Report No: CCIS13070022504

TEST REPORT

Applicant:	Shenzhen Concox Information Technology Co., Ltd
Address of Applicant:	Floor 4th, Building B, Gaoxinqi Industrial Park, Liuxian 1st Road, District 67, Bao'an, Shenzhen,Guangdong
Equipment Under Test (EUT)	
Product Name:	GPS Vehicle tracker
Model No.:	TR02,TR02N,TR02A,GT02A,GT02B,GT02D
Applicable standards:	EN 301 511 V9.0.2 (2003-03)
Date of sample receipt:	18 Jul., 2013
Date of Test:	19 Jul., to 22 Jul., 2013
Date of report issue:	23 Jul., 2013
Test Result :	PASS *

* In the configuration tested, the EUT complied with the standards specified above.

The CE mark as shown below can be used, under the responsibility of the manufacturer, after completion of an EC Declaration of Conformity and compliance with all relevant EC Directives. The protection requirements with respect to electromagnetic compatibility contained in Directive 1999/5/EC are considered.

Bruce Zhang
Laboratory Manager

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 and does not permit the use of the CCIS product certification mark. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards.

2 Version

Version No.	Date	Description
00	*23 Jul., 2013*	*Original*

Prepared By: Sera ***Date:*** *23 Jul., 2013*

Report Clerk

Check By: Joe.Zhou ***Date:*** *23 Jul., 2013*

Project Engineer

3 Contents

4 Test Summary

Description of Test	Result
Transmitter – Frequency error and phase error	PASS
Transmitter – Frequency error under multi path and interference conditions	PASS
Transmitter – Frequency error and Phase Error in HSCSD Multi slot Configuration	N/A
Frequency error and phase error in GPRS multi slot configuration	PASS
Transmitter output power and burst timing	PASS
Transmitter – Output RF spectrum	PASS
Transmitter output power and burst timing in HSCSD multi slot configuration	N/A
Transmitter – Output RF spectrum in HSCSD multi slot configuration	N/A
Transmitter – Output RF spectrum for MS supporting the R-GSM frequency band	N/A
Transmitter output power in GPRS multi slot configuration	PASS
Output RF spectrum in GPRS multi slot configuration	PASS
Conducted spurious emissions – MS allocated a channel	PASS
Conducted spurious emission – MS in idle mode	PASS
Conducted spurious emissions for MS supporting the R-GSM frequency band – MS allocated a channel	N/A
Conducted spurious emissions for MS supporting the R-GSM frequency band – MS in idle mode	N/A
Radiated spurious emissions – MS allocated a channel	PASS
Radiated spurious emissions – MS in idle mode	PASS
Radiated spurious emissions for MS supporting the R-GSM frequency band – MS allocated a channel	N/A
Radiated spurious emissions for MS supporting the R-GSM frequency band – MS in idle mode	N/A
Receiver blocking and spurious responses – speech channels	PASS
Receiver blocking and spurious response – speech channels for MS supporting the R-GSM frequency band	N/A

5 General Information

5.1 Client Information

Applicant:	Shenzhen Concox Information Technology Co., Ltd
Address of Applicant:	Floor 4th, Building B, Gaoxinqi Industrial Park, Liuxian 1st Road, District 67, Bao'an, Shenzhen,Guangdong
Manufacturer:	Shenzhen Concox Information Technology Co., Ltd
Address of Manufacturer:	Floor 4th, Building B, Gaoxinqi Industrial Park, Liuxian 1st Road, District 67, Bao'an, Shenzhen,Guangdong

5.2 General Description of E.U.T.

Product Name:	GPS Vehicle tracker	
Model No.:	TR02,TR02N,TR02A,GT02A,GT02B,GT02D	
Power supply:	DC 12V	
Remark:	The Model: TR02,TR02N,TR02A,GT02A,GT02B,GT02D were identical inside, the electrical circuit design, layout, components used and internal wiring, with only difference being different model number.	
GPRS class	12	
Operating frequency bands	E-GSM900	TX: 880---915MHz
		Rx: 925---960 MHz
	DCS1800	TX: 1710--1785 MHz
		RX: 1805----1880 MHz

5.3 Laboratory Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **FCC - Registration No.: 817957**

Shenzhen Zhongjian Nanfang Testing Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in out files. Registration 817957, February 27, 2012.

- **IC - Registration No.: 10106A-1**

The 3m Semi-anechoic chamber of Shenzhen Zhongjian Nanfang Testing Co., Ltd. has been Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 10106A-1.

- **CNAS - Registration No.: CNAS L6048**

Shenzhen Zhongjian Nanfang Testing Co., Ltd. is accredited to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration laboratories for the competence of testing. The Registration No. is CNAS L6048.

5.4 Laboratory Location

Shenzhen Zhongjian Nanfang Testing Co., Ltd.

Address: No.B-C, 1/F., Building 2, Laodong No.2 Industrial Park, Xixiang Road,

Bao'an District, Shenzhen, Guangdong, China

Tel: 0755-23118282

Fax: 0755-23116366

5.5 Objective

The following type approved report of a radio equipment and system (RES) is prepared on behalf of the OTG CO.LIMITED in accordance with EN 301 511 V9.0.2 (2003-03), Global System for Mobile communications (GSM); Harmonized EN for mobile stations in the EGSM 900 and DCS1800 bands.

The objective of the manufacturer is to determine compliance with EN 301 511 V9.0.2 (2003-03), Global System for Mobile communications (GSM); Harmonized EN for mobile stations in the GSM 900 and GSM 1800 bands.

In order to determine compliance, the manufacturer or a contracted laboratory makes measurements and takes the necessary steps to ensure that the equipment complies with the appropriate technical standards.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product maybe which result in lowering the immunity should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing and/or I/O cable changes, etc.)

5.6 Related Submittal(s)/Grant(s)

No Related Submittal(s).

6 Equipments Used during Test

Radiated Emission:

Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (dd-mm-yy)	Cal.Due date (dd-mm-yy)
1	3m Semi- Anechoic Chamber	SAEMC	9(L)*6(W)* 6(H)	CCIS0001	June 09 2013	June 08 2014
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	CCIS0002	N/A	N/A
3	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	CCIS0005	June 04 2013	June 03 2014
4	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA9120D	CCIS0006	May 30 2013	May 29 2014
5	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
6	Coaxial Cable	CCIS	N/A	CCIS0016	Apr. 01 2013	Mar. 31 2014
7	Coaxial Cable	CCIS	N/A	CCIS0017	Apr. 01 2013	Mar. 31 2014
8	Coaxial cable	CCIS	N/A	CCIS0018	Apr. 01 2013	Mar. 31 2014
9	Coaxial Cable	CCIS	N/A	CCIS0019	Apr. 01 2013	Mar. 31 2014
10	Coaxial Cable	CCIS	N/A	CCIS0087	Apr. 01 2013	Mar. 31 2014
11	Amplifier(10kHz-1.3GHz)	HP	8447D	CCIS0003	Apr. 01 2013	Mar. 31 2014
12	Amplifier(1GHz-18GHz)	Compliance Direction Systems Inc.	PAP-1G18	CCIS0011	June 09 2013	June 08 2014
13	Pre-amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	Apr. 01 2013	Mar. 31 2014
14	Horn Antenna	ETS-LINDGREN	3160	GTS217	Mar. 30 2013	Mar. 29 2014
15	Printer	HP	HP LaserJet P1007	N/A	N/A	N/A
16	Positioning Controller	UC	UC3000	CCIS0015	N/A	N/A
17	Spectrum analyzer 9k-30GHz	Rohde & Schwarz	FSP	CCIS0023	May. 29 2013	May. 28 2014
18	EMI Test Receiver	Rohde & Schwarz	ESPI	CCIS0022	Apr 01 2013	Mar. 31 2014
19	Loop antenna	Laplace instrument	RF300	EMC0701	Aug. 12 2012	Aug. 11 2013
20	Universal Radio communication tester	ROHDE&SCHWARZ	CMU200	CCIS0069	May. 29 2013	May. 28 2014

7 SYSTEM TEST CONFIGURATION

7.1 Justification

The EUT and test equipment were configured for testing according to EN 301 511 V9.0.2.

The EUT was tested in the normal operating mode to represent worst-case results during the final qualification test.

The EUT was tested with a dummy battery.

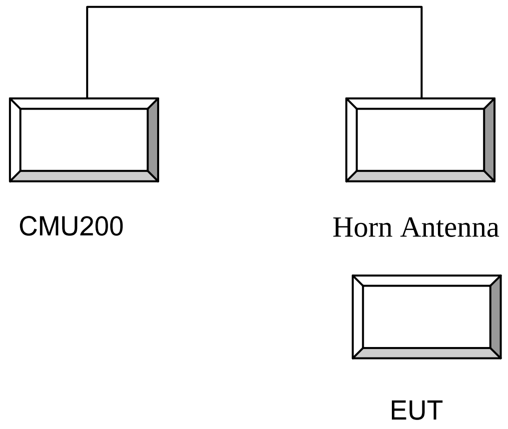
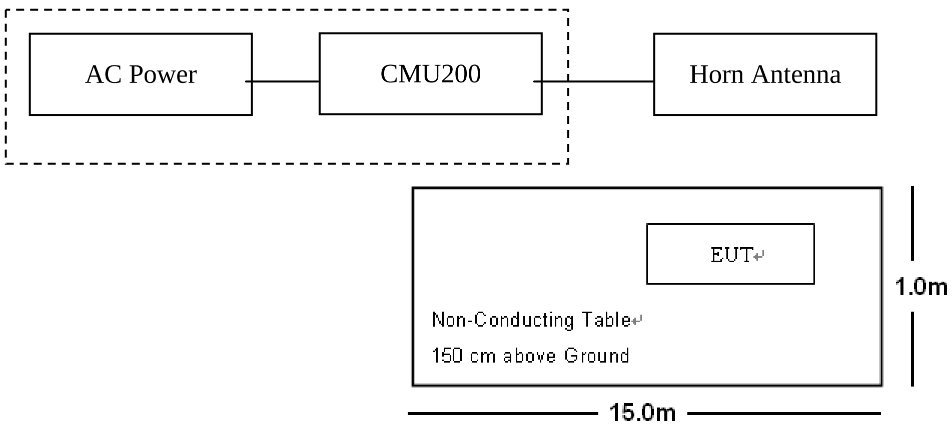
7.2 EUT Exercise Software

N/A

7.3 Equipment Modifications

No modifications were made to the EUT.

7.4 Test Setup

Configuration	
Block Diagram	

8 TRANSMITTER – FREQUENCY ERROR AND PHASE ERROR

8.1 Standard Applicable

Requirement: Per EN 301 511 V9.0.2 (2003-03), section 4.2.1, 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.

8.2 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:

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

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 .e of the phase errors is given by:

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

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, 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).

8.3 Test Data

Environmental Conditions

Temperature:	25 ° C
Relative Humidity:	56%
ATM Pressure:	100.0 kPa

GSM 900 (Middle Channel): 0.1ppm means 90.2Hz for frequency 902.0MHz

GSM 900	Test Condition	Frequency Error (Hz)	Limit (Hz)	Result	Phase Error (degree)		Limit (degree)	Result
Reference Frequency 902.0 (MHz)	Normal	-9	90.2	Pass	RMS	0.5	5	Pass
					Peak	2.4	20	Pass
	L.V. L.T.	-8	90.2	Pass	RMS	0.8	5	Pass
					Peak	2.6	20	Pass
	L.V. H.T.	-6	90.2	Pass	RMS	1.2	5	Pass
					Peak	2.8	20	Pass
	H.V L.T	-9	90.2	Pass	RMS	1.4	5	Pass
					Peak	3.0	20	Pass
	H.V. H.T	-4	90.2	Pass	RMS	1.6	5	Pass
					Peak	3.2	20	Pass
	Vibration	4	90.2	Pass	RMS	1.8	5	Pass
					Peak	3.3	20	Pass

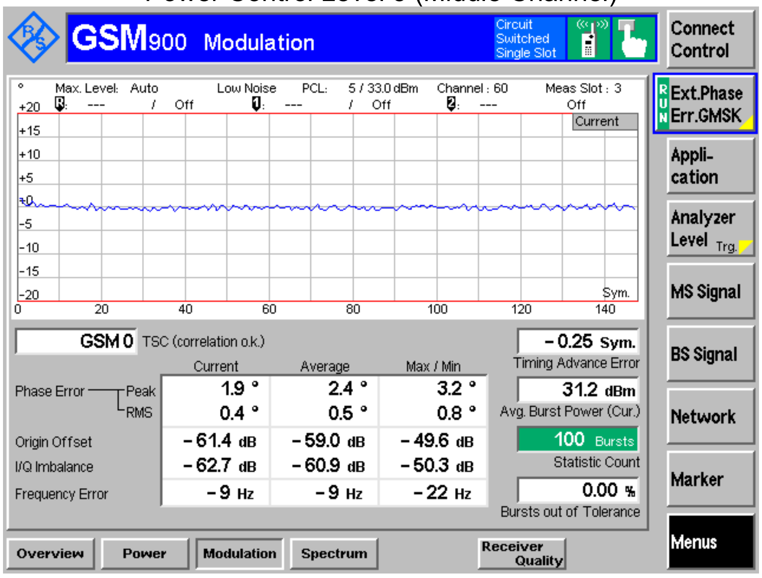
MS under maximum power control level

GSM 900	Test Condition	Frequency Error (Hz)	Limit (Hz)	Result	Phase error (degree)		Limit (degree)	Result
Reference Frequency 902.0 (MHz)	Normal	5	90.2	Pass	RMS	0.5	5	Pass
					Peak	1.3	20	Pass
	L.V. L.T.	7	90.2	Pass	RMS	0.7	5	Pass
					Peak	1.5	20	Pass
	L.V. H.T.	3	90.2	Pass	RMS	1.2	5	Pass
					Peak	2.0	20	Pass
	H.V L.T	4	90.2	Pass	RMS	1.5	5	Pass
					Peak	2.3	20	Pass
	H.V. H.T	1	90.2	Pass	RMS	1.8	5	Pass
					Peak	2.5	20	Pass
	Vibration	-1	90.2	Pass	RMS	2.0	5	Pass
					Peak	2.7	20	Pass

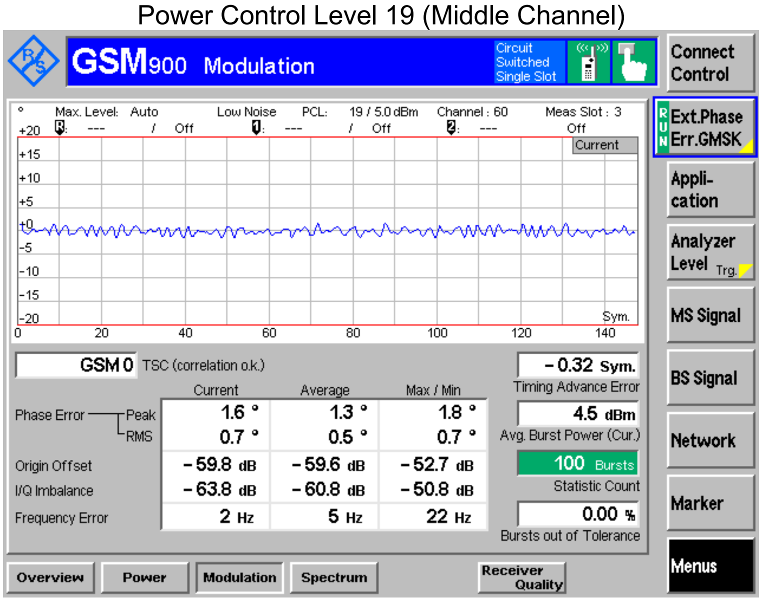
MS under minimum power control level

Normal Condition:

Power Control Level 5 (Middle Channel)



Power Control Level 19 (Middle Channel)



DCS1800 (Middle Channel): 0.1ppm means 174.78Hz for frequency 1747.8MHz

DCS1800	Test Condition	Frequency Error (Hz)	Limit (Hz)	Result	Phase Error (degree)		Limit (degree)	Result
Reference Frequency 1747.8 (MHz)	Normal	5	174.78	Pass	RMS	0.7	5	Pass
					Peak	3.3	20	Pass
	L.V. L.T.	8	174.78	Pass	RMS	1.0	5	Pass
					Peak	3.5	20	Pass
	L.V. H.T.	9	174.78	Pass	RMS	1.3	5	Pass
					Peak	3.8	20	Pass
	H.V L.T	6	174.78	Pass	RMS	1.5	5	Pass
					Peak	3.7	20	Pass
	H.V. H.T	2	174.78	Pass	RMS	1.7	5	Pass
					Peak	3.5	20	Pass
	Vibration	-2	174.78	Pass	RMS	1.8	5	Pass
					Peak	3.9	20	Pass

MS under maximum power control level

DCS 1800	Test Condition	Frequency Error (Hz)	Limit (Hz)	Result	Phase error (degree)		Limit (degree)	Result
Reference Frequency 1747.8 (MHz)	Normal	14	174.78	Pass	RMS	0.5	5	Pass
					Peak	1.4	20	Pass
	L.V. L.T.	10	174.78	Pass	RMS	0.7	5	Pass
					Peak	1.8	20	Pass
	L.V. H.T.	16	174.78	Pass	RMS	0.9	5	Pass
					Peak	1.9	20	Pass
	H.V L.T	13	174.78	Pass	RMS	1.0	5	Pass
					Peak	2.0	20	Pass
	H.V. H.T	8	174.78	Pass	RMS	1.2	5	Pass
					Peak	2.3	20	Pass
	Vibration	7	174.78	Pass	RMS	1.4	5	Pass
					Peak	2.4	20	Pass

MS under minimum power control level

Note:

L.V.: Low Voltage 10.8Vdc

H.V.: High Voltage 15.6Vdc

L.T.: Low Temperature -10 °C

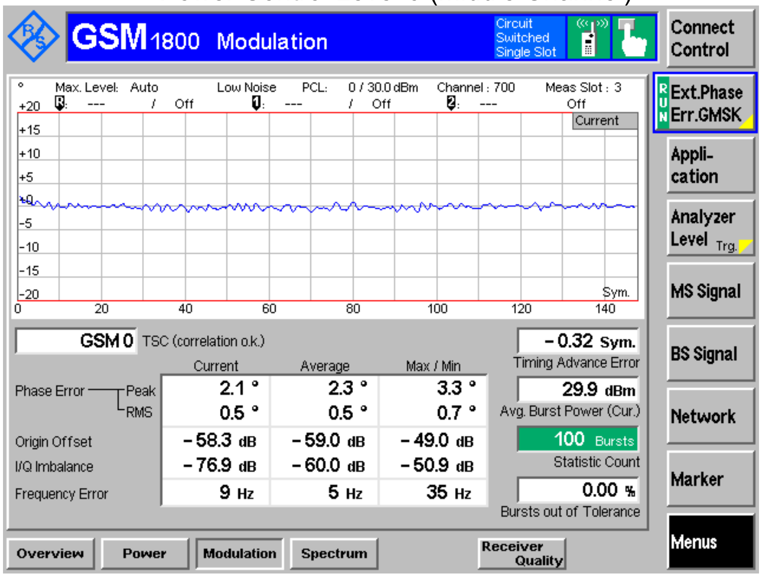
H.T.: High Temperature +55 °C

N.V.: Normal Voltage 13.2Vdc

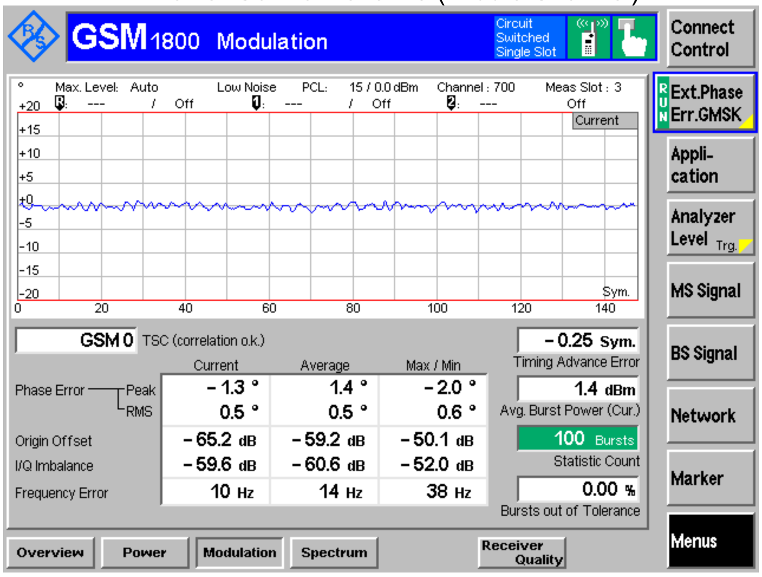
N.T.: Normal Temperature +25 °C

Normal Condition:

Power Control Level 0 (Middle Channel)



Power Control Level 15 (Middle Channel)



9 TRANSMITTER – FREQUENCY ERROR UNDER MULTI PATH AND INTERFERENCE CONDITIONS

9.1 Standard Applicable

Requirement: Per EN 301 511 V9.0.2 (2003-03), section 4.2.2, 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.

9.2 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 TUlow.

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

9.3 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	±300 Hz	RA130	±400 Hz
HT100	±180 Hz	HT100	±350 Hz
TU50	±160 Hz	TU50	±260 Hz
TU3	±230 Hz	TU1.5	±320 Hz

9.4 Test Results

Environmental Conditions

Temperature:	20 ° C
Relative Humidity:	55% ~ 75%
ATM Pressure:	100.1 kPa ~ 100.7 kPa

GSM 900 (Middle Channel)

1) *MS under maximum power control level:*

	Test Condition		Frequency error (Hz)	Limit (Hz)	Result
EGSM 900 Ref. Freq. 902 (MHz)	Normal	RA250	-174	±300	Pass
		HT100	+45	±180	Pass
		TU50	+87	±160	Pass
		TU3	+99	±230	Pass
	L.V. L.T.	RA250	-130	±300	Pass
		HT100	+66	±180	Pass
		TU50	-20	±160	Pass
		TU3	-65	±230	Pass
	L.V. H.T.	RA250	-148	±300	Pass
		HT100	-155	±180	Pass
		TU50	+50	±160	Pass
		TU3	+45	±230	Pass
	H.V. L.T.	RA250	-26	±300	Pass
		HT100	+32	±180	Pass
		TU50	-65	±160	Pass
		TU3	+150	±230	Pass
	H.V. H.T.	RA250	-98	±300	Pass
		HT100	-80	±180	Pass
		TU50	-60	±160	Pass
		TU3	+50	±230	Pass

2) *MS under minimum power control level:*

	Test Condition		Frequency error (Hz)	Limit (Hz)	Result
EGSM 900 Ref. Freq. 902 (MHz)	Normal	RA250	+65	±300	Pass
		HT100	+66	±180	Pass
		TU50	-18	±160	Pass
		TU3	+25	±230	Pass
	L.V. L.T.	RA250	-43	±300	Pass
		HT100	-70	±180	Pass
		TU50	+44	±160	Pass
		TU3	-19	±230	Pass
	L.V. H.T.	RA250	+165	±300	Pass
		HT100	+80	±180	Pass
		TU50	-27	±160	Pass
		TU3	-38	±230	Pass
	H.V. L.T.	RA250	+199	±300	Pass
		HT100	-83	±180	Pass
		TU50	-72	±160	Pass
		TU3	-150	±230	Pass
	H.V. H.T.	RA250	+28	±300	Pass
		HT100	-12	±180	Pass
		TU50	+80	±160	Pass
		TU3	-97	±230	Pass

DCS 1800 (Middle Channel)

1) MS under maximum power control level:

	Test Condition		Frequency error (Hz)	Limit (Hz)	Result
DCS 1800 Ref. Freq. 1747.8 (MHz)	Normal	RA130	-60	±400	Pass
		HT100	+85	±350	Pass
		TU50	-49	±260	Pass
		TU1.5	-195	±320	Pass
	L.V. L.T.	RA130	-155	±400	Pass
		HT100	-64	±350	Pass
		TU50	-26	±260	Pass
		TU1.5	-115	±320	Pass
	L.V. H.T.	RA130	-78	±400	Pass
		HT100	+49	±350	Pass
		TU50	+90	±260	Pass
		TU1.5	-62	±320	Pass
	H.V. L.T.	RA130	+22	±400	Pass
		HT100	-113	±350	Pass
		TU50	+84	±260	Pass
		TU1.5	+40	±320	Pass
	H.V. H.T.	RA130	+155	±400	Pass
		HT100	-95	±350	Pass
		TU50	+40	±260	Pass
		TU1.5	+86	±320	Pass

2) MS under minimum power control level:

	Test Condition		Frequency error (Hz)	Limit (Hz)	Result
DCS 1800 Ref. Freq. 1747.8 (MHz)	Normal	RA130	+77	±400	Pass
		HT100	+40	±350	Pass
		TU50	+95	±260	Pass
		TU1.5	+59	±320	Pass
	L.V. L.T.	RA130	-113	±400	Pass
		HT100	+20	±350	Pass
		TU50	+32	±260	Pass
		TU1.5	-115	±320	Pass
	L.V. H.T.	RA130	+128	±400	Pass
		HT100	-68	±350	Pass
		TU50	+54	±260	Pass
		TU1.5	+62	±320	Pass
	H.V. L.T.	RA130	+20	±400	Pass
		HT100	-45	±350	Pass
		TU50	+90	±260	Pass
		TU1.5	-55	±320	Pass
	H.V. H.T.	RA130	-90	±400	Pass
		HT100	-107	±350	Pass
		TU50	+70	±260	Pass
		TU1.5	+49	±320	Pass

10 Frequency error and phase error in GPRS multislot configuration

10.1 Standard Applicable

According to EN 301 511 V9.0.2 (2003-03), section 4.2.4, 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.

10.2 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.

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).

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:

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

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 * 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:

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

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

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

10.3 Test Data

Environmental Conditions

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

GSM900: 0.1ppm means 90.2Hz for frequency 902.0MHz

GSM900 (GPRS)	Test Condition	Frequency Error (Hz)	Limit (Hz)	Result	Phase Error (degree)		Limit (degree)	Result
Reference Frequency 902.0 (MHz)	Normal	-11	90.2	Pass	RMS	0.5	5	Pass
					Peak	2.3	20	Pass
	L.V. L.T.	-8	90.2	Pass	RMS	0.8	5	Pass
					Peak	2.4	20	Pass
	L.V. H.T.	-13	90.2	Pass	RMS	1.0	5	Pass
					Peak	2.8	20	Pass
	H.V L.T	-5	90.2	Pass	RMS	1.3	5	Pass
					Peak	2.6	20	Pass
	H.V. H.T	2	90.2	Pass	RMS	1.5	5	Pass
					Peak	2.7	20	Pass
	Vibration	-6	90.2	Pass	RMS	1.2	5	Pass
					Peak	2.5	20	Pass

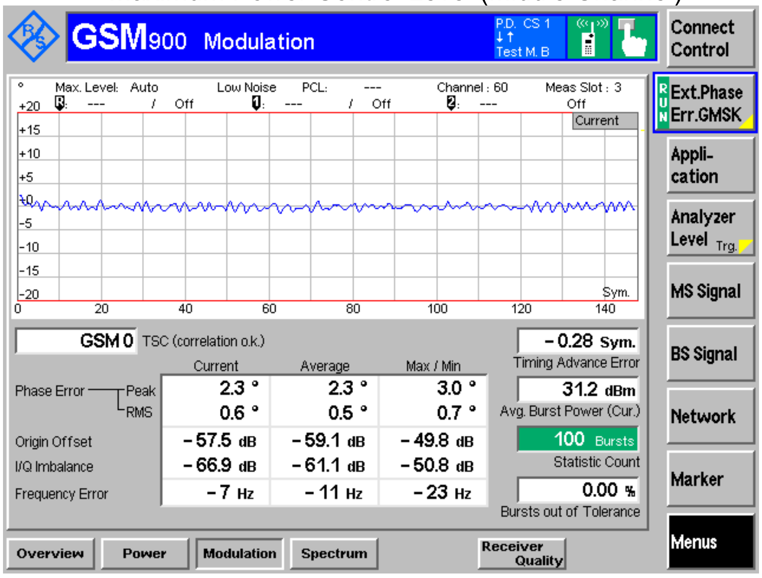
MS under maximum level

GSM900 (GPRS)	Test Condition	Frequency Error (Hz)	Limit (Hz)	Result	Phase Error (degree)		Limit (degree)	Result
Reference Frequency 902.0 (MHz)	Normal	8	90.2	Pass	RMS	0.4	5	Pass
					Peak	1.2	20	Pass
	L.V. L.T.	4	90.2	Pass	RMS	0.5	5	Pass
					Peak	1.5	20	Pass
	L.V. H.T.	3	90.2	Pass	RMS	0.8	5	Pass
					Peak	1.8	20	Pass
	H.V L.T	6	90.2	Pass	RMS	1.5	5	Pass
					Peak	2.0	20	Pass
	H.V. H.T	7	90.2	Pass	RMS	1.3	5	Pass
					Peak	2.1	20	Pass
	Vibration	5	90.2	Pass	RMS	1.7	5	Pass
					Peak	2.6	20	Pass

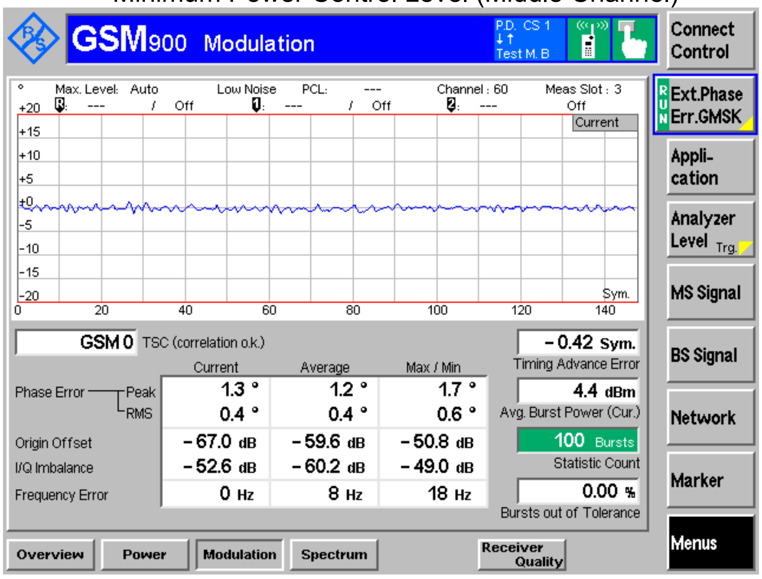
MS under minimum level

Normal Condition:

Maximum Power Control Level (Middle Channel)



Minimum Power Control Level (Middle Channel)



DCS1800: 0.1ppm means 174.78Hz for frequency 1747.8MHz

GSM1800 (GPRS)	Test Condition	Frequency Error (Hz)	Limit (Hz)	Result	Phase Error (degree)		Limit (degree)	Result
Reference Frequency 1747.8 (MHz)	Normal	9	174.78	Pass	RMS	0.5	5	Pass
					Peak	2.0	20	Pass
	L.V. L.T.	-2	174.78	Pass	RMS	0.6	5	Pass
					Peak	2.2	20	Pass
	L.V. H.T.	-3	174.78	Pass	RMS	0.8	5	Pass
					Peak	2.4	20	Pass
	H.V L.T	5	174.78	Pass	RMS	1.0	5	Pass
					Peak	2.6	20	Pass
	H.V. H.T	1	174.78	Pass	RMS	1.3	5	Pass
					Peak	2.8	20	Pass
	Vibration	3	174.78	Pass	RMS	1.5	5	Pass
					Peak	2.5	20	Pass

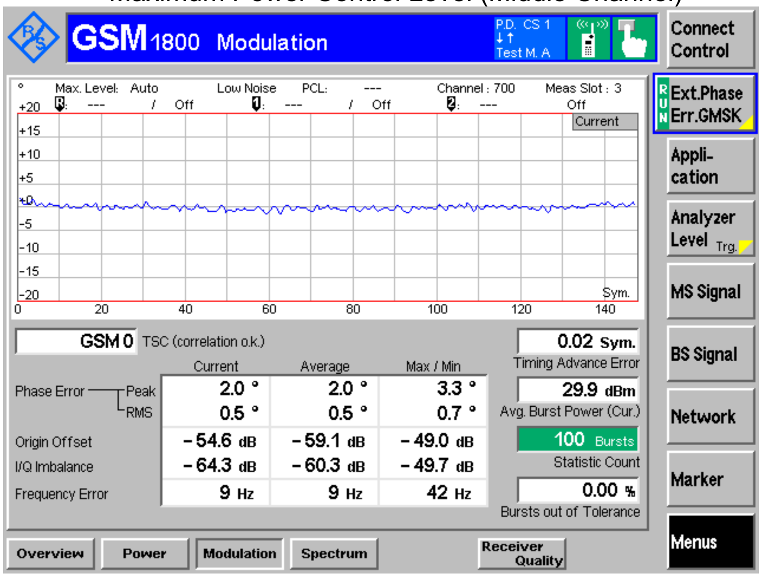
MS under maximum level

GSM1800 (GPRS)	Test Condition	Frequency Error (Hz)	Limit (Hz)	Result	Phase Error (degree)		Limit (degree)	Result
Reference Frequency 1747.8 (MHz)	Normal	19	174.78	Pass	RMS	0.5	5	Pass
					Peak	1.4	20	Pass
	L.V. L.T.	10	174.78	Pass	RMS	0.8	5	Pass
					Peak	1.6	20	Pass
	L.V. H.T.	8	174.78	Pass	RMS	1.0	5	Pass
					Peak	1.8	20	Pass
	H.V L.T	15	174.78	Pass	RMS	1.3	5	Pass
					Peak	2.1	20	Pass
	H.V. H.T	12	174.78	Pass	RMS	1.4	5	Pass
					Peak	2.3	20	Pass
	Vibration	5	174.78	Pass	RMS	1.5	5	Pass
					Peak	2.4	20	Pass

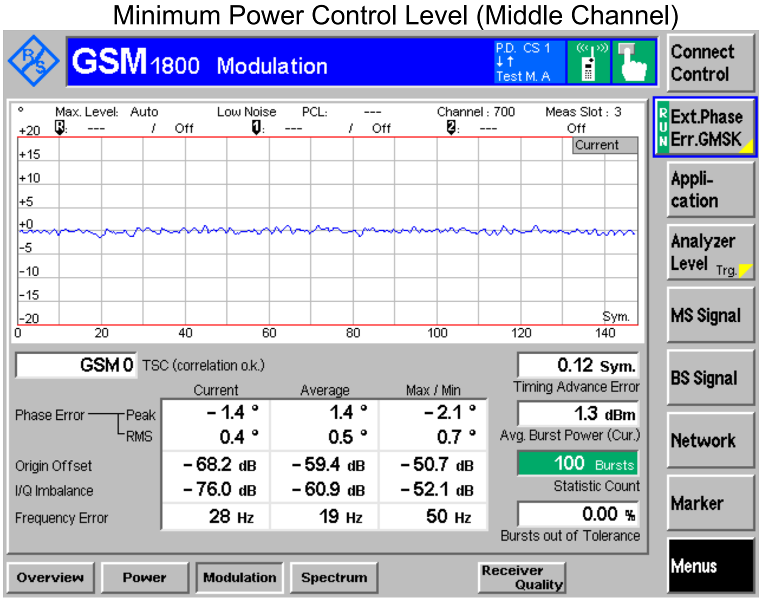
MS under minimum level

Normal Condition:

Maximum Power Control Level (Middle Channel)



Minimum Power Control Level (Middle Channel)



11 TRANSMITTER OUTPUT POWER AND BURST TIMING

11.1 Standard Applicable

According to EN 301 511 V9.0.2 (2003-03), section 4.2.5:

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.

11.2 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.

11.3 Test Data

Environmental Conditions

Temperature:	25 ° C
Relative Humidity:	56%
ATM Pressure:	100.0 kPa

Please refer to following tables.

GSM900 output power

High Channel (914.80 MHz) Output Power

High Channel F =914.80 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	31.08	31.09	31.12	31.10	31.12	Pass
6	29.47	29.41	29.42	29.43	29.40	
7	27.58	27.51	27.54	27.49	27.50	
8	25.25	25.26	25.20	25.25	25.26	
9	23.36	23.36	23.32	23.27	23.33	
10	21.45	21.44	21.38	21.43	21.44	
11	19.79	19.74	19.78	19.73	19.74	
12	17.86	17.87	17.81	17.86	17.87	
13	15.68	15.68	15.62	15.67	15.68	
14	13.91	13.87	13.81	13.86	13.87	
15	11.50	11.44	11.48	11.43	11.44	
16	9.27	9.25	9.22	9.27	9.24	
17	7.17	7.17	7.11	7.16	7.17	
18	5.40	5.37	5.34	5.36	5.35	
19	4.27	4.72	4.74	4.66	4.73	

Middle Channel (902.00MHz) Output Power

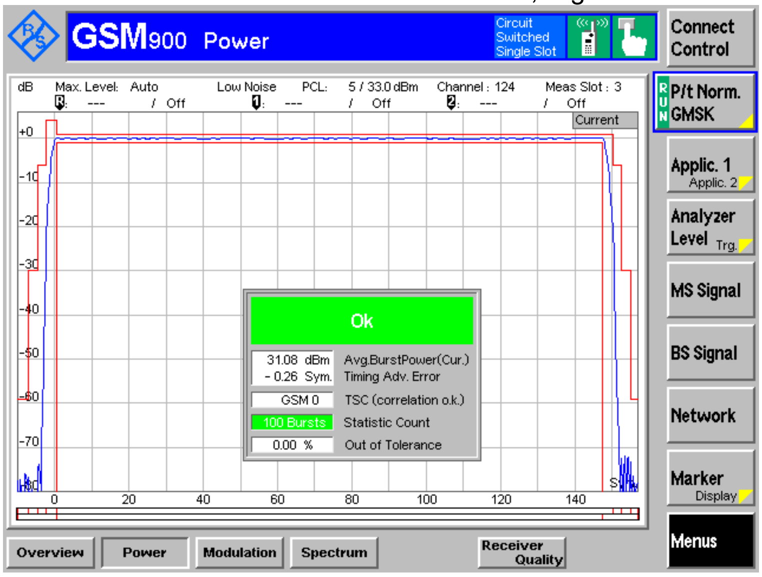
Middle Channel F = 902.00 MHz						
Power Control Level	OUTPUT POWER (dBm)					Result
	Normal	L.T. L.V.	H.T. L.V.	L.T. H.V.	H.T. H.V.	
5	31.20	31.00	31.95	31.97	31.01	Pass
6	29.57	29.55	29.49	29.54	29.55	
7	27.24	27.20	27.24	27.19	27.20	
8	25.29	25.23	25.27	25.22	25.23	
9	23.58	23.53	23.47	23.52	23.53	
10	21.37	21.34	21.38	21.33	21.34	
11	19.89	19.87	19.81	19.86	19.87	
12	17.27	17.21	17.25	17.20	17.21	
13	15.34	15.28	15.32	15.27	15.28	
14	13.67	13.61	13.65	13.60	13.61	
15	11.08	11.07	11.03	11.08	11.05	
16	9.17	9.16	9.10	9.15	9.16	
17	7.16	7.12	7.16	7.11	7.12	
18	5.88	5.83	5.87	5.82	5.83	
19	4.50	4.84	4.85	4.86	4.84	

Low Channel (880.2MHz) Output Power

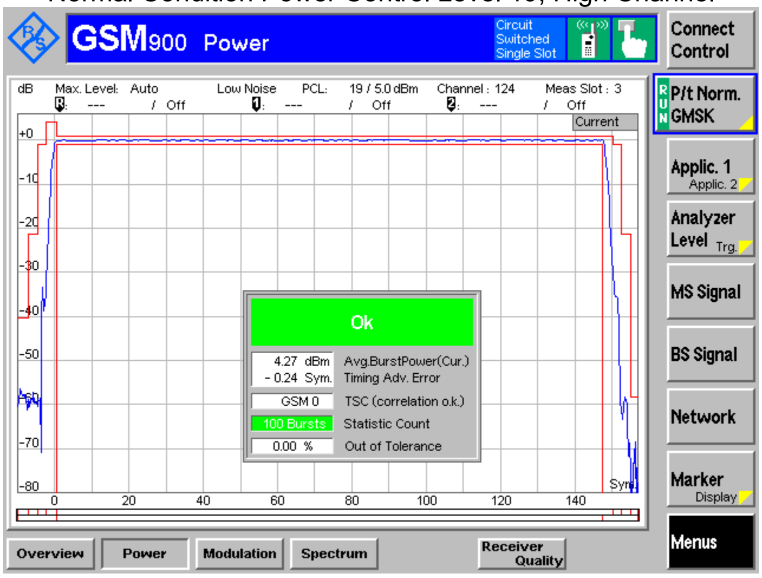
Low Channel F = 880.2 MHz						
Power Control Level	OUTPUT POWER (dBm)					Result
	Normal	L.T. L.V.	H.T. L.V.	L.T. H.V.	H.T. H.V.	
5	31.36	31.23	31.24	31.24	31.30	Pass
6	29.57	29.50	29.55	29.53	29.56	
7	27.83	27.82	27.75	27.74	27.77	
8	25.45	25.36	25.37	25.41	25.41	
9	23.38	23.33	23.32	23.32	23.34	
10	21.89	21.81	21.81	21.87	21.83	
11	19.17	19.14	19.12	19.14	19.14	
12	17.58	17.55	17.56	17.50	17.58	
13	15.83	15.78	15.81	15.75	15.74	
14	13.80	13.73	13.72	13.80	13.80	
15	11.25	11.24	11.17	11.25	11.18	
16	9.19	9.11	9.15	9.11	9.17	
17	7.33	7.33	7.26	7.25	7.31	
18	6.52	6.47	6.51	6.50	6.52	
19	4.82	4.86	4.84	4.83	4.82	

Normal Condition

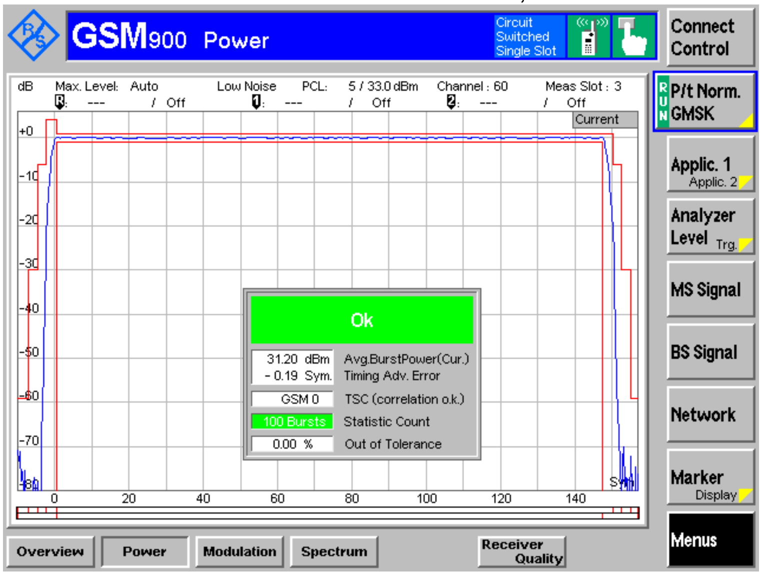
Normal Condition Power Control Level 5, High Channel



