	32.29	31.48	32.43	31.55	
7	28.44	29.98	29.23	30.07	29.30	
8	26.58	28.10	27.38	28.16	27.44	
9	24.49	25.98	25.32	26.04	25.36	
10	22.62	24.10	23.48	24.17	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	

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	31.66	33.10	32.32	33.26	33.29	Pass
6	30.85	32.18	31.46	32.26	31.52	
7	28.49	29.75	29.09	29.84	29.12	
8	26.63	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	7.07	6.39	

DCS 1800 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	28.69	30.37	29.50	30.43	29.55	Pass
1	26.4	27.91	27.30	27.95	27.36	
2	24.9	26.30	25.78	26.34	25.81	
3	22.1	23.50	2305	23.53	23.09	
4	20.1	21.54	21.14	21.56	21.17	
5	18.1	19.58	19.23	19.61	19.28	
6	16.0	17.45	17.14	17.43	17.18	
7	13.5	14.80	14.65	14.86	14.73	
8	11.7	12.94	12.88	12.99	12.94	
9	10.4	11.53	11.51	11.59	11.62	
10	8.5	9.65	9.72	9.74	9.80	
11	6.7	7.79	7.88	7.91	7.97	
12	4.4	5.54	5.58	5.68	5.72	
13	2.1	3.26	3.08	3.41	3.29	
14	0.6	1.88	1.46	2.06	1.68	
15	0.54	0.88	0.19	1.06	0.42	

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	28.96	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	

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

ETSI EN 301 511 V12.5.5: 2018 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.	Last Cal.	Cal. Interval
Temperature& Humidity Chamber	Wuhuan	HTP206	200611212	2022-12-29	1 Year
Universal Radio Communication Tester	Rohde&Schwarz	CMU200	1100.864.02	2022-12-29	1 Year

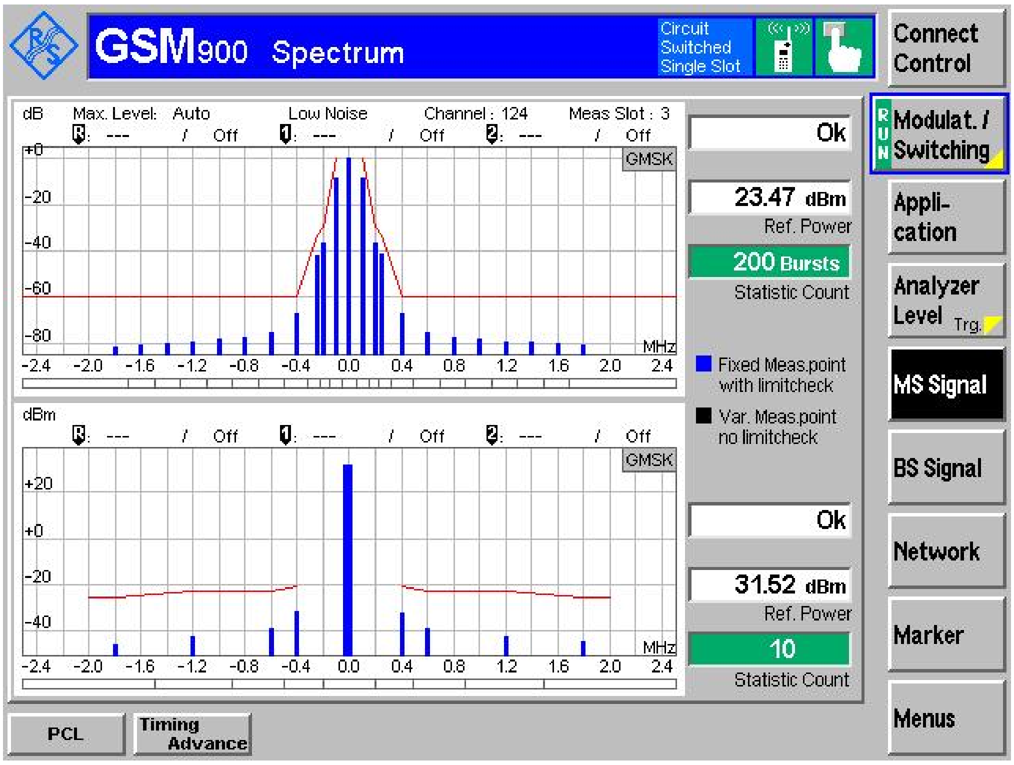
7.4 Test Data

Environmental Conditions:

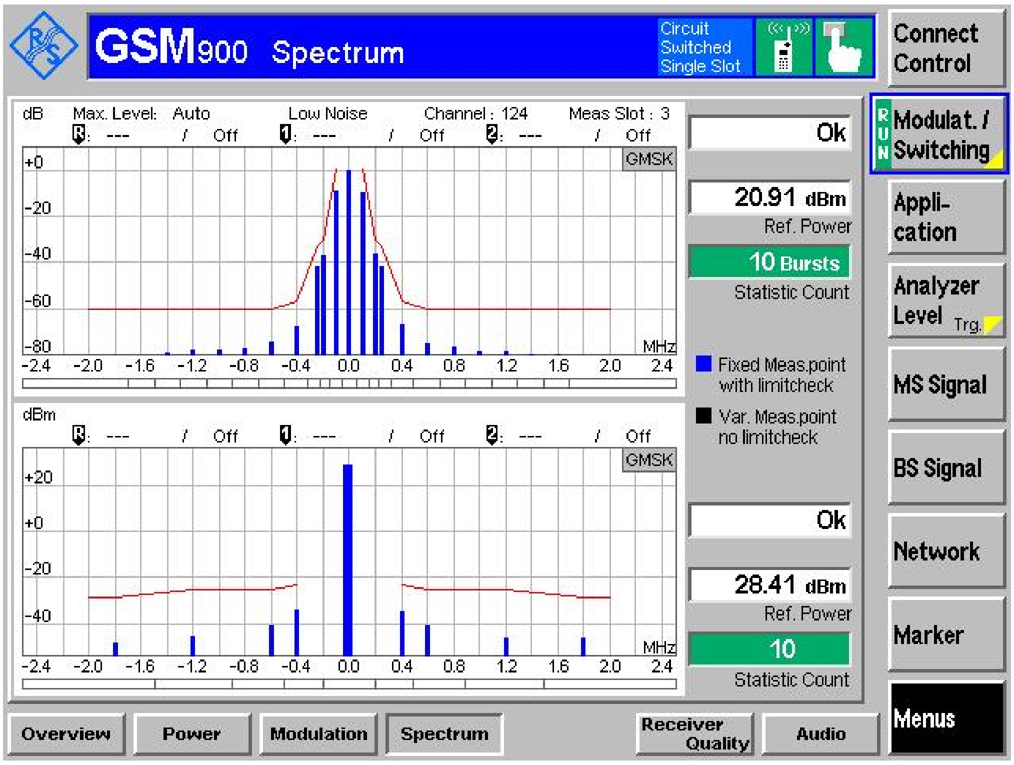
Temperature:	25 ° C
Relative Humidity:	56%
ATM Pressure:	100.2 kPa

GSM900:

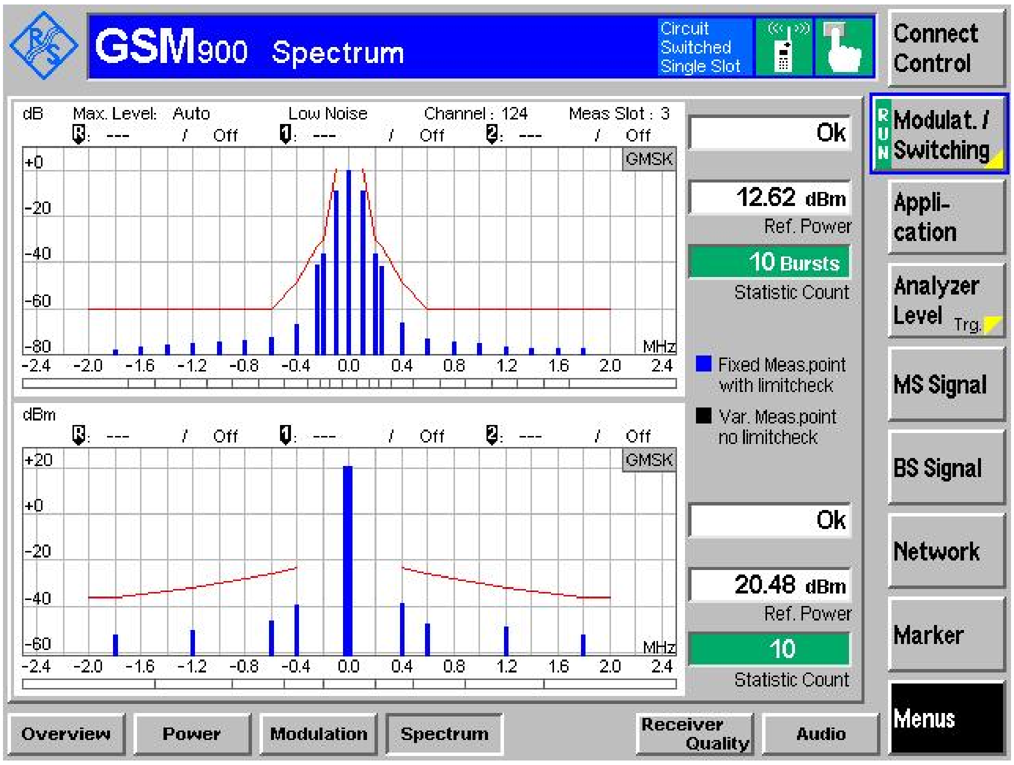
Normal Condition Power Control Level 5, High Channel



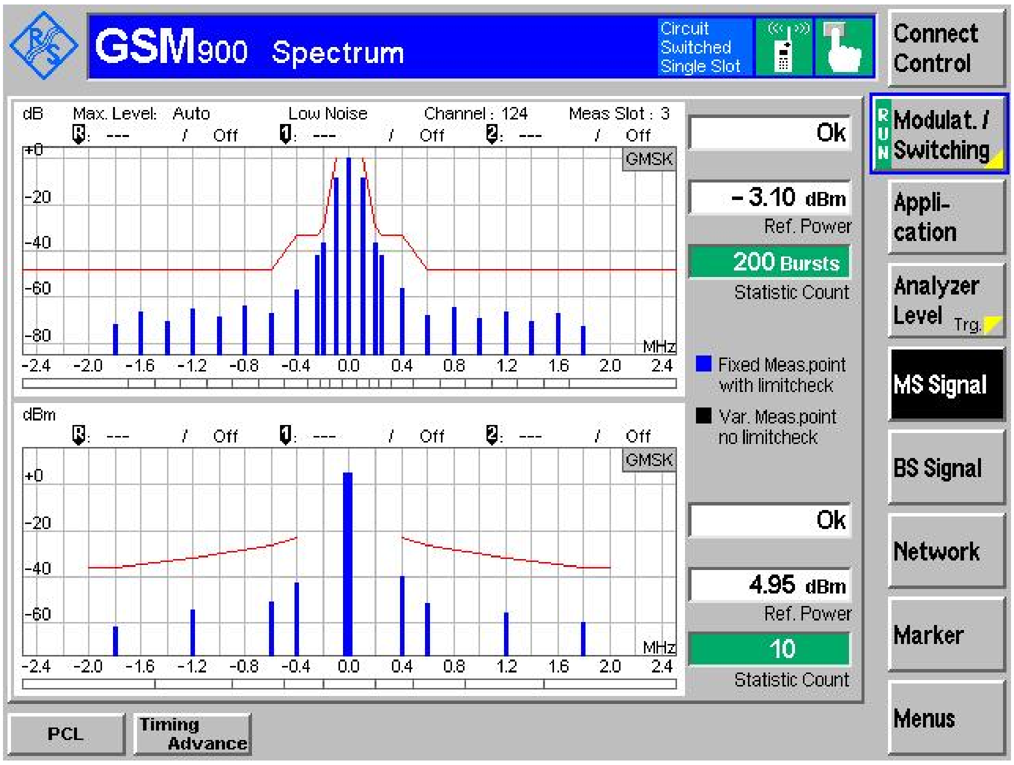
Normal Condition Power Control Level 7, High Channel



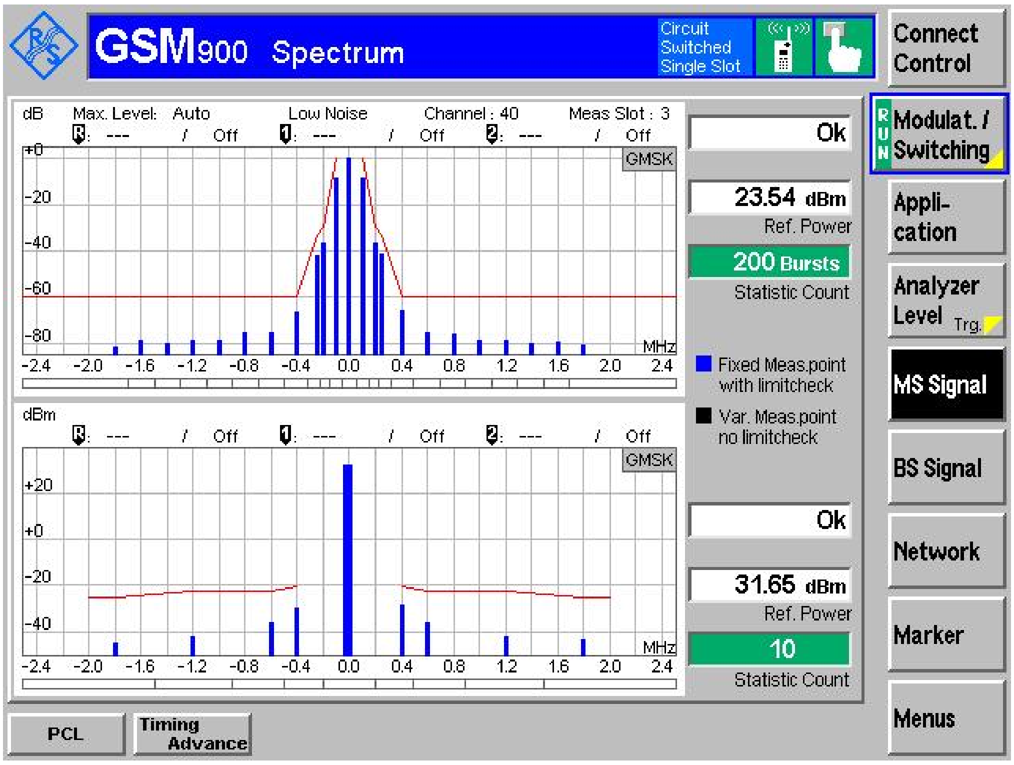
Normal Condition Power Control Level 11, High Channel



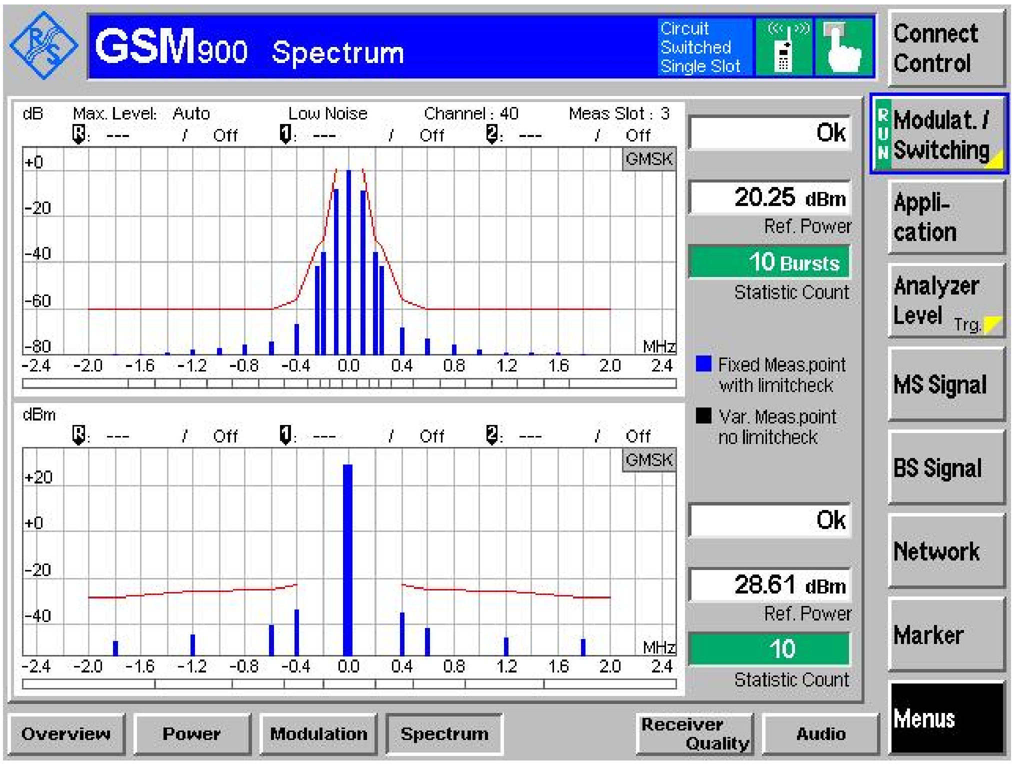
Normal Condition Power Control Level 19, High Channel



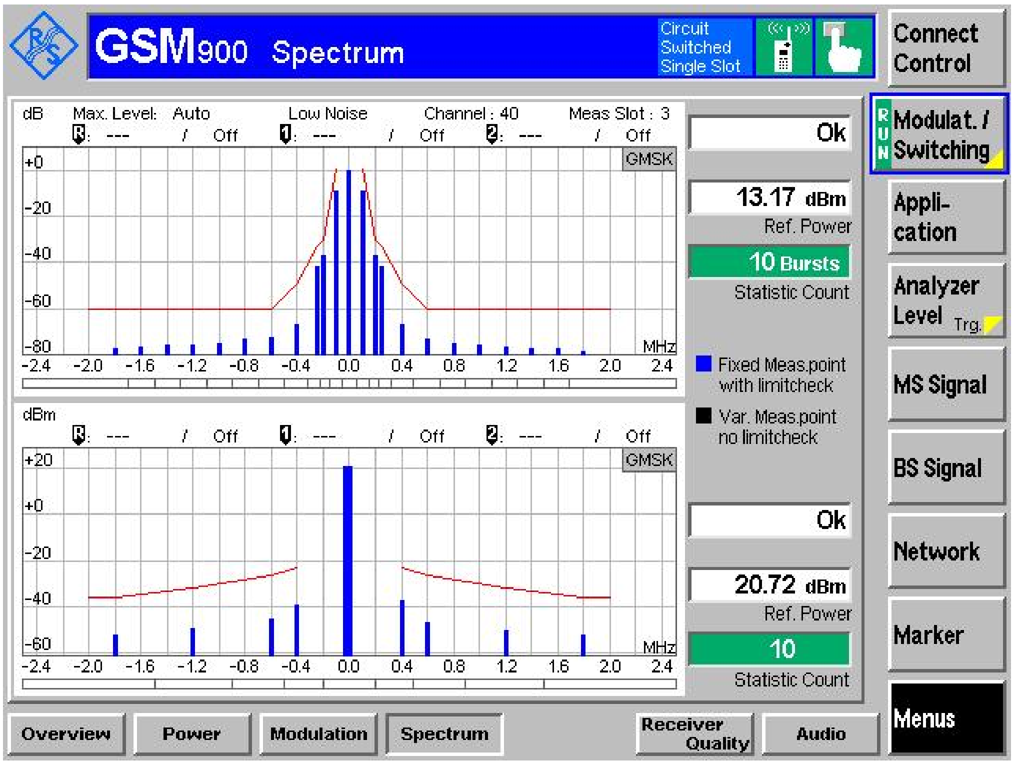
Normal Condition Power Control Level 5, Middle Channel



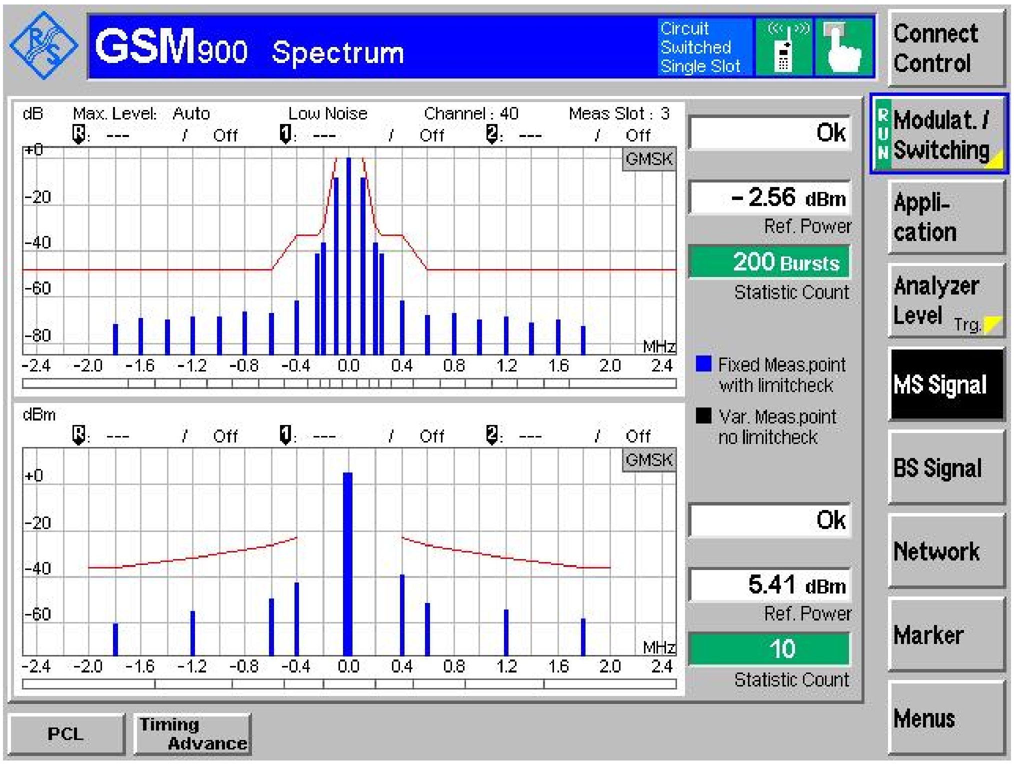
Normal Condition Power Control Level 7, Middle Channel



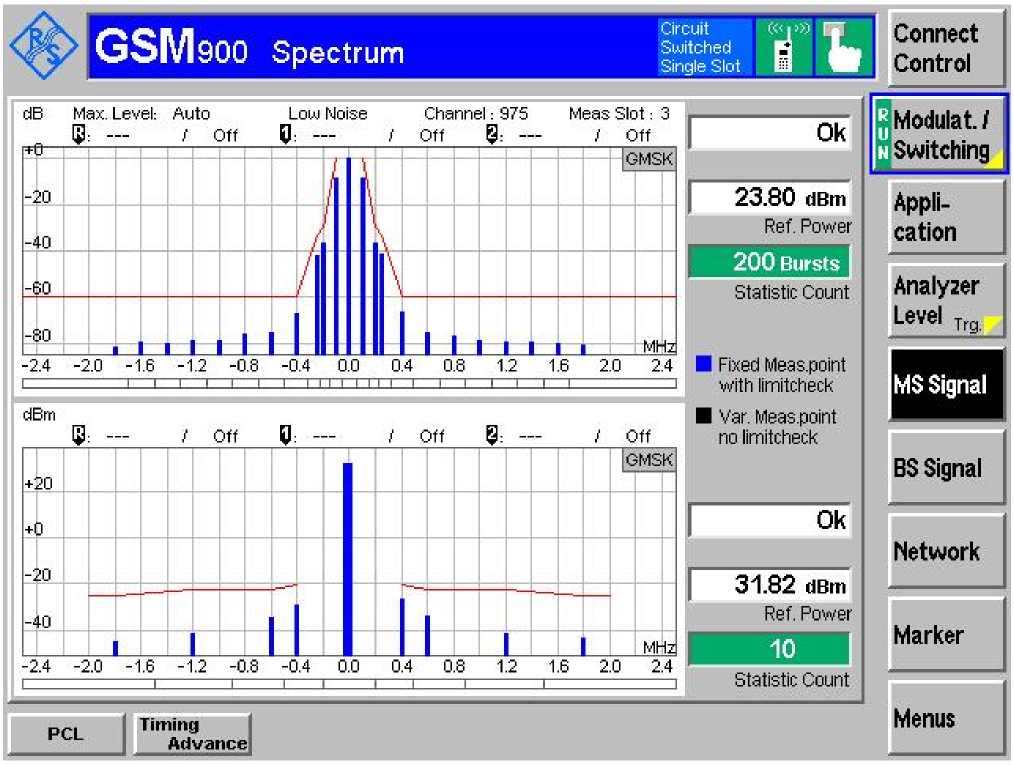
Normal Condition Power Control Level 11, Middle Channel



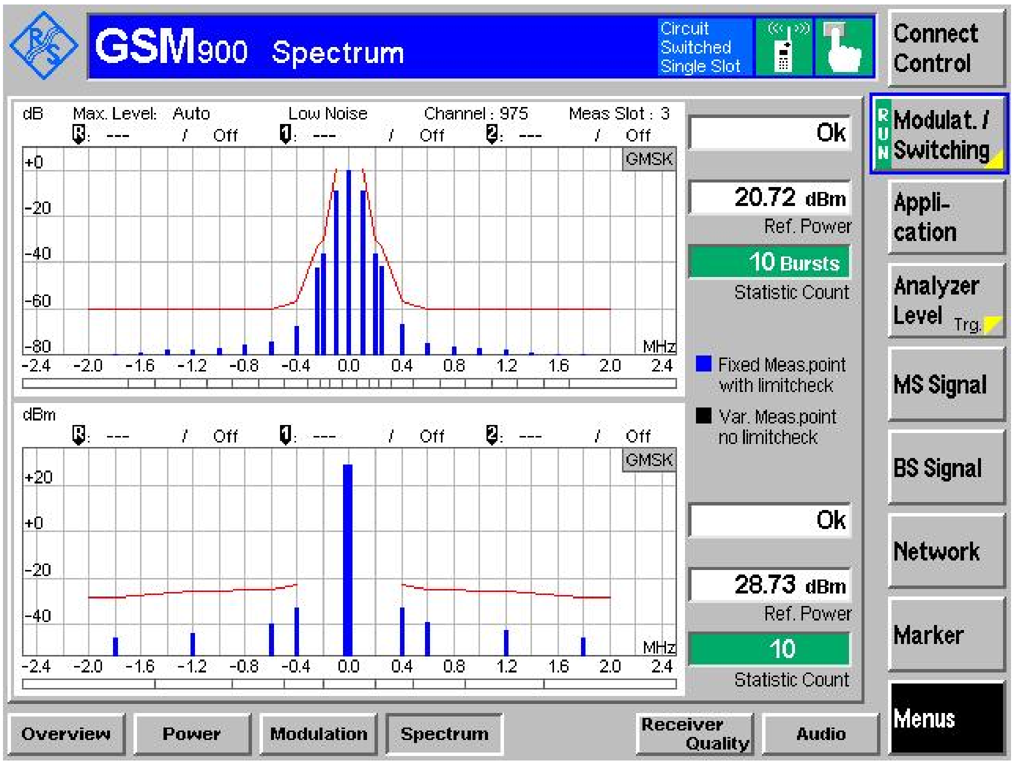
Normal Condition Power Control Level 19, Middle Channel