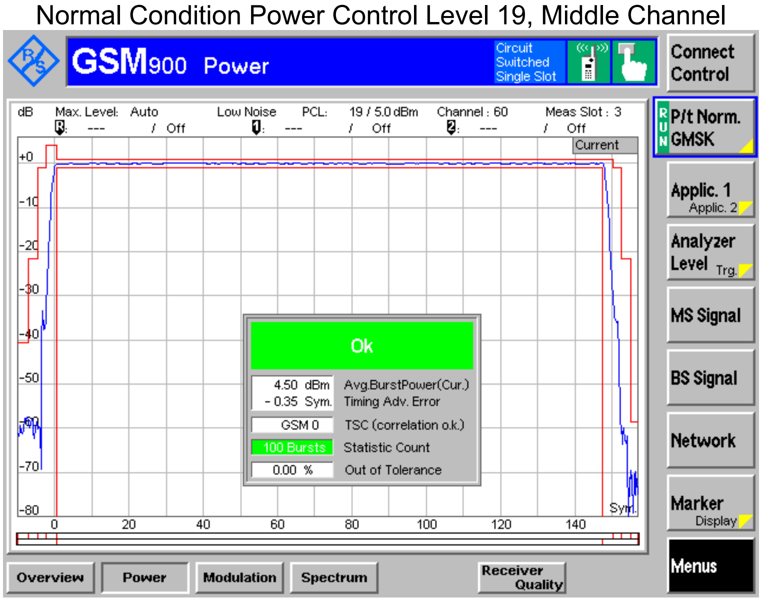
Normal Condition Power Control Level 19, High Channel



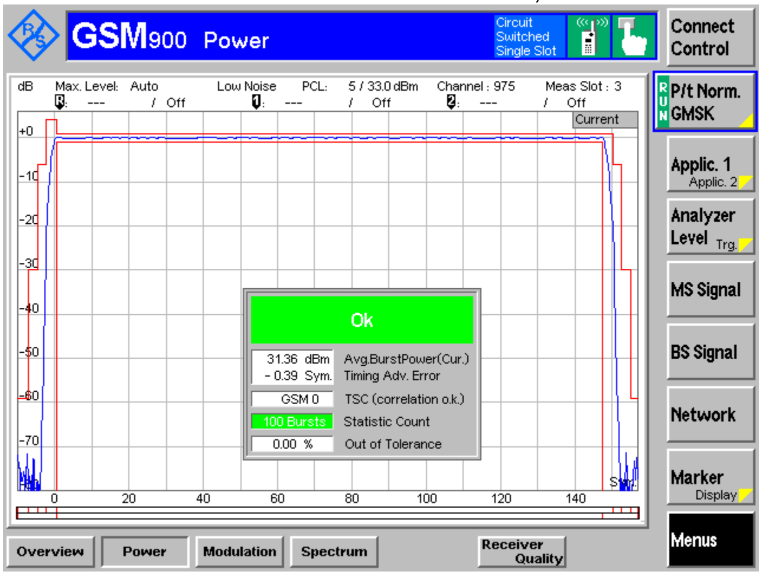
Normal Condition Power Control Level 5, Middle Channel



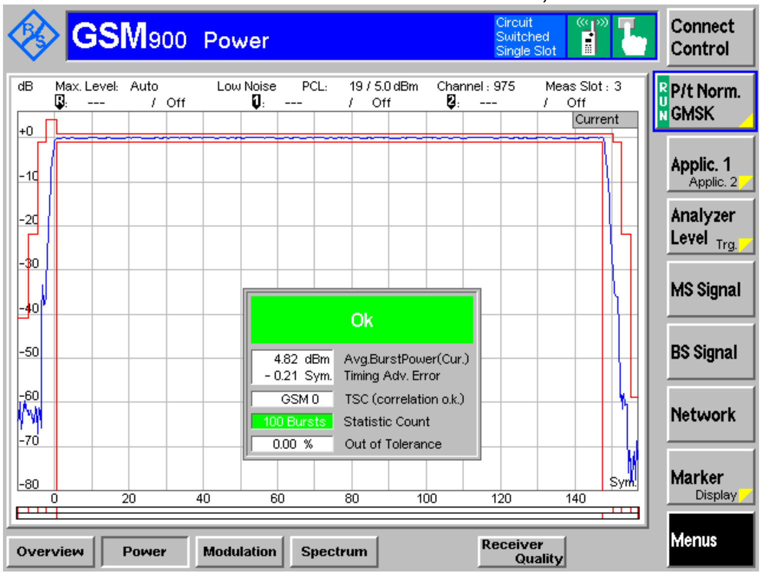
Normal Condition Power Control Level 19, Middle Channel



Normal Condition Power Control Level 5, Low Channel



Normal Condition Power Control Level 19, Low Channel



DCS1800 output power

High Channel (1784.8MHz) Output Power

High Channel F = 1784.8 MHz						
Power Control Level	OUTPUT POWER (dBm)					Result
	Normal	L.T. L.V.	H.T. L.V.	L.T. H.V.	H.T. H.V.	
0	30.08	30.30	30.32	30.31	30.34	Pass
1	28.87	28.87	28.84	28.84	28.85	
2	26.17	26.15	26.16	26.16	26.16	
3	25.54	25.48	25.47	25.47	25.48	
4	24.63	24.60	24.61	24.63	24.60	
5	22.38	22.33	22.34	22.35	22.36	
6	20.90	20.81	20.90	20.81	20.91	
7	18.12	18.04	18.03	18.07	18.04	
8	16.74	16.68	16.68	16.66	16.68	
9	14.13	14.08	14.09	14.09	14.08	
10	12.58	12.54	12.56	12.56	12.57	
11	10.80	10.72	10.72	10.72	10.72	
12	8.69	8.63	8.67	8.62	8.63	
13	6.33	6.27	6.31	6.31	6.27	
14	3.07	3.06	3.04	3.05	3.06	
15	1.57	1.55	1.56	1.52	1.53	

Middle Channel (1747.8MHz) Output Power

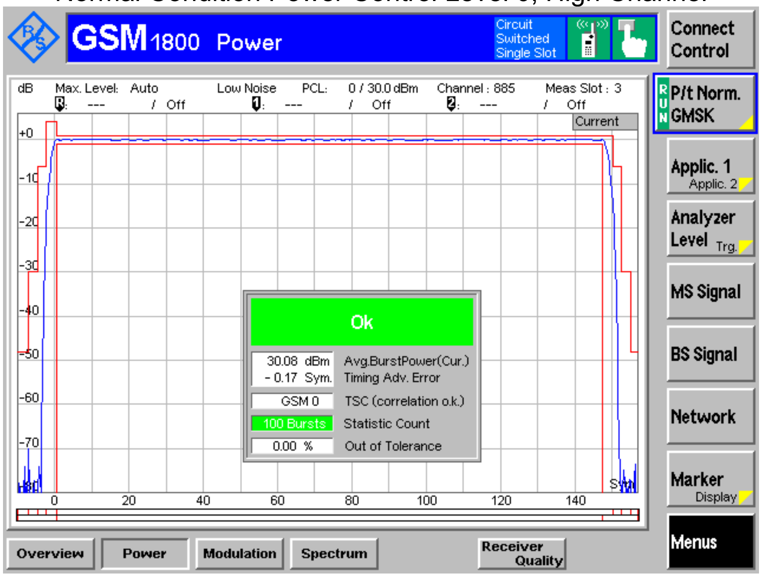
Middle Channel F = 1747.8 MHz						
Power Control Level	OUTPUT POWER (dBm)					Result
	Normal	L.T. L.V.	H.T. L.V.	L.T. H.V.	H.T. H.V.	
0	29.83	29.80	29.78	29.82	29.79	Pass
1	27.55	27.56	27.50	27.55	27.56	
2	26.68	26.60	26.64	26.69	26.60	
3	24.87	24.87	24.81	24.86	24.87	
4	22.09	22.06	22.00	22.05	22.06	
5	20.73	20.79	20.73	20.78	20.79	
6	18.60	18.67	18.61	18.66	18.67	
7	16.37	16.32	16.36	16.31	16.32	
8	14.07	14.09	14.03	14.08	14.09	
9	12.57	12.58	12.52	12.57	12.58	
10	10.79	10.73	10.77	10.72	10.73	
11	8.35	8.34	8.38	8.33	8.34	
12	6.25	6.25	6.29	6.24	6.25	
13	4.36	4.32	4.36	4.31	4.32	
14	2.42	2.42	2.46	2.41	2.42	
15	1.36	1.35	1.37	1.30	1.34	

Low Channel (1710.2MHz) Output Power

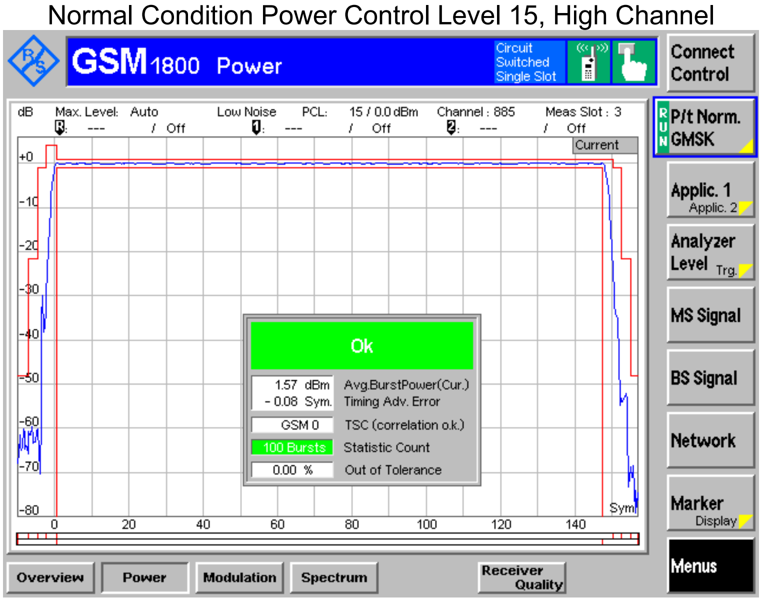
Low Channel F = 1710.2 MHz						
Power Control Level	OUTPUT POWER (dBm)					Result
	Normal	L.T. L.V.	H.T. L.V.	L.T. H.V.	H.T. H.V.	
0	29.54	29.07	29.02	29.06	29.05	Pass
1	27.57	27.54	27.55	27.54	27.53	
2	26.67	26.65	26.63	26.63	26.64	
3	24.88	24.86	24.82	24.85	24.86	
4	22.25	22.23	22.21	22.27	22.28	
5	20.18	20.14	20.13	20.13	20.16	
6	18.03	18.01	18.00	18.08	18.07	
7	16.75	16.73	16.72	16.71	16.70	
8	14.62	14.68	14.62	14.67	14.68	
9	12.02	12.00	12.07	12.09	12.04	
10	10.13	10.11	10.10	10.17	10.16	
11	8.79	8.74	8.76	8.72	8.71	
12	6.82	6.81	6.85	6.87	6.80	
13	4.27	4.24	4.25	4.25	4.26	
14	2.68	2.65	2.61	2.66	2.63	
15	1.28	1.25	1.26	1.22	1.28	

Normal Condition

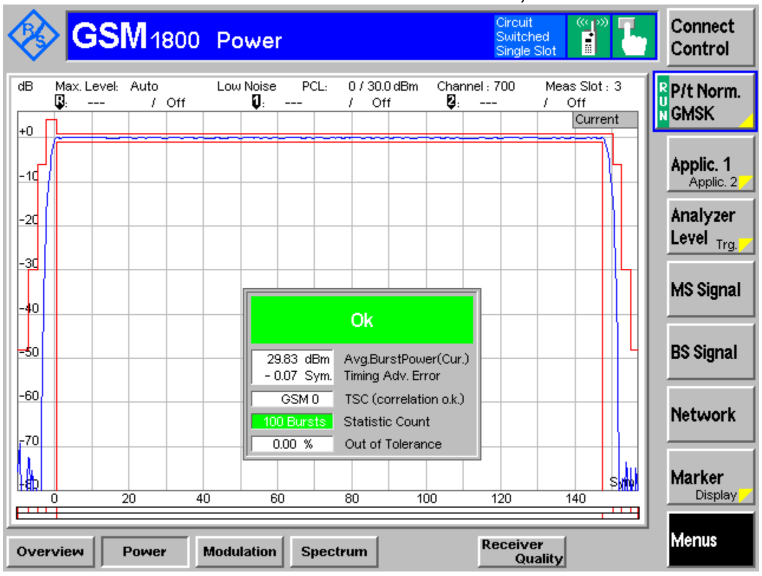
Normal Condition Power Control Level 0, High Channel



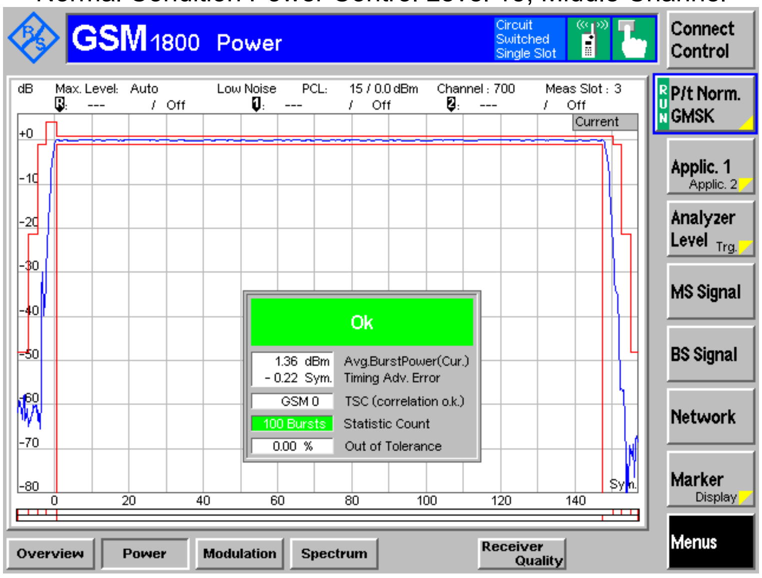
Normal Condition Power Control Level 15, High Channel



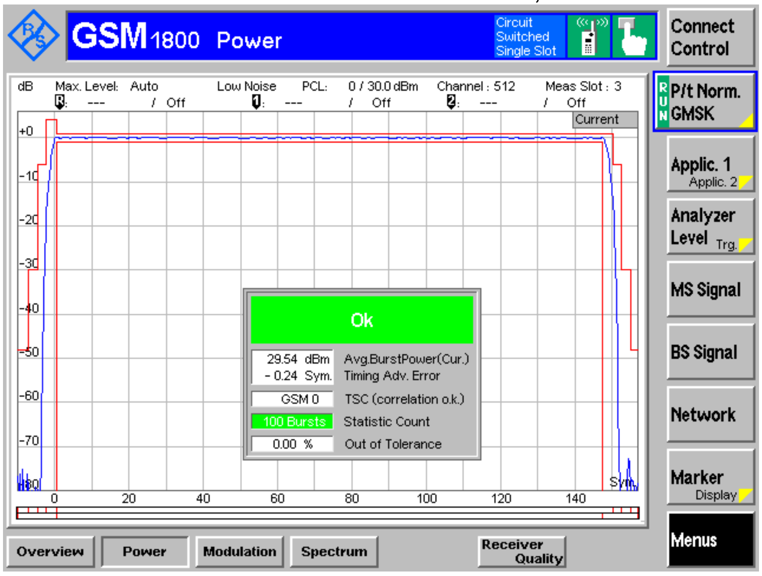
Normal Condition Power Control Level 0, Middle Channel



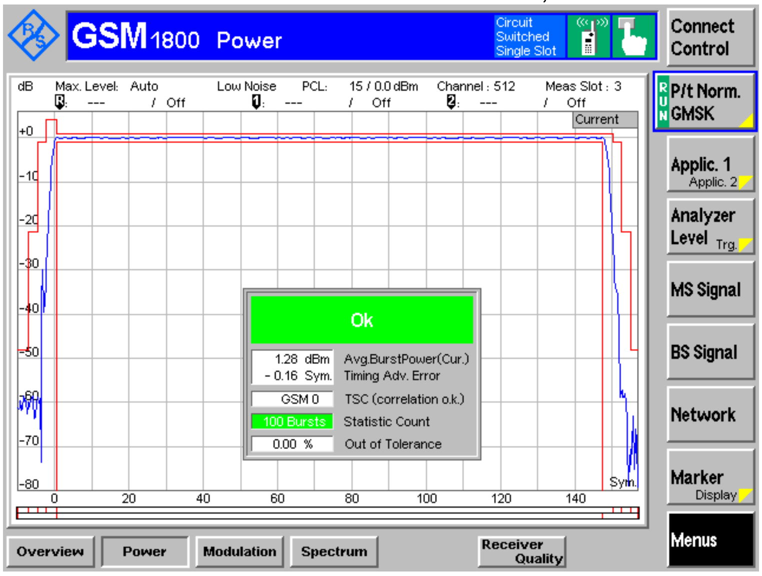
Normal Condition Power Control Level 15, Middle Channel



Normal Condition Power Control Level 0, Low Channel



Normal Condition Power Control Level 15, Low Channel



12 TRANSMITTER – OUTPUT RF SPECTRUM

12.1 Standard Applicable

Requirements: According to EN 301 511 V9.0.2 (2003-03), section 4.2.6, the level of the output RF spectrum due to modulation shall be no more than that given in ETSI TS 151 010-1 V7.11.0 (2008-10), sub clause 13.4.5, table Table 13-6) GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900 Spectrum due to modulation out to less than 1800 kHz offset, Table 13-7) DCS 1800 Spectrum due to modulation out to less than 1800 kHz offset, Table 13-9) Spectrum due to modulation from 1800 kHz offset to the edge of the transmit band (wideband noise), Table 13-10) Spurious emissions in the MS receive bands.

For GSM 400, T-GSM 810, GSM 900 and DCS 1800 MS the spurious emissions in the bands 850 MHz to 866 MHz, 925 MHz to 935 MHz, 935 MHz to 960 MHz and 1805 MHz to 1880 MHz, measured in step d), shall not exceed the values shown in table 13-10 except in up to five measurements in the band 925 MHz to 960 MHz and five measurements in the band 1805 MHz to 1880 MHz where a level up to -36 dBm is permitted. For GSM 400 MS, in addition, the MS spurious emissions in the bands 460, 4 MHz to 467,6 MHz and 488,8 MHz to 496 MHz shall not exceed the value of -67 dBm, except in up to three measurements in each of the bands 460,4 MHz to 467,6 MHz and 488,8 MHz to 496 MHz where a level up to -36 dBm is permitted. For GSM 700, GSM 850 and PCS 1 900 MS the spurious emissions in the bands 698 MHz to 716 MHz, 747 MHz to 762 MHz, 869 MHz to 894 MHz and 1930 MHz to 1990 MHz shall not exceed the values shown in table 13-10 except in up to five measurements in each of the bands 698 MHz to 716 MHz, 747 MHz to 762 MHz, 869 MHz to 894 MHz and 1930 MHz to 1990 MHz where a level up to -36 dBm is permitted.

Table 13-10: Spurious emissions in the MS receive bands

Band (MHz)	Spurious emissions level (dBm)	
	GSM 400, T-GSM 810,, GSM 900 and DCS 1 800	GSM 700, GSM 850 and PCS 1 900
460.4 – 467.6 (GSM 400 MS only)	-67	-
488.8 - 496 (GSM 400 MS only)	-67	-
850 to 866 (T-GSM 810 MS only)	-79	-
925 to 935	-67	-
935 to 960	-79	-
1 805 to 1 880	-71	-
728 to 736	-	-79
736 to 746	-	-73
747 to 757	-	-79
757 to 763	-	-73
869 to 894	-	-79
1 930 to 1 990	-	-71

12.2 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.

12.3 Test Data

Environmental Conditions

Temperature:	25 ° C
Relative Humidity:	56%
ATM Pressure:	100.0 kPa

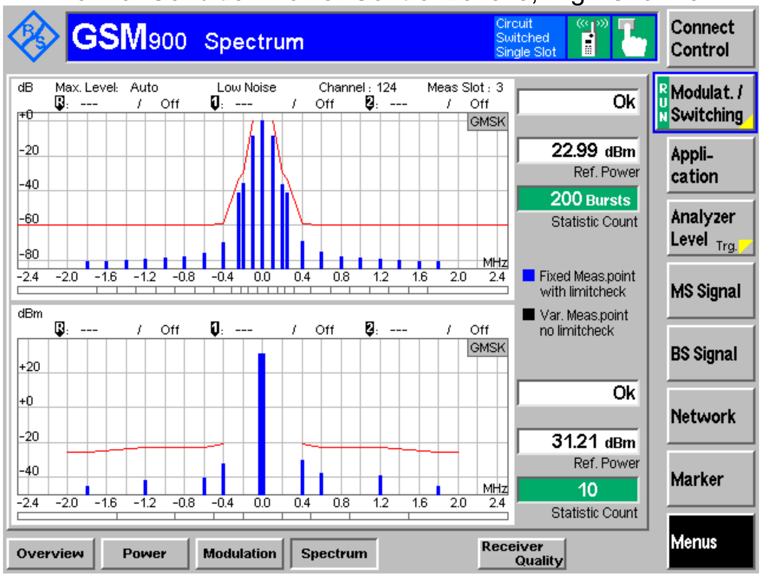
Please see the following plots.

Spectrum:

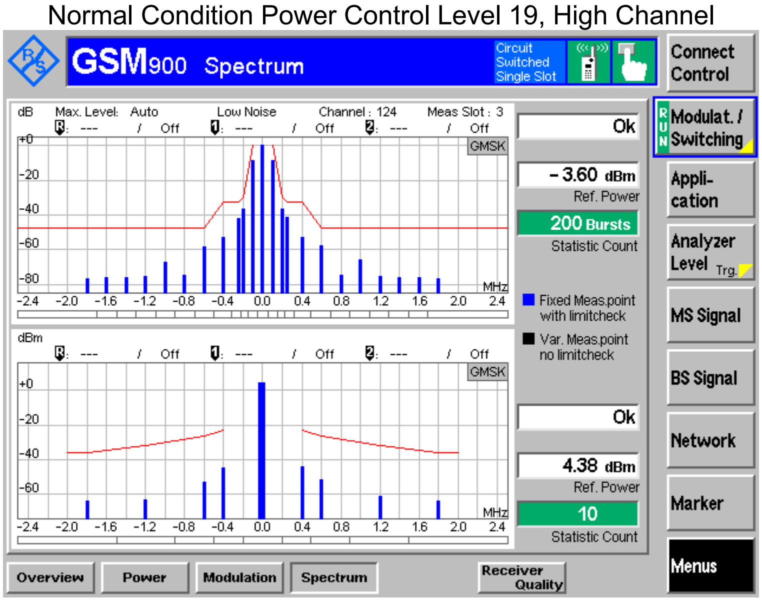
Normal Condition

GSM900:

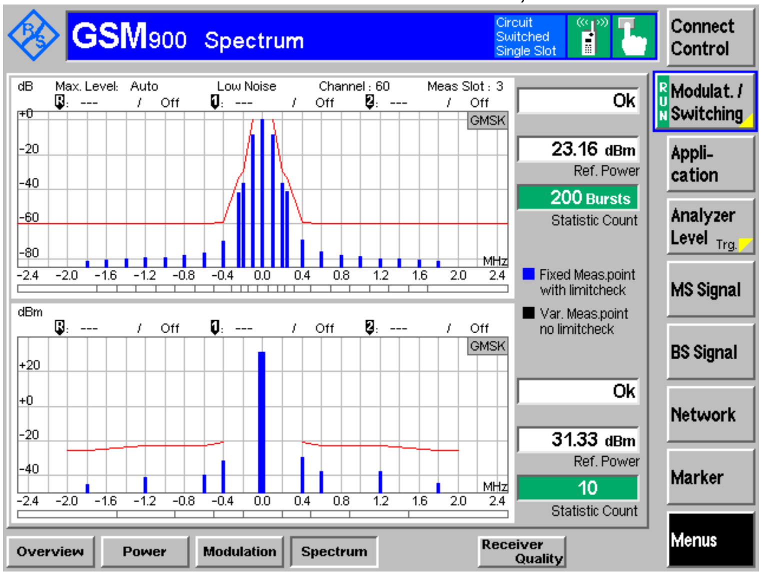
Normal Condition Power Control Level 5, High Channel



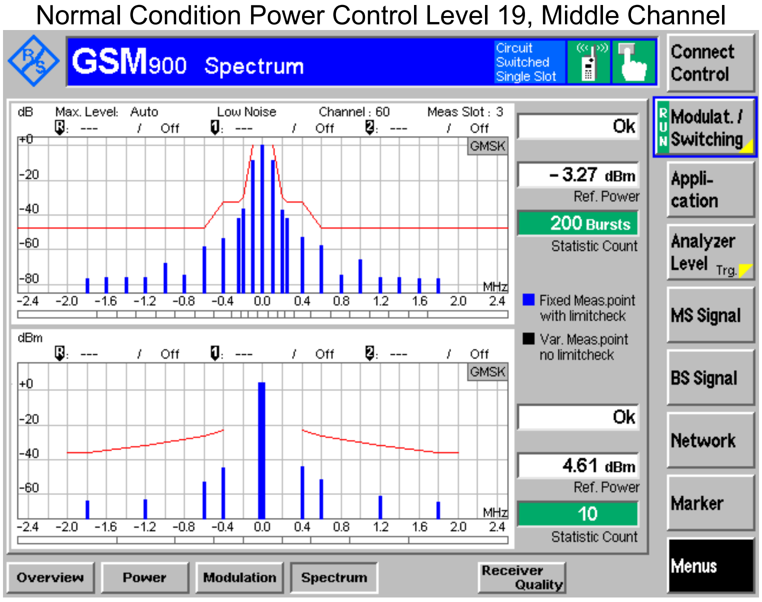
Normal Condition Power Control Level 19, High Channel



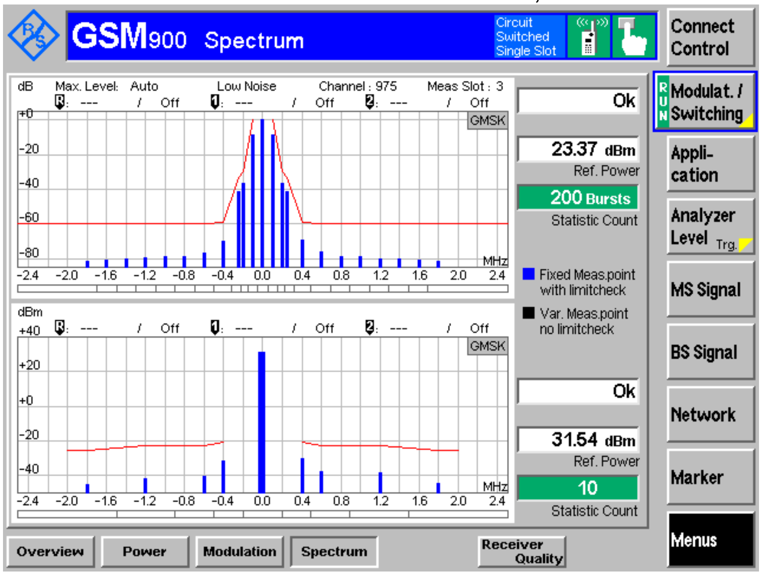
Normal Condition Power Control Level 5, Middle Channel



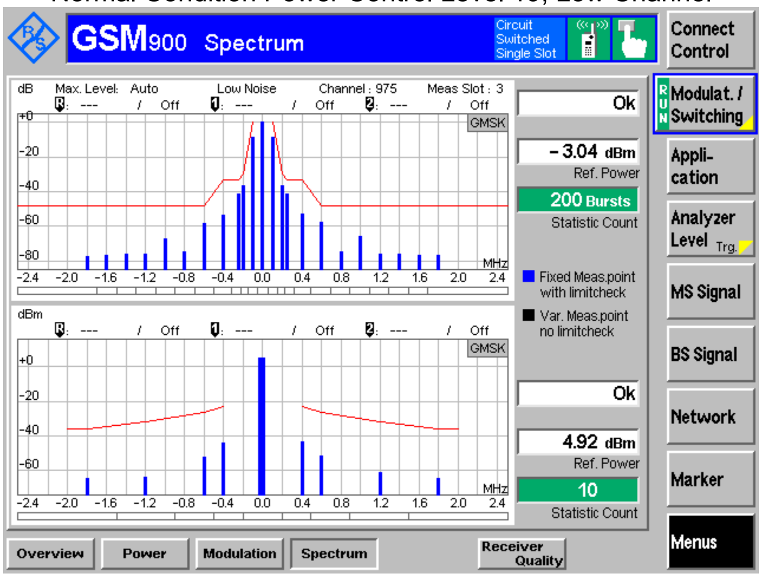
Normal Condition Power Control Level 19, Middle Channel



Normal Condition Power Control Level 5, Low Channel



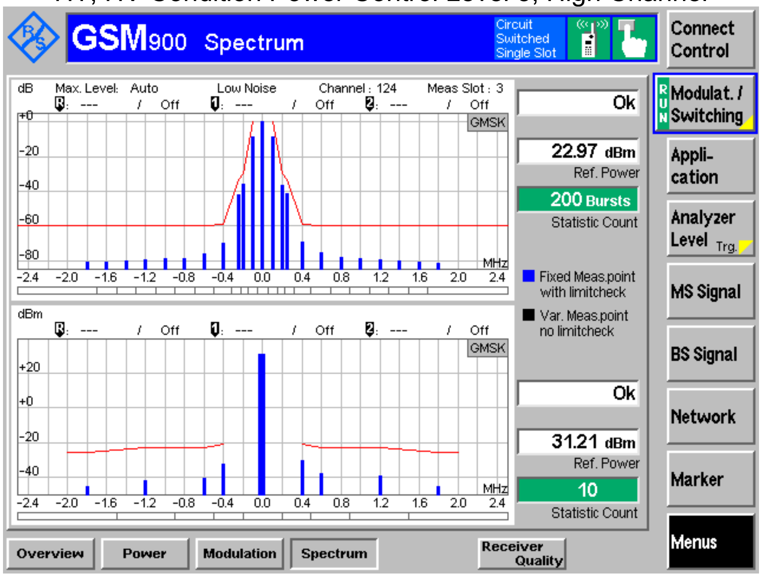
Normal Condition Power Control Level 19, Low Channel



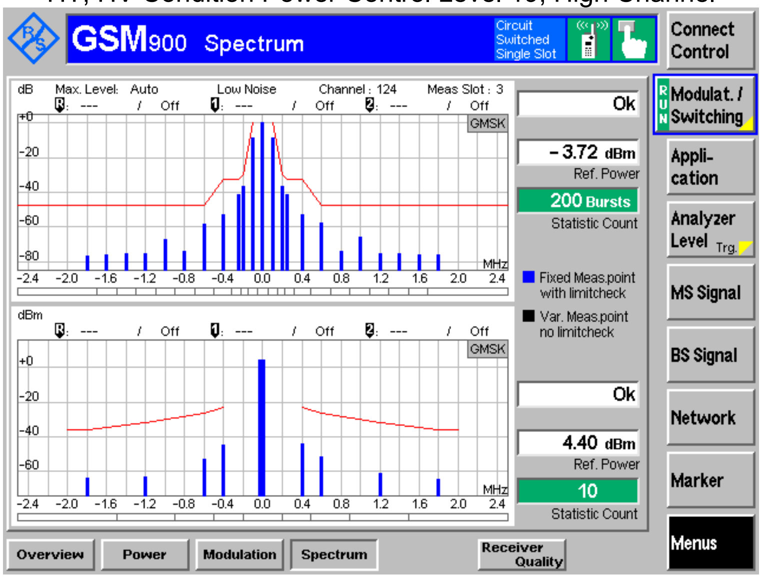
Extreme Condition

GSM900:

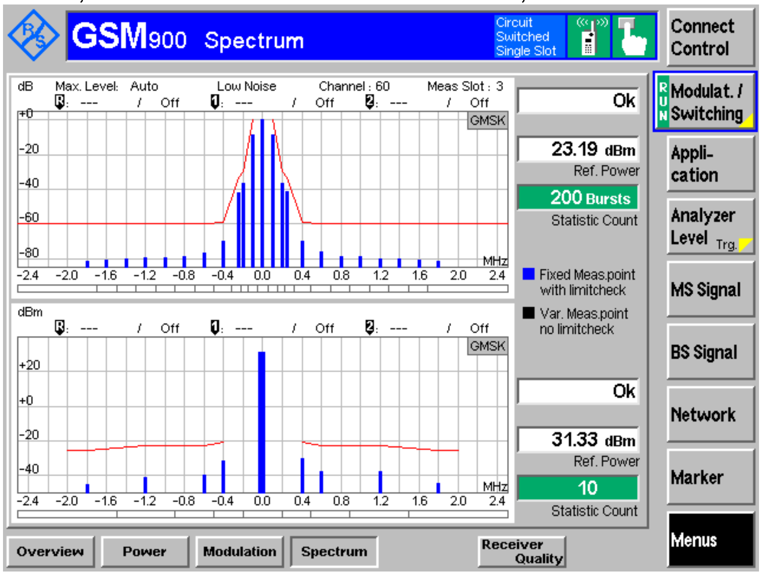
HT, HV Condition Power Control Level 5, High Channel



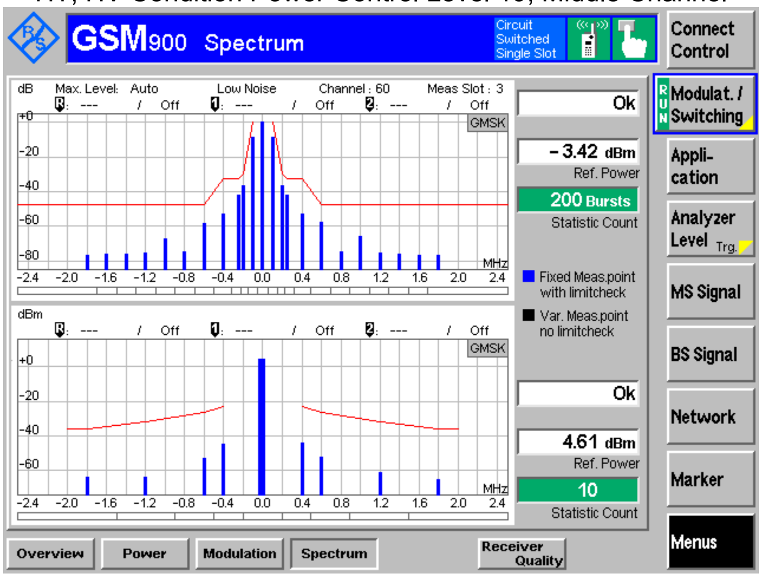
HT, HV Condition Power Control Level 19, High Channel



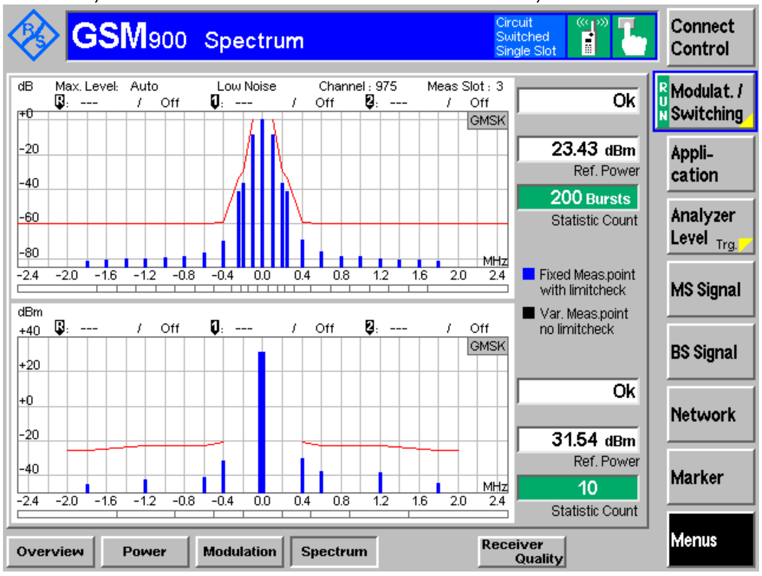
HT, HV Condition Power Control Level 5, Middle Channel



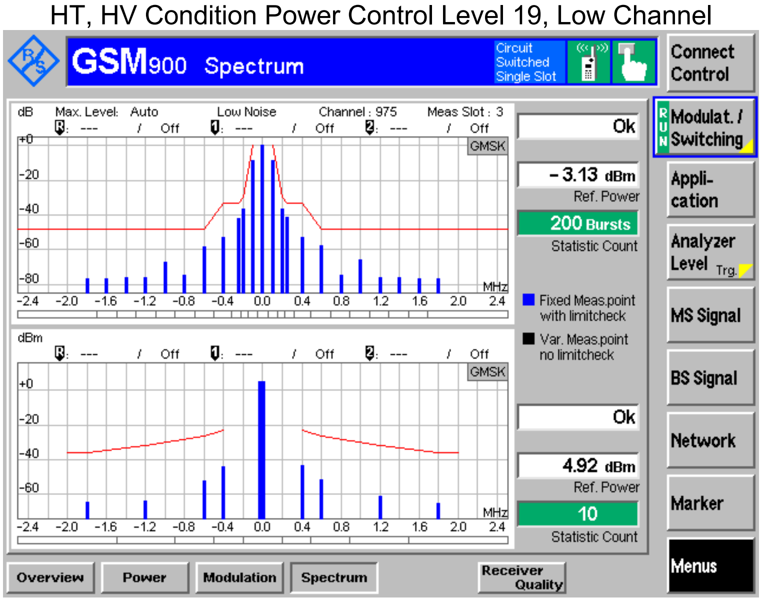
HT, HV Condition Power Control Level 19, Middle Channel



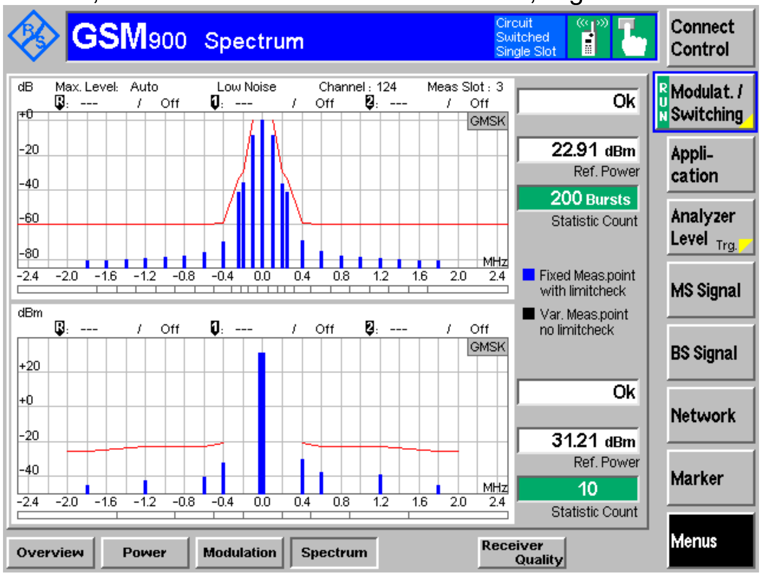
HT, HV Condition Power Control Level 5, Low Channel



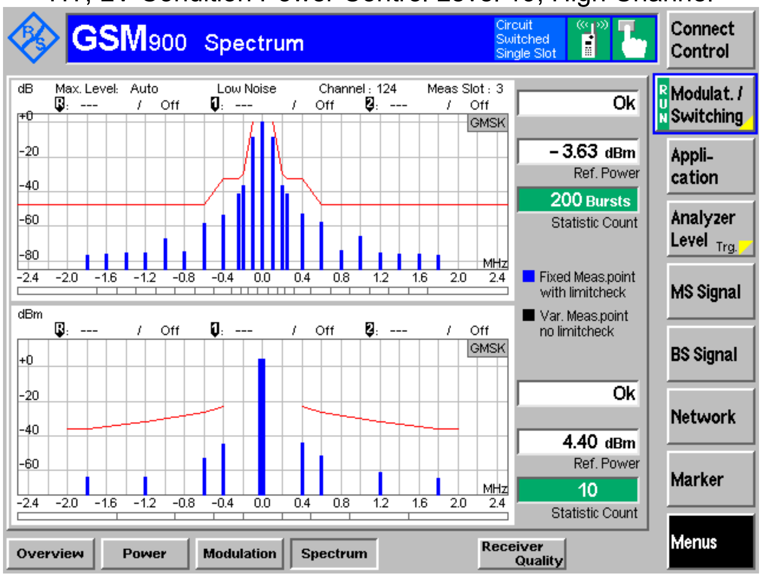
HT, HV Condition Power Control Level 19, Low Channel



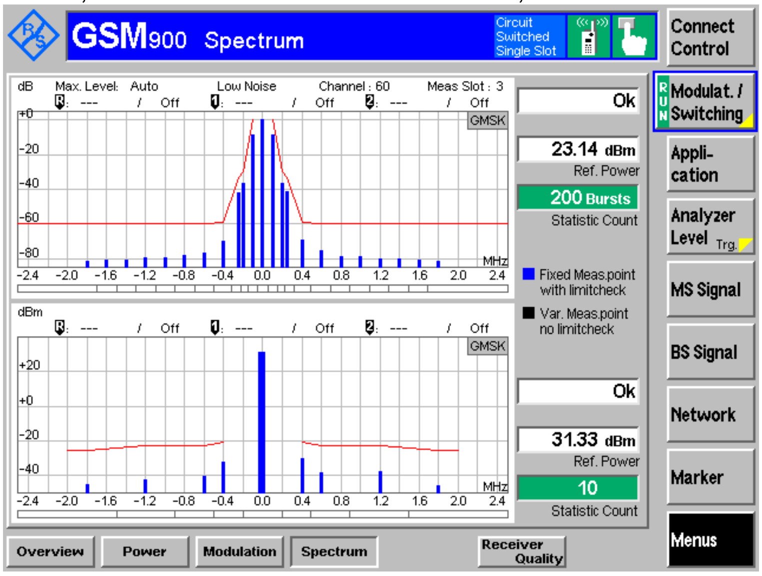
HT, LV Condition Power Control Level 5, High Channel



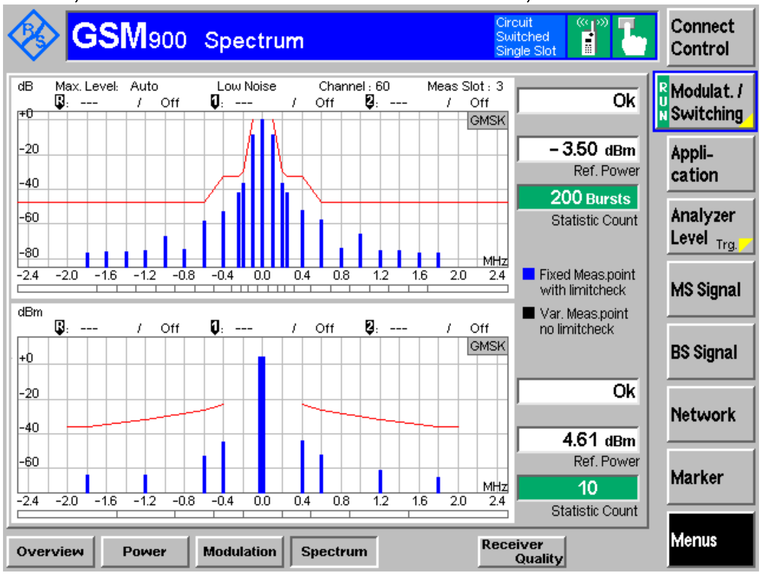
HT, LV Condition Power Control Level 19, High Channel



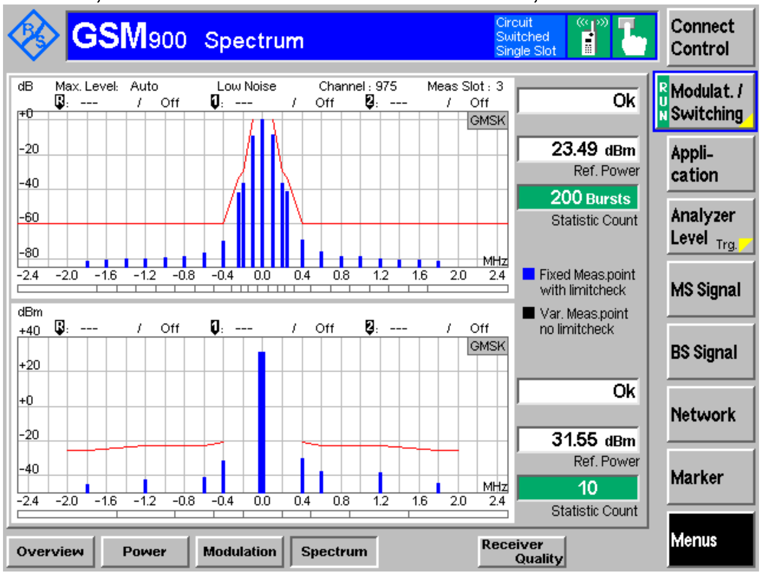
HT, LV Condition Power Control Level 5, Middle Channel



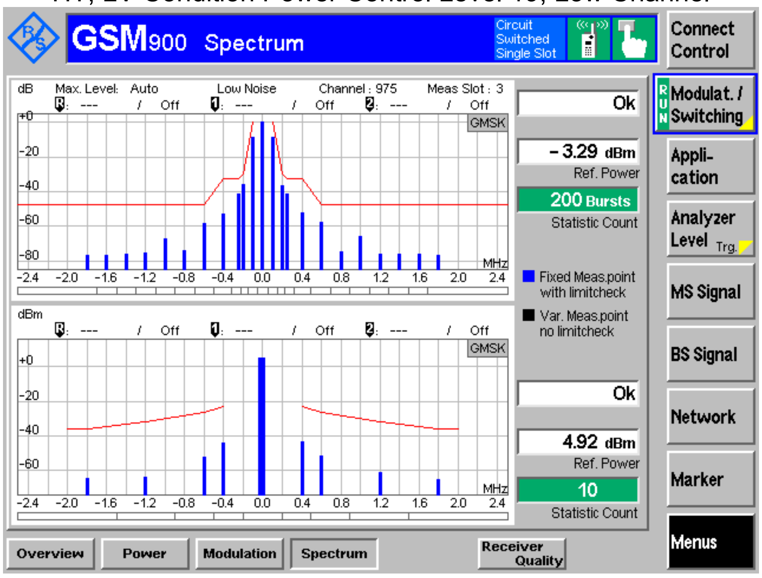
HT, LV Condition Power Control Level 19, Middle Channel



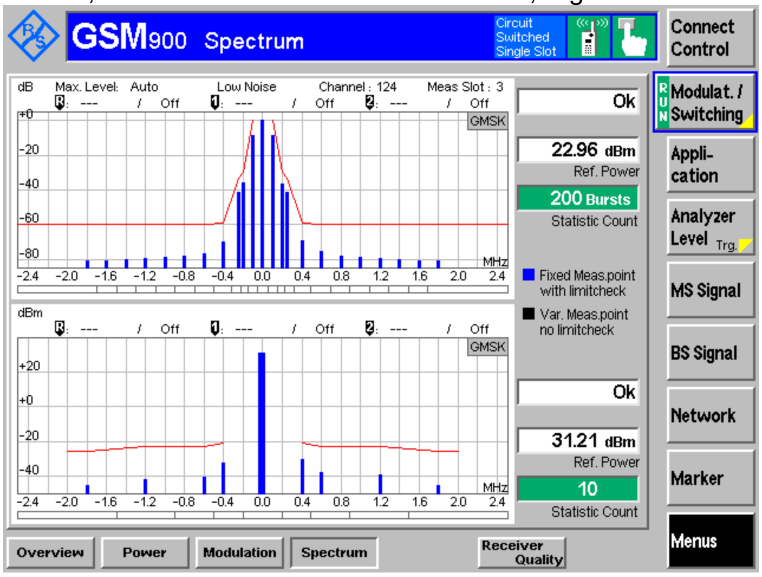
HT, LV Condition Power Control Level 5, Low Channel



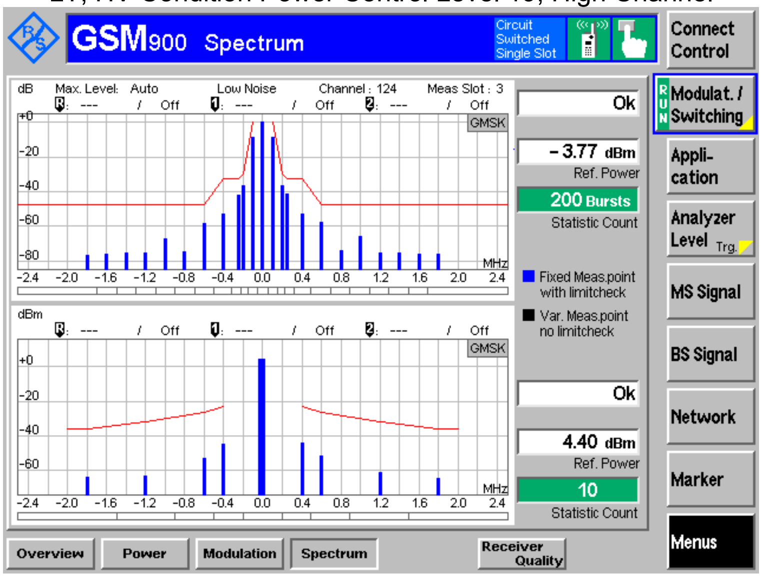
HT, LV Condition Power Control Level 19, Low Channel



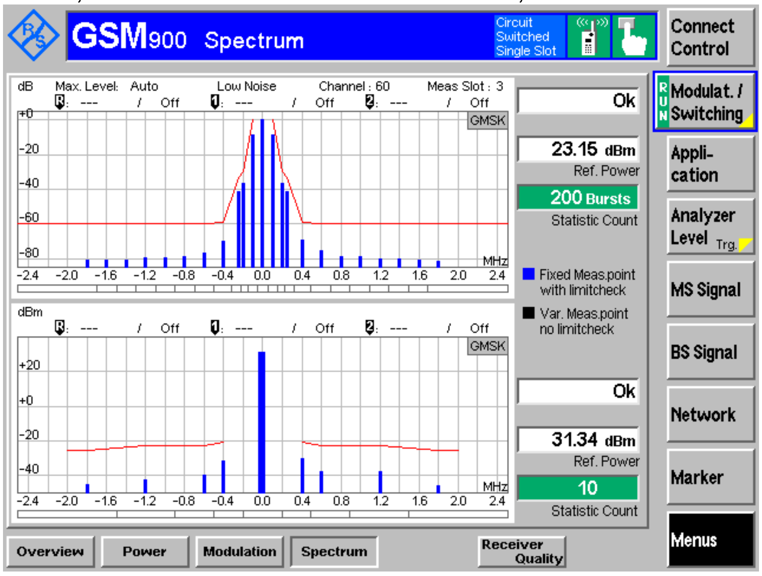
LT, HV Condition Power Control Level 5, High Channel



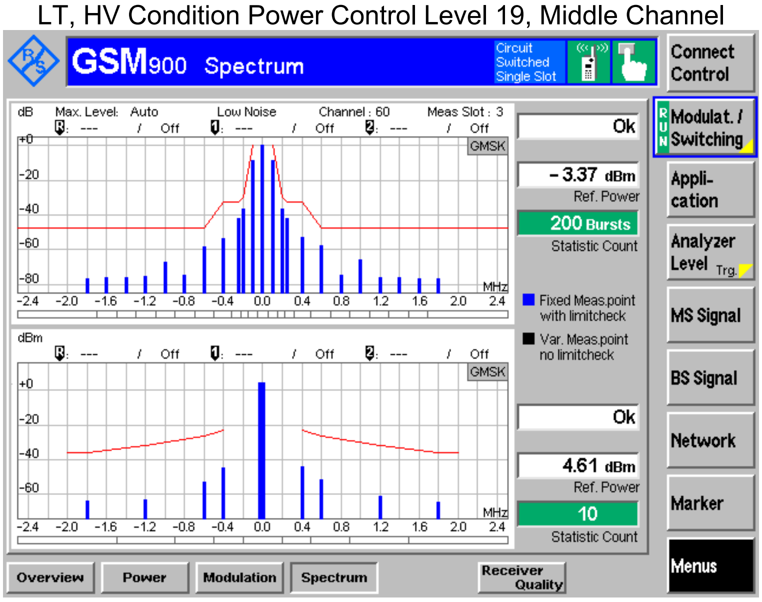
LT, HV Condition Power Control Level 19, High Channel



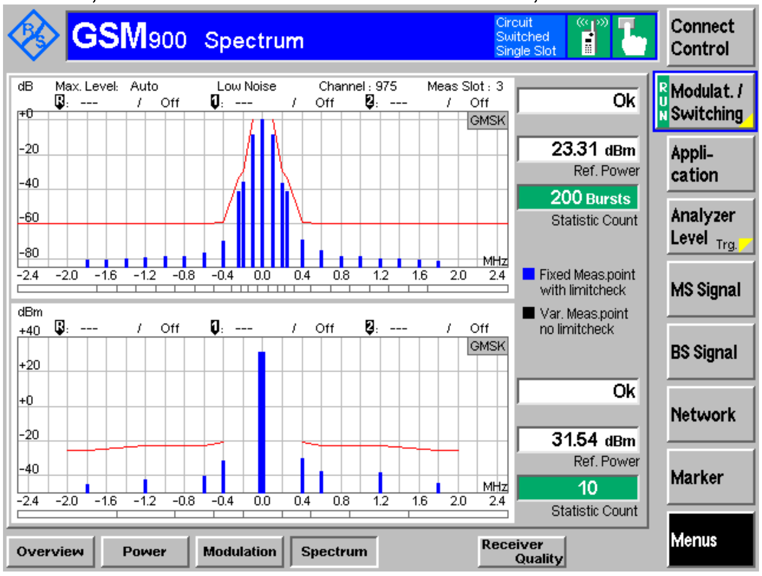
LT, HV Condition Power Control Level 5, Middle Channel



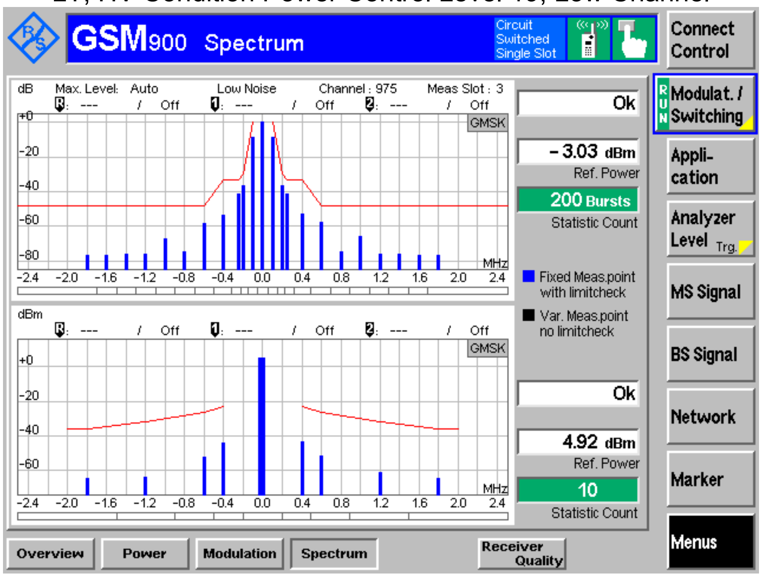
LT, HV Condition Power Control Level 19, Middle Channel



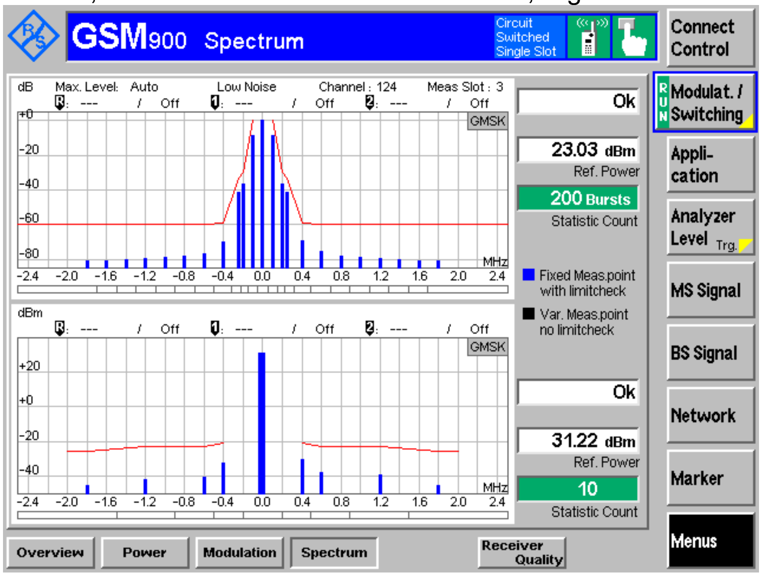
LT, HV Condition Power Control Level 5, Low Channel



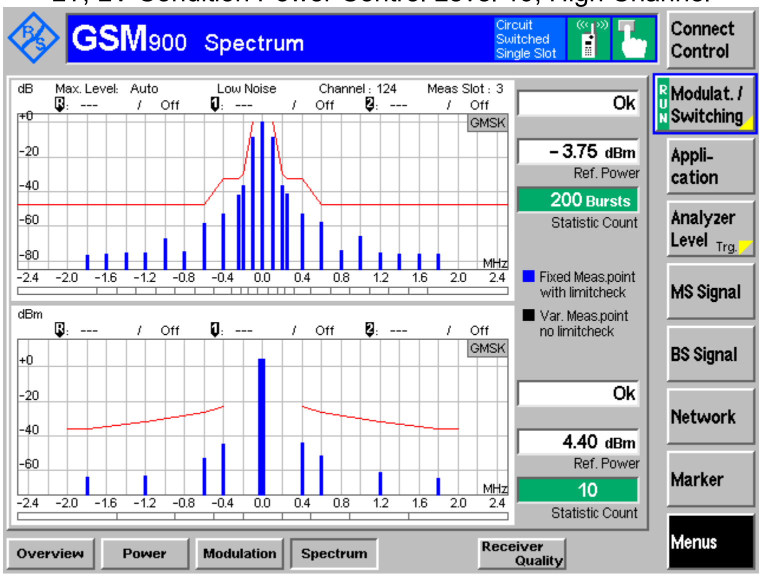
LT, HV Condition Power Control Level 19, Low Channel



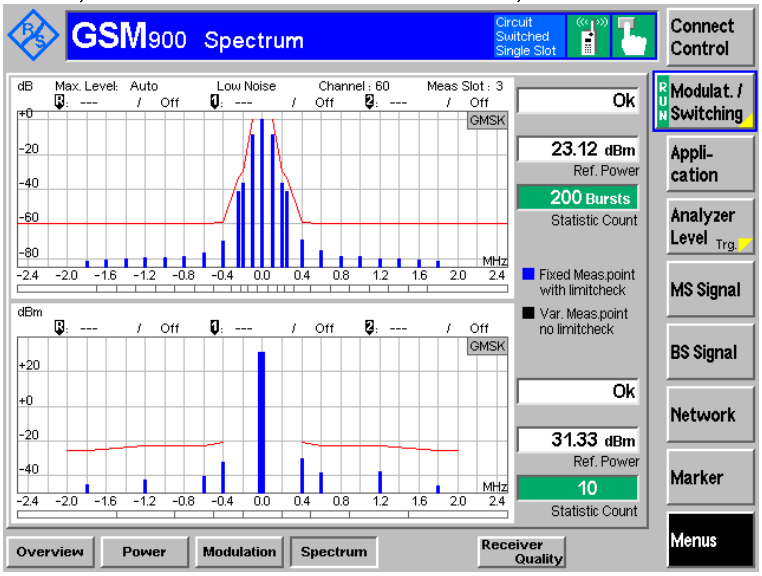
LT, LV Condition Power Control Level 5, High Channel



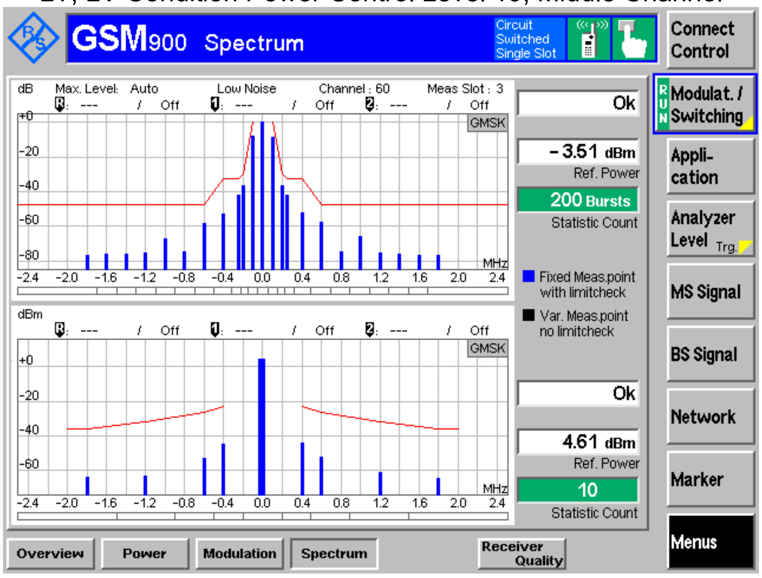
LT, LV Condition Power Control Level 19, High Channel



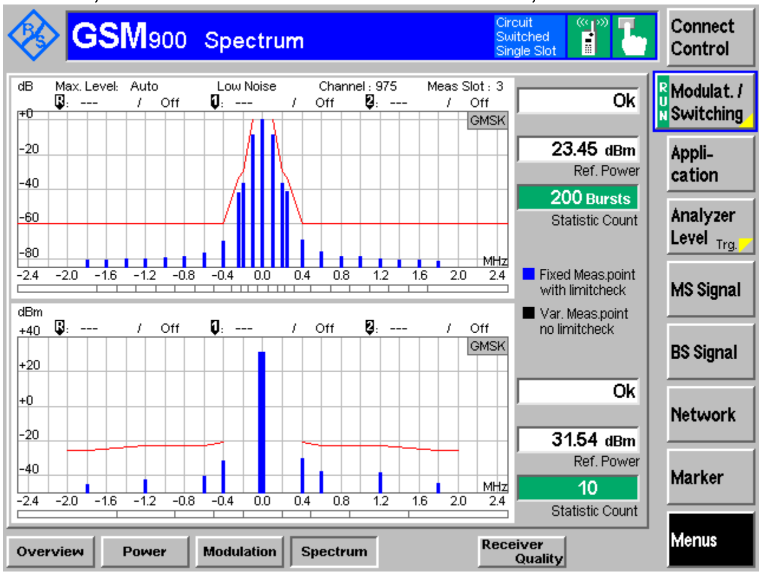
LT, LV Condition Power Control Level 5, Middle Channel



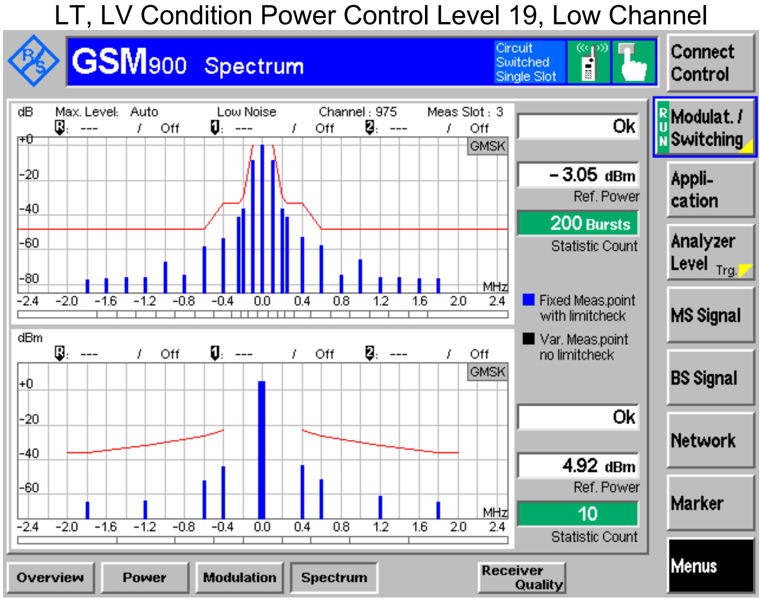
LT, LV Condition Power Control Level 19, Middle Channel



LT, LV Condition Power Control Level 5, Low Channel



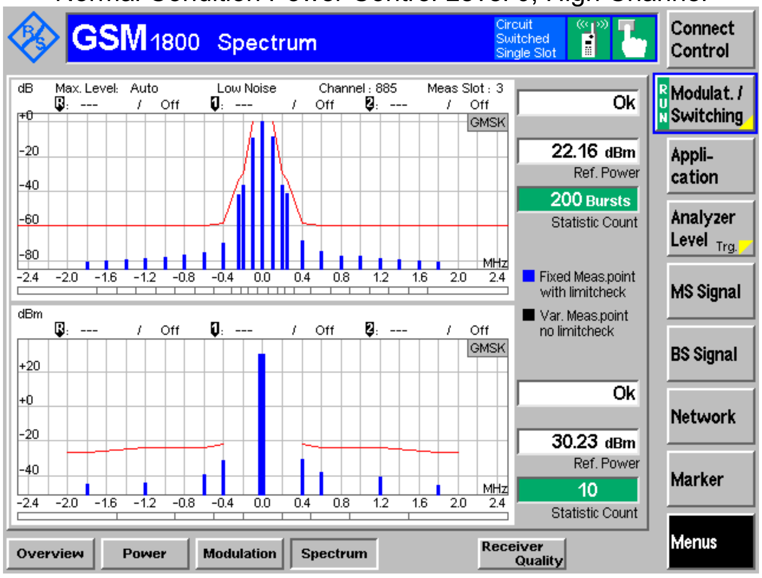
LT, LV Condition Power Control Level 19, Low Channel



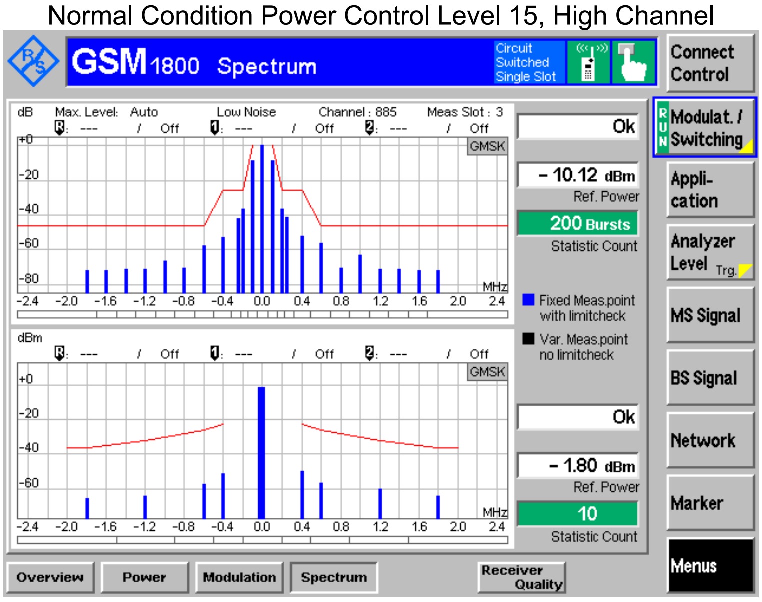
Normal Condition

DCS1800:

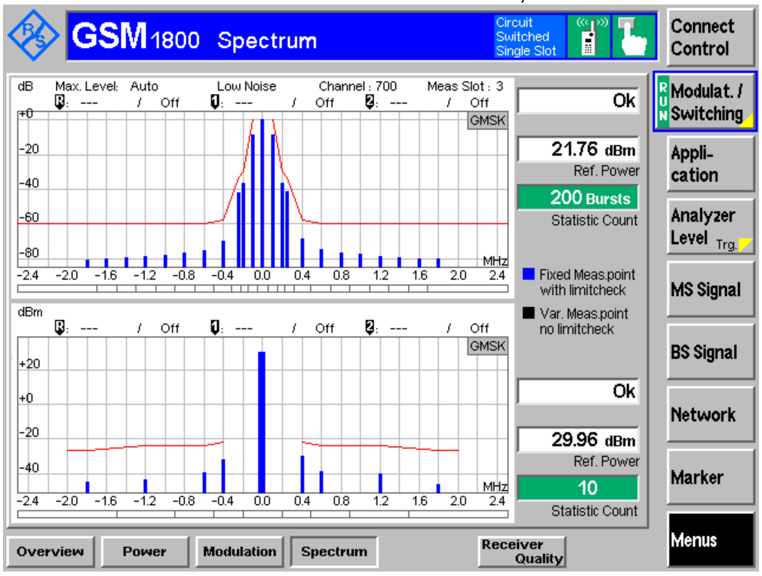
Normal Condition Power Control Level 0, High Channel



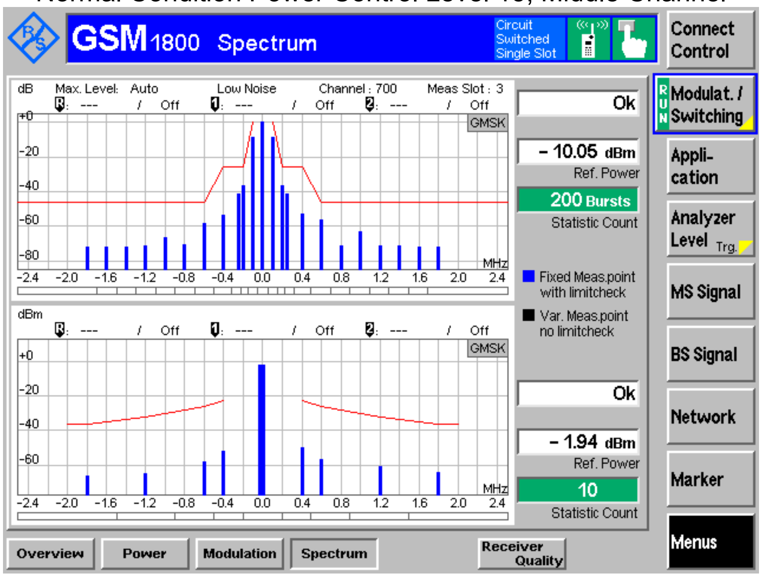
Normal Condition Power Control Level 15, High Channel



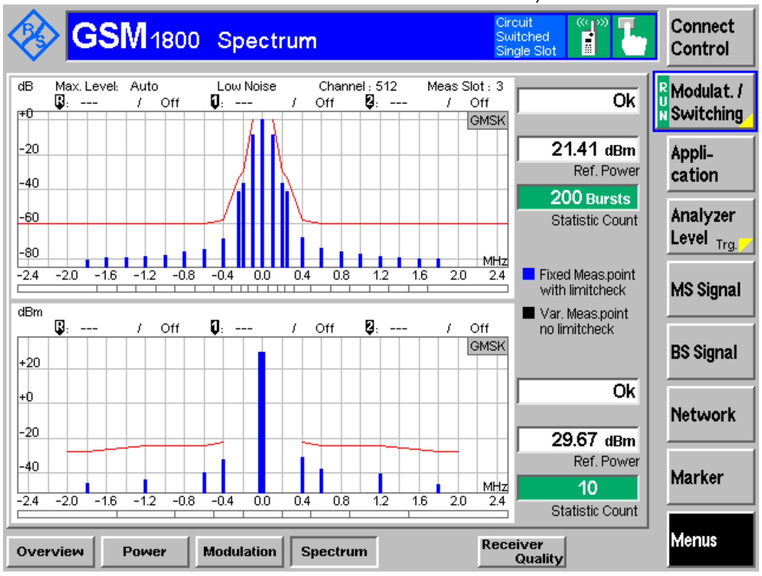
Normal Condition Power Control Level 0, Middle Channel



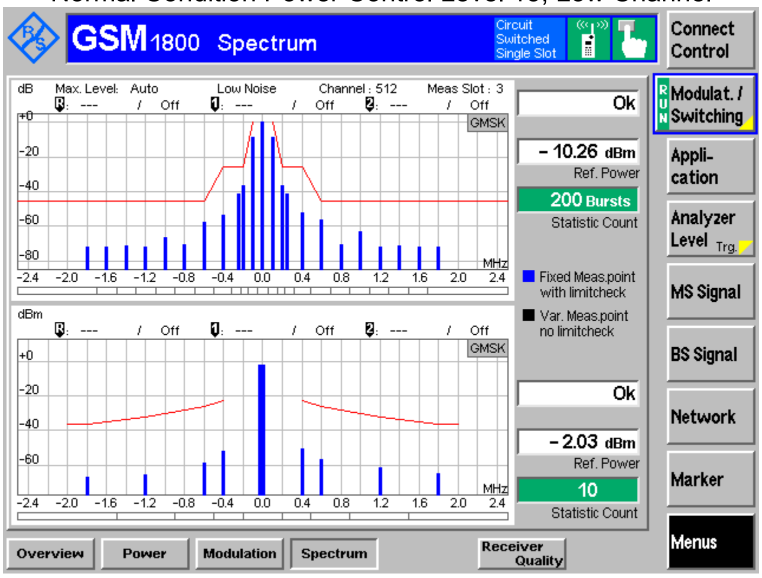
Normal Condition Power Control Level 15, Middle Channel



Normal Condition Power Control Level 0, Low Channel



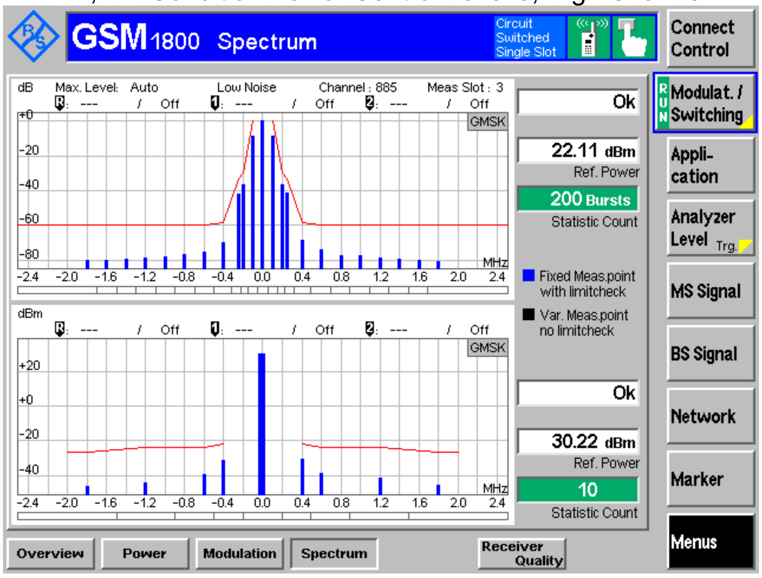
Normal Condition Power Control Level 15, Low Channel



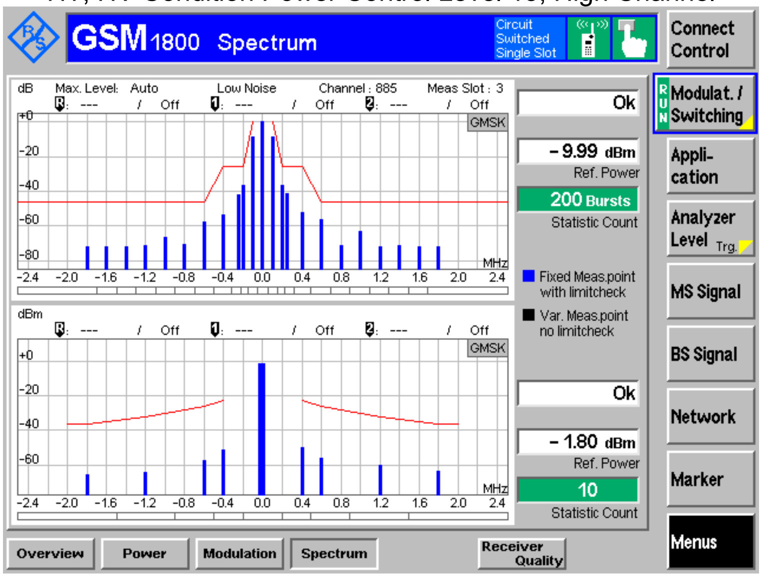
Extreme Condition

DCS1800:

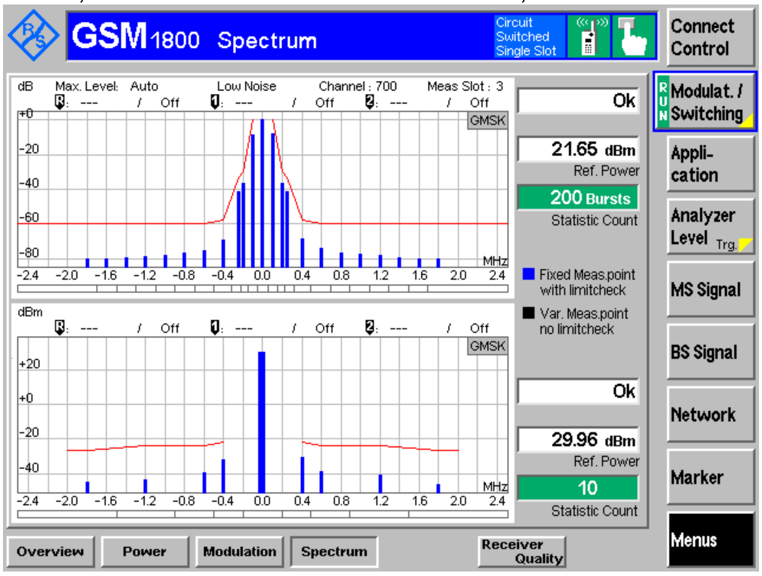
HT, HV Condition Power Control Level 0, High Channel



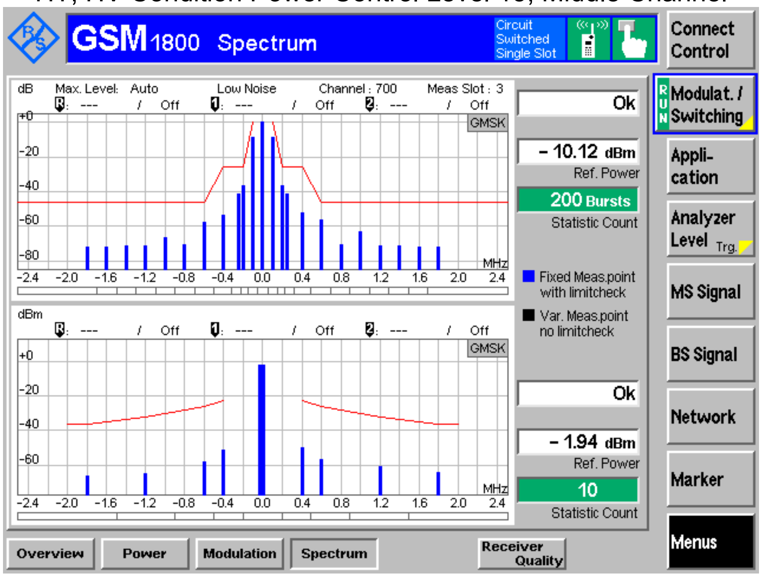
HT, HV Condition Power Control Level 15, High Channel



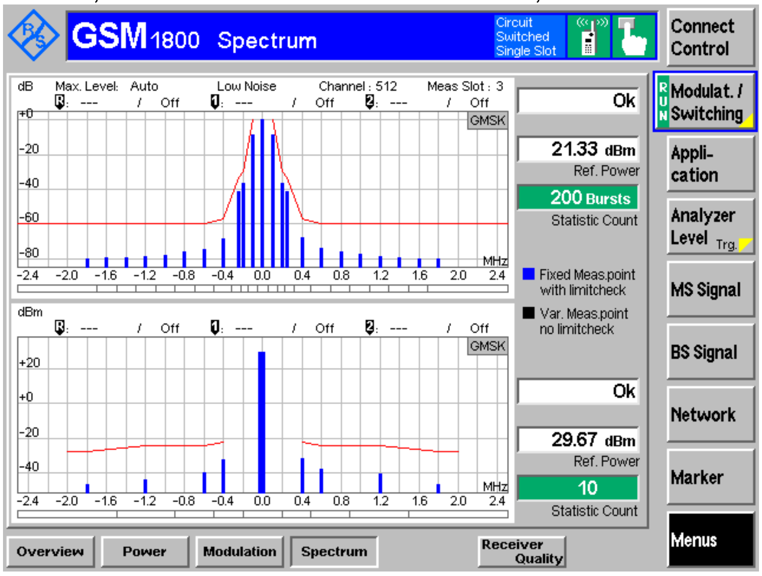
HT, HV Condition Power Control Level 0, Middle Channel



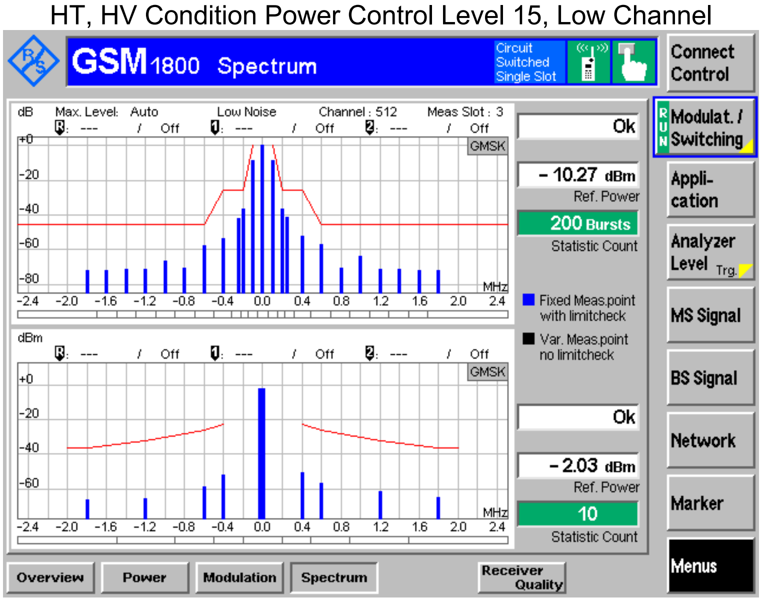
HT, HV Condition Power Control Level 15, Middle Channel



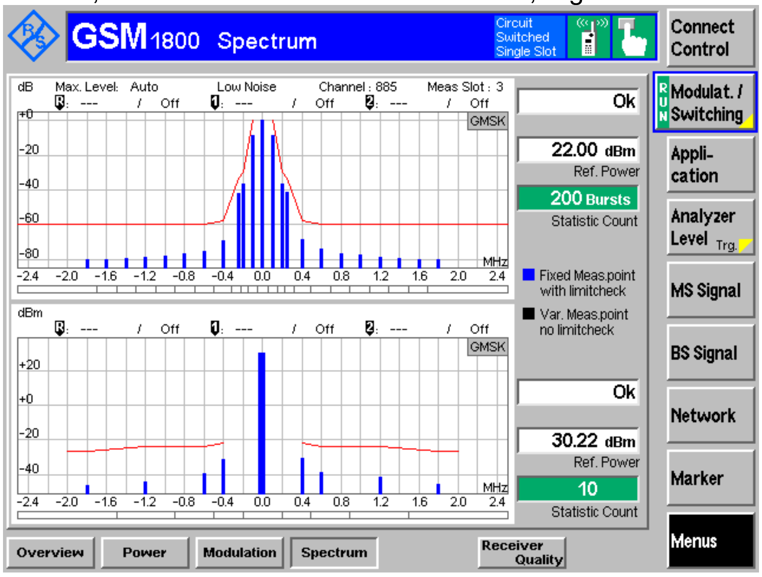
HT, HV Condition Power Control Level 0, Low Channel



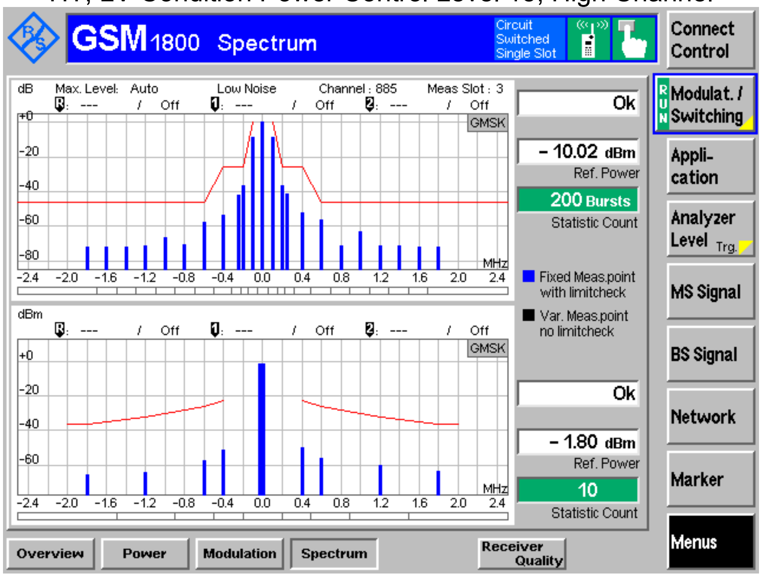
HT, HV Condition Power Control Level 15, Low Channel



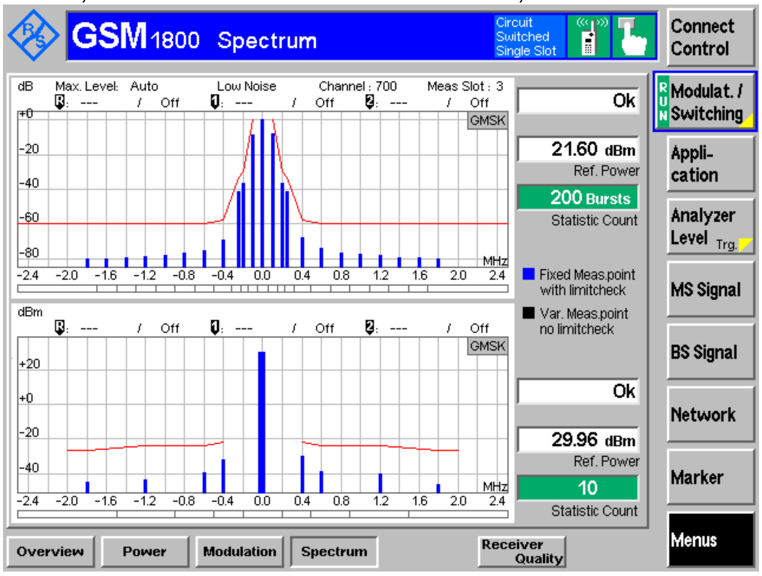
HT, LV Condition Power Control Level 0, High Channel



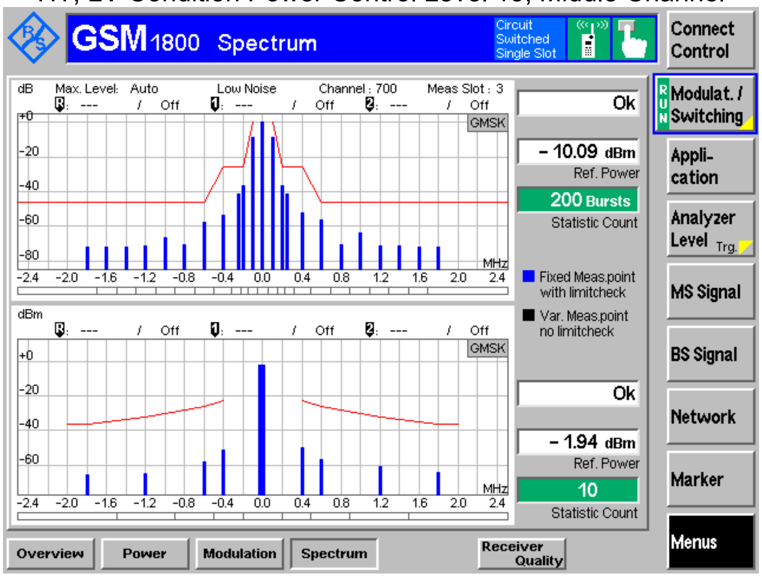
HT, LV Condition Power Control Level 15, High Channel