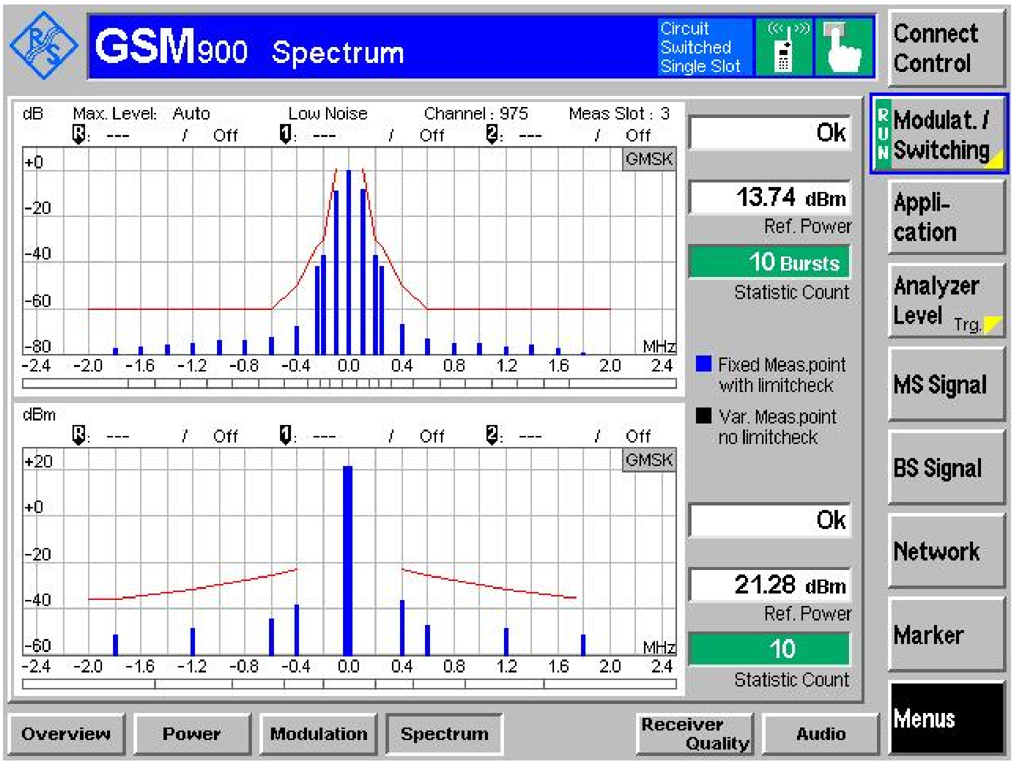
Normal Condition Power Control Level 5, Low Channel



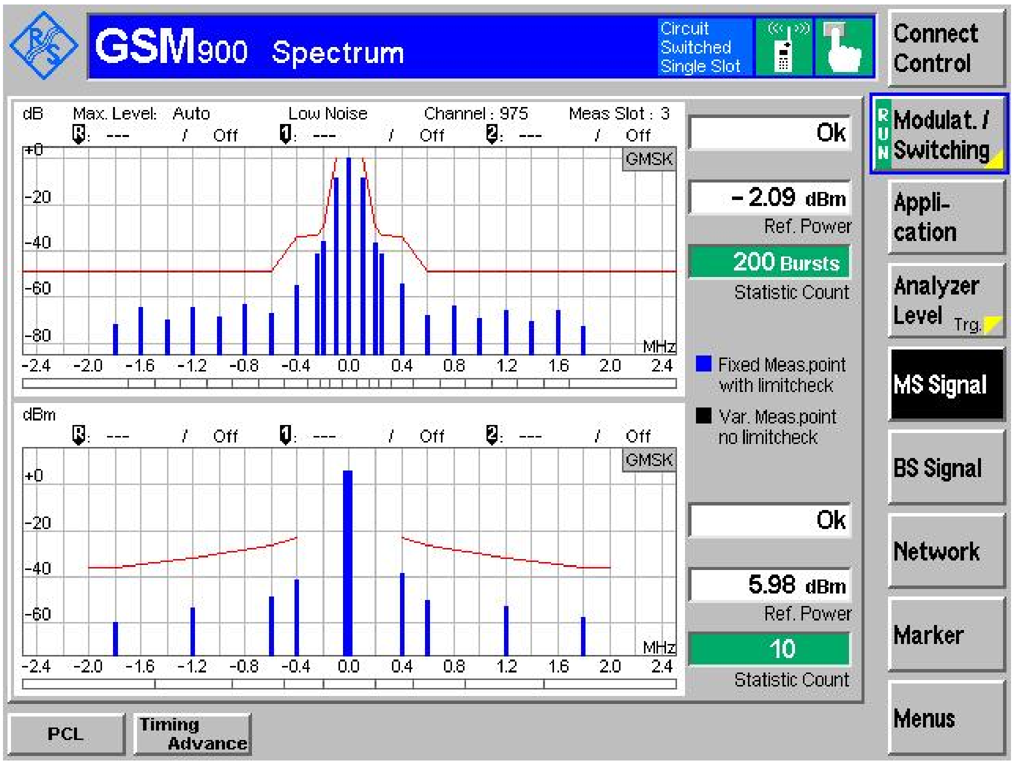
Normal Condition Power Control Level 7, Low Channel



Normal Condition Power Control Level 11, Low Channel

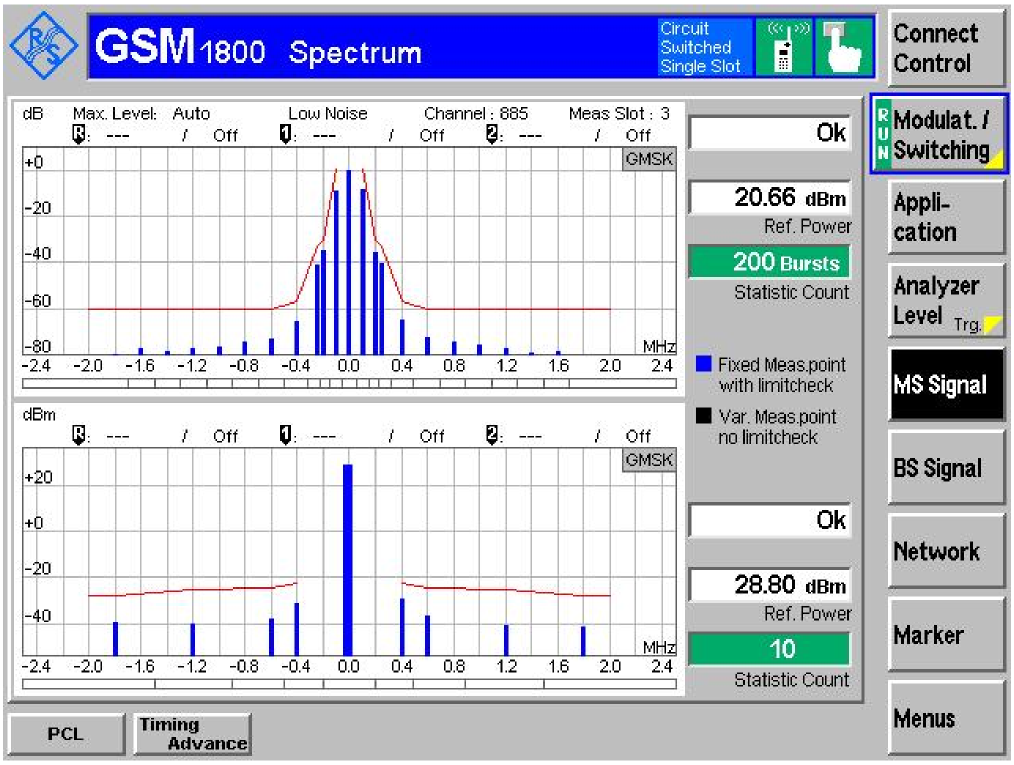


Normal Condition Power Control Level 19, Low Channel

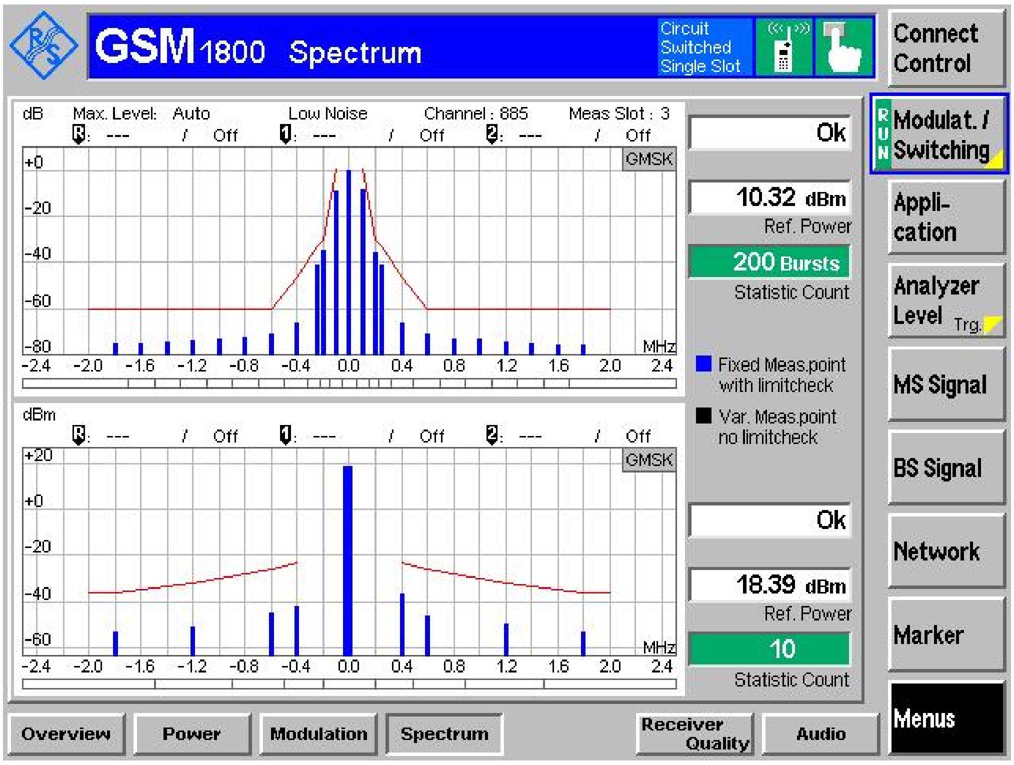


DCS1800:

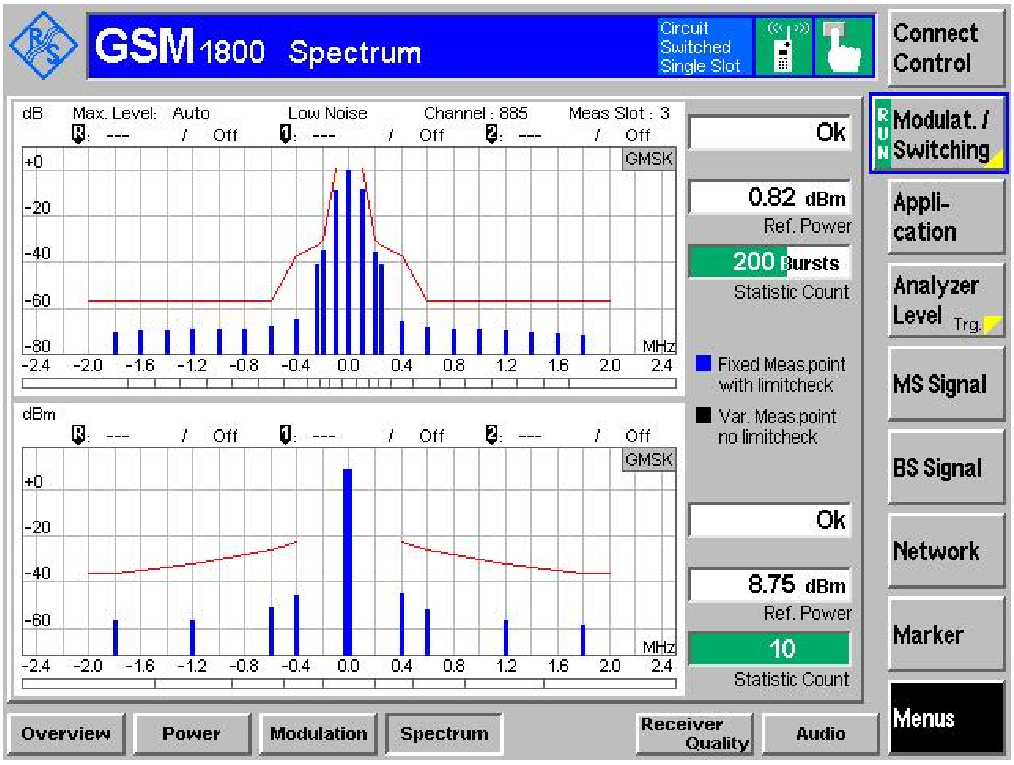
Normal Condition Power Control Level 0, High Channel



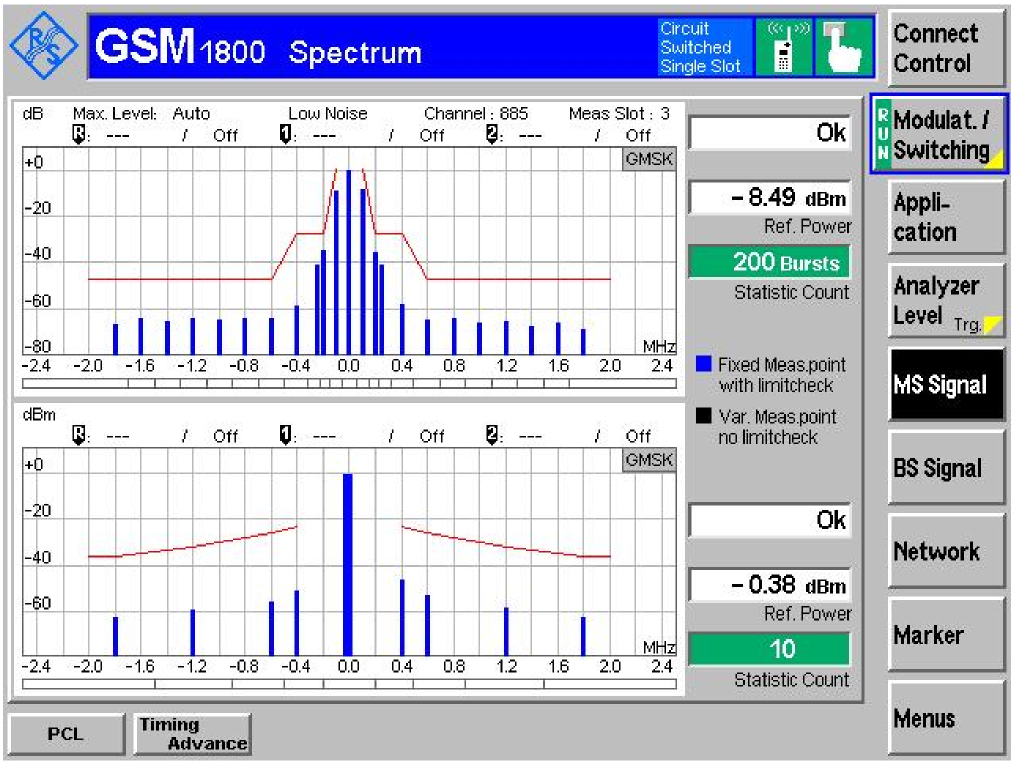
Normal Condition Power Control Level 5, High Channel



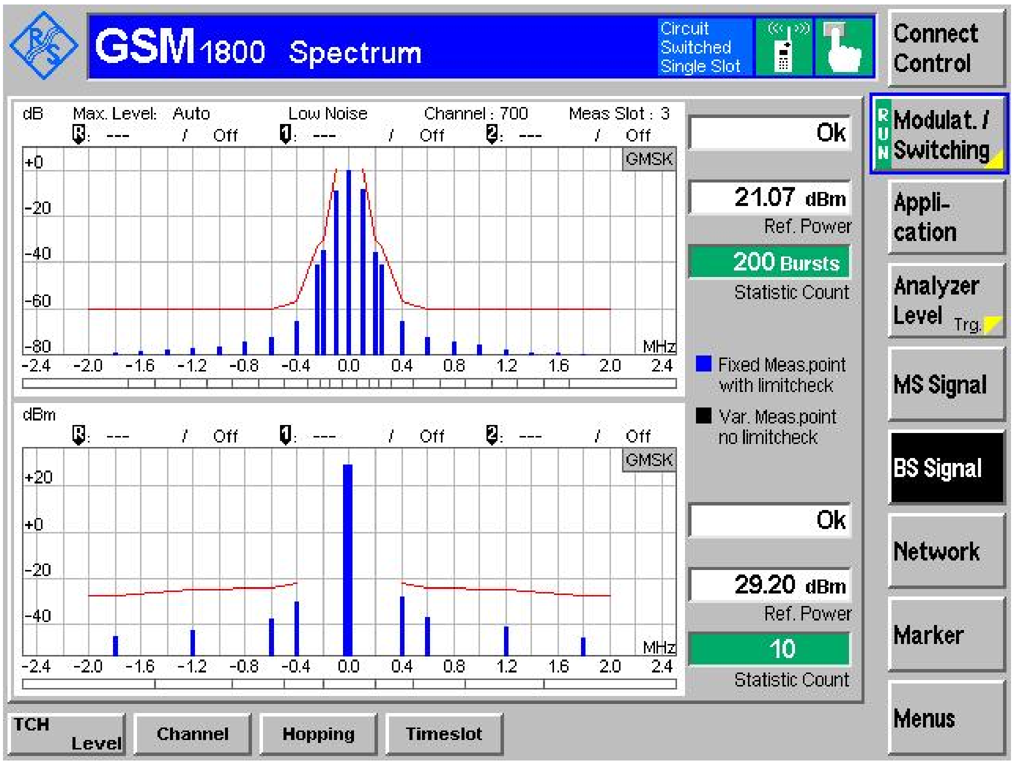
Normal Condition Power Control Level 10, High Channel



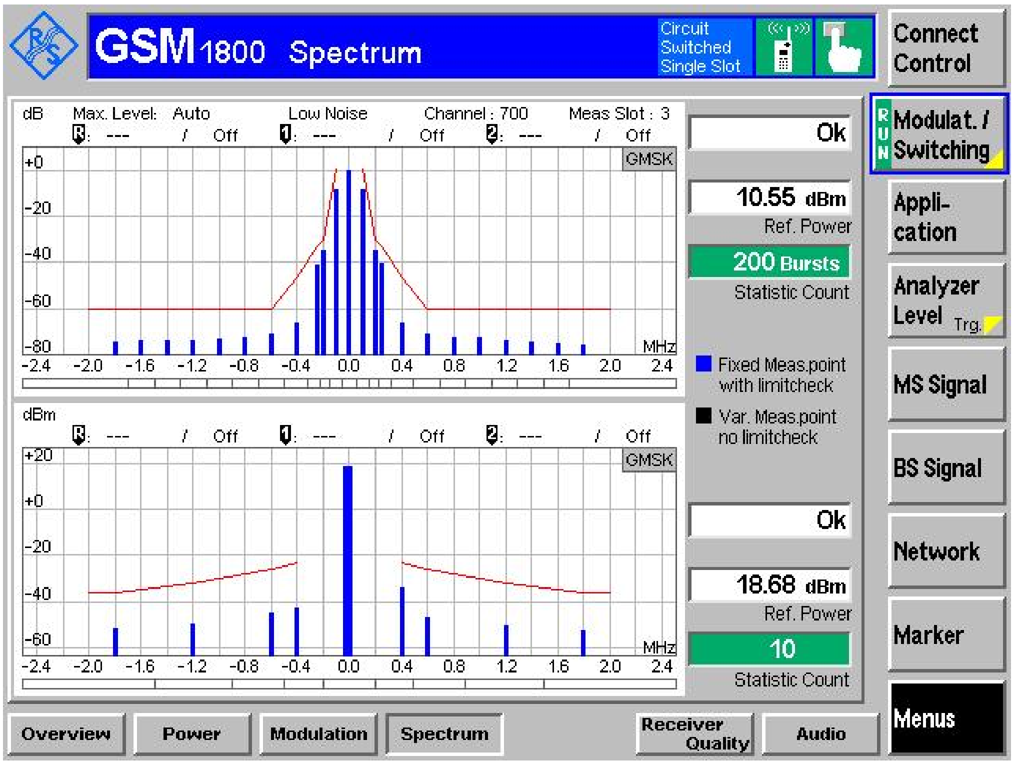
Normal Condition Power Control Level 15, High Channel



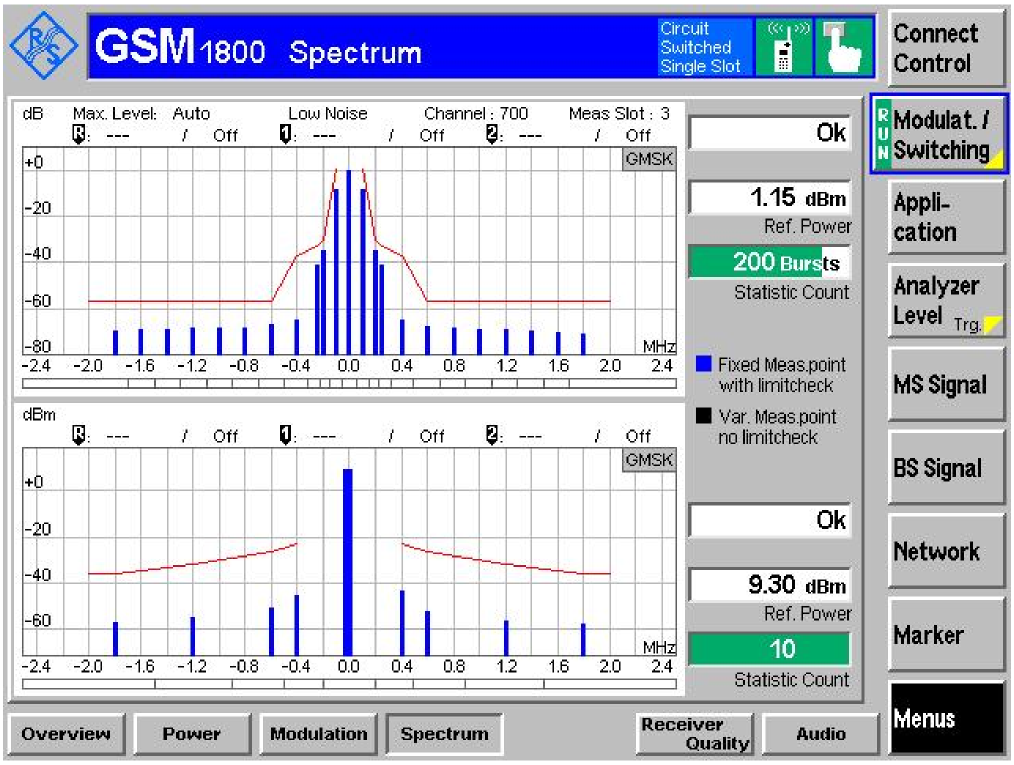
Normal Condition Power Control Level 0, Middle Channel



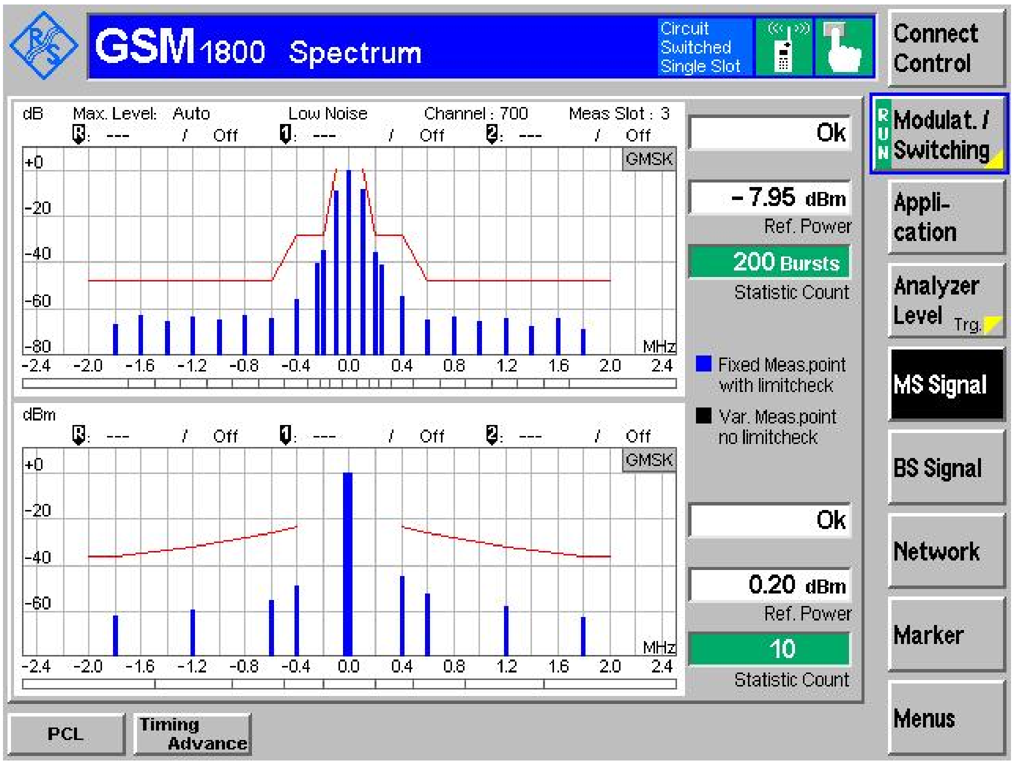
Normal Condition Power Control Level 5, Middle Channel



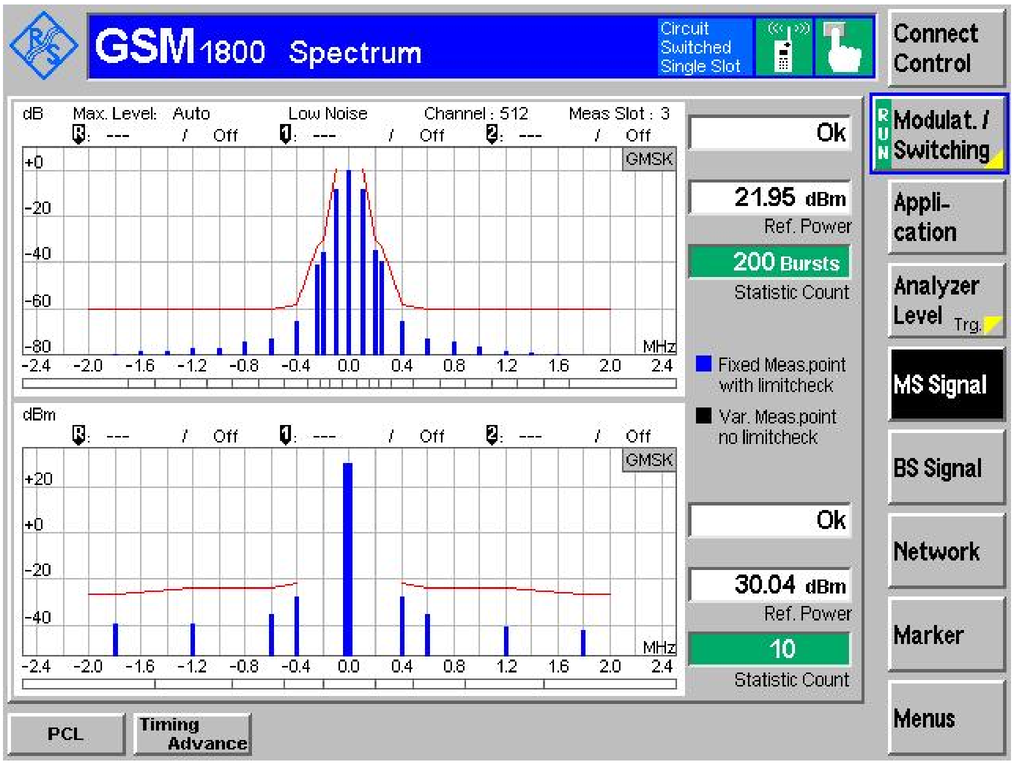
Normal Condition Power Control Level 10, Middle Channel



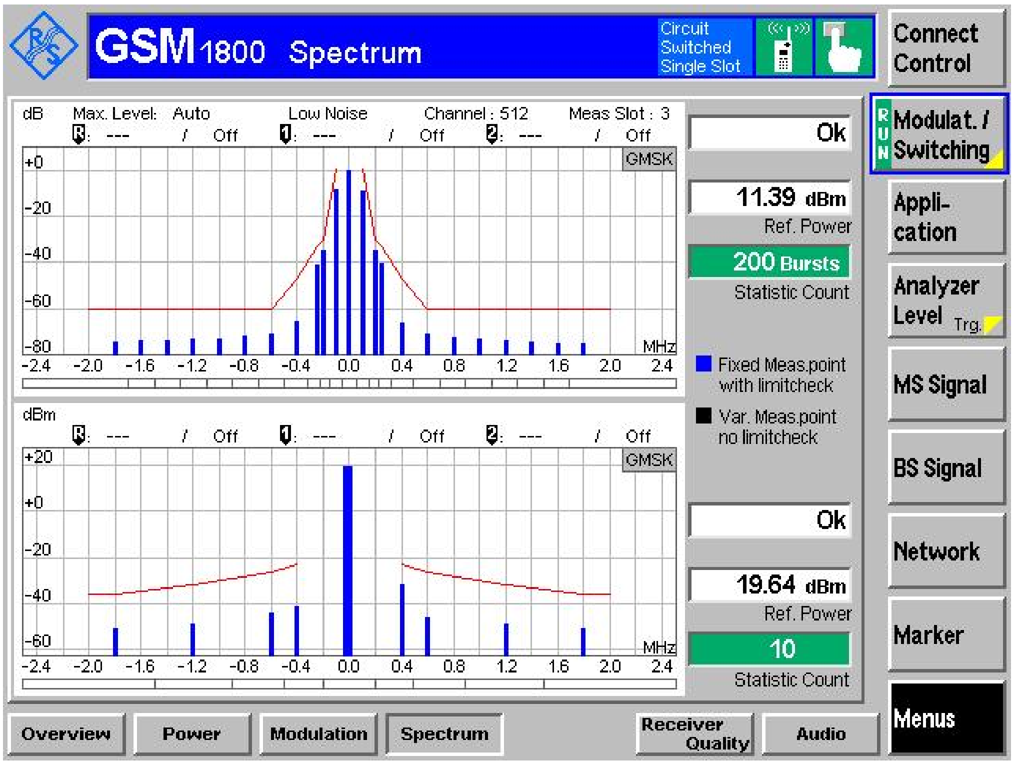
Normal Condition Power Control Level 15, Middle Channel