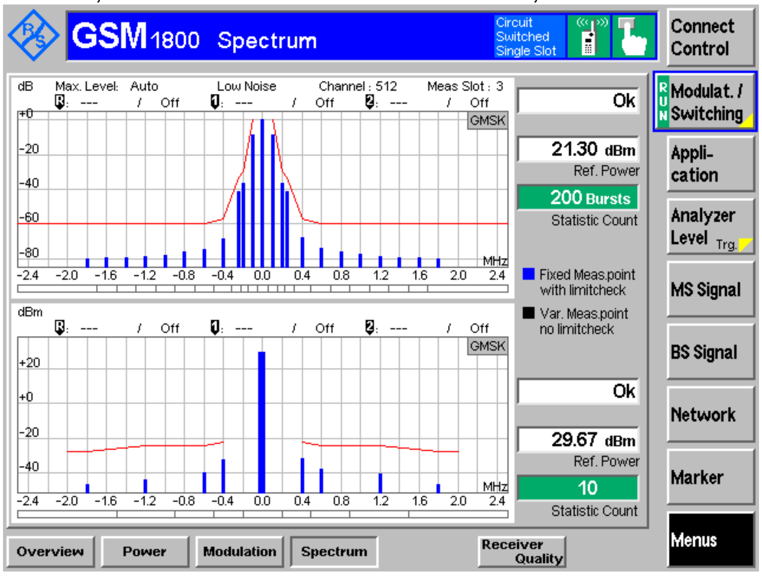
HT, LV Condition Power Control Level 0, Middle Channel



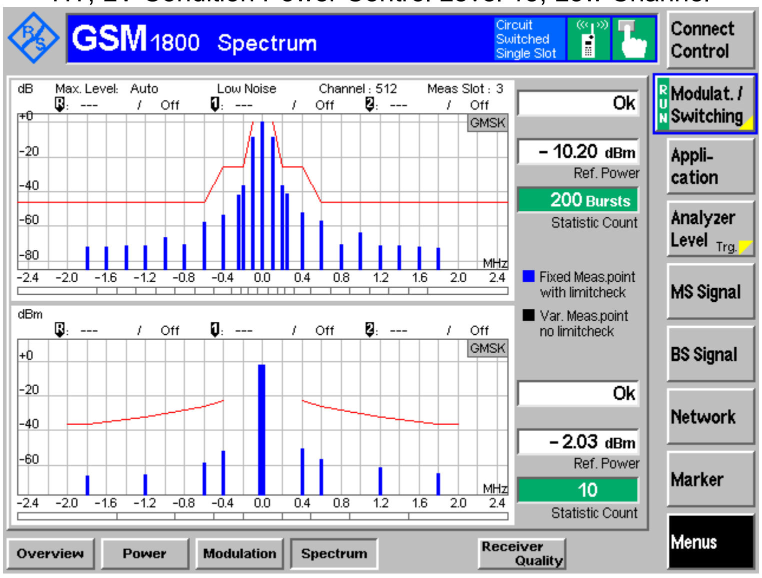
HT, LV Condition Power Control Level 15, Middle Channel



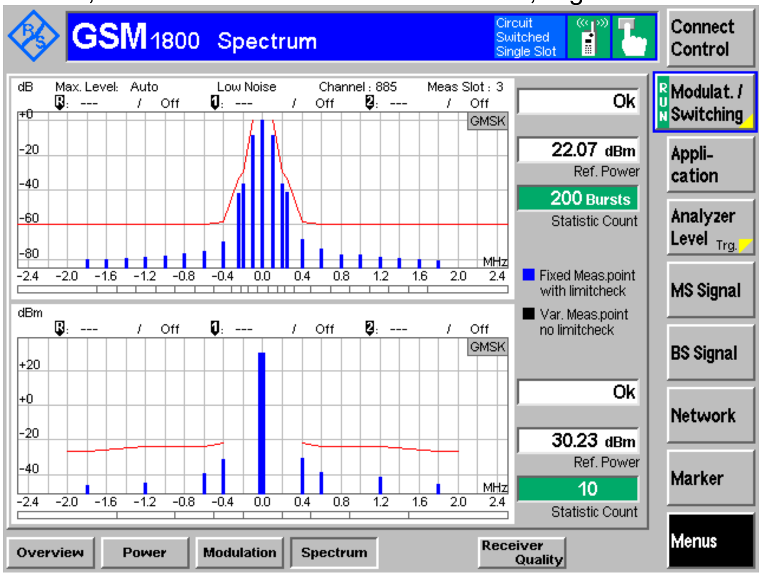
HT, LV Condition Power Control Level 0, Low Channel



HT, LV Condition Power Control Level 15, Low Channel



LT, HV Condition Power Control Level 0, High Channel



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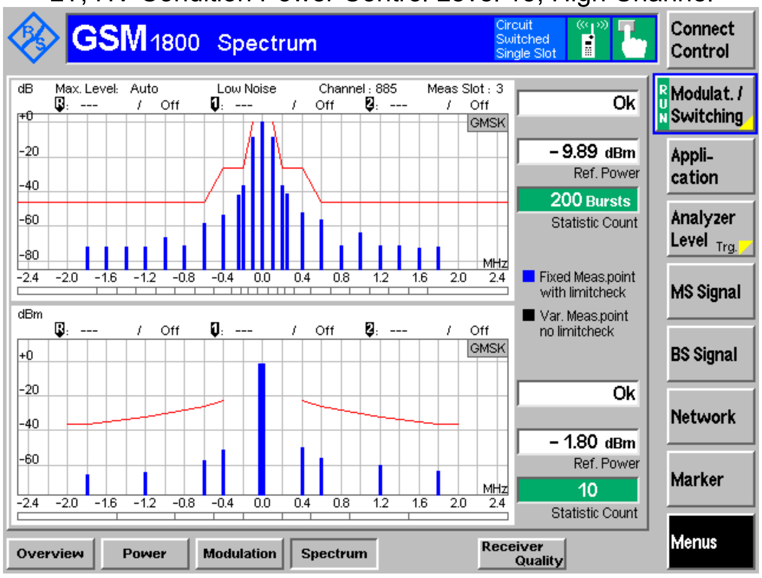

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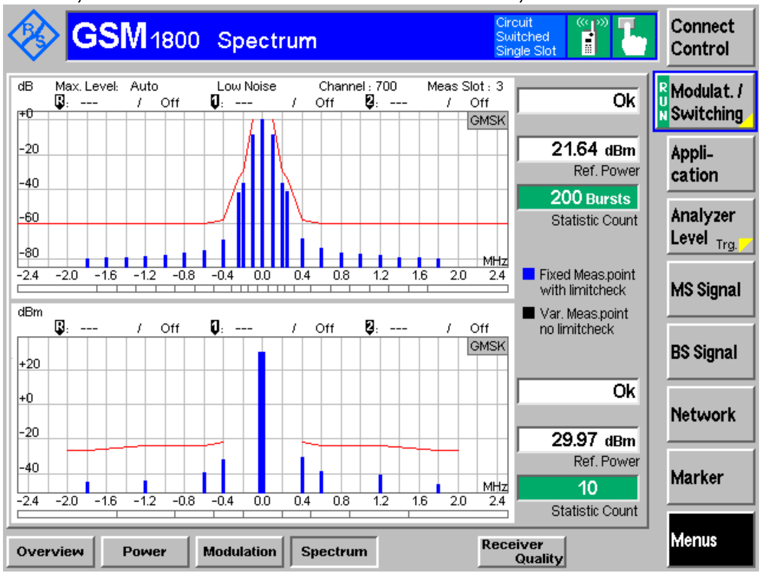

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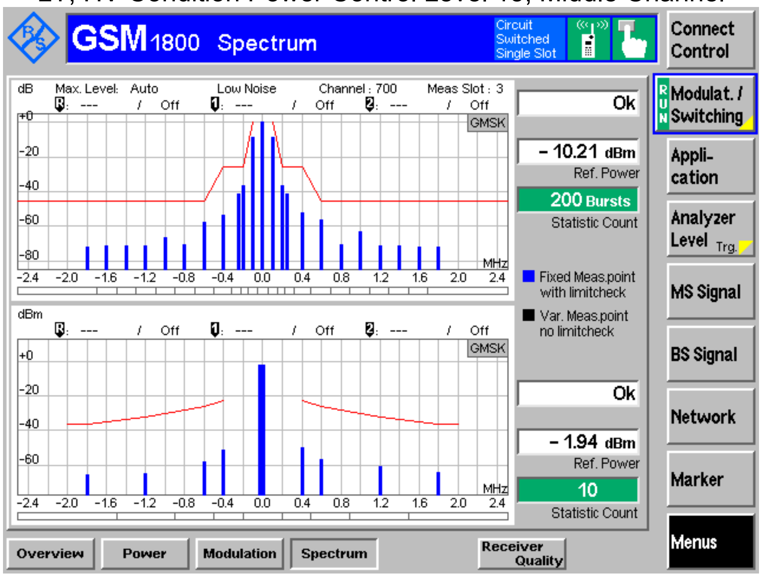

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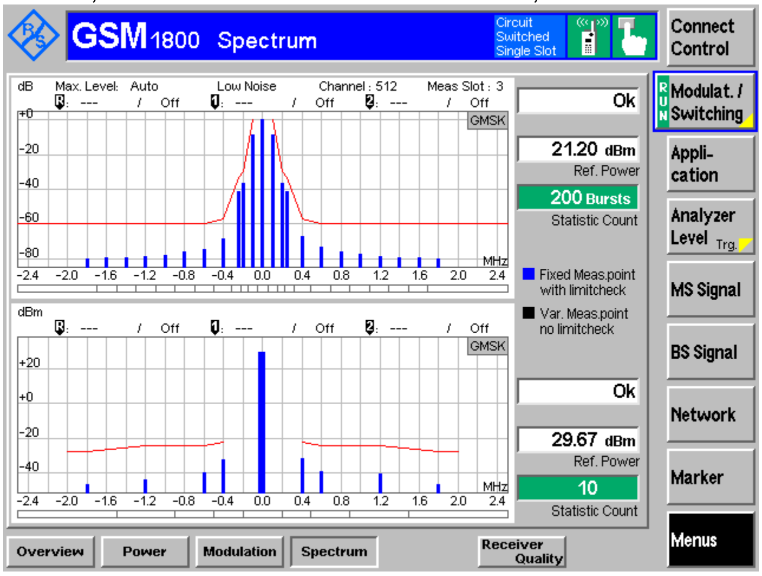

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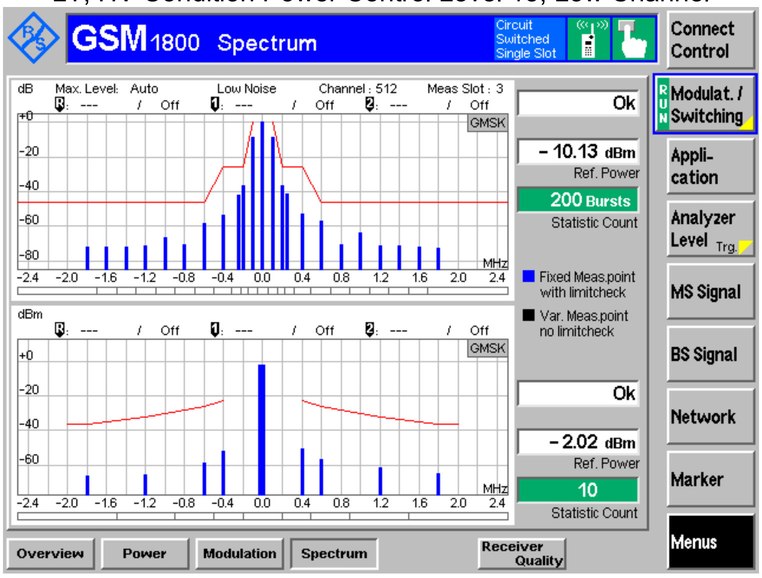
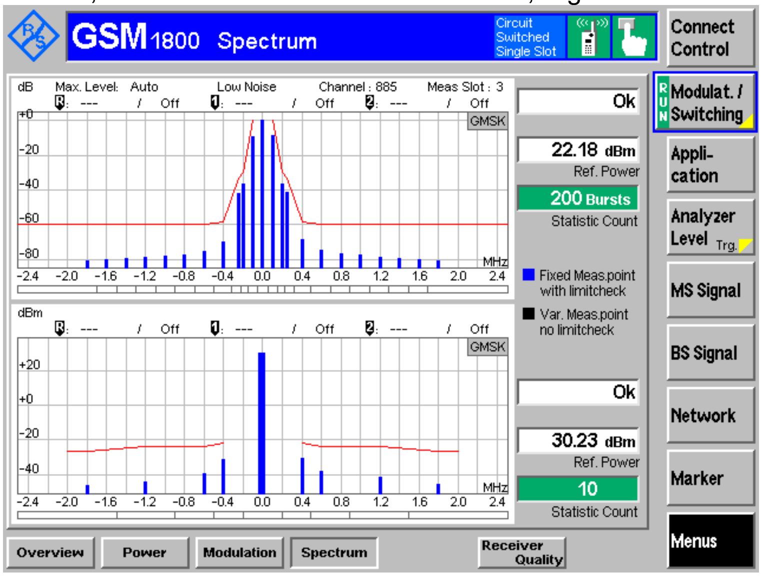


LT, LV Condition Power Control Level 0, High Channel



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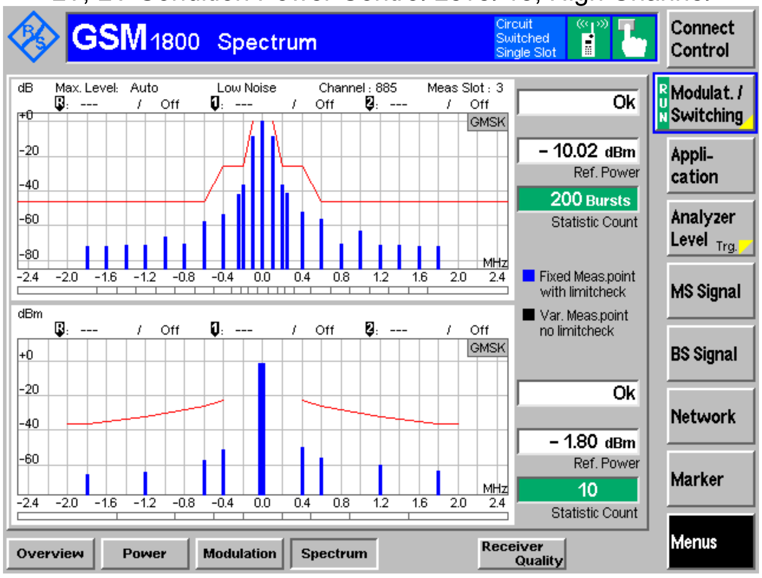
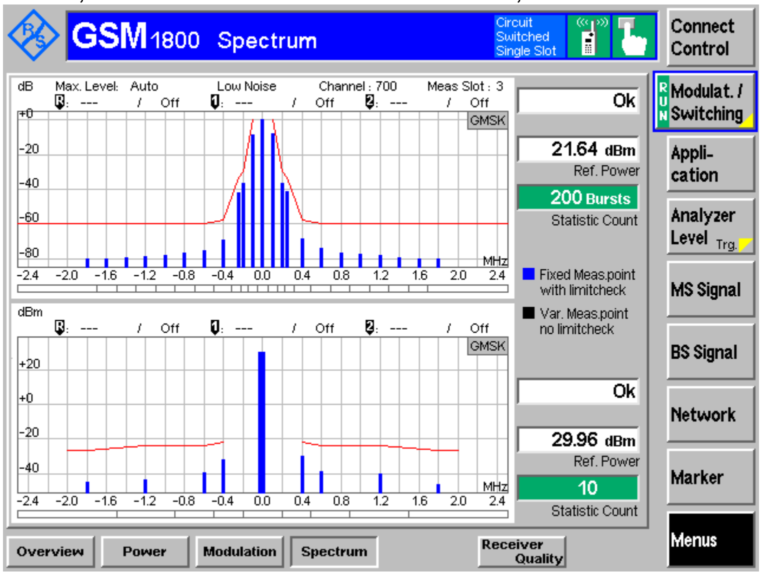
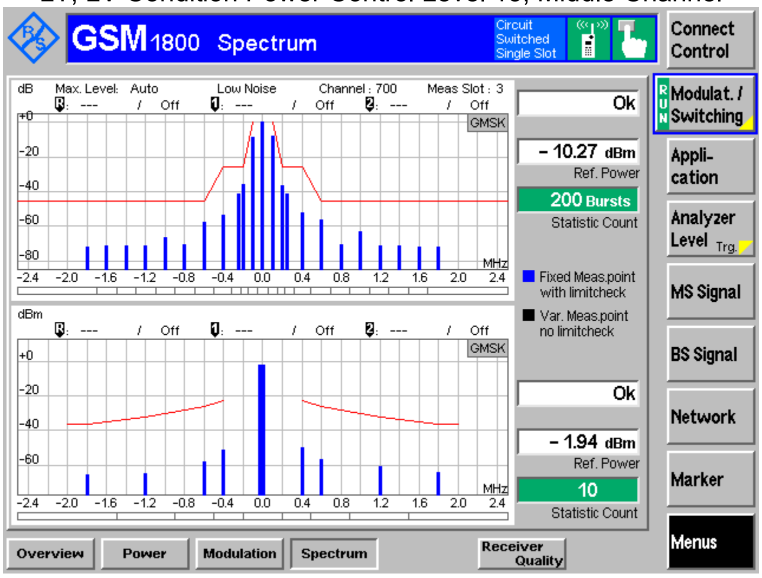


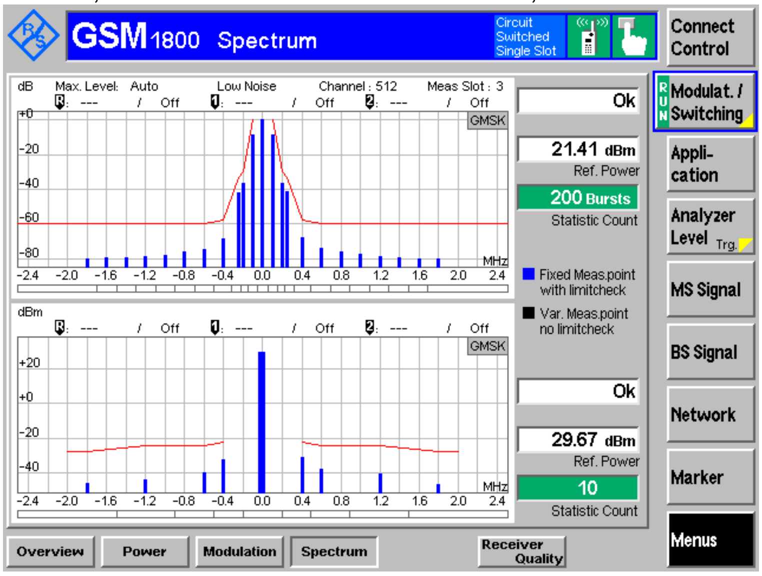
LT, LV Condition Power Control Level 0, Middle Channel



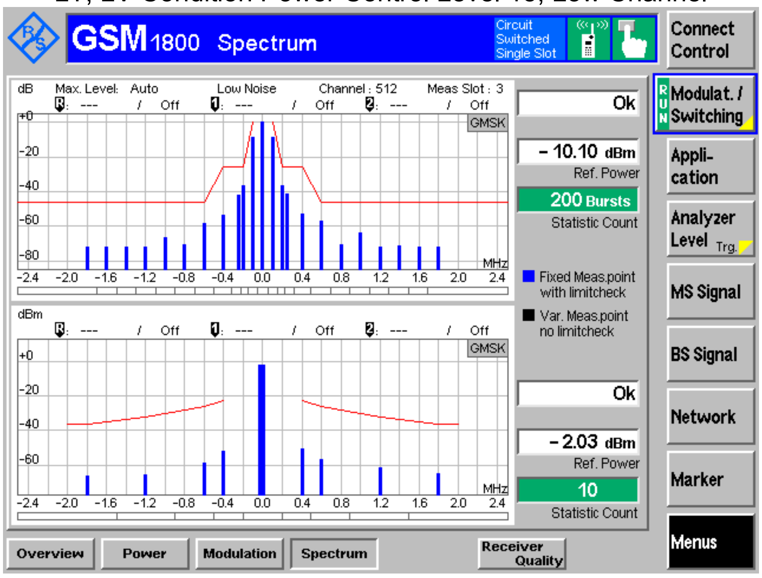
LT, LV Condition Power Control Level 15, Middle Channel



LT, LV Condition Power Control Level 0, Low Channel



LT, LV Condition Power Control Level 15, Low Channel



Spurious Emissions in the MS receive bands:

For GSM900 Band (Middle channel)

Frequency range (MHz)	Frequency (MHz)	Level (dBm)				
		Normal	L T L V	H T L V	L T H V	H T H V
925-935	925.10	-72.14	-72.24	-72.74	-73.21	-73.24
	930.55	-73.23	-72.43	-72.79	-72.55	-72.42
935-960	933.60	-82.15	-82.03	-84.47	-83.85	-83.41
	942.40	-83.14	-83.52	-84.25	-84.35	-84.42

For DCS1800 Band (Middle channel)

Frequency range (MHz)	Frequency (MHz)	Level (dBm)				
		Normal	L T L V	H T L V	L T H V	H T H V
1805-1880	1865.42	-78.76	-79.25	-80.22	-79.13	-80.02
	1830.65	-81.21	-81.34	-81.53	-82.12	-81.21
	1810.88	-81.09	-81.43	-83.68	-81.15	-81.52
	1840.85	-81.78	-82.06	-83.75	-82.23	-81.04

Note: The MS is commanded to its maximum power level.

13 Transmitter output power in GPRS multislot configuration

13.1 Standard Applicable

According to EN 301 511 V9.0.2 (2003-03), section 4.2.10,

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 bursts in 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.
   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 PCS 1 900 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.

13.2 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
   a) 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 reselection 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.

13.3 Test Data

Environmental Conditions

Temperature:	18 °C ~ 22 °C
Relative Humidity:	45 % ~ 66 %
ATM Pressure:	100.1 kPa ~ 100.7 kPa

Test Results: Pass.

GSM900 Output Power in GPRS

High Channel (914.8MHz) Output Power

High Channel F = 914.8 MHz						
γ =	OUTPUT POWER (dBm)					Result
	Normal	L.T. L.V.	H.T. L.V.	L.T. H.V.	H.T. H.V.	
3	31.10	31.13	31.15	31.13	31.15	Pass
4	29.72	29.72	29.65	29.71	29.72	
5	27.38	27.33	27.35	27.36	27.32	
6	25.87	25.83	25.85	25.85	25.86	
7	23.88	23.85	23.86	23.87	23.88	
8	21.52	21.44	21.45	21.46	21.47	
9	19.39	19.32	19.34	19.34	19.35	
10	17.05	17.01	17.04	17.05	17.03	
11	15.42	15.34	15.40	15.41	15.41	
12	13.17	13.10	13.11	13.12	13.13	
13	11.86	11.81	11.82	11.83	11.84	
14	9.33	9.30	9.34	9.29	9.30	
15	7.37	7.30	7.35	7.33	7.30	
16	5.89	5.82	5.86	5.81	5.85	
17	4.19	4.18	4.12	4.11	4.14	

Middle Channel (902.00MHz) Out Power

Middle Channel F = 902.00 MHz						
γ =	OUTPUT POWER (dBm)					Result
	Normal	L.T. L.V.	H.T. L.V.	L.T. H.V.	H.T. H.V.	
3	31.24	31.26	31.29	31.20	31.27	Pass
4	29.76	29.74	29.71	29.73	29.75	
5	27.58	27.56	27.50	27.50	27.56	
6	25.24	25.23	25.17	25.22	25.23	
7	23.14	23.07	23.11	23.06	23.07	
8	21.52	21.52	21.46	21.51	21.51	
9	19.39	19.32	19.33	19.38	19.31	
10	17.78	17.77	17.71	17.76	17.77	
11	15.28	15.28	15.22	15.27	15.28	
12	13.91	13.90	13.89	13.84	13.86	
13	11.37	11.30	11.31	11.36	11.37	
14	9.07	9.02	9.02	9.07	9.03	
15	7.55	7.48	7.52	7.47	7.49	
16	6.36	6.33	6.27	6.30	6.33	
17	4.40	4.45	4.46	4.43	4.50	

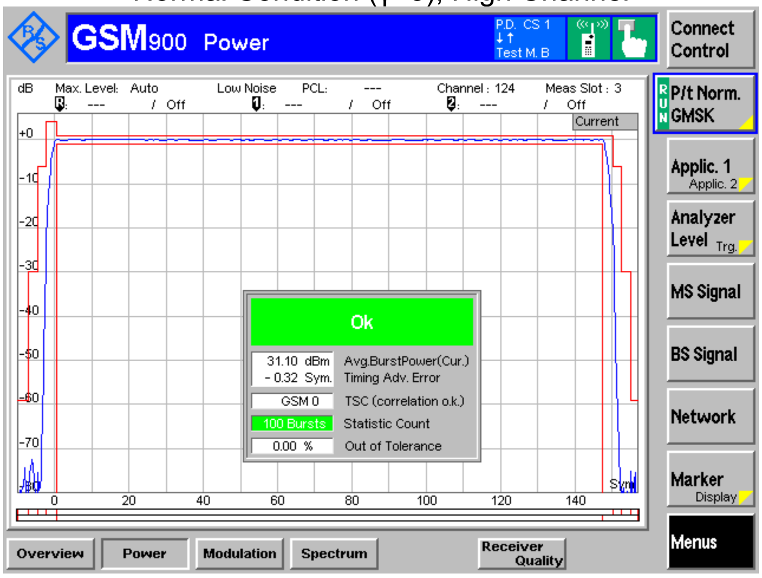
Low Channel (880.20 MHz) Output Power

Low Channel F = 880.20 MHz						
γ =	OUTPUT POWER (dBm)					Result
	Normal	L.T. L.V.	H.T. L.V.	L.T. H.V.	H.T. H.V.	
3	31.43	31.44	31.46	31.45	31.40	Pass
4	29.75	29.72	29.67	29.75	29.68	
5	27.36	27.28	27.31	27.30	27.33	
6	25.25	25.16	25.17	25.21	25.21	
7	23.14	23.11	23.06	23.06	23.08	
8	21.21	21.13	21.19	21.15	21.21	
9	19.32	19.30	19.24	19.26	19.26	
10	17.54	17.54	17.52	17.46	17.54	
11	15.72	15.68	15.71	15.65	15.64	
12	13.38	13.37	13.36	13.34	13.34	
13	11.93	11.87	11.85	11.93	11.86	
14	9.27	9.18	9.20	9.25	90.20	
15	7.11	7.07	7.02	7.11	7.07	
16	6.33	6.26	6.31	6.33	6.25	
17	4.71	4.70	4.77	4.75	4.70	

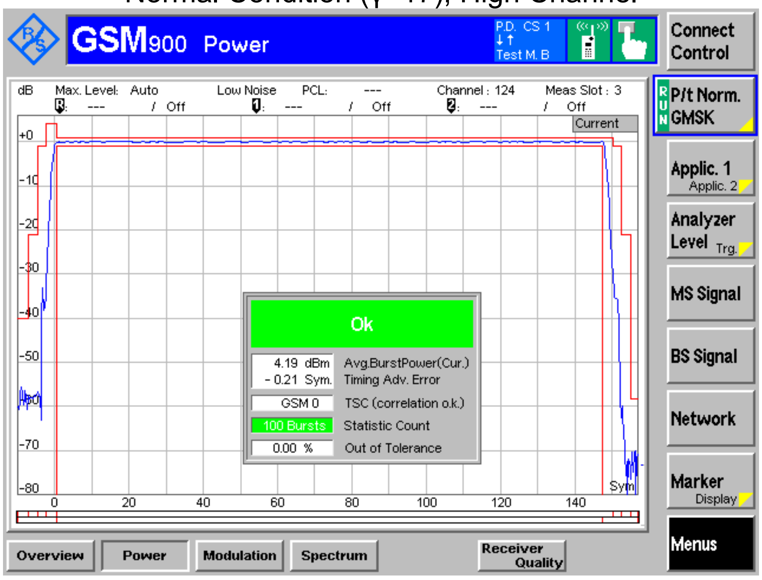
Normal Condition:

GSM900:

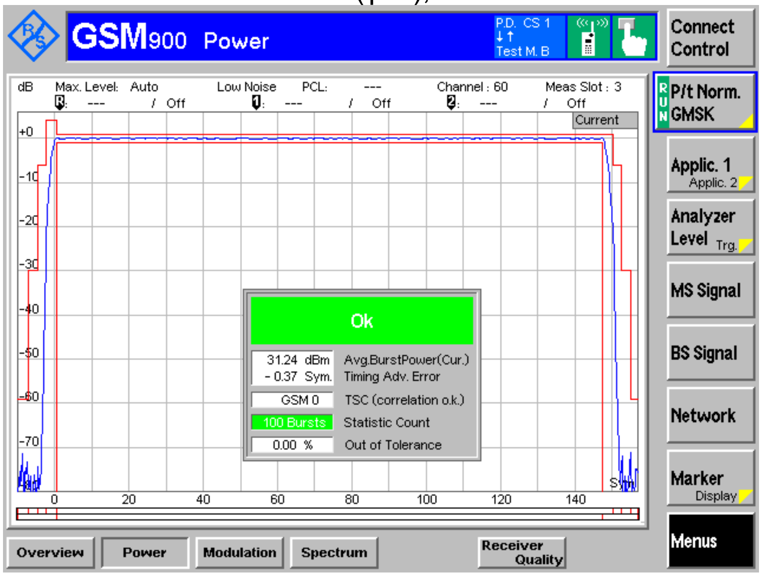
Normal Condition (γ=3), High Channel



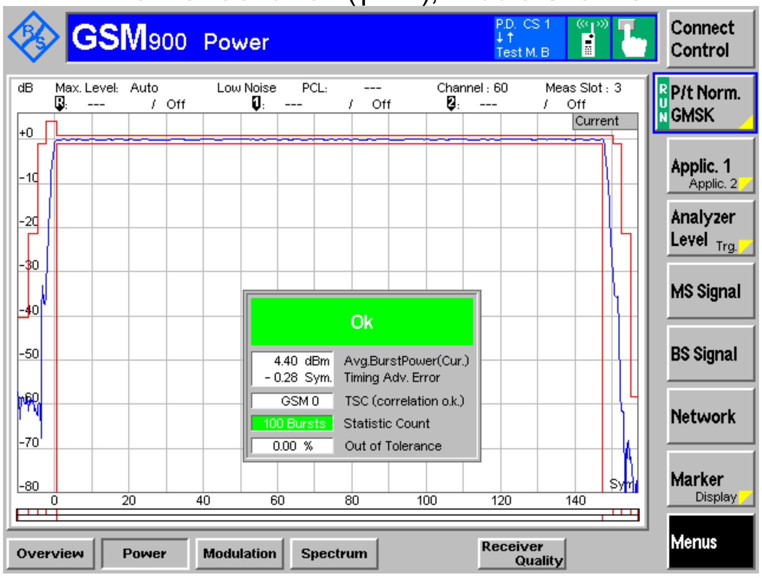
Normal Condition (γ=17), High Channel



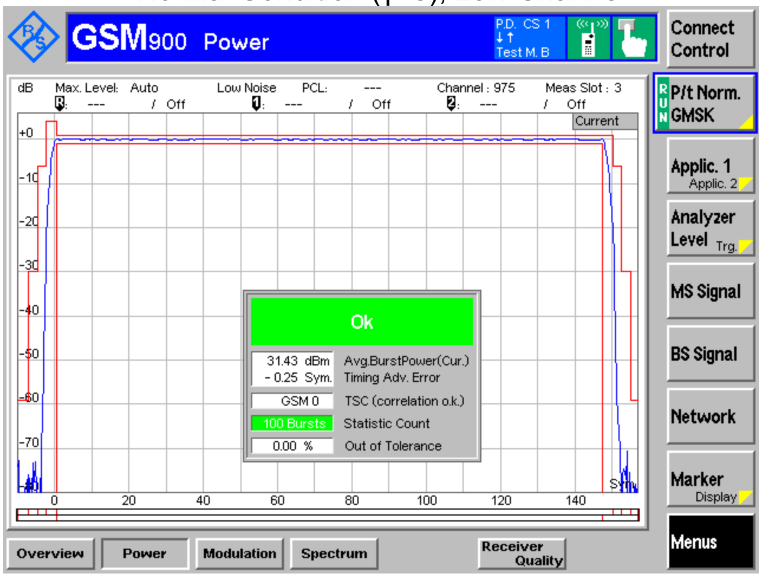
Normal Condition (γ=3), Middle Channel



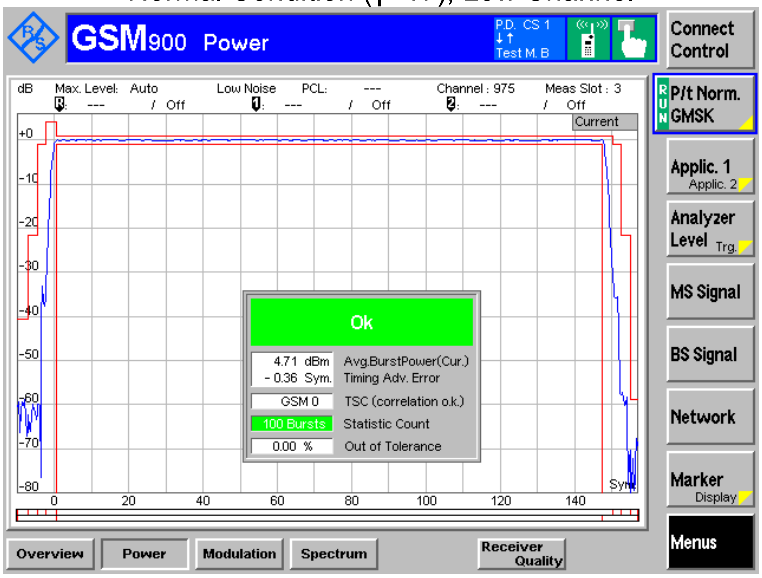
Normal Condition (γ=17), Middle Channel



Normal Condition (γ=3), Low Channel



Normal Condition (γ=17), Low Channel



DCS1800 Output Power in GPRS

High Channel (1784.8MHz) Output Power

High Channel F = 1784.8 MHz						
γ =	OUTPUT POWER (dBm)					Result
	Normal	L.T. L.V.	H.T. L.V.	L.T. H.V.	H.T. H.V.	
3	30.04	30.01	29.98	30.02	30.00	Pass
4	28.27	28.24	28.28	28.23	28.24	
5	26.58	26.57	26.51	26.56	26.57	
6	24.79	24.73	24.77	24.72	24.73	
7	22.67	22.67	22.61	22.66	22.67	
8	20.47	20.41	20.45	20.49	20.48	
9	18.95	18.93	18.97	18.92	18.93	
10	16.18	16.13	16.17	16.12	16.13	
11	14.03	14.04	14.08	14.03	14.04	
12	13.35	13.34	13.38	13.33	13.34	
13	11.73	11.74	11.78	11.73	11.74	
14	10.85	10.82	10.86	10.81	10.82	
15	8.15	8.14	8.18	8.13	8.14	
16	5.63	5.64	5.63	5.60	5.63	
17	2.04	2.01	2.09	2.00	2.01	
18	1.53	1.58	1.59	1.55	1.54	

Middle Channel (1747.8MHz) Output Power

Middle Channel F = 1747.8 MHz						
γ =	OUTPUT POWER (dBm)					Result
	Normal	L.T. L.V.	H.T. L.V.	L.T. H.V.	H.T. H.V.	
3	29.83	29.26	29.34	29.32	29.32	Pass
4	27.04	27.05	27.09	27.06	27.05	
5	25.15	25.11	25.15	25.10	25.11	
6	23.52	23.50	23.54	23.59	23.50	
7	21.78	21.71	21.75	21.70	21.71	
8	19.18	19.16	19.10	19.15	19.16	
9	18.27	18.26	18.20	18.25	18.26	
10	16.08	16.03	16.07	16.02	16.03	
11	14.35	14.32	14.36	14.31	14.32	
12	12.56	12.53	12.57	12.52	12.53	
13	10.77	10.70	10.74	10.79	10.72	
14	8.15	8.13	8.17	8.12	8.13	
15	6.29	6.26	6.20	6.25	6.26	
16	4.01	4.02	4.04	4.07	4.08	
17	2.11	2.17	2.11	2.16	2.17	
18	1.30	1.32	1.34	1.36	1.37	

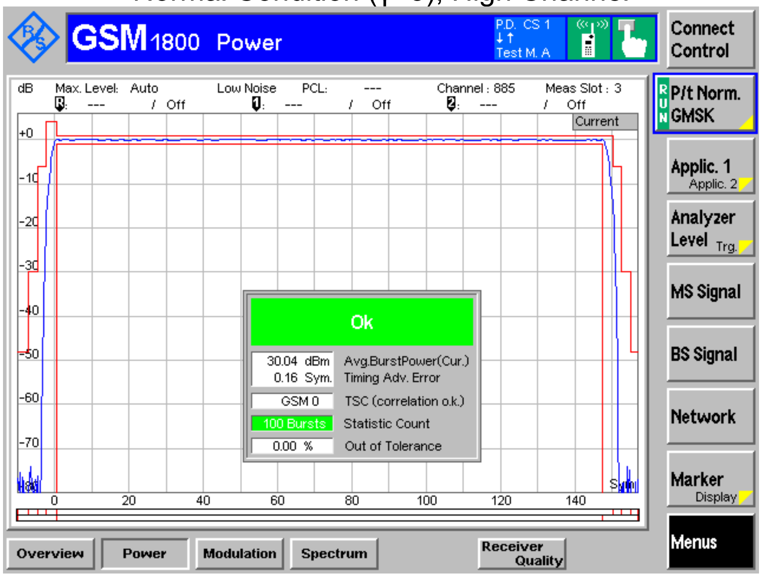
Low Channel (1710.2MHz) Output Power

Low Channel F = 1710.2 MHz						
γ =	OUTPUT POWER (dBm)					Result
	Normal	L.T. L.V.	H.T. L.V.	L.T. H.V.	H.T. H.V.	
3	29.68	29.74	29.78	29.76	29.74	Pass
4	27.24	27.15	27.19	27.24	27.15	
5	25.35	25.35	25.29	25.34	25.35	
6	23.56	23.49	23.53	23.48	23.49	
7	21.69	21.69	21.63	21.68	21.69	
8	19.89	19.85	19.86	19.87	19.82	
9	18.78	18.76	18.75	18.75	18.76	
10	17.22	17.17	17.14	17.17	17.17	
11	15.45	15.44	15.41	15.41	15.42	
12	14.39	14.30	14.34	14.37	14.33	
13	12.75	12.68	12.72	12.67	12.68	
14	10.63	10.63	10.57	10.62	10.63	
15	8.25	8.22	8.16	8.21	8.22	
16	6.33	6.24	6.28	6.33	6.24	
17	3.27	3.22	3.26	3.21	3.22	
18	1.23	1.22	1.21	1.23	1.24	

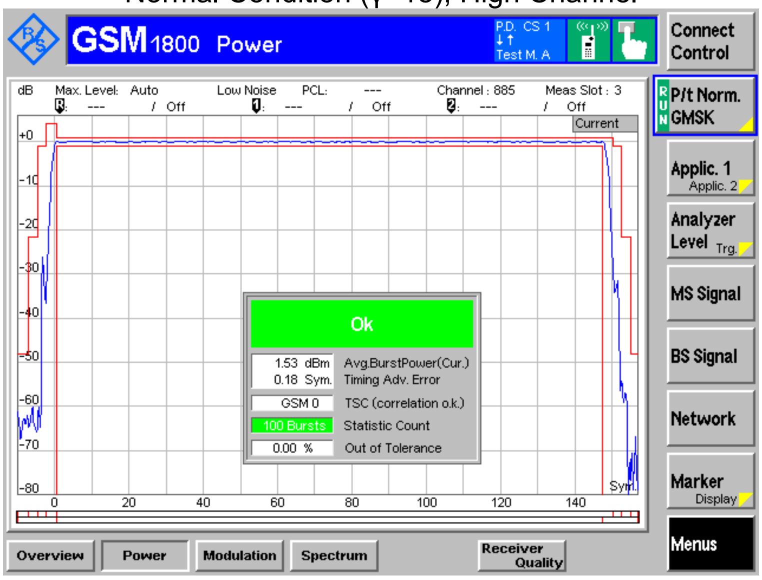
Normal Condition:

DCS1800:

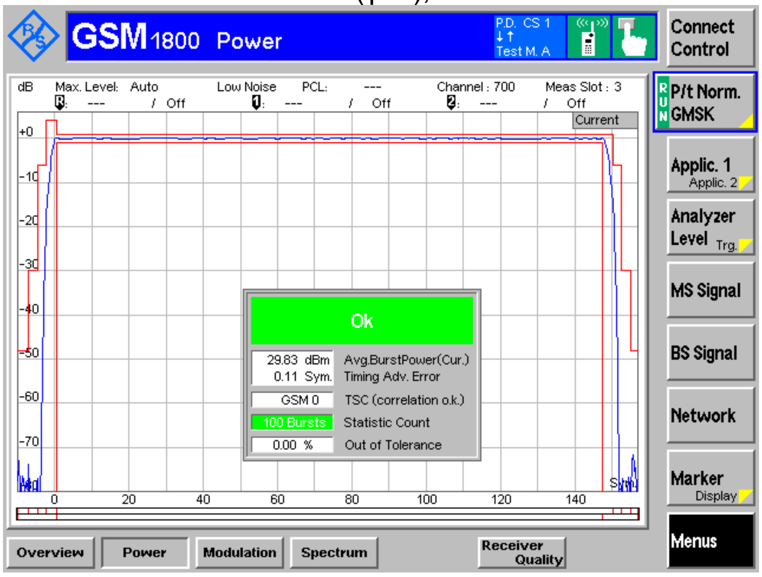
Normal Condition (γ=3), High Channel



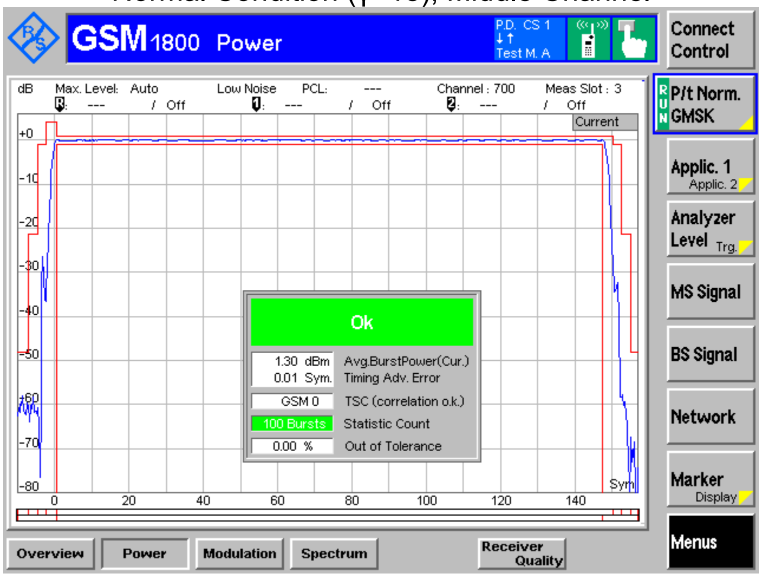
Normal Condition (γ=18), High Channel



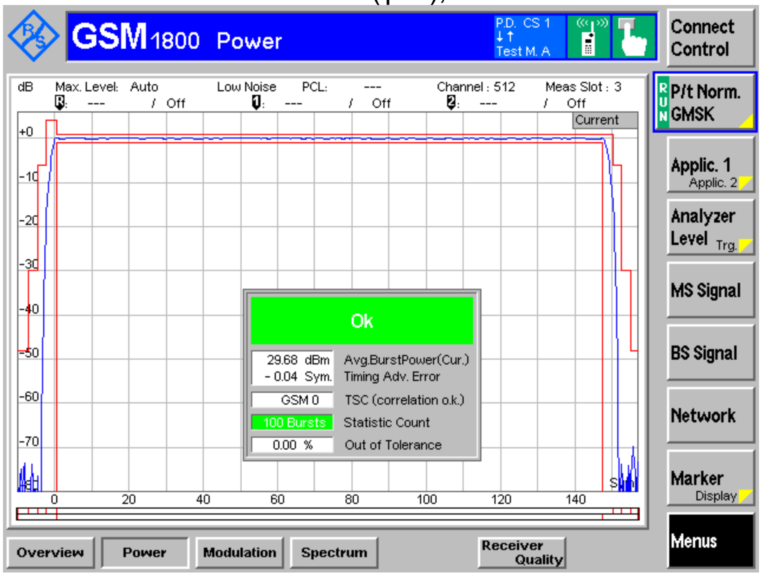
Normal Condition (γ=3), Middle Channel



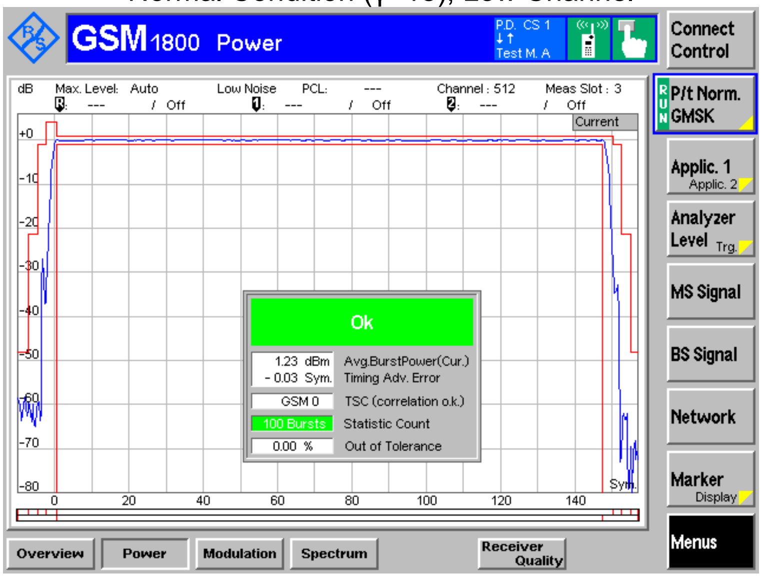
Normal Condition (γ=18), Middle Channel



Normal Condition (γ=3), Low Channel



Normal Condition (γ=18), Low Channel



14 Output RF spectrum in GPRS multislot configuration

14.1 Standard Applicable

According to EN 301 511 V9.0.2 (2003-03), section 4.2.11,

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:
   - 36 dBm below 600 kHz offset from the carrier;
   - -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;
   - -46 dBm for GSM 400, GSM 700, GSM 850 and GSM 900 or -51 dBm for DCS 1 800 and PCS 1 900 at and beyond 1 800 kHz offset from the carrier; but with the following exceptions at up to -36 dBm:
   - up to three bands of 200 kHz width centred on a frequency which is an integer multiple of 200kHz in the combined range 600 kHz to 6 000 kHz above and below the carrier;
   - 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.

   1.1 Under normal conditions; 3GPP TS 05.05, subclause 4.2.1.

   1.2 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 880MHz 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.

Table 13.16.3-5: Spurious emissions in the MS receive bands

Band (MHz)	Spurious emissions level (dBm)	
	GSM 400, GSM 900 and DCS 1 800	GSM 700 GSM 850 PCS 1 900
925 to 935	-67	
935 to 960	-79	
1805 to 1880	-71	
728 to 736		-79
736 to 746		-73
747 to 757		-79
757 to763		-73
869 to 894		-79
1930 to 1990		-71

14.2 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.

14.3 Test Data

Environmental Conditions

Temperature:	18 °C ~ 22 °C
Relative Humidity:	45 % ~ 66 %
ATM Pressure:	100.1 kPa ~ 100.7 kPa

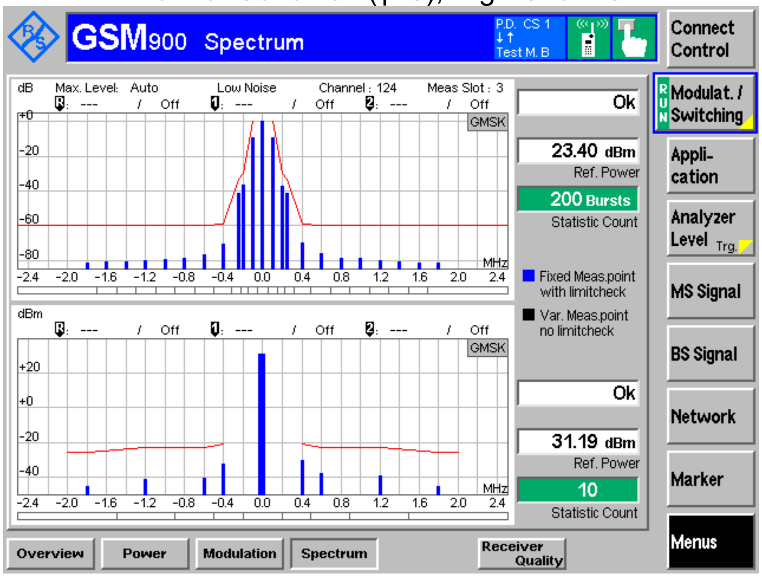
Test Results: Pass.

Please see the following plots:

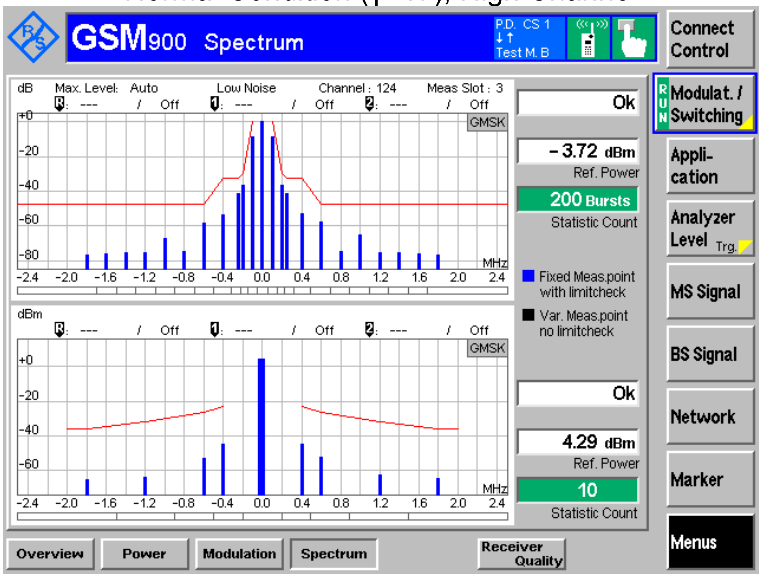
Normal Condition:

GSM900:

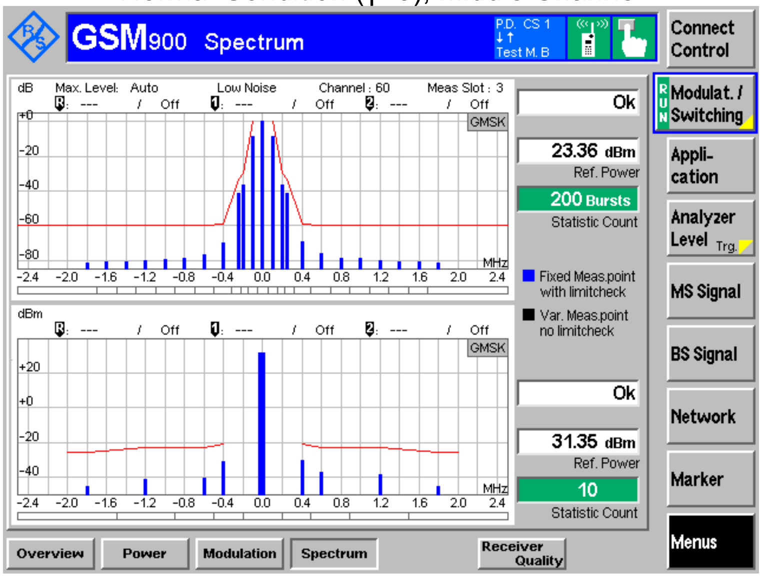
Normal Condition (γ=3), High Channel



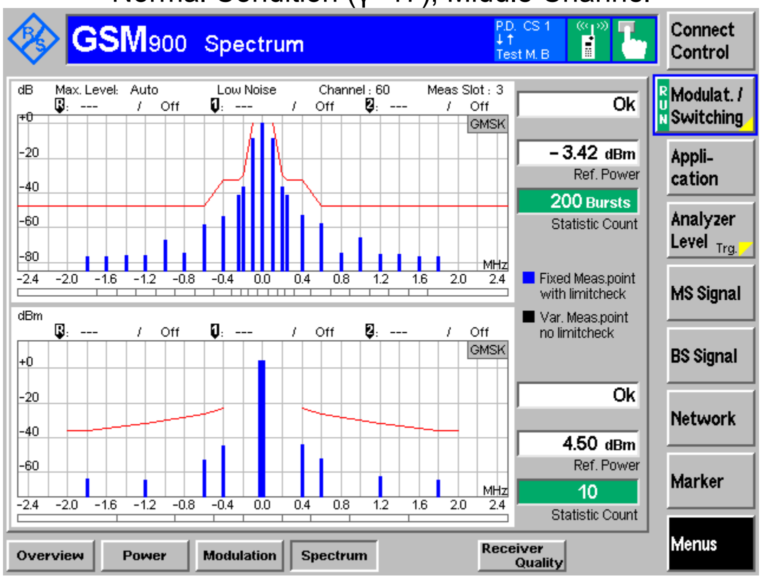
Normal Condition (γ=17), High Channel



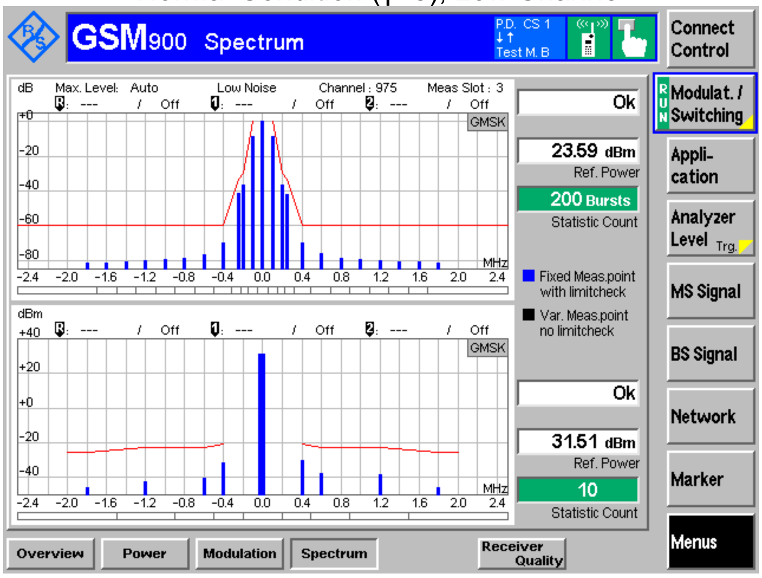
Normal Condition (γ=3), Middle Channel



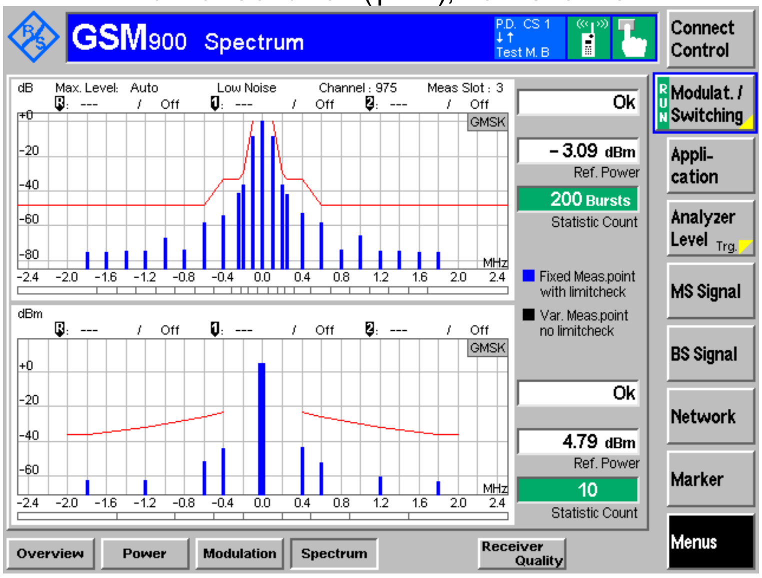
Normal Condition (γ=17), Middle Channel



Normal Condition (γ=3), Low Channel



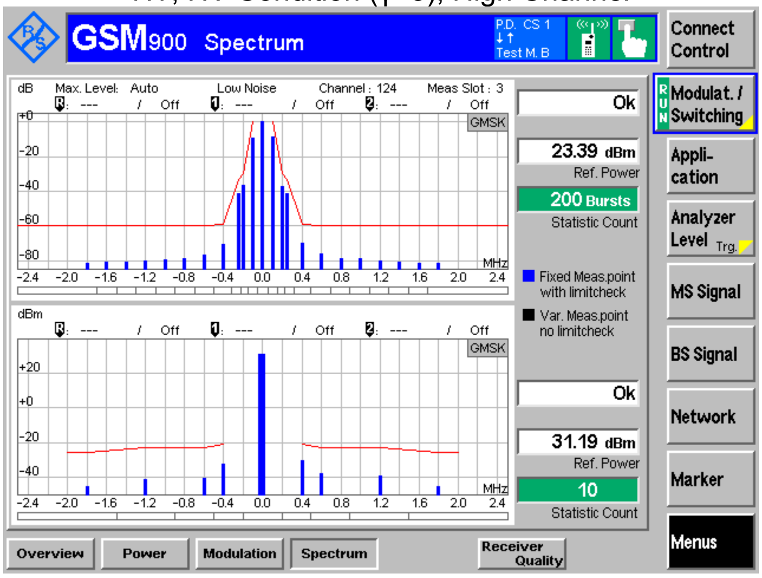
Normal Condition (γ=17), Low Channel



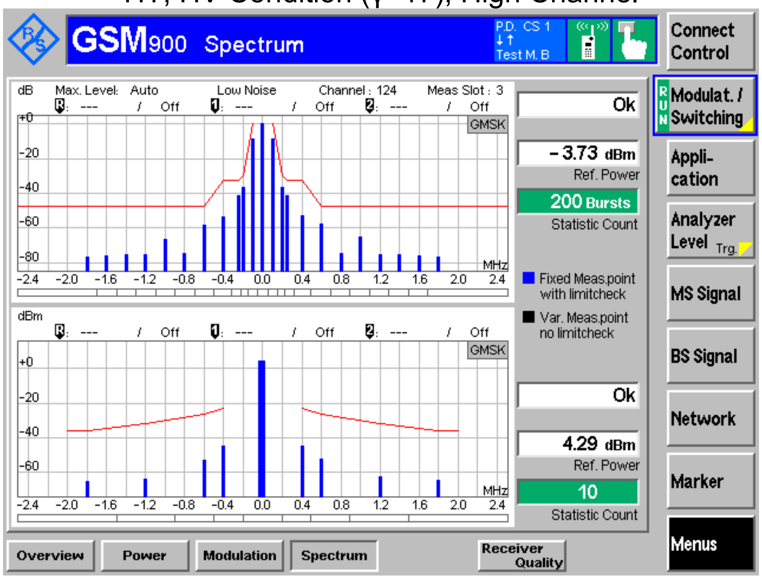
Extreme Condition:

GSM900:

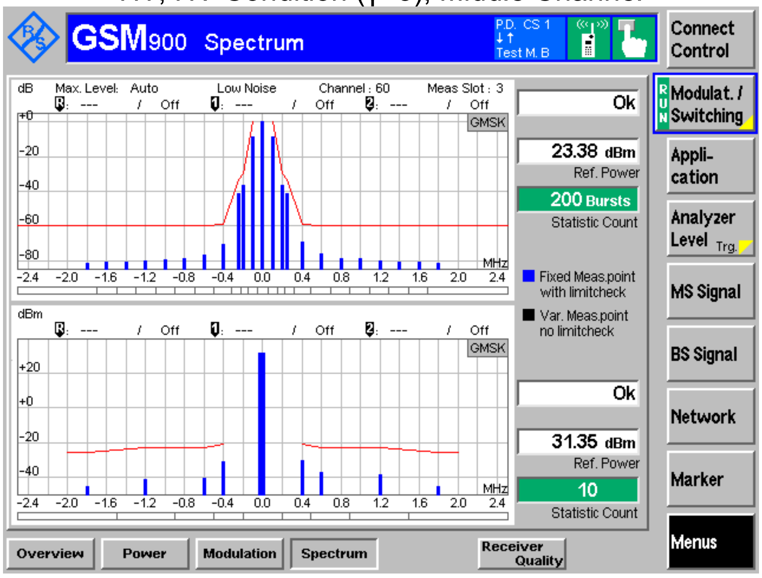
HT, HV Condition (γ=3), High Channel



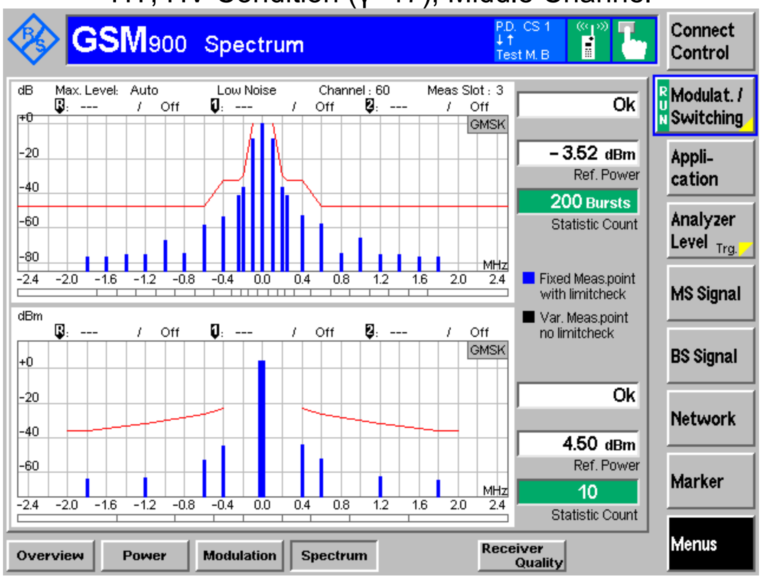
HT, HV Condition (γ=17), High Channel



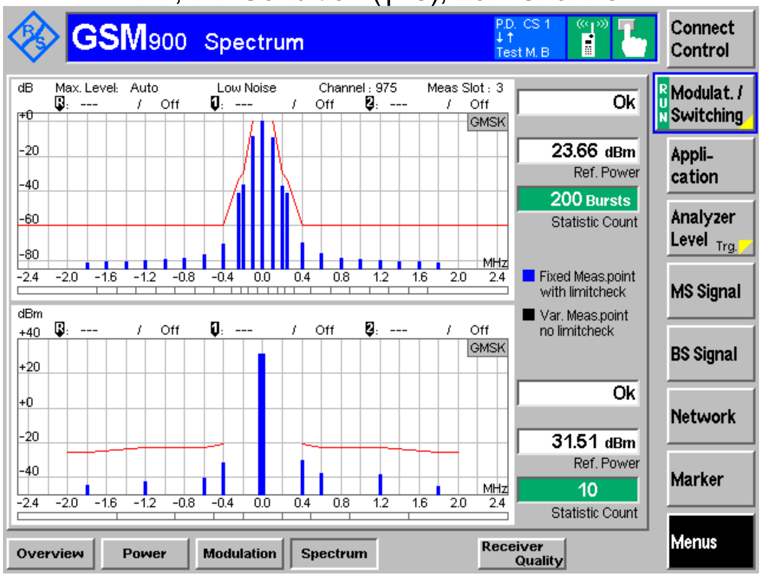
HT, HV Condition (γ=3), Middle Channel



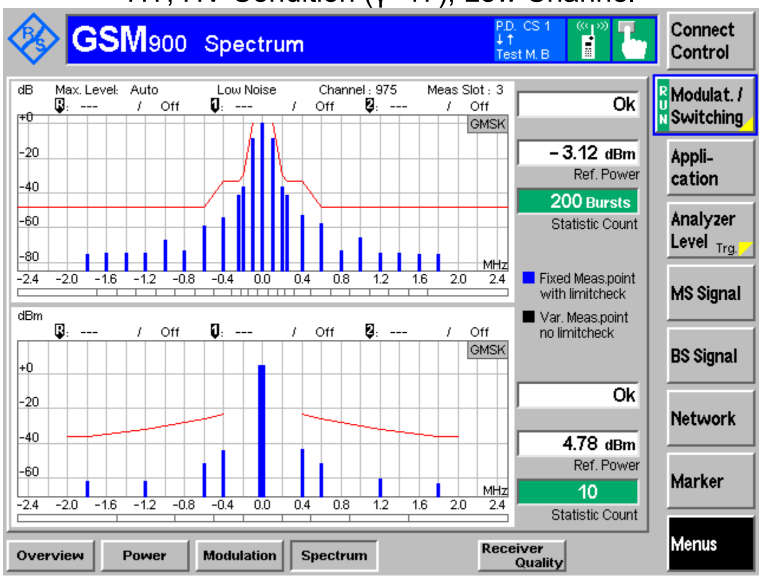
HT, HV Condition (γ=17), Middle Channel



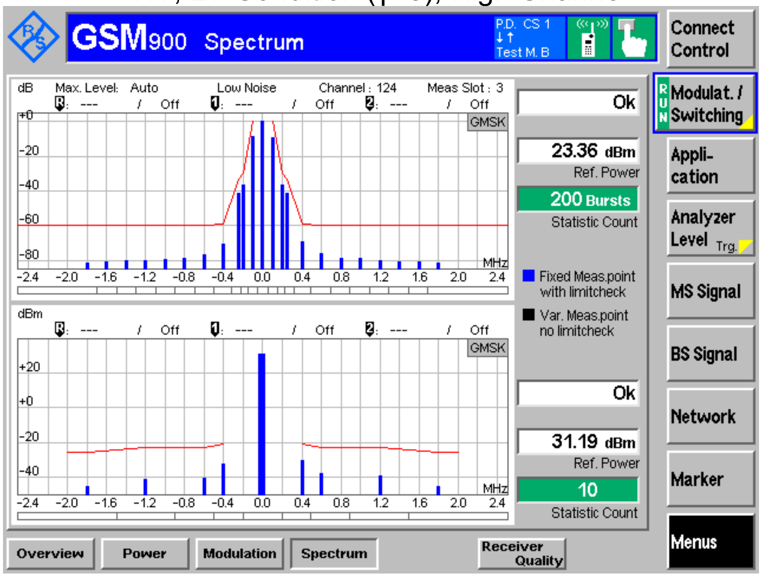
HT, HV Condition (γ=3), Low Channel



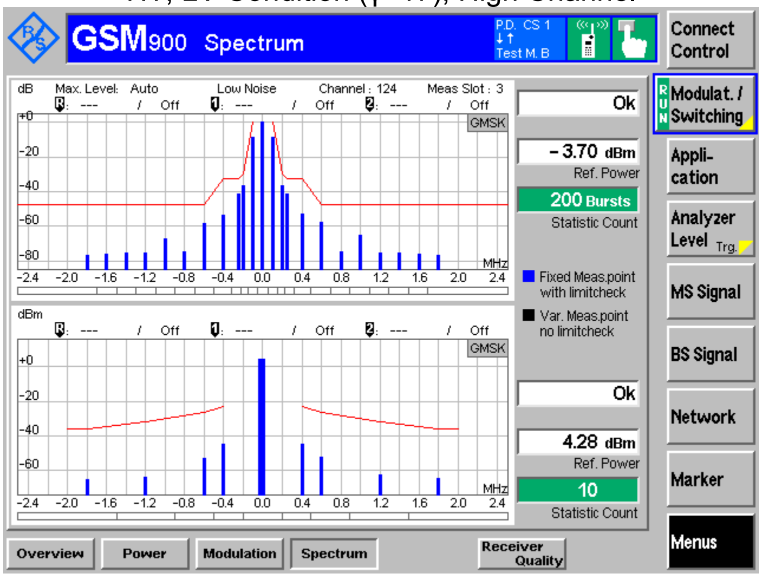
HT, HV Condition (γ=17), Low Channel



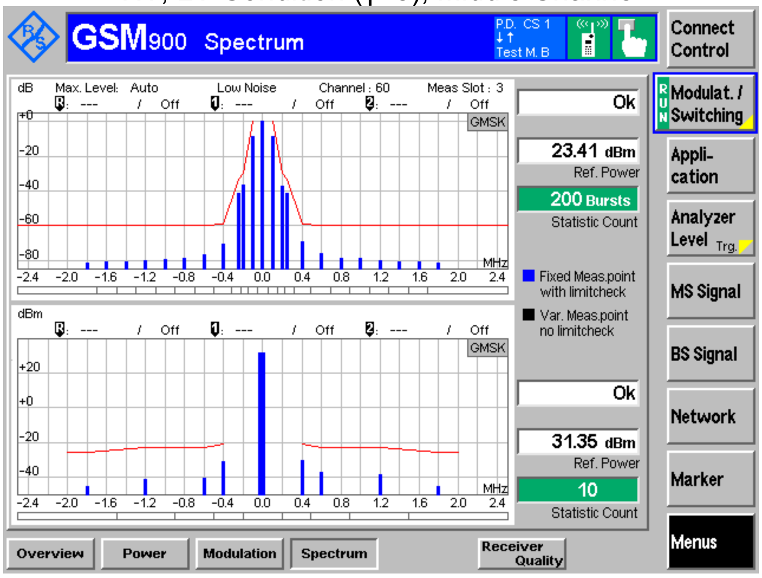
HT, LV Condition (γ=3), High Channel



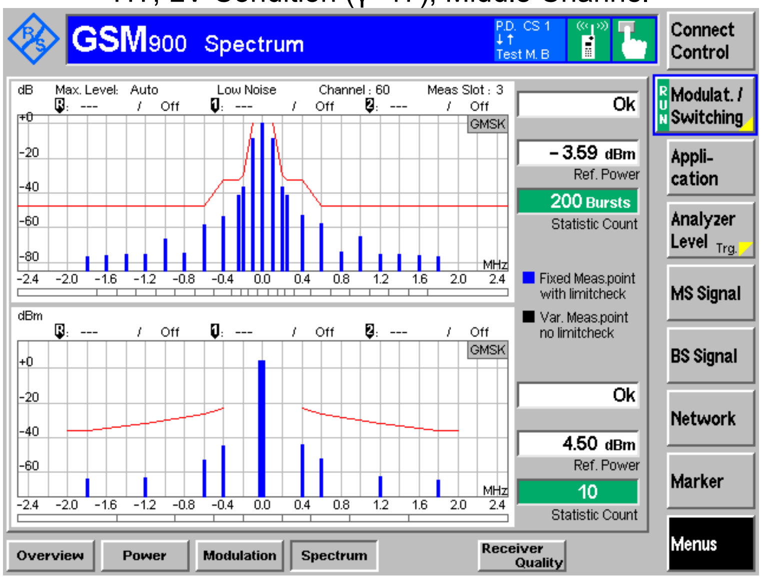
HT, LV Condition (γ=17), High Channel



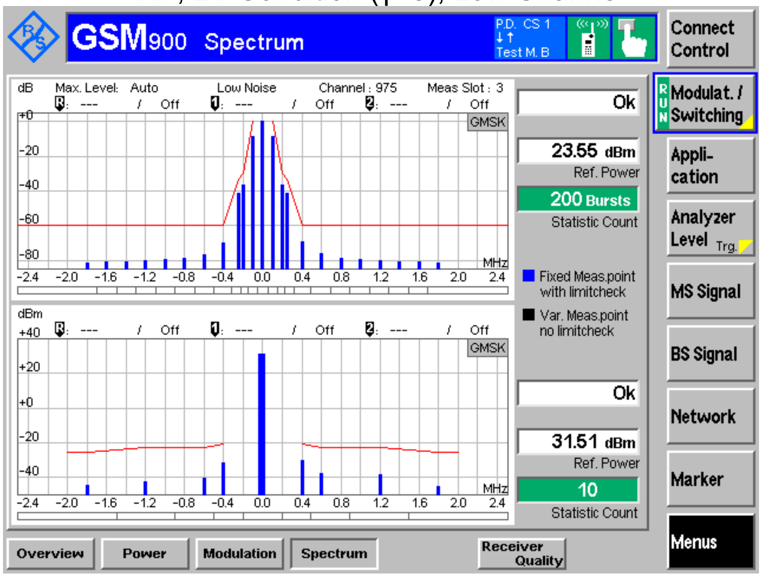
HT, LV Condition (γ=3), Middle Channel



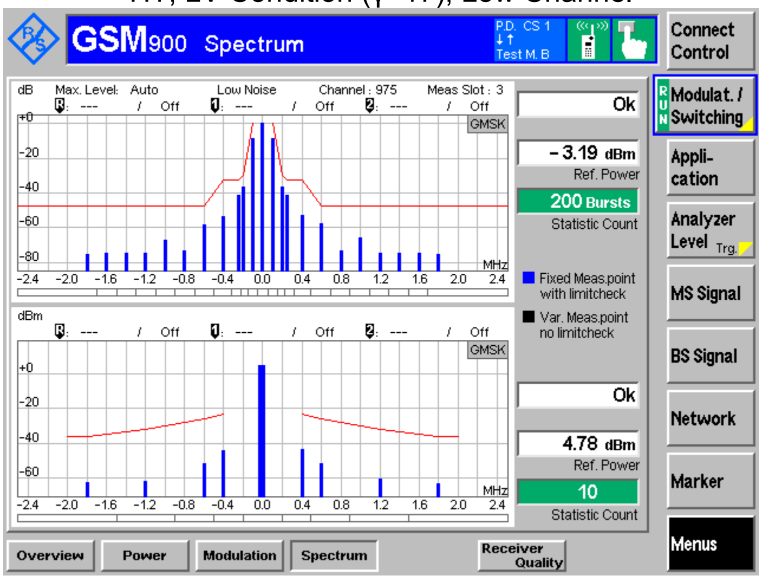
HT, LV Condition (γ=17), Middle Channel



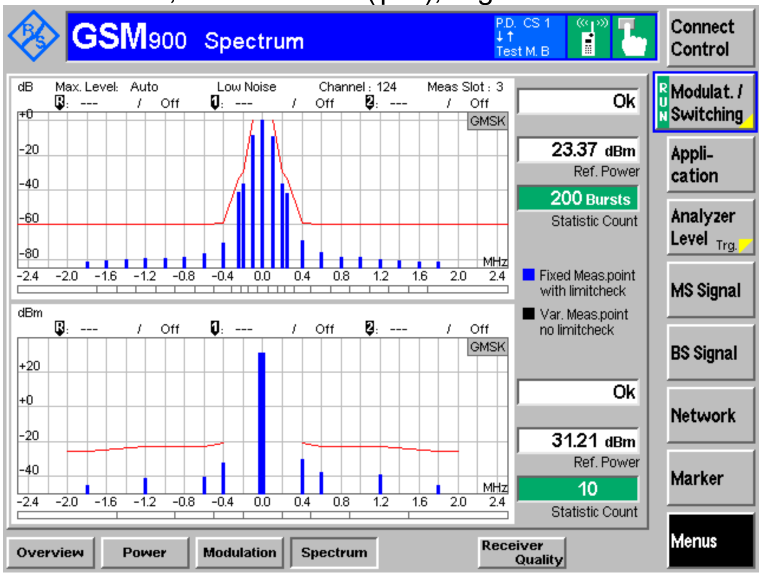
HT, LV Condition (γ=3), Low Channel



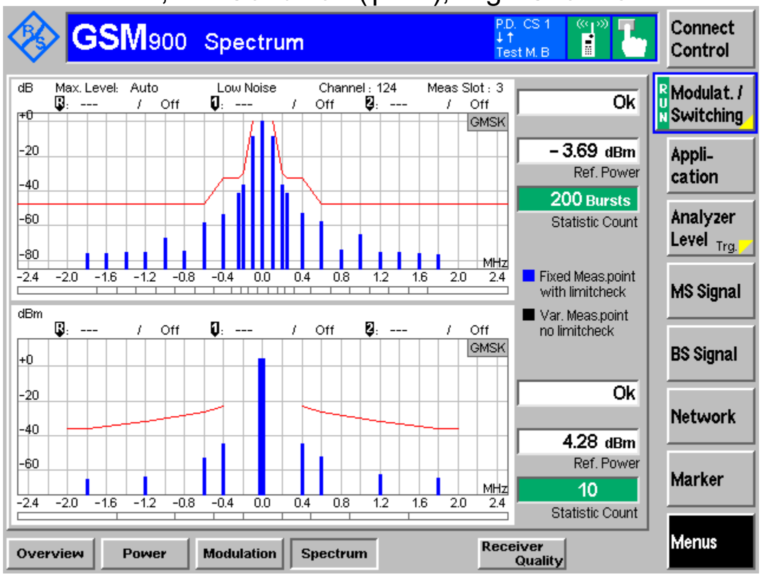
HT, LV Condition (γ=17), Low Channel



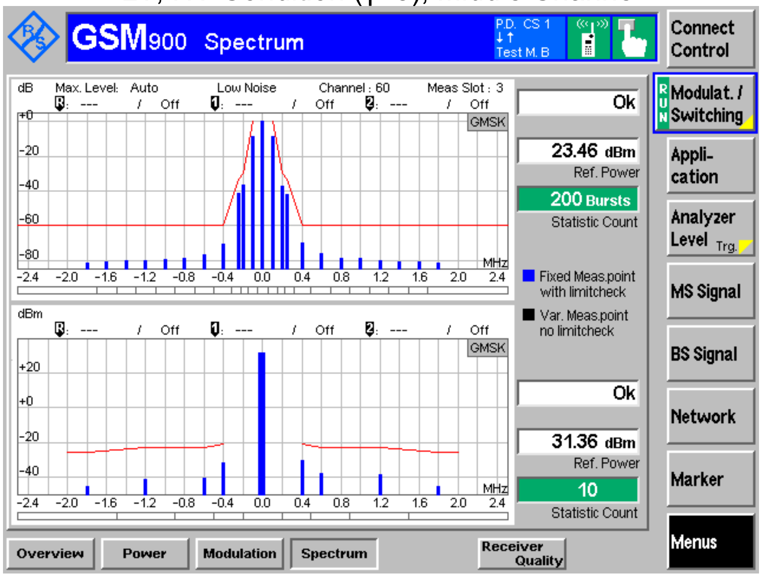
LT, HV Condition (γ=3), High Channel



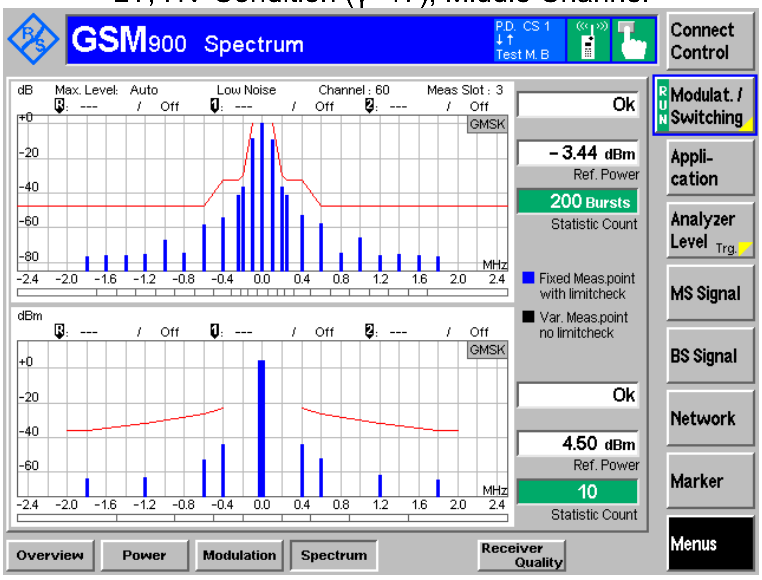
LT, HV Condition (γ=17), High Channel



LT, HV Condition (γ=3), Middle Channel

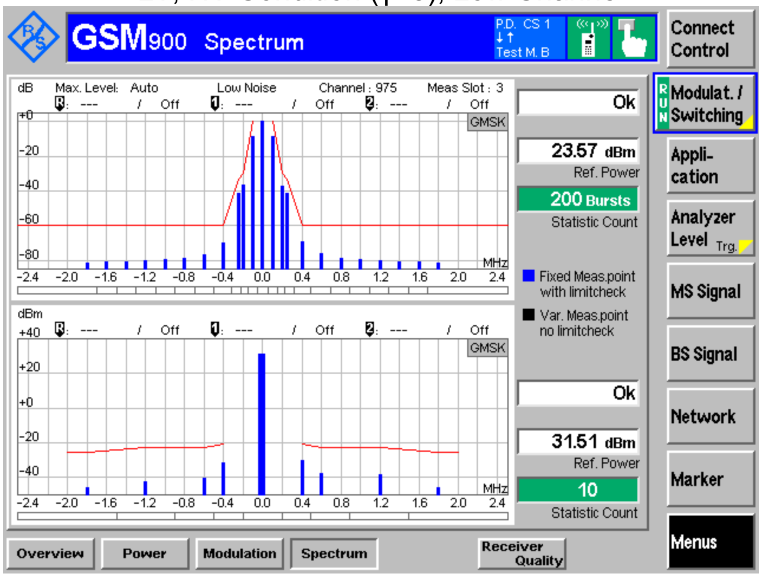


LT, HV Condition (γ=17), Middle Channel

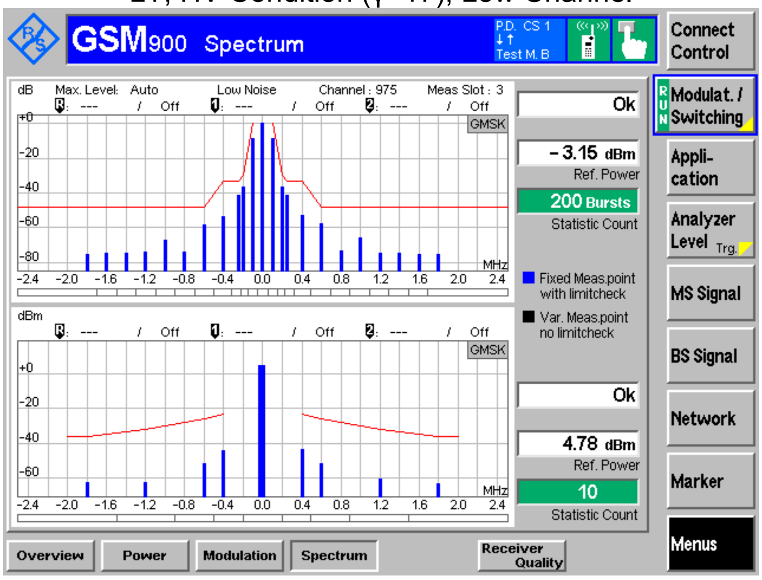


CCIS

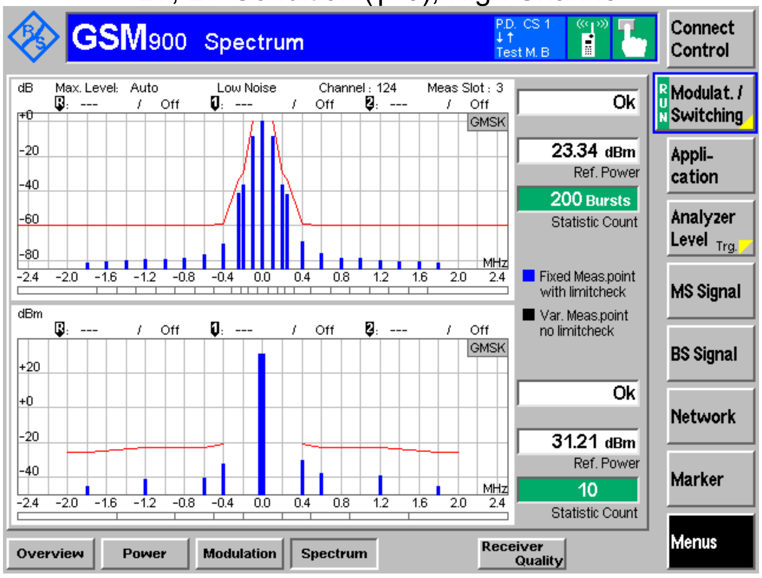
LT, HV Condition (γ=3), Low Channel



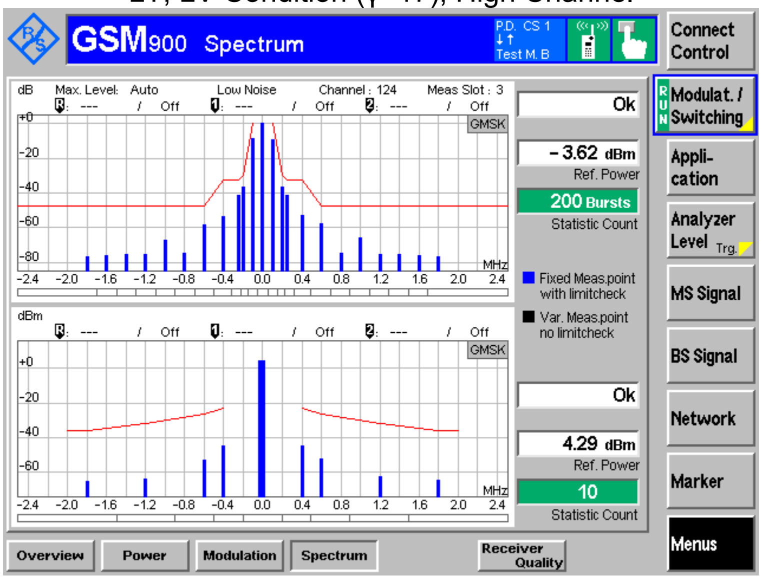
LT, HV Condition (γ=17), Low Channel



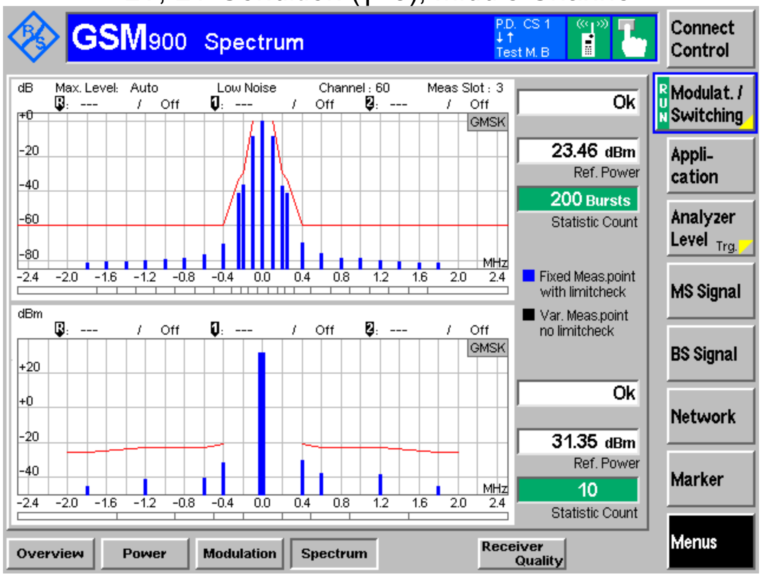
LT, LV Condition (γ=3), High Channel



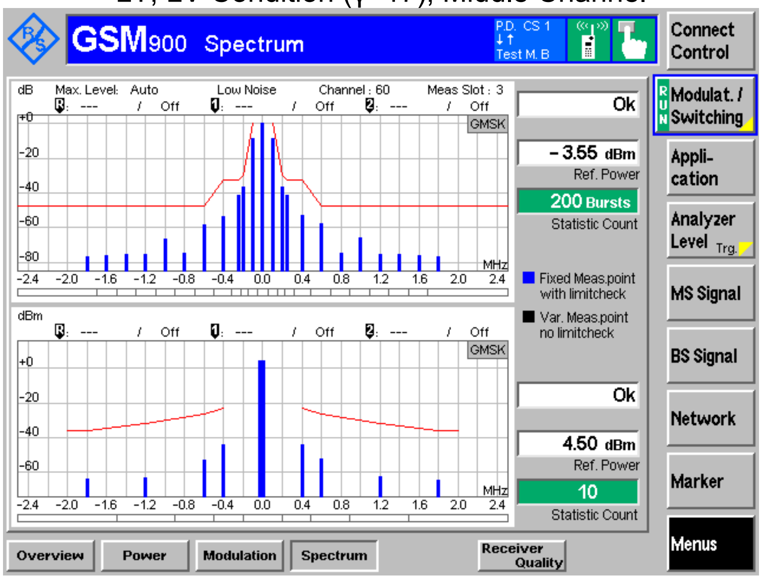
LT, LV Condition (γ=17), High Channel



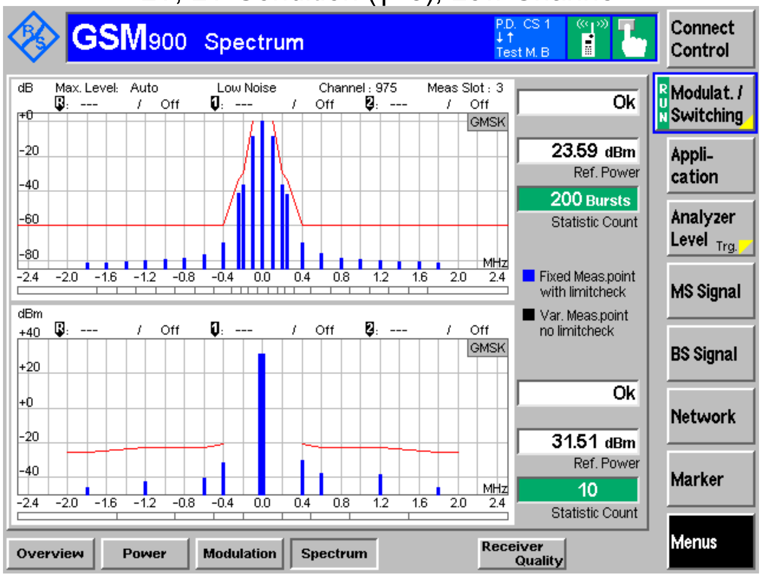
LT, LV Condition (γ=3), Middle Channel



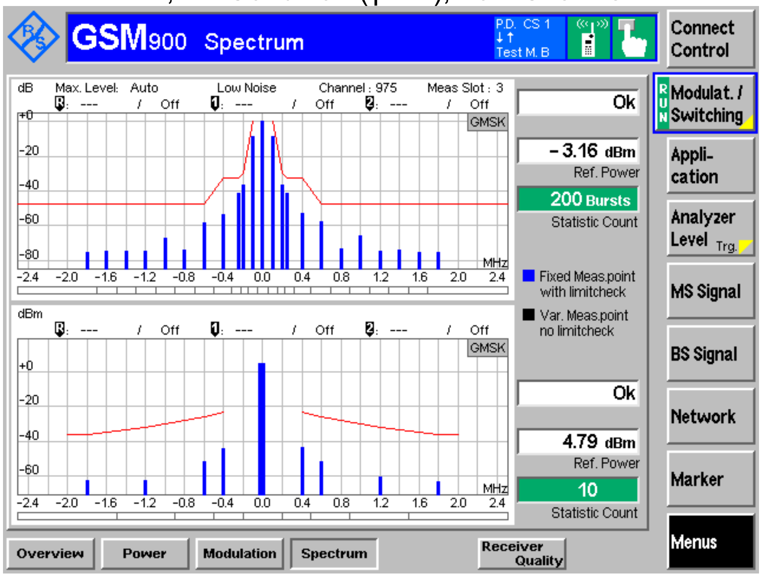
LT, LV Condition (γ=17), Middle Channel



LT, LV Condition (γ=3), Low Channel



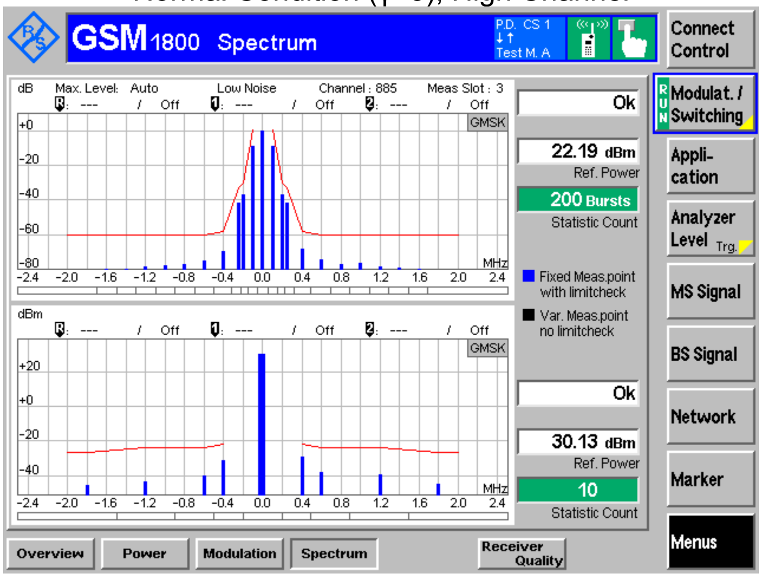
LT, LV Condition (γ=17), Low Channel



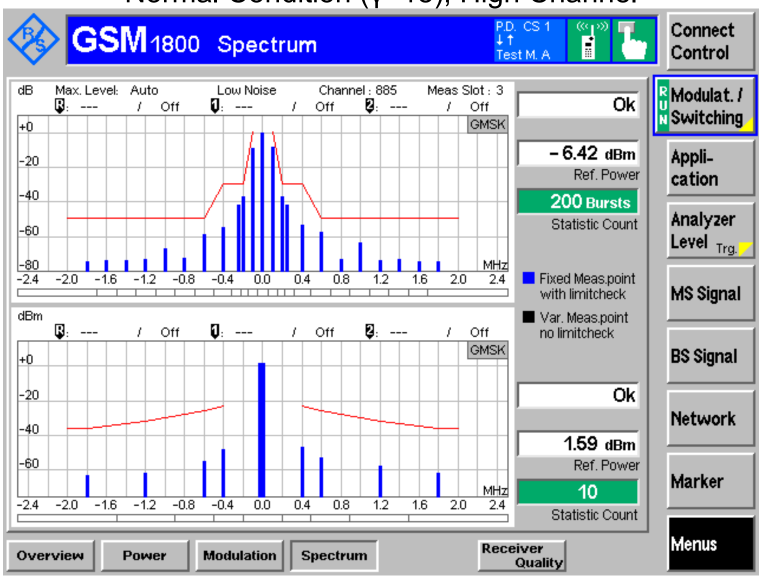
Normal Condition:

DCS1800:

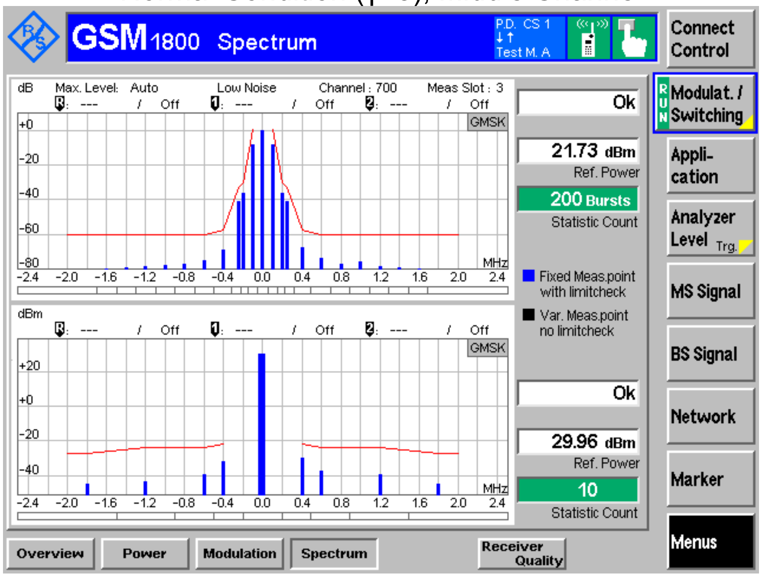
Normal Condition (γ=3), High Channel



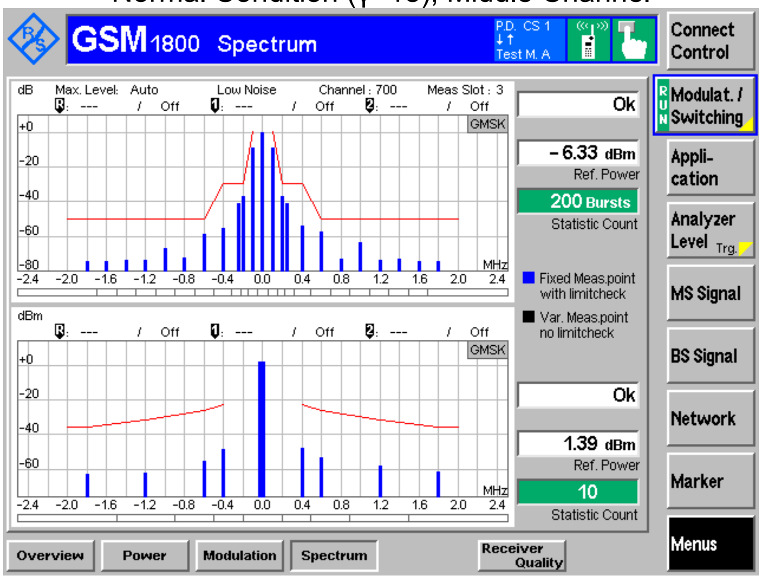
Normal Condition (γ=18), High Channel



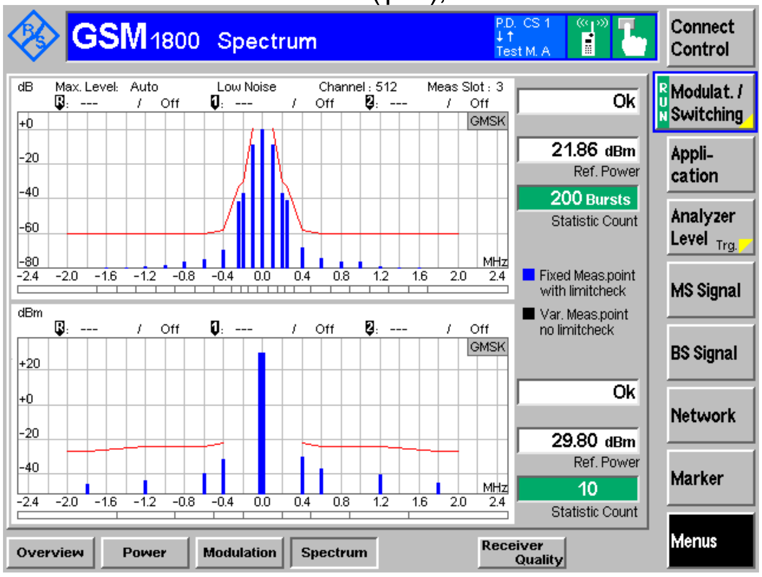
Normal Condition (γ=3), Middle Channel



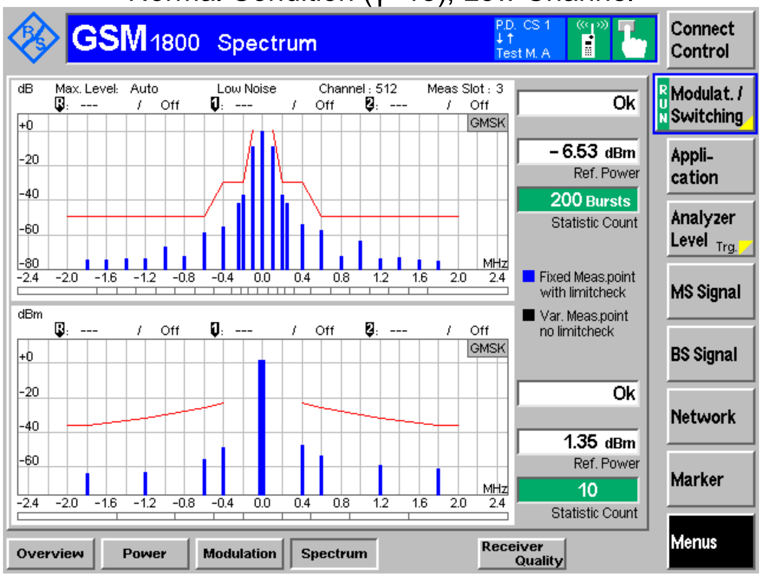
Normal Condition (γ=18), Middle Channel



Normal Condition (γ=3), Low Channel



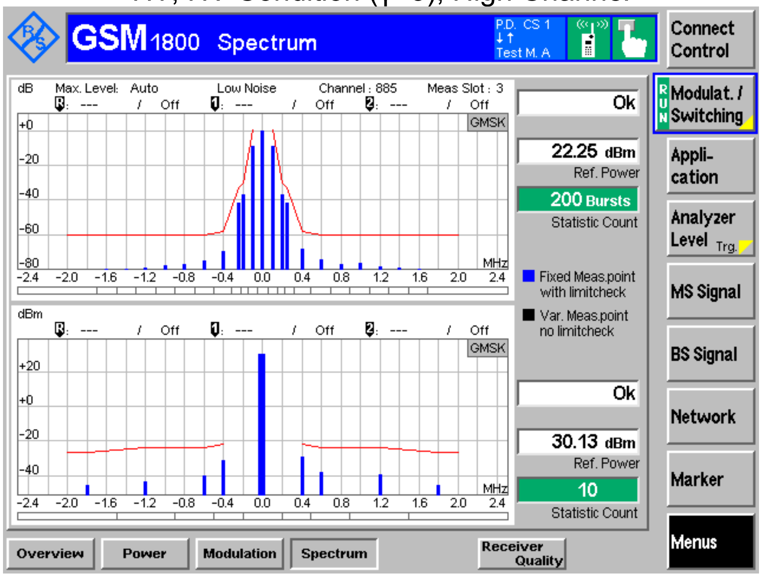
Normal Condition (γ=18), Low Channel



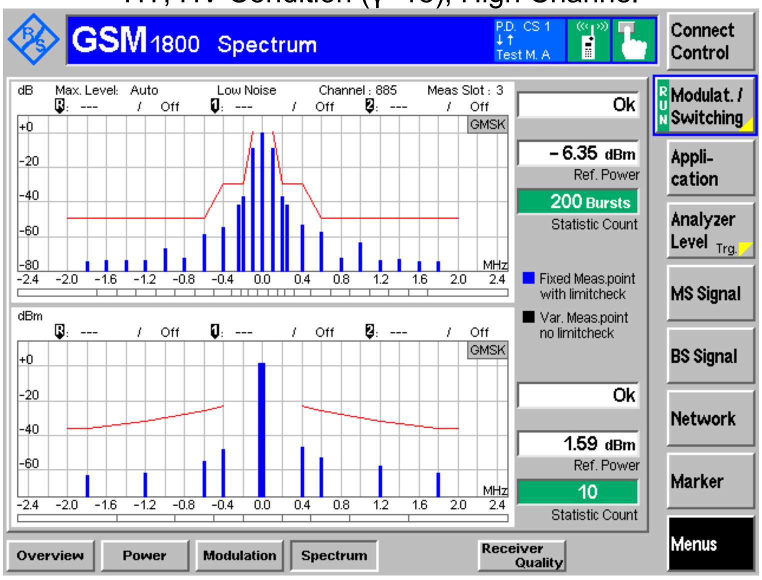
Extreme Condition:

DCS1800:

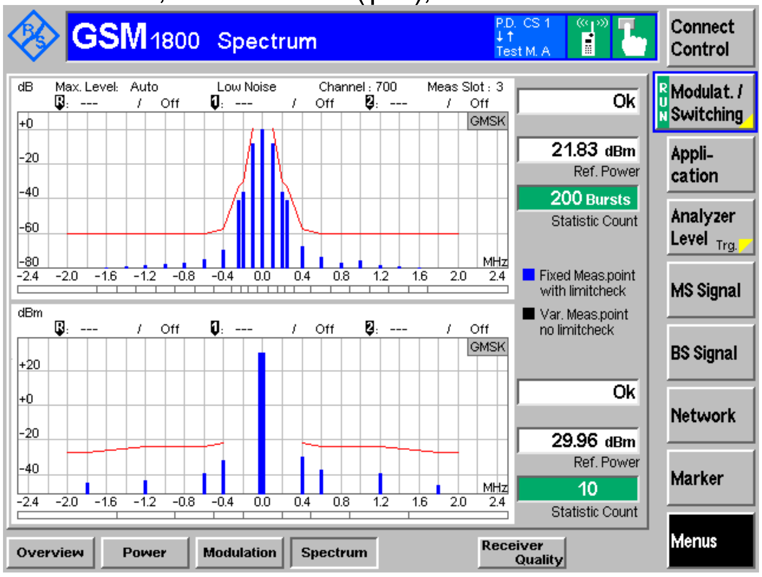
HT, HV Condition (γ=3), High Channel



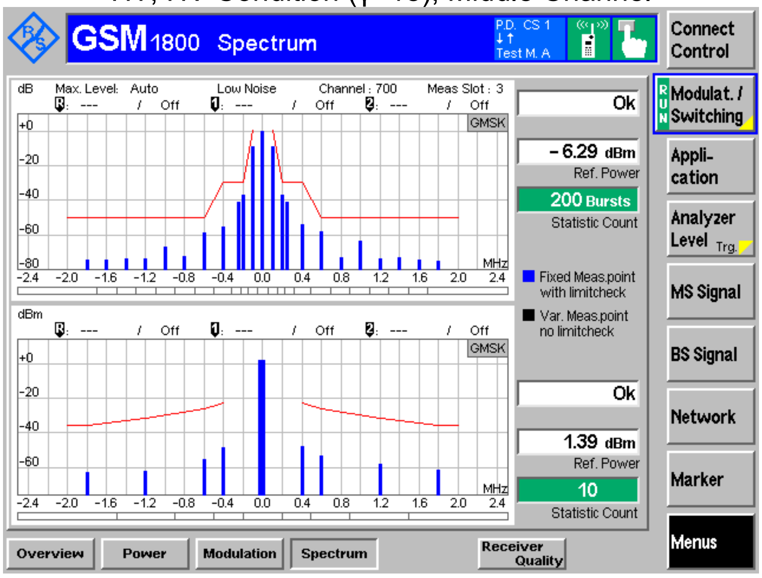
HT, HV Condition (γ=18), High Channel



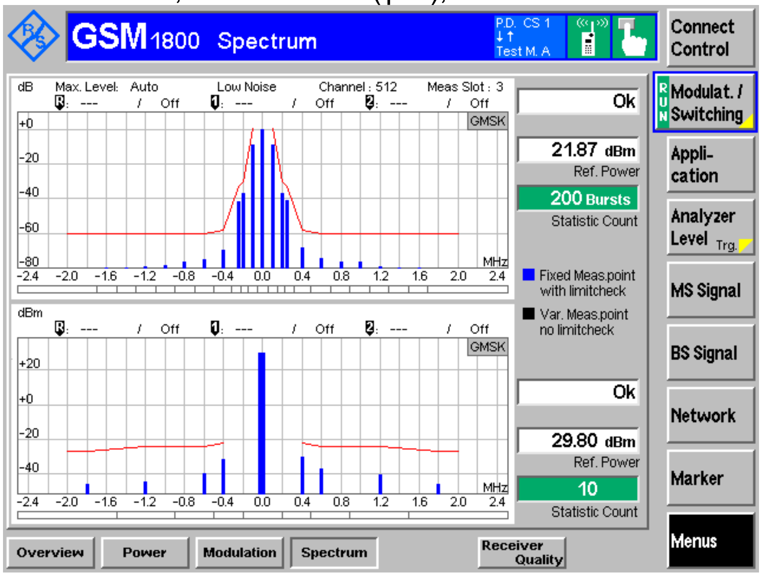
HT, HV Condition (γ=3), Middle Channel



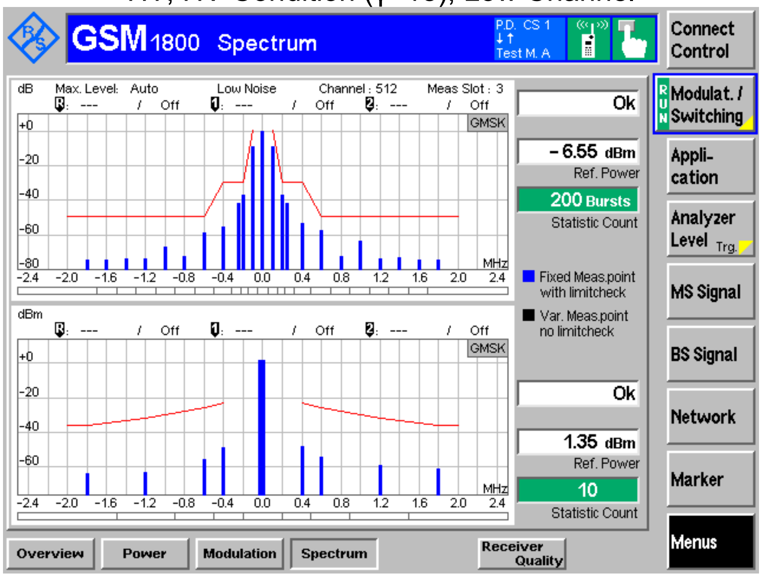
HT, HV Condition (γ=18), Middle Channel



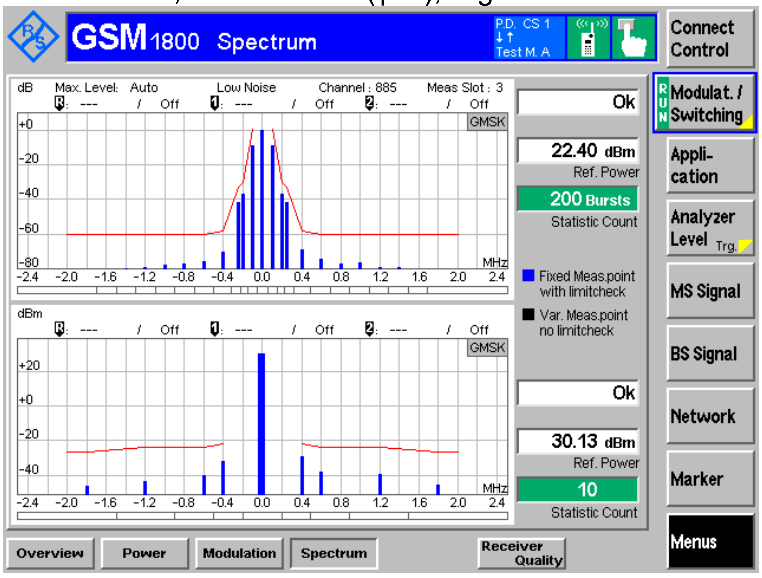
HT, HV Condition (γ=3), Low Channel



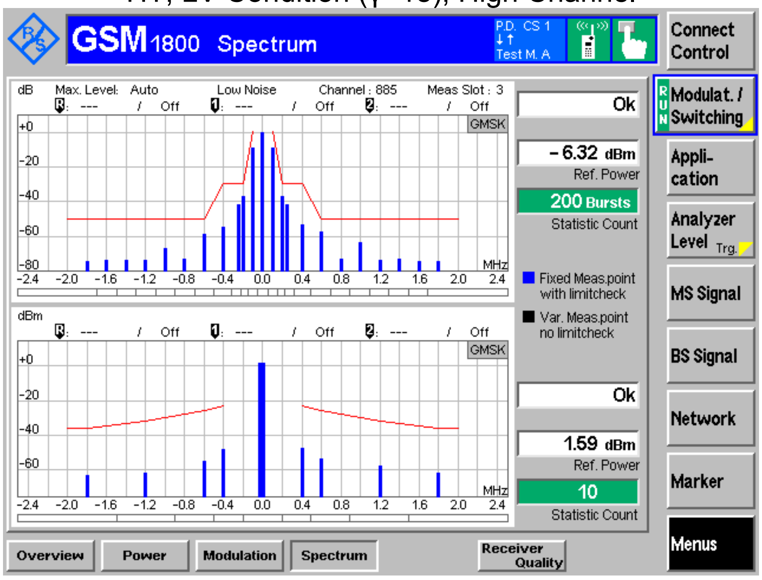
HT, HV Condition (γ=18), Low Channel



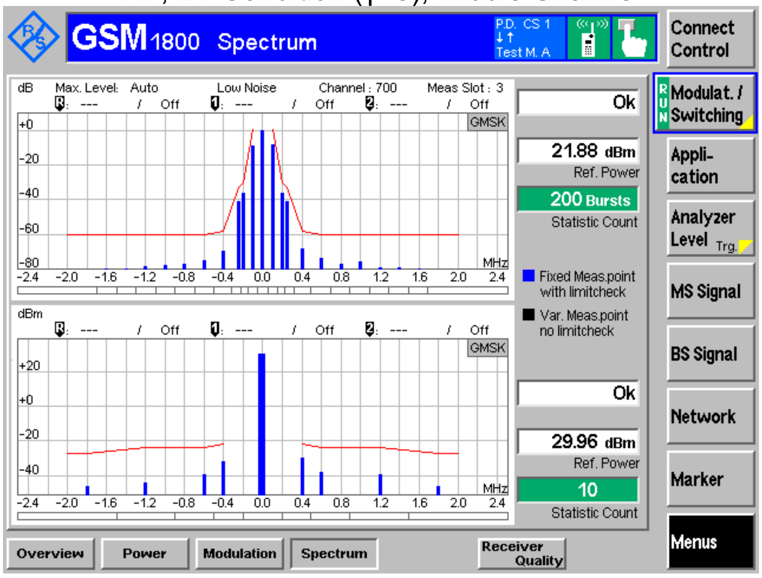
HT, LV Condition (γ=3), High Channel



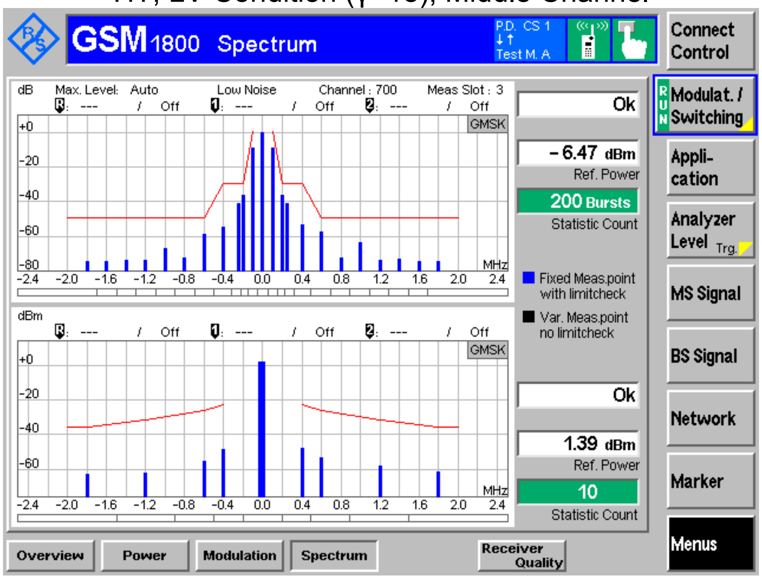
HT, LV Condition (γ=18), High Channel



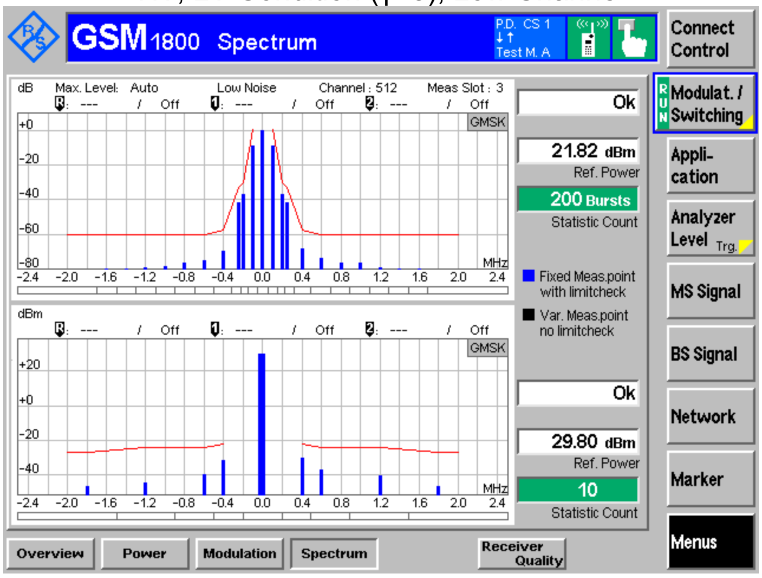
HT, LV Condition (γ=3), Middle Channel



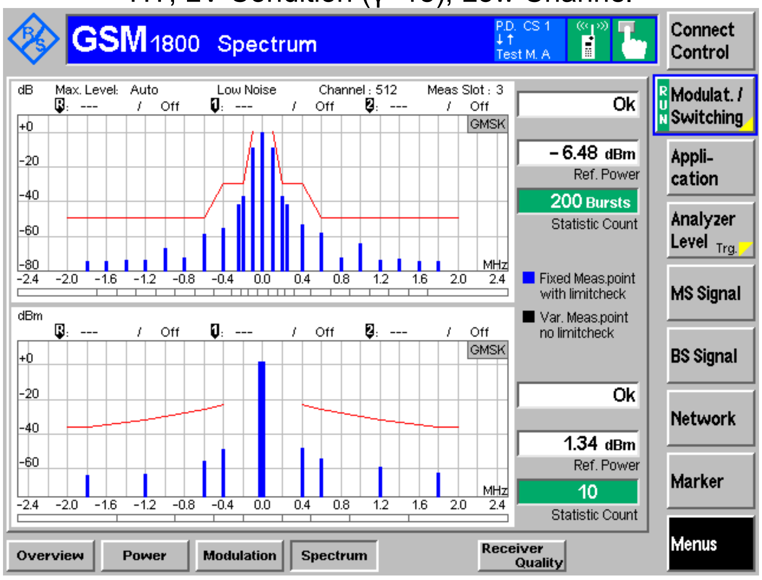
HT, LV Condition (γ=18), Middle Channel



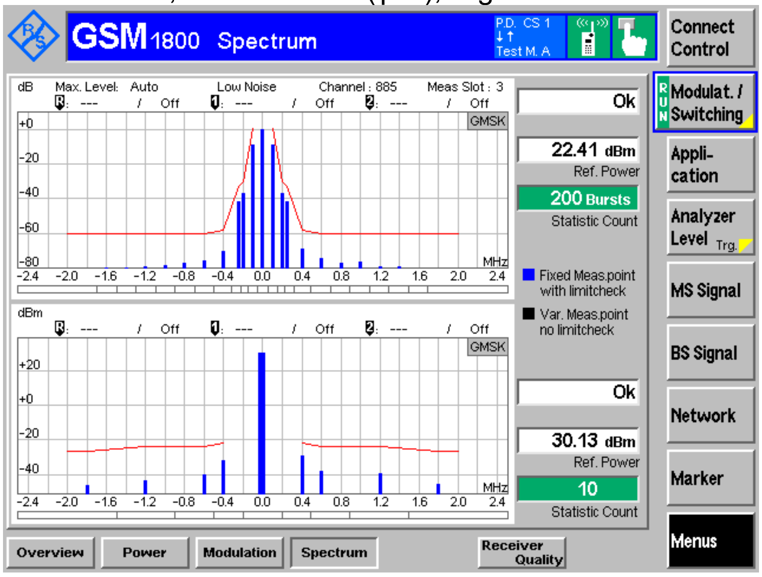
HT, LV Condition (γ=3), Low Channel



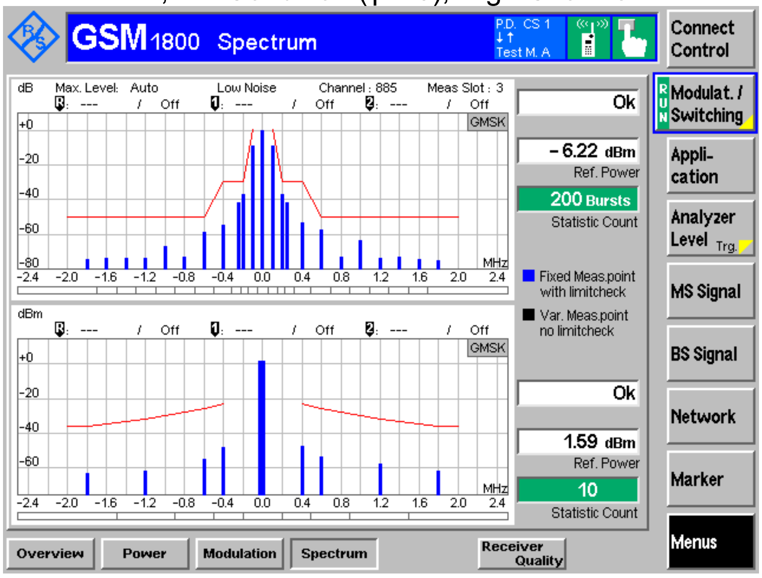
HT, LV Condition (γ=18), Low Channel



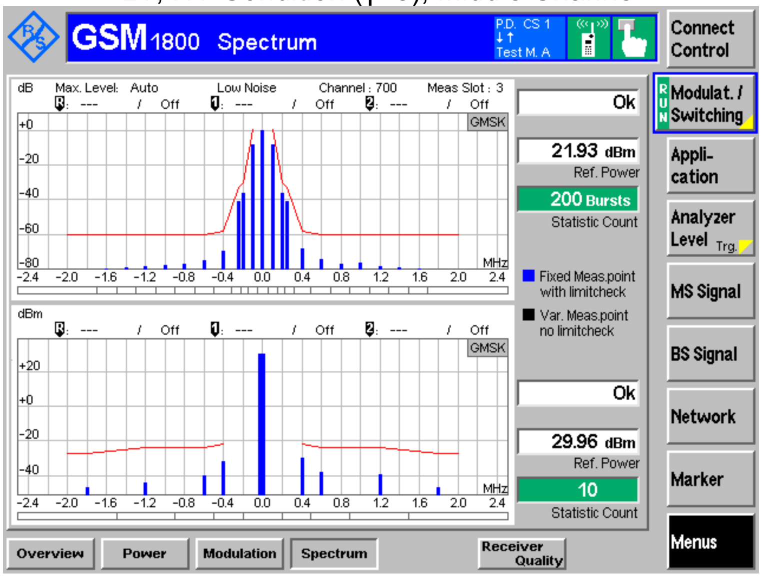
LT, HV Condition (γ=3), High Channel



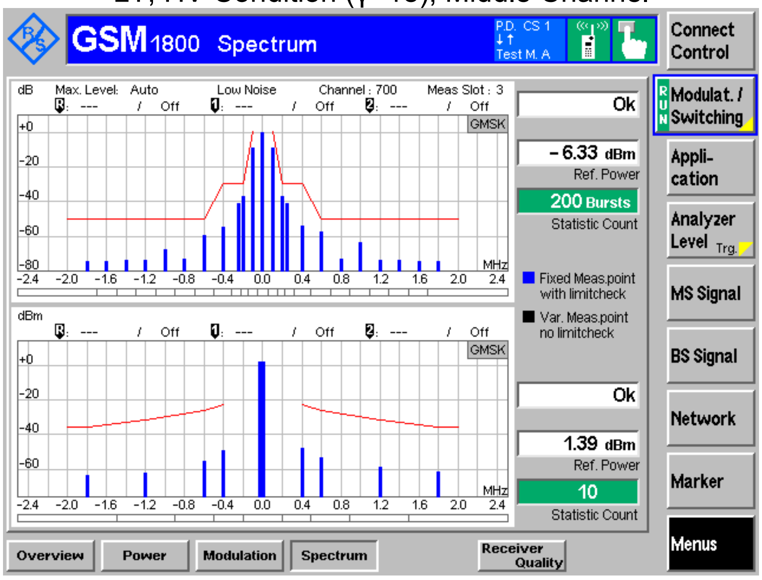
LT, HV Condition (γ=18), High Channel



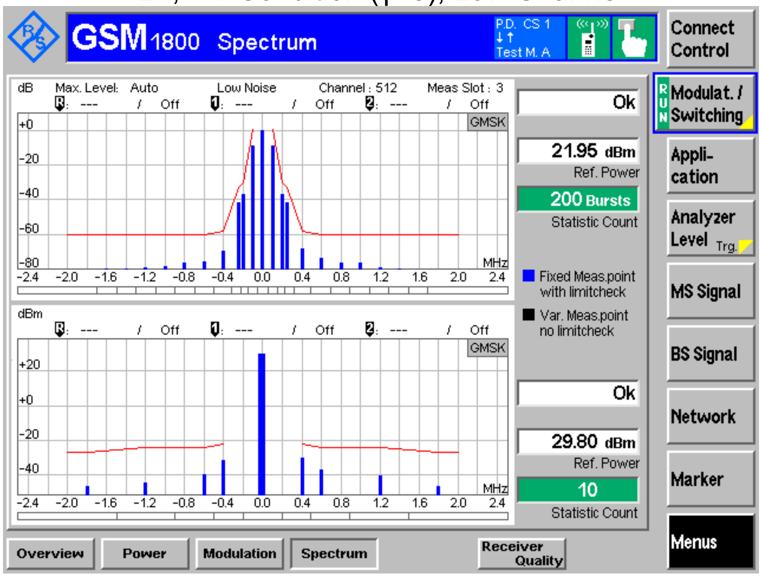
LT, HV Condition (γ=3), Middle Channel



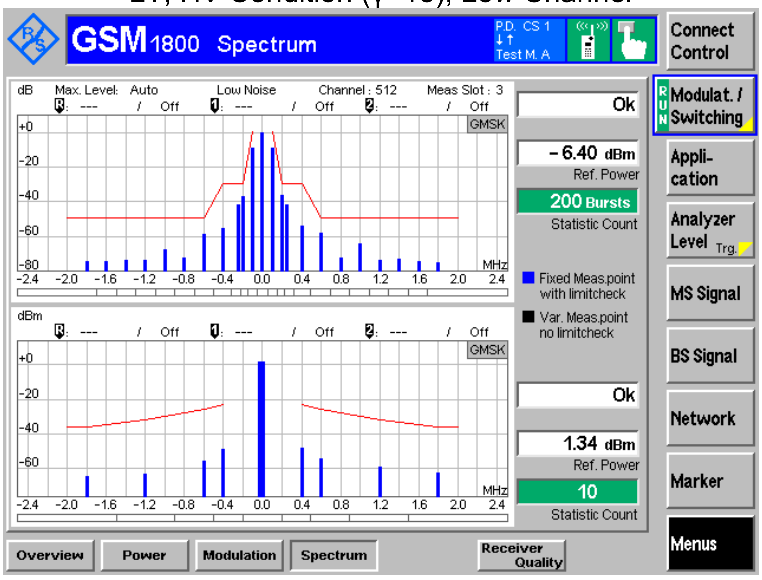
LT, HV Condition (γ=18), Middle Channel



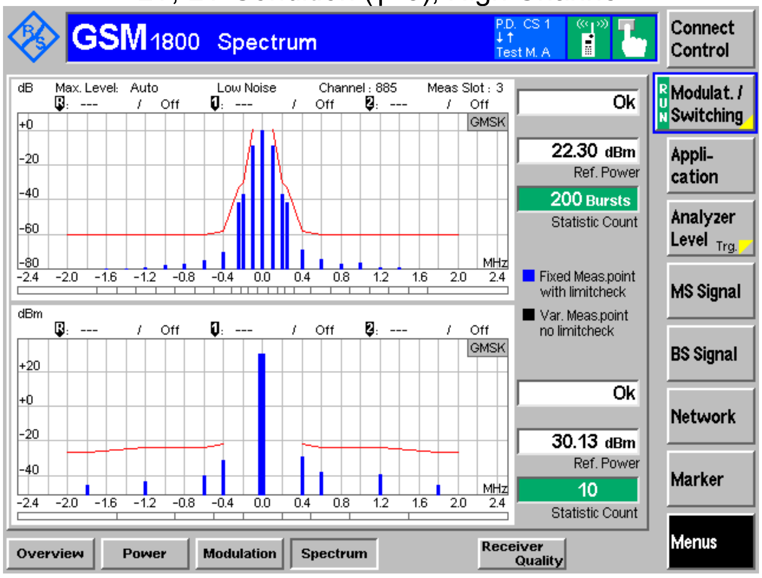
LT, HV Condition (γ=3), Low Channel



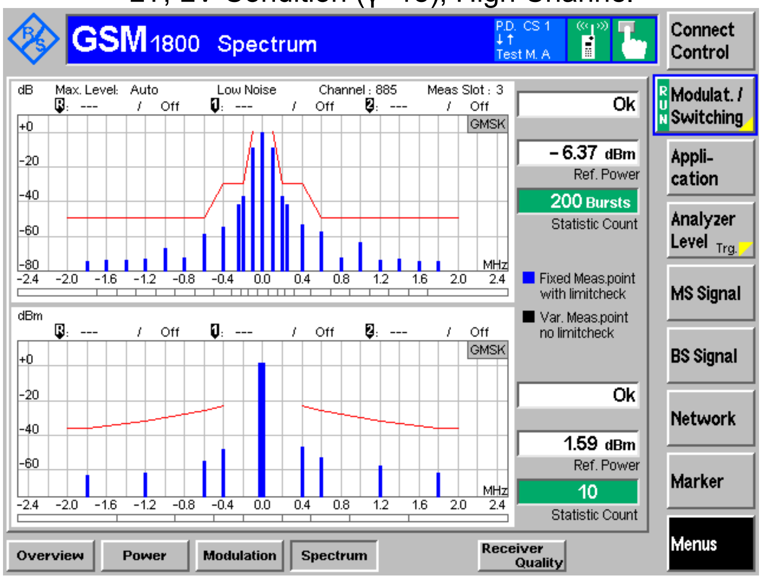
LT, HV Condition (γ=18), Low Channel



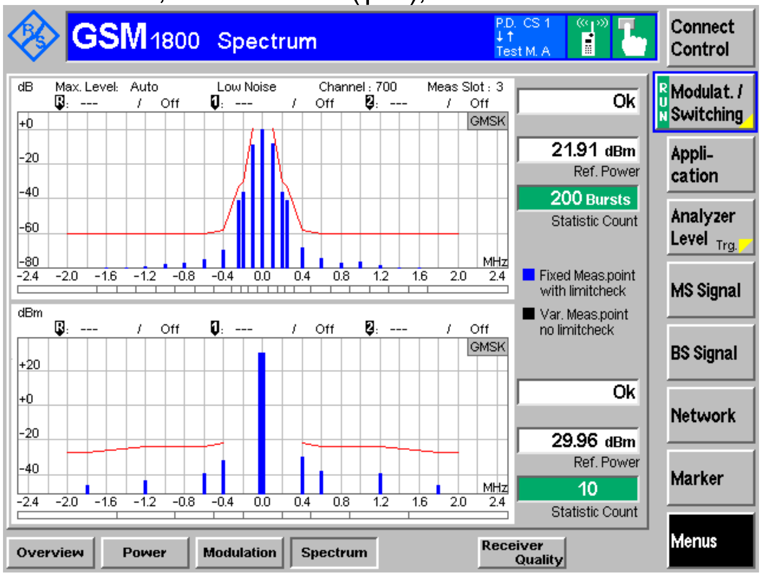
LT, LV Condition (γ=3), High Channel



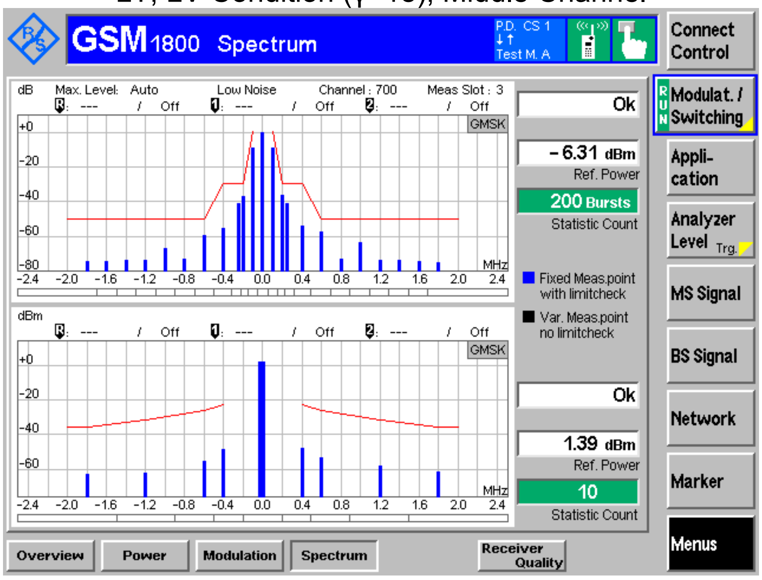
LT, LV Condition (γ=18), High Channel



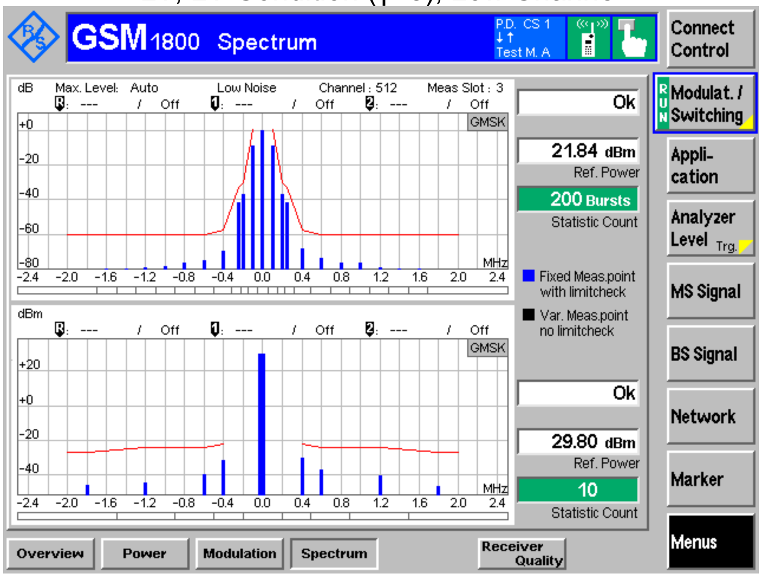
LT, LV Condition (γ=3), Middle Channel



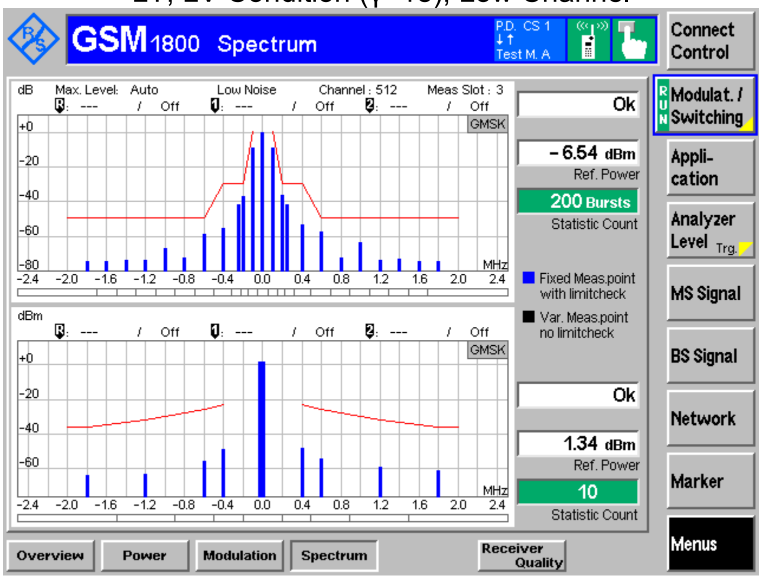
LT, LV Condition (γ=18), Middle Channel



LT, LV Condition (γ=3), Low Channel



LT, LV Condition (γ=18), Low Channel



15 CONDUCTED SPURIOUS EMISSIONS – MS ALLOCATED A CHANNEL

15.1 Standard Applicable

Requirements: According to EN 301 511 V9.0.2 (2003-03), 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 1 800	PCS 1 900
9 kHz to 1 GHz	-36	-36	-36
1 GHz to 12,75 GHz	-30		-30
1 GHz to 1 710 MHz		-30	
1 710 MHz to 1 785 MHz		-36	
1 785 MHz to 12,75 GHz		-30	

15.2 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]).