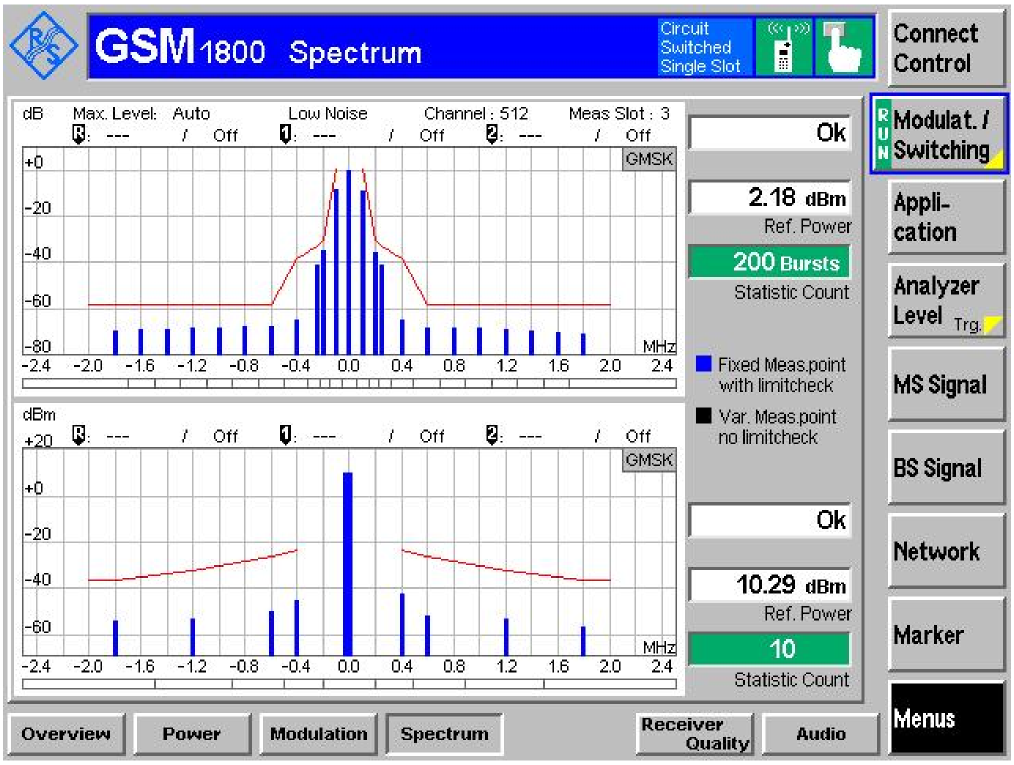
Normal Condition Power Control Level 0, Low Channel



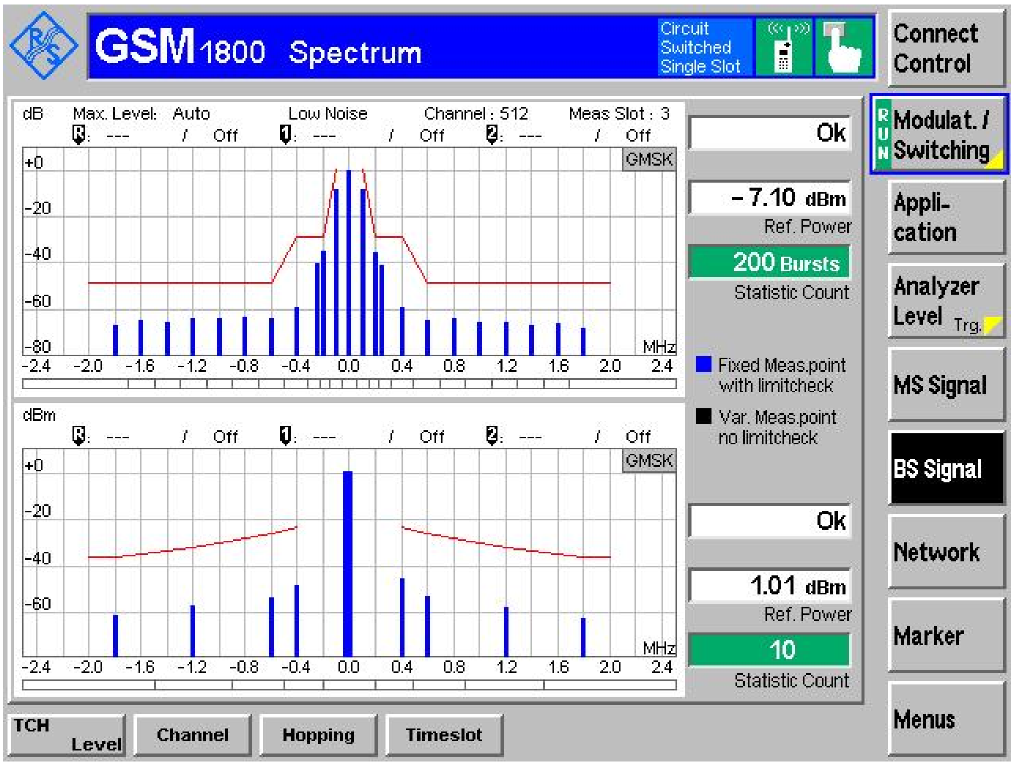
Normal Condition Power Control Level 5, Low Channel



Normal Condition Power Control Level 10, Low Channel



Normal Condition Power Control Level 15, Low Channel



8 Transmitter Output Power In GPRS Multislot Congiguration

8.1 Test Standard and Limit

8.1.1 Test Standard

ETSI EN 301 511 V12.5.5: 2018clause 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:

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

6.2 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:
   8.1 Under normal conditions; 3GPP TS 05.05, subclause 4.5.2.
   8.2 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

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 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.
b) 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).
c) 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.
d) 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.
e) 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.

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 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 DCS 1 800 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.

g) 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).

h) 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.

i) 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.	Last Cal.	Cal. Interval
Universal Radio Communication Tester	Rohde&Schwarz	CMU200	1100.864.02	2022-12-29	1 Year
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	31.39	32.41	30.31	32.58	31.76	Pass
4	30.59	31.66	29.38	31.68	30.99	
5	28.23	29.32	27.05	29.26	28.65	
6	26.36	27.48	26.77	27.36	26.80	
7	24.27	25.33	24.72	25.27	24.73	
8	22.44	23.43	22.86	23.41	22.88	
9	20.48	21.45	20.88	21.43	20.88	
10	18.12	19.01	18.56	19.03	18.55	
11	16.41	17.25	16.88	17.29	16.88	
12	14.66	15.48	15.14	15.52	15.12	
13	12.81	13.57	13.32	13.70	13.26	
14	10.85	11.59	11.35	11.73	11.31	
15	8.74	9.50	9.24	9.66	9.18	
16	7.17	7.93	7.56	8.11	7.48	
17	5.10	5.92	5.52	6.19	5.40	

Middle Channel (898.0MHz) Out Power

Middle Channel F = 898.0 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	31.59	32.98	31.14	33.19	32.30	Pass
4	30.71	32.16	30.36	32.27	31.55	
5	28.46	29.87	29.40	30.01	29.36	
6	26.62	27.99	27.55	28.24	27.47	
7	24.53	25.89	25.50	26.03	25.42	
8	22.7	24.03	23.65	24.20	23.58	
9	20.75	21.95	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

ETSI EN 301 511 V12.5.5: 2018 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.	Last Cal.	Cal. Interval
Universal Radio Communication Tester	Rohde&Schwarz	CMU200	1100.864.02	2022-12-29	1 Year
Temperature & Humidity Chamber	Wuhuan	HTP206	200611212	2022-12-29	1 Year

9.4 Test Data

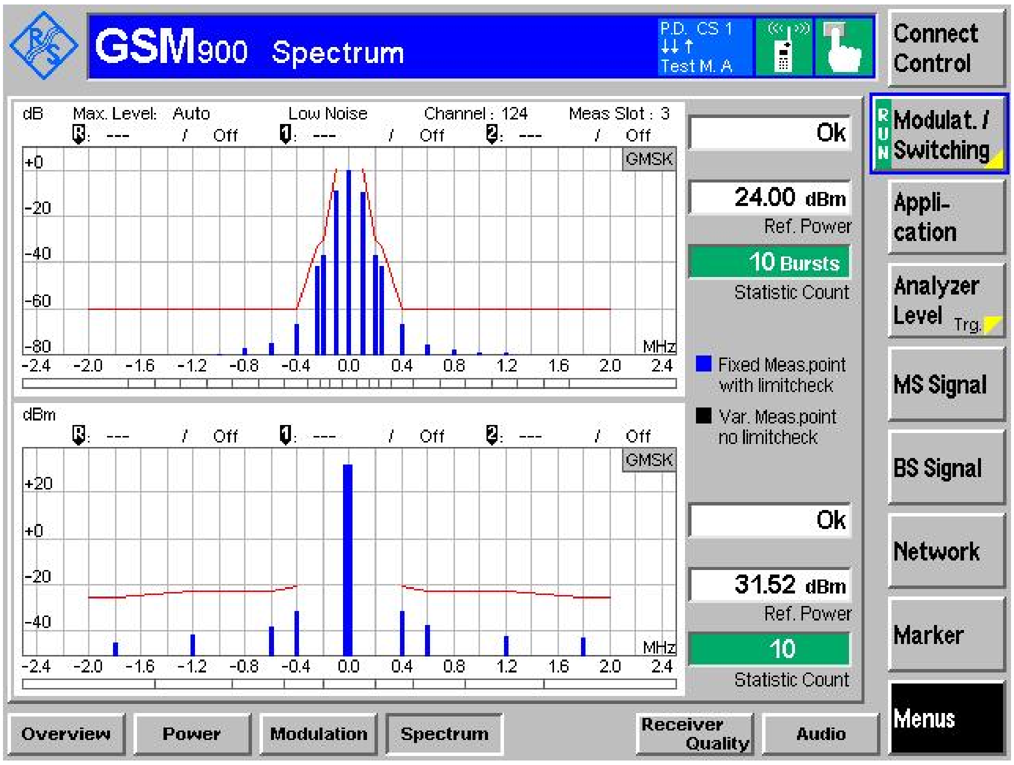
Environmental Conditions:

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

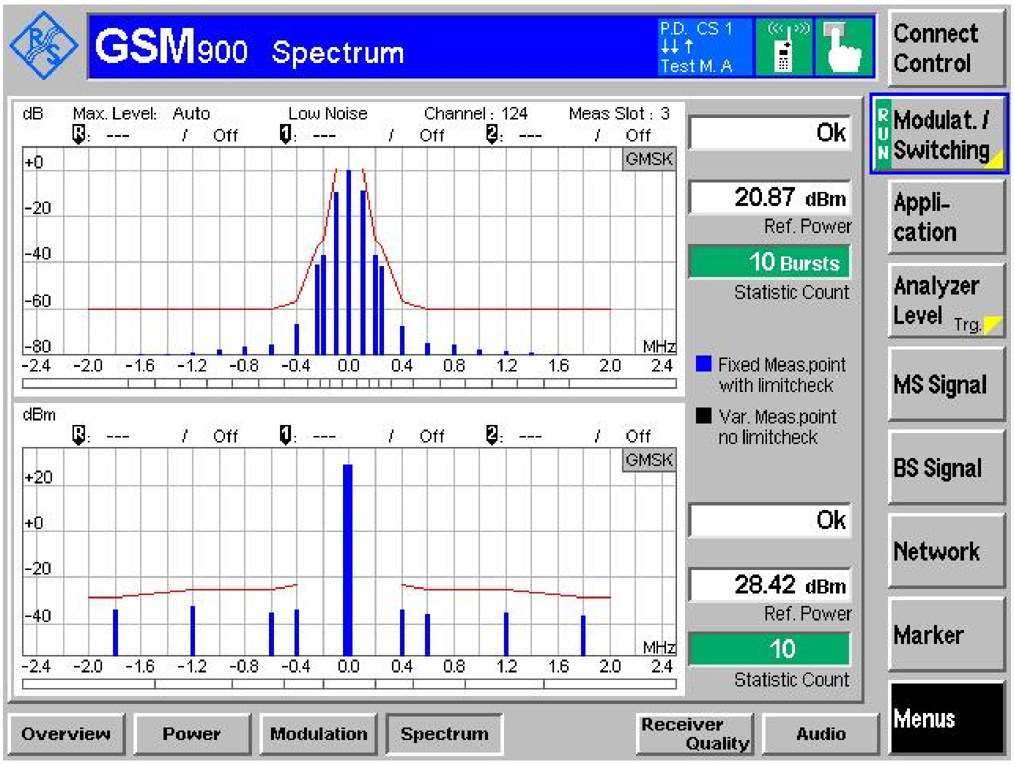
Normal Condition:

GSM900:

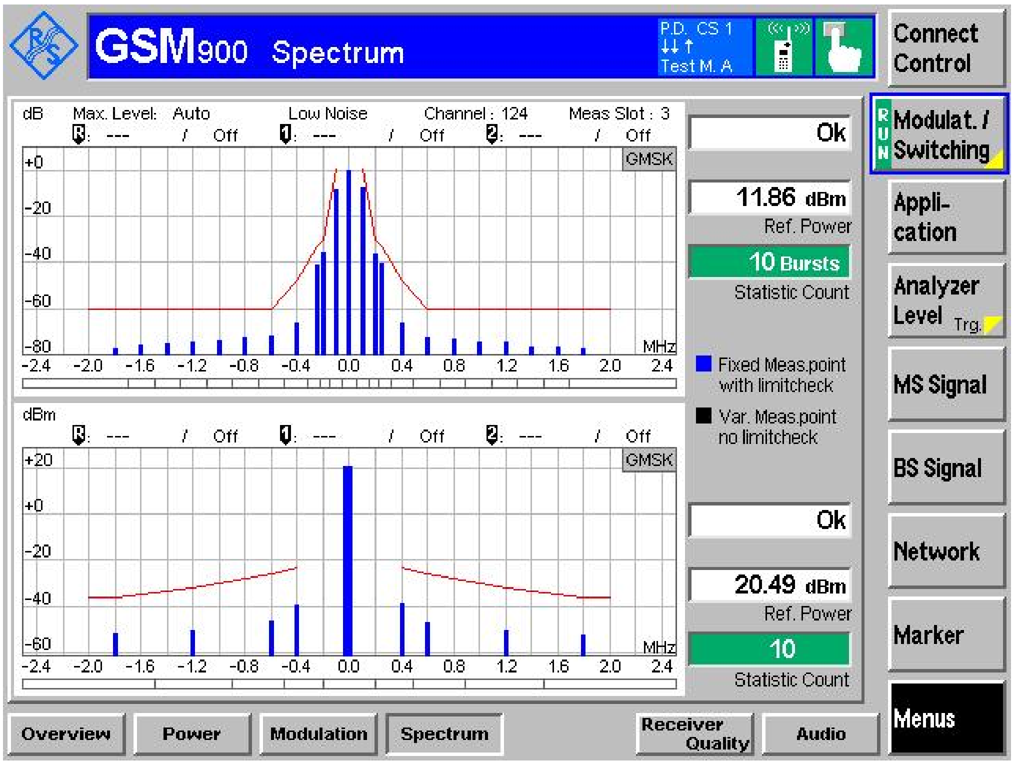
Normal Condition Power Control Level (σ=3), High Channel



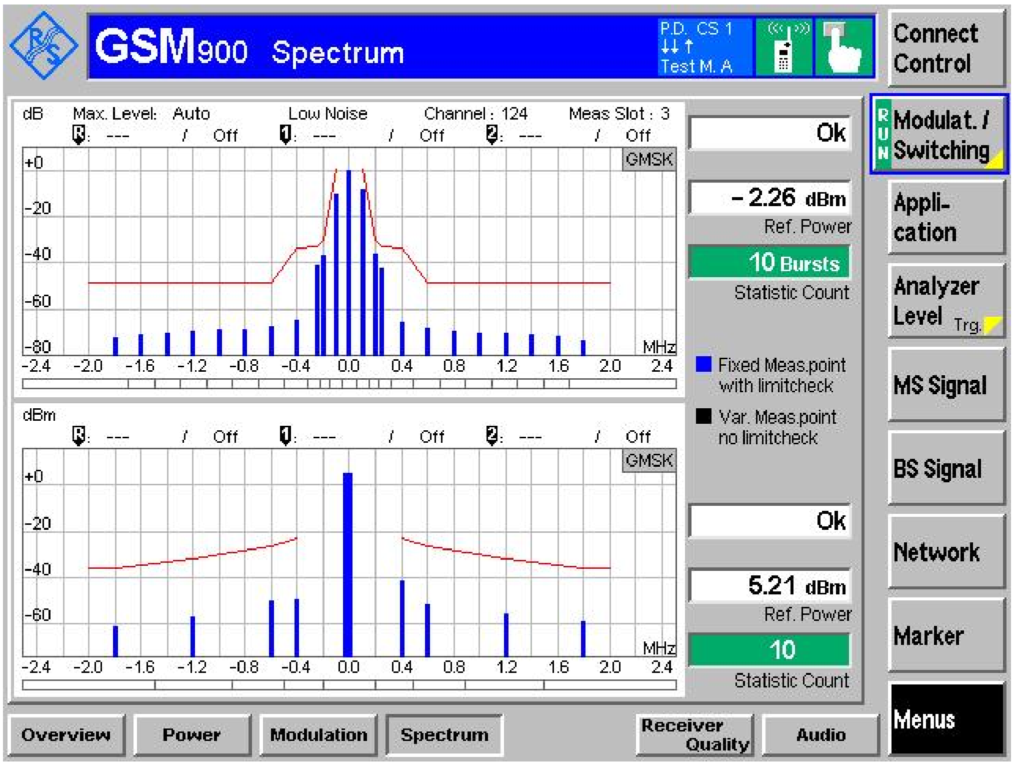
Normal Condition Power Control Level (σ=5), High Channel



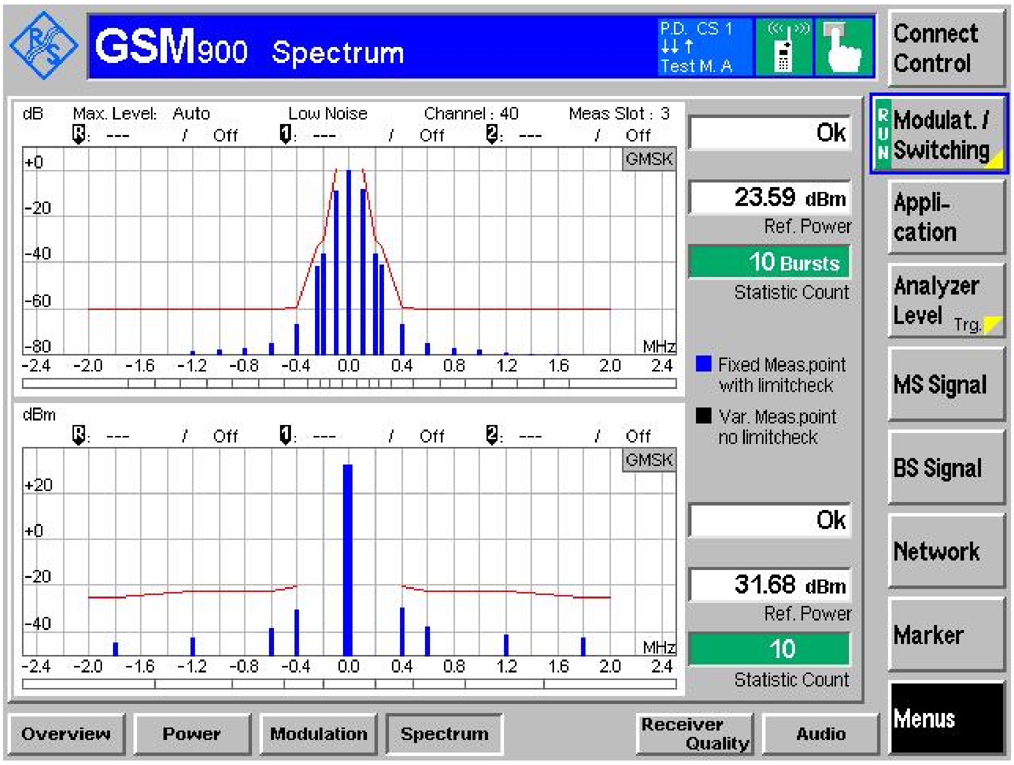
Normal Condition Power Control Level (σ=9), High Channel



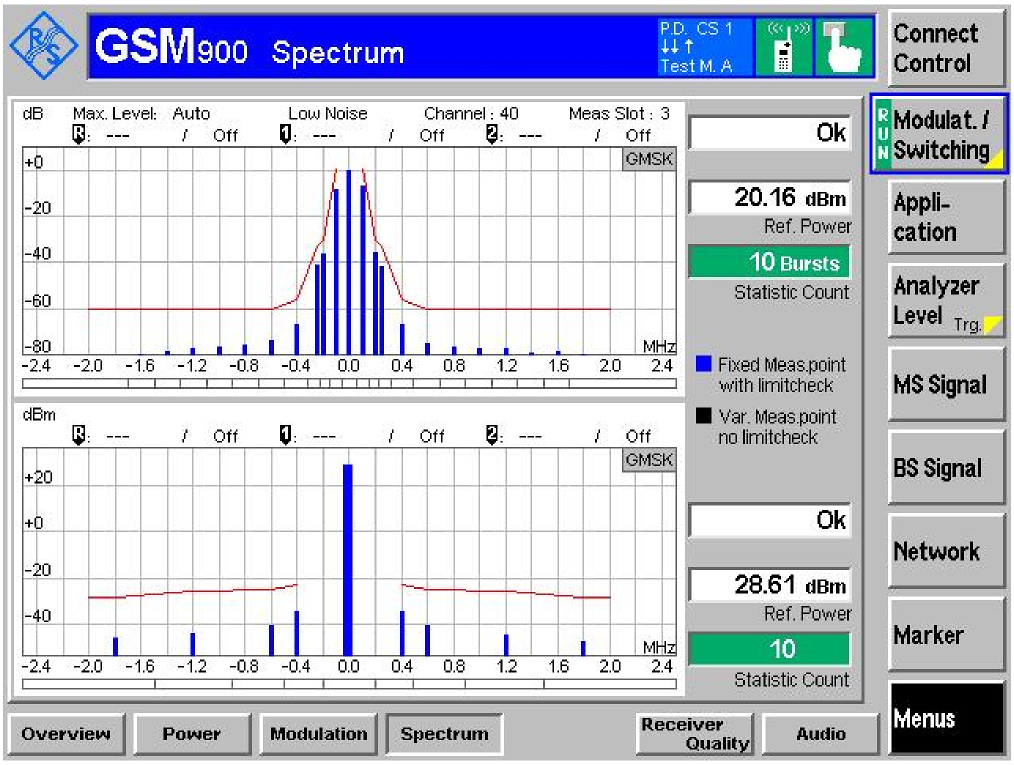
Normal Condition Power Control Level (σ=17), High Channel



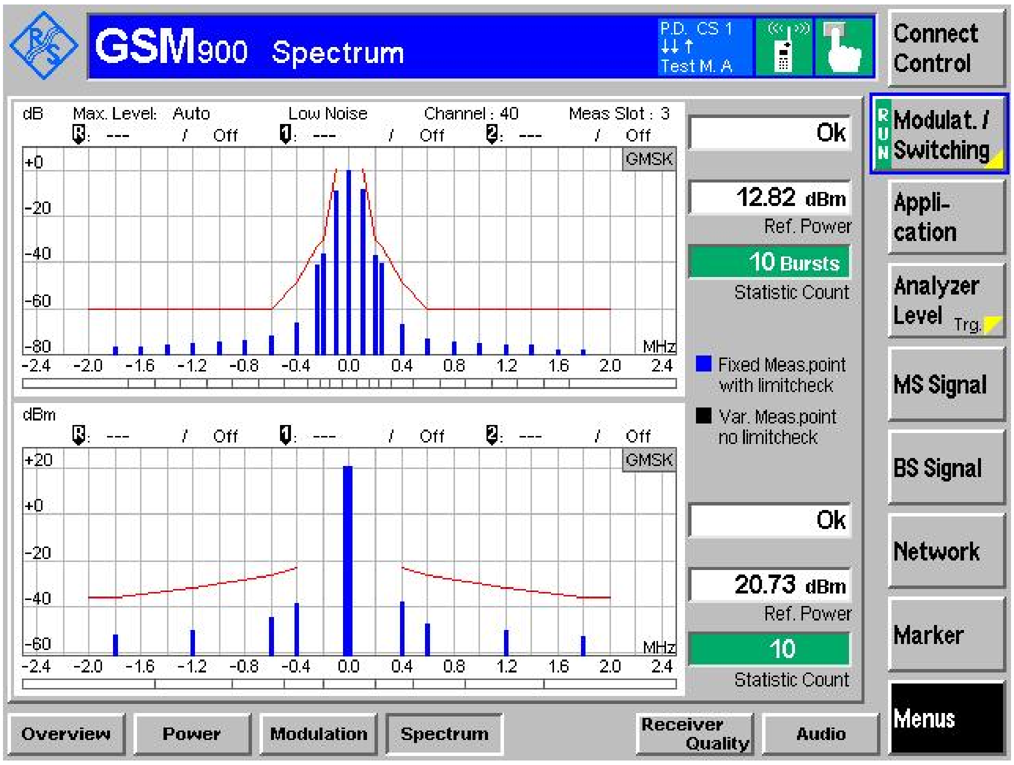
Normal Condition Power Control Level (σ=3), Middle Channel



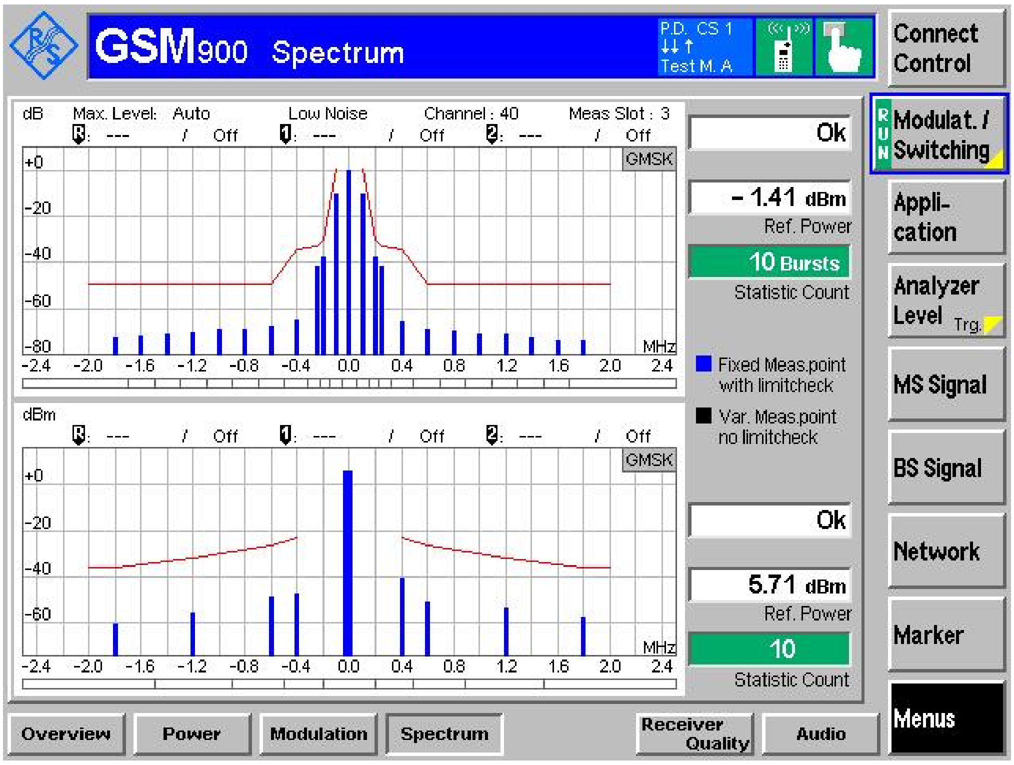
Normal Condition Power Control Level (σ=5), Middle Channel



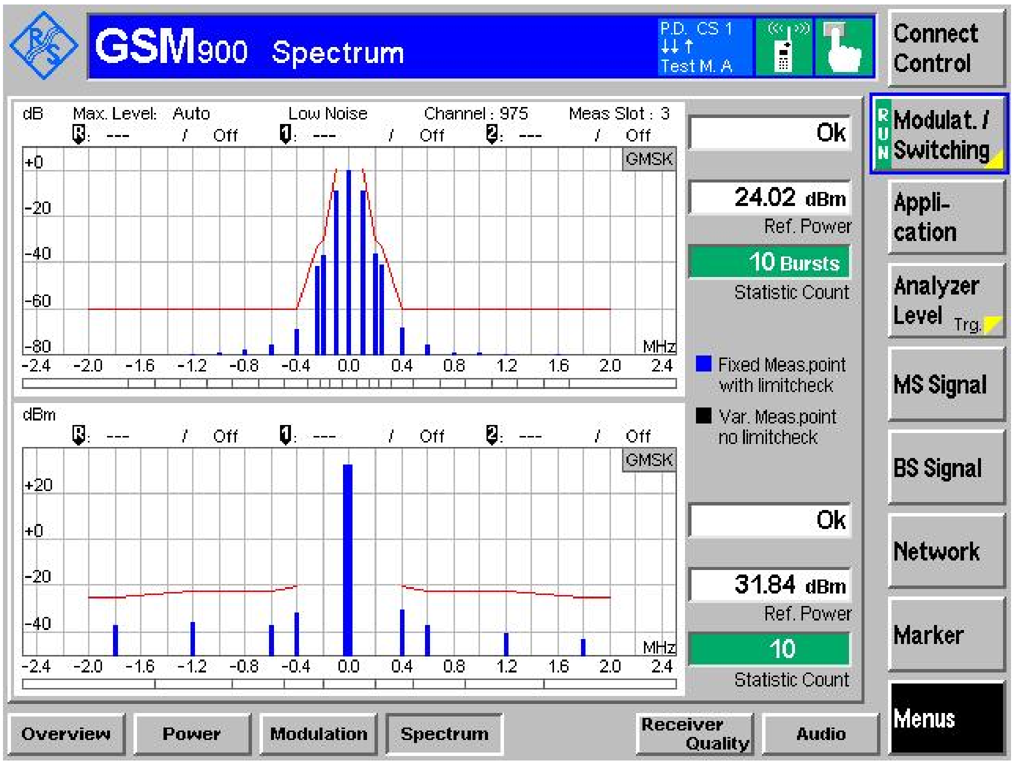
Normal Condition Power Control Level (σ=9), Middle Channel



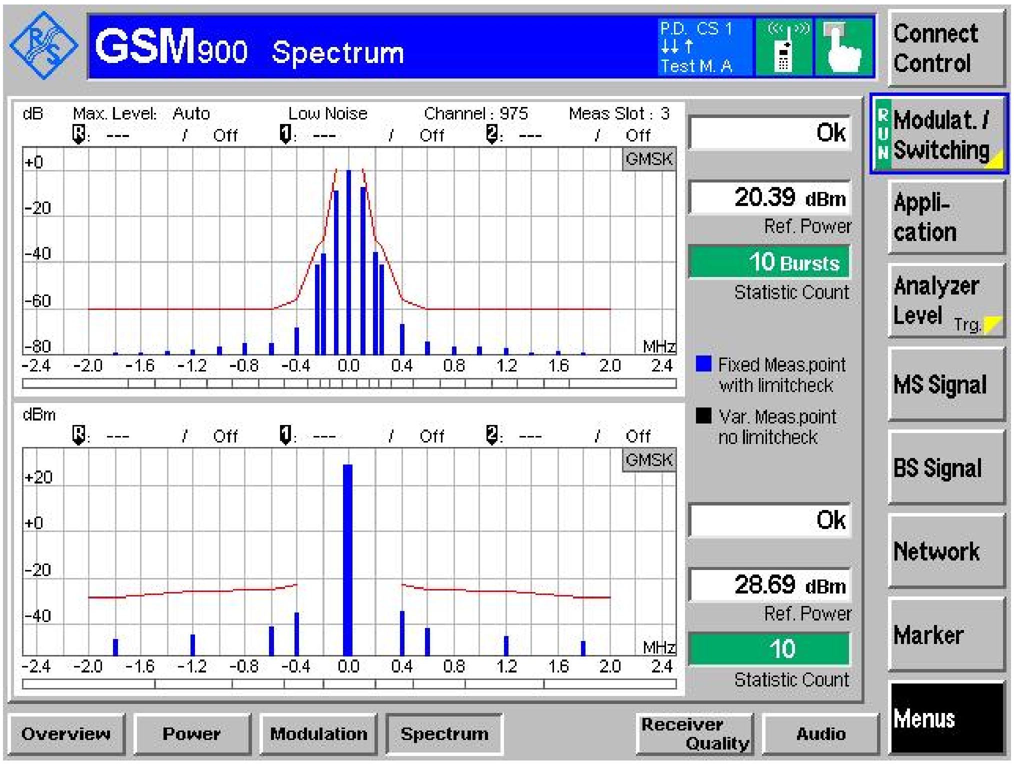
Normal Condition Power Control Level (σ=17), Middle Channel



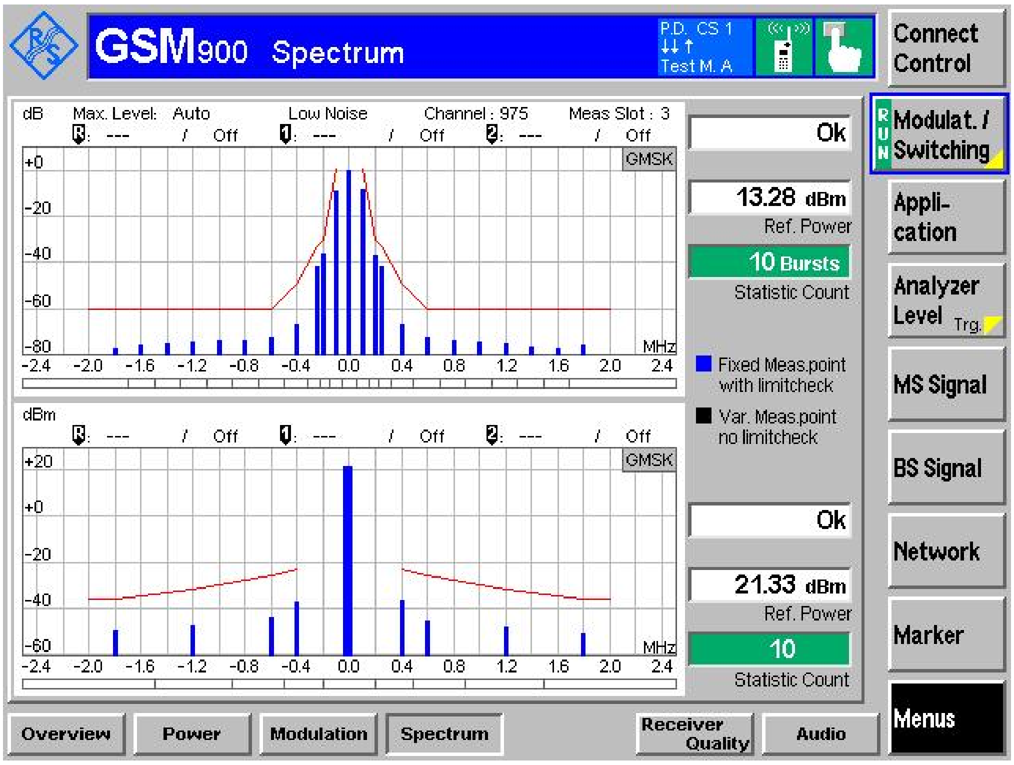
Normal Condition Power Control Level (σ=3), Low Channel



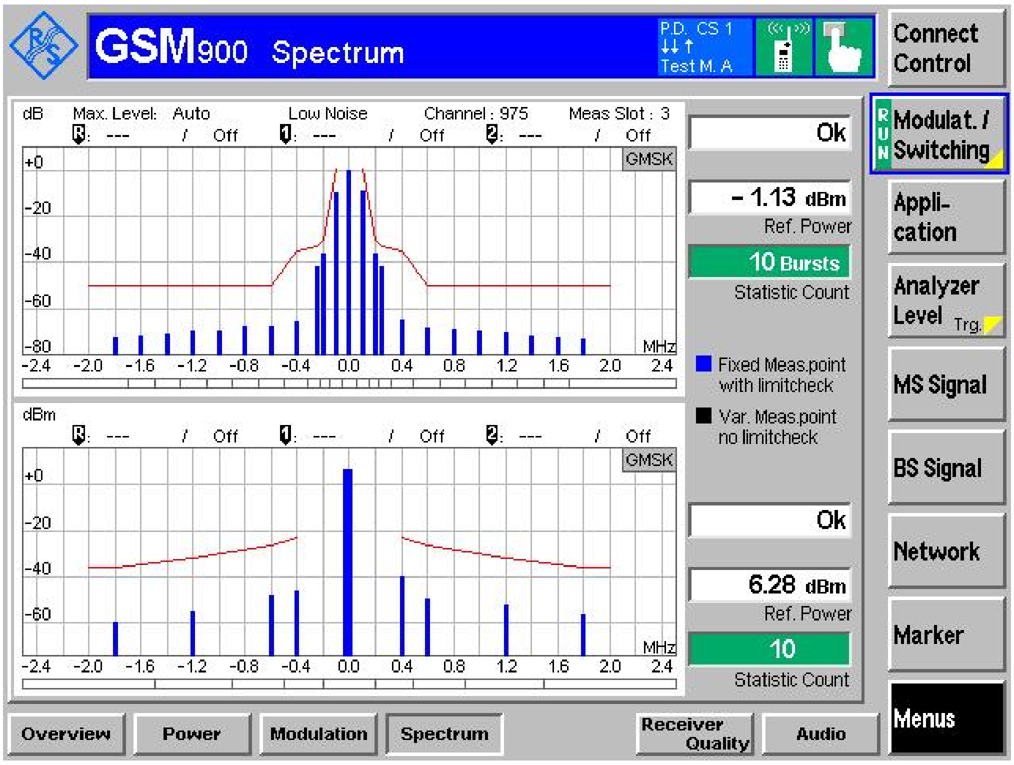
Normal Condition Power Control Level (σ=5), Low Channel



Normal Condition Power Control Level (σ=9), Low Channel



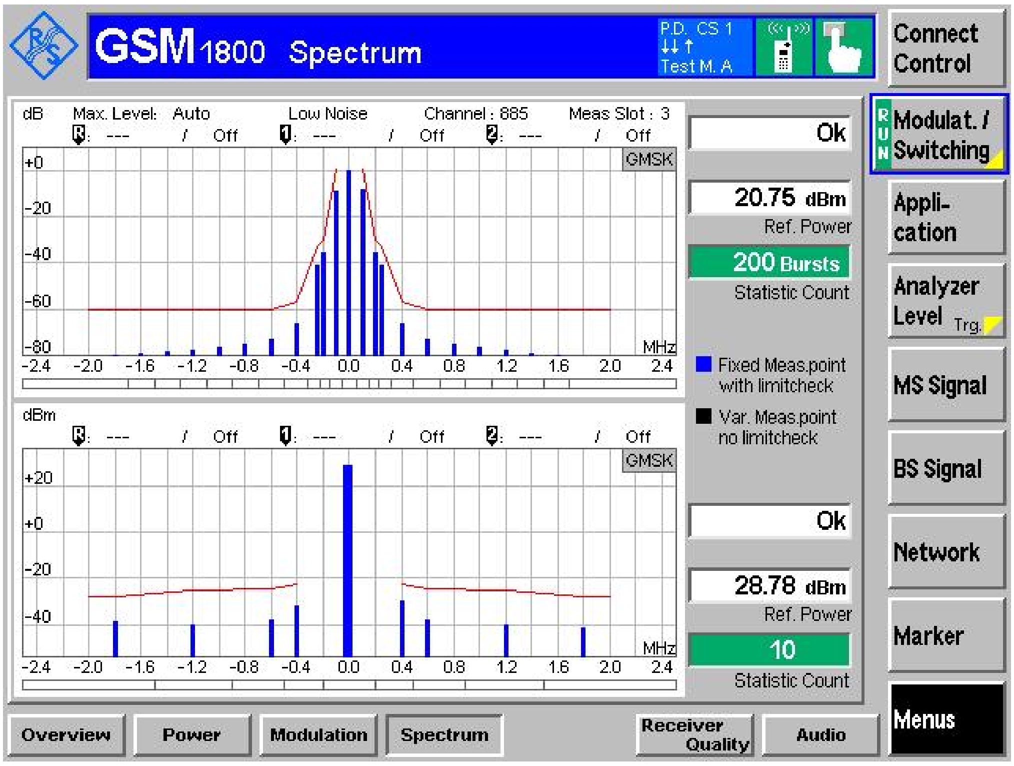
Normal Condition Power Control Level (σ=17), Low Channel



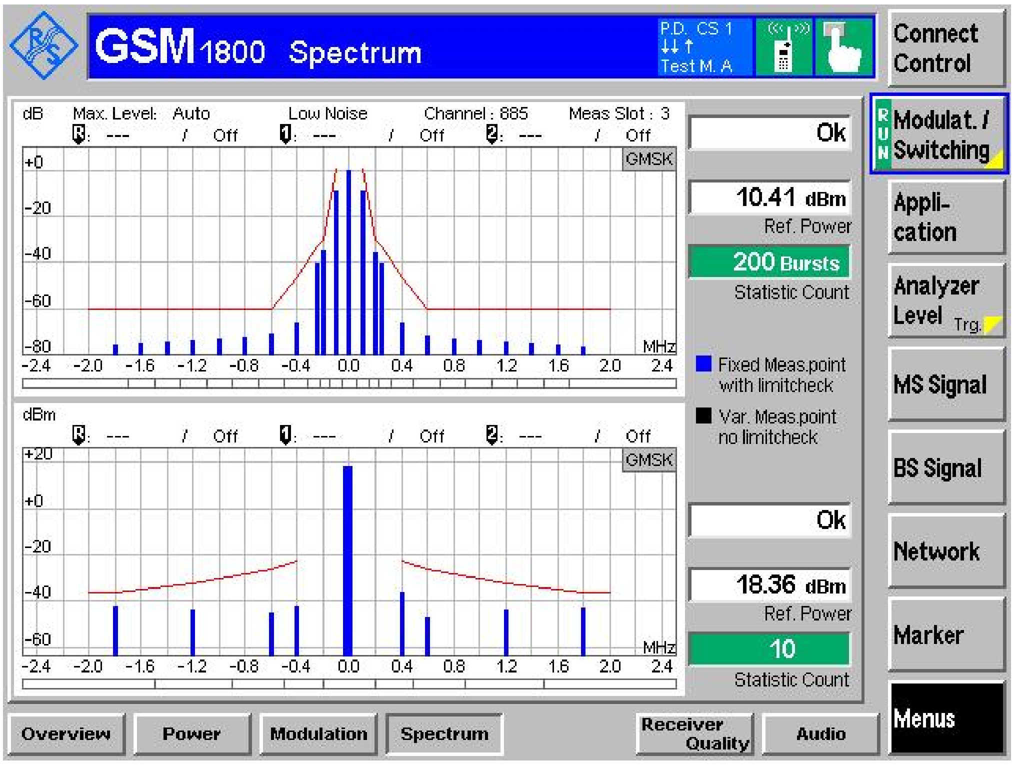
Normal Condition:

DCS1800:

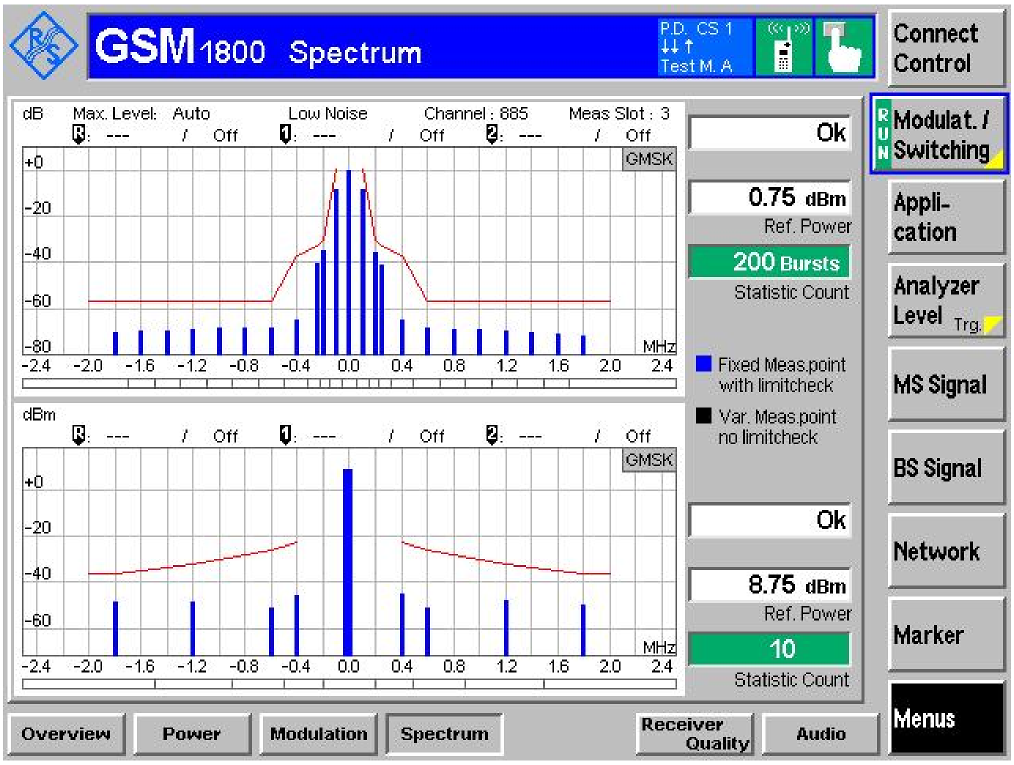
Normal Condition Power Control Level (σ=3), High Channel



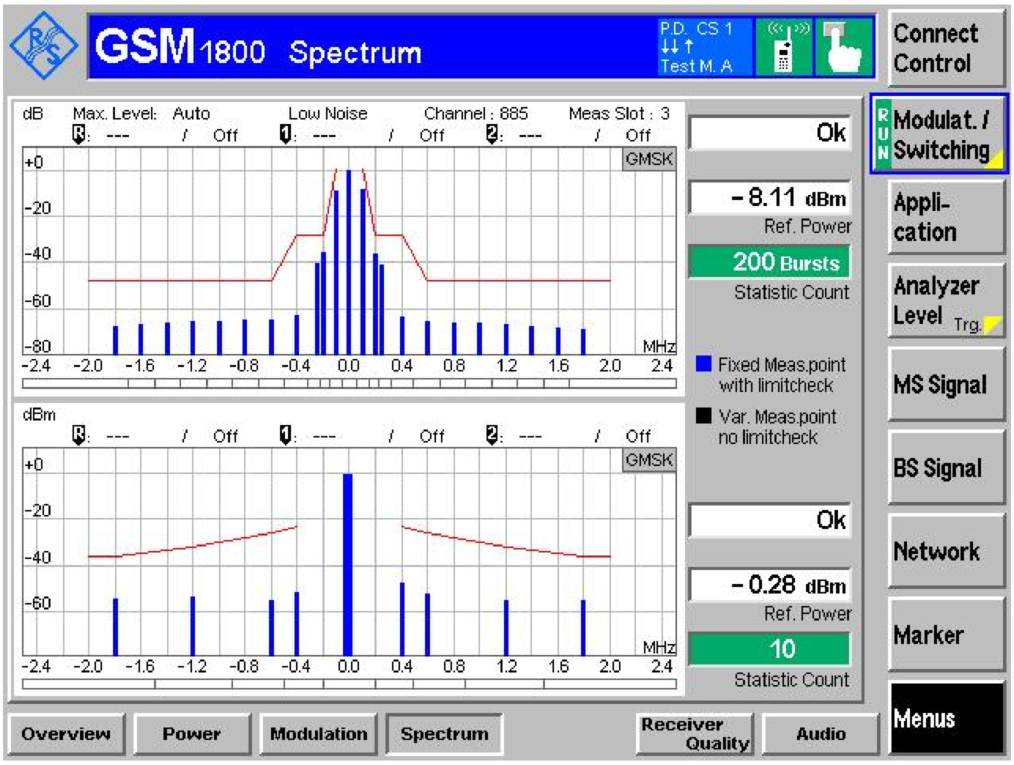
Normal Condition Power Control Level (σ=8), High Channel



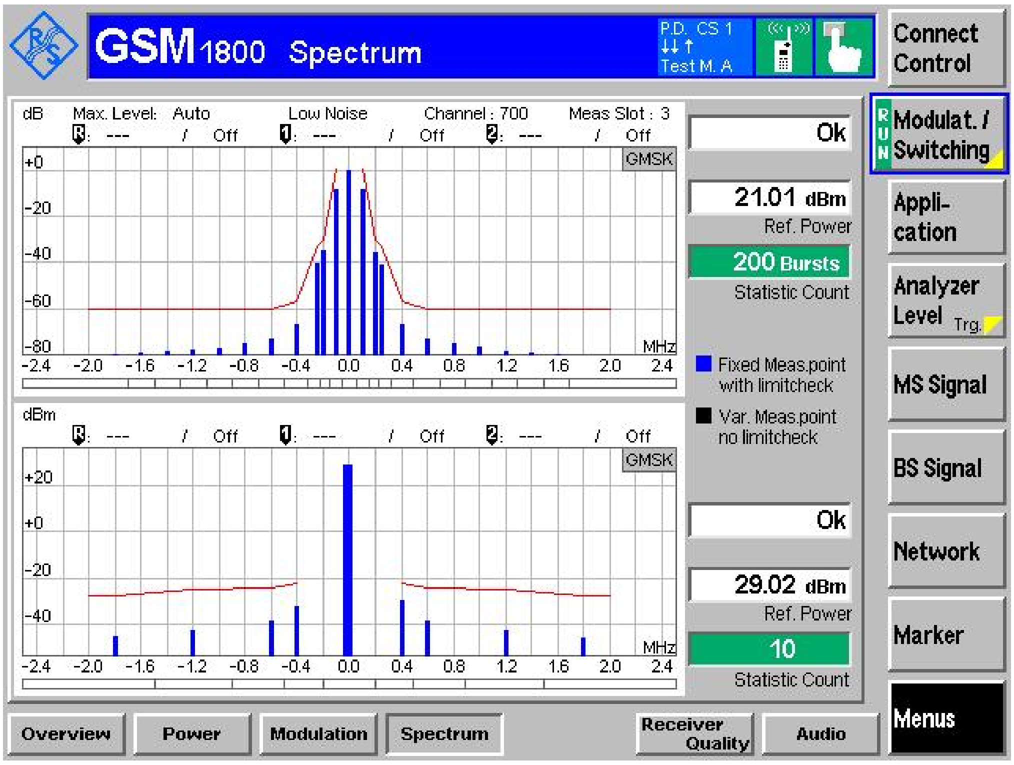
Normal Condition Power Control Level (σ=13), High Channel



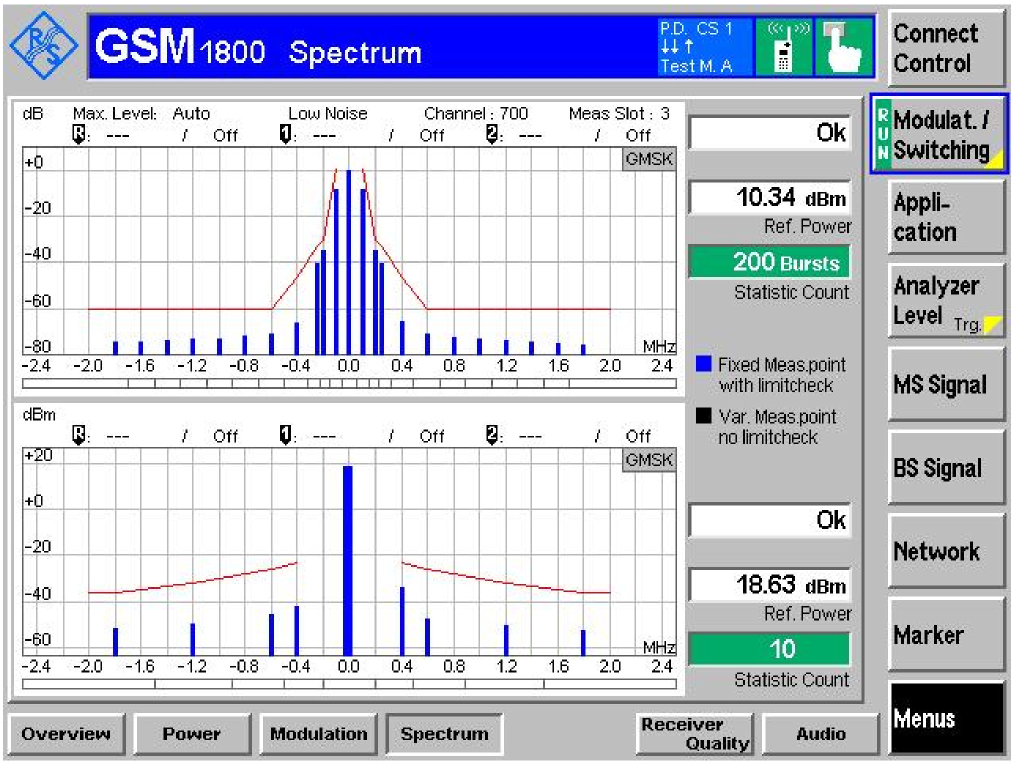
Normal Condition Power Control Level (σ=18), High Channel



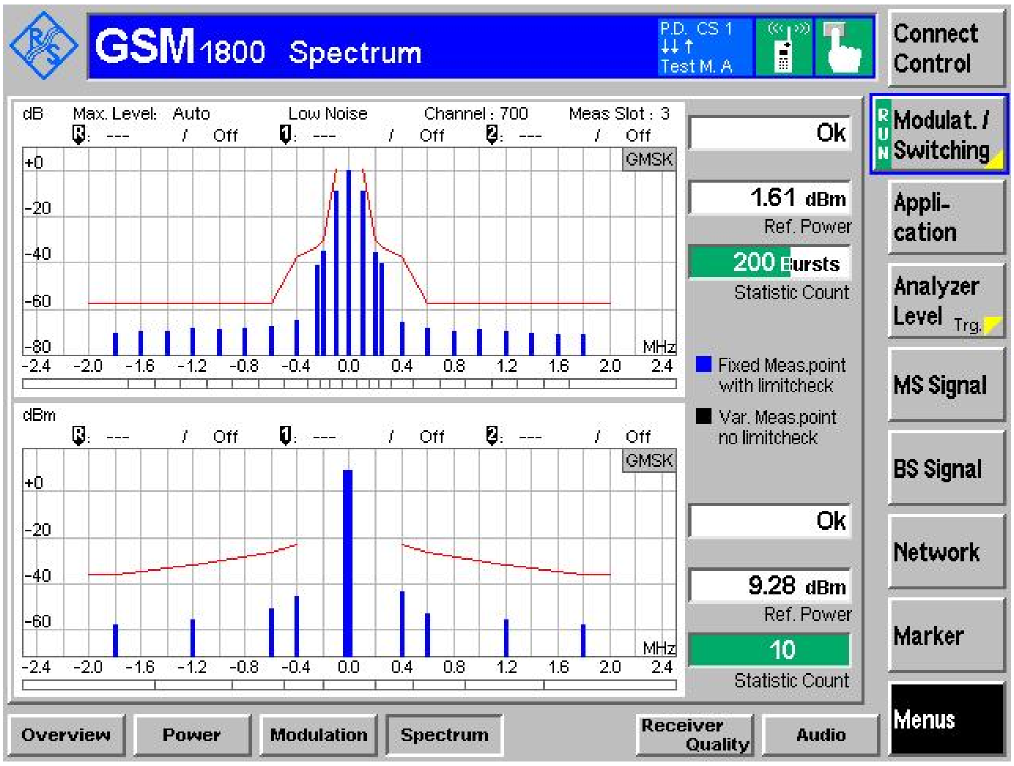
Normal Condition Power Control Level (σ=3), Middle Channel



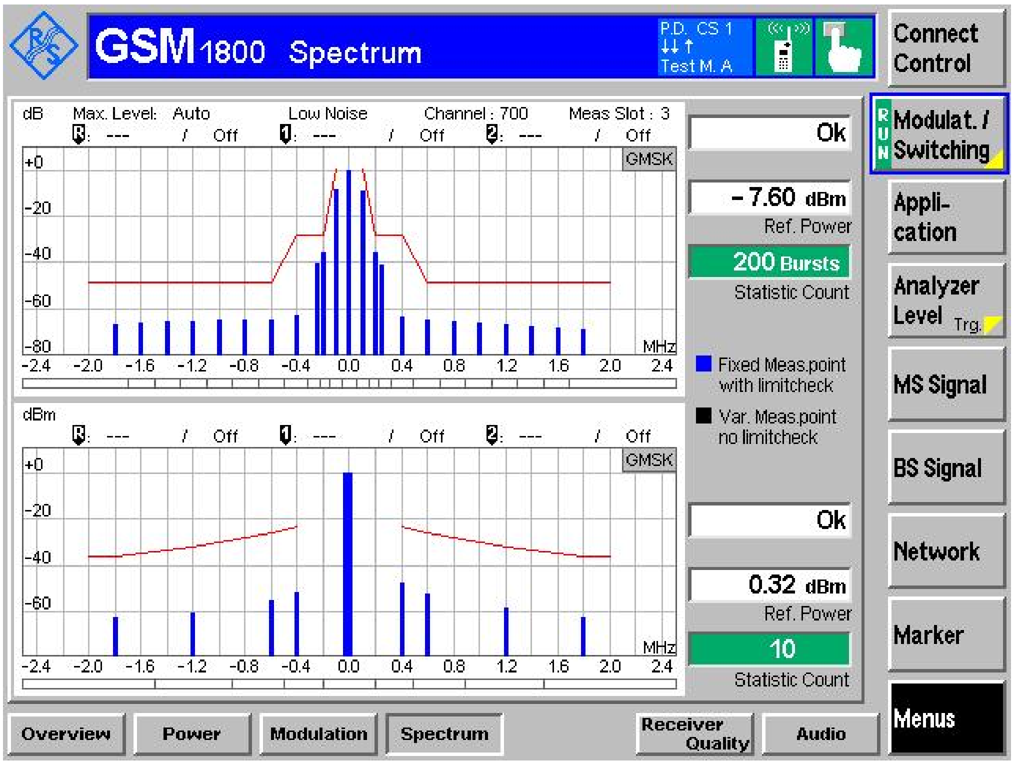
Normal Condition Power Control Level (σ=8), Middle Channel



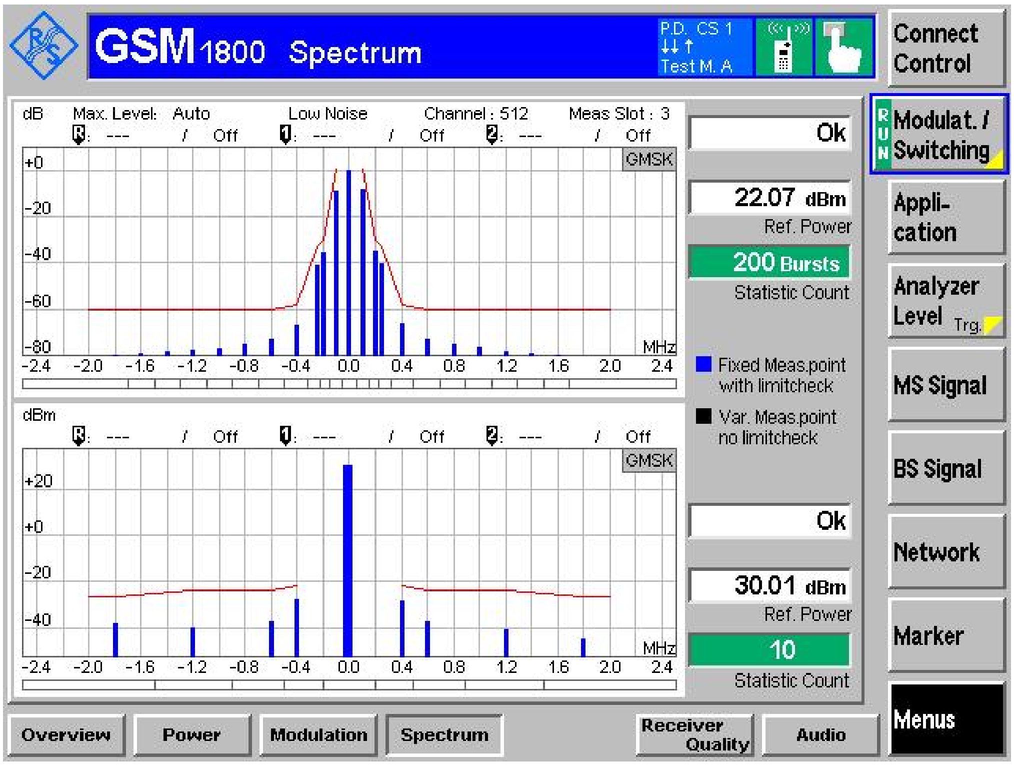
Normal Condition Power Control Level (σ=13), Middle Channel



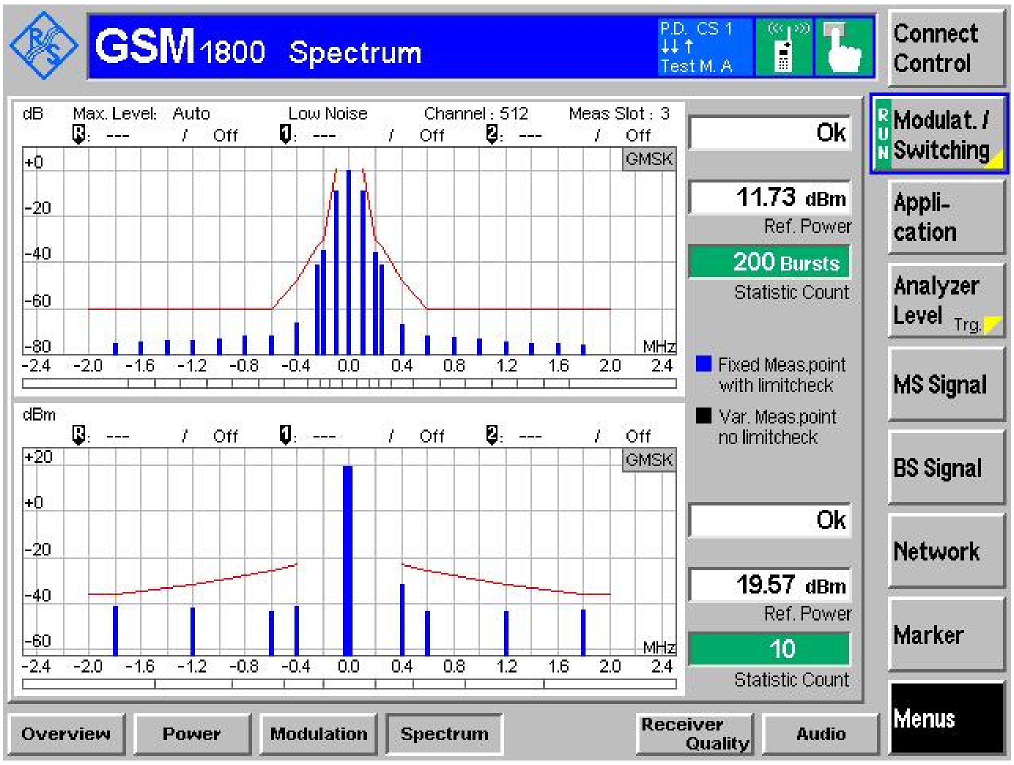
Normal Condition Power Control Level (σ=18), Middle Channel



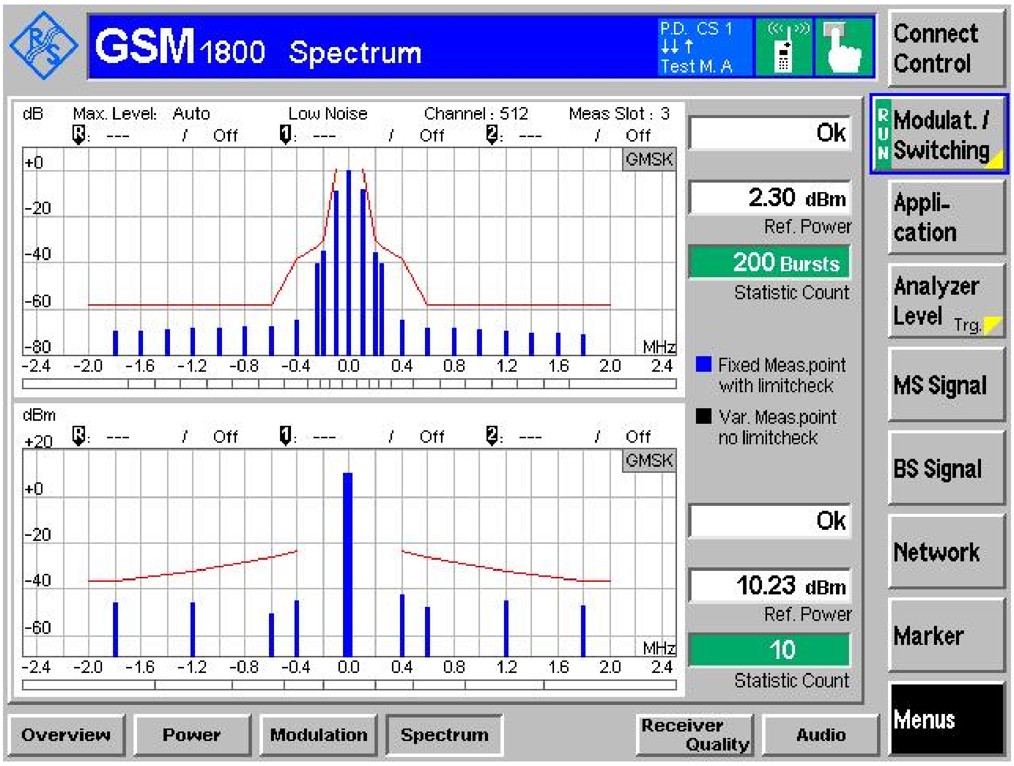
Normal Condition Power Control Level (σ=3), Low Channel



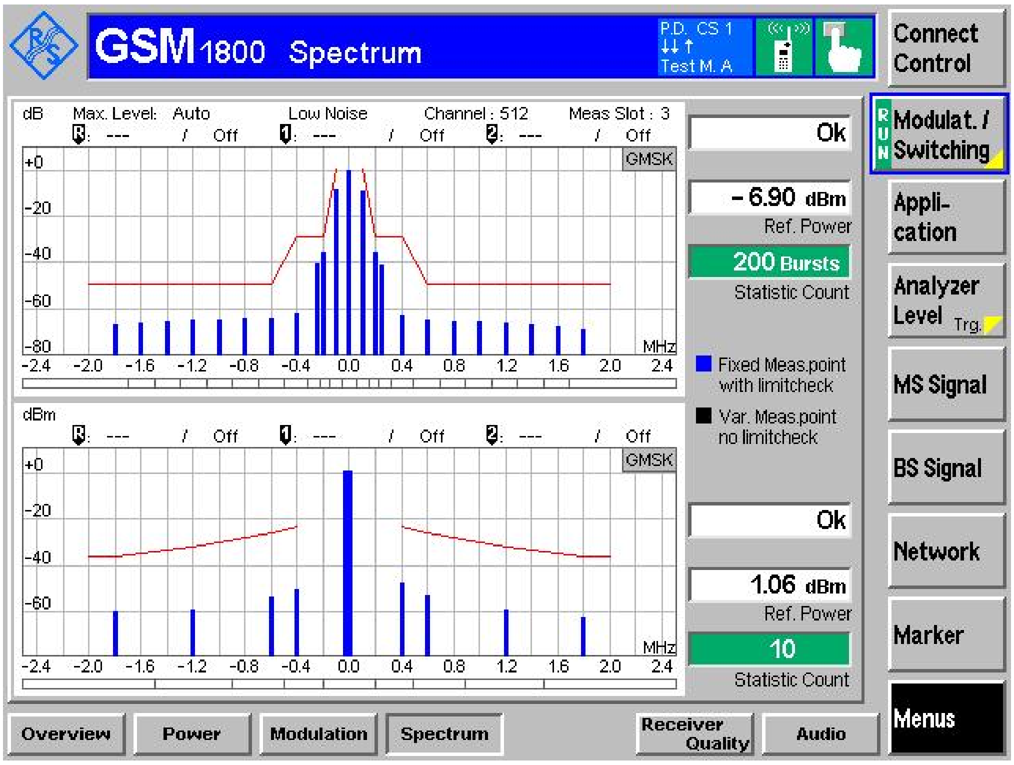
Normal Condition Power Control Level (σ=8), Low Channel



Normal Condition Power Control Level (σ=13), 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

ETSI EN 301 511 V12.5.5: 2018 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 table 1:

Table 1

Frequency Range	Power Level in 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	-	100 kHz	300 kHz

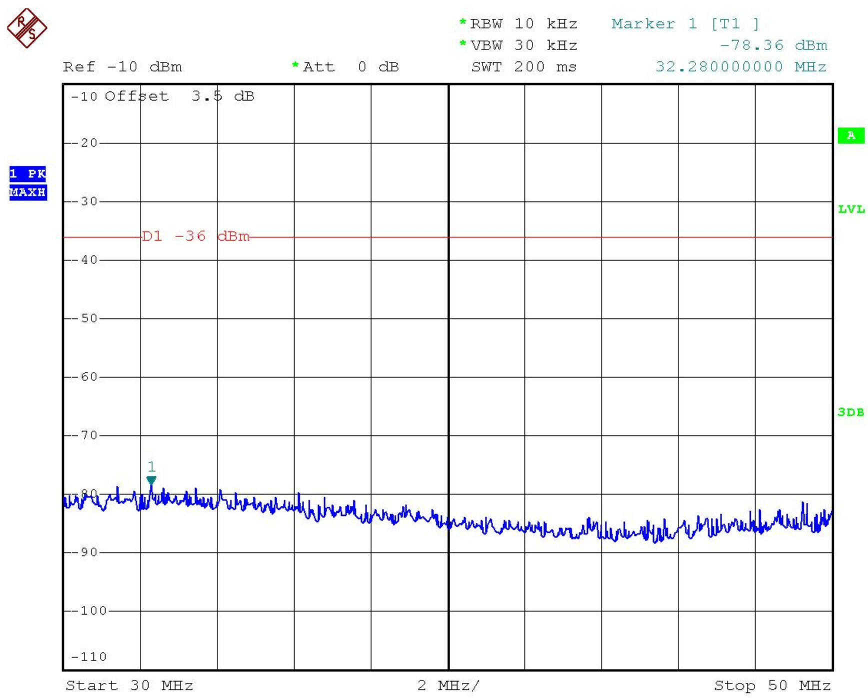
GSM 450:450.4 MHz to 457.6 MHz GSM 480: 478.8 MHz to 486 MHz, and the RX bands: For GSM 400 MS: 460.4 MHz to 467.6 MHz; 488.8 MHz to 496 MHz.			
500 MHz to 12.75 GHz excl. relevant TX band: GSM 750: 777 MHz to 792 MHz GSM 850: 824 MHz to 849 MHz; P-GSM: 890 MHz to 915 MHz; DCS: 1710 MHz to 1785 MHz, 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.			

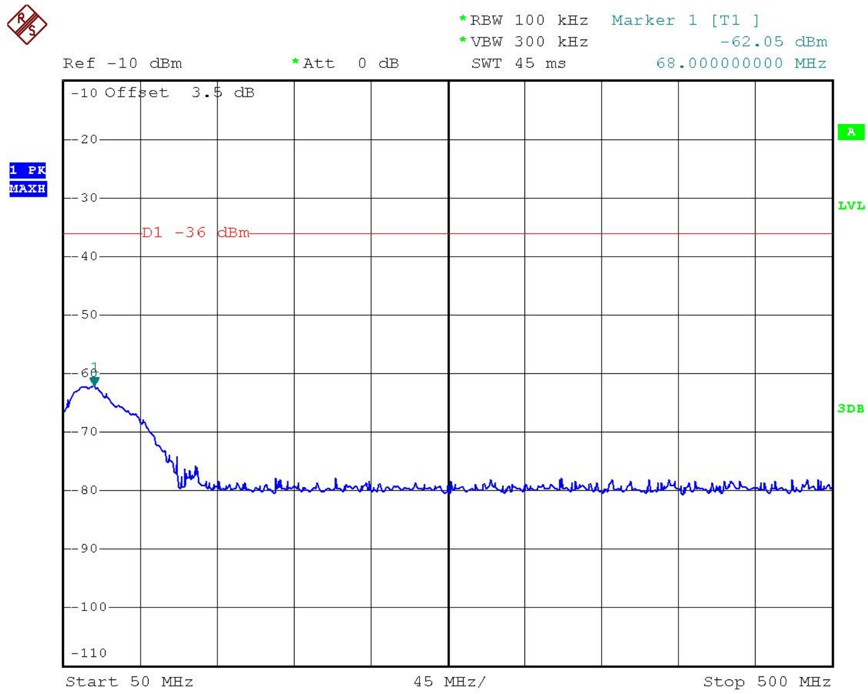
10.3 Test Equipment Used

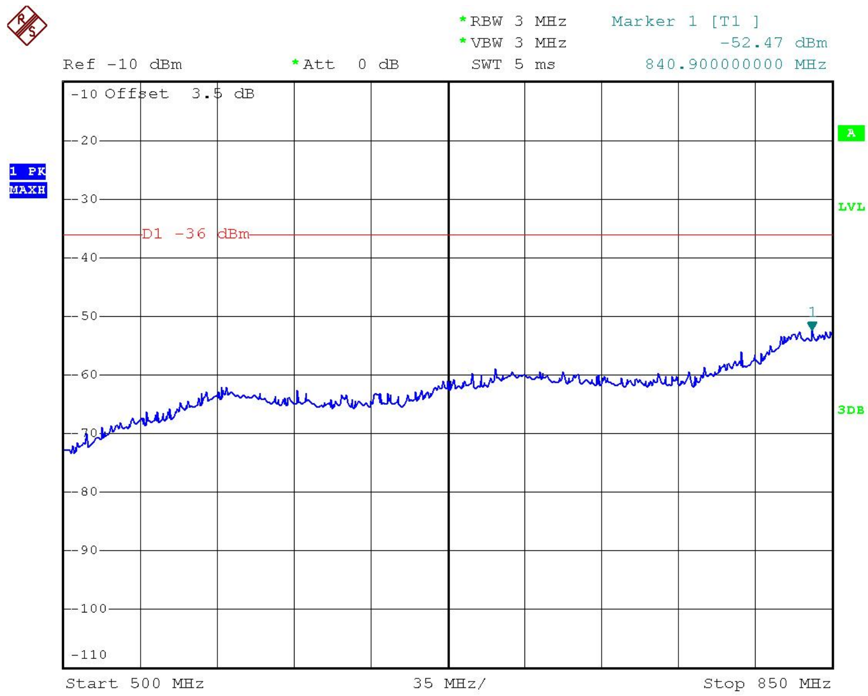
Description	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
Universal Radio Communication Tester	Rohde&Schwarz	CMU200	1100.864.02	2022-12-29	1 Year
Spectrum Analyzer	Rohde&Schwarz	FSL	MY4509214	2022-12-29	1 Year

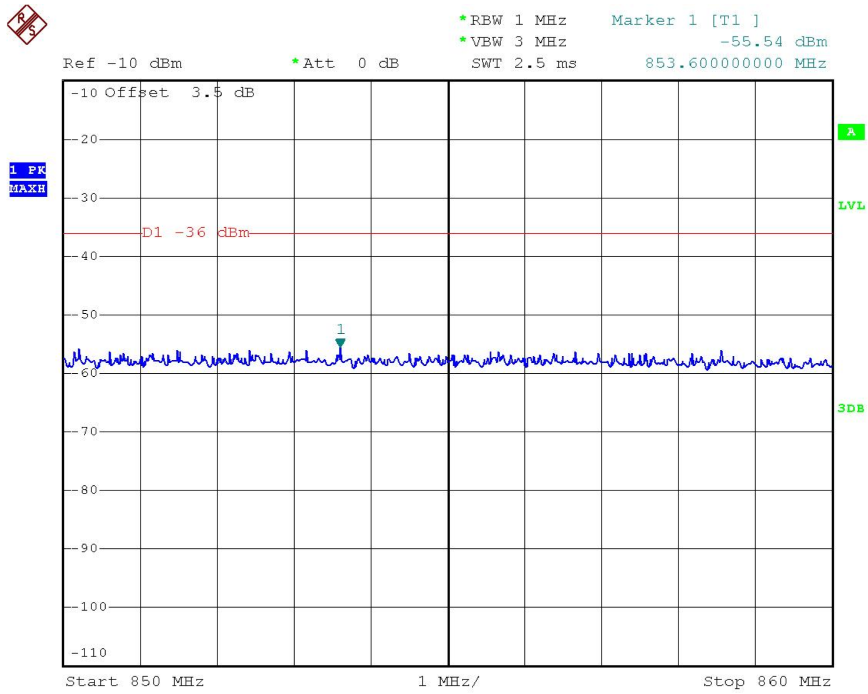
10.4 Test Data

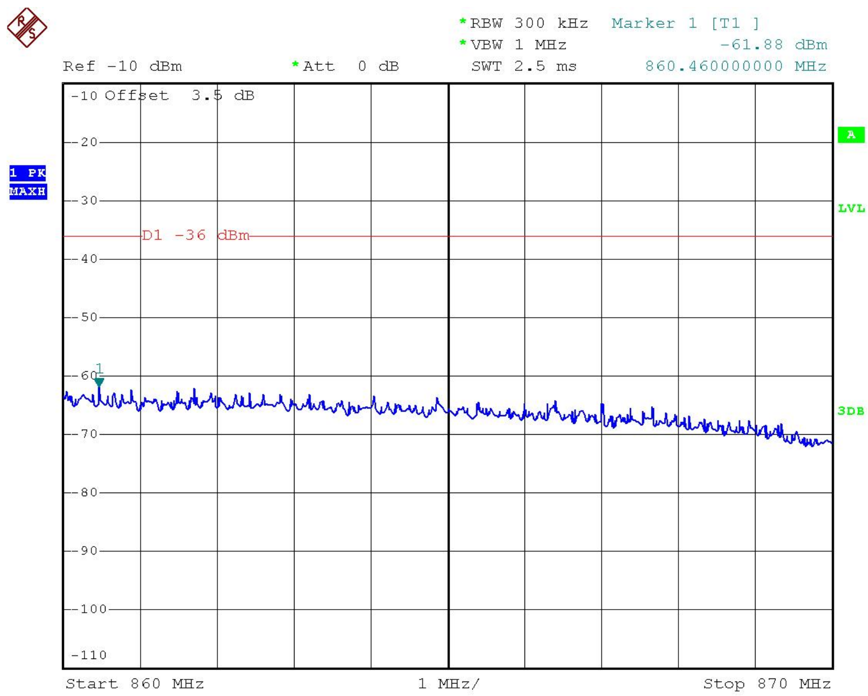
EGSM 900

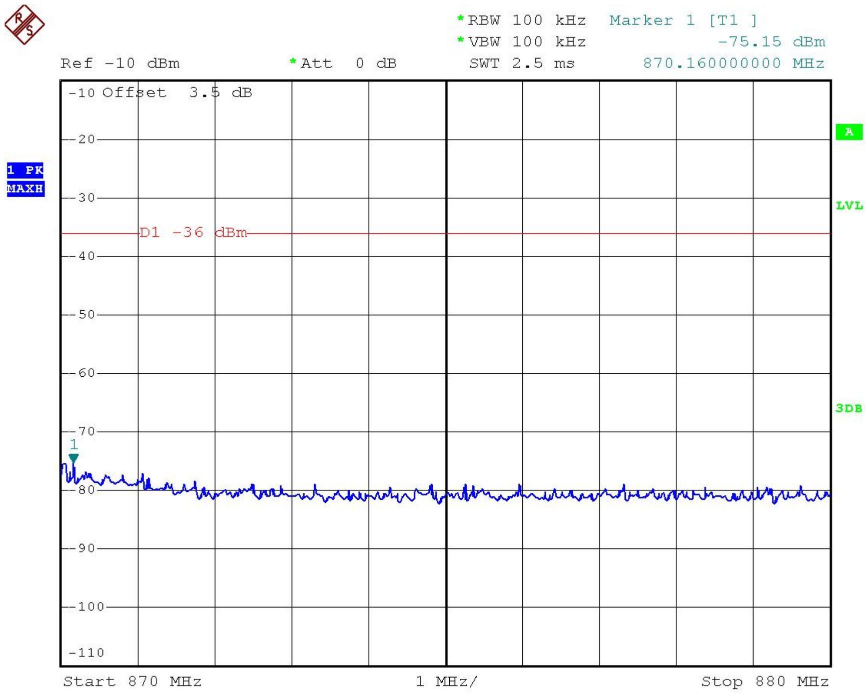


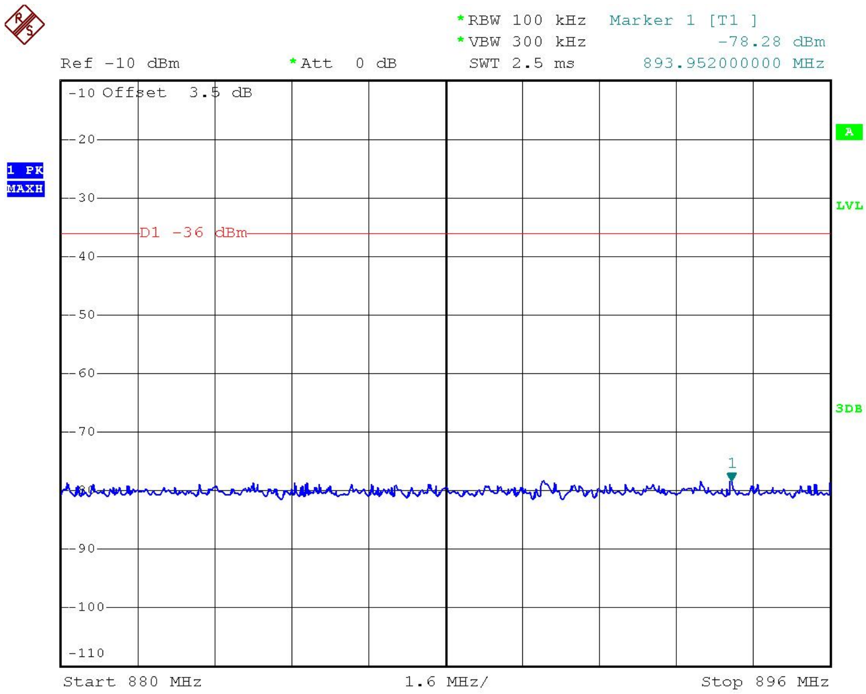

*RBW 100 kHz
Marker 1 [T1]
*VBW 300 kHz
-62.05 dBm
Ref -10 dBm
*Att 0 dB
SWT 45 ms
68.000000000 MHz
-10 Offset 3.5 dB
1 PK
MAXH
A
LVL
3DB
D1 -36 dBm
Start 50 MHz
45 MHz/
Stop 500 MHz

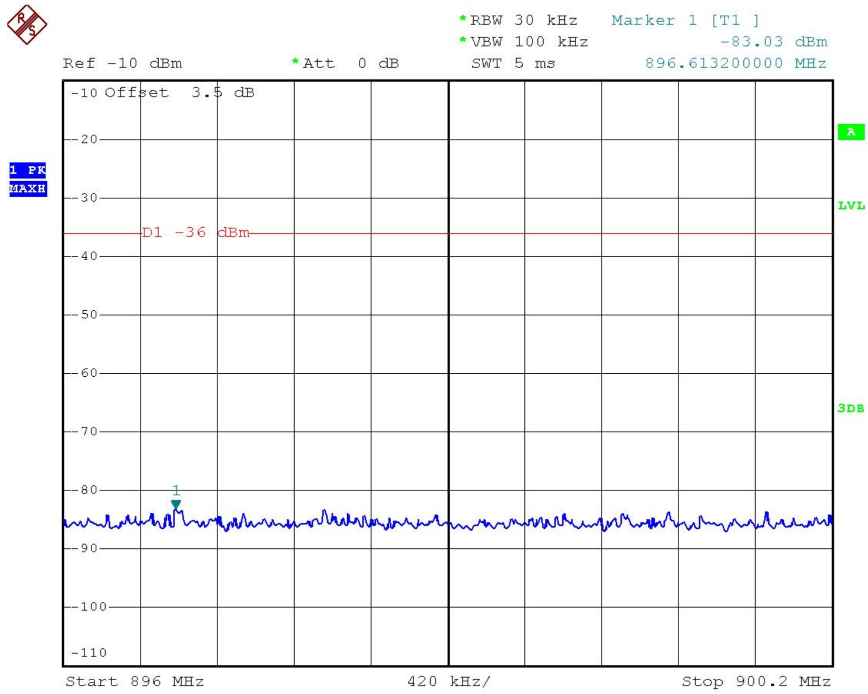

*RBW 3 MHz
Marker 1 [T1]
*VBW 3 MHz
-52.47 dBm
Ref -10 dBm
*Att 0 dB
SWT 5 ms
840.900000000 MHz
-10 Offset 3.5 dB
1 PK
MAXH
A
LVL
3DB
D1 -36 dBm
Start 500 MHz
35 MHz/
Stop 850 MHz

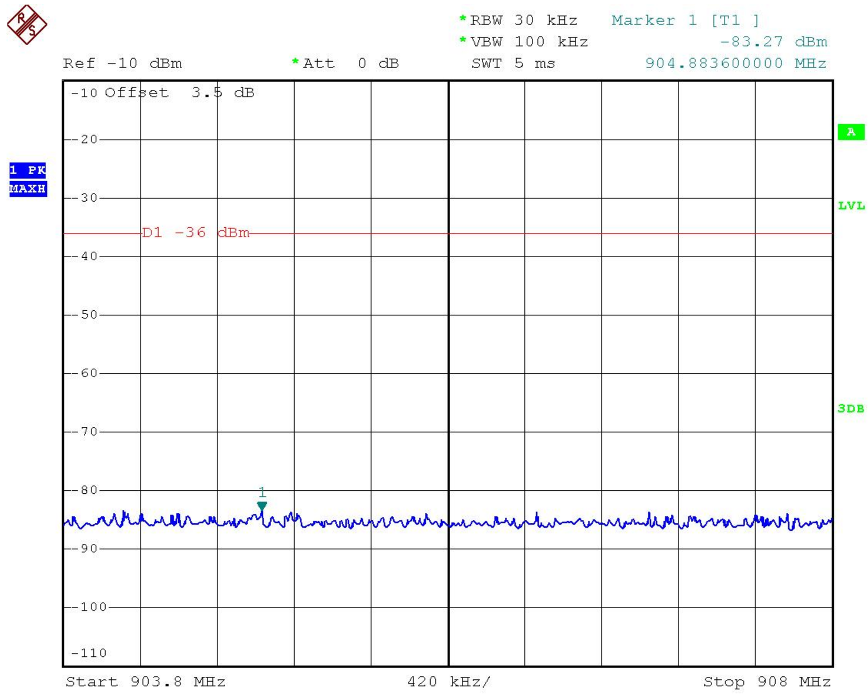

*RBW 1 MHz
*VBW 3 MHz
SWT 2.5 ms
Marker 1 [T1]
-55.54 dBm
853.600000000 MHz
Ref -10 dBm
*Att 0 dB
Offset 3.5 dB
1 PK
MAXH
D1 -36 dBm
A
LVL
3DB
Start 850 MHz
1 MHz/
Stop 860 MHz

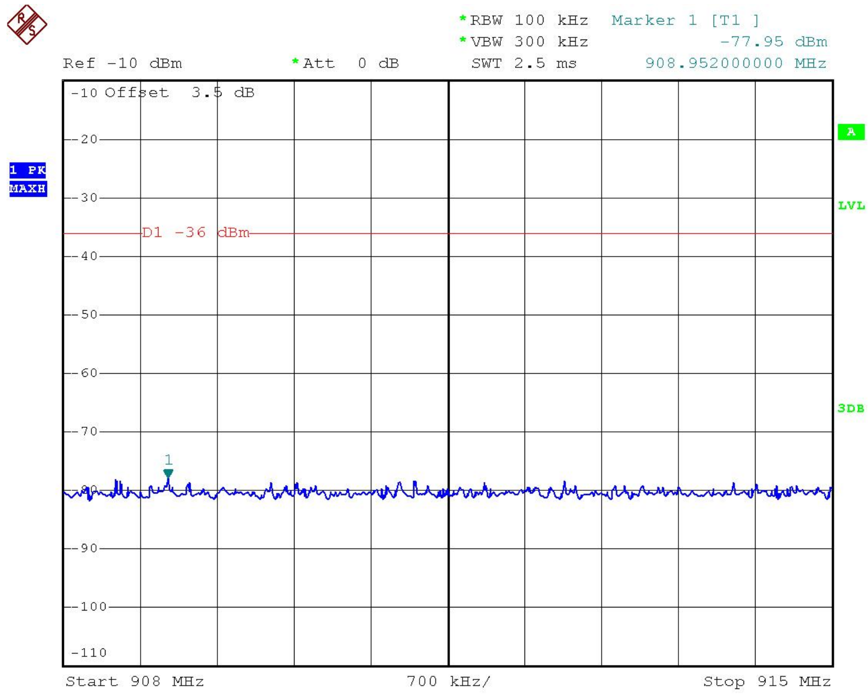

*RBW 300 kHz
*VBW 1 MHz
SWT 2.5 ms
Marker 1 [T1]
-61.88 dBm
860.460000000 MHz
Ref -10 dBm
*Att 0 dB
Offset 3.5 dB
1 PK
MAXH
D1 -36 dBm
A
LVL
3DB
Start 860 MHz
1 MHz/
Stop 870 MHz

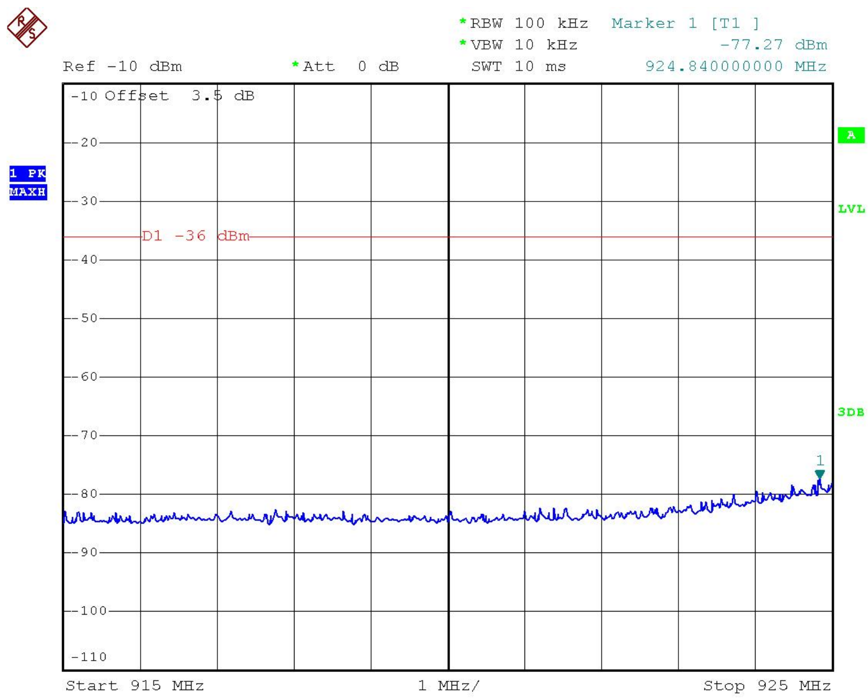

*RBW 100 kHz
Marker 1 [T1]
*VBW 100 kHz
-75.15 dBm
Ref -10 dBm
*Att 0 dB
SWT 2.5 ms
870.160000000 MHz
Offset 3.5 dB
1 PK
MAXH
D1 -36 dBm
A
LVL
3DB
Start 870 MHz
1 MHz/
Stop 880 MHz

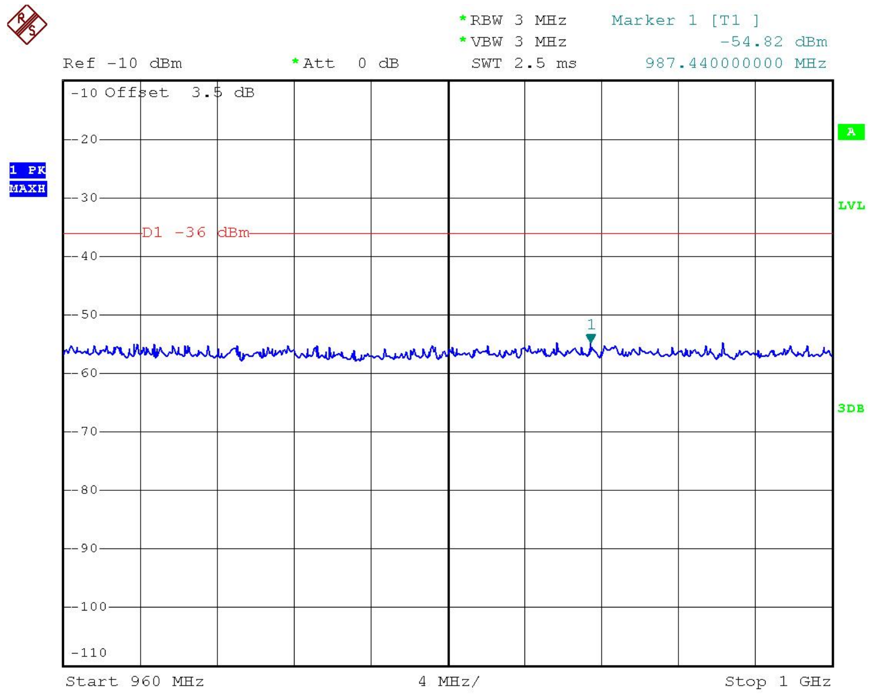

*RBW 100 kHz
Marker 1 [T1]
*VBW 300 kHz
-78.28 dBm
Ref -10 dBm
*Att 0 dB
SWT 2.5 ms
893.952000000 MHz
Offset 3.5 dB
1 PK
MAXH
D1 -36 dBm
A
LVL
3DB
Start 880 MHz
1.6 MHz/
Stop 896 MHz

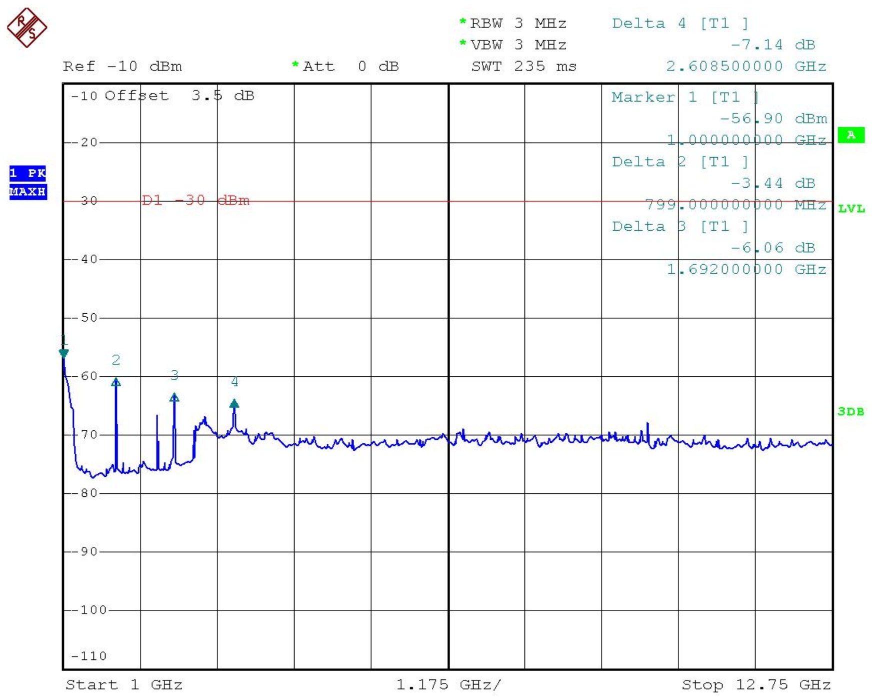

*RBW 30 kHz
Marker 1 [T1]
*VBW 100 kHz
-83.03 dBm
Ref -10 dBm
*Att 0 dB
SWT 5 ms
896.613200000 MHz
Offset 3.5 dB
1 PK
MAXH
A
LVL
3DB
D1 -36 dBm
Start 896 MHz
420 kHz/
Stop 900.2 MHz


*RBW 30 kHz
Marker 1 [T1]
*VBW 100 kHz
-83.27 dBm
Ref -10 dBm
*Att 0 dB
SWT 5 ms
904.883600000 MHz
Offset 3.5 dB
1 PK
MAXH
A
LVL
3DB
D1 -36 dBm
Start 903.8 MHz
420 kHz/
Stop 908 MHz

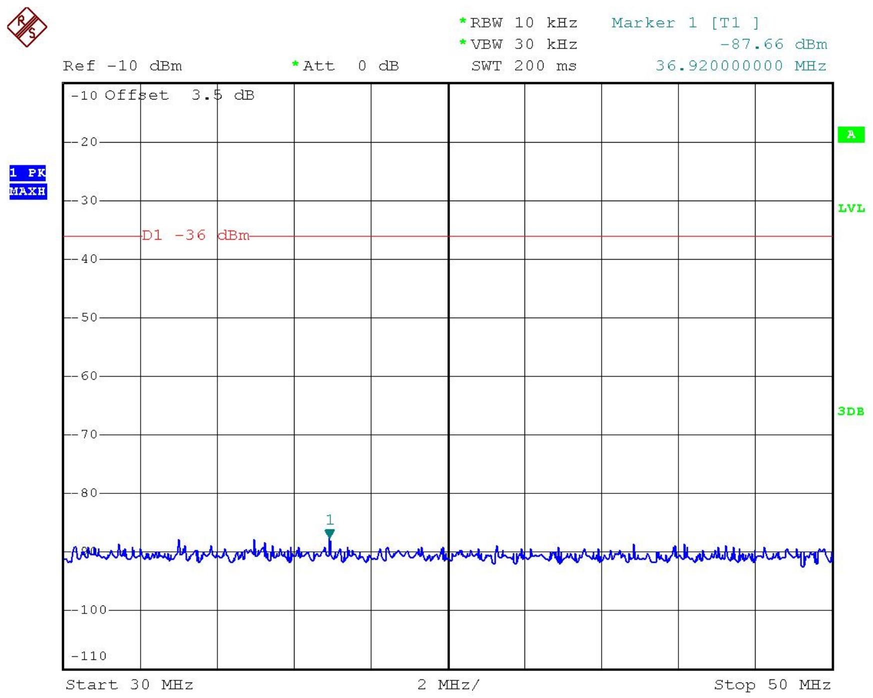

*RBW 100 kHz
Marker 1 [T1]
*VBW 300 kHz
-77.95 dBm
Ref -10 dBm
*Att 0 dB
SWT 2.5 ms
908.952000000 MHz
Offset 3.5 dB
1 PK
MAXH
D1 -36 dBm
A
LVL
3DB
Start 908 MHz
700 kHz/
Stop 915 MHz

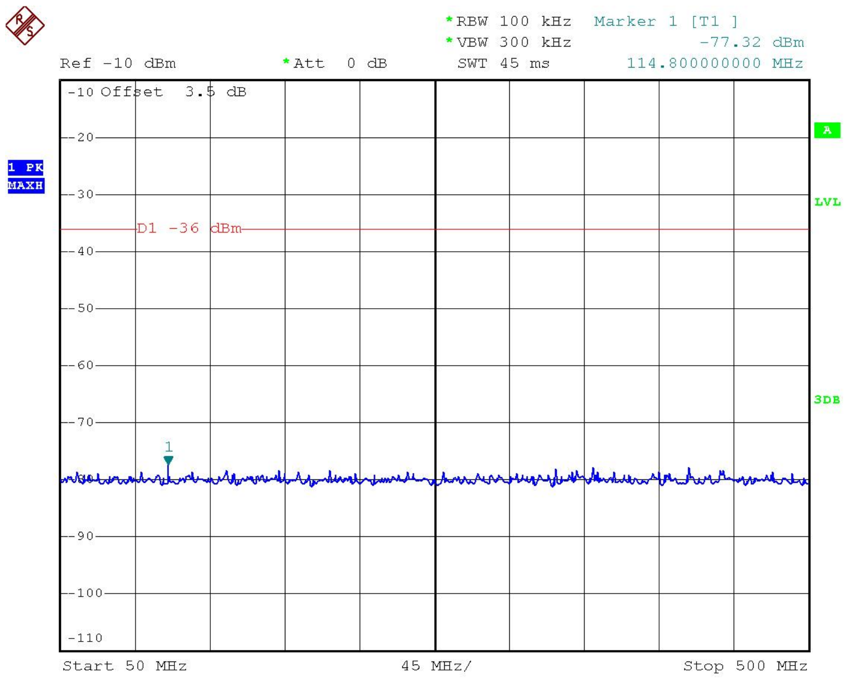

*RBW 100 kHz
Marker 1 [T1]
*VBW 10 kHz
-77.27 dBm
Ref -10 dBm
*Att 0 dB
SWT 10 ms
924.840000000 MHz
Offset 3.5 dB
1 PK
MAXH
D1 -36 dBm
A
LVL
3DB
Start 915 MHz
1 MHz/
Stop 925 MHz

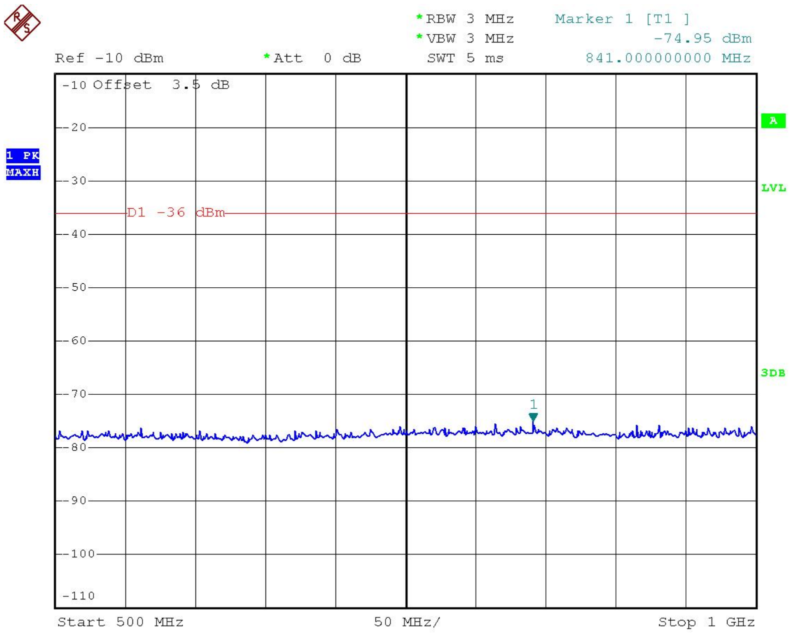

*RBW 3 MHz
*VBW 3 MHz
Marker 1 [T1]
-54.82 dBm
Ref -10 dBm
*Att 0 dB
SWT 2.5 ms
987.440000000 MHz
Offset 3.5 dB
1 PK
MAXH
D1 -36 dBm
A
LVL
3DB
Start 960 MHz
4 MHz/
Stop 1 GHz

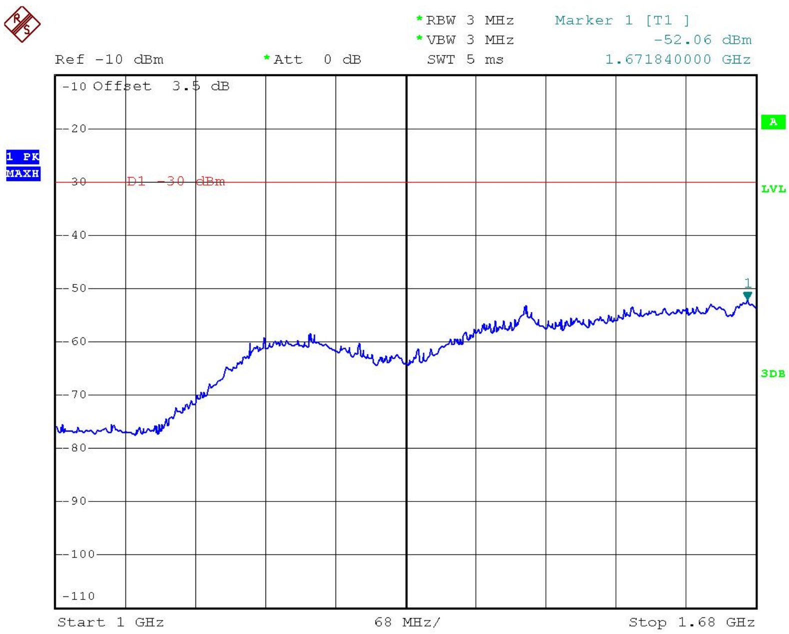

*RBW 3 MHz
*VBW 3 MHz
Delta 4 [T1]
-7.14 dB
Ref -10 dBm
*Att 0 dB
SWT 235 ms
2.608500000 GHz
Offset 3.5 dB
Marker 1 [T1]
-56.90 dBm
1.000000000 GHz
Delta 2 [T1]
-3.44 dB
799.000000000 MHz
Delta 3 [T1]
-6.06 dB
1.692000000 GHz
1 PK
MAXH
D1 -30 dBm
A
LVL
3DB
Start 1 GHz
1.175 GHz/
Stop 12.75 GHz

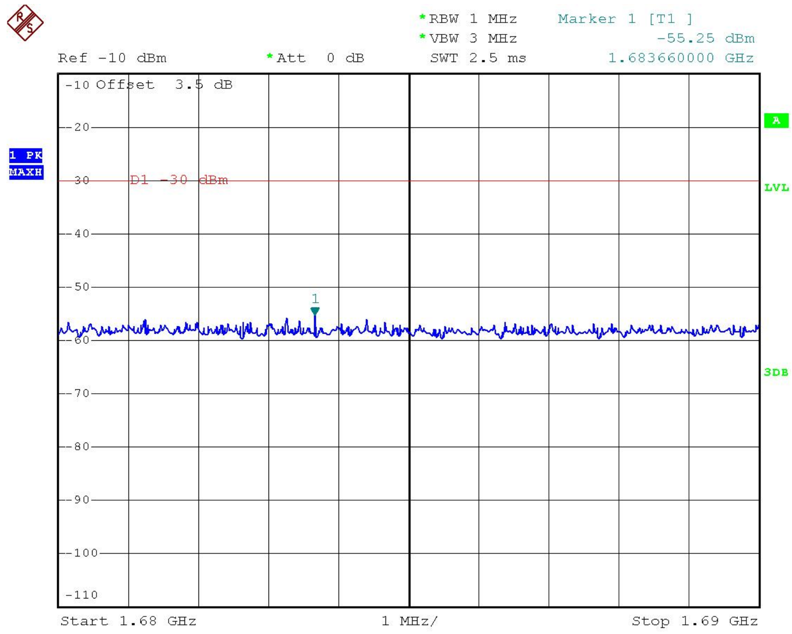
DCS 1800

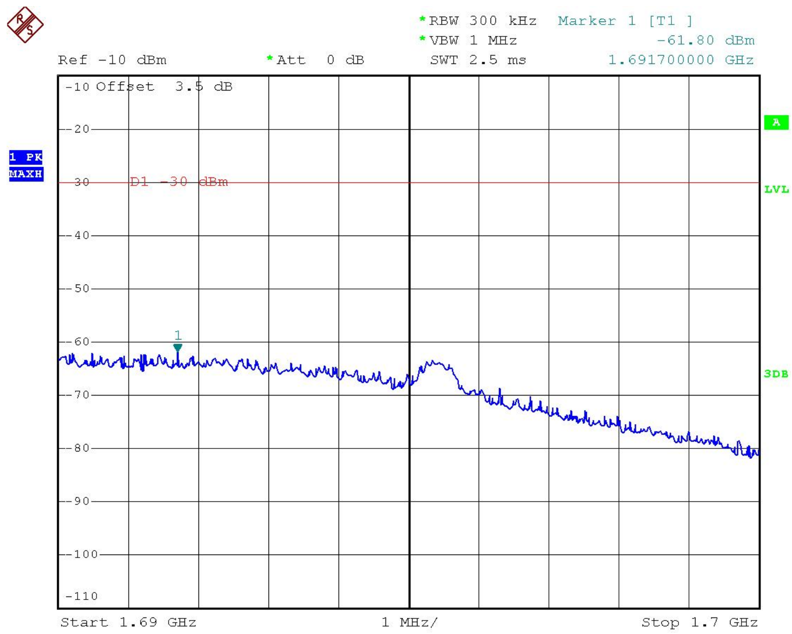

*RBW 10 kHz
Marker 1 [T1]
*VBW 30 kHz
-87.66 dBm
Ref -10 dBm
*Att 0 dB
SWT 200 ms
36.920000000 MHz
Offset 3.5 dB
D1 -36 dBm
1 PK
MAXH
A
LVL
3DB
Start 30 MHz
2 MHz/
Stop 50 MHz

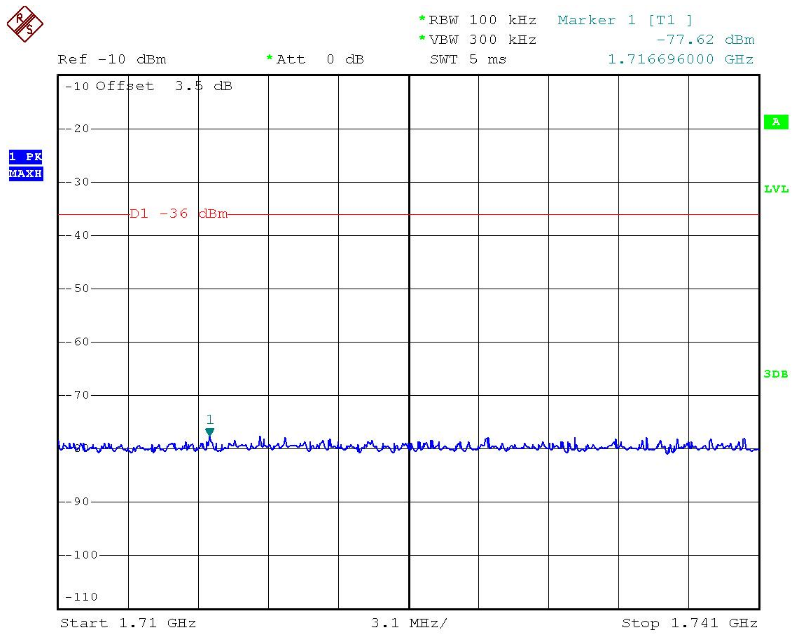

*RBW 100 kHz
Marker 1 [T1]
*VBW 300 kHz
-77.32 dBm
Ref -10 dBm
*Att 0 dB
SWT 45 ms
114.800000000 MHz
Offset 3.5 dB
D1 -36 dBm
1 PK
MAXH
A
LVL
3DB
Start 50 MHz
45 MHz/
Stop 500 MHz

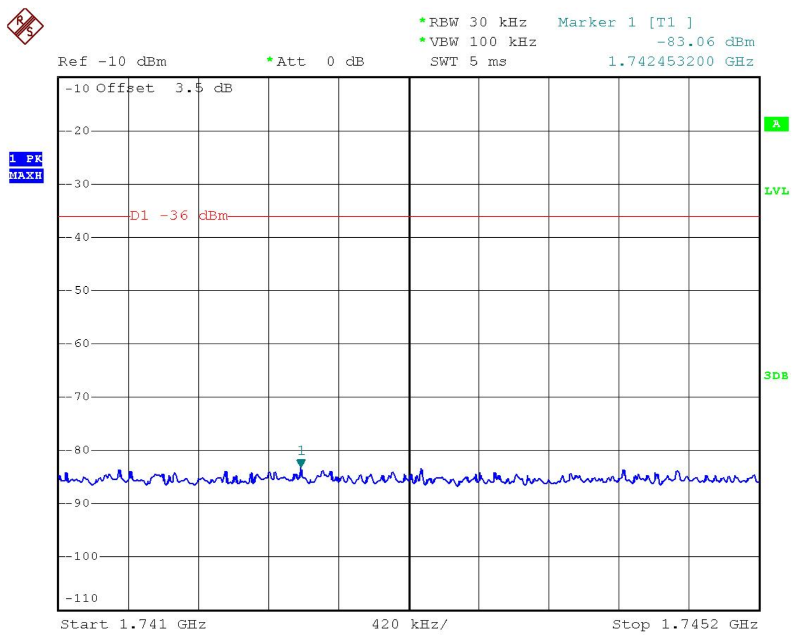

*RBW 3 MHz
Marker 1 [T1]
*VBW 3 MHz
-74.95 dBm
Ref -10 dBm
*Att 0 dB
SWT 5 ms
841.000000000 MHz
Offset 3.5 dB
1 PK
MAXH
D1 -36 dBm
A
LVL
3DB
Start 500 MHz
50 MHz/
Stop 1 GHz

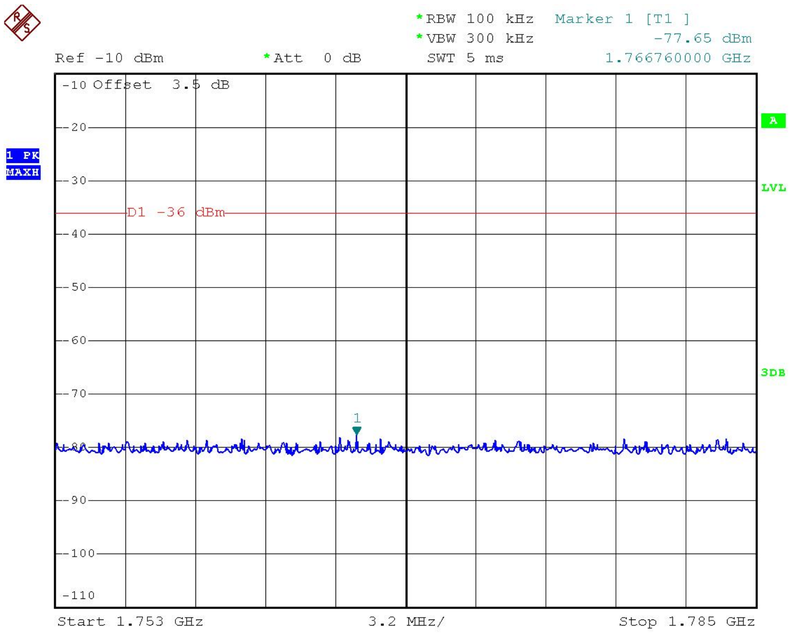

*RBW 3 MHz
Marker 1 [T1]
*VBW 3 MHz
-52.06 dBm
Ref -10 dBm
*Att 0 dB
SWT 5 ms
1.671840000 GHz
Offset 3.5 dB
1 PK
MAXH
D1 -30 dBm
A
LVL
3DB
Start 1 GHz
68 MHz/
Stop 1.68 GHz

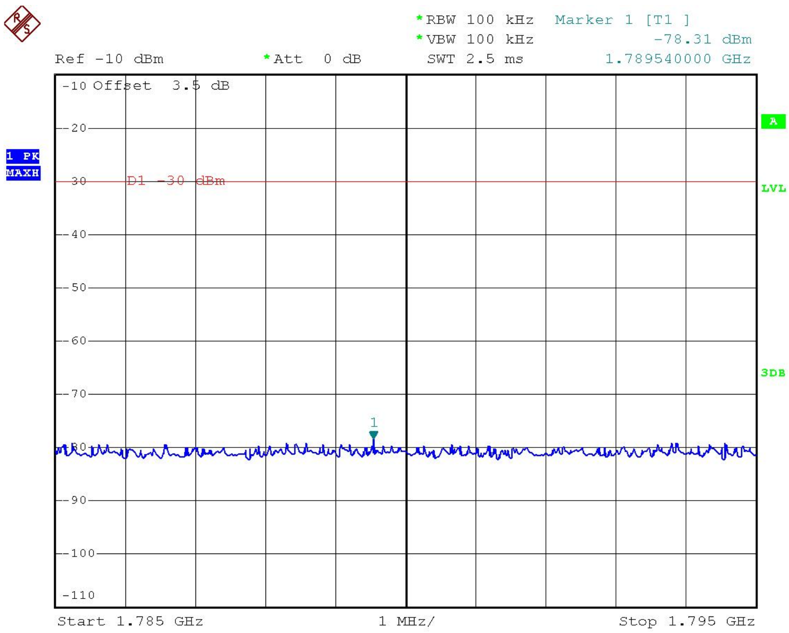

*RBW 1 MHz
*VBW 3 MHz
SWT 2.5 ms
Marker 1 [T1]
-55.25 dBm
1.683660000 GHz
Ref -10 dBm
*Att 0 dB
Offset 3.5 dB
1 PK MAXH
D1 -30 dBm
A
LVL
3DB
Start 1.68 GHz
1 MHz/
Stop 1.69 GHz

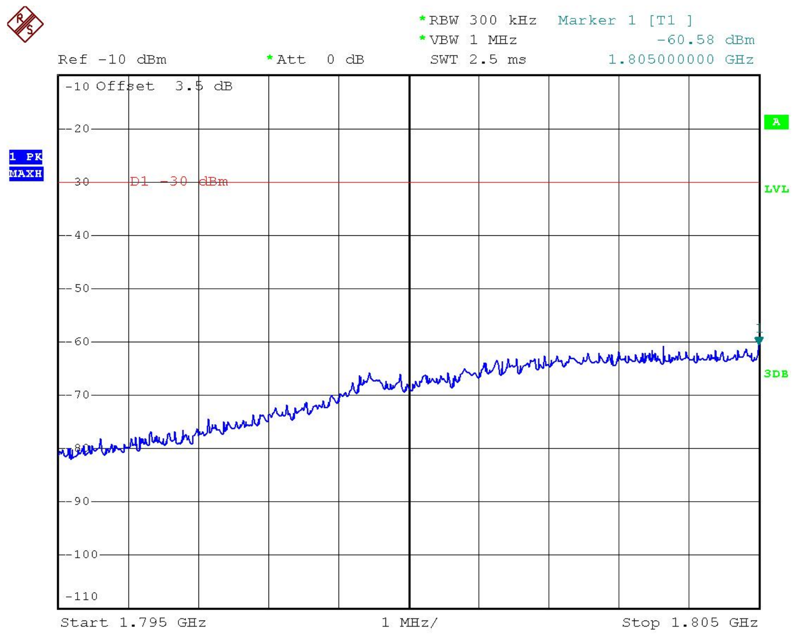

*RBW 300 kHz
*VBW 1 MHz
SWT 2.5 ms
Marker 1 [T1]
-61.80 dBm
1.691700000 GHz
Ref -10 dBm
*Att 0 dB
Offset 3.5 dB
1 PK MAXH
D1 -30 dBm
A
LVL
3DB
Start 1.69 GHz
1 MHz/
Stop 1.7 GHz

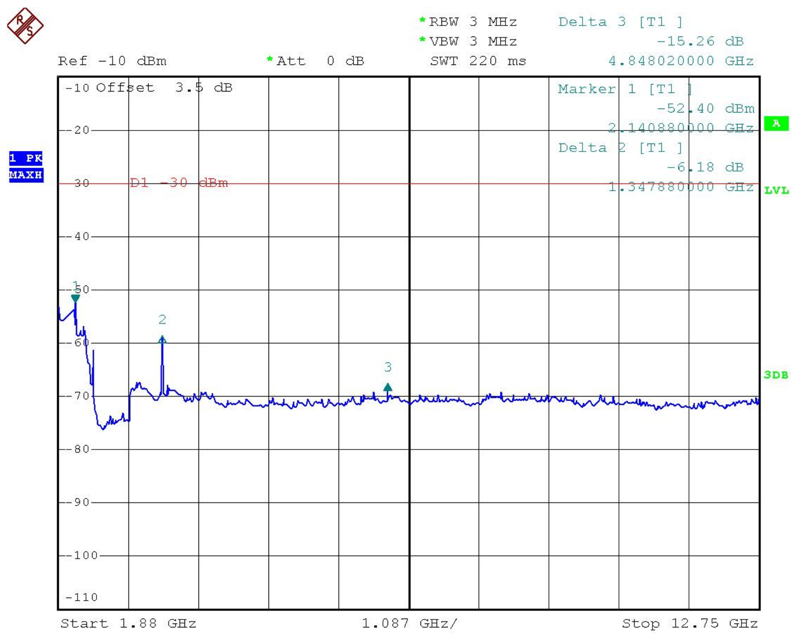

*RBW 100 kHz
Marker 1 [T1]
*VBW 300 kHz
-77.62 dBm
Ref -10 dBm
*Att 0 dB
SWT 5 ms
1.716696000 GHz
Offset 3.5 dB
1 PK
MAXH
D1 -36 dBm
A
LVL
3DB
Start 1.71 GHz
3.1 MHz/
Stop 1.741 GHz


*RBW 30 kHz
Marker 1 [T1]
*VBW 100 kHz
-83.06 dBm
Ref -10 dBm
*Att 0 dB
SWT 5 ms
1.742453200 GHz
Offset 3.5 dB
1 PK
MAXH
D1 -36 dBm
A
LVL
3DB
Start 1.741 GHz
420 kHz/
Stop 1.7452 GHz


RBW 100 kHz
Marker 1 [T1]
VBW 300 kHz
-77.65 dBm
Ref -10 dBm
Att 0 dB
SWT 5 ms
1.766760000 GHz
Offset 3.5 dB
1 PK
MAXH
D1 -36 dBm
A
LVL
3DB
Start 1.753 GHz
3.2 MHz/
Stop 1.785 GHz


RBW 100 kHz
Marker 1 [T1]
VBW 100 kHz
-78.31 dBm
Ref -10 dBm
Att 0 dB
SWT 2.5 ms
1.789540000 GHz
Offset 3.5 dB
1 PK
MAXH
D1 -30 dBm
A
LVL
3DB
Start 1.785 GHz
1 MHz/
Stop 1.795 GHz


*RBW 300 kHz
Marker 1 [T1]
*VBW 1 MHz
-60.58 dBm
Ref -10 dBm
*Att 0 dB
SWT 2.5 ms
1.805000000 GHz
-10 Offset 3.5 dB
1 PK MAXH
D1 -30 dBm
LVL
3DB
Start 1.795 GHz
1 MHz/
Stop 1.805 GHz


*RBW 3 MHz
Delta 3 [T1]
*VBW 3 MHz
-15.26 dB
Ref -10 dBm
*Att 0 dB
SWT 220 ms
4.848020000 GHz
-10 Offset 3.5 dB
Marker 1 [T1]
-52.40 dBm
2.140880000 GHz
Delta 2 [T1]
-6.18 dB
1.347880000 GHz
1 PK MAXH
D1 -30 dBm
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

ETSI EN 301 511 V12.5.5: 2018 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 table 3:

Table 3

Frequency range		Power level in 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

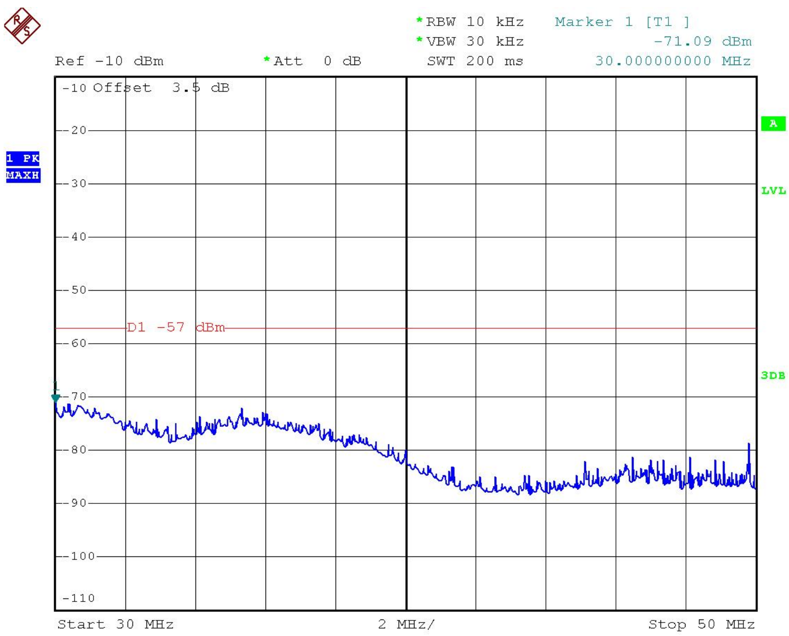
Description	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
Universal Radio Communication Tester	Rohde&Schwarz	CMU200	1100.864.02	2022-12-29	1 Year
Spectrum Analyzer	Rohde&Schwarz	FSL	MY4509214	2022-12-29	1 Year

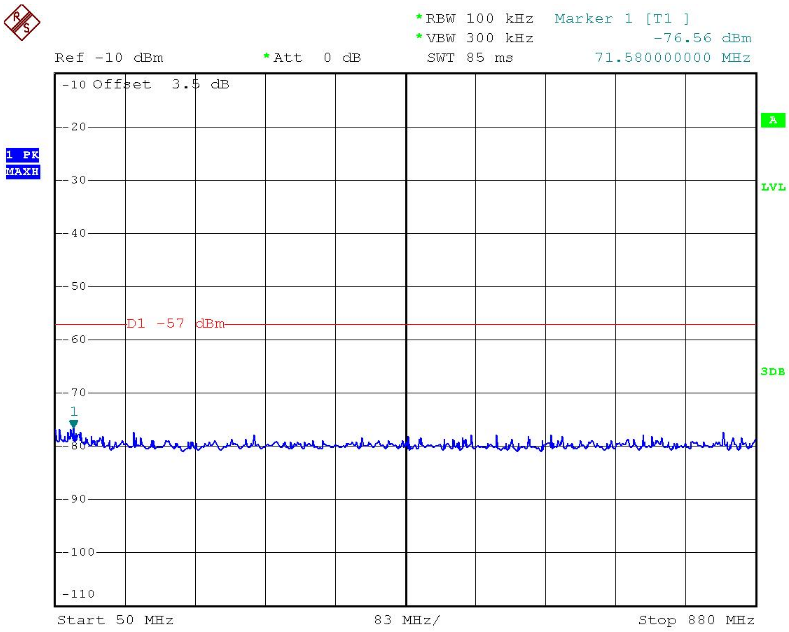
11.4 Test Data

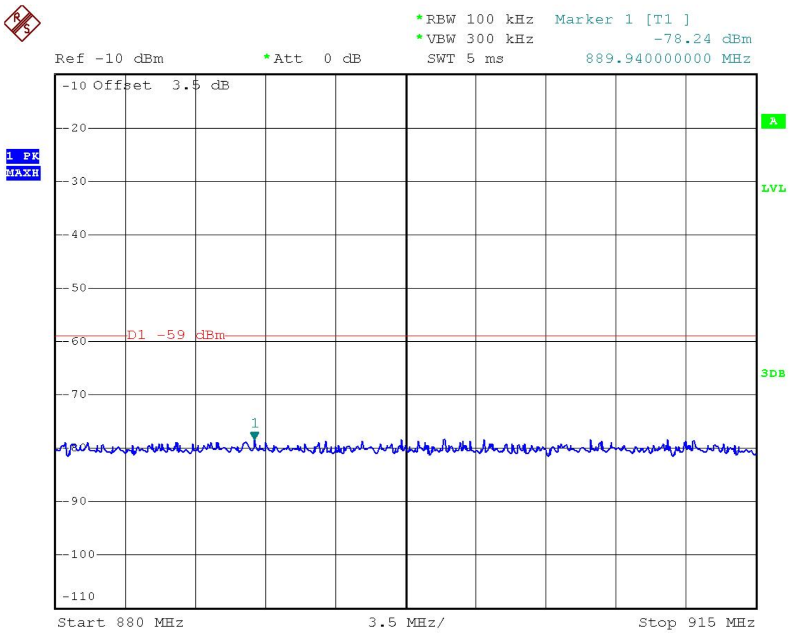
Environmental Conditions:

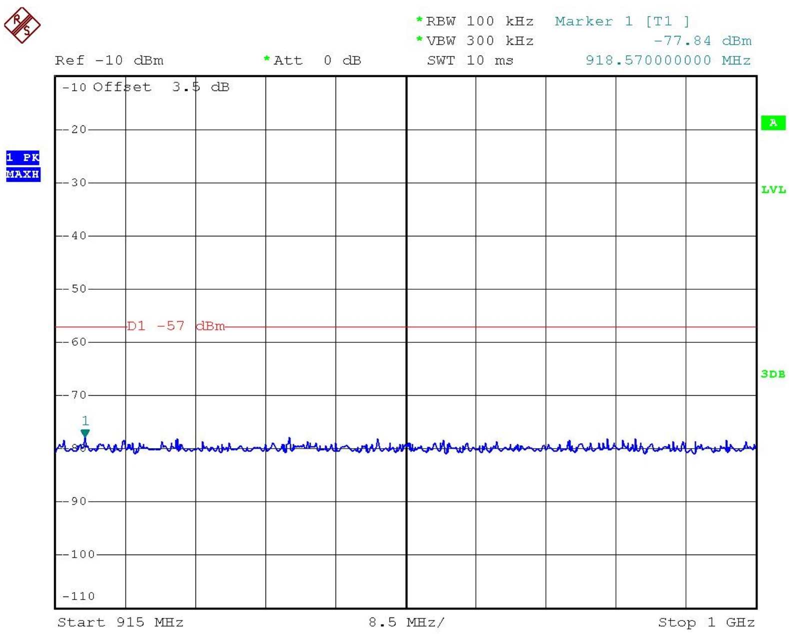
Temperature:	25 ° C
Relative Humidity:	56%
ATM Pressure:	100.2 kPa

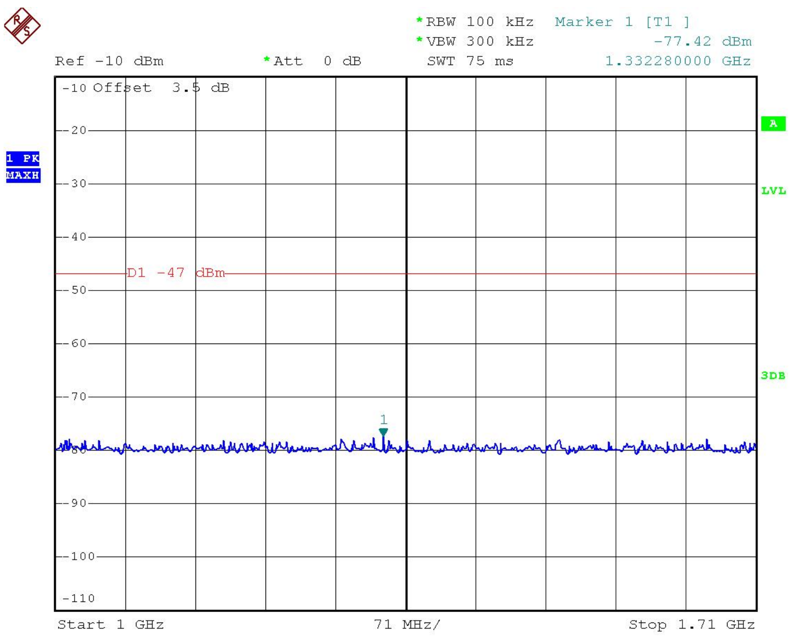
EGSM 900

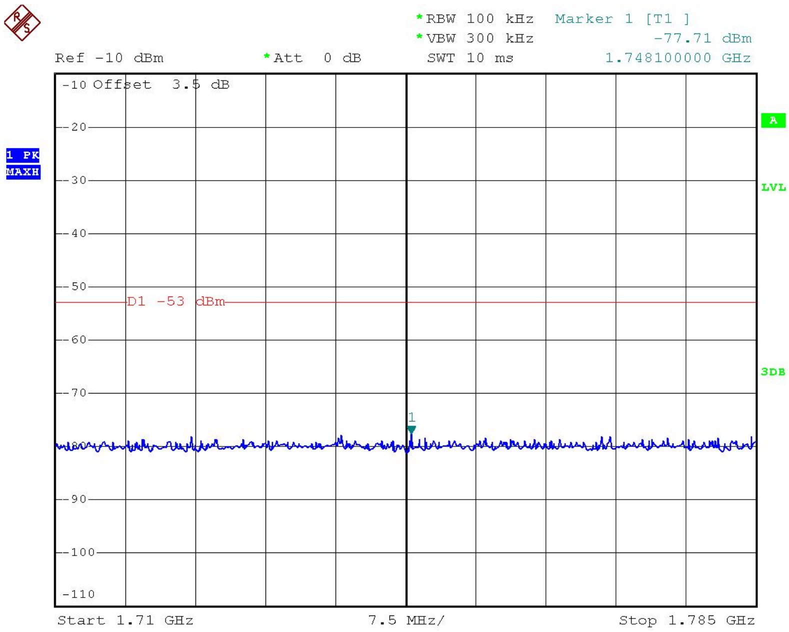


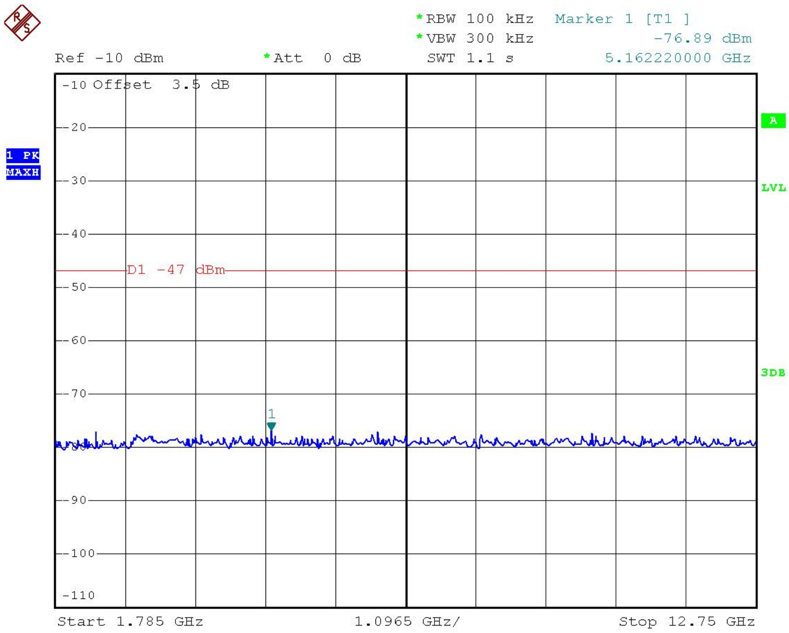

*RBW 100 kHz Marker 1 [T1]
*VBW 300 kHz -76.56 dBm
Ref -10 dBm *Att 0 dB SWT 85 ms 71.580000000 MHz
Offset 3.5 dB
1 PK MAXH
A
LVL
3DB
D1 -57 dBm
Start 50 MHz 83 MHz/ Stop 880 MHz


*RBW 100 kHz Marker 1 [T1]
*VBW 300 kHz -78.24 dBm
Ref -10 dBm *Att 0 dB SWT 5 ms 889.940000000 MHz
Offset 3.5 dB
1 PK MAXH
A
LVL
3DB
D1 -59 dBm
Start 880 MHz 3.5 MHz/ Stop 915 MHz

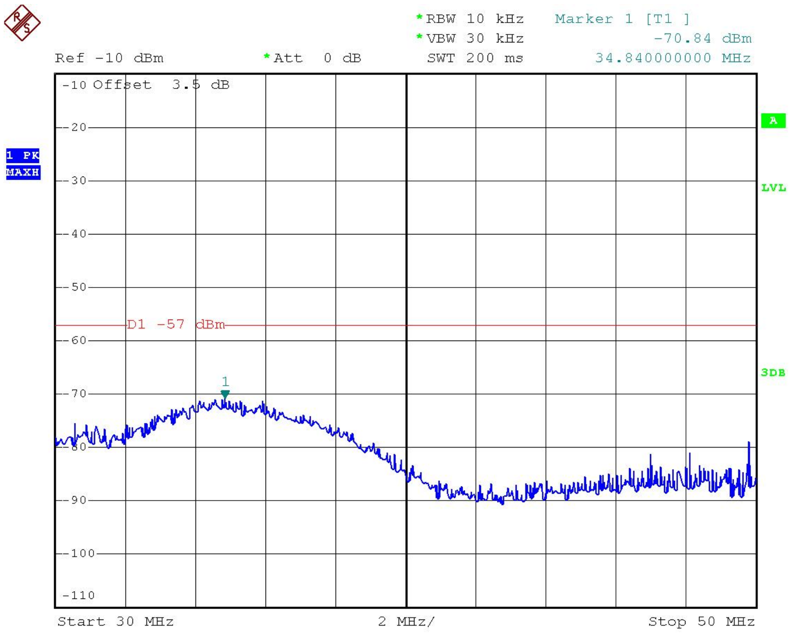

*RBW 100 kHz
Marker 1 [T1]
*VBW 300 kHz
-77.84 dBm
Ref -10 dBm
*Att 0 dB
SWT 10 ms
918.570000000 MHz
Offset 3.5 dB
1 PK
MAXH
D1 -57 dBm
A
LVL
3DB
Start 915 MHz
8.5 MHz/
Stop 1 GHz

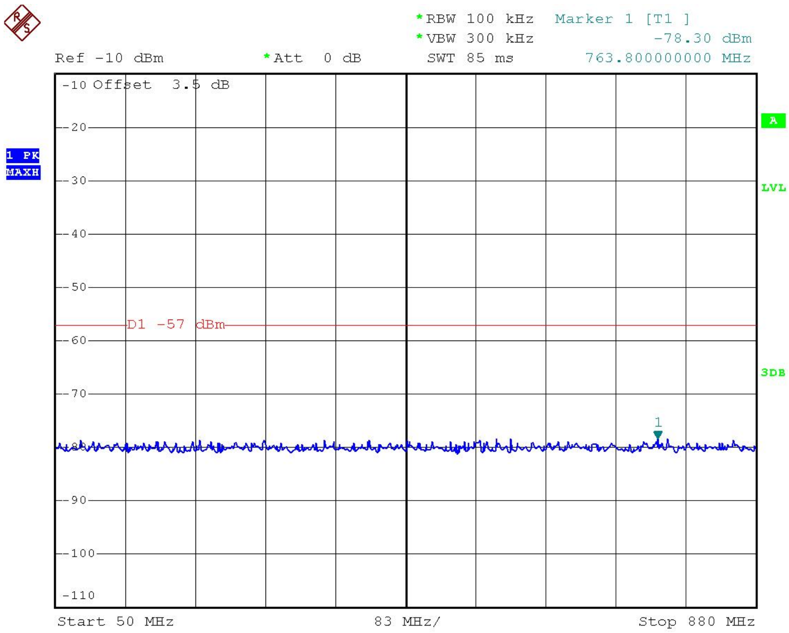

*RBW 100 kHz
Marker 1 [T1]
*VBW 300 kHz
-77.42 dBm
Ref -10 dBm
*Att 0 dB
SWT 75 ms
1.332280000 GHz
Offset 3.5 dB
1 PK
MAXH
D1 -47 dBm
A
LVL
3DB
Start 1 GHz
71 MHz/
Stop 1.71 GHz

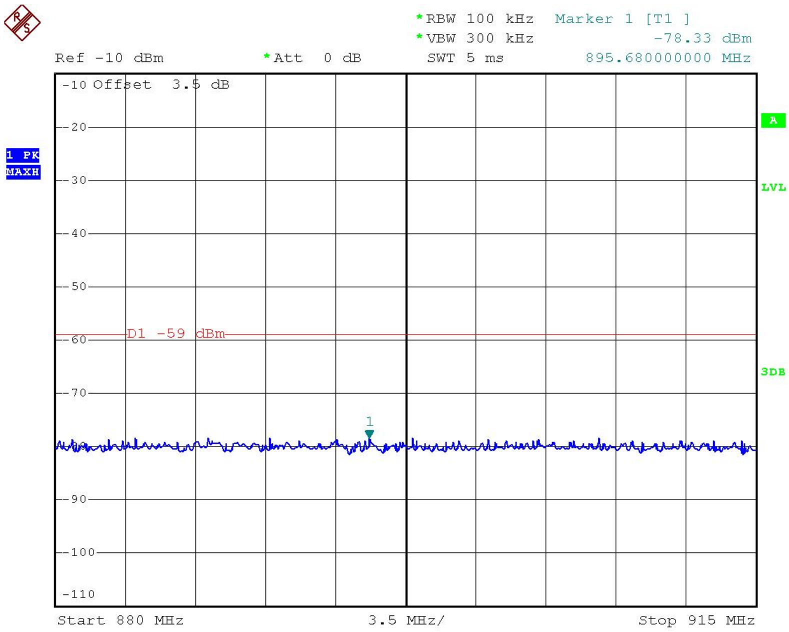

*RBW 100 kHz
Marker 1 [T1]
*VBW 300 kHz
-77.71 dBm
Ref -10 dBm
*Att 0 dB
SWT 10 ms
1.748100000 GHz
Offset 3.5 dB
1 PK
MAXH
D1 -53 dBm
A
LVL
3DB
Start 1.71 GHz
7.5 MHz/
Stop 1.785 GHz

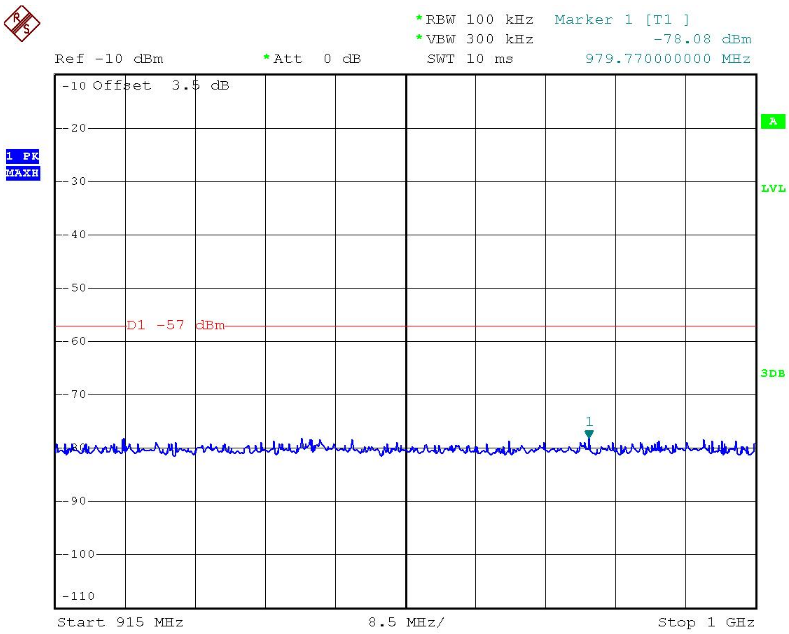

*RBW 100 kHz
Marker 1 [T1]
*VBW 300 kHz
-76.89 dBm
Ref -10 dBm
*Att 0 dB
SWT 1.1 s
5.162220000 GHz
Offset 3.5 dB
1 PK
MAXH
D1 -47 dBm
A
LVL
3DB
Start 1.785 GHz
1.0965 GHz/
Stop 12.75 GHz

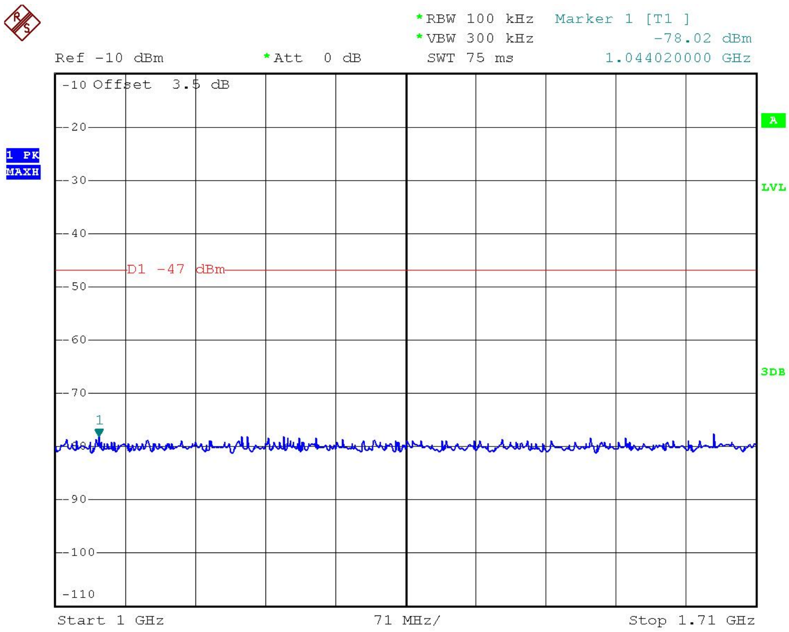
DCS 1800

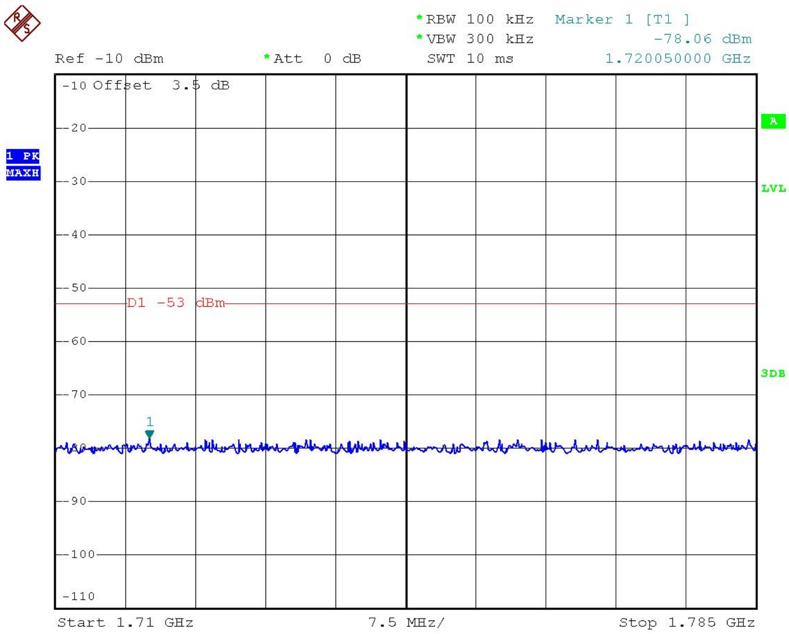

*RBW 10 kHz
Marker 1 [T1]
*VBW 30 kHz
-70.84 dBm
Ref -10 dBm
*Att 0 dB
SWT 200 ms
34.840000000 MHz
Offset 3.5 dB
1 PK MAXH
D1 -57 dBm
Start 30 MHz
2 MHz/
Stop 50 MHz

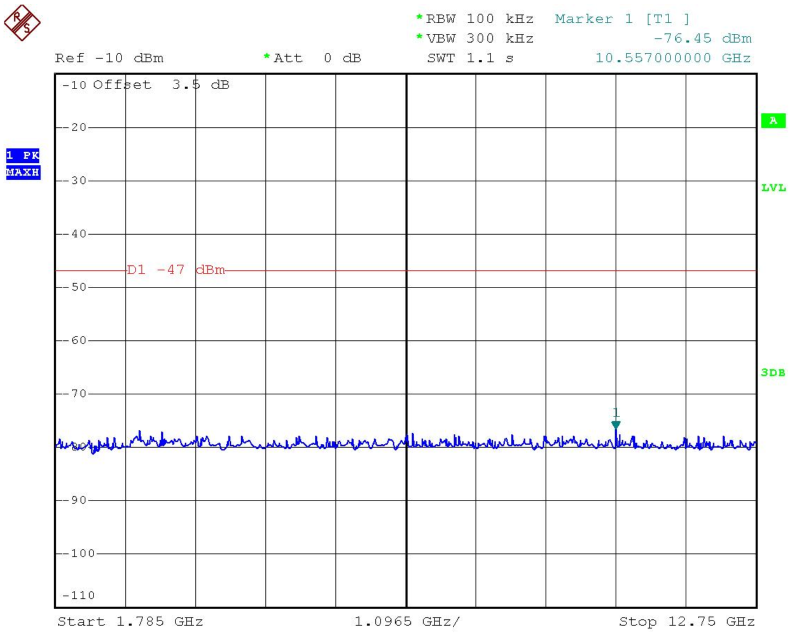

*RBW 100 kHz
Marker 1 [T1]
*VBW 300 kHz
-78.30 dBm
Ref -10 dBm
*Att 0 dB
SWT 85 ms
763.800000000 MHz
Offset 3.5 dB
1 PK MAXH
D1 -57 dBm
Start 50 MHz
83 MHz/
Stop 880 MHz


*RBW 100 kHz
Marker 1 [T1]
*VBW 300 kHz
-78.33 dBm
Ref -10 dBm
*Att 0 dB
SWT 5 ms
895.680000000 MHz
Offset 3.5 dB
1 PK MAXH
A
LVL
3DB
D1 -59 dBm
Start 880 MHz
3.5 MHz/
Stop 915 MHz


*RBW 100 kHz
Marker 1 [T1]
*VBW 300 kHz
-78.08 dBm
Ref -10 dBm
*Att 0 dB
SWT 10 ms
979.770000000 MHz
Offset 3.5 dB
1 PK MAXH
A
LVL
3DB
D1 -57 dBm
Start 915 MHz
8.5 MHz/
Stop 1 GHz


RBW 100 kHz
Marker 1 [T1]
VBW 300 kHz
-78.02 dBm
Ref -10 dBm
Att 0 dB
SWT 75 ms
1.044020000 GHz
Offset 3.5 dB
D1 -47 dBm
Start 1 GHz
71 MHz/
Stop 1.71 GHz


RBW 100 kHz
Marker 1 [T1]
VBW 300 kHz
-78.06 dBm
Ref -10 dBm
Att 0 dB
SWT 10 ms
1.720050000 GHz
Offset 3.5 dB
D1 -53 dBm
Start 1.71 GHz
7.5 MHz/
Stop 1.785 GHz


*RBW 100 kHz
*VBW 300 kHz
SWT 1.1 s
Marker 1 [T1]
-76.45 dBm
10.557000000 GHz
Ref -10 dBm
*Att 0 dB
Offset 3.5 dB
1 PK
MAXH
A
LVL
3DB
D1 -47 dBm
-10
-20
-30
-40
-50
-60
-70
-90
-100
-110
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

ETSI EN 301 511 V12.5.5: 2018 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.

Table 5

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

Table 6

Frequency range	**Frequency offset**	**Filter bandwidth**	**Approx video bandwidth**
30 MHz 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	-	100 kHz	300 kHz
500 MHz to 4 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; E-GSM: 880 MHz to 915 MHz; DCS: 1710 MHz to 1785 MHz. PCS 1900: 1850 MHz to 1910 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 MHz to 6.0 MHz > 6.0 MHz (offset from carrier)	30 kHz 100 kHz	100 kHz 300 kHz
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.**	**Last Cal.**	**Cal. Interval**
Universal Radio Communication Tester	Rohde&Schwarz	CMU200	1100.864.02	2022-12-29	1 Year

Pre-Amplifier	Ducommun	85745A	99056-01	2022-12-29	1 Year
Pre-Amplifier	HP	84487B	314500	2022-12-29	1 Year
Signal Generator	HP	865220B	522144B	2022-12-29	1 Year
Horn Antenna	Sunol Sciences	DRH-336	A05554	2022-12-29	1 Year
Horn Antenna	A.R.A	DRG-198/A	1135	2022-12-29	1 Year
Spectrum Analyzer	Agilent	E4446A	US2547074	2022-12-29	1 Year

12.4 Test Data

Environmental Conditions:

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

EUT:	Car radio	Model Name :	Z0625
Temperature:	20° C	Relative Humidity:	56%
Pressure:	1010 hPa	Test Voltage :	DC 12V
Test Mode :	EGSM 900 Middle Channel		

Scan 30 MHz~4 GHz, Middle Channel.

No.	Freq. (MHz)	Ant.Pol. H/V	Reading (dBm)	Factor (dB)	Measure-ment (dBm)	Limit (dBm)	Margin (dB)	Detector
1	1796.00	H	-46.44	7.89	-38.55	-30	8.55	Peak
2	2694.00	H	-57.25	8.64	-48.61	-30	18.61	Peak
3	3592.00	H	-56.48	9.68	-46.80	-30	16.80	Peak
4	1796.00	V	-46.84	9.25	-38.95	-30	8.95	Peak
5	2694.00	V	-57.88	8.64	-49.24	-30	19.24	Peak
6	3592.00	V	-54.98	9.68	-45.30	-30	15.30	Peak

EUT:	Car radio	Model Name :	Z0625
Temperature:	20° C	Relative Humidity:	56%
Pressure:	1010 hPa	Test Voltage :	DC 12V
Test Mode :	EGSM 1800 Middle Channel		

Scan 30 MHz~4 GHz, Middle Channel.

No.	Freq. (MHz)	Ant.Pol. H/V	Reading (dBm)	Factor (dB)	Measure-ment (dBm)	Limit (dBm)	Margin (dB)	Detector
1	3495.60	H	-46.13	8.11	-38.02	-30	8.02	Peak
2	5243.40	H	-50.84	7.83	-43.01	-30	13.01	Peak
3	6991.20	H	-48.02	7.71	-40.31	-30	10.31	Peak
4	3495.60	V	-44.23	8.11	-36.12	-30	6.12	Peak
5	5243.40	V	-50.74	7.83	-42.91	-30	12.91	Peak
6	6991.20	V	-48.62	7.71	-40.91	-30	10.91	Peak

13 Radiated Spurious Emissions – MS In Idle Mode

13.1 Test Standard and Limit

13.1.1 Test Standard

ETSI EN 301 511 V12.5.5: 2018 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.

Table 7

Frequency range		Power level in 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		
1850 MHz to	1910 MHz		-47
1910 MHz to	4 GHz		-53
			-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.

Table 8

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.	Last Cal.	Cal. Interval
Universal Radio Communication Tester	Rohde&Schwarz	CMU200	1100.864.02	2022-12-29	1 Year
Pre-Amplifier	Ducommun	85745A	99056-01	2022-12-29	1 Year
Pre-Amplifier	HP	84487B	314500	2022-12-29	1 Year
Signal Generator	HP	865220B	522144B	2022-12-29	1 Year
Horn Antenna	Sunol Sciences	DRH-336	A05554	2022-12-29	1 Year
Horn Antenna	A.R.A	DRG-198/A	1135	2022-12-29	1 Year
Spectrum Analyzer	Agilent	E4446A	US2547074	2022-12-29	1 Year

13.4 Test Data

Environmental Conditions:

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

EUT:	Car radio	Model Name :	Z0625
Temperature:	20° C	Relative Humidity:	56%
Pressure:	1010 hPa	Test Voltage :	DC 12V
Test Mode :	EGSM 900 Idle Mode		

Scan 30 MHz~4 GHz, Idle Mode

No.	Freq. (MHz)	Ant.Pol. H/V	Reading (dBm)	Factor (dB)	Measure-ment (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:	Car radio	Model Name :	Z0625
Temperature:	20° C	Relative Humidity:	56%
Pressure:	1010 hPa	Test Voltage :	DC 12V
Test Mode :	DCS 1800 Idle Mode		

Scan 30 MHz~4 GHz, Idle Mode

No.	Freq. (MHz)	Ant.Pol. H/V	Reading (dBm)	Factor (dB)	Measure-ment (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 Photographs - Constructional Details

Photo 1 Appearance of EUT

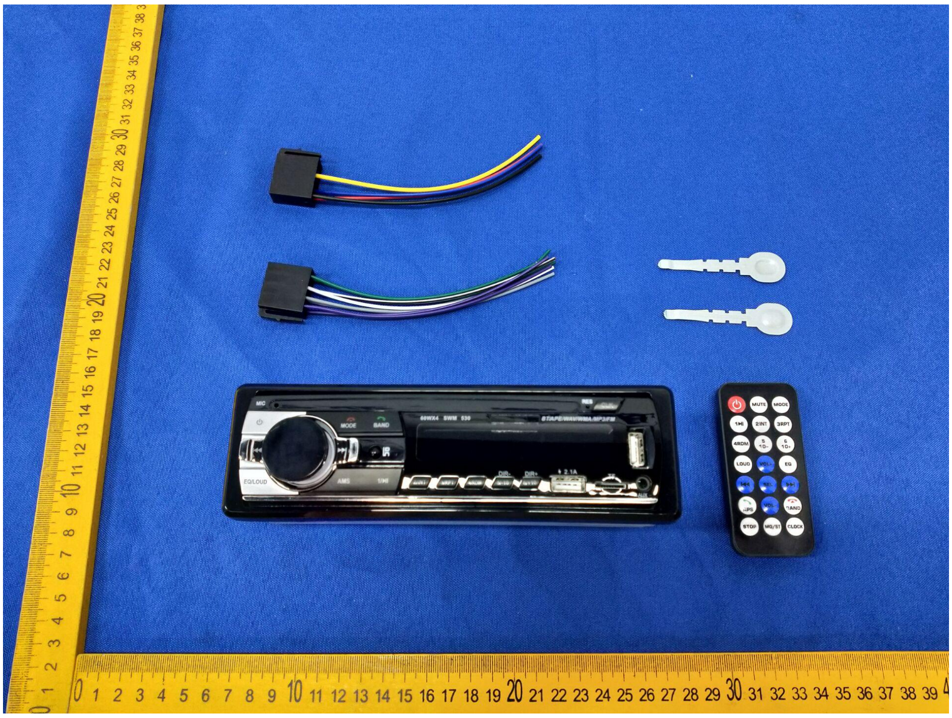


Photo 2 Appearance of EUT

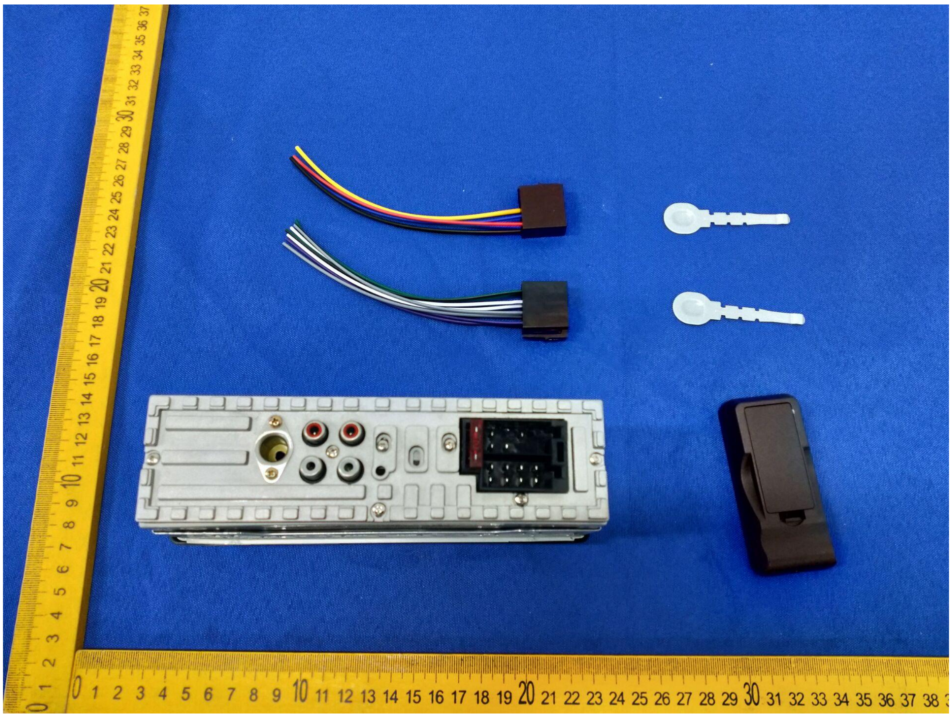


Photo 3 Appearance of EUT

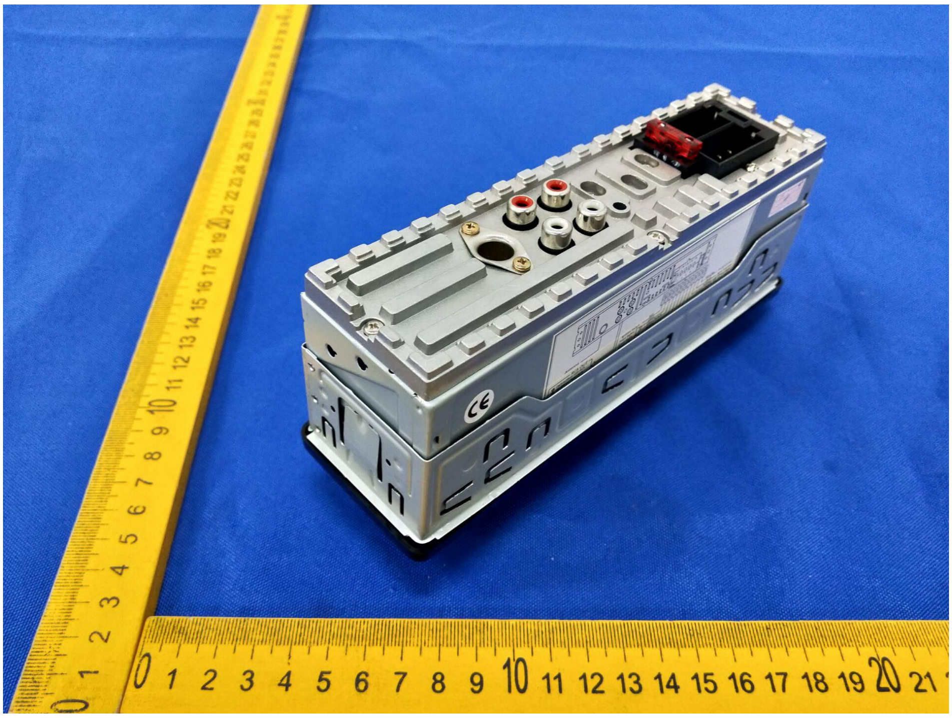


Photo 4 Inside of EUT

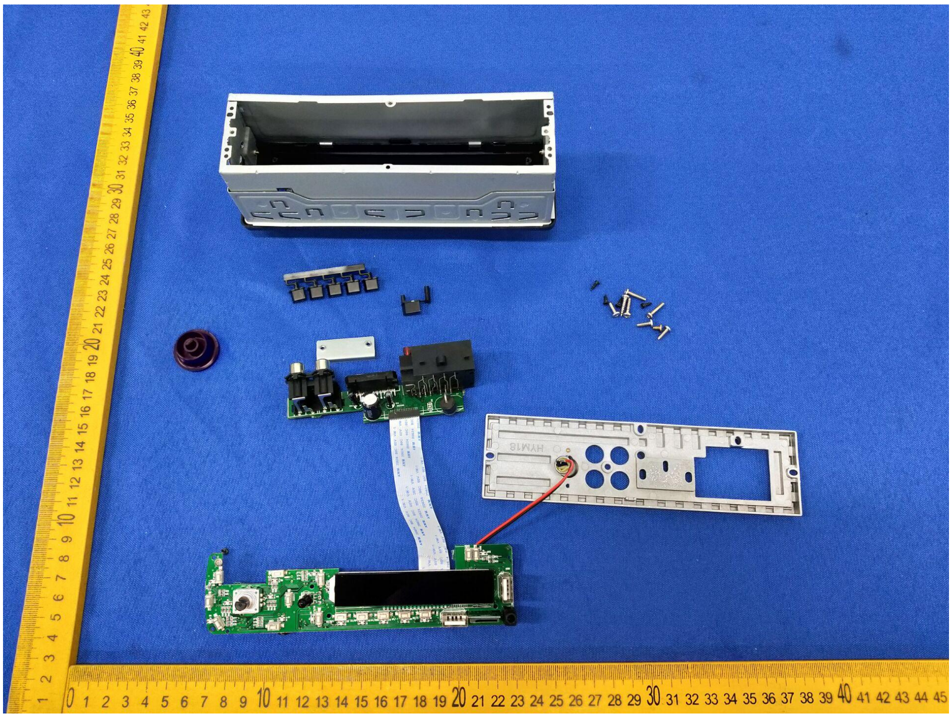


Photo 5 Appearance of PCB

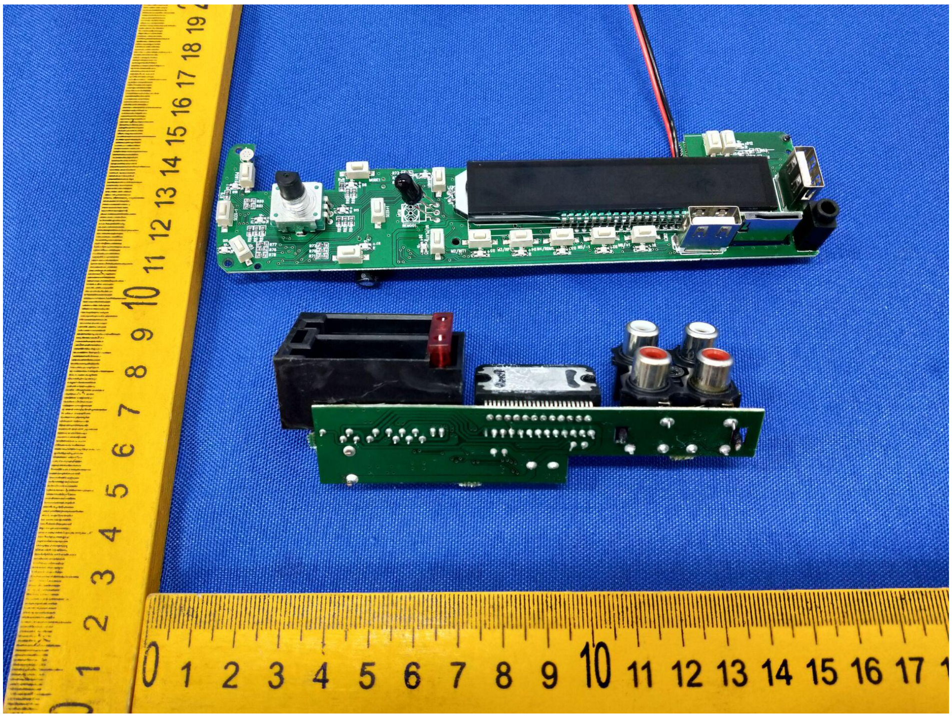
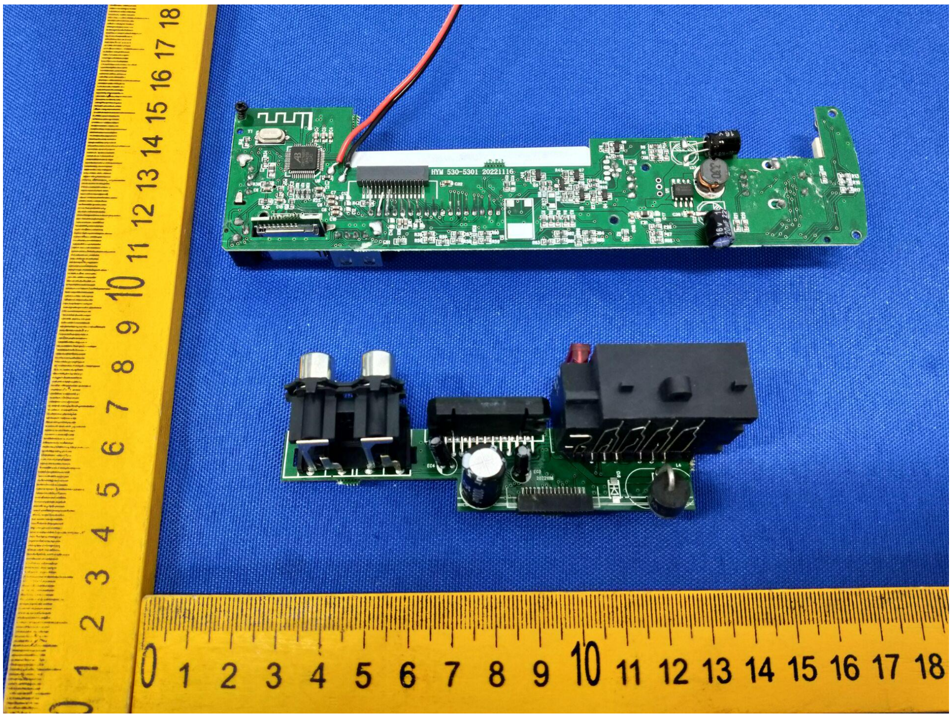


Photo 6 Appearance of PCB



END OF REPORT