Table 2

Frequency range	Frequency offset	Filter bandwidth	Approx video bandwidth
100 kHz to 50 MHz	-	10 kHz	30 kHz
50 MHz to 500 MHz excl. relevant TX band: GSM 450: 450,4 MHz to 457,6 MHz; GSM 480: 478,8 MHz to 486 MHz, and the RX bands: For GSM 400 MS: 460,4 MHz to 467,6 MHz; 488,8 MHz to 496 MHz.	-	100 kHz	300 kHz
500 MHz to 12,75 GHz, excl. relevant TX band: GSM 750: 777 MHz to 792 MHz GSM 850: 824 MHz to 849 MHz; P-GSM: 890 MHz to 915 MHz; E-GSM: 880 MHz to 915 MHz; DCS: 1 710 MHz to 1 785 MHz, PCS 1 900: 1 850 MHz to 1 910 MHz; and the RX bands: For GSM 400 MS, GSM 900 MS and DCS 1 800 MS: 925 MHz to 960 MHz; 1 805 MHz to 1 880 MHz. For GSM 700 MS, GSM 850 MS and PCS 1 900 MS: 747 MHz to 762 MHz; 869 MHz to 894 MHz; 1 930 MHz to 1 990 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: 1 710 MHz to 1 785 MHz PCS 1 900: 1 850 MHz to 1 910 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. 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.			

15.3 Test Result

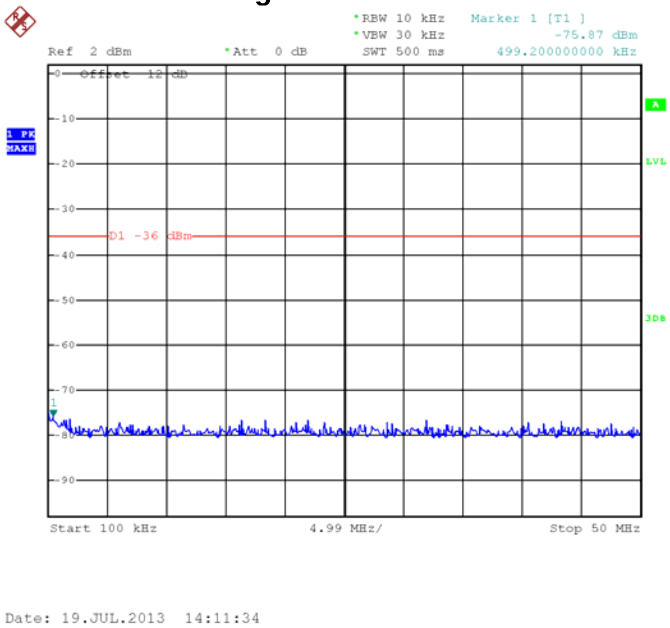
Environmental Conditions

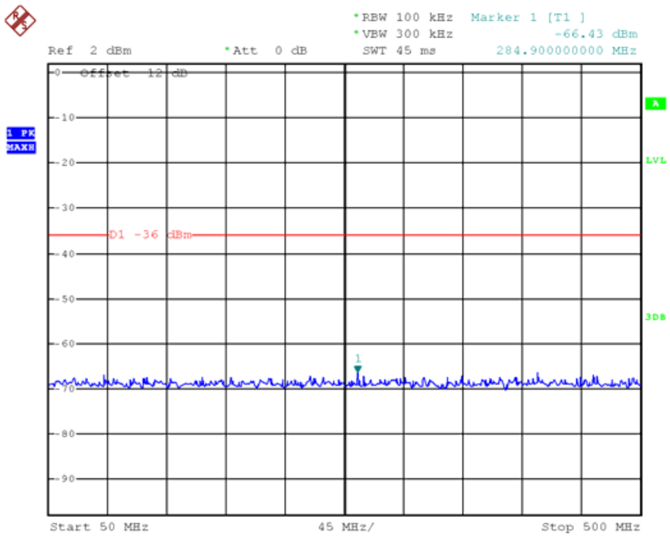
Temperature:	18 °C ~ 22 °C
Relative Humidity:	45 % ~ 66 %
ATM Pressure:	100.1 kPa ~ 100.7 kPa

Please see the following plots:

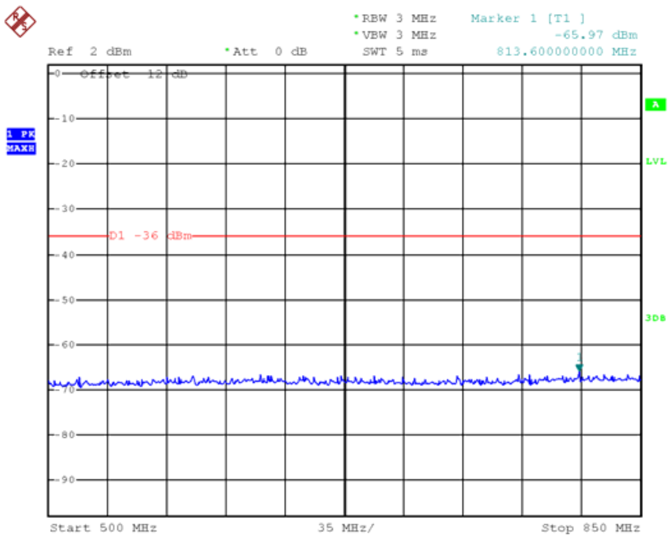
GSM 900

Normal Voltage Condition at Middle Channel

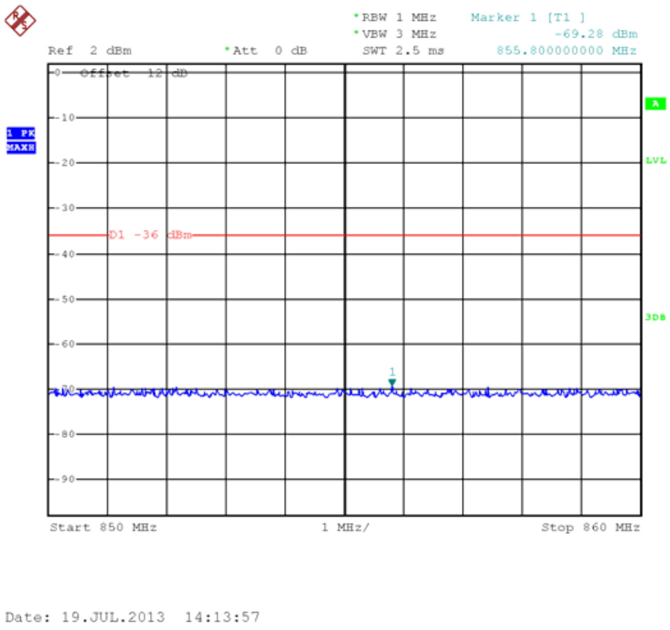


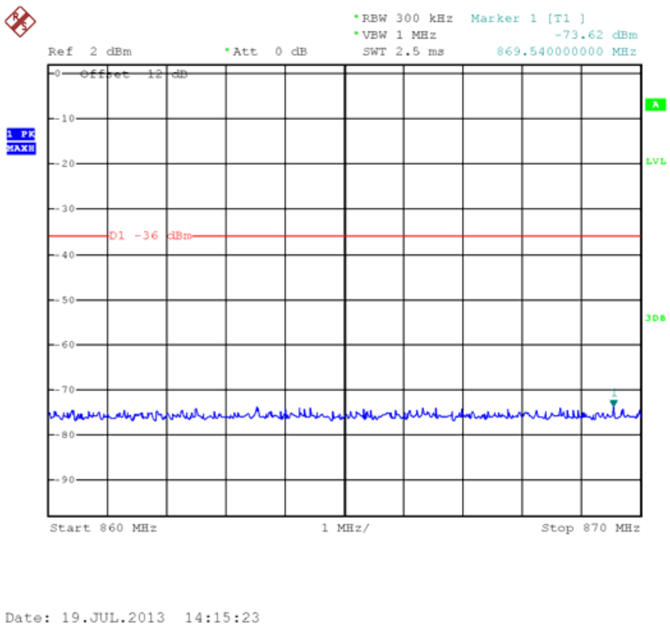


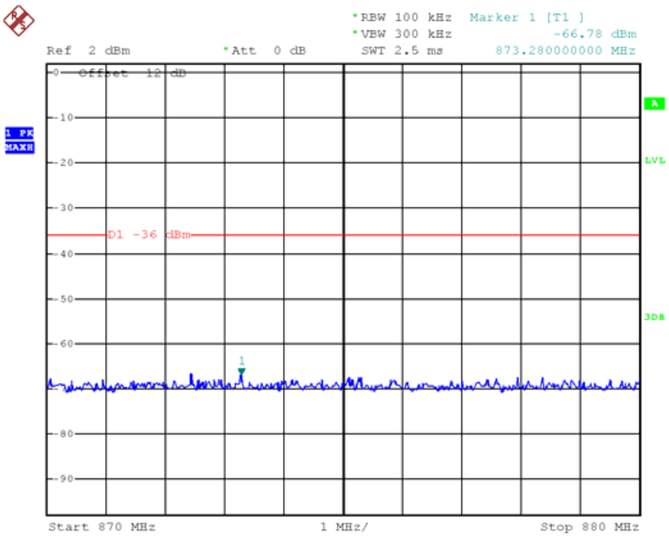
Date: 19.JUL.2013 14:12:03



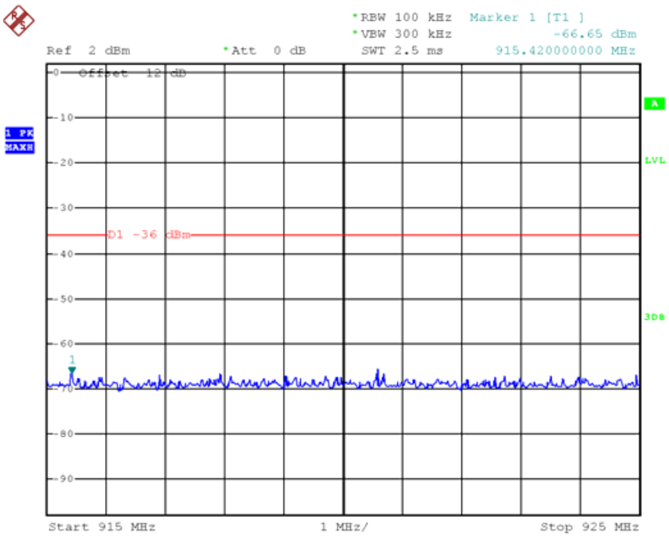
Date: 19.JUL.2013 14:13:27


RBW 1 MHz
VBW 3 MHz
SWT 2.5 ms
Marker 1 [T1]
-69.28 dBm
855.800000000 MHz
Ref 2 dBm
Att 0 dB
Offset 12 dB
D1 -36 dBm
Start 850 MHz
1 MHz/
Stop 860 MHz
Date: 19.JUL.2013 14:13:57

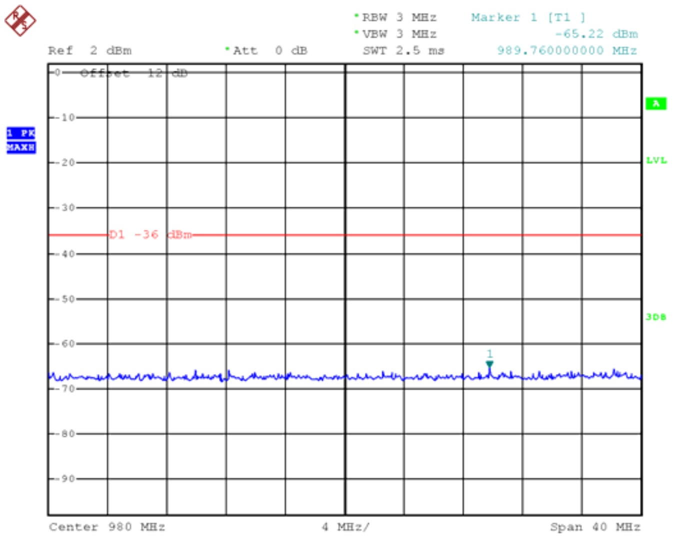

RBW 300 kHz
VBW 1 MHz
SWT 2.5 ms
Marker 1 [T1]
-73.62 dBm
869.540000000 MHz
Ref 2 dBm
Att 0 dB
Offset 12 dB
D1 -36 dBm
Start 860 MHz
1 MHz/
Stop 870 MHz
Date: 19.JUL.2013 14:15:23



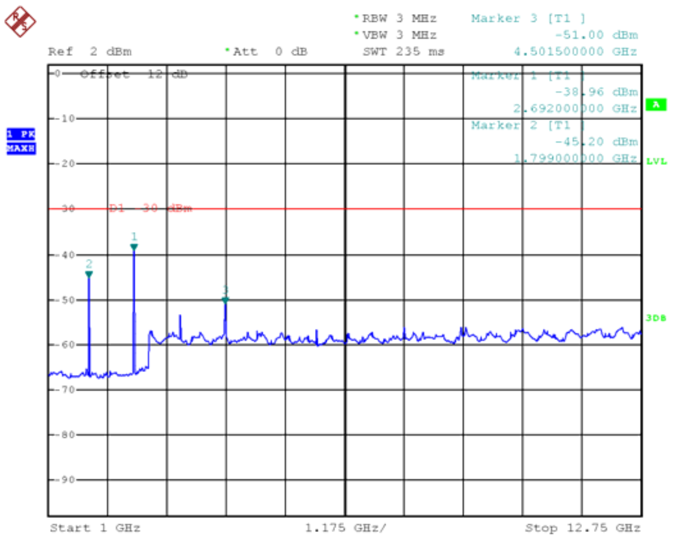
Date: 19.JUL.2013 14:15:53



Date: 19.JUL.2013 14:19:17



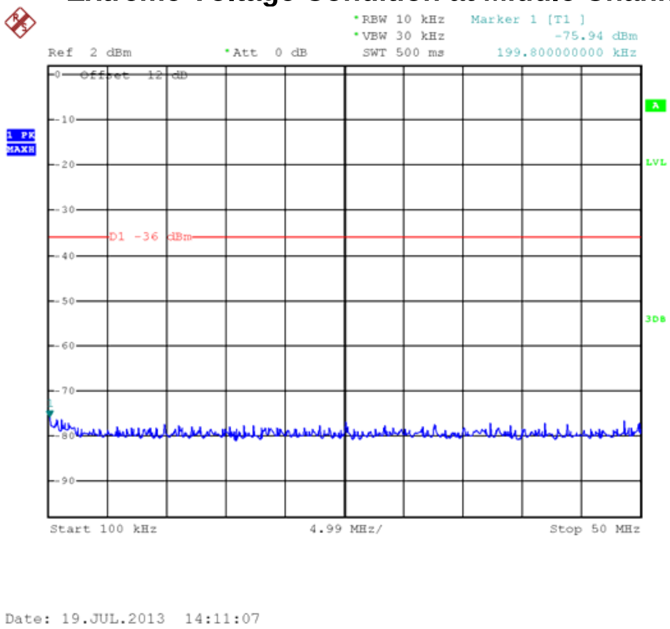
Date: 19.JUL.2013 14:18:43

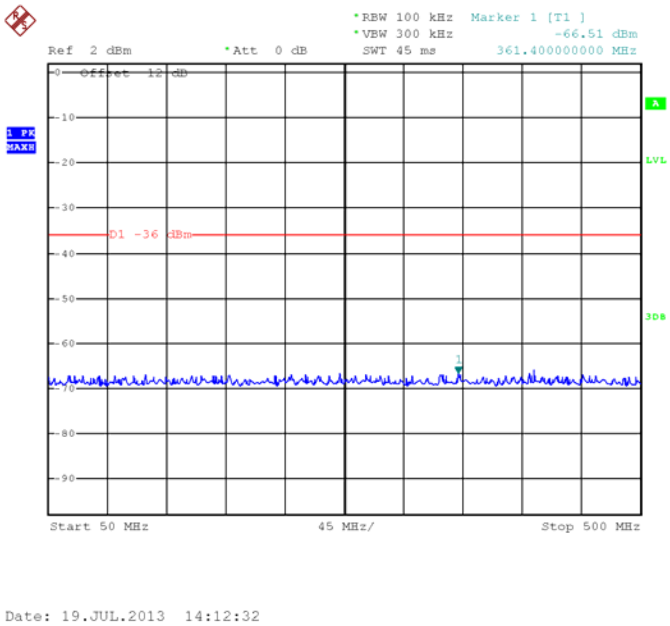


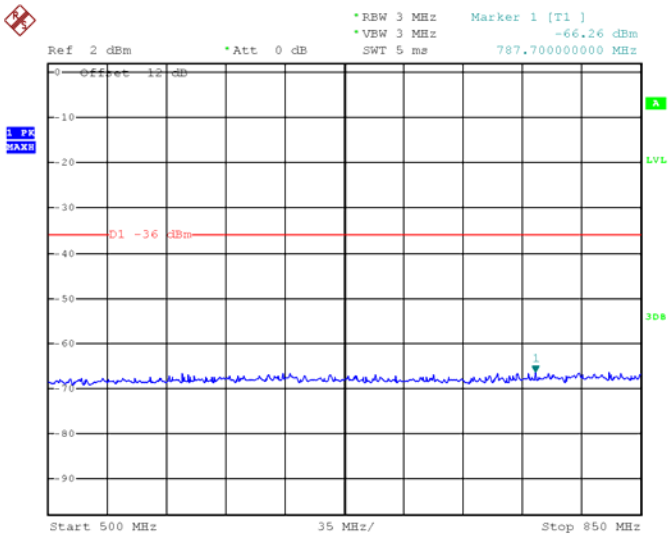
Date: 19.JUL.2013 14:19:53

GSM 900

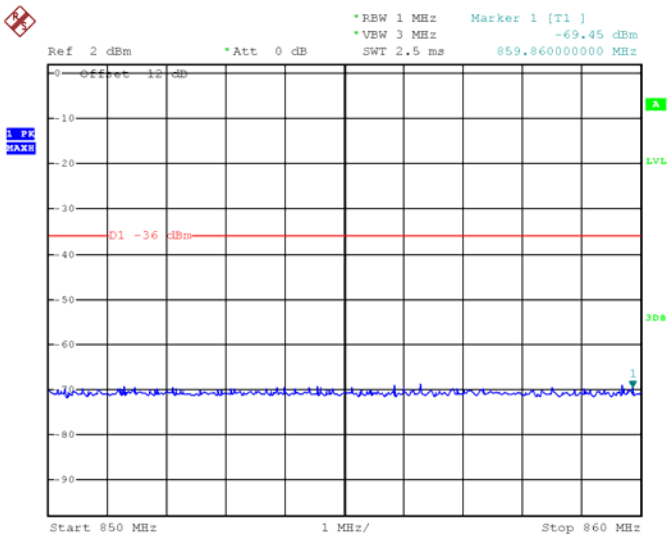
Extreme Voltage Condition at Middle Channel



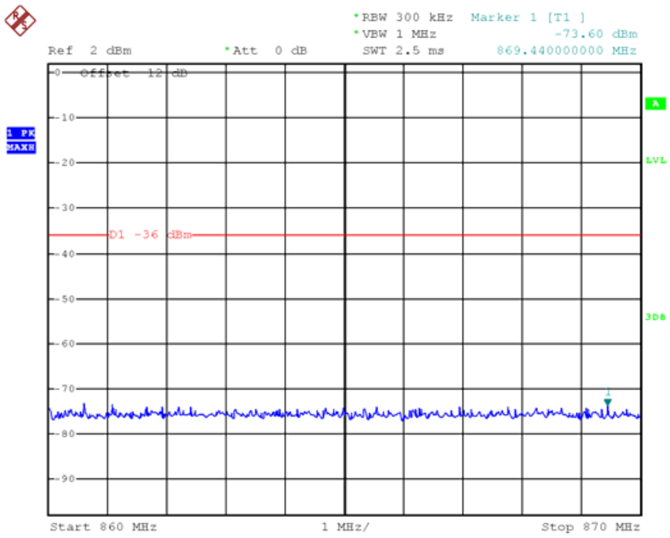




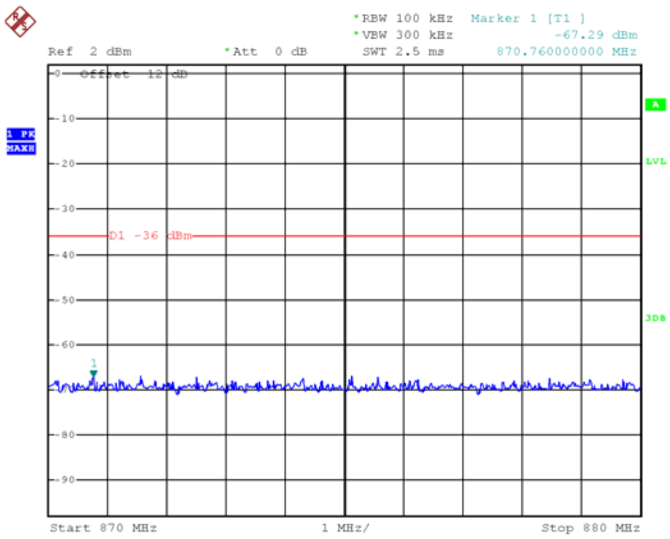
Date: 19.JUL.2013 14:13:09



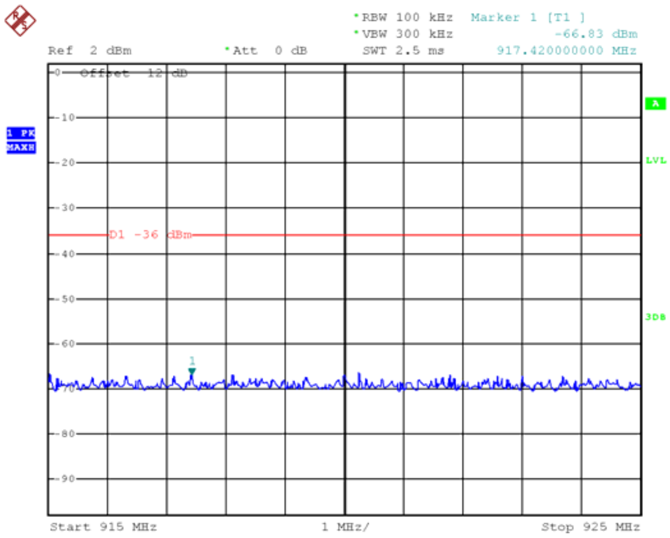
Date: 19.JUL.2013 14:14:32



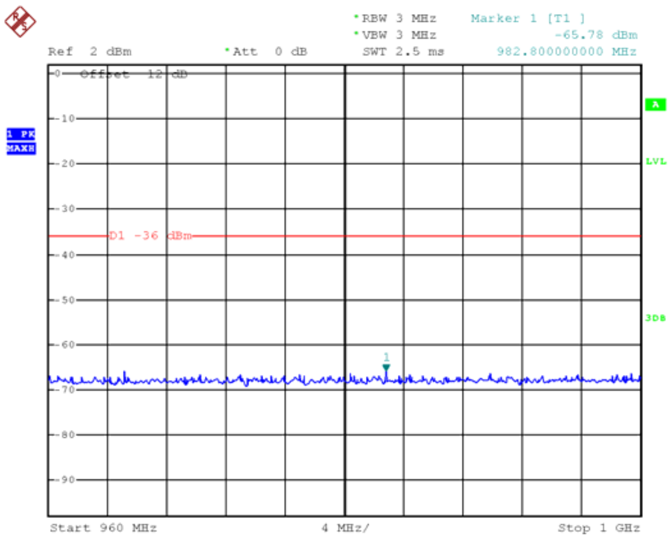
Date: 19.JUL.2013 14:15:03



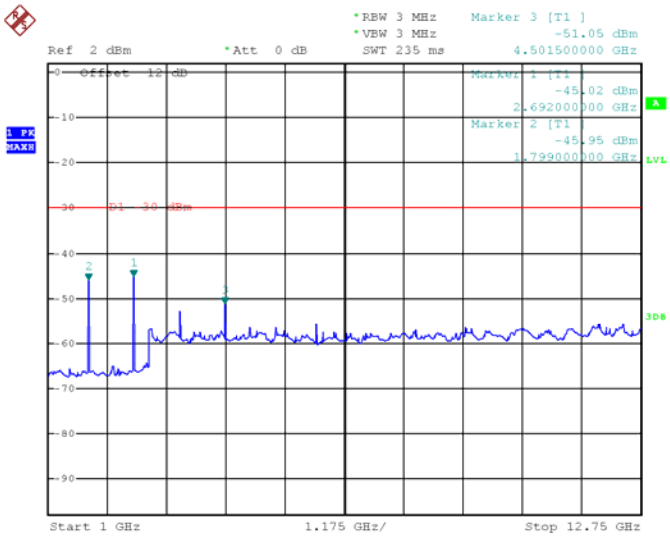
Date: 19.JUL.2013 14:16:10



Date: 19.JUL.2013 14:17:01



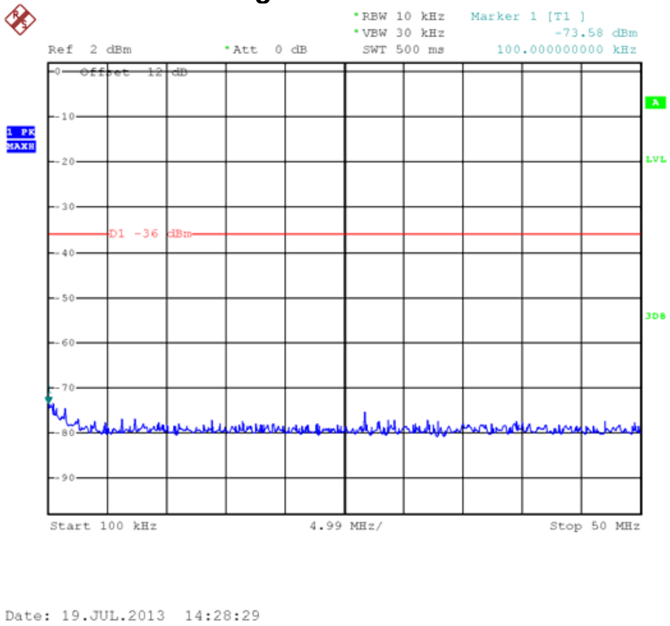
Date: 19.JUL.2013 14:17:32

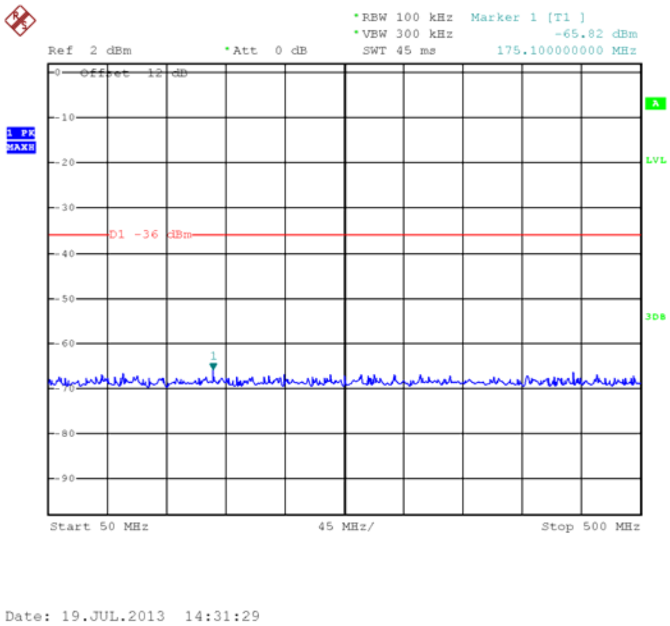


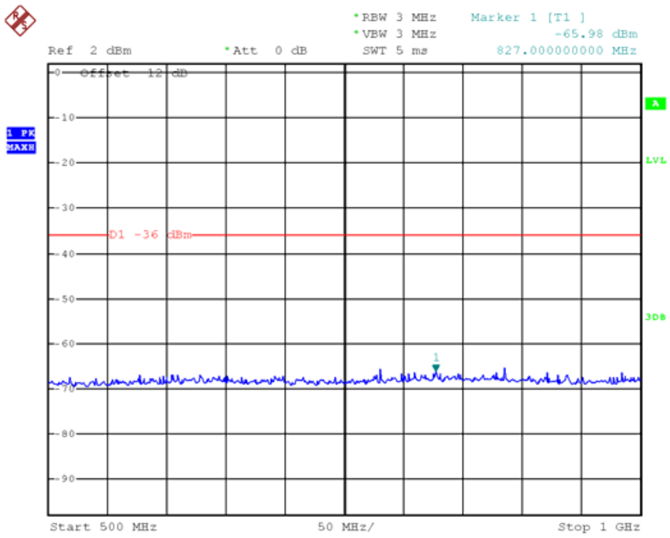
Date: 19.JUL.2013 14:20:27

DCS 1800

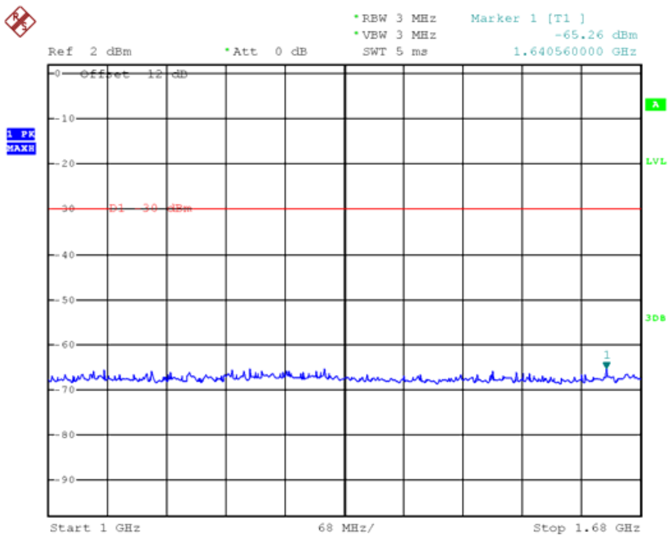
Normal Voltage Condition at Middle Channel



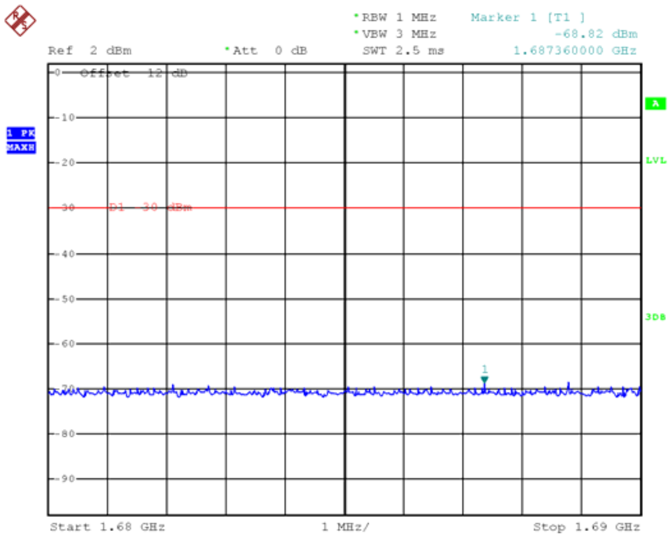




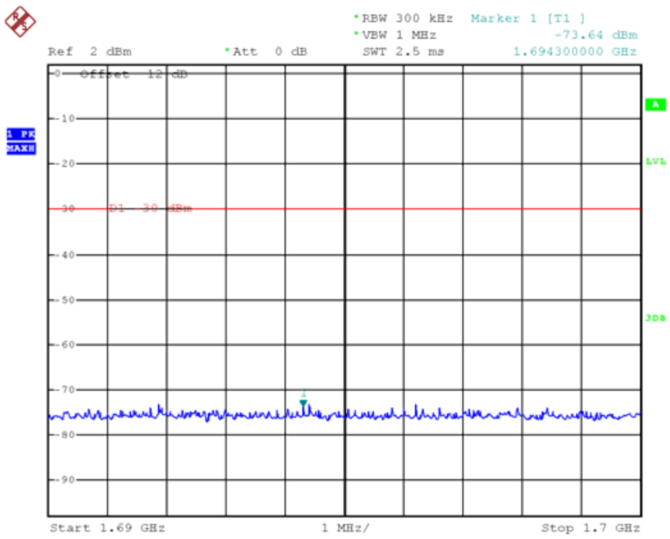
Date: 19.JUL.2013 14:31:57



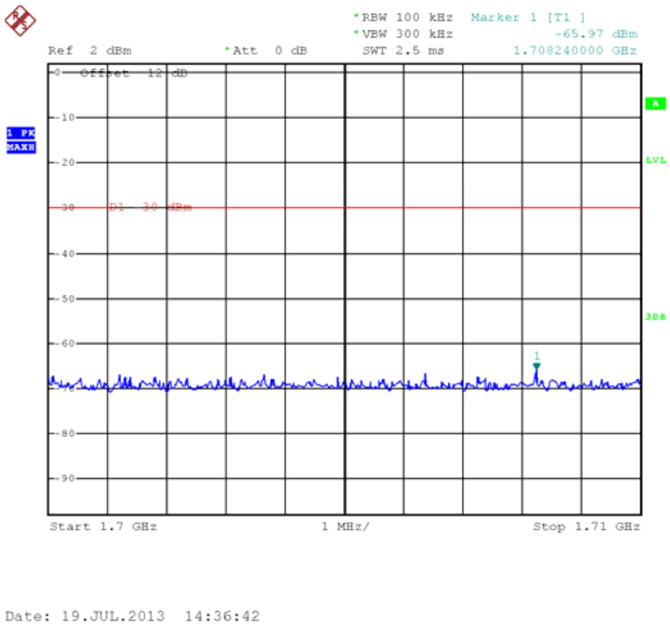
Date: 19.JUL.2013 14:33:52

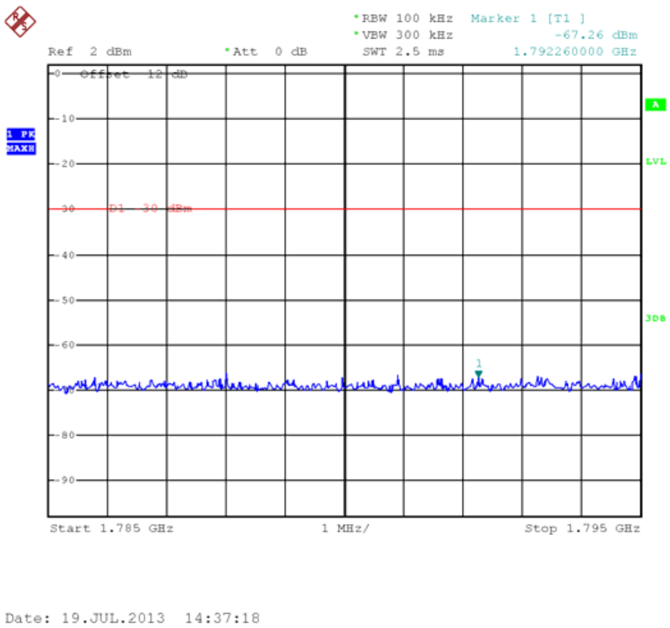


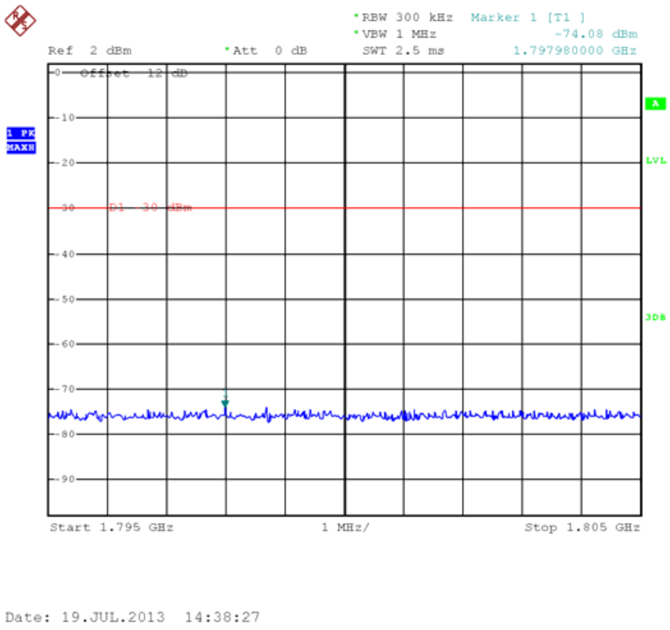
Date: 19.JUL.2013 14:35:07

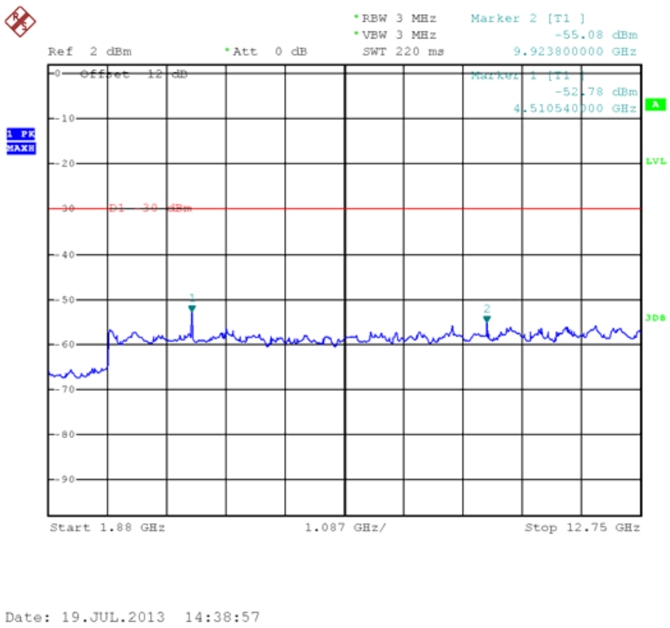


Date: 19.JUL.2013 14:35:32


*RBW 100 kHz Marker 1 [T1]
*VBW 300 kHz -65.97 dBm
Ref 2 dBm *Att 0 dB SWT 2.5 ms 1.708240000 GHz
Offset 12 dB
D1 -30 dBm
1 PK MAXH
A
LVL
3DB
Start 1.7 GHz 1 MHz/ Stop 1.71 GHz
Date: 19.JUL.2013 14:36:42

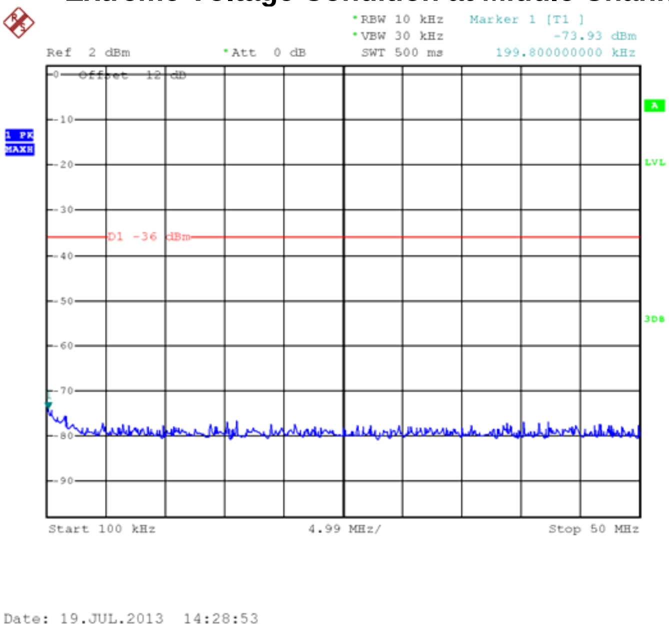

*RBW 100 kHz Marker 1 [T1]
*VBW 300 kHz -67.26 dBm
Ref 2 dBm *Att 0 dB SWT 2.5 ms 1.792260000 GHz
Offset 12 dB
D1 -30 dBm
1 PK MAXH
A
LVL
3DB
Start 1.785 GHz 1 MHz/ Stop 1.795 GHz
Date: 19.JUL.2013 14:37:18

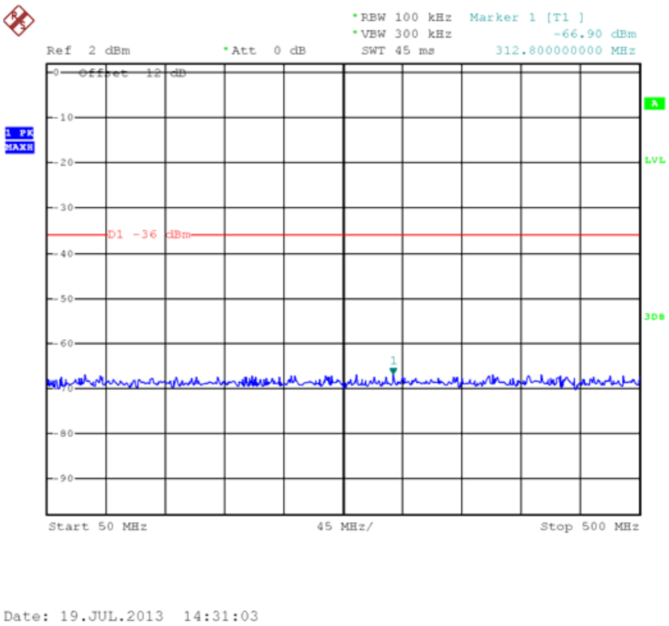

*RBW 300 kHz
Marker 1 [T1]
*VBW 1 MHz
-74.08 dBm
Ref 2 dBm
*Att 0 dB
SWT 2.5 ms
1.797980000 GHz
Offset 12 dB
D1 -30 dBm
Start 1.795 GHz
1 MHz/
Stop 1.805 GHz
Date: 19.JUL.2013 14:38:27

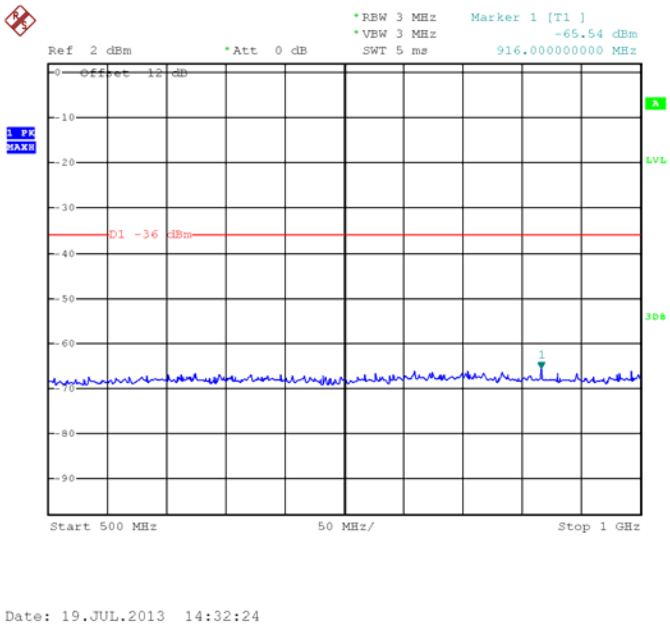

*RBW 3 MHz
Marker 2 [T1]
*VBW 3 MHz
-55.08 dBm
Ref 2 dBm
*Att 0 dB
SWT 220 ms
9.923800000 GHz
Offset 12 dB
Marker 1 [T1]
-52.78 dBm
4.510540000 GHz
D1 -30 dBm
Start 1.88 GHz
1.087 GHz/
Stop 12.75 GHz
Date: 19.JUL.2013 14:38:57

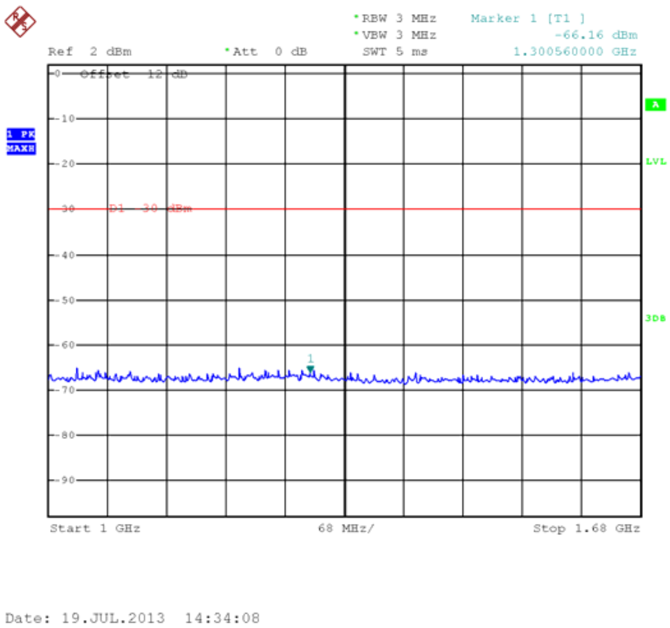
DCS 1800

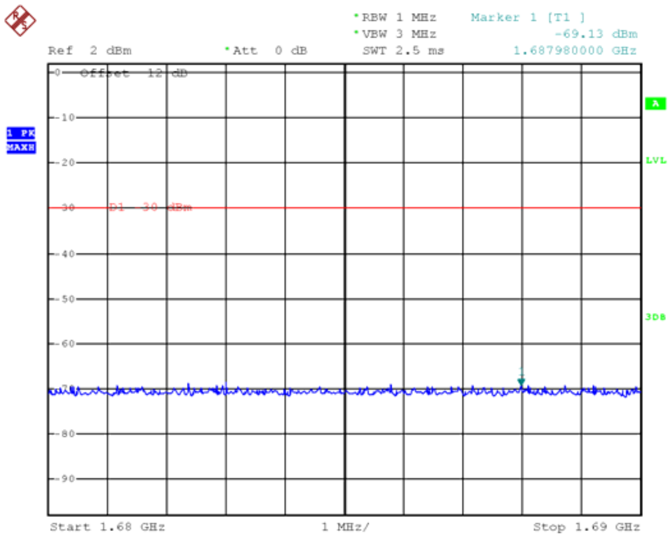
Extreme Voltage Condition at Middle Channel



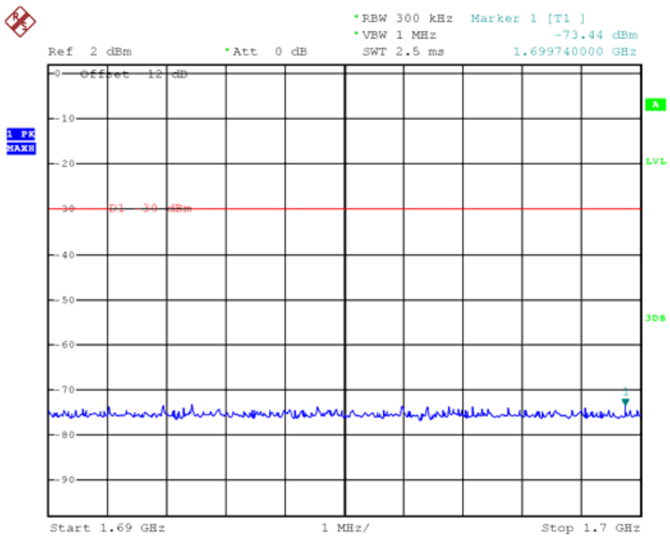



*RBW 3 MHz
*VBW 3 MHz
SWT 5 ms
Marker 1 [T1]
-65.54 dBm
916.000000000 MHz
Ref 2 dBm
*Att 0 dB
Offset 12 dB
1 PK MAXH
D1 -36 dBm
Start 500 MHz
50 MHz/
Stop 1 GHz
Date: 19.JUL.2013 14:32:24

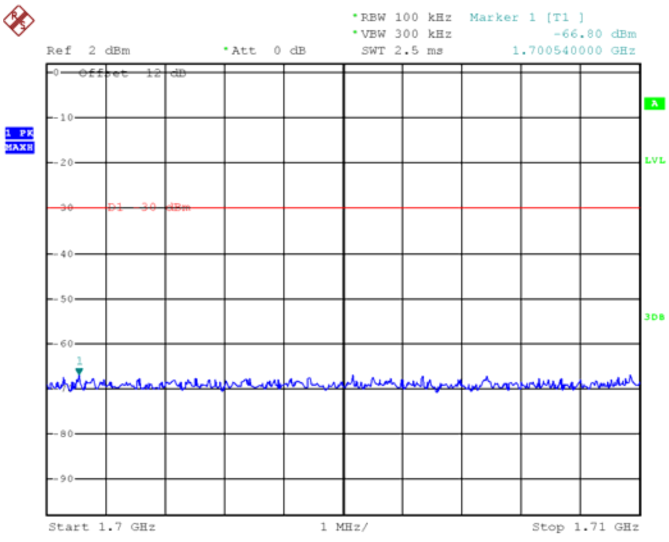

*RBW 3 MHz
*VBW 3 MHz
SWT 5 ms
Marker 1 [T1]
-66.16 dBm
1.300560000 GHz
Ref 2 dBm
*Att 0 dB
Offset 12 dB
1 PK MAXH
D1 -30 dBm
Start 1 GHz
68 MHz/
Stop 1.68 GHz
Date: 19.JUL.2013 14:34:08



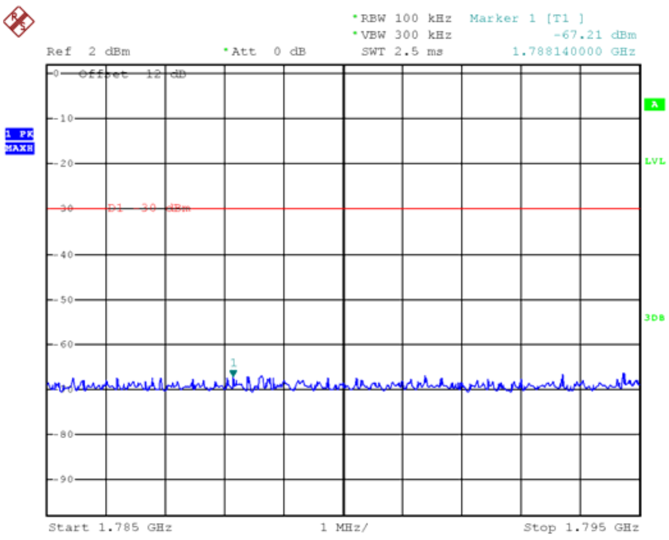
Date: 19.JUL.2013 14:34:50



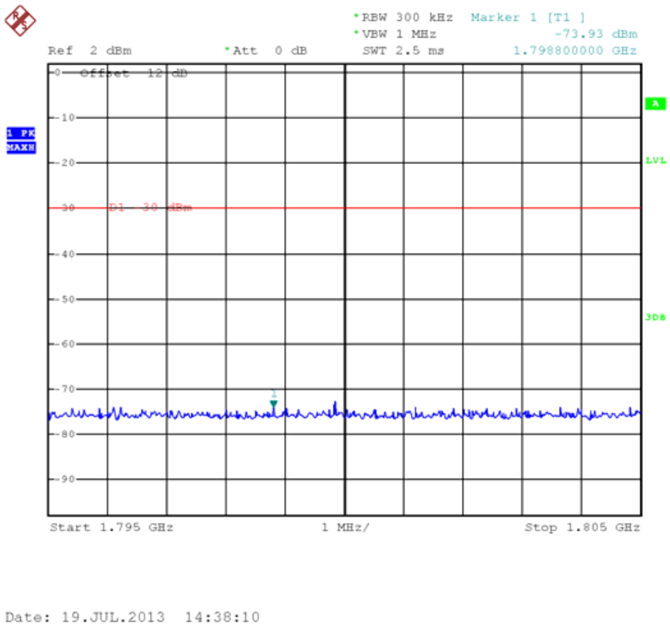
Date: 19.JUL.2013 14:35:53

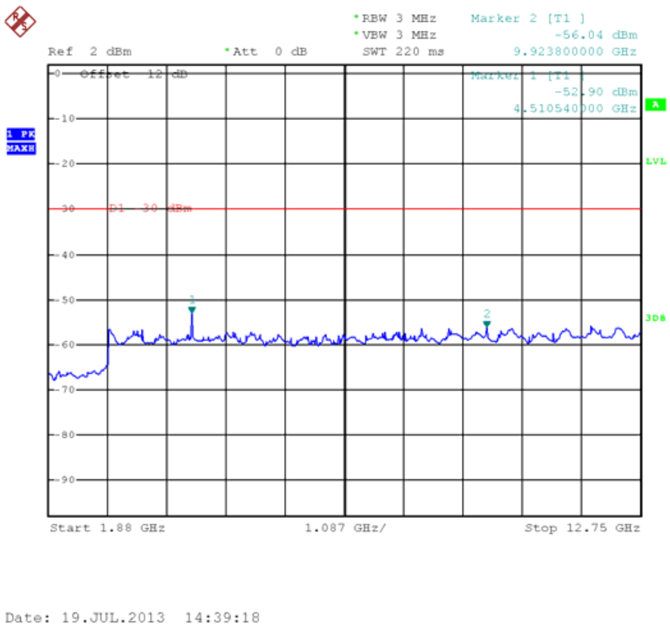


Date: 19.JUL.2013 14:36:25



Date: 19.JUL.2013 14:37:37


RBW 300 kHz
VBW 1 MHz
SWT 2.5 ms
Marker 1 [T1]
-73.93 dBm
1.798800000 GHz
Ref 2 dBm
Att 0 dB
Offset 12 dB
D1 -30 dBm
Start 1.795 GHz
1 MHz/
Stop 1.805 GHz
Date: 19.JUL.2013 14:38:10


RBW 3 MHz
VBW 3 MHz
SWT 220 ms
Marker 2 [T1]
-56.04 dBm
9.923800000 GHz
Ref 2 dBm
Att 0 dB
Offset 12 dB
Marker 1 [T1]
-52.90 dBm
4.510540000 GHz
D1 -30 dBm
Start 1.88 GHz
1.087 GHz/
Stop 12.75 GHz
Date: 19.JUL.2013 14:39:18

16 CONDUCTED SPURIOUS EMISSIONS – MS IN IDLE MODE

16.1 Standard Applicable

Requirements: According to EN 301 511 V9.0.2 (2003-03), 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 12.4:

Table 12.4

Frequency range		Power level in dBm	
		GSM 400, T-GSM 810 GSM 900, DCS 1 800	GSM 700, GSM 850, PCS 1 900
9 kHz to	880 MHz	-57	-57
880 MHz to	915 MHz	-59	-57
915 MHz to	1000 MHz	-57	-57
1 GHz to	1 710 MHz	-47	
1 710 MHz to	1 785 MHz	-53	
1 785 MHz to	12,75 GHz	-47	
1 GHz to	1 850 MHz		-47
1 850 MHz to	1 910 MHz		-53
1 910 MHz to	12,75 GHz		-47

16.2 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.

Table 4

Frequency range	Filter bandwidth	Video bandwidth
100 kHz to 50 MHz	10 kHz	30 kHz
50 MHz to 12,75 GHz	100 kHz	300 kHz

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

16.3 Test Result

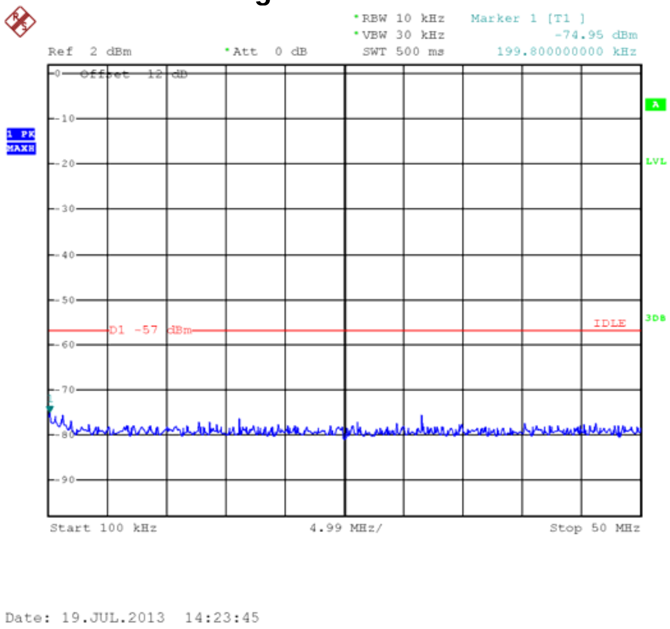
Environmental Conditions

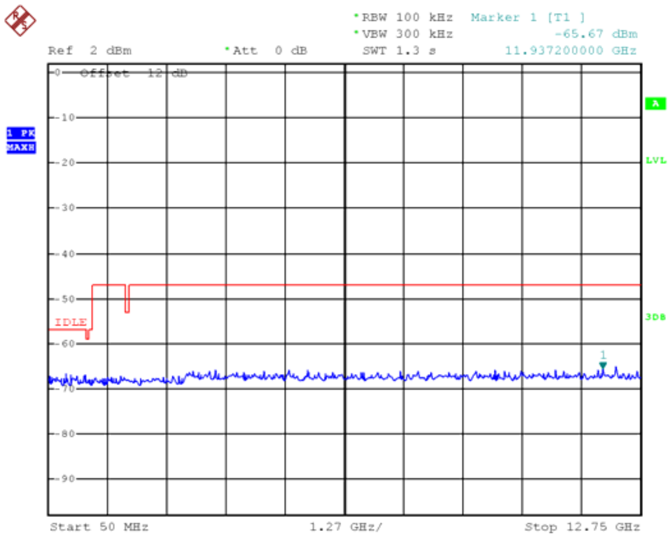
Temperature:	18 °C ~ 22 °C
Relative Humidity:	45 % ~ 66 %
ATM Pressure:	100.1 kPa ~ 100.7 kPa

Please refer to the following plots.

GSM 900

Normal Voltage Condition at Middle Channel

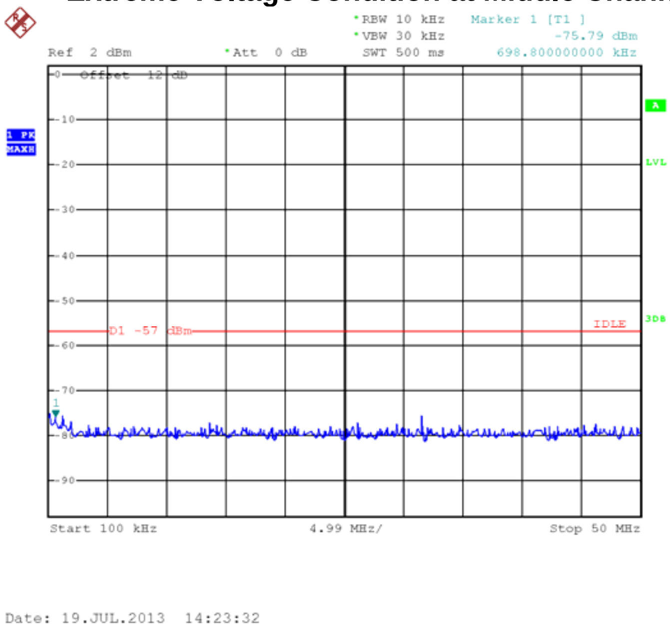


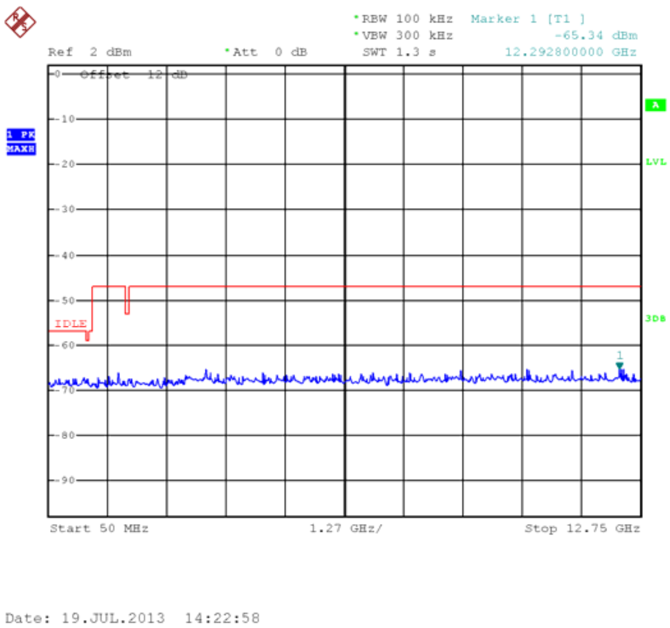


Date: 19.JUL.2013 14:22:36

GSM 900

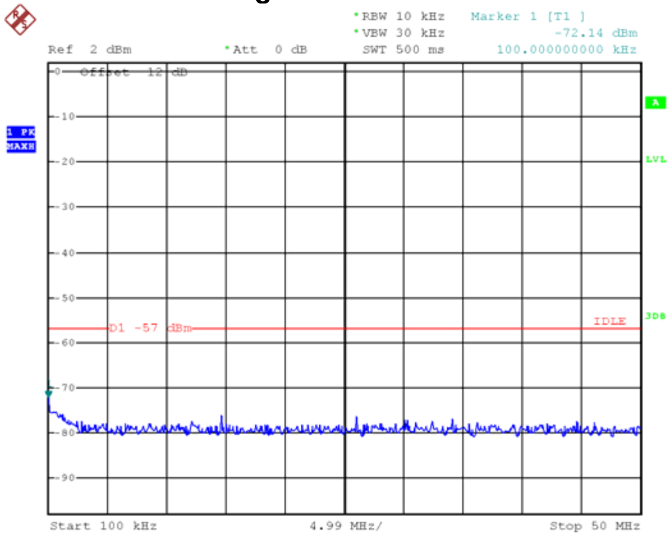
Extreme Voltage Condition at Middle Channel





DCS 1800

Normal Voltage Condition at Middle Channel



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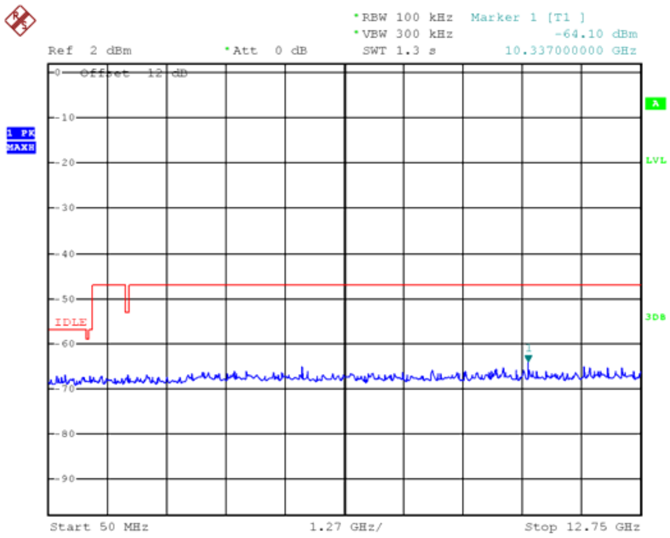
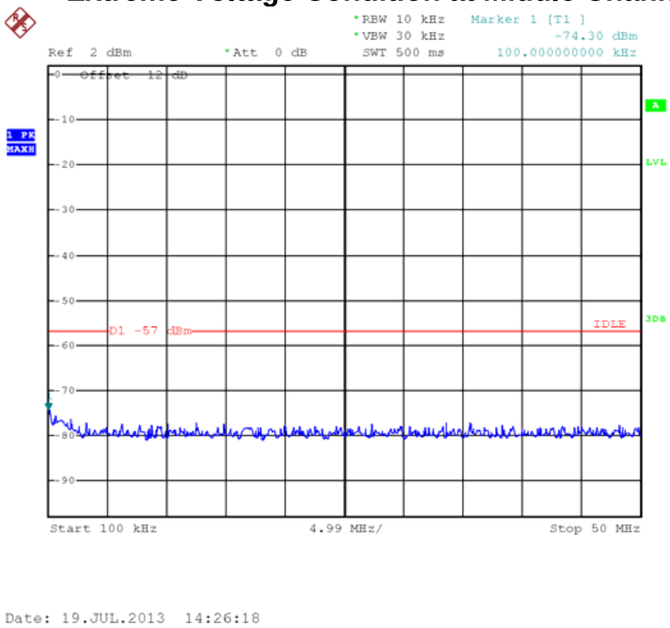
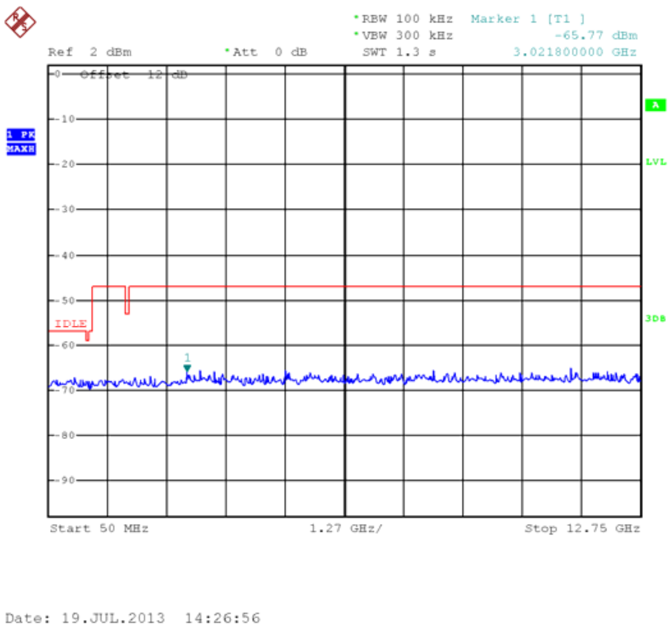


Date: 19.JUL.2013 14:27:23

DCS 1800

Extreme Voltage Condition at Middle Channel





17 RADIATED SPURIOUS EMISSIONS – MS ALLOCATED A CHANNEL

17.1 Standard Applicable

Requirements: According to EN 301 511 V9.0.2 (2003-03), 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 1 800	PCS 1 900
30 MHz to	1 GHz	-36	-36	-36
1 GHz to	4 GHz	-30		-30
1 GHz to	1 710 MHz		-30	
1 710 MHz to	1 785 MHz		-36	
1 785 MHz to	4 GHz		-30	

17.2 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: 1 710 MHz to 1 785 MHz. PCS 1 900: 1 850 MHz to 1 910 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: 1 710 MHz to 1 785 MHz PCS 1 900: 1 850 MHz to 1 910 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.

17.3 Test Results

Environmental Conditions

Temperature:	18 °C ~ 22 °C
Relative Humidity:	45 % ~ 66 %
ATM Pressure:	100.1 kPa ~ 100.7 kPa

GSM 900 Band: Middle Channel, Normal Voltage				
Frequency (MHz)	Spurious Emission		Limit (dBm)	
	polarization	Level(dBm)		
1197.48	Vertical	-41.12	-30.00	Test Result
1805.00	V	-46.68	-30.00	
3391.68	V	-44.40	-30.00	
1197.48	Horizontal	-48.22	-30.00	
1805.00	H	-49.88	-30.00	
3048.29	H	-45.86	-30.00	

GSM 900 Band: Middle Channel, Low Voltage				
Frequency (MHz)	Spurious Emission		Limit (dBm)	
	polarization	Level(dBm)		
1802.50	Vertical	-38.74	-30.00	Test Result
2928.17	V	-46.68	-30.00	
3610.00	V	-44.92	-30.00	
1195.82	Horizontal	-48.22	-30.00	
1805.00	H	-51.32	-30.00	
3048.29	H	-45.86	-30.00	

Remark: The test data of below 1GHz is too lower than the limit, so not show in this test item.

GSM 1800 Band: Middle Channel, Normal Voltage				
Frequency (MHz)	Spurious Emission		**Limit (dBm)**	**Test Result**
	polarization	**Level(dBm)**		
1736.28	Vertical	-50.40	-36.00	
3496.72	V	-41.37	-30.00	
1736.28	Horizontal	-50.16	-36.00	
3496.72	H	-44.32	-30.00	

GSM 1800 Band: Middle Channel, Low Voltage				
Frequency (MHz)	Spurious Emission		**Limit (dBm)**	**Test Result**
	polarization	**Level(dBm)**		
1733.88	Vertical	-50.42	-36.00	
3496.72	V	-41.00	-30.00	
1733.88	Horizontal	-51.14	-36.00	
3496.72	H	-46.81	-30.00	

Remark: The test data of below 1GHz is too lower than the limit, so not show in this test item.

18 RADIATED SPURIOUS EMISSIONS – MS IN IDLE MODE

18.1 Standard Applicable

Requirements: According to EN 301 511 V9.0.2 (2003-03), 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 1 800	GSM 700, GSM 850, PCS 1 900
30 MHz to	880 MHz	-57	-57
880 MHz to	915 MHz	-59	-57
915 MHz to	1 000 MHz	-57	-57
1 GHz to	1 710 MHz	-47	
1 710 MHz to	1 785 MHz	-53	
1 785 MHz to	4 GHz	-47	
1 GHz to	1 850 MHz		-47
1 850 MHz to	1 910 MHz		-53
1 910 MHz to	4GHz		-47

18.2 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	10 kHz	30 kHz
50 MHz to 4 GHz	100 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]).

18.3 Test Results

Environmental Conditions

Temperature:	18 °C ~ 22 °C
Relative Humidity:	45 % ~ 66 %
ATM Pressure:	100.1 kPa ~ 100.7 kPa

GSM 900 Band: Middle Channel, Normal Voltage				
Frequency (MHz)	Spurious Emission		**Limit (dBm)**	
	polarization	**Level(dBm)**		
236.69	Vertical	-62.21	-57.00	**Test Result**
465.20	V	-61.30	-57.00	
1195.82	V	-60.21	-47.00	
2134.65	V	-55.95	-47.00	
3391.68	V	-49.53	-47.00	
112.20	Horizontal	-61.20	-57.00	
450.36	H	-62.00	-57.00	
1195.82	H	-53.69	-47.00	
2134.65	H	-51.25	-47.00	
3151.42	H	-50.77	-47.00	

GSM 900 Band: Middle Channel, Low Voltage				
Frequency (MHz)	Spurious Emission		**Limit (dBm)**	
	polarization	**Level(dBm)**		
114.23	Vertical	-62.10	-57.00	**Test Result**
287.63	V	-61.31	-57.00	
1195.82	V	-53.74	-47.00	
2134.65	V	-50.82	-47.00	
3487.03	V	-49.07	-47.00	
156.69	Horizontal	-59.12	-57.00	
285.56	H	-60.13	-57.00	
1195.82	H	-53.69	-47.00	
1907.92	H	-51.25	-47.00	
3410.54	H	-50.77	-47.00	

GSM 1800 Band: Middle Channel, Normal Voltage				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	polarization	**Level(dBm)**		
158.47	Vertical	-62.89	-57.00	
268.95	V	-64.75	-57.00	
1731.47	V	-60.82	-47.00	
2378.41	V	-58.93	-47.00	
3103.72	V	-51.97	-47.00	
125.26	Horizontal	-59.46	-57.00	
147.68	H	-62.75	-57.00	
2056.23	H	-60.09	-47.00	
2391.64	H	-52.54	-47.00	
3368.25	H	-49.42	-47.00	

GSM 1800 Band: Middle Channel, Low Voltage				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	polarization	**Level(dBm)**		
139.26	Vertical	-59.56	-57.00	
304.56	V	-62.01	-57.00	
2378.41	V	-60.51	-47.00	
3103.72	V	-59.35	-47.00	
3396.39	V	-50.76	-47.00	
136.52	Horizontal	-62.44	-57.00	
235.00	H	-62.23	-57.00	
2047.69	H	-61.02	-47.00	
2388.33	H	-58.81	-47.00	
3358.93	H	-50.52	-47.00	

19 RECEIVER BLOCKING AND SPURIOUS RESPONSE – SPEECH CHANNELS

19.1 Standard Applicable

The blocking characteristics of the receiver are specified separately for in-band and out-of-band performance as Identified in 3GPP TS 05.05 sub clause 5.1.

The reference sensitivity performance as specified in table 1 of 3GPP TS 05.05 shall be met when the following Signals are simultaneously input to the receiver:

- a useful signal at frequency f0, 3 dB above the reference sensitivity level as specified in 3GPP TS 05.05 sub clause 6.2;
- a continuous, static sine wave signal at a level as in the table of 3GPP TS 05.05 sub clause 5.1 and at a frequency(f) which is an integer multiple of 200 kHz;
- with the following exceptions, called spurious response frequencies:

a) GSM 700, GSM 850 and GSM 900: in band, for a maximum of six occurrences (which if grouped shall not exceed three contiguous occurrences per group);

b) out of band, for a maximum of 24 occurrences (which if below f0 and grouped shall not exceed three contiguous occurrences per group).

where the above performance shall be met when the continuous sine wave signal (f) is set to a level of 70 dBμV(emf) (i.e. -43 dBm). 3GPP TS 05.05, sub clause 5.1.

19.2 Test Procedure

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

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

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

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

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

i) The total frequency range formed by:

E-GSM 900 the frequencies between Flo + (IF1 + IF2 + ... + IFn + 17,5 MHz) and Flo - (IF1 + IF2 + ... + IFn + 17,5 MHz).

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

Measurements are made at 200 kHz intervals.

ii) The three frequencies IF1, IF1 + 200 kHz, IF1 - 200 kHz.

iii) The frequencies:

mFlo + IF1;

mFlo - IF1;

mFR;

where m is all positive integers greater than or equal to 2 such that either sum lies in the range 100 kHz to 12,75 GHz.

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

Where:

Flo - local oscillator applied to first receiver mixer

IF1 ... IFn - are the n intermediate frequencies

Flo, IF1, IF2 ... IFn - shall be declared by the manufacturer in the PIXIT statement 3GPP TS 51.010-1 annex 3.

d) The level of the unwanted signal is set according to table 14-28.

Table 14-28a: Level of unwanted signals

FREQUENCY	GSM 900 Small MS	GSM 900 Other MS	DCS 1 800
	LEVEL IN dBµVemf( )		
FR ±600 kHz to FR ±800 kHz	70	75	70
FR ±800 kHz to FR ±1,6 MHz	70	80	70
FR ±1,6 MHz to FR ±3 MHz	80	90	80
915 MHz to FR - 3 MHz	90	90	-
FR + 3 MHz to 980 MHz	90	90	-
1 785 MHz to FR - 3 MHz	-	-	87
FR + 3 MHz to 1 920 MHz	-	-	87
835 MHz to < 915 MHz	113	113	
> 980 MHz to 1 000 MHz	113	113	
100 kHz to < 835 MHz	90	90	
> 1 000 MHz to 12,75 GHz	90	90	
100 kHz to 1 705 MHz	-	-	113
> 1 705 MHz to < 1 785 MHz	-	-	101
> 1 920 MHz to 1 980 MHz	-	-	101
> 1 980 MHz to 12,75 GHz	-	-	90

Table 14-28b: Level of unwanted signals

FREQUENCY	GSM 450 Small MS	GSM 450 Other MS	GSM 480 Small MS	GSM 480 Other MS
	LEVEL IN dBµVemf( )			
FR ±600 kHz to FR ±800 kHz	70	75	70	75
FR ±800 kHz to FR ±1,6 MHz	70	80	70	80
FR ±1,6 MHz to FR ±3 MHz	80	90	80	90
457,6 MHz to FR - 3 MHz	90	90	-	-
FR + 3 MHz to 473,6 MHz	90	90	-	-
486 MHz to FR - 3 MHz	-	-	90	90
FR + 3 MHz to 502 MHz	-	-	90	90
100 kHz to < 457,6 MHz	113	113	-	-
> 473,6 MHz to 12,75 GHz	113	113	-	-
100 kHz to < 486 MHz	-	-	113	113
> 502 MHz to 12,75 GHz	-	-	113	113

Table 14-28c: Level of unwanted signals

FREQUENCY	PCS 1 900 LEVEL IN dBµVemf( )
FR ±600 kHz to FR ±800 kHz	70
FR ±800 kHz to FR ±1,6 MHz	70
FR ±1,6 MHz to FR ±3 MHz	80
1 910 MHz to FR - 3 MHz	87
FR + 3 MHz to 2 010 MHz	87
100 kHz to 1 830 MHz	113
> 1 830 MHz to < 1 910 MHz	101
> 2 010 MHz to 2 070 MHz	101
> 2 070 MHz to 12,75 GHz	90

Table 14-28d: Level of unwanted signals

FREQUENCY	GSM 750	GSM 850
	LEVEL IN dBµVemf( )	
FR ±600 kHz to FR ±800 kHz	70	70
FR ±800 kHz to FR ±1,6 MHz	70	70
FR ±1,6 MHz to FR ±3 MHz	80	80
727 MHz to FR - 3 MHz	90	-
FR + 3 MHz to 782 MHz	90	-
849 MHz to FR - 3 MHz	-	90
FR + 3 MHz to 914 MHz	-	90
100 kHz to < 727 MHz	113	-
> 782 MHz to 12,75 GHz	113	-
100 kHz to < 849 MHz	-	113
> 914 MHz to 12,75 GHz	-	113

NOTE 1: These values differ from 3GPP TS 05.05 because of practical generator limits in the SS.

NOTE 2: For an E-GSM 900 MS the level of the unwanted signal in the band 905 MHz to < 915 MHz is relaxed to 108 dBuVemf( ).

NOTE 3: For a GSM 450 small MS the level of the unwanted signal in the band 450,4 MHz to < 457,6 MHz is relaxed to 108 dBuVemf( ). For a GSM 480 small MS the level of the unwanted signal in the band.

478,8 MHz to < 486 MHz is relaxed to 108 dBuVemf( ).

e) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication. The SS tests the RBER compliance for the bits of class II, by examining sequences of at least the minimum number of samples of consecutive bits of class II, where bits are taken only from those frames for which no bad frame indication was given. The number of error events is recorded.

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

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

19.3 Test Data

Environmental Conditions

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

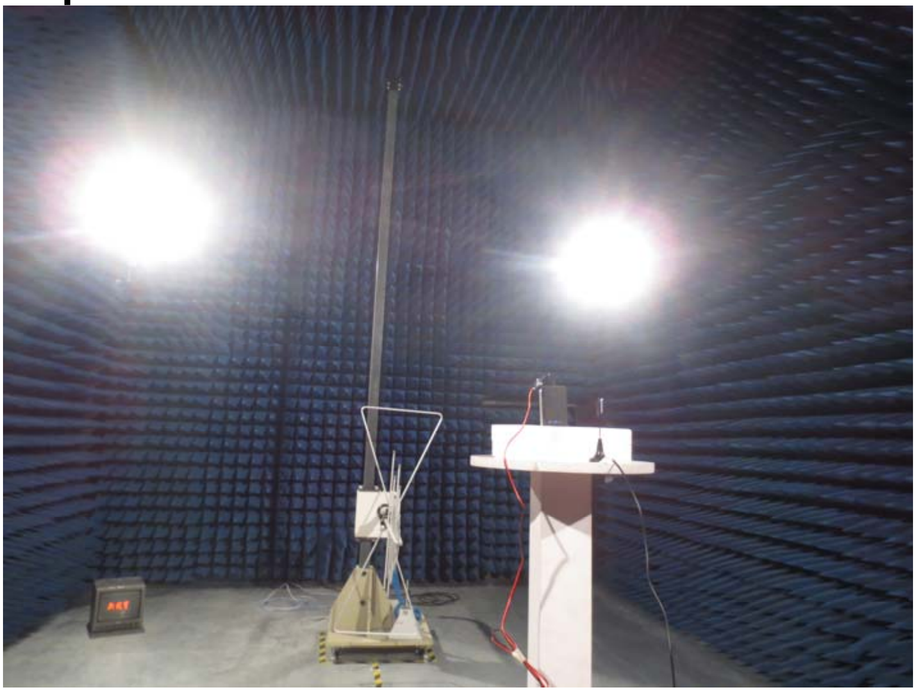
GSM 900 Band:

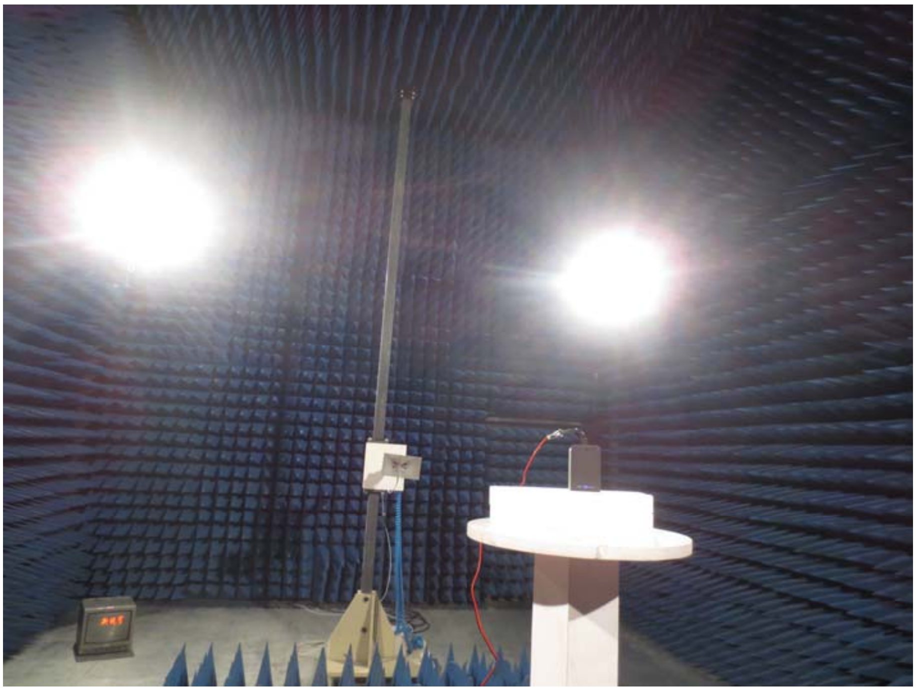
Channel frequency (MHz)	FBER (%)	Number of test samples	Limit (%)	Result
880.2	0.154	10000	2.439	pass
902.0	0.141	10000	2.439	pass
914.8	0.051	10000	2.439	pass

DCS 1800 Band:

Channel frequency (MHz)	FBER (%)	Number of test samples	Limit (%)	Result
1710.2	0.026	10000	2.439	pass
1747.8	0.051	10000	2.439	pass
1784.8	0.038	10000	2.439	pass

20 Test Setup Photo





21 EUT Constructional Details

Reference to the test report No. CCIS13070022501

------End of report